LEAVENWORTH NATIONAL FISH HATCHERY
PILOT CIRCULAR TANK and SOLIDS HANDLING PROJECT

VOLUME 1

Technical Specifications
Issued for Construction

Prepared For: US Bureau of Reclamation

Prepared By: McMillen Jacobs Associates

Signed update on April 30, 2020

April 2020
This page intentionally left blank.
Leavenworth National Fish Hatchery – Pilot Circular Tanks and Solids Handling

Solicitation No. 140R1020R0012
Leavenworth National Fish Hatchery, Washington
This solicitation issued by
Contracting Officer
Columbia Pacific Northwest Interior Region 9
Bureau of Reclamation
1150 North Curtis Road, Suite 100
Boise ID 83706-1234

Phone inquiries
regarding this solicitation
should be made to
Regional Acquisition Management Officer
Telephone Number: (208) 378-5364
SECTION 00 00 30
FOREWORD

Leavenworth National Fish Hatchery
Pilot Circular Tanks and Solids Handling Project
Leavenworth, Washington

FOREWORD

The work is located at the Leavenworth National Fish Hatchery, 12790 Fish Hatchery Road, Leavenworth, Chelan County, WA 98826. The work of this Contract comprises the construction of a water supply and drain system that will connect to the existing Leavenworth National Fish Hatchery (Hatchery) infrastructure and provide required piping for the operation of a partial reuse aquaculture system (PRAS). Demolition of the northern bank of Small Foster Lucas Pond raceways is required to allow for the installation of two (2) circular tank PRAS. Each PRAS is comprised of two (2) 26-foot diameter by 7-foot high dual drain circular tanks, a carbon dioxide (CO2) stripper system, microscreen drum filter, ultra-violet disinfection equipment, low head oxygenators (LHOs), submersible pumps, pump sump, and associated support equipment and piping. The solids handling equipment is comprised of microscreen drum filters, a radial flow separator, solids pumping station, and construction of concrete evaporation ponds and associated support equipment and piping. The circular tank PRAS and solids handling facility will be enclosed in a pre-manufactured metal building.

The installation of new raw water supply piping and ground water piping will be connected to existing water supplies located just outside (west side) of the existing hatchery building. Overflow drain pipes (clean effluent from PRAS) will connect to existing drain manholes. Effluent piping will be routed from the solids handling equipment to either the existing abatement ponds or to the solids handling evaporation ponds.

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 PLACE OF BID OPENING, SEE "SOLICITATION, OFFER, AND AWARD," STANDARD FORM 1442.

FOR INFORMATION REGARDING BUREAU OF RECLAMATION'S PUBLICATION "RECLAMATION SAFETY AND HEALTH STANDARDS" INCLUDING REVISIONS AT http://www.usbr.gov/ssle/safety/RSHS/rshs.html WHICH IS APPLICABLE TO WORK UNDER THIS CONTRACT, SEE CLAUSE AT "WBR 1452.223-81 SAFETY AND HEALTH."
PART I THE SCHEDULE ........................................................................................................... A-1

SECTION A SOLICITATION/CONTRACT FORM .................................................................. A-1

SECTION B SUPPLIES OR SERVICES AND PRICES/COSTS ......................................... B-1

SECTION C DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK .......... C-1

DIVISION 01 - GENERAL REQUIREMENTS

Section 01 00 00 Table of Contents
Section 01 11 00 Summary of Work
Section 01 14 10 Use of Site
Section 01 14 30 Interruption of Service
Section 01 31 19 Project Management and Coordination
Section 01 32 10 Construction Program
Section 01 33 00 Submittals
Section 01 35 10 Safety Data Sheets
Section 01 35 20 Safety and Health
Section 01 35 30 Contractor On-site Safety Personnel
Section 01 42 10 Reference Standards
Section 01 46 00 Quality Procedures
Section 01 46 20 Testing Agency Services
Section 01 51 00 Temporary Utilities
Section 01 52 10 Field Office
Section 01 55 00 Vehicular Access and Parking
Section 01 56 10 Protection of Existing Installations
Section 01 56 15 Protection of Existing Utilities
Section 01 56 32 Temporary Safety Fence
Section 01 57 20 Environmental Controls
Section 01 57 30 Water Pollution Control
Section 01 57 90 Preservation of Historical and Archeological Data
Section 01 60 00 Product Requirements
Section 01 71 20 Surveying
Section 01 74 00 Cleaning and Waste Management
Section 01 78 30 Project Record Documents

DIVISION 02 - EXISTING CONDITIONS

Section 02 41 00 Demolition, Salvage, and Rehabilitation
Section 02 83 30 Removal and Disposal of Coatings Containing Heavy Metals

DIVISION 03 - CONCRETE

Section 03 11 13 Concrete Formwork
Section 03 20 00 Reinforcement Steel
Section 03 30 00 Cast-in-Place Concrete
Section 03 32 00 Joints in Concrete
Section 03 60 00 Cementitious Grout
Section 03 65 00 Epoxy Resin Adhesive Systems
**DIVISION 05 – METALS**
Section 05 12 00  Structural Steel Framing
Section 05 50 00  Miscellaneous Metalwork

**DIVISION 07 – THERMAL AND MOISTURE PROTECTION**
Section 07 92 00  Sealants and Caulking

**DIVISION 8 - OPENINGS**
Section 08 91 00  Louvers

**DIVISION 09 – FINISHES**
Section 09 96 00  Protective Coatings

**DIVISION 13 – SPECIAL CONSTRUCTION**
Section 13 34 13  Pre-engineered Metal Buildings
Section 13 34 19  Pre-Manufactured Chemical Storage Unit
Section 13 94 01  Fiberglass Tanks
Section 13 99 60  Partial Reuse Aquaculture System (Circular Tanks)
Section 13 99 61  Aquaculture System Installation

**DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING**
Section 23 00 00  Heating, Ventilation, and Air Conditioning, General
Section 23 05 00  Common Work Results for HVAC
Section 23 05 93  Testing, Adjusting, and Balancing for HVAC
Section 23 34 23  HVAC Power Ventilators
Section 23 82 39  Unit Heaters

**DIVISION 26 – ELECTRICAL**
Section 26 05 00  Electrical Work, General
Section 26 05 10  Conductors and Cables
Section 26 05 26  Grounding
Section 26 05 36  Wiring Devices
Section 26 05 43  Underground Raceway Systems
Section 26 08 00  Electrical Testing
Section 26 12 16  Panel Boards and General Purpose Dry Type Transformers
Section 26 29 23  Variable Frequency Drives
Section 26 32 10  Engine-Generator Set
Section 26 50 00  Lighting, Interior and Exterior
Section 26 90 00  SCADA Controls and Automation

**DIVISION 31 – EARTHWORK**
Section 31 11 00  Site Preparation (Clearing and Grubbing)
Section 31 23 19  Dewatering
Section 31 30 00  Earthwork
Section 31 35 00  Erosion and Sediment Control, General
Section 31 35 26   Erosion and Sediment Control, Barriers

DIVISION 32 – EXTERIOR IMPROVEMENTS
Section 32 11 13   A.C. Pavement and Base

DIVISION 33 – UTILITIES
Section 33 05 31   Precast Concrete Manholes and Vaults
Section 33 11 21   PVC Pressure Pipe, Rubber Joints (AWWA C900, Modified)
Section 33 11 22   PVC Pressure Pipe, Rubber Joints (AWWA C905, Modified)

DIVISION 40 – PROCESS PIPING AND INTEGRATION
Section 40 23 00   Piping, General
Section 40 23 02   Pipe Supports
Section 40 23 16   Stainless Steel Pipe
Section 40 23 22   PVC Pressure Pipe
Section 40 91 00   Meters, General
Section 40 91 23   Electromagnetic Flow Meter

DIVISION 43 – PROCESS GAS AND LIQUID Handling
Section 43 25 00   Valves, General
Section 43 25 01   Valve and Gate Actuators
Section 43 25 02   Butterfly Valves
Section 43 25 03   Check Valves
Section 43 25 04   Ball Valves
Section 43 25 41   Pressure Relief Valves
Section 43 25 42   Miscellaneous Valves

DIVISION 44 – WASTE CONTROL EQUIPMENT
Section 44 35 00   Pumps General

DIVISION 52 - DRAWINGS
Section 52 00 00   Drawings

SECTION D   PACKAGING AND MARKING ................................................................. D-1
SECTION E   INPSECTION AND ACCEPTANCE....................................................... E-1
   E.1.  52.236-5 Material and Workmanship (Apr 1984).................................E-1
   E.2.  52.246-12 Inspection of Construction (Aug 1996)...............................E-1
   E.3.  52.246-21 Warranty of Construction (Mar 1994).................................E-1
SECTION F   Section F Deliveries and Performance............................................F-1
   F.1.  52.211-10 Commencement, Prosecution, and Completion of Work (Apr 1984),
       Alternate I (Apr 1984).............................................................................F-1
   F.2.  52.211-18 Variation in Estimated Quantity (Apr 1984)........................F-1
Solicitation No. 140R1020R0012
Pilot Circular Tank and Solids Handling Project
Leavenworth National Fish Hatchery

F.3. 52.212 Liquidated Damages - Construction (Sep 2000) ........................................ F-1

F.4. 52.242-14 Suspension of Work (Apr 1984) .......................................................... F-1

SECTION G CONTRACT ADMINISTRATION .................................................... G-1

G.1. 1452.242-90 Government Point of Contact ......................................................... G-1

G.2. 1452.201-70 Authorities and Delegations (Sep 2011) ........................................... G-1

G.3. DOI-AAAP-0028 Electronic Invoicing and Payment Requirements – Invoice Processing Platform (IPP) ................................................................. G-1

G.4. 1452.201-80 Contracting Officer’s Representative’s Authorities and Limitations – Bureau of Reclamation (May 2018) ...................................................... G-2

SECTION H SPECIAL CONTRACT REQUIREMENTS ........................................ H-1

H.1. 1452.209-90 Key Personnel Requirements – Bureau of Reclamation – PN Region (Feb 1995) ................................................................................................. H-1

H.2. DOI-AAAP-0050 Contractor Performance Assessment Reporting System ........ (May 2018) ........................................................................................................ H-1

PART II CONTRACT CLAUSES ....................................................................... H-1

SECTION I CONTRACT CLAUSES ................................................................... I-1

I.1. 52.252-2 Clauses Incorporated by Reference (Feb 1998) ....................................... I-1

I.2. 52.202-1 Definitions (Nov 2013) ........................................................................... I-1

I.3. 52.203-3 Gratuities (Apr 1984) ............................................................................. I-1

I.4. 52.203-5 Covenant Against Contingent Fees (May 2014) .................................. I-1

I.5. 52.203-6 Restriction on Subcontractor Sales to the Government (Sep 2006) ...... I-1

I.6. 52.203-7 Anti-Kickback Procedures (May 2014) ................................................... I-1

I.7. 52.203-8 Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity (May 2014) ................................................................. I-1

I.8. 52.203-10 Price or Fee Adjustment for Illegal or Improper Activity (May 2014) I-1

I.9. 52.203-12 Limitations on Payments to Influence Certain Federal Actions ......... (Oct 2010) ................................................................. I-1


I.11. 52.203-14 Display of Hotline Poster(s) (Oct 2015) ............................................. I-1

I.12. 52.203-17 Contractor Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights (Apr 2014) ........................... I-1

I.13. 52.203-19 Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (Jan 2017) ............................................................... I-1

I.15. 52.204-4 Printed or Copied Doubled-Sided on Postconsumer Fiber Content Paper (May 2011) .................................................................................................................. I-1
I.17. 52.204-9 Personal Identity Verification of Contractor Personnel (Jan 2011)......... I-6
I.18. 52.204-10 Reporting Executive Compensation and First-Tier Subcontract Awards (Oct 2018) ................................................................................................................... I-6
I.19. 52.204-12 Unique Entity Identifier Maintenance (Oct 2016) ................................ I-6
I.20. 52.204-13 System for Award Management (Oct 2018) ......................................... I-6
I.21. 52.204-14 Service Contract Reporting Requirements (Oct 2016) ..................... I-6
I.22. 52.204-18 Commercial and Government Entity Code Maintenance (Jul 2016) ...... I-6
I.23. 52.204-19 Incorporation by Reference Representations and Certifications ...... (Dec 2014) .................................................................................................................. I-6
I.24. 52.204-23 Prohibition on Contracting for Hardware, Software, and Services Developed or Provided by Kaspersky Lab and Other Covered Entities (Jul 2018) ... I-6
I.25. 52.204-25 Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Aug 2019) ..................................................... I-6
I.26. 1452.204-70 Release of Claims – Department of Interior (Jul 1996) ................. I-6
I.27. 52.209-6 Protecting the Government’s Interest When Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment (Oct 2015) .......... I-6
I.29. 52.209-10 Prohibition on Contracting with Inverted Domestic Corporations ........ (Nov 2015) .................................................................................................................. I-6
I.30. 52.215-2 Audit and Records – Negotiation (Oct 2010) ......................................... I-6
I.32. 52.215-10 Price Reduction Defective Cost or Pricing Data (Aug 2011) ............. I-6
I.33. 52.215-12 Subcontractor Cost or Pricing Data (Oct 2010) .................................. I-7
I.34. 1452.215-70 Examination of Records by the Department of Interior ............... (Aug 1996) (Deviation) .............................................................................................. I-7
I.35. 52.215-21 Requirements for Cost or Pricing Data and Data Other Than Certified Cost or Pricing Data – Modifications (Oct 2010) ....................................................... I-7
I.37. 52.219-6 Notice of Total Small Business Set-Aside (Mar 2020) (Deviation) .... I-7
I.38. 52.219-8 Utilization of Small Business Concerns (Oct 2018) ....................................... I-8
I.39. 52.219-14 Limitations on Subcontracting (Mar 2020) (Deviation) ............................... I-8
I.40. 52.219-28 Post Award Small Business Program Re-representation (Mar 2020) .......... I-10
I.41. 52.222-3 Convict Labor (Jun 2003) ........................................................................ I-10
I.42. 52.222-4 Contract Work Hours and Safety Standards (Jun 2003) ........................... I-10
I.43. 52.222-6 Construction Wage Rate Requirements (Aug 2018) ............................... I-10
I.44. 52.222-7 Withholding of Funds (May 2014) ......................................................... I-10
I.45. 52.222-8 Payrolls and Basic Records (Aug 2018) .................................................... I-10
I.46. 52.222-9 Apprentices and Trainees (Jul 2005) ......................................................... I-10
I.47. 52.222-10 Compliance with Copeland Act Requirements (Feb 1998) ..................... I-10
I.48. 52.222-11 Subcontracts (Labor Standards) (May 2014) ........................................ I-10
I.49. 52.222-12 Contract Termination – Debarment (May 2014) .................................... I-10
I.50. 52.222-13 Compliance with Construction Wage Rate Requirements and Relation Regulations (May 2014) .............................................................. I-10
I.51. 52.222-14 Disputes Concerning Labor Standards (Feb 1988) ................................. I-10
I.52. 52.222-15 Certification of Eligibility (May 2014) ................................................ I-10
I.53. 52.222-21 Prohibition of Segregated Facilities (Apr 2015) ................................. I-10
I.54. 52.222-26 Equal Opportunity (Sep 2016) ............................................................ I-10
I.55. 52.222-27 Affirmative Action Compliance Requirements for Construction ............ (Apr 2015) ........................................................................................................ I-10
I.56. 52.222-35 Equal Opportunity for Veterans (Oct 2015) ......................................... I-10
I.57. 52.222-36 Equal Opportunity for Workers with Disabilities (Jul 2014) ............... I-11
I.58. 52.222-37 Employment Reports on Veterans (Feb 2016) ...................................... I-11
I.59. 52.222-40 Notification of Employee Rights Under the National Labor Relations Act (Dec 2010) ..................................................................................................... I-11
I.60. 52.222-50 Combating Trafficking of Persons (Jan 2019) .......................................... I-11
I.61. 52.222-54 Employment Eligibility Verification (Oct 2015) .................................. I-11
I.63. 52.222-62 Paid Sick Leave Under Executive Order 13706 (Jan 2017) ................. I-11
I.64. 52.223-2 Affirmative Procurement of Bio-based Products Under Service and Construction Contracts (Sept 2013) .............................................................. I-11
I.65. 52.223-3 Hazardous Material Identification and Material Safety Data (Jan 1997), Alternate I (Jan 1995) .................................................................
I.66.  52.223-5 Pollution Prevention and Right-to-Know Information (May 2011) ..........I-11
I.67.  52.223-6 Drug Free Workplace (May 2001) ....................................................I-11
I.68.  52.223-9 Estimate of Percentage of Recovered Material Content for EPA-Designated Items (May 2008) .................................................................I-12
I.69.  52.223-18 Encouraging Contractor Policies to Ban Text Messaging While Driving (Aug 2011) .........................................................................................I-12
I.70.  52.223-20 Aerosols (Jun 2016) .....................................................................I-12
I.71.  52.223-21 Foams (Jun 2016) .......................................................................I-12
I.72.  WBR 1452.223-80 Asbestos Free Warranty – Bureau of Reclamation (Oct 1992) I-12
I.73.  WBR 1452.223-81 Safety and Health – Bureau of Reclamation (Jun 2015) ......I-12
I.74.  WBR 1452.223-82 Protecting Federal Employees and the Public from Exposure to Tobacco Smoke in the Federal Workplace (Dec 2009).................................I-13
I.75.  52.225-9 Buy-American – Construction Materials (May 2014) .....................I-13
I.76.  52.225-13 Restrictions on Certain Foreign Purchases (Jun 2008) .....................I-17
I.77.  52.227-1 Authorization and Consent (Dec 2007) ............................................I-17
I.78.  52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement (Dec 2007) ....................................................................................I-17
I.79.  52.227-4 Patent Indemnity – Construction Contracts (Dec 2007) ......................I-17
I.80.  52.227-17 Rights in Data – Special Works (Dec 2007) .....................................I-17
I.81.  52.228-2 Additional Bond Security (Oct 1997) .............................................I-17
I.82.  52.228-5 Insurance – Work on a Government Installation (Jan 1997) ............I-17
I.83.  52.228-11 Pledges of Assets (Aug 2018) ......................................................I-17
I.84.  52.228-12 Prospective Subcontract Requests for Bonds (May 2014) .......... I-17
I.85.  52.228-14 Irrevocable Letter of Credit (Nov 2014) ........................................I-17
I.86.  52.228-15 Performance and Payment Bonds – Construction (Oct 2010) ........I-17
I.87.  1452.228-70 Liability Insurance – Department of Interior (Jul 1996) .........I-18
I.88.  WBR 1425.228-84 Certification of Representatives for Corporate Sureties (Jul 1993) .................................................................................................I-19
I.89.  52.229-3 Federal, State, and Local Taxes (Feb 2013) ....................................I-19
I.91.  WBR 1452.231-81 Equipment Ownership and Operating Expense (Jul 1998) ....I-19
I.92.  52.232-5 Payment Under Fixed-Price Construction Contracts (May 2014) ....I-21
I.93.  52.232-17 Interest (May 2014) .................................................................I-21
I.94. 52.232-23 Assignment of Claims (May 2014) ................................................................. I-21
I.95. 52.232-27 Prompt Payment for Construction Contracts (Jan 2017) ..................... I-21
I.96. 52.232-33 Payment by Electronic Funds Transfer – System for Award Management (Oct 2018) ........................................................................................................ I-21
I.97. 52.232-39 Unenforceability of Unauthorized Obligations (Jun 2013) ............... I-21
I.98. 52.232-40 Providing Accelerated Payments to Small Business Subcontractors (Dec 2013) .......................................................................................................................... I-21
I.100. WBR 1452.232-82 Other Invoice Requirements- Bureau of Reclamation (Jul 1998) ....................................................................................................................... I-23
I.101. 52.233-1 Disputes (Mar 2014), Alternate I (Dec 1991) ................................................ I-24
I.102. 52.233-3 Protest After Award (Aug 1996) ............................................................... I-24
I.104. WBR 1452.233-81 Claims Accounting – Bureau of Reclamation (Jul 1993) ..... I-24
I.105. 52.236-2 Differing Site Conditions ........................................................................ I-24
I.106. 52.236-3 Site Investigation and Conditions Affecting Work (Apr 1984) .......... I-24
I.107. 52.236-4 Physical Data (Apr 1984) ........................................................................ I-24
I.108. 52.236-6 Superintendence by the Contractor (Apr 1984) ..................................... I-24
I.109. 52.236-7 Permits and Responsibilities (Nov 1991) ............................................... I-24
I.110. 52.236-8 Other Contracts (Apr 1984) ................................................................. I-24
I.111. 52.236-9 Protecting Existing Vegetation, Structures, Equipment, Utilities, and Improvements (Apr 1984) ................................................................. I-24
I.112. 52.236-10 Operation and Storage Areas (Apr 1984) ............................................. I-24
I.113. 52.236-11 Use and Possession Prior to Completion of Work (Apr 1984) .......... I-24
I.114. 52.236-12 Cleaning Up (Apr 1984) ..................................................................... I-25
I.116. 52.236-16 Quantity Surveys (Apr 1984) .............................................................. I-25
I.117. 52.237-17 Layout of Work (Apr 1984) ............................................................... I-25
I.118. 52.236-21 Specifications and Drawings for Construction (Feb 1997), Alternate I (Apr 1984) .............................................................................................................. I-25
I.119. 52.236-26 Preconstruction Conference (Feb 1995) ............................................. I-25
PART III LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS ..... I-1

SECTION J LIST OF ATTACHMENTS ........................................................................ J-1

J.1. Department of Labor, WA General Wage Decision No. WA20200065, dated 3/13/2020, eight (8) pages. ................................................................. J-1

J.2. Past Performance Questionnaire, three (3) pages............................................. J-1

J.3. Pilot Circular Tank & Solids Handling Drawings – Separate Attachment. ............ J-1

J.4. Bid Bond, two (2) pages – Separate Attachment................................................. J-1

PART IV REPRESENTATIONS AND INSTRUCTIONS............................................. J-1

SECTION K REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF OFFERORS OR RESPONDENTS............................................ K-1

K.1. 52.203-2 Certificate of Independent Price Determination (Apr 1985)................. K-1

K.2. 52.203-18 Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements- Representation (Jan 2017).......... K-2

K.3. 52.204-8 Annual Representations and Certifications (Mar 2020).......................... K-2

K.4. 52.204-24 Representation Regarding Certain Telecommunications and Video Surveillance Services or Equipment (Dec 2019)............................... K-6

K.5. 52.209-7 Information Regarding Responsibility Matters (Oct 2018)............... K-9

SECTION L INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS.. L-1
Solicitation No. 140R1020R0012  
Pilot Circular Tank and Solids Handling Project  
Leavenworth National Fish Hatchery

L.1. 52.252-1 Solicitation Provisions Incorporated by Reference ...........................................L-1
L.2. 52.204-7 System for Award Management (Oct 2018) ....................................................L-1
L.3. 52.204-16 Commercial and Government Entity Code Reporting (Jul 2016) ..............L-1
L.4. 52.211-1 Availability of Specifications Listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 (Aug 1998) .................................................................L-1
L.5. 52.211-2 Availability of Specifications, Standards, and Data Item Descriptions Listed in the Acquisition Streamlining and Standardization Information System (ASSIST) (Apr 2014) .................................................................................................................L-1
L.6. 52.215-1 Instructions to Offerors – Competitive Acquisitions (Jan 2017) .................L-1
L.7. 52.216-6 Brand Name or Equal (Aug 1999) .................................................................L-6
L.8. 52.215-16 Facilities Capital Cost of Money (Jun 2003) ................................................L-6
L.9. 52.215-20 Requirement for Cost or Pricing Data Information Other than Cost or Pricing Data (Oct 2010) .................................................................L-6
L.14. WBR 1452.215-84 Pricing Proposal Instructions and Submission of Cost or Pricing Data – Bureau of Reclamation (Jan 2001) .........................................................L-13
L.15. WBR 1452.215-91 Facsimile Acknowledgement of Amendments, Modifications to Offers, and Withdrawals of Offers .........................................................L-16
L.17. 52.216-1 Type of Contract (Apr 1984) ........................................................................L-17
L.18. 52.222-5 Construction Wage Requirements – Secondary Site of Work (May 2014) .................................................................................................................L-17
L.20. 1452.222-90 Non-Discrimination Notice to U.S. DOI Contractors, Subcontractors, and Lessor (May 2014) .................................................................L-19
L.21. 52.228-1 Bid Guarantee (Sep 1996) ............................................................................L-19
L.22. 52.233-2 Service of Protest – Department of Interior (Deviation) (Aug 1996) ......L-20
L.23. 52.236-27 Site Visit (Construction) (Feb 1995), Alternate I (Feb 1995) ...............L-20
L.24. 52.236-28 Preparation of Offers – Construction (Oct 1997) ....................................L-21
L.26. 52.252-5 Authorized Deviation in Provisions (Apr 1984) .......................................L-21

SECTION M EVALUATION FACTORS FOR AWARD ............................................. M-1

M.1. WBR 1452.215-85 – Evaluation Factors for Award - Quality Predominance – Bureau Of Reclamation (Sep 2019) ........................................................................................................... M-1

This page intentionally left blank.
IMPORTANT -- The "offer" section on the reverse must be fully completed by offeror.

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder."

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date)

Project Title: Pilot Circular Tank and Solids Handling Project, Leavenworth National Fish Hatchery, WA

This solicitation is being solicited as a Total Small Business Set-Aside.

The construction magnitude is between $5,000,000.00 and $10,000,000.00

A site visit has been scheduled for 27 May 2020 at 1:00 PM PT. Please refer to Section L.24 in the solicitation for DETAILED instructions/requirements for the site visit.

Block 11 states the Period of Performance (POP) is 269 days from Notice to Proceed (NTP) which is correct. Due to system limitations, the POP reflected under CLIN 10 reflects a date as the system will not accept number of days.

Block 13 below: states offerors must provide 4 copies of the proposal--please review provision WBR 1452.215-81, General Proposal Instructions for detailed instructions on proposal requirements. Please ensure company DUNS number is included on your proposal.

Continued ...
OFFER (Must be fully completed by offeror)

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

15. TELEPHONE NO. (Include area code)

16. REMITTANCE ADDRESS (Include only if different than item 14.)

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within ____________ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in item 13d. Failure to insert any number means the offeror accepts the minimum in item 13d.)

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation -- give number and date of each)

AMENDMENT NO. 
DATE.

20a. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)

20b. SIGNATURE

20c. OFFER DATE

AWARD (To be completed by Government)

Continued...

21. ITEMS ACCEPTED:

22. AMOUNT

23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified)

ITEM

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

☐ 10 U.S.C. 2304(c) ( )

☐ 41 U.S.C. 253(c) ( )

26. ADMINISTERED BY CODE

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT

(Contractor is required to sign this document and return 4 copies to issuing office.)

Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations,

30a. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)

30b. SIGNATURE

30c. DATE

31. NAME OF CONTRACTING OFFICER (Type or print)

Connie Gordon

31a. UNITED STATES OF AMERICA

31c. DATE

By

STANDARD FORM 1442 (REV. 4-85) BACK
<table>
<thead>
<tr>
<th>ITEM NO. (A)</th>
<th>SUPPLIES/SERVICES (B)</th>
<th>QUANTITY (C)</th>
<th>UNIT (D)</th>
<th>UNIT PRICE (E)</th>
<th>AMOUNT (F)</th>
</tr>
</thead>
</table>
| 00010       | LEAVENWORTH NATIONAL FISH HATCHERY PILOT CIRCULAR TANK and SOLIDS HANDLING PROJECT Leavenworth, WA (Price Schedule CLINS 1 Through 24)

See Following Continuation Page(s).
Product/Service Code: Y1JZ
Product/Service Description: CONSTRUCTION OF MISCELLANEOUS BUILDINGS

Legacy Doc #: BOR
Delivery: 06/23/2021
Delivery Location Code: 0009906765
Bureau of Reclamation-PN-CCAO
Columbia Cascades Area Office
1917 Marsh Road
Yakima WA 98901-2058 US

Period of Performance: 08/31/2020 to 06/23/2021
B.1 PRICE SCHEDULE

(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 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 clause at FAR 52.211-18, Variation in Estimated Quantity, no claim shall be made against the Government for overruns or underruns. The contract clause at FAR 52.211-18, Variation in Estimated Quantity does not apply to lump sum items.

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

(e) Definitions:

   (1) CLIN – Contract Line Item Number.

### PRICE SCHEDULE

<table>
<thead>
<tr>
<th>CLIN</th>
<th>Section</th>
<th>Supplies or Services</th>
<th>Quantity and Unit</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WBR 1452.232-81</td>
<td>Mobilization and Preparatory Work</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>02 41 00</td>
<td>Demolition, Salvage, and Rehabilitation</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>02 83 30</td>
<td>Removal and Disposal of Coatings Containing Heavy Metals</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>03 30 00</td>
<td>Concrete</td>
<td>284 CY $</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>05 50 00</td>
<td>Miscellaneous Metalwork</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>08 91 00</td>
<td>Louvers</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>13 34 13</td>
<td>Metal Building System</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>13 34 13</td>
<td>Generator Cover</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>13 34 19</td>
<td>Chemical Metal Storage Unit System</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. 13 94 01</td>
<td>Fiberglass Tanks</td>
<td>For the lump sum of $</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Price Schedule
B - 1
<table>
<thead>
<tr>
<th>CLIN</th>
<th>Section</th>
<th>Supplies or Services</th>
<th>Quantity and Unit</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>13 99 60</td>
<td>Partial Reuse Aquaculture System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>23 34 23</td>
<td>HVAC Power Ventilators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>23 82 39</td>
<td>Unit Heaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>26 05 00</td>
<td>Complete Electrical System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>31 11 00</td>
<td>Site Preparation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>31 30 00</td>
<td>Excavation, Backfill and Compacting for Structures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>32 11 13</td>
<td>Asphalt Concrete Pavement and Base</td>
<td>25,750 SF</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>33 05 31</td>
<td>Precast Concrete Manholes and Vaults</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>33 11 21</td>
<td>PVC Pressure Pipe, Rubber Joints (AWWA C900, Modified)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>33 11 22</td>
<td>Large PVC Pressure Pipe, Rubber Joints (AWWA C905, Modified)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>40 23 16</td>
<td>Stainless Steel Pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>40 23 22</td>
<td>PVC Pressure Pipe (IPS Solvent Welded)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>40 91 23</td>
<td>Electromagnetic Flow Meters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>43 25 00</td>
<td>Valves</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL FOR PRICE SCHEDULE $_________________

END OF SUPPLIES OR SERVICES AND PRICES
1. The person signing the Specifications package as "Prepared by" shall have developed or assembled the written Specifications.

2. The person signing the Specifications package for "Technical Approval" shall have been in responsible charge of the overall design including developing or assembling the Specifications. This person will typically be the design team leader. In cases where the designs described by the Specifications meet the criteria for preparation by a registered engineer or architect, this person shall be registered with the applicable professional designation after their signature, such as P.E. for professional engineer or R.A. for registered architect. By this signature, this person is certifying the written Specifications convey the design intent as portrayed on the Drawings included therein. For Specifications package containing designs from multiple disciplines, it is the signing individual’s responsibility to ensure (using procedures defined by his/her organization) that the technical information prepared by other professions and disciplines and depicted in the document is compatible with the overall design intent and that the documents used to depict that information (e.g., drawings) include signatures with appropriate professional registration designations.
This page intentionally left blank.
DIVISION 01 - GENERAL REQUIREMENTS
PART 1 GENERAL

1.01 LOCATION

A. The work is located at the Leavenworth National Fish Hatchery, 12790 Fish Hatchery Road, Leavenworth, Chelan County, WA 98826. From the west end of Leavenworth, travel approximately 2 miles south on Icicle Road, and turn left onto Fish Hatchery Road.

1.02 PRINCIPAL COMPONENTS OF WORK

A. The work of this Contract comprises the construction of a water supply and drain system that will connect to the existing Leavenworth National Fish Hatchery (Hatchery) infrastructure and provide required piping for the operation of a partial reuse aquaculture system (PRAS). Demolition of the northern bank of Small Foster Lucas Pond raceways is required to allow for the installation of two (2) circular tank PRAS. Each PRAS is comprised of two (2) 26-foot diameter by 7-foot high dual drain circular tanks, a carbon dioxide (CO2) stripper system, microscreen drum filter, ultra-violet disinfection equipment, low head oxygenators (LHOs), submersible pumps, pump sump, and associated support equipment and piping. The solids handing equipment is comprised of microscreen drum filters, a radial flow separator, solids pumping station, and construction of concrete evaporation ponds and associated support equipment and piping. The circular tank PRAS and solids handling facility will be enclosed in a pre-manufactured metal building.

B. The installation of new raw water supply piping and ground water piping will be connected to existing water supplies located just outside (west side) of the existing hatchery building. Overflow drain pipes (clean effluent from PRAS) will connect to existing drain manholes. Effluent piping will be routed from the solids handling equipment to either the existing abatement ponds or to the solids handling evaporation ponds.

1.03 SPECIFICATIONS REQUIREMENTS

A. Requirements in Division 1, General Requirements, apply to Divisions 2 through 52.

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

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

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

1. Government: Bureau of Reclamation
2. Owner: Government, Bureau of Reclamation
3. Engineer: McMillen Jacobs Associates

1.05 ACRONYMS

A. The following acronyms apply to specifications Divisions 1 through 52:

1. CO: Contracting Officer.
2. COR: Contracting Officer’s Representative.
3. OGR: Onsite Government Representative.

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 (USBR)
      Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species (Technical memorandum No. 86-68220-07-05) 2012 Edition
      Available online at: http://www.usbr.gov/mussels/prevention

1.03 SUBMITTALS

A. Submit the following 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 site 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) Utilities including air, power, and water lines; fire hydrants; and compressor station.
         4) First-aid and medical facilities.
         5) Concrete and aggregate plants. Show sizes, rated capacities, and general features of aggregate processing plant including transporting, storing, screening, and washing facilities; concrete batching and mixing plant; and concrete conveying, placing, and cooling plants.
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. 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.

1.04 PROJECT CONDITIONS

A. Government land as shown on drawings may be used for required construction facilities.

B. When private land is used for construction facilities, or other construction purposes, make necessary arrangements associated with use of private land.

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

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 Cleaning Manual.
3. COR will inspect construction equipment following procedures described in Cleaning Manual before allowing equipment onsite.

3.02 RESTORATION

A. Restore Contractor use areas to pre-construction condition.

B. Restore temporary construction roads to original contours and make impassable to vehicular traffic when no longer required.

C. After completion of work, regrade and scarify Government land used for construction purposes and not required for completed installation so that surfaces blend with natural terrain and are in a condition that will facilitate revegetation, provide proper drainage, and prevent erosion.

D. Seed disturbed areas of Government land used for construction purposes and not required for completed installation with species of native plants, or other approved perennial species, as recommended by an experienced local horticulturist.

END OF SECTION
This page intentionally left blank.
SECTION 01 14 30
INTERRUPTION OF SERVICE

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Cost:
   1.  Include cost in prices offered in the Price Schedule for items of work for which
       interruption of services are required.

1.02  SUBMITTALS

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

B.  RSN 01 14 30-1, Interruption of Service Request:
   1.  Area where work will be done (by number or other description).
   2.  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.
   3.  Commencement time of work.
   4.  Duration of work.
   5.  Number of personnel and their classification.
   6.  Description of equipment to be used.
   7.  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.

4. Interruption of service window available to Contractor:
   a. The Contractor's attention is directed to the fact that during the period of early June to April, no interruption in the water supply flow can be accommodated, and the Contractor shall so schedule its construction operations that no interference with the operation of the hatchery will occur during this critical period.
   b. Connection to the existing hatchery water supply piping (raw water and ground water) shall occur between April and May. Contractor shall coordinate connections with HATCHERY. HATCHERY personnel shall provide exact dates for connection of the water supply pipeline. Interruption periods shall be made as short as possible.

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 in construction schedule.

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 PROJECT COORDINATION

A. The following meetings are considered significant, but do not relieve the Contractor from the responsibility of other meetings required by the specifications.

1. Progress Review Meetings:
   a. Meeting shall be held weekly at the work site project office. Prepare agenda and distribute 24 hours before the meeting.
   b. Prepare and distribute meeting minutes.
   c. 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) USFWS Hatchery Personnel.
      5) Representatives may attend by telephone and / or video conference.
   d. 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 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 Prices 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)

1.04 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:
   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 and WBR 1452.232-82 - Other Invoice Requirements. 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


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) will 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. 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, 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 will 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/or manufacture schedules, material orders, construction seasons, and labor and/or 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. CO 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  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

1.03  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:
   1.  A - Approval:
       a.  Government will respond as to adequacy of submittal.
       b.  Action Submittals:  Considered “shop drawings” within the terms of the clause at FAR 52.236-21, Specifications and Drawings for Construction.
       c.  Approval by the Government does not relieve the Contractor of the responsibilities for any errors or omissions, or for complying with the requirements of the contract, or incurrence of any additional cost to the Government.
   2.  I - Informational:
       a.  Government will acknowledge receipt of Informational submittals.
       b.  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 as an Approval type submittal.
c. Informational Submittals: Considered “shop drawings” within terms of the clause at FAR 52.236-21, Specifications and Drawings for Construction, except that approval by the Government is not required.

d. Acknowledgement does not relieve the Contractor of the responsibilities for an errors or omissions, or for complying with the requirements of the contract, or incurrence of any additional cost to the Government.

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.
4. Provide a unique transmittal number for each submittal.

C. Drawings:

1. Minimum Identification in Title Block:
   a. Contract number and title.
   b. Contractor's or supplier's title and drawing number.
   c. Date.
2. Reserve 3- by 3-inch space next to title block for review stamps.
4. Draw to scale using computer drafting or drafting equipment, unless otherwise specified.
   a. Computer drafted drawings:
      1) Electronic file format: Compatible with AUTOCAD, Version 2018 or later.
      2) Compile using “eTransmit” utility in AUTOCAD.
   b. Drawing prepared with drafting equipment, when allowed: Lettering shall be neat.
5. Drawings Designated as “Government Format” or “Government Format” in Specifications:
   a. Computer drafted.
   b. Government will provide an electronic AutoCAD format template.
   c. Title block and sheet format:
1) As shown on standard drawing 40-D-7102.
2) Government will provide template.
3) Government will provide specific title block information to be used.

6. Final Drawings:
   a. Computer drafted.
   b. Government will provide an electronic AutoCAD format template.
   c. Show as-built changes, including revision dates, made during installation. Indicate changes by clouding.

7. Electronic Files: On CD or DVD discs.

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. Manuals:
   1. Copies:
      a. Printed copies: Bound and indexed.
      b. Electronic copies: Adobe pdf on CD or DVD discs or USB external hard drive.
         1) Bookmark longer files to assist in navigating file.
   2. Contents:
      a. Parts identification lists, lists of special tools, and accessories.
      b. Schematics and wiring diagrams.
      c. Detailed instructions for installing, operating, lubricating, and maintaining equipment.
d. As-built drawings, photographs, and test records or reports.

G. Photographs:
   1. Include negatives, or digital files on CD or DVD or USB or External Hard Drive in .jpeg or similar format.

H. Samples and Color Selection Submittals:
   1. Label with complete manufacturer's product and color 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. Xerographic sheets for color selection are not acceptable.
   4. Color Chips: Sample paint chips. Ink color reproductions are not acceptable.
   5. Label each sample, sample kit, set of color chips, or color chart with contract number and title.
   6. Government will select architectural color and pattern after product approval.

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 listed items for RSNs with multiple parts.

C. Include the following information in transmittal letters:
   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 14 days after receiving the comments, unless otherwise directed.
   4. Requirements for initial submittals apply to resubmittals.
E. More than one RSN may be submitted under a transmittal letter, provided responsible code is same.

1.06 REVIEW OF SUBMITTALS

A. Time Required:
   1. Submittal review will require 21 days for review of each submittal or resubmittal, unless otherwise specified.
   2. 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.

B. Time in Excess of Specified:
   1. CO may extend contract completion date to allow additional time for completing work affected by excess review time.
      a. Time extension will be to extent that excess review time caused delay to contract completion date.
      b. Time extension will not exceed time used in excess of specified number of days for review of submittals or resubmittals.
      c. Concurrent days of excess review time resulting from review of 2 or more separate submittals or resubmittals will be counted only once in extending contract completion date.
   2. No time extension will be allowed if Contractor fails to make complete action submittals in sequence and within time periods specified.
   3. 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.
   4. Adjustment will be subject to terms of clause at FAR 52.242-17, Government Delay of Work.

C. Return of Submittals:
   1. Action Submittals: 1 set of submittals required for action 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 CO after drawings, documentation, and technical data have been approved.
   2. Informational Submittals: Government will acknowledge Informational submittals.
a. Informational submittals will not be returned when they satisfy contract requirements.

b. Informational submittals that do not satisfy contract requirements may be returned for resubmittal or additional information may be requested.

1.07 ELECTRONIC TRANSMITTALS

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

B. SharePoint submittal must meet the requirements of Article 1.05 Submittal Procedures.

C. Only one complete set shall be submitted with each SharePoint 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, CD-ROM or other.

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. SharePoint submittals will be responded to through SharePoint.

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: Connie Gordon, Bureau of Reclamation
Pacific Northwest Region
1150 N. Curtis Road, Suite 100
Boise, Idaho 83706-1234

2. Project Construction Engineer: Eduardo Lopez-Owsley
   Bureau of Reclamation
   Pacific Northwest Region
   1150 N. Curtis Road, Suite 100
   Boise, Idaho 83706-1234

3. Project Manager: David Child
   Bureau of Reclamation
   Pacific Northwest Region, Columbia Cascades Area Office
   1917 Marsh Rd.
   Yakima, WA 98901

4. Technical Service Center, Bureau of Reclamation, Attn: Chou Cha, 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
   1. Contracting Officer: Connie Gordon, Bureau of Reclamation
      Pacific Northwest Region
      1150 N. Curtis Road, Suite 100
      Boise, Idaho 83706-1234.

   2. Responsible codes starting with “86-6” are located in Technical Service Center.
      Send these submittals to the TSC address shown above.

D. Send copy of transmittal letter with appropriate number of sets to offices that are not
   responsible code, but show “Sets to be sent” in Table 01 33 00A - List of Submittals.

E. When “Sets to be sent” is 0, send a copy of transmittal letter to that office.

F. Submittals required by specifications, but not listed in Table 01 33 00A - List of
   Submittals:
   1. Submit in accordance with this section.

PART 2     PRODUCTS

Not Used
PART 3 EXECUTION

Not Used
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>Release of Claims (1452.204-70)</td>
<td>Release of Claims (DI-137) Against United States</td>
<td>After completion of work and prior to final payment</td>
<td>I</td>
<td>CO</td>
<td>1 0 0</td>
</tr>
<tr>
<td>I-2</td>
<td>Payrolls and Basic Records</td>
<td>Certified Payrolls</td>
<td>Weekly for each week any contract work is performed</td>
<td>I</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-3</td>
<td>Labor Standards Data (52.222-11)</td>
<td>1) List of Subcontractor 2) Statement and Acknowledgement Form (SF-1413) for each Subcontract</td>
<td>Within 14 days after award of contract, and within 14 days after award of any subcontract</td>
<td>I</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-4</td>
<td>Equal Opportunity (52.222-26)</td>
<td>Information required by Executive Order 11246 (SF-100)</td>
<td>Within 30 days following the award</td>
<td>I</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-5</td>
<td>Estimate of Percentage of Recovered Material Content for EPA-designated Items (52.223-9)</td>
<td>Estimate the percentage of the total recovered material content for the EPA-designated item(s) delivered and/or used in contract performance</td>
<td>On completion of the contract (no later than with submittal of final invoice)</td>
<td>I</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-6</td>
<td>Safety and Health (WBR 1452.223-81)</td>
<td>Safety Program</td>
<td>Submitted and accepted before commencing onsite work. See Section 3 of RSHS</td>
<td>A</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-7</td>
<td>Safety and Health (WBR 1452.223-81)</td>
<td>Monthly Accident Summary Report</td>
<td>First Monday of each month. See Paragraph 3.8 of RSHS</td>
<td>I</td>
<td>COR</td>
<td>1 Share Point</td>
</tr>
<tr>
<td>I-8</td>
<td>Bonds (52.228-15)</td>
<td>Performance and Payment Bonds</td>
<td>Within 10 calendar days after award</td>
<td>I</td>
<td>CO</td>
<td>1 0 0</td>
</tr>
<tr>
<td>I-9</td>
<td>Liability Insurance (1452.228-70)</td>
<td>Acceptable evidence showing that insurance has been obtained</td>
<td>Within 10 calendar days after award</td>
<td>I</td>
<td>CO</td>
<td>1 0 0</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-10</td>
<td>Security Requirements (WBR 1452.237-80)</td>
<td>Security Program</td>
<td>Submitted and approved prior to mobilization</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>I-11</td>
<td>Security Requirements (WBR 1452.237-80)</td>
<td>List of onsite employees</td>
<td>At least 7 days before employee arrival</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 14 10-1</td>
<td>Use of Site</td>
<td>Land Use and Landscape Rehabilitation Plan</td>
<td>At least 28 days before use of Government land</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 14 30-1</td>
<td>Interruption of Service</td>
<td>Interruption of Service Request</td>
<td>At least 7 days before service interruption.</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 32 10-1</td>
<td>Construction Program</td>
<td>Representative Information</td>
<td>Within 7 days after receipt of Notice of Award</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 32 10-2</td>
<td>Construction Program</td>
<td>Baseline Schedule</td>
<td>Within 21 days after receipt of Notice to Proceed</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 32 10-3</td>
<td>Construction Program</td>
<td>Updated Schedule Reports</td>
<td>With monthly requests for progress payments.</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 32 10-4</td>
<td>Construction Program</td>
<td>Time Impact Analysis</td>
<td>Within 28 days after the CO directs a contract change with schedule impacts. Or With proposal for future modification, value engineering proposal, or request or claim for equitable adjustment to the contract.</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 10-1</td>
<td>Safety Data Sheets</td>
<td>Complete LHM and SDS</td>
<td>At least 14 days before jobsite delivery of hazardous material</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 10-2</td>
<td>Safety Data Sheets</td>
<td>Updated LHM and SDS</td>
<td>At least 14 days before jobsite delivery of hazardous material not previously listed</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>RSN</td>
<td>Clause or Section Title</td>
<td>Submittals required</td>
<td>Due date or delivery time</td>
<td>Type *</td>
<td>Responsible code</td>
<td>Sets to be sent: **</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------</td>
<td>----------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>--------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>01 35 20-1</td>
<td>Safety and Health</td>
<td>Emergency Action Plans Written Program and Training Records</td>
<td>At preconstruction conference</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 20-2</td>
<td>Safety and Health</td>
<td>Job Hazard Analysis</td>
<td>At preconstruction conference</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 20-3</td>
<td>Safety and Health</td>
<td>Exposure Assessment Form</td>
<td>At least 14 days before performing work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 30-1</td>
<td>Contractor's Onsite Safety Personnel</td>
<td>Qualifications</td>
<td>Prior to employment</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 35 30-2</td>
<td>Contractor's Onsite Safety Personnel</td>
<td>Safety Report</td>
<td>At least once each week</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 46 20-1</td>
<td>Testing Agency Services</td>
<td>Testing Agency Services Plan</td>
<td>At preconstruction conference</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 52 10-1</td>
<td>Field Office</td>
<td>Delivery Schedule</td>
<td>Within 5 days after notice to proceed.</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 55 00-1</td>
<td>Vehicular Access and Parking</td>
<td>Initial Digital Recording</td>
<td>At least 21 days before beginning on-site work</td>
<td>A</td>
<td>COR</td>
<td>1</td>
</tr>
<tr>
<td>01 55 00-2</td>
<td>Vehicular Access and Parking</td>
<td>Post Construction Digital Recording</td>
<td>At least 21 days before leaving site.</td>
<td>A</td>
<td>COR</td>
<td>1</td>
</tr>
<tr>
<td>01 55 00-3</td>
<td>Vehicular Access and Parking</td>
<td>Post Repair Digital Recording</td>
<td>Within 14 days of making repairs.</td>
<td>A</td>
<td>COR</td>
<td>1</td>
</tr>
<tr>
<td>01 56 10-1</td>
<td>Protection of Existing Installations</td>
<td>Plan for protecting existing installations</td>
<td>At least 28 days before commencing on site construction work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 56 15-1</td>
<td>Protection of Existing Utilities</td>
<td>Utility Owner Acknowledgement</td>
<td>At least 28 days before commencing on site construction work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 57 30-1</td>
<td>Water Pollution Control</td>
<td>Pollution Prevention Plan</td>
<td>At least 28 days before start of onsite construction work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 57 30-2</td>
<td>Water Pollution Control</td>
<td>Spill Prevention Control and Countermeasure Plan (SPCC)</td>
<td>At least 28 days before delivery or storage of oil</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>RSN</td>
<td>Clause or Section Title</td>
<td>Submittals required</td>
<td>Due date or delivery time</td>
<td>Type *</td>
<td>Responsible code</td>
<td>Sets to be sent: **</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>01 57 90-1</td>
<td>Preservation of Historical and Archaeological Data</td>
<td>Sample Submittal in association with Spec 13 34 13 Pre-Engineered Metal Buildings</td>
<td>Within 30 days of Notice to Proceed, Identical submittal to Spec 13 34 13 for SHPO</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 71 20-1</td>
<td>Surveying</td>
<td>Surveying Plan</td>
<td>At least 35 days before beginning survey work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 71 20-2</td>
<td>Surveying</td>
<td>Resumes</td>
<td>At least 35 days before beginning survey work; At least 35 days before personnel change</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 71 20-3</td>
<td>Surveying</td>
<td>Accuracy Check Results</td>
<td>At least 14 days before beginning survey work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 71 20-4</td>
<td>Surveying</td>
<td>Completed and Reduced Survey Notes</td>
<td>Within 2 days of completing and reducing notes</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 71 20-5</td>
<td>Surveying</td>
<td>Quantity Survey Notes and Computations</td>
<td>Accompanying progress payment requests</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 74 00-1</td>
<td>Cleaning and Waste Management</td>
<td>Waste Production and Disposal Plan</td>
<td>At least 28 days before starting onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 74 00-2</td>
<td>Cleaning and Waste Management</td>
<td>Waste Production and Disposal Records</td>
<td>Within 7 days of waste disposal</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 74 00-3</td>
<td>Cleaning and Waste Management</td>
<td>Environmental Consultant Resume</td>
<td>At least 35 days before beginning environmental assessment</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 74 00-4</td>
<td>Cleaning and Waste Management</td>
<td>Environmental Site Assessment</td>
<td>Within 14 days of completion of work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>01 78 30-1</td>
<td>Project Record Documents</td>
<td>Draft As-built Drawings</td>
<td>Within 30 days of completion of work</td>
<td>I</td>
<td>COR</td>
<td>0 1 0</td>
</tr>
<tr>
<td>01 78 30-2</td>
<td>Project Record Documents</td>
<td>Final As-built Drawings</td>
<td>Within 14 days of completion of work</td>
<td>I</td>
<td>COR</td>
<td>0 2 1</td>
</tr>
<tr>
<td>01 78 30-3</td>
<td>Project Record Documents</td>
<td>Warranties</td>
<td>Within 14 days of completion of work</td>
<td>A</td>
<td>COR</td>
<td>1 2 1</td>
</tr>
</tbody>
</table>
**Table 01 33 00A. - List of Submittals**

* Submittal Types:  A - Action, I - Information  
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sets to be sent: CO COR TSC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02 41 00-1</td>
<td>Demolition Salvage and Rehabilitation</td>
<td>Demolition Plan</td>
<td>At least 30 days before beginning onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>02 83 30-1</td>
<td>Removal and Disposal of Coatings Containing Heavy Metals</td>
<td>Documentation</td>
<td>At least 30 days before beginning onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>02 83 30-2</td>
<td>Removal and Disposal of Coatings Containing Heavy Metals</td>
<td>Plans</td>
<td>At least 30 days before beginning onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>02 83 30-3</td>
<td>Removal and Disposal of Coatings Containing Heavy Metals</td>
<td>Certificate of disposal</td>
<td>Within 14 days after disposal</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>02 83 30-4</td>
<td>Removal and Disposal of Coatings Containing Heavy Metals</td>
<td>Sampling</td>
<td>Within 7 days of commencement and completion of the work</td>
<td>I</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>03 11 13-1</td>
<td>Concrete Formwork</td>
<td>Approval Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 20 00-1</td>
<td>Reinforcement Steel</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 30 00-1</td>
<td>Cast-in-Place Concrete</td>
<td>Materials</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 30 00-2</td>
<td>Cast-in-Place Concrete</td>
<td>Concrete Mix Designs</td>
<td>Within 14 days of the Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 30 00-3</td>
<td>Cast-in-Place Concrete</td>
<td>Field Test Results</td>
<td>Within 7 days of completion of the work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 30 00-4</td>
<td>Cast-in-Place Concrete</td>
<td>Curing</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information

** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 30 00-5</td>
<td>Cast-in-Place Concrete</td>
<td>Temperature-Affected Concrete Work</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 30 00-6</td>
<td>Cast-in-Place Concrete</td>
<td>Delivery Tickets</td>
<td>Within 7 days of completion of the work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 32 00-1</td>
<td>Joints in Concrete</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 32 00-2</td>
<td>Joints in Concrete</td>
<td>Samples</td>
<td>At least 28 days before starting production of materials</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 32 00-3</td>
<td>Joints in Concrete</td>
<td>Certificates</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 60 00-1</td>
<td>Cementitious Grout</td>
<td>Testing and Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>03 65 00-1</td>
<td>Epoxy Resin Adhesive System</td>
<td>Testing and Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>05 12 00-1</td>
<td>Structural Steel Framing</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>05 50 00-1</td>
<td>Mics Metals</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>07 92 00-1</td>
<td>Sealants &amp; Caulking</td>
<td>Technical Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>07 92 00-2</td>
<td>Sealants &amp; Caulking</td>
<td>Certificates</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>08 91 00-1</td>
<td>Louvers</td>
<td>Product Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>08 91 00-2</td>
<td>Louvers</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>08 91 00-3</td>
<td>Louvers</td>
<td>Manufacturer’s Certificate</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>08 91 00-4</td>
<td>Louvers</td>
<td>Test Reports</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>09 96 00-1</td>
<td>Protective Coatings</td>
<td>Coating Systems</td>
<td>At least 30 days before starting coating work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>09 96 00-2</td>
<td>Protective Coatings</td>
<td>Samples</td>
<td>At least 30 days before starting coating work</td>
<td>I</td>
<td>0</td>
<td>1 0</td>
</tr>
<tr>
<td>09 96 00-3</td>
<td>Protective Coatings</td>
<td>QA/QC Plan</td>
<td>At least 28 days before starting coating work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 34 13-1</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Shop Drawings and Calculations</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-2</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Schedule</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-3</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Material and Color Samples</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>0 1 0</td>
</tr>
<tr>
<td>13 34 13-4</td>
<td>Pre-Engineered Metal Buildings</td>
<td>PEMB Information</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-5</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Certificates</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-6</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Written Certification</td>
<td>Within 14 days of completion of the work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-7</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Erector Experience</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-8</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Quality Assurance</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 13-9</td>
<td>Pre-Engineered Metal Buildings</td>
<td>Product Data</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 19-1</td>
<td>Premanufactured Chemical Storage Unit</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 19-2</td>
<td>Premanufactured Chemical Storage Unit</td>
<td>Schedule</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 34 19-3</td>
<td>Premanufactured Chemical Storage Unit</td>
<td>Manufacturer Performance</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 19-4</td>
<td>Premanufactured Chemical Storage Unit</td>
<td>Operation and Maintenance</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 34 19-5</td>
<td>Premanufactured Chemical Storage Unit</td>
<td>Certificates</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 94 01-1</td>
<td>Fiberglass Tanks</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 94 01-2</td>
<td>Fiberglass Tanks</td>
<td>Product Data</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 60-1</td>
<td>PRAS System</td>
<td>Shop Drawings</td>
<td>Within 45 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 60-2</td>
<td>PRAS System</td>
<td>Spare Parts List</td>
<td>Within 45 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 60-3</td>
<td>PRAS System</td>
<td>Certifications</td>
<td>Within 45 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 60-4</td>
<td>PRAS System</td>
<td>Warranties</td>
<td>Within 14 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 61-1</td>
<td>Aquaculture System Installation</td>
<td>Installation Plan</td>
<td>At least 28 days before starting onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 61-2</td>
<td>Aquaculture System Installation</td>
<td>Certificate of Completion and Training Timelines</td>
<td>Within 7 days after completion</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>13 99 61-3</td>
<td>Aquaculture System Installation</td>
<td>Acceptance</td>
<td>Within 7 days after completion</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 00 00-1</td>
<td>HVAC - General</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 00 00-2</td>
<td>HVAC - General</td>
<td>Certified Fan Curves</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 05 93-1</td>
<td>Testing, Adjusting, Balancing for HVAC</td>
<td>Strategies and Procedures Plan</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 05 93-2</td>
<td>Testing, Adjusting, Balancing for HVAC</td>
<td>Certified TAB Reports</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 05 93-3</td>
<td>Testing, Adjusting, Balancing for HVAC</td>
<td>Warranties</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 34 23-1</td>
<td>HVAC Power Ventilators</td>
<td>Product Data</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 34 23-2</td>
<td>HVAC Power Ventilators</td>
<td>Shop Drawings</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 34 23-3</td>
<td>HVAC Power Ventilators</td>
<td>Field Quality Control Test Reports</td>
<td>Within 7 days of completion of test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 34 23-4</td>
<td>HVAC Power Ventilators</td>
<td>Operation and Maintenance Data</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 82 39-1</td>
<td>Unit Heaters</td>
<td>Product Data</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 82 39-2</td>
<td>Unit Heaters</td>
<td>Shop Drawings</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 82 39-3</td>
<td>Unit Heaters</td>
<td>Field Quality Control Test Reports</td>
<td>Within 7 days of completion of test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>23 82 39-4</td>
<td>Unit Heaters</td>
<td>Operation and Maintenance Data</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 00-1</td>
<td>Electric Work, General</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 00-2</td>
<td>Electric Work, General</td>
<td>Technical Manuals</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 00-3</td>
<td>Electric Work, General</td>
<td>Record Drawings</td>
<td>Within 30 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 10-1</td>
<td>Conductors and Cables</td>
<td>Approval Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 10-2</td>
<td>Conductors and Cables</td>
<td>Test Reports</td>
<td>Within 7 days of completion of test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
**Table 01 33 00A. - List of Submittals**

* Submittal Types:  A - Action, I - Information  
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 05 26-1</td>
<td>Grounding</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 26-2</td>
<td>Grounding</td>
<td>As-Built Drawings</td>
<td>Within 30 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 26-3</td>
<td>Grounding</td>
<td>Test Reports</td>
<td>Within 7 days of completion of test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 36-1</td>
<td>Wiring Devices</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 36-2</td>
<td>Wiring Devices</td>
<td>Reports of Contractor Quality Field Tests Reports</td>
<td>7 days Prior to test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 43-1</td>
<td>Underground Raceway Systems</td>
<td>Material Catalogue Cut Sheets</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 05 43-2</td>
<td>Underground Raceway Systems</td>
<td>As-built Drawings</td>
<td>Within 14 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 08 00-1</td>
<td>Electrical Testing</td>
<td>Electrical Test Plan</td>
<td>15 days prior to performing inspections or tests</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 08 00-2</td>
<td>Electrical Testing</td>
<td>Test Report</td>
<td>Within 7 days of completion of test</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 12 16-1</td>
<td>Panelboards &amp; General-Purpose Dry Transformers</td>
<td>Shop Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 12 16-2</td>
<td>Panelboards &amp; General-Purpose Dry Transformers</td>
<td>Factory Test Report</td>
<td>Within 7 days of completion of test</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 12 16-3</td>
<td>Panelboards &amp; General-Purpose Dry Transformers</td>
<td>Operation and Maintenance Instruction Books</td>
<td>At least 28 days before starting onsite work</td>
<td>A</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-1</td>
<td>Variable Frequency Drives</td>
<td>Specification</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-2</td>
<td>Variable Frequency Drives</td>
<td>Catalog and Technical Data</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
### Table 01 33 00A. - List of Submittals

* Submittal Types: **A** - Action, **I** - Information  
**CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 29 23-3</td>
<td>Variable Frequency Drives</td>
<td>Motor Data Sheets</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-4</td>
<td>Variable Frequency Drives</td>
<td>Diagrams</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-5</td>
<td>Variable Frequency Drives</td>
<td>External Connection Diagram</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-6</td>
<td>Variable Frequency Drives</td>
<td>VFD Layout Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-7</td>
<td>Variable Frequency Drives</td>
<td>Product Data</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-8</td>
<td>Variable Frequency Drives</td>
<td>Factory Certification</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-9</td>
<td>Variable Frequency Drives</td>
<td>O&amp;M Manuals</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 29 23-10</td>
<td>Variable Frequency Drives</td>
<td>MCC Drawings and Layout</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 32 10-1</td>
<td>Engine Generator Set</td>
<td>Approval Drawings and Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 32 10-2</td>
<td>Engine Generator Set</td>
<td>Final Drawings and Data</td>
<td>Within 14 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 32 10-3</td>
<td>Engine-Generator Set</td>
<td>Quality Test Plan</td>
<td>Within 14 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 32 10-4</td>
<td>Engine-Generator Set</td>
<td>Quality Test Report</td>
<td>Within 14 days of Testing Completion</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 50 00-1</td>
<td>Lighting, Interior and Exterior</td>
<td>Lighting Material</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 50 00-2</td>
<td>Lighting, Interior and Exterior</td>
<td>Lighting Schematic</td>
<td>Within 14 days of Installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types: A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 90 00-1</td>
<td>SCADA Controls and Automation</td>
<td>Pre-installation HMI &amp; PLC Programming</td>
<td>120 days after Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 90 00-2</td>
<td>SCADA Controls and Automation</td>
<td>Factory Acceptance Testing</td>
<td>At least 20 days prior to execution</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 90 00-3</td>
<td>SCADA Controls and Automation</td>
<td>Pre-commissioning HMI and PLC Programming</td>
<td>15 days after completion of Factory Acceptance Testing</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 90 00-4</td>
<td>SCADA Controls and Automation</td>
<td>Commissioning Procedure</td>
<td>20 days prior to scheduled site commissioning</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 90 00-5</td>
<td>SCADA Controls and Automation</td>
<td>Detailed Control System Narrative</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>26 90 00-6</td>
<td>SCADA Controls and Automation</td>
<td>Detailed Wiring and Schematic Drawings</td>
<td>Within 30 days of Notice to Proceed</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>31 23 19-1</td>
<td>Dewatering</td>
<td>Dewatering Plan</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>31 30 00-1</td>
<td>Earthwork</td>
<td>Detailed Excavation Plan</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>31 35 00-1</td>
<td>Erosion and Sediment Control, General</td>
<td>Erosion and Sediment Control Plan</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>31 35 26-1</td>
<td>Erosion and Sediment Control, Barriers</td>
<td>Product Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>31 35 26-2</td>
<td>Erosion and Sediment Control, Barriers</td>
<td>Weed Free Certification</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>32 11 13-1</td>
<td>AC Pavement and Base</td>
<td>Mix Design Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>32 11 13-2</td>
<td>AC Pavement and Base</td>
<td>Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 05 31-1</td>
<td>Precast Concrete Manholes and Vaults</td>
<td>Approval Data</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 05 31-2</td>
<td>Precast Concrete Manholes and Vaults</td>
<td>Shop Drawings</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 05 31-3</td>
<td>Precast Concrete Manholes and Vaults</td>
<td>Manufacturer’s Certification</td>
<td>At least 28 days prior to procurement or fabrication</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 11 21-1</td>
<td>PVC Pressure Pipe, AWWA C900</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 11 21-2</td>
<td>PVC Pressure Pipe, AWWA C900</td>
<td>Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 11 22-1</td>
<td>Large PVC Pressure Pipe, AWWA C905</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>33 11 22-2</td>
<td>Large PVC Pressure Pipe, AWWA C905</td>
<td>Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 00-1</td>
<td>Piping, General</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 00-2</td>
<td>Piping, General</td>
<td>Samples</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 00-3</td>
<td>Piping, General</td>
<td>Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 02-1</td>
<td>Pipe Supports</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 16-1</td>
<td>Stainless Steel Pipe</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 22-1</td>
<td>PVC Pressure Pipe</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 23 22-2</td>
<td>PVC Pressure Pipe</td>
<td>Manufacturer’s Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
### Table 01 33 00A. - List of Submittals

* Submittal Types: A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 91 00-1</td>
<td>Meters, General</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 00-2</td>
<td>Meters, General</td>
<td>Manufacturer’s Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 00-3</td>
<td>Meters, General</td>
<td>Operation and Maintenance Manual</td>
<td>Within 14 days of installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 00-4</td>
<td>Meters, General</td>
<td>Spare Parts List</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 00-5</td>
<td>Meters, General</td>
<td>Special Tools</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 00-6</td>
<td>Meters, General</td>
<td>Documentation</td>
<td>Within 14 days of installation</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 23-1</td>
<td>Electromagnetic Flowmeters</td>
<td>Data sheets</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 23-2</td>
<td>Electromagnetic Flowmeters</td>
<td>Connection Diagrams</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>40 91 23-3</td>
<td>Electromagnetic Flowmeters</td>
<td>Spare Parts List</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 00-1</td>
<td>Valves, General</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 00-2</td>
<td>Valves, General</td>
<td>Technical Manual</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 00-3</td>
<td>Valves, General</td>
<td>Spare Parts List</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 00-4</td>
<td>Valves, General</td>
<td>Factory Test Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 01-1</td>
<td>Valve &amp; Gate Actuators</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 01-2</td>
<td>Valve &amp; Gate Actuators</td>
<td>Calculations</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>43 25 02-1</td>
<td>Butterfly Valves</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>44 35 00-1</td>
<td>Pumps, General</td>
<td>Shop Drawings</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>44 35 00-2</td>
<td>Pumps, General</td>
<td>Technical (O&amp;M) Manual</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>44 35 00-3</td>
<td>Pumps, General</td>
<td>Spare Parts List</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
Table 01 33 00A. - List of Submittals

* Submittal Types:  A - Action, I - Information
** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center.

<table>
<thead>
<tr>
<th>RSN</th>
<th>Clause or Section Title</th>
<th>Submittals required</th>
<th>Due date or delivery time</th>
<th>Type *</th>
<th>Responsible code</th>
<th>Sets to be sent: **</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 35 00-4</td>
<td>Pumps, General</td>
<td>Factory Test Data</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
<tr>
<td>44 35 00-5</td>
<td>Pumps, General</td>
<td>Certifications</td>
<td>At least 28 days before starting onsite work</td>
<td>I</td>
<td>COR</td>
<td>SharePoint</td>
</tr>
</tbody>
</table>
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
B. SDS: Safety Data Sheet.
   1. Referred to as Material Safety Data Sheets in the clause at 52.223-3, Hazardous Material Identifications and Material Safety Data - Alternate 1.

1.03 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.

1.04 SUBMITTALS
A. Submit the following 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.
   2. In addition to requirements in Table 01 33 00A, submit copies of updated LHM and SDS to COR at least 14 days before delivering hazardous materials to job site.

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 COST
A. Include cost of complying with this Section in prices offered in the schedule for other items of work.

1.02 REFERENCE STANDARDS
A. Bureau of Reclamation (USBR)
   1. RSHS Reclamation Safety and Health Standards
   2. FIST I-1 Reclamation Facilities Instructions, Standards, and Techniques, Volume I-1
   3. F-HECP Facility Hazardous Energy Control Plan
B. Code of Federal Regulations (CFR)
   1. 29 CFR 1926 Safety and Health Regulations for Construction, current Edition
C. Applicable State Safety and Health Regulations for Construction, current Edition:
   1.

1.03 SUBMITTALS
A. Supplement RSN I-6, Safety Program with the following in accordance with Section 01 33 00 - Submittals:
   1. RSN 01 35 20-1, Emergency Action Plans Written Program and Training Records.
   2. RSN 01 35 20-2, Job Hazard Analyses (JHA).
      a. For each distinct phase of work under the contract.
   3. RSN 01 35 20-3, Exposure Assessment Form if applicable, completed by a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP).
      a. Form can be obtained at http://www.usbr.gov/pn/forms/ro-351.pdf.
B. Prior to submittal of RSN I-6, Safety Program meet with COR to review plan outline and attachment.
1.04 DOCUMENTATION AND RECORDS

A. Prepare and retain all safety plans, programs, training content, and training records that are applicable to the scope of the work and make them available to the COR unless they are already included in the written safety program. Some examples include but are not limited to:

1. Asbestos Exposure Assessment and Training Records.
2. Benzene Written Program and Training Records.
5. Confined Space and when deemed necessary by existing and/or introduced hazards of Permit Required Confined Space through the Written Program and Training Records.
6. Forklifts and Other Industrial Trucks Training Records.
9. Fall Protection Written Program and Training Records.
11. Flammable and Combustible Liquids Written Spill Control Plan.
15. Ladder Written Compliance Program and Training Records.
16. Lead Written Program and Training Records.
17. Lockout/Tagout: Refer to RSHS Section 15 Hazardous Energy Control Program (HECP) Training Records.
19. Methyleneedianiline Training Records, if applicable.
23. Respiratory Protection Written Program and Training Records.
26. Steel Erection Training Records, if applicable.
27. Welding, Cutting, and Brazing Written Program and Training Records.

1.05 SAFETY AND HEALTH

A. Under no circumstances will on site work, including mobilization, be permitted until the Safety Program has been considered acceptable by the COR.

B. Fully participate in a Contractor Safety Program Review meeting, according to RSHS, prior to mobilization. If applicable, include subcontractor management representatives.

C. If a JHA and the COR deem necessary, the minimum work crew at any time on the construction site may consist of no less than two (2) people and in accordance with other contractual obligations.

D. Develop Job Hazard Analyses (JHA) for each distinct phase of work under the contract.
   1. Work will not begin on the phase of work until a JHA is provided to the COR in accordance with Submittals article (1.03).
   2. Activities involving hazardous materials shall have the appropriate Material Safety Data Sheet(s) attached to the JHA.
   3. The completed JHA shall meet all requirements of Reclamation Safety & Health Standards (RSHS) Section 4.2.

E. 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 and exposures are maintained as low as reasonably achievable.
   1. Exposure assessments must be provided to the COR prior to any activity, and prior to any changes in a work condition employing previously unidentified or undocumented hazard.
   2. Exposure assessment will be based on outcomes from the basic characterization and incorporated into the JHA.
   3. Exposure assessments are required for operations that include, but are not limited to operations that:
      a. use hazardous materials or physical agents including, but not limited to, toxic, reactive, biohazard, corrosive, flammable or those that have radiological properties;
      b. use PPE (e.g., respirators, chemical-resistant clothing, and chemical resistant gloves);
      c. require grinding, crushing, cutting, blasting, or other abrasive processes;
d. involve tasks or operations that release metals (e.g. welding, grinding, soldering, brazing, cutting, burning, gouging, plasma cutting, laser cutting);

e. involve mixing, handling, storage, removal or application of thinners, catalysts, solvents, adhesives, epoxies, sealants, base coats, middle coats, top coats, fillers or resins;

f. involve mixing, handling, storage, and application of pesticides/herbicides;

g. involve work tasks, operations, or equipment that generate noise levels which equal or exceed 85 decibel A-weighted (dBA) as an 8-hour TWA;

h. involve entry into a confined space;

i. involve a work-related medical surveillance program, or medical monitoring associated with work tasks, operations, regulatory task requirements, or unacceptable exposure;

j. involve handling, or working with or on equipment that handle, bodily fluids or biological hazards;

k. involve batching, mixing, cutting, chipping, crushing, coring, or drilling concrete; and

l. involve entry into an area, or conducting a work task or working on equipment, contaminated with rodent feces, dander, or nests.

4. In no case will any phase of work commence until an exposure assessment for that portion of the work has been accepted by the COR.

F. Perform all training as required by federal, state, and local regulations prior to any activity that requires it.

1. Training records must be submitted to the COR upon request.

2. In no case shall an employee perform work until all required training is complete.

G. In addition to the Contractor Requirements set forth in the RSHS, fully comply with all other sections of the RSHS, [FIST 1-1, F-HECP,] 29 CRF 1926, and all other federal, state, and local codes and regulations as they apply.


2. The FIST 1-1 manual referenced above shall be obtained at http://www.usbr.gov/power/data/fist/fist1_1/FIST%201-1%20(1-10-2013).pdf

3. The F-HECP is available for viewing at [Insert location of F-HECP, check with facility manager or safety representative]. Contact [Insert facility manager or safety representative and contact information] to schedule review.
4. Construction Safety and Health Standards promulgated by the Secretary of Labor may be obtained from any regional or area office of the Occupational Safety and Health Administration of the U.S. Department of Labor.

H. Be cognizant of and ensure compliance with requirements set forth in paragraphs above.
   1. Contractor’s responsibility applies to all operations, including those of the Contractor’s Subcontractors.
   2. When violations of safety and health requirements contained in these specifications or referenced standards are called to the Contractor’s attention by the CO or the CORs, immediately correct the condition to which attention has been directed.
   3. Either oral or written notice shall be deemed sufficient.

I. When the Contractor fails or refuses to promptly correct a compliance directive, the CO or the COR 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, nor to claim for damage, or to additional compensation by reason of either the directive or the stop order.
   3. Failure of the CO or the COR 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.

PART 2 PRODUCTS
   Not Used

PART 3 EXECUTION
   Not Used

END OF SECTION
This page intentionally left blank.
SECTION 01 35 30
CONTRACTOR'S ONSITE SAFETY 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 (USBR)
   1.  RSHS Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.html

1.03  PROJECT CONSTRUCTION SAFETY MANAGER

A.  Prior to submittal of safety plan, Contractor shall schedule a meeting with the COR to review the draft plan.

1.04  SUBMITTALS

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

B.  RSN 01 35 30-1, Qualifications:
   1.  Contractor’s Full Time Onsite Safety and Health Representative

C.  RSN 01 35 30-2, Safety Reports:
   1.  Prepare detailed monthly safety inspection reports listing noted deficiencies, digital photos, abatement dates and follow-up action for all jobsite activities
      a.  Submit written report to COR within 7 days of the inspection.
      b.  Inspection report shall include findings of jobsite walk-through with COR
   2.  Detailed monthly summary report for all coatings removal and application activities.
      a.  Summary of exposure monitoring results and sampling activities and interpretation of the data to confirm that the work is being performed in accordance with the approved plans.
      b.  Include noted deficiencies, digital photos, abatement dates and follow-up action.
c. Submit written report to COR within 7 days of the inspection.
d. Inspection report shall include findings of jobsite walk-through with COR

1.05 QUALIFICATIONS

A. Full Time Onsite Safety Representative:

1. Competent supervisory employee with current safety and health related training, experience and duties on at least three projects of similar nature, size, complexity, and work to be performed as the current project

2. OSHA Construction 30-Hour Training Course including applicable elective subjects, for example Concrete and Masonry Construction; Confined Space Entry; Cranes, Derricks, Hoists, Elevators, and Conveyors; Ergonomics; Excavations; Fire Protection and Prevention; Materials Handling, Storage, Use and Disposal; Motor Vehicles, Mechanized Equipment and Marine Operations; Rollover Protective Structures and Overhead Protection; and Signs; Signals and Barricades; Powered Industrial Vehicles; Safety and Health Programs; Scaffolds; Steel Erection; Tools - Hand and Power; Welding and Cutting. Current first aid CPR certification

a. Include resume with current telephone numbers of references, description of safety representative responsibilities, and copies of training certifications

3. Safety Professional requirements may be met by retaining appropriate level of services of an acceptable safety consultant.

1.06 APPLICATION

A. Designate an employee as the Contractor's Onsite Safety Representative prior to start of construction and employ Safety Professional for part-time on the job.

1.07 QUALITY ASSURANCE

A. Contractor's Part-time Onsite Safety and Health Professional:

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

2. Should the Contractor's part-time safety professional effort be deemed insufficient the Contractor may be required to provide the services of a qualified, full-time Safety and Health Professional at no additional cost to the Government.

PART 2 PRODUCTS

Not Used
PART 3  EXECUTION

Not Used

END OF SECTION
This page intentionally left blank.
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.
C. All work completed shall conform to the most recent edition of applicable standards of the closing date of the contract solicitation unless specified otherwise in the Contract Documents.

1.03 JOBSITE REFERENCE STANDARDS
A. Maintain at fabrication site, access to referenced standard specifications, codes, and manuals required for work in progress at fabrication site. Make available for use by the Government.

1.04 AVAILABILITY
   1. Available online, authorized by the National Archives and Records Administration (NARA) and the Government Printing Office (GPO), at http://www.gpo.gov/fdsys/search/home.action

B. Federal Specifications, Standards, and Commercial Item Descriptions:
   1. Copies of Federal Specifications, Standards, and Commercial Item Descriptions may be obtained from GSA Federal Supply Service, see the provision at FAR 52.211-1, Availability of Specifications Listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29.

C. Bureau of Reclamation Documents:
   1. Reclamation Safety and Health Standards (RSHS) may be downloaded at www.usbr.gov/sslc/safety/RSHS/rshs.html.
a. Hard copies of RSHS, stock number 024-003-00204-6, may be purchased from The Superintendent of Documents at the U.S. Government Printing Office (GPO), phone number 202-512-1800. Hard copies of RSHS are subject to revisions posted on the site shown above.

1) GPO online bookstore:

2. 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
5285 Port Royal Road
Springfield, VA  22161
Telephone: 703-487-4650 or 1-800-553-6847

D. 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 Bureau of Reclamation specifications and standards) specifications, standards, and codes are listed in Table 01 42 10A - Addresses for Specifications, Standards, and Codes.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| AASHTO  | American Association of State Highway and Transportation Officials  
          444 North Capitol Street, NW., Suite 249  
          Washington, DC 20001  
          [www.aashto.org](http://www.aashto.org) | 202-624-5800  
          800-231-3475 |
| ACI     | American Concrete Institute  
          38800 Country Club Dr.  
          Farmington Hills, MI 48331-3439  
          [https://www.concrete.org/home.aspx](https://www.concrete.org/home.aspx) | 248-848-3700 |
| AEIC    | Association of Edison Illuminating Companies  
          PO Box 2641  
          Birmingham, AL 35291-0992  
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC</td>
<td>Associated General Contractors of America 333 John Carlyle Street, Suite 200 Alexandria, VA 22314 <a href="http://www.agc.org">www.agc.org</a></td>
<td>703-548-3118</td>
</tr>
<tr>
<td>AISC</td>
<td>American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 <a href="http://www.aisc.org">www.aisc.org</a></td>
<td>312-670-2400</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute 1819 L. Street, NW. Washington, DC 20036 <a href="http://www.ansi.org">www.ansi.org</a></td>
<td>202-293-8020</td>
</tr>
<tr>
<td>APA/EWA</td>
<td>APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 <a href="http://www.apawood.org">www.apawood.org</a></td>
<td>253-565-6600</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers 3 Park Avenue New York, NY 10016-5990 <a href="http://www.asme.org">www.asme.org</a></td>
<td>800-843-2763</td>
</tr>
<tr>
<td>ASTM</td>
<td>ASTM International P.O. Box C700 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 <a href="http://www.astm.org">www.astm.org</a></td>
<td>610-832-9585</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society 550 NW LeJeune Road Miami, FL 33126 <a href="http://www.amweld.org">www.amweld.org</a></td>
<td>800-443-9353 305-443-9353</td>
</tr>
<tr>
<td>ICEA</td>
<td>Insulated Cable Engineers Association P.O. Box 2694 Alpharetta, GA 30023 <a href="http://www.icea.net/">http://www.icea.net/</a></td>
<td></td>
</tr>
</tbody>
</table>
Table 01 42 10A - Addresses for Specifications, Standards, and Codes

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| ICRI    | International Concrete Repair Institute  
1000 Westgate Drive, Suite 252 | St. Paul, Minnesota 55114  
http://www.icri.org/ | 651-366-6095 |
| IEEE    | Institute of Electrical and Electronics Engineers  
3 Park Avenue, 17th Floor  
New York, NY 10016-5997 | www.ieee.org | 212-419-7900 |
| NACE    | NACE International  
1440 South Creek Drive  
Houston, TX 77084 | www.nace.org | 281-228-6200 |
| NEMA    | National Electrical Manufacturers Association  
1300 N 17th Street, Suite 1847  
Rosslyn, VA 22209 | www.nema.org | 703-841-3200 |
| NETA    | International Electrical Testing Association Inc.  
3050 Old Centre Ave., Suite 102  
Portage, MI 49024 | http://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  
1090 Vermont Avenue, NW., Suite 700  
Washington, DC 20005-4905 | www.nibs.org | 202-289-7800 |
| SSPC    | SSPC: The Society for Protective Coatings  
40 24th Street, 6th Floor  
Pittsburgh, PA 15222-4656 | www.sspe.org | 800-837-8303  
412-281-2331 |
| TIA/EIA | Telecommunications Industry Association/Electronic Industries Alliance  
2500 Wilson Boulevard, Suite 300  
Arlington, VA 22201 | www.tiaonline.org | 703-907-7700 |
Table 01 42 10A - Addresses for Specifications, Standards, and Codes

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>Underwriters Laboratories, Inc. 333 Pfingsten Road</td>
<td>847-272-8800</td>
</tr>
<tr>
<td></td>
<td>Northbrook, IL 60062-2096</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.ul.com">www.ul.com</a></td>
<td></td>
</tr>
</tbody>
</table>

3. Additional References

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION
This page intentionally left blank.
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.

PART 2  PRODUCTS

Not Used

PART 3  EXECUTION

Not Used
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.
   2. 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 C1077-16a Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
   2. ASTM C1093-15a Accreditation of Testing Agencies for Masonry
   3. ASTM D3666-16 Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
   4. ASTM D3740-12a Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
   5. ASTM E329-14a Agencies Engaged in Construction Inspection, Testing, or Special Inspection
   6. ASTM E543-15 Agencies Performing Nondestructive Testing

1.03 SUBMITTALS

A. Submit the following 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 CO.

1.04 QUALIFICATIONS

A. Testing agency organization:
   1. Agencies testing construction materials: Meet requirements of ASTM E329.
   3. Agencies testing concrete masonry units: Meet requirements of ASTM C1093.
   4. Agencies testing soil and rock: Meet requirements of ASTM D3740.
   5. Agencies testing bituminous paving materials: Meet requirements of ASTM D3666.
   6. Agencies engaged in nondestructive testing: Meet requirements of ASTM E543.

B. Equipment:
   1. 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 following Sections:
   1. 03 30 00 – Cast-in-Place Concrete
   2. 03 32 00 – Joints in Concrete
   3. 03 60 00 – Cementitious Grout
   4. 03 65 00 – Epoxy Resin Adhesive Systems
   5. 09 96 00 – Protective Coatings
   6. 31 30 00 – Earthwork
7. 32 11 13 – AC Pavement and Base
8. 33 05 31 – Precast Concrete Manholes and Vaults

3.02 GOVERNMENT CONTRACT 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 replacement for specified Contractor quality testing.

END OF SECTION
This page intentionally left blank.
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 C2-12 National Electrical Safety Code (NESC)

1.03 TEMPORARY ELECTRICITY
A. Provide generators, transmission lines, distribution circuits, transformers, and other electrical equipment and facilities required for obtaining power and distributing power to points of use.
B. Provide additional electric power as required by the Contractor for the work.
C. Comply with IEEE C2 clearances and spacing for temporary communications and supply lines.

1.04 TEMPORARY WATER
A. Provide water required for construction purposes.
B. Use water which meets specified requirements for water used in concrete, soil-cement, masonry, grouting, and other permanent work.
C. Provide means of conveying water to points of use.

1.05 TELEPHONE/INTERNET
A. Contractor shall supply a communications system as required for the project at no additional cost to the Government.
B. Contractor shall supply internet service as required for the project at no additional cost to the Government.

1.06 SANITARY FACILITIES
A. Restroom facilities will not be available to Contractor personnel.
B. Contractor shall provide sanitary facilities.

**PART 2 PRODUCTS**

Not Used

**PART 3 EXECUTION**

3.01 **REMOVAL**

A. Remove temporary equipment and facilities upon completion of work under this contract and return to pre-existing condition or better.

**END OF SECTION**
SECTION 01 52 10
FIELD OFFICE

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 Society of Heating, Refrigerating, And Air-conditioning Engineers, Inc. (ASHRAE)
   1. ASHRAE HSE-12 HVAC Systems and Equipment (I-P), 2012 Handbook
B. National Fire Protection Association (NFPA)
   1. NFPA 10-13 Portable Fire Extinguishers
C. Public Law (PL)

1.03 Submittals
A. Submit in accordance with Section 01 33 00 - Submittals.
B. RSN 01 52 10-1, Delivery Schedule:
   1. For office facility and related items to be furnished.

PART 2    PRODUCTS

2.01 Field Office
A. Field office: Office facility, furnishings, portable toilet facility, storage shed, and parking area for exclusive use of Government in addition to and separate from office facilities provided for Contractor use.
B. Materials and installations: In compliance with PL 101-336 and applicable Federal, State, and local regulations, laws, codes, and requirements for accommodating individuals with disabilities.
**2.02 OFFICE FACILITY**

A. Portable-type office facility:
   1. Floor area: Not less than 160 square feet.
   2. Structurally sound, secure, weather tight enclosure with windows.
   3. Floors raised above ground.
   4. Securely fix to foundation.
   5. Steps and ramps with landings at entrance doors.
   6. Door locks:
      a. Deadbolt type locking devices.
      b. Doors keyed alike.
      c. Furnish 4 sets of keys.

B. HVAC Equipment:
   1. Distribution system: Sufficient for uniform heating, cooling, and comfort.
   2. Heating: Size in accordance with ASHRAE HSE for minimum 70 degrees F inside temperature under winter outside design conditions applicable to construction site location.
   3. Ventilation: Mechanical type sufficient for comfort during change between heating and cooling seasons.
   4. Air-Conditioning: Size system in accordance with ASHRAE HSE for maximum 80 degrees F inside temperature under summer outside conditions applicable to construction site location.
   5. Equipment Options: Equivalent heating, ventilating, and air-conditioning in a single combination unit or other combinations.

C. Electrical:
   1. Wiring system: Complete including service entrance, 1 duplex convenient outlet for each 150 square feet of floor space and additional outlets and circuits for heating, ventilating, and air-conditioning units as required.
   2. Lighting: Fluorescent lighting suitable for tasks, based on 3-watts-per-square-foot uniform distribution.

D. Fire Extinguishers:
   1. ABC fire extinguishers.
   2. Number, location, and extinguisher rating: In accordance with NFPA 10.
   3. Listed or approved by a nationally recognized testing laboratory.
E. Electric Water Cooler: 5-gallon water cooler.

2.03 FURNISHINGS

A. New or "like new" reconditioned furniture listed in Table 01 52 10A - Field Office Furniture Requirements.

<table>
<thead>
<tr>
<th>Item</th>
<th>Number Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desk</td>
<td>2</td>
<td>Flat top double pedestal, size 30 inches by 60 inches</td>
</tr>
<tr>
<td>Desk</td>
<td>0</td>
<td>Steno, size 34 inches by 48 inches</td>
</tr>
<tr>
<td>Chair</td>
<td>2</td>
<td>Swivel</td>
</tr>
<tr>
<td>Chair</td>
<td>0</td>
<td>Side</td>
</tr>
<tr>
<td>Chair</td>
<td>0</td>
<td>Typist, posture</td>
</tr>
<tr>
<td>Filing Cases</td>
<td>1</td>
<td>Metal 5 drawer [legal size] 27 inches deep, baked-on enamel finish</td>
</tr>
<tr>
<td>Bookcases</td>
<td>0</td>
<td>[   ] shelves [   ] inches deep, [   ] inches wide</td>
</tr>
<tr>
<td>Reference Tables</td>
<td>0</td>
<td>Tables of 2 by 4 open framework and a durable pressed board top surface or commercial equivalent. Table height 36 inches, depth 44 inches, and lengths [   ] inches</td>
</tr>
<tr>
<td>Storage Shelves</td>
<td>0</td>
<td>Ceiling high units [   ] inches deep by _______ feet wide. Divide vertically into 4 equal compartment heights. Compartamentalize horizontally with vertical intermediate supports not over 3 feet apart. Close ends and backs with plywood sheet.</td>
</tr>
<tr>
<td>Plan Racks</td>
<td>1</td>
<td>Unit with 25 sets of plan binders for each unit. Racks 32 inches deep by 42 inches face width by 40 inches high.</td>
</tr>
<tr>
<td>Plan Binders</td>
<td>1</td>
<td>Pairs of 1-inch hardwood strips with post binding screws or commercially available equivalent.</td>
</tr>
</tbody>
</table>
B. Shades: Standard fabric roller shades or metal slat venetian blinds at windows.

2.04 SIGN
A. 18-inch by 4-foot by 1/4-inch exterior plywood sign with frame.
B. Paint exposed surfaces of sign, supports, and framing.
C. Paint lettering as directed by COR.

2.05 PORTABLE TOILET FACILITIES
A. Separate portable toilets for men and women.
B. Self-Contained Toilet Units:
   1. Single-occupant units.
   2. Chemical, aerated recirculation, or combustion type.
   3. Vented.
   4. Fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

2.06 PARKING AREA
A. Parking area: Gravel surfaced for not less than 2 vehicles
B. Walkway from parking area to office facility: Gravel surfaced.

PART 3 EXECUTION
3.01 PREPARATION
A. Grade field office site for drainage.

3.02 INSTALLATION
A. Install or construct field office at location approved by COR.
B. Connect electricity, and other required services to existing public utilities systems.
   1. Adequately size and correctly place to perform their function without damage or interruption of service.
C. Locate toilet facilities within 20 feet of office facility.
D. Locate parking area within 20 feet of office facility.
E. Install sign at location directed by COR. Install sign surface plumb and level. Anchor sign securely.

3.03 MAINTENANCE

A. Provide maintenance and janitorial services required for field office during contract period or until removal of field office is directed by COR.
   1. Includes payment for electrical, water, and sanitary services.
   2. Clean field office weekly.
   3. Wash windows monthly.
   4. Clean and service portable toilets weekly.
   5. Keep approach walks free of mud, water, and snow.

3.04 REMOVAL AND CLEANUP

A. Promptly remove complete field office including buildings, foundations, utility services, and debris upon written direction from COR.

B. Disconnect and cap or remove utility services as appropriate and leave area free of any undesirable features resulting from utility service installation.

C. Restore areas: Comply with Section 01 14 10 - Use of Site.

END OF SECTION
This page intentionally left blank.
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, or
bridges.

1.03  SUBMITTALS

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

B. RSN 01 55 00-1, Initial Digital Recording

C. RSN 01 55 00-2, Post Digital Recording

D. RSN 01 55 00-3, Post Repair Digital Recording.

1.04  SITE CONDITIONS

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

   1. In accordance with 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 Contractor when and as
      authorized by CO.

   2. Subject to 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.
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 COR.

C. Materials to maintain roadways and parking areas constructed under this contract and used by 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 jobsite.

3.02 ESTABLISHED ROADWAYS AND PARKING AREAS

A. Established roadways and parking areas are available for Contractor's use subject to existing restrictions and approval of the COR.

B. Do not allow heavy vehicles or construction equipment in established parking areas.

3.03 TEMPORARY ROADWAYS AND PARKING AREAS

A. Roadways:
   1. Construct temporary all-weather surfaced roadways for access from public thoroughfares to serve construction area, of a width and load-bearing capacity to provide unimpeded traffic for construction purposes.
   2. Construct temporary bridges or culverts at stream crossings or cross-drainage channels to allow for unimpeded surface drainage.

B. Parking Areas:
   1. Locate as indicated by the COR.

3.04 HAUL ROUTES

A. Perform work on rights-of-way established by 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 public where haul routes cross public highways or roads.

3.05 MAINTENANCE

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

B. Maintain surfacing of roads and parking areas until completion and acceptance of all work under this contract. As approved by 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 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 work under this contract.

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

3.06 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.

3.07 REMOVAL

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

END OF SECTION
This page intentionally left blank.
SECTION 01 56 10
PROTECTION OF EXISTING 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 the following in accordance with Section 01 33 00 – Submittals:
   1. RSN 01 56 10-1, Plan for protecting existing installations.

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 PROTECTION

A. Provide protection for personnel and existing facilities from harm due to the Contractor's operations. Protection shall be subject to approval of the Government.

B. Arrange protective installations to permit operation of existing equipment and facilities by the Government while work is in progress.

C. Do not discharge anything but clear water into building drainage system.

D. Prevent dust from entering ventilating systems.
3.02 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.

3.03 REPAIR

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

END OF SECTION
SECTION 01 56 15
PROTECTION OF EXISTING 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. Bureau of Reclamation (USBR)
   1. RSHS-2009 Reclamation Safety and Health Standards
B. Institute of Electrical and Electronics Engineers (IEEE)

1.03 SUBMITTALS
A. Submit the following in accordance with Section 01 33 00 - Submittals.
B. RSN 01 56 15-1, Utility owner acknowledgment.

1.04 PROJECT CONDITIONS
A. Drawings included in these specifications show existing utilities, but may not show all
   utilities existing at the jobsite.
B. Obtain location of buried conduit, pipe, cable, ground mat, and other buried items before
   excavating.

PART 2 PRODUCTS
Not Used

PART 3 EXECUTION

3.01 INTERFERENCE WITH OPERATION OR MAINTENANCE
A. Do not interfere with operation or maintenance service on utilities, existing on date offers
   are received.
1. 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 56 32
TEMPORARY SAFETY FENCE

PART 1  GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Cost:
   1. Include in prices offered in Price Schedule for other items of work.

PART 2  PRODUCTS

2.01 SAFETY FENCE
A. Fence:
   1. High-density polyethylene grid.
   4. Recovered Material Content:
      a. 90 to 100 percent.
   5. Postconsumer Content:
      a. 60 to 100 percent.
B. Posts: Steel fence posts.

PART 3  EXECUTION

3.01 INSTALLATION
A. Erect fence around work areas at location approved by the COR.
B. Space posts 10 feet, maximum, on center.
C. Secure grid to posts.

3.02 MAINTENANCE AND REMOVAL
A. Maintain fence until work in area is complete and accepted by the COR.
B. Remove fence when no longer required.
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 (USBR)
   1. RSHS Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.html

1.03 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.
D. 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.
E. 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.

1.04 DUST CONTROL
A. Provide dust control and abatement during performance of work.
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 to prevent dust nuisance or damage to persons, property, or activities, including, but not limited to, crops,
orchards, cultivated fields, wildlife habitats, dwellings and residences, agricultural activities, recreational activities, traffic, and similar conditions.

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

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 (USBR)
  1.  RSHS  Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.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  REFERENCE SPECIFICATIONS

A.  Section 31 35 00  Erosion and Sediment Control General

B.  Section 31 35 26  Erosion and Sediment Control Barriers

1.04  SUBMITTALS

A.  Submit the following 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 permit[s].
  3.  Submit 28 days prior to any construction activities.

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).

1.05 REGULATORY REQUIREMENTS

A. Construction Safety Standards:
   1. Comply with sanitation and potable water requirements of section 7 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 CO. 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.

1.06 REQUIRED PERMITS

A. Stormwater Discharge Permit Associated with a Construction Site:
   1. Contractor shall be responsible for contacting and securing a construction permit for stormwater discharge with the Washington State Department of Ecology.
   2. Notice of Intent (NOI):
a. Both the Bureau of 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.

1.07 CONTRACTOR RESPONSIBILITIES

A. Permits:
   1. Any permits obtained by the Bureau of 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:
   1. 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:
   1. Retain records and data required by permits.

PART 2 PRODUCTS

A. Not Used, See Reference Specifications
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, 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 drain water collection, aggregate processing, concrete batching, 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. Do not operate mechanized equipment in waterbodies without having first obtained a section 404 permit, and then only as necessary to construct crossings or perform the required 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:
   a. 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.
      1) Line diked areas with an impermeable barrier at least 50 mils thick.
   d. Areas for refueling operations: Lined with impermeable barrier at least 10 mils thick covered with 2 to 4 inches of soil.

END OF SECTION
This page intentionally left blank.
SECTION 01 57 90

PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL 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 Indian 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 SUBMITTALS

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

1. RSN 01 57 90-1, Samples in accordance with Specification 13 34 13 Pre-Engineered Metal buildings and in accordance with these additional requirements:
   a. Submit color and texture samples of exterior building components to match existing hatchery building as close as possible to meet SHPO requirements.
   b. Samples shall be approved by the COR with input from the Hatchery.

1.04 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-Indian lands.

D. Discovery of Resources

1. When the 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:
   a. Immediately cease work at that location.
   b. Provide immediate verbal notification to the CO, giving the location and nature of the findings.
   c. Follow with written confirmation to the CO within 2 days.

2. 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.

3. 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.
PART 2          PRODUCTS

A.  Pre-engineered Metal Building materials shall meet the requirements of Specification 13
    34 13 Pre-Engineered Metal Buildings. Architectural treatments shall be utilized to
    match as close as possible the existing Hatchery Building and the Existing Metal
    Building Cover over the 10x100 raceways.

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 the Price Schedule 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)
   2. ASME B1.20.1-2013 Pipe Threads, General Purpose, Inch

B. Bureau of Reclamation (USBR)
   1. RSHS Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.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. Protect materials from adverse effects of moisture, sunlight, ultraviolet light, or weather during storage at jobsite.

D. Remove and replace damaged items with new items.

E. Store curing compounds, sealants, adhesives, paints, coatings, sealers, joint compounds, grouts, and similar products at the temperature and environmental conditions recommended by manufacturer.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

A. Provide materials required for completion of work.

B. Provide type and quality described in these specifications. Make diligent effort to procure specified materials from all available sources.

C. Furnish new materials conforming to referenced standards unless otherwise specified.

D. For materials not covered by these or referenced specifications, furnish materials of standard commercial quality.

E. 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.

F. 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.

G. 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 Price 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 GOVERNMENT CONTRACT 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 CO:

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 CO, 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 GOVERNMENT CONTRACT 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 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 DEFINITIONS

A. GPS: Global Positioning System
B. GNSS: Global Navigation Satellite Systems
C. TPS: Terrestrial Positioning Systems (i.e. total stations and automatic levels)

1.03 SUBMITTALS

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

B. RSN 01 71 20-1, Surveying Plan:
   1. Describe work layout and survey methods.
   2. Surveying schedule.
   3. Example of field records format on electronic data collection devices.
   4. Plan for quantity surveys for bid schedule items requiring field measurement (sequence and schedule).

C. RSN 01 71 20-2, Resumes:
   1. Professional Land 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, Completed and Reduced Survey Notes:
   1. Copy of completed and reduced survey notes (electronic or paper) for a survey or portion of survey. Include ASCII coordinate files.
   2. Field records on electronic data collection devices: Include electronic files and paper copies of notes.

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, landXML).

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.

### 1.04 PRIMARY CONTROL

A. The Government has established primary control to be used for establishing work lines and grades.

B. Primary control consists of benchmarks and horizontal control points in work vicinity as shown on drawings.

C. Survey data is based on the datums illustrated on the drawings.

D. Check and verify primary control and resolve discrepancies with Government before beginning work.

E. 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.

### 1.05 QUALIFICATIONS

A. Responsible Surveyor:
   1. Professional Land Surveyor
   2. Registered in the State of Washington
   3. When GPS/GNSS is utilized, shall have working knowledge of geodesy, GNSS/GPS capabilities.

### PART 2 PRODUCTS

#### 2.01 SURVEYING MATERIALS AND EQUIPMENT

A. Provide materials required for surveying work, including, but not limited to, stakes, spikes, steel pins, templates, platforms, and tools.
   1. Except as required to be incorporated in work or left in place, surveying materials remain property of Contractor.

B. Instruments:
1. GNSS/GPS: Dual or multi-frequency survey grade receivers using accepted standards of practice.
2. TPS: Check total station level calibration, vertical index and horizontal collimation monthly and as recommended by instrument manufacturer. Include pre-measurement checks in surveyor reports.
3. Check and adjust optical plummets, tribrachs, tripods, and leveling bubbles monthly and after harsh treatment or long-term storage. For barometers and thermometers, check regularly for accuracy.

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. Place and mark controls so COR can monitor progress without the use of survey equipment.

3.02 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 notes and computations.

C. Perform quantity surveys in presence of authorized Government representative, unless specifically waived. Notify the Government at least 24 hours before performing a quantity survey.

D. Use Government provided AutoCAD Civil 3D 2018 drawing template (DWT), Figure Prefix Database, Linework Code Set to import survey points file and to import survey data and generate 3D surfaces. Naming utilities for original ground and final ground surfaces include project year, project I.D., abbreviated project name, OG (Original Ground), FG (Final Ground) (e.g., xx-xxx NDM OG_01 or xx-xxx NDM FG_01).

1. Use Government provided codes and special codes from Figure Prefix Database Manager and Linework Code Set when collecting topographic data points and importing survey data into drawing file. Refer to Government provided Linework Code Set for Special Codes, Line Segment Codes and Curve Segment Codes.
2. Survey data points (Numeric Point ID, Northing, Easting, Elevation, and Description) shall be provided to the Government as a comma delimited ASCII text format only (csv). When importing survey point data (project coordinates only) into AutoCAD Civil 3D 2018 Survey Data Base (SDB), the point file format shall be PNEZD (comma delimited). See surveyor’s report as shown on drawings for geodesy details.


4. Include in each drawing all metadata (i.e. surveyors report) including but not limited to, control points table associated with specific surveying event, survey methodology, equipment, datums, units, control points used, check shot Northing, Easting and Elevation differences, geodesy, and post processing survey software and version.

5. Control point table in AutoCAD Civil 3D 2018 survey drawing shall display point number, project coordinates, orthometric heights (elevations), and description or point name. Northings, Eastings and orthometric heights shall be shown to the nearest 0.01 ft. Use point table style “Survey Control Points” provided by Government when inserting survey control table in survey drawing files.

3.03 SURVEY REQUIREMENTS

A. Structures: Stake out of structures and checkouts before and during construction.

B. Pavement: Blue tops each 50 feet on tangent and each 25 feet on curves.

   1. When using GPS/GNSS/Real Time Kinematics (RTK) or TPS, input roadway design templates, horizontal and vertical alignments, and superelevation rate data or a Digital Terrain Model (DTM) surface in Data Controller before proceeding with construction staking work.

C. Quantity surveys: Original, final, and intermediate Digital Terrain Models (DTMs) for structure sites and other locations as required for quantity surveys. Volumetric quantities shall be determined by preliminary (before) and final (as-constructed) DTM.

D. Set additional stakes as required by COR.

E. As-builts: As required for structures and other features of work.

3.04 ACCURACY

A. Degree of Accuracy:

   1. Structure Points: Within 0.01 foot, except where installation or operation considerations require tighter tolerances.

   2. Blue Tops:

      a. Subgrades and gravel surfaced roads: Within 0.1 foot.

      b. Pavements: Within 0.01 foot.
3. DTM’s and slope stakes: Within 0.10 foot, horizontally and vertically.

4. Horizontal Control Surveys: Precision shall be dictated by expected use of control point utilizing accepted standards of practice.

B. Beginning and ending of each survey shall include check measurement on known survey point(s).

3.05 FIELD RECORDS

A. Record field notes, computations, and other surveying data on electronic data collection devices or in fieldbooks. Field records shall be complete and accurate record of survey.

B. Record survey data in accordance with recognized professional surveying standards.
   1. Notes or data not in accordance with standard formats will be rejected.
   2. Electronic files of notes on electronic data collection devices: In approved format.
   3. Fieldbooks:
      a. Illegible notes or data or erasures in a fieldbook will be sufficient cause for rejection of part or all of fieldbook.
      b. Corrections by ruling or lining out errors will be permitted.
      c. Copied notes or data will not be permitted.
      d. Rejection of part or all of a fieldbook may necessitate resurveying.

C. Field notes shall include as a minimum:
   1. Daily title page.
   2. Date of survey.
   3. Names and duties of survey crew members.
   4. Pertinent atmospheric conditions, such as temperature, pressure and ppm settings.
   5. Explanatory notes about conditions(s) that might affect accuracy or result of survey.
   6. Instrument data:
      a. Instrument model(s), including GPS antenna type(s), offsets, measurement to ARP (Antenna Reference Point), atmospheric conditions entered, curvature and refraction constant, sea level correction, scale factor, prism model and offset.
      b. Care and adjustment of instruments including pegging the leveling instrument, level rod length checks, use of rod levels, collimation of total stations, prism model and offsets, and other pertinent information.
   7. Survey location.
8. Diagrams or sketches.

9. Pertinent record information and references.

10. Original “raw” data values (without mathematical manipulations and without corrections for errors) of distance, angle, and elevations.

11. Monuments found or set; with complete descriptions (e.g., found 5/8-inch rebar with 1 ½-inch plastic yellow cap, including markings), and description of stampings.

12. Consecutively number pages in upper right-hand corner.

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 schedule for other items of work except as specified.
   2. Cost of environmental site assessments are the Contractor’s responsibility.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (USBR)
   1. RSHS-2009 Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.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

1.03 DEFINITIONS

A. Hazardous waste: Defined as hazardous by 40 CFR 261.3; or by other Federal, State, or local laws or regulations.

1.04 SUBMITTALS

A. Submit the following 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.
   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.

B. Hazardous Waste Locations:
   1. Within the Small Foster Lucas Ponds to be demolished and waste materials to be removed from site, there are sections of pipe that have been painted. The paint contains lead at or above the maximum limit. These sections of pipes and brackets shall be removed and disposed of in accordance with State of Washington Department of Ecology Regulations and Requirements.
   2. See Photo of affected pipe bracket with red paint. All pipe within the demolition area with this type of paint on it shall be removed per 1.07 B 1.
3. See Specification 02 83 30 for additional requirements.

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. 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.
   4. Disposal by Removal:
      a. Reuse or recycle waste materials whenever possible.
   5. Do not burn waste materials.
   6. Do not bury waste materials.

B. Hazardous Waste Disposal:
   1. Hazardous waste is not anticipated at the project site other than the painted pipe brackets illustrated in 1.07 B 2 of this specification.
   2. Dispose by removal from jobsite.
   3. Recycle hazardous waste whenever possible.
   4. Dispose of hazardous waste materials that are not recycled at appropriately permitted treatment or disposal facilities.
   5. 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 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 SUBMITTALS

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

B. RSN 01 78 30-1, Draft As-built Drawings:
   1. Certified marked sets.

C. RSN 01 78 30-2, Final As-built Drawings:
   1. Certified marked sets.

D. RSN 01 78 30-3, Warranties

1.03 RECORD 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. Upon completion of work, sign marked prints as certified correct.
   1. Sign and date each drawing as certified correct. Do not include or certify Information Only drawings.
   2. If no revisions were necessary to illustrate as-built conditions, mark the drawing with “No Changes.”

1.04 WARRANTIES

A. Provide warranties in accordance with the clause at FAR 52.246-21 "Warranty of Construction, the specifications, and this section.

B. Warranty of Construction
   1. Submit data concerning warranty of construction, required by the clause at FAR 52.246-21 "Warranty of Construction, including the warranty period (dates), and warranty contacts with names, addresses, and telephone numbers. Also, post this data, under glass, at a location as directed by the CO.

C. Other Warranties
   1. For other warranties, including those warranties for equipment specified by the CO or the Contract Documents, provide the following:
   2. Warranty List
      a. Bound and indexed notebook containing written warranties obtained, required, or furnished under the contract. Prepare complete list of warranted products, equipment, materials, processes, and other warranted items. Fully execute and deliver this list to the CO prior to final acceptance of contract work. Provide the list in the following format:

      | Specification Section | Warranted Item | Warranty Period Dates | Point of Contact |
      |-----------------------|----------------|-----------------------|-----------------|
      |                       |                |                       |                 |

3. Equipment Warranty Tags
   a. At installation, tag each warranted item with a durable, oil- and water-resistant tag approved by the CO.
      1) Attach tag with copper wire and spray with a clear silicone waterproof coating.
2) Leave date of acceptance and inspector's signature blank until project is accepted.

3) Provide tags showing the following information:

<table>
<thead>
<tr>
<th>Warranty Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Item</td>
</tr>
<tr>
<td>Warranty Period</td>
</tr>
<tr>
<td>[Period] or [Form ___ To ____]</td>
</tr>
<tr>
<td>Contract No.</td>
</tr>
<tr>
<td>Inspector's Signature</td>
</tr>
<tr>
<td>Date Accepted</td>
</tr>
<tr>
<td>Construction Contractor</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Telephone</td>
</tr>
<tr>
<td>Warranty Contact</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Telephone</td>
</tr>
</tbody>
</table>

PART 2  PRODUCTS

Not Used

PART 3  EXECUTION

Not Used

END OF SECTION
This page intentionally left blank.
DIVISION 02 – EXITING CONDITIONS
This page intentionally left blank.
SECTION 02 41 00

DEMOLITION, SALVAGE, AND REHABILITATION

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. Demolition, Salvage, and Rehabilitation

1. Payment: Lump sum price offered in the schedule.
   a. Includes: Shall be on a lump sum basis for all of the project demolition including but not limited to concrete, piping, asphalt, miscellaneous materials, etc.

1.02  SUMMARY

A. Existing pavement, structures, equipment, piping, valves, ductwork, electrical gear, instrumentation, utilities, and related appurtenances such as anchors, supports, and hardware indicated or required to be demolished as part of the work shall be removed and disposed of unless otherwise indicated. Removal of buried structures, utilities, and appurtenances includes the related excavation and backfill as required. Removed items shall be disposed of offsite by the Contractor.

B. See Specification 02 83 30 Removal and Disposal of Coatings Containing Heavy Metals for removal of pipe and brackets with lead paint.

C. Items to be removed include:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt</td>
<td>Sawcut and remove existing asphalt to the extents shown on the Drawings to accommodate concrete removal and pipe installation.</td>
</tr>
<tr>
<td>Raceway Concrete</td>
<td>Remove existing raceway walls and slab as indicated on the Drawings.</td>
</tr>
<tr>
<td>Piping</td>
<td>Existing raceway water main, existing raceway pipe drain, and auxiliary piping within raceways to be demolished. Protect all existing manholes and active water supply piping.</td>
</tr>
<tr>
<td>Grass Sod, trees, and brush</td>
<td>Remove existing grass sod, trees, and brush to the extents shown on the Drawings to accommodate the work.</td>
</tr>
</tbody>
</table>
1.03 SUBMITTALS

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

B. RSN 02 41 00-1, Demolition plan
   1. Demolition and reconstruction activities and procedures, including operational sequence, shall be submitted to the COR for approval. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials and equipment, protection of existing facilities which are to remain undisturbed, coordination with existing facilities to remain in service, and timely disconnection and reconnection of utility services. The procedures shall include a detailed description and time schedule of the methods and equipment to be used for each operation and the sequence of operation. A storage plan for salvaged items shall be included. An off-site certified disposal facility shall be identified for demolished materials.

1.04 COORDINATION

A. The Contractor shall carefully coordinate the work in areas where existing facilities are interconnected with new facilities and where existing facilities remain operational. The work as indicated is not all inclusive, and the Contractor shall be responsible to perform the reconstruction indicated plus that which can be reasonably inferred from the Contract Documents as necessary to complete the Project. The Specifications and Drawings identify the major facilities that shall be demolished and reconstructed, but auxiliary utilities such as water, air, chemicals, drainage, lubrication, fluid power, electrical wiring, controls, and instrumentation are not necessarily shown.

B. The Contractor shall note that the Drawings used to indicate demolition and reconstruction are based on record drawings of the existing facilities. These record drawings have been reproduced to show existing conditions and to clarify the scope of work as much as possible. Prior to bidding, the Contractor shall conduct a comprehensive survey at the Site to verify the correctness and exactness of the Drawings, the scope of work, and the extent of auxiliary utilities.

C. While demolition and reconstruction are being performed, the Contractor shall provide adequate access for the continued operation and maintenance of equipment and hatchery operations. The Contractor shall erect and maintain fences, warning signs, barricades, and other devices around the reconstruction as required for the protection of the public, Contractor's employees, and the COR's personnel at the hatchery. The Contractor shall remove such protection when reconstruction activities are complete, or as work progresses, or when directed by the COR.

1.05 SALVAGE

A. Contractor to coordinate with COR and Hatchery Manager on any additional equipment to be salvaged.
1.06 RELOCATION

A. A power line that extends north into the evaporation pond location shall be re-located as illustrated in the Contract Documents. Relocation shall include all materials, equipment, and labor required to relocate the power line and initialize power per Federal, State, and Local requirements.

1.07 ABANDONMENT

A. Items of existing equipment, piping, valves, electrical gear, instrumentation, utilities, and appurtenances required to be abandoned shall be prepared by the Contractor as indicated.

B. All abandoned pipe shall be backfilled with grout, sand, flowable fill, or equivalent to help preclude adverse settlement if the pipe collapses.

1.08 REHABILITATION

A. Existing civil, landscaping, structural, architectural, mechanical, HVAC, electrical, and instrumentation work disturbed or damaged by reconstruction activities shall be repaired and rehabilitated as indicated.

B. Damaged items shall be repaired or replaced with new items to restore items or surfaces to a condition equal to and matching that existing prior to damage.

C. In buildings with reconstruction work, the Contractor shall not use any Hatchery or USFWS equipment (e.g., bridge cranes and monorails) unless authorized in advance in writing by the COR.

1.09 DISPOSAL

A. The Contractor shall be responsible for the offsite disposal of debris resulting from reconstruction in compliance with local, state, and federal codes and requirements.

1.10 RECYCLING

A. The Contractor shall recycle as much of the existing metals at a local recycling facility as deemed reasonable by the COR. Metals include rebar, raceway standpipes, and miscellaneous embeds recovered during demolition of the existing north bank of Small Foster Lucas Ponds.

PART 2 PRODUCTS

Not Used
PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall coordinate demolition and reconstruction work with the COR. Unless otherwise indicated, the Contractor shall be responsible for the sequence of activities. Work shall be performed in accordance with applicable safety rules and regulations.

B. The Contractor shall verify that any utilities connected to structures, equipment, and facilities to be removed, relocated, salvaged, replaced, or abandoned are rendered inoperable, replaced with new utilities, or adequately bypassed with temporary utilities before proceeding with demolition and reconstruction.

C. The Contractor shall take precautions to avoid damage to adjacent facilities and to limit the work activities to the extent indicated. If reconstruction beyond the scope indicated is required, the Contractor shall obtain approval from the COR prior to commencing.

3.02 PROTECTION OF EXISTING FACILITIES

A. Before beginning any reconstruction, the Contractor shall carefully survey the existing installations and examine the Specifications and Drawings to determine the extent of reconstruction and coordination with the work. Existing installations not subject to reconstruction shall be protected and maintained in accordance with Section 01 56 10 - Protection of Existing Installations. Damaged existing installations shall be repaired to the previous condition or replaced.

B. Persons shall be afforded safe passages around areas of demolition.

C. Structural elements shall not be overloaded. The Contractor shall be responsible for shoring, bracing, or adding new supports as may be required for adequate structural support as a result of work performed under this Section. The Contractor shall remove temporary protection when the work is complete.

D. The Contractor shall carefully consider bearing loads and capacities before placement of equipment and material on Site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, the Contractor shall consult with the COR prior to the placement of such equipment or material.

3.03 DEMOLITION, SALVAGE, AND RELOCATION

A. The Contract Documents indicate existing facilities to be demolished, salvaged, and/or relocated. Auxiliary utilities including such services as water, air, chemicals, drainage, lubrication, fluid power, electrical wiring, controls, and instrumentation are not necessarily indicated. The Contractor shall verify the scope of the work to remove the equipment indicated; coordinate its shutdown, removal, replacement, or relocation; and submit in the demolition activities and procedures as per Section 1.3 above. The removal
of existing facilities for demolition, salvage, and relocation shall include the following requirements:

1. Exposed piping including vents, drains, and valves shall be removed. Where exposed piping penetrates existing floors and walls, the piping, including wall thimbles, shall be removed to a minimum depth of 2-inches. Resultant openings in the structure shall be repaired as indicated.

2. Electrical control panels, junction boxes, motor control centers, and local switches and pushbuttons shall be removed.

3. Exposed electrical conduits and associated wiring shall be removed. Resultant openings in structures shall be repaired as indicated.

4. Connections to embedded electrical conduits shall be removed a minimum of 2-inches inside the finished surface of the existing structure. Wiring shall be removed, and the resulting openings shall be repaired as indicated.

5. Associated instrumentation devices shall be removed.

6. Auxiliary utility support systems shall be removed.

7. The area shall be thoroughly cleaned such that little or no evidence of the previous equipment installation will remain.

8. Asphalt and concrete pavement, curbs, and gutters shall be removed as necessary to perform reconstruction. The limits of removal shall be sawcut. When the required improvements have been constructed, new asphalt and concrete pavement, curbs, and gutters shall be placed to match the original unless otherwise indicated.

9. Footings, foundation walls, below-grade construction and concrete slabs on grade shall be demolished and removed to a depth which will not interfere with new construction, but not less than 36-inches below existing ground surface or future ground surface, whichever is lower.

10. Below-grade areas and voids resulting from demolition of structures shall be completely filled. Fill and compaction shall be in accordance with Section 31 30 00 - Earthwork. After fill and compaction, surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures, or as indicated.

11. When existing pipe is removed, the Contractor shall plug the resulting open ends whether or not so indicated. Where removed piping is exposed, the remaining piping shall be blind-flanged or fitted with a removable cap or plug.

12. When existing piping is removed from existing structures, the Contractor shall fill resulting openings in the structures and repair any damage such that the finished rehabilitated structure shall appear as a new homogeneous unit with little or no indication of where the new and old materials join. The openings in water-bearing structures shall be filled with non-shrink grout to be watertight and reinforced as required or indicated. In locations where the surface of the grout
will be exposed to view, the grout shall be recessed approximately 0.5-inch and the recessed area filled with cement mortar grout.

13. Electrical reconstruction shall be conducted by the Contractor in a safe and proper manner to avoid injury from electrical shock to the COR's and Contractor's personnel. Electrical equipment to be shut off for a period of time shall be tagged, locked out, and sealed with a crimped wire and lead seal and made inoperable. At no time shall electrical wiring or connections which are energized or could become energized be accessible to Contractor, Government, or other personnel without suitable protection or warning signs.

B. The Contractor shall perform a functional test of existing equipment that is relocated and reinstalled to ensure the equipment functions in the manner documented during the initial inspection. The Contractor shall inform the COR in writing a minimum of 5 Days prior to the functional testing in order for the COR and COR to witness the test. If, in the opinion of the COR, the relocated equipment does not function in a satisfactory manner, the Contractor shall make repairs and modifications necessary to restore the equipment to its original operating condition at no additional cost to the COR.

3.04 ABANDONMENT

A. Existing facilities to be abandoned shall be prepared as indicated. Where existing buried piping is to be abandoned, the Contractor shall remove the abandoned pipe for a distance of 5-feet from any connecting structures. Openings at the existing structures shall be repaired. The remaining pipe shall be capped at both ends prior to backfill.

3.05 REHABILITATION

A. Certain areas of existing structures, piping, conduits, and the like will be affected by work necessary to complete modifications under this Contract. The Contractor shall be responsible to rehabilitate those areas affected by its construction activities as per this Section or as indicated in the Contract Documents, whichever is more stringent.

B. Where new rectangular openings are to be installed in concrete or concrete masonry walls or floors, the Contractor shall score the edges of each opening (both sides of wall or floor slab) by saw-cutting clean straight lines to a minimum depth of 1-inch and then chipping out the concrete. Alternately, the sides of the opening (not the corners) may be formed by saw cutting completely through the slab or wall. Saw cuts deeper than 1-inch (or the depth of cover over existing reinforcing steel, whichever is less) shall not be allowed to extend beyond the limits of the opening. Corners shall be made square and true by a combination of core drilling and chipping or grinding. Necessary precautions shall be taken during removal of concrete to prevent debris from falling into or entering adjacent tanks in service or from damaging adjacent equipment or piping. Saw cuts allowed to extend beyond the opening shall be repaired by filling with non-shrink grout. The concrete around any exposed reinforcement steel shall be chipped back and exposed reinforcement steel cut a minimum of 2-inches from the finished face of the new opening and be painted with epoxy paint. The inside face of the new opening shall be grouted
with an epoxy cement grout to fill any voids and cover the exposed aggregate and shall be trowel-finished to provide a plumb and square opening.

C. Where new piping is installed in existing structures, the Contractor shall accurately position core-drilled openings in the concrete as indicated or otherwise required. Openings shall be of sufficient size to permit a final alignment of pipelines and fittings without deflection of any part and to allow adequate space for satisfactory packing where pipe passes through the wall to provide water-tightness around openings so formed. The boxes or cores shall be provided with continuous keyways to hold the filling material in place, and they shall have a slight flare to facilitate grouting and the escape of entrained air during grouting. Before placing the non-shrink grout, concrete surfaces shall be sandblasted, thoroughly cleaned of sand and any other foreign matter, and coated with epoxy bonding compound.

D. Pipes, castings, or conduits shall be grouted in place by pouring in grout under a head of at least 4-inches. The grout shall be poured or rammed or vibrated into place to fill completely the space between the pipes, castings, or conduits, and the sides of the openings so as to obtain the same water-tightness as through the wall itself. The grouted casings shall then be water cured.

E. In locations where the surface of the grout will be exposed to view, the non-shrink grout shall be recessed approximately 0.5-inch and the recessed area filled with cement mortar grout.

F. When new piping is to be connected to existing piping, the existing piping shall be cut square and ends properly prepared for the connection.

G. Where existing equipment, piping, and supports, electrical panels and devices, conduits, and associated appurtenances are removed, the Contractor shall rehabilitate the affected area such that little or no evidence of the previous installation remains. Openings in concrete floors, walls, and ceilings from piping, conduit, and fastener penetrations shall be filled with non-shrink grout and finished to match the adjacent area. Concrete pads, bases associated with equipment, supports, and appurtenances shall be removed by chipping away concrete and cutting any exposed reinforced steel and anchor bolts a minimum of 2-inches below finished grade and be painted with epoxy paint. The area of concrete to be rehabilitated shall be scored by saw cutting clean, straight lines to a minimum depth of 1.5-inches, and concrete within the scored lines removed to a depth of 1.5-inches (or the depth of cover over reinforcing steel, whichever is less). The area within the scored lines shall be patched with non-shrink grout to match the adjacent grade and finish. Abandoned connections to piping and conduits shall be terminated with blind flanges, caps, and plugs suited for the material, type, and service of the pipe or conduit.

H. Existing reinforcement to remain in place shall be protected, cleaned, and extended into new concrete. Existing reinforcement not to be retained shall be cut-off as follows:

1. Where new concrete joins existing concrete at the removal line, reinforcement shall be cut-off flush with the concrete surface at the removal line.
2. Where the concrete surface at the removal line is the finished surface, the reinforcement shall be cut back 2-inches below the finished concrete surface, the ends painted with epoxy paint and the remaining holes patched with a cement mortar grout.

I. Where reconstruction activities damage the painting and coating of adjacent or nearby facilities, the damaged areas shall be surface prepared and coated in accordance with Section 09 96 00 - Protective Coating to match the original painting and coating with a compatible system. Surfaces of equipment items that are to be relocated shall be prepared and be coated in accordance with Section 09 96 00 - Protective Coating. Contractor shall provide a repair plan for COR approval prior to making any corrections.

3.06 DISPOSAL

A. Demolition and removal of debris shall minimize interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the COR. Alternate routes shall be provided around closed or obstructed traffic ways.

B. Site debris, rubbish, and other materials resulting from reconstruction operations shall be legally removed and disposed of. Structures and equipment to be demolished shall be cleaned prior to demolition and the wash water properly disposed of. No trace of these structures shall remain prior to placing of backfill in the areas from which structures were removed.

C. Refuse, debris, and waste materials resulting from demolition and clearing operations shall not be burned.

3.07 OCCUPANCY AND POLLUTION CONTROL

A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. The Contractor shall comply with Government regulations pertaining to environmental protection.

B. Water shall not be used if it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

3.08 CLEANING

A. During and upon completion of work, the Contractor shall promptly remove tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a clean, approved condition.

B. Adjacent structures shall be cleaned of dust, dirt, and debris caused by reconstruction, as directed by the COR or governing authorities, and adjacent areas shall be returned to condition existing prior to start of work.

END OF SECTION
SECTION 02 83 30

REMOVAL AND DISPOSAL OF COATINGS CONTAINING HEAVY METALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Removal and Disposal of Coatings Containing Heavy Metals:
   1. Payment: Lump-sum price offered in the Price Schedule.

1.02 SUMMARY

A. Contractor shall remove pipe and pipe brackets that contain lead-based paint. Photos of a few of the items of concern are illustrated below, illustrated in red paint.

   1.

B. All pipe and brackets within the Small Foster Lucas Pond demolition area shall be removed and disposed of in accordance with State of Washington Department of Ecology Regulations and Requirements.

C. Upon Contractor request, Government shall provide the hazardous materials report for the project site.
1.03 DEFINITIONS

A. Competent Person:
   1. For lead hazards: As defined in 29 CFR 1926.62.
   2. For designing and implementing technical controls to limit employee exposure to airborne contaminants: As defined in 29 CFR 1026.55.

B. Handling: Includes containment, collection, storage, and transportation.

C. Regulated area: Areas on project site where Action Level is exceeded for heavy metals listed below.

D. Coatings Containing Heavy Metals:
   1. Coating containing lead, heavy metals, and other contaminants which may be present in such quantities that solid waste generated from coating removal operations will exhibit the toxicity characteristic when tested in accordance with 40 CFR 261.24 and/or which present airborne hazards during disturbance and removal operations.
   2. The following metals and compounds may be present in aging paint and coating systems, unless otherwise noted:

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM)
   1. ASTM E1728-16 Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination

B. Bureau of Reclamation (USBR)
   1. RSHS Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/ssle/safety/RSHS/rshs.html

C. Code of Federal Regulations (CFR)
   1. 29 CFR 1910.1025 Lead
   2. 29 CFR 1926.32 (f) Definitions – Competent Person
   3. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
   4. 29 CFR 1926.62 Lead
   5. 40 CFR 117 Determination of Reportable Quantities for Hazardous Substances
7. 40 CFR 261 Identification and Listing of Hazardous Waste
8. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
9. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
10. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, Disposal Facilities
11. 40 CFR 268 Land Disposal Restrictions
12. 40 CFR 300 National Oil and Hazardous Substances Pollution Contingency Plan
13. 40 CFR 302 Designation, Reportable Quantities, and Notification
14. 49 CFR 107 Hazardous Materials Program Procedures
15. 49 CFS 172 Training and transport requirements for Hazardous Materials
16. 49 CFR 178 Specifications for Packaging
17. 49 CFR Chapter I Research and Special Programs Administration, Department of Transportation, Hazardous Materials Regulations

D. Society for Protective Coatings (SSPC)
   1. SSPC Guide 6-2015 Containing Surface Preparation Debris Generated During Paint Removal Operations

1.05 SUBMITTALS

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

B. RSN 02 83 30-1, Documentation:
   1. Qualifications of onsite supervisor.

C. RSN 02 83 30-2, Plans:
   1. Worker Protection Compliance Program:
      a. Include information required by 29 CFR 1926.62 (e)(2).
      b. Prepared by Competent Person.
2. Emissions Monitoring Plan:
   a. Include:
      2) Plan for decontamination of contaminated areas and surfaces as required.
   b. Signed by Competent Person.

3. Waste Characterization, Handling, and Disposal Plan:
   a. Include:
      1) Plan for handling, storage, transporting, and disposal of project-generated waste and cleaning of reusable items.
      2) Plan for disposal of wastewater: Include name, location, and address of proposed treatment facility and contact person at proposed treatment facility.
      3) Name, address and qualifications of transporter.
      4) Name, address and qualifications of disposal facility.
      5) Written notice from owner or operator of disposal facility documenting permits and agreement to accept waste generated under this contract.

D. RSN 02 83 30-3, Certificate of disposal:
   1. Certification hazardous materials have been treated.

E. RSN 02 83 30-4, Sampling
   1. Pre-work Sampling Results:
      a. Contractor shall perform Pre-work sampling in accordance with section 1.04 to identify at what level heavy metal contamination may be present prior to commencing work.
   2. Post-work Sampling Results:
      a. Contractor shall perform Post-work sampling in accordance with section 1.04 to verify that existing heavy metal contamination, if any, does not exceed contamination levels encountered during Pre-work sampling.

1.06 QUALIFICATIONS

A. Onsite Supervisor Qualifications: Competent Person, as defined in 40 CFR 1926.32 (f), experienced working under OSHA and EPA regulations.

1.07 REGULATORY REQUIREMENTS
A. Solid waste debris is subject to Federal, State, local, requirements. The most stringent regulation shall apply.

1.08 SAFETY AND HEALTH REGULATIONS
A. Comply with 29 CFR 1926.
B. Limit employee exposure to lead and other airborne contaminants in accordance with 29 CFR 1926.55 and 29 CFR 1926.62.

1.09 PROJECT CONDITIONS
A. Existing coating contains lead and may contain other heavy metals. The Hazardous Materials Testing report is available to the Contractor.
B. The Contractor will be considered the co-generator of any hazardous waste, in accordance with 40 CFR 260.10.
C. Contractor shall coordinate with the Hatchery Facility owner to obtain the EPA Identification number.

1.10 CONTRACTORS RESPONSIBILITIES
A. Obtain EPA Identification number, in accordance with 40 CFR 262.12 before treating, storing, or transporting hazardous waste.
B. Prepare manifest, in accordance with 40 CFR 262 Subpart B, before transporting hazardous waste for offsite treatment, storage, or disposal. Manifest must be signed by a DOT/RCRA Hazmat Certified representative from BOR.
C. Before transporting hazardous waste, obtain written notice from owner or operator of hazardous waste facility, including documentation that facility has required permits and that facility will accept waste to be shipped under this contract, in accordance with 40 CFR 264.12.
D. Obtain certificate of disposal from disposal facility when hazardous waste has been treated.
E. Obtain required transportation permits.

PART 2 PRODUCTS
Not Used
PART 3 EXECUTION

3.01 CONTAINMENT SYSTEM

A. Design and construct containment system to control emissions to the environment in conformance with Federal, State, and local regulations and the following criteria:
   1. Do not exceed ambient air quality standards.
   2. Prevent contamination of any reservoir, watercourse, or water system.
   3. Prevent contamination of sediment in any reservoir or watercourse.
   4. Prevent contamination of soil.

B. Perform the following activities within containment system:
   1. Waste and debris containerization,
   2. Activities which may spread contamination outside contained area.

C. Provide signs and barriers at each point of entry to containment area to prevent unauthorized personnel access.

3.02 WASTE CHARACTERIZATION, HANDLING, AND DISPOSAL

A. Characterize solid waste debris generated from removal operations, in accordance with 40 CFR 261, TCLP Method 1311.

B. Comply with approved written Plan for Waste Characterization, Handling, and Disposal.

C. RCRA-defined Hazardous Waste:
   2. Do not co-mix different types of hazardous and non-hazardous waste materials.
   3. Store coating debris in EPA approved weatherproof, watertight steel containers.
   4. Seal, label, and store in accordance with 49 CFR 178.
   5. Dispose of waste at EPA permitted RCRA Subtitle C disposal facility.

D. Non-hazardous Waste:
   1. Store in closed containers separate from hazardous waste storage areas.
   2. Dispose of waste in accordance with local, county, state, and federal regulations.
   3. Comply with Section 01 74 00 - Cleaning and Waste Management.

E. Wastewater from Coating Removal Operations:
   1. None anticipated.
   2. Filter water contaminated with lead-containing coating debris.
   3. Dispose of wastewater in accordance with Federal, State, local, regulations.
F. Transport hazardous waste materials in accordance with 40 CFR 263, 49 CFR 107, and applicable regulations contained in 49 CFR Chapter I.

3.03 REPORTABLE RELEASES

A. Notify applicable agencies and COR.

3.04 CLEARANCE TESTING

A. Porous surfaces:
   1. Visual methods:
      a. Visible paint chips and dust.

3.05 DECONTAMINATION OF CONTAMINATED AREAS

A. Decontaminate areas and surfaces contaminated with lead and other heavy metals in accordance with approved Emissions Monitoring Plan.

END OF SECTION
This page intentionally left blank.
This page intentionally left blank.
SECTION 03 11 13
CONCRETE FORMWORK

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Cost:
   1. Include cost of furnishing and constructing forms in applicable prices offered in
      Price Schedule for concrete items for which forms are required.

1.02 DEFINITIONS
A. “Hydraulic Structure”. An environmental engineering concrete structure for the
   containment, treatment, or transmission of water, wastewater, other fluids, or gases.
   Hydraulic structures includes concrete Recessed Areas and Sumps in the hatchery
   buildings that contain or transmit water, but do not include foundations, perimeter stem
   walls, and slabs that are not also part of a Hydraulic Structure per the stated definition.

1.03 REFERENCE STANDARDS
A. American Concrete Institute:
   1. ACI 318-14 Building Code Requirements for Structural
      Concrete and Commentary
   2. ACI 350-06 Code Requirements for Environmental
      Engineering Concrete Structures and Commentary

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/ssle/safety/RSHS/rshs.html

D. Western Wood Products Association (WWPA)
   1. WWPA WLGR-2011 Western Lumber Grading Rules 2011

E. National Sanitation Foundation (NSF)
   1. NSF/ANSI 61-2016 Drinking Water System Components –
      Health Effects
1.04 SUMMARY

A. The Contractor shall furnish concrete formwork, bracing, shoring, and supports for cast-in-place concrete all in accordance with the Contract Documents.

B. Work performed shall comply with the standard herein and the Bureau of Reclamation Safety and Health Standards (RSHS).

1.05 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 03 11 13-1, Approval Data:
   1. Manufacturer's information demonstrating compliance with requirements for the following:
      a. Form ties and related accessories, including taper tie plugs, if taper ties are used.
      b. Form gaskets.
      c. Form release agent, including NSF certification if not using mineral oil.
      d. Manufacturer's information on formwork, form materials, and locations for use.

1.06 QUALITY CONTROL

A. Tolerances: The variation from required lines or grade shall not exceed 1/4-inch in 10-feet, non-cumulative, and there shall be no offsets or visible waviness in the finished surface. Other tolerances shall be within the tolerances of ACI 117 - Standard Tolerances for Concrete Construction and Materials

PART 2 PRODUCTS

2.01 GENERAL

A. Unless noted otherwise, work performed for the design and construction of Hydraulic Structures shall be performed per the ACI 350 Standard.

B. Form materials shall not adversely affect the concrete.

C. Forms shall be tight as to prevent loss of water, cement, and fines.

D. Except as otherwise expressly accepted by the COR, lumber brought on the Site for use as forms, shoring, or bracing shall be new material. Forms shall be smooth surface forms and shall be of the following materials:
2.02 FORM MATERIALS

A. Materials. Materials for concrete forms and formwork shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20 - American Softwood Lumber Standard

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork, shall conform to the requirements of PS 1 - Construction and Industrial Plywood, for Concrete Forms, Class I, and shall be edge sealed.

3. Form materials shall be metal, wood, plywood, or other material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade indicated. Metal forms shall accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.

4. Steel leave in place forms shall not be used.

B. Chamfer Edges. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers or be tooled to 0.5-inch radius. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

C. NSF-61 Compliance. Form materials that may leave residues on the concrete shall be certified as compliant with NSF Standard 61.

2.03 FORM TIES

A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties or other removable form tie fasteners having a circular cross-section shall not exceed 1.5 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties for water-retaining structures shall have integral waterstops that tightly fit the form tie so that they cannot be moved from mid-point of the tie. Form ties shall be Wrench Head Snap Tie by MeadowBurke; Snap-Ties by Dayton/Richmond; or equal.

B. Removable taper ties may be used when approved by the COR. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the

<table>
<thead>
<tr>
<th>Walls</th>
<th>Steel, fiberglass, or plywood panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>All other work</td>
<td>Steel panels, fiberglass, plywood or tongue and groove lumber</td>
</tr>
</tbody>
</table>
hole left by the removal of the taper tie. Use Taper-Tie by MeadowBurke, Taper-Tie by Dayton/Richmond, or equal.

PART 3 EXECUTION

3.01 GENERAL

A. Unless noted otherwise, work performed for the design and construction of Hydraulic Structures shall be performed per the ACI 350 Standard.

B. Unless noted otherwise, work performed for the design and construction of Non-Hydraulic Structures shall be performed per the ACI 318 Standard.

C. Design Responsibility. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of forms, and any forms that are unsafe or inadequate in any respect shall promptly be removed from the work and replaced.

1. A sufficient number of forms of each kind shall be available to permit the required rate of progress to be maintained.

2. Provide worker protection from protruding reinforcement bars in accordance with applicable safety codes.

3. The design and inspection of concrete forms shall comply with applicable local, state, and Federal regulations.

4. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the COR and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

D. Quality Control & Bracing. Concrete forms shall conform to the shape, lines, and dimensions of members required, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

E. All forms shall be removed, after the appropriate curing times have been obtained, unless approved otherwise by the COR.

3.02 FORM DESIGN

A. Forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on forms for holding adjacent edges and ends of panels and sections tightly together and in accurate
alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete.

1. Plywood, 5/8-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete.

2. The forms shall be tight so as to prevent the loss of water, cement, and fines during placing and vibrating of the concrete in all instances.

3. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the COR.

4. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03 30 00 - Cast-in-Place Concrete. The size, number, and location of such form windows shall be as acceptable to the COR.

3.03 CONSTRUCTION

A. Vertical Surfaces:

1. Vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is indicated.

2. Not less than 1-inch of concrete shall be added to the indicated thickness of a concrete member where concrete is permitted to be placed against trimmed ground in lieu of forms. Permission to do this on other concrete members will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

B. Construction Joints:

1. Concrete construction joints will not be permitted at locations other than those indicated, except as may be acceptable to the COR.

2. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete.

3. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Form Ties

1. Embedded Ties: Holes left by the removal of form tie cones shall be prepared so as to leave the surface of the holes clean and rough before being filled with mortar. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall
not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties that cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.

2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below-grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls that are dry on both sides. Exposed faces of walls shall have the outer 2-inches of the exposed face filled with a cement grout that shall match the color and texture of the surrounding wall surface.

3.04 REMOVAL OF FORMS

A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted.

1. For vertical walls of Hydraulic Structures, forms shall remain in place at least 36 hours after the concrete has been placed.

2. For parts of the work not specifically mentioned herein, forms shall remain in place for periods of time as recommended in ACI 347 - Guide to Formwork for Concrete.

3.05 REUSE OF FORMS

A. Forms may be reused only if in good condition and only if acceptable to the COR. Light sanding between uses may be required wherever necessary to obtain uniform surface texture on exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of Hydraulic Structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the COR.

3.06 MAINTENANCE OF FORMS

A. General Condition. Forms shall be maintained in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Before concrete is placed, the forms shall be thoroughly cleaned.
B. Form Oil. The form surfaces shall be treated with a lubricant acceptable to the COR. Any excess lubricant shall be satisfactorily removed before placing the concrete. Care shall be exercised to keep lubricant off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

END OF SECTION
SECTION 03 20 00
REINFORCEMENT STEEL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost of concrete reinforcing in applicable prices offered in the Price Schedule for concrete items for which concrete reinforcing is required.

1.02 REFERENCE STANDARDS

A. American Concrete Institute (ACI)
   1. ACI 315-99 Details and Detailing of Concrete Reinforcement (Part of SP-66-04 ACI Detailing Manual)

B. ASTM International (ASTM)
   1. ASTM A615/A615M-16 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

1.03 SUMMARY

A. The Contractor shall provide reinforcement steel and appurtenant work, complete and in place, in accordance with the Contract Documents.

1.04 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 03 20 00-1, Shop Drawings:
   1. Shop drawings shall be provided for reinforcement steel, showing the details of the reinforcement steel which shall conform to ACI 315 – Details and Detailing of Concrete Reinforcement, and the requirements herein. Shop drawings shall include the following items:
      a. Bending diagrams. The shop bending diagrams shall show the actual lengths of bars to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross-section) of the outside surface.
      b. Placement diagrams. Includer bar placement diagrams which shall also clearly indicate the dimensions of splices and where they occur.
c. Bar quantities. The quantity of bars shall be identified for each bar configuration.

1.05 QUALITY CONTROL

A. If requested by the COR, the Contractor shall furnish samples from each heat of reinforcement steel in a quantity adequate for testing. Costs of initial tests will be paid by the COR. Costs of additional tests if material fails initial tests shall be the Contractor’s responsibility.

PART 2 PRODUCTS

2.01 REINFORCEMENT STEEL

A. Reinforcement Steel ASTM Standards. Reinforcement steel for cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar and spiral reinforcement shall conform to ASTM A 615 - Deformed and Plain Billet - Steel Bars, for Grade 60 reinforcement unless otherwise indicated.

B. Accessories

1. Accessories shall include necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement.


a. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating that extends at least 0.5-inch from the concrete surface. Plastic shall be gray in color.

b. Concrete blocks (i.e. dobies) used to support and position reinforcement steel shall have the same or higher compressive strength as required for the concrete in which they are located. Wire ties shall be embedded in concrete block bar supports.

C. Post-Installed Reinforcement

1. Grouts and/or adhesive materials used for connecting post-installed reinforcement to concrete shall be specifically formulated for such application. Materials for post-installed reinforcement using cementitious grout shall conform to Sections 03 60 00 - Cementitious Grout. Materials for post-installed reinforcement using adhesive resin systems shall conform to Sections 03 65 00 – Adhesive Resin Systems.
PART 3 EXECUTION

3.01 GENERAL
A. Reinforcement steel and other appurtenances shall be fabricated, and placed in accordance with the Building Code and the supplementary requirements herein.

3.02 FABRICATION
A. General
1. Reinforcement steel shall be accurately formed to the dimensions and shapes indicated, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318 - Building Code Requirements for Reinforced Concrete, except as modified by the Drawings. Bars shall be bent cold. Bars shall be bent per ACI 318.
2. The Contractor shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings.

B. Fabricating Tolerances: Bars used for concrete reinforcement shall satisfy the following fabricating tolerances:
   1. Sheared length: plus and minus 1-inch
   2. Depth of truss bars: plus zero, minus 0.5-inch
   3. Stirrups, ties, and spirals: plus and minus 0.5-inch
   4. Other bends: plus and minus 1-inch

3.03 PLACING
A. General. Reinforcement steel shall be accurately positioned as indicated and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. Tie wires shall be bent away from the forms in order to provide the required concrete coverage. Reinforcement steel shall be supported by concrete, plastic or metal support spacers, or metal hangers that are strong and rigid enough to prevent any displacement of the reinforcement steel. Concrete dobies used to support reinforcement steel shall be tied to the steel with wire ties that are embedded in the blocks. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

B. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.

C. Plastic Bar Supports: permitted at every location except on grade.
D. Limitations on Bar Supports. Limitations on the use of bar support materials shall be as follows:
   1. Concrete dobies.
      a. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous.

E. Placing tolerances. Unless otherwise indicated, reinforcement placing tolerances shall be within the limits in Section 7.5 of ACI 318 except where in conflict with the Building Code.

F. Adjusting Bar Locations: Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above tolerances, the resulting arrangement of bars shall be as reviewed and accepted by the COR.

G. Additional Bars: Bars additional to those indicated that may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at its own expense.

3.04 SPACING OF BARS

A. General. The clear distance between parallel bars shall be not less than the nominal diameter of the bars, nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one-inch. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

B. Bar Deflection in Walls. When used to space the reinforcing bars from wall forms. The forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.05 SPlicing

A. General
   1. Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where indicated, the character of the splice shall be as reviewed and accepted by the COR.

   2. Unless otherwise indicated, dowels shall match the size and spacing of the spliced bar.

B. Splices Class
   1. The length of lap for reinforcement bars, unless otherwise indicated, shall be in accordance with ACI 318, Section 12.15.1 for a Class B splice.

C. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars shall be bent or straight as indicated. Do not use
bends different from the bends indicated. Bars shall be bent cold, unless otherwise permitted by the COR. No bars partially embedded in concrete shall be field-bent except as indicated or specifically permitted by the COR.

3.06 CLEANING AND PROTECTION

A. Reinforcement steel shall always be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary, recleaned.

3.07 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS

A. Hole Preparation
   1. The hole diameter shall be as recommended by the epoxy manufacturer.
   2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless indicated otherwise.
   3. The hole shall be drilled by methods that do not interfere with the proper bonding of epoxy.
   4. The hole shall be prepared for the use of the epoxy per the epoxy manufacturer recommendations.

B. Embedment
   1. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

END OF SECTION
This page intentionally left blank.
SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Concrete:

1. Measurement: Volume of concrete measured to structure neatlines shown on drawings.
   a. Where concrete is placed on or against excavated surfaces, measurement will be made to lines for which payment for excavation is made.
   b. Measurement of other concrete will be made to structure neatlines shown on drawings.
   c. Volume of openings, recesses, embedded pipes, and metalwork larger than 100 square inches in cross section will be deducted.

   a. Includes cost of concrete reinforcement.
   b. Includes thrust blocks, manhole slabs, footings, stem walls and any other miscellaneous concrete.

1.02 ACRONYMS

A. NRMCA: National Ready Mixed Concrete Association

1.03 DEFINITIONS

A. Hydraulic Structure. An environmental engineering concrete structure for the containment, treatment, or transmission of water, wastewater, other fluids, or gases. Hydraulic structures includes concrete Recessed Areas and Sumps in the hatchery buildings that contain or transmit water, but do not include foundations, perimeter stem walls, and slabs that are not also part of a Hydraulic Structure per the stated definition.

B. Structural Concrete. Structural concrete is all concrete not explicitly defined in the Specifications as non-structural concrete.

C. Shrinkage Reducing Admixture Concrete (SRA Concrete): Concrete with use of Shrinkage Reducing Admixture (SRA) to reduce material shrinkage due to drying. Applicable concrete mix(es) in Table 03 30 00A – Concrete Mixes are identified as SRA Concrete in the Notes column.
D. Supplementary Cementitious Materials (SCM): Cementitious materials other than Portland cement.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 201.2R – 16 Guide to Durable Concrete
2. ACI 301-16 Structural Concrete
3. ACI 304R-00(2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
4. ACI 305.1-14 Hot Weather Concreting
6. ACI 318-14 Building Code Requirements for Structural Concrete
7. ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures and Commentary

B. ASTM International (ASTM)

1. ASTM C31/C31M-18 Making and Curing Concrete Test Specimens in the Field
2. ASTM C33/C33M-18 Concrete Aggregates
3. ASTM C39/C39M-18 Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C42/C42M-16 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5. ASTM C94/C94M-17a Ready-Mixed Concrete
6. ASTM C114-15 Chemical Analysis of Hydraulic Cement
7. ASTM C117-17 Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
8. ASTM C136-14 Sieve Analysis of Fine and Coarse Aggregates
9. ASTM C138/C138M-17a Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
10. ASTM C143/C143M-15a Slump of Hydraulic-Cement Concrete
11. ASTM C150/C150M-17 Portland Cement
12. ASTM C157/C157M-17 Length Change of Hardened Hydraulic-Cement Mortar and Concrete
<table>
<thead>
<tr>
<th>No.</th>
<th>Standard Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>ASTM C171-16</td>
<td>Sheet Materials for Curing Concrete</td>
</tr>
<tr>
<td>14</td>
<td>ASTM C231/C231M-17a</td>
<td>Air Content of Freshly Mixed Concrete by the Pressure Method</td>
</tr>
<tr>
<td>16</td>
<td>ASTM C309-11</td>
<td>Liquid Membrane-Forming Compounds for Curing Concrete</td>
</tr>
<tr>
<td>17</td>
<td>ASTM C494/C494M-17</td>
<td>Chemical Admixtures for Concrete</td>
</tr>
<tr>
<td>18</td>
<td>ASTM C595/C595M-17</td>
<td>Blended Hydraulic Cements</td>
</tr>
<tr>
<td>19</td>
<td>ASTM C618-17a</td>
<td>Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete</td>
</tr>
<tr>
<td>20</td>
<td>ASTM C1017/C1017M-13</td>
<td>Chemical Admixtures for Use in Producing Flowing Concrete</td>
</tr>
<tr>
<td>21</td>
<td>ASTM C1064/C1064M-17</td>
<td>Temperature of Freshly Mixed Hydraulic-Cement Concrete</td>
</tr>
<tr>
<td>22</td>
<td>ASTM C1260-14</td>
<td>Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)</td>
</tr>
<tr>
<td>23</td>
<td>ASTM C1293-08b(2015)</td>
<td>Determination of Length of Change of Concrete Due to Alkali-Silica Reaction</td>
</tr>
<tr>
<td>24</td>
<td>ASTM C1315-11</td>
<td>Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete</td>
</tr>
<tr>
<td>25</td>
<td>ASTM C1567-13</td>
<td>Determining the Potential Alkali-Silica Reactivity of Combination of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)</td>
</tr>
<tr>
<td>26</td>
<td>ASTM C1602/C1602M-12</td>
<td>Mixing Water Used in the Production of Hydraulic Cement Concrete</td>
</tr>
<tr>
<td>27</td>
<td>ASTM D1752-04a(2013)</td>
<td>Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction</td>
</tr>
</tbody>
</table>

C. 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)

D. International Concrete Repair Institute (ICRI)
1. ICRI 310.2-2013  
Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732)

E. Bureau of Reclamation (USBR)

1. USBR M-47  

2. USBR Concrete Manual  

1.05 SUMMARY

A. The Contractor shall provide cast-in-place concrete, joints in concrete, reinforcement steel and appurtenant work, formwork, bracing, shoring, supports, complete and in place, in accordance with the Contract Documents.

1.06 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 03 30 00-1, Materials:

1. Test data relating to the cement, aggregate, and admixtures shall be less than 6 months old. Furnish submittals as required by the Contract Documents and the following in accordance with ACI 301:
   
a. Cement. Mill tests, including fineness, for each shipment of cement to be used.
   
b. Aggregates. Submit gradation test results for aggregate.
   
c. Admixtures. Admixture product data and certifications. Chloride ion content shall be included.

C. RSN 03 30 00-2, Concrete Mix Designs:

1. Prior to beginning the work and within 14 Days of the Notice to Proceed, submit preliminary concrete mix designs which shall show the proportions and gradations of materials proposed for each class and type of concrete. When a trial batch is produced and tested, costs related to trial batch and related laboratory testing shall be Contractor’s responsibility as part of the work. Whether by testing of a trial batch or by the use of acceptable historical tests, the adequacy of mix designs shall be checked through testing by an independent testing laboratory acceptable to the CO.

D. RSN 03 30 00-3, Field Test Results:
1. Submit field test results. When tests are conducted by a Special Inspector as required by the requirements herein, the test results shall be certified by the Special Inspector.

E. RSN 03 30 00-4, Curing:
   1. Submit materials and methods for curing.

F. RSN 03 30 00-5, Temperature-Affected Concrete Work:
   1. If required by the COR or the Specifications herein, submit detailed procedures for concrete work in hot or cold weather as required by this Section of the Specifications.

G. RSN 03 30 00-6, Delivery Tickets:
   1. Where ready-mix concrete is used, the Contractor shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state-certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, the amount of water in the aggregate added at the batching plant, and the amount allowed to be added at the Site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the Site, when unloading began, and when unloading was finished.

1.07 TYPES OF CONCRETE

A. General. Concrete used in the work shall be provided and tested according to the requirements identified herein.

B. Alternatives. Alternative types of concrete may be used for an application upon approval by the COR. The Contractor is not permitted to construct with an alternative type of concrete without receiving approval by the COR.

C. Types and Subtypes. Concrete types listed below may have numerical suffixes added to the type in order to distinguish mix subtypes (ex: SR-1 and SR-2). If subtypes are identified, the Contractor shall construct concrete elements with the subtype corresponding to these elements as defined in the Contract Documents. Each type and subtype of concrete, which requires a uniquely formulated concrete mix different from other concrete mixes in the work, is considered a separate “class of concrete” as defined by ACI standards and shall be sampled and tested accordingly.

D. Standard Structural Concrete. The types of standard structural concrete covered in this Section are listed in the following table.
### E. Non-Structural Concrete

The types of non-structural concrete covered in this Section are listed in the following table.

<table>
<thead>
<tr>
<th>Concrete Type</th>
<th>Type of Structural Concrete</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type SR-2</td>
<td>Standard Regular Mix</td>
<td>Concrete items not indicated otherwise in the Contract Documents.</td>
</tr>
</tbody>
</table>

#### Type SW

Sitework Mix

- Minor concrete elements such as curbs, gutters, catch basins, sidewalks, fence and guard post embedment, underground duct bank encasement, and other concrete appurtenant to electrical facilities unless otherwise indicated.
- Slabs, foundations, or other concrete members for transformers, generators, or other large mechanical or electrical equipment shall not be constructed with Type SW Concrete.

#### Type L

Lean Mix

Concrete to be used for thrust blocks, pipe trench cut-off blocks, and cradles that are indicated on the Drawings as unreinforced. Lean concrete shall be used as protective cover for dowels intended for future connections.

### 1.08 QUALITY CONTROL

#### A. General

Tests of the component materials and of the concrete are required to verify compliance of the materials and mix designs to the Contract Documents and shall be performed as indicated. Laboratory and field testing of materials and concrete shall be in accordance to the standards identified herein. The standards listed in this paragraph do not contain all standards related to the quality control of the cast-in-place concrete.

#### B. Laboratory Standard

Laboratories testing concrete material components and mixes shall meet ASTM C 1077.

#### C. Air Content

Air content of concrete shall be tested in accordance with ASTM C 231. Air content shall be tested at the point of placement.

#### D. Aggregates
1. Testing for aggregate shall include sand equivalence, reactivity, organic impurities, abrasion resistance, and soundness, according to ASTM C 33 and this Section of the Specifications.

2. Aggregate testing shall be performed within 12 months of the start of construction and every 12 months during construction to determine continued compliance.

E. Slump. Slump shall be tested in accordance with ASTM C 143.

F. Temperature. Temperature of concrete shall be tested in accordance with ASTM C 1064.

G. Curing of Test Specimens. Field-sampled concrete test specimens shall be handled and cured in accordance with ACI C 31. Laboratory-cured concrete test specimens shall be handled and cured in accordance with ACI C 192.

H. Access and Sampling. Concrete for testing shall be furnished by the Contractor, and the Contractor shall obtain samples and dispose and cleanup excess material. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling.

I. Special Inspections. Inspection by a Special Inspector approved by the regulatory body having jurisdiction and by the CO will be required when necessary to conform with code requirements, or the requirements of the Contract Documents. Inspection reports shall be submitted to the COR. The Special Inspector shall observe the work in conformance to the Contract Documents, including the preparation and taking of test specimens and placement of concrete except sitework concrete which is fully supported on earth.

J. Testing Costs.

1. Laboratory-testing of the concrete materials and concrete mixes shall be the Contractor's responsibility, unless otherwise noted in the Contract Documents.

2. When a trial batch is produced and tested, the cost of laboratory tests of the concrete, in addition to any testing required to qualify materials of the trial batch, shall be the Contractor's responsibility.

3. The cost of laboratory tests on field-placed cement, aggregates, and concrete and the cost of Special Inspection required by Code will be the Contractor's responsibility. The Contractor shall be responsible for the cost of any tests and investigations of work that is determined to be Defective work.

K. Compression Tests

1. Compression test specimens for concrete shall be made in accordance with Section 9.2 of ASTM C 31. Specimens shall be 6-inches diameter by 12-inches tall cylinders.

2. Each set of specimens shall be a minimum of five (5) cylinders.
3. Sampling of concrete to collect test specimens for each class of concrete shall be as follows. Frequency of sampling may be changed at the discretion of the COR.
   a. Sampling for each class of concrete shall be in accordance with ACI 350, Chapter 5, as follows:
   b. Not less than once a day for each class of concrete placed, nor less than:
   c. Once for each 100 yd³ of each class of concrete placed each day, nor less than:
   d. Once for each 5,000 ft² of slab or wall surface area placed each day.
   e. Minimum Sampling of Concrete. Notwithstanding the above criteria, at a minimum, for a given class of concrete, sampling shall be adequate to provide samples, consisting of at least five (5) test specimens each, made from at least five (5) randomly selected batches or from each batch if fewer than five (5) batches are used.

4. Compression tests shall be performed in accordance with ASTM C 39. One (1) test cylinder shall be tested at 7 Days and two (2) test cylinders shall be tested at 28 Days. The remaining cylinders will be held to verify test results, if needed.

L. Evaluation and Acceptance of Compressive Strength

1. Evaluation and acceptance of the compressive strength of concrete shall be in accordance to ACI 318, Chapter 5, for non-hydraulic structures; or ACI 350, Chapter 5, for hydraulic structures; and the following:

2. If any concrete fails to meet both of the following requirements, immediate corrective action shall be taken to increase the compressive strength for subsequent batches of the type of concrete affected:
   a. The arithmetic average of any three (3) strength tests equals or exceeds the required minimum 28-day compressive strength, and;
   b. No strength test falls below the minimum 28-day compressive strength by more than 500 psi if the 28-day compressive strength is 5,000 psi or less; or more than 10-percent of the 28-day compressive strength is greater than 5,000 psi.

3. When required by the COR, a statistical analysis of compression test results will be provided by the Contractor according to ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.

4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any three (3) consecutive tests being below the required compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard deviation.
5. Concrete that fails to meet the ACI requirements and these Specifications is subject to removal and replacement.

M. Shrinkage Test

1. General. The CONTRACTOR shall perform drying shrinkage tests for test batches or provide drying shrinkage historical test results prior to the first placement of each class of structural concrete which requires drying shrinkage testing.

2. Applicable Concrete. Drying shrinkage tests are required for the following concrete types or concrete structures. Non-structural concrete and structural concrete identified as “pea gravel” mixes do not need to be tested for shrinkage.

3. Testing During Placement. Further drying shrinkage tests are required during placement to determine continued compliance.

4. Test Specimen Preparation. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gauge length of 10-inches; fabricated, cured, dried, and measured in accordance with ASTM C 157, modified as follows: Specimens shall be removed from molds at an age of 23 hours plus or minus 1 hour after batching, shall be placed immediately in water at 70 degrees F plus or minus 3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then be submerged in saturated lime water at 73 degrees F plus or minus 3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 Days. This length at age 7 Days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F plus or minus 3 degrees F and 50 percent plus or minus 4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 Days of drying after 7 Days of moist curing. Drying shrinkage test specimens shall be taken from the same concrete used for preparing compressive strength specimens.

5. Evaluation. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Allowable shrinkage limitations are indicated in Part 2 below.

N. Mix Design Tolerances.
1. Measurement of Water. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the COR and capable of measuring the water in variable amounts within a tolerance of one (1) percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any required amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism shall prevent leakage when the valves are closed.

2. Measurement of Cement and Aggregate. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the Contractor and acceptable to the COR. Weighing tolerances for the materials shall be a maximum of that given below.

<table>
<thead>
<tr>
<th>Material</th>
<th>Percent of Total Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>1</td>
</tr>
<tr>
<td>Aggregates</td>
<td>3</td>
</tr>
<tr>
<td>Admixtures</td>
<td>3</td>
</tr>
</tbody>
</table>

O. Construction Tolerances:

1. General. The Contractor shall set and maintain concrete forms and perform finishing operations to ensure that the completed work is within tolerances. Surface defects and irregularities are defined as finishes and are different from tolerances. Tolerance is the permissible variation from lines, grades, or dimensions indicated on the Drawings.

2. Permitted Tolerances. The following non-cumulative construction tolerances apply to finished walls and slabs unless otherwise indicated in the following Table. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 117.

<table>
<thead>
<tr>
<th>Item</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variation of the constructed linear outline from the established position in plan.</td>
<td>In 10-feet: 1/4-inch; In 20-feet or more: 1/2-inch</td>
</tr>
<tr>
<td>Variation from the level or from the grades indicated.</td>
<td>In 10-feet: 1/4-inch; In 20-feet or more: 1/2-inch</td>
</tr>
</tbody>
</table>
Variation from plumb

| Variation from plumb |  |
|----------------------|--
| In 10-feet: 1/4-inch;|  |
| In 20-feet or more: 1/2-inch |

Variation in the thickness of slabs and walls.

| Variation in the thickness of slabs and walls. |  |
|-----------------------------------------------|--
| Minus 1/4-inch;                               |  |
| Plus 1/2-inch;                                |  |

Variation in the locations and sizes of slabs and wall openings

| Variation in the locations and sizes of slabs and wall openings |  |
|---------------------------------------------------------------|--
| Plus or minus 1/4-inch                                        |  |

PART 2  PRODUCTS

2.01 GENERAL

A. Materials for use in concrete shall comply with ACI 301 and the requirements herein.

B. Unless noted otherwise, work performed for the design and construction of Hydraulic Structures shall be performed per the ACI 350 Standard.

C. Lithium additives shall not be used in concrete mix designs for water bearing structures.

D. Ready-mix concrete shall conform to the requirements of ASTM C 94.

2.02 CEMENT

A. General. Cement for use in concrete shall comply with ACI 301 and the following requirements:
   1. Cement for concrete that will contact potable water shall not be obtained from kilns that burn metal rich hazardous waste fuel.
   2. Cement reclaimed from cleaning bags or leaking containers shall not be used.
   3. Cement shall be used in the sequence of receipt of shipments.
   4. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be accepted by the COR.
   5. Cement that has become lumpy shall not be used.

B. Cement Type. Cement shall be standard brand portland cement conforming to ASTM C 150, for Type I/II or Type V.

C. Fineness. A minimum of 85 percent of cement by weight shall pass a 325 screen.

D. Test Reports. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the COR, if requested, regarding compliance with the Specifications.
2.03 WATER

A. General. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies.

B. Agricultural Water. Agricultural water with high total dissolved solids (greater than 1000 mg/l TDS) shall not be used.

2.04 AGGREGATE

A. General. Aggregates for use in concrete shall be obtained from pits acceptable to the COR, shall be non-reactive, and shall conform to ASTM C 33.

B. Maximum Size. Maximum size of coarse aggregate shall be as indicated.

C. Lightweight Sand. Substituting lightweight sand for fine aggregate will not be permitted.

D. Coarse Aggregates. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock, or a combination thereof. The coarse aggregates shall be prepared and handled in 2 or more size groups for combined aggregates with a maximum size greater than 3/4-inch. When the aggregates are proportioned for each batch of concrete, the 2 size groups shall be combined. When tested in accordance with ASTM C 33, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions or 10.5 percent after 100 revolutions.

E. Fine Aggregates. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that is hard and durable. When tested in accordance with ASTM D 2419, the sand equivalency shall not be less than 75 percent for an average of 3 samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33 when tested in accordance with ASTM C 136 for the fineness modulus of the sand used, including the optional grading in Section 6.2. The fineness modulus of sand used shall not be over 3.1. When tested in accordance with ASTM C 33, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

F. Combined Aggregates. Combined aggregates shall be well graded from coarse to fine sizes and shall be uniformly graded between screen sizes to produce concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

G. Ratio of Silica Release. When tested in accordance with ASTM C 33, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.
H. Soundness. When tested in accordance with ASTM C 33, the loss resulting after 5 cycles of the soundness test shall not exceed 10 percent for fine aggregate and 12 percent for coarse aggregate when using sodium sulfate.

I. Reactivity. Aggregates in the concrete mix shall not react to produce deterioration related to Alkali-Silica Reaction (ASR). The aggregates shall comply with the requirements in the Paragraph “Alkali-Silica Reactivity (ASR) of Aggregates” in this Section of the Specifications.

2.05 FLYASH

A. Fly ash for use in concrete shall be Class F and meet ASTM C 618.

2.06 ADMIXTURES

A. General. Admixtures for use in concrete shall comply with the following requirements:
   1. Single Manufacturer. Admixtures shall be compatible and be furnished by a single manufacturer capable of providing qualified field service representation.
   2. Application and Use. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior end result, the Contractor shall discontinue use of the admixture.
   3. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion, and shall be non-toxic after 30 days.
   4. COR’s Approval. All admixtures shall be approved by the COR prior to use.

B. Air-Entraining Agents.
   1. Agents shall meet the requirements of ASTM C 260.
   2. The COR reserves the right, at any time, to sample and test the air-entraining agent.
   3. The air-entraining agent shall be added to the batch in a portion of the mixing water.
   4. The solution shall be batched by means of a mechanical batcher capable of accurate measurement.

C. Set-Controlling and Water-Reducing Agents.
   1. Admixtures shall conform to ASTM C 494. Normal range water reducer shall conform to ASTM C 494, Type A. High range water reducer shall conform to ASTM C 494, Type F or G. All admixtures shall be approved by the COR prior to use.
   2. Admixtures may be added at the Contractor's option, subject to the COR's approval, to control the set, effect water reduction, and increase workability. The cost of adding an admixture shall be the Contractor's responsibility.
3. The quantity of admixture used, and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.

4. Concrete shall not contain more than one water reducing admixture.

5. Concrete containing a set-controlling or water reducing admixture shall be first placed at a location determined by the COR.

6. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

7. Set controlling admixtures. Set controlling admixture may be either with or without water-reducing properties. Admixture shall be appropriate for the air temperature at time of placement.

8. High range water reducing admixtures (HRWR Admixtures). High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified. All admixtures shall be approved by the COR prior to use.
   a. Water reducer shall be considered as part of the mixing water when calculating the water/cement ratio.
   b. If the high range water reducer is added to the concrete at the Site, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3-inches plus or minus 1/2-inch prior to adding the high range water reducing admixture at the Site.
   c. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the primary system.
   d. Concrete shall be mixed at mixing speed for a minimum of 70 mixer revolutions or 5 minutes after the addition of the high range water reducer, unless recommended otherwise by the manufacturer.

2.07 ALKALI-SILICA REACTIVITY (ASR) OF AGGREGATES

A. General. All aggregates used in the concrete mix designs shall generally be considered non-reactive (innocuous) aggregate according to the requirements of ASTM C 1260 or ASTM C 1567 and tested according to the requirements below.

B. Standard Aggregate Test. Fine and coarse aggregates to be used in all concrete shall be evaluated individually and tested for alkali-aggregate reactivity, according to ASTM C 1260. The average expansion of the mortar bars for the fine aggregate test according to ASTM C 1260 shall not exceed 0.10% at 16-days of immersion in a 1N NaOH solution. Likewise, the average expansion of the mortar bars for the coarse aggregate test according to ASTM C 1260 shall not exceed 0.10% at 16-days of immersion in a 1N NaOH solution.
C. Subsequent Approach. If either of the aggregates do not pass the ASTM C 1260 test requirements as described above, the CONTRACTOR shall provide the following:

1. Information to the COR that the proposed fine and course aggregate is the best (i.e. least reactive) locally available material within 100-miles of the project site.

2. In addition, the CONTRACTOR shall provide testing of the proposed aggregates (fine and course) along with approved mitigating additives (i.e. fly ash, class N pozzolan, GGBF slag, silica fume or other approved additives) to the concrete mix design, according to the requirements of ASTM C 1567 and the following requirements:
   a. The concrete mix design parameters used in the ASTM C 1567 expansion test shall be within the allowable ranges of mix design parameters as specified under the Paragraph “Alkali-Silica Reactivity (ASR) of Aggregates” of this Section. After 16-days of immersion in a 1N NaOH solution, the average expansion of the three mortar bars shall not exceed 0.10% as measured according to ASTM C 1567 standards and protocol.
   b. ASR tests on both the fine and course aggregate and concrete mix additives (i.e. fly ash, pozzolan, or other approved additives), sample bar preparation, testing and all analytical methods shall meet the ASTM C 1567 testing procedural requirements.
   c. Alkali content of the cement in the proposed concrete mix design shall not be greater than the alkali content of the cement used in the test samples.
   d. Results of the ASR test show that expansion of the concrete sample is less than 0.10% at 16-days after the start of the expansion test procedure.
   e. Test results shall be reported to the COR for 7-days, 11-days, and 16-days.
   f. The Concrete Supplier is still actively mining and using aggregate from the same representative portion of the aggregate pit from which the aggregate samples were taken for testing.

D. Alternative Subsequent Approach. In lieu of the ASR testing above the aggregate may be tested in accordance with the requirements of ASTM C 1293, meeting the following requirements:

1. The concrete mix design parameters used in the ASTM C 1293 expansion test shall be within the allowable ranges of mix design parameters as specified under Paragraph “Alkali-Silica Reactivity (ASR) of Aggregates” of this Section.

2. Alkali content of the cement in the proposed concrete mix design shall not be greater than the alkali content of the cement used in the test samples.

3. Results of the test, in accordance with ASTM C 33, shall indicate less than 0.04% expansion at 1-year for cement aggregate combinations to demonstrate aggregates to be non-reactive.
4. Results of the test, in accordance with ASTM C 33, shall indicate less than 0.04% expansion at 2-years for cement aggregate combinations with pozzolan or slag to demonstrate aggregates to be non-reactive.

2.08 CURING MATERIALS

A. Curing Compounds. Curing compounds shall be resin-based, compliant with local VOC requirements, and meet the following requirements:

1. Concrete curing compound shall be approved by the COR prior to use.

2. Regular curing compounds shall be white pigmented and conform to ASTM C 309, Type 2, Class B. Sodium silicate compounds shall not be allowed.

3. When curing compound must be removed for finishes or grouting, compounds shall be a dissipating type meeting ASTM C 309, type 1 or 2, Class B materials for curing concrete shall conform to the following requirements and ASTM C 309 - Liquid Membrane-Forming Compounds for Curing Concrete:

B. Polyethylene sheets. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a nominal thickness of 6-mils. The loss of moisture when determined in accordance with ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

C. Polyethylene-coated waterproof paper sheeting. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, have a nominal thickness of 2-mils, and be permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A – Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant). The loss of moisture, when determined in accordance with ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

D. Polyethylene-coated burlap. Polyethylene-coated burlap for use as concrete curing blanket shall be 4-mils thick with white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

E. Curing Mats. Curing mats for use in Curing Method 6 below shall be heavy shag rugs or carpets or cotton mats quilted at 4-inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

F. Evaporation retardant. Evaporation retardant shall be a material such as Confilm by BASF, Eucobar by Euclid Chemical Company, E-CON by L & M Construction Chemicals, Inc., or equal.
2.09 MISCELLANEOUS MATERIALS

A. General. All miscellaneous materials shall be approved by the COR prior to use.

B. Joint Materials. Joint materials shall conform to Section 03 20 00 – Joints in Concrete.

2.10 CONCRETE MIX DESIGN REQUIREMENTS

A. General. Concrete shall be composed of cement, admixtures, aggregates, and water of the qualities indicated. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage, and where deposited in forms, to have good consolidation properties and maximum smoothness of surface. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items.

B. Proportions. Exact proportions of individual mix components each concrete mix will be determined in advance of the placement of that mix, and these proportions shall be submitted to the COR for review.

C. Adjustments to the Mix Design. The Contractor shall adjust the design mixes whenever such change is necessary to secure the required strength, density, workability, and surface finish. In addition, the Contractor may elect to decrease the water/cement ratio to enhance the strength and shrinkage performance and/or add water reducers, as required to achieve workability. Whether changes are performed to achieve the requirements of the Specifications or performed to enhance workability, the Contractor shall be entitled to no additional compensation because of such changes. Any changes to the accepted concrete mix design shall be submitted to the COR for review and is subject to testing in accordance with these Specifications.

D. Water/Cement Ratio W/C: The water/cement ratio indicated is for saturated-surface dry condition of aggregate. Every Day, throughout the day, the water added to batches shall be adjusted as required to account for changes in the total free moisture in the aggregates. The total free moisture in the aggregates shall be determined as follows:
   1. Total free moisture of aggregates shall be determined by subtracting both the moisture absorbed by the fine aggregate (determined per ASTM C 128) and the moisture absorbed by the coarse aggregate (determined per ASTM C 127) from the total moisture content of all aggregate (determined by ASTM C 566).

E. Aggregate Composition. In mix designs for structural concrete, the percentage of fine aggregate in total aggregate by weight shall be as indicated in the following table.
1. For non-structural concrete, the maximum percentage of fine aggregate of total aggregate by weight shall not exceed 50.

F. Water-Reducing Admixtures. No more than 14 ounces of water reducer per sack of cement shall be used.

G. Trial Batches. If the preparation and testing of a trial batch is required to verify the performance and quality of a concrete mix, then the Contractor shall prepare and test a trial batch in conformance with the requirements herein.

H. Concrete Property Tables.
   1. General. Concrete mixes shall meet the criteria identified in the Concrete Property Tables below.
   2. Disclaimer. The Contractor is cautioned that the limiting parameters are not a mix design. Admixtures may be required to achieve workability required by the Contractor's construction methods and aggregates. The Contractor is responsible for providing concrete with the required workability and strength.
   3. Higher Quality Mixes. The Contractor is permitted to propose substitutions for any given type or subtype of concrete to the COR for approval, and this may include substitutions that will reduce the total number of mix types used in the work. Notwithstanding any provision in the Specifications, only mix designs approved by the COR can be used in the work at the locations approved by the COR.

<table>
<thead>
<tr>
<th>Mix Type:</th>
<th>SR-2</th>
<th>Sitework</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.11 CONSISTENCY

A. General. The quantity of water in a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete that can be worked properly into place.
without segregation and which can be compacted by vibratory methods to give the desired density, impermeability, and smoothness of surface.

B. Uniformity. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency.

C. Testing. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as indicated with the concrete properties.

2.12 TRIAL BATCHES AND LABORATORY TESTS

A. Since laboratory trial batches require 35 calendar days to complete, if test batches are used to qualify a concrete mix design, the Contractor shall test a minimum of 2 mix designs for each class of concrete.

B. The Contractor shall only use a mix design for construction that has first met the trial batch testing requirements or approved historical concrete testing results as specified below.

1. Trial Batch Concrete Testing. Before placing any concrete, a testing laboratory selected by the COR shall prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the Contractor. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments will be considered refinements to the mix design and will not be the basis for extra compensation to the Contractor. Concrete shall conform to the requirements of this Section whether the aggregate proportions are from the Contractor's preliminary mix design or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement, and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and 6 compression test specimens from each batch.

2. Historical Concrete Testing. For shrinkage testing [[as well as ASR expansion testing]] requirements, the Contractor may propose the use of historical test results on these tests provided that all of the following conditions are met:

a. The test results are no more than 6-months old from the project Notice-to-Proceed date.

b. The mix design used in the proposed historical tests has the same characteristics, as described below, as the mix design proposed for use on the project:

1) The type and quantity of cement used in the historical tested mix, is the same as that of the proposed mix design.
2) The quantity and source location of the coarse and fine aggregate used in the historical tested mix is the same as that of the proposed mix design. In addition, the aggregate used in the historical tests must be screened to the same gradations as that proposed for the project mix design.

3) The type and quantity of cementations substitutes (fly ash or slag or other approved substitute) used in the historical tested mix, is the same as that of the proposed mix design.

4) The water to cement ratio of the historical tested mix is within +/- 5% of the proposed water to cement ratio.

5) The air content of the historical tested mix is within 1% of the proposed air content (for example: for a proposed air content of 6% in the proposed mix design, the historical air content must be in the range of 5 to 7%).

6) The same additives, including water reducing additives, that were used in the historical batch test results are being proposed for the new concrete mix design, and the proportions of those additives used in the historical mix design are within +/- 5% of that of the proposed project mix design.

C. Compressive Strength Testing. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured, and tested in accordance with ASTM C 192 and ASTM C 39. Three compression test cylinders will be tested at 7 Days and 3 at 28 Days. The average compressive strength for the 3 cylinders tested at 28 Days for any given trial batch shall not be less than 125 percent of the indicated compressive strength.

D. Sieve Analysis. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

2.13 SHRINKAGE LIMITATION FOR STRUCTURAL CONCRETE

A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21 Day drying age or at 28 Day drying age shall be 0.042 percent or 0.050 percent, respectively. Standard deviation will not be considered. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete.

B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

C. If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions to reestablish compliance. These actions may include changing the source of aggregates, cement and/or admixtures; reducing water/cement ratio; washing of coarse and/or fine aggregate to reduce fines; increasing
the number of construction joints; modifying the curing requirements; or other actions to minimize shrinkage or the effects of shrinkage.

2.14 READY-MIXED CONCRETE

A. At the Contractor's option, ready-mixed concrete may be used if it meets the requirements as to materials, batching, mixing, transporting, and placing indicated herein and is in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete shall be delivered to the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever occurs first.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be the resettable, recording type and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. Materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one-inch when the required slump is 3-inches or less, or if they differ by more than 2-inches when the required slump is more than 3-inches, the mixer shall not be used on the work unless the causative condition is corrected and satisfactory performance is verified by additional slump tests. Mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

F. Each batch of ready-mixed concrete delivered to the Site shall be accompanied by a delivery ticket that is furnished to the COR in accordance with the Paragraph above entitled "Delivery Tickets."

PART 3 EXECUTION

3.01 GENERAL

A. Unless noted otherwise, work performed for the design and construction of Hydraulic Structures shall be performed per the ACI 350 Standard.
B. Proportioning: Proportioning of the mix shall conform to ACI 301.

C. Mixing: Mixing shall conform to ACI 301.

D. Slump: Slumps shall be as indicated.

E. Retempering: Retempering of concrete or mortar that has partially hardened shall not be permitted.

3.02 PREPARATION OF SURFACES FOR CONCRETING

A. General. Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. 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.

C. After the surfaces have been prepared, each approximately horizontal construction joint shall be covered with a 6-inch lift of a pea gravel mix. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

D. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the COR.

E. Embedded Items. No concrete shall be placed until formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the COR’s Inspector at least 4 hours before placement of concrete.

F. Inserts or other embedded items shall conform to the requirements herein.

G. Reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated or by Shop Drawings and shall be acceptable to the COR before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.
H. No concrete shall be placed in any structure until water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to the review of the COR.

I. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

J. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided for during the placing of concrete.

K. Anchor Bolts. Anchor bolts shall be accurately set and shall be maintained in position by templates while embedded in concrete.

L. Cleaning. The surfaces of metalwork to be in contact with concrete shall be thoroughly cleaned of dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.03 HANDLING, TRANSPORTING, AND PLACING

A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.

B. Non-Conforming work or Materials: Concrete which during or before placing is found not to conform to the requirements indicated herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications or which is of inferior quality shall be removed and replaced.

C. Unauthorized Placement: No concrete shall be placed except in the presence of a duly authorized representative of the COR. The Contractor shall notify the COR in writing at least 24 hours in advance of placement of any concrete.

D. Placement in Wall Forms

1. Concrete shall not be dropped through reinforcement steel or into any deep form nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case
shall the free fall of concrete exceed 4-feet in walls and 8-feet in columns below
the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed
during the process of depositing and in no case after depositing shall any portion
be displaced in the forms more than 6-feet in horizontal direction. Concrete in
wall forms shall be deposited in uniform horizontal layers not deeper than 2-feet;
and care shall be taken to avoid inclined layers or inclined construction joints
except where such are required for sloping members. Each layer shall be placed
while the previous layer is still soft. The rate of placing concrete in wall forms
shall not exceed 5-feet of vertical rise per hour. Sufficient illumination shall be
provided in the interior of forms so that the concrete at the places of deposit is
visible from the deck or runway.

2. The surface of the concrete shall be level whenever a run of concrete is stopped.
To insure a level, straight joint on the exposed surface of walls, a wood strip at
least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete
shall be carried about 0.5-inch above the underside of the strip. About one hour
after the concrete is placed, the strip shall be removed and any irregularities in the
edge formed by the strip shall be leveled with a trowel, and laitance shall be
removed.

E. Conveyor Belts and Chutes: Ends of chutes, hopper gates, and other points of concrete
discharge throughout the Contractor's conveying, hoisting, and placing system shall be so
designed and arranged that concrete passing from them will not fall separated into
whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type
acceptable to the COR. Chutes longer than 50-feet will not be permitted. Minimum
slopes of chutes shall be such that concrete of the required consistency will readily flow
in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a
manner that none of the mortar adhering to the belt will be wasted. Conveyor belts and
chutes shall be covered.

F. Placement in Slabs. Concrete placement in sloping slabs shall proceed uniformly from
the bottom of the slab to the top for the full width of the placement. As the work
progresses, the concrete shall be vibrated and carefully worked around the slab
reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

G. Temperature of Concrete: The temperature of concrete when it is being placed shall be
not more than 90 degrees F nor less than 50 degrees F. For sections less than 12-inches
thick the temperature of concrete when placed shall be not less than 55 degrees.

1. If required by COR, Contractor shall submit detailed procedures for production,
transportation, placement, protection, curing, and temperature monitoring of
concrete during hot or cold weather. The submittal shall include procedures to be
implemented upon abrupt changes in weather conditions or equipment failures.

2. Contractor shall not be entitled to additional compensation for satisfying the hot
weather placement or the cold weather placement requirements below.

H. Hot Weather Placement.
1. If the temperature of the concrete is 85 degrees F or greater, the time between introducing the cement into the aggregates and discharge shall not exceed 45 minutes.

2. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, Contractor shall employ effective means such as precooling of aggregates and using ice as mixing water or placing at night as necessary to maintain the temperature of the concrete below 90 degrees F as it is placed.

3. During the curing period, the maximum temperature decrease measured at the surface of the concrete shall not exceed 50 degrees F in 24 hours nor 5 degrees F in one hour.

I. Cold Weather Placement.

1. Placement of concrete shall conform to ACI 306.1, and the following.

2. Remove snow, ice, and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6-inches. Reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.

3. Maintain the concrete temperature above 50 degrees F for at least 72 hours after placement.

4. Concrete ingredients shall not be heated more than necessary to prevent the temperature of the mixed concrete, as placed, from falling below the minimum temperature criterion.

3.04 PUMPING OF CONCRETE

A. General: If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment

1. The pumping equipment shall have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the Site during pumping.

2. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R - Placing Concrete by Pumping Methods.

3. Pumping equipment and hose conduits that are not functioning properly, shall be replaced.

4. Aluminum conduits for conveying the concrete shall not be permitted.

5. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the placement end of the hose.
3.05 ORDER OF PLACING CONCRETE

A. The order of placing concrete in the work shall be acceptable to the COR. To minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints at the indicated locations. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 5 Days for hydraulic structures and 2 Days for all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 10 Days for hydraulic structures and 4 Days for all other structures.

B. The surface of the concrete shall be level whenever a run of concrete is stopped. For a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and laitance shall be removed.

3.06 TAMING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted throughout the entire depth of the layer which is being consolidated into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete. Vibrators shall be Group 3 per ACI 309, high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with at least one standby unit as required. Group 2 vibrators per ACI 309 may be used only at specific locations when accepted by the COR.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against each surface. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall not contact the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.
3.07 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions indicated are defined as tolerances and are indicated above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects.

1. Surface holes larger than ½-inch in diameter or deeper than ¼-inch are defined as surface defects in basins and exposed walls.

C. Unformed Surfaces: After proper and adequate vibration and tamping, unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Whenever the air temperature exceeds 85 degrees F or the wind speed exceeds 25 mph at the time of placement, the concrete shall be treated as follows. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish for unformed concrete surfaces are designated and defined as follows:

1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.

2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where indicated or as determined by the COR.

3. Finish U3 - After the Finish U2 surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of irregularities.

4. Finish U4 - Trowel the Finish U3 surface to remove local depressions or high points. In addition, the surface shall be given a light broom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:
Pilot Circular Tanks and Solids Handling  
Leavenworth National Fish Hatchery  
Solicitation No. 140R1020R0012

UNFORMED SURFACE FINISH SCHEDULE

<table>
<thead>
<tr>
<th>Area</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade slabs and foundations to be covered with concrete or fill</td>
<td>U1</td>
</tr>
<tr>
<td>material</td>
<td></td>
</tr>
<tr>
<td>Top surface of walls</td>
<td>U3</td>
</tr>
<tr>
<td>Water bearing slabs with slopes 10 percent and less</td>
<td>U3</td>
</tr>
<tr>
<td>Water bearing slabs with slopes greater than 10 percent</td>
<td>U4</td>
</tr>
</tbody>
</table>

3.08 CURING

A. General: Concrete shall be cured for not less than 7 Days after placing, in accordance with the methods indicated below for the different parts of the work.

<table>
<thead>
<tr>
<th>Surface to be Cured</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstripped forms</td>
<td>1</td>
</tr>
<tr>
<td>Construction joints between footings and walls, and between floor slab and columns</td>
<td>2</td>
</tr>
<tr>
<td>Encasement and ductbank concrete and thrust blocks</td>
<td>3</td>
</tr>
<tr>
<td>Concrete surfaces not specifically provided for elsewhere in this Paragraph</td>
<td>4</td>
</tr>
<tr>
<td>Buried slabs and backfilled walls</td>
<td>5</td>
</tr>
<tr>
<td>Floor slabs on grade in Hydraulic Structures</td>
<td>5</td>
</tr>
<tr>
<td>Wall sections with forms removed</td>
<td>6</td>
</tr>
</tbody>
</table>

B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removal. If steel forms are used, the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 Days of placing the concrete, curing shall be continued in accordance with Method 4 below.
C. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

D. Method 4: The surface shall be sprayed with a liquid curing compound.
   1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200-square feet per gallon and in such a manner as to cover the surface with a uniform film that will seal thoroughly.
   2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the 7 Day curing period. If the seal is damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
   3. Wherever curing compound has been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, compound shall be entirely removed by high pressure washing just prior to the placing of new concrete.
   4. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within 2 hours after removal of forms. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound.
   5. During the curing period, no traffic of any nature and no depositing of any materials, temporary or otherwise, shall be permitted on surfaces coated with curing compound. Foot traffic and the depositing of materials may be allowed after 3 Days if the surface is covered with 5/8-inch plywood placed over polyethylene sheets.

E. Method 5: This method applies to both buried slabs and walls to be backfilled.
   1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 Days beginning immediately after the concrete has reached final set or forms have been removed.
   2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water through nozzles that atomize the flow so that the surface is not marred or washed.
   3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held substantially in contact with the concrete surface to prevent being dislodged by wind or any other causes. Edges shall be continuously held in place.
4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4 above.

6. The Contractor shall dispose of excess water from the curing operation to avoid damage to the work.

F. Method 6. This method applies to both walls and slabs.

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 Days beginning immediately after the concrete has reached final set or forms have been removed.

2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.

3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held substantially in contact with the concrete surface to prevent dislodging by wind or any other causes. Edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, the entire concrete surface shall be wetted, and curing compound shall be immediately applied to the entire surface in accordance with Method 4 above.

6. The Contractor shall dispose of excess water from the curing operation to avoid damage to the work.

G. The Contractor may submit alternate methods of curing which maintain the concrete in a continuously wet condition for acceptance by the COR.

3.09 PROTECTION

A. The Contractor shall protect concrete against injury until final acceptance.

B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The Contractor shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

3.10 CURING IN COLD WEATHER

A. Water curing of concrete may be reduced to 6 Days during periods when the mean daily temperature in the vicinity of the Site is less than 40 degrees F; provided that, during the
prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.

B. Concrete cured by an application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise, the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water shall be protected against freezing temperatures for 72 hours immediately following the 72 hours of protection at 50 degrees F.

C. Discontinuance of protection against freezing temperatures shall be such that the drop-in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 Days, 72 hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.

D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

3.11 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, exposed concrete surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the COR. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. Repairs and replacements shall be performed promptly.

B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 0.5-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of laitance or soft material, plus not less than 1/32-inch depth of the surface film from hard portions by means of an efficient sandblast. After cutting and surface preparation, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces underneath will remain moist but not so wet as to overcome the suction upon which a good bond depends. The material used for repair shall consist of a mixture of one sack of cement to 3-cubic feet of sand. For exposed walls, the cement
shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.

C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.

D. Repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this Section as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.12 PATCHING HOLES IN CONCRETE

A. Patching Small Holes
   1. Holes that are less than 12-inches in the least dimension and extend completely through concrete members shall be filled.
   2. Small holes in members that are water-bearing or in contact with soil or other fill material shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2-inches from the finished surface. The remaining 2-inches shall then be patched according to the Article above entitled "Treatment of Surface Defects."
   3. Small holes through other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.

B. Patching Large Holes
   1. Holes which are larger than 12-inches in the least dimension shall have a keyway chipped into the edge around the opening, unless a formed keyway exists. The holes shall then be filled with concrete as indicated herein.
   2. Holes which are larger than 24-inches in the least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless indicated otherwise.
   3. Large holes in members that are water bearing or in contact with soil or other fill shall have a hydrophilic type waterstop material placed around the perimeter of the hole in accordance with Section 03 32 00 unless there is an existing waterstop in place.
3.13 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, which becomes defective at any time prior to the final acceptance of the completed work, which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete.

B. All bug holes and surface repairs shall be completed within 24-hours of the forms being stripped.

END OF SECTION
SECTION 03 32 00
JOINTS IN CONCRETE

PART 1   GENERAL

1.01  MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost of constructing joints and furnishing joint materials in applicable
      prices offered in Price Schedule for concrete items for which these items are
      required.

1.02  DEFINITIONS

A. “Hydraulic Structure”. An environmental engineering concrete structure for the
   containment, treatment, or transmission of water, wastewater, other fluids, or gases. 
   Hydraulic structures includes concrete Recessed Areas and Sumps in the hatchery 
   buildings that contain or transmit water, but do not include foundations, perimeter stem 
   walls, and slabs that are not also part of a Hydraulic Structure per the stated definition.

1.03  REFERENCE STANDARDS

A. American Concrete Institute:
   1. ACI 318-14 Building Code Requirements for Structural 
      Concrete and Commentary
   2. ACI 350-06 Code Requirements for Environmental 
      Engineering Concrete Structures and 
      Commentary

1.04  SUMMARY

A. The Contractor shall provide joints in concrete, complete and in place, in accordance 
   with the Contract Documents.

B. Joints in concrete structures shall be the types defined below and will be permitted only 
   where indicated, unless specifically accepted by the COR.

1.05  TYPES OF JOINTS

A. Construction Joints 
   1. When fresh concrete is placed against a hardened concrete surface, the joint 
      between the pours shall be defined as a construction joint.
   2. Unless otherwise indicated, joints in water-bearing members shall be provided 
      with a waterstop and/or sealant groove of the shape indicated.
B. Contraction Joints

1. Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the earlier pour.

2. Waterstop and/or sealant groove shall be provided where indicated.

C. Expansion Joints

1. In order to allow the concrete to expand freely, a space shall be provided between the 2 pours, and the joint shall be formed as indicated.

2. The space shall be obtained by placing a filler joint material against the earlier pour to act as a form for the later pour.

3. Unless otherwise indicated, expansion joints in water bearing members shall be provided with a center-bulb type waterstop.

4. Provide premolded expansion joint material with the edge at the indicated distance below or back from the finished concrete surface.

5. Provide a slightly tapered, dressed and oiled wooden strip secured to or placed at the edge of the expansion joint during concrete placement, and remove the strip later to form a space for the sealing material.

6. The space so formed shall be filled with a joint sealant material as indicated below. In order to keep the two wall or slab elements in line.

7. If indicated on the drawings, the joint shall be provided with a sleeve-type dowel as indicated.

D. Crack Control Joints

1. The function of the crack control joint is to provide a weaker plane in the concrete to promote shrinkage-related cracking at engineered locations and to discourage shrinkage-related cracking elsewhere in the structure.

2. Formed Groove

   a. A groove, of the shape and dimensions indicated, shall be formed or saw-cut in the concrete and the groove shall then be filled with a joint sealant material.

   b. The formed groove shall be placed in the first of the two sections cast at the control joint, in order to assure that the sealant bonds to the second section across the joint and not to the cement paste from the first pour.

1.06 SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 - Submittals

B. RSN 03 32 00-1, Shop Drawings:
1. Furnish placement drawings showing the location and types of joints for each structure.

2. Test Reports
   a. Furnish certified test reports from the sealant manufacturer on the actual batch of material supplied, demonstrating compliance with the indicated requirements.
   b. Furnish the test reports before using the sealant on the Project.

3. Welding Certification
   a. Furnish copies of the waterstop welding certification by manufacturer or authorized agent of the manufacturer.
   b. Every person who is to be involved with waterstop installation shall be required to have individual certification on file with the COR, stating that the named individual is certified and trained to install waterstop in accordance with the manufacturer's recommendations and specifications.

4. Furnish manufacturer's information demonstrating compliance of the following with the indicated requirements:
   a. bearing pad
   b. neoprene sponge
   c. preformed joint filler
   d. backing rod
   e. waterstop
   f. slip dowels

C. RSN 03 32 00-2, Samples:
   1. Prior to production of the material required under this Section, submit qualification samples of waterstops which accurately represent the material being provided.
   2. Such samples shall be extruded or molded sections of each size or shape to be installed.
   3. The balance of the material to be used shall not be produced until after the COR has reviewed the qualification samples.

D. RSN 03 32 00-3, Certificates:
   1. Furnish written certification from the manufacturer, as an integral part of the shipping form, that the material shipped to the Site meets or exceeds the indicated physical property requirements.
   2. Supplier certificates will not be accepted.
1.07 QUALITY CONTROL

A. Construction Joint Sealant
   1. The Contractor shall prepare adhesion and cohesion test specimens at intervals of 5 Days while sealants are being installed.
   2. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:
      a. Sealant specimen shall be prepared between 2 concrete blocks (1-inch by 2-inch by 3-inch).
      b. Spacing between the blocks shall be one inch.
      c. Coated spacers (2-inch by 1.5-inch by 0.5-inch) shall be used to set and hold sealant cross-sections of 0.5-inch by 2-inch with a width of one inch.
      d. The sealant shall be cast and cured in accordance with the manufacturer's recommendations, except that the curing period shall be not less than 24 hours.
      e. Following the curing period, the gap between the blocks shall be widened to 1.5-inches, and spacers shall be used to maintain this gap for 24 hours prior to inspection for failure.

1.08 SPECIAL CORRECTION OF DEFECTS REQUIREMENT

A. The Contractor shall furnish a 5-year written warranty of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that the Contractor agrees to repair or replace, to the satisfaction of the CO, any defective areas which become evident within the 5-year period.

PART 2 PRODUCTS

2.01 JOINT MATERIALS

A. Neoprene Sponge
   1. The sponge shall be neoprene, closed-cell, expanded, conforming to ASTM D 1056 - Flexible Cellular Materials - Sponge or Expanded Rubber, Type 2C5-E1.

B. Joint Filler
   1. Joint filler for expansion joints in hydraulic structures shall be neoprene conforming to ASTM D 1056, Type 2C5-E1.
   2. Joint filler material in other locations shall be of the preformed non-extruding type, constructed of cellular neoprene sponge rubber or polyurethane of firm texture.
   3. Bituminous fiber type will not be accepted.
4. Non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction, for Type I, except as otherwise indicated.

2.02 WATERSTOP

A. PVC Waterstops

1. Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the indicated requirements of this Section.

2. No reclaimed or scrap material shall be used.

3. The Contractor shall obtain from the waterstop manufacturer and shall furnish to the COR for review, a written certification of the manufacturer that the material to be shipped to the Site meets the physical requirements as outlined in the U.S. Army Corps of Engineers Specification CRD-C572-PVC Waterstops, and those indicated.

4. Center-Bulb Waterstops

a. Center-bulb waterstops shall be manufactured such that at no place shall the thickness of the waterstops be less than 3/8 inch.

b. The waterstop shall be provided with hog rings installed at 12 inches on centers along the waterstop.

c. Shapes shall be as indicated, or as acceptable to the COR.

5. When tested in accordance with the indicated test standards, the waterstop material shall meet or exceed the following requirements:

<table>
<thead>
<tr>
<th>Physical Property, Sheet Material</th>
<th>Value</th>
<th>ASTM Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength-min, psi</td>
<td>2,000</td>
<td>D 638, Type IV</td>
</tr>
<tr>
<td>Ultimate Elongation-min, percent</td>
<td>350</td>
<td>D 638, Type IV</td>
</tr>
<tr>
<td>Low Temp Brittleness, max degrees F</td>
<td>-35</td>
<td>D 746</td>
</tr>
<tr>
<td>Stiffness in Flexure, min, psi</td>
<td>600</td>
<td>D 747</td>
</tr>
</tbody>
</table>

Accelerated Extraction (CRD-C572)

| Tensile Strength-min, psi        | 1,500  | D 638, Type IV    |
| Ultimate Elongation, min, percent | 300    | D 638, Type IV    |
Effect of Alkalis (CRD-C572)

| Change in Weight, percent | plus 0.25/minus 0.10 | ------ |
| Change in Durometer, Shore A | plus and minus 5 | D 2240 |

B. Preformed Hydrophilic Waterstops

1. Hydrophilic (bentonite-free) waterstops shall be Sika Hydrotite CJ manufactured by Sika Corporation, Type NB 190 manufactured by JP Specialties, or equal as approved by the COR.
2. The cross-sectional area of the waterstop shall not be less than 0.5 square inch.
3. Hydrophilic waterstop shall be the type that expands in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast.
4. The waterstop shall be manufactured from butyl rubber with hydrophilic properties.
5. The waterstop shall have a delay coating to inhibit initial expansion due to moisture present in fresh concrete.
6. The minimum expansion ratio of modified chloroprene shall be not less than 2-to-1 volumetric change in distilled water at 70 degrees F (21 degrees C).
7. The bonding agent for hydrophilic waterstop shall be the manufacturer's recommended adhesive for wet, rough concrete.

2.03 BACKING ROD

A. The backing rod shall be an extruded closed-cell, polyethylene foam rod.

B. The rod material shall be compatible with the joint sealant material, and shall have a tensile strength of not less than 40-psi and a compression deflection of approximately 25 percent at 8-psi.

C. The rod shall be 1/8-inch larger in diameter than the joint width except that a one-inch diameter rod shall be used for a 3/4-inch wide joint.

2.04 SLIP DOWELS

A. Slip dowels in joints shall be smooth epoxy-coated bars conforming to ASTM A 775 - Epoxy Coated Reinforcing Steel Bars.

2.05 PVC TUBING

A. PVC tubing in joints shall be SDR 13.5, conforming to ASTM D 2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
PART 3 EXECUTION

3.01 JOINT CONSTRUCTION

A. Joint Location
   1. Construction joints and other types of joints shall be provided where indicated.
   2. If not indicated, construction joints shall be provided at a 25-foot maximum spacing.
   3. Where joints are indicated to be spaced greater than 40 feet apart, additional joints shall be provided to maintain the 25-foot maximum spacing.
   4. The location of joints, regardless of type, shall be submitted for acceptance by the COR.

B. Joint Preparation
   1. Special care shall be used in preparing concrete surfaces at joints where bonding between 2 sections of concrete is required.
   2. Unless otherwise indicated, such bonding shall be required at every horizontal joint in walls.
   3. Surfaces shall be prepared in accordance with Section 03 30 00 - Cast-in-Place Concrete.

C. Retrofit Joint Preparation
   1. Existing surfaces to receive a retrofit waterstop shall be clean and free from any loose or foreign material.
   2. The surface shall be given a light sandblast or hydroblast finish to 1/8-inch amplitude prior to the application of epoxy and waterstop.

D. Construction Joint Sealant
   1. Construction joints in water-bearing floor slabs and elsewhere as indicated shall be provided with tapered grooves which shall be filled with a construction joint sealant.
   2. The material used to form the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant.
   3. After removing the forms from the grooves, laitance and fins shall be removed, and the grooves shall be sand blasted.
   4. The grooves shall be allowed to thoroughly dry, after which they shall be blown out and immediately thereafter they shall be primed and filled with the construction joint sealant.
   5. The primer shall be furnished by the sealant manufacturer, and no sealant shall be used without a primer.
   6. Care shall be used to completely fill the sealant grooves.
7. Areas designated to receive a sealant fillet shall be thoroughly cleaned as outlined for the tapered grooves prior to application of the sealant.

8. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant prior to application.

9. The sides of the sealant groove shall not be coated with bond breaker, curing compound, or any other substance which would interfere with proper bonding of the sealant.

10. The sealant shall achieve final cure at least 7 Days before the structure is filled with water.

11. The sealant shall be installed by a competent waterproofing specialty contractor with a successful record of performance in similar installations.

E. Mixing

1. Catalyst-cured, 2-part materials shall be thoroughly and uniformly mixed, and special care shall be taken to properly mix the sealer before its application.

2. Before any sealer is placed, the Contractor shall arrange to have workers performing the work carefully instructed on the proper method of mixing and application by a representative of the sealant manufacturer.

F. Failure to Cure

1. Any joint sealant that fails to fully and properly cure after the manufacturer's recommended curing time for the conditions of the work shall be completely removed, and the groove shall be thoroughly sandblasted to remove traces of the uncured or partially cured sealant and primer.

2. The groove shall be re-sealed with the indicated joint sealant.

3. Costs of such removal, joint treatment, re-sealing, and appurtenant work shall be the Contractor's responsibility as part of the work.

END OF SECTION
SECTION 03 60 00
CEMENTITIOUS GROUT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost of cementitious grout in applicable prices offered in the Price Schedule for concrete items for which cementitious grout is required.

1.02 SUMMARY

A. The Contractor shall provide grout, complete and in place, in accordance with the Contract Documents.

B. Grout Types. The following types of grout are covered in this Section:
   1. Cement Grout
   2. Non-Shrink Grout - Class I (cement-based)
   3. Non-Shrink Grout - Class II (cement-based)
   4. Topping Grout and Concrete/Grout Fill

1.03 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 03 60 00-1, Testing and Certifications
   1. Certified testing lab reports for tests indicated herein.
   2. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.
   3. Certification that grouts used on the project contain no chlorides or other chemicals that cause corrosion.
   4. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, curing, and appropriate uses for each type of grout used in the work, and location of use.
   5. Manufacturer's certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.
   6. Submit manufacturer's written warranty as indicated herein.
1.04 QUALITY CONTROL

A. Field Tests
   1. Compression test specimens will be taken from the first placement of each type of grout, and at intervals thereafter selected by the COR. The specimens will be made by the Contractor.
   2. Compression tests and fabrication of specimens for cement grout and cement based non-shrink grout will be performed in accordance with ASTM C 1107 - Packaged Dry, Hydraulic-Cement Grout (Nonshrink), at intervals during construction selected by the COR. A set of 3 specimens will be made for testing at 7 Days, 28 Days, and each additional time period as appropriate.
   3. Compression tests and fabrication of specimens for topping grout and concrete/grout fill will be performed in accordance with Section 03 30 00- Cast-in-Place Concrete, at intervals during construction selected by the COR.
   4. The cost of laboratory tests on grout will be paid by the Contractor. In such case, the Contractor shall pay for the tests, removal and replacement of Defective Work, and re-testing, all as part of the work.
   5. The Contractor shall obtain specimens for testing and shall furnish materials necessary for fabricating the test specimens.

B. Construction Tolerances: Construction tolerances shall be as indicated in Section 03 30 00 - Cast-in-Place Concrete, unless indicated otherwise.

1.05 SPECIAL CORRECTION OF DEFECTS PROVISIONS

A. Manufacturer's Warranty
   1. Furnish one year warranty for work provided under this section.
   2. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 PRODUCTS

2.01 APPLICATION

A. Unless indicated otherwise, grouts shall be provided as listed below whether indicated on the Drawings or not.

<table>
<thead>
<tr>
<th>Application</th>
<th>Type of Grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor bolts and reinforcing steel required to be set in grout in which the</td>
<td>Non-Shrink - Class I</td>
</tr>
<tr>
<td>average working or operating temperature will be over 100 degrees F or in</td>
<td></td>
</tr>
<tr>
<td>high fire risk areas.</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>Type of Grout</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
</tbody>
</table>
| When approved by the COR, anchor bolts and reinforcing steel required to be set in grout that is not in high temperature or high fire risk areas. | Epoxy Anchor Grout  
(See Section 03 65 00)                                      |
| Beam and column base plates in the least dimension.                        | Non-Shrink - Class I                                |
| Storage tanks and other non-motorized equipment and machinery under 30 horsepower | Non-Shrink - Class I                                |
| Filling blockout spaces for embedded items such as railing posts, gate guide frames, etc. | Non-Shrink - Class I (Class II where placement time exceeds 20 min.) |
| Under precast concrete elements                                            | Non-Shrink - Class II                               |
| Toppings and concrete/grout fill less than 3-inches thick                  | Topping Grout                                       |
| Toppings and concrete/grout fill greater than 3-inches thick               | Structural Concrete per Section 03 30 00             |
| Surface repairs                                                            | Cement Grout                                        |
| Repair of holes and defects in concrete members which are not water bearing and not in contact with soil or other fill material | Non-Shrink - Class I                                |
| Repair of holes and defects in concrete members which are water bearing or in contact with soil or other fill material | Non-Shrink - Class II                               |
| Any application not listed above, where grout is indicated                 | Non-Shrink Class I, unless specifically indicated otherwise |

2.02 CEMENT GROUT

A. Cement grout shall be composed of one part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 Days shall be 4,000 psi.

B. Cement grout materials shall be as indicated in Section 03 30 00 - Cast-in-Place Concrete.
2.03 NON-SHRINK GROUTS (cement-based)

A. General

1. Cement-based non-shrink grout shall be a prepackaged, inorganic, fluid, non-gas liberating, non-metallic, cement type grout requiring only the addition of water. Cement from kilns burning metal-rich hazardous waste fuel shall not be used.

2. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout shall be as recommended by the manufacturer for the particular application.

3. Grout shall not contain chlorides or additives that may contribute to corrosion.

4. Grout shall be formulated to be used at any consistency from fluid to plastic.

5. Cement-based non-shrink grout shall have the following minimum properties when tested at a fluid consistency, at 28 Days:
   c. Grout shall be certified for use in freeze/thaw environments.

B. Class I Non-Shrink Grout

1. Class I non-shrink grout shall have a minimum 28 Day compressive strength of 5000 psi when mixed at a fluid consistency.

2. Class I non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C, when mixed to fluid, flowable, and plastic consistencies.

3. Grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827 – Test Method for Early Volume Change of Cementitious Mixtures. The grout when tested shall not bleed or segregate at maximum allowed water.

4. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090 - Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

5. Furnish certification that the non-shrink property of grout is not based on gas production or gypsum expansion.

6. Class I Non-Shrink Grout shall be Masterflow 713 Plus by BASF, Five Star Grout by Five Star Products, Sikagrout 212 by Sika Corporation, Premier by L&M Construction Chemicals; High-Flow Grout by Euclid Chemical Company, CG 200 PC by Hilti, or approved equal.
C. Class II Non-Shrink Grout
   1. Class II non-shrink grout shall be a high precision, fluid, extended working time grout. The minimum 28-Day compressive strength shall be 7,500 psi, when mixed at a fluid consistency.
   2. Grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827.
   3. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090.
   4. Class II non-shrink grout shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C 827 at temperature extremes of 45 to 90 degrees F in accordance with ASTM C 1107.
   5. Class II non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C 939.
   6. The grout when tested shall not bleed or segregate at maximum allowed water content.
   7. Provide certification that its non-shrink property is not based on gas production or gypsum expansion.
   8. Class II non-shrink grout shall be Masterflow 928 by BASF, Five Star Fluid Grout 100 by Five Star Products, Crystex by L&M Construction Chemicals, or approved equal.

D. Topping Grout and Concrete/Grout Fill
   1. Where fill is thicker than 3-inches, structural concrete, as indicated in Section 03 30 00 - Cast-in-Place Concrete, may be used when accepted by the COR.
   2. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated. Materials and procedures indicated for normal concrete in Section 03 30 00 - Cast-in-Place Concrete, shall apply unless indicated otherwise.
   3. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45.
   4. Coarse aggregate shall be graded as follows:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 in</td>
<td>100</td>
</tr>
<tr>
<td>3/8 in</td>
<td>90-100</td>
</tr>
</tbody>
</table>
5. Topping grout and concrete grout/fill shall contain air-entraining agent per Section 03 30 00 - Cast-in-Place Concrete.

6. Strength: Minimum compressive strength of topping grout and concrete/grout fill at 28 Days shall be 4,000 psi.

2.04 CURING MATERIALS

A. Curing materials shall be in accordance with Section 03 30 00 - Cast-in-Place Concrete and as recommended by the manufacturer of prepackaged grouts.

2.05 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is defined such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.

B. The slump for topping grout and concrete/grout fill shall be adjusted to match placement and finishing conditions but shall not exceed 4-inches.

2.06 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3    EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Grout shall be stored in accordance with manufacturer's recommendations.

3.02 GENERAL

A. Contractor shall arrange for the manufacturer of prepackaged grouts to provide on-Site technical assistance within 72 hours of request, as part of the work.
B. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the COR.

C. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water for 24 hours prior to placement. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. Concrete substrate shall not be wet prior to placement of machine base grouts.

D. Surface preparation, curing, and protection of cement grout shall be in accordance with Section 03 30 00 - Cast-in-Place Concrete. The finish of the grout surface shall match that of the adjacent concrete unless otherwise indicated.

E. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

F. Shade the work from sunlight for at least 24 hours before and 48 hours after grouting.

G. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable.

3.03 **GROUTING PROCEDURES**

A. General: Mixing, surface preparation, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Equipment, Tank, and Pipe Supports. Structural, equipment, tank, and piping support bases shall be grouted, unless indicated otherwise.

1. The original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a minimum one-inch thickness of grout or other thickness if indicated.

2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout through a headbox of appropriate size. The mixture shall be of a fluid consistency and poured continuously into the space between the plate and the base concrete. Forms for grout shall be tight against retaining surfaces, and joints shall be sealed as recommended by the grout manufacturer to be liquid-tight. Forms shall be coated as recommended by the grout manufacturer for easy form release. Where this method of placement is not practical or where required by the COR, alternate grouting methods shall be submitted for acceptance by the COR.

3. Concrete equipment pads for equipment bases that will be grouted shall be sized so that, when the equipment base is fully grouted, the grout is stopped not less than 4-inches from the edge of the pad.

C. Drilled Anchors and Reinforcing Bars
1. General
   a. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, and cleaned. Drilled anchors shall not be installed until the concrete has reached the required 28 Day compressive strength. Anchors shall not be loaded until the grout has reached its indicated strength in accordance with the manufacturer's instructions.
   b. The Contractor shall identify position of reinforcing steel and other embedded items prior to drilling holes. Care shall be exercised in coring and drilling to avoid damaging existing reinforcing or embedded items. Notify the COR if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and communications conduit, and piping.

2. Cement Based Non-Shrink Grout
   a. In places of high temperature or fire hazard, anchor bolts shall be grouted in using cement based non-shrink grout, Class I.
   b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICBO/ES report, but shall not be less than 16 diameters for threaded rod or 24 diameters for reinforcing or smooth bars.
   c. When the bolt diameter is one-inch or less, the hole diameter should be a minimum of 2-inches. When the bolt diameter is greater than one-inch, the hole diameter should be at least twice the bolt diameter.
   d. Drilled holes shall be saturated with water for not less than 24 hours before installation of anchor/rod/rebar.
   e. The non-shrink grout should be placed in the holes in a non-sag (trowelable) consistency. The grout should be placed in the holes before the anchor and then the anchor inserted and vibrated to ensure proper coverage.

3. Topping Grout and Concrete/Grout Fill
   a. Mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively where accepted by the COR, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.
   b. The minimum thickness of grout topping and concrete/grout fill shall be one-inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to
be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-1/2 inches deep.

c. The base slab shall be thoroughly cleaned and wetted to saturated surface dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.

d. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

e. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.

f. As soon as topping or fill finishing is completed, coat surface with curing compound.

3.04 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be grouted is completely filled.

3.05 CURING

A. Cement based grouts shall be cured per Section 03 30 00 - Cast-in-Place Concrete and per the manufacturer's recommendations.

END OF SECTION
This page intentionally left blank.
SECTION 03 65 00
EPOXY-RESIN ADHESIVE SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost of resin adhesives in applicable prices offered in the Price Schedule for concrete items for which resin adhesives are required.

1.02 DEFINITIONS

A. “Epoxy-Resin Adhesive Systems”: High-strength adhesive systems for the anchoring of reinforcement, threaded rod, metal embeds, or other structural elements into concrete for the construction of structural elements regardless if the adhesive is an epoxy resin or a comparable high-strength resin material (ex: acrylic resin) upon curing.

1.03 SUMMARY

A. The Contractor shall provide grout, complete and in place, in accordance with the Contract Documents

B. Grout Types. The following types of grout are covered in this Section:
   1. Epoxy Anchor Resins for Adhesive Anchors

1.04 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 03 65 00-1, Testing and Certification
   1. Certified testing lab reports for tests indicated herein.
   2. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.
   3. Certification that grouts used on the project contain no chlorides or other chemicals that cause corrosion.
   4. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, curing, and appropriate uses for each type of grout used in the work, and location of use. ICC/ES report shall be submitted for epoxy anchor grout for adhesive anchors.
   5. Submit manufacturer's written warranty as indicated herein.
6. Name and telephone number of resin manufacturer's representative who will give on-Site service. The representative shall have at least one year of experience with the indicated resins.

1.05 QUALITY CONTROL

A. Field Tests
   1. Compression test specimens will be taken from the first placement of each type of resin, and at intervals thereafter selected by the COR. The specimens will be made by the COR or its representative.
   2. Compression tests and fabrication of specimens for epoxy resins will be performed in accordance with ASTM C 579 - Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings and Polymer Concretes, Method B, at intervals during construction selected by the COR. A set of 3 specimens will be made for testing at 7 Days and each earlier time period as appropriate.
   3. The cost of laboratory tests on resin will be paid by the Contractor. In the case of Work determined to be defective, the Contractor shall pay for the tests, removal and replacement of Defective Work, and re-testing; all as part of the work.
   4. The Contractor shall assist the COR in obtaining specimens for testing and shall furnish materials necessary for fabricating the test specimens.

1.06 PRE-INSTALLATION DEMONSTRATION AND TRAINING

A. Special inspection as recommended by the ICC/ES report or as required by the building department shall be required for adhesive anchor installations. Cost of special inspection of adhesive anchors will be paid by the Contractor.

B. Before installing adhesive anchors in the work, adhesive anchor installers shall be trained and qualified at the Site by the manufacturer's representative. Training and qualification for each installer shall include at least:
   1. Hole drilling procedure, hole preparation and cleaning techniques, adhesive injection technique and dispenser training/maintenance, rebar dowel preparation and installation, and proof loading/torquing.
   2. Anchors installed in both the vertical and horizontal positions in a mock-up concrete panel of adequate size and thickness. Anchors shall be tested in tension and shear loading. A minimum of 3 anchors shall be tested for each installation position.
   3. Anchors shall be tested at 2 times the published allowable load in tension and in shear as indicated in the ICC/ES report.
   4. If any of the 3 test bolts in any installation position fail to reach the test loads, the installer shall be re-tested with the same procedure. Re-testing is required only for the failed installation position.
5. An installer who has 3 consecutive successful bolt tests in the first or second trial is considered qualified for adhesive anchor installation for this project. The manufacturer's representative shall issue a certificate to the qualified installer, and a copy of the certificate shall be filed with the Contractor and be submitted to the COR.

6. The test anchor size shall be the largest size adhesive anchor used on the project. The embedment length shall be long enough to develop the allowable steel strength per AISC Manual of Steel Construction.

7. Each installer shall be re-qualified every 6 months for the duration of the project by the same qualifying procedure.

8. The certification of each qualified installer shall be available for verification at the Special Inspector's request.

9. Defective anchors noted by the Special Inspector shall be replaced and re-installed by the Contractor without any additional compensation.

1.07 SPECIAL CORRECTION OF DEFECTS PROVISIONS

A. Manufacturer’s Warranty:
   1. Furnish one-year warranty for work provided under this section.
   2. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 PRODUCTS

2.01 APPLICATION

A. Unless indicated otherwise, epoxy resin adhesive systems shall be provided as listed below whether indicated on the Drawings or not.

<table>
<thead>
<tr>
<th>Application</th>
<th>Type of Grout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor bolts and reinforcing steel required to be set in resin that is not in high temperature or high fire risk areas; nor with pumps over 1000 horsepower.</td>
<td>Epoxy Resin Adhesive Systems</td>
</tr>
<tr>
<td>Other applications.</td>
<td>Cementitious Grout (See Section 03 60 00)</td>
</tr>
</tbody>
</table>

2.02 EPOXY RESIN ADHESIVE SYSTEMS

A. Epoxy anchor resin shall conform to ASTM C 881 - Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class B & C, Grade 3 with the exception of gel time.
B. Heat deflection temperature per ASTM D 648 -- Test Method for Deflection Temperature of Plastics Under Flexural Load shall be a minimum 120 degrees F.

C. Manufacturer shall certify that the epoxy anchor resin will maintain 90 percent of its strength up to a temperature of 125 degrees F.

D. Resin shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The resin shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.

E. Epoxy anchor resin shall be capable of being used in submerged applications once cured.

F. Compressive strength per ASTM D 695 - Test Method for Compressive Properties of Rigid Plastics shall be 10,000 psi minimum.

G. Whenever possible, overhead anchors subject to vibration, anchors in fire-resistive construction or high fire risk areas, and anchors subject to working or operating temperatures above 100 degrees F shall be cast-in-place anchors. Whenever cast-in-place anchors cannot be used in these applications, use cement based non-shrink resin and oversized holes.

H. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar. Embedment shall not exceed 67 percent of the member depth.

I. Epoxy anchor resin shall be Epcon C6 by ITW Ramset/Red Head; Power-Fast Epoxy Injection Gel by Powers Fasteners; HIT RE 500 by Hilti, Sikadur AnchorFix-4, or approved equal.

2.03 CURING MATERIALS

A. Curing materials shall be in accordance with recommendations by the manufacturer of prepackaged resins.

2.04 CONSISTENCY

A. The consistency of resins shall be that necessary to completely fill the space to be resined for the particular application.

2.05 MEASUREMENT OF INGREDIENTS

A. Prepackaged resins shall have ingredients measured by means recommended by the manufacturer.

PART 3 EXECUTION

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Resin shall be stored in accordance with manufacturer's recommendations.
3.02 GENERAL

A. Contractor shall arrange for the manufacturer of prepackaged resins to provide on-Site technical assistance within 72 hours of request, as part of the work.

B. Resin shall not be placed until base concrete has attained its design strength, unless authorized otherwise by the COR.

C. Concrete substrate shall not be wet prior to placement of epoxy resins.

D. The finish of the resin surface shall match that of the adjacent concrete unless otherwise indicated.

E. Surfaces that will be in contact with resin shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

F. Shade the work from sunlight for at least 24 hours before and 48 hours after resining.

G. Contact the resin manufacturer's representative for assistance on hot and cold weather resining techniques and precautions if applicable.

3.03 RESINING PROCEDURES

A. General: Mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for adhesive resins shall be done according to the instructions and recommendations of the manufacturer.

B. Drilled Anchors and Reinforcing Bars
   1. General
      a. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions, including the recommendations for the preparation of the holes for resining.
      b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICC/ES report, but shall not be less than 8 diameters for threaded rod or 12 diameters for reinforcing or smooth bars.

3.04 CONSOLIDATION

A. Resin shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be resined is completely filled.

3.05 CURING

A. Curing of adhesive resin systems shall be performed according to the recommendations of the resin manufacturer.
DIVISION 04 – NOT USED
This page intentionally left blank.
DIVISION 05 - METALS
SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Cost

1. Include cost of furnishing and constructing structural steel framing in applicable prices offered in Price Schedule for items for which structural steel framing are required.

1.02  REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A.  References herein to "Building Code" shall mean the International Building Code - 2015 IBC. The edition of the codes adopted as of the date of award of this contract shall apply to the work herein.

B.  American Institute of Steel Construction (AISC)

1. AISC 316-89  Manual of Steel Construction, 14th Edition

C.  ASTM International (ASTM)

1. ASTM A36/A36M-19  Carbon Structural Steel
2. ASTM A53/A53M-18  Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
3. ASTM A123/A123M-17  Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products
4. ASTM A153A153M-16a  Zinc Coating (Hot-Dip) on Iron and Steel Hardware
5. ASTM A307-14e1  Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
6. ASTM A500/A500M-14  Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
7. ASTM A501/A501M-07  Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
8. ASTM A563-15  Carbon and Alloy Steel Nuts
9. ASTM A586-18
   Zinc-Coated Parallel and Helical Steel Wire Structural Strand and Zinc-Coated Wire for Spun-In-Place Structural Strand

10. ASTM A653/A653M-19a
    Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

11. ASTM A780/A780M-15
    Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

12. ASTM A992/A992M-11
    Structural Steel Shapes

13. ASTM F3125-19
    High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

14. ASTM F436-18a
    Hardened Steel Washers

15. ASTM F844-07a
    Washers, Steel, Plane (Flat), Unhardened for General Use

D. American Welding Society (AWS)
   1. AWS D1.1/D1.1M-15
      Structural Welding Code - Steel

E. Society of Protective Coatings (SSPC)/NACE International (NACE)
   1. NACE 3/SSPC-SP6-06
      Commercial Blast Cleaning (Joint Surface Preparation Standard - NACE No. 3/ SSPC-SP6)

   2. NACE 4/SSPC-SP7-07
      Brush-Off Blast Cleaning (Joint Surface Preparation Standard - NACE No. 4/ SSPC-SP7)

1.03 SUMMARY

A. The Contractor shall provide structural steel framing and appurtenant metal parts required for permanent connection of the structural steel system, complete and in place, in accordance with the Contract Documents.

1.04 SUBMITTALS

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

B. RSN 05 12 00-1, Shop Drawings
   1. Shop Drawings shall conform to AISC recommendations and specifications and shall show all holes, etc. required for other work. Drawings shall include
complete details showing members and their connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams showing the sequence of erection.

1.05 QUALIFICATIONS

A. Qualify welds in accordance with AWS D1.1.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide Flange Shapes</td>
<td>ASTM A 992</td>
</tr>
<tr>
<td>Other Shapes, Plates, Bars</td>
<td>ASTM A 36</td>
</tr>
<tr>
<td>Pipe, Pipe Columns, Bollards</td>
<td>ASTM A 53, Type E or S, Grade B standard weight unless noted otherwise</td>
</tr>
<tr>
<td>HSS</td>
<td>ASTM A 500 Grade B</td>
</tr>
</tbody>
</table>

B. Bolts for connections shall be ASTM F3125-Type A325, unless indicated otherwise. Bolts used to connect dissimilar metals shall be ASTM A193 and A194, Type 316 stainless steel.

C. Welded anchor studs shall be headed concrete anchor studs (HAS), or deformed bar anchors (DBA), or threaded studs (TAS), as indicated on the Drawings and as supplied by Nelson Stud Welding Company, Lorain, OH; Omark Industries, KSM Fastening Systems Division, Seattle, WA, or Portland, OR; or equal.

D. Non-galvanized structural steel shall be cleaned and coated in accordance with Section 09 96 00 - Protective Coating. Galvanized structural steel shall be coated in accordance with Section 05 50 00 – Miscellaneous Metalwork.

E. Steel members in contact with aluminum shall be galvanized per Section 05 50 00 - Miscellaneous Metalwork, unless indicated otherwise.

F. Structural members shall be furnished full length without splices unless otherwise indicated or approved by the COR.

2.02 INSPECTION AND TESTING

A. Shop inspection may be undertaken by the COR at its own expense. The Contractor shall give ample notice to the COR prior to the beginning of any fabrication so that inspection may be provided. The Contractor shall furnish
facilities for the inspection of materials and workmanship in the shop, and inspectors shall be allowed free access to the necessary parts of the work. Inspectors shall have the authority to reject any materials or work that does not meet requirements. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but it is expressly understood that it will in no way relieve the Contractor from responsibility for proper materials or workmanship under this Specification.

B. The COR may engage inspectors to inspect welded connections and high-strength bolted connections, and to perform tests and prepare test reports.

1. Ten percent of all butt and bevel welds which extend continuously for 24-inches or less may be completely tested in accordance with AWS D1.1, Part E, Radiographic Testing of Welds, Chapter 6. Butt and bevel welds that extend continuously for more than 24-inches will be spot tested at intervals not exceeding 36-inches.

2. Defective welds shall be corrected or redone and retested at the Contractor's expense and to the satisfaction of the welding inspector.

3. The Contractor shall test to failure 3 bolts from each heat lot of bolts furnished to the job to verify compliance with this Specification. The testing laboratory shall be approved by the COR, and test reports shall be furnished to the COR in accordance with Section 01 33 00. In addition, high-strength bolts shall be inspected using one of the methods set forth in the AISC Specification "Structural Joints Using ASTM A 325 or A 490 Bolts."

C. The costs for initial testing will be paid by the COR. However, the Contractor shall pay testing costs for any additional testing and investigation on work that proves to be defective. The Contractor shall supply material for testing at no cost to the COR and shall assist the COR in obtaining material for test samples.

PART 3   EXECUTION

3.01 MEASUREMENT

A. The Contractor shall verify dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The Contractor shall review the Drawings, and any discrepancies shall be reported to the COR for clarification prior to starting fabrication.

3.02 FABRICATION

A. Structural steel shall be fabricated in accordance with the Drawings, AISC Specifications, and the Shop Drawings.

B. Materials shall be properly marked and match marked for field assembly.
C. Where finishing is required, assembly shall be completed including bolting and welding of units, before start of finishing operations.

### 3.03 CONNECTIONS

A. Shop and field connections shall be bolted or welded as indicated. Connections shall develop full strength of members joined and shall conform to AISC standard connections.

B. Unless otherwise indicated, welds shall conform to AISC LRFD Specification for Structural Steel Buildings.

### 3.04 WELDED CONSTRUCTION

A. The Contractor shall comply with the current AWS D1.1 Code for procedures, appearance, and quality of welds and welders, and methods used in correcting Defective work. Welded architectural metal that is exposed to view shall have welds ground smooth. Shielded metal arc welding method or gas metal arc welding methods shall be used for welding structural steel.

B. Unless otherwise indicated, butt and bevel welds shall be complete penetration.

### 3.05 HOLES FOR OTHER WORK

A. Holes shall be provided as necessary or as indicated for securing other work to structural steel framing, and for the passage of other work through steel framing members. No torch cut holes will be permitted.

### 3.06 PROTECTIVE COATINGS

A. Protective coatings shall be applied in accordance with Section 09 96 00. Omit shop-applied primer at field weld locations, for the portion of a member to be embedded in concrete, and where galvanizing with no further coating is required.

### 3.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being excessively stressed, deformed, or otherwise damaged.

B. Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

### 3.08 ERECTION

A. The Contractor shall comply with the AISC Specifications and Code of Standard Practice, and with indicated requirements.
B. High strength bolts shall be installed in accordance with the AISC Specification for Structural Joints Using ASTM F3125-Type A325 Bolts. The connections shall be the friction type, unless indicated otherwise.

C. Anchor bolts and other connectors required for securing structural steel to in place work and templates and other devices for presetting bolts and other anchors to accurate locations shall be furnished by the Contractor.

D. The Contractor shall be responsible for designing and installing any temporary bracing required for the safe erection of structural steel members.

3.09 SETTING BASES AND BEARING PLATES

A. Prior to the placement of non-shrink grout beneath base and bearing plates, the bottom surface of the plates shall be cleaned of all bond reducing materials, and concrete and masonry bearing surface shall also be cleaned of all bond reducing materials and be roughened to improve bonding.

B. Loose and attached baseplates and bearing plates for structural members shall be set on wedges, leveling nuts, or other adjustable devices.

C. Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non shrink grout has attained its indicated strength.

D. Baseplates shall be grouted with non shrink grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure.

3.10 FIELD ASSEMBLY

A. Structural frames shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before permanently fastening. Bearing surfaces and other surfaces that will be in permanent contact shall be cleaned before assembly. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.

B. Individual members of the structure shall be leveled and plumbed within AISC tolerances.

C. Required leveling and plumbing measurements shall be established on the mean operating temperature of the structure.

3.11 MISFITS AT BOLTED CONNECTIONS

A. Where misfits in bolting are encountered, the ENGINEER shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the COR. The COR will determine whether the remedy is acceptable or if the member must be refabricated.
B. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins.

C. Correction of misfits is part of the work.

3.12 GAS CUTTING

A. Gas cutting torches shall not be used in the field for correcting fabrication errors in the structural framing, except when approved by the COR. Gas cut sections shall be finished equal to a sheared appearance.

3.13 TOUCH-UP PAINTING

A. Immediately after erection, field welds, bolted connections, and abraded areas shall be cleaned of the shop paint primer. Touch up paint primer applied by brush or spray shall be the same thickness and material as used for the shop coat. Galvanized surfaces that have been field welded or damaged shall be repaired in accordance with Section 05 50 00.

B. Finish coating of structural steel shall be as indicated in Section 09 96 00.

END OF SECTION
This page intentionally left blank.
SECTION 05 50 00
MISCELLANEOUS METALWORK

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Miscellaneous metalwork:
   1. Payment: Lump-sum price offered in the schedule.
      a. Include cost of furnishing and constructing miscellaneous metalwork in applicable prices offered in Price Schedule for items for which miscellaneous metalwork are required.
      b. Includes bollards and associated materials and installation as depicted in the contract drawings.

1.02 DEFINITIONS

A. Miscellaneous metalwork: Where either shown on the drawings or specified elsewhere in this Section or these specifications means metal fabrications as used in this Section.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. AASHTO -12 AASTHO LFRD Bridge Design Specifications, 2012

B. Aluminum Association (AA)
   1. AA ADM-105-2005 Aluminum Design Manual

C. American Institute of Steel Construction (AISC)

D. American Society of Mechanical Engineers (ASME)

E. American Society of Testing Materials (ASTM)
   1. ASTM A36/A36M-19 Carbon Structural Steel
   2. ASTM A53/A53M-18 Pipe, Steel, Black and Hot-dipped, Zinc-Coated Welded and Seamless
   3. ASTM A108-18 Steel Bars, Carbon, Cold-Finished, Standard Quality
<table>
<thead>
<tr>
<th></th>
<th>ASTM Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>ASTM A123/A123M-17</td>
<td>Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products</td>
</tr>
<tr>
<td>5.</td>
<td>ASTM A153/A153M-16a</td>
<td>Zinc Coating (Hot-Dip) on Iron and Steel Hardware</td>
</tr>
<tr>
<td>6.</td>
<td>ASTM A307-14</td>
<td>Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength</td>
</tr>
<tr>
<td>7.</td>
<td>ASTM A385-17</td>
<td>Providing High-Quality Zinc Coatings (Hot-Dip)</td>
</tr>
<tr>
<td>8.</td>
<td>ASTM A500/A500M-14</td>
<td>Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes</td>
</tr>
<tr>
<td>9.</td>
<td>ASTM A501/A501M-07</td>
<td>Hot-Formed Welded and Seamless Carbon Steel Structural Tubing</td>
</tr>
<tr>
<td>10.</td>
<td>ASTM A513-19</td>
<td>Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing</td>
</tr>
<tr>
<td>11.</td>
<td>ASTM A563-15</td>
<td>Carbon and Alloy Steel Nuts</td>
</tr>
<tr>
<td>12.</td>
<td>ASTM A653/A653M-19a</td>
<td>Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process</td>
</tr>
<tr>
<td>13.</td>
<td>ASTM A668/A668M-19a</td>
<td>Steel Forgings, Carbon and Alloy, for General Industrial Use</td>
</tr>
<tr>
<td>14.</td>
<td>ASTM A780/A780M-15</td>
<td>Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings</td>
</tr>
<tr>
<td>15.</td>
<td>ASTM A786/A786M-15</td>
<td>Rolled Steel Floor Plates</td>
</tr>
<tr>
<td>16.</td>
<td>ASTM A992/A992M-11</td>
<td>Structural Steel Shapes</td>
</tr>
<tr>
<td>17.</td>
<td>ASTM A1008/A1008M-18</td>
<td>Steel, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability</td>
</tr>
<tr>
<td>18.</td>
<td>ASTM A1011/A1011M-18a</td>
<td>Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability</td>
</tr>
<tr>
<td>19.</td>
<td>ASTM B209-14</td>
<td>Aluminum and Aluminum-Alloy Sheet and Plate</td>
</tr>
<tr>
<td>20.</td>
<td>ASTM B221-12</td>
<td>Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes</td>
</tr>
<tr>
<td>21.</td>
<td>ASTM F3125-19</td>
<td>High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat</td>
</tr>
</tbody>
</table>
Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

22. ASTM F436/F436M-18a Hardened Steel Washers
23. ASTM F844-07a Washers, Steel, Plain (Flat), Unhardened for General Use
24. ASTM F1267-18 Metal, Expanded, Steel

F. American Welding Society, Inc. (AWS)
1. AWS D1.1/D1.1M-15 Structural Welding Code - Steel
2. AWS D1.2/D1.2M-14 Structural Welding Code - Aluminum

G. Society of Protective Coatings (SSPC)/NACE International (NACE)
1. NACE 3/SSPC-SP6-06 Joint Surface Preparation Standard - NACE No. 3/ SSPC-SP6 - Commercial Blast Cleaning
2. NACE 4/SSPC-SP7-07 Joint Surface Preparation Standard - NACE No. 4/ SSPC-SP7 - Brush-Off Blast Cleaning

1.04 SUMMARY

A. The Contractor shall provide miscellaneous metalwork and appurtenances, complete and in place, as indicated in accordance with the Contract Documents.

1.05 SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 –Submittals.

B. RSN 05 50 00-1; Shop Drawings:
1. Shop Drawings shall conform to AISC recommendations and specifications, and shall show holes, and the like, as may be required for other parts of the work.
2. Shop Drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.
3. Grating
   a. Submit layout drawings for grating, showing the direction of span, type and depth of grating, size and shape of grating panels, support seat angle and ledger details, and details of grating hold down fasteners.
   b. Submit load and deflection tables for each style and depth of grating used.
4. Anchors
   a. Submit an ICC report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
   b. Submit manufacturer's recommended installation instructions and procedures for adhesive anchors.
   c. Upon review by the COR, these instructions shall be followed specifically.
   d. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICC report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.

5. Bollards
   a. Submit drawings illustrating materials and methods of construction.

1.06 QUALITY CONTROL

A. Welder qualifications shall be made available by the Contractor upon request of the COR.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Steel

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide Flange Shapes</td>
<td>ASTM A 992</td>
</tr>
<tr>
<td>Shapes, Plates, Bars</td>
<td>ASTM A 36</td>
</tr>
<tr>
<td>Pipe, Pipe Columns, Bollards</td>
<td>ASTM A 53, Type E or S, Grade B standard weight unless indicated otherwise</td>
</tr>
<tr>
<td>HSS</td>
<td>ASTM A 500 Grade B</td>
</tr>
</tbody>
</table>

B. Corrosion Protection
   1. Unless otherwise indicated, fabricated steel metalwork which will be used in a corrosive environment and/or will be submerged in water shall be coated in accordance with the requirements of Section 09 96 00 - Protective Coating, and shall not be galvanized prior to coating.
   2. Other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

C. Stainless Steel
1. Unless otherwise indicated, stainless steel metalwork and bolts shall be fabricated from Type 316 stainless steel.

D. Aluminum
1. Unless otherwise indicated, aluminum metalwork shall be fabricated from Alloy 6061-T6.
2. Aluminum in contact with concrete, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with the requirements of Section 09 96 00 - Protective Coating.

E. Cast Iron
1. Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B, or better.

2.02 STEEL PIPE HANDRAILS
A. Steel pipe handrails, including brackets and related hardware which may be partially or wholly submerged or which are located inside a hydraulic structure, shall be fabricated entirely of Type 316 stainless steel.

B. Other steel pipe handrails shall be standard 1.5-inch black steel pipe made up by welding, and shall be hot-dip galvanized after fabrication.

2.03 LADDERS
A. Materials
1. Ladders which may be partially or wholly submerged or which are located inside a hydraulic structure shall be fabricated entirely of Type 316 stainless steel.
2. Other ladders shall be fabricated from aluminum.

B. Pop-Up Extension
1. Every ladder that does not have an exterior handhold shall be equipped with a pop-up extension.
2. The pop-up extension device shall be manufactured of the same material and finish as the ladder, and shall be provided with a telescoping tubular section that locks automatically when fully extended.
3. Upward and downward improvement shall be controlled by stainless steel spring balancing mechanisms.
4. The units shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer’s instructions.

2.04 METAL GRATING
A. General
1. Metal grating shall be of the indicated design, size, and type.
2. Grating shall be supported around an opening by support members.
3. Where grating is supported on concrete, unless otherwise indicated provide embedded support angles that match the grating material and are mitered and welded at their corners.
4. Unless noted otherwise, weight of any individual grating piece shall be 80 lbs. maximum. Grating pieces at ladder locations for access to the ladders shall have a maximum weight per Contract Drawings. The maximum weight of grating pieces at ladder access locations shall apply to all ladders that require grating removal to access.
5. Banding
   a. The grating shall be completely banded at edges and cutouts.
   b. The banding material and cross-section shall be equivalent to the bearing bars.
   c. The banding shall be welded to each cut bearing bar.
6. The grating pieces shall be fastened to each support in two (2) locations.
7. Where grating forms the landing at the top of a stairway, the edge of the grating that forms the top riser shall have an integral non-slip nosing with a width equal to that of the stairway.
8. Where the grating depth is not indicated, provide grating within allowable stress levels and which shall not exceed a deflection of ¼-inch or the span divided by 180, whichever is less.
9. Design Loading
   a. For standard duty plank and safety grating, the loading to be used for determining stresses and deflections shall be the uniform live load of the adjacent floor or 100 psf, whichever is greater, or a concentrated load of 600 pounds.

B. Material
1. Except where indicated otherwise, bar grating shall be fabricated entirely of:
   a. galvanized steel
2. Safety grating shall be fabricated from galvanized steel.
3. Plank grating shall be fabricated from galvanized steel.

C. Standard-Duty Grating
1. No single piece of grating shall weigh more than 80 pounds, unless indicated otherwise.
2. Standard duty grating shall be composed of serrated bar grating.
3. Cross bars shall be welded or mechanically locked tightly into position such that there is no movement between the bearing and cross bars.

2.05 CHECKERED PLATE

A. Checkered plate shall be provided with a pattern of raised lugs on one face, and shall be smooth on the opposite face.

B. Lugs
   1. Lugs shall be a minimum of one inch in length and raised a minimum of 1/2-inch above the surface.
   2. The lugs shall be located in a pattern in which the lugs are oriented at 90 degrees from the adjacent lugs in 2 orthogonal directions.
   3. The rows of lugs shall be oriented at 45 degrees from the edges of the plates.

C. Where no material is indicated, the plates shall be fabricated from aluminum.

D. Unless indicated otherwise, the minimum plate thickness shall be as required to limit deflection resulting from a live load of 100 psf to 1/4-inch, or the span divided by 240, whichever is less.

E. Individual checkered plates shall be connected to grating using Hilti X-FCP-R fasteners, or approved equal, with four fasteners minimum per plate, evenly distributed over plate. If only four fasteners are used, fasteners shall be at corners, with additional fasteners provided at no additional cost upon request of COR. Fasteners shall be installed per fastener manufacturer recommendations.

2.06 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application)
   1. Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be fabricated from carbon steel as indicated, and hot dip galvanized after fabrication.
   2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.
   3. Except as otherwise indicated, steel for bolt material, anchor bolts, and cap screws shall be in accordance with the following requirements:
      a. Structural Connections: ASTM A 307, Grade A or B, hot-dip galvanized
      b. Anchor Bolts: ASTM A 307, Grade A or B, or ASTM A 36, hot-dip galvanized
      c. High-Strength Bolts, where indicated: ASTM F 3125-Type A 325
      d. Pipe and Equipment Flange Bolts: ASTM A 193, Grade B-7

B. Corrosive Service
1. Bolts, nuts, and washers in the locations listed below shall be fabricated from Type 316 stainless steel as indicated below or as indicated otherwise on the Contract Drawings.
   a. Buried locations
   b. Submerged locations
   c. Locations subject to seasonal or occasional flooding
   d. Inside hydraulic structures below the top of the structure
   e. Inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump
   f. Inside trenches, containment walls, and curbed areas
   g. Locations indicated or designated by the COR to be provided with corrosion resistant steel bolts

2. Stainless Steel Nuts on SS Bolts. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be fabricated from Type 316 stainless steel, Class 1, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts.

C. Anti-seize Lubricant Coating

1. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless-steel bolts, meeting government specification MIL-A-907E.
2. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.
3. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
4. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

D. Bolt Requirements

1. The bolt and nut material shall be free-cutting steel.
2. The nuts shall be capable of developing the full strength of the bolts.
3. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads.
4. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
5. Bolts and nuts shall be installed with washers fabricated from material matching the base material of bolts, except that hardened washers for high-strength bolts shall conform to the requirements of the AISC Specification.
6. Lock washers fabricated from material matching the bolts shall be installed where indicated.
7. The length of each bolt shall be such that the bolt extends at least 1/8-inch beyond the outside face of the nut before tightening, except for anchor bolts which shall be flush with the face of the nut before tightening.

2.07 DRILLED ANCHORS IN CONCRETE

A. General
   1. Unless otherwise indicated, drilled concrete anchors shall be adhesive anchors.
   2. No substitutions will be considered unless accompanied with an ICC report verifying strength and material equivalency.
   3. Threaded rod shall be galvanized for general purpose applications and fabricated from Type 316 stainless steel for use in corrosive applications.
   4. Expanding type anchors are not permitted.

B. Epoxy Anchors
   1. Adhesive resins shall be in accordance with the requirements of Section 03 65 00 – Epoxy Resin Adhesive Systems.
   2. Embedment depth shall be as the manufacturer recommends for the load to be supported.

C. Non-Shrink Grouted Anchors
   1. Cementitious grout shall be in accordance with the requirements of Section 03 60 00 – Cementitious Grout.
   2. Embedment depth shall be as the manufacturer recommends for the load to be supported.

PART 3 EXECUTION

3.01 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Erection
   1. Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. Steel Railings
   1. Field welding of steel pipe handrail joints will be permitted only if approved by the COR, and then only in accordance with the COR's instructions.

3.02 WELDING

A. Methods & Qualifications
1. Welding shall comply with AWS D1.1 Code.

2. Welding shall be performed by the metal-arc method or gas-shielded arc method as described in the American Welding Society "Welding Handbook" as supplemented by other pertinent standards of the AWS.

3. The qualification of the welders shall be in accordance with the AWS Standards.

B. Quality

1. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained in order to minimize distortion and for control of dimensions.

2. Weld reinforcement shall be as indicated by the AWS Code.

3. Upon completion of welding, remove weld splatter, flux, slag, and burrs left by attachments.

4. Welds shall be repaired in order to produce a workmanlike appearance, with uniform weld contours and dimensions.

5. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

3.03 GALVANIZING

A. Structural steel plates shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123.

B. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.

C. Bolts, anchor bolts, nuts, and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A153.

D. Field Repairs

1. Field repairs to damaged galvanizing shall be performed by preparing the surface and applying a coating.

2. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush-off blast cleaning (SSPC SP7) over an area extending at least 4 inches into the undamaged area.

3. The coating shall be applied to at least 3 mils dry film thickness, and shall be Zinc-Clad XI by Sherwin-Williams, Galvax by Alvin Products, Galvite by ZRC Worldwide, or equal.
3.04 DRILLED ANCHORS

A. Installation of drilled anchor using cementitious grout shall be performed in accordance with Section 03 60 00 – Cementitious Grout.

B. Installation of drilled anchor using cementitious grout shall be performed in accordance with Section 03 65 00 – Epoxy Resin Adhesive Systems.

C. Anchors shall not be loaded until the securing compound (grout or epoxy resin) has reached its indicated strength in accordance with the manufacturer's instructions.

END OF SECTION
This page intentionally left blank.
DIVISION 06 – NOT USED
DIVISION 07 – THERMAL AND MOISTURE PROTECTION
SECTION 07 92 00
SEALANTS AND CAULKING

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost in prices offered in the Price Schedule for items of work for which
      sealants and caulking are required.

1.02  REFERENCE STANDARDS

A. General: Portions of the following standards are incorporated into this Section by
   references below. The standards are listed here for convenience.

B. Federal Specifications:
   1. TT-S-001543A  Sealing Compound, Silicone Rubber Base, (For
       Caulking, Sealing and Glazing in Buildings and Other Structures)
   2. SS-S-200D   Sealants, Joint, Two Compound, Jet Blast Resistant,
       Cold Applied for Portland Cement Concrete Pavement
   3. TT-S-00227E  Sealing Compound, Elastomeric Type, Multi-
       Component, (For Caulking, Sealing and Glazing in
       Buildings and Other Structures)
   4. TT-S-00230C  Sealing Compound, Elastomeric Type, Single
       Component, (For Caulking, Sealing, and Glazing in
       Buildings and Other Structures)

C. Commercial Standards:
   1. ASTM C 557  Adhesives for Fastening Gypsum Wallboard to
       Wood Framing
   2. ASTM C 834  Latex Sealants
   3. ASTM C 919  Standard Practice for Use of Sealants in Acoustical
       Applications
   4. ASTM C 920  Elastomeric Joint Sealants
   5. ASTM D 1752 Preformed Sponge Rubber and Cork Expansion
       Joint Fillers for Concrete Paving and Structural
       Construction
8. UL 1479  Underwriter's Laboratory Standard for Safety Fire Tests of Through Penetration Firestops

1.03 SUMMARY
A. The Contractor shall provide caulking, sealing, and appurtenant work, complete and in place, in accordance with the Contract Documents.

1.04 SUBMITTALS
A. Furnish submittals in accordance with Section 01 33 00 - Submittals.
B. RSN 07 92 00-1, Technical Data:
   1. A complete materials list along with the manufacturer's technical data and literature, specifications, joint width and depth tables, and installation instructions.
C. RSN 07 92 00-2, Certificates:
   1. If requested by the COR, certificates from an independent testing laboratory approved by the COR, certifying that the submitted materials meet all the requirements of the ASTM and Federal Specifications cited.

PART 2 PRODUCTS
2.01 SEALANTS AND CAULKING MATERIALS
A. General
   1. Manufacturer's Standards: In addition to the standards listed below, the sealants and caulking products and application shall be in accordance with the manufacturer's published recommendations and specifications.
   2. Any sealant or caulking that will come in contact with fish or production water utilized by the fish shall be NSF 61 Compliant.
   3. Wherever manufacturer's names and products are listed in this Section, "or equal" products will be considered in accordance with Section 01 33 00 - Submittals
   4. All sealants and caulking materials provided shall have a manufacturer warranty against defects in materials.
B. Materials shall conform to the following requirements:
1. Significant Movement Sealants (plus or minus 25 percent movement capability)
a. For expansion wall joints; masonry and metal curtainwall joints; precast concrete joints and concrete panels; perimeter sealing (windows, doors, and panels); control joints; interior and non-traffic horizontal joints.
   1) Two component, non-sag, polyurethane or polysulfide sealant conforming to Federal Specification TT-S-227E, Class A, Type II, and ASTM C 920, Type M, Class 25, Grade NS.
      a) Products Research & Chemical Corp. "RC-2"
      b) Progress Unlimited "Iso-Flex 2000"
      c) Or Equal
   2) One component, non-sag, low modulus, polyurethane or polysulfide sealant conforming to Federal Specification TT-S-230C, Class A, Type II, and ASTM C 920, Type S, Class 25, Grade NS.
      a) Products Research & Chemical Corp. "RC-1"
      b) Tremco "Dymonic"
      c) Or Equal
   3) One component, non-sag, medium modulus, neutral cure, silicone sealant conforming to Federal Specification TT-S-1543A, Class A, and ASTM C 920, Type S, Class 25, Grade NS.
      a) Products Research & Chemical Corp. "PRC-4000"
      b) Dow Corning "795"
      c) Or Equal

2. Glazing Sealants
a. For non-structural applications
   1) One component, non-sag, medium modulus, neutral cure, silicone sealant conforming to Federal Specification TT-S-1543A, Class A, and ASTM C 920, Type S, Class 25, Grade NS.
      a) Products Research & Chemical Corp. "4000"
      b) Dow Corning "795"
      c) Or Equal
   2) One component, non-sag, high modulus, acetoxy cure, silicone sealant conforming to Federal Specification TT-S-1543A, Class A, and ASTM C 920, Type S, Class 25, Grade NS.

3. Interior Sealant and Caulking
a. For general applications
1) One component, acrylic latex caulking conforming to ASTM C 834  
   a) Pecora Corp. "AC-20"  
   b) Bostic "Chem-Calk 600"  
   c) Or Equal

b. For non-exposed acoustical applications
   1) One component, non-drying, non-hardening, non-shrinking,  
      acoustical caulking conforming to ASTM C 557 and ASTM C 919.  
      a) Inmont Company "Prestite 579.64"  
      b) Tremco, "Acoustical Sealant"  
      c) United States Gypsum, "Acoustical Sealant"  
      d) W.W. Henry, "Type 313, Acoustical Sealant"  
      e) Or Equal

4. Acoustic Sheet Caulking: For use on all outlet boxes including intercoms,  
   telephone or other services that require penetrations in the walls, acoustic sheet  
   caulking shall be resilient synthetic polymer, self-adhesive, 1/8-inch thick, 6-inch  
   x 8-inch sheet acoustic sealer. Pads shall be Lowry's Electrical Box Pads as  
   manufactured by Harry A. Lowry & Associates, Inc., 11176 Penrose Street, Sun  
   Valley, CA 91352; or equal.

5. Firestop Sealant: Where piping, conduit, wire, or other materials pass through  
   fire rated walls, floors, ceilings or roofs, provide a 1-hour fire rated sealant in  
   accordance with ASTM E 814 and UL 1479. Fire-resistant penetration sealant  
   shall be a medium density fire-resistant foam that retains form and stability at  
   high temperature. Fire-resistant sealant shall be Dow-Corning Corporation "3-  
   6548 Silicone RTV" foam; 3M Corporation "Fire Barrier Caulk CP25N, No-sag"  
   or "CP25 S/L, Self-Leveling", as appropriate for the use intended. Equivalent  
   products of General Electric and Metalines, Inc. will also be considered Or Equal

6. Preformed Sealants: Preformed sealant shall be polybutylene or isoprene-butylene  
   based pressure sensitive weather resistant tape or bead sealant capable of  
   sealing out moisture, air, and dust when installed as recommended by the  
   manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant  
   shall be non-bleeding and shall have no loss of adhesion.

7. Tape Sealant: Dimensions shall be as required for application conditions. Tape  
   sealants shall be type recommended by tape manufacturer for connecting and  
   bonding to surfaces.

8. Joint backing (backer rod) material shall be resilient, closed-cell polyethylene  
   foam conforming to ASTM D 1752, Type II or III, and/or bond breakers of proper  
   size for joint widths. Joint backing shall be compatible with sealant
manufacturer's product and shall not stain the sealant nor the materials to which applied.

9. Primer: Primers shall be as recommended in the manufacturer's printed instructions for caulking and sealants, and shall not stain the sealant nor the materials to which applied. Manufacturer shall be consulted for all surfaces not specifically covered in submittal application instructions. Primer shall be used in accordance with manufacturer's instructions with all primers being applied prior to the installation of any backer rod or bond breaker tape.

10. Cleaning and cleanup solvents, agents, and accessory materials shall be as recommended in the manufacturer's printed instructions for cleaning up.

2.02 COLOR OF SEALANTS

A. Color of sealants that are visible after installation shall match adjacent building finish. If in doubt of color match, obtain color approval from COR.

PART 3 EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken packages or containers bearing the manufacturer's label. Packages or containers shall be delivered to the Site with seals unbroken.

B. Shelf Life: Materials whose shelf life dates have expired shall not be used in the work. Such materials shall be promptly removed from the Site.

C. Storage: All materials shall be carefully stored in accordance with the manufacturer's instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the product. Materials shall be stored at temperatures between 40 and 90 degrees unless otherwise specified by the manufacturer.

3.02 INSTALLATION

A. Manufacturer's Recommendations: All work under this Section and all testing, where applicable, shall be performed in accordance with manufacturer's printed recommendations, specifications, and installation instructions except where more stringent requirements are indicated herein; and, except where project conditions require extra precautions or provisions to assure performance of the waterproofing system.

B. Authorized Installers: Caulking and sealants shall be complete systems and be installed only by installers authorized and approved by the respective manufacturers.

C. Surface Preparation

1. General: The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances
shall be removed from surfaces of joints which will be in contact with the sealant. Ferrous metal surfaces shall be cleaned of all rust, mill scale, and other coatings by wire brush, grinding, or sandblasting. Oil and grease shall be removed by cleaning in accordance with sealant manufacturer's printed recommendations. Protective coatings shall be removed from all aluminum surfaces against which caulking or sealing compound is to be placed. Bituminous or resinous materials shall be removed from surfaces to receive caulking or sealants.

2. Concrete and Masonry Surfaces: Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.

3. Steel Surfaces: Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

4. Aluminum Surfaces: Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

5. Wood Surfaces: Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

D. Joint Types and Sizes: Joint shapes and sizes shall be as indicated or as necessary for job conditions where not indicated. Joints to be caulked or sealed include through-bolt holes, door frames, louver and ventilator frames, joints between openings where items pass through exterior walls, concrete masonry, or combination of these surfaces, and as otherwise indicated or required for watertightness, weatherproofing, or airtightness. Use sealing compound at both exterior and interior surfaces of exterior wall penetrations.

3.03 SEALANT FILLED JOINTS

A. Sealant: Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be installed to the required depth without displacing the backing. Unless otherwise indicated or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges, and sags. Sealer shall be applied over the sealant if recommended by the sealant manufacturer.
B. Sealant Depth: Sealant depth in joints shall be 1/2 the width of joint, but not less than 1/8-inch deep and 1/4-inch wide nor more than 1/2-inch deep and 1-inch wide. All joints shall have a rigid filler material installed to proper depth prior to application of sealant.

C. Masking Tape: Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

D. Backing: Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

E. Bond-Breaker: Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

F. Applications: A full bead of sealant shall be applied into the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application, the tip of the nozzle shall be kept at the bottom of the joint thereby forcing the sealant to fill from the bottom to the top. Sealants shall be tooled immediately after exposure with a caulking tool or soft bristled brush moistened with solvent. The finished sealant-filled joint shall be slightly concave unless otherwise indicated.

G. Acoustic Partition Joints: Acoustic partition joints shall be made air and sound-tight with acoustic caulking material.
   1. Partitions shall be sealed where indicated on the Drawings. Gypsum panels may have joint treatment applied in the normal manner over sealed joints, or panels may be finished with base or trim as required.
   2. A 1/4-inch minimum round bead of sealant shall be applied around all cut-outs, such as at electrical boxes and air conditioning ducts, sufficient to seal the openings.

3.04 ACOUSTIC CAULKING

A. Preparation: Joints and surfaces to be sealed shall be clean, dry, and free of loose materials.

B. Concealed Joints: Concealed joints in acoustic partitions including perimeters and intersections of walls and penetrations through finish work and at conduit ends with boxes shall be sealed with acoustic caulking compound. Backs of electrical boxes shall be sealed with acoustic sheet caulking, covering all holes and knock-outs.

3.05 CLEANING

A. After application of sealant and caulking materials, adjacent materials which have been soiled shall be cleaned and left in a neat, clean, undamaged, or unstained condition. On porous surfaces, excess sealant shall be removed per sealant or caulking manufacturer's printed instructions.
END OF SECTION
DIVISION 08 - OPENINGS
This page intentionally left blank.
SECTION 08 91 00
LOUVERS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A.  Louvers:
   1.  Payment: Lump sum price offered in the Price Schedule.

1.02  SECTION INCLUDES
A.  Louvers, frames, and accessories.

1.03  RELATED SECTIONS
A.  Section 07 92 00 - Joint Sealants.
B.  Section 09 91 00 - Painting and Coating: Field painting.
C.  Refer to mechanical drawings for sizes and locations.

1.04  REFERENCE STANDARDS

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

---

Louvers
08 91 00 - 1
B. RSN 08 91 00-1, Product Data:
   1. Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. RSN 08 91 00-2, Shop Drawings:
   1. Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. RSN 08 91 00-3, Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.

E. RSN 08 91 00-4, Test Reports:
   1. Independent agency reports showing compliance with specified performance criteria.

1.06 QUALITY ASSURANCE

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

1.07 WARRANTY

A. Provide twenty-year manufacturer warranty against distortion, metal degradation, and failure of connections.
   1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ruskin, Model ELF6375 is used as the standard for design. Other available manufacturers are as follows:
   4. Carnes
   5. Greenheck
2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, formed galvanized steel sheet construction, with concealed intermediate mullions.
   1. Free Area: 50 percent, minimum.
   2. Blades: Drainable, extruded aluminum alloy 6063-T5., Angle 37.5 degrees, 0.081-inch-thick., nominal.
   3. Frame 6 inches deep; corner joints mitered and mechanically fastened.
   4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
   5. Finish: Kynar 500 Fluoropolymer Coating, finished after fabrication.
   6. Color: As selected from manufacturer's standard colors.

2.03 MATERIALS

A. Aluminum: Extruded aluminum, Alloy 6063-T5,

B. Insect Screen: 16mm x 1mm size aluminum mesh.

C. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, louver manufacturer's standard finish, complying with AAMA 2604.

2.04 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced, mitered, and welded corners.

B. Fasteners and Anchors: Stainless steel.

C. Flashings: Of same material as louver frame, to required shape, single length in one piece per location.

D. Sealant: As specified in Section 07 92 00.
PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Install perimeter sealant and backing rod in accordance with Section 07 92 00.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION
DIVISION 09 – FINISHES
This page intentionally left blank.
SECTION 09 96 00
PROTECTIVE COATINGS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost in prices offered in the Price Schedule for items of work for which protective coatings are required.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)
   1. ASTM A 380-13 Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems
   3. ASTM B 117-16 Standard Practice for Operating Salt Spray (Fog) Apparatus
   4. ASTM C 920-14a Elastomeric Joint Sealants
   5. ASTM D 522-13 Mandrel Bend Test of Attached Organic Coatings
   7. ASTM D 638-14 Tensile Properties of Plastics
   8. ASTM D 695-15 Compressive Properties of Rigid Plastics
   11. ASTM D 1002-10 Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimen by Tension Loading (Metal-to-Metal)
   12. ASTM D 1141-98(2013) Preparation of Substitute Ocean Water
   14. ASTM D 2240-15 Rubber Properties – Durometer Hardness
<table>
<thead>
<tr>
<th></th>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>ASTM D 2244-15</td>
<td>Calculation of Color Differences from Instrumentally Measured Color Coordinates</td>
</tr>
<tr>
<td>18.</td>
<td>ASTM D 3359-09</td>
<td>Measuring Adhesion by Tape Test</td>
</tr>
<tr>
<td>19.</td>
<td>ASTM D 3363-11</td>
<td>Film Hardness by Pencil Test</td>
</tr>
<tr>
<td>20.</td>
<td>ASTM D 4060-14</td>
<td>Abrasion Resistance of Organic Coatings by the Taber Abraser</td>
</tr>
<tr>
<td>22.</td>
<td>ASTM D 4285-83(2012)</td>
<td>Indicating Oil or Water in Compressed Air</td>
</tr>
<tr>
<td>23.</td>
<td>ASTM D 4541-09</td>
<td>Pull-Off Strength of Coatings Using Portable Adhesion Testers</td>
</tr>
<tr>
<td>24.</td>
<td>ASTM D 4587-11</td>
<td>Conducting Tests on Paint and Related Coatings and Materials Using a Fluorescent UV-Condensation Light- and Water-Exposure Apparatus</td>
</tr>
<tr>
<td>25.</td>
<td>ASTM D 5894-10</td>
<td>Cyclic Salt Fog/UV Exposure of painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)</td>
</tr>
<tr>
<td>27.</td>
<td>ASTM G 14-04(2010)</td>
<td>Impact Resistance of Pipeline Coatings (Falling Weight Test)</td>
</tr>
<tr>
<td>28.</td>
<td>ASTM G 32-16</td>
<td>Cavitation Erosion using Vibratory Apparatus</td>
</tr>
<tr>
<td>31.</td>
<td>ASTM G 154-12</td>
<td>Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials</td>
</tr>
</tbody>
</table>

### B. American Water Works Associations (AWWA)

<table>
<thead>
<tr>
<th></th>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>AWWA C 205-12</td>
<td>Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4In. (100mm) and Larger – Shop Applied</td>
</tr>
</tbody>
</table>
3. **AWWA C 215-10**
   Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines

4. **AWWA C 216-15**
   Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings

5. **AWWA C 222-08**
   Polyurethane Coatings for the Interior and Exterior of Steel Pipe and Fittings

6. **AWWA C 224-11**
   Two-Layer Nylon-11-Based Polyamide Coating System for the Interior and Exterior of Steel Water Pipe, Connections, Fittings, and Special Connections

7. **AWWA C 602-11**
   Cement Mortar Lining of Water Pipelines in Place – 4In. (100mm) and Larger

C. Federal Standards (Fed Std)

1. **Fed Std 595C(1)-08**
   Colors Used in Government Procurement

D. International Organization for Standardization (ISO)

1. **ISO 8502-3-1992**
   Assessment of dust on Steel Surface Prepared for Painting (Pressure-Sensitive Tape Method)

E. Military Specifications (MIL) and Quality Products List (QPL)

1. **MIL-PRF-16173E-06**
   Corrosion Preventive Compound, Solvent Cutback, Cold-Application Qualified products listed by Qualified Data Set (QDS) in the Qualified Products Database (QDS)

2. **MIL-DTL-24441/19B**
   Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III Qualified products listed by Qualified Data Set (QDS) in the Qualified Products Database (QDS)

F. National Association of Pipe Fabricators (NAPF)

1. **NAPF 500-03-04-06**
   Abrasive Blast Cleaning of Ductile Iron Pipe

2. **NAPF 500-03-05-06**
   Abrasive Blast Cleaning of Cast Ductile Iron Fittings

G. NSF International (NSF)

1. **NSF 61-2013**
   Drinking Water System Components
<table>
<thead>
<tr>
<th></th>
<th>The Society for Protective Coatings (SSPC)/NACE International (NACE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SSPC-AB1-15 Mineral and Slag Abrasives</td>
</tr>
<tr>
<td>2.</td>
<td>SSPC-AB2-15 Cleanliness of Recycled Ferrous Metallic Abrasives</td>
</tr>
<tr>
<td>3.</td>
<td>SSPC-AB3-04 Newly Manufactured or Re-Manufactured Steel Abrasives</td>
</tr>
<tr>
<td>4.</td>
<td>SSPC-Guide 15-13 Field Methods for Retrieval and Analysis of Soluble Salts on Substrates and Other Nonporous Substrates</td>
</tr>
<tr>
<td>5.</td>
<td>SSPC-PA1-04 Shop, Field, and Maintenance Painting of Steel</td>
</tr>
<tr>
<td>6.</td>
<td>SSPC-PA2-15 Measurement of Dry Paint Thickness with Magnetic Gages</td>
</tr>
<tr>
<td>7.</td>
<td>SSPC-QP1-15 Evaluating Painting Contractors (Field Application to Complex Industrial Structures)</td>
</tr>
<tr>
<td>8.</td>
<td>SSPC-QP2-09 Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Industrial Structures)</td>
</tr>
<tr>
<td>9.</td>
<td>SSPC-QP3-10 Evaluating the Qualification of Shop Painting Contractors</td>
</tr>
<tr>
<td>10.</td>
<td>SSPC-SP1-15 Solvent Cleaning</td>
</tr>
<tr>
<td>11.</td>
<td>SSPC-SP2-04 Hand Tool Cleaning</td>
</tr>
<tr>
<td>12.</td>
<td>SSPC-SP3-04 Power Tool Cleaning</td>
</tr>
<tr>
<td>13.</td>
<td>SSPC-SP5/NACE 1-07 White Metal Blast Cleaning</td>
</tr>
<tr>
<td>14.</td>
<td>SSPC-SP5 (WAB)/NACE WAB-1 White Metal Wet Abrasive Blast Cleaning</td>
</tr>
<tr>
<td>15.</td>
<td>SSPC-SP6/NACE 3-07 Commercial Blast Cleaning</td>
</tr>
<tr>
<td>16.</td>
<td>SSPC-SP6 (WAB)/NACE WAB-3 Commercial Wet Abrasive Blast Cleaning</td>
</tr>
<tr>
<td>17.</td>
<td>SSPC-SP7 (WAB)/NACE WAB-4 Brush off Wet Abrasive Blast Cleaning</td>
</tr>
<tr>
<td>18.</td>
<td>SSPC-SP10/NACE 2-07 Near-White Blast Cleaning</td>
</tr>
<tr>
<td>19.</td>
<td>SSPC-SP10 (WAB)/NACE WAB-2 Near-White Metal Wet Abrasive Blast Cleaning</td>
</tr>
<tr>
<td>20.</td>
<td>SSPC-SP11-13 Power Tool Cleaning to Bare Metal</td>
</tr>
</tbody>
</table>
21. SSPC-SP WJ-1/NACE WJ-1-12  Surface Preparation Standard – Waterjetting Cleaning of Metals – Clean to Bare Substrate
23. SSPC-SP WJ-3/NACE WJ-3-12  Surface Preparation Standard – Waterjetting Cleaning of Metals – Thorough Cleaning
24. SSPC-SP WJ-4/NACE WJ-4-12  Surface Preparation Standard – Waterjetting Cleaning of Metals – Light Cleaning
25. SSPC-TR2/NACE 6G198-04  Wet Abrasive Blast Cleaning
26. SSPC-VIS1-02  Guide and Reference Photographs for Steel Surfaces Prepared by Abrasive Blast Cleaning
27. SSPC-VIS3-04  Visual Standard for Power- and Hand-Tool Cleaned Steel
29. SSPC-VIS5/NACE VIS9-01  Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Cleaning
30. NACE RP 0287-02  Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape
31. NACE RP 0297-04  Maintenance Painting of Electrical Substation Apparatus Inducing Flow Coating of Transformer Radiators
32. NACE SP 0188-06  Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
33. NACE SP 0274-11  High Voltage Electrical Inspection of Pipeline Coatings
34. NACE TM 0174-02  Laboratory Method for the Evaluation of Protective Coatings and Linings Materials on Metallic Substrates in Immersion Service

1.03 SUMMARY

A. The Contractor shall provide protective coatings, complete and in place, in accordance with the Contract Documents.
B. Definitions

1. The term "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

2. The term "DFT" means minimum dry film thickness, without any negative tolerance.

C. The following surfaces shall not be coated, unless specifically noted otherwise in the Contract Documents:

1. Fibrous Reinforced Plastic (FRP) / fiberglass surfaces
2. Stainless steel or aluminum surfaces
3. Bronze, brass, or copper surfaces
4. Concrete, unless required by items on the concrete coating schedule below or the Drawings
5. Electrical conduit
6. Machined surfaces
7. Grease fittings
8. Glass
9. Equipment nameplates
10. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.

D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the Drawings are used to show or extend the limits of coating schedules, to show exceptions to the schedules, or to clarify or show details for application of the coating systems.

E. Where protective coatings are to be performed by a Subcontractor, the Subcontractor shall provide at least five (5) references which show that the Subcontractor has previous successful experience with the indicated or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the Subcontractor provided the protective coating.

1.04 REGULATORY REQUIREMENTS

A. Environmental Protection. In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local governing agency and regional jurisdiction. Notify the COR of any coating system specified herein which fails to conform to such requirements.
1. Lead Content. Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content
2. Chromate Content. Do not use coatings containing zinc-chromate or strontium-chromate
3. Asbestos Content. Materials shall not contain asbestos
4. Mercury Content. Materials shall not contain mercury or mercury compounds.
5. Silica. Abrasive blast media shall not contain free crystalline silica.

1.05 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 09 96 00-1, Coating Systems:
   1. Submittals shall include the following information and be submitted at least 30 Days prior to commencing protective coating work:
      a. Materials List: Eight copies of a coating materials list showing the manufacturer and the product number, keyed to the coating systems herein. The list shall be submitted prior to or at the time of submitting samples.
      b. Approval Data: For each coating system to be used, the following data:
         1) Approval data sheet for each product proposed, including statements on the suitability of the material for the intended use.
         2) Technical and performance information that demonstrates compliance with the system performance and material requirements.
         3) Paint manufacturer's instructions and recommendations on surface preparation and environmental conditions for application.
         4) Colors available for each product (where applicable).
         5) Compatibility of shop and field applied coatings (where applicable).
         6) Material Safety Data Sheet for each product proposed.

C. RSN 09 96 00-2, Samples:
   1. Samples of paint, finishes, and other coating materials shall be submitted on 8-1/2" x 11" sheet metal pieces. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.
2. Two sets of color samples to match each color selected by the COR from the manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the COR. The color formula shall be shown on the back of each color sample.

D. RSN 09 96 00-3, QA/QC Plan:
   1. The Contractor shall submit a Quality Assurance / Quality Control (QA/QC) Plan for review by the COR. The Contractor shall provide an inspector and field test reports according to the approved QA/QC plan.

PART 2 PRODUCTS

2.01 GENERAL

A. Suitability: The Contractor shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.

B. Material Sources: Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. If a named product does not comply with VOC limits in effect at the time of Bid opening, that product will not be accepted, and the Contractor shall propose a substitution product of equal quality that does comply. Proposed substitute materials will be considered as indicated below. Coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, and water and wastewater treatment plants.

C. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

D. Containers: Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.

E. Colors: Colors and shades of colors of coatings shall be as indicated or selected by the COR to match the existing Hatchery buildings. Each coat shall be of a slightly different shade to facilitate inspection of surface coverage of each coat. Finish colors shall be custom mixed to match color samples furnished by the COR.

2.02 NON-SUBMERGED INDUSTRIAL COATING SYSTEMS

A. System 30 - Epoxy
   1. Materials
### Protective Coatings

<table>
<thead>
<tr>
<th>Primer</th>
<th>manufacturer's recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish Coat</td>
<td>High Solids, High Build Polyamide Epoxy</td>
</tr>
<tr>
<td>Demonstrated suitable for</td>
<td>Interior and Exterior-Use Ferrous Steel, subject to moisture and/or sweating.</td>
</tr>
<tr>
<td>VOC Content, max</td>
<td>300 grams per liter</td>
</tr>
</tbody>
</table>

#### 2. Application and manufacturers

<table>
<thead>
<tr>
<th>Surface Preparation</th>
<th>Prime Coat (Shop Applied) ( (DFT = 4 \text{ to } 6 \text{ mils}) )</th>
<th>Finish Coat (Shop Applied) ( (DFT = 4 \text{ to } 6 \text{ mils}) )</th>
<th>Total System DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSPC SP-6</td>
<td>Sherwin Williams Macropoxy 646 FC Epoxy</td>
<td>Sherwin Williams Macropoxy 646 FC Epoxy</td>
<td>8 to 12 mils</td>
</tr>
<tr>
<td>SSPC SP-6</td>
<td>Approved Equivalent</td>
<td>Approved Equivalent</td>
<td>8 to 12 mils</td>
</tr>
</tbody>
</table>

#### B. System 108 - Aluminum Metal Isolation

1. **Material**

<table>
<thead>
<tr>
<th>Type</th>
<th>high build polyamide epoxy with chemical and abrasion resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrated suitable for</td>
<td>concrete and aluminum substrates, to isolate aluminum from contact with concrete and the resulting chemical degradation</td>
</tr>
<tr>
<td>VOC content, max</td>
<td>250</td>
</tr>
</tbody>
</table>

2. **Application and manufacturers**
### Protective Coatings

### PART 3 EXECUTION

#### 3.01 MANUFACTURER'S SERVICES

A. The Contractor shall require the protective coating manufacturer to furnish a qualified technical representative to visit the Site for technical support as may be necessary to resolve field problems.

#### 3.02 WORKMANSHIP

A. Skilled craftsmen and experienced supervision shall be used on coating work.

B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough surface preparation. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given so that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.

C. Damage to other surfaces resulting from the work shall be cleaned, repaired, and refinshed to original condition.

#### 3.03 STORAGE, MIXING, AND THINNING OF MATERIALS

A. Manufacturer's Recommendations: Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for other procedures relative to coating shall be strictly observed.

B. Coating materials shall be used within the manufacturer's recommended shelf life.

C. Storage and Mixing: Coating materials shall be stored under the conditions recommended by the Product Data Sheets, and shall be thoroughly stirred, strained, and
kept at a uniform consistency during application. Coatings from different manufacturers shall not be mixed together.

3.04 PREPARATION FOR COATING

A. General: Surfaces to receive protective coatings shall be prepared as indicated prior to application of coatings. The Contractor shall examine surfaces to be coated and shall correct surface defects before application of any coating material. Marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any field coating application. Surfaces to be coated shall be dry and free of visible dust.

B. Protection of Surfaces Not to be Coated: Surfaces that are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.

C. Hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

D. Care shall be exercised not to damage adjacent work during blasting operations. Spraying shall be conducted under carefully controlled conditions. The Contractor shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blasting or coating operations.

E. Protection of Painted Surfaces: Cleaning and coating shall be coordinated so that dust and other contaminants from the preparation process will not fall on wet, newly-coated surfaces.

3.05 SURFACE PREPARATION STANDARDS

A. Steel Structures Painting Council (SSPC) Standards. The following referenced standards for surface preparation according to specifications of the Steel Structures Painting Council (SSPC) shall form a part of this specification:

1. SSPC SP1 - Solvent Cleaning: Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. SSPC SP2 - Hand Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.

3. SSPC SP3 - Power Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
4. **SSPC SP5 - White Metal Blast Cleaning**: Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

5. **SSPC SP6 - Commercial Blast Cleaning**: Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.

6. **SSPC SP7 Brush-Off Blast Cleaning**: Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.

7. **SSPC SP10 Near-White Blast Cleaning**: Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

8. **SSPC-SP13 Surface Preparation of Concrete**: Removal of protrusions, laitance and efflorescence, existing coatings, form-release agents, and surface contamination by detergent or steam cleaning, abrasive blasting, water jetting, or impact or power tool methods as appropriate for the condition of the surface and the requirements of the coating system.

### 3.06 FERROUS METAL SURFACE PREPARATION (UNGALVANIZED)

**A.** The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these requirements and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.

**B.** Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast-cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.

**C.** Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.

**D.** Sharp edges shall be rounded or chamfered, and burrs and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

**E.** The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular product and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting will use hard, sharp cutting crushed slag.
F. Abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50 percent grit.

G. The Contractor shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

H. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators that remove at least 95 percent of the contaminants.

I. Surfaces shall be cleaned of dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.

J. Enclosed areas and other areas where dust settling is a problem shall be vacuum-cleaned and wiped with a tack cloth.

K. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.

L. If the required abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 may be used.

M. Shop-applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast-iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning has been started.

N. Shop primed equipment shall be solvent-cleaned in the field before finish coats are applied.

3.07 FERROUS METAL SURFACE PREPARATION (GALVANIZED)

A. Galvanized ferrous metal shall be alkaline cleaned per SSPC SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system, followed by brush off blast cleaning per SSPC SP7.

B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.08 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

A. General: Grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.
B. Abrasive Blast Cleaning: The Contractor shall provide the degree of cleaning indicated in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not indicated in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC SP6. Areas of tightly adhering coatings shall be cleaned to SSPC SP7, with the remaining thickness of existing coating not to exceed 3-mils.

C. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the Contractor shall apply intermediate coatings per the manufacturer's recommendation for the indicated coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.

D. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.

E. Water Abrasive or Wet Abrasive Blast Cleaning: Where indicated or where Site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged or severe service coating systems unless indicated.

3.09 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. Surface preparation shall not begin until at least 30 Days after the concrete or masonry has been placed.

B. Oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC SP1 before abrasive blast cleaning.

C. Concrete, concrete block masonry surfaces, and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.

D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.

E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.

F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.
3.10  CONCRETE SURFACE PREPARATION FOR WATERPROOFING

A. Concrete deck shall be dry, clean, and free of contaminants that may interfere with proper adhesion or curing. The concrete shall be properly cured for a minimum of 28 Days, or be at 80 percent of design strength.

B. Verify that the concrete deck is finished by a power or hand steel trowel followed by a soft hair broom, or equivalent.

C. Before starting application, conduct a Mat Test as follows: place a 2-foot by 2-foot non-breathing rubber mat onto the concrete deck not in sunlight; tape the edges of the mat to the concrete. If no condensation is seen under the mat at 16 hours, the concrete is dry enough that application may begin.

D. Visible hairline cracks and cold joints in the concrete shall be treated with a liquid flashing a minimum of 2-inches on each side of the crack or joint. Liquid flashing shall have a minimum dry thickness of 30-mils.

3.11  PLASTIC, FIBER GLASS AND NONFERROUS METALS SURFACE PREPARATION

A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.

B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC SP1 followed by sanding or brush-off blast cleaning SSPC SP7.

C. Surfaces shall be clean and dry prior to coating application.

3.12  ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

A. The mortar surfaces shall be cured at least 14 Days before surface preparation work is started.

B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.

C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.13  SHOP COATING REQUIREMENTS

A. Unless otherwise indicated, items of equipment or parts of equipment which are not submerged in service shall be shop-primed and then finish-coated in the field after installation with the indicated or selected color. The methods, materials, application equipment, and other details of shop painting shall comply with this Section. If the shop primer requires topcoating within a specific period of time, the equipment shall be finish-coated in the shop and then be touched up after installation.
B. Items of equipment or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have surface preparation and coating performed in the field.

C. The interior surfaces of steel water reservoirs, except for Part A surfaces, shall have surface preparation and coating work performed in the field.

D. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the indicated quality in the field. Such equipment shall be primed and finish-coated in the shop and touched up in the field with the identical material after installation. The Contractor shall require the manufacturer of each such piece of equipment to certify as part of its Shop Drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the Shop Drawings for the equipment.

E. For certain small pieces of equipment the manufacturer may have a standard coating system that is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the Shop Drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.

F. Shop-painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before being topcoated, or less time if recommended by the coating manufacturer.

G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

H. The Contractor shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment Shop Drawings.

3.14 APPLICATION OF COATINGS

A. The application of protective coatings to steel substrates shall be in accordance with SSPC PA1 - Paint Application Specification No. 1.

B. Cleaned surfaces and each coat shall be inspected prior to applying each succeeding coat. The Contractor shall schedule such inspection with the COR in advance.

C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same day.
D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations and this Section, whichever has the most stringent requirements.

E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to occur. Use stripe painting with a brush in these areas.

F. Special attention shall be given to materials that will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

G. Finish coats, including touch-up and damage repair coats shall be applied in a manner that will present a uniform texture and color matched appearance.

H. Coatings shall not be applied under the following conditions:
   1. Temperatures exceeding the manufacturer's recommended maximum and minimum allowable.
   2. Concrete surfaces will be in direct sunlight during application or within 3 hours after application.
   3. Dust or smoke laden atmosphere.
   4. Damp or humid weather.
   5. Substrate or air temperature is less than 5 degrees F above the dewpoint.
   6. Air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
   7. Wind conditions are not calm.

I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychometric tables.

J. Unburied steel piping shall be abrasive blast cleaned and primed before installation.

K. Finish coats shall be applied after concrete, masonry, and equipment installation is complete, and the working areas are clean and dust free.

3.15 CURING OF COATINGS

A. The Contractor shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the most stringent, prior to placing the completed coating system into service.

B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.
3.16  SHOP AND FIELD INSPECTION AND TESTING

A. General: The Contractor shall give the COR a minimum of 7 Days advance notice of the start of any field surface preparation or coating application, and a minimum of 7 Days advance notice of the start of any surface preparation activity in the shop.

B. Such work shall be performed only in the presence of the COR, unless the COR has granted prior approval to perform such work in its absence.

C. Inspection by the COR, or the waiver of inspection of any particular portion of the work, shall not relieve the Contractor of its responsibility to perform the work in accordance with these Specifications.

D. Scaffolding shall be erected and moved to locations where requested by the COR to facilitate inspection. Additional illumination shall be furnished on areas to be inspected.

E. Inspection Devices: The Contractor shall furnish inspection devices in good working condition for the detection of holidays and measurement of dry film thicknesses of coatings. Dry-film thickness gauges shall be made available for the COR's use while coating is being done, until final acceptance of such coatings. The Contractor shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the COR.

F. Holiday Testing: The Contractor shall test for continuity all coated ferrous surfaces inside a steel reservoir, other surfaces that will be submerged in water or other liquids, surfaces that are enclosed in a vapor space in such structures, and surfaces coated with any of the submerged and severe service coating systems. Areas that contain discontinuities shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then be retested.

   1. Coatings with thickness exceeding 20-mils total DFT: Pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the required coating thickness.

   2. Coatings with thickness of 20-mils or less total DFT: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75 volts. For thicknesses between 10- and 20-mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo or equal, shall be added to the water prior to wetting the detector sponge.

G. Film Thickness Testing: On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC Paint Application Specification No. 2 using a magnetic type dry film thickness gauge such as Mikrotest Model FM, Elcometer Model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous
metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.

H. Surface Preparation: Evaluation of blast cleaned surface preparation will be based upon comparison of the blasted surfaces with the standard samples available from NACE, using NACE standards TM-01-70 and TM-01-75.
### 3.17 COATING SYSTEM SCHEDULE, FERROUS METAL - NOT GALVANIZED

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Surface / Equipment / Area Description</th>
<th>Surface Preparation Requirements</th>
<th>System No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM-1</td>
<td>All non-galvanized steel including pre-engineered primary steel (rafters and columns; milled steel beams, etc.), secondary steel (purlins, girts, and framed opening elements); carbon-steel angles, bars, and plates; and carbon-steel bracing elements. All non-galvanized steel for the <strong>Re-Use and Generator Buildings</strong> shall use surface type <strong>FM-1</strong>.</td>
<td>Manufacturer recommendation</td>
<td>(30) Epoxy</td>
</tr>
<tr>
<td>FM-3</td>
<td>Unless otherwise noted as galvanized, surfaces of equipment and ferrous surfaces submerged or intermittently submerged in potable water, utility water, and wastewater including all surfaces lower than 2 feet above high-water level in hydraulic structures, and all surfaces inside enclosed hydraulic structures and vents (excluding shop-coated valves, couplings, pumps).</td>
<td>White metal blast cleaning SSPC SP5</td>
<td>(50) Amine cure epoxy</td>
</tr>
</tbody>
</table>
DIVISION 13 – SPECIAL CONSTRUCTION
This page intentionally left blank.
SECTION 13 34 13
PRE-ENGINEERED METAL BUILDINGS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Metal Building System:
    1.  Payment:  Lump sum price offered in the Price Schedule.

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

1.02  DEFINITIONS

A.  “PEMB”:  Pre-Engineered Metal Building.

B.  “Gravity Load Cases”:  Load combinations applied to the PEMB which correspond to the actions which will have the net effect of the loads creating tensile stresses on the bottom of horizontal members and compression stresses on the top of horizontal members, or any similarly behaving action on a diagonally positioned members (ex: snow acting on a roof making a purlin bend down).

C.  “Uplift Load Cases”:  Load combinations applied to the PEMB which correspond to the actions which will have the net effect of the loads creating compressive stresses on the bottom of horizontal members and tensile stresses on the top of horizontal members, or any similarly behaving action on a diagonally positioned members (ex: wind acting on a roof making a purlin bend down).

1.03  REFERENCE STANDARDS

A.  American Institute of Steel Construction (AISC)
    1.  AISC 360-16  Specification for Structural Steel Buildings

B.  American Society of Civil Engineers (ASCE)
    1.  ASCE 7-15  Minimum Design Loads for Buildings and Other Structures

C.  ASTM International (ASTM)
    1.  ASTM A36/A36M-19  Carbon Structural Steel
    2.  ASTM A307-14e1  Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
3. ASTM A500/A500M-18  
   Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

4. ASTM A501-14  
   Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

5. ASTM A529/A529M-19  
   High-Strength Carbon-Manganese Steel of Structural Quality

6. ASTM A572/A572M-18  
   High-Strength Low-Alloy Columbium-Vanadium Structural Steel

7. ASTM A653/A653M-19a  
   Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

8. ASTM A792/A792M-10  
   Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

9. ASTM C1363-19  
   Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

10. ASTM F3125-19  
    High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

D. American Welding Society (AWS)
   1. AWS D1.1/D1.1M-15  
      Structural Welding Code - Steel

E. International Accreditation Service
   1. IAS  
      IAS Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems

F. International Code Council (ICC)
   1. IBC  
      2015 International Building Code, with Washington State Amendments

G. Metal Building Manufacturers Association (MBMA)
   1. MBMA Manual  
      Metal Building Systems Manual, 2018 Edition

H. Underwriters Laboratories Inc. (UL)
1. UL 580-14 Tests for Uplift Resistance of Roof Assemblies

1.04 SUMMARY

A. The PEMB Supplier shall furnish and install all components, materials and sub-assemblies, and all appurtenant work to construct the pre-engineered metal building system, complete as defined in this specification, and in accordance with the requirements of the Contract Documents.

B. PEMB supplier shall also meet the requirements of Specification 01 57 90 Preservation of Historical and Archeological Data to meet Washington State Preservation Office requirements for the Aquaculture building and the Generator Cover.

1.05 WORK INCLUDED

A. Pre-engineered metal building(s) as shown on Contract Document shall be complete with structural framing (rigid frames, struts, purlins, girts), pre-finished roofing and siding panel systems, metal flashing and trim, diagonal bracing, fastening systems, man doors and overhead door, skylights, gutters and downspouts, roof and wall accessories, roof and wall penetration flashing, and all other components and materials as required for a complete and weather tight installation.

B. Pre-engineered metal building cover for the backup generator as shown on the Contract Document is included.

1.06 DESCRIPTIONS

A. Building Type: Clear span gabled rigid frame with variable depth column and rafter sections of shop welded steel plates.

B. Building Height and Roof Slope: As shown on Contract Drawings.

C. Column Spacing at Exterior Walls: As shown on Contract Drawings and compatible with placement of openings and other requirements.

1.07 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 13 34 13-1, Shop Drawings and Calculations:
   1. Shop Drawings and Calculations shall include:
      a. Design Calculations and Erection Drawings: The final shop drawing corrected calculations and drawings shall be sealed by a Registered Professional Engineer, licensed to practice in the State which the building is to be constructed, and shall be submitted by the PEMB Supplier to the COR, through the Contractor, for review. If computer programs are
utilized in the preparation of calculations, the program's operational premise shall be submitted along with the output data.

b. Shop drawings shall show each type of structural building frame required and its location within the structure. Include details of anchor bolt settings; sidewall, endwall, and roof framing; bracing and location within the structure; longitudinal and transverse cross sections; details of curbs, roof jacks, and items penetrating the roof; trim, wall and roof coverings; doors, window and louver details; and all accessory items; materials; finishes; construction and installation details; and other pertinent information required for proper and complete fabrication, assembly and erection of a watertight metal building system. Drawings shall show sealant locations.

c. Shop drawings shall show sectional elevations required of light metal framing for each of the exterior wall systems, including location of all windows, doors, overhead doors, and louvers and the metal framing details required to accommodate and structurally support these openings.

d. ANCHORS: Calculations and details of anchorage, including embedment length, shall be by the PEMB Supplier and shall be submitted for review.

e. PEMB Supplier literature on doors, windows, sealant and finish hardware shall be submitted for review.

f. SNOW GUARDS: Show locations of the snow retention system on the roof plan and specify clamp spacing as required by manufacturer.

C. RSN 13 34 13-2, Schedule:

1. The CONTRACTOR shall submit a complete schedule of fabrication, delivery, and erection of the pre-engineered building, including critical start and completion dates for all related areas of construction. The schedule shall include detailed sequencing of erection of the pre-engineered building and clearly define the relationship of work of this Section to the overall project schedule.

D. RSN 13 34 13-3, Material and Color Samples:

1. Color and texture samples shall be submitted to the CONTRACTOR for review. The samples shall be clearly marked to show the paint manufacturer's name and product identification.

2. 12-inch square of roofing and siding panels, with required finishes.

3. Fasteners for application of roofing and siding panels.

4. Sealants and closures.

5. Color and texture sample sets shall be representative of the full range of alternatives available for selection by the COR to match the existing Reuse buildings walls, roof, trim, and doors. Not less than 4 colors shall be submitted for color selection by the COR. Two 12-inch samples of the selected trim color, roof and siding color shall be submitted after color selection. Sample
requirements herein shall apply to translucent panels in addition to the non-translucent (standard) metal panels.

E. RSN 13 34 13-4, PEMB Information:
1. PEMB Supplier’s complete technical literature, building system description, and maintenance instructions shall be submitted to the Contractor.

F. RSN 13 34 13-5, Certificates:
1. Building engineer & fabricator's certification shall be submitted, prepared and signed by a Registered Professional Engineer licensed to practice in the State which the building is to be constructed, attesting that the building design meets all specified system performance design criteria and the requirements of applicable codes and authorities having jurisdiction at the project site.
2. Documentation shall be submitted to the Contractor, confirming that the building engineer & fabricator is currently certified by the American Institute of Steel Construction Quality Certification Program, Category MB.
3. Documentation shall be submitted to the Contractor confirming that the roof system qualifies for the Underwriters Laboratories Class 90 rating.

G. RSN 13 34 13-6, Written Certification:
1. The PEMB Supplier shall provide written certification that the final installation has been both provided and erected in conformance with the building engineer & fabricator's recommendation and meets the requirements of the Specifications.

H. RSN 13 34 13-7, Erector Experience:
1. The Contractor shall submit documentation showing that the Erector of the PEMB has not less than 5 years successful experience in the erection of prefabricated buildings similar to that required for this project.

I. RSN 13 34 13-8, Quality Assurance:
1. PEMB Supplier shall provide documentation of their quality assurance / quality control program for their engineering and drafting program, procurement, and fabrication / operations procedures. The PEMB Supplier shall have a certification form IAS AC472.

J. RSN 13 34 13-9, Product Data:
1. SNOW GUARDS: Include detailed product cut sheets, installation instructions and specifications.

1.08 QUALITY ASSURANCE

A. PEMB Supplier shall provide documentation of their quality assurance / quality control program for their engineering and drafting program, procurement, and fabrication / operations procedures. The PEMB Supplier shall have a certification form IAS AC472.
B. Snow Guards

1. Snow guards shall be installed by a qualified roofing contractor with the knowledge and ability to properly install the product.

2. Install the snow retention system in accordance with an approved layout and installation instructions, per manufacturer’s recommendations.

C. Design Criteria

1. Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturer’s Association (MBMA) "Design Practices Manual."

2. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA "Design Practices Manual."

3. Structural Steel: For the design of structural steel members, comply with the requirements of the American Institute of Steel Construction (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

4. Light Gauge Steel: For the design of light gauge steel members, comply with the requirements of the American Iron and Steel Institutes (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gauge Steel Diaphragms" for design requirements and allowable stresses.

5. For welded connections, comply with the American Welding Society (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

6. Anchor Bolts: All anchor bolts shall be designed and detailed by the PEMB Supplier and furnished by the Contractor.

7. Overhead Doors and Metal Doors: Contractor shall provide each sectional door as a complete unit produced by one door manufacturer, including frames, sections, brackets, guides, weather-stripping and installation accessories. Provide each metal door as a complete unit produced by one door manufacturer, including frames, sections, brackets, guides, weather-stripping and installation accessories.

1.09 SYSTEM PERFORMANCE & DESIGN LOADINGS

A. International Building Code and ASCE 7 Standard. The pre-engineered metal building shall be designed for the load criteria given below, at a minimum.

B. Wind Conditions:

1. Ultimate Design Wind Speed = 100 MPH

2. Exposure = C

3. Risk Category = II
4. Internal Pressure Coefficient \((G) = +/- 0.18\) (Reuse Building. Note: Internal pressure as defined by ASCE 7 is not applicable to the Generator Building since it is open on all sides.)

C. Seismic Conditions:
   1. Seismic Design Category = D
   2. Risk Category = II
   3. Mapped Spectral Response Acceleration (per ASCE 7): \(S_s = 0.548\) g
   4. Mapped Spectral Response Acceleration (per ASCE 7): \(S_1 = 0.216\) g
   5. Design Spectral Response Acceleration (per ASCE 7): \(S_{ds} = 0.498\) g
   6. Design Spectral Response Acceleration (per ASCE 7): \(S_{d1} = 0.285\) g
   7. Site Class = D

D. Vertical Live Loads: Vertical live loads shall be as indicated below. Live loads shall be in addition to actual dead loads and applied to horizontal projection of roof:
   1. Purlins and Roof Joists: Design for 20 PSF (live load) uniformly distributed over supported roof area.
   2. Primary Framing (Frames): Design for 20 PSF (live load) uniformly distributed over supported roof area.
   3. Roof Covering: Design to support either a 20 PSF uniformly distributed load or a 300-lbs. concentrated load over a 1-ft x 1-ft area located at center of maximum roofing panel span. The most severe loading condition shall govern the design.
   4. Snow Load: 115 psf ground snow load, uniformly distributed. Snow drift and unbalanced loads shall be taken into consideration for roof snow load.
   5. Heated applications: \(C_t = 1.0\) (Reuse Building); Unheated applications: \(C_t = 1.2\) (Generator Building).

E. Dead Loads: Dead loads for the building shall include all known dead loads. Minimum design dead loads for common building materials shall be obtained from ASCE 7. Equipment loads and loads from materials not listed in that publication can be obtained from other recognized sources.

F. Collateral Loads: 3.0 psf throughout the roof structure to account for miscellaneous mechanical and electrical equipment loads which shall be applied in Gravity Load Cases but not Uplift Load Cases (Reuse Building). 0.0 psf (Generator Building).

G. Horizontal Deflections: Horizontal deflections \((DH)\) of sheeting, secondary and primary structural elements shall not exceed the following:
   1. Lateral Sidesway Frames: \(DH < H/120\);
   2. Longitudinal Sidesway Bracing: \(DH < H/120\);
   3. Wall Panels: \(DH < L/120\);
4. Girts: \[DH < \frac{L}{120};\]
5. End wall Columns: \[DH < \frac{L}{120};\]
   where \(H\) = height of bay to top of column and \(L\) = length of structural member

H. Vertical Deflections: Vertical deflections (DV) for structural roof members due to live, wind, or snow loadings shall not exceed \(L/240\) of the member span.

I. Design temperature differential shall be a minimum of 120 degrees F for thermal expansion and contraction analysis of framing systems.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials and prefabricated components shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the building engineer & fabricator.

B. Storage: All materials shall be carefully stored in conformance with the building engineer & fabricator's recommendations, on platforms or pallets above grade or on concrete slab, covered with opaque tarpaulins or other approved weather-resistant ventilated covering. Storage shall be in a manner that will prevent damage or marring of finish.

1.11 WARRANTY

A. All Components: The PEMB Supplier shall furnish to the Contractor the PEMB Supplier's standard 1-year workmanship warranty, commencing on the date of acceptance of the Project to the COR, through the Contractor.

B. Roof Panels: The PEMB Supplier shall provide standard 10-year paint finish warranty and standard 20-year no-perforation warranty to the COR, through the Contractor.

C. Wall Panels: The PEMB Supplier shall provide standard 10-year paint finish warranty to the COR, through the Contractor.

PART 2 PRODUCTS

2.01 STRUCTURAL STEEL

A. Materials
   1. Structural Plate or Bar Stock for the fabrication of milled or 3-plate steel columns and rafters: Minimum yield strength (Fy) of 50,000 PSI.
   2. Cold Formed Structural Steel: Minimum yield strength (Fy) of 55,000 PSI.
   3. Primary Structural Bolts and Nuts: ASTM F3125-Type A325

B. Building System Design and Fabrication
1. Primary and End-Wall Framing: Rigid frames of shop-welded steel plate columns and rafters and base plates, both tapered and uniform depth sections as required by the building engineer & fabricator, complete with all necessary stiffeners, connection plates and holes for field-bolted assembly.
   a. East End Wall Expansion: The East end wall only shall consist of a rigid frame that allows for future expansion of the building. The east end wall shall be designed by the building engineer & fabricator to support loads from the bay shown in the Contract Documents plus the loads from a future expansion that is equal in width.
   b. Columns and Rafters: Fabricated with holes in web and/or flanges for attachment of secondary members.
   c. Splice Plates: Factory fabricated for precision for all rafter-to-rafter and/or column-to-rafter connections, complete with connection bolt holes.
   d. Base Plates, Cap Plates, Splice Plates and Stiffeners: Fabricate to sizes required, complete with all holes for connection of primary and secondary structural members. Factory weld into place.
   e. Join flanges and webs of structural members fabricated of plate or bar stock together by continuous automatic submerged arc welding process with all welding performed under the supervision of certified welders in accordance with standard practices of AWS D1.1.
   f. Make all primary rigid frame field-bolted connections with ASTM F3125-Type A325 high-strength bolts of size determined by building engineer & fabricator.

2. Secondary Framing: Provide Purlins, Girts, Struts, Flange Braces, Base Angles, as required.
   a. Purlins: Provide the Building Engineer & Fabricator's standard Z sections, roll formed from minimum (Fy) 55,000 PSI steel, punched for attachment.
   b. Girts: Z or channel sections of roll formed (Fy) 55,000 PSI steel, punched for attachment with minimum 1/2-inch diameter bolts.
      1) Vertical spacing between horizontal girts shall be as determined by system design, but shall not exceed 7 ft. 4 in.
      2) Building Engineer & Fabricator shall design all light steel framing systems to accommodate all wall openings including the intake louvers, windows, man-door frames and overhead roll-up door frames.
      3) On south face of the building, Building Engineer & Fabricator shall design the horizontal girts to be just above and below the 4-ft tall air intake louvers on that side of the building. There are a total of four (4) of these intake louvers to be provided by the Contractor. (See the Architectural Elevation drawings.)
c. Eave Struts: Cold formed sections with minimum (Fy) 55,000 PSI steel, with vertical web to receive sidewall panels and two 1/2-inch-diameter bolt attachments to rigid frame in factory-punched holes in column or bracket.

d. Roof Struts: Provide as required, by the building engineer & fabricator, with attachment to top flange of rigid frame rafters by two of 1/2-inch minimum size diameter bolts at each end of strut.

e. Flange Braces: Steel angles attached to purlin or girt, to stiffen rigid frame flanges as dictated by the building engineer & fabricator design and noted on final shop drawings.

C. Coatings

1. Primary Structural Steel Members (as defined under Part 2.01.B.1)
   a. All primary structural steel shall be factory prime coated with building engineer & fabricator standard primer as temporary protection against ordinary atmospheric conditions. The primer shall be compatible, including aesthetically, with the finish coat. The primer color shall not be visible through the finish coat. Provide proper SSPC metal surface preparation and factory paint all surfaces.
   b. All primary structural steel shall be factory finish coated with system per Section 09 96 00 – Protective Coatings. Color of the finish coat shall be selected by the COR from available colors.

2. Secondary Structural Steel Members (as defined under Part 2.01.B.2)
   a. Secondary structural steel members (purlins, girts, struts, braces, etc.) shall be coated with **G90 Galvanizing**, meeting ASTM A 653.

**2.02 WALL AND ROOFING PANELS**

A. Metal Wall Panels – Reuse Building

1. Insulated Metal Panels (IMPs) shall be used, with a thickness as required to achieve: R-value = 19 h*ft²·°F/Btu, as defined by the Washington State Energy Code. The IMP will need to achieve the aforementioned R-Value through the installation of a single panel thickness unaided by a liner system or additive insulative layer or system. An IMP with an R-value of less than 3.25 h*ft² F/Btu will not be accepted.

2. Exterior Face of Panel:
   a. Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.
   b. Gauge: 26 gauge.
   c. Profile: 300 Series: Minor Rib, by Kingspan; or similar product, approved by the COR.
Pre-engineered Metal Buildings

Pilot Circular Tanks and Solids Handling
Leavenworth National Fish Hatchery

Solicitation No. 140R1020R0012

3. Interior Face of Panel:
   a. Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.
   b. Gauge: 26 gauge
   c. Profile: Minor Rib, by Kingspan; or similar product, approved by the COR.
   d. Finish System: Modified polyester, dry film thickness of 1.0 mil including primer.
   e. Color: Selected by the COR from the supplier color chart.

4. Panels shall be longest length possible (24-ft maximum) to minimize panel ends.

5. Corner trim, base trim and transition flashings shall be provided as required to complete the wall assembly. Closures and fasteners shall be provided as required for a weather tight installation. Fastener spacing and type shall be the building MBSS standard as required. Trims shall have thickness or stiffening required to prevent oil-canning appearance.

6. Fasteners: Self-drilling fasteners shall be corrosion resistant plated steel with neoprene washer, as recommended by the manufacturer.

2.03 ROOFING PANELS

A. Metal Roof Panels – Reuse Building

1. Insulated Metal Panels (IMPs) shall be used, with a thickness as required to achieve an equivalent to the following: R-value = 25 h·ft²·°F/Btu added to a R-value = 11 h·ft²·°F/Btu Liner System, as defined by the Washington State Energy Code. To be approved by the COR, the IMP will need to achieve the aforementioned equivalency through the installation of a single panel thickness unaided by a liner system or additive insulative layer or system. An IMP with an R-value of less than 3.25 h*ft² F/Btu will not be accepted.

2. Exterior Face of Panel:
   a. Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.
   b. Gauge: 24 gauge.
   c. Profile: Kingzip, by Kingspan; or similar product, approved by the COR.
   d. Texture: Stucco embossed.
e. Finish System: Valspar Fluropon PVDF finish, dry film thickness of 1.0 mil. Including primer.

f. Color: Selected by the COR from the supplier color chart.

3. Interior Face of Panel:
   a. Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.
   b. Gauge: 26 gauge
   c. Profile: Minor Rib, by Kingspan; or similar product, approved by the COR.
   d. Texture: Stucco embossed.
   e. Finish System: Modified polyester, dry film thickness of 1.0 mil including primer.
   f. Color: Selected by the COR from the supplier color chart.

4. Panels shall be longest length possible (24-ft maximum) to minimize panel ends.

5. Corner trim, base trim and transition flashings shall be provided as required to complete the wall assembly. Closures and fasteners shall be provided as required for a weathertight installation. Fastener spacing and type shall be the building MBSS standard as required. Trims shall have thickness or stiffening required to prevent oil-canning appearance.

6. Clips: Panel attachment clip shall be two pieces and fully concealed within the panel sidejoint. Base clip shall be a minimum 14 gauge galvanized, and top clip shall be a minimum 20-gauge stainless steel with an integral thermal break.

7. Fasteners: Self-drilling fasteners shall be corrosion resistant plated steel with neoprene washer, as recommended by the manufacturer. These are limited to locations that are defined by the manufacturer as not addressed by the standing seam joint.

8. Standing Seam Sealant: Approved type non-shrinking, non-drying butyl-based sealant specifically formulated for factory application in standing seams and to allow roof panel assembly at temperatures from minus 10 degrees F to 140 degrees F.

9. Roof Panel Sealant: Approved type, non-shrinking, non-drying butyl-based sealant, specifically formulated for roof application at temperatures from 20 degrees F to 120 degrees F.

B. Metal Roof Panels – Generator Building

1. Fabrication and finish of primary and secondary steel elements shall conform with the provisions for the Reuse Building.

2. A mechanically-seamed standing seam at all panel side laps. The standing seam projects beyond the nominal outermost surface of the panel forming a trapezoidal-
shaped union of adjacent sheets beneath the outermost elevation of the standing seam.

3. Roof Panel:
   a. Material: Steel coil material shall be in accordance with ASTM A755: AZ50 Galvalume®/Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.
   b. Gauge: 24 gauge.
   c. Minimum yield strength of 33 ksi.
   d. Profile: MR24, by Butler Manufacturing Co.; or similar product, approved by the COR.
   e. Finish System: Valspar Fluropon PVDF finish, dry film thickness of 1.0 mil. Including primer.
   f. Color: Selected by the COR from the supplier color chart.
   g. Single Piece: Panels shall be one piece from ridge to eave (without end laps).

4. Trims and flashings shall be provided as required to complete the roof assembly. Closures and fasteners shall be provided as required for a weathertight roof surface. Fastener spacing and type shall be the building MBSS standard as required. Trims shall have thickness or stiffening required to prevent oil-canning appearance.

5. Clips: Panel attachment clip shall be fully concealed within the panel sidejoint.

6. Fasteners: Self-drilling fasteners shall be corrosion resistant plated steel with neoprene washer, as recommended by the manufacturer. These are limited to locations that are defined by the manufacturer as not addressed by the standing seam joint.

7. Standing Seam Sealant: Approved type non-shrinking, non-drying butyl-based sealant specifically formulated for factory application in standing seams and to allow roof panel assembly at temperatures from minus 10 degrees F to 140 degrees F.

8. Roof Panel Sealant: Approved type, non-shrinking, non-drying butyl-based sealant, specifically formulated for roof application at temperatures from 20 degrees F to 120 degrees F.

C. Roof Penetrations. The structural framing members and sheet metal work to support roof penetrations (exhaust fans, process air vents, plumbing vents, etc.) shall be provided by MBSS in their submittal drawings and coordinated with the locations shown on the Contract Documents.
2.04 **SOFFIT PANELS**

A. Reuse Building: Soffit panels shall be low rib panels with 7/8-inch deep ribs and shall be installed reverse run. Contractor's heat tracing system will be installed by Electrical Subcontractor on outside of soffit and on the underside of the eave overhang drip edge of the roof metal panels.

B. Generator Building: Soffit panels and/or roof liner are not required.

2.05 **INTERIOR WALL LINER PANELS**

A. General. Wall liner panels shall be a minimum of 26-gauge with 1-inch or 1.25-inch ribs at 12-inches on center, and shall be full-height single piece panels extending from top to bottom of the interior walls. Panels shall be fastened to every girt the full height of the wall.

B. Coatings. Interior wall panels shall be the PEMB Supplier's standard G-90 galvanized substrate coated panels. Over the galvanized substrate, a factory primer shall be placed for the following finished coating system. Finish coating shall be a factory applied, thermal-set (i.e. oven baked) protective polyester coating (no requirement for silicon modified resin on interior panels) to a total primer and finish coating thickness of approximately 1.0 mil. The PEMB Supplier shall supply the standard color chart and samples to the Contractor for selection of a standard color by the COR.

C. Full-height liner panels and trims are required on both sides of the partition wall in the Reuse Building.

2.06 **STEEL DOORS AND FRAMES**

A. General: The Building Engineer and Fabricator shall supply all steel man-doors, door frames, and hardware in accordance with the following requirements.

B. The standard of quality adopted for swing doors and frames shall be that established by the Steel Door Institute as well as U.S. Department of Commerce Standard PS4-66 relative to the manufacture of 1-3/4-inch thick flush steel doors

C. Exterior swing type doors are to be furnished by the PEMB Supplier. Door sizes, swings and handles of doors are indicated on the Contract Documents.

D. Include all required hardware and accessories in addition to the necessary framing, door jambs, and fasteners required to properly install and to replace structurally the wall panels and/or framing displaced.

1. Door leaves and frames shall be manufactured from galvanized steel, bonderized and given a baked-on prime coat of paint of neutral color, shop applied.

2. Door leaves shall be of the flush type with vertical mechanical interlocking seams on both hinge and lock edges. Door panels shall be framed from not less than 20 gage steel.
3. The door leaf shall be reinforced, stiffened and sound deadened with an impregnated draft honeycomb core completely filling the inside of the door and laminated to both inside faces of the panels.

4. Doors shall be insulated to achieve a min of R-9 Thermal Resistance.

5. Doors shall have top and bottom inverted 14 gage minimum steel channels welded to the panels. The top of each door leaf shall be closed and made watertight with a rigid vinyl cap.

6. Doors shall have 1/8-inch bevel in 2-inch both hinge and lock edges.

7. Door leaves shall be mortised for mortise lock preparation conforming to A.S.A. Specification A-115.1 and for one and 1/2 pair of template hinges as hereinafter specified.

8. Door leaves shall be provided with 3/16-inch thick steel hinge reinforcements and a 16-gage steel integral lock box, securely welded into the stile. Hinge and lock reinforcements are to be drilled and topped to receive finished hardware.

9. Door leaves are to receive closers and shall either have a concealed 16 gage channel reinforcing located to receive surface mounting or the door closer can be surface mounted with full shouldered six-bolts. Field drilling and/or topping for attaching the closer shall be accomplished by the erector.

10. Door frames shall be formed of 16-gauge galvanized steel to conform to building engineer & fabricator's standards with reinforcements for hardware and 4 wall anchors per jamb and 2 per head. Door frames are to be secured to concrete wall and to metal building wall.

11. Furnish and install hinges, locksets and closers at all doors furnished under this Section, as follows:

E. **Hinges:** Ball bearing, steel, template type full mortised and concealed button tip, non-removable pin (set screw in barrel), size 4-1/2" x 4-1/2". Federal Specification #FFH-116c; Government type T-2107, finish USP over US2c base.

F. **Lock Sets:** Lock sets shall be as follows to match existing lock sets at the Sherard WTP facility (as requested by CBOPU staff): Kaba ILCO Series L 1000, Model LR 1011-260-41, Finish shall be Satin Chrome, with push button lock style. Doors to building keyed alike.

G. **View Lights in Doors.** None.

### 2.07 OVERHEAD DOOR

A. **General:** The PEMB Supplier shall supply all overhead doors, frames, and hardware in accordance with the following requirements.

B. **Sectional Doors:** PEMB Supplier shall provide Thermacore, insulated, sectional steel overhead doors, by Access Systems Division, or approved equal. Materials shall include
all tracks, guides, hinges, brackets, weather-stripping, spring counterbalance, hardware, lock, and any special features required for complete and operational sectional door.

1. Finish: Exterior shall be factory applied two-coat baked-on gloss enamel finish over epoxy primer. The base material shall be hot dip galvanized steel per ASTM A-525 and A-526.

2. Weather-stripping: Bottom of door to have flexible U-shaped vinyl seal. Provide perimeter seal for jambs, header and between sections.

3. Thermal Resistance: minimum R-17

4. Gauge: minimum 20

5. Hardware: Door manufacturer to provide hinges, brackets, rollers, locking devices, and other hardware required for complete installation. Install roller bracket sand hinges with 14 gage galvanized steel. Provide rollers with ball bearings and case-hardened races. Provide reinforcing on doors where roller hinges are connected. Provide a positive locking device and interior cylinder lock with two keys on manually operated doors.

6. Provide heavy duty galvanized steel tracks with adjustable brackets to obtain a weather-tight closure at jambs. Reinforce horizontal track with galvanized steel angle; support with galvanized steel angles and cross bracing as necessary to provide a rigid installation.

7. Counterbalance doors with an oil-tempered, helical-wound torsional spring mounted on a steel shaft. Provide adjustable spring-tension connect spring to doors with cable through cable drums. Provide cable safety factor of at least 7 to 1.

   a. Provide lifting handles on both sides of door. Do not exceed the maximum lifting force of 25 pounds required to operate the door. Provide pull down straps or ropes at bottom of doors over 7 feet high.

2.08 WIND AND SEISMIC BRACING

A. Cross braces or knee braces shall be used for lateral wind and seismic bracing and shall be located as determined by building engineer & fabricator on the final shop drawings.

B. Cross braces or knee brace shall be provided complete with necessary connection hardware. Structural steel angle shall be used as knee braces.

2.09 SNOW GUARDS

A. Snow guards shall be Sno Gem iClad-S HD by SNO-GEM INC, or approved equal.

B. Number of rows shall be per manufacturer’s recommendations.

C. Number of guards shall be per manufacturer’s recommendations.
D. Clamp selection shall be per manufacturer’s recommendations for the given snow load and standing seam roof panel profile.

2.10 ACCEPTABLE METAL BUILDING SYSTEM SUPPLIERS

A. Subject to compliance with specified requirements, the following are acceptable PEMB Supplier:

1. Butler Manufacturing Company;
2. Nucor Building Systems,
3. Behlen Manufacturing Company,
4. Or approved equal.

PART 3 EXECUTION

3.01 ERECTION

A. General

1. Erector's Qualifications: The Contractor shall self-perform the erection of the PEMB, or subcontract this to a qualified subcontractor. The Contractor is ultimately responsible to furnish the completed PEMB, notwithstanding the contractual relationship between the Contractor and the erecting party.

2. The Erector of the PEMB shall have not less than 5 years successful experience in the erection of prefabricated buildings similar to that required for this project.

3. Metal building system components shall be installed in strict compliance with the building engineer & fabricator's instructions shown on final shop drawings.

4. Handle and store all materials to avoid damage and replace any damaged materials.

5. The PEMB Supplier shall observe and follow recommendations of the Metal Building Manufacturers Association (MBMA) practice and procedures where applicable and the recommendations of the building engineer & PEMB Supplier.

6. The PEMB shall not be field cut or altered without approval from the building engineer & fabricator.

7. A minimum of 1-inch of non-shrink, non-metallic grout shall be provided under each column base plate.

B. Structural Frames

1. Structural frames shall be erected true to line, level and plumb, braced and secured with temporary bracing in all directions as required.

2. Base plates shall be leveled and secured with anchor bolts to a level plane with full bearing on foundation supporting structures. A minimum of 1-inch grout shall be used under base plates.
C. Bracing
   1. All permanent bracing shall be installed in appropriate roof and sidewall locations as indicated on approved shop drawings. Sidewall knee braces, if knee braces are used, shall be located within 5-feet from the top of the building columns.

D. Framed Openings
   1. Securely attach to building structural framing members, square and plumb.

E. Roofing and Siding Panels:
   1. General
      a. Install roof and canopy panels in such a manner to permit drainage to eaves of building, with panel ends square to eave.
      b. Install wall panels with vertical edges plumb.
      c. Arrange and nest side lap joints away from prevailing winds when possible.
      d. Apply panels and associated items for neat and weather-tight enclosure.
      e. Avoid "panel creep" or application not true to grid lines.
      f. Protect factory finishes from mechanical damage or abrasions.
      g. Install approved type closures to exclude weather.
         1) Install weather seal under ridge cap. Flash and seal roof panels at eave, gable and perimeter of all openings through roof and elsewhere as required or shown on Contract Drawings.
         2) Flash and/or seal wall and liner panels at perimeter of all openings, under eaves and gable trims, along lower panel edges, and elsewhere as required or shown on Contract Drawings, as applicable.
      h. Remove all fastener or cutting shavings from roof and wall as erection is completed.
   2. Wall Panels
      a. Align bottoms of panels to proper coverage and fasten with panel manufacturer's recommended and supplied fasteners.
      b. Cut and fasten flashing and trims with approved type fasteners.
      c. Install all fasteners with power tool having adequate torque and proper r.p.m. adjusted to seat fastener without damage to heads, washers or panels.
      d. Install panel side lap away from prevailing wind or view direction when possible, maintaining proper lap without fastener dimpling or excessive overlap.
3. Accessories: Install flashings, trim, ridge covers, roof curbs, skylights, pipe flashings, closure strips, roof jacks, gutters, roof drains, and other accessories and sheet metal items in accordance with manufacturer's recommendations for positive attachment to building and provide a weathertight mounting.

F. Overhead Doors: The PEMB Supplier shall install doors, tracks, hardware, and accessories in accordance with door manufacturer's instructions and as shown on Drawings for fully operational door system. The overhead doors installment shall be performed by an authorized distributor of the door manufacturer.

G. Snow Guards: Inspect the roof system in its entirety to verify proper attachment, completion and the ability of the building structure to withstand additional loading applied by the snow retention system.

3.02 COATINGS

A. All abrasions, scratches, field welds or other damages in shop-primed or factory-finished painted surfaces shall be touched-up consistent with the quality and coating thickness of original shop primer or factory-finished painting.

B. Finish paint coats shall be field applied to factory-primed items.

C. Finish coats shall be provided which are compatible with the metal building engineer & fabricator's prime coat paints.

D. Hardware, accessories and similar items not intended to be finish-painted shall be properly protected during painting operations.

3.03 FIELD QUALITY CONTROL

A. All framing members shall be erected plumb, level or aligned not to exceed a deviation 1:300 (i.e no more than 1-inch in 25-ft).

B. The PEMB Supplier shall provide written certification that the final installation has been erected in conformance with the building engineer & fabricator's recommendation and meets the requirements of the Specifications.

END OF SECTION
SECTION 13 34 19
PRE-MANUFACTURED CHEMICAL STORAGE UNIT

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. Chemical Metal Storage Unit System:
   1. Payment: Lump sum price offered in the Price Schedule.

1.02  SUMMARY

A. The Pre-Manufactured Chemical Storage Unit (Unit) Manufacturer shall furnish all components, materials, fabrications, and sub-assemblies, and all appurtenant work for the pre-engineered metal building system, complete as defined in this specification, and in accordance with the requirements of the Contract Documents. The unit shall be utilized to store Formalin (37% Formaldehyde Solution).

1.03  WORK INCLUDED

A. Contractor shall supply and install a Unit as per the manufacturer directions on a concrete lid to be constructed over a future solids handling vault and provide all electrical connections required.

1.04  DESCRIPTIONS

A. Unit Type: The Unit shall be a 4-hour Fire Rated Hazardous Materials Storage Unit with secondary containment that complies with OSHA and EPA Regulations. The unit shall provide space for storage of two (2) 55-gallon barrels of Formalin.

1.05  SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals. All submittals subject to approval by COR prior to fabrication.

B. RSN 13 34 19-1, Shop Drawings:
   1. Submittals shall contain complete dimensions and interface requirements including piping and electrical requirements.
   2. Shop drawings shall illustrate all detail of dimensions, materials, connections, anchoring requirements, electrical components and wiring, adjustable shelving locations, doors, walls, floor, ceiling, frames, HVAC, mechanical components, and all unit components. For use of local building and fire authorities approving process, manufacturer shall submit: (1) a copy of Factory Mutual approval, (2) three sets of custom engineered drawings and available on one CD, and (3)
drawings stamped by a registered professional structural engineer as a part of submittals.

C. RSN 13 34 19-2, Schedule:
   1. A submittal on schedule for fabrication, delivery, and installation of the chemical storage unit shall be provided for review by COR.

D. RSN 13 34 19-3, Manufacturer Performance:
   1. Manufacturer proof of performance shall be required. Evidence of experience, knowledge, and warranty capability in manufacturing of heavy-duty steel units as described herein that are still in service after ten (10) years. Proof of same shall be provided with a published list with a minimum of five (5) references including up-to-date contact person and phone number for each.

E. RSN 13 34 19-4, Operation and Maintenance:
   1. Provide three (3) separately bound copies of operating and maintenance manuals for each unit including complete parts list for the entire storage unit. Provide one (1) complete copy of installation instructions.
   2. Literature on OSHA and EPA compliance, containment, exterior finish, installation procedures, and operational procedures shall be submitted for review.

F. RSN 13 34 19-5, Certificates:
   1. Documentation shall be submitted to the COR, confirming that the building engineer & fabricator is currently certified by the American Institute of Steel Construction Quality Certification Program, category MB.
   2. Documentation shall be submitted to the COR confirming that the roof system qualifies for the Underwriters Laboratories Class 90 rating.

1.06 MANUFACTURERS QUALIFICATIONS

A. Only manufacturers regularly engaged in the design and construction of Factory Mutual (FM) approved hazmat building units and conforming to the following trade and industrial standards and codes shall be considered. Units shall exceed requirements of EPA, OSHA (29 CFR1910.106), NFPA 101, UBC, and UFC, as well as ASTM, AISI, and AWS - and is approved by Factory Mutual with UL listed components and fire wall construction.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials and prefabricated components shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the building engineer & fabricator.

B. Storage: All materials shall be carefully stored in conformance with the building engineer & fabricator's recommendations, on platforms or pallets above grade or on
concrete slab, covered with opaque tarpaulins or other approved weather-resistant ventilated covering. Storage shall be in a manner that will prevent damage or marring of finish.

C. The formalin storage unit shall be delivered to the Leavenworth National Fish Hatchery. Manufacturer shall provide a construction and delivery schedule. Manufacturer shall coordinate delivery with the Contractor and COR a minimum of 12 calendar days prior to delivery date.

D. Any damage occurring to the storage units prior to final acceptance shall be repaired or replaced at no additional cost to the COR.

1.08 WARRANTY

A. Warranty by the manufacturer for materials, labor, and workmanship on the units shall be as follows:
   1. Ten (10) years on all welded steel including, but not limited to, quarter ¼” thick tube steel skeleton and ten (10) gauge steel exterior skin.
   2. Two (2) years on all painted steel surfaces.
   3. Warranty for all accessories and components shall be provided by each individual manufacturer.

PART 2 PRODUCTS

A. Pre-Manufactured Chemical Storage Unit shall be weather proof and meet at the minimum the following requirements:

B. Exterior minimum dimensions shall be 8 feet 4 inches tall, 9 feet wide and 7 feet deep. There shall be adequate interior room for two (2) 55-gallon barrels, formalin treatment pump station, associated piping, and one operator. Removable and adjustable shelving shall be included on both side walls of the unit. 
   1. Manufacturer shall provide for a 6-inch diameter penetration for distribution piping and controls for the formalin pump station that will maintain all certifications and ratings. Location of wall penetration to be coordinated by Contractor for piping economy and to avoid conflicts with existing features.
   2. Manufacturer shall provide electrical provisions for connecting the chemical feed pumps for the formalin treatment pump station that will maintain all certifications and ratings.

C. Interior Fire Ratings, Insulation, & Finishes: The storage units shall have a 4-hour fire rating.

D. Structural:
1. Unit shall be ideally suited for heavy duty industrial usage to resist damage during lifting operations or vehicular impact resistance such as forklift impact and punctures as may occur from the forklift forks and from forklift loads with protrusions. Units shall meet or exceed NFPA 30 standards and be FM Approved.

### Table 2: Structural Loads

<table>
<thead>
<tr>
<th>Description</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Blast Resistance</td>
<td>100 lbs/sf</td>
</tr>
<tr>
<td>Wind Loading(^1)</td>
<td>90 mph wind or pressure of 20 lbs/sf, whichever is greater</td>
</tr>
<tr>
<td>Live Load</td>
<td>20 lbs/sf</td>
</tr>
<tr>
<td>Floor Support System Under Dry Conditions</td>
<td>250 lbs/sf</td>
</tr>
<tr>
<td>Seismic Condition (^1)</td>
<td>Minimum Sds = 0.498 (An equivalent to old UBC Codes seismicity of Zone 4 is conservative and acceptable)</td>
</tr>
</tbody>
</table>

\(^1\) Structure is indoors and protected from external wind. Wind load to be taken as a lateral force requirement of robustness of unit and for incidental loading during installation.

2. Walls: Storage unit at a minimum shall have continuously welded steel double walls of 12-gauge plate steel. Seams shall be welded at wall supports. Wall Steel frame shall be at a minimum 3”x2”x1/8” structural steel tubing at 24” on center spacing. Corners and door frames shall have a minimum of 3”x3”x3/16” structural steel tubing. A 6”x3”x3/16” structural steel tube perimeter shall be installed above and below wall studs.

3. Roof: The roof shall be constructed from a minimum of 3.5”x3.5”x1/8” structural steel tubes at 24” centers.

4. Floor:
   a. Sump: Grating and Leak Proof Spill-Containment Sump Assembly shall have a minimum capacity of 100% of the total number of 55-gallon drums that could be packed into the unit. Sump will be 4-hour fire rated. Sump shall be at minimum 10-gauge plate steel continuously welded with a structural tube steel frame. A chemical-resistant epoxy coating shall be applied to secondary containment sump.
   b. Spark Resistant Elevated Flooring: Continuous elevated floor grating system throughout unit shall be designed for 250 lbs per sf live load. Welded grating shall be a minimum of 1 x 3/16” bearing bars at 1 x 3/16” inches on center and crossbars at 4 inches on center. Flooring shall be provided over the sump floor so when there is a spill, containers, machinery, etc., will not be sitting-in chemical liquids and employees will not be passing through chemical liquids. The elevated floor section (sized
in removable sections) shall be mechanically fastened to floor supports to prevent uneven joints. The grating shall be of dissimilar metal than the floor supports so as to provide a spark resistant floor construction. The support steel shall be continuously welded to the sump wall and floor to prevent spilled chemicals from getting under crevices, etc., and causing corrosion and hidden contamination. The elevated floor shall be designed for 250 lbs per sf live load.

c. Base: The base shall be open channel construction with underside coated with chemical resistant epoxy for maximum corrosion resistance. Forklift pockets and hold-down brackets for ease of off-loading and relocation. Unit base framing shall be capable of withstanding 1000 psf minimum. The unit base is constructed in this manner to ensure the fork lifting, loading, transporting, offloading, and relocation do not affect this chemical storage unit. This is to ensure the unit remains square after transport or relocation. The unit base assembly shall consist at a minimum of the following materials: 6 x 4 x 3/16” rectangular tubing, Hold Down Brackets welded to unit are ½” thick plate steel angles, Floor Channel C 4x5.4, Floor Channel C6x8.2, and 4 x 2 x 1/8” rectangular tubing. The chemical storage unit shall be placed onto asphalt pavement located adjacent to the hatchery building.

5. Metal Materials - Unit shall be at a minimum ASTM-A Grade 500-B4 tubular steel stock, ASTM-A 36 channels, and 12-gauge plate steel shall be ASTM-A 36. All structural steel members, doors, frames, and exposed metal components after an extensive cleaning process shall be protected with a high performance 2-part epoxy base coat (primer) and a high finish polyurethane top coat providing proven interior chemical resistance as well as exterior abrasion, corrosion, UV resistance and exceptional durability. All surfaces shall be prepared per paint manufacturer's specification prior to application of prime coat.

a. Building Color: Finished exterior color shall be an earth tone of tan, brown, or olive green, selected by the COR.

6. Lifting Lugs: A Minimum of Four (4) Crane Lifting Lugs shall be strategically located and continuously welded where vertical wall and roof members intersect the 6" x 3" tube at the roof edge along the long walls of the unit. Each lug shall have a minimum lifting capacity of 50% of the total unit weight, eliminating rigging with full width spreader bars over the roof or slings under the floor of the unit.

7. Ergonomics: Interior Shall Be Ergonomically Worker-Safe for handling hazardous material containers near walls with all vents, conduits, ductwork, plumbing, fire suppression and alarm system components, explosion relief panels, and heaters wall mounted above 42" off the elevated floor, recessed into the wall, or mounted in weatherproof housing on the exterior. Loading and unloading of the 55-gallon drums shall be by forklift.
8. Runoff: Water Runoff shall be provided for all units with a minimum of one (1) inch sloped roof and a drip edge over all standard doors. The drip edge shall be two (2) inches wide and angled down from wall of unit.

E. Sump Drain: Drain shall consist of a rectangular drain pit of a minimum 10-gauge steel with 4" high walls which are recessed from the sump floor plate to foundation level, and a 1" diameter polypropylene pipe mechanically fastened to the pit wall. The pipe shall have a hand operated valve and a cap screwed on the end. The pipe drain shall allow for the complete draining of the sump and drain pit.

F. Sump Floor: Single Sloped Sump Floor shall facilitate the natural gravity movement of air under the floor grate and heavier-than-air fumes, gases and vapors, as well as liquid chemical spills and cleaning water and agents to move toward the low portion of the sloped floor. The floor shall be sloped a minimum of one (1) inch from one long wall to the other. A sump drain as described in Paragraph 2.D shall be located along the wall, at the low edge of the sloped floor. ASTM E119 – Standard Test for Fire Tests of Building Construction and Materials AND UL 263 Fire Resistance Ratings.

G. Provide one door 42” wide by 62” high minimum to the unit and shall have an R Factor of 15.

H. Class A Steel Ramps per CFR 29, OSHA 1910.37, minimum width of the doors, and length a minimum of 8” inches long for every 1” of door threshold height. Ramp shall have 3/16" thick checker or diamond plate surface welded to steel supports. There shall be a 1’ wide section of the ramp that is hinged to allow the leading edge to be no higher than 3/16" to allow for easy passage of hand-trucks onto the ramp. Ramp shall be painted to match unit’s exterior color. The ramp shall have forklift handles in order for a single ramp to be fork lifted as required.

I. Electrical Components: The electrical system shall be complete, including all necessary non-sparking equipment, rigid galvanized steel conduits and elbows, cast iron devices with threaded hubs, J-boxes, and seal-offs. All interior and exterior electrical components (A/C units, heaters, fans, dampers, sensors, alarm devices, etc.) shall be mounted on the same end wall of the unit as the entrance box. Electrical installations shall be inspected at the factory by a certified third-party electrical inspection agency and be so labeled as having passed inspection before being shipped.

1. Wiring:
   a. Exterior wiring: UL Listed, Single-Phase, 3 Wire, 120/240V 100 A Load Center (NEMA 3R). Rainproof and Ice Resistant-Outdoor enclosures are intended for use outdoors to protect the enclosed equipment against rain and meet the requirements of Underwriters' Laboratories, Inc., Publication No. UL 508, applying to "Rainproof Enclosures."
   b. Interior wiring shall have: (1) all-threaded joint having 5 full threads with 3/4" per foot taper, (2) seal-offs where required at exterior wall penetrations, devices, appliances and components, (3) no fittings between seal-offs and exterior wall, and (4) only THHN conductors rated at 75NC.
minimum used with all conduits supported every 6\' and fastened within 3\' of a junction box.

c. Static Electricity Grounding System: Exterior grounding connection, one 10-foot long 5/8\" diameter copper-clad steel grounding rod, one No. 4AWG copper conductor, and grounding lugs. The number of grounding bars shall be determined by the manufacturer.

d. Provide explosion proof lighting. Provide three explosion proof electrical outlets in the unit for the formalin pump station. Provide explosion proof interior/exterior GFCI duplex receptacle at exterior load center.

e. Provide load center appropriate for pre-manufactured chemical storage unit electrical loads and associated formalin pump station.

f. Provide for an external connection for a temporary backup generator.

J. Ventilation System: Units shall have ventilation system exhaust fans. They shall provide six (6) air changes per hour. Each exhaust fan shall have a direct drive aluminum non-overheating centrifugal wheel mounted in a square steel housing with formed collars for duct connection for Contractor to provide ductwork from the unit to the outside as necessary. The motor shall be sealed from contaminants in the unit’s exhausted air stream and cooled through a separate outside fresh air tube. All electrical connections and motor shall be accessible through a removable cover. The fan shall draw fresh air into the unit through the air intake vent across the top of the elevated flooring to the other end wall's exhaust air opening. This opening shall be within one (1) foot of the grated floor line and constructed with a 4-hour fire rated damper. The opening through the wall shall lead to a 12-gauge duct which shall be welded up the outside wall to within six (6) inches of the roof line.

1. Air Intake Vents shall be provided to minimize accumulation of heavier than air hazardous vapors. The vent shall be framed with tubular steel and recess mounted on exterior wall at 12" above the floor grating (N.F.P.A. 30). Vent shall be sized for a minimum capacity of 6 air changes per hour with a fixed outside louver designed to keep rain out. The vent shall have a UL approved 4-hour fire rated damper with folding blades held open by a 165-degree fusible link and a bird screen.

K. Heating/Cooling: Units shall be heated/cooled and insulated to maintain a temperature range of 45\° to 80\°F. The unit will be exposed to outdoor temperature ranges of 0\° to 100\°F. Heating/cooling unit shall be placed near the air intake vents to facilitate the heating/cooling of the incoming air and sized to handle 6 air changes per hour.

1. A temperature logging device shall be incorporated into each unit. The temperature logging device shall collect temperature data every two hours and have three collection ports: one set high inside the unit, one set low inside the unit, one set to be outside the unit. The data shall be easily downloadable to a laptop or USB data storage key. Logging device shall be powered by the storage unit’s electrical system and have a lithium battery backup energy supply. The
logging device shall have sufficient memory to hold up to three months of data. Data shall be transferable to a Microsoft Excel® spreadsheet format.

L. Manufacturers

1. US Chemical Storage, LLC
2. Securall
3. Or approved equal

PART 3 EXECUTION

A. General

1. Final Factory Inspection of the storage unit shall be performed in accordance with Factory Mutual whereby quality control inspection and test forms shall be filled in, signed off, and delivered with the unit to the COR. Provisions shall be arranged with a national manufacturer for COR to contact and contract with an authorized local dealership to provide for inspection and the availability in the future for local inspection.

2. Units shall have all corners, sharp edges, and protrusions covered with foam padding and covered with heat shrunk, non-smear type plastic wrap strapped with nylon ties prior to shipping.

3. Identifying Devices: NFPA 704 Sign Rating Decal, DOT Flip Chart Placards (Formalin), and a Metal Plate with Factory Mutual (FM) approved mark, model number, storage capacity, fire rating, and location limits shall be provided on the doors of each unit. There shall be a 6" high red stripe (denoting a fire rated building) and a green stripe (denoting a non-combustible building) between the top of a standard door and the roof. In the stripe shall be appropriate white-colored Factory Mutual and hour fire rating decals.

4. The Contractor shall install the Pre-Manufactured Chemical Storage Unit including placing the unit on existing asphalt, leveling the unit, anchoring the unit, and connection to required utilities to provide a fully functional chemical storage unit.

5. The chemical storage unit will be placed on asphalt concrete adjacent to the hatchery building as illustrated in the Contract Documents.

6. Contractor shall include the installation of electrical power connections, including, but not limited to, wiring, conduit, supports, transformers, disconnect switch, remote wiring, etc. as required for a fully functional chemical storage unit.

7. All systems shall be checked by the Contractor. The Contractor shall provide training on the proper operation, maintenance, and systems within the chemical storage unit. Contractor shall incorporate support from the Manufacturer of the chemical storage unit for training and commissioning of the unit.
This page is intentionally left blank.
SECTION 13 94 01
FIBERGLASS TANKS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Fiberglass Tanks:
   1. Payment: Lump sum price offered in the Price Schedule.
      a. Includes: Shall be made on a lump sum basis on completed and fully functioning fiberglass tanks.

1.02 REFERENCE STANDARDS
A. Codes:
   1. NFPA 70 National Electric Code

B. Commercial Standards:
   1. ASTM C 581 Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures, Intended for Liquid Service
   2. ASTM D 638 Test Method for Tensile Properties of Plastics
   3. ASTM D 695 Test Method for Compressive Properties of Rigid Plastics
   4. ASTM D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
   5. ASTM D 883 Definitions of Terms Relating to Plastics
   6. ASTM D 2563 Recommended Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts
   7. ASTM D 2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impessor
   8. ASTM D 2584 Test Method for Ignition Loss of Cured Reinforced Resins
   9. ASTM D 3299 Filament-Wound Glass Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks
  10. ASTM D 4097 Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks
C. When 2 or more of the above regulations are applicable, the more stringent requirement shall be met.

1.03 SUMMARY

A. The work includes furnishing all labor, materials and equipment for the installation of fiberglass fish rearing tanks as shown on the drawings and as specified herein.

B. Provide the following:

1. Four (4) 26-foot diameter by 7-foot deep dual drain fiberglass fish culture tanks (FCT-101-202), including inlet supply manifold, side box drains assemblies, screens, and bottom drain assemblies as shown on the Drawings and specified herein.

2. Four (4) 2-foot diameter by 6-foot tall Center Drain Standpipe wells (SPW-101-202)

3. Two (2) 4-Foot diameter by 14’ tall Mixing Head Tanks (MHT-100-200) with overflow side box, cone bottom outlet and inlet fittings as shown on the Drawings and specified herein.

4. One (1) 5-foot diameter by 9-foot Tall Radial Flow Settler (RFS) with 60 deg solids collection cone, integrated stand, inlet stilling well, v-notched overflow and clarified effluent fitting.

1.04 SUBMITTALS

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

B. RSN 13 94 01-1, Shop Drawings:

1. Shop drawings and design calculations shall be submitted showing details of construction and layouts for review and acceptance before materials are fabricated.

C. RSN 13 94 01-2, Product Data:

1. Submit manufacturer's printed literature for care and maintenance for review and acceptance, including certification the manufacturer has at least five years of experience in the fabrication and supply of circular dual drain aquaculture tanks of the size specified.

2. Contractor shall provide color samples of a standard color palette for COR selection and approval.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Tanks that are installed below grade should be prioritized for delivery, early in the construction process. Tanks that set on finished floor should be delivered/installed after the floor is poured and all coordinated infrastructure is in place. Tanks and accessories shall be delivered and placed without damage.
1.06 WARRANTY

A. All Components: The Manufacturer shall furnish to the Contractor the Manufacturer standard 1-year workmanship warranty, commencing on the date of installation and acceptance at the Project by the COR, through the Contractor.

PART 2 PRODUCTS

2.01 REQUIREMENTS

A. Manufacturers' Qualifications

1. Only manufacturers with 5 years or more of proven experience and satisfactory performance in the manufacture of fiberglass reinforced plastic fish rearing tanks.

2. All manufacturers shall be required to submit a complete set of design calculations, material specifications and shop drawings.

B. Description of Fiberglass Fish Rearing Tank

1. Provide fiber-reinforced plastic tanks complete and ready for piping hookup and installation. The tanks are to be used for the production of fish in water temperatures ranging from 4 to 20 degrees Celsius. The tanks are to be used for an interior, covered application as shown on the drawings but may be subjected to the maximum ambient temperature range and fluctuations for the geographical location in the event of a facility shut-down.

2. Tanks shall conform to all dimensions and have the features indicated on the Drawings. Contractor shall verify tank dimensions and resolve any spacing changes required prior to installation. Units to be provided with reinforcement sufficient to maintain less than 1/2" total deflection at midpoint when filled with water.

3. Tank standpipe openings and screen slots shall be fabricated for use as shown on the project plans.

4. Each Tank will include a 4” port near floor level to accommodate the fish tagging trailer.

5. Tanks shall include viewing windows of approximately 1.5ft square located with the top of the window 1-ft below the top of the tank. Window shall be located to face the central drive aisle in the hatchery building as shown on the Drawings.

6. All tank side box drain standpipes shall be provided by the tank manufacturer. Standpipes shall seat in a molded PVC pipe coupling where shown in the Drawings to provide watertight seal at base. Each tank shall be provided with slotted screens to prevent fish from entering the sidebox area and bottom drain sumps.

a. Screens shall be marine grade aluminum 1/8-inch maximum opening size. Slotted perforations shall be oriented horizontally.
b. Screens for multiple tanks of a given size shall be interchangeable between tanks.

c. Screens shall be smooth on both faces without any sharp edges.

d. Screens shall be secured using Stainless steel hardware.

7. Tanks shall be provided with an 18” tall “Jump Screen” around the perimeter of the tank. This screen shall be mounted to the Tank Flange and be installed in sections with an arc length sufficient to cover 15 degrees of the tank flange circumference (24 Section). Each section shall independently removeable. The jumps screen should be semi ridged and hold their radius with perimeter support structure or ribbing. Suitable materials include extruded, UV stabilized polyethylene diamond mesh netting.

8. Provide fiber-reinforced plastic Center drain sumps complete and ready for piping hookup and installation.

9. All tanks shall be fitted with a bottom drain assembly that is either factory installed, or field installed and is adequately protected from damage during normal shipping and handling.

10. All tanks shall be fitted with a side box provided by the tank manufacturer. Side boxes that will have a screened inlet and two (2) outlet options, controlled by standpipes. The standpipes will regulate the water height in the culture tank. Side boxes can be installed at factory or field mounted on tanks.

11. All tank side box drain standpipes shall be provided by the tank manufacturer. Standpipes shall seat in a molded PVC pipe coupling where shown in the Drawings to provide watertight seal at base. All standpipes will include an aluminum handle secured to the top of the standpipe and chamfered internal and external edges at both ends. Standpipes are removeable and shall remain unglued.

C. Description of fiberglass Center Drain Standpipe Wells (SPW)

1. Provide fiber-reinforced plastic SPW complete and ready for piping hookup and installation.

2. SPW shall conform to all dimensions and have the features indicated on the Drawings. CONTRACTOR shall verify tank dimensions and resolve any spacing changes required prior to installation. Units to be provided with reinforcement sufficient to withstand forces consistent with proper operation of standpipe and appurtenances under normal flow conditions.

3. SPW will accept flow from the FCT center drain, and report that flow either to the effluent ETS-1000 or to the Recirc Return for that system. Standpipes shall seat in a molded PVC pipe coupling where shown in the Drawings to provide watertight seal at base. Inlet from tank will accommodate a low point drain prior to entering SPW. This drain will be accessed via an internal standpipe within the SPW inlet fitting.

D. Description of Radial Flow Settler (RFS-1000)
1. Provide fiber-reinforced plastic RFS complete and ready for piping hookup and installation.

2. RFS shall conform to all dimensions and have the features indicated on the Drawings. Contractor shall verify tank dimensions and resolve any spacing changes required prior to installation. Units to be provided with reinforcement sufficient to withstand forces consistent with proper operation of standpipe and appurtenances under normal flow conditions.

3. RFS will accept inlet flow from a SPS-1000. This is the backwash flow from Microscreen Drum filter (MSDF-1000). This backwashed is pumped into RFS-1000 by solids sump pump (SSP-1000). The flow is intermittent and should not exceed 15 gal/min. the inlet flow enters a stilling well where it follows a tortuous path to promote solids separation until it overflows a V-Notched weir, collects in an overflow trough and is directed to an outlet fitting.

E. Description of Mixing Head Tank (MHT-100-200)

1. Provide fiber-reinforced plastic MHT complete and ready for piping hookup and installation.

2. MHT shall conform to all dimensions and have the features indicated on the Drawings. Contractor shall verify tank dimensions and resolve any spacing changes required prior to installation. Units to be provided with reinforcement sufficient to withstand forces consistent with proper operation of standpipe and appurtenances under normal flow conditions.

3. MHT will accept inlet flow from a Recirc Supply (RS), Raw Water (RW) bypass, and Ground Water (GW). MHT will supply mixed supply waters to the associated (2) Fish Culture Tanks. An additional outlet from MHT-100 will supply feed water to MSDF-100 and 1000 backwash pumps through a 4” gravity fed delivery line and MHT-200 will supply MSDF-200 backwash pumps with supply water.

4. MHT will be partially buried with a bottom outlet cone and skirt. MHTs will have an overflow side box that diverts unused water to the Recirc Return (RR) piping, bypassing the culture tanks.

5. MHT will be supplied with a level and temperature transmitter.

2.02 WORKMANSHIP

A. Visual Defects: ASTM D2563 shall be used for quality control of both filament-wound and hand lay-up construction. Acceptance levels shall be as follows:

<table>
<thead>
<tr>
<th>Process Surface</th>
<th>Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blisters</td>
<td>None</td>
</tr>
<tr>
<td>Burned Areas</td>
<td>None</td>
</tr>
<tr>
<td>Chips</td>
<td>None</td>
</tr>
</tbody>
</table>
### Process Surface: Defects:

- **Cracks**: None
- **Crazing**: None
- **Dry Spots**: None
- **Entrapped Air**: None at surface. If in laminate 1/16-in dia max and 5/sq in max.
- **Exposed Glass**: None
- **Exposed Cut Edges**: None
- **Foreign Matter**: None
- **Pits**: Max 1/8-in dia X 1/32-in deep, max 10/sq ft.
- **Scratches**: None (coated)
- **Surface Porosity**: None
- **Wrinkles**: Max deviation 10 percent of wall thickness
- **Sharp Discontinuity**: None

### Non-Process Surface: Defects:

- **Blisters**: Max 1/4-in X dia 1/16-in high
- **Burned Areas**: None
- **Chips**: Max 1/4-in with max thickness of 20 percent of wall
- **Cracks**: None
- **Crazing**: Slight
- **Dry Spots**: Max 2 sq in/sq ft
- **Entrapped Air**: 1/8-in dia max; no more than 3 percent of area
- **Exposed Glass**: None
- **Exposed Cut Edges**: None
- **Foreign Matter**: None if it affects the properties of laminate
- **Pits**: Max 1/8-in dia X 1/16-in deep
- **Scratches**: None (coated)
- **Surface Porosity**: None
- **Wrinkles**: Max deviation 20 percent of wall thickness, but not exceed 1/8-in.
- **Sharp Discontinuity**: None

---

**B.** If the area fails to meet the requirements of entrapped air or voids in less than 40 percent of the total surface, those areas shall be repaired and reinspected. If the defective areas exceed 40 percent of the total surface, the entire vessel shall be rejected.
C. Shop Inspection: The COR shall be permitted access to the manufacturing area during fabrication and shall be notified one week prior to the estimated date of tests and/or inspections. Final inspection and approval shall be obtained prior to shipment unless written waiver is obtained. The shop inspection of the equipment shall include the following:

1. Check for compliance with drawing dimensions and adherence to construction standards.
2. An acetone wipe test to check surface cure. No surface tackiness is permitted.
3. A Barcol hardness test; at least 90 percent of manufacturer's specified hardness must be attained.
4. Examination of laminated (nozzle) cutouts.
5. A hydrotest of at least 24 hours duration to check for leaks.

2.03 BOLTS, ANCHOR BOLTS, WASHERS, SUPPORTS, AND HOLD DOWN LUGS

A. The Contractor shall provide bolts, anchor bolts, nuts, washers, and supports as required for the plastic and fiber glass items in this Section and in accordance with the requirements of the manufacturers of the plastic and fiber glass items. Bolts, anchor bolts, washers, hold down lugs, and supports required in connection with the plastic or fiber glass items shall be of Type 316 stainless steel.

PART 3 EXECUTION

3.01 TANK INSTALLATION AND DELIVERY

A. The fiberglass tank manufacturer shall review and certify in writing that all installation requirements as shown on the plans are in accordance with design character and limitations of the unit.

B. The tanks shall be covered and protected to prevent damage in shipment and handling. All finished surfaces are to be protected. Tanks shall not be stored in the open at manufacturer’s site or at job site. Any damage to the units incurred in transit and unloading shall be the responsibility of the manufacturer. Permits, import requirements, and precautionary measures required for highway transport are the entire responsibility of the manufacturer.

C. The manufacturer shall be responsible for delivering and supervising the unloading of the units at the hatchery. Visually imperfect units shall be rejected. The manufacturer and Contractor shall fully cooperate in the unloading and installation of the units at the hatchery.

D. The manufacturer shall fully cooperate and shall assist the Contractor with respect to the tank shipping and loading/unloading schedule. The shipping schedule shall conform to the project completion schedule.
E. The manufacturer shall provide a qualified site representative with the first shipment of units to the project site to insure proper unloading, handling and final installation. The Contractor shall provide equipment to handle and install the tanks in strict accordance with the manufacturer's instructions.

F. The manufacturer shall provide a qualified site representative during installation of the units to verify proper installation and grading of the tank bedding material, verify proper tank installation, and connections to the process piping.

G. The manufacturer shall provide a qualified site representative during start up and commissioning to provide guidance to the Contractor and to provide training to Hatchery personnel on the correct operation of the tanks including start up procedures, operational procedures, and end of season draining procedures.

H. All minor defects shall be refinished by the manufacturer prior to completion of the Project and acceptance by the COR. The refinished surface shall show no discernible variations in appearance from the surrounding areas.

I. Prior to shipment, the tanks shall be cleaned to remove any residual parting agent, film or other deleterious material. The units shall be carefully cleaned (per the manufacturer’s instructions) prior to completion of the project.

J. The first tank manufactured shall be inspected by the COR and the Contractor for conformance to drawings and specifications prior to manufacturing remaining order. All subsequent tanks shall be inspected by the Contractor prior to shipment to the site.

END OF SECTION
SECTION 13 99 60
PARTIAL REUSE AQUACULTURE SYSTEM (CIRCULAR TANKS)

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A.  Cost: Payment shall be made on a lump sum basis on completed and fully functioning partial reuse aquaculture system including pumps, UV, microscreen drum filters, pressure filters, aeration basin equipment, regenerative blowers, low head oxygenators, and backup oxygen diffusers and any miscellaneous equipment required for a fully operating system. This excludes the fiberglass tanks in Specification 13 94 01 – Fiberglass Tanks.

1.02  REFERENCE STANDARDS
1.  American Society of Mechanical Engineers (ASME): B16.5, Pipe Fittings and Flange Fittings

1.03  SUMMARY
A.  Each Partial Reuse Aquaculture Module (MOD-100-200) will consist of 2 (two) fish culture tanks (FCT) and a Partial Reuse Treatment Sump (PTS). The FCT water supply will be fed by a mixing head tank (MHT). The MHT will accept influents from the treated raw water (RW), ground water (GW) and the reuse supply (RS) water, post filtration through the PTS. The FCT effluent will report to the effluent treatment systems (ETS) and the Reuse Return (RR) piping, which reports the PTS. The system is designed to operate at 75% Reuse flow and 25% RW flow. GW will be used as a backup for RW, and for summertime temperature control for Reuse MOD-100-200.

B.  The PTS on each module will receive RR flow from the culture tanks and process the water through a sequence of filter events to ensure the RS flow is suitable to support the fish culture requirements identified in the basis of design. The treatment processes within the RUTU include:
1.  Mechanical solids filtration using Microscreen Drum Filters.
2.  Atmospheric gas balancing of dissolved carbon dioxide (CO2) and dissolved oxygen (DO) within an Aeration Basin (AB) using diffusers and low-pressure air.
3.  Low Head Oxygenator (LHO) for supersaturation of DO.
4.  Pump Sump with overflow to (OF).
5.  Accommodation for Future:
   b.  Drop in Water to Water Heat Exchangers for temperature control.

C.  Additional treatment of the RS water that takes place outside of the RUTU includes:
1. Reuse Pumps to recirculate water back to FCT.
2. Ultraviolet filtration to disinfect RS flow.

D. The FCT and supporting miscellaneous tanks are described in section 13 94 01.

E. The requirements of Section 01 33 00 - Submittals, Section 01 60 00 – Product Requirements apply.

1.04 SUBMITTALS

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

1. RSN 13 99 60-1 Shop Drawings
   a. Furnish complete drawings and technical information for equipment, piping, valves, and controls. Where indicated or required by the COR, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements proposed by the CONTRACTOR.

2. RSN 13 99 60-2 Spare Parts List
   a. The CONTRACTOR shall obtain from the manufacturer and submit at the same time as Shop Drawings a list of suggested spare parts for each piece of equipment. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment.

3. RSN 13 99 60-3 Certifications
   a. Certify that equipment and equipment support comply with seismic and wind design criteria from Code.

4. RSN 13 99 60-4 Warranties
   a. All equipment shall be provided with a minimum 1-year complete warranty that will initiate upon final commissioning, and training by the CONTRACTOR and acceptance by the COR.

PART 2 PRODUCTS

2.01 PARTIAL - REUSE TREATMENT SUMPS (PTS-100-200)

A. The Partial-Reuse Treatment Sumps are inground concrete sumps designed to accommodate specific treatment processes that can take place without re-pressurizing the RR water flow. The RUTU will be formed and poured on site. Where applicable, the sump walls will be integrated into the building foundation to support columns and conserve space. The concrete finish within the PTS will be in accordance with specification section 03 30 00 3.07, Finishing Concrete Surfaces, U3 Finish type to accommodate, smoothness and lack of voids. The interior walls will require smooth surfaces that can be cleaned and brushed daily.
1. The PTSs will be designed to accommodate all the filtrations equipment specified below while maintaining adequate service access and fall protection. Safely ladders and self-rescue equipment must be installed in each treatment compartment.

2. The PTSs should be constructed to ensure that ground water is prevented from entering and process water is prevented from exiting the vessels unintentionally.

3. See concrete specifications Section 03 30 00

2.02 MICROSCREEN DRUM FILTERS (MSDF)

A. Reuse Module (MOD-100-200), MSDF-100-200

1. Reuse Return (RR): RR shall be gravity fed to the microscreen drum filter. Upon entering the drum, the flow disperses radially as it moves through the woven polyester screen panels mounted to the periphery of the drum frame.

2. Operating Liquid Levels: The influent hydrostatic head shall be sufficient to overcome head-loss within the microscreen filter and ensure gravity flow through the microscreen filter. Influent flow shall enter the inside of the drum where the water level shall vary between the minimum allowable water level and a maximum water level as set by an internal bypass weir. The fluctuating water level inside the drum is caused by the increased head-loss as particles to be filtered collect on the screen panels. A constant water level shall be maintained around the filter drum using an internal weir prior to exiting the filter vessel. The microscreen filter shall be operated at minimum submergence of 40 percent of its filtering surface area.

3. Backwash Cycle: Cycle: When the differential water level between the inside of the drum and the filter enclosure reaches a pre-set limit, a level switch shall initiate the backwash cycle. After the switch is activated, the drum drive shall rotate the drum 2 to 2½ rotations, which is controlled by a timer in the control panel. As the drum rotates, the backwash pump shall operate to convey high-pressure filtered process water to the spray bar and spray nozzles located above the drum screens. To withdraw filtered process water, the inlet of the backwash pump shall draw from the filter enclosure. As backwash water passes through the screens, it is collected in a solid’s trough located directly under the spray bar inside the drum. The collected solids water is conveyed out of the drum by the inclined trough to discharge by gravity.

B. Effluent Treatment System (ETS-1000) MSDF-1000

1. Effluent Treatment System flow shall be gravity fed to the microscreen drum filter(s). Upon entering the drum, the flow disperses radially as it moves through the woven polyester screen panels mounted to the periphery of the drum frame.

2. Operating Liquid Levels: The influent hydrostatic head shall be sufficient to overcome head-loss within the microscreen filter and ensure gravity flow through the microscreen filter. Influent flow shall enter the inside of the drum where the water level shall vary between the minimum allowable water level and a
maximum water level as set by an internal bypass weir. The fluctuating water level inside the drum is caused by the increased head-loss as particles to be filtered collect on the screen panels. A constant water level shall be maintained around the filter drum using an internal weir prior to exiting the filter vessel. The microscreen filter shall be operated at minimum submergence of 40 percent of its filtering surface area.

3. Backwash Cycle: When the differential water level between the inside of the drum and the filter enclosure reaches a pre-set limit, a level switch shall initiate the backwash cycle. After the switch is activated, the drum drive shall rotate the drum 2 to 2½ rotations, which is controlled by a timer in the control panel. As the drum rotates, the backwash pump shall operate to convey high-pressure filtered process water to the spray bar and spray nozzles located above the drum screens. To withdraw filtered process water, the inlet of the backwash pump shall draw from the filter enclosure. As backwash water passes through the screens, it is collected in a solid’s trough located directly under the spray bar inside the drum. The collected solids water is conveyed out of the drum by the inclined trough to discharge by gravity.

C. Operating Conditions: Conform to the following operating conditions:

<table>
<thead>
<tr>
<th>Module</th>
<th>MOD-100</th>
<th>MOD-200</th>
<th>ETS-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>One (1)</td>
<td>One (1)</td>
<td>One (1)</td>
</tr>
<tr>
<td>Model Type</td>
<td>Frame</td>
<td>Frame</td>
<td>Frame</td>
</tr>
<tr>
<td>Design flow rate (USGPM)</td>
<td>2100</td>
<td>2100</td>
<td>1296</td>
</tr>
<tr>
<td>Design Influent TSS (mg/L)</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Screen Pore Size</td>
<td>40 microns</td>
<td>40 microns</td>
<td>30 microns</td>
</tr>
<tr>
<td>Minimum Drum Submergence</td>
<td>40% of filtering surface area</td>
<td>40% of filtering surface area</td>
<td>40% of filtering surface area</td>
</tr>
<tr>
<td>Maximum screen hydraulic loss</td>
<td>12 in</td>
<td>12 in</td>
<td>12 in</td>
</tr>
</tbody>
</table>
D. Equipment Requirements:

1. Support Frame (for Frame models MOD-100, 200 and ETS-1000):
   a. Each microscreen drum filter shall have a structural welded 304 stainless steel frame that provides support for the rotating drum assembly and all mechanical components.
   b. The support frame shall include an integral sump for control of the filter water level downstream of the micro-screen panels.
   c. Bypass: The rotary microscreen drum filter frame must be equipped with a bypass such that if the input flow exceeds the filter capacity, excess water will overflow from the inlet side of the filter to the outlet side of the filter, bypassing the filter panels.
   d. Include support frame leg extensions as needed to provide for water surface operating levels shown on the Drawings.

2. Filter Cover
   a. The filter shall be furnished with a cover constructed of fiberglass (FRP) with a hinged access panel for access to the spray-bar. The cover must also be removable to facilitate maintenance.

3. Drive Train Assembly:
   a. The drive axle shall be constructed of 316 stainless steel and shall have a keyed shaft. The axle shall be coupled to an FRP plate forming the closed end of the drum assembly. The FRP plate shall be capable of absorbing flexure due to normal wear of drum support wheels.
   b. Ensure that there is no risk of lubricants or grease directly contacting the process water or dripping into the process water.
   c. Frame Models shall have a sealed mechanical gear reducer mounted to a drive tower. The drive shaft shall be driven by a lubricated chain and supported by self-aligning pillow block bearings.
   d. The mechanical gear reducer shall be coupled to a high efficiency, TEFC electric motor.

4. Screen Media:
   a. Screen media is to be woven polyester fabric with a nominal screen contained within and supported by a molded injected polypropylene grid. Screen media shall be furnished in complete pre-formed panels that can be
individually installed, repaired or replaced. Individual cells of the media panel grid must be designed to allow the use of patching plug(s), as furnished by the manufacturer, for repair of minor damage to filter plates.

b. Screen panels, when mounted on the drum filter, shall be capable of withstanding a maximum continuous head-loss of twelve (12)-inches of water.

c. Each screen panel shall be sealed continuously on all edges with a silicon sponge gasket, attached to the drum frame with 304 stainless steel anchoring assemblies.

d. Replacement of the filter media must be possible from outside the filter tank. Individual panel removal shall be achievable without removal or disengagement of more than one additional panel.

5. Rotating Drum:

a. The rotating drum shall be fabricated from structural welded, 304 stainless steel and shall be open at one end to allow the influent to enter. The drum assembly shall be sealed sufficiently to prevent bypassing of influent flow into the filtered water tank except in a bypass condition.

6. Drum Seal:

a. The drum seal is to consist of a synthetic elastomer seal wear ring integrally assembled to the front face of the drum filter enclosure or support frame. The seal shall be formed to maintain continuous contact with the surface of the open end of the rotating drum assembly.

7. Backwash System:

a. Each filter shall be supplied with a backwash system comprised of a backwash spray bar assembly, a backwash collection trough, and a backwash pump. The backwash system must operate automatically based on high differential water level between the inside of the drum and the outside of the drum.

b. The backwash collection trough must be located to allow the rotating drum to achieve a bypass condition without influent overflowing into the waste trough. The trough shall discharge by gravity.

c. Backwash spray bar assembly is to consist of a stationary spray header, oriented along the length of the drum assembly, on which are mounted a series of spray nozzles. The spray nozzles shall be sufficient in quantity and shall be spaced appropriately to ensure full spray coverage of the drum length. Spray nozzles shall be of quick-disconnect design to allow for cleaning without turning the spray bar off. The spray nozzle shall consist of a nozzle tip made of 303 SS stainless steel, mounting cap for quick removal, nozzle body and seals. The replacement or cleaning of nozzles must be possible from outside of the filter enclosure.
d. The backwash pump shall be of the horizontal multi-stage design with the motor mounted directly to the pump. The pump shall be capable of supplying the required backwash flow, as specified by the Manufacturer, at a pressure of 100 psi. The motor shall be Totally Enclosed Fan Cooled (TEFC). The pump and backwash piping system for MS-700 shall be configured for year-round outdoor service in conjunction with heat trace and insulation as needed to prevent freezing.

e. Filtered effluent shall be used as the backwash water source. A valve and pressure gauge assembly shall be installed on the backwash spray header piping downstream of the pump in order to regulate to the desired nozzle pressure. The backwash system shall be plumbed with PVC or stainless-steel piping supplied and installed by the Contractor.

8. Control Panel:

a. Each microscreen filter shall have a local control panel which shall house the automatic level control circuit and motor controls. The panel will have a lockable NEMA-4X enclosure. The circuit shall be UL approved. The circuit shall be capable of closing and opening the motor contacts for the drive motor, and the backwash pump motor. The circuitry for the level switch shall be operated at low voltage.

b. The control panel shall activate the motors for operation when the backwash cycle is initiated. Each of the motors shall have a hand-off-auto (HOA) selector switch and run indication pilot lights on the panel door.

1) "Hand" Operation - When the HOA selector switch is in "hand" or "manual" mode, the drum drive and backwash pump shall operate continuously without any interlocking logic.

2) "Auto" Operation - When the HOA selector switch is in "auto" or "automatic" mode, the level switch shall control the operation of the drum drive and backwash pump.

c. The control panel shall include a VFD or soft start circuitry to ensure the smooth, controlled starting of the filter motor on initiation of the backwash cycle, preventing damaging the filter or electrical components due to high initial torque and current draw.

d. In addition to the Backwash cycle level switch, a High-level alarm switch is also included with the filter. When triggered, the High-level switch will be able to activate a visual or audible alarm. Level switch is a single-point magnetic reed switch constructed from 316 SS.

E. Equipment Construction: Construction shall be as follows:

<table>
<thead>
<tr>
<th>Filter enclosure (FRP Tank models)</th>
<th>NA</th>
</tr>
</thead>
</table>

---

Partial Reuse Aquaculture System (Circular Tanks) 13 99 60 - 7
Filter support frame (Frame models) | 304 Stainless Steel
---|---
Filter Drum, Screen Clamps, Drive Structure | 304 Stainless Steel
Filter Element | Polyester fabric on polypropylene grid with silicone sponge gasket
Drum Seal | EPDM
Drive Motor | TEFC, 480 V 3PH 60 Hz
Drive Shaft | 316 Stainless Steel
Backwash Pump | TEFC, 480 V 3PH 60 Hz
Control Panel | NEMA 4X, UL
Lubrication | Food safe mineral oil and grease

F. Manufacturers, or Equal
1. Hydrotech
2. Integrated Aqua Systems, Inc.
3. Innovasea

2.03 INFLUENT PRESSURE FILTER (IPF-100 - 200)

A. Influent Treatment System, Raw Water Sediment Filter
1. Raw water is subject to elevated Total Suspended Solids (TSS) levels during high flow water events in the source stream. During these events TSS levels can elevate to 40 mg/l and can have a negative impact on the UV transmittance (UVT). To ensure the UV firewall remains effective, the RW influent should be screened to 20 microns to remove excessive TSS loads and ensure sufficient UV transmittance.

2. ITS-100 and ITS-200 will both require a filter that can screen the RW to 20 Microns, with a pressure drop of 7 PSI. Automated Backwash will be accomplished without interrupting flow. An Influent Booster Pump (IBP-100-200) will be required to provide the minimum influent Pressure of 30 PSI to each IPF and the required backwash pressure of 50 PSI.

B. Equipment
1. Filter
The filter unit shall be an automatic, self-cleaning type. The body of the filter shall be carbon steel (ST 37-2). The inside and outside of the body shall be coated per the FINISHES section. The body shall contain two raised face flange connections drilled with dimensions conforming to 150-pound ANSI. The cover shall be removable to facilitate maintenance. The maximum operating pressure of the filter body shall be 150 PSI and the maximum operating temperature shall be 140˚F. Minimum operating pressure during the cleaning cycle shall be 30 PSI (40 PSI for 50- & 25-micron filtration 50 PSI for 10 micron).

2. Inlet and outlet flange connections shall be 8” inches in diameter.

3. The filter system shall have a clean-screen pressure drop of no greater than 7 PSI at a flow rate of 600 GPM.

4. Cleaning shall be accomplished by an IEC frame, TEFC electric motor driven rotating cleaning element made of Type 316L stainless steel that simultaneously moves linearly as a result of a threaded-shaft/fixed-threaded-bearing mechanism. This linear movement shall be limited by two normally closed limit switches and monitored by the PLC in the control panel. The cleaning element, called a “suction scanner,” shall have six radially oriented nozzles of circular cross section, each of which shall have a thread mounted polyacetal nozzle cap with a circular orifice for sacrificial wear. The sum of the cross-sectional areas of the four nozzle orifices shall not exceed 1.43 square inches. The velocity created at the nozzle head shall be 49 feet per second. The motor drive for the rotating cleaning element shall turn the cleaning element at no more than 24-rpm, shall be suitable for operation with 480-volt, 3-phase, 60-hertz current and shall be minimum 1/2-horsepower. The cleaning cycle shall last for no more than 30 seconds.

5. The filter shall be supplied with spring loaded nozzles with polymer tips that press against the fine screen inner surface at a constant pressure. This ensures highly focused flush flow for superior cleaning of the four-layer fine screen.

6. The filter shall have a removable cylindrical four-layer filtration element made entirely of Type 316L stainless steel weave-wire screen with a 20-micron filtration degree. First, against the dirty liquid, shall be a 3000-micron square-wire weave-wire layer. Next shall be the fine weave-wire layer providing the solids removal. A second 3000-micron square-wire weave-wire layer shall make up the third layer. The fourth layer surrounding the entire cylinder is a welded wedge-wire grid providing structural strength. The total effective filtration area of the cylindrical filtration element shall be 1550 square inches. Filtration elements with filtration degrees ranging from 500-microns to 10-microns shall be interchangeable in the same filter body.

7. The cleaning system for the filter shall include a 3-inch hydraulic diaphragm valve operated by the pressurized liquid on the upstream side of the cleaning element. The body of this valve shall be polyester coated cast iron.

C. Motors
1. Motor(s) shall be Baldor Metric-E series. The motor(s) will be IEC frame designed and comply with IEC34/72 standards. Enclosure(s) shall be TEFC complying with IP55. Frame shall be aluminum. Efficiency class is EFF2 and the motors are EPAct compliant. Class F insulation. CSA and CSAUS listed to C22.2

D. Pressure Differential Switch

1. The nonadjustable differential pressure switch shall be preset at 7-psi and enclosed in a NEMA 4X enclosure and shall be suitable for up to 240V AC/DC. The differential pressure switch shall have an easy to read “pointer & dial” gauge and shall be the fully automatic diaphragm type differential pressure switch.

E. Flush Valve

1. The flush valve shall be a globe style Bermad 400 series valve for on/off service and controlled by an ASCO solenoid. The valve body and cover shall be cast iron, flanged per ANSI B16.41. The diaphragm assembly shall be natural rubber with a glass fiber infused polyamide with a vulcanized radial seal disk. The spring shall be stainless steel 302. External bolts shall be zinc coating plated steel. Coating shall be polyester. The valve is rated for operating between 7-232 PSI and for temperatures up to 140°F.

F. Accessories

1. Equipment Anchor Bolts: CONTRACTOR shall provide anchor bolts as specified in Section 05 50 00 2.10.

2. Equipment Identification Plates: CONTRACTOR shall provide one identification plate securely mounted on each separate equipment component and control panel(s) in a readily visible location as specified in Section (Front)

G. Finishes

1. External coating shall be a polyester UNIVERCOL 7000 and internal coating shall be a phenolic epoxy UNIVERCOL 9000, both applied by an electrostatic coating process and then oven baked. Pretreatment shall include weld inspection, removal of greases, protection of non-coated elements and sand blasting per SA 2.5 (coating to start within 6 hours of sand blasting completion). Final coating thickness shall be 4-8 mil per SSPC – PA2. Final coating shall be tested by adhesion test according to ISO 2409 and continuity testing using a Holiday spark test on all coated surfaces. Coating color shall be Red 3002 or Blue 5010.

H. Installations

1. Install the filter in accordance with the manufacturer’s recommendations, Installation, Operation and Maintenance Manual and approved general arrangement drawings.
I. Field Quality Control
   1. Manufacturer’s Field Services: Provide Two (2) days of service at the site by a qualified representative of the system manufacturer to inspect the installation of their respective unit, make any necessary adjustments, test the equipment, place the equipment in initial hands-free operation and instruct the operating personnel in its operation and maintenance in accordance with Division 01.

J. Manufacturers
   1. Filters: Acceptable manufacturers are listed below.
      Amiad Water Systems, Filter Model EBS 15,000 or equal.

2.04 ACCOMMODATION FOR FUTURE MOVING BED BIOLOGICAL REACTOR (MBBR)

A. Reuse MOD-100-200, within the PTU
   1. Directly following the MSDF 100-200 within the RUTU, will be an area set aside for a future Moving Bed Biological Reactor (MBBR). The extent of the accommodations will include the aeration manifolds to provide the motive force to move the media, the space within the treatment unit and the blower to supply aeration. Future installation requirements will include the media and the media screens to contain the media within the designated space. Future installation of the media screens will require the system to be off-line and drained.

   2. The MBBR aeration manifold will be a series of perforated PVC pipes secured to the floor of the RUTU at an elevation of 12”-18” off the floor. The perforation should allow for a course bubble aeration which will provide 80-100 CFM of air flow. The aeration should be applied to ensure that 280 CUFT of media is sufficiently agitated and the filter screens are kept clear from media impingement.

<table>
<thead>
<tr>
<th>Future Equipment</th>
<th>MBBR-100</th>
<th>MBBR-200</th>
<th>Shared Blower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>One (1)</td>
<td>One (1)</td>
<td>One (1)</td>
</tr>
<tr>
<td>Fish Feed Rate</td>
<td>26 kg/day</td>
<td>26 kg/day</td>
<td></td>
</tr>
<tr>
<td>Design Temperature</td>
<td>50 deg F</td>
<td>50 deg F</td>
<td></td>
</tr>
<tr>
<td>Filter media capacity</td>
<td>280 CUFT</td>
<td>280 CUFT</td>
<td></td>
</tr>
</tbody>
</table>
Future Equipment | MBBR-100 | MBBR-200 | Shared Blower
--- | --- | --- | ---
Water Depth | 8 ft | 8 ft | 
TAN Removal Rate | 0.4 g/m2-day | 0.4 g/m2/day | 
Aeration Rate | 100 CFM | 100 CFM | 200 CFM |
THD | 10 ft | 10 ft | 10 ft |
Regenerative Blower | | | BLW-1000 |

2.05 AERATION BASIN (AB-100-200)

A. Immediately following the MBBR, the RUTU will accommodate an aeration basin design to strip dissolved CO2 from the reuse water and bring oxygen level close to 100% saturation. The AB will have a water depth of 4.5 ft and be lined with diffuser disks attached to low pressure air distribution piping. Each diffuser disk will accommodate between 2-6 CFM of air flow each. 90 diffusers will line aeration basin at an elevation of 8-14” above the floor. Regenerative blowers will supply atmospheric air at a rate of 450 CFM to the diffuser grid supporting each AB. The regenerative blowers will be supplied with a VFD drives to manually adjust the volume of air being delivered to the AB.

Aeration Basin | AB-100 | AB-200
--- | --- | ---
Water Depth | 4.5 ft | 4.5 ft |
Diffuser QTY | 90 | 90 |
Diffuser Air flow | 2-5 CFM | 2-5 CFM |
AB Total Air flow | 360 CFM | 360 CFM |
THD | 5 ft | 5 ft |
2.06 REGENERATIVE BLOWERS (BLW-100-200, 1000)

A. Regenerative blowers will be located outside, at the west end of each Reuse Building (RB) with distribution piping supporting each service location. Blowers should be secured to an equipment base that elevates the mounting feet 12” above ground level. The blowers and the equipment base will be in an enclosure to protect the equipment from inclement weather and to provide sound dampening. Air intakes will extrude from the enclosure and be equipped with an inlet filter manifold suitable for the specified air flow.

B. Construction requirements: All blowers will meet the following specifications:
   1. UL and CSA certified TEFC motor
   2. IP54 Rate motor enclosure
   3. Cast iron blower housing and cover
   4. Pilot duty overload protection
   5. Aluminum impeller
   6. Oil-less operation ensuring discharge air is contaminant free.
   7. Suited for outdoor use applications.
   8. No wearing components.
   9. Variable frequency drive (3 phase motors)

C. Regenerative Blower Schedule:

<table>
<thead>
<tr>
<th>Regenerative Blower</th>
<th>BLW-100</th>
<th>BLW-200</th>
<th>BLW-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Depth</td>
<td>4.5 ft</td>
<td>4.5 ft</td>
<td>8 ft</td>
</tr>
<tr>
<td>Diffuser QTY</td>
<td>90</td>
<td>90</td>
<td>NA</td>
</tr>
<tr>
<td>Diffuser Air flow</td>
<td>2-5 CFM</td>
<td>2-5 CFM</td>
<td>NA</td>
</tr>
<tr>
<td>Regenerative Blower</td>
<td>BLW-100</td>
<td>BLW-200</td>
<td>BLW-1000</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------</td>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td>AB Total Air flow</td>
<td>360 CFM</td>
<td>360 CFM</td>
<td>200 CFM</td>
</tr>
<tr>
<td>THD</td>
<td>5 ft</td>
<td>5 ft</td>
<td>10 ft</td>
</tr>
<tr>
<td>Control Options</td>
<td>Manual VFD</td>
<td>Manual VFD</td>
<td>Manual VFD</td>
</tr>
<tr>
<td>Power</td>
<td>15 hp</td>
<td>15 hp</td>
<td>15 hp</td>
</tr>
<tr>
<td>Service</td>
<td>480/3/60</td>
<td>480/3/60</td>
<td>480/3/60</td>
</tr>
</tbody>
</table>

D. Manufacturer, or Equal.

1. Gast

2.07 LOW HEAD OXYGENATOR (LHO-100-200)

A. Immediately following the aeration basin, the RUTU will house a Low head Oxygenator (LHO) to will supersaturate the RR flow with oxygen. LHO's are passive devices that consist of the following components:

1. Distribution plate
   a. The LHO distribution plate is a perforated sheet that distributes the entire RR flow through a perforated plate. The perforation is designed so that the water level builds on the distribution plate to a level of 5" and creates an airtight cap over the LHO. The water is driven down through the perforations and into the enriched oxygen chamber where the gas exchange takes place.

2. Enriched Oxygen chamber
   a. This area is divided into at least 8 different chambers over the entire footprint of the LHO vessel. The water flow travels in parallel through these chambers, while the enriched oxygen gas flow is series through the chambers. The chamber should be at least 12" high from the bottom of the distribution plate to the water level in the plunge pool below. The chamber divider wall should continue down into the plunge pool at least 1.5 times the height of the enriched oxygen chamber.

3. Oxygen Feed Gas
   a. Concentrated O2 feed gas should be supplied to the first chamber and follow a tortuous path to the final chamber where it exits. Oxygen flow
should not exceed 1.5% of the Water flow by volume. Dissolved oxygen levels of 150% saturation should be targeted for maximum oxygen transfer efficiencies.

4. Design and operating criteria for LHOs:

<table>
<thead>
<tr>
<th>Low Head Oxygenator</th>
<th>LHO-100</th>
<th>LHO-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel Width</td>
<td>8 ft</td>
<td>8 ft</td>
</tr>
<tr>
<td>Vessel Length</td>
<td>2 ft</td>
<td>2 ft</td>
</tr>
<tr>
<td>Vessel Flow Rate</td>
<td>1294 GPM</td>
<td>1294 GPM</td>
</tr>
<tr>
<td>Hydraulic loading rate</td>
<td>81 gpm/ft²</td>
<td>81 gpm/ft²</td>
</tr>
<tr>
<td>Oxygen flow Rate</td>
<td>49 LPM</td>
<td>49 LPM</td>
</tr>
<tr>
<td>Control Options</td>
<td>Manual Rotometer</td>
<td>Manual Rotometer</td>
</tr>
<tr>
<td>Number of Enrichment Chambers</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Maximum Saturation Level</td>
<td>150% DO Saturation</td>
<td>150% DO Saturation</td>
</tr>
</tbody>
</table>

5. Construction Requirements
   a. LHO vessels should be constructed of material suitable for contact with ozone Gas.
   b. LHO distribution plate secures to the RUTU, AB wall, and LHO legs rest on the Sump Pump Floor.

6. Manufactures, or equal
   a. PRAqua
   b. WMT/InnovaSea
   c. Integrated Aqua Systems inc.
2.08 PUMP SUMP

A. The final stage of the RUTU is the sump pump. This area is designed to provide an overflow point in the system where excess water can leave. There should always be some amount of water being discharge to the sump overflow. The overflow elevation sets the normal operating water level in the sump at a level adequate for the operation of the LHO. The water level should never exceed this elevation and should only run lower during an initial startup of the pumps as the system is being “charged” with water. The area of the sump pump and the depth of the intakes should be designed to accommodate a system startup without water loss in the sump in excess of the low-level alarm elevation. It is assumed that the during a pump shut down, there is still 25-100% RW being supplied directly to the tanks. A portion of this flow is leaving directly through the tank center drains and reporting to the ETS, while a portion is returning to the RUTU and overflowing the pump sump overflow. The overflow fitting is size at 20” and should accommodate 1500 gpm of overflow for a short period of time.

B. The pump sump is designed with a divider wall that increases the velocity within the sump and prevents the short circuiting of flow from the LHO to the pump intakes.

2.09 REUSE PUMPS -VERTICAL LINESHAFT TURBINE PUMPS

A. Installation Location:
   1. Reuse MOD-100, (PMP-101-102)
   2. Reuse MOD-200, (PMP-201-202)

B. Reuse module pumps shall be provided complete with VFD’s and modulating control based on tank supply pressure in the Mixing Head Tank (MHT). Inlet and outlet piping, inlet and outlet isolation butterfly valves, inlet compound and outlet pressure gauges, outlet check valves, and pipe supports for discharge header should be installed per the manufacturing guidelines and in accordance with contract drawings. Piping shall be schedule 80 PVC per Section 40 23 22. Butterfly valves shall conform to Section 43 25 02, Butterfly Valves. Check valves shall conform to Section 43 25 03, Check Valves. Gages shall conform to industry standards for Pressure and Level Measuring Systems for VFD control systems and the Contract Documents.

C. Operating Conditions: conform to the following operating conditions:

<table>
<thead>
<tr>
<th>Module</th>
<th>MOD-100</th>
<th>MOD-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Pumps</td>
<td>2 (Two)</td>
<td>2 (Two)</td>
</tr>
<tr>
<td>Design flow rate (USGPM)</td>
<td>1000 (ea)</td>
<td>1000 (ea)</td>
</tr>
</tbody>
</table>
**D. Equipment Requirements:**

1. **Pump Type**
   a. Vertical Lineshaft Turbine pump

2. **Discharge Case**
   a. Heavy Duty class 30 cast iron with water lube

3. **Bowls**
   a. Heavy Duty class 30 cast iron with flanged design
   b. Coated passages for increased efficiency.

4. **Impellers**
   a. Investment cast, 316 stainless steel, with smooth core and dynamic balance.

5. **Bowl Bearings**
   a. Rubber option

6. **Suction Bowl**
   a. Heavy duty cast iron.

7. **Driver:**
   a. The driver shall be an electric motor in accordance with the latest NEMA Standards, and shall have the following characteristics:

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>TEFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltages</td>
<td>480 Volt</td>
</tr>
<tr>
<td>Number of Phases</td>
<td>Three</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Impeller Size</td>
<td>7.75</td>
</tr>
<tr>
<td>Efficiency</td>
<td>80% or greater</td>
</tr>
<tr>
<td>Speed</td>
<td>1180 RPM</td>
</tr>
</tbody>
</table>
## Partial Reuse Aquaculture System (Circular Tanks)

### Pilot Circular Tanks and Solids Handling

**Leavenworth National Fish Hatchery Solicitation No. 140R1020R0012**

<table>
<thead>
<tr>
<th>HP</th>
<th>7.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duty</td>
<td>Inverter Duty</td>
</tr>
<tr>
<td>Voltage</td>
<td>460/3phase/60 hrz</td>
</tr>
</tbody>
</table>

b. Each motor shall have a sufficient horsepower rating to operate the pump at any point on the pump's head-capacity curve without overloading the nameplate horsepower rating of the motor, regardless of service factor and shall be inverter rated for VFD control. VFD's shall be as specified in Section 26 29 23 Variable Frequency Drives.

E. Equipment Construction: Construction shall be as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing</td>
<td>Cast Iron (ASTM A48)</td>
</tr>
<tr>
<td>Impellor</td>
<td>Stainless Steel (ASTM 316)</td>
</tr>
<tr>
<td>Motor Bracket</td>
<td>Cast Iron (ASTM A48)</td>
</tr>
<tr>
<td>Shaft</td>
<td>Steel (AISI C1045)</td>
</tr>
<tr>
<td>Shaft Sleeve</td>
<td>Stainless Steel (ASTM 316)</td>
</tr>
</tbody>
</table>

F. Manufacturers, or Equal

1. Pentair: Berkeley 10VT or equal

### 2.10 INFLUENT BOOSTER PUMPS (IBP-100 & 200)

A. Installation Location:

1. Influent Treatment System (ITS 100-200) RW Supply

B. Influent booster pumps shall be provided complete with VFD’s and modulating control based on RW-FT-100-200 flow meter supply RW in the Mixing Head Tank (MHT). Inlet and outlet piping, inlet and outlet isolation butterfly valves, inlet compound and outlet pressure gauges, outlet check valves, and pipe supports for discharge header should be installed per the manufacturing guidelines and in accordance with contract drawings. Piping shall be schedule 80 PVC per Section 40 23 22. Butterfly valves shall conform to Section 43 25 02, Butterfly Valves. Check valves shall conform to Section 43 25 03, Check Valves. Gages shall conform to industry standards for Pressure and Level Measuring Systems for VFD control systems and the Contract Documents.
C. **Operating Conditions:** conform to the following operating conditions:

<table>
<thead>
<tr>
<th>Module</th>
<th>ITS-100</th>
<th>ITS-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Pumps</td>
<td>1 (One)</td>
<td>1 (One)</td>
</tr>
<tr>
<td>Design flow rate (USGPM)</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Design TDH</td>
<td>100 ft TDH</td>
<td>100 ft TDH</td>
</tr>
</tbody>
</table>

D. **Equipment Requirements:**

1. **Pump Type**
   a. Split Coupled Vertical in-line pumps

2. **Casing**

3. **Impeller**

4. **Shaft**
   a. Stainless Steel 416.

5. **Coupling**
   a. Cast iron ASTM A-48 Class 30

6. **Mechanical Seal**
   a. Stainless Steel, Multi Spring outside Balanced
   b. Secondary Viton Seal, carbon rotating face and silicon carbide stationary seat

7. **Electric Motor**
   a. TEFC, vertical, “c” flange and standard shaft.

8. **Size**
   a. 4 X 4 X 6

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>TEFC</th>
</tr>
</thead>
</table>
### Pilot Circular Tanks and Solids Handling

**Leavenworth National Fish Hatchery Solicitation No. 140R1020R0012**

**Partial Reuse Aquaculture System (Circular Tanks)**

<table>
<thead>
<tr>
<th>Voltagess</th>
<th>480 Volt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Phases</td>
<td>Three</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Impeller Size</td>
<td>8</td>
</tr>
<tr>
<td>Efficiency</td>
<td>75% or greater</td>
</tr>
<tr>
<td>Speed</td>
<td>3500 RPM</td>
</tr>
<tr>
<td>HP</td>
<td>15</td>
</tr>
<tr>
<td>Duty</td>
<td>Inverter Duty</td>
</tr>
<tr>
<td>Voltage</td>
<td>460/3phase/60 hrz</td>
</tr>
</tbody>
</table>

---

**E. Manufacturers, or Equal**

1. Barmesa Pump, BVL series.

---

**2.11 UV DISINFECTION**

**A. Operating Conditions:** Conform to the following operating conditions:

<table>
<thead>
<tr>
<th>Service</th>
<th>MOD-100 (UV-100)</th>
<th>MOD-200 (UVU-200)</th>
<th>RW (UVU-101)</th>
<th>RW (UVU-201)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of UV</td>
<td>1-2</td>
<td>1-2</td>
<td>1-3</td>
<td>1-3</td>
</tr>
<tr>
<td>Design flow rate (TOTAL GPM)</td>
<td>1174</td>
<td>1174</td>
<td>1050</td>
<td>1050</td>
</tr>
<tr>
<td>UV Dosage (mJ/cm² EOLL)</td>
<td>130</td>
<td>130</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td>UV Transmittance @ 253.7nm</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
</tr>
</tbody>
</table>

---

**B. Equipment Requirements:**

1. UV Reactor:
a. All lamp electrical connections shall be at one end of the UV lamp. The major axis of the UV lamps shall be parallel to the direction of flow in the reactor.

b. The UV reactor vessel shall be of the "L" design configuration with its inlet flange fitted inline with the vessel and its outlet flange fitted to the sidewall of the vessel at 90 degrees as to ensure a minimum hydraulic efficiency of 80%.

1) Note: "U" & "Z" vessel configurations which have both their inlet & outlet ports at right angles to the main vessel shall not be allowed due to poor hydraulic efficiencies.

c. The UV reactor shall be manufactured from UV resistant stainless-steel vessel.

d. The UV reactor shall have a drain port fixed to its outer wall.

e. The UV reactor shall accept its respective UV lamps and quartz sleeves through only one end of the vessel. This end of the UV reactor shall allow for complete reactor entry so internal inspection and/or service can be accomplished.

f. The service side of the UV reactor and the UV lamp sleeve seals shall be made using suitable O-ring materials i.e. EPDM or FVMQ.

g. UV reactors shall be able to operate safely at a maximum inlet pressure of 10 psi.

h. Each UV reactor shall have a UV intensity sensor that can be removed and cleaned.

i. A factory certified computational UV fluence (dose) calculation shall be furnished as proof of system UV fluence (dose) performance.

1) All acceptable UV fluence (dose) calculations shall be from commercially available software i.e. UV Calc Bolton Photosciences Inc.

2. UV Lamps:

a. The filament shall be significantly rugged to withstand shock and vibration.

b. Lamp bases shall be ceramic to resist UV and ozone.

c. All electrical connections to the UV lamp shall be terminated at one end.

d. UV lamps shall have a lamp stepped base design that prevents arcing between electrical pins.

e. UV lamps shall have a monochromatic spectral output, with the emissions peaking at 254 nanometers and be non-ozone producing.

f. The type of quartz used for lamp manufacture shall be compatible with wavelength emission.
g. The mercury contained in the lamps shall be mixed with a base metal and fixed to the inside wall of the UV lamp quartz.

h. Lamp type & wattage: Amalgam with 320-watt input watts.

3. Lamp End Seal and Lamp Holder:
   a. The open end of the UV lamp sleeves shall be sealed to the sleeve guide by a suitable compression O-ring assembly.
   b. O-ring compression shall be made by a sleeve nut, which shall require no special tools for installation or removal and be made of a translucent HDPE for quick lamp operation reference.
   c. Each UV lamp electrical connection shall incorporate a sealing gland nut type cable seal which is held firmly in place by the sleeve nut to prevent emission of ultraviolet rays.

4. UV Lamp Sleeves:
   a. Clear fused quartz tubing, closed at one end shall be used. Type 219 quartz shall be used for disinfection and ozone destruction applications.

5. Electrical General:
   a. The UV reactor shall be powered from a remote mountable System Control Center by means of a waterproof cable interfacing with a watertight strain relief.
   b. The System Control Center shall be of nonconductive wall mountable NEMA 4X enclosure.
   c. The System Control Center shall operate on 230-volt AC 50/60-Hz Single phase.
   d. Electronic Power Supplies:
      1) Each UV lamp shall be powered by one fully electronic power supply (ballast) with a 90% or better power factor rating.
      2) The electronic power supply (ballast) shall not be frequency dependent.
      3) Each lamp power supply (ballast) and lamp within the system shall operate on its own circuit within the power supply so as to prevent consecutive lamp failures should one power supply (ballast) fail.
      4) UV lamps are to be operated by an electronic power supply which automatically adjusts lamp output as a function of lamp age.

6. Control and Instrumentation:
   a. System control shall be microprocessor based. Operator interface is to be display type only.
b. The systems local PLC displays main screen shall allow the operator to view current system operating statuses; providing information inclusive of:

1) UV intensity,
2) system operating hours,
3) total number of lamps operating,
4) individual lamp operating hours,
5) system input power,
6) reactor vessel temperature,
7) power supply enclosure temperature,
8) alarm conditions.
9) Display shall allow the operator to further view alarm conditions and history, system configuration/settings, and operation.

7. Alarm Conditions:

a. The microprocessor based local display shall allow the operator to access and view the following alarm conditions:

1) Individual lamp failure - failed lamps shall be indicated by specific address (i.e. lamp #). Position in the reactor shall be indicated via lamp numbers fixed to the lamp wiring at the service end of the UV reactor.

2) UV intensity and Low UV intensity Alarm - Intensity to be monitored by a silicon carbide photodiode (SiC) with UV Intensity being displayed in percent (%) (0 to 100%). A user settable low UV intensity alarm will occur once minimum design UV intensity has been exceeded.

3) Lamp life status - at the end of UV lamp(s) lifetime (12,000 hours) the monitoring system shall set an end of lamp life alarm. The monitoring system continually alarm for the next 72 hours to alert the operator that all lamps in the reactor require change out.

b. Remote ON/OFF capabilities are to be provided via a discrete input circuit to allow either "Remote on" or "Remote/Local" control.

8. Alarm Signals:

a. Each system, through its microprocessor board shall be capable of providing the following outputs for remote monitoring and control:

1) One (1) master analog output relay for remote monitoring of any alarm condition.

2) The master alarm relay shall be a normally open "Form A" contacts rated at 200 milliamps at 24 VDC/AC.
C. Equipment Construction: Construction shall be as follows:

<table>
<thead>
<tr>
<th>Reactor</th>
<th>Body: UV resistant Stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seals: EPDM or FVMQ</td>
</tr>
<tr>
<td>Lamp Sleeve</td>
<td>Clear-fused Quartz (Type 219)</td>
</tr>
<tr>
<td>Electrical Cabinet</td>
<td>Fiberglass (FRP)</td>
</tr>
</tbody>
</table>

D. Manufacturers, or Equal
1. Aquafine Inc.
2. Innova Sea

2.12 PRIMARY SLUDGE PUMP (PSP-1000)

A. Installation Location:
1. Effluent Treatment System (ETS 1000), SLG piping

B. Product description
1. PSP-1000 is incorporated into an ejector pump system that includes a 24” diameter by 24” tall polyethylene basin, a single pump with tether float, 4” inlet fitting, 2” vent, high level alarm float switch.
2. The pump is a cast iron submersible pump capable of handing solids up to 2”.
3. The pump is 1.0 HP rated for 39 GPM at 15 feet of head.
4. The assembly is powered by 120 VAC and draws 12 amps, with a 10-foot power cord.
5. The basin holds 41 gals of sludge and is meant to pump out intermittently based on water lever.
6. The assembly will set on the floor and accept backwash flow from MSDF-1000.
7. This backwash SLG will be pumped to the RFS-1000 for solids dewatering.

C. Manufacturers
1. Liberty Pumps
2. Zoeller

2.13 BACKUP OXYGEN DIFFUSERS

A. Operating Conditions: conform to the following operating conditions:
B. Equipment Requirements:

1. Oxygen Diffusers:
   a. Diffusers shall be self-weighted ceramic diffuses
   b. Shall have barbed fittings for the gas inlet and gas outlet plumbing connection
   c. Shall be suitable for supply pressure of oxygen up to 50psig

C. Manufacturers, or Equal

1. Pentair/Point Four oxygen diffusers.

PART 3 EXECUTION

3.01 INSTALLATION

A. See Specification Section 13 99 61 for Aquaculture System Installation Requirements.

END OF SECTION
This page intentionally left blank.
SECTION 13 99 61
AQUACULTURE SYSTEM INSTALLATION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost in prices offered in the Price Schedule for items of work for which aquaculture equipment is required.

1.02 GENERAL

A. The recirculating aquaculture system will hereafter be referred to as the “Circular Tank System”.

B. The provider of the System will hereafter be referred to as the MANUFACTURER.

C. All components supplied by the MANUFACTURER are listed in the Equipment List provided in the Contract Documents, and more fully described in the PRAS Equipment Submittal appended to the Contract Documents.

D. The Contractor is responsible for supplying all components and installation materials that are not supplied by the MANUFACTURER.

E. The Contractor is responsible for installing all components of the aquaculture system in compliance with the quality and workmanship standards as described in the Contract Documents.

1.03 SUBMITTALS

A. Contractor shall provide an aquaculture installation plan for COR review and approval. The plan shall identify the following items:
   1. RSN 13 99 61-01, Installation Plan;
      a. Contractor shall provide an aquaculture installation plan for COR review and approval. The plan shall identify the sequence of installation, initial startup, and anticipated corrective measures as required for complete installation of the system.
   2. RSN 13 99 61-02, Certificate of Completion and Training timelines.
   3. RSN 13 99 61-03, Acceptance;
PART 2  PRODUCTS

2.01  MATERIAL RESTRICTIONS

A. The Contractor shall not use any materials which are toxic to aquatic organisms or materials which could leach toxic chemicals or organic chemicals into culture waters or in areas where condensates could drip into culture waters.

B. The Contractor shall not install any material containing cadmium, brass, bronze, copper, zinc, or their alloys which could come in contact with fish rearing water. These heavy metal materials have been shown to be toxic to fish.

C. All pumps, valves, piping, or other wetted components that may come in contact with water shall be of a material specified or approved by the MANUFACTURER.

D. Only metals deemed safe for use in humid or water environments may be used in installation, including stainless steel, titanium or ductile cast iron suitably coated with non-toxic corrosion resistant finish approved by MANUFACTURER. Wherever possible, non-metallic materials shall be used as a replacement for metals. Any other variation from these recommended metals must be approved in writing by the MANUFACTURER prior to installation. Where dissimilar metals could come into contact, insulating materials such as nylon washers or gaskets must be used to minimize the possibility of galvanic reactions.

E. The Contractor shall not utilize any lubricants which are not biodegradable and NSF registered food safe lubricants or supply any products which require non-biodegradable, non-food safe lubricants that may come in contact with system water.

F. Any paint or coatings (including anti-seize) in direct contact with the process water must be NSF registered and safe for use in potable water systems.

G. The Contractor shall use primer and solvents in accordance with NSF/ANSI 14 and NSF/ANSI 61 for PVC pipe.

2.02  PROCESS PLUMBING REQUIREMENTS

A. The Contractor shall provide plumbing according to the following guidelines:

1. Aquaculture Process Water:
   a. Pipe & Fittings: supply as directed by Construction Document pipe schedule.
   b. All materials in contact with process water to comply with NSF/ANSI 61.

2. Joints:
   a. PVC Glued
1) Solvent cemented in accordance with ASTM D-2855, and manufacturer guidelines. PVC glues are specific to pipe size and must be used as per manufacturers’ direction.

2) Use low-VOC solvents in accordance with ASTM D-2564, NSF/ANSI 14 and NSF/ANSI 61.
   a) Weld-On or equivalent.

3) Use low-VOC primer in accordance with ASTM F-656, NSF/ANSI 14 and NSF/ANSI 61.
   a) Weld-On or equivalent.

b. Threaded
   1) Thread sealant and/or Teflon (PTFE) tape shall be used on threaded joints
      a) Weld-On or equivalent (thread sealant)
      b) 3M or equivalent (Teflon tape)

2.03 PROCESS VALVE REQUIREMENTS

A. General:
   1. All valves shall be manufacturers’ standard design unless otherwise specified and shall be furnished with operating wheel, wrench nut or lever as noted on the Construction Documents. Unless otherwise indicated, the direction of rotation of the wheel, wrench nut or lever to open the valve shall be to the left (counterclockwise). A union fitting or flanged connection shall be provided within 2 feet of each valve unless the valve can be otherwise easily removed and such techniques of removal is reviewed and accepted by the COR.

   2. All valves of the same type shall be from a single manufacturer.

   3. Valves are to be suitable for intended service.

   4. Valve ends to suit adjacent piping.

   5. Unless otherwise specifically noted in these specifications or on the drawings, all valves in contact with process water shall have only stainless steel, epoxy coated cast iron or plastic bodies and trim. All valve materials shall be compatible with the connecting pipe material.

   6. Nominal valve size shall correspond to nominal size of connecting pipe unless noted otherwise.

B. Ball Valves Stainless Steel (type 316) Body
   1. Ball valves up to ½” shall have NPT connections. Body and ball shall be stainless steel (type 316). Seats and seals shall be Teflon (PTFE).

C. Ball Valves Plastic Body
1. Ball valves over ½” to 4 inches shall be true union and rated at 150 psi, non-shock. Valves shall be thermoplastic PVC materials, full-port design.
2. Internal wetted parts are to comply with the non-toxic materials requirements.
3. Ball valve CV shall meet or exceed approved manufacturer values
4. Manufacturers or equivalent:
   a. Spears True Union Ball Valve

D. Butterfly Valves
1. Butterfly valves shall have body, disc and stem supplied in stainless steel, epoxy coated cast iron or PVC.
2. Butterfly valves shall be rated at 150 psi, non-shock.
3. Flange shall conform to ANSI/ASME B16.5 Class 150 Bolt Pattern.
4. Internal wetted parts are to comply with the non-toxic materials requirements.
5. Butterfly valve CV values shall meet or those of the approved manufacturer’s product
6. Manufacturers or equivalent:
   a. Center Line Valves

E. Electrically Actuated Control Valve
1. Model selected must be appropriate for the designated valve type and size.
2. Actuated valve shall have body, disc and stem supplied in stainless steel, epoxy coated cast iron or PVC.
3. Valves shall be rated at 150 psi, non-shock
4. Flange shall conform to ANSI/ASME B16.5 Class 150 Bolt Pattern
5. Internal wetted parts are to comply with the non-toxic materials requirements.
6. Actuated valve shall have:
   a. Operating Speed: 20-25sec/90° (full open/close)
   b. Control signal input: 4 to 20mA (when modulating valve required)
   c. Control signal output: 4 to 20mA (when modulating valve required)
   d. Operating Voltage: 120VAC ±10%
   e. Manual Override
   f. Environmental Rating: Nema 4X
7. Manufacturers or equivalent:
   a. Kitz (butterfly valve) with Promation Actuator
   b. Asahi Series 92 Electric Actuated Butterfly Valve
F. Pinch Valves
1. Pinch valve shall have cast iron valve body with carbon steel mechanism closing on flexible elastomer sleeve.
2. Flange shall conform to ANSI B16.10 Class 150 Bolt Pattern
3. Manufacturers or equivalent:
   a. Red Valve Series 75

G. Dual Disc Check Valves
1. Dual disc check valve shall have a cast iron valve body with stainless steel mechanism closing on EPDM seal.
2. Internal wetted parts are to comply with the non-toxic materials requirements.
3. Check valve CV shall meet or exceed approved manufacturer values
4. Manufacturers or equivalent:
   a. Flomatic Model 895 Split Disc Check Valve
   b. Crane Duo-Chek Check Valve

H. Foot Valves
1. Foot valve shall have a cast iron valve body and internals closing on leather seat.
2. Internal wetted parts are to comply with the non-toxic materials requirements.
3. Check valve CV shall meet or exceed approved manufacturer values
4. Manufacturers or equivalent:
   a. Flomatic Model 357

I. Air Release Valve
1. Air Release Valves shall be PVC and rated at 150 psi, non-shock.
2. Air Release Valve shall be installed vertically at high points in system whether or not shown on construction drawings.
3. Internal wetted parts are to comply with the non-toxic materials requirements.
4. Manufacturers or equivalent:
   a. Chemline AR Series Air Release Valves

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. The Contractor is responsible for installing all components of the System in compliance with the quality and workmanship standards as described in the Contract
Documents provided by the MANUFACTURER. Only drawings that are stamped “FOR CONSTRUCTION” should be used in installation of the System.

B. The Contractor shall provide all supervision, labor, tools, construction equipment, pipe and fittings, conduit, wiring and cable, anchors, incidental materials, and the necessary services required to complete the installation and testing of the equipment.

C. The System has been designed to be coordinated with other equipment, services, and with building structure provided by others. Should conflicts arise, the Contractor shall seek written approval from the MANUFACTURER prior to implementing changes from the Construction Documents.

3.02 EQUIPMENT DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for receipt and unloading of the equipment at the project location, including the provision of suitable equipment and tools as required, and for unpacking and disposal of packing materials. Damage to equipment identified at time of unloading must be photographed and sent to MANUFACTURER within 72 hr of equipment receipt.

B. The Contractor shall be responsible for providing adequate and appropriate storage for equipment as specified by the MANUFACTURER. Equipment shall be stored in original shipping crates or pallets and protected from damage at all times prior to installation. This may include tarps for items that may be damaged due to exposure. Heated enclosed storage may be required for items with sensitive electrical components if at risk of exposure to moisture and cold. COR acknowledges that the Contractor will be responsible for damage incurred due to improper storage and handling of equipment.

3.03 EQUIPMENT INSTALLATION AND RESTRAINT

A. Mount all equipment level and plumb except where noted otherwise on Contract Documents. For FRP culture tanks, top flange of tank shall be level to within a tolerance of 0.15% of the tank diameter (0.18” on 30 ft diameter tank).

B. When backfilling or pouring concrete around buried fiberglass tanks, the Contractor shall ensure that the tank is filled with process water and shall provide additional shoring and bracing as necessary to prevent distortion or damage. Care shall be taken in placement and vibration of fill or concrete to avoid damaging equipment. Deflection of the tank wall inward due to backfilling, compaction, or concrete placement shall be limited to 0.2% of the tank wall height.

C. Where concrete is to be in contact with fiberglass components, the Contractor shall coat fiberglass component with an emulsion foundation coating prior to concrete placement. Coating is only required and shall be limited to the points of contact with the concrete.
D. For flat bottomed tanks and equipment with bases located at finished floor level or on housekeeping pads, a uniform and level surface shall be made between the bottom of the equipment and the support foundations by means of grouting. Equipment shall be set in wet grout tapered from a point 1 inch higher at equipment center to the foundation edges. Equipment shall be settled down squeezing out excess grout in such a manner as to leave no voids in the foundation interface. The grout shall not be used to support any load, only to fill irregularities in the tank bottoms and foundations. Once installed, the tanks/equipment shall not be exposed to any loads until the grout has hardened.

E. For equipment on metal stands or base plates, the base shall be leveled by means of 316 grade stainless steel shims (plates and shims). Accomplish shimming so there is no change of level or springing of base-plate when anchor bolts are tightened. Once set in position, aligned, and shimmed to proper elevation, the gap between the bottom of the base-plate and the concrete foundation shall be sealed with a marine grade caulk (for gaps of less than 0.25”) or with an appropriate poured, non-shrinking grout (for gaps of greater than 0.25”).

F. All anchor bolts required for appropriate anchoring of the equipment shall be provided by the Contractor unless otherwise specified in the Contract Documents.

G. Equipment shall be installed in such a manner that no stresses shall be applied to the equipment by the connected plumbing.

H. The aquaculture equipment shall be coordinated with other instrumentation, piping, and equipment.

3.04 PROCESS PLUMBING INSTALLATION AND RESTRAINT

A. Supply and installation of plumbing supports are the responsibility of the Contractor. Exposed plumbing shall be supported in such a manner that no stresses shall be applied to the equipment by the connected plumbing. The values do not apply where loads are concentrated due to valves, flanges or other fittings. Where possible, loads of this type shall be supported with hangers either side of the load.

B. Supply and installation of directional flow arrow pipe banding tape on all exposed plumbing is the responsibility of the Contractor.

1. Banding tape shall be color coded:
   a. Blue banding with white arrows: indicates Recirculation Supply plumbing.
   b. Green banding with white arrows: indicates Recirculation Return plumbing.
   c. Yellow banding with black arrows: indicates Bypass plumbing.

2. Banding tape shall be positioned to be easily seen from normal angle of approach and be positioned:
a. Adjacent to all valves and flanges.
b. Adjacent to all changes of direction.
c. On both sides of wall penetrations.

C. Floor Penetrations
   1. Supply of materials and labor for the installation of plumbing floor penetrations is the responsibility of the Contractor.
   2. Plumbing shall penetrate the floor in such a way that it is isolated from the concrete slab ensuring relative movement does not stress and/or crack either the plumbing string or slab.
   3. The penetration shall be sealed water-tight to prevent the ingress of water. A self-leveling 2-part polyurethane (Sikaflex 2c SL or equivalent) or Mastic shall be provided by the Contractor.

3.05 PROCESS VALVE INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.

C. For threaded valves, provide union on one side within 2 FT of valve to allow valve removal.

D. Install valves accessible for operation, inspection, and maintenance.

E. Valves and fittings shall have the interiors cleaned of all foreign matter. Valves shall be inspected by the Contractor in both open and closed position prior to installation.

F. Valves shall be installed at all points indicated on the Contract Documents.

G. All valve stems shall be oriented to optimize operator access. Where possible, install valves with stems oriented vertically.

H. Ball valves shall operate freely without binding or sticking in any position from fully open to fully closed. Any valves that do not operate freely shall have operations adjusted by the Contractor to the satisfaction of the COR.

I. Check valves shall be installed at all points indicated on the Drawings, in either a true vertical or horizontal position and must conform to manufacturer’s installation instructions.

J. Check valves shall be installed with regard to the direction of flow.

K. Air release valves shall be installed at all points indicated on the Drawings, in a true vertical position.
3.06 PRESSURE TESTING OF EQUIPMENT AND PIPING

A. Perform testing on all installed equipment and piping prior to and after backfilling or encasement with concrete. Ensure that all pipes are supported sufficiently for tests to prevent sagging or deformation due to weight of water.

B. Filling:
   1. Fill all piping and equipment with clean water.
   2. Maximum Pipe Filling Velocity: 0.25 foot per second, applied over the full area of the pipe.
   3. Vent Piping During Filling: Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.

C. Hydrostatic Testing for Process Piping:
   1. Maximum Allowable Leakage: There shall be no leakage over the test period.
   2. Test Period: Maintain hydrostatic test pressure for 60 minute minimum, and for such additional time as necessary to conduct examination for leakage.
   3. Testing Head: Test to maximum free water surface.

D. Hydrostatic Testing for Tankage:
   1. Maximum Allowable Leakage: There shall be no leakage, no signs of weeping, and no signs of capillary action over a period of 48 hours.
   2. Test Period: Maintain hydrostatic test pressure for 48 hours, and for such additional time as necessary to conduct examination for leakage.
   3. Testing Head: Test at the maximum free water surface or to such point that the highest overflow begins to take water.

E. Examine joints and connections for leakage. Correct visible leakage and retest as specified.

3.07 SYSTEM CLEANING

A. Prior to pump operation, flushing or disinfection, the Contractor shall be required to clean all interior surfaces of culture tanks and treatment equipment using pressurized water and tools suitable for adequate scrubbing and cleaning. Cleaning shall:
   1. Remove all debris and deposits of foreign nature.
   2. Remove all biological growths.
   3. Clean the slopes, walls, top and bottom.
   4. Avoid damage to the structure.
   5. Avoid pollution or oil deposits by workers and equipment.
B. Flush all piping of foreign matter and construction materials. Operate valves during flushing process at least twice during each flush.

C. Where possible, isolate the equipment or pipes being cleaned to prevent contaminating materials from entering downstream treatment processes or culture tanks.

D. After cleaning, pump or drain scrub water from structures.

E. Disinfect as per COR’s requirements.

3.08 COMMISSIONING AND TRAINING

A. Prior to execution of commissioning of System and Equipment, and prior to vendor representatives arriving on site, the Contractor is required to complete pre-commissioning checklists as provided by the MANUFACTURER.

B. Commissioning of System and Equipment shall be performed by the MANUFACTURER. However, the Contractor shall be present and/or available throughout the commissioning procedure to assist in testing and for the immediate correction of deficiencies identified in the commissioning process.

C. Equipment shall not be started without the presence of the MANUFACTURER, with the exception of “bumping” motors to confirm connectivity and/or correct rotation.

D. Further to the unit process commissioning requirements, the MANUFACTURER shall be responsible for functional and performance testing of the SYSTEM as a whole. The Contractor is not required to be present during the testing period but may be called upon to resolve issues related to installation and/or workmanship that arise during testing.

E. When training is complete and the Aquaculture System is deemed by the MANUFACTURER to be functionally complete and ready for operation by the HATCHERY, a “Certificate of System Acceptance” shall be signed by all parties and copies of all Commissioning Documents will be provided to the COR. This document will be presented as a submittal in the proper format.

3.09 RUN-IN PERIOD AND SUBSTANTIAL COMPLETION

A. After System Acceptance, the culture systems shall be operated for a period of five (5) days prior to the introduction of fish into the facility. This period shall be the “Run-in” period.

B. During the run-in period, all systems shall be operated simultaneously at the design flow rate. Operation of all modules shall be continuous throughout the run-in period with the exception of short duration outages of 4 hours or less as required to make adjustments to equipment or system function, or to simulate culture operations.
C. During the run-in period, the COR may develop a specific Punch-list of work that does not conform to contract specifications, to be provided in its final form at the end of the Run-in Period.

D. If any Punch-list item identified during the Run-in period is mutually deemed by MANUFACTURER and COR to be a “Functional Deficiency” (a system or component deficiency that would prevent the system’s use for its intended purpose):
   1. The Run-in period will be immediately halted until the deficiency is corrected.
   2. The party responsible for the deficiency shall work within reasonable expectations to correct the deficiency quickly. Responsibility for correcting deficiencies will depend on the nature of the deficiency and shall be assigned to the responsible party by the MANUFACTURER and the COR.
   3. Once all Functional Deficiencies are corrected, the Run-in period is to be restarted and shall not be shortened in length as a result of the deficiency.

E. Substantial Completion: The date on which the System is complete to the extent it can be used for its intended purpose and on which the warranty period begins. System is deemed to be substantially complete if the run-in period is completed without Functional Deficiency. Introduction of fish into the system shall immediately cause the system to be deemed Substantially Complete.

END OF SECTION
This page is intentionally left blank.
DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING
This page intentionally left blank.
SECTION 23 00 00
HEATING, VENTILATION, AND AIR CONDITIONING, GENERAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in prices offered in the Price Schedule for other similar items of work.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The work and materials shall be in full accordance with the latest rules and regulations or publications of the State Energy Commission, the State Fire Marshall, and the local building and mechanical code, and other local codes.

B. Nothing in the Contract Documents shall be construed to permit work in violation of the above codes, rules and regulations.

C. In the absence of applicable codes, the installation and workmanship shall follow the standards set by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

1.03 SUMMARY

A. The Contractor shall provide heating, ventilating, and air conditioning systems and associated equipment complete with supports, mounting frames, ventilators, louvers, panels, and controls, mechanical equipment, electrical work, appurtenances, testing, and balancing, as indicated in accordance with the Contract Documents.

B. The equipment shall be installed ready for operation.

1.04 SUBMITTALS

A. RSN 23 00 00-1, Shop Drawings:
   1. Submit complete shop drawings and certificates, test reports, affidavits of compliance, for all equipment, and systems, in accordance with the requirements in Section 01 33 00 – Submittals, and as indicated in the individual equipment Sections.
   2. Construction Drawings
      a. The HVAC Drawings define the general layout, configuration, routing, size and the general intent of the design, and are not fabrication drawings.
      b. It shall be the Contractor's responsibility to develop the Shop Drawings required for the construction of the HVAC system.
3. The Shop Drawings shall include all necessary dimensions and details regarding equipment, joints, fittings, valves, appurtenances, design calculations, and material lists.

4. The submittals shall include detailed layout, spool, or fabrication drawings which shall show all fittings, and supports as necessary to accommodate the equipment as a complete and functional system.

5. Equipment is identified by assigned numbers for reference and location purposes in the Contract Documents.

6. Indicate the appropriate equipment numbers on the Shop Drawings and other submittals.

B. RSN 23 00 00-2, Furnish certified fan curves for each fan.

1.05 WARRANTY

A. Heaters, fans, ventilators, grilles, and the like, that are provided by the Contractor shall carry the manufacturer’s standard warranty.

B. Warranties shall be furnished to the COR upon final acceptance of the completed systems by the COR.

C. Control System

1. The temperature and equipment control system shall be warranted free from defects in workmanship and material under normal use and service for a period of one year after acceptance by the COR.

2. Equipment that proves to be defective in workmanship or material during the warranty period shall be adjusted, repaired, or replaced by the control manufacturer as part of the Contract.

PART 2 PRODUCTS

2.01 GENERAL

A. Quality

1. Mechanisms and other parts shall be amply proportioned for the stresses which may occur during operation and for any other stresses which may occur during fabrication and erection.

2. Individual parts furnished which are alike in all units shall be alike in workmanship, design, and materials, and shall be of the manufacturer's top-line, industrial-commercial grade.

B. Supports
1. Equipment and appurtenances shall be firmly anchored or connected to supporting members.

2. Equipment shall be supported with restrained spring-type vibration isolators.

3. Supports as required for the proper installation of the equipment, but not forming an integral part of the building structure, shall be provided unless otherwise indicated.

C. Noise and Vibration Control
   1. The system shall be free of objectionable vibrations and noise.

2.02 MOTORS

A. Motors provided with the equipment shall conform to the latest IEEE and NEMA requirements for mechanical and electrical characteristics, including service factors.

B. Each motor shall bear the manufacturer’s nameplate with complete motor data.

C. Each motor shall be of ample size and construction to continuously carry the loads which might be imposed by the equipment throughout the full range of operation of the equipment.

D. The maximum motor loading shall be less than or equal to the nameplate horsepower rating, exclusive of the service factor.

2.03 ELECTRICAL WORK

A. General
   1. Provide controls, sensors and control panels relating to the HVAC systems, including starters, thermostats, motorized dampers, louver operators and other equipment as indicated.
   2. Provide control wiring of 120-volt and less as indicated in this Section and in conformance the requirements of Division 26 – Electrical.
   3. Provide local power disconnects, where required.
   4. Provide circuit breakers, starters in motor control centers, and 120-, 208-, 240- and 480-volt power feeders from the starters and circuit breakers to the HVAC equipment, as indicated.

B. Enclosures shall be of the same NEMA class as the electrical equipment in the same area.

C. Starters shall be of the same manufacturer as the starters indicated under Section 16480 – Low-Voltage Motor Control Centers.

D. Low-voltage control wiring shall be in accordance with the National Electric Code.
2.04 FLASHING

A. Equipment that passes through roofs of buildings or structures shall be provided with flashing as indicated.

2.05 MOTORIZED DAMPERS

A. General
   1. Provide the motorized opposed blade dampers as indicated.
   2. Damper sizes and capacities shall be as indicated on the Drawings.

B. Design and Construction
   1. The damper and frames shall be fabricated from aluminum with a minimum thickness of B&S 12-gauge.
   2. The aluminum blades shall be provided with interlocking edges, with one center and two edge crimps, and brass bearings.
   3. The frame shall be of welded channel construction and shall be provided with lugs and mounting brackets for damper operators.
   4. The dampers shall be provided with felt or rubber seals at their edges in order to minimize air infiltration when closed.

C. Motors
   1. Damper motors shall be electric, with necessary linkages for positioning the damper blades.
   2. The motors shall be powered open and spring-closed, unless otherwise indicated.

2.06 BACKDRAFT OR GRAVITY DAMPERS

A. General
   1. Provide backdraft dampers on the exhaust fans and ventilators where indicated.
   2. Damper sizes and capacities shall be as indicated on the Drawings.

B. Design and Construction
   1. The dampers shall be of the multi-blade type, with soft-seating gaskets for minimizing noise and air leakage when closed.
   2. Blades shall be constructed of 16-gauge aluminum and shall be of an air foil design.
   3. Frames shall be fabricated from 16-gauge extruded aluminum alloy.
   4. The frames shall be totally out of the air stream and arranged for flange mounting.
   5. The dampers shall be designed to operate at 0.05-inch w.g. S.P., or less.
6. Blades shall be individually counterbalanced and shall be provided with non-ferrous pins turning in nylon bearings.

C. Damper Manufacturers, or Equal
   1. Air Balance, Inc.
   2. Air Dynamic
   3. Ruskin,
   4. Louvers complete with aluminum bird screen and necessary linkages for the operating section.
   5. Louver sizes and capacities shall be as indicated on the Drawings.
   6. Louvers shall be of the adjustable type or fixed type as indicated or required and shall be provided with a drain gutter in each blade and downspouts in jambs and mullions.

2.07 VIBRATION ISOLATORS

A. General
   1. Provide vibration control isolation all rotating equipment except electric motors.
   2. Where rotating units are part of factory-assembled package units, such as a package air handling unit, provide the isolator under the unit casing.

B. Support suspended equipment by a combination of spring and fiberglass isolation hangers, incorporating minimum 2-inch thick neoprene jacketed fiberglass inserts in series with springs, encased in steel brackets.

C. Springs used in the vibration isolators shall have approximately one inch of deflection under load and shall have a minimum additional travel of 50 percent between the design height and the solid height.

D. All isolation equipment shall be provided in strict compliance with the manufacturer's recommendations.

2.08 TEMPERATURE AND EQUIPMENT CONTROL

A. General
   1. Design and provide a complete electric-electronic system of automatic temperature control as indicated.
   2. The temperature control equipment and devices shall be furnished by Honeywell, or Barber Colman.

B. Wiring and Switches
   1. Provide wiring incidental to the temperature control system, including electrical interlock.
2. Furnish detailed wiring diagrams along with necessary supervision.

3. Provide control wiring (line voltage or low voltage) as required to complete the temperature control system (by interconnecting starters, thermostats, relays, and like devices) in accordance with the requirements of Section 16050 – Electrical Work, General.

4. Switches shall be UL-listed and of a type to meet the current and voltage requirements of the particular application.

C. Thermostats

1. Room thermostats and Humidity Sensors shall be of the digital type, provided with heating and cooling and humidity setpoints.

2. Adjustment shall be accomplished by pressing the controller UP or DOWN arrows.

3. Comfort Setpoints: adjustable from 65 to 80 degrees F

4. Setback Setpoints: adjustable from 55 to 70 degrees F for heating setback; adjustable from 75 to 90 degrees F for cooling setback

5. Automatic Setback Time Period:
   a. 7-day setback programming;
   b. up to 2 automatic setback comfort time periods per day;
   c. built-in setback override, adjustable from 10 minutes to 40 hours;
   d. 7-day electric time clock; and

6. The thermostats shall meet the Energy Conservation Standard approval where required by the State having jurisdiction over the Project.

7. Provide an insulating back where exterior wall mounting is indicated.

8. Provide NEMA 4X guards for room thermostats and humidistats.

D. Relays

1. Provide relays, capacity relays, sequencing relays, and other controls as necessary in order to provide a properly operating automatic control system.

2. Relays shall be UL-listed and of a type to meet the current and voltage requirements of the particular application.

E. Sequence of Operation

1. Eight electric unit heaters providing heat for the space. Eight thermostats control the unit heaters, one for each unit heater. The thermostats shall be set to provide 4 stage heating cycle. First two stages off one thermostat, stage 3 and four off other thermostat. Temperature staging shall be set at 4 degrees F. between stages.

2. Tank Room Ventilation:
1st Stage of ventilation: One humidistat/de-humidistat provides signal for exhaust fan EF-1B for start/stop. Room humidistat setpoint shall be 50% relative humidity as stage 1 ventilation. EF-1B shall be interlocked with louvers L-1 and L-2 with motorized damper. Upon a call to de-humidify, the motorized damper at the louvers shall open. An end switch on the louver provides a signal, at 30% open, for the exhaust fan to start. Once humidity levels are satisfied, the exhaust fan stops and the motorized damper closes. A separate switch will be provided for user override of the system to engage the ventilation system.

2nd Stage of ventilation: One humidistat/de-humidistat provides signal for exhaust fan EF-1A for start/stop. Room humidistat setpoint shall be 60% relative humidity as stage 2 ventilation. EF-1A shall be interlocked with louvers L-1 and L-2 with motorized damper. Upon a call to de-humidify, the motorized damper at the louvers shall open. An end switch on the louver provides a signal, at 30% open, for the exhaust fan to start. Once humidity levels are satisfied, the exhaust fan stops and the motorized damper closes. A separate switch will be provided for user override of the system to engage the ventilation system.

3. Solids Room Ventilation:

1st Stage of ventilation: One humidistat/de-humidistat provides signal for exhaust fan EF-2B for start/stop. Room humidistat setpoint shall be 50% relative humidity as stage 1 ventilation. EF-2B shall be interlocked with louvers L-3 and L-4 with motorized damper. Upon a call to de-humidify, the motorized damper at the louvers shall open. An end switch on the louver provides a signal, at 30% open, for the exhaust fan to start. Once humidity levels are satisfied, the exhaust fan stops and the motorized damper closes. A separate switch will be provided for user override of the system to engage the ventilation system.

2nd Stage of ventilation: One humidistat/de-humidistat provides signal for exhaust fan EF-2A for start/stop. Room humidistat setpoint shall be 60% relative humidity as stage 2 ventilation. EF-2A shall be interlocked with louvers L-3 and L-4 with motorized damper. Upon a call to de-humidify, the motorized damper at the louvers shall open. An end switch on the louver provides a signal, at 30% open, for the exhaust fan to start. Once humidity levels are satisfied, the exhaust fan stops and the motorized damper closes. A separate switch will be provided for user override of the system to engage the ventilation system.

4. Two exhaust fans will be provided for ventilation of the CO2 pits. The fans shall run continuously.

5. A gas detection system will be provided to monitor solids area room CO2 levels. The gas detection system will be providing strobe and horn alarm on 5000 PPM or higher detection of CO2 levels.
2.09 PAINTING

A. Painting of the equipment and materials shall comply with the requirements of Section 09 96 00 – Protective Coating.

B. Field Touch-Up Coating Repair
   1. Touch up factory-painted surfaces that are rusted or scratched.
   2. Clean finishes to be touched up to bright metal, prime with a corrosion inhibitor, and finish with a coating to match the original finish.

PART 3 EXECUTION

3.01 GENERAL

A. Openings - New Construction
   1. Provide necessary openings in walls, floors and roofs for the passage of heating and ventilating equipment in the buildings.
   2. Openings shall be as indicated or as required to provide passage for heating and ventilating work.
   3. Provide hanger and support inserts into masonry or structural steel as required for proper completion of the work.

3.02 BALANCING AND TESTING

A. Balancing Subcontractor
   1. After the installation work has been completed, the Contractor shall provide the services of an independent balancing subcontractor who shall perform necessary adjustments of, exhaust blowers, exhaust fans, and heating units.
   2. The balancing subcontractor shall:
      a. have at least 5 years of balancing experience, and experience in at least 5 projects of the Project type;
      b. not be associated with any firms doing engineering or construction work in HVAC and/or Plumbing;
      c. use the balancing methods approved by the Associated Air Balance Council; and,
      d. send a copy of all correspondence and reports, as they are written, pertaining to this project, directly to the COR.

B. The Contractor shall:
   1. provide labor, tools, testing equipment and appliances for the necessary testing and adjustment that is required;
2. submit to the COR an experience resume and project resume for approval of the balancing subcontractor;

3. demonstrate to the COR, in an extensive operating test covering every component of the installation, that the entire heating, ventilating and air conditioning system meets the indicated requirements and is ready for continuous, satisfactory operation; and,

4. make repairs and revisions as necessary to make the system operative, as part of the Contract.

3.03 VIBRATION ISOLATORS

A. Install isolation equipment in strict compliance with the manufacturer's recommendations.

3.04 TEMPERATURE AND EQUIPMENT CONTROL

A. After completion of the installation, use trained personnel to adjust thermostats and sensors in the motors and other provided equipment, and place them in complete operating condition subject to the approval of the COR.

B. Instruct the operating personnel in the operation of the control system.

END OF SECTION
This page intentionally left blank.
SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

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

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.03 SUMMARY

A. This Section includes the following:

1. Equipment installation requirements common to equipment sections.
2. Supports and anchorages.

1.04 QUALITY ASSURANCE

A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
PART 2  PRODUCTS

Not Used

PART 3  EXECUTION

A. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for material and size. Assemble sleeve seals and tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

B. Verify final equipment locations for roughing-in.

C. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02  EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

END OF SECTION
SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Cost:
   1. Include in prices offered in the Price Schedule for other similar items of work.

1.02 SUMMARY
A. This Section includes TAB to produce design objectives for the following:
   1. Air Systems:
      a. Exhaust systems.
   2. HVAC equipment quantitative-performance settings.
   3. Verifying that control devices are functioning properly.
   4. Reporting results of activities and procedures specified in this Section.

1.03 SUBMITTALS
A. RSN 23 05 93-1, Strategies and Procedures Plan:
   1. Within 30 days from Contractor's Notice to Proceed, submit 2 copies of TAB
      Include a complete set of report forms intended for use on this Project.

B. RSN 23 05 93-2, Certified TAB Reports:
   1. Submit two copies of reports prepared, as specified in this Section, on approved
      forms certified by TAB firm.

C. RSN 23 05 93-3, Warranties specified in this Section.

1.04 QUALITY ASSURANCE
A. TAB Firm Qualifications: Engage a TAB firm certified by AABC, NEBB or TABB or
   approved by the COR.
   1. The Contractor shall submit the name and credentials of the TAB firm for review
      and approval within 30 days after signing the construction contract.
      a. The TAB firm shall provide qualifications of the firm and of both the
         individual who is to do the test and balance. Provide proof of completed
         balancing work on at least five projects of similar size and scope, along
         with a list of references which may verify qualifications.
b. Final approval of the TAB firm will be at the Engineer’s discretion, based on the information submitted.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
   2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.


1.05 PROJECT CONDITIONS

A. Partial Hatchery Occupancy: Hatchery may occupy completed areas of building before Substantial Completion. Cooperate with Hatchery during TAB operations to minimize conflicts with Hatcher’s operations.

1.06 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
   1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.

2. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.
3. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

4. Sensors are located to sense only the intended conditions.

5. Sequence of operation for control modes is according to the Contract Documents.

6. Controller set points are set at indicated values.

7. Interlocked systems are operating.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.02 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Hydronic systems are filled, clean, and free of air.
   3. Automatic temperature-control systems are operational.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" layouts.

C. Check airflow patterns from the outside-air louvers and dampers and exhaust-air dampers, through the supply-fan discharge.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
E. Verify that motor starters are equipped with properly sized thermal protection.

3.05 PROCEDURES FOR EXHAUST SYSTEMS SYSTEM

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible.
   2. Measure static pressure across each component that makes up the system.
   3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
   4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
   5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur.

3.06 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
   1. Manufacturer, model, and serial numbers.
   4. Efficiency rating.
   5. Nameplate and measured voltage, each phase.
   6. Nameplate and measured amperage, each phase.
   7. Starter thermal-protection-element rating.
3.07 TEMPERATURE-CONTROL VERIFICATION

A. The temperature control system test and report shall be performed by the temperature control Contractor.

B. Verify that controllers are calibrated and commissioned.

C. Check locations and note conditions that would adversely affect control functions.

D. Record settings and note variances between set points and actual measurements.

E. Check the operation of limiting controllers (i.e. high- and low-temperature controllers).

F. Check free travel and proper operation of control devices such as damper and valve operators.

G. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

H. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or non-grounded power supply.

I. Note operation of electric actuators using spring return for proper fail-safe operations.

3.08 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
   2. Air Outlets and Inlets: 0 to minus 10 percent.

3.09 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
   1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
   a. Indicated versus final performance.
   b. Notable characteristics of systems.
   c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Notes to explain why certain final data in the body of reports varies from indicated values.
14. Test conditions for fans performance forms including the following:
   a. Settings for dampers.
   b. Fan drive settings including settings and percentage of maximum pitch diameter.
   c. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air systems. Present each system with single-line diagram and include the following:

1. Quantities of supply, and exhaust airflows.
2. Position of balancing devices.

END OF SECTION
This page intentionally left blank.
SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A. HVAC Power Ventilators:
   1. Payment: Lump sum price offered in the Price Schedule

1.02  SUMMARY
A. This Section includes the following:
   1. Wall mounting Propeller fans.

1.03  SUBMITTALS
A. RSN 23 34 23-1, Product Data:
   1. Include rated capacities, furnished specialties, and accessories for each type of
      product indicated and include the following:

B. RSN 23 34 23-2, Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required
      clearances, method of field assembly, components, and location and size of each
      field connection.

C. RSN 23 34 23-3, Field quality-control test reports.

D. RSN 23 34 23-4, Operation and maintenance data.

1.04  QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in
   NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction,
   and marked for intended use.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA
   standards.

C. UL Standard: Power ventilators shall comply with UL 705.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   1. Greenheck.
   2. Cook
   3. Penn-Barry.
   4. Soler and Palau, USA

2.02 PROPELLER WALL VENTILATORS

A. Description: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.

B. Housing: 14-gage welded and bolted construction, corrosion resistant fasteners, integral venturi inlet cone.


D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
   1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
   2. Shaft Bearings: Regreasable pillow blocks ball bearings for a minimum L50 life.

E. Accessories:
   1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
   2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
   3. Wall Sleeve.
   4. Discharge Weather Hood
   5. Powder Coat Finish
   6. Dampers: Motorized, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.
   7. Motor guard.
PART 3  EXECUTION

3.01 INSTALLATION

A. Install power ventilators level and plumb.
B. Install units with clearances for service and maintenance.
C. Ground equipment according to Division 26 Section
D. Connect wiring according to Division 26 Section

3.02 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that the connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Adjust belt tension.
   6. Adjust damper linkages for proper damper operation.
   7. Verify lubrication for bearings and other moving parts.
   8. Adjust fan to indicated rpm, and measure and record motor voltage and amperage.
   9. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION
This page intentionally left blank.
SECTION 23 82 39
UNIT HEATERS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Unit Heaters:

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

1.02  SUMMARY

A.  Section Includes:

1.  Electric resistance unit heaters.

1.03  SUBMITTALS

A.  RSN 23 82 39-1, Product Data:

1.  Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B.  RSN 23 82 39-2, Shop Drawings:

1.  Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   a.  Plans, elevations, sections, and details.

   b.  Location and size of each field connection.

   c.  Equipment schedules to include rated capacities, furnished specialties, and accessories.

C.  RSN 23 82 39-3, Field quality-control test reports.

D.  RSN 23 82 39-4, Operation and maintenance data.

1.04  QUALITY ASSURANCE

A.  Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
PART 2    PRODUCTS

2.01    CABINET UNIT HEATERS

A.  Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   1.  Modine
   2.  Reznor.

B.  Description: A factory-assembled and -tested unit complying with ARI 440.

C.  Cabinet: 16-gauge stainless steel with manufacturer's standard finish, in color selected by Architect.
   1.  Adjustable stainless-steel outlet louvers.
   2.  High limit temperature control with automatic reset.
   3.  Control Access Door: Key operated.

D.  Fan and Motor Board: Anodized aluminum, delayed action.
   2.  Wiring Terminations: Connect motor to chassis wiring with plug connection.
   3.  24-volt control circuit with transformer and contactor.

E.  Basic Unit Controls:
   1.  Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
   2.  Unit Supply-Air Fan Operations:
       a.  Occupied Periods: Fan runs on call for heat.
       b.  Unoccupied Periods: Fan cycles to maintain setback room temperature.

F.  Electrical Connection: Factory wire motors and controls for a single field connection.

PART 3    EXECUTION

3.01    INSTALLATION

A.  Install unit heaters to comply with NFPA 90A.
B. Suspend unit heaters from structure with elastomeric or spring hangers and seismic restraints.

C. Install NEMA 4X wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Comply with safety requirements in UL 1995.

E. Ground equipment and connect wiring in accordance with Division 26 specifications.

3.02 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
   3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION
This page intentionally left blank.
DIVISION 24 THROUGH 25 – NOT USED
This page intentionally left blank.
SECTION 26 05 00
ELECTRICAL WORK, GENERAL

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. Complete Electrical System:

1. Payment: Lump sum price offered in the schedule.
   a. Furnishing certified calibrated testing equipment.
   b. Performing testing.
   c. Modifying equipment.
   d. Assembling, adjusting, and installing equipment.
   e. Painting equipment and materials.
   f. Brackets, fasteners, bolts, nuts, lock washers, and other accessories required for mounting or installing electrical equipment and materials.
   g. Drilling holes in steel structures (other than tubular structures) as required for mounting or installing electrical equipment and materials.
   h. Furnishing, handling, and storing spare parts for electrical equipment.
   i. Grounding materials and installation, including meeting all requirements of the NEC.
   j. Furnishing special tools and appliances for maintenance and adjustment of equipment.
   k. Making all electrical connections.
   l. Coordinating with the local electric utility and filing application for a modification to, or upgrade of, the primary electrical service, providing all material and equipment that meet the local utility requirements.

1.02  REFERENCE STANDARDS

A. Codes:

1. NEC (NFPA 70) National Electrical Code-2020
2. NETA International Electrical Testing Association
3. NEMA 250 Enclosure for Electrical Equipment (1000 Volts Maximum)

B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL) or an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction.
C. Installation of electrical equipment and materials shall comply with OSHA Safety and Health Standards (29 CFR 1910 and 29 CFR 1926, as applicable), state building standards, and applicable local codes and regulations.

D. Where the requirements of the specifications conflict with UL, NEMA, NFPA, or other applicable standards, the more stringent requirements shall govern.

1.03 SUMMARY

A. The Contractor shall provide electrical work, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section apply to all sections in Division 26, except as indicated otherwise.

C. The work of this Section is required for operation of electrically-driven equipment provided under specifications in other Divisions. The Contractor's attention is directed to the requirement for proper coordination of the work of this Section with the work of equipment specifications, and the work of instrumentation sections.

D. Concrete, excavation, backfill, and steel reinforcement required for encasement, installation, or construction of the work of the various sections of Division 26 is included as a part of the work under the respective sections, including duct banks, manholes, handholes, equipment housekeeping pads, and light pole bases.

E. Equipment supports and foundations shall be in conformance with the Contract Documents.

1.04 SIGNAGE AND MARKINGS

A. Identification: Provide danger, caution, and warning signs and equipment identification markings in accordance with applicable federal and state OSHA and NEC requirements.

B. Local Disconnect Switches
   1. Each local disconnect switch for motors and equipment shall be legibly marked to indicate its purpose unless the purpose is indicated by the location and arrangement.

C. Motor Control Center (MCC)
   1. Each MCC section and door shall be legibly marked to indicate its purpose and equipment included, and shall include equipment numbering or identification as indicated on the engineering plans.

D. Electrical Panels & Junction Boxes
   1. Each local electrical panel and Junction Box shall be legibly marked to indicate its purpose, equipment identifier, and what is included in the junction box.
E. Miscellaneous Electrical Enclosures

F. All other electrical enclosures shall be legibly marked to indicate its purpose, equipment identifier, and what is included in the enclosure.

1.05 PERMITS AND INSPECTION

A. Permits shall be obtained and inspection fees shall be paid according to the General Conditions.

1.06 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 26 05 00-1, Shop Drawings:
   1. Include the following:
      a. Complete material lists stating manufacturer and brand name of each item or class of material.
      b. Front, side, rear elevations, and top views with dimensional data.
      c. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size, and cable numbers.
      d. Method of anchoring, seismic requirements, weight.
      e. Types of materials and finish.
      f. Nameplates.
      g. Temperature limitations, as applicable.
      h. Voltage requirement, phase, and current, as applicable.
      i. Front and rear access requirements.
      j. Grounding requirements.
      k. Catalog cuts or photocopies of applicable pages of bulletins or brochures for mass produced, non-custom manufactured material. Catalog data sheets shall be stamped to indicate the project name, applicable Section and paragraph, model number, and options.

C. RSN 26 05 00-2, Technical Manuals:
   1. Complete information in accordance with Section 01 33 00.

D. RSN 26 05 00-3, Record Drawings:
   1. The Contractor shall show invert and top elevations and routing of duct banks and concealed below-grade electrical installations. Record drawings shall be prepared, be available to the COR, and be submitted according to Section 01 33 00.
1.07 AREA DESIGNATIONS

A. General
   1. Raceway system enclosures shall comply with Section 26 05 33 - Electrical Raceway Systems.
   2. Electric work specifically indicated in sections within any of the specifications shall comply with the requirements of those sections unless indicated otherwise.

B. Material Requirements
   1. NEMA 1, 3R, and 12 enclosures shall be steel, primed and coated with ANSI 61 light grey paint.

1.08 TESTS

A. The Contractor shall be responsible for factory and field tests required by specifications in Division 26 and by the COR or other authorities having jurisdiction. The Contractor shall furnish necessary testing equipment and pay costs of tests, including replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.

B. Where test reports are indicated, proof of design test reports for mass-produced equipment shall be submitted with the Shop Drawings, and factory performance test reports for custom-manufactured equipment shall be submitted and be approved prior to shipment. Field test reports shall be submitted for review prior to Substantial Completion.

C. Equipment or material that fails a test shall be removed and replaced or if the COR approves, may be repaired and retested for compliance. Corrections to equipment or materials with a factory warranty shall be as recommended by the manufacturer and shall be done in a manner that does not void the warranty.

PART 2 PRODUCTS

2.01 GENERAL

A. Equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. Equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the work shall be products of the same manufacturer. Equipment and materials shall be of industrial grade standard of construction.

B. Where a NEMA enclosure type is indicated in a non-hazardous location, the Contractor shall utilize that type of enclosure, despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.
2.02 MOUNTING HARDWARE

A. Miscellaneous Hardware
   1. Nuts, bolts, and washers shall be stainless steel.
   2. Threaded rods for trapeze supports shall be continuous threaded galvanized steel, 3/8-inch diameter minimum.
   3. Strut for mounting of conduits and equipment shall be galvanized steel or stainless steel. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion. Strut shall be as manufactured by Unistrut, B-Line, or equal.
   4. Anchors for attaching equipment to concrete walls, floors, and ceilings shall be stainless steel expansion anchors, such as "Rawl-Bolt," "Rawl-Stud" or "Lok-Bolt" as manufactured by Rawl, similar by Star, or equal. Wood plugs shall not be permitted.

2.03 ELECTRICAL IDENTIFICATION

A. Nameplates: Nameplates shall be fabricated from white-letter, black-face laminated plastic engraving stock, Formica Type ES-1 or equal. Each shall be fastened securely, using fasteners of brass, cadmium-plated steel, or stainless steel, screwed into inserts or tapped holes as required. Engraved characters shall be block style with no characters smaller than 1/8-inch top to bottom.

B. Conductor and Equipment Identification: Conductor and equipment identification devices shall be either imprinted plastic-coated cloth marking devices such as manufactured by Brady, Thomas & Betts, or equal, or shall be heat-shrink plastic tubing, imprinted split-sleeve markers cemented in place, or equal.

PART 3 EXECUTION

3.01 GENERAL

A. Incidentals: The Contractor shall provide materials and incidentals required for a complete and operable system, even if not required explicitly by the Contract Documents. Typical incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and control wiring required by vendor-furnished equipment to connect with other equipment indicated in the Contract Documents.

B. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined by the Contractor in the field based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations on the Drawings, however, shall be followed as closely as possible.
1. Where conduit development drawings or "home runs" are indicated, the Contractor shall route the conduits in accordance with those requirements. Routings shall be exposed or encased as indicated, except that conduit in finished areas shall be concealed unless specifically indicated otherwise. Conduits encased in a slab shall be sized for conduit OD to not exceed one-third of the slab thickness and be laid out and spaced to not impede concrete flow.

2. Conduit and equipment shall be installed in such a manner as to avoid obstructions, to preserve headroom, and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms as indicated. Where the Drawings do not indicate exact locations, such locations will be determined by the COR. If equipment is installed without instruction and must be moved, it shall be moved without additional cost to the Government. Lighting fixture locations shall be adjusted slightly to avoid obstructions and to minimize shadows.

3. Wherever conduits and wiring for lighting and receptacles are not indicated, it shall be the Contractor's responsibility to provide lighting and receptacle-related conduits and wiring as required, based on the actual installed fixture layout and the circuit designations as indicated. Wiring shall be #12 AWG minimum, and conduits shall be 3/4-inch minimum (exposed) and 1-inch minimum (encased). Where circuits are combined in the same raceway, the Contractor shall derate conductor ampacities in accordance with NEC requirements.

C. Workmanship: Materials and equipment shall be installed in strict accordance with printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.

D. Protection of Equipment and Materials: The Contractor shall fully protect materials and equipment against damage from any cause. Materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. Moving parts shall be kept clean and dry. The Contractor shall replace or refinish damaged materials or equipment, including faceplates of panels and switchboard sections as part of the work.

E. The Contractor shall provide power wiring in conduit for the HVAC equipment in accordance with Section 23 00 00 - Heating, Ventilating, and Air Conditioning.

3.02 CORE DRILLING

A. The Contractor shall perform core drilling required for installation of raceways through concrete walls and floors. Locations of floor penetrations, as may be required, shall be based on field conditions. Verify exact core drilling locations based on equipment actually furnished as well as exact field placement. To the extent possible, identify the existence and locations of encased raceways and other piping in existing
walls and floors with the COR prior to any core drilling activities. Damage to any encased conduits, wiring, and piping shall be repaired as part of the work.

3.03 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for indoor floor-standing electrical equipment. Housekeeping pads for equipment, including future units, shall be 3-1/2 inches above surrounding finished floor or grade and 2 inch(es) larger in both dimensions than the equipment, unless otherwise indicated.

B. Concrete housekeeping curbs shall be provided for conduit stub-ups in indoor locations that are not concealed by equipment enclosures. Such curbing shall be 3-inches above finished floor or grade.

3.04 EQUIPMENT ANCHORING

A. Floor-supported, wall, or ceiling-hung equipment and conductors shall be anchored in place by methods that will meet seismic requirements in the area where the project is located.

B. Anchoring methods and leveling criteria in the printed recommendations of the equipment manufacturers are a part of the work of this Contract. Such recommendations shall be submitted as Shop Drawings under Section 01 33 00.

3.05 EQUIPMENT IDENTIFICATION

A. General: Equipment and devices shall be identified as follows:

1. Nameplates shall be provided for panelboards, control and instrumentation panels, starters, switches, and pushbutton stations. In addition to nameplates, control devices shall be equipped with standard collar-type legend plates.

2. Control devices within enclosures shall be identified as indicated. Identification shall be similar to the subparagraph above.

3. Toggle switches that control loads out of sight of switches and multi-switch locations of more than 2 switches shall have suitable labeled finish plates.

4. Equipment names and tag numbers, where indicated on the Drawings, shall be utilized on nameplates.

5. The Contractor shall furnish typewritten circuit directories for panelboards; circuit directory shall accurately reflect the outlets connected to each circuit.

6. Termination points on terminal blocks shall be labeled by identifiers on the blocks. Identifiers shall be preprinted by the terminal manufacturer or custom-printed. Hand lettered markers will not be acceptable.

7. Distribution equipment, stand-alone disconnects, starters, and VFDs shall be tagged with appropriate arc-flash labels.
3.06 CLEANING

A. Before final acceptance, the electrical work shall be thoroughly cleaned. Exposed parts shall be thoroughly cleaned of cement, plaster, and other materials. Temporary tags, markers, stickers, etc. shall be removed. Oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and cracks and corners scraped out. Touch-up paint shall be applied to scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum-cleaned.

B. Light fixtures shall be cleaned inside and out.

C. Debris and refuse from cleaning shall be disposed of off the Site.

END OF SECTION
SECTION 26 05 10
CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General.

1.02 REFERENCE STANDARDS

A. Section 26 05 00 Electrical Work, General

B. ASTM International (ASTM)
   1. ASTM B 8-04 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

C. The following is a list of standards which may be referenced in this Section:
      b. B3, Standard Specification for Soft or Annealed Copper Wire
      c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. 48, Standard Test Procedures and Requirements for Alternating Current Cable Terminations
   3. Insulated Cable Engineer's Association, Inc. (ICEA) and National Electrical Manufacturers' Association (NEMA):
      a. ICEA S-58-679, Standard for Control Cable Conductor Identification
      b. ICEA S-73-532 / NEMA WC57, Standard for Control, Thermocouple Extension, and Instrumentation Cables
      c. ICEA S-105-692, 600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable
      d. ICEA S-81-570, Direct Burial, 600 Volt, Ruggedized Insulation
e. ICEA T 29 520, Procedure for Conducting Vertical Cable Tray Flame Test with a Theoretical Heat Input of 210,000 Btu/hour
f. NEMA CC1, Electric Power Connectors for Substations


5. Underwriters Laboratories, Inc. (UL):
   a. 13, Standard for Safety Power-Limited Circuit Cables
   b. 44, Standard for Safety Thermoset-Insulated Wires and Cables
   c. 486A, Standard for Safety; Wire Connectors and Soldering Lugs for Use with Copper Conductors
   d. 510, Standard for Safety Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
   e. 910, Standard for Safety Test Method for Flame Propagation and Smoke Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
   f. 1072, Standard for Safety Medium-Voltage Power Cables
   g. 1277, Standard for Safety Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
   h. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords

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 data.

C. RSN 26 05 10-2, Test Reports.

1.04 DEFINITIONS

A. Cable: Cable, cables, wire, or wires of one or more insulated conductors.

B. Power Cable: For power loads including receptacle outlets; motors; alternating- and direct-current distribution circuits; heating, ventilating, and air-conditioning and lighting circuits; and cable that is used for controlling heating, ventilating, air-conditioning, and lighting equipment.

C. Control Cable: For control, metering, indication, annunciation, and relaying circuits; and circuits not identified as power circuits.
D. Instrumentation Cable: For RTD and transducer output circuits, for low voltage less than 300 V.

E. Telemetering Cable: For supervisory computer control, voice communication, and logic level signals.

F. Outdoor Cable: Cable with any portion located outdoors or installed underground.

G. Indoor Cable: Cable with entire length indoors, in conduit or cable tray.

PART 2 PRODUCTS

2.01 CABLE

A. Manufactured no more than 24 months prior to Notice to Proceed.

B. Round, except for 2-conductor cable with parallel conductors.

C. Copper conductor: ASTM B 8, class B or C.

D. AWG or kcmil designation.

E. Coverings or insulation: Suitable for installation in vertical position without injury to covering or deformation of insulation when supported in accordance with NFPA 70 article 300-19.

F. Stranded conductors.

G. Cable color coding:
   1. Provide No. 10 AWG and smaller single-conductor cable used in branch lighting circuits with identified insulation or colored insulation:
      a. Phase A - black or orange*
      b. Phase B - red or yellow*
      c. Phase C - blue or brown*
      d. Neutral - white or gray*

         *To be used when more than one multiwire branch circuit is contained in a single conduit.

   2. 3-phase power cable:
      a. Phase A - Brown.
      b. Phase B - Orange.
      c. Phase C - Yellow.

   3. Control and instrumentation cable:
a. In accordance with NEMA WC 57.

b. Colored insulation or jacket compound. Do not apply color coatings to insulation or jacket surface.

4. Indoor telemetering cable: In accordance with 7 CFR 1755.390.

H. Conductor Sizes:

1. Determine size of power and lighting circuits in accordance with NFPA 70 based on 60 degrees C conductor temperature for sizes No. 1 AWG and smaller and 75 degrees C conductor temperature for sizes No. 1/0 AWG and larger.

2. Determine all other conductor sizes, except where indicated on drawings or specified, in accordance with: NFPA 70 or use minimum conductor size No. 12 AWG. In event of conflict with NFPA 70 and minimum conductor size, use larger conductor.

3. Indoor telemetering cable size: No. 20 AWG, minimum.

2.02 600-VOLT RATED CONTROL AND POWER CABLE

A. General:

1. Type TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 20,000 Btu/hr, and NFPA 70, Article 340, or UL 13 Listed Power Limited Circuit Cable meeting requirements of NFPA 70, Article 725

2. Conform to applicable requirements of NEMA WC 3, WC 5, and WC 7

3. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark

4. Suitable for installation in open air, in cable trays, or conduit

5. Minimum Temperature Rating: 90 degrees C dry locations, 75 degrees C wet locations

B. Multiconductor Control Cable:

1. Conductors:

   a. Material: Copper
   b. Size: No. 14 AWG
   c. Stranding: Class B

2. Insulation:

   a. Type: Cross-linked polyethylene (XLP)
   b. Standards: UL 44 listed as Type XHHW-2 rated VW-1
   c. Conductor group bound with spiral wrap of barrier tape
   d. Color Code: In accordance with ICEA S-58-679, Method 1, Table 2
3. Jacket: Chlorinated polyethylene (cross-linked type) (CPE) per ICEA S-73-532 and UL 1277.

4. Cable: Passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test

5. Cable Sizes:

<table>
<thead>
<tr>
<th>No. of Conductors</th>
<th>Max. Diameter (Inches)</th>
<th>Jacket Thickness (Mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.41</td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td>0.48</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>0.52</td>
<td>45</td>
</tr>
<tr>
<td>12</td>
<td>0.72</td>
<td>60</td>
</tr>
<tr>
<td>19</td>
<td>0.83</td>
<td>60</td>
</tr>
<tr>
<td>25</td>
<td>1.00</td>
<td>60</td>
</tr>
<tr>
<td>37</td>
<td>1.15</td>
<td>80</td>
</tr>
</tbody>
</table>

C. Multiconductor Power Cable:

1. Conductors:
   a. Material: Copper
   b. Stranding: Class B

2. Insulation:
   a. Type: Flame retardant, cross-linked polyethylene (FR-XLP)
   b. Standards: UL 44 listed as Type XHHW-2, rated VW-1
   c. Color Code: Conductors, size No. 8 AWG and smaller, colored conductors, ICEA S-58-679, Method 1, Table 1. Conductors size No. 6 AWG and larger, ICEA S-73-532, Method 4
   d. Jacket: Chlorinated polyethylene (cross-linked type) (CPE) per ICEA S-73-532 and UL 1277

3. Cable passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test

4. Cable Sizes:

<table>
<thead>
<tr>
<th>Conductor Size</th>
<th>Minimum Ground Wire Size</th>
<th>No. of Conductors</th>
<th>Max. Outside Diameter (Inches)</th>
<th>Nominal Jacket Thickness (Mils)</th>
</tr>
</thead>
</table>
**Conductors and Cables**

<table>
<thead>
<tr>
<th>Conductor Size</th>
<th>Minimum Ground Wire Size</th>
<th>No. of Conductors</th>
<th>Max. Outside Diameter (Inches)</th>
<th>Nominal Jacket Thickness (Mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>12</td>
<td>2</td>
<td>0.42</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.45</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.49</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>2</td>
<td>0.54</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.58</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.63</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>3</td>
<td>0.66</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>3</td>
<td>0.74</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>3</td>
<td>0.88</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.97</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>3</td>
<td>1.01</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1.11</td>
<td></td>
</tr>
<tr>
<td>1/0</td>
<td>6</td>
<td>3</td>
<td>1.22</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1.35</td>
<td></td>
</tr>
<tr>
<td>2/0</td>
<td>4</td>
<td>3</td>
<td>1.32</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1.46</td>
<td></td>
</tr>
<tr>
<td>4/0</td>
<td>4</td>
<td>3</td>
<td>1.56</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1.78</td>
<td>110</td>
</tr>
</tbody>
</table>

**D. Cable for Variable Frequency Drive Application**

1. The variable frequency drive supplier shall confirm appropriate rating and configuration of the cable and adjust the below specified requirements accordingly.

2. Conductors: Copper, 3-conductor configuration with symmetric bare ground conductors with overall shield. Manufacturer of cable shall be as indicated on the plans or approved equal.

3. Insulation: XLPE or EPR for conductors and PVC for jacket.

4. Voltage Rating: 1000V min

5. Cable passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test
E. Single Conductor Power Cable

1. Conductors:
   a. Material: Copper
   b. Stranding:
      1) Class B
      2) Indoor lighting and receptacle circuits No. 10 AWG and smaller: Solid copper conductor if not terminated on terminal blocks.
   c. Insulation:
      1) Conductors No. 6 AWG and larger: Flame retardant, cross-linked polyethylene (FR-XLP) Conductors smaller than No. 6 AWG: Polyvinyl chloride (PVC) sheathed with nylon
   d. Standards: No. 6 AWG and larger: UL 44 listed as Type XHHW-2, rated VW-1
   e. Jacket:
      1) Conductors No. 6 AWG and larger: Chlorinated polyethylene (cross-linked type) (CPE) per ICEA S-73-532 and UL 1277.
      2) Conductors smaller than No. 6 AWG: Nylon

2. Cable passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test

E. Direct Burial and Aerial Conductors and Cables:

1. Type USE/RHH/RHW insulation, UL 854 listed or Type RHW-2/USE-2
2. Conform to physical and minimum thickness requirements of NEMA WC 3

F. Flexible Cords and Cables:

1. Type SOW-A/50 with ethylene propylene rubber insulation in accordance with UL 62H. Conform to physical and minimum thickness requirements of NEMA WC 8

2.03 MULTICONDUCTOR INDOOR TELEMETERING CABLE

A. Twisted pair, individually insulated, having varying lengths of lay to minimize crosstalk.

B. Insulation: Extruded high-density polyethylene or crystalline propylene/ethylene copolymer insulating compound.
C. Core that is completely covered with a layer of nonhygroscopic dielectric material. Apply covering with an overlap.

D. Shield: 0.006-inch-thick copper or 0.0008-inch plastic-coated aluminum.

E. Cable jacket: High-molecular-weight polyethylene, resistant to abrasion, moisture, weather, and environmental cracking.

2.04 300-VOLT RATED INSTRUMENTATION CABLE

A. General:

1. 300-V rated cable shall not be routed in same raceway with cabling containing 600 V circuits. If instrumentation wiring to be routed with such cables and conductors, then instrumentation cable shall be rated 600-V with other requirements listed in this section.

2. Type PLTC, meeting requirements of UL 13, UL Listed Power Limited Circuit Cable meeting requirements of NFPA 70, Article 725

3. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark

4. Suitable for installation in open air, in cable trays, or conduit

5. Minimum Temperature Rating: 105 degrees C

6. Passes vertical tray flame test

7. Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant

B. Twisted, Shielded Pair Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 55.

1. Size: No. 16 AWG

2. Outer Jacket: 60-mil nominal

3. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage

4. Conductors:
   a. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8
   b. Tinned copper drain wire
   c. Insulation: PVC
   d. Color Code: Pair conductors black and white

C. Twisted, Shielded Triad Instrumentation Cable: Single triad, designed for noise rejection for process control, computer, or data log applications meeting requirements of NEMA WC 55.

1. Size: No. 16 AWG

2. Outer Jacket: 60-mil nominal thickness
3. Individual Pair Shield: double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage

4. Conductors:
   a. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8
   b. Tinned copper drain wire
   c. Insulation: PVC
   d. Color Code: Triad conductors black, red, and white

D. Multi-Twisted, Shielded Pairs with a Common Overall Shield Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable meeting NEMA WC 55.

1. Conductors:
   a. Size: No. 18 AWG
   b. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8
   c. Tinned copper drain wires
   d. Insulation: PVC
   e. Color Code: Pair conductors black and white, with white conductor numerically printed for group identification
   f. Individual Pair Shield: aluminum/mylar
   g. Cable Shield: double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage

2. Cable Sizes:

<table>
<thead>
<tr>
<th>Number of Pairs</th>
<th>Maximum Diameter (Inches)</th>
<th>Outside Thickness (Mils)</th>
<th>Nominal Jacket (Mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.52</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.71</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0.85</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1.05</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>1.20</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>1.37</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1.71</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

E. Multi-Twisted Pairs with a Common Overall Shield Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable meeting NEMA WC 55.

1. Conductors:
a. Size: No. 18 AWG
b. Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8
c. Tinned copper
d. Group drain wire
e. Insulation: PVC
f. Color Code: Pair conductors black and white, with white conductor numerically printed for group identification
g. Cable Shield: double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage

2. Cable Sizes:

<table>
<thead>
<tr>
<th>Number of Pairs</th>
<th>Maximum Diameter (Inches)</th>
<th>Outside Nominal Jacket Thickness (Mils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.49</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>0.65</td>
<td>60</td>
</tr>
<tr>
<td>12</td>
<td>0.76</td>
<td>60</td>
</tr>
<tr>
<td>16</td>
<td>0.89</td>
<td>80</td>
</tr>
<tr>
<td>24</td>
<td>1.03</td>
<td>80</td>
</tr>
<tr>
<td>36</td>
<td>1.18</td>
<td>80</td>
</tr>
<tr>
<td>50</td>
<td>1.45</td>
<td>80</td>
</tr>
</tbody>
</table>

2.05 Cable for Variable Frequency Drive Application

A. The variable frequency drive supplier shall confirm appropriate rating and configuration of the cable and adjust the below specified requirements accordingly.
B. Conductors: Copper, 3-conductor configuration with symmetric bare ground conductors.
C. Insulation: XLPE or EPR for conductors and PVC for jacket.
D. Voltage Rating: 1000V minimum
E. Cable passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test
F. UL Listed
2.06 Grounding Conductors

A. Equipment: Stranded copper with green, type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

B. Direct Buried or Exposed: Bare stranded copper, No. 4/0 AWG.

2.07 Accessories for Conductors 600 Volts and Below

A. Tape:
   1. General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33, rated for 90 degrees C minimum, meeting requirements of UL 510
   2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88

B. Identification Devices:
   1. Sleeve: Permanent, PVC, yellow or white, with legible machine-printed black markings
   2. Heat Bond Marker:
      a. Transparent thermoplastic heat bonding film with acrylic pressure sensitive adhesive
      b. Self-laminating protective shield over text
      c. Machine printed black text
   3. Marker Plate: Nylon, with legible designations permanently hot stamped on plate
   4. Tie-On Cable Marker Tags:
      a. Chemical resistant white tag
   5. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum

C. Connectors and Terminations:
   1. Nylon, Self-Insulated Crimp Connectors
   2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator
   3. Self-Insulated, Set Screw Wire Connector:
      a. Two-piece compression type with set screw in brass barrel
      b. Insulated by insulator cap screwed over brass barrel

D. Cable Lugs:
   1. In accordance with NEMA CC 1
   2. Rated 600 volts of same material as conductor metal
3. Insulated, Locking-Fork, Compression Lugs:
   a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity
   b. Seamless

4. Uninsulated Crimp Connectors and Terminators:
   a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity

2.08 Pulling Compound

A. Nontoxic, noncorrosive, noncombustible, nonflammable, wax-based lubricant; UL listed.

B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.

C. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.

2.09 ACCESSORIES

A. Conductor markers:
   1. White.
   2. Self-laminating-vinyl type or heat-shrink type.
   3. Marked with conductor designation.

B. Cable tags.
   1. Suitable for outdoor use.
   2. Shape: Rectangular.

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:
1. Heavy-duty, preinsulated, pressure-crimp-type with ring tongues.
2. Tin-plated copper.
3. Serrated inner barrel.
4. 600-volt-rated nylon insulation.
5. Insulation support sleeve for vibration resistance.
6. UL listed.
7. Compatible with conductor size and type of cable for which it is used

PART 3 EXECUTION

3.01 INSTALLATION


B. Install cable without exceeding allowable pulling tensions and sidewall pressures recommended by cable manufacturer.

C. Do not splice multiconductor control cables.

D. Buried cables within fenced yards:
   1. Install in accordance with Standard Drawing 40-D-5370.

E. 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.

F. Conduit installation:
   1. Do not pull cable into conduits until conduit runs 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 to prevent cuts or abrasions in insulation or protective covering, or kinks in cable.
   4. Block cable opening in sleeves under equipment or passing through blockouts, with silicone-foam, fire-retardant type material in accordance with NFPA 70.
   5. Lubricant:
      a. Use only as aid to pulling.
b. Soapstone or other suitable material not injurious to cable sheath.

G. Excavation, sand backfill, and placing and compacting backfill for buried cable:
   1. In accordance with Sections – 31 23 11 Earthwork for Structures.

H. Grounding.
   1. Provide one nonactive conductor grounded at both ends in each non-twisted pair shielded control cable. Ground shielding of each shielded control cable on both ends directly to equipment ground bus by method indicated on Standard Drawing 40-D-4335, Figure 8.
   2. Ground shielding of twisted pair shielded cables only to source equipment ground bus using pressure crimp type connectors with ring tongues on drain wire.
   3. Ground spare conductors by wire jumpers from equipment terminal block points to equipment ground bus.

I. Marking:
   1. Mark conductors, whether single-conductor cables or individual conductors of multiconductor control, instrumentation, and power cables at each end with conductor designation on first line followed by cable designation on second line as indicated on approved wiring diagrams.
   2. Mark spare conductors of multiconductor cables with cable designation and word "SPARE".
   3. Numerically sequence markings (e.g., 2CSA-CSB-SPARE1).

J. Spare conductors:
   1. Provide spare conductors in accordance with Government-furnished information marked on Contractor's approval wiring diagram drawings.

K. Tagging.
   1. Tag multiconductor cables at each end.
   2. Attach tags to cable by self-locking cable ties.
   3. Mark tags with cable designation.
      a. Cable designations: As indicated on approved wiring diagrams.

L. Terminate control and instrumentation wire with terminal connectors.

M. Wiring methods:
   1. Form conductors into neat packs, or lace conductors, or tie conductors with self-locking cable ties at termination point of multiconductor cable.
   2. Do not combine alternating- and direct-current circuits, or current and potential transformer circuits in same multiconductor cable.
3. Support cable installed in a vertical or inclined plane by cable grips (including hooks). Installed cable with slack spans between supports.

4. Clamp cable entering equipment with commercial type cable clamps.

5. Leave sufficient length cable ends to make connections conveniently to equipment, fixtures, and devices.

6. Provide 5-conductor cable for each three-phase current and each potential transformer circuit.

7. Retain sufficient length of conductors in a current transformer cable length to reach farthest terminal used to select current transformer ratios.

8. Retain spare single conductors at each end of a multiconductor cable in a length equal to longest single conductor of multiconductor cable.

9. Run direct-current circuits connected to a device radially.

10. Run both positive and negative leads of a circuit in same cable.

11. Tie cables that are installed under a raised floor system or are installed external to plant and are not in conduit, and that consist of two or more single conductors, together at 10-foot intervals by self-locking cable ties.

3.02 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.

D. Perform following tests:

1. 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: \( R \text{ in MΩ} = (\text{rated voltage in kV} + 1) \times 1000/\text{length in ft} \).
   
   d. Record following test data on test report for each conductor tested:

   1) Date of test.
   
   2) Name or names of Contractor's personnel who performed test.
   
   3) Name of Government inspector who witnessed test.
   
   4) Conductor identification.
   
   5) Megohms between conductor and ground.
6) Total length of conductor.

2. Insulation resistance test for telemetry cables:
   a. Measure insulation resistance between each conductor and each of remaining conductors, and between each conductor and shield for telemetry cable. Conduct test after cable sheath has been floated at transducer end but prior to connecting any ground conductors.

END OF SECTION
SECTION 26 05 26
GROUNDING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)
   1. ASTM B 3-01(2007) Soft or Annealed Copper Wire
   2. ASTM B 8-04 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   3. ASTM B 228-04 Concentric-Lay-Stranded Copper-Clad Steel Conductors

B. Institute of Electrical and Electronic Engineers (IEEE)
   1. IEEE 142-2007 Grounding of Industrial and Commercial Power Systems
   2. IEEE 837-2002 Qualifying Permanent Connections Used in Substation Grounding

C. National Fire Protection Association (NFPA)
   1. NFPA 70-2020 National Electric Code (NEC)

D. Underwriters Laboratories (UL)

E. UL 467-2004 Grounding and Bonding Equipment

1.03 SUMMARY

A. Provide the electrical grounding system, complete and operable, as indicated in accordance with the Contract Documents.

B. The requirements of Section 26 05 00 – Electrical Work, General apply to this Section.

C. Single Manufacturer
   1. Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.
1.04 SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 – Submittals and Section 26 05 00 – Electrical Work, General.

B. RSN 26 05 26-1, Shop Drawings
   1. Submit manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this Section.

C. RSN 26 05 26-2, As-built drawings
   1. Specifications drawings indicating changes made to grounding systems.

D. RSN 26 05 26-3, Test reports

PART 2 PRODUCTS

2.01 GENERAL

A. Components of the grounding electrode system shall be manufactured in accordance with UL 467 - Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code Article 250 and local codes.

2.02 GROUNDING SYSTEM

A. Grounding loop conductors shall be bare annealed copper conductors.

B. Conductors shall be No. 4/0 unless indicated otherwise.

C. Ground Rods
   1. Unless indicated otherwise, provide ground rods minimum of 3/4 inch in diameter, 10 feet long, and with a uniform covering of electrolytic copper metallically bonded to a rigid steel core.
   2. Provide corrosion-resistant copper-to-steel bond.
   3. The rods shall conform to UL 467.
   4. The rods shall be of the sectional type, joined by threaded copper alloy couplings.

D. Make buried and concrete-encased cable-to-cable and cable-to-ground rod connections using exothermic welds by Cadweld, Thermoweld, or equal.

E. Exposed Connectors
1. Exposed grounding connectors shall be of the compression type (connector-to-cable), constructed of high-copper alloy, and manufactured specifically for the particular grounding application.

2. The connectors shall be FCI-Burndy, O.Z. Gedney, or equal.

F. Use grounding clamps to bond each separately-derived system to the grounding electrode conductors.

G. Equipment Grounding Circuit Conductors
   1. The conductors shall be the same type and insulation as the load circuit conductors.
   2. The minimum size shall be as outlined in Table 250.122 of the National Electrical Code, unless indicated otherwise.
   3. Metallic conduit systems shall have an equipment grounding wires as well as being equipment grounding conductors themselves.

H. Grounding Materials Manufacturer, or Equal
   1. Copperweld
   2. Thermoweld
   3. FCI-Burndy

PART 3 EXECUTION

3.01 GROUNDING

A. Bond each building steel column using a single 8’x3/4” copper clad ground rod connected via #1/0 bare soft drawn copper wire. Connection to the steel column shall use a thermo weld type connector.

B. Provide a separate grounding conductor, securely grounded in each raceway independent of raceway material.

C. Provide a separate grounding conductor for each motor and connect at motor box.

D. Do not use bolts for securing the motor box to the frame or the cover for grounding connectors.

E. Sizes shall be as indicated on the Conduit Schedule and in accordance with NEC Article 250.

F. Route the conductors inside the raceway.

G. Provide a grounding-type bushing for secondary feeder conduits that originate from the secondary section of each MCC section, switchboard, or panelboard.
H. Individually bond the raceway to the ground bus in the secondary section.

I. Provide a green insulated wire as grounding jumper from the ground screw to a box grounding screw, and, for grounding type devices, to the equipment grounding conductor.

J. Provide a separate grounding conductor in each individual raceway for parallel feeders.

K. Interconnect the secondary switchgear MCC or panelboard neutral bus to the ground bus in the secondary switchgear compartment only at the service entrance point or after a transformer.

L. Provide the duct bank ground system as indicated, including trenching, splices, ground rods, and connections to equipment and structures.

M. Measure ground impedance in accordance with IEEE STD 81 after installation but before connecting the electrode to the remaining grounding system.

N. Low Voltage Grounded System (600V or less)
   1. A low-voltage grounded system is defined as a system where the local power supply is a transformer, with the transformer secondary grounded.
   2. Grounding system connections for a premises-wired system supplied by a grounded AC service shall be provided with a grounding electrode connector connected to the grounded service conductor at each service, in accordance with the NEC.
   3. The grounded circuit conductor shall not be used for grounding non-current-carrying parts of equipment, raceways, and other enclosures except where specifically listed and permitted by the NEC.

O. Embedded Ground Connections
   1. Underground and grounding connections embedded in concrete shall be UL-listed ground grid connectors.
   2. The connection shall be made in accordance with the manufacturer's instructions.
   3. Do not conceal or cover ground connections until the COR or an authorized representative has established that every grounding connection conforms to the requirements of the Contract Documents and has given the Contractor written confirmation.

P. Ground Ring
   1. Furnish trenching and materials as necessary to install the ground ring as indicated.
   2. The bonding conductor shall be in direct contact with the earth and of the indicated size.
   3. Provide a minimum burial depth of 36 inches or as indicated on the Drawings, whichever is greater.
4. Re-compact disturbed soils to their original density in 6-inch lifts.

Q. Duct Bank Ground
   1. Embed a grounding conductor in every duct bank as indicated.

R. Ground Rods
   1. Provide ground rods at the indicated locations.
   2. A single electrode that does not have resistance-to-ground of 5 ohms or less shall be augmented by additional electrodes to obtain this value.
   3. Take the resistance-to-ground measurement during dry weather, a minimum of 48 hours after a rainfall.
   4. Rods forming an individual ground array shall be equal in length.

S. Shield Grounding
   1. Shielded instrumentation cable shall have its shield grounded at one end only unless the Shop Drawings indicate that the shield will be grounded at both ends.
   2. The grounding point shall be at the control panel or at the receiving end of the signal carried by the cable.
   3. The termination of the shield drain wire shall be on its own terminal screw.
   4. Jumper together the terminal screws, using manufactured terminal block jumpers or a No. 14 green insulated conductor.
   5. Connect the ground bus via a green No. 12 conductor to the main ground bus for the panel.

END OF SECTION
SECTION 26 05 36
WIRING DEVICES

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A.  Cost:
   1.  Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General

1.02  REFERENCE STANDARDS
A.  Institute of Electrical and Electronics Engineers (IEEE)

1.03  SUMMARY
A.  The Contractor shall provide wiring devices, complete and operable, as indicated in accordance with the Contract Documents.
B.  The requirements of Section 26 05 00 – Electrical Work, General apply to this Section.
C.  Single Manufacturer
   1.  Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.

1.04  SUBMITTALS
A.  Furnish submittals in accordance with the requirements of Section 01 33 00 – Submittals.
B.  RSN 26 05 36-1, Shop Drawings:
   1.  Submit complete catalog cuts of switches, receptacles, enclosures, covers and appurtenances, marked to clearly identify the proposed materials.
   2.  Submit documentation showing that the proposed materials comply with the requirements of NEC and U.L.
   3.  Submit documentation of the manufacturer's qualifications.
C.  RSN 26 05 36-2, Reports of Contractor Quality Field Tests Reports.
PART 2  PRODUCTS

2.01  GENERAL

A. Devices shall carry the U.L. label.

B. Color
   1. General purpose duplex receptacles and toggle switch handles shall be brown everywhere except in finished rooms where they shall be ivory.
   2. Special purpose receptacles shall have a body color as indicated.

C. Receptacles and switches shall be of specification grade and shall conform to NEMA WD-1, Federal Specifications W-C-596E and W-S-896E, respectively.

2.02  LIGHTING SWITCHES

A. Local branch switches shall be of the toggle type, rated at 20 amperes, 120-277 VAC, and shall be General Electric Cat. No. GE-5951-1 for single pole, GE-5953-1 for 3 way and GE-5954-1 for 4-way, similar types as manufactured by Hubbell, Leviton, or equal.

B. Switches for hazardous locations shall be factory-sealed, rated at 20 amperes, 120-277 VAC, and shall be as manufactured by Crouse-Hinds, Appleton, or Killark, or equal.

2.03  GENERAL PURPOSE RECEPTACLES

A. Duplex receptacles that are rated at 125V, 20 amperes, shall be of the polarized 3-wire type for use with a 3-wire cord with grounded lead, and one designated stud shall be permanently grounded to the conduit system in accordance with NEMA 5-20R.

B. Dry Areas
   1. Duplex 120V receptacles for dry areas shall be G.E. 5362, Hubbell 5362, or equal.
   2. Single receptacles for dry areas shall be G.E. 4102, Hubbell 6361, or equal.

C. Damp/Wet Areas
   1. Receptacles for damp/wet locations shall be weather-resistant-listed in accordance with NEC-2008, Article 406.8.
   2. Duplex 120V receptacles for damp/wet areas shall be Hubbell HBL5362IWR, or equal.

D. GFCIs
   1. Ground-fault circuit-interrupting receptacles (GFCIs) shall be installed at the indicated locations and as required by the NEC.
   2. GFCIs shall be duplex receptacles, of specification grade, and tripping at 5 mA.
3. GFCI ratings shall be 125V, 20 amperes, NEMA WD-1, Configuration 5-20R, and capable of interrupting 5,000 amperes without damage.

4. GFCIs shall be weather resistant-listed in accordance with NEC-2008, Article 406.8.

5. Feed-through-type GFCIs serving standard receptacles will not be permitted.

6. GFCIs shall be Hubbell GFR5362SGI or similar as manufactured by Bryant, Leviton, or equal.

2.04 ENCLOSURES AND COVERS

A. Surface-mounted switches and receptacles shall be housed in FS- or FD-type weatherproof conduit fittings.

B. Switch and receptacle covers on surface-mounted boxes shall be constructed of die-cast copper-free aluminum.

C. In finished areas, switch and receptacle boxes shall be provided with "super stainless-steel covers" as manufactured by Harvey Hubbell, Arrow Hart, Bryant, or equal.

D. In areas where cast boxes are used, switch and receptacle covers shall be Crouse-Hinds Catalogue No. DS185 and WLRD-1, or Adalet No. WSL and WRD, or equal.

E. Wet Locations

1. Receptacles in wet locations shall be provided with a hinged non-metallic cover/enclosure marked "Suitable for Wet Locations when in use" and "UL Listed."

2. Provide a gasket between the enclosure and the mounting surface, and between the hinged cover and mounting plate/base.

3. The cover shall be TayMac Specification Grade, or equal.

2.05 Safety Disconnect Switches

A. Non-Fusible:

1. Where shown on the drawings as non-fusible, safety disconnect switches shall be heavy-duty, non-fusible, safety type rated 600 V AC. Unless otherwise specified, indoor enclosures shall be NEMA 12; enclosures installed in outdoor, wet, or corrosive areas shall be NEMA 4X, nonmetallic; and enclosures installed in hazardous areas shall be NEMA 7. Switch enclosures located in classified areas shall be suitable for the specified classification. The operating handle shall be capable of being padlocked in the "off" position. The operator shall be a positive, quick-make, quick-break mechanism. Switch mechanisms shall be provided with one auxiliary contact that opens before the switchblades. This auxiliary contact shall be rated B150, per NEMA ICS 2 125.

B. Fusible:
1. Where shown on the drawings as fusible, safety disconnect switches shall be heavy-duty, fusible, safety type rated 600 V AC. Fuse clips shall be UL Class R rejection type with Type RK-5 dual element fuses for a minimum 200,000-amp short circuit rating. Unless otherwise specified, indoor enclosures shall be NEMA 12; enclosures installed in outdoor, wet, or corrosive areas shall be NEMA 4X, stainless steel; and enclosures installed in hazardous areas shall be NEMA 7. Switch enclosures located in classified areas shall be suitable for the specified classification. The operating handle shall be capable of being padlocked in the "off" position. The operator shall be a positive, quick-make, quick-break mechanism. Switch mechanisms shall be provided with one auxiliary contact that opens before the switchblades. This auxiliary contact shall be rated B150, per NEMA ICS 2 125.

C. Switches shall be horsepower rated for motors and shall comply with NEMA KS 1. Switches shall be provided with defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position. Switches shall have line terminal shields. Switches shall be Cutler Hammer Type DH; General Electric Mill Duty, Type TH; or equal. Fuses shall be provided per the equipment manufacturer's recommendations.

2.06 NAMEPLATES

A. Provide nameplates or equivalent markings on the switch enclosures to indicate the ON and OFF positions of each switch.

B. ON and OFF for 3-way or 4-way switches will not be accepted.

C. Provide receptacles for special purposes with nameplates indicating their use.

D. Nameplates shall meet the requirements of Section 26 05 00 – Electrical Work, General.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with the requirements of the NEC.

3.02 CONNECTION

A. Rigidly attach wiring devices in accordance with the NEC and as indicated, avoiding interference with other equipment.

B. Securely fasten nameplates using screws, bolts, or rivets centered under or on the device, unless otherwise indicated.

C. Nameplates shall meet the requirements of Section 26 05 00 – Electrical Work, General, and shall consist of a red plate with white letters a minimum of 1/4 inch tall.
3.03 GROUNDING

A. Devices, including switches and receptacles, shall be grounded in accordance with NEC, Article 250, and Section 26 05 26 – Grounding.

B. Switches and associated metal plates shall be grounded through the switch mounting yoke, outlet box, and raceway system.

C. Flush Receptacles
   1. Flush receptacles and their metal plates shall be grounded through positive ground connections to the outlet box and grounding system.
   2. Maintain the ground to each receptacle by a spring-loaded grounding contact to the mounting screw, or by a grounding jumper, each making a positive connection to the outlet box and grounding system at all times.

D. Receptacles served from an uninterruptible power supply shall be provided with an isolated grounding conductor from the serving power panelboard.

3.04 FIELD TESTING

A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 26 05 00 – Electrical Work, General.

B. Test each receptacle for polarity and ground integrity, using a standard receptacle tester.

END OF SECTION
This page intentionally left blank
SECTION 26 05 43
UNDERGROUND RACEWAY SYSTEMS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 – Electrical Work, General.

1.02  SUMMARY

A.  The Contractor shall provide underground raceway systems, complete and in place, in accordance with the Contract Documents.

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 43-1, Material catalog cut sheets
   1. Complete catalog cuts of all raceways, fittings, pullboxes, and hand holes, marked where applicable to show proposed materials and finishes.

C.  RSN 26 05 43-2, As-built drawings:
   1. Marked prints of specifications drawings indicating “as-built” changes made to electrical conduit during construction.
   2. Show routings, burial depths and handhole locations and sizes, and where applicable, connections to drainage systems.

PART 2  PRODUCTS

2.01  GENERAL

A.  Handholes, pullboxes, and fittings that are dedicated to the underground raceway system shall comply with the requirements of this Section.

2.02  HANDHOLES AND PULLBOXES

A.  Handholes and pullboxes shall be precast with construction and load rating as indicated.
1. Covers shall be traffic type, H-20 loading, except as indicated otherwise. Manhole and pullbox covers shall be identified as "Electric" by raised letters cast into the covers.

2. Manholes and pullboxes shall have frost-proof and water-tight grey iron frames and covers with solid lids and inner lids with 28-inch clear openings. Covers and lids shall be bolted to cast-in-place steel frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be cast-iron and shall have pick holes. Frames shall have a 1/2-inch drilled and tapped hole and lug to accommodate a #4/0 AWG bare stranded copper conductor connected to a ground rod and the ground conductor of power cables passing through the manhole.

B. Manholes and pullboxes shall be equipped with pulling-in irons opposite and below each ductway entrance.

C. Manholes and pullboxes shall have closed bottoms. Open bottom manholes and pullboxes will not be accepted.

D. PVC ductbank conduits shall be provided with end bells.

E. Fabricated handholes and pullboxes shall be provided, concrete polymer, Hubbell Quazite PG3036DA30 or larger with solid bottom and cover, or equal. Handhole indicated on the drawings are minimum size and shall not be smaller. Handholes may be larger as required to terminate conduits and pull cable. Contractor to provide handhole sized for the application.

F. Handholes and pull boxes shall be located away from normal vehicular traffic. Propose handhole and pull box location and obtain Government approval.

PART 3 EXECUTION

3.01 GENERAL

A. Underground raceways shall be installed between manholes and pullboxes as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be fabricated with tools designed for this purpose. Factory elbows shall be utilized wherever possible.

B. Raceway routings on plan views shall be followed to the extent possible.

C. Routings shall be adjusted to avoid obstructions. Coordinate the trades prior to installation of raceways. Lack of coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be performed by the Contractor as part of the work.

D. Duct entrances shall be grouted smooth; ducts shall be terminated with flush end bells. Sections of pre-fabricated manholes and pullboxes shall be assembled with waterproof
mastic and shall be set on a 6-inch bed of gravel, Type GF Specification 31 30 00, as recommended by the manufacturer or as required by field conditions.

E. Ductbank penetration through walls of manholes, pullboxes, and building walls below grade shall be watertight.

F. Concrete encased ductbank shall terminate at building foundations. When duct enters the building on a concrete slab on grade, duct shall not be encased but shall transition to rigid steel PVC-coated conduits on stub-ups.

G. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor. The sealing device shall be utilized with rigid steel conduit. Transition from PVC to rigid steel conduit prior to building entry, minimum 6” below surface. Wrap or coat all embedded steel conduit with corrosion protection tape or coating.

END OF SECTION
This page intentionally left blank.
SECTION 26 08 00
ELECTRICAL TESTING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26
      05 00 - Electrical Work, General

1.02 REQUIREMENTS

A. Provide the services of qualified testing personnel or firm for inspection, calibration, and
   testing of all installed equipment to establish equipment conforms to requirements
   specified in these specifications and is ready for commissioning tests. The testing firm
   shall be an independent business entity, or individuals not intimately involved with
   construction of the project, and shall be certified as a Nationally Recognized Testing
   Laboratory (NRTL) by OSHA, or otherwise qualified and approved by COR.

B. Organize the tests such that all aspects of installed equipment are covered, including the
   interface to existing equipment.

C. Submit reports of all tests performed, including test procedures, measurements taken,
   settings entered, conclusions and recommendations.

1.03 REFERENCE STANDARDS

A. Testing shall be performed in accordance with the applicable test criteria and requirements
   included in the following list of standards:

   1. Institute of Electrical and Electronics Engineers (IEEE)
   2. National Electrical Manufacturers Association (NEMA)
      Testing Specifications (ATS) for Electrical Power Distribution Equipment and
      Systems.
      a. 70, National Electrical Code (NEC).
      b. 70E, Standard for Electrical Safety in the Workplace.

1.04 SUBMITTALS

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

B. RSN 26 08 00-1, Electrical Test Plan: Submit Electrical Test Plan 15 days prior to
   performing inspections or tests:
1. Qualifications of testing firm or individuals.
2. Schedule for performing inspection and tests.
3. List of references to be used for each test.
4. Test procedures to be used for all equipment and subsystems.
5. Equipment and materials inspection form(s) to be used.
6. Individual device test forms to be used.
7. Individual system test forms to be used.

C. RSN 26 08 00-2, Test Report: Submit within 7 days after completion of test. Report shall include:

1. Executive Summary
2. Test criteria or standards used
3. Test instruments used, including calibration records
4. Test sheets with tester’s and witness’ initials organized to cover the following subsystems:
   a. Wiring and Conduit system
   b. Control Panels
   c. Field sensors
   d. Motor Controls
   e. Equipment Interconnections
   f. Secondary unit substation
   g. Interconnections of SCADA and control systems
   h. Others

5. Observation, summary, and recommendations

1.05 QUALIFICATIONS

A. Test personnel shall be engineers and/or technicians routinely engaged in testing and inspecting of electrical equipment, installations, and systems.

B. Test personnel certified by NETA or otherwise qualified and approved by COR.

C. Test equipment shall have an operating accuracy equal to, or greater than, requirements established by NETA ATS.

D. Test instrument calibration shall be in accordance with NETA ATS.

1.06 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform tests with apparatus de-energized whenever feasible.

C. Inspection and electrical tests on energized equipment are to be:

1. De-energize in accordance with FIST and RSHS.
2. Scheduled with COR prior to de-energization.
3. Minimized to avoid extended period of interruption to the operating plant equipment.

D. Notify COR at least 48 hours prior to performing tests on energized electrical equipment.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 GENERAL

A. Tests and inspection shall establish that:

1. Electrical equipment is operational within industry and manufacturer's tolerances.
2. Wiring is correctly labeled, and terminations are correct.
3. Equipment is suitable for energization.
4. Installation conforms to requirements of Contract Documents and referenced industry standards.
5. Manufacturers’ settings have been correctly entered and equipment operation verified.
6. Equipment is ready for commissioning tests in accordance with Division 01 – General Requirements.

B. Perform inspection and testing in accordance with NETA Acceptance Testing Specifications, industry standards, and manufacturer's recommendations.

C. Verify, test, and calibrate protective relays, circuit breakers, fuses, VFDs, motor starters, and other applicable devices.

D. Adjust mechanisms and moving parts for free mechanical movement.

E. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

F. Verify nameplate data for conformance to Contract Documents.

G. Realign equipment not properly aligned and correct unlevelness.

H. Properly anchor electrical equipment found to be inadequately anchored.

I. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer's recommendations, or as otherwise specified.

J. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
K. Inspect raceways and busways for proper routing and support. Verify each raceway is properly identified with label.

L. Verify cables and wiring are properly identified with circuit labels and conductor identifications.

M. Investigate and repair or replace:
   1. Electrical or control items that fail tests.
   2. Active components not operating in accordance with manufacturer's instructions.
   3. Damaged electrical equipment.

N. Electrical Enclosures and Panels:
   1. Remove foreign material and moisture from enclosure interior.
   2. Vacuum and wipe clean enclosure interior.
   3. Remove corrosion found on metal surfaces.
   4. Repair or replace door and panel sections having dented surfaces.
   5. Repair or replace poor fitting doors and panel sections.
   6. Repair or replace improperly operating latching, locking, or interlocking devices.
   7. Replace missing or damaged hardware.
   8. Finish:
      a. Provide matching paint and touch up scratches and mars.
      b. If required due to extensive damage, refinish the entire assembly.

3.02 WIRING AND CABLE TESTING

A. Visual and Mechanical Inspections:
   1. Physical damage to jacket and insulation.
   2. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
   3. Proper support.
   5. Proper shield grounding.
   7. Correct phasing and polarities.
   8. Correct point-to-point terminations.
   9. Proper lug type for conductor material.
   11. Proper clearances.
   12. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.

B. Insulation Resistance Tests:
   1. Perform insulation resistance test using DC voltages per NETA ATS Table 100.1.
2. Test each conductor with respect to ground and to adjacent conductors per IEEE 118 procedures.
3. Investigate values less than shown in Table 100.1.
4. Continuity test by ohmmeter method to ensure proper cable connections.

C. Current and Voltage Application Tests:
   1. Inject AC or DC test current, as applicable, to each current loop and confirm proper currents are measured at target devices.
   2. Apply AC or DC test voltage, as applicable, and confirm proper voltage is received by target devices.

D. Operational Tests:
   1. Initiate control devices.
   2. Check proper operation of control system and VFDs.
   3. Check alarms and shutdown circuits.

3.03 CONTROL PANELS AND DEVICES

A. Visual and Mechanical Inspection:
   1. Verify that power supply and equipment grounding conductors are correctly provided in accordance with NEC.
   2. Verify by point-to-point check that field wiring is correctly terminated with devices, sensors, switches, relays, interlocks, communication lines, PLCs, and other interfacing devices in accordance with the approved shop drawings.
   3. Verify that low voltage signal wiring is correctly terminated and shields grounded.
   4. Verify conductor labels and terminal identifications in accordance with shop drawings provided by manufacturers and suppliers.
   5. Verify nameplate data.

B. Electrical Tests:
   1. Verify and calibrate instrumentation input and output loops
   2. Verify shutdown functions.
   3. Verify proper inputs are received from field transducers and sensors.
   4. Verify operation of control circuits by observing target field devices.
   5. Verify HMI for data accuracy and correct control outputs.
   7. Verify remote monitoring by existing SCADA system at the powerhouse.

3.04 SENSORS AND TRANSDUCERS

A. Visual and Mechanical Inspection:
   1. Verify devices against nameplate data.
2. Verify correct locations, polarity and orientation.
3. Verify integrity of installation.

B. Electrical Tests:
   1. Verify sensors are correctly connected to power source.
   2. Calibrate for linearity and output range.
   3. Verify signal isolation with adjacent circuits.
   4. Verify proper grounding of conductor shields

3.05 GROUNDING SYSTEM

A. Visual and Mechanical Inspection:
   1. Equipment and circuit grounds in motor controllers, panelboards, and switchgear assemblies for proper connection, continuity and tightness.
   2. Ground bus connections in motor controllers, panelboards, and switchgear assemblies for proper termination and tightness.
   3. Effective transformer core and equipment grounding.
   4. Accessible connections to grounding electrodes for proper fit and tightness.
   5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

B. Electrical Tests:
   1. Verify interconnections to existing grounding grid system.

3.06 LOW VOLTAGE MOTOR CONTROL

A. Visual and Mechanical Inspection:
   1. Proper barrier and shutter installation and operation.
   2. Proper operation of indicating and monitoring devices.
   3. Proper overload protection for each motor.
   4. Improper blockage of air-cooling passages.
   5. Proper operation of drawout elements.
   6. Integrity and contamination of bus insulation system.
   7. Check nameplates for proper identification of devices installed.
   8. Verify performance of each control device and feature furnished as part of the motor controller.
   9. Control Wiring:
      a. Compare wiring to local and remote control, and protective devices with elementary diagrams.
      b. Check for proper conductor lacing and bundling.
      c. Check for proper conductor identification.
      d. Check for proper conductor lugs and connections.
B. Operational Tests:

   1. Operate equipment by initiating controls from control station.
   2. Check for correct rotation.
   3. Verify HOA switch functions.

3.07 INTERFACE WITH EXISTING EQUIPMENT

A. Check that communication links are properly installed and operating between PLC1 controls and existing plant control SCADA system.

3.08 MISCELLANEOUS CIRCUITS AND DEVICES

A. Contractor shall ensure that all other equipment supplied and installed under this Contract are properly installed, interconnected, and ready for operation whether or not they are specifically identified in this Section.

END OF SECTION
This page intentionally left blank.
SECTION 26 12 16
PANELBOARDS AND GENERAL PURPOSE DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General

1.02 REFERENCE STANDARDS

A. Federal Specifications (FS)
   1. FS W-C-375D Circuit Breakers, Molded Case; Branch Circuit and Service

B. Electrical Institute of Electrical and Electronics Engineers (IEEE)
   1. IEEE C37.13-2008 Low-Voltage AC Power Circuit Breakers Used in Enclosures
   2. IEEE C37.14-2002 Low-Voltage DC Power Circuit Breakers Used in Enclosures

C. National Electrical Manufacturers Association (NEMA)
   1. NEMA 250-2008 Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA AB 3-2006 Molded Case Circuit Breakers and Their Application
   3. NEMA PB 1-2007 Panelboards

D. National Fire Protection Association (NFPA)
   1. NFPA 70-2008 National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL)
   1. UL 50-1995 Enclosures for Electrical Equipment
   2. UL 67-1993 Panelboards
   3. UL 489-2002 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
1.03 SUMMARY

A. The Contractor shall provide panelboards and general purpose dry-type transformers, complete and operable, in accordance with the Contract Documents.

B. Integrated transformer and panelboard assemblies shall meet the requirements for both transformers and panelboards in this Section. Any exceptions shall be specifically noted on submittals.

C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer’s services.

1.04 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 - Submittals and Section 26 05 00 - Electrical Work, General.

B. RSN 26 12 16-1, Approval Data: Shop Drawings
   1. Transformers
      a. Dimension drawings
      b. Technical certification sheets
      c. Drawing of conduit entry/exit locations
      d. Transformer ratings, including:
         1) Voltage
         2) Continuous current
         3) Basic impulse level for equipment over 600 volts
         4) KVA
      e. Descriptive bulletins
      f. Product sheets
   2. Panelboards
      a. Breaker layout drawings with dimensions and nameplate designations
      b. Component list
      c. Drawings of conduit entry/exit locations
      d. Assembly ratings including:
         1) Short circuit rating
         2) Voltage
         3) Continuous current
      e. Cable terminal sizes
f. Descriptive bulletins
g. Product sheets
h. Installation information
i. Seismic certification and equipment anchorage details

C. RSN 26 12 16-2, Factory Test Report.
D. RSN 26 12 16-3, Operation and Maintenance Instruction Books.

PART 2 PRODUCTS

2.01 GENERAL

A. Transformers
   1. The transformers shall be dry-type, designed, manufactured, and tested in accordance with the latest applicable standards of ANSI and NEMA.
   2. Transformers shall be UL-listed and bear the UL label.

B. Panelboards
   1. Panelboards shall be dead front factory assembled. Panelboards shall comply with NEMA PB-1-Panelboards, as well as the provisions of UL 50 - Safety Enclosures for Electrical Equipment and UL 67 - Safety Panelboards. Panelboards used for service equipment shall be UL labeled for such use. Lighting panelboards shall be rated for 120/208 volt, 3 phase operation or 120/240 volt for single phase operation as indicated. Power panelboards shall be rated for 480 volts, 3 phase, 3 wire operation.
   2. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers.

2.02 TRANSFORMERS

A. Ratings
   1. KVA and voltage ratings shall be as indicated.
   2. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96 - Guide for Loading Dry Type Distribution and Power Transformers
   3. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:

<table>
<thead>
<tr>
<th>KVA Range</th>
<th>Maximum Sound Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 9 kVA</td>
<td>40 db</td>
</tr>
</tbody>
</table>
B. Construction

1. Insulation Systems
   a. Transformers shall be insulated as follows:
      1) 2 kVA and smaller: 150 deg C insulation system based upon 80 deg C rise.
      2) 3 to 15 kVA: 185 deg C insulation system based upon 115 deg C rise.
      3) 15 kVA and larger: 220 deg C insulation system based upon 150 deg C rise.
   b. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 deg C maximum ambient.
   c. Insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

2. Transformer windings shall be copper.

3. Transformers shall have four 2-1/2 percent taps, 2 above and 2 below 480 volts.

C. Manufacturers: Transformers shall be floor or wall-mounted type by General Electric, Eaton Electrical, Square D, or equal.

2.03 PANELBOARDS

A. Ratings

1. Panelboards rated 240 VAC or less shall have short circuit ratings not less than 10,000 amperes RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.

2. Panelboards rated 480 VAC shall have short circuit ratings not less than 25,000 amperes RMS symmetrical or as indicated by the Short Circuit Study, whichever is greater.

3. Panelboards shall be labeled with a UL short circuit rating. Series ratings are not acceptable.

B. Construction

1. Lighting and power distribution panels shall have copper busbars.
2. Breakers shall be one, 2, or 3 pole as indicated, with ampere trip ratings as required by the equipment. Breakers shall be quick-make and quick-break, inverse time trip characteristics, to trip free on overload or short circuit, and to indicate trip condition by the handle position. Panelboard circuit breakers at 480 VAC shall be individually lockable.

3. The panels shall have hinged doors with combination catch and latch. The front panels shall be so arranged that when the plates are removed, the gutters, terminals and wiring will be exposed and accessible. The doors shall have inner doors within the plates to have only the breaker operating mechanism exposed when they are opened. Live conductors and terminals shall be concealed behind the plates.

4. Panelboards shall be rated for the intended voltage.

5. Circuit breakers shall be interchangeable and capable of being operated in any position as well as being removable from the front of the panelboard without disturbing adjacent units. No plug-in circuit breakers will be acceptable.

6. Lighting and power distribution panels which are not part of a motor control center shall be constructed in accordance with Section 26 05 00 – Electrical Work, General. Panels shall have the necessary barriers, supports, and liberal wiring gutters. Trim screws shall be stainless steel. All panelboard parts of metal other than copper, aluminum, or stainless steel shall be cadmium plated. Panelboards shall be as manufactured by General Electric or Eaton Electrical.

7. Panelboards shall be UL listed except for special enclosures which are not available with UL listing.

8. Panelboards shall be suitable for use as service entrance as indicated or as otherwise required by the N.E.C. or the authority having jurisdiction.

PART 3 EXECUTION

3.01 GENERAL

A. Work of this Section shall be installed as indicated in Section 26 05 00 – Electrical Work, General.

END OF SECTION
This page intentionally left blank.
SECTION 26 29 23

VARIABLE FREQUENCY DRIVES

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A.  Cost:

1.  Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General.

1.02  DESCRIPTION
A.  Scope: This Section specifies low voltage variable frequency drive (VFD) systems. The VFD systems shall include variable frequency drives, control circuitry, protective equipment, and accessories as necessary to provide the specified functions. All variable frequency drives provided on the project shall be the product of a single manufacturer and provided in a factory supplied NEMA 12 rated enclosure.

B.  Variable frequency drives shall be sized and selected to operate with 480-V single-phase input and provide three-phase 480-V output to the gate actuators, rated for the site conditions and elevation.

C.  VFDs shown on the engineering plans, basic type and ratings, shall be provided and meet the requirements listed herein.

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 29 23-1, Specification:

1.  A copy of this specification Section, with addendum updates included, and all referenced and applicable Sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

C.  RSN 26 29 23-2, Catalog and Technical Data:

1.  Catalog and technical data indicating the equipment meets the specifications. Include information sufficient to verify that the VFD Supplier has met the specified functional requirements for the equipment specified in this Section and ascertained the equipment spatial requirements based on these requirements. This shall include panel layout drawings of the VFD’s.

D.  RSN 26 29 23-3, Motor Data Sheets:
1. Include motor data sheets from the driven equipment suppliers with all information required to verify that the VFD’s are coordinated with the specific requirements of each driven equipment application.

E. RSN 26 29 23-4, Diagrams:
   1. A copy of the contract document control diagrams and process and instrumentation diagrams, with addendum updates that apply to the equipment in this Section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required." Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

F. RSN 26 29 23-5, External Connection Diagram:
   1. External connection diagram showing function and identification of all terminals requiring field connections.

G. RSN 26 29 23-6, VFD Layout Drawings:
   1. VFD layout drawings, showing the front, side and top views, and installation dimensions and anchor holes.

H. RSN 26 29 23-7, Product Data:
   1. Applicable operation and maintenance information including safety precautions, startup, operation, and shutdown procedures.
   2. Preventive maintenance instructions.
   3. Step by step troubleshooting and diagnostic techniques to promptly isolate the cause of typical malfunctions including descriptions of the procedure and conditions being sought.
   4. Bill of material listing all components including manufacturer's catalog numbers.
   5. Component fabrication drawings consisting of detailed circuit schematics, wiring diagrams, printed circuit board drawings, and chassis layouts for all electrical and electronic components.
   6. Manufacturer's certification that controller can withstand fault conditions specified in paragraph 1.01 F.2 of this Section.
   7. Manufacturer's certification that VFD can withstand environmental conditions specified in paragraph 1.01 E.3 of this Section.
   8. Installation and replacement instructions.
9. List of recommended spare parts and supplies required for maintenance and repair.

10. Manufacturer's certification that the equipment has been properly installed, aligned, and tested; and meets all requirements for satisfactory performance under the conditions specified.

11. Manufacturer's instruction certification that instructions to operators have been completed.

12. Configuration parameters set up in the VFD.

I. RSN 26 29 23-8, Factory Certification:

1. Factory certification in writing that the drives will work with the motors in this specific application, stating the VFDs will operate with single-phase power in and provide the necessary three-phase power out to drive the gate actuators as depicted on the engineering drawings.

J. RSN 26 29 23-9, O&M Manuals for VFDs.

K. RSN 26 29 -23-10, MCC Drawings and Layout

1. Dimensional drawings.
2. Wiring schematics and wiring diagrams.
3. O&M manuals.
4. Bus ratings for each MCC section.

1.04 VFD SYSTEM RESPONSIBILITY:

A. The VFD’s specified in this Section shall be the product of a single manufacturer. Integrated VFDs in vendor supplied equipment may be of a different manufacturer, but shall adhere to these requirements. VFDs for specialty process equipment may be of a different manufacturer, provided all process equipment provided by supplier employs the same series and manufacture VFD throughout.

B. The Contractor shall submit letters of certification with the shop drawings from the VFD manufacturer or supplier, the motor manufacturer, the power cable manufacturer and the driven equipment manufacturer stating that they have reviewed each application and that the combination will satisfy the application duties required, for the actual motor sizes required, regardless of deviations from the scheduled "nominal horsepower."

C. VFDs shall be sized to accommodate the single-phase input operation while providing three-phase output to the motors operated. Contractor to provide a letter from the VFD manufacturer that the drives selected will operate at required. VFDs shall be UL listed for normal three-phase operation (input and output).
1.05 VFD FEATURES:

A. The VFD’s shall be provided with the following features:

1. Adjustable minimum/maximum frequency limits. Minimum frequency shall be adjustable from 6 to 40 hertz; maximum frequency shall be adjustable from 48 to 65 hertz.

2. Independent timed linear acceleration and deceleration functions, adjustable from 6 to 60 seconds.

3. Adjustable motor slip compensation based on motor current.

4. Terminal blocks for control and signal wires entering and leaving the controller and for associated controls.

5. Current limit adjustable from 50 to 150 percent of motor rating.

6. Automatic restart with defeat selector.

7. Capability of picking up a spinning load.

8. Modbus TCP communication capability, to be controlled and monitored via digital communications with SCADA/PLC.

1.06 FUNCTIONAL REQUIREMENTS:

A. General: The VFD shall convert 480 V, single-phase, 60 hertz nominal input power to a suitable three-phase voltage and frequency to cause a standard inverter duty squirrel-cage induction motor to run at a speed proportional to the analog input signal speed reference from the instrumentation system. Each VFD shall be provided with a dedicated and independent digital control panel with HMI display, referred to herein as a Pin Pad.

B. VFDs shall be mounted in a motor control center (MCC) assembly. The MCC shall be arranged as indicated on the engineering plans, with current ratings as required to meet the operational conditions shown.

C. Supply Power: The VFD shall operate continuously as specified with single-phase supply power from 440 V minimum to 504 V maximum, 60 hertz plus or minus 3 percent.

D. Ambient Conditions: The VFDs shall operate continuously at maximum load as specified with temperature of 32 to 95 degrees F and a humidity of 0 to 90 percent.

E. Power Factor: VFD systems shall have a displacement power factor of not less than 0.95 at any operating point.
F. Efficiency: Efficiency of the variable frequency drives shall be not less than 90 percent at 60 hertz output driving the specified maximum load. Efficiency shall be defined as follows:

\[
\text{Efficiency} = \frac{\text{POWER IN (watts)} - \text{LOSSES (watts)}}{\text{POWER IN (watts)}} \times 100\%
\]

where losses include control power losses, rectifier, intermediate circuit, inverter, fan, and output filter.

G. Frequency and Voltage Regulation: VFD inverter output frequency shall be regulated to within 0.6 hertz of the specified instrumentation signal/output frequency relationship. VFD inverter output voltage shall be regulated to within 1.0 percent of that value which will produce minimum motor heating at any operating frequency within the specified range.

H. Frequency Range: VFD shall be capable of continuous operation with the specified load at any frequency between 6 and 90 hertz. Where operation at 90 hertz is required, it may be assumed that this corresponds to the maximum specified load.

I. Rectifier Input Line Harmonics: Rectifier input line current harmonics shall not exceed the following:

<table>
<thead>
<tr>
<th>Order</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th</td>
<td>36</td>
</tr>
<tr>
<td>7th</td>
<td>16</td>
</tr>
<tr>
<td>11th</td>
<td>10</td>
</tr>
<tr>
<td>13th</td>
<td>6</td>
</tr>
<tr>
<td>17th</td>
<td>5</td>
</tr>
</tbody>
</table>

J. Converter Output Harmonics: Total output voltage harmonics to motor shall not exceed 5 percent.

1.07 PROTECTION AND ANNUNCIATION:

A. Overcurrent Protection: The VFD system shall provide adjustable electronic current limit. Current limit shall be accurate to within 1.0 percent and shall smoothly limit motor speed at whatever value is necessary to limit motor current to that value.

B. The VFD shall also provide motor running overcurrent protection in compliance with NFPA 70. This function may be included in the electronic overload circuitry if suitably UL labeled.

C. Short Circuit Protection: The VFD shall be fully protected against load and internal faults and shall be U.L.508C labeled as well as NEMA ICS 7.1 rated. Bolted, phase to phase, or phase to ground faults shall not damage the unit. In addition, these faults and/or internal
faults shall not create a hazard to property or personnel. Fault protection shall be based on a power source short circuit capacity of 42,000 A RMS symmetrical at the VFD power input terminals. Any impedance or other current limiting necessary to meet this requirement shall be provided as part of the VFD system, and any losses caused by current limiting devices shall be included in efficiency calculation for the VFD system.

D. Torque Sensing: Each VFD shall have an internal electronic torque sensing element which can be programmed to stop the VFD and fault in the event over torque is sensed when operating in either raise or lower direction.

E. Line Voltage: The VFD shall be protected against high and low line voltage on one or more phases.

F. Internal Faults: The VFD shall incorporate an internal fault monitoring system to detect malfunctions. This system shall be designed to protect the VFD from transient and sustained faults and to limit damage that may be caused by these faults.

G. External Faults: External fault requirements vary with the driven equipment. The VFD’s shall be configured as required to shut down upon actuation of any of these external faults and to also provide an indication of the nature of the fault. The VFD Supplier shall note that certain driven equipment suppliers will include thermistors and thermistor relays rather than snap action type switches. In those cases, the VFD’s shall include a 120 V AC power source for the thermistor relays and shall configure the VFD controls to accept a normally open rather than normally closed contact. In cases where the only external fault monitoring requirement is the motor thermal protection, the VFD shall include all components necessary to sense a contact opening or closing and disconnect the affected motor if the motor winding temperature exceeds maximum rated operating temperature. An indication of the fault shall be provided either via the unit mounted operator interface panel or by indicator lights. Where indicator lights are used, they shall include seal in provision with reset.

H. Control Panel Annunciation: The VFD shall be provided with a fault annunciation system, at the control, which shall indicate the cause of any shutdown. Annunciator shall identify the first fault in those cases where multiple faults occur between manual or automatic resets and shall be visible without opening the motor control center door. As a minimum, the following faults shall be annunciated:
1. External fault
2. Input power loss
3. DC bus undervoltage
4. DC bus overvoltage
5. Motor stalled
6. Motor overload
7. Drive overtemperature
8. Drive overcurrent
9. Ground fault
10. Output short
11. Drive controller hardware fault
12. Drive controller software fault
13. Drive configuration error

1.08 EXTERNAL CONTROL AND MONITORING:

A. General: Control and monitoring interface shall conform to the requirements specified in this Section. Internal control and signal circuitry in the VFD that connects external to the VFD shall be designed to prevent the transmission of voltage and/or current harmonics inherent in power converter operation. VFD contacts for external status monitoring or control shall be isolated and shall be rated not less than 2 amps resistive or 2 amps inductive at 115 V AC/30V DC. AC coils in the VFD shall be suppressed to limit inductive switching surges to less than 200 volts peak. DC coils shall be provided with free-wheeling diodes to limit inductive surges to 28 V peak.

B. Speed reference input: The VFD shall accept a digital (for those with digital connections) reference signal for speed control in the REMOTE mode. Speed control in the LOCAL mode shall be via a manual potentiometer or via keypad input from the VFD operator interface panel. The speed reference shall also be selected and set by the local PIN Pad in lieu of a remote input. Frequency reference shall be locally indicated via the VFD PIN Pad.

C. Speed output: The VFD speed signal output shall be available to the SCADA system via Modbus digital communications or by assignment of a 4-20mA output signal. The VFD output speed shall also be indicated locally by via the VFD operator interface panel.

D. Running: The VFD shall include a running status indication either on its operator interface panel or via push to test indicating lights mounted on the enclosure door. Also provide running status via an isolated contact output for remote indication of running status. Where indicated on the drawings or specified in this contract, the VFD shall include control provisions to operate a 120 VAC solenoid valve. An additional run contact shall be included for this where indicated on the Drawings. Run contacts shall actuate when the controller is running at or above the minimum speed setting. Also include the 120-V AC source for the solenoid valves.

E. Fault status: The VFD shall provide a common fault status isolated contact output for remote fault annunciation. In addition, the VFD shall include local indication of the fault either via an indicator on the VFD operator interface panel or via a push to test indicator light mounted enclosure door. The fault status shall actuate on any internal or external monitored fault that shuts down the VFD.

F. Local/remote status: The VFD shall allow the selection of exclusive command control including start, stop, and speed reference commands from either its unit mounted operator interface (LOCAL), or from externally wired inputs (REMOTE). The selection of this control shall be via a separate selector switch mounted on the enclosure. In addition to this, provide a discrete isolated contact output that indicates that the controller is operating in the remote mode.
G. External run command: VFD shall accept an external digital command to run or stop in the REMOTE mode, following a speed set point command from the PLC. While in automatic mode, the VFD shall follow speed set points provided by the PLC.

H. External wiring interface: Terminal blocks shall be provided for all external wiring requirements.

I. Ready: The VFD shall include a ready status indication either on its operator interface panel or via push to test indicating lights mounted on the enclosure door. Also provide ready status via isolated contact output for remote indication of ready status. The ready status shall indicate the availability of control power, no overload fault, permissive contacts are okay, and no other internal or external active faults.

1.09 MOTOR CONTROL CENTER (MCC) RATINGS

A. The MCC shall be rated for the system voltage as indicated on the contract drawings.

B. The MCC horizontal and vertical power bus bracing shall be rated to meet or exceed the available fault current as shown on the contract drawings, but shall not be less than 42,000 A rms symmetrical.

C. All MCC units shall have a full rated short-circuit rating that meets or exceeds the available fault current as shown on the contract drawings.

1. The use of series short-circuit current ratings shall be permitted only for panelboards; series short-circuit ratings for other types of units is not acceptable.

L. All circuit breakers used in the motor control center shall have full-rated short-circuit current ratings based on the applied MCC voltage.

M. Slash rated short-circuit interrupting ratings for circuit breakers are not acceptable except for branch circuit breakers in panelboards, and then only if the power system specified in the contract drawings is a Wye with a solidly grounded neutral.

N. The MCC shall provide Accessibility as defined by IEEE C37.20.7 ‘IEEE Guide for Testing Metal-enclosed Switchgear Rated up to 38 kV for Internal Arcing Faults’.

1.10 MCC ENCLOSURE

A. The MCC enclosure shall be NEMA 3R Type, non-walk-in, rated for direct sun exposure.

B. Each section shall be equipped with two full-metal side sheets to isolate each vertical section and to help reduce the likelihood of fault propagation between sections.

C. All interior and exterior surfaces shall be painted ANSI 49 medium-light gray. The vertical wireways and unit backplates shall be painted high-visibility gloss white.

D. All unpainted parts shall be plated for corrosion resistance.

E. Removable closing plates on each end of the MCC shall cover all horizontal bus and horizontal wireway openings.
F. Insulating sheets shall be provided on the inside of end closing plates for horizontal bus openings to help prevent burn-through of the end closing plate in the event that an internal arcing fault occurs in the horizontal bus compartment.

G. The enclosure shall provide Arc protection without the use of plenum on top of the structure.

1.11 MCC STRUCTURE

A. The MCC shall be of dead front construction and shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly. The systems shall be designed to allow for the addition of future sections at either end and to permit the interchanging of units.

B. Vertical sections shall be rigid, free-standing structures.
   1. Vertical sections shall have internal mounting angles running continuously within the shipping block.
   2. An external mounting channel that is required to maintain structure integrity is not acceptable.
   3. Vertical sections shall be 90 in. high, 20 in. deep and 20 in. wide, except where larger dimensions are required.

C. Vertical sections shall be provided with a removable steel lifting angle on all shipping blocks. The angle shall run the length of the shipping block.

D. Each standard section shall be capable of being subdivided into 12 usable, unit spaces.

E. Two-unit spaces shall constitute one space factor and shall be 13 in. in height.

F. One-unit space shall constitute one-half space factor and shall be 6.5 in. in height.

G. Horizontal wireways.
   1. Horizontal wireways shall be located at the top and bottom of the MCC
   2. Horizontal wireways shall be 6 in. in height and extend the full depth of the vertical section to allow maximum flexibility in locating conduit for MCC feeds and loads.
      a) Pull-boxes to extend the height of the top horizontal wireway by 12 in. shall be provided, if specified on the contract drawings.

H. Horizontal wireways shall be continuous across the length of the MCC, except where access needs to be denied due to electrical isolation requirements.

I. The horizontal wireways shall be isolated from the power bus.

J. The horizontal wireways shall have removable covers held in place by captive screws

K. Provide a full height vertical wireway, independent of the plug-in units, in each standard vertical section.
   1. The vertical wireway shall be isolated from the vertical and horizontal buses.
   2. The vertical wireway shall be covered with a hinged and secured door.
3. Wireway tie bars shall be provided.
4. Isolation between the wireway and units shall be provided.
5. Vertical wireway doors shall be provided with arc resistant latches to help keep the door latched in the event that an internal arcing fault occurs.

1.12 MCC BUS BARS

A. Horizontal Power Bus.
   1. The horizontal bus shall be rated as shown on the drawings
   2. The horizontal bus material shall be copper with tin plating
   3. The horizontal bus shall be supported, braced and isolated from the vertical bus with a high strength, non-conductive, non-tracking, glass polyester material
   4. For standard sections, the horizontal bus shall be continuous within each shipping block and shall be braced within each section
   5. Horizontal bus splices shall have at least two bolts on each side
   6. The horizontal bus shall be insulated by using a polypropylene flame-retardant wrap.

B. Vertical Bus.
   1. The vertical power bus shall have an effective rating of 600 A. If a center horizontal bus construction is utilized, then the rating shall be 300 A above and below the horizontal bus for an effective rating of 600 A. If a top or bottom mounted horizontal bus is utilized, then the full bus must be rated for 600 A.
   2. The vertical bus material shall be copper with tin plating
   3. The vertical bus shall attach to the horizontal bus with at least two bolts
   4. The vertical bus shall be continuously braced by a high strength, non-conductive, non-tracking, glass-filled polyester material and isolated from the unit spaces by a non-conductive, polycarbonate molded cover.
   5. The vertical bus shall be isolated from the horizontal power bus except where necessary to connect the vertical power bus to the horizontal power bus.
   6. Automatic shutters shall cover plug-in stab openings when units are removed.

C. Ground Bus.
   1. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.
   2. Provide an tin-plated copper 0.25 x 2 in. horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the drawings
   3. Provide a pressure-type mechanical lug mounted on the ground bus in the incoming line section.
   4. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stabs engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.
   5. Provide a copper vertical-unit load ground bus in each section that can accommodate plug-in units.
6. Provide a unit load connector on all units that require load wire connections. The load connector shall provide a termination point for the load ground conductor at the unit.

D. Neutral Bus.
1. In a 4-wire system with a main incoming device rated 400 A or less, if there are no neutral loads in the MCC, an incoming neutral termination plate in the MCC main device unit is acceptable in lieu of a horizontal neutral bus.
2. In a 4-wire system with a main incoming device rated more than 400 A, if there are no neutral loads in the MCC, an incoming neutral termination plate in the MCC main device unit that is connected to horizontal neutral bus in the section with the main is acceptable.
3. If neutral loads are specified within the MCC, provide neutral connection plates in sections with horizontal neutral bus as indicated on the contract drawings.
4. Horizontal neutral bus shall be provided in all sections.
5. Neutral bus rating shall be half of the horizontal power bus rating. For neutral loads that are served, Vertical neutral bus in 9 in. wireway shall be provided in sections with plug-in units as defined on the contract drawings.

1.13 QUALITY ASSURANCE

A. References:

1. This Section contains references to the following documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 519</td>
<td>Recommended Practices and Requirements for Harmonic Control in Electric Power Systems</td>
</tr>
<tr>
<td>NEMA 250</td>
<td>Enclosures for Electrical Equipment (1000 Volts Maximum)</td>
</tr>
</tbody>
</table>
B. Industry Standards:

1. The VFD shall comply with the applicable requirements of NEMA ICS 3 and 7 and additional standards referenced therein.

C. Regulatory Agency Approvals:

1. The VFD shall comply with requirements of NEC and UL. All VFD’s provided shall bear a UL 508 C label acceptable to the inspection authority having jurisdiction.

1.14 PRODUCT HANDLING

A. Where necessary to ensure against shipping damage, electronic assemblies or other fragile parts shall be removed from the VFD assembly and packed in suitable protective containers.

1.15 SHIPPING AND STORAGE

A. The equipment shall be protected during shipping and storage.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. The VFD’s shall all be from one of the following manufacturers:

1. ABB;
2. Allen-Bradley;
3. Siemens;
4. Eaton;
5. Siemens;
6. Dan Foss;
7. Or Equal
2.02 ENCLOSURES

A. General:
   1. As noted on the Drawings, variable frequency drives shall come from the manufacturer in outdoor rated NEMA 3R motor control center (MCC) enclosure.

2.03 VARIABLE FREQUENCY DRIVE

A. General:
   1. Controller shall include the following assemblies:
      a. Disconnect switch/circuit breaker
      b. Line fuses or circuit breaker
      c. Rectifier
   2. DC bus filter
   3. Inverter
   4. Control processor
   5. Thermal or electronic overload protection.
   6. Output reactors as specified.

B. Rectifier:
   1. The rectifier shall be uncontrolled full-wave silicon diode bridge.

C. DC Bus Filter:
   1. Filter shall include series inductive (dc link reactor) and shunt capacitive components to smooth the rectified wave form, and for reduction of the input line harmonics distortion.

D. Inverter:
   1. The inverter shall utilize volts/hertz control with programmable boost at low frequencies. Inverter shall be IGBT type with programmable carrier frequency initially set at not more than 4 kHz.

E. Overload Protection:
   1. Provide 3-phase motor overload protection in conformance with NEC requirements.
A. Each VFD shall have an interactive programming panel and HMI to permit set-up and adjustment of all VFD tuning parameters, indicate fault condition, permit manual monitoring and control of drive, and display the following operating parameters:

1. Motor speed in Hz or percentage of max speed.
2. Motor voltage
3. Motor current
4. Percent torque

B. The programming panel shall be mounted on the door of the VFD enclosure.

2.04 SPARE PARTS

A. The VFD manufacturer shall furnish one complete set of all components as spare parts for each size of controller supplied. The spare parts shall be labeled and packaged in a sturdy container suitable for storage. As a minimum, the spare parts shall include:

1. One complete VFD for each make and model provided.
2. One spare programming panel.

PART 3 EXECUTION

3.01 COORDINATION

A. Provide a fully coordinated drive system in accordance with the following:

1. The Contractor shall be responsible for coordinating the transfer of submittal information between the driven equipment suppliers and the VFD Supplier in a timely manner after notice to proceed. The Contractor shall assess the overall schedule impacts for the delivery of this equipment to the project site based on the project schedule analysis and shall establish the requirements and project timelines for submittals, manufacture, testing and delivery. It shall be the Contractor’s responsibility to effect a contract for delivery of the equipment under this Section that can be coordinated with the overall contract construction sequence.

2. The VFD Supplier shall be responsible for ensuring the VFD’s meet the performance requirements of the driven equipment based on the information provided. The VFD Supplier shall provide verification that this coordination has taken place by including the necessary driven equipment submittal information in their submittal package.

3.02 START-UP AND FIELD TESTING
A. The Contractor or VFD Supplier shall provide trained supervision during installation and startup service for all VFD’s. The service shall include inspection, final adjustments of configuration settings, operational checks, functional checks of all spare parts and a final report for record purposes. Each variable frequency drive shall be inspected and tested by factory-trained service technicians in accordance with the manufacturer's specifications and approved test procedure. A minimum of one day per VFD supplied shall be included for field start up and testing services. Final O&M documentation shall reflect any modifications made during this period. Startup and field testing shall also include any necessary coordination with the driven equipment supplier for VFD configuration tuning and adjustments that may be required for optimization and protection of the equipment.

3.03 TRAINING

A. A four-hour session of basic operation and maintenance training covering all sizes of controllers supplied shall be provided. Training shall be coordinated with the COR and shall be performed by a factory trained service technician at the plant site.

3.04 INSTALLATION

A. VFD systems furnished under this Section shall be installed per the manufacturer’s requirements.

END OF SECTION
This page intentionally left blank.
SECTION 26 32 10
ENGINE-GENERATOR SET

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General.

1.02 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)
   1. ASME BPVC, VIII - 2007 ASME Boiler and Pressure Vessel Code Section VIII – Rules for Construction of Pressure Vessels, Division I

B. International conference of Building Officials (ICBO)
   1. UBC-1997 Uniform Building Code

C. National Electrical Manufacturer’s Association (NEMA)
   1. NEMA 250-2008 Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA FU 1-2002(2007) Low Voltage Cartridge Fuses
   4. NEMA ICS 5-2000 Industrial Control and Systems: Control Circuit and Pilot Devices
   5. NEMA MG 1-2006 Motors and Generators (with Revision 1 - 2007)
   6. NEMA WC 3-1992 Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

D. National Fire Protection Association (NFPA)
   1. NFPA 30-2008 Flammable and Combustible Liquids Code
   2. NFPA 37-2006 Installation and Use of Stationary Combustion Engines and Gas Turbines
5. NFPA 90A-2009  Installation of Air Conditioning and Ventilating Systems

E. Underwriters Laboratories (UL)
1. UL 142-06  Steel Aboveground Tanks for Flammable and Combustible Liquids
2. UL-508  Industrial Control Equipment
3. UL 1008-2018  UL Standard for Safety Transfer Switch Equipment

1.03 SUBMITTALS

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

B. RSN 26 32 10-1, Approval Drawings and Data:
1. Detailed shop drawings for components, for both the generator set and ATS.
2. Commercial product data for components for both the generator set and ATS.
3. Electrical control diagrams, interconnection wiring diagrams, and schematics showing wire connections and conduit layout. Provide electrical control schematic diagrams in ladder-logic format.
4. O&M manual for generator set and ATS.

C. RSN 26 32 10-2, Final Drawings and Data:
1. Service manuals:
   a. Operating and maintenance instructions.
   b. Full-size prints of installation and detailed assembly drawings.
   c. Electrical schematics and wiring diagrams.
   d. Lubrication schedule.
   e. List of special tools.
   f. Parts catalog for components provided.
2. Electronic copies of drawings, schematics, and diagrams submitted in the service manuals.
3. Certified copies of mechanical and electrical tests.
4. Photographs: Including one side view of installed engine-generator set showing fuel system and one end view of engine-generator set after installation.

D. RSN 26 32 10-3, Quality Test Plan: Provide the site acceptance test plan per paragraph 2.07 – Contractor Source Quality Testing.
E. RSN 26 32 10-4, Quality Test Report: Provide a written report of the results of the site acceptance test plan executed under paragraph 3.03 – Contractor Field Quality Testing.

1.04 Design Requirements

A. Overview

1. In accordance with the specifications contained in this section and as shown on the engineering drawings, the Contractor shall design, furnish, install and commission one 550-kW diesel fueled, 480V, three-phase, backup standby generator, to include the generator starting system with batteries and charger, disconnect switch, electrically operated automatic transfer switch (ATS) in a single enclosure as depicted on the engineering plans. The generator, with a day-tank sized for a 48-hour operation at 50% loading, shall be mounted in a weatherized enclosure and installed outside as shown. The ATS and accessories shall also be installed in an outdoor weatherized enclosure and located in proximity to the standby generator. For maintenance purposes, a 300-kW load bank shall be provided as shown on the engineering plans.

2. The General Contractor shall supply and install:

   a. Single standby generator and fuel tank in an outdoor enclosure;
   b. Generator controls and ATS controls in an outdoor enclosure;
   c. Necessary wire, cable, conduits and supports.
   d. The standby generator shall include:
      1) Diesel fuel operated engine-generator
      2) Self-contained, weather-proof, fire rated, sound attenuated enclosure;
      3) Control panel, complete with local controls and Local/Remote selector switch;
      4) Resistive load bank with fused disconnect;
      5) Remote start in from a dry contact;
      6) Main circuit breaker, 900A, with minimum 42-kIA;
      7) Starting battery and charger;
      8) Exhaust system complete with silencer;
      9) Generator ventilation and cooling system complete with radiator, fans, pumps and jacket water heaters;
      10) All other equipment and facilities required for outdoor use;
      11) Above-ground skid base diesel fuel storage vessel (sized for minimum 48-hour, 50% loading operation), piping, valves, from the tank to the standby generator;
12) Diesel fuel tank, with 4-20 mA fuel level output signal scaled to indicate remaining fuel within the tank.

3. The standby generator shall have a remote mode operation allowing, through a dry contract, to start and initiate an ATS flop over operation. The SCADA system identified in Section 26 90 00 shall be interfaced to operate, starting and stopping, the standby generator.

1.05 EXTRA MATERIALS

A. Furnish the following spare parts in a metal box:
   1. Twelve engine oil filters.
   2. Six spare fuses of each type of fuse.
   3. Four air filter elements.
   4. Four engine fuel filters.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Materials and equipment specified in this section shall be products of:
   1. Cummins,
   2. Caterpillar,
   3. Onan Corporation,
   4. MTU/Detroit Diesel, or
   5. COR approved alternative.

2.02 ENGINE-GENERATOR SET

A. Fully operational system with associated control and electrical equipment installed complete.

B. Nameplate rating, minimum after derating: 550kW
   1. Ambient air temperature range: 0 Degrees F to plus 120 degrees F.
   2. Elevation: less than 3,3500 feet sea level.

C. Engine:
   1. 4-cycle.
   3. Speed: 1800 to 2100 rpm.
   4. Starting system: 12-volt DC or 24-volt DC with a positive solenoid starting motor.
   5. Governor: Electronic, adjustable from isochronous to a 5 percent droop.
6. Cooling system: Closed recovery, liquid coolant, with a unit-mounted radiator, belt-driven pusher fan, thermostatic temperature control, and engine-mounted circulating pump.

D. Power factor: 0.8 power factor.

E. Voltage: 480 volts.

F. Phase: Three phase, four wire.

G. Synchronization: 60 hertz.

H. Generator: Low reactance permanent magnet type.

I. Alternator:
   1. At full rated load without exceeding 125 degrees C temperature rise as defined by NEMA MG1-22.40 for ambient temperatures above 40 degrees C (104 degrees F).
   2. Winding insulation: NEMA MG1-1.65, Class B, F, or H.

J. Voltage regulator: Torque-matched with under-frequency and over-voltage protection and 3-phase voltage sensing.

K. Excitation system:
   1. Brushless.
   2. Shaft mounted.
   3. Full wave silicon diode rectifiers.

L. Frequency: Isochronous for all applied loads from no load to full-rated load.

M. Random frequency: Plus or minus 0.5 percent of its mean value for constant loads, from no load to full-rated load.

N. Transient voltage dip: Not to exceed 20 percent of the rated voltage.

O. Steady-state frequency: Voltage output shall be constant.

P. Voltage regulation: Plus or minus 1.0 percent between no load and full-rated load.

2.03 Enclosure and Layout

A. Each standby generator shall be housed in a self-contained fire rated outdoor enclosure that shall be acoustically designed per NFPA 110 so that the measured peak sound level shall not exceed 85 dBA radially at one meter from the engine exhaust pipe and the enclosure at any time.

B. The standby generator shall be cooled by air flow or use of radiators mounted on the enclosure.
C. The generator, engine, and all auxiliaries shall be mounted on a common skid in accordance with the specified seismic anchoring and restraint requirements. Connections to the engine shall be with flexible couplings.

D. A containment area, for engine oil, around standby generator shall be provided.

### 2.04 COMPONENTS

A. **Circuit Breaker.**
   1. Type: Thermal-magnetic.
   3. Trip: 900 amperes.
   4. Frame Size: 1200 amperes.

B. **Battery.**
   1. Voltage: 12 or 24 volt DC.
   2. Type: Lead-acid.
   3. Rated: 900 cold cranking amps.
   4. Accessories: One set of cables of the engine manufacturer's recommended size and type.
   5. Life expectancy: 6 years on float charge.
   6. Insulation: Size and type recommended by the manufacturer of the battery.

C. **Battery Charger.**
   1. Voltage: 12 or 24 volts DC.
   2. Current: 6 amperes and tapering to 0 ampere.
   3. Service power: 120 volts, single phase, 60 hertz.
   5. Meters: Direct-current voltmeter and ammeter, accuracy within 2 percent of full scale with an independently adjustable float and equalize charge.

D. **Control Panel.**
   3. Schematic wiring diagrams: Attached to the inside door of the control panel cabinet door showing the relationship and location of the controls and alarm contacts.
   4. Selector switch.
      a. Three position selector switch, labeled MANUAL-OFF-AUTOMATIC, and START-STOP pushbuttons, and a fault reset switch.
b. In the MANUAL position, manual startup or shutdown of the engine-generator set in response to START-STOP pushbuttons.

c. In the OFF position, prevention of manual or automatic operation of the engine-generator set and a lockout safety for periodic maintenance and resetting of the engine-generator.

d. In the AUTOMATIC position, starting and operating the engine-generator in response to breakers and the automatic engine-starting system controls.

5. Voltage rheostat: Within 3 percent of the rated output voltage, including gauge reading.

6. Gauges:
   a. Battery charge rate ammeter.
   b. Running time meter (hour meter) to log actual hours of engine operation.
   c. Oil pressure.
   d. Oil temperature.
   e. Tachometer.
   f. Engine coolant temperature.
   g. Dual range AC voltmeter and AC ammeter.
   h. Voltmeter/ammeter phase selector switch with an off position.
   i. Fuel-level indication meter.

7. Controls and controller positions: Clearly marked.

E. Alarm contacts and illuminated annunciation lamps.

   1. Form C type contacts wired to terminal blocks in the engine-generator control panel, to close and indicate the following conditions:
      a. Engine-generator running.
      b. Engine-generator shutdown.
      c. Engine-generator overcrank shutdown.
      d. Engine-generator overspeed shutdown.
      e. Engine-generator high coolant temperature shutdown.
      f. Engine-generator low coolant temperature.
      g. Engine-generator low oil pressure shutdown.
      h. Low fuel level in the main fuel tank.

F. Cranking Controls.

2. Oil-pressure bypass switch: Bypass the engine oil-pressure protective switch for the duration of the cranking interval to permit engine-generator startup.

G. Shutdown Controls.
   1. Conditions.
      a. High engine coolant temperature.
      b. Low coolant level.
      c. Low oil-pressure.
      d. Overspeed.
      e. Failure to start after the stipulated number of cranking attempts.
   2. Contacts: Dry signal output annunciation, rated 10 amperes at 120 volts AC.

H. Exhaust System:
   1. Flexible air duct section: Between engine-generator and building in accordance with NFPA 90A.
   2. Flexible Exhaust Connector: Spiral or bellows type.
   3. Exhaust Piping: Carbon steel with sweeping long-radius elbows.
   4. Rain Cap: Installed on the discharge end of the exhaust pipe.
   5. Condensation Trap and Drain valve: Installed before muffler.
   7. Exhaust thimble with bird screen.

I. Fuel System:
   1. Double Containment Fuel Pipe System, UL approved.
      a. Seamless standard weight black steel inner fluid carrier pipe.
      b. PVC (Polyvinyl Chloride) containment pipe.
      c. Installed between fuel tank and day tank as shown on the drawing.
      d. Interstitial leak detection system installed on tank.
      e. Pipe Sizes: In accordance with manufacturer's recommendations based on kilowatt rating, lift, and run requirements of engine-generator set.
   2. Flexible fuel line sections: Connecting between the fuel tank pipe and the day tank and between the day tank pipes and the engine-generator set.
   3. Storage (day) tank design:
      a. Skid base, located beneath the generator;
      b. Capacity: Sized for minimum 24-hours of operation at 25% load;
      c. Double-wall construction or provide secondary containment skirt;
Accessories: Strainer, float controls, pump, fuel level gauge, vent line, alarm contacts, drain petcock, and immersion heater;

4-20 mA fuel level indicator;

A control to shut off the heater element in the day tank when the fuel level drops below the element. Heating supply available is 120VAC.

2.05 ELECTRICAL EQUIPMENT

A. Automatic Transfer Switch (ATS)

1. General:
   a. The transfer switch, complete with all timers, relays, and accessories, shall be UL-listed under Standard UL 1008 and approved for use on emergency systems. The UL listing shall include the specific amperage ratings that are called for on the drawings.
   b. Have a withstand capability and closing ratings of 42,000 A.
   c. Completely wired, assembled, and tested by the manufacturer at the factory to ensure compatibility and to completely test the assembly.
   d. Provide a 1200 A transfer switch as shown on the drawings that is rated for the standby generator full load current rating of amperes at 480-V, three-phase, three-pole, 4 wire, 60 Hertz AC normal and emergency.
   e. Capable of switching all classes of load and rated for continuous duty when installed in non-ventilated enclosures.
   f. Provide exercise timer, automatically actuated, to permit weekly programming of engine generator test runs under load. If the emergency source should fail during the exercise period, and if normal power is available, the switch shall immediately restore to normal.
   g. Auxiliary contacts shall be provided to monitor the status of the ATS.
   h. Listed and rated as service equipment.

B. Transfer Switch Construction:

1. Inherent 3-pole, non-switched neutral type with all poles on a common shaft.

2. Double-throw actuated by two electrical operators momentarily energized and connected to the transfer mechanism by a simple over center type linkage with a minimum transfer time of 400 MSEC. Provide an adjustable pneumatic timer, 0 to 60 seconds, on delayed equipment transfer switch.

3. Capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.

4. Open Transition: The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions.
without the use of hooks, latches, magnets, or springs and shall be silver tungsten alloy protected by arcing contacts with magnetic blowouts on each pole.

5. Equipped with safe manual operators that are designed to prevent injury to the operating personnel if the electrical operation should suddenly become energized during manual transfer. The manual operator shall provide the same contact transfer speed as the electrical operator in order to prevent a flashover caused by switching the main contacts too slowly.

6. Include pilot lights on the enclosure door to indicate the switch closed on normal or emergency, and four auxiliary contacts on the main shaft, two closed on normal, and two closed on emergency. Load test switch to simulate normal power failure. All relays, timers, control wiring, and accessories shall be front accessible.

7. Voltage Sensing: Provide the automatic transfer switch with voltage sensing relays for each phase. Connection of these sensing relays shall be made to the normal power input terminals of the transfer switch. Voltage range shall be field adjustable.

8. Include a two-position selector switch to select either automatic or manual transfer operation with pushbuttons to transfer to emergency and re-transfer to normal.

9. Install each automatic transfer switch in an enclosure with locking hinged door conforming to NEMA ICS and complying with the requirements of UL 508.

10. Main terminals requiring field wiring connections shall be suitable for copper wiring.

11. Automatic transfer switches shall be suitable for satisfactory performance when installed for operation at 4500-feet altitude, 40°C high and minus 20°C low ambient temperature, 90 percent relative humidity.

12. Color of the finish coat of paint shall be manufacturer’s standard.

C. Unassigned Auxiliary Contacts

1. One set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

2.06 NAMEPLATE

A. Location: Attached to control panel.

B. Inscribe the following:

1. Ratings: Kilowatt and Kva, rpm, single-phase, 60 hertz, Voltage, full load current.

2. Engine: 4-cycle engine, fuel type, number of cylinders.

3. Name and address of manufacturer.

2.07 CONTRACTOR SOURCE QUALITY TESTING

A. Perform mechanical, electrical, and operational tests to confirm that equipment meets specification requirements and applicable codes, standards, and regulations.

B. Furnish test equipment and factory test supervisor.
C. Perform testing in presence of the Government Inspector.

D. Notify COR at least 5 days in advance when tests are to be performed.

E. Documentation:
   1. Date and sign.
   2. Identify specific feature being tested.
   3. Include test results and items such as: rated loads, power factor, ambient temperature, altitude, and fuel grade under which the test is performed.
   4. Submit as part of final data.

F. Conduct testing against a 0.8 power factor.

G. Factory tests to include the following:
   1. Full load test: Conducted and documentation provided per NFPA 110, paragraph 5-13.2.5.
   2. Cycle crank test: Conducted and documentation provided per NFPA 110, paragraphs 5-13.2.8 and 5-13.2.9.
   3. Vibration:
      a. Loads: 50, 75, and 100 percent of nameplate rating.
      b. At each of the loads, conduct a vibration test and document engine-generator set vibration in mils (peak to peak).
      c. Acceptable level of vibration: Vibration tolerance not greater than 5 mils (peak to peak), at full-rated operating speed, as measured in any direction (horizontal, vertical or axial) on the main frame, engine, generator, and associated components.
      d. If vibration exceeds this tolerance, properly balance and/or provide vibration isolators to reduce vibrations to an acceptable level prior to shipping.

H. Test generator in accordance with NEMA MG 1. Demonstrate and document that electrical properties of generator excitation system, voltage regulation system, engine governor system, illuminated annunciators, and controls are acceptable for intended purpose and are in accordance with specification requirements

I. Make adjustments as required and retest until unit functions properly.

J. Correct defects demonstrated by the above tests by and at the expense of the Contractor to make the equipment fully operational to the satisfaction of the COR.
PART 3 EXECUTION

3.01 INSTALLATION
A. Install engine-generator set in control building as shown on drawings.
B. Lubricate and winterize equipment in accordance with manufacturer’s recommendations.
C. Install engine-generator set according to manufacturer’s instructions and as shown on the drawings.

3.02 PAINT AND PROTECTIVE COATINGS
A. Coat engine-generator set equipment in accordance with Manufacturer’s recommendations.
B. Coat fuel tank and fuel piping in accordance with manufacturer standard recommendations.

3.03 CONTRACTOR FIELD QUALITY TESTING
A. Perform mechanical, electrical, and operational tests to confirm that equipment meets specification requirements and applicable codes, standards, and regulations.
   1. Furnish test equipment and on-site test supervisor.
   2. Perform testing in presence of the COR.
   3. Notify COR at least 5 days in advance when tests are to be performed.
   4. Conduct on-site testing of engine-generator unit after complete installation of equipment.
   5. Documentation:
      a. Sign and date.
      b. Identify specific feature being tested.
   6. Include test results and items such as rated loads, power factor, ambient temperature, altitude, and fuel grade under which the test is performed.
B. On-site test.
   1. Conduct on-site test and document per NFPA 110, paragraph 5-13.2.3.
   2. Test: Approved by COR.
   3. Correct defects disclosed by the tests, or vibration which is detrimental to the equipment, to the satisfaction of the COR.

3.04 TRAINING
A. Provide 8-hours of onsite training at the project site to instruct Government and operating personnel in systems and operations of the engine-generator set and fuel tank equipment.
END OF SECTION
This page intentionally left blank.
SECTION 26 50 00
LIGHTING, INTERIOR AND EXTERIOR

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in price offered in the schedule for Complete Electrical System, Section 26 05 00 - Electrical Work, General.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this Section:
   2. Certified Ballast Manufacturer (CBM).
   5. Underwriters Laboratories, Inc. (UL):
      a. 595 Standard for Safety Marine-Type Electric Lighting Fixtures.
      b. 924 Standard for Safety Emergency Lighting and Power Equipment.

1.03 SUBMITTALS

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

B. RSN 26 50 00-1, Lighting Material: Lighting electrical schematic, depicting the control panel, dimming units, and overall wiring of the lighting fixtures and controls:

   1. Lighting Control Contactor/Panel:
      a. Catalog data sheet.
      b. Bill of material comprising the lighting contactor.
      c. Schematic and wiring diagrams.

   2. Luminaires:
      a. Catalog data sheets and pictures.
b. Luminaire finish and metal gauge.

c. Lens material, pattern, and thickness.

d. Candle power chart 0 to 90 degrees.

e. Lumen output chart.

3. Lamps:
   a. Voltages.
   b. Colors.
   c. Approximate life (in hours).
   d. Approximate initial lumens.
   e. Lumen maintenance curve.
   f. Lamp type and base.

4. Ballasts:
   a. Wiring diagram.
   b. Nominal watts and input watts.
   c. Input voltage and power factor.
   d. Starting current, line current, and restrike current values.
   e. Temperature rating.
   f. Efficiency ratings.

5. Lighting Poles:
   a. Material
   b. Length and diameter
   c. Manufacturer cutsheet and part number.
   d. Structural calculations verifying compliance with wind and ice loading requirements.

C. RSN 26 50 00-2, Lighting Schematic as-built: As built lighting electrical schematic diagram.
1.04 QUALITY ASSURANCE

A. UL Compliance:
   1. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART 2 PRODUCTS

2.01 LUMINARIES, EMERGENCY LIGHTS, AND EXIT SIGNS

A. See Light Fixture Schedule on Drawing.

B. Alternative fixtures are allowed provided they are equivalent to those listed on the luminaire schedule.

C. Include factory furnished installation accessories.

2.02 LAMPS

A. See Light Fixture Schedule. Not fixtures requiring dimmable features.

B. All lamps/bulbs shall be of the LED type. No CFL fixtures, without LED bulb replacement, will be acceptable.

2.03 BALLASTS

A. General

   1. Meet requirements for fixture light output, reliable starting, radio interference, total harmonic distortion, electromagnetic interference, and dielectric rating.

   2. Certified by electrical testing laboratory to conform to Certified Ballast Manufacturer's specifications.

   3. Ballasts shall be able to produce reliable starting of lamps at 10 degrees F at 90 percent of nominal line voltage.

B. LED

   1. LED-based lights are required.

2.04 LIGHTING CONTROL

A. Manual Switch, ON/OFF.

   1. Provide where indicated on Drawings.
B. Manual Switch, AUTO/OFF/MANUAL
   1. Provide where indicated on Drawings.
   2. When the switch is in AUTO position the outdoor lights shall be controlled by
      photocell. When the switch is in MANUAL position the lights shall be controlled
      manually.

C. Three-Way Switch
   1. Provide where indicated on Drawings.

D. Occupancy Sensor
   1. Provide occupancy sensor switches in all spaces shown on the lighting plan. Occupancy
      sensors shall have an adjustable timer unit set at installation and shall shut off lighting
      power in the event no occupancy is detected.

E. Photocell
   1. Automatic ON/OFF switching,
   2. Shall not be affected by rain, vibration, or temperature changes.
   3. Field Adjustable Settings: ON at dusk and OFF at dawn.
   4. Time delay feature to prevent false switching.
   5. Provide for all exterior wall mounted lights.

F. Lighting Control Panel
   1. Lighting Control Contactors mounted in a NEMA 1 enclosure shall be per the
      engineering plans.
   2. Light Dimming Control panel shall be provided to modulate lighting in fish rearing
      areas to follow outdoor natural lighting, dimming and going off at night and at full
      intensity on sunny days. Provide outdoor lighting sensor compatible with lighting
      control panel (either 0-5V, 0-10V, or 4-20 mA output) to use as the control point for
      dimming lighting.
PART 3 EXECUTION

3.01 INSTALLATION

A. Install and adjust fixtures, lamps, ballasts, fuses, receptacles, and photoelectric units in accordance with manufacturer's recommendations.

B. Provide proper hangers, pendants, and canopies as necessary for complete installation at locations indicated on Drawings.

C. Install plumb and level. Mounting heights shall be as shown.

D. Install each luminaire outlet box with galvanized stud.

3.02 CLEANING

A. Remove labels and markings, except UL listing mark.

B. Wipe luminaires inside and out to remove construction dust.

C. Touch up all painted surfaces of luminaires with matching paint ordered from manufacturer.

END OF SECTION
This page intentionally left blank.
SECTION 26 90 00

SCADA CONTROLS AND AUTOMATION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in price offered in the schedule for Complete Electrical System,

   a. Fabrication, delivery, and installation of PLC/Control enclosure as specified herein and on the drawings, including assigning necessary I/O channels and redlining engineering PLC schematic drawings.

   b. PLC and HMI programming, factory acceptance testing (FAT), and commissioning the controls, development software licenses, necessary for the installation and commissioning of SCADA. Laptop required for commissioning to be provided during commissioning, but shall not become property of the Government.

   c. PLC control panel fabrication, factory acceptance testing (FAT) of the PLC control panel, site commissioning SCADA controls, and providing SCADA HMI hardware (video keyboard and mouse). Costs for field installation, including setting in place and field wiring shall be included under Section 26 05 00 – Electrical Work, General and all accompanying Division 26 specifications.

   d. Modifying the existing HMI computer display to incorporate identical screens as provided with the Reuse SCADA PLC/HMI, and network the two systems into a single HMI center for the facility. Provide all necessary software licensing as required to expand the existing HMI system as required.

   e. Providing detail control panel wiring diagrams and redline of engineering plans. Redlining of drawings includes adding cable labeling to the schematic plans and wiring diagrams.

1.02 SCOPE OF WORK

A. Contractor to provide a Reuse facility Supervisory Control and Data Acquisition (SCADA) system as specified herein. Contractor shall employ a qualified integrator/engineer experienced with PLC/HMI software programming, logic controls, VFD programming, instrumentation selection and installation, Ethernet Control Networks, and configuring data historian applications.

B. Contractor shall design, fabricate and deliver controllers for the reuse and solids pump operation, flow monitoring, modulating pumps to manage flow as shown on the
engineering plans and/or specified herein, and integrate them into a central SCADA system.

C. Contractor to integrate all third-party vendor supplied control and monitoring systems, into the facility wide HMI scheme, using discrete I/O interfacing.

D. Contractor shall coordinate its work with the USBOR and any other contractor hired by the USBOR performing work in or near the Project site.

E. Contractor shall provide detail control panel wiring diagrams and redlining of engineering plans. Redlining of drawings includes adding cable labeling and cable conductor sizes to the schematic plans and wiring diagrams.

F. Contractor to network and integrate the new Reuse SCADA system PLC and HMI into the existing hatchery HMI screens and auto dialer, modifying the existing HMI PC to include all the screens and information available at the Reuse PLC.

1.03 REFERENCE STANDARDS

A. The SCADA/HMI system and various controllers shall be designed and fabricated in accordance with the following standards:

1. National Electrical Manufacturers Association (NEMA):
   a. 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
   b. AB 1 Molded Case Circuit Breakers and Molded Case Switches.
   c. ICS 2 Industrial Control Devices and Systems: Controllers, Contactors, and Overload Relays Not More than 2000 volts ac or 750 volts.
   d. WD 1 General Requirements for Wiring Devices.


3. Underwriters Laboratories, Inc. (UL):
   a. 486E Standard for Safety for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors
   b. 489 Standard for Safety Molded-Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures
   c. 508 Standard for Safety for Industrial Control Equipment

4. Instrumentation, Systems, and Automation (ISA) Standards and Guidelines


c. ANSI/ISA-61804-3 (104.00.01)-2007 Function Blocks (FB) for Process Control - Part 3: Electronic Device Description Language (EDDL).

d. ANSI/ISA-TR61804-4 (104.00.02)-2007 - Function Blocks (FB) for Process Control - Part 4: EDD Interoperability Guideline

e. ANSI/ISA-62381-2011 Automation Systems in the Process Industry - Factory Acceptance Test (FAT), Site Acceptance Test (SAT), and Site Integration Test.


1.04 SUBMITTALS

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

B. RSN 26 90 00-1, Pre-installation HMI & PLC programming:

1. Provide the following for review 120 days after notice to proceed:

   a. Initial HMI and PLC programming developed, including images of each HMI screen and description, to be used at factory acceptance testing.

   b. Control network diagram depicting the automated control system devices and addressing schemes, including all directly communicated IP VFD or vendor supplies stand-alone control systems.

   c. Device IP address assignments shall be depicted on the diagram. This diagram shall be considered confidential and not widely available to other Contractor employees.

   d. List of I/O assignment for each I/O brick, and a short description of the function. The list of I/O assignment shall be provided to USBOR in Excel format.
e. List of alarm points, both discrete and analog, and the range of normal operation as appropriate, provided to USBOR in Excel format, along with a proposed designation as Critical or Non-critical.

f. Provide a copy of the software and documentation as outline in paragraph 1.08 – Software Documentation.

C. RSN 26 90 00-2, Factory Acceptance Testing (FAT) test plan and outline,
   1. to be provided with notice of scheduled FAT 20 days prior to execution. Test plan shall contain check list of I/O and functionality to be demonstrated during the FAT.

D. RSN 26 90 00-3, Pre-Commissioning HMI and PLC programming:
   1. Provide a copy of revised HMI and PLC programming, including images of each HMI screen prior to field deployment of the HMI system, 15 days after completion of Factory Acceptance Testing.

E. RSN 26 90 00-4, Commissioning Procedure:
   1. Twenty days prior to scheduled site commissioning, Contractor to provide a commissioning test procedure for review and approval by the USBOR.

F. RSN 26 90 00-5, Detailed Control System Narrative,
   1. Include descriptive text with illustrations detailing operations of the SCADA interface and manual control functions. Descriptions shall include, but not be limited to, interface screens with snap-shots, description of any popup screens, navigation means for getting to various screens, troubleshooting screens dedicated to troubleshooting network and I/O issues, local/remote and automatic/manual operations, alarm list and alarm explanation.

G. RSN 26 90 00-6, Detailed Wiring and Schematic Drawings,
   1. Provide a copy of detailed wiring and schematic drawings with terminal numbers and wire/cable numbers. The schematics and wiring diagrams shall identify all external cable names. Wiring diagrams shall identify and show relay contacts used and not used. Wiring diagrams shall depict point-to-point terminal wiring.

H. All software applications developed shall be delivered in hard copy printouts and on two universal serial bus (USB) jump drives.

1.05 FACILITY AND SCADA DESCRIPTION

A. INTRODUCTION:
   1. Leavenworth Hatchery presently has a monitor only SCADA system consisting of a central HMI PC running AB FactoryTalk application, Master Terminal Unit
Pilot Circular Tanks and Solids Handling
Leavenworth National Fish Hatchery Solicitation No. 140R1020R0012

(MTU), and eleven Remote Terminal Unit (RTU) based on the Micrologix 1100 PLC. The central PC HMI/workstation consists of the following:

a. Dell Precision Workstation - Windows 10 Professional, i7 processor, 16GB ram, 256GB SSD, Primary
b. NIC for PLC Ethernet comm, Secondary NIC for remote access over internet
c. FactoryTalk View SE - 100 display license
d. FactoryTalk View Studio (development)
e. RSLogix 500 PLC programming software
f. TopView Alarm Notification software - 250 tag license
g. Grandstream UCM6202 VOiP to analog phone line converter (i.e. Ethernet to POTS)
h. RSView32 application to FactoryTalk View SE 64-bit

2. A new PLC with HMI for the Reuse System shall be provided and integrate into the existing SCADA monitoring scheme, using similar hardware and software, to maintain the common applications and materials. The Reuse PLC shall consist of a Rockwell Compactlogix series hardware. Embedded with the PLC enclosure will be a touchscreen Windows 10 Professional PC running a dedicated application of FactoryTalk providing the local HMI function.

3. Contractor to provide licensing for the following:
   a. Reuse PLC programming software installed on the HMI touchscreen PC
   b. Enhanced licensing on the central HMI PC as necessary to add Reuse screens and network the two systems
   c. Any other software licensing required for the development, deployment, operation, and maintenance of the SCADA as designed by the integrator.

B. Standby Generator:

1. A standby diesel generator and automatic transfer switch (ATS) shall provide automatic backup power in the event of loss of utility power. The ATS and standby generator shall be connected to the PLC to monitor status and allow SCADA to monitor status of backup power and to initiate generator and ATS operation through the HMI.

C. Flow Meters:

1. Flow meters are strategically located within the reuse water flow system and used to monitor flow and allow adjustments to the flow by the facility operator. Flow meters are externally power via the AC system and provides a 4-20 mA signal scaled to the flow. Integrator has the option of using Modbus serial communication to integrate the flow meters into the Reuse SCADA system.

D. Variable Frequency Drives (VFDs):
1. Variable frequency drive shall be monitored by the SCADA PLC and allow for manual control and setpoint. The VFDs shall be networked to the SCADA via Modbus TCP or other approved digital communication protocol.

E Instrumentation:

1. Pressure and temperature transducers shall be loop powered devices, sourced at the PLC cabinet and provide 4-20 mA signals to the PLC. Water quality instrumentation may require separate controllers or transmitters using 120VAC power and shall provide a 4-20 mA signal to the PLC.

1.06 SCADA-HMI OVERVIEW

A. INTRODUCTION:

1. Leavenworth hatchery Reuse system and solids handling system first and foremost be operable manually without a functioning SCADA PLC. Individual controllers, VFDs, and standalone equipment will have local control panels or interfacing allowing operators to manually adjust flow and other settings locally. The lack of an operable PLC may deprive operating personnel of a central location where all facility status information is displayed, along with loss of data logging functions (by remote monitoring), however, the operator will always have manual control of the flow indication on the central control panel, independent and outside of the PLC/HMI.

2. Automation systems refer to standalone controller, PLC, or VFD with programming to perform a specific function independently of operator intervention, based on last operator setting. SCADA system refers to the umbrella monitoring and display function achieved by networking each automation system into a single controlled and monitored HMI.

3. The facility SCADA system shall be comprised of a PLC, touchscreen HMI display monitor, centralized and remote I/O along and communications, an assortment of distributed intelligent electronic devices (IED), instrumentation, control devices, network switches, and discrete instrumentation (i.e. flow, temperature, levels, etc.), displaying alarm and event data, and initiating an automatic phone dialer to hatchery personnel in the event of a critical alarm condition, as depicted and called out on the engineering plans.

4. When automatic operation of components or systems is in use initiate alarms when operation deviates outside operator adjustable operating bands.

B. Reuse SCADA PLC/HMI

1. Hardware:

a. The Reuse HMI shall be embedded with the SCADA-PLC enclosure located in the Reuse 100 building as indicated on the plans. The Reuse
SCADA PLC cabinet shall contain the PLC, network devices, terminal blocks, I/O bricks, and accessory equipment. Manual control switches, display meters, and indicator lights shall be mounted on the exterior door of the enclosure as shown. The SCADA HMI display shall be solid color touch screen monitor with keyboard and mouse, located on the SCADA-PLC enclosure door.

2. PLC Application
   a. The PLC shall be programmed to provide the monitoring and automated features as described herein. The PLC shall use the discrete and analog input and outputs to interface with various instrumentation and equipment. The PLC shall also digitally communicate with selected IEDs, such as VFDs and UV units.

3. HMI Application
   a. The HMI application shall be developed using the Rockwell FactoryTalk programming software. The HMI application shall have numerous screens dedicated for special purpose and facility systems. Screens shall consist of color graphics developed to logically display information to hatchery personnel. The screens shall be reviewed by the COR, or COR representative, and approved. Contractor shall work with USBOR to arrange and modify screens to meet USBOR and operating personnel needs.

4. Data Historian
   a. The FactoryTalk application will use the inherent data logging function, logging all instrumentation and runtimes of all pumps, blowers, and other motors. The inherent logging feature shall be used to log and store alarm data, including time when alarm event occurs, when cleared, and when acknowledged.

C. Serial Modbus Communication
   1. TCP/IP Modbus communications shall be used between PLC and VFDs or other IEDs, as indicated on the engineering plans.

D. Instrumentation
   1. An assortment of instrumentation shall be provided by the Contractor, either standalone or included with vendor supplied equipment (such as the actuators), and include level sensors, flow meters, and other sensors. Each of these shall use analog (4-20mA) signals to communicate directly with the PLC. Contractor has the option to digitally connect instrumentation which is able to communicate digitally with the PLC.

E. Monitoring and Alarm
1. Primarily the function of the PLC and HMI is to provide overall monitoring of the process flow and water quality. The HMI shall display alarms and status of all instrumentation and equipment on various screens logically arranged. New alarm events shall be displayed to make them easily seen over other information until acknowledged or cleared. Alarms shall be grouped into two categories: 1) Critical which must be addressed immediately and 2) Non-critical, which can be addressed on a more routine basis. All critical alarms will initiate an auto dialer operation, calling a list of up to four phone numbers and play one of at least four different alarm messages.

2. Alarm monitoring shall include at minimum the following:
   1. Loss of Instrumentation signal
   2. Loss of Communication with IED.
   3. Loss of PLC
   4. Low O2 Pressure
   5. Low Air Pressure
   6. High Temperature
   7. Low Tank Level
   8. Low Sump Level
   9. Loss of Flow
   10. UV Unit Alarm
   11. UV Unit Not Running
   12. MSDF Alarm
   13. MSDF Not Running
   14. VFD Fault
   15. VFD Not Ready

F. Manual Control Panel

1. Through the HMI and PLC operation, the facility operator shall be capable of manually operating all pumps, blowers, and starting/stopping the ultraviolet disinfecting units. Screens shall be developed to allow for manual operation of all devices controlled by the PLC. In manual mode, the equipment will be set to a fixed mode and speed operation.

G. Automated Control

1. Automation functionality shall include operation of the following:
   1. Operation of the RW make up water valves (RW-VLV-100 & RW-VLV-200) to maintain water level the MHT-100 and MHT-200.
   2. Timed cycle operation of the PSP-1000 solids pump valve as set through the HMI by the facility Operator.

H. Integrate with Existing HMI PC
1. All screens developed for the Reuse PLC-HMI shall be imported to the existing HMI PC located in the administrative office building. Data on the screens shall be transmitted from the local Reuse HMI PC, over a fiber network link as shown on the plans, using inherent features of the FactoryTalk application. In the event of loss of communication with the Reuse HMI occurs, the Central HMI shall so indicate on the display.

1.07 SYSTEM ARCHITECTURE

A. The SCADA system shall be configured as described above and shown on the engineering plans.

B. The SCADA system shall monitor tank water elevations, pump and flow operation for all blowers and pumps, water treatment equipment, providing status information, logging data, and initiate alarms as appropriate, on the HMI.

C. The SCADA system shall receive operator settings and commands from facility personnel via the touch screen HMI.

D. Alarm notification shall be displayed on the HMI and through an auto dialer. SCADA shall develop alarm messages and a table within the HMI for inputting cell numbers for automatic test messaging when SCADA is connected securely to the Internet.

E. Where time delays or setpoints are used for flow control or alarm initiation in the SCADA system; allow these fields to be adjusted from the operator displays on the HMI.

F. When automatic operation of components or systems is in use, initiate alarms when operation deviates outside of operator adjustable operating bands.

G. The FactoryTalk HMI application will interface with the existing FactoryTalk application at Leavenworth, and provide duplicate screens on the HMI as is provided in the hatchery office building.

1.08 SOFTWARE DOCUMENTATION

A. Provide overview description of the SCADA system configuration and operations relating to control software and HMI application prepared by Contractor’s Integrator. Provide explanation for each HMI screen page and how it is to be understood and operated. Include how setpoints can be changed and entered using the HMI to local control systems. Level of details shall be suitable for the technician assigned to operate the equipment under normal conditions. How alarms, current and historical, will be accessible to the operator, and how historical data will be searched and displayed.

B. Printout of HMI and PLC coding or pictorials, where practical, fully annotated with network numbers and descriptions, addresses of all contacts and coils, I/O numbers, and verbal description of each rung’s function or how each function block works. Program shall liberaly use subroutines to breakout functions and communications that operate on
an interrupt time cycle. The drawings and logic/function code shall correlate by using the same device labeling convention in both HMI/PLC applications and on the drawings.

C. Two jump drives copies of software documentation information outlined above.

D. All documentation shall be written in English.

1.09 SYSTEM INTEGRATOR (EMPLOYEE OR SUB) QUALIFICATIONS

A. Integrator of the automated control system shall be located in U.S.A. and shall be available for direct telephone contact during normal working hours of the USBOR. All communications, verbal or written, between UFWS, USBOR, and Integrator shall be in English.

B. Integrator shall have specialized experience and knowledge in the design, assembly, testing, installation and service of SCADA-based control systems of a similar scale and complexity to this Project.

C. Lead integrator shall have 10 years automated design and programming experience, and an understanding and knowledge of Rockwell/Allen Bradley Compactlogix PLC and FactoryTalk HMI programming.

1.10 SOFTWARE LICENSE TRANSFER

A. All drawings and documentation shall become the property of the USBOR. All commercial application software (PLC/HMI, alarming, etc.) purchased for the Project shall be licensed in the name of USBOR and become the property of the USBOR. Any restrictive “revocable use” language or “license to use” terms will not be acceptable. One licensed copy of each commercial development software shall be provided. Laptop computer provided for only during commissioning and checkout.

B. Application software, documentation, control algorithms, and programming specifically generated for this Project shall not be copyrighted, encrypted, nor coded, nor be considered “intellectual property” of the designer/supplier. The USBOR reserves the right to use any or all software application developed under this contract in operating, maintaining, updating, or troubleshooting as necessary. USBOR may alter any PLC/HMI, or control application provided by Contractor as deemed necessary after the Warranty Period has expired.

C. Supplier shall maintain and archive a copy of all PLC/HMI programs as a backup, available to USBOR, for the life of the system. System updates that may be necessary to enhance program efficiencies or correct program errors shall be provided and installed at no extra cost to the USBOR as soon as such updates are identified and become available.

D. All program updates relating to HMI/PLC, and controls shall be calibrated, debugged, and tested using system simulation equipment at the factory prior to customer delivery.
1.11 TRANSIENT IMMUNITY

A. All electronics shall be immune from false operation or failure from high voltage, high frequency transients which may be conducted in the control circuitry and power supplies. To reduce transients coupled from external sources, shielded cables shall be used for connecting to external low-voltage signals. Surge suppression devices shall be included on all inductive devices. The Contractor shall assume, however, that high voltage, high frequency transients will persist in the external circuitry. The Contractor shall isolate these circuits by means of solid state optically coupled or transformer coupled isolation amplifiers.

B. All inductive devices, such as relays and solenoids shall be provided with surge suppression devices to limit surge voltages which may be generated when the coil circuits are interrupted. All electronics shall be designed and tested for surge withstand capability in accordance with IEEE standard 472 (ANSI C37.90a).

C. AC power circuits shall be surge protected to meet the requirements of IEEE 587.

1.12 WARRANTY

A. Contractor shall warrant the SCADA system functionality for one full year from the date of commissioning and shall provide technical support to field troubleshoot and correct as required to address any functions which have been specified, or are inherently required to meet specified functionality, that have not been met. This includes software alternations or modifications as well as hardware modifications or changes required. Onsite support, if required, will be coordinated with the USBOR and costs associated with the integration technical support shall be the responsibility of the Contractor. Contractor shall not be responsible for costs associated with USBOR employees participating in the troubleshooting and modifying as required.

B. Warranty for all control hardware shall be for two years post commissioning. Contractor shall bare the expense of any replacement or repair of control hardware that fails to perform within its specification, or fails to meet specified functional requirements, two years post commissioning of the facility. Control hardware selected by the Contractor which fails to meet specified functional requirements shall be replaced with devices or hardware that will meet the requirements and shall be physically replaced by the Contractor at Contractor’s expense.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Hardware, including that from sub suppliers, which is new, shall be of the highest quality, reliable, complete, tested, fully documented, properly installed, and which has been proven in a power plant environment or industrial environment. All hardware shall be the latest offering by respective manufacturers at the time of bid award.
B. All devices shall be rated for continuous duty. This particularly applies to processors, power supplies, displays, and data storage devices.

C. All components shall be suitable for outdoor operation (when in enclosed in weatherized cabinet) at temperatures between 10- and 110-degree Fahrenheit. The value of resistors, capacitors, and other passive components shall be marked on the device. Documentation shall be provided for the specific hardware furnished. The intent, operation, and design of the hardware shall be easily understood. Documentation of a general or generic nature is not acceptable. All documentation shall be clear, concise, and complete with references as appropriate.

D. Power Supplies shall be high efficiency switched power supplies rated for at minimum 150% of the final total load placed on the power supply, not the design load. Power supply input and output voltage rating shall be rated as required. Dual redundant power supplies shall be provided within the PLC and HMI enclosure.

E. UPS or backup battery shall provide continuous uninterrupted power to the DC power supplies within the PLC and HMI enclosure.

F. Interposing Relays shall be used to protect the I/O brick input and output modules from external shorts. Interposing relays control power shall be sourced by the device operating the relay. Interposing relays controlled by the PLC shall use 24 VDC coils or 120VAC coils as indicated. All interposing relay contacts shall be rated for 120 VAC (5 A) and 24 VDC (5A) minimum. Interposing relays shall be of the socketed type and replaceable without removing any wiring.

2.02 SCADA NETWORK HARDWARE

A. Network Switches: shall be TrendNET or approved equal. All network switches shall be configured as shown on the plans, and manufactured by the same manufacturer. Mixing of network switches within the control network will not be allowed.

2.03 HUMAN-MACHINE INTERFACE TERMINAL

A. HMI graphic display shall be developed within the touch screen PC, 21”, SXVGA, 1920x1080 pixel, computer running Windows 10 professional. The computer shall be a Nematron model as identified on the engineering plans, or approved equal.

B. Functional Requirements: HMI graphic display shall include functions and related screen displays, as follows:

1. Overall Project Status;
2. Flow setpoint;
3. Flow data;
4. Water quality instrumentation data (temperature, pressure, levels, pH, etc.);
5. Water treatment equipment status and operational run time;

6. Pump flow equipment status and operational run time;

7. Maintenance and troubleshooting screens;

8. Alarm and events, with alarm history

9. Alarm Messages (System alarms as listed herein and as required by the integration design).

2.04 CONTROL PANEL FABRICATION

A. The SCADA-PLC enclosure shall be a stand-alone floor-mounted control cabinet as shown on the engineering plans.

B. Individual controllers as specified herein shall be fabricated and supplied as indicated on the engineering plans and integrated with the SCADA system.

C. Control wiring and termination facilities shall be in accordance with the following requirements:

1. Provide the required electrostatic and magnetic shielding to reduce noise for low-level signal circuits. Both wiring and instruments associated with low-level signal circuits shall be equipped to provide such shielding.

2. Instrumentation, communication and transducer cables shall use stranded copper conductors of minimum No. 22 AWG, or as specified in Section 26 05 10 – Conductors and Cables.

3. Provide interposing relays to protect the I/O modules input and output channels.

4. All control and signal wiring in and out of the control panel shall terminate on high density terminal blocks manufactured by Phoenix Contact or approved equal, fused as indicated on the engineering drawings.

5. All spare I/O shall be wired to terminal blocks for future uses.

6. The control branch circuits shall be protected by 250-volt fuses or circuit breakers having the required interrupting capacity. All fuses shall be of indicating type.

7. Each branch circuit shall be identified with a nameplate.

8. Provide a copper ground bus with a compression lug at each end for field connection.

9. Provide SCADA-PLC enclosure LED light fixture controlled by door switch for interior lighting.
10. Provide sufficient bending space for external wiring and cables at the bottom of the cabinet.

11. Provide 20% spare terminal block points.

12. Contractor fabricate the enclosures as depicted in the engineering plans, wiring per the engineer schematic drawings.

D. INSTRUMENT LOOP POWER SUPPLY

1. Provide DC power supplies of sufficient rating required for the level sensors, flow sensors and signal transmitters located external to the control panel and as depicted on the plans. Loop power supplies shall be rated at least 1.5 times maximum calculated full load current.

E. AUXILIARY RELAYS AND SWITCHES

1. Unless otherwise noted, all relays shall be dust-tight construction and contacts shall have a minimum rating of 120VAC, 5 A. This includes all control, level, pressure, temperature, flow, and limit switches, as well as contacts on relays and other devices.

2. All pushbuttons shall be of the heavy-duty oil-tight type.

F. Low Voltage Circuit Breakers

1. Internal power distribution circuit breakers shall be provided for AC and DC control circuits.

G. Terminal Blocks

1. Terminal Blocks for signal and lower power control shall use screw type high density terminals, knife switch or fused, for all internal PLC control cabinet wiring, such as available from Phoenix Contact or approved equal. Source circuits shall use fused terminals or circuit breakers rated for the application. Analog circuits shall use fused terminals to protect field devices. Integrator shall design in each cabinet a minimum of 20% spare terminals or each type when laying out the quantity of terminals required for the application.
2. Terminal blocks for power circuits, 120/240 VAC: Rated for 600 volts, 20 Amps, molded block type, DIN-rail mountable, screw connected, suitable for 24 – 8 AWG conductors.

3. Arrange the terminal blocks by inputs and outputs for field wiring. Terminal blocks used for internal wiring shall not be co-mingled with external terminal blocks.

4. Manufacturer: Phoenix Contact or approved equal.

PART 3 EXECUTION

3.01 FACTORY ACCEPTANCE TESTS

A. Perform factory acceptance testing (FAT) of hardware and software prior to shipping hardware to the site. Notify COR 15 days in advance of factory testing so that UFWS and USBOR representatives may witness testing.

B. All HMI screens shall be available during FAT checkout for inspection and feedback. Setup at least one VFD drive and motor starter operation for testing in the factory.

C. I/O channel testing shall also be part of the FAT checkout, and performed separately and prior to system testing. CONTRACTOR shall allow USBOR to witness checkout of all I/O channels by monitoring the HMI maintenance screen and verifying the I/O operation, for all main and remote PLC I/O channels. Contractor shall apply discrete I/O signals (both analog and discrete) to verify all I/O channels are properly displayed on the HMI maintenance screens.

D. Upon completion of the factory checkout, Contractor shall provide USBOR with a report documenting how the function requirements were demonstrated. A copy of the simulation application developed for the site checkout shall be provided to the USBOR.

E. Shipment of control panels is contingent upon acceptance of the factory test by the USBOR.

3.02 SITE ACCEPTANCE TESTING

A. Upon installation of SCADA and control hardware, develop checklist and perform wiring and I/O checkout, similar to the I/O checkout performed under the FAT.

3.03 ON-SITE TECHNICAL ASSISTANCE AND CERTIFICATION

A. Provide qualified system integrator/engineer during installation and startup of automation and control equipment in accordance with Section 01 60 60 – Facility Startup. Various manufacturer's field service engineers (such as for VFDs, HMI screens, or other provided systems) shall also be provided to assist in assembly, connections, adjustments, programming, software loading and updates, and coordinate field interconnection and testing of all associated equipment and devices provided.
B. Confirm and test remote secure access.

C. Provide for information the following testing procedures 2 weeks in advance of any site testing:

1. Individualized startup and commissioning procedures for all stand-alone equipment and systems furnished.

2. Provide an I/O and communication tag checkout procedure, verifying all I/O and communications with the PLC are working and correctly assigned.

3. Verify calibration of flow meters, level sensors and other instrumentation.

4. Provide an alarm list checkout sheet to be used during all phases of commission and checkout.

5. Perform individual equipment and stand-alone system checkout.

6. Perform PLC I/O field verification, testing all I/O channels for correct wiring and calibration and communications with network devices, witnessed by the USBOR or USBOR Representative.

7. System wide commissioning and operational checkout shall begin after commissioning and testing of the individual equipment and stand-alone systems, and I/O checkout. Facility wide automation and control verification shall demonstrate system operation in both the manual mode through the HMI and under SCADA control.

8. Test automated control features.

END OF SECTION
DIVISIONS 27 THROUGH 30 – NOT USED
This page intentionally left blank.
DIVISION 31 – EARTHWORK
This page intentionally left blank.
SECTION 31 11 00
SITE PREPARATION (CLEARING AND GRUBBING)

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Site Preparation:
1. Payment: Lump-sum price offered in the Price Schedule.
   a. 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.

1.03 SUMMARY
A. In its initial move onto the Site, the Contractor shall protect existing fences, structures, and associated improvements, streets, and utilities near construction areas from damage due to boulders, trees, or other objects dislodged during the construction process and clear, grub, strip; and regrade certain areas, in accordance with the Contract Documents.

1.04 SITE INSPECTION
A. Prior to moving onto the Site, the Contractor shall inspect the Site conditions and review maps of the Site and facilities delineating the Hatchery’s property and right-of-way lines.

PART 2 PRODUCTS
Not Used

PART 3 EXECUTION

3.01 PRIMARY SITE ACCESS
A. The Contractor shall develop any necessary access to the Site, including access barriers to prohibit entry of unauthorized persons.

B. Utility Interference: Where existing utilities interfere with the work, notify the utility owner and the COR before proceeding in accordance with the General Conditions.
3.02 CLEARING, GRUBBING, AND STRIPPING

A. Construction areas shall be cleared of grass and weeds to at least a depth of 6-inches and cleared of structures, pavement, sidewalks, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the work, create a hazard to safety, or impair the subsequent usefulness of the work, or obstruct its operation. Loose boulders within 10-feet of the top of cut lines shall be incorporated in landscaping or removed from the Site. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction.

B. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove stumps, roots, buried logs, and other objectionable material. Septic tanks, drain fields, and connection lines and any other underground structures, debris or waste shall be removed if found on the Site. Objectionable material from the clearing and grubbing process shall be removed from the Site and wasted in approved safe locations.

C. Unless otherwise indicated, native trees larger than 3-inches in diameter at the base shall not be removed without the COR’s approval. The removal of any trees, shrubs, fences, or other improvements outside of rights-of-way, if necessary for the Contractor's choice of means and methods, shall be arranged with the COR of the property, and shall be removed, as part of the work.

3.03 OVEREXCAVATION, REGRADING, AND BACKFILL UNDER FILL AREAS

A. Over excavation is not anticipated for the project. Should unforeseen sight conditions warrant over excavation, contact the COR immediately.

END OF SECTION
SECTION 31 23 19
DEWATERING

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.

B. Unwatering: Control and removal of ponded, seeping, or flowing surface water or emerging subsurface water from excavated surfaces and from precipitation within and adjacent to excavations and construction zones using channels, ditches, gravel drains, grave blankets, pipe, sumps, and discharge lines. Includes control and discharge of effluent waters.

1.03 SUMMARY

A. The Contractor shall dewater trench and structure excavations, in accordance with the Contract Documents. The Contractor shall secure all necessary permits to complete the requirements of this Section of the Specifications.

B. Dewatering is not anticipated for this project however Contractor shall have dewatering equipment and plan in place as set forth in this specification if groundwater is encountered.

1.04 SUBMITTALS

A. RSN 31 23 19-1, Dewatering Plan:
   1. Prior to commencement of excavation, the Contractor shall submit a detailed plan and operation schedule for removal of water from excavations. The Contractor may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater or unwater the excavations at all locations and times. The Contractor's dewatering plan is subject to review by the COR. The plan shall include:
      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.
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.
f. 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, and storativity of materials, and groundwater levels.
   3. Efficiency of pumps, collectors, and discharge systems.

B. Water content and water levels in subsurface materials vary with location, depth, and material.

1.07 QUALITY CONTROL

A. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.
PART 2    PRODUCTS

2.01 EQUIPMENT

A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the Site.

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.

B. Where excavation for pipe trenches and excavation for structures extends below ground-water level, dewater the portion below the water level in advance of excavation.

1.02 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. Use sandbags, sand and gravel filter bedding, and other materials and techniques to control localized seepage.

1.03 DEWATERING

A. Accomplish dewatering by use of sufficient number of properly screened wells or other equivalent methods.

B. Dewater to prevent loss of fines from the foundation, maintain stability of excavated slopes and bottom of excavations, and to result in construction operations being performed in the dry.

C. Pipe and Structures:
   1. Before excavating to final grade for pipe and structures, bring the water level to an elevation at least 3 feet below the bottom of the pipe and structures.
   2. Maintain this water level until pipe has been placed and the structures completed, and backfill has been placed around and over the pipe and about the structures.
   3. After the pipeline and structures have been completed and backfilled, subject to the approval of the COR, allow ground water to rise about the pipe and structures.
   4. Control pumping operations so that the water level rises slowly and uniformly along the entire length of each reach of pipe and about each structure.
SECTION 31 30 00
EARTHWORK

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Excavation, Backfill and Compacting for Structures:
   1.  Payment: Lump sum price offered in the Price Schedule.
       a.  Includes:
            1)  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; placing and compacting backfill.
            2)  Haul of necessary material.  Material from required excavation
                used for backfill.
            3)  Cost of furnishing water and moistening materials.

1.02  DEFINITIONS

A.  Additional Excavation:  Excavation beyond specified lines as directed by the CO 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  REFERENCE STANDARDS

A.  WSDOT – Washington Department of Transportation, Standard Specifications for Road,
    Bridge, and Municipal Construction, 2020

1.04  SUMMARY

A.  The Contractor shall perform earthwork as indicated and required for construction of the
    work, complete and in place, in accordance with the Contract Documents.

1.05  CONTRACTOR SUBMITTALS

A.  RSN 31 30 00-1, Contractor's Detailed Excavation Plan:
   1.  The Contractor, prior to beginning any trench or structure excavation 5 feet deep
       or deeper, shall submit to the COR and shall be in receipt of the COR's written
       acceptance of the Contractor's detailed plan showing the design of shoring,
       bracing, sloping of the sides of excavation, or other provisions for worker
protection against the hazard of caving ground during the excavation of such trenches or structure excavation.

2. The Contractor’s plan shall be prepared and signed and sealed by a Professional Engineer experienced in the field of geotechnical engineering and licensed in the State where the work is being performed.

3. The COR’s acceptance of said plan will be for verification of submittal of the plan with this requirement.

PART 2 PRODUCTS

2.01 FILL AND BACKFILL MATERIAL REQUIREMENTS

A. General

1. Fill, backfill, and embankment materials shall be selected or shall be processed and clean fine earth, rock, gravel, or sand, free from grass, roots, brush, other vegetation and organic matter.

2. Fill and backfill materials that are to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

B. Suitable Materials

1. Materials not defined below as unsuitable will be considered as suitable materials and may be used in fills, backfilling, and embankment construction, subject to the indicated requirements.

2. If acceptable to the COR, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

3. Mixing or blending of materials to obtain a suitable composite is the Contractor's option but is subject to the approval of the COR.

4. The Contractor shall submit certification to the COR that the chloride concentration in imported materials within the pipe zone does not exceed 100 ppm, when tested in accordance with the requirements of AASHTO T291-94 – Standard Method of Test for determining Water-Soluble Chloride Ion Content in Soil.

5. Suitable materials may be obtained from on-Site excavations, may be processed on-Site materials, or may be imported.

6. If imported materials are required by this Section or are required in order to meet the quantity requirements of the work, the Contractor shall provide the imported materials as part of the work.

C. Types of Suitable Materials. The following types of suitable materials are defined:
1. Type BD: Sandy backfill and bedding material shall meet the requirements of WSDOT Gravel Backfill for Pipe Zone Bedding, Section 9-03.12(3)

2. Type AS (Aggregate Subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. This material is often specified and required underneath the base course of asphaltic or concrete pavement. Crushed rock aggregate subbase shall meet the requirements of WSDOT aggregates for ballast and crushed surfacing, specifically specification 9-03.9(1) – Ballast.

3. Type C (Civil Fill) (Not for use beneath concrete foundations): Civil Fill may consist of imported materials or natural on-site materials. Civil Fill may be a combination of Type AS material, Type GF, or Type SF material, or any mixture thereof, except as shown. Some mixing, removal of oversized particles (greater than 4-inch diameter) and/or removal of other unsuitable material may be required.

4. Type DRC (Drain-rock Coarse): Crushed rock or gravel meeting the following gradation requirements.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-inch</td>
<td>100</td>
</tr>
<tr>
<td>1-1/2 inch</td>
<td>90 - 100</td>
</tr>
<tr>
<td>1-inch</td>
<td>20 - 55</td>
</tr>
<tr>
<td>3/4-inch</td>
<td>1 - 15</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 3</td>
</tr>
</tbody>
</table>

5. Type DRG (Drain-rock Graded): Drain-rock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The drainrock shall have a sand equivalent value greater than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The material shall be uniformly graded and shall meet the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4-inch</td>
<td>90 – 100</td>
</tr>
</tbody>
</table>
6. Type GF (Granular Fill 3/4-inch minus): Angular crushed rock, stone or gravel, and sand conforming to the requirements listed in WSDOT specification 9-03.9(3) – Crushed Surfacing – Top Course and Keystone gradation.

7. Type SF (Structural Fill / Foundation Base): Crushed rock structural fill material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for fill material required beneath concrete foundations. This material is often specified and required directly underneath the finish course of asphaltic or concrete pavement. At the option of the Contractor, the grading for either the 1-1/2 inch maximum size or 3/4-inch maximum size gradation may be used material beneath concrete foundations. The material shall meet the requirements of WSDOT specification 9-03.9(3) – Crushed Surfacing – Base Course Gradation.

8. Type SN (Sand Fill): Sand material shall meet the requirements of WSDOT specification 9-03.13 – Backfill for Sand Drains

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8-inch</td>
<td>40 – 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25 – 40</td>
</tr>
<tr>
<td>No. 8</td>
<td>18 – 33</td>
</tr>
<tr>
<td>No. 30</td>
<td>5 – 15</td>
</tr>
<tr>
<td>No. 50</td>
<td>0 – 7</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 – 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8-inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>90 - 100</td>
</tr>
<tr>
<td>No. 16</td>
<td>50 - 80</td>
</tr>
<tr>
<td>No. 50</td>
<td>5 - 25</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 5</td>
</tr>
</tbody>
</table>
9. Type T (Topsoil): Stockpiled topsoil material which has been obtained at the Site by removing soil to a depth not exceeding 1 foot. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

D. Schedule: Earth materials shall be as indicated in the Contract Drawings. Where clear definition in the drawings is not defined, the following schedule may be used to define acceptable fill materials.

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Material Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Zone (unless indicated as Trench Zone)</td>
<td></td>
</tr>
<tr>
<td>Small PVC (&lt; 6-inch dia), HDPE (ADS) Drain Pipe, &amp; other pipes &lt; 3-inch dia.</td>
<td>GF, SN</td>
</tr>
<tr>
<td>Other PVC, VCP, HDPE Pipe</td>
<td>GF</td>
</tr>
<tr>
<td>Trench zone backfill except as identified below</td>
<td>C, GF or an approved mixture thereof.</td>
</tr>
<tr>
<td>Final backfill for irrigated unpaved areas</td>
<td>T</td>
</tr>
<tr>
<td>Trench zone and final backfill under structures</td>
<td>Same as pipe zone except where concrete encasement is required</td>
</tr>
<tr>
<td>Asphalt &amp; Concrete Pavement Aggregate base &amp; Gravel Road base materials</td>
<td>DRG</td>
</tr>
<tr>
<td>Asphalt &amp; Concrete Pavement Aggregate subbase &amp; Gravel Road subbase materials</td>
<td>AS</td>
</tr>
<tr>
<td>Backfill around structures (including berms)</td>
<td>C, or an approved mixture</td>
</tr>
<tr>
<td>All other structures</td>
<td>DRG</td>
</tr>
<tr>
<td>Top 6-inches of reservoir roofs, embankment fills, or backfills around structures</td>
<td>T</td>
</tr>
</tbody>
</table>

E. Unsuitable Materials.

1. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of PT, OH, CH, MH, or OL shall be classified as unsuitable materials.
2. In addition to the materials identified as unsuitable in the table above, a material shall be classified as unsuitable if one of the following conditions is present;
   a. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.
   b. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

2.02 MATERIALS TESTING

A. Samples
   1. Soils testing of samples submitted by the Contractor shall be performed by the Contractor selected testing laboratory and approved by the CO.

B. Analysis per Contractor’s Testing laboratory at Contractor’s cost
   1. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.
   2. Determination of sand equivalent value will be performed using ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
   3. Unified Soil Classification System
      a. References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487.
      b. The Contractor shall be bound by applicable provisions of ASTM D 2487 in the interpretation of soil classifications.
   4. Testing for sulfate, resistivity, and pH shall be performed in accordance with WSDOT testing requirements.
   5. Testing for chloride shall be performed in accordance with AASHTO T291-94 – Standard Method of Test for determining Water-Soluble Chloride Ion Content in Soil.

2.03 IDENTIFICATION TAPE

A. Unless otherwise indicated, identification tape shall be placed above buried pipelines that are not comprised of magnetic components at least in part.

B. Identification tape shall be 6-inches wide, yellow in color, composed of polyethylene, and provided with an integral metallic wire.

C. Tape shall be labeled with CAUTION – BURIED UTILITIES.
PART 3    EXECUTION

3.01  EXCAVATION AND BACKFILLING - GENERAL

A.   General

1.  The Government reserves the right, during progress of work, to vary slopes, grades, and dimensions of excavations from those specified.

2.  Excavate structure foundations to elevations shown on the drawings or established by the COR.

3.  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.

4.  Perform excavation in the dry.

5.  Except when specifically provided to the contrary, excavation shall include the removal of materials, including obstructions that would interfere with the proper execution and completion of the work.

6.  The removal of such materials shall conform to the lines and grades indicated or ordered.

7.  The Contractor shall furnish, place, and maintain supports and shoring that may be required for the sides of excavations.

8.  Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable state safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

B.   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.

C.   Removal and Exclusion of Water


3.02  OVER-EXCAVATION

A.   Not Indicated

1.  When ordered to provide additional excavation in areas deeper and/or wider than required by the Contract Documents, the Contractor shall over-excavate to the dimensions ordered and backfill to the indicated grade.

B.   Neither Indicated nor Ordered
1. Any over-excavation carried below the grade that is neither ordered or nor indicated shall be backfilled and compacted to the required grade with the indicated material as part of the work.

3.03 EXCAVATION IN LAWN AREAS

A. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the Hatchery and the COR at no additional cost to the Government.

3.04 EXCAVATION IN VICINITY OF TREES

A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations.

3.05 ROCK EXCAVATION

A. It is expected that nearly all excavation can be accomplished using conventional equipment as follows:

1. If material is encountered which the Contractor believes cannot be excavated by conventional equipment, the COR shall be notified immediately. The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the COR confirms in writing that the conventional equipment cannot perform at the production rates indicated, the excavation will be considered rock excavation.

B. Rock excavation shall include removal and disposal of the following items:

1. Boulders measuring 1/3 of a cubic yard or more in volume;
2. Rock material in ledges, bedding deposits, and un-stratified masses that cannot be removed using conventional equipment as defined herein and which require systematic drilling and blasting for removal;
3. Concrete or masonry structures that have been abandoned; and,
4. Conglomerate deposits that are so firmly cemented that they possess the characteristics of solid rock and cannot be removed using conventional equipment as herein defined and require systematic drilling and blasting for removal.

C. Scope and Payment

1. Payment will be made in accordance with a negotiated price.

D. Explosives and Blasting: Blasting will not be permitted.

3.06 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The Contractor shall be responsible for the removal and disposal of excess excavated material.
B. The Contractor shall obtain required permits and landowner and agency approvals for disposal of excess excavated material on-Site or off-Site and shall submit copies of related documents to the COR for information prior to disposal. Contractor shall pay costs associated with the removal and disposal.

### 3.07 BACKFILL

**A. General**

1. Backfill shall not be dropped directly upon any structure or pipe.
2. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.
3. Backfill around water-retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

**B.** Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after water is removed from the excavation and the trench sidewalls and bottom have been dried to a moisture content suitable for compaction.

**C. Pre-Placement Conditions**

1. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have any loose, sloughing, or caving soil and rock materials removed.
2. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

**D. Layering**

1. Backfill materials shall be placed and spread evenly in layers.
2. When compaction is achieved using mechanical equipment, the layers shall be evenly spread such that when compacted each layer shall not exceed 9 inches in thickness.

**E.** During spreading, each layer shall be thoroughly mixed as necessary in order to promote uniformity of material in each layer.

**F. Moisture Content**

1. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.
2. Where the backfill material moisture content is too high to permit the indicated degree of compaction, the material shall be dried until the moisture content is satisfactory.
3.08 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION AND BACKFILL

A. Excavation Beneath Structures and Embankments
   1. Except where indicated otherwise for a particular structure or where ordered by the COR, excavation shall be carried to an elevation 12 inches below the bottom of the footing or slab and brought back to grade with compacted materials acceptable for placement beneath structures.
   2. The area where a fill or embankment is to be constructed shall be cleared of vegetation, roots, and foreign material.
   3. Where indicated or ordered, areas beneath structures or fills shall be over-excavated.
   4. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched.
   5. When such over-excavation is indicated, both the over-excavation and the subsequent backfill to the required grade shall be performed by the Contractor at no additional cost to the Government.
   6. After the required excavation or over-excavation for fills and embankments has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 90 percent of maximum density.

B. Excavation Beneath Paved Areas
   1. Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness.
   2. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.
   3. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement.
   4. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

C. Compaction of Fill, Backfill, and Embankment Materials
   1. Each layer of backfill materials as defined herein, where the material is graded such that 10 percent or more passes a No. 4 sieve, shall be mechanically compacted to the indicated percentage of density.
   2. Equipment that is consistently capable of achieving the required degree of compaction shall be used, and each layer shall be compacted over its entire area while the material is at the required moisture content.
3. Each layer of coarse granular backfill materials with less than 10 percent passing the No. 4 sieve shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of obtaining the required density in 2 passes.

D. Flooding, ponding, and jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.

E. Heavy Equipment
1. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the vertical depth of the fill above undisturbed soil at that time.
2. Hand-operated power compaction equipment shall be used where the use of heavier equipment is impractical or restricted due to weight limitations.

F. Layering
1. Embankment and fill material shall be placed and spread evenly in approximately horizontal layers.
2. Each layer shall be moistened and aerated as necessary.
3. Unless otherwise approved by the COR, no layer shall exceed 9 inches of compacted thickness and no layer shall exceed 6 inches of compacted thickness when located below structural footings or hydraulic structures.
4. The embankment and fill shall be compacted in conformance with Paragraph K, below.

G. Embankments and Fills
1. When an embankment or fill is to be constructed and compacted against hillsides or fill slopes steeper than 4:1, the slopes of the hillsides or fills shall be horizontally benched in order to key the embankment or fill to the underlying ground.
2. A minimum of twelve (12) inches perpendicular to the slope of the hillside or fill shall be removed and re-compacted as the embankment or fill is brought up in layers.
3. Material thus cut shall be re-compacted along with the new material.
4. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

H. Compaction Requirements
1. The following compaction requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³) where the material is graded such that ten (10) percent or more passes a No. 4 sieve and in accordance
with ASTM D 4253 - Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, where the material is coarse granular backfill materials with less than ten (10) percent passing the No. 4 sieve:

<table>
<thead>
<tr>
<th>Location or Use of Fill or Backfill</th>
<th>Percentage of Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embankments and fills not identified otherwise</td>
<td>90</td>
</tr>
<tr>
<td>Embankments and fills beneath paved areas or structures</td>
<td>95</td>
</tr>
<tr>
<td>Backfill beneath structures and hydraulic structures</td>
<td>95</td>
</tr>
<tr>
<td>Topsoil</td>
<td>80</td>
</tr>
<tr>
<td>Aggregate base or subbase</td>
<td>95</td>
</tr>
</tbody>
</table>

### 3.09 PIPELINE AND UTILITY TRENCH EXCAVATION AND BACKFILL

**A. Exploratory Excavations**

1. The Contractor shall excavate and expose buried points of connection to existing utilities as indicated or requested by the COR.

2. Data, including dates, locations excavated, and dimensioned sketches, shall be submitted to the COR within one week of excavation by the Contractor.

3. Damage to utilities from excavation activities shall be repaired by the Contractor in accordance with the Contract Documents.

**B. General**

1. Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with minimum widths as indicated.

**C. Trench Bottom**

1. Except where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe.

2. Excavations for pipe bells and welding shall be made as required.
3. Where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding.

D. Open Trenches
1. The maximum amount of open trench permitted in any one location shall be the length necessary to accommodate the amount of pipe installed in a single day.
2. Trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates and the area fenced off with construction fencing and warning tape at the end of each day.

E. Embankments, Fills and Structural Backfills
1. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.
2. Upon completion of the embankment or structural backfill, a trench conforming to the appropriate detail may be excavated and the pipe may be installed.

F. Trench Shield
1. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield such that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls and causing sloughing or caving of the trench walls.
2. If the trench walls cave or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.
3. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally.
4. The Contractor shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

G. Placing and Spreading of Backfill Materials
1. Each layer of coarse granular backfill materials with less than 10 percent passing the No. 4 sieve shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of achieving the required density in 2 passes and that is acceptable to the COR.
2. Where such materials are used for pipe zone backfill, vibratory compaction shall be used at vertical intervals of the lesser of:
   a. one-half the diameter of the pipe; or
   b. 24 inches, measured in the uncompacted state.
3. In addition, these materials shall be subjected to vibratory compaction at the springline of the pipe and the top of the pipe zone backfill, regardless of whether that dimension is less than 24 inches or not.

4. Each layer of backfill material with greater than 10 percent passing the No. 4 sieve shall be compacted using mechanical compactors suitable for the work.

5. The material shall be placed and compacted under the haunch of the pipe and up each side evenly so as not to move the pipe during the placement of the backfill.

6. The material shall be placed in lifts that will not exceed 6 inches when compacted to the required density within 18 inches of the top of the pipe. Material above 18 inches of the pipe shall be placed in lifts that will not exceed 9 inches when compacted to the required density. Material within 18 inches of the finish grade over the trench in paved areas shall be placed in lifts that will not exceed 6 inches when compacted to the required density unless noted otherwise.

H. Mechanical Compaction

1. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand-operated vibratory compactors and rollers that do not damage the pipe.

2. After completion of at least 2 feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

I. Pipe and Utility Trench Backfill

1. Pipe Zone Backfill
   a. Definitions
      1) The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane below the bottom surface of the pipe and a plane at a point above the top surface of the pipe as indicated.
      2) The bedding is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe.
      3) The embedment is defined as that portion of the pipe zone backfill material between the bedding and a level line as indicated.

   b. Final Trim
      1) After compacting the bedding, the Contractor shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe.
      2) Excavation for pipe bells and welding shall be made as required.

   c. The pipe zone shall be backfilled with the indicated backfill material.
d. Pipe zone backfill materials shall be manually spread evenly around the pipe, maintaining the same height on both sides of the pipe such that when compacted the pipe zone backfill will provide uniform bearing and side support.

e. The Contractor shall exercise care in order to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill operations.

2. Trench Zone Backfill

a. After the pipe zone backfill has been placed, backfilling of the trench zone may proceed.

b. The trench zone is defined as that portion of the vertical trench cross-section lying as indicated between a plane above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade.

3. Final Backfill

a. Final backfill is defined as backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, backfill within 18 inches of the roadway subgrade.

J. Identification Tape

1. Install identification tape as indicated.

K. Compaction Requirements

1. The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft·lbf/ft³) (2,700 kN-m/m³) where the material is graded such that 10 percent or more passes a No. 4 sieve, and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density where the material is coarse granular backfill materials with less than 10 percent passing the No. 4 sieve.

<table>
<thead>
<tr>
<th>Location or Use of Fill or Backfill</th>
<th>Percentage of Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe embedment backfill for flexible pipe.</td>
<td>95</td>
</tr>
<tr>
<td>Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs.</td>
<td>95</td>
</tr>
<tr>
<td>Location or Use of Fill or Backfill</td>
<td>Percentage of Maximum Dry Density</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Pipe zone backfill portion above embedment for flexible pipe</td>
<td>90</td>
</tr>
<tr>
<td>Pipe embedment backfill for rigid pipe</td>
<td>95</td>
</tr>
<tr>
<td>Pipe zone backfill portion above embedment for rigid pipe.</td>
<td>95</td>
</tr>
<tr>
<td>Pipe bedding and over-excavated zones under bedding for rigid pipe.</td>
<td>95</td>
</tr>
<tr>
<td>Final backfill, beneath paved areas or structures.</td>
<td>95</td>
</tr>
<tr>
<td>Final backfill, not beneath paved areas or structures.</td>
<td>85</td>
</tr>
<tr>
<td>Trench zone backfill, beneath paved areas and structures, including trench plugs.</td>
<td>95</td>
</tr>
<tr>
<td>Trench zone backfill, not beneath paved areas or structures, including trench plugs.</td>
<td>90</td>
</tr>
</tbody>
</table>

### 3.10 FIELD TESTING

**A. General:**

1. Field soils testing will be performed by the same Contractor materials testing laboratory listed in Section 2.02 of this Specification.

**B. Frequency:**

1. At a minimum, perform test at frequencies specified in the Contractor Materials Testing Requirements and Frequency table below.

2. Greater frequency of testing is normally performed at beginning of new work, new work crew, or new equipment.

3. After a successful work operation pattern is established, testing frequency may be performed at the minimum guidelines.
4. 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>
<thead>
<tr>
<th>PROCEDURE</th>
<th>TEST STANDARD</th>
<th>STANDARD TITLE</th>
<th>MINIMUM FREQUENCY OF TESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Classification</td>
<td>ASTM D2487</td>
<td>Classification of Soils for Engineering Purposes</td>
<td>As necessary to classify material to meet specification requirements or to index material for determining density by nuclear method.</td>
</tr>
<tr>
<td></td>
<td>ASTM D2488</td>
<td>Description and Identification of Soils</td>
<td></td>
</tr>
<tr>
<td>Moisture Content</td>
<td>ASTM D2216</td>
<td>Laboratory Determination of Water (Moisture Content of Soil and Rock by Mass.)</td>
<td>With in-place density or as required to index material for determining density by nuclear method.</td>
</tr>
<tr>
<td>Laboratory Compaction</td>
<td>ASTM D698, Procedure A.</td>
<td>Laboratory Compaction Characteristics of Soil Using Standard Effort</td>
<td>One test every 500 yd³</td>
</tr>
<tr>
<td>(Standard Effort)</td>
<td></td>
<td></td>
<td>Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.</td>
</tr>
<tr>
<td>Laboratory Compaction</td>
<td>ASTM D7382</td>
<td>Standard Test Methods for Determination of Maximum Dry Unit Weight and Water Content Range for Effective Compaction of Granular Soils Using a Vibrating Hammer</td>
<td>One test every 500 yd³</td>
</tr>
<tr>
<td>(Vibratory Hammer)</td>
<td></td>
<td></td>
<td>Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.</td>
</tr>
<tr>
<td>Oversized Correction</td>
<td>ASTM D4718</td>
<td>Correction of Unit Weight and Water Content for Soils Containing Oversize Particles</td>
<td>When oversize material is between 5 to 30 percent</td>
</tr>
<tr>
<td>Rock Factor</td>
<td></td>
<td>USBR Guidelines for Earthwork Construction Control Testing of Gravelly Soils</td>
<td>When oversize material is greater than 30 percent</td>
</tr>
<tr>
<td>PROCEDURE</td>
<td>TEST STANDARD</td>
<td>STANDARD TITLE</td>
<td>MINIMUM FREQUENCY OF TESTING</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sand Cone</td>
<td>ASTM D1556</td>
<td>Density and Unit Weight of Soil in Place by the Sand-Cone Method</td>
<td>One test every 500 yd³ Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.</td>
</tr>
<tr>
<td>Rapid Construction Control</td>
<td>ASTM D5080</td>
<td>Rapid Determination of Percent Compaction</td>
<td>One test every 500 yd³ Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.</td>
</tr>
<tr>
<td>Nuclear Method</td>
<td>ASTM D6938</td>
<td>In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)</td>
<td>One test every 100 yd³ Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed. Minimum 1 test per foundation prior to concrete placement.</td>
</tr>
</tbody>
</table>

C. Density
1. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557.
2. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254.
3. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the COR.

D. Remediation
1. In case the test of the fill or backfill shows non-compliance with the required density, the Contractor shall accomplish such remedy as may be required to ensure compliance.
2. Subsequent testing to show compliance shall be by a testing laboratory selected by the COR and paid by the Contractor.

E. Contractor's Responsibilities
1. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the Hatchery and the COR.
SECTION 31 35 00
EROSION AND SEDIMENT CONTROL, GENERAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost
   1. Include cost in prices offered in the Price Schedule for items of work for which erosion and sediment control are required.

1.02 REFERENCE STANDARDS

A. U.S. DEPARTMENT OF AGRICULTURE (USDA) AMS Seed Act (1940; R 1988; R 1998) Federal Seed Act


1.03 SUMMARY

A. Work includes furnishing all labor, materials and equipment required for the installation and maintenance of both permanent and temporary erosion and sediment control measures as shown on the drawings and as specified herein.

B. Erosion and sediment control measures shall remain in place while potential for erosion exists from construction activities at the site and disposal area, during the duration of the contract and warranty period;
   1. Protect and stabilize soils susceptible to erosion. This includes areas where vegetative cover cannot be achieved due to soils, slopes or time of year. The contractor shall be aware of and conform to measures necessary for the control of erosion and sediment runoff according to applicable regulations.
   2. Prevent sediment or sediment laden water from entering all creeks and the storm drain systems or to be discharged from the construction site in accordance with the Washington Department of Ecology, the USEPA, and other applicable regulations.

C. All temporary erosion and sediment control measures shall be installed prior to commencement of construction.

1.04 SUBMITTALS

A. RSN 31 35 00-1, Erosion and Sediment Control Plan:
1. Submit Erosion and Sediment Control Plans for acceptance in accordance with the provisions of Section 01 33 00 – Submittals and Section 01 57 20 – Environmental Controls.
   a. Submit a Stormwater Pollution Prevention Plan for work during construction for approval by the COR. Plan shall meet all federal, state, and local requirements.
   b. Submit Notice of Intent (NOI).

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 INSTALLATION

A. Install erosion and sediment control measures per manufacturer’s directions or as illustrated on the contract drawing or as identified in Section 31 35 26 – Erosion Control Barriers.

3.02 MAINTENANCE AND REMOVAL

A. Repair and reinstall temporary soil erosion control measures as necessary to ensure proper function for the duration of ground disturbing activities and through the warranty period.

B. Temporary erosion control devices shall be removed only after they have performed their intended function.

C. All pipes, end sections, drainage curbs, sand bags, sediment fences and other materials which are removed from temporary erosion control devices and not incorporated into the permanent work shall become the property of the Contractor and shall be removed from the area.

END OF SECTION
SECTION 31 35 26
EROSION AND SEDIMENT CONTROL BARRIERS

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 Erosion and Sediment Control Barriers are required.

1.02 REFERENCE STANDARDS
A. ASTM International (ASTM)
   2. ASTM D6462-03(2008) Silt Fence Installation

1.03 SUMMARY
A. The Contractor shall provide erosion control barriers, complete and in place, in accordance with the Contract Documents
B. Follow the State of Washington Department of Ecology requirements and best management practices, including BMP C-233 Silt Fence, and BMP C220 Storm Drain Inlet Protection.

1.04 CONTRACTOR SUBMITTALS
A. Submittals shall be in accordance with Section 01 33 00 - Contractor Submittals and Section 01 57 20 –Environmental Controls.
B. RSN 31 35 26-1, Product Data:
   1. Manufacturer's catalog sheets and certifications on all erosion and control barrier materials.
C. RSN 31 35 26-2, Weed free certifications where applicable.

PART 2 PRODUCTS

2.01 SILT FENCE
A. Fabric:
   1. Fabric may be woven or non-woven, made from polypropylene, polyethylene, or polyamid, and shall contain sufficient UV inhibitors and stabilizers so that it will
provide a minimum of 6 months of expected usable construction life at a temperature range of 0 degrees F to 120 degrees F. Fabric shall be replaced as needed to meet or exceed the project requirements by the Contractor as directed at no additional cost to the Contract.

2. Fabric shall have the following properties:

<table>
<thead>
<tr>
<th>Fabric Properties</th>
<th>Value</th>
<th>Minimum Acceptable Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength – Standard Strength Fabric (lbs)</td>
<td>100</td>
<td>ASTM D4751</td>
</tr>
<tr>
<td>Grab Tensile Strength – Extra Strength Fabric (lbs)</td>
<td>180</td>
<td>ASTM D4751</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>30% max.</td>
<td>ASTM D4632</td>
</tr>
<tr>
<td>Ultraviolet Resistance (%)</td>
<td>70 min.</td>
<td>ASTM D4355</td>
</tr>
<tr>
<td>Polymeric Mesh AOS (mm)</td>
<td>0.15 min.</td>
<td>ASTM D4751</td>
</tr>
<tr>
<td>Water Permittivity (sec(^{-1}))</td>
<td>0.02 min.</td>
<td>ASTM D4491</td>
</tr>
</tbody>
</table>

B. Posts
1. Wood posts shall be of sound quality hardwood, at least 2-inches by 2-inches, and at least 3-feet long. Wood posts shall be free of defects such as knots, splits, or gouges.
2. Steel posts shall be 1.5-inch, U, T, L, or C-shaped, weighing not less than 1.35-lb per linear foot, and at least 3-feet long with protective coating.
3. No. 6 steel rebar or larger.
4. ASTM A 120 steel pipe with a minimum diameter of 1-inch.

C. Fencing
1. Wire fabric 2-inches x 2-inches x 14-gauge.

D. Fasteners
1. Fasteners to wood posts shall be steel, at least 1.5-inches long.
2. Fasteners to steel posts shall be galvanized clips.

E. Prefabricated Units
1. Prefabricated units may be used in lieu of the above method providing the unit is installed per the manufacturer’s instructions.

2. Approved Manufacturer, or equal:
   a. Envirofence

2.02 PLASTIC SHEETING
A. Clear polyethylene plastic with a minimum thickness of 6 mils.

2.03 STORM DRAIN INLET PROTECTION
A. Storm drain or catch basin insert filter.
B. Approved manufacturers, or equal:
   1. UltraTech International Inc., Ultra-Drain Guard

PART 3 EXECUTION
3.01 PREPARATION
A. Provide erosion control barriers to the lengths, quantities, and at the indicated locations and where shown on the plans, as noted in the submittal, or as required to prevent erosion and material loss from the Site.

B. Contractor shall not commence clearing, grubbing, earthwork, or other activities which may cause erosion until barriers are in place.

3.02 SILT FENCE INSTALLATION
A. The Contractor shall install and maintain temporary silt fences at the locations shown on the Drawings.

B. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

C. The silt fence shall have a 2-feet minimum and a 2.5-feet maximum height above the original ground surface.

D. The filter fabric shall be sewn together at the point of manufacture to form filter fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided the Contractor can demonstrate, to the satisfaction of the COR, that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
E. Attach the filter fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer’s recommendations. Attach the filter fabric to the posts in a manner that reduces the potential for tearing.

F. Support the filter fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the filter fabric up-slop of the mesh.

G. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180-lbs grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the filter fabric it supports.

H. Bury the bottom of the filter fabric 4-inches minimum below the ground surface. Backfill and tamp soil in place over the buried portion of the filter fabric, so that no flow can pass beneath the fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches minimum.

I. Drive or place fence posts into the ground 18-inches minimum. A 12-inch minimum depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post minimum depths by 6-inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.

J. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet.

K. Locate silt fence on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

L. If the fence must cross contours, with the exception of the ends of the fence, place gravel check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

3.03 PLASTIC SHEET COVERING

A. Install covering and maintain tightly in place by using sandbags or tires on ropes with a maximum 10 foot grid spacing in all directions on aggregate stockpiles as required by the SWPPP

B. Tape or weigh down all seams along the full length of the covering. Leave a minimum overlap of 12 inches for all seams
C. For seams parallel to the slope contour, the uphill sheet shall overlap the downhill sheet

D. Do not allow drainage from areas covered by plastic sheeting to discharge directly onto unprotected, disturbed areas of the construction site

3.04 STORM DRAIN INLET PROTECTION

A. Insert storm drain and catch basin filter according to manufacturer’s recommendations.

3.05 INSPECTION AND MAINTENANCE

A. Regularly inspect and repair or replace damaged components of the barrier. Unless otherwise directed, maintain the erosion control system until the disturbed area is permanently stabilized or upon final acceptance; then remove erosion and sediment control systems promptly and according to manufacturer’s instructions.

B. Silt Fence
   1. Inspect fence for collapse, damage, undermined areas, comprised integrity, torn or puncture fabric, or other installation or functional inadequacies. Ensure fence is keyed. Repair and re-establish silt fences as needed.
   2. Remove sediment deposits when silt reaches a depth of 9-inches or 1/2 the height of the barrier, whichever is less. Dispose of sediments on the Site, if a location is indicated on the Drawings, or at a site arranged by the CONTRACTOR which is not in or adjacent to a stream or floodplain.

C. Plastic Sheet Covering
   1. Re-secure sheeting where wind or water have loosened the sheeting and left exposed earth.

D. Storm Drain Inlet Protection
   1. Inspect storm drain and catch basin filters frequently, especially after storm events. Clean and replace clogged inserts.
   2. Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land or stockpile and stabilize as appropriate.

3.06 REMOVAL

A. Silt Fence
   1. Once final stabilization has been achieved, cut fabric at ground level. Remove stakes and spread sediment. Seed and mulch bare ground immediately and discard filter fence.

B. Storm Drain Inlet Protection
1. Remove and dispose of sediment accumulated in filter. Remove and dispose of filter.

END OF SECTION
DIVISION 32 – EXTERIOR IMPROVEMENTS
This page intentionally left blank.
SECTION 32 11 13
A.C. PAVEMENT AND BASE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Asphalt Concrete Pavement and Base:
   1. Measurement: Square feet measured to outlines placed and to thickness shown on drawings or as directed by CO.
   2. Payment: Square feet price offered in the Price Schedule.
      a. Includes cost of tack coat
      b. Includes all labor, material, and equipment for installation and compaction.

1.02 REFERENCE STANDARDS

A. Commercial Standards:

1. AASHTO M 82 Cut-Back Asphalt (Medium Curing Type)
2. AASHTO M 140 Emulsified Asphalt
3. AASHTO M 208 Cationic Emulsified Asphalt
4. AASHTO M 226 Viscosity Graded Asphalt Cement
5. ASTM D 242 Mineral Filler for Bituminous Paving Mixtures
6. ASTM D 692 Coarse Aggregate for Bituminous Paving Mixtures
7. ASTM D 977 Emulsified Asphalt
8. ASTM D 1073 Fine Aggregate for Bituminous Paving Mixtures
9. ASTM D 1188 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
10. ASTM D 1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf per cu ft)
11. ASTM D 2027 Cutback Asphalt (Medium Curing Type)
12. ASTM D 2397 Cationic Emulsified Asphalt
13. ASTM D 2726 Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
14. ASTM D 3381  Viscosity-Graded Asphalt Cement for Use in Pavement Construction
15. ASTM D 3515  Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

B. State Standards

1. Washington State Department of Transportation (WSDOT)
   a. WSDOT Specifications Standard Specifications for Road and Bridge Construction, 2020
      1) Maintain a copy of WSDOT Specifications at jobsite during paving work.

1.03 SUMMARY

A. The Contractor shall provide Hot Mix Asphalt (HMA) pavement and base, complete and in place, in accordance with the Contract Documents. All asphalt mixes, materials, gradations, applications, methodology, and testing shall meet the requirements of Washington Department of Transportation (WSDOT) specification 5-04 – Hot Mix Asphalt.

1.04 CONTRACTOR SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 - Submittals. Include materials testing reports, job-mix formulas, and other pertinent information dated within the most recent 6-month period that is satisfactory to the COR.

B. RSN 32 11 13-1, Mix Design Data.

C. RSN 32 11 13-2, Certifications:
   1. Manufacturer's certificate of compliance for aggregate and bituminous materials in accordance with WSDOT Specifications 5-04 Hot Mix Asphalt.

PART 2 PRODUCTS

2.01 AGGREGATE BASE

A. Materials for aggregate base shall be in accordance with WSDOT specification 5-04 – Hot Mix Asphalt or Type GF fill from Specification 31 30 00.

2.02 ASPHALT

A. Asphalt shall be PG 64-22 in accordance with WSDOT specification 9-02 and 5-04.
2.03 TACK COAT

A. Tack coat shall be emulsified asphalt Grade SS-1 or SS-1h, CSS-1 or CSS-1h diluted with one part water to one part emulsified asphalt, undiluted asphalt Grade RS-1 or CRS-1, or paving asphalt Grade AR-1000. Emulsified asphalt shall comply with the requirements of AASHTO M 140 (ASTM D 977) or M 208 (ASTM D 2397); paving asphalt shall comply with the requirements of AASHTO M 226 (ASTM D 3381).

2.04 ASPHALT-AGGREGATE MIXTURE

A. Commercial HMA Course Mixture and Test Criteria: The Contractor shall submit for approval a job-mix formula for each mixture. The job-mix formula, test criteria and mixture tolerances for the asphalt-aggregate course mixture shall meet the requirements of WSDOT specification 5-04 – Hot Mix Asphalt.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. The subgrade shall be prepared in accordance with Section 31 30 00 - Earthwork as applicable to roadways and embankments. The surface of the subgrade after compaction shall be hard, uniform, smooth and true to grade and cross-section. Subgrade for pavement shall not vary more than 0.02-foot from the indicated grade and cross section. Subgrade for base material shall not vary more than 0.04-foot from the indicated grade and cross section.

3.02 EXISTING ASPHALT PREPARATION

A. Contractor shall provide neat clean edges of existing asphalt for placement of adjacent asphalt. Any existing asphalt edges that have spalled or are otherwise deteriorated due to construction activities shall be saw cut to the limits of the deterioration to provide a neat clean edge for asphalt paving.

3.03 AGGREGATE BASE

A. Aggregate base shall be provided where indicated to the thickness indicated. Imported aggregate bases shall be delivered to the Site as uniform mixtures and each layer shall be spread in one operation. Segregation shall be avoided and the base shall be free of pockets of coarse or fine material. Where the required thickness is 6-inches or less, the base materials may be spread and compacted in one layer. Where the required thickness is more than 6-inches; the base material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 6-inches. The relative compaction of each layer of aggregate base shall be not less than 95 percent of maximum density when measured in accordance with ASTM D 1557. The compacted surface of the finished aggregate shall be hard, uniform, smooth and at any point shall not vary more than 0.02 foot from the indicated grade or cross-section.
3.04 TACK COAT

A. A tack coat shall be applied to existing paved surfaces where new asphalt concrete is to be placed on existing pavement. It shall also be applied to the contact surfaces of all cold pavement joints, curbs, gutters, manholes and the like immediately before the adjoining asphalt pavement is placed. Care shall be taken to prevent the application of tack coat material to surfaces that will not be in contact with the new asphalt concrete pavement. Diluted emulsified asphalt shall be applied at the rate of 0.05 to 0.15 gal/sq yd. Undiluted emulsified asphalt shall be applied at the rate of 0.025 to 0.075 gal/sq yd. Paving asphalt shall be applied at the rate of approximately 0.05 gal/sq yd.

3.05 ASPHALT CONCRETE

A. Asphalt Concrete Paving: Place, Finish, and Compact asphalt concrete in accordance with WSDOT Specifications 5-04 Hot Mix Asphalt and this section, whichever is more stringent.

B. At the time of delivery to the Site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather.

C. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F or during unsuitable weather.

D. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be of the required cross section and grade of the course being constructed.

E. The depositing, distributing, and spreading of the asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled mechanical spreading and finishing machine designed specifically for that purpose. The machine shall be equipped with a screed or strike-off assembly capable of being accurately regulated and adjusted to distribute a layer of the material to a definite pre-determined thickness. When paving is of a size or in a location that use of a self-propelled machine is impractical, the COR may waive the self-propelled requirement.

F. Spreading, once commenced, shall be continued without interruption.

G. The mix shall be compacted immediately after placing. Initial rolling with a steel-wheeled tandem roller, steel three-wheeled roller, vibratory roller, or a pneumatic-tired roller shall follow the paver as closely as possible. If needed, intermediate rolling with a pneumatic-tired roller shall be done immediately behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In areas too small for the roller, a vibrating plate compactor or a hand tamper shall be used to achieve thorough compaction.

H. Upon completion the pavement shall be true to grade and cross-section. When a 10-foot straightedge is laid on the finished surface parallel to the center of the roadway, the surface shall not vary from the edge of the straightedge more than 1/8-in except at

A.C. Pavement and Base
32 11 13 - 4
intersections or changes of grade. In the transverse direction, the surface shall not vary from the edge of the straightedge more than 1/4-in.

I. The relative density after compaction shall be 95 percent of the density obtained by using ASTM D 1188 or D 2726. Testing shall be completed by Contractors testing firm for every 10,000 square feet. A properly calibrated nuclear asphalt testing device shall be used for determining the field density of compacted asphalt concrete, or slabs or cores may be laboratory tested in accordance with ASTM D 1188.

END OF SECTION
This page intentionally left blank
DIVISION 33 – UTILITIES
This page intentionally left blank.
SECTION 33 05 31
PRECAST CONCRETE MANHOLES AND VAULTS

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A. Precast Concrete Manholes and Vaults:
   1. Payment: For the lump sum price offered in the Price Schedule.

1.02  SUMMARY
A. The Contractor shall provide precast concrete manholes and vaults, complete and in place, in accordance with the Contract Documents.
B. The term MANUFACTURER refers to the manufacturer of precast manhole or vault. The term MANUFACTURER’S ENGINEER refers to the engineer representing the manufacturer of the precast manhole or vault, in responsible charge for the structural design calculations described in this Section.

1.03  REFERENCE STANDARDS
A. ASTM International (ASTM)
   1. ASTM A48   Gray Iron Castings
   2. ASTM C150   Portland Cement
   3. ASTM C443   Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
   4. ASTM C478-09 Precast Reinforced Concrete Manhole Sections
   7. ASTM C923-08 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
   8. ASTM C990-09 Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

1.04  SUBMITTALS
A. Submit the following in accordance with Section 01 33 00 - Submittals.
B. RSN 33 05 31-1, Approval Data:
   1. Manufacturer’s product data for precast reinforced concrete manhole or vault sections and joint sealant.
      a. Include manufacturer’s recommended details for installing manhole on cast-in-place concrete slab.
   2. Manufacturer’s product data for connectors between manhole or vault and pipes.

C. RSN 33 05 31-2, Shop Drawings:
   1. Detailed drawings showing complete information for fabrication of manhole or vault including, but not limited to:
      a. Member dimensions and cross section: locations, lifting inserts, and reinforcement.
      b. Details of connections, joints, accessories, and openings.
      c. Watertight joint details.
   2. Design calculations for manhole or vault, signed by a registered professional engineer in the State of Washington.

D. RSN 33 05 31-3, Manufacturer’s Certification:
   1. Written certification that the manhole or vault complies with the referenced ASTM's.

1.05 CONTRACTOR QUALITY CONTROL

A. Inspection: After installation, the Contractor shall demonstrate that manholes and vaults have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with the Contract Documents.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE MANHOLE

A. Precast Reinforced Concrete Manhole Sections: ASTM C478.


C. Adjusting rings shall be standard items from the manufacturer of the manhole sections. Minimum wall thickness of rings shall be 4-inches if steel reinforced and 6-inches if not reinforced.
   1. Axial length of sections shall be selected to provide the correct total height with the fewest joints.
D. **Design Criteria:** Manhole walls, transitions, and base shall be designed per ASTM C 478 for the depths indicated and the following:
   1. AASHTO HL93 loading applied to the cover.

E. **Manhole Manufacturers, or Equal**
   1. Hanson Concrete Products, Inc., Milpitas, CA
   2. Wilbert Precast, Inc., Spokane, WA
   3. Teichert Precast, Sacramento, CA

F. **Connectors Between Manhole and Pipes:** ASTM C923.
   1. Designed for casting connector integrally with wall of manhole.

2.02 **FRAMES AND COVERS**

A. **Castings**
   1. Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30.
   2. Unless otherwise indicated, cast iron covers and frames shall be heavy traffic type, diameter as indicated on the DRAWINGS, with embossed lettering saying, “Grey Water”.
   3. Frame and cover shall be designed for HL93 traffic loading.

B. **Castings Manufacturers, or Equal**
   1. Alhambra Foundry Co., Ltd.
   2. Neenah Foundry Co.
   3. Vulcan Foundry, Inc

2.03 **PRECAST CONCRETE VAULT**

A. The Contractor shall provide precast vaults designed for the indicated applications and of the sizes indicated.

B. **Design Requirements:**
   1. Comply with ASTM C858, except as modified herein.
   2. Reinforcement: All reinforcing steel shall be embedded in the concrete with a minimum clear cover as recommended by ACI 318. Deformed Bars shall be ASTM A615, Grade 60.
   3. Nominal Dimensions: As shown on the DRAWINGS.
   4. Design Loads: Per ASTM C857, and Site-specific values below:
      a. Soil Loading: Refer to Project Structural General Notes Sheets.
b. Live Loads: AASTHO HL-93 truck loading plus impact.

5. Accommodate additional stresses or loadings due to factory precasting, transportation, erection and placement.

6. Sealant:
   a. Provide a lasting watertight bond using nonswelling preformed joint sealants.
   b. Manufacturer and Product: Henry Company; RAM-NEK or Equal.
   c. Joints: Where joints are designed in pre-cast concrete vaults, such joints shall be interlocking to secure proper alignment between members and prevent migration of soil through the joint. Structural sections at joints shall be sized sufficiently to reinforce the section against localized distress during transportation and handling and against excess contact bearing pressures through the joint.
   d. Access Openings: Where openings for access to the vault are required, the full clear space opening indicated shall be provided, without obstructions from brackets or supports. For large openings where brackets or supports are designed to protrude into the opening for support of required covers, such brackets or supports shall be designed to be easily removed and replaced with a minimum of effort and without cutting or welding.
   e. Penetrations: Where penetration of the pre-cast concrete vault are required for piping, conduit, or ducts, such penetrations shall be accommodated through pre-cast openings or thin-wall knock-out sections. All openings for penetrations shall be smooth and free of surface irregularities and without exposed steel reinforcing. Vaults need not be designed to resist thrust from piping passing through the vault.

PART 3 EXECUTION

3.01 HANDLING

A. Pre-cast concrete sections shall be transported and handled with care in accordance with the manufacturer’s written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the Contractor shall follow the manufacturer’s recommendations for lifting procedures to provide proper support during lifting.

3.02 INSTALLATION

A. Excavation: Buried pre-cast concrete vaults and manholes shall be assembled and placed in excavations on properly compacted soil foundations as indicated. Pre-cast concrete vaults shall be set to grade and oriented to provide the required dimensions and clearances from pipes and other structures.
B. **Backfill:** Backfill around precast concrete vaults and manholes shall be per Section 31 30 00 – Earthwork.

C. **Filling of Cracks:** Prior to backfilling, all cracks and voids in pre-cast concrete vaults shall be filled with non-shrink grout or polyurethane sealant, or both. Around pipe and conduit penetrations, openings shall be sealed with polyurethane sealant. With the authorization of the MANUFACTURER’S ENGINEER, grout or a closed-cell flexible insulation may be used as filler material prior to placing a final bed of polyurethane sealant.

D. **Inspections:** Contractor shall schedule all necessary inspections.

**END OF SECTION**
This page intentionally left blank.
PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. PVC Pressure Pipe, Rubber Joints (AWWA C900, Modified)

1. Payment: Lump-sum price offered in the Price Schedule
   a. Includes:
      1) Cost of furnishing materials, fittings and appurtenances; manufacturing and laying pipe; furnishing and placing concrete in collars, blowoffs, encasements and blocking; and furnishing maintenance warranty bond.
      2) 4”, 6”, 8”, 10”, and 12” PVC Pressure Pipe.

1.02  REFERENCE STANDARDS

A. Commercial Standards:

1. AWWA C104/A21.5 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings 3-in Through 48-in for Water and Other Liquids
3. AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C600 Installation of Ductile-Iron Water Mains and Appurtenances
5. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe 4-in Through 12-in for Water Distribution
6. ASTM D 2584 Test Method for Ignition Loss of Cured Reinforced Resins
8. AWWA Manual M23 PVC Pipe - Design and Installation

1.03  SUMMARY

A. The Contractor shall provide polyvinyl chloride (PVC) pressure pipe, complete in place, in accordance with the Contract Documents.
B. Pipe Material Group No. 19. The piping system defined in this section is referred to in the Pipe Schedule Drawing as Piping Material Group No.19.

1.04 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 33 11 21-1, Shop Drawings:
   1. Drawings of pipe, fittings, and appurtenances. Design calculations to demonstrate compliance of pipe and fittings with this Section. Manufacturer's literature for metallic locating tape.

C. RSN 33 11 21-2, Certifications:
   1. A certified affidavit of compliance for pipe and other products or materials under this Section and the following supplemental requirements:
      a. Hydrostatic proof test reports.
      b. Sustained pressure test reports.
      c. Burst strength test reports.

D. The Contractor shall be responsible for performing and paying for sampling and testing as necessary for the certifications.

1.05 QUALITY CONTROL

A. Inspection: Pipe shall be subject to inspection at the place of manufacture. The Contractor shall notify the COR in writing of the manufacturing starting date not less than 14 Days prior to the start of any phase of the pipe manufacture.

B. During manufacture of the pipe, the COR shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

C. Tests: Materials used in manufacture of the pipe shall be tested in accordance with the requirements of this Section and the referenced standards, as applicable.

D. The Contractor shall perform said material tests. The COR shall have the right to witness testing; provided, that the Contractor’s schedule is not delayed for the convenience of the COR.

E. In addition to those tests specifically required, the COR may request additional samples of any material for testing by the COR. The additional samples shall be furnished as a part of the work.
PART 2 PRODUCTS

2.01 GENERAL

A. PVC pressure pipe (4-inch through 12-inch) shall conform to the applicable requirements of AWWA C900 subject to additional requirements herein. (Pipe Group No 19 on Piping Schedule)

2.02 PIPE DESIGN CRITERIA

A. General: PVC pressure pipe wall thickness for internal pressure shall be designed in accordance with the requirements of AWWA M23, as applicable, and the supplemental requirements in this Section.

B. The truck live loads shall be determined using the method recommended by AASHTO in "Standard Specifications for Highway Bridges." For depths of cover less than 10 feet HS-20 live loads shall be added to the earth loads to determine the total load. For depths of cover 3 feet or less, HS-20 live load plus impact shall be included.

C. Deflection Control: The deflection of the pipe after installation, as determined from the Modified Iowa Formula outlined in AWWA M23, shall not exceed 0.03 times the outside diameter. If the calculated deflection exceeds 0.03 times the outside diameter the pipe class shall be increased or the quality of the pipe zone backfill shall be improved to achieve a higher modulus of soil reaction, E'. For purposes of calculation, values of E' shall be 1100 psi at 90 percent Standard Proctor; 1500 psi at 95 percent Standard Proctor; and 2500 psi at 100 percent Standard Proctor. Similarly, the deflection lag factor shall be 1.5.

2.03 PIPE

A. The pipe shall be of the diameter and pressure class indicated, shall be furnished complete with rubber gaskets, and all specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for Dimension Ratios for large PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.'s shall conform to the requirements of AWWA C900.

B. Additives and Fillers: Unless otherwise allowed in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F and for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin). If requested by the COR, the additive and filler content shall be determined using the pyrolysis method as specified in ASTM D 2584.

C. Joints: Joints for the buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and
valves available from local water works supply distributors. Where indicated, restrained joint pipe shall be ductile iron pipe. No restrained joint PVC pipe will be allowed.

D. Joint Deflection: Deflection at the joint shall not exceed 1.5 degrees or the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints that are over-belled or not belled to the stop mark.

2.04 PIPE SCHEDULE – (See Contract Drawing 60061)

2.05 FITTINGS

A. Fittings shall be ductile iron and shall conform to the requirements of AWWA C153, Class 250. PVC pipe fittings shall be mechanical joint.

B. Fittings shall be lined and coated in accordance with the requirements of Section 09 96 00 - Protective Coating.

C. Each fitting shall be clearly labeled to identify its size and pressure class.

PART 3 EXECUTION

3.01 GENERAL

A. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the COR, and shall be subject to approval before acceptance. Material found to have defects will be rejected and the Contractor shall promptly remove such defective materials from the Site.

B. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.02 HANDLING AND STORAGE

A. Handling: Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.

B. Storage: Pipe should be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets
should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.03 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Section 31 30 00 - Earthwork.

3.04 INSTALLATION

A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each day's work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.

B. Pipe shall be supported at its proper elevation and grade; care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints, and couplings. Anchors and supports shall be provided where indicated and where necessary for fastening work into place. Fittings shall be independently supported.

C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.

D. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

E. Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander, or abrasive disc.

3.05 IDENTIFICATION TAPE

A. Polyvinyl chloride pipelines shall be provided with identification tape as per Section 31 30 00 - Earthwork.

3.06 SERVICE CONNECTIONS

A. Service Connections: Direct tapping will not be permitted. Double strap bronze service clamps shall be used for all service connections. Service clamps shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when
the saddle is made tight. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters or twist drills are not acceptable. Lubricate the cutting and tapping edges of the tool with cutting lubricant. Make the cuts slowly and use the follower very lightly - do not force cutter through pipe wall. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddle is 2-inches.

B. Tapping sleeves and valves shall be used for all outlet sizes greater than 2-inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations.

3.07 CONNECTIONS TO EXISTING WATERLINES

A. The Contractor shall locate underground improvements and install the pipelines to the depths indicated. Where the new work is to be connected to existing pipelines, the Contractor shall make its arrangements with the serving utility well in advance of the connections, to allow adequate time for dewatering of the existing line, if necessary, and shall expedite the work to minimize water outages to the users. Where sections of existing distribution mains are taken permanently out of service and abandoned in place, the cut ends shall be plugged solid with concrete to a depth of not less than one pipe diameter.

END OF SECTION
SECTION 33 11 22
LARGE PVC PRESSURE PIPE, RUBBER JOINTS (AWWA C905, MODIFIED)

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Large PVC Pressure Pipe, Rubber Joints (AWWA C905, Modified):
   1. Payment: Lump-sum price offered in the Price Schedule.
      a. Includes:
         1) Cost of furnishing materials, fittings and appurtenances; manufacturing and laying pipe; furnishing and placing concrete in collars, blowoffs, encasements and blocking; and furnishing maintenance warranty bond.
         2) 14”, 18”, 20”, and 24” PVC Pressure Pipe.

1.02 REFERENCE STANDARDS

A. Commercial Standards:
   1. AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
   2. AWWA C110 Ductile-Iron and Gray-Iron Fittings 3-in Through 48-in for Water
   3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
   4. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
   6. AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-in Through 48-in, for Water Transmission and Distribution
   7. AWWA Manual M23 PVC Pipe - Design and Installation
1.03 SUMMARY

A. The Contractor shall provide polyvinyl chloride (PVC) pressure pipe, complete in place, in accordance with the Contract Documents.

B. Pipe Material Group No. 19. The piping system defined in this section is referred to in the Pipe Schedule Drawing as Piping Material Group No. 19.

1.04 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 33 11 22-1, Shop Drawings:
   1. Drawings of pipe, fittings, and appurtenances. Calculations showing compliance with this Section. Manufacturer's literature on the metallic locating tape.

C. RSN 33 11 22-2, Certifications:
   1. A certified affidavit of compliance for all pipe and other products or materials furnished under this Section.
      a. Hydrostatic proof test reports.
      b. Sustained pressure test reports.
      c. Burst strength test reports.

D. The Contractor shall be responsible for performing and paying for sampling and testing as necessary for the certifications.

1.05 QUALITY CONTROL

A. Inspection: Pipe shall be subject to inspection at the place of manufacture. Notify the COR in writing of the manufacturing starting date not less than 14 Days prior to the start of any phase of the pipe manufacture.

B. During the manufacture of the pipe, the COR shall be given access to areas where manufacturing is in process and shall be permitted to make inspections necessary to confirm compliance with the Specifications.

C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with this Section and the referenced standards, as applicable.

D. The Contractor shall perform said material tests. The COR shall have the right to witness testing; provided, that the Contractor’s schedule is not delayed for the convenience of the COR.

E. In addition to those tests specifically required, the COR may request additional samples of any material for testing by the COR. The additional samples shall be furnished as part of the work.
PART 2  PRODUCTS

2.01  GENERAL

A. Large PVC pressure pipe (14-inch through 48-inch) shall conform to the applicable requirements of AWWA C905 and the additional requirements herein. (Pipe Group No 19 on Piping Schedule)

2.02  PIPE

A. The pipe shall be of the diameter and pressure class indicated, shall be furnished complete with elastomeric gaskets, and specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for large PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.’s shall conform to Table 2 of AWWA C905. If not indicated the pressure class shall be DR 25.

B. Additives and Fillers: Unless otherwise provided in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred parts of resin). If requested by the COR, the additive and filler content shall be determined by using the pyrolysis method per ASTM D 2584.

C. Joints: Joints for buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing an elastomeric gasket. The bell and coupling shall be the same thickness as the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors. Where indicated, restrained joint pipe shall be ductile iron pipe. No restrained joint PVC pipe will be allowed.

D. Joint Deflection: Deflection at the joint shall not exceed 1.5 degrees or the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints that are over-belled or not belled to the stop mark.

2.03  FITTINGS

A. Fittings shall be ductile iron conforming to AWWA C153, Class 250. PVC pipe fittings shall be mechanical joint.

B. Fittings shall be lined with standard thickness cement mortar in accordance with AWWA C104 and coated in accordance with the requirements of Section 09 96 00 - Protective Coating.

C. Each fitting shall be clearly labeled to identify its size and pressure class.
PART 3 EXECUTION

3.01 GENERAL

A. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the COR, and shall be subject to approval before acceptance. Material having defects will be rejected and the Contractor shall promptly remove such defective materials from the Site.

B. Installation shall conform to AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements or modifications herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.02 HANDLING AND STORAGE

A. Handling: Pipe, fittings, and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings, or any other pipe-related material be dropped or dumped into trenches.

B. Storage: Pipe should be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe shall be stored in such a way as to prevent sagging or bending and shall be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Store gaskets in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.03 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Section 31 30 00 - Earthwork.

3.04 INSTALLATION

A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each day's work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.

B. Pipe shall be supported at its proper elevation and grade; care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints and couplings. Anchors and supports shall be
provided where indicated and where necessary for fastening work into place. Fittings shall be independently supported.

C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.

D. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

E. Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters that will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander, or abrasive disc.

3.05 IDENTIFICATION TAPE

A. Polyvinyl chloride pipelines shall be provided with identification tape as per Section 31 30 00 - Earthwork.

3.06 SERVICE CONNECTIONS

A. Service Connections: Direct tapping will not be permitted. Double strap bronze service clamps shall be used for all service connections. Service clamps shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when the saddle is made tight. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters or twist drills are not acceptable. Lubricate the cutting and tapping edges of the tool with cutting lubricant. Make the cuts slowly and use the follower very lightly - do not force cutter through pipe wall. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddle is 2-inches.

B. Tapping sleeves and valves shall be used for outlet sizes greater than 2-inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations.

3.07 CONNECTIONS TO EXISTING PIPELINES

A. The Contractor shall locate underground improvements and install the pipelines to the depths indicated. Where the new work is to be connected to existing pipelines, the Contractor shall make its arrangements with the serving utility well in advance of the connections, to allow adequate time for dewatering of the existing line, if necessary, and shall expedite the work to minimize water outages to the users. Where sections of existing distribution mains are taken permanently out of service and abandoned in place,
the cut ends shall be plugged solid with concrete to a depth of not less than one pipe diameter.

END OF SECTION
DIVISION 34 THROUGH 39 – NOT USED
This page intentionally left blank.
DIVISION 40 – PROCESS PIPING AND INTEGRATION
This page intentionally left blank.
SECTION 40 23 00
PIPING, GENERAL

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  SUMMARY

A. The Contractor shall provide the piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all piping sections.

C. Pipe Fabrication Drawings. The mechanical Drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. The Contractor shall provide detailed pipe fabrication and pipe laying submittals in accordance with the requirements of the individual pipe material specification sections.

D. Pipe Supports and Spacing. Where pipe supports and spacing are indicated on the Drawings and are referenced to a Standard Detail, the Contractor shall use that Detail. Where pipe supports are not indicated on the Drawings, it is the Contractor's responsibility to develop the details necessary to design and construct mechanical piping systems to accommodate the specific equipment provided, and to provide spacers, adapters, and connectors for a complete and functional system in accordance with the Contract Documents.

1.03  SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.

B. RSN 40 23 00-1, Shop Drawings:
   1. Shop Drawings shall contain information as required in the individual pipe material specification section as well as the following information:
      a. Layout and Fabrication Drawings: Layout drawings including necessary details, dimensions, and material lists for pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate spacers, pipe adapters and couplings, connectors, fittings, and location of pipe supports to accommodate the equipment and valves in a complete and functional system.
b. Gasket Material: Submit gasket manufacturer’s catalog indication that the recommended product is suitable for each fluid service application.

c. Modular Seals for Pipe Penetrations: Manufacturer's information sheets showing materials and installation procedures.

C. RSN 40 23 00-2, Samples:

1. The CONTRACTOR shall provide and pay for any pipe material sampling and product testing as necessary and as required in the individual pipe material specifications.

D. RSN 40 23 00-3, Certifications:

1. Necessary certificates, test reports, and affidavits of compliance for all pipe shall be obtained by the CONTRACTOR.

2. A certification from the pipe fabricator that each pipe will be manufactured subject to the fabricator’s or a recognized Quality Control Program. An outline of the program shall be submitted to the COR for review prior to manufacture of any pipe.

PART 2 PRODUCTS

2.01 GENERAL

A. Extent of Work: Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable specification Sections and as indicated. Materials and pipe coatings in contact with potable water or fisheries process water shall be listed as compliant with NSF Standard 61.

B. Pipe Supports: Pipes shall be adequately supported, restrained, and anchored in accordance with Section 40 23 02 - Pipe Supports, and as indicated on the Contract Drawings.

C. Interior Linings: Application, thickness, and curing of pipe interior linings shall be in accordance with the applicable Sections unless otherwise indicated.

D. Exterior Coatings: Application, thickness, and curing of exterior coatings on buried pipe shall be in accordance with the applicable Sections unless otherwise indicated. Pipes above ground or in structures shall be coated in accordance with Section 09 96 00 - Protective Coating.

E. Pressure Rating: Piping systems shall be designed for the maximum expected pressure as indicated on the Piping Schedule.

F. Inspection: Pipe shall be subject to inspection at the place of manufacture. During the manufacture, the COR shall be given access to areas where manufacturing is in progress.
and shall be permitted to make inspections necessary to confirm compliance with requirements.

G. Tests: Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The Contractor shall be responsible for performing material tests.

H. Welding Requirements: Qualification of welding procedures used to fabricate pipe shall be in accordance with the provisions of AWS D1.1 - Structural Welding Code. Welding procedures shall be submitted for the COR's review.

I. Welder Qualifications: Welding shall be done by skilled welders and welding operators who have adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9, by an independent local, approved testing agency not more than 6 months prior to commencing work on the piping. Machines and electrodes similar to those used in the work shall be used in qualification tests. Qualification testing of welders and materials used during testing is part of the work.

2.02 PIPE FLANGES

A. General: Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small diameter pipes shall be in accordance with the standards indicated for these pipes.

B. Pressure Ratings

1. 150 psi or less: Flanges shall conform to either AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ASME B16.5 - Pipe Flanges and Flanged Fittings, 150 lb class.

2. Selection based on test pressure: AWWA flanges shall not be exposed to test pressures greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

C. Blind Flanges: Blind flanges shall be in accordance with AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 10-inches and greater shall be provided with lifting eyes in the form of welded or screwed eye bolts.

D. Flange Coating: Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

E. Flange Bolts: Bolts and nuts shall conform to Section 05 50 00 - Miscellaneous Metalwork, unless noted otherwise on the Contract Drawings. All-thread studs may be used on valve flange connections where space restrictions preclude the use of regular bolts.
F. Flange Gaskets

1. Gaskets for flanged joints used in general water and wastewater service shall be full-faced type, with material and thickness in accordance with AWWA C207, suitable for temperatures to 700 deg F, a pH of one to 11, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted unless otherwise indicated. Flange gaskets shall be as manufactured by John Crane, Style 2160, Garlock, Style 3000, or equal.

2. Gaskets for flanges for PVC and CPVC piping used in general water, fisheries, and wastewater service shall be full faced, 1/8-inch thick, made of ethylene propylene rubber (EPR) having a Type A durometer hardness of 50 to 70 when tested in accordance with ASTM D 2240. When the mating flange has a raised face, provide a flat ring gasket filler between the PVC flange and gasket and the adjacent flange.

3. Gaskets for flanged joints used in chemicals, air, solvents, hydrocarbons, steam, chlorine and other fluids shall be made of materials compatible with the service, pressure, and temperature.

2.03 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. General: Cast mechanical-type couplings shall be provided where indicated. The couplings shall conform to the requirements of AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to the requirements of Section 05 50 00. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of grooved piping shall conform to the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid excessive load on equipment caused by pipe movement due to steady state or transient pressure conditions, equipment connections with mechanical-type couplings shall have rigid grooved couplings or flexible type coupling with harness in sizes where rigid type couplings are not available, unless thrust restraint is provided by other means. Mechanical type couplings shall be bonded. The Contractor shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To assure uniform and compatible piping components, grooved fittings, couplings, and valves shall be furnished by the same manufacturer as the coupling. Grooving tools shall be from the same manufacturer as the grooved components.

B. Manufacturers of couplings for PVC pipe, or equal

1. Gustin-Bacon, (Aeroquip Corp)
2. Victaulic Style 775

Note: Couplings for PVC pipe shall be furnished with radius cut or standard roll grooved pipe ends.
2.04 SLEEVE-TYPE COUPLINGS

A. General: Sleeve-type couplings shall be provided where indicated. The Contractor will not be allowed to substitute a sleeve-split coupling, or any other type in lieu of sleeve coupling unless approved by the COR.

B. Construction: Sleeve couplings shall be in accordance with AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. The coupling shall be either 5- or 7-inches long for sizes up to and including 30-inches and 10-inches long for sizes greater than 30-inches, for standard steel couplings, and 16-inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to the requirements of Section 05 50 00. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

C. Pipe Preparation: Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12-inches from the ends of the pipe, with outside diameter not more than 1/64 inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

D. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:
   a. Color: Black
   b. Surface: Non-blooming
   c. Durometer Hardness: 75 +/- 5
   d. Tensile Strength: 1000 psi minimum
   e. Elongation: 175 percent minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. Gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z,
meeting Suffix B13 Grade 3, except as noted above. Where sleeve couplings are used in water containing chloramine or other fluids which attack rubber materials, gasket material shall be compatible with the piping service and fluid utilized.

E. Piping Connection to Equipment: Where piping connects to mechanical equipment such as pumps, compressors, and blowers, the piping shall be brought to the equipment connection aligned and perpendicular to the axis of the flange or fitting for which the piping is to be connected. The piping shall not impose excessive stress to the equipment connection to cause misalignment of the equipment. The Contractor shall assign the responsibility to the equipment manufacturer to review the piping connection to the equipment and submit any modifications to the COR for review.

F. Restrained Joints: Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with AWWA Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation to prevent misalignment of the pump imparted by the thrust within the piping system.

G. Manufacturers, or equal
   1. Dresser, Style 38
   2. Ford Meter Box Co., Inc., Style FC1 or FC3
   3. Smith-Blair, Style 411

2.05 FLANGE COUPLING ADAPTERS

A. Flange coupling adapters shall be provided where indicated. The Contractor will not be allowed to substitute any other type in lieu of flange coupling adapter unless approved by the COR. The coupling shall be rated as indicated.

B. Construction: Flange coupling adapter body shall be fabricated from steel ASTM A 512 - Cold-Drawn Buttweld Carbon Steel Mechanical Tubing or A 513 - Electric-Resistance Welded Carbon and Alloy Steel Mechanical Tubing with steel bolts, without pipe stop. Flange shall be in accordance with AWWA C207. Couplings shall be of sizes to fit the pipe and fittings indicated. The body shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the body material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. The follower flange shall be fabricated from steel, ASTM A 576 - Steel Bars, Carbon, Hot Wrought, Special Quality or AISI C1012. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Flange coupling adapters installed in piping system rated for positive pressure, the coupling shall be restrained with harness bolts or tie rods. Other means of restraining the coupling such as set screws will not be acceptable. Bolts and
nuts shall conform to the requirements of Section 05 50 00. Buried couplings shall be epoxy-coated at the factory as indicated.

C. Gaskets: Gaskets for flange coupling adapters shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60 NSF approved, or equivalent suitable elastomer.

1. The rubber in the gasket shall meet the following specifications:
   a. Color - Jet Black
   b. Surface - Non-blooming
   c. Durometer Hardness - 74 plus and minus 5
   d. Tensile Strength - 1000 psi Minimum
   e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. Gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Where flange coupling adapters are used in water containing chloramine or other fluids which attack rubber materials, gasket material shall be compatible with the piping service and fluid utilized.

D. Piping Connection to Equipment: Where piping connects to mechanical equipment such as pumps, compressors, and blowers, the piping shall be brought to the equipment connection aligned and perpendicular to the axis of the flange or fitting for which the piping is to be connected. The piping shall not impose excessive stress to the equipment connection to cause misalignment of the equipment. The CONTRACTOR shall assign the responsibility to the equipment manufacturer to review the piping connection to the equipment and submit any modifications to the COR for review.

E. Restrained Joints: Flange coupling adapters on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be designed by the pipe manufacturer in accordance with AWWA Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation to prevent misalignment of the pump imparted by the thrust within the piping system.

F. Manufacturers, or equal

1. Smith-Blair, Model 975
2. JCM, Model 309
2.06 EXPANSION JOINTS

A. Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be flanged end, stainless steel, Monel, rubber, or other materials best suited for each individual service. The Contractor shall submit detailed calculations and manufacturer's Shop Drawings of proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature, and pressure ratings.

2.07 PIPE THREADS

A. Pipe threads shall be in accordance with ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

2.08 MODULAR MECHANICAL SEALS FOR PIPING PENETRATIONS

A. Where indicated and where required to prevent flow of water or air, the passages of piping through wall sleeves and cored openings shall be sealed with modular interlocking link mechanical closures. Individual links shall be constructed of EPDM rubber, be suitable for temperatures between minus 40 and plus 250 deg F, and be shaped to fill the annular space between the outside of the pipe and the inside of the wall sleeve or cored opening.

1. Links shall be assembled with type 316 stainless steel bolts and nuts to form a continuous rubber belt around the pipe.
2. Pressure plates under each bolt and nut shall be fabricated of a corrosion-resistant composite material.
3. Sizing and installation of sleeves and assemblies shall be in accordance with the manufacturer's recommendations.
4. Modular mechanical seals for pipe penetrations shall be Link Seal by Thunderline Corporation, or equal

PART 3 EXECUTION

3.01 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials.
3.02 GENERAL

A. Piping, fittings, and appurtenances shall be installed in accordance with the requirements of applicable Sections. Proprietary manufactured couplings shall be installed in accordance with the coupling manufacturer's recommendation.

B. Care shall be taken to insure that piping flanges, mechanical-type couplings, sleeve-type couplings, flexible connectors, and expansion joints are properly installed as follows:

1. Gasket surfaces shall be carefully cleaned and inspected prior to making up the connection. Each gasket shall be centered properly on the contact surfaces.

2. Connections shall be installed to prevent inducing stress to the piping system or the equipment to which the piping is connected. Contact surfaces for flanges, couplings, and piping ends shall be aligned parallel, concentric, and square to each axis at the piping connections.

3. Bolts shall be initially hand-tightened with the piping connections properly aligned. Bolts shall be tightened with a torque wrench in a staggered sequence to the AISC recommended torque for the bolt material.

4. Groove ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove.

5. After installation, joints shall meet the indicated leakage rate. Flanges shall not be deformed nor cracked.

C. Lined Piping Systems: The lining manufacturer shall take full responsibility for the complete, final product and its application. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.

D. Core Drilling: Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and reinforcing bars.

E. Cleanup: After completion of the work, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

END OF SECTION
This page intentionally left blank
SECTION 40 23 02
PIPE SUPPORTS

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   SUMMARY

A. Provide pipe supports, hangers, guides, and anchors, complete and in place, as indicated in accordance with the Contract Documents.

B. Where pipe support systems are not indicated on the Drawings, the Contractor shall design and provide the supports in accordance with this Section.

C. Seismic and Wind Forces
   1. Pipe support details indicated in the Contract Drawings shall be provided to resist seismic and wind forces.
   2. The Contractor shall provide additional supports as needed to resist such forces.

1.03   SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 – Submittals.

B. RSN 40 23 02-1, Shop Drawings:
   1. Submit Shop Drawings which shall include the following information:
      a. Drawings of pipe supports, hangers, anchors, and guides
      b. Calculations for special supports and anchors, stamped and signed by a registered professional engineer.

PART 2   PRODUCTS

2.01   GENERAL REQUIREMENTS

A. Code Compliance
   1. Piping systems and pipe connections to equipment shall be properly anchored and supported in order to prevent undue deflection, vibration, and dislocation due to seismic events, line pressures, pipe weight, fluid weight, liquid movement,
thermal changes, vibration, probable forces applied during construction, and stresses on piping, equipment, and structures.

2. Supports and parts thereof shall conform to the requirements of ASME B31.1 - Power Piping, except as supplemented or modified in this Section.

3. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.

B. Structural Members

1. Wherever possible, pipes shall be supported from structural members.

2. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the Contractor.

3. Supplementary members shall be in accordance with the requirements of the Building Code and the American Institute of Steel Construction, and shall be as acceptable to the COR.

C. Pipe Hangers

1. Pipe hangers shall be capable of supporting the pipe in operation, allowing free expansion and contraction of the piping and preventing excessive stress on equipment.

2. Hangers shall have a means of vertical adjustment after erection.

3. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe.

4. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves shall include hydraulic shock suppressors.

5. Hanger rods shall be subjected to vertical loading only.

D. Hangers Subject to Horizontal Movements

1. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement.

2. Where horizontal pipe movement is greater than 1/2 inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold-to-hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

E. Spring-Type Hangers

1. Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping.

2. Spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered.
3. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate the compression of the spring.

4. Supports shall be capable of accommodating at least 4 times the maximum travel due to thermal expansion.

F. Thermal Expansion
   1. Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or expansion joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely away from the anchored points.
   2. Components shall be structurally suitable to withstand the imposed loads.

G. Heat Transmission
   1. Supports, hangers, anchors, and guides shall be designed and insulated such that excessive heat will not be transmitted to the structure or to other equipment.

H. Riser Supports
   1. Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

I. Freestanding Piping
   1. Freestanding pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure.
   2. Exterior, freestanding overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, or with horizontal, welded steel angles, and U-bolts or clamps securing the pipes.

J. Materials of Construction
   1. Pipe support assemblies, including framing, hardware, and anchors, shall be of steel construction, galvanized after fabrication, unless otherwise indicated.
   2. Submerged supports, as well as piping, conduits, and equipment in hydraulic structures within 24 inches of the water level, shall be supported with support assemblies, including framing, hardware, and anchors constructed of Type 316 stainless steel, unless otherwise indicated.

K. Point Loads
   1. Meters, valves, heavy equipment, and other point loads on PVC, FRP, or other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations, in order to avoid undue pipe stresses and failures.
2. In order to avoid point loads, the supports on PVC, FRP, or other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

L. Concrete Anchors

1. Unless otherwise indicated, concrete anchors for pipe supports shall be according to the following table; consult the COR for any anchor applications not appearing on the table.

2. Anchor embedment shall be in accordance with the requirements of Section 05 50 00 – Miscellaneous Metalwork.

<table>
<thead>
<tr>
<th>Pipe Support Application</th>
<th>Type of Concrete Anchor</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Concrete:</td>
<td>Use embedded concrete insert anchors on a grid pattern. Use Grinnell (Anvil International), Tolco, or equal.</td>
</tr>
<tr>
<td>Existing Concrete:</td>
<td>Use non-shrink grouted anchors, metallic type expansion anchors, or epoxy anchors.</td>
</tr>
<tr>
<td></td>
<td>Exceptions: Metallic type expansion anchors and epoxy anchors are not permitted for pipe supports subject to vibrating loads. Epoxy anchors are not permitted where the concrete temperature is in excess of 100 deg F or higher than the limiting temperature recommended by the manufacturer. Epoxy anchors are not accepted where anchors are subject to vibration or fire.</td>
</tr>
<tr>
<td>Vibratory Loads and High-Temperature Conditions:</td>
<td>Use non-shrink grouted anchors</td>
</tr>
</tbody>
</table>

M. Noise Reduction

1. In order to reduce the transmission of noise in piping systems, copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar suitable material at each pipe support, bracket, clip, or hanger.

2.02 SUPPORT SPACING

A. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads.
B. Pipe support spacing shall not exceed the maximum indicated spans.

C. For temperatures other than ambient temperatures or those listed, and for other piping materials or wall thicknesses, the pipe support spacings shall be modified in accordance with the pipe manufacturer's recommendations.

D. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of loading effects.

E. Other Pipe Materials
   1. Support spacing for pipe constructed of other materials shall be based on design temperature and in accordance with the pipe manufacturer's recommendations.

2.03 MANUFACTURED SUPPORTS

A. Provide pipe supports, hangers, guides, and anchors, complete and in place, as indicated in accordance with the Contract Documents.

B. Stock Parts
   1. Where not specifically indicated, designs that are generally accepted as exemplifying good engineering practice and using stock or production parts shall be utilized wherever possible.
   2. Such parts shall be locally available, new, of best commercial quality, and designed and rated for the intended purpose.

C. Manufacturers, or Equal
   1. Basic Engineers Inc.
   2. Bergen-Paterson Pipesupport Corp.
   3. Grinnell Corp. (Anvil International)
   4. NPS Products, Inc.
   5. Power Piping Company
   6. Tolco Incorporated

2.04 COATING

A. Galvanizing
   1. Unless otherwise indicated, fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. Other Coatings
1. Other than stainless steel or non-ferrous supports, supports shall receive protective coatings in accordance with the requirements of Section 09 96 00 – Protective Coating.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ASME B31.1 - Power Piping.

2. Concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. Appearance

1. Pipe supports and hangers shall be positioned in order to produce an orderly, neat piping system.

2. Hanger rods shall be vertical, without offsets.

3. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, and without interference with other work.

3.02 FABRICATION

A. Quality Control

1. Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available.

2. Fabricated supports shall be neat in appearance without sharp corners, burrs, or edges.

END OF SECTION
SECTION 40 23 16
STAINLESS STEEL PIPE (ASTM A312, MODIFIED)

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A.  Stainless Steel Pipe
   1.  Payment: Lump-Sum price offered in the Price Schedule.
      a.  Includes cost of furnishing materials, fittings and appurtenances;
          manufacturing and installing pipe; furnishing and placing supports;
          connections to equipment or tanks; and furnishing maintenance warranty
          bond.

1.02  SUMMARY
A.  The Contractor shall provide stainless steel pipe and appurtenances, complete and in
    place, in accordance with the Contract Documents.
B.  The requirements of Section 40 23 00 - Piping, General apply to the work of this Section.
C.  Pipe Material Group No. 14.  The piping system defined in this section is referred to in

1.03  CONTRACTOR SUBMITTALS
A.  Submittals shall be in accordance with Section 01 33 00 - Submittals.
B.  RSN 40 23 16-1, Shop Drawings:
   1.  The Contractor shall submit Shop Drawings of pipe, joints, bends, special fittings,
       and piping appurtenances.

PART 2  PRODUCTS

2.01  PIPE MATERIAL
A.  Unless otherwise indicated, stainless steel pipe shall be in accordance with ASTM A 312
    - Seamless and Welded Austenitic Stainless Steel Pipe, Type 316, seamless, Schedule 40,
    with screwed fittings for sizes up to and including 2.5 inches and welded fittings or
    flanged fittings for sizes 3-inches and larger.  Stainless steel pipe 12-inches in diameter
    and larger shall be in accordance with ASTM A 409 - Welded Large Diameter Austenitic
    Steel Pipe for Corrosive or High-Temperature Service, or A 778 - Welded, Unannealed
    Austenitic Stainless Steel Tubular Products, Type 316, of the schedules indicated, with
    welded or flanged joints.
2.02 PIPE JOINTS

A. Stainless steel pipe for sizes 2.5 inches and smaller shall have screwed ends with NPT threads made up with Teflon tape. Stainless steel pipe 3-inches and larger and where indicated shall have welded joints with socket-welding fittings, butt-welding fittings, or socket welding flanges. Stainless steel flanges shall have stainless steel bolts and nuts. Where indicated, stainless steel pipe shall have grooved ends for shouldered couplings, except that no pipe with less than Schedule 40 wall thickness shall be grooved. Where indicated, stainless steel pipe shall have plain ends for sleeve-type couplings.

2.03 FITTINGS

A. Threaded Fittings: Forged stainless steel fittings conforming to ASME B 16.11 - Forged Fittings, Socket-Welding and Threaded, Type 316.

B. Socket-Welding Fittings: Forged stainless steel fittings conforming to ASME B 16.11, Type 316.


D. Grooved Fittings: Wrought stainless steel grooved fittings conforming to ASTM A 403 and ASME B 16.9, with grooving conforming to AWWA C606 - Grooved and Shouldered Joints, Type 316.

E. Flanged Fittings: Type 316 stainless steel flanged fittings and flanges conforming to ASME B 16.5 - Pipe Flanges and Flanged Fittings.

F. Pressure Class: Unless otherwise indicated, fittings shall be in accordance with the pressure classes called for in the Piping Schedule. Where not indicated, the fittings shall have the same pressure rating as the pipe.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Stainless steel pipe shall be installed in a neat and workmanlike manner, properly aligned and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. Installation shall be free from defects.

B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 40 23 02 - Pipe Supports. Where
necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

3.02 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, be flushed clean of any debris or dust, and be straightened if not true. Ends of threaded pipes shall be reamed and filed smooth. Fittings shall be equally cleaned before assembly.

3.03 PIPE JOINTS

A. Threaded Joints: Pipe threads shall conform to ASME B 1.20.1 - Pipe Threads, General Purpose (inch), and shall be full and cleanly cut with sharp dies. Not more than 3 threads shall remain exposed after installation.

B. Welded Joints: Welded joints shall conform to the specifications and recommendations of ASME B 31.1 - Power Piping. Welding shall be done by skilled and qualified welders per Section 40 23 00 - Piping, General.

1. Field welding shall be minimized to the greatest extent possible by use of couplings and prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the Site, providing the butt welds are performed only with an inert gas shielded process and that other indicated welding requirements are followed rigidly.

2. Residue, oxide, and heat stain shall be removed from any type of field weld and the affected areas adjacent by the use of stainless steel wire brushes, followed by cleaning with an agent such as Eutectic Company's "Euclean" or equal, followed by complete removal of the agent.

C. Grooved Joints: Grooves for grooved couplings and fittings shall be made with specially designed grooving tools to the manufacturer's recommendations and conforming to AWWA C606. Grooves shall be clean and sharp without flaws, and the pipe ends shall be accurately cut at 90 degrees to the pipe axis.

3.04 INSPECTION AND FIELD TESTING

A. Inspection: The finished installation shall be carefully inspected for proper supports, anchoring, interferences, and damage to pipe, fittings, and coating. Defects shall be repaired.
B. Field Testing: Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1.5 times the maximum working pressure. The Contractor shall furnish test equipment, labor, materials, and devices as part of the work.

C. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. Fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

D. Leaks shall be repaired, and the system shall be re-tested until no leaks are found.

END OF SECTION
SECTION 40 23 22
PVC PRESSURE PIPE (IPS SOLVENT WELDED)

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A. PVC Pressure Pipe (IPS Solvent Welded):
   1. Payment: Lump-Sum price offered in the Price Schedule.
      a. Includes cost of furnishing materials, fittings and appurtenances; manufacturing and laying pipe; furnishing and placing concrete in collars, blowoffs, encasements and blocking; and furnishing maintenance warranty bond.
      b. 4”, 6”, 8”, 10”, 12”, 14”, and 20” PVC Pressure Pipe.

1.02  SUMMARY

A. The Contractor shall provide polyvinyl chloride (PVC) pressure pipe, complete and in place, in accordance with the Contract Documents.

B. Pipe Material Group No. 16 and 17. This piping system is referred to in the Piping Schedule in Contract Drawings as Piping Material Group No. 16.

C. The requirements of Section 40 23 00 - Piping, General, apply to the WORK of this Section.

D. This Section includes PVC pressure pipe with solvent-welded, flanged, or screwed joints. PVC pipe with bell and spigot joints for drainage or sanitary service is not covered under this Section.

1.03  CONTRACTOR SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00 - Submittals.

B. RSN 40 23 22-1, Shop Drawings:
   1. The Contractor shall submit Shop Drawings of pipe, joints, bends, special fittings, and piping appurtenances.

C. RSN 40 23 22-2, Manufacturer’s Certification:
   1. A certification from the pipe fabricator that each pipe will be manufactured subject to the fabricator’s or a recognized Quality Control Program. An outline of the program shall be submitted to the COR for review prior to manufacture of any pipe.
PART 2  PRODUCTS

2.01 PIPE MATERIAL

A. PVC pipe shall be made from new rigid unplasticized polyvinyl chloride and shall be normal impact Type 1, Grade 1, class 12454, Schedule 80, listed as compliant with NSF Standard 61, unless otherwise indicated, in accordance with ASTM D 1785-Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

2.02 PIPE JOINTS

A. Pipe joints shall be solvent-welded type with solvent cement and primer as recommended by the pipe manufacturer for the chemical in the pipe.

B. Screwed joints that are necessary to match up to threaded valves or fittings shall be made up with appropriate thread sealant, either paste or tape.

C. Flanged joints shall be made with solvent-welded PVC flanges, drilled to ASME B16.5 - Pipe Flanges and Flanged Fittings, Class 150, unless otherwise indicated. Gaskets shall be ANSI 150 lb. full face, 1/8-inch thick Neoprene for water service. Gasket material for chemicals shall be suitable for the chemical service.

2.03 FITTINGS

A. Solvent Welded and Threaded Fittings: Solvent-welded and threaded fittings shall be Schedule 80 PVC fittings in accordance with ASTM D 2467 - Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule per Drawings.

B. Flanged Fittings: Flanged fittings shall be Schedule per Drawings, fabricated PVC fittings with 150 lb. flanges to ASME B 16.5.

PART 3  EXECUTION

3.01 INSTALLATION

A. General: PVC pipe shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. It is recommended that the Contractor obtain the assistance of the pipe manufacturer's field representative to instruct the pipefitters in the correct installation and support of PVC piping.

B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 40 23 02 - Pipe Supports. Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored.
or harnessed. Expansion joints and guides shall compensate for pipe expansion due to
temperature changes.

C. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of
fixtures and equipment shall be provided with a shutoff valve and union, unless the valve
has flanged ends. Unions shall be provided at threaded valves, equipment, and other
devices requiring occasional removal or disconnection. Valves and flanges attached to
PVC pipe shall be provided with adequate supports.

3.02 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any
debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed
and filed smooth. Pipe fittings shall be equally cleaned before assembly.

3.03 PIPE JOINTS

A. Solvent-Welded Joints: Solvent-welded joints shall be made with fresh primer and
solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed
at all times and the joints shall be made up at the recommended ambient temperatures, to
the pipe or cement manufacturer's written recommendations. Pipe ends shall be inserted
to the full depth of the socket.

B. Flange Joints: Flanged joints shall be made with gaskets and Type 316 stainless steel
bolts and nuts. Care shall be taken not to over-torque the bolts, in accordance with the
manufacturer's written recommendations.

3.04 INSPECTION AND FIELD TESTING

A. Inspection: Finished installations shall be carefully inspected for proper joints and
sufficient supports, anchoring, interferences, and damage to pipe, fittings, and coating.
Defective WORK shall be repaired.

B. Field Testing: The Contractor shall allow adequate time for the solvent cement joints to
cure. Curing time shall be per the solvent cement manufacturer's recommendation. Prior
to enclosure or burying, piping systems shall be pressure tested as required in the Piping
Schedule, for a period of not less than one hour, without exceeding the tolerances listed
in the Piping Schedule. Caution - Do not use air or gas for testing PVC pipe. Where no
pressures are indicated, the pipes shall be subject to 1.5 times the maximum working
pressure. The Contractor shall furnish test equipment, labor, materials, and devices.

C. Leakage shall be determined by loss of pressure. Fixtures, devices, or other accessories
that would be damaged if subjected to the test pressure shall be disconnected and ends of
the branch lines shall be plugged or capped as appropriate during the testing procedures.

D. Leaks shall be repaired, and the piping shall be re-tested until no leaks are found.
END OF SECTION
SECTION 40 91 00
METERS, GENERAL

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 SUMMARY

A. Commercial Standards
   1. ISA - S 5.1 Instrumentation Symbols and Identification
   2. ANSI - B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
   3. ANSI/AWWA C207 Steel Pipe Flanges for Waterworks Service - Sizes 4 In Through 144 In.
   4. ANSI/AWWA C701 Cold-Water Meters - Turbine Type for Customer Service
   5. ANSI/AWWA C702 Cold-Water Meters - Compound Type
   6. AWWA C704 Cold-Water Meters - Propeller Type for Main Line Applications

1.03 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals.
   1. RSN 40 91 00-1, Shop Drawings:
      a. Each meter shall be identified with its equipment number, as indicated.
   2. RSN 40 91 00-2, Manufacturer's Data:
      a. With the Shop Drawings, furnish certified curves indicating flow versus differential pressure and any other information called for in the individual meter specifications.
   3. RSN 40 91 00-3, Operation and Maintenance Manual:
      a. Furnish 5 identical copies of complete operation and maintenance instructions of all the metering systems including instrumentation and controls, in accordance with the paragraph “Operational Procedures” in Section 01 33 00.
   4. RSN 40 91 00-4, Spare Parts List:
a. The Contractor shall furnish a list of manufacturer's recommended spare parts.

5. RSN 40 91 00-5, Special Tools:
   a. A list of special tools shall be submitted to the COR.

6. RSN 40 91 00-6, Documentation:
   a. After completion the Contractor shall furnish to the COR the manufacturer's written guarantees, that the metering systems will operate within the published accuracies and flow ranges and meet these Specifications. The Contractor shall also furnish the manufacturer's warranties as published in its literature and as specified.

1.04 QUALITY ASSURANCE

A. Accuracy Requirements: Unless otherwise indicated, flow meters shall be guaranteed to register flow to an accuracy of plus and minus 2 percent of actual flow throughout the range indicated. Density measuring equipment shall have a degree of accuracy within plus and minus 2 percent of actual solids content over the range indicated.

PART 2 PRODUCTS

2.01 SPARE PARTS AND SPECIAL TOOLS

A. Furnish the spare parts listed in the individual meter sections. Spare parts shall be suitably packaged and labeled by part name and associated equipment number.

B. The Contractor shall furnish special tools suitably wrapped and identified for application.

PART 3 EXECUTION

3.01 SERVICES OF MANUFACTURER

A. After installation, the Contractor shall obtain the services of an experienced factory service representative to inspect the installation and test all meters for proper performance.

B. Instruction of Hatchery's Personnel: After completion of the installation and during startup of the plant, the Contractor shall instruct the Hatchery's personnel with COR coordination in the proper operation, maintenance and repair of all metering equipment. For this purpose, the Contractor shall obtain the services of an experienced factory service representative, who shall spend sufficient time on the Site to fully instruct the COR's operating personnel on all phases of the metering equipment.
3.02 INSTALLATION

A. The Contractor shall assemble and install equipment in strict accordance with the manufacturer's published instructions, under the supervision of the manufacturer's representative. Installation shall be accomplished by competent craftsmen in a workmanlike manner.

B. Meters shall be installed in easily accessible locations for ease of reading and maintenance, and, where shown, for balancing of flow in several lines, in conjunction with throttling and shut-off valves. Wherever possible, all meters shall be installed in such a way to provide the manufacturer's recommended straight approach and straight piping downstream. Meters and shut-off and balancing valves shall be firmly supported from the structure or from the floor with approved supports. In-line meters shall be installed to provide full-line flow and not less than the manufacturer's recommended head at all times.

3.03 TESTING

A. Equipment shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required.

B. Each item shall be subjected to an operating test over the total range of capability of the equipment. Where applicable, tests shall be conducted in accordance with the Test Code of the Standards of the Hydraulic Institute. The Contractor shall obtain copies of factory test certifications and shall notify the COR one week in advance of all tests to be conducted on Site.

END OF SECTION
This page intentionally left blank
SECTION 40 91 23
ELECTROMAGNETIC FLOW METERS

PART 1   GENERAL

1.01 MEASUREMENT AND PAYMENT
A. Electromagnetic Flow Meters:
   1. Payment: Lump-sum price offered in the Price Schedule:
      a. Includes:
         1) Cost of furnishing materials; manufacturing installation and electrical connections; and furnishing maintenance warranty bond.
         2) 6”, 10”, and 12” Electromagnetic Flow Meters

1.02 SUMMARY
A. This section describes the requirements for an electromagnetic flow meters and microprocessor-based signal converters. Under this item, the Contractor shall furnish and install the full port flow sensor and accessories as indicated by the COR and as herein specified.

1.03 CONTRACTOR SUBMITTALS
A. The following information shall be included in the submittal for this section:
   1. RSN 40 91 23-1. Data sheets and catalog literature for the Meter and the microprocessor-based signal converter.
   2. RSN 40 91 23-2, Connection diagrams for equipment wiring.
   3. RSN 40 91 23-3, List of spare parts and optional equipment.

PART 2   PRODUCTS

2.01 ELECTROMAGNETIC FLOW METER (INSERTION MAGMETER)
A. The electromagnetic flow meters shall consist of an adjustable depth insertion magmeter for piping sizes 3”-48”

B. A total of (6) six meters:
   1. (2) 6” pipes for GW-FT-(100&200)
   2. (2) 10” for RW-FT-(100&200)
   3. (2) 14” for RS-FT-(100&200)
C. Flow Meter Requirements:
   1. (2) Pipe saddle/fitting for each pipe size with hot tap.
   2. Construction: Tubing/fitting/Sensor material: Type 316L stainless steel.
   3. Ambient and Operating Fluid Temp: 32 to 200° F
   4. Minimum conductivity 20 uS/cm²
   5. Water Velocity Requirements, 0.28 - 20 ft/sec, +/- 1% accuracy
   6. Quantity and Size: As illustrated in the Contract Drawings.
   7. Installation hardware shall be compatible for mounting between standard ANSI B16.5 pipe flanges.
   8. Converter enclosure:
      a. IP-67 enclosure or NEMA 4X watertight.
      b. Powder coated Cast Alum.
   9. Power supply: 12-24 VDC, 250 mA
   10. Operating temperature: 0 to 160 degrees F.
   11. Outputs: 4-20 mA (load resistance 0 to 750 Ω).
   12. Two separate digital outputs: Transistor open collector and solid-state relay

2.02 MANUFACTURER
   1. Seametrics or equal

2.03 SPARE PARTS
   A. Spare parts for the equipment shall include the following, unless otherwise noted:
       B. 1. One set of manufacturer’s recommended spare parts for each meter.

2.04 OPERATOR FUNCTIONS
   A. Calibration
      1. Field Calibration per manufacturers recommendations.

PART 3 EXECUTION

3.01 INSTALLATION
   A. A. Follow manufacturer’s written recommendations.

3.02 MANUFACTURER’S ASSISTANCE
   A. Warranty
1. The manufacturer of the electromagnetic flow meter shall guarantee for two years of operation that the equipment shall be free from defects in design, workmanship, or materials.

2. In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall promptly repair or replace the defective part at no cost to the Government.

END OF SECTION
This page intentionally left blank.
DIVISIONS 41 THROUGH 42 – NOT USED
This page intentionally left blank.
DIVISION 43 – PROCESS GAS AND LIQUID HANDLING
SECTION 43 25 00
VALVES, GENERAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Valves:
   1. Payment: Lump-sum price offered in the Price Schedule.
      a. Includes:
         1) Installed, complete, and operational
         2) Butterfly Valves.
         3) Check Valves.
         4) Ball Valves.
         5) Pressure Relief Valves.
         6) Miscellaneous Valves.

1.02 SUMMARY

A. The Contractor shall provide valves, actuators, and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.

C. Where a valve is to be supported by means other than the piping to which it is attached, the Contractor shall obtain from the valve manufacturer a design for support and foundation that satisfies the criteria in Section 40 23 02.

D. Unit Responsibility: A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing each valve; however, the Contractor shall be responsible to the COR for compliance with the requirements of each valve section. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.

E. Single Manufacturer: Where 2 or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.03 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Contractor Submittals.
B. RSN 43 25 00-1, Shop Drawings:
   1. Shop Drawings shall contain the following information:
      a. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number.
      b. Complete information on valve actuator, including size, manufacturer, model number, limit switches, and mounting.
      c. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, handwheels, position indicators, limit switches, integral control systems, needle valves, and control systems.
      d. Valve Labeling: A schedule of valves to be provided with stainless steel tags, indicating in each case the valve location and the proposed wording for the tag.

C. RSN 43 25 00-2, Technical Manual:
   1. The Technical Manual shall contain the required information for each valve.

D. RSN 43 25 00-3, Spare Parts List:
   1. A Spare Parts List shall contain the required information for each valve assembly, where indicated.

E. RSN 43 25 00-4, Factory Test Data:
   1. Where indicated, signed, dated, and certified factory test data for each valve requiring certification shall be submitted before shipment of the valve. The data shall also include certification of quality and test results for factory-applied coatings.

PART 2  PRODUCTS

2.01 PRODUCTS

A. General: Valves and gates shall be new and of current manufacture. Shut-off valves 6-inches and larger shall have actuators with position indicators. Gate valves 18-inches and larger or where chain wheel is required, shall be furnished with spur gear and hand wheel. Buried valves shall be provided with valve boxes and covers containing position indicators and valve extensions. Manual shut-off valves mounted higher than 7-feet above working level shall be provided with chain actuators.

B. Valve Actuators: Unless otherwise indicated, actuators shall be in accordance with Section 43 25 01 - Valve and Gate Actuators.

C. Protective Coating: The exterior surfaces of valves and the wet interior surfaces of ferrous valves of sizes 4-inches and larger shall be either liquid epoxy or fusion-bonded
epoxy coated in accordance with the individual valve specification sections and in accordance with Section 09 96 00 - Protective Coating. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Flange faces of valves shall not be epoxy coated.

D. Valve Labeling: Except when such requirement is waived by the COR in writing, a label shall be provided on shut-off valves and control valves except for hose bibs. The label shall be of 1/16-inch plastic or stainless steel, minimum 2-inches by 4-inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the COR.

E. Valve Testing: As a minimum, unless otherwise indicated or recommended by the reference standards, valves 3-inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4-inches in diameter and larger shall be factory tested as follows:

1. Hydrostatic Testing: Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valve rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. Seat Testing: Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves. Resilient-seated valves shall be drop-tight.

3. Performance Testing: Valves shall be shop-operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.

F. Certification: Prior to shipment, the Contractor shall submit for valves over 12-inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

G. Valve Marking: Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

### 2.02 MATERIALS

A. General: Materials shall be suitable for the intended application. Materials in contact with potable water shall be listed as compliant with NSF Standard 61. Materials not indicated shall be high-grade standard commercial quality, free from defects and
imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:


4. **Bronze**: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

5. **Stainless Steel**: Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel.

6. **PVC**: Poly vinyl chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454.

7. **CPVC**: Chlorinated poly vinyl chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447.

8. **NSF Standard 14**: Materials shall be listed for use in contact with potable water.

**2.03 VALVE CONSTRUCTION**

A. **Bodies**: Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.

B. **Valve End Connections**: Unless otherwise indicated, valves 2.5-inches diameter and smaller may be provided with threaded end connections. Valves 3-inches and larger shall have flanged end connections.

C. **Bonnetts**: Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, and of the same or higher temperature rating and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.
D. Stems: Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal.

E. Stem Guides: Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.

F. Internal Parts: Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

G. Nuts and Bolts: Nuts and bolts on valve flanges and supports shall be in accordance with Section 05 50 00 - Miscellaneous Metalwork.

2.04 VALVE ACCESSORIES

A. Valves shall be furnished complete with the accessories required to provide a functional system.

2.05 SPARE PARTS

A. The Contractor shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The Contractor shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the Hatchery, after expiration of the correction of defects period.

2.06 MANUFACTURERS

A. Manufacturer's Qualifications: Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the valves indicated.

PART 3 EXECUTION

3.01 VALVE INSTALLATION

A. General: Valves, actuating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as indicated. Gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. Access: Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, piping, or other equipment.
C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the Contractor shall properly assemble and install such items so that systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on Shop Drawing submittals.

END OF SECTION
SECTION 43 25 01
VALVE AND GATE ACTUATORS

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 SUMMARY

A. The Contractor shall provide valve and gate actuators and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to valves and gates except where otherwise indicated in the Contract Documents.

C. Unit Responsibility: The valve or gate manufacturer shall be made responsible for coordination of design, assembly, testing, and installation of actuators on the valves and gates; however, the Contractor shall be responsible to the COR for compliance of the valves, gates, and actuators with the Contract Documents.

D. Single Manufacturer: Where 2 or more valve or gate actuators of the same type or size are required, the actuators shall be produced by the same manufacturer.

E. Contract Drawings illustrates a valve schedule.

1.03 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittals and Section 43 25 00 - Valves, General.

B. RSN 43 25 01-1, Shop Drawings:
   1. Shop Drawing information for actuators shall be submitted together with the valve and gate submittals as a complete package.

C. RSN 43 25 01-2, Calculations:
   1. Selection calculations showing dynamic seating and unseating torques versus output torque of actuator.
PART 2  PRODUCTS

2.01  GENERAL

A. Unless otherwise indicated, shut-off and throttling valves and externally actuated valves and gates shall be provided with manual actuators. The Contractor shall furnish actuators complete and operable with mounting hardware, gears, handwheels, levers, chains, and extensions, as applicable. Actuators shall have the torque ratings equal to or greater than required for valve seating and dynamic torques, whichever is greater, and shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering. Actuator torque ratings for butterfly valves shall be determined in accordance with AWWA C504 - Rubber-Seated Butterfly Valves.

B. Manufacturers: Valves and gates shall be provided with actuators manufactured by the valve or gate manufacturer.

C. Materials: Actuators shall be current models of the best commercial quality materials and be liberally-sized for the required torque. Materials shall be suitable for the environment in which the valve or gate is to be installed.

D. Actuator Mounting and Position Indicators: Actuators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and be of ample strength. The word "open" shall be cast on each valve or actuator with an arrow indicating the direction to open in the counter-clockwise direction. Gear and power actuators shall be equipped with position indicators. Where possible, manual actuators shall be located between 48- and 60-inches above the floor or the permanent working platform.

E. Standard: Unless otherwise indicated and where applicable, actuators shall be in accordance with AWWA C 540 - Power-Actuating Devices for Valves and Slide Gates.

F. Fasteners shall be in accordance with Section 05 55 00 - Miscellaneous Metalwork.

G. Protective coatings shall be in accordance with Section 09 96 00 - Protective Coatings.

2.02  MANUAL ACTUATORS

A. General: Unless otherwise indicated, valves and gates shall be furnished with manual actuators. Valves in sizes up to and including 4-inches shall have direct acting lever or handwheel actuators of the manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual actuators, with an operating pull of maximum 60 pounds on the rim of the handwheel. Buried and submerged gear-assisted valves, gates, gear-assisted valves for pressures higher than 250 psi, valves 30-inches in diameter and larger, and where so indicated, shall have worm gear actuators, hermetically-sealed water-tight and grease-packed. Other valves 6-inches to 24-inches in diameter shall have traveling nut actuators, worm gear actuators, spur or bevel gear actuators, as appropriate for each valve.
B. Buried Valves: Unless otherwise indicated, buried valves shall have extension stems to grade, with square nuts or floor stands, position indicators, and cast-iron or steel pipe extensions with valve boxes, covers, and operating keys. Where so indicated, buried valves shall be in cast-iron, concrete, or similar valve boxes with covers of ample size to allow operation of the valve actuators. Covers of valve boxes shall be permanently labeled as required by the local Utility Company or the COR. Wrench nuts shall comply with AWWA C 500 - Metal - Seated Gate Valves for Water Supply Service.

C. Floor Boxes: Hot dip galvanized cast iron or steel floor boxes and covers to fit the slab thickness shall be provided for operating nuts in or below concrete slabs. For operating nuts in the concrete slab, the cover shall be bronze-bushed.

D. Tee Wrenches: Buried valves with floor boxes shall be furnished with 2 operating keys or 1 key per 10 valves, whichever is greater. Tee wrenches sized so that the tee handle will be 2 to 4 feet above ground, shall fit the operating nuts.

E. Manual Worm Gear Actuator: The actuator shall consist of a single or double reduction gear unit contained in a weather-proof cast iron or steel body with cover and minimum 12-inch diameter handwheel. The actuator shall be capable of 90-degree rotation and shall be equipped with travel stops capable of limiting the valve opening and closing. The actuator shall consist of spur or helical gears or worm gearing. The gear ratio shall be self-locking to prevent "back-driving." The spur or helical gears shall be of hardened alloy steel and the worm gear shall be alloy bronze. The worm gear shaft and the handwheel shaft shall be of 17-4 PH or similar stainless steel. Gearing shall be accurately cut with hobbing machines. Ball or roller bearings shall be used throughout. Output shaft end shall be provided with spline to allow adjustable alignment. Actuator output gear changes shall be mechanically possible by simply changing the exposed or helical gearset ratio without further disassembly of the actuator. Gearing shall be designed for a 100 percent overload. The entire gear assembly shall be sealed weatherproof.

PART 3 EXECUTION

3.01 SERVICES OF MANUFACTURER

A. Field Adjustments: Field representatives of manufacturers of valves or gates with pneumatic, hydraulic, or electric actuators shall adjust actuator controls and limit-switches in the field for the required function.

3.02 INSTALLATION

A. Valve and gate actuators and accessories shall be installed in accordance with Section 43 25 00 - Valves, General. Actuators shall be located to be readily accessible for operation and maintenance without obstructing walkways. Actuators shall not be mounted where shock or vibrations will impair their operation, nor shall the support systems be attached to handrails, process piping, or mechanical equipment.
END OF SECTION
SECTION 43 25 02
BUTTERFLY VALVES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT
   A. Cost:
      1. Include cost of Butterfly Valves in prices offered in the Price Schedule for
         Section 43 25 00 Valves.

1.02 SUMMARY
   A. The Contractor shall provide butterfly valves and appurtenances, complete and operable,
      in accordance with the Contract Documents.
   B. The requirements of Section 43 25 00 - Valves, General apply to this Section.
   C. The requirements of Section 43 25 01 - Valve and Gate Actuators apply to this Section.

1.03 CONTRACTOR SUBMITTALS
   A. Furnish submittals in accordance with Section 43 25 00 – Valves, General.
   B. RSN 43 25 02-1, Shop Drawings:
      1. Complete Shop Drawings of butterfly valves and actuators.
      2. Drawings showing valve port diameter complete with dimensions, part numbers, and
         materials of construction.
      3. Dynamic seating and unseating torque for motor actuated valves.
      4. Certified statement of proof-of-design tests from the valve manufacturer. Valve
         manufacturer shall state that the valves proposed for this project will be
         manufactured with identical basic type of seat design and materials of
         construction to the prototype evaluated under the proof of design testing.
      5. Manufacturer's certification that the valve complies with applicable provisions of
         AWWA C504 – Rubber-Seated Butterfly Valves.

1.04 QUALITY ASSURANCE
   A. Valves shall be subjected to performance, leakage, and hydrostatic tests in accordance
      with procedures and acceptance criteria established by AWWA C504.
PART 2   PRODUCTS

2.01  RUBBER SEATED BUTTERFLY VALVES 25 TO 150 PSI (AWWA)

A. General: Butterfly valves for steady-state water working pressures and steady-state differential pressure up to 150 psi and for fresh water service having a pH range from 6 to 10 and temperature range from 33 to 125 degrees F shall conform to AWWA C504 and be as indicated.

1. Valves subjected to steady state working pressures and steady state differential pressures from 25 to 150 psi in sizes 3-inches through 24-inches shall be rated for Class 150B with actuator sized for Class 150B.

2. Valves 30 inches through 72-inches shall be of the class indicated.

B. Valve Schedule. Valves of 4-inch diameter and larger shall be of the body type, pressure class, end joint, and actuator type as indicated on the valve schedule on Contract Sheet GM001. If the operating conditions such as flow, velocity, and differential pressures are not indicated, the valve body and shaft shall be sized for the pressure class rating of the valve.

C. Construction: Unless otherwise indicated, materials of construction shall be in accordance with AWWA C504, suitable for the service. Seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats that rely on a high coefficient of friction for retention shall not be acceptable. Seat material shall be guaranteed to last for at least 75 percent of the number of cycles in the AWWA C504 proof-of-design test without premature damage.

<table>
<thead>
<tr>
<th>Description</th>
<th>Material Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve bodies</td>
<td>Gray iron, ASTM A 48, Class 40 or Gray iron, ASTM A 126, Class B, or Ductile iron, ASTM A 536, grade 65-45-12 or 70-50-05</td>
</tr>
<tr>
<td>End flanges</td>
<td>Same material as valve bodies</td>
</tr>
<tr>
<td>Valve shafts</td>
<td>Stainless steel ASTM A 240 or A 276, Type 316</td>
</tr>
<tr>
<td>Valve discs</td>
<td>Same material as valve bodies</td>
</tr>
<tr>
<td>Rubber seats</td>
<td>New natural or synthetic rubber</td>
</tr>
<tr>
<td>Seat mating surfaces</td>
<td>Stainless steel, ASTM A 240 or A 276, Type 316</td>
</tr>
<tr>
<td>Clamps and retaining rings</td>
<td>Type 316 retaining rings and cap screws.</td>
</tr>
<tr>
<td>Description</td>
<td>Material Standards</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Valve bearings</td>
<td>Self-lubricating materials per AWWA C504</td>
</tr>
<tr>
<td>Shaft seals</td>
<td>Resilient non-metallic materials suitable for service</td>
</tr>
<tr>
<td>Painting and coating</td>
<td>Refer to Section 09 96 00 – Protective Coating</td>
</tr>
</tbody>
</table>

D. Manual Actuators: Unless otherwise indicated, manually-actuated butterfly valves shall be equipped with a handwheel and 2-inch square actuating nut and position indicator. Screw-type (traveling nut) actuators will not be permitted for valves 30-inches in diameter and larger.

E. Worm Gear Actuators: All valves, as well as submerged and buried valves, shall be equipped with worm-gear actuators, lubricated and sealed to prevent entry of dirt or water into the housing.

F. Ferrous Surface Coating: All corrosive ferrous surfaces of valves 3-inches and larger, exclusive of flange faces, shall be properly primed and epoxy-coated per the Manufacturer’s standard liquid-applied epoxy coating system. For buried valves, all ferrous surfaces, exclusive of flange faces, shall be given proper primer and fusion-bonded epoxy coatings, per AWWA C550, for buried service.

G. Manufacturers, or Equal
1. Clow / M & H Valve Company
2. DeZURIK Water Controls, Corporation
3. Henry Pratt / Mueller Company. (Series 2FII for valves 20” dia and smaller indoors. Series “Groundhog” for all buried valves.)
4. Kennedy Valve
5. Val Matic / American Darling. (Series 2000 for valves 20” dia and smaller – indoors, and Series 2030 for all buried valves)
6. Rodney Hunt Company (24-inches and larger)

PART 3    EXECUTION

3.01 INSTALLATION

A. Exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator. Installation shall be in accordance with Section 43 25 00 – Valves, General.

END OF SECTION
This page intentionally left blank.
SECTION 43 25 03
CHECK VALVES

PART 1       GENERAL

1.01     MEASUREMENT AND PAYMENT

A.     Cost:

1. Include cost of Check Valves in prices offered in the Price Schedule for Section 43 25 00 Valves.

1.02     SUMMARY

A.     The Contractor shall provide check valves and appurtenances, complete and operable, in accordance with the Contract Documents.

B.     The requirements of Section 43 25 00 - Valves, General apply to this Section.

1.03     CONTRACTOR SUBMITTALS

A.     Furnish submittals in accordance with Section 43 25 00 – Valves, General.

PART 2       PRODUCTS

2.01     INTERNAL SPRING-LOADED CHECK VALVES (GLOBE STYLE)

A.     General: Internal spring-loaded check valves for water pumps, compressors, gas, air, and steam shall be of the full-flow internal spring-loaded poppet type. The valves shall be designed for a water-working pressure of not less than 150 psi unless otherwise indicated.

B.     Body: The bodies of valves 3-inches and larger shall be of cast iron conforming to ASTM A 126 with 125 lb flanged ends conforming to ASME B 16.1 unless otherwise indicated. Where necessary, there shall be a positive, watertight seal between the removable seat and the valve body. The stem guide shall be integrally cast with the body or screwed into the body.

C.     Disc and Stem: The disc and stem of all valves in sizes 3-inches and larger shall be of bronze conforming to ASTM B 584 - Copper Alloy Sand Castings for General Applications, or stainless steel. The stem shall have 2 point bearings. The downstream bearing shall have a bronze or other suitable bushing, to provide a smooth operation.

D.     Stem Guide: The stem guide shall be either firmly fixed in the valve body to prevent it from sliding into the adjacent pipe and damaging the pipe lining, or the valve manufacturer shall provide each valve with one matching flange compatible with the
adjacent pipe and its lining to prevent damage to the lining. The compatible flange shall be part of the Shop Drawing submittal.

E. Seat: Valves for general service at temperatures up to 250 degrees F shall have bubble-tight shut-off with resilient seats of Buna-N, Teflon, or other suitable material. Valves for steam service and temperatures over 250 degrees F shall have metal-to-metal seating of bronze or stainless steel, as recommended by the manufacturer for the specific service condition. Resilient seats shall be firmly attached to the seating ring by compression molding or other acceptable method.

F. Spring: Valves in sizes 3-inches and larger shall have Type 316 stainless steel springs, and valves smaller than 3-inches shall have stainless steel or beryllium copper springs, as suitable for the service. The spring tension of the valves shall be designed for the individual pressure condition of each valve or 20 psi whichever is greater.

G. Manufacturers, or Equal
   1. APCO (Valve and Primer Corp.)
   2. CPV (Combination Pump Valve Company)
   3. Miller Valve Co., Inc.
   4. VAL-MATIC (Valve and Manufacturing Corporation)
   5. FloMatic Valves

PART 3 EXECUTION

3.01 GENERAL

A. Valves shall be installed in accordance with provisions of Section 43 25 00 - Valves, General.

END OF SECTION
SECTION 43 25 04
BALL VALVES

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT
A. Cost:
   1. Include Cost of Ball Valves in prices offered in the Price Schedule for Section 43 25 00 Valves.

1.02  SUMMARY
A. The Contractor shall provide ball valves and appurtenances, complete and operable, in accordance with the Contract Documents.
B. The requirements of Section 43 25 00 - Valves, General apply to this Section.

1.03  CONTRACTOR SUBMITTALS
A. Furnish submittals in accordance with Section 43 25 00 – Valves, General.

PART 2  PRODUCTS

2.01  METAL BALL VALVES (4-INCHES AND SMALLER)
A. General: Unless otherwise indicated, general purpose metal ball valves in sizes up to 4-inches shall have actuators in accordance with Section 43 25 01 - Valve and Gate Actuators.
B. Body: Ball valves up to and including 1-1/2 inches in size shall have bronze or carbon steel 2 or 3 piece bodies with screwed ends for a pressure rating of not less than 600 psi WOG. Valves 2-inches to 4-inches in size shall have bronze or carbon steel 2 or 3 piece bodies with flanged ends for a pressure rating of ANSI 125 psi or 150 psi unless otherwise indicated.
C. Balls: The balls shall be solid chrome-plated brass or bronze, or stainless steel, with standard port (single reduction) or full port openings.
D. Stems: The valve stems shall be of the blow-out proof design, of bronze, stainless steel, or other acceptable construction, with reinforced Teflon seal.
E. Seats: The valve seats shall be of Teflon or Buna-N, for bi-directional service and easy replacement.
F. Manufacturers, or Equal
2.02 PLASTIC BALL VALVES

A. General: Plastic ball valves for corrosive fluids shall be made of polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), polypropylene (PP), or polyvinylidene fluoride (PVDF), as recommended by the manufacturer for the specific application. Valves shall have manual actuators in accordance with Section 43 25 01 - Valve and Gate Actuators, unless otherwise indicated.

B. Construction: Plastic ball valves shall have union ends or flanged ends to mate with ANSI B 16.5, class 150 flanges for easy removal. The balls shall have full size ports and Teflon seats. Body seals, union O-ring seals, and stem seals shall be in accordance with the corrosion resistance requirements of Section 46 30 00. External (without entering into the wetted area) seat packing adjustment is preferred. Metal reinforced stems to prevent accidental breakage are preferred. Ball valves for sodium hypochlorite solution service shall be drilled through the ball or body per valve manufacturer recommendation to relieve offgas and equalize pressure across the valve. The valves shall be suitable for a maximum working non-shock pressure of 150 psi at 73 degrees F for PVC and CPVC, with decreasing ratings for higher temperatures and other plastics.

C. Manufacturers, or Equal

1. ASAHI-America
2. George Fischer, Inc.
3. NIBCO Inc., (Chemtrol)
4. Plast-O-Matic Valves, Inc.
6. Watts Regulator

PART 3 EXECUTION

3.01 GENERAL

A. Valves shall be installed in accordance with provisions of Section 43 25 00 - Valves, General.
SECTION 43 25 41
PRESSURE RELIEF VALVES

PART 1   GENERAL

1.01   MEASUREMENT AND PAYMENT

A. Cost:
   1. Include cost of Pressure Relief Valves in prices offered in the Price Schedule for Section 43 25 00 Valves.

1.02   SUMMARY

A. The Contractor shall provide pressure relief valves and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 43 25 00 - Valves, General apply to this Section.

1.03   CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 43 25 00 – Valves, General.

1.04   SPECIAL WARRANTY REQUIREMENT

A. The valve shall be warranted for a period of 3 years from the date of shipment to be free of defects in materials and workmanship

PART 2   PRODUCTS

2.01   FLANGED PRESSURE RELIEF VALVES, SIZES 1-1/2 INCHES THROUGH 42-INCHES

A. Valve Characteristics: The pressure relief valve shall open when the inlet pressure exceeds a set maximum level. It shall maintain that pressure and gradually close as the pressure drops below the maximum pressure. The valve shall be a hydraulically-operated, adjustable, pilot controlled diaphragm or piston type globe or angle valve as indicated. Necessary repairs shall be possible without removing the valve from the pipeline.

B. Valve Body: The valve body shall be of cast iron, ASTM A 48 - Gray Iron Castings, or ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with 125 lb flanged ends to ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or the body shall be of ductile iron to ASTM A 536 - Ductile Iron Castings, with 150 lb flanged ends to ASME B16.42 - Ductile Iron Pipe Flanges and
Flanged Fittings. The valve cover shall be flanged and be of the same material as the body.

C. Valve Trim: The valve stems, springs, body seat rings, and bolts, nuts, and washers shall be of Type 302, 303, or 316 stainless steel. The valve stems shall have top and bottom guides. Rubber parts shall be Buna-N. The diaphragms shall be of Nylon-reinforced Buna-N, supported firmly between body and valve cover. The valve pistons and piston liners shall be bronze to ASTM B 62 - Composition Bronze or Ounce Metal Castings.

D. Valve Controls: The valve shall be furnished with a complete, externally-mounted control system, including adjustable speed control needle valves, strainer, and necessary copper or stainless steel connecting tubing and fittings. The controls shall be capable of achieving the flow and speed adjustment indicated.

E. Factory Tests: Valves shall be factory tested with a hydrostatic test and a functional test and a test certificate shall be submitted to the COR prior to delivery of the valve.

F. Operating Conditions shall meet the pump discharge and pressure requirements for each pump within the aquaculture reuse system.

G. Spare Parts: The following spare parts shall be furnished in accordance with Section 43 25 00:
   1. One complete set of resilient seals and discs
   2. One diaphragm (for diaphragm valves, only)

H. Manufacturers, or Equal
   1. Cla-Val Company
   2. Golden-Anderson
   3. OCV Control Valves
   5. Singer Valve, Inc.
   6. Watts, ACV EXECUTION

2.02 THREADED PRESSURE RELIEF VALVES, SIZES 1/2- THROUGH 2-1/2 INCHES

A. Valve Characteristics: The pressure relief valve shall open when the inlet water pressure exceeds a set maximum level. It shall maintain that pressure and gradually close as the pressure drops below the maximum pressure. The valve shall be a spring and hydraulically operated, direct-acting, adjustable diaphragm or piston type globe or angle valve as indicated.
B. Valve Body: The valve body shall be bronze with threaded inlet and outlet to standard NPT and with flanged top, suitable for an inlet pressure of 300 psi. The spring shall be adjustable with an adjusting screw, to regulate the pressure setting.

C. Valve Trim: The valve trim shall be of stainless steel or bronze with stainless steel spring. The rubber seat shall be replaceable.

D. Pressure Setting: The valve shall be set for a relief pressure of 100 psi.

E. Manufacturers, or equal
   1. Cla-Val Company
   2. Golden-Anderson

PART 3 EXECUTION

3.01 GENERAL

A. Valves shall be installed in accordance with provisions of Section 43 25 00 - Valves, General.

END OF SECTION
This page intentionally left blank
SECTION 43 25 42
MISCELLANEOUS VALVES

PART 1  GENERAL

1.01  MEASUREMENT AND PAYMENT

A.  Cost:

   1.  Include cost for miscellaneous valves in other items of associated work in which
       the miscellaneous valve is installed.

1.02  SUMMARY

A.  The Contractor shall provide miscellaneous valves and appurtenances, complete and
     operable, in accordance with the Contract Documents.

B.  The requirements of Section 43 25 00 - Valves, General apply to this Section.

1.03  SUBMITTALS

A.  Furnish submittals in accordance with Section 43 25 00 – Valves, General.

PART 2  PRODUCTS

2.01  AIR-VACUUM AND AIR RELEASE VALVES

A.  Air and Vacuum Valves:  Air and vacuum valves shall be capable of venting large
     quantities of air while pipelines are being filled and allowing air to re-enter while
     pipelines are being drained.  They shall be of the size per manufacturer direction, with
     flanged or screwed ends to match piping.  Bodies shall be of high-strength cast iron.  The
     float, seat, and moving parts shall be constructed of Type 316 stainless steel.  Seat
     washers and gaskets shall be of a material insuring water tightness with a minimum of
     maintenance.  Valves shall be designed for minimum 150 psi water-working pressure,
     unless otherwise indicated.  Air and vacuum valves shall be placed at all highpoints in the
     piping system to venting as required for a fully functioning piping system.

B.  Air-Release Valves:  Air-release valves shall vent accumulating air while system is in
     service under pressure and be of the size indicated.  Valves shall meet the same general
     requirements as indicated for air and vacuum valves except that the vacuum feature will
     not be required.  Valves shall be designed for a minimum water-working pressure of 150
     psi, unless otherwise indicated.  Valves shall be placed at all highpoints in the piping
     system to venting as required for a fully functioning piping system.

C.  Combination Air Valves:  Combination air valves shall combine the characteristics of air
     and vacuum valves and air release valves by exhausting accumulated air in systems under

Miscellaneous Valves
43 25 42 - 1
pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. Valves shall have the same general requirements as indicated for air and vacuum valves. Valves shall be placed at all highpoints in the piping system to venting as required for a fully functioning piping system.

D. Sewage Air Release Valves: Sewage air release valves shall vent accumulating gases during system operation. Valves shall have long float stems and bodies to minimize clogging. The same general requirements shall apply as indicated for air and vacuum valves. Each sewage air release valve shall be furnished with the following backwash accessories, fully assembled on the valve:

1. Inlet shut-off valve.
2. Blow-off valve.
3. Clear water inlet valve.
4. Rubber supply hose.
5. Quick disconnect couplings.

E. Manufacturers, or Equal

1. APCO (Valve and Primer Corporation)
2. Crispin Valves
3. GA Industries

PART 3  EXECUTION

3.01  GENERAL

A. Valves shall be installed in accordance with provisions of Section 43 25 00 - Valves, General.

B. Backflow preventers, as well as air and vacuum release valves, shall have piped outlets to the nearest acceptable drain, firmly-supported, and installed in such a way as to avoid splashing and wetting of floors and obstruction of traffic.

END OF SECTION
DIVISION 44 – WASTE CONTROL EQUIPMENT
This page intentionally left blank.
SECTION 44 35 00
PUMPS, GENERAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:
   1. Include in prices offered in the Price Schedule for Section 13 99 60 Partial Reuse Aquaculture System.

1.02 SUMMARY

A. Provide pumps and pumping appurtenances, complete and operable, as indicated in accordance with the Contract Documents.

B. The provisions of this Section shall apply to pumps and pumping equipment throughout the Contract Documents, except where otherwise indicated.

C. Responsibilities
   1. The pump manufacturer shall be made responsible for furnishing the work and for the coordination of design, assembly, testing, and installation of the work of each specific pump Section.
   2. The Contractor shall be responsible to the COR for overall compliance with the requirements of each specific pump Section.

D. Single Manufacturer
   1. Where two or more pump systems of the same type / style are required, pumps shall be provided by only one (1) manufacturer and shall be of the same model type.

1.03 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 – Contractor Submittals.

B. RSN 44 35 00-1, Shop Drawings:
   1. At a minimum, submit the following information:
      a. Submit pump name, identification number, and specification Section number.
      b. Performance Information
1) Submit performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump.

2) Require the equipment manufacturer to indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions and the maximum and minimum flow conditions.

3) Submit performance curves at intervals of 100 RPM from minimum speed to maximum speed for each centrifugal pump equipped with a variable speed drive.

c. Operating Range
1) Require the manufacturer to indicate the limits on the performance curves recommended for stable operation without surge, cavitation, or excessive vibration.

2) Provide a stable operating range as wide as possible, based on actual hydraulic and mechanical tests.

d. Submit assembly and installation drawings including shaft size, seal, coupling, bearings, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.

e. For the electric motor proposed for each pump, submit data in accordance with the requirements of Section 26 05 10 – Electric Motors.

f. Submit interior and front-panel elevations of the proposed local control panel, showing panel-mounted devices, details of enclosure type, a single-line diagram of power distribution, current draw of the panel, and a list of all terminals required to receive inputs or to transmit outputs from the local control panel.

g. Submit a wiring diagram of field connections, with identification of terminations between local control panels, junction terminal boxes, and equipment items.

h. Submit a complete electrical schematic diagram.

C. RSN 44 35 00-2, Technical (O & M) Manual:
1. Submit a Technical Manual containing the required information indicated in Section 01300 – Contractor Submittals and each specific pump Section.

D. RSN 44 35 00-3, Spare Parts List:
1. Submit a spare parts list containing the required information indicated in Section 01 33 00 – Contractor Submittals and each specific pump Section.

E. RSN 44 35 00-4, Factory Test Data:
1. Submit signed, dated, and certified factory test data for each pump system which requires factory testing.
2. Submit these data before shipment of equipment.

F. RSN 44 35 00-5, Certifications:
   1. Submit the pump manufacturer's certification of proper installation for each pump furnished for the project.
   2. Submit the Contractor's certification of satisfactory field testing for each pump furnished for the project.

PART 2 PRODUCTS

2.01 GENERAL

A. Compliance with the requirements of the specific pump Sections may necessitate modifications to the manufacturer's standard equipment.

B. Pump Performance Curves
   1. Provide centrifugal pumps with a continuously rising curve or with the system operating range not crossing the pump curve at two different flow capacities or "dip region."
   2. Unless otherwise indicated, the required shaft horsepower for the entire pump assembly at any point on the performance curve shall not exceed the rated horsepower of the motor or engine and shall not encroach on the motor service factor.

C. Compatibility
   1. Provide entirely compatible components of each pump system provided under the specific pump Section.
   2. In each unit of pumping equipment, incorporate basic mechanisms, couplings, electric motors or engine drives, necessary mountings, and appurtenances.
   3. For variable frequency drive (VFD) units, the Contractor and pump manufacturer shall be responsible to insure that the furnished VFD units are fully compatible with both the pump’s inverter duty motor and with pump system controls provided.

2.02 MATERIALS

A. Provide materials suitable for the intended application.

B. Pump materials shall be as indicated below, unless specified otherwise in the specific pump sections. Pump materials shall be high-grade, standard commercial quality, free
from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended, and conforming to the following requirements:

1. **Casing and Bowls.** Provide cast iron pump casings and bowls constructed of close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or equal.

2. **Impellers.** Provide bronze pump impellers conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings, or B 584 - Copper Alloy Sand Castings for General Applications, where dezincification does not occur.

3. **Shafts.** Provide pump shafts constructed of Type 416 or Type 316 stainless steel.

4. **Miscellaneous stainless steel parts shall be of Type 316.**

5. **Anchor Bolts, Washers, and Nuts**

6. **Materials in contact with potable water or fisheries supply water shall be listed as compliant with NSF Standard 61.**

### 2.03 PUMP COMPONENTS - GENERAL

**A. Flanges and Bolts**

1. Provide suction and discharge flanges conforming to ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800 or ASME B16.5 - Pipe Flanges and Flanged Fittings dimensions, unless noted otherwise in the specification.

2. Flange bolts and hardware shall be in accordance with the requirements of Section 05 50 00 – Miscellaneous Metalwork.

**B. Lubrication**

1. Vertical pump shafts of clean water pumps shall be product water-lubricated, unless otherwise indicated.

2. Provide deep-well pumps and vertical pumps with dry barrels with water- or oil- lubricated bearings and seals, and enclosed line shafts.

3. Pumps for sewage, sludge, and other process fluids shall be lubricated as indicated.

**C. Hand holes**

1. Provide hand holes on pump casings shaped to follow the contours of the casing in order to avoid any obstructions in the water passage.

**D. Drains**

1. Pipe gland seals, air valves, and any cooling water drains to the nearest floor sink or drain, using galvanized steel pipe or copper pipe, per the contract Pipe Schedule requirements, that is properly supported with brackets and unistrut or other required hardware.
E. Grease Lubrication
   1. For vertical propeller, mixed-flow, and turbine pumps, other than deep well pumps, of bowl sizes 10-inch and larger, provide a stainless-steel tube attached to the column for grease lubrication of the bottom bearing.

F. Stuffing Boxes
   1. Where stuffing boxes are indicated for the pump seal, provide stuffing boxes of the best quality, using the manufacturer's suggested materials best suited for the specific application.
   2. For sewage, sludge, drainage, and liquids containing sediments, provide fresh-water-flushed seals, using lantern rings.
   3. If fresh water is not available, the seal shall be flushed with product water cleaned by a solids separator as manufactured by John Crane Co., Lakos (Claude Laval Corp.), or equal.

G. Mechanical Seals (Conventional Non-Split-Type)
   1. Provide mechanical seals of the fresh water-flushed-type, unless otherwise indicated in which case use product water cleaned by a solids separator as indicated above.
   2. Provide mechanical seals as manufactured by the following, or equal:

<table>
<thead>
<tr>
<th>Sewage, Sludge, or Wastewater Pumps</th>
<th>Double seals</th>
<th>John Crane Type 5620P, Flowserve Type ISCPP, Chesterton Type GDS or 255</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasives, Grit, or Lime Slurry Pumps</td>
<td>Double seals</td>
<td>John Crane Type 5620P (hard faces), Flowserve Type ISCPP or SLC (check with pump manufacturer), Chesterton Type GDS or 255</td>
</tr>
<tr>
<td>Chemicals or Corrosive Liquid Pumps</td>
<td>Single seals</td>
<td>John Crane Type 8-1 or 9, Flowserve Type ISCPX, or Chesterton Type UV, GSS, or 155</td>
</tr>
<tr>
<td>Water Pumps (hot and cold)</td>
<td>Single seals</td>
<td>John Crane Type 5610Q, Flowserve Type ISCPX, Chesterton Type UV, GSS, or 155</td>
</tr>
</tbody>
</table>

H. Where indicated, circulate a buffer fluid at a minimum 20 psi above discharge pressure, or as required by the manufacturer, in order to maintain reliable seal performance.
I. Equip mechanical seals with nonclogging, flexible–mounted seats with elastomer secondary seals.

J. Provide wetted metal parts constructed of Type 316 stainless steel, Alloy 20, or Hastelloy B or C, whichever has the best corrosion resistance to the pumped fluid.

K. Provide double-balanced dual cartridge seals in order to allow for seal integrity in case of flush water pressure reversal.

L. Provide springs in single and double seals, in the non-wetted end of the seal.

M. Deliver fresh water to the seals through appropriate size piping with plug valves, strainers, pressure regulators, electrically operated solenoid valves, and rotameters.

N. Wiring shall comply with the requirements of Division 26 – Electrical, and solenoid control shall comply with the requirements of Division 40 – Instrumentation and Control.

2.04 PUMP APPURTEANCES

A. Nameplates
   1. Equip each pump with a stainless steel nameplate indicating serial number(s), rated head and flow, impeller size, pump speed, and manufacturer's name and model number.

B. Pressure Gauges. Provide pressure gauge assemblies as indicated on the Process Schematic Drawings or Process and Instrumentation Drawings (P&IDs), as follows:
   1. Except for sample pumps, sump pumps, and hot water circulating pumps, equip pumps with pressure gauge assemblies installed at the pump discharge lines.
   2. Provide pump suction lines with compound gauges, where indicated on the process sche.
   3. Locate gauges in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings. Where subject to shock or vibrations, wall-mount the gauges or attach the gauges to galvanized channel floor stands and connect by means of flexible connectors
   4. Where subject to freezing temperatures, provide gauges with glycol liquid fill fluid, and Contractor shall minimize the ¾” or 1” connecting pipe nipple length to the process pipe or provide heat tracing on the gauge connection to prevent freezing.
   5. Provide pressure and compound gauges in accordance with the requirements of Section 17108 – Pressure Measuring Systems.

2.05 FACTORY TESTING

A. Conduct the following tests on each indicated pump system:
B. Motors
1. Test electric motors in accordance with the requirements of Section 26 05 10 – Electric Motors.
2. Furnish test results to the pump manufacturer prior to the pump test.

C. Factory Non-witnessed Test (for pumps from 1 HP to 125 HP)
1. For sump pumps, sample pumps, and smaller pumps of motor size from 0.75 to 10 HP, acceptance grade shall be in accordance with Grade 2U or 2B of ANSI / HI Rotodynamic Pumps for Hydraulic Performance Acceptance Tests – 2011.
2. Perform tests using the complete pump system to be furnished, including the Project motor and variable speed drive if equipped with variable speed drive.
3. For pumps with motors of 100 HP or smaller, the manufacturer's certified test motor will be acceptable for use during factory testing.
4. Testing of prototype pump models will not be accepted.
5. Conduct the following minimum tests and submit the test results:
6. Hydrostatic test;
7. Performance Test:
   a. Conduct performance testing at maximum speed, obtain a minimum of 5 hydraulic test readings between shutoff head and 25 percent beyond the maximum indicated capacity, and record on data sheets as defined by the Hydraulic Institute standards;
   b. For variable speed driven pumps of 125 HP or smaller, pump manufacturer shall provide either previously conducted factory test curves for the given pump model at 100 rpm increments, with application of pump affinity laws where necessary; or shall test each pump between maximum and minimum speed at 100-RPM increments;
   c. Submit pump curves showing head, flow, bhp, and efficiency results;
8. Mechanical test;
9. NPSH
   a. Perform a net positive suction head required test (NPSHr3), if required by the specific pump Section.
   b. If not required by the specific pump Section, submit the published manufacturer-calculated NPSHr3 curve.
10. Submit certification signed by a senior official of the pump manufacturer that the pump shaft horsepower demand did not exceed the rated motor horsepower of 1.0 service rating at any point on the curve.
11. Submit test results to the COR for review prior to delivery to the Site.

D. Acceptance
1. In the event of failure of any pump to meet any of the requirements, make necessary modifications, repairs, or replacements in order to conform to the requirements of the Contract Documents, and re-test the pump until found satisfactory.

PART 3 EXECUTION

3.01 MANUFACTURERS SERVICES

A. Inspection, Startup, and Field Adjustment
   1. Where required by the specific pump Section, furnish an authorized service representative of the manufacturer at the Site continuously to supervise the following items and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:
      2. installation of the equipment;
      3. inspection, checking, and adjusting the equipment;
      4. startup and field testing for proper operation; and
      5. performance of field adjustments to ensure that the equipment installation and operation comply with the indicated requirements.

B. Instruction of Hatchery's Personnel
   1. Where required by the individual pump Section, furnish an authorized training representative of the manufacturer at the Site for the number of Days indicated in the specific pump Section, to instruct the Hatchery’s personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment.
   2. Furnish instruction specific to the model of equipment provided.
   3. Qualifications
      a. Furnish a representative with at least two years’ experience in training.
      b. Submit a resume for the representative.
   4. Schedule the training a minimum of three weeks in advance of the first session.
   5. Lesson Plan Review
      a. Submit the proposed training material and a detailed outline of each lesson for review.
      b. Incorporate review comments into the material.
   6. The trainees will keep the training materials.
   7. The COR may videotape the training for later use with the Hatchery's personnel.
3.02 INSTALLATION

A. General
   1. Install pumping equipment in accordance with the manufacturer's written recommendations.

B. Alignment
   1. Field-test the equipment in order to verify proper alignment and freedom from binding, scraping, shaft runout, or other defects.
   2. Measure the pump drive shafts just prior to assembly in order to ensure correct alignment without forcing.
   3. Ensure that the equipment is secure in position and neat in appearance.

C. Lubricants
   1. Provide the necessary oil and grease for initial operation.

3.03 PROTECTIVE COATING

A. Coat materials and equipment in accordance with the requirements of Section 09 96 00 – Protective Coatings, unless otherwise specified in the specific pump section.

3.04 FIELD TESTS

A. Field-test each pump system after installation in order to demonstrate:
   1. Satisfactory operation without excessive noise and vibration;
   2. No material loss caused by cavitation;
   3. No overheating of bearings; and,
   4. Pump performance and acceptance tolerances of contractual head, flow, and efficiency at the design point. Field tests of pump performance shall meet the requirements of ANSI / HI Rotodynamic Pumps for Hydraulic Performance Acceptance Tests – 2011 as follows:
      a. Rate of flow, total dynamic head and efficiency per acceptance Grade 2U or 2B for pumps of 10 HP or less.
      b. Rate of flow, total dynamic head and efficiency per acceptance Grade 1U, 1B or 2U for pumps of 15 HP to 125 HP or less.
      c. Failure to meet the above acceptance tolerance criteria for the given Grade determination shall result in the Pump Manufacturer removing the installed pump or pumps, correcting the pump deficiency, and reinstalling the pump assemblies at no added cost to the Government.

B. Conduct the following field testing:
   1. Startup, check, and operate the pump system over its entire speed range.
2. If the pump is driven by a variable speed drive, test the pump and motor at 100-RPM increments.

3. If the pump is driven at constant speed, test the pump and motor at the maximum RPM.

4. Unless otherwise indicated, vibration shall be within the amplitude limits recommended by the Hydraulic Institute standards at a minimum of 4 pumping conditions defined by the COR.

5. Obtain concurrent readings of motor voltage, amperage, pump suction head, and pump discharge head for at least 4 pumping conditions at each pump rotational speed.
   a. Perform tests at 100-RPM increments if equipped with a variable frequency drive unit, or
   b. Perform tests at maximum RPM if equipped with a constant speed drive.

6. Check each power lead to the motor for proper current balance.

7. Bearing Temperatures
   a. Determine bearing temperatures by a contact-type thermometer.
   b. Precede this test with a run time sufficient to stabilize bearing temperatures, unless an insufficient liquid volume is available to furnish such a run time.

8. Ensure that electrical and instrumentation tests conform to the requirements of the Section under which that equipment is specified.

C. Witnessing
   1. Field testing will be witnessed by the COR.
   2. Furnish the COR with at least 7-Days advance notice of field testing.

D. If the pumping system fails to meet the indicated requirements, modify or replace the pump and re-test as indicated above until it satisfies the indicated requirements.

E. Certification
   1. After each pumping system has satisfied the requirements, certify in writing that it has been satisfactorily tested and that final adjustments have been performed.
   2. Certification shall include the date of the field tests, a listing of persons present during the tests, and the test data.

F. The Contractor shall be responsible for costs of field tests, including related services of the manufacturer's representative, except for power and water, which the Government will bear.

G. If available, the Hatchery’s operating personnel will provide assistance in field testing.
END OF SECTION
This page is intentionally left blank.
DIVISIONS 45 THROUGH 51 – NOT USED
This page intentionally left blank.
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. Promptly inform the CO of discrepancies discovered on the drawings. The CO will make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense.

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  SPECIFICATION DRAWINGS
A. Some drawings show details of fabrication or other details and specifications which are not a part of work under this contract. Disregard specifications and details shown on these drawings which are not applicable to work under this contract.

B. Reference drawings referred to on specification drawings and not considered necessary for contract purposes are not included in specifications.

C. Parts of work for which dimensions are not shown have been drawn to scale as nearly to final dimensions as possible before purchase of machinery or equipment.

1.04  LIST OF DRAWINGS
A. Drawings listed on Drawing 60057, are made a part of Section C - Description/Specifications.

PART 2  PRODUCTS
Not Used

PART 3  EXECUTION
Not Used
END OF SECTION
DIVISION 53 – NOT USED
SECTION D  PACKAGING AND MARKING

Section not used.
SECTION E  INSPECTION AND ACCEPTANCE

E.1.  52.236-5 Material and Workmanship (Apr 1984)

E.2.  52.246-12 Inspection of Construction (Aug 1996)

E.3.  52.246-21 Warranty of Construction (Mar 1994)

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of one (1) year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one (1) year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor’s expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor’s expense any damage to Government-owned or controlled real or personal property, when that damage is the result of –

(1) The Contractor’s failure to conform to contract requirements; or
(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor’s warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor’s expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall --

(1) Obtain all warranties that would be given in normal commercial practice;
(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and
(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor’s warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor’s, manufacturer’s, or supplier’s warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government’s rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.
SECTION F  Section F Deliveries and Performance

F.1.  52.211-10 Commencement, Prosecution, and Completion of Work (Apr 1984), Alternate I (Apr 1984)
The Contractor shall be required to - (a) commence work under this contract within ten (10) calendar days after the date the Contractor receives the Notice to Proceed (NTP),

(b) prosecute the work diligently, and

(c) complete the entire work ready for use not later than 269 days. The time stated for completion shall include final cleanup of the premises.

F.2.  52.211-18 Variation in Estimated Quantity (Apr 1984)

F.3.  52.212 Liquidated Damages - Construction (Sep 2000)
(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of $2,880.48 for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor’s right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

F.4.  52.242-14 Suspension of Work (Apr 1984)
SECTION G CONTRACT ADMINISTRATION

G.1. 1452.242-90 Government Point of Contact

The Contracting office's point of contact for this contract is:

Name: Vicki Keen
Title: Contract Specialist
Address: Bureau of Reclamation, Suite 100, 1150 North Curtis Road, Boise ID 83706-1234
Phone: (208) 378-5108
FAX: (208) 378-5080
E-Mail: vkeen@usbr.gov

G.2. 1452.201-70 Authorities and Delegations (Sep 2011)

G.3. DOI-AAAP-0028 Electronic Invoicing and Payment Requirements – Invoice Processing Platform (IPP)

Payment requests must be submitted electronically through the U. S. Department of the Treasury's Invoice Processing Platform System (IPP).

"Payment request" means any request for contract financing payment or invoice payment by the Contractor. To constitute a proper invoice, the payment request must comply with the requirements identified in the applicable Prompt Payment clause included in the contract, or the clause 52.212-4 Contract Terms and Conditions - Commercial Items included in commercial item contracts. The IPP website address is: https://www.ipp.gov.

Under this contract, the following documents are required to be submitted as an attachment to the IPP invoice: Company Standard Invoice and Updated Schedule in accordance with RSN 01 32 10-7, paragraph B.

The Contractor shall also submit an electronic copy of the IPP invoice to the Contract Specialist/Contracting Officer at cgordon@usbr.gov or vkeen@usbr.gov once the invoice has been submitted to IPP. Failure to email the invoice may cause significant delay or possible rejection of your payment request.

The Contractor must use the IPP website to register access and use IPP for submitting requests for payment. The Contractor Government Business Point of Contact (as listed in SAM) will receive enrollment instructions via email from the Federal Reserve Bank of Boston (FRBB) within 3 - 5 business days of the contract award date. Contractor assistance with enrollment can be obtained by contacting the IPP Production Helpdesk via email ippgroup@bos.frb.org or phone (866) 973-3131.

If the Contractor is unable to comply with the requirement to use IPP for submitting invoices for payment, the Contractor must submit a waiver request in writing to the Contracting Officer with its proposal or quotation.
G.4.  **1452.201-80 Contracting Officer’s Representative’s Authorities and Limitations**  
– Bureau of Reclamation (May 2018)

(a) Performance of the work under this contract shall be subject to the technical direction of the Reclamation Contracting Officer's Representative (COR). The term “technical direction” is defined to include, without limitation:

1. Inspecting and accepting or rejecting work performed under the contract.
2. Representing the Government in technical phases of the work. The COR is responsible for the technical administration of the contract and will provide instructions and interpretations to the Contractor on all technical matters relating to the contract. The COR will supervise or oversee all Government technical and administrative personnel assigned to assist the COR.
3. Reviewing and, where required by the contract, approving submittals of technical data, shop drawings, samples, literature, plans, or other data required to be delivered by the Contractor to the Government.

(b) The Contractor will receive a copy of the written COR designation from the Contracting Officer. It will specify the extent of the COR's authority to act on behalf of the Contracting Officer.

(c) Technical direction must be within the scope of work stated in the contract. Only the Contracting Officer is authorized to determine if a change is within the scope of the contract; therefore, the COR does not have the authority to, and may not, issue any technical direction that:

1. Constitutes a direction of additional work outside the Contract requirements;
2. Constitutes a change as defined in the contract clause FAR 52.243-1 entitled “Changes-Fixed-Price;”
3. In any manner causes an increase or decrease in the total contract cost, or the time required for contract performance;
4. Changes any of the expressed terms, conditions or specifications of the contract; or
5. Interferes with the Contractor's right to perform the terms and conditions of the contract.

(d) All technical direction shall be issued in writing by the COR.

(e) The Contractor must proceed promptly with the performance of technical direction duly issued by the COR in the manner prescribed by this clause and within its authority under the provisions of this clause. If, in the opinion of the Contractor, any instruction or direction by the
COR falls within one of the categories defined in (c)(1) through (c)(5) of this clause, the Contractor must not proceed and must notify the Contracting Officer in writing within five (5) working days after receipt of any such instruction or direction and must request the Contracting Officer to modify the contract accordingly. Upon receiving the notification from the Contractor, the Contracting Officer must -

(1) Advise the Contractor in writing after receipt of the Contractor's letter that the technical direction is within the scope of the contract effort and does not constitute a change under the Changes clause of the contract; or

(2) Advise the Contractor that the Government will issue a written change order.

(f) A failure of the Contractor and Contracting Officer either to agree that the technical direction is within the scope of the contract or to agree upon the contract action to be taken with respect to the technical direction will be subject to the provisions of the clause entitled “Disputes.”
SECTION H SPECIAL CONTRACT REQUIREMENTS

H.1. 1452.209-90 Key Personnel Requirements – Bureau of Reclamation – PN Region (Feb 1995)

(a) Certain skilled experience professional and/or technical personnel are essential for successful Contractor accomplishment of the work to be specified under this contract. These are defined as "Key Personnel" and are those persons whose resumes shall be submitted for evaluation in support of the contract. The Contractor agrees that such personnel shall not be removed from the contract work or replaced without compliance with paragraphs b. and c. hereof.

(b) The Contractor shall obtain the Contracting Officer's written approval to substitute for any key personnel should they become unavailable for performance of the contract for any continuous period in excess of 5 days. The Contractor shall consult with the Contracting Officer if any of the key personnel, in any way, plans or anticipates less effort to be contributed to the work than specified in the technical proposal incorporated herein. If Reclamation determines that the reduction of effort would be so substantial as to impair the successful prosecution of work it may request a change in personnel, termination of the effort, or other appropriate modification of the contract.

(c) In addition to the above, the Contractor shall consult with the Contracting Officer if changes are to be made in key personnel previously committed to perform work in accordance with his proposal. No changes of key personnel shall be permitted without prior approval of the Contracting Officer. All requests for approval of substitutions hereunder must be in writing and provide a detailed explanation of the circumstances necessitating the proposed substitutions. They must contain a complete resume for the proposed substitution, and any other information requested by the Contracting Officer or needed by him to approve or disapprove the proposed substitution. The Contracting Officer or his authorized representative will evaluate such requests and promptly notify the Contractor of his approval or disapproval thereof in writing.

H.2. DOI-AAAP-0050 Contractor Performance Assessment Reporting System (May 2018)

(1) FAR 42.1502 directs all Federal agencies to collect past performance information on contracts. The Department of the Interior (DOI) has implemented the Contractor Performance Assessment Reporting System (CPARS) to comply with this regulation. One or more past performance evaluations will be conducted in order to record your contract performance as required by FAR 42.15.

(2) The past performance evaluation process is a totally paperless process using CPARS. CPARS is a web-based system that allows for electronic processing of the performance evaluation report. Once the report is processed, it is available for Government use in evaluating past performance as part of a source selection action.

(3) We request that you furnish the Contracting Officer (CO) with the name, position title, phone number, and email address for each person designated to have access to your firm's
past performance evaluation(s) for the contract no later than **30 days after award**. Each person granted access will have the ability to provide comments in the Contractor portion of the report and state whether or not the Contractor agrees with the evaluation, before returning the report to the Assessing Official (AO). Information in the report must be protected as source selection sensitive information not releasable to the public.

(4) When your Contractor Representative(s) are registered in CPARS, they will receive an automatically generated email with detailed login instructions. Further details, systems requirements, and training information for CPARS is available at [https://www.cpars.gov/](https://www.cpars.gov/).

(5) Within 60 days after the end of a performance period, the AO will complete an interim or final past performance evaluation, and the report will be accessible at [https://www.cpars.gov/](https://www.cpars.gov/).

(a) Contractor Representatives may then provide comments in response to the six (6) point evaluation or return the evaluation without comment.

(b) Your comments should focus on objective facts in the AO's narrative and should provide your views on the causes and ramifications of the assessed performance.

(c) All information provided should be reviewed for accuracy prior to submission.

(d) If you elect not to provide comments, please acknowledge receipt of the evaluation by indicating "No comment" in the space provided, and then selecting “Accept the Ratings and Close the Evaluation”.

(e) Your response is due within 60 calendar days after receipt of the CPAR. On day 15, the evaluation will become available in CPARS marked as “Pending” with or without comments and whether or not it has been closed.

(f) If you do not sign and submit the CPAR within 60 days, it will automatically be returned to the Government and will be annotated: "The report was delivered/received by the contractor on (date). The contractor neither signed nor offered comment in response to this assessment."

(6) The following guidelines apply concerning your use of the past performance evaluation:

(a) Protect the evaluation as source selection information. After review, transmit the evaluation by completing and submitting the form through CPARS. If for some reason you are unable to view and/or submit the form through CPARS, contact the CO for instructions.

(b) Strictly control access to the evaluation within your organization. Ensure the evaluation is never released to persons or entities outside of your control.
(c) Prohibit the use of or reference to evaluation data for advertising, promotional material, pre-award surveys, responsibility determinations, production readiness reviews, or other similar purposes.

(7) If you wish to discuss a past performance evaluation, you should request a meeting in writing to the CO no later than seven (7) days following your receipt of the evaluation. The meeting will be held in person or via telephone or other means during your 60-day review period.

(8) A copy of the completed past performance evaluation will be available in CPARS for your viewing and for Government use supporting source selection actions after it has been finalized.
PART II CONTRACT CLAUSES

SECTION I CONTRACT CLAUSES

I.1. 52.252-2 Clauses Incorporated by Reference (Feb 1998)
This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es): Federal Acquisition Regulations: https://www.acquisition.gov/browse/index/far Department of Interior Acquisition Regulations: https://www.doi.gov/pam/programs/acquisition/pamareg.

I.2. 52.202-1 Definitions (Nov 2013)

I.3. 52.203-3 Gratuities (Apr 1984)

I.4. 52.203-5 Covenant Against Contingent Fees (May 2014)

I.5. 52.203-6 Restriction on Subcontractor Sales to the Government (Sep 2006)

I.6. 52.203-7 Anti-Kickback Procedures (May 2014)

I.7. 52.203-8 Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity (May 2014)

I.8. 52.203-10 Price or Fee Adjustment for Illegal or Improper Activity (May 2014)

I.9. 52.203-12 Limitations on Payments to Influence Certain Federal Actions (Oct 2010)


I.11. 52.203-14 Display of Hotline Poster(s) (Oct 2015)

I.12. 52.203-17 Contractor Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights (Apr 2014)

I.13. 52.203-19 Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements (Jan 2017)


I.15. 52.204-4 Printed or Copied Doubled-Sided on Postconsumer Fiber Content Paper (May 2011)

(a) All Contractor employees must have an “Enter on Duty” (EOD) approval issued by the Bureau Personnel Security Office (PSO) before they begin performing work on any Bureau contract. The Contractor must ensure that all employees requesting an EOD are citizens of the United States of America, or an alien who has been lawfully admitted for permanent residence or employment (indicated by immigration status) as evidenced by Immigration and Naturalization Service documentation and the employee must have resided in the United States for a minimum of 3 years. The EOD may be issued in advance of a completed Background Investigation and may be rescinded by the PSO at any time. However, all contractors who require network access are required to complete the identity proofing process, and must be able to obtain a successfully adjudicated National Criminal History Check (NCHC) and National Agency Check with Inquiries (NACI) of higher to stay on the contract.

(b) Starting Work – Contractor employees with an approved EOD may begin performing unsupervised work on Bureau contracts. To remain on the contract, the Contractor employees will need a completed favorable Background Investigation.

(c) Rescission of EOD – The PSO may rescind the EOD at any time. This may occur as the result of additional information obtained or the final results of the background investigation.

(d) Background Investigation – Contractor employees who will have unsupervised access to Bureau facilities, access to the Department of Interior (DOI) information technology (IT) systems or DOI data, or will develop custom applications, must have a favorably adjudicated background investigation from the Office of Personnel Management (OPM). Existing clearances at the same or higher level are acceptable upon the PSO’s review and approval. If the employee does not already have a complete investigation, they must apply for one. The employee may begin work with an EOD, but must receive a favorable background investigation to continue working on the contract. The background investigation includes obtaining fingerprints through a USAccess Credentialing Center for an FBI criminal history and a credit report. Once the investigation has been scheduled by OPM, the Bureau will receive advance reports. If those reports are favorable, the Bureau PSO will issue the EOD. The type of background investigation required is based on the risk/sensitivity level designation. Citizenship requirements and guidance for determining the appropriate type of background investigation required for the designated risk/sensitivity level are contained in DOI Departmental Manual (DM) Part 441. The DM is available on the Internet at http://elips.doi.gov/app_home/index.cfm?fuseaction=home.

(e) Electronic Questionnaire for Investigations Processing (e-QIP) – The Bureau uses the e-QIP for all background investigations or reinvestigations. To initiate an investigation, the Contractor, in collaboration with the COR, will complete and e-QIP Request Form. This request form is available through the COR. The COR will submit the completed request form to the Bureau PSO. The PSO will enter the information into e-QIP to either establish a new applicant profile or determine if an existing investigation that meets Bureau requirements is on file. The PSO will then contact the applicant to provide additional information and instructions. Generally, the Contractor is required to complete the following forms:

- e-QIP application (on-line)
- Fair Credit Release
The Contractor shall complete the required background investigation forms and submit them to the PSO. The PSO shall determine if individuals meet the required background investigation standards and citizenship requirements, and then make a suitability determination. Minimum standards used in suitability determinations are contained in the DOI Departmental Manual Part 441. The Government will pay for any background investigations required for contractor employees. If the Contractor employee’s background investigation is returned as unfavorable, the Government reserves the right to request reimbursement of the actual costs for the investigation from the Contractor.

(f) Reinvestment – Contractor employees occupying high risk public trust positions must be reinvestigated every 5 years. A reinvestigation may be initiated prior to the normal periodic reinvestigation schedule when an individual’s continued ability to meet the minimum background investigation standards is in question. The electronic fingerprints on file in the USAAccess system will be electronically submitted to OPM for the reinvestigation. The PSO shall review the records and documentation and make the suitability determination.

(g) Disputes – In the event of a disagreement between the Contractor and the Government concerning the suitability of a particular employee to perform work under this contract, the Government has the right of final determination. Determinations under this requirement are subject to the Disputes Clause, FAR 52.233-1. Failure of the Contractor to comply with the requirements of this clause could constitute grounds for termination for default.

(h) Physical Security Requirements – DOI Access Cards.

(1) Contractor employees must have a DOI Access Card before being given unsupervised access to a Government facility.

(2) To gain unsupervised access to Government facilities, Contractor employees must present their DOI Access Card for examination by the security guard or electronically authenticate their DOI Access Card, as required. Contractor employees must keep their DOI Access Card in a shielded card holder, and visually display the card at all times while in the facility. Refusal or repeated neglect to display the DOI Access Card may result in limiting Contractor employee’s access to Government facilities or revoking of authorized access.

(3) When a Contractor employee is no longer working under this award, the Contractor is responsible for returning all DOI Access Cards, keys, and other Government property issued to that employee. The Contractor shall coordinate all returns with the COR. The COR is responsible for ensuring the Contractor complies with these requirements. However, failure by the Contractor to comply with these requirements may result in the Contractor’s liability for all costs associated with correcting any resultant breech in building security.

(i) Issuance & Maintenance – DOI Access Cards
(1) Process: To obtain a DOI Access Card the COR will use the online DOIAccess System to initiate the access request. Contractor employees will receive email notifications to enroll at a USAccess Credentialing Center with two forms of identification, and after adjudication, a second email notification to pick up and activate their DOI Access Card. The Contractor employee shall schedule an enrollment appointment at a USAccess Center at least two weeks prior to the targeted EOD.

(2) Contractor Responsibilities: Contractor employees must complete actions in a timely manner to prepare for on-boarding and access to DOI network resources. The Contractor shall allow their personnel sufficient time to schedule and attend an enrollment appointment at the USAccess Center prior to the contract start date. If the Contractor employee’s DOI Access Card becomes lost or stolen, the Contractor employee shall notify the COR immediately to request a new DOI Access Card.

(3) COR Responsibilities: The COR (or designated individual) and Contractor shall maintain a list of all Contractor employees who received a DOI Access Card, the date the card was issued, the date the electronic certificates expire (3 years from issue date), and the date the DOI Access Card expires (5 years from issued date). If the Contractor employee’s DOI Access Card of certificates will expire before the contract is completed, the COR (or designated individual) and Contractor are responsible for ensuring that the Contractor employee visits a USAccess Center to update certificates on the existing card or obtain a new DOI Access Card. No later than one week prior to the DOI Access Card’s certificate or card expiration, the COR (or designated individual) shall notify the Contractor that DOI Access Card actions are required. The COR (or designated individual) and the Contractor shall update their listing to reflect the new issue date, certificate expiration date and card expiration date.

(j) Information Technology Security Requirements.

(1) Training – If Contractor employees require access to any DOI/IT systems, the Contractor shall ensure its employees complete all Bureau/DOI required IT security training. The Contractor’s employees shall complete this training before being granted access to Bureau/DOI data or being issued network access. The current training requirements are: (i) annual end-user IT Security Awareness, (ii) annual IT Resources Rules of Behavior, and (iii) annual Role-Based Security training for IT professionals. The Contractor shall comply with all Bureau/DOI IT security training requirements in effect during contract performance. The COR will notify the Contractor of all Bureau mandatory IT training. The Contractor shall submit training completion certificates to the COR for all required training. Failure to meet this training requirement may result in removal of the Contractor employee from the contract. The Bureau will determine if the Contractor can later return to the contract.

(2) Access to Contractor’s Facilities for IT audit purposes – The Contractor shall afford Bureau and the Department of the Interior Office of Inspector General access to the Contractor’s and subcontractor’s facilities, installations, operations, documentation, databases, and personnel used in performance of the contract. Access shall be provided to the extent required to carry out a program of IT inspection, investigation, and audit that will safeguard against threats and hazards to the integrity, availability, and confidentiality of Government data or to the function of computer systems operated on behalf of the Government and to preserve evidence of computer
crime. If the Contractor questions the Government employee’s right to access its facilities, it should contact the CO for resolution.

(3) Contractor Location – Custom software development and outsourced operations shall be located in the United States to the maximum extent practical. If such services are proposed to be performed abroad, the Contractor shall provide an acceptable security plan that addresses the mitigation of problems related to communication, control, and protecting the confidentiality, integrity, and availability of IT systems and information.


(5) Incident Reporting – The Contractor shall immediately report computer security incidents affecting Bureau/DOI data and systems in accordance with the Bureau Computer Incident Response policy. The Contractor shall request copies of the Bureau Computer Incident Response policy by contacting the COR.

(6) Assessment and Authorization (A&A) and Continuous Monitoring – The Contractor shall comply with Bureau policy when developing, upgrading, modifying or supporting applications and/or systems that require A&A and Continuous Monitoring. The Contractor shall request copies of Bureau A&A policy by contacting the COR. The A&A requirement does not apply when the Contractor’s employees merely access data or have “read only” access.

(k) Documentation – The Contractor shall document all work performed and ensure that the appropriate Assessment and Authorization (A&A) documents are updated to reflect the work performed and the current state of Bureau systems and networks. The Documentation requirement does not apply when the Contractor’s employees merely access data or have “read only” access.

(l) Personnel Changes, Contractor Request – The Contractor shall immediately notify the COR and PSO when an employee is reassigned or leaves the Contractor’s employment and prior to any termination. The Contractor must adhere to the Bureau or Office’s mandatory exit clearance procedure. Once the COR has been notified that a Contractor employee is leaving the contract, the COR will initiate the exit clearance process in the DOIAccess System and forward to the Contractor the necessary instructions and form required to be completed prior to the Contractor’s employee’s departure. This form must be completed by the Contractor’s employee and signed by both the Contractor’s employee and the COR and then forwarded to the bureau/office specific program responsible for employee, volunteer, and contractor departures.
(m) Personnel Removal, Government Request – The Government retains the right to direct the Contractor to remove any prime or subcontractor personnel, regardless of prior clearance or background investigation adjudication status, whose actions, while assigned to this contract, clearly conflict with the security interests of the Government. The justification for the Government’s direction to remove Contractor personnel will be documented and provided to the Contractor by the CO.

(n) Subcontract Inclusion – The requirements of this clause must be incorporated into any subcontract if the subcontractor’s employee must have access to Bureau facilities

I.17.  52.204-9 Personal Identity Verification of Contractor Personnel (Jan 2011)
I.18.  52.204-10 Reporting Executive Compensation and First-Tier Subcontract Awards (Oct 2018)
I.19.  52.204-12 Unique Entity Identifier Maintenance (Oct 2016)
I.20.  52.204-13 System for Award Management (Oct 2018)
I.21.  52.204-14 Service Contract Reporting Requirements (Oct 2016)
I.22.  52.204-18 Commercial and Government Entity Code Maintenance (Jul 2016)
I.23.  52.204-19 Incorporation by Reference Representations and Certifications (Dec 2014)
I.24.  52.204-23 Prohibition on Contracting for Hardware, Software, and Services Developed or Provided by Kaspersky Lab and Other Covered Entities (Jul 2018)
I.25.  52.204-25 Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Aug 2019)
I.26.  1452.204-70 Release of Claims – Department of Interior (Jul 1996)
I.27.  52.209-6 Protecting the Government’s Interest When Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment (Oct 2015)
I.29.  52.209-10 Prohibition on Contracting with Inverted Domestic Corporations (Nov 2015)
I.30.  52.215-2 Audit and Records – Negotiation (Oct 2010)
I.32.  52.215-10 Price Reduction Defective Cost or Pricing Data (Aug 2011)
I.33. 52.215-12 Subcontractor Cost or Pricing Data (Oct 2010)

I.34. 1452.215-70 Examination of Records by the Department of Interior (Aug 1996) (Deviation)

For purposes of the Audit and Records -- Negotiation (JUN 1999) clause of this contract (FAR 52.215-2), the Secretary of the Interior, the Inspector General, and their duly authorized representative(s) from the Department of the Interior shall have the same access and examination rights as the Comptroller General of the United States.

I.35. 52.215-21 Requirements for Cost or Pricing Data and Data Other Than Certified Cost or Pricing Data – Modifications (Oct 2010)


Portions of the successful offeror's technical proposal, listed on the award sheet of the contract, have been incorporated, either physically or by reference, into this contract.

I.37. 52.219-6 Notice of Total Small Business Set-Aside (Mar 2020) (Deviation)

(a) Definition. Small business concern, as used in this clause, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation.

(b) Applicability. This clause applies only to—

1. Contracts that have been totally set aside or reserved for small business concerns; and
2. Orders set aside for small business concerns under multiple-award contracts as described in 8.405-5 and 16.505(b)(2)(i)(F).

(c) General.

1. Offers are solicited only from small business concerns. Offers received from concerns that are not small business concerns shall be considered nonresponsive and will be rejected.
2. Any award resulting from this solicitation will be made to a small business concern.

(d) Agreement.

A small business concern submitting an offer in its own name shall furnish, in performing the contract, only end items manufactured or produced by small business concerns in the United States or its outlying areas. If this procurement is processed under simplified acquisition procedures and the total amount of this contract does not exceed $25,000, a small business concern may furnish the product of any domestic firm. This paragraph does not apply to construction or service contracts.

((1) For a contract at or below the simplified acquisition threshold, a small business concern may provide the end item of any firm. For a contract...
exceeding the simplified acquisition threshold and the requirements of paragraphs (d)(1)(i) through (iii) of this clause have not been waived by SBA in accordance with 13 CFR 121.1204, a small business concern that provides an end item it did not manufacture, process, or produce, shall—

(i) Provide an end item that a small business has manufactured, processed, or produced in the United States or its outlying areas;
(ii) Be primarily engaged in the retail or wholesale trade and normally sell the type of item being supplied; and
(iii) Take ownership or possession of the item(s) with its personnel, equipment, or facilities in a manner consistent with industry practice; for example, providing storage, transportation, or delivery.

(2) Paragraph (d)(1) of this clause does not apply to construction or service contracts.

I.38. 52.219-8 Utilization of Small Business Concerns (Oct 2018)

I.39. 52.219-14 Limitations on Subcontracting (Mar 2020) (Deviation)

(a) This clause does not apply to the unrestricted portion of a partial set-aside.

(b) Definition. As used in this clause—

“Similarly situated entity” means a first-tier subcontractor, including an independent contractor, that has the same small business program status as that which qualified the prime contractor for the award, and that is considered small for the NAICS code the prime contractor assigned to the subcontract the subcontractor will perform. An example of a similarly situated entity is a first-tier subcontractor that is a HUBZone small business concern for a HUBZone set-aside or sole source award under the HUBZone Program.

(c) Applicability. This clause applies only to—

(1) Contracts that have been set aside or reserved for small business concerns or 8(a) participants;
(2) Part or parts of a multiple-award contract that have been set aside for small business concerns or 8(a) participants; and
(3) Orders set aside for small business or 8(a) participants under multiple-award contracts as described in 8.405-5 and 16.505(b)(2)(i)(F).

[(1) Contracts that have been set aside or reserved any of the small business concerns identified in 19.000(a)(3);
(2) Part or parts of a multiple-award contract that have been set aside for any of the small business concerns identified in 19.000(a)(3);
(3) Contracts that have been awarded on a sole-source basis in accordance with subparts 19.8, 19.13, 19.14, and 19.15; and
(4) Orders set aside for any of the small business concerns identified in 19.000(a)(3) under multiple-award contracts as described in 8.405-5 and 16.505(b)(2)(i)(F).]
[(d) **Independent contractors.** An independent contractor shall be considered a subcontractor.]

[(e) **Agreement.**] (e) By submission of an offer and execution of a contract, the Offeror/Contractor agrees in performance of the contract in the case of a contract for—

(b) **Services (except construction).** At least 50 percent of the cost of contract performance incurred for personnel shall be expended for employees of the concern.

[(1) Services (except construction), it will not pay more than 50 percent of the amount paid by the Government for contract performance to subcontractors that are not similarly situated entities. Any work that a similarly situated entity further subcontracts will count toward the 50 percent subcontract amount that cannot be exceeded;]

(c) **Supplies (other than procurement from a nonmanufacturer of such supplies).** The concern shall perform work for at least 50 percent of the cost of manufacturing the supplies, not including the cost of materials.

[(2) Supplies (other than procurement from a nonmanufacturer of such supplies), it will not pay more than 50 percent of the amount paid by the Government for contract performance, excluding the cost of materials, to subcontractors that are not similarly situated entities. Any work that a similarly situated entity further subcontracts will count toward the 50 percent subcontract amount that cannot be exceeded;]

(d) **General construction.** The concern will perform at least 15 percent of the cost of the contract, not including the cost of materials, with its own employees.

[(3) General construction, it will not pay more than 85 percent of the amount paid by the Government for contract performance, excluding the cost of materials, to subcontractors that are not similarly situated entities. Any work that a similarly situated entity further subcontracts will count toward the 85 percent subcontract amount that cannot be exceeded; or]

(4) **Construction by special trade contractors.** The concern will perform at least 25 percent of the cost of the contract, not including the cost of materials, with its own employees.

[(4) Construction by special trade contractors, it will not pay more than 75 percent of the amount paid by the Government for contract performance, excluding the cost of materials, to subcontractors that are not similarly situated entities. Any work that a similarly situated entity further subcontracts will count toward the 75 percent subcontract amount that cannot be exceeded.]

(f) A joint venture agrees that, in the performance of the contract, the applicable percentage specified in paragraph (e) of this clause will be performed by the aggregate of the joint venture participants.]
I.40. 52.219-28 Post Award Small Business Program Re-representation (Mar 2020)
I.41. 52.222-3 Convict Labor (Jun 2003)
I.42. 52.222-4 Contract Work Hours and Safety Standards (Mar 2018)
I.43. 52.222-6 Construction Wage Rate Requirements (Aug 2018)
I.44. 52.222-7 Withholding of Funds (May 2014)
I.45. 52.222-8 Payrolls and Basic Records (Aug 2018)
I.46. 52.222-9 Apprentices and Trainees (Jul 2005)
I.47. 52.222-10 Compliance with Copeland Act Requirements (Feb 1998)
I.48. 52.222-11 Subcontracts (Labor Standards) (May 2014)
I.49. 52.222-12 Contract Termination – Debarment (May 2014)

I.50. 52.222-13 Compliance with Construction Wage Rate Requirements and Relation Regulations (May 2014)
I.51. 52.222-14 Disputes Concerning Labor Standards (Feb 1988)
I.52. 52.222-15 Certification of Eligibility (May 2014)
I.53. 52.222-21 Prohibition of Segregated Facilities (Apr 2015)
I.54. 52.222-26 Equal Opportunity (Sep 2016)
I.55. 52.222-27 Affirmative Action Compliance Requirements for Construction (Apr 2015)
I.56. 52.222-35 Equal Opportunity for Veterans (Oct 2015)

(a) Definitions. As used in this clause--

“Active duty wartime or campaign badge veteran,” “Armed Forces service medal veteran,” “disabled veteran,” “protected veteran,” “qualified disabled veteran,’ and “recently separated veteran” have the meanings given at FAR 22.1301.

(b) Equal opportunity clause. The Contractor shall abide by the requirements of the equal opportunity clause at 41 CFR 60-300.5(a), as of March 24, 2014. This clause prohibits discrimination against qualified protected veterans and requires affirmative action by the Contractor to employ and advance in employment qualified protected veterans.
(c) Subcontracts. The Contractor shall insert the terms of this clause in subcontracts of $150,000 or more unless exempted by rules, regulations, or orders of the Secretary of Labor. The Contractor shall act as specified by the Director, Office of Federal Contract Compliance Programs, to enforce the terms, including action for noncompliance. Such necessary changes in language may be made as shall be appropriate to identify properly the parties and their undertakings.

I.57. 52.222-36 Equal Opportunity for Workers with Disabilities (Jul 2014)

(a) Equal opportunity clause. The Contractor shall abide by the requirements of the equal opportunity clause at 41 CFR 60.741.5(a), as of March 24, 2014. This clause prohibits discrimination against qualified individuals on the basis of disability and requires affirmative action by the Contractor to employ and advance in employment qualified individuals with disabilities.

(b) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $15,000 unless exempted by rules, regulations, or orders of the Secretary, so that such provisions will be binding upon each subcontractor or vendor. The Contractor shall act as specified by the Director, Office of Federal Contract Compliance Programs of the U.S. Department of Labor, to enforce the terms, including action for noncompliance. Such necessary changes in language may be made as shall be appropriate to identify properly the parties and their undertakings.

I.58. 52.222-37 Employment Reports on Veterans (Feb 2016)

I.59. 52.222-40 Notification of Employee Rights Under the National Labor Relations Act (Dec 2010)

I.60. 52.222-50 Combating Trafficking of Persons (Jan 2019)

I.61. 52.222-54 Employment Eligibility Verification (Oct 2015)

I.62. 52.222-55 Minimum Wages Under Executive Order 13658 (Dec 2015)

I.63. 52.222-62 Paid Sick Leave Under Executive Order 13706 (Jan 2017)

I.64. 52.223-2 Affirmative Procurement of Bio-based Products Under Service and Construction Contracts (Sept 2013)

I.65. 52.223-3 Hazardous Material Identification and Material Safety Data (Jan 1997), Alternate I (Jan 1995)

I.66. 52.223-5 Pollution Prevention and Right-to-Know Information (May 2011)

I.67. 52.223-6 Drug Free Workplace (May 2001)
I.68. **52.223-9 Estimate of Percentage of Recovered Material Content for EPA-Designated Items (May 2008)**

(a) *Definitions.* As used in this clause-

“Postconsumer material” means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. Postconsumer material is a part of the broader category of “recovers material.”

“Recovered material” means waste materials and by-products recovered or diverted from solid waste, but the term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process.

(b) The Contractor, on completion of this contract, shall-

(1) Estimate the percentage of the total recovered material content for EPA-designated item(s) delivered and/or used in contract performance, including, if applicable, the percentage of post-consumer material content; and

(2) Submit this estimate to the Contracting Officer Representative (COR).

I.69. **52.223-18 Encouraging Contractor Policies to Ban Text Messaging While Driving (Aug 2011)**

I.70. **52.223-20 Aerosols (Jun 2016)**

I.71. **52.223-21 Foams (Jun 2016)**


(a) The Contractor warrants that all items delivered, or work required by the contract, shall be free of asbestos in any form whatsoever except for the use of asbestos cement pipe.

(b) The Contractor may request the Contracting Officer to approve an exception to this prohibition when an asbestos-free product is not available. Such requests shall be fully documented and submitted as soon as possible after the contractor determines that an asbestos-free product is not available. Contracting Officer disapproval of a request for an exception shall be final and not subject to the Disputes clause of this contract.

I.73. **WBR 1452.223-81 Safety and Health – Bureau of Reclamation (Jun 2015)**

(a) The Contractor shall not require any person employed in the performance of this contract (including subcontracts) to work under conditions which are unsanitary, hazardous, or dangerous to the employee's health or safety.

(b) Contractor shall comply with the most current version of the Bureau of Reclamation “Reclamation Safety and Health Standards” (RSHS) and, if applicable, the requirements of the Accident Prevention Clause (FAR 52.236-13).

(1) The RSHS manual as referenced in subparagraph (b) above shall be obtained at [http://www.usbr.gov/ssle/safety/RSHS/rshs.html](http://www.usbr.gov/ssle/safety/RSHS/rshs.html)
(c) (1) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 from the Occupational Safety and Health Administration, U.S. Department of Labor, www.osha.gov

(d) In the event there is a conflict between the requirements contained in paragraphs (b) and (c) referenced herein, the more stringent requirement shall prevail

(e) The Contractor shall submit a written proposed safety program as prescribed in the RSHS and the written specifications.

(f) The Contractor shall maintain an accurate record of and shall report to the Contracting Officer (or authorized representative) in the manner prescribed by the Contracting Officer, all cases of death, occupational diseases, or traumatic injury to employees or the public involved, and property damage in accordance with the RSHS and OSHA guidelines.

(g) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(h) If the RSHS is updated or amended by Reclamation during the course of this contract, the contractor will be notified in writing. The contractor shall comply with the current RSHS immediately upon written notification. Should the contractor feel that the updated version of RSHS constitutes a substantive change to the contract, affecting price or time (or both), the contractor may request an equitable adjustment in the contract price. Any such requests shall include a price proposal submitted in compliance with Contract Clause WBR 1452.243-80, Modification Proposals - Bureau of Reclamation, and in sufficient detail to allow meaningful analysis of labor, equipment and material.

I.74. WBR 1452.223-82 Protecting Federal Employees and the Public from Exposure to Tobacco Smoke in the Federal Workplace (Dec 2009)

(a) In performing work under this contract, the contractor shall comply with the requirements of Executive Order 13058, dated August 9, 1997, which prohibits the smoking of tobacco products in all interior space owned, rented, or leased by the executive branch of the Federal Government, and in any outdoor areas under executive branch control in front of air intake ducts.

(b) In addition, pursuant to Federal Management Regulation (FMR) Bulletin 2009-B1, effective December 22, 2008, smoking is prohibited in courtyards and within 25 feet of doorways and air intake ducts on outdoor space under the jurisdiction, custody or control of GSA

I.75. 52.225-9 Buy-American – Construction Materials (May 2014)

(a) Definitions. As used in this clause--

“Commercially available off-the-shelf (COTS) item”—

(1) Means any item of supply (including construction material) that is—
(i) A commercial item (as defined in paragraph (1) of the definition at FAR 2.101);

(ii) Sold in substantial quantities in the commercial marketplace; and

(iii) Offered to the Government, under a contract or subcontract at any tier, without modification, in the same form in which it is sold in the commercial marketplace; and

(2) Does not include bulk cargo, as defined in 46 U.S.C. 40102(4), such as agricultural products and petroleum products.

“Component” means an article, material, or supply incorporated directly into a construction material.

“Construction material” means an article, material, or supply brought to the construction site by the Contractor or a subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

“Cost of components” means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the construction material.

“Domestic construction material” means—

(1) An unmanufactured construction material mined or produced in the United States;

(2) A construction material manufactured in the United States, if—

   (i) The cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which non-availability determinations have been made are treated as domestic; or

   (ii) The construction material is a COTS item.

“Foreign construction material” means a construction material other than a domestic construction material.
United States” means the 50 States, the District of Columbia, and outlying areas.

(b) Domestic preference.

(1) This clause implements the 41 U.S.C. chapter 83, Buy American, by providing a preference for domestic construction material. In accordance with 41 U.S.C. 1907, the component test of the Buy American statute is waived for construction material that is a COTS item. (See FAR 12.505(a)(2)). The Contractor shall use only domestic construction material in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to information technology that is a commercial item or to the construction materials or components listed by the Government as follows: none.

(3) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(2) of this clause if the Government determines that

(i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the requirements of the Buy American statute is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

(ii) The application of the restriction of the Buy American statute to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American statute.

(1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(3) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

(C) Quantity;

(D) Price;

(E) Time of delivery or availability;

(F) Location of the construction project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.
(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American statute applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(3)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American statute applies, use of foreign construction material is noncompliant with the Buy American statute.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

<table>
<thead>
<tr>
<th>Construction material description</th>
<th>Unit of measure</th>
<th>Quantity</th>
<th>Price (dollars) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign construction material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic construction material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign construction material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic construction material</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).
I.76. 52.225-13 Restrictions on Certain Foreign Purchases (Jun 2008)
I.77. 52.227-1 Authorization and Consent (Dec 2007)
I.78. 52.227-2 Notice and Assistance Regarding Patent and Copyright Infringement (Dec 2007)
I.79. 52.227-4 Patent Indemnity – Construction Contracts (Dec 2007)
I.80. 52.227-17 Rights in Data – Special Works (Dec 2007)
I.81. 52.228-2 Additional Bond Security (Oct 1997)
I.82. 52.228-5 Insurance – Work on a Government Installation (Jan 1997)
I.83. 52.228-11 Pledges of Assets (Aug 2018)
I.84. 52.228-12 Prospective Subcontract Requests for Bonds (May 2014)
I.85. 52.228-14 Irrevocable Letter of Credit (Nov 2014)
I.86. 52.228-15 Performance and Payment Bonds – Construction (Oct 2010)

(a) Definitions. As used in this clause --

“Original contract price” means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

(b) Amount of required bonds. Unless the resulting contract price is $150,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance Bonds (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.

(2) Payment Bonds (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.

(3) Additional bond protection.

(i) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

(ii) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.
(c) **Furnishing executed bonds.** The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.

(d) **Surety or other security for bonds.** The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier’s check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the *Federal Register* or may be obtained from the:

U.S. Department of Treasury  
Financial Management Service  
Surety Bond Branch  
3700 East West Highway, Room 6F01  
Hyattsville, MD 20782  

(e) **Notice of subcontractor waiver of protection (40 U.S.C. 3133(c)).** Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

I.87. **1452.228-70 Liability Insurance – Department of Interior (Jul 1996)**

(a) The Contractor shall procure and maintain during the term of this contract and any extension thereof liability insurance in form satisfactory to the Contracting Officer by an insurance company which is acceptable to the Contracting Officer. The named insured parties under the policy shall be the Contractor and the United States of America. The amounts of the insurance shall be not less than as follows:

- $200,000.00 each person
- $500,000.00 each occurrence
- $100,000.00 property damage

(b) Each policy shall have a certificate evidencing the insurance coverage. The insurance company shall provide an endorsement to notify the Contracting Officer 30 days prior to the effective date of cancellation or termination of the policy or certificate; or modification of the policy or certificate which may adversely affect the interest of the Government in such insurance. The certificate shall identify the contract number, the name and address of the Contracting Officer, as well as the insured, the policy number and a brief description of contract services to be performed. The contractor shall furnish the Contracting Officer with a copy of an acceptable insurance certificate prior to beginning the work.
I.88. WBR 1425.228-84 Certification of Representatives for Corporate Sureties (Jul 1993)

Each surety company bond, that purports to have been executed by an agent or attorney-in-fact for the corporate surety, shall --

(1) be accompanied by a power of attorney to the signatory agent or attorney-in-fact; and

(2) the power of attorney or attorney-in-fact shall have been executed by the corporate surety upon a date prior to the date of the execution of the bond; or

(3) be accompanied by a certification of the sureties to the effect that the power of attorney was in full force and effect upon the date of the bond.

I.89. 52.229-3 Federal, State, and Local Taxes (Feb 2013)

I.90. Notice of Washington State Sales and Use Tax (Feb 1995)

Offerors are advised that Washington State Sales and Use Tax may be assessed on Government furnished equipment and materials. The Contractor shall be responsible for payment of the tax.

I.91. WBR 1452.231-81 Equipment Ownership and Operating Expense (Jul 1998)

(a) Definitions. "Acquisition cost," as used in this clause means, the Contractor's original purchase price (including sales tax less salvage value) of an item of equipment including any and all accessories and expendable components required for utilization the item of equipment. For used equipment which is reconditioned and recapitalized, "acquisition cost" shall mean the adjusted amount resulting from the recapitalized value of the equipment as determined from the Contractor's accounting records.

"Equipment," as used in this clause, means equipment in sound workable condition at the construction work site, either owned or controlled by the Contractor or its subcontractors at any tier, or obtained from a commercial rental source, and furnished for use under this contract.

"Ownership cost," as used in this clause, means allowances for construction equipment depreciation and cost of facilities capital.

"Operating cost," as used in this clause, means the cost of operating equipment such as operating crew labor, servicing labor and equipment, labor and parts for all repairs and maintenance, fuel, oil, grease, supplies, tire wear and repair.

(b) Policy. Equitable adjustments made in the price of this contract pursuant to the Changes, Differing Site Condition, Suspension of Work, or other clause of the contract, may include allowable ownership and operating costs for equipment. In accordance with FAR 31.105(d), allowable ownership and operating costs for each piece of equipment, or groups of similar serial or series equipment, shall be determined using actual cost data when such data are available from...
the Contractor's accounting records. When actual costs cannot be so determined or when actual cost data for a specific element of operating cost do not contain costs for individual pieces or types of equipment, the procedures in paragraph (d) of this clause shall be used to determine allowable costs (provided, in the case of operating costs, that the costs are reconciled to the Contractor's total cost for that operating element). For fully depreciated equipment, the procedures in paragraph (e) of this clause shall be used to determine allowable costs.

(c) Required data. In any request made for an equitable adjustment, the Contractor shall furnish to the Contracting Officer --

(1) A complete description of each item of equipment (including all accessory equipment attached thereto) to be used in connection with the work to be performed listing the date of manufacture, date of acquisition, make, model, size, capacity, mounting, and type of power;

(2) Evidence of the acquisition cost of new or used equipment to be used including all available current and historical supporting cost data. If evidence of acquisition cost is not provided by the Contractor or if the data provided are unacceptable to the Contracting Officer, the Contracting Officer may determine the acquisition cost by other appropriate means.

(d) Use of the predetermined rate schedule.

(1) When the Contracting Officer determines that allowable ownership and operating costs cannot be determined from the Contractor's accounting records, the U.S. Army Corps of Engineers pamphlet entitled "Construction Equipment Ownership and Operating Expense Schedule" (Schedule) for the State in which the construction site is located shall be used to calculate ownership and operating rates. Copies of the Schedules can be obtained, free of charge, from the U.S. Army Corps of Engineers, Publications Depot, 2803 52nd Avenue, Hyattsville, MD 20781-1102.

(2) For the purpose of determination of the hourly rates to be applied under this contract, working conditions shall be considered average, unless otherwise determined by the Contracting Officer.

(3) Rates for equipment not listed in the Schedule shall be calculated using the formulas in the Schedule. Alternatively, the Contracting Officer may determine to use rates in the Schedule for equipment comparable to the unlisted equipment, including horsepower and auxiliary features.

(e) Fully depreciated equipment. No depreciation or rental cost shall be allowed on equipment fully depreciated by the Contractor or by any division, subsidiary, parent company, or affiliate under common control. However, a reasonable rate for using fully depreciated equipment may be allowed by the Contracting Officer. Unless otherwise determined by the Contracting Officer, such hourly rate shall not exceed a value computed by multiplying the depreciation rate for the equipment (as shown in the Schedule table entitled "Construction Equipment Ownership and
Operating Expense") by the economic index for the year of equipment manufacture (as shown in the Schedule table entitled "Economic Indexes for Construction Equipment"), divided by the economic index correspondingly with the year the Schedule is published. The year used for the basis of the rates in the Schedule is indicated in the table entitled "Equipment Age Adjustment Factors for Ownership Costs." Idle or standby time will not be paid for fully depreciated equipment.

(f) Idle or standby time. Equipment ownership costs for idle or standby time of equipment not fully depreciated shall be determined as follows:

1. The allowable rate shall be made at 50 percent of the hourly rate for ownership costs if actual cost data are used. The maximum hours per week allowed shall not exceed 40 hours or the number of hours regularly worked by the Contractor, whichever is less. No allowance shall be made for Saturdays, Sundays, or holidays, when work is not actually performed.

2. If actual cost data cannot be determined, the rate shall be computed in accordance with the Schedule.

3. No costs shall be allowed for time when the equipment would have been otherwise idle or was not in good operating condition.

4. Periods of time less than 2 hours on which equipment is down for normal and regular servicing and for minor field repair or field maintenance shall be considered by the Contractor to be operating time rather than idle or standby time and such periods shall not be deducted from use or operating time.

5. No costs are allowable for fully depreciated equipment.

(g) Rental. Allowable costs for renting or leasing of equipment shall be determined in accordance with FAR 31.105(d)(2)(ii) and 31.205-36.

(a) General. Payment for the Mobilization and Preparatory Work line item of the schedule will be made as reflected herein. To the extent that this line item exceeds the percentage of total contract pricing as estimated by the Contracting Officer in WBR 1452.236-85, Instruction for Mobilization and Preparatory Work Schedule Line Item, payment will be made as reflected in Section (d)(5) below. Reclamation will make payment to the Contractor in accordance with this clause for operations including, but not limited to, those necessary for --

1. Movement of personnel, equipment, supplies, and incidentals to the project site;

2. The establishment of offices, buildings, plants and other facilities, at the site (excludes temporary buildings (e.g. storage sheds, shops, offices) and utilities listed in the Operations and Storage Areas clause of this contract;

3. Payment of premiums for project bonds and insurance; and

4. Other work and operations which must be performed, or costs incurred incident to the initiation of meaningful work at the site and for which the contract does not otherwise provide for payment.

(b) Facilities and equipment covered by mobilization work.

1. All facilities, plant, and equipment which are established at, or brought to, the site shall be deemed to be subject to the provisions of this paragraph unless the Contracting Officer specifically provides other written authorization for a particular item or items.

2. The Contractor shall be solely responsible for the adequacy, efficiency, use, protection, maintenance, repair, and preservation of all facilities, plant, and equipment on site.

3. The facilities, plant, and equipment covered by this paragraph shall not be dismantled or removed from the site prior to completion of the work under the contract without the written authorization of the Contracting Officer.

(c) Termination for default. Should the Contractor be terminated for default as provided by the Default clause of this contract --

1. All facilities, plant, and equipment on the site shall be subject to the Government's right to take possession of and utilize such items for the purpose of completing the work;

2. The Contractor shall provide evidence of encumbrances, liens, or other security interests, to the Contracting Officer; and
(3) Any encumbrance, lien, or other security interest on such facilities, plant, or equipment shall be subordinated to the Government's rights under the Default clause of this contract to utilize all facilities, plant, and equipment to complete the work under the contract.

(d) Payment. Payment for mobilization and preparatory work under paragraph (a) of this clause shall be made at the contractor lump-sum price for this item as contained in the Schedule. Progress payments for mobilization and preparatory work shall be made as follows --

(1) In accordance with paragraph (g) of the Payments under Fixed Price Construction Contracts clause of this contract and upon submission of a proper invoice, the Government will reimburse the Contractor for the total amount of premiums paid for performance and payment bonds as required by the Performance and Payment Bond Requirements clause of this contract and for any insurance which is specified as payable by the Government under this contract.

(2) Except as provided in (d)(1) above, progress payments for mobilization and preparatory work shall not be considered a separate division of work for the purposes of progress payments and shall be subject to retainage before payment of the total amount for this contract line item.

(3) When progress payments totaling 5 percent of the total original contract amount have been made by the Government for all other work accomplished under the contract, the Government shall pay the Contractor 50 percent of the mobilization and preparatory work contract line item amount or 5% (percent) of the total original contract amount (whichever is the lower) exclusive of any payment already made to the Contractor for performance and payment bond premiums and specified insurance under subparagraph (d).

(4) When progress payments totaling 10% (percent) of the total original contract amount have been made by the Government for all other work accomplished under the contract, the balance of the amount for the mobilization and preparatory work contract line item or 2.5 percent of the total original contract amount (whichever is the lower) shall be paid to the contractor.

(5) If the contract amount for mobilization and preparatory work exceeds the total of the payments allowed under (3) and (4) above, the balance shall be paid when the contract work is substantially complete as determined by the Contracting Officer.

I.100. WBR 1452.232-82 Other Invoice Requirements- Bureau of Reclamation (Jul 1998)

(a) As permitted by subparagraph (a)(2)(xi) of the Prompt Payment for Construction Contracts clause of this contract, to constitute a proper invoice the Contractor shall submit the update
reports required by the "Construction Program" paragraph of the contract specification with each request for payment under the contract.

(b) No payment shall be authorized for work performed out of sequence. If work is performed in violation of the sequence shown on the approved logic diagram(s) but is performed in a logical sequence and in compliance with the contract requirements, the current approved logic diagram(s) shall be updated to correct the out of sequence condition, thereby allowing approval of payment. Progress payments for incomplete activities shall be approved only if the activity's original duration exceeds 15 workdays or 20 shifts and the activity is in process at the end of the billing period, or if the estimated earnings for the activity exceed $1,000.

I.101. 52.233-1 Disputes (Mar 2014), Alternate I (Dec 1991)
I.102. 52.233-3 Protest After Award (Aug 1996)
I.103. 52.233-4 Applicable Law for Breach of Contract Claim (Oct 2004)
I.104. WBR 1452.233-81 Claims Accounting – Bureau of Reclamation (Jul 1993)

The Contractor shall maintain separate accounting records substantially the same as prescribed under the Change Order Accounting Clause at FAR 52.243-6 Change Order Accounting on any claim for adjustment of contract price that may exceed $50,000 under this contract.

I.105. 52.236-2 Differing Site Conditions
I.106. 52.236-3 Site Investigation and Conditions Affecting Work (Apr 1984)
I.107. 52.236-4 Physical Data (Apr 1984)
I.108. 52.236-6 Superintendence by the Contractor (Apr 1984)
I.109. 52.236-7 Permits and Responsibilities (Nov 1991)
I.110. 52.236-8 Other Contracts (Apr 1984)
I.111. 52.236-9 Protecting Existing Vegetation, Structures, Equipment, Utilities, and Improvements (Apr 1984)
I.112. 52.236-10 Operation and Storage Areas (Apr 1984)
I.113. 52.236-11 Use and Possession Prior to Completion of Work (Apr 1984)
I.114. 52.236-12 Cleaning Up (Apr 1984)
I.116. 52.236-16 Quantity Surveys (Apr 1984)
I.117. 52.237-17 Layout of Work (Apr 1984)
I.118. 52.236-21 Specifications and Drawings for Construction (Feb 1997), Alternate I (Apr 1984)
I.119. 52.236-26 Preconstruction Conference (Feb 1995)
I.120. WBR 1452.236-84 Preservation of Cultural Resources – Bureau of Reclamation (Feb 2000)

(a) General. Federal legislation provides for the protection and preservation of cultural resources that may be impacted or altered as a result of any Federal project, activity, or program or federally licensed or assisted project, activity, or program.

(b) Discovery of Resources. Should the Contractor, or any of the Contractor's employees, subcontractors, or parties operating or associated with the Contractor, in the performance of this contract discover evidence of possible cultural resources, the Contractor shall immediately cease work at that location and provide oral notification to the Contracting Officer, giving location and nature of the findings. The Contractor shall forward a written report of findings to the Contracting Officer within 48 hours.

(i) If a cultural resource is determined by Reclamation to be a Native American cultural item, then the Contractor shall cease the activity in the area of the discovery, make a reasonable effort to protect the items discovered, and wait for written approval from the Contracting Officer before resuming activity. This requirement is prescribed under the Native American Graves Protection and Repatriation Act (NAGPRA). Many States have "burial laws" that apply to non-Federal and non-Indian lands; the Contractor is responsible for complying with applicable state law when operating on non-Federal and non-Indian lands.

(ii) If the discovery occurs on tribal lands, the Contractor shall immediately orally notify the responsible tribal official and the Contracting Officer and follow with written confirmation within 2 days to the responsible tribal official and the Contracting Officer. (The Reclamation office will supply the name and phone number of the tribal official.

(iii) The Contractor shall exercise care so as not to disturb or damage any cultural resources discovered during the execution of this contract and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by Reclamation. The Contractor shall not resume work in the area of a discovery until written notice to proceed is received from the Contracting Officer.
(c) Destruction of Archaeological Resources. Any person who excavates, removes, damages, alters or defaces or attempts to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands or Indian lands is subject to a maximum of five years in prison and $250,000 fine, as prescribed under Sections 6 and 7 of the Archaeological Resources Protection Act. State law may provide other penalties on non-Federal lands.

(d) Approval of Use Areas and Borrow Sources. If the Contractor proposes to use a location other than an approved location (approved locations to be provided by the Contracting Officer), the location(s) must first be approved for use by the Contracting Officer. When considering an unapproved use area or borrow source, the Contractor shall submit a map showing the location to the Contracting Officer at least 45 calendar days in advance of any proposed use. The Contractor or his subcontractors shall take no action to use or alter the proposed location until written approval is provided by the Contracting Officer.

(e) Compensation for Delays. Where appropriate by reason of discovery, the Contracting Officer may order changes in the schedule or work. If such delays or changes are ordered, any equitable adjustment under the contract will be provided in accordance with the applicable clauses of the contract.

(f) Subcontractors. The Contractor shall insert this clause in all subcontracts that involve performance of work on job site terrain.

(g) Cost. Except as provided in subsection e above, the cost of complying with this contract clause shall be included in the prices offered in the schedule for other items of work.

(h) Government Access. The Contractor's arrangement with landowners shall permit the Government or its representatives’ access to the land to identify cultural resources and conduct appropriate inspections during the Contractor's use of the area or during material procurement.

(i) Definitions.

(i) "Cultural items" as defined by NAGPRA include Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony.

(ii) "Cultural resources" is a broad term that includes prehistoric, historic, architectural, and traditional cultural properties; specific items include, but are not limited to, human skeletal remains, archaeological artifacts, records, and material remains related to such properties.

(iii) "Funerary objects" means 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.

(iv) "Human remains" means the physical remains of the body of a person.

(v) "Native American" means of, or relating to, a tribe, people, or culture that is indigenous to the United States.
(vi) "Sacred objects" means 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.

(vii) "Objects of cultural patrimony" means Native American items having ongoing historical, traditional, or cultural importance central to the Indian tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member.

I.121. WBR 1452.237-80 Security Requirements – Bureau of Reclamation (Feb 2017)

(a) General Security Requirements:

(1) This clause addresses security requirements, including general procedural requirements, information security requirements, contractor employee suitability requirements, identification card requirements, site security requirements, vessel exclusion barriers, and information technology security requirements. Within this clause, COR means Contracting Officer's Representative. If there is no COR appointed and identified to the Contractor, the term instead will mean the Program Manager or any other authorized individual responsible for technical oversight under the contract. “Work site” means the Government facility, office, construction site, and any other area within the Government office or facility that the Contractor must access to accomplish work under this contract.

(2) The work performed under this contract shall only be accomplished by individuals (in the employment of the Contractor or any subcontractors) whose conduct and behavior is consistent with the efficiency of the Federal Service and the requirements of this contract, and who are acceptable to the CO. If Reclamation finds a Contractor employee to be unsuitable or unfit for his or her assigned duties, the CO will direct the Contractor to remove the individual from the contract and access to the Federal facility at which the contract activities are occurring.

(3) The Contractor’s employees governed by this contract may need access to sensitive information and/or sensitive areas. The Federal Government (Government) reserves the right, in its sole discretion, to determine suitability of Contractor personnel and deny access to any sensitive information or project specific area to any personnel for any cause.

(4) The Contractor is responsible for informing and ensuring compliance by its employees with any applicable security procedures of the Government facility where work may be performed under this contract.
(5) Any Contractor employee that will have access to a Federally-controlled facility or information system will be required to have a Government-issued identification card, consisting of a Personal Identity Verification (PIV) Card, a temporary identification card, or a visitor badge. (Note: within the Department of the Interior this card is known as a DOI Access Card.) During performance of the contract, the Contractor shall keep the COR apprised of any changes in personnel, or changes in personnel access or duration, to ensure that performance is not delayed by compliance with credentialing processes.

(6) A Contractor employee will not be provided access to a Government facility or information system until a Government PIV Card, temporary identification card, or visitor identification badge has been issued to the Contractor employee. For those individuals that will be receiving a PIV Card, the Government may, at its discretion, issue a temporary identification card or visitor identification badge after the electronic background investigation forms have been received and the investigation is initiated.

(7) All Contractor employees shall access the facility via the facility’s entry screening system and visibly display the Government-issued PIV Card, temporary identification card, or visitor identification badge at all times. Contractor employees must visibly wear the Government-issued identification card at all times they are on Government facilities. Contractor employees are responsible for the safekeeping of all Government-issued identification cards, whether on-site or off-site. Cards that have been lost, damaged, or stolen must be reported to the COR and DOI Access Sponsor within 24 hours. The Contractor shall return all identification cards and card keys and any other Government property and information upon completion of performance or when personnel depart permanently or for a period of seven (7) days or more. The Contractor may be required to turn in access control cards or identification cards on a daily basis.

(8) Misuse or loss of access control or identification cards, or failure to comply with required surrender of such cards may, at Government discretion, result in Contractor personnel being denied access to the work site, at no cost to Government. The Contractor may be charged up to $500 for each occurrence for any required replacement of Government-issued access control or identification cards due to loss or misuse. At the end of contract performance, or when a Contractor employee is no longer working under this contract, the Contractor shall ensure that all access control and identification cards are returned to the COR.

(9) All Contractor personnel, including subcontractor personnel, with access to the work site shall be U.S. citizens or foreign individuals legally residing in, or legally admitted to, the U.S. For all non-U.S. citizens working under this contract, irrespective of length of time working on the contract, the Contractor shall provide to the COR, legible and valid copies of the individual’s passport and visa (unless individual is on the Visa Waiver Program) a minimum of 14 calendar days prior to beginning work or arriving at the facility. A driver’s license is not acceptable identification. In addition, a completed form I-94 shall be submitted to the COR upon the individual’s arrival at the work facility and prior to beginning work.
(10) The Contractor shall report all contacts with entities, individuals, and
counsel/representatives (including foreign entities and foreign nationals) who seek in any
way to obtain unauthorized access to sensitive information or areas. The Contractor shall
report any violations of contract provisions, laws, executive orders, regulations, and
guidance to the Contracting Officer (CO). The Contractor shall report any information
raising a doubt as to whether an individual’s eligibility for continued employment or
access to sensitive information is consistent with the interests of National Security and
the Public Trust.

(11) Unsanctioned, negligent, or willful inappropriate action on the part of the Contractor
(or its employees) may result in termination of the contract or removal of some
Contractor employees from Reclamation facilities at no cost to the Government. These
actions include, but are not limited to, exploration of a sensitive system and/or
information, introduction of unauthorized and/or malicious software, inappropriate
release of sensitive information, or failure to follow prescribed access control policies
and/or security procedures. Failure to comply with Reclamation policies, procedures, or
other published security requirements may result in termination of the contract or
removal of some contracted employees from Reclamation buildings and/or facilities at no
cost to the Government.

(12) All provisions of this clause shall equally apply to all subcontractors. The Contractor
shall incorporate the substance of this clause in all subcontracts.

(13) These security requirements apply to all sections of this Contract including Contract
Drawings and other Contract Specifications as applicable. Related documents include
other general provisions of Construction or Operations and Maintenance type Contracts,
including FAR clauses by reference or as amended by related documents.

(b) Information Security Requirements.

(1) Sensitive Information. The term “sensitive information” means any information
which warrants a degree of protection and administrative control as defined by
Reclamation or that meets the criteria for exemption from public disclosure set forth
under Sections 552 and 552a of Title 5, United States Code: The Freedom of Information
Act and the Privacy Act. Sensitive information is generally categorized as FOR
OFFICIAL USE ONLY (FOUO) information or CONTROLLED UNCLASSIFIED
INFORMATION (CUI), but in some cases may include other unclassified information.
(The protection of National Security information is beyond the scope of this clause. If
any work on National Security information is required under this contract, it is addressed
under other contract clauses.) The Contractor shall protect this type of information from
unauthorized release into public domain, or to unauthorized persons, organizations, or
subcontractors. Information which, either alone or in aggregate, is deemed sensitive by
Reclamation shall be handled and protected in accordance with Reclamation directives
and standards for identifying and safeguarding sensitive information (SLE 02-01), which
is available from the COR or at http://www.usbr.gov/recman/DandS.html#sle.
(i) Any Government-furnished information or material does not become the property of the Contractor and may be withdrawn at any time. Upon expiration or termination of the contract, all documents released to the Contractor and any material created using data from such documents shall be returned to the COR for final disposition. Government-furnished information residing on any electronic systems (laptops, servers, desktops, media) shall be deleted from those systems using a COR-approved data erasure solution. Only with prior authorization from the CO may the Contractor retain the material. The Contractor or subcontractor shall not disclose or release the materials provided to the Contractor to any individuals of the Contractor's organization not directly engaged in providing services under the contract or that do not have a valid need-to-know. All technical data provided to the Contractor by the Government shall be protected from public or private disclosure in accordance with the markings printed on them. All other information relating to the items to be delivered or the services to be performed under this contract shall not be disclosed by any means without prior approval of the CO. Prohibited dissemination or disclosure includes, but is not limited to: permitting access to such information by foreign nationals or by immigrant aliens who may be employed by the Contractor, publication of technical or scientific papers, advertising, disclosure to Contractor staff not investigated and deemed acceptable at the appropriate information sensitivity level, and any other public release. The Contractor shall maintain, and furnish upon request of the CO, records of the names of individuals who have access to sensitive material in its custody. All questions regarding information security, access, and control shall be referred to the COR.

(ii) The Contractor shall not release to anyone outside the Contractor’s organization any sensitive, or otherwise protected information, regardless of medium in which it is contained (for example, film, tape, document, electronic), pertaining to any part of this contract or any Reclamation program or activity, unless the CO has given prior written approval. This includes, but is not limited to, news releases, marketing promotions, articles, interviews, reports, social media posts, and any other media releases. Requests for approval shall identify the specific information to be released, the medium to be used, the purpose for the release, and a description of the need-to-know. The Contractor shall submit its request to the CO ten business days before the proposed date for release. Subcontractors shall submit requests for authorization to release through the prime Contractor to the CO.

(iii) The Contractor shall notify the COR immediately when known or suspected loss/compromise of sensitive information or other documents, notes, drawings, sketches, reports, photographs, exposed film or similar information which may affect the security interests of Government has occurred. This requirement extends to employees and other personnel working on behalf of the Contractor.
(2) Classified Information.

(i) The disclosure of U.S. Government documents by third parties can result in damage to our national security. While this contract may not deal directly with classified information, each contractor is obligated to protect classified information pursuant to all applicable laws and to use Government information technology systems in accordance with agency procedures so that the integrity of such systems is not compromised.

(ii) Unauthorized disclosures of classified documents (whether in print, on a blog, or on websites, or other electronic or non-electronic media) do not alter the documents' classified status or automatically result in declassification of the documents. To the contrary, classified information, whether or not already posted on public websites or disclosed to the media, remains classified, and must be treated as such by Federal employees and contractors, until it is declassified by an appropriate U.S. Government authority. Executive Order 13526, Classified National Security Information (December 29, 2009), Section 1.1.(c) states, "Classified Information shall not be declassified automatically as a result of any unauthorized disclosure of identical or similar information."

Although the Department has taken steps to prevent access to publicly disclosed classified materials from Departmental computers, it is important to understand our continuing duties and responsibilities in this regard.

(iii) Contractors (which include all employees of the contractor, as well as subcontractors and its employees performing work for the contractor) are reminded of the following obligations with respect to the treatment of classified information and the use of unclassified government information technology systems:

(iv) The contractor shall not, while using unclassified Government computers or other devices (such as phones or tablets) access documents that are marked classified (including classified documents made publicly available by a third party), as doing so risks that material still classified will be placed onto unclassified systems. This requirement does not restrict contractor access to unclassified, publicly available news reports (and other unclassified material) that may in turn discuss classified material, as distinguished from access to underlying documents that themselves are marked classified (including if the underlying classified documents are available on public web sites or otherwise in the public domain).

(v) For contracts that require access to classified information, the contractor is responsible for obtaining the required national security clearance through the
Department of the Defense National Industrial Security Program Operating Manual (NISPOM). Any classified contracts will be coordinated through the Reclamation Chief Security Officer, or for IT requirements, the Bureau Chief Information Security Officer. No contractor shall access classified information unless proper clearances have been obtained and transmitted to Reclamation. For further information, refer to 443 DM 1 or DOD NISPOM 5220.22-M dated February 28, 2006 (incorporating change 2 dated May 18, 2016).

(vi) Classified information shall not be removed from official premises.

(vii) Classified information shall not be disclosed without proper authorization.

I.122. 52.242-13 Bankruptcy (Jul 1995)

I.123. 52.243-4 Changes (Jun 2007)


(a) In submitting any proposal for a modification under this contract (including any proposal for an equitable adjustment resulting from a change under the Changes clause of this contract), the Contractor shall:

(1) Comply with the contract time limits for submission of a proposal or as specified by the Contracting Officer;

(2) Apply the contract cost principles and procedures in Part 31 of the Federal Acquisition Regulation (FAR) in effect on the date of this contract;

(3) Furnish a breakdown of all costs estimated to complete the work required by the modification (i.e., cost of added work, incurred cost of deleted work already performed, estimated cost of deleted work not yet performed, and net cost of the modification) to include all costs associated with materials (identified by item and quantity), equipment (identified by item, quantity and whether contractor-owned or rented), categories of direct labor, bond and insurance premium adjustments, subcontracts, overhead and other indirect costs, profit/fee, and any other pricing information requested by the Contracting Officer, in sufficient detail to permit a detailed analysis of fair and reasonable price and comply with the requirements of the Equipment Ownership and Operating Expense clause of this contract.

(4) Furnish a written justification for any requested time extensions; and

(5) For any pricing adjustment expected to exceed $500,000 (considering both increases and decreases) --

   (i) Submit cost and pricing data using the format specified in Table 15-2 of FAR 15.408 unless the Contracting Officer agrees that an exception applies under the circumstances set forth in FAR 15.403-1;
(ii) Certify in substantially the format prescribed in FAR 15.406-2 that to the best
of its knowledge and belief, the data are accurate, complete and current as of the
date of agreement on the negotiated price of the modification; and

(iii) Comply with the requirements of either the Subcontractor Cost or Pricing
Data clause or, the Subcontractor Cost or Pricing Data -- Modifications clause of
this contract when the adjustment includes a subcontract modification involving a
pricing adjustment expected to exceed 500,000.

(b) Under the Changes clause of this contract, failure of the Contractor to timely assert its right
for an adjustment or to submit a proposal for an adjustment by the date specified in the clause (or
another date specified by the Contracting Officer) may result in a unilateral adjustment of the
contract by the Contracting Officer pursuant to the Disputes clause of this contract.

I.125. 52.244-2 Subcontracts (Oct 2010)

I.126. 52.244-6 Subcontracts for Commercial Items (Aug 2019)


I.128. 52.249-2 Termination for Convenience of the Government (Fixed Price) (Apr
2012), Alternate I (Sep 1996)

I.129. 52.249-10 Default (Fixed-Price Construction) (Apr 1984)

I.130. 52.252-6 Authorized Deviation in Clauses (Apr 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR
Chapter 1) clause with an authorized deviation is indicated by the addition of “(DEVIATION)”
after the date of the clause.

(b) The use in this solicitation or contract of any Department of Interior Acquisition Regulations
(48 CFR  Chapter 14) clause with an authorized deviation is indicated by the addition of
“(DEVIATION)” after the name of the regulation.

I.131. 52.253-1 Computer Generated Forms (Jan 1991)
PART III LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS

SECTION J LIST OF ATTACHMENTS


J.2. Past Performance Questionnaire, three (3) pages.


J.4. Bid Bond, two (2) pages – Separate Attachment.

J.5. Subcontracting Worksheet
PART IV  REPRESENTATIONS AND INSTRUCTIONS

SECTION K  REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF OFFERORS OR RESPONDENTS

K.1.  52.203-2 Certificate of Independent Price Determination (Apr 1985)

(a) The offeror certifies that --

   (1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to --

      (i) Those prices;

      (ii) The intention to submit an offer; or

      (iii) The methods or factors used to calculate the prices offered.

   (2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

   (3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

   (1) Is the person in the offeror’s organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

   (2)(i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision [insert full name of person(s) in the offeror’s organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror’s organization];

      (ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) of this provision have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; and

      (iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.
K.2. 52.203-18 Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements- Representation (Jan 2017)

K.3. 52.204-8 Annual Representations and Certifications (Mar 2020)

(a)(1) The North American Industry classification System (NAICS) code for this acquisition is 236220 – Commercial and Institution Building Construction.

(2) The small business size standard is $39.5 Million.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b)(1) If the provision at 52.204-7, System for Award Management, is included in this solicitation, paragraph (d) of this provision applies.

(2) If the provision at 52.204-7, System for Award Management, is not included in this solicitation, and the Offeror has an active registration in the System for Award Management (SAM), the Offeror may choose to use paragraph (d) of this provision instead of completing the corresponding individual representations and certifications in the solicitation. The Offeror shall indicate which option applies by checking one of the following boxes:

[ ] (i) Paragraph (d) applies.

[ ] (ii) Paragraph (d) does not apply and the offeror has completed the individual representations and certifications in the solicitation.

(c)(1) The following representations or certifications in SAM are applicable to this solicitation as indicated:

(i) 52.203-2, Certificate of Independent Price Determination. This provision applies to solicitations when a firm-fixed-price contract or fixed-price contract with economic price adjustment is contemplated, unless—

(A) The acquisition is to be made under the simplified acquisition procedures in Part 13;

(B) The solicitation is a request for technical proposals under two-step sealed bidding procedures; or

(C) The solicitation is for utility services for which rates are set by law or regulation.
(ii) 52.203-11, Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions. This provision applies to solicitations expected to exceed $150,000.

(iii) 52.203-18, Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements-Representation. This provision applies to all solicitations.

(iv) 52.204-3, Taxpayer Identification. This provision applies to solicitations that do not include the provision at 52.204-7, System for Award Management.

(v) 52.204-5, Women-Owned Business (Other Than Small Business). This provision applies to solicitations that—

(A) Are not set aside for small business concerns;

(B) Exceed the simplified acquisition threshold; and

(C) Are for contracts that will be performed in the United States or its outlying areas.

(vi) 52.204-26, Covered Telecommunications Equipment or Services-Representation. This provision applies to all solicitations.

(vii) 52.209-2, Prohibition on Contracting with Inverted Domestic Corporations—Representation.

(viii) 52.209-5; Certification Regarding Responsibility Matters. This provision applies to solicitations where the contract value is expected to exceed the simplified acquisition threshold.

(ix) 52.209-11, Representation by Corporations Regarding Delinquent Tax Liability or a Felony Conviction under any Federal Law. This provision applies to all solicitations.

(x) 52.214-14, Place of Performance--Sealed Bidding. This provision applies to invitations for bids except those in which the place of performance is specified by the Government.

(xi) 52.215-6, Place of Performance. This provision applies to solicitations unless the place of performance is specified by the Government.

(xii) 52.219-1, Small Business Program Representations (Basic & Alternate I). This provision applies to solicitations when the contract will be performed in the United States or its outlying areas.
(A) The basic provision applies when the solicitations are issued by other than DoD, NASA, and the Coast Guard.

(B) The provision with its Alternate I apply to solicitations issued by DoD, NASA, or the Coast Guard.

(C) The provision with its Alternate II applies to solicitations that will result in a multiple-award contract with more than one NAICS code assigned.

(xiii) 52.219-2, Equal Low Bids. This provision applies to solicitations when contracting by sealed bidding and the contract will be performed in the United States or its outlying areas.

(xiv) 52.222-22, Previous Contracts and Compliance Reports. This provision applies to solicitations that include the clause at 52.222-26, Equal Opportunity.

(xv) 52.222-25, Affirmative Action Compliance. This provision applies to solicitations, other than those for construction, when the solicitation includes the clause at 52.222-26, Equal Opportunity.

(xvi) 52.222-38, Compliance with Veterans' Employment Reporting Requirements. This provision applies to solicitations when it is anticipated the contract award will exceed the simplified acquisition threshold and the contract is not for acquisition of commercial items.

(xvii) 52.223-1, Bio-based Product Certification. This provision applies to solicitations that require the delivery or specify the use of USDA-designated items; or include the clause at 52.223-2, Affirmative Procurement of Biobased Products Under Service and Construction Contracts.

(xviii) 52.223-4, Recovered Material Certification. This provision applies to solicitations that are for, or specify the use of, EPA-designated items.

(xix) 52.223-22, Public Disclosure of Greenhouse Gas Emissions and Reduction Goals—Representation. This provision applies to solicitations that include the clause at 52.204-7.

(xx) 52.225-2, Buy American Certificate. This provision applies to solicitations containing the clause at 52.225-1.

(xxi) 52.225-4, Buy American--Free Trade Agreements--Israeli Trade Act Certificate. (Basic, Alternates I, II, and III.) This provision applies to solicitations containing the clause at 52.225-3.
(A) If the acquisition value is less than $25,000, the basic provision applies.

(B) If the acquisition value is $25,000 or more but is less than $50,000, the provision with its Alternate I applies.

(C) If the acquisition value is $50,000 or more but is less than $80,317, the provision with its Alternate II applies.

(D) If the acquisition value is $80,317 or more but is less than $100,000, the provision with its Alternate III applies.

(xxii) 52.225-6, Trade Agreements Certificate. This provision applies to solicitations containing the clause at 52.225-5.

(xxiii) 52.225-20, Prohibition on Conducting Restricted Business Operations in Sudan--Certification. This provision applies to all solicitations.

(xxiv) 52.225-25, Prohibition on Contracting with Entities Engaging in Certain Activities or Transactions Relating to Iran—Representation and Certification. This provision applies to all solicitations.

(xxv) 52.226-2, Historically Black College or University and Minority Institution Representation. This provision applies to solicitations for research, studies, supplies, or services of the type normally acquired from higher educational institutions.

(2) The following representations or certifications are applicable as indicated by the Contracting Officer:

_X_ (i) 52.204-17, Ownership or Control of Offeror.

_X_ (ii) 52.204-20, Predecessor of Offeror.

___ (iii) 52.222-18, Certification Regarding Knowledge of Child Labor for Listed End Products.

___ (iv) 52.222-48, Exemption from Application of the Service Contract Labor Standards to Contracts for Maintenance, Calibration, or Repair of Certain Equipment--Certification.

___(v) 52.222-52 Exemption from Application of the Service Contract Labor Standards to Contracts for Certain Services--Certification.
(vi) 52.223-9, with its Alternate I, Estimate of Percentage of Recovered Material Content for EPA-Designated Products (Alternate I only).

(vii) 52.227-6, Royalty Information.

(A) Basic.

(B) Alternate I.

(viii) 52.227-15, Representation of Limited Rights Data and Restricted Computer Software.

(d) The Offeror has completed the annual representations and certifications electronically in SAM accessed through https://www.sam.gov. After reviewing the SAM information, the Offeror verifies by submission of the offer that the representations and certifications currently posted electronically that apply to this solicitation as indicated in paragraph (c) of this provision have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201); except for the changes identified below [offeror to insert changes, identifying change by clause number, title, date]. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

<table>
<thead>
<tr>
<th>FAR Clause</th>
<th>Title</th>
<th>Date</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on SAM.

K.4. 52.204-24 Representation Regarding Certain Telecommunications and Video Surveillance Services or Equipment (Dec 2019)

(a) Definitions. As used in this provision--

Covered foreign country means The People’s Republic of China.

Covered telecommunications equipment or services means—

(1) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);
(2) For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);

(3) Telecommunications or video surveillance services provided by such entities or using such equipment; or

(4) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Critical technology means—

(1) Defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations;

(2) Items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations, and controlled-

(i) Pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology; or

(ii) For reasons relating to regional stability or surreptitious listening;

(3) Specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities);

(4) Nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material);

(5) Select agents and toxins covered by part 331 of title 7, Code of Federal Regulations, part 121 of title 9 of such Code, or part 73 of title 42 of such Code; or

Substantial or essential component means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(b) Prohibition. Section 889(a)(1)(A) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2019, from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. The Contractor is prohibited from providing to the Government any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in Federal Acquisition Regulation 4.2104.

(c) Exceptions. This clause does not prohibit contractors from providing—

(1) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(2) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(d) Reporting requirement.

(1) In the event the Contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the Contractor is notified of such by a subcontractor at any tier or by any other source, the Contractor shall report the information in paragraph (d)(2) of this clause to the Contracting Officer, unless elsewhere in this contract are established procedures for reporting the information; in the case of the Department of Defense, the Contractor shall report to the website at https://dibnet.dod.mil. For indefinite delivery contracts, the Contractor shall report to the Contracting Officer for the indefinite delivery contract and the Contracting Officer(s) for any affected order or, in the case of the Department of Defense, identify both the indefinite delivery contract and any affected orders in the report provided at https://dibnet.dod.mil.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause

   (i) Within one business day from the date of such identification or notification: the contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.
(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial items.

K.5. 52.209-7 Information Regarding Responsibility Matters (Oct 2018)

(a) Definitions. As used in this provision—

Administrative proceeding means a non-judicial process that is adjudicatory in nature in order to make a determination of fault or liability (e.g., Securities and Exchange Commission Administrative Proceedings, Civilian Board of Contract Appeals Proceedings, and Armed Services Board of Contract Appeals Proceedings). This includes administrative proceedings at the Federal and State level but only in connection with performance of a Federal contract or grant. It does not include agency actions such as contract audits, site visits, corrective plans, or inspection of deliverables.

Federal contracts and grants with total value greater than $10,000,000 means—

(1) The total value of all current, active contracts and grants, including all priced options; and

(2) The total value of all current, active orders including all priced options under indefinite-delivery, indefinite-quantity, 8(a), or requirements contracts (including task and delivery and multiple-award Schedules).

Principal means an officer, director, owner, partner, or a person having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a division or business segment; and similar positions).

(b) The offeror ☐ has ☐ does not have current active Federal contracts and grants with total value greater than $10,000,000.

(c) If the offeror checked “has” in paragraph (b) of this provision, the offeror represents, by submission of this offer, that the information it has entered in the Federal Awardee Performance and Integrity Information System (FAPIIS) is current, accurate, and complete as of the date of submission of this offer with regard to the following information:
(1) Whether the offeror, and/or any of its principals, has or has not, within the last five years, in connection with the award to or performance by the offeror of a Federal contract or grant, been the subject of a proceeding, at the Federal or State level that resulted in any of the following dispositions:

   (i) In a criminal proceeding, a conviction.

   (ii) In a civil proceeding, a finding of fault and liability that results in the payment of a monetary fine, penalty, reimbursement, restitution, or damages of $5,000 or more.

   (iii) In an administrative proceeding, a finding of fault and liability that results in–

   (A) The payment of a monetary fine or penalty of $5,000 or more; or

   (B) The payment of a reimbursement, restitution, or damages in excess of $100,000.

   (iv) In a criminal, civil, or administrative proceeding, a disposition of the matter by consent or compromise with an acknowledgment of fault by the Contractor if the proceeding could have led to any of the outcomes specified in paragraphs (c)(1)(i), (c)(1)(ii), or (c)(1)(iii) of this provision.

(2) If the offeror has been involved in the last five years in any of the occurrences listed in (c)(1) of this provision, whether the offeror has provided the requested information with regard to each occurrence.

(d) The offeror shall post the information in paragraphs (c)(1)(i) through (c)(1)(iv) of this provision in FAPIIS as required through maintaining an active registration in the System for Award Management, which can be accessed via https://www.sam.gov (see 52.204-7).
SECTION L  INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS

L.1. 52.252-1 Solicitation Provisions Incorporated by Reference

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

Federal Acquisition Regulation Clauses: https://www.acquisition.gov;
Department of Interior Acquisition Regulation Clauses: https://www.doi.gov/pam/programs/acquisition/pamareg

L.2. 52.204-7 System for Award Management (Oct 2018)

L.3. 52.204-16 Commercial and Government Entity Code Reporting (Jul 2016)

L.4. 52.211-1 Availability of Specifications Listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 (Aug 1998)

L.5. 52.211-2 Availability of Specifications, Standards, and Data Item Descriptions Listed in the Acquisition Streamlining and Standardization Information System (ASSIST) (Apr 2014)

L.6. 52.215-1 Instructions to Offerors – Competitive Acquisitions (Jan 2017)

(a) Definitions. As used in this provision-
“Discussions” are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer’s discretion, result in the offeror being allowed to revise its proposal.
“In writing,” “writing,” or “written” means any worded or numbered expression that can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.
“Proposal modification” is a change made to a proposal before the solicitation’s closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.
“Proposal revision” is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.
“Time,” if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.
(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals.

(1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show—

(i) The solicitation number;
(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);
(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;
(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror’s behalf with the Government in connection with this solicitation; and
(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent’s authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, revision, and withdrawal of proposals.

(i) Offerors are responsible for submitting proposals, and any modifications or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 14:30 p.m., Mountain time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is “late” and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and-
(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government’s control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at FAR 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.
(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) *Offer expiration date.* Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) *Restriction on disclosure and use of data.* Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall-

(1) Mark the title page with the following legend:

This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed-in whole or in part-for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of-or in connection with-the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend:

“Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.”

(f) Contract award.

(1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government’s interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror’s initial proposal should contain the offeror’s best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the
Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government’s best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more-line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) If a post-award debriefing is given to requesting offerors, the Government shall disclose the following information, if applicable:

(i) The agency’s evaluation of the significant weak or deficient factors in the debriefed offeror’s offer.

(ii) The overall evaluated cost or price and technical rating of the successful and the debriefed offeror and past performance information on the debriefed offeror.

(iii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection.

(iv) A summary of the rationale for award.

(v) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(vi) Reasonable responses to relevant questions posed by the debriefed offeror as to whether source selection procedures set forth in the solicitation, applicable regulations, and other applicable authorities were followed by the agency.
The Government intends to evaluate proposals submitted under this solicitation, conduct negotiations, and select a source for contract award in accordance with the following provision: FAR 52.215-1 Instructions to Offerors -- Competitive Acquisition (Jan 2017). Source selection shall be in accordance with procedures contained in FAR Part 15, Department of the Interior Acquisition Regulation (DIAR) Part 1415 (48 CFR 1415) and Bureau of Reclamation Acquisition Regulation WBR Part 1415. These procedures are summarized as follows:

(a) Technical evaluation. Technical proposals are being requested in order to obtain information to be used in the evaluation process. Technical proposals are considered to be part of offers as to technical performance. A Technical Proposal Evaluation Committee has been established to objectively evaluate technical proposals in accordance with the Evaluation Factors for Award -- Bureau of Reclamation provision in Part IV, Section M of this solicitation. Technical proposals shall be submitted in accordance with the Technical Proposal Instructions -- Bureau of Reclamation provision in Part IV, Section L of this solicitation.

(b) Past Performance Evaluation. In addition to any other past performance information required under the solicitation, the Contracting Officer (C0) shall use past performance information available from the Past Performance Information Retrieval System (PPIRS.GOV) in the source selection process on offerors competing for awards in excess of $100,000, unless the CO has documented an exception from past performance consideration in accordance with FAR 15.304(c)(2)(iv).

(c) Cost or price evaluation. An objective cost or price evaluation of contract pricing proposals will be made in accordance with the Evaluation Factors for Award provision in Part IV, Section M of this solicitation. Pricing proposals shall be submitted in accordance with the Contract Pricing Proposal Instructions -- Bureau of Reclamation provision in Part IV, Section L of this solicitation. Pursuant to FAR 15.305(a)(1), a cost or price analysis will be performed to determine price reasonableness and any instances of unbalanced pricing, using one or more of the techniques at FAR 15.404-1

(d) Clarifications. Clarifications are limited exchanges, between the Government and offerors,
that may occur when award without discussions is contemplated. If award will be made without conducting discussions, offerors may be given the opportunity to clarify certain aspects of proposals (e.g., the relevance of an offeror’s past performance information and adverse past performance information to which the offeror has not previously had an opportunity to respond) or to resolve minor or clerical errors.

(e) Communications. Communications are exchanges, between the Government and offerors, after receipt of proposals, leading to establishment of the competitive range. Communications may be conducted to enhance Government understanding of proposals, allow reasonable interpretation of the proposal, or facilitate the Government’s evaluation process. Such communications may not be used to cure proposal deficiencies or material omissions, materially alter the technical or cost elements of the proposal, and/or otherwise revise the proposal. Communications are for the purpose of addressing issues that must be explored to determine whether a proposal should be placed in the competitive range. They shall not provide an opportunity for the offeror to revise its proposal but may address ambiguities in the proposal or other concerns and information relating to past performance.

(f) Competitive range. If discussions are to be conducted, the contracting officer shall establish the competitive range based on the ratings of each proposal against all evaluation criteria. The competitive range shall comprise all the most highly rated proposals, unless the range is further reduced for purposes of efficiency. The contracting officer may determine that the number of most highly rated proposals that might otherwise be included in the competitive range exceeds the number at which an efficient competition can be conducted. The contracting officer may then limit the number of proposals in the range to the greatest number that will permit an efficient competition among the most highly rated proposals. If, after discussions have begun (see paragraph (g) below), an offeror originally in the competitive range is no longer considered to be among the most highly rated offerors being considered for award, that offeror may be eliminated from the range whether or not all material aspects of the proposal have been discussed, or whether or not the offeror has been afforded an opportunity to submit a proposal revision.

(g) Pre-award debriefing of offerors. Offerors excluded from the competitive range or otherwise excluded from further consideration prior to the final source selection decision may request a debriefing before award. The process for requesting and conducting pre-award debriefings may be found at FAR 15.505.

(h) Discussions. Discussions are exchanges between the Government and offerors, after establishment of the competitive range, that are undertaken with the intent of allowing the offeror to revise its proposal. These discussions may include bargaining, including persuasion, alteration of assumptions and positions, give-and-take, and may apply to price, schedule, technical requirements, type of contract, or other terms of a proposed contract. Discussions are tailored to each offeror’s proposal and shall be conducted by the contracting officer with each offeror within the competitive range. The primary objective of discussions is to maximize the
Government’s ability to obtain best value, based on the requirement and the evaluation factors set forth in the solicitation.

(i) Proposal revisions. The contracting officer may request or allow proposal revisions to clarify and document understandings reached during negotiations. At the conclusion of discussions, each offeror in the competitive range shall be given an opportunity to submit a final proposal revision. The contracting officer is required to establish a common cut-off date only for receipt of final proposal revisions. Requests for final proposal revisions shall advise offerors that the final proposal revisions shall be in writing and that the Government intends to make award without obtaining further revisions.

(j) Pre-award survey. A Government survey activity may contact an offeror, or visit its facility, to obtain information for determining its financial resources and/or its technical capabilities to perform the work when available information is not sufficient for the Contracting Officer to make a determination regarding contractor responsibility as required by FAR Subpart 9.1. Current financial statements and other information required to make this determination shall be made available to the survey activity. Information provided shall be protected from release or disclosure outside the Government, except as provided in FAR Subpart 24.2, Freedom of Information Act.

(k) Organizational conflicts of interest. Award will not be made to an apparent successful offeror when an organizational conflict of interest is determined to exist and cannot be avoided or mitigated, unless the Contracting Officer determines that award is in the best interest of the United States and a waiver is obtained pursuant to DIAR 1409.503 (48 CFR 1409.503).

(l) Source selection decision. The source selection authority’s (SSA) decision shall be based on a comparative assessment of proposals against all source selection criteria in the solicitation. While the SSA may use reports and criteria prepared by others, the source selection decision shall represent the SSA’s independent judgment. The source selection decision shall be documented, and the documentation shall include the rationale for any business judgments and tradeoffs made or relied on by the SSA, including benefits associated with additional costs. Although the rationale for the selection decision must be documented, that documentation need not quantify the tradeoffs that led to the decision.

(m) Post-award notice. After contract award, unsuccessful offerors will be provided with written notice regarding contract award (including the information listed in FAR 15.503(b)) by the Contracting Officer. Offerors receiving prior notice of exclusion from the competitive range under paragraph (f) of this provision will not receive this notice.

(n) Post-award debriefing of offerors. An offeror shall be debriefed and furnished the basis for the source selection decision and contract award if its written request is received by the contracting officer within three days after the offeror receives notice of contract award. The
process for requesting and conducting post-award debriefings may be found at FAR 15.506.


In addition to the requirements of the Instructions to Offerors - Competitive Acquisitions provision of this solicitation, each offeror shall submit a proposal in accordance with the instructions contained in this provision.

(a) General contents. Each proposal shall:

1. Be specific and complete in every detail;
2. Conform to all solicitation provisions, clauses, or other requirements;
3. Be logically assembled, practical, legible, clear, concise, coherent; and indexed (cross-indexed, where appropriate); and
4. Contain appropriately numbered pages of each volume or part.

(b) Arrangement of Proposal. The proposal shall consist of two (2) original and two (2) copies, for a total of four (4) physically separated volumes, individually entitled as stated below. The required number of copies for each volume are shown below:

<table>
<thead>
<tr>
<th>Volume</th>
<th>Title</th>
<th>Copies Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Section A, Section B, Section K, Past Performance Questionnaire, Bid Bond</td>
<td>Original + 1 Copy</td>
</tr>
<tr>
<td>II</td>
<td>Technical Proposal</td>
<td>Original + 1 Copy</td>
</tr>
</tbody>
</table>

(c) Separation of volumes. All copies of each proposal volume (i.e., all copies of Volume I) are to be packaged individually and clearly marked to identify contents. The exterior of each package containing proposals shall be marked with the solicitation number, and the time and date for receipt of proposals and the name and address of the offeror, in order to prevent mishandling.

(d) Representations, certifications, and other offeror statements (Volume I). Volume I shall incorporate the other Volumes by reference but shall not physically include them. It shall consist of:

1. A fully executed Solicitation, Offer, and Award form required by Part I, Section A of this solicitation. It shall be used as the cover sheet (or first page) of each copy of Volume I;
2. Fully executed and completed offeror representations, certifications, and acknowledgments required by Part IV, Section K of this solicitation;
3. Additional information required by the solicitation to be furnished by the offeror which is not required to be obtained in another volume of the proposal;
(4) Requests for any waivers of any solicitation provisions or contract clauses; and

(5) A summary of any exemptions from, or deviations to, any other solicitation requirements.

e) Technical Proposal (Volume II) See WBR 1452.215-82 Technical Proposal Instructions – Bureau of Reclamation provision of this solicitation, Part IV, Section L.

(f) Pricing Proposal (Volume I). See WBR 1452.215-84 Pricing Proposal Instructions -- Bureau of Reclamation provision of the solicitation, Part IV, Section L. Offerors are hereby notified that even if cost or pricing data are not initially requested in this solicitation, the Contracting Officer reserves the right to request such data if they are later found necessary pursuant to FAR 15.403-5(a)(1).


(a) General. The technical proposal shall be identified as Volume II of the offeror's proposal and shall be an orderly, specific, and complete document in every detail. It should be presented in a manner which allows it to "stand alone" without the need to reference other documents. It should convincingly describe the capability of the offeror's organization to participate in this project and effectively demonstrate a thorough understanding of the work statement contained in Part I, Section C of this solicitation. The proposal shall be organized and written so that it can be easily read and meaningfully evaluated by Reclamation personnel from a variety of different functional and technical disciplines. It should be a coherent document free of internal inconsistencies as well as inconsistencies with other volumes of the proposal.

(b) Use and Disclosure of Proposal Information. In accordance with the Use and Disclosure of Proposal Information -- Department of the Interior provision of this solicitation, offerors shall mark trade secret, or confidential commercial or financial information contained in the proposal with the restrictive legends specified. The offeror shall also clearly and separately mark all proprietary information (as defined in FAR 3.104-3) contained in the proposal with the restrictive legend "Proprietary Information."

(c) Format and General Content. To assist in the uniform evaluation of proposals, the following format shall be utilized in preparing the technical proposal:

1. Table of Contents. The Table of Contents shall list all sections of the technical proposal. Any future amendments, additions and/or revisions to the proposal shall be included in an updated Table of Contents;

2. Enclosures. The Enclosures Section shall include a list of any tables, drawings, charts, and any other enclosures which summarize data or information;

3. Technical Approach. The Technical Approach section shall include proposed technical aspects to accomplish the statement of work/specifications/performance work statement. The discussion of the technical approach shall:
Based on the information presented in Section C of the Work Specifications, all Offerors shall submit the following:

**FACTOR 1: Experience: Corporate and Key Personnel for Prime and/or Subcontractors:** The offeror’s company experience information will be evaluated to assess the offeror’s experience level on recent contracts for similar work. The greater the extent to which the offeror can demonstrate successful completion of projects similar in size and complexity to that required under this solicitation, the more favorably the proposal will be rated.

Identify any major subcontractors that will perform any of the tasks set forth in the below proposed work plan and furnish complete and detailed resumes.

Furnish a list (no more than 5) of Federal, State, local government or commercial projects completed within the last 6 years similar in scope and complexity to the work required under this solicitation. The projects must clearly demonstrate the ability to successfully accomplish projects in a timely manner, utilize resources, and work with project owners. Similar projects are defined as work involving hatchery and/or installation of partial recirculating aquaculture systems for hatcheries.

The following information must be provided for each project:

- Name and location of project.
- Description of work.
- Note whether or not offeror was the prime contractor and what portion of the work was performed by the offeror and what portion was performed by subcontractors.
- Original completion time and date, and actual dates and duration for each project (including modifications).
- Initial contract amount and final contract amount (including modifications).
- Name, address and phone number of CO/owner/COR/point of contact who may verify information for this project.
- Any problems encountered in performance of the work and corrective actions taken.

Furnish complete and detailed resumes for all key personnel. At a minimum, key personnel includes the Project Manager, Site Superintendent, Supervisory Sub-contractor Personnel, Safety and Health Professional.

Resumes are limited to 3 pages per individual and, at a minimum, shall address the following:

- Name and role/responsibilities for this project
- Educational background, professional registrations or certifications
- Qualifying experience covering at least the last five years to include the following:
i. Project names, locations and dates of assignments.
ii. Description of duties and responsibilities for each assignment.
iii. Accomplishments or other pertinent information which demonstrates their suitability for the work assigned to them on this project.

If an offeror intends to utilize a subcontractor or subcontractor employee to occupy any of the above key positions identified above, resumes must be submitted for these individuals as well.

Failure to provide any of the required information listed above may result in lower rating. Owner or other references with incorrect or missing phone numbers and contact names may not be able to be evaluated, which may result in lower ratings as well.

**FACTOR 2 – General Technical Plan** - Provide a narrative work plan to include anticipated production rates. The work plan shall also identify potential subcontractors and the work they would perform. The narrative shall correlate with your proposed construction schedule and explain in detail your approach to accomplish the following construction tasks:

A. Proposed Work Plan:
   1. Hatchery Water supply during construction
      a. Describe means and methods for maintaining water supply to active fish rearing during construction.
   2. Circular Tanks
      a. Describe means and methods for installing circular tanks and all necessary components to include but limited to internal piping, pumps, HVAC, SCADA, solids holding tank(s), and electrical.
   3. Demolition of Foster Lucas Ponds/Raceways
      a. Describe means and methods for demolition of Foster Lucas Ponds/Raceways to include asphalt/concrete removal, saw cutting, lead coat abatement.

B. Project Schedule - Provide a planned detailed (Gantt Chart in Portable Document Format - PDF) construction work schedule(s) to include at a minimum:
   a. For each activity on the Gantt chart, display activity identification number, activity description, planned duration in work days, start date, finish date, total float, and calendar identification.
   b. Key submittals as indicated in Table 01 33 00A-Submittals with “yes” in the CP column to include submission and review time durations as well as related lead times.
   c. Material procurement and/or processing, delivery, and stockpiling.
   d. Sequence and duration of construction activities to accomplish the work within the work restrictions identified in the specifications. Be sure to include appropriate level of detail for activity durations to demonstrate offeror understands the construction sequencing for the project.
   e. Assumptions used to account for typical (not unusually severe) weather impacts in
creating the schedule.
f. Clearly identify the critical path.
g. The Government’s evaluation of the schedule will be in regards to correlation with the proposed work plan and perceived risk to the Government regarding the offeror’s understanding of the project.

The purpose of this proposal requirement is to have offerors submit a CPM schedule in sufficient detail to allow for meaningful analysis and evaluation of the offeror's proposal without having to prepare a 100% complete contract-quality schedule as described in specification section 01 32 10. For use in preparing your proposed schedule, and for our subsequent analysis of the technical proposals only, offerors can anticipate an award date of approximately August 31, 2020. This estimated award date is subject to change.

**FACTOR 3: Past Performance**: Offerors will be evaluated on the degree to which they have completed similar projects on schedule and without performance problems. Information submitted regarding adverse performance problems will be considered, as well as mitigating circumstances detailed in the proposal for any performance problems identified.

- Offerors shall have a Past Performance Questionnaire (PPQ), contained in Section J, completed by at least three (3) of the offeror’s previous clients/owners. Offerors are strongly encouraged to inform previous clients of the importance of the questionnaires as it is a determining factor in rating the proposal. It is the offeror’s responsibility to ensure that the government receives the requested questionnaires by the time and date specified in the solicitation for the receipt of proposals.

- If an offeror intends on utilizing subcontractors to perform any of the work beyond supplying materials, PPQs shall be submitted on behalf of each proposed subcontractor.

The Government may also use past performance information obtained by other sources than those identified by the offeror. The Government will utilize the Past Performance Information Retrieval System (PPIRS) database located at [http://www.ppirs.gov](http://www.ppirs.gov) for obtaining past performance information.

**Factor 4: Price Proposal**: N/A for Technical proposal.

(d) Cost/Price Information. To permit objective evaluation of the technical proposal, no cost or price information shall be included in the technical proposal.

**L.14. WBR 1452.215-84 Pricing Proposal Instructions and Submission of Cost or Pricing Data – Bureau of Reclamation (Jan 2001)**
(a) General. The pricing proposal shall be identified as Volume I of the offeror's proposal and shall be an orderly, specific, and complete document in every detail. It should be a coherent document free of internal inconsistencies and should be consistent with the technical approach(es) proposed in the technical proposal (Volume II).

(b) Submission of Cost or Pricing Data. Offerors are hereby notified that cost or pricing data are required by this solicitation to be submitted by the offeror with its pricing proposal. These data are also required to be submitted by the offeror for each prospective subcontract when the total amount of the subcontract (including options) is expected to exceed: (a) $10,000,000 or more; or (b) both $550,000 and more than 10 percent of the offeror's total proposed price. Information contained in the offeror's pricing proposal and its subcontractors' proposals containing cost or pricing data must be current, complete, and accurate to the best of its knowledge and belief. Prior to the time agreement is reached on price, the offeror shall submit, or identify in writing, to the Contracting Officer any information reasonably available on factors that affect the currency, completeness, or accuracy of cost or pricing data submitted (including subcontractor data). In addition to the data submitted by the offeror in the pricing proposal, the Contracting Officer may require the offeror to submit additional data as are necessary in order to perform an adequate analysis and evaluation of the proposal. In accordance with FAR 15.408(m), Table 15-2, Note 1, merely marking books, records, and other documents without specific identification does not constitute submission of cost or pricing data.

(c) Prices set by law or regulation or commercial item exception. When exception from the requirement to submit cost or pricing data is requested, whether the item was produced by the offeror or others, the offeror shall provide justification for the exception in a form regularly maintained by the offeror in commercial operations. Information on sales data is limited to data for the same or similar items during a relevant time period.

(d) Use and Disclosure of Proposal Information. In accordance with the Use and Disclosure of Proposal Information -- Department of the Interior provision of this solicitation, offerors shall mark trade secret, or confidential commercial or financial information contained in the proposal with the restrictive legends specified. The offeror shall also clearly and separately mark all proprietary information (as defined in FAR 3.104-3) contained in the proposal with the restrictive legend "Proprietary Information."

(e) Format and Content. To assist in the uniform evaluation of proposals, the following format shall be utilized in preparing the pricing proposal:

(1) Table of Contents. The Table of Contents shall list all sections of the pricing proposal. Any future amendments, additions and/or revisions to the proposal, up to the date of agreement on price, shall be included an updated Table of Contents;

(2) Index. The index shall cross reference the work statement to the terms of the proposal and specifically indicate how the proposal conforms to the evaluation factors contained in Part IV, Section M of this solicitation. It shall comply with the requirements of FAR
Table 15-2, IB which requires an index of all cost or pricing data and information accompanying or identified in the pricing proposal;

(3) Enclosures. A list shall be included of all enclosures, attachments, tables, drawings, charts, and any other material which summarize data or information contained or referenced in the pricing proposal;

(4) First page of pricing proposal. Offerors not claiming exemption from the submission of Cost or Pricing Data are required to submit a Contract Pricing Proposal which shall be prepared in accordance with the general instructions in FAR 15.408(m) (Table 15-2).

(5) Contract Line Item Cost Breakdown. For each contract line item, the offeror shall submit a detailed cost breakdown containing the applicable elements of cost (see instructions in FAR Table 15-2, II) which, when added together, equal the total price proposed for the line item. Each cost breakdown shall be separately identified, prepared in accordance with the format prescribed in. For each cost element listed on the format, the offeror shall identify, by referencing and including as a separate attachment to the format, sufficient information which supports the basis for the proposed cost element amount. The Offeror shall also provide in the attachment any necessary cross references to assist in tracking the pricing proposal to applicable portions of its technical proposal.

(6) Cost Element Summary Total Amounts. When more than one contract line item is required, the offeror shall submit for each proposed element of cost a separate, summary total amount which covers all contract line items.

(7) Facilities Capital Cost of Money. If the offeror elects to claim facilities capital cost of money as an allowable cost, Form CASB-CMF shall be submitted by the offeror with the pricing proposal in accordance with instructions in, FAR Table 15-2, I.

(f) Subcontracts. All subcontracted items shall be clearly identified in the pricing proposal and include the name and address of the prospective subcontractor. Written quotations shall, whenever possible, be included or referenced for all subcontracted services. Subcontract costs shall be included or referenced in attachments which support the basis for an offeror's proposed cost element amount. Unless the offeror claims an exemption under paragraph (c) of this provision, cost and pricing data required under paragraph (b) of this provision to be submitted for subcontracts shall be submitted in accordance with the instructions contained in subparagraphs (e)(iv)-(vi) and those contained in FAR Table 15-2. For pricing of modifications, see the Subcontracting Cost or Pricing Data clause of this contract.

(g) Cost Information in Other Volumes. No cost information shall be included in any other volume of a proposal unless required by paragraph (d) of the Technical Proposal Instructions -- Bureau of Reclamation provision of this solicitation.

(h) Page Numbering. All pages in the cost proposal should be consecutively numbered (including pages containing attachments, tables and exhibits).
(i) Rounding of Costs. All price or cost amounts proposed shall be expressed to the nearest whole dollar except for individual hourly labor rates (if required). All percentages shall be expressed to one decimal place.

(j) Changes. Any changes made by the offeror to its pricing proposal shall include the same level of detail as the original proposal and shall include revised copies of all tables or exhibits affected by the changes.

(k) Alternate Proposals. If submission of alternate technical proposals is permitted by the General Proposal Instructions - Bureau of Reclamation clause of this solicitation, the offeror shall submit a separate, detached pricing proposal conforming to the requirements of this provision for each alternate submitted. The alternate(s) pricing proposal(s) shall be clearly labeled and identified.

(l) Certificate of Current Cost or Pricing Data. Unless the circumstances in FAR 15.403-4(c) apply, the successful offeror shall be required by the Contracting Officer after completion of negotiations to execute and submit a Certificate of Current Cost or Pricing Data (illustrated in FAR 15.406-2) or the Contracting Officer may request that each offeror remaining in the competitive range submit the Certificate with its final proposal revision after conclusion of negotiations.

L.15. WBR 1452.215-91 Facsimile Acknowledgement of Amendments, Modifications to Offers, and Withdrawals of Offers

(a) Definition. "Facsimile submission" as used in this solicitation, means acknowledgment of amendments, modifications to offers, and withdrawals of offers, that are transmitted to and received by the Government via electronic equipment that communicates and reproduces both printed and handwritten material. (A COPY OF THE OFFER DOCUMENT ITSELF MAY NOT BE TRANSMITTED BY FACSIMILE TRANSMISSION).

(b) Offerors may submit facsimile acknowledgments to amendments and/or may change offers already received by the Government in response to this solicitation and/or may withdraw offers. These responses must arrive at the place and by the time, specified in the solicitation.

(c) Facsimile submissions that fail to furnish required representations or information or that reject any of the terms, conditions, and provisions of the solicitation may be excluded from consideration.

(d) Facsimile submissions must contain the required signatures.

(e) If requested to do so by the Contracting Officer, the successful offeror agrees to promptly submit the complete original signed documents.

(f) Facsimile receiving data and compatibility characteristics are as follows:

1. Telephone number of receiving facsimile equipment: (208) 378-5080.

2. Receiving facsimile equipment is a RICOH MP C6502.
(g) If the offeror chooses to transmit a facsimile submission, the Government will not be responsible for any failure attributable to the transmission or receipt of the facsimile document including, but not limited to, the following:

1. Receipt of garbled or incomplete submission.
2. Availability or condition of the receiving facsimile equipment.
3. Incompatibility between the sending and receiving equipment.
4. Delay in transmission or receipt of submission.
5. Failure of the offeror to properly identify the submission.
6. Illegibility of submission.
7. Security of submission data.


(a) Portions of the successful offeror's technical proposal shall be incorporated, physically or by reference, in any contract resulting from this solicitation.

(b) The successful offeror may be asked to provide an updated technical proposal which reflects the results/responses to all negotiations and exchanges during the negotiation process for incorporation in the awarded contract.

L.17. 52.216-1 Type of Contract (Apr 1984)

The Government contemplates award of a firm fixed-price contract resulting from this solicitation.

L.18. 52.222-5 Construction Wage Requirements – Secondary Site of Work (May 2014)

(a)(1) The offeror shall notify the Government if the offeror intends to perform work at any secondary site of the work, as defined in paragraph (a)(1)(ii) of the FAR clause at 52.222-6, Construction Wage Rate Requirements, of this solicitation.

(2) If the offeror is unsure if a planned work site satisfies the criteria for a secondary site of the work, the offeror shall request a determination from the Contracting Officer.

(b)(1) If the wage determination provided by the Government for work at the primary site of the work is not applicable to the secondary site of the work, the offeror shall request a wage determination from the Contracting Officer.
(2) The due date for receipt of offers will not be extended as a result of an offeror’s request for a wage determination for a secondary site of the work.


(a) The offeror’s attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor’s aggregate workforce in each trade on all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Goals for Minority Participation for Each Trade</th>
<th>Goals for Female Participation for Each Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

These goals are applicable to all the Contractor’s construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor’s compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on

(1) its implementation of the Equal Opportunity clause,

(2) specific affirmative action obligations required by the clause entitled “Affirmative Action Compliance Requirements for Construction,” and

(3) its efforts to meet the goals.

The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor’s goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following
award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

(1) Name, address, and telephone number of the subcontractor;

(2) Employer’s identification number of the subcontractor;

(3) Estimated dollar amount of the subcontract;

(4) Estimated starting and completion dates of the subcontract; and

(5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the “covered area” is Washington, Columbia Basin, Pasco.

L.20. 1452.222-90 Non-Discrimination Notice to U.S. DOI Contractors, Subcontractors, and Lessors (May 2014)

Based upon law, Executive Order, or internal policy, the Department of the Interior prohibits discrimination in the workplace, including sexual harassment, based on race, color, national origin, sex, religion, disability, age, or sexual orientation. The Department urges its contractors, subcontractors, and lessors to develop and enforce comprehensive anti-discrimination policies for their places of work.

L.21. 52.228-1 Bid Guarantee (Sep 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier’s check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds --

(1) To unsuccessful bidders as soon as practicable after the opening of bids; and

(2) To the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

(c) The amount of the bid guarantee shall be 20% percent of the bid price or $3,000,000.00 whichever is less.

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.
(c) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

**L.22.  52.233-2 Service of Protest – Department of Interior (Deviation) (Aug 1996)**

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the Government Accountability Office (GAO), shall be served on the Contracting Officer by obtaining written and dated acknowledgment of receipt from the address and official designated in block 7 of the Standard Form 1442 or block numbers 7 and 10 of the Standard Form 33. A copy of the protest served on the Contracting Officer shall be simultaneously furnished by the protester to the Assistant Solicitor for Procurement and Patents, Office of the Solicitor, Room 6511, U.S. Department of the Interior, 18th and C Streets, NW., Washington DC 20240.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(c) A copy of the protest served on the Contracting Officer shall be simultaneously furnished by the protester to the Department of the Interior Assistant Solicitor for Procurement and Patents, 1849 C Street, NW, Room 6511, Washington D.C. 20240.

**L.23.  52.236-27 Site Visit (Construction) (Feb 1995), Alternate I (Feb 1995)**

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors are urged and expected to inspect the site where the work will be performed.

(b) An organized site visit has been scheduled for -- **27 May 2020** at **1:00PM, PT**.

(c) Participants will meet at the Leavenworth Fish Hatchery.

(d) Pre-registration of participants planning to attend the site visit is required. The point of contact for pre-registration is Jason Pledger, who can be reached at jpledger@usbr.gov or via work phone at (208) 378-6543. Pre-registration must be completed no later than 21 May 2020. If foreign national are expected to attend, offerors shall submit a copy of their passport information not later than 18 May 2019.

(e) To register, the below information needs to be provided to the point of contact in paragraph (i).

   - Company name.
   - Company address.
   - Company telephone number.
   - List of attendees.
   - Attendee email addresses.

   Do not provide any Personally Identifiable Information (i.e. Social security numbers or birth dates).

(f) A current driver’s license is required at site check-in.
(g) Attendees are required to bring Personal Protective Equipment (PPE). Appropriate PPE shall be worn throughout the duration of the site visit (i.e. hard hats, safety shoes, safety vests, and safety glasses).


(a) Proposals must be
   (1) submitted on the forms furnished by the Government or on copies of those forms, and
   (2) manually signed. The person signing a proposal must initial each erasure or change appearing on any proposal form.

(b) The proposal form may require offerors to submit proposed prices for one or more items on various bases, including --
   (1) Lump sum price;
   (2) Alternate prices;
   (3) Units of construction; or
   (4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words “no proposal” in the space provided for any item on which no price is submitted.

(d) Alternate proposals will not be considered unless this solicitation authorizes their submission.


The Contracting Officer estimates that the Section B Mobilization and Preparatory Work schedule line item should not exceed 5 percent of the total bid price. Your attention is directed to contract clause WBR 1452.232-81 Payment for Mobilization and Preparatory Work, which reflects how the Government will pay for this line item, including how payment will be made when the price bid for this schedule line item is higher than the percentage stated herein.


(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Department of the Interior Acquisition Regulation (48 CFR chapter 14) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.
SECTION M EVALUATION FACTORS FOR AWARD

M.1. WBR 1452.215-85 – Evaluation Factors for Award - Quality Predominance – Bureau of Reclamation (Sep 2019)

(a) Award will be made to the responsible offeror submitting a proposal which conforms to the solicitation and is most advantageous to the Government considering the factors and any significant subfactors listed in this provision.

(b) In the evaluation of proposals, all evaluation factors other than cost or price (listed in this provision), when combined, are considered to be significantly more important than cost or price. The relative importance to be placed on the factors in relation to each other is contained in paragraph (e) of this provision. However, the degree of importance of cost or price may increase with the degree of non-cost or non-price equality between the proposals. If a proposal is determined by the Contracting Officer to be "technically unacceptable" as a result of evaluating all factors other than cost or price, the proposal may be rejected from further consideration. The Contracting Officer reserves the right to make award to other than the technically-acceptable offeror with the lowest cost/price proposal if it is determined that the technical benefits of another offeror's proposal justify its higher cost/price. The Contracting Officer also reserves the right to make award to a lower-cost/price, lower-scored offeror if it is determined that the cost/price premium involved in awarding to a higher-rated, higher-cost/price offeror is not justified. Since technical proposals are being solicited to obtain information to be used in the evaluation, the Government reserves the right to use information outside of the proposal to evaluate the capability of offerors and the value of offers.

(c) Pursuant to FAR 15.305(a)(1), a cost or price analysis will be performed to determine price reasonableness and any instances of unbalanced pricing, using one or more of the techniques at FAR 15.404 -1.

(d) The following factors and significant subfactors (if listed), will be considered in evaluating proposals and making the source selection:

FACTOR 1: Experience: Corporate and Key Personnel for Prime and/or Subcontractors

Evaluation Standards: The Government intends to evaluate projects performed by the offeror for project relevancy – similarity in scope, complexity, and magnitude. During evaluation of experience, the Government reserves the right to give greater consideration to information on those contracts deemed most relevant to the effort described in this RFP.

FACTOR 2: General Technical Plan

Evaluation Standards: The Government will evaluate the depth, completeness and effectiveness of the offeror’s proposed technical approach to ensure that the narrative demonstrates that the offeror, acting as the prime contractor understands the principle components of the work identified in the specifications.
The Government will evaluate equally, as regards time of delivery/outage schedule, offers that propose delivery/outage of each quantity within the acceptable period specified in Section F, clause no. 52.211-10, Commencement, Prosecution, and Completion of Work (Apr 2012). Offers that propose delivery/outage that will not clearly fall within the applicable required delivery period specified in Section F will be considered unacceptable for this evaluation factor. The Government reserves the right to award under either the required delivery/outage schedule or the proposed delivery/outage schedule, when the offeror offers an earlier delivery/outage schedule than required in Section F. If the offeror proposes no other delivery/outage schedule, the required delivery schedule found in Section F will apply.

**FACTOR 3: Past Performance**

**Evaluation Standards:** Past performance will be evaluated based on information received from: 1) responses to PPQs; 2) data independently obtained from the government and commercial sources (for example CPARS and FAPIIS).

The purpose of the past performance evaluation is to allow the government to assess the offeror's ability to safely perform the work in a timely manner, and as required by the specifications, based on the offeror's demonstrated past performance history.

Offerors without relevant past or present performance history, or whose performance record is so limited that an adjectival rating cannot be reasonably assigned shall receive the rating “Neutral," meaning the offeror is treated neither favorably nor unfavorably.

During the evaluation of past performance, the Government reserves the right to give greater consideration to information on those contracts deemed most relevant to the effort described in this RFP.

**FACTOR 4: Price Proposal**

**Evaluation Standards:** The price proposal will be evaluated for price reasonableness and any instances of unbalanced pricing.

The relative importance of the factors listed above is as follows: Factors 1 through 3 are of equal importance, and when combined, are significantly more important than Factor 4. In evaluating past performance, the government reserves the right to give greater consideration to information on those contracts deemed most relevant to the effort described in this RFP.


In accordance with the Agreement on Government Procurement, as amended by the Uruguay Round Agreements Act (Pub. L. 103-465), and other trade agreements, FAR Subpart 25.4,
World Trade Organization Government Procurement Agreement, applies to Bureau of Reclamation acquisitions. In order to apply trade agreements unique to Reclamation, the contracting officer will (irrespective of any other provision or clause of this solicitation) evaluate acquisitions at or above the dollar thresholds listed in FAR 25.402(b) without regard to the restrictions of the Buy American Act.
Superseded General Decision Number: WA20190065

State: Washington

Construction Type: Heavy
including water and sewer line construction

County: Chelan County in Washington.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number     Publication Date
0              01/03/2020
1              02/14/2020
2              03/13/2020

CARP0059-011 06/01/2018

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARPENTER (Including Formwork) EAST OF 120TH MERIDIAN......$ 33.40</td>
<td>16.40</td>
</tr>
<tr>
<td>MILLWRIGHT EAST OF 120TH MERIDIAN......$ 45.42</td>
<td>18.83</td>
</tr>
</tbody>
</table>

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - ALL CLASSIFICATIONS EXCEPT MILLWRIGHTS AND PILEDIVERS)

Hourly Zone Pay shall be paid on jobs located outside of the free zone computed from the city center of the following listed cities:

Seattle
Auburn
Renton
Aberdeen-Hoquiam
Ellensburg
Centralia
Chelan

Olympia
Bremerton
Shelton
Tacoma
Everett
Mount Vernon
Pt. Townsend

Bellingham
Anacortes
Yakima
Wenatchee
Port Angeles
Sunnyside
Pt. Townsend

Zone Pay:
0 -25 radius miles Free
26-35 radius miles $1.00/hour
36-45 radius miles $1.15/hour
46-55 radius miles $1.35/hour
Over 55 radius miles $1.55/hour

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - MILLWRIGHT AND PILEDRIVER ONLY)

Hourly Zone Pay shall be computed from Seattle Union Hall, Tacoma City center, and Everett City center

Zone Pay:
0 -25 radius miles Free
26-45 radius miles $.70/hour
Over 45 radius miles $1.50/hour

----------------------------------------------------------------

CARP0770-002 06/01/2019

Rates Fringes

CARPENTER (Including Formwork)
WEST OF 120TH MERIDIAN.......$ 45.92 16.52

MILLWRIGHT
WEST OF 120TH MERIDIAN.......$ 47.42 16.52

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - ALL CLASSIFICATIONS EXCEPT MILLwrightS AND PILEDRIVERS

Hourly Zone Pay shall be paid on jobs located outside of the free zone computed from the city center of the following listed cities:

Seattle Olympia Bellingham
Auburn Bremerton Anacortes
Renton Shelton Yakima
Aberdeen-Hoquiam Tacoma Wenatchee
Ellensburg Everett Port Angeles
Centralia Mount Vernon Sunnyside
Chelan Port Townsend

Zone Pay:
0 -25 radius miles Free
26-35 radius miles $1.00/hour
36-45 radius miles $1.15/hour
46-55 radius miles $1.35/hour
Over 55 radius miles $1.55/hour

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - MILLWRIGHT AND PILEDRIVER ONLY)

Hourly Zone Pay shall be computed from Seattle Union Hall, Tacoma City center, and Everett City center

Zone Pay:
0 -25 radius miles Free
26-45 radius miles $.70/hour
Over 45 radius miles $1.50/hour

----------------------------------------------------------------

ELEC0191-013 06/01/2019

Rates Fringes

ELECTRICIAN
DOUGLAS, CHELAN, and OKANOGAN Counties........$ 42.45 21.34
ISLAND, SAN JUAN, SKAGIT, SNOHOMISH and WHATCOM Counties.............$ 46.45 23.66
WEST OF THE 120TH MERIDIAN

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1A</td>
<td>$46.78</td>
</tr>
<tr>
<td>Group 1AA</td>
<td>$47.46</td>
</tr>
<tr>
<td>Group 1AAA</td>
<td>$48.14</td>
</tr>
<tr>
<td>Group 1</td>
<td>$46.09</td>
</tr>
<tr>
<td>Group 2</td>
<td>$45.50</td>
</tr>
<tr>
<td>Group 3</td>
<td>$44.98</td>
</tr>
<tr>
<td>Group 4</td>
<td>$42.10</td>
</tr>
</tbody>
</table>

Zone Differential (Add to Zone 1 rates):
Zone 2 (26-45 radius miles) - $1.00
Zone 3 (Over 45 radius miles) - $1.30

BASEPOINTS: Aberdeen, Bellingham, Bremerton, Everett, Kent, Mount Vernon, Port Angeles, Port Townsend, Seattle, Shelton, Wenatchee, Yakima

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1AAA - Cranes-over 300 tons, or 300 ft of boom
(including jib with attachments)

GROUP 1AA - Cranes 200 to 300 tons, or 250 ft of boom
(including jib with attachments); Tower crane over 175 ft in height, base to boom; Excavator/Trackhoe, Backhoes: Over 90 metric tons

GROUP 1A - Cranes, 100 tons thru 199 tons, or 150 ft of boom
(including jib with attachments); Crane-overhead, bridge type, 100 tons and over; Tower crane up to 175 ft in height base to boom; Excavator/Trackhoe, backhoes: over 50 metric tons to 90 metric tons

GROUP 1 - Cranes 45 tons thru 99 tons, under 150 ft of boom
(including jib with attachments); Crane-overhead, bridge type, 45 tons thru 99 tons; Derricks on building work; Excavator/Trackhoe, backhoes: over 30 metric tons to 50 metric tons; Dozer D-10; Paver; Scraper-self propelled 45 yards and over Paver

GROUP 2 - Cranes, 20 tons thru 44 tons with attachments; Crane-overhead, bridge type-20 tons through 44 tons; Excavator/Trackhoe, backhoe: 15 to 30 metric tons; Drilling Machine; Screed; Piledriver; Scraper-self propelled under 45 yards; Boring Machine

GROUP 3 - Cranes-thru 19 tons with attachments; A-frame crane over 10 tons; Dozers-D-9 and under; Excavator/Trackhoe, backhoe: under 15 metric tons; Forklift: 3000 lbs and over with attachments; Oiler; Drill Assistant; Boom Truck over 10 tons

GROUP 4 - Cranes-A frame-10 tons and under; Forklift: under 3000 lbs with attachments; Boom Truck 10 tons and under

EAST OF THE 120TH MERIDIAN

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>$28.46</td>
</tr>
</tbody>
</table>
## POWER EQUIPMENT OPERATORS CLASSIFICATIONS

**GROUP 1:** Drill Assistant

**GROUP 2:** Fork Lift

**GROUP 3:** Bulldozer (up to D-6 or equivalent); Boring Machine

**GROUP 4:** Oiler; Drill (churn, core, calyx or diamond)

**GROUP 5:** Backhoe (Under 45,000 gw); Trackhoe/Excavator (under 3/4 yd.); Drilling equipment (8 unch bit and over) (robbins, reverse circulation and similar); Piledriver; Cranes (25 tons & under); Boom Truck (Under 25 tons)

**GROUP 6:** Backhoe (45,000 gw and over to 110,000 gw); Trackhoe/Excavator (3/4 yd. to 3 yd.), Bulldozer, 834 R/T & similar; Paver; Scraper; Screed; Cranes (over 25 tons, to and including 45 tons)

**GROUP 7:** Backhoe (Over 110,000); Trackhoe/Excavator (3 yds & over); Cranes (over 45 tons to but not including 85 tons)

**GROUP 8:** Cranes (85 tons and over, and all climbing, overhead, rail and tower)

### BOOM PAY: (All Cranes, Including Tower)

<table>
<thead>
<tr>
<th>Length</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 ft to 250 ft</td>
<td>$0.50 over scale</td>
</tr>
<tr>
<td>Over 250 ft</td>
<td>$0.80 over scale</td>
</tr>
</tbody>
</table>

### NOTE:

In computing the length of the boom on Tower Cranes, they shall be measured from the base of the Tower to the point of the boom.

### HAZMAT:

Anyone working on HAZMAT jobs, working with supplied air shall receive $1.00 an hour above classification.

---

### IRON0086-008 07/01/2019

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$33.59</td>
<td>29.26</td>
</tr>
</tbody>
</table>

---

### LAB00348-008 06/01/2019

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GROUP 2: $26.51
GROUP 3: $29.01
GROUP 4: $29.71
GROUP 5: $30.22

ZONE DIFFERENTIAL (ADD TO ZONE 1 RATES):
ZONE 2 - $1.00
ZONE 3 - $1.30

BASE POINTS: BELLINGHAM, MT. VERNON, EVERETT, SEATTLE, KENT, TACOMA, OLYMPIA, CENTRALIA, ABERDEEN, SHELTON, PT. TOWNSEND, PT. ANGELES, AND BREMERTON

ZONE 1 - Projects within 25 radius miles of the respective city hall
ZONE 2 - More than 25 but less than 45 radius miles from the respective city hall
ZONE 3 - More than 45 radius miles from the respective city hall

LABORERS CLASSIFICATIONS

GROUP 2: Flagger

GROUP 3: General or Common Laborer; Form-Stripping

GROUP 4: Pipe Layer; Pipelayer

GROUP 5: Mason Tender-Brick; Mason Tender-Cement/Concrete; Grade Checker; High Scaler

PAINTER (Brush, Roller, and Spray.) $22.94

--------------
PAINTER (Brush, Roller, and Spray.) .................................. $22.94

--------------

FOOTNOTE A - Anyone working on a HAZMAT job, where HAZMAT certification is required, shall be compensated as a premium, in addition to the classification working in as follows:
LEVEL C-D: - $.50 PER HOUR - This level may use an air purifying respirator or additional protective clothing.
LEVEL A-B: - $1.00 PER HOUR - Uses supplied air in conjunction with a chemical splash suit or fully
encapsulated suit with a self-contained breathing apparatus.

Employees shall be paid Hazmat pay in increments of four(4) and eight(8) hours.

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEMENT MASON/CONCRETE FINISHER... $24.50</td>
<td>6.30</td>
</tr>
<tr>
<td>LABORER: Common or General (Water and Sewer Lines)........ $20.79</td>
<td>4.63</td>
</tr>
<tr>
<td>LABORER: Landscape &amp; Irrigation....................... $12.27</td>
<td>2.73</td>
</tr>
<tr>
<td>OPERATOR: Asphalt Plant........ $34.14</td>
<td>0.68</td>
</tr>
<tr>
<td>OPERATOR: Broom/Sweeper........ $27.03</td>
<td>4.67</td>
</tr>
<tr>
<td>OPERATOR: Grader/Blade........ $27.56</td>
<td>5.53</td>
</tr>
<tr>
<td>OPERATOR: Loader................ $26.90</td>
<td>7.65</td>
</tr>
<tr>
<td>OPERATOR: Mechanic.............. $27.09</td>
<td>7.30</td>
</tr>
<tr>
<td>OPERATOR: Power Shovel........... $25.12</td>
<td>7.83</td>
</tr>
<tr>
<td>OPERATOR: Roller................ $29.18</td>
<td>4.14</td>
</tr>
<tr>
<td>OPERATOR: Skid Steer............ $10.63</td>
<td>0.00</td>
</tr>
<tr>
<td>TRUCK DRIVER, Includes Dump Truck.......................... $13.00</td>
<td>0.04</td>
</tr>
<tr>
<td>TRUCK DRIVER: Flatbed Truck..... $22.74</td>
<td>6.29</td>
</tr>
<tr>
<td>TRUCK DRIVER: Lowboy Truck...... $22.89</td>
<td>5.72</td>
</tr>
<tr>
<td>TRUCK DRIVER: Water Truck....... $23.46</td>
<td>6.06</td>
</tr>
</tbody>
</table>

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).
The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classifications(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.
WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party’s position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION
SOURCE SELECTION INFORMATION WHEN COMPLETED (SEE FAR 3.104)

PAST PERFORMANCE QUESTIONNAIRE (PPQ)

This information will be provided to the U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Region, for use in selecting a contractor to perform construction work for Solicitation No. 140R1018R0026 for Snow Lake Tunnel Outlet Valve Replacement, Leavenworth National Fish Hatchery, Washington. Completed forms shall be submitted to the Bureau of Reclamation by one of the following means: By fax to (208) 378-5108, Attn: Connie Gordon; by e-mail to cgordon@usbr.gov, or by regular mail to: Bureau of Reclamation, Attn: PN-7302, 1150 N. Curtis Road, Boise, ID 83706-1234.

This information must be submitted no later than the date for receipt of proposals as stated in Block 13 of the SF-1442. It is the offeror’s responsibility to ensure each questionnaire is submitted timely.

**Contract Information**

<table>
<thead>
<tr>
<th>Name and Address of Firm Being Evaluated:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract No.:</td>
</tr>
<tr>
<td>Project Title:</td>
</tr>
<tr>
<td>Initial Amount:</td>
</tr>
<tr>
<td>Award Date:</td>
</tr>
</tbody>
</table>

**Evaluator Information**

<table>
<thead>
<tr>
<th>Name of Evaluator:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company/Agency Name:</td>
</tr>
<tr>
<td>Address:</td>
</tr>
</tbody>
</table>
Phone Number:  

Email Address:  

Position Held or Function in Relation to Project:  

### Past Performance Rating

Rating: If the rating is “Acceptable” or “Poor,” please provide additional information in the appropriate block or in the remarks section of this form.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>“O” Outstanding</td>
<td>Performance greatly exceeded the contract requirements.</td>
<td></td>
</tr>
<tr>
<td>“E” Excellent</td>
<td>Performance exceeded the contract requirements.</td>
<td></td>
</tr>
<tr>
<td>“G” Good</td>
<td>Performance met the contract requirements.</td>
<td></td>
</tr>
<tr>
<td>“A” Acceptable</td>
<td>Performance met the minimum contract requirements but some material aspects of the contractor’s performance were less than satisfactory.</td>
<td></td>
</tr>
<tr>
<td>“P” Poor</td>
<td>Performance was poor and/or did not satisfy contract requirements.</td>
<td></td>
</tr>
<tr>
<td>N/A Not applicable</td>
<td>Insert N/A if a question is not applicable to the project.</td>
<td></td>
</tr>
</tbody>
</table>

Please circle the appropriate rating and provide any supporting information/comments for the following:

<table>
<thead>
<tr>
<th></th>
<th>Firm and Client’s/Customer’s Contract Team Relationship:</th>
<th>O E G A P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Management and Coordination of Subcontractors:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>2.</td>
<td>Overall Corporate Management, Integrity, Reasonableness and Cooperative Conduct:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>3.</td>
<td>Timeliness and Quality of Submittals:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>4.</td>
<td>Responsiveness to Customer/Client’s Requirements:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>5.</td>
<td>Quality of work:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>6.</td>
<td>Quality Control:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>7.</td>
<td>Ability to meet the Performance Schedule:</td>
<td>O E G A P</td>
</tr>
<tr>
<td></td>
<td>Ability/Actions to Improve Schedule Problems:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>10.</td>
<td>Ability to Control Costs and Provide the Required Work at a Reasonable Total Price:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>11.</td>
<td>Ability of contractor to maintain key personnel through the entire project performance period</td>
<td>O E G A P</td>
</tr>
<tr>
<td>12.</td>
<td>Quality of Contract Administration:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>13.</td>
<td>Compliance with Labor Standards:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>14.</td>
<td>Change Order Management:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>15.</td>
<td>Overall Contract Compliance:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>16.</td>
<td>Compliance with safety standards and/or number of safety related incidents, code compliance, as applicable:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>17.</td>
<td>Construction Project Management:</td>
<td>O E G A P</td>
</tr>
<tr>
<td>18.</td>
<td>Have any cure notices, show cause letters, letter of reprimand, suspension of payment, or termination been issued? If yes, please explain:</td>
<td>Yes No</td>
</tr>
<tr>
<td>19.</td>
<td>Would you award another contract to the firm being evaluated? If no, please explain:</td>
<td>Yes No</td>
</tr>
<tr>
<td>20.</td>
<td>Was the customer satisfied with the end product? If no, please explain:</td>
<td>Yes No</td>
</tr>
<tr>
<td>21.</td>
<td>Has the firm being evaluated been provided an opportunity to discuss or respond to any negative comments or performance ratings? If so, what were the results?</td>
<td>Yes No</td>
</tr>
<tr>
<td>22.</td>
<td>Was the contractor safety conscious and did it maintain a safe work environment for all prime and subcontractor employees?</td>
<td>O E G A P</td>
</tr>
<tr>
<td>23.</td>
<td>Additional Remarks:</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Overall rating for this firm:</td>
<td>O E G A P</td>
</tr>
</tbody>
</table>
**BID BOND**

(See instructions on reverse)

**DATE BOND EXECUTED** (Must not be later than bid opening date)

**OMB Control Number:** 9000-0045

**Expiration Date:** 8/31/2022

---

**PAPERWORK REDUCTION ACT STATEMENT**

This information collection meets the requirements of 44 USC § 3507, as amended by section 2 of the Paperwork Reduction Act of 1995. You do not need to answer these questions unless we display a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 9000-0045. We estimate that it will take 1 hour to read the instructions, gather the facts, and answer the questions. Send only comments relating to our time estimate, including suggestions for reducing this burden, or any other aspects of this collection of information to: General Services Administration, Regulatory Secretariat Division (M1V1CB), 1800 F Street, NW, Washington, DC 20405.

---

**BID BOND**

- **Principal (Legal name and business address)**
- **Type of Organization**
  - INDIVIDUAL
  - PARTNERSHIP
  - JOINT VENTURE
  - CORPORATION
  - OTHER (Specify)
- **State of Incorporation**

**Surety(i(es) (Name and business address)**

---

**Penal Sum of Bond**

<table>
<thead>
<tr>
<th>Percent of Bid Price</th>
<th>Amount Not to Exceed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MILLION(S)</td>
</tr>
</tbody>
</table>

**Bid Identification**

<table>
<thead>
<tr>
<th>Bid Date</th>
<th>Invitation Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOR (Construction, Supplies or Services)</td>
<td></td>
</tr>
</tbody>
</table>

**Obligation**

We, the Principal and Surety(i(es) are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

**Conditions**

The Principal has submitted the bid identified above.

**Therefore**

The above obligation is void if the Principal - (a) upon acceptance by the Government of the bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), executes the further contractual documents and gives the bond(s) required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by the principal; or (b) in the event of failure to execute such further contractual documents and give such bonds, pays the Government for any cost of procuring the work which exceeds the amount of the bid.

Each Surety executing this instrument agrees that its obligation is not impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Government. Notice to the surety(i(es) of extension(s) is waived. However, waiver of the notice applies only to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

**Witness**

The Principal and Surety(i(es) executed this bid bond and affixed their seals on the above date.

---

**Principal**

<table>
<thead>
<tr>
<th>Signature(s)</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name(s) &amp; Title(s)</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
</tr>
</tbody>
</table>

**Corporate Seal**

**Individual Surety(i(es)**

<table>
<thead>
<tr>
<th>Signature(s)</th>
<th>1.</th>
<th>2.</th>
<th>(Seal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name(s)</td>
<td>1.</td>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>

**Corporate Surety(i(es)**

<table>
<thead>
<tr>
<th>Name &amp; Address</th>
<th>State of Incorporation</th>
<th>Liability Limit ($)</th>
<th>Corporate Seal</th>
</tr>
</thead>
</table>

---

**Attachment J.2**
INSTRUCTIONS

1. This form is authorized for use when a bid guaranty is required. Any deviation from this form will require the written approval of the Administrator of General Services.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. The bond may express penal sum as a percentage of the bid price. In these cases, the bond may state a maximum dollar limitation (e.g., 20% of the bid price but the amount not to exceed __________ dollars).

4. (a) Corporations executing the bond as sureties must appear on the Department of the Treasury's list of approved sureties and must act within the limitations listed therein. The value put into the LIABILITY LIMIT block is the penal sum (i.e., the face value) of the bond, unless a co-surety arrangement is proposed.

(b) When multiple corporate sureties are involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)." In the space designated "SURETY(IES)" on the face of the form, insert only the letter identifier corresponding to each of the sureties. Moreover, when co-surety arrangements exist, the parties may allocate their respective limitations of liability under the bond, provided that the sum total of their liability equals 100% of the bond penal sum.

(c) When individual sureties are involved, a completed Affidavit of Individual Surety (Standard Form 28) for each individual surety, shall accompany the bond. The Government may require the surety to furnish additional substantiating information concerning its financial capability.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal"; and shall affix an adhesive seal if executed in Maine, New Hampshire, or any other jurisdiction requiring adhesive seals.

6. Type the name and title of each person signing this bond in the space provided.

7. In its application to negotiated contracts, the terms "bid" and "bidder" shall include "proposal" and "offeror."

<table>
<thead>
<tr>
<th>SURETY</th>
<th>NAME &amp; ADDRESS</th>
<th>STATE OF INCORPORATION</th>
<th>LIABILITY LIMIT ($)</th>
<th>SIGNATURE(S)</th>
<th>NAME(S) &amp; TITLE(S) (Typed)</th>
<th>SIGNATURE(S)</th>
<th>NAME(S) &amp; TITLE(S) (Typed)</th>
<th>SIGNATURE(S)</th>
<th>NAME(S) &amp; TITLE(S) (Typed)</th>
<th>SIGNATURE(S)</th>
<th>NAME(S) &amp; TITLE(S) (Typed)</th>
<th>SIGNATURE(S)</th>
<th>NAME(S) &amp; TITLE(S) (Typed)</th>
<th>SIGNATURE(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STANDARD FORM 24 (REV. 8/2016) BACK
Subcontracting Percentage Worksheet
General Construction

FAR clause 52.219-14, Limitations of Subcontracting, states that by submission of an offer and execution of a contract, the contractor agrees that in performance of the contract, a certain percentage of the cost of the contract, less materials, will be performed by the contractor.

Review the requirements of clause 52.219-14, complete the table below, and submit it with your offer to ensure that the prime contractor plans to perform the required percentage of work stated in the clause for the type of contract work being performed. Use valid estimates for subcontract amounts and material costs that may not be known at the time of offer submission. The NAICS code for this acquisition 237990 is a painting NAICS code, and thus 15% of the cost of the contract, less materials, shall be performed by the prime contractor.

| A. Total potential contract award price from Section B | $ |
| B. Subcontractor name and/or type of subcontract description* | Subcontract value |
|                                      | $ |
|                                      | $ |

| C. Total amount of subcontracts | $ |
| D. Total amount of materials to be purchased | $ |
| E. Total price less subcontracts and materials (A-C-D) | $ |
| F. Total percentage of contract performed by prime contractor (E/A) | % |

*If you need more rows please modify the worksheet to include all subcontracts.

Here is a sample calculation for this worksheet:

| A. Total potential contract award price from Section B | $200,000 |
| B. Subcontractor name and/or type of subcontract description* | Subcontract value |
| Excavation | $20,000 |
| Electrical | $25,000 |

| C. Total amount of subcontracts | $45,000 |
| D. Total amount of materials to be purchased | $15,000 |
| E. Total price less subcontracts and materials (A-C-D) | $140,000 |
| F. Total percentage of contract performed by prime contractor (E/A) | 70% |

(In this sample, the prime contractor would be in compliance with clause 52.219-14)