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DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD

CIVIL ENGINEERING UNIT OAKLAND
OAKLAND, CALIFORNIA 94612-5203

PSN 27843489

SPECIFICATIONS

FOR

REPAIR FLOATING DOCK #3 (SET B)

AT

Station Cape Disappointment

Ilwaco, Washington

JUNE 12, 2026

Civil Engineering Unit Oakland	Digital Signature
Robert Tyzzer, P.E. PROJECT MANAGER	
Joel Tomco SUPERVISOR, RE DESIGN TEAM B	
Steven F. Osgood TECHNICAL DIRECTOR	

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DIVISION 01 - GENERAL REQUIREMENTS

01 10 00 - GENERAL PARAGRAPHS

PART 1 GENERAL

- 1.01 BASE WORK - SCOPE OF WORK: Provide all labor, materials, and equipment necessary to repair Floating Dock #3 at USCG Station Cape Disappointment. The work includes, but is not limited to, the following:
- A. Install concrete floating dock system.
 - B. Install gangway platform superstructure.
 - C. Reset existing gangway.
 - D. Install anodes on steel guide and support piles.
 - E. Existing Boathouse Access Bridge handrail modification.
 - F. Install Utilities including:
 - 1) Electrical - Provide power for shore-tie pedestals, convenience power pedestal (with welder outlet), fuel dispensers, potable water hose reel, fuel leak detection system, and security camera replacement.
 - 2) Diesel and Gasoline Dispensing Units and associated hoses, valves, containment, leak detection, etc.
 - 3) Potable water - Provide associated hoses, valves and hose reels.
- 1.02 LOCATION: Project site is located at USCG Station Cape Disappointment, Ilwaco, Washington.
- 1.03 RESTRICTIONS:
- The work is restricted to the following:
- A. The Station must remain operational at all times, except as noted, or otherwise specified.
 - B. In-water work will only be allowed to be completed between November 1st and February 28th.

- 1.04 SITE INVESTIGATION: Investigate the site per FAR 52.236-3 to ascertain the general and local conditions which can affect the work or its cost. Refer to the Request for Proposal (RFP) for Site Investigation and/or Site Visit instructions as well as Point of Contact.
- 1.05 CONTRACTOR SECURITY REQUIREMENTS: The Contractor shall provide a list of all on-site personnel, including sub-contractors (including second and third-tier subcontractors) and suppliers, to the Contracting Officer. The Contractor shall update this list when changes occur. Contractor personnel not listed may be denied access to the Coast Guard facility. Contractor personnel will be restricted to designated working areas. Any personnel violating this policy may lose access to the Coast Guard facility. Contractor personnel shall have photo identification at all times while working on Coast Guard facilities.

Contractor and delivery personnel may be required to present personal photo identification to gain access to a Coast Guard installation. If identification does not indicate United States citizenship, Coast Guard Security may require proof of the legal right to work in the United States. Contractor and delivery personnel also may be subjected to an immigration status and outstanding criminal warrants check.

The Real ID Act of 2005 established minimum security standards for license issuance and production and prohibits federal agencies from accepting, for certain purposes, driver's licenses and identification cards from states not meeting the Act's minimum standards. Anyone requiring access to a military facility under this contract, to include subcontractors, who holds a driver's license from any state without approved licenses will be required to provide identification other than that driver's license to gain access. Government IDs annotated with "Federal Limits Apply" will not be accepted for access purposes. It is the responsibility of the Contractor to ensure that their personnel have federally acceptable personal photo identification and comply with any other requirements for base access.

Contractors shall provide the Contracting Officer's Technical Representative with 24 hours of advance notice of every delivery to the site (e.g., steel, concrete,

lumber, parts, etc.) and provide the company name, delivery person, and phone number of the firm(s) making deliveries. All vehicle access to government property requires vehicle registration and proof of liability insurance. Otherwise access to the Coast Guard facility may be denied.

- 1.06 CONTINUITY OF FACILITIES OPERATION: Schedule work to minimize interference with the facilities normal operations. Notify the Contracting Officer and the site contact 3 business days in advance of any shutdowns. Perform all on-site work, including deliveries, between the hours of 7:00 AM and 5:00 PM, Monday through Friday (Federal Holidays excluded), unless otherwise approved by the Contracting Officer and the Unit Commanding Officer.
- 1.07 NOTIFICATION OF START AND COMPLETION OF WORK: The Contractor shall notify the Contracting Officer in writing five (5) business days in advance of the date they intend to commence work, and five (5) business days prior to the date that work will be ready for final inspection.
- 1.08 RECYCLING AND DISPOSAL OF REFUSE: Refuse and excess or waste materials resulting from construction operations shall become the property of the Contractor and the Contractor shall recycle, reuse and/or salvage to the maximum extent feasible construction, demolition and land clearing waste. Disposal shall be off government property in accordance with federal, state, and local laws and regulations. A Construction Waste Management Plan shall be submitted in accordance with Section 01 35 29.
- 1.09 ENERGY STAR AND FEMP DESIGNATED PRODUCTS: In accordance with the Energy Policy Act of 2005 and the Federal Acquisition Regulations (FAR) Part 23, any energy consuming products that the Contractor provides shall be listed in the ENERGY STAR Program or Federal Energy Management Program (FEMP) unless an exemption applies.
- 1.10 RECYCLED MATERIAL: Use products meeting or exceeding EPA's recycled content recommendations for EPA-designated products and for other products Contractor shall make all attempts to maximize the procurement of materials with recycled content.

- 1.11 REGIONAL MATERIALS: The Contractor shall make all attempts to maximize the procurement of materials within a 500 mile radius of the project site.
- 1.12 SAFETY: During the execution of this contract, the Contractor shall conform to the rules and regulations as set forth by OSHA Safety and Health Standards, 29 CFR Part 1926 - Safety and Health Regulations for Construction and the Washington Industrial Safety and Health Administration (WISHA) regulations. When the standards differ, the more restrictive standard shall apply. The Contractor shall provide barriers, temporary fencing, trench covers, etc. wherever work could cause injury to workers, visitors, Coast Guard personnel, or dependents. An Accident Prevention Plan shall be submitted in accordance with Section 01 35 29, paragraph 1.07.
- 1.13 PROTECTED WORK ENVIRONMENT: The Contractor shall maintain a safe and healthy work environment for employees, subcontractors, suppliers and occupants in the areas where work is performed. Contractor shall not allow introduction into the work areas or the air surrounding the work areas any chemical or biological contaminants whether or not visible or detectable by sight or smell that are known to cause or increase the potential for harm to personal health. Contractor shall prohibit anyone from entering the work area who has been exposed to or has contracted a communicable disease which can be passed through physical contact or air borne particulates. Contractor shall comply with all federal, state, and local health agency instructions for responses to known threats to personal health. Smoking or vaping shall only be permitted in areas specifically designated by the Station Commander.
- 1.14 CONSTRUCTION INSPECTION REQUIREMENTS: Construction inspection is the responsibility of the Contractor. This responsibility, established by FAR 52.246-12, requires that the Contractor maintain an adequate inspection system and perform such inspection as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain inspection and test records and make them available to the Contracting Officer. The government reserves the right to inspect and test any phase of the work at all reasonable times without relieving the Contractor of any responsibility for contract compliance.

1.15 TEMPORARY FACILITIES:

- A. STORAGE: The location for exterior stock piling of materials is shown on the drawing. The Contractor shall be responsible for protecting materials stockpiled against weather, damage, theft, and other risks of loss. The Coast Guard assumes no responsibility for material or equipment left in the storage area.
- B. SANITARY FACILITIES: There are no toilet facilities available for Contractor use at the job site. Provide such facilities, including hand washing facilities, in accordance with 29 CFR 1926, Subpart D, paragraph 1926.51 (c) (1) and (f) (1).
- C. WATER AND ELECTRICITY: Water and 120V electricity are available at no additional cost. Provide utility connections and disconnections at no additional cost to the government. Personnel using extension cords to bring power from another location to construction, maintenance, remodeling, etc., must employ portable ground fault circuit interrupters (GFCI), even if connecting to building wiring.
- D. TELEPHONE: No telephone service is available for use.

1.16 EXISTING UTILITIES: Utility locations shown are approximate. The Contractor shall field verify all utility locations. This shall include but not be limited to the use of sonic, electronic or magnetic detection devices, by noting pullbox and utility box locations at the surface, and by potholing. Contractor shall be responsible for repairing any utilities damaged during construction at no additional cost to the government.

1.17 WASHINGTON STANDARD SPECIFICATIONS: Whenever the Washington State Department of Transportation (WSDOT) Standard Specifications are referenced, the following shall be understood:

- A. The terms Commission or Department shall mean the U.S. Government.
- B. The terms Director, Executive Officer, or Engineer shall mean the Contracting Officer.
- C. All references to measurement and payment are deleted.

- 1.18 DRAWINGS: The work shall conform to the drawings listed below which form a part of these specifications.

<u>Number</u>	<u>Title</u>
G-001	COVER SHEET
G-002	GENERAL NOTES
G-003	SITE PHOTOS
G-101	WORK PLAN
SD101	DEMOLITION PLAN
SD501	DEMOLITION DETAILS
S-101	PILE PLAN
S-102	FLOATING DOCK PLAN
S-301	FLOATING DOCK SECTIONS
S-501	PILE DETAILS
S-502	FLOATING DOCK DETAILS
S-503	GANGWAY PLATFORM DETAILS - 1
S-504	GANGWAY PLATFORM DETAILS - 2
S-505	MISCELLANEOUS DETAILS
M-001	LEGENDS AND ABBREVIATIONS
MD101	DEMOLITION PLAN - MECHANICAL
M-101	SITE PLAN - MECHANICAL
M-201	ENLARGED PLAN - MECHANICAL
M-301	DETAILS - MECHANICAL
E-001	SYMBOLS AND ABBREVIATIONS
E-101	SITE PLAN - ELECTRICAL
E-501	POWER PEDESTAL SHORE TIE DETAILS
E-502	POWER PEDESTAL DETAILS

E-503 FUEL DISPENSER DETAILS
E-601 PARTIAL ONE-LINE DIAGRAM
E-602 PANEL SCHEDULES - 1
E-603 PANEL SCHEDULES - 2

- 1.19 REFERENCE DRAWINGS: The drawings listed below are included for reference only. They are known not to accurately reflect all existing conditions. Field verify all necessary information.

<u>Number</u>	<u>Title</u>
7478-A100	3'x50' GANGWAY SITE ELEVATIONS
7478-A200	3'x50' GANGWAY PLAN, ELEVATION AND SECTION VIEWS
7478-A201	3'x50' GANGWAY PARTS LIST
7478-A210	3'x50' GANGWAY WELD DETAILS
7478-A220	3'x50' GANGWAY HANDRAIL, MIDRAIL AND DECK DETAILS
7478-A230	3'x50' GANGWAY WHEEL DETAILS
7478-A300	3'x50' GANGWAY TRANSITION PLATE
7478-A400	3'x50' GANGWAY SHORE MOUNT

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01 33 00 – SUBMITTALS PROCEDURES

PART 1 GENERAL

1.01 GENERAL

- A. Forward all submittals, except as stated elsewhere, to the Contracting Officer by email as indicated on the submittal register. Submittals shall be accompanied with the USCG furnished material submittal form in PDF Format. Unless noted otherwise, all submittals shall be provided in an electronic image format. Provide these submittal images to the Contracting Officer, the Construction Manager, and the Contracting Officer's Representative (COR) simultaneously. If the electronic image is insufficient to ascertain submittal acceptability, the Contracting Officer may request a hard copy submittal. Unless otherwise noted, the Construction Manager will e-mail approval or disapproval of submittals, within 10 calendar days after receipt.
- B. The Construction Manager will review all submittals for compliance with these specifications. Submittals shall have been approved by the Contracting Officer before any item is delivered to the job site.
- C. Approval of submittals, and corrections or comments made during the review, do not relieve the Contractor from compliance with the requirements of the plans and specifications.
- D. The schedule of submittals listed in the submittal register and in the individual sections are the submittals required for this contract. Unsolicited submittals may be returned to the Contractor without review.

- 1.02 CATALOG CUTS: Catalog cuts shall contain manufacturer's description, specifications and sketches of the material and equipment provided. The catalog cut shall contain sufficient information which can be used to determine compliance with these specifications.

- 1.03 CERTIFICATES OF COMPLIANCE: Certificates of compliance shall be signed by an authorized officer of the manufacturing company furnishing the material which states that the material being furnished meets all requirements of these specifications and referenced specifications.
- 1.04 SAMPLES: Samples shall be submitted as described in the referencing specification section.
- 1.05 SHOP DRAWINGS: Prepare project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Drawings shall indicate layouts, dimensions, materials, and other information required to fully describe the items being installed. In addition to shop drawings for approval, submit full size set of as-built shop drawings in electronic formats, including AutoCAD and pdf formats at completion of contract work. If drawings are prepared using computer aided drafting, electronic files shall be compatible for use with AutoCAD 2018.
- 1.06 STATEMENTS OF PROCEDURES: Job-specific detailed procedure statements for aspects of the project requiring special attention. The statements shall indicate all methods and materials to be used for proper execution of the work. The statements shall also indicate any limiting criteria and scheduling requirements.
- 1.07 STANDARD COMPLIANCE: When materials or equipment must conform to the standards of organizations such as the American Society for Testing and Materials (ASTM), and Underwriter's Laboratories (UL), proof of such conformance shall be submitted to the Contracting Officer for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence. In lieu of the label or listing, submit a certificate from an independent testing organization, which is competent to perform the test. The certificate shall state that the item has been tested in accordance with the specified organization's standard.
- 1.08 TEST RESULTS: Submit test results as described in the individual referencing specification section.

- 1.09 PERMITS AND CERTIFICATES: Submit applications and copies of all permits and certificates as described in the individual referencing specification section and listed in the Submittal Register.
- 1.10 HAZARDOUS MATERIAL IDENTIFICATION: Submit Safety Data Sheets (SDS) for any materials defined as hazardous under the most current revision of Federal Standard 313. One copy of each SDS shall be submitted to the Contracting Officer's Representative no later than the delivery date of the product. Two copies shall be submitted to the Construction Manager.
- 1.11 AS-BUILT DRAWINGS: Maintain at the job site one set of full size contract drawings marked in red to show any deviations which are found to exist or have been made from the contract drawings. Upon completion of the work, deliver the marked set of prints to the Contracting Officer. Request for final payment will not be approved until the marked prints are delivered to the Contracting Officer.
- 1.12 OPERATION AND MAINTENANCE MANUAL: Furnish one hardcopy and one electronic file of the operation and maintenance manual as described in the submittal register. The hard copy manual shall be bound in a standard 8-1/2" x 11", 3 ring, loose leaf, hard cover binder. The manual shall have a general index and each section shall have a separate index tab. The manual's cover shall carry the following identification:

OPERATION AND MAINTENANCE MANUAL
[System Identification], PSN: PSN #27843489
Station Cape Disappointment
Contract No. _____

The manual shall contain, as a minimum, the following:

1. The manufacturer and local representative's name, address, and telephone number.
2. Catalog sheets, model numbers, and other descriptive literature for each system component.
3. Instructions for installation, connection, start-up, operation, shut-down, trouble-shooting, maintenance, lubrication, overhaul, and safety precautions particular to the equipment being installed (written

lockout procedures) for the List Items the O&M is to cover and consider the need for guidance discussing the impact upon existing affected system's procedures. Exploded or other detailed views of all components shall be included with complete parts list and ordering instructions.

One preliminary O&M manual shall be submitted as an electronic file by email within 21 calendar days before the system is put into operation. The government will review and return the preliminary O&M manual by e-mail within 14 calendar days of receipt. The O&M manual shall be revised and/or amended as required and the hard copy final manual shall be submitted to the Contracting Officer along with a final version in electronic format. Request for final payment will not be approved until the final O&M manuals are complete and approved.

1.13 SUBCONTRACTOR CERTIFICATION: The Contractor shall submit a list of all subcontractors with a statement (i.e. SF-1413 per FAR 48 CFR 53.222(e)) signed by each subcontractor that they have been provided a complete set of the contract specifications, contract drawings, reference documents, and all solicitation RFI responses. Provide the printed name and business address of each subcontractor along with a signature by the responsible individual for each subcontractor. This signed list shall be submitted before any work starts. If any subcontractor is added or changed from the original list, Contractor shall provide an amended list with required signature(s) within ten work days of the addition or change for approval by the Contracting Officer.

1.14 BAR CHART PROGRESS SCHEDULE: Within 20 calendar days after award, submit a bar chart progress schedule. On-site work shall not begin until a bar chart schedule has been approved. The bar chart shall show the complete sequence of construction by activity (including acquisition of materials and equipment). The chart shall identify the construction start date, the completion date, and all workdays through the duration of the project. If the project requires various delivery dates, dates will be indicated for each of the required deliverable elements (i.e., housing unit or specific building). The bar chart shall also identify the cost for the various activities which shall be used as the basis for the Contractor's periodic request for payments. Submission and approval of as-built drawings and O&M

manuals shall each be separate line items (with associated costs) on the bar chart.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

CEU OAKLAND SUBMITTAL REGISTER				PSN: PSN #27843489	CONTRACT NO.:						
PROJECT TITLE AND LOCATION: REPAIR FLOATING DOCK #3 AT STATION CAPE DISAPPOINTMENT ILWACO, WA				CONTRACTOR NAME:							
NO.	Submittal Reference Location			DESCRIPTION OF SUBMITTAL	DATE REQUIRED Days after award	DATE SUBMITTED	ACTION DATE				REVIEWER
	SPEC SECTION	PARA.	PAGE				APPROVED	APPROVED AS NOTED	DISAPPROVED	RESUBMITTAL APPROVED	
001	01 33 00	1.11	10	AS-BUILT DRAWINGS							
002	01 33 00	1.13	11	SUBCONTRACTOR CERTIFICATION							
003	01 33 00	1.14	11	BAR CHART PROGRESS SCHEDULE							
004	01 35 29	1.07A	30	CONSTRUCTION WASTE MANAGEMENT PLAN							
005	01 35 29	1.07B	30	SOLID WASTE DISPOSAL PERMIT							
006	01 35 29	1.07C	30	HW MANIFESTS							
007	01 35 29	1.07D	30	HM/HW HANDLING PLAN							
008	01 35 29	1.07E	31	SAFETY DATA SHEETS							
009	01 35 29	1.07F	31	ACCIDENT PREVENTION PLAN (APP)							
010	01 35 29	1.07G	31	MOBILE EQUIPMENT OPERATOR LIST							
011	01 35 29	1.07H	31	FALL PROTECTION							
012	01 35 29	1.07I	31	SCAFFOLD AND POWERED PLATFORMS							
013	01 35 29	1.07J	31	DIVE SAFETY PLAN							
014	02 41 00	1.03A	39	DEMOLITION PLAN							
015	02 41 00	1.03B	39	EXISTING CONDITIONS							
016	02 41 00	1.03C	39	NOTIFICATION							
017	05 05 23.16	1.03A	48	WELDING QUALITY ASSURANCE PLAN							

018	05 05 23.16	1.03B	48	WELDING PROCEDURE QUALIFICATIONS							
019	05 05 23.16	1.03C	48	WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION							
020	05 05 23.16	1.03D	48	PREVIOUS QUALIFICATIONS							
021	05 05 23.16	1.03E	49	PRE-QUALIFIED PROCEDURES							
022	05 05 23.16	1.03F	49	WELDING ELECTRODES AND RODS							
023	05 05 23.16	1.03G	49	NONDESTRUCTIVE TESTING							
024	05 05 23.16	1.03H	49	WELD INSPECTION LOG							
025	05 05 23.16	1.03I	49	CERTIFIED WELDING INSPECTOR							
026	05 05 23.16	1.03J	49	NONDESTRUCTIVE TESTING PERSONNEL							
027	05 12 00	1.03A	61	FABRICATION DRAWINGS							
028	05 12 00	1.03B	61	STEEL							
029	05 12 00	1.03C	61	BOLTS, NUTS, WASHERS, AND THREADED RODS							
030	05 12 00	1.03D	61	BOLT TESTING REPORTS							
031	05 12 00	1.03E	61	GALVANIZING							
032	06 13 33	1.03A	68	PIER TIMBERWORK							
033	06 13 33	1.03B	68	PRESERVATIVE TREATMENT - PIER TIMBERWORK							
034	06 13 33	1.03C	68	DELIVERY INSPECTION LIST							
035	06 13 33	1.03D	69	SDS AND CIS							
036	06 13 33	1.03E	69	PESTICIDE APPLICATOR COMPANY SELF-CERTIFICATION							
037	06 13 33	1.03F	69	BEST MANAGEMENT PRACTICES (BMPS)							
038	06 73 01	1.03A	75	INSTALLATION DRAWINGS, TEMPLATES, AND DIRECTIONS							
039	06 73 01	1.03B	75	FRP GRATING & CLIPS AND ANCHORAGE							
040	06 73 01	1.03C	75	DESIGN REQUIREMENTS							

041	06 73 01	1.03D	75	MANUFACTURER'S SAMPLE WARRANTY							
042	06 73 01	1.03E	75	CERTIFICATION OF ANCHORAGE SYSTEM COMPLIANCE WITH ASCE 7-16							
043	06 73 01	1.03F	75	MANUFACTURER'S RECOMMENDATIONS							
044	06 73 01	1.03G	75	MANUFACTURER'S CERTIFICATION OF INSTALLATION							
045	06 73 01	1.03H	75	MANUFACTURER'S WARRANTY							
046	09 97 13.27	1.03A	81	QUALITY CONTROL PLAN							
047	09 97 13.27	1.03B	82	FIELD COATING REPAIR PLAN							
048	09 97 13.27	1.03C	82	COATING SYSTEM							
049	09 97 13.27	1.03D	82	INSPECTION REPORT FORMS							
050	09 97 13.27	1.03E	82	INSPECTION REPORTS							
051	09 97 13.27	1.03F	82	FIELD INSPECTION REPORTS							
052	09 97 13.27	1.03G	82	QUALIFICATIONS							
053	09 97 13.27	1.03H	82	COATING SYSTEM INSTRUCTIONS							
054	09 97 13.27	1.03I	82	WARRANTY							
055	22 00 00	1.02A	97	PLUMBING SYSTEM SHOP DRAWINGS							
056	22 00 00	1.02B	97	RECYCLED CONTENT FOR STEEL PIPE							
057	22 00 00	1.02C	97	PLUMBING SYSTEM PRODUCT DATA							
058	22 00 00	1.02D	97	TESTS, FLUSHING AND DISINFECTION TEST							
059	22 00 00	1.02E	97	MATERIALS AND EQUIPMENT							
060	22 00 00	1.02F	97	BOLTS							
061	22 00 00	1.02G	97	PLUMBING SYSTEM OPERATION AND MAINTENANCE DATA							
062	23 07 00	1.02A	119	MICA PLATES							

063	23 07 00	1.02B	119	PIPE INSULATION SYSTEMS AND ASSOCIATED ACCESSORIES							
64	23 07 00	1.02C	119	RECYCLED CONTENT FOR INSULATION MATERIALS							
65	23 07 00	1.02D	119	PIPE INSULATION SYSTEMS							
66	23 07 00	1.02E	120	EQUIPMENT INSULATION SYSTEMS							
67	23 07 00	1.02F	120	THERMAL INSULATION							
68	23 07 00	1.02G	120	DISPLAY SAMPLES							
69	23 07 00	1.02H	120	PIPE INSULATION SYSTEMS							
70	26 27 29	1.03A	138	WIREWAYS							
71	26 27 29	1.03B	138	RECEPTACLES							
72	26 27 29	1.03C	138	CIRCUIT BREAKERS							
73	26 27 29	1.03D	138	CONDUIT AND FITTINGS (EACH TYPE)							
74	26 27 29	1.03E	139	POWER PEDESTAL							
75	26 27 29	1.03F	139	GROUNDING AND BONDING EQUIPMENT							
76	26 27 29	1.03G	139	DEVICE PLATES							
77	26 27 29	1.03H	139	WIRES AND CABLES							
78	26 27 29	1.03I	139	OUTLET BOXES AND COVERS							
79	26 27 29	1.03J	139	SPLICE AND TERMINATION COMPONENTS							
80	26 27 29	1.03K	139	WIREWAYS							
81	26 27 29	1.03L	139	CABINETS, JUNCTION BOXES, AND PULL BOXES							
82	26 27 29	1.03M	139	MOUNTING STRAPS							
83	26 27 29	1.03N	139	CONDUIT SUPPORT							
84	26 27 29	1.03O	139	600-VOLT WIRING TEST							
85	26 42 13	1.03A	154	DRAWINGS							
86	26 42 13	1.03B	155	ANODES							
87	26 42 13	1.03C	155	CATHODIC PROTECTION SYSTEM TESTING REPORTS							

88	26 42 13	1.03D	155	NATIVE POTENTIAL MEASUREMENT TESTING							
89	26 42 13	1.03E	155	PROTECTED POTENTIAL MEASUREMENT TESTING							
90	28 10 05	1.02A	162	ESS COMPONENTS SHOP DRAWINGS							
91	28 10 05	1.02B	162	OVERALL SYSTEM SCHEMATIC							
92	28 10 05	1.02C	162	VIDEO SURVEILLANCE SYSTEM (VSS) SCHEDULE							
93	28 10 05	1.02D	162	CAMERAS							
94	28 10 05	1.02E	162	COMPONENT ENCLOSURE							
95	28 10 05	1.02F	162	CONTRACTOR QUALIFICATIONS							
96	28 10 05	1.02G	162	INSTRUCTOR QUALIFICATIONS							
97	28 10 05	1.02H	162	WIRE AND CABLE							
98	28 10 05	1.02I	162	BONDING, GROUNDING, AND SHIELDING							
99	28 10 05	1.02J	163	ESS COMPONENTS							
100	28 10 05	1.02K	163	ESS TRAINING							
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102	28 10 05	1.02M	163	AS-BUILT DRAWINGS							
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143	33 52 40	1.03J	251	AUTOMATIC AIR VENT PRODUCT DATA							
144	33 52 40	1.03K	251	HYDROSTATIC TEST REPORT							
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148	33 52 40	1.03O	251	VALVE RECONDITIONING REPORT							
149	33 52 40	1.03P	251	BALL VALVE OPERATION AND MAINTENANCE DATA							
150	33 52 40	1.03Q	251	THERMAL RELIEF VALVE OPERATION AND MAINTENANCE DATA							
151	33 52 40	1.03R	251	STRAINER OPERATION AND MAINTENANCE DATA							
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163	35 51 13.00 20	1.04D	299	ANCHORAGE AND LIFTING INSERTS AND DEVICES							
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170	35 51 13.00 20	1.04K	300	TESTING TECHNICIAN AND TESTING AGENCY							
171	35 51 13.00 20	1.04L	300	HANDLING AND DOCK SYSTEM INSTALLATION INSTRUCTIONS							
172	35 51 13.00 20	1.04M	300	MANUFACTURER'S WARRANTY							
173	35 51 13.00 20	1.04N	300	AS-DRIVEN SURVEY VERIFICATION							

01 35 00 - DESIGN REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all work required for preparation of project structural calculations, as referenced in these contract documents. This includes, but is not limited to, the Floating Dock design.

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

A. American Concrete Institute

ACI 318, 2019 Building Code Requirements for
Structural Concrete

B. American Forest & Paper Association

NDS, 2018 National Design Specification for Wood
Construction ASD/LRFD

C. American Institute of Steel Construction, Inc.

AISC 325, 2017 Steel Construction Manual

D. American Society of Civil Engineers

ASCE-7, 2016 Minimum Design Loads for Buildings and
Other Structures

E. International Code Council

IBC, 2021 International Building Code

F. Precast/Prestressed Concrete Institute

PCI, 8th Ed., 2017 Design Handbook: Precast and
Prestressed Concrete

1.03 DEFINITIONS

A. Terms used in this document are defined as follows:

1) Complete Documents: Final design calculations

documenting all aspects of the structural system.

- 2) IBC: International Building Code published by the International Code Council.
- 3) Non-Structural Component: An architectural, mechanical, electrical, or special purpose part of the building that, by its size or standardized manufacturing and installation methods, possesses the internal structural capability to perform its function and utilizes its own support or connection to the Primary Building Structure.
- 4) Design Submittal Documents: All calculations that are considered complete as herein, and have been prepared and sealed by the PE.
- 5) Professional Engineer: A reference to a licensed engineer in general, that is duly licensed as defined by the State in which the project is located.

1.04 GENERAL SUBMITTAL REQUIREMENTS

- A. Design Submittal Documents shall be submitted with the Professional Engineer of Record's (PER) seal, signature and date affixed to the cover sheet of the calculations and on each structural drawing. Refer to Section 3 for more information on signing and stamping plans and calculations. Include on the cover sheet a summary of design loads and performance criteria as specified in Section 35 51 13.00 20 CONCRETE FLOATING DOCK SYSTEM.
- B. Only Design Submittal Documents which are complete as defined in the definitions shall be stamped and submitted for approval.
- C. Structural calculations, drawings, notes and/or specifications shall be submitted.

1.05 MINIMUM STRUCTURAL CALCULATION REQUIREMENTS

- A. In order to adequately review the technical aspects of design of the Structure for compliance, the following minimum calculation documentation shall be submitted:
 - 1) Design Criteria: See Section 35 51 13.00 20 CONCRETE FLOATING DOCK SYSTEM for design criteria. Calculations submitted shall clearly document on a summary sheet

the following information:

- (a) The codes used in the design.
- (b) Itemized dead & live loads used in the gravity design.
- (c) Wind loading.
- (d) Special loading(s) including mooring, berthing, current and wave.
- (e) Materials (wood, steel, concrete, etc.), grade of materials and stresses of materials used in design (bending, shear, compression) shall be noted in the calculations, notes and/or specifications.
- (f) Load combinations used in design for each material shall be documented.

2) Gravity Design: The following key items shall be included:

- (a) Design of the Primary Structural Components: design shall document the location, tributary area, span, loading and controlling condition for each member designed.
- (b) Calculations of the Primary Structural Components shall be keyed to the plans for reference.
- (c) Calculations shall note the final member size as shown on the plans, including the support condition.
- (d) Calculations shall include design of the connections between the Primary Structural Components.

B. Structural Component Design

- 1) Computer analysis and design results shall be submitted with an input model or sketch showing geometry, loading, boundary conditions, etc.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 STAMPING & SIGNING PLANS and CALCULATIONS

- A. Each original set of final calculations shall, as a minimum, be sealed, with original signature and date placed on the cover or title sheet.
- B. A seal may be a wet stamp, embossed or electronically produced.
- C. Documents that are signed using a digital signature shall have an authentication process attached to or logically associated with the electronic document. The digital signature shall be:
 - 1) Unique to the person using it.
 - 2) Capable of verification.
 - 3) Under sole control of the person using it.
 - 4) Linked to a document in such a manner that the electronic signature is invalidated if any data in the document is changed.
- D. Calculations: The front page of each set of calculations shall bear an original stamp, signature and date, printed name, address and phone number of the preparer along with the site location and project title clearly identifying the project. At minimum, the body of the report shall include a table of contents, a list of appendices and attachments, and a narrative describing the method of analysis, assumptions, and design approach presented in the report.

END OF SECTION

01 35 29 – HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to steps taken by the Contractor to comply with the health and safety requirements listed herein. The Contractor shall comply with all applicable federal, state, and local laws and regulations. The ultimate responsibility for identifying applicable requirements and protecting Contractor employees or sub-contractors' rests with the prime contractor.

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

ANSI/ASSP Z359 Series Fall Protection Code, Version 2
(Z359.1-2020, Z359.2-2017, Z359.3-2019, Z359.4-2013, Z359.6-2016, Z359.12-2019, Z359.13-2013, Z359.14-2021, and historical Z359.1-1992 (R1999))

B. ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATIONS:

40 CFR 204	Noise Abatement Program for Construction Equipment
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 302.4	Designation of Hazardous Substances
40 CFR 763	Asbestos Hazards and Emergency Response Act (AHERA)

C. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electric Code
NFPA 70E	Standard for Electrical Safety in the Workplace

NFPA 241 Standard for Safeguarding
 Construction, Alteration and
 Demolition Operations

D. U.S. Army Corps of Engineers (USACE):

 EM 385-1-1 Safety and Health Requirements
 Manual

E. U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH
 ADMINISTRATION (OSHA) REGULATIONS:

29 CFR 1910.134 Respiratory Protection

 29 CFR 1910.1200 Hazard Communication

 29 CFR 1910 Subpart I Personal Protective Equipment

29 CFR 1926.106 Working Over or Near Water

 29 CFR 1926.453 Aerial Lifts (Construction
 Specific)

29 CFR 1926 Subpart K Electrical Safe Work Practices

29 CFR 1926 Subpart L Scaffolds

29 CFR 1926 Subpart M Fall Protection

29 CFR 1926 Subpart T Demolition

 OSHA 3990-3 Guidance on Preparing Workplaces
 for COVID-19

F. U. S. DEPARTMENT OF TRANSPORTATION REGULATIONS:

 49 CFR 100-199 Hazardous Materials
 Transportation, Handling, and
 Storage Regulations

1.03 REFERENCE STATUTES: The statutes listed below form a
 part of this specification to the extent referenced.

 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
 (7 U.S.C. §§ 136 to 139y)

 Noise Control Act (NCA) (42 U.S.C. §§ 4901 to 4918)

1.04 HAZARDOUS MATERIAL TESTING:

- A. No tests have been conducted on the materials expected to be encountered during this work. The Contractor shall comply with the requirements of this specification in the event any materials are encountered which may pose a potential health hazard.

1.05 UNFORESEEN HAZARDOUS MATERIALS:

- A. If, during the course of work, additional material is determined to be hazardous to human health upon disturbance during construction operations, stop that portion of work and notify the Contracting Officer immediately.
- B. If asbestos is the hazard of concern, the materials shall be sampled by an EPA/State Certified/licensed Inspector and tested following the negative assessment protocol found in 40 CFR Part 763, Asbestos Hazards and Emergency Response Act (AHERA).

1.06 DEFINITIONS

- A. Sediment: Soil and other debris that has been eroded and transported by runoff water.
- B. Solid Waste: Rubbish, debris and other discarded solid materials resulting from industrial, commercial, and agricultural operations, and from community activities. Solid waste may also include non-sewage liquids.
- C. Rubbish: A variety of combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.
- D. Debris: Includes combustible and noncombustible wastes, such as ashes, waste materials that result from construction or maintenance and repair work, leaves, and tree trimmings.
- E. Chemical Wastes: Includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.
- F. Sanitary Wastes:
 - 1) Sewage: Wastes characterized as domestic sanitary sewage.

- 2) Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.
- G. Asbestos and Asbestos Containing Materials: Asbestos means actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite. Asbestos containing material means asbestos or any material containing asbestos such as asbestos waste, scrap, debris bags, containers, equipment, and asbestos-contaminated clothing consigned for disposal. Friable asbestos material means any material that contains more than one percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder, when dry, by hand pressure.
- H. Oily Waste: Includes petroleum products and bituminous materials.
- I. PCB (Polychlorinated Biphenyls): Toxic and non-biodegradable materials used extensively under trade names, such as Pyranol or Askarel, as insulating cooling fluids in capacitors and transformers.
- J. Hazardous Material (HM): Chemicals defined by OSHA 29 CFR 1910.1200 and under the U.S. Department of Transportation (DOT) regulations (Title 49 CFR Parts 100 through 199) which are determined by the Secretary of Transportation to present risks to safety, health, and property during transportation. The DOT regulations include requirements for shipping papers, package marking, labeling, transport vehicle placarding, and training of personnel handling hazardous materials.
- K. Hazardous Substance: Substances defined under the Clean Water Act and CERCLA as chemicals which are harmful to aquatic life or the environment and are regulated, if spilled or otherwise released to the environment. The EPA has designated "reportable quantities" for each hazardous substance (Table 40 CFR 302.4) under CERCLA. If an amount equal to or greater than the reportable quantity of a hazardous substance is released to the environment, that spill must be reported.
- L. Hazardous Waste (HW): Substances which are hazardous and have been discarded are regulated as hazardous waste under RCRA or State Health and Safety Codes and their implementing regulations. A waste is hazardous if it meets certain levels of reactivity, ignitability,

corrosivity, or toxicity, or is otherwise listed as a hazardous waste in Title 40 CFR Part 261 or in the respective State Health and Safety Code or Code of Regulations.

1.07 SUBMITTALS: Submit the following in accordance with Section 01 33 00, "Submittal Procedures":

- A. Construction Waste Management Plan: Refuse and excess or waste materials resulting from construction operations shall become the property of the Contractor and shall be recycled to maximum extent possible or disposed of off government property. All disposal shall be done in accordance with federal, state, and local laws and regulations. Develop and implement a Construction Waste Management Plan quantifying material diversion in order to recycle, reuse and/or salvage to the maximum extent feasible construction, demolition and land clearing waste.
- B. Solid Waste Disposal Permit: Upon disposal, provide copies of the acceptance receipts for the material, from the disposal site.
- C. HW Manifests: Upon disposal of hazardous waste, submit a copy of the completed manifests within 5 calendar days of delivery of the wastes to the EPA approved treatment, storage and disposal facility.
- D. HM/HW Handling Plan: Comply with all local, state, and federal laws and regulations when handling hazardous materials and disposing of and handling hazardous and other wastes. The Contractor shall have a compliance program outlining how the Contractor handles and disposes of hazardous materials, petroleum products, hazardous substances, and hazardous waste. The program shall include, but is not limited to, the following elements as appropriate: a general storage site plan, methods used to analyze whether generated material (blasting debris, paint waste, etc.) is hazardous, any hazardous waste licenses and permits, air district permits, and the identification of hazardous waste and material transportation and disposal contractors. The Coast Guard has the right to require removal from the contract performance of any subcontractor who fails to comply with these laws and regulations or who fails to provide appropriate evidence of compliance with them.

- E. Safety Data Sheets (SDS's): Copies of all SDS's for all hazardous materials (including petroleum products) shall be submitted along with a listing of quantities of these hazardous materials proposed to be stored on site.
- F. Accident Prevention: Submit a copy of your "Accident Prevention" or "Injury and Illness Prevention" Plan as required under the submittal register. The work plan shall address the specific hazards on the jobsite including Fire Prevention and Hot Work authorization per EM-385-1-1 and NFPA 241, Chapter 5.1. EM 385-1-1 Appendix A illustrates typical content for the Accident Prevention Plan (APP). Contractor shall post the company OSHA 300A in a conspicuous location.
- G. Mobile Equipment Operator List: A list of qualified operators for all mobile equipment that will be brought onto the job site with employee name(s), qualifications, and specific equipment to be operated shall be provided to the Contracting Officer prior to equipment operation. (This includes forklifts, cranes, motorized lifting device, etc.)
- H. Fall Protection: All construction activities shall comply with the fall protection requirements of CFR 1926 Subpart M and ANSI Z359. Submit a work plan if required under the submittal register.
- I. Scaffolds and Powered Platforms: All above ground level work which requires scaffolds shall meet 29 CFR 1926 Subpart L - Scaffolds. The Contractor shall submit the name of their competent person, designated and authorized by the employer to install and inspect scaffolding. All work that requires powered platforms, vehicle-mounted elevation and rotating work platform shall meet 29 CFR 1910. Subpart F - Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms.
- J. Dive Safety Plan: Submit a Dive Operations Plan, AHA, emergency management plan, and personnel list that includes qualifications, for each separate diving operation. Submit these documents for review and approval at least 15 working days prior to commencement of diving operations. These documents must be at the diving location at all times. Provide each of these documents as a part of the project file.

- 1.08 DUST CONTROL: Keep dust down at all times, including non-working hours, weekends, and holidays. Sprinkle or treat with dust suppressors, haul roads, and other areas disturbed by operations. No dry power brooming is permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing is permitted only for cleaning nonparticulate debris, such as steel reinforcing bars. No sandblasting is permitted unless dust is confined. Only wet cutting of concrete blocks, concrete, and asphalt is permitted. No unnecessary shaking of bags is permitted where bagged cement, concrete mortar, and plaster is used.
- 1.09 NOISE: Make the maximum use of "low-noise-emission products" as certified by EPA and described at 40 CFR Part 204. No blasting or use of explosives is permitted. Comply with applicable portions of the Noise Control Act (NCA). The Contractor is responsible for complying with all other federal, state, and local noise control laws and regulations.
- 1.10 ELECTRICAL WORK: All electrical work shall comply with electrical safety-related work practices, wiring methods and protection, maintenance and environmental considerations in 29 CFR 1926 Subpart K and NFPA 70 and 70E as well as applicable National Electrical Safety Code (NESC), National Electric Code (NEC), OSHA and USCG regulations.
- 1.11 WORKING OVER OR NEAR WATER: When working over or near water, comply with 29 CFR 1926.106.
- 1.12 UNSAFE OR UNHEALTHY WORKING CONDITIONS: Each contract employee is responsible for complying with applicable safety and occupational health requirements, wearing prescribed safety and health equipment, reporting unsafe conditions/activities, and avoiding actions and conditions that may result in an accident. The Contractor is responsible for ensuring that all of its subcontractors are compliant with all of the Contractor requirements outlined in this section. Contractors will conduct appropriate safety meetings for all onsite employees, to include subcontractors. Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent aspects of appropriate Activity Hazard Analyses, establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation.

- 1.13 EMERGENCY PLANNING: The Contractor shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employees shall receive training in the procedures. The Emergency Action Plan must provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures.
- 1.14 CONTRACTOR SAFETY INSPECTION AND INVESTIGATION: The Contractor's safety representative shall be present on the project site per the criteria of "Collateral Duty Safety Officer" as defined in EM-385-1-1 Section titled "SITE SAFETY AND HEALTH OFFICER." The Contractor shall cooperate with any government-authorized investigation of Type A, B, C, or D Mishaps, or near miss incidents by providing access to employees; and relevant information in the possession of the Contractor regarding the incident. Additionally, the Contractor shall be prepared to provide proof of training upon request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

01 35 43 – ENVIRONMENTAL PROCEDURES

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to all necessary steps taken by the Contractor to comply with the environmental protection requirements listed herein.
- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.
- A. ENVIRONMENTAL PROTECTION AGENCY (EPA) REGULATIONS:
- | | |
|------------|---|
| 40 CFR 122 | National Pollution Discharge Elimination System |
| 40 CFR 261 | Identification and Listing of Hazardous Waste |
| 40 CFR 262 | Standards Applicable to Generators of Hazardous Waste |
| 40 CFR 263 | Standards Applicable to Transporters of Hazardous Waste |
| 40 CFR 761 | Polychlorinated Biphenyls (PCB) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions |
- B. U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS:
- | | |
|-----------------|----------------------------|
| 29 CFR 1910.120 | Hazardous Waste Operations |
|-----------------|----------------------------|
- C. U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS:
- | | |
|----------------|---|
| 49 CFR 100-199 | Hazardous Materials Transportation, Handling, and Storage Regulations |
|----------------|---|
- 1.03 REFERENCE STATUTES: The statutes listed below form a part of this specification to the extent referenced.
- Clean Air Act (CAA) (42 U.S.C. §§ 7401 to 7642)

Clean Water Act (33 U.S.C. §§ 1251 to 1387)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. §§ 9601 to 9675)

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §§ 136 to 139y)

Federal Water Pollution Control Act (CWA) (33 U.S.C. §§ 1251)

Toxic Substance Control Act (TSCA) (15 U.S.C. §§ 2601 to 2654)

Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §§ 6901 to 6991i)

1.04 ENVIRONMENTAL PROTECTION REQUIREMENTS: Provide and maintain environmental protection during the life of the Contract to control pollution or to correct conditions that develop during construction. Comply with all federal, state, and local laws and regulations pertaining to water, air, soil, and noise pollution.

1.05 PROTECTION OF NATURAL RESOURCES

- A. Preserve the natural resources within the project boundaries and outside the limits of permanent work performed under this Contract in their existing condition or restore to an equivalent or improved condition upon completion of the work. Repair or restore to original condition all trees or other landscape features scarred or damaged by equipment or operations. Obtain Contracting Officer's approval before repair or restoration. Confine construction activities to areas defined by the work schedule, drawings, and specifications. Federal Acquisition Regulation clause 52.236-9 applies.
- B. Except in areas indicated to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without special written permission from the Contracting Officer. Protect existing trees which may be damaged by construction operations.
- C. Construction equipment is to be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they shall be cleaned up

immediately. Drip pans shall be utilized when vehicles are parked. Confine equipment maintenance and/or repair to one location. Control runoff in this area to prevent contamination of soils and water.

- D. At or before Contract completion, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and all other vestiges of construction. Temporary roads, parking areas, staging areas, and similar temporary use areas where excavation has been accomplished shall be graded in conformance with surrounding areas. Restore all disturbed areas to their original condition.
- E. For all work in or over water habitats, provide a debris boom approved by the Contracting Officer. Take precautions to preclude construction materials from entering the water and immediately remove any material that enters the water in the work area. Report spills of any liquids into the water habitat and take steps to preclude spread or dissipation of spilled liquids.

1.06 CONTROL AND DISPOSAL OF WASTES: With the exception of materials specifically indicated or specified to be salvaged for reuse in construction, or turned over to the government, all wastes and demolished materials become the Contractor's property and shall be removed from the job site daily.

1.07 HAZARDOUS WASTE DISPOSAL: Any hazardous or regulated waste generated by work under this contract is the responsibility of the Contractor and shall be disposed of in accordance with all applicable federal, state, and local regulatory requirements. The facility is the generator of record and will provide the EPA ID number and manage manifests. The site environmental manager must approve and sign all manifests. The Contractor may leave wastes on site pending analysis for disposal. The wastes will be accumulated at a location designated by the POC. The facility address will be used on each manifest. CEU Oakland shall not appear on any manifest. The Contractor shall arrange and be responsible for the transportation and final disposal of any hazardous waste. Comply with applicable parts of 40 CFR 262. Any manifest of hazardous waste shall be signed by the Government Hazardous Materials/Hazardous Waste Coordinator at the work site (hereinafter "HM/HW Coordinator"). The

Contractor shall contact the HM/HW Coordinator for disposal of any hazardous waste. No Contractor or subcontractor shall have the authority to sign a hazardous waste manifest using the facility's EPA generator ID number. Only the HM/HW Coordinator may sign a manifest for hazardous waste.

- A. HM/HW Spill Response: Store chemical waste in corrosion resistant containers labeled to identify type of waste and date filled. Comply with 49 CFR 178. Remove containers from government property and dispose of in accordance with federal, state, and local regulations. Submit a certified copy of the acceptance receipts for these materials, indicating quantities. For oil and hazardous material spills which may be large enough to violate federal, state, and local regulations, notify the Contracting Officer immediately.
- B. Dispose of petroleum products and petroleum contaminated soil and water in accordance with procedures meeting federal, state, and local regulations. Comply with 40 CFR 761 for removal and disposal of PCB containing articles.
- C. Comply with 40 CFR 262 and 263, 29 CFR 1910.120, and state regulations for removal, transportation and disposal of hazardous waste as discussed in the Contractor's HM/HW Handling Plan.
- D. Coordinate use of sanitary, odor, and pest control systems with COR. The Contractor is responsible for compliance with FIFRA at the work site.
 - 1) Herbicides: Any herbicides shall be applied in strict compliance with the product's EPA or State of California registered labeling. All manufacturer's instructions and recommendations for the preparation and application of herbicides shall be strictly followed. In addition, the Contractor shall comply with all other applicable federal, state or local laws and regulations concerning the application, storage and disposal of such chemicals.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

02 41 00 - DEMOLITION

PART 1 GENERAL

- A. SECTION INCLUDES: This section applies to demolition works as shown on the Contract Drawings.

- 1.01 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

- A. AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.6	(2006; R 2016) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations Standard Title
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- B. U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements Standard Title
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- C. U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2016; Rev L; Change 2) Obstruction Marking and Lighting
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- D. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
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- 1.02 DEFINITIONS

- A. Demolition

Demolition is the process of tearing apart and removing any feature of a facility together with any related handling and disposal operations.

B. Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES

A. Demolition Plan

Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Append tracking forms for all removed materials indication type, quantities, condition, destination, and end use. Provide procedures for safe conduct of the work in accordance with EM 385-1-1.

B. Existing Conditions

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs or electronic images with a minimum resolution of 3072 x 2304 pixels, capable of a print resolution of 300 dpi, will be acceptable as a record of existing conditions. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results to the Contracting Officer.

C. Notification

Submit timely notification of demolition to federal, state, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the Contracting Officer in

writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M.

1.04 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 17, Demolition, and other applicable Sections.

1.05 ITEMS TO REMAIN IN PLACE

Comply with FAR 52.236-9 to protect existing vegetation, structures, equipment, utilities, and improvements. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements to remain.

A. Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

B. Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Contractor, and disconnected and sealed by the Contractor.

C. Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities is specified or indicated, provide approved barricades, temporary

covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

1.06 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.07 QUALITY ASSURANCE

Comply with federal, state, and local hauling and disposal regulations. Conform to the safety requirements contained in ASSP A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

A. Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.08 PROTECTION

A. Traffic Control Signs

- 1) Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind. Notify the Contracting Officer prior to beginning such work.
- 2) Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 100 feet, but less than 200 ft, above ground level. The use of LED based obstruction lights are permitted. For temporary structures (including cranes) over 200 ft above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Perform light construction and installation in compliance with FAA AC 70/7460-1. Lights must be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and

tested and are in operation.

B. Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure and take immediate action to protect all personnel working in and around the project site. No area, section, or structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.09 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE REMOVED

A. Structures

- 1) Remove existing structures indicated to be removed.
- 2) Demolish structures in a systematic manner from the top of the structure to the ground.
- 3) Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to the existing structure.

B. Utilities and Related Equipment

1) General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the government except when approved in

writing and then only after temporary utility services have been approved and provided. Do not begin demolition work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

2) Disconnecting Existing Utilities

Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

C. Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage of removed members or members to remain.

D. Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Make finished surfaces of patched area flush with the adjacent existing surface and match the existing adjacent surface as closely as possible to texture and finish.

E. Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated on station storage area as directed by the

Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse.

1) Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; drain tanks, piping and fixtures; if previously used to store flammable, explosive, or other dangerous liquids, steam clean interiors. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit.

2) Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, attach end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Classify piping not designated for salvage, or not reusable, as scrap metal.

3) Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify non-porcelain broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.

F. Electrical Equipment and Fixtures

Remove motors, motor controllers, and operating and control equipment. Remove wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

1) Electrical Devices

Remove switches, conductors including wire, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

2) Conduit and Miscellaneous Items

Remove conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports and straps as debris to be removed and disposed.

3.02 DISPOSITION OF MATERIAL

A. Title to Materials

All materials and equipment removed and not reused or salvaged, become the property of the Contractor and must be removed from government property. Materials approved for storage by the Contracting Officer must be removed before completion of the contract. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer. The government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

B. Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable combustible material off the site.

3.03 CLEANUP

Remove debris and rubbish from project site. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.04 DISPOSAL OF REMOVED MATERIALS

A. Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations.

B. Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on government property.

END OF SECTION

DIVISION 05 - METALS

05 05 23.16 – STRUCTURAL WELDING

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to the requirements for all welding shown on the Contract Drawings and specified herein.
- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.
- A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
- | | |
|----------|---|
| AISC 360 | (2016) Specification for Structural Steel Buildings |
|----------|---|
- B. AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
- | | |
|------------------|--|
| ANSI/ASNT CP-189 | (2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel |
|------------------|--|
- C. AMERICAN WELDING SOCIETY (AWS)
- | | |
|----------------|---|
| AWS A2.4 | (2020) Standard Symbols for Welding, Brazing and Nondestructive Examination |
| AWS D1.1/D1.1M | (2020; Errata 1 2021) Structural Welding Code - Steel |
| AWS D3.6 | (2017) Underwater Welding Code |
| AWS QC1 | (2016) Specification for AWS Certification of Welding Inspectors |
| AWS Z49.1 | (2021) Safety in Welding, Cutting and Allied Processes |

D. ASTM INTERNATIONAL (ASTM)

ASTM E165/E165M (2023) Standard Practice for
Liquid Penetrant Examination for
General Industry

ASTM E709 (2021) Standard Guide for Magnetic
Particle Testing

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

A. Welding Quality Assurance Plan

Submit a Welding Quality Assurance Plan and records of
tests and inspections.

B. Welding Procedure Qualifications

Conform to AWS D1.1/D1.1M and to the specifications in
this section. Submit for approval copies of the welding
procedure specification and the procedure qualification
records for each type of welding being performed.
Approval of any procedure, however, does not relieve the
Contractor of the sole responsibility for producing a
finished structure meeting all the specified
requirements. Submit this information on the forms in
Annex M of AWS D1.1/D1.1M.

C. Welder, Welding Operator, and Tacker Qualification

Each welder, welding operator, and tacker assigned to
work on this contract must be qualified in accordance
with the applicable requirements of AWS D1.1/D1.1M and as
specified in this section. Welders, welding operators,
and tackers who make acceptable procedure qualification
test welds will be considered qualified for the welding
procedure used within the applicable essential variables
for welder qualification.

D. Previous Qualifications

Welding procedures previously qualified by test in
accordance with AWS D1.1/D1.1M, may be accepted for this
contract without re-qualification, upon receipt of the
test results, if the following conditions are met:

- 1) Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- 2) The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- 3) The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

Re-qualification is required if any of the conditions of paragraph 1.05.B.3 are met.

E. Pre-Qualified Procedures

Welding procedures which are considered pre-qualified as specified in AWS D1.1/D1.1M will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not pre-qualified. Procedure qualification is mandatory for these joints.

F. Welding Electrodes and Rods

Submit product data on welding electrodes and rods.

G. Nondestructive Testing (NDT)

Submit all records of nondestructive testing.

H. Weld Inspection Log

Document all visual inspections in the Visual Weld Inspection Log and submit.

I. Certified Welding Inspector

Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

J. Nondestructive Testing Personnel

Submit qualifications for nondestructive testing personnel in accordance with the requirements of ANSI/ASNT CP-189 for Levels I or II in the applicable nondestructive testing method. Level I inspectors must

have direct supervision of a Level II inspector.

1.04 GENERAL REQUIREMENTS

Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved. Each contractor performing welding must maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.05 QUALITY ASSURANCE

Except for pre-qualified (in accordance with AWS D1.1/D1.1M) and previously qualified procedures, each contractor performing welding must record in detail and qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Individually identify and clearly reference on the detail drawings and erection drawings all welding procedure specifications, or suitably key them to the contract drawings. In case of conflict between this specification and AWS D1.1/D1.1M, this specification governs.

A. General Requirements

Provide documentation of the following:

- 1) Component Thickness 1/8 inch and greater:
Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.1/D1.1M.

B. Welder, Welding Operator, and Tacker Qualification

- 1) Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without re-qualification if all the following conditions are met:

- a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.
- b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

2) Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, submit the names and certification that each individual is qualified as specified. State in the certification the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. Keep the certification current, on file, and furnish 3 copies.

3) Renewal of Qualification

Re-qualification of a welder or welding operator is required under any of the following conditions:

It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Submit as evidence of conformance all records showing periods of employment, name of employer where welder, or welding

operator, was last employed, and the process for which qualified.

A tacker who passes the qualification test is considered eligible to perform tack welding indefinitely in the positions and with the processes for which he/she is qualified, unless there is some specific reason to question the tacker's ability or there has been a gap greater than 6 months since he/she last used the process. In such a case, the tacker is required to pass the prescribed tack welding test.

C. Symbols and Safety

Use symbols in accordance with AWS A2.4, unless otherwise indicated. Follow safe welding practices and safety precautions during welding in conformance with AWS Z49.1.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

Conform the design of welded connections to AISC 360, unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Perform all testing at or near the work site. Maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

2.02 WELDING EQUIPMENT AND MATERIALS

Provide all welding equipment, welding electrodes and rods, welding wire, and fluxes capable of producing satisfactory welds when used by a qualified welder or welding operator. Provide welding equipment and

materials that comply with the applicable requirements of AWS D1.1/D1.1M.

PART 3 EXECUTION

3.01 WELDING OPERATIONS

A. Requirements

Conform workmanship and techniques for welded construction to the requirements of AWS D1.1/D1.1M and AISC 360. When AWS D1.1/D1.1M and the AISC 360 specification conflict, the requirements of AWS D1.1/D1.1M govern.

Underwater welding must be in accordance with AWS D3.6.

B. Electrodes

Use E70XX electrodes. All welding electrodes must be such as will best develop the full strength and equivalent characteristics of the respective steel sections being welded. Do not use welding materials which are not readily identifiable, or on which the flux has been damaged, or which are otherwise of questionable acceptability.

C. Welding Machines

Perform all arc-welding with welding machines in such condition as to enable qualified welders and welding operators to follow the applicable procedure specifications and attain resulting welds of acceptable quality as required by the codes and/or specifications.

D. Preparation

Perform shearing, flame cutting, beveling and chipping carefully and accurately in such a manner to produce a smooth and uniform surface. Whenever possible, this work must be done with automated or mechanically guided tools. Leave all edges, including bevels, free of slag, deep scars and gouges.

E. Beveling

Particular importance must be assigned to maintaining joint detail dimensions, included groove angle, and joint root opening clearance during fit-up activities. Any

beveled edge that has been damaged or does not conform to the standard joint welding detail shown in AWS D1.1/D1.1M must be restored to the minimum acceptable tolerance prior to its incorporation into the structure.

F. Preheating

Preheating of base metal prior to welding must be in accordance with the qualified welding procedure.

G. Weather

Welding will not be permitted during conditions of precipitation or wind speeds exceeding the conditions for which a welding procedure has been qualified, unless performed in a protective environment.

H. Sequencing

Weld bead sequencing must be typically as shown in the applicable welding procedure. Perform weld sequencing to minimize residual stress build up.

I. Grounding

During welding offshore, ground the welding generator only to the component of the structure being welded and as close as practical to the work. Grounding connections to the barge/ship carrying the welding generators will not be permitted. Completely insulate the welding and ground cable and do not allow to drop or hang in the water. The minimum cross-sectional area of the return ground cable must be one million circular mils per 2,000 amperes per 100 feet of cable. Tightly secure grounding cable lugs to grounding plates. Thoroughly clean the lug contact to bare metal. Monitor grounding efficiency by simultaneously measuring the potential of the structure and the barge/ship housing the welding generators. A change in potential reading from either indicates insufficient grounding.

3.02 CONNECTIONS

A. Joints for Rolled Shapes, Plates and Tubes

All fabrication involving the connection of steelwork by welding must conform to the weld size and joint preparation shown on the drawings. Unless otherwise

indicated, join sections with complete joint penetration groove welds in such a manner as to develop 100 percent joint efficiency.

3.03 QUALITY CONTROL

A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Weld inspection must include preparation and performance of weld operations. Document this inspection in the Visual Weld Inspection Log. Test 100% of CJP welds using ultrasonic testing. Randomly test 25% of all PJP and fillet welds or as indicated by magnetic particle or dye penetrant testing. Verify the welds conform to paragraph STANDARDS OF ACCEPTANCE. Conform procedures and techniques for inspection with applicable requirements of AWS D1.1/D1.1M, ASTM E165/E165M, and ASTM E709.

3.04 STANDARDS OF ACCEPTANCE

Conform dimensional tolerances for welded construction, details of welds, and quality of welds with the applicable requirements of AWS D1.1/D1.1M and the contract drawings.

3.05 INSPECTION OF PRODUCTION WELDING

A. Inspector and Non-Destructive Testing (NDT) Personnel Requirements

- 1) Welding Inspectors: Personnel performing weld inspections must be AWS Certified Welding Inspectors (CWI) qualified and certified in accordance with the provisions of AWS QC1.
- 2) Nondestructive Testing Personnel: Personnel performing nondestructive testing must be qualified in accordance with the American Society for Nondestructive Testing Recommended Practice No. ASNT SNT-TC-1A. Only individuals qualified for NDT LEVEL I and working under the NDT LEVEL II or individuals qualified for NDT Level II may perform nondestructive testing.
- 3) Area Preparation: Prior to inspection of the Contractor's work, clean the working area sufficiently to allow access to the work. Provide and maintain in a safe operating condition, the necessary scaffolding,

ladders, walkways, lighting, etc., to allow for safe and thorough inspection by the COTR.

- 4) Access to Work: Technicians engaged in non-destructive test activities must have access to the Contractor's fabricating facility in general and area of testing in particular. Do not interfere with testing activities and allow adequate time for inspection.
- 5) Surface Preparation: Clean all major welds of slag, spatter, dirt, grease, oil and loose scale to aid in the visual inspection of those welds. The surface condition for properly applied welds must be adequate for proper interpretation of test results; therefore, any additional preparation of surfaces necessary, prior to instituting specific nondestructive mediums, must be provided by the Contractor.

B. Weld Classification

All welds are subject to visual examination. Welds vital to the strength and integrity of the structure are defined as "critical welds" and will be subject to nondestructive examination by means other than visual. Welds designated as critical include:

Splices in primary structural members

Plate-to-piling connections

Plate-to-support connections

Beam-to-beam connections

3.06 NONDESTRUCTIVE TESTING

The welding is subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop do not relieve the Contractor of the responsibility to provide weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment. Any indication of a defect is regarded as a defect, unless re-evaluation by nondestructive methods or by surface conditioning shows

that no unacceptable defect is present. Submit all records of nondestructive testing.

A. Radiographic Inspection (RT)

All "critical welds" must be radiographically inspected, throughout their full length where possible. Those "critical welds" which cannot be radiographically inspected must be tested by ultrasonic methods as specified hereinafter.

B. Magnetic Particle Inspection (MT)

All "critical welds" not amenable to radiographic examinations must be cleared by magnetic particle inspection prior to performing ultrasonic inspection.

C. Ultrasonic Inspection (UT)

All "critical welds" not amenable to radiographic examination must be inspected by ultrasonic methods following magnetic particle inspection. Butt welds made from one side must be checked to determine that the depth of penetration into the joint root meets the requirements of the design welding details.

3.07 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The work may be performed by the government's own forces or under a separate contract for inspection and testing. The government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.08 CORRECTIONS AND REPAIRS

If inspection or testing indicates defects in the weld joints, repair defective welds using a qualified welder or welding operator as applicable. Conduct corrections in accordance with the requirements of AWS D1.1/D1.1M and the specifications. Repair all defects in accordance with the approved procedures. Repair defects discovered between passes before additional weld material is deposited. Wherever a defect is removed and repair by

welding is not required, blend the affected area into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before re-welding, examine the area by suitable methods to ensure that the defect has been eliminated. Repaired welds must meet the inspection requirements for the original welds.

A. Radiographic Inspection

Repair weld areas containing defects exceeding the standards of acceptance in AWS D1.1/D1.1M as revealed by radiography, and perform additional radiographs of the repaired areas at the Contractor's expense.

END OF SECTION

05 12 00 – STRUCTURAL STEEL

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to the requirements for structural steel and fasteners as shown on the Contract Drawings and specified herein. All structural steel, fasteners, plates, and pipes not specifically identified as being coated must be hot dipped galvanized in accordance with this specification.
- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.
- A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
- | | |
|---------------|---|
| AISC 325 | (2017) Steel Construction Manual |
| AISC 326 | (2009) Detailing for Steel Construction |
| AISC 360 | (2016) Specification for Structural Steel Buildings |
| ANSI/AISC 303 | (2022) Code of Standard Practice for Structural Steel Buildings and Bridges |
- B. AMERICAN WELDING SOCIETY (AWS)
- | | |
|----------|---|
| AWS A2.4 | (2020) Standard Symbols for Welding, Brazing and Nondestructive Examination |
|----------|---|
- C. ASTM INTERNATIONAL (ASTM)
- | | |
|-----------------|---|
| ASTM A53/A53M | (2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM A123/A123M | (2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |

ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A500	(2021; E2021) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572/A572M	(2021; E 2021) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2022) Standard Specification for Structural Steel Shapes
ASTM F436/F436M	(2024) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2019; R 2024) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
D. SOCIETY FOR PROTECTIVE COATINGS (SSPC)	
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
E. U.S. DEPARTMENT OF DEFENSE (DOD)	
UFC 3-301-01	(2023; with Change 4, 2025) Structural Engineering

F. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926,
Subpart R

Steel Erection

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

A. Fabrication Drawings

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with ANSI/AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

B. Steel

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements.

C. Bolts, Nuts, Washers, and Threaded Rods

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

D. Bolt Testing Reports

Submit bolt testing reports.

E. Galvanizing

Submit certificate that galvanizing conforms to the requirements stated herein.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

Provide the structural steel system, including galvanizing, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with ANSI/AISC 303, AISC 360, and UFC 3-301-01 except as modified in this contract.

If there are locations where dissimilar metals are in contact with each other, use isolation bushing.

2.02 STEEL

All steel must be hot dipped galvanized unless otherwise noted.

A. Structural Steel

Wide flange and W shapes, ASTM A992/A992M. Angles, Channels and Plates, ASTM A572/A572M, Grade 50.

B. Steel Hollow Shape Section (HSS)

Hollow Shape Sections, ASTM A500, Grade B, $F_y = 46$ ksi.

C. Steel Pipe

ASTM A53/A53M, Type E or S, Grade B, weight class STD (Standard).

D. Steel Pipe Pile

ASTM A252, Grade 3.

2.03 BOLTS, NUTS, AND WASHERS.

A. High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized must be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretensioned installation without stripping. The supplier must supply

nuts that have been lubricated and tested with the supplied bolts.

1) Bolts

ASTM A325, Type 1 Heavy Hex Head Style, plain finish hot dipped zinc coating.

2) Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

3) Washers

ASTM F436/F436M, plain carbon steel.

B. Threaded Rods

1) Threaded Rods

ASTM F1554 Gr 55, Class 1A.

2) Anchor Nuts

ASTM A563, Grade A, hex style.

3) Anchor Washers

ASTM F844.

2.04 GALVANIZING

ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.05 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member. Splices not indicated require the approval of the Contracting Officer.

A. Markings

Prior to erection, identify members by a painted erection

mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

B. Shop Primer

1) Cleaning

SSPC SP 6/NACE No.3. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

PART 3 EXECUTION

3.01 ERECTION

Erection of structural steel must be in accordance with the applicable provisions of AISC 325, ANSI/AISC 303 and 29 CFR Part 1926, Subpart R.

3.02 STORAGE

Protect from corrosion, deformation, and other types of damage. Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.03 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

A. High-Strength Bolts and Threaded Rods

High-strength bolts and threaded rods must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Protect fastener components from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the

work must be returned to protected storage at the end of the work shift.

3.04 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing.

3.05 WELDING

Welding must be in accordance with Section 05 05 23.16 STRUCTURAL WELDING.

3.06 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.07 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Notify the Contracting Officer in writing of defective welds, bolts, threaded rods, nuts, and washers within 7 working days of the date of the inspection.

A. High-Strength Bolts

1) Testing Bolt, threaded rod, Nut, and Washer Assemblies

Test a minimum of 3 bolt, threaded rod, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Testing must be completed by a third party. Demonstrate that the bolts, threaded rods, and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements.

2) Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

06 13 33 – PIER TIMBERWORK

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all timber work required for the Covered Mooring repair.

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

A. AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M4 (2023) Standard for the Care of Preservative-Treated Wood Products

AWPA M6 (2024) Brands Used on Preservative Treated

AWPA P34 (2014) Standard for Copper Naphthenate, Waterbone (CuN-W)

AWPA T1 (2024) Use Category System: Processing and Treatment Standard Materials

AWPA U1 (2024) Use Category System: User Specification for Treated Wood

B. ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A307 (2023) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

ASTM D5643/D5643M (2012) Standard Specification for
Coal Tar Roof Cement, Asbestos
Free

C. U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-P-21035 (1991; Rev B; Notice 2 2003;
Notice 3 2021) Paint, High Zinc
Dust Content, Galvanizing Repair
(Metric)

D. WESTERN WOOD PRESERVERS INSTITUTE (WWPI)

WWPI Mgt Practices (1996; R 2011) Best Management
Practices for the Use of Treated
Wood in Aquatic and Wetland
Environments

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

A. Pier Timberwork

Submit drawings of treated timber showing dimensions of
cut, framed, or bored timbers.

B. Preservative Treatment - Pier Timberwork

The Contractor must provide the Contracting Officer's
Representative (COR) with the inspection report of an
independent inspection agency, approved by the
Contracting Officer, that offered products comply with
applicable AWPA standards.

C. Delivery Inspection List

Field inspect and submit a verification list of each
treated timber member and each strapped bundle of treated
lumber indicating the wording and lettering of the
quality control markings, the species and the condition
of the wood. Do not incorporate materials damaged in
transport from plant to site. Inspect all preservative-
treated wood, visually to ensure there are no excessive
residual materials or preservative deposits. Material
must be clean and dry or it will be rejected due to
environmental concerns.

D. SDS and CIS

Provide Safety Data Sheets (SDS) and Consumer Information Sheets (CIS) associated with timber preservative treatment. Contractor must comply with all safety precautions indicated on SDS and CIS.

E. Pesticide Applicator Company Self-Certification

Provide the Contracting Officer, a statement signed by the responsible site supervisor or higher company representative, certifying that the Contractor will comply with all pesticide label instructions. The certification should identify by name all individuals (applicators) who will be working with wood preserving pesticide products on site.

F. Best Management Practices (BMPs)

The producer of the treated wood products must provide certification that WWPI Mgt Practices for the use of Treated Wood in Aquatic and Wetland Environments were utilized including a written description and appropriate documentation of the BMPs utilized.

1.04 DELIVERY, STORAGE, AND HANDLING

Handle and store timber in accordance with AWPA M4. Follow precautions identified in SDS and CIS provided by the supplier of treated wood products.

Open-stack untreated timber and lumber material on skids at least 12 inches above ground, in a manner that will prevent warping and allow shedding of water. Close-stack treated timber and lumber material in a manner that will prevent long timbers or preframed material from sagging or becoming crooked. Keep ground under and within 5 feet free of weeds, rubbish, and combustible materials. Protect materials from weather. Handle treated timber with ropes or chain slings without dropping, breaking outer fibers, bruising, or penetrating surface with tools. Do not use cant dogs, peaveys, hooks, or pike poles. Protect timber and hardware from damage.

1.05 QUALITY ASSURANCE

A. Preservative Treatment - Pier Timberworks

The Contractor must be responsible for the quality of treated wood products. The Contractor must provide the Contracting Officer's Representative (COR) with the inspection report of an independent inspection agency, approved by the Contracting Officer, certifying that the offered products comply with applicable AWP standards. Identify treatment on each piece by the quality mark of an agency accredited by the Board of Review of the American Lumber Standard Committee. Inspect all preservative-treated wood visually to ensure there are no excessive residual materials or preservative deposits. Material must be clean and dry or it will be rejected because of environmental concerns.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber and Timbers

Provide solid sawn lumber and timbers of stress-rated Southern Pine, Douglas Fir-Larch, or Red Pine. The association or independent inspection agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Use lumber or timbers rated No. 1 or better.

B. Preservative Treatment

Fabricate lumber and timbers before preservative treatment. Each piece of treated lumber or timber must be branded, by the producer, in accordance with AWP M6. The type of preservative, retention, and penetration must be based on Use Category and species and in accordance with AWP U1 and AWP T1. The Contractor must be responsible for the quality of treated wood products.

C. Hardware

Hardware must consist of bolts with necessary nuts and washers, timber connectors, drift pins, dowels, nails, screws, spikes, and other fastenings. Bolts and nuts must conform to ASTM A307. Provide bolts with washers under nut and head. Hot-dip galvanize all hardware in accordance with ASTM A123/A123M or ASTM A153/A153M, as

applicable.

PART 3 EXECUTION

3.01 INSTALLATION

Cut, bevel, and face timbers prior to plant preservative treatment. Provide protective equipment for personnel fabricating, field treating, or handling materials treated with creosote or water-borne salts.

A. Framing

Cut and frame lumber and timber so that joints will fit over contact surface. Open joints are unacceptable. Shimming is not allowed. Drill holes for drift pins and dowels with a bit 1/16 inch less in diameter than the pin or dowel. Drill holes for bolts with a bit 1/16 inch larger in diameter than rod or bolt. Drill holes for lag screws in two parts. Make lead hole for shank the same diameter as shank. Make lead hole for the threaded portion approximately two-thirds of the shank diameter. Counterbore for countersinking wherever smooth faces are indicated or specified.

B. Fastening

Vertical bolts must have nuts on the lower end. Where bolts are used to fasten timber to timber bolt members together when they are installed and retighten immediately prior to final acceptance of contract. Provide bolts having sufficient additional threading to provide at least 3/8 inch per foot thickness of timber for future retightening.

3.02 FIELD TREATMENT

A. Pier Timberwork

Field treat all cuts, holes, bevels, notches, refacing, abrasions, and injuries such as abrasions or holes from removal of spikes or nails made in the field in treated timbers in accordance with AWPA M4, SDS and CIS. Trim cuts and abrasions before field treatment. Depressions or openings around bolt holes, joints, or gaps including recesses formed by counterboring must be field treated with copper naphthenate conforming to AWPA P34; and after

bolt or screw is in place, fill with coal-tar roofing cement conforming to ASTM D5643/D5643M.

B. Galvanized Surfaces

Repair and recoat zinc coating which has been field or shop cut, burned by welding, abraded, or otherwise damaged to such an extent as to expose the base metal. Thoroughly clean the damaged area by wire brushing and remove traces of welding flux and loose or cracked zinc coating prior to painting. Paint cleaned area with two coats of zinc oxide-zinc dust paint conforming to MIL-P-21035. Compound paint with a suitable vehicle in a ratio of one part zinc oxide to four parts zinc dust by weight.

END OF SECTION

06 73 01 – FIBERGLASS REINFORCED PLASTIC (FRP) GRATING

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to the FRP grating for gangway platform.
- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.
- A. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
- ASCE 7-16 (2017) Minimum Design Loads for Buildings and Other Structures
- B. ASTM INTERNATIONAL (ASTM)
- ASTM D635 (2022) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- ASTM D696 (2024) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
- ASTM D953 (2019) Standard Test Method for Pin-Bearing Strength of Plastics
- ASTM D2344/D2344M (2022) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
- ASTM D2863 (2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
- ASTM D3039/D3039M (2017) Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

ASTM D7264/D7264M	(2021) Standard Test Method for Flexural Properties of Polymer Matrix Composite Materials
ASTM D7869	(2017) Standard Practice for Xenon Arc Exposure Test with Enhanced Light and Water Exposure for Transportation Coatings
ASTM E84	(2024) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E662	(2021a; E 2021) Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
ASTM G154	(2023) Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Materials

C. INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2024) International Building Code
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D. U.S. DEPARTMENT OF DEFENSE (DOD)

SMP 800-C	Bombardier Test Method for Toxic Gas Generation from Material Combustion
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E. UL SOLUTIONS (UL)

UL 94	(2023; Reprint Jan 2024) UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
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1.03 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

A. Installation Drawings, Templates, and Directions

Submit installation drawings, templates, and directions for installing anchorages, anchor bolts, and items with integral anchors.

B. FRP Grating & Clips and Anchorage

Submit manufacturer's catalog data, to include two copies of the manufacturer's specifications, load tables, dimension diagrams, and anchor details

C. Design Requirements

Submit documentation that the FRP grating meets all design requirements in this specification.

D. Manufacturer's Sample Warranty

Provide three-year manufacturer's limited warranty on all FRP products against defects in materials and workmanship. Submit the Manufacturer's Sample Warranty before work starts.

E. Certification of Anchorage System compliance with ASCE 7-16.

Submit Certification of Anchorage System compliance with ASCE 7-16. Deliver such items to the Contracting Officer and the project site before installation starts. Ensure that the manufacturer is certified to ISO 9001-2008.

F. Manufacturer's Recommendations

Submit shipping, handling, and erection procedures, along with instructions for care and maintenance after installation.

G. Manufacturer's Certification of Installation

Submit Manufacturer's Certification of Installation confirming FRP grating was installed in accordance with the manufacturer's instructions.

H. Manufacturer's Warranty

Submit original and one copy of manufacturer's signed Warranty.

1.04 QUALITY CONTROL

Provide items by manufacturers having a minimum of 10 years of experience in the design and manufacture of similar products and systems. In addition, if requested, provide a record of at least five separate, similar, successful installations in the last 5 years.

1.05 DELIVERY, HANDLING, AND STORAGE

Deliver manufactured materials in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Ensure that all adhesives, resins, and their catalysts and hardeners are crated or boxed separately, and noted as such.

Handle all materials to prevent abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Store adhesives, resins and their catalysts in dry indoor facilities between 70 and 85 degrees F until they are required.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

Provide gratings composed of continuous roving fiberglass reinforcement and resin in qualities, quantities, properties, arrangements, and dimensions as necessary to meet the design requirements and dimensions as specified.

Provide resin of isophthalic polyester with chemical formulations as necessary to provide the corrosion resistance, strength, and other physical properties conforming to the specified requirements.

Ensure that all surfaces of FRP items and fabrications are nonslip grit, resin-rich, and free of voids, dry spots, cracks, and unreinforced areas. Completely cover all glass fibers with resin to protect against their exposure to ultraviolet light, wear, or weathering.

A. Design Requirements

Test	Standard	Structural Performance Requirements	Minimum Flexural Strength	Minimum Flexural Modulus
Bearing Strength Testing	ASTM D953			
Flexural Properties	ASTM D7264/D7264M		30,000 psi	(1.8 x 10 to power of 6) psi
Ultraviolet Testing	ASTM D7869 ASTM G154			
Shear Strength	ASTM D2344/D2344M	4,500 psi		
Tensile Properties	ASTM D3039/D3039M	30,000 psi		
Toxicity Testing	SMP 800-C			
Coefficient of Lineal Thermal Expansion	ASTM D696	8.0 x 10 power minus 6 in/in/degree F		
Flame Spread Testing	ASTM D2863 ASTM E662 UL 94			

B. Performance Requirements

1. Structural Performance of Gratings

Provide gratings capable of withstanding the effects of gravity loads in accordance with ASCE 7-16, ICC IBC, and the following loads and stresses within the limits and under the conditions indicated:

Assembly Areas (Platforms): Uniform load of 100 lb/square foot.

Provide grating products with a flame spread rating of 25 or less per ASTM E84 Tunnel Test. Test gratings for burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

2.02 FABRICATION

A. Molded FRP Grating

Ensure that all field-fabricated and shop-fabricated grating cuts are coated with vinyl ester resin to provide maximum corrosion resistance in accordance with the manufacturer's instructions.

Provide grating made as one-piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane with a rectangular mesh pattern providing unidirectional strength and reinforced with continuous roving of an equal number of layers in each direction. Ensure that the top layer of reinforcement is no more than 1/8 inch below the top surface of the grating to provide maximum stiffness and prevent resin chipping of unreinforced surfaces having percentage of glass (by weight) not exceeding 35 percent.

Ensure that no dry glass fibers are visible on any surface of bearing bars or cross bars after molding, and that all bars are smooth and uniform, with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin-rich areas or resin-starved areas.

Provide nonslip surfacing manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance.

Fillet grating bar intersections to a minimum radius of 1/16 inch to eliminate local stress concentrations and the possibility of resin cracking at these locations.

Provide fire-retardant grating with a tested flame spread rating of 25 or less when tested in accordance with ASTM E84.

B. Fasteners

Provide Type 316 stainless-steel fasteners, clips, and anchorage for exterior use. Select fasteners for type, grade, and class required.

PART 3 EXECUTION

3.01 INSTALLATION

Install items at locations indicated, according to the

manufacturer's instructions. Submit one copy of manufacturer's Certification of Installation to the Contracting Officer. Verify all measurements and take all field measurements necessary before fabrication. Include all materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines; and levels and free of rack. Comply with recommendations of cited bar grating standards, including installation clearances and standard anchoring details.

Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

A. Anchorage, Fastenings, and Connections

Provide anchorage where necessary for fastening miscellaneous FRP items securely in place.

END OF SECTION

DIVISION 09 – FINISHES

09 97 13.27 – HIGH PERFORMANCE COATING FOR STEEL STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to field coating of utilities as specified in Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

A. ASTM INTERNATIONAL (ASTM)

ASTM D3276 (2015; E 2016) Standard Guide for Painting Inspectors (Metal Substrates)

ASTM D4285 (1983; R 2018) Indicating Oil or Water in Compressed Air

ASTM D7091 (2021) Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nondestructive Coatings Applied to Non-Ferrous Metals

ASTM D7127 (2017) Standard Test Method for Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces using a Portable Stylus Instrument

B. SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 2 (2015; E 2016) Cleanliness of Recycled Ferrous Metallic Abrasive

SSPC AB 3 (2023; R 2023) Ferrous Metallic Abrasive

SSPC PA 1	(2024) Shop, Field, and Maintenance Coating of Metals
SSPC PA 2	(2015; E 2018) Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC QP 3	(2010) Standard Procedure for Evaluating Qualifications of Shop Painting Applicators
SSPC QP 5	(2022) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

C. U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-22262	(1993; Rev B; Am 1 1994; Am 2 1996; Notice 1 2021) Abrasive Blasting Media Ship Hull Blast Cleaning
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D. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.59	Hazard Communication
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1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

A. Quality Control Plan

Include certifications, qualifications, inspection report
forms, inspection procedures, Corrective Action Plan,
equipment, and calibration records.

B. Field Coating Repair Plan

Submit a field coating repair plan detailing the field inspection procedures, products used for repairs, and procedures for repairing defects found in the field. Include manufacturer's written recommendations and literature for field repair procedures of specified coating. If abrasive blasting is required, submit a plan for capturing the used material.

C. Coating System

Submit Coating System product data, certificates, manufacturer's data, material safety data sheets, catalog cuts, and other relevant descriptive data for approval.

D. Inspection Report Forms

Submit as part of the Quality Control Plan.

E. Inspection Reports

Submit all inspection reports.

F. Field Inspection Reports

Submit all field inspection reports.

G. Qualifications

Submit qualifications for approval. Qualifications must include name, titles, experience, training, and certifications. Submit qualifications of key personnel from the coating shop. Key personnel include, but are not limited to, those who perform the following duties; surface preparation, coating application, quality control, and inspection.

H. Coating System Instructions

Submit manufacturer's printed instructions including detailed mixing and application procedures, number and types of coats required, minimum and maximum application temperatures, and curing procedures.

I. Warranty

Submit warranty that the coating system is of good quality, free from defects, and conforms to

specifications herein. Warranty must be good for one year after final acceptance of work.

1.04 QUALITY ASSURANCE

A. Quality Control Plan

A minimum of 30 days prior to beginning work, submit a Quality Control Plan.

B. Corrective Action (CA)

Include CA in the Quality Control Plan and implement if there is a nonconformity found in the coating. The plan must develop procedures for determining causes of defects, a plan to repair defects, and ensure defects are not repeated.

1) Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated. Develop Corrective Action Request (CAR) forms for initiating CA, and for tracking and documenting each step.

2) Implement Corrective Action

Identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These procedures shall apply to non-compliance in the work, and to non-compliance in the QC System. Corrective actions must be appropriate to the effects of the non-compliance encountered. Each CAR must be serialized, tracked in a Log to completion and acceptance by the Contracting Officer, and retained in project records. The Corrective Action Log, showing status of each CAR, must be submitted to the Contracting Officer.

C. Coating Work Plan

This work plan must be considered as part of the Quality Control Plan.

Provide procedures for reviewing contract documents immediately after award to identify errors, omissions, and discrepancies so that any such issues can be resolved

prior to project planning and development of detailed procedures.

Provide procedures for verification of key processes during Initial Phase to ensure that contract requirements can be met. Key processes must include surface preparation, coating application and curing, inspection, and documentation, and any other process that might adversely impact orderly progression of work.

Provide procedures for all phases of coating operations, including planned work, rework, repair, inspection, and documentation. Address mobilization and setup, surface preparation, coating application, coating initial cure, tracking and correction of noncompliant work, and demobilization. Coordinate work processes with health and safety plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

Provide procedures for correcting noncompliant work. Detailed procedures are required in advance to avoid delays in meeting overcoat windows as well as to avoid delays in production. Provide procedures for repairing defects in the coating film, such as runs, drips, sags, holidays, overspray, as well as how to handle correct coating thickness noncompliance, any other areas of repair or rework that might be adversely affected by delays in preparing and approving new procedures.

If a procedure is based on a proposed or approved request for deviation, the deviation must be referenced. Changes to procedures must be noted by submittal number and date approved, clearly delineating old requirements and new requirements, so that the records provide a continuous log of requirements and procedures.

D. Qualifications

1) Qualifications of Coating Contractor

All contractors and subcontractors that perform surface preparation or coating application must be

certified to either SSPC QP 3 prior to contract award, and must remain certified while accomplishing any surface preparation or coating application. The painting contractors and painting subcontractors must remain so certified for the duration of the project. If a contractor's or subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply.

1.05 NONCONFORMANCE

Identify the location of nonconformance's during the inspections. Nonconformities include, but are not limited to, holidays, bond failures, and thickness requirements. Repair nonconformance's according to the Corrective Action Plan and manufacturer's written instructions.

1.06 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with SSPC PA 1, and as modified in this Section. Maintain temperature in storage spaces between 40 and 85 degrees F, and air temperature more than 5 degrees F above the dew-point at all times. Inspect materials for damage prior to use and return non-compliant materials to manufacturer.

If materials are approaching shelf life expiration and an extension is desired, samples may be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer may issue an extension, referencing the product evaluation and the review of storage records. Products may not be extended longer than allowed in the product specification.

Do not drop or drag coated steel or handled in any manner that will result in damage to the coating. Equipment for handling coated sections must have padded contact areas. Isolate stacked steel with suitable separators to prevent coating damage.

PART 2 PRODUCTS

2.01 COATING SYSTEM

Alternate systems or products will not be considered.
Provide a complete system from one supplier.

A. Epoxy Intermediate Coat

Epoxy polyamide, (Formula 152, Type IV, White (Tinted)).
Tint to approximately color number 27778 parchment using pigment dispersions prepared for epoxy paint tinting.
Manufacturer shall tint material and appropriately label.
All other requirements of this Military Specification apply.

B. Polyurethane Topcoat

Polyurethane coating topcoat of MIL-PRF-85285, Type II,
White SAE AMS-STD-595A color number 17925.

Modify paragraph 3.6.4 of MIL-PRF-85285, Viscosity and
Pot Life, as follows:

- 1) The viscosity of the admixed coating, when tested in accordance with ASTM D1200 through a No. 4 Ford cup, shall be as follows:

Time from mix (minimum)	Maximum time through a No. 4 Ford Cup
Initially	30 seconds
2 hours	60 seconds
4 hours	No gel

Modify paragraph 3.7.1 of MIL-PRF-85285, Drying Time, as follows:

- 2) When applied by spray techniques and when tested in accordance with ASTM D1640/D1640M, the coating shall be set-to-touch within four hours and dry-hard within eight hours.

2.02 TEST KITS

A. Test Kit for Measuring Chloride, Sulfate and Nitrate Ions on Steel and Coated Surfaces

Provide test kits that meet all of the following requirements:

- 1) Contains all materials, supplies, tools, and instructions for field testing and on-site quantitative evaluation of chloride, sulfate, and nitrate ions;
- 2) Extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;
- 3) Components and solutions are mercury free and environmentally friendly;
- 4) Contains new materials and solutions for each test extraction;
- 5) Contains an extraction test container (vessel, sleeve, cell) that creates a sealed, encapsulated environment during salt ion extraction;
- 6) Contains a test extract container suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough; and
- 7) All salt ion concentrations are directly measured in micrograms per square centimeter.

B. Test Kit for Identifying Amine Blush on Epoxy Surfaces

Provide test kits that meet all of the following requirements:

- 1) Is a completely self-contained field test kit with all materials, supplies, tools, and instructions to perform tests and indicate the presence of unreacted amines;
- 2) Uses an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;
- 3) Contains no mercury or lead and is environmentally friendly; and

- 4) Contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution.

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coating Work Plan.

3.01 SURFACES TO BE COATED

Field coat utility surfaces as stated in Section 33 52 40 FUEL PIPING (NON-HYDRANT).

3.02 ENVIRONMENTAL CONDITIONS

A. Automated Monitoring Requirements

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. Locate sensors to provide pertinent data for the surface preparation and coat application being performed. Monitor any heating, cooling, or dehumidification equipment used.

3.03 SURFACE PREPARATION

Surface preparation must be in accordance with the manufacturer's instructions.

3.04 MIXING AND APPLICATION OF COATING SYSTEM

A. Mixing Intermediate Coat Materials

Mix in accordance with manufacturer's instructions, which may differ for each product. Do not mix partial kits, or alter mix ratios. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time based on its temperature.

B. Mixing Topcoat Material

Do not mix partial kits, or alter mix ratios. Mix polyurethane coating materials in same temperature conditions specified in paragraph DELIVERY AND STORAGE. The polyurethane coating material is moisture sensitive and any introduction of moisture or water into the material during mixing or application will shorten usable

pot life. Use a mixer that does not create a vortex. Do not add solvent without specific written recommendation from the manufacturer. No induction time is required, only thorough agitation of the mixed material.

C. Pot Life

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Add all required solvent at time of mixing. Do not add solvent to extend pot life. Pot life is based on standard conditions at 70 degrees F and 50 percent relative humidity. For every 18 degrees F rise in temperature, pot life is reduced by approximately half, and for every 18 degrees F drop it is approximately doubled. Usable pot life depends on the temperature of the material at the time of mixing and the sustained temperature at the time of application. Other factors such as the shape of the container and volume of mixed material may also affect pot life. Precooling or exterior icing of components for at least 24 hours to a minimum of 50 degrees F in hot climates will extend pot life. High humidity at time of mixing and application shortens pot life of the Polyurethane topcoat material. Following are approximate pot life times:

Epoxy intermediate materials - 4 hours

Polyurethane topcoat materials - 2 hours

D. Application Conditions and Recoat Windows

The application condition requirements for the coating system are very time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of sealant, primer, stripe coat, intermediate coat and topcoat, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating or cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats.

Maintain air and steel surface temperature between 60 and 100 degrees F during application and the first four hours

of cure for epoxy coats and the first eight hours of cure for polyurethane coats. Maintain steel surface temperature more than 5 degrees F above the dew-point of the ambient air for the same period.

Recoat windows must be in accordance with the manufacturer's written instructions.

E. Application of Coating System

Apply coatings in accordance with SSPC PA 1, the manufacturer's written instructions, and as specified herein. Apply coatings to surfaces that meet all stated surface preparation requirements.

3.05 QUALITY CONTROL

Use chalk for marking bare steel, and water based markers for marking coated surfaces, and remove marks prior to coating. Do not use any wax or grease based markers, or any other markers that leave a residue or stain.

A. Field Tests

Complete field tests on repair work only. Advise the Contracting Officer five days prior to performing each field test.

1) Holiday Testing

Conduct holiday testing with guidelines stated in paragraph entitled "Holiday Testing." Submit test results in accordance with Paragraph entitled "Inspection Reports."

2) Dry Film Thickness

After repair of holidays, measure dry film thickness using a magnetic dry film thickness gage in accordance with ASTM D7091 and SSPC PA 2. Re-measure after an additional coat is applied, and add it to meet minimum thickness requirements. Submit test results in accordance with Paragraph entitled "Inspection."

B. Coating Inspector

The coating inspector shall be considered a QC Specialist and must report to the QC Manager. The Coating Inspector must be present during all pre-preparation testing,

surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities. The Coating Inspector must provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system.

C. Inspection

At a minimum, inspections must be recorded after surface preparation, after coating, after curing, and after testing.

Inspections must include surface profile measurements, chloride measurements, holiday testing, and thickness measurements. Following each inspection, an inspection report must be submitted.

1) Inspection Requirements

Perform field inspection in accordance with ASTM D3276 and the approved Coating Work Plan. Document Contractor's compliance with the approved Coating Work Plan and submit Inspection Reports.

Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:

- a. Location or area;
- b. Purpose (required or special);
- c. Method;
- d. Criteria for evaluation;
- e. Results;
- f. Determination of compliance;
- g. List of required rework; and

h. Observations.

Collect and record Environmental Conditions as described in ASTM D3276 on a 24 hour basis, as follows:

- a. During surface preparation, every two hours or when changes occur;
- b. During coating application and the first four days of initial cure, every hour, or when changes occur;
- c. Note location, time, and temperature of the highest and lowest surface temperatures each day; and
- d. Use a non-contact thermometer to locate temperature extremes, then verify with contact thermometers.

Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed.

Document Contractors compliance with the approved Coating Work Plan.

2) Inspection Report Forms

Develop project-specific report forms as required to report measurements, test results, and observations being complete and conforming to contract requirements. This includes all direct requirements of the contract documents and indirect requirements of referenced documents. Show acceptance criteria with each requirement and indication of conformity of each inspected item. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3) Inspection Equipment

All equipment must be in good condition, operational within its design range, and calibrated as required by the specified standard for use of each device.

3.06 FIELD INSPECTION

Complete a field inspection of the coating work prior to installation. The inspection must ensure coating conforms to specifications and is free from defects.

END OF SECTION

DIVISION 22 - PLUMBING

22 00 00 – PLUMBING, GENERAL PURPOSE

1.01 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B31.1	(2024) Power Piping
ASME B31.9	(2020) Building Services Piping
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications

B. AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(2024) Hypochlorites
AWWA B301	(2024) Liquid Chlorine
AWWA C606	(2022) Grooved and Shouldered Joints
AWWA C651	(2023) Standard for Disinfecting Water Mains
AWWA C652	(2019) Disinfection of Water- Storage Facilities

C. AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2019) Specification for Filler Metals for Brazing and Braze Welding
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D. ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2024) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
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ASTM A105/A105M	(2023) Standard Specification for Carbon Steel Forgings for Piping Applications
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ASTM A183	(2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
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ASTM A193/A193M	(2024a) Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
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ASTM A516/A516M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
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ASTM B32	(2020) Standard Specification for Solder Metal
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ASTM B813	(2024) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tubes
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ASTM D2000	(2018; R 2024) Standard Classification System for Rubber Products in Automotive Applications
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ASTM D3139	(2019) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
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ASTM F477 (2014; R 2021) Standard
Specification for Elastomeric
Seals (Gaskets) for Joining
Plastic Pipe

ASTM F2389 (2024a) Standard Specification for
Pressure-rated Polypropylene (PP)
Piping Systems

E. INTERNATIONAL CODE COUNCIL (ICC)

ICC IPC (2024) International Plumbing Code

F. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY (MSS)

MSS SP-25 (2018) Standard Marking System for
Valves, Fittings, Flanges and
Unions

MSS SP-58 (2018) Pipe Hangers and Supports -
Materials, Design and Manufacture,
Selection, Application, and
Installation

MSS SP-67 (2022) Butterfly Valves

MSS SP-70 (2011) Gray Iron Gate Valves,
Flanged and Threaded Ends

MSS SP-71 (2018) Gray Iron Swing Check
Valves, Flanged and Threaded Ends

MSS SP-72 (2010a) Ball Valves with Flanged
or Butt-Welding Ends for General
Service

MSS SP-78 (2011) Cast Iron Plug Valves,
Flanged and Threaded Ends

MSS SP-80 (2019) Bronze Gate, Globe, Angle
and Check Valves

MSS SP-110 (2010) Ball Valves Threaded,
Socket-Welding, Solder Joint,
Grooved and Flared Ends

G. NSF INTERNATIONAL (NSF)

NSF 372	(2022) Drinking Water System Components - Lead Content
NSF/ANSI 14	(2023) Plastics Piping System Components and Related Materials
NSF/ANSI/CAN 61	(2024) Drinking Water System Components - Health Effects

H. SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508	(2023) Hose Clamp Specifications
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I. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SM 9223	(2004) Enzyme Substrate Coliform Test
PL 93-523	(1974; A 1999) Safe Drinking Water Act

J. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 141.80	National Primary Drinking Water Regulations; Control of Lead and Copper; General Requirements
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1.02 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

- A. Plumbing System Shop Drawings
- B. Recycled Content for Steel Pipe
- C. Plumbing System Product Data
- D. Tests, Flushing and Disinfection Test
- E. Materials and Equipment
- F. Bolts
- G. Plumbing System Operation and Maintenance Data

1.03 SHOP DRAWINGS

Submit Plumbing System Detail drawings consisting of schedules, performance charts, instructions, diagrams, and other information to illustrate the requirements and operations of systems that are not covered by the Plumbing Code. Submit Plumbing System Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings must indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details must include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, must be drawn to scale.

1.04 STANDARD PRODUCTS

Specified materials and equipment must be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment must essentially duplicate equipment that has performed satisfactorily at least 2 years prior to bid opening. Standard products must have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation must conform to the code and a certificate must be submitted for the equipment.

A. Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

B. Service Support

The equipment items must be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations must be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. Manufacturer's Nameplate

Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

D. Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1) Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions must be considered mandatory, the word "should" must be interpreted as "must." Reference to the "code official" must be interpreted to mean the "Contracting Officer." References to the "permit holder" must be interpreted to mean the "Contractor."

2) Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project.

References in the ICC Codes to sections of Chapter 1, must be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.05 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.06 PERFORMANCE REQUIREMENTS:

A. Welding

Piping must be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Submit a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. Procedures and welders must be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.9, unless temperature and pressure limits specified then may be accepted as permitted by ASME B31.1. The Contracting Officer must be notified 24 hours in advance of tests, and the tests must be performed at the work site if practicable. Welders or welding operators must apply their assigned symbols near each weld they make as a permanent record.

1.07 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work must be in accordance with ICC IPC.

1.08 PROJECT/SITE CONDITIONS

The Contractor must become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

1.09 INSTRUCTION TO GOVERNMENT PERSONNEL

Furnish the services of competent instructors to give

full instruction to the designated government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

Instruction must be given during the first regular work week after the equipment or system has been accepted and turned over to the government for regular operation. The number of man-days (8 hours per day) of instruction furnished must be as specified in the individual section.

When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.10 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.01 MATERIALS

Materials for various services must be in accordance with TABLE I. Pipe schedules must be selected based on service requirements. Pipe fittings must be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement must meet NSF/ANSI 14 and must be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service must bear the NSF seal "NSF-PW." Polypropylene pipe and fittings must conform to dimensional requirements of Schedule 80, Iron Pipe size and must comply with NSF/ANSI 14, NSF/ANSI/CAN 61 and ASTM F2389. Polypropylene piping that will be exposed to UV light must be provided

with a Factory applied UV resistant coating. Pipe threads (except dry seal) must conform to ASME B1.20.1. Grooved pipe couplings and fittings must be from the same manufacturer. Material or used in any potable water system intended for human consumption be certified in accordance with NSF 372 with the exception of brazing materials. In line devices such as water meters, check valves, meter stops, valves, fittings and back flow preventers must comply with PL 93-523 and NSF/ANSI/CAN 61, Section 8. Plastic pipe must not be installed in air plenums. Plastic pipe must not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

A. Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe must not be used underground. Joints and gasket materials must conform to the following:

- 1) Coupling for Steel Pipe: AWWA C606.
- 2) Flange Gaskets: Gaskets must be made of non-asbestos material in accordance with ASME B16.21. Gaskets must be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets must be the full face or self centering flat ring type. Gaskets used for hydrocarbon service must be bonded with NBR.
- 3) Brazing Material: Brazing material must conform to AWS A5.8/A5.8M, BCuP-5.
- 4) Brazing Flux: Flux must be in paste or liquid form appropriate for use with brazing material. Flux must be as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.
- 5) Solder Material: Solder metal must conform to ASTM B32.
- 6) Solder Flux: Flux must be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.
- 7) PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.

- 8) Rubber Gaskets for Grooved Pipe: ASTM D2000, maximum temperature 230 degrees F.
- 9) Flexible Elastomeric Seals: ASTM D3139 or ASTM F477.
- 10) Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A183.
- 11) Flanged fittings including, but not limited to, flanges, bolts, nuts and bolt patterns must be in accordance with ASME B16.5 class 150 and must have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material must conform to ASTM A105/A105M. Blind flange material must conform to ASTM A516/A516M cold service. Bolts must be high strength or intermediate strength with material conforming to ASTM A193/A193M. Submit written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

B. Miscellaneous Materials

Miscellaneous materials must conform to the following:

- 1) Hose Clamps: SAE J1508.
- 2) Hypochlorites: AWWA B300.
- 3) Liquid Chlorine: AWWA B301.

C. Pipe Insulation Material

Insulation must be as specified in Section 23 07 00
THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.02 PIPE HANGERS, INSERTS, AND SUPPORTS:

Pipe hangers, inserts, and supports must conform to MSS SP-58.

2.03 VALVES

Valves must be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller must be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger must have flanged iron bodies and bronze trim. Pressure ratings must be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the

performance requirements of applicable MSS standard. Valves must conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80

2.04 MISCELLANEOUS PIPING ITEMS

A. Pipe Hangers (Supports)

Provide MSS SP-58 Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

B. Nameplates

Provide 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 0.25 inch high normal block lettering into the white core. Minimum size of nameplates must be 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame

charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

The plumbing system must be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Submit diagrams, instructions, and other sheets proposed for posting for Plumbing System. Submit for Plumbing System manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe. Valves must be installed with control no lower than the valve body. Avoid the use of combination double wye and one-eighth bend fittings in the horizontal orientation below grade or below slab.

A. Water Pipe, Fittings, and Connections

1) Utilities

The piping must be extended to fixtures, outlets, and equipment. The cold-water piping system must be arranged and installed to permit draining. The supply line to each item of equipment or fixture control valves which are supplied with integral stops, must be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures and faucets must be anchored to prevent movement.

2) Cutting and Repairing

The work must be carefully laid out in advance, and unnecessary cutting of construction must be avoided. Damage piping, wiring, or equipment as a result of cutting must be repaired by mechanics skilled in the trade involved.

3) Protection of Fixtures, Materials, and Equipment

Pipe openings must be closed with caps or plugs during installation. Fixtures and equipment must be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of

the work, the fixtures, materials, and equipment must be thoroughly cleaned, adjusted, and operated. Safety guards must be provided for exposed rotating equipment.

4) Mains, Branches, and Runouts

Piping must be installed as indicated. Pipe must be accurately cut and worked into place without springing or forcing. Aboveground piping must run parallel with the lines of the structure/pier, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings must be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines must not bear directly against structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Changes in pipe sizes must be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Change in direction must be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends must be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

5) Expansion and Contraction of Piping

Allowance must be made throughout for expansion and contraction of water pipe. Horizontal runs of pipe over 50 feet in length must be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility must be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility must be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved

pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

6) Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger must be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking must be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking must be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed on drawings, the base and thrust bearing sides of the thrust block must be poured against undisturbed earth. The side of the thrust block not subject to thrust must be poured against forms. The area of bearing will be as indicated on drawings. Blocking must be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, must be used to anchor vertical down bends into gravity thrust blocks.

B. Joints

Installation of pipe and fittings must be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints must be made up with fittings of compatible material and made for the specific purpose intended.

1) Threaded

Threaded joints must have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads must be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or must have a polytetrafluoroethylene tape applied.

2) Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for aboveground, ferrous or non-ferrous, cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

a. Mechanical Couplings Permissibility

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints must incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe. Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

b. Grooved Fittings and Couplings

Grooved fittings and couplings, and grooving tools must be provided from the same manufacturer. Segmentally welded elbows must not be used. Grooves must be prepared in accordance with the coupling manufacturer's latest published standards. Grooving must be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations. The Contracting Officer must be notified 24 hours in advance of test to demonstrate operator's capability, and the test must be performed at the work site, if practical, or at a site agreed upon. The operator must demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

3) Unions and Flanges

Unions, flanges and mechanical couplings must not be concealed in walls, ceilings, or partitions. Unions must be used on pipe sizes 2-1/2 inches and smaller; flanges must be used on pipe sizes 3 inches and larger.

4) Grooved Mechanical Joints

Grooves must be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools must be products of the same manufacturer. Pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field must be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe must be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints must not be used in concealed locations.

C. Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe must be made with dielectric unions or flange waterways. Dielectric waterways must have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways must have metal connections on both ends suited to match connecting piping. Dielectric waterways must be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges must meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe must be made with transition fitting for the specific purpose.

D. Supports

1) General

Hangers used to support piping 2 inches and larger must be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors must be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures must be supported by variable spring hangers and supports or by constant support hangers.

In the support of multiple pipe runs on a common base member, a clip or clamp must be used where each pipe crosses the base support member. Spacing of the base support members must not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods must not be formed or bent.

2) Pipe Hangers, Inserts and Supports

Installation of pipe hangers, inserts and supports must conform to MSS SP-58 except as modified herein.

- a. Types 5, 12, and 26 must not be used.
- b. Type 3 must not be used on insulated pipe.
- c. Type 18 inserts must be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps must be torqued per MSS SP-58 and must have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels must be furnished with an added malleable-iron heel plate or adapter.

- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 40 shields must:
 - i. Be used on insulated pipe less than 4 inches.
 - ii. Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.
 - iii. Have a high density insert for all pipe sizes. High density inserts must have a density of 8 pcf or greater.
- h. Horizontal pipe supports must be spaced as specified in MSS SP-58 and a support must be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports must be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe must be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs must include allowances for expansion and contraction.
- i. Vertical pipe must be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers must include allowances for expansion and contraction.
- j. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides must be provided to allow longitudinal pipe movement. Slide materials must be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints must be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:
 - i. On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

- ii. On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
- k. Pipe hangers on horizontal insulated pipe must be the size of the outside diameter of the insulation. The insulation must be continuous through the hanger on all pipe sizes and applications.
- l. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide must include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe must be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- m. Hangers and supports for plastic pipe must not compress, distort, cut or abrade the piping, and must allow free movement of pipe except where otherwise required in the control of expansion/contraction.

3) Structural Attachments

Attachment to structure concrete and masonry must be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors must be applied with a safety factor not less than 5. Supports must not be attached to metal decking. Supports must not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications must be constructed of ferrous materials only.

E. Weld Installation

Plumbing pipe weldments must be as indicated. Changes in direction of piping must be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings must be forged, flared for improvement of flow where attached

to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld must conform to ASME B31.1. Weld defects must be removed and repairs made to the weld, or the weld joints must be entirely removed and rewelded. After filler metal has been removed from its original package, it must be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating must not be used.

3.02 IDENTIFICATION SYSTEMS

A. Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number must be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags must be 1-3/8 inch minimum diameter, and marking must be stamped or engraved. Indentations must be black, for reading clarity. Tags must be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.03 TESTS, FLUSHING AND DISINFECTION

Submit test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report must indicate the final position of controls.

A. Plumbing System

The following tests must be performed on the plumbing system in accordance with, except that the drainage and vent system final test must include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure and reasons for choosing this option in lieu of the smoke test to the Contracting Officer for approval.

1) Water Supply Systems Tests

B. Defective Work

If inspection or test shows defects, such defective work or material must be replaced or repaired as necessary and inspection and tests must be repeated. Repairs to piping must be made with new materials. Caulking of screwed joints or holes will not be acceptable.

C. System Flushing

1) During Flushing

Before operational tests or disinfection, potable water piping system must be flushed with hot potable water. Sufficient water must be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) must specify the number of fixtures to be operated during flushing. Contractor must provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor must be responsible for any flood damage resulting from flushing of the system. Flushing must be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI/CAN 61, Section 9, must be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

2) After Flushing

System must be drained at low points. Strainer screens must be removed, cleaned, and replaced. After flushing and cleaning, systems must be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system must be repaired by the Contractor. Flushing devices and automatic control systems must be adjusted for proper operation according to manufacturer's instructions. Flow rates on fixtures

must not exceed those stated in PART 2 of this Section.

Unless more stringent local requirements exist, lead levels must not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building must be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

D. Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor must subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests must cover a period of not less than 8 hours for each system and must include the following information in a report with conclusion as to the adequacy of the system:

- 1) Time, date, and duration of test.
- 2) Water pressures at the most remote and the highest fixtures.
- 3) Operation of each fixture and fixture trim.
- 4) Operation of each valve, hydrant, and faucet.

E. Disinfection

After all system components are provided and operational tests are complete, the entire cold-water distribution system must be disinfected. Before introducing disinfecting chlorination material, entire system must be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure must be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material must be hypochlorites or liquid chlorine. The chlorinating material must be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator.

1) Water Chlorination Monitoring

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet must be opened and closed several times. After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

2) Water Chlorination Flushing

Upon the specified verification, the system including tanks must then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet must be opened and closed several times.

3) Sample Testing

Take additional samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with EPA SM 9223.

The testing method used must be EPA approved for drinking water systems and must comply with applicable local and state requirements.

4) Disinfection Acceptance

Disinfection must be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.04 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, must be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system must be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions must be posted before acceptance testing of the systems.

3.05 TABLES

		Table I			
		PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS			
Item #	Pipe and Fitting Materials	Service A	Service B	Service C	Service D
1	Steel pipe: Seamless, black, ASTM A53/A53M, Type S, Grade B.		X		
2	High-density polyethylene (HDPE) plastic pipe, Schedule 80, UV-Rated	X			
	SERVICE: A - Potable Water on Dock B - Potable Water from Pier				

END OF SECTION

DIVISION 23 – HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 07 00 - THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCES: The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. At the discretion of the government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

A. AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2022) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASHRAE 90.1 - SI (2022) Energy Standard for Buildings Except Low-Rise Residential Buildings

B. ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M (2024b) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

ASTM C534/C534M (2024) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

ASTM C552 (2022) Standard Specification for Cellular Glass Thermal Insulation

ASTM C1136 (2023) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation

- | | |
|------------|---|
| ASTM E84 | (2023) Standard Test Method for Surface Burning Characteristics of Building Materials |
| ASTM E2231 | (2021) Standard Practice for Specimen Preparation and Mounting of Pipe and Duct |
- C. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
- | | |
|-----------|---|
| MSS SP-58 | (2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation Insulation Materials to Assess Surface Burning Characteristics |
|-----------|---|
- D. MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)
- | | |
|----------------------|--|
| MICA Insulation Stds | (8th Ed) National Commercial & Industrial Insulation Standards |
|----------------------|--|
- E. SCIENTIFIC CERTIFICATION SYSTEMS (SCS)
- | | |
|-----|--|
| SCS | SCS Global Services (SCS) Indoor Advantage |
|-----|--|
- F. UL SOLUTIONS (UL)
- | | |
|--------|--|
| UL 723 | (2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials |
|--------|--|

1.02 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

- A. MICA Plates
- B. Pipe Insulation Systems and Associated Accessories
- C. Recycled Content for Insulation Materials
- D. Pipe Insulation Systems

E. Equipment Insulation Systems

F. Thermal Insulation

G. Display Samples

H. Pipe Insulation Systems

1.03 SYSTEM DESCRIPTION

A. General

Provide field-applied insulation and accessories on mechanical systems as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated. Provide field applied insulation materials required for use on government-furnished items as listed in the SPECIAL CONTRACT REQUIREMENTS.

1.04 QUALITY ASSURANCE

A. Installer Qualification

Qualified installers must have successfully completed three or more similar type jobs within the last 5 years.

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's unopened containers. Protect materials delivered and placed in storage from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Attach manufacturer's stamp or label giving the name of the manufacturer and brand, and a description of the material, date codes, and approximate shelf life (if applicable) to packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval. Insulation packages and containers must be asbestos free.

PART 2 PRODUCTS

2.01 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening and is an acceptable product per this specification. Submit a complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. Include the product number, k-value, thickness and furnished accessories including adhesives, sealants and jackets for each mechanical system requiring insulation. The product data must be copyrighted, have an identifying or publication number, and have been published prior to the issuance date of this solicitation. Submit materials furnished under this section together in a booklet.

A. Insulation System

Provide insulation systems in accordance with the approved MICA National Insulation Standards plates as supplemented by this specification. Provide field-applied insulation for plumbing systems. Provide CFC and HCFC free insulation.

B. Surface Burning Characteristics

Unless otherwise specified, insulation must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Determine flame spread, and smoke developed indexes, by ASTM E84 or UL 723. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Prepare and mount test specimens according to ASTM E2231.

2.02 PIPE INSULATION SYSTEMS

Conform insulation materials to Table 1 and minimum insulation thickness as listed in Table 2 and meet or exceed the requirements of ASHRAE 90.1 - SIASHRAE 90.1 - IP. Limit pipe insulation materials to those listed herein and meeting the following requirements:

A. Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Rock Wool: 75 percent slag of weight

Fiberglass: 20 percent glass cullet

Rigid Foam: 9 percent recovered material

Phenolic Rigid Foam: 9 percent recovered material

Provide data identifying percentage of recycled content for insulation materials.

B. Aboveground Cold Pipeline (-30 to 60 deg. F)

Provide insulation for outdoor, indoor, exposed or concealed applications, as follows:

1) Cellular Glass

ASTM C552, Type II, and Type III. Supply the insulation from the fabricator with (paragraph WHITE VAPOR RETARDER ALL SERVICE JACKET (ASJ)) ASJ vapor retarder and installed with all longitudinal overlaps sealed and all circumferential joints ASJ taped or supply the insulation unfaced from the fabricator and install with all longitudinal and circumferential joints sealed with vapor barrier mastic.

2) Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with ASTM C534/C534M, Grade 1, Type I or II. Type I, Grade 1 for tubular materials. Type II, Grade 1, for sheet materials. Ensure Type I and II have vapor retarder/vapor barrier skin on one or both sides of the insulation, and require an additional exterior vapor retarder covering for high relative humidity and below ambient temperature applications.

2.03 EQUIPMENT INSULATION SYSTEMS

Insulate equipment and accessories as specified in Tables 5 and 6. In outside locations, provide insulation 1/2 inch thicker than specified. Increase the specified insulation thickness for equipment where necessary to

equal the thickness of angles or other structural members to make a smooth, exterior surface. Submit a booklet containing manufacturer's published installation instructions for the insulation systems. The instructions must be copyrighted, have an identifying or publication number, and have been published prior to the issuance date of this solicitation. A booklet is also required by paragraphs titled: Pipe Insulation Systems and Duct Insulation Systems.

PART 3 EXECUTION

3.01 APPLICATION - GENERAL

Apply insulation to unheated and uncooled piping and equipment. Do not compress flexible elastomeric cellular insulation at joists, studs, columns, ducts, and hangers. The insulation must not pull apart after a one hour period; replace any insulation found to pull apart after one hour.

A. Display Samples

Submit and display, after approval of materials, actual sections of installed systems, properly insulated in accordance with the specification requirements. Such actual sections must remain accessible to inspection throughout the job and will be reviewed from time to time for controlling the quality of the work throughout the construction site. Identify each material used by indicating on an attached sheet the specification requirement for the material and the material by each manufacturer intended to meet the requirement. The Contracting Officer will inspect display sample sections at the jobsite. Keep approved display sample sections on display at the jobsite during the construction period. Upon completion of construction, the display sample sections will be closed and sealed.

1) Pipe Insulation Display Sections

Include as a minimum an elbow or tee, a valve, dielectric waterways and flanges, a hanger with protection shield and insulation insert, or dowel as required, at support point, method of fastening and sealing insulation at longitudinal lap, circumferential lap, butt joints at fittings and on pipe runs, and terminating points for each type of

pipe insulation used on the job, cold pipelines, both interior and exterior, even when the same type of insulation is used for these services.

B. Installation

Except as otherwise specified, install material in accordance with the manufacturer's written instructions. Do not apply insulation materials until tests and heat tracing specified in other sections of this specification are completed. Remove material such as rust, scale, dirt and moisture from surfaces to receive insulation. Keep insulation clean and dry. Do not remove insulation from its shipping containers until the day it is ready to use and return to like containers or equally protect from dirt and moisture at the end of each workday. Thoroughly clean insulation that becomes dirty prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, reject the insulation, and immediately remove from the jobsite. Stagger joints on multi layer insulation. Mix mineral fiber thermal insulating cement with demineralized water when used on stainless steel surfaces. Install insulation, jacketing and accessories in accordance with MICA Insulation Stds plates except where modified herein or on the drawings.

C. Welding

Welding is not permitted on piping, or equipment without written approval of the Contracting Officer.

D. Pipes/Equipment That Require Insulation

Insulation is required on all pipes, or equipment, except for omitted items as specified.

3.02 PIPE INSULATION SYSTEMS INSTALLATION

A. Pipe Insulation

1) General

Install pipe insulation on aboveground cold pipeline systems as specified below to form a continuous thermal retarder/barrier, including straight runs, fittings and appurtenances unless specified otherwise. Install full length units of insulation

using a single cut piece to complete a run. Do not use cut pieces or scraps abutting each other. Omit pipe insulation on the following:

- a. Air chambers.
 - b. Adjacent insulation.
 - c. ASME stamps.
 - d. Access plates of fan housings.
- 2) Pipes Passing Through Walls, Roofs, and Floors
- 3) Pipes Passing Through Hangers

Ensure insulation is continuous through hangers. Support all horizontal pipes 2 inches and smaller on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-58. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, install insulation inserts as specified below for piping larger than 2 inches, or factory insulated hangers (designed with a load bearing core) can be used.

- a. Horizontal Pipes Larger Than 2 Inches and Below 60 Degrees F:

Supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-58. Install an insulation insert of cellular glass, prefabricated insulation pipe hangers, or perlite above 80 degrees F above each shield. Ensure insert covers no less than the bottom 180-degree arc of the pipe. Provide inserts that are the same thickness as the insulation, and extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. Ensure the

insulation jacket is continuous over the wooden dowel, wooden block, or insulation insert.

b. Vertical Pipes:

Supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-58 covering the 360-degree arc of the insulation. Install an insulation insert of cellular glass or calcium silicate between each shield and the pipe. Ensure the insert covers the 360-degree arc of the pipe. Provide inserts that are the same thickness as the insulation, and extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. Ensure the insulation jacket is continuous over the wooden dowel, wooden block, or insulation insert. Support the vertical weight of the pipe with hangers located in a horizontal section of the pipe. Use insulated hangers and seal the insulation jacket as indicated herein for anchors in a similar service.

c. Inserts:

Covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, overlap the adjoining pipe jacket 1-1/2 inches, and seal as required for the pipe jacket. Use jacket material to cover inserts in flexible elastomeric cellular insulation conforming to ASTM C1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

4) Flexible Elastomeric Cellular Pipe Insulation

Use tubular form flexible elastomeric cellular pipe insulation for pipe sizes 6 inches and less. Grade 1, Do not stretch Type II sheet insulation used on pipes larger than 6 inches around the pipe. On pipes larger

than 12 inches, adhere the insulation directly to the pipe on the lower 1/3 of the pipe. Stagger seams when applying multiple layers of insulation. Insulate sweat fittings with miter-cut pieces the same size as on adjacent piping. Insulate screwed fittings with sleeved fitting covers fabricated from miter-cut pieces and overlap and seal to the adjacent pipe insulation. Type II requires an additional exterior vapor retarder/barrier covering for high relative humidity and below ambient temperature applications.

5) Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1 and must meet or exceed the requirements of ASHRAE 90.1 - IP.

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VR/VB Req'd
Cold Domestic Water Piping, Makeup Water, and Condenser Water Piping					
	Cellular Glass	ASTM C552	II	2	No
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		No

TABLE 2						
Piping Insulation Thickness (inch)						
Do not use integral wicking material in Chilled water applications exposed to outdoor ambient conditions in climatic zones 1 through 4.						
Service						
	Material	Conductivity K-value (Btu-in/ hr- ft^2-deg F)	Tube And Pipe Size (inch)			
			<1	1- <1.5	1.5- <4	4-<8 > or = >8

B. Aboveground Cold Pipelines

Insulate the following cold pipelines for minus 30 to plus 60 degrees F in accordance with Table 2 except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted. This includes but is not limited to the following:

1) Potable water.

a. Insulation Material and Thickness

Determine insulation thickness for cold pipelines using Table 2.

b. Factory or Jacket

Cover insulation with a factory applied vapor retarder jacket/vapor barrier or seal welded PVC jacket or greater than 3 ply laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.02 permeability, standard grade, silver, white, black and embossed for use with Mineral Fiber, Cellular Glass, and Phenolic Foam Insulated Pipe. Install the aluminum jacket, PVC jacket or fittings (installed over a vapor retarder jacket), or greater than 3 ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.02 permeability, standard grade, embossed silver, White & Black, as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required.

c. Installing Insulation for Straight Cold Pipe

Apply insulation to the pipe with tight butt joints. Seal all butted joints and ends with joint sealant and seal with a vapor retarder coating, greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or PVDC adhesive tape.

i. Longitudinal Laps of the Jacket Material

Overlap not less than 1-1/2 inches. Provide butt strips 3 inches wide for circumferential joints.

ii. Laps and Butt Strips

Secure with adhesive and staple on 4 inch centers if not factory self-sealing. If staples are used, seal in accordance with paragraph STAPLES below. Note that staples are not required with cellular glass systems.

iii. Factory Self-Sealing Lap Systems

May be used when the ambient temperature is between 40 and 120 degrees F during installation. Install the lap system in accordance with manufacturer's recommendations. Use a stapler only if specifically recommended by the manufacturer. Where gaps occur, replace the section or repair the gap by applying adhesive under the lap and then stapling.

iv. Staples

Coat all staples, including those used to repair factory self-seal lap systems, with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - 0.0000 perm adhesive tape. Coat all seams, except those on factory self-seal systems, with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

v. Breaks and Punctures in the Jacket Material

Patch by wrapping a strip of jacket material around the pipe and secure it with adhesive, staple, and coat with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Extend the patch not less than 1-1/2 inches past the break.

vi. Flexible Elastomeric Cellular Pipe Insulation

Install by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. Secure all seams and butt joints and seal with adhesive. When using self seal products, secure only the butt joints with adhesive. Push insulation on the pipe, never pulled. Stretching of insulation may result in open seams and joints. Clean cut all edges. Rough or jagged edges of the insulation are not be permitted. Use proper tools such as sharp knives.

d. Insulation for Fittings and Accessories

- i. Butt pipe insulation tightly to the insulation of the fittings and accessories. Seal the butted joints and ends with joint sealant and seal with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.
- ii. Place precut or preformed insulation around all fittings and accessories and conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation must be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Use insulation of the same thickness and conductivity as the adjoining pipe insulation. If nesting size insulation is used, overlap the insulation 2 inches or one pipe diameter. Elbows insulated using segments must conform to MICA Tables 12.20 "Mitered Insulation Elbow". Submit a booklet containing completed MICA Insulation Stds plates detailing each insulating system for each pipe, or equipment insulating system, after approval of materials and prior to applying insulation.

(1) Ensure MICA plates detail the materials to be installed and the specific insulation

application. Submit all MICA plates required showing the entire insulating system, including plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. Present all variations of insulation systems including locations, materials, vaporproofing, jackets and insulation accessories.

(2) If the Contractor elects to submit detailed drawings instead of edited MICA Plates, ensure the detail drawings are technically equivalent to the edited MICA Plate submittal.

iii. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers must be protected with PVDC or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or two coats of vapor retarder coating with a minimum total thickness of 1/16 inch, applied with glass tape embedded between coats. Overlap tap seams 1 inch. Extend the coating out onto the adjoining pipe insulation 2 inches. Protect fabricated insulation with a factory vapor retarder jacket with either greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape, standard grade, silver, white, black and embossed or PVDC adhesive tape or two coats of vapor retarder coating with a minimum thickness of 1/16 inch and with a 2 inch wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, seal the joints with a vapor retarder coating and a 4 inch wide ASJ tape which matches the jacket of the pipe insulation.

iv. Mark insulation to show the location of unions, strainers, and check valves.

e. Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut insulation inserts or premolded insulation segments must be used under the fitting covers for elbows, tees and other miscellaneous configurations. Insulation inserts must be the same installed insulation thickness. One insert must be installed for each inch of pipe insulation. The installed and compressed insert must have the same thermal performance as the pipe insulation. Premolded insulation segments must be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. PVC fitting covers must be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. For above ambient pipe temperatures, secure PVC covers using tacks. As an option circumferential joints can be covered with PVC vapor retarder tape. For below ambient conditions seal system using PVC vapor retarder tape, and vapor retarder mastic with vapor dams. Longitudinal seams may be sealed with vapor retarder mastic, PVC vapor retarder tape or solvent weld adhesive to obtain a continuous vapor seal. For severe service conditions install PVC jackets over the existing ASJ jacket and seal using a solvent weld adhesive.

C. Piping Exposed to Weather

Insulate and jacket piping exposed to weather as specified for the applicable service per paragraph 3.2.2. After this procedure, apply a laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.02 permeability (greater than 3 ply, standard grade, silver, white, black and embossed aluminum jacket, stainless steel or PVC jacket).

PVC jacketing requires no factory-applied jacket beneath it, however apply an all service jacket if factory applied jacketing is not furnished.

1) Insulation for Fittings

Insulate and finish flanges, unions, valves, fittings, and accessories as specified for the applicable service. Apply two coats of breather emulsion type

weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer with glass tape embedded between coats. Overlap tap no less than 1 inch and the adjoining aluminum jacket no less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Provide molded PVC fitting covers when PVC jackets are used for straight runs of pipe. PVC fitting covers must be sealed based upon the pipe temperature in combination with ambient conditions and if the pipe insulation will be exposed to severe service conditions. For below ambient conditions, the pipe insulation and insulation fittings must be covered and sealed with a vapor barrier or weatherproofing jacket with a minimum 0.02 permeability as defined per ASTM C1136 before installing the PVC jacket and fitting cover. When in doubt as to the pipe temperature or service conditions, secure the PVC jacket using a weld adhesive using the manufacturer's recommended adhesive.

2) PVC Jacket

Provide ultraviolet resistant PVC jacket that is adhesive welded weather tight with manufacturer's recommended adhesive. Include provision for thermal expansion.

3) Stainless Steel Jackets

ASTM A240/A240M; Type 304, minimum thickness of 33 gauge (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 1/2 inch.

3.03 EQUIPMENT INSULATION SYSTEMS INSTALLATION

A. General

Provide removable insulation sections to cover parts of equipment that must be opened periodically for maintenance including vessel covers, fasteners, flanges and accessories. Omit equipment insulation on the following:

- 1) Cleanouts.
- 2) ASME stamps.

3) Manufacturer's nameplates.

4) Duct Test/Balance Test Holes.

B. Insulation for Cold Equipment

Cold equipment below 60 degrees F: Furnish insulation on equipment handling media below 60 degrees F including the following:

1) Potable water.

a. Insulation Type

Provide insulation suitable for the temperature encountered. Provide material and thicknesses as shown in Table 3:

TABLE 3		
Insulation Thickness for Cold Equipment (inches)		
Equipment handling media at indicated temperature		
	Material	Thickness (inches)
35 to 60 degrees F		
	Cellular Glass	1.5
	Flexible Elastomeric Cellular	1
1 to 34 degrees F		
	Cellular Glass	3
	Flexible Elastomeric Cellular	1.5
Minus 30 to 0 degrees F		
	Cellular Glass	3.5
	Flexible Elastomeric Cellular	1.75

b. Vapor Retarder/Vapor Barrier

Upon completion of installation of insulation, caulk penetrations. Apply two coats of vapor retarder coating or vapor barrier jacket over insulation, including removable sections, with a layer of open mesh synthetic fabric embedded between the coats. Ensure the total dry thickness of the finish is 1/16 inch. Apply flashing sealant or vapor barrier tape to parting line between equipment and removable section insulation.

C. Equipment Exposed to Weather

1) Installation

Insulate equipment exposed to weather and finish in accordance with the requirements for pipes exposed to weather in paragraph EQUIPMENT INSULATION INSTALLATION.

2) Optional Panels

At the option of the Contractor, prefabricated metal insulation panels may be used in lieu of the insulation and finish previously specified. Thermal performance must be equal to or better than that specified for field applied insulation. Provide panels that are the standard catalog product of a manufacturer of metal insulation panels. Provide fastenings, flashing, and support system conforming to published recommendations of the manufacturer for weatherproof installation and that prevent moisture from entering the insulation. Design panels to accommodate thermal expansion and to support a 250 pound walking load without permanent deformation or permanent damage to the insulation. Exterior metal cover sheet must be aluminum and exposed fastenings must be stainless steel or aluminum.

END OF SECTION

DIVISION 26 - ELECTRICAL

26 27 29 – MARINA ELECTRICAL WORK

PART 1 GENERAL

1.01 SECTION INCLUDES: This section applies to all electrical work shown on the Contract Drawings and stated herein.

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

A. ASTM INTERNATIONAL

ASTM B1 (2013) Standard Specification for Hard-Drawn Copper Wire

ASTM B8 (2023) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials

B. NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)

NECA NEIS 1 (2015) Standard for Good Workmanship in Electrical Construction

C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1 (2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)

NEMA ICS 6 (1993; R 2016) Industrial Control and Systems: Enclosures

NEMA TC 2 (2020) Standard for Electrical Polyvinyl Chloride (PVC) Conduit

NEMA TC 14 (2002) Standard for Reinforced Thermosetting Resin Conduit (RTRC)

and Fittings

NEMA WD 1 (1999; R 2020) Standard for
General Color Requirements for
Wiring Devices

D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1)
National Electrical Code

NFPA 303 (2021) Fire Protection Standards
for Marinas and Boatyards

E. UNDERWRITERS LABORATORIES (UL)

UL 6 (2022) UL Standard for Safety
Electrical Rigid Metal Conduit-
Steel

UL 50 (2024) UL Standard for Safety
Enclosures for Electrical
Equipment, Non-Environmental
Considerations

UL 83 (2017; Reprint Mar 2020) UL
Standard for Safety Thermoplastic-
Insulated Wires and Cables

UL 467 (2022) UL Standard for Safety
Grounding and Bonding Equipment

UL 486A-486B (2018; Reprint Jul 2023) UL
Standard for Safety Wire
Connectors

UL 489 (2016; Rev 2019) UL Standard for
Safety Molded-Case Circuit
Breakers, Molded-Case Switches and
Circuit-Breaker Enclosures

UL 498 (2017; Reprint Jun 2024) UL
Standard for Safety Attachment
Plugs and Receptacles

UL 510 (2020; Dec 2022) UL Standard for
Safety Polyvinyl Chloride,
Polyethylene and Rubber Insulating
Tape

UL 514B	(2012; Reprint Mar 2024) UL Standard for Safety Conduit, Tubing and Cable Fittings
UL 514C	(2014; Reprint Apr 2024) UL Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 651	(2011; Reprint May 2022) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 870	(2016; Reprint Nov 2023) UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(2016; Reprint Sep 2023) UL Standard for Safety Ground-Fault Circuit-Interrupters
UL 1203	(2023; Reprint May 2024) UL Standard for Safety Explosion- Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations

F. US COAST GUARD

SILC-CSTO-36-11	(2025) 21 27 11 04 (Rev B), Configuration Standard Technical Order, Electrical Shore Ties
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1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

- A. Wireways
- B. Receptacles
- C. Circuit Breakers
- D. Conduit and Fittings (each type)

- E. Power Pedestal
 - F. Grounding and Bonding Equipment
 - G. Device Plates
 - H. Wires and Cables
 - I. Outlet Boxes and Covers
 - J. Splice and Termination Components
 - K. Wireways
 - L. Cabinets, Junction Boxes, and Pull Boxes
 - M. Mounting Straps
 - N. Conduit Support
 - O. 600-volt Wiring Test
- 1.04 QUALITY ASSURANCE
- A. Grounding System Tests
- Submittal must include written results of each test and indicate location of rods as well as resistance and soil conditions at the time measurements were made.
- PART 2 PRODUCTS
- 2.01 MATERIALS AND EQUIPMENT
- Materials, equipment, and devices must, as a minimum, meet requirements of UL where UL standards are established for those items, and requirements of NFPA 70 and NFPA 303.
- 2.02 CONDUIT AND FITTINGS
- Rigid conduit conforming to the following:
- A. Rigid Metallic Conduit
 - 1. Rigid, Threaded Zinc-Coated Steel Conduit
- ANSI C80.1, UL 6.

B. Rigid Nonmetallic Conduit

PVC Type EPC-80 in accordance with NEMA TC 2, or fiberglass conduit in accordance with NEMA TC 14.

C. Fittings for Metal Conduit and Liquid tight Flexible Metal Conduit

UL 514B. Ferrous fittings must be cadmium or zinc coated in accordance with UL 514B. 1.

D. Fittings for Use in Hazardous Locations

UL 1203.

E. Fittings for Rigid Nonmetallic Conduit

UL 514B and UL 651.

F. Expansion Joints

Provide conduit expansion joints having 6 inch expansion at each expansion joint in the pier and in each conduit run exceeding 250 feet. Provide expansion joints having 2 inch expansion in each conduit run of less than 250 feet.

2.03 POWER PEDESTAL

A complete factory-assembled and prewired unit specifically constructed for marine applications. Power center must be a two outlet pedestal mounted type having a separate circuit breaker for each outlet. Circuit breaker size must be the same size as outlet to which it is connected. Power outlets must be single, locking and grounding type, size and voltage as indicated. Power center enclosure must be 316L stainless steel with powder coated polyester resin coating. Each individual outlet and circuit breaker enclosure must have a separate gasketed weatherproof cover. Entire exterior surface of power center must be nonmetallic design for exposure to saltwater environment. Provide photo controlled LED station light.

A. Warning Sign

Provide permanently mounted waterproof warning sign at each power center. Sign must have red letters on a white background with letters no less than .25 inch in height. Sign must be worded as follows:

"WARNING
To minimize shock and fire hazards:
Turn off the boat's shore connection switch before connecting or disconnecting shore cable.
Connect shore power cable at the boat first.
Disconnect shore power cable at shore outlet first.
Close shore power inlet cover tightly.
DO NOT ALTER SHORE POWER CABLE CONNECTORS"

2.04 OUTLET BOXES AND COVERS

UL 514C.

A. Outlet Boxes in Hazardous Locations

UL 1203. Suitable for wet locations.

2.05 CABINETS, JUNCTION BOXES, AND PULL BOXES

Volume greater than 200 cubic inches, UL 50, NEMA 4X 316 stainless steel.

2.06 WIRES AND CABLES

Must meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Do not provide wires and cables manufactured more than 12 months prior to date of delivery to site.

A. Conductors

No. 8 AWG and larger diameter must be stranded; No. 10 AWG and smaller must be solid, except that conductors for remote control, alarm, and signal circuits, Classes 1, 2, and 3, must be stranded. Conductors must be copper. Conductor sizes and ampacities shown are based on copper.

1) Minimum Conductor Sizes

Minimum size for branch circuits must be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; for Class 2 low-energy, remote-control and

signal circuits, No. 18 AWG; and for Class 3 low-energy, remote-control, alarm, and signal circuits, No. 22 AWG.

B. Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color must be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutral must be white with colored, except green, stripe. Color of ungrounded conductors in different voltage systems must be as follows:

1) 120/208 volt, three phase:

Phase A - black

Phase B - red

Phase C - blue

2) 277/480 volt, three phase:

Phase A - brown

Phase B - orange

Phase C - yellow

3) 120/240 volt, single phase: red and black

C. Insulation

Unless otherwise required by NFPA 70, power and lighting wires must be 600-volt, Type THWN, XHHW, USE 2 or RHW, except that grounding wire may be Type TW; remote-control and signal circuits must be Type TW, THW, or TF. Conductors must conform to UL 83. Where lighting fixtures require 90-degree C conductors, provide only conductors with 90-degree C insulation or better.

D. Bonding Conductors

ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

E. Splice and Termination Components

UL 486A-486B, for wire connectors, and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires must be insulated, pressure type in accordance with UL 486A-486B, twist-on splicing connector. Provide solderless terminal lugs on stranded conductors.

1) Watertight Pin Connectors

Connectors must be rated 600 volts, and individual pins must have ampere rating equal to or greater than the cable to which they are joined. Connectors must be molded-to-cable, quick-disconnect, polarized type having full male shroud so that when male and female assemblies are joined the shroud must provide a completely sealed connection. Connector material must be neoprene resistant to oil, dust, acids, and sunlight and must be watertight.

2.07 DEVICE PLATES

Provide UL listed, one-piece device plates for outlets to suit the devices installed. Plates must be nylon or lexan, minimum 0.10 inch wall thickness. Plates must be same color as receptacle with which they are mounted. Screws must be stainless steel machine type with countersunk heads in color to match finish of plate. Use of sectional-type device plates will not be permitted. Plates must be gasketed and UL listed for wet locations.

2.08 RECEPTACLES

UL 498 and NEMA WD 1, heavy-duty, grounding type. Bodies must be of ivory thermosetting plastic supported on a metal mounting strap. Provide screw type, side wired wiring terminals. Connect grounding pole to mounting strap.

A. Duplex Receptacles

Receptacles must be 20 amperes, 125 volts, specification grade.

B. Weatherproof Receptacles

Provide in nonmetallic box with gasketed, weatherproof, nonmetallic cover plate and gasketed cap over each receptacle opening. Provide caps with a spring-hinged flap. Provide UL listed receptacle for use in wet locations.

C. Ground-Fault Protection of Equipment (GFPE) and Ground-Fault Circuit Interrupter (GFCI) Receptacles

UL 943. Receptacles providing shore power must have individual GFPE set to open at currents not exceeding 30 milliamperes.

GFCI protection for personnel, duplex type for mounting in standard outlet box. Device must be capable of detecting current leak of 5 milliamperes or greater and tripping in accordance with UL 943 for Class A GFCI devices.

D. Special-Purpose Receptacles

Receptacles serving motor life boats are special purpose. Provide Russell Stoll DBRS11161000 for 47' MLB per SILC-CSTO-36-11.

2.09 CIRCUIT BREAKERS

UL 489 thermal magnetic type having a minimum short-circuit current rating equal to the short-circuit rating of the panelboard in which the circuit breaker will be mounted. Breaker terminals must be UL listed as suitable for type of conductor provided. Circuit breakers must be bolt-on type and compatible with existing panelboard. Din-rail mounted and half-width circuit breakers are not acceptable. Plug-in circuit breakers and series rated circuit breakers are unacceptable.

A. Multiple Breakers

Provide common trip type with single operating handle. Breaker design must be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A. B. and C respectively.

2.10 MOUNTING STRAPS

Fiberglass PVC coated steel, two-hole type designed for rigid steel conduit support. PVC coating must be between 20 and 40 mil thickness.

2.11 GROUNDING AND BONDING EQUIPMENT

UL 467.

A. Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible by exothermic weld or high compression connector.

- 1) Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
- 2) Make high compression connections using a hydraulic or electric compression tool to provide the correct circumferential pressure. Provide tools and dies as recommended by the manufacturer. Use an embossing die code or other standard method to provide visible indication that a connector has been adequately compressed on the ground wire.

2.12 HAZARDOUS LOCATIONS

Electrical materials, equipment, and devices for installation in hazardous locations must be specifically approved by UL or Factory Mutual Research Corporation (FM) for particular class, division, and group of hazardous locations involved. Equipment must be waterproof and suitable for marine environment.

2.13 WIREWAYS

UL 870. Material must be 316 stainless steel, 16 gage for sizes 2 1/2 by 2 1/2, 4 by 4, 6 by 6 inches, 14 gage for sizes 8 by 8, 12 by 12 inches. Provide in length required for the application with gasketed hinged cover NEMA 4X enclosure in accordance with NEMA ICS 6.

2.14 FIELD FABRICATED NAMEPLATES

Provide field fabricated nameplates in accordance with the following:

- 1) ASTM D709.
- 2) Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
- 3) Each nameplate inscription: identify the function and, when applicable, the position.
- 4) Nameplates: melamine plastic, 0.125 inch thick, white with black center core.
- 5) Surface: matte finish. Corners: square. Accurately align lettering and engrave into the core.
- 6) Minimum size of nameplates: one by 2.5 inches.
- 7) Lettering size and style: a minimum of 0.25 inch high normal block style.

PART 3 EXECUTION

3.01 INSTALLATION

Electrical installations must conform to requirements of NFPA 70 and to requirements specified herein.

A. Service Entrance Identification

1) Nameplates

Where work results in service disconnect devices in more than one enclosure, as permitted by NFPA 70, label each enclosure, new and existing, as one of several enclosures containing service entrance disconnect devices. Label, at minimum, must indicate number of service disconnect devices housed by enclosure and must indicate total number of enclosures that contain service disconnect devices. Provide laminated nameplates with letters no less than 0.25 inch in height; and engrave on black-on-white matte finish.

Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

B. Wiring Methods

Provide insulated conductors installed in rigid conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor must be separate from electrical system neutral conductor. Provide insulated, green equipment grounding conductors for circuits installed in conduit and raceways. Minimum conduit size must be 1/2 inch in diameter for low-voltage lighting and power circuits.

1) Galvanized Rigid Steel

Use where indicated and for NFPA hazardous locations.

2) PVC Schedule 40 and PVC Schedule 80

a. Do not install PVC Schedule 80 in areas subject to severe physical damage. Do not install PVC Schedule 80 under or along piers and floating docks.

b. Do not install in hazardous areas.

3) Liquid tight Flexible Metal Conduit

Install in accordance with NFPA 70.

C. Conduit Installation

Run conduit exposed on side of wood and existing concrete pier structures, supported by hangers under pier structure and concealed in new concrete pier structure. Install conduit parallel with or at right angles to structural members.

1) Conduit Support

Support conduit by nonmetallic pipe straps, wall brackets, hangers, or trapeze. Fasten by stainless steel wood screws to wood and by concrete inserts or expansion bolts on concrete. Threaded C-clamps may be provided on rigid steel conduit only. Load applied to fasteners must not exceed one-fourth proof test load. Fasteners attached to concrete ceiling must be vibration resistant and shock resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints must not cut main reinforcing bars.

Fill unused holes. Where conduit crosses expansion joints, provide suitable watertight expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means.

2) Directional Changes in Conduit Runs

Make changes in direction of runs with symmetrical bends or molded fittings. Make field-made bends and offsets with conduit-bending machine suitable for type of conduit used. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent dirt or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

3) Expansion Joints

Install as recommended by the manufacturer for the temperature conditions at time of installation.

4) Pull Wire

Install in empty conduits in which wire is to be installed by others. Pull wire must be plastic having minimum 200 pound tensile strength. Leave minimum 12 inches of slack at each end of pull wire.

5) Signal System Conduits

Install in accordance with specified requirements for conduit and with additional requirement that no length of run must exceed 150 feet for trade sizes 2 inches and smaller and must not contain more than two 90 degree bends or equivalent. Provide pull or junction boxes where necessary to comply with these requirements. Inside radii of bends in conduits one inch trade size and larger must be minimum five times nominal diameter. Terminate conduit in terminal cabinet with two locknuts and plastic bushing.

6) Conduit Installed in Concrete

Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not stack conduits. Space conduits horizontally minimum three diameters, except at cabinet locations. Curved portions of bends must

not be visible above finish slab. Increase slab thickness as necessary to provide minimum one inch cover over conduit. Where embedded conduits cross expansion joints, provide suitable watertight expansion fittings and bonding jumpers when using metallic conduit. Conduit larger than one inch trade size must be parallel with or at right angles to main reinforcement; when at right angles to reinforcement, conduit must be close to one of supports of slab.

7) Locknuts and Bushings

Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are provided, and where bushings cannot be brought into firm contact with the box; otherwise, provide minimum single locknut and bushing. Locknuts must have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

8) Stub-Ups

Provide conduits stubbed up through concrete structures for connection to freestanding equipment with adjustable top or coupling threaded inside for plugs, set flush with finished structure. Extend conductors to equipment in rigid conduit. Where no equipment connections are made, install screwdriver-operated threaded flush noncorroding plugs in conduit end.

9) Conduit and Cable Connections

Provide watertight connectors for conduit and cable connections to boxes and cabinets.

D. Boxes, Outlets, and Supports

Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways must be stainless steel type 304, hub type, and when specifically indicated. Boxes in other locations must be nonmetallic boxes provided with nonmetallic conduit system. Each box must have volume required by NFPA 70 for number of conductors enclosed in a box.

Provide gaskets for boxes. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature. Fasten boxes and supports with wood screws on wood and with bolts and expansion shields on concrete. Support boxes directly from structure or by nonmetallic or stainless steel hangers. Where nonmetallic stainless steel bar hangers are provided, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

1) Boxes

Boxes for use with raceway systems must be minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes must be minimum 4 inches square, except that 4 by 2 inch boxes may be provided where only one raceway enters outlet.

2) Pull Boxes

Construct of at least minimum size required by NFPA 70 compatible with nonmetallic raceway systems, except where stainless steel boxes are required in locations specified herein. Furnish boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

E. Mounting Heights

Mount disconnecting switches so maximum height of operating handle is 78 inches above finished structure. Mount receptacles a minimum of 18 inches above finished structure. In no case must entire or part of panelboards, boxes, cabinets, receptacles, and other electrical devices be mounted below the electrical datum plane as defined in NFPA 303. Measure mounting heights of wiring devices and outlets to center of device or outlet.

F. Conductor Identification

Provide within each enclosure where tap, splice, or termination is made. For conductor sizes No. 6 AWG and smaller diameter, color coding must be by factory-applied, color-impregnated insulation. For conductor

sizes No. 4 AWG and larger diameter, color coding must be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations.

G. Splices

Make splices in accessible locations. Make splices in conductor sizes No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductor sizes No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

H. Covers and Device Plates

Install gasketed plates with alignment tolerance of 1/16 inch.

I. Grounding and Bonding

NEPA 70. Ground-exposed, noncurrent-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Where ground-fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

J. Equipment Connections

Provide power wiring for the connection of motors and control equipment under this section. Except as otherwise noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section, but must be provided under the section specifying associated equipment.

3.02 REPAIR AND SERVICE OF EXISTING STRUCTURES AND EQUIPMENT

A. Workmanship

NECA NEIS 1. Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of existing surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to structure, piping, and

equipment using skilled craftsmen of trades involved.

B. Existing Electrical Distribution System Removal

Include removal of equipment's associated wiring, including conductors, cables, exposed conduit, boxes, fittings, anchors, supports, and other such items, back to equipment's source. Fill holes in structure where electrical equipment is removed with material to match adjacent surface. Provide unused openings in remaining boxes, fittings, and equipment with watertight nonmetallic knockout seals.

C. Continuation of Service

Maintain continuity of service to existing circuits of equipment to remain. Existing circuits of equipment must remain energized. Circuits which are to remain but were disturbed during demolition must have circuits wiring and power restored back to original condition.

3.03 FIELD QUALITY CONTROL

Furnish test equipment and personnel. Notify Contracting Officer 5 working days prior to each test.

A. Devices Subject to Manual Operation

Operate each device subject to manual operation at least five times, demonstrating satisfactory operation each time.

B. 600-Volt Wiring Test

Test wiring rated 600 volts and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance must be 250,000 ohms.

3.04 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements are as follows:

PRODUCTS	INCH-POUND _____	METRIC _____
a. Device plate (thickness)	0.10 inch	2.54 mm
PRODUCTS	INCH-POUND _____	METRIC _____
b. Mounting straps (thickness)	20 and 40 mil	0.5 and one mm
c. Ground rod		
Diameter	3/4 inch	19 mm
Length	10 feet	3050 mm
d. Wireways	2 1/2 by 2 1/2 inches	63.5 by 63.5 mm
	4 by 4 inches	100 by 100 mm
	8 by 8 inches	200 by 200 mm
	12 by 12 inches	300 by 300 mm
e. Boxes		
Depth	1 1/2 inches	38 mm
Size	4 inches (square)	100 mm

END OF SECTION

26 42 13 – GALVANIC (SACRIFICIAL) ANODE CATHODIC PROTECTION (GACP) SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK: Work under this section covers the requirements for the selection and installation of anodes as shown on the Contract Drawings and specified herein

1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

B. NACE INTERNATIONAL (NACE)

NACE SP0169 (2024) Control of External Corrosion on Underground or Submerged Metallic Piping Systems

NACE SP0176 (2007) Corrosion Control of Submerged Areas of Permanently Installed Steel Offshore Structures Associated with Petroleum Production

C. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1) National Electrical Code

1.03 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

A. Drawings

Submit detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts,

installation instructions.

B. Anodes

Submit product data, certificates, manufacturer's data, material safety data sheets, catalog cuts, and other relevant descriptive data for approval.

C. Cathodic Protection System Testing Reports

Submit test results at detailed within this section.

D. Native Potential Measurement Testing

Submit test results at detailed within this section.

E. Protected Potential Measurement Testing

Submit test results at detailed within this section.

1.04 (GACP) SYSTEM REQUIREMENTS

The Cathodic Protection System installation must conform to the applicable rules of NFPA 70 and all applicable federal, state, and local codes.

Construct the Cathodic Protection System in accordance with the design requirements set forth in the reference NACE and ASTM documents. Only acceptable materials shall be permitted on site.

All materials must conform to the requirements set forth herein or as designated on the drawings, unless otherwise specified. All materials must be new, free from defects and be of the best commercial quality for the purpose specified. All necessary items and accessories not shown on the drawings or specified herein, but which are required to fully carry out the specified intent of the work, must be furnished without additional cost to the government.

All materials must be installed and used in accordance with the manufacturer's recommendations and safety procedures.

1.05 DELIVERY, STORAGE AND HANDLING

Storage area for corrosion materials will be designated by the Contracting Officer. If materials are not stored

in a building, tarps or similar protection must be used to protect material from inclement weather.

PART 2 PRODUCTS

2.01 ALUMINUM ANODES

A. Anode Composition

Chemical composition as follows:

Zinc	2.8-6.5 percent maximum
Indium	0.01-0.025 percent maximum
Silicon	0.08-0.21 percent maximum
Copper	0.006 percent maximum
Iron	0.12 Percent maximum
Other	0.02 percent maximum each
Aluminum	Remainder

B. Dimensions and Weights

Anode Length: 24 inches

Anode Size: 9 inches x 9 inches (or equivalent surface area)

C. Anode Core

The anodes must have a continuous carbon steel core with 90 or 45 degree bends. The core must be formed from a steel flat bar and must extend from the bottom of the anode to allow the anode to stand off from the pile. The steel flat bar must comply with ASTM A36/A36M.

The core of the anode must be located in the center of the anode casting along the longitudinal axis of that cast.

To facilitate proper bonding of the aluminum alloy to the steel core during casting, the surface of the steel must be prepared by a dry blast cleaning process. Rust discoloration and/or visible surface contamination shall

not be permitted. Surface preparation must be NACE No. 2 (near-white metal) or better and comply with NACE SP0176.

2.02 TESTS, INSPECTIONS, AND VERIFICATIONS

A. Non-Destructive Testing of Anodes

Contractor must perform the tests in the presence of the Contracting Officer or the Contracting Officer's Representative, Technical Expert and Project Manager. One anode will be chosen at random for non-destructive testing and will be submerged in a container of fresh water for about 30 minutes. Contractor must then measure the anode-to-water potential difference between a calibrated silver/silver chloride reference electrode. The anode open circuit potential must be -1.150 volts.

If the test anode fails to conform to this specification, test the next three anodes. Additional failures can be cause for rejecting all anodes from the same lot as the test anode. The Contractor must mark all rejected anodes on the ends with a 6 inch high "X" using yellow spray paint. Failed anodes must be removed from the job site by the end of the day. The Contractor must replace any rejected anodes at the Contractor's expense.

B. Inspection of Anode Surface

Anodes must meet all of the following requirements. In failure to meet the requirements The Contractor must mark all rejected anodes on the ends with a 6 inch high "X" using yellow spray paint. Failed anodes must be removed from the job site by the end of the day. The Contractor must replace any rejected anodes at the Contractor's expense.

- 1) Shrinkage depressions on the anode surface must not exceed 10 percent of the nominal height of the anode as measured from the uppermost corner to the bottom of the depression.
- 2) Not more than one percent of the total surface of the anode casting shall be contaminated with nonmetallic inclusions visible to the naked eye.
- 3) The straightness of the anode must not deviate more than two percent of the anode nominal length from the longitudinal axis of the anode.

- 4) Within the aluminum section transverse cracks of unlimited length and depth are permitted if width does not exceed 0.20 inches and there are not more than 10 cracks per anode. Small dense cracks must be considered one crack and cracks of 0.02 inches wide or less shall be ignored. Longitudinal cracks are not permitted in any length except in the final "topping-up" metal at shrinkage depressions.

PART 3 EXECUTION

3.01 INSTALLATION

Unless otherwise indicated, all materials must be installed as shown on the Contract Drawings in accordance with the manufacturer's recommendations and safety procedures. Installation must conform to NFPA 70 and welding must be in accordance with Section 05 05 23.16 STRUCTURAL WELDING.

3.02 ANODES

Install anodes in accordance with the drawings.

The area where the anode is to be welded must be cleaned to near white material just prior to welding the anode. The weld for each anode must be capable of fully supporting the anode weight with a minimum of one quarter inch fillet weld around the perimeter of the strap. Repair pile coating at anode welds.

The anode must be maintained free of oils, chemicals, paint, petroleum products, and other foreign chemicals or coatings. All coatings, wrapping, and protective shipping material must be removed from the anode prior to installation.

3.03 FIELD QUALITY CONTROL

Field tests must be witnessed by the Contracting Officer or the Contracting Officer's Representative, Technical Expert and Project Manager or their designated representative. Advise the Contracting Officer or Contracting Officer's Representative 5 days prior to performing each field test. Quality control for the cathodic protection system must consist of the following:

- 1) Native Potential Measurement Testing

2) Protected Potential Measurement Testing

A. Test, Inspection, and Measurements

Record test data, including date, time, and locations of testing and submit cathodic protection system testing reports. Correct and retest, at the Contractor's expense, deficiencies in the materials and installation observed by these tests and inspections.

Perform tests on 30 percent of piles. Testing must be completed at the same piles during the native and protected potential measurement testing intervals.

1) Native Potential Measurement Testing

After the installation of the piles, but prior to the installation of the galvanic cathodic protection system, measure potentials using a silver-silver chloride reference electrode and a voltmeter having an input impedance of not less than 10 megaohms. Perform test at each pile. Potentials should be made at water surface, the midpoint, and the mudline as a minimum.

2) Protected Potential Measurement Testing

With the entire galvanic system put into operation for at least one week, measure potentials using a silver-silver chloride reference electrode and a voltmeter having an input impedance of not less than 10 megaohms. Perform test at same locations as the native potential test.

3) Criteria for Cathodic Protection

Conduct in accordance with NACE SP0169. Criteria for determining the adequacy of protection must be selected by the corrosion engineer as applicable:

A negative voltage of at least 800 millivolts as measured between the structure surface and a saturated silver-silver chloride reference electrode contacting the water. Determination of this voltage is to be made with the protective current applied. OR

A cathodic polarization shift of at least 100 mV. The polarization shift is the difference between the native potential and the protected potential

measurements.

END OF SECTION

DIVISION 28 – ELECTRICAL SAFETY AND SECURITY

28 10 05 – ELECTRONIC SECURITY SYSTEMS (ESS)

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM B32 (2020) Standard Specification for Solder Metal

ASTM D709 (2017) Standard Specification for Laminated Thermosetting Materials

B. INTELLIGENCE COMMUNITY STANDARD (ICS)

ICS 705-1 (2010) Physical and Technical Security Standard for Sensitive Compartmented Information Facilities

C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2020) Enclosures for Electrical Equipment (1000 Volts Maximum)

D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1) National Electrical Code

E. OPEN NETWORK VIDEO INTERFACE FORUM (ONVIF)

ONVIF (2017) Core Specification Version 17.06

F. UL SOLUTIONS (UL)

UL 294	(2023) UL Standard for Safety Access Control System Units
UL 639	(2007; Reprint Jun 2024) Standard for Intrusion Detection Units
UL 681	(2014; Reprint Jan 2021) UL Standard for Safety Installation and Classification of Burglar and Holdup Alarm Systems
UL 969	(2017; Reprint May 2023) UL Standard for Safety Marking and Labeling Systems
UL 1037	(2016; Reprint Aug 2023) UL Standard for Safety Antitheft Alarms and Devices
UL 1076	(2018; Reprint Feb 2021) UL Standard for Safety Proprietary Burglar Alarm Units and Systems

1.02 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

- A. ESS Components
- B. Overall System Schematic
- C. Video Surveillance System (VSS) Schedule
- D. Cameras
- E. Component Enclosure
- F. Contractor Qualifications
- G. Instructor Qualifications
- H. Wire And Cable
- I. Bonding, Grounding, And Shielding

J. ESS Components

K. ESS Training

L. ESS Training Outline

M. As-Built Drawings

1.03 QUALITY ASSURANCE

A. Regulatory Requirements

The advisory provisions in each of the publications referred to in this specification are mandatory. Interpret these publications as though the word "must" has been substituted for "should" wherever it appears.

Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

B. Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

- i. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening and have been utilized in applications of equipment and materials under similar circumstances and of similar size.
- ii. Have been available on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.
- iii. Where two or more items of the same class of equipment are required, provide products of a single manufacturer.
- iv. Provide commercial off-the-shelf (COTS) products in which the manufacturer allows a network of

qualified distributors to sell, install, integrate, maintain, and repair the hardware and software products that make up the system. All products are to be NDAA and FAR subpart 4.21 compliant.

1) Alternative Qualifications

Products having less than a 2 year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

2) Material and Equipment Manufacturing Date

Products manufactured more than one year prior to date of delivery to the site are not acceptable.

3) Product Safety

System components are to conform to applicable rules and requirements of NFPA 70. Equip system components with instruction stickers including warnings and cautions describing physical safety, and special or important procedures to be followed in operating and servicing system equipment.

C. Shop Drawings

1) ESS Components

Submit the ESS Components. Submit drawings that clearly and completely indicate each ESS component function that includes:

- a. Termination device points
- b. Interconnections required for system operation
- c. Interconnections between modules and devices
- d. Component and device wiring diagrams
- e. Proposed wireway or conduit systems to be used including:
 - i. Locations

- ii. Sizes
- iii. Types
- f. Drawings showing:
 - i. Device locations and spacing
 - ii. Mounting and positioning details
 - iii. Riser Diagrams with cable sizes and types
 - iv. Bill of Materials (Device make, model and quantities)
 - v. Video Surveillance System (VSS) and sensor coverage areas
 - vi. Overall system schematic diagram(s)

D. Evidence of Experience and Qualifications

1) Contractor Qualifications

Contractor or its subcontractor(s) must be a Value Added Resaler (VAR)/Authorized Dealer (AD) of the manufacturer line of products being installed. Provide manufacturer certificate showing current dealership status. Technicians working the project must provide certificates of training for the requirements of the manufacturer, and those certificates must be from the manufacturer or approved by the manufacturer.

Submit experience and certified qualifications data prior to installation. Show that specific installers who will perform the work have a minimum of 2 years of experience successfully installing ESS of the same type and similar design as specified. Include the names, locations, and points of contact of at least two installations of similar type and design as specified in this document where the installer has installed such systems. Indicate the type of each system installed. Certify that each system has performed satisfactorily in the manner intended for a period of at least 12 months.

2) Instructor Qualifications

Submit the instructor's experience and certified qualifications data prior to installation. Show that the instructor has received a minimum of 24 hours of ESS training from the manufacturer of the product being installed, and 2 years experience in installing the specified ESS type.

1.04 ENVIRONMENTAL CONDITIONS

A. Exterior Conditions

Components in enclosures must meet performance requirements when exposed to the following ambient conditions:

1) Temperature

Minus 25 to 140 degrees F.

2) Pressure

Sea level to 15,000 feet above sea level.

3) Solar Radiation

Six hours of solar radiation per day at dry bulb temperature of 120 degrees F including 4 hours of solar radiation at 104 watts per square foot.

4) Rain

2 inches per hour and 5 inches per hour cyclic with wind plus one period of 12 inches per hour in accordance with UL 294 and UL 639.

5) Humidity

5 to 95 percent.

6) Salt Fog

Salt atmosphere with 5 percent salinity.

7) Snow

Snow loading of 48 (psf) per hour; blowing snow of 4.6 psf per hour. Blowing snow from any angle

(falling vertically to horizontal blowing from any azimuth) must not penetrate ESS equipment.

8) Wind

Continual velocity up to 50 mph with gusts to 66 mph, except that fence sensors must detect intrusions up to 35 mph.

9) Acoustical Noise

Visual alert device and components should be used in high noise areas above 110 dB without adversely affecting their performance. Examples areas include flight lines, run-up pads, and generator sites.

1.05 AS-BUILT DRAWINGS

Maintain a separate set of drawings, elementary diagrams, and wiring diagrams of the system to be used for as-built drawings. Keep this set accurately and neatly up to date with all changes and additions. This set is not to be used for installation purposes.

Finish the final drawings submitted with the endurance test report in accordance with as-built requirements.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

Project includes the addition of VSS cameras to an existing ESS.

2.02 PERFORMANCE REQUIREMENTS

All system components shall be National Defense Authorization Act (NDAA) compliant, and shall be compatible with the existing ESS and VSS at the site.

A. Maintainability

Provide components that can be maintained using commercially available tools and equipment. Arrange and assemble components to be readily accessible to maintenance personnel without compromising system defeat resistance and with no degradation in tamper protection, structural integrity, EMI or RFI attenuation, or line

supervision after maintenance when it is performed in accordance with manufacturer's instructions.

B. Availability

Provide components rated for continuous operation. Provide power-dissipating components with safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Provide heat sinks or other heat dissipation devices on appropriate components and assemblies.

C. Special Test Equipment

Provide all special test equipment, special hardware, software, tools, instructions, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

D. Interchangeability

Use off-the-shelf components which are physically, electrically, and functionally interchangeable with equivalent components as complete items. Equivalent, replacement components must not require new or other component modification. Do not use custom designed or one-of-a-kind items. Interchangeable components or modules must not require trial and error matching in order to meet integrated system requirements, system accuracy, or restore complete system functionality.

2.03 VIDEO SURVEILLANCE SYSTEM (VSS)

Select system components that conform to the Open Network Video Interface Forum (ONVIF) specification.

A. Cameras

1) VSS Camera

Provide Internet Protocol (IP) cameras of fixed.

- a. Day-Night Color fixed, are to be used in all outdoor environments.

- b. Provide IP camera compatible with the existing security system. For reference, the existing camera is a Lorex LNB8111-C mode.

B. Video Surveillance System (VSS) Schedule

Provide a spreadsheet describing each individual camera installation location including the following items:

- A. Unique camera location identifier.
- B. EMake/model/type (PTZ, fixed, fixed IR, etc.)/part-number of camera.
- C. Make/model/part-number of camera mount.
- D. Intended camera field of view.
- E. Any additional information pertinent to that unique location.

2.04 COMMUNICATIONS

Cameras shall communicate/link with and function properly with the existing ESS.

A. Wire and Cable

Provide all wire and cable (including copper power cable, UTP data cable, optical fiber cable, and coaxial cable) not indicated as government-furnished equipment. Wiring must meet NFPA 70 standards and as indicated in the Wire and Cable Data Sheets Attachment at the end of this section. Provide optical fiber test data and UTP test data for field connectorized cable, including any existing optical fiber cable and/or existing UTP which will be used to transmit data for any ESS items provided in the project.

B. Digital Data Interconnection Wiring

Interconnecting cables carrying digital data between equipment located at the SCC or at a secondary control and monitoring site is to be optical fiber cable.

2.05 COMPONENT ENCLOSURE

Alarm enclosures with a tamper switch(es). Enclosures is to be formed and assembled to be sturdy and rigid. These include:

Sensor control and terminal cabinets

A. Exposed-to-Weather Enclosures

Enclosures to house equipment in an outdoor environment must be housed in a metallic enclosure and meet the requirements of NEMA 250 Type 4X.

B. Corrosion-Resistant Enclosures

Enclosures to house equipment in a corrosive environment must be housed in a metallic enclosure and meet the requirements of NEMA 250 Type 4X.

2.06 EQUIPMENT RACK

A. Labels

Provide a labeling system for cabling as required by UL 969. Provide stenciled lettering for voice and data circuits.

2.07 FIELD FABRICATED NAMEPLATES

Nameplates must comply with ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device as specified or as indicated on the drawings. Each nameplate inscription is to identify the function and, when applicable, the position.

Nameplates are to be melamine plastic, 0.125 inch thick, white with black center core. Surface is to be matte finish. Corners are to be square. Accurately align lettering and engrave into the core. Minimum size of nameplates must be 1 by 2.5 inches. Provide lettering a minimum of 0.25 inch high normal block style. Nameplates are not required for devices smaller than 1 x 3 inches.

A. Manufacturer's Nameplate

Each item of equipment is to have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the

nameplate of the distributing agent will not be acceptable.

2.08 FACTORY APPLIED FINISH

Electrical equipment is to have factory-applied painting systems which meets the requirements of the NEMA 250 corrosion-resistance test as a minimum.

PART 3 EXECUTION

3.01 INSTALLATION

Install the system in accordance with safety and technical standards NFPA 70, UL 681, UL 1037, and UL 1076. Configure components within the system with appropriate service points to pinpoint system trouble in less than 20 minutes.

Install all system components, including any equipment that is furnished by the government, and appurtenances in accordance with the manufacturer's instructions, NFPA 70 and as shown on the drawings, and furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.

A. Existing Equipment

Connect to and utilize existing equipment, control signal transmission lines, and devices as shown on the drawings. Any equipment and signal lines that are usable in their original configuration without modification may be reused with government approval.

Make written requests and obtain approval prior to disconnecting any signal lines and equipment that creates equipment outage. Such work can proceed only after receiving government approval of these requests. If any device fails after work has commenced on that device, signal, or control line, diagnose the failure and perform any necessary corrections to the equipment. The government is responsible for maintenance and repair of government equipment. The Contractor will be held responsible for repair costs due to negligence or abuse of government equipment on their part.

B. Enclosure Penetrations

Enclosures are to be penetrated from the bottom unless shown otherwise. Penetrations of interior enclosures having transitions of conduit from interior to exterior, and penetrations of exterior enclosures are to be sealed with rubber silicone sealant to preclude the entry of water.

Terminate conduit risers in a hot-dipped galvanized metal cable terminator that is filled with a sealant as recommended by the cable manufacturer, and in a manner that does not damage the cable.

C. Cable and Wire Runs

Perform required cable and wire routings per NFPA 70 and as specified. Terminate conduits including flexible metal and armored cable in the sensor or device enclosure. Fit ends of conduit with insulated bushings. Exposed conductors at ends of conduits external to sensors and devices are not acceptable.

D. Soldering

Soldered electrical connections must use composition Sn60, Type AR or S, for general purposes; use composition Sn62 or Sn63, Type AR or S, for special purposes. Flux must conform to ASTM B32 when Type S solder is used for soldering electrical connections.

E. Galvanizing

Ferrous metal is to be hot-dip galvanized in accordance with ASTM A123/A123M. Provide screws, bolts, nuts, and other fastenings and supports that are corrosion resistant.

Field welds or brazing on factory galvanized boxes, enclosures, conduits, and so on, are to be coated with a cold galvanized paint containing at least 95 percent zinc by weight.

F. Conduits

Install interior conduits in accordance with NFPA 70 and ICS 705-1. Install exterior conduits in accordance with NFPA 70, and ICS 705-1.

G. Field Applied Painting

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

H. Bonding, Grounding, and Shielding

Provide in accordance with NFPA 70. Provide bonding conductors per NFPA 70.

1) Grounding

Provide a ground system that consists of the earth electrode and lightning protection, surge protection, fault protection and signal reference subsystems.

a. Earth Electrode Subsystem

Provide an earth electrode subsystem that provides a path of low resistance to earth for lightning and power fault currents.

I. Nameplate Mounting

Provide nameplate number, location, and letter designation as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or rivets.

3.02 ADJUSTMENT, ALIGNMENT, SYNCHRONIZATION, AND CLEANING

- A. Clean each system component of dust, dirt, grease, or oil incurred during and after installation or accrued subsequent to installation from other project activities subsequent to installation.
- B. Prepare for system activation by manufacturer's recommended procedures for adjustment, alignment, or synchronization.
- C. Prepare each component in accordance with appropriate provisions of component installation, operations, and maintenance manuals.
- D. Remove large vegetation that may sway in the wind and touch fencing.

- E. Adjust sensors so that coverage is overlapping and maximized without mutual interference.

3.03 SYSTEM STARTUP

Do not apply power to the system until after:

- A. Set up system equipment items and communications in accordance with manufacturer's instructions.
- B. Conduct a system visual inspection to ensure that defective equipment items have not been installed and that there are no loose connections.
- C. Test and verify system wiring as correctly connected.
- D. Verify system grounding and transient protection systems as properly installed.
- E. Verify the correct voltage, phasing, and frequency of the system power supplies.

Satisfaction of the requirements above does not relieve the Contractor of responsibility for incorrect installations, defective equipment items, or collateral damage as result of Contractor work or equipment.

3.04 ESS SYSTEM TESTING

Test system function in accordance with ESS system manufacturer requirements.

3.05 ESS TRAINING

Conduct training courses for 3 designated personnel in system maintenance and operation. Coordinate training with the government. The training is to be oriented to the specific system being installed. Training content is to include training manuals and audio-visual materials. Deliver training manuals for each trainee with 2 additional copies delivered for archiving at the project site. The manuals are to include an agenda, defined objectives for each lesson, and a detailed subject matter description for each lesson.

Furnish audio-visual equipment and other training materials and supplies. Deliver copies of the audio-visual materials to the government either as a part of the printed training manuals or on the same media as that

used during the training sessions when course portions are presented using audio-visual material.

A. ESS Training Outline

Submit a training plan for the training phases, including type of training to be provided, outline of training manuals, training course agendas, and a list of reference material, for government approval.

B. Typical Training Day

A training day is defined as:

A. Four hours of classroom and on-site instruction

B. Conducted:

Monday through Friday

During the daytime shift in effect at a government-provided training facility

For guidance in planning the required instruction, assume that attendees will have a high school education or equivalent, and are familiar with ESS. Approval of the planned training schedule is to be obtained from the government at least 30 days prior to the training.

END OF SECTION

DIVISION 33 – UTILITIES

33 01 50.31 – LEAK DETECTION FOR FUELING SYSTEMS

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced.

A. AMERICAN PETROLEUM INSTITUTE (API)

API RP 540 (1999; R 2004) Electrical Installations in Petroleum Processing Plants

API RP 2003 (2015; 8th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents

B. ASTM INTERNATIONAL (ASTM)

ASTM B117 (2019) Standard Practice for Operating Salt Spray (Fog) Apparatus

C. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142 (2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book

IEEE 1100 (2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment

D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2023; ERTA 1 2024; TIA 24-1) National Electrical Code

NFPA 77 (2024; ERTA 1 2023) Recommended Practice on Static Electricity

NFPA 407 (2022; TIA 24-2) Standard for Aircraft Fuel Servicing

1.02 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

- A. Leak Detection System Shop Drawings
- B. Leak Detection System Product Data
- C. Leak Detection System Test
- D. Demonstrations
- E. Leak Detection System Manufacturer's Instructions
- F. Leak Detection System Operation and Maintenance Data

1.03 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Provide materials and equipment that are standard products of a manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship, and that have been in satisfactory commercial or industrial use for a minimum 2 years prior to bid opening. Include applications of the equipment and materials under similar circumstances and of similar size. Materials and equipment must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

- A. Nameplates

Attach nameplates to all specified equipment defined herein. List on each nameplate the manufacturer's name,

address, component type or style, model or serial number, catalog number, capacity or size, and the system which is controlled. Construct plates of stainless steel. Install nameplates in prominent locations with nonferrous screws, nonferrous bolts, or permanent adhesive. Provide nameplates with a minimum size of one by 2.5 inches. Provide normal block style lettering with a minimum 0.25 inch height. Accurately align all lettering on nameplates.

B. Metallic Requirements

Do not construct internal parts and components of equipment, piping, piping components, and valves that could be exposed to fuel during system operation of zinc coated (galvanized) metal. Do not install cast iron bodied valves in piping systems that could be exposed to fuel during system operation.

2.02 ELECTRICAL WORK

Provide controllers, integral disconnects, contactors, controls, and control wiring with their respective pieces of equipment. Provide electrical equipment, including motors and wiring, as specified in Section 26 27 29 MARINA ELECTRICAL WORK. Provide switches and devices necessary for controlling and protecting electrical equipment. Provide controllers and contactors that have a maximum of 120-volt control circuits and that have auxiliary contacts for use with the controls provided.

A. Underground Wiring

Enclose underground electrical wiring in PVC coated conduit. Dielectrically isolate conduit at any steel storage tank connection.

B. Grounding and Bonding

Perform grounding and bonding in accordance with NFPA 70, NFPA 77, NFPA 407, NFPA 780, API RP 540, API RP 2003, IEEE 142, and IEEE 1100. Provide jumpers to overcome the insulating effects of gaskets, paints, or nonmetallic components.

2.03 LEAK DETECTION SYSTEM

Provide leak detection connection to existing system.

Provide a system, including sensors and detectors, that is intrinsically safe for use in a Class 1, Division 1, Group D environment as defined by NFPA 70. Provide system compatible with the fuel to be handled. Furnish sensors that distinguish and report the difference between hydrocarbons and water. Provide electronic output and transmission from sensors and detectors. Provide sensors that have a minimum probability of detection of 95 percent and a maximum probability of false alarm of 5 percent. Provide sensors and detectors that are compatible with the electronic monitoring/alarm panel. Reuse sensors after an alarm condition is sensed. Submit shop drawings for the leak detection system that include the following.

- 1) Wiring schematics for all parts of the system showing each operating device and listing their normal ranges of operating values (including pressures, temperatures, voltages, currents, speeds, etc.).
- 2) Single line diagrams of the entire system, including any required alterations to the existing piping and tank(s).
- 3) Diagrams for posting that include distance markings such that alarm indications can be correlated to leak location in plan view. Include a piping and wiring display map with schematic diagrams from the leak detection system manufacturer. Frame diagrams under glass or laminated plastic and be posted where indicated by the Contracting Officer.

A. Containment Sumps

Provide Leak Detection System on sumps that continuously and automatically monitors each containment sump with an electronic capacitance type liquid sensor. Furnish sensor that detects liquids within a minimum of 1 inch above a sump's bottom. The leak detection system must be capable of triggering shutdown of the submersible turbine pump or the dispenser pump.

2.04 FINISHES

A. Factory Coating

Unless otherwise specified, provide equipment and components fabricated from ferrous metal with the

manufacturer's standard factory finish. Each factory finish must be capable of withstanding 500 hours exposure to the salt spray test specified in ASTM B117. For test acceptance, the test specimen must show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark immediately after completion of the test. For equipment and component surfaces subject to temperatures above 120 degrees F, appropriately design the factory coating for the temperature service.

B. Field Painting

Do not paint stainless steel and aluminum surfaces. Do not coat equipment or components provided with a complete factory coating. Prior to any field painting, clean surfaces to remove dust, dirt, rust, oil, and grease.

PART 3 EXECUTION

3.01 INSTALLATION

Install parts requiring periodic inspection, operation, maintenance, and repair in locations that allow ready access. Install leak detection system and components in accordance with manufacturer's installation instructions.

A. Storage Tank Sensors/Detectors

Install interstitial tank sensors and detectors at the tank's low end. Install sensors in accordance with the tank manufacturer's recommendations and do not compromise the tank's secondary containment in any manner. Provide sensors that are easily removed from a tank. Connect metal conduit to steel tanks with dielectric fittings.

B. Automatic Line Leak Detector

Install detector on discharge side of each submersible pump in accordance with the pump and detector manufacturer's recommendations.

C. Sensors in Sumps

Install sensors in the low point of a sump in accordance with sump and sensor manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL

A. Leak Detection System Test

Activate and test the entire leak detection system in accordance with manufacturer's testing procedures. Use the electronic monitoring/alarm panel to record and present the results.

3.03 DEMONSTRATIONS

Field tests must be witnessed by the Contracting Officer or the Contracting Officer's Representative, Technical Expert and Project Manager or their designated representative. Advise the Contracting Officer or Contracting Officer's Representative 5 days prior to performing each field test. Quality control for the cathodic protection system must consist of the following:

Native Potential Measurement Testing

Protected Potential Measurement Testing

A. Test, Inspection, and Measurements

Conduct a training session for designated government personnel in the operation and maintenance procedures related to the equipment/systems specified herein. Include pertinent safety operational procedures in the session as well as physical demonstrations of the routine maintenance operations. Furnish instructors who are familiar with the installation/equipment/systems, both operational and practical theories, and associated routine maintenance procedures. The training session must consist of a total of 2 hours of normal working time and must start after the system is functionally completed, but prior to final system acceptance. Submit a letter, at least 14 working days prior to the proposed training date, scheduling a proposed date for conducting the onsite training.

END OF SECTION

33 08 55 –FUEL DISTRIBUTION SYSTEM START-UP (NON-HYDRANT)

PART 1 GENERAL

1.01 SUMMARY/APPLICABILITY

This specification defines the requirements and procedures for startup and performance testing of all equipment, components, control systems, devices, and associated appurtenances which are used for the receipt, storage, transfer and issue of petroleum fuel products for non-hydrant fuel facility systems. It covers requirements for safety, government scheduling and coordination, device testing, existing and new system cleanliness, system flushing and cleaning, demonstration of indicated and specified system performance, and final acceptance and reporting. The types of fuel systems covered include:

- 1) Marine Off-Loading Systems
- 2) Installation Pipelines

It does not cover private vehicle fueling stations such as exchange service stations, nor aircraft direct refueling hydrant systems.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced.

A. AMERICAN PETROLEUM INSTITUTE (API)

API 570	(2016; Addendum 1 2017; Addendum 2 2018; ERTA 1 2018) Piping Inspection Code: In-Service Inspection, Rating, Repair, and Alteration of Piping Systems
API RP 1595	(2012; R 2019; 2nd Ed) Design, Construction, Operation, Maintenance, and Inspection of Aviation Pre-Airfield Storage Terminals

B. U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-3004-1 (2018) Quality Assurance for Bulk
Fuels, Lubricants and Related
Products

1.03 ADMINISTRATIVE REQUIREMENTS

A. Plans

The Contractor must submit detailed written plans for implementation of the System Start-Up Plan, the Existing System Cleanliness Confirmation Plan, the Fuel Provisioning Plan, and the Performance Testing Plan. The plans must specify a detailed plan incorporating in a sequential manner all work specified in PART 3 EXECUTION of this specification section. Plan elements must include:

- 1) Personnel. List of Contractor's personnel by trade, list of key personnel, list of safety equipment, list of miscellaneous equipment such as two-way radios, and personnel transportation vehicles Installation Pipelines
- 2) Fluid Used for Hydrotesting, Flushing, and Cleaning. Identify what fluid will be used for each operation in each system section.
- 3) Fuel. See the Fuel Provisioning Plan.
- 4) Storage-Into. Identify where the contents of the piping will be pushed into including the capacity required, how the storage vessel will be prepared for receiving the piping content, how it will be emptied and how it will be cleaned after the contents are removed.
- 5) Storage-From. Identify where the fluid that will be drained or pushed into the piping will come from including the capacity required, the number, size and type of the storage vessel, how the storage vessel is filled, how it will be emptied, and how it will be cleaned after the contents are removed.
- 6) Piping. Notwithstanding the requirements described elsewhere, every pipe section and individual component in the system covered by this specification section

must be filled, vented, hydrostatically tested, flushed, cleaned, and tested for fuel quality. It must also be able to be isolated and drained if found that it needs repair. The Plans must detail how this is to be done.

- 7) Equipment Tests. Detailed procedures and schedules for each system component to perform all system tests under each operating scenario in accordance with paragraph EQUIPMENT TESTS.
- 8) Performance Testing. Detailed procedures and schedules for each system component to perform all system tests under each operating scenario in accordance with paragraph PERFORMANCE TESTING.
- 9) Hydrotesting Plans. See the Work Plan in Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).
- 10) Schedule. Schedules must be generated with listing dates and durations of all system start-up activities as well as regular coordination and safety meetings and dates of key events for government participation.
- 11) Contingency plans. Information on spill and fire contingencies, along with the required Government Fire and Safety Office involvement and approvals.
- 12) Coordination with Installation. Description of how Contractor must implement system start-up in coordination with ongoing operations at the Installation. Plan must incorporate all phasing and work restriction requirements of the Contract documents.

B. Copies of API Publication

Provide four copies of API RP 1595 to the Contracting Officer.

C. Existing System Cleanliness Confirmation Plan

Submit a detailed written plan prepared by the Contractor for the Contractor to verify and confirm the cleanliness of the existing system before connecting it to the new system or extension. The cleanliness confirmation test of the existing system (pre-cleanliness test) must be per MIL-STD-3004-1. Submit the plan 60 (CONUS) days prior to

making the connection to the existing system. The Contractor are responsible for implementing the Existing System Cleanliness Confirmation Plan in coordination with ongoing base operations.

D. Fuel Testing Laboratory Qualifications

Contractor must submit the qualifications of the DoD Fuel Testing Laboratory which will be used to test the fuel samples.

E. System Start-up Plan

Submit a detailed written plan prepared by the Contractor for implementation of System Start-Up. Submit the plan 60 (CONUS) days prior to System Start-Up. The Contractor are responsible for implementing System Start-Up in coordination with ongoing operations.

F. Performance Testing Plan

Submit a detailed written plan prepared by the Contractor for implementation of Performance Testing. Submit the plan 60 (CONUS) days prior to System Start-Up. The Contractor is responsible for implementing the Performance Testing Plan in coordination with ongoing operations.

G. Fuel Provisioning Plan

Submit a detailed written Fuel Provisioning Plan prepared by the Contractor. The Fuel Provisioning Plan must include a timeline for the required receipt date(s), grade of fuel, and quantity of fuel on each receipt date required to execute the Start-up and the Performance Testing plans.

H. Certification (Ready for Start-Up and Performance Testing)

As a prerequisite to fuel system start-up, the Contractor must submit a certificate that certifies all work provided on the fuel system, except for touch-up field painting, has been inspected and approved by the specified approving authorities. Further, the Contractor must certify on this certificate that all specified checks and inspections have been successfully completed prior to start-up. Submit the plan 30 (CONUS) calendar

days prior to commencement of fuel system start-up. The Contractor must submit the Certificate of Completion to the Contracting Officer at least 7 calendar days prior to commencement of system start-up and performance testing. The Contracting Officer must then be responsible for scheduling the government representatives and appropriate military command authority for participation in the inspection, performance testing, and final approval activities. Any contractual deficiencies observed must be corrected by the Contractor without cost to the government.

1.04 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

- A. Copies of API 1595
- B. Existing System Cleanliness Confirmation Plan
- C. System Start-Up Plan
- D. Performance Testing Plan
- E. Fuel Provisioning Plan
- F. Final Reports
- G. Equipment Tests
- H. Piping Flushing Checklist
- I. Piping Cleaning Checklist
- J. Fuel Testing laboratory Qualifications
- K. Certification (Ready for Start-Up and Performance Testing)
- L. Contractor Start-Up Qualifications
- M. Certificate of Calibration
- N. Disposal Of Waste Materials
- O. Certification of Entire System

1.05 CLOSEOUT SUBMITTALS

A. Final Reports

Contractor must prepare a final report that documents the execution of the approved start-up and performance testing plan. All items of work specified in the Start-up and Performance Testing plans must be carried out and reported in this report unless otherwise approved by the Contracting Officer. Include as a part of this report:

- 1) Verification letters of approved fuel storage tank hydrostatic tests and the approved piping hydrostatic tests, as generated under other specification sections.
- 2) Final settings of the values and switches.
- 3) A copy of the flow and pressure output graphs and excel data and charts on CDR media with an explanation of what the graph indicates and what the system is doing.
- 4) A schematic flow diagram drawing of the resultant system showing major valves with the "normal" position of each manual valve noted, equipment, and the type, location, and setpoints of each safety relief valve and thermal relief valve.
- 5) A certified pipeline inventory - a detailed list with sizes, lengths, quantity, and volumes must be provided for the systems in this project. Such systems include, but are not limited to: marine receipt, pipeline receipt, truck off-loading receipt, pumphouse, pump pad, truck loading, marine loading, transfer pipeline, product recovery, and other miscellaneous piping systems. Fuel system volume must be calculated using as constructed pipe lengths, internal diameters, fittings, and components. Totals must be provided for all items containing fuel with the exception of tanks which is covered by other specifications.

1.06 QUALITY ASSURANCE

A. Contractor Start-Up Qualifications

Submit the following for approval:

- 1) Certification stating that the Contractor has provided start-up services (including start-up, existing system cleanliness confirmation, and performance testing experience) for five similar systems in the last 5 years.
- 2) Project names, locations, system description, and items provided at these installations. Include user point-of-contact and current telephone numbers.

B. Certification of Entire System

Prior to the acceptance of the newly constructed system by the government, all installed mechanical and electrical system components must be inspected and approved by the Contracting Officer. Provide the Contracting Officer 45 days notice in order to schedule the Installation and Service Headquarters or their designated appointee for participation in the inspection, Performance Testing, and approval. Any deficiencies observed must be corrected by the Contractor without cost to the government.

1.07 SYSTEM SUPPLIER INVOLVEMENT

The System Supplier is defined in Specification 33 57 55 FUEL SYSTEMS COMPONENTS (NON-HYDRANT). The Contractor and the System Supplier must work together to prepare the Start-Up Plan, the Existing System Cleanliness Confirmation Plan, Equipment Testing Plan, Performance Testing Plan, and the Final Reports. They must both be present during all activities described in this section. The System Supplier must be responsible to the Contractor for scheduling all Contractor, sub-Contractor, and manufacturer's service personnel during activities described in this specification section.

1.08 DISPOSAL OF WASTE MATERIALS

The Contractor must be responsible for properly disposing of any sludge, debris, filtration elements, and waste fuel resulting from piping and tank flushing and cleaning activities as specified. Comply with all applicable Installation, local (city and county), State, and federal regulations for hazardous waste disposal.

PART 2 PRODUCTS

2.01 GOVERNMENT-FURNISHED MATERIAL AND EQUIPMENT

A. Fuel

1) MOGAS and Diesel

Some fuel loss should be expected. Fuel that is lost during flushing and cleaning, equipment testing, and performance testing is viewed as a Start-up and Performance Testing expense and should be budgeted for in Contractor estimates. As Basis of Bid, the Contractor must allow for 200 gallons of fuel losses in the bid.

The Contractor must establish a Department of Defense Activity Address Code and must reimburse the U.S. Government for any U.S. Government fuel lost resulting from poor workmanship or contamination.

2) Lead Time

The government will provide fuel given that the requirements are submitted with sufficient lead time to allow the U.S. Government to secure the grade and volume required and make the necessary transportation requirements. The Contractor must provide a copy of the Start-up, Fuel Provisioning, and Performance Testing plans a minimum of 60 days in advance of System Start-up.

B. Flushing, Cleaning, Equipment Tests and Performance Testing

The flushing and cleaning and testing phases will be identified separately in the start-up and Performance Testing plans. Fuel used for flushing and cleaning, and testing will become contaminated, the fuel must be isolated and is considered off-specification until the quality can be verified. Fuel volumes required for flushing and cleaning and testing should be minimized to limit costs, so estimates should be made accordingly. The Contractor will be responsible for disposing of any waste product.

Upon satisfactory completion of the flushing and cleaning operations, the government will supply the additional

quantities of fuel required to complete the other work under this section. This larger volume of fuel will not be delivered to the system until the Contractor has satisfactorily completed all work and, in particular, the removal of preservatives and foreign matter from those portions coming in contact with the fuel valves, pumps, filter-separators and other such system components.

2.02 CONTRACTOR-FURNISHED MATERIAL AND EQUIPMENT

A. Contractor-furnished

Provide material, equipment and labor not specified to be government-furnished and required for proper System Start-Up of the system. Equipment being provided must be calibrated and the certificate of calibration be submitted to the Contracting Officer prior to use. Equipment must include but not be limited to the following:

- 1) Temporary strainers
- 2) Pipe spools
- 3) Flow meters
- 4) Pressure gauges
- 5) Electronic sensors and recorders for pressure are included in the Pump Control Panel (PCP). This equipment must be used to monitor and record the system during the "Equipment Tests" and "Performance Testing" portions of this Specification Section. Recorded data must be used by the Contractor and equipment factory representatives to achieve final control valve and equipment adjustments. Recorded data must include:
 - a. Fueling pumps discharge pressures.
 - b. Storage Tank levels.
 - c. Product Recovery Tank levels.
 - d. Fueling pumps suction pressures.

B. Design Conditions

Use temporary flushing lines and equipment that are equal

in strength, stability, and materials to the associated permanent components. However, spools may be carbon steel. Additional design conditions must be as specified in Section 33 57 55 FUEL SYSTEMS COMPONENTS (NON-HYDRANT).

2.03 WATER FOR FLUSHING PIER PIPING

Water must be furnished by the Contractor and must be potable and treated and must meet all the requirements of water used for hydrostatic testing in API 570.

PART 3 EXECUTION

3.01 SEQUENCE OF EVENTS

The following events take place in the Start-Up and Performance Testing of a system and their definitions:

- A. System Start-Up Phase: The System Start-Up phase encompasses all of the events described below up to the Performance Tests Phase.
- B. Preliminary Requirements: Confirms completion of the system before fuel is received including verification of the cleanliness of the existing piping system being connected to.
- C. Preparations for Flushing: Activities that take place before initial receipt of fuel.
- D. Pneumatic Testing: Test for leaks in a piping system using air under pressure as the test medium. For requirements see Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).
- E. Hydrostatic testing - Fuel: Use of fuel to test for leaks in a piping system using liquid under pressure as the test medium. For requirements see Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).
- F. Soak Testing: Perform "Soak Testing" of the piping system using fuel, as per Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).
- G. Flushing: In this context, refers to removing gross contamination (free water and solids) from a fuel system using water (fuel pier only).

- H. Cleaning (filter vessels and strainers): Filter vessels and strainers that are designed to be opened for cleaning must be opened and cleaned.
- I. Control Valve Adjustment: Control valve adjustment so that equipment can be safely tested and adjusted.
- J. Equipment Tests: Tests performed by the Contractor and the System Supplier to confirm that individual components of the fuel system are correctly installed and are operational.
- K. Performance Tests Phase: Government witnessed demonstration of the proper operation of the individual pieces of equipment and the system or systems as a whole.

3.02 PRELIMINARY REQUIREMENTS

All activities listed in paragraph PART 3 EXECUTION must be performed sequentially in the order they are presented. Prior to any on-site system start-up activities, the Contractor must ensure that all requirements of the paragraph SAFETY are satisfied. Project must be substantially complete, except for touch-up field painting, and Contractor's work area must be free of debris, trash and obstacles. Perform the following activities prior to receipt of fuel.

A. Safety

Prior to any on-site system start-up activities, the following safety procedures must be accomplished in all fueling areas to be started up and performance tested under this specification section: testing/operation of emergency showers and eyewash stations, placement of Contractor-provided portable eyewash units within 100 feet or 10 seconds from the fueling point, verification of proper grounding throughout system, coordination with Government Fire and Safety Office and Fuels personnel, placement of Contractor-provided spill pads, placement of Contractor-provided fire extinguishers capable of extinguishing a fuel fire. Ensure that all radios/devices at all Class I, Division 1 areas are intrinsically safe.

B. Electrical Preparations

Prior to energizing the electrical system components, verify that short-circuit links have been removed from current transformer and that secondary circuits have been connected. Confirm that all tests required for fire detection and suppression systems have been performed and accepted. Verify all electrical transmitter connections and ensure proper calibration. Verify all electrical system components meet the classification and division as required by the design. Verify correct rotation of all motors prior to testing. Verify paddle type flow switches by physically actuating vanes and checking outputs. Conduit explosion-proof sealoffs must be poured after initial electrical checks but before fuel receipt.

C. Emergency Fuel Shutoff (EFSO) System Testing

Prior to initial fuel receipt, verify that each switch will trip the circuit breaker of the fuel pumps and de-energize the EFSO relay and close the main emergency fuel shut-off valve.

D. Piping System

Ensure that all piping weld integrity, leak detection systems, and coating inspections have been performed per the applicable specifications. Provide statement that required testing has been completed in the Final Reports. Evacuate all accumulated water from piping low point drains, valve cavities, and equipment drains. Verify all bolted connections are tightness tested to required torque using a calibrated torque wrench. Verify that all pressure gauges are properly calibrated, located and installed. Ensure that piping's cathodic protection system is tested, calibrated and operational. Ensure that pipe marking and identification are provided as specified. Ensure that piping system thermal relief provisions are installed as designed. Verify the correct installation of piping expansion loops, joints, and supports.

1) Pier Piping Systems

For pier delivery/receipt systems or other over-water piping installations, ensure compliance with the Contractor's previously approved spill control plans.

E. Existing System Cleanliness Confirmation

Contractor and System Supplier must conduct tests to confirm the cleanliness of the existing system before connecting it to the new system or an extension, upgrade or repair of the existing system. Confirm that the fuel in the existing system meets the intra-governmental receipt limits defined in MIL-STD-3004-1. Sampling must be performed by the Contractor and testing must be done by an independent fuel testing laboratory approved by the Contracting Officer.

3.03 PREPARATIONS FOR FLUSHING

Upon completion of the system to the satisfaction of the Contracting Officer and the Service Headquarters and or their designated appointee, make the following preparations for flushing the system.

A. Protection of System Components

The following items must be removed from the system prior to start of flushing operations and, where applicable, replaced with spools of pipe, diameter equal to the item removed.

- 1) Sensors which are exposed to the fluid such as pressure gauges and thermometers.

- 2) Meters.

After flushing, the above items must be reinstalled in the system and the spool sections turned over to the Contracting Officer.

B. Strainers

Ensure strainers are clean before flushing. Temporary 40 mesh strainers with minimum 300 percent open area must be provided in the suction line ahead of each fueling pump for the entire flushing operation. A temporary strainer should be installed immediately upstream of the product recovery tank overfill valve. Any damaged permanent or temporary strainers must be replaced by the Contractor at no additional cost to the government.

C. Water Draw-off

Remove any accumulated water from piping, equipment, and sumps and bottoms. Repeat process until all water is removed. Dispose of petroleum contaminated water in accordance with Installation, local, state, and federal regulations.

3.04 FLUSHING

Flushing procedures remove gross particulate and water contaminants and must precede cleaning procedures. All piping including but not limited to issue piping, supply and return lines to the storage tanks, low point drains, must be flushed with fuel. Pier piping must be flushed with water.

In the event flushing identifies the presence of clay or soil like material in the system, Contractor must immediately notify Contracting Officer for direction.

A. Flushing Requirements

Begin flushing of fuel system piping at low flow rates using one pump in multiple pump systems or a throttled pump in single pump systems (using the downstream isolation valve to throttle the pump) at 25 percent of rated flow. Slowly increase flushing flow rate until a plus or minus 12 FPS fuel velocity is achieved. Flush for a minimum of 30 minutes. Sampling must be performed by the Contractor and testing must be done by an independent fuels testing laboratory approved by the Contracting Officer. Fuel must be free of gross contamination and visible free water to the satisfaction of the Contracting Officer.

In the event flushing identifies the presence of clay or soil like material in the system, Contractor must immediately notify Contracting Officer for direction.

B. Fueling System Piping

During flushing procedure periodically bleed air through high point vent and drain water through low point drains.

1) Pier Piping

Pier piping and loading arms should be hydrostatically

tested with fresh water per the requirements of Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT). After testing, flush piping with fresh water at 12 FPS for 30 minutes. Drain all water from piping system and refill with product. Perform flushing with product at 12 FPS for 30 minutes. At end of testing, drain pier piping of water.

C. Piping Flushing Checklist

The Contractor must generate a comprehensive matrix of all new and existing piping sections in the system. Matrix must serve as an Owner's piping inventory and a checklist for all Contractor-provided flushing operations. Column entries must include pipe section name, location, diameter, approximate length, flushing fuel velocity and volume achieved and acceptable results of sampling.

3.05 CLEANING

After initial flushing is completed, clean each piping segment with product in accordance with the procedure specified hereafter.

In the event cleaning identifies the presence of clay or soil like material in the system, Contractor must immediately notify Contracting Officer.

A. Preparation for Cleaning

Filter elements must be installed in the filter-separators. Adjust filter-separator flow control valve. Valves and system components removed for flushing must be reinstalled. Tanks must be drained, vapor freed and cleaned.

B. Cleaning Requirements

Cleaning must continue until the Contracting Officer certifies that the fuel meets the intra-governmental receipt limits as defined in MIL-STD-3004-1. Sampling must be performed by the Contractor and testing must be done by an independent testing laboratory approved by the Contracting Officer.

C. Cleaning Procedure

During cleaning procedure periodically bleed air through

high point vent and drain water through low point drains.

1) General Fuel Lines

General fuel lines must be cleaned as follows:

- a. Position manual valves to circulate fuel through the piping and into temporary tanks at the discharge end.
- b. Initially pump fuel at a flow rate of 10 gpm, then increase flow rate up to the same velocity the line was flushed at using as many pumps and filter/separators as required, starting manually one pump at a time.
- c. Monitor pressure drop through the filter-separators during the cleaning operation and provide flow vs. pressure drop graphs as specified herein before.
- d. Periodically take samples from all sample connections. Continue cleaning until the fuel meets specified requirements of paragraph CLEANING REQUIREMENTS.

D. Piping Cleaning Checklist

The Contractor must generate a comprehensive matrix of all new and existing piping sections in the system. Matrix must serve as an Owner's piping inventory and a checklist for all Contractor-provided cleaning operations. Column entries must include pipe section name, location, diameter, approximate length, cleaning fuel velocity and volume achieved and acceptable results of sampling.

3.06 CONTROL VALVE ADJUSTMENT

Check all control valve settings and field adjust from the factory settings at System Start-Up as necessary to provide a smooth operation, devoid of pressure surges, spikes, and hunting. Check the filter separator control valves and fueling pump non-surge check valve and adjust as follows:

- A. Rate of Flow Control Feature on Fueling Pump Non-Surge Check Valve

Run one pump at a time and adjust rate of flow feature at nominal rated flow.

3.07 EQUIPMENT TESTS

After completion of flushing, cleaning, and control valve and electrical components adjusting operations, Contractor System Supplier must complete and submit the Equipment Tests (see Attachment 1 - Equipment Tests). Equipment Tests must be submitted prior to Performance Testing.

A. Control System and Control Valves

Field adjustment of automatic control valves and automatic pump controls while in operation must be made only by the valve manufacturer's authorized field test engineer. Both the mechanical and electrical components must be adjusted concurrently. Record required data necessary to prepare Equipment Tests Report.

B. Fueling Pump Operation

Demonstrate operation of all pump control start/stop station to start and stop the fueling pumps at the indicated pressure and flow rates in the presence of the Contracting Officer. Repeat the operating sequence with each of the pumps being selected as lead pump if the pumps are controlled by a Pump Control Panel or an automatic control system with a variable lead pump. For this test, measure the flow rates. Witness and record flow rates and test results.

C. Emergency Shutdown

With one fueling pump circulating fuel through the system, test each "Emergency Stop" pushbutton station to verify that the pump stops and the emergency shutoff solenoid activates and the control valve closes. Repeat above procedure for each fueling pump and "Emergency Stop" pushbutton station. Conduct tests for both the automatic and manual modes. With all the fueling pumps circulating fuel through the system, push an "Emergency Stop" pushbutton station.

3.08 PERFORMANCE TESTS

Performance testing must occur after the Contractor has

performed the Equipment Tests. Performance testing must demonstrate to the satisfaction of the Contracting Officer and Service Headquarters and/or their designated appointee these portions of the fueling system are working as specified. Performance testing must consist of repeating the Equipment Tests (indicated in previous paragraphs) and operating the fueling system during actual operations in the presence of government Witnesses. The maximum rated capacity of the system must be demonstrated. The Contractor must notify the Contracting Officer 30 calendar days in advance of the test to permit arrangement for the use of government-furnished items. During the time period of performance testing, no construction activities will be allowed on the project site. The project site must be considered an operational (fuel) zone (verses a construction zone) during this performance testing period. Personnel, dressed for fuel's operation, will be present to witness testing and participate in Contractor provided training.

A. Final Performance Test

A final performance test must consist of demonstrating the operation of the system for the purpose for which it is intended:

- 1) Loading marine vessels

B. Satisfactory Performance

In the event a portion of the system or any piece of equipment fails to meet the test, make the necessary repairs or adjustments and repeat the Performance Test until satisfactory performance is obtained. The determination of satisfactory performance must be made by the Contracting Officer and the Service Headquarters and/or their designated appointee.

C. Performance Testing Plan

Contractor must edit the example Performance Testing plan and submit for approval. An example Performance Testing plan can be found at the end of this Section as Attachment 2 - Performance Testing Plan. Submit plan a minimum of 60 days prior to performance testing.

D. Equipment Tests

Contractor must provide electronic copies of the completed Equipment Tests to the Service Headquarters and/or their designated appointee at the start of Performance Testing for validation during Performance Testing.

E. Control Valve Tagging

After the performance testing and system acceptance, tag the control valves with their final adjustments.

F. Final Acceptance

Fill the system with fuel and operate leak-free prior for acceptance. Anything wet with fuel is considered to be leaking.

END OF SECTION

33 52 23.15 – POL SERVICE PIPING WELDING

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced.

A. AMERICAN PETROLEUM INSTITUTE (API)

- | | |
|-------------|---|
| API 570 | (2016; Addendum 1 2017; Addendum 2 2018; ERTA 1 2018) Piping Inspection Code: In-Service Inspection, Rating, Repair, and Alteration of Piping Systems |
| API RP 2009 | (2002; R 2007; 7th Ed) Safe Welding, Cutting, and Hot Work Practices in Refineries, Gasoline Plants, and Petrochemical Plants |
| API Std 650 | (2013; Errata 1 2013; Addendum 1 2014; Errata 2 2014; Addendum 2 2016; Addendum 3 2018) Welded Tanks for Oil Storage |

B. AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

- | | |
|------------------|---|
| ANSI/ANST CP-189 | (2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel |
| ANST SNT-TC-1A | (2020) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing |

C. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- | | |
|-------------|--|
| ASME B16.5 | (2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard |
| ASME B16.48 | (2015) Line Blanks |

ASME B31.3	(2024) Process Piping
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
ASME BPVC SEC V	(2017) BPVC Section V-Nondestructive Examination

D. AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A3.0M/A3.0	(2025) Standard Welding Terms and Definitions
AWS A5.1/A5.1M	(2025) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.3/A5.3M	(2023) Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding
AWS A5.4/A5.4M	(2012; R 2022) Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding
AWS A5.9/A5.9M	(2022) Welding Consumables-Wire Electrodes, Strip Electrodes, Wires, and Rods for Arc Welding of Stainless and Heat Resisting Steels- Classification
AWS A5.10/A5.10M	(2023) Welding Consumables - Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys - Classification
AWS A5.18/A5.18M	(2023) Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding
AWS A5.22/A5.22M	(2024) Specification for Stainless Steel Flux Cored and Metal Cored Welding Electrodes and Rods

AWS A5.32/A5.32M	(2021) Welding Consumables-Gases and Gas Mixtures for Fusion Welding and Allied Processes
AWS C5.5/C5.5M	(2003) Recommended Practices for Gas Tungsten Arc Welding
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum
AWS D1.6/D1.6M	(2017) Structural Welding Code - Stainless Steel
AWS D10.4	(1986; R 2000) Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing
AWS D10.7/D10.7M	(2008) Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe
AWS D10.10/D10.10M	(2021) Recommended Practices for Local Heating of Welds in Piping and Tubing
AWS D10.11M/D10.11	(2007) Guide for Root Pass Welding of Pipe Without Backing
AWS D10.12M/D10.12	(2000) Guideline for Welding Mild Steel Pipe
AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors
AWS WHB-4.9	(2010) Welding Handbook, Volume 4 - Materials and Applications Part 1
AWS Z49.1	(2021) Safety in Welding, Cutting and Allied Processes

E. ASTM INTERNATIONAL (ASTM)

ASTM E329 (2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

ASTM E1316 (2020a) Standard Terminology for Nondestructive Examinations

ASTM E2700 (2014) Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays

F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 326 (2015) Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair

G. U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

H. U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-460-01 (2019; with Change 3, 2023) Design: Petroleum Fuel Facilities

1.02 DEFINITIONS

Except as provided in this Section, definition of welding terms is in accordance with AWS A3.0M/A3.0, and definition of inspection and examination terms is in accordance with ASTM E1316.

A. Closure Weld

The final weld connecting POL service piping systems, components, or sub-assemblies which have been successfully tested in accordance with ASME B31.3. For purposes of this Section, a closure weld can include connection of new work to existing piping and is considered within the scope of ASME B31.3.

B. Complete Joint Penetration (CJP)

A weld condition in which fusion between base and filler has occurred across the entirety of surfaces intended for welding and between all weld passes.

C. Designer of Record

The professional engineer designated by the prime Contractor to be in multidisciplinary responsible charge of all POL service piping design and repair.

D. Examination

As used in this Section, a process for determining weld properties, conditions, or characteristics using nondestructive techniques, technologies, and methods, and performed by qualified and certified examiner(s). Nondestructive examination (NDE) is a quality control function performed by the Contractor as part of oversight organization duties.

E. Examiner

As used in this Section, specialist with responsibility to use various nondestructive techniques, technologies, and methods to inform the quality of welds.

F. Hazardous Area

As used in this Section, any area within 100 feet of active storage tanks, areas within 100 feet of leaking section of fuel pipeline or other vapor sources, areas within 200 feet of the downwind side of potential vapor emission sources (i.e., pressure-vacuum vents, sample ports, open vents on active tanks, weeping flanges or joints).

G. Heat-Affected Zone (HAZ)

The portion of base metal whose mechanical properties or microstructure have been altered by the heat of welding, brazing, soldering, or thermal cutting.

H. Independent

Impartial third party not a part or affiliated with Contractor or subcontractor principal or subsidiary businesses.

I. In-Process Examination

A series of steps prescribed in ASME B31.3 to inspect and examine a closure weld for which a hydrostatic leak test is not possible. Can also be used on other joints. As used in this Section, in-process examination requires visual means aided by liquid penetrant examination (PT) or magnetic particle examination (MT) methods in determination of the weld condition. In this Section, the terms in-process examination and in-process inspection are used synonymously.

J. Inspection

As used in this Section, Contractor oversight activity to observe work performed on materials or components to determine acceptability and control the quality of welds. Inspection is performed by qualified and certified inspector(s). In this Section, the weld inspection function is separate and distinct from inspection activities performed by an Owner's Inspector (pursuant to ASME B31.3) and from inspection activity of the Quality Control Manager.

K. Inspector

As used in this Section, specialist with oversight responsibility to control the quality of welds. Inspector(s) is part of the Contractor quality control organization. The Contractor inspector role is separate and distinct from both an Owner's Inspector (pursuant to ASME B31.3), and separate and distinct from the Quality Control Manager role.

L. Hot Work

For work covered by this Section, drilling, boring, flame heating, welding, torch cutting, brazing, carbon arc gouging, grinding, abrasive blasting, or any work which produces heat, by any means, of 400 degrees F or more; or in the presence of flammable material or flammable atmosphere, other ignition sources such as spark or arc producing tools or equipment, static discharges, friction, impact, open flames or embers, nonexplosion-proof lights, fixtures, motors or equipment.

M. Marine Chemist

The holder of a valid Certificate issued by the National Fire Protection Association in accordance with the "Rules for Certification of Marine Chemists" establishing the individual as a Qualified Person pursuant to NFPA 326.

N. Owner's Inspector

Technical representative(s) of the Contracting Officer responsible for assuring that Contractor performance meets requirements and Contractor quality control organization is effective. In this Section, the Owner's Inspector role (pursuant to ASME B31.3) is separate and distinct from Inspector, Examiner, and Quality Control Manager roles.

O. Piping Engineer

One or more licensed professional engineers, or an engineering firm, acceptable to the Contracting Officer who are knowledgeable and experienced in the engineering disciplines associated with evaluating hydraulic, mechanical, and material characteristics which affect integrity and reliability of POL service piping systems. The piping engineer is the piping or pipeline subject matter expert. More than one individual can serve in the role as long as one is designated to be in responsible charge.

P. POL Service Piping

Pipe, piping, pipeline, fittings, components, assemblies, and appurtenances used for petroleum, oil, or lubricant (POL) conveyance service under pressure or force of gravity, including modifications to existing systems.

Q. Weld Map

Drawing(s) containing sketches and tables which correlate design, weld plan, shop drawings, welder identification, weld inspection, nondestructive examination, and physical locations.

R. Timely

As used in this Section, receipt of reporting records by the Contracting Officer no more than 10 days after installation of weld.

S. Weld Slag

Crystalline residue remaining on a weld surface.

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

- A. Welding Procedure Specification
- B. Procedure Qualification Record
- C. Welder Performance Qualification
- D. Weld Plan
- E. Pigging plan
- F. Weld Log
- G. Weld Inspector Certificate
- H. Independent Test Organization
- I. Process Weld Inspector Certificates
- J. Weld Examiner Certificate

1.04 SAFETY

Safety precautions must conform to Section 01 35 29
HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, EM
385-1-1, API 570, API RP 2009, and AWS Z49.1.

A. Control of Hazardous Energy

Prior to welding, provide proper lockout and tagout (LOTO) of the piping or pipeline and appurtenances to completely isolate work from fuel, vapors, and sources of energy. Isolate using physical means such as blind flange compliant with ASME B16.5 or solid-plate line blank compliant with ASME B16.48 to prevent fuel or vapor transfer into the workspace. Use isolation means of sufficient strength to withstand pressure which might be exerted by liquid, gas, or vapor in an active pipeline, piping, or tank. Use gaskets on both sides if a line blank is inserted between two flanges. Do not use a valve as

sole means of isolation. If LOTO isolates a segment of active fuel piping from thermal relief, install temporary relief capability.

B. Preparation for Welding

Develop written procedures in accordance with EM 385-1-1, Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, and AWS Z49.1. Test piping for hydrocarbons and purge as necessary. Do not start grinding or welding until vapor-free certification is received from the Marine Chemist and requirements of EM 385-1-1 have been met.

C. Gas-Free Condition

Degas piping until requirements of Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, the accepted Accident Prevention Plan, and the certified Marine Chemist are met. Obtain gas-free certification from the Marine Chemist. Maintain the gas-free environment. Display the Marine Chemist certificate on-site and available for review at all times during welding work.

1.05 PERFORMANCE

Establish and maintain a system integral with the quality control program for inspection and examination of design and construction. Perform inspection and examination to ensure contract work conforms to requirements. Maintain complete records and make them available to the government.

Contractor is responsible for the quality of all design, joint preparation, welding, inspection, examination, testing, records maintenance, and reporting. All materials used in welding operations must be clearly identified and recorded. Inspection, examination, and testing defined in this Section are minimum requirements. Provide additional inspection, examination, and testing when necessary to achieve the required quality of work.

1.06 GENERAL REQUIREMENTS

This section covers welding of POL service piping systems. Contractor must oversee the quality of design, joint preparation, welding, inspection, and examination. Deviation from applicable codes, approved procedures, and approved drawings is not permitted without prior written

approval by the Contracting Officer. Materials or components with welds made offsite are not accepted if the welding does not conform to requirements of this Section, unless otherwise specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Unless otherwise specified, the choice of weld process is responsibility of the Contractor. See paragraph DESIGN REQUIREMENTS for limitations on use of closure welds.

The Contracting Officer or Owner's Inspector may conduct inspection, test, or oversight work. Government inspection or testing are for the sole benefit of the government. They do not:

- Relieve Contractor of responsibility for providing adequate quality control measures
- Relieve Contractor of responsibility for damage to or loss of the material before acceptance
- Constitute or imply acceptance

1) Procedures

Develop procedures for welding all metals included in the work. Procedures for making transition welds between different P-number materials or between plates or pipes of different thickness must be qualified.

2) Weld Inspection

This Section contains requirements to inspect all welds. Ensure full compliance with requests of the weld inspector(s) to correct deficiencies in materials and workmanship. It provides minimum requirements to qualify personnel, procedures, and equipment, and contains acceptance criteria. Correct all deficiencies in materials and workmanship in accordance with requirements of this Section.

3) Nondestructive Examination

This Section contains requirements to examine welds with nondestructive means to detect the presence of defects. It provides minimum requirements to qualify personnel, procedures, and equipment, and contains acceptance criteria. Correct all deficiencies in materials and

workmanship in accordance with requirements of this Section.

4) Records Retention

Maintain current records of test results obtained in weld procedure qualification. Maintain current records of performance test results obtained to qualify welders and welding operators.

Maintain welder continuity records. Maintain all records of weld inspection and NDE at the site and readily available for review by the Contracting Officer. Produce all records as part of Statement of Work (SOW) or Project Program completion report requirements.

5) Timely Reporting

Timely reporting of weld inspection and examination progress is required. A weld is not finished until its associated Weld Log record with affirmative inspection and examination results has been received and is found complete and accurate. Do not submit a request for progress payment for unfinished welding work.

6) Protect in Place

Protect in place tanks, piping, components, flanges, gaskets, motors, valves, pumps, impellers, risers, coating, finishes, gauges, alarms, conduit, and conductors. Employ measures to protect people, equipment, and surfaces from exposure to and damage from sparks, heat, radiant energy, and light emission. See paragraph MAINTAINING CLEANLINESS OF PIPING for more requirements.

1.07 DESIGN REQUIREMENTS

Consult with experts experienced in fuel piping or pipeline welding. Provide subject matter professional engineering expertise to design welding. Validate site conditions to fully inform procedures, specifications, sketches and shop drawings. Produce work plans, procedures, specifications, sketches, and shop drawings which are complete and usable. Provide means to minimize heat distortion. Identify work which requires special methods such as preheat or post weld heat treatment, dissimilar metal joints or thickness, in-process weld examination, or closure welds. Establish fit-up and edge

preparation tolerances.

Products to be conveyed in the piping ASTM D4814 Mogas(F-46) and Diesel (F-76). Unless noted otherwise in SOW or Project Program, Fluid Service Category is Normal per ASME B31.3.

A. Code and Criteria Basis

UFC 3-460-01, API 570, and ASME B31.3 are relevant design codes and criteria. ASME B31.3 incorporates by reference other requirements of ASME BPVC SEC V, ASME BPVC SEC IX, and American Welding Society (AWS). For applicable processes, provide design and plans consistent with standards and guides AWS D10.4, AWS D10.10/D10.10M, AWS D10.11M/D10.11, AWS D10.12M/D10.12, and AWS C5.5/C5.5M.

B. Closure Welds

Restrict use of closure welds, as defined in this Section, to the minimum. Design work to maximize use of hydrostatic test(s) as means of compliance with leak test requirements of ASME B31.3 paragraph 345. Refer to Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT) for hydrostatic test requirements. Designate on drawings or sketches the location of each closure weld and provide notes which state in-process examination requirements in accordance with this Section, API 570, and ASME B31.3. Ad-hoc, field-determined, or unnecessary closure weld designations are not allowed.

Closure welds in the work are only acceptable under the following circumstances.

- 1) A closure weld is the only means by which the pipe or assembly can be installed into the system due to a physical constraint
- 2) The closure weld cannot be leak-tested in accordance with ASME B31.3, either in-situ or offsite

C. Structural Welds

In accordance with AWS D1.1/D1.1M Structural Welding Code, AWS D1.2/D1.2M Structural Welding Code (aluminum), and AWS D1.6/D1.6M Structural Welding Code (stainless steel). Welding of hangers, supports, and plates to structural members must conform to Section 05 05 23.16 STRUCTURAL

WELDING. Do not weld attachment studs to any surface of the pressure-containing boundary. A weld which connects a support to the pressure-containing boundary is considered a piping or pipeline weld.

D. Piping or Pipeline Welds

In accordance with API 570, ASME B31.3 Process Piping Code, and this Section. Restrict process for root pass to gas tungsten arc. Butt joint or groove welds must have CJP. Branch connection welds must be no closer than two times the run piping thickness from an adjacent weld.

E. Weld Plan

Provide a weld plan which addresses all aspects of welding operations, inspection, and examination to meet requirements of this Section. Include specification and qualifying record for each procedure along with a summary table which lists all qualified welding personnel and the Welding Procedure Specification (WPS) under which they are qualified. For each welding operation, identify a sequence to minimize heat distortion both in-situ and offsite. Provide a process for machine welding if used. Describe how the quality of welding operations will be controlled. Submit Weld Plan in accordance with paragraph SUBMITTALS.

1.08 QUALITY ASSURANCE

Provide welding procedure specifications, procedure qualification records, and welder performance qualification records for each procedure and welder. Provide means and methods to control the quality of welding operations. If used, provide a method to track and control the quality of multiple welders on the same weld.

A. Data Management

Organize repair data in a non-proprietary management system such as a database or spreadsheet. Establish a piping location identification scheme which uniquely identifies each piping weld, its location, its orientation, and its relative position to other piping features. Provide secure, auditable, and organized data. Ensure the system has the capability to track the provenance of each weld. Cloud-based systems are not

acceptable. Limit access to the management system to ensure data integrity.

B. Weld Log

Produce, populate, and maintain a Weld Log capable of uniquely tracking the specific location of every weld in the work. Follow the established location identification scheme. Weld identification on shop drawings must match weld tracking log and weld marking. The log must include the following minimum contents.

- 1) Weld map depicting physical location, location on the piping, clock position, and orientation
- 2) Type of weld including temporary and tack welds
- 3) Applicable WPS
- 4) Name or identification number of welding personnel
- 5) Date and time of completion of welding or tacking
- 6) Date and type of weld inspection, inspector name, acceptance criteria; acceptance determination
- 7) Date and type of nondestructive examination, examiner name, acceptance criteria, acceptance determination
- 8) Date, name, description of defects found, reason for noncompliance
- 9) Corrective action planned or taken, including all steps above leading to an acceptance determination
- 10) Date and time of the QCM inspection for each determination that a specific weld (welding, inspection, and examination) is complete, meets requirements, and is acceptable in-situ or offsite

a. Progress Reporting

Update and populate the log as work progresses. Submit to the Contracting Officer on a regular basis as part of progress documentation. Provide a progress submittal weld log (including records for in-process inspection and examination) for oversight in a timely manner and indicating the QCM

determination that a weld is complete, meets requirements, and is acceptable. Notify the Contracting Officer if weld log submittal lags by more than 10 work days.

C. Weld Symbolology

Provide weld symbolology in accordance with AWS A2.4.

D. Weld Making

Neatly mark on the work with a marker or paint pen sufficient information for government QA of the work. Use block letters approximately 2 inches in height and in legible color contrasting with the work surface. The QCM is responsible to manage and oversee all marking, timeliness, and content. In the event marking cannot be made on the piping itself, use an all weather placard attached to the work at the location of each weld. Minimum information is listed below. Should weld rework be required, neatly place a single line through obsolete marking and provide new marking.

- 1) Unique weld identifier (correlated to the design)
- 2) Welder identification
- 3) Inspector identification, date, and result
- 4) Examiner identification, date, and result
- 5) QCM determination, date, and result

E. Shop Drawings

Prepare and submit detail CAD drawings showing location, length, clock position, and type of welds. Indicate preweld and postweld heat treatment, inspection, and NDE. The drawings must identify the WPS to be used at each weld location. Indicate locations of closure welds and in-process examination per the design.

F. Inspection Procedures

Provide weld inspection procedures compliant with API 570, ASME B31.3, and paragraph PROCEDURE STANDARDS. The weld inspector(s) is considered a QC Specialist and must report results directly to the QC Manager.

G. Examination procedures

Provide examination procedures compliant with API 570, ASME B31.3, and paragraph PROCEDURE STANDARDS. The weld examiner(s) is considered a QC Specialist and must report results directly to the QC Manager. Identify a procedure standard for any method planned to be used which is not listed. Apply standard practice ASTM E2700 when developing procedure for examining welds using phased array ultrasonic method (PAUT). Paragraph SPECIAL REQUIREMENTS FOR PAUT contains additional procedure requirements.

H. Procedure Standards

Method	Procedure Standard
Ultrasonic Examination (UT)	ASME BPVC SEC V Article 4
Method	Procedure Standard
PAUT in lieu of RT	API Std 650 Annex U ASME BPVC SEC V Article 4 and Mandatory Appendix VII
PT	ASME BPVC SEC V Article 6
MT	ASME BPVC SEC V Article 7
Radiographic Examination (RT)	ASME BPVC SEC V Article 2
Visual Examination (VT)	ASME BPVC SEC V Article 9

I. Inspection and Examination Reporting

Provide timely reports in accordance with paragraphs SUBMITTALS and weld log PROGRESS REPORTING. At minimum, reports must consist of the following.

- 1) Records made by the AWS certified inspector for all duties performed per paragraph 4.2 of AWS QC1 using the unique identifier for each weld inspected.
- 2) All NDE examiner reports using the unique identifier for each weld examined.
- 3) Weld map location of each weld, weld procedure, welder identification, results of visual inspection, results of NDE.
- 4) Up-to-date Weld Log.
- 5) Records made by the AWS certified inspector for in-process weld inspection, including visual method report as required in ASME B31.3.

1.09 QUALIFICATIONS AND CERTIFICATIONS

Before assigning welders or welding operators to the work, provide the Contracting Officer with names and certification that each individual is performance-qualified as specified. The certification must state the type of welding and positions for which each is qualified, the code and welding procedure specification under which each is qualified, date qualified, and the firm and individual who certified the qualification tests. Provide a summary table showing all welders and the WPS for which they are qualified to weld.

Do not start welding until qualified weld procedures, welders, and welding operators have been provided. Qualify procedures for making transition welds between different materials or between metal of different wall thickness. Qualification testing must be performed by an approved independent test laboratory, or by the Contractor if approved by the Contracting Officer. Cost of such testing must be borne by the Contractor. Notify the Contracting Officer at least one week in advance of the time and place of tests. If the Contracting Officer elects to witness the tests, the qualification tests must be performed at or near the worksite and at the notified time and place.

A. Welding Procedure Specification

Qualify the WPS for every proposed welding procedure. Qualification must conform to the requirements of ASME

B31.3 and this Section. Specify back purge gas requirements and end preparation for joints to include cleaning, alignment, and root opening tolerances. Include procedures for weld repairs. Specify interpass temperature control and any weld special treatment requirements as required by the design. Identify weld procedures uniquely and reference on the Weld Tracking Log and shop drawings.

Submit copies of the WPS for each type of welding required in accordance with paragraph SUBMITTALS. Approval of any procedure does not relieve the Contractor of the sole responsibility to produce acceptable welds.

B. Procedure Qualification Record

Perform tests, qualify all procedures including weld repair, and document the results in detail on procedure qualification records. Qualify each proposed welding procedure. Qualify procedures in compliance with ASME B31.3, ASME BPVC SEC IX, and this Section. Use the PQR format QW-483 in ASME BPVC SEC IX. Submit each PQR together with its associated WPS, and in accordance with paragraph SUBMITTALS.

C. Welding Personnel

Conduct tests using qualified procedures to determine welding personnel are capable of producing the minimum requirements of an acceptable weldment. Test all welding personnel for each welding process to be used. Tests conducted by a different employer are not acceptable. Test in accordance with ASME B31.3 and ASME BPVC SEC IX.

1) Welder Performance Qualification

A welder or welding operator may be qualified by volumetric NDE or by bend tests on a test coupon. Qualification by initial production welding is not allowed. Before assigning welding personnel to the work, provide WPQ records which certify the individual is performance-qualified for the procedure in accordance with ASME B31.3. The certification must state the type of welding and positions for which each is qualified, the code and welding procedure specification under which each is qualified, date qualified, and the firm and individual certifying the qualification tests. Use

the WPQ format in ASME BPVC SEC IX QW-484A for welders and QW-484B for welding operators. All welder qualification records must be signed and stamped by a certified welding inspector (CWI) as defined in AWS QC1. Submit each WPQ in accordance with paragraph SUBMITTALS.

2) Renewal of Welder Qualification

Regualification of a welder or welding operator is required under any of the following conditions:

- a. When a welder or welding operator has not used the specific welding procedure for a period of 3 months; the period may be extended to 6 months if the welder or welding operator has been employed on another welding procedure.
- b. When a welder or welding operator has not welded with any procedure during a period of 3 months, all the personal qualifications are considered expired, including any extension by virtue of a. above.
- c. There is specific reason to question the person's ability to make welds that will meet requirements of the specifications.
- d. The welder or welding operator was qualified by an employer, other than firms performing work under this contract, and a qualification test has not been taken within the preceding 12 months.
- e. Renewal of qualification for a specific welding procedure under conditions a., b., and d., above, needs to be made on only a single test joint or pipe of a thickness, position, or material required by the welding procedure specifications to reestablish the welder or welding operator qualification for the previous qualification.

D. Previously Qualified Procedures and Personnel

Welding procedure specifications, welders, and welding operators previously qualified by test may be accepted for

the work without requalification, provided that all of the following conditions are fulfilled.

- 1) Copies of each WPS, procedure qualification record (PQR), and welder performance qualification (WPQ) are submitted and approved in accordance with paragraph SUBMITTALS.
- 2) Testing was performed by an approved test laboratory, approved technical consultant, or by the Contractor's approved quality control organization.
- 3) The welding procedures, welders, and welding operators were qualified in accordance with API 570 and ASME B31.3, and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of the design and this Section.
- 4) The requirements of paragraph RENEWAL OF WELDER QUALIFICATION are met and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

E. Independent Test Organization

The independent test organization can be a testing laboratory, technical consultant, or NDE testing firm, and must meet principles of ASTM E329. The principal business of the testing organization, testing laboratory, technical consultant, or firm must be NDE, inspection, and testing, and must have no involvement in project procurement, fabrication, construction or installation. The test organization, testing laboratory, technical consultant or NDE testing firm must be a first tier subcontractor. Submit current Independent Test Organization certification which demonstrates compliance with this Section in accordance with paragraph SUBMITTALS.

F. Inspection and Examination Personnel

Provide a commercially independent organization for all weld examinations. Submit qualifications of all inspection and examination personnel for approval by the Contracting Officer. All inspection and NDE personnel

must be qualified in accordance with the following requirements.

1) Prohibited Practices

- a. The Contractor quality control manager cannot be the weld inspector or the weld examiner.
- b. Should a weld inspector also be a welder, that individual is disqualified from inspecting or examining a weld or any portion thereof of the inspector's own work.
- c. Should a weld examiner also be a welder, that individual is disqualified from inspecting or examining a weld or any portion thereof of the examiner's own work.

2) Weld Inspector

- a. Qualification: Weld inspector must be qualified in accordance with ASME B31.3 and API 570, and have minimum 5 years of experience inspecting process pipe or pipeline welding on military or commercial fuel systems. The weld inspector(s) is considered a QC Specialist.
- b. Certification: Welding inspectors must be certified as CWI or senior certified welding inspector (SCWI) as defined in AWS QC1 with a ASME BPVC SEC IX endorsement. Provide AWS Weld Inspector Certificate in accordance with paragraph SUBMITTALS.

3) In-Process Weld Inspector

- a. Qualification: In-process weld inspector must be qualified in accordance with ASME B31.3 and API 570, and have minimum 5 years of experience inspecting process pipe or pipeline welding on military or commercial fuel systems. The in-process weld inspector(s) is considered a QC Specialist.
- b. Certification: In-process weld inspector must be certified as CWI or senior certified welding inspector (SCWI) as defined in AWS QC1 with a ASME BPVC SEC IX endorsement, and must be

certified as a Level II in visual method compliant with ASNT SNT-TC-1A. Provide both AWS and ASNT In-Process Weld Inspector Certificates in accordance with paragraph SUBMITTALS.

4) Nondestructive Examiner

- a. **Qualification:** Examiners must be qualified to perform NDE in accordance with ASME B31.3 and API 570. Examiners must meet minimum requirements for qualification in ANSI/ASNT CP-189. Qualified examiners must have minimum 3 years verifiable experience performing nondestructive examination of fuel pipeline or piping. Experience is defined as work activity performing a specific NDE method under the direction of qualified supervision but does not include time spent in training programs. Examiners performing PAUT must be qualified in accordance with ASME BPVC SEC V Mandatory Appendix VII, and API Std 650 Annex U Personnel Qualifications and Training, with Level III Review. Personnel performing nondestructive examination must not represent nor be an employee of the prime construction Contractor, welding subcontractor, fabricator, erector, or manufacturer, and must be employed by an independent test organization.
- b. **Certification:** Provide examiners certified compliant with ANSI/ASNT CP-189 pursuant to the table EXAMINER CERTIFICATION STANDARDS for the applicable method. Level II Limited certification does not meet the Level II requirement. Provide Weld Examiner Certificate in accordance with paragraph SUBMITTALS.

5) Examiner Certification Standards

Method	Standard
UT	Level II or III
PAUT in lieu of RT	API Std 650 Annex U with Level III review
PT	Level II or III
MT	Level II or III
RT	Level III
VT	Level II

G. Piping Engineer of Record

Professional engineer in responsible charge of the POL service piping design.

- 1) Qualification: 5 years of experience in POL facilities engineering, including design, inspection, and construction of pipelines or process piping systems.
- 2) Certification: Bachelor of Science degree in Civil or Mechanical Engineering; Licensed as a professional civil or mechanical engineer.

1.10 DELIVERY, STORAGE, AND HANDLING

All filler metals, electrodes, and other welding materials must be delivered to the site in manufacturer original package and stored in a dry space until used. Packages must be properly labeled and designed to give maximum protection from moisture, prevent contamination, and to ensure safe handling.

A. Material Control

Store materials in a controlled access and clean, dry area that is weathertight and is maintained at a temperature recommended by the manufacturer. Materials must not be in contact with the ground or floor, and must be stored on wooden pallets or cribbing.

B. Partial Issue

When a container of covered electrodes is opened and only a portion of the content is issued, the remaining portion must, within 1/2-hour be placed and kept in a storage oven until use.

C. Damaged Container

Low-hydrogen steel electrodes must be stored in their sealed shipping container. If the seal is damaged during shipment or storage, and the damage is not immediately detected, the covered electrodes in that container must be rebaked in accordance with the manufacturer's instructions prior to issuance, or they must be discarded. If a container is damaged in storage and the damage is witnessed, the electrodes from that container must be

immediately placed in a storage oven. The storage oven temperature must be as recommended by the manufacturer or the welding material specification.

D. Damaged Material

Materials which are damaged must be discarded. Do not use covered electrodes which are oil or water-soaked, dirty, or on which the flux has separated from the wire.

PART 2 PRODUCTS

2.01 WELDING MATERIALS

Welding materials for carbon steel, stainless steel and aluminum must comply with AWS WHB-4.9. Welding equipment, electrodes, welding wire, shielding and backing gas, and fluxes must be capable of producing satisfactory welds when used by a qualified welder or welding operator using qualified welding procedures. All field girth root pass welds must be made with non-covered electrodes or welding wire. All root passes must be made with shielding and backing gas. External welds on the pipe such as attaching pipe supports may be made with covered electrodes or welding wire. Electrodes, welding wire and/or fluxes must be in accordance with Table 1. Welding materials for aluminum and aluminum alloy must comply with AWS D10.7/D10.7M.

TABLE I				
AWS	Process	Alloy	Consumable	Use
			(Examples) (1)	
AWS A5.1/A5.1M	SMAW	Low Carbon	E7018	Fill
AWS A5.4/A5.4M	SMAW	Stainless	E308L, E309L	Fill
AWS A5.3/A5.3M	SMAW	Aluminum		Fill
AWS A5.9/A5.9M	GTAW	Stainless	ER308L, ER309L	Root and Fill
AWS A5.10/A5.10M	GTAW	Aluminum		Root and Fill
AWS A5.18/A5.18M	GTAW	Low Carbon	E70S-3, E70S-6	Root and Fill
AWS A5.22/A5.22M	GTAW	Stainless	E308LT1-1	Root (Backing and Shielding Gas Required)
AWS A5.32/A5.32M	GTAW	All		Shielding Gas
Note(1): The consumable material designations shown are examples only and are not intended to limit the Contractor's selection of consumable materials.				

PART 3 EXECUTION

3.01 WELDING OPERATIONS

Perform welding in accordance with the Weld Plan and qualified procedures using qualified personnel. Do not weld when the quality of the completed weld could be impaired by prevailing working or weather conditions. The Contracting Officer must determine when weather or working conditions are unsuitable for welding.

For applicable processes, provide operations consistent with standards and guides AWS D10.4, AWS D10.10/D10.10M, AWS D10.11M/D10.11, AWS D10.12M/D10.12, and AWS C5.5/C5.5M.

- i. The root pass on stainless steel, aluminum, and carbon steel pipe must be by the GTAW process.

- ii. All joints unless indicated otherwise, in carbon steel, aluminum and stainless steel piping systems must be welded.
- iii. Unless otherwise approved, all girth welds must be CJP groove welds made in accordance with qualified welding procedures.
- iv. Weld preparation must comply with the requirements of ASME B31.3 and the qualified Welding Procedure Specification. The use of "rice paper" as purge blocks is not permitted. Contractor must submit alternate method for approval.
- v. Backing Rings. The use of backing rings for making or repairing welds will not be permitted.

A. Identification

Assign each welder or welding operator weld a unique identification mark (number, letter, or symbol). Place identification mark on the work and the weld map. Ensure each identification is neat and legible, traceable to a welder, and associated with a performance qualification record. Apply the unique identification mark adjacent to each weld with permanent weatherproof means using a rubber stamp, felt-tipped marker, paint pen, or other method approved by the Contracting Officer. Do not use fluorescent paint or any method which deforms the metal. Identification by die stamps or electric etcher is not allowed.

B. Base Metal Preparation

Use mechanical grinding of thermal cut ends to remove the HAZ, or to dress metal for proper fit-up. This practice is limited to the HAZ or a maximum 1/8 inch length of removal. Do not use oxy-fuel cutting on austenitic stainless steel or nonferrous materials. Do not reduce pipe thickness outside of a weld. See paragraph GRINDING for requirements in the event pipe thickness is reduced from nominal.

C. Weld Joint Fit-Up

Provide fabrication, assembly, erection, preparation, and fit-up in accordance with API 570 and ASME B31.3. Use

bars, jacks, clamps, or other mechanical fixtures to fit, align, and retain joints in position during the welding operation. Align and prepare end joints prior to welding in accordance with Chapter V of ASME B31.3. For socket-welded joints, implement a program to ensure gaps are properly measured and documented to be in conformance with ASME B31.3. Branch connection welds must be no closer than 2 times the run piping thickness from an adjacent weld.

Do not use welded temporary attachments except when it is impractical to use mechanical fixtures. When temporary attachments are used, they must be the same material as the base metal and must be completely removed by careful cutting or grinding after the weld operation is completed. Cut the attachment no closer than 1/4 inch from the member and remove remaining material by careful grinding. Do not grind into base metal. After the temporary attachment has been removed, inspect the area using VT. For any area with grinding that could reduce metal or pipe wall thickness below nominal, refer to and follow requirements in paragraph GRINDING.

D. Butt Weld Joint Spacing

Butt weld joints must be spaced a minimum of 6 inches apart with measurement taken from the toe of the first weld to the toe of the second weld. Measure at the closest point between the welds when visually inspected. If spacing is not possible due to existing conditions, a reduction in spacing to not less than 2 inches may be made.

E. Preheat and Interpass Temperatures

Meet the requirements specified by ASME B31.3 for preheat temperatures. However, in no case can the preheat be below 50 degrees F for ferritic steel or austenitic stainless steel, or 32 degrees F for nonferrous alloys. Maximum interpass temperatures must not exceed 300 degrees F for austenitic stainless steels, nickel alloys, and copper alloys; and 500 degrees F for carbon steels. Preheat techniques must be such as to ensure the full thickness of weld joint preparation and adjacent base material, at least 3 inches in all directions, is at the specified temperature. Preheating by induction or resistance methods is preferred. When flame heating, only use a neutral flame. Do not use oxy-fuel heating on

austenitic stainless steel. However, air-fuel heating is acceptable if controlled to ensure that the surface temperature does not exceed 150 degrees F. Interpass temperatures must be checked on the surface of the component within 1 inch of the weld groove and at the starting location of the next weld pass, and for a distance of 6 inches ahead of the weld, but not on the area to be welded.

F. Production Welding Instructions

- i. Welding must not be done when ambient temperature is lower than 0 degrees F.
- ii. Welding is not permitted on surfaces that are wet or covered with ice, when snow or rain is falling on the surfaces to be welded. During periods of high winds welding is not permitted unless the welders and the work are properly protected.
- iii. Gases for purging and shielding must be welding grade and must have a dew point of minus 40 degrees F or lower.
- iv. Back purges are required for austenitic stainless steels and nonferrous alloys welded from one side and must be set up such that the flow of gas from the inlet to the outlet orifice passes across the area to be welded. The oxygen content of the gas exiting from the purge vent must be less than 2 percent prior to welding. The flow rate must be that required by the approved weld procedure specification.
- v. The purge on groove welds must be maintained for at least two passes or 3/16 inch whichever is greater.
- vi. Removable purge dam materials must be made of expandable or flexible plugs, such as plexiglass or dry and clean plywood. Wood dams must be kiln-dried quality. Do not use purge dams made of polyvinyl alcohol.
- vii. Any welding process which requires the use of external gas shielding cannot be done in a draft or wind unless the weld area is protected by a shelter. This shelter must be of material and

shape appropriate to reduce wind velocity in the vicinity of the weld to a maximum of 5 mph (440 fpm).

- viii. Tack welds to be incorporated in the final welds must have their ends tapered by grinding or welding technique. Remove tack welds that are cracked or defective and retack the groove prior to welding. Temporary tack welds must be removed, the surface ground smooth, and visually inspected. For low-alloy and hardenable high-alloy steels, the area must be examined by MT.
- ix. Grinding of completed welds is to be performed only to the extent required for inspection or NDE, including in-process examination, and to provide weld reinforcement within the requirements of ASME B31.3. If the surface of the weld requires grinding, reducing the weld or base material below the minimum required thickness is not allowed. See paragraph CORRECTION AND REWORK. Minimum weld external reinforcement must be flush between external surfaces.
- x. Each qualified welder must be assigned unique identification. All welds must be permanently annotated with the mark or symbol of the individual who made the weld.
- xi. Direct welded connection of carbon steel and stainless steel must not be made. See Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT) for method of connection

G. Postweld Heat Treatment

- i. When required, perform postweld heat treatment in accordance with ASME B31.3. Temperatures for local postweld heat treatment must be measured continuously by thermocouples in contact with the weldment.
- ii. Postweld heat treatment of low-alloy steels, when required, must be performed immediately upon completion of welding and prior to the temperature of the weld falling below the preheat temperature. However, postweld heat treatment

may be postponed after the completion of the weld, if, immediately after the weld is completed, it is maintained at a minimum temperature of 300 degrees F or the preheat temperature, whichever is greater, for 2-hours per 1 inch of weld thickness.

3.02 EXAMINATIONS, INSPECTIONS AND TESTS

Provide the services of a qualified inspection, testing, or examination organization meeting requirements of paragraph QUALIFICATIONS AND CERTIFICATIONS and approved by the Contracting Officer. Radiographic examination is required pursuant to this Section. Perform inspection, examination, and testing as required by the SOW or Project Program, this Section, the piping engineer, API 570, ASME B31.3, and in accordance with written procedures.

- i. When in-process weld examination is required, perform in accordance with paragraph IN-PROCESS WELD INSPECTION.
- ii. Hydrostatic test requirements are found in the SOW or Project Program and Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).
- iii. In all cases where PAUT is used in lieu of RT, permanently record the weld examinations. Have the results reviewed and receive concurrence by an examiner certified to ANSI/ASNT CP-189 Level III and requirements of this Section.
- iv. When examination, inspection, and testing indicate a defect in a weld joint, the weld must be repaired by a qualified welder in accordance with paragraph CORRECTION AND REWORK.
- v. When inspection, examination, and tests substantiate defects in a weld, rework the weld with a qualified welder in accordance with paragraph CORRECTION AND REWORK. Perform all inspection, examination, and tests on rework until acceptable results are achieved.
- vi. Submit all weld inspection, examination, and test reports to the Contracting Officer.

A. Quality control of welding

- 1) Verify base materials and consumable welding materials conform to the specifications, and that welding filler metals used are as specified for each base material.
- 2) Verify welding equipment to be used for the work is appropriate for use with the welding procedure specification and has the capability to meet requirements of the welding procedure.
- 3) Verify only approved or qualified welding procedures are used for the work.
- 4) Verify that edge preparation and joint geometry meet requirements of the welding procedure and drawings.
- 5) Verify specified filler metals are used and that filler metals are maintained in proper condition, per requirements and as recommended by the manufacturer.
- 6) Verify work conforms to requirements of the applicable code, standards, drawings, design, or other documents.
- 7) Verify the approved WPS pre-heat and post heat procedures are being used.
- 8) Prepare clear and concise reports and verify that records of the results of weld inspection and examinations are maintained.

B. Weld Inspection

Perform weld inspection to detect surface and subsurface discontinuities in completed welds. Visually inspect all welds in accordance with requirements of ASME B31.3, ASME BPVC SEC V, and AWS D1.1/D1.1M. Aid the VT by using PT or MT as-needed to determine the condition of a weld.

- 1) Provide inspector personnel qualified and certified in accordance with paragraph INSPECTION AND EXAMINATION PERSONNEL.
- 2) Visually inspect all tack welds and completed welds.
- 3) Submit weld inspection reports to the Contracting Officer within 10 work days of performance.
- 4) Provide inspection in accordance with paragraph

EXAMINATION AND INSPECTION FREQUENCY.

- 5) Weld personnel found making defective welds must be removed from the work or must be required to be requalified in accordance with ASME B31.3 by the Quality Control Manager.
- 6) For each method used, provide a qualified procedure in accordance with paragraph INSPECTION PROCEDURES.

1. Weld Inspection Duties

- a. Verify the technique and performance of each welder, welding operator, and tack welder are as specified.
- b. Verify the work inspected is identified and documented in accordance with SOW or Project Program requirements and this Section.
- c. Prepare clear and concise reports and verify that records of the results of weld inspection and examinations are maintained.
- d. Review requirements in paragraph QUALITY CONTROL OF WELDING and determine whether the quality control program is effective.
- e. Perform VT inspection of all welds

C. In-Process Weld Inspection

For closure welds or welds designated for in-process inspection or examination, inspect in accordance with requirements of ASME B31.3, ASME BPVC SEC V, API 570, and AWS D1.1/D1.1M. Aid visual inspection with PT or MT in accordance with API 570 if needed to determine the condition of a weld. Perform in-process inspection in accordance with paragraph WELD INSPECTION and the following.

- 1) Provide in-process inspection in accordance with paragraph EXAMINATION AND INSPECTION FREQUENCY.
- 2) Before welding: Inspect for compliance with requirements for joint preparation, cleanliness, preheating, fit-up, joint clearance, and internal alignment in accordance with ASME B31.3. Assess compliance with variables specified in the WPS

including filler material, position, and electrode.

- 3) During welding: After cleaning, inspect root pass for cracks, slag, and conformance to approved welding procedure. Assess weld condition between passes. When it is accessible, perform visual inspection of the interior side of the root pass by remote means allowed in ASME BPVC SEC V Article 9.
- 4) After welding: Inspect for defects, contour and finish, bead reinforcement, undercutting, overlap, weld slag on the interior of the pipe, appearance, and weld size in accordance with ASME B31.3 and AWS D1.1/D1.1M. Perform visual inspection of the interior by remote means allowed in ASME BPVC SEC V Article 9 when it is accessible.
- 5) Prepare and provide inspection record of in-process weld inspection including visual method report. Submit in-process weld inspection records and reports to the Contracting Officer within 10 work days of performance.

D. Nondestructive Examination

Perform NDE as required by API 570, ASME B31.3, SOW or Project Program, this Section, the design, and in accordance with written procedures. Procedures must conform to paragraph EXAMINATION PROCEDURES. Each approved procedure must be demonstrated to the satisfaction of the Contracting Officer. In addition to essential variables required in paragraph EXAMINATION PROCEDURES, the written procedures must include proper timing of NDE in relation to welding operations, weld inspection, and safety precautions.

Provide non-destructive examination in accordance with paragraph EXAMINATION AND INSPECTION FREQUENCY. Service organization must meet requirements of paragraph INDEPENDENT TEST ORGANIZATION and must be approved by the Contracting Officer.

Provide services of a commercially independent qualified testing agency approved by the Contracting Officer for examination and testing of piping welds. The cost of examination and testing, including re-examination and re-test of repaired welds, must be borne by the Contractor. Weld ripples or surface irregularities that might mask or

be confused with the radiographic image of any objectionable defect must be removed by grinding or other suitable mechanical means. The weld surface must be merged smoothly with the base metal surface.

E. Special Requirements for PAUT

In addition to requirements below, see paragraph EXAMINATION PROCEDURES.

- 1) Phased array ultrasonic examination must meet review requirements of API Std 650 Annex U Personnel Qualifications and Training and Level III Review, and Inspection Requirements of ASME BPVC SEC V.
- 2) Calibration standards must meet the requirements of ASME BPVC SEC V Figures T-434.3-1 and T-434.3-2.
- 3) Only ASNT SNT-TC-1A (or ANSI/ASNT CP-189) Level II or Level III certified personnel can perform PAUT examination, analyze the data, or interpret result.
- 4) Final data package must be reviewed by an ASNT SNT-TC-1A (or ANSI/ASNT CP-189) Level III individual qualified in PAUT, and in accordance with the employer's written practice. The review may be achieved by arranging for a data acquisition and initial interpretation by a Level II individual with final interpretation and evaluation performed by a Level III individual. The review must include the following.

1. Procedure Essential Variables

Essential variables are listed below. Changes in any of the essential variables beyond that allowed in this Section triggers procedure requalification

- a. Weld configurations to be examined, including thickness dimensions and base material product form (pipe, plate)
- b. The surfaces from which the examination will be performed
- c. Technique(s), angle(s), and mode(s) of wave propagation in the material

- d. Search unit type(s), frequency(ies), and element size(s), shape(s), number, pitch and gap dimensions
- e. Focal range: Identify plane, depth, or sound path
- f. Virtual aperture size (i.e., number of elements, effective height, and element width)
- g. Angular range used (i.e., 40 deg to 50 deg, 50 deg to 70 deg)
- h. Angle incremental change (i.e., 12 deg, 1 deg)
- i. Element incremental change (i.e., 1,2)
- j. Additional S-scan, E-scan requirement range of element numbers used (i.e., 1-126, 10-50)
- k. Scan plan
- l. Weld axis reference point marking
- m. Rastering angle(s)
- n. Aperture start and stop element numbers
- o. Aperture incremental change(s), number of elements stepped
- p. Angular sweep increment (incremental angle change, deg)
- q. Aperture element numbers (first and last)
- r. Calibration technique(s) and block(s)
- s. Scanning technique (automated or semi-automated)
- t. Scanner adhering and guiding mechanism
- u. Method for discriminating geometric from flaw indications
- v. Method for sizing indications
- w. Computer enhanced data acquisition when used, scan overlap

- x. Computer software revision identification
 - y. Personnel performance requirements, personnel qualification requirements
 - z. Surface condition (examination surface, calibration block)
 - aa. Recording equipment
2. Non-Essential Variables
- a. Couplant: brand name or type
 - b. Post-examination cleaning technique
 - c. Automatic alarm when applicable
 - d. Records, including minimum calibration data to be recorded (e.g., instrument settings)

F. Examination, Inspection, and Tests by the Government

Welding is subject to inspection and tests in the mill, shop, and field. When materials or workmanship do not conform to SOW or Project Program, or requirements of this Section, the work may be rejected at any time before final acceptance of the system containing the weldment. If defective work is identified, provide a corrective action plan and initiate rework procedures. Perform rework, repair, inspection, examination, and testing compliant with SOW or Project Program requirements and this Section. The rework, repair, inspection, examination, and testing, except as noted below, is at no additional cost to the government.

1) Supplemental NDE, Inspection, and Tests

In addition to requirements of the SOW or Project Program and this Section, the government Owner's Inspector may perform supplemental nondestructive examination, inspection, or tests as deemed necessary. The cost of supplemental NDE, inspection, or tests will be borne by the government. Coordinate safe access to the work for the NDE, inspection, and test personnel and equipment. If defective work is identified, provide a corrective action plan and initiate rework procedures.

2) Destructive Tests

In addition to requirements of the SOW or Project Program and this Section, the Contracting Officer or Owner's Inspector may order destructive tests to be performed by the Contractor. If destructive test results indicate that materials or workmanship do not conform to contract requirements, the cost of destructive tests, corrective action, and repair must be borne by the Contractor. When destructive tests are made, repairs must be made by qualified welders or welding operators using qualified welding procedures which will develop the full strength of the member.

3.03 EXAMINATION AND INSPECTION FREQUENCY

Conduct NDE and inspection of all welding, including high point vent and low point drain piping. Determine and report conformance to the paragraph ACCEPTANCE STANDARDS. Provide frequency of NDE and inspection in accordance with the below requirements and paragraph EXAMINATION AND INSPECTION SCHEDULE.

- i. Provide 100 percent RT for welds on underground or inaccessible piping.
- ii. Provide 100 percent RT for welds on severe cyclic piping to include aviation hydrant systems and truck fillstands.
- iii. Examine each socket weld or socket welded branch connection with either magnetic particle or liquid penetrant methods.
- iv. For aboveground welds examined by radiography at frequency less than 100 percent, provide random RT in accordance with ASME B31.3 on no less than 20 percent of welds. Random testing must include representation of welds made by each welding operator or welder and must include representation of each weld type present in the work. The progressive sampling requirements of ASME B31.3 apply.
- v. Where RT is infeasible, notify and provide justification to the Contracting Officer. Justification must be substantive and not be based

on convenience. Upon approval by the Contracting Officer, perform UT in lieu of RT in accordance with this Section and API Std 650 Annex U and ASME BPVC SEC V.

- vi. Provide select RT in accordance with ASME B31.3 for all aboveground piping welds. The inspection must include an examination of welds made by each welding operator or welder. If the testing reveals that a weld fails to meet minimum quality requirements, an additional percent of the welds in that same group must be inspected in accordance with ASME B31.3. If all of the additional welds inspected meet quality requirements, the entire group of welds represented is accepted and the defective welds must be repaired. If any of the additional welds inspected fail to meet quality requirements, the entire group of welds represented is rejected. Rejected welds must be removed and rewelded.

A. Examination and Inspection Schedule

Weld Type	Joint Type or Configuration	Frequency	Method
CJP groove	Butt	Each pass	VT
CJP groove	Butt	Final pass	VT, RT
Closure	Root pass	Each	VT, PT or MT; Note 1
Closure	Cover pass	Final	VT, RT; Note 1
Fillet		Final	VT, MT
Weld Type	Joint Type or Configuration	Frequency	Method
Structural attachment	Installation or removal	Final pass or after removal	VT, PT or MT
	Cutline	Each	VT; Note 2

Repair		Note 3	Note 3
	Pipe interior	Root or final pass, when accessible	VT
Insert	Branch connection	Final pass	VT, RT
Non radiographicable	Branch Connection	Final pass	VT, PT or MT
CJP groove	Butt; inaccessible	Final pass	VT, RT
Socket		Final pass	VT, PT or MT

Note 1. In-process weld examination IAW API 570, ASME B31.3 and this Section.

Note 2. Examine the cutline for laminations, scale, burrs before welding.

Note 3. Examination and inspection requirement for a weld repair is pursuant to that of the original weld and must be repeated until no defect exists.

3.04 ACCEPTANCE STANDARDS

Inspection and examination acceptance standards must be in accordance with ASME B31.3. Acceptance criteria are in paragraph ACCEPTANCE CRITERIA and notes. For hydrant systems and stainless steel systems, use severe cyclic conditions. Interpretation of results and limitations on imperfections in welds must comply with the requirements of 100 percent radiography as defined in ASME B31.3.

A. Acceptance Criteria

Method	Criterion	Note
VT	ASME B31.3 Table 341.3.2	1
RT	ASME B31.3 Table 341.3.2	-
MT	ASME B31.3 344.3	2
PT	ASME B31.3 344.4	3
Method	Criterion	Note
UT	ASME B31.3 344.6	-
PAUT in lieu of RT	ASME B31.3 Table 341.3.2	4

Note 1. In addition to paragraph ACCEPTANCE CRITERIA, requirements of paragraph VISUAL also apply.

Note 2. In addition to paragraph ACCEPTANCE CRITERIA, requirements of paragraph MAGNETIC PARTICLE also apply.

Note 3. In addition to paragraph ACCEPTANCE CRITERIA, requirements of paragraph LIQUID PENETRANT also apply.

Note 4. Use acceptance criteria for RT.

B. Visual

The following indications are unacceptable.

- 1) Weld Slag on the interior of the pipe.

C. Magnetic Particle

The following relevant indications are unacceptable.

- 1) Any linear indication.
- 2) Rounded indication with any dimension greater than 3/16 inch.
- 3) Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.

- 4) Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches (linear dimension), and with the area calculated in the most unfavorable location relative to the indications being evaluated.

D. Liquid Penetrant

Indications with a major dimension greater than 1/16 of an inch must be considered relevant. The following relevant indications are unacceptable.

- 1) Any crack or linear indication.
- 2) Rounded indication with any dimension greater than 3/16 inch.
- 3) Four or more rounded indications in a line separated by 1/16 inch or less edge-to-edge.
- 4) Ten or more rounded indications in any 6 square inches of surface with the major dimension of this area not to exceed 6 inches (linear dimension), and with the area calculated in the most unfavorable location relative to the indications being evaluated.

3.05 CORRELATION AND REWORK

Disqualifying or rejectable inspection findings or examination indications must be completely removed and repaired as specified in ASME B31.3, unless specified otherwise in this Section. Defects discovered between weld passes must be completely removed and repaired before additional weld passes are made. After defect removal is complete and before rewelding, the area must be inspected and examined by the same method(s) which first revealed the defect to ensure the defect has been eliminated. After rewelding, the repaired area must again be inspected and examined by the same method(s) originally used for that area. Any indication of a defect must be regarded as a defect unless reevaluation by NDE or by surface conditioning shows that no defects are present.

A. Defect Removal

Defective or unsound weld joints must be corrected by removing and replacing the entire weld joint, or for the

following defects, corrections must be made as follows.

- i. Excessive Convexity and Overlap: Reduce by careful removal of excess metal.
- ii. Excessive Concavity of Weld, Undersized Welds, Undercutting: Clean and deposit additional weld metal.
- iii. Excessive Weld Porosity, Inclusions, Lack of Fusion, Incomplete Penetration: Remove defective portions including sound weld metal for a distance of twice the thickness of the base metal or 2 inches, whichever is less, and reweld.
- iv. Cracks or linear indications in weld or base metal: Remove crack or linear indication throughout its length, extending removal into sound weld metal for a distance of twice the thickness of the base metal or 2 in, whichever is less, beyond each end of a crack or linear indication. Confirm complete removal by MT for carbon steel or PT for stainless steel. Once removal is inspected and examined, then rework can commence.
- v. Poor Fit-Up: Cut apart improperly fitted parts, re-fit, and reweld.

1. Methods of Defect Removal

Remove weld metal or portions of base metal by chipping, grinding, sawing, machining, or other mechanical means. It is less preferable but defects also can be removed by thermal cutting techniques. If thermal cutting techniques are used, clean and smooth the cut surfaces by mechanical means to remove the HAZ. In addition, a maximum of 1/8 inch of metal must be removed by mechanical means from the cut surfaces of stainless steel.

Wherever a defect is removed, and repair by welding is not required, the affected area must be blended into the surrounding surface eliminating sharp notches, crevices, or corners.

2. Grinding

For surfaces which require grinding, exercise

caution to avoid reducing wall thickness. After all grinding operations are complete, measure with UT and record remaining metal thickness on areas which were ground. Perform thickness measurements, compare to nominal, and analyze results in accordance with API 570. Report results to the Contracting Officer.

3. Rewelding

Make repair welds using an electrode or filler wire smaller than that used in making the original weld. Rewelding must be done using qualified welding procedures. The surface must be cleaned before rewelding. Repair welds must meet all requirements of this Section.

4. Peening or Caulking

The use of force (peening) or foreign materials to mask, fill, seal, or disguise any welding defect is prohibited.

3.06 MAINTAINING CLEANLINESS OF PIPING

Keep the interior and ends of all new pipe and piping affected by work thoroughly cleaned of foreign matter and water before, during, and after installation. Keep piping systems clean during installation by means of plugs, covers, or other effective methods. When work is not in progress, secure ends of piping, components, and fittings so no water, debris, or foreign substance can enter. Inspect piping before placing into position. Clean the interior of each length of pipe after welding. Use a swab with a leather or canvas belt disc to fit the inside diameter of pipe and pull through each length of pipe after welding in place. It is the Contractor's responsibility to ensure the interior of piping is free of dirt, debris, water, and foreign matter, including weld slag, when it is connected into the system.

3.07 QUALITY CONTROL DETERMINATION

Perform quality control oversight of the welding, inspection, testing, and NDE work. Provide a determination by the QCM that each weld is complete, has been inspected by the inspector, has been examined by the examiner(s), and meets contract requirements. Mandatory

elements of the determination are below. See paragraphs WELD MARKING and WELD LOG.

- i. Review of the weld
- ii. Welder, inspector, and NDE examiner markings are complete, accurate, and up to date
- iii. Weld inspection and results
- iv. Weld examination and results
- v. Weld Log is complete, accurate, and up to date
- vi. Reporting to the Contracting Officer is complete, accurate, and up to date

3.08 COMMISSIONING

For commissioning of POL service piping systems see Section 33 08 55 FUEL DISTRIBUTION SYSTEM START-UP (NON-HYDRANT).

END OF SECTION

33 52 40 – FUEL SYSTEMS PIPING (NON-HYDRANT)

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

1) AMERICAN PETROLEUM INSTITUTE (API)

API 570	(2016; Addendum 1 2017; Addendum 2 2018; ERTA 1 2018) Piping Inspection Code: In-Service Inspection, Rating, Repair, and Alteration of Piping Systems
API RP 540	(1999; R 2004) Electrical Installations in Petroleum Processing Plants
API RP 621	(2022; 5th Ed) Reconditioning of Metallic Gate, Globe, and Check Valves
API RP 1110	(2013; R 2018) Recommended Practice for the Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids, or Carbon Dioxide
API RP 1169	(2020; 2nd Ed) Pipeline Construction Inspection
API RP 1595	(2012; R 2019; 2nd Ed) Design, Construction, Operation, Maintenance, and Inspection of Aviation Pre-Airfield Storage Terminals
API RP 2003	(2015; 8th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents

API RP 2009	(2002; R 2007; 7th Ed) Safe Welding, Cutting, and Hot Work Practices in Refineries, Gasoline Plants, and Petrochemical Plants
API RP 2200	(1999; R 2004) Electrical Installations in Petroleum Processing Plants
API STD 608	(2012) Metal Ball Valves - Flanged, Threaded, And Welding End
API Spec 6D	(2021; Addendum 1 2025) Specification for Pipeline and Piping Valves
API Std 598	(2009) Valve Inspecting and Testing
API Std 607	(2016) Fire Test for Quarter-turn Valves and Valves Equipped with Non-metallic Seats
API Std 1163	(2021; 3rd Ed) In-line Inspection Systems Qualification
2) AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)	
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.34	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
ASME B16.48	(2015) Line Blanks
ASME B31.3	(2024) Process Piping
ASME B40.100	(2022) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications

- | | |
|-----------------------|--|
| ASME BPVC SEC V | (2017) BPVC Section V-
Nondestructive Examination |
| ASME BPVC SEC VIII D1 | (2023) BPVC Section VIII-Rules for
Construction of Pressure Vessels
Division 1 |
- 3) AMERICAN WELDING SOCIETY (AWS)
- | | |
|-----------|---|
| AWS Z49.1 | (2021) Safety in Welding, Cutting
and Allied Processes |
|-----------|---|
- 4) ASTM INTERNATIONAL (ASTM)
- | | |
|-----------------|--|
| ASTM A36/A36M | (2019) Standard Specification for
Carbon Structural Steel |
| ASTM A123/A123M | (2024) Standard Specification for
Zinc (Hot-Dip Galvanized) Coatings
on Iron and Steel Products |
| ASTM A153/A153M | (2023) Standard Specification for
Zinc Coating (Hot-Dip) on Iron and
Steel Hardware |
| ASTM A240/A240M | (2025) Standard Specification for
Chromium and Chromium-Nickel
Stainless Steel Plate, Sheet, and
Strip for Pressure Vessels and for
General Applications |
| ASTM A307 | (2023) Standard Specification for
Carbon Steel Bolts, Studs, and
Threaded Rod 60 000 PSI Tensile
Strength |
| ASTM A653/A653M | (2023) Standard Specification for
Steel Sheet, Zinc-Coated
(Galvanized) or Zinc-Iron Alloy-
Coated (Galvannealed) by the Hot-
Dip Process |
| ASTM A924/A924M | (2022a) Standard Specification for
General Requirements for Steel
Sheet, Metallic-Coated by the Hot-
Dip Process |

- | | |
|------------|--|
| ASTM B696 | (2000; R 2023) Standard
Specification for Coatings of
Cadmium Mechanically Deposited |
| ASTM B766 | (2023) Standard Specification for
Electrodeposited Coatings of
Cadmium |
| ASTM D3308 | (2012; R 2017) Standard
Specification for PTFE Resin
Skived Tape |
- 5) INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
- | | |
|-----------|--|
| IEEE 142 | (2007; Errata 2014) Recommended
Practice for Grounding of
Industrial and Commercial Power
Systems - IEEE Green Book |
| IEEE 1100 | (2005) Emerald Book IEEE
Recommended Practice for Powering
and Grounding Electronic Equipment |
- 6) INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
- | | |
|-------------------|--|
| ISO 9001 | (2015) Quality Management Systems-
Requirements |
| ISO ISO/IEC 17025 | (2017) General Requirements for
the Competence of Testing and
Calibration Laboratories |
- 7) MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY (MSS)
- | | |
|-----------|---|
| MSS SP-58 | (2018) Pipe Hangers and Supports -
Materials, Design and Manufacture,
Selection, Application, and
Installation |
|-----------|---|
- 8) NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- | | |
|----------|--|
| NFPA 30 | (2024; TIA 24-1) Flammable and
Combustible Liquids Code |
| NFPA 30A | (2024; ERTA 1 2023) Code for Motor
Fuel Dispensing Facilities and
Repair Garages |

- | | |
|---------|--|
| NFPA 70 | (2023; ERTA 1 2024; TIA 24-1)
National Electrical Code |
| NFPA 77 | (2024; ERTA 1 2023) Recommended
Practice on Static Electricity |
| NFPA407 | (2022; TIA 24-2) Standard for
Aircraft Fuel Servicing |
| NFPA780 | (2023) Standard for the
Installation of Lightning
Protection Systems |
- 9) SOCIETY FOR PROTECTIVE COATINGS (SSPC)
- | | |
|------------|---|
| SSPC SP 16 | (2010) Brush-Off Blast Cleaning of
Coated and Uncoated Galvanized
Steel, Stainless Steels, and Non-
Ferrous Metals |
|------------|---|
- 10) U.S. ARMY CORPS OF ENGINEERS (USACE)
- | | |
|------------|--|
| EM 385-1-1 | (2024) Safety -- Safety and
Occupational Health (SOH)
Requirements |
|------------|--|
- 11) U.S. DEPARTMENT OF DEFENSE (DOD)
- | | |
|---------------|---|
| MIL-PRF-13789 | (1999; Rev E; Notice 1 2008;
Notice 2 1016; Notice 3 2021)
Strainers, Sediment: Pipeline,
Basket Type |
| MIL-STD-161 | (2005; Rev G; Notice 1 2010)
Identification Methods for Bulk
Petroleum Products Systems
Including Hydrocarbon Missile
Fuels |
| UFC 3-460-01 | (2019; with Change 3, 2023)
Design: Petroleum Fuel Facilities |
- 12) U.S. GENERAL SERVICES ADMINISTRATION (GSA)
- | | |
|---------------|---|
| CID A-A-59326 | (Rev D) General Specification For
Coupling Halves, Quick-Disconnect,
Cam-Locking Type |
|---------------|---|

1.02 DEFINITIONS

1) Anomaly

Unexamined deviation from the norm in pipe material, coatings, or welds, which may or may not be a defect.

2) Defect

A physically examined anomaly with dimensions or characteristics that exceed acceptable limits.

3) Designer of Record

The professional engineer designated by the prime Contractor to be in multidisciplinary responsible charge of all POL service piping design and repair.

4) Hot Work

For work covered by this Section, drilling, boring, flame heating, welding, torch cutting, brazing, carbon arc gouging, grinding, abrasive blasting, or any work which produces heat, by any means, of 400 degrees F or more; or in the presence of flammable material or flammable atmosphere, other ignition sources such as spark or arc producing tools or equipment, static discharges, friction, impact, open flames or embers, nonexplosion-proof lights, fixtures, motors or equipment.

5) Piping Engineer

One or more licensed professional engineers, or an engineering firm, acceptable to the Contracting Officer who are knowledgeable and experienced in the engineering disciplines associated with evaluating hydraulic, mechanical, and material characteristics which affect integrity and reliability of POL service piping systems. The piping engineer is the piping or pipeline subject matter expert. More than one individual can serve in the role as long as one is designated to be in responsible charge.

6) POL Service Piping

Pipe, piping, pipeline, fittings, components, assemblies, and appurtenances used for petroleum, oil, or lubricant (POL) conveyance service under pressure or force of gravity, including modifications to existing systems.

1.03 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

- A. Hydrostatic Pressure Test Plan
- B. Work Plan
- C. Pipe Support
- D. Double Wall Piping
- E. Ball Valve Product Data
- F. Thermal Relief Valve Product Data
- G. Strainer Product Data
- H. Sample Connection
- I. Flexible Hose Connector
- J. Automatic Air Vent Product Data
- K. Hydrostatic Test Report
- L. Water for Hydrotesting
- M. Contractor Qualification
- N. Pipeline Inventory
- O. Valve Reconditioning Report
- P. Ball Valve Operation and Maintenance Data
- Q. Thermal Relief Valve Operation and Maintenance Data
- R. Strainer Operation and Maintenance Data
- S. Automatic Air Vent Operation and Maintenance Data

1.04 SAFETY

Adhere to safety precautions in Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, EM 385-1-1, API 570, API RP 2009, NFPA 30, NFPA 30A, and NFPA 407. If a pneumatic test is approved to be performed, ensure the

test is incorporated into safety plans and activity hazard analysis fully recognizing the hazard of energy stored in compressed gas.

A. Control of Hazardous Energy

Provide proper lockout and tagout (LOTO) of piping or pipeline and appurtenances to completely isolate work from fuel, vapors, and sources of energy. Isolate using physical means such as blind flange compliant with ASME B16.5 or solid-plate line blank compliant with ASME B16.48 to prevent fuel or vapor transfer into the workspace. Use isolation means of sufficient strength to withstand pressure which might be exerted by liquid, gas, or vapor in an active pipeline, piping, or tank. Use gaskets on both sides if a line blank is inserted between two flanges. Do not use a valve as sole means of isolation. If LOTO isolates a segment of active fuel piping from thermal relief, install temporary relief capability.

Execute in accordance with accepted Accident Prevention Plan, Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, and EM 385-1-1. Coordinate LOTO installation, maintenance, inspection, and removal with facility fuel system operator.

B. Hazard of Released Energy

Pneumatic testing involves the hazard of released energy stored in compressed gas. Particular care must be taken to mitigate the hazard. Establish a boundary around the test segment. Restrict access into the boundary to authorized personnel during pneumatic test. Provide pressure control to prevent test pressure in excess of 25 psig.

C. Preparation for Hot Work

Develop written procedures in accordance with EM 385-1-1, Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, and AWS Z49.1. Test piping for hydrocarbons and purge as necessary. Do not start grinding or welding until vapor-free certification is received from the Marine Chemist and requirements of EM 385-1-1 have been met. See Section 33 52 23.15 POL SERVICE PIPING WELDING for welding safety requirements.

D. Gas-Free Condition

Degas piping until requirements of Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES, the accepted Accident Prevention Plan, and the certified Marine Chemist are met and a gas-free condition is achieved. Obtain gas-free certification from the Marine Chemist. Maintain the gas-free environment. Display the Marine Chemist certificate on-site and available for review at all times during hot work.

1.05 GENERAL REQUIREMENTS

This section defines requirements for pipe, fittings, piping components, and valves related to non-hydrant, non-service station fuel distribution systems. Such systems include, but are not limited to: marine receipt, pipeline receipt, truck off-loading receipt, pump house, pump pad, truck loading, marine loading, transfer pipeline, product recovery, and other miscellaneous piping systems.

Provide fuel distribution as a complete and fully operational system. Size, select, construct, and install components and equipment to operate together as a complete system. Substitution of functions specified herein will not be acceptable. Coordinate the work of the system manufacturer service personnel during construction, testing, calibration, and acceptance.

A. Contractor Qualification and Experience

Contractors performing fabrication and installation work must be experienced and qualified in performance of POL system piping. Experience must include erection of piping, systems, or components in compliance with requirements of ASME B31.3 and NFPA 30.

Submit a letter listing prior projects, dates of construction, a point of contact for each prior project, brief scope of work for each prior project, and a detailed list of work performed. Provide in the letter evidence of manufacturer training and state licensing. Each contractor providing installation work must have the following minimum level of experience and qualification.

- 1) Successful completion of at least three projects of similar scope and size (or larger) within the last 6 years

- 2) Specific installation experience with regard to the piping, system, or component installation work to be performed
- 3) Successful completion of, if applicable, manufacturer training courses on installation of piping, system, or component work to be performed
- 4) Meet State licensing requirement, if applicable, for piping, system, or component work to be performed

B. System Supplier

As per requirements in Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT) .

C. Protect in Place

Physically verify the location and elevation of existing facilities and utilities prior to starting construction. Protect in place tanks, piping, components, equipment, flanges, gaskets, motors, valves, pumps, impellers, risers, coating, finishes, gauges, alarms, conduit, and conductors. Employ measures to protect people, equipment, and surfaces from damage. Support uncovered pipelines or existing utilities affected by excavation until backfilled.

D. Fuel for Testing

If fuel is used for hydrotesting, comply with all the requirements in Section 33 08 55 FUEL DISTRIBUTION SYSTEM START-UP (NON-HYDRANT) .

1.06 DESIGN REQUIREMENTS

In this Section, the term "as-indicated" is defined as referring to the design or drawings.

- (a) Design conditions are as provided in this Section and Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT) .
- (b) Design system components and piping to handle a working pressure of 125 psig at 100 degrees F. Components specified herein must be compatible with the fuel to be handled. Components must be suitable for outside, unsheltered location, and able to

function properly in ambient temperatures between 30 degrees F and 95 degrees F.

- (c) Consult with experts experienced in fuel piping or pipeline design. Provide Piping Engineer to design piping or pipeline systems. Produce drawings, details, specifications, and sketches which are complete and usable.
- (d) Identify on drawings work which requires in-process weld examination.
- (e) Annotate piping grade (pitch) and grade changes on drawings.
- (f) Establish fit-up, edge, and end preparation tolerances. Ensure the tolerance is consistent with the WPS for welded joints.
- (g) If fabrication or shop drawings are prepared by a vendor or subcontractor, provide oversight to the documents to ensure designer intent is met and fabrication tolerances are correct.

A. Code and Criteria Basis

UFC 3-460-01, API 570, and ASME B31.3 are relevant design codes and criteria. ASME B31.3 incorporates by reference other requirements of ASME BPVC SEC V and ASME BPVC SEC IX. API Std 1163 is the basis for ILI work.

B. Closure Weld

Design piping and pipeline in a manner which minimizes use of closure welds and maximizes use of hydrostatic means as compliance with leak test requirements in ASME B31.3 Paragraph 345. Designate on drawings or sketches the location of each closure weld and provide notes which state in-process examination requirements in accordance with Section 33 52 23.15 POL SERVICE PIPING WELDING, API 570, and ASME B31.3. Unnecessary closure weld designations are not allowed. Refer to Section 33 52 23.15 POL SERVICE PIPING WELDING for closure weld definition and in-process weld examination requirements.

C. POL Product

Product to be conveyed in the piping ASTM D4814 Mogas(F-

46) and Diesel (F-76). Unless noted otherwise in the Statement of Work or Project Program, Fluid Service Category is Normal per ASME B31.3.

D. Flexibility

Make provisions for absorbing expansion and contraction without excess stress in any part of the system. Do not use flexible connectors in permanently mounted pump suction and discharge lines as means of compensating for piping misalignment. Provide appropriate means of flexibility to eliminate vibration.

E. Support for Piping

Support piping at no more than the maximum spacing in Table 1. Provide additional pipe supports at locations of concentrated loads (valves). Provide anchors where required to resist or transmit loads.

Table 1. Maximum Support Spacing									
Nominal Pipe Size (Inches)	one-inch and under	1.5-in	2-in	3-in	4-in	6-in	8-in	10-in	12-in
Maximum Support Spacing (ft)	7-ft	9-ft	10-ft	12-ft	14-ft	17-ft	19-ft	22-ft	23-ft

Provide supports near each change of direction. Select support components which do not restrict movement of pipe due to thermal expansion. Space supports uniformly, and arrange symmetrically.

F. Space and Access

Incorporate efficient operations and maintenance access in design. Design piping, valves, control tubing, and components to be close to structures and columns as an efficient use of space. Ensure adequate maintenance access is provided for system components, valves, and gauges. For heavy components such as isolation valves, ensure there is adequate access for lifting equipment and rigging.

G. Structural Support

Design supplementary or intermediate members as required to transmit loads to the support structure and foundation. Do not support piping from other piping. Specify material used for support in Section 05 12 00 STRUCTURAL STEEL.

H. Structural connections

Design connections to concrete and masonry by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Ensure inserts and anchors have a safety factor not less than 5. Do not connect pipe supports to metal decking. For overhead applications, only use masonry anchors of ferrous material. Do not weld attachment studs to any pressure-containing boundary surface.

I. Size Change

Make changes in pipe size with reducing fittings. Do not use bushings. Make branch connections with butt-welded tees except where the branch is at least two pipe sizes smaller than the run, in which case the branch connection can be made with a forged or seamless branch outlet fitting. Use insert type branch connection fittings designed to be radiographed.

Branch connection fittings may be non-radiographicable type if the following conditions are met.

- 1) Branch connection is made to aboveground piping
- 2) Branch outlet size is 2.5 inches or less in diameter, and
- 3) Branch outlet is located in a contained pumphouse, a contained truck fill stand, or other area with spill containment

J. Direction Change

Make changes in direction of pipes with 1.5 D fittings. Where piping is to be piggable, make changes in direction with 1.5 D fittings and/or 3 D sweeps as indicated. For piggable pipelines, do not place 1.5 D fittings back to back. Provide special fittings when required. Make odd-angle offsets with pipe bends or elbows cut to the proper angle. Make changes in direction with fittings, except

that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. Mitering or notching pipe or other similar construction to form elbows or tees will not be permitted. The centerline radius of bends must not be less than 6 diameters of the pipe if a pipe bender is used.

K. Hydrostatic Pressure Test Plan

Submit a detailed site-specific plan covering all aspects of pipeline hydrostatic testing operations, including procedures and sequencing of testing, segments of piping to be tested, fluid to be used during testing, equipment removal and isolation, hydrostatic testing pressures, disposal of test fluid, and safety protocols.

Provide a Hydrostatic Pressure Test Plan which will establish tightness and strength of piping. Testing must be compliant with ASME B31.3, API 570, and consistent with API RP 1110. Plan must include site specific procedure, sequence, segment identification, fill points and volume, air bleed, closure means and material specification, valves, flanges, fittings, and instruments in each segment. Provide pre-test review by the Piping Engineer to ensure pipe support and foundation structures are suitable for hydrostatic load. Use fresh water with less than 50 ppm chloride content as the test medium. Designate a test operator in responsible charge of executing the plan, examining for leaks, and certifying results. Acceptance criteria are the no leak condition and unaccountable error less than one degree of temperature change. Dispose of test water in accordance with paragraph HYDROSTATIC TEST WATER DISPOSAL.

L. Pipeline Inventory

Calculate fuel system volume using as-constructed pipe dimensions, inside diameters, fittings, and components. Provide a certified pipeline inventory containing a detailed list with sizes, dimensions, quantities, and volumes for the systems in this project. Provide volume totals for all items containing fuel except tanks which are covered by other specifications. Systems include, but are not limited to: marine receipt, pipeline receipt, truck off-loading receipt, pump house, pump pad, truck loading, marine loading, transfer pipeline, product

recovery, and other miscellaneous piping systems.

M. Piping Identification

Provide piping identification in accordance with MIL-STD-161 unless specified otherwise.

N. Nameplates

As per requirements in Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

O. Material and System Component Qualification

As per requirements in Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

1.07 QUALITY ASSURANCE

A. Construction Inspection

Establish and maintain a program of inspection and testing to control the quality of design and construction. Ensure program and personnel are experienced and qualified to perform inspection and test activities safely and effectively during construction. Perform inspection and examination to ensure contract work conforms to requirements, and consistent with principles of API RP 1169. Maintain complete records and make them available to the government.

Contractor is responsible for the quality of all design, layout, fabrication, inspection, examination, testing, records maintenance, and reporting. All materials used in the piping system must be clearly identified and recorded. Inspection, examination, and testing defined in this Section are minimum requirements. Provide additional inspection, examination, and testing when necessary to achieve the required quality of work.

B. Data Management

Organize underground piping locational data in a non-proprietary management system such as a database or spreadsheet. Establish a piping location identification scheme which uniquely identifies system features, dimensions, location, aboveground markers, and relative position to other facilities. Provide secure, auditable, and organized data. Cloud-based systems are not

acceptable. See paragraph PIPE PIGGING VERIFICATION for pig tool data requirements.

C. Work Plan

Submit a comprehensive Work Plan that provides sufficient detail to demonstrate a thorough understanding of the project. Coordinate the plan with requirements of Section 33 52 23.15 POL SERVICE PIPING WELDING. Document that all piping, systems, or components to be provided will function together and produce the result expected by the government. Include proposed dates for piping system outages. Plan must demonstrate Contractor ability to complete the work within the allotted outage period. For work that requires support of government system operations, provide proposed dates and the nature of support that is required. Include a list of personnel, spare materials and system components that will be on hand for each phase of work. Describe in detail the means to accomplish the following.

- 1) Coordinating work with government and third parties.
- 2) Preparing for safe piping repair work.
- 3) Pneumatic pressure testing new piping sections.
- 4) Hydrostatic pressure testing new piping sections.
- 5) Purging piping.
- 6) Vapor monitoring.
- 7) Preparations for containing and disposing of residual fuel.
- 8) Cutting, sealing, and welding into existing piping systems.
- 9) Welding tie-ins in place.
- 10) Examining repair section tie-in welds.
- 11) Collecting, storing and disposing of waste fuel generated during work.

1.08 Delivery, Storage, and Handling

A. Material Control

Protect system components and materials to prevent damage before, during, and after installation in accordance with this Section and manufacturer instructions.

- 1) Inspect material and components for damage upon arrival. Reject materials which are mechanically damaged.
- 2) Inspect the condition of shop-applied coating upon arrival. Identify damage to the protective coating system. Notify the Contracting Officer of material with damaged shop-applied coating. Provide corrective action plan by which the damage will be repaired.
- 3) Store and handle material in method and environment compliant with manufacturer instructions.
- 4) Replace damaged or defective components and material.
- 5) Clean surfaces of all dirt, debris, or foreign substances. Verify condition and cleanliness of material prior to handling for installation.

B. Proper Storage

- 1) Store all valves, tubing, accessories, and components with protective covering to prevent internal contamination by any substance or liquid. Protect from damage by plant or animal. Store elevated from the ground surface and covered with secured tarps. Store in a manner and location which protects material from damage.
- 2) Store pipe or piping on blocks or dunnage racks at least 18 inches above the ground and adequately supported to prevent sagging. Use padded blocks or dunnage racks for coated pipe. The method, environment, and height of storing coated pipe must be in accordance with the coating manufacturer's instructions. Pipe ends must be protected and capped at all times, except to accommodate immediate installation.
- 3) Use plugs, covers or other methods to secure the cleanliness of piping materials during storage. Maintain secure covers at all times during storage and prior to installation.

- 4) For material, components, or equipment which are received with
- 5) factory-applied shrink preservation wrap, maintain the covering intact during storage to prevent ingress. Repair minor damage to shrink wrap with manufacturer-supplied preservation tape.
- 6) For piping and materials which are stored without protective coating, provide means to ensure external surfaces are protected from precipitation and rust.
- 7) When work is not in progress, close and secure coverings on stored materials so that water, contamination, or other foreign substances can not enter.
- 8) See paragraph CLEANING OF PIPING for storage and cleanliness requirements during and after installation.

PART 2 PRODUCTS

2.01 MATERIALS

Pipe and fittings in contact with fuel must be stainless steel, interior epoxy coated carbon steel, or interior uncoated carbon steel as indicated on the drawings or as specified herein. Zinc coated metal, brass, bronze or other copper bearing alloys must not be used in contact with fuel. Steel underground piping and all carbon steel must have an exterior protective coating. Material for manual valves must be as specified in this Section. Do not use aluminum valves.

A. Double Wall Piping

- 1) Primary Piping:
 - a. Shall be made from T316 series Stainless Steel Strip conforming to ASTM A240/A240M.
 - b. Piping shall not be subjected to heat treating or annealing after the corrugation forming operation.
 - c. Piping shall be suitable for operation with all fuels as defined in UL 971A and UL 1369.

- d. Piping is rated for 125 Psig (1"), 100 Psig (1-1/2") and 75 Psig (2").

2) Secondary Jackets:

- a. The jacket shall be a 2-layer co-extrusion of EFEP and Nylon 12.
- b. The secondary jacket shall be rated for 50 Psig (All Sizes).
- c. Nylon 12 Jacket is to be resistant to UV.

B. Fittings

1) General

- a. Fittings shall be made from 300 series Stainless Steel.
- b. Fittings shall provide a metal-to-metal seal (no gaskets).
- c. Fittings shall incorporate a port for interstitial space monitoring and or testing.

C. Flange Protector

Protectors must protect the bolts, studs, nuts, and gaskets of a flanged end connection from corrosion or damage due to exposure to the environment. Protectors must be weather and ultraviolet (UV) resistant. Protectors must allow for quick and easy removal and re-installation by maintenance personnel. Corrosion inhibitor grease must be non-expansive and designed for the service and ambient temperatures.

2.02 MANUAL VALVES

All portions of a valve coming in contact with fuel in stainless steel pipelines or epoxy lined carbon steel pipelines must be of noncorrosive material. Valves in stainless steel pipelines or epoxy lined carbon steel pipelines must be Type 304 or Type 316 stainless steel or carbon steel internally plated with chromium or nickel or internally electroless nickel plated. Valves in unlined carbon steel pipelines must have carbon steel body. Stem and trim must be stainless steel for all valves. Manually operated valves 6 inches and larger must be worm-gear

operated and valves smaller than 6 inches must be lever operated or handwheel operated. Valves smaller than 2 inches must have lever-type handles. Valves installed more than 8 feet above finished floor standing platform must have chain operators and a position indicators visible from ground (standing) level. Sprocket wheel for chain operator must be aluminum.

A. Ball Valve

Ball valves must be fire tested and qualified in accordance with the requirements of API Std 607 and API STD 608. Seal material for the fire test must be graphite, seal material for the project must be as indicated below. Ball valves must be nonlubricated valves that operate from fully open to fully closed with 90-degree rotation of the ball. Valves 2 inches and larger must conform to applicable construction and dimension requirements of API Spec 6D, ANSI Class 150 and must have flanged ends. The balls in valves 10 inches and larger full port and 12 inches and larger regular port and larger must have trunnion type support bearings. Except as otherwise specified or indicated, reduced port or full port valves may be provided at the Contractor's option. Balls must be solid, not hollow cavity.

1) Materials

Ball must be stainless steel. Ball valve seats, body seals, and stem seals must be polytetrafluoroethylene (PTFE) or fluoroelastomer (FKM), commonly referred to as Viton. Valves 4 inches and smaller must have a locking mechanism.

2) Electric Valve Actuator

Electric valve actuator must be as indicated for Plug (Double Block and Bleed) Valves, electric valve actuator.

2.03 THERMAL RELIEF VALVE

A. Valve Material

Valves must have carbon steel bodies (stainless steel on stainless steel pipelines) and bonnets with stainless steel springs and trim. Valves must be Class 150 flanged end connections.

B. Thermal Relief Valve (ASME Type)

Thermal relief valves must be the fully enclosed, spring loaded, angle pattern, single port, hydraulically operated type with plain caps, and must be labeled in accordance with ASME BPVC SEC VIII D1. Valve stems must be fully guided between the closed and fully opened positions. The valves must be factory-set to open at pressures indicated on the drawings. Operating pressure must be adjustable by means of an enclosed adjusting screw. The valves must have a minimum capacity of 20 GPM at 10 percent overpressure. Valves must have a replaceable seat. Relief valves that do not relieve to a zone of atmospheric pressure or tank must be a balanced type relief valve.

2.04 PIPING ACCESSORIES

A. Mechanically Adjustable Segmented Elastomeric Seal

Mechanically adjustable segmented elastomeric seals must be constructed of fuel resistant Buna-N elastomers and Type 316 stainless steel fasteners and hardware.

B. Pipe Sleeve

Install pipe sleeves where indicated on design and at all points where piping passes through concrete construction. Sleeves must be of sufficient inside diameter to provide a minimum clear distance between the pipe and the sleeve of 1/2-inch. Sleeves through concrete pits or slabs must be standard weight carbon steel pipe with a protective coating. Each sleeve must extend through the respective pit wall or slab and must be provided with a wrap around Buna-N (Viton when exposed to sunlight) end seal (boot) and secured to the pipe sleeve and piping with adjustable stainless steel hose clamps. Sleeves where piping passes under roads or piping indicated to be double walled must be standard weight carbon steel pipe with a protective coating. Alignment of the sleeve and piping must be such that the pipe is accurately centered within the sleeve by a nonconductive positioning element. The sleeve must be securely anchored to prevent dislocation. Close the space between the pipe and sleeve with a mechanically adjustable segmented elastomeric seal. The seal must be installed so as to be flush.

C. Strainer

1) Basket Type

Strainer must be basket type arranged in a simplex configuration in compliance with MIL-PRF-13789. Strainer end connections must be designed in accordance with ASME B16.5, Class 150. Strainer body material must be the same as the material specified for manual valves. Strainers must have removable baskets of 40 mesh wire screen with larger wire mesh reinforcement; wire must be stainless steel, Type 316. Pressure drop for clean strainer must not exceed 3 psig at maximum design flow rate. The ratio of net effective strainer area to the area of the connecting pipe must be not less than three to one. Each strainer must be provided with a suitable drain at the bottom, equipped with a ball valve. The strainer must be equipped with a direct-reading, piston type differential pressure gauge that measures the differential pressure across the basket in accordance with Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

D. Pressure Gauge

See Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

E. Pipe Support

1) General

Pipe supports must conform to MSS SP-58. Design pipe supports to meet the applicable requirements of ANSI/ASME B31.3 or ANSI/ASME B31.4. Provide hot-dip galvanized finish on rods, nuts, bolts, washers, and supports. Provide Type 316 stainless steel nuts, bolts, washers, and screws when located at a pier. Provide miscellaneous metal that conforms to ASTM A36/A36M, standard mill finished structural steel shapes, hot-dipped galvanized. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2) Adjustable Type

Adjustable types consist of a bearing surface such as a saddle or low friction half-round and u-bolt supported by a threaded nipple connected to a carbon steel pipe by means of a special reducer conforming

to MSS SP-58. The supports must be provided with PTFE insulation strips.

3) Low Friction Type

Supports must have self-lubricating anti-friction bearing elements composed of 100 percent virgin tetrafluoroethylene polymer and reinforcing aggregates, prebonded to appropriate backing steel members. The coefficient of static friction between bearing elements must be 0.06 from initial installation for both vertical and horizontal loads and deformation must not exceed 0.002-inch under allowable static loads. Bonds between material and steel must be heat cured, high temperature epoxy. Design pipe support elements for the loads applied. Provide anti-friction material with a minimum of 0.09-inch thick. Provide hot-dipped galvanized steel supports. Provide supports that are factory designed and manufactured.

4) U-bolt Half Round Type

Supports must have anti-friction bearing half-round in contact with the bottom of the pipe. Provide polytetrafluoroethylene or like hydrophobic, anti-corrosive material half-round with a minimum compressive strength of 10 ksi or greater as indicated. U-bolts must be installed in either a loose or limited guide configuration. Provide hot-dip galvanized u-bolts with seamless non-metallic low friction coating. U-bolt connection must be double nutted on the bottom and single bolted on top.

F. Quick Disconnect Coupler and Adapter

Couplers and adapters must be quick disconnect, cam type, that conforms to CID A-A-59326.

2.05 FLEXIBLE HOSE CONNECTOR

- A. Flexible hoses connectors for fueling pumps must have ANSI Class 300 or 150 flanges to mate directly to the pump and Class 150 flanges to the system flanges. Flanges must be stainless steel and must conform to ASME B16.5. These units must have an inner stainless steel or Inconel, corrugated tube with external stainless steel braid, and all components must be rated for not less than 275 psig at

100 degrees F. Face to Face dimension must be as recommended by the manufacturer. Use Inconel 625 inner bellows in coastal environments or where chlorides are present in the atmosphere.

- B. For sizes larger than 6 inches, connectors must incorporate the use of Lo-corr, multi-ply bellows, without external braid, with bellows rating of 300 psig and overall rating consistent with the flange ANSI class. Flanges must be plate type, Vanstone design, with axial movement control rods.
- C. Fabricate piping to measurements established on the project site and position into place without springing or forcing. Make provisions for absorbing expansion and contraction without undue stress in any part of the system. The use of flexible connectors in permanently mounted pump suction and discharge lines as a method of compensating for piping misalignment is not acceptable

2.06 AUTOMATIC AIR VENT

Unit must have one-inch connections and automatically vent air under pressure, and prevent a vacuum when pressure drops below positive. As fuel fills the vent, a float must rise and form a drip-tight closure. The unit pressure rating must be a minimum of 275 psi. The float must be stainless steel. Body and cover be carbon steel or ductile iron and be internally epoxy coated.

2.07 MISCELLANEOUS ACCESSORIES

A. Concrete Anchor Bolt

Concrete anchors must conform to ASTM A307, Grade C, hot-dipped galvanized.

B. Coating for Bolts, Studs, Nuts, and Washers

Carbon steel bolts, studs, nuts, and washers must be provided with a factory applied cadmium coating that conforms to ASTM B696 or ASTM B766.

C. Polytetrafluoroethylene (PTFE) Tape

Tape must conform to ASTM D3308.

PART 3 EXECUTION

3.01 GENERAL

Provide installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing in accordance with ASME B31.3 and NFPA 30 except as modified herein. Strictly observe safety rules as specified in Section 01 35 29 HEALTH, SAFETY, AND EMERGENCY RESPONSE

PROCEDURES, EM 385-1-1, NFPA 30, and NFPA 407. Never direct bury threaded connections, socket welded connections, unions, flanges, valves, air vents, or drains. Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible.

3.02 VERIFICATION OF DIMENSIONS

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.03 CLEANLINESS OF PIPING

Inspect the cleanliness of piping, fittings, and components before placing into position. Clean the interior of each length of pipe, fitting, and component before and after installation to ensure surfaces are free of water, slag, debris, particulates, or foreign material. See paragraph PROPER STORAGE OF MATERIAL for pre-installation storage requirements.

Keep the interior and ends of all piping, fittings, or components which are part of or affected by construction thoroughly cleaned of foreign material and water before and after installation. Use plugs, covers or other approved methods to keep piping systems clean. When work is not in progress, close and secure openings in pipe, piping systems, fittings, and components to prevent ingress of water, contamination, or foreign substances. See paragraph PIPE PIGGING - CLEANING for post-installation cleanliness requirements.

A. Dehydration of Piping

For piping containing water, remove all water and open all low point drains to confirm water removed. Provide

mechanical dehydration with either dehumidification equipment, forced air, or vacuum extraction. Verify that dehydration is complete by measuring dew point of exhausted air. Dry and dehumidify piping using air with a dew point less than minus 20 degrees F, until no residual water accumulates in low points and the dew point of the air at the outlet is less than minus 10 degrees F. Do not allow water to remain in piping for more than 48 hours.

Submit Piping Dehydration Results prior to filling pipelines with fuel.

3.04 ELECTRICAL

A. General

Provide wiring for motors, manual or automatic motor control system components (except where installed in a motor control center), and protective or signal devices required for operation specified in this Section in accordance with Section 26 27 29 MARINA ELECTRICAL WORK. Provide wiring required for operation specified in this Section but not shown on electrical drawings in accordance with Section 26 27 29 MARINA ELECTRICAL WORK.

B. Grounding and Bonding

Ground and bond as indicated on the drawings and in accordance with NFPA 70, NFPA 77, NFPA 407, NFPA 780, API RP 540, API RP 2003, IEEE 142, and IEEE 1100. Provide jumpers to overcome the insulating effects of gaskets, paints, or nonmetallic components.

3.05 PIPING LAYOUT REQUIREMENTS

Determine and provide an efficient pipe routing. Use offsets, fittings, and accessories required to eliminate interference, efficiently match existing system configuration, optimize operability and maintenance access, and minimize alignment stress.

A. Service and Maintenance Access

Place unions on each side of equipment. Do not place unions in locations that will be inaccessible after the completion of the work.

B. Pipe Fabrication

- 1) Fabricate piping to measurements established on the project site and within design tolerances.
- 2) Position piping into place without cold spring, bending, or forcing. Do not use heat to obtain alignment.
- 3) Distortion of piping to correct misalignment for joint assembly is prohibited.
- 4) Prepare pipe or component ends to be smooth and true.
- 5) Remove slag from surfaces cut by oxygen or thermal arc means.
- 6) Inside surfaces of components at ends to be joined in girth or miter groove welds must be aligned within the dimensional tolerance in the WPS and the design.
- 7) Do not tack welded alignment lugs to pipe for fit-up or fabrication.

C. Interference and Measurement

Verify dimensions before commencing work. Submit discrepancies for clarification to the Contracting Officer before proceeding with installations.

D. Structural Attachment

Provide structural steel attachments and connections required to support piping system, headers, accessories, and components. This includes elements not shown on design drawings. Material used for support must be as specified under Section 05 12 00 STRUCTURAL STEEL.

E. Grade Tolerance

Where profiles of piping lines are shown on the drawings, grade the line uniformly between changes in slope or direction. Maintain gradient to within 1/4-inch over the entire length of pipe.

F. Grade Survey

When backfilling has been completed to top of pipe, perform a relative positional survey of the horizontal and vertical alignment and elevation at each joint or change in direction. Record measurements with an associated

odometer reading. See paragraph DATA MANAGEMENT for database requirements. Before backfilling can continue, submit Grade Survey to the Contracting Officer.

G. Threaded End Connections

Provide threaded end connections only on piping 2 inches in nominal size or smaller, and only where indicated on the drawings. Provide threaded connections with PTFE tape or equivalent thread-joint compound applied to the male threads only. Not more than three threads must show after the joint is tightened.

H. Existing Pipe System

Do not interrupt or isolate an existing fuel handling service or system unless the actions are appropriately documented in an approved work plan. Perform initial cutting of existing fuel pipe with a multiwheel pipe cutter, using a nonflammable lubricant. After cut is made, seal interior of piping with a gas barrier plug. Refer to API RP 2009 and API RP 2200. Purge interior of piping with carbon dioxide or nitrogen prior to performing any welding process. See paragraph CLOSURE WELDS for requirements in the event a closure weld is required. See Section 33 52 23.15 POL SERVICE PIPING WELDING for welding safety and closure weld requirements.

I. Bolted Connection

For each bolted connection of stainless steel components (pipes, piping components, valves, system components) use stainless steel bolts or studs, nuts, and washers. For each bolted connection of carbon steel components, use carbon steel bolts or studs, nuts, and washers. See paragraph BOLTS, NUTS AND WASHERS for fastener requirements. Prior to installing nuts, apply a compatible anti-seize compound to the male threads.

J. Flange and Union

Except where threaded end connections and/or unions are indicated, provide flanged joints in each line immediately preceding the connection to system components or material requiring maintenance such as pumps, general valves, control valves, strainers, and other similar items and as indicated. Assemble flanged joints square and tight with matched flanges, gaskets, and bolts.

K. Flange Protection

Provide flange protectors on each flanged end connection, including valves and system components. Provide protectors that allow visual inspection of flange gasket without removal. Provide grease filled bolt caps.

L. Manual Valve

Install isolation plug or ball valve on each side of system equipment, at the midpoint of a looped main, and at other points indicated or required to be drained, isolated, or sectionalized. Install valve with stem in the vertical position unless otherwise indicated. Provide individual support and anchor for each valve.

M. Air Vent

Provide 1-1/2 inches air vent at all high points and where indicated to ensure adequate venting of the piping system.

N. Drain

Provide 2 inches drain at all low points and where indicated to ensure complete piping can completely drain.

O. Thermometer

Provide thermometer with separable socket. Install separable socket in pipeline in a manner to sense the temperature of flowing fluid and minimize obstruction to flow.

P. Pipe Sleeve

Provide a pipe sleeve around any pipe that penetrates a wall, floor, or slab. Do not install sleeves in structural members except where indicated or approved. Install pipe sleeve in masonry structures at the time of the masonry construction. Sleeve must be of such size as to provide a minimum of 1/2-inch all-around clearance between bare pipe and the sleeve. Align sleeve and piping such that the pipe is accurately centered within the sleeve by a nonconductive centering element. Securely anchor the sleeve to prevent dislocation. Close the space between the pipe and the pipe sleeve with a mechanically adjustable segmented elastomeric seal. Install seal to be flush. For wall or floor penetration, extend each sleeve

through the respective wall or floor and cut flush with each surface. Seal around sleeves that penetrate through valve or fuel related pits with a Buna-N casing seal.

3.06 WELDING

A. General

All joints, unless indicated otherwise, in carbon steel and stainless steel piping systems must be welded. Do not weld carbon steel to stainless steel. Ad-hoc or field-determined closure welds are not allowed. Welding of fuel pipe joints must comply with Section 33 52 23.15 POL SERVICE PIPING WELDING.

3.07 VALVE REFURBISHMENT

Provide professional valve reconditioning services in accordance with API Std 598 and API RP 621. Provide services from an independent reconditioning facility with a documented and established quality assurance program which includes essential elements described in the ISO 9001 standard, and has written procedures compliant with API RP 621.

Disassemble, clean, and inspect all components for dimensional accuracy, surface condition, mating fit, and mechanical integrity. Use PT examination procedures in accordance with this Section and API RP 621. Provide supplementary PT examination of castings or forgings in accordance with Part 8 of ASME B16.34. Replace slips, soft seats, bonnet and cover fasteners, packing, gaskets, and grease fittings. Recondition valves to manufacturer standards and API RP 621. Pressure test each assembled valve compliant with API Std 598. Recoat exterior valve surfaces in accordance with Project Program.

Provide Valve Reconditioning Report for each valve in accordance with paragraph SUBMITTALS. Reinstall valves with new fasteners and gaskets. Commission valves back into service. Verify proper operation through the entire range. Ensure plug rotation towards open lifts the plug without wiping the seals and retracts the sealing slips so clearance is maintained between the slips and valve body. Verify full range of operation.

A. Valve Operation

Adjust motor operator limit switches and torque settings to provide proper operation. Verify operation through its entire range and demonstrate to government proper operation prior to requesting return to service.

3.08 COATING

A. Field Applied

Adjust motor operator limit switches and torque settings to provide proper operation. Verify operation through its entire range and demonstrate to government proper operation prior to requesting return to service.

For field repairs to hot dip galvanized steel, omit application of the zinc-rich epoxy primer coat from Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES. Apply only the epoxy intermediate coat and polyurethane topcoat to these surfaces.

B. Pipe Supports

When hot dip galvanized pipe support steel must be field coated, prepare surfaces to SSPC SP 16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals. Once the steel is prepared, apply only the epoxy intermediate coat and polyurethane topcoat per Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES.

C. Interior Epoxy

When internally epoxy lined pipe is cut, the lining must be ground back from the end a minimum of one-inch but not more than 1-1/2 inches.

D. Damage Repair

When the protective coating on pipe is damaged, notify the Contracting Officer and inspect the pipe before coating is patched. Repair and inspect damaged areas of coating pursuant to all requirements in this Section for coating application.

3.09 CORRECTION AND REWORK

Defects in work, disqualifying or rejectable inspection findings or examination results, and installation damage

must be completely removed and repaired as specified in ASME B31.3, unless stated otherwise in this Section.

3.10 SYSTEM COMMISSIONING

Conform to Section 33 08 55 FUEL DISTRIBUTION SYSTEM START-UP (NON-HYDRANT).

3.11 TESTING

Piping must be tested by hydrostatic pressure. Testing must comply with applicable requirements of ASME B31.3, NFPA 30 and requirements specified herein. Perform hydrostatic test using fuel as the liquid. Do not perform pressure testing until weld inspection and NDE have been successfully completed. Furnish labor, material, equipment, electricity, repair, and retesting necessary to achieve successful results. Schedule work so tests are in accordance with paragraph TIMING.

Provide means to brace piping and prevent displacement during testing.

Keep personnel clear of piping during testing. Control access to only permit authorized personnel in the area during testing.

Isolate system components such as pumps, strainers, instruments, tanks, filter separators, and meters from test pressure.

Do not exceed the pressure rating of any component in the piping system during testing.

Following satisfactory completion of each test, relieve pressure and seal the pipe immediately.

A. Timing

Plan work to properly time pipe assembly, inspection, NDE, joint coating, and test activities. Use caution when timing the gross leak test, placing pipe into the trench, and coating joints. Avoid rework performed inside a trench.

Do not leave fuel piping in trench with exposed welds for longer than 30 days. Do not backfill piping before completing weld inspection, weld NDE, pneumatic test, coating (of welds) application and testing, and other

quality control work have been successfully completed. For piping that will be pneumatically tested, do not apply protective coating on welds until successful test results are achieved. Schedule hydrotest such that the pipeline can be filled with fuel as soon as possible after test is complete. Fill line with fuel no more than two weeks following draining of water and dehydration of piping.

B. HYDROSTATIC TEST

Upon successful completion of pneumatic testing and after backfilling, hydrostatically test piping system with fuel at 275 psig in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gauge pressure. Furnish electricity, instruments, connecting devices, and personnel for test. Fuel must be furnished by the government. Defects in work must be corrected at the Contractor's expense, and the test repeated until the work is proven to be in compliance with the Contract requirements.

Duration of the test must be a minimum of 4 hours.

Designate a competent test operator who is in responsible charge of the test. Test operator must control or direct application and release of pressure, verify connections are secure, ensure test segment and area is safe and clear of unauthorized personnel, and remain in constant communication with observers.

Upon successful completion of hydrostatic testing, perform Soak Testing of the piping systems per API RP 1595.

Only authorized personnel are permitted in the area during hydrostatic testing.

If leaks are discovered, discontinue the test and repair the piping. Inspect and perform NDE on the repair. Restart the test on the repaired segment. Repeat process until system is leak-free. See paragraph CORRECTION AND REWORK.

1) Instruments

- a. Instruments must be clean, in good working order, and within the calibration interval. Instruments without a calibration certificate must not be used.

- a. Calibrate all test instruments against a standard by a laboratory A2LA accredited to ISO ISO/IEC 17025. Calibration must have taken place no more than 6 months prior to the hydrostatic testing. Calibration certificates must include the Model, Serial Number, date of certification and must be signed by the testing company. Provide current Instrument Calibration Certificate for measurement instruments.
- b. Provide indicating pressure test gauge connected directly to the segment and readily visible to the operator controlling pressure for the duration of the test. Analog type gauges must be compliant with ASME B40.100 Grade 3A, accurate to plus or minus 0.25 percent full scale, graduated over a range not less than 1-1/2 times nor more than 4 times the test pressure, and incremented no greater than 0.5 psi.
- c. Digital type pressure gauge must be integral transducer type, compliant with ASME B40.100 Grade 3A, and accurate to plus or minus 0.25 percent full scale.
- d. Provide digital contact thermometer incremented to 0.1 degree F or less. Memorialize pressure data with analog chart recorder. Transducers must have a range not less than 1.5 times and not greater than 4 times the pressure being tested.
- e. Use calibrated continuous recorders (dataloggers) with adequate storage capacity to record temperature and pressure data. Synchronize the time interval for both measurements.
- f. Measure the volume of test medium with a calibrated meter.

2) Procedure

- a. For inaccessible segments, account for the volume of any test medium added or removed by measuring with a calibrated meter.
- b. After filling has been completed, allow the test section to stabilize at 25 percent of the test pressure for 24 hours or until a temperature-time

plot is asymptotic to ground temperature. Start pressure and temperature recorders prior to pressurization and run throughout the stabilization period to ensure proper stabilization has taken place before starting the hydrotest.

- c. Maintain segment at a steady test pressure condition for a minimum of 15 minutes prior to initiation of examination for leakage. Examine piping, joints, and connections of accessible piping for leaks while maintaining test pressure. Leakage of temporary gaskets and seals, installed for the purpose of conducting the hydrostatic test and which will be replaced later, is permitted unless the leakage rate precludes maintenance of system test pressure for the required duration. Personnel performing the examination for leaks must be qualified for visual examination. Extend the test interval as needed to ensure positive reconciliation of test data. Monitor temperature and pressure. Analyze consistent error, inconsistent error, the magnitude of any lost volume, and pressure versus temperature data trends.

3) Test Report

Provide certification from the hydrostatic test examiner the piping segments are either pass or fail. Inconclusive results are not acceptable. Prepare a pressure test report consistent with API RP 1110 to serve as the permanent qualification record, demonstrate the operating pressure limit and includes test drawings and logs of recorded test data. Provide written Hydrostatic Test Report.

C. System Integrity Check

After system installation, inspection, NDE, and pressure testing are complete, check flanges, valves, fittings, joints, gaskets, connections, and components for visible weep, leak, or any area wetted with fuel. Replace, repair, or tighten to establish integrity. Re-check system to verify compliance.

D. Performance Testing

After fuel system testing is completed (including integrity check), flush, clean, and performance-test as specified in Section 33 08 55 FUEL DISTRIBUTION SYSTEM START-UP (NON-HYDRANT). Verify proper operation of all valves, pumps, controls, and motors. After start-up is complete, re-check the system for leaks and proper operation. Repair or replace to correct any defects.

3.12 DEMONSTRATIONS

As per requirements in Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

3.13 POSTED OPERATING INSTRUCTIONS

As per requirements in Section 33 57 55 FUEL SYSTEM COMPONENTS (NON-HYDRANT).

END OF SECTION

33 57 55 – FUEL SYSTEM COMPONENTS (NON-HYDRANT)

PART 1 GENERAL

1.01 SUMMARY

This section defines the requirements for system components as related to a non-hydrant fuel distribution system. Provide the entire fuel distribution system as a complete and fully operational system. Size, select, construct, and install equipment and system components to operate together as a complete system. Substitutions of functions specified herein will not be acceptable. Coordinate the work of the system manufacturer's service personnel during construction, testing, calibration, and acceptance of the system. System components and piping specified herein must be designed to handle a working pressure of 275 psig for stainless steel systems at 100 deg F. Components specified herein must be compatible with the fuel to be handled. Components to be suitable for outside, unsheltered location, and to function normally in ambient temperatures between 30 degrees F and 95 degrees F. If gasoline is being handled, refer to 40 CFR Part 60 Subpart Kb and XX, 40 CFR Part 63 Subpart R,BBBBBB (6B), and CCCCCC (6C) for design, installation, and testing requirements.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced.

A. AMERICAN PETROLEUM INSTITUTE (API)

- | | |
|-------------|--|
| API RP 540 | (1999; R 2004) Electrical Installations in Petroleum Processing Plants |
| API RP 2003 | (2015; 8th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents |

B. ASTM INTERNATIONAL (ASTM)

ASTM C827/C827M	(2023) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
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C. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 142	(2007; Errata 2014) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book
IEEE 1100	(2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment
IEEE 70	(2023; ERTA 1 2024; TIA 24-1) National Electrical Code
IEEE 77	(2024; ERTA 1 2023) Recommended Practice on Static Electricity
IEEE 407	(2022; TIA 24-2) Standard for Aircraft Fuel Servicing
IEEE 780	(2023) Standard for the Installation of Lightning Protection Systems

D. SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS3275	(2009; Rev C) Sheet, Acrylonitrile Butadiene (NBR) Rubber and Non-Asbestos Fiber Fuel and Oil Resistant
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E. U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-130	(2007; Rev N; Change 1 2012) Identification Marking of U.S. Military Property
MIL-STD-161	(2005; Rev G; Notice 2010) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

F. UL SOLUTIONS (UL)

UL 842 (2015; Reprint Oct 2017) UL
Standard for Safety Valves for
Flammable Fluids

1.03 ADMINISTRATIVE REQUIREMENTS

Submit detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operation of the system components and systems. Provide the drawings as one package with the design analysis. Shop fabrication drawings must include type of material, configuration, thickness, and necessary details of construction of the steel tank and vault. Shop drawings must also show the steel grating and supports.

1.04 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

- A. Grounding and Bonding
- B. FRP Containment Sump
- C. Product Dispensing Unit
- D. Fuel Piping
- E. Piping Connections
- F. System Supplier
- G. Product Dispensing Unit

1.05 QUALITY ASSURANCE

Submit the following data for approval:

- i. Certification stating that the System Supplier has provided and installed at least five Programmable Logic Control (PLC)-based pump control systems in the last five years, for automatic cycling of pumps based upon varying dispensing demands, utilizing multiple pumps.

- ii. Certification that six systems have been successfully operated over the last three years and are currently in service.
- iii. Project names, locations, system description, and items provided at these installations. Include user point-of-contact and current telephone numbers.

A. Material and Equipment Qualifications

Provide materials and system components that are standard products of a manufacturer regularly engaged in the manufacturing of such products, that are of a similar material, design and workmanship. Materials and system components must have been in satisfactory commercial or industrial use for a minimum two years prior to bid opening. The two year period must include applications of the system components and materials under similar circumstances and of similar size. Materials and system components must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the two year period.

B. Nameplates

Attach nameplates to all specified system components, thermometers, gauges, and valves defined herein. List on each nameplate the manufacturer's name, address, component type or style, model or serial number, catalog number, capacity or size, and the system that is controlled. Construct plates of stainless steel. Install nameplates in prominent locations with nonferrous screws, nonferrous bolts, or permanent adhesive. Minimum size of nameplates must be 1 by 2-1/2 inches. Lettering must be the normal block style with a minimum 1/4-inch height. Accurately align all lettering on nameplates.

1.06 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect system components and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

PART 2 PRODUCTS

If gasoline is being handled, refer to 40 CFR Part 60

Subpart Kb and XX, 40 CFR Part 63 Subpart R, BBBBBB (6B), and CCCCCC (6C) for design, installation, and testing requirements.

2.01 MATERIALS

Materials of construction must be stainless steel, aluminum or nonferrous material except positive displacement meter case may be steel with electroless nickel plated internals coated to 3 mil thickness, or interior epoxy coating. No ferrous or zinc-coated material bronze, brass or other copper bearing alloys must be used in contact with the fuel. Do not install cast iron bodied valves or system components. Do not use aluminum valves.

A. Types of Fuel

Components to be ANSI Class 150 (275) psig at 100 degrees F) unless noted otherwise. Components to be suitable for outside, unsheltered location, and to function normally in ambient temperatures between 30 degrees F and 95 degrees F.

B. Composition of Materials

Materials in contact with the fuel must be noncorrosive. No zinc-coated metals, brass, bronze, iron, lead or lead alloys, copper or copper alloys, or other light metal alloys containing more than 4 percent copper must be used in contact with the fuel.

C. Gaskets

Gaskets must be in accordance with Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).

D. Bolts and Nuts

Bolts and nuts must be in accordance with Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).

E. Flanges

Flanges and flanged end system components must be in accordance with Section 33 52 40 FUEL SYSTEMS PIPING (NON-HYDRANT).

F. Nitrile Butadiene (Buna-N)

Provide Buna-N material that conforms to SAE AMS3275.

G. Acrylonitrile Butadiene Rubber (NBR)

Provide NBR material that conforms to SAE AMS3275.

2.02 SYSTEM COMPONENTS AND MATERIAL

A. General

All items of system components and material must be new and of the best quality used for the purpose in commercial practice and must be products of reputable manufacturers. Each major component of the system components must have the manufacturer's name, address and catalog number on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. The gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto must be fully enclosed or properly guarded. System Components, assemblies and parts must be marked for identification in accordance with MIL-STD-130 and MIL-STD-161. Pump and filter vessel numbers must be as indicated on the drawings. In addition, filter vessels must include element numbers and the date of the next element change. Identification tags made of brass, stainless steel, or engraved anodized aluminum, indicating valve number and normally open (NO) or normally closed (NC) must be installed on valves. Tags must be 1-3/8 inch minimum diameter, and marking must be stamped or engraved. Indentations must be black, for reading clarity. Tags must be attached to valves with No 12 AWG, copper wire, stainless or aluminum hanging wires, or chrome-plated beaded chain designed for that purpose.

B. System Supplier

Since the pump control system, including but not limited to pump control panel, transmitters, flow switches, fueling system pumps, all field instrumentation, and control valves with all hardware and software, is an integrated system it must be furnished by a single systems supplier regularly engaged in the supplying of these system components. System Supplier must be a company whose regular, normal, and primary business is representing manufacturers in the distribution and start-up of aviation fueling facilities, and have no

affiliation with the Contractor other than as a seller to the Contractor. Supplier must provide all system components and appurtenances regardless of manufacture, be a factory authorized certified representative, and be responsible to the Contractor for satisfactory operation of the entire system, and must oversee the installation of the system components. Substitutions of functions specified will not be acceptable. The Contractor and the System Supplier must be present at the system commissioning, and must coordinate and schedule the work during construction, testing, calibration, and acceptance of the system. The System Supplier must be on-site with their mechanical and control personnel to supervise and assist the Contractor during pre-commissioning check-out of the mechanical systems and control systems, initial fuel receipt, initial firing, hydrostatic testing, pigging, flushing, cleaning, system component tests, performance testing and all training for the owner's representatives. The System Supplier must be responsible to the Contractor for scheduling all Contractor, Sub-contractor, and manufacturer's service personnel during system start-up and final commissioning.

2.03 ELECTRICAL

Motors, manual or automatic motor control system components except where installed in motor control centers, and protective or signal devices required for the operation specified herein must be provided under this section in accordance with Section 26 27 29 MARINA ELECTRICAL WORK. Any wiring required for the operation specified herein, but not shown on the electrical plans, must be provided under this section in accordance with Section 26 27 29 MARINA ELECTRICAL WORK.

A. Grounding and Bonding

Ground and bond in accordance with NFPA 70, NFPA 77, NFPA 407, NFPA 780, API RP 540, API RP 2003, IEEE 142, and IEEE 1100. Provide jumpers to overcome the insulating effects of gaskets, paints, or nonmetallic components.

2.04 FRP CONTAINMENT SUMP

Sump must be constructed of fiberglass reinforced plastic (FRP) that is chemically compatible with the fuels to be handled. Do not connect sump in any way to the manway cover or concrete above. Cap the top of each containment

sump with a watertight access cover. Construct cover of the same material as the sump. Cover must have a minimum diameter of 22-inches. Cover must be easily removable through the manway above.

- 1) Rainfall drainage must not drain into a sump. Sump must be capable of withstanding underground burial loads to be encountered. Container must have a minimum 5 gal fuel storage capacity. Container must not contain any type of drain.
- 2) The sides of a containment sump must allow the penetration of carrier pipes, exterior containment pipes, conduits, and vapor pipes as required. Boot or seal penetrations in the containment sump sides to ensure that liquid will not escape from the sump in the event that the liquid level within the sump rises above the pipe penetration. Provide boots and seals that are chemically compatible with the fuel to be handled and that are water resistant to the influx of ground water. Boots and seals must be designed and installed to accommodate the anticipated amount of thermal expansion and contraction in the piping system.

2.05 FUELING SYSTEM COMPONENTS

A. Product Dispensing Unit

Cabinet: Unpainted 18 gauge stainless steel housing, Locking handle, Latch, and Hinged down door.

Equipment Base: Formed steel channel, reinforced.

Inlet Strainer: Cast Iron construction, located on suction side of pump, 40 mesh basket.

Pump: Blackmer positive displacement type, 50 PSI by-pass.

Motor: 3 HP 230 Volt, 60 Hz, 3 phase, class 1, division 1, group D, for hazardous location.

Motor Starter: Manual type with on/off switch, for hazardous location. Filter/Separator: Facet Int'l. VFCS-21-7 Fuel Gard.

Meter: 1-1/2 inch size, positive displacement type, non-ferrous construction, large numerical counter, totalizer, air eliminator and strainer GALLONS.

Hose Reel: Electric rewind, 115V AC, 50/60Hz, single phase motor, class 1, division 1, group D, non-ferrous swivel joint/internals.

Hose: 75 feet long hose certified for aviation fueling coupled male x male non-reusable couplings.

Nozzle: Overwing nozzle, rigid drop tube, 100 mesh strainer, swivel, grounding wire, non-ferrous construction.

Static Reel: 75 feet cable length, alligator clamp and spring rewind.

Piping: All aluminum with flange couplings to ease removal of pipe assembly.

Electrical: All wiring in rigid conduit in accordance with National Electric Code for hazardous location.

Finish: Base, equipment and piping finish painted air dry enamel, color white.

1) Emergency Shutoff Valve

Provide valve that conforms to UL 842. Valve must provide complete shutoff of a fuel line in the event a dispenser is dislocated or overturned due to a sudden impact. Valve must include a secondary poppet to limit spillage from the dispenser after a knockdown or during installation.

PART 3 EXECUTION

3.01 GENERAL

A. Installation

Install equipment and components in position, true to line, level and plumb, and measured from established benchmarks or reference points. Follow manufacturer's recommended practices for system components installation. Provide required clearances between equipment components, system components, apparatus, and accessories requiring normal servicing or maintenance to be accessible.

B. Anchoring

Anchor system components in place. Check alignment of anchor bolts before installing system components and clean-out associated sleeves. Do not cut bolts because of misalignment. Notify Contracting Officer of errors and obtain the Contracting Officer's acceptance before proceeding with corrections. Cut anchor bolts of excess length to the appropriate length without damage to threads. Where anchor bolts or like devices have not been installed, provide appropriate self-drilling type anchors for construction condition.

C. Grouting

System components which are anchored to a pad is to be grouted in place. Before setting system components in place and before placing grout, clean surfaces to be in contact with grout, including fasteners and sleeves. Remove standing water, debris, oil, rust, and coatings which impair bond. Clean contaminated concrete by grinding. Clean metal surfaces of mill scale and rust by hand or power tool methods. Provide necessary formwork for placing and retaining grout. Grout to be non-metallic, non-shrink, fluid precision grout of a hydraulic cementitious system with graded and processed silica aggregate, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents; free of aluminum powder agents, oxidizing agents and inorganic accelerators, including chlorides; proportioned, pre-mixed and packaged at factory with only the addition of water required at the project site. Grouting must be in accordance with ASTM C827/C827M. Perform all grouting in accordance with system components manufacturer's and grout manufacturer's published specifications and recommendations.

D. Leveling and Aligning

Level and align system components in accordance with respective manufacturer's published data. Do not use anchor bolt, jack-nuts or wedges to support, level or align system components. Install only flat shims for leveling system components. Place shims to fully support system components. Wedging is not permitted. Shims to be fabricated flat carbon steel units of surface configuration and area not less than system components bearing surface. Shims to provide for full system

components support. Shim to have smooth surfaces and edges, free from burrs and slivers. Flame or electrode cut edges not acceptable

E. Direct Drives

Alignment procedure follows:

1. Rotation Direction and Speed

Check and correct drive shaft rotation direction and speed.

2. End Play

Run drive shafts at operational speed. Determine whether axial end play exists. Run drive shaft at operational speed and mark drive shaft axial position when end play exists. Block drive shaft in operating position when aligning drive shaft with driven shaft.

3. Shaft Leveling and Radial Alignment

Pump alignment must be accomplished by the factory technician or a millwright trained in pump alignment, and with the use of dial gauges or laser alignment equipment.

4. Angular Alignment and End Clearance

Check angular alignment and end clearance by inserting a feeler gage at 4 points, 90 degrees apart around outer edges of coupling halves.

5. Final Recheck

Check adjustments with dial indicator after completing recheck. Align shafts within 0.001-inch tolerance, except as otherwise required by more stringent requirements of system components manufacturer.

F. Precautions

Special care must be taken to ensure that system components and materials are stored properly to prevent damage and maintain cleanliness, and that the completed system is free of rocks, sand, dirt, and foreign objects.

Take the following steps to insure these conditions.

1. System components brought to the site and not stored inside, must be stored on blocks or horses at least 18-inches above ground.
2. Visual inspection must be made of each piece of system components to ensure that it is clean prior to installation.
3. The open ends of system components must be closed when work with that piece of system components is not in progress.

3.02 POSTED OPERATING INSTRUCTIONS

For each designated system or system components item, provide instructions for guidance of operating and maintenance personnel. Following approval of content, prepare these instructions in a form and scale that will be readily legible when displayed in appropriate locations, to be designated by the Contracting Officer and meet the following requirements:

A. Each System

For each system, include diagrams of system components, piping, wiring and control. Define control sequences.

B. Each Item

For each system components item, include starting, adjustment, operation, lubrication, safety precautions and shut-down procedures. Identify procedures to be performed in event of system components failure. Provide other instructions recommended by the manufacturer.

C. Diagrams

Provide a professionally prepared isometric piping diagram of the fueling system apparatus. Diagram must be 36 by 54 inches and must be color coded to match PCP color diagrams. Diagram must show the entire facility and must include all system components and the operational sequences of all system components with equipment numbers displayed. Diagram must show all valves along with the valve numbers shown on the drawings and listed as normally open/closed. It must be wall mounted under

glass.

3.03 DEMONSTRATIONS

Conduct a training session for designated government personnel in the operation and maintenance procedures related to the system components/systems specified herein. Include pertinent safety operational procedures in the session as well as physical demonstrations of the routine maintenance operations. Furnish instructors who are familiar with the installation/system components/systems, both operational and practical theories, and associated routine maintenance procedures. The training session must consist of a total of 4 hours of normal working time and must start after the system is functionally completed, but prior to final system acceptance. Submit a letter, at least 14 working days prior to the proposed training date, scheduling a proposed date for conducting the on-site training.

End of Section

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTION

35 51 13.00 20 – CONCRETE FLOATING DOCK SYSTEM

PART 1 GENERAL

- 1.01 SECTION INCLUDES: This section applies to all requirements for the materials and installation of the concrete floating dock system as shown on the Contract Drawings and specified herein.

The floating dock system shall be designed and fabricated for use in a severe marine environment, intended for a 25-year design life. The floating dock must be constructed of precast concrete and must consist of either a single monolithic unit or multiple match-cast precast concrete modules connected by post-tensioning or bolted together to act as a single integral structural unit.

The Walkway and Finger Piers must be structurally connected as a single system. Do not rely on wales to structurally connect the float units.

- 1.02 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent applicable.

A. AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.2 1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete

ACI 304R (2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete

ACI 305R (2020) Guide to Hot Weather Concreting

ACI 306.1 (1990; R 2002) Standard Specification for Cold Weather Concreting

ACI 309R (2005) Guide for Consolidation of Concrete

- ACI 318 (2019; R 2022) Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19)
- B. AMERICAN WELDING SOCIETY (AWS)
- AWS D1.4/D1.4M (2018) Structural Welding Code - Reinforcing Steel
- C. AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
- AWPA C1 (2003) All Timber Products - Preservative
- AWPA C2 (2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes Treatment by Pressure Processes
- AWPA C18 (2003) Standard For Pressure Treated Material in Marine Construction
- AWPA C28 (2003) Standard for Preservative Treatment of Structural Glued Laminated Members and Lamination Before Gluing of Southern Pine, Coastal Douglas Fir, Hemfir and Western Hemlock by Pressure Processes
- AWPA C33 (2003) Standard for Preservative Treatment of Structural Composite Lumber by Pressure Processes
- AWPA P5 (2015) Standard for Waterborne Preservatives
- D. ASTM INTERNATIONAL (ASTM)
- ASTM A27/A27M (2020) Standard Specification for Steel
- ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel Castings, Carbon, for General Application

ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A123/A123M	(2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2023) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A615/A615M	(2024) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A767/A767M	(2024) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M	(2022) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A1064/A1064M	(2024) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C94/C94M	(2024d) Standard Specification for Ready-Mixed Concrete

ASTM C138/C138M	(2024a) Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C150/C150M	(2024) Standard Specification for Portland Cement
ASTM C173/C173M	(2024a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2024) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2024) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C272/C272M	(2018; R 2024) Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2024) Standard Specification for Chemical Admixtures for Concrete
ASTM C578	(2023) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C1077	(2024) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM D2000	(2018; R 2024) Standard Classification System for Rubber Products in Automotive Applications
ASTM D4020	(2011) Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials
ASTM D5456	(2017) Standard Specification for Evaluation of Structural Composite Lumber Products
ASTM F844	(2019; R 2024) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM G109	(2023) Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments E(2000)

E. PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(2021) Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 5th Edition
PCI MNL-120	(2021) PCI Design Handbook - Precast and Prestressed Concrete, 8th Edition

1.03 MODIFICATIONS TO REFERENCES

In the ACI publications, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer" and the "Architect/Engineer" shall be interpreted to mean the Contracting Officer.

1.04 SUBMITTALS

Government approval is required for all submittals.
Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES.

A. Manufacturer's Qualifications

Precast floats must be the product of a manufacturer specializing in the production of precast concrete floats with a minimum of 10 years experience in the manufacture of precast concrete floating dock system. Submit manufacturer's qualifications.

B. Drawings of Precast Floats

Submit shop drawings of precast floats in accordance with the requirements of this section.

C. Pile Guide Assemblies

Submit pile guide assembly shop drawings for approval prior to fabrication.

D. Anchorage and Lifting Inserts and Devices

Submit shop drawings and material certifications for all anchorage and lifting inserts and devices.

E. Floating Dock System Catalogs, Illustrations, And Brochures

F. Fender Elements

Submit product data, certificates, manufacturer's data, catalog cuts, and other relevant descriptive data for approval.

G. Design Calculations

Submit floating dock design calculations in accordance with the requirements stated within this section and SECTION 01 35 00 DESIGN REQUIREMENTS.

H. Concrete Mix Design

Submit copies of test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job

conditions. Obtain approval before concrete placement.

I. Performance Reports

Submit copies of performance reports indicating that the as-built system conforms to the performance criteria under dead load conditions at initial installation and one year later.

J. Quality Control Procedures

Submit quality control procedures established in accordance with PCI MNL-116 or equivalent requirements unless specified otherwise.

K. Testing Technician And Testing Agency

Submit qualification for concrete testing technician and testing agency as specified in this section.

L. Handling And Dock System Installation Instructions

Submit manufacturer's literature on handling and installation.

M. Manufacturer's Warranty

Submit manufacturer's warranty that the concrete floating dock system will be free of defects in materials, workmanship, design, or fabrication, and will meet the criteria specified for a period of three years. Such warranty must start upon final acceptance of the work or the date the government takes possession, whichever is earlier.

N. As-Driven Survey Verification

Submit an as-driven survey verification showing actual location, top elevation, and batter in both orthogonal directions of each pile. Show any deviation from the provided as-built survey that may affect the installation of the floating dock system.

1.05 MANUFACTURER'S EXPERIENCE

The work includes the provision of precast concrete floating dock herein referred to as precast floats, and all other items relating to the precast floating dock system.

1.06 DESIGN CRITERIA

The floating dock system is defined as the assembled precast floating units (floats) into a monolithic dock of the length shown on the Contract Drawings, including attached pile guides, cleats, fendering, and other attached or specified items and loadings. The floating dock must be constructed of precast concrete and must consist of either single monolithic units or multiple match-cast precast concrete modules connected by post tensioning or bolted together to act as a single integral structural unit.

The precast floats must be structural concrete floats with top deck, side walls, end walls, and intermediate walls reinforced with galvanized rebar and galvanized deformed wire. Additionally, corners and connection areas must have added reinforcement. The center of the precast floats must be constructed of closed-cell polystyrene foam. Concrete strength, thickness and steel reinforcement must be as specified by the precast floating dock system designer to achieve a 25-year design life.

1.07 PRECAST CONCRETE FLOAT DESIGN

ACI 318 and the PCI MNL-120. Design precast floats (including connections) for the design load conditions specified herein. Design precast floats for handling without cracking in accordance with the PCI MNL-120.

A. Dock Loading

Design floating dock system and its mooring connections to withstand and transmit all expected loads over its design life with regard to environmental conditions and including, but not limited to, vertical dead and live loads, horizontal forces due to environmental conditions acting on the float system and moored vessels, berthing impact from vessels, and stresses in float due to wave action as described in the following subsections. Design floating dock to withstand maximum shear, moment, and torsion stresses in accordance with allowable working stress design except for maximum wave height must be below yield stress levels.

1) Dead Load

Dead loads must consist of the floats, framing, wale, attachment steel, miscellaneous connection devices, and all other permanently attached equipment such as utilities, boxes, and mechanical, and electrical equipment as indicated in the contract drawings. Special floats must be designed to support the additional concentrated loads as imposed by transformers or other equipment, and concentrated loads for gangway.

2) Live Load

500-pound concentrated load anywhere, and a concentrated load corresponding with the uniform rating for the gangway (3,750 pound), and 50 psf uniformly distributed over entire floating deck plus gangway live load reaction force under the same uniform load.

3) Wind Pressure

As indicated on drawings.

Acting on the projected area of the pier and moored vessels, assuming full occupancy.

4) Minimum current pressure

3 knots

Acting on the projected area of the pier and moored vessels, assuming normal occupancy.

5) Berthing load

20 kip over 2 feet horizontal length.

6) Mooring load

Includes wind, current, and waves. The design must consider a transverse horizontal force of 250 plf applied at the deck level and acting along the entire length of the float.

7) Wave load

As determined from a 4 feet wave height, 3 second period.

B. Performance

- 1) Size precast float modules so that a single module is used to attain the indicated pier width. The use of more than one module connected side by side to attain dock width is unacceptable.
- 2) Freeboard under dead load only shall not be less than 16 inches nor exceed 24 inches. Precast floats must be designed to float level under dead load only. Maximum out of level tolerance for transverse and longitudinal slope is 1 in. per 10 ft. Freeboard under dead and live load shall not be less than 10 inches.
- 3) Design precast floats to support the additional concentrated loads as imposed by gangways, transformers, or other equipment. Modules with special loadings must have the same freeboard as standard modules without special loading, so that there will be no residual stresses or tilting when modules are interconnected.
- 4) Flotation units must be capable of supporting a 300 lb moving point load in any area on a module without causing excessive rolling or tilting of the dock. The dock must be capable of supporting a 400 lb point load at 1 ft from the offshore end of the dock and loose no more than 4 in of freeboard; and supporting a 300 lb point load applied to the corner of the offshore end of the pier and loose no more than 2 inches of freeboard differential per 3 ft of pier width between the offshore corners.
- 5) Precast floats must have PVC sleeves and pull boxes embedded as required for electrical and communications systems. Pull boxes must have a nominal 1-inch concrete bottom with a light brushed, slip resistant finish. All bolts and inserts for pull box lids must be 316 stainless steel. Pull box lids must be flush with the deck surface and rated for the pier deck loading. Sleeves must remain above water surface under dead load conditions and must be designed to facilitate installation, removal, and servicing of utilities. Pull boxes and access openings must be sized and located as indicated on the drawings.

C. PCI Quality Certifications

PCI MNL-116. At the precast manufacturer's option, in lieu of core samples, and ACI 318, full scale load tests may be performed. Perform on randomly selected precast floats, as directed by the Contracting Officer.

1) Product Quality Control

PCI MNL-116 for PCI enrolled plants. Where precast floats are manufactured by specialists in plants not currently enrolled in the PCI "Quality Control Program," provide a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory. Submit test results to the Contracting Officer.

1.08 DELIVERY AND STORAGE

Lift and support precast floats at the lifting and supporting points indicated on the shop drawings. Store precast floats off the ground. Separate stacked precast floats by battens across the full width of each bearing point. Protect from weather, marring, damage, and overload.

1.09 FACTORY INSPECTION

Precast floats must be inspected by the QC Representative prior to being transported to the job site. Provide 14 days notice prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the government's right to enforce contractual provisions after units are transported or erected.

1.10 QUALITY ASSURANCE

A. Manufacturer's Publications

Submit the following:

- 1) Floating dock system catalogs, illustrations, and brochures commonly published for distribution
- 2) Handling and Dock System Installation Instructions
- 3) Operation and Maintenance Data

B. Drawing Information

Submit drawings indicating complete information for the fabrication, handling, and erection of the floating dock system. Drawings shall not be reproductions of contract drawings. Design drawings of precast floats must be prepared and sealed by a registered professional engineer, and submitted for approval prior to fabrication. The drawings must indicate, as a minimum, the following information:

- 1) Floating dock system layout
- 2) Marking of floats for assembly
- 3) Connections between floats, and connections between floats and other construction
- 4) Location and anchorage of mooring fittings
- 5) Waler size and splice pattern
- 6) Guide pile assembly details
- 7) Reinforcing details
- 8) Material properties of all materials used
- 9) Lifting and assembly inserts and embedded items
- 10) Dimensions and surface finishes of each float
- 11) Erection sequence and handling requirements
- 12) All loads used in design (such as live, dead, wind, current, berthing, handling, and erection)
- 13) Bracing/shoring required
- 14) Fenders
- 15) Utility routing and connections for work of other trades

C. Design Calculations

Submit calculations reflecting design conforming to requirements of paragraph entitled "Floating Dock System Design Criteria" and Section 01 35 00 DESIGN REQUIREMENTS - STRUCTURAL CALCULATIONS AND DRAWINGS.

Provide design calculations demonstrating that the floating dock will achieve a minimum 25-year design service life. Calculations shall address durability and corrosion protection of all structural components, including, but not limited to, reinforcing steel, post tensioning tendons and anchorage components, embedded steel, and exposed metal support and connection elements.

Design calculations of precast floats and gangways (including connections) must be prepared and sealed by a

licensed professional engineer in the state of Washington and submitted for approval prior to fabrication.

The calculations must be clear, legible, and organized with continuous page numbers and a table of content. The calculation package must cover all design loading on the floating dock and appurtenances. Calculations also must include weight and submerged unit weights as applicable to demonstrate the assembled dock will meet the required freeboard and performance requirements.

In addition to member sizing calculations, submit calculations for the floating dock system which include:

- 1) Guide pile assembly and post-tensioned or bolted attachment points to ensure reactions must be appropriately and rationally distributed throughout the system.
- 2) Overall system loads under full occupancy, with consideration for shielding factors, and deflection of the system.

D. Concrete Mix Design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Include a complete list of materials including type; brand; source and amount of cement, pozzolan, and admixtures; applicable reference specifications; and past performance history. Submit all material testing including cement, aggregates and admixtures.

1) Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians.

Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 or Grade 2 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.

PART 2 PRODUCTS

2.01 CONTRACTOR-FURNISHED MIX DESIGN

ACI 211.2, using weight method. The minimum compressive strength of concrete at 28 days must be no less than 5,000 psi per ASTM C94/C94M. Mix must contain a corrosion inhibitor and air-entraining admixtures at the mixer to produce between 5 to 8 percent air by volume and must be tested in accordance with ASTM C138/C138M, ASTM C173/C173M, or ASTM C231/C231M. The use of foaming agents is prohibited.

2.02 PRECAST FLOAT MATERIALS

A. Cement

ASTM C150/C150M, Type I or Type II. Type III cement may be used if the Tri-Calcium Aluminate of the cement is certified by the manufacturer to be between five percent and eight percent, and alkali content (Na₂O) and (K₂O) is less than 0.6 percent. The water cement ratio must not exceed 0.45.

B. Water

Water must be fresh, clean, and potable.

C. Aggregates

1) Aggregates Selection

Course and fine aggregates must conform to ASTM C33. Obtain aggregates for exposed concrete surfaces from one source. Aggregates must not contain any substance which may be deleteriously reactive with the alkalies in the cement.

D. Grout

1) Nonshrink Grout

ASTM C1107/C1107M.

2) Cementitious Grout

Cementitious grout must be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water

based on placement method. Provide air entrainment for grout exposed to the weather.

E. Admixtures

1) Air-Entraining

ASTM C260/C260M.

2) Accelerating

ASTM C494/C494M, Type C or E.

3) Water Reducing

ASTM C494/C494M, Type A, E, or F.

4) Corrosion Inhibitor

ASTM G109 or ASTM C494, Type as recommended by dock designer, and ASTM C1582. Quantity as recommended by dock designer.

F. Reinforcement

1) Reinforcing Bars

ASTM A615/A615M, Grade 60 and must be galvanized in accordance with ASTM A767/A767M or ASTM A1094.

2) Welded Wire Fabric

ASTM A1064/A1064M. Provide flat sheets of welded wire fabric, rolled fabric is not acceptable. Maximum fabric grid is 2 in. x 2 in.

3) Post Tensioning System

Match-cast post tensioning system per floating dock manufacturer's recommendations. Provide corrosion protection for all post-tensioning components suitable for the marine environment and the required 25-year design life.

G. Metal Accessories

Provide ASTM A123/A123M or ASTM A153/A153M, hot-dipped galvanized.

1) Inserts

ASTM A47/A47M, Grade 32510 or 35018, or ASTM A27/A27M Grade U-60-30.

2) Structural Steel

ASTM A36/A36M.

3) Bolts

ASTM A307 and ASTM A36/A36M or as recommended by floating dock manufacture for float unit connections.

4) Nuts

ASTM A563.

5) Washers

ASTM F844 washers for ASTM A307 bolts.

6) Cleats

Cleats must be of the sizes (length over horns) as called for on the drawings, galvanized, cast steel. Cleat anchorage must consist of galvanized bolts. Number of cleats must be as shown on the Contract Drawings. Approximate spacing of cleats is shown on the Contract Drawings.

H. Foam Core

Closed cell, expanded polystyrene (EPS), ASTM C578. Foam core laminations must be glued with a low solvent glue. Core shall not be made from more than four laminated sections. Horizontal laminations in the upper 10 in are not permitted. Core must be strapped to prevent delamination during transportation and handling. Core shall not contain more than 10 percent reground EPS foam material. Reground foam pieces must not exceed 3/8 in diameter. Unit Weight: 0.70 - 3.00 pcf.

Water absorption (ASTM C272/C272M): 3 percent (by volume)

Dimensional tolerance: plus or minus 1/8 inch.

2.03 FABRICATION

Manufacturing facility must be designed to provide the proper environment and physical conditions necessary for float casting. The facility must provide adequate workspace, equipment, level casting surfaces, and protection from direct sunlight, wind, moisture, and freezing. Floats must be cast in an all weather environment that includes an enclosed casting building with heated casting beds for use when ambient temperatures are below 60 degrees.

A. Precast Floats

Precast floats must be cast monolithically, cold joints of any type are not acceptable. Modules must have a minimum deck and wall thickness of 2.5 inches. The bottom must be encased in concrete or alternate approved material that fully encases the concrete and will ensure the minimum 25 year service life. Precast float decks must be constructed to drain freely and there must be no floodable enclosed spaces.

B. Forms

Brace forms to prevent deformation. Forms must produce a smooth, dense surface. Chamfer exposed edges of floats 1/2 inch, unless otherwise indicated. Form dimensions must be within 1/8 inch dimensions indicated on shop drawings. When measured diagonally, floats more than 1/2 inch out of square shall be rejected.

C. Reinforcement Placement

ACI 318 for placement and splicing. Reinforcement may be preassembled before placement in forms. Use plastic chairs.

D. Concrete

1) Concrete Mixing

ASTM C94/C94M. Mixing operations must produce batch-to-batch uniformity of strength, consistency, and appearance.

2) Concrete Placing

ACI 304R, ACI 305R for hot weather concreting , ACI 306.1 for cold weather concreting, and ACI 309R, unless otherwise specified. Concrete must be vibrated internally and/or externally to assure a smooth, dense finish.

3) Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide wet curing procedures to keep the temperature of the concrete between 50 and 160 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts. In lieu of wet curing, a chemical curing compound may be used. Cure in accordance with the manufacturer's requirements prior to transporting, launching and assembly.

E. Surface Finish

Precast floats containing hairline cracks which are larger than 0.005 inches in width, must be repaired by epoxy injection or an approved penetrating epoxy provided it does not result in a slippery surface. Precast floats which contain cracks greater than 0.04 inches in width may be rejected by the Contracting Officer, prior to being repaired. Any precast float that is structurally impaired or contains honeycombed section deep enough to expose reinforcing shall be rejected.

1) Unformed Surfaces

Provide a steel troweled and broomed finish for dock deck surface. Slip resistant broomed deck finish shall be transverse to dock orientation. All deck edges must have a 3/8 inch tooled radius with a minimum 1 1/2 inch wide, smooth, hard steel finished face.

2) Formed Surfaces

PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes. Provide a standard grade surface finish for both exposed and unexposed areas.

F. Float Identification

All precast floats are to be clearly identified on one side and one end, between the bottom of the waler and the waterline. Identification must include name of manufacturer, date of manufacture, specific float type, and job number.

2.04 TIMBER AND WOOD PRODUCTS

All walers, if composed of timber, must be fabricated from parallel strand lumber (PSL) engineered structural beams. PSL structural beams must be in accordance with ASTM D5456. All other structural lumber must be No. 1 Southern Yellow Pine or dense number 1 Douglas fir.

A. Preservative Treatment

Treat wood to be used in contact with salt water or salt water splash in accordance with AWPA C2 (Material Subject to Marine Borer Exposure) with waterborne preservative AWPA P5, (ACA - Ammoniacal Copper Arsenate, ACZA - Ammoniacal Copper Zinc Arsenate, CCA - Chromated Copper Arsenate) to 0.6 pcf retention. For wood continuously immersed, treat in accordance with AWPA C1 and AWPA C18 as applicable, to 2.5 pcf retention. For glue laminated engineered structural beams treat in accordance with AWPA C28 and AWPA C33 as applicable.

2.05 PILE GUIDE ASSEMBLIES

Submit pile guide assembly shop drawings for approval prior to fabrication. Pile guide assemblies must be adjustable longitudinally and transversely and be constructed of structural steel conforming to ASTM A36/A36M. Ensure that dimensions of the pile guide assembly is adequate for the installed guide piles so as to provide proper clearance between the guide assemblies and other structures during tidal fluctuations. Pile guide assemblies must be fabricated to resist all loading applied to the floating dock including berthing and mooring loads. The guide pile assembly must be designed to resist a 10,000 lb horizontal load applied in any direction horizontally and 0 degrees vertically. Each pile guide assembly must include four pile guides. Pile guides must consist of a rubber element, provided to appropriately distribute loading, and a UHMW wear pad, both with a minimum contact area of 0.5 square feet. A

minimum clear wear material thickness of 1 inch must be provided between the outer UHMW wear surface and the nearest steel connecting element. Wear pads must be low friction, ultra high molecular weight polyethylene in accordance with ASTM D4020.

2.06 FENDER ELEMENTS

System must include D-fenders. D-fender system must be a continuous 12-inch hollow D-shaped cross section extruded rubber fendering attached along all exposed edges, corners and ends, which could be struck by a boat. Fendering must be an EPDM rubber compound, resistant to ozone and ultraviolet deterioration that will not mark the hull of the vessel. The rubber compound must conform to ASTM D2000 (3BA 620 A₁₄, B₁₃, C₁₂, EA₁₄, F₁₇, GA₁₄). A-611 Acceptance requirement is 250 ppi, minimum.

2.07 GUIDE PILES

Prior to floating dock installation, steel guide piles will be installed by others. A guide pile as-built survey will be provided upon request. It is the Contractor's responsibility to independently verify the as-built survey and provide any discrepancies, that may affect the installation of the floating dock system, to the attention of the Contracting Officer. A professional surveyor licensed in Washington must be used to verify the as-built survey.

Repair guide pile coating damage that results from floating dock installation by methods approved by the Contracting Officer.

2.08 GANGWAY

Reinstall existing gangway as shown on the Contract Drawings.

2.09 GANGWAY ACCESSORIES

Refer to the Referenced Drawings for Government Furnished Equipment (GFE) Gangway shop drawings.

A. Gangway Roller Guides

Roller guides must be fabricated from structural steel angles conforming to ASTM A36/A36M and galvanized in

accordance with ASTM A123/A123M. Fasten roller guides to top of floating dock with steel bolts. Install roller guides once gangway is in its final position and in the location shown on the Contract Drawings. Roller guides shall have no more than 1/2 inch clearance between the guide and the roller.

B. Gangway Roller Wear Plate

Roller wear plates must be mounted on the floating dock to form a riding surface for the rollers.

PART 3 EXECUTION

3.01 SURFACE REPAIR

Precast floats must be free of damage including, but not limited to cracking, spalling, and honeycombing. Precast floats that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" must be repaired, or removed and replaced with new precast floats.

3.02 LAUNCH AND ASSEMBLY

Launch precast floats after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Assemble in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Brace precast floats, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads.

3.03 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.

3.04 WELDING

AWS D1.4/D1.4M for welding connections and reinforcing splices.

Protect the concrete and other reinforcing from heat during welding. Weld continuously along the entire area of contact. Grind smooth visible welds in the finished

installation. Welding of epoxy-coated reinforcing is not allowed.

3.05 OPENINGS

Holes or cuts requiring reinforcing to be cut, which are not indicated on the approved shop drawing, shall only be made with the approval of the Contracting Officer and the precast manufacturer. Drill holes less than 12 inches in diameter with a diamond tipped core drill.

3.06 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanized surfaces damaged by handling, transporting, cutting, welding, bolting, or acid washing. Do not heat surfaces to which repair paint has been applied.

3.07 GROUTING

Clean and fill indicated areas, solidly with nonshrink grout or cementitious grout. Provide reinforcing where indicated. Remove excess grout before hardening.

3.08 FREEBOARD PERFORMANCE

Submit freeboard measurements reflecting that the as-built system conforms to the specifications under dead load conditions. Performance reports must be submitted upon completion of the initial installation. Submit copies of performance reports indicating that the as-built system conforms to the performance criteria under dead load conditions at initial installation and one year later.

Should freeboard adjustments be necessary after installation they must be accomplished with the use of supplemental flotation approved by the manufacturer. Supplemental flotation must be installed such that it will not affect the performance or the longevity of the dock system.

END OF SECTION