Willamette Water Supply
Our Reliable Water

April 1, 2024

Environmental Protection Agency
Water Infrastructure Division
Office of Wastewater Management
Attention: Sejal Soni
Portfolio Manager/WIFIA Program
via email

RE: Willamette Water Supply System, Tualatin Valley Water District (Loan #N18167OR) and City of Hillsboro, Oregon (Loan #N18105OR); American Iron and Steel Waiver Request for 4-6 Inch High Performance Couplings

Dear Ms. Soni:

On behalf of the Tualatin Valley Water District and City of Hillsboro, Oregon (Borrowers), this letter is submitted to request a project waiver pursuant to the "American Iron and Steel" requirements for the purchase and installation of twenty-five (25) 4-6-inch high performance couplings for use on the Water Treatment Plant project [WTP_1.0]. The WTP is a component project of the Willamette Water Supply System (WWSS) project located in Washington and Clackamas counties, Oregon. The WWSS project will establish a new, seismically-resilient water supply for the Project Partners and other communities.

As the projects are funded by Water Infrastructure Finance and Innovation Act (WIFIA) loans, the American Iron and Steel (AIS) requirements apply to the project. According to the AIS requirements, recipients may request and receive a waiver to the AIS requirement in certain circumstances. For this project, we hereby request a waiver on the basis that "Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality," which is condition number two as listed in the EPA's AIS guidance documents.

JUSTIFICATION OF USE: The WTP_1.0 project requires twenty-five (25) 4-6-inch high performance couplings, which will be installed at the water treatment plant located in Sherwood, Oregon. The high performance couplings will be used in all areas where we have 4-6-inch CU at the expansion joints coming out of the building.

The project requirements for the 4-6-inch high performance couplings include the following:

- Axial restraint coupling suitable for use with plain end steel, stainless steel, ductile iron, FRP, PVC/CPVC, PVC C900, concrete, and copper pipe

- Couplings that require special tools or disassembly to install on the pipe shall not be acceptable
- Pressure responsive seal
- Stab-fit design
- Rated for Post install deflection
- NSF61 Compliant

Materials:

- Casing: 316L stainless steel
- Bolts: 316L stainless steel
- Bars: 316L stainless steel
- Anchoring ring: 301 stainless steel
- Strip insert: 316L stainless steel
- Gasket: EPDM

NON-AVAILABILITY: The engineer of record for WTP_1.0 is CDM Smith. The engineering firm, general contractor, and WWSS program management staff evaluated and confirmed the non-availability of the domestic construction materials for which the waiver is sought. Previously it was found there was a Armor Seal product from Romac that appeared to meet all requirements, including AIS. However, after further discussions with Romac engineering it was found that not only were the couplings not AIS as previously indicated, but did not meet NSF61 or Post Install Deflection requirements.

Below is information for the manufacturer that was contacted (no other manufacturers were found for 4-6 inch high performance couplings). Their representative indicated that the company does not manufacture an AIS-compliant 4-6-inch high performance coupling.

MANUFACTURER/SUPPLIER INFORMATION		
Vendor Name	**Contact Person**	**Contact Information**
Straub	Lorena Vasquez	lorena@straubsales.com 619-991-5610
Romac	Derek Sorenson	425-951-6220

COST:Item Description	**Quantity**	**Unit of Measure**	**Unit Cost**	**Extended Cost**
High Performance Coupling:				
used in all areas where we have 4-6-inch CU at the expansion joints coming out of the building	25	each	$350	$8,750

SCHEDULE AND LEAD TIME:
The lead time is 60 days, with install scheduled for May 2024.

SIMILAR APPROVED WAIVER REQUESTS: EPA's AIS website (https://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement) indicates that AIS waiver requests have been

granted for high performance couplings that are substantially the same as this request. These waivers were for projects in:

- High Performance Couplings (https://www.epa.gov/system/files/documents/2023-10/waiver_decision_tvwd_couplings.pdf)

SUMMARY: Based on the information discussed herein, we are requesting that 4-6-inch high performance couplings as specified and proposed be allowed for this project:

- Straub Grip
- Straub Metal Grip

Please let us know of any questions or comments after reviewing this request. Thank you for your consideration in this matter.

Sincerely,

David Kraska

David Kraska, P.E.
WWSS Program Director

Enclosures:
WWSP Summary Construction Schedule
Specification Section 40 05 06 – *see section 2.13*
EPA response regarding de minimis eligibility

cc: Matt Gribbins
Kristina McLean
Doug Shermack

SECTION 23 11 13 - FACILITY FUEL-OIL PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fuel-oil transfer pumps system
2. Fuel-oil filtration and conditioning system.
3. Fuel-oil tank filling station.
4. Fuel-oil pipes, tubes, and fittings.
5. Double-containment piping and fittings.
6. Piping specialties.
7. Joining materials.
8. Specialty valves.
9. Mechanical leak-detection valves.
10. Leak detection and monitoring system.
11. Labels and identification.

B. Related Requirements:

1. Section 09 91 00 “Piping and Equipment Painting”
2. Section 23 13 23 “Facility Aboveground Fuel-Oil Storage Tanks”
3. Division 40 – Process Interconnections for instruments and requirements.
4. Section 26 32 13.13 “Diesel Standby Engine Generators”

1.2 DEFINITIONS

A. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

B. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

3. For valves, include pressure rating, capacity, settings, and electrical connection data of selected models.

B. Shop Drawings: For fuel-oil piping.

1. Include plans, elevations sections, hangers, and supports for multiple pipes.
2. Include details of location of anchors, alignment guides, and expansion joints and loops.
3. For fuel-oil piping indicated to comply with performance requirements and design criteria.
    a. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
    b. Detail fabrication and assembly of anchors and seismic restraints.
    c. Design Calculations: Calculate requirements for selecting seismic restraints.
    d. Detail fabrication and assembly of pipe anchors, hangers, supports for multiple pipes, and attachments of the same to building structure.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plans and details, drawn to scale, on which fuel-oil piping and equipment are shown and coordinated with other installations, using input from installers of the items involved.
2. Site Survey: Plans, drawn to scale, on which fuel-oil piping, equipment, and tanks are shown and coordinated with other services and utilities.

B. Welding certificates.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-oil equipment and accessories to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.9 WARRANTY

A. Manufacturer agrees to repair or replace components of fuel oil transfer system and fuel oil filtration and conditioning system and related equipment that fail in materials or workmanship within specified warranty period.

1. Failures due to defective materials or workmanship for materials including piping, pumps, valves, controllers, enclosures, fittings, sensors, and other accessories.
2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.

C. Fuel-Oil Valves: Comply with UL 842 and have service mark initials "WOG" permanently marked on valve body.

D. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of fuel-oil piping.

2.2 PERFORMANCE REQUIREMENTS

A. Maximum Operating-Pressure Ratings: 50-psig fuel-oil supply pressure.

B. Engage a qualified professional engineer, licensed in the State of Oregon, to design restraints and anchors and multiple pipes supports and hangers for fuel-oil piping.

2.3 AUTOMATIC FUEL OIL TRANSFER PUMPS SYSTEM

A. Acceptable manufacturers: Simplex Inc., Preferred Utilities or equal

B. General System Description and Requirements:

1. Provide factory assembled, packaged self-contained, automatic fuel oil transfer and monitoring system to ensure a reliable supply of fuel oil to the emergency generators with all components factory piped and mounted inside weatherproof enclosure with spill containment.
2. The system shall include:

    a. Automatic duplex lead/ lag pump set.
    b. Storage tank and day tank level monitoring.
    c. Leak detection and monitoring.
    d. LCD operator display
    e. Time and date stamped alarm and event summary.

3. The system shall be network compatible with other elements of fuel supply system and include the capability to simultaneously communicate to a Supervisory Control and Data Acquisition system (SCADA), Building Automation System (BAS) or Building Management System (BMS) via Modbus protocol, Ethernet TCP/IP, or BACnet IP protocol.
4. The system shall be the standard product of a single manufacturer. Custom, job-fabricated products shall not be acceptable.
5. The self-contained system shall consist of the following principal elements:

    a. Duplex pumps.
    b. Valves, gauges, and sensors.
    c. Controller and control panel.
    d. Pad mountable enclosure, suitable for outdoor installation.

C. Pump Set Control Cabinet:

1. The pump set and control cabinet shall be completely factory pre-wired and tested to ensure reliability. The pump set and control cabinet shall be the product of one manufacturer for single source responsibility. Provide a factory assembled NEMA 4X enclosure with all operator interface control switches, indicators and displays physically separated from any field terminations.

2. The control cabinet shall be manufactured and labeled in accordance with UL 508.

D. Controller: The fuel oil transfer pumps system controller shall be PLC-based digital controller equipped with a color touchscreen Operating Interface Terminal (OIT) for pump status, storage tank level indication, alarm listing, and troubleshooting functions. The following indications, alarms, pushbuttons, and control switches shall be provided as minimum:

1. Lead pump selection – auto/manual
2. Pump status – off/ run/ standby
3. Day tank status – normal/ high/ low/ leak
4. Main tank status – normal/ high/ low/ leak
5. System Enclosure “Leak Detection” Alarm
6. Three most recent alarms

The touchscreens shall be capable to communicate to an external controller, building automation system, or energy management system via Modbus, Ethernet TCP/IP, or BACnet IP protocol.

E. Alarms: The control system shall record and annunciate the following alarms: pump thermal overload, pump loss of flow, pump set failure, day tank leak, day tank high level and day tank low level. The control system shall record the following events: pump started, pump control switch in "off" position, pump set prime test OK, and pump selected as lead.

F. Fuel Pump Alternation and Lead-Lag Operation:

1. Provide automatic, microprocessor-based day tank level control. The lead fuel pump shall be energized when day tank fuel level falls below 50%. The lead pump shall continue to operate until the day tank level is greater than 80%. Upon the next call for fuel, the lead pump shall be automatically alternated.
2. The control system shall automatically energize the lag pump upon detecting a low-level condition (40% full condition). Both pumps shall then continue to operate until the level of fuel reaches the high-level point (90% full condition).
3. Upon detection of loss of flow or lead pump thermal overload, the control system shall automatically energize the lag pump and de-energize the lead pump.

G. Automatic Pump Prime and Suction Line Integrity Check:

1. The control system shall include a real-time clock and shall be capable of automatically energizing the lead pump once every day. This is to verify suction piping integrity and pump prime and verify pump operation.
2. Once the lead pump has proven satisfactory operation, the lag pump shall be energized and run through the same test.
3. These tests shall be recorded in the controller memory with a time/ date stamp for later verification.
4. If either lead or lag pump fails any of these tests, the control system shall generate an audible and visual alarm and log the "failed pump" condition.

H. Main Storage Tank Monitoring:

1. The control system shall include main storage tank level sensor and discriminating leak sensor monitoring. Provide a continuous display of tank content, in both gallons and inches of product, within the main storage tank.
2. Tank alarm displays shall not interfere with the display of the tank content. Provide data recall of the instantaneous display of tank content at the time of leak alarm condition.
3. The control system shall include an overfill alarm circuit test pushbutton to provide instantaneous proving of audible and visual alarm circuitry associated with instrument overfill alarm contact.

I. Pumps, Valves, Piping and Mounting:

1. Provide a duplex pump set that is factory assembled with components piped and mounted inside NEMA4X containment enclosure with plugged drain connection. The containment enclosure shall be sized to contain (capture) potential leaks from all factory installed piping and components. Pipe shall be schedule 40 ASTM A-53 Grade "A" with ANSI B16.3 Class 150 malleable iron threaded fittings.

2. Transfer Pumps: Transfer pumps shall be factory assembled, positive displacement gear pump type, cast iron housing with mechanical shaft seal. High vacuum, prime maintenance and lift performance. Motor shall be AC dire-drive, TEFC construction, continuous duty performance. Pumps that have aluminum, brass, or bronze housings or rotors are not acceptable. Packing gland equipped pumps, close-coupled pumps, carbonator shaft mounted pumps or centrifugal pumps are not acceptable.
3. Pump isolation valves: Provide and install one valve on the suction and discharge side of each pump. Isolation valves shall allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type valves to provide full flow while open and positive shutoff when closed.
4. Check valves: Provide and install on the discharge side of each pump
5. Oil Strainers: Provide and install simplex strainers with 40 mesh baskets on the suction side of each pump.
6. Relief Valves: Provide and install relief valves sized to relieve the full outlet flow of the pump without causing the pump motor to overload or any component's pressure rating to be exceeded if the discharge is inadvertently valved off. Relief valves shall be externally mounted from the pumps and piped to the return line in the field according to NFPA 30. Pump internal relief valves shall not be accepted.
7. Containment Enclosure Leak Detection Switch: Provide, install, and wire a float operated containment basin leak detection switch to shut off the pump and energize an audible and visual alarm should a leak be detected. The level sensor shall be a plasma welded stainless steel construction. Electrical connections shall be contained in a NEMA 4X junction box

J. Pump Automatic Sequencing Flow Switch

1. Provide a time delayed flow sensing switch on the discharge of the pump set to energize the lag pump should the lead pump fail to maintain flow. Flow switch shall be vane operated to actuate a single double throw snap switch. Switch shall be factory wired to the control cabinet for alarm and backup pump operation. Switch shall be rated for 250 PSIG. Provide a flow switch outlet isolation valve for maintaining the flow switch without draining the fuel system

K. Enclosure: Provide the filtration system with factory packaged pad-mountable enclosure suitable for outdoor installation:

1. Welded construction.
2. NEMA 4X
3. Hinged and lockable service access doors, with rain gutters.
4. Leak containment basin integral to enclosure floor, including leak detector.
5. Lifting eyes.
6. Forklift channels.
7. Bolt-down feet.

2.4 AUTOMATIC FUEL OIL FILTRATION AND CONDITIOING SYSTEM

A. Acceptable manufacturers: Simplex Inc., Preferred Utilities or equal.

B. General System Description and Requirements:

1. Provide factory assembled, packaged self-contained, automatic fuel oil filtering and conditioning system to maintain quality of fuel oil held in extended storage with components factory piped and mounted inside an enclosure with spill containment.
2. The system shall include transfer pump, leak monitoring, LCD operator display, time and date stamped alarm and event summary.
3. The system shall be network compatible with other elements of fuel supply system and include the capability to simultaneously communicate to a Supervisory Control and Data Acquisition system (SCADA), Building Automation System (BAS) or Building Management System (BMS) via Modbus protocol, Ethernet TCP/IP, or BACnet IP protocol.
4. The system shall be the standard product of a single manufacturer. Custom, job-fabricated products shall not be acceptable.
5. The self-contained system shall consist of the following principal elements:

    a. Transfer pump.
    b. Three stage filtration and water removal elements.
    c. Valves, gauges, and sensors.
    d. Controller
    e. Pad mountable enclosure, suitable for outdoor installation.

C. Pump Set Control Cabinet:

1. The pump set and control cabinet shall be completely factory pre-wired and tested to ensure reliability. The pump set and control cabinet shall be the product of one manufacturer for single source responsibility. Provide a factory assembled NEMA 4X enclosure with all operator interface control switches, indicators and displays physically separated from any field terminations.

2. The control cabinet shall be manufactured and labeled in accordance with UL 508.

D. Controller: The fuel filtration and conditioning system shall include UL 508 listed, NEMA 4X enclosed, digital controller with the following features:

1. PLC-based digital controller.
2. Capable to communicate to an external controller, building automation system, or energy management system via Modbus, Ethernet TCP/IP, or BACnet IP protocol
3. Equipped with a color touchscreen Operating Interface Terminal (OIT) for pump status, alarm listing, and troubleshooting functions
4. Time of day, day of week, interval programming timing.
5. Analog to digital inputs for:

    a. Pressure differential across strainer.
    b. Pressure differential across filters.
    c. Pressure differential across coalescer.

6. Point sensing inputs for:

    a. Fuel Flow
    b. Leak sensing
    c. Coalescer water detection

7. Display of the following data:

    a. Pressure differentials across strainer, filters and coalescer.
    b. Filtration history.
    c. No fuel flow alarm.
    d. Leak alarm.
    e. Water in Coalescer alarm.
    f. Service strainer alarm.
    g. Service pre-filter alarm.
    h. Service coalescer alarm.

8. User programmable for:

    a. Filtration cycle.
    b. Delivery history.
    c. Fuel quality history.

9. System Hand-Off-Auto switch.
10. Alarm reset pushbutton.

E. Alarms: The control system shall record and annunciate the following alarms: pump thermal overload, pump loss of flow, pump failure, and leak detection.

F. Pump, Filtration, Valves, Piping and Mounting:

1. Provide self-contained fuel oil filtration and conditioning system that is factory assembled with components piped and mounted inside containment enclosure with plugged drain connection. The containment enclosure shall be sized to contain (capture) potential leaks from all factory installed piping and components. Pipe shall be schedule 40 ASTM A-53 Grade “A” with ANSI B16.3 Class 150 malleable iron threaded fittings.

2. Transfer Pump: Transfer pump shall be factory assembled, positive displacement gear pump, cast iron housing with mechanical shaft seal. High vacuum, prime maintenance and lift performance. Motor shall be AC dire-drive, TEFC construction, continuous duty performance. Pumps that have aluminum, brass, or bronze housings or rotors are not acceptable. Packing gland equipped pumps, close-coupled pumps, carbonator shaft mounted pumps or centrifugal pumps are not acceptable.

3. Valves: Provide and install one valve on the suction and discharge side of each pump. Isolation valves shall allow off-line pump maintenance without system loss of availability. Isolation valves shall be ball type valves to provide full flow while open and positive shutoff when closed.

4. Check valves: Provide and install on the discharge side of each pump

5. Filtration Devices: Provide and install filter elements to provide filtration for particulate and water removal. Three stages of fuel oil dewatering and cleaning shall be provided:

    a. Inlet Strainer: Removal of large particulates. Install simplex basket type strainer on the suction side of the pump. 100-mesh, stainless steel screen, cleanable basket,

cast-iron strainer body with NPT screw thread connection. Equipped with pressure differential switch.

b. Pre-Filter: Particulate filtration to 10 microns. Disposable micro-glass media, spin-on type. Equipped with pressure differential sensors and gauge.
c. Final Filter: particulate filtration to 2 microns. Disposable media, canister type construction. Equipped with pressure differential sensors and gauge.
d. Water Separation: Water coalescer and separator, semi-permanent, canister type construction. Equipped with pressure differential sensors and gauge

6. Relief Valves: Provide and install relief valves sized to relieve the full outlet flow of the pump without causing the pump motor to overload or any component's pressure rating to be exceeded if the discharge is inadvertently valved off. Relief valves shall be externally mounted from the pumps and piped to the return line in the field according to NFPA 30. Pump internal relief valves shall not be accepted.

7. Containment Enclosure Leak Detection Switch: Provide, install, and wire a float operated containment basin leak detection switch to shut off the pump and energize an audible and visual alarm should a leak be detected. The level sensor shall be a plasma welded stainless steel construction. Electrical connections shall be contained in a NEMA 4X junction box.

G. Pump performance:

1. Filtration Rate: 8 hours nominal filtration cycle once per week.
2. Pump flow: 1200 gallons-per-hour at 50 psi.
3. Power Requirements: 115 Volts/1 Phase/60 HZ

H. Fuel Filtration and Conditioning System Operation: The fuel oil filtration and conditioning system shall have an adjustable automatic start and run time. The operator shall be able to set the system to run at a certain time every day or week.

I. Filters Monitoring: Each Filter shall have a differential pressure switch piped across it to indicate when the filter needs to be changed. The switch shall provide indication on the main filtration control cabinet to alert operators and sound a horn. The differential pressure switch shall provide clear indication of strainer basket status with the use of a Tri-Colored Scale Plate with GREEN denoting Clean, YELLOW denoting Change and RED denoting dirty strainer.

J. Automatic Pump Safety Integrity Check Test: The Control system shall include a battery backed, real time clock and shall be capable of automatically energizing the filtration pump once every day with a test. This is to verify filtration suction piping integrity, pump prime, and verify pump operation. Once the pump has been operated and proved operational, the test shall be recorded in the controller memory with a Time/Date stamp for later verification. If the pump fails the test, the control system shall generate an audible and visual alarm and log the "Failed Pump" condition.

K. Enclosure: Provide the filtration system with factory packaged pad-mountable enclosure suitable for outdoor installation:

1. Welded construction.
2. NEMA 4X
3. Hinged and lockable service access doors, with rain gutters.
4. Leak containment basin integral to enclosure floor, including leak detector.

5. Lifting eyes.
6. Forklift channels.
7. Bolt-down feet.

2.5 AUTOMATIC FUEL OIL FILLING STATION

A. Acceptable manufacturers: Simplex Inc., Preferred Utilities or equal.

B. General System Description and Requirements:

1. Provide factory assembled, packaged self-contained, automatic fuel oil filling station for control and filling operation to aboveground fuel storage tanks that are filled from a bumper truck with components factory piped and mounted inside an enclosure with spill containment.
2. The system shall include overfill prevention, automatic fill shutoff, leak monitoring, and controller with LCD operator display.
3. The control cabinet shall be manufactured and labeled in accordance with UL 508.

C. Fuel filling station shall be free standing, tank mountable with lockable full weatherproof NEMA 4X enclosure and spill containment seven gallons sump.

D. Fuel filling station shall include:

1. Quick disconnect hose coupling with duct plug for fuel delivery truck connection.
2. Check valve.
3. Electrically operated shut-off valve.
4. Hand pump (1 gallons-per-minute capacity) for spill containment with shut-off and check valve.
5. Ground stud.
6. Controller includes:

a. Level transmitter.
b. Digital level indicator scaled in percent level.
c. Tank full visual alarm.
d. High level visual alarm.
e. Tank leak alarm.
f. Audible alarm horn activated by alarms above.
g. Powe available indicator.
h. Control power on-off switch.
i. Valve open-close pushbutton.
j. NEMA 4X enclosure.

2.6 FUEL-OIL PIPING TRANSITION SUMP

A. Acceptable manufacturers: Flexworks by OPW Fueling Containment Systems model PST-4630 or approved equal.

B. Material: Polyethylene containment sump with fiberglass top. Adjustable to a minimum of 26-inches.

C. Inspection hatch: FRP, minimum 27-inch diameter.

D. Provide with manufacturer standard double pipe entry boot fittings and fuel-oil leak detection sensor.

E. See Process Mechanical drawings for fuel-oil piping transition sumps locations.

2.7 FUEL-OIL PIPES, TUBES, AND FITTINGS

A. See "Outdoor Piping Installation" articles for where pipes, tubes, fittings, and joining materials are applied in various services.

B. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M, for butt and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: Asbestos free, ASME B16.20 metallic, or ASME B16.21 nonmetallic, gaskets compatible with fuel oil.
    e. Bolts and Nuts: ASME B18.2.1, cadmium-plated steel.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.8 DOUBLE-CONTAINMENT PIPE AND FITTINGS

A. Flexible, Metallic, Double-Containment Piping: Comply with UL 971A.

1. Pipe Materials:

    a. Metallic Lining: ASTM A 240/ASTM A 240M Type 316 corrugated stainless steel tubing.
    b. Carrier Pipe: Fluoropolymer tube.
    c. Jacket: UV stabilized.

2. Watertight sump entry boots, pipe adapters with test ports and tubes, coaxial fittings, and couplings.
3. Minimum Operating Pressure Rating: 50 psig.
4. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

5. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

B. Rigid, Double-Containment Piping: Comply with UL 971.

1. RTRP: ASTM D 2996 or ASTM D 2997 carrier and containment piping and mechanical couplings to seal carrier and containment piping or individually bonded joints.

a. Minimum Operating-Pressure Rating for RTRP NPS 2 and NPS 3: 150 psig.
b. Minimum Operating-Pressure Rating for RTRP NPS 4 and NPS 6: 125 psig. Compliance with UL 971 is not required for NPS 6 and larger piping.
c. Fittings: RTRF complying with ASTM D 2996 or ASTM D 2997 and made by RTRP manufacturer; watertight sump entry boots, termination, or other end fittings.

2. Leak-Detection System: Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

2.9 PIPING SPECIALTIES

A. Metallic Flexible Connectors:

1. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.
2. Stainless-steel bellows with woven, flexible, stainless-steel, wire-reinforcing protective jacket.
3. Minimum Operating Pressure: 150 psig.
4. End Connections: Socket, flanged, or threaded end to match connected piping.
5. Maximum Length: 30 inches.
6. Swivel end, 50-psig maximum operating pressure.
7. Factory-furnished anode for connection to cathodic protection.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

2.10 JOINING MATERIALS

A. Joint Compound and Tape for Threaded Joints: Suitable for fuel oil.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Bonding Adhesive for RTRP and RTRF: As recommended by piping and fitting manufacturer.

2.11 SPECIALTY VALVES

A. Pressure Relief Valves:

1. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
2. Body: Brass, bronze, or cast steel.
3. Springs: Stainless steel, interchangeable.
4. Seat and Seal: Nitrile rubber.
5. Orifice: Stainless steel, interchangeable.
6. Factory-Applied Finish: Baked enamel.
7. Maximum Inlet Pressure: 150 psig.
8. Relief Pressure Setting: 60 psig.

B. Emergency Shutoff Valves:

1. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
2. Single poppet valve.
3. Body: ASTM A 126, cast iron.
4. Disk: FPM.
5. Poppet Spring: Stainless steel.
6. Stem: Plated brass.
7. O-Ring: FPM.
8. Packing Nut: PTFE-coated brass.
9. Fusible link to close valve at 165 deg F.
10. Thermal relief to vent line pressure buildup due to fire.
11. Air test port.
12. Maximum Operating Pressure: 0.5 psig.

2.12 MECHANICAL LEAK-DETECTION VALVES

A. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.

B. Body: ASTM A 126, cast iron.

C. O-Rings: Elastomeric compatible with fuel oil.

D. Piston and Stem Seals: PTFE.

E. Stem and Spring: Stainless steel.

F. Piston Cylinder: Burnished brass.

G. Indicated Leak Rate: Maximum 3 gph at 10 psig.

H. Leak Indication: Reduced flow.

2.13 LEAK-DETECTION AND MONITORING SYSTEM

A. Cable and Sensor System: Comply with UL 1238.

1. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil piping.
2. Include fittings and devices required for testing.

2.14 LABELS AND IDENTIFICATION

A. Detectable Warning Tape: Acid- and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of fuel-oil piping.

B. Examine installation of fuel-burning equipment and fuel-handling and storage equipment to verify actual locations of piping connections before installing fuel-oil piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Comply with requirements in Section 31 23 00 "Earthwork" for excavating, trenching, and backfilling.

3.3 PREPARATION

A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.

B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.4 OUTDOOR PIPING INSTALLATION

A. Install Underground Fuel-Oil Piping Buried:

1. Under Compacted Backfill: 18 inches below finished grade.
2. Under Asphalt 2 Inches Thick: 8 inches below bottom of asphalt.
3. Under 4 Inches of Reinforced Concrete in Areas Subject to Vehicle Traffic: 4 inches below bottom of concrete.
4. Comply with requirements in Section 31 23 00 "Earthwork" for excavating, trenching, and backfilling.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining, to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer. Review protective coating damage with Owner's Representative prior to repair.
3. Replace pipe having damaged PE coating with new pipe.

C. Install double-containment, fuel-oil pipe at a minimum slope of 1 percent downward toward fuel-oil storage tank sump.

D. Install vent pipe at a minimum slope of 2 percent downward toward fuel-oil storage tank sump.

E. Assemble and install entry boots for pipe penetrations through sump sidewalls for liquid-tight joints.

F. Install metal pipes and tubes, fittings, valves, and flexible connectors at piping connections to AST and UST.

G. Install fittings for changes in direction in rigid pipe.

H. Install system components with pressure rating equal to or greater than system operating pressure.

3.5 VALVE INSTALLATION

A. Install manual fuel-oil shutoff valves on branch connections to fuel-oil appliance.

B. Install valves in accessible locations.

C. Install oil safety valves at inlet of each oil-fired appliance.

D. Install pressure relief valves in distribution piping between the supply and return lines.

E. Install one-piece, bronze ball valve with hose end connection at low points in fuel-oil piping.

F. Install manual air vents at high points in fuel-oil piping.

G. Install emergency shutoff valves at dispensers.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Bevel plain ends of steel pipe.
2. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Fiberglass-Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.7 HANGER AND SUPPORT INSTALLATION

A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1-1/4 and Smaller: Maximum span, 5 feet; minimum rod size, 3/8 inch.
2. NPS 1-1/2 and larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

B. Support vertical steel pipe at spacing not greater than 15 feet.

3.8 LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION

A. Install leak-detection and monitoring system.

B. Double-Containment, Fuel-Oil Piping: Install leak-detection sensor probes at low points in piping and cable probes in interstitial space of double-containment piping.

3.9 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance.

B. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

C. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

D. Connect piping to equipment with shutoff valve and union. Install union between valve and equipment.

3.10 LABELING AND IDENTIFYING

A. Nameplates, pipe identification, and valve tags are specified in Section 40 05 53 “Piping and Equipment Identification”.

B. Install detectable warning tape directly above fuel-oil piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs. Terminate tracer wire in an accessible area and identify as "tracer wire" for future use with plastic-laminate sign.

1. Piping: Over underground fuel-oil distribution piping.

3.11 FIELD QUALITY CONTROL

A. Pressure Test Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system:

1. Fuel-Oil Distribution Piping: Minimum 7 psig for minimum 30 minutes.
2. Fuel-Oil, Double-Containment Piping:

    a. Carrier Pipe: Minimum 7 psig for minimum 30 minutes.
    b. Containment Conduit: Minimum 7 psig for minimum 60 minutes.

3. Suction Piping: Minimum 20-in. Hg for minimum 30 minutes.
4. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig.

B. Inspect and test fuel-oil piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.

C. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Bleed air from fuel-oil piping using manual air vents.

F. Fuel-oil piping and equipment shall be considered defective if it does not pass tests and inspections.

G. Pump sets shall be fully tested at factory prior to shipment. Testing shall include both a pressure and vacuum testing period:

1. The complete pump set shall be pressure tested to rated pressure using an air pressure source. The test shall confirm that the pump set piping system can maintain rated pressure for four hours.

2. Next, the complete pump set shall be brought to a vacuum greater than 25 inch Hg. The test shall confirm that the pump set piping system can maintain vacuum for four hours.
3. Following a pressure and vacuum test the pump set shall be given a full operational test. The pump set shall be connected to a fuel oil supply and return. The pump set shall be operated normally. Motor amps shall be noted at no load and full load for each motor. The motor amps shall be within 10% of rated motor amps. During the test the relief valve shall be set and tested.
4. Operation of pump set instrumentation shall be tested. A copy of the test procedures shall be sent to the Owner's Representative. The Owner's Representative, at their discretion, shall observe this and all other tests.
5. A Manufacturer's Certificate of Source Testing (see Section 01 75 17), together with a copy of the wiring and arrangement diagrams shall be placed in the control cabinet prior to shipment.

H. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Underground and Aboveground Fuel-Oil Piping: flexible, double-containment piping. Size indicated is carrier-pipe size.

B. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.13 SHUTOFF VALVE SCHEDULE

A. Valves for aboveground distribution piping NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

B. Distribution piping valves for pipe NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze, nonlubricated plug valve.

C. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION 23 11 13