

SECTION 23 10 00
FACILITY FUEL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 RELATED WORK

- A. Concrete ballast foundations and concrete pads: Section 03 30 00, CAST-IN-PLACE CONCRETE.

1.3 DESCRIPTION

- A. E85 fuel tank with remote dispenser, piping, and accessories located outside, aboveground as shown on contract drawings. Refer to contract drawings for type of fuel and for tank capacities.
- B. Tank fluid level monitoring and alarm systems.
- C. Leak detection system for tank.

1.4 SUMMARY

- A. This Section includes E85 storage tank and fuel system accessories to serve vehicle fueling installation. Products include the following:
 - 1. Steel pipe and fittings - Aboveground piping.
 - 2. Pipe specialties and valves.
 - 3. Aboveground fuel storage tank E85 Ethanol.
 - 4. Submersible Turbine Pump.
 - 5. Overfill Alarm System.
 - 6. Fuel Port.
 - 7. E85 Fuel.
- B. Related Sections include the following:
 - 1. Section 23 10 01 "Fleet Management System" for fuel management, interstitial monitoring and level control for aboveground fuel storage tank.

1.5 QUALITY ASSURANCE

- A. Minimum Working-Pressure Rating: Unless otherwise indicated, minimum pressure requirement for E85 fuel piping is 150 psig.
- B. Approval by Contracting Officer is required of products or services of proposed manufacturers, suppliers and installers, and will be based on Contractor's certification that:

1. Manufacturers regularly and currently manufacture tanks, tank and piping accessories, tank fluid level monitoring and leak detection systems, fuel quality management systems.
 2. Manufacturers of steel tanks participate in the Quality Assurance Program of the Steel Tank Institute (STI).
 3. The design and size of each item of equipment provided for this project is of current production and has been in satisfactory operation on at least three installations for approximately three years. Current models of fluid level and leak detection systems with less than three years service experience are acceptable if similar previous models from the same manufacturer have at least three years service experience.
- C. Apply and install materials, equipment and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract drawings and specifications shall be referred to the COR (RE)/Contracting Officers Technical Representative (COR) for resolution. Provide copies of installation instructions to the RE/COR two weeks prior to commencing installation of any item.
- D. All equipment shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components or overall assembly.
- E. Tanks, Fuel Dispensing, Tank Interstitial and Level Monitoring Systems, Leak Detection Systems, Fuel Quality Management Systems: Authorized manufacturers representatives shall provide on-site training of installers and supervision of the installation and testing of the equipment and systems to assure conformance to written instructions of manufacturers.
- F. Tank and piping installation contractor shall be certified as acceptable by local and state pollution control authorities.
- G. Entire installation shall conform to requirements of local and state pollution control authorities.
- H. Pipe Welding: Conform to requirements of ASME B31.1. Welders shall show evidence of qualification. Welders shall utilize a stamp to identify their work. Unqualified personnel will be rejected.
- I. Where specified codes or standards conflict, consult the RE/COR.
- J. Label of Conformance (definition): Labels of accredited testing laboratories showing conformance to the standards specified.

- K. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a safe, complete and fully operational system which conforms to contract requirements and in which no item is subject to conditions beyond its design capabilities.

1.6 SUBMITTALS

- A. In accordance with Section 23 10 00 - Contractor Submittals, submit product data for the following:
1. Specialty valves and pipe specialties
 2. Fuel maintenance system. Include rated capacities, operating characteristics, furnished specialties, accessories, pressure ratings, dimensions, and written description of controls.
 3. Wiring Diagrams: Power, signal, and control wiring.
 4. Shop Drawings detailing fabrication and installation of fuel storage tanks and accessories. Detail equipment assemblies and indication dimensions, weights, loading, required clearances, method of field assembly, components, and location and size of each field connection.
- B. Operation and Maintenance Data: For fuel transfer equipment to include in operation and maintenance manuals. Specified in Division 1
- C. Seismic Qualification Certificates: For ASTs, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 4. Seismic anchorage and certification.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Protection of Equipment:
1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.

2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the RE/COR. Such repair or replacement shall be at no additional cost to the Government.
 3. Protect new equipment and piping systems against entry of foreign matter on the inside. Clean both inside and outside before painting or placing equipment in operation.
 4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
 5. Protect plastic piping and tanks from ultraviolet light (sunlight).
- B. Cleanliness of Equipment and Piping:
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 2. Piping systems shall be flushed, blown or pigged as necessary to provide clean systems.
 3. Clean interior of all tanks prior to delivery for beneficial use by the Government.
 4. Contractor shall be fully responsible for all costs, damages and delay arising from failure to provide clean systems and equipment.

1.7 APPLICABLE PUBLICATIONS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with ASME B31.9, "Building Services Piping," for fuel oil piping materials, installation, testing, and inspecting.
- C. Comply with NFPA 30, "Flammable and Combustible Liquids Code," and NFPA 31, "Installation of Oil Burning Equipment," for fuel oil piping materials, components, installations, testing, and inspecting.
- D. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
 1. Federal Specifications (Fed. Spec.):
 2. A-A-60005 Frames, Covers, Grating, Steps, Sump and Catch Basin, Manhole
 3. CASTM International (ASTM):
 4. A36/A36M-08 Carbon Structural Steel

5. A53/A53M-10 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
6. A106/A106M-10 Seamless Carbon Steel Pipe for High Temperature Service
7. A126-04(R2009) Gray Iron Castings for Valves, Flanges and Pipe Fittings
8. A234/A234M-10 Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
9. B62-09 Composition Bronze or Ounce Metal Castings
- E. American Society of Mechanical Engineers (ASME):
 1. B16.5-09 Pipe Flanges and Flanged Fittings (NPS ½-24).
 2. B16.11-09 Forged Fittings, Socket-Welding and Threaded
 3. B31.1-10 Code for Pressure Piping, Power Piping with Current Amendments
- F. National Electrical Manufacturers Association (NEMA):
 1. 250-08 Enclosures for Electrical Equipment (1000 Volts Maximum)
 2. F. National Fire Protection Association (NFPA):
 3. 30-12 Flammable and Combustible Liquids Code
 4. 31-11 Installation of Oil Burning Equipment
 5. 70-11 National Electrical Code
- G. Underwriters Laboratories Inc. (UL):
 1. 142-10 Steel Aboveground Tanks for Flammable and Combustible Liquids
 2. 2085-10 Protected Above-ground Tanks for Flammable and Combustible Liquids
- H. Steel Tank Institute (STI):
 1. F001 Standard for Fire Resistant Tanks
 2. F911 Standard for Diked Aboveground Storage Tank System
 3. F941 Standard for Fireguard Thermally Insulated Aboveground Storage Tanks
- I. NACE International (Corrosion Engineers) (NACE):
 1. NACE 3/SSPC-SP6-07 Commercial Blast Cleaning
 2. NACE 4/SSPC-SP7-07 Brush-off Blast Cleaning
 3. J. American Petroleum Institute (API):

1.8 PERMITS

- A. Contractor shall obtain and complete all tank permit and registration forms required by governmental authorities.

1.9 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 30 00.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel storage tanks and flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

- a. Failures include, but are not limited to, the following when used for storage of E85 fuel at temperatures not exceeding **150 deg F** :

- 1) Structural failures including cracking, breakup, and collapse.
- 2) Corrosion failure including external and internal corrosion of steel tanks.

- b. Warranty Period: **30** years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 ABOVEGROUND PIPING MATERIALS

- A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M. Retain one of first three subparagraphs below.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
4. Gasket Material: Thickness, material, and type suitable for E85 Fuel.

- B. Transition Fittings: Type, material, and end connections to match piping being joined.

- C. Pipe Connectors: UL 567, swivel or compression type for connection to equipment.
- D. Y-Pattern Strainers: Minimum 125 psig working pressure; cast-iron body (ASTM A 126, Class B), threaded connections, perforated stainless-steel basket, and bottom drain connection.
- E. Flexible Connectors: UL listed for E85 fuel systems; stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150 psig minimum working pressure and 250 deg F maximum operating temperature.

2.3 SPECIALTY VALVES

- A. Gate and Check Valves, NPS 2 and Smaller: Class 125, bronze body, valves suitable for fuel oil service, with "WOG" indicated on body.
 - 1. Gate valves shall have solid wedge.
 - 2. Swing check valves shall have bronze disc.
 - 3. Lift check valves shall be vertical pattern; two-piece construction with bronze disc.
- B. Ball Valves: UL 842; metal-body ball valve with threaded ends according to ASME B1.20.1 for pipe threads and as specified in Section 15204 - Ball Valves.
 - 1. Available Manufacturers:
 - a. Conbraco Industries, Inc.; Apollo Div.
 - b. Jomar International Ltd.
 - c. KITZ Corporation.
 - d. McCANNA, Inc.; Flowserve Corporation.
 - e. NIBCO INC.
 - f. Watts Industries, Inc.; Water Products Div.
- C. Safety Valves: UL listed for E85 fuel service. Include metal body; broken-line, oil shutoff feature; and 40 psig minimum pressure rating.
 - 1. Available Manufacturers:
 - a. Suntec Industries, Inc.
 - b. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.
- D. Drain Valves: Bronze ball valves, complying with MSS SP-110 and having outlet connection according to ASME B1.20.7 for garden-hose thread with cap.

2.4 ABOVEGROUND FUEL STORAGE TANK (E85 ETHANOL FUEL)

- A. General Description: The Aboveground steel tank shall be designed for aboveground storage of flammable and combustible liquids at atmospheric

pressure. Tank shall include integral steel secondary containment and thermal insulation that provides a minimum two hour fire rating.

- B. Tank shall be delivered as a complete UL listed assembly with two factory supplied, welded on saddles. Saddles shall be set level on a solid foundation. Aboveground steel tank shall comply with the latest edition of NFPA 30 Flammable and Combustible Liquids Code. Tank shall be supplied with emergency vents for the primary and the secondary containment tanks.
- C. Inner and outer tank shall be manufactured in accordance with UL 142 standard for Steel Aboveground Tanks for Flammable and Combustible Liquids. Entire tank shall be labeled for UL 2085 Standard for Insulated Secondary Containment Aboveground Tank for Flammable Liquids. The tank design shall comply with UL 2085 Protected Tank standard and shall be tested for Ballistics, Impact, Hose Stream and Pool Fire UL 2085 performance standards.
- D. The aboveground steel tank shall meet or exceed the requirements of:
 - 1. 2010 Oregon Fire Code.
 - 2. 2010 Oregon Building Code.
 - 3. National Fire Protection Association NFPA 30.
- E. The aboveground tank shall be fabricated per UL 142 of mild carbon steel with shell seams of continuous lap weld construction.
- F. The aboveground tank shall be of double wall construction and provide complete secondary containment of the primary storage tank contents by an impervious steel outer wall.
- G. Provide a minimum of 3" of porous, lightweight monolithic thermal insulation material shall be installed at the factory within the interstitial space between the inner and outer wall of tank. Thermal insulating material shall be in accordance with ASTM C-332 and C495, shall allow liquid to migrate through it to the monitoring point and shall not be exposed to weathering and shall be protected by the steel secondary containment outer steel wall.
- H. Provide lifting lugs at balancing points to facilitate handling and installation.
- I. Provide exterior protective coating - Surface Preparation: Grit blast SSPC-SP-6 White Blast and Finish: White finish paint system 5-7 DFT on the shell and tank heads.
- J. Provide threaded fittings with thread protectors as follows- interstitial monitoring, normal primary tank vent, emergency primary

tank vent, emergency secondary tank vent, product fill, product pump or supply, liquid level gauge and one 18" manway with emergency vent. Opening sizes are to be coordinated with fuel management system accessories and fuel dispensing system.

- K. All openings shall be from the top only per UL.
- L. All exposed metal must be powder coated to inhibit corrosion.
- M. The protected and insulated AST system shall have a coated steel exterior to resist weather and reflect sunlight.
- N. Tank accessory-Provide remote tank mounted fuel port for filling and spill prevention for aboveground fuel storage tank, similar to Simplex "FuelPort". Fill box shall be weatherproof, lockable box with 7 gallon spill containment capacity. Box and parts shall be compatible to use with fuel oil, gasoline, automotive products and certain chemicals. Provide mounting brackets, quick disconnect hose coupling with dust plug, check valve, shut off valve and grounding stud. Spill containment shall have a hand pump with shut off valve and check valve.
- O. The protected and insulated AST system shall have a warranty of 30 years.
- P. The protected and insulated AST system shall have two bolts for connecting grounding conductors for lightning protection in accordance with NFPA 780.

2.5 E85 FUEL AST ACCESSORIES

- A. Tank Manholes: 18-inch- minimum diameter; bolted, flanged, and gasketed; centered on top of tank with emergency vent.
- B. Threaded pipe connection fittings on top of tank, for fill, supply, vents, sounding, and gauging. Include cast-iron plugs for shipping.
- C. Striker Plates: Provide 300 mm (12 inch) square, 6 mm (0.25 inch) thick steel plates welded to tank bottom directly under the sounding opening, the fuel vent, gage and the fill discharge.
- D. Lifting Lugs: For handling and installation.
- E. Ladders: Carbon-steel ladder outside tank, anchored to top and side wall.
 - 1. Cage: Include welded steel cage around ladders for tanks 20 feet high or higher.
- F. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.
- G. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6 inches above tank bottom and cut at a 45-degree angle.

2.6 E85 FUEL STORAGE TANK PIPING SPECIALTIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EBW, Inc.
 2. Environ Products, Inc.
 3. Morrison Bros. Co.
 4. OPW.
 5. Preferred Utilities Manufacturing Corporation.
- B. Fitting Materials: Cast iron, malleable iron, brass, or corrosion-resistant metal; suitable for fuel-oil service.
1. Aboveground-Mounted Fittings: Weatherproof.
- C. Supply and Sounding Drop Tubes: E85 Fuel supply piping or fitting, inside tank, terminating 6 inches above bottom of tank, and with end cut at a 45-degree angle.
- D. Pipe Adapters and Extensions: Compatible with piping and fittings.
- E. Suction Strainers and Check Valves: Bronze or corrosion-resistant metal components.
- F. Foot Valves and Antisiphon Valves: Poppet-type, bronze or corrosion-resistant metal components.
- G. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.
- H. Metal Manholes: **18-inch-** minimum diameter frame and cover. Furnish manhole units of adequate size for access to fittings if size is not indicated.
- I. Monitoring Well Caps: Locking pipe plug and manhole.

2.7 SUBMERSIBLE TURBINE PUMP

- A. The Contractor shall furnish and install a fuel pump in E85 fuel tanks.
- B. The submersible turbine pump shall be designed and manufactured to be compatible with 100% Ethanol and Methanol. The pump assembly shall meet the standards of UL 79.
- C. The pump shall be of submersible centrifugal type installed through 4" threaded tank opening.
- D. Pump shall be multi-stage, self-lubricating and easily removed from storage tank without disconnecting discharge piping, mechanical or electronic leak detectors or siphon systems. The pump and motor

assembly shall be readily separable from the pump column pipe to allow for simple field replacement of the pump and motor.

- E. Impellers shall be splined to the pump shaft to provide positive, non-slip rotation. Diffusers shall be tightly secured to prevent rotation.
- F. Pump intake inlet shall be horizontal to prevent drawing sediment from the tank bottom into the pump inlet. The intake inlet shall be compatible with the particulate "Trapper" to prevent particulate from being ingested into the motor.
- G. Manifold Head assembly shall consist of a manifold and extractable packer assembly and shall be completely sealed against product leakage into the ground and exterior water leakage into the storage tank. The discharge outlet shall be 2" NPT opening. The manifold shall have a built-in air purge screw, line check valve, pressure relief valve, and shall support dual vacuum sensor siphon systems. The extractable packer shall incorporate industrial die springs to break loose the o-ring seals when the flange nuts holding the extractable packer in place are removed. The extractable packer assembly shall incorporate a lifting eye.
- H. The electrical disconnect shall be an integral part of the manifold assembly. The electrical disconnect shall automatically disconnect and sever electrical connection to the pump motor.
- I. The check valve shall incorporate a "Lock-n-Lift" feature that mechanically locks the check valve and lifts to provide a larger path to depressurize the line and manifold head assembly.
- J. The vacuum sensor siphon system shall be capable of drawing 25" of mercury vacuum through a venturi. The vacuum sensor siphon shall incorporate a one-piece rubber check valve to maintain the siphon system vacuum after the pump has been turned off. Check valves shall be incorporated on the siphon inlet and fuel source inlet to the venturi. The inlet shall incorporate a screen that reduces clogs and failures that can cause false alarms on vacuum monitor systems. The vacuum sensor siphon system shall incorporate a swivel top for easy connection to siphon tubing. The vacuum sensor siphon system shall be designed to integrate with Veeder-Root Vacuum Sensors. The Manifold Head Assembly shall support dual vacuum sensor siphon systems for vacuum monitoring or siphon manifold applications. Unused vacuum siphon ports shall be sealed with a plug designed specifically for that purpose.

- K. The motor shall be permanent split capacitor type continuous duty, rated explosion proof in Class 1, Group D, petroleum products. The motor windings shall be hermetically sealed against leakage of product or moisture, and shall have a thermal overload device with automatic reset built into the motor windings for motor cut-off when motor temperature reaches a level which may cause damage to the motor.
- L. The pump assembly shall be rated for operation between -40°F (-40°C) and 105°F (40.5°C) in non-gelling petroleum products. . The pump assembly shall be listed under UL 79 for operation between -20°F (-4°C) and 125°F (51°C) ambient environment.

2.8 OVERFILL ALARM SYSTEM

- A. General Description: Overfill alarming system complete with weatherproof enclosure and float switches housing circuitry to alarm channels for monitoring up to four independent sensing points.

2.9 FUEL PORT

- A. General Description: Filling and spill prevention for aboveground fuel storage tanks. Fuel Port Cabinet includes shut off and check valves and quick disconnect hose coupling with dust plug fittings necessary for hose connection from a pumper truck to an aboveground storage tank, packaged with a lockable weatherproof spill containment box. Filling box is suitable for use with E85 fuel, fuel oil, gasoline and automotive products.
- B. Spill Containment - 7 gallons.

2.10 E85 FUEL

- A. E85 Fuel: ASTM D5798-11

2.11 LABELING, SIGNAGE AND IDENTIFYING

- A. Signage: Provide Signage per Oregon Motor Vehicle Fuel Storage and Dispensing Guidelines.
 - 1. **Warning Signs** - Warning signs shall be conspicuously posted within sight of each dispenser in the fuel-dispensing area and shall state the following:
 - a. No smoking
 - b. Shut off motor
 - c. Discharge your static electricity before fueling by touching a metal surface away from the nozzle
 - d. To prevent static charge, do not reenter your vehicle while gasoline is pumping
 - e. If a fire starts, do not remove nozzle - use emergency shut off

2. An approved emergency procedure sign, in addition to other required signs, shall be posted in a conspicuous location and shall read:

IN CASE OF FIRE, SPILL OR RELEASE

1) USE EMERGENCY PUMP SHUT OFF

2) REPORT THE ACCIDENT!

FIRE DEPARTMENT TELEPHONE NO. xxxxxxxxxx

FACILITY ADDRESS xxxxxxxxxxxxxx

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. 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 Architect prior to repair.
3. Replace pipe having damaged PE coating with new pipe.

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

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

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

3.2 E85 FUEL AST INSTALLATION

A. Install tank bases and supports. Anchor to concrete foundations. Provide molded neoprene isolation pads between the steel supports and the concrete foundation.

B. Connect piping and vent fittings.

C. Install electrical grounding in accordance with NFPA 70..

D. Install tank leak-detection and monitoring devices.

E. Install insulated steel ASTs according to STI R942.

F. Fill storage tanks with E85 fuel.

3.3 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Connect piping to equipment with oil ball valve and union. Install union between valve and equipment.

C. Ground equipment according to Division 26.

D. Connect wiring according to Division 26.

3.4 FIELD QUALITY CONTROL

A. Test E85 fuel piping in accordance with NFPA 31.

B. Remake leaking joints and connections using new materials.

3.5 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.6 COMMISSIONING

A. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Before activating system perform these steps:

1. Open valves to full open position. Close bypass valves.
2. Remove and clean strainer screens.
3. Check pump for proper direction of rotation.
4. Check dispenser for proper operation.

C. Testing: Leak testing of the primary tank shall be in accordance with the UL 142. Results of the testing shall be documented.

1. Test and adjust fuel management and leak monitoring systems controls and devices. Replace damaged and malfunctioning controls and devices.
2. Submit reports of test and procedure in writing to the Engineer.

D. Inspection: Inspection and field tests shall be performed in accordance with API 620 and the manufacturer's instructions.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain liquid-level gage systems, leak-detection and monitoring systems.

3.8 OUTDOOR PIPING SCHEDULE

A. Aboveground fuel-oil piping shall be one of the following:

1. NPS 2 and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
2. NPS 2-1/2 and Larger: Steel pipe, steel welding fittings, and welded joints.

3.9 ABOVEGROUND MANUAL E85 FUEL SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe 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.

3.10 FUEL

- A. Provide 5,000 gallons of E85 fuel for aboveground fuel storage tank.

3.11 Painting

- A. Contractor shall touch up all scratches and chips caused by installation. Painting shall meet manufactures factory color and specifications.

3.12 PERSONNEL TRAINING

- A. Train Owners maintenance personnel on procedure and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance. Provide **eight (8)** hours of training.
- B. Representatives of equipment suppliers for the leak monitoring system shall provide necessary training and technical support to the Owner so that the Owner may properly operate and maintain the systems.

- - - E N D - - -