SECTION 23 11 13 – fuel oil piping systems

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
			2. summary
				1. Perform all Work required to provide and install fuel oil piping systems.
			3. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

ANSI B31.1 ‑ Power Piping.

ANSI B31.4 ‑ Liquid Petroleum Transportation Piping Systems.

ANSI B31.9 ‑ Building Service Piping.

API 2000 ‑ Venting Atmospheric and Low Pressure Storage Tanks.

ASME Section 9 ‑ Welding and Brazing Qualifications.

ASME B16.3 ‑ Malleable Iron Threaded Fittings.

ASME B36.10 ‑ Welded and Seamless Wrought Steel Pipe.

ASTM A53 ‑ Pipe, Steel, Black and Hot‑Dipped Zinc Coated, Welded and Seamless.

ASTM A234 ‑ Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

ASTM D2310 ‑ Machine‑Made Reinforced Thermosetting Resin Pipe.

ASTM D2996 ‑ Filament‑Wound Reinforced Thermosetting Resin Pipe.

ASTM D4021 ‑ Glass‑Fiber‑Reinforced Polyester Underground Petroleum Storage Tanks.

NFPA 30 ‑ Flammable and Combustible Liquids Code.

NFPA 31 ‑ Installation of Oil Burning Equipment.

UL 1316 ‑ Glass‑Fiber‑Reinforced Plastic Underground Tanks for Petroleum Products.

TNRCC, Chapter 334 - Underground and Aboveground Storage Tanks.

Conform to applicable EPA, State of Texas and Local Regulations for installation of fuel oil systems.

* + - 1. QUALITY ASSURANCE
				1. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum three (3) years documented experience.
				2. Installer: Company specializing in performing the work of this Section with minimum three (3) years documented experience.
				3. Valves: Manufacturer’s name and pressure rating marked on valve body.
				4. Welding Materials and Procedures: Conform to ASME Code.
				5. Welders Certification: In accordance with ASME Section 9.
				6. Maintain one copy of each document at the Project Site.
			2. SUBMITTALS
				1. Product Data:

Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

* + - * 1. Record Documents:

Record actual location of piping system, storage tanks and system components.

Shop Drawings: Indicate tanks, system layout, pipe sizes, location and elevations. For fuel oil tanks, indicate dimensions and accessories including manholes and hold down straps.

* + - * 1. Operation and Maintenance Data:

Include installation instructions, spare parts lists, exploded assembly views.

* + - 1. DELIVERY, STORAGE and HANDLING
				1. Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.
				2. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
			2. FUEL OIL AND TANK VENT PIPING, BURIED
				1. FRP: ASTM D2310 and ASTM D2996, UL listed filament wound fiberglass reinforced epoxy pipe with integral epoxy liner and exterior coating.

Fittings: Compression molded, filament wound fiberglass reinforced epoxy.

Joints: Tapered bell and spigot adhesive bonded.

* + - 1. FUEL OIL AND TANK VENT PIPING, ABOVE GROUND
				1. Steel Pipe: ASTM A53 or ASME B36.10, Schedule 40 black.

Fittings: ASTM B16.3, black malleable iron, Class 150 (300 lb. WOG), threaded.

Joints: NFPA 30, threaded ANSI B31.4.

Thread Sealant: Make up all threaded connections utilizing "Gasoila Soft Set" manufactured by Federal Process Company, Cleveland, Ohio.

* + - * 1. **Press-pipe type piping systems are expressly prohibited for fuel oil piping.**
			1. FUEL OIL PIPING (DS AND DR), BELOW GRADE
				1. Provide R.T. (Red Thread) II double-wall secondary containment piping of fiberglass reinforced epoxy piping and fittings with UL label as manufactured by A.O. Smith Inland, Inc.

Fiberglass pipe and fittings shall be joined together with A.O. Smith Adhesive Kit No. DS‑7014.

Primary and secondary piping shall be of the same specified material. The secondary piping shall be minimum one pipe size larger than primary piping.

Secondary containment piping shall be joined with two-piece fittings assembled with standard bolts, nuts and flat washers along with A.O. Smith Inland adhesive.

* + - 1. FLANGES, UNIONS and COUPLINGS
				1. Pipe Size 3 Inches and Under:

Ferrous pipe: Class 300 all malleable iron threaded unions.

Thread Sealant: Same as specified for fuel oil piping above ground.

* + - 1. BALL VALVES
				1. Manufacturers:

Stockham Model S-216-BR-R-T.

Other acceptable manufacturers offering equivalent products.

Apollo Model 70-100.

Nibco Model T-580-BR-R-70.

* + - * 1. Bronze two-piece body, chrome plated brass or bronze ball, Teflon seats and stuffing box ring, lever handle, threaded ends.
				2. Thread Sealant: Same as specified for fuel oil piping above ground.
			1. CHECK VALVES
				1. Provide spring-loaded check valve as an integral part of the turbine fuel pump.
			2. RELIEF VALVES
				1. Provide overpressure relief valve as an integral part of the turbine fuel pump.
			3. STRAINERS
				1. Manufacturers:

McAlear Model 531S.

Other acceptable manufacturers offering equivalent products.

Mueller.

* + - * 1. Threaded cast steel for 1480 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
				2. Thread Sealant: Same as specified for fuel oil piping above ground.
			1. UNDERGROUND FUEL STORAGE TANKS
				1. Manufacturers:

Fluid Containment Model DWT - Type II.

Other acceptable manufacturers offering equivalent products.

Xerxes.

* + - * 1. Capacity:

Volume gallons.

Diameter: feet.

Overall Length: feet.

* + - * 1. Tank: ASTM D4021, UL 1316, UL listed and labeled, closed double wall type, reinforced glass fiber polyester, capable of underground liquid storage with specific gravity of 1:1 and temperatures up to 150 degrees F (65 degrees C), anchor straps and attachments, fittings, lifting lugs and tappings for accessories.
				2. Tank Fittings: Provide 7 each, 4 inch NPT primary tank fittings; 1 each, 22 inch manways; 2 each, tank monitoring fittings, and others as detailed.
				3. Filler Cap: 4-inch watertight brass as detailed.
				4. Manhole: 22-inch diameter manhole at top of tank with cover and gasket, and turbine enclosure and cover.
				5. Turbine Enclosure: 42 inch diameter x 72 inch with 23 inch diameter top.
				6. Gauge: Remote reading, electronic, for two wire, 24 volt power, with wall mounted direct reading gauge.
				7. Leak Detector System: Tanks shall have an integrally-mounted reservoir installed for hydrostatic monitoring, and shall be capable of detecting a breach in the inner and/or outer tank. All monitoring equipment, including FRP reservoirs and electronic control, shall be UL listed. The system shall be installed complete as detailed by Fluid Containment tank data, including #DF reservoir sensor, #CCS containment collar sensor and #TGMS-02 inventory gauge control panel.
				8. Provide Fluid Containment #TGMP tank gauge probe assemblies, compatible with diesel fuel, as required to monitor fuel level.
				9. Inventory Gauge Control Panel:

Provide Fluid Containment #TGMS-02 control panel, UL listed, with NEMA 1 enclosure, 8 circuit including minimum 4 remote relay contacts, alarm lights and alphanumeric LCD display, 120 VAC input.

Utilize this panel for combining all tank gauges, alarms and monitoring sensors.

Provide 98 db local alarm bell with alarm silence button.

Provide interconnecting wiring and compatible sensors to assure a complete and operating system.

* + - 1. FUEL STORAGE DAY TANKS
				1. Day tanks shall be provided as a part of the emergency generator skid.
			2. FUEL OIL PUMPS (DP-1 AND DP-2)
1. Manufacturers:

FE Petro Model DI STPH150.

Other acceptable manufacturers offering equivalent products.

Red Jacket.

* + - * 1. Performance:

Flow: 20 gallons per minute, at 132 feet head.

Motor: 1.5 horsepower, 460 volt, three phase, 60 Hz.

* + - * 1. Turbine pump with submersible impeller.
				2. Impeller: Celcon copolymer.
			1. TRANSFER SYSTEM
				1. System: Interconnect fuel pumps (DP-1 and DP-2) with emergency generators to automatically energize transfer pumps when generators start. This in turn will fill day tanks from main storage tank. The pumps shall automatically stop when generators stop.

Alarm: Provide flow switch and timer which shall sound audible alarm if pump DP-1 and/or DP-2 fails to start/stop within one minute after generator starts/stops, respectively.

Alarm Reports: Provide low fuel, high fuel, high water and product loss monitor reports.

Control Panel: Provide a control panel in a NEMA 4 enclosure, complete with fused disconnect switches, magnetic starters with overload and low voltage protection, Hand-On Automatic selector switches, an electric alternator, reset buttons, running lights and alarm bell with alarm silencing switch.

Provide and wire to accessible terminal strip the following dry contacts for remote monitoring by the building automation system (BAS): One set of contacts to activate when control panel alarms and one set of contacts to activate when fuel flow is present. BAS Provider shall connect to the building automation system and alarm as directed.

1. EXECUTION
	* + 1. PREPARATION
				1. Verify that excavations are excavated to required grade, are dry, and not over-excavated.
				2. Ream pipe and tube ends. Remove burrs.
				3. Remove scale and dirt, on inside and outside, before assembly.
				4. Prepare piping connections to equipment with threaded unions.
			2. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. All installation shall be in accordance with manufacturer’s published recommendations.
				3. Piping Installation:

Use compatible sealant when assembling all threaded joints and fittings.

Route piping in orderly manner and maintain gradient.

Install piping to conserve building space and not interfere with use of space.

Group piping whenever practical at common elevations.

Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

Provide clearance for access to valves and fittings.

Provide access where valves and fittings are not exposed.

Prepare pipe, fittings, supports and accessories not prefinished, ready for finish painting.

Identify piping systems including underground piping.

Install valves with stems upright or horizontal, not inverted.

Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

Slope underground fuel supply and vent piping back to storage tank.

Secondary containment pipe shall be positioned over product pipe prior to bonding the product piping. After testing the product pipe, the containment fittings shall be assembled. The containment system shall then be tested.

* + - * 1. Fuel Tank Installation:

Clean and flush underground tanks prior to delivery to the Project Site. Seal until pipe connections are made.

Install underground tanks on concrete ballast pad with mass equal to tank capacity and secure with hold down straps and turnbuckles.

Backfill glass fiber tanks with washed pea gravel per manufacturer's instructions. Do not bed on timbers, beams or cradles.

Provide piping connections to tanks with unions and swing joints. Provide venting to API 2000.

Extend fill line and cover to grade and provide minimum 24 x 24 x 6 inch (600 x 600 x 150 mm) concrete pad.

Fill tanks at Project completion with appropriate fuel, including generator day tanks.

* + - 1. TESTING
				1. Pneumatically test tanks in accordance with manufacturer's recommendations upon arrival at the Project Site and after tank installation to assure tank integrity.
				2. Primary (Product) Piping Test: Hydrostatically test system at 100 psi and carefully check for leaks. Repair all leaks and retest until proven watertight. Flush system thoroughly with diesel fuel until all moisture or debris is removed and diesel is clear. Fill system with clean diesel fuel, close end valves and allow system to remain full. Legally dispose of flush diesel.
				3. Secondary Containment Piping Test: Seal secondary containment piping to primary piping at both ends with concentric termination fittings as recommended by the manufacturer. Provide test gauge and pipe connection at this point for pneumatic testing. Pneumatically test system at 10 psi for ten (10) minutes, then soap all joints and check for leaks. Retest until there are no leaks and system is proven tight.

END OF SECTION 23 11 13