SECTION 231213 - FACILITY FUEL-OIL PUMPS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Submersible fuel-oil storage tank pumps.

Simplex fuel-oil pumps.

Duplex fuel-oil pumps.

Triplex fuel-oil pumps.

Fuel-oil maintenance systems.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
        2. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
        3. 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. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.

Include construction details, material descriptions, and dimensions of individual components and profiles.

Include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

* + - * 1. Shop Drawings: For fuel-oil pumps.

Include construction details and dimensions of individual components for fuel-oil pumps.

Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

Retain "Delegated-Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Qualification Data: For qualified professional engineer.

Retain "Seismic Qualification Certificates" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Certificates: For fuel-oil pumps from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
        2. Sample Warranty: For special warranty.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For fuel-oil pumps and fuel-oil maintenance systems to include in emergency, operation, and maintenance manuals.

1. PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products.

* + - 1. PERFORMANCE REQUIREMENTS
         1. Maximum Operating-Pressure Ratings: 3-psig fuel-oil supply pressure at oil-fired appliances.

Retain "Delegated Design" paragraph below if Contractor is required to assume responsibility for design.

* + - * 1. Delegated Design: Engage a qualified professional engineer, to design restraint and anchors for fuel-oil pumps, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Certificates" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with Structural Engineer.

* + - * 1. Seismic Performance: Factory-installed support attachments for pumps shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7] <Insert requirement**>.

Retain subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified[ **and the unit will be fully operational after the seismic event**]."

* + - * 1. 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.
        2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
      1. SUBMERSIBLE FUEL-OIL STORAGE TANK PUMPS
         1. 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:

Franklin Fueling Systems.

Red Jacket Pumps.

Preferred Utilities Manufacturing Corporation

Approved equivalent.

* + - * 1. Description: Comply with UL 79, UL 87, and UL 343.

Impeller: Turbine.

Housing and Volute: Cast iron.

Bearings: Bronze, self-lubricating.

Seals: Mechanical.

Shaft: Polished steel.

Suspension Piping: Telescoping to accommodate tank diameter and depth of bury.

Base: Steel.

Pressure Relief: Built in.

Discharge Check Valve: Built in.

Drive: Direct, close coupled.

* + - * 1. Controls: Pump controller panel complying with UL 353 and UL 508C and with interlock and terminals for connections to fuel-oil-burning equipment.

Retain desired control features from subparagraphs below.

Maintain minimum manifold pressure with outdoor-air temperature less than [**60 deg F**] <**Insert temperature**>.

Seven-day schedule.

Stage multiple pumps to maintain pressure at a common supply manifold.

Alternate pumps to equalize run time.

Alarm motor failure.

Manual reset dry-run protection.

Stop pumps if fuel level falls below pump suction.

De-energize and sound alarm for pump, locked-rotor condition.

Sound alarm for open circuit and for high and low voltage.

Lights shall indicate normal power on, run, and off conditions.

Interface with automatic control system. Comply with requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC" to control and indicate the following:

Start/stop pump set when required by schedule, fuel-fired appliance operation, day tank level control, or weather conditions.

Operating status.

Alarm off-normal status.

If Project has more than one submersible fuel-oil pump, delete "Capacities and Characteristics" paragraph below and schedule pumps on Drawings.

* + - * 1. Capacities and Characteristics:

Number of Stages: <**Insert number**>.

Capacity: <**Insert gph**>.

Discharge Pressure: <**Insert psig**>.

Outlet Size: <**Insert NPS**>.

Motor Speed: <**Insert rpm**>.

Motor Horsepower: <**Insert value**>.

Electrical Characteristics:

Volts: [**120] [208] [240**] <**Insert value**>.

Phase: [**Single] [Three**].

Hertz: 60.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**.>

* + - 1. SIMPLEX FUEL-OIL TRANSFER PUMPS
         1. 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:

DESMI INC./Rotan Pumps.

Earthsafe Systems Inc.

Preferred Utilities Manufacturing Corporation.

Suntec Industries Incorporated.

Tuthill Corporation.

Approved equivalent.

* + - * 1. Description: Comply with UL 343 and HI 3.1-3.5.

Type: Positive-displacement, rotary type.

Impeller: [**Steel gear with crescent] [Carbon vane**].

Housing: Cast-iron foot mounted.

Bearings: Bronze, self-lubricating.

Shaft: Polished steel.

Seals: Mechanical.

Base: Steel.

Pressure Relief: Built in.

Discharge Check Valve: Built in.

Some manufacturers provide close-coupled pumps in "Drive" paragraph below only in certain size ranges.

* + - * 1. Drive: [**gear reducer; or direct, close coupled] [Gear reducer] [Direct, close coupled**].
        2. Controls:

Select desired control features from subparagraphs below.

Maintain minimum manifold pressure with outdoor-air temperature less than [**60 deg F] <Insert temperature>.**

Seven-day schedule.

Alarm motor failure.

Manual reset dry-run protection.

Stop pump if fuel level falls below pump suction.

De-energize and sound alarm for pump, locked-rotor condition.

Sound alarm for open circuit and for high and low voltage.

Lights shall indicate normal power on, run, and off conditions.

Interface with automatic control system. Comply with requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC" to control and indicate the following:

Start/stop pump set when required by schedule, fuel-fired appliance operation, day tank level control, or weather conditions.

Operating status.

Alarm off-normal status.

If Project has more than one simplex fuel-oil transfer pump, delete "Capacities and Characteristics" paragraph below and schedule pumps on Drawings.

* + - * 1. Capacities and Characteristics:

Number of Stages: <**Insert number**>.

Capacity: <**Insert gph**>.

Inlet Vacuum: <**Insert inches Hg**>.

Discharge Pressure: <**Insert psig>.**

Inlet and Outlet Size: <**Insert NPS**>.

Motor Speed: <**Insert rpm>.**

Motor Horsepower: <**Insert value**>.

Electrical Characteristics:

Volts: [**120] [208] [240] <Insert value**>.

Phase: [**Single] [Three].**

Hertz: **60**.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. [**DUPLEX] [TRIPLEX**] FUEL-OIL TRANSFER PUMP SETS
         1. 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:

Earthsafe Systems, Inc.

Flo Fab Inc.

Preferred Utilities Manufacturing Corporation.

Smith-Koch, Inc.

Approved equivalent.

* + - * 1. Description: Comply with HI 3.1-3.5.

Type: Positive-displacement, rotary type.

Impeller: [**Steel gear with crescent] [Carbon vane**].

Housing: Cast-iron foot mounted.

Bearings: Bronze, self-lubricating.

Shaft: Polished steel.

Seals: Mechanical.

Base: Steel.

Pressure Relief: Built in.

Discharge Check Valve: Built in.

Some manufacturers provide close-coupled pumps in "Drive" paragraph below only in certain size ranges.

* + - * 1. Drive: [**gear reducer, or direct close coupled] [Gear reducer] [Direct close coupled**].
        2. Controls:

Select desired control features from subparagraphs below.

Maintain minimum manifold pressure with outdoor-air temperature less than [**60 deg F**] <**Insert temperature**>.

Seven-day schedule.

Stage multiple pumps to maintain pressure at a common supply manifold.

Alternate pumps to equalize run time.

Alarm motor failure.

Manual reset dry-run protection.

Stop pumps if fuel level falls below pump suction.

De-energize and sound alarm for pump, locked-rotor condition.

Sound alarm for open circuit and for high and low voltage.

Lights shall indicate normal power on, run, and off conditions.

Interface with automatic control system. Comply with requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC" to control and indicate the following:

Start/stop pump set when required by schedule, fuel-fired appliance operation, day tank level control, or weather conditions.

Operating status.

Alarm off-normal status.

* + - * 1. Piping Furnished with Pumps: Steel with ferrous fittings and threaded or welded joints.
        2. Strainers Furnished with Pumps: Duplex, basket type with corrosion-resistant-metal-screen baskets.

If Project has more than one duplex or triplex fuel-oil transfer pump set, delete "Capacities and Characteristics" paragraph below and schedule pump sets on Drawings.

* + - * 1. Capacities and Characteristics:

Number of Stages: <**Insert number**>.

Capacity (Each Pump): <**Insert gph**>.

Inlet Vacuum: <**Insert inches Hg**>.

Discharge Pressure: <**Insert psig**>.

Inlet and Outlet Size: <**Insert NPS**>.

Motor Speed: <**Insert rpm**>.

Motor Horsepower (Each Pump): <**Insert value**>.

Electrical Characteristics (Pump Set):

Volts: [**120] [208] [240] <Insert value**>.

Phase: [**Single] [Three**].

Hertz: 60.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. FUEL MAINTENANCE SYSTEM

Retain this article for fuel systems that serve diesel-engine-driven equipment. Authorities having jurisdiction may require this system for healthcare facilities. Fuel maintenance systems circulate fuel oil from storage tanks through filters and back to storage tanks to remove moisture, particulates, and bio growth. A fuel maintenance program may be implemented by using fuel oil before it begins to deteriorate (approximately one month), by periodic replacement of fuel oil, or by filtering the fuel and adding stabilizers.

* + - * 1. 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:

Fuel Technologies, International, LLC.

AXI International

ACS Manufacturing, Inc.

Approved equivalent.

* + - * 1. Description: Factory-fabricated and wired fuel maintenance system for fuel-oil filtration; with enclosure, filter, fuel-oil pump, and controls.

System shall be FMG approved and listed and labeled by an NRTL acceptable to authorities having jurisdiction.

Enclosure: NEMA 250, Type 3R, painted steel containing pumps, filters, accessories, and controls. Hinged door on the front of enclosure.

Pump: Comply with HI 3.1-3.5, steel gear with crescent, positive displacement, direct coupled, rotary type.

Materials: Cast-iron housing; bronze bearings; steel shaft; mechanical seals; and built-in, pressure relief bypass valve.

Piping: Steel with malleable-iron fittings and threaded joints or wrought-steel fittings and welded joints.

Spin-On, Replaceable, Multistage Filters:

Stage 1: 100-mesh strainer.

Stage 2: Centrifuge to separate particulates and water from oil.

Stage 3: Coalescing water and particulate filter.

Stage 4: 30-micron particulate removal.

Stage 5: 10-micron particulate removal.

Stage 6: Minimum 99.5 percent water removal with see-through bowl and water-sensor probe.

Stage 7: [1.5] [3]-micron particulate removal.

Retain "Multiple-Tank Manifolds" subparagraph below for multiple fuel-oil storage tanks.

Multiple-Tank Manifolds:

Manifold fabricated of Schedule 80, black steel pipe and threaded nipples for [two] [**three] [four**] tanks.

Solenoid valves for supply and return piping to each tank.

Strainers for each tank supply connection.

Programmable Logic Controller:

Alarm on maximum 15-in. Hg vacuum at pump suction indicating plugged filter.

Alarm on high water level in filter.

Alarm leak in enclosure.

Touch screen; with minimum 2-line, 20-character, backlit, LCD display.

Controller strip heater with thermostat.

Interface with automatic control system is specified in Section 230900 "Instrumentation and Control for HVAC" to control and indicate the following:

Start/stop system when required by schedule.

Operating status.

Alarm off-normal status.

If Project has more than one fuel maintenance system, delete "Capacities and Characteristics" paragraph below and schedule systems on Drawings.

* + - * 1. Capacities and Characteristics:

Capacity (Each Pump): [**3 gpm] [8 gpm] [24 gpm] <Insert value**>.

If maximum suction lift exceeds 15 feet, delete pumps from this equipment and specify a submersible pump in storage tank(s). Control submersible pump(s) with fuel-oil maintenance system.

Maximum Suction Lift: [**15 feet] <Insert value**>.

Inlet and Outlet Size: <**Insert NPS**>.

Motor Horsepower (Each Pump): <**Insert value**>.

Electrical Characteristics (Pump Set):

Volts: [**120] [208] [240] <Insert value**>.

Phase: [**Single] [Three**].

Hertz: 60.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. MOTORS

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

* + - * 1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Verify enclosure types with manufacturer of specified equipment. Delete "Enclosure" subparagraph below if included in schedule on Drawings or in "Capacities and Characteristics" paragraph above.

Enclosure: [**Open, dripproof] [Totally enclosed, fan cooled] [Totally enclosed, air over] [Open, externally ventilated] [Totally enclosed, nonventilated] [Severe duty] [Explosion proof] [Dust-ignition-proof machine**].

Retain subparagraphs below if options are available from equipment manufacturers and are different from default requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment." Consider each subparagraph and retain only those that vary from default requirements.

Enclosure Materials: [**Cast iron] [Cast aluminum] [Rolled steel**].

Motor Bearings: <**Insert requirements**>.

Unusual Service Conditions:

Ambient Temperature: <**Insert deg F**>.

Altitude: <**Insert feet**> above sea level.

High humidity.

Review following list of unusual conditions which may affect motor construction or operation and insert in paragraph below as applicable to the project [Combustible, explosive, abrasive or conducting dusts], [Accumulated dirt and debris that may interfere with normal ventilation] [Chemical fumes; flammable or explosive gases] [Steam, salt-laden air, oil vapor] [Damp locations, radiant heat, vermin infestation, atmospheres conducive to the growth of fungus] [Abnormal shock, vibration or mechanical loading from external sources].

<**Insert conditions**>.

Efficiency: Premium efficient.

NEMA Design: <**Insert designation**>.

Service Factor: <**1.15> <Insert value**>.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine roughing-in for fuel-oil pumps to verify actual locations of pump connections before equipment installation.
          2. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. PREPARATION

Retain first paragraph below for renovations and additions.

* + - * 1. Close equipment shutoff valves before turning off fuel oil to premises or piping section.
        2. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.
      1. FUEL-OIL PUMP INSTALLATION
         1. Submersible Pumps:

Suspend pumps from supply piping and anchored to bottom of tank.

* + - * 1. Transfer Pumps:

Install pumps with access space for periodic maintenance including removal of motors, impellers, and accessories.

Set pumps on and anchor to concrete base.

Pump Mounting:

Retain first subparagraph below to require pump sets to be installed on cast-in-place concrete equipment bases.

Install pump base on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

Retain one of two subparagraphs below if vibration isolation is required. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-control device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

* + - * 1. Install two-piece, full-port ball valves at suction and discharge of pumps. Comply with requirements in Section 230523.12 "Ball Valves for HVAC Piping."
        2. Install mechanical leak-detector valves at pump discharge.

Duplex or triplex pumps are furnished with strainers.

* + - * 1. Install [**Y-pattern] [basket] [T-pattern**] strainer on inlet side of simplex fuel-oil pumps.

Duplex or triplex pumps are furnished with check valves.

* + - * 1. Install check valve on discharge of simplex fuel-oil pumps.
        2. Install suction piping with minimum fittings and change of direction.
        3. Install vacuum and pressure gage, upstream and downstream, respectively, at each pump to measure the differential pressure across the pump. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."
      1. FUEL MAINTENANCE SYSTEM INSTALLATION

Retain this article for fuel maintenance system installation.

* + - * 1. Install suction line, with foot valve, at one end of storage tank, 1 inch from the bottom of tank.
        2. Install return line at the opposite end of storage tank from suction line.
      1. LABELING AND IDENTIFYING
         1. Install nameplates and signs on each fuel-oil pump. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment."
      2. FIELD QUALITY CONTROL

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a company field advisor to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections[ **with the assistance of a company field advisor**]:

Start fuel-oil transfer pumps to verify for proper operation of pump, and check for leaks.

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

* + - * 1. Fuel-oil pumps will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. DEMONSTRATION
         1. [**Engage a company field advisor to train] [Train**] Facility’s maintenance personnel to adjust, operate, and maintain [**fuel-oil pumps] <Insert other**>.

END OF SECTION 231213