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SECTION 231213 - FACILITY FUEL-OIL PUMPS

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Fuel-oil pumps - multiplex.

Fuel-oil maintenance systems.

* + - 1. ACTION SUBMITTALS

Action submittals are submittals requiring responsive action and return of reviewed documents to Contractor.

* + - * 1. Product Data:

Submersible fuel-oil storage tank pumps.

Fuel-oil pumps - simplex.

Fuel-oil pumps - multiplex.

Fuel-oil maintenance systems.

* + - * 1. Product Data Submittals: For each product.

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

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

* + - * 1. Shop Drawings: For fuel-oil pumps[ **and fuel-oil maintenance systems**].

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

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

Scale: [**1/4 inch per foot**] <**Insert scale**>.

Retain "Delegated Design Submittals" Paragraph below if design services have been delegated to Contractor. If seismic restraints are not applicable, signing and sealing by professional engineer may not be required. Verify with authorities having jurisdiction.

* + - * 1. Delegated Design Submittals: For vibration isolation[ **and seismic restraints**] indicated to comply with performance requirements and design criteria, including analysis data[ **signed and sealed by the qualified professional engineer responsible for their preparation**].

Detail fabrication and assembly of anchors[ **and seismic restraints**].

Design Calculations: Calculate requirements for selecting seismic restraints.

Detail fabrication and assembly of hangers, supports, and attachments of the same to building structure.

* + - 1. INFORMATIONAL SUBMITTALS

Informational submittals are submittals that require review by Architect, but they do not require Architect's responsive action and return of reviewed documents to Contractor, provided submittals comply with requirements. If rejected, submittals with responsive action must be returned to Contractor.

Retain "Coordination Drawings" Paragraph below where coordination is required for installation of products and materials by separate installers. Preparation of coordination drawings requires participation of each trade involved; coordinate with other Sections specifying products and materials to be included. See Section 013100 "Project Management and Coordination."

* + - * 1. Coordination Drawings: Plans and details, or Building Information Model (BIM), drawn to scale, showing items described in this Section and coordinated with all building trades.

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[**, and fuel-oil maintenance systems,**] from [**manufacturer**] [**or**] [**engineer retained by Contractor**].

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.

Coordinate "Qualification Statements" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article. If inserting additional entities or specialist, add qualifications to "Quality Assurance" Article.

* + - * 1. Qualification Statements: For professional engineer retained by Contractor.
				2. Sample Warranties: For [**fuel-oil pumps**] [**and**] [**fuel-oil maintenance system**].
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For fuel-oil pumps[ **and fuel-oil maintenance systems**].
			2. MAINTENANCE MATERIAL SUBMITTALS

See Section 017700 "Closeout Procedures" for submission of maintenance material items.

* + - * 1. Extra Stock Material: Furnish extra materials[**, from the same production run,**] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Retain paragraph below when belt-driven fuel-oil pumps are included in Project design.

* + - * 1. Drive Belt: [**One**] <**Insert number**> for each belt-driven pump.
			1. QUALITY ASSURANCE
				1. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in [**state**] <**Insert jurisdiction**> where Project is located and who is experienced in providing engineering services of the type indicated.
			2. WARRANTY

When warranties are required and available, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Warranty: Repair or replace fuel-oil pumps[ **and fuel-oil maintenance systems**] that fail in materials or workmanship within specific warranty period.

Verify warranty periods in "Warranty Period for Fuel-Oil Pumps" and "Warranty Period for Fuel-Oil Maintenance Systems" paragraphs below.

* + - * 1. Warranty Period for Fuel-Oil Pumps: One year from date of Substantial Completion.
				2. Warranty Period for Fuel-Oil Maintenance Systems: [**One**] <**Insert number**> year(s) from date when fuel-oil maintenance system was shipped.
1. PRODUCTS
	* + 1. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

In "Maximum Operating-Pressure Ratings” Paragraph below, retain first option when Fuel Technologies model FTI-1.5A or 2.8A is selected. Retain second option when model FTI-5A, 10A, or 20A is selected.

* + - * 1. Maximum Operating-Pressure Ratings: [110 psig] [110 psig and automatic shutdown at 45 psig] <**Insert pressure**> 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, as defined in Section 014000 "Quality Requirements," to design restraint and anchors for fuel-oil pumps[ **and fuel-oil maintenance systems**], including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

Retain "Seismic Performance" Paragraph below 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: Provide support attachments for pumps[ **and fuel-oil maintenance systems**] able to withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first 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**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, system components serving critical healthcare functions, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table, for requirements to be inserted in subparagraph below.

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

* + - * 1. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
			1. FUEL-OIL MAINTENANCE SYSTEMS

Retain this article for fuel systems that serve diesel-engine-driven electrical generating equipment. Authorities having jurisdiction may require this system for some types of facilities such as healthcare facilities. Fuel-maintenance systems circulate fuel oil from storage tanks through filters and back to storage tanks to remove moisture, particulates, and biological growth.

Common fuel maintenance programs may be implemented by using fuel oil before it begins to deteriorate (approximately one month), by periodic replacement of fuel oil, or by dewatering and filtering the fuel, and by adding stabilizer chemicals.

Retain "Basis-of-Design Product" Paragraph and list of manufacturers below to identify a specific product or a comparable product from manufacturers listed.

Retain first option in paragraph below for fuel systems consisting of a single fuel-oil tank holding up to 1000 gallons.

Retain second option for fuel systems consisting of a single fuel-oil tank holding up to 5000 gallons.

Retain third option for fuel systems consisting of one to four fuel-oil tanks holding up to 15,000 gallons, combined.

Retain fourth option for fuel systems consisting of one to four fuel-oil tanks holding up to 30,000 gallons, combined.

Retain fifth option for fuel systems consisting of one to four fuel-oil tanks holding up to 60,000 gallons, combined.

* + - * 1. Basis-of-Design Product: Subject to compliance with requirements, provide Fuel Technologies, International; model [**FTI-1.5A**] [**FTI-2.8A**] [**FTI-5A**] [**FTI-10A**] [**FTI-20A**]**:** FTI Automated Stored Diesel Fuel Maintenance System or comparable product by one of the following:

Competitor #1.

Competitor #2.

<**Insert manufacturer's name**>.

* + - * 1. Source Limitations: Obtain fuel-oil maintenance system from single manufacturer.
				2. Description: Factory-fabricated and -wired, fuel-oil maintenance system for fuel-oil dewatering and filtration; with enclosure, water separator, filter, fuel-oil circulating pump, and automatic controls.

Provide FM Approvals approved system, listed and labeled by an NRTL acceptable to Authorities Having Jurisdiction (AHJ).

Enclosure: NEMA 250, Type 3R, [**powder coated**] [**stainless**] steel containing pumps, filters, accessories, and controls.

Provide lockable, hinged, lift-off door on front of enclosure.

Provide mounting flanges for rack or wall mounting.

In subparagraph below, retain first option when model FTI-1.5A or FTI-2.8A is selected. Retain second option when model FTI-5A, FTI-10A or FTI-20A is selected

Pump: Provide HI 3.1-3.5 compliant, steel gear, positive-displacement, direct-coupled, rotary type pump having built-in, pressure relief bypass valve rated for full pump capacity, set to relieve at [**90**] [**60**] psig.

Motor: 1/3 HP, ODP.

Power: [**115 V, 6 A**] [**208-240 V, 3 A**], 50/60 Hz.

Piping: Stainless steel with compatible hydraulic fittings.

Filters, Spin-on, Replaceable, Multistage:

Retain first two subparagraphs below when model FTI-1.5A or FTI-2.8A is selected.

Stage 1: Particulate removal to 2 microns.

Stage 2: Water separation to 5 ppm, with see-through bowl and water-sensor probe.

Retain first five subparagraphs below when model FTI-5A, FTI-10A or FTI-20A is selected.

Stage 1: Strainer, 100 mesh, incorporated in spin-on filter.

Stage 2: 10-micron particulate removal, incorporated in spin-on filter.

Stage 3: 3-micron particulate removal, incorporated in spin-on filter.

Stage 4: Water coalescer and separator to 5 ppm.

Stage 5: 1-micron particulate removal.

Programmable Logic Controller:

Provide fully automatic operation of system.

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

Alarm on high water level in filter.

Alarm on leak in enclosure.

Provide digital display showing alphanumeric characters, and soft key controls on front of controller.

Display day of week and time of day in 24-hour format.

Retain “Fuel-Quality Analyzer” Subparagraph below when such equipment is included in Project design. Consult manufacturers to verify availability and capabilities.

Fuel-Quality Analyzer: Continuously monitors fuel quality to detect and record particulate contamination and presence of water.

Retain subparagraph below when fuel maintenance systems with Modbus communications are selected.

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

Start/stop system when required by schedule.

Operating status.

Alarm off-normal status.

Retain subparagraph below when fuel maintenance systems without Modbus communications are selected.

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

Alarm off-normal status.

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

* + - * 1. Pump Capacities and Characteristics:

Retain first option in first subparagraph below when model FTI-1.5A is selected.

Retain second option when model FTI-2.8A is selected.

Retain third option when model FTI-5A is selected.

Retain fourth option when model FTI-10A is selected.

Retain fifth option when model FTI-20A is selected.

Fuel Oil Maintenance System Flow Rate: [**1.5**] [**2.8**] [**5.0**] [**10**] [**20**] <**Insert value**> gpm.

<**Insert value**>.

Verify maximum pump suction lift with manufacturer.

Maximum Suction Lift: 15 ft.

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

In first subparagraph below, retain first option when model FTI-1.5A or FTI-2.8A is selected.

Retain second option when model FTI-5A is selected.

Retain third option when model FTI-10A is selected.

Retain fourth option when model FTI-20A is selected.

Motor Horsepower (Each Pump): [**1/3**] [**1/2**] [**3/4**] [**1.5**]<**Insert value**>.

Electrical Characteristics (Pump Set):

Volts: [**120**] [**208/240**].

Phase: [**Single**].

Hertz: 60.

In first subparagraph below, retain first option when model FTI-1.5A or FTI-2.8A is selected, and fed from a 120 V source. Retain second option when fed from a 208/240 V source.

Full-Load Amperes: [**6**] [**3**] <**Insert value**>.

In first subparagraph below, retain first option when model FTI-5A is selected, and fed from a 120 V source. Retain second option when fed from a 208/240 V source.

Full-Load Amperes: [**8**] [**4**] <**Insert value**>.

In first subparagraph below, retain first option when model FTI-10A is selected, and fed from a 120 V source. Retain second option when fed from a 208/240 V source.

Full-Load Amperes: [**8.4**] [**4.2**] <**Insert value**>.

In first subparagraph below, retain first option when model FTI-20A is selected, and fed from a 120 V source. Retain second option when fed from a 208/240 V source.

Full-Load Amperes: [**18**] [**9**] <**Insert value**>.

Minimum Circuit Ampacity: [**30**] <**Insert value**>.

Maximum Overcurrent Protection: [**40**] circuit breaker <**Insert amperage**>.

Retain the paragraphs below for fuel systems that serve diesel-engine-driven fire pumps. Authorities having jurisdiction may require this system for some types of facilities such as healthcare facilities. Fuel-maintenance systems circulate fuel oil from storage tanks through filters and back to storage tanks to remove moisture, particulates, and biological growth.

* + - * 1. Basis-of-Design Product: Subject to compliance with requirements, provide Fuel Technologies, International; model FTI-1.5A**:** Automated Stored Diesel Fuel Maintenance System or comparable product by one of the following:

Competitor #1.

Competitor #2.

<**Insert manufacturer's name**>.

* + - * 1. Source Limitations: Obtain fuel-oil maintenance system from single manufacturer.
				2. Description: Factory-fabricated and -wired, fuel-oil maintenance system for fuel-oil dewatering and filtration; with enclosure, water separator, filter, fuel-oil circulating pump, and automatic controls.

Provide FM Approvals approved system, listed and labeled by an NRTL acceptable to Authorities Having Jurisdiction (AHJ).

Enclosure: NEMA 250, Type 3R, [**powder coated**] [**stainless**] steel containing pumps, filters, accessories, and controls.

Provide lockable, hinged, lift-off door on front of enclosure.

Provide mounting flanges for rack or wall mounting.

Pump: Provide HI 3.1-3.5 compliant, steel gear, positive-displacement, direct-coupled, rotary type pump having built-in, pressure relief bypass valve rated for full pump capacity, set to relieve at 90 psig.

Motor: 1/3 HP, ODP.

Power: [**115 V, 6 A**] [**208-240 V, 3 A**], 50/60 Hz.

Piping: Stainless steel with compatible hydraulic fittings.

Filters, Spin-on, Replaceable, Multistage:

Stage 1: Particulate removal to 2 microns.

Stage 2: Water separation to 5 ppm.

Programmable Logic Controller:

Provide fully automatic operation of system.

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

Alarm on high water level in filter.

Alarm on leak in enclosure.

Provide digital display showing alphanumeric characters, and soft key controls on front of controller.

Display day of week and time of day in 24-hour format.

Retain subparagraph below when fuel maintenance systems without Modbus communications are selected.

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

Alarm off-normal status.

* + - * 1. Pump Capacities and Characteristics:

Retain first option in first subparagraph below when model FTI-1.5A is selected.

Fuel Oil Maintenance System Flow Rate: 1.5 gpm.

Verify maximum pump suction lift with manufacturer.

Maximum Suction Lift: 15 ft.

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

Motor Horsepower (Each Pump): 1/3<**Insert value**>.

Electrical Characteristics (Pump Set):

Volts: [**120**] [**208/240**].

Phase: [**Single**].

Hertz: 60.

In first subparagraph below, retain first option when model FTI-1.5A is selected, and fed from a 120 V source. Retain second option when fed from a 208/240 V source.

Full-Load Amperes: [**6**] [**3**] <**Insert value**>.

Minimum Circuit Ampacity: [**30**] <**Insert value**>.

Maximum Overcurrent Protection: [**40**] circuit breaker <**Insert amperage**>.

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. EARTHWORK
				1. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
			3. 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. INSTALLATION OF FUEL-OIL TRANSFER PUMPS
				1. Submersible Fuel-Oil Storage Tank Pumps:

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

* + - * 1. Simplex and Multiplex Fuel-Oil Pumps:

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

Set pumps on and anchor to concrete base.

Pump Mounting:

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

Install base-mounted pumps 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 first 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."

Retain "Equipment Mounting" Subparagraph below for in-line pumps suspended from structure.

Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and [**elastomeric hangers**] [**spring hangers**] [**spring hangers with vertical-limit stop**] of size required to support weight of in-line pumps.

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 seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

* + - * 1. Install two-piece, full-port ball valves at suction and discharge of pumps. Comply with requirements in Section 230523 "General-Duty Valves for HVAC Piping."
				2. Install mechanical leak-detector valves at pump discharge.
				3. Install [**Y-pattern**] [**basket**] [**T-pattern**] strainer on inlet side of all fuel-oil pumps.
				4. Install check valve on discharge of all fuel-oil pumps unless provided with built-in check valve.
				5. Install suction piping with minimum fittings and change of direction.
				6. Install vacuum and pressure gauge, upstream and downstream, respectively, at each pump to measure the differential pressure across the pump. Pressure gauges are specified in Section 230500 "Common Work Results for HVAC."
			1. INSTALLATION OF FUEL-OIL MAINTENANCE SYSTEMS

Retain this article for fuel-oil maintenance system installation.

* + - * 1. Maintenance System Mounting:

Retain first subparagraph below to require system to be installed on wall or racking members.

Install equipment cabinet on wall or rack fabricated from structural members. Provide mounting hardware, anchors, and supplemental supports.

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

Install equipment cabinet on cast-in-place concrete equipment base. 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 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.
				3. Install priming fittings in fuel-oil maintenance piping in accordance with manufacturer’s installation instructions.
			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 first option in "Testing Agency" Paragraph below if Owner hires an independent testing agency.

* + - * 1. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" Paragraph below to require a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

* + - * 1. Manufacturer's Field Service: Engage a factory-authorized service representative to [**support**] [**supervise**] field tests and inspections.
				2. Tests and Inspections:

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

Start fuel-oil transfer pumps [**and fuel-oil maintenance system 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.

Fuel-oil pumps[ **and fuel-oil maintenance systems**] will be considered defective if they do not pass tests and inspections.

* + - * 1. Prepare test and inspection reports.
			1. DEMONSTRATION
				1. [**Engage a factory-authorized service representative to train**] [**Train**] Owner's maintenance personnel to adjust, operate, and maintain [**fuel-oil pumps**] [ **and fuel-oil maintenance system**] <**Insert other**>.

END OF SECTION 231213