SECTION 238239.16 - PROPELLER UNIT HEATERS

This Section includes requirements for sustainable design systems. However, equipment specified in this Section may not meet requirements of those systems. Verify, with manufacturers, that the requirements can be met. To comply, HVAC system design alternatives that do not include propeller unit heaters may be required.

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 propeller unit heaters with [hot-water] [steam] [electric-resistance heating] coils.
			2. DEFINITIONS

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

* + - * 1. CWP: Cold working pressure.
				2. PTFE: Polytetrafluoroethylene plastic.
				3. TFE: Tetrafluoroethylene plastic.
			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 rated capacities, operating characteristics, furnished specialties, and accessories.

* + - * 1. Shop Drawings:

Include plans, elevations, sections, and details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include location and size of each field connection.

Include details of anchorages and attachments to structure and to supported equipment.

Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.

Retain first subparagraph below for hot-water and steam propeller unit heaters.

Indicate location and arrangement of piping valves and specialties.

Retain first subparagraph below for propeller unit heaters with integral controls; delete if control devices are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

Indicate location and arrangement of integral controls.

Wiring Diagrams: Power, signal, and control wiring.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Suspended ceiling components.

Structural members to which propeller unit heaters will be attached.

Method of attaching hangers to building structure.

Size and location of initial access modules for acoustical tile.

Items penetrating finished ceiling, including the following:

Lighting fixtures.

Air outlets and inlets.

Speakers.

Sprinklers.

Access panels.

**<Insert item>**.

Retain "Seismic Qualification Data" 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 Data: Submit certification that propeller unit heaters, accessories, and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC." Include the following:

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.

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

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For propeller unit heaters 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. MANUFACTURERS
				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:

Airtherm; a Mestek company.

Engineered Air.

Rosemex Products.

Trane.

Approved equivalent.

* + - 1. DESCRIPTION
				1. Assembly including casing, coil, fan, and motor in [vertical] [and] [horizontal] discharge configuration with adjustable discharge louvers.
				2. 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.

Retain first paragraph below for electric propeller unit heaters.

* + - * 1. Comply with UL 2021.

Retain paragraph below for explosion-proof electric propeller unit heaters.

* + - * 1. Comply with UL 823.
			1. PERFORMANCE REQUIREMENTS

"ASHRAE Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Sustainable design systems require compliance with requirements in ASHRAE 62.1, including requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, coil selection and cleaning, and equipment access. Verify, with manufacturers, availability of units with components and features that comply with these requirements.

* + - * 1. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

"ASHRAE/IESNA 90.1 Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Sustainable design systems require compliance with requirements in ASHRAE/IESNA 90.1.

* + - * 1. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" 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: Propeller unit heaters 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. HOUSINGS
				1. Finish: Manufacturer's **[standard] [custom]** baked enamel applied to factory-assembled and -tested propeller unit heaters before shipping.

"Airstream Surfaces" paragraph below may be required to comply with Project requirements or authorities having jurisdiction and is required for sustainable design systems.

* + - * 1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
				2. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.
			1. COILS
				1. General Coil Requirements: Test and rate **[hot-water] [steam]** propeller unit-heater coils according to ASHRAE 33.

Retain one of eight coil paragraphs below. First "Hot-Water Coil" paragraph is standard coil construction for hot-water heating systems. Remaining "Hot-Water Coil" paragraphs are for situations where higher pressure ratings are required or corrosion resistance is required for some fluids inside the coils.

* + - * 1. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.
				2. Hot-Water Coil: Cupronickel tube, minimum 0.031-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 400 psig and a maximum entering-water temperature of 450 deg F, with manual air vent. Test for leaks to 600 psig underwater.
				3. Hot-Water Coil: Red-brass tube, minimum 0.049-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 260 psig and a maximum entering-water temperature of 390 deg F, with manual air vent. Test for leaks to 390 psig underwater.
				4. Hot-Water Coil: Steel tube, minimum 0.049-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 400 psig and a maximum entering-water temperature of 450 deg F, with manual air vent. Test for leaks to 600 psig underwater.

"Hot-Water Coil" paragraph below is industrial-quality construction available from a limited number of manufacturers.

* + - * 1. Hot-Water Coil: Vertical steel tube, minimum 0.065-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 400 psig and a maximum entering-water temperature of 450 deg F, with steel headers at top and bottom. Test for leaks to 600 psig underwater.

First "Steam Coil" paragraph below is standard coil construction for steam heating systems. Second and third "Steam Coil" paragraphs are for situations where higher pressure ratings are required or corrosion resistance is required for some fluids inside the coils.

* + - * 1. Steam Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 75 psig.
				2. Steam Coil: Red-brass tube, minimum 0.049-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 75 psig.

"Steam Coil" paragraph below is industrial-quality construction available from a limited number of manufacturers.

* + - * 1. Steam Coil: Vertical steel tube, minimum 0.065-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of [100 psig] [200 psig], with steel headers at top and bottom.
				2. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.

Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.

Wiring Terminations: Stainless-steel or corrosion-resistant material.

* + - 1. FAN AND MOTOR
				1. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Section 230513 "Common Motor Requirements for HVAC Equipment." If different characteristics are required, insert paragraphs below to suit Project.

* + - * 1. Motor: Permanently lubricated, **[explosion proof] [multispeed] [variable speed]**. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
			1. CONTROLS

Delete this article if controls are part of control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." See Evaluations for discussion on control schemes and energy efficiency.

* + - * 1. Control Devices:

**[Unit] [Wall]**-mounted, [variable ]fan-speed switch.

**[Unit] [Wall]**-mounted thermostat.

* + - 1. CAPACITIES AND CHARACTERISTICS

If Project has more than one type or configuration of heater, delete this article and schedule propeller unit heaters on Drawings.

* + - * 1. Heating Capacity:

Heat Output: **<Insert Btu/h>**.

Length of Throw: **<Insert feet>**.

Mounting Height: **<Insert feet>**.

* + - * 1. Water Coil:

Entering-Water Temperature: **<Insert deg F>**.

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

Water Flow: **<Insert gpm>**.

Water-Side Pressure Drop: **<Insert feet>**.

* + - * 1. Steam Coil:

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

Condensing Capacity: **<Insert lb/h>**.

* + - * 1. Electric Coil:

Heating Capacity: **<Insert kilowatts>**.

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

* + - * 1. Supply Air:

Airflow: **<Insert cfm>**.

Leaving-Air Temperature: **<Insert deg F>**.

Entering-Air Temperature: **<Insert deg F>**.

* + - * 1. Fan Motor:

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

Motor Size: **<Insert horsepower>**.

* + - * 1. Electrical Characteristics for Single-Point Connection:

Volts: **<Insert value>**.

Phase: **<Insert value>**.

Hertz: **<Insert value>**.

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

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

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

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Examine roughing-in for **[piping and ]**electrical connections to verify actual locations before unit-heater installation.
				3. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. Install propeller unit heaters to comply with NFPA 90A.
				2. Install propeller unit heaters level and plumb.
				3. Suspend propeller unit heaters from structure with all-thread hanger rods and **[elastomeric hangers] [spring hangers] [spring hangers with vertical-limit stop]**. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in **[Section 230548 "Vibration and Seismic Controls for HVAC."] [Section 230548.13 "Vibration Controls for HVAC."]**

Retain paragraph below if controls are provided by propeller unit-heater manufacturer. To comply with requirements of the Americans with Disabilities Act, verify mounting height with authorities having jurisdiction.

* + - * 1. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
			1. CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Drawings indicate general arrangement of piping, fittings, and specialties. Piping installation requirements are specified in the following Sections:

Section 232113 "Hydronic Piping."

Section 232116 "Hydronic Piping Specialties."

Section 232213 "Steam and Condensate Heating Piping."

Section 232216 "Steam and Condensate Heating Piping Specialties."

* + - * 1. Install piping adjacent to machine to allow service and maintenance.
				2. Connect piping to propeller unit heater's factory, hot-water piping package. Install the piping package if shipped loose.

Retain first paragraph below for propeller unit heaters with either hot-water or steam coils.

* + - * 1. Comply with safety requirements in UL 1995.

Retain first paragraph below for hot-water propeller unit heaters if factory piping package is not required.

* + - * 1. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of propeller unit heater. Hydronic specialties are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

Retain first paragraph below for steam propeller unit heaters.

* + - * 1. Unless otherwise indicated, install union and gate or ball valve on steam-supply connection and union, strainer, steam trap, and gate or ball valve on condensate-return connection of propeller unit heater. Steam specialties are specified in Section 232216 "Steam and Condensate Piping Specialties."
				2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
			1. FIELD QUALITY CONTROL
				1. Perform the following tests and inspections**[ with the Company Field Advisor per OGS Spec Section 014216]**:

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

Retain first subparagraph below for units that have electric-resistance heating coils.

Operate electric heating elements through each stage to verify proper operation and electrical connections.

Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Units will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. ADJUSTING

Retain this article if control devices are specified in this Section; delete if they are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

* + - * 1. Adjust initial temperature set points.
				2. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to **[two] <Insert number>** visits to Project during other-than-normal occupancy hours for this purpose.
			1. DEMONSTRATION

Delete this article if factory-authorized service representative is not required.

* + - * 1. Engage a Company Field Advisor per OGS Spec Section 014216 to train Director’s Representative's Facility’s maintenance personnel to adjust, operate, and maintain propeller unit heaters.

END OF SECTION 238239.16