SECTION 235533.16 - GAS-FIRED UNIT HEATERS

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 gas-fired unit heaters.
			2. 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 gas-fired unit heater.

Include rated capacities, operating characteristics, and accessories.

In "Shop Drawings" Paragraph below, retain option if equipment is required to withstand specific design loads and design responsibilities have been delegated to Contractor or if structural data are required as another way to verify equipment's compliance with performance requirements.

* + - * 1. Shop Drawings: For gas-fired unit heaters. Include plans, elevations, sections, and attachment details.

Prepare detailing fabrication and assembly of gas-fired unit heaters, as well as procedures and diagrams.

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

Retain option in subparagraph below if thermostat is specified in this Section; delete if thermostats for these units are specified in Section 230923.27 "Temperature Instruments."

Include diagrams for 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: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from trades of the items involved:

Structural members to which equipment will be attached.

Items penetrating roof and the following:

Vent and gas piping rough-ins and connections.

<**Insert item**>.

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 gas-fired unit heaters, accessories, and components, 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.

* + - * 1. Field quality-control reports.
				2. Sample Warranty: For special warranty.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For gas-fired unit heaters to include in emergency, operation, and maintenance manuals.
			2. MAINTENANCE MATERIAL SUBMITTALS
				1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Fan Belts: [**One**] <**Insert number**> for each belt-driven fan size.

* + - 1. QUALITY ASSURANCE

Retain "ASHRAE/IES 90.1 Compliance" Paragraph below to require compliance with ASHRAE/IES 90.1. LEED Prerequisite EA 2 requires compliance with ASHRAE/IES 90.1.

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

When warranties are required, verify with Director’s Representative Owner's counsel that warranties stated in this article are not less than remedies available to Director’s Representative under prevailing local laws. Coordinate with Section 016000 "Product Requirements."

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace heat exchanger of gas-fired unit heater that fails in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods for units and components. Two-year warranty is applicable to aluminized heat exchangers; five-year warranty, to stainless-steel heat exchangers.

Warranty Period: [**Two**] [**Five**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 016000 "Product Requirements."

* + - 1. MANUFACTURERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9375) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Lennox Industries, Inc.; Lennox International](http://www.specagent.com/Lookup?uid=123456985819).

[Modine Manufacturing Company](http://www.specagent.com/Lookup?uid=123456985820).

[REZNOR, a brand of Nortek Global HVAC](http://www.specagent.com/Lookup?uid=123456985821).

[Sterling HVAC Products; a Mestek company](http://www.specagent.com/Lookup?uid=123456985822).

[Trane](http://www.specagent.com/Lookup?uid=123456985823).

Approved equivalent.

* + - 1. PERFORMANCE REQUIREMENTS

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: Gas-fired unit heaters shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Seismic Fabrication Requirements: Fabricate and reinforce suspension attachments of gas-fired unit heaters, accessories mountings, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC” Section 15074 "Vibration and Seismic Controls for HVAC" when gas-fired unit heater is anchored to building structure.

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**]."

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. 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.

If Project has more than one type or configuration of gas-fired unit heater, delete "Capacities and Characteristics" Paragraph below and schedule unit heaters on Drawings.

* + - * 1. Capacities and Characteristics:

Gas Input: <**Insert Btu/h (kW)**>.

Gas Output: <**Insert Btu/h (kW)**>.

LEED Prerequisite EA 2 requires compliance with ASHRAE/IES 90.1. LEED Credit EA 1 requires efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1.

Annual Gas Utilization Efficiency: [**80**] <**Insert number**> percent.

Minimum Airflow: <**Insert cfm (L/s)**>.

External Static Pressure: <**Insert inches wg (kPa)**>.

Verify enclosure types with manufacturer of specified equipment.

Motor Enclosure: Totally enclosed, fan cooled.

Retain "Electrical Characteristics" Subparagraph below if characteristics are not indicated on Drawings or in this article.

Electrical Characteristics:

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

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

Volts: [**120**] [**208**] [**230**] <**Insert value**>.

Phase: [**Single**] [**Poly**].

Hertz: 60.

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

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

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

* + - 1. MANUFACTURED UNITS
				1. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
				2. Gas Type: Design burner for [**natural**] [**propane**] gas having characteristics same as those of gas available at Project site.

Retain "Type of Venting" Paragraph below unless more than one type of venting is required; in which case, delete below and indicate type of venting in a schedule on Drawings. See the sample schedule in the Evaluations.

* + - * 1. Type of Venting: [**Gravity**] [**Powered**] [**Indoor, separated combustion, power**] vented.
				2. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.

External Casings and Cabinets: [**Baked enamel**] [**Powder coating**] over corrosion-resistant-treated surface.

Retain "Discharge Louvers" or "Discharge Nozzle" Subparagraph below. Delete both subparagraphs and indicate discharge configuration in a schedule on Drawings if multiple units are required and have different configurations.

Discharge Louvers: Independently adjustable, [**horizontal**] [**vertical**] blades.

Discharge Nozzle: Discharge at [**25 to 65 degrees (0.44 to 1.13 radians)**] [**50 to 90 degrees (0.87 to 1.57 radians)**] from horizontal.

* + - * 1. Accessories:

Retain one or more of three optional accessories in subparagraphs below.

Four-point suspension kit.

Retain "Power Venter" Subparagraph below for power-vented model.

Power Venter: Centrifugal aluminized-steel fan, with stainless-steel shaft; 120-V ac motor.

Retain "Concentric, Terminal Vent Assembly" Subparagraph below for separated-combustion model.

Concentric, Terminal Vent Assembly: Combined combustion-air inlet and power-vent outlet with wall or roof caps. Include adapter assembly for connection to inlet and outlet pipes, and flashing for wall or roof penetration.

Retain "Heat Exchanger" Paragraph below unless more than one heat-exchanger material is required; in which case, delete below and indicate heat-exchanger material in a schedule on Drawings. See the sample schedule in the Evaluations.

* + - * 1. Heat Exchanger: [**Aluminized**] [**Stainless**] steel.

Retain "Burner Material" Paragraph below unless more than one burner material is required; in which case, delete below and indicate burner material in a schedule on Drawings. See the sample schedule in the Evaluations.

* + - * 1. Burner Material: [**Aluminized steel with stainless-steel inserts**] [**Stainless steel**].

Retain "Propeller Unit Fan" or "Centrifugal Unit Fan" Paragraph below, or revise to suit selected equipment. If multiple units are required and some units require propeller fans and some require centrifugal fans, retain both paragraphs and indicate fan type in a schedule on Drawings. See the sample schedule in the Evaluations.

* + - * 1. Propeller Unit Fan:

[**Formed-steel**] [**Aluminum**] propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.

Fan-Blade Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.

* + - * 1. Centrifugal Unit Fan:

Steel, centrifugal fan dynamically balanced and resiliently mounted.

Belt-Driven Drive Assembly:

Resiliently mounted to housing, with the following features:

Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

Pulleys: Cast-iron, adjustable-pitch motor pulley.

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

* + - * 1. Motors:

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

Retain "Enclosure Materials," "Motor Bearings," "Unusual Service Conditions," "Efficiency," "NEMA Design," and "Service Factor" 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: Rolled steel.

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

Unusual Service Conditions:

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

Altitude: <**Insert feet (m)**> above sea level.

High humidity.

<**Insert conditions**>.

Efficiency: Premium efficient.

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

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

* + - * 1. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

Gas Control Valve: [**Single stage**] [**Two stage**] [**Modulating**].

Ignition: [**Standing pilot**] [**Electronically controlled electric spark with flame sensor**].

Fan Thermal Switch: Operates fan on heat-exchanger temperature.

First option in "Vent Flow Verification" Subparagraph below is for gravity-vented units; second option is for units with a power venter.

Vent Flow Verification: [**Flame rollout switch**] [**Differential pressure switch to verify open vent**].

Control transformer.

High Limit: Thermal switch or fuse to stop burner.

Retain one of two subparagraphs below.

Thermostat: Devices and wiring are specified in Section 230923.27 "Temperature Instruments."

[**Wall**] [**Unit**]-Mounted Thermostat:

[**Single**] [**Two**] stage.

Fan on-off-automatic switch.

24-V ac.

50 to 90 deg F (10 to 32 deg C) operating range.

* + - * 1. Electrical Connection: Factory wire motors and controls for a single electrical connection.
1. EXECUTION
	* + 1. INSTALLATION

Retain first option in this article for projects in the United States; retain second option for projects in Canada.

* + - * 1. Install and connect gas-fired unit heaters and associated gas and vent features and systems according to [**NFPA 54**] [**CSA B149.1**], applicable local codes and regulations, and manufacturer's written instructions.
			1. EQUIPMENT MOUNTING
				1. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
				2. Substrate-Mounted Units: Provide supports connected to substrate. Secure units to supports.

Spring hangers[**and seismic restraints**] are specified in [**Section 230529 "Hangers and Supports for HVAC Piping and Equipment."**] [**Section 230548 "Vibration and Seismic Controls for HVAC."**] [**Section 230529 "Hangers and Supports for HVAC Piping and Equipment" and Section 230548 "Vibration and Seismic Controls for HVAC."**]

Retain one of first two subparagraphs below.

Threaded Rods, Spring Hangers, and Building Attachments: Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" and Section 230548 "Vibration and Seismic Controls for HVAC."

Retain both subparagraphs below if Project site is in an active seismic area.

Threaded Rods, Spring Hangers, Building Attachments, and Seismic Restraints: Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." and Section 230548 "Vibration and Seismic Controls for HVAC."

Anchor the unit to resist code-required horizontal acceleration.

* + - 1. CONNECTIONS

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

* + - * 1. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Where installing piping adjacent to gas-fired unit heater, allow space for service and maintenance.
				3. Gas Piping: Comply with [**Section 231123 "Facility Natural-Gas Piping."**] [**Section 231126 "Facility Liquefied-Petroleum Gas Piping."**] Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
				4. Vent Connections: Comply with Section 235123 "Gas Vents."
				5. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				6. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
			1. FIELD QUALITY CONTROL

Retain "Manufacturer's Field Service" Paragraph below to require Company ServiceField Advisor to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 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 per OGS Spec Section 014216**]:

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

Verify bearing lubrication.

Verify proper motor rotation.

Test Reports: Prepare a written report to record the following:

Test procedures used.

Test results that comply with requirements.

Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

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

* + - * 1. Gas-fired unit heater will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. ADJUSTING
				1. Adjust initial temperature and humidity set points.
				2. Adjust burner and other unit components for optimum heating performance and efficiency.
			2. DEMONSTRATION
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Owner's Director’s Representative's maintenance personnel to adjust, operate, and maintain gas-fired unit heaters.

END OF SECTION 235533.16