

SECTION 238239 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cabinet unit heaters.
 - 2. Propeller unit heaters.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. LEED Submittal:
 - 1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Location and arrangement of piping valves and specialties.

Retain first subparagraph below for cabinet unit heaters with integral controls; delete if control devices are specified in Division 23 Section "Instrumentation and Control for HVAC."

- 2. Location and arrangement of integral controls.
- 3. Wiring Diagrams: Power, signal, and control wiring.

- D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

Retain first paragraph below if Contractor is responsible for field quality-control testing.

- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

LEED Prerequisite IEQ 1 requires compliance with requirements in ASHRAE 62.1, including requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, finned-tube coil selection and cleaning, and equipment access. Verify, with manufacturers, availability of units with components and features that comply with these requirements.

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

LEED Prerequisite EA 2 requires compliance with requirements in ASHRAE/IESNA 90.1.

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

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airtherm; a Mestek Company.
2. Carrier Corporation.
3. Dunham-Bush, Inc.
4. Daikin McQuay.
5. Trane.
6. Sterling Hydronic Products
7. Vulcan Radiator.
8. ZehnderRittling

- B. Description: A factory-assembled and -tested unit complying with ARI 440.

- C. Coil Section Insulation: Comply with NFPA 90A or NFPA 90B. Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.

1. Thickness: 1/2 inch (13 mm).
2. Thermal Conductivity (k-Value): 0.24 Btu x in./h x sq. ft. at 75 deg F (0.034 W/m x K at 24 deg C) mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.
4. Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch- (1.35-mm-) thick, sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch- (1.35-mm-) thick, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.

Retain first subparagraph below for units that are semirecessed or fully recessed in walls or ceilings.

3. Recessing Flanges: Steel, finished to match cabinet.
4. Control Access Door: Key operated.

Retain first subparagraph below for surface, vertical, wall-mounting units.

5. Base: Minimum 0.0528-inch- (1.35-mm-) thick steel, finished to match cabinet, 4 inches (100 mm) high with leveling bolts.
6. Extended Piping Compartment: 8-inch- (200-mm-) wide piping end pocket.

Accessories described in two subparagraphs below are furnished for vertical, wall-mounting units only.

7. False Back: Minimum 0.0428-inch- (1.1-mm-) thick steel, finished to match cabinet.
8. Outdoor-Air Wall Box: Minimum 0.1265-inch- (3.2-mm-) thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen. Aluminum louver with anodized finish in color selected by Architect from manufacturer's standard colors.

Retain subparagraph below only if retaining subparagraph above. LEED Prerequisite IEQ 1 requires compliance with ASHRAE 62.1 and Prerequisite EA 2 requires compliance with ASHRAE/IESNA 90.1.

- a. Outdoor-Air Damper: Galvanized-steel blades with edge and end seals and nylon bearings; with electronic, two-position actuators.

E. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 90 percent arrestance and 7 MERV.

F. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig (1378 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain.

G. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.

Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." If different characteristics are required, add subparagraphs below to suit Project.

2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 3. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. Factory, Hot-Water Piping Package: ASTM B 88, Type L (ASTM B 88M, Type B) copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet and outlet.

Retain one or more of first four subparagraphs and associated subparagraphs below.

1. Two-way, modulating control valve.
 2. Hose Kits: Minimum 400-psig (2758-kPa) working pressure, and operating temperatures from 33 to 211 deg F (0.5 to 99 deg C). Tag hose kits to equipment designations.
 - a. Length: 24 inches (600 mm).
 - b. Minimum Diameter: Equal to cabinet unit heater connection size.
 3. Two-Piece, Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
 4. Calibrated-Orifice Balancing Valves: Bronze body, ball type, 125-psig (860-kPa) working pressure, 250 deg F (121 deg C) maximum operating temperature; with calibrated orifice or venture, connection for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.
 5. Automatic Flow-Control Valve: Brass or ferrous-metal body, 300-psig (2068-kPa) working pressure at 250 deg F (121 deg C), with removable, corrosion-resistant, tamperproof, self-cleaning, piston-spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig (13.8 to 552 kPa).
 6. Y-Pattern, Hot-Water Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig (860-kPa) minimum working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 (DN 15) threaded pipe and full-port ball valve in strainer drain connection.
 7. Wrought-Copper Unions: ASME B16.22.
- I. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

Retain paragraph above and delete paragraph and subparagraphs below if controls are part of overall temperature-control system.

- J. Basic Unit Controls:
1. Control voltage transformer.
 2. Wall-mounting thermostat with the following features.
 - a. Heat-off switch.
 - b. Fan on-auto switch.
 - c. Manual fan speed switch.

- d. Adjustable deadband.
 - e. Concealed set point.
 - f. Concealed indication.
 - g. Deg F (Deg C) indication.
3. Wall-mounting temperature sensor.
 4. Unoccupied period override push button.
 5. Data entry and access port.
 - a. Input data includes room temperature, and occupied and unoccupied periods.
 - b. Output data includes room temperature, supply-air temperature, entering-water temperature, operating mode, and status.

Retain first paragraph and subparagraphs below and coordinate with "Basic Unit Controls" Paragraph and subparagraphs above or with control devices specified in Division 23 Section "Instrumentation and Control for HVAC."

K. DDC Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied Period Override: Two hours.
3. Unit Supply-Air Fan Operations:
 - a. Occupied Periods: Fan runs continuously.
 - b. Unoccupied Periods: Fan cycles to maintain setback room temperature.
4. Heating Coil Operations:
 - a. Occupied Periods: Modulate control valve to provide heating if room temperature falls below thermostat set point.
 - b. Unoccupied Periods: Start fan and modulate control valve if room temperature falls below setback temperature.

Retain first subparagraph and associated subparagraphs below for automatic outdoor-air intake damper. LEED Prerequisite IEQ 1 requires compliance with ASHRAE 62.1 and Prerequisite EA 2 requires compliance with ASHRAE/IESNA 90.1.

5. Outdoor-Air Damper Operation:
 - a. Occupied Periods: Open dampers. Delay damper opening if room temperature is more than three degrees below set point.
 - b. Unoccupied Periods: Close damper.
6. Controller shall have volatile-memory backup.

L. BAS Interface Requirements:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at central workstation.

3. Interface shall be BAC-net compatible for central BAS workstation and include the following functions:
 - a. Adjust set points.
 - b. Cabinet unit heater start, stop, and operating status.
 - c. Data inquiry, including outdoor-air damper position, supply-air and room-air temperature.
 - d. Occupied and unoccupied schedules.
- M. Electrical Connection: Factory wire motors and controls for a single field connection.

2.2 PROPELLER UNIT HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Airtherm; a Mestek Company.
 2. Daikin McQuay.
 3. Trane.
 4. Vulcan.
 5. Sterling Hydronic Products
 6. ZehnderRittling
- B. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.

Retain paragraph below for explosion-proof electric unit heaters.

- C. Comply with UL 823.
- D. Cabinet: Removable panels for maintenance access to controls.
- E. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.

Retain first paragraph below to comply with LEED-NC Prerequisite EQ 1.

- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- G. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.
- H. General Coil Requirements: Test and rate propeller unit heater coils according to ASHRAE 33.

Retain one of first two paragraphs below.

- I. Hot-Water Coil: Copper tube, minimum 0.025-inch (0.635-mm) wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig (1380 kPa) and a maximum entering-water temperature

of 325 deg F (163 deg C), with manual air vent. Test for leaks to 350 psig (2413 kPa) underwater.

- J. Steam Coil: Copper tube, minimum 0.025-inch (0.635-mm) wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 75 psig (520 kPa).

- K. 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 Division 23 Section "Common Motor Requirements for HVAC Equipment." If different characteristics are required, add paragraphs below to suit Project.

- L. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

- 1. Motor Type: Permanently lubricated.

Delete first paragraph below if controls are part of control system specified in Division 23 Section "Instrumentation and Control for HVAC." See Evaluations for discussion on control schemes and energy efficiency.

- M. Control Devices:

- 1. Wall-mounting, fan-speed switch.
 - 2. Wall-mounting thermostat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Retain first paragraph below for vertical, wall-mounting cabinet unit heaters with wall boxes and outdoor-air intake louvers.

- A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."
- B. Install cabinet unit heaters to comply with NFPA 90A.

- C. Install propeller unit heaters level and plumb.
- D. Suspend cabinet unit heaters from structure with elastomeric hangers. Vibration isolators are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- E. Suspend propeller unit heaters from structure with all-thread hanger rods and spring hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- F. Install wall-mounting 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.
- G. Install new filters in each cabinet unit heater within two weeks of Substantial Completion.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. Comply with safety requirements in UL 1995.

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

- E. 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 unit heater. Hydronic specialties are specified in Division 23 Section "Hydronic Piping."

Retain first paragraph below for steam unit heaters.

- F. 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 unit heater. Steam specialties are specified in Division 23 Section "Steam and Condensate Heating Piping."
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238239