

SECTION 23 82 00
TERMINAL HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Air Moving and Conditioning Association (AMCA): 300, Reverberant Room Method for Sound Testing of Fans.
2. American Gas Association (AGA).
3. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): 90.1 IP/SI, Energy Standard for Buildings, Except Low-Rise Residential Buildings.
4. ASTM International (ASTM):
 - a. A106/A106M, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
 - b. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
5. Canadian Gas Association (CGA).
6. Electrical Test Laboratories (ETL).
7. National Electrical Manufacturer's Association (NEMA).
8. National Fire Protection Association (NFPA):
 - a. 54, National Fuel Gas Code.
 - b. 70, National Electrical Code (NEC).
 - c. 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
9. Sheet Metal and Air Conditioning Contractors' National Assoc., Inc. (SMACNA): Ducted Electric Heat Guide for Air Handling Systems.
10. UL: Product Directories.

1.02 ABBREVIATIONS

A. The following is a list of abbreviations which may be used in this section:

1. AC: Alternating Current.
2. dB: Decibel.
3. DWDI: Double Width, Double Inlet.
4. FRP: Fiberglass Reinforced Plastic.
5. hp: Horsepower.
6. ODP: Open Drip Proof.
7. PSC: Permanent Split Capacitor.
8. SWSI: Single Width, Single Inlet.

9. TEFC: Totally Enclosed, Fan Cooled.
10. UV: Ultraviolet.
11. XP: Explosion Proof.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
2. Complete specifications, descriptive drawings, catalog cuts, and descriptive literature which shall include make, model, dimensions, weight of equipment, and electrical schematics for products specified.
3. Manufacturer's standard finish color selection for cabinet finishes.
4. Performance data, including sound power level data (reference 10 power watts to minus 12 power watts) at design operating point, shall be based on AMCA 300.
5. Factory dip-applied protective coating product data.

B. Informational Submittals:

1. Manufacturer's test reports for the following:
 - a. Electric duct heater.
2. Recommended procedures for protection and handling of equipment and materials prior to installation.
3. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data. Include as-built version of equipment schedules.

1.04 QUALITY ASSURANCE

- #### A. Heating Equipment: Minimum operating efficiencies, specified in ASHRAE 90.1.

PART 2 PRODUCTS

2.01 EQUIPMENT

- #### A. Equipment Schedules: Refer to Article Supplements.

2.02 UNIT HEATER, ELECTRIC, SUSPENDED

A. Manufacturers and Products:

1. Indeeco: Type UHIR.
2. Or equal.

B. Physical Characteristics:

1. Factory assembled including casing, heater elements, fan wheel, drive assembly, motor, controls and accessories.
2. UL listed.
3. Meet requirements of National Electrical Code.
4. Casing:
 - a. Heavy gauge steel casing.
 - b. Baked enamel finish.
 - c. Individual adjustable discharge louvers.
 - d. Protective air inlet louvers or fan guards.
5. Heating elements shall be one of the following types:
 - a. Aluminum finned, copper clad, steel sheath.
 - b. High mass, all steel tubular finned type, copper brazed, in fixed element banks.
 - c. Nickel-chromium wire elements enclosed in powder filled aluminum coated steel tubes with permanently fused fins.
 - d. Steel tubes with nickel chromium resistance wire embedded in a dielectric with steel fins crimped and brazed to the tube.
 - e. Corrosion-resistant steel fins brazed to tubular heating elements.
6. Fan and Motor:
 - a. Totally enclosed motor.
 - b. Direct drive fan.
 - c. Sealed bearings. Permanently lubricated.
7. Controls: Controls, transformers, and contactors shall be factory assembled, except wall mounted thermostats when indicated.

C. Functional Characteristics:

1. Three phase heaters shall have balanced phases.
2. Controls: Thermal overload protection with automatic reset.

D. Performance Characteristics: None.

E. Accessories and Features: Provide as scheduled in Equipment Schedule.

2.03 DUCT HEATER, ELECTRIC, OPEN COIL

A. Manufacturers and Products:

1. Indeeco; Type QUA.
2. Or equal.

B. Physical Characteristics:

1. Electric-resistance blast type open coil, duct mounted.
2. UL or ETL listed.

3. Arranged in accordance with NFPA 70.
4. Heaters with more than one stage shall have each stage cover the full-face area of the coil.
5. Coils:
 - a. Open coils of high-grade wire insulated by ceramic insulators in aluminized steel brackets.
 - b. Coils supported in flanged aluminized steel frames.
 - c. Stainless steel terminal bolts, nuts, and washers.

C. Functional Characteristics:

1. UL listed for minimum 100,000 cycles of operation.
2. Controls and Safeties:
 - a. Integral airflow safety switch.
 - b. Protective screen on upstream side of coil.
 - c. UL listed integral manually resettable or replaceable secondary and automatically resettable primary thermal overload cutouts.
 - d. Clearly marked and matched line terminals with attached wiring diagram.
 - e. Integral fuse blocks with fusing in each leg of each power circuit.
 - f. Built-in disconnect switches for control and power wiring.
 - g. Magnetic contactors with 24-volt holding coils, factory prewired to terminal strips for line and control connections.
 - h. End mounted control cabinet.
 - i. SCR controls for 0 percent to 100 percent modulation.

D. Performance Characteristics: None.

2.04 BASEBOARD HEATER

A. Manufacturers:

1. Indeeco Model 903U.
2. Or equal.

B. Physical Characteristics:

1. 22-gauge steel body with 20-gauge front panel and welded junction box. Removable front panel to access heater element and terminal box.
2. Built in wireway with factory installed wiring.
3. Nickel chromium heating element wire, enclosed in a stainless steel sheath. Aluminum fins bonded to the sheath.
4. Automatic reset thermal overheat protection to run the length of the heater and turns off the unit in the event of overheating. The overtemperature protection will automatically reset after the unit cools down.
5. Color: White.

6. Flush mounting to the floor.
7. Built-in factory thermostat.

C. Functional Characteristics:

1. Electrical: 208-volt, single-phase with factory disconnect switch.
Maximum 275 watts/ft power density.

D. Performance Characteristics: None.

2.05 ELECTRICAL

A. General:

1. Units shall include high and low voltage terminal block connections.
2. Control voltage to indoor unit fan shall be 24 volts.
3. Motor Starters/Contactors: Factory installed with unitary equipment, unless otherwise noted.
4. Disconnects: Factory installed nonfused disconnects or circuit breakers on each unit, unless otherwise noted.

B. Motors:

1. Physical Characteristics: None.
2. Functional Characteristics:
 - a. Refer to Section 26 20 00, Low-Voltage AC Induction Motors, for general requirements.
 - b. Unless otherwise stated, electric motors shall comply with the following:
 - 1) Voltage, Phase, Horsepower, Synchronous Speed: Refer to Equipment Schedule for motor driven equipment.
 - 2) Enclosure: ODP.
 - 3) Torque Characteristics: Sufficient to accelerate driven loads satisfactorily.
 - 4) Winding Thermal Protection: Manufacturer's standard.
 - 5) Space Heater: Manufacturer's standard.
 - 6) Multispeed Motors, Synchronous Speed, Number of Windings: Manufacturer's standard.
 - 7) Efficiency: Minimum efficiency per Section 26 20 00, Low-Voltage AC Induction Motors.
3. Performance Characteristics: None.

2.06 ACCESSORIES

A. Physical Characteristics:

1. Equipment Identification Plates: Furnish 16-gauge stainless steel identification plate securely mounted on each separate equipment component in a readily visible location. Plate shall bear 3/8-inch high engraved block type black enamel filled equipment identification number as specified and as shown.
2. Lifting Lugs: Furnish suitably attached for equipment assemblies and components weighing over 100 pounds.

B. Functional Characteristics: None.

C. Performance Characteristics: None.

2.07 SOURCE QUALITY CONTROL

A. Functional Test:

1. Perform manufacturer's standard factory test on equipment.
2. Equipment with Electric Resistance Heating Coils: Test with 2,000-volt dielectric test.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install in strict compliance with manufacturer's instructions. Maintain clearances around unit as listed in manufacturer's recommendations.

B. Electric Unit Heaters, All Types:

1. Bottom of unit shall be a minimum of 8 feet above finish floor.
2. Heater shall be permanently mounted in position indicated with a fixed power supply.
3. Install so obstructions do not block heater air inlet or outlet.

C. Duct Heater, Electric:

1. Install in accordance with NFPA 70 and NFPA 90A, and SMACNA "Ducted Electric Heat Guide for Air Handling Systems."
2. Do not locate heaters closer than 4 feet from an elbow, takeoff, or balancing damper.
3. Install unit with control cabinet mounted on side of duct, unless heater is specifically designed for other mounting.

3.02 SUPPLEMENTS

A. The supplements listed below, following “End of Section,” are a part of this specification:

1. Unit Heaters.
2. Baseboard Unit Heaters.
3. Duct Heaters.

END OF SECTION

