

SECTION 23 55 13.20 – ELECTRIC DUCT HEATERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 23 01 00, "Mechanical General Provisions", govern this Section.

1.2 SUMMARY

- Perform all Work required to provide and install the electric duct heaters indicated by the Contract Documents with supplementary items necessary for proper installation.
- Refer to Division 26 sections for the following Work:
 - Power supply wiring from power source to power connection on electric duct heater. Include, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
 - Interlock wiring between electrically-operated duct heater and field-installed control devices.
 - Interlock wiring specified as factory-installed in work of this section.
- Provide the following as Work of this Section, complying with requirements of Division 26 Sections:
 - Control wiring between field-installed controls, indicating devices, and electric duct heater control panels.

1.3 REFERENCE STANDARDS

- All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - National Fire Protection Association (NFPA) 70
 - National Electrical Code
 - ANSI/UL 1996 - Electric Duct Heaters

1.4 QUALITY ASSURANCE

- Manufacturer's Qualifications: Firms engaged in manufacture of electric duct heaters, of types and sizes required.
- Codes and Standards:
 - Heater shall be UL approved for zero clearance to combustible surfaces and have a UL/ cUL label.
 - Provide electrical components for electric duct heaters, which have been listed and labeled by UL.

1.5 SUBMITTALS

- Product Data:
 - Submit manufacturer's data for duct heaters showing dimensions, capacities, ratings, performance characteristics, electrical and control wiring, gages and finishes of materials, and installation instructions.
 - Submittal data shall consist of drawings showing coil dimensions, construction materials, watt density, ratings and performance including pressure drops on airside
- Wiring Diagrams:
 - Furnish a separate, complete wiring diagram for each heater.
 - Diagram shall include recommended supply wire gauges per NEC, and fuse sizes.
 - Typical wiring diagrams are not acceptable.
 - Each heater shall be complete with clearly marked power and control terminals.
- Control Box:
 - Verify control panel size, door swing and duct size with contractor supplied ductwork shop drawings prior to submittal, and ordering heaters.

- Verify electrical characteristics and control requirements prior to order.
- Record Documents:
 - Manufacturers wiring diagrams detailing electrical connection to duct heaters for wiring for power, signal, and control systems, differentiating clearly between manufacturer-installed wiring and field-installed wiring.

1.6 DELIVERY, STORAGE, AND HANDLING

- Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.
- Accept products at the Project Site in factory-fabricated protective containers or coverings, with factory-installed shipping skids. Inspect for damage.
- Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- Check and maintain equipment on a monthly basis to ensure that equipment is being stored in accordance with manufacturer's recommended practices. Storage records shall be maintained that indicate these requirements have been met.

PART 2 - PRODUCTS

2.1 GENERAL

- Duct heaters shall be open coil heaters.
 - Voltage, size, wattage, control type and control voltage shall be as scheduled on the drawings.
 - Manufacturer shall be capable of furnishing [single-phase] [three-phase] heaters. Refer to mechanical schedules.
 - Heaters shall be UL listed for zero clearance and meet all applicable requirements of the NEC.
 - Electric duct heaters shall be independently powered.
- Type: Heaters shall be of the [slip-in] [flanged] mount type for duct mounting.
- Duct heaters shall be for indoor use only.
- Heating Elements: Open coil of resistance wire, [60 percent nickel, 20 percent chromium, and 20 percent iron] [80 percent nickel and 20 percent chromium] supported and insulated by floating ceramic bushings. Heating element support structure shall consist of galvanized steel wire formed and constructed to support ceramic bushings through which the heating element passes.
- All heating elements shall be made of nickel/chromium resistance wire with ends terminated by means of staking and heliarc welding to machine screws.
- Coil Layout: [Vertical (air flow horizontal)] [Horizontal (air flow vertical)]. Heater shall be capable of being installed where airflow in ductwork is vertical through the heater. [EH series is only approved for vertical up airflow.] [Vertical up and down airflow available in EK series.]
- Casing Assembly: [Slip-in type] [Flanged type], galvanized-steel frame
- Coil terminals shall be [nickel] [stainless steel] plated, terminal insulators and bracket bushings shall be of ceramic and securely positioned.
- Control Box: Control cabinet shall have a solid cover also of heavy gauge galvanized steel and held in place with hinges and interlocking disconnect switch.
- Orientation: Heaters shall be interchangeable for mounting in a horizontal or vertical duct.
- [Heaters up to 60 kW shall be capable of being rotated 180°F.]
- Built-in components shall include disconnecting break magnetic contactors, transformer with primary fusing, pressure-type airflow switch set at 0.05" \pm 0.02" WC all as required by UL, branch circuit fuses per NEC, interlocking disconnect switch and a single terminal block to accept the number, type and size of conductors as required.
- Over-Temperature Protection:
 - Serviceable through electric duct heater without removing heater from duct or unit.
 - Disk-type, automatic reset, thermal-cutout safety devices for primary over-temperature protection.
 - Secondary over-temperature protection by built in disc type manually resettable thermal cutouts. These devices must function independently of one another and are not acceptable if series connected in the control circuit wiring.
 - All duct heaters will require either a fan interlock circuit or an airflow switch. The airflow switch shall be diaphragm operated differential pressure switch to prevent duct heater from operating when there is no air flow.

- A disconnecting magnetic control circuit is required.
- [Over-current protection by means of factory-installed fusing within the control cabinet shall be provided. Heating elements shall be subdivided and fused accordingly.]
- All wiring, component sizing, component spacing and protective devices within the control cabinet shall be factory installed and comply with NEC and UL standards.
- Control Panel: Mounted on unit, with means of a safety disconnect and overcurrent protection. Include the following controls:
 - Magnetic contactor.
 - [Single-stage] [Two-stage] [Four-stage] [duct thermostat for the control of the heater.] [Silicon Controlled Rectifier (SCR) that shall be capable of accepting 0-10Vdc or 4-20mA as control signal.] [electronic step control with room thermostat that shall be capable of providing 4-stage sequencing controls by converting analog input signal into discrete steps] using 4 to 20 ma or 1 to 10 Volt input signal.]
 - [Recessed Control Box that shall extend 1" beyond internally insulated duct. Only applicable for installing in internally insulated ducts with an insulation thickness of 1".]
 - [Dust tight control box via compression type gasket installed on control box flanges to seal door opening. Control box seams are filled to prevent dust intrusion.]
 - [Time delay relay]
 - [Pilot light to indicate the heater is energized]
 - [24V] [120V] control voltage
- A wiring diagram depicting layout and connections of electrical components within the control cabinet shall be affixed to the inside of the control cabinet cover.
- A rating plate label shall be affixed to the exterior of the control cabinet cover which states model number, serial number, volts, amps, phase, frequency, control volts, volt-amps and minimum airflow requirements.

2.2 MANUFACTURER

- The UL approved electric heater shall be manufactured by RenewAire.

PART 3 – EXECUTION

3.1 INSTALLATION

- Locate, orient, and connect ductwork per AMCA, ASHRAE, and SMACNA guidelines. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.
- Provide a structurally suitable support as necessary for all units. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- Perform all work required to provide and install the following electric duct heaters indicated by the contract documents with supplementary items necessary for proper installation.
- All installation shall be in accordance with manufacturer's published recommendations.
- Inspect areas and conditions under which heater units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- Do not operate electric heaters for any purpose until ductwork is clean of any possible debris.
- Maintain minimum working clearances around the heater electrical panel in accordance with NEC Article 110.
- Install duct heaters in metal ducts and casings constructed according to SMACNA "HVAC Duct Construction Standards".
- If applicable, anchor duct heaters in position using suitable supports.
- Connect duct heaters and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.
- After construction is completed, including painting, clean unit's exposed surfaces and vacuum clean electric duct heaters and inside of cabinets.
- Touch up scratches and marks from handling and placement of equipment with masking enamel to match manufacturer's color. Refer to Division 09 for site-applied finishes.