

Specifications for HEATING, VENTILATING AND AIR CONDITIONING

1.0 GENERAL REQUIREMENTS

- a. **General Conditions:** Refer to the General Conditions; all provisions of which apply to work under this section as if written in full herein.
- b. **Work Under This Section:** This section and the accompanying drawings cover furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the installation of a complete air conditioning and heating system.

2.0 ORDINANCES AND PERMITS

- a. The workmanship and materials covered by these specifications shall conform to all ordinances and regulations of the City, County, State and/or other authorities having jurisdiction.

3.0 EQUIPMENT, MATERIALS, BID BASIS

- a. Manufacturer's names & model numbers, as specified herein, are for the purpose of describing type, capacity, function and quality of equipment and materials to be used.
- b. Unless "or equal" is specifically stated, bids shall be based on equipment named in specifications or on drawings as "base" or "equal products".
- c. "Equal Product" and "or equal" items listed shall conform to specified base items and shall be substantially equal in weight, construction, and capacities.

4.0 SHOP DRAWINGS

- a. Within six weeks after award of the contract, Contractor shall submit five copies of shop drawings in brochure form for approval. Each brochure shall contain one copy of all shop drawings. Shop drawings shall be submitted simultaneously, and none will be checked until all have been submitted. Shop drawings shall include manufacturer's recommendations for installation.

- b. All literature shall clearly indicate the specified model number, dimension, arrangements, ratings and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.
- c. Should any equipment furnished by Contractor differ radically from base items indicated or specified herein, and which may require added cost to other trades, it shall be the Contractor's responsibility to assume the extra cost involved.
- d. Shop drawings shall be submitted for all major items of equipment, including grilles, registers, diffusers, fans, electric unit heaters, electric duct heaters, temperature controls, and A.C. units.

5.0 PAINTING

- a. Painting, except as otherwise specified, will be done under another section of these specifications, but Contractor shall leave all surfaces of work free of rust, dirt, and grease.
- b. Contractor shall touch-up to match original finish any equipment scratched in shipment or installation.
- c. Any ductwork visible through grilles, registers and diffusers shall be painted flat black. Provide one coat of rust-preventive primer on all new structural steel supports and new ferrous surfaces not galvanized.

6.0 ELECTRICAL WORK

- a. Except as otherwise specified or noted, electrical equipment shall be as specified herein.
- b. Motor controls, system controls, starters, pilot lights, push buttons, etc., shall be furnished by the Contractor complete as a part of the motor or apparatus which they operate. Electrical equipment shall be wired for the voltage shown on the electrical plans.
- c. Motors shall be standard NEMA continuous-duty type. Each motor shall have ample capacity to drive the equipment to which it is connected at its full load capacity without loading the motor beyond its nameplate ratings, and shall have overload protection.
- d. Starters shall be Allen-Bradley as specified herein. Starters for motors 1/3 HP and smaller shall be manual AB Bulletin 600; for 1/2

HP and larger, magnetic AB Bulletin 709. Starters for motors with remote or automatic control shall be magnetic. Relays, interlocks, and auxiliary contacts, shall be provided as specified and required.

- e. Motor controls shall be either "Hand-Off-Auto" switches AB Bulletin 800 or "On-Off" push buttons with one indicating light, AB Bulletin 800. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.
- f. Motor starters not an integral part of equipment shall be installed as specified under the Electrical Section. Fusible disconnects shall be provided as specified under the Electrical Section.
- g. Electrical power wiring to fused disconnects, starters, motors and similar devices shall be provided as specified under the Electrical Section.
- h. Contractor shall provide all system controls, line and low voltage control and interlock wiring, and conduits, in accordance with materials and installation requirements of the Electrical Section.
- i. All starters and control devices, other than those located in Mechanical Rooms, Electrical Closets, and Storage Rooms, shall be flush-mounted type.
- j. Wiring diagrams shall be furnished by the Contractor.
- k. Equal products of Westinghouse, General Electric, Square D, Cuttler-Hammer, Furnas or Clark will be acceptable.

NFPA-90A shall mean the 1969 edition "Installation of Air Conditioning and Ventilating Systems" as published by the National Fire Protection Association.

7.0 FLEXIBLE CONNECTIONS

- a. Provide flexible duct connection to all air handling units. Flexible connections shall be 20 oz. Neoprene-coated glass fabric, Neoflex as manufactured by Cain Manufacturing, Inc. Flexible connections shall not be less than 6" long and shall have metal collar frame at each end. Allow at least 1" slack in fabric to eliminate vibration transmission.
- b. Equal Product - Ventglass.

8.0 INSULATION

- a. All drain piping and fittings shall be insulated with 1/2" thick Owens Corning O-C Flexible Tubing foamed plastic insulation. Insulation butt joints shall be sealed with OC-500 adhesive. Where slipon is not possible, the insulation shall be slit and applied to the pipe with longitudinal seams and butt joints sealed with OC-500 adhesive. All exposed pipe insulation shall be finished with two coats of rubber-based finish.
- b. Supply and return air ducts for a distance of 10 ft. from roof-top unit shall be lined with 3/4" thick Owens Corning 2 lb. density duct liner with Neoprene spray coat. Duct liner shall be applied by adhering the liner in a continuous piece to clean, flat metal sheets with a rubber-based adhesive and forming the liner with the metal through the brake. Coated side of duct liner shall face the airstream. All exposed edges shall be pointed and coated with adhesive. Ducts over 18" in width or depth shall have the liner additionally secured with stud welding pins and clips. Metal clips shall be spaced on not over 12" centers each way. The ductwork dimensions indicated are clear inside dimensions. Increase duct sizes to accommodate duct liner. Where ducts are lined, other type of insulation will not be required.

9.0 LOW VELOCITY DUCT SYSTEM

- a. **General:** This section covers low velocity metal ductwork casings, housings, and related items. All ductwork shall be fabricated as shown in the drawings.
- b. **Extractors:** Provide Series EX88A Extractor for each supply register and diffuser. Extractor shall be adjustable through grille or side of duct.
- c. **Equal products:** Carnes, Tuttle & Bailey, BarberColman, Titus, Metal-Aire, Airguide, Grillemaster.

10.0 DRAIN PIPING SYSTEM

- a. Provide all drain piping and fittings from equipment as indicated.
- b. Provide drain piping system for A.C. units, beginning at unit drip pans and extending to termination at indirect connection to plumbing system.

- c. Drain piping shall be Type "1" copper pipe with wrought copper fittings. Each drain shall be trapped.

11.0 GRILLES, REGISTERS, DIFFUSERS, ETC.

- a. **Provide grilles, registers and diffusers** as manufactured by Krueger Manufacturing Company. Refer to Architectural Section for type of ceiling.
- b. **Ceiling Supply Diffusers (Square):** Series 1100, perforated face, with opposed blade volume control, Baked white enamel finish.
- c. **Ceiling Exhaust Registers:** Series EGC-5, 1/2" x 1/2" egg crate aluminum core and opposed blade volume control.
- d. **Transfer Grilles:** Series 1190, perforated face, core only. Baked white enamel finish.
- e. **Door Grilles:** Series 77-C (core only) of sizes as indicated, frame to duct door construction. Coordinate with doors. Furnish for installation under General Construction Work.

12.0 FANS

- a. Provide fans of types, sizes, and capacities as indicated and specified.
- b. Capacities, RPM, motor sizes, and tip speed shall be substantially equal to those indicated and specified. Fan brake horsepower shall not exceed the specified by more than 5%.
- c. Fans, motors, drives and controls exposed to weather shall be weatherproof construction. Roof-mounted fans shall have disconnect switches, and all fans 16" in diameter and over shall have firestats.
- d. Fans shall be complete with guards, bird screens, and automatic shutters as indicated and required.
- e. Equal products as applicable: Acme, Alladin, American-Standard, Buffalo, Davidson, Penn, Hurricane, Trane, Westinghouse, Greenheck, Ammerman, Exitaire, Breidert, Cook, Jenn-Air.

13.0 ELECTRIC UNIT HEATERS

- a. Unless otherwise indicated, provide electric unit heaters as manufactured by Chromalox of sizes, capacities, and models indicated.
- b. Wall type unit heaters shall be Model RSF UL approved heavy duty complete with heating element, fan, wall box, automatic thermostatic control, safety switch and 16 gauge louvered grille with color as selected.
- c. Suspended type unit heaters shall be UL approved and complete with heating element, fan, housing, safety switch, adjustable discharge louvers, hanger bracket. Unit shall be provided with "On-Off" switch.
- d. Equal product: Electromode.

14.0 ELECTRIC DUCT HEATERS

- a. Provide, as indicated and specified, Electric Heaters, Inc. electric heaters of the heating capacities shown. Heaters shall be listed by Underwriters Laboratories, Inc. and shall bear the appropriate UL Label.
- b. All frame members, terminal box covers, splice boxes, and similar associated sheet metal parts shall be of heavy gauge, die formed steel with integral corrosion resisting coating. Assembly into a rigid structure shall be by means of spot welding or threaded fastenings. Heaters shall be flange mounted. Provide access door in duct. Unit shall be accessible for servicing.
- c. Heating banks shall be composed of individually wire-wound heating elements having highest quality alloy coiled resistors. Each element shall have a ceramic insulator. Heating banks shall be connected for either single phase or 3-phase operation. Provide control transformer where control voltage exceeds 277 volts.
- d. Each heater shall be equipped with a UL listed automatic reset snap-action limit control designed to protect the equipment from overheating from any cause. (Provide a McDonnell-Miller Air Flow Switch).
- e. Each step shall have fused overcurrent protection, factory mounted contactors, and manual reset thermal cut-out. All fuse blocks, contactors, terminal strips, and control power transformers shall be

factory mounted and wired in an 18 gauge steel ventilated enclosure with hinged cover. Wiring diagram and UL Label shall be affixed to inside of cover. Maximum of 40 amps per step.

- f. Equal products: ESI, Indeeco, Chromalox, Brasch.

15.0 ROOF TOP A.C. UNITS

- a. Units shall be York Type "SA" of size and capacity as indicated. Units shall be constructed of 18 gauge minimum casing, zinc plated and finished with rust resistant baked enamel. Units shall be weatherized for outdoor installation. Units shall have structural mounting curb. Provide flexible duct connections to unit.
- b. Compressor section shall be hermetic with internally protected motor, crankcase heater, oil failure switch, transformer, motor starters, contactors, Freon drier, external spring isolators, suction and discharge stop valves with 1/4" SAE service connection. Compressor shall have 5-year warranty. Condenser fan motor shall be direct drive, permanently lubricated, permanent-split-capacitor motor with thermal overload protection. Unit shall have low ambient control to 30#.
- c. Compressor shall have locked rotor protection, over- and under-voltage protection, and high-low pressure cut-out with auto reset.
- d. Evaporator section shall have resiliently mounted, permanently lubricated, induction type motor with variable pitch "V" belt drive. Provide throw-away filters in filter box and frame, insulated drain pan, thermal expansion valve, liquid line strainer. Compartment shall have 3/4" thick insulation. Provide firestat in return and supply.
- e. Unit shall be equipped with provision for minimum outside air intake.
- f. Unit shall be complete with all controls, relays, room thermostat with guard, a single Paragon Model 7210 time clock, interval timer, etc.
- g. Equal products: Trane, Carrier, Lennox and American Standard.

16.0 SPLIT SYSTEM COOLING UNIT

- a. Provide split system cooling unit as manufactured by York of type, size, capacity, and arrangement indicated and specified herein.

- b. Condensing unit shall be complete including cabinet, hermetic compressor, non-ferrous condenser coil with guard, condenser fan and motor, refrigerant reservoir or receiver, charging valve, controls, Freon 22 holding charge, heavy duty permanently lubricated motors with built-in thermal overload protection, locked rotor, over and under voltage protection, high pressure cut-out with auto-reset, motor starters and contactors, compressor protection, cut-out with auto reset, crankcase heater, transformer, Freon drier, vibration isolation, and other required components. Casings shall be constructed of zinc coated steel, double phosphatized, and finished with baked enamel for positive weatherproof protection. Units shall be fitted with mounting rails and a galvanized steel coil guard. Removable panels shall provide access to all components from one side of the unit. Drain holes shall be provided in all units for elimination of rain. Provide head pressure control for low ambient operation down to 30#. Compressor shall have 5 year warranty.
- c. Air handling evaporator unit shall be complete including cabinet, electric heating coil, non-ferrous DE Cooling Coil, centrifugal fans, adjustable V-belt drives, permanently lubricated 1800 RPM motors with thermal overload protection, 1/2" thick high velocity type filters, expansion valves, solenoid valves, Freon 22 holding charge, insulated galvanized drain pan, and other required components. Casings shall be constructed of heavy gage steel, phosphatized or zinc coated to prevent corrosion and be finished with baked enamel and insulated with permanent, fireproof glass fiber material.
- d. Equal product: Trane, Carrier, Lennox.
- e. Provide all controls, thermostat with guard and automatic summer-winter change-over.