

SECTION 15970

HVAC CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Thermostats, temperature transmitters, controllers, automatic valves, dampers, damper operators, pneumatic/electric switches, electric/pneumatic switches, control panels, compressed air system, accessory control equipment, and a complete system of air piping to provide the specified sequence of operation with the Energy Management system as shown in Construction Documents.
2. Control System shall employ electronic sensing and pneumatic actuation on all proportional, proportional integral, or 2 position control routines required by the sequence of operation or as specified.

B. Related Sections:

1. 13810 - Energy Management System.
2. 15510 - Piping (HVAC).
3. 15515 - Valves, Hangers, and Specialties.
4. 15985 - Point Schedule.
5. 16120 - Wire and Cable.
6. 16155 - Motor Power and Control Wiring.

1.02 SUBMITTALS

- A. Control System: Temperature control and wiring diagrams and sequence of operations. Furnish sets of wiring diagrams to electrical contractor for wiring as provided in Division 16.
- B. Control System Components: Catalog cuts.
- C. Valves, Dampers, and Operators: Catalog cuts, performance data, schedules showing proposed installation location, sizes, and capacities.
- D. System warranty.

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- E. Contract Closeout Submittals: After completion of control system installation, control system manufacturer shall furnish 4 sets of operating and maintenance instructions, including complete control system "as-built" diagrams.

1.03 MAINTENANCE

- A. The Board shall be fully instructed in the operation and maintenance of the environmental control system before substantial completion or beneficial occupancy of the project by the Board.
- B. Automatic temperature control manufacturer shall furnish a service contract for the system as specified, for 1 year after substantial completion of system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Control Systems:
  - 1. Andover.
  - 2. Barber Coleman.
  - 3. Carrier.
  - 4. Honeywell, Inc.
  - 5. Johnson Corp.
  - 6. Landis Gyr/Steafa.
  - 7. Robert Shaw/Seibe.
  - 8. Trane.

2.02 EQUIPMENT

- A. Pneumatic Actuated Valves:
  - 1. Proportioning automatic valves shall have a plug and disc inner valve to insure modulation of flow.
  - 2. Valve operators shall have power to insure tight seating against the specified working pressures.
  - 3. Valves 2" and smaller shall have screwed connections and valves 2-1/2" and larger shall be flanged.
  - 4. Valves shall have self-sealing packing, arranged to tighten the seal as the water pressure increases, to eliminate manual adjustments.
- B. Damper Operators:

1. Damper operators shall be of the molded rubber diaphragm piston type and shall be fully proportioning unless otherwise specified.
2. Operators shall have ample power to overcome friction of damper linkages and air pressure acting on the louvers.
3. The damper operator mounting arrangement shall be outside the air stream wherever possible.
4. The operator shall be capable of operating at varying rates of speed to correspond to the controllers and variable load requirements.
  - a. The operators shall be capable of operating in sequence when required by the sequence of operation.
  - b. The operator shall have external adjustable stops to limit the stroke in either direction.
  - c. The operator linkage arrangement shall allow for normally open or normally closed positions of the dampers as required.

C. Air Compressor:

1. Furnish and install a duplex high pressure (70-80 psi) air compressor assembly as indicated.
  - a. Compressors shall be complete with ASME storage tank, pressure switches, oil filter, (dual) pressure reducing valves, relief valve, belt guards, and motors.
  - b. Provide refrigerated after-cooler, automatic drain traps, and drain connections made to drain traps.
  - c. Provide air intake filters and mufflers at air intakes.
  - d. Provide an automatic alternator to allow continuous alternation of air compressors' operation.
  - e. Provide system relief valve. Each air compressor of the duplex unit shall be selected on 1/3 run time, 2/3 off time.
  - f. Compressor assembly shall be installed on a 6" high concrete pad with neoprene and cork isolators under each support leaf.
2. Air compressor and after cooler shall be sized to handle the entire building exclusive of HVAC systems that are part of tenant work.

D. Pneumatic Air Tubing:

1. Tubing in mechanical equipment rooms shall be hard drawn copper or polyethylene installed in EMT.
  - a. Single runs from the air compressors to control panels and to controllers shall be hard drawn copper.
  - b. Multiple runs to panels and controllers shall be polyethylene installed in EMT.
2. Inaccessible tubing outside mechanical rooms shall be polyethylene installed in EMT.
  - a. Tubing shall be installed above the ceilings or shall be concealed in the walls.
  - b. Junctions and splices shall be made in junction boxes.
  - c. Hard drawn copper tubing shall be installed using tool made fittings constructed of brass or copper with solder type joints.
  - d. Tubing and EMT shall be installed at right angles or parallel to the building structure.
    - 1) Tubing and EMT shall be securely fastened to the building structure and equipment using brackets or fasteners.
    - 2) Tubing and EMT shall be supported from equipment, piping, or ductwork.
    - 3) Copper tubing shall be directly attached to ferrous or galvanized metals.
    - 4) Where copper tubing is supported by ferrous supports, the copper shall be wrapped with plastic tape to isolate the two materials.

E. Dampers:

1. Control dampers shall be substantially built in steel frames fabricated from 2 inch channels or equal.
  - a. Frames shall be equipped with brass trunnions and bearings and blade end stops.
  - b. Damper blades shall be galvanized steel, maximum blade width shall be 6 inches.
  - c. Furnish corner braces for all damper frames exceeding a 4 square foot area.

- d. Maximum width of any section shall be 48 inches and maximum height shall be 96 inches.
      - e. Furnish horizontal stiffening for any section exceeding 48 inches in height.
    - 2. Where low leakage or shutoff dampers are indicated, provide replaceable butyl rubber seals with the damper.
      - a. Install seals along each blade and end stops.
      - b. Seals shall provide a tight closing low leakage damper.
      - c. Leakage and flow characteristic charts must be submitted to A/E before approval of dampers.
      - d. Outdoor air and exhaust air shall be the low leakage type as specified.
    - 3. Modulating dampers shall be opposed blade operation type and 2 position dampers shall be parallel blade type. Smoke dampers shall meet NFPA 90A requirements.
  - F. Differential Pressure Switches shall be diaphragm actuated type with a single pole double throw snap acting switch.
    - 1. Motion of the diaphragm shall be restrained by a calibrated spring that can be adjusted to set the exact pressure differential to actuate the electrical switch.
    - 2. Motion of the diaphragm shall be transmitted to the switch button by means of a direct mechanical linkage.
  - G. Local Control Panels:
    - 1. Controllers, relays, switches, etc., for equipment located within the mechanical equipment rooms shall be mounted next to the system controlled.
      - a. Temperature setting, adjustments, and calibration shall be made at the system control panel.
      - b. Panel shall be extruded alloy with a baked prime coat enamel finish.
    - 2. Provide LED digital thermometers on the local panels. Temperature indications shall be provided for each point of temperature measurement for control and additionally for those points as outlined in this specification or shown on Construction Documents.
    - 3. Details of each panel shall be submitted for approval before fabrication.

- a. Locations of each panel are to be convenient for adjustment and service.
  - b. Provide engraved nameplates beneath each panel mounted control device and air gage clearly describing the function of said device and range of operation.
  - c. Manual switches, dial thermometers, and indicating air gages shall be flush mounted on the hinged door.
4. Electrical devices within the panels shall be factory prewired to a numbered terminal strip. Wiring within the panel shall be according to NEMA and UL standards and shall meet local codes.

H. Room Thermostats:

- 1. Room thermostats shall be of the 2 pipe, non-bleed or relay type design.
  - a. Thermostats shall be fully proportional with adjustable throttling range and tamper-proof locking settings.
  - b. Thermostats shall be single or dual temperature, direct acting, or reverse acting as detailed in the sequence of operation.
  - c. Thermostats shall be provided with concealing adjustments and metal cover with a satin chrome finish.
- 2. Single temperature thermostats shall be 2 pipe type with adjustable throttling range and lockable, but adjustable, range stops. They shall have gage plugs for accuracy of calibration and observation.

I. Temperature Elements: RTDs that provide rapid linear responses using a precision nickel wire wound element. No thermistors will be acceptable. Configuration will be available for mounting in:

- 1. Room.
- 2. Duct.
- 3. Well (Chilled Water and Condenser Water).

J. Flow Switches: Equivalent to FG1KB able to detect flow on refrigeration and heating systems. It shall provide a SPDT

contact for liquid flow sensing. Paddles shall accommodate pipe diameters up to 10 inches.

K. Electro-Pneumatic Transducers:

1. The transducer shall allow 12 volt D.C. binary output signals to position pneumatic damper and valve actuators.
  - a. Transducers shall be capable of being mounted either remotely or in place of the pilot positioner on some actuators.
  - b. The single transducer shall be used if 2 position control of the actuator is required.
  - c. The dual transducer shall be used to extend, retract, or hold the actuator at any position.
2. The EPT shall be used to convert electrical signals to pressure change in high precision applications. The polarity of the drive motor shall determine motor direction. A feedback potentiometer shall be employed to indicate the position of the motor cam.

L. High Limit Safety Thermostats shall be electric high temperature thermostats with bimetal sensing element with at least 10 inches insertion length. Thermostats shall be 2 position manual reset type.

M. Miscellaneous Devices: Provide necessary relays, cumulators, 3-way air valves, positioners, pneumatic/electric switches, solenoid valves, switches, relays, clocks, transformers, and other appurtenances to make a complete and operable system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Sequence of Operation:

1. Sequence of operation shall be as indicated in Construction Documents.
2. Where motors are shown on the electrical drawings to be provided with Hand-Off-Auto switch in starter, automatic or remote control devices shall be connected

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in "auto" position. Any safety device, such as firestats or smoke detector, shall be connected in "hand" and "auto" position.

3.02 FIELD QUALITY CONTROL

- A. After completion of installation, Building Automation System manufacturer shall regulate and adjust thermostats control valve actuators, damper actuators, and additional equipment provided under this contract. Place components in operating condition subject to approval of A/E and supply any service incidental to proper performance of temperature control system under guarantee outlined above.
- B. Control Air Supply: Test line at 30 psi for leaks.
- C. Maintain test pressure within 1 psi for 14 hours without pumping. Supply pressure to building systems is 15 psi.

END OF SECTION