

SECTION 15840 - AIR TERMINAL BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Single duct terminal units.
- B. Exhaust and return terminal units.
- C. Variable volume.
- D. Constant volume.
- E. Constant volume laboratory/hood exhaust valves.
- F. Integral heating coils.
 - 1. Hot water.
- G. Integral Sound attenuator.
- H. Integral terminal unit controls.
 - 1. Direct digital.
 - a. By ATC

1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. UL 1995, Heating and Cooling Equipment.
- D. CUL C22.2 No. 236, Heating and Cooling Equipment.
- E. ARI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals
- F. ASTM A 653/A653M (Steel Sheet, Zinc Coated Galvanized).
- G. A-A-1419 or F-F-310 Federal specification (filter element, Air conditioning, Viscous-impingement or Dry type, replaceable), Tested per UL 900.

1.5 SUBMITTALS

- A. See Section 15050 and General Conditions for additional requirements.
- B. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.
- C. Submit product performance data indicating design air flow, minimum static pressure drop, fan operating condition.
- D. Submit sound power and noise criteria (NC) values for radiated and discharge paths.
- E. Submit installation, operation and maintenance documentation.

1.6 QUALIFICATIONS

- A. Manufacturer: The company manufacturing the products specified in this section shall have a minimum of ten years experience producing products of this type.

1.7 SYSTEM RESPONSIBILITY

- A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the listed acceptable manufacturers.

1.8 WARRANTY

- A. Provide manufacturer's parts warranty for one year from unit start-up.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Acceptable manufacturers contingent on compliance with the specifications:
1. Enviro-Tec
 2. Anemostat
 3. Metal Industries
 4. Krueger
 5. Nailor
 6. Titus
 7. Tuttle & Bailey
 8. Air Monitors
 9. Phoenix
- B. Provide variable volume (VV), constant volume (CV) and variable/constant volume (VCV) supply and/or return/exhaust type air terminals, with operating characteristics and other requirements so as to comply with schedules and details on the drawings and as hereinafter specified. The physical sizes of units shall not be larger than the scheduled units.
- C. Manufacturer shall participate in the ARI Certification program. Unit performance data shall be rated in accordance with ARI Standard 880. The manufacturer shall display the ARI Symbol on all units.
- D. Terminal units shall be UL listed as an entire assembly.
- E. All terminals shall be "Hospital Grade" and shall be equipped with a foil reinforced faced sheet covering of the acoustical/thermal lining. Additionally, for cleaning purposes, the terminals shall have integral gasketed access doors securely attached to the box upstream of the heating coil. The HVAC Contractor shall provide a duct mounted access door immediately downstream of the coil to allow for cleaning.
1. INSULATION - Foil Faced - The interior surface of unit casing is acoustically and thermally lined with a minimum of 1/2 inch, 2.0 lb./cu. ft. density glass fiber with foil facing. The insulation R-Value shall be a minimum of 2.2. The interior foil liner shall isolate the fiberglass insulation from the airstream and allow for cleaning of the terminal unit interior surfaces. Insulation shall meet NFPA-90A, UL 181 and bacteriological standard ASTM C 665.
- F. Unit performance shall be determined in strict accordance with ARI 880 (latest Edition) in an ARI certified laboratory. Acoustical data presented shall be for true reverberant room sound power in bands 2 thru 7. Any NC calculation application effects shall be clearly stated.
- G. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory-set air flow, minimum factory-set air flow, and coil type.

- H. All boxes with heating coils shall be provided with an access door for inspection and cleaning of coil.

2.2 SINGLE-DUCT TERMINAL UNITS

- A. Provide air terminal units (boxes) of the single duct type, with integral hot water heating coils and sound attenuators, as scheduled and shown on the drawings. Units shall be similar to Enviro-Tec Model SDR -SA-WC or Model SSDII -SA-WC
- B. Terminal casings shall be constructed of a minimum 22 gauge sheet metal casing and insulation as specified herein and a minimum 20 gauge for damper assembly construction.
- C. Terminal shall be mechanically assembled and sealed for an airtight casing allowing a maximum air leakage of 0.5% at 3" w.g. Interior walls of the terminal casing shall be lined with 1/2" minimum dual density fiberglass insulation with 4 lbs./cu.ft. skin outer layer, rated for a maximum air velocity of 4500 fpm. Insulation and/or liner must meet all requirements of UL 723, ASTM C665 Bacteriological Standards, UL 723 Flamespread, ASTM 84 Flamespread, and NFPA 90A. Raw edges exposed to the airstream shall be secured with a metal edging for isolation. All terminals shall have the insulation faced with an internal liner foil reinforced Kraft facing (FRK), "Hospital Grade". All exposed foil lining edges must be wrapped, tucked and secured with metal brackets. For supply boxes, provide 3'-0" long factory installed sound attenuators with foil liner at the discharge of all supply air terminals between the terminal damper and the air diffusers/registers. For return boxes, provide 3'-0" long factory sound attenuator at the inlet of air terminals between the terminal damper and the return registers/grilles. Sound attenuators shall be a 1-piece construction using the same materials as box specification.
- D. Valve assembly shall be manufactured of a minimum 22 gauge air valve body to handle high pressure and a minimum 16 gauge composite damper blade, with key attached to a solid shaft. The shaft shall have a position indicator marked on the end to verify damper position. Two (2) galvanized damper blades shall sandwich closed cell foam gasket material to ensure minimum valve leakage. Damper leakage shall not exceed 2% of unit maximum rated capacity with inlet pressure up to 6" w.g. Damper shall pivot in nylon self-lubricating bearings and shall remain unaffected by temperature and humidity. The valve assembly shall have built-in maximum heavy gauge mechanical stops to prevent over-stroking of the damper.
- E. Primary Air Pressure Sensor
 - 1. The primary air valve shall include a differential pressure type sensor upstream of the damper blade. The sensor shall traverse the inlet collar (for total pressure) along (2) axis. A minimum of (12) sensing points shall be utilized. Each sensing point shall be centered within equal concentric cross-sectional areas for accuracy. The sensor shall be designed to average the pressure signals by utilizing a center averaging pressure chamber. Each of the pressure sensing points shall be connected to this chamber. The average signal of these pressures shall pass to the control device signal through a single port located on the center averaging chamber. Brass balancing taps and airflow calibration charts shall be provided for field measurements.

The sensor shall be designed to provide an amplified differential pressure signal a minimum 2.5 times the equivalent velocity pressure signal for the same capacity as measured with a conventional pitot tube. Documentation shall be submitted which substantiates this requirement.

- F. All constant and variable/constant volume supply terminals shall be equipped with hot water heating coils.
 - 1. Coils shall be furnished by the terminal manufacturer as a complete assembly, with capacities and other characteristics as scheduled on the drawings.
 - 2. Coils shall be enclosed in a sheet metal casing to match the size of the terminal.
 - 3. Coils shall be connected to the terminal with slip and drive connections to allow for coil removal.
 - 4. Terminals with water coils shall have access doors upstream of the coil for cleaning access. Coils shall have left- or right-hand connections to suit job conditions, and shall be 2-row to meet heating requirements.
 - 5. Coils shall have aluminum plate fins (maximum of 10 fpi), and shall be tested with 400 psig hydrostatic pressure (underwater). All coils shall be performance certified in accordance with ARI 410 (latest Edition).

2.3 SINGLE DUCT RETURN OR EXHAUST BOX

- A. Similar to single duct terminal units except.
 - 1. Boxes shall be provided with a bellmouth at the inlet of the VAV sensing neck to minimize pressure drop.
 - 2. Designed with the sound attenuator on the inlet side.
 - 3. Boxes shall be provided without reheat coil.
 - 4. Airflow measuring probes shall be removable for cleaning or replacement.

2.4 SINGLE DUCT TERMINAL UNIT CONTROLS

- A. DDC Controls
 - 1. Terminal unit controls, transformers and actuators shall be DDC, furnished and shipped to the box manufacturer by the ATC Contractor. The ATC Contractor shall be responsible for all costs associated with shipping the controls to the terminal box manufacturing facility. Box damper actuators, transformers and controller shall be installed by the box manufacturer. The box manufacturer shall factory mount and wire the controller and actuator in accordance with the ATC Contractor's instructions. Controller installation costs shall be borne by the airflow terminal box manufacturer. Box manufacturer shall provide velocity inlet probe and NEMA control cover. **Note:** Controller and actuator specified in ATC.

2. The box manufacturer shall provide a label with the following caption; "maintain a minimum 16" clearance all around the box controller for servicing access." The label shall be mounted adjacent to the box controller and shall be a 10" x 10" fluorescent tag with 3/4" high black letter.

2.5 VARIABLE VOLUME AIRFLOW CONTROL TERMINAL (CUSTOM RETURN AIR BOXES)

- A. Provide variable volume airflow control units consisting of a multi-point, symmetrical averaging pitot tube traverse station with built-in processing section and electric operated opposed-blade volume damper. Designation on the drawings is variable volume return (VVR) unit. The ATC Subcontractor shall furnish, install and wire the controller and normally open electric actuator onto the custom return air boxes. The HVAC Contractor shall be responsible for all costs associated with shipping the terminal boxes to the ATC Contractor's facility for installation of the controls. The ATC Contractor shall be responsible for all costs associated with shipping the terminal box complete with all controls to the project site after installation of controls. Terminal box installation by the HVAC Contractor.
- B. Each VVR unit shall be fabricated of a minimum 20 gauge galvanized or thicker steel casing in a rectangular configuration and equivalent size approximating that of the duct in which it is to be mounted, sized as scheduled on the drawings. Each unit shall be complete with air equalizer total and static pressure sensors with symmetrical averaging manifold, electric operated, opposed-blade volume damper, and fittings for controller.
- C. The maximum allowable pressure loss through the units shall not exceed 0.25" w.c. at 2000 fpm. The sound level within the duct shall not be increased more than 5 dB at an airflow rate of 2500 fpm. Maximum airflow for an individual unit shall be 5000 cfm.
- D. The VVR units shall be VOLU-trol, DAD, as manufactured by Air Monitor Corp., or approved equal.
- E. Control of the unit shall be provided by the ATC Contractor, including the controller and electric damper actuator.

2.6 LABORATORY & HOOD EXHAUST AIR VALVES

- A. The airflow control device shall be a venturi valve equal to the Phoenix Controls Accell II model.
- B. The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.

- C. The airflow control device shall maintain accuracy within $\pm 5\%$ of signal over an airflow turndown range of no less than 15 to 1.
- D. Minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.
- E. The airflow control device shall be constructed as follows:
 - 1. Room/Lab General Exhaust: The airflow control device shall be constructed of 16 gauge aluminum. The device's shaft and shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of aluminum. The pressure independent springs shall be spring-grade stainless steel. All shaft bearing surfaces shall be made of a Teflon, or polyester, or PPS (polyphenylene sulfide) composite.
 - a. Sound attenuating devices used in conjunction with general exhaust airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. Refer to project schedule for compliance of external sound attenuator devices.
 - 2. Fume Hoods/Bio-safety Cabinets: The airflow control device shall have baked-on corrosion resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal mounting link shall be made of 316 stainless steel. The pressure independent springs shall be a spring grade stainless steel. The internal nuts, bolts and rivets shall be stainless steel. All shaft bearing surfaces shall be made of Teflon or PPS (polyphenylene sulfide) composite.
- F. For two-position or VAV operation, an electric actuator shall be factory mounted to the valve. Loss of control power shall cause normally open valves to fail to maximum position, and normally closed valves to fail to minimum position. Electric actuators that fail in last position are not acceptable when used in fume hood control applications.
 - 1. A UL 916 listed electronic actuator shall be factory mounted to the valve. Loss of main power shall cause the valve to position itself in an appropriate failsafe state for the application. Options for these failsafe states include: normally open maximum position, normally closed minimum position, or last position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The air terminal boxes shall be installed in accordance with manufacturer recommendations, Contract Drawings and reviewed submittals.

- B. The inlet duct size shall be as noted on the plans and/or the schedule. Air terminal boxes shall be connected to the sheet metal per requirements found herein under "Sheet Metal Work" Section.
- C. Terminal boxes shall be installed with adequate service space to access the controller side of the unit and the reheat coil control valve.
- D. Provide an access door in ductwork downstream of heating coil in addition to access door on unit upstream of coil. Label all access doors in accordance with labels specified under "Sheet Metal Installation" Section.
- E. Support each box adequately and independently without blocking access doors, control instrument access, or any other required access.

END OF SECTION