

SECTION 15930
VARIABLE AIR VOLUME TERMINAL UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The other Contract Documents complement the requirements of this Section. The General requirements apply to the work of this Section.

1.2 SCOPE

- A. Provide material, equipment, labor and supervision necessary to install Variable Air Volume Terminal Units as required by the Drawings and this Section.

1.3 STANDARDS

- A. All lining materials shall meet the requirements of NFPA 90A, UL 181 and ASTM-C-655.
- B. Compliance with performance specified, including air pressure drop, flow and radiated/discharge sound power levels, shall be verified by manufacturers published certified data derived from tests conforming to ARI 880.
- C. All electrical components shall be listed by Underwriters Laboratories.

1.4 QUALIFICATIONS

- A. Variable Air Volume Terminal Units by Trane, Envirotech, Aneomostat, Titus or Carrier. Arrangement, capacity, performance and type as scheduled and/or indicated on the Drawings and specified herein.
- B. Equipment shall be certified in accordance with ARI 880 for air and acoustical performance. All units shall meet or exceed specified acoustical parameters.

1.5 SUBMITTALS

- A. Submit product information on terminal units including physical dimensions, heaters, air performance, acoustical data, access/maintenance requirements, support locations, wiring diagrams and similar data.
- B. Provide certified sound performance data for each terminal unit (and silencers, if necessary) at the scheduled operating conditions with 1.5" of inlet static pressure (corrected for silencer pressure drop). Provide pressure drop data for each terminal unit at the scheduled conditions.

PART 2 EQUIPMENT

2.1 GENERAL

- A. Variable air volume terminal units shall be of size, capacity and style scheduled on the drawings.
 - 1. Casing shall be constructed of not less than welded 22-gauge galvanized steel. Leakage rate shall not exceed 4% of the design airflow at 3" water gauge.
 - 2. Interior surface of casing shall be acoustically and thermally lined with 1" thick, 1.0 lb/cu.ft. density glass fiber insulation, with Foil Facing. Insulation shall be UL listed, and meet NFPA 90A, UL 181 requirements and bacteriological standard ASTM-C-655.

3. Units shall be provided with a cylindrical, cast aluminum airflow control device or damper assembly with internal or external actuator. Verify control requirement with Control Subcontractor. Leak rate shall be 4 percent or less at 3.0' WG. Integral multi-point airflow taps and calibration chart shall be provided on unit. Flow taps shall have an accuracy of $\pm 5\%$ with 1.5 diameters of straight duct at the unit inlet. Air valves shall be normally open unless scheduled otherwise. If applicable the internal actuator and controller shall be provided with VAV unit.
4. VAV box terminal unit controls consisting of the volume control external (only) actuator and the microprocessor based volume controller shall be provided by the Owner's Authorized Control Representative. The control representative will ship control components and a typical wiring diagram to the terminal box manufacturer for factory installation (field installation is not acceptable). The components will be identified by the control representative for each box. The terminal box manufacturer shall factory mount the components on the terminal box and complete all interconnecting wiring between the controller, actuator, and electrical heater to allow for a single point power connection to the terminal box disconnect. The control circuit shall be fused. The terminal box manufacturer is solely responsible for proper integration of owner furnished control components and the terminal box operation.
5. Provide with electric heaters as specified in schedule. Heaters shall be factory provided and wired, UL listed, resistance open-type element of nickel-chromium. Provide with airflow switch, disc-type automatic thermal primary safety device, and manual reset thermal secondary device. Provide with ceramic insulators, interlocking door handle disconnect, and magnetic contractors. Electric heaters shall be listed for use with a circuit breaker protection.
6. VAV boxes that do not have electric heat shall be provided with disconnect and transformer for control voltage circuit.
7. For units with internal actuators, provide a removable access panel in the bottom of each VAV unit for access to the actuator. Access doors shall be fully gasketed and specified casing leakage rates shall not be exceeded.
8. All VAV terminal box units shall meet the following levels of radiated and discharge noise without any credit for environmental adjustment, space effect, sound division, end reflection or similar elements external to the terminal box. Noise levels shall be measure at inlet static pressures of 1.5" W.G.
 - a. Radiated Noise

i) Octave Band	2	3	4	5	6	7
ii) Frequency	63	125	250	500	1000	2000
iii) dB	76	69	62	57	56	55
 - b. Discharge Noise

i) Octave Band	2	3	4	5	6	7
ii) Frequency	63	125	250	500	1000	2000
iii) dB	70	65	61	75	71	66
 - c. A maximum variance of +1db is allowed in each octave band and 2db in any octave band.
 - d. At the Manufacturer's option a premanufactured duct type silencer may be mounted on the box discharge to obtain the discharge noise levels listed. Calculations, including the effect of silencer generated noise levels, shall be submitted indicating the net discharge noise levels and compliance with the above requirements. Performance for silencers shall be based upon independent testing performed in accordance with ASTM E477-84. Additional pressure drop associated with the silencer shall be added to the inlet static pressure requirements in determining discharge and radiated noise levels.

- e. Noise levels listed are for internally lined boxes without foil facing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components. Locate bottom of unit not more than 18" above finished ceilings. Design and installation work shall be coordinated to avoid location of VAV units above the ceiling mounted light fixtures. Support units individually from structure. Do not support from adjacent ductwork.
- C. Connect to ductwork using rigid duct at inlet and outlet. Provide a minimum of 5 straight duct diameters upstream of the terminal box inlet and a minimum of 10' of duct downstream of the terminal box prior to the first air device connection.
- D. Locate and install units to ensure that a minimum of 42" of unobstructed clearance is maintained at electric heater panels in accordance with NEC requirements. Advise other trades of encroachment violations and have offending items relocated or with the Engineers approval relocate terminal box to correct nonconforming conditions at no additional cost to the Owner.

3.2 TESTING

- A. Provide testing of units.
- B. Test run fan/motor combinations, volume dampers and controls. Check sequence of operation and airflow limits at factory prior to shipment, or in the field if factory testing is not possible.
- C. Base performance on tests conducted in accordance with ARI 880.
- D. Automatic flow controller shall be capable of maintaining airflow to within 5% of set point with inlet static pressure variations up to 4" WG.
- E. Field verify operation and response of each terminal unit and electric heater with temperature sensors. Provide written verification that all terminal boxes are functioning properly and are installed in conformance with the contract documents, prior to start of Test and Balance.
- F. The terminal box manufacturer shall correct all malfunctioning terminal boxes. Where Owner furnished control elements are suspected, the manufacturer shall demonstrate that factory installation, wiring, or system component compatibility is not the cause of operational difficulties.

END OF SECTION