SECTION 23.75.00
VARIABLE AIR VOLUME TERMINAL UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Variable Air Volume Terminal Units

1.02 REFERENCES
B. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.
C. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
E. UL 181 - Factory Made Air Ducts and Connectors.

1.03 QUALITY ASSURANCE
A. ISO 9001 Certification
B. Unit designed and tested in compliance with ARI 430 air delivery ratings per ARI 430.

1.04 SUBMITTALS
A. Submit unit performance data including: capacity, nominal and operating performance.
B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
D. Submit data on electrical requirements. Include safety and start-up instructions.

1.05 REGULATORY REQUIREMENTS
A. Units must be UL listed for Safety requirements and UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
B. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his expense provide for a field inspection by a UL/CUL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the Owner.
C. Manufacturers must participate in the ARI Certification program. Unit performance data must be rated in accordance with ARI Standard 440, and must display the ARI Symbol on all standard units. If a manufacturer does not participate in the ARI Certification program, specified equipment must be witnessed by the engineer to meet the criteria of the specification.
D. Conform to UL1995 for internal wiring of factory-wired equipment.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Comply with manufacturer’s installation instructions for rigging, unloading, and transporting units.
B. Units shall ship fully assembled. Units not shipped fully assembled shall have tags on each section to indicate location and orientation in direction of airflow. Each section shall have lifting points to allow for field rigging and final placement of section
C. Store in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

D. Deliver units to site with factory mounted piping package. If piping package is not factory installed, contractor shall be responsible for all expenses associated with installation, and leak testing the assembly.

1.07 START-UP AND OPERATING REQUIREMENTS
A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place.
B. Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, including filter replacement and unit lubrication schedule.

1.08 WARRANTY
A. The equipment purchaser shall be provided, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or eighteen (18) months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and have capacities and ratings set forth in the equipment manufacturer’s catalog and bulletins.

PART 2 - PRODUCTS

2.01 CONSTRUCTION
A. Terminals shall be constructed of not less than 22 gauge galvanized steel, able to withstand a 125 hour salt spray test per ASTM B-117. Stainless steel casings, or galvannealed steel casings with a baked enamel paint finish, may be used as an alternative. The terminal casing shall be mechanically assembled (spot-welded casings are not acceptable).
B. Casing shall be internally lined with 1/2” thick fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m. Maximum thermal conductivity shall be .24 (BTU • in) / (hr • ft² • °F). Insulation must meet all requirements of ASTM C1071 (including C665), UL 181 for erosion, and carry a 25/50 rating for flame spread/smoke developed per ASTM E-84, UL 723 and NFPA 90A. Raw insulation edges on the discharge of the unit must be covered with metal liner to eliminate flaking of insulation during field duct connections. Simple "buttering" of raw edges with an approved sealant is not acceptable. All appurtenances including control assemblies, control enclosures, hot water heating coils, and electric heating coils shall not extend beyond the top and bottom of the unit casing. At an inlet velocity of 2000 f.p.m., the static pressure drop across the basic terminal or basic terminal with a sound attenuator shall not exceed .08” W.G. for all unit sizes.

2.02 PRIMARY AIR VALVE
A. The primary air valve shall consist of a minimum 22 gauge cylindrical body that includes embossment rings for rigidity. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners. The shaft shall be manufactured of a low thermal conducting composite material, and include a molded damper position indicator visible from the exterior of the unit. The damper shall pivot in self lubricating bearings. The damper actuator shall be mounted on the exterior of the terminal for ease of service. The valve assembly shall include internal mechanical stops for both full open and closed positions. The damper blade seal shall be secured without use of adhesives. The air valve leakage shall not exceed 1% of maximum inlet rated airflow at 3” W.G. inlet pressure.

2.03 PRIMARY AIRFLOW SENSOR
A. For inlet diameters 6” or greater, the differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Cylindrically shaped inlets shall utilize the equal cross sectional area or log-linear traverse method. Single axis sensor shall not be acceptable for duct diameters 6” or larger. A minimum of 12 total pressure sensing points shall be utilized. The total
pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.03" w.g. at an air velocity of < 450 FPM. Documentation shall be submitted which substantiates this requirement. Balancing taps and airflow calibration charts shall be provided for field airflow measurements.

2.04 HOT WATER COIL
A. Single duct terminal shall include an integral hot water coil where indicated on the plans. The coil shall be manufactured by the terminal unit manufacturer and shall have a minimum 22 gauge galvanized sheet metal casing.
B. Stainless steel casings, or galvannealed steel casings with a baked enamel paint finish, may be used as an alternative. Coil to be constructed of pure aluminum fins with full fin collars maintaining accurate fin spacing and maximum tube contact. Fins shall be spaced with a minimum of 10 per inch and mechanically fixed to seamless copper tubes for maximum heat transfer.
C. Each coil shall be hydrostatically tested at a minimum of 450 PSIG under water, and rated for a maximum 300 PSIG working pressure at 200°F.

2.05 FOIL FACED INSULATION
A. Insulation shall be covered with scrim backed foil facing. All insulation edges shall be covered with foil or metal nosing. Insulation shall meet ASTM C1136 for mold, mildew, and humidity resistance.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
B. Verify that required utilities are available, in proper location, and ready for use.
C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install units as indicated. Coordinate to assure correct recess size for recessed units.
C. Protect units with protective covers during balance of construction.
D. Contractor is responsible for providing hydronic units with shut-off valve on supply and lockshield balancing valve on return piping, as well as float operated automatic air vents with stop valve.
E. Furnish copy of manufacturer's wiring diagram submittal. Verify that electrical wiring installation is in accordance with manufacturer's submittals and installation requirements of Electrical sections.

3.03 CLEANING
A. Clean work.
B. After construction is completed, including painting, clean exposed surfaces of units.
C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials available from manufacturer.

END OF SECTION