

## TERMINAL UNITS

### DESIGN GUIDELINES

1. General: This section includes the following air terminal units:
  - a. Single-duct
  - b. Dual-duct
  - c. Exhaust
2. Design
  - a. Terminal units shall be pressure independent.
  - b. For terminal units with reheat coils, duct and piping insulation shall be installed continuous on all exterior surfaces of reheat coils to prevent sweating when the reheat coil is not activated.
  - c. Design for a minimum of 3 duct diameters of straight duct upstream of the terminal units.
  - d. Ductwork shall be at least the same size as the terminal box inlet.
  - e. A maximum of 2'-6" of flex duct may be installed upstream of the straight duct into the terminal unit.
  - f. The duct upstream boxes shall not have more than one 90 degree fitting.
  - g. Factory installed access door to enable viewing of the damper(s) and inlet of the reheat coil face.
  - h. Internal liner shall be foil faced. Liner is not allowable on exhaust terminal units.
  - i. Following Terminal Units are DISCOURAGED:
    - Dual duct - where required, units shall be specified with mixing sections.
    - Fan-powered - where required:
      1. Provisions must be made to filter the plenum air intake.
      2. Direct drive fans are preferred over belt driven fans.
3. Piping at Terminal Units
  - a. Dielectric unions not acceptable. See piping guidelines for acceptable alternatives.
  - b. Pre-piped valve assemblies are acceptable.
  - c. Flexible pipe connections are acceptable.
4. Zoning
  - a. Zoning shall be determined on a project basis.
  - b. No more than (3) rooms to be zoned together.
  - c. Lab spaces shall have individual temperature control.
5. Service and Clearance
  - a. Terminal units shall be designed to facilitate maintenance.

- b. Design with a minimum of 24" of clearance from the building automation enclosure mounted on the side of the box.
  - c. Drawings shall indicate the location of the control enclosure and shall also illustrate that the clearance requirement be maintained.
  - d. Terminal Units shall be designed to be installed ~12" above the ceiling.
6. Building Automation
- a. Terminal units shall be controlled for a maximum leaving air temperature (LAT) of 95°F.
  - b. Provide DDC control on all terminal units.
  - c. Pneumatic controls shall not be acceptable.
  - d. Terminal Units shall have discharge air temperature sensor.
7. Related Sections
- a. Labeling
  - b. Piping and Valves – Hydronic.
  - c. DDC Controls
  - d. Air Handling Units
  - e. HVAC Fans – Laboratory
  - f. Motors

## EQUIPMENT AND PRODUCT MANUFACTURERS

1. Approved Manufacturers
  - a. Titus
  - b. Krueger
  - c. Tuttle and Bailey
2. Single-Duct Air Terminal Units
  - a. Configuration: Damper and flowmeter assembly inside unit casing with control components inside a protective metal shroud.
  - b. Casing: No less than 22 gauge welded, galvanized steel, single wall.
    - Casing Lining: Adhesive attached, 1-inch thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
      1. Cover liner with nonporous foil.
    - Air Inlet: Round stub connection for duct attachment.
    - Air Outlet: S-slip and drive connections.
    - Airflow Meter: Provide a multiple point averaging flow sensing ring with high and low pressure pneumatic tubes compatible with DOC velocity pressure sensor. A

calibration chart shall be mounted on each terminal unit. Flow sensor shall have fire resistant tubing connection static and total pressure sensor with brass tap for measurement and balancing. Rubber pressure taps are not allowable due to deterioration.

- Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.
- c. Damper Assembly: Heavy gauge steel blades with solid steel shaft, with nylon-fitted pivot points.
- d. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 10 fins per inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 140 deg F. The box hot water coil shall be sized for 140°F EWT even if the existing building design temperature is greater than this. The coils to be sized for this temperature to be able to heat properly when a future heat recovery chiller is added to the building plant.
- Coil shall be sized for a maximum water pressure drop of 5 feet of head.
- e. Valve packages by Nexus are allowable for connections at VAV boxes. All piping, valves and flexible piping shall be insulated.
- Any valve packages with flex hoses shall have piping supports at the hose and pipe connection so when hose is disconnected, piping remains supported and free of movement.
  - Flexible hose shall be insulated.
- f. Provide vent and drain at high and low point respectively. Coil shall be guaranteed to drain. Drain shall include a hose end connection.
- g. Maximum air pressure drop through the terminal unit shall be 0.4"wg

### 3. Dual-Duct Air Terminal Units

- a. Configuration: Two volume dampers inside unit casing with mixing section and control components inside a protective metal shroud.
- b. Casing: No less than 22 gauge welded, galvanized steel, single wall.
- Casing Lining: Adhesive attached, 1-inch thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
    1. Cover liner with nonporous foil.
  - Air Inlet: Round stub connection for duct attachment.
  - Air Outlet: S-slip and drive connections.
  - Airflow Meter: Provide a multiple point averaging flow sensing ring with high and low pressure pneumatic tubes compatible with DOC velocity pressure sensor on each terminal unit inlet. A calibration chart shall be mounted on each terminal unit.
  - Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.

- c. Damper Assembly: Heavy gauge steel blades with solid steel shaft, with nylon-fitted pivot points
  - Maximum Damper Leakage: ARI 880 rated, 3 percent of nominal airflow at 6.-inch w.g. inlet static pressure.

END OF SECTION