

SECTION 23 36 00 – AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
 - 2. UL 181 - Factory-Made Air Ducts and Connectors.
 - 3. ARI Standard 880 for Air Terminals.
 - 4. ANSI/ASHRAE Standard 130 – Methods of Testing for Rating Ducted Air Terminal Units.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Shop Drawings of product data indicating configuration, general assembly, access space required for service, and materials used in fabrication.
 - 2. Electronic or Printed Catalog performance ratings that indicate nominal inlet size, CFM, applicable static pressure at the inlet or discharge of terminal unit, and noise criteria with sound octave band and sound decibel test in accordance with ARI 880, for the insulation lining selected.
 - 3. Leakage curves indicating inlet static pressure and actual tested leakage rates shall be submitted for all non-standard or custom-built terminal units.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 MANUFACTURERS

- A. The same manufacturer shall provide all products supplied and/or installed under this Section.
- B. Manufacturers:
 - 1. Daikin.
 - 2. Enviro-Tec.

3. Metalaire.
4. Price.

2.3 GENERAL CONSTRUCTION

A. Casing:

1. Unit casing: Terminal unit casing shall be constructed of minimum 22 gage galvanized steel.
2. Insulation: Insulation shall meet the requirements of UL181 and NFPA-90A and shall not support bacterial or fungal growth. Edges and seams shall be sealed or "captured" using sheet metal, formed to hold the insulation. Insulation shall be neatly installed with no rough edges to interrupt the smooth flow of air through the unit. Casing shall be insulated throughout its interior.
 - a. For general use applications in supply and return air systems; Provide a minimum 1-inch thick, 1.5-lb/f³ density, closed cell, fiber-free insulation liner.
 - b. For wet, corrosive, or other applications such as outdoor air, exhaust air, mixed air, laboratories, natatoriums, showers, locker rooms, kitchens, etc.; Provide terminal unit casing of double-wall construction, internally insulated with a 1-inch thick, 1.9-pcf, glass fiber insulation to produce an R-value of 4.2 or greater. The interior liner shall be minimum 26-gauge metal of the type suitable for the application (galvanized steel, aluminum, stainless-steel, etc.).
 - c. Casing Leakage: Assembled units shall be constructed such that casing leakage does not exceed 1.0 percent of terminal unit rated airflow at 4 inches w.g. of inlet static pressure.

B. Damper:

1. Damper Leakage: Units shall be tested for inlet leakage with 4 inches w.g. static pressure imposed. The maximum percent leakage from all tests shall be reported. The following table provides the maximum allowable damper leakage for the various size diameter inlets at 4 inches w.g. differential pressure.

INLET DIAMETER (INCHES)	MAXIMUM ALLOWABLE CFM (AREA X 2000 FPM)	MAXIMUM ALLOWABLE CFM DAMPER LEAKAGE
6	393	6.0
8	698	11.0
10	1091	17.0
12	1571	20.0
14	2138	30.0

2. Flow Measurement: Airflow through the unit shall be accomplished by the use of a metal multi-port velocity pressure cross sensor or multi-axis flow ring devices with a minimum of four (4) radially distributed pick-up points connected to a center averaging chamber.

C. Access Plenum:

1. Single duct units with hot water coils shall be provided with one access section or plenum between the single duct terminal and the coil, and another access downstream of the coil, for coil inspection. Plenum construction shall be equal to the quality of materials and workmanship of the terminal unit.

2. Access plenum may also be used as a transition. Construct with a transition angle not to exceed 15 degrees.
3. Access plenum shall contain a minimum of a 12 inch diameter or 12 inch x 12 inch (or full unit width if less than 12 inches) access door as specified in Section 23 33 00.
4. Door frame may be bolted, screwed, or flanged and sealed to the casing. Door shall be gasketed and shall be doublewall construction or insulated similar to main casing. Door shall be held in place with latches or other captive retainer devices.

D. Hot Water Heating Coil:

1. Heating coils shall be installed on all terminal units without exception and regardless of area served. The heating coil shall be provided with modulating temperature controls. See *Section 23 82 16 – Heating and Cooling Coils* for specifications on coils.

E. Unit Controls:

1. General Performance: Flow stations, control transformers, disconnect switch, and controls enclosure shall be furnished, mounted and adjusted by the terminal unit manufacturer to assure their proper placement within the units. If DDC controls of another manufacturer (not the terminal unit manufacturer) are provided for the Project, the terminal unit manufacturer shall be responsible only for construction of the terminal unit and installation of internal control components installed at the manufacturer's factory and shall not be responsible for installation of controls not installed at the terminal unit manufacturer's factory, nor shall the manufacturer be responsible for the performance of the DDC controls. The performance of DDC controls in connection with terminal units shall be the responsibility of the BAS Provider.
2. Control Performance: Assemblies shall be able to be reset to any airflow between zero and the maximum CFM shown on Drawings. To allow for maximum future flexibility, it shall be necessary to make only simple screwdriver or keyboard adjustments to arrange each unit for any maximum airflow within the ranges for each inlet size as scheduled on the Drawings. The control devices shall be designed to maintain the desired flow regardless of inlet flow deflection.
3. Control Sequences: Terminal units shall be shipped from the manufacturer with all necessary control devices to accomplish each sequence, except as may be prohibited by the BAS Provider.

F. DDC Controls Protocol/Description:

1. BAS Provider will be responsible for providing all damper actuators, linkages, flow transducers, controllers, room temperature sensors, and any other devices required for unit control, except as specified below.
2. BAS Provider will be responsible for calibrating the actuator and its controller through TAB work for scheduled airflow rates. Units shall be capable of field calibration and readjustment with external gauge taps.
3. Unit manufacturer shall provide unit inlet flow sensor and pneumatic tubing for BAS Provider's use.
4. Unit manufacturer shall factory install all devices furnished by BAS Provider to result in a complete functioning unit. Unit manufacturer shall be responsible for reviewing compatibility of devices furnished by BAS Provider to units provided.

2.4 SINGLE DUCT VARIABLE OR CONSTANT VOLUME TERMINAL UNIT

- A. Pressure independent, single duct variable or constant air volume control assemblies with integral attenuator, of the sizes, capacities and configurations as scheduled on the Drawings.
- B. Unit pressure drop across the assembly with an equivalent 2000 fpm inlet velocity through the inlet shall not exceed 0.15 inches water gauge.
- C. Sound Ratings: All sound power levels shall be obtained from testing in accordance with ARI Standard 880.
- D. Fan powered terminal units are prohibited.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Provide clearance for inspection, repair, replacement, and service. Ensure accessibility to all terminal unit electrical control panel doors, controllers and operators are located a minimum of 30 inches from all obstructions (walls, pipe, etc.).
- D. Provide ceiling access doors or locate units above easily removable ceiling components.
- E. Install terminal units with a minimum of four (4) diameters of straight duct directly prior to the entry into each terminal unit connection.
- F. Support units individually from structure. Do not support from adjacent ductwork. Refer to Section 20 05 48 for terminal unit vibration isolation requirements. Spring isolated terminal units shall be supported using units hanger brackets and threaded rods.
- G. Connect to ductwork in accordance with Section 23 31 00.
- H. Install heating coils in accordance with Section 23 82 16.
- I. Wiring and controller compartments, electronic motors and damper motors shall have a minimum 24 inch clear wide and deep working space readily accessible from lift out ceiling tiles or access panels.

END OF SECTION **23** 36 00

This section of the *U of I Facilities Standards* establishes minimum requirements only.
It should not be used as a complete specification.