

SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
 - 1. Constant volume terminal units.
 - 2. Variable volume terminal units.
 - 3. Dual duct terminal units.
 - 4. Fan powered terminal units.
 - 5. Variable volume regulators.
 - 6. Integral sound attenuator.
 - 7. Integral heating coils.
 - 8. Integral damper motor operators.
 - 9. Integral controls.
- C. Related Sections:
 - 1. Division 01 Section "General Requirements."
 - 2. Division 01 Section "Special Procedures."
 - 3. Division 23 Section "Common Motor Requirements for HVAC Equipment".
 - 4. Division 23 Section "Hydronic Piping" for connections to heating coils.
 - 5. Division 23 Section "Hydronic Specialties" for connections to heating coils.
 - 6. Division 23 Section "Metal Ducts".
 - 7. Division 23 Section "Metal Ducts Fittings" for backdraft dampers.
 - 8. Division 23 Section "Air Outlets and Inlets".
 - 9. Division 23 Section "Instrumentation and Control Devices for HVAC" for thermostats and control components.
- D. Products Furnished But Not Installed Under This Section:
 - 1. Thermostats and control components.
- E. Products Installed But Not Furnished Under This Section:
 - 1. Owner furnished air terminal units (excess stock).

1.2 REFERENCES

- A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
 4. Refer to Division 23 Section "Common Results for HVAC" for codes and standards, and other general requirements.
- B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- C. UL 181 - Factory-Made Air Ducts and Connectors.
- D. ADC 1062 - Air Distribution and Control Device Test Code.

1.3 SUBMITTALS

- A. Submit under provisions of Division 23 Section "Common Results for HVAC, Review of Materials and Division 01 Section "General Requirements."
- B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.
- C. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation.
- D. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of one to 4 inch wg (250 to 1000 Pa).
- E. Submit manufacturer's installation instructions.
- F. Operation and Maintenance Data:
1. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.
 2. Include directions for resetting constant volume regulators.
- G. LEED Submittals:
1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

1.4 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. Mockup: Provide mockup of typical [exterior] building module.

1. If acceptable, mockup will demonstrate minimum standard for the Work. Mockup may [not] remain as part of the Work.

1.5 WARRANTY

- A. Provide one year manufacturer's warranty.
- B. Warranty: Include coverage of system powered control systems. operating controls. electric motors.

PRODUCTS

1.6 MANUFACTURERS

- A. Titus
- B. Price
- C. Kruger
- D. Substitutions: Under provisions of Division 01 Section "General Requirements."

1.7 MANUFACTURED UNITS

- A. Ceiling mounted variable air volume fan powered] supply air control terminals for connection to single medium pressure duct.
- B. Identify each airflow 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.

1.8 FABRICATION

- A. A. Casings: 0.034-inch steel.
- B. B. Lining: Minimum 1/2 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Line attenuator sections with 2 inch thick insulation.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Assembly: Air volume damper, fans, and controls in single cabinet.
- E. Plenum Air Inlets: Round stub connections for duct attachment.

- F. Mixing Sections: Multiple deflection baffles designed for mixing air with minimum pressure loss.

1.9 VOLUME DAMPER

- A. Locate air volume damper [and automatic flow control] assembly inside unit casing. Construct from extruded aluminum or 20 gage (0.9 mm) galvanized steel components. Key damper blades into shaft with nylon fitted pivot points.
- B. Automatic flow control assembly shall combine spring rates matched for each volume regulator size with machined dashpot for stable operation.
- C. Mount manually operated damper quadrant or automatic damper operator, and automatic flow control assembly externally[.] [or provide access doors.]
- D. Air volume control damper shall be factory calibrated assembly consisting of damper and damper shaft extension for connection to externally mounted control actuator.
- E. Externally mounted electric actuator shall position damper normally open as indicated.
- F. Provide self-contained system-air powered bellows section consisting of polypropylene bellows actuating pivot drive plate mechanically linked to extruded aluminum damper, with nylon fitted pivot points. Polypropylene material shall perform at temperatures of 0 to 140 degrees F and be impervious to moisture and fungus. Design bellows for 10 inches static pressure and factory check for leaks.

1.10 HEATING COILS

- A. Electric Heating Coil: Slip-in type, open coil design, factory wired and installed, and equipped with primary and secondary over-temperature protection, integral control box with built-in magnetic contactors, minimum airflow switches, and relays, UL listed.

1.11 FAN ASSEMBLY

- A. Forward curved centrifugal type fan with direct drive permanent split capacitor type, thermally protected motor. Refer to Division 23 Section "Common Motor Requirements for HVAC Equipment".
- B. Provide infinitely adjustable speed control with electric/pneumatic and electronic controls.
- C. Internally suspend and isolate fan/motor assembly from casing on rubber isolators.

1.12 WIRING

- A. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.

- B. Factory mount transformer for control voltage on electric and electronic control units. Provide terminal strip in control box for field wiring of thermostat and power source.
- C. Factory wire fan to terminal strip.
- D. Provide unfused disconnect.

1.13 CONTROLS

- A. Automatic Damper Operator:
 - 1. Operate: Air volume damper.
 - 2. Electric Actuator: 24 volt.
- B. Thermostat: Wall-mounted electric type with appropriate mounting hardware.
- C. System Powered Controls:
 - 1. Suitable for operation with duct pressures between 0.25 and 3.0 inches static pressure.
 - 2. Factory mounted and piped 5 micron filter, velocity resetting adjustable high limit control and amplifying relay.
 - 3. Aspiring wall mounted thermostats.
 - 4. Mount controls in sheet metal enclosure on unit.
 - 5. Provide morning warmup control to sense duct temperature and control unit at maximum airflow during heating mode.

1.14 FAN POWERED UNIT CONTROLS

- A. Electronic Controls: Contain in NEMA-1 enclosure with access panel sealed from air flow and mounted on side of unit. Factory mount controls [and thermostat] to accomplish the following specified sequence of operation.
- B. Electronic Control, Central System Fan "On" - Occupied Mode:
 - 1. When duct pressure is sensed indicating primary air system operating, thermostat and primary variable volume damper proportions air flow from central system.
 - 2. As thermostat senses reduced cooling demand, volume damper closes. At field adjustable point, unit fan is energized. As cooling demand continues to fall, volume damper closes and fan speed increases.
 - 3. If central duct system pressure varies, volume damper maintains constant primary air flow.
 - 4. As thermostat senses no cooling, control system closes volume damper. Before heating is initiated, control enters field adjustable no load band. On sensing need for heat, heating coil is energized proportionally.
- C. Electronic Control, Central System Fan "Off" - Unoccupied Mode:
 - 1. Provide field adjustable temperature setback. On need for heat, terminal unit fan and heating coil are energized.
 - 2. Hold volume damper closed.

1.15 TESTS

- A. Provide testing of units under provisions of Division 01 Section "General Requirements."
- B. Test run [fan/motor combinations,] volume dampers and controls. Check sequence of operation and air flow limits [corrected for project altitude] at factory prior to shipment.
- C. Base performance on tests conducted in accordance with ADC 1062.
- D. D. Automatic flow controller shall be capable of maintaining air flow to within 5 percent of set point with inlet static pressure variations up to 2 inches.
- E. Maximum Casing Leakage: 2 percent of design air flow at rated inlet static pressure.
- F. Maximum Damper Leakage: 2 percent of design air flow at one inch inlet static pressure.

EXECUTION

1.16 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components.
- C. Support units individually from structure. Do not support from adjacent ductwork.
- D. Connect to ductwork in accordance with Division 23 Section "Air Coils".
- E. Provide minimum of [feet of 1 inch 2 thick lined ductwork downstream of units.
- F. Install heating coils in accordance with Division 23 Section "Air Coils".

1.17 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 20 percent full flow. Set units with heating coils for minimum 50 percent full flow.

1.18 TERMINAL UNIT SCHEDULE

- A. Drawing Code:
 - 1. Location :
 - 2. Minimum/Maximum Minimum
 - 3. Coil Airflow:

4. Static Pressure:
5. Heat Output:
- B. Size:
- C. Air Flow Range:
 1. Minimum:
 2. Maximum:
- D. Sound Power dB
 1. @ 1.5 inch:
 2. Static Pressure:
- E. Radiated:
 1. 2nd Octave:
 2. 3rd Octave:
 3. 4th Octave:
 4. 5th Octave:
 5. 6th Octave:
 6. Noise Criterion:
- F. Discharge:
 1. 2nd Octave:
 2. 3rd Octave:
 3. 4th Octave:
 4. 5th Octave:
 5. 6th Octave:
 6. Noise Criterion:
- G. Coil at Minimum Air
 1. Heat Output:
 2. Entering Air Temp:
 3. Air Temp Rise:
 4. Number of Rows:
 5. Entering Water Temp:
 6. Leaving Water Temp:
 7. Electric Input:

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CDH Partners, Inc.
21077.00

Estoria Urgent Care Center
GHS-FD Q2025027
Atlanta, Georgia

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