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SECTION 23 36 00_AIR TERMINAL UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Constant/Variable volume supply terminal units.
2. Fan powered terminal units.
3. Supply and Exhaust valves.

B. Related Sections:

1. Section 23 05 00: Common Work for HVAC Systems
2. Section 23 05 01: Common Requirements for HVAC Systems
3. Section 23 05 53: Identification of HVAC Equipment and Piping
4. Section 23 05 93: Testing and Balancing of HVAC Systems
5. Section 23 30 00: Air Distribution Systems
6. NFPA 90A: (National Fire Protection Association) - Installation of Air Conditioning and Ventilation Systems
7. UL 181: (Underwriters Laboratories, Inc.) - Factory-Made Air Ducts and Connectors.
8. 23 35 00: Lab Ventilation

1.2 ENGINEERING DESIGN GUIDELINES

- A. Air terminal units shall be above corridors, no more than 12” directly above the suspended ceilings, with unobstructed access above and below the ceiling (includes furniture) for maintenance and removal. The size of the unobstructed access shall extend 6” around the bottom footprint of the unit or conform to the manufactures clearance recommendations, whichever is more stringent.
- B. DDC controlled boxes require a minimum of 36” in front of and the width of the controller or shall follow manufacturer service/removal clearance recommendations, whichever is more stringent
- C. Provide terminal air unit detail identifying clearances requirements, supports and any other pertinent information that may affect the installation of units and coordinate locations with Architect and other disciplines to ensure clearance requirements are accommodated.
- D. The reheat coil shall be sized to meet the temperature at maximum design flow and shall be 2-rows minimum.

- E. The air terminal unit assembly must have an UL or OSHA approved equivalent label. All mechanical, electrical and electronic devices that are used in the air terminal unit assembly must have an UL or OSHA approved equivalent label.

1.3 SUBMITTALS

- A. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include electrical characteristics and connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 inch to 4 inches wg.
- B. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.5 QUALITY ASSURANCE

- A. Test and rate air terminal units' performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 VARIABLE VOLUME AIR TERMINAL UNITS

- A. Acceptable Manufacturers:
 - 1. Carnes
 - 2. Krueger
 - 3. Metal Aire
 - 4. Nailor
 - 5. Price
 - 6. Titus Model

7. Tuttle & Bailey
- B. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.
- C. Basic Assembly:
 1. Casings: Casings shall be double wall.
 2. Insulation: Minimum 1-inch-thick closed cell insulation, meeting NFPA 90A requirements located between inner and outer casing walls.
- D. Basic Unit:
 1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 3 inches inlet static pressure.
 3. Mount damper operator to position damper normally open.
 4. Access Door: Provide an access door in VAV terminals that have heating coils.
- E. Hot Water Heating Coil:
 1. Construction: Minimum 1/2-inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
- F. Automatic Damper Operator:
 1. Electric Actuator: 24 volts with remote temperature read and reset capability.
 2. For laboratory applications see Section Lab Ventilation.

2.2 FAN POWERED VARIABLE VOLUME UNITS

- A. Manufacturers: Consult with the assigned Facilities Engineer before designing a fan powered VAV system
 1. Carnes
 2. Krueger
 3. Metal Aire
 4. Nailor
 5. Price
 6. Titus Model.
 7. Tuttle & Bailey

- B. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.
- C. Basic Assembly:
 - 1. Casings: Casing shall be double wall
 - 2. Lining: Minimum 1-inch-thick closed cell insulation, meeting NFPA 90A requirements located between inner and outer casing walls.
- D. Basic Unit:
 - 1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
 - 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 3 inches inlet static pressure. Damper shaft shall be minimum ½” diameter round.
 - 3. Mount damper operator to position damper normally open.
 - 4. Access Door: Provide an access door in VAV terminals that have heating coils.
- E. Automatic Damper Operator:
 - 1. Electric Actuator: 24 volts with remote temperature read and reset capability.
- F. Fan Assembly:
 - 1. Fan: Forward curved centrifugal type with direct drive permanent-split-capacitor type, thermally protected motor.
 - 2. Speed Control: Infinitely adjustable through BAS system
 - 3. Isolation: Fan/motor assembly on rubber isolators.
- G. Hot Water Heating Coil:
 - 1. Construction: Minimum 2 row, 1/2-inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
 - 2. See HVAC Design Guidelines for entering and leaving water temperatures.
- H. Wiring:
 - 1. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.
 - 2. Factory mount transformer for control voltage on electric and electronic control units. Furnish terminal strip in control box for field wiring of thermostat and power source.
 - 3. Wiring Terminations: Wire fan and controls to terminal strip. Furnish terminal lugs to match branch-circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box.

- 4. Disconnect Switch: Factory mount non-fused disconnect switch in control panel.
 - I. Controls: Electronic Controls: Contain in NEMA 250 Type 1 enclosure with access panel sealed from airflow and mounted on side of unit. Factory mount controls.
- 2.3 LABORATORY AIR EXHAUST VALVES & LABORATORY AIR SUPPLY VALVES
- A. Refer to Standard Laboratory Ventilation for laboratory supply and exhaust air valve requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify ductwork is ready for air terminal installation.

3.2 INSTALLATION

- A. Connect to ductwork in accordance with Standard Air Distribution Systems.
- B. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- C. Install air terminal units' level and plumb. Maintain sufficient clearance for routine service/maintenance and future replacement.
- D. Install ceiling access doors or locate units above easily removable ceiling components. If boxes have coils, install duct access doors downstream of same per Standard Air Distribution Systems.
- E. Support units individually from structure. No more than 12" above suspended ceilings and easy unobstructed access from floor when no ceiling finish is used. Comply with service/maintenance requirements indicated above in section 1.2A/B. Do not support from adjacent ductwork.
- F. Support air terminal units connected by flexible duct independently of flexible duct. Flexible duct shall be no more than 6 feet in length. Connect air terminal unit to flexible duct with stainless steel draw bands. Do not use flexible duct to make 90 degree turns. Rigid elbows shall be used to make 90 degree turns.
- G. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.
- H. Label each air terminal unit with nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Standard Identification of HVAC Equipment and Piping, for equipment labels and warning signs and labels.

3.3 STARTUP SERVICE

- A. Complete installation and startup check according to manufacturer's written instructions.
- B. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
- C. Verify that controls and control enclosure are accessible.
- D. Verify that control connections are complete.
- E. Verify that nameplate and identification tag are visible.
- F. Verify that controls respond to inputs as specified.

PART 4 END OF SECTION