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 SUMMARY

A. Section Includes:

1. Bypass, single-duct air terminal units.
2. Shutoff, single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 BYPASS, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carnes.
2. Carrier Corporation.
3. Titus.
4. Trane.

B. Configuration: Diverting-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch steel, single wall.
   1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric closed cell foam insulation complying with UL 181 erosion requirements, 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.
   2. Air Inlet: Round stub connection for duct attachment.
   3. Air Outlet: S-slip and drive connections.
   4. Access: Removable panels for access to diverting damper and other parts requiring service, adjustment, or maintenance; with airtight gasket.
   5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Diverter Assembly: Galvanized-steel gate, with polyethylene linear bearings Aluminum blade, with nylon-fitted pivot points.

E. Multioutlet Attenuator Section: With 6-inch, 8-inch, and 10-inch diameter collars, with locking butterfly balancing damper.


   1. Access door interlocked disconnect switch.
   2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
   3. Nickel chrome 80/20 heating elements.
   4. Airflow switch for proof of airflow.
   5. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
   7. Pneumatic-electric switches and relays.
   8. Magnetic contactor for each step of control (for three-phase coils).
G. Electric Controls: Damper actuator and thermostat.

1. Damper Actuator: 24 V, powered closed, powered open with microswitch to energize heating control circuit.
2. Thermostat: Duct-mounted electric type with temperature display in Fahrenheit, and space temperature set point.
3. Changeover Thermostat: Duct-mounted, field-adjustable, electric type reverses action of zone thermostat when air temperature reaches 70 deg F.

H. Electronic Controls: Bidirectional damper operator and microprocessor-based thermostat. Control devices shall be compatible with temperature controls specified in Section 15900 “Control and Instrumentation for HVAC” and shall have the following features:

1. Damper Actuator: 24 V, powered closed, powered open.
2. Thermostat: Wall-mounted electronic type with the following features:
   a. Temperature set-point display in Fahrenheit and Celsius.
   b. Auxiliary switch to energize heating control circuit.
   c. Changeover thermistor to reverse action.

2.4 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:

1. Anemostat Products; a Mestek Company.
2. Carnes.
3. Environmental Technologies, Inc.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Phoenix Controls Corporation.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch, single wall.

1. Casing Lining: Adhesive attached, 1-inch thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements, 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.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. **Airstream Surfaces**: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and M-DCPS Design Criteria.

D. **Regulator Assembly**: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. **Volume Damper**: Galvanized steel with peripheral gasket and self-lubricating bearings.
   1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.

   *Note to Specifier: Specify damper position as required for application. Unless required otherwise, damper shall be normally open.*

F. **Attenuator Section**: 0.034-inch (0.85-mm) steel sheet.
   1. Lining: Adhesive attached, 1-inch- thick, elastomeric, closed cell foam insulation complying with UL 181 erosion requirements, 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.
   2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1 and M-DCPS Design Criteria.

G. **Multioutlet Attenuator Section**: With 6-inch- (150-mm-) 8-inch- (200-mm-) 10-inch- (250-mm-) diameter collars, each with locking butterfly balancing damper.

H. **Electric-Resistance Heating Coils**: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware.
   1. Access door interlocked disconnect switch.
   2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable.)
   3. Nickel chrome 80/20 heating elements.
   4. Airflow switch for proof of airflow.
   5. Fan interlock contacts.
   6. Fuses in terminal box for overcurrent protection (for coils more than 48 A).
   7. Mercury contactors.
   8. Pneumatic-electric switches and relays.
   9. Magnetic contactor for each step of control (for three-phase coils).

I. **Electric Controls**: Damper actuator and thermostat.
   1. Damper Actuator: 24 V, powered closed, spring return open.
2. Thermostat: Duct-mounted electronic type with clock display, temperature display in Fahrenheit, and space temperature set point.

J. Direct Digital Controls: Single-package unitary controller and actuator specified in Section 15900 "Control and Instrumentation for HVAC" Direct Digital Controls: Bidirectional damper operators and microprocessor-based controller and room sensor. Control devices shall be compatible with temperature controls specified in Section 15900 "Control and Instrumentation for HVAC" and shall have the following features:

1. Damper Actuator: 24 V, powered closed, spring return open.
2. Terminal Unit Controller: Pressure-independent, variable-air-volume controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
   a. Occupied and unoccupied operating mode.
   b. Remote reset of airflow or temperature set points.
   c. Adjusting and monitoring with portable terminal.
   d. Communication with temperature-control system specified in Section 15900 "Control and Instrumentation for HVAC" Room Sensor: Duct mounted with temperature set-point adjustment and access for connection of portable operator terminal.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: [Galvanized steel complying with ASTM A 603] [Stainless steel complying with ASTM A 492].

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
C. Controlling thermostat shall be mounted on wall or temperature sensor behind return air grilled as shown on Plans.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

   1. Where practical, install concrete inserts before placing concrete.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Connect ducts to air terminal units according to M-DCPS Master Specifications Section 15890 – Ductwork.

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 15047 "Identification " for equipment labels.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

   1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.

   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Air terminal unit will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

   1. Complete installation and startup checks according to manufacturer’s written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION