

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART I - 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 referenced code or standard shall be applicable to this Project unless identified by a specific edition date.

1.3 SUBMITTALS

- A. Product Data
 - 1. Submit Manufacturer's technical product data and installation instructions for each: Inlet and Outlet component, blower, motor, flexible connection, all sealant and gasketing materials, products and accessories.
- B. Shop Drawings:
 - 1. Submit shop drawings of all Inlet and Outlet models for entire facility for approval prior to production. Do not release units for production prior to approval of shop drawings by the AE and Owner.

PART 2 - PRODUCTS

2.1 LOUVERS

- A. The General Contractor shall provide louvers.
- B. Blank-off panels on unused portion of louver shall be 2-inch thick insulated panels fabricated of minimum 22-gauge galvanized steel on both surfaces. Insulation shall be rigid type with minimum R-value of 10. Panels shall be reinforced with minimum 20 gauge steel stiffeners.

2.2 BIRD SCREENS

- A. Bird screens shall be color matched and installed to the exterior of louvers.
- B. Bird screens shall be provided by the General Contractor.

2.3 AIR MIXING DEVICES

- A. Acceptable Manufacturer: Blender Products, Inc or *[Note to AE: Include 2 additional Owner-approved manufacturers.]*
- B. Units shall be not less than .08-inch aluminum of all welded construction.
- C. Units shall be completely fixed devices capable of providing mixed air temperatures within 6 degrees F of theoretical values.

2.4 ELECTRIC MOTOR

- A. Unless otherwise stated here in *Section 23 33 00* and / or in the Drawings, see *Sections 26 60 00 – Common Motor Requirements* and *26 29 23 – Variable Frequency Drives* for additional criteria.
- B. Open drip-proof is acceptable except where specifically noted otherwise.
- C. Motors shall be designed for 1750 rpm and VFD or Inverter approved.

2.5 ULTRAVIOLET LIGHT

- A. *[Note to AE: Ultraviolet germicidal-irradiation (UVGI) technology that can reduce the transmission of various airborne bacteria may be deemed appropriate for certain applications. All potential applications shall be reviewed and designed in cooperation with F&S Engineering Services].*

2.6 PRESSURE CLASS

- A. VAV: For coordination purposes, unless otherwise indicated, the pressure class for VAV system ductwork upstream of the air terminal devices shall be equal to or greater than the static pressure at the fan outlet but not less than 4 inches w.g. for the discharge side ductwork.
- B. Constant Volume: For coordination purposes, unless otherwise indicated, pressure class for Constant Volume system ductwork shall be equal to the external static pressure (fan outlet or discharge pressure minus associated unit internal component pressure drop).

2.7 SUPPORT

- A. Accessories and associated components tied to ductwork shall be supported or suspended in like manner as the connected air handling ductwork.

2.8 GALVANIZED SHEET STEEL

- A. G90: First quality, lock former quality (LFQ), cold rolled, open hearth soft steel sheet capable of double seaming without fracture, ASTM A924 (formerly ASTM A525) or ASTM A653 (formerly ASTM A527). Galvanized coating shall be G90. G90 means the total amount of zinc on both sides is 0.90-oz/sq.ft. (0.45 oz/sq.ft per side).
- B. Painting: Use G90 Galvaneal or Zincgrip coating where painting is specified.

2.9 UNIT SEALANT AND GASKETING

- A. Sealant:
 - 1. UL Classified sealant as compounded specifically for sealing joint and seam in ductwork. Acceptable manufacturers are Hardcast, United McGill, Mon-Eco Industries or H.B. Fuller/Foster.
 - 2. Duct tapes are not allowed.
 - 3. Select sealant as recommended by manufacturer for specific application.
 - 4. Submit sealant manufacturer's data sheets including performance data, pressure ratings, surface burning characteristics data, and manufacturer's detailed installation instructions.
- B. Gaskets:
 - 1. Butyl or polymer based tape similar to Ductmate 440, Venfabrics Ventlok No. 797 or 799 in flanged joints.
 - 2. Gasket material shall be FDA or USDA approved.

2.10 ACOUSTICAL ENCLOSURE

- A. Enclosure: Inner layer shall be a 2 inch thick minimum layer of 3 psf glass or mineral fiber similar to type R insulation where specified in Division 23 for wall construction. Outer layer shall consist of 2 layers of 5/8 in. thick sheet rock with staggered seams, attached to sheet metal studs which are attached to structure not ductwork.

2.11 SILENCERS

- A. All silencer ratings shall be determined in accordance with the ASTM E-477-99 test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.
- B. All silencers shall withstand change(s) in system air pressure without "oil canning" and shall be designed to net reduce sound, i.e., self-generated noise must be accounted for in selections to meet intent.
- C. Submittals shall include necessary calculations meeting schedule and design requirements.
- D. Straight or Elbow Silencer
 - 1. All silencers shall be factory fabricated by the same manufacturer, except that "No-Loss" silencers (thicker than normal double-wall ducts) may be Contractor fabricated.
 - 2. Duct silencers shall have length, air pressure drop, and self-generated sound ratings not to exceed the values scheduled on the drawings. Dynamic insertion ratings shall not be less than those scheduled on the drawings. Silencer inlet and outlet dimensions must match the sizes on the drawings. Transitions are not acceptable unless shown on the drawings.
 - 3. All silencer ratings shall be determined in accordance with the ASTM E-477-99 test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.
 - 4. Silencers shall be constructed of galvanized steel, have 26 gauge minimum perforated interior (22 gauge for transitional silencers), be able to withstand 8" of positive and 4" of negative pressure, and shall have inorganic, bacteria, and fungus resistant glass fiber filler with not less than 5% compression. Silencers shall meet SMACNA standards for the duct pressure class specified.
 - 5. Tedlar shall completely separate the media from the airstream. No-media silencers shall not contain absorptive packing of any kind.
 - 6. Silencers shall not exceed 25/50 flame spread/smoke developed per ASTM E84, NFPA 255, OR UL 723.
 - 7. Acceptable Manufacturers: Vibro-Acoustics, VAW, United McGill, Semco, Ruskin Sound Control (Rink), AeroSonics, Dynasonics. All silencers shall be by the same manufacturer.

2.12 PRESSURE RELIEF DOORS

- A. Similar to Ruskin Model PRD 18 for positive pressure applications and Ruskin Model ADHP-3 for negative pressure applications.
- B. Door and frames shall be 12-gauge galvanized steel with seal around door perimeter. Doors shall be double-wall and insulated, when installed in insulated ductwork.
- C. Doors shall open automatically to relieve excess pressure above set point and to close when pressure is reduced to less than 3-inches WG. Setting shall be adjustable from 3-inches to 8-inches WG.

2.13 INSTRUMENT TEST HOLES

- A. Acceptable Manufacturers: Ventlok 699 (up to 1-inch insulation thickness) or Ventlok 699-2 (over 1-inch insulation thickness) or *[Note to AE: Include 2 additional Owner-approved manufacturers.]*
- B. Use concave gaskets for round ductwork.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Provide all necessary means for delivery, storage and handling of all related materials and components for the AHU system(s) such that they be kept clean and void of all

miscellaneous construction materials including but not limited to dust, dirt, fluids, and scrap materials.

3.2 EXAMINATION

- A. Damage or Defects: All steel and sheet metal for purposes, including but not limited to, framing and surfaces, shall be free of kinks, dents, scratches, stains etc. and shall not exhibit an absence of proper galvanizing or prepared finish before and after assembly.

3.3 FINISHES

- A. Responsibility: Installing Contractor shall be responsible for finishes, ensuring they are per approved Specifications. Only minor superficial repairs will be conditionally approved by the AE. Relevant replacement of rejected component(s) shall be required. Components shall not be altered to appear as other than their respective original design and manufacture as approved by the AE.

3.4 SOURCE QUALITY CONTROL

- A. Responsibility: Installing Contractor shall be responsible for verifying finishes for received materials, ensuring finishes are per approved specifications and have not been altered to appear as other than their respective original design and manufacture as approved by the AE.

3.5 CONSTRUCTION IAQ MANAGEMENT PLAN

- A. See *Section 01 35 46 – Indoor Air Quality Procedures* for related installation, protection, replacement, flush-out and testing requirements.

3.6 INSTALLATION

- A. Craftsmanship: Install components so that interior joint surfaces are smooth.
- B. See also Design Criteria: Provide transitions where different size or different shape connections are required between ductwork segments and Inlets and \ or Outlets. Unless otherwise indicated and hard duct connections are required, make diverging transitions with a maximum angle of 15 degrees per side (or 30 degrees total diverging) and 25 degrees per side for converging transitions (or 50 degrees total converging).
- C. Install all components as specified by the manufacturer.
- D. All components shall be installed in a neat workmanlike manner.
- E. Support Requirements: All components shall be installed level (in the same dimensional plane) as per the drawings.
- F. Dissimilar Metals: Where two dissimilar metals meet, install joint in such a manner that metals do not contact each other by using a proper seal, sealant or compound
- G. Outside Air Intakes: Refer to *Section 23 37 00 – Air Outlets and Inlets*.
- H. Maximum Air Velocity: Dampers shall be selected such that air velocity through the damper shall not exceed 2/3 of the manufacturer's published maximum for the make and module used.
- I. Branch Duct Balancing Volume Control: Volume dampers in branch ducts larger than 18 inches in any direction shall be of multiple, opposed blade pattern
- J. Splitter Dampers: Splitter dampers or air extractors not allowed
- K. Electrical Centers: Do not install air-handling related equipment over electrical panelboards, switchgear, switchboards or motor control centers
- L. . Installation of Other Equipment: Install all motor operated dampers and connect to or install all equipment furnished by others. Provide all necessary blank-off plates or transitions to facilitate control dampers as specified in *Section 23 09 13.43 – Control Dampers*.
- M. Sealing Requirements: Seams and joint-sealing requirements shall meet SMACNA Class A.

- N. Mechanical Support: Support air handling related equipment with removable angles or channels and fasteners. Make all connections to equipment including equipment furnished by others. Secure frames with gaskets, nuts, bolts and washers.
- O. Protection: All air handling related equipment shall be protected with fabricated end caps for "end of the day" runs to prevent dirt or moisture contamination of the unit(s) until components are permanently attached.
- P. TURNING VANES
1. Install turning vanes as shown on Drawings and for all rectangular square throat elbows unless otherwise indicated. Do not provide turning vanes in transfer air ducts. Install turning vanes in accordance with SMACNA Standard and/or manufacturer's recommendations.
 2. Install turning vanes so that they are tangent to the airflow.
- Q. FLASHINGS
1. Install counter flashings were shown on Drawings. Install in accordance with SMACNA recommendations.
- R. SOUND ATTENUATING DEVICES
1. Install sound attenuating devices as indicated on the Drawings and/or as scheduled.
 2. For modular installation of sound attenuators, install galvanized steel holding frame, gaskets, seals, supports and fasteners all in accordance with the manufacturer's recommendations for multiple unit installation.
- S. LOUVERS
1. Provide insulated metal panel on unused portion of louver.
 2. General Contractor shall provide louvers.
- T. BIRD SCREENS
1. Bird screens shall be installed on the exterior of louvers and provided by General Contractor.
- U. AIR MIXING DEVICES
1. Install air-mixing devices as indicated on the Drawings and/or as scheduled. The stacking of air mixing devices one above the other is not allowed. Install devices and associated duct connection in strict accordance with manufacturer's recommendations.
- V. PRESSURE RELIEF DOOR
1. Install doors vertically where shown on the Drawings and in accordance with manufacturer's recommendations.
- W. INSTRUMENT TEST HOLES
1. Provide instrument test holes at air entering and air leaving side of all internal air handling system components for static pressure differential (Delta P) or temperature differential (Delta T) measurements.
 2. Provide instrument test holes at all ducts insulated with Type R insulation, as directed by TAB personnel, AE or as shown on Drawings.
- 3.7 REPAIR AND RE-INSTALLATION
- A. Surface Preparation: Prepare damaged surface by using power sanders or wire brushes to remove materials such as rust and paint.
- B. Paint: Use a galvanized paint specifically designed for painting of G90 galvanized surfaces where touch-up painting is required to prevent rusting of raw edges.
- C. Rework: Provide quality Work in like manner as initial installation, replacing all damaged components. Install materials conforming to the same criteria as outlined in these Specifications and conforming to SMACNA as previously described.

3.8 CLEANING

- A. Standards from National Air Duct Cleaners Association, NADCA for HVAC & Duct Systems shall be utilized for determining the need for and the extent of cleaning that will be required. These standards will be used to resolve any related issues.
- B. Fees: All fees related to testing, cleaning and repairs that are required to cover professional testing, cleaning and equipment repair to new conditions, if so jointly determined by the AE and the Owner as a result of implementing testing under the NADCA standards, shall be the Contractor's responsibility and shall not be passed on to the U of I.
- C. Cleaning Agents: Use only non-hazardous non-toxic cleaning agents and materials. Provide MSDS cut sheets upon request.

3.9 COMMISSIONING

- A. Coordinate with the AE and the Owner. See *Section 01 91 13 – General Commissioning Requirements*.

END OF SECTION **23** 33 00

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