

SECTION 23 33 00 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes various duct accessories such as fire dampers, volume dampers and other items that are typically part of a duct system.

1.3 SUBMITTALS

- A. Submit Product Data for all accessories provided on the project.
- B. Submittals for smoke dampers will require a coordination review by the HVAC Controls manufacturer/installer prior to submission to the Engineer. Refer to Section 230900.
- C. Duct Silencer Submittals:
 - 1. Provide acoustical system calculations for all duct systems with silencers to demonstrate that the resultant duct-borne sound levels of the equipment as measured in the occupied spaces meet the specified criteria. In the absence of specified background sound level criteria, the guidelines as expressed in Table 34 of Chapter 47, "Sound and Vibration Control" of the 2015 ASHRAE Handbook - HVAC Applications, shall be used.
 - 2. The manufacturer shall supply certified test data for each scheduled silencer. The data shall include dynamic insertion loss, generated noise and pressure drop for forward or reverse flow, matching the project's air distribution system requirement. All ratings shall be conducted in the same facility and shall utilize the same silencer.
 - 3. The manufacturer shall test the silencer(s) as indicated in the silencer schedule. The engineer shall be notified of the test date at least two weeks in advance and the test may be witnessed by the engineer. Test shall show compliance with the project criteria and is subject to engineer approval.
 - 4. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to ASTM E-477-06a and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E-477-06a test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Where indicated in Part 2, provide products manufactured by the listed companies.

2.2 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 or G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A 480/A 480M.
- D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement, where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT DAMPERS

- A. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
- B. Frame: 0.052-inch thick, galvanized sheet steel, with welded corners and mounting flange.
- C. Blades: 0.025-inch thick, roll-formed aluminum.
- D. Blade Seals: Vinyl or Neoprene.
- E. Blade Axles: Nonferrous.
- F. Tie Bars and Brackets: Galvanized steel.
- G. Return Spring: Adjustable tension.

2.4 MANUAL BALANCING DAMPERS

- A. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
 - 1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- B. Standard Balancing Dampers: Multiple or single-blade, with opposed blade design, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications. Provide single blade dampers where the duct dimension is 10 inches or less in height. Provide dampers with multiple blade design in larger ducts.
 - 1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; provide frames with flanges where required for attaching to walls and flangeless frames, where indicated for installing in ducts.
 - 2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
 - 3. Blade Axles: Galvanized steel.
 - 4. Bearings: Molded synthetic.
 - 5. Tie Bars and Brackets: Galvanized steel.
- C. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include factory supplied or field installed elevated platform for insulated duct mounting.

2.5 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Pottorff.
 - 2. Young Regulator
- B. General description: cable system designed for remote control of manual dampers. Provide stainless steel cable and wall box mounting.

2.6 FIRE DAMPERS

- A. Manufacturers:
 - 1. Arrow.
 - 2. CESCO Products.
 - 3. Greenheck.
 - 4. Nailor Industries Inc.
 - 5. Pottoroff, Inc.
 - 6. Ruskin Company.

DUCT ACCESSORIES

- B. Fire dampers shall be listed and bear the label of an approved testing agency indicating compliance with the requirements of the International Mechanical Code 607.3.1. Fire dampers shall be labeled according to UL 555.
- C. Fire Rating: 1-1/2 or 3 hours as noted on the drawings.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, minimum 22-gauge galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory or field-installed, galvanized sheet steel.
- F. Mounting Orientation: Vertical or horizontal as required.
- G. Blades: Roll-formed, interlocking, minimum 24-gauge galvanized sheet steel. In place of interlocking blades, use full-length galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Fusible Links: Replaceable, 165 deg F rated.

2.7 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes with the edge of the vanes parallel with the air flow.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, double vane, curved blades of galvanized sheet steel; support with bars perpendicular to blades set 2 inches and set into vane runners suitable for duct mounting.
- C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill and install where noted on the drawings.

2.8 DUCT MOUNTED ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include 1-by-1-inch butt or piano hinge and cam latches.
 - 1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 2. Provide number of hinges and locks as follows:
 - a. Less Than 12 Inches Square: Secure with two sash locks.
 - b. Up to 18 Inches Square: Two hinges and two sash locks.
 - c. Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - d. Sizes 24 by 48 Inches and Larger: One additional hinge.
- C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- D. Insulation: 1-inch thick, fibrous-glass or polystyrene-foam board.

2.9 FLEXIBLE CONNECTORS

- A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 0.028-inch thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Select metal compatible with ducts.
- C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- D. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd.
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.

2.10 FLEXIBLE DUCTS AND ACCESSORIES

- A. Manufacturers:
 - 1. Thermaflex MK-E or equal.
- B. Insulated Flexible Duct: UL 181, Class 1, flexible air duct complying with NFPA Standards 90A and 90B. Flexible duct shall be factory made and composed of a resilient film liner duct liner permanently bonded to a coated spring steel wire helix and supporting a fiberglass insulating blanket. Provide with a low permeability outer vapor barrier of fiberglass reinforced film laminate insulation.
- C. Operating temperatures: -20 Deg. F. minimum; 250 deg. F. maximum.
- D. Operating pressure: 10" w.g. positive; 1" w.g. negative.
- E. Insulation: minimum R 6.0.
- F. Rated velocity 5000 fpm.
- G. Maximum flame spread = 25. Maximum smoke developed = 50.
- H. Flexible Duct Clamps: Nylon strap to suit duct size.
- I. Flexible duct elbow supports: Thermaflex FlexFlow or FlexRight.

2.11 DUCT ACCESSORY HARDWARE

- A. Instrument Test Ports: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit the specified external duct insulation thickness. Provide special gaskets where test holes are to be installed in round or oval ducts. Test Ports to be Duro-Dyne model TH1, IP2 and/or IP4.

- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.12 DUCT SILENCERS

- A. Furnish and install factory pre-fabricated duct silencers of the types and sizes shown on the drawing schedules with acoustical performance as indicated. Silencers to be manufactured by Price Industries, models as indicated on the drawings.
- B. General: Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. Silencers shall be fabricated by the same manufacturer. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
- C. Silencer Construction:
 - 1. Silencers shall be constructed in accordance with ASHRAE and SMACNA Standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted, to provide leakage-resistant construction.
 - 2. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
 - 3. Perforated steel shall be adequately stiffened to insure flatness and form. Spot welds shall be painted as required.
- D. Fire Performance Rating: Silencer assemblies, including acoustic media fill, natural cotton fiber, sealants and acoustical spacers shall have Class 1 flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E84, NFPA 255 or UL 723.
- E. Rectangular Silencers: Outer casing shall be not less than ASTM A653/653M, 22 gauge, die-formed, type G60 galvanized lock former quality steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Install manual balancing dampers in ducts with liner utilizing an insulated "hat" section at the damper frame. Avoid damage to and erosion of duct liner. Where balancing dampers are located in ducts with exterior insulation, provide and insulated hat section to house the damper operator.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
- F. Provide test holes at fan inlets and outlets and elsewhere as required.

DUCT ACCESSORIES

- G. Install fire dampers, with fusible links, according to manufacturer's UL-approved written instructions. Provide the required identification for all fire, smoke and combination fire/smoke dampers as indicated in the International Mechanical Code, Chapter 6; 607.4
- H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
 - 1. Adjacent to all fire dampers, providing access to reset or reinstall fusible links.
 - 2. To interior of ducts for cleaning at maximum 100-foot spacing between access doors.
- I. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. Minimum size 12 x 12 inches.
 - 2. Ducts with one dimension 24" or larger, install a 20" x 20" access door.
- J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- K. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- L. Where indicated on the drawings, connect diffusers to low pressure ducts with maximum 72-inch length of insulated flexible duct. Connect flexible ducts to metal ducts and support flexible ducts in accordance with SMACNA Duct Construction Standards Metal and Flexible, Chapter 3. Install flexible duct elbow supports at all 90-degree flex connections to diffusers.
- M. Install duct test holes, where indicated and required for testing and balancing purposes. Coordinate location with testing, adjusting, and balancing contractor.
- N. Provide turning vanes in all mitered elbows.

3.2 ADJUSTING

- A. Adjust duct accessories for proper settings.

END OF SECTION 23 33 00