SECTION 233300 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Backdraft dampers.
   2. Volume dampers.
   3. Fire dampers.
   4. Ceiling fire dampers.
   5. Smoke and combination fire and smoke dampers.
   6. Turning vanes.
   7. Duct-mounting access doors.
   8. Flexible connectors.
   10. Domestic Clothes Dryer Connection Box
   11. Duct silencers.
   12. Duct accessory hardware.
   13. Motorized dampers and actuators.

B. See Division 13 or 16 for duct-mounting fire and smoke detectors.

C. See Division 15 Section "HVAC Control System" for electric damper actuators.

1.2 SUBMITTALS

A. Product Data: For the following:
   1. Backdraft dampers.
   2. Volume dampers.
   3. Fire dampers.
   4. Ceiling fire dampers.
   5. Combination fire and smoke dampers, including wiring diagrams.
   6. Turning vanes.
   7. Duct-mounting access doors.
   8. Flexible connectors.
   10. Domestic Clothes Dryer Connection Box
   11. Duct silencers.
   12. Motorized dampers and actuators.

B. Operating and maintenance data for fire dampers, ceiling fire dampers, and combination fire and smoke dampers, as applicable.

C. Test reports for combination fire and smoke dampers.
1.3 QUALITY ASSURANCE


PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. 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.

B. Stainless Steel: ASTM A 480/A 480M.

C. 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. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. 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. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Duro Dyne Corp.
5. Penn Ventilation Company, Inc.
6. Potterff.
7. Prefco Products, Inc.
8. Ruskin Company.

B. Description: Multiple-blade, parallel action gravity-type, counter-balanced, with 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.
C. Frame: 0.052-inch thick, galvanized sheet steel, with welded corners and mounting flange as required for application.

D. Blades: 0.050-inch thick aluminum sheet.

E. Blade Seals: Vinyl or Neoprene.

F. Blade Axles: Galvanized steel.

G. Tie Bars and Brackets: Galvanized steel.

H. Adjustment Device: Adjustable counterweight or adjustable spring.

2.4 VOLUME DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. American Warming and Ventilating.
   3. Flexmaster U.S.A., Inc.
   5. METALAIRE, Inc.
   6. Nailor Industries Inc.
   7. Penn Ventilation Company, Inc.
   8. Potterff.
   10. Swartwout

B. General: 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.

C. Standard Volume Dampers: Multiple-opposed blade type in rectangular applications, and single-blade in round applications, standard leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated 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.
5. Tie Bars and Brackets: Galvanized steel.

D. [Volume Dampers in Rectangular, Metal Product Conveying Ductwork: Multiple-opposed blade type, low leakage rating per AMCA 500, and suitable for horizontal or vertical applications.]

1. Frames: Hat-shaped, channels, same material as ductwork, with mitered and welded corners; frames with flanges for attaching to ducts.
2. Blades: Airfoil shaped, same material as ductwork.
3. Blade Axles: Same material as ductwork.
4. Bearings: Oil-impregnated bronze or molded synthetic.
5. Tie Bars and Brackets: Galvanized steel mounted outside of airstream.
6. Seals:
   a.) Blades Edge: Neoprene, extruded double edge design with inflatable pocket.
   b.) Jamb: Stainless steel, flexible, compressible type.

E. [Volume Dampers in Round, Metal Product Conveying Ductwork: Single-blade, low leakage rating per AMCA 509, suitable for horizontal or vertical applications.]

1. Frames: Channels, same material as ductwork with welded seams; frames with flanges for attaching to ducts.
2. Blades: Stiffened, same material as ductwork.
3. Blade Axles: Same material as ductwork.
4. Bearings: Oil-impregnated bronze or grease lubricated ball bearings, bolted to frame.
5. Blade Stop: Same material as ductwork.
6. Seals: Neoprene on both blades and shafts.

F. Jackshaft for Multiple-Damper Assemblies: 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.

G. 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 elevated platform for insulated duct mounting.

2.5 BLAST GATES (CUT-OFFS)

A. Manufacturers:
   1. Tate-Jones
   2. Approved Equal

B. General: Full cut-offs consisting of cast or fabricated housings with duct mounting collars and slide gates suitable for air volume control in metal product conveying ducts.

C. Materials: Housing and slide gates constructed of same materials as attached ductwork. Exception: Cast aluminum housings may be used in galvanized steel duct systems.

D. Features: Fully retractable slide gates with handles and set screws to maintain balanced position.

2.6 FIRE DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. Greenheck.
   4. METALAIRE, Inc.
5. Nailor Industries Inc.
7. Potorff.
8. Prefco Products, Inc.

B. General: Fire dampers shall be dynamic type and labeled according to UL 555.

C. Fire Rating: 1-1/2 hours.

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
   1. Minimum Thickness: 18 gauge (0.052 inch thick) and of length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

H. Blade Lock/Closure Spring: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 degrees F rated.

2.7 CEILING FIRE DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. Greenheck.
   4. METALAIRE, Inc.
   5. Nailor Industries Inc.
   7. Potorff.
   8. Prefco Products, Inc.

B. General: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.
E. Fusible Links: Replaceable, 165 degrees F rated.

2.8 SMOKE AND COMBINATION FIRE AND SMOKE DAMPERS

A. Damper Manufacturers:

   1. Air Balance, Inc.
   2. Greenheck.
   3. Nailor Industries Inc.
   4. Penn Ventilation Company, Inc.
   5. Pottorff.
   6. Ruskin Company.

B. General Description: Damper and actuator tested and labeled according to UL 555S and UL 555. Rating as required for the application but not less than 1-1/2-hour rating.

C. Leakage classification shall be UL555S Class I or Class II.


E. Velocity and Pressure Rating: Minimum 2,000 FPM velocity and minimum 4 inches water gage pressure ratings in low velocity (less than or equal to 2,000 FPM) applications.

F. Thermal-Switch: Resetable, 165 degrees F rated.

G. Frame and Blades: 0.064-inch- thick, galvanized sheet steel.

H. Mounting Sleeve: Factory-installed, minimum 0.040-inch- thick, galvanized sheet steel; length to suit wall or floor application.

I. Damper Motors: Provide for two-position action.

   2. Outdoor Motors and Motors in Outside-Air Intakes: Equip with gaskets and seals designed to make motors weatherproof. Operating temperature range shall be minus 22 degrees F to plus 122 degrees F.
   3. Electrical Connection: 115 V, single phase, 60 Hz.

2.9 TURNING VANES

A. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, single-vane, curved blades with extended trailing edge of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

   1. Manufacturers:

      a. Ductmate Industries, Inc.
      b. Duro Dyne Corp.
2.10 DUCT-MOUNTING ACCESS DOORS

A. General: Fabricate doors airtight and suitable for duct pressure class.

B. Door in Rectangular Duct: Double wall, duct mounting, square or rectangular; fabricated of galvanized sheet metal with insulation fill to match adjacent ductwork and thickness as indicated for duct pressure class. Where used in metal product conveying ducts, use same material as duct. Include vision panel where indicated on Drawings. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:
   a. American Warming and Ventilating.
   b. Ductmate Industries, Inc.
   c. Flexmaster U.S.A., Inc.
   d. Greenheck.
   f. Nailor Industries Inc.
   g. Ventfabrics, Inc.
   h. Ward Industries, Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets. Where used in metal product conveying ducts, use same material as duct.

3. 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. Door in Round Duct: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Where used in metal product conveying ducts, use same material as duct. Include cam latches.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Flexmaster U.S.A., Inc.

2. Frame: Galvanized sheet steel, with spin-in notched frame. Where used in metal product conveying ducts, use same material as duct.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.11 FLEXIBLE CONNECTORS
A. Manufacturers:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Corp.
   3. Ventfabrics, Inc.

B. General: Metal flanges connected by flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1. Provide with minimum 4-inches of exposed fabric.

   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 degrees F.

2.12 FLEXIBLE DUCTS

A. Manufacturers:
   1. Atco Rubber Products, Inc.
   2. Flexmaster U.S.A., Inc.
   6. Thermaflex.

B. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation with minimum R-value of 4.2; metallized, fiberglass-reinforced, film laminate.
   1. Pressure Rating: 6-inch wg positive and 1.0-inch wg negative.
   3. Temperature Range: Minus 10 to plus 160 degrees F.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

2.13 DUCT SILENCERS

A. Manufacturers:
   1. Commercial Acoustics Division
   2. Industrial Acoustics Company
   3. Rink Sound Control
   4. Vibro-Acoustics

B. General: Silencers shall be of the size, configuration, capacity, and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.
C. Construction: 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 they are installed. Silencer materials, including acoustic media, shall have a maximum flamespread classification of 25 and a maximum smoke development rating of 50 when tested in accordance with ASTM E84, NFPA 255 or UL 723. Silencers shall be tested in accord with ASTM-E477.

D. Rectangular Silencers:

1. Outer casing: Minimum 22 gauge galvanized steel construction. All external seams shall be lockformed and filled with mastic and shall be airtight up to 8” W.G. differential pressure.
2. Interior Baffles: Airfoil shape, constructed of not less than 26 gauge perforated galvanized steel. Baffles shall be designed for minimal pressure drop and maximum attenuation.

E. Acoustic Media:

1. Natural Cotton Fiber Insulation: Media shall be 100% natural cotton fibers treated with an EPA registered, non-toxic borate solution, “flash dried” to provide resistance to mold mildew and fungi. Media shall comply with UL 181 and NFPA 90A. Media shall not cause or accelerate corrosion of aluminum or steel.
2. Glass Fiber Insulation: Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 5% compression during silencer assembly. Media shall be bacteria and fungus resistant, resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel.
3. No-Media Silencers: No-Media silencers shall not contain any absorptive media. Attenuation shall be achieved solely with controlled impedance membranes and broadly tuned resonators.

F. Media Protection: Acoustic media shall be completely wrapped with a non-erosive, non-pregnable, cleanable mylar film to help prevent shedding, erosion and impregnation of the acoustic media. The wrapped acoustic media shall be separated from the perforated metal by a factory installed ½” thick acoustically transparent spacer. The spacer shall be flame retardant and erosion resistant.

2.14 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: 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 duct insulation thickness.

2.15 MOTORIZED DAMPERS

A. Damper Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Flexmaster U.S.A., Inc.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Ruskin Company.

B. Dampers: AMCA-rated, parallel or opposed-blade design; 0.1084-inch minimum, galvanized-steel frames with holes for duct mounting; damper blades shall not be less than 0.0635-inch galvanized steel with maximum blade width of 8 inches.

1. Blades shall be secured to 1/2-inch-diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 degrees F.
3. For standard applications, include optional closed-cell neoprene edging.
4. For low-leakage applications, use parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 in. x lb; when tested according to AMCA 500D.

C. Actuator Manufacturer: Belimo.

D. Actuators: Direct-coupled type design for minimum 60,000 full-stroke cycles at rated torque.

1. Sizing: Size for running torque calculated as follows:
   b. Opposed-Blade Damper: 5 inch-pounds/sq. ft. of damper.
2. Coupling: V-bolt and V-shaped, toothed cradle.
3. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Power Requirements (Two-Position Spring Return): 120-V ac.
6. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
7. Temperature Rating: Minus 22 to plus 122 degrees F.
8. Run Time: Not more than 15 seconds or less than 5 seconds.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" or SMACNA's "Round Industrial Duct Construction Standards," as applicable for metal ducts [and in SMACNA's, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts].
B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel [and fibrous-glass] ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Provide duct accessories suitable for the pressure class of the ductwork to which it is attached.

D. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

E. In lined ducts install volume dampers in a manner that avoids damage to and, erosion of duct liner.

F. Provide balancing dampers at points on supply, return, outside air 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.

G. Install turning vanes in all rectangular duct elbows having a 45-degree or greater bend and not provided with radiused inside and outside corners.

H. [Provide test holes at fan inlets and outlets and elsewhere as indicated.]

I. Mount duct smoke detectors in strict conformance with manufacturer’s recommendations. Duct smoke detectors to be furnished and wired in Division 13 or 26.

J. Install fire and smoke dampers where required and where indicated on Drawings according to manufacturer’s UL-approved written instructions.

K. Install duct access doors on sides of ducts where space permits to allow for inspecting, adjusting, and maintaining accessories and terminal units. Locate on side of duct with greatest clearance. Install as follows:

1. On both sides of duct coils. (Minimum head and hand access.)
2. Downstream from automatic control dampers. (Minimum two hand access.)
3. Adjacent to fire dampers or combination fire and smoke dampers, providing access to reset or reinstall thermal-switch. (Minimum two hand access.)
4. Downstream of duct mounted equipment, e.g., humidifier grids, duct heaters. (Minimum head and hand access.)
5. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing. (Minimum two hand access.)

L. Install the following sizes for duct-mounting, rectangular access doors:

1. Two-Hand Access: 12 by 6 inches.

M. Install the following sizes for duct-mounting, round access doors:

2. Head and Hand Access: 12 inches in diameter.

N. Label access doors according to Division 22 Section "Identification for HVAC Piping and Equipment".
O. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators. Provide sheetmetal sunshields on exterior flexible connectors.

P. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

Q. Connect air outlets to low pressure ducts with maximum 96-inch lengths of flexible duct where indicated on Drawings.

R. Secure inner liner of flexible ducts to metal ducts and collars with a stainless steel draw band.

S. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Test fire and smoke dampers for proper action. Repair or replace defective components or wiring.

C. Final positioning of manual-volume dampers is specified in Division 17 Section "Testing, Adjusting, and Balancing."

END OF SECTION