SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Back-draft dampers.
2. Combination fire-and-smoke dampers.
3. Duct access doors.
4. Dynamic fire dampers.
5. Ceiling fire dampers.
6. Volume control dampers.
7. Flexible duct connections.
8. Duct test holes.
9. Sound traps.

B. Related Sections:

1. Division 23 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.
2. Division 26 - Equipment Wiring Connections: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.

1.02 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. ASTM International:

1. ASTM E1 - Standard Specification for ASTM Thermometers.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 92A - Recommended Practice for Smoke-Control Systems.

D. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc.:

1. UL 555 - Standard for Safety for Fire Dampers.
2. UL 555C - Standard for Safety for Ceiling Dampers.
3. UL 555S - Standard for Safety for Smoke Dampers.

1.03 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.

C. Product Data: Submit data for shop fabricated assemblies and hardware used.

D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.

1. Fire dampers including locations and ratings.
2. Smoke dampers including locations and ratings.
3. Backdraft dampers.
4. Flexible duct connections.
5. Volume control dampers.
6. Duct access doors.
7. Duct test holes.

E. Product Data: For fire dampers, smoke dampers, combination fire and smoke dampers submit the following:

1. Include UL ratings, California State Fire Marshal approval and NFPA 90A, dynamic ratings, leakage, pressure drop and maximum pressure data.
2. Indicate materials, construction, dimensions, and installation details.
3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

F. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access doors, test holes and combination smoke/fire dampers.

C. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.05 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

C. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum three weeks prior to commencing work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Protect dampers from damage to operating linkages and blades.

C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

D. Storage: Store materials in a dry area indoor, protected from damage.

E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work where appropriate with building control Work.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.12 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 BACK-DRAFT DAMPERS

A. Manufacturers:

1. Pottorff
2. Ruskin
3. Greenheck

B. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, extruded aluminum. Blades, maximum 6 inch width, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment counter balance weight to permit setting for varying differential static pressure. Back draft damper shall be capable of adjusting to 0.025 inches of water pressure.

2.02 COMBINATION FIRE AND SMOKE DAMPERS / FIRE DAMPERS

A. Manufacturers:

1. Pottorff
2. Ruskin
3. Greenheck

B. Furnish and install California State Fire Marshal approved combination smoke/fire dampers where shown on plans. The dampers shall meet all the requirements for smoke dampers per the latest edition of NFPA 90A and UL standards. Combination fire and smoke dampers shall be louver bladed type. Rating 1-1/2 hours for installation in one or two hour partitions. The units will incorporate a low friction design that provides overlapping. The blade edge seals will be silicone and provide a minimum Class 2 seal at 350 degrees as per UL 555S. The damper shall be capable of being remotely controlled and reset for pressurization and smoke evacuation. The fire releasing device will be a UL 33 listed HS10. Provide PI50 end switch key operated switch and wire to RCP-1 (remote control panel) mounted on ceiling below respective fire smoke damper. The fire releasing device must also be listed by the CSFM for use with the damper assembly. Melting fusible links are not acceptable. The dampers shall be provided in sleeves with pre-mounted motor actuators and dual position indicators for remote annunciation. The damper must be able to fail open or close for smoke, depending on the system requirements. The motors must be Belimo FSLF120 or FSLF24 and have a minimum 5 year warranty. The motors must be mounted on a bracket that allows for use of slip joint connections or "Duct-mate" type connections without modification. The complete assembly must be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. All smoke/fire dampers shall be tested by the Developer Design/Builder in the presence of the field inspector and the State Fire Marshal. This test shall be performed prior to the installation of the ceilings.

C. Fire dampers shall be Pottorff VFD dynamic curtain fire damper or equivalent by Ruskin or Air Balance, sized to maintain full duct area at the fire dampered opening, installed at the location indicated and provided where required by NFPA 90A or Code and shall have CSFM's listing number. Fire damper shall be curtain type with blades removed from the air stream to allow for maximum free area. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1 1/2 hours for installation in one or two hour partitions. Provide UL listed fusible links of adequate size and temperature rating. Dampers to be installed according to the manufacturers recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper.

2.03 DUCT ACCESS DOORS

A. Manufacturers:

1. Air Balance, Inc.
2. Duro Dyne Corp.
3. Register & Grille Mfg. Co., Inc.
4. Ruskin Mfg. Co.
5. Ventfabrics, Inc.
6. Zurn Industries, Inc.; Air Systems Div.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged other side with one handle type latch for doors 12 inch high and smaller, 2 handle type latches for larger doors.

2.04 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Ventfabrics, Inc.
2. Young Regulator Co.
3. Duro Dyne Corp.
4. Eco Dampers (for round duct 14" and under)

B. General Description: Factory or shop 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 axle's full length of damper blades and bearings at both ends of operating shaft.
2. Shop fabricated volume dampers shall be submitted for approval.

C. Standard Volume Dampers: Multiple-opposed-blade design, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications. Single blade design may be used for duct sizes 12" and smaller.

1. Steel Frames: Hat-shaped, galvanized (provide stainless in outside air system) 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 (provide stainless in outside air system) sheet steel.
3. Blade Axles: Stainless steel.
4. Bearings: Stainless-steel sleeve.
5. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers for fume hoods and similar installations: Multiple- or single-blade, parallel- or opposed-blade design low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: stainless sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, stainless sheet steel.
3. Blade Axles: Stainless steel.
4. Bearings: Stainless-steel sleeve thrust or ball.
5. Blade Seals: Neoprene.

E. Jamb Seals: Cambered stainless steel Jack shaft: 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.

F. 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.

2.05 MOTORIZED CONTROL DAMPERS

A. Manufacturers:

1. Pottorff.
2. Ruskin Company.

B. General duty control dampers: AMCA-rated, opposed-blade design, air foil shape; minimum of 0.1084-inch-thick (12 ga), galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- thick (16 ga), galvanized-steel damper blades with maximum blade width of 8 inches and stainless steel jamb seals.

1. Secure blades 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 deg F.
3. Provide 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-inch wg when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.
4. Maximum pressure drop shall be 0.07 inches WG for a 24-inch by 24-inch duct-mounted damper handling 8,000 cfm.

C. Fan isolation control dampers: AMCA rated, opposed blade design, airfoil shape, for fan isolation under dynamic conditions. Dampers shall be low leakage industrial grade control dampers that meet the following minimum construction standards.

1. Frame shall be 8 inches deep by 2-inch flanged 12 gage galvanized steel channel. Blades shall be double skin airfoil, maximum 8" wide and minimum 14 gage galvanized steel. Axles shall be minimum ¾" diameter plated steel rod. Provide dampers with neoprene blade seals and stainless steel jamb seals.
2. Ball bearings shall be mounted outboard external of frame. Oil impregnated bronze, stainless sleeve or synthetic bearings are not acceptable.
3. Linkage shall be located out of air stream and constructed of minimum 10 gage steel clevis arms with 3/16" x ¾" plated steel tie bars pivoting on 3/8" diameter stainless steel pivot pins with lock type retainers. Standard construction shall include crank lever for motor operation. Face linkage in air stream is not acceptable. Each damper panel shall have separate drive actuator.
4. Submittal data must include published leakage, pressure drop, and maximum pressure dta for full range of damper sizes based on AMCA standard 500 testing. Data from one size sample test is not acceptable. Performance data for 48" x 48" damper at 1" w.g. is 0.12% of maximum flow or 4.3 cfm per square foot.
5. Dampers shall be Ruskin model CD80AF3 or equal.

D. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

2.06 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

1. Duro Dyne Corp.
2. Ventfabrics, Inc.
3. Substitutions: Not Permitted.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick (24 ga), galvanized sheet steel or 0.032-inch- thick aluminum sheets. Select metal compatible with ducts.

D. 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 lb/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric insulated double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz. /sq. yd.
2. Insulation: Fiberglass.
3. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
4. Service Temperature: Minus 50 to plus 250 deg F.

F. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz. /sq. yd.
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

G. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz. /sq. yd.
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

2.07 SCREENS

A. Screens shall be 1 inch mesh, 12 gauge stainless steel wire set in 1 inch galvanized channel frames for all openings.

2.08 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Test holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
2. Quadrant locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12 inch. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Manufacturer: Subject to compliance with requirements, provided duct hardware of one of the following:

1. Ventfabrics, Inc.
2. Young Regulator Co.
3. Duro Dyne

2.09 TURNING VANES

A. Square throat elbow with vanes not allowed. Provide short radius elbows with vanes per SMACNA details.

2.10 ACCESS DOORS

A. Pressure Relief Access Door: Double wall and duct mounting; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated, latches, and retaining chain.

1. Manufacturers:

a. American Warming and Ventilating.
b. Ductmate Industries, Inc.
c. Greenheck.

d. McGill AirFlow Corporation.
e. Ruskin Company
f. Or equal

2. Frame: Galvanized sheet steel, with bend-over tabs and neoprene gaskets.
3. Provide negative pressure and positive pressure relief doors design to open automatically to prevent exploding or imploding ductwork in the event dampers close or some other event may occur while the fan is still operating. The door shall automatically close and reset when the pressure is equalized or the system shuts down. Ruskin models PRD18, NRD18 or ADHP-3. Provide insulated doors in supply air systems, stainless steel construction for hazardous air exhaust systems and construction shall be appropriate for the pressure class.

2.11 DUCT SILENCERS (SOUND TRAPS)

A. Manufacturers:

1. Industrial Acoustics Company (IAC).
2. Ruskin (Rink) Sound Control
3. Vibro-Acoustics

B. General Description: Factory-fabricated and -tested, round or rectangular silencers with performance characteristics and physical requirements as indicated.

C. Fire Performance: Adhesives, sealants, packing materials, and accessory materials shall have fire ratings not exceeding 25 for flame-spread index and 50 for smoke-developed index when tested according to ASTM E 84.

D. Rectangular Units: Fabricate casings with a minimum of 0.034-inch- thick (22 ga), solid galvanized sheet metal for outer casing and 0.022-inch- thick (24ga), ASTM A 653/A 653M, G90, perforated galvanized sheet metal for inner casing.

E. Round Units:

1. Outer Casings:

a. ASTM A 653/A 653M, G90, galvanized sheet steel.
b. Up to 24 Inches in Diameter: 0.034 inch thick. (22 ga)
c. 26 through 40 Inches in Diameter: 0.040 inch thick. (20 ga)
d. 42 through 52 Inches in Diameter: 0.052 inch thick. (18 ga)
e. 54 through 60 Inches in Diameter: 0.064 inch thick. (16 ga)
f. Casings fabricated of spiral lock-seam duct may be one size thinner than that indicated.

2. Interior Casing, Partitions, and Baffles:

a. ASTM A 653/A 653M, G90, galvanized sheet steel.
b. At least 0.034 inch thick (22 ga) and designed for minimum aerodynamic losses.
c. Attenuators in 100% outside air or fume exhaust system shall have a solid stainless steel internal lining.

F. Sheet Metal Perforations: 1/8-inch diameter for inner casing and baffle sheet metal.

G. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 5 percent compression.

1. Erosion Barrier: Polymer bag enclosing fill and heat-sealed before assembly.

H. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations.

1. Do not use nuts, bolts, or sheet metal screws for unit assemblies.
2. Lock form and seal or continuously weld joints.
3. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
4. Reinforcement: Cross or trapeze angles for rigid suspension.

I. Source Quality Control:

1. Acoustic Performance: Test according to ASTM E 477.
2. Record acoustic ratings, including dynamic insertion loss and self-noise power levels with an airflow of at least 2000-fpm face velocity.
3. Leak Test: Test units for air tightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.

J. Supply, Return, and Outside Air Ducts shall be equipped with “fiber-free” duct silencers and shall be based on IAC Model HLFL.” (Silencers shall be IAC Model HLFL in lieu of previous drawing references to Model LFL.)

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installation are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.02 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Division 23 for duct construction and pressure class.

B. Provide a volume control for each grille and diffuser and in all other locations necessary to properly balance the system.

C. Quadrants on insulated ducts shall be mounted on sheet metal brackets, set flush with the insulation.

D. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside. Back draft dampers are not required for the fans with continuous operation and kitchen exhaust fans.

E. Access Doors: Install access doors at the following:

1. Adjacent to each duct mounted filter.
2. Adjacent to each duct mounted coil.
3. Before and after each duct mounted fan.
4. Adjacent to each fire damper, smoke damper and combination fire and smoke damper.
5. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.

F. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access. Review locations prior to fabrication.

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

1. 8 inches in diameter for up to 12-inch diameter duct size.
2. 12 inches in diameter for 13-inch to 19 inch duct sizes.
3. 18 inches in diameter for 20-inch to 25 inch duct sizes.
4. 24 inches in diameter for larger duct sizes than listed above.

H. Label access doors according to Division 23.

I. Install temporary duct test holes required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

J. Install fire dampers, combination fire and smoke dampers and smoke dampers at locations as determined by Developer/Design Builder. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
2. Install dampers square and free from racking with blades running horizontally.
3. Do not compress or stretch damper frame into duct or opening.
4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

K. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

L. For fans developing static pressures of 5 inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Provide stainless steel condensate removal hoods with baffles and drains, as necessary for capture of condensate from moisture laden exhaust air applications. Provide stainless steel manual volume dampers.

N. Provide instrument test holes in ductwork at fan inlets and outlets and elsewhere as required by Testing, Adjusting and Balancing Contractor for testing and balancing purposes.

3.03 DEMONSTRATION

A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate re-setting of fire dampers and combination fire/smoke dampers to County's representative.

END OF SECTION