



## **SECTION 23 33 00-AIR DUCT ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
1. Back-draft dampers.
  2. Backdraft and pressure relief dampers.
  3. Barometric relief dampers.
  4. Combination fire/smoke dampers.
  5. Duct access doors.
  6. Static fire dampers.
  7. Ceiling fire dampers.
  8. Volume control dampers.
  9. Flexible duct connections.
  10. Dial thermometers.
  11. Static pressure gauges.
  12. Motorized control dampers.
  13. Louvers.
  14. Air flow measuring stations.
  15. Turning vanes.

#### **1.2 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 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
  3. NFPA 92A - Recommended Practice for Smoke-Control Systems.
- D. Sheet Metal and Air Conditioning Contractors' National Association:



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.

### **1.3 SUBMITTALS**

- A. Product Data: Submit data for shop fabricated assemblies and hardware used.
- B. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
1. Fire dampers including locations and ratings.
  2. Combination Fire-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.
- C. Product Data: For fire dampers and combination fire/smoke dampers submit the following:
1. Include UL ratings, 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.
- D. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke/Fire Dampers.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

## **PART 2 - PRODUCTS**

### **2.1 BACK-DRAFT DAMPERS**

- A. Manufacturers:
1. **Air Balance, Inc.**
  2. **Ruskin.**
  3. **Pottorf.**



- B. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gauge thick steel, or 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 device to permit setting for varying differential static pressure.

## 2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. **Air Balance Inc**
  - 2. **Ruskin**
  - 3. **Pottorf.**
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 2-inch WG (0.5 kPa).
- E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.050-inch- (1.2-mm-) thick aluminum sheet noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
  - 1. Material: Stainless steel.
  - 2. Diameter: 0.20 inch (5 mm).
- J. Tie Bars and Brackets: Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
  - 1. Adjustment device to permit setting for varying differential static pressure.
  - 2. Counterweights and spring-assist kits for vertical airflow installations.
  - 3. Electric actuators.
  - 4. Chain pulls.



5. Screen Mounting: Front mounted in sleeve.
  - a. Sleeve Thickness: 20-gauge (1.0-mm) minimum.
  - b. Sleeve Length: 6 inches (152 mm) minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Insect.
9. 90-degree stops.

### 2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. **Air Balance Inc.**
  2. **Ruskin.**
  3. **Pottorf.**
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 2-inch WG (0.5 kPa).
- E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.
- F. Blades:
  1. Multiple, 0.050-inch- (1.2-mm-) thick aluminum sheet.
  2. Maximum Width: 6 inches (150 mm).
  3. Action: Parallel.
  4. Balance: Gravity.
  5. Eccentrically pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets:
  1. Material: Aluminum.
  2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Stainless steel.



- L. Accessories:
  - 1. Flange on intake.
  - 2. Adjustment device to permit setting for varying differential static pressures.

## 2.4 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
  - 1. **Air Balance, Inc.**
  - 2. **Ruskin.**
  - 3. **Pottorf.**
- B. Fire Resistance: 1-1/2 hours or 3 hours Conform to UL 555.
- C. Leakage Rating: Class I, maximum of 8 cfm at 4 inches WG differential pressure.
- D. Damper Temperature Rating: 250 degrees F.
- E. Frame: 16 gauge, galvanized steel.
- F. Blades:
  - 1. Style: Airfoil-shaped, single piece, double skin.
  - 2. Action: Opposed.
  - 3. Orientation: Horizontal.
  - 4. Material: Minimum 14 gauge equivalent thickness, galvanized steel.
  - 5. Width: Maximum 6 inches.
- G. Bearings: Stainless steel pressed into frame.
- H. Seals: Silicone blade edge seals and flexible stainless steel jamb seals.
- I. Linkage: Concealed in frame.
- J. Release Device: Close in controlled manner and allow damper to be automatically reset.
- K. Actuator:
  - 1. Type: Electric 120 volt, 60 hertz, two-position, fail close or Electric 24 volt, 60 hertz, two-position, fail close as shown on drawings.
  - 2. Mounting: External or Internal.
- L. Fusible Link Release Temperature: 165 degrees F.
- M. Finish: Mill galvanized.



- N. Factory installed sleeve and mounting angles. Furnish silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.

## 2.5 DUCT ACCESS DOORS

- A. Manufacturers:
  - 1. **American Warming and Ventilating.**
  - 2. **Pottorf.**
  - 3. **McGill.**
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
  - 1. Less than 12 inches square, secure with sash locks.
  - 2. Up to 18 inches Square: Furnish two hinges and two sash locks.
  - 3. Up to 24 x 48 inches: Three hinges and two compression latches.
  - 4. Larger Sizes: Furnish additional hinge.
  - 5. Access panels with sheet metal screw fasteners are not acceptable.

## 2.6 FIRE DAMPERS

- A. Manufacturers:
  - 1. **Air Balance, Inc.**
  - 2. **Ruskin.**
  - 3. **Pottorf.**
- B. Fire Rating: UL 555 classified, curtain type, and labeled as a 1-1/2 or 3 hour static fire damper.
- C. Air Flow Rating: UL approved for dual directional air flow.
- D. Integral Sleeve Frame: Minimum 20 gauge by 12 inches roll formed, galvanized steel.
  - 1. Factory Sealant: Apply to dampers in HVAC systems with pressures to maximum 4 inches WG.
- E. Blades:
  - 1. Style: Curtain type, in airstream.
  - 2. Action: Spring or gravity closure upon fusible link release.
  - 3. Orientation: Horizontal.
  - 4. Material: Minimum 24 gauge roll formed, galvanized steel.
- F. Closure Springs: Type 301 stainless steel, constant force type, if required.



- G. Temperature Release Device:
  - 1. Fusible link, 165 degrees F.
  - 2. Mounting: Vertical or Horizontal as shown on the drawings.
- H. Finish: Mill galvanized.
- I. Picture Frame Mounting Angles:
  - 1. One-piece, roll formed retaining angles as detailed.
  - 2. Factory matched and shipped attached to damper.

## 2.7 CEILING FIRE DAMPERS

- A. Manufacturers:
  - 1. **Air Balance, Inc.**
  - 2. **Ruskin.**
  - 3. **Pottorf.**
- B. Fire Rating: UL 555C classified and labeled as a 1-1/2 hour ceiling damper.
- C. Air Flow Rating: UL approved for dual directional air flow.
- D. Frame: Galvanized steel with roll formed ridge for blade stop.
- E. Blades:
  - 1. Style: Two-piece, single-thickness with blade insulation, hinged in center, and held open with fusible link.
  - 2. Action: Butterfly.
  - 3. Orientation: Horizontal.
  - 4. Material: Minimum 20 gauge galvanized steel.
- F. Hinge: Spring stainless steel, mechanically attached to blades.
- G. Mounting: Horizontal.
- H. Temperature Release Device: Fusible link, 165 degrees F.
- I. Finish: Mill galvanized.
- J. Performance Data:
  - 1. Pressure Drop: Maximum 0.1 inches w.g. at 500 fpm across 18 x 18 inch damper.
- K. Fusible Volume Adjust: UL classified.



## 2.8 VOLUME CONTROL DAMPERS

### A. Manufacturers:

1. **Air Balance, Inc.**
2. **Ruskin.**
3. **Pottorf.**

### B. Splitter Dampers:

1. **Material:** Same gauge as duct to 24 inches size in both dimensions, and two gauges heavier for sizes over 24 inches.
2. **Blade:** Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.
3. **Operator:** Minimum 1/4 inch diameter rod in self-aligning, universal joint action, flanged bushing with set screw.
4. **Single Blade Dampers:** Fabricate for duct sizes up to 6 x 30 inch.

### C. Multi-Blade Damper:

Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

### D. Quadrants:

1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches furnish regulator at both ends.

## 2.9 FLEXIBLE DUCT CONNECTIONS

### A. Manufacturers:

1. **Duro Dyne Inc.**
2. **Ventfabrics.**
3. **Ward Industries**

### B. Connector:

Fabric crimped into metal edging strip.

1. **Fabric:** UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
2. **Net Fabric Width:** Approximately 3 inches wide.
3. **Metal:** 3 inch wide, 24 gauge galvanized steel.

### C. Leaded Vinyl Sheet:

Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in the 10 to 10,000 Hz range.



## 2.10 DIAL THERMOMETERS

- A. Manufacturers:
  - 1. **Ashcroft.**
  - 2. **Trelice.**
  - 3. **Watts.**
- B. Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
  - 1. Size: 3 inch diameter dial.
  - 2. Lens: Clear Lexan.
  - 3. Accuracy: 1 percent.
  - 4. Calibration: Degrees F.

## 2.11 STATIC PRESSURE GAUGES

- A. Manufacturers:
  - 1. **Ashcroft.**
  - 2. **Trelice.**
  - 3. **Watts.**
- B. Dial Gauges: 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front calibration adjustment, 2 percent of full scale accuracy.
- C. Inclined Manometer: Plastic with red liquid on white background with black figures, front calibration adjustment, 3 percent of full scale accuracy.
- D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

## 2.12 MOTORIZED CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by BAS vendor or one of the following:
  - 1. **Air Balance Inc.; a division of Mestek, Inc.**
  - 2. **Ruskin Company.**
  - 3. **Pottorf.**
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
  - 1. Hat shaped.



2. Stainless-steel channels, 0.064 inch (1.62 mm) thick.
  3. Mitered and welded corners.
- D. Blades:
1. Multiple blades with maximum blade width of 8 inches (200 mm).
  2. Opposed-blade design.
  3. Stainless steel.
  4. 0.064 inch (1.62 mm) thick.
  5. Blade Edging: Closed-cell neoprene edging.
  6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch- (13-mm-) diameter; stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- F. Bearings:
1. Stainless-steel sleeve.
  2. Dampers in ducts with pressure classes of 3-inch WG (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  3. Thrust bearings at each end of every blade.
  4. Damper Motors: Modulating action.

## 2.13 LOUVERS

- A. Connect to louvers furnished under General Construction work.

## 2.14 AIR FLOW MEASURING STATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. **Ruskin, IAQ Measuring Damper, Model AML3.**
  2. **Air Monitor Corp.**
  3. **Wetmaster Co.**
- B. Description: Factory fabricated unit with casing, velocity traverse section and sensors, companion volume meter, and interconnection to volume meter. Air monitoring station must be accurate within 5% between 350 and 400 fpm free area velocity. Air flow resistance not to exceed 0.04" WG at 1000 fpm face velocity.
- C. Casing: 0.064 inch (1.62 mm) thick welded galvanized sheet steel, with flanged ends to match connecting ductwork.



- D. Velocity Traverse Section:
  - 1. Copper static pressure sensors.
  - 2. Copper total pressure sensing manifolds and control averaging manifold.
  - 3. Operation: Equalizing and integrating all sensor measurements into one total pressure and one static pressure metering port.
  - 4. Sensors positioned on equal-area traverse principle.
  - 5. Aluminum honeycomb air straightener.
- E. Volume Meter:
  - 1. Dry dial and diaphragm-actuated type.
  - 2. Calibrated in CFM (cu cm/sec) and FPM (m/s).
  - 3. Provided with mounting bracket.
- F. Install nameplate for each station to indicate:
  - 1. Unit size and unit designation.
  - 2. Design air quantity.
  - 3. Design air flow.
  - 4. Design air velocity.

## 2.15 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. **Ductmate Industries, Inc.**
  - 2. **Duro Dyne Inc.**
  - 3. **Metalaire.**
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized steel, aluminum or stainless steel sheet, to match duct material; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.



## **PART 3 - EXECUTION**

### **3.1 INSTALLATION.**

- A. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside.
- B. Access Doors:
  - 1. Install access doors at the following locations:
    - a. On both sides of duct coils.
    - b. Upstream and downstream from duct filters.
    - c. At outdoor-air intakes and mixed-air plenums.
    - d. At drain pans and seals.
    - e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
    - f. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
    - g. At each change in direction and at maximum 50-foot spacing.
    - h. Upstream and downstream from turning vanes.
    - i. Upstream or downstream from duct silencers.
    - j. Control devices requiring inspection, including smoke detection heads.
    - k. At fan bearings enclosed in ducts.
    - l. Inlet side of each single width centrifugal fan.
    - m. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.
  - 2. Install access doors with swing against duct static pressure.
  - 3. Access Door Sizes:
    - a. One-Hand or Inspection Access: 8 by 5 inches.
    - b. Two-Hand Access: 12 by 6 inches.
    - c. Head and Hand Access: 18 by 12 inches.
    - d. Head and Shoulders Access: 21 by 14 inches.
    - e. Body Access: 25 by 14 inches.
    - f. Body plus Ladder Access: 25 by 17 inches.
  - 4. Label access doors according to Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.



5. Mark access doors for fire and smoke dampers on outside surface, with minimum 1/2 inch high letters reading: FIRE/SMOKE DAMPER, SMOKE DAMPER, OR FIRE DAMPER.
- C. Flexible Connectors.
1. Install flexible connectors at duct connections to equipment, at building expansion joints, at connections between ducts of dissimilar metals and at penetrations of mechanical equipment room walls.
  2. Install flexible connections with 2 inches slack in fabric and minimum movement of 1 inch.
  3. For fans developing static pressures of 5-inch WG and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- D. Flexible Ducts
1. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
  2. Connect diffusers or light troffer boots to ducts with maximum 18-inch lengths of flexible duct clamped or strapped in place.
  3. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws. Attach to supply air duct with low entrance loss, bellmouth type connector at air inlet end.
- E. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.
- F. Install wire mesh screen grilles at return air ducts in hung ceilings and in other places where indicated. Bolt grilles to flanged connections or ducts at terminations.
- G. Install louvers in building construction at locations where indicated. Coordinate mounting details with particular building construction and/or window framing details. Install blank-off panels at unused portions of louvers; secured with bolts and/or screws.
- H. Air Flow Measuring Stations
1. Install air flow measuring stations where indicated, or as directed by engineer.
  2. Install all interconnecting tubing between measuring station, companion meter and control systems, in accordance with the manufacturer's printed instructions.
- I. Install temporary duct test holes and 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 and combination fire and smoke dampers at required locations. 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 control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- L. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts and as indicated. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
1. Install volume dampers at the following locations:
    - a. At all splits, except grease exhaust ducts.
    - b. In ducts serving single supply, return and exhaust outlets.
    - c. In open return ducts above ceiling.
    - d. In ducts connecting to a common plenum.
    - e. Where required for balancing.
  2. Install remote damper operators for volume dampers above ceilings which are non-accessible or without access panels.
  3. Install steel volume dampers in steel ducts.
  4. Install aluminum volume dampers in aluminum ducts.
  5. Do not install volume dampers in grease ducts.

END OF SECTION 23 33 00