

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

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

**A. Section Includes:**

1. Backdraft dampers.
2. Manual volume dampers.
3. Fire dampers.
4. Smoke dampers.
5. Combination fire/smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Screened openings.
12. Duct accessory hardware.

#### **1.2 SUBMITTALS**

- A. Product Data:** For each type of product indicated.
- B. Shop Drawings:** For duct accessories. Include plans, elevations, sections, details and attachments to other work.
1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.
    - b. Manual volume damper installations.
    - c. Fire damper, smoke damper, and combination fire/smoke damper installations, including sleeves; and duct-mounted access doors.
    - d. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and maintenance data.**

#### **1.3 QUALITY ASSURANCE**

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."**
- B. Comply with AMCA 500-D testing for damper rating.**

## PART 2 - PRODUCTS

### 2.1 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. Refer to Division 23 Section "Metal Ducts."

### 2.2 BACKDRAFT DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - 1. Air Balance Inc.; a division of Mestek, Inc.
  - 2. American Warming and Ventilating; a division of Mestek, Inc.
  - 3. Cesco Products; a division of Mestek, Inc.
  - 4. Duro Dyne Inc.
  - 5. Greenheck Fan Corporation.
  - 6. Nailor Industries Inc.
  - 7. NCA Manufacturing, Inc.
  - 8. Pottorff; a division of PCI Industries, Inc.
  - 9. Ruskin Company.
  - 10. SEMCO Incorporated.
  - 11. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: 2 inch wg.
- E. Frame: 0.063 inch thick extruded aluminum, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6 inch width, 0.050 inch thick aluminum sheet with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Extruded vinyl, mechanically locked.
- I. Blade Axles:
  - 1. Material: Nonferrous metal.
  - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Aluminum.
- K. Return Spring: Adjustable tension.

L. Bearings: 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.

N. Sleeve: Minimum 20 gage thickness.

## 2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - a. Air Balance Inc.; a division of Mestek, Inc.
  - b. American Warming and Ventilating; a division of Mestek, Inc.
  - c. McGill AirFlow LLC.
  - d. METALAIRE, Inc.
  - e. Nailor Industries Inc.
  - f. Pottorff; a division of PCI Industries, Inc.
  - g. Ruskin Company.
  - h. Vent Products Company, Inc.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
  - a. Hat shaped, galvanized steel channels, 0.064 inch minimum thickness.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel or opposed blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
  - a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3 inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
9. Blade Axles: Galvanized steel.

10. Bearings:

- a. Oil-impregnated bronze.
- b. Dampers in ducts with pressure classes of 3 inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

11. Tie Bars and Brackets: Aluminum.

B. Jackshaft:

1. Size: 1 inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. 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.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

1. American Warming and Ventilating; a division of Mestech, Inc.
2. Arrow United Industries; a division of Mestech, Inc.
3. Cesco Products; a division of Mestech, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. METALAIRE, Inc.
8. Nailor Industries Inc.
9. MCA Manufacturing, Inc.
10. Ruskin Company.
11. Young Regulator Company.

B. Frames:

1. Hat shaped.
2. Galvanized steel channels, 0.064 inch thick.
3. Mitered and welded corners.

C. Blades:

1. Multiple blade with maximum blade width of 8 inches.

2. Parallel and opposed blade design.
  3. Galvanized steel.
  4. 0.064 thick.
  5. Blade Edging: Closed-cell neoprene edging.
  6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- D. Blade Axles: 1/2 inch diameter; galvanized steel, glade-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.
- E. Bearings:
1. Molded synthetic.
  2. Dampers in ducts with pressure classes of 3 inch wg 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.

## 2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
1. Air Balance Inc.; a division of Mestek, Inc.
  2. Greenheck Fan Corporation.
  3. Nailor Industries Inc.
  4. NCA Manufacturing, Inc.
  5. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4 inch wg static pressure class and minimum 4000 fpm velocity.
- D. Fire Rating: 1-1/2 hours or as indicated on the Drawings.
- E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory or field installed, galvanized sheet steel.
1. Minimum Thickness: 0.052 inch thick and of length to suit application.
  2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.

- H. 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.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

## 2.6 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - 1. Air Balance Inc.; a division of Mestek, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. Nailor Industries Inc.
  - 4. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single point connection.
- D. Frame: Multiple-blade type; fabricated with roll-formed, 0.034 inch thick galvanized steel; with mitered and interlocking corners.
- E. Blades: Roll formed, horizontal, interlocking, 0.034 inch thick, galvanized sheet steel. In place of interlocking blades, use full length, 0.034 inch thick, galvanized steel blade connectors.
- F. Leakage: Class I.
- G. Rated pressure and velocity to exceed design airflow conditions.
- H. Mounting Sleeve: Factory installed, 0.052 inch thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- I. Damper Motors: Pneumatic.
- J. Accessories:
  - 1. Auxiliary switches for position indication.
  - 2. Momentary test and reset switches, remote mounted.

## 2.7 COMBINATION FIRE/SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
  - 1. Air Balance Inc.; a division of Mestek, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. Nailor Industries Inc.
  - 4. Ruskin Company.

- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4 inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 hours or as indicated on the Drawings.
- E. Frame: Multiple blade type; fabricated with roll formed, 0.034 inch thick galvanized steel; with mitered and interlocking corners.
- F. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- G. Blades: Roll-formed, horizontal, 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. Leakage: Class I.
- I. Rated pressure and velocity to exceed design airflow conditions.
- J. Mounting Sleeve: Factory-installed, 0.052-inch thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- K. Damper Motors: Pneumatic.
- L. Accessories:
  - 1. Auxiliary switches for position indication.
  - 2. Momentary test and reset switches, remote mounted.

## 2.8 TURNING VANES

- A. 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."
- B. Manufactured Turning Vanes for Metal Ducts: Fabricate of 1-1/2 inch wide curved blades of galvanized sheet steel at 3/4 inch on center; support with bars perpendicular to blades at 2 inches on center; 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. Vane Construction: Single or double wall.
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

## 2.9 DUCT-MOUNTED ACCESS DOORS

- A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1 inch by 1 inch butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  2. Frame: Galvanized sheet steel, with bend over tabs and foam gaskets.
  3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
    - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

## 2.10 FLEXIBLE CONNECTORS

- A. Materials: Flame retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4 inch wide, 0.028 inch thick, galvanized sheet steel or 0.032 inch thick aluminum sheets. Provide metal compatible with connected 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 lbf/inch in the filling.
  3. Service Temperature: Minus 40 to plus 200 deg F.
- E. 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.



## 2.11 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous glass insulation; polyethylene vapor-barrier film.
  - 1. Pressure Rating: 10 inch wg positive and 1.0 inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.
  - 3. Temperature Range: Minus 10 to plus 160 deg F.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous glass insulation; polyethylene vapor-barrier film.
  - 1. Pressure Rating: 4 inch wg positive and 0.5 inch wg negative.
  - 2. Maximum Air Velocity: 4000 fpm.
  - 3. Temperature Range: Minus 20 to plus 175 deg F.
- C. Flexible Duct Connectors:
  - 1. 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.

## 2.12 SCREENED OPENINGS

- A. Screened Openings: 16 gauge steel angle frame enclosing 1/2 inch mesh, 14 gauge galvanized steel wire screen.

## 2.13 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.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.
- C. Concealed Damper Regulators: Gear operated linkage, minimum 3/8 inch diameter, steel rod, chrome plated ceiling cover, flush mount.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- B. Install duct accessories of materials suited to duct materials; use galvanized steel accessories in galvanized steel ducts, and stainless-steel accessories in stainless-steel ducts.

- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. 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. Install as far upstream as layout and accessibility allow.
  - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire, smoke, and combination fire/smoke dampers according to UL listings.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On both sides of duct coils.
  - 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.
  - 3. Adjacent to and close enough to fire, smoke, and combination fire/smoke dampers, to reset or reinstall fusible links.
  - 4. At each change in direction and at maximum 50 foot spacing.
  - 5. Upstream of turning vanes.
  - 6. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
  - 1. One-Hand or Inspection Access: 8 by 5 inches.
  - 2. Two-Hand Access: 12 by 6 inches.
  - 3. Head and Hand Access: 18 by 10 inches.
  - 4. Head and Shoulders Access: 21 by 14 inches.
  - 5. Body Access: 25 by 14 inches.
  - 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Division 23 Section "Identification for Mechanical Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. Connect terminal units to supply ducts directly or with maximum 12 inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to low-pressure ducts directly or with maximum 60 inch lengths of flexible duct clamped or strapped in place.

- O. Connect flexible ducts to metal ducts with liquid adhesive plus draw bands.
- P. Install duct test holes where required for testing and balancing purposes.

### 3.2 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire/smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

**END OF SECTION 23 33 00**