

SECTION 23 31 14 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 23 01 00, "Mechanical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Work Included: Provide ductwork accessories as shown on the Drawings, specified and required.
- B. Types: The types of ductwork accessories required for the project include, but are not limited to:
 - 1. Flexible connections.
 - 2. Direction and volume control dampers.
 - 3. Fire dampers.
 - 4. Fire/smoke dampers.
 - 5. Smoke Dampers.
 - 6. Radiation dampers.
 - 7. Flashing and counterflashing.
 - 8. Turning vanes.
 - 9. Duct access doors and inspection plates.
 - 10. Test openings.
 - 11. Screens.
 - 12. Miscellaneous ductwork materials.

1.3 QUALITY ASSURANCE:

- A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "HVAC Duct Construction Standards", current edition.
- B. ASHRAE Standards: Comply with American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
- C. Certification: Fire, fire/smoke and smoke dampers shall be UL-listed, FM-approved and comply with applicable building code requirements.
- D. Manufacturers: Provide products complying with the specifications and produced by one of the following:
 - 1. American Foundry.
 - 2. Duro-Dyne.
 - 3. Elgin Sheet Metal Products.
 - 4. Nailor Industries.
 - 5. Prefco.
 - 6. Ruskin.
 - 7. Tuttle and Bailey.
 - 8. United Sheet Metal.
 - 9. Vent-Fabrics, Inc.
 - 10. Ventlok.
 - 11. Young Regulator Co.

1.4 SUBMITTALS:

- A. Shop drawings submittals shall include, but not be limited to, the following:

1. Cut sheets of ductwork accessories, clearly indicating materials, construction dimensions, ratings, approvals, and other pertinent information.
2. Manufacturers' UL-approved installation instructions for fire, fire/smoke, and smoke dampers.
3. Additional information as required in Section 23 01 00.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver ductwork accessories in factory-fabricated water-resistant wrapping.
- B. Handle ductwork accessories carefully to avoid damage to material component, enclosure and finish.
- C. Store ductwork accessories in a clean, dry space and protect from the weather.

PART 2 - PRODUCTS

2.1 DUCTWORK ACCESSORIES, MATERIALS, AND FABRICATION:

- A. General: Provide ductwork accessories which comply with Sections 15840, "Ductwork", and 15845, "Ductwork Accessories", for applicable product requirements of ductwork materials and as required for a complete ductwork system installation.

2.2 FLEXIBLE CONNECTIONS:

- A. General: Flexible connections shall be minimum 3" wide and be UL-labeled, 30 ounces glass fabric-lined with insulation and coated on both sides with neoprene, complete with attachment accessories, "Vent-Glass" by Vent-Fabrics, Inc., Elgen "Zipper-lock" HZ-LN-14, Duro-Dyne Excelon "Metal-Fab", flexible connections shall be fabricated in accordance with Fig. No. 2-19 of the SMACNA HVAC Duct Construction Standards, current edition, or approved equal.

2.3 DIRECTION AND VOLUME CONTROL DAMPERS:

- A. General: Provide all direction and balancing (volume control) shown or noted on Drawings. All damper control devices shall be installed so as to be fully concealed in finished rooms and spaces.
- B. Control Dampers:
 1. Splitter Dampers: Splitter dampers shall be fabricated of steel not lighter than 16 gauge. The leading edge of the damper shall be hemmed. Each splitter shall be a minimum of 12" long or 1-1/2 times the width of the smaller of the two branches it controls, whichever is greater. Dampers shall be carefully fitted, and shall be controlled by locking quadrants equal to Ventlok No. 555 on exposed uninsulated ductwork, Ventlok No. 644 on exposed externally insulated ductwork and Ventlok No. 677 (2-5/8" diameter) chromium plated cover plate for concealed ductwork not above lay-in accessible ceilings, or approved equals.. Furnish and install end bearings for the damper rods on the end opposite the quadrant when Ventlok No. 555 or No. 644 regulators are used, and on both ends when Ventlok No. 677 regulators are used. On concealed ductwork above lay-in accessible ceilings use Ventlok No. 555 or No. 644 locking quadrant for splitter dampers. Dampers larger than 3 square feet in area shall be controlled by means of rods hinged near the leading edge of the damper with provisions for firmly anchoring the rod and bearings supporting the axle.
 2. Balancing Dampers: Balancing dampers shall be provided in all zones of multi-zone air handling units, in all air device taps and where shown on the drawings. Refer to Section 233113 "Ductwork" for air device flexible duct taps. Balancing dampers shall consist of single blade dampers in rigid round duct and rectangular duct up to 10" high and 12" wide, and opposed blade dampers in ducts 11" high and larger. Single blade dampers shall be in accordance with Fig. 2-14 of the SMACNA HVAC Duct Construction Standards (SDCS), current edition, and opposed blade dampers shall be in accordance with SDCS Fig. No. 2-15. Single blade dampers for rectangular duct shall be Ruskin MD35 22 ga. single blade galvanized steel dampers or an approved equal. Single blade dampers for round duct shall be Ruskin MDRS35 20 ga. single blade galvanized steel dampers. Single blade dampers shall be provided with full length 3/8" square shafts secured to the damper blade with a minimum of 2 U-bolts, nylon bearings, insulation build out and heavy duty locking hand quadrants. Opposed blade dampers for rectangular duct shall be Ruskin MD35/OB 16 ga. Galvanized steel opposed blade dampers or

an approved equal. Opposed blade dampers shall be provided with full length 1/2" square shafts, concealed linkage, nylon bearings, insulation build out and heavy duty locking hand quadrants. Air pressure drop through each balancing damper not to exceed 0.05" wg at design airflow. All balancing dampers shall have 100% free area with damper open.

3. Damper Regulators: Damper regulators for concealed accessible applications shall be Young Valcalox 400 series lever handle damper quadrants or an approved equal. Where regulators are installed on externally insulated ductwork, provide stand-off platforms at least 1/4" higher than the insulation thickness. Where damper regulators are required in non-accessible locations, provide access doors or Young or equal extension rods, couplings, 90 degree gear drives, etc. as required and Young 301 or approved equal flush mounted remote regulator as directed by the Architect.
4. Extractors: Provide extractors of the size and type indicated, with hex-key operated adjustable blades, with gang operated galvanized steel blades on one inch centers.
5. Backdraft Dampers: Provide all aluminum gravity type backdraft dampers with an extruded frame and roll formed blades with silicon impregnated felt seals. Blade height shall not exceed 4", blade width shall not exceed 48" and blade linkage shall be provided to gang operate dampers by section.

- C. Operators: Damper operators for concealed inaccessible ductwork shall be Young Regulator Company, Catalog No. 700 or No. 315, as shown. Non-insulated accessible ductwork shall be Young Regulator Company, Catalog No. 433. Accessible insulated ductwork shall be Young Regulator Company, Catalog No. 443. Approved equal units by Duro-Dyne or Vent Fabrics, Inc. will be acceptable.

2.4 FIRE DAMPERS:

- A. General: Provide fire dampers at duct penetrations of rated floors, fire walls, elsewhere as shown in the Drawings and where required by **[City of Houston]** [] Building Code. Fire dampers shall comply with Uniform Building Code Standard No. 43-7, be inspected and approved by an approved inspection agency and be labeled at the factory in accordance with Uniform Building Code Standard 43, Section 43.714. Dampers shall be UL-labeled and shall meet all of the requirements of NFPA 90A and UL Standard 555.
1. Provide 1 hour rated dampers where penetrations are in required 1 hour fire rated assemblies.
 2. Provide 1-1/2 hour rated dampers where penetrations are in required 2 hour fire rated assemblies.
 3. Provide 3 hour rated dampers where penetrations are in required 4 hour fire rated assemblies. 4 hour occupancy separating walls are excepted and shall not be penetrated by ductwork..
 4. Dampers shall be activated by a UL-approved fusible link which shall automatically close the damper upon operation. Fusible links shall operate at approximately 50°F above the maximum temperature in the duct system in normal operation, but not less than 165°F. All dampers associated with Life Safety Systems shall have minimum 212°F fusible links. Hinged dampers shall have stainless or cadmium-plated spring steel catches. All dampers shall be dynamic rated and shall have spring closure to ensure positive shutoff at velocities up to 5000 fpm and pressures up to 10" wg.
 5. Dampers shall be UL-rated per UL Standard 555 and shall be Ruskin Type DIBD Series, Style A, B or C, or an approved equal.
 6. Dampers shall be sized so that the free area space is not less than **[95%]** **[100%]** of the connected duct free area space for low velocity, low pressure ductwork and 100% of the connected duct free area space for high velocity, high pressure ductwork. Dampers shall be installed so as to provide a positive barrier to the passage of air when in the closed position. Dampers shall be installed with angle iron frames and slip joint connections per manufacturer's installation requirements and SMACNA Standards such that they are self-supporting in the case of duct destruction due to heat. The installing contractor shall be responsible for coordinating locations which require special sleeves.

7. Provide access doors as specified under ductwork for all internally actuated dampers. Where duct access doors are installed in non-accessible locations, provide ceiling or wall access doors. Label duct access doors "FIRE DAMPER ACCESS" with 1/2" high black stencil letters.

2.5 FIRE/SMOKE DAMPERS:

- A. General: Provide low leakage fire/smoke dampers at all locations shown on the Drawings or required. Dampers shall be multi-blade type combination fire/smoke dampers and shall possess a 1-1/2 hour UL label in accordance with UL 555S and shall meet all requirements of the latest edition of NFPA 90A and 101. Dampers shall be tested and certified in accordance with AMCA Standard 500-75 and shall leakage Class II per UL Standard 555S.
 1. Fire/smoke dampers and operators shall be UL-listed and labeled in the sizes used on the project and all dampers on the project shall be by the same manufacturer. UL-labeling of damper sizes used on the project shall be clearly indicated on shop drawing submittals.
 2. Dampers shall be suitable for opening and closing at static pressure up to 6" wg and at air velocities up to 3500 fpm. Damper leakage shall not exceed 10 cfm/sf at one inch wg or 200 cfm/sf at 4" wg.
 3. All combination fire/smoke dampers shall include an operating shaft which, when rotated, causes the damper to operate between open and closed. Operating shaft and damper combination shall be suitable for linking to and operation by any standard **[pneumatic] [electric]** damper operator having sufficient torque characteristics. Combination fire/smoke dampers shall be Ruskin Type FSD-60 or an approved equal with 212°F thermal links and rectangular, round or oval duct connections as required.
 4. Each combination fire/smoke damper shall be furnished complete with factory sleeve, damper operator, and thermal link factory-installed. The installing contractor shall be responsible for coordinating locations which require a special sleeve. Actuators shall be **[pneumatic] [electric]** type as specified or required and shall be of the spring fail closed type that will close upon loss of **[air supply] [power]**. Damper operators shall be UL-listed as fire damper operators, shall bear the appropriate UL fire damper operator label and shall be rated for continuous operation at 250°F.
 5. All pneumatic piping and controls to operate damper motors shall be furnished under **[Section 1230600, "Building Controls and Automation"**. **[All wiring and materials to interface the controls with the fire detection and alarm systems shall be furnished and installed under Division 26.]** Dampers shall be installed with angle iron frames and slip joint connections per manufacturer's recommendations and SMACNA Standards such that they are self-supporting in the case of duct destruction due to heat. Provide access doors as specified under Ductwork for all internally actuated dampers and for maintenance inspection of all externally actuated dampers. Where duct access doors are installed in non-accessible locations, provide ceiling or wall access doors. Label duct access doors "FIRE/SMOKE DAMPER ACCESS" with 1/2" high black stencil letters.
 6. **[A double pole double throw (DPDT) limit switch shall be provided factory-installed on each fire/smoke damper. The switch shall change position when the fire damper closes. Refer to Division 26 for wiring of limit switches.]**

2.6 SMOKE DAMPERS:

- A. General: Provide smoke dampers at all locations shown on the Drawings or required. Dampers shall meet all requirements for fire/smoke dampers except that the dampers shall not incorporate a thermal link feature.

2.7 RADIATION DAMPERS:

- A. General: Ceiling radiation type fire dampers shall be installed in all UL design assembly fired rated ceilings in strict accordance with manufacturers UL-listed installation instructions. Ceiling dampers shall conform to UL Standard 555 and shall be Ruskin Model #CFD5A or approved equal rectangular or round neck damper with a fusible volume adjustment link for up to 20" diameter round or up to 18" x 18" square neck T-bar 24 x 24 face lay-in diffuser with 1/2" thick ceramic insulation blanket for

diffuser pan. Air device pan shall be minimum of 24 gauge steel as required by UL. Thermal insulation blankets for radiation dampers shall be enclosed in an approved mesh material to allow easy handling of the blankets.

2.8 HIGH PRESSURE, LOW LEAKAGE, INDUSTRIAL CONTROL DAMPERS.

- A. **General:** Provide factory-fabricated all stainless steel construction opposed blade-type control dampers as shown on the Drawings or required by the Sequence of Operation specified in Section 230593. Dampers shall be provided by the Division 15 contractor for control by the control subcontractor.
- B. **Construction:** Dampers shall have stainless steel channel frames the full size of the duct or opening in which the damper is installed. Frames on dampers over 4 square feet shall have corner bracing. Damper frames shall be minimum 16 gauge formed stainless steel enclosed in a stainless steel round transition duct. Fabricate damper blades of not less than 16 gauge stainless steel with airfoil design. Damper blades shall have a maximum width of 6" and a maximum length of 48". All dampers shall be provided with stainless steel bearings, stainless steel jamb seals, and stainless steel hardware as standard. Axles shall be a minimum of 1/2" diameter and be locked to the blade with rivets or be welded. All blades on each damper section shall be interconnected to act in unison. Maximum leakage rate through a 48" x 48" closed damper shall not exceed 32.0 cfm per square foot of damper face area at 10.0" of water pressure differential and a maximum closing torque of 50 inches/ pounds. Damper leakage ratings shall be certified in accordance with AMCA Standard 500. Dampers shall be Ruskin CD30AF series low leakage control dampers or an approved equal and shall be rated for system pressures up to 10.0" wg for damper blades up to 48" wide.
- C. **Damper Sizing:** Two position dampers shall be full duct or louver size. Modulating dampers shall be sized according to approach velocities, pressure drops, and similar criteria to obtain linearized characteristics. Maximum approach velocity shall be 1500 feet/ minute. Damper free area shall be sized by the BCAS manufacturer. Provide necessary blankoff plates between damper leaves to obtain the required free area. Damper sizing shall be submitted to the Engineer for approval.
- D. **Operating Temperature Range:** Range shall be from -40°F to 180°F.
- E. **Operating Linkage:** Linkage shall be factory-assembled and shall be capable of withstanding a load equal to twice the maximum operating force of the damper operator without deflection.

2.9 AUTOMATIC MANIFOLD BLEED DAMPERS:

- A. Provide heavy duty round butterfly or opposed blade control dampers as shown on the drawings and required by the Sequence of Operation specified in Section 230593. The Division 15 contractor shall provide dampers for control by the control subcontractor.
- B. Dampers shall be 316 stainless steel construction. Dampers shall be butterfly type consisting of circular blade, mounted to axle within formed flanged frame. Frame shall be constructed of steel channel and shall have full circumference blade stop located in air stream. Damper shaft shall be continuous, solid cold rolled steel extending through entire diameter of damper and beyond damper bearing a minimum of 6 inches. Axle shall be supported in sealed, relubricable ball bearings mounted to damper frame. Damper frame and blade shall be fabricated from hot rolled steel. Damper frame shall be minimum 10 gauge. Damper flanges shall be minimum 1 1/2" wide. Provide bolt holes in both flanges. Minimum blade thickness shall be 1/4". Axle diameter shall be minimum 3/4". Dampers shall be Ruskin model CDR92 or approved equal. At the contractor's option these dampers may be rectangular opposed blade dampers.

2.10 FLASHING AND COUNTERFLASHING:

- A. **General:** Flashing and counterflashing shall be as specified in other Divisions of these Specifications.

2.11 TURNING VANES:

- A. **General:** Provide turning vanes in the size and type indicated with the following additional construction features:
 - 1. **Blades:** 2" galvanized steel for up to and including 18" ducts.
 - 2. **Blades:** 4-1/2" galvanized steel for ducts over 18".

3. Construction: Single wall blade, constructed in accordance with Fig. No. 2-3 and Fig. No. 2-4 of the SMACNA HVAC Duct Construction Standards, current edition.
4. Types: Fixed blades for 90 degree elbows, adjustable for transition elbows and fixed for 45 degree elbows where shown.

2.12 DUCT ACCESS DOORS AND INSPECTION PLATES:

- A. Access Doors: Provide [**Flexmaster Inspector Series Spin-In low leakage, round, high pressure, dual wall, insulated**][**Ruskin Type ADH2, Flexmaster Inspector Series Tab Doors or approved equal dual wall, insulated, hinged**] access doors in ductwork as required for access to fire, smoke and fire/smoke dampers, duct smoke detectors, sampling tubes, humidifiers and other duct mounted devices. Minimum door size shall be [**12" round**][**14" x 14"**] unless a smaller size is required due to duct dimensions. Square access doors shall be constructed in accordance with Fig. No. 2-12 and 2-13 of the SMACNA HVAC Duct Construction Standards, current edition.
- B. Inspection Plates: Provide inspection plates where shown on the Drawings. If not detailed, provide a minimum opening of 4" x 4" with a 6" x 6" cover plate. The cover plate shall be one gauge heavier than the ductwork, gasketed and secured with a minimum of eight sheet metal screws.

2.13 TEST OPENINGS:

- A. General: Ventlok No. 699 instrument test holes in locations as required to measure pressure drops across each item in the system, e.g., O.A. louvers, filters, fans, coils, intermediate points in duct runs, etc. Test holes in stainless steel duct systems shall be 316 stainless steel or an approved corrosion resistant design.

2.14 SCREENS:

- A. General: Provide screens on all duct, fan, etc., openings furnished by this Contractor which lead to, or are, outdoors. Screens shall be No. 16 gauge, 1/2" galvanized steel mesh in removable galvanized steel frame. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

2.15 MISCELLANEOUS DUCTWORK MATERIALS:

- A. General: Provide miscellaneous materials for ductwork accessories, including hinges, refrigerator latches, sash locks, bolts and wing nuts, gaskets and pitot tubes as recommended by the ductwork accessories manufacturer for the application indicated.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Flexible Connections: Install flexible connections where ducts connect to fans, including roof exhausters. There shall be a minimum of 1/2" slack in the connections, and a minimum of 2-1/2" distance between the edges of the ducts except that there shall also be a minimum of one inch (1") of slack for each inch of static pressure on the fan system.
- B. Dampers: Install balancing, splitter and backdraft dampers where shown on the Drawings and wherever necessary for complete control of the airflow, including all supply, return and exhaust branches, "division" in main supply, return and general exhaust ducts, each individual air supply outlet and fresh air ducts. Where access to dampers through a fixed suspended ceiling is necessary, this Contractor shall be responsible for the proper location of the access doors. Install balancing dampers in each zone of multi-zone units.
- C. Fire, Fire/Smoke and Smoke Dampers: Install fire, fire/smoke and smoke dampers as detailed on the Drawings and in strict accordance with the damper manufacturers UL-approved installation instructions.
- D. Flashing: Install flashing where ducts pass through roofs or exterior walls, suitable flashing shall be provided to prevent rain or air currents from entering the building. The flashing shall be of not less than No. 24 gauge 316 stainless steel.
- E. Turning Vanes: Install turning vanes per SMACNA standards. Turning vanes in ducts carrying air under pressure of 1-1/2" water gauge or more shall be anchored to the cheeks of the elbow in such a

way that the cheeks will not breathe at the surfaces where the vanes touch the cheeks. In most cases, this will necessitate the installation of an angle iron support on the outside of the cheek parallel to the line of the turning vanes.

- F. Access Doors: Install access doors so that the doors open against the system air pressure wherever feasible and that their latches are operable from either side, except where the duct is too small to be entered. Provide access to each fire damper link to permit resetting. Comply with City Code Requirements and NFPA 96. Install hinged access doors in ductwork to provide access to all fire dampers, mixed air plenums, upstream of steam reheat coils, automatic dampers, etc. Where the ducts are insulated, the access doors shall be double skin doors with one inch of insulation in the door. Where access doors are located above a suspended ceiling, this Contractor shall be responsible for the proper location of the ceiling access doors, if the ceiling system does not provide proper access.
- G. Inspection Plates: Install plates at each multi-zone zone damper and where otherwise indicated on the Plans.
- H. Test Openings: Install test openings for pitot transverse of all supply, return, and exhaust duct connections to fan powered equipment, at each duct mounted balancing damper and at other locations required for proper measurement of airflow in all duct systems.

3.2 TESTING:

- A. General: Check installed ductwork accessories for required operation and leakproof performance during the system's operational test. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.
- B. Damper Testing: Test all fire, fire/smoke and smoke dampers for proper operation after the damper installation is complete. Dampers which exhibit any binding or other forms of impaired operation shall be replaced and retested. Refer to Section 23 05 93 for additional requirements.
- C. Damper Certification: The Contractor shall include in the Operating and Maintenance Manuals, a letter certifying that all fire, fire/smoke and smoke dampers have been tested and are fully operational. Refer to Section 23 05 93 for additional requirements.

END OF SECTION 23 31 14