SECTION 23 3114 - DUCTWORK ACCESSORIES

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:

1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction.*

1.2 DESCRIPTION OF WORK

A. Work Included: Provide ductwork accessories as shown on the Drawings or as otherwise 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", third 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.

1.4 SUBMITTALS

A. 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 0100 “Mechanical General Provisions.”

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 that comply with Section 23 3113 "Ductwork" 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 inches wide and be UL-labeled, 30 ounces glass fabric-lined with insulation and coated on both sides with neoprene, complete with attachment accessories, flexible connections shall be fabricated in accordance with Fig. No. 7-8 and 7-9of the SMACNA HVAC Duct Construction Standards, third edition. Manufacturer shall certify that the product is suitable for the application in which it is installed.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Duro-Dyne Corporation.
   b. Elgen Manufacturering.
   c. Vent Fabrics Inc.

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.

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 Specification Section 23 3113 "Ductwork" for air device flexible duct taps.

B. Damper Material: Where damper is to be installed in a duct system that is a material other than galvanized steel, damper material shall match adjoining duct system.

C. Manual 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 inches 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 inch 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. Single Blade Rectangular Balancing Dampers: Balancing dampers shall consist of single blade dampers in rigid duct and rectangular duct up to 10 inches high and 12 inches wide. Single blade dampers shall be in accordance with Fig. 7-4 of the SMACNA HVAC Duct Construction Standards (SDCS), third edition.Single blade dampers shall be provided with full length 3/8 inch square shafts secured to the damper blade with a minimum of 2 U-bolts, nylon bearings, insulation build out and heavy duty locking hand quadrantsAir pressure drop through each balancing damper not to exceed 0.05 inches wg at design airflow.
   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
      1) Ruskin MD 35.
      2) Approved equal.
3. Multiple Blade Rectangular Balancing Dampers: Balancing dampers shall consist of multiple, opposed blade dampers in ducts 11 inches high and larger. Multiple blade dampers shall be in accordance with the SMACNA HVAC Duct Construction Standards (SDCS) Fig. No. 7-5. 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 ½ inch square shafts, conceals\ed linkage, nylon bearings, insulation build out and heavy duty locking hand quadrants. Air pressure drop through each balancing damper not to exceed 0.05 inches wg at design airflow.
   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
      1) Ruskin MD 35.
      2) Approved equal.
4. Single Blade Round Balancing Dampers: Balancing dampers shall consist of single blade dampers in rigid round duct up to 20" diameter. Single blade dampers shall be in accordance with Fig. 7-4

of the SMACNA HVAC Duct Construction Standards (SDCS), third edition. Single blade dampers shall be 20 ga. galvanized steel minimum and provided with full length 3/8" shafts secured to the damper blade with a minimum of 2 U-bolts, nylon bearings, insulation build out and heavy duty locking hand quadrants. Air pressure drop through each balancing damper not to exceed 0.05 inches wg at design airflow.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:

1) Ruskin MDRS25.
2) Approved equal.

5. Round Balancing Dampers over 20 Inches Diameter: For round dampers in ductwork over 20 inches diameter the damper shall be single blade dampers. Damper blade shall be 10 ga. galvanized steel minimum and provided with full length ¾ inch shafts secured to the damper blade with a minimum of 2 U-bolts, nylon bearings, insulation build out and heavy duty locking hand quadrants. Air pressure drop through each balancing damper not to exceed 0.05 inches wg at design airflow.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:

1) Ruskin CDR82.
2) Approved equal.

6. 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 ¼ inch 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.
7. 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.
8. 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 inches, blade width shall not exceed 48 inches and blade linkage shall be provided to gang operate dampers by section.

D. 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 curtain style fire dampers at duct penetrations of rated floors, fire walls, and elsewhere as shown in the Drawings and where required by NFPA or the International Building Code, whichever is the most stringent. Dampers shall be UL-labeled and listed according to UL 555 as a dynamic style fire damper. Damper shall comply with NFPA 90A.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Ruskin DIBD.
   b. Approved equal.
2. Provide 1-1/2 hour rated dampers where penetrations are required in 1 and 2 hour fire rated assemblies. Provide 3 hour rated dampers where penetrations are required in 3 and 4 hour fire rated assemblies.
3. All dampers on the project shall be by the same manufacturer.
4. Dampers shall be activated by a non-reusable fusible link which shall automatically close the damper upon operation. Fusible links shall operate at 165 degrees F.All dampers shall be dynamic rated and shall have spring closure to ensure positive shutoff at velocities up to 4,000 fpm and pressures up to 4 inch wg.
5. Dampers shall be sized so that the free area space is not less then **[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 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.
6. Provide access doors as specified under ductwork for all fire 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 ½ inch high black stencil letters. Access doors should be installed so that 100% of the damper face is accessible and can be touched. If required, provide multiple access doors.

2.5 FIRE/SMOKE DAMPERS:

A. General: Provide low leakage, multi-blade type combinationfire/smoke dampers at duct penetrations of rated floors, walls, and elsewhere as shown on the Drawings and where required by NFPA or the International Building Code, whichever is the most stringent. Dampers shall be UL-labeled and listed according to UL 555 and UL 555S. Damper shall comply with NFPA 80, 90A, 92A, 92B and 105.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Ruskin FSD-60.
   b. Approved equal.
2. All dampers on the project shall be by the same manufacturer.
3. Provide 1-1/2 hour rated dampers where penetrations are required in 1 and 2 hour fire rated assemblies. Provide 3 hour rated dampers where penetrations are required in 3 and 4 hour fire rated assemblies.
4. Dampers shall be suitable for opening and closing at static pressure up to 8 inches wg and at air velocities up to 4,000 fpm. Damper air performance shall comply with requirements in AMCA

511 and shall be licensed to bear AMCA seal for air performance. Damper shall be Class 1 leakage minimum.

5. 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.
6. Provide damper with temperature sensitive, re-operable electric activating device set for 165 degrees F. **[Temperature device shall be capable of being re-opened after initial closure for smoke evacuation or pressurization. Device shall be operable through a minimum of 250 degrees F]**
7. Each combination fire/smoke damper shall be furnished complete with factory sleeve, damper operator, and thermal link factory-installed. 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. 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 label.
8. All pneumatic piping and controls to operate damper motors shall be furnished under **[Division 25]**. **[All wiring and materials to interface the controls with the fire detection and alarm systems shall be furnished and installed under Division 26.]**
9. 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 ½ inch high black stencil letters. Access doors should be installed so that 100% of the damper face is accessible and can be touched. If required, provide multiple access doors.
10. **[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.]**
11. Provide a local switch mounted on the exterior of the damper assembly for local operation to be used to reset damper or during testing.

2.6 SMOKE DAMPERS:

A. General: Provide low leakage, multi-blade type smoke dampers at duct penetrations of rated floors, walls, and elsewhere as shown on the Drawings and where required by NFPA or the International Building Code, whichever is the most stringent. Dampers shall be UL-labeled and listed according to UL 555S. Damper shall comply with NFPA 90A, 92A, 92B and 105. Dampers shall meet all requirements for fire/smoke dampers except that the dampers shall not incorporate a thermal link feature.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Ruskin SD-60.

b. Approved equal.

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. Dampers shall be UL-labeled and listed according to UL 555C. Dampers shall have rectangular or round neck damper with a fusible volume adjustment link for up to 20 inches diameter round or up to 18 inches x 18 inches square neck T-bar 24 x 24 face lay-in diffuser with ½ inch 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.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Ruskin CFD5 for rectangular and Ruskin CFDR5 for round.
   b. Approved equal.

2.8 FLASHING AND COUNTERFLASHING

A. General: Flashing and counterflashing shall be as specified in Section 07 6200 “Sheet Metal Flashing and Trim.”

2.9 TURNING VANES

A. General: Provide turning vanes in the size and type indicated with the following additional construction features:

1. Blades: 2 inch galvanized steel for up to and including 18 inch ducts.
2. Blades: 4-1/2 inch galvanized steel for ducts over 18 inches.
3. Construction: Single wall blade, constructed in accordance with Fig. No. 4-3 and Fig. No. 4-4 of the SMACNA HVAC Duct Construction Standards, third edition.
4. Types: Fixed blades for 90 degree elbows, adjustable for transition elbows and fixed for 45 degree elbows where shown.

2.10 DUCT ACCESS DOORS AND INSPECTION PLATES

A. Rectangular Access Doors: Provide 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 14 inches x 14 inches unless a smaller size is required due to duct dimensions. Square access doors shall be constructed in accordance with Fig. No. 7-2 and 7-2M of the SMACNA HVAC Duct Construction Standards, third edition.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Flexmaster Inspector Series Tab Door
   b. Ruskin ADH22
   c. Approved equal.

B. Round Access Doors: low leakage, round, high pressure, dual wall, insulated 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 inches round unless a smaller size is required due to duct dimensions.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work:
   a. Flexmaster Inspector Series Spin Door
   b. Approved equal.

C. Inspection Plates: Provide inspection plates where shown on the Drawings. If not detailed, provide a minimum opening of 4 inches x 4 inches with a 6 inch x 6 inch cover plate. The cover plate shall be one gauge heavier than the ductwork, gasketed and secured with a minimum of eight sheet metal screws.

2.11 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, and elsewhere as required by the Test and Balance Contractor. Test holes in stainless steel duct systems shall be 316 stainless steel or an approved corrosion resistant design.

2.12 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, ½ inch 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.

2.13 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 exhaust fans. There shall be a minimum of ½ inch slack in the connections, and a minimum of 2-1/2 inch distance between the edges of the ducts except that there shall also be a minimum of 1 inch 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, Contractor shall be responsible for the proper location of 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 inches 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, fire smoke and smoke damper. Comply with NFPA 96. Install hinged access doors in ductwork to provide access to all fire dampers, mixed air plenums, upstream of 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, 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. Coordinate locatons of test openings with Test and Balance Contractor.

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 0593 “Testing, Adjusting and Balancing” 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 0593 “Testing, Adjusting and Balancing” for additional requirements.

END OF SECTION 23 3114