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SPECIFICATION DIVISION 23

NUMBER SECTION DESCRIPTION

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 233300 - AIR DUCT ACCESSORIES AND RGD'S

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DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 233300 - AIR DUCT ACCESSORIES AND RGD'S

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

B. Related Sections:

1. Section 233100: HVAC Ducts and Casings.
2. Section 230900: Mechanical Systems Controls.
3. Section 233600: Air Terminal Units.
4. Division 26: Electrical.

1.2 SUMMARY

A. Section Includes:

1. Sheet metal accessories as shown in the Contract Documents and required for a complete and operable air distribution system
2. Access doors in ductwork.
3. Duct test holes.
4. Duct air turning vanes.
5. Flexible connectors.
6. Fire dampers, fire/smoke dampers, smoke dampers, and combination smoke/isolation dampers.
7. Balance dampers.
8. Iris balance dampers
9. Backdraft dampers.
10. Sound attenuators.
11. Registers, grilles and diffusers.
12. Duct connections to laboratory airflow units.
13. Wire mesh screens.

B. This Section does not include sheet metal accessories for fiberglass reinforced duct (FRP) or other specialty duct systems. Refer to other specification sections for requirements.

C. Section does not include automatic control dampers. See Related Section 230900 Mechanical Systems Controls.

1.3 SUBMITTALS

A. Product Data: Submit performance data, rated capacities, furnished specialties, sound-power ratings, and accessories for each type of product.

B. Duct Silencers: Include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

C. Damper manufacturer's installation instructions.

D. Product Data for each type of product.

E. Shop Drawings:

1. Indicate the location and rating of all dampers on shop drawings and submittals.

F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the following quality assurance standards; latest editions, unless noted otherwise.

C. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

D. SMACNA "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

E. UL 555C "Standard for Fire Dampers."

F. UL 555S "Standard for Smoke Dampers."

1.5 WARRANTY

A. Provide a complete parts and labor warranty for a minimum of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCESS DOORS IN DUCTWORK

A. Provide access doors in ductwork to permit access to the linkage side of automatic dampers, fire dampers, smoke damper, combination fire/smoke dampers, upstream side of coils, filters, humidifiers, airflow measuring stations, other equipment or devices requiring access or other locations as indicated on Drawings for cleaning, maintenance, or inspection purposes.

B. Hang access doors on heavy gauge continuous hinges and secure in the closed position by means of metal clinching type cam latches. Hinges shall move freely. Where space conditions preclude hinges, provide four heavy duty cam-lock type latches, in addition to a retainer chain.

C. Access doors shall be of double wall insulated construction of not less than 20 gauge sheet metal, neoprene gasketed around the entire perimeter. Insulation between the metal panels shall be of the same thickness as the duct or panel adjacent to the access doors. Doors shall match duct material type, and at a minimum, the pressure class of the duct system in which they are installed.

D. Minimum Size: 24 inches by 24 inches when permitted by duct size. For smaller ducts, provide largest size access door that can be accommodated by duct height or width.

E. Acceptable Manufacturers:

1. Air Balance, Inc.
2. Ruskin Company,
3. Ductmate Industries, Inc.
4. Nailor Industries, Inc.
5. American Warming & Ventilating.

2.2 DUCT TEST HOLES

A. A. Permanent, factory fabricated duct test holes, with air-tight flanged fittings and screw cap. Provide extended neck fittings to clear insulation. Acceptable manufacturer and model:

1. Ventlock Model 699 by Ventfabrics, Inc.

2.3 DUCT AIR TURNING VANES

A. Provide factory manufactured turning vanes in each elbow where inside radius is less than the width of the duct, and in all square elbows located in duct construction of greater than 2 inches w.g.

B. Turning vane assemblies shall be adequately supported and affixed to prevent rattling, breakaway, and shall not deform. Assemblies longer than 12 inches shall be double wall.

C. Turning vanes in negative pressure ductwork with pressure rating above 2 inches shall be installed in accordance with SMACNA Industrial Duct Construction Standard.

D. Turning vanes shall match the duct material construction.

E. In lieu of turning vanes, use long radius elbows when the elbow free area is less than one square foot.

F. Airfoil turning vanes are not permitted.

G. Acceptable Manufacturers:

1. Aero Dyne.
2. Ductmate Industries, Inc.
3. Sheet Metal Connectors, Inc.
4. Duro-Dyne.
5. DynAir Inc.

2.4 FLEXIBLE CONNECTORS

A. Provide flexible connectors of 4-inch minimum fabric width.

B. Fabric for flexible duct connectors at equipment shall be a minimum of 22 oz. glass fabric, double coated with neoprene, fire retardant, flame-proofed, waterproof, airtight, and approved by UL and conforming to NFPA 90A. Flexible connectors susceptible to sweating shall be of the insulated type.

C. Flexible connectors shall be rated for the same pressure as duct or equipment.

D. Flexible connectors in laboratory and process exhaust systems shall be of the material and type suitable for that environment.

E. Acceptable Manufacturers:

1. Senior Flexonics Pathway, Inc.
2. McGill AirFlow LLC, An enterprise of United McGill Corporation.
3. Duro-Dyne.
4. Ventfabrics, Inc.
5. Fanair
6. Pathway
7. Ductmate
8. Ventglas

2.5 GENERAL DAMPER CONSTRUCTION REQUIREMENTS

A. Dampers shall be rated for the maximum close-off pressure at the installed location, but not less than the rating as indicated in the Damper Construction and Application Schedule.

B. Dampers installed in galvanized ductwork shall be all galvanized construction including blades, shafts, bearings, linkages, etc. or as indicated in other sections.

C. Dampers installed in stainless steel ductwork, polyvinyl coated ductwork (PCD), or located in any corrosive atmosphere shall be constructed of Type 304 or Type 316 stainless steel construction including blades, shafts, bearings, linkages, etc.

D. Refer to the Damper Construction and Application Schedule on the Drawings for additional requirements. If not on the Drawings, refer to the following location for the Damper Construction and Application Schedule.

1. https://umaec.umich.edu/for-vendors/design-guidelines/standard-details-and-schedules/.

2.6 FIRE DAMPERS, FIRE/SMOKE DAMPERS, SMOKE DAMPERS, AND COMBINATION SMOKE/ISOLATION DAMPERS

A. General:

1. Devices shall be of the appropriate service for the partition rating into which they are installed.
2. Dampers shall meet the requirements of NFPA 90A and labeled in accordance with the latest editions of UL 555, UL 555S, and UL 555C.
3. Provide dynamic rated dampers.
4. Each damper shall be rated to close against the maximum design air velocity and pressure at its installed location, with an additional 400 fpm velocity and 0.5 in. w.g. static pressure safety factor.
5. Dampers of all ratings and types shall be of the nominal 100 percent face area type, with blade package and frame components out of the airstream (type B). Dampers shall include the required oversize enclosures that shall be sealed by the damper manufacturer for the appropriate duct pressure class. Dampers shall have rectangular, flat oval or round duct collars for connection to mating ductwork.
6. Furnish sleeves and mounting accessories as required per code.

B. Fire Dampers

1. Fire dampers shall be provided as shown on the Drawings and wherever Drawings indicate fire rated partitions.
2. Fusible link temperature rating for fire dampers shall be 165 degrees F, or 50 degrees F above the highest duct system temperature, whichever is greater.

C. Smoke Dampers and Combination Fire/Smoke Dampers

1. Provide smoke dampers and combination fire/smoke dampers as shown on the Drawings and where architectural drawings indicate smoke/fire rated partitions.
2. Smoke dampers and combination fire/smoke dampers and actuators shall meet the requirements of NFPA 92A and NFPA 92B and shall be labeled as a "Leakage Rated Damper for Use in Smoke Control Systems" in accordance with latest edition of UL 555S. Smoke dampers shall be of low leakage design qualified to UL 555S leakage Class I and shall have a UL 555S elevated temperature rating of 350 degrees F minimum.
3. Supply each smoke damper and combination fire/smoke damper with a factory mounted damper actuator. Combination fire/smoke dampers shall be manufactured with a metal sleeve of appropriate length and thickness for the required damper installation, and the damper actuator shall be installed on the sleeve exterior. Damper actuators shall be electric unless otherwise indicated. Dampers shall fail to the closed position.
4. Damper Frame: Galvanized steel formed into a structural hat channel shape with reinforced corners. The blades shall be airfoil type. Bearings shall be sintered bronze sleeve turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 250 degrees F and jamb seals shall be stainless steel flexible metal compression type with silicone rubber backing, Class I rated.
5. Each combination fire/smoke damper shall also be equipped with a temperature limited re-openable feature as required by Code to meet the smoke control sequence of operation.

D. Smoke/Isolation Damper:

1. Smoke/isolation dampers, typically used at air handling units in discharge and return ductwork, shall comply with NFPA 90A and the above requirements for smoke dampers, except that dampers shall have UL rated electric actuators, with a minimum of one actuator for each sixteen square feet of damper area.

E. Acceptable Manufacturers:

1. Ruskin Company.
2. Air Balance Inc, a Mestek Company.
3. American Warming & Ventilating Co.
4. Vent Products Co., Inc.
5. Nailor Industries Inc.
6. Greenheck.

2.7 BALANCE DAMPERS

A. For pressure dependent systems, as a minimum, provide balance dampers at each branch duct, at each outlet or inlet, and as indicated for supply air, return air, and exhaust air duct systems.

B. For pressure independent systems, as a minimum, balance dampers shall be provided at each branch for each outlet downstream of each supply air Terminal Airflow Unit (TAU) or Laboratory Terminal Airflow Unit (LTAU) and at each branch inlet upstream of each return air or exhaust air TAU or LTAU box and as indicated.

C. Comply with SMACNA requirement and provide continuous rod and bearings on each end of shaft regardless of pressure class.

D. Use 3/8 inch continuous square rod and 18 gauge stiffened blade for duct sizes 18 inches wide by 18 inches high and smaller, or 12 inches diameter and smaller.

E. Use 1/2 inch continuous square rod and 16 gauge stiffened blade for single blade dampers in ducts 19 inches to 48 inches wide by a maximum of 10 inches high; and in 12-inch to 16-inch round ducts.

F. When multi-blade dampers are required, use a manufactured 16 gauge, stiffened, opposed blade damper in a 14 gauge hat channel steel frame with reinforced corners. All hardware shall be galvanized, except use brass trunnions and bronze, steel, or synthetic bearings.

G. Quadrant shall be locking type.

H. Quadrant end of damper rod shall be factory slotted to indicate blade position.

I. Provide galvanized or stainless steel sheet metal "hat section" on ducts with exterior insulation so that quadrant will be exposed. Provide tight sealing nylon brushing at duct opening for damper shaft under hat section.

J. Each square rod shall be installed so that quadrant will be accessible for adjusting.

K. Provide 24-inch-by-24-inch access door through ceiling or wall construction for each balance damper that is not accessible.

L. Acceptable Manufacturers:

1. Ruskin Company.
2. Young Regulator Company,
3. American Warming & Ventilating Co.
4. Vent Products Co., Inc.
5. Arrow United Industries.
6. Greenheck.
7. Flexmaster

2.8 IRIS BALANCE DAMPERS

A. Supply and exhaust air duct connections at ventilated animal racks, and where indicated, shall utilize Iris type balance dampers.

B. Damper shall use interlocking steel plates and a calibrated positioning system to form an adjustable aperture. Differential pressure ports on either side of aperture shall allow airflow measurement from catalogued (damper position vs. differential pressure) performance curves.

C. Accuracy of measurement shall be plus or minus 7 percent with one diameter of straight duct upstream of damper.

D. Damper shall be constructed of heavy gauge galvanized steel and suitable for slip-in duct installation.

E. When indicated, provide positive seal type iris dampers capable of being set at a fully closed position.

F. Acceptable Manufacturer:

1. Continental Fan Manufacturing Inc.

2.9 BACKDRAFT DAMPERS

A. Frames shall be flanged, a minimum of 3 inches wide, and a minimum of 20 gauge roll formed galvanized steel or 0.125 inch extruded aluminum with pre-punched mounting holes and welded corner clips for maximum rigidity.

B. Blades shall be a single piece, with a maximum width of 6 inches, counter-balanced, and shall be constructed of a minimum of 28 gauge roll formed galvanized steel or 0.070 inch extruded aluminum. Blade ends shall overlap for maximum weather protection.

C. Blade seals shall be extruded vinyl and mechanically attached to blade edge.

D. Bearings shall be corrosion resistant synthetic.

E. Linkages shall use a galvanized tie bar with stainless steel pivot pins.

F. Axles shall be stainless steel.

G. Mounting shall be suitable for the required orientation.

H. Acceptable Manufacturers:

1. Young Regulator Company.
2. American Warming & Ventilating Co.
3. Vent Products Co., Inc.
4. Arrow United Industries.

2.10 SOUND ATTENUATORS

A. Silencers shall be of the size, configuration, capacity, and acoustic performance as indicated on drawings.

B. Insertion losses listed in the schedule are minimums allowable and pressure drops are maximum allowable. Silencer performance data shall be in accordance with ASTM E477 and validated by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited independent testing laboratory.

C. All silencers shall be factory fabricated and supplied by the same manufacturer. Inlet and outlet dimensions must be equal to duct sizes shown whether rectangular or round. Duct transitions at silencers are not permitted unless shown.

D. Outer casing shall be a minimum of 20 gauge G-90, galvanized steel. Inner partitions shall be minimum of 24 gauge G-90 galvanized steel. Casings shall be airtight.

E. Filler material shall be inorganic glass fiber of proper density to obtain specified performance and packed under a minimum of 5 percent compression to eliminate voids due to vibration and settling. Material shall be inert, vermin-proof, moisture-proof, and shall be totally encapsulated with a 1.5 mils thick Mylar or Tedlar film.

F. Combustion rating for fill shall be in accordance with ASTM E84, NFPA 255, or UL 723.

G. Provide packless type attenuator when indicated.

H. Mounting shall be suitable for the required orientation.

I. Acceptable Manufacturers:

1. Industrial Acoustics.
2. SEMCO Incorporated.
3. Vibro-Acoustics.
4. Ruskin
5. United McGill
6. VAW Systems
7. Price

2.11 REGISTERS, GRILLES AND DIFFUSERS

A. General:

1. Diffusers, grilles, and registers shall be of steel or aluminum construction, factory primed and painted with baked enamel or acrylic, white color, unless otherwise scheduled.
2. Diffusers, registers and grilles shall be compatible with the designed ceiling/wall type. Provide registers and grilles with frames that are compatible with adjacent construction, with countersunk mounting holes. Refer to architectural drawings for exact details of ceiling/wall construction.
3. Engineering data shall be based upon tests conducted in accordance with the latest ASHRAE Standard 70, Method of Testing for Rating the Performance of Air Outlets and Inlets at non-isothermal conditions. Published Noise Criteria (NC) data shall be determined based upon a 10 dB room attenuation across all octave bands. Lab test reports shall be available upon request.

B. Supply diffuser:

1. Diffusers shall be of the restricted multi-orifice jet induction and air mixing type, consisting of louvered sections with built-in diffusing vanes.
2. Diffusers shall be square with neck sizes to match connecting duct size.
3. Diffusers shall be assembled for indicated patterns that provide 1-way, 2-way, 3-way or 4-way air discharge with each side delivering a quantity of air proportional to the area served.
4. The diffusers shall be constructed with an integral leak-proof collar extending minimum 1 inch above the core to accommodate duct connection. Square and rectangular collars shall have welded corners.

C. Return and Exhaust diffuser:

1. Diffusers shall be square with neck sizes to match connecting duct size.
2. The diffusers shall be constructed with an integral leak-proof collar extending minimum 1 inch above the core to accommodate duct connection. Square and rectangular collars shall have welded corners.

D. Sidewall Adjustable Supply Register:

1. Sidewall registers shall have mitered corners, double deflection adjustable blades, and horizontal front blades.

E. Low Wall Return/Exhaust registers:

1. Return and exhaust registers shall have (1) set of fixed blades, 42 to 45 degree deflection.
2. Wall return and exhaust registers mounted 18 inches AFF or lower, shall be have mitered corners, fixed blades, horizontal front louvers. Frame and blade shall be manufactured of minimum 8 gauge aluminum or 12 gauge steel for rugged use.
3. Low wall registers used in UMHHC facilities for clinical rooms shall utilize a hinged register face with turn screws for access to filter media, mounted in a factory provided channel behind the register face.

F. Supply and Return Bar Grille

1. Bar grilles shall be extruded aluminum, nominal 1/8 inch wide bars with 0 degree deflection, on maximum 1/4 inch centers, or as scheduled.
2. Continuous grilles over 72 inches in length shall be butted together using keyed splices for precise alignment.
3. Concealed spring latch fasteners shall be used for attaching grille to plaster frame. No screw holes shall be visible on plaster frame or grille.
4. Provide blank-off baffles for inactive sections of grilles, as noted on the drawings.

G. Plenum Slot Diffusers

1. Diffusers shall be insulated for supply and uninsulated for return and shall have of the slot widths, number of slots, and lengths as indicated on the Drawings.
2. Units shall be constructed of a minimum of 24 gauge galvanized steel with a black face.
3. Inlets shall be drawn from the plenum wall to eliminate leakage and shall have a minimum of a 1 inch duct connection flange.
4. Slot face shall be constructed of double metal thickness to provide rigidity and pattern controller shall be of the adjustable type.
5. Provide blank-off baffles for inactive sections, as indicated on Drawings.

H. Acceptable Manufacturers:

1. Tuttle & Bailey.
2. MetalAire.
3. Titus.
4. Price Industries.
5. Nailor Industries, Inc.
6. Carnes

7. Krueger

2.12 DUCT CONNECTIONS TO LABORATORY TERMINAL AIRFLOW UNITS

A. Inlet and outlet connections may utilize draw bands with dual bolts/nuts and elastomeric gasket or, as a minimum, be permanently attached using appropriate fasteners and sealed with appropriate duct sealant.

2.13 WIRE MESH SCREENS

A. Screen assemblies shall be removable.

B. Mesh: 1/2 -inch square pattern, 1/16 inch galvanized wire, interwoven, welded at wire intersections and to the frame to prevent rattles.

C. Frames: Minimum of 1 inch by 1 inch by 1/8 inch galvanized steel angles for duct sizes through 24 inches, 1-1/2 inch by 1-1/2 inch by 3/16 inch for duct sizes between 25 inches to 48 inches, and 2 inches by 2 inches by 3/16 inch for ducts larger than 48 inches continuous around perimeter of screen. Provide intermediate supports to limit screen deflection to 1/16 inch at maximum design airflow.

PART 3 - EXECUTION

3.1 SHEET METAL ACCESSORIES INSTALLATION

A. Install sheet metal accessories in accordance with manufacturers' recommendations, Contract Drawings and approved submittals.

B. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Refer to other related sections for installation requirements, including joint connections and sealant requirements.

D. Install duct accessories according to applicable details in SMACNA "HVAC Duct Construction Standards - Metal and Flexible."

E. Install duct accessories of materials suited to duct materials. Use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless steel ducts, use aluminum accessories in aluminum ducts.

3.2 DUCT ACCESS DOORS INSTALLATION

A. Locate access doors so they can be opened completely without interferences and to allow easy access by maintenance personnel.

B. Fire, smoke, combination fire/smoke damper or similar automatic shutting device access doors shall be mounted downstream (after shutoff) to permit resetting and inspection.

C. Doors shall seal tightly into frame.

D. Label access doors to note equipment that is accessed through the door. Labels and lettering on labels shall be in accordance with the mechanical identification section. Provide 1-inch-high minimum letters.

3.3 DUCT AIR TURNING VANES INSTALLATION

A. Mount the outboard-most vane in the duct heel. Vanes shall be spaced across the entire corner diagonal, parallel to the airstream, adequately supported and affixed to prevent rattle and breakaway.

3.4 DUCT TEST HOLES INSTALLATION

A. Provide duct test holes where required for testing and balancing purposes and as shown on Drawings.

3.5 DAMPER- INSTALLATION - GENERAL (INCLUDING AUTOMATIC CONTROL DAMPERS FURNISHED UNDER RELATED SECTION)

A. Dampers shall be installed square and plumb to casing, duct, wall, etc. without racking. Align and adjust dampers to ensure proper opening and closing without binding or hesitation.

B. Seal completely around frame.

C. Install dampers designed for horizontal mounting in horizontal orientation, and dampers designed for vertical mounting in vertical orientation.

D. Adequately reinforce multiple section dampers per manufacturer's recommendations.

E. Install dampers so quadrants will be accessible for adjusting.

F. Coordinate access through ceilings or walls to ensure each damper is accessible.

G. 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.

H. Set dampers to fully open position before testing, adjusting, and balancing.

3.6 FIRE, SMOKE, AND COMBINATION FIRE/SMOKE DAMPERS INSTALLATION

A. Provide sleeves, mounting angles, and all other required accessories.

B. Fire dampers shall not be installed in hazardous exhaust systems.

C. Demonstrate re-setting of fire dampers to authorities having jurisdiction.

D. Install fire, smoke, and combination fire and smoke dampers according to UL listing.

3.7 FLEXIBLE CONNECTORS INSTALLATION

A. Flex connectors shall be used in all ductwork that crosses building expansion joints and at attachment to any equipment mounted on vibration isolators, and inlets and outlets of fans.

B. The connectors shall be installed as close to equipment as practical and the clear gap at rest shall not be less than 3 inches.

C. There shall be no tension of the fabric under static or dynamic loads. Connector shall be free of wrinkles caused by misalignment or fan reaction. End and overlaps shall be sealed airtight.

D. Check connections during operation for leaks and binding.

E. Outdoor flexible connectors shall be protected by a three-sided sheet metal weatherhood, open on the bottom, securely anchored on one side of the flexible connector only. Weatherhood to be of the same material as the ductwork.

3.8 REGISTERS, GRILLES AND DIFFUSERS INSTALLATION

A. Support devices independent of the ceiling construction when required for safe and workmanlike installation.

B. Paint visible duct, mounting clips, and accessories behind registers and grilles flat black.

C. Adjust throw patterns as shown on Drawings.

3.9 WIRE MESH SCREEN INSTALLATION

A. Screen assemblies shall be firmly affixed and shall not vibrate.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers and operators to verify full range of movement.
2. Inspect locations of access doors and verify proper labeling and access to equipment.
3. Operate fire, smoke, and combination fire and 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.

3.11 COMMISSIONING

A. Perform the commissioning activities as outlined in the Division 01 Section Commissioning and other requirements of the Contract Documents.

END OF SECTION 233300