

SECTION 23 30 00 - HVAC FOR DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and the specifications including SECTION 23 05 00 "Common Work Results for HVAC" are hereby made a part of the work of this section.
- B. SECTION 01 91 13 - BUILDING COMMISSIONING

1.2 DESCRIPTION OF WORK

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the ductwork systems indicated.
- B. Ductwork shall be protected from dirt and debris in accordance with SMACNA Standard "Duct Cleanliness for New Construction".

1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 23 05 00-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 23 05 00, Common Work Results for HVAC, apply are as follows:
 - 1. Ductwork.
 - 2. Ductwork accessories.
 - 3. Air devices.
 - 4. Firestopping materials and methods.
 - 5. Louvers and dampers.
 - 6. Ductwork sealing products.
 - 7. Combination Fire / Smoke Dampers.
 - 8. Elevator Shaft Vent.
 - 9. Roof mounted ductwork supports.
 - 10. Boiler venting (breeching and chimney).
 - 11. Ceiling Radiation Dampers.

PART 2 PRODUCTS

2.1 DUCTWORK

- A. Classification of Ductwork: Low pressure ductwork: up to 2" W.G. static pressure.
- B. Materials: Unless otherwise indicated low pressure ductwork shall be galvanized steel. Galvanized sheet metal shall be new galvanized steel sheets of lock forming quality with zinc coating that will not flake or peel under forming operation.

C. Construction for Low Pressure Round and Rectangular Ductwork:

1. Material: Galvanized steel conforming to ASTM A527, weight of galvanized coating shall be not less than 1-1/4 ounces total for both sides of one sq.ft. of a sheet. Construction, metal gage, and reinforcements shall conform with SMACNA "Duct Construction Standards" and NFPA 90A for 2" W.G. pressure class.
2. Fittings: Shall be constructed in accordance with SMACNA Standards and shall be of the types indicated (ONLY).
3. Longitudinal joints shall be Pittsburgh lockseam (ONLY). Button punch snap locks are not acceptable.
4. Joints shall be sealed to SMACNA seal class B.

D. Construction for Spiral Seam Round and Flat Oval Ductwork:

1. Exposed, double wall exterior ductwork and fittings above the roof shall be United McGill Uni-seal or Uni-rib, Eastern Sheetmetal, Lindab, Semco or Monroe Sheetmetal, galvanized steel, factory fabricated, spiral lockseam or welded longitudinal seam, round or flat oval type, as indicated. Seams shall be solid welded or spot-welded and factory sealed airtight. Ducts and fittings shall be specifically designed for medium pressure application. Round or flat oval ductwork indicated as acoustically lined or double-wall (DW) shall be United-McGill Acousti-K27, double wall medium pressure construction with solid 26 gauge sheetmetal inner liner and 3" thick fiberglass insulation (R8 minimum). Ductwork and fittings shall be furnished with solid liners. Insulation shall be provided with thermal conductivity of 0.27 BTU/HR-°F-FT²-IN. Exposed exterior ductwork shall be double-wall construction (DW) with aluminum outer shell, sealed air and watertight, 3" thick (R-8) fiberglass insulation.
 - a. Sheetmetal Gauges: Per SMACNA for listed pressure class.
 - b. Fittings: Fittings shall be machine formed type or welded multi-segment type. All seams shall be factory sealed or welded airtight. Tap offs shall be 90° conical type or 45° standard type, with smooth, machine formed entrance, designed for low pressure drop and low noise generation. 90° elbows shall be 5 piece construction (where space permits) or vanned type mitered elbow where space is restricted. Unless specifically indicated (and field-verified) as 5 piece construction, use vanned 90° elbows. Vanes shall be single thickness, solid-welded in place.
 - c. Joints on round spiral ductwork shall be slip type, coupling type, Van Stone flanges, or factory fabricated flange system type connectors, as standard with the manufacturer. Flat oval joints shall be Van Stone flanges (gasketed) or factory fabricated flange system type connectors. Joints shall be made up with joint sealer applied in strict accordance with the manufacturer's recommendations. Joint sealer shall be as recommended by the manufacturer.
 - d. Duct and fittings shall have been tested for air friction loss and leakage in an independent testing laboratory. Test results shall be submitted with the Shop Drawings for review.

- e. External reinforcing angles shall be provided in accordance with the manufacturer's recommendations. External reinforcing angles shall be galvanized or painted with a rust inhibiting aluminum paint. Include reinforcing data with Shop Drawing submittal. Duct and reinforcing shall be designed for a positive static pressure of 6 inches of water gage.
- f. No internal tie rod reinforcing will be allowed.
- g. Hangers shall be of the clamp-on or trapeze type. Exposed ductwork shall use clamp-on hangers only. Holes shall not be drilled through the ducts.

2.2 DUCTWORK ACCESSORIES

- A. Access Doors: Ruskin Model ADC2, 12"x12" size, 24 gauge galvanized steel, steel on both sides of door, foam gasket seals, 1" insulation, 2 cam locks, no hinge.
- B. Counter Balanced Dampers (CBD): Aluminum frame and blades, extruded vinyl edge seals, 2-1/4" deep, set 0.06" WG.
- C. Backdraft Dampers (BDD): Ruskin Model CBD2 or American Warming and Ventilating aluminum frame and blades, extruded vinyl edge seals, field set at 0.10" W.G. pressure differential for full open operation.
- D. Fire Dampers: Greenheck FD-series, Ruskin Model IBD2, or Cesco, curtain type, 100% free area (ONLY), Style C for round duct installations, and Style B for rectangular duct applications. Fire dampers located immediately behind transfer grilles may be Style A dampers. The dampers shall be UL rated for 1-1/2 hours and have a 165°F fusible link. Fire dampers shall comply with UL "Standard for Safety" 555.
- E. Ceiling Radiation Dampers: Ruskin CFD series or Greenheck CRD-1LP series, UL rated for 1-1/2 hours with 165 °F fusible link. Furnish with integral volume control option and thermal blanket for acoustical tile ceilings and where required. Ceiling Radiation Dampers shall comply with UL "Standard for Safety 555.
- F. Flexible Duct Connections: Ventfabrics, Inc. neoprene coated glass fabric.
- G. Drawbands for Flexible Ducts: Clinch type stainless steel with screwdriver adjustment, or nylon with lever action tightening tool provided by the drawband manufacturer.
- H. Turning Vanes: (Low Pressure):
 - 1. Solid blade, mounted with the long edge down stream in accordance with duct construction details indicated. Submit a 12"x12" sample elbow for review prior to fabrication.
- I. Volume Dampers:
 - 1. Factory fabricated as specified, or shop fabricated in accordance with SMACNA "HVAC Duct Construction Standards".
 - 2. Rectangular: Ruskin Model MD-35, or American Warming and Ventilating, 12 gauge galvanized steel, locking quadrant, opposed blade over 11", single blade 11" and under.

3. Round: Ruskin Model MDRS25, or American Warming and Ventilating, 20 gauge galvanized steel with locking quadrant(ONLY). Dampers may be provided integral with spin-in fittings.
- J. Joint Sealer:
1. Hardcast Two-Part II DT tape with RTA-50 indoor/outdoor activator.
 2. Hardcast Duct-Seal 321 water based indoor/outdoor sealant.
- K. Louvers (L): Ruskin Model ELF6375DX, Greenheck, or American Warming and Ventilating. Extruded aluminum construction, 0.081" thick, aluminum extrusions, drainable blade, 1/2" expanded metal bird screen, size and performance as scheduled. AMCA certified leakage rate shall be a maximum of 0.02 ounces of water per square foot of free area at 1000 FPM free area velocity. Provide Kynar 500 finish, color selected by Architect. Provide frame styles compatible with building construction, see architectural details. Provide concealed architectural or standard visible mullions in multi-panel louver assemblies as indicated on the drawings. Inactive / blanked-off louvers shall have a double wall sheetmetal closure on the interior face of the louver. The closure shall have a 2" thickness of 1.5 pcf rigid fiberglass board insulation with a foil face. Both sides of the sheetmetal shall be painted flat black.
- L. Acoustical duct liner for rectangular ductwork shall be Type AP Armaflex SA duct liner. The liner shall be elastomeric unicellular (closed cell) and have a thermal conductivity of 0.27 Btuh/⁰F.-sf-in. and be cleanable and suitable for duct velocities of 4000 FPM. Duct liner thickness shall be 1" unless indicated otherwise. The installation shall include 100% coverage of the manufacturer's recommended adhesive and protective Z-strips at all exposed upstream edges. Mechanical fasteners shall be used in addition to adhesive. Insulation shall comply with NFPA 90A and NFPA 90B and be approved by Factory Mutual. Duct dimension are net inside of liner.
- M. Wall Caps: Mid-America Building Products MountMaster series 6" Hooded Vent. Vinyl hood construction with concealed exhaust flap, wire mesh screen (except on dryer vents) and 8" long, 6 inch diameter duct extension. Wall caps shall be available in 200 colors and shall be field paintable. Color by architect.
- 2.3 AIR DEVICES (Krueger, Price, Metal Aire, Titus, Seiho) ONLY
- A. Material and Finishes: Construct diffusers, registers, and grilles of steel, suitable for use with ceiling radiation dampers (CRD). Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded. Steel parts shall be factory zinc-phosphate treated prior to priming and painting or have a baked-on enamel finish. Provide frame style compatible with ceiling or wall type. Colors shall be selected by Architect. Devices to be installed on exposed duct installations shall be furnished in primer suitable for field application of color coat.
 - B. Sound Pressure Level: Manufacturer certified sound pressure level rating of inlets and outlets in accordance with ADC 1062 R4. Conform with the permissible room sound pressure level for each device as scheduled.
 - C. Throw: Defined as distance from the diffuser, register, or grille to the point which the resultant room air velocity is 50 to 35 feet per minute.

- D. Ceiling Diffusers: Equip with core styles required to provide air distribution pattern indicated. Internal parts shall be removable through the diffuser-neck for access to the duct and without the use of special tools. Construct each diffuser of four or more concentric elements designed to deliver air in a generally horizontal direction. The interior elements of square and rectangular ceiling diffusers may be square or rectangular as manufacturer's standard. Screws or bolts in exposed face of frames or core elements are not acceptable. Diffusers shall have an opposed blade volume damper in the diffuser neck. Diffusers shall have a 24"x24" lay-in panel for areas with acoustical ceilings and surface-mount frame for GWB ceilings. Provide Ceiling Radiation Dampers (CRD) where indicated and required.
- E. Grilles and Registers: Construction and finish as indicated, 1/2" louver spacing, 45° curved blade. Grilles and registers shall have opposed-blade volume dampers with screwdriver adjuster. Unless otherwise indicated, registers shall be provided.
- F. General: The interior of all sheetmetal connections to grilles, registers and diffusers shall be painted with a non-specular flat black paint so that no sheetmetal surfaces are visible from the finished space. All ceiling mounted registers, grilles and diffusers shall be provided with ceiling radiation dampers.

2.4 COMBINATION FIRE / SMOKE DAMPERS

- A. Combination fire / smoke dampers shall be Greenheck Model FSD-311, Ruskin, or approved equal, 1½ hour rating, UL-classified, Class 1 with fusible link, actuator end switch and integral damper actuator and duct smoke detector. Blades shall be airfoil type. Provide a test switch. Installation shall be per the manufacturers recommendations.
- B. Provide combination fire / smoke dampers at each duct shaft wall penetration.

2.5 BOILER VENTING PRODUCTS

- A. Boiler venting products and materials shall consist of a complete breeching and chimney system, installed per the venting and boiler manufacturers' requirements, including supports, flashing, expansion joints, drain fittings and joint sealing. The chimney shall be Van Packer, Ampco, Hart and Cooley or Metalfab, double-wall construction. The venting shall be suitable for ANSI Category I, II, III and IV appliances, constructed of AL29-4C stainless steel. Fittings and accessories shall be compliant with NFPA54 National Fuel Gas Code, International Building Code and ASHRAE recommendations.
- B. The system shall be suitable for flue gas temperatures up to 550F.
- C. The boiler breeching shall be Saf-T- Vent CI Plus double wall construction with a 1" air space, AL29-4C inside liner and Type 430 stainless steel exterior jacket with Sure Seal closure system. All fittings shall have a 45 degree entrance. Furnish with 45 degree entrance fittings and high velocity exit cone discharge. The vent shall terminate 8'-0" above the roof.

2.6 ELEVATOR SHAFT VENT

- A. Shall be Greenheck Model PEV-400, Ruskin, or equal, with 26"x26" smoke damper and 120V. actuator with "Open-Closed Indicator" located in the throat. Furnish with birdscreen and Kynar 500 finish with color selection by Architect. Furnish with 12 gauge cold-rolled steel roof curb.

- B. The vent shall be 38"x38"x18" high on a 36" high curb. Vent and louver construction shall be heavy gauge 6063-T5 aluminum. The vent shall be insulated and the glass section(s) shall be 1/8" thick annealed glass.

2.7 DUCT LEAK TESTING

- A. Ductwork systems shall be leak-tested by the Commissioning Agent in accordance with SMACNA, Maine State Housing Authority "Green Building" Standards and as follows:
 - 1. The duct system shall be tested per Maine State Housing Authority requirements. Total maximum leakage shall not exceed 2% of total system design airflow. Leaks shall be located and sealed until the system passes the leak test.
- B. The leakage testing shall be witnessed by a representative of the Owner and the results shall be submitted to the Engineer and Maine State Housing Authority for review.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
 - 2. Verify that the duct systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.
 - 3. Ductwork shall be protected from dirt and debris in accordance with SMACNA Standard "Duct Cleanliness for New Construction".

3.2 INSTALLATION OF DUCTWORK AND AIR DEVICES

- A. Provide and erect in accordance with the best practice of the trade ductwork shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place ductwork in proper position to avoid conflicts with other work and to allow the application of insulation and finish painting to the satisfaction of the Architect. Sizes given are "inside - clear" dimensions and not necessarily that of sheet metal. Ducts shall be arranged to adjust to "field conditions". The Sheet Metal trades shall coordinate his work with other trades. Work shall conform to ASHRAE duct construction recommendations, SMACNA "Duct Construction Standards", NFPA, and the requirements of the IMC code.
- B. Joint Sealing: See PRODUCTS section.
- C. Longitudinal joints: See PRODUCTS section.
- D. Turns shall be made with long radius elbows or, if physically impossible to use long radius elbows, shall be square turns with specified turning vanes. CAUTION: Turns not conforming to this requirement shall be ordered removed and replaced with properly built turns.

- E. Access Doors: Provide access doors for concealed apparatus requiring service and inspection in the duct system including but not limited to dampers, sensors and motors, and upstream and downstream from duct coils.
- F. Duct Sleeves and Prepared Openings: Install duct sleeves and prepared openings for duct mains, duct branches, and ducts passing through walls, roofs, and ceilings. Insure the proper size and location of sleeves and prepared openings. Allow one-inch clearance between duct and sleeve or one-inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.
- G. Duct Supports: Unless otherwise indicated, provide one-inch wide by 16 gage galvanized steel sheet metal strips on each side of ducts. Anchor risers in the center of the vertical run to allow ends or riser free vertical movements. Attach supports only to structural framing members. Do not anchor supports to metal decking unless a means is provided (architectural review required) for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.
- H. Flexible Collars and Connections: Provide flexible collars between fans and ducts or casings and where ducts are of dissimilar metals, as indicated or required. For round ducts, securely fasten flexible connections using stainless steel clinch-type draw-band. Nylon drawbands may be used if installed using the drawband manufacturer's lever-action tightening tool. For rectangular ducts, lock flexible connections to metal collars.
- I. Flexible Ducts: Provide where indicated. No fiberglass shall be in contact with air flow. Flexible duct length shall not be more than 4'-0". Install with metal band hangers and without excess length, provide maximum extension of flex duct. Securely fasten flexible ducts to metal collars using a stainless steel or tool-tightened nylon drawband on the duct core and a second drawband on the insulation vapor barrier. If the duct exceeds 12 inches diameter, position the drawband behind a bead on the metal collar. Taping in lieu of drawbands is not allowed.
- J. Any deviation in the duct system must be submitted as a shop drawing and stamped. CAUTION: Any deviation not submitted and favorably reviewed will be ordered removed from the system and replaced with that which is shown on the Drawings.
- K. Discrepancies between actual field conditions and the Contract Documents shall be brought to the attention of the Architect prior to fabrication.
- L. Field Changes to Ductwork: Field changes of ducts such as those required to suit the sizes of factory-fabricated equipment actually furnished shall be designed to minimize expansion and contraction. Use 4:1 transitions in field changes as well as modifications to connecting ducts.
- M. Transitions with a slope greater than 4 to 1 shall be ordered removed from the system and replaced with a transition which meets this criteria.
- N. Joints and seams at intake and exhaust plenums and joints on intake and exhaust ductwork for a distance of 3 feet from the plenum shall be sealed watertight on the bottom and side joints and seams.
- O. Isolation dampers at intake and exhaust louvers and vent hoods shall be sealed to the ductwork to provide an airtight assembly with similar performance characteristics to the isolation damper.

3.3 CLOSING IN WORK

- A. Cover up or enclose work after it has been properly and completely tested and reviewed.
- B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.4 TEST AND ADJUST

- A. Ductwork shall be leak tested in accordance with Section 23 05 93 "Testing and Balancing Air and Water Systems" and Maine State Housing Authority Standards. Provide end cap and closure pieces. Close off and seal openings in ductwork to be tested. Ductwork shall be tested before it is insulated.
- B. Before operating any system, the system shall be cleaned out to remove dust and foreign materials.
- C. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.
- D. Correct defects which develop during the test period, conduct additional testing until defect free operation is achieved.

3.5 CLEANUP AND CORROSION PREVENTION

- A. Ductwork and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.
- B. Before covering is applied to duct systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces.

3.6 INSTRUCTIONS

- A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

3.7 FIRESTOPPING

- A. Firestopping shall be performed in accordance with Specification Section 07 84 00 "Firestopping". All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *