

## SECTION 15815 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes ducts and duct systems.
- B. Related Sections include the following:
  - 1. Division 7 for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.
  - 2. Division 8 for wall- and ceiling-mounted access doors for access to concealed ducts.
  - 3. Division 15 Section "Mechanical Insulation" for duct insulation.
  - 4. Division 15 Section "Power Ventilators"
  - 5. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

#### 1.3 SYSTEM DESCRIPTION

- A. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions, which maybe altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.

#### 1.4 SUBMITTALS

- A. Product Data: For duct liner and sealing materials.
- B. Product Data: For the following:
  - 1. Duct-mounted access doors and panels.
- C. Ductwork:
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Duct layout indicating pressure classifications and sizes on plans.
  - 3. Fittings.
  - 4. Reinforcement and spacing.
  - 5. Seam and joint construction.
  - 6. Penetrations through fire-rated and other partitions.
  - 7. Hangers and supports, including methods for building attachment, and duct attachment.

### METAL DUCTS

- D. The contractor must comply with the enclosed specification in its entirety. If on inspections, the engineer finds changes have been made without prior written approval, the contractor will make the applicable changes to comply with this specification, at the contractor's expense.
- E. At the discretion of the engineer, sheet metal gauges, and reinforcing may be randomly checked to verify all duct construction is in compliance.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and fire stopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant and fire stopping materials according to manufacturer's written recommendations.
- C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.
- D. All ductwork and fittings delivered and stored on the job site must be capped to prevent the entry of moisture, construction dust or other debris.

### PART 2 - PRODUCTS

#### 2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel, normal service: Lock-forming quality; ASTM A 653, G60 or better.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

#### 2.2 SEALANT MATERIALS

- A. Joint Sealant/Mastic: Shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall prevent the entry of water, air and moisture into the duct system. Sealer shall be UL 723 listed and meet NFPA requirements for Class I ductwork. Ductmate PROseal or approved equal.
  - 1. Maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer.
  - 2. Generally provide liquid sealant for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger.
- B. Flange Gasket: A butyl rubber gasket which complies with UL Standard 181 and 723 testing and meets Mil-C 18969B and TTS-S-001657. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth. Approved: Ductmate 440 Butyl gasket tape.

#### 2.2 HANGERS AND SUPPORTS

- A. Building Attachments: Support fasteners appropriate for building materials.

### METAL DUCTS

- B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

### 2.3 RECTANGULAR DUCT FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
  - 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
  - 3. Maximum allowable deflection for transverse joints and intermediate reinforcements will not exceed 0.250 inch.
  - 4. Longitudinal Seams: Pittsburgh lock shall be used on all longitudinal seams. Snap-lock seams are not acceptable.
  - 5. If SMACNA seal class A or B is specified, the longitudinal seam shall be sealed from the inside.
- B. Slide-on Transverse Joint Connectors: Prefabricated slide-on transverse duct connectors and components will be accepted. Duct constructed using prefabricated systems will refer to the manufacturer guidelines for sheet gauge, intermediate reinforcement size and spacing, and proper joint reinforcement(s). Approved connection systems: Ductmate Industries: or W.D.C.I.
- C. Kitchen grease hood exhaust ducts: Comply with NFPA 96.
- D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
  - 1. Return, Exhaust, and Relief Air Ducts: 2-inch wg, negative pressure.
  - 2. Supply and Fresh Air Ducts: 3-inch wg.
- E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of un-braced panel area, unless ducts are lined. All large ducts must be braced as required to prevent drumming.
- F. Fittings per SMACNA acceptable, specific fittings requirements below:
  - 1. Fig. 2-3 Rectangular Elbows: Type RE2 square throat with vanes or Type RE1 radius.
  - 2. Fig. 2-5 Rectangular Divided Flow Branches: Type 1, Type 2, Type 4A, or 4B.
  - 3. Fig. 2-6 Branch Connections: 45-degree entry. 45-degree lead-in, bell-mouth, or spin-in.
  - 4. Fig. 2-7 Offsets and Transitions

### 2.4 FIRE DAMPERS

- A. Fire Dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules. Dampers shall meet the requirements of the latest edition of NFPA 90A.

## METAL DUCTS

- B. Dampers shall be tested, rated and labeled in accordance with the latest edition of UL Standard 555. Dampers shall have a UL555 fire rating of 1 1/2 hours. Each damper shall be equipped with a heat responsive device which has been tested and approved for use with the damper assembly in accordance with UL555. The heat responsive device shall have a temperature rating of 165 °F. Dampers shall be UL labeled for use in dynamic systems. The damper shall have a dynamic closure pressure rating of 4 in. wg.
- C. Damper actuator shall be manual quadrant. Manufacturer's submittal data shall indicate actuator space requirements around the damper.
- D. UL555 Dynamic Closure Ratings shall be qualified for airflow and pressure in either direction through the damper. UL ratings shall allow for mounting damper vertically (with blades running horizontal) or horizontally.
- E. The Damper Manufacturer's submittal data shall certify all air performance pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3 and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D.
- F. Damper blades shall be 16 ga. galvanized steel 3 Vee type with three longitudinal grooves for reinforcement. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow and operation in either direction through the damper (blades that are non-symmetrical relative to their axle pivot point or utilize blade stops larger than 0.5 in. are unacceptable).
- G. Damper frames shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearings shall be sintered bronze sleeve type rotating in extruded holes in the damper frame. Jamb seals shall be stainless steel compression type.

## 2.5 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
  - 1. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct. Mounting rails shall have friction insert tabs that align the vanes automatically.
  - 2. Tab spacing shall be as specified in Figure 2-3 of the 1995 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible" Second Edition standard. Rail systems with non-standard tab spacing shall not be accepted.
  - 3. Due to tensile loading, vanes shall be capable of supporting 250 pounds when secured according to the manufacturers instructions.

## 2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustical lined doors where duct is of the same construction.
- B. Systems designed for 3" w.g. and less (SMACNA Seal Class B or C) shall utilize a hinged, cam or hinged & cam, square-framed access door.

## METAL DUCTS

- C. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.
- D. Acceptable manufacturers: Ductmate Industries, Inc. or approved equal

### PART 3 - EXECUTION

#### 3.1 DUCT INSTALLATION, GENERAL

- A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Construct and install each duct system for the specific duct pressure classification indicated.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct.
- F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- J. Coordinate layout with other finished work.
- K. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
- L. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Firestopping materials and installation methods are specified in Division 7.

#### 3.2 SEAM AND JOINT SEALING

- A. Seal all ductwork to Seal Class A: All joints.
- B. Seal externally insulated ducts before insulation installation.

#### 3.3 DUCT ACCESSORIES INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible".

#### **METAL DUCTS**

- B. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards
- C. Perform the following as directed by the controls contractor:
  - 1. Installation of:
    - a. Automatic control dampers.
  - 2. Access doors where and as required.
- D. Install duct access panels downstream from, fire dampers and all other components that require servicing.
  - 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining per equipment manufacturers' requirements.
  - 2. Install access panels on side of duct where adequate clearance is available.

### 3.4 FIRE DAMPER INSTALLATION

- A. All fire damper installations shall comply with the manufacturer's installation instructions or any submitted deviations and must be acceptable to the appropriate authority having jurisdiction.
- B. Contractor shall provide suitable access at each fire damper to allow inspection, cycling or testing of the fire damper and replacement of the fusible link. This includes furnishing and installing duct access doors and wall or ceiling access panels as may be required.
- C. Contractor installing fire dampers shall be responsible for these access doors and panels.

### 3.5 HOOD EXHAUST DUCT INSTALLATIONS

- A. Furnish and install in accordance with NFPA 96.
- B. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.
- C. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.
- D. Install access openings at each change in direction and at 20-foot intervals; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
- E. Do not penetrate fire-rated assemblies.

### 3.6 HANGING AND SUPPORTING

- A. Install duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

### 3.7 CONNECTIONS

- A. Connect fans with flexible connectors.

## METAL DUCTS

3.8 ADJUSTING

- A. Adjust fire dampers for proper action.
- B. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for detailed procedures.

3.9 CLEANING

- A. HVAC systems shall not be operated during construction.
- B. All ductwork shall be provided with temporary enclosures to keep the HVAC system free of dust and construction debris.

END OF SECTION 15815

**METAL DUCTS**