

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Casing and plenums.
- C. Kitchen hood ductwork.
- D. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9123 - Interior Painting: Weld priming, paint or coating.
- C. Section 11 4000 - Foodservice Equipment: Supply of kitchen range hoods for placement by this Section.
- D. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- E. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- F. Section 23 3300 - Air Duct Accessories.
- G. Section 23 3600 - Air Terminal Units.
- H. Section 23 3700 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2015b.
- D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016.
- E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2015.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- K. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- M. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- N. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- O. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

- P. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- Q. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- R. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.
- S. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- T. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.
- U. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012, 2nd Edition.
- V. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.
- W. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.
- X. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.
- D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.
- E. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.
- F. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- G. Kitchen Cooking Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
 - 1. Construct of 16 gage, 0.0598 inch sheet steel using continuous external welded joints in rectangular sections.
 - 2. Construct of 18 gage, 0.0500 inch stainless steel using continuous external welded joints in rectangular sections.
- H. Dishwasher Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
 - 1. Construct of 16 gage, 0.0598 inch sheet steel using continuous external welded joints in rectangular sections.

2. Construct of 18 gage, 0.0500 inch stainless steel using continuous external welded joints in rectangular sections.
- I. Grease Exhaust: 1/2 inch w.g. pressure class, stainless steel.
 1. Construct of 18 gage, 0.0500 inch stainless steel.
 2. Construction:
 - a. Liquid tight with continuous external weld for all seams and joints.
 - b. Where ducts are not self draining back to equipment, provide low point drain pocket with copper drain pipe to sanitary sewer.
 3. Access Doors:
 - a. Provide for duct cleaning inside horizontal duct at drain pockets, every 20 feet and at each change of direction.
 - b. Use same material and thickness as duct with gaskets and sealants rated 1500 degrees F for grease tight construction.
- J. Fume Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- K. Outside Air Intake: 1/2 inch w.g. pressure class, galvanized steel.
- L. Combustion Air: 1/2 inch w.g. pressure class, galvanized steel.
- M. Emergency Generation Ventilation: 1/2 inch w.g. pressure class, galvanized steel.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Stainless Steel for Ducts: ASTM A666, Type 304.
- C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 2. VOC Content: Not more than 250 g/L, excluding water.
 3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 4. For Use With Flexible Ducts: UL labeled.
 5. Manufacturers:
 - a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com/sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Fittings: Manufacture at least two gages heavier metal than duct.
 - 3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 - 2. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: Minus 20 degrees F to 175 degrees F.
- C. Kitchen Cooking Hood and Grease Exhaust: Nominal 3 inches thick ceramic fiber insulation between 20 gage, 0.0375 inch, Type 304 stainless steel liner and 24 gage, 0.0239 inch aluminized steel sheet outer jacket.
 - 1. Tested and UL listed for use with commercial cooking equipment in accordance with NFPA 96.
 - 2. Certified for zero clearance to combustible material in accordance with:
 - a. UL 2221 with a 2 hour rating.
 - 3. Materials and construction of the modular sections and accessories to be in accordance with the terms of the following listings:
 - a. UL 1978.
 - b. UL 2221.
- D. Dishwasher Exhaust: Minimum 21 gage, 0.0344 inch thick, single wall, Type 304 stainless steel.
 - 1. Single wall, factory built chimney liner system.
 - 2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
 - 3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.
- E. Fume Hood Exhaust: Minimum 21 gage, 0.0344 inch thick, single wall, Type 304 stainless steel.
 - 1. Single wall, factory built chimney liner system.
 - 2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
 - 3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.

2.05 CASINGS

- A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

2.06 KITCHEN HOOD EXHAUST DUCTWORK

- A. Fabricate in accordance with ductwork manufacturer's installation instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive.
- E. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.
- F. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use double nuts and lock washers on threaded rod supports.
- I. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.02 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION 23 3100

