

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM A480/A480M-15, Specification for General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip.
  - .2 ASTM A635/A635M-15, Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - .3 ASTM A653/A653M-15, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .2 National Fire Protection Agency (NFPA)
  - .1 NFPA 90A-15, Installation of Air Conditioning and Ventilating Systems.
  - .2 NFPA 90B-15, Installation of Warm Air Heating and Air Conditioning Systems.
  - .3 NFPA 91-15, Standard for Exhaust System for Air Conveying of Vapours, Gases, Mists, and Non-combustible Particle Solids.
  - .4 NFPA 96-2014, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA 1966-2006 HVAC Duct Construction Standards, Metal and Flexible.
  - .2 SMACNA 016-2012 HVAC Duct Leakage Test Manual.

### **1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate following:
  - .1 Sealants.
  - .2 Tape.
  - .3 Proprietary Joints.

### **1.3 CERTIFICATE OF RATINGS**

- .1 Catalogue or published ratings must be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with municipal regulations and Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

## **PART 2 - PRODUCTS**

### **2.1 SEAL CLASSIFICATION**

- .1 Classification to SMACNA Seal Class A.
- .2 Seal classification:
  - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

### **2.2 SEALANT**

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 300°C to plus 930°C.

### **2.3 TAPE**

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50mm wide.

### **2.4 FITTINGS**

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
  - .1 Rectangular: Centreline radius: 1.5 times width of duct.
  - .2 Round: smooth radius or five piece. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:

- .1 To 400mm: with single thickness turning vanes.
- .2 Over 400mm: with double thickness turning vanes.
- .4 Branches:
  - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45° entry on branch.
  - .2 Round main and branch: enter main duct at 45° with conical connection.
  - .3 Provide volume control damper in branch duct near connection to main duct.
  - .4 Main duct branches: with volume control damper.
- .5 Transitions:
  - .1 Diverging: 200 maximum included angle.
  - .2 Converging: 300 maximum included angle.
- .6 Offsets:
  - .1 Full short radiused elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

## **2.5 FIRE STOPPING**

- .1 Retaining angles around duct, on both sides of fire separation only if required by authority having jurisdiction.
- .2 Firestopping material and installation must not distort duct.

## **2.6 GALVANIZED STEEL**

- .1 Lock forming quality: to ASTM A653, G90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA. Less than 24 gauge is not permitted.
- .3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

## **2.7 HANGER AND SUPPORTS**

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500mm.
- .2 Hanger configuration: to SMACNA.

- .3 Hangers: galvanized steel angle with black steel rods to ASHRAE or SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	38 x 38 x 3	6
1051 to 1500	38 x 38 x 3	5
1501 to 2100	50 x 50 x 3	5
2101 to 2400	50 x 50 x 50	5
2401 and over	50 x 50 x 50	5

- .4 Upper hanger attachments:

- .1 For concrete: manufactured concrete inserts.
  - .1 Acceptable manufacturers Myatt, Grinnell, Hunt.
- .2 For steel joist: manufactured joist clamp steel plate washer.
  - .1 Acceptable manufacturers Myatt, Grinnell, Hunt.
- .3 For steel beams: manufactured beam clamps:
  - .1 Acceptable manufacturers Myatt, Grinnell, Hunt.

- .5 Duct shaft supports:

- .1 Design with steel angles to rigidly support ductwork within the shaft opening. Use SMACNA standard details where possible. Submit shop drawing with supported weights for installations outside SMACNA guidelines.
- .2 Steel angle must never be smaller than 38mm x 38mm x 6mm for shaft supports.

## **PART 3 - EXECUTION**

### **3.1 DUCT SYSTEMS**

- .1 Exhaust ducts to be galvanized steel.
- .2 Supply ducts to be galvanized steel flexible connections at equipment.

### **3.2 GENERAL**

- .1 Do work in accordance with NFPA 90A, NFPA 90B, and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100mm beyond insulated duct.

- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation. Do not place fire stopping material in expansion space between damper sleeve and fire partition.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.
- .7 Protect all ductwork from dirt and weather during transportation, prior to and during installation. Use enclosed trailers and store material indoors in a covered and protected area.

### **3.3 HANGERS**

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA or as follows:

<u>Duct Size (mm)</u>	<u>Spacing (mm)</u>
to 1500	3000
1501 and over	2500

### **3.4 SEALING AND TAPING**

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations. Sealant and tape to be applied to full perimeter of duct.

### **3.5 LEAKAGE TESTS**

- .1 Perform duct leakage on all fume exhaust ductwork in accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Install no additional ductwork until trial test has been passed.

- .5 Test section minimum of 30m long with not less than three (3) branch takeoffs and two (2) 90° elbows.
- .6 Complete test before insulation or concealment.

**END OF SECTION**