

## **PART 1 GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 480/A 480M (Latest Edition), Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  - .2 ASTM A 635/A 635M (Latest Edition), Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
  - .3 ASTM A 653/A 653M (Latest Edition), Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Association (NFPA).
  - .1 NFPA 90A (Latest Edition), Standard for the Installation of Air-Conditioning and Ventilating Systems.
  - .2 NFPA 90B (Latest Edition), Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
  - .2 SMACNA HVAC Air Duct Leakage Test Manual.
  - .3 IAQ Guideline for Occupied Buildings Under Construction.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
  - .1 Certification of Ratings:
    - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **PART 2 PRODUCTS**

### **2.1 SEAL CLASSIFICATION**

- .1 Classification as follows:

Maximum Pressure (Pa)	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

- .2 Seal classification:
  - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
  - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.
  - .3 Class C: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.
  - .4 Unsealed seams and joints.

### **2.2 SEALANT**

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

### **2.3 TAPE**

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

### **2.4 DUCT LEAKAGE**

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

## **2.5 FITTINGS**

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
  - .1 Rectangular: standard radius.
  - .2 Round: smooth radius. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
  - .1 To 400 mm: with single thickness turning vanes.
  - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
  - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.
  - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
  - .3 Provide volume control damper in branch duct near connection to main duct.
  - .4 Main duct branches: with balancing damper.
- .5 Transitions:
  - .1 Diverging: 20 degrees maximum included angle.
  - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
  - .1 Full or short radiused elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area.
  - .1 Maximum included angles: as for transitions.

## **2.6 FIRE STOPPING**

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.
- .2 Fire stopping material and installation must not distort duct.

## **2.7 GALVANIZED STEEL**

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE or SMACNA.
- .3 Joints: to ASHRAE, SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

## **2.8 STAINLESS STEEL**

- .1 To ASTM A480/A480M, Type 304.
- .2 Finish: No. 4.

- .3 Thickness, fabrication and reinforcement: to ASHRAE, SMACNA.
- .4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.

## 2.9 HANGERS AND SUPPORTS

- .1 Hangers and Supports:
  - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    - .1 Maximum size duct supported by strap hanger: 500.
  - .2 Hanger configuration: to ASHRAE and SMACNA.
  - .3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp or steel plate washer.
  - .3 For steel beams: manufactured beam clamps:

## PART 3 EXECUTION

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal duct installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.2 GENERAL

- .1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA, and as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.

- .1 Ensure diffuser is fully seated.
- .3 Support risers as indicated.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .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.

### 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 ASHRAE and SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

### 3.4 WATERTIGHT DUCT

- .1 Provide watertight duct for:
  - .1 Fresh air intake.
  - .2 As indicated.
- .2 Form bottom of horizontal duct without longitudinal seams.
  - .1 Solder or weld joints of bottom and side sheets.
  - .2 Seal other joints with duct sealer.
- .3 Slope horizontal branch ductwork down towards hoods served.
  - .1 Slope header ducts down toward risers.
- .4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and trap primer and discharging to open funnel drain as indicated.

### 3.5 SEALING AND TAPING

- .1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturer's recommendations.

### 3.6 LEAKAGE TESTS

- .1 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

- .2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .3 Do leakage tests in sections.
- .4 Make trial leakage tests as instructed to demonstrate workmanship.
- .5 Do not install additional ductwork until trial test has been passed.
- .6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degree elbows.
- .7 Complete test before applying insulation or concealment Work.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**