

1. **PART 1 – GENERAL**

1.1 References

- .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/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A 635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A 653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Agency Association (NFPA).
 - .1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-02, 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, 2nd Edition 1995 and Addendum No. 1, 1997.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

2. **PART 2 - PRODUCTS**

2.1 Seal Classification

- .1 The seal class of ducts has to be determined according the following table :

<u>Maximum Pressure Pa</u>	<u>SMACNA Seal Class</u>
500	B
250	B
125	B

- .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 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 degrees C to plus 93 degrees C.
 - .1 Acceptable products : Duro-Dyne S-2; Foster 30-02; 3M; EC-800.

2.3 Tape

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50mm wide.
 - .1 Acceptable product : Duro-Dyne FT-2.

2.4 Duct Leakage

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual for a Class B.

2.5 Fittings

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius.
 - .2 Round: 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 45 degrees entry on branch.
 - .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 splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 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.
- .2 Fire stopping material and installation must not distort duct.

2.7 Galvanized Steel Ducts

- .1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.
- .3 Joints: to ASHRAE, SMACNA, 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 A 480/A 480M, Type 316.
- .2 Finish: No. 4.
- .3 Thickness, fabrication and reinforcement: to ASHRAE, SMACNA, as indicated.
- .4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.

2.9 Hangers and Supports

- .1 Hangers and Supports: in accordance with Section 230529E - Hangers and Supports for HVAC Piping and Equipment.
 - .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 and the following table :

<u>Duct Size (mm)</u>	<u>Angle Size (mm)</u>	<u>Rod Size (mm)</u>
Up to 750	25 x 25 x 3	6
751 to 1 050	40 x 40 x 3	6
1 051 to 1 500	40 x 40 x 3	10
1 501 to 2 100	50 x 50 x 3	10
2 101 and 2 400	50 x 50 x 3	10
2 401 and over	50 x 50 x 3	10

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

3. PART 3 - EXECUTION

3.1 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 Insulate strap hangers 100 mm beyond insulated duct. Ensure diffuser is fully seated.
- .3 Support risers in accordance with ASHRAE, SMACNA, 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.

3.2 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, SMACNA and as follows:

<u>Duct Size (mm)</u>	<u>Spacing</u>
To 1 500	3 000
1 501 and over	2 500

3.3 Watertight Duct

- .1 Provide watertight duct for:
 - .1 Dishwasher exhaust.
 - .2 Fresh air intake.
 - .3 Minimum 1000 mm from duct mounted humidifier in all directions.
 - .4 All indicated ducts.
- .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 fume or gas hoods served.
 - .1 Slope header ducts down toward risers.
- .4 Fit base of riser with 150mm deep drain sump and 32mm drain connected, with deep seal trap and valve, trap primer and discharging to open funnel drain as indicated.

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.

3.5 Leakage Tests

- .1 Refer to Section 230593E – Testing, Adjusting and Balancing (TAB) of Mechanical Systems.
- .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 30m long with not less than three branch takeoffs and two 90 degrees elbows.
- .7 Complete test before performance insulation or concealment Work.