

PART 1 - GENERAL**1.1 RELATED SECTIONS**

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

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection 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.
- .6 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.

1.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings.
 - .1 Catalogue or published ratings are those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to Codes and Standards.
- .2 Health and Safety.
 - .1 Apply pertinent safety rules in accordance with section 01 35 29.06 - Health and Safety Requirements.

PART 2 - PRODUCTS**2.1 SEAL CLASSIFICATION**

- .1 Seal classification for ductwork is to be determined by the following table:

Maximum Pressure	Seal Classification
500 Pa	A (SMACNA)

- .2 Seal Classification:
 - .1 Class A: Longitudinal seams, transverse joints and connections made airtight with sealing product or tape embedded in sealing product.
 - .2 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.2 SEALANT

- .1 Transverse Joints:
 - .1 Rectangular or round ducts with slotted or "S" joints.
 - .1 Tube applied sealant.
 - .1 Acceptable products: Mulco-Butyle; Ductmate 5511M.

- .2 "T" joints and flanged joints.
 - .1 Waterproof tape.
 - .1 Acceptable products: Ductmate 440 Gasket tape.
- .2 Longitudinal Joints:
 - .1 Round duct.
 - .1 Tube applied sealant of sealant product.
 - .1 Acceptable products: Mulco-Butyle; Ductmate 5511M.
 - .2 Rectangular duct.
 - .1 Tube sealant.
 - .1 Acceptable products: Mulco-Butyle; Ductmate No. 5511M.
- .3 Miscellaneous:
 - .1 For installation temperature higher than -7°C .
 - .1 Sealing product: sealing product for air duct, water based, ULC certified, with fire spread factor smaller than 26 and smoke density rating lower than 51, usable within -7°C to 93°C temperature range.
 - .1 Acceptable products: Duro Dyne DWN or equivalent.

2.3 TAPE

- .1 Tape: Polyvinyl treated, open weave fiberglass tape, 50 mm wide.
 - .1 Acceptable products: Duro Dyne FT-2 or equivalent.

2.4 FITTINGS

- .1 Fabrication: According to SMACNA.
- .2 Rounded Elbows:
 - .1 Rectangular ducts: Elbows bend radius equal to one times the width of the duct.
 - .2 Ducts round: Elbows bend radius equal to 1.5 times the diameter of the pipe "Standard manufacturers."

- .3 90° Elbows: Rectangular Ducts:
 - .1 Ducts whose largest dimension is less than or equal to 400 mm equipped with baffles elbows single thickness.
 - .2 Ducts whose largest dimension is greater than 400 mm equipped with baffles elbows double thickness.
- .4 Bypass Fittings:
 - .1 Main and branch ducts, rectangular:
 - .1 Lateral entry at 90°: With damper in the branch closest to the main duct.
 - .2 Lateral entry to 45°: Radius of curvature equal to one time the width of the duct with damper in the branch closest to the main duct.
 - .2 Ducts, main, and branch, round: Entering the main duct with conical fitting.
- .5 Transition Elements:
 - .1 Divergent elements: Transition angle of up to 20°.
 - .2 Elements converging transition angle exceeding 30°.
- .6 Offsets: 90° bends or elbows rounded, as indicated.
- .7 Deflectors for obstacles to keep the same effective area. The angles of maximum transition must be the same as in the case of regular transformations.

2.5 FIRE STOPPING

- .1 Angle restraints must be installed around the sleeves on each side of fire separations.
- .2 Fire stopping material and installation must not distort duct.

2.6 GALVANIZED STEEL

- .1 Lock Forming Quality: To ASTM A653/A653M, Z90 zinc coating.
- .2 Design Criteria: Pressure of 500 Pa.
- .3 Thickness, Manufacturing and Reinforcement: To ASHRAE and SMACNA recommendations.

- .4 Joints.
- .1 Complying with ASHRAE and SMACNA for following usage:
- .1 Ducts, with greater dimension up to 1,200 mm or 900 mm diameter.
- .2 Prefab trade marked flanged joints for air ducts, for following usage.
- .1 Ducts, with greater dimension up to 1,200 mm or 900 mm diameter.
- .2 Acceptable products: Ductmate Canada or equivalent.
- .5 Circular and Oval Ducts.
- .1 Ducts: Factory manufactured, spiral, with assorted fittings and special parts, in accordance with SMACNA.
- .2 Transverse joints for ducts up to 900 mm diameter: Interlocked type, use sealing product and tape for tightness.
- .3 Transverse joints for ducts over 900 mm diameter: Vanstone.
- .4 Acceptable products: Spiro Metal Canada Inc.; Ductmate Canada.

2.7 HANGERS

- .1 Hanging Straps: Used for ducts with greater dimension up to 500 mm Same material as suspended duct, one gauge thicker than suspended duct material.
- .2 Hangers Configuration: In accordance with ASHRAE and SMACNA recommendations.
- .3 Angles and hanger rods; angles made from galvanized steel, retained by galvanized steel rods, in accordance with ASHRAE and SMACNA recommendations and following table:

DUCT SIZE mm	ANGLES SIZE mm	RODS SIZE mm
Up to 750	25 x 25 x 3	6
From 751 to 1,050	40 x 40 x 3	6
From 1,051 to 1,500	40 x 40 x 3	10
From 1,501 to 2,100	50 x 50 x 3	10
From 2,101 to 2,400	50 x 50 x 5	10
Over 2,400	50 x 50 x 6	10

- .4 "Ramset" type impact anchors and simply laid anchors (drop-in anchors) are prohibited.
- .5 Hanger Attachment Devices.
 - .1 Attachment for concrete works; prefab concrete anchorage.
 - .2 Steel beam attachment: prefab concrete clamps.
 - .3 Steel beam attachment: prefab clamps.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, and SMACNA, as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Insulate strap hangers 100 mm beyond insulated duct. Ensure diffuser is fully seated.
- .4 Support risers in accordance with ASHRAE and SMACNA, as indicated.
- .5 Install breakaway joints in ductwork on sides of fire separation.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining, as indicated.

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 and SMACNA recommendations, as follows:

Duct Size (mm)	Spacing (mm)
To 1,500	3,000
1,501 and over	2,500

3.3 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 Seal every opening in air ducts (i.e.: openings for instruments, dampers liking parts, coils, etc.), using sealing product or neoprene or silicone trim. Equipment installed within the duct must be allowed to move freely as required.

END OF SECTION