

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 (ASHRAE).
 - .1 ASHRAE Handbook, Fundamentals and Systems Volumes.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A525, Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanised) by the Hot-Dip Process (Metric).
 - .3 ASTM A621/A621M, Specification for Steel Sheet and Strip, Carbon, Hot Rolled, Drawing Quality.
 - .4 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice of Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA).
- .4 National Air Duct Cleaners Association (NADCA).
 - .1 Assessment, Cleaning and Restoration of HVAC Systems (ACR 2006).
- .5 National Fire Protection Association (NFPA).
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).

- .7 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 (Duct Cleanliness for New Construction Guidelines).

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal procedures.

1.4 QUALITY ASSURENCE

- .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.

1.5 PRESSURE OF DUCT DESIGN

- .1 Hot and cold air supply duct upstream of mixing boxes.
 - .1 Supply: 2,150 Pa (maximum pressure).

PART 2 - PRODUCTS

2.1 DUCTS AND FITTINGS

- .1 Materials:
 - .1 Galvanized steel ducts with G90 zinc coating, flexible, lock forming quality, to ASTM A653/A653M.
 - .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

- .2 Construction of round ducts:
 - .1 Ducts: Manufactured in the factory, with matching fittings and special parts according to SMACNA.
 - .2 Transverse joints of ducts with a diameter of 900 mm or less: nesting type, sealed with sealant and sealing tape.
 - .3 Traverse joints for duct 900 mm diameter and larger: flanges type.
 - .4 Fittings:
 - .1 Elbows: centerline radius 1.5 times the standard duct diameter or 5 pieces 90°, 45° 3 pieces type.
 - .2 Branches: Concentric transitions with reduced branch at 45° and curved branch at 45°.
- .3 Firestopping:
 - .1 Retaining angles around duct, on both sides of the fire separation.
 - .2 Firestopping material and installation must not distort duct.

2.2 SEAL CLASSIFICATION

- .1 Class A: longitudinal seams, traverse joints and connections made airtight with sealant, tape, or combination thereof.

2.3 SEALANT

- .1 General:
 - .1 Tapes and sealants shall conform to CAN/ULC-S109 (tape), NFPA 90A and 90B standards and have a maximum flame spread of 25 and a smoke index of not more than 50.
- .2 For temperatures above -7°C:
 - .1 Sealant for air duct, ULC approved water base having a flame spread index of not more than 25 and a Smoke Index of not more than 50 that may be used in a range of operating temperature ranging from -7°C to 93°C.
 - .1 Acceptable products: Duro Dyne DWN or equivalent.

- .3 Sealing tape: Fiberglass tape, loose, 50 mm wide, polyvinyl-treated.
 - .1 Acceptable Products: Duro Dyne FT-2 or equivalent.
- .4 Seal packing.
 - .1 Acceptable Products: Ductmate or equivalent.

2.4 HANGERS AND SUPPORTS

- .1 Hanger straps: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Angles and hanger rods: galvanized steel angles retained by galvanized steel rods to ASHRAE and SMACNA and the indications in the following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
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 to 2,400	50 x 50 x 5	10
2,401 and higher	50 x 50 x 6	10

- .4 "Ramset" impact anchors and simply laid anchors (drop-in anchors) are prohibited.
- .5 Upper hanger attachments:
 - .1 Concrete: zinc-plated steel anchor bolts with a hexagon head and internal threaded washer.
 - .2 Concrete:
 - .1 Galvanized steel expansion anchor (6 mm diameter to 25 mm diameter):
 - .3 Steel joist: prefabricated steel joist clamp or steel plate.

- .4 Steel beam: prefabricated beam clamps.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do work in accordance with ASHRAE and SMACNA, as well as ANSI/NFPA 90A and ANSI/NFPA 90B.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with ASHRAE and SMACNA, and as indicated.
- .4 Install breakaway joints in ductwork on sides of fire separation

3.2 HANGERS

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

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

3.3 SEALING

- .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 manufacturer's recommendations.
- .3 Seal all openings in air ducts, such as instrumentation openings, damper linkage, coils, etc., using neoprene or silicone sealant, while allowing the normal movement of the equipment installed in the ducts.

3.4 LEAKAGE TESTS

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

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- .2 Make trial leakage tests (to detect air leakage) as instructed to demonstrate workmanship.
 - .3 Install no additional ductwork until trial test has been passed.
 - .4 Test section minimum of 30 m long with not less than three branch takeoffs and two 90° elbows.
 - .5 Do not insulate or conceal ducts before completing required tests and having the test report be approved.

END OF SECTION