

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
 - .1 ASTM A 480/A 480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A 635/A 635M-09b, Standard 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, General Requirements for.
 - .3 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada 2009 for Design and Construction, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
- .4 Green Seal Environmental Standards (GS)
 - .1 GS-36-11, Standard for Adhesives for Commercial Use.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, 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, 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

- 1.1 REFERENCES (Cont'd)
- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit 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 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador.
- .4 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.
- .5 Sustainable Design Submittals:
.1 LEED Canada submittals: in accordance with Section 01 35 21 - LEED Requirements.
.2 Construction Waste Management:
.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
.3 Recycled Content:
.1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer
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1.3 DELIVERY, STORAGE AND HANDLING (Cont'd) .5 Packaging Waste Management: (Cont'd) Disposal and Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A
250	A
125	A

.2 Seal classification:
.1 Class A: Longitudinal seams, transverse joints, duct wall penetration and connections made air tight with sealant or tape.

2.2 SEALANT .1 Sustainability Characteristics:
.1 Adhesives and sealants: in accordance with Section 07 92 00 - Joint Sealants.
.2 Adhesives and sealants: VOC limit 30 g/L maximum to SCAQMD Rule 1168.
.2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees 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 centreline radius: 1.5 times width of duct.
 - .2 Round: five piece, 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 splitter damper.
 - .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
 - .6 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 - Fire Stopping.
 - .2 Fire stopping material and installation must not distort duct.
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- 2.7 GALVANIZED STEEL
- .1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.
 - .2 Thickness, fabrication and reinforcement: to SMACNA.
 - .3 Joints: to SMACNA.

- 2.8 HANGERS AND SUPPORTS
- .1 Hangers and Supports: in accordance with Section 23 05 29 - 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 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

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp.
 - .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 and SMACNA.
- .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 SMACNA.
 - .4 Install breakaway joints in ductwork on sides of fire separation.
 - .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- 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:
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3.3 HANGERS .3 Hanger spacing: (Cont'd)
(Cont'd)

Duct Size (mm)	Spacing (mm)
to 1500	3000

- 3.4 WATERTIGHT DUCT .1 Provide watertight duct for:
- .1 Fresh air intake.
 - .2 Minimum 3000 mm from duct mounted humidifier in all directions.
 - .3 As indicated.
- .2 Form bottom of horizontal duct without longitudinal seams.
- .1 Solder 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 valve and discharging to open funnel drain.

- 3.6 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 manufacturers recommendations.

- 3.7 LEAKAGE TESTS .1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air 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.

- 3.7 LEAKAGE TESTS (Cont'd)
- .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 degrees elbows.
 - .7 Complete test before performance insulation or concealment Work.
- 3.8 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.
 - .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.