
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00 – Common Work Results for HVAC.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process. (Metric).
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-36, Standard for Adhesives for Commercial Use.
- .4 Sheet Metal 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.
 - .3 SMACNA IAQ Guideline for Occupied Buildings Under Construction, 2007.
- .5 National Fire Protection Association (NFPA)
 - .1 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
 - .2 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 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 Canada and OIQ member.
- .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.

- .2 Construction IAQ Management Plan:
 - .1 Submit Indoor Air Quality (IAQ) Plan for pre-occupancy phases of building.
 - .2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Where materials or products are specified by their trademark, consult the Instructions to Bidders document for the procedures to follow regarding the request for approval for materials or product replacement.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 off ground, ideally indoors or in a clean, dry, well ventilated area and in accordance with manufacturer's recommendations.
 - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DUCTWORK

- .1 Material:
 - .1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A653/A653M.
 - .2 Thickness: to SMACNA.
- .2 Construction: round
 - .1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.
 - .2 Transverse joints up to 900 mm: slip type with tape and sealants.
 - .3 Transverse joints over 900 mm: Vanstone.
 - .4 Fittings:
 - .1 Elbows: large radius, type four (4) pieces for duct up to 225mm – 90 degrees, of type three (3) pieces – 45 degrees; radius of curvature corresponding to 1.5 x diameter.
 - .2 Branches: conical transition with conical branch at 45 degrees and 45 degrees elbow.
- .3 Construction: rectangular:
 - .1 Ducts: to SMACNA.
 - .2 Transverse joints: proprietary duct joints SMACNA seal Class A and B.

- .3 Fittings:
 - .1 Elbows: smooth radius; centreline radius 1.5 x width of duct. No vanes.
 - .2 Sharp angle elbow: duct equal or less than 450 mm, round back elbows without blade; duct equal to 450 mm and less than 610 mm round back elbows with a blade in the center of the conduit; duct superior than 610 mm: round back elbows with a blade at third of the duct and a blade to two-thirds of the duct.
 - .3 Branches: with conical branch at 45 degrees and 45 degrees elbow.
- .4 Fire stopping:
 - .1 50 x 50 x 3 mm retaining angles around duct, on both sides of fire separation.
 - .2 Fire stopping material must not distort duct.

2.2 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
2500	A
1500	A
1000	A
750	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.

2.3 SEALANT

- .1 Sustainability Characteristics:
 - .1 Adhesives and sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .2 Oil resistant, water-borne polymer type flame resistant high velocity duct sealing compound.
 - .1 Temperature range of minus -30 degrees C to plus 93 degrees C.

2.4 TAPE

- .1 Tape: polyvinyl treated, open weave fibre glass, 50 mm wide.
 - .1 Acceptable products: Duro Dyne FT-2 or approved equivalent.
 - .2 Color: Aluminum gray.

2.5 HANGERS AND SUPPORTS

- .1 Hangers and supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping Equipment.
 - .1 Band hangers: use on round up to 500 mm diameter, of same material as duct but next sheet metal thickness heavier than duct.

- .2 Trapeze hangers: ducts over 500 mm diameter or longest side, to SMACNA.
- .3 Hangers: galvanized steel angle with galvanized steel rods to 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 more	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .1 Acceptable products: Myatt, fig. 485 or a replacement product approved via addenda in accordance with Bidder instructions.
 - .2 For steel joist: manufactured joist clamp or steel plate washer.
 - .1 Anvil, fig. ou equivalent for clamps, Anvil, fig. 60 or a replacement product approved via addenda in accordance with Bidder instructions.
 - .3 For steel beams: manufactured beam clamps:
 - .1 Acceptable products: Anvil fig. 86 or a replacement product approved via addenda in accordance with Bidder instructions.

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 Install ducts in accordance with construction, SMACNA, ASHRAE and ANSI/NFPA, AINSI, NFPA 90B standards.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.

- .1 Insulate band hangers 100 mm beyond insulated duct.
- .2 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 commercial kitchen exhaust system according to ANSI/NFPA 96 and as indicated.
- .6 In the multi-purpose room of the central building, all exposed duct shall be black painted. Furthermore, if the interior ducts are visible by the diffusers, they shall be painted black. Coordinate the exact color with the architect.
- .7 All others exposed duct shall be painted. Coordinate the exact color with the architect

3.3 HANGERS

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

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

3.4 SEALING AND TAPING

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

3.5 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 Perform leakage tests in sections.
- .4 Perform trial leakage tests, as instructed to demonstrate quality of work.
- .5 Do not install additional ductwork until trial tests have been achieved.
- .6 Test section minimum of 30 m long with not less than 3 branch takeoffs and two 90 degrees elbows.
- .7 Complete tests before performing insulation or concealment Work.

3.6 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 recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION