Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 23 31 13 01.

1.2 SUMMARY

.1 Section Includes:

.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

.2 Sustainable requirements for construction and verification.

.2 Related Sections:

.1 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.3 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 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Material Safety Data Sheets (MSDS).

.4 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.

.5 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.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 – General Requirements.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Division 01 – General Requirements for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary joints.

.3 Co-ordinate submittal requirements and provide submittals required by Division 01 – General Requirements.

.4 Submit Indoor Air Quality (IAQ) Management Plan in accordance with Division 01 – General Requirements.

.5 Indicate VOC's for adhesives and solvents during application and curing.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Construction occupational health and safety in accordance with Division 01 – General Requirements.

.3 Indoor Air Quality (IAQ) Management Plan:

.1 Develop and implement an Indoor Air Quality (IAQ) Management Plan in accordance with Division 01 – General Requirements.

.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

.4 Sustainable Requirements:

.1 Construction requirements: in accordance with Division 01 – General Requirements.

.2 Verification: Contractor's verification in accordance with Division 01 – General Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store and manage hazardous materials in accordance with Division 01 – General Requirements.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA and Applicable Laws.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and resources in accordance with Division 01 – General Requirements.

2.2 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A – All HVAC supply and return duct unless noted
250	B – All exhaust Ducts unless noted

.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 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

.2 Indicate VOC’s during application and curing.

2.4 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.5 DUCT LEAKAGE

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

2.6 FITTINGS

.1 Fabrication: in accordance with 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 (16”): with double thickness turning vanes.

.2 Over 400 mm (16”): with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45° entry on branch.

.2 Round main and branch: enter main duct at 45° with concentric conical connection.

.3 Provide volume control damper in branch duct near connection to main duct unless otherwise noted.

.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 Full radius elbows.

.7 Obstruction deflectors: maintain full cross-sectional area:

.1 Maximum included angles: as for transitions.

2.7 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.8 GALVANIZED STEEL

.1 Lock forming quality: in accordance with ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: in accordance with SMACNA.

.3 Joints: in accordance with SMACNA proprietary manufactured duct joint.

.4 Round Duct: Spiral wound locked seam; made for high static ventilation system.

2.9 HANGERS AND SUPPORTS

.1 Hangers and Supports: Refer to 23 05 29 – Hangers and Supports for HVAC Piping and Equipment for General Requirements:

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500mm round or single side.

.2 Hanger configuration: in accordance with ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods shall be in accordance with the 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 over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp.

.3 For steel beams: manufactured beam clamps.

2.10 FLEXIBLE DUCTWORK

.1 Underwriters Laboratories UL 181 and CUL S110 listed, and complies with NFPA Standards 90A and 90B.

.2 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

.3 Duct shall be factory made and composed of a resilient calendared film liner duct permanently bonded to a coated spring steel wire helix and supporting a fiberglass insulating blanket. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the composite.

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.

.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 as follows:

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

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint in accordance with manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.4 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.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m (98 feet) long with not less than three branch takeoffs and two 90 degree elbows.

.7 Complete test before performance insulation or concealment Work.

3.5 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Division 01 – General Requirements, include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Low-emitting materials.

END OF SECTION