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**PART 1        GENERAL**

**1.1            SUMMARY**

.1        Section Includes:

- .1        Materials and installation of flexible ductwork, joints and accessories.

**1.2            RELATED SECTIONS**

- .1        Section 01 33 00 – Submittal Procedures.
- .2        Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.3            REFERENCES**

- .1        American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2        Department of Justice Canada (Jus).
  - .1        Canadian Environmental Protection Act (CEPA).
  - .2        Transportation of Dangerous Goods Act, (TDGA).
- .3        Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1        Material Safety Data Sheets (MSDS).
- .4        National Fire Protection Association (NFPA).
  - .1        NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
  - .2        NFPA 90B, Standard for 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.
  - .2        SMACNA IAQ Guideline for Occupied Buildings under Construction.
- .6        Underwriters' Laboratories Inc. (UL).
  - .1        UL 181, Standard for Factory-Made Air Ducts and Air Connectors.
- .7        Underwriters' Laboratories of Canada (ULC).
  - .1        CAN/ULC-S110, Fire Tests for Air Ducts.

**1.4            SUBMITTALS**

- .1        Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Product Data: submit WHMIS MSDS in accordance with Section 02 60 00.01 - Hazardous Materials for the following:
  - .1 Thermal properties.
  - .2 Friction loss.
  - .3 Acoustical loss.
  - .4 Leakage.
  - .5 Fire rating.
- .3 Samples: submit samples with product data of different types of flexible duct being used in accordance with Section 01 33 00 - Submittal Procedures.

## **1.5 QUALITY ASSURANCE**

- .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.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .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 Place materials defined as hazardous or toxic in designated containers.
  - .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
  - .6 Ensure emptied containers are sealed and stored safely.
  - .7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

## **1.7 INDOOR AIR QUALITY (IAQ)**

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

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**PART 2      PRODUCTS**

**2.1      GENERAL**

- .1      Factory fabricated to CAN/ULC S110.
- .2      Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3      Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

**2.2      METALLIC - UNINSULATED**

- .1      Type 1: spiral wound flexible aluminum.
- .2      Performance:
  - .1      Factory tested to 1000 Pa without leakage.
  - .2      Maximum relative pressure drop coefficient: 3.

**2.3      METALLIC - INSULATED**

- .1      Type 2: spiral wound flexible aluminum with factory applied, 25 mm thick flexible glass fibre thermal insulation with vapour barrier and vinyl or reinforced mylar/neoprene laminate jacket.
- .2      Performance:
  - .1      Factory tested to 1000 Pa without leakage.
  - .2      Maximum relative pressure drop coefficient: 3.
  - .3      Thermal loss/gain: 1.3 W/m<sup>2</sup>.°C. mean.

**2.4      NON-METALLIC - UNINSULATED**

- .1      Type 3: non-collapsible, coated mineral base fabric or aluminum foil mylar type, mechanically bonded to, and helically supported by, external steel wire.
- .2      Performance:
  - .1      Factory tested to 1000 Pa without leakage.
  - .2      Maximum relative pressure drop coefficient: 3.

**2.5      NON-METALLIC - INSULATED**

- .1      Type 4: non-collapsible, coated mineral base fabric or aluminum foil mylar type mechanically bonded to, and helically supported by, external steel wire with factory applied, 25 mm thick flexible glass fibre thermal insulation with vapour barrier and vinyl or reinforced mylar/neoprene laminate jacket.
- .2      Performance:

- .1 Factory tested to 1000 Pa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.
- .3 Thermal loss/gain: 1.3 W/m<sup>2</sup>.EC mean.

## 2.6 METALLIC ACOUSTIC INSULATED MEDIUM PRESSURE

- .1 Type 5: Spiral wound, flexible perforated aluminum with factory applied 25 mm thick flexible glass fibre thermal insulation and sleeved by aluminum foil and mylar laminate vapour barrier.

- .2 Performance:

- .1 Factory tested to 3 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

## 2.7 METALLIC ACOUSTIC INSULATED HIGH PRESSURE

- .1 Type 6: Spiral wound, flexible perforated aluminum with factory applied 37 mm thick flexible glass fibre thermal insulation and encased in spiral wound flexible aluminum jacket, as indicated.

- .2 Performance:

- .1 Factory tested to 2.5 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

## 2.8 NON-METALLIC - ACOUSTIC INSULATED

- .1 Type 7: Non-collapsible, coated mineral base perforated fabric type helically supported by and mechanically bonded to steel wire with factory applied flexible glass fibre acoustic insulation and encased in aluminum foil and mylar laminate vapour barrier.

- .2 Performance:

- .1 Factory tested to 3 kPa without leakage.

- .2 Maximum relative pressure drop coefficient: 3.
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

### **PART 3      EXECUTION**

#### **3.1      DUCT INSTALLATION**

- .1 Install in accordance with: NFPA 90A and NFPA 90B SMACNA.
- .2 Do leakage test in accordance with Section 23 05 94 - Pressure Testing of Ducted Air System.
- .3 Do trial test to demonstrate workmanship.

**END OF SECTION**