

## 1. **General Information**

### 1.1 **Section Contents**

- .1 Low pressure metal air ducts, materials, joints, accessories and related installation methods.

### 1.2 **Related sections**

- .1 Section 21 05 01 - General requirements for work results.
- .2 Section 23 05 94 - Testing the aeraulic networks under pressure.

### 1.3 **References**

- .1 Unless otherwise indicated, complete all work in accordance with the current edition of the "*Code de Construction du Québec*"
- .2 In addition, perform the work in accordance with any other code or other standard having jurisdiction, according to the edition in force, including but not limited to:
  - .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 (Galvanized) by the Hot-Dip Process (Metric).
    - .3 ASTM A621/A621, Specification for Steel Sheet and Strip, Carbon, Hot Rolled, Drawing Quality.
    - .4 ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
    - .5 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
  - .3 Canadian Standards Association (CSA).
    - .1 CSA Z317.2-10, Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities: Specific requirements.

- .4 Department of Justice - Canada
  - .1 Canadian Environmental Protection Act (CEPA).
- .5 National Air Duct Cleaners Association (NADCA).
  - .1 Assessment, Cleaning and Restoration of HVAC Systems (ACR 2006).
- .6 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.
  - .3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Data Sheets (DS).
- .8 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).
- .9 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act, (c. 34)
- .10 Underwriters Laboratories of Canada (ULC).

#### **1.4 Reliability of the technical data**

- .1 Data from catalogs and manufacturers' documentation must be reliable data, confirmed by tests carried out by the manufacturers themselves or, on their behalf, by independent laboratories and certifying the compliance of the elements with the requirements of the codes and standards in effect.

## 1.5 Cleanliness of the air ducts

- .1 The Contractor must take the necessary measures to ensure the cleanliness of the air ducts during manufacturing, delivery and storage before assembly and during the works until the provisional acceptance of the work.
  - .1 After manufacturing and during delivery, the ducts must be protected from dust.
  - .2 When storing ducts prior to installation, ducts must be protected by a polythene cover against dust and weather.
  - .3 All open ends of ventilation ducts installed by the Contractor must be sealed with a new polythene film to prevent dust and debris from entering the ducts during the execution of the work.
- .2 The air ducts must be clean before the start-up of the ventilation systems. The amount of dust on the surface of the air ducts must be less than 0.75 mg / 100 cm<sup>2</sup>, according to the NADCA Vacuum Test.
- .3 If the cleanliness of the air ducts does not meet the criteria of 0.75 mg / 100 cm<sup>2</sup>, the Contractor must have all the ducts cleaned according to the Guide:
  - .1 Assessment, Cleaning and Restoration of HVAC Systems (ACR 2006), and then demonstrate once again the compliance with cleanliness of the air ducts.

## 2. Products

### 2.1 Rectangular duct

- .1 U.S. sheet size chart (dimensions based on the largest side)

| Dimension |    |          | U.S. gauge |
|-----------|----|----------|------------|
| 0         | to | 760 mm.  | 24         |
| 790       | to | 1370 mm. | 22         |
| 1400      | to | 2130 mm. | 20         |

## 2.1 Circular duct

### .1 Circular ducts with spiral joints.

| Dimension |    |          | U.S. gauge |   |         |
|-----------|----|----------|------------|---|---------|
|           |    |          | Duct       | – | Fitting |
| 0         | to | 200 mm.  | 26         | – | 22      |
| 230       | to | 560 mm.  | 24         | – | 20      |
| 585       | to | 914 mm.  | 22         | – | 20      |
| 940       | to | 1270 mm. | 20         | – | 18      |

## 2.2 Airtightness classes

### .1 The duct airtightness class will be determined according to the data in the table below:

| Maximum pressure | Sealing class |
|------------------|---------------|
| 500 Pa           | B (SMACNA)    |

## 2.3 Sealing class:

- .1 Class B: longitudinal joints, transverse joints and fittings sealed by means of a sealant, a sealing tape or a combination thereof.
- .2 According to the requirements formulated in the HVAC Air Duct Leakage Test Manual by SMACNA.

## 2.4 Sealing compounds

- .1 Transverse joints:
  - .1 Circular ducts and rectangular ducts with slide joints or S hooks
  - .2 ULC approved laminated / canvas / aluminum roll laminate tape.
- .2 Tee joints and flanged joints.
  - .1 Aluminum sealing tape.
- .3 Longitudinal joints:

.1 Circular ducts.

.1 ULC approved laminated / canvas / aluminum roll laminate tape.

.2 Rectangular ducts.

.1 Tube sealant.

.4 Various:

.1 For service temperature greater than -7 ° C (19.4 ° F).

.1 Sealant: ULC-approved water-based air-barrier sealant with a Flame spread value less than 25 and Smoke Developed Value less than 50, and be used in a range of operating temperatures from -7 ° C (19.4 ° F) to 93 ° C (199.4 ° F).

.2 For service temperature less than or equal to -7 ° C (19.4 ° F).

.1 Sealant: Polymer-based, flame retardant, oil-resistant, air-duct sealant capable of withstanding temperatures from -30 ° C (22 ° F) to 93 ° C (199.4 ° C) F).

## **2.5 Sealing tape**

.1 Sealing tape: 50 mm wide, polyvinyl-treated loose-weave fiberglass tape.

.2 Sealing compound

.1 Sealant: for air ducts, polymer-based, flame retardant, oil resistant and withstand temperatures from -30 ° to 93 ° C.

## **2.6 Fittings**

.1 Manufacturing: According to SMACNA.

.2 Rounded elbows:

.1 Rectangular ducts: Elbows with radius of curvature equal to one time the width of the duct.

.2 Round ducts: Elbows with a radius of curvature equal to 1.5 times the diameter of the duct "Manufacturer's standard".

.3 90° elbows: Rectangular ducts:

.1 Ducts with the largest dimension equal to or less than 400 mm: elbows with single-thickness baffles.

- .2 Ducts whose largest dimension is greater than 400 mm: elbows with double thickness baffles.
- .4 Bypass fittings:
  - .1 Main and branch ducts, rectangular:
    - .1 90 ° inlet branch: with balancing damper in the branch as close as possible to the main duct.
    - .2 45 ° inlet branch: with a radius of curvature equal to one duct width and with a balancing damper in the branch line as close as possible to the main duct.
  - .2 Conduit, main and branch, round: main duct entry with conical fittings.
- .5 Transition elements:
  - .1 Divergent elements: transition angle of no more than 20 °.
  - .2 Convergent elements: transition angle of no more than 30 °.
- .6 Offsets: 90 ° elbows or rounded elbows as indicated.
- .7 Deflectors for obstacles: To maintain the same section in use. The maximum transition angles must be the same as in the case of ordinary transformations.

## **2.7 Feedthroughs for firestop separations**

- .1 Retaining angles should be placed around the sleeves on each side of the firestop separations.
- .2 The fireproof material and its installation must not deform the duct.

## **2.8 Galvanized steel air ducts**

- .1 Galvanized steel pipe, Z90 zinc plated, foldable, to form staples, according to the ASTM A653 / A653M standard.
- .2 Design criteria: For pressure of 500 Pa.
- .3 Thickness, manufacturing and reinforcement: according to ASHRAE and SMACNA.
- .4 Joints:
  - .1 Joints compliant with ASHRAE and SMACNA for the following uses:
    - .1 Ducts with the largest dimension equal to or less than 1,200 mm or 900 mm in diameter.

.2 Prefabricated flange gaskets, registered trademark, for air ducts, for the following uses:

.1 Ducts with the largest dimension is more than 1,200 mm or 900 mm in diameter.

.5 Manufacturing of oval ducts:

.1 Ducts: factory-made, spiraled, with fittings and matching special parts, according to SMACNA.

.2 Transverse joints of ducts of 900 mm or less in diameter (interlocking)

.3 Transverse joints of ducts more than 900 mm (flanged)

.4 Rectangular ducts: prefabricated flanged joints, registered trademark, or welded seams, as indicated.

## **2.9 Dielectric joints**

.1 Install dielectric joints where aluminum ducts connect to galvanized or stainless steel conduits.

## **2.10 Supports and suspensions**

.1 Suspension straps: made of the same material used for the duct, but of a thickness immediately greater than that of the duct. Maximum size of conduits to be supported by straps: 500 mm.

.2 Suspension configurations: according to ASHRAE and SMACNA.

.3 Angles and suspension rods: galvanized steel angles supported by galvanized steel rods according to the recommendations of ASHRAE and SMACNA, and the indications in the following table:

| DIMENSIONS OF THE DUCTS<br>(mm) | DIMENSIONS OF THE ANGLES<br>(mm) | DIAMETER OF THE RODS<br>(mm) |
|---------------------------------|----------------------------------|------------------------------|
| Up to 750                       | 25 x 25 x 3                      | 6                            |
| From 751 to 1,050               | 40 x 40 x 3                      | 6                            |
| From 1,051 to 1,500             | 40 x 40 x 3                      | 10                           |
| From 1,501 to 2,100             | 50 x 50 x 3                      | 10                           |
| From 2,101 to 2,400             | 50 x 50 x 5                      | 10                           |
| 2,401 or more                   | 50 x 50 x 6                      | 10                           |

- .4 For ducts with fire resistant insulation, the suspension must comply with Section 23 07 13.
- .5 Anchor devices for suspensions:
  - .1 For attachment in concrete structures: prefabricated concrete anchors.
  - .2 For attachment on steel joists: brackets or prefabricated steel support plates.
  - .3 For mounting on steel girders: prefabricated clamps.

### 3. **Execution**

#### 3.1 **General information**

- .1 Perform work in accordance with the requirements of ASHRAE and SMACNA, and the ANSI/NFPA 90A, ANSI/NFPA 90B standards.
- .2 Avoid interrupting the insulation vapour barrier membrane by installing the straps or suspension rods. Extend the insulation of the suspension straps at a distance of 100 mm beyond the insulated duct.
- .3 Secure the vertical ducts in accordance with the requirements of ASHRAE and SMACNA and as indicated.
- .4 Make embrittled joints around the duct, on each side of the firestop separations.



- .5 Install factory-made prefabricated flange gaskets according to the manufacturer's instructions.
- .6 Fabricate the ducts in sections to facilitate the installation of the soundproofing lining.

### 3.2 Suspensions

- .1 Suspension straps: install the suspension straps in accordance with SMACNA requirements.
- .2 Suspension angles: equipped with locking nuts and washers.
- .3 Spacing of the suspensions:

| DIMENSIONS OF THE DUCTS (mm) | SPACING (mm) |
|------------------------------|--------------|
| Up to 1,500                  | 3,000        |
| 1,501 or more                | 2,500        |

### 3.3 Watertight ducts

- .1 The following ducts must be watertight:
  - .1 Air extraction ducts connected to dishwashers (aluminum duct);
  - .2 Outlets and plenums of fresh air and evacuation;
  - .3 Upstream and downstream duct mounted humidifiers over a distance of at least 1,000 mm;
  - .4 All indicated ducts.
- .2 Shape the bottom of the horizontal ducts without making longitudinal joints. Braze or weld the transverse joints for the bottom and side sheets. Seal all other joints with sealant for air ducts.
- .3 Give the horizontal ducts a downward slope, to the extraction hoods to which they are connected or to their drainage point.
- .4 At the bottom of the main vertical ducts, install a drip pan 150 mm deep, braze or solder all joints.

- .5 Install, at the following locations, a drainage fitting of nominal diameter DN 1½ connected to a "P" trap with a deep water trap; the water resistance must correspond to at least 1.5 times the static pressure measured at this point but not less than 300 mm.
  - .1 Below plenums of fresh air and evacuation;
  - .2 At the bottom of the vertical duct drip pans;
  - .3 At the low point of watertight horizontal ducts;
  - .4 In the indicated locations.

### **3.4 Sealing**

- .1 Apply sealants to the outside of the joints as per the manufacturer's recommendations.
- .2 Dredge the tape into the sealant and cover it with at least one coat of the same product as per the manufacturer's recommendations.
- .3 Seal all openings in the air ducts, such as openings for instrumentation, damper linkage, coils, etc. using a sealant or a neoprene or silicone gasket, while allowing the normal movement of the equipment installed in the ducts.

### **3.5 Leak testing air ducts**

- .1 Follow the methods indicated in the HVAC Air Duct Leakage Test Manual by SMACNA.
- .2 Perform the tests by proceeding by section and provide a report with the results for approval.
- .3 Conduct preliminary leak tests (to detect air leaks) according to the instructions, to check the quality of the work.

**Do not install other ducts until the results of these preliminary tests are deemed satisfactory.**

- .1 The tested sections must be at least 30 m in length and have at least three branches and two 90 ° elbows.
- .2 Do not insulate or conceal ducts until you have completed the required leak tests and before the leak test report is approved.

**END OF SECTION**