

1. **General Information**

1.1 **Summary**

- .1 Materials, equipment and installation methods associated with air duct accessories, including flexible fittings, access doors, baffles and diffusion fittings.

1.2 **Related sections**

- .1 Section 21 05 01 - General requirements for work results.

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 Canadian Standard Association (CSA).
 - .1 CSA B228.1, Pipes, Ducts and Fittings for Residential Type Air-Conditioning.
 - .2 CSA Z317.2-10, Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities
 - .2 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
 - .3 Underwriters Laboratories of Canada (ULC).

2. **Products**

2.1 **General information**

- .1 The accessories must be manufactured in accordance with the following standards:
 - .1 CSA B228.1 standard;
 - .2 HVAC, Duct Construction Standard from SMACNA.

2.2 **High induction diffuser**

- .1 The helicoid jet high induction diffuser is to be manufactured from 20 ga brushed steel. The 610 mm x 610 mm square frontal plate must integrate with the adjustable offset rollers.

- .2 The 100 mm long offset rollers must be equipped with alphanumeric identification that allows for the adjustment of the pattern for the air distribution across 180 degrees.
- .3 The diffuser plate must be adaptable for standard suspended ceilings or gypsum ceilings.
- .4 The diffuser plate must be available for configurations allowing for an air diffusion in 1, 2 or 3 ways, corner or in "L".
- .5 The diffuser must be powder-coated polyester-based and TGIC free. It should have a smooth surface that prevents dust accumulation, facilitating cleaning, resistant to flaking and discoloration. The colour according to the RAL colour chart, will be the choice of the architect or the client.
- .6 The diffuser must be delivered with a plenum manufactured and identified (TAG) by the manufacturer. The plenum should be made of 24 ga galvanized steel and include a perforated plate that stabilizes the air. It must be suspended by four points to respect the earthquake-proof standards. The inlet collar must be centered on the side or top of the plenum, and must be sized to fit the specified airflow. Inner joints will be pressure welded and sealed with a VOC-free sealant.
- .7 The diffuser plate must be attached to the plenum by a central screw.
- .8 When required, the plenum must come with a swing key accessible from the visible face of the diffuser to adjust the volume of air. Radial key with pivotal circular blades on a flexible metal cable for adjusting the flow rate between 0% and 100%
- .9 Colour selected by the architect, collar diameter and capacities according to plans.
- .10 The diffuser performance data must demonstrate a maximum velocity of 0.15 m/s (30ppm) in an occupied area at 1.3m from the ground. This performance guarantee must be demonstrated in a top view by circles illustrating the path of the air jet.
- .11 The diffuser must ensure a maximum temperature difference of -1°C between the air jet and the occupied zone at 1.3m from the ground. The temperature differential ratio must be at least $\Delta T_{xy} / \Delta T_0 \leq 0.1$ (for an initial differential of $\Delta T_0 = -10^{\circ}\text{C}$).
- .12 The air diffuser must meet an ACE air change efficiency value: (Air Change Effectiveness) or (Zone Air Distribution Effectiveness) of $E_z = 1.1$. This value must be measured according to ASHRAE 62.1-2007, ASHRAE 129 Standard and tested with tracer gas by an independent laboratory. It's the manufacturer's responsibility to prove in writing that his product has been tested and meets these performances.

The value of $E_z = 1.1$ was considered for this project and allowed to reduce the heating and cooling consumption capacities of the units.

2.3 High induction duct diffuser

.1 The high induction duct diffuser shall be made of 22 ga brushed steel for ducts inferior to 508 mm in diameter, and 20 ga for diameters superior or equal to 508mm.

1.2 The circular duct diffuser shall be available in diameters ranging from 203 mm to 1419 mm. The duct diffuser shall be grooved at each end and fitted with a PVC gasket to insure a tight seal between sections. The sections shall be assembled using union sleeves.

1.3 Steel reinforcements shall be installed inside ducts of more than 433 mm (17 inches) in diameter in order to maintain it's shape.

1.4 The diffuser shall be powder coated with a polyester TGIC-free paint, providing a smooth, easy-to-clean, chip and fade resistant finish. The architect or client shall choose a standard colour from the RAL colour chart.

1.5 The duct diffuser shall be supplied with slots containing UL94 certified ABS (black, creme or white) eccentric rollers and / or nozzle rollers. The 100 mm long eccentric rollers shall be alphanumerically identified allowing for the adjustment of the air flow pattern over 180 degrees.

1.6 A reducer fitting or perforated balancing damper with a self locking mechanism allowing for an output between 25% and 100%, shall be installed after a maximum of 5 consecutive active sections of the same diameter. A slot register shall be integrated to the last active section of the system.

1.7 The union sleeves shall not exceed the dimensions of the duct by 3 mm, and will be rounded to facilitate cleaning. The duct shall have as smooth as possible surface to maintain an esthetic appeal.

1.8 The duct diffuser can be passive, without slots.

.2 Installation and suspension

2.1 The suspension of the duct shall be done with threaded rods 9.5 mm supplied by the installer.

2.2 The threaded rods shall be covered with rod covers supplied by the manufacturer of the diffuser. The colour of the rod covers shall be chosen by the architect or the customer according to the RAL colour chart.

2.3 When required, the suspension of the duct diffuser shall be available in three options.

2.3.1 Rail suspension: The duct diffuser shall be slid into an aluminium rail suspended, offering a solution for varied types of ceilings. The rail shall be painted according to the RAL colour chart and chosen by architect or

customer.

2.3.2 Suspension by metallic cable: The duct diffuser shall be suspended by metallic cable (aviation style) 7 X 7 or 7 X 9 of galvanised or stainless steel (304 or 316) of medium or high traction resistance.

2.3.3 Wall suspension: The duct diffuser shall be anchored laterally with an adjustable wall support in the same colour as the duct diffuser. This wall mount shall be supplied by the manufacturer of the diffuser.

2.4 When the duct diffuser goes through a wall, a collar adapted to the duct diffuser shall be supplied by the manufacturer.

2.5 The standard accessories shall have the same finish as the duct diffuser (elbows, sleeves, reducers, branches, etc.)

2.6 Each conduit diffuser shall be identified with a label. This label shall contain the section number, the direction of the air flow, the number of slots and the positioning of the eccentric rollers.

3. Performances

The manufacturer shall supply for approval the following:

3.2 A diagram of the air flow, illustrating the trajectory of the air jets.

3.2 The pressure loss generated by the system and duct diffusers supplied by the manufacturer. The pressure loss generated by the entire network

4. Adjustment

4.1 The adjusting of the eccentric rollers shall be done by the manufacturer according to the required output.

4.2 The adjustment of the eccentric rollers shall be possible even after the installation of the diffuser in order to meet new output requirements.

5. Balancing

5.1 The balancing of the diffusers shall be done by a ventilation balancing technician, accredited as a qualified professional.

5.2 When required, the technician shall refer to the eccentric roller adjustment mode available in the manufacturers' reference manual.

2.4 Compact Heat-Pump:

.1 General

Equipment shall be completely assembled, piped, internally wired, fully charged with R-410A and test operated at the factory. Filters, thermostat field interface terminal strip, and all safety controls are furnished and factory installed. The system water inlet and outlet connections shall be female NPT composed of either copper or a bronze option. The equipment shall contain ETL, CETL, and AHRI-ISO 13256-1 listings and labels prior to leaving the factory. Service and caution area labels shall also be placed on the unit in their appropriate locations.

.2 Unit casing

Panels shall be insulated with either 1/2-inch thick dual density bonded glass fiber, 1/2-inch thick foil faced glass fiber, or closed cell elastomeric foam. Foil faced insulation edges are encapsulated to prevent glass fibers from entering the airstream. The elastomeric foam is UL listed with a flammability rating of 5V. The glass fiber insulations have a flame spread of 25 or less and a smoke developed classification of 50 or less per ASTM E-84 and UL 723. The dual density insulation has a minimum rated service air velocity of 3600 feet per minute (FPM) and meets the erosion requirements of UL 181. Access for inspection and cleaning of the unit drain pan, coils and fan section shall be provided. The unit shall be installed for proper access. Procedures for proper access inspection and cleaning of the unit shall be included in the maintenance manual.

.3 Hanging Rod Grommets

A set of four rubber grommets shall be enclosed with each GEHE 006-060 and EXHF/DXHF 006 - 070 units. These grommets are to be used in conjunction with unit hanging rods to isolate the vibration.

.4 Compressor

The unit shall contain a high efficiency rotary or scroll compressor. External vibration isolation shall be provided by rubber mounting devices located underneath the mounting base of the compressor. A second isolation of the refrigeration assembly shall be supported under the compressor mounting base. Internal thermal overload protection shall be provided. Protection against excessive discharge pressure shall be provided by means of a high pressure switch. Protection against a loss of charge shall be provided by a low pressure safety.

.5 Air-to-refrigerant coil

The air-to-refrigerant coil shall consist of copper tubes mechanically bonded into evenly spaced aluminum fins. All coils shall be leak tested to 450 psig and pressure tested to 650 psig at the factory to ensure the pressure integrity. The tubes are to be completely evacuated of air and correctly charged with proper volume of refrigerant

prior to shipment. The refrigerant coil distributor assembly shall be of orifice style with round copper distributor tubes. The tubes are sized consistently with the capacity of the coil. Suction headers are fabricated from rounded copper pipe.

A thermostatic expansion valve shall be factory selected and installed for a wide range of control.

.6 Electrical

The unit control box shall contain all necessary devices to allow heating and cooling operation to occur from a remote wall thermostat. These devices shall be as follows:

- 24 VAC energy limiting class II 50 VA (minimum) transformer

- 24 VAC blower motor relay

- 24 VAC compressor contactor for compressor control

- Field thermostat connections shall be provided for ease of hook-up to a terminal strip located in the unit's control box

- Lockout relay which controls cycling of the compressor shall be provided to protect the compressor during adverse operating conditions. The device may be reset by interrupting power to the 24 VAC control circuit. Reset may be done either at a remote thermostat or through a momentary main power interruption

.7 Thermostatic expansion valve

The equipment is provided with a bi-directional thermal expansion valve. This device allows operation of the equipment in the range of 25 to 110 degrees F entering fluid temperatures and 55 to 90 degrees F entering air temperatures. The equipment operates with one variable (entering water temperature, entering air temperature, cfm or gpm) at an extreme condition. All other variables must be within the nominal range of operation. The deluxe control package provides a 50 VA transformer. The controller includes a lockout relay, anti-short cycle compressor protection, random start delay, brown-out protection, time delay, general alarm, compressor delay on start and an open relay for night setback or pump request. Optional wiring from the factory for night setback, condensate overflow, hot gas reheat, electric heat and compressor enable is provided. Three LED (light emitting diodes) are included for diagnostics of the equipment.

.8 Motor/Fan

The motor is an ECM variable speed motor with thermal overload protection. The ECM motor is programmed to provide soft starting and a constant CFM over a range of static pressure. A means to adjust the air flow is provided on the control board. The motor contains a quick disconnect plug and permanently lubricated bearing. The fans are placed in a draw-through configuration. They

are constructed of corrosion resistant galvanized material. Removal of the motor and fan wheel can be made with the assistance of a factory provided orifice ring device. This device attaches the wheel and motor to the fan housing in a single assembly eliminating the need for access to the set screw on the backside of the fan hub.

.9 2" Filters

.1 Two inches, throwaway filters will be factory supplied on all 3-10 ton units.

.10 On/Off Switch

Unit mounted disconnect switch is not offered as a standard option on these units. It can be ordered as a special if needed.

2.5 Flexible fittings

.1 Metal Components: 1.3 mm (0.05 in) thick galvanized sheet metal elements to which the flexible fitting is bonded using double staple gaskets.

.2 Materials:

.1 Neoprene-coated, flame-retardant, self-extinguishing glass fiber, capable of withstanding temperatures ranging from -40 ° C to 90 ° C, with a density of 1.3 kg / m³ (0.08 lb / ft³).

.2 Asbestos fiber fabric treated with acrylic resins, non-combustible, meets environmental protection standards, can withstand a rated temperature of 480 ° C, ASTM grade AAAA grade, a density of 0.920 kg / m² (0.06 lb / ft³), ULC (S109) certified.

2.6 Access doors for air ducts

.1 Non-insulated ducts: double-walled ("sandwich-construction") doors of the same material used for the manufacturing of ducts, but of an immediately greater thickness, which must not be less than 0.6 mm, with frame in metal angles.

.2 Insulated ducts: double-walled ("sandwich-construction") doors of the same material used for the manufacturing of ducts, but of an immediately greater thickness, which must not be less than 0.6 mm, with built in metal angles and rigid insulating fiberglass 25 mm thick.

.3 Sealing gaskets: Neoprene 20 mm x 10 mm.

.4 Hardware pieces:

.1 For doors up to 1000 mm: a piano-type continuous hinge and at least two Duro-Dyne SL-1 latches.

- .2 For doors over 1000 mm in length: a piano-type continuous hinge and three handles that can be operated from the inside and the outside, respectively.
- .3 Doorstop: holding fixtures in the open position.
- .5 For high-speed ducts: the access door must open towards the inside of the duct.

2.7 Deflectors

- .1 Single or double-thickness, aerodynamic deflectors, manufactured in factory or workshop, in accordance with SMACNA recommendations and indications.

2.8 Fittings for test instruments

- .1 Steel elements 1.6 mm, Zinc plated after manufacturing.
- .2 Fittings consisting of a cam handle with chain and a neoprene expansion pad.
- .3 Inside diameter of at least 28 mm; length appropriate to the thickness of the insulation.
- .4 Mounting gaskets: neoprene.

2.9 Diffusion fittings with corrugated interlocking

- .1 Tapered fittings made of galvanized sheet metal with lockable shutter.
- .2 The thickness of the sheet must be compliant with the round ducts.

3. Execution

3.1 Manufacturer's instructions

- .1 Compliance: Comply with manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins, instructions for handling, storing, and installing products, and data sheet instructions.

3.2 Installation

- .1 Flexible fittings:
 - .1 To install in the following locations:
 - .1 At the intakes and backflows of fans;
 - .2 In the indicated locations.
 - .2 Length of the flexible fittings: 150 mm.

- .3 86/5000 Minimum distance between metallic elements when the system is in operation: 75 mm.
- .4 Perform installation according to SMACNA recommendations.
- .5 When the fan is operating:
 - .1 The metal elements at each end of the flexible duct connection must be properly aligned;
 - .2 The flexible connector must be slightly slack.
- .2 Access doors for air ducts:
 - .1 Dimensions:
 - .1 450 mm x 1000 mm for an access door.
 - .2 300 mm x 300 mm for a handhole.
 - .3 300 mm x 450 mm for a porthole.
 - .4 According to the indications.
 - .2 Locations of the access doors:
 - .1 Where required to allow access to airflow control dampers.
 - .2 Where required to allow access to devices requiring periodic maintenance.
 - .3 Where required, as required by applicable codes.
 - .4 Where required to allow access from each side of the coils.
 - .5 In the indicated locations.
 - .1 Where required, in accordance with the CSA Z2317-2-10 standard:
 - .2 At the base of all main risers;
 - .3 On both sides of the guide vanes, silencers and coils mounted on the ducts;
 - .4 Near firestop and smoke dampers;
 - .5 In such a way that no duct section is more than 15 m from an access point, and so that no section of a duct downstream of a high efficiency filter is located at more than 3 m from an access well.

- .3 Locations of the handholes:
 - .1 Where required to provide access to smoke evacuation dampers and firestop dampers.
 - .2 Where required to allow access to airflow control dampers.
 - .3 Where required to allow access to devices requiring periodic maintenance.
 - .4 Where required, as required by applicable codes.
 - .5 Where required to allow access from each side of the coils.
 - .6 In the indicated locations.
- .3 Kitchen hood exhaust duct access door:
 - .1 Locations of the access doors:
 - .1 With each change of direction.
 - .2 Every 3.6 m of linear duct.
 - .3 At each connection of the hood.
 - .4 In the indicated locations according to NFPA 96.
- .4 Fittings for receiving test instruments:
 - .1 General information:
 - .1 Install the fittings in accordance with SMACNA's recommendations and the manufacturer's instructions.
 - .2 Arrange them so they can be easily handled.
 - .3 Install insulation feedthroughs as required.
 - .4 Placement:
 - .1 Measure of the air flow:
 - .1 At the intakes and backflows of fans;
 - .2 On the main ducts and main branches.
 - .3 In the indicated locations.
 - .2 Temperature measurement:
 - .1 On the external air intakes.

- .2 On air mixing boxes, at locations approved by the Engineer.
 - .3 For the coil entry and exits.
 - .4 Downstream of any meeting point between two convergent air streams of different temperatures.
 - .5 In the indicated locations.
- .5 Deflectors:
- .1 Install in accordance with SMACNA recommendations and as indicated.

END OF SECTION