

1 GENERAL

- 1.1 The work of this section includes the provision of all design, labour, materials, equipment and services required to fabricate and install terminal and package units as required for a complete project. The work includes, but is not necessarily limited to, the items referenced herein:
- 1.1.1 Unit Heaters (Hydronic)
 - 1.1.2 Unit Heaters (Gas Fired)
 - 1.1.3 Make Up Air Units
 - 1.1.4 Infrared Radiant Heating
- 1.2 Electric space heating is not acceptable.
- 1.3 Oil fired infrared radiant heating is generally not accepted.
- 1.4 Install equipment located outdoors on supports approved by Manufacturer and Owner.
- 1.5 Provide proper load bearing support and access for maintenance.
- 1.6 Steel supports and ladders used outdoors: galvanized or painted.
- 1.7 All new equipment being provided to comply with Ontario Building Code, local gas code and requirements of the authorities having jurisdiction.
- 1.8 Terminal and Packaged Units shall be capable of meeting full design load as per the applicable space data sheets. Provide heating and cooling calculations where applicable.
- 1.9 All products are to be the supply of one manufacturer.
- 1.10 All equipment to operate at best efficiency points.

2 DESIGN

- 2.1 Unit Heaters (Hydronic): Unit heaters to be complete with all necessary accessories and appurtenances for proper operation and control.
- 2.2 Unit Heaters (Gas Fired)
- 2.2.1 To be used only if hydronic unit heaters are not practical
 - 2.2.2 All units to be CGA certified.
 - 2.2.3 Gas fired unit heaters to be indirect and individual forced venting.
- 2.3 Make Up Air Units
- 2.3.1 Use CGA certified units.
 - 2.3.2 Can be located outdoors.

2.3.3 Can be direct gas fired if installed according to local gas code and hardwire interlocked with exhaust fan.

2.3.4 If unit is indirect fired, heat exchangers are to be fabricated from stainless steel.

2.4 Infrared Radiant Heating

2.4.1 Provide heaters in locations where there is high degree of air infiltration (eg: loading areas, garage areas).

2.4.2 Due to high surface temperature during operation, do not use these units where the atmosphere has high concentrations of ignitable dust, flammable gases or flammable vapours.

2.4.3 Provide combustion air as per gas code.

2.4.4 If units are unvented, hardwire interlock with exhaust fans.

2.4.5 Provide access for burners and exhausts for servicing.

2.4.6 Provide CGA certified units.

2.4.7 Controls and safeties to be supplied by manufacturer.

2.4.8 Units must be able to operate or withstand splashing caused by the operation of sprinkler system (if applicable).

3 MATERIALS

3.1 Unit Heaters (Hydronic)

3.1.1 Casings shall be minimum 1.6 mm thick cold rolled steel with glossed enamel finish.

3.1.2 Coils shall be seamless copper tubing, silver brazed to steel headers with evenly spaced aluminum fins mechanically bonded to tubing.

3.1.3 Fan to be factory balanced with an anti-corrosive finish and fan guard.

3.1.4 Motor to be rated for continuous duty, with built in overload protection and resilient supports.

3.2 Unit Heaters (Gas Fired)

3.2.1 Casings shall be minimum 1.6 mm thick cold rolled steel with glossed enamel finish.

3.2.2 Tubular heat exchangers shall be stainless steel, and shall be laboratory life cycle tested, with minimum warranty of ten years.

3.2.3 Fan to be factory balanced with an anti-corrosive finish and fan guard.

3.2.4 Motor to be rated for continuous duty. with built in overload protection and resilient supports.

3.3 Make Up Air Units

3.3.1 Units to be certified to [ARI 430] and bear ARI seal.

3.3.2 Unit to consist of fan section with motor and drive, filter section, dampers (where applicable), heating coil, cooling coil (where applicable), humidifier (where applicable). and mixing box (where applicable).

3.3.3 Casing to be galvanized or phosphate treated steel, reinforced and braced for rigidity. Inspection or walk-in access doors are to be provided for maintenance of internal parts. Casing shall be internally acoustically lined and be protected with perforated steel liner.

3.3.4 Drain pans shall be stainless steel plastic, copper or FRP. Galvanized steel is not permitted. Drain pans shall be insulated with 13 mm external foam type. Drain connection shall be in bottom at low point, and shall be 75 mm minimum.

3.3.5 Fan(s) shall be centrifugal type, selected to operate at stable part of performance curve at all times, with self-aligning bearings. Motor to be rated for continuous duty, with but in overload protection and resilient supports, complete with adjustable V-belt drive and guard.

3.3.6 Filter box material to match casing. Filters to be provided to meet requirements of applicable space data sheets.

3.3.7 Mixing box material to match casing. Box to produce uniformly mixed air temperature within $\pm 5^{\circ}\text{C}$ of design across face of outlet. Dampers shall be parallel blade type for mixing.

3.3.8 Coils

3.3.8.1 Capacity to match requirements of applicable space data sheets.

3.3.8.2 Ratings: ARI certified.

3.3.8.3 Construction

3.3.8.3.1 Casings: 1.5 mm thick galvanized sheet steel. Supports of galvanized steel channel insulated sandwich construction.

3.3.8.3.2 Non-freeze steam coils: tube-in-tube type with internal perforated steam distributing, tubes. Slope tubes to drain condensate.

3.3.8.3.2.1 Tubes: copper.

3.3.8.3.2.2 Fins: copper, aluminum.

- 3.3.8.3.2.3 Headers: cast iron, steel.
- 3.3.8.3.2.4 Pressure tests: 1.7 MPa.
- 3.3.8.3.3 Hot and Chilled water coils: cleanable fins.
- 3.3.8.3.3.1 Tubes: copper, steel.
- 3.3.8.3.3.2 Fins: aluminum plate, spiral wound.
- 3.3.8.3.3.3 Headers: cast iron, steel.
- 3.3.8.3.3.4 Pressure tests: 1.7 MPa.
- 3.3.8.3.4 Direct expansion refrigerant coils:
 - 3.3.8.3.4.1 Serpentine type or Straight tube type arranged to prevent trapping of oil Liquid distributors to ensure even distribution of liquid refrigerant to all circuits. Silver solder or braze joints in refrigerant tubing. Evacuate and charge coil with nitrogen and seal before sending to site.
 - 3.3.8.3.4.1.1 Tubes: copper.
 - 3.3.8.3.4.1.2 Fins: copper, aluminum, plate, or spiral wound.
 - 3.3.8.3.4.1.3 Headers: copper.
 - 3.3.8.3.4.1.4 Pressure tests: to Canadian Refrigeration Code. Dehydrated. Sealed with nitrogen charge.
- 3.3.8.3.5 Spray washer coils: cleanable fins
 - 3.3.8.3.5.1 Tubes: copper.
 - 3.3.8.3.5.2 Fins: copper, aluminum, plate or spiral wound.
 - 3.3.8.3.5.3 Headers: copper.
 - 3.3.8.3.5.4 Pressure tests: 1.7 MPa.
- 3.3.9 Humidifier to suit application and meet requirements of the project.
- 3.4 Infrared Radiant Heating
 - 3.4.1 System to be complete with burner(s); vacuum exhauster(s); tubular infrared emitters, shields, hangers and fittings, burner control modules; and system controls. System to conform to *[ANSI Standard Z83.6]*.
 - 3.4.2 Burners to be suitable for either natural gas or propane. Pre-wired safety controls to be provided at each burner. Burners and vacuum exhausters shall be electrically interlocked.

- 3.4.3 Vacuum exhauster shall be direct driven, dynamically balanced fan wheel constructed of stainless steel with isolating mounts. Housing and mounting bracket to be protected by baked on epoxy coating. Stainless steel bird screen shall be provided at discharge.
- 3.4.4 Controls shall be electronic type.
- 3.4.5 Combustion tube shall be min. 16 gauge aluminized steel
- 3.4.6 Reflectors to be 22 gauge "A" finish aluminized steel.
- 3.4.7 Combustion air is to be provided without the use of supplementary supply blowers or fans.

4 INSTALLATION

4.1 Unit Heaters (Hydronic)

- 4.1.1 Install in accordance with manufacturer's instructions.
- 4.1.2 Provide double swing pipe joints as indicated.
- 4.1.3 Hot water units: install gate valve on inlet and calibrated balancing valve on outlet of each unit. Install drain valve at low point. Install manual air vent at high point.
- 4.1.4 Steam units: for each unit, install gate valve on inlet, steam trap assembly on outlet.
- 4.1.5 Clean finned tubes and comb straight.
- 4.1.6 Provide supplementary suspension steel as required.
- 4.1.7 Thermostats on outside walls: mount on insulated backplates.
- 4.1.8 Before acceptance, set discharge patterns and fan speeds to suit requirements.

4.2 Unit Heaters (Gas Fired)

- 4.2.1 Install in accordance with manufacturer's instructions.
- 4.2.2 Provide supplementary suspension steel as required.
- 4.2.3 Thermostats on outside walls: mount on insulated backplates.
- 4.2.4 Before acceptance, set discharge patterns and fan speeds to suit requirements.
- 4.2.5 B-vent exhaust gas flue to be installed in accordance with local gas codes and requirements of authorities having jurisdiction.

4.3 Make Up Air Units: Install units in accordance with manufacturer's instructions.

- 4.4 Infrared Radiant Heating: Install units in accordance with manufacturer's instructions, in accordance with local gas code, electrical code and applicable ANSI and NFPA codes and authorities having jurisdiction.

End of Section