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**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
  - .1 ANSI/ASHRAE Standard 15 (Latest Edition), Safety Standard for Refrigeration Systems.
- .2 Air-Conditioning, Heating, and Refrigeration Institute (AHRI)
  - .1 AHRI 210/240 (Latest Edition), Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- .3 CSA International
  - .1 CAN/CSA-C656 (Latest Edition), Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.
- .4 Environment Canada, (EC) / Environmental Protection Services (EPS)
  - .1 EPS 1/RA/2 (Latest Edition), Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.
  - .2 Environment Canada (Latest Edition), Ozone-Depleting Substances Alternatives and Suppliers List.
- .5 National Fire Protection Association (NFPA)
  - .1 NFPA 90A (Latest Edition), Standard for Installation of Air Conditioning and Ventilating Systems.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for heat pumps and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Rated capacity
    - .2 Ratings
    - .3 Components
    - .4 Installation/Wiring diagrams
    - .5 Certifications

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

- .2 Operation and Maintenance Data: submit operation and maintenance data for heat pumps for incorporation into manual.

- .3 *Include manufactures list of recommended spare parts.*

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect heat pumps from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

### **PART 2 PRODUCTS**

#### **2.1 DESCRIPTION**

- .1 Heat pumps: to EPS 1/RA/2, CSA approved and with ARI or CSA certification seal.

#### **2.2 REFRIGERANTS**

- .1 Type of refrigerant: R-410A.

#### **2.3 AIR-SOURCE HEAT PUMP**

- .1 General:
  - .1 To consist of air-to-air outdoor unit and two indoor units, for use with R-410A.
  - .2 Outdoor and indoor units to be of the same manufacturer.
- .2 Performance data:
  - .1 Electrical: 208/230 V, 1 ph, 60 Hz.
  - .2 Cooling:
    - .1 Rated capacity: 5.27 kW.
    - .2 Capacity range: 2.28 kW to 5.86 kW.
    - .3 Total unit power input: 2.19 kW.
    - .4 SEER: 18.0.
    - .5 EER: 12.0.
  - .3 Heating at 8.3°C:
    - .1 Rated capacity: 6.44 kW.
    - .2 Capacity range: 2.49 kW to 7.47 kW.

- .3 Total unit power input: 2.62 kW.
- .4 HSPF: 8.9.
- .5 Ratings: to ARI 210/240.
- .4 Heating at -8.3°C:
  - .1 Maximum capacity: 4.25 kW.
  - .2 Total unit power input: 1.5 kW maximum.
- .3 Outdoor unit:
  - .1 Shall be compatible with both indoor units.
  - .2 The outdoor unit shall be equipped with a control board that interfaces with the indoor units to perform all functions necessary for operation and it shall be completely factory assembled.
  - .3 This unit shall be capable of operating at -15°C ambient temperature without additional low ambient controls in heating mode.
  - .4 The outdoor unit shall have the ability to operate with the tubing length required between the indoor and outdoor units without additional requirement for field supplied line segments, traps or additional oil.
  - .5 The unit shall be test run at the factory prior to being supplied.
  - .6 The casing shall be constructed from galvanized steel plate and finished with rust protector such as acrylic paint Munsell 3.0Y 7.8/1.1 or equal.
  - .7 The fan grille shall be of ABS plastic or similarly suitable material.
  - .8 The unit shall be furnished with an AC fan as per the manufacturer's recommendations to match the capacity of the indoor units.
  - .9 The fan blades shall be of aerodynamic design for quiet operation.
  - .10 The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front.
  - .11 The L-shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build-up.
  - .12 The coil shall be protected with an integral metal guard.
  - .13 Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be controlled by a microprocessor-controlled step motor.
  - .14 Finish: primer and corrosion restraint coatings.
- .4 Compressor:
  - .1 The compressor shall be driven by inverter circuit to control compressor speed.
  - .2 The compressor speed shall match the required load.
  - .3 The outdoor unit shall have an accumulator and high pressure safety switch.
- .5 Electrical: as indicated with single point power connection.
  - .1 The outdoor unit shall be controlled by the microprocessor located in the indoor units.
  - .2 The control signal between the indoor and the outdoor units shall be pulse signal 24 volts DC.

- .3 The unit shall have pulse amplitude modulation circuit which shall enable the unit to use 98% of input power supply.
- .6 Indoor units:
  - .1 The indoor units shall be factory assembled, wired and tested.
    - .1 EV-1: ceiling cassette style, cooling capacity: 2.64 kW with fresh air inlet connection.
    - .2 EV-2: Wall-mounted style, cooling capacity: 1.76 kW.
  - .2 All factory wiring, internal piping, control circuit board, and fan motor shall be contained within the units.
  - .3 The units in conjunction with the remote controllers shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch.
  - .4 Refrigerant piping for the indoor units shall be charged with helium gas before shipment from the factory.
  - .5 Return air shall be filtered by means of an easily removable and washable filter.
  - .6 The casing shall be ABS plastic and have Munsell 3.4Y7.7/0.8 finish or equal.
  - .7 Multi-directional drain and refrigerant piping offering four directions for refrigerant piping and two directions for draining shall be standard.
  - .8 The unit casing shall have a back plate which shall secure the unit firmly onto the wall.
  - .9 The evaporator fans shall produce a fully adjustable air jet as directed by the discharge louvers with aluminum mounting and vibration isolators.
  - .10 The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
  - .11 Manual adjustable louvers shall be provided to laterally change the direction of airflow.
  - .12 A motorized valve shall close the outlet port when operation is stopped and shall also automatically direct air flow in a vertical direction for uniform air distribution.
  - .13 The fans shall consist of multiple speed settings:
    - .1 EV-1: Low-Med-Hi-SuperHi
    - .2 EV-2: Quiet-Low-Med-Hi-SuperHi
  - .14 The evaporator coil shall be of nonferrous construction with aluminum strake pre-coated fins on copper tubing. All tube joints shall be brazed with phosphor or silver alloy.
  - .15 The coils shall be pressure tested at the factory.
  - .16 The units shall be configured for gravity condensate drain.
- .7 Controls:
  - .1 Each unit shall have a wireless remote controller to perform input functions necessary to operate the system.
  - .2 Remote shall consist of the following:
    - .1 Operational display
    - .2 On-Off switch

- .3 Temperature buttons
- .4 Operation select button
- .5 Fan speed control button
- .6 Louver direction control button
- .7 Timer Start/Stop buttons
- .3 The microprocessor located in the indoor units shall have the capability to monitor return air temperature and indoor coil temperature, receiving and processing commands from the wireless controllers, providing emergency operation and controlling the outdoor unit.
- .4 The control signal between the outdoor and indoor units shall be pulse signal 24 volts DC. The system shall be capable of automatic restart when power is restored after power interruption.
- .8 Refrigeration piping:
  - .1 Between outdoor unit and indoor units, complete with refrigerant metering devices and valves.
  - .2 Refer to Section 23 21 13.02 - Refrigerant Piping.
- .9 Accessories:
  - .1 Outdoor unit wind guard.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for heat pumps installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.2 INSTALLATION**

- .1 Install where indicated and in accordance with manufacturer's instructions.
- .2 Install outdoor units wall mounted.
- .3 Secure with hold-down bolts in accordance with manufacturer's recommendations.
- .4 Level unit with fans running. Misalignment with fan stopped not to strain or damage flexible connection.
- .5 Make piping connections.

- .6 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

### **3.3 START-UP AND COMMISSIONING**

- .1 Have manufacturer certify installation.
- .2 Have manufacturer present during tests and start up units and certify performance.
- .3 Submit written start-up and commissioning reports to Departmental Representative.

### **3.4 CLOSEOUT ACTIVITIES**

- .1 Manufacturer to deliver verbal, video, and written instructions to operating personnel.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

### **3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by heat pumps installation.

**END OF SECTION**