

SECTION 23 81 40 - AIR-COOLED UNITARY EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes design, performance, refrigerants, controls, and installation requirements for air-cooled packaged and split HVAC units.

1.2 DEFINITIONS

- A. Coefficient of Performance (COP) - Cooling: The ratio of the rate of heat removed to the rate of energy input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
- B. Energy Efficiency Ratio (EER): The ratio of net cooling capacity in Btu/h to total rate of electricity input in Watts under designated operating conditions.
- C. Heating Seasonal Performance Factor (HSPF) - Total heating output of heat pump during its normal annual usage period for heating in Btu/h divided by total electric energy input in Watts during the same period.
- D. Seasonal Energy Efficiency Ratio (SEER) - Total cooling output of an air conditioner during its normal annual usage period for cooling in Btu/h divided by total electric energy input in Watts during the same period.
- E. Air-Source Unitary Heat Pump - One or more factory made assembly(ies) that normally include an indoor conditioning coil, compressor(s), and an outdoor refrigerant-to-air coil. These units provide both heating and cooling functions.

1.3 QUALITY ASSURANCE

- A. Comply with ASHRAE Standard 90.1-2010, Energy Standard for Buildings except Low-Rise Residential Buildings, for cooling and heating performance requirements when tested in accordance with AHRI Standards.
- B. Heating Performance shall conform to ASHRAE requirements when tested in accordance with AHRI Standards.
- C. Comply with specification requirements for seismic restraints if applicable.
- D. Scheduled performance represents the minimum acceptable level of performance.
- E. Manufacturer shall provide for design of all refrigerant piping systems to include line sizing and refrigerant pressure requirements. Manufacturer shall provide all components as required for reliable operation in long line length applications. It shall be the responsibility of the manufacturer to identify if the maximum distance, both vertical and total, exceeds the listed limits of the equipment and to provide equipment and components as required for reliable operation given the length of the refrigerant line runs.

1.4 SUBMITTALS

- A. Submit in accordance with specifications.
- B. Manufacturer's Literature and Data:
 - 1. Air-Source Unitary Equipment:
 - a. Packaged units.
 - b. Split system.
- C. Certification: Submit, simultaneously with shop drawings, a proof of certification that this product has been certified by AHRI.
- D. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities, EER, SEER, HSPF, and COP values as applicable.
- E. Performance information indicated in the equipment schedules shall represent the minimum level of acceptable performance. All submitted equipment shall meet or exceed the stated performance.
- F. Submit wind load pressure calculations for exterior components to demonstrate compliance with the prevailing codes at the time of permit. This shall include unit casing calculations, unit to curb attachment calculations, and curb to roof calculations.

2.1 PACKAGED TERMINAL AIR CONDITIONERS

- A. PTAC units shall be provided where indicated on the drawings. PTAC efficiencies shall be in accordance with the requirements of the prevailing energy code in effect at the time of permit.
- B. All PTAC units shall be provided with wall sleeve, decorative anodized aluminum exterior grille, electrical sub-base suitable for hard wiring units, thermostat interface, condensate drain connection, integral air filter, refrigerant filter/drier, extended range heating, automatic supplemental heat, freeze protection, refrigerant pressure limit switches, leveling legs, and power disconnect switch.
- C. Maximum PTAC STC level shall not exceed 28.
- D. For PTAC units mounted within 15 miles of the sea coast or in corrosive environments, the PTAC wall sleeve, exterior wall grille, unit casing, and condenser coil shall be coated with a corrosion resistant coating in accordance with the requirements as listed in the corrosion protection section of this specification.

2.2 OPERATING CONTROLS

- A. Low voltage, adjustable room thermostat to control heating and cooling in sequence with delay between stages, compressor, and supply fan to maintain temperature setting. Include system selector switch (off-heat-auto-cool) and fan control switch (auto-on). Thermostats are to be provided with adaptive recovery for all heat pump based systems. Thermostats shall be equal to the Honeywell VisionPRO IAQ series with integral 7 day programming and humidistat. System shall be capable of operating in dehumidification mode regardless of space temperature when humidity levels exceed setpoints.
- B. Unit DDC Controller (for projects with DDC based control systems)
 - 1. Unit controller shall include input, output, and self-contained programming as needed for complete control of unit.

2. Unit controller shall be BACnet/Lon Works compliant and utilize the same communications protocol as the main DDC based control system.
3. All program sequences shall be stored on board in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices.
4. Programming of logic controller shall be completely modifiable in temperature control system interface: Points shall be available from the unit controller for service access, display, and/or control in the field over installed LAN.
5. Refer to control system specification for additional information.

2.3 ACCESSORIES

- A. Electric Heater: Constructed of heavy-duty nickel chromium elements. Staging shall be achieved through the unit control processor. Each heater shall have automatically reset high limit control. Heaters shall be individually fused from the factory and shall comply with NEC requirements. Power assemblies shall provide single point connection. Electric heat modules shall be listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction. Electric heater controls shall confirm the supply fan is operating before electric elements are energized. Operate electric heater in stages when outdoor ambient is too low to maintain space thermostat setting with compressor operation.

2.4 CORROSION PROTECTION (WITHIN 15 MILES OF THE SEA COAST OR IN CORROSIVE ENVIRONMENTS)

- A. Outdoor Condenser Coils and Indoor Evaporator Coils:
 1. This coating requirement applies to all condenser coils and all evaporator coils with a total outdoor air flow rate in excess of 15% of the total air flow rate.
 2. As an alternative to the immersion coating, a factory applied corrosion resistance coating shall be acceptable as long as the performance requirements indicated below are met or exceeded.
 3. Epoxy Immersion Coating – Electrically Deposited: The multi-stage corrosion-resistant coating application comprises of cleaning (heated alkaline immersion bath) and reverse-osmosis immersion rinse prior to the start of the coating process. The coating thickness shall be maintained between 0.6-mil and 1.2-mil. Before the coils are subjected to high-temperature oven cure, they are treated to permeate immersion rinse and spray. Where the coils are subject to UV exposure, UV protection spray treatment comprising of UV-resistant urethane mastic topcoat shall be applied. Provide complete coating process traceability for each coil and minimum five years of limited warranty. The coating process shall be such that uniform coating thickness is maintained at the fin edges. The quality control shall be maintained by ensuring compliance to the applicable ASTM Standards for the following:
 - a. Salt Spray Resistance (Minimum 6,000 Hours)
 - b. Humidity Resistance (Minimum 1,000 Hours)
 - c. Water Immersion (Minimum 260 Hours)
 - d. Cross-Hatch Adhesion (Minimum 4B-5B Rating)
 - e. Impact Resistance (Up to 160 Inch/Pound)
- B. Exposed Outdoor Cabinet:
 1. Casing Surfaces (Exterior and Interior): All exposed and accessible metal surfaces shall be protected with a water-reducible acrylic with stainless steel pigment spray-applied over the manufacturer's standard finish. The spray coating thickness shall be 2-4 mils and provide minimum salt-spray resistance of 1,000 hours (ASTM B117) and 500 hours UV resistance (ASTM D4587).

3.1 INSTALLATION

- A. Install split systems and packaged systems according to manufacturer's printed instructions.
- B. Manufacturer shall provide for design of all refrigerant piping systems to include line sizing and refrigerant pressure requirements. Manufacturer shall provide all components as required for reliable operation in long line length applications. It shall be the responsibility of the manufacturer to identify if the maximum distance, both vertical and total, exceeds the listed limits of the equipment and to provide equipment and components as required for reliable operation given the length of the refrigerant line runs.
- C. Install electrical and control devices furnished by the manufacturer but not specified to be factory mounted. All electrical work shall comply with the electrical specifications
- D. Perform startup checks according to manufacturer's written instructions.
- E. Provide start-up for all units. Provide Project Engineer with copies of the start-up sheets.
- F. Test controls and demonstrate its compliance with project requirements. Replace damaged or malfunctioning controls and equipment and retest the equipment to the satisfaction of the Project Engineer.
- G. Provide services of manufacturer's technical representative for four hours to instruct owner personnel in operation and maintenance of units.

END OF SECTION 23 81 40