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SECTION 23 81 00_DX BASED REFRIGERATION SPLIT SYSTEMS - COMFORT

PART1 GENERAL

1.1 SUMMARY

- A. This Standard Includes the Following:
 - 1. Air Cooled Condensing Units
 - 2. Duct Free Split Air Conditioning Systems
 - 3. Light Duty Ducted Split Air Conditioning Systems including condensing units, fan coil unit or gas fired furnace & evaporator coil (5 tons and less)

- B. The intent of these standards are to provide input to the design team on the University's preference of manufacturers, design, equipment options and quality assurance to maintain the longevity of its assets

1.2 REFERENCES

- A. Common Work for HVAC Systems 23 05 00
- B. Common Requirements for HVAC Systems 23 05 01
- C. Identification for HVAC Piping & Equipment 23 05 53
- D. Refrigeration Piping & Specialties 23 23 00
- E. Air Distribution Systems 23 30 00

1.3 ENGINEERING AND DESIGN REQUIREMENTS

- B. The University of Delaware Energy and Engineering Department must be consulted prior to designing and specifying DX based refrigeration split systems. Prior authorization is required from the University Energy and Engineering Department to utilize this equipment.
- C. DX refrigerant based comfort split systems shall be limited to 5 tons and below. Engineering Design firm shall explore all other options for providing cooling (ie. packaged systems, chilled water..etc) prior to considering a DX refrigerant based split system for cooling loads greater than 5 tons.
- D. Condensing units must not be located above evaporator coil unless specifically agreed to by the specified manufacturer of equipment.

- E. The specified equipment manufacturer shall either assist in the design of the refrigerant piping system or approve the design of the refrigerant piping system.
- F. In order to optimize performance, all split systems shall have consist of fan coil unit or furnace & evaporator coil matched to the condensing unit and be from the same manufacturer.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.
- B. Product Data Equipment:
 - 1. Cooling and heating capacities.
 - 2. Dimensions.
 - 3. Rough-in connections and connection requirements.
 - 4. Duct connections.
 - 5. Electrical requirements with electrical characteristics, connection requirements and wiring diagrams.
 - 6. Controls.
 - 7. Accessories.
 - 8. Weights.
- C. Product data sheets must be submitted for each device or equipment. Data sheets shall not contain information for multiple pieces of equipment.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- E. Manufacturer's Field Reports: Submit start-up report for each piece of equipment.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit start-up instructions, maintenance instructions, parts lists, controls, and accessories.

1.6 QUALITY ASSURANCE

- A. Verify field measurements prior to fabrication.
- B. Coordinate wall openings, wall sleeve installation, sealing of louvers, piping rough-in locations and electrical rough-in locations to accommodate packaged terminal air conditioning units.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Accept equipment on site in factory packaging. Inspect for damage.
- D. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.
- E. Protect equipment from damage by providing temporary covers until construction is complete in adjacent space.
- F. Protect items shipped loose with units in original packaging and store in secured area.

PART 2 PRODUCTS

2.1 DUCT FREE SPLIT AIR CONDITIONING OR HEAT PUMP UNITS

- A. Manufacturers:
 - 1. Daikan Corp.
 - 2. Mitsubishi.
- B. Indoor Unit Wall Mounted: Inverter duty wall mounted unit including mounting bracket, microprocessor controlled operation, air sweep control, quiet fan operation anti mold filter, built in drain pump, evaporator coil constructed of copper tubing with aluminum fins mechanically bonded to tubes, electric refrigerant control valve and electric heating coil.
- C. Indoor Unit Ceiling Mounted: Inverter duty ceiling mounted unit for mounting in 2x4 T-bar type ceiling, microprocessor controlled, air sweep control, quiet fan operation anti mold filter, built in drain pump, evaporator coil constructed of copper tubing with aluminum fins mechanically bonded to tubes, electric refrigerant control valve and electric heating coil.

- D. Outdoor Unit: Inverter duty, Hermetically sealed compressor with internal spring isolation, permanent split capacitor motor and overload protection, holding charge of refrigerant, crank case heater, condenser fan constructed of copper tubing and aluminum fins, electric refrigerant control valve, reversing valve(heat pumps) and propeller type condenser fan with separate permanent split capacitor motor,
- E. Low ambient control for operation down to 0 degrees Fahrenheit.
- F. Refrigerant Accessories: filter drier, sight glass, suction and liquid service valves.
- G. SEER rating of 16 or greater
- H. Condensing units must sit upon a prefabricated support or concrete pad approved by the University of Delaware.

2.2 LIGHT DUTY SPLIT SYSTEM AIR CONDITIONING & HEAT PUMP UNITS (UP TO 5 TONS)

- A. Manufacturers (Provide Matched Sets):
 - 1. Arco Aire
 - 2. Carrier
 - 3. Goodman
 - 4. Rheem
 - 5. Ruud
 - 6. York
- B. The University of Delaware’s prefers light duty heat pumps over light duty air conditioning with electric heat. The use of electric heat as a heat source must be approved by the University of Delaware prior to design.
- C. Product Description: Split system consisting of air handling unit and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, electric heating coil, air filters, air handling unit accessories, condensing unit accessories, and refrigeration specialties.
- D. AIR HANDLING UNIT – DX REFRIGERATION & ELECTRIC HEAT
 - 1. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.
 - 2. Configuration: Upflow, counterflow or horizontal air delivery as indicated on Drawings.

3. Cabinet: Steel with baked enamel finish, easily removed and secured access-doors, glass fiber insulation and reflective liner.
4. Supply Fan: Centrifugal type rubber-mounted with direct drive motor.
9. Evaporator Coil: Constructed of copper tubes expanded onto aluminum fins. Factory leak tested under water. Removable, PVC construction, double-sloped drain pan with piping connections on both sides.
10. Refrigeration System: Single refrigeration circuit controlled by factory installed thermal expansion valve.
11. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental stages of with porcelain insulators with single point electrical connection. **NOTE: USE ELECTRIC HEAT WHEN NO OTHER HEAT OR ENERGY SOURCE IS AVAILABLE**
12. Electric Heater Operating Controls:
 - a. Low voltage adjustable room thermostat energized heater stages in sequence with pre-determined delay between heating stages.
 - b. High limit temperature control de-energizes heating elements, automatic resets.
 - c. Supply fan starts simultaneously with or after before electric elements are energized and continue operating until thermostat is satisfied or until outlet air temperature reaches minimum setting. Include manual switch for continuous fan operation.
 - d. Outdoor thermostat locks out some heating elements until outdoor temperature drops.
13. Air Filters: 1 inch thick glass fiber disposable media in metal frames. Furnish two sets of air filters
14. Vibration Isolators: Neoprene-in-shear type.

E. GAS FIRED FURNACES

1. AFUE of 96% or greater
2. Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter and accessories; wired for single power connection with control transformer.

3. Fuel: Natural gas fired
4. Cabinet: Steel with baked enamel finish, easily removed and secured access panels with safety interlock switches for furnaces installed indoors, insulation. For downflow units, furnish base for combustible floors.
5. Supply Fan: Centrifugal type rubber mounted with direct or belt drive.
6. Motor: Direct drive; 1750 rpm variable speed, , permanently lubricated.
7. Heat Exchanger: Aluminized steel crimped or welded construction Aluminized steel tubular type.
8. Air Filters: 1 inch thick glass fiber disposable media in metal frames. Furnish two sets of air filters
9. Vibration Isolators: Neoprene-in-shear.

F. EVAPORATOR COIL UNITS

1. Evaporator Coil: Copper tube aluminum fin assembly, galvanized or polymeric drain pan, drain connection, refrigerant piping connections, thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.

G. CONDENSING UNITS

1. Compressor hermetic: resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Furnish time delay control to prevent short cycling and rapid speed changes.
2. Refrigeration Accessories: Filter Drier, high-pressure switch (manual reset), low-pressure switch (automatic reset), filter-drier, sight glass, service valves and gage ports and thermometer well (in liquid line). Furnish thermostatic expansion valves. Furnish reversing valves on heat pump units.
3. Air Cooled Condenser: aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
4. Low Ambient Kit: Furnish refrigerant pressure or temperature switch to cycle condenser fan motor on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

5. Minimum SEER rating of 16
 6. Condensing units must sit upon a prefabricated support approved by the University of Delaware.
- H. HUMIDIFIER (for use in Light Duty DX Split Systems Only):
1. Type: Self-contained steam.
- I. ELECTRONIC AIR CLEANERS (for use in Light Duty DX Split Systems Only):
1. Enameled steel assembly containing pre-filters, collecting cells and pre-wired power pack unit with on-off switch, test button, and integral air pressure switch. Provide optional wall mounted indicator showing 'on', 'wash', and 'check' functions.
- J. CONTROLS
1. Thermostat: Honeywell 8000 series only. Thermostat shall control all cooling, auxiliary heating and dehumidification/humidification functions.

PART 3 PRODUCTS

3.1 INSTALLATION LIGHT DUTY SPLIT SYSTEM AIR CONDITIONING UNITS

- A. Mount air cooled condenser-compressor package on concrete pads or approved supporting devices.
- B. Provide electrical interlock between condensing unit and air handling unit
- C. Connect return air and supply duct to system ductwork with flexible duct connection.

3.2 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units.
- B. Vacuum clean coils and inside of cabinets.
- C. Touch up marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.
- D. Install temporary filters during construction period. Replace with permanent filters after Substantial Completion.

3.3 DEMONSTRATION AND TRAINING

- A. Demonstrate starting, maintenance, and operation of unit.
- B. Demonstrate low ambient operation during winter testing or service specified above.

END OF SECTION