

SECTION 23 81 27

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Specifications:
- C. 23 07 00 – HVAC Insulation
- D. 23 23 00 – Refrigerant Piping
- E. 23 05 93 – Testing Adjusting and Balancing

1.2 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of one-to-one evaporator-fan coil units and variable capacity compressor-condenser components. Units are designed for exposed or concealed mounting and may be connected to ducts.

1.3 SUBMITTALS

- A. Compliance Review: In addition to the submittal requirements of this section, preorder bidders shall provide a Compliance Review of the Specifications and Addenda. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications with the following information, “C”, “D,” or “E” marked in the margin of the original Specifications and any subsequent Addenda.
 - 1. “C”: Comply with no exceptions.
 - 2. “D”: Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
 - 3. “E”: Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives.
 - 4. The notes associated with “D” and “E” responses shall be typewritten and submitted alongside the compliance review for review by the Engineer.
 - 5. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Bidder is in complete compliance with the plans and Specifications. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction do not release the Bidder from being

in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review submitted with the Bid.

- B. Product Data: For each type of product indicated. Include rated capacities at scheduled design conditions in project documents, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics including:
 - 1. Piping schematics with intended piping line lengths indicated on the drawings (piping plan to be coordinated between manufacturer and contractor prior to submittal. Generic piping schematics are not acceptable). The manufacturer shall include notes on the piping schematics indicating locations where expansion loops shall be installed.
 - 2. Wiring schematics showing electrical connection requirements, and field control wiring terminations.
 - 3. Field refrigerant charge volume shall be noted along with factory charge. Note schedule limitations. Submittal shall include data sheets for refrigerant alarms where scheduled refrigerant charge is exceeded.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

1.5 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:

- a. For Compressor: One year from date of Substantial Completion.
- b. For Parts: One year from date of Substantial Completion.
- c. For Labor: One year from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Filters: One set for each air-conditioning unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products shall be provided by the following manufacturer as noted.
 1. Basis-of-Design Product: Subject to compliance with requirements. Provide Trane as the base bid.
 2. Substitute manufacturers listed must meet the requirements of the specifications herein; being listed as an acceptable substitute does not absolve manufacturer from meeting full intent of the specifications.
 - a. Daikin.
 - b. Johnson Controls, Inc.
 - c. LG Electronics.
- B. The system shall consist of a single evaporator and matching condensing unit and a two-pipe refrigeration distribution system. The outdoor unit is a direct expansion (DX), air-cooled air-conditioning condensing unit or heat pump using R-454A refrigerant.

2.2 HORIZONTAL WALL MOUNTED EVAPORATOR

- A. Concealed Evaporator-Fan Components:
 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
 3. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
 4. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Filters: Removable, washable.
7. Condensate Drain Pans:
 - a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
 - 2) Depth: A minimum of 2 inches deep.
 - b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
 - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - 1) Minimum Connection Size: NPS 1.
 - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

2.3 AIR COOLED CONDENSING UNIT

- A. Air-Cooled, Compressor-Condenser Components:
 1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
 2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Variable speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant Charge: R-454B.
 - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
 3. For Systems with Heat Pumps:
 - a. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
 4. Fan: Aluminum-propeller type, directly connected to motor.
 5. Motor: Permanently lubricated, with integral thermal-overload protection.
 6. Low Ambient Kit: Permits operation down to -10 deg F.
 7. Mounting Base: Polyethylene.

2.4 CONTROLS

- A. Unit Controller: Evaporator shall include a 7-Day Programmable controller with the following features:

1. Backlit LCD display. Display information shall be selectable from English, French, or Spanish. Day of the week as well as time of day configurable for 12/24 hour clock shall be displayed. Display of temperature information shall be Fahrenheit. The controller shall be able to display and adjust room temperature in one degree increments.
 2. The controller shall have COOL, HEAT, FAN ONLY, DRY (dehumidification), and AUTO-CHANGE-OVER modes.
 3. For AUTO change over mode, the controller shall allow independent setpoints for heating and cooling to eliminate wide swings in temperature and unnecessary change over.
 4. Setback function shall be included with adjustable setback temperature override.
 5. The programmable controller shall have the capability of individually disabling the following buttons:
 - a. Menu/OK
 - b. ON/OFF
 - c. Mode
 - d. Fan Speed
 - e. Setpoint Adjustment (Up/Down Keys)
 6. The controller shall allow for a local (controller-level) adjustable limitation of user setpoint range.
 7. Scheduling: The following scheduling capability shall be available:
 - a. 7-Day, Weekday/Weekend, or Weekday/Saturday/Sunday schedule formats
 - b. 5 Schedule events per day with independent heat/cool setpoints and/or setback.
 - c. Off-Timer override function that will turn off the system at a set interval when scheduled to be off and a user enables the system
 8. The Remote Controller shall display error codes on the screen in the event of a system error.
 9. The following Fan Coil Unit sensor values shall be available at the wall mounted remote controller:
 - a. Controller thermistor temp
 - b. Liquid line temperature
 - c. Gas line temperature
 10. 48 Hour battery backup of clock/date. All other settings shall be stored in non-volatile memory to ensure that settings are not lost upon power failure.
 11. Controller shall be able to communicate with the BAS system utilizing BACNet IP communications protocol. Manufacturer shall provide a gateway to convert communications protocol to BACNet IP if it is not native to the controller.
- B. BACnet Gateway: Manufacturer's BTL certified gateway for integration of BACnet/IP. Gateway to provide open-protocol, 2 way communication between building automation system and central/zone controllers.
- 1) Processor: Single Core 800 MHz
 - 2) Memory: 128 x 2 MB DDR2 SDRAM
 - 3) Storage: 4 GB Flash

- 4) Display: 20 x 4 Character LCD
- 5) Power: 24Vac
- 6) Communication Ports:
 - a) Ethernet 10/100 x1
 - b) USB x1
 - c) Mini-USB x1
 - d) RS-485 x6
 - e) SD Card x1
 - f) RS-232 x1
 - g) DI/DO x1

2.5 ACCESSORIES

- A. Automatic-reset timer to prevent rapid cycling of compressor.
- B. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install unit level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install grade-mounted, compressor-condenser components on concrete equipment housekeeping pads specified in Division 03 Section "Cast-in-Place Concrete". Anchor units to pads with removable, cadmium-plated fasteners.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Sheet Metal Work". Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

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