

University of Houston Master Specification

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SECTION 23 6213 - AIR-COOLED SPLIT SYSTEM AIR CONDITIONING UNITS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Engineer." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

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. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
 - 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide split system air-conditioning unit work including, but not limited to, the furnishing and installation of:
 - 1. DX/Electric heat air handling units with related accessories and controls.
 - 2. Air-cooled DX condensing units with related accessories and controls.
 - 3. Manufacturer's controls that provide a complete and operational system independent of any other building controls.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide products of one of the following:
 - 1. Carrier Corporation
 - 2. RECO
 - 3. Trane Company
 - 4. York
 - 5. McQuay (part of Daikin Industries)
 - 6. Approved Equal.
- B. Certification: Provide manufacturer's certification of compliance with ARI Standard 210.

1.4 SUBMITTALS

- A. Shop Drawings submittals shall include, but are not limited to, the following:
 - 1. Unit cut sheets clearly showing all features, accessories, dimensions, weights and capacities.

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2. Written instructions for equipment to installation.
3. Wiring and piping diagrams and connection locations.
4. Refrigerant piping sizing calculations.
5. Performance certifications and test results.
6. Warranty information.
7. Additional information as required in Section 23 0100 "Mechanical General Provisions."

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver DX/Electric heat air handling units, condensing units and accessories in factory-fabricated water-resistant wrapping.
- B. Handle DX/Electric heat air handling units, condensing units and accessories carefully to avoid damage to material components, enclosure and finish.
- C. Store DX/Electric heat air handling units, condensing units and accessories in a clean, dry space and protect from the weather.

PART 2 - PRODUCTS

2.1 DX/ELECTRIC HEAT AIR HANDLING UNITS

- A. General: Provide the DX/Electric heat air handling units manufacturer's standard materials, components and accessories as indicated by product information, designed and constructed as recommended by the manufacturer and as required for a complete installation, except as otherwise indicated. Units shall be rated and tested in accordance with ARI 210, 240 and 360 and shall be UL listed and labeled in accordance with UL 465/1995.
- B. Units: Air handling units shall be completely factory assembled in an insulated vertical housing, complete with DX cooling coils, condensate drain pan, fan, fan motor, electric heater (where scheduled), filters, controls and accessories. Units shall be factory wired for a single point electrical connection.
- C. Casings: Casings shall be constructed of heavy gauge zinc-coated, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish. Casing shall be completely insulated with fire-retardant, permanent, odorless glass fiber material.
- D. Refrigerant Circuits: Units up to 7-1/2 tons shall have a single refrigerant circuit. Units 10 tons and larger shall have dual refrigerant circuits. Each refrigerant circuit shall be controlled by a factory installed thermal expansion valve.
- E. Evaporator Coils: Evaporator coils shall be configured aluminum fins mechanically bonded to seamless copper tubing. Coils shall be factory pressure and leak-tested to 375 psig air pressure. Coils shall be arranged for draw-thru airflow and shall be completely factory assembled, including expansion valves. Coils shall have condensate drain pans with external drain connections on each side of the unit. Dual circuited coils shall be circuited in an intertwined configuration.
- F. Cabinet Construction/Finish: Cabinet shall be constructed of galvanized steel with an acrylic high-heat baked-on enamel finish. The blower cabinet shall be internally insulated.
- G. Fan Section: Provide fan section (blower unit) as scheduled.
 1. Centrifugal Fans: Provide double width, double inlet, multi-blade type fans with air foil, forward curved or backward inclined blades, as scheduled. All fans shall be statically and

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dynamically balanced and tested after being installed on properly sized shafts. Fan shafts must not pass through their first critical speed as unit comes up to rated rpm. Fan wheels and scrolls shall be constructed of galvanized steel, all aluminum or fabricated steel protected with two coats of rust-inhibiting paint. Wheels and scrolls of fans used for outside air service shall be coated with two coats of fire resistant epoxy paint.

2. Sheaves: Permanent fan sheaves shall be nonadjustable with removable machined bushings, machined on all contact surfaces. Sheaves with over three grooves shall be dynamically balanced and so designated on each sheave. Fan sheaves with three grooves or less shall be statically balanced and if weights are required, they shall be welded to the sheave. Sheaves shall be manufactured by Browning, Eaton Yale and Towne, Dodge Manufacturing Company or Fort Worth Steel and Machinery Company.
 - a. Air Handling Units: Provide a nonadjustable type sheave selected for the rated fan rpm as determined. Provide variable sheaves as required to determine correct fan rpm as established by tenant requirements. Furnish additional fixed sheaves as required after correct speed has been determined. All unused fixed sheaves shall become the property of the Owner.
 3. Belts: Provide "V-groove" type suitable for the service intended with the capacities specified. Belts shall be closely matched and tagged for use prior to shipment. Recheck belts for proper match during operation and if necessary, replace with closely matched belt sets. Belts shall be Gates, Durkee-Atwood, Goodyear, Uniroyal or Browning.
 - a. General: Provide belt guards for all fan drives mounted outside the unit housing. The finish of the guard shall be similar to that of the unit housing. Brace and fasten guards to prevent objectionable vibration. Provide tachometer openings at least 2 inches in diameter for checking fan and motor speeds. Openings shall be centered on shafts to allow checking rpm.
 4. Shafts: Provide one piece design shafts, either solid or hollow tube with solid stub. Hollow tube with solid stub shafts shall be hot-formed, stress relieved, and manufactured by Pittsburgh Tubular Shafting, Inc. Fans and shafts shall not pass through their first critical speed as the unit comes up to rated rpm.
 5. Shaft Bearings: Provide externally or internally mounted grease lubricated, self-aligning ball or roller bearings on each end of the shaft. Bearings shall have an average B-10 life as defined by AFBMA of 100,000 hours at design operating conditions. All bearings shall be the same size. Internally mounted bearings shall have grease lines extended so as to be readily accessible from the drive side of the unit. In addition, the bearing on the drive end of the shaft shall have grease line extended beyond the belt guard. All grease lines shall terminate in a zerk fitting. Bearings shall be by SKF, Sealmaster, Timken, or Fafnir.
- H. Blower Motor/Drive: Blower motors shall be energy efficient 3 phase open drip-proof type. Refer to Section 15140 for additional requirements. Blower drive shall be a belt drive with adjustable pitch pulleys.
- I. Blower Motor Starter: A factory wired, unit mounted NEMA type motor starter with 3 phase overloads and a control power transformer shall be provided.
- J. Filter Rack/Filters: Provide units with a filter rack and 1 inch disposable filters.
- K. Duct Connections: Unit shall be designed for outside air, return air and supply air connections as shown on the drawings.

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- L. Operating Controls: Furnish unit controls including system of automatic sequencing, safety and operating controls consisting of the following:
 - 1. High temperature cutoff.
 - 2. Differential air pressure switch to verify air flow.
 - 3. 115/24 volt control transformer.
 - 4. Programmable Space Thermostat for continuous fan operation during programmed occupied conditions.
 - 5. Two-stage heater capacity control (where scheduled).
 - 6. Firestat.
 - 7. Interlock unit controls with fan or air unit so that unit may not be energized with fan not in operation.
- M. Performance/Ratings: Provide minimum performance as scheduled on drawings.

2.2 AIR-COOLED DX CONDENSING UNITS

- A. General: Provide the DX condensing unit manufacturer's standard materials, components and accessories as indicated by product information, designed and constructed as recommended by the manufacturer and as required for a complete installation, except as otherwise indicated. Units shall be UL 1995 listed and rated in accordance with ARI Standard 210/240, 360 and 270.
- B. Units: Provide air cooled condensing units of the size, type, capacity and arrangement as shown and scheduled on the Drawings. Condensing units shall be assembled on a heavy-gauge integral steel mounting/lifting base. Units shall be weatherproofed and include hermetic compressor(s), condensing coils, fans and motors, controls and holding charge of refrigerant. Units shall have a control box access panel and removable end panels which allow access to all major components and controls.
- C. Unit Frame: Frame shall be a welded assembly of heavy gauge zinc-coated, galvanized steel. Drainage holes shall be provided as required. Exterior surfaces shall be cleaned, phosphatized and coated with an epoxy resin primer and finished with an enamel finish. Units shall have removable end panels for access to all major components and controls.
- D. Refrigeration Circuits: Units up to 7-1/2 tons shall have single compressors and a single refrigerant circuit for use with a single circuit cooling coil. Units 10 tons and larger shall have two compressors and two independent refrigerant circuits for use with a dual circuit cooling coil. Each refrigeration circuit shall have an integral sub-cooling circuit and a refrigerant filter/dryer.
- E. Compressors: Each compressor shall be a direct-drive hermetic type with centrifugal oil pump; two-point lubrication for each bearing and connecting rod; thermostatically controlled crankcase heater and well; high strength, ring-type suction and discharge valves; large gas passages and minimum clearance volumes; and internal spring isolation and muffling. External high and low cutout devices shall be provided. Evaporator defrost control provided in the indoor blower coil shall prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.
- F. Compressor Motors: Each compressor motor shall be suction gas-cooled and have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Internal temperature and current-sensitive motor overloads shall protect compressors under loss of charge and other abnormal operating conditions.

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- G. Condenser Coils: Condenser coils shall be configured aluminum fins mechanically bonded to seamless copper tubing. Sub-cooling circuit(s) shall be provided as standard for each refrigeration circuit. Coils shall be factory pressure and leak-tested to 425 psig air pressure. Corrosion resistant metal grilles for coil protection shall be provided.
- H. Condenser Fans: Fans shall be vertical discharge, direct-drive type, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs. Motors shall have permanently lubricated ball bearings, built-in current and thermal overload protection and weathertight slingers over bearings. The fan motors shall be mounted in rubber isolators. Corrosion resistant fan grills shall be provided.
- I. Controls: Unit controls shall include a fused 24-volt control power transformer, magnetic contactors for each compressor, cooling low ambient fan switches, high pressure cut-out(s), low pressure cut-out(s) and reset relays. Unit completely factory-wired with necessary controls and terminal block for connection of field control power wiring. A solid state anti-short-cycle timer shall be available for retrofit on all units to prevent rapid on-off compressor cycling in light load conditions. A time-delay relay shall be provided in all dual compressor units to prevent both compressors from coming on line simultaneously.
- J. Refrigerant/Oil Charge: Units shall be shipped from the factory with a sufficient charge of refrigerant and oil for the complete system when used with pre-charged refrigerant lines.
- K. Refrigerant Line Connections: Connections shall be either compression or sweat type. Brass liquid and suction line service valves, gauge/charging ports and a suction and discharge pressure gauge panel shall be provided.
- L. Warranty: Provide manufacturer's one year parts and labor and five year extended (non pro-rated) compressor warranty.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install DX/Electric heat air handling units and condensing units in accordance with manufacturer's instructions, the NEC, and applicable local codes and ordinances. Test installed systems for compliance with these Specifications. Rework as required and as directed to ensure that specified and indicated requirements are met and that installed systems function as intended.
- B. Condensing Unit Mounting: Mount units on reinforced concrete pads. Pads shall extend to a minimum of 3-1/2 inches above finished grade and shall be a minimum of 6 inches thick. Refer to Section 23 0100 "Mechanical General Provisions" for additional requirements.
- C. Air Handling Unit Mounting: Hang the unit from the structure with all thread and vibration isolators or set on a concrete pad.
- D. Leveling: Install units level to operate without noticeable vibration after installation.
- E. Vibration Isolators: Air handling units shall be installed with vibration isolators and separated from ductwork with flexible duct connections.
- F. Refrigerant Piping: Install, test, evacuate and charge refrigerant piping per the manufacturer's recommendations and as specified in Section 23 2000 "HVAC Piping Systems."
- G. Drain Connections: Pipe condensate directly to a primed floor drain. Provide P-traps on air handling unit condensate drain connections with seal depths at least equal to the total static pressure of the unit as installed. P-traps shall be constructed of pipe and tees as detailed on the Drawings. Elbows

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shall not be used. All unused openings of tees shall be closed with removable plugs that shall serve as cleanouts.

- H. Filters: Install initial set of filters after ductwork has been blown out and prior to continuous operation of each air handling unit.
- I. Coil Pull Space: Air handling units shall be installed with adequate space to allow unit coils to be removed without demolition of building construction. Coil pull space and any required demolition of building construction shall be clearly indicated on As-built Drawings. The Contractor shall insure that all field-piping, valves, ductwork, and other obstructions are not in the way or can be easily removed with flanges to facilitate coil removal.

3.2 START-UP

- A. Start-up, test, and adjust electric heaters in accordance with manufacturer's published start-up instructions. Adjust air diffusion louvers for proper air flow. Check and calibrate controls.
- B. Controls: Unit controls, including, but not limited to overcurrent protection, magnetic evaporator fan and heater stage contactors, control power transformers, terminal strips, relays and a single point power entry shall be factory installed and wired in the unit such that the only field wiring required is a single power connection to the unit and control wiring to the thermostat and condensing units. Evaporator defrost control shall be provided to prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

3.3 TESTING AND BALANCING

- A. Refer to Section 23 0593 "Testing, Adjusting, and Balancing for HVAC" for air handling unit testing and balancing.

3.4 IDENTIFICATION

- A. Refer to Section 23 0300 "Basic Materials and Methods" for applicable painting, nameplates, and labeling requirements.

END OF SECTION 23 6213

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