SECTION 238123 - COMPUTER-ROOM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Floor-mounted computer-room air conditioners, 6 tons and larger.
   2. Floor-mounted computer-room air conditioners, 5 tons and smaller.
   3. Ceiling-mounted computer-room air conditioners.
   4. Console computer-room air conditioners.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Computer-room air conditioners shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For computer-room air conditioners. Include plans, elevations, sections, details, and attachments to other work.
C. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For computer-room air conditioners, accessories, and components, from manufacturer.
B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 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."
   2. Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."
   3. Applicable requirements in ASHRAE/IESNA 90.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of computer-room air conditioners that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
   2. Warranty Period for Humidifiers: Manufacturer's standard, but not less than three years from date of Substantial Completion.
   3. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED UNITS 6 TONS AND LARGER

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:
   1. Carrier Corporation; a United Technologies company.
   2. Liebert Corporation.
   3. Trane; a business of American Standard Companies.

B. Description: Packaged, factory assembled, prewired, and prepiped; consisting of cabinet, fans, filters, humidifier, and controls.

C. Cabinet and Frame: Welded steel, braced for rigidity, and supporting compressors and other mechanical equipment and fittings.
   2. Insulation: Thermally and acoustically insulate cabinet interior with 1-inch-thick duct liner.
   3. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
   4. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel; color as selected from manufacturer's standard colors.
   5. Floor Stand: Welded tubular steel, with adjustable legs and vibration isolation pads.

D. Supply-Air Fan(s):
1. Double-inlet, forward-curved centrifugal fan(s); statically and dynamically balanced.
2. Drive: V-belt, with steel shaft with self-aligning ball bearings and cast-iron or steel sheaves, variable- and adjustable-pitch motor sheave, minimum of two matched belts, with drive rated at a minimum of two times the nameplate rating of motor.

E. Refrigeration System:
2. Refrigeration Circuits: Two; each with hot-gas mufflers, thermal-expansion valve with external equalizer, liquid-line solenoid valve, liquid-line filter-dryer, sight glass with moisture indicator, service shutoff valves, charging valves, and charge of refrigerant.
3. Refrigerant: R-407C or R-410A.
4. Refrigerant Evaporator Coil: Alternate-row or split-face-circuit, direct-expansion coil of seamless copper tubes expanded into aluminum fins.
   a. Mount coil assembly over stainless-steel drain pan[complying with ASHRAE 62.1] [and] [having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir].
5. Remote Air-Cooled Refrigerant Condenser: Corrosion-resistant cabinet, copper-tube aluminum-fin coils arranged for two circuits, multiple direct-drive propeller fans with permanently lubricated ball bearings, and single-phase motors with internal overload protection and integral electric control panel[and disconnect switch]. Control capacity by [cycling fans] [modulating fan speeds] [three-way refrigerant bypass with receiver and isolation valve].

F. Electric-Resistance Heating Coil: Enclosed finned-tube electric elements arranged for minimum of three stages, with thermal safety switches, manual-reset overload protection, and branch-circuit overcurrent protection.

G. Refrigerant Heating Coil: Hot-gas coil of seamless copper tubes expanded into aluminum fins with three-way solenoid valve on first-stage refrigerant circuit.

H. Extended-Surface, Disposable, Panel Filter: Pleated, lofted, nonwoven, reinforced cotton fabric; supported and bonded to welded-wire grid; enclosed in cardboard frame.

I. Infrared Humidifier: High-intensity quartz lamps mounted above stainless-steel evaporator pan, serviceable without disconnecting water, drain, or electrical connections; prepped and using condensate water from cooling coils with stainless-steel or brass float-valve mechanism; located in bypass airstream; with flush-cycle timer and solenoid drain valve.

J. Integral Electrical Controls: Unit-mounted electrical enclosure with piano-hinged door, grounding lug, combination magnetic starters with overload relays, circuit breakers and cover interlock, and fusible control-circuit transformer.

K. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
L. **Electronic-Control System:** Solid state, with start button, stop button, temporary loss of power indicator, manual-reset circuit breakers, temperature control, humidity control, and monitor panel.
   1. **Monitor Panel:** Backlighted, with no visible indicator lights until operating function is activated; indicators include cooling, humidification, loss of airflow, change filters, high temperature, low temperature, high humidity, low humidity, high head pressure (each compressor), and low suction pressure (each compressor).
   2. **Temperature- and Humidity-Control Modules:** Solid state, plug-in; with adjustable set point, push-to-test calibration check button, and built-in visual indicators to show mode of operation.

2.2 **FLOOR-MOUNTED UNITS 5 TONS AND SMALLER**

A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings:
   1. Liebert Corporation.

B. **Description:** Self-contained, factory assembled, prewired, and prepiped; consisting of cabinet, fan, filters, and controls; for vertical floor mounting in upflow or downflow configuration.

C. **Cabinet and Frame:** Welded tubular-steel frame with removable steel panels with baked-enamel finish, insulated with 1-inch-thick duct liner.
   1. **Floor Stand:** Welded tubular steel, with adjustable legs and vibration isolation pads.
   2. **Finish of Interior Surfaces:** Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. **Supply-Air Fan:** Forward curved, centrifugal, and with adjustable V-belt drive.

E. **Refrigeration System:**
   1. **Compressor:** Hermetic, with oil strainer, internal motor overload protection, resilient suspension system, and crankcase heater.
   2. **Refrigeration Circuit:** Low-pressure switch, manual-reset high-pressure switch, thermal-expansion valve with external equalizer, sight glass with moisture indicator, service shutoff valves, charging valves, and charge of refrigerant.
   3. **Refrigerant:** R-407C or R-410A.
   4. **Refrigerant Evaporator Coil:** Direct-expansion coil of seamless copper tubes expanded into aluminum fins, with two circuits, each with solenoid valve.
      a. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1 [and] having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.
   5. **Remote Air-Cooled Refrigerant Condenser:** Integral, copper-tube aluminum-fin coil with [propeller] [centrifugal] fan, direct driven.
   6. **Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.**

F. **Electric-Resistance Heating Coil:** Finned-tube electric elements with contactor and high-temperature-limit switches.
G. Filter: 2-inch-thick, disposable, glass-fiber media.

H. Infrared Humidifier: High-intensity quartz lamps mounted above stainless-steel evaporator pan, serviceable without disconnecting water, drain, or electrical connections; prepiped and located in bypass airstream; with flush-cycle timer and solenoid drain valve.

I. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.

J. Control System: Unit-mounted panel with main fan contactor, compressor contactor, compressor start capacitor, control transformer with circuit breaker, solid-state temperature and humidity control modules, time-delay relay, heating contactor, and high-temperature thermostat.

2.3 CONSOLE UNITS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:
1. Liebert Corporation.

C. Description: Split system consisting of evaporator section for floor or wall mounting and remote condensing section.

D. Evaporator Cabinet: Furniture-grade steel with baked-enamel finish; with front access and containing direct-drive centrifugal fans and two-speed motor.
1. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

E. Condenser Cabinet: Steel with baked-enamel finish and containing compressor and condenser.

F. Refrigeration System:
1. Compressor: Hermetic, with oil strainer, internal motor overload protection, resilient suspension system, and crankcase heater.
2. Refrigeration Circuit: Filter/dryer, manual-reset high-pressure switch, thermal-expansion valve with external equalizer, sight glass with moisture indicator, service shutoff valves, charging valves, and charge of refrigerant.
3. Refrigerant: R-407C or R-410A.
4. Refrigerant Evaporator Coil: Direct-expansion coil of seamless copper tubes expanded into aluminum fins.
   a. Mount coil assembly over stainless-steel drain pan[complying with ASHRAE 62.1] [and] [having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir].
6. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.

G. Electric-Resistance Heating Coil: Finned-tube electric elements with contactor and high-temperature-limit switches.

H. Filter: Cleanable.

I. Filter: 1-inch thick, disposable, glass-fiber media.
   1. Initial Resistance: <Insert inches wg>.
   3. Arrestance (ASHRAE 52.1): 90 percent.

J. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.

K. Control System: Unit-mounted panel with contactors, control transformer with circuit breaker, and solid-state temperature-[and humidity]-control modules. Provide solid-state, unit-mounted control panel with start-stop switch[, adjustable humidity set point,] and adjustable temperature set point.

2.4 FAN MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

B. <Insert unique motor characteristics>.

2.5 CAPACITIES AND CHARACTERISTICS

A. Unit Configuration:
   1. [Upflow] [Downflow].
   2. [Draw] [Blow] through.

B. Supply-Air Fan:
   1. Number of Fans: [One] [Two] <Insert number>.

C. Refrigeration System:
   1. Unit Energy Efficiency: <Insert COP or EER>.
   2. Refrigerant Compressor:
a. Total Unit Cooling Capacity: <Insert Btu/h>.
b. Sensible Unit Cooling Capacity: <Insert Btu/h>.
c. Number of Compressors: [One] [Two] <Insert number>.
d. Motor Size: <Insert number> hp.

3. Refrigerant Evaporator Coil:
   a. Cooling Capacity: <Insert Btu/h>.
   b. Entering-Air Dry-Bulb Temperature: <Insert deg F>.
   c. Entering-Air Wet-Bulb Temperature: <Insert deg F>.
   d. Leaving-Air Dry-Bulb Temperature: <Insert deg F>.
   e. Leaving-Air Wet-Bulb Temperature: <Insert deg F>.

4. Air-Cooled Refrigerant Condenser:
   a. Cooling Capacity: <Insert Btu/h>.
   b. Entering-Air Temperature: <Insert deg F>.
   c. Number of Condenser Fan Motors: <Insert number>.
   d. Condenser Fan Motors: <Insert number> hp.

D. Electric-Resistance Heating Coil:
   1. Total Capacity: <Insert >.

E. Humidifier:
   1. Total: <Insert lb/h>.
   2. Input: <Insert Btu/h>.

F. Electrical Characteristics:
   1. Volts: [120] [208] [240] [277] [480] <Insert value>.
   2. Phase: [Single] [Three].
   3. Hertz: 60.
   5. Minimum Circuit Ampacity: <Insert value>.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install computer-room air conditioners level and plumb, maintaining manufacturer's recommended clearances. [Install according to ARI Guideline B.]

B. Computer-Room Air-Conditioner Mounting: Install using [elastomeric pads] [elastomeric mounts] [restrained spring isolators] <Insert device>. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
   1. Minimum Deflection: [1/4 inch] [1 inch] <Insert dimension>.

C. Suspended Computer-Room Air Conditioners: Install using continuous-thread hanger rods and [elastomeric hangers] [spring hangers] [spring hangers with vertical-limit stop] of size required to support weight of computer-room air conditioner.
1. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Fabricate brackets or supports as required.

2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

D. Air-Cooled Refrigerant Condenser Mounting: Install using [elastomeric pads] [elastomeric mounts] [restrained spring isolators] <Insert device>. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."


3.2 CONNECTIONS

A. Piping installation requirements are specified in other heating, ventilating, and air-conditioning Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Water and Drainage Connections: Comply with applicable requirements in Section 221116 "Domestic Water Piping." Provide adequate connections for water-cooled units, condensate drain, and humidifier flushing system.

D. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Provide shutoff valves and piping.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   2. After installing computer-room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Computer-room air conditioners will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

D. After startup service and performance test, change filters and flush humidifier.

3.4 ADJUSTING

A. Adjust initial temperature[ and humidity] set points.
B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within [12] <Insert number> months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [two] <Insert number> visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION