

## SECTION 238123 - COMPUTER-ROOM 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Floor-mounted computer-room air conditioners, 6 tons (21 kW) and larger.
  - 2. Floor-mounted computer-room air conditioners, 5 tons (18 kW) and smaller.
  - 3. Console computer-room air conditioners.

#### 1.3 DEFINITION

- A. BAS: Building automation system.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. LEED Submittals:
  - 1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.
  - 2. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."
- C. Shop Drawings: For computer-room air conditioners. 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.
- D. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.
- E. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from Installers of the items involved.

- F. Field quality-control reports.
- G. Operation and Maintenance Data: For computer-room air conditioners to include in emergency, operation, and maintenance manuals.
- H. Warranty: Sample of special warranty.

#### 1.5 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."

LEED-NC Prerequisite EQ 1 requires compliance with requirements in ASHRAE 62.1-2004. In addition to establishing minimum ventilation rates, ASHRAE 62.1-2004 includes requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, humidification and dehumidification, drain pan construction and connection, finned-tube coil selection and cleaning, and equipment access. Verify, with manufacturers, availability of units with components and features that comply with these requirements.

- 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."

LEED-NC Prerequisite EA 2 requires minimum efficiency equal to requirements in ASHRAE/IESNA 90.1-2004.

- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- D. ASME Compliance: Fabricate and label water-cooled condenser shell to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

#### 1.6 COORDINATION

- A. Coordinate installation of computer-room air conditioners with computer-room access flooring Installer.

Retain first paragraph below for units mounted on concrete bases.

- B. Coordinate sizes and locations of concrete bases with actual equipment provided.

Retain paragraph below for remote air-cooled refrigerant condensers and remote, air-cooled, glycol-solution coolers.

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

## 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.

## 1.8 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. Fan Belts: One set(s) for each belt-driven fan.
  - 2. Filters: One set(s) of filters for each unit.

## PART 2 - PRODUCTS

### 2.1 FLOOR-MOUNTED UNITS 6 TONS (21 kW) AND LARGER

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Airflow Company; a division of The McClain Company, Inc.
  - 2. Data Aire Inc.
  - 3. Liebert Corporation.
- 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.
  - 1. Doors and Access Panels: Galvanized steel with polyurethane gaskets, hinges, and concealed fastening devices.
  - 2. Insulation: Thermally and acoustically insulate cabinet interior with 1-inch- (25-mm-) thick duct liner.

Retain first subparagraph below to comply with LEED-NC Prerequisite EQ 1.

- 3. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- 4. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel; color as selected from manufacturer's standard colors.

Retain subparagraph below for downflow units; delete for upflow units.

- 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.

Retain first paragraph below for units with direct-expansion refrigerant cooling.

E. Refrigeration System:

1. Compressors: Semihermetic reciprocating; with suction-gas-cooled, 1750-rpm motors; thermal overloads; oil sight glass; suction-line strainer; and reversible oil pumps; with oil strainer, internal motor overload protection, resilient suspension system, crankcase heater, manual-reset high-pressure switch, and pump-down low-pressure switch.
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 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain one of two subparagraphs below for integral, water-cooled or remote air-cooled refrigerant condenser.

5. Integral, Water-Cooled Refrigerant Condenser: Shell-and-tube type fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII with liquid-line stop valve and head-pressure-actuated, three-way regulating valve. Terminate fluid connections outside cabinet.
  - a. Cooling Medium: Glycol solution.
6. 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.

Retain one of first two paragraphs below for units with external or supplementary (seasonal) cooling. Three-way control valve is standard. Units can be chilled-water cooled without a refrigeration system. If that is the purpose of paragraph below, delete "Refrigeration System" Paragraph above.

F. Hydronic Cooling Coil: Seamless copper tubes expanded into aluminum fins with modulating three-way control valve.

1. Cooling Medium: Glycol solution.
2. Control Valve: Class 125 body.
  - a. Maximum Pressure Drop: 3 psig (21 kPa) at design flow rate.
  - b. Close-Off (Differential) Pressure Rating: 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

3. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain first two paragraphs below for units with glycol-solution-cooled condenser or with supplementary cooling coil.

- G. Remote, Air-Cooled, Glycol-Solution Cooler: Corrosion-resistant cabinet, copper-tube aluminum-fin coil, multiple direct-drive propeller fans with fan guards, and single-phase motors with internal overload protection and integral electric control panel. Control capacity by cycling fans.
  1. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- H. Glycol-Solution Pump Package: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing two centrifugal pump(s) with mechanical seals; electrical-control cabinet with starters, lead-lag switch, automatic switchover, and alarm light.
  1. Piping: Interconnecting piping, to and from remote, air-cooled, glycol-solution cooler, with shutoff valves, flow switches, check valves in pump discharge, unions, and pressurized expansion tank with air purge vent and system-charging connection.
  2. Glycol: Inhibited ethylene glycol and water solution mixed 50:50, suitable for operating temperature of minus 40 deg F (minus 40 deg C).
  3. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.

Retain one of first two paragraphs below for units with heating.

- I. Hot-Water Heating Coil: Seamless copper tubes expanded into aluminum fins with two-way modulating control valve and strainer.
  1. Control Valve: Class 125 body.
    - a. Maximum Pressure Drop: 3 psig (21 kPa) at design flow rate.
    - b. Close-Off (Differential) Pressure Rating: 100 percent of pressure differential across valve or 100 percent of total system (pump) head.
- J. Steam Heating Coil: Seamless copper tubes expanded into aluminum fins with two-way modulating control valve, strainer, and float-and-thermostatic trap.
  1. Control Valve: Class 125 body.
    - a. Maximum Pressure Drop (15-psig (103-kPa) Steam): 80 percent of inlet steam pressure.
    - b. Close-Off (Differential) Pressure Rating: 150 percent of operating (inlet) pressure.
- K. Extended-Surface, Disposable, Panel Filter: Pleated, lofted, nonwoven, reinforced cotton fabric; supported and bonded to welded-wire grid; enclosed in cardboard frame.
  1. Thickness: 4 inches (100 mm).
  2. Arrestance (ASHRAE 52.1): 90 percent.

LEED-NC Prerequisite EQ 1 requires compliance with ASHRAE 62.1-2004, which requires a MERV rating of 6 or higher.

3. Merv (ASHRAE 52.2): 7.
  - L. Steam Grid Humidifier: “Armstrong” steam separator type with an internal drying chamber, steam jacketed stainless steel distribution manifold, pre-piped solenoid control valve, F&T steam trap, and cleanable Y strainer.
  - M. 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.
  - N. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
  - O. Microprocessor-Control System: Continuously monitors operation of process cooling system; continuously displays room temperature and room relative humidity; sounds alarm on system malfunction and simultaneously displays problem. If more than one malfunction occurs, system displays fault in sequence with room temperature and continues to display fault when malfunction is cleared until system is reset.
    1. Malfunctions:
      - a. Power loss.
      - b. Loss of airflow.
      - c. Clogged air filter.
      - d. High room temperature.
      - e. Low room temperature.
      - f. High humidity.
      - g. Low humidity.
      - h. Smoke/fire.
      - i. Water under floor.
      - j. Supply fan overload.
      - k. Compressor No. 1 - Overload.
      - l. Compressor No. 1 - Low Pressure.
      - m. Compressor No. 1 - High Pressure.
      - n. Compressor No. 2 - Overload.
      - o. Compressor No. 2 - Low Pressure.
      - p. Compressor No. 2 - High Pressure.
    2. Digital Display:
      - a. Control power on.
      - b. Humidifying.
      - c. Dehumidifying.
      - d. Compressor No. 1 - Operating.
      - e. Compressor No. 2 - Operating.
      - f. Heat operating.
      - g. Economy cooling.

3. Push buttons shall stop and start process cooling system, silence audible alarm, test indicators, and display room's relative humidity.

Retain subparagraph below if unit controls interface with the BAS. Coordinate with Division 23 Section "Instrumentation and Control for HVAC."

4. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display unit status and alarms.

Retain first subparagraph below if interface with the BAS is through hardwired points and minimal interface is required.

a. Hardwired Points:

- 1) Monitoring: On-off status, common trouble alarm.

P. Accessories

1. Firestat: Mounted in the electrical panel with the sensing element in the return air. Immediately shut down the control system when activated.
2. Water Detection Cable: 25 ft water detection cable for each A/C unit. Mounted under the raised floor and attached to the floor with fasteners supplied with the cables.
3. LCD Hand Held Meter: Include one LCD hand held Temperature/Humidity meter for calibrating A/C units. Meter shall be factory calibrated and certified by NIST. A certified NIST certificate shall accompany the meter.

## 2.2 FLOOR-MOUNTED UNITS 5 TONS (18 kW) AND SMALLER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airflow Company; a division of The McClain Company, Inc.
2. Data Aire Inc.
3. 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- (25-mm-) thick duct liner.

Retain first subparagraph below for downflow units; delete for upflow units.

1. Floor Stand: Welded tubular steel, with adjustable legs and vibration isolation pads.

Retain subparagraph below to comply with LEED-NC Prerequisite EQ 1.

2. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

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

Retain first paragraph below for units with direct-expansion refrigerant cooling.

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 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain one of first two subparagraphs below for integral, water-cooled or remote air-cooled refrigerant condenser.

5. Integral, Water-Cooled Refrigerant Condenser: Brazed-plate type with liquid-line stop valve and head-pressure-actuated, three-way regulating valve.
  - a. Cooling Medium: Glycol solution.
6. Remote Air-Cooled Refrigerant Condenser: Integral, copper-tube aluminum-fin coil with propeller fan, direct driven.

Retain subparagraph below if retaining one of last two subparagraphs above.

7. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.

Retain one of first two paragraphs below for units with external or supplementary (seasonal) cooling. Units can be chilled-water cooled without a refrigeration system. If that is the purpose of paragraph below, delete "Refrigeration System" Paragraph above.

- F. Hydronic Cooling Coil: Seamless copper tubes expanded into aluminum fins with modulating three-way control valve.
  1. Cooling Medium: Glycol solution.
  2. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain first two paragraphs below for units with glycol-solution-cooled condenser or with supplementary cooling coil.

- G. Remote Air-Cooled, Glycol-Solution Cooler: Corrosion-resistant cabinet, copper-tube aluminum-fin coil, direct-drive propeller fan with fan guards, and single-phase motors with internal overload protection.
  1. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- H. Glycol-Solution Pump Package: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing centrifugal pump with mechanical seal.



1. Piping: Interconnecting piping, from suction to discharge, with shutoff valves, flow switches, unions, and pressurized expansion tank with air purge vent and system-charging connection.
  2. Glycol: Inhibited ethylene glycol and water solution mixed 50:50, suitable for operating temperature of minus 40 deg F (minus 40 deg C).
  3. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- I. Filter: 2-inch- (50-mm-) thick, disposable, glass-fiber media.
1. Arrestance (ASHRAE 52.1): 90 percent.

LEED-NC Prerequisite EQ 1 requires compliance with ASHRAE 62.1-2004, which requires a MERV rating of 6 or higher.

2. Merv (ASHRAE 52.2): 7.

Retain one or both of first two paragraphs below or delete both. Humidifiers are optional features on this type of equipment. Retain more than one paragraph to allow Contractor to choose.

- J. 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.
- K. Electrode Steam Humidifier: Self-contained, microprocessor-controlled unit with disposable, polypropylene-plastic cylinders and having field-adjustable steel electrodes and stainless-steel steam dispersion tube.
1. Plumbing Components and Valve Bodies: Plastic, linked by flexible rubber hosing, with water fill with air gap and solenoid valve incorporating built-in strainer, pressure-reducing and flow-regulating orifice, and drain with integral air gap.
  2. Control: Fully modulating to provide gradual 0 to 100 percent capacity with field-adjustable maximum capacity; with high-water probe.
  3. Drain Cycle: Field-adjustable drain duration and drain interval.
- L. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- M. 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, humidity contactor, time-delay relay, heating contactor, and high-temperature thermostat. Provide solid-state, wall-mounted control panel with start-stop switch, adjustable humidity set point, and adjustable temperature set point.

## 2.3 CONSOLE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Data Aire Inc.
  2. Liebert Corporation.

- B. Description: Split system consisting of evaporator section for floor or wall mounting and remote condensing section.
- C. Evaporator Cabinet: Furniture-grade steel with baked-enamel finish; with front access and containing direct-drive centrifugal fans and two-speed motor.

Retain subparagraph below to comply with LEED-NC Prerequisite EQ 1.

- 1. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

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

Retain first paragraph below for units with direct-expansion refrigerant cooling.

- E. 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 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain one of first two subparagraphs below for integral, water-cooled or remote air-cooled refrigerant condenser.

- 5. Integral, Water-Cooled Refrigerant Condenser: Coaxial, counterflow, tube-in-tube or brazed-plate type with liquid-line stop valve and head-pressure-actuated, water-regulating valve.
- 6. Remote Air-Cooled Refrigerant Condenser: Integral, copper-tube aluminum-fin coil with propeller fan, direct driven.

Retain subparagraph below if retaining one of last two subparagraphs above.

- 7. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.

Retain one of first two paragraphs below for units with external or supplementary (seasonal) cooling. Units can be chilled-water cooled without a refrigeration system. If that is the purpose of paragraph below, delete "Refrigeration System" Paragraph above.

- F. Hydronic Cooling Coil: Seamless copper tubes expanded into aluminum fins with modulating control valve.
  - 1. Cooling Medium: Glycol solution.
  - 2. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1-2004 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.

Retain first two paragraphs below for units with glycol-solution-cooled condenser or with supplementary cooling coil.

- G. Remote, Air-Cooled, Glycol-Solution Cooler: Corrosion-resistant cabinet, copper-tube aluminum-fin coil, direct-drive propeller fan with fan guards, and single-phase motor with internal overload protection.
- H. Glycol-Solution Pump Package: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing centrifugal pump with mechanical seal.
  - 1. Piping: Interconnecting piping, to and from remote, air-cooled, glycol-solution cooler, with shutoff valves, flow switches, unions, and pressurized expansion tank with air purge vent and system-charging connection.
  - 2. Glycol: Inhibited ethylene glycol and water solution mixed 50:50, suitable for operating temperature of minus 40 deg F (minus 40 deg C).

LEED-NC Prerequisite EQ 1 requires compliance with ASHRAE 62.1-2004, which requires a MERV rating of 6 or higher.

- I. Filter: 1-inch- (25-mm-) thick, disposable, glass-fiber media.
  - 1. Arrestance (ASHRAE 52.1): 90 percent.
  - 2. Merv (ASHRAE 52.2): 7.

Retain first paragraph below for units with humidifiers.

- J. Electrode Steam Humidifier: Self-contained and microprocessor controlled; with replaceable cylinder.
- 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. 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

Default motor characteristics are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "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 Division 26 Sections.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for hydronic piping systems to verify actual locations of piping connections before equipment installation.
- C. Examine walls, floors, and roofs for suitable conditions where computer-room air conditioners will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install computer-room air conditioners level and plumb, maintaining manufacturer's recommended clearances.

Retain one or more of paragraphs below. Coordinate with Drawings and Sections specifying vibration controls. Retain or insert amount of required deflection.

- B. Computer-Room Air-Conditioner Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- C. Air-Cooled Refrigerant Condenser Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- D. Remote, Air-Cooled, Glycol-Solution Cooler Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- E. Glycol-Solution Pump Package Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."

#### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 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 Division 22 Section "Domestic Water Piping." Provide adequate connections for water-cooled units, condensate drain, and humidifier flushing system.

Retain first paragraph below for units with hot-water coils.

- D. Hot-Water Heating Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Provide shutoff valves in inlet and outlet piping to heating coils.

Retain first paragraph below for units with steam coils.

- E. Steam and Condensate Piping: Comply with applicable requirements in Division 23 Section "Steam and Condensate Heating Piping." Provide shutoff valves in steam inlet and steam trap in condensate outlet piping to heating coils.
- F. Condenser-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Provide shutoff valves in water inlet and outlet piping on water-cooled units.
- G. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Provide shutoff valves and piping.

### 3.4 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. 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.
- C. Computer-room air conditioners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. After startup service and performance test, change filters and flush humidifier.

### 3.5 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 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain computer-room air conditioners.

END OF SECTION 238123