SECTION 238123.13 - COMPUTER-ROOM AIR-CONDITIONERS, CEILING-MOUNTED UNITS

This Section includes requirements for a Sustainable Rating System. However, equipment specified in this Section may not qualify for prerequisites and credits. Verify, with manufacturers, that the requirements for prerequisites and credits can be met. To achieve prerequisites and obtain credits, HVAC system design alternatives that do not include computer-room air conditioners may be required.

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

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

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section includes ceiling-mounted, computer-room air conditioners.
      2. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. COP: Coefficient of performance.
        2. EER: Energy efficiency ratio.
        3. SCR: Silicon-controlled rectifier.
      1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.

Include material descriptions, dimensions of individual components and profiles, and finishes for computer-room air-conditioning units.

Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

* + - * 1. Shop Drawings: For computer-room air conditioners.

Include plans, elevations, sections, and attachment details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

* + - * 1. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from other trades.

Retain "Seismic Qualification Certificates" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Certificates: For computer-room air conditioners, accessories, and components, from manufacturer.
        2. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
        2. Sample Warranty: For special warranty.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For computer-room air conditioners to include in emergency, operation, and maintenance manuals.
      2. MAINTENANCE MATERIAL SUBMITTALS
         1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Fan Belts: **[One] <Insert number>** set(s) for each belt-driven fan.

Filters: **[One] <Insert number>** set(s) of filters for each unit.

* + - 1. WARRANTY

When warranties are required, verify with Director’s Representative's counsel that warranties stated in this article are not less than remedies available to Director’s Representative under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of computer-room air conditioners that fail in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods for units and components.

Warranty Period for Compressors: Manufacturer's standard, but not less than **[five] [10] <Insert number>** years from date of Substantial Completion.

Warranty Period for Humidifiers: Manufacturer's standard, but not less than **[three] <Insert number>** years from date of Substantial Completion.

Warranty Period for Control Boards: Manufacturer's standard, but not less than **[three] <Insert number>** years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or AVITRU. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. MANUFACTURERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=11526) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[APC by Schneider Electric](http://www.specagent.com/Lookup?uid=123457102652).

[Compu-Aire, Inc](http://www.specagent.com/Lookup?uid=123457102648).

[Data Aire Inc](http://www.specagent.com/Lookup?uid=123457102649).

[Liebert; Vertiv Holdings Co](http://www.specagent.com/Lookup?uid=123457102650).

[Stulz-ATS](http://www.specagent.com/Lookup?uid=123457102651).

Approved equivalent.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Seismic Performance" paragraph below with "Seismic Qualification Certificates" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

* + - * 1. Seismic Performance: Computer-room air-conditioners, ceiling-mounted units shall withstand the effects of earthquake motions determined according to **[ASCE/SEI 7] <Insert requirement>**.

Retain subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified**[ and the unit will be fully operational after the seismic event]**."

* + - * 1. 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.
        2. ASHRAE Compliance:

Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

"ASHRAE Compliance" subparagraph below may be required to comply with Project requirements or authorities having jurisdiction. Verify, with manufacturers, availability of units with components and features that comply with these requirements.

ASHRAE Compliance: 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."

"ASHRAE/IES Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction.

* + - * 1. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
        2. 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. MANUFACTURED UNITS
         1. Description: Self-contained, factory assembled, prewired, and prepiped; consisting of cabinet, fan, filters, and controls.

Retain one of three "Mounting Configuration" subparagraphs below. Delete all three if more than one mounting configuration is required and units are scheduled on Drawings.

Mounting Configuration: Exposed in the space.

Mounting Configuration: Fit T-bar in lay-in ceiling opening.

Mounting Configuration: Concealed above a hard ceiling.

* + - * 1. Cabinet: Galvanized steel serviceable from one side, with baked-enamel finish, insulated with 1/2-inch- thick duct liner, and mounting bracket attached to the unit.

Retain first subparagraph below for units where grilles are available, usually 1.5 tons and smaller. Retain second subparagraph for ducted units. Retain third subparagraph for units with air distribution plenum, usually 3 tons and smaller. Retain fourth subparagraph for units less than 3 tons. Retain fifth subparagraph for units 5 tons and larger. Retain sixth subparagraph for high static blower assembly.

Integral factory-supplied supply and return grille to fit ceiling grid kit of 24 by 48 inches, with filter.

Unit with supply and return collars for ducting in the field.

Unit with 24-by-48-inch air distribution plenum, with integral MERV 8 filter and three-way air distribution.

Unit with two-speed, centrifugal direct-drive fan.

Unit with single-speed, centrifugal belt-driven fan.

Unit with high static blower assembly consisting of field-attached blower box with double-inlet, centrifugal belt-driven fan; with single-speed motor mounted on an adjustable base, and providing up to 2 inches wc of external pressure.

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

* + - * 1. Supply-Air Fan:

Retain one of two subparagraphs below. Plug/plenum fans are only available on downflow models.

Forward curved, double width, double inlet, centrifugal, with adjustable V-belt drive.

Plug/plenum, single inlet, direct drive, electronically commutated, and variable speed.

Retain "Refrigeration System" paragraph below for units with direct-expansion refrigerant cooling.

* + - * 1. Refrigeration System:

Compressor: Scroll, with oil strainer, internal motor overload protection, resilient suspension system, and crankcase heater.

Refrigeration Circuit Components:

Low-pressure switch.

Manually reset, high-pressure switch.

Thermal-expansion valve with external equalizer.

Sight glass with moisture indicator.

Service shutoff valves.

Charging valves.

Hot-gas bypass.

Refrigerant charge.

Retain "Refrigerant" subparagraph below to require a specific refrigerant type; delete if any refrigerant type is acceptable.

Refrigerant: **[R-407C] [or] [R-410A] <Insert type>**.

Refrigerant Evaporator Coil: Direct-expansion coil of seamless copper tubes expanded into aluminum fins.

Refrigerant line sets precharged in lengths of **[15 feet] [30 feet]** and of sufficient length to serve the unit from its condensing unit.

Refrigerant line-sweat-adapter kit to permit field brazing of refrigerant lines.

Mount 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]** under coil assembly.

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

Integral, Water-Cooled Refrigerant Condenser: **[Coaxial, counterflow, tube-in-tube] [Brazed-plate]** type with liquid-line stop valve and head-pressure-actuated, water-regulating valve.

Cooling Medium: **[Water] [Glycol solution]**.

Remote, Air-Cooled Refrigerant Condenser: Integral, copper-tube aluminum-fin coil with direct-drive, **[propeller] [centrifugal]** fan.

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

Retain "Hydronic Cooling Coil" paragraph below for units with external or supplementary (seasonal) cooling. Units can be chilled-water cooled without a refrigeration system. If retaining paragraph below, delete "Refrigeration System" paragraph.

* + - * 1. Hydronic Cooling Coil: Seamless copper tubes expanded into aluminum fins with two-way control valve.

Cooling Medium: **[Water] [Glycol solution]**.

Mount 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]** under coil assembly.

Retain "Hot-Water Reheat" paragraph below for units with reheat.

* + - * 1. Hot-Water Reheat: Copper-tube, aluminum-fin coil with two-way, modulating control valve and cleanable Y-strainer.

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

* + - * 1. Remote, Air-Cooled, Glycol-Solution Cooler:

Corrosion-resistant cabinet.

Copper-tube aluminum-fin coil.

Direct-drive propeller fan with fan guards.

Single-phase motors with internal overload protection.

* + - * 1. Glycol-Solution Pump Package:

Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing centrifugal pump with mechanical seal.

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.

Glycol: Inhibited ethylene glycol and water solution mixed 50:50, suitable for operating temperature of minus 40 deg F.

Retain "Electric-Resistance Reheat Coil" paragraph below for units with reheat.

* + - * 1. Electric-Resistance Reheat Coil:

Retain first subparagraph below for units with heating. Retain fourth subparagraph for more precise control; otherwise, delete. SCR heating is less efficient because the compressor is locked on with this type of heating.

Finned-tube electric elements with contactor.

Dehumidification relay.

High-temperature-limit switches.

SCR to proportionally control the reheat elements providing precise temperature control.

* + - * 1. Filter: 1-inch- thick, disposable, glass-fiber media.

Retain "Initial Resistance" and "Recommended Final Resistance" subparagraphs below if units are not scheduled on Drawings.

Initial Resistance: **<Insert number>** inches wg.

Recommended Final Resistance: **<Insert number>** inches wg.

Retain one of either "Pre-Filter Minimum Efficiency Reporting Value and Average Arrestance" or "Pre-Filter Minimum Efficiency Reporting Value" subparagraphs below. Retain first subparagraph if requiring MERV 1, 2, 3, or 4 and if information is not scheduled on Drawings. Retain second subparagraph below if inserting requirements for MERV 5 and higher and if information is not scheduled on Drawings. LEED 2009 IEQ Prerequisite 1 and LEED v4 EQ Prerequisite, "Minimum Indoor Air Quality Performance," require compliance with ASHRAE 62.1 (2007 and 2010 versions, respectively), which requires a MERV rating of 6 or higher for service to occupied spaces. LEED 2009 IEQ Credit 5 and LEED v4 IEQ Credit, "Enhanced Indoor Air Quality Strategies," require MERV 13 or higher. Insert values appropriate to Project sustainability goals.

Pre-Filter Minimum Efficiency Reporting Value and Average Arrestance:

MERV Rating: **[MERV 1] [MERV 2] [MERV 3] [MERV 4] <Insert value>** and corresponding average arrestance according to ASHRAE 52.2.

Pre-Filter Minimum Efficiency Reporting Value:

**[MERV 6] <Insert value>** according to ASHRAE 52.2.

Filter Minimum Efficiency Reporting Value:

MERV Rating: **[MERV 6] [MERV 13] <Insert value>** according to ASHRAE 52.2.

Retain "Electrode Steam Humidifier" paragraph below if this optional feature is required.

* + - * 1. 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.

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.

Control: Fully modulating to provide gradual modulation from zero to 100 percent capacity with field-adjustable maximum capacity; with high-water probe.

Drain Cycle: Field-adjustable drain duration and drain interval.

Retain "Disconnect Switch" paragraph below to require unit manufacturer to provide a factory-installed disconnect switch. Standard unit does not come with disconnect switch. Switches provided by manufacturers may not be of quality required for Project. Coordinate with Section 262816 "Enclosed Switches and Circuit Breakers."

* + - * 1. Disconnect Switch: Non-automatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
        2. Single point power kit permitting single electrical feed to the evaporator and condensing unit of a close-coupled system.
        3. Epoxy-coated, step-down transformer suitable for mounting on the outdoor condensing unit to provide it with 277-V input power.
        4. Control System:

Microprocessor **[unit] [remote]**-mounted panel.

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.

Smoke sensor.

Filter clog switch.

Alarm contacts.

High-temperature thermostat.

Solid-state, wall-mounted control panel with start-stop switch**[, adjustable humidity set point,] [remote temperature sensors] [remote humidity sensors]** and adjustable temperature set point.

Remote panel to monitor and change temperature and humidity set points and sensitivities of the unit and unit alarms.

* + - * 1. Fan Motors:

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load does not require motor to operate in service factor range above 1.0.

Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

If unique characteristics are required for motors in this Section, insert paragraphs below.

**<Insert unique motor characteristics>**.

* + - 1. CAPACITIES AND CHARACTERISTICS

If Project has more than one type or configuration of computer-room air conditioner, delete this article and schedule units on Drawings.

Retain "Supply-Air Fan" paragraph below for floor-mounted units; delete for ceiling-mounted and console units.

* + - * 1. Supply-Air Fan:

Airflow: **<Insert cfm>**.

Minimum Static Pressure: **<Insert inches wg>**.

Motor Size: **<Insert number>** hp.

Retain one of first two paragraphs below. Retain first paragraph for units with a refrigeration package; retain second for hydronic cooling coils.

* + - * 1. Refrigeration System:

Unit Energy Efficiency: **[COP] [EER]**.

Refrigerant Compressor:

Total Unit Cooling Capacity: **<Insert Btu/h>**.

Sensible Unit Cooling Capacity: **<Insert Btu/h>**.

Number of Compressors: **[One] [Two] <Insert number>**.

Motor Size: **<Insert number>** hp.

Refrigerant Evaporator Coil:

Cooling Capacity: **<Insert Btu/h>**.

Entering-Air Dry-Bulb Temperature: **<Insert deg F>**.

Entering-Air Wet-Bulb Temperature: **<Insert deg F>**.

Leaving-Air Dry-Bulb Temperature: **<Insert deg F>**.

Leaving-Air Wet-Bulb Temperature: **<Insert deg F>**.

Retain first subparagraph below for water-cooled units.

Water-Cooled Refrigerant Condenser:

Cooling Capacity: **<Insert Btu/h>**.

Condenser Water Flow: **<Insert gpm>**.

Cooling Medium: **[Water] [Glycol solution]**.

Entering-Water Temperature: **<Insert deg F>**.

Fluid Pressure Drop: **<Insert feet of head>**.

Retain subparagraph below for air-cooled units.

Air-Cooled Refrigerant Condenser:

Cooling Capacity: **<Insert Btu/h>**.

Entering-Air Temperature: **<Insert deg F>**.

Number of Condenser Fan Motors: **<Insert number>**.

Condenser Fan Motors: **<Insert number>** hp.

Retain first paragraph below for hydronic cooling units.

* + - * 1. Hydronic Cooling Coil:

Cooling Coil Capacity: **<Insert Btu/h>**.

Entering-Air Dry-Bulb Temperature: **<Insert deg F>**.

Entering-Air Wet-Bulb Temperature: **<Insert deg F>**.

Leaving-Air Dry-Bulb Temperature: **<Insert deg F>**.

Leaving-Air Wet-Bulb Temperature: **<Insert deg F>**.

Fluid Flow: **<Insert gpm>**.

Entering-Fluid Temperature: **<Insert deg F>**.

Fluid Pressure Drop: **<Insert feet of head>**.

Cooling Medium: **[Water] [Glycol solution]**.

Retain first paragraph below for units with a remote, air-cooled, glycol-solution cooler.

* + - * 1. Remote, Air-Cooled, Glycol-Solution Cooler:

Cooling Coil Capacity: **<Insert Btu/h>**.

Entering-Air Temperature: **<Insert deg F>**.

Leaving-Air Temperature: **<Insert deg F>**.

Glycol Flow: **<Insert gpm>**.

Entering-Glycol Temperature: **<Insert deg F>**.

Number of Fans: **<Insert number>**.

Fan Motors: **<Insert number>** hp.

Number of Pumps: **<Insert number>**.

Pump Motors: **<Insert number>** hp.

Retain first paragraph below for units with hydronic reheating coils.

* + - * 1. Hydronic Reheating Coil:

Total: **<Insert Btu/h>**.

Entering-Air Dry-Bulb Temperature: **<Insert deg F>**.

Leaving-Air Dry-Bulb Temperature: **<Insert deg F>**.

Water Flow: **<Insert gpm>**.

Entering-Water Temperature: **<Insert deg F>**.

Leaving-Water Temperature: **<Insert deg F>**.

Fluid Pressure Drop: **<Insert feet of head>**.

Retain first paragraph below for units with electric-resistance reheating coils.

* + - * 1. Electric-Resistance Reheating Coil:

Total Capacity: **<Insert kilowatts>**.

Stages of Heating: **[1] [2] <Insert number>**.

Retain first paragraph below for units with humidifiers.

* + - * 1. Humidifier:

Total: **<Insert lb/h>**.

Input: **<Insert Btu/h>**.

* + - * 1. Electrical Characteristics:

Volts: **[120] [208] [240] [277] [480] <Insert value>**.

Phase: **[Single] [Three]**.

Hertz: 60.

Full-Load Amperes: **<Insert value>**.

Minimum Circuit Ampacity: **<Insert value>**.

Maximum Overcurrent Protection: <Insert amperage>.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Examine roughing-in for hydronic piping systems to verify actual locations of piping connections before equipment installation.
          3. Examine walls, floors, and roofs for suitable conditions where computer-room air conditioners will be installed.
          4. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLATION
          1. Layout and install computer-room air conditioners and suspension system coordinated with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
          2. Install computer-room air conditioners coordinated with computer-room access flooring Installer.
          3. Install computer-room air conditioners level and plumb, maintaining manufacturer's recommended clearances.**[ Install according to AHRI Guideline B.]**

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

* + - * 1. 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.

Comply with requirements for vibration isolation devices specified in **[Section 230548 "Vibration and Seismic Controls for HVAC."] [Section 230548.13 "Vibration Controls for HVAC."]** Fabricate brackets or supports as required.

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

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

* + - * 1. Air-Cooled Refrigerant Condenser Mounting: Install using **[elastomeric pads] [elastomeric mounts] [restrained spring isolators] <Insert device>** on concrete base. Comply with requirements for vibration isolation devices specified in **[Section 230548 "Vibration and Seismic Controls for HVAC."] [Section 230548.13 "Vibration Controls for HVAC."]**

Minimum Deflection: **[1/4 inch] [1 inch] <Insert dimension>**.

* + - * 1. Remote, Air-Cooled, Glycol-Solution Cooler Mounting: Install using **[elastomeric pads] [elastomeric mounts] [restrained spring isolators] <Insert device>** on concrete base. Comply with requirements for vibration isolation devices specified in **[Section 230548 "Vibration and Seismic Controls for HVAC."] [Section 230548.13 "Vibration Controls for HVAC."]**

Minimum Deflection: **[1/4 inch] [1 inch] <Insert dimension>**.

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

* + - * 1. Glycol-Solution Pump Package Mounting: Install using **[elastomeric pads] [elastomeric mounts] <Insert device>**. Comply with requirements for vibration isolation devices specified in **[Section 230548 "Vibration and Seismic Controls for HVAC."] [Section 230548.13 "Vibration Controls for HVAC."]**
      1. CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Piping installation requirements are specified in other heating, ventilating, and air-conditioning Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
        2. Where installing piping adjacent to computer-room air conditioners, allow space for service and maintenance.
        3. 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.

Retain "Hot-Water Heating Piping" paragraph below for units with hot-water coils.

* + - * 1. Hot-Water Heating Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Provide shutoff valves in inlet and outlet piping to heating coils.
        2. Condenser-Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Provide shutoff valves in water inlet and outlet piping on water-cooled units.
        3. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Provide shutoff valves and piping.
      1. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" paragraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" paragraph, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections**[ with the Company Field Advisor per OGS Spec Section 014216]**:

Inspect for and remove shipping bolts, blocks, and tie-down straps.

After installing computer-room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Computer-room air conditioners will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
        3. After startup service and performance test, change filters and flush humidifier.
      1. ADJUSTING
         1. Adjust initial temperature**[ and humidity]** set points.
         2. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
         3. 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.
      2. DEMONSTRATION
         1. **[Engage a Company Field Advisor per OGS Spec Section 014216 to train] [Train]** Director’s Representative's Facility’s maintenance personnel to adjust, operate, and maintain computer-room air conditioners.

END OF SECTION 238123.13