SECTION 238123 – COMPUTER ROOM AIR-CONDITIONERS

This Section includes floor mounted air conditioning units specifically intended for computer room applications and ceiling mounted unitary computer room air conditioning units, and their accessories.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
   * + 1. SUMMARY
          1. Section includes air conditioning units, controls and control panels.
          2. Related Sections:

Section 230513 - Common Motor Requirements for HVAC Equipment: Product requirements for motors for placement by this section.

Section 232113 - Hydronic Piping: Execution requirements for water, glycol, and drain piping specified by this section.

Section 232116 - Hydronic Piping Specialties: Product requirements for hydronic piping specialties at unit connections.

Section 232213 - Steam and Condensate Heating Piping: Execution requirements for steam supply and steam condensate return piping specified by this section.

Section 232216 - Steam and Condensate Piping Specialties: Product requirements for steam piping specialties at unit connections.

Section 232300 - Refrigerant Piping: Execution requirements for refrigerant piping specified by this section.

Section 234000 - HVAC Air Cleaning Devices: Product requirements for filters for placement by this section.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. Air-Conditioning, Heating, and Refrigeration Institute

ARI 210/240 - Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment.

ARI 340/360 - Performance Rating of Commercial and Industrial Unitary Air-Conditioning & Air-Source Heat Pump Equipment.

* + - * 1. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

* + - * 1. American Society of Mechanical Engineers:

ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

* + - * 1. National Electrical Manufacturers Association:

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the
         2. General Conditions.
         3. Manufacturer’s installation instructions shall be provided along with product data.
         4. Submittals shall be provided in the order in which they are specified and tabbed (for
         5. combined submittals).

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Section 013300 - Submittal Procedures: Submittal procedures.
        2. Product Data: Submit manufacturers literature and data indicating [water,] drain, [refrigeration,] and electrical characteristics and connection requirements.
        3. Manufacturer's Installation Instructions: Submit procedures for rigging and making service connections.
        4. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
        5. Manufacturer's Field Reports: Indicate conditions at initial start-up including date, and initial set points.
      1. CLOSEOUT SUBMITTALS
         1. Section 017716 – Contract Closeout
         2. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.
      2. QUALITY ASSURANCE

Retain ARI 340/360 for commercial and industrial systems. Retain ARI 210/240 for all others.

* + - * 1. Performance Requirements: **<\_\_\_\_\_\_\_\_>**, Energy Efficiency Rating (EER) not less than prescribed by ASHRAE 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” when used in combination with compressors and evaporator coils when tested in accordance with **[ARI 210/240] [ARI 340/360]**.

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain one copy of each document on site.
      1. QUALIFICATIONS
         1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' **[documented]** experience **[, and with service facilities within [100] <\_\_\_\_\_\_\_\_> miles of Project]**.
         2. Installer: Company specializing in performing Work of this section with minimum three years' **[documented]** experience **[approved by manufacturer]**.
      2. PRE-INSTALLATION MEETINGS
         1. Section 013000 - Administrative Requirements: Pre-installation meeting.
         2. Convene minimum **[one] <\_\_\_\_\_\_\_\_>** week prior to commencing work of this section.
      3. DELIVERY, STORAGE, AND HANDLING
         1. Section 016500 – Materials and Equipment
         2. Accept computer room units on site in factory packing. Inspect for damage.
         3. Protect units from damage by storing away from computer room until floor and ceiling are installed.
      4. WARRANTY
         1. Section 017716 – Contract Closeout
         2. Furnish **[five] <\_\_\_\_\_\_\_\_>**-year manufacturer's warranty for **[refrigeration compressors.] [entire unit.] <\_\_\_\_\_\_\_\_.>**
      5. MAINTENANCE SERVICE
         1. Section 017716 – Contract Closeout

Evaluate need for maintenance and emergency service based Project requirements. If desired, retain the following paragraphs.

* + - * 1. Furnish service and maintenance of units for **[one] [five] <\_\_\_\_\_\_\_\_>** years from Date of Substantial Completion.
        2. Examine unit components **[weekly] [semi-monthly] [monthly] [bi-monthly]**. Clean, adjust, and lubricate equipment.
        3. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.
        4. Perform work without removing units from service during building normal occupied hours.
        5. Provide emergency call back service **[at all hours] [during working hours]** for this maintenance period.
        6. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.
        7. Perform maintenance work using competent and qualified personnel under supervision [and in direct employ] of manufacturer or original installer.
        8. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of **[Director’s Representative.] <\_\_\_\_\_\_\_\_.>**
      1. EXTRA MATERIALS
         1. Section 017716 – Contract Closeout
         2. Furnish **[one] <\_\_\_\_\_\_\_\_>** set of filters for each unit.

1. PRODUCTS
   * + 1. FLOOR MOUNTED AIR CONDITIONING UNITS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Compu-Aire, Inc.

Data Aire Inc.

Liebert; Vertiv Holdings Co.

Stulz-ATS.

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Packaged, **[water] [glycol] [air]** cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fans filters, humidifier and controls, reheat and heating coils.
        2. Assembly: **[Up-flow] [Down-flow]** air delivery, in **[draw-through] [or] [blow-through]** configuration.
        3. Cabinet and Frame:

Structural Frame: **[10] [14] <\_\_\_\_\_\_\_\_>** gage welded steel suitably braced for rigidity, capable of supporting compressors and other mechanical equipment and fittings **[with welded tubular steel floor stand with adjustable legs and vibration isolation pads]**.

Doors and Access Panels: **[18] [20] <\_\_\_\_\_\_\_\_>** gage **[galvanized]** steel with polyurethane gaskets, hinges to allow removal of panels, and concealed fastening devices.

Insulation: Thermally and acoustically line cabinet interior with 1 inch thick acoustic duct liner.

Finish of Exterior Surfaces: Baked-on textured vinyl enamel; **[<\_\_\_\_\_\_\_\_> color.] [to match computer equipment.] [as selected.]**

* + - * 1. Evaporator Fans and Motors:

Fans: Double inlet, forward curved centrifugal fans, statically and dynamically balanced **[,] [on steel shaft with self-aligning [grease] [permanently**] lubricated ball bearings] [and V-belt drive.] [and direct drive.]

Motor: Drip proof, permanently lubricated ball bearing motor with built-in current and overload protection.

V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed, variable and adjustable pitch motor sheave, minimum of two matched belts, drive rated minimum 2.0 times nameplate rating of motor.

* + - * 1. Compressors:

Type: **[Semi-hermetic with suction gas cooled motors, vibration isolators, thermal overloads, oil sight glass, manual reset high pressure switch and pump down low pressure switch. Suction line strainer, reversible oil pumps, 1750 rpm] [or] [Hermetic with resilient suspension system, oil strainer, crankcase sight glass, internal motor protection, low pressure switch, manual reset high pressure switch]**.

Compressors: Individually serviceable without dismantling other components **[or removing unit from service]**.

Refrigeration Circuits: Two, each with hot gas mufflers, thermal expansion valve with external equalizer, liquid line solenoid valve, liquid line filter-drier, refrigerant sight glass with moisture indicator, service shut-off valves and charging valves **[and accumulator sized for liquid seal under light load]**.

* + - * 1. Evaporator Coils:

**[Alternate row] [Split face]** circuits, direct expansion cooling coils of seamless copper tubes expanded into aluminum fins **[in A-frame configuration] [in vertical flat face configuration]**.

Mount coil assembly in stainless steel drain pan.

* + - * 1. Condensers:

Select applicable type of condenser.

**[Water] [Glycol]** Cooled: **[Shell and tube type ASME Section VIII] [or] [Coaxial tube in tube type]** with liquid line stop valve and head pressure actuated water regulating valve. Terminate outside cabinet for easy external connections.

Air Cooled: Corrosion resistant cabinet, copper tube aluminum fin coils arranged for two circuits, multiple direct drive propeller fans with **[permanently lubricated ball bearing]** single phase motors with internal overload protection. Furnish capacity control by **[cycling fans] [cycling fans and modulating one fan]**.

* + - * 1. **[Chilled Water] [Hot Water Reheat] [Steam Reheat] [Glycol Cooling]** Coil:

Seamless copper tubes expanded into aluminum fins with **[three way modulated valve.] [two way modulating control valve and strainer.] [two way modulating control valve, strainer, and float and thermostatic trap.] [head pressure actuated three way glycol regulating valve.]**

* + - * 1. Filters:

Media: Pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid; enclosed in cardboard frame; **[2 inch] [4 inch]** nominal thickness.

Rating, ASHRAE 52.1 “Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter”:

Dust spot efficiency: **[25-30] <\_\_\_\_\_\_\_\_>** percent.

Weight arrestance: **[90-92] <\_\_\_\_\_\_\_\_>** percent.

Initial resistance at 500 fpm face velocity: **[0.30 inch wg] [<\_\_\_\_\_\_\_\_> inch wg]**.

Recommended final resistance: **[1.0 inch wg] [<\_\_\_\_\_\_\_\_> inch wg]**.

* + - * 1. Refrigerant Reheat Coil:

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

* + - * 1. Reheat/heating Coils:

Heating Coils: Enclosed fin electrical elements arranged for minimum of **[two] [three]** stages.

Circuit Protection: Primary and secondary thermal cutouts, differential air pressure switch, and manual reset overload protection and branch circuit overcurrent protection.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

**[Hot water] [Steam]** heating coil of seamless copper tubes expanded into aluminum fins.

* + - * 1. Humidifier:

Select appropriate humidifier type or indicate several types are acceptable. Most manufacturers differ.

Infrared Type: High intensity quartz lamps mounted above stainless steel evaporator pan, serviceable without disconnecting water, drain, or electrical connections; pre-piped and utilizing condensate water from cooling coils with stainless steel or brass float valve mechanism; located in bypass air stream **[;] [.] [with flush cycle timer and solenoid drain valve.]**

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Evaporative Pan Type: Stainless steel pan and cover, serviceable without disconnecting water, drain, or electrical connections; pre-piped with stainless steel or brass float valve mechanism; electric heating coil and low water cut-off switch; with flush cycle timer and solenoid drain valve.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Electrode Steam Type:

Type: Self contained replaceable cylinder, microprocessor controlled electrode steam generating unit.

Cylinders: **[Disposable] [Cleanable]**, polypropylene plastic with field adjustable steel electrodes.

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 on drain.

Cabinet: Steel, 16 gage with enamel finish, with hinged and lockable access door.

Control: Fully modulating control for gradual 0 to 100 percent capacity with field adjustable maximum capacity; high water probe.

Drain Cycle: Field adjustable drain duration and drain interval.

Steam Distributor: Stainless steel steam dispersion tube.

* + - * 1. Remote Glycol Cooler:

Corrosion resistant **[aluminum] <\_\_\_\_\_\_\_\_>** cabinet with copper tube aluminum fin coils and multiple direct drive propeller fans with fan guard and [permanently lubricated ball bearing] single-phase motors with internal overload protection. Furnish capacity control by **[cycling fans] [cycling fans and modulating one fan]**.

* + - * 1. Glycol Pump Package:

Cabinet: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame.

Pumps: **[One] [Two]** centrifugal pumps with mechanical seal. **[Refer to Section 232123.]**

Controls: Electrical control cabinet with starters, disconnect, lead/lag switch, and automatic switchover and alarm light.

Piping: Interconnecting piping, from suction to discharge with shut-off valves, flow switches, check valves in pump discharge, unions, and pressurized expansion tank with air purge vent and system charging connection.

* + - * 1. Control Cabinet: NEMA 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”; Type **[2] <\_\_\_\_\_\_\_\_>** enclosure, UL listed, with piano hinged door, grounding lug, combination magnetic starters with overload relays, circuit breakers and cover interlock, and fusible control circuit transformer.
        2. Disconnect Switch: Non-automatic molded case circuit breaker with handle accessible with panel closed **[and capable of preventing access until switched to "off" position]**.

The following article is representative of standard electronic controls offered by most manufacturers.

* + - * 1. 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.

Monitor Panel: Back lighted with no visible indicator lights until operating function is activated; indicators include cooling, humidification, loss of air flow, change filters, high temperature, low temperature, high humidity, low humidity, high head pressure (each compressor), and low suction pressure (each compressor).

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 indicate mode of operation.

Location: Through hinged door in front of unit; isolated from conditioned air stream to allow service while system is operating.

The following article is representative of optional microprocessor controls offered by most manufacturers.

* + - * 1. Microprocessor Control System:

Logic Circuitry: Microprocessor continuously monitors operation of process cooling system; continuously displays room temperature and room relative humidity; sounds alarm on system malfunction and simultaneously displays problem. When more than one malfunction occurs, display fault in sequence with room temperature, capability of remembering alarm even when malfunction is cleared, and continue to display fault until reset.

Malfunctions:

Power Loss.

Loss of Air Flow.

Clogged Air Filter.

High Room Temperature.

Low Room Temperature.

High Humidity.

Low Humidity.

[Smoke/Fire.]

Compressor No. 1 - Overload.

Compressor No. 1 - Low Pressure.

Compressor No. 1 - High Pressure.

Compressor No. 2 - Overload.

Compressor No. 2 - Low Pressure.

Compressor No. 2 - High Pressure.

[Water-Under-Floor.]

Supply Fan Overload.

Light Emitting Diodes Display: Control Power On, System On, Humidification, De-humidification taking place, Compressor No. 1 operating, Compressor No. 2 operating, Heat or Reheat operating, Economy Cooling.

Push Buttons: To STOP process cooling system, START process cooling system, SILENCE audible alarm, push-to-test LED indicators, and display room relative humidity.

Remote Signaling: Furnish termination for remote signaling of system status and alarms.

* + - * 1. Performance:

Select the following paragraphs for water-cooled, glycol-cooled, or air-cooled units, with appropriate options, and insert performance requirements. Use for one or identical units. When specifying units of differing sizes, use schedules.

Cooling:

Capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Air flow: <\_\_\_\_\_\_\_\_> cfm.

Air entering evaporator: <\_\_\_\_\_\_\_\_> degrees F DB and <\_\_\_\_\_\_\_\_> degrees F WB.

Air leaving evaporator: <\_\_\_\_\_\_\_\_> degrees F DB and <\_\_\_\_\_\_\_\_> degrees F WB.

Number of evaporator fans: **[one] [two]** <\_\_\_\_\_\_\_\_>.

Evaporator fan motors: <\_\_\_\_\_\_\_\_> hp.

**[Water] [Glycol]** Cooled:

Condenser water flow: **<\_\_\_\_\_\_\_\_>** gpm.

Condenser entering water: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of condenser fans: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Condenser fan motors: **<\_\_\_\_\_\_\_\_>** hp.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Air Cooled:

Entering air: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of condenser fan motors: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Condenser fan motors: **<\_\_\_\_\_\_\_\_>** hp.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Glycol Cooling:

Coil capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Entering air: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Leaving air: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Glycol flow: **<\_\_\_\_\_\_\_\_>** gpm.

Entering glycol: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of pumps: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Pump motors: **<\_\_\_\_\_\_\_\_>** hp.

Reheat:

Capacity: <\_\_\_\_\_\_\_\_> Btu/hr.

Water flow: <\_\_\_\_\_\_\_\_> gpm.

Entering water: <\_\_\_\_\_\_\_\_> degrees F.

Leaving water: <\_\_\_\_\_\_\_\_> degrees F.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Reheat:

Capacity: <\_\_\_\_\_\_\_\_> Btu/hr.

Steam flow: <\_\_\_\_\_\_\_\_> lb./hr.

Steam pressure: <\_\_\_\_\_\_\_\_> psig.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Reheat:

Capacity: <\_\_\_\_\_\_\_\_> Btu/hr.

Humidifier:

Total capacity: <\_\_\_\_\_\_\_\_> lb./hr.

Input: <\_\_\_\_\_\_\_\_> W.

* + - 1. CEILING MOUNTED AIR CONDITIONING UNITS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: 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.

Compu-Aire, Inc.

Data Aire Inc.

Liebert; Vertiv Holdings Co.

Stulz-ATS.

Approved equivalent.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Product Description: Self-contained **[water] [glycol] [air]** cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fan, filters, **[humidifier,]** controls.
        2. Assembly: For horizontal ceiling mounting to fit 24 x 48 inches T-bar ceiling opening.
        3. Cabinet: **[10] [14] <\_\_\_\_\_\_\_\_>** gage welded steel with baked enamel finish, and lined with 1/2 inch thick acoustic duct liner.
        4. Evaporator Fan: Forward curved centrifugal, directly driven by two-speed motor.
        5. Compressor: Hermetic with resilient suspension system, oil strainer, internal motor overload protection, low pressure switch, manual reset high-pressure switch.
        6. Evaporator Coil: Direct expansion cooling coil of seamless copper tubes expanded into aluminum fins, with thermal expansion valve with external equalizer, liquid line filter-drier, service shut-off valves and charging valves. Mount coil assembly in stainless steel drain pan.

Select applicable type of condenser.

* + - * 1. Water **[(Glycol)]** Cooled Condenser: Coaxial counter flow tube-in-tube type with liquid line stop valve and head pressure actuated water regulating valve, sized for rated capacity with **<\_\_\_\_\_\_\_\_>** gpm water entering at **<\_\_\_\_\_\_\_\_>** degrees F.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Air Cooled Condenser: Integral copper tube aluminum fin coil sized for rated capacity at **[95] <\_\_\_\_\_\_\_\_>** degrees F with **[fan driven by double shafted evaporator fan motor] [remote fan package]**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Remote Air Cooled Condenser: Integral copper tube aluminum fin coil sized for rated capacity at **[95] <\_\_\_\_\_\_\_\_>** degrees F with **[fan driven by double shafted evaporator fan motor] [remote fan package]**.
        2. Filter: 1 inch thick disposable glass fiber media.
        3. Heating Coils: Nichrome wire electric elements with contactor, dehumidification relay, and high temperature limit switch.

Select appropriate humidifier type or indicate several types are acceptable. Type of humidifier differs between manufacturers. Humidifiers are optional on this type of equipment.

* + - * 1. Atomizing Humidifier: Centrifugal atomizer with stainless steel pan, demister pad, and solenoid valve.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Evaporative Pan Type: Stainless steel pan and cover, with stainless steel or brass float valve mechanism, electric heating coil with low water cut-off switch, flush cycle timer and solenoid drain valve.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Electrode Steam Type: Self contained type with replaceable cylinder, microprocessor controlled.
        2. Remote Glycol Cooler:

Cooler: Corrosion resistant cabinet with copper tube aluminum fin coil, direct drive propeller fan with fan guards and **[permanently lubricated ball bearing,] [multiple speed,]** single phase **<\_\_\_\_\_\_\_\_>** hp fan motors with internal overload protection.

Pump: In-line type centrifugal pump with mechanical seal, **<\_\_\_\_\_\_\_\_>** hp.

Controls: Electrical control cabinet with starters, relays, and disconnects.

Piping: Interconnecting piping, from suction to discharge with shut-off valves, flow switch, check valve in pump discharge and unions.

Glycol: Inhibited **[ethylene] [propylene]** glycol and water solution mixed **[50-50] <\_\_\_\_\_\_\_\_>** suitable for operation temperature of **[-40] <\_\_\_\_\_\_\_\_>** degrees F.

Expansion Tank: **[Diaphragm] [Open]** expansion tank and vent fitting with air separator, **[automatic air vent,]** and system charging connection.

* + - * 1. Remote Air Cooled Condenser: Corrosion resistant cabinet, copper tube aluminum fin coils arranged for **[two] <\_\_\_\_\_\_\_\_>** circuits, multiple direct drive propeller fans with **[permanently lubricated ball bearing]** single phase motors with internal overload protection. Furnish capacity control by **[cycling fans] [cycling fans and modulating one fan]**.
        2. Control System:

Unit Mounted: Main fan contactor, compressor [and condenser fan] contactor, compressor start capacitor, controls transformer with circuit breaker, solid state temperature **[and humidity]** control modules, **[humidity contactor, time delay relay, reheat contactor, and high temperature thermostat]**.

Solid state [wall] [unit] mounted with start/stop switch, **[adjustable humidity setpoint,]** adjustable temperature setpoint.

* + - * 1. Performance:

Select the following paragraphs for water-cooled units or air-cooled units, with appropriate options, and insert performance requirements. Use for one or identical units. When specifying units of differing sizes, use schedules.

Cooling:

Capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Air flow: **<\_\_\_\_\_\_\_\_>** cfm.

Air entering evaporator: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Air leaving evaporator: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Number of evaporator fans: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Evaporator fan motors: **<\_\_\_\_\_\_\_\_>** hp.

**[Water] [Glycol]** Cooled:

Condenser water flow: **<\_\_\_\_\_\_\_\_>** gpm.

Condenser entering water: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of condenser fans: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Condenser fan motors: **<\_\_\_\_\_\_\_\_>** hp.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Air Cooled:

Entering air: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of condenser fan motors: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Condenser fan motors: **<\_\_\_\_\_\_\_\_>** hp.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Glycol Cooling:

Coil capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Entering air: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Leaving air: **<\_\_\_\_\_\_\_\_>** degrees F DB and **<\_\_\_\_\_\_\_\_>** degrees F WB.

Glycol flow: **<\_\_\_\_\_\_\_\_>** gpm.

Entering glycol: **<\_\_\_\_\_\_\_\_>** degrees F.

Number of pumps: **[one] [two] <\_\_\_\_\_\_\_\_>**.

Pump motors: **<\_\_\_\_\_\_\_\_>** hp.

Reheat:

Capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Water flow: **<\_\_\_\_\_\_\_\_>** gpm.

Entering water: **<\_\_\_\_\_\_\_\_>** degrees F.

Leaving water: **<\_\_\_\_\_\_\_\_>** degrees F.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Reheat:

Capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Steam flow: **<\_\_\_\_\_\_\_\_>** lb./hr.

Steam pressure: **<\_\_\_\_\_\_\_\_>** psig.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Reheat:

Capacity: **<\_\_\_\_\_\_\_\_>** Btu/hr.

Humidifier:

Total capacity: **<\_\_\_\_\_\_\_\_>** lb./hr.

Input: **<\_\_\_\_\_\_\_\_>** W.

* + - 1. ELECTRICAL CHARACTERISTICS AND COMPONENTS

Select one or more of the following subparagraphs appropriate to equipment requirements.

* + - * 1. Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_>hp.] [<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

<\_\_\_\_\_\_\_\_> percent minimum power factor at rated load.

* + - * 1. Motors: In accordance with Section 230513.
        2. Disconnect Switch: Factory mount **[in control panel] [on equipment]**.

1. EXECUTION
   * + 1. EXAMINATION
          1. Section 013000 - Administrative Requirements: Coordination and project conditions.
          2. Verify computer-flooring system is ready to receive work and opening dimensions are as **[indicated on shop drawings.] [instructed by manufacturer.]**
          3. Verify ceiling system is ready to receive work and opening dimensions are as **[indicated on shop drawings.] [instructed by manufacturer.]**
       2. INSTALLATION
          1. Coordinate installation of computer room air conditioning units with computer room raised floor.
          2. Coordinate installation of air conditioning unit with computer room ceiling.
          3. Install the following piping accessories on **[condenser] [chilled]** water piping connections. Refer to Section 232116 and Section 232113.

On inlet:

Thermometer well and thermometer.

Strainer.

Flow switch.

Flexible pipe connection.

Pressure gage.

Shut-off valve.

On outlet:

Thermometer well and thermometer.

Flexible pipe connection.

Pressure gage.

**[Shut-off] [Balancing]** valve.

* + - * 1. Install drainage piping connections for **[water cooled units] [condensate]** and humidifier flushing system. Refer to Section 232113.
        2. Install hot water heating piping connections to reheat coils. Install shut-off valves in hot water heating inlet and outlet piping. Refer to Section 232113.
        3. Install steam piping connections to steam heating coils. Install shut-off valves in steam supply piping and in condensate outlet piping. Install steam trap in condensate outlet piping. Refer to Section 232216 and Section 232213.
        4. Install refrigerant piping connections to air-cooled condensing units. Refer to Section 232300.
        5. Install accessories furnished loose for field mounting.
        6. Install electrical devices furnished loose for field mounting.
        7. Install control wiring between control panel and field mounted control devices.
        8. Provide connection to electrical service. Refer to Section 260503.
      1. FIELD QUALITY CONTROL
         1. Test and record for maintenance of room conditions over continuous 24-hour period.
         2. Adjust and balance and repeat test when necessary to demonstrate compliance with performance.
      2. MANUFACTURER'S FIELD SERVICES
         1. Furnish services of Company Field Advisor per OGS Spec Section 014216 for minimum of **[one] <\_\_\_\_\_\_\_\_>** days to start-up, calibrate controls, and instruct Facility maintenance personnel on operation and maintenance.
         2. Set initial temperature and humidity set points.
      3. DEMONSTRATION
         1. Section 017716 – Contract Closeout
         2. Demonstrate system operations and verify specified performance.
         3. Demonstrate alarm conditions.
      4. SCHEDULES

Include schedule when more than one unit is required. No units of measurement are indicated; these may be added to schedule legend or included within each insert. Coordinate equipment tags and abbreviations with project specific requirements.

Consider the following examples when developing Project schedule.

* + - * 1. Computer Room Air Conditioning Unit Schedule:

Equipment Tag: **<CAC-1>**:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: **<\_\_\_\_\_\_\_\_>**.

Cooling Capacity:

Total: **<\_\_\_\_\_\_\_\_>**.

Sensible: **<\_\_\_\_\_\_\_\_>**.

Evaporator:

Air Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Entering Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Evaporator Fan Motors: **<\_\_\_\_\_\_\_\_>**.

Condenser:

Water Flow Rate: **<\_\_\_\_\_\_\_\_>**.

[Water] [Ambient Air] Temperature: **<\_\_\_\_\_\_\_\_>**.

Fan Motors: **<\_\_\_\_\_\_\_\_>**.

Glycol Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Glycol Temperature: **<\_\_\_\_\_\_\_\_>**.

Reheat:

Capacity: **<\_\_\_\_\_\_\_\_>**.

Water Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Water Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Water Temperature: **<\_\_\_\_\_\_\_\_>**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Steam Flow: **<\_\_\_\_\_\_\_\_>**.

Steam Pressure: **<\_\_\_\_\_\_\_\_>**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Power Input: **<\_\_\_\_\_\_\_\_>**.

Glycol Cooling:

Total Capacity: **<\_\_\_\_\_\_\_\_>**.

Entering Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Entering Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Glycol Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Glycol Temperature: **<\_\_\_\_\_\_\_\_>**.

Glycol Pump Motors: **<\_\_\_\_\_\_\_\_>**.

Humidifier:

Capacity: **<\_\_\_\_\_\_\_\_>**.

Power Input: **<\_\_\_\_\_\_\_\_>**.

Equipment Tag: **<CAC-2>**:

**[Manufacturer: <\_\_\_\_\_\_\_\_>.]**

**[Model: <\_\_\_\_\_\_\_\_>.]**

Location: **<\_\_\_\_\_\_\_\_>**.

Cooling Capacity:

Total: **<\_\_\_\_\_\_\_\_>**.

Sensible: **<\_\_\_\_\_\_\_\_>**.

Evaporator:

Air Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Entering Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Evaporator Fan Motors: **<\_\_\_\_\_\_\_\_>**.

Condenser:

Water Flow Rate: **<\_\_\_\_\_\_\_\_>**.

[Water] [Ambient Air] Temperature: **<\_\_\_\_\_\_\_\_>**.

Fan Motors: **<\_\_\_\_\_\_\_\_>**.

Glycol Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Glycol Temperature: **<\_\_\_\_\_\_\_\_>**.

Reheat:

Capacity: **<\_\_\_\_\_\_\_\_>**.

Water Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Water Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Water Temperature: **<\_\_\_\_\_\_\_\_>**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Steam Flow: **<\_\_\_\_\_\_\_\_>**.

Steam Pressure: **<\_\_\_\_\_\_\_\_>**.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Power Input: **<\_\_\_\_\_\_\_\_>**.

Glycol Cooling:

Total Capacity: **<\_\_\_\_\_\_\_\_>**.

Entering Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Entering Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Dry Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Leaving Air Wet Bulb Temperature: **<\_\_\_\_\_\_\_\_>**.

Glycol Flow Rate: **<\_\_\_\_\_\_\_\_>**.

Entering Glycol Temperature: **<\_\_\_\_\_\_\_\_>**.

Glycol Pump Motors: **<\_\_\_\_\_\_\_\_>**.

Humidifier:

Capacity: **<\_\_\_\_\_\_\_\_>**.

Power Input: **<\_\_\_\_\_\_\_\_>**.

END OF SECTION 238123