SECTION 23 81 23 – COMPUTER ROOM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of computer room air conditioning units:

1. Floor-mounting units 6 tons and larger.
2. Floor-mounting units 5 tons and smaller.
3. Ceiling-mounting units.
4. Console units.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include details of installation and wiring diagrams.

C. Manufacturer Seismic Qualification Certification: Submit certification that computer-room air-conditioning units, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for Mechanical Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports.

E. Operation and maintenance data.

F. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Owner’s Representative, and marked for intended use.

B. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. Energy Efficiency Ratio: Equal to or greater than prescribed by Seattle Energy Code.

D. Coefficient of Performance: Equal to or greater than prescribed by Seattle Energy Code.

E. ASME Compliance: Fabricate and label water-cooled condenser shell to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 01.

F. Units shall be designed to operate with HCFC-free refrigerants.

1.4 COORDINATION

A. Coordinate layout and installation of computer room air conditioning units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, and partition assemblies.

B. Coordinate installation of computer room air conditioning units with computer room access flooring Installer.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of computer-room air-conditioning units that fail in materials or workmanship within specified warranty period.

B. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

C. Warranty Period for Humidifiers: Manufacturer's standard, but not less than five years from date of Substantial Completion.

D. Warranty Period for Control Boards: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FLOOR MOUNTING UNITS 6 TONS AND LARGER

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

1. Compu-Aire, Inc.

2. Data Aire Inc.
3. Liebert Corporation.
4. Stulz Investment Corp. of America.

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

1. Assembly: Downflow air delivery, in [**draw**] [**blow**]-through configuration.

C. Cabinet and Frame: Welded steel, suitably braced for rigidity, supporting compressors and other mechanical equipment and fittings; with floor stand with adjustable legs and vibration isolation pads.

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- thick duct liner.
3. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel, color as selected from manufacturer's standard colors or to match computer equipment as selected by the Owner.
4. Floor Stand: Welded tubular steel, [**12**] [**18**] inch high.

D. Evaporator Fan: Double inlet, forward curved, centrifugal, and statically and dynamically balanced.

1. Drive: V-belt drive 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.
2. Motor: Comply with requirements in Division 23 Section "Electric Motors for Mechanical Equipment."
    a. Noise Rating: Quiet.

E. Compressors: [**Semi-hermetic reciprocating with suction gas cooled, 1750-rpm motors; thermal overloads; oil sight glass; suction line strainer; and reversible oil pumps;**] [**Hermetic reciprocating;**] [**Hermetic scroll;**] with oil strainer, internal motor overload protection, resilient suspension system, crankcase heater, manual-reset high pressure switch, and pumpdown low pressure switch.

1. 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, accumulator sized for liquid seal under light load, and charge of refrigerant.
2. Refrigerant: [**R-407C**] [**R-410A**].

F. Evaporator Coil: Alternate row or split face circuit, direct expansion coil of seamless copper tubes expanded into aluminum fins. Mount coil assembly over stainless steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

G. Water-Cooled Condenser: [**Shell-and-tube type fabricated and labeled according to ASME Boiler and Pressure Vessel Code, Section VIII,**] [**Coaxial tube-in-tube type**] with liquid line stop valve and head pressure-actuated, [**two**] [**three**]-way, water regulating valve. Terminate water connections outside cabinet.

H. Air Cooled 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, integral electric control panel, and disconnect switch. Control capacity by cycling fans.

I. Chilled Water Coil: Seamless copper tubes expanded into aluminum fins with modulating control valve. Mount coil assembly over stainless steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

OR

J. Glycol Cooling Coil: Seamless copper tubes expanded into aluminum fins with three-way control valve.

OR

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

L. 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.

M. Filter: Pleated, lofted, nonwoven, reinforced cotton fabric; supported and bonded to welded-wire grid; enclosed in cardboard frame[**with 2 inch thick, disposable, glass fiber prefilter**].

1. Nominal Thickness: [**2 inches**] [**4 inches**].
2. Dust-Spot Efficiency: [**20**] [**30**] [**65**] percent.
3. Weight Arrestance: 90 to 92 percent.
4. Initial Resistance at 500 FPM Face Velocity: 0.30 inch wg.
5. Recommended Final Resistance: 1 inch wg.

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

OR

O. Evaporative Pan Humidifier: Stainless-steel pan and cover, serviceable without disconnecting water, drain, or electrical connections; prepiped with stainless-steel or brass float valve mechanism; electric resistance heating coil with low-water-cutoff switch; flush cycle timer; and solenoid drain valve.

OR

P. 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 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.
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.

Q. Remote Glycol 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, integral electric control panel, and disconnect switch. Control capacity by cycling fans.

R. Glycol Pump Package: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing two centrifugal pumps with mechanical seals; electrical control cabinet with starters, disconnect switch, lead lag switch, automatic switchover, and alarm light.

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

S. 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.

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

U. Electronic Control System: Solid state, with start button, stop button, temporary loss of power indicator, manual reset circuit breakers, temperature control, humidity control, and monitor panel.

1. Monitor Panel: Backlighted, with no visible indicator lights until operating function is activated; indicators include cooling, humidification, loss of airflow, change filters, high temperature, low temperature, high humidity, low humidity, high head pressure (each compressor), and low suction pressure (each compressor).
2. Temperature and Humidity Control Modules: Solid state, plug-in; with adjustable set point, push-to-test calibration check button, and built-in visual indicators to show mode of operation.
3. Location: Behind hinged door in front of unit; isolated from conditioned airstream to allow service while system is operating.

V. 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. LED 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 LED indicators, and display room relative humidity.
4. Remote Signaling: Provide terminals for remote signaling of system status and alarms.

2.2 FLOOR MOUNTING UNITS 5 TONS AND SMALLER

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

1. Compu-Aire, Inc.
2. Data Aire Inc.
3. Liebert Corporation.
4. Stulz Investment Corp. of America.

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: Welded tubular steel frame with removable steel panels with baked enamel finish, insulated with 1 inch thick duct liner.

1. Floor Stand: Welded tubular steel, [**12**] [**18**] inch high.

D. Evaporator Fan: Forward curved, centrifugal, with adjustable V-belt drive.

1. Motor: Comply with requirements in Division 23 Section "Electric Motors for Mechanical Equipment."

a. Noise Rating: Quiet.

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

1. 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.
2. Refrigerant: [**R-407C**] [**R-410A**].

F. Evaporator Coil: Direct-expansion cooling coil of seamless copper tubes expanded into aluminum fins, with two circuits, each with solenoid valve. Mount coil assembly over stainless-steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

G. Water Cooled Condenser: Brazed plate type with liquid-line stop valve and head pressure actuated, water regulating valve.

H. Air Cooled Condenser: Integral copper tube aluminum fin coil with propeller fan, direct driven.

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

I. Chilled Water Coil: Seamless copper tubes expanded into aluminum fins with modulating control valve. Mount coil assembly over stainless-steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

J. Glycol Cooling Coil: Seamless copper tubes expanded into aluminum fins with three-way control valve.

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

L. Filter: 2 inch thick, disposable, glass-fiber media with 20 percent dust-spot efficiency.

M. 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.

OR

N. 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 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.
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.

O. Remote Glycol Cooler: Corrosion resistant cabinet, copper-tube aluminum-fin coil, direct-drive propeller fan with fan guards, and single-phase motors with internal overload protection.

P. Glycol 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.

Q. 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, reheat contactor, and high temperature thermostat. Provide solid state, wall mounting control panel with start-stop switch, adjustable humidity setpoint, and adjustable temperature setpoint.

2.3 CEILING-MOUNTING UNITS

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

1. Compu-Aire, 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 horizontal ceiling mounting to fit 24 by 48 inch T-bar ceiling opening.

C. Cabinet: Galvanized steel with baked-enamel finish, insulated with 1/2 inch thick duct liner.

D. Evaporator Fan: Forward curved, centrifugal, and directly driven by two speed motor.

1. Motor: Comply with requirements in Division 23 Section "Electric Motors for Mechanical Equipment."
   a. Noise Rating: Quiet.

E. Compressor: Hermetic, with resilient suspension system, oil strainer, and internal motor overload protection.

1. 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.
2. Refrigerant: [**R-407C**] [**R-410A**].

F. Evaporator Coil: Direct-expansion cooling coil of seamless copper tubes expanded into aluminum fins. Mount coil assembly over stainless-steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

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

H. Air Cooled Condenser: Integral copper tube aluminum fin coil with propeller fan, direct driven.

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

I. Chilled-Water Coil: Seamless copper tubes expanded into aluminum fins with modulating control valve. Mount coil assembly over stainless-steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

J. Electric Resistance Heating Coil: Finned-tube electric elements with contactor, dehumidification relay, and high temperature limit switch.

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

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

OR

M. 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 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.
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.

N. 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, reheat contactor, and high temperature thermostat. Provide solid state, wall mounting control panel with start-stop switch, adjustable humidity setpoint, and adjustable temperature setpoint.

2.4 CONSOLE UNITS

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

1. Compu-Aire, Inc.
2. Data Aire Inc.
3. Liebert Corporation.
4. Stulz Investment Corp. of America.

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, two speed motor, and cleanable foam filter.

1. Motor: Comply with requirements in Division 23 Section "Electrical Motors for Mechanical Equipment."

a. Noise Rating: Quiet.

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

E. Compressor: Hermetic, with resilient suspension system, oil strainer, and internal motor overload protection.

1. Refrigeration Circuit: Crankcase heater, 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.
2. Refrigerant: [**R-407C**] [**R-410A**].

F. Evaporator Coil: Direct expansion cooling coil of seamless copper tubes expanded into aluminum fins. Mount coil assembly over stainless-steel drain pan[**having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir**].

G. Air-Cooled Condenser: Integral copper-tube aluminum fin coil with propeller fan, direct driven.

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

H. Chilled-Water Coil: Seamless copper tubes expanded into aluminum fins with modulating control valve. Mount coil assembly over stainless steel drain pan[**having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir**].

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

J. Filter: 1 inch thick, disposable, glass fiber media.

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

L. Remote Glycol Cooler: Corrosion resistant cabinet with copper tube aluminum fin coil, direct drive propeller fan with fan guard, and single phase motor with internal overload protection.

M. Glycol Pump Package: Weatherproof and vented enclosure of enameled, galvanized steel on structural base frame containing centrifugal pump with mechanical seal; pressurized expansion tank with air purge vent and system charging connection.

N. 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 setpoint, and adjustable temperature setpoint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install computer room air conditioning units level and plumb, maintaining manufacturer's recommended clearances. Install according to ARI Guideline B.

B. Curb Support: Install and secure roof-mounting units on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

C. Install suspended components level. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.

D. Install air cooled condenser on rubber-in-shear vibration isolators.

E. Install remote glycol cooler on rubber-in-shear vibration isolators.

F. Install glycol pump package on rubber-in-shear vibration isolators.

G. Install floor mounting units on bases designed to withstand, without damage to equipment, seismic forces required by code.

H. Support suspended units from structure using threaded steel rods and spring hanger having 1 inch deflection. Vibration control devices and installation requirements are specified in Division 23 Section "Vibration and Seismic Controls for Mechanical Piping and Equipment."

3.2 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 Sections. Provide adequate connections for condensate drain and humidifier flushing system.

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

H. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

J. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections**,** and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
2. After installing computer room air conditioning units 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. Subject completed systems to an operating test as stipulated in the Mechanical Refrigeration Ordinance, Field Test Section, 14.1-3 and Instructions, 15.1-7. The Owner’s Representative will witness this test.

3.4 STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service.

B. Verify that computer room air conditioning units are installed and connected according to manufacturer's written instructions and the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.

D. Complete installation and startup checks according to manufacturer's written instructions.

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 site outside normal occupancy hours for this purpose, without additional cost.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain computer-room air-conditioning units. Refer to Division 01 Section "Project Closeout."

END OF SECTION 23 81 23