

SECTION 15787 - COMPUTER ROOM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Provide computer room air conditioning units required by this section as indicated by requirements of this section.
- B. Types of computer room air conditioning units specified in this section include the following:
 - 1. Chilled water computer room units.
 - 2. Air Cooled computer room units.
 - 3. Water Cooled computer room units.
 - 4. Glycol Cooled computer room units.
- C. Electrical Work: Refer to Division-15 section "Mechanical/ Electrical Requirements for Mechanical Equipment" for requirements.

OR

Electrical Work: Provide the following wiring as work of this section, in accordance with requirements of Division 16:

- 1. Low voltage control wiring between computer room units and remote mounted thermostats and controls.
 - 2. Provide factory-mounted and factory-wired controls and electrical devices as specified in this section.
 - D. Provide factory-mounted and wired controls and electrical devices as specified in this section.
 - E. Refer to Division-16 sections for other electrical work including motor starters, disconnects, wires/cables, raceways, and other required electrical devices; not work of this section.
- 1.2 REFRIGERANTS:
- A. All refrigerants used for each condensing unit shall be on the latest EPA list of approved refrigerants & environmentally friendly.
 - B. No CFC based refrigerants shall be used.
- 1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of computer room air conditioning units, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
 - B. Codes and Standards:
 - 1. ARI Compliance: Provide capacity ratings for computer room air conditioning units in accordance with ARI Standard 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".

2. ASHRAE Compliance: Construct refrigerating system of computer room air conditioning units in accordance with ASHRAE Standard 15 "Safety Code for Mechanical Refrigeration".
3. UL Compliance: Provide computer room air conditioning units which are UL-listed and labeled.
4. NEC Compliance: Install computer room air conditioning units in accordance with National Electrical Code.

1.4 SUBMITTALS:

- A. Each manufacturer shall describe in writing, how their company is addressing the CFC legislation issue. Provide equipment capable of accepting a substitute refrigerant. The equipment provided shall provide the scheduled capacity when the substitute refrigerant proposed, the nominal equipment capacity reduction effects (if any), performance in KW/TON, the refrigerant change out procedure and long term maintenance effects the new refrigerant has on the equipment.
- B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions.
- C. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- D. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to computer room air conditioning units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of computer room air conditioning units and controls. Clearly differentiate between portions of wiring that are factory-installed and portions to be field- installed.
- E. Record Drawings: At project closeout, submit record drawings of installed systems products in accordance with requirements of Division 15.
- F. Maintenance Data: Submit maintenance data and parts list for each computer room air conditioning unit, control, and accessory; including "trouble-shooting" maintenance guide. Include this data and product data in maintenance manual; in accordance with requirements of Division 15.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Handle computer room air conditioning units and components carefully to prevent damage, breaking, denting and scoring.
- B. Store computer room air conditioning units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's rigging and installation instructions for unloading computer room air conditioning units, and moving units to final location for installation.

1.6 SPECIAL PROJECT WARRANTY:

- A. Warranty on Motor/Compressor: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate and defective

materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.

1. Warranty Period: 5 years from Date of acceptance by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

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

1. Indoor Packaged Units:
 - a. Liebert
 - b. Airflow Co.
 - c. Data Air, Inc.

2.2 COMPUTER ROOM AIR CONDITIONING UNITS (3 TONS TO 5 TONS):

- A. General: Provide factory-assembled and tested chilled water/water cooled/glycol cooled/air cooled packaged units as specified /scheduled, consisting of casing, condensate pump, liquid tect sensor, [chilled water] [D.X.] [Glycol] [A frame type cooling coil], [air cooled condenser with fan speed control] [Lee-Tempwinter control system], water cooled condenser, glycol cooled condenser with pump package, dry cooler, fan, compressors, filters, electric reheat coil, [steam grid] [infrared with autoflush system] humidifier, floor stand, firestat, smoke detector disconnect switch(es) HOA Switches and controls. Provide capacities and electrical characteristics as scheduled.
- B. Casing: Provide manufacturer's standard casing construction, corrosion protection coating, and exterior finish. Provide removable panels with 1" - 1-1/2 lbs density fiber insulation and concealed fasteners for service and access to internal parts. Unit shall be downflow/upflow arrangement with return air in top/bottom front and supply air out bottom/top of unit. Provide knockouts for electrical and piping connections with the following options.
 1. Provide [twenty-four (24)] [] inch high adjustable floor stands.
 2. Provide top discharge air plenum with two (2) [three (3)] grilles.
 3. Cabinet color shall be [Z-0180, light grey], [] without/with [] accent color.
 4. Provide piping access through top of unit and discharge air plenum/bottom of unit.
- C. Chilled Water Cooling Coil: Construct of copper tubes with aluminum fins. Pressure and leak tested at 1.5 times working pressure, the coil shall be of A-frame design, 4 rows with a minimum face area of 6.94 square feet. The unit coil capacity shall be controlled by a 250/400 psig rated, modulating valve. Provide factory piped coil with ball valve, bleed valve, flow switch, piping and 3-way modulating chilled water valve. Piping shall be arranged to allow unit to be piped from through the top/bottom of the unit casing discharge air plenum section. Provide stainless steel condensate drain pan. All factory provided piping, valves and fittings shall be insulated with minimum of 1" thick, 25/50 rated, fiberglass pipe insulation as specified in section 15250.

OR

DX Cooling Coil: Constructed of copper tubes and aluminum fins. Pressure and leak tested at 1.5 times working pressure, the coil shall be of A-frame design, 3/4 rows with minimum face area of 6.94 square feet. The unit coil capacity shall be controlled by expansion valve.

- D. Pre-piped coil shall be arranged to allow unit to be piped from through the top/bottom of the unit casing and discharge air plenum section. Provide stainless steel condensate drain pan.
- E. Water Cooled Condenser: The water cooled condensers shall be coaxial counterflow type. Condenser shall be A.S.M.E. stamped for a maximum refrigerant pressure of 400 PSI at 300 degrees F. The unit shall require the GPM of the temperature water and have a maximum drop as scheduled on the drawings. The condenser circuit shall be pre-piped with a 2-way, 300/150 psig regulating valve which is head pressure activated.
- F. Glycol Cooled Condenser: The system shall include a copper tube, aluminum fin coil, three-way solenoid valve and refrigerant check valve. The capacity of the coil shall be BTU/HR. The water regulating valves shall be pre-piped with head pressure activated 3-way/2-way with bypass regulating valve, with maximum water pressure of 150/300 PSI. The glycol cooled condensers shall be coaxial counterflow type. The condenser shall be A.S.M.E. stamped for a maximum pressure of 400 PSI at 300 degrees F. Condenser circuit shall be prepiped with head pressure activated regulating valve and parallel bypass valve. The unit shall require the GPM and maximum pressure drop as scheduled on the drawings. The dry cooler shall be the low profile, slow speed, multiple, direct drive propeller fan type with fan speed control. The dry cooler shall be constructed of aluminum and contain copper tube aluminum fin coil with an integral electric control panel and disconnect switch. The dry cooler shall be designed for degrees F. ambient. This system shall be provided with a single centrifugal pump mounted in a weather proof and vented enclosure. The pump shall be rated for the GPM and feet of head scheduled on the drawings.

OR

Air Cooled Condenser: The air cooled condenser shall be the low profile, direct drive propeller fan type. The condenser shall have refrigeration circuit rated at degrees F. ambient. The condenser shall be constructed of aluminum and contain a copper tube, aluminum fin coil arranged for vertical air discharge. The winter control system for the air cooled condenser shall be Fan Speed Control and operate at -20 degrees F. ambient. Variable speed motor shall be designed with ball bearings, permanent lubricated, internal overload protection, 40 degrees C. rise at full speed, 65 degrees C. rise at 10 RPM. The control system shall be complete with transducers, thermostats and electrical control circuit, factory pre-packaged in the integral condenser control box. The package shall include factory insulated receivers, pressure relief valves, head pressure three-way control valves and roto lock valves. Receivers shall be factory mounted ready for field connection to the air cooled condenser. The heater shall require separate power supply. Provide a factory mounted and wired disconnect switch for condenser control panel accessible from the exterior.

- G. Compressor: The compressors shall be Hermetic type located in a separate compartment with crankcase heater, vibration isolators, thermal overloads, oil sight glass, manual reset high and low pressure switches and maximum operating speed of 1750 RPM. Refrigeration circuit shall include refrigerant sight glass with moisture indicator, adjustable externally equalized expansion valve and discharge service valve.
- H. Fans: Provide variable speed, direct drive, double-inlet, forward curved, centrifugal fans with slide base. Provide 100,000 hours self-aligning, lubricated fan and motor bearings, and thermal overloads in motor.
- I. Filters: Provide 2" thick fiberglass, throwaway pre-filters with 20% efficiency rating (ASHRAE 52-76).

- J. Humidifier: Provide units with Armstrong steam grid, steam separator type with internal drying chamber and steam jacketed stainless steel distribution manifold. Complete system shall include pre-piped solenoid control valve, F & T steam trap, cleanable Y-strainer and fiberglass insulation. Humidifier shall have a capacity of [] lbs per hour at [] psig steam supply pressure. Infrared type with high intensity quartz lamps, serviceable stainless steel evaporator pan, prepiped for final connector and automatic water supply system with adjustable water-overfeed. The humidifier shall have a capacity of [] lbs/hr using a [] kw electric element. Provide autoflush system.
- K. Electric Heating Coil: Provide 2 stage 9/15 Kw electric heating coil with built-in auto-reset thermal overload protection wired into the control circuit and manual-reset thermal overload protection wired into the power circuit. Controlling contactors shall be mercury relay type and shall be wired so as to de-energize the heater circuits. All contactors and over current protection devices shall be factory wired and installed in accordance with the National Electric Code, and National Fire Protection Association, and Underwriters' Laboratories.
- L. Condensate Pump: The condensate pump shall have a capacity of 145 GPH at 20 foot head complete with integral float switch, pump, motor assembly and reservoir.
- M. Liquid-Tect Sensor: Provide [] solid state water sensor(s) under the unit/raised floor.
- N. Floor Stand: The floor stand shall be constructed of a heliarc welded tubular steel frame, shall have adjustable legs with vibration isolation pads and floor stand shall be [] inches high.
- O. Disconnect Switch(es): The non-locking/locking type non-automatic molded case circuit breaker shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the accent panel closed and prevent access to the high voltage electrical components until switched to the "OFF" position. Electrical panel shall be in accordance with UL requirements, pre-wired and tested. Comply with N.E.C. and local codes.
- P. Firestat: The firestat shall shut down the environmental control system when activated and shall be mounted in the electrical panel with sensing element in the return air compartment.
- Q. Control Processor (Level 0): The control system shall be microprocessor based. The system shall be provided with two 0.43 inch high, seven segment LED numerical display to allow observation of room temperature and humidity and each setable function:
1. Temperature Setpoint 65-85°F.
 2. Temperature Sensitivity +1° +5°F.
 3. Humidity Setpoint 40-60% R.H.
 4. Humidity Sensitivity +1% + 10%.
 5. Humidifier Flush Rate.
 6. Normal Operating Modes (Heating, Cooling, Humidification/ Dehumidification) shall be indicated by colored LEDs on the unit mounted display panel.
 7. The control system shall monitor unit operation and activate an audible and visual alarm in the event the following factory present alarm conditions:
 - a. High Temperature

- b. Low Temperature
 - c. High Humidity
 - d. Low Humidity
 - e. Change Filters
 - f. Loss of air
 - g. Local Alarm (Customer Accessible)
8. A common alarm light shall be activated when any of the above conditions exist and indicate high head pressure and water under floor.
9. Panel shall have start-stop push buttons.
10. Provide Sitemaster having the capacity to monitor the operation of up to 24 environmental control or power conditioning systems. The 9" CRT display shall be provided in English. The Sitemaster shall have the capability to access and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide chronological alarm information and shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.
- R. Testing and Certification: All equipment shall be factory run and tested with certified test data furnished.

2.3 COMPUTER ROOM AIR CONDITIONING UNITS (ABOVE 5 TONS):

- A. General: Provide factory-assembled and tested packaged units as specified, consisting of casing:

- 1. condensate pump
- 2. liquid tect sensor
- 3. chilled water
- 4. [D.X.] [Glycol] cooling coil
- 5. air cooled condenser with fan speed control
- 6. Lee-Tempwinter control system
- 7. water cooled condenser
- 8. glycol cooled condenser with pump package
- 9. dry cooler
- 10. fans
- 11. compressors
- 12. filters
- 13. [electric] [steam] [hot water] [hot gas] reheat coil
- 14. [steam grid] [infrared] humidifier
- 15. floor stand
- 16. firestat
- 17. smoke detector
- 18. disconnect switch(es)
- 19. four step system
- 20. and controls.

Provide capacities and electrical characteristics as scheduled.

- B. Casing: Provide manufacturer's standard casing construction, corrosion protection coating, and exterior finish. Provide removable panels with 1" - 1-1/2 lbs density fiber insulation and fasteners for service and access to internal parts. Unit shall be downflow/upflow arrangement with return air in top/bottom front and supply air out bottom/top of unit. Provide knockouts for electrical and piping connections with the following options.

1. Return air plenum over return air opening.
 2. Provide twenty-four (24)/[] inch high adjustable floor stands
 3. Provide discharge air turns.
 4. Cabinet color shall be Z-0180, light grey/[], without/with [] accent color.
 5. Provide piping access through top of unit and filter plenum/bottom front of unit/bottom side of unit.
 6. Provide separation compartment between the piping compressor and air-stream components.
- C. Chilled Water Cooling Coil: Construct of copper tubes with aluminum fins. Pressure and leak tested at 1.5 times working pressure, the coil shall be of A-frame design, [] rows with a minimum face area of [] square feet. The unit coil capacity shall be controlled by a [] 300 psig rated, modulating valve. Provide factory piped coil with ball valve, bleed valve, flow switch, piping and 2 way/3-way modulating chilled water valve. Piping shall be arranged to allow unit to be piped from through the top/bottom/front side of the unit casing and prefilter plenum/discharge air plenum section. Provide stainless steel condensate drain pan.
- OR
- DX Cooling Coil: Constructed of copper tubes and aluminum fins. Pressure and leak tested at 1.5 times working pressure, the coil shall be of A-frame design, [] rows with minimum face area of [] square feet. The unit coil capacity shall be controlled by expansion valve. Provide compressor crankcase heaters.
- D. Pre-piped coil shall be arranged to allow unit to be piped from through the top/bottom/front side of the unit casing and prefilter plenum section/discharge air plenum section. Provide stainless steel condensate drain pan. All factory provided piping, valves and fittings shall be insulated with minimum of 1" thick, 25/50 rated, fiberglass pipe insulates as specified in section 15250.
- E. Water Cooled Condensers: The water cooled condensers for each circuit shall be cleanable, shell and tube, counterflow type with removable heads. Condenser shall be A.S.M.E. stamped for a maximum refrigerant pressure of 400 PSI at 300 degrees F. The unit shall require the GPM of the temperature water and have a maximum drop as scheduled on the drawings. The condenser circuit shall be pre-piped with a 2-way, 300/150 psig regulating valve which is head pressure activated.
- F. Glycol Cooled Condensers: The complete hot gas reheat system shall include a copper tube, aluminum fin coil, three-way solenoid valve and refrigerant check valve. The capacity of the coil shall be [] BTU/HR. The water regulating valves shall be pre-piped with head pressure activated 3-way/2-way with bypass regulating valve, with maximum water pressure of 150/300 PSI. The glycol cooled condensers for each circuit shall be cleanable, shell and tube, counterflow type with removable heads. The condenser shall be A.S.M.E. stamped for a maximum pressure of 400 PSI at 300 degrees F. Each condenser circuit shall be prepiped with head pressure activated regulating valve and parallel bypass valve. The unit shall require the GPM and maximum pressure drop as scheduled on the drawings. The dry cooler shall be the low profile, slow speed, multiple, direct drive propeller fan type. The dry cooler shall be constructed of aluminum and contain copper tube aluminum fin coil with an integral electric control panel and disconnect switch. The dry cooler shall be designed for [] degrees F. ambient. This system shall be provided with a single/dual centrifugal pump(s) mounted in a weather proof and vented enclosure. The pump(s) shall each be rated for the GPM and feet

of head scheduled on the drawings. Dual pump package shall include a lead/ lag switch. Glycol coil shall be copper tube, aluminum fin coil located in the return air before the A-frame coil. The coil shall be rated at the BTU/HR sensible cooling capacity with a 45 degrees F. entering glycol solution temperature as scheduled on the drawing. The glycol coil shall require the GPM and total pressure drop when in the Econ-O-Cycle mode operation as scheduled on the drawing. The complete glycol cooled hot gas reheat system shall include a copper tube aluminum fin coil, three-way solenoid valve and refrigerant check valve. The capacity shall be [] BTU/HR.

- G. Air Cooled Condenser: The air cooled condenser shall be the low profile, slow speed, multiple direct drive propeller fan type. The condenser shall have two separate refrigeration circuits rated at [] degrees F. ambient. The condenser shall be constructed of aluminum and contain a copper tube, aluminum fin coil arranged for vertical/horizontal air discharge. The winter control system for the air cooled condenser shall be Fan Speed Control and operate at -20 degrees F. ambient. Variable speed motor shall be designed with ball bearings, permanent lubricated, internal overload protection, 40 degrees C. rise at full speed, 65 degrees C. rise at 10 RPM. The control system shall be complete with transducers, thermostats and electrical control circuit, factory pre-packaged in the integral condenser control box. The winter control system for the air cooled condenser shall be Lee-Temp. and shall allow start-up and positive head pressure control with ambient temperature at -30 degrees F. The package shall include, for each circuit, factory insulated receivers, pressure relief valves, head pressure three-way control valves and roto lock valves for isolating the refrigerant charge. Receivers shall be factory mounted ready for field connection to the air cooled condenser. The heater shall require separate power supply. Provide a factory mounted and wired disconnect switch for condenser control panel accessible from the exterior.
- H. Compressors: The compressors shall be Semi-Hermetic type located in a separate compartment with a suction gas cooled motor, vibration isolators, thermal overloads, oil sight glass, manual reset high pressure switch, pump down low pressure switch, suction line strainer, reversible oil pumps and maximum operating speed of 1750 RPM. Each refrigeration circuit shall include hot gas mufflers, liquid line filter dryers, refrigerant sight glass with moisture indicator, adjustable externally equalized expansion valve and liquid line solenoid valve.
- I. Fans: Provide 1750 RPM, double-inlet, forward curved, centrifugal fans with adjustable belt drive and slide base. Provide 100,000 hours self-aligning, lubricated fan and motor bearings, and thermal overloads in motor.
- J. Filters: Provide 2" thick fiberglass, throwaway pre-filters and [4"] [] thick [30%] [] pleated, [medium] [] efficiency throwaway final-filters (ASHRAE 52-76).
- K. Humidifier: Provide units with Armstrong steam grid, steam separator type with internal drying chamber and steam jacketed stainless steel distribution manifold. Complete system shall include pre-piped solenoid control valve, F & T steam trap and cleanable Y-strainer. All mechanical control components shall be located in a separate compartment, isolated from the air stream. Each humidifier shall have a capacity of [] lbs per hour at [] psig steam supply pressure. Infrared type with high intensity quartz lamps, serviceable stainless steel evaporator pan, prepiped for final connector and automatic water supply system with adjustable water-overfeed. The humidifier shall have a capacity of [] lbs/hr using a [] kw electric element.
- L. Electric Heating Coil: Provide [] stage [] Kw electric heating coil with built-in auto-reset thermal overload protection wired into the control circuit and manual-reset thermal overload protection wired into the power circuit. Controlling contactors shall be mercury relay type and shall be wired so as to de-energize the heater circuits. All contactors and over current protection devices shall be factory wired and installed in accordance with the National Electric Code, and National Fire Protection Association, and Underwriters' Laboratories.

OR

Steam Reheat Coil: The steam reheat coil shall have copper tubes and aluminum fins with a capacity of [] BTU/HR with [] PSIG steam. The coil shall be factory pre-piped with 2-way modulating control valve, Y-strainer and F & T steam trap.

OR

Hot Water Reheat Coil: The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of [] BTU/HR with [] degrees F. entering water temperature and [] GPM at [] PSI pressure drop. The coil shall be factory pre-piped with a 2-way modulating control valve and cleanable Y-strainer.

- M. Condensate Pump: The condensate pump shall have a capacity of 145 GPH at 20 foot head complete with integral float switch, pump, motor assembly and reservoir.
- N. Liquid-Tect Sensor: Provide [] solid state water sensor(s) under the unit/raised floor.
- O. Floor Stand: The floor stand shall be constructed of a heliarc welded tubular steel frame, shall have adjustable legs with vibration isolation pads factory supplied, field mounted turning vanes and floor stand shall be [] inches high.

EDIT NOTE: Carefully edit and/or select paragraphs P & Q. Coordinate disconnect with Electrical Engineer as required.

- P. Disconnect Switch(es): The non-locking/locking type non-automatic molded case circuit breaker shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the accent panel closed and prevent access to the high voltage electrical components until switched to the "OFF" position. Electrical panel shall be in accordance with UL requirements, pre-wired and tested. Comply with N.E.C. and local codes.
- Q. HOA Switches: HOA Switches shall be maintained contact pushbuttons with pilot lights. Provide with trip free thermal overload relays, each phase. Provide interlocks for switches and similar devices for coordination with other Division 15 control sections. Refer to Section 15040 for additional HOA requirements.
- R. Firestat: The firestat shall shut down the environmental control system when activated and shall be mounted in the electrical panel with sensing element in the return air compartment.
- S. Smoke Detector: The smoke detector shall shut down the environmental control system, activate the alarm system when activated and shall be mounted in the electrical panel with sensing element in the return air compartment.
- T. Temperature and Humidity Recorder: Provide a 7 day/24 hour temperature and humidity recorder of the full scope, two pen, surface mounted type with 100 recording charts, one red and on blue bottle of recording ink and single phase power supply.
- U. Control Processor (Level 0): The control system shall be microprocessor based. The system shall be provided with two 0.43 inch high, seven segment LED numerical display to allow observation of room temperature and humidity and each setable function:
 1. Temperature Setpoint 65-85°F.

2. Temperature Sensitivity $+1^{\circ} +5^{\circ}\text{F}$.
3. Humidity Setpoint 40-60% R.H.
4. Humidity Sensitivity $+1\% + 10\%$.
5. Humidifier Flush Rate.
6. Normal Operating Modes (Heating, Cooling, Humidification/ Dehumidification) shall be indicated by colored LEDs on the unit mounted display panel.
7. The control system shall monitor unit operation and activate an audible and visual alarm in the event the following factory present alarm conditions:
 - a. High Temperature
 - b. Low Temperature
 - c. High Humidity
 - d. Low Humidity
 - e. Change Filters
 - f. Loss of air
8. A common alarm light shall be activated when any of the above conditions exist and indicate high head pressure and water under floor.
9. A compressor sequence shall be provided to change the lead/lag sequence of the compressors.
10. Panel shall have start-stop push buttons.

DESIGN NOTE: TO BE PROVIDED ON ALL AT&T PROJECTS.

11. Provide hand-off-auto switch to allow the unit to override the Building DDC System.
12. Provide Sitemaster having the capacity to monitor the operation of up to 24 environmental control or power conditioning systems. The 9" CRT display shall be provided in English. The Sitemaster shall have the capability to access and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide chronological alarm information and shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.

OR

The Control System shall be microprocessor based and allow programming of temperature and humidity setpoints, alarm parameters, provide monitoring of operational status and maintain a data-base of room conditions and environmental system operational status and allow programming of the following room conditions.

13. Temperature Setpoint (65-85°F)
14. Temperature Sensitivity $+1\text{--}+5^{\circ}\text{F}$ in 0.1°F increments)
15. Humidity Setpoint (40-60% RH)

16. Humidity Sensitivity (+1--+10% RH in 0.1% increments)
17. All setpoints shall be adjustable from the individual unit front monitor panel, hand-held Service Terminal, or Site Monitoring Device.
18. The control system shall be capable of predictive control of temperature and humidity.
19. The microprocessor shall be capable of responding to varying rates of temperature change in the room. The control system shall delay heating or cooling in response to very low rates of change, shall advance heating or cooling in response to rapid temperature changes, calculate the moisture content in the room, prevent unnecessary humidification and dehumidification cycles by responding to changes in dewpoint temperature, and provide the following internal controls:
 - a. Prevent compressor short-cycling by incrementally expanding the control hysteresis of the compressor stages when compressor cycles approach 10 cycles per hour. Timer-based short-cycle controls are unacceptable.
 - b. Automatically change the lead/lag sequence of the compressors after each start.
 - c. For start-up after power failure, the system shall provide automatic restart with a programmable (up to 10 minutes in 6-second increments) time delay from either the unit or from the central site monitoring system.
 - d. During start-up, or after power failure, sequence operational load activation to minimize inrush current. Systems allowing multiple loads to start simultaneously are unacceptable.
 - e. Chilled water and hot water coils automatically flushed to prevent the build-up of contaminants.
 - f. Provide a monitor panel to display operational status, alarms and permit calibration and programming of operation parameters. All indicators shall be in language form. No symbols or codes shall be acceptable.
 - g. The front monitor panel shall be provided with a three digit, 0.43 inch high, seven segment LED numerical display to indicate temperature, humidity, percent capacity (cooling, heating, humidification de-humidification, and econ-o-cycle), temperature and humidity setpoints and sensitivities, and humidifier flush rate. Operational Status (Heating, Cooling, Humidification and Dehumidification) and alarm conditions shall be indicated by colored LED's.
 - h. Activate an audible and visual alarm in event of any of the following conditions:
 - 1) High Temperature
 - 2) Low Temperature
 - 3) High Humidity
 - 4) Low Humidity
 - 5) High Compressor Head
 - 6) Pressure (Compressorized Systems Only)
 - 7) Humidifier Problem
 - 8) Loss of Air Flow
 - i. Provide four customer accessible local alarms to be indicated on the front panel capable of being programmable activation time delays.

- j. The audible alarm shall have adjustable volume.
- k. Common alarm shall be provided to interface selected alarms with a remote alarm device.
- l. All alarms shall be communicated to the Site monitoring system with the following information: Date and time of occurrence, unit number and present temperature and humidity.
- m. Provide the capability of maintaining a log of system performance and environmental conditions communicated and displayed at a remote monitoring and control device with the following information included in the log, complete with time and date:
 - 1) Temperature (present, minimum and maximum for last 24 hours)
 - 2) Humidity (present, minimum and maximum for last 24 hours)
 - 3) Compressor Operating Hours Alarm Occurrence
- n. All electronic circuitry shall be provided with self diagnostics for troubleshooting. Each printed circuit board shall be diagnosed and reported as pass/not pass.
- o. The microprocessor shall be compatible with all remote monitoring and control devices.
- p. Provided Sitemaster having the capacity to monitor the operation of up to 24 environmental control or power conditioning systems. The Sitemaster shall display unit operating mode and alarm conditions on a 9" CRT display. The display shall be provided in English. The Sitemaster shall have the capability to access and change (at the discretion of the user) the temperature and humidity setpoints and sensitivities of each unit. The printer that shall provide the user with chronological alarm information capable of being programmed to print out environmental conditions or operating modes at each unit, as well as a summary of environmental information which shall include:
 - 1) Daily Compressor Run
 - 2) Time
 - 3) Present Temperature
 - 4) Present Humidity
 - 5) Daily High Temperature
 - 6) Daily Low Temperature
 - 7) Daily Low Humidity
 - 8) Daily Low Humidity
 - 9) Present Average Temperature
 - 10) Present Average Humidity

V. Service Terminal: Provide [] service terminal(s) to be used to monitor, program or troubleshoot the system.

W. Testing and Certification: All equipment shall be factory run and tested with certified test data furnished.

PART 3 - EXECUTION:

3.1 INSPECTION:

- A. General: Examine areas and conditions under which computer room air conditioning units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF COMPUTER ROOM AIR CONDITIONING UNITS:

- A. General: Install computer room air conditioning units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- C. Ductwork: Refer to Division-15 section "Ductwork". Connect supply and return ducts to computer room air conditioning units with flexible duct connections. Provide transitions to exactly match unit duct connection size.
- D. Water Glycol Cooled Condenser Piping: Refer to Division-15 section "Basic Piping Materials & Methods". Connect supply and return piping to units as indicated, with unions and shutoff valves and accessories.
- E. Hot Water Heating Coil Piping: Refer to Division-15 section "Basic Piping Materials & Methods". Connect supply and return piping to hot water coil as indicated, with unions and shutoff valves and accessories.
- F. Steam Heating Coil Piping: Refer to Division-15 section "Steam Piping Systems". Connect steam and condensate piping in steam coil as indicated, with thermostatic steam trap, unions and shutoff valves.
- G. Drain Piping: Connect condensate pump drain pan to nearest indirect waste connection, or as indicated.

3.3 FIELD QUALITY CONTROL:

- A. General: Start-up computer room air conditioning units, with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.4 CLOSEOUT PROCEDURES:

- A. Training: Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of computer room air conditioning units.
 - 1. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

3.5 SPARE PARTS:

- A. General: Furnish to Owner, with receipt, the following spare parts:

1. One set of matched fan belts for each belt driven fan.
2. One set of Pre and final filters for each unit.

END OF SECTION 15787