

SECTION 15731 – COMPUTER ROOM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish and install all computer room air conditioning units. This shall include all piping, ducts and supports specified in this Division and as shown on the drawings
- B. All units shall be new and manufactured for the specific purpose of providing conditioned air (heating and cooling) to the systems indicated.
- C. All system components shall be installed in accordance with local codes including seismic isolation.
- D. Secure all permits and local/state approval for the components as specified and included under this Section.

1.3 RELATED SECTIONS

- A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made part of the Contract Documents.
 - 1. ABMA STD 9 – Load Ratings and Fatigue Life for Ball Bearings.
 - 2. ABMA STD 11 – Load Ratings and Fatigue Life for Roller Bearings.
 - 3. AMCA 99 – Standards Handbook.
 - 4. AMCA 210 – Laboratory Methods of Testing Fans for Rating.
 - 5. AMCA 300 – Reverberant Room Method for Sound Testing of Fans.
 - 6. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 - 7. AMCA 500 – Test Methods for Louvers, Dampers and Shutters.

8. ARI 410 – Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
9. ARI 430 – Standard for Central-Station Air-Handling Units.
10. ARI 610 – Central System Humidifiers.
11. ARI Guideline D – Application and Installation of Central Station Air-Handling Units.
12. NEMA MG 1 – Motors and Generators (1).
13. NFPA 70 – National Electrical Code.
14. SMACNA (DCS) – HVAC Duct Construction Standards – Metal and Flexible.
15. UL 900 – Standard for Air Filter Units.
16. UL 1096 – Electric Central Air Heating Equipment.

1.5 SUBMITTALS

- A. See Section 15050 and General Condition for additional submittal requirements.
- B. The unit manufacturer shall submit without delay after receipt of notice of award, shop drawings for approval which shall indicate, but not be limited to, the following information in detail:
 1. Detailed drawings and data of all proposed components.
 2. To scale dimensional drawings (plans and sections) of the entire air handling unit showing all component locations, equipment arrangements, piping connections and sizes, duct connections and sizes, and all safing required.
 3. Casing and hoisting details including floor structures, internal structures, panel fabrication, insulation material and equipment supports. Location of drains and method of piping penetration and sealing of penetrations through the casings.
 4. The sound power levels on all fans, fan and motor efficiency, horsepower, RPM and fan size.
 5. Fan curves shall be submitted. Fan curves shall be prepared and submitted indicating performance of the fans.
 6. ARI certified calculations for coil selections.
 7. List of proposed component manufacturers and models, such as fans, casing, coils, humidifiers, filters, dampers, controls, door hinges, disconnect switches, controls, etc.
 8. Pressure drop calculation indicating losses of all components, plenums, contractions, expansions at rated flow of unit. Pressure drop calculations are to be submitted in tabular form and shall indicate the total of all unit-associated losses plus the scheduled external static pressure. Calculations are to be based upon wet cooling coils and filters at recommended dirty change out pressure drop.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements and include start-up instructions.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listing.
- E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, as pre-qualified and in accordance with technical specifications herein.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. The units shall be UL or ETL or equivalently labeled.

1.7 DELIVERY, STORAGE AND HANDLING

A. Cleanliness

- 1. The intent of this Section is to ensure the Owner that the air handling units are manufactured, shipped, stored, field reconnected and started-up while maintaining a high degree of cleanliness. Unit interior and exterior shall be fully cleaned prior to start-up by the Contractor. Units shall be shrink-wrapped with a minimum of 10 mil plastic to protect the sections during shipping and while in storage. Once the units are received by the contractor, it shall be the contractor's responsibility to take whatever steps are necessary to deliver the units in like new condition upon start-up and turn-over to the Owner, whichever occurs the latest.

B. Manufacturing

- 1. Casings shall be manufactured only after all panel components (structural members, facing sheets, etc.) have been thoroughly cleaned of any mill grease, oxidation, etc.
- 2. The interior and exterior of the casing system shall be thoroughly protected from contamination from the manufacturing process through start-up procedures and Owner's acceptance.
- 3. Internal components (fans, coils, air filter frames, etc.), shall arrive from their respective manufacturing facilities free of all grease and dirt.
- 4. In general, any products such as caulks, gaskets, etc., employed within the unit shall be non-petroleum based products with no outgasing characteristics.

C. Shipping

- 1. Shipping protection shall be provided such that both the interior and the exterior of each unit is protected from road dirt exposure during shipment. This protection shall remain on the unit until unit start-up is performed.
- 2. Any units damaged in shipment shall be returned to the factory for all corrective work.

D. On-Site Storage

1. If equipment is to be stored before use, the unit manufacturer shall have provided adequate protection at the factory to ensure that Cleanliness Standards for both the unit interior and unit exterior are met. This protection shall remain on the unit until such time as unit start-up is performed. Accommodations shall be made by the contractor to rotate fan assemblies on a periodic basis as recommended by the fan manufacturer. Fan assemblies shall be rotated without compromising Cleanliness Standards.

E. Rigging

1. The Contractor shall be responsible for rigging under the direct supervision of the unit manufacturer.

F. Leveling

1. The Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The contractor shall furnish and install all necessary permanent shim material to assure the levelness of the individual sections and the entire assembled unit.

1.8 WARRANTY

- A. The unit manufacturer shall be responsible for and warranty the proper operation and performance of the units, all unit components, leak tightness and non-condensation of the unit casing, structural integrity of the unit including all provisions required for rigging, trucking and installation of units in the areas indicated on the drawings. Units shall be guaranteed for 1 year from date of acceptance of project by owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Acceptable manufacturers subject to compliance with the specification:

1. Liebert
2. Data Air
3. Stulz

2.2 FLOOR MOUNTED UNITS

A. Cabinet and Frame Construction

1. The frame shall be constructed of heliarc welded 14 ga. tubular steel. The frame shall be finished. This finish shall allow superior performance versus epoxy finishes in film thickness, pencil hardness, zero T-bend, reverse impact, cross hatch adhesion, humidity/tape adhesion, neutral salt-spray (scribed and unscribed).
2. The exterior panels shall be 16 ga. steel and insulated with a minimum 1" (25.4 mm), 1.5 lbs. (0.68 kg) density, neoprene coated fiber insulation. All panels shall have captive 1/4 turn fasteners and shall be removable for service access. The exterior panels shall be finished with an epoxy based powder paint baked for proper adhesion.

B. Fan Section

1. The fans (two each) shall be Class II, centrifugal type, double width double inlet (DWDI), and finished with an epoxy coating. The fans shall be statically and dynamically balanced as a completed assembly to a maximum vibration level of two mils in any plane. The shafts shall be heavy duty steel with self-aligning pillow block bearings with an L-10 life of 200,000 hours. Each fan shall be driven by a separate Totally Enclosed Fan Cooled (TEFC) motor, rated at 1,750 RPM and mounted on an adjustable slide base. The drive packages shall be two-belt, variable speed, sized for 200% of the fan motor horsepower. The fans shall be located to draw air over the evaporator coil to ensure even air distribution and maximum coil performance. The fan and motor assemblies shall be completely serviceable and removable from the front of the unit.

C. Filters

1. Filters shall be disposable pleated media type and shall be rated at not less than the scheduled efficiency based on ASHRAE 52.1 – 1992 and ASHRAE 52.2 - 1999.

D. Advanced Microprocessor Control with Graphics.

1. The optional Advanced control processor shall be microprocessor based with a front monitor dot matrix display panel and control keys for user inputs. The controls shall be menu driven with on-screen prompts for easy user operation. The system shall allow user review and programming of temperature and humidity setpoints, alarm parameters, and setup selections including choice of control type. A password shall be required to make system changes. For all user selections, the range of acceptable input (temperature, humidity, or time delay) shall be displayed on the monitor screen. The system shall provide monitoring of room conditions, operational status in % of each function, component run times, date and time, and four analog inputs from sensors provided by others.

E. Front Monitor Display Panel, with Graphics

1. The microprocessor shall provide a front monitor 240 x 120 dot matrix display panel with adjustable backlighting. This display (along with five front mounted control keys) shall be the only operator interface required to obtain all available system information such as room conditions, operational status, graphical data, alarms, control and alarm setpoints, and all user selections including alarm delays, sensor calibration, DIP switch selections, and diagnostics. All indicators shall be in language form. No symbols or codes shall be acceptable.
2. The control shall display the following graphical data:
 - a. Temperature, humidity, analog inputs
 - b. Component operating status by hour
 - c. Water detection floor plan
 - d. Operating status
3. Control Parameters
 - a. The control system shall allow programming of the following room conditions:
 - b. Temperature Setpoint 65 to 85°F
 - c. Temperature Sensitivity +1 to +9.9°F in 0.1° increments
 - d. Humidity Setpoint 20 to 80% RH
 - e. Humidity Sensitivity +1 to +30% RH
 - f. All setpoints shall be adjustable from the individual unit front monitor panel. Temperature and Humidity Sensors shall be capable of being calibrated using the front monitor panel controls to coordinate with other temperature and humidity sensors in the room.
4. Unit Controls
 - a. Control Type
 - 1) The user shall be able to select the type of control the advanced microprocessor will use. Selections available shall be intelligent, proportional, and tunable PID (proportional, integral, and derivative gains). If tunable PID is selected, the user shall be able to program each of the three gains.
 - b. Predictive Humidity Control
 - 1) The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dewpoint temperature.

- c. System Auto-Restart
 - 1) For start up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.
- d. Sequential Load Activation
 - 1) During start up, or after power failure, the microprocessor shall sequence operational load activation to minimize inrush current. Systems allowing multiple loads to start simultaneously are unacceptable.
- e. Diagnostics: The control system and electronic circuitry shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as on or off at the front monitor panel. Control outputs shall be able to be turned on or off from the front monitor panel without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.
- f. Data Collection: The control system shall maintain accumulative operating hours of compressor, reheat, humidifier, fan motor, Econ-O-Coil, and heat rejection. The sixty most recent alarms shall also be retained.
- g. Analog Inputs: The system shall include four customer accessible analog inputs for sensors provided by others. The analog inputs shall accept a 4 to 20 mA signal. The user shall be able to change the input to 0 to 5 vdc or 0 to 10 vdc if desired. The gains for each analog input shall be programmable from the front panel. The analog inputs shall be able to be monitored from the front panel.

5. Alarms

- a. Unit Alarms: The microprocessor shall 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) Main Fan Overload
 - 6) Humidifier Problem
 - 7) Change Filter
 - 8) Loss of Air Flow
 - 9) Loss of Power
 - 10) Custom Alarm (#1 to #4)
 - 11) Custom Alarms: Custom alarms are four customer accessible alarm inputs to be indicated on the front panel. Custom alarms can be

identified with prepared (programmed) alarm labels for the following frequently used inputs:

- 12) Water Under Floor
- 13) Smoke Detected
- 14) Loss of Water Flow
- 15) User customized text can be entered for all four custom alarms.

- b. Alarm Controls: Each alarm (unit and custom) can be separately enabled or disabled, selected to activate the common alarm, and programmed for a time delay of 0 to 255 seconds.
- c. Audible Alarm: The audible alarm shall annunciate any alarm that is enabled by the operator.
- d. Common Alarm: A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.
- e. Remote Monitoring: 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.

6. Communications

- a. The microprocessor shall be compatible with all remote monitoring and control devices.

F. Hot Water Reheat

1. The hot water reheat coil shall have copper tubes and aluminum fins with a capacity as scheduled on the Drawings. The control system shall be factory pre-piped with a 2-way modulating control valve and cleanable Y-strainer.

G. Chilled Water Systems

1. Chilled Water Control Valve

- a. The water circuit shall include a 2-way high pressure modulating valve. The valve shall be designed for up to 400 PSI (2758 kPa) water pressure. The microprocessor positions the valve in response to room conditions. Cooling capacity will be controlled by bypassing chilled water around the coil. The modulating valve for dehumidification shall be proportional.

2. A-Frame Chilled Water Coil

- a. The cooling coil shall be of A-frame design with capacity, area and rows as schedule on the Drawings. The coil shall be controlled by a 2-way modulating control valve. It shall be constructed of copper tubes and aluminum fins. The water circuit shall be designed to distribute water into the entire coil face area. The coil shall be supplied with 45°F (°C) entering water temperature, with a 15°F (°C) temperature rise. The entire coil assembly shall be mounted in a stainless steel condensate drain pan.

3. Flow Switch
 - a. The flow switch shall activate the alarm system should the chilled water supply be interrupted. The switch shall be factory mounted and wired.
- H. Provide the Following Accessories:
 1. Disconnect Switch (Locking Type)
 - a. The non-automatic molded case circuit breaker shall be mounted in the high voltage section of the unit 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 components until switched to the "OFF" position.
 2. Firestat
 - a. The firestat shall immediately shut down the air conditioning system when activated. The firestat shall be mounted with the sensing element in the return air.
 3. Steam Grid Humidification
 - a. The steam humidifier shall be the "Armstrong" steam separator type with an internal drying chamber and steam jacketed stainless steel distribution manifold. The complete system shall include a prepiped solenoid control valve, F&T steam trap, low temperature cutout and cleanable Y-strainer. All mechanical control components shall be located in a separate compartment, isolated from the air stream. The humidifier shall have a capacity as scheduled at the scheduled steam supply pressure.
 4. Condensate Pump
 - a. The condensate pump shall have the capacity of 145 GPH (548 l/h) at 20 ft. head (60 kPa). It shall be complete with integral float switch, pump and motor assembly and reservoir.
 5. Liqui-TECT Sensors (Maximum of two per unit)
 - a. Shall provide 2 solid state water sensors. These sensors, when in contact with water, shall create an audio and visual alarm on the air conditioner's display panel.
 6. Smoke Detector
 - a. The smoke detector shall immediately shut down the air conditioning system and trigger the alarm system when activated. The smoke detector shall be mounted in the unit electrical panel with the sensing element in the return air compartment.

7. Cabinet Air Distribution Grilles
 - a. The packaged system shall include a front return cabinet and the front discharge plenum.
8. Floor Stand
 - a. Provide floor stand constructed of Heliarc welded tubular steel frame. The floor stand shall have adjustable legs with vibration isolation pads. Coordinate floor stand height with the computer room floor height.
9. Turning Vane
 - a. Provide turning vane or turning scoop for each unit.
10. Smoke Detector
 - a. The smoke detector shall immediately shut down the environmental control system and activate the alarm system when activated. The smoke detector shall be mounted in the electrical panel with the sensing element in the return air compartment.

2.3 CEILING MOUNTED UNITS

- A. The units shall be factory assembled, Liebert Mini-Mate 2, chilled water style unit, with fan located in a draw-through arrangement. Systems shall include humidifiers and reheat.
- B. Cabinet and Frame Construction
 1. The unit cabinet and frame chassis shall be constructed of heavy gauge galvanized steel and designed for service access from one (1) side only. Mounting brackets shall be factory attached to the cabinet.
- C. Fan Section
 1. Fan section shall be constructed with a quiet, direct-drive fan assembly equipped with double inlet blower, self-aligning sleeve bearings, and lifetime lubrication. Fan motor shall be permanent split capacitor, high efficiency type, equipped with two (2) speeds for airflow modulation. Dehumidification shall utilize the lower fan speed. System shall be suitable for plenum or ducted air distribution.
- D. Humidifiers
 1. The electric steam generating humidifier shall be factory piped, mounted and wired to the integral control system. The steam generator shall provide dry steam to the bypass air around the evaporator coil. Humidifier controls shall include humidity setpoint, automatic water feed, drain valves and disposable canister. An LED light on the

humidifier assembly shall indicate cylinder full, over-current detection, fill system fault and end of cylinder life conditions.

E. Hot Water Reheat

1. The hot water reheat coil shall have copper tubes and aluminum fins of capacity listed on drawings. Reheat coil shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The control system shall be factory pre-piped with a 2-way solenoid valve and cleanable Y-strainer.

F. Chilled Water System

1. Chilled Water Control Valve

- a. The control solenoid valve shall be motorized slow-acting type to reduce water hammer. Design pressure shall be 300 psig static pressure, with a maximum close-off pressure of 10 psi.

2. Chilled Water Coil

- a. The cooling coil shall have a minimum of 3.1 sq.ft. face area, 3 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 450 ft. per minute. The coil shall be supplied with 45°F entering water temperature. The coil assembly shall be mounted in a stainless steel condensate drain pan.

G. Disconnect Switch, Non-Locking

1. The non-automatic, non-locking, molded case circuit breaker shall be factory mounted in the high voltage section of the electrical panel. The switch shall be accessible from the front of the unit.

H. Firestat

1. The firestat shall immediately shut down the system when high temperatures are detected. The firestat shall be mounted with the sensing element in the return air.

I. Smoke Detector

1. The smoke detector shall immediately shut down the environmental control system and activate the alarm system when activated. The sensing element shall be located in the return air compartment.

J. Air Distribution Plenum

1. Evaporator section to be supplied with an air distribution plenum with integral filter. Plenum shall be 2' x 4' in size and provide 4 way air distribution. Filter shall be 4"

deep pleated type with a minimum efficiency of 20% based on ASHRAE 52.1 – 1992 and a minimum rating of MERV 6 based on ASHRAE 52.2 – 1999.

K. Microprocessor Control System

1. The control system shall be microprocessor based. The wall-mounted control enclosure shall include an LCD custom display providing a continuous display of operating status and alarm condition. An 8 key membrane keypad for setpoint/program control, unit on/off, and fan speed shall be located below the display.
2. The auto restart feature shall automatically restart the mini-Mate Plus after a power failure.
3. The control shall have two temperature control setpoints for cooling and heating functions with a minimum 2°F differential between them. The control shall automatically switch from cooling to heating modes based on return air conditions. The temperature control setpoint range shall be 60°F to 85°F.
4. Humidity control: The control shall have two humidity control setpoints for humidification and dehumidification functions with a minimum 4% RH differential between them. The control shall automatically switch from humidifying to dehumidifying based on return air conditions.
5. The humidity control setpoint range shall be 20% RH to 80% RHL.
6. Programmability
 - a. The control shall be programmable on a daily basis or on a 5 day/2 day program schedule. It shall be capable of accepting 2 programs per day.
 - b. The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 10 to 90 seconds.
 - c. The control shall be capable of displaying temperature values in °F or °C.
7. Monitoring
 - a. The LCD display shall provide an on/off indication, fan speed indicating, operating mode indication (cooling, heating, humidifying) and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the Hospital's central DDC automation system.
8. Alarms
 - a. The control system shall monitor unit operation and activate an audible and visual alarm for the following field adjustable conditions:
 - 1) High Temperature (max. 85°F)
 - 2) Low Temperature (min 35°F)
 - 3) High Humidity (max 80% RH)
 - 4) Low Humidity (min. 15% RH)
 - 5) High Water Alarm – Lock out unit operation

- b. The control shall be capable of disabling any alarm if required.
9. Condensate Pump
- a. The condensate pump shall have the minimum capacity of 30 GPH at 20 ft. head. It shall be complete with integral float switch, pump, motor assembly, and reservoir.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

3.2 ELECTRICAL WIRING

- A. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to the Electrical Contractor.

3.3 PIPING CONNECTIONS

- A. Install and connect devices furnished by the manufacturer but not specified to be factory mounted. Furnish a copy of manufacturer's piping connection diagram submittal to the piping contractor.

3.4 SUPPLY AND DRAIN WATER PIPING

- A. Connect water supply and drain connections to the air conditioning unit. Provide pitch and trap per manufacturer's instructions and local codes.

3.5 START UP

- A. Start up air conditioning unit in accordance with manufacturer's start up instructions. Test controls and demonstrate compliance with requirements.

END OF SECTION