1.0 GENERAL

1.1 Summary
These specifications describe requirements for a precision environmental control system. The system shall be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.

The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements of the room.

1.2 Design Requirements
The precision environmental control system shall be a Liebert self-contained factory assembled unit with (upflow) (down-flow) air delivery. The system shall have a total cooling capacity of ____ BTU/HR, (kW) with a sensible cooling capacity of ____ BTU/HR (kW) based on an entering air temperature of ____ °F (°C) dry bulb and ____ °F (°C) wet bulb. The unit is to be supplied with ____ volt ____ ph ____ Hz electrical service.

1.3 Submittals
Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity Data; Piping and Electrical Connection Drawings.

2.0 PRODUCT

2.1 Cabinet and Frame Construction
The frame shall be constructed of heliarc welded tubular steel. It shall be painted using the autophoretic coating process for maximum corrosion protection. The exterior panels shall be insulated with a minimum 1 in. (25.4mm), 1.5 lbs. (.68 kg) density fiber insulation. The main front panel shall have captive 1/4 turn fasteners. The main unit color shall be ____. The accent color shall be ____.

The exterior panels shall be powder coated.

2.2 Filter Chamber
The filter chambers shall be an integral part of the system, located within the cabinet serviceable from either end of the unit. The filters shall be rated not less than ____% efficiency (based on ASHRAE 52.1).

For models FH/UH600C, FH/UH599C and FH/UH740C, FH/UH739C the filters shall be serviceable from the front of the unit.

2.3 Fan Section
The fan shall be the centrifugal type, double width double inlet, and shall be statically and dynamically balanced as a completed assembly to a maximum vibration level of two mils in any plane. The shaft shall be heavy duty steel with self-aligning ball bearings with a minimum life span of 100,000 hours. The fan motor shall be ____ hp at 1750 RPM at 60 Hz (1450 RPM at 50 Hz) and mounted on an adjustable slide base. The drive package shall be two-belt, variable speed, sized for 200% of the fan motor horsepower.

The fans shall be located to draw air over the A-frame coil to ensure even air distribution and maximum coil performance.

2.4 Infrared Humidifier
The humidifier shall be of the infrared type consisting of high intensity quartz lamps mounted above and out of the water supply. The evaporator pan shall be stainless steel and arranged to be serviceable without disconnecting high voltage electrical connections. The complete humidifier section shall be pre-piped ready for final connection. The infrared humidification system
shall use bypass air to prevent overhumidification of the computer room. The humidifier shall have a capacity of ____ lbs./hr. (kg/h). The humidifier shall be equipped with an automatic water supply system. The system has an adjustable water-over-feed to prevent mineral precipitation.

2.4 **(Optional) Steam Generating Humidifier**

The environmental control system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor, and electronic controls. The need to change canister shall be annunciated on the microprocessor control panel. The humidifier shall be designed to operate with water conductivity from 200-500 micromhos.

2.4 **(Optional) Steam Grid Humidifier**

The steam humidifier shall be the “Armstrong” steam separator type with an internal drying chamber and steam jacketed stainless steel distribution manifold. Complete system shall include a pre-piped solenoid control valve, steam trap, and cleanable Y-strainer. All mechanical control components shall be located in a separate compartment, isolated from the air steam. The humidifier shall have a capacity of ____ lbs./hr. (kg/h) at ____ PSIG (kPa) steam supply pressure.

2.5 **Electric Reheat**

The electric reheat coils shall be low watt density, 304/304 stainless steel fin tubular construction, protected by thermal safety switches, shall be ____ BTU/HR, ____ kW, controlled in three stages.

2.5 **(Optional) Steam Reheat**

The steam reheat coil shall have copper tubes and aluminum fins with a capacity of ____ BTU/HR (kW) with ____ PSIG (kPa) steam. The system shall be factory pre-piped with a 2-way modulating control valve, Y-strainer, and F & T steam trap.

2.5 **(Optional) Hot Water Reheat**

The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of ____ BTU/HR (kW) when supplied with ____ °F (°C) entering water temperature at ____ GPM (l/s) flow rate. Maximum pressure drop shall be ____ PSI (kPa).

The control system shall be factory pre-piped with a 2-way modulating control valve and cleanable Y-strainer.

2.6 **Optional Advanced Control Processor**

The Advanced control processor shall be microprocessor based with a front monitor LCD 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.

**Control**

The control system shall allow programming of the following room conditions:

- Temperature Setpoint
65-85°F (18-29°C)
• Temperature Sensitivity
  ±1° to 9.9°F (0.6 to 5.6°C)
in 0.1°F (.1°C) increments
• Humidity Setpoint
  20-80% R.H.
• Humidity Sensitivity
  +1% to +30% R.H.

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.

**Predictive Humidity Control**
The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dewpoint temperature.

In addition the system shall provide the following internal controls:

**System Auto-Restart**
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.

**Sequential Load Activation**
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.

**Front Monitor Display Panel**
The microprocessor shall provide a front monitor LCD backlit display panel with 4 rows of 20 characters with adjustable contrast. 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, 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.

**Alarms**
The microprocessor shall activate an audible and visual alarm in event of any of the following conditions:

• High Temperature
• Low Temperature
• High Humidity
• Low Humidity
• Main Fan Overload (opt)
• Humidifier Problem
• Change Filters
• Loss of Air Flow
• Loss of Power
• Custom Alarm (#1 to #4)
Custom alarms are four customer accessible alarm inputs to be indicated on the front panel. Custom alarms can be identified with prepared (programmed) labels for the following frequently used inputs:

- Leak Under Floor
- Smoke Detected
- Loss of Water Flow
- Standby Unit On

User customized text can be entered for two of the four custom alarms.

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.

**Audible Alarm**

The audible alarm shall annunciate any alarm that is enabled by the operator.

**Common Alarm**

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

**Remote Monitoring**

All alarms shall be communicated to the Liebert site monitoring system with the following information: date and time of occurrence, unit number, and present temperature and humidity.

**Control Type**

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). The intelligent control shall incorporate control logic that uses Artificial Intelligence techniques including “fuzzy logic” and “expert systems” methods to maintain precise, stable control. If tunable PID is selected, the user shall be able to program each of the three gains.

**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.

**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.

**Data Collection**

The control system shall maintain accumulative operating hours of compressors, reheats, humidifier, fan motor and econ-o-coil. The ten most recent alarms shall be retained.

**Communications**

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

**2.6 Advanced Microprocessor Control w/Graphics (Optional)**
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.

**Control**

The control system shall allow programming of the following room conditions:

- **Temperature Setpoint**
  - 65-85°F (18-29°C)
- **Temperature Sensitivity**
  - +1° to + 9.9°F (°C) in 0.1°F (°C) increments
- **Humidity Setpoint**
  - 20-80% R.H.
- **Humidity Sensitivity**
  - +1% to +30% R.H.

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.

**Predictive Humidity Control**

The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and dehumidification cycles by responding to changes in dewpoint temperature.

In addition the system shall provide the following internal controls:

**System Auto-Restart**

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.

**Sequential Load Activation**

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.

**Front Monitor Display Panel**

The microprocessor shall provide a front monitor 240 x 128 dot matrix graphics display panel with 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 set-points, 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.

**Alarms**

The microprocessor shall activate an audible and visual alarm in event of any of the following conditions:
2.7 Chilled Water Systems

2.7.1 Chilled Water Control Valve
The water circuit shall include a 3-way (2-way) modulating valve. 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 travel for dehumidification shall be proportional.

2.7.1 (Optional) High Pressure Chilled Water Control Valve
The chilled water circuit shall include a 3-way (2-way) high pressure modulating valve. The valve shall be designed for up to 400 PSI (2758 kPa) water pressure.

2.7.2 A-Frame Chilled Water Coil
The cooling coil shall be of A-frame design with a minimum of ____ sq. ft. (sq.m.) face area, ____ rows deep. The coil shall be controlled by a 3-way modulating control valve. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of ____ ft. per minute (m/s) at ____ CFM (CMH).

The water circuit shall be designed to distribute water into the entire coil face area. The coil shall be supplied with _____ °F (°C) entering water temperature, with a _____ °F (°C) temperature rise. The coil shall require ____ GPM (l/s) of chilled water and the pressure drop shall not exceed ____ PSI (kPa). The entire coil assembly shall be mounted in a stainless steel condensate drain pan.

For models FH600C, FH599C and FH740C and FH739C the end sheets shall be aluminum, and the coil can be removed from the front or either side of the unit.

2.7.3 (Optional) Flow Switch
The flow switch shall activate the alarm system should the chilled water supply be interrupted. The switch shall be factory mounted and wired.

2.7.4 (Optional) Variable Speed Drive
A variable speed drive (VSD) is available for models FH/UH600C, FH/UH599C, FH/UH740C, and FH/UH739C to reduce energy consumption. The fan motor speed shall be varied from 100% to 60% of rated speed in response to room conditions. This shall be controlled automatically by the advanced microprocessor control. The variable speed drive option shall be available with an infrared humidifier.

2.8 Optional Specifications
The computer room environmental control system shall be equipped with the following optional components.

Disconnect Switch
(Non-Locking Type)
The manual disconnect switch shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible with the door closed.

**Disconnect Switch**

(Locking Type)

The manual disconnect switch 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 door closed, and prevent access to the high voltage electrical components until switched to the “OFF” position.

**Firestat**

The firestat shall immediately shut down the environmental control system when activated. The firestat shall be mounted in the electrical panel with the sensing element in the return air.

**Condensate Pump**

The condensate pump shall have a minimum capacity of 100 GPH at 20 ft. (378 l/hr at 6m) head. (Consult factory for 200V or 230V, 50 Hz applications.) It shall be complete with integral float switch, pump and motor assembly, and reservoir.

**Liqui-Tect Sensors**

(Max. of two per unit)

Provide ____ (quantity) solid state water sensors under the raised floor.

**Floor Stand**

The floor stand shall be constructed of a heliarc welded tubular steel frame. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be ____ inches high.

**Floor Stand Turning Vane**

A factory supplied, field mounted turning vane shall be provided.

**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 one blue bottle of recording ink. Recorder shall be a 110 volt, single phase, 60 Hz (50 Hz) power supply.

**Smoke Detector**

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.

**SiteScan Site Monitoring System**

Provide a SiteScan monitor system with the Deluxe System/3. The SiteScan shall have the capability to monitor and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide the user with chronological alarm information. It shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.

### 3.0 EXECUTION

#### 3.1 Installation of Precision Environmental Air Conditioning Units

#### 3.1.1 General
Install precision environmental air conditioning units in accordance with manufacturer’s installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer’s recommended clearances.

3.1.2 Electrical Wiring
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 electrical contractor.

3.1.3 Piping Connections
Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer’s piping connection diagram submittal to piping contractor.

3.2 Field Quality Control
Start up mainframe coolant units in accordance with manufacturer’s start up instructions. Test controls and demonstrate compliance with requirements.

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