Liebert Industrial Cooling Series (ICS)

10 - 60 Ton Environmental Control System

GUIDE SPECIFICATIONS

1.0 GENERAL

1.1 SUMMARY

These specifications describe requirements for an industrial type packaged air conditioning system. The system shall be designed to maintain temperature and relative humidity conditions within a process control room. The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements of the site.

1.2 DESIGN REQUIREMENTS

The air conditioning system shall be a Liebert Industrial Cooling Series factory assembled unit. The unit shall be designed for draw-through air arrangement, to ensure even air distribution to the entire face area of the coil. Each system shall be capable of handling _____ CFM (CMH) at _____ inches (mm) of water external static pressure with up discharge air flow pattern. It shall have a total cooling capacity of _____ BTU/HR (kW), sensible cooling capacity of _____ BTU/HR (kW), based on the entering air condition of _____ °F (°C) dry bulb, and _____ °F (°C) wet bulb. The humidifier shall have a capacity of _____ lbs./hr (kg/hr). Reheat shall have a capacity of _____ BTU/HR (kW). Each fan motor shall be _____ HP (kW).

The unit is to be supplied with _____ VAC, 3-phase, _____ Hz power supply.

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.

1.4 WARRANTY

The system shall be provided with a warranty against defects in material and workmanship for a period of one year from the start up date, not to exceed eighteen months from the date of shipment.

1.5 QUALITY ASSURANCE

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, “Hi-Pot” Test (two times rated voltage plus 1000 volts, per UL requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

2.0 PRODUCT

2.1 STANDARD FEATURES / ALL SYSTEMS

2.1.1 Cabinet and Frame Construction

The frame shall be constructed of heliarc welded 14 ga. tubular steel. The frame shall be coated with an autophoretic® finish. The autophorectic® finish is described as "the controlled destablization of an anionically or negatively-charged latex polymer on ferrous surfaces by chemical means". This finish allows 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).

NOTE: A two-part catalyzed epoxy finish may be used on 60-ton units.

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.

2.1.2 Fan Section

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.

2.1.3 Filters

Filters shall be disposable pleated media type and shall be rated at not less than _____ % efficiency based on ASHRAE 52-76.

2.1.4 Standard Microprocessor Control (Standard)

The control system shall be microprocessor based. The system shall be provided with two .43 inch (11 mm) high, seven segment LED numerical display to allow observation of room temperature and humidity and each settable function.

2.1.4.1 Monitoring

Normal Operating Modes (Heating, Cooling, Humidification, Dehumidification) shall be indicated by colored LEDs on the unit-mounted display panel.

2.1.4.2 Control Parameters

- Temperature Setpoint 65 to 85°F (18 to 29°C)
- Temperature Sensitivity 1 to 5°F (1 to 3°C)
- Humidity Setpoint 20 to 80% RH
- Humidity Sensitivity 1 to 10% RH
- Humidifier Flush Rate

2.1.4.3 Unit Controls

A. Compressor Short-Cycle Control: The control system shall prevent compressor short-cycling by a 3 minute timer from compressor stop to the next start.

B. Common Alarm or Remote On/Off: A common alarm relay shall be provided to interface alarms with a remote alarm device. This same relay may be used as a remote on/off control contact, instead of the common alarm function.

2.1.4.4 Alarms

The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- High Head Pressure
- Change Filter
- Loss of Air
- Local Alarm

2.1.4.5 Communications

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

2.1.5 Advanced Microprocessor Control (Optional)

The optional 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.

2.1.5 1 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.

2.1.5.2 Control

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

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

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.

2.1.5.3 Unit Controls

A. 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). If tunable PID is selected, the user shall be able to program each of the three gains.

B. 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:

C. Compressor Short-Cycle Control: The control system shall include a program to prevent compressor short-cycling.

D. 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.

E. 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.

F. Chilled Water/Hot Water/Econ-O-Coil Flush Cycles: Chilled water, hot water, and Econ-O-Cool coils shall be automatically flushed to prevent the buildup of contaminants. Systems without this feature shall include the necessary devices to bypass fluid into the coil on a programmed basis.

G. 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.

H. Data Collection: The control system shall maintain accumulative operating hours of compressor, reheat, humidifier, fan motor, and Econ-O-Coil. The ten most recent alarms shall also be retained.

I. 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.

2.1.5.4 Alarms

A. Unit 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
- Short Cycle
- Compressor Overload (Optional)
- Main Fan Overload (Optional)
- Humidifier Problem
- High Head Pressure
- Change Filter
- Loss of Air Flow
- Low Suction Pressure
- Loss of Power
- Custom Alarm (#1 to #4)

B. 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:

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

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

C. 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.

D. Audible Alarm: The audible alarm shall annunciate any alarm that is enabled by the operator.

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

F. 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.

2.1.5.5 Communications

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

2.1.6 Advanced Microprocessor Control with 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.

2.1.6.1 Front Monitor Display Panel, with Graphics

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.

The control shall display the following graphical data:

- Temperature, humidity, analog inputs
- Component operating status by hour
- Water detection floor plan
- Operating status

2.1.6.2 Control Parameters

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

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

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.

2.1.6.3 Unit Controls

A. 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). If tunable PID is selected, the user shall be able to program each of the three gains.

B. 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.

C. Compressor Short-Cycle Control
The control system shall include a program to prevent compressor short-cycling.

D. 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.

E. 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.

F. Chilled Water/Hot Water/Econ-O-Coil Flush Cycles
Chilled water, hot water, and Econ-O-Cool coils shall be automatically flushed to prevent the buildup of contaminants. Systems without this feature shall include the necessary devices to bypass fluid into the coil on a programmed basis.

G. 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.

H. 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.

I. 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.

2.1.6.4 Alarms

A. Unit 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
- Short Cycle
- Compressor Overload (Optional)
- Main Fan Overload (Optional)
- Humidifier Problem
- High Head Pressure
- Change Filter
- Loss of Air Flow
- Low Suction Pressure
- Loss of Power
- Custom Alarm (#1 to #4)

B. 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:

Water Under Floor

Smoke Detected

Standby GC Pump On

Loss of Water Flow

Standby Unit On

User customized text can be entered for all four custom alarms.

C. 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.

D. Audible Alarm: The audible alarm shall annunciate any alarm that is enabled by the operator.

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

F. 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.

2.1.6.5 Communications

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

2.1.7 Steam Generating Humidifier

The humidifier shall be electrode steam type controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor, and electronic controls. The canister assembly and all mechanical components shall be located out of the air stream to allow for service and maintenance without interrupting the airflow. The disposable canister shall use bypass air to prevent over-humidification. The humidifier shall have a capacity of _____ lbs./hr. (kg/hr).

2.1.8 Stainless Steel Finned Tubular Reheat

The electric reheat coils shall be low watt density, fin-tubular type, constructed of stainless steel fins and sheath. The reheat section shall include U.L. approved (high and low voltage) safety switches to protect the system from overheating. The capacity of the reheat coils shall be _____ BTU/HR (kW), with input power of _____ kW, controlled in three equal stages.

2.1.9 A-Frame Evaporator Coil

The evaporator shall be manufactured by Liebert with an A-frame design (slab coil on 60-ton models), and have _____ sq. ft. (sq. m) area, _____ rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of _____ ft. per minute (m per second) at _____ CFM (CMH). For enhanced temperature and dehumidification control, the coil shall be designed to provide two steps cooling. The coil shall be provided with a stainless steel drain pan.

2.1.10 Refrigeration System

Dual refrigeration circuits include hot gas muffler, liquid line filter drier, refrigerant sight glass with moisture indicator, adjustable externally equalized thermostatic expansion valve, and liquid line solenoid valve. All brazed refrigeration joints are made with BAg-5 (45% Ag) solder. Compressors shall be located in a separate compartment so they may be serviced during operation of the equipment without disrupting the air flow pattern. The refrigeration system shall consist of two semi-hermetic compressors, suction gas cooled motors, vibration isolator, thermal overloads, oil sight glass, manual reset high pressure switch, pump down low pressure switch, suction line strainer, and reversible oil pumps for forced feed lubrication. Each compressor shall have a maximum operating speed of 1,750 RPM.

2.1.11 Electrical Panel

The electrical panel shall be split into two sections, both of which are positively ventilated with filtered discharge air from the left blower. The high voltage panel contains contactors, transformers (high side taps for proper output voltage), overloads and all other exposed high voltage components. Each high voltage component shall be provided with overcurrent protection on each individual leg. The entire high voltage section shall be enclosed by a safety lock dead front panel. When the accent panel is opened by operating personnel, the high voltage components remain enclosed by the dead front panel for operator safety. The low voltage section contains the microprocessor based controls and multiple, fused control voltage transformers.

2.2 STANDARD FEATURES / INDIVIDUAL SYSTEMS

2.2.1 Air Cooled Systems Condenser

The Liebert manufactured air cooled condenser shall be the low profile, slow speed, direct drive, propeller-fan type. The condenser shall have two separate refrigeration circuits to balance the heat rejection of each compressor at _____ °F (°C) ambient. The condenser frame and panels shall be

constructed of aluminum and contain a copper tube, aluminum fin coil arranged for vertical (up) air discharge. The winter control system for the air cooled condenser shall be Liebert Fan Speed Control. The variable speed motor shall operate from 0 to 230 VAC, single phase, 10 to 1,050 RPM. It shall be designed with permanently lubricated ball bearings, internal overload protection, 40°C rise at full speed, 65°C rise at 10 RPM. The control system shall be complete with transducers, thermostats and electrical control circuit factory prepackaged in the integral condenser control box.

The transducer shall automatically sense the highest head pressure of either operating compressor and control the variable speed fan on the air cooled condenser to properly maintain the head pressure. The fan speed control system shall provide positive start up and operation in ambient temperatures as low as -20°F (–28.9°C). The air cooled condenser shall have a _____ VAC, _____ phase, _____ Hz power supply.

2.2.2 Water Cooled Systems

2.2.2.1 Water Cooled Condensers

The water cooled condensers for each circuit shall be cleanable shell and tube, counter flow type with removable heads. Condensers shall be A.S.M.E. stamped for a maximum refrigerant pressure of 400 PSI (2758 kPa) at 300°F (149°C) and maximum water side pressure of [(200 PSI (1379 kPa)) (300 PSI (2068 kPa))]. The unit shall require _____ GPM (l/s) of _____ °F (°C) water and have a maximum pressure drop of _____ PSI (kPa). Each water cooled condenser shall have separate water side supply and return lines piped in black iron.

2.2.2.2 Water Regulating Valve

Each condenser circuit shall be prepiped with a 2-way regulating valve which is head pressure activated. Valves are rated for a maximum of [(150 PSI (1034 kPa)) (300 PSI (2068 kPa))].

2.2.2.3 Chilled Water Systems

The Chilled Water models shall come standard with a 3-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 valve shall modulate in proportion to the dehumidification load. The coil shall be removable from the right-hand side of the cabinet.

2.3 OPTIONAL SYSTEMS / ALL SYSTEMS

2.3.1 Disconnect Switch (Non-Locking Type)

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 with the unit accent panel closed.

2.3.2 Disconnect Switch (Locking Type)

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.

2.3.3 Firestat

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.

2.3.4 Steam Grid Humidification

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 of _____ lbs./hr. (kg/hr) at _____ PSI (kPa) steam supply pressure.

2.3.5 Condensate Pump

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.

2.3.6 Liqui-tect Sensors (Maximum of two per unit)

Shall provide _____ 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.

2.3.7 Smoke Detector

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.

2.3.8 Four-Step System (Standard on 40 and 60 ton units)

The air conditioning system shall include cylinder unloaders on the semi-hermetic compressors. The unloaders shall be activated by solenoid valves which are controlled from the microprocessor. In response to the return air temperature, the microprocessor control shall activate the unloader solenoids and the liquid line solenoids such that four stages of refrigeration cooling are obtained. The stages shall be:

- One compressor unloaded
- Two compressors unloaded
- One compressor unloaded, one compressor loaded (full)
- Two compressors loaded (full)

On a call for dehumidification, the microprocessor shall ensure that at least one compressor is fully loaded for proper relative humidity control.

2.3.9 Corrosion Resistance Options

2.3.9.1 Phenolic Coated Evaporator Coil

Evaporator coil shall be provided with a dipped and baked phenolic coating for corrosion resistance.

2.3.9.2 Closed Cell Gasketing

The removable panels shall be provided with closed cell gasketing to prevent the infiltration of corrosive, untreated air.

2.4 OPTIONAL EQUIPMENT / INDIVIDUAL SYSTEMS

2.4.1 Optional Equipment, Air Cooled Systems

2.4.1.1 Lee-Temp Winter Control System

The winter control system for the air cooled condenser shall be "Lee-Temp." The Lee-Temp system shall allow start up and positive head pressure control with ambient temperatures as low as –30°F. The Lee-Temp package shall include, for each circuit, the insulated receivers, pressure relief valves, head pressure three-way control valves, and rotoloc valves for isolating the refrigerant charge. The Lee-Temp receivers shall be factory insulated and mounted, ready for the field connection to the air cooled condenser. The Lee-Temp heater shall require a separate power supply of _____ VAC, single phase, _____ Hz. Piggyback (Optional) Condenser, see Series PB Engineering Manual. Series HR (Optional), see Series HR Engineering Manual.

2.4.1.2 Air Cooled Condenser Disconnect Switch

A disconnect switch shall be factory mounted and wired to the condenser control panel, accessible from the exterior.

2.4.1.3 Phenolic Coated Condenser Coil

Condenser coil shall be provided with dipped and baked phenolic coating.

2.4.2 Optional Equipment, Water Cooled Systems

2.4.2.1 Copper-Nickel Water Cooled Condensers

The water cooled condensers for each circuit shall be cleanable shell and tube, counter flow type with removable heads. The condensers shall be constructed of 90/10 CuNi tubes and tubesheets with epoxy-coated cast iron, or bronze heads. The condensers shall be A.S.M.E. stamped for maximum refrigerant pressure of 400 PSI (2758 kPa) at 300°F (149°C) and a maximum water pressure of [(150 PSI (1034 kPa)) (300 PSI (2068 kPa))]. The unit shall require _____ GPM (l/s) of _____ °F (°C) water and have a maximum pressure drop of _____ PSI (kPa).

2.4.2.2 Stainless Steel Water Cooled Condensers

The water cooled condensers for each circuit shall be cleanable shell and tube, counter flow type with removable heads. The condensers shall be constructed of stainless steel tubes, tubesheets, and heads. The condensers shall be A.S.M.E. stamped for a maximum refrigerant pressure of 400 PSI (2758 kPa) at 300°F (149°C) and a maximum water pressure of [(150 PSI (1034 kPa)) (300 PSI (2068 kPa))]. The unit shall require _____ GPM (l/s) of _____ °F (°C) water and have a maximum pressure drop of _____ PSI (kPa).

2.4.2.3 Optional 3-Way Regulating Valves

The water regulating valves shall be prepiped with head pressure activated 3-way regulating valves with a maximum water pressure of [(150 PSI (1034 kPa)) (300 PSI (2068 kPa))].

NOTE: This option may not be available on all unit sizes.

3.0 EXECUTION

3.1 INSTALLATION OF INDUSTRIAL COOLING SERIES AIR CONDITIONING UNITS

3.1.1 General

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.

3.1.2 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 the electrical contractor.

3.1.3 Piping Connections

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.

3.1.4 Supply and Drain Water Piping

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

3.2 FIELD QUALITY CONTROL

3.2.1 Start up

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

Included in SL-18510 (R 12/95)