COOLING TOWER BASIN HEATER CONTROL PANEL

INSTALLATION, OPERATING, AND MAINTENANCE INSTRUCTIONS

1) GENERAL DESCRIPTION

The HEATREX cooling tower basin heater and control system consists of electric immersion heater(s), a heater control panel, and a combination temperature/liquid level sensor. They are designed to prevent basin freeze up during shutdown or standby conditions

The electric immersion heaters are sized, (kW rating, voltage, phase, and sensor cord immersion length), for the specific tower, basin size, and climate. The heaters are available in various mounting configurations and materials.

Both the heater and control panel have a liquid-proof and corrosion-proof enclosure suitable for outdoor locations.

CAUTION

These controls are not designed to prevent icing of the tower components during operation.

The control panel contains the electronic temperature/low liquid level control, control voltage transformer, and the magnetic contactor used to energize and de-energize the heaters. The control panel may control more than one heater, up to its nameplate voltage, phase, and kW rating. Various options are available for the control panel such as fusing, circuit breakers, or a disconnect switch.

The electronic temperature/low liquid level sensor probe is stainless steel with a ½" NPT mounting fitting. It is pre-connected to the control panel with a UL rated outdoor cord.

The sensor has an on/off relay output that de-energizes the heaters whenever the basin liquid temperature is above 45ºF or whenever the sensor probe is not submersed. A low voltage (12 VAC) is connected across the sensor probe and fitting. When the probe is submersed a 50 milliamp AC current passes through the conductive liquid from the sensor probe to the mounting fitting, completing the circuit. A break in this circuit indicates low liquid level and de-energizes the heaters.

WARNING

The HEATREX temperature/low level control can only be used with an HEATREX combination temperature and liquid sensor probe.

The 24V transformer in the control panel provides control voltage for the electronic temperature/low liquid level control and the magnetic contactor(s).

The magnetic contactor(s) are used to switch the line voltage to the heaters. The operating coil of the contactor is energized by the output relay on the electronic temperature/low liquid level control.

2) OPERATING INSTRUCTIONS

Visually check that the water level is above the sensor probe before energizing the main supply disconnect. The combination temperature/low level control is preset at 45ºF and the system will not energize if the water level is too low or if the water temperature is above 45ºF.

WARNING

Water level must be above sensor probe.

Under normal operating conditions the energized heater control panel will automatically cycle the heaters on and off if the basin liquid temperature is below 45ºF.

WARNING

Disconnect the heater control panel at its source and tag the circuit out for maintenance before performing the following steps.

<u>For operation above 45ºF:</u>

a) Disconnect the heater control panel and tag circuit out for maintenance.

b) Remove the heater control panel enclosure cover.

c) Remove the sensor wires connected to terminals T1 and T2 on the combination temperature/low level control and isolate them.

d) Install the 1.5K ohm test resistor supplied with the heater control panel (in bag on inside of cover) across terminals T1 and T2.

e) Install the heater control panel enclosure cover.

f) Energize the system. You should hear the contactor(s) close, energizing the heater(s).

CAUTION

Do not operate system unattended or for extended periods with the resistor across terminals T1 and T2. The excessive water temperature could damage the cooling tower.

g) After operation, de-energize the circuit, remove the resistor and place it back into storage bag. Check all

connections, reconnect sensor wires per the wiring diagram to terminals T1 and T2, replace the cover, and place the system back in service.

For operation if the sensor probe is encased in ice:

a) De-energize the heater control panel and tag circuit out for maintenance.

b) Remove the heater control panel enclosure cover.

c) Install a jumper wire between terminals G1 and G2 on the combination temperature/low level control circuit board.

d) Install the heater control panel enclosure cover.

CAUTION

Do not operate the system unattended or for an extended period of time with the G1-G2 jumper installed. A low liquid level condition could occur and the system will not shut off. This could result in damage to the heater(s) and cooling tower.

e) Energize the system and listen for the contactor closing.

f) Operate the system until the ice is melted around the probe.

g) After operation, de-energize the circuit, remove the jumper, check all connections, replace the cover, and place the system back in service.

3) INSTALLATION

This section consists of general information, mechanical installation, electrical installation, and start up.

GENERAL

Carefully plan the locations of heaters, control panels, and probes. Measure the factory supplied probe cord length.

WARNING

DO NOT ATTEMPT TO CHANGE THE CORD LENGTH.

The heater control panel should be within sight of the heater if a disconnect switch option is selected. Maintain a water level at least 2" over the heaters using the makeup water controls (furnished separately with the equipment or by the user). Low water level may lead to overtemperature conditions near the heater. Consider additional safety devices or overtemperature protection.

MECHANICAL INSTALLATION

HEATER CONTROL PANEL

After selecting the installation site mount the control panel with four 5/16" (field supplied) bolts through the mounting feet on the enclosure.

Connect the main incoming power conduit to the main power hub and the heater power conduit to the heater power hubs. If alternative conduit hubs are drilled, or if supplied hubs are not used, replace the plastic protective caps inside the hubs with steel plugs. If leakage or condensation is likely to occur in the conduit runs leading to the control panel, install a drain in the bottom of the control panel and form a conduit loop.

TEMPERATURE/LOW LIQUID LEVEL SENSOR.

Mount the combination temperature/low liquid level sensor at least 1" above the uppermost heating element, at least 6" away horizontally, and extending into the basin at least 4" (see Figure 3-1). Optimum location is where the coldest temperatures and lowest basin water levels are anticipated.

WARNING

Do not confine or surround the sensor probe with any type of well, piping, or housing, as it may adversely affect its operation.

Drill a 1 1/8" clearance hole in the basin wall. Remove the mounting nut from the ½" NPT PVC bulkhead fitting (leave the gasket in place) and insert the sensor probe through the clearance hole. Hold the bulkhead fitting in place (to prevent cord twisting) while wrench-tightening the mounting nut.

Sensor probe connections to the heater control panel are made at the factory. No electrical installation is required.

MAIN POWER INPUT WIRING

The main incoming power hub and the main power termination points are sized for wires based on the total nameplate kW and voltage. The actual load for a particular installation may be less. Either compute the actual load on the heater control panel (the total kW of all the heaters connected to it) or use the nameplate rating in determining the wire size required.

Calculate the amperage as follows:

$$\text{Single Phase Amperage} = \frac{\text{Total kW} \times 1000}{\text{Voltage}}$$

$$\text{Three Phase Amperage} = \frac{\text{Total kW} \times 1000}{\text{Voltage} \times 1.732}$$

The field supplied branch circuit disconnect switch and the branch circuit protective devices (fusing or circuit breaker) should be sized to carry at least 100% of the current calculated above.

Wiring with a temperature rating of 75ºC should be used. The wiring should be sized for the quantity of incoming wires in the conduit and the amperage of the branch

circuit protective device as directed by the NEC/CEC, or any other local directives.

If non-metallic conduit is used, provide a circuit grounding conductor that meets NEC/CEC requirements. Ground lugs are provided in the heater control panel.

Connect the incoming power wire conduit to the incoming power hub provided on the control panel. Make sure the connection is water tight and secure. Pull the incoming power wire into the control panel enclosure and make the connections per the control panel-wiring diagram.

HEATER POWER WIRING

One heater control panel may control one or more heaters (up to the maximum nameplate kW rating). The power wiring to the heater(s) must have an ampacity equal to the branch circuit over-current protection device rating, or equal to the rating of sub-circuit fusing if installed in the control panel. Some exceptions to this requirement may apply to a specific installation, such as a tap rules in the NEC/CEC. All heater power wiring should have a temperature rating of 75ºC, and be rated for the number of wires in the conduit. It must comply with any local codes, NEC, or CEC depending on the installation location.

If non-metallic conduit is used, provide a circuit grounding conductor that meets NEC/CEC requirements. Ground lugs are provided in the heater control panel.

Connect the heater power wire conduit(s) to the heater power wire hub(s) provided on the control panel. Make sure the connection is water tight and secure. Pull the heater power wire into the control panel enclosure and make the connections per the control panel-wiring diagram. Conduit connections to multiple heaters should be run so that each individual heater is branched off of the run until the conduit terminates at the last heater. Jumpering from one heater to the next is not recommended.

THERMAL CUTOFF WIRING

If the heater has a thermal cutoff, wire the cutoff back to the terminal block in the panel per the wiring diagram. This is a Class 1 circuit and can be in the same conduit as the power wiring. If there are two or more heaters connect the cutoffs in series as shown in the wiring diagram.

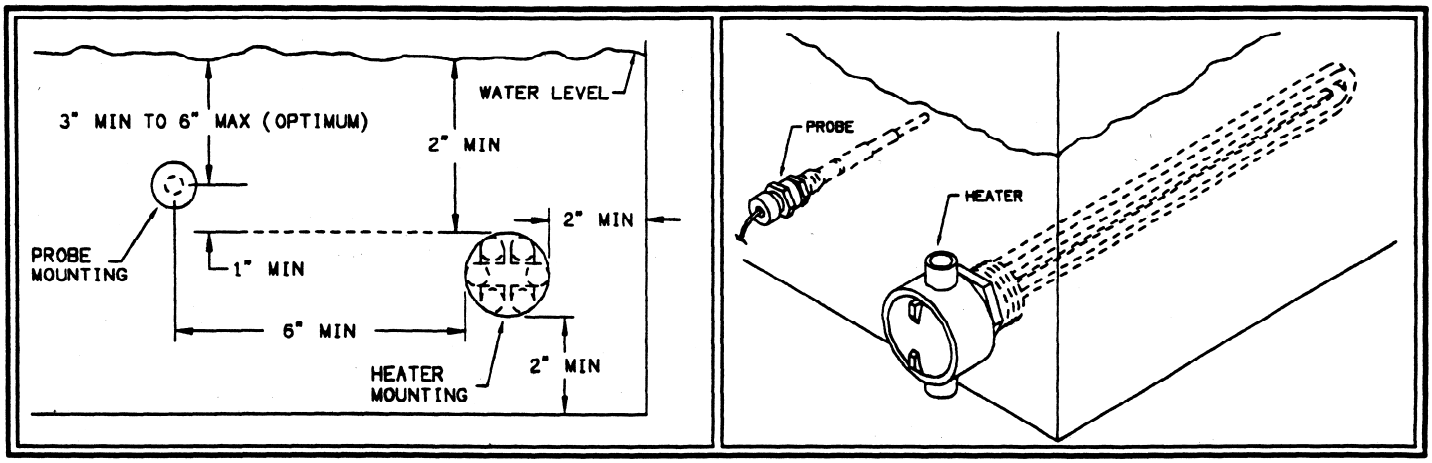

Figure 3-1.

1. Water level must never fall below 2” above heater elements while heater is energized.
2. Probe must be positioned at least 1” above and 6” horizontally away from heater. For best performance, probe should be placed between 3” and 6” below water level.
3. Heater must be positioned at least 2” above container floor to clear sludge and at least 2” from container wall for circulation. For best performance, heater should be placed midway between container walls.

4) START UP

Once installation is complete, verify proper operation:

a) Check all mechanical and electrical connections to ensure they are tight.

b) Make sure all other system components are installed and ready to operate.

c) Follow the instructions listed in Section 2 (according to conditions).

d) Once proper operation has been verified, ensure all jumpers and/or test resistors are removed and permanent wiring is installed and tightened.

5) TROUBLESHOOTING

WARNING

Possibly dangerous voltages are present in the equipment. Disconnect electrical service at the source and tag circuit out for maintenance before servicing.

CAUTION

Troubleshooting should only be performed by qualified personnel.

a) Perform a visual inspection of the system to verify:

1) Basin has adequate liquid level and is not frozen. If liquid level is low check liquid level controls and add water as required. If basin is frozen see Section 2.

2) All components appear to be undamaged and in sound operating order. If the heater has a thermal cutoff, check for continuity and replace if open.

b) Check voltage on incoming power lines at the heater control panel. The voltage on all phases should match the nameplate rating. Correct as required.

c) Remove the heater control panel enclosure cover.

d) Disconnect sensor cord and install test resistor across terminals T1 and T2 ; jumper across terminals G1 and G2.

e) Energize the system:

1) Measure the voltage at terminals “N” and “24/240” on the circuit board. The voltage should be 21-29 volts. If not, the transformer is faulty and should be replaced.

2) Measure the voltage at terminals “N” on the circuit board and “NO” on the relay. The voltage should be between 21-29 volts. If not , the circuit board is faulty and should be replaced.

3) The green LED light should be “ON” and the red LED light “OFF” when the contactor(s) are energized. If not, the contactor(s) are faulty and should be replaced.

4) Remove the test resistor and jumper wire; reconnect the sensor cord.

5) Make sure the liquid level is adequate and at a temperature of 40ºF or below. The green LED light should be “ON” , the red LED light should be “OFF”, and the contactor(s) should be energized. If they are not the cord and sensor are faulty and should be replaced

6) When the tests are completed and proper operation verified, ensure all jumpers and/or test resistors are removed and permanent wiring is installed and tightened. Replace control panel enclosure cover.

WARNING

Dangerous voltages are present in this equipment. Disconnect electrical service of source and tag circuit out before servicing or replacing components.

6) If the red LED light is flickering on and off it may indicate electrical interference with the LWCO signal from the probe. The probe cord is a (4) conductor cable, T1, T2, G1 and G2 with a shield connected to circuit board common. Connecting a lead from the circuit board common, SH, to the earth ground provided on the back panel, G, should restore the signal and normal operation.

7) REPAIR

None of the control components are field repairable. Remove and replace any failed components.

8) MAINTENANCE

The system should be inspected annually, just prior to the heating season:

a) Visually inspect the system components for physical damage, overheating, loose connections, leaks, etc. Repair as required.

b) Physically check that all wiring insulation is sound and that all wiring connections are tight. Repair and tighten as required.

c) Check operation per Section 2.

d) Maintain proper water quality per cooling tower manufacturer’s specifications. A high chlorine content and/or deposit build-up on the element tubes may reduce heater life. Correct water quality and clean deposits from element tubes as required.

e) Wipe sensor probe to remove any deposit build up.