



**Installation, Operation and  
Maintenance Manual  
For  
Heating Systems on  
Poly Processing Company  
Storage Tanks**

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# **Chapter One**

## **System Overview**

SILCOPAD Tank Heating Systems are specifically designed for temperature maintenance on polyethylene and polypropylene tanks. SILCOPAD Tank Heating Systems maintain the desired product temperature, not to exceed 100°F. Each heating system consists of tank heating pad(s) and a temperature controller.

The quantity and type of SILCOPAD Tank Heating Pads required is determined by the size of the tank, desired temperature maintenance and environmental conditions. Tanks are available with standard heating systems with a delta-T of 30, 60 and 100°F. The delta-T is the difference between the product temperature and the minimum ambient temperature. For example if you wanted to maintain 60°F in a 0°F ambient a heating system with a 60°F delta-T would be selected.

Tanks are typically supplied with the heating panels and a controller installed by Poly Processing. The only field connection required is supply power to the heating system.

## **Chapter Two**

### **General Information**

#### **2.1 System Design**

SILCOPAD Tank Heating Systems are manufactured by HTD Heat Trace, Inc. specifically for use on polyethylene and polypropylene storage tanks. Each tank heating system is specifically designed to suit a specific tank based on desired maintenance temperature and environmental conditions.

#### **2.2 Thermal Insulation**

All tanks must be thermally insulated for SILCOPAD Tank Heating Systems to be effective. Do not operate the SILCOPAD Tank Heating System without thermal insulation installed over the entire surface area of the tank. Tanks supplied by Poly Processing Company are normally supplied to the end user with 2” of polyurethane insulation installed at the factory.

## **Chapter Three**

### **Heating Pad Installation**

Heating pad and controller installation is normally completed by Poly Processing prior to supply to the end user. Installation information is provided only to give an overview of the total heating system.

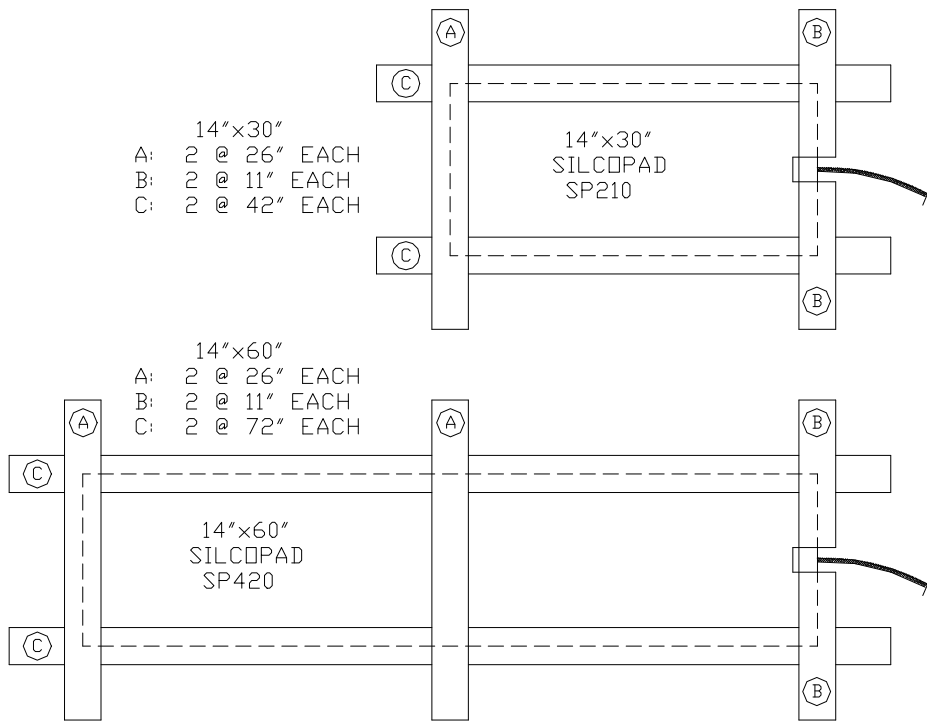
#### **3.1 Preparation**

- 1) Determine the heating panel Locations for the style and type of tank.
- 2) Determine control package location, making sure heating pad cold leads reach the control package.
- 3) Ensure that the tank surface is clean, dry and free of dirt, grease, oil, or any other substance that may interfere with the self-adhesive bonding material on the heating pad.

#### **3.2 Installation Tasks**

- 4) Remove a heating pad from the shipping box and carefully peel back the protective backing to expose adhesive surface.
- 5) Affix the heating pad to the tank surface in the position determined in step 1. Ensure the junction box end and the cold leads are in the correct position relative to the control package position determined in Step 2.
- 6) Beginning at the junction box end, carefully press the heating pad to the surface of the tank. Apply sufficient pressure to the back of the heating pad so the first 6 to 8” of the heating pad adheres to the tank surface.
- 7) With continuing pressure and smooth hand strokes to the back of the heating pad, adhere the next several inches of the heating pad to the tank. Use firm pressure to ensure that no creases, bubbles, or air gaps are present between the heating pad and surface of the tank. Repeat this process until the total inner pad surface is bonded to the tank surface.
- 8) Use 3” aluminum wide tape to secure cold leads to the tank, and seal the outer edges of the heating pad to prevent ingress of dirt, moisture and other contaminants. Cut the tape in the required lengths as shown on figure 1.





Aluminum Tape Requirements for Heating Pad Installation

Figure 1

- 9) Apply the aluminum tape as shown.
- 10) Repeat Steps 4 through 9 for each additional heating pad.

## **Chapter Four**

### **Heating System Controller**

#### **4.1 Overview**

SILCOPAD Tank Heating Systems are available with a choice of two controllers. The 2SPCP is for use in electrically non-hazardous areas and the 2HSPCP controller for use in electrically hazardous areas.

The controller is provided mounted on the tank with the heaters connected. The customer/end user must provide power to the controller.

#### **4.2 Control Location**

Both the 2SPCP and 2HSPCP are rated NEMA4 and suitable for outdoor installation. Where possible the controller should be mounted out of direct sunlight to provide maximum visibility for the heater on light.

#### **4.3 Ordinary, Non-hazardous Areas**

The 2SPCP controller is for use in ordinary, non-hazardous areas. The controller has two electronic thermostats one for process temperature control and one for over temperature protection. The process thermostat should be set to the desired process temperature, but limited to a maximum of 100°F.

The over temperature setting protects the tank or product from high heater temperatures. If the heating pad reaches the over temperature setting the heating system is shut off to avoid high tank or product temperatures. The over temperature thermostat is factory locked to 150°F.

#### **4.4 Hazardous Areas**

The 2HSPCP controller is suitable for use in hazardous Class I, Division 2, Groups B, C, D and Class II, Division 2 areas. The 2HSPCP uses two explosion-proof thermostats one for process temperature and one for over temperature with a general purpose junction box for heater connection.

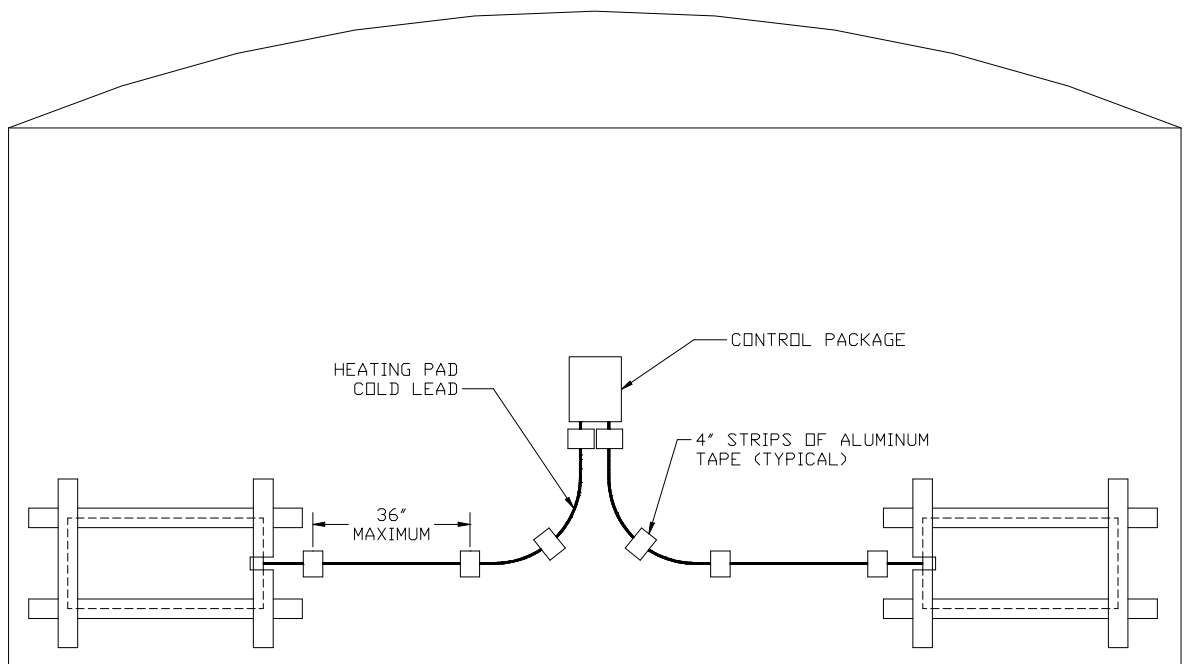
The 2HSPCP controller is provided with the process temperature thermostat factory set to 60°F. The process temperature thermostat should be set to the desired product temperature. The over temperature thermostat is factory set to 150°F, this setting should not be changed.

# Chapter Five

## **Controller Installation**

### **5.1 Physical Installation**

- 1) Mount the control package in the location determined during the heating pad installation.
- 2) Run the cold leads from each heating pad to a common point below the control package. Cold leads should be secured to the tank with 4" long strips of aluminum tape as shown in fig 2. *Do no route cold leads over the surface of any tank heating pads.*



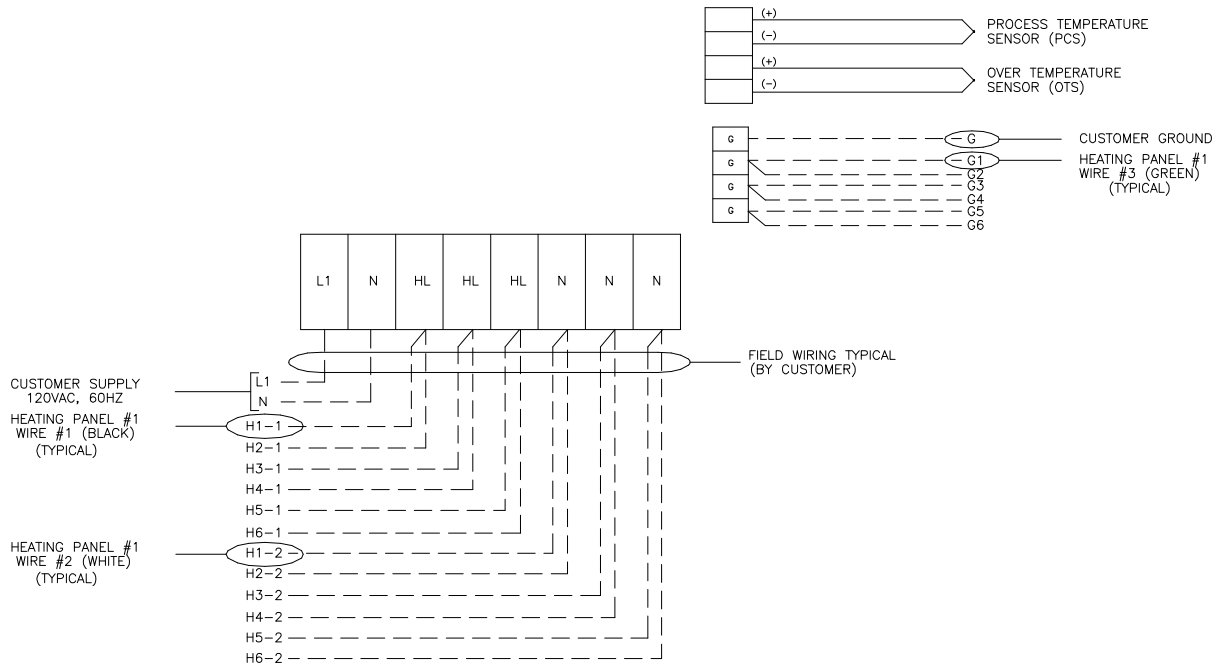
Cold Lead Routing

Figure 2

- 3) Install one entry fitting on each cold lead and install the entry fitting into one of the holes on the base of control package. Allow approximately 6" of cold lead for termination inside the control package. Seal any unused holes.

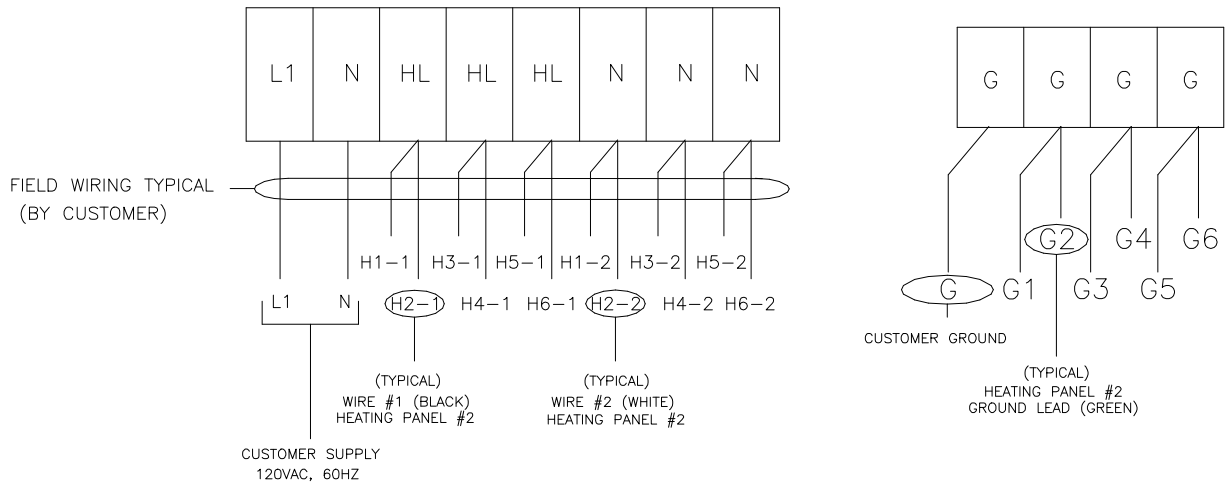
## 5.2 Heater Connection

- 1) Connect each heating pad into the heater terminal blocks as shown in either figure 3 or 4. An additional wiring diagram is included inside each control box. Ensure all connections are tight.



2SPCP Heater Connection

Figure 3



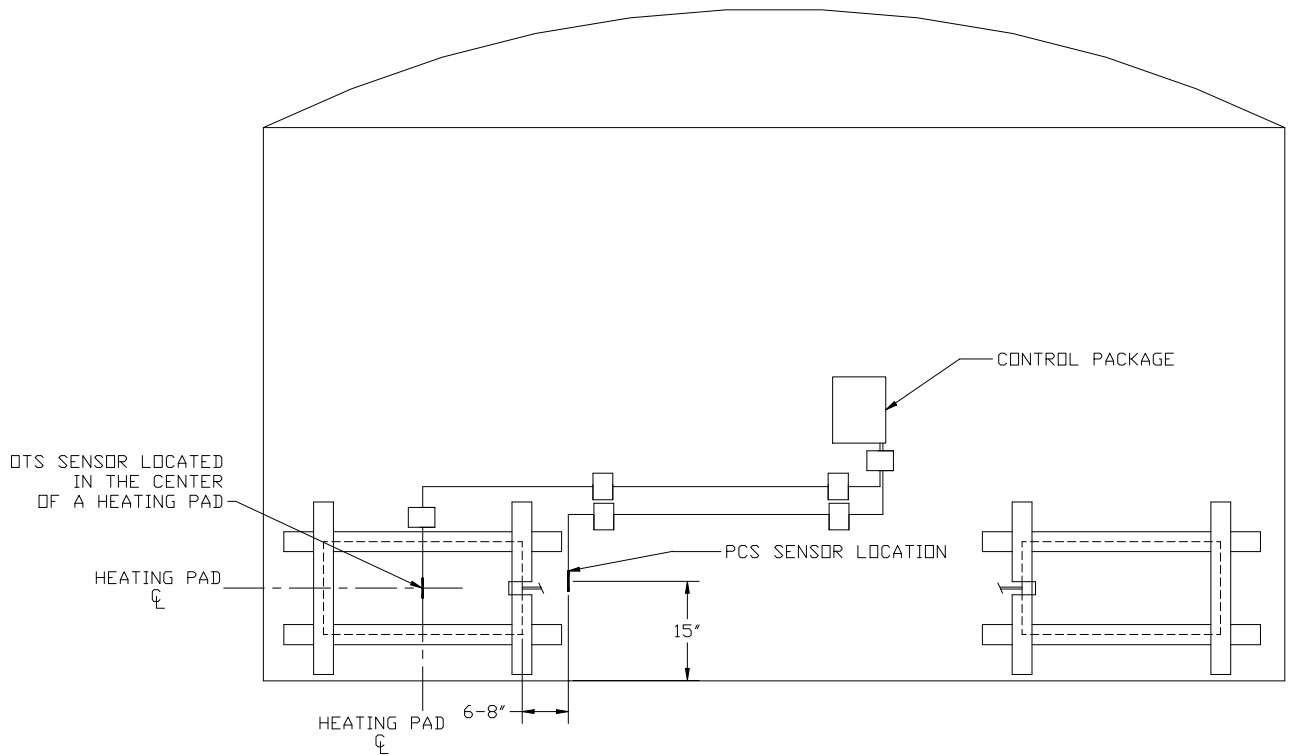
2HSPCP Heater Wiring Diagram

Figure 4

- 2) The black (hot) lead and the white (neutral) lead on each SILCOPAD heater are supplied with factory installed ring terminals. Connect ring terminals to designated terminal blocks as per wiring diagram. The green (ground) lead should be connected to the grounding bar as per wiring diagram.
- 3) After connecting customer supply in Chapter 6, test the heaters as shown on Chapter 8.

## 5.4 Sensor Location

- 1) The temperature sensor designated as “PCS” inside the control package must be located as per fig 5 and installed on the tank surface using aluminum tape.



Sensor Location  
Figure 5

- 2) The temperature sensor that is designated “OTS” must be located as per fig. 5 and installed directly onto the selected heating pad using sufficient lengths of aluminum tape.
- 3) Route the leads/capillary tubes from the sensors as shown in fig 5 using 4” strips of aluminum tape. Excess sensor lead or capillary should be coiled neatly under the control package and protected.

# Chapter Six

## **Power Supply Connection**

### **6.1 Supply Requirements**

The required customer supply to the controller is 120 VAC, 60HZ, with the current sized to match the heating system. Heating systems range in size from 210 watts to 2,520 watts depending upon the heating system supplied. The controller is labeled “120VAC, 26A Service” reflecting the maximum rating of the controller. The incoming supply should be sized to fit the specific heating system supplied.

The heating pads are available in two wattages and three types. The available heaters are shown in table 1.

SILCOPAD Size	Part#	Reference	Watts	Volts
14”x30”	2028758	SP210	210	120
14”x60”	2028756	SP420	420	120
14”x60”	2028757	S420-16	420	120

Silcopad Types

Table 1

The NEC (Section 426-22) requires that all heat tracing systems be ground fault protected. Circuit breakers are commonly available to provide ground fault protection. Circuit breakers for protection of tank heating systems should be 30 mA trip units such as Square D type QO-EPD. *GFI type breakers with a 5 mA trip are not suitable for this type of protection and can cause nuisance tripping.*

#### Circuit Breaker Sizing Criteria:

1. Determine the power of the heating system.
2. Divide the heating system power by 120 VAC to determine the nominal current.
3. Size the circuit breaker at 125% of the heating load minimum or as required by voltage drop calculations.
4. Choose the circuit breaker that most closely matches the calculation, see example.

Example:

1. A heating system with 2 – SP420 heating pads has a power of 840 watts.
2. By dividing the power by 120 VAC the nominal current is 7 A.
3. Sizing the circuit breaker at 125% requires a circuit breaker of 8.75 A or greater.
4. Pick the closest circuit breaker that is not less than 125% of the nominal load. The lowest commonly available circuit breaker trip setting is 15 A. Use a 15A, 120VAC, 30mA ground fault protected circuit breaker such as Square D part# QO115EPD.

## **6.2 Customer Connection**

Each controller is provided with a cord grip for incoming power suitable for 10 AWG, SJO flexible cable. Suitability of flexible cable should be evaluated by the customer based on the specific application. Where required the cord grip can be removed and supply connection completed using conduit connections supplied by the end user or installer. Conduit is recommended where physical protection is required.



# Chapter Seven

## **Controller Operation**

### **7.1 General Information**

The type 2SPCP and 2HSPCP controllers have two temperature settings. The PCS sensor is for control of the process temperature and the OTS for over temperature protection. The heating system is energized when the process temperature drops below the set point. The heating system stays energized until the process temperature exceeds the set point. In this manner the desired tank temperature is maintained by cycling the heating system on and off as required.

The OTS sensor shuts off the heating system if a heating pad temperature exceeds the over temperature thermostat setting. This protects the tank and/or product from over temperature caused by upset conditions, such as low liquid level.

Heating system status indication is provided via the power on to heaters light. When heat is required and the heaters are energized the power on to heaters light is illuminated.

### **7.2 Temperature Settings**

- 1) The PCS controller/thermostat is factory set to 60°F. This setting can be adjusted for the desired maintenance temperature of the specific application. The process knob in the 2SPCP is limited to a maximum of 100°F. Under no circumstances should the process setting for the 2SPCP or 2HSPCP be set in excess of 100°F.
- 2) The OTS controller/thermostat is factory set to 150°F. In the 2SPCP the over temperature thermostat knob is locked at 150°F. This setting should not be adjusted regardless of the application. *Do not operate the SILCOPAD Tank Heating System with the OTS Controller/Thermostat set point at any temperature other than 150°F.*

### **7.3 Heating System On/Off Indication**

SILCOPAD Tank Heating control packages are supplied with a “Power On to Heaters” indicating light. This light will stay illuminated only when the OTS Controller/Thermostat is permitting safe operation of the system and the PCS Controller/Thermostat is calling for heat. This light will not be illuminated when:

- a. The tank and tank contents have reached the desired maintenance temperature and the PCS controller is not calling for heat.
- b. The OTS controller has sensed unusually high heating pad temperatures and has switched off the heating system.
- c. There is no power to the system.
- d. The bulb inside the “Heat On” indicating light has failed and requires replacing.

Items “c” and “d” will require on site attention before safe operation of the system can resume.

# Chapter Eight

## Post Installation Testing and Setup

*Some testing requires exposure to electrically live components and should only be completed by an electrician or other qualified personnel.*

### 8.1 Testing

- 1) Use an Ohmmeter to check the resistance of each heating pad. Compare your reading with Table 1. Do not proceed with any heating pad that is outside the tolerance bands shown on table 1.

SILCOPAD Size	Part#	Reference	Watts	Volts	Nom $\Omega$	Acceptable $\Omega$ Range
14"x30"	2028758	SP210	210	120	68.6	65.2 to 72.0
14"x60"	2028756	SP420	420	120	34.3	32.6 to 36.0
14"x60"	2028757	S420-16	420	120	34.3	32.6 to 36.0

SILCOPAD Resistance Tolerances

Table 2

- 2) Using a 500 VDC Megger, measure the insulation resistance (IR) value between the heating element and the ground. All values below 20 M $\Omega$  are unacceptable. Do not proceed with any tank heating pad that has an unacceptable Megger reading.

### 8.2 Customer Power

- 1) Turn on customer power to the heating system.
- 2) Verify 120 VAC is present between terminals L1 & N in the controller.
- 3) Correct power wiring if necessary.

### 8.3 Controller

- 1) Once presence of customer power is verified proceed to step 2.
- 2) Raise the process temperature setting until the "power on to heaters" light illuminates. Verify 120 VAC is present on HL & N.
- 3) Verify correct current out from the HL terminal, determined by the total current for the system using the values listed below.
  - 1.75 Amps for each SP210
  - 3.5 Amps for each SP420 or SP420-16
- 4) Decrease the process and verify 120 VAC is not present on HL & N.

#### **8.4 Setup**

- 1) After testing proper operation of the heating system and controller complete the following two steps.
- 2) Set the Process Temperature knob to the desired tank maintenance temperature.
- 3) Verify proper setting of the over temperature setting, not to exceed 150°F.

## Chapter Nine

### System Maintenance

#### SILCOPAD Maintenance Schedule

<b>Procedure</b>	<b>Frequency</b>	<b>Recommendations</b>
Visual inspection of outer coating and thermal insulation.	Monthly	1) Repair all damage to the outer coating and/or thermal insulation.
Resistance Check (ohmmeter)	Every 6 Months	2) Disconnect any SILCOPAD Tank Heating Pad that shows a resistance value outside the $\pm 5\%$ tolerance figures (table 1). Remove and replace the heating pad and the earliest opportunity.
Insulation Resistance (IR) Test or Megger® Test	Every 6 Months	3) Disconnect any SILCOPAD tank heating pad with an IR value of less than $20M\Omega$ . Remove and replace the pad at the earliest opportunity.
Voltage Check (voltmeter)	Every 6 Months	4a) Reduced voltages should be evaluated to determine decreased power levels and the potential impact on the performance of the tank heating system.  4b) Operating voltages above 130 VAC are not acceptable. De-energize the system and investigate cause of over-voltage. Do not re-energize the system until the cause of excess voltage is eliminated.
Current Check* (ammeter)	Every 6 Months	5a) Any reduction in operating current should be evaluated based on the values for 2 and 4a above. Reduced current resulting from a damaged or failed heating pad(s) requires heating pad replacement.  5b) Increased current readings resultant from 2 and 4b may be normal and acceptable. Maximum acceptable current readings for SILCOPAD Heaters are: SP210 - 2.0 Amps SP420 - 4.0 Amps  <b><i>Do not operate any SILCOPAD Heating Pad Above These Values</i></b>

Table 3

\*Some clamp on ammeters may give unreliable readings at these operating currents.

## System Maintenance (continued)

### SILCOPAD Resistance Tolerances

<b>SILCOPAD Size (IN)</b>	<b>Catalog Reference</b>	<b>Part #</b>	<b>Watts</b>	<b>Volts</b>	<b>Nominal W</b>	<b>Acceptable W Range</b>
14x30	SP210	2028758	210	120	68.6	65.2 to 72.0
14x60	SP420	2028756	420	120	34.3	32.6 to 36.0
14x60	SP420-16	2028757	420	120	34.3	32.6 to 36.0

Table 4

# Chapter Ten

## Troubleshooting and Spare Parts

### 10.1 SILCOPAD Troubleshooting Guide

<b>Problem</b>	<b>Probable Cause</b>	<b>Possible Solution</b>
<b>Heaters do not energize</b>	<ul style="list-style-type: none"> <li>a. No incoming power</li> <li>b. Blown fuse</li> <li>c. Incorrect Heater Connections</li> <li>d. Failed SSR</li> <li>e. Failed or damaged Thermocouple</li> <li>f. Failed Temperature Controller</li> </ul>	<ul style="list-style-type: none"> <li>Switch on/reset</li> <li>Replace</li> <li>Correct wiring</li> <li>Replace</li> <li>Replace</li> <li>Replace</li> </ul>
<b>“Power on to Heaters” light does not illuminate</b>	<ul style="list-style-type: none"> <li>a. Heating not required to maintain temp.</li> <li>b. No incoming power</li> <li>c. Blown fuse</li> <li>d. Incorrect temp. controller settings</li> <li>e. Burnt out light bulb</li> <li>f. Failed or damaged Thermocouple</li> <li>g. Failed Temperature Controller</li> </ul>	<ul style="list-style-type: none"> <li>Heat not required</li> <li>Switch on/reset</li> <li>Replace fuse</li> <li>Correct settings</li> <li>Replace bulb</li> <li>Repair wiring</li> <li>Replace</li> </ul>
<b>Low tank Temp.</b>	<ul style="list-style-type: none"> <li>a. No incoming power</li> <li>b. Blown fuse</li> <li>c. Incorrect temp. controller settings</li> <li>d. Low incoming product temp.</li> <li>e. Damaged/missing thermal insulation</li> <li>f. Low tank liquid level</li> <li>g. Damaged/failed heating pad</li> <li>h. Incorrect heater connections</li> <li>i. Failed SSR</li> <li>j. Failed or damaged Thermocouple</li> <li>k. Failed Temperature Controller</li> <li>l. Maintenance temp. too high</li> </ul>	<ul style="list-style-type: none"> <li>Switch on/reset</li> <li>Replace fuse</li> <li>Correct temp. controller settings</li> <li>Wait for product heat up (can take a very long time)</li> <li>Repair or replace insulation</li> <li>Fill Tank</li> <li>Repair or replace</li> <li>Correct wiring</li> <li>Replace</li> <li>Replace</li> <li>Replace</li> <li>Lower process temp. setting</li> </ul>
<b>High Tank Temp.</b>	<ul style="list-style-type: none"> <li>a. Incorrect temp. settings</li> <li>b. Failed SSR</li> </ul>	<ul style="list-style-type: none"> <li>Correct</li> <li>Replace</li> </ul>
<b>Customer supplied breaker trips</b>	<ul style="list-style-type: none"> <li>a. Damaged wiring</li> <li>b. Damaged heater</li> <li>c. Incorrect heater connection</li> </ul>	<ul style="list-style-type: none"> <li>Repair or replace</li> <li>Repair replace</li> <li>Correct wiring</li> </ul>

Table 5

## 10.2 Spare Parts List

<u>HTD Part#</u>	<u>Item</u>
H01020	2SPCP Fuse
H05703	4 pt Power Terminal
H01038	Thermocouple Terminals
H01010	Thermocouple
H01034 H01072 H01036	Heater Cord grip (including sealing ring and nut)
H01024 H01071 H01037	Thermocouple Cord grip (including sealing ring and nut)
H01035 H01072 H01036	Customer Power Cord grip (including sealing ring and nut)
H05808A	Light Bulb (120 VAC, 3W)
H05808	Replacement Light Assembly
H01009	Silcopad Cold Lead
H05120	Thermostat, Hazardous Rated, N7, N9, 480VAC, 22A, 10' Bulb and capillary.

Table 6



# Chapter Eleven

## Component Details

### 11.1 Components

A detailed control panel parts list can be seen on drawing D-251 for the 2SPCP or D-194 for the 2HSPCP. This list includes HTD manufacturer part numbers. Most common spare parts are listed in Chapter 10, table 4.

### 11.2 Replacing Components

#### **WARNING!!!!**

The interior of the Control Panel must not be accessed while energized. Remove power to the control panel using the customer supplied disconnect switch or circuit breaker.

Replacement of components or panel repair should only be attempted by qualified personnel. *Incorrect wiring can cause injury to personnel and/or damage to components, heaters and/or the tank. If there are any questions or concerns contact HTD Heat Trace before commencing any work.*

To replace a component it is first necessary to note all the wiring connections and the corresponding location on the component. All these connections can also be seen on the associated drawings. Disconnect the wires and remove the component from the sub-panel or front door. Care must be taken to make sure that the mounting screws and washers do not fall into other components.

Mount the new component and reconnect the wires. Vacuum any debris out of the enclosure especially around the new component. Double-check the wire connections to insure they are correct. Close the enclosure and energize the control panel. Test the operation of the new component to insure it functions correctly.

## **Chapter Twelve**

### **HTD Heat Trace Contact Information**

#### **12.1 General Contact Information**

HTD Heat Trace can be contacted via any of the methods listed below:

##### US Mail

HTD Heat Trace, Inc.  
PO Box 398  
Whitehouse Station, NJ 08889

##### Physical Address

HTD Heat Trace, Inc.  
Bldg. #1, Salem Industrial Park  
291 Route 22 East  
Whitehouse, NJ 08888

##### Phone

Telephone: 908 534-8313  
Fax: 908 534-8023

e-mail: [support@htdheattrace.com](mailto:support@htdheattrace.com)

#### **12.2 Technical Support**

Technical support is available from 8:00 am to 5:00 PM EST Monday through Friday at 908 534-8313.