RADIANT
ELECTRIC HEAT

Troubleshooting Guide
for Heating Green Customers

The purpose of this guide is to provide instructions for the collection of the necessary information to address a Radiant Electric Heat (REH) heater that is not operational, and to explain what is / is not covered under the 10-Year material warranty.

- Is the issue with the heating element, or is there an external reason why the heater is not operational?
- If the heating element is not operating, was there a material defect, or is there an external issue that caused damage to the heating element (such as a short or a power surge)?

Is the heating element functional?

The heating element is a simple resistive heater. Outside of any external controls, it is either on or off; in terms of performance, it is either functional or it is not.

To determine if the heating element is functioning, test the resistance across the leads of the heater. Use a multimeter to measure the resistance at the end of the wires attached to the heater.

Positive reading: If the resistance test measures a positive value (typically 10 – 100 ohm range depending on the model and voltage), the heating element is functional. The cause of a non-operational heater is an issue with the broader installation or control system (such as a thermostat, temperature sensor, or relay).

Infinite / Open Loop reading: If the resistance test measures an infinite/open loop ("OL") reading, then the heating element has failed. The heating element has no electrical continuity from one end of the element to the other, the electrical circuit is broken, and the issue is internal to the heater. If more than one heater indicates a failed element, all heaters in the installation should be checked with the same procedure and results documented.

The cause of the failure could be a material defect or something external to the heater, such as a power surge or an electrical short somewhere in the system. Because external issues can propagate to other heaters in the installation (via the ground circuit), it is very important to determine so that proactive measures can be taken prior to additional failures occurring.

Are there additional tests that should be performed?

While the connections are accessible, perform an electric continuity check between each of the leads and the bare metal frame of the heater (or the metal whip which is connected to the heater). This will identify if there is a path for current to flow to ground. If there is continuity between the connections and the frame of the heater there is an active short somewhere in the system that must be addressed. Take a photo of the electrical box, making sure the box and all connections are visible.

Did the heating element fail due to an issue external to the heater?

Element failure caused by external issues is not under warranty.

While external issues are outside of Radiant Electric Heat's scope, the information below is provided to help diagnose and resolve potential issues.

An issue external to the heater can cause an element failure. If more voltage than specified is applied to the element (such as a power surge, lightning strike, etc.), or more current than would be found in normal operations is running through the lead wires (such as through an electric short somewhere in the system that causes a large amount of current to flow to ground), then the lead wires and terminals may overheat. In severe cases this will melt the solder connecting the terminals to the heating element.

If the solder joints have become disconnected, it is due to one of the above issues, which may cause a failure in the porcelain insulation as a secondary result. If the primary cause of the issue was a material defect in the porcelain, no current will flow after the failure. In that instance there isn't a way for the solder joints to overheat.

An electrical short somewhere in the system may cause sparking every time the system cycles on and off and needs to be resolved. (As noted above, a failed element on its own will not cause sparking at any time other than the initial failure.) The circuit breaker(s) that power(s) the sparking element(s) should be shut off prior to utilizing the system until the electrical short is resolved.

Damage can propagate to other heaters due to the common building ground connection. In this case, the electrical connections for all heaters should be checked. Also, verify there is no electrical continuity between the connections and the heater frames.

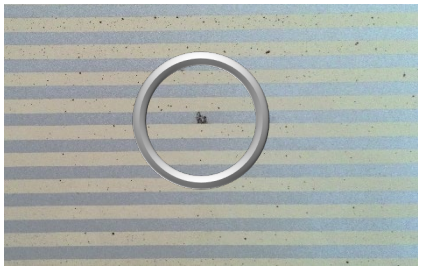
In addition, the system should be powered up and the heater frames and other components of the system checked with a stray voltage detector. Because the frame of the heater is also grounded, current can also run to the heater frames. This can result in discoloration or peeling on the painted areas of the frame, caused by the frame being heated up far more than they would during normal operation.

Did the heating element fail due to a material defect?

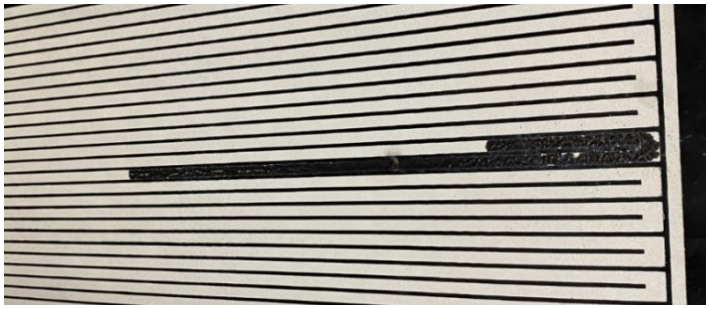
Element failure due to a material defect is under warranty.

There are only two distinct ways in which these heating elements can fail from material defects. They are both easy to identify visually. In addition to the photos of the electrical box, provide a photo of the element(s) that failed. The photo should show the full surface of the element, including the connector tabs where the lead wires attach to the heating element.

Material defect in the resistive material: The first possible material defect that is possible is if the element shows a black scorch mark at some point on the resistive trace. This is a failure of the actual resistive material. This results in no continuity across the element, where no current results in no heat. (As shown in photo to right.) This type of failure can present something that looks like a spark at the moment of failure, but there would be no sparks or any visible issue present when the system cycles on or off in the future. To be covered under warranty as a material defect, the failure of the resistive material must be the primary cause.



Material defect in the porcelain material: The other possible material defect that is possible is if the porcelain insulation between the resistive element and the steel core fails due to a defect in the porcelain material. If this occurs, current will short through from the element to the steel core. This causes the area to get much too hot for a short period of time and burns out the element. (As shown in photo to right.) When this type of failure occurs, a sustained spark could occur for a short period of time (less than a minute). However, like the previous type of failure, there would be no spark or visible issue present when the system cycles on or off in the future. Instead, at the point of failure the resistive element will appear glassy/shiny compared to the gray metallic material that comprises the element. This is because porcelain material is similar in property to glass. If it gets hotter than it would during normal function, the heating element will attain the glassy/shiny look.



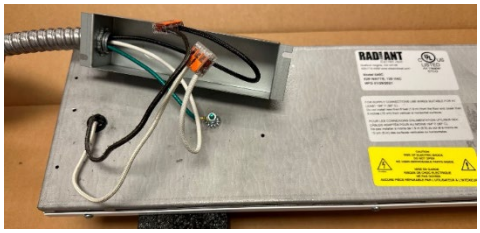
Steps after following the checklist.

After all steps are complete, send resistance readings, continuity checks, and all pictures of connections and failed elements of failed elements to support@heatinggreen.com.

If the elements failed due to a material defect, replacement heating elements will be provided under warranty, along with any further advice and instructions. If the elements failed due to external factors, new elements would need to be purchased.

Checklist for inspection of a nonfunctional heater:

1) Check resistance of non-functional heating element using a multi-meter across the lead wires in the junction box where connection is made to the heater. Document the result with a picture.
2) If resistance is normal (~10-100 ohms depending on model and voltage rating), the issue is with the external control system. Proceed to verifying function of other systems.
   If the resistance shows infinity or open loop ("OL"), proceed to step 3.
3) Check electrical continuity between the lead wires at the connection and a bare metal surface of the heater of the metal conduit. Document the result.
4) Take a picture of the junction box where the connection is made that shows all connections. Make sure the image is broad enough to show if any scorch marks or shorts are present in the junction box. (As shown in photo to right.)



5) Disconnect the lead wire to the failed element from the circuit.
6) Remove heating element from the heater frame and take a picture that shows the full surface of the element, including the terminals/tabs where the lead wires connect to the heater. (As shown in photo to right.)

7) Replace heating element in the frame, and re-hang frame on wall, on ceiling, or in the ceiling grid (depending on the mounting method). Note that this is for aesthetic reasons until a replacement can be received/installed, and the heater is no longer connected to the circuit.
8) Repeat steps 1-7 for all failed heaters, and step 3 for all heaters in the installation if more than one element has failed.
9) For each heater, send the following results to support@heatinggreen.com for review.
   a. Results of heating element resistance check in step 1
   b. Results of continuity test in step 3
   c. Picture of junction box that shows all connections in step 4
   d. Picture that shows the entire heating element, including connector tabs in step 6
10) For aesthetic purposes, any failed elements can be put back in the heater frames, and the heaters re-hung. However, lead wire to heaters with failed elements should be disconnected from the circuit until the replacement heating elements are installed.

If covered under the 10 year limited warranty:
New heating elements will be provided to be installed by the contractor/electrician on a return visit. The warranty covers the new heating element including shipping & handling. Installation costs are not covered, stated, or implied under the 10 year limited warranty.

If it is determined that the heating element failed due to external factors:
A new heating element can be purchased.