



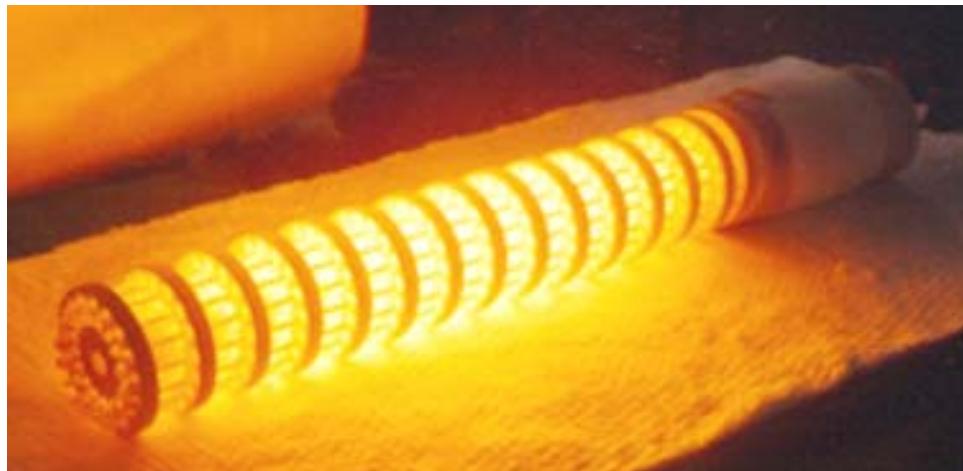
NATIONAL ELEMENT, INC.

# Instruction Manual

## Firebar®

Firebar® Patent #4,016,403 RE 30838

### Electric Heating Element for Radiant Tubes





## Firebar® Instructions

Firebar® Patent #4,016,403 RE 30838

1. The circuit must contain a suitably calibrated thermocouple (T/C) connected to a fail safe instrument with alarm or signal. This thermocouple must be mounted within the radiant tube for the purpose of monitoring the heating element temperature within the radiant tube and/or furnace element chamber, and actuating the above mentioned device should an over-temperature condition exist within the tube. This thermocouple must be used to control the Firebars. Maintenance schedules for thermocouples is required for proper control of heating elements, we recommend thermocouples be replaced once a month.
2. Each heating element assembly includes an entry hole for one thermocouple. Horizontal Firebars include 3 air holes which have been drilled through the end cover plate. Before installation of the element, be sure these air vents are clear, thereby allowing air to enter the radiant tube for the purpose of oxidizing the element rod. **DO NOT USE AIR VENTS AS THERMOCOUPLE ENTRY, OR UNDER ANY CIRCUMSTANCES INSERT ANY TOOL OR INSTRUMENT WHILE POWER IS ON TO HEATING ELEMENTS.**
3. ELECTRICAL GROUND CONNECTION IS A MUST.
4. Radiant tubes should be wire brushed and vacuumed or cleaned once a year minimum to prevent oxidation scale build up with in the tube, remove all debris.
5. The I.D. of the radiant tube must be protected if maximum tube and element life is to be achieved. National Element, Inc. recommends a process known as ALONIZING, (a pack heat treat operation during which one alloys aluminum in a high temperature vapor phase into the surface of the alloy or alloy substrate). the resultant diffusion zone is impervious to high temperature oxidation, sulfidation, and/or carburization.
6. The SCR can be either a Phase Angle or Zero voltage type. The gain control adjustment must be set at the lowest reasonable point for furnace start-up. If the furnace reacts to slowly, only adjustments of 10% increments should be allowed prior to establishing a set program. Selection of the proper control unit should be made by a qualified controls or applications engineer. Under no circumstances must this paragraph be ignored.
7. During initial start-up and after extended shut downs for maintenance or holidays, the instrument must be manually controlled through the utilization of the High Limit thermocouple within the radiant tube or element chamber, until the furnace assumes operating temperature. At this time the unit may be programmed or returned to existing program to respond to the needs of the furnace control thermocouple. Maximum allowable increase per hour as sensed by the furnace control thermocouple should not exceed 200 F., from 68 F., and/or ambient to 1400 F., and 100 F per hour to furnace operating temperature. High Limit set point on the thermocouple monitoring the temperature within the radiant tube should not exceed furnace operating temperature by more than 100 F. Each circuit should contain one such couple. Failure to comply with these important procedures will promote



## Firebar® Instructions

Firebar® Patent #4,016,403 RE 30838

over temperature conditions to exist within the tube, resulting in premature element and radiant tube fatiguing, and/or failure. Product and material warranties may be considered null and void.

8. Firebars must not be shipped mounted within the furnace, or apparatus. Save all packing material and repack carefully after in plant test at manufacturing site. See page 5 for further handling information.
9. The furnace manufacturer is solely responsible for handling, installation, and control of heating elements, their cycling and furnace heat up time.
10. Procedures mentioned are merely recommendations to follow during installation and are not intended or implied as operating instructions regarding furnace equipment. Refer to furnace manufacturers operation manual.
11. Application engineers are available for consultation at a standard daily cost plus any travel or additional expenses.

### INSTALLATION GUIDELINES

- 1. Do NOT install new heating elements randomly. New elements must be installed as complete phases. The remaining used elements are to be spares for replacement in phases with other used elements.**
- 2. Slide Firebars in slowly to prevent damage to ceramics. The Top support plate is fragile, do NOT overtighten retaining nuts, bolts, or clamps. Hand snug is all that is required.**
- 3. Electrical connectors and cable are not to restrict movement. The Firebars must be free to expand and contract, without stressing the top plate, terminal leads, or element.**

### General Operating and Maintenance Instructions for Heating Elements

1. During initial start-up and after extended shut downs (maintenance periods, breakdowns, or holidays, etc...), the control instrument must be manually controlled through the High Limit thermocouple within the radiant tube or element chamber. Maximum allowable increase per hour as sensed by the heating element control thermocouple should not exceed 500 F. per hour up to 1000 F, and only 100 F per hour thereafter until furnace operating temperature is obtained. Without careful control of element temperature, over-temperature conditions will occur, causing sagging, distortion, and rapid fatigue leading to melting.



## Firebar® Instructions

Firebar® Patent #4,016,403 RE 30838

2. Use a high quality pyrometer, and be sure safe operating conditions are NOT exceeded. Make sure that the T/C's are functioning and in proper position at all times the equipment is in operation.
3. The thermocouple used to control the Firebar should be within the radiant tube, minimum of 1/3 third down the effective heater length. Remember the greater the distance the T/C is from the element, the greater the lag time in temperature readings.
4. Sometimes excessive temperature is caused by furnace control couple calling for heat too rapidly. Batch loaded furnaces with doors are the most likely type to have this condition. Controller must be set to specific rate to prevent overheating of elements.
5. When a burnout occurs, either due to normal use or excessive temperature, the metal in the center of the wire melts first and may run out and the end will be hollow, this is not a defect, at the point of breakage there will always be a sign of fusion.
6. Turn off and secure disconnects for all power to the electrical devices being worked on. Wear safety glasses and insulating gloves.
7. Heat generated by electric heating elements will cause bolted terminal connections to expand and loosen. Retighten connections after initial furnace start-ups or installation of new elements. Periodic tightening of buss bars, transformer lugs, and element connections will prevent downtime for equipment repair. Do NOT continue to operate the furnace if the terminal connectors are red hot. Tighten clamp and/clean contact.
8. Proper grounding guards against shock when working on part of the system. It also prevent damage to sensitive electrical and computer equipment. We recommend ground connections be re-torqued once a year. Electrical ground connection is a MUST.
9. The furnace manufacturer is solely responsible for handling, installation, and control of heating elements, their cycling and furnace heat up time.
10. Maintenance schedules for thermocouples is required for proper control of elements, we recommend they be replaced once a month minimum, depending on the type being used.
11. Procedures mentioned are merely recommendations to follow during installation and are not intended or implied as operating instructions regarding furnace equipment. Refer to furnace manufacturers operation manual.
12. KEEP ELECTRICITY SAFE, always cut power to elements before removing any safety cover. Terminal covers should be tagged DANGER HIGH VOLTAGE.



## Firebar® Instructions

Firebar® Patent #4,016,403 RE 30838

### UNPACKING INSTRUCTIONS

#### 1. INSPECT CRATE FOR OUTSIDE DAMAGE(S).

The heating elements contained in this box(s) must be handled with care. They contain assembled electric heaters, manufactured with ceramic parts and resistance alloy. Great care has been taken to wrap these heaters in foam and materials to prevent damages during transit. If the crate shows evidence of damages or opening during transit, mark your bill of lading the box is damaged, and ask the carrier to call for an inspection immediately.

- A. PLEASE MARK NOTE ON BILL OF LADING BEFORE ACCEPTANCE
- B. NOTIFY CARRIER, AND ASK FOR INSPECTOR BY CARRIER AT SITE.
- C. OPEN ALL SUSPECT BOXES WITH INSPECTOR PRESENT TO DETERMINE DAMGES.
- D. THESE PARTS ARE PACKAGED PROPERLY, ANY DAMGE IS THE CARRIERS RESPOSIBLITY.

#### 2. THE ENCLOSED ELECTRIC HEATING ELEMENTS ARE LONG IN LENGTH AND CAN BE HEAVY TO LIFT.

Weight: 110 lbs 50 kg

50% OF THESE UNITS ARE CERAMIC, EARTHEN WARE  
**VERY FRAGILE. HANDLE WITH CARE**

3. To prevent damages during uncrating, the heaters should be lifted by more than one person by hand. NO LIFTING SLINGS. Large parts (Greater than 5 Feet Long) may require three (3) people due to the heavy weight.

NOTE: Top Plates and other items within the box which are packed separately from the heaters, always check packing materials for other boxes and loose items.

