Boiler and Steam Generator Heating Element Replacement

**WARNING:** Hazard of electric shock, can cause severe personal injury or death. Disconnect power at source before servicing.

**WARNING:** Hazard of severe personal injury. Allow boiler to cool and pressure to drop to zero before servicing.

**WARNING:** Provision should be made to prevent water damage from any eventual leaking of boiler or components. Install near a floor drain.

1. Before proceeding with heating element replacement review causes of element failure on reverse side of this sheet to determine if items other than element replacement need to be serviced.
2. Check that boiler is properly drained. Note wire locations disconnect wires, and remove failed heating element from boiler.
3. Boilers with multiple heater elements examine condition of other elements in the boiler. If heavy solids build-up is evident or elements are distorted, replace all elements effected.
4. Examine heater element bolts. If these are corroded, replace with ASME grade B-7 bolt of equivalent size.
5. Clean flange face on boiler carefully so as to maintain smooth gasket surface.

6. Install gasket over heater element and insert element into boiler when installing heating element gasket do not use any liquid sealer etc. Install dry.
7. Shown below is the bolt tightening sequence required when replacing heating elements. All bolts finger tight should be sequentially tightened (Fig. 1, Fig. 2 & Fig. 3) in two (2) stages. First to 100 in/lb. then to a final torque of 200 in/lb.

   **Sequence**
   - Fig. 1 - Eight (8) bolt flange (5⅞ Sq.) 1-5-3-7-2-4-6-8
   - Fig. 2 - Six (6) bolt flange (4½ Sq.) 1-3-5-6-2-4
   - Fig. 3 - Four (4) bolt flange (2½ Sq.) 1-3-2-4

8. Reconnect wiring to heater element and follow boiler startup procedures. Check that required electrical clearance between terminals is maintained.

**Note:** Heater element bolts should be retorqued after generator has been operating several hours at working pressure.

**WARNING:** Retorquing should be done when unit is cold and with power disconnected at source.
# IMMERSION HEATER FAILURE CAUSES

<table>
<thead>
<tr>
<th>Heater Element Condition</th>
<th>Probable Cause</th>
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2. Debris on heater flange or generator flange surface. Clean prior to installation.  
3. Heater bolts not retorqued after initial operation. Refer to flange tightening instructions. |
| 2. Water leakage at heater element to flange junction. | 1. Faulty weld or braze on element to flange connection or corrosion.  
2. Verify water is not exiting through heater terminal. Normally seen in condition #5. |
2. High resistance in wire connection due to oxidation. Clean wires before reconnecting to element. Replace if necessary. |
| 4. Heater element has open circuit. (Element looks OK but Ohmmeter check shows infinite resistance.) | 1. Element has open circuit due to normal wear and tear to end life.  
2. If generator is undersized for its application, heaters will be over worked and reach end of life sooner.  
3. Element has been overheated due to excessive scale build up. The scale acts as an insulator retarding heat transfer to the water. Short life will result. If signifiant scale is observed on element, this would indicate need for more frequent blowdown or descaling.  
4. Wrong voltage supplied to element.  
5. Element not totally immersed in water. This causes a localized hot spot which melts the wire inside the element. Cause of problem is fault in water level control system. Elements damaged in this manner may be distorted. Repair and verify operation of the level control prior to restarting the heater. |
| 5. Heater element has developed a ground fault. When this occurs, a hole may be formed in the sheath material, allowing water to enter the element. | 1. Corrosion of heater element sheath-use of corrosive descaler compounds will etch sheath. Use only approved descaler to remove scale.  
2. Element has overheated due to excessive scale build up. This can cause localized hot spot which sometimes arcs thru insulation and the ground metal sheath. More frequent blowdown and/or descaling is needed.  
3. Element not totally immersed in water. This causes a localized hot spot which produces a hole in sheath. Cause of problem is fault in water level control system. Elements damaged in this manner may be distorted.  
4. Excess vibration. Vibration could cause rubbing of elements wearing a hole in the sheath. Vibration could be caused by a large machinery nearby.  
5. Wrong voltage supplied to element. |

**Limited Warranty:**