SECTION 4. Maintenance

1. At start-up and every six (6) months thereafter, the pilot and main burner flame should be observed for proper performance (see Figures 9 and 10; see attached lighting and shutdown instructions for proper pilot flame pattern). If flame has the appearance of "sooting" tips, check for debris near orifices. Call service technician.

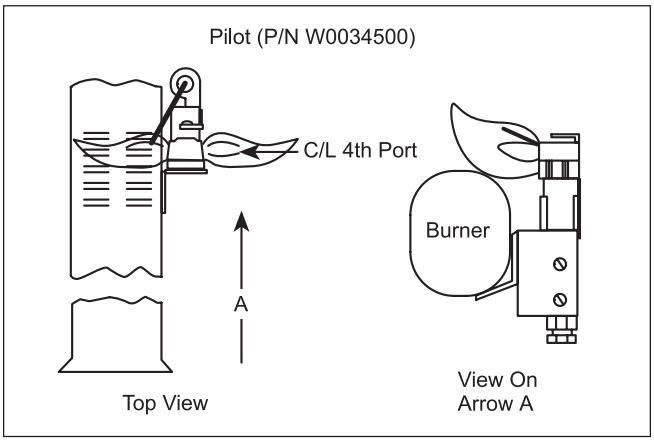

Figure 9. Pilot Location.

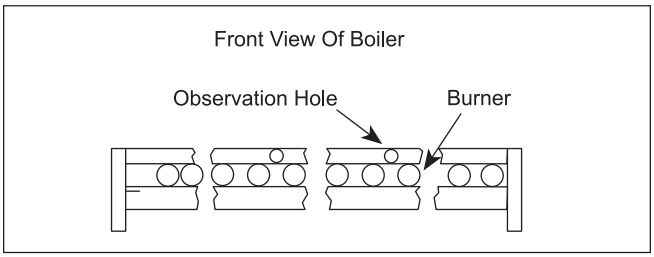

Figure 10. Periodic Flame Observation.

2. Inspect the venting system for obstruction, leakage, and corrosion at least once a year.
3. Keep boiler area clear and free from combustible material, gasoline and other flammable liquids and vapors. Boiler surfaces are hot and could ignite combustible materials.
4. Be certain all combustion air and ventilation openings are unobstructed.
5. Check for fouling on the external surfaces of the heat exchanger every six months.

NOTE: *After installation and first start-up, check the heat exchanger for fouling after the following periods of operation: 24 hours, 7 days, 30 days, 90 days, and once every six months thereafter.*

Fouling on the external surfaces of the heat exchanger is caused by incomplete combustion, and is a sign of combustion air and/or venting problems. As soon as any fouling is observed, the cause of the fouling should be corrected (see Section 5 Troubleshooting). The heat exchanger can be checked with a flashlight by locating a mirror under the burners. An alternate method is to remove the venting and top panel as necessary to inspect from above. Also, check the vent system for defects at the same time.

a. If cleaning is required, shut off all electrical and gas supply to the boiler.

b. To expose the heat exchanger:

Remove top panel covers located at the base of the front and rear flue collector panels. Remove all but the top screws on each side of the front and rear flue collector panels. The panels can be swung outward and propped up to reveal the heat exchanger. Remove all heat exchanger baffles.

c. Remove all burners:

⚠Caution

Black carbon or green soot on a dirty heat exchanger can, under certain conditions, be ignited by a random spark or open flame. To prevent this unlikely occurrence, dampen the soot deposits with a wet brush or fine water spray before servicing or cleaning the heat exchanger.

With a wire brush, remove soot and loose scale from the heat exchanger. Do not use water or compressed air for cleaning. Clean fallen debris from the bottom of the boiler. Check that burner ports are clear and pilot assembly is free of debris.

d. Reassemble in reverse order:
Be sure to replace the heat exchanger baffles.

6. The gas and electric controls installed on the boilers are designed for both dependable operation and long life. But the safety of this equipment depends completely on their proper functioning. It is strongly recommended that the basic items be checked by a competent service technician every year, and replaced when necessary. The basic controls are:

a. Water temperature controls.

b. Pilot safety system.

c. Automatic electric gas valve(s).

d. Water pressure switch.

e. Flow sensing safety device (when used).

7. Low water cutoffs should be inspected every six (6) months, including flushing or float types.

NOTE: Warranty does not cover any damage caused by lack of required maintenance or improper operating practices.

SECTION 5. Troubleshooting and Analysis of Service Problems

1. For proper service and problem diagnosis of the boiler and system, the following tools are required:
   a. Gas pressure test kit with range from zero to 14" W.C. Either a slack tub manometer or an accurate gas pressure gauge is acceptable with proper adaptors which will connect to the available fittings in the line and on the gas valve.
   b. Electric meter(s) with the following ranges:
      0 to 500 volts A.C.
      0 to 1000 ohms continuity.
   c. Millivolt meter with the following ranges:
      0 to 50 millivolts. 0 to 500 millivolts.
      0 to 1000 millivolts.
   d. Tube cleaning kit consisting of reamer, stainless steel brush, speed handle and handle extensions.
   e. Accurate thermometer and pressure gauge.
2. In addition, the boiler should be equipped with a thermometer with proper ranges.

Boiler Will Not Fire	
Possible Cause	**What To Do**
Electric Power is off.	Check to see that main power switch is ON. Use testing device to trace power to boiler junction box.
Operating or safety control has opened circuit to electric gas valve.	Turn off power. Use continuity tester to check continuity across terminals of each operating and safety control switch up to the electric gas valve. Replace defective control.
Pilot flame is out.	Relight pilot per instructions.
Manual reset device has tripped.	Follow instructions for start-up. Reset pilot safety and all manual reset safety switches.
No gas pressure to burners.	Trace gas line to service shutoff cock. If service cock is open, trace gas line to meter. If no pressure is present at meter, call for public utility service. If gas is present in heater inlet, check pressures in following sequence: (1) downstream from pressure regulator, (2) downstream from electric gas valve. Replace or adjust as necessary.
Electric gas valve operator is burned out or shortened.	Disconnect wiring harness at gas valve terminals. Check continuity to actuator coil. If open circuit or short is indicated, replace coil or operator.

Boiler is Pounding, Knocking, or Emitting Steam from Relief Valves	
Possible Cause	**What To Do**
Lower or no water flow.	This condition is usually caused by lack of adequate water flow through heater. check the following: 1. Is the heater wired into the pump circuit so that the heater cannot fire unless the pump is running? 2. Check to see that all valves in system are open to be sure that water can circulate through the heater and the system. 3. Examine pump for clogged impeller. 4. Check water filter.
Debris from system is blocking tubes.	Remove header covers. Examine all tubes and waterways. Use new gaskets when reassembling. Clean out tubes.
Scale has formed in tubes.	This is always caused by heavy mineral content of the water or clogged filter. Check the water chemistry. Replace the filter and clean all the internal wet surfaces.

Soot in Flueways or in Tubes, or Noxious Fumes Indicative of Bad Combustion	
Possible Cause	**What To Do**
Combustion air supply to equipment room is inadequate.	Check air supply opening. Look for debris in screen or louvre which covers combustion air opening, or for material blocking the opening.
Stack or vent is blocked or restrictive.	Look for blocked stack and excessive number of elbows in stack or excessive length of horizontal runs.
Severe down draft is causing spillage of flue products into room.	Check for (1) proper vent cap on stack; (2) adequate height of stack above roof; (3) equipment exhausting air from inside of building.
Gas pressure to burners is excessive.	Check gas pressure with manometer,and adjust with heater firing at full rate.
Heater not fitted for the fuel being supplied.	See nameplate for correct fuel.
Heater installed at high altitude without proper derating.	Installations at altitudes in excess of 2000 ft. above sea level are subject to jurisdiction of the local inspection authorities. Check with the factory.

Water Dripping in Firebox	
Possible Cause	**What To Do**
Tube in heat exchanger has overheated and ruptured.	A tube failure is almost always caused by: (a) Scale formation in the tube, or: (b) inadequate water flow through the boiler. Replace heat exchanger tube(s) and check for proper flow.