

## XIII Service and Maintenance

### A. Water Side Maintenance

The following procedure should be performed on an annual basis:

- 1) Turn off electrical power and oil supply to the boiler.
- 2) Inspect the low water cut-off:
  - For Hydrolevel CG450 low water cut-offs - Remove and inspect the probe for scale and sediment buildup. Clean any sediment or scale from the probe with a scouring pad or steel wool. Consult the Hydrolevel CG450 manual for any additional maintenance information. Test the low water cut-off before placing the boiler back into service.
- 3) Allow the boiler to cool to room temperature and drain the boiler. Remove the 1-1/4" plug from the unused return tapping. Use a flashlight to inspect the bottom row of push nipples for accumulated scale or mud. If a significant amount is present, use the following procedure to clean the inside of the heat exchanger:
  - a) Temporarily install a 1-1/4" inch or larger full port ball valve in place of the 1-1/4" plug. Temporarily pipe the outlet of this valve to a location where hot water and steam can be safely discharged.
  - b) Make sure that this valve is closed and that the water level is at the normal water line.
  - c) If a king valve is present in the steam main takeoff, close it. Alternatively, temporarily replace enough of the vents on the mains and/or radiators with plugs so that 2-5 psi can be developed when the boiler is fired.
  - d) Fire the boiler and allow it to steam until 2-5 psi is registered on the gauge.
  - e) Turn off the burner and immediately fully open the 1-1/4" valve.
  - f) Allow the boiler to blow down until either the water runs clear or the water level reaches the bottom of the gauge glass.
  - g) Allow all parts of the boiler to cool to room temperature. Drain the boiler completely and remove the 1-1/4" valve.
  - h) If significant mud or scale is still present in the bottom of the boiler, repeat steps (b) through (g) until all mud or scale is removed.
  - i) Once all mud or scale is removed, replace the 1-1/4" valve and temporary blow-down piping with the standard plug.
  - j) After all parts of the boiler are at room temperature, refill the boiler to the normal water line.

#### NOTE

A large accumulation of mud or scale in the bottom of the heat exchanger is usually a sign of excessive feedwater make-up. Such accumulations can cause severe heat exchanger damage. If mud or scale accumulations are found:

- Make sure that all vents are in working order. Vents should not permit any passage of steam or water.
- Check all steam and return piping for leaks. Be aware that buried return piping can leak and go undetected during normal operation.

#### TANKLESS HEATER MAINTENANCE

- During the warm months, make sure that the water level in the boiler is 30 to 31-1/2 inches above the surface on which the boiler is installed. Failure to do this may result in inadequate hot water and/or steaming when there is no call for heat.
- Maintain the mixing valve in accordance with the valve manufacturer's instructions.

## B. Fire Side Maintenance



All boiler cleaning must be completed with the burner service switch turned off. Boilers equipped with burner swing door have a potential hazard which can cause severe property damage, personal injury or loss of life if ignored. Before opening swing door, turn off service switch to boiler to prevent accidental firing of burner outside the combustion chamber. Disconnect the burner plug from the receptacle in the front jacket. Be sure to tighten the swing door fastener completely when service is completed.

The following procedure should be performed on an annual basis:

- 1) Turn off electrical power and oil supply to the boiler.
- 2) Clean the boiler as follows:
  - a) Remove the two 3/8" bolts from either side of the swing door and open the door to access the combustion chamber.
  - b) Remove the two smoke box clean-out covers from the rear smoke box by removing the four 5/16" bolts. It is not necessary to remove the vent connector from the smoke box to clean boiler however if there is heavy soot accumulation in the boiler remove the vent connector to inspect the base of the chimney for condensate or accumulation of debris.
  - c) Remove the baffles (if installed) from the flue passages.
  - d) Clean the 3rd Pass - Insert a 2" dia x 42" long wire or fiber bristle brush into one of the two 3rd flue passes. Using long strokes push the brush all the way through the boiler until the brush has exited the smoke box opening. Pull the brush all the way forward until it has exited the front of the boiler. Continue this operation for the entire height of the flue way until clean. Repeat the operation for the other 3rd pass flue way.
  - e) Clean the 2nd Pass - Insert a 2" dia x 42" long wire or fiber bristle brush into one of the two 2nd flue passes. Using long strokes push the brush all the way through the boiler until the brush hits the back wall of the reversing chamber. Pull the brush all the way forward until it has exited the front of the boiler. Continue this operation for the entire height of the flue way until clean. Repeat the operation for the other 2nd pass flue way.
  - f) Vacuum to loose debris in the bottom of the combustion chamber and smoke box
  - g) Clean the Combustion Chamber - Use a wire or fiber bristle brush to clean the surfaces of the combustion chamber. Vacuum all loose debris in the chamber.
  - h) Check condition of the burner swing door insulation and rope gaskets for signs of damage; replace if required.
  - i) Check burner head for signs of deterioration. Clean the head of any deposits.
  - j) Insert baffles (if originally installed) into the correct flueways.
  - k) Attach the smoke box clean-out covers onto the rear of the boiler using the 5/16" bolts originally removed. Verify that the rope gasket is in good order before assembly. Replace rope gasket if necessary. Do not over tighten. The bolts should be snug but not bottomed out.
  - l) Close the swing door and tighten it with the 3/8" bolts originally removed. When securing the burner swing door make sure the door is drawn-in equally on both sides by alternating the tightening method for right side to left side. Do not over tighten. The rope gasket will provide sufficient seal when door is snugged into place.

### IMPORTANT

Clean The Boiler Even If There Are No Significant Soot Deposits. Failure To Remove All Sulfur And Ash Deposits Annually Can Cause Severe Corrosion Damage.



## WARNING

The boiler must be connected to an approved chimney in good condition. Serious property damage could result if the boiler is connected to a dirty or inadequate chimney. The interior of the chimney flue must be inspected and cleaned before the start of the heating season and should be inspected periodically throughout the heating season for any obstructions. A clean and unobstructed chimney flue is necessary to allow noxious fumes that could cause injury or loss of life to vent safely and will contribute toward maintaining the boiler's efficiency.

- 3) Inspect the vent system:
  - a) Make sure that the vent system is free of obstructions and soot.
  - b) Make sure that all vent system supports are intact.
  - c) Inspect joints for signs of condensate or flue gas leakage.
  - d) Inspect venting components for corrosion or other deterioration. Replace any defective vent system components.
  - e) Ensure all vent piping joints are gas tight and secured with sheet metal screws.
- 4) Service the oil burner:
  - a) Replace oil nozzle with identical make and model (see Table 12.1).
  - b) Inspect the electrodes. Replace if they are deteriorated. Make sure that the electrode position is set according to the burner manufacturer's instructions.
  - c) Remove and clean fuel pump strainer.
  - d) Remove any accumulations of dust, hair, etc. from the air shutter, blower wheel, and other air handling parts of the burner.
  - e) Replace the fuel oil line filter element and gaskets.
- 6) Inspect all oil piping and fittings for kinks and leaks. Repair any found.
- 7) Inspect the hydronic piping and boiler for water leaks. Repair any leaks found immediately.
- 8) Verify operation of relief valve by manually lifting lever; replace relief valve immediately if valve fails to relieve pressure.
- 9) Open fuel line shut-off valve(s) and restore electrical power to the boiler.
- 10) Fire the boiler and check it out using the procedure outlined in "Start-up and Checkout". This must include checking the burner adjustments using instruments. Check for proper operation of all controls.



## WARNING

Water leaks can cause severe corrosion damage to the boiler or other system components. Repair any leaks found immediately.

## **Important Product Safety Information** **Refractory Ceramic Fiber Product**

### **Warning:**

The Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures about 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

### **AVOID Breathing Fiber Particulates and Dust**

### **Precautionary Measures:**

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
  2. Long sleeved, loose fitting clothing
  3. Gloves
  4. Eye Protection
- Take steps to assure adequate ventilation.
  - Wash all exposed body areas gently with soap and water after contact.
  - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
  - Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

### **First Aid Procedures:**

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

## XIV Trouble Shooting

### A. Combustion

- 1) Nozzles - The selection of the nozzle supplied with the FSZ boiler is the result of extensive testing to obtain the best flame shape and efficient combustion. Other brands of the same spray angle and pattern may be used but may not perform at the expected level of CO<sub>2</sub> and smoke. Nozzles are delicate and should be protected from dirt and abuse. Nozzles are mass-produced and can vary from sample to sample. For all of those reasons a spare nozzle should be part of a serviceman's replacement parts inventory.
- 2) Flame Shape - As seen for the observation port, the flame should appear straight with no sparklers rolling up toward the crown of the chamber. If the flame drags to the right or left, sends sparklers upward or makes wet spots on the chamber walls, the nozzle should be replaced. If the condition persists look for fuel leaks, air leaks, water or dirt in the fuel as described below.
- 3) Fuel Leaks - Any fuel leak between the pump and the nozzle will be detrimental to good combustion results. Look for wet surfaces in the air tube, under the ignitor and around the air inlet. Any such leaks should be repaired as they may cause erratic burning of the fuel and in the extreme case may become a fire hazard.
- 4) Air Leaks - Any such leaks should be repaired as they may cause erratic burning of fuel and in extreme cases may become a fire hazard.
- 5) Gasket Leaks - If CO<sub>2</sub> readings between 11.5% and 12.8% with a #1 smoke cannot be obtained in the breeching, or if odors are observed, look for leaks around the burner mounting gasket, observation door and canopy gasket, or in the breeching below the point where the flue gas sample is taken. Air leakage into the boiler or breeching can cause low CO<sub>2</sub> readings (the lower the firing rate, the greater effect an air leak can have on CO<sub>2</sub> readings). Such leaks can also cause flue gas leakage into the building, resulting in odor complaints.
- 6) Dirt - The use of a fuel filter is good practice. Accidental accumulation of dirt in the fuel system can clog the nozzle or nozzle strainer and produce a poor spray pattern from the nozzle. The smaller the firing rate, the smaller the slots in the nozzle and the more prone to plugging it becomes.
- 7) Water - Water in the fuel in large amounts will stall the fuel pump. Water in the fuel in smaller amounts will cause excessive wear on the pump. More importantly it chills the flame and causes smoke and unburned fuel to pass through the combustion chamber and clog the flueways of the boiler.
- 8) Cold Oil - If the oil temperature near the fuel pump is 40°F or lower, poor combustion or delayed ignition may result. Cold oil is harder for the nozzle to atomize, thus the oil droplets get larger and travel further creating a longer flame. An outside fuel tank that is above grade or has fuel lines in a shallow bury is a good candidate for cold oil. The best solution is to bury the tank and lines deep enough to keep the oil above 40°F. Be sure to follow any state and local codes when burying fuel oil tanks and/or fuel oil lines.
- 9) Start-Up Noise - Delayed ignition is the cause of start-up noises. If it occurs recheck for electrode settings, flame shape, air or water in the fuel lines.
- 10) Shut Down Noise - If the flame runs out of air before it runs out of fuel, an after burn with noise may occur. That may be the result of a faulty cut-off valve in the fuel pump, or it may be air trapped in the nozzle line. It may take several firing cycles for that air to be fully vented through the nozzle. Water in the fuel or poor flame shape can also cause shut down noises.

### TEST PROCEDURE FOR FUEL SIDE PROBLEMS

A good test for isolating fuel side problems is to disconnect the fuel system and with a 24" length of tubing, fire the burner out of an auxiliary five gallon pail of clean, fresh, warm #2 fuel oil from another source. If the burner runs successfully when drawing out of the auxiliary pail then the problem is isolated to the fuel or fuel lines being used on the installation.