



# **LE, WLE & WHE SERIES BOILERS**

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## **INSTALLATION, OPERATION and MAINTENANCE MANUAL**

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# IMPORTANT

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- 1. Read and familiarize yourself with this installation, operation, and maintenance manual before installing, operating, or servicing your boiler.**
- 2. All cover plates, enclosures, and safety devices must be installed at all times except while performing maintenance and service.**
- 3. Only trained service technicians should do any work on your boiler.**
- 4. All state and local codes take precedence over any recommendations given in this manual.**

## LIMITED PARTS WARRANTY

The Pottstown Engineered Products, Inc. (hereinafter PEP) warrants the burner components and controls installed on its boiler/burner units to be free from defects in material and workmanship under normal use and service for 12 months from the date of start-up (proof of start-up date is required) or 18 months from original ship date, whichever date occurs first\*, and is subject to warranty approval by the manufacturer of the specific components. Equipment which is defective in material or workmanship and is removed within 12 months from the date of installation will be repaired or replaced as follows:

- a) After receiving authorization from PEP, such defective equipment should be returned after receiving authorization from your dealer, freight pre-paid, to Pottstown Engineered Products, Inc., 390 Old Reading Pike, Pottstown PA 19464. The use of the PEP returned goods form is mandatory when returning defective material. All burner components must be returned with a complete startup report which can be found in PEP's Installation Manual.
- b) PEP is not responsible for any labor cost for the removal and replacement of equipment.
- c) Equipment which is repaired or replaced will carry a warranty equal to the unexpired portion of the original equipment warranty.
- d) If inspection by PEP or manufacturer of the specific component does not disclose any defect covered by this warranty, the equipment will be repaired or replaced at the expense of the Customer, and PEP's regular charges will apply.

**\*Boiler feed pump warranty is 30 days from date of start-up (proof of start-up date is required) or 90 days from original ship date.**

**THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE EXCLUDED. IN NO EVENT WILL POTTSTOWN ENGINEERED PRODUCTS, INC. BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.**

PEP neither assumes nor authorizes any person to assume for PEP any other liability or obligation in connections with the sale of this equipment. PEP's liability and Customer's exclusive remedy being limited to repairs or replacement as set forth above.

July 15, 2024

# INTRODUCTION

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## **Series LE and WLE Water Tube Boilers**

The PEP Models LE and WLE are water tube boilers designed for hot water, and/or low pressure steam applications. These units are manufactured to the specifications set forth by Section IV of the ASME Boiler and Pressure Vessel Code. Boilers are inspected and stamped for conformity to requirements of the National Board of Boiler and Pressure Vessel Inspectors. All boilers are designed to be fired using No. 2 fuel oil, and/or natural, manufactured, or liquid propane (LP) gas, and are powered by standard AC electrical service.

## **WHE Series Steam Boiler**

The WHE Series is a steam boiler used for indirect hot water applications. This boiler classification consists of all LE and WLE Series Boilers providing heat transfer to one or two coils, depending on boiler size. The boiler is a self contained unit allowing a steam cavity above the water line for expansion.

PEP hot water and low pressure steam boilers are typically shipped knocked down (unassembled), but are also available factory packaged. All boilers are furnished with a jacket kit, burner, and boiler trim. Boiler trim consists of the operating and limit controls, pump and/or low water cut off (LWCO) controls, a safety valve, and a smokehood for all WLE Series Boiler Models, and Model LE-32. Factory packaged boilers are fully assembled and test fired.

# **SERVICE POLICY**

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Anything mechanical will inevitably need servicing. Steam and hot water boilers are routinely serviced by the installer or another boiler maintenance company. Occasionally the service technician may be unable to determine the cause of the problem. In this situation, the dealer or service organization should contact the selling distributor for help.

Should the problem persist, the distributor will contact the sales representative for assistance. Depending on the extent of the problem, the representative may request technical assistance from the factory.

If the problem cannot be resolved by the representative, he should contact the Technical Service/Engineering Department at the factory. The sales representative will need the following information. It is essential that this information be available to assure prompt service.

Boiler Model and Size (HP) \_\_\_\_\_

Boiler Serial Number \_\_\_\_\_

Boiler National Board Number \_\_\_\_\_

Date Installed \_\_\_\_\_

Burner Type and Model \_\_\_\_\_

Primary Burner Control Type \_\_\_\_\_

Installer's Name \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Address \_\_\_\_\_

Distributors Name \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Address \_\_\_\_\_

Sales Representative \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Address \_\_\_\_\_

Specific Problem - Detailed

# INSTALLATION

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## **BEFORE BEGINNING INSTALLATION, CAREFULLY STUDY THESE INSTRUCTIONS AND ALL CHARTS, DRAWINGS, AND DIAGRAMS SHIPPED WITH THE BOILER.**

Installation must follow all state and local code requirements, Fire and Underwriters regulations, and standard plumbing practices. The electrical installation shall be in accordance with the National Electrical Code.

Remove all boiler components from packaging and inspect prior to assembly to ensure that damage has not occurred in shipping.

### **BOILER ROOM**

Locate the boiler in a well lit area on a noncombustible, level floor. Make available a convenient water supply and allow adequate drainage, including unobstructed floor drains, for flushing and filling the boiler. Provide sufficient make-up air for combustion at all times. Power the boiler using a properly rated electrical service. Include fused disconnects for control circuits, blower motor circuits, and feed pump circuits that require a motor contactor or motor starter relay.

Where possible, place the boiler on a 3 inch concrete pad. Allow adequate clearance between the boiler and any walls or obstructions to permit inspection and service on burner, boiler piping, controls, or combustion vent.

**DO NOT** install exhaust fans in or near the boiler room. Exhaust fans steal available make-up air during burner operation; and more importantly, when the boiler cycles off, exhaust fans pull hot flue gases back through the burner causing burner parts to deteriorate, and to eventually fail prematurely. Maintain a positive pressure in the boiler room at all times.

**Do not allow your boiler room to become a storage room.**

### **VENTING**

All PEP boiler models utilize a pressure fired burner and need only to be properly vented. For situations where unusual conditions may exist, consult the factory for proper venting.

Locate the boiler as close as possible to the chimney or other approved exhaust vent. For boiler models with a rectangular flue outlet, first bolt the supplied smokehood in place. Attach all flue piping to the round flue connection and make each connection secure. The flue pipe should not be inserted beyond the inside wall of the chimney.

### **DO NOT REDUCE THE SIZE OF THE FLUE OUTLET OR FLUE PIPING.**

PEP recommends the use of galvanized B Type vent for stack connections suitable for temperatures to 550F. The flue pipe should be pitched upward at least 1/4" per foot of run. Avoid the use of tees, sharp bends, and long horizontal runs. Install a draft regulator if required.

**PEP SHALL NOT BE HELD LIABLE FOR DAMAGE TO THE BOILER CAUSED BY INCORRECT VENT CONDITIONS AND/OR INSUFFICIENT BURNER MAKEUP AIR.**

## **JACKET ASSEMBLY**

Assemble the jacket kit around the boiler as shown in Figure 1. Place each panel against its respective side of the boiler.

**NOTE: The side panels for boiler Models WLE-120, WLE-140 and WLE-180 are two piece side walls. Assemble these side wall pieces together before proceeding with jacket installation.**

Assemble the lower front panel to one side wall at a time. Next, attach the lower rear panel to each side wall of the boiler. When applicable, mount the upper front and rear panels in their respective locations. Attach the joiner plate behind the lower portion of the lower front panel as shown. Finally, assemble the top right and left jacket panels on top of the boiler. Attach these panels to the previously assembled jacket components. If necessary, prepipe the top of the boiler before assembling the top jacket panels. The top jacket panels are designed to allow prepping to the top center boiler fittings, if needed.

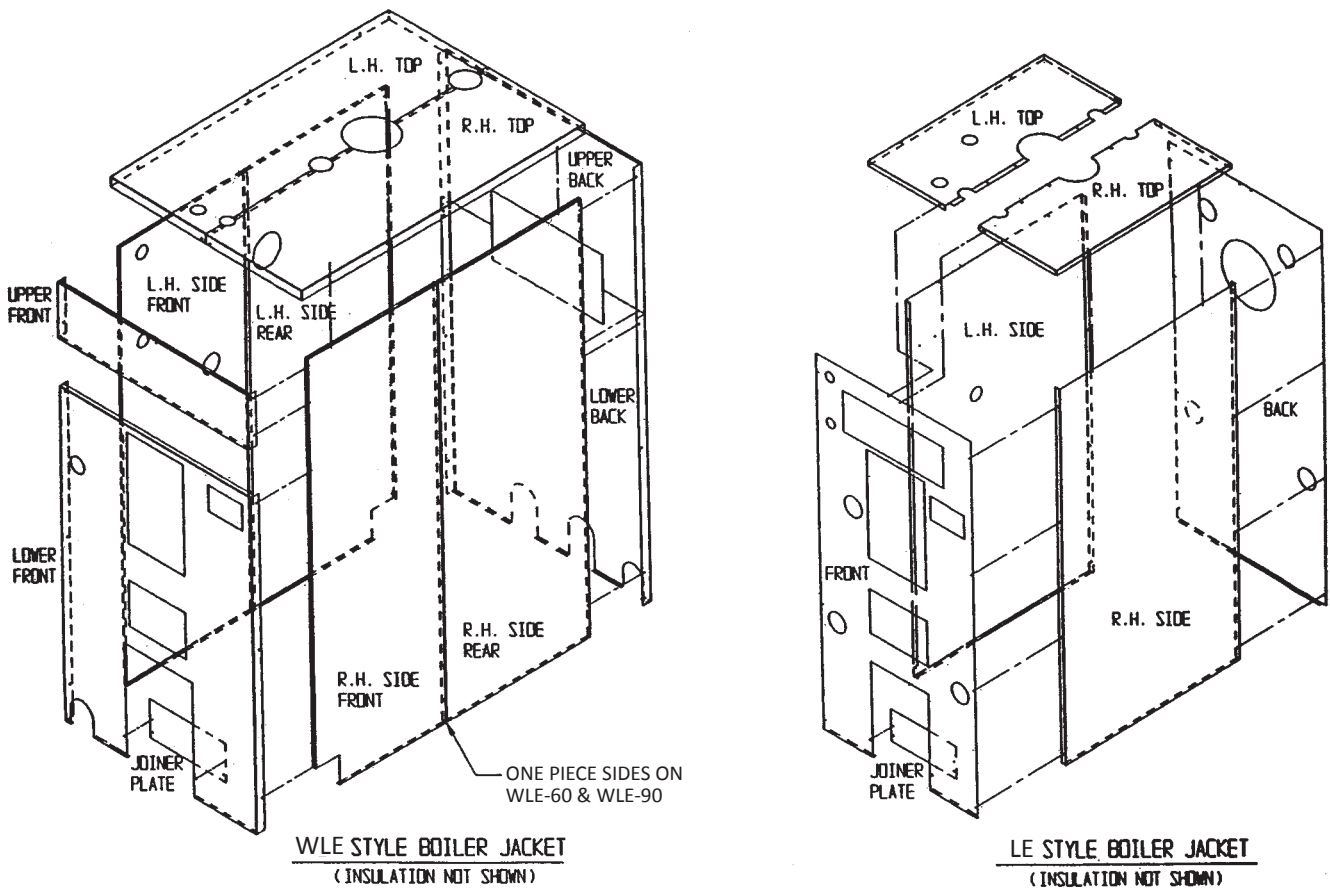


Figure 1



## BURNER MOUNTING

If the burner is to be installed on site, first apply a gasketing material between the burner flange and the burner mounting plate to seal the burner. Use a non-asbestos fiber rope, or a wet insulating material for a gasket, as shown in Figure 2. Wet insulation is the preferred gasketing material because it compresses into a flat gasket which conforms to and fills any and all voids. Secure the burner in the boiler using the four bolts supplied with the burner. See the Burner Section of this manual for proper electrical wiring, and fuel supply piping.

**Note: All factory packaged boilers use a wet insulation material as a gasket.**

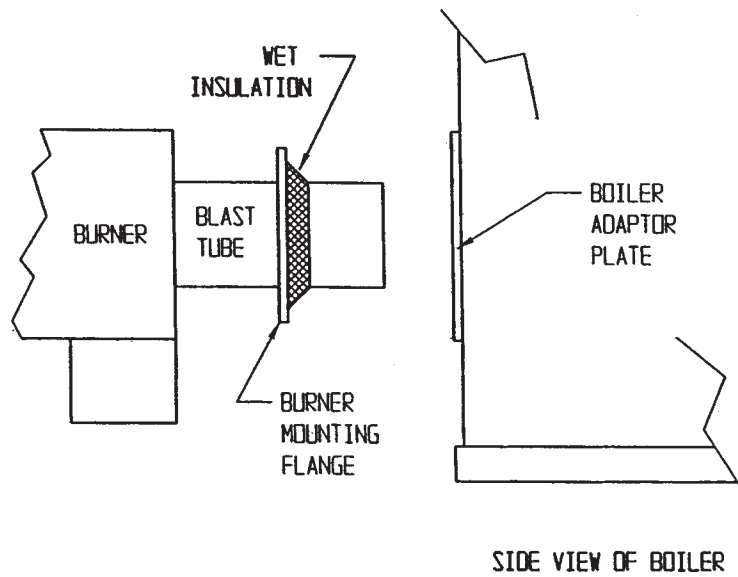


Figure 2

# BOILER CONNECTIONS

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## Drains

All PEP units have (4) washouts located around the lower corners of the boiler for drainage purposes. Install a pipe nipple and ball valve in a least one washout for use as a drain. If a washout is not needed, plug it by using the proper size nipple and a pipe cap. DO NOT use a pipe plug.

## Low Water Cut-Offs

All PEP boilers are supplied with a single low water cut-off (LWCO) as standard equipment. Several boiler applications may require a secondary LWCO. The standard equipment is as follows:

Hot Water Boilers - *McDonnell & Miller 750-MT-120 Probe Type Low Water Cut-Off with Remote Sensor* - Thread the Remote Sensor into the 3/4" NPT fitting located on top of the boiler. Mount the Control Box near the top of the front jacket panel (or upper front jacket panel on some units).

Steam Boilers - Warrick 26C1D1C Probe Type LWCO with manual reset.

Water Heaters - Warrick 26C1D1C Probe Type LWCO with manual reset.

## Secondary Low Water Cut-Offs

Secondary LWCO s may be required to meet local codes or CSD-1 requirements. A *Warrick 26C1D1C Probe Type Low Water Cut-Off* is used in steam applications to meet CSD-1 requirements. Thread the remote sensor into the 1/2" NPT fitting located on top of the boiler using a 1/2" x 3/8" bushing. See Table 1. for proper probe rod length. Mount the control box to a front or side jacket panel on the boiler.

LENGTH OF PROBE ROD IN "LE" and UP TO "WHE-610" SERIES BOILERS						
BOILER MODEL	LE-18 WHE-170	LE-20 WHE-240	LE-22 WHE-300	LE-24 WHE-390	LE-30 WHE-475	LE-32 WHE-610
ROD LENGTH	4-7/8"	6-1/4"	6-1/4"	6-1/4"	7"	9-5/8"

Table 1a

LENGTH OF PROBE ROD IN "WLE" and UP TO "WHE-780 & UP" SERIES BOILERS					
BOILER MODEL	WLE-60 WHE-780	WLE-90 WHE-240	WLE-120 WHE-1510	WLE-140 WHE-1810	WLE-180 WHE-2460
ROD LENGTH	14-1/2"	14-1/2"	14-1/2"	14-1/2"	14-1/2"

Table 1b

Other secondary LWCOs include combination LWCO / Water Feeders. These devices are typically connected externally using an equalizing line, and piped into the available 1" NPT fittings found in boiler top, and left side or front. Most commonly used combination units are McDonnell & Miller 42 Series Pump Controls and Low Water Cut-Off or McDonnell & Miller No. 247-2 Feeder Combination. For piping diagram, see the List of Figures on the Table of Contents Page of this manual.

**NOTE:** Mount a combination unit so the low water cut-off line on the device is approximately 3 inches above the lowest permissible water level plate found on the left side jacket panel of the boiler.

### Water Gauge

The water gauge is piped into the (2) 1/2" NPT fittings located in the left side of the boiler. During operation, the boiler's water level should always be above the Lowest Permissible Water Level indicator label found on the left side jacket panel of the boiler. Hot water boilers do not require a Water Gauge.

### Pressure Controls

Low pressure, 15 PSI controls are supplied with steam units only. These controls consist of an Operating Control and a Safety Limit. An additional operating control may also be supplied for burners that function with low-high-low operation. Pipe the Pressure Control and the 30 PSI Steam Gauge using the supplied steam syphons. See Drawing PL-099 in the Appendix.

The Pressure Control must be level in order to operate accurately. A Pressure Control is level when the leveling indicator hangs freely with its pointer directly over the index mark, inside the back cover of the case.

### Aquastat Controllers®

Aquastat Controllers are used to regulate boiler water temperature. PEP supplies an Operating Control (Honeywell L4006A Aquastat®) and a Safety Limit (Honeywell L4006E Aquastat®) with all hot water boilers and water heaters. An additional Operating Aquastat® may also be supplied for burners that function with low-high-low operation or steam boilers using an optional coil. Aquastat®s are mounted in the 3/4" NPT fittings located on the coil plate on the front of the boiler.

## **Safety Valve / Relief Valve**

All safety or relief valves are located in the rear center fitting on top of the boiler. A 15 PSI Steam Safety Valve is supplied for steam boiler and water heater applications. A 30 PSI Water Relief Valve is used for hot water applications. All safety and relief valves should be safely piped away from the boiler without reducing the valve's outlet port size.

## **Steam Supply**

Pipe the steam lines to the largest fitting or flange located on top of the boiler.

**Note: For WHE UNITS ONLY** - Plug the main steam outlet unless an expansion tank is used.

## **Hot Water Supply**

Use the fitting/pipe flange on the top of the boiler for the hot water supply to the system. Hot water applications also require the use of an expansion tank in the supply piping, to compensate for fluctuations in the water volume during heating and cooling cycles.

## **Feed Water Supply**

Virtually any unused port on the heat exchanger can be used for the feed water supply, including any unused drain port. In situations where make up water is needed, the water supply must be treated before it enters the boiler, to prevent the formation of scale, or to protect the boiler surfaces from the corrosive effects of oxygenated water. Water treatment and a water treatment program must be practiced, or the life of the boiler will be severely limited. If a Condensate Return / Feedwater Tank is used, connect the feedwater source to the float valve on the tank.

## **Coils**

Boilers are shipped with the coil(s) assembled to the coil plate(s), and mounted in the boiler. WHE models larger than a WHE-390 always have two coils.

When making coil connections for twin coil units, manifold indirect water piping using copper tubing and fittings connected in parallel. Pipe the outside coil openings together for cold water inlets, and the inside coil openings for hot water outlets. If necessary, temper the hot water supply by using a mixing valve. Connect the hot water outlet source and a cold water supply line to a mixing valve, to temper the hot water supply to the proper temperature requirements for process equipment.

Whenever boilers are supplied with one or two coils, the coils must be covered by a minimum of two inches of water, during normal operation, to allow proper heat transfer through the coil. Adjust all LWCO piping to keep the coil(s) submerged in the event of a low water situation.

# FUEL CONNECTIONS

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## OIL SUPPLY PIPING

Connect burner to oil supply. Refer to fuel unit manufacturer literature for piping, connections, lift and tank installation. If such information is unavailable use the following guidelines:

**Fuel supply “level with” or “above” burner:** A single stage fuel unit connected to the fuel supply with a single supply line is the most common type of installation for these conditions. Manual venting of the fuel oil is usually required on initial start up. Failure to vent air could result in air lock/oil starvation.(One Pipe)

**Fuel supply below the level of the burner:** Use a single stage fuel pump in lift conditions of up to 10 feet and a two stage pump when lift exceeds 10 feet. Both conditions require the use of a return line which purges the fuel pump of air, returning it to the fuel tank. The by-pass plug must be inserted into the fuel pump when installing a return line.(Two Pipe)

**Fuel line installation:** Consult the burner section of this manual for oil line type and sizing requirements for proper operation. The size of oil lines is extremely important for proper operation. Continuous lengths of heavy wall copper tubing are recommended and should be installed under the floor whenever possible. Fuel lines should not chaff the appliance or building structure.

All oil feed lines must be air tight. Use as few fittings as possible when assembling the oil lines. Compression fittings allow more of a chance for air to be introduced into the oil supply. The slightest air leak, usually caused by loose fittings or bad gaskets, can cause poor starts, smoky starts, sooting of burner parts, inefficient operation, and a dangerous combustion condition. Always install fittings in accessible locations.

### **WARNING:**

**TEFLON® TAPE SHOULD NEVER BE USED WITH ANY OIL LINE CONNECTIONS.  
THE USE OF TEFLON® TAPE ON BURNER COMPONENTS OR OIL SERVICE LINES  
WILL VOID MOST BURNER WARRANTIES.**

A vacuum test should be done on all installations to ensure that all fittings are tight and the oil lines are of proper size. Suction vacuums must be held to acceptable limits.

**Fuel line valve and filter:** (Not supplied) Install two high quality shutoff valves in accessible locations on the oil supply line. Locate one close to the tank and the other close to the burner ahead of the filter. Some filters come with built-in shutoff valves. Install a generous capacity filter inside the building between the fuel tank shutoff and burner.

For additional information consult the burner section of this manual.

## **GAS SUPPLY PIPING**

Contact your local gas company to ensure that adequate gas service is available, and to review applicable installation codes for your area.

The minimum gas supply pressure required by the burner is 7-14 inches water column for all LE and WLE Series boilers. The maximum gas supply pressure to the burner is fourteen inches water column. Gas pressure greater than fourteen inches water column will require an additional gas pressure regulator to prevent damage to the primary gas regulator. Gas pressure below the minimum will cause combustion efficiency problems and should be avoided if possible. Low gas pressure may also prevent the boiler from obtaining the desired input rate, which will cause the boiler to be unable to produce the desired output. Consult the factory if your gas supply pressure is not in the recommended range.

Use the following tables to determine the size of the main gas line required for the boiler that is being installed. First determine the required input volume of gas needed at the gas manifold, then determine the correct pipe size for the length of run needed.

**REQUIRED INPUT - CUBIC FEET OF GAS PER HOUR**

GAS TYPE	LE-18 WHE-170	LE-20 WHE-240	LE-22 WHE-300	LE-24 WHE-390	LE-30 WHE-475	LE-32 WHE-610
NATURAL	168	252	336	399	560	700
PROPANE	67	101	134	156	224	280

GAS TYPE	WLE-60 WHE-780	WLE-90 WHE-240	WLE-120 WHE-1510	WLE-140 WHE-1810	WLE-180 WHE-2460
NATURAL	840	1260	1680	1960	2520
PROPANE	336	504	672	784	1008

**CAPACITY OF PIPE - CUBIC FEET OF GAS PER HOUR AT 0.2" W.C. PRESSURE DROP**

Equivalent Length (ft)	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
10	425	725	1170	2360	4300	6250	12800
20	300	520	800	1700	3000	4500	9300
30	250	425	690	1400	2500	3750	7500
40	210	360	560	1200	2100	3200	6400
50	190	325	500	1100	1900	2850	5800
60	180	300	480	1000	1800	2300	4800
80	150	260	410	850	1550	2000	4200
100	135	230	370	750	1375	1680	3500
150	110	190	300	600	1100	1200	2750
200	75	165	260	540	950	1000	2000
Fitting	Equivalent Lengths of Standard Pipe in Feet for Listed Fittings						
Std. Tee	5.5	7.5	9.0	12.0	13.5	15	20
Std. Elbow	2.7	3.7	4.5	5.5	6.1	8	11

Vent lines, if required, are to be run outside the building, stopping clear of windows or fresh air intakes. The vent should terminate in a way that will not allow the possibility of water, dirt, insects, animals, and other matter from entering and clogging the vent pipe.

Gas lines should be tested for leaks. Your gas company may wish to witness this test. **Do not** exceed the maximum pressures allowed by the valve train.

Additional gas piping information is included in the burner section of this manual.

## **COMBUSTION AIR**

It is essential that provisions are made for a fresh supply of outside air into the boiler room to insure complete combustion, proper boiler efficiency, and a clean fire. Sufficient makeup air also helps prevent nuisance shut-downs due to excessive combustion byproduct build-up on burner parts. Outside air may be provided through ducts, fixed louvers or motorized louvers.

A rule of thumb for calculating fresh air openings to the outside is 63 sq. in. for every 100,000 BTUH gross output, or 21 sq. in. per boiler horsepower. The result of the above calculation is expressed as free area, meaning no restrictions of any kind. If louvers or screens are used over combustion air openings, calculate the percentage of free area to allow for these restrictions.

**Do not** have exhaust fans in the immediate proximity of the boiler room **if at all possible**, as they will cause a reversal of draft through the boiler when the burner is cycled off. This draft reversal draws heat from the combustion chamber back through the burner. This heat will deteriorate burner components prematurely, and eventually, burner operation will fail. The boiler room should experience a positive pressure when the burner is not firing.

In situations where a boiler room experiences a negative pressure, use a direct air intake. A direct air intake uses an adapter over the burner fan intake housing to draw in outside air through duct work, from an external source. Consult burner manufacturer for parts and availability.

**Important Note: Surface discoloration of the building may occur due to improper boiler/burner adjustment and maintenance. PEP will not accept any liability for such discoloration.**



**REQUIRED BOILER MAKE-UP AIR**

<b>BOILER SIZE (HORSEPOWER)</b>	<b>BTU INPUT</b>	<b>OPENING MIN. SQUARE INCHES</b>	<b>SQUARE HOLE SIZE - INCHES (APPROXIMATE)</b>	<b>ROUND PIPE SIZE - INCHES (APPROXIMATE)</b>
<b>LE-18 WHE-170</b>	196,000	84	10 X 10	1
<b>LE-20 WHE-240</b>	280,000	126	12 X 12	14
<b>LE-22 WHE-300</b>	336,000	168	14 X 14	16
<b>LE-24 WHE-390</b>	399,000	210	15 X 15	18
<b>LE-30 WHE-475</b>	560,000	273	17 X 17	20
<b>LE-32 WHE-610</b>	700,000	336	19 X 19	22
<b>LE-60 WHE-780</b>	840,000	420	21 X 21	24
<b>LE-90 WHE-1200</b>	1,260,000	630	26 X 26	30
<b>LE-120 WHE-1510</b>	1,680,000	840	30 X 30	34
<b>LE-140 WHE-1810</b>	1,960,000	987	32 X 32	36
<b>LE-180 WHE-2460</b>	2,520,000	1260	36 X 36	38

# CLEANING AND FILLING A NEW STEAM BOILER

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**Note:** The following procedure is for the steam boilers only. This procedure should also be used for indirect water boilers (WHE-Series).

In order to minimize the corrosive effects of raw water oxidation on the boiler, the water must be heated to at least 180°F immediately after entering the boiler, in order to drive off the corrosive dissolved gases. This applies to all water - whether from a well, a spring, or from the local municipal water system.

The oil and grease that accumulate in a new steam boiler can usually be washed out by boiling as follows:

1. Fill the boiler to the normal waterline.
2. Remove the safety valve.
3. Provide a boil-out compound of caustic soda and trisodium phosphate in the proportions of 2-1/2 lbs. of each chemical per 120 gallons of water.

**CAUTION: USE CARE IN HANDLING THESE CHEMICALS. THE CAUSTIC SODA IS EXTREMELY CORROSIVE TO SKIN AND CLOTHING. DO NOT PERMIT EITHER THE DRY MATERIAL OR THE CONCENTRATED SOLUTION TO CONTACT SKIN OR CLOTHING.**

<b>BOILER MODEL</b>	<b>EQUAL AMOUNTS CAUSTIC SODA AND TRISODIUM PHOSPHATE</b>
<b>WLE-18 / WHE-170</b>	8 oz
<b>WLE-20 / WHE-240</b>	10 1/3 oz
<b>WLE-22 / WHE-300</b>	14 1/3 oz
<b>WLE-24 / WHE-390</b>	1 lb 2 1/3 oz
<b>WLE-30 / WHE-475</b>	1 lb 10 2/3 oz
<b>WLE-32 / WHE-610</b>	1 lb 14 oz
<b>WLE-60 / WHE-780</b>	2 lb 12 1/3 oz
<b>WLE-90 / WHE-1200</b>	3 lb 3 1/3 oz
<b>WLE-120 / WHE-1510</b>	4 lb 1/3 oz
<b>WLE-140 / WHE-1810</b>	4 lb 7 1/3 oz
<b>WLE-180 / WHE-2460</b>	6 lb

4. Mix the chemicals with water and pour into the boiler through the safety valve opening.
5. Replace the safety valve.
6. Start the firing equipment.
7. Boil the water for at least five hours.
8. Stop the firing equipment.
9. Drain the boiler to a location where hot water can be discharged safely.
10. Wash the boiler thoroughly using a hose with sufficient pressure.
11. Fill the boiler to the normal waterline.
12. Add boiler water treatment as prescribed by a water treatment specialist.
13. Boil or bring water temperature to at least 180°F immediately.
14. The boiler is ready to put into service or on standby.

# OPERATING THE BOILER

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**NOTE:** Although each factory packaged unit has been test fired at the factory, each boiler must be “set up” for the conditions on location. Improper combustion settings may cause the burner to operate erratically, resulting in boiler shutdowns, lost time, and unnecessary service expenses.

## PRE-START CHECKS AND INFORMATION

A new or relocated boiler should not be put into service until it has been inspected by an authorized inspector for the jurisdiction or the insurance company, and the required certificates have been issued.

Whenever a new boiler is placed in service, operating data should be recorded and saved for future reference. This information is extremely valuable for diagnosing problems if abnormal operation occurs. Record all operating parameters such as pressures, stack temperatures, oxygen or carbon dioxide levels, flows, draft, motor amps, damper positions, and interlock set points. A burner start up and test information sheet has been included at the end of this section for your convenience.

All cover plates, enclosures, and safety devices must be installed at all times except while performing maintenance and service.

The fuel supply should not be turned on until the combustion chamber has been vented and the pilot light (if gas ignited) checked for proper operation.

All drain valves including blowdown valves for steam boilers, water column drain valves, gauge glass drain valves, and gauge cocks, should be closed.

The safety/relief valves should be inspected externally to see that they are free to operate, and that the discharge piping and drain piping are open to the atmosphere, and free to expand without imposing a load on the safety valve bodies. Make sure the safety valve is piped to a safe location to prevent injury.

The boiler feed pump(s) for steam applications should be checked to ensure that they are ready for service. Check the data on rating plates of all electrical equipment to be certain the electrical characteristics match those of the electric supply to which they are connected.

Before attempting start-up, carefully study the instructions included in the burner section of this manual.

It is important to have the proper test equipment in order to adjust the combustion and pilot if equipped. Those items that may be required include a manometer, micro ammeter, vacuum gauge, 0-300 PSI pressure gauge, carbon dioxide or oxygen analyzer, carbon monoxide tester, smoke gun, and stack thermometer.

## STARTING THE BOILER

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**WARNING:** NEVER OPERATE A BOILER WITHOUT BEING SURE IT IS FILLED WITH WATER AND THAT PROPER WATER TREATMENT CHEMICALS HAVE BEEN ADDED.

Allow the boiler to fill with water to its normal operating level.

Supply power to the boiler disconnects.

**NOTE:** The burner will not operate when the boiler has reached its normal water level, until the reset button on the manually reset, probe type, low water cut-off is pushed.

**NOTE:** **Combustion efficiency must be checked at this time.** See the burner manufacturers instructions for correct settings and more detailed information.

Follow the adjustment procedures outlined in the burner section of this manual to set up the burner for proper operation.

## STOPPING THE BOILER

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To stop the boiler turn the main disconnect to the **OFF** position.

# BURNER START UP AND TEST INFORMATION

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For a new boiler start up, or for troubleshooting an existing installation, the following information is essential for effective service assistance.

Boiler Model \_\_\_\_\_ Serial No. \_\_\_\_\_ N.B. No. \_\_\_\_\_  
Burner Model \_\_\_\_\_ Invoice No. \_\_\_\_\_ Serial No. \_\_\_\_\_  
Installation Name \_\_\_\_\_ Start Up Date \_\_\_\_\_  
Start Up Contractor \_\_\_\_\_ Phone No. \_\_\_\_\_  
Name of Technician Performing Start Up \_\_\_\_\_  
Fuel Type:  Natural Gas  LP Gas  Fuel Oil (#2)  Other \_\_\_\_\_

## Gas Firing

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<b>Gas Pressure At Train Inlet</b> Burner In Off Position _____ "W.C.	<b>Flame Signal Readings</b> Pilot _____	<b>Stack Outlet Test Point Draft</b> High Fire _____ "W.C.
<b>Gas Pressure At Train Inlet</b> High Fire _____ "W.C.	<b>CO2</b> High Fire _____	<b>Over Fire Draft</b> High Fire _____ "W.C.
<b>Gas Pressure At Main Orifice</b> High Fire _____ "W.C.	<b>CO</b> High Fire _____	<b>Net Stack Temperature</b> High Fire _____ °F
<b>Gas Pressure At Pilot Orifice</b> _____ W.C.	<b>Measured Input Rate - BTU/HR</b> High Fire _____ "W.C.	

## Oil Firing

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<b>High Fire Vacuum Reading At Oil</b> Pump Inlet _____ "H.G.	<b>CO2</b> Low Fire _____ High Fire _____	<b>Stack Outlet Test Point Draft</b> Low Fire _____ "W.C. High Fire _____ "W.C.
<b>Oil Nozzle Supply Pressure</b> Low Fire _____ PSI High Fire _____ PSI	<b>Bachrach Scale Smoke Number</b> Low Fire _____ High Fire _____	<b>Net Stack Temperature</b> Low Fire _____ °F High Fire _____ °F
<b>Firing Rate - GPH</b> Low Fire _____ High Fire _____	<b>Over Fire Draft</b> Low Fire _____ "W.C. High Fire _____ "W.C.	

## Operational Check of Controls

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Operating Limit _____ <input type="checkbox"/>	Aux LWCO _____ <input type="checkbox"/>	Flame Safeguard _____ <input type="checkbox"/>
Safety Limit _____ <input type="checkbox"/>	Low Gas Pressure _____ <input type="checkbox"/>	Ignition Failure _____ <input type="checkbox"/>
Low Water Cut Off _____ <input type="checkbox"/>	High Gas Pressure _____ <input type="checkbox"/>	Flame Failure _____ <input type="checkbox"/>

## Comments

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# CONTROL DESCRIPTIONS

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## STEAM BOILERS

### **Pressure Controls**

All PEP steam boilers are controlled by both operating and safety limit Pressure Control. Both devices are adjustable and use pressure actuated snap switches. These switches open when pressure reaches the main scale set point value, cycling the boiler off.

The operating Pressure Control also has an adjustable differential feature. Differential settings values are subtractive from the main scale set point value, indicating the change in pressure for when the boiler will refire. Always adjust the differential set point above the required steam pressure for the system. Make the differential value as large as possible to prevent short cycling.

The safety limit Pressure Control does not have an adjustable differential, and has a manual reset feature. The safety limit Pressure Control breaks the control circuit if the operating Pressure Control becomes inoperable, and steam pressure continues to climb. The burner will not start until the excessive pressure situation is corrected and the reset button is pushed.

Adjust the safety limit value higher than the operating limit under normal operating conditions. This setup allows the operating control to function properly and reduces the need to reset the control circuit constantly. Set the safety limit value less than the error margin of the safety relief valve, so the Pressure Control can safely control boiler pressure.

Make set point value adjustments by turning the adjusting screws found on top of the Pressure Control casing.

For additional information on either Pressure Control, see the Danfoss Publication following this booklet.

### **Low Water Cut-offs**

Low water cut-offs safely control boiler operation in the event of a low water condition. The standard LWCO for steam applications is a Warrick 26C1D1C probe type LWCO with manual reset. If an installation has a CSD-1 requirement, an additional LWCO is supplied. Other LWCOs include water feeders and combination LWCO/ feeders/pump controls.

A *Warrick 26C1D1C* "Probe" type LWCO is used only as a Secondary low water cut-off device. Its primary function is to protect the boiler against low water situations where the primary LWCO fails to break the control circuit. The probe mounts in the top head of the boiler and has a rod length lower than that of the primary LWCO. This relay must be manually reset if power is interrupted to the control circuit for any reason. During operation, if the water level falls below the probe rod, the energized circuit breaks, causing the relay to open, disconnecting power to the burner. Restore the water level to the normal operating level, then manually reset the control to resume operation.

The most common optional equipment includes the *McDonnell & Miller 42 Series Pump Control and Low Water Cut-Off* and the *McDonnell & Miller No. 247-2 Feeder Combination*. These controls are mounted on the left side of the boiler using the 1" tappings found in the side and on top of the boiler, as part of an equalizing line. These devices may be used as a primary or secondary LWCO. Both controls use a float activated switch to control LWCO and pump control functionality.

For additional information on the appropriate Low Water Cut-Off, see the LWCO cut sheets following this booklet.

## **Safety Valve**

Safety valves shall be piped so that any discharge cannot cause injury to people or damage to property. The discharge piping must be supported so that the weight of the piping is not transmitted to the safety valve body. The weight supported by the valve outlet should not exceed that of a drip pan elbow. Installations requiring long discharge piping should not be connected directly to the safety valve. Refer to Drawing PL-049 in the Appendix.

In order to achieve the topmost performance and maximum safety valve life, maintain a proper operating gap between the set pressure of the safety valve and the maximum operating pressure of the boiler.

If the valve discharges on its own, contact a qualified service technician to determine the cause. This may be an indication of equipment or system malfunction.



# HOT WATER BOILERS

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## Aquastat® Controllers

All PEP water boilers and indirect water heaters are controlled by both operating (Honeywell L4006A-100-240F) and safety limit (Honeywell L4006E 130-290F) Aquastat® Controllers. The safety limit should always be adjusted higher than the operating limit under normal operating conditions. If for any reason the water temperature would exceed the operating limit and not trip the control, the safety limit should break the circuit to the burner.

The operating Aquastat® (*Honeywell L4006A-100-240F*) consists of an adjustable thermostatic control and separate temperature sensing immersion well. The immersion well mounts in the boiler's coil plate. Adjust the indicating dial to set the maximum operating temperature. The differential wheel setting is subtractive from the operating limit indicating the refire temperature. This differential set point should be adjusted above the required water temperature for the system. The differential wheel can be adjusted for 3° to 5°F.

The safety limit (*Honeywell L4006E 130-290F*), like the operating Aquastat®, consists of an adjustable thermostatic control and separate temperature sensing immersion well. This controller has a manual reset switch which must be depressed in the event that the operating circuit reached and shut off on safety.

For additional information on either the L4006A or L4006E, see Honeywell Publication 60-2104-8 following this booklet.

## Low Water Cut-off

Hot water boilers utilize the *McDonnell & Miller 750-MT-120 Probe Type Low Water Cut-Off with Remote Sensor*. The 750-MT-120 has a test feature that allows this control to meet CSD-1 requirements. Similar to the Warrick 26C1D1C, this control breaks the control circuit in the event of a low water condition and must be manually reset once the proper water level is restored.

For additional information on the *McDonnell & Miller 750-MT-120 Probe Type Low Water Cut-Off with Remote Sensor* see *McDonnell & Miller Bulletin MM-212(A)* and *Installation and Maintenance Instructions MM-213(C)*.

## Relief Valve

Relief valves are a safety devices to relieve boiler water pressure. Like safety valves, relief valves should be piped so any discharge cannot cause injury to people or damage property. See the "Safety Valve" description in the Control Descriptions, Steam Boiler section of this booklet.

# MAINTENANCE

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## RECORD KEEPING

All manufacturers literature, spare parts lists, operating and maintenance procedures should be maintained in the boiler room at all times. A log book should also be provided to record maintenance work, inspections, and other performance test results.

### General

Clean the boiler and heating surfaces whenever required. The frequency of the cleaning required to maintain the boiler at peak efficiency will be determined only by frequent inspections. It cannot be predicted. Your operating conditions might be different from your neighbors .

**When in doubt - check it out.**

**WARNING: DISCONNECT ALL INCOMING ELECTRICAL POWER BEFORE SERVICING THE BOILER. USE EXTREME CAUTION AROUND BOILER PIPING THE LOW WATER CUT OFFS, SINCE THEY MAY BE VERY HOT.**

The life of your boiler will be determined by the level of care given it by those who are responsible for maintenance. A log of the following items should be maintained in the boiler room at all times.

### Daily Boiler Check & Maintenance List

1. Water Level Controls and Cut Offs are operating normally.
2. Instrument and equipment settings are normal.
3. Gauge glass is clean. If leaks are detected, replace glass, gaskets, and brass washers immediately. When replacing gauge glass use only 5/8" O.D. Pyrex® red line, high pressure, high temperature, glass tubing, with fire polished ends. See gauge glass maintenance section for proper method when installing this gauge glass.
4. Boiler water at proper operating level.
5. Blow down boiler as instructed under BLOWDOWN if required by application.

Remember, the life of your boiler is drastically reduced by sludge, scale, and corrosion. By proper treatment of the boiler water and systematic blow down procedures your boiler will provide years of service.

### Weekly Boiler Check & Maintenance List

1. Check flame failure detection system.
  - A. Gas boilers: Close fuel supply to pilot and main gas and check shut down timing.
  - B. Oil boilers: Remove cad cell leads and check shut down timing.
2. Check fuel valves; Open limit switch and make aural and visual check.
3. Check ignition system flame signal.

## Monthly Boiler Check & Maintenance List

1. Test all fan interlocks.
2. Check main burner safety shut off valve(s) for operational closure.
3. Oil fired; check fuel pressure interlocks when provided.
4. Gas fired; check high and low fuel pressure switches.
5. Flue or stack dampers; make visual inspection for proper operation.
6. Inspect heating surfaces for cleanness.

## Semiannual Boiler Check & Maintenance List

1. Inspect burner components; Refer to burner manufacturers instructions.
2. Check the flame failure system components; Refer to the burner section of this manual.
3. Check piping and wiring of all interlocks and shut off valves.
4. Internal boiler plate inspection. Remove hand-hole assemblies; use new gaskets when replacing covers.

## Annual Boiler Check & Maintenance List

1. Check operating Pressure Control Controller or Aquastat Controller.
2. Check high limit Pressure Control Controller or Aquastat Controller.
3. Test safety valves.
4. Remove the Low Water Cut Off and clean inside casting.
5. Oil fired - clean/replace oil filters or strainers if equipped
6. Oil fired - replace ignition electrodes if equipped.
7. Gas pilots - conduct pilot turndown test.
8. Gas fired - replace ignition and flame rods.
9. Gas fired - check drip leg/strainer.
10. Oil fired - check for refractory hold in.
11. Check Automatic Change Over Control if equipped.
12. Gas fired - perform valve leakage test.

### **Gauge Glass - Not required on hot water boilers only.**

The water gauge glass must be kept clean. Dirt on, or in, the glass may be mistaken for the water level. Do not allow steam or water to leak from the water glass, as this may effect the accuracy of the level indication. Leaking of the gauge glass will also reduce the wall thickness of the glass to the point where it may explode.

**WARNING: DO NOT OPERATE THE BOILER WITHOUT THE GAUGE GLASS PROTECTOR INSTALLED. NEVER ATTEMPT TO WORK ON THE GAUGE GLASS WHILE THE BOILER IS UNDER PRESSURE. ALWAYS CLOSE GAUGE VALVES PRIOR TO TIGHTENING GASKETS ON WATER LEVEL GAUGE GLASS. SERIOUS INJURY COULD RESULT.**

## Gauge Glass Replacement Instructions:

1. Make absolutely certain that the new water level gauge glass is 5/8" O.D. and is the correct length Pyrex® red line, high pressure, high temperature glass tubing with fire polished ends.
2. Close gauge glass valves.
3. Remove gauge glass protector.
4. Remove the old glass, gaskets, brass washers, and brass nuts. Be sure threads on the gauge valves are clean.
5. Install brass nuts, brass washers, and gaskets on each end of the gauge glass.
6. Insert glass tube into top gauge valve and lower the glass tube into the bottom gauge valve which contains a seat. Then raise glass 1/16". Do not allow glass to rest directly on the valve.
7. Hand tighten the lower glass nut and then the upper nut. While tightening these nuts, be sure to keep the red line opposite the viewing side.
8. With a wrench, snug up the bottom nut and then the top nut.
9. Replace gauge glass protector.
10. Open gauge glass valves fully. Failure to completely open the gauge glass valves renders the ball check safety feature inoperative.
11. Without pressure on boiler and with gauge valves closed, snug up the bottom nut and then the top nut with a wrench, after 1 day of operation.

## Blowdown

Perform blowdown procedures on boilers that require make-up water such as steam boilers. Hot water and indirect hot water heaters (WHE-Series) are closed loop systems that recirculate the same water. These boilers should require minimal make-up water.

Blowing down the boiler is done to remove excess total dissolved solids. The actual amount of blowdown should be determined through boiler water analysis, done by a water treatment specialist. Until an analysis of your boiler water is made, the following guidelines should be used.

Blow down the boiler after firing equipment has been shut down for the evening. Allow boiler water to settle for approximately 10 minutes. Then open blowdown valve at a pressure between 5 and 10 psi for 30 seconds then close. Use this same procedure with the low water cut off blowdown ball valve. Then go back to the boiler blowdown valve, open and close the valve, very fast, two more times. Repeat this procedure with the low water cut off valve. This will rid the boiler of most precipitated sediment. **DO NOT EMPTY THE BOILER OF ALL ITS WATER.**

# WATER TREATMENT

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Proper treatment of make-up water and boiler water is necessary to prevent scale, or other deposits, and corrosion within the boiler. The absence of adequate external and internal treatments can lead to operational upsets or total boiler failure. Where a choice is available, pretreatment external to the boiler is always preferred and more reliable than treatment within the boiler.

Obtain, and follow, Instructions for feedwater treatment, prepared by a competent feedwater chemist. Do not experiment with homemade treatment methods or compounds.

Representative samples of feedwater and boiler water must be analyzed frequently to ensure that they are in specification. The following terms and guidelines are to be used in conjunction with the advice of a water treatment specialist.

## Recommended Guidelines for Boiler Water Treatment

ANALYSIS	RECOMMENDED RANGE	COMMENTS
pH	10-11	Low pH promotes corrosion
Total Alkalinity	200-700 ppm	Low; promotes corrosion
Phosphates	30-100 ppm	Prevents scale formation
Total Hardness	0-50 ppm	Prevents scale formation
Chlorides	60-200 ppm	A measure of proper blow down
Total Dissolved Solids	2000 ppm Maximum	High solids may cause surging
Sulfites	20-30 ppm	A good oxygen scavenger
Specific Conductance	< 700 micro ohms cm	A measure of proper blowdown
Oxygen	< .007 mg/liter	Prevents corrosion and pitting

ppm = parts per million

Use proper water treatment **to prevent the buildup of scale** on the boiler. After scale has built up on the walls of the boiler it is almost impossible to remove it from the boiler. The introduction of acids into the pressure vessel is thoroughly discouraged, since virtually any solution that will chemically attack the scale will also attack the boiler metal.

### pH

The pH value of the boiler water is a number between zero and fourteen. Values below seven are acidic, seven is neutral, and values above seven are alkaline.

The pH factor is the most important factor influencing scale formation and the corrosive tendencies of boiler water. The pH should be maintained between a minimum of 10.5, and a maximum of 11.0 to prevent acidic corrosion of boiler tubes and plates, and to provide for the precipitation of scale forming salts before scale is deposited.

Below a pH of 5.0 the water is acidic enough to dissolve the steel boiler plates. Under these conditions the steel gradually becomes thinner and thinner until its destruction. At a pH between 5 and 9.4 pitting of shell plates will occur at a rate depending on the amount of dissolved oxygen in the boiler.

### **Dissolved Oxygen**

Dissolved oxygen is caused by the solubility of atmospheric oxygen into the supply water. Aeration of the city water supply is frequently used to remove other noxious gasses. Efficient aeration results in saturation of the water with oxygen.

The majority of corrosion problems are directly related to the quantity of dissolved oxygen in the boiler water. Elimination of the corrosive effect of dissolved oxygen can be accomplished both directly or chemically.

Direct or mechanical removal of dissolved oxygen is done through the use of a deaerator or by heating the water to a temperature above 180°F. Heating the water can be done with a preheater or a sparge tube installed in the return system.

Chemical deaeration is done through the introduction of specific chemicals in the boiler to react with the oxygen. The dissolved oxygen content should be maintained at a minimum but at no time should it exceed 0.007 mg/l.

### **Sulfites**

Sodium sulfite is generally used for the chemical removal of dissolved oxygen within the boiler water. To assure the rapid and complete removal of the oxygen entering the boiler feedwater system the concentration of sulfite in the boiler must be maintained at a minimum of 20 PPM.  
(parts per million)

### **Solids**

Solids can be broken up into two categories: suspended solids, and dissolved solids. Suspended solids are those which can be removed by filtration, while dissolved solids are in solution with the water. The best test for the determination of solids content of the boiler water is through a conductance test.

The conductance value of boiler water varies by the various ionized salts present. The conductance can be used to measure the total dissolved solids in the boiler water and to serve as an accurate means for the control of solids through the use of blowdown.

Another test which is sometimes used as a gauge of solids is to measure the chloride present in the boiler water. The ratio of chlorides in the boiler water to that of the feed water can be used as a means to determine the amount of blowdown required. The chloride test is unsuitable for feedwater with low incoming concentrations and the concentrations in the feedwater must be averaged over time for accuracy.

High boiler solids will lead to foaming, priming, surging and carry over. These problems can be overcome by proper, daily blowdown of the boiler.

**Alkalinity**

The alkalinity of boiler water should be sufficiently high enough to protect shell and plates against acidic corrosion, but not high enough to produce carryover. A minimum value for alkalinity for adequate protection is 200 PPM.

High boiler alkalinity, which is in excess of 700 PPM. should be avoided. Values higher than this can lead to embrittlement of the steel.

**Phosphates**

Phosphates are used to react with calcium hardness in the boiler water. In order for this reaction to take place it is important to maintain a pH at a minimum value of 9.50. It is desirable to keep the concentration of phosphates in the water to 30-50 PPM in order for complete reaction of the phosphates with the calcium hardness entering the boiler through the feedwater.

**Hardness**

The hardness of water is caused by calcium and magnesium ions which will vary greatly throughout the country depending on the source of the water.

In boilers the hardness of the water can cause the formation of scale and sludge or mud. The hardness must be removed in the makeup water to the return system. Total hardness should not exceed 50 PPM.

**Oils**

Every effort should be made to prevent oils from getting into the boiler water. Oil causes foaming, or combines with suspended solids to form a sludge which can cause the overheating of boiler plates. If oil does get into the boiler, the boiler should be taken out of service immediately, and thoroughly cleaned.

**Pottstown Engineered Products, Inc.**  
**Limited (Five-Year) Warranty**  
**For**  
**Commercial/Industrial Boilers**  
**Effective July 15, 2024**

**This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.**

**LIMITED WARRANTY**

Pottstown Engineered Products, Inc. ("PEP") hereby warrants to the original consumer purchaser ("purchaser") that the pressure vessel of its Commercial/Industrial boilers models LE, WLE, VT, MPH and WHE, are free from defects in materials and workmanship, and if such pressure vessel proves to be so defective within five (5) years of the date of installation, PEP shall, at its option, furnish a replacement for, or repair such pressure vessel, provided PEP is notified of the defect within thirty (30) days of the discovery of such defect. Purchaser's remedy shall be limited to such repair or replacement. Adjustment Policy: In the event that a pressure vessel is found to be defective one year or more following installation and is replaced by PEP, the purchaser shall pay a proportionate charge for the time the defective pressure vessel has been in service based upon a percentage of the list price of such vessel at the time PEP is notified of the defect as follows: 2nd year - 30%, 3rd year - 40%, 4th year - 50%, and 5th year - 60%.

**THIS SHALL BE THE BUYER'S EXCLUSIVE REMEDY.**

**PEP SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.**

**PRODUCTS COVERED BY THIS WARRANTY**

This warranty is applicable only to the pressure vessel of those models of Commercial/Industrial boilers specified above that are installed in accordance with the basic BOCA Building Code and local statutes or ordinances, whichever shall be more restrictive. This warranty shall not apply to components of other manufacturers such as controls, instantaneous tankless heaters, burners, and other accessories, used or incorporated by PEP. **ALL IMPLIED WARRANTIES RELATING TO SUCH COMPONENTS, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. ANY IMPLIED WARRANTY RELATING TO THE PRESSURE VESSEL COVERED BY THIS LIMITED WARRANTY, INCLUDING THAT OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL BE LIMITED TO THE PERIOD OF THIS LIMITED WARRANTY.**

Some states do not allow limitations on how long an implied

warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitations on relief such as incidental or consequential damages, so the above limitation or exclusion may not apply to you.

**PURCHASER RESPONSIBILITIES**

This limited warranty shall not apply and PEP shall have no obligation thereunder unless the card attached hereto is completed and mailed to PEP within thirty (30) days from the date of installation.

In the event the original consumer purchaser believes that there is a defect in material or workmanship of the pressure vessel, he shall, within thirty (30) days of the discovery of the defect, notify PEP, in writing. PEP or its authorized representative will inspect the pressure vessel to determine whether a defect exists and recommend repair or replacement if necessary under the terms of the warranty. If PEP determines that no such defect exists, purchaser may still pursue its remedies by commencing a civil action, but must do so **WITHIN ONE (1) YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.** Some states do not allow this one year limitation, so it may not be applicable to you.

This warranty does not cover expenses for removal or reinstallation. The Purchaser shall be responsible for the cost of removing the defective pressure vessel and reinstalling the replacement vessel including freight, labor and material connected therewith. Upon request of PEP, it shall be the obligation of the purchaser to ship pre-paid to PEP the defective pressure vessel for inspection or repair.

This limited warranty is applicable only to defects in material and workmanship and shall not cover failure of the pressure vessel due to any other reason including, but not limited to (a) lack of water, (b) freezing, (c) floods, (d) fire, (e) acts of God, (f) negligent or improper operation or installation, (g) corrosion of tubes or plates, (h) mud or scale accumulation, (i) leaky gaskets, (j) improper water conditioning, (k) improper maintenance of external and fireside surfaces.

**A Start-Up Report detailing combustion analysis and draft measurements is required for all warranty claims.**

**POTTSTOWN ENGINEERED PRODUCTS, INC.**

390 Old Reading Pike, Pottstown, PA 19464  
Telephone 610-323-3477

July 15, 2024