



**L · WL · CWH SERIES
BOILERS**

**INSTALLATION,
OPERATION and
MAINTENANCE MANUAL**

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IMPORTANT

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 Columbia Boiler Company (hereinafter Columbia) 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 installation or 18 months from the date of manufacture, whichever date occurs first and is subject to warranty approval by the manufacturer of the specific components. This warranty does not extend to equipment subjected to misuse, neglect, accident or improper installation. 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) Motors, fuel units, controls, and transformers should be sent for repair or replacement to an authorized service point or distributor of the manufacturer of such component when reasonably available in Customer's locality.
- (b) Where such local service is not available with respect to the above listed components, or where other components are involved, such defective equipment should be returned after receiving authorization from your dealer, freight prepaid, to the Columbia Boiler Co., 390 Old Reading Pike, Pottstown PA 19464. The use of the Columbia returned goods form is mandatory when returning defective material.
- (c) Columbia is not responsible for any labor cost for the removal and replacement of equipment.
- (d) Equipment which is repaired or replaced will carry a warranty equal to the unexpired portion of the original equipment warranty.
- (e) If inspection by Columbia does not disclose any defect covered by this warranty, the equipment will be repaired or replaced at the expense of the Customer, and Columbia's regular charges will apply.

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 COLUMBIA BOILER CO. BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE. Columbia neither assumes nor authorizes any person to assume for Columbia any other liability or obligation in connections with the sale of this equipment. Columbia's liability and Customer's exclusive remedy being limited to repairs or replacement as set forth above.

March 10, 1997

INTRODUCTION

Series L and WL Water Tube Boilers

The Columbia Models L and WL 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.

CWH Series Steam Boiler

The CWH Series is a steam boiler used for indirect hot water applications. This boiler classification consists of all L and WL 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.

Columbia 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 WL Series Boiler Models, and Model L-32. Factory packaged boilers are fully assembled and test fired.

SERVICE POLICY

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

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 Columbia 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.

Columbia Boiler 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.

COLUMBIA BOILER COMPANY OF POTTSTOWN 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 WL-120, WL-140 and WL-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, prepiping the top of the boiler before assembling the top jacket panels. The top jacket panels are designed to allow prepiping to the top center boiler fittings, if needed.

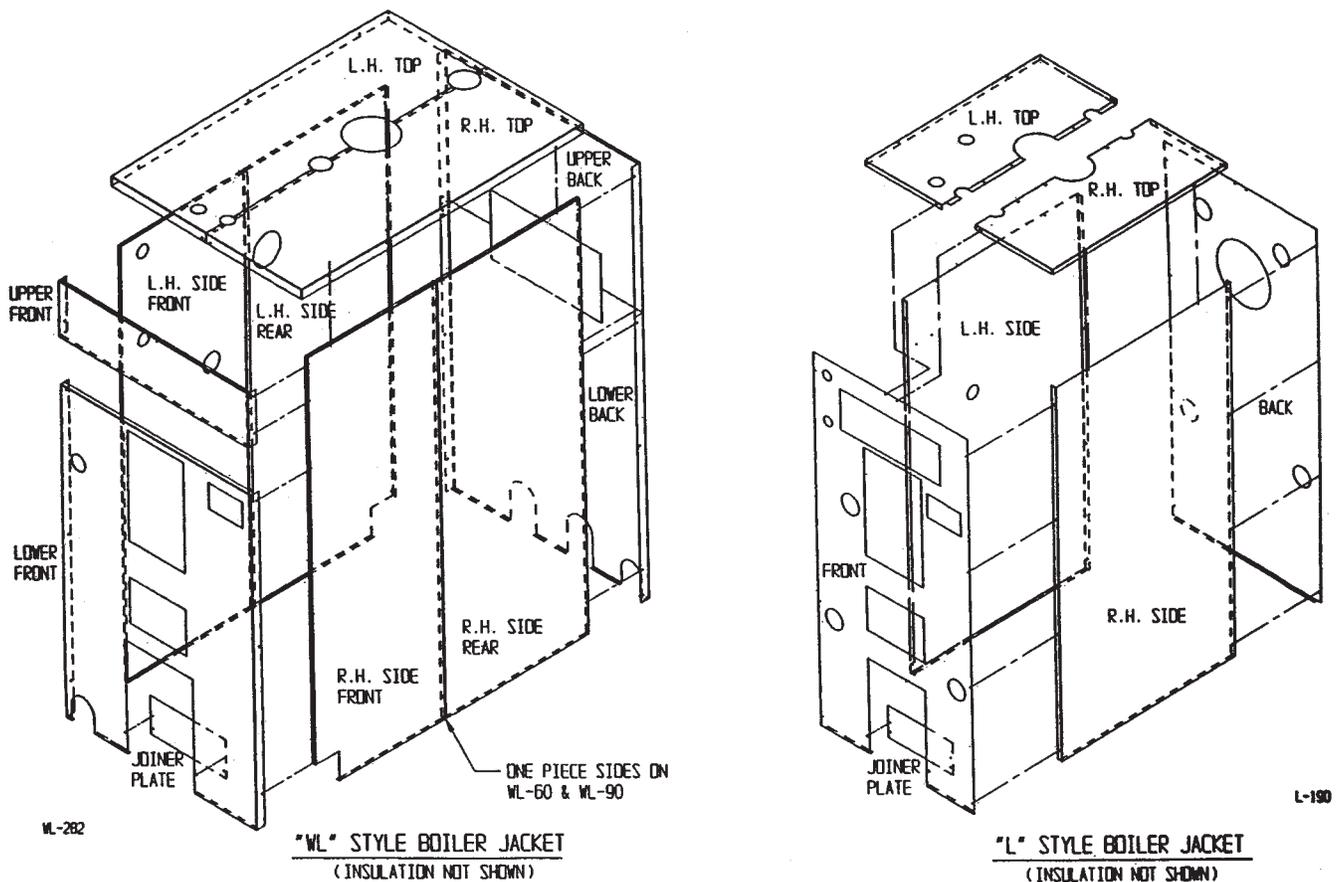


Figure 1

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.

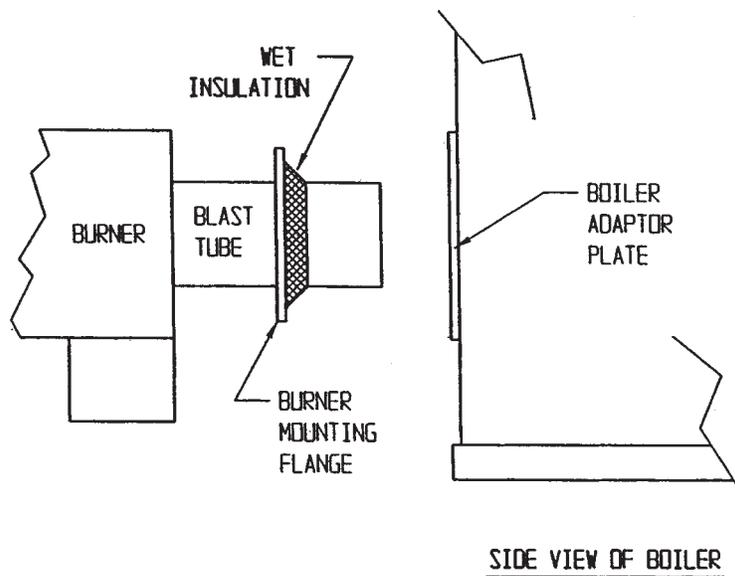


Figure 2

BOILER CONNECTIONS

Drains

All Columbia Boiler 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 Columbia 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 - *McDonnell & Miller Model 767 Quick-Hook-Up Low Water Cut-Off* - Install this device into the 2-1/2" NPT welded coupling found on the coil plate for L Series boilers, and on the left hand side of the heat exchanger for WL Series boilers.

Water Heaters - *McDonnell & Miller Model 767 Quick-Hook-Up Low Water Cut-Off* - Install this device into the 2-1/2" NPT welded coupling found on the coil plate for CWH-170 / -610 Series boilers, and on the left hand side of the heat exchanger for CWH-780 / -2460 Series boilers.

Secondary Low Water Cut-Offs

Secondary LWCO s may be required to meet local codes or CSD-1 requirements. A *Warrick 26C1C1C 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 "L" AND UP TO" CWH-610" SERIES BOILERS						
BOILER MODEL	L-18 CWH-170	L-20 CWH-240	L-22 CWH-300	L-24 CWH-390	L-30 CWH-475	L-32 CWH-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 "WL" AND UP TO" CWH-780 & UP" SERIES BOILERS					
BOILER MODEL	WL-60 CWH-780	WL-90 CWH-1200	WL-120 CWH-1510	WL-140 CWH-1810	WL-180 CWH-2460
ROD LENGTH	14-1/2"	14-1/2"	14-1/2"	14-1/2"	14-1/2"

Table 1b

Other secondary LWCO s 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. Columbia 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 CWH 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. For the smaller L-Series, L-18(CWH-170) thru L-24(CWH-390), the coil plates cover the opening for which the coils pass through. The indirect water inlet and outlet connections are made in the rear of the boiler. All other Columbia models can be furnished with one or two coils. CWH models larger than a CWH-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

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 five inches water column for the GL-18, GL-20, GL-22, GL-24, CWH-170, CWH-240, CWH-300, CWH-390 and seven inches water column for the GL-30, GL-32, CWH-470, CWH-610, CWH-780, CWH-1200 CWH-1510, CWH-1810, CWH-2460 and all WL 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	L-18 CWH-170	L-20 CWH-240	L-22 CWH-300	L-24 CWH-390	L-30 CWH-475	L-32 CWH-610
NATURAL	168	252	336	420	560	700
PROPANE	67	101	134	168	224	280

GAS TYPE	WL-60 CWH-780	WL-90 CWH-1200	WL-120 CWH-1510	WL-140 CWH-1810	WL-180 CWH-2460
ROD LENGTH	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. Columbia Boiler Company will not accept any liability for such discoloration.

REQUIRED BOILER MAKE-UP AIR

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

CLEANING AND FILLING A NEW STEAM BOILER

Note: The following procedure is for steam boilers only. This procedure should also be used for indirect water boilers (CWH-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.

BOILER MODEL	EQUAL AMOUNTS CAUSTIC SODA AND TRISODIUM PHOSPHATE
L-18 / CWH-1708	8 oz
L-20 / CWH-240	10 1/3 oz
L-22 / CWH-300	14 1/3 oz
L-24 / CWH-390	1 lb 2 1/3 oz
L-30 / CWH-475	1 lb 10 2/3 oz
L-32 / CWH-610	1 lb 14 oz
WL-60 / CWH-780	2 lb 12 1/3 oz
WL-90 / CWH-1200	3 lb 3 1/3 oz
WL-120 / CWH-1510	4 lb 1/3 oz
WL-140 / CWH-1810	4 lb 7 1/3 oz
WL-180 / CWH-2460	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

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

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

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

BURNER START UP AND TEST INFORMATION

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

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

Oil Firing

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

Operational Check of Controls

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

CONTROL DESCRIPTIONS

STEAM BOILERS

Pressure Controls

All Columbia steam boilers are controlled by both operating *and safety limit* Pressure Control. Both devices are adjustable and use pressure actuated mercury 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 re-fire. 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 *McDonnell & Miller #767*. If an installation needs a CSD-1 requirement, an additional *Warrick 26C1C1C* probe type LWCO is supplied. Other optional equipment used in place of, or in addition to, one of the aforementioned LWCOs includes water feeders and combination LWCO/ feeders.

The *McDonnell & Miller #767* is a float operated control consisting of a large sediment chamber with its own spring closing blow-off valve. The float actuated low water switch opens in a low water condition. In the same instance, the *McDonnell & Miller #767* has an extra set of contacts that close with a drop in water level. If necessary, this set of contacts could be used to activate an additional water feeder.

A *Warrick 26C1C1C* "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" tapings 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

Aquastat® Controllers

All Columbia 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 26C1C1C, 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

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 cleanliness.

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 (CWH-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

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.

APPENDICES

Recirculation

Whenever hot water is supplied for process to some distant point, the water in the connecting line will cool, making it necessary to draw off the cool water before hot is obtained. In some applications where lines are long and large, this could be a troublesome factor, but it can be readily corrected by installing a circulator pump. A recirculation system generally requires a small line (1/2" is often adequate) connected between the end of the hot supply header and the cold supply to the heater. A conventional circulating pump, preferably bronze or stainless trimmed, when installed in this return line, will effectively maintain hot water throughout the supply header. A swing check valve will prevent short circuiting.

Twin Units and Tank Systems

If larger volumes of hot water are required beyond the range of the largest Columbia water heater, we would suggest either using multiple units or combination tank systems. The combination tank system consists of a galvanized storage tank of suitable capacity connected to the water heating coils in the Columbia indirect water heater through a bronze or stainless trimmed circulating pump. The pump circulates the water from the tank through the water heater and is controlled by an Aquastat located in the lower part of the storage tank. A high head pump is recommended for this service. A needle valve and a thermometer should be installed in the circulating line so that the rate of circulation can be adjusted to match the capacity of the water heater.

COLUMBIA

GL-L SERIES



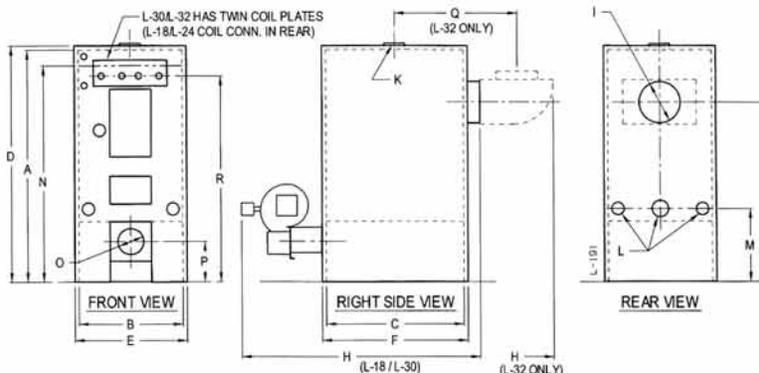
The GL Series offers fast and efficient hot water heating and processing, and low pressure steam heating and processing.

The GL is ideal for bakeries, micro breweries, health spas, canneries, restaurants, plus humidification, and many other small low pressure steam applications.

You can do BETTER with Columbia
GOOD people. BETTER Boilers. BEST value.

SPECIFICATIONS AND DATA

**INDIRECT
HOT WATER
COILS
OPTIONAL**



**SERIES
CAN BE
ALTERED
FOR
PRESSURE
FIRING**

BOILER DIMENSIONS						
MODEL NO.	GL-18 L-18	GL-20 L-20	GL-22 L-22	GL-24 L-24	GL-30 L-30	GL-32 L-32
A Height	44"	48"	52"	56"	56"	60"
B Width	19"	19"	25"	25"	30"	30"
C Length	22"	25"	26-1/2"	30-1/2"	31"	36"
JACKET DIMENSIONS						
D Height	45"	49"	53"	57"	57"	61"
E Width	21"	21"	27"	27"	32"	32"
F Length	25-1/2"	28-1/4"	30-1/2"	34-1/4"	34-3/4"	40-3/4"
H Length w/Burner (Oil)	36-1/4***	39***	44-1/2***	41-1/4***	45-1/2"	51-1/2"
Length w/Burner(Gas)	37-1/2"	40-1/4"	42-1/2"	46-1/4"	46-3/4"	55"
MISCELLANEOUS DIMENSIONS						
I Flue Outlet	8"	8"	9"	9"	10"	10"
J Flue Outlet-to floor	32-1/4"	36-1/4"	39-1/2"	41-3/4"	42"	43"
Chimney Size	8" Sq. x 20'	8" Sq. x 20'	8" Sq. x 30'	10" Sq. x 30'	10" Sq. x 30'	12" Sq. x 30'
K Supply Outlet	3"	3"	3"	4"	4"	4"
L Return Inlet	(2) 1-1/2"	(2) 1-1/2"	(2) 1-1/2"	(2) 1-1/2"	(1) 3"	(1) 3"
M Return Inlet to Floor	15-1/2"	15-1/2"	17-1/2"	17-1/2"	18-3/4"	18-3/4"
N Water Line to Floor	40"	44"	48"	52"	51"	53"
Firebox Width	11"	12"	15"	15"	18"	18"
Firebox Length	14"	16"	16"	18"	19"	24"
O Burner Opening	5"	5"	5"	5"	5-1/2"	5-1/2"
P Burner Opening to Floor	8"	8"	9"	9"	10"	10"
Q c Supply Outlet to c Smoke Outlet	-	-	-	-	-	29-1/4"
Shipping Weight	650 lb.	770 lb.	1080 lb.	1260 lb.	1500 lb.	1890 lb.
R Coil Conn.C/L	38"	42"	46-1/2"	47-3/4"	49-1/2"	50-1/2"

**Adjustable Flange Length

BOILER-BURNER UNIT						
MODEL NO.	GL-18 L-18	GL-20 L-20	GL-22 L-22	GL-24 L-24	GL-30 L-30	GL-32 L-32
Horsepower	4	6	8	9.5	13	16
Input-BTU per hour	196,000	280,000	326,000	399,000	560,000	700,000
L Series Input - Gals. per hour	1.40	2.00	2.40	2.85	4.00	5.00
Gross Output BTU per hour	157,000	224,000	269,000	320,000	448,000	560,000
Net Output BTU per hour - water	137,000	195,000	234,000	279,000	390,000	487,000
Net Output BTU per hour - steam	118,000	168,000	202,000	209,000	336,000	420,000
Net Output Sq. Ft. - Steam	492	700	842	871	1400	1750
Heating Surface - Sq. Ft	24.2	32.5	41.5	53.6	65.0	90.0
Combustion Volume - Cu. Ft.	3.6	5.1	6.5	8.5	10.8	13.8
Water Capacity Water - Gallons	24	31	43	55	80	90
Water Capacity Steam - Gallons	18	23	32	43	60	68
Tankless Water Heater						
Gals. per hr. 100' rise (continuous)	170	240	300	330	360	390
Gals. per min. 100' rise	5***	5***	5	5	6	6-1/2
Coil Model No.	#2	#2	#3	#3	N-1	N-1

***Intermittent Flow Rate -- All others are continuous flow rates



Operating Pressures: Steam 15 P.S.I.
Water 30 P.S.I.



Manufactured in USA by
COLUMBIA BOILER COMPANY
P.O. Box 1070, Pottstown, PA 19464
(610) 323-2700 FAX (610) 323-7292
www.columbiaboiler.com cbcsales@ptd.net



CONSTRUCTED in accordance with Section IV,
ASME Boiler & Pressure Vessel Code.

COLUMBIA

WL SERIES

**WATER LEG BOILERS FOR HYDRONIC OR STEAM
HEATING, PROCESS STEAM AND POTABLE HOT WATER**

30 PSI WATER

15 PSI STEAM



Columbia's WL Series is an extremely versatile commercial boiler. It is ideal for schools, office buildings, apartments, bakeries, greenhouses, laundries and laundromats, health clubs, light industrial structures, breweries and brew pubs, mushroom farms and many other applications. Wherever you need steam or hydronic heating, instantaneous clean hot water, or low-pressure process steam, the WL is the perfect choice.

Since 1936



You can do BETTER with Columbia
GOOD people. BETTER Boilers. BEST value.



COLUMBIA

CWH SERIES

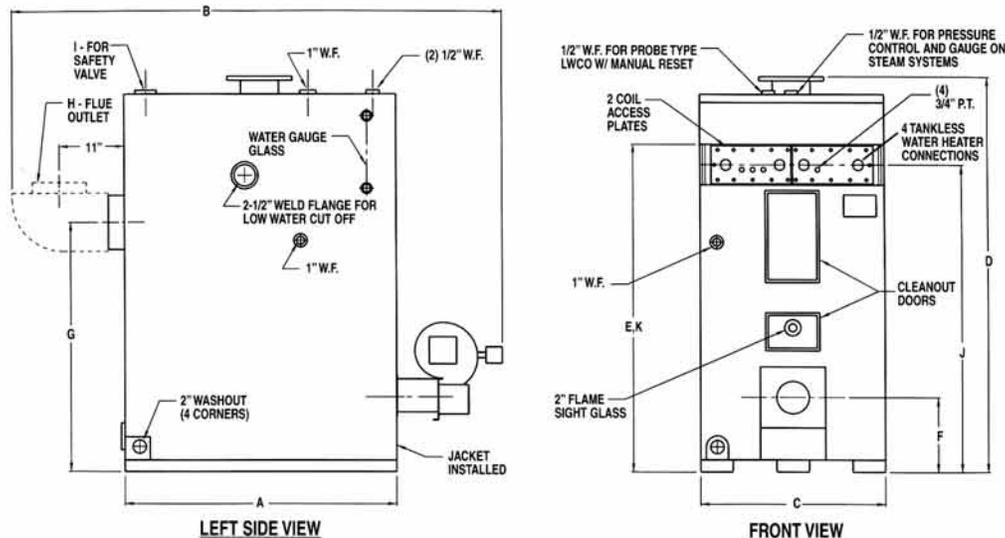
TANKLESS INDIRECT WATER HEATERS

Gas or Oil Fired • Continuous Draw Outputs
from 170 to 2460 gallons of water per hour,
at 100°F rise.



You can do BETTER with Columbia
GOOD people. BETTER Boilers. BEST value.

SPECIFICATIONS AND DATA



MODEL NO.	CWH 170	CWH 240	CWH 300	CWH 390	CWH 475	CWH 610	CWH 780	CWH 1200	CWH 1510	CWH 1810	CWH 2460
RATINGS											
Input --Gals. per hour	1.40	2.00	2.40	3.00	4.00	5.00	6.00	9.00	12.00	14.00	18.00
Input -- MBTU per Hr.	196	280	336	420	560	700	840	1260	1680	1960	2520
Gross Output	157	224	269	336	448	560	680	1014	1357	1568	2054
Horsepower	4	6	8	10	13	16	20	30	40	47	60
Continuous Draw Outputs											
Gals. per minute 80°F Rise*	3.50	5.00	6.25	8.20	9.9	12.6	16	25	31	38	51
Gals. per minute 100°F Rise**	2.80	4.00	5.00	6.50	7.9	10.1	13	20	25	30	41
Gals. per Hr.*	210	300	375	490	595	750	975	1500	1890	2280	3060
Gals. per Hr.**	170	240	300	390	475	610	780	1200	1510	1810	2460
HEATER DIMENSIONS											
A Base Length	22"	25"	27"	31"	31"	35"	39"	43"	51"	55"	63"
B Length w/Smoke Hood & Burner ⁽¹⁾	33"	36"	38"	45"	45"	68"	73"	76"	84"	95"	104"
C Boiler Width	19"	19"	26"	26"	30"	30"	32"	34"	34"	34"	40"
D Height Overall	45"	49"	53"	57"	57"	60"	64"	68"	74"	74"	75"
E Min. Safe Water Level	38"	43"	48"	51"	48"	49"	49"	49"	55"	55"	55"
F Burner Opening to Floor	8"	8"	9"	9"	11"	10"	12"	12"	14"	14"	14"
G Flue Outlet to Floor	32"	37"	40"	44"	42"	43"	42"	41"	47"	47"	47"
H Flue Outlet ^(2 & 3 - see note)	8 ⁽³⁾	8 ⁽³⁾	9 ⁽³⁾	9 ⁽³⁾	10 ⁽³⁾	10 ⁽³⁾	10 ⁽²⁾	10 ⁽²⁾	12 ⁽²⁾	12 ⁽²⁾	14 ⁽²⁾
I Safety Valve Opening	3/4"	3/4"	3/4"	1"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/2"	1-1/2"	2"
J Coil Connections to Floor	39"	43"	47"	51"	50"	51"	51"	51"	57"	57"	57"
K Recommended Operating Water Level	41"	45"	49"	52"	52"	55"	57"	57"	63"	63"	63"
MISCELLANEOUS DIMENSIONS											
Approximate Shipping Weight	650	770	1080	1260	1500	1900	2100	2450	2800	3000	3850
Water Capacity -- Gals.	24	31	43	55	80	90	133	154	193	214	287
Tankless Water Heater Size No.	N6	#3	N1	N7	N1	N1	N2	N3	N4	N4	N5
Tankless Water Heater Connections	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
No. of Tankless Water Heaters	1	1	1	1	2	2	2	2	2	2	2
Header/Mixing Valve Size	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/4"	1-1/2"	1-1/2"	2"	2"	2"	2-1/2"

NOTES: (1) - Standard Oil Burner. (2) Stack need only be vented with CWH-780 through CWH-2460.
 (3) CWH-170 through CWH-610 - chimney required, not pressure fired.

* 80°F Rise -- 40°-120°F
 ** 100°F Rise - 40°-140°F



Manufactured in USA by
COLUMBIA BOILER COMPANY
 P.O. Box 1070, Pottstown, PA 19464
 (610) 323-2700 FAX (610) 323-7292

www.columbiaboiler.com cbcsales@columbiaboiler.com



CONSTRUCTED in accordance with Section IV,
 ASME Boiler & Pressure Vessel Code.

**REPLACEMENT PARTS FOR L-SERIES BOILERS and
CWH-170 thru CWH-610 WATER HEATERS**

REF. No.	DESCRIPTION	BOILER MODEL	ITEM NUMBER‡
1	BURNER - SEE BURNER SECTION OF MANUAL	ALL	SEE PARTS LIST
2	BOILER ONLY - WITH COIL	L-18	840010
		L-20	840210
		L-22	840410
		L-24	840610
		L-30	840810
	(DOES NOT INCLUDE SMOKEHOOD)	L-32	841010
2	BOILER ONLY - WITH TWO COILS	L-30	840812
		L-32	841012
2	BOILER ONLY - WITHOUT COIL	L-18	840015
		L-20	840215
		L-22	840415
		L-24	840615
		L-30	840815
	(DOES NOT INCLUDE SMOKEHOOD)	L-32	841015
3	WATER TRIM - WITHOUT COIL	L-18 thru L-22	842901
	WATER TRIM - WITHOUT COIL	L-24 thru L-32	842906
	WATER TRIM - WITH COIL	L-18 thru L-22	842902
	WATER TRIM - WITH COIL	L-24 thru L-32	842905
3A	AQUASTAT, L4006A-1827	ALL	552010
3B	AQUASTAT, L4006E-1109	ALL	552020
3C	WELL, 3/4" X 3, HONEYWELL 123871A	ALL	552800
3D	T/A GAUGE, 2.5" WINTERS #400	ALL	559581
3E	CONBRACO RELIEF VALVE, 3/4 X 3/4 F, 30 PSI	L-18 thru L-22	570181
3E	CONBRACO RELIEF VALVE, 1", 30 PSI	L-24 thru L-32	570190
3F	NIPPLE, 3/4" X 3"	L-18 thru L-22	512151
3F	NIPPLE, 1" X 3"	L-24 thru L-32	513131
4	McDONNELL/MILLER #764 LOW WATER CUT-OFF	ALL	557190
4A	NIPPLE, 2-1/2" CLOSE (FOR 764 INSTALLATION)	ALL	517101
4(ALT.)	M&M 750-MT-120 PROBE CONTROL (CDS-1)	ALL	557220
	M&M RS-1-LP PROBE SENSOR ASSY. (CSD-1)	ALL	557230
5	STEAM TRIM - WITH COIL	L-18 thru L-22	842903
	STEAM TRIM - WITH COIL	L-24	842907
	STEAM TRIM - WITH COIL	L-30, L-32	842909
	STEAM TRIM - WITHOUT COIL	L-18 thru L-22	842904
	STEAM TRIM - WITHOUT COIL	L-24	842908
	STEAM TRIM - WITHOUT COIL	L-30, L-32	842910
5A	PRESSURE CONTROL, OPERATING, 2-15 PSI	ALL	553600
5B	PRESSURE CONTROL, SAFETY LIMIT, 2-15 PSI	ALL	553605
5C	STEAM SYPHON, STRAIGHT	ALL	559310
5D	STEAM GAUGE, 30 PSI, 2.5" WINTERS #E1437	ALL	559201
5E	WATER GAUGE ASSY. 5/8	L-18 thru L-24	571010
	WATER GAUGE ASSY. 5/8" X 8 2/4"	L-30, L-32	571000
5F	RL GAUGE GLASS ONLY, 5/8" X 5 3/4"	L-18 thru L-24	571094
	RL GAUGE GLASS ONLY, 5/8" X 8 3/4"	L-30, L-32	571103
5G	CONBRACO SAFETY VALVE, 3/4", 15 PSI	L-18 thru L-22	570250
	CONBRACO SAFETY VALVE, 1 X 1" F, 15 PSI	L-24	570260
	CONBRACO SAFETY VALVE, 1 1/4 X 1 1/2", 15 PSI	L-30, L-32	570270
5H	McDONNELL/MILLER #767 LOW WATER CUT-OFF	ALL	557200
5F	NIPPLE, 1 1/2" CLOSE	ALL	517101
6	AQUASTAT, L4006A-1827 (COIL ONLY)	ALL	552010
6A	WELL, 3/4" X 3, HONEYWELL 123871A (COIL ONLY)	ALL	552800

‡WHEN ORDERING PARTS, SUPPLY THE BOILER MODEL NUMBER, SERIAL NUMBER, AND THE SIX DIGIT ITEM NUMBER.

**REPLACEMENT PARTS FOR WL-SERIES BOILERS and
CWH-780 thru CWH-2460 WATER HEATERS**

REF. No.	DESCRIPTION	BOILER MODEL	ITEM NUMBER‡
1	BURNER - SEE BURNER SECTION OF MANUAL	ALL	SEE PARTS LIST
2	BOILER ONLY - WITH COIL	WL-60	842400
		WL-90	842500
		WL-120	842600
		WL-140	842700
		WL-180	842800
2	BOILER ONLY - WITH TWO COILS *	WL-60	842402
		WL-90	842502
		WL-120	842602
		WL-140	842702
		WL-180	842802
2	BOILER ONLY - WITHOUT COIL *	WL-60	842405
		WL-90	842505
		WL-120	842605
		WL-140	842705
		WL-180	842805
	(*DOES NOT INCLUDE BURNER BLOCK OR SMOKEHOOD)		
3	WATER TRIM	WL-60	842912
		WL-90, 120, 140	842920
		WL-180 G/O/DF	842934
3A	AQUASTAT, L4006A-1827	ALL	552010
3B	AQUASTAT, L4006E-1109	ALL	552020
3C	WELL, 3/4" X 3, HONEYWELL 123871A	ALL	552800
3D	T/A GAUGE, 2.5" WINTERS #400	ALL	559581
3E	CONBRACO RELIEF VALVE, 1", 30 PSI	L-24 thru L-32	570190
3E	CONBRACO RELIEF VALVE, 1" X 1 1/4", 30 PSI	WL-90, 120, 140	570192
3E	CONBRACO RELIEF VALVE, 1 1/4" X 1 1/2", 30 PSI	WL-180 G/O/DF	570195
3F	NIPPLE, 1" X 3"	WL-60	513131
3F	NIPPLE, 1" X 2"	WL-90, 120, 140	513111
3F	NIPPLE, 1 1/2" X 3"	WL-180 G/O/DF	515380
4	McDONNELL/MILLER #764 LOW WATER CUT-OFF	ALL	557190
4A	NIPPLE, 2-1/2" CLOSE (FOR 764 INSTALLATION)	ALL	517101
3J	BUSHING, 1 1/2" X 1"	WL-90, 120, 140	322300
4	STEAM TRIM - WITH COIL	WL-60	842914
	STEAM TRIM - WITH COIL	WL-90	842917
	STEAM TRIM - WITH COIL	WL-120	842922
	STEAM TRIM - WITH COIL	WL-140 GAS	842925
	STEAM TRIM - WITH COIL	WL-140 OIL/DF	842932
	STEAM TRIM - WITH COIL	WL-180	842928
	STEAM TRIM - WITHOUT COIL	WL-60	842915
	STEAM TRIM - WITHOUT COIL	WL-90	842918
	STEAM TRIM - WITHOUT COIL	WL-120	842923
	STEAM TRIM - WITHOUT COIL	WL-140 GAS	842926
	STEAM TRIM - WITHOUT COIL	WL-140 OIL/DF	842931
	STEAM TRIM - WITHOUT COIL	WL-180	842929
4A	PRESSURE CONTROL, OPERATING, 2-15 PSI	ALL	553600

**REPLACEMENT PARTS FOR WL-SERIES BOILERS and
CWH-780 thru CWH-2460 WATER HEATERS**

REF. No.	DESCRIPTION	BOILER MODEL	ITEM NUMBER‡
4B	PRESSURE CONTROL, SAFETY LIMIT, 2-15 PSI	ALL	553605
4C	STEAM SYPON, STRAIGHT	ALL	559310
4D	STEAM GAUGE, 30 PSI, 2.5" WINTERS #E1437	ALL	559201
4E	WATER GAUGE ASSY. 5/8" X 12"	ALL	571030
4F	RL GAUGE-GLASS ONLY, 5/8" X 12"	ALL	571096
4G	CONBRACO SAFETY VALVE, 1 1/4 X 1 1/2", 15 PSI	WL-90	570270
	CONRACO SAFETY VALVE, 1 1/2 X 2" F, 15 PSI	WL-120, 140	570280
	CONBRACO SAFETY VALVE, 2 X 2", 15 PSI	WL-180	570290
4H	McDONNELL/MILLER #767 LOW WATER CUT-OFF	ALL	557200
4J	NIPPLE, 2 1/2" CLOSE	ALL	517101
4K	AQUASTAT, L4006A-1827 (COIL ONLY)	ALL	552010
4M	WELL, 3/4" X 3, HONEYWELL 123871A (COIL ONLY)	ALL	552800
5	WATER HEATER TRIM	CWH-780	842916
		CWH-1200	842919
		CWH-1510	842924
		CWH-1810 GAS	842927
		CWH-1810 OIL/DUAL FUEL	842936
		CWH-2460	82930
5A	AQUASTAT, L4006A-1827	ALL CWH	552010
5B	AQUASTAT, L4006-1109	ALL CWH	552020
5C	WELL, 3/4" X 3, HONEYWELL 123871A	ALL CWH	552800
5D	T/A GAUGE, 2.5" WINTERS #400	ALL CWH	559581
5E	WATER GAUGE ASSEMBLY, 5/8" X 12"	ALL CWH	571030
5F	RL GAUGE-GLASS ONLY, 5/8" X 12"	ALL CWH	571096
5G	CONBRACO SAFETY VALVE, 1 1/4 X 1 1/2", 15 PSI	CWH-780,-1200	570270
5G	CONBRACO SAFETY VALVE, 1 1/2 X 2" F, 15 PSI	CWH-1510,-1810	570280
5G	CONBRACO SAFETY VALVE, 2 X 2", 15 PSI	CWH-2460	570290
5H	McDONNELL/MILLER #764 LOW WATER CUT-OFF	ALL CWH	557190
5J	NIPPLE, 2-1/2" CLOSE (FOR 764 INSTALLATION)	ALL CWH	517101
7	JACKET ASSEMBLY, 18 GA.	WL-60, CWH-780	500015
	JACKET ASSEMBLY, 18 GA.	WL-90, CWH-1200	500025
	JACKET ASSEMBLY, 18 GA.	WL-120, CWH-1510	500035
	JACKET ASSEMBLY, 18 GA.	WL-140, CWH-1810	500045
	JACKET ASSEMBLY, 18 GA.	WL-180, CWH-2480	500060
8	COIL PLATE, RIGHT WITH COIL	WL-60 thru WL-140	530740
	COIL PLATE, LEFT WITH COIL	WL-60 thru WL-140	530741
	COIL PLATE, RIGHT LESS COIL	WL-60 thru WL-140	530742
	COIL PLATE, LEFT LESS COIL	WL-60 thru WL-140	530743
	COIL PLATE, RIGHT WITH COIL	WL-180	530745
	COIL PLATE, LEFT WITH COIL	WL-180	530746
	COIL PLATE, RIGHT LESS COIL	WL-180	530747
	COIL PLATE, LEFT LESS COIL	WL-180	530748
9	COIL GASKET KIT	WL-60 thru WL-140	530905
	COIL GASKET KIT	WL-180	530910
9A	GASKET, COIL PLATE	WL-60 thru WL.140	480600
	GASKET, COIL PLATE	WL-180	480620
9B	COIL SPUD LOCK NUT	ALL	530805
	GASKET FOR COIL SPUD LOCKNUT	ALL	530810
9C	GASKET FOR COIL SPUD LOCKNUT	ALL	530810

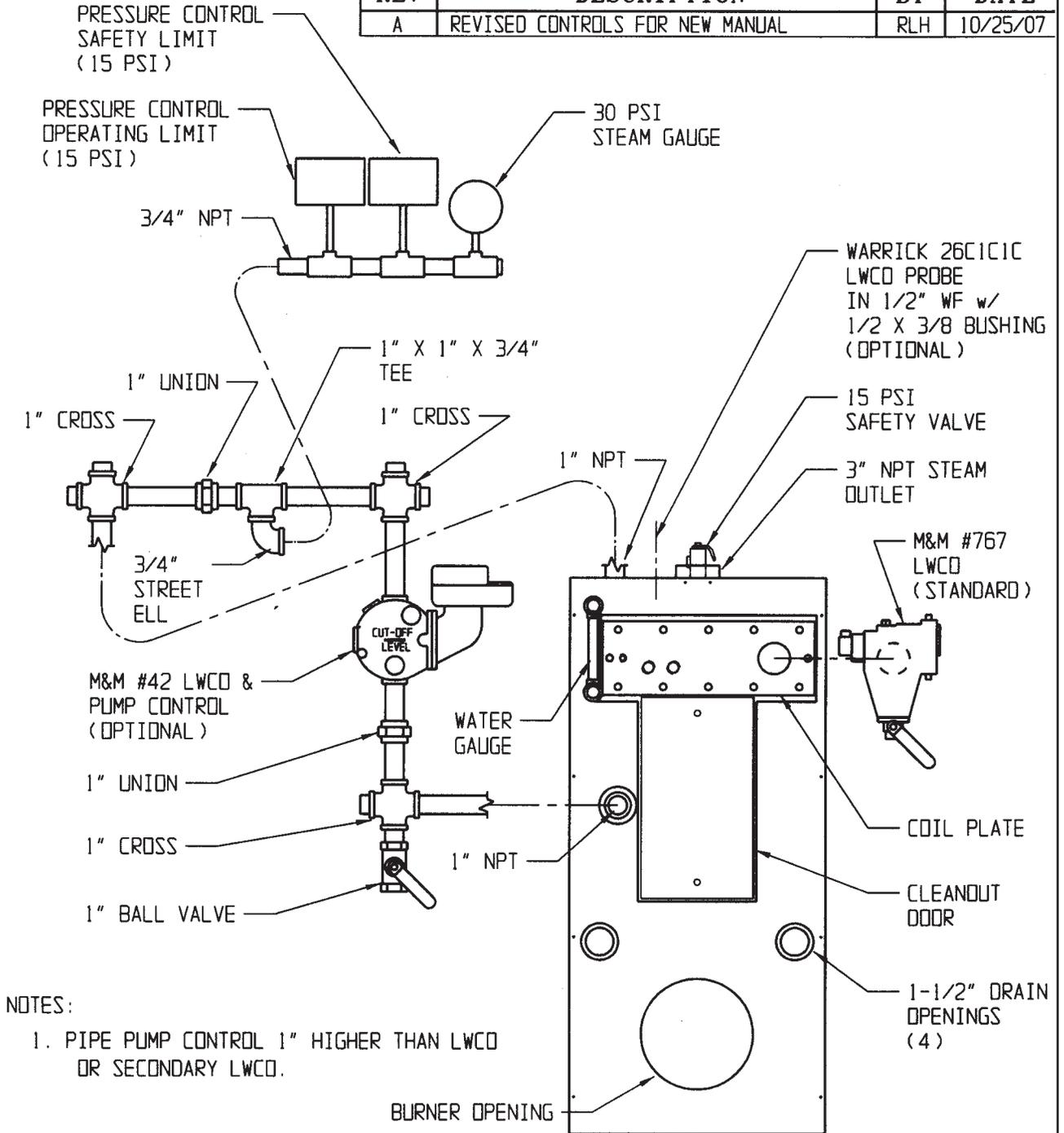
**REPLACEMENT PARTS FOR WL-SERIES BOILERS and
CWH-780 thru CWH-2460 WATER HEATERS**

REF. No.	DESCRIPTION	BOILER MODEL	ITEM NUMBER‡
	COIL REPAIR STUD, 3/8"-16 (USE 5/16" DRILL BIT)	ALL	316215
10	COIL, #N-2	WL-60, CWH-780	530510
	COIL, #N-3	WL-90, CWH-1200	530520
	COIL, #N-4	WL-120,-140 CWH-1510,-1810	530530
	COIL, #N-5	WL-180, CWH-2460	530540
11	CLEAN-OUT DOOR	WL & L-20 / L-32	843300
12	INSPECTION "PEEP" DOOR	WL SERIES	843306
12A	SIGHT-GLASS WITH GASKETS, 2"	WL SERIES	970725
13	MILLBOARD, CLEAN-OUT DOOR	L/WL	332320
14	MILLBOARD, INSPECTION DOOR	ALL	332310
15	SMOKE HOOD, 10"	WL-60	843315
	SMOKE HOOD, 10"	WL-90	843316
	SMOKE HOOD, 12"	WL-120,-140	843318
	SMOKE HOOD, 14"	WL-180	843320
16	MILLBOARD GASKET, WL SMOKEHOOD	ALL	843322
17	BURNER BLOCK, FOR BECKETT CF-800	WL-60	843060
	BURNER BLOCK, FOR POWER FLAME JR30A	WL-60,-90	843075
	BURNER BLOCK, FOR POWER FLAME CR1 BURNER	WL-60,-90	843100
	BURNER BLOCK, FOR POWER FLAME CR2 BURNER	WL-90	843150
	BURNER BLOCK, FOR BECKETT CF-1400, CARLIN 601	WL-90	843160
	BURNER BLOCK, FOR POWER FLAME JR50A BURNER	WL-90	843185
	BURNER BLOCK, FOR IRON FIREMAN C120	WL-60,-90	843202
	BURNER BLOCK, FOR INDUSTRIAL COMB. FPG-12	WL-90	843205
	BURNER BLOCK, FOR POWER FLAME JR50A-15	WL-120,-140	843225
	BURNER BLOCK, FOR GORDON PIATT R8	WL-120	843210
	BURNER BLOCK, FOR IRON FIEMAN CF-100	WL-120	843215
	BURNER BLOCK, FOR BECKETT CF-1400	WL-120	843231
	BURNER BLOCK, FOR BECKETT CF-2300	WL-120 thru 180	843241
	BURNER BLOCK, FOR POWER FLAME CR2 BURNER	WL-120 thru 180	843250
	BURNER BLOCK, FOR CARLIN 601/801	WL-120 thru 180	843275
	BURNER BLOCK, FOR GORDON PIATT R8.1-GO	WL-180	843280
	BURNER BLOCK, FOR INDUSTRIAL COMBUSTION	WL-180	843290
	BURNER BLOCK, FOR IRON FIREMAN	WL-180	843292
	BURNER BLOCK, FOR WEBSTER JBX2	WL-180	843294
OPTIONS	WL PROBE LWCO ASSEMBLY (STEAM CSD-1)	ALL	558940
	M&M 750-MT-120 PROBE CONTROL (CSD-1 WATER)	ALL	557220
	M&M RS-1-LP REMOTE PROBE SENSOR (CSD WATER)	ALL	557230

‡WHEN ORDERING PARTS, SUPPLY THE BOILER MODEL NUMBER, SERIAL NUMBER, AND THE SIX DIGIT ITEM NUMBER.

REVISIONS

REV	DESCRIPTION	BY	DATE
A	REVISED CONTROLS FOR NEW MANUAL	RLH	10/25/07



NOTES:

- 1. PIPE PUMP CONTROL 1" HIGHER THAN LWCO OR SECONDARY LWCO.

COLUMBIA BOILER CO.

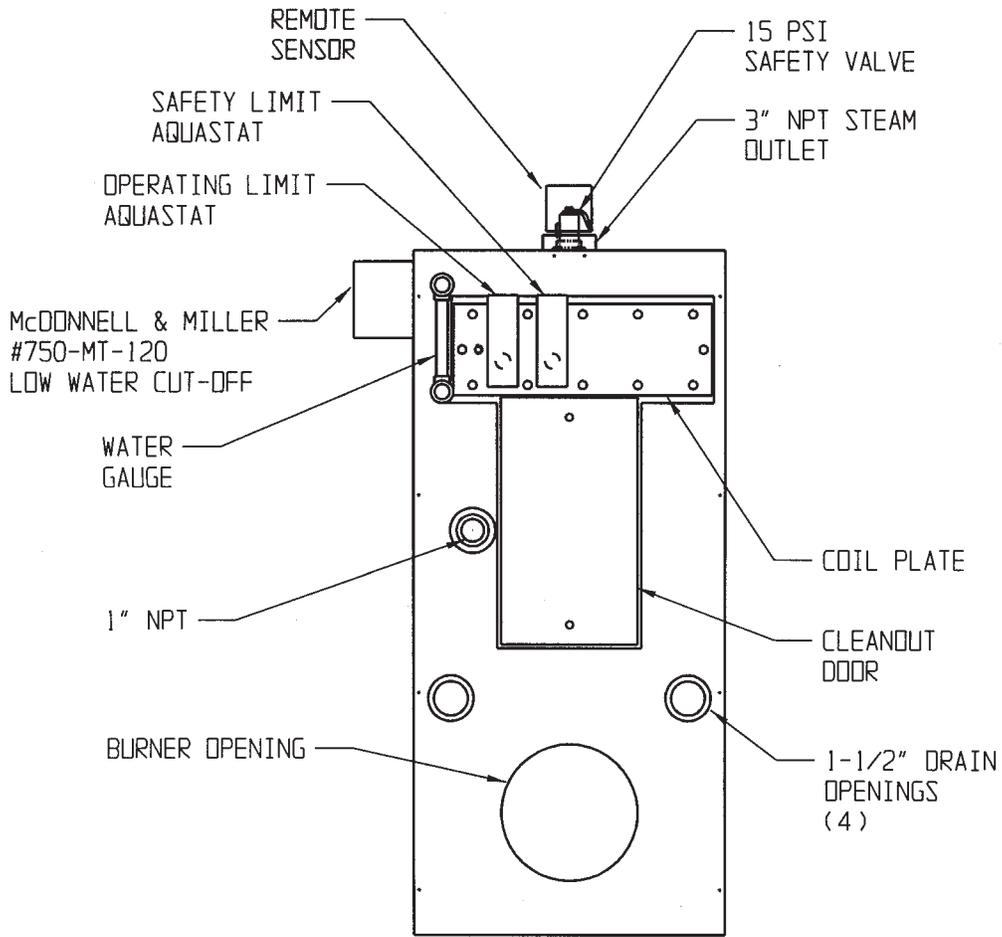
L-18 STEAM (L/COIL) BOILER
w/ 767 & OPTIONAL 26C1C1C
OR M&M 42 LWCO

DRW BY JJM	DATE 14 FEB 00
SCALE -	CHK'D BY

MATERIAL: -	DWG NO. PL-100	REV A
TOLERANCE (unless spec.) PART #		

REVISIONS

REV	DESCRIPTION	BY	DATE
-	-	-	-



COLUMBIA BOILER CO.

L-18 WATER BOILER
 WITH COIL AND M&M
 750-MT-120 LOW WATER CUT-OFF

DRW BY JJM	DATE 25 SEP 00
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SCALE -	CHK'D BY
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MATERIAL: -

DWG NO.

REV

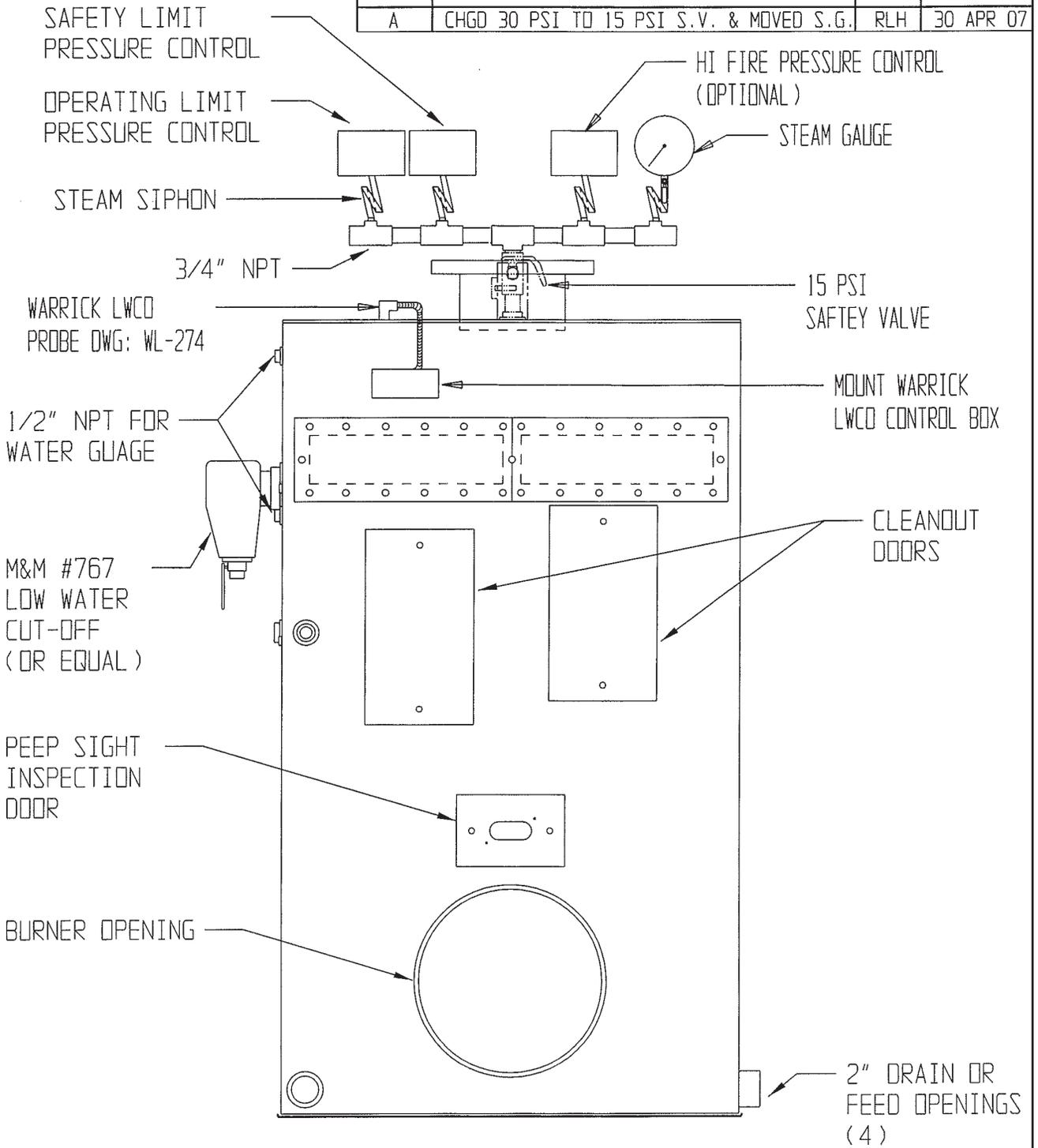
TOLERANCE (unless spec.) PART #

PL-101

-

REVISIONS

REV	DESCRIPTION	BY	DATE
A	CHGD 30 PSI TO 15 PSI S.V. & MOVED S.G.	RLH	30 APR 07



COLUMBIA BOILER CO.

WL-180 STEAM BOILER WITH PRESSURE CONTROLS AND M&M #767 LOW WATER CUT-OFF

DRW BY
HWR

DATE
07 OCT 97

SCALE
-

CHK'D BY

MATERIAL: -

DWG NO.

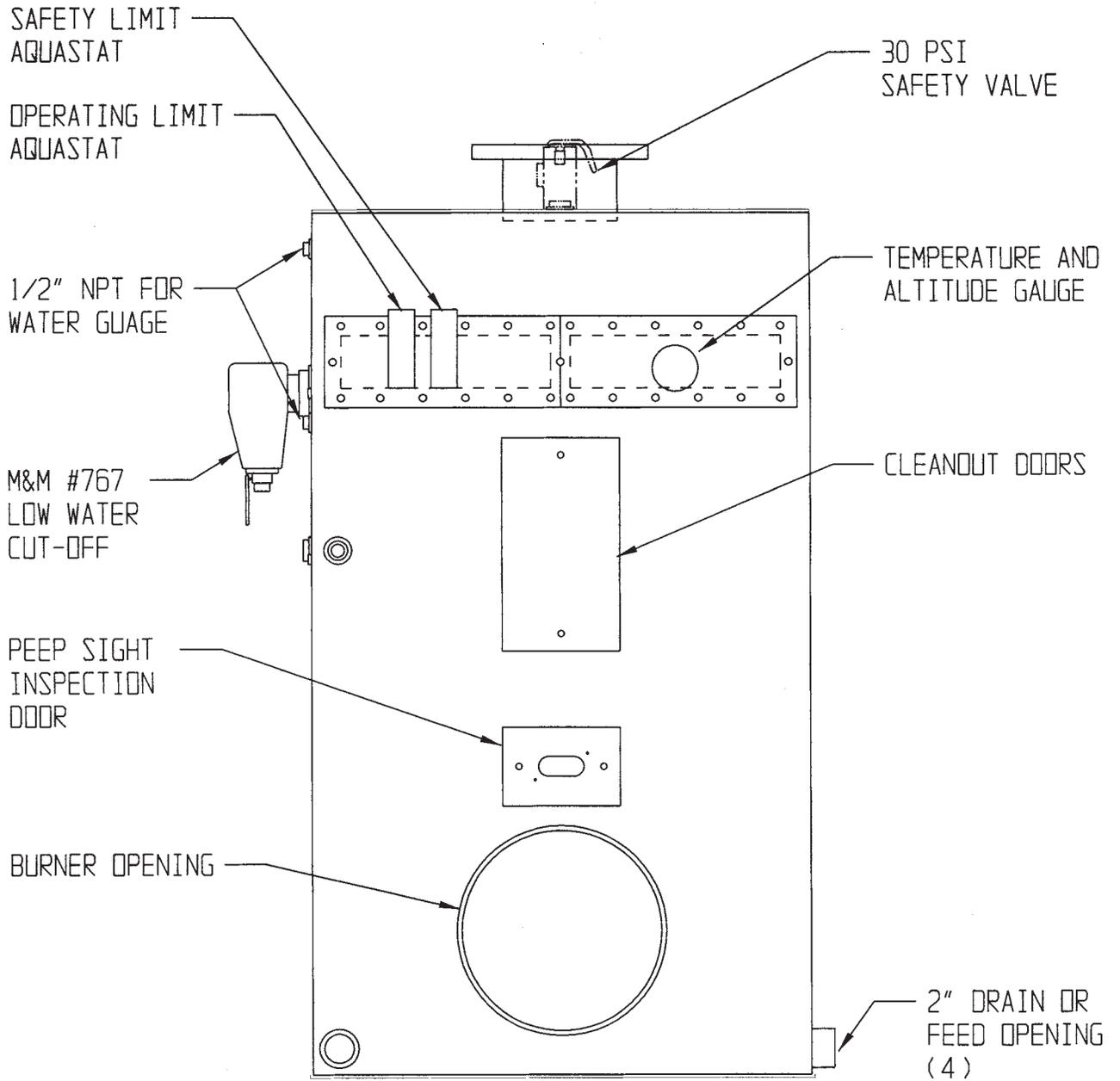
REV

TOLERANCE (unless spec.) PART #

PL-099

A

REVISIONS			
REV	DESCRIPTION	BY	DATE
-	-	-	-
-	-	-	-



COLUMBIA BOILER CO.			
CWH SERIES WATER HEATER with AQUASTATS and M&M #767 LOW WATER CUT-OFF		DRW BY JJM	DATE 25 SEP 00
		SCALE -	CHK'D BY
MATERIAL: -		DWG NO.	REV
TOLERANCE (unless spec.) PART #		PL-102	-

TUBULAR GAGE GLASSES

Red Line, Standard, Heavy Wall and High Pressure

USE AND CARE

NOTICE:

READ THESE WARNINGS & INSTRUCTIONS BEFORE INSTALLING OR REPLACING PYREX® TUBULAR GAGE GLASS.

Improper installation or maintenance of tubular glass can cause immediate or delayed glass breakage resulting in bodily injury. To avoid breakage observe the following Do's and Do Not's and Use and Care Instructions, as well as tubular gage manufacturer's instructions.

If a gage glass breaks, contained substances can be released and glass can be blown out of the unit with great force. Always wear safety glasses when looking toward a gage or working on a gage glass assembly. Guard against the possibility of fire and explosion.

Protect glass from impact, scratches, other surface damage and sudden temperature changes. These can weaken or stress the glass and lead to breakage.

FAILURE TO OBSERVE THE FOLLOWING DO'S AND DO NOT'S CAN RESULT IN GLASS BREAKAGE AND ITS EXPLOSIVE RELEASE OF PRESSURIZED SYSTEM CONTENTS AND FLYING GLASS PARTICLES.

DO NOT'S

- DO NOT work on any gage until you have carefully read these warnings & instructions.
- DO NOT reuse any tubular glass, packing, or seals.
- DO NOT use glass that is scratched, chipped, or otherwise damaged. Used glasses may contain damage and are poor safety risks.
- DO NOT exceed the glass or gage manufacturer's recommended working pressures or maximum recommended gage glass length.
- DO NOT bump, impact or scratch the glass.
- DO NOT tighten gland nut and packing beyond gage manufacturer's recommendations.
- DO NOT operate gages unless gage valve sets are equipped with drain vent and safety ball check.
- DO NOT attempt to clean glass while the unit is in operation. Cleaning should be done without removing the gage glass.
- DO NOT attempt to inspect the glass, to adjust tie rods, packing nuts or glands, to inspect or tighten other fittings without isolating the gage from the pressure vessel and opening the drain vent.
- DO NOT weld, impact, or sandblast in the gage glass area without protecting the glass.
- DO NOT have glass-to-metal contact.
- DO NOT subject gage glass to bending or twisting stresses.
- DO NOT allow the gage glass to contact the bottom of the packing gland.

DO'S

- DO inspect the gage glass daily, keep maintenance records, and conduct routine replacements.
- DO install protective guards where necessary to protect personnel.
- DO protect the outside of the gage glass from sudden temperature changes, such as drafts, water spray, etc.
- DO remove all deposits from the seal areas, the gland nuts, glands (where used) and use new packing before installing a tubular gage glass.
- DO examine gage glass for damage and seals for hard deposits and tears.
- DO verify that the tubular gage glass, gland, nuts, packing, etc. are the correct size and type before installing.
- DO ensure that system is protected by safety shut-off system (e.g. safety ball check).

MAINTENANCE

Examine the gage glass regularly for any signs of clouding, scratching, erosion, or corrosion. In new processes, the glass should be inspected daily until the need for replacement becomes apparent. This will help establish the routine inspection and routine replacement cycles.

CLEANING

Keep gage glass clean using non-abrasive commercial glass cleaners. Where regular cleaners do not seem to work, use dilute acids such as Hydrochloric (muriatic) acid. Always observe safety rules when handling hazardous cleaning solutions. Never use wire brushes, metal scrapers, or harsh abrasives which could scratch the glass.

INSPECTION

Scratches, corrosion, chips, surface flaws, or nicks on the surface or edges weaken the gage glass. To examine for these, shine a very bright concentrated light ("Burton Lite" or powerful flashlight) at about 45° angle. Anything which glistens and catches the fingernail or any star-shaped or crescent-shaped mark which glistens, is cause for replacement. Any gage glass which appears cloudy or roughened and will not respond to cleaning procedures, should be replaced.

STORING

Keep gage glasses in original packaging until ready to install.

HANDLING

Avoid bumping, chipping, or scratching glass. Any glass-to-glass contact can cause scratches and must be avoided.

Corning Glass Works
Industrial Supplies
MP-21-1-4
Corning, New York 14831
607-974-4231

TGG-U&C-88

PYREX is a registered trademark of Corning Glass Works

CORNING

Printed in U.S.A.

TUBULAR GAGE GLASSES

Red Line, Standard, Heavy Wall and High Pressure

USE AND CARE

INSTALLATION

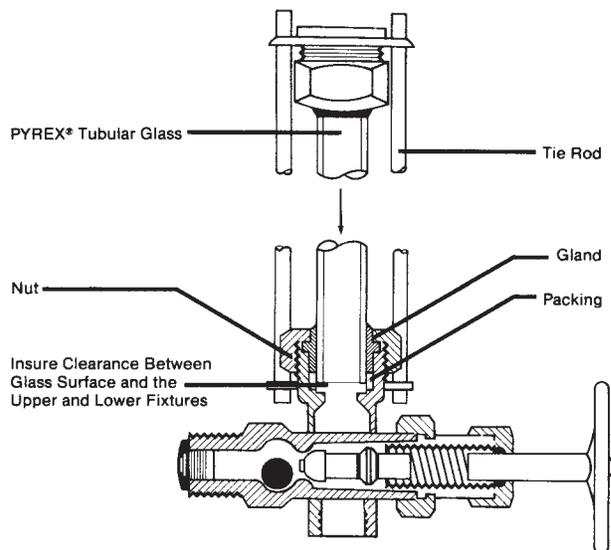
Always follow tubular gage manufacturer's recommended procedures for glass replacement.

Before installing a gage glass, remove all deposits from the seal contact surfaces of the gland nut and the gland (where used). Check sealing surfaces for cleanliness and smoothness. Once a gage glass has been removed from its mounting, regardless of the reason for its removal, discard the glass and replace with a new piece.

Always use new packing, seals, and/or O-rings (if required) when replacing a tubular gage glass. Used packing seals and O-rings will not properly support the gage glass or provide the proper pressure seal without stressing the glass.

1. Hold fittings rigidly to prevent misalignment, which can cause severe bending stresses in the glass, when packing nuts are tightened.
2. Provide metal washers so nuts can be tightened without twisting packing or tube.
3. Provide positive, but not excessive, clearance between glass, packing nuts, and bearing washers.
4. Keep glass short enough to allow for expansion.
5. Provide positive clearance between the ends of the gage glass and the metal fittings. Glass-to-metal contact will keep the gage glass from expanding and cause breakage.
6. Tighten packing nuts enough to prevent leakage, but not so much that you hinder expansion and contraction. Follow gage manufacturer's recommendations.
7. Generally, you can use cylindrical or conical rubber packings for LOW and MEDIUM pressures. HIGHer pressures and HIGH temperatures may require specialized packings. In all cases you should follow the recommendations of the gage manufacturer.

Installation View



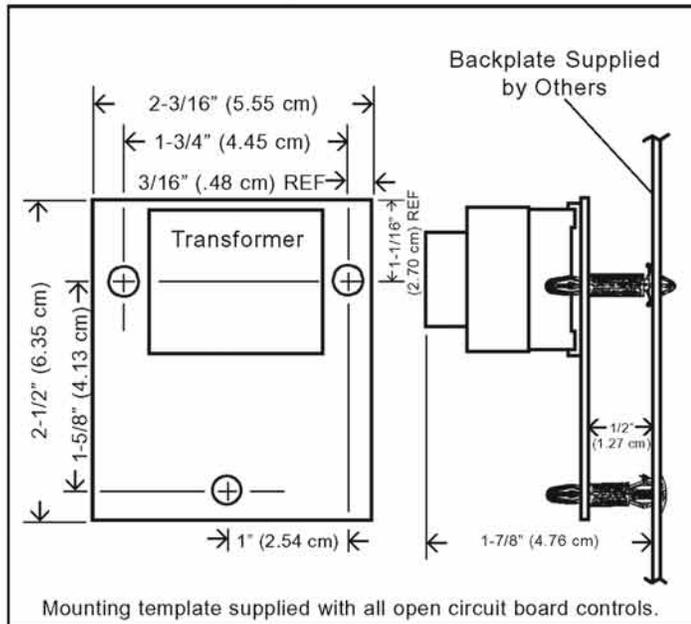
Warrick® Series 26 Controls Installation and Operation Bulletin

This bulletin should be used by experienced personnel as a guide to the installation of Series 26 controls. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Gems Sensors Inc., or its local representative if further information is required.

Specifications

- Control Design:** Open circuit board design
Contact Design: SPDT (1 form C): one normally open (N.O.) and one normally closed (N.C.), non-powered contacts.
Contact Ratings: 10A @ 120 or 240 VAC resistive (120°F), 1 A @ 120, 240 VAC resistive (150°F), 1/3 H.P. @ 120, 240 VAC (120°F)
Contact Life: Mechanical: 5 million operations. Electrical: 100,000 operations minimum at rated load.
Supply Voltage: 120, 240 or 24 VAC models: +10% - 15%, 50/60 Hz. 208/240 Model: 187 Vmin to 255 Vmax. VAC 50/60 Hz
Supply Current: Relay energized 4.4 VA.
Secondary Circuit: 12 VAC RMS voltage on probes, 1.5 milli-amp current.
Sensitivity: Models operate from 4.7K to 100K maximum specific resistance
Temperature: -40 to 150° F. ambient.
Terminals: Probe connections 3/16" spade: Line and power connections 1/4" space
Time Delays: Standard - LLCO probe, 3 seconds standard for lowering level
Listing: UL limit control recognition (353). 240 and 208/240 volt units are not U.L. limit control recognized.

Dimensions



Notes

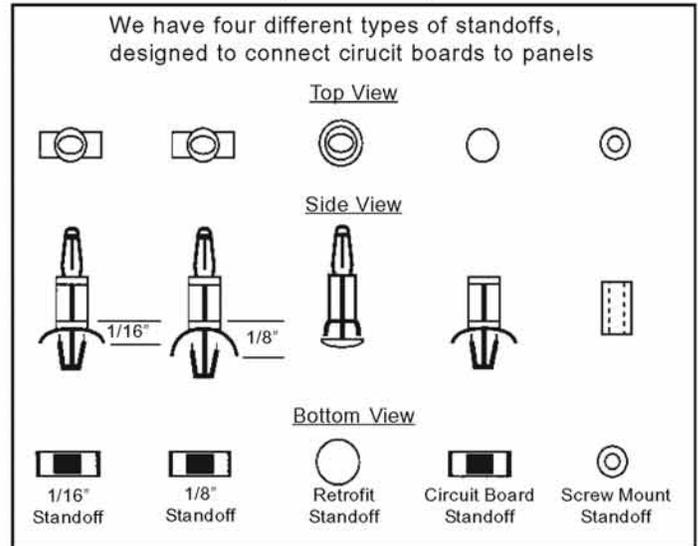
If panel mount stand-off is to be used, thru-holes to be drilled in back plate should be .187" Dia.

If retrofit stand-off is to be used, thru-holes to be drilled in back plate should be .250" Dia.

Installation

1. Drill three .187 dia. holes in customer supplied backplate using stick on template supplied with control. Standard standoffs are designed for backplate thickness of .062 (1/16"). Standoffs are available for backplates of .125 (1/8") nominal thickness. If retrofit plate standoffs are used, drill three .250 dia. holes in proper location.
2. Install three standoffs onto backplate. Install circuit board onto standoffs by pushing down on circuit board at outer edges of all four corners. Use both hands to slide board onto standoffs until standoffs lock.
CAUTION: Do not overflex circuit board during installation. Do not push down on transformer or relays during installation. See sketch for proper installation. Install control in appropriate enclosure.
3. Wire control per diagram, following N.E.C. and local codes. Use appropriately sized spade terminals.

Standoffs

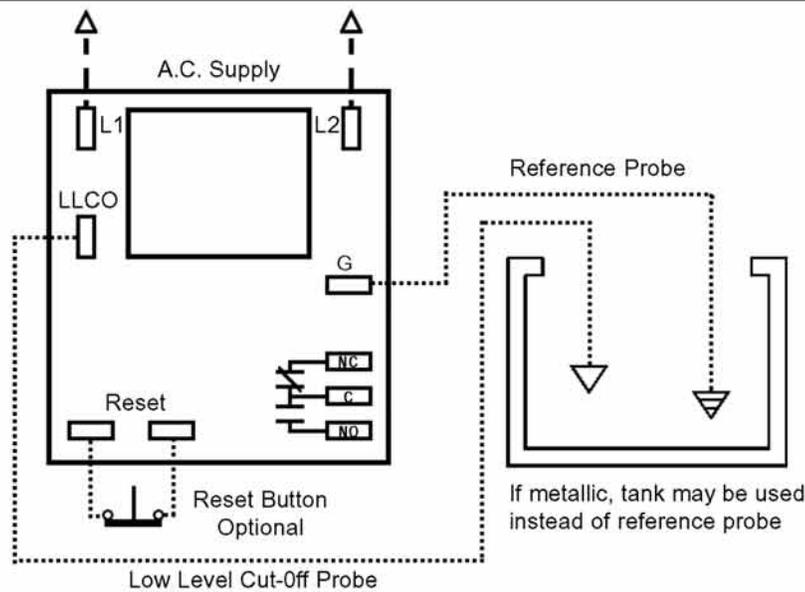


Sensitivities vs Maximum Probe Wire Distance*

SENSITIVITY CHARACTER	SENSITIVITY (KOHMS)	DISTANCE (FT)
A	4.7	900
B	10	600
C	26	250
D	50	100
E	100	50

* Based on type MTW or THHN wire, #14 or #16 Awg

Wiring Diagram



OPTIONS:

AUTOMATIC RESET (Reset terminals not used) When the liquid rises to the electrode on terminal LLCO, the control energizes, changing state of the load contacts. (LED will be lit) The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for a full three seconds before control de-energizes.

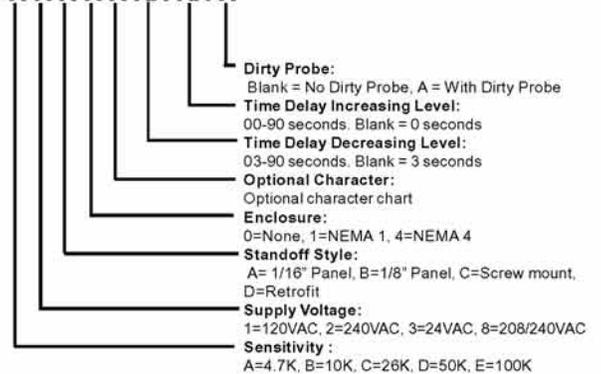
MANUAL RESET (Normally closed pushbutton installed across reset terminals) When the liquid rises to the electrode on terminal LLCO, the control will remain de-energized until the pushbutton is depressed. The control will then energize, (LED will be lit) changing the state of the contacts. The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will not be lit) returning load contacts to their original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for full three seconds before control de-energizes.

MANUAL RESET OPTIONAL POWER OUTAGE FEATURE (Normally closed pushbutton across reset terminals) Control will ignore power loss to control. With liquid above electrode on terminal LLCO, a power outage will cause the control to de-energize, but will automatically energize upon return of power. However, loss of liquid will cause control to de-energize and remain so until liquid again rises to electrode and pushbutton is depressed.

DIRTY ELECTRODE DETECTION The LED will flash every half-second once the probe resistance reaches a value greater than the nominal control sensitivity rating. The relay state will not change until it exceeds the nominal sensitivity by more than 25% (typically) at nominal input voltage. At which time the LED and relay contact return to the dry state. Such a condition may suggest electrode maintenance is required.

TEST FEATURE Allows LLCO circuit to be tested. Holding down the reset button for 3 seconds will allow the LLCO circuit to trip which simulates the loss of water, without the need of draining the water level in the boiler. The control will return to normal operation once the reset button is pressed a second time.

26 X X X X X X X X



Optional Character Chart

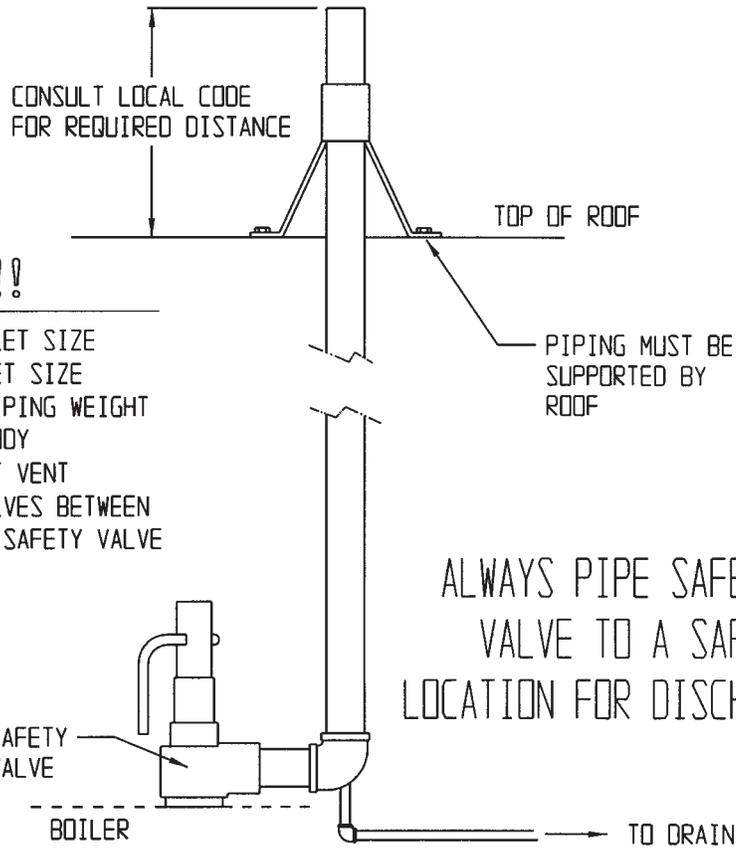
	N.C. Pushbutton	Power Outage	Retrofit Plate	Test Feature
A	X	X		X
B				X
C	X			
E		X		
F	X	X		
N		X	X	
P	X	X	X	
R			X	
Y	X			X
Z		X		X
X	No Option			



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NEVER !!!

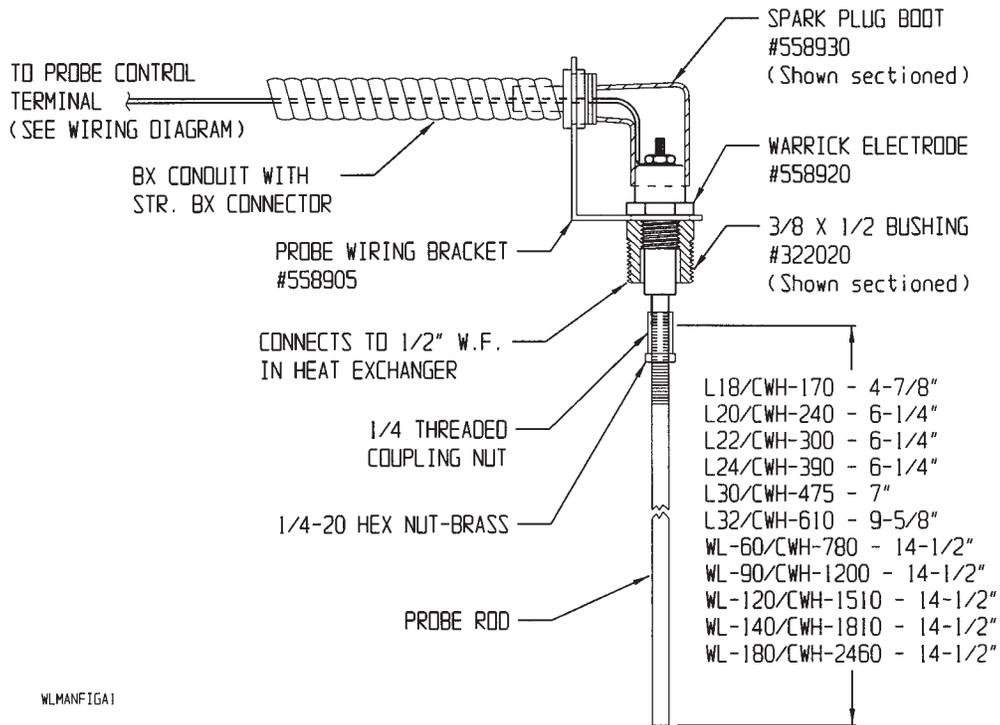
1. REDUCE OUTLET SIZE
2. REDUCE INLET SIZE
3. HANG ANY PIPING WEIGHT ON VALVE BODY
4. PLUG BONNET VENT
5. INSTALL VALVES BETWEEN BOILER AND SAFETY VALVE



ALWAYS PIPE SAFETY VALVE TO A SAFE LOCATION FOR DISCHARGE

WLMANFIGA2

TYPICAL SAFETY VALVE PIPING



WLMANFIGA1

WARRICK PROBE ASSEMBLY



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