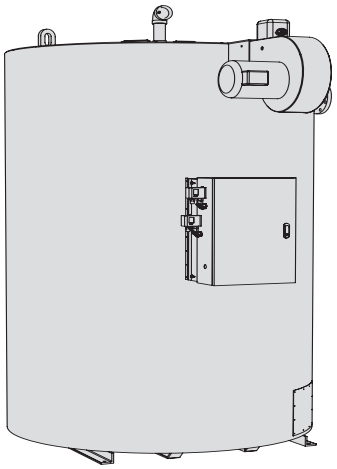
INSTALLATION AND OPERATION MANUAL

Vertical Multi-Port Hot Water Boilers

Model VMP-W
40 -150 HP



Serial/ National Board Number _____

Model _____

Fulton Order _____

Sold To _____

Job Name _____

Date _____

VMPW-IOM-2023-0124

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Overview

Prior to shipment, the following inspections and tests are made to ensure the highest standards of manufacturing for our customers:

- Material inspections
- Manufacturing process inspections
- American Society of Mechanical Engineers (ASME) welding inspection
- ASME hydrostatic test inspection
- Electrical components inspection
- Operating test
- Final engineering inspection
- Crating inspection

This manual is provided as a guide to the correct operation and maintenance of your Fulton equipment, and should be read in its entirety and be made permanently available to the staff responsible for the operation of the boiler. It should not, however, be considered as a complete code of practice, nor should it replace existing codes or standards which may be applicable. Fulton reserves the right to change any part of this installation, operation and maintenance manual.

Installation, start-up, and maintenance of this equipment can be hazardous and requires trained, qualified installers and service personnel. **Trained personnel are responsible for the installation, operation, and maintenance of this product, and for the safety assurance of installation, operation, and maintenance processes. Do not install, operate, service or repair any component of this equipment unless you are qualified and fully understand all requirements and procedures. Trained personnel refers to those who have completed Fulton Service School training specific to this product.**

When working on this equipment, observe all warnings, cautions, and notes in literature, on stickers and labels, and any additional safety precautions that apply. Follow all safety codes and wear appropriate safety protection. Follow all jurisdictional codes and consult any jursidictional authorities prior to installation.

Warnings & Cautions

WARNINGS and CAUTIONS appear in various chapters of this manual. It is critical that all personnel read and adhere to all information contained in WARNINGS and CAUTIONS.

- WARNINGS must be observed to prevent serious injury or death to personnel.
- CAUTIONS must be observed to prevent damage or destruction of equipment or loss of operating effectiveness.

All Warnings and Cautions are for reference and guidance purposes, and do not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes or regulations.

Disclaimers and Local Codes

Installation of the equipment shall conform to all the requirements or all national, state and local codes established by the authorities having jurisdiction or, in the absence of such requirements, in the US to the National Fuel Gas Code ANSI Z2231/NFPA 54 latest edition, and the specific instructions in this manual. Authorities having jurisdiction should be consulted prior to installation.

When required by local codes, the installation must conform to the American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1).

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⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

This boiler is certified for indoor installation only.

A competent rigger experienced in handling heavy equipment should handle rigging your equipment into position.

The equipment must be installed on a non-combustible surface.

Do not store or use gasoline or other flammable vapors and liquids or corrosive materials in the vicinity of this or any other appliances.

⚠ CAUTION

Do not allow weight to bear on equipment components to prevent damage.

Placement & Rigging

Proper placement of your Fulton Product (see Figure 1, and Tables 1 and 2) is essential. Attention paid to the following points will save a great deal of difficulty in the future. Correct placement is the first step to trouble-free installation, operation and maintenance.

Adhere to the following for equipment placement and rigging:

1. Consult authorities with jurisdiction over any national or local codes (including but not limited to National Fire Protection Agency (NFPA), American National Standards Institute (ANSI), Underwriters Laboratories (UL), SCA, and ASME, which might be applicable to boiler applications before beginning.
2. Make appropriate determinations for placement, based on the following:

- Check building specifications and Table 2 for unit weights.
- Ensure the equipment is to be placed on a non-combustible level base with adequate clearances from combustible materials. **See Clearances & Serviceability section.**
- Locate boiler as close as possible to the place where the heat will be used in order to keep pipe work costs to a minimum.
- Ensure that there is adequate clearance around the unit to provide access for operators and maintenance personnel to all parts of the equipment. Ensure also that clearance provides for component removal for maintenance. **See Clearances & Serviceability section.** The equipment should be placed in a suitable boiler house or well ventilated separate room through which personnel do not normally pass. The layout should eliminate traffic in potentially hazardous areas. For instance, the service engineer or the operator should not have to pass exposed, hot pipe work to make adjustments to the boiler controls.
- Ensure the equipment is to be placed in such a way that the electrical components are protected from exposure to water or excessive humidity.
- Ensure the boiler is located a safe distance from the fuel oil tank (if applicable).

3. Determine rigging procedure, based on the following:

- Units are shipped and crated for forklift transport. Once uncrated, all units can be transported with a forklift and/or lifting lugs at the top of the boiler. All skidded units can be moved with forklifts.
- If means of lifting are not available, place rollers beneath the frame of the equipment for guidance to the position of where it is to be installed.
- Under no circumstances allow weight to bear on the jacket, control panel, burner, fuel train or fan housing of any Fulton boiler.
- Tagged support legs on boiler are *for shipping purposes only*. These must be removed at time of installation, and may not be used to mount or anchor boilers.

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TABLE 1- DIMENSIONS- REFER TO FIGURE 1

Model VMP-W	40	50	60	80	100	130	150
Unit Size BHP	40	50	60	80	100	130	150
A. Boiler Diameter							
IN	49	55	55	63	69	76.5	76.5
MM	1245	1397	1397	1600	1753	1943	1943
(B) Boiler Height							
IN	84	91	97	100	100	115	115
MM	2133	2312	2464	2540	2540	2921	2921
(C) Boiler Depth							
IN	90	100	100	114	119	128	130
MM	2286	2540	2540	2896	3022	3251	3302
(D) Boiler Height With Trim							
IN	107	113	119	125	125	149	149
MM	2718	2870	3023	3175	3175	3785	3785
(E) Overall Boiler Width							
IN	56	62	62	68	74	84.5	84.5
MM	1422	1575	1575	1727	1880	2146	2146
(F) Flue Outlet Diameter							
IN	12	12	12	14	14	14	14
MM	305	305	305	356	356	356	356
(G) To Center of Flue Outlet							
IN	79	83	89	95	95	107	107
MM	2006	2108	2261	2413	2413	2718	2718
(H) Return Water Inlet Height							
IN	20.3	20.3	20.3	20.3	20.3	23.6	23.6
MM	516	516	516	516	516	599	599
(J) Water Outlet							
IN	73.8	77.8	83.8	89.8	89.8	101.1	101.1
MM	1870	1980	2130	2280	2280	2570	2570
(K) Min. Clearance to Ceiling for Burner Removal							
IN	123	135	144	147	147	155	155
MM	3124	3429	3658	3734	3734	3937	3937

All data is approximate. Fulton reserves the right to change data without prior notice.

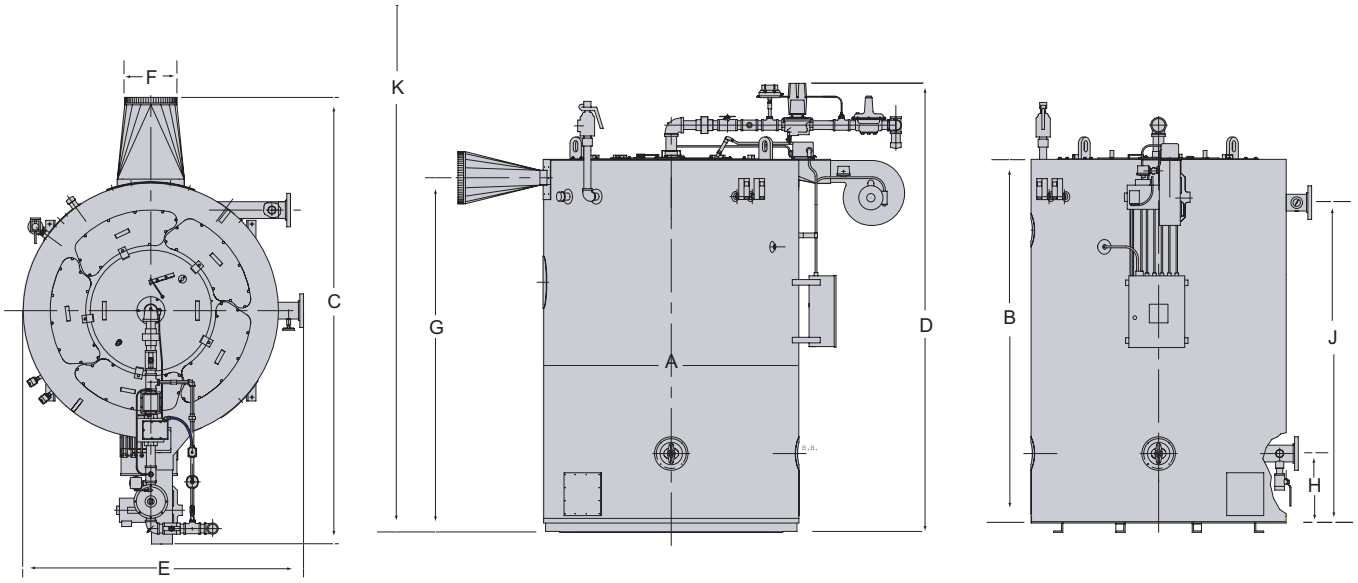

FIGURE 1 -MODEL VMP-W DIMENSIONS/SPECIFICATIONS (REFER TO TABLES 1 AND 2)

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/ professional codes and regulations.

Failure to provide required and safe access to the equipment could impede commissioning and maintenance. Service technicians are instructed not to commence commissioning if hazardous conditions exist.

Failure to provide proper minimum clearances between equipment and combustible materials may result in fire.

The installation of an exhaust fan in the boiler room is not recommended. An exhaust fan or similar equipment can create a downdraft in the stack or restrict the burner's air supply and result in poor combustion. It is essential only fresh air be allowed to enter the combustion air system. Foreign substances such as combustible volatiles and lint may create hazardous conditions.

Ensure all labels on the boiler are legible. All connections and safety devices, both mechanical and electrical, must be kept clean, with ease of access for inspection, use and maintenance.

➨ *NOTE: When calculating ventilation requirements, heat losses from the Fulton equipment (and other equipment) should be considered.*

Clearances & Serviceability

Adhere to the following for equipment clearances and serviceability:

1. Ensure appropriate front, back, sides and top clearances are met. This will allow access around the equipment to facilitate maintenance and a safe work environment, and ensure technicians will commission the unit. Technicians will not commence commissioning if hazardous conditions exist.
2. Place boiler with clearances to unprotected combustible materials, including plaster or combustible supports, not less than the following:

- Heater Front: 36 in. (914 mm)
- Heater Sides and Rear: 18 in. (457 mm)
- Heater top: 24 in. (610 mm)
- Allow for additional minimum clearances for personnel access and burner removal, as necessary.
- Verify that all clearances are acceptable with the local ordinances.

Environment, Ventilation and Combustion Air Requirements

It is critical to provide free access of air to the boiler. To burn fuel properly, it requires one square inch opening for every 3,000 BTU input of fuel (6.4 cm2 for every 756 kCal).

Adhere to the following to meet ventilation and combustion air requirements:

1. Install two fresh air openings, one at a low level, 24" (610 mm) from the floor, and one at a higher level on the equipment room wall. This will provide a flow of air to exhaust the hot air from the equipment room.
2. Ensure the equipment room air supply openings are kept clear at all times.

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TABLE 2 - SPECIFICATIONS (REFER TO FIGURE 1)

Model VMP-W	40	50	60	80	100	130	150
Boiler Connections							
Safety Valve Outlet IN MM	 1.5 38.1	 1.5 38.1	 1.5 38.1	 2 50.8	 2 50.8	 2 50.8	 2 50.8
Safety Valve Inlet IN MM	 1.25 31.8	 1.25 31.8	 1.25 31.8	 1.5 38.1	 1.5 38.1	 1.5 38.1	 1.5 38.1
Natural Gas Connection IN MM	 1.5 38	 1.5 38	 2 51	 2 51	 2 51	 2.5 63	 2.5 63
Water Supply & Return Connections* IN MM	 4 102	 4 102	 4 102	 4 102	 4 102	 4 102	 4 102
Ratings (sea level to 3000 ft/914 m) Output 1000 BTU/HR 1000 KCAL/HR	 1356 342	 1693 427	 2033 512	 2710 683	 3387 853	 4405 1110	 5081 1280
Water Content GAL Liters	 210 795	 290 1098	 315 1192	 440 1665	 602 2278	 920 3482	 920 3482
Model VMP-W STANDARD MOTOR							
Light Oil Connection IN MM	 .25 6	 .25 6	 .25 6	 .25 6	 .25 6	 .375 9.5	 .375 9.5
Burner Motor HP Watts	 1.5 1119	 1.5 1119	 1.5 1119	 3 2237	 3 2237	 10 7460	 10 7460
Approximate Weights							
Shipping Weight LB KG	 5775 2620	 6575 2980	 7370 3340	 8000 3636	 9500 4318	 12,350 5601	 12,500 5675
Operating Weight LB KG	 7526 3414	 8994 4080	 9997 4535	 11670 5294	 14520 6587	 20023 9083	 20172 9150
Approximate Fuel Consumption at Rated Capacity+							
Natural Gas FT^3 M^3	 1595 45	 1992 56	 2392 68	 3188 90	 3985 113	 5182 147	 5978 169
LP Gas FT^3 M^3	 638 18	 797 23	 957 27	 1275 36	 1594 45	 2080 59	 2381 68
Light Oil GPH LPH	 11 41.6	 14 53	 17 64.3	 23 87	 28 106	 37 140	 42 159
Min. Gas Pressure Required; In. W.C.	7	7	7	9	9	40	40
Max Gas Pressure Required (Standard Gas Train) In. W.C.	13	13	13	27	27	10 psig	10 psig
Electric Power Requirements/Amps for Burner Motor							
208V 50/60 CY 3 Phase (Gas/Oil)	6.6/7.5	6.6/7.5	6.6/7.5	10.6	10.6	30.8	30.8
230V 50/60 CY 3 Phase (Gas/Oil)	6.0/6.8	6.0/6.8	6.0/6.8	9.6	9.6	28	28
460V 50/60 CY 3 Phase (Gas/Oil)	3.0/3.4	3.0/3.4	3.0/3.4	4.8	4.8	14	14

CONTINUED ON NEXT PAGE

* 150 pound flanged.

Model VMP-W Low Emissions (LE) MOTOR							
Model VMP-WModel	**40**	**50**	**60**	**80**	**100**	**130**	**150**
Model VMP-W	40	50	60	80	100	130	150
Burner Motor **							
HP	5	5	5	5	5	Consult	Consult
Watts	3730	3730	3730	3730	3730	Factory	Factory
Approximate Weights							
Shipping Weight							
LB	6575	7373	8170	8800	10300	12800	12800
KG	2982	3345	3706	3992	4672	5806	5806
Operating Weight							
LB	8659	9684	10671	12051	14700	20585	20585
KG	3928	4393	4840	5466	6668	9337	9337
Approximate Fuel Consumption at Rated Capacity+							
Natural Gas							
FT^3	1595	1992	2392	3188	3985	5182	5978
M^3	45	56	68	90	113	147	169
Required Gas Pressure (IN. W.C./PSIG)							
Minimum/Maximum	30/10	30/10	40/10	40/10	40/10	60/10	60/10
208V, 60 CY, 3 Phase	16.7	16.7	16.7	16.7	24.2	Consult Factory	
230V 60 CY 3 Phase	15.2	15.2	15.2	15.2	22	Consult Factory	
460V 60 CY 3 Phase	7.6	7.6	7.6	7.6	11	Consult Factory	

Specifications and dimensions are approximate. We reserve the right to change data without prior notification.
Design conditions based on 160 F return and 180 F supply.
+ Consumption based on natural gas 1000 Btu/ft3.
** Sub 20 ppm; for lower requirements, consult factory.

3. See Table 3 for minimum make up air openings required for each model.

TABLE 3- MINIMUM MAKE UP AIR OPENING REQUIREMENTS

Model	Fresh Air Opening FT2 (M2)
40	1 (.09)
50	1 (.09)
60	1.5 (.14)
80	4 (.37)
100	4 (.37)
130	5 (.46)
150	7.5 (.69)

4. If positive forced ventilation is adopted, ensure that there will be no appreciable pressure variation in the equipment room.

5. Avoid ventilation which creates a negative pressure in the building as it will seriously affect combustion and proper operation of the burner. Please note that exhaust fans or similar equipment can create a down draft in the chimney or starve the burner's air supply. Either case may result in poor combustion or nuisance failures. A properly designed make-up air system in the equipment room will preclude these possibilities and is required to maintain proper combustion.

6. Eliminate potential for high risk situations for particulate matter to be in the combustion air supply (e.g., as a result of construction and maintenance activities).

Utilities

■ The Gas Supply

Adhere to the following for gas supply installation:

1. Install gas piping in accordance with all applicable codes.

2. Ensure pipe and fittings used are new and free of dirt or other deposits.

3. Ensure piping is of the proper size for adequate gas supply to the gas head assembly. Consult your gas company for specific recommendations.

4. When making gas piping joints, use a sealing compound resistant to the action of liquefied petroleum gases. Do not use Teflon tape on gas line heads.

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5. Ensure no piping stresses are transmitted to the equipment. The equipment shall not be used as a pipe anchor.
6. Ensure all vent connections on diaphragms, gas valves, pressure regulators, and pressure switches (gas-fired units) are vented per local code.
7. On gas-fired units with NFPA 85 valve trains, ensure the vent valve is piped to atmosphere per local code.
8. During any pressure testing of the system at pressures in excess of 1/2 psig (14 inch W.C.), isolate the boiler with the manual shutoff valve (located at the end of the supplied gas train) from the gas supply piping system.
9. Ensure the supply pressure is regulated by a non-stacking, tight, shut-off regulator.
10. Arrange gas piping so that it does not interfere with any cover or burner, inhibit service or maintenance, or prevent access between unit and walls or another unit.
11. After gas piping is completed and before wiring installation is started, carefully check all piping connections, (factory and field), for gas leaks. Use an appropriate leak test solution.

■ The Oil Supply

Adhere to the following for installation:

1. Fuel pipes must be of approved materials and of a diameter suitable for the quantity of oil being delivered to the burner. Vacuum must not exceed 10 in. (254 mm) of mercury at the pump inlet. Maximum inlet pressure to oil pump is 3 PSIG.
2. Make fuel connection in accordance with the details on the enclosed fuel pump cut sheet.
3. Ensure fuel oil piping is in accordance with local/national requirements.
4. Meet the maximum pressure allowed at the fuel oil pump inlet per the National Fire Protection Association (NFPA).
5. Oil pumps are of a two-line design system, requiring a return line and a supply line. The oil pump is factory set per Test Fire Sheet. Do not alter the setting without consulting the factory.
6. A stop valve, a check valve, and an oil filter must be installed on the oil supply line.
7. Ensure there are no loose fittings. Loose fittings in the fuel oil line will permit air to enter the fuel line and cause improper firing.

⚠ WARNING

A qualified installer, service agency or the gas supplier must perform installation and service on the fuel delivery system.

Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

What to do if you smell gas:
Do not try to light the appliance.
Do not touch any electrical switch.
Do not use any phone in the building.
Leave building and contact gas supplier from neighbor's phone. If you cannot reach gas supplier, phone the fire department.

When making gas piping joints, maintain proper ventilation to reduce breathing hazards.

An exhaust fan may draw products of combustion into the work environment creating a possible hazard to personnel.

△ CAUTION

It is essential that only fresh air be allowed to enter the combustion air system. Foreign substances, such as combustible volatiles and lint in the combustion system can create hazardous conditions. If foreign substances can enter the air stream, the combustion air inlet must be piped to an outside location. Failure to do so will void the warranty.

To avoid failures due to poor combustion, ensure make-up air system is properly designed.

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⚠ CAUTION

Loose fittings in the fuel oil line will permit air to enter the fuel line and cause improper firing.

Electrical Supply

Adhere to the following for electrical supply installation:

1. Locate electrical schematic diagram, a copy of which is inside of the panel box.
2. Ensure the information on the electrical drawing corresponds to your voltage and frequency. Check the supply voltage and make sure that there is no over- or under-voltage exceeding 10% of the nominal value.
3. Install a separate fuse switch for the contactor and a separate fuse switch for the circulating pump. If pump motor is 3/4 HP or larger, install an across-the-line starting switch ahead of the circulating pump motor.
4. Install wiring and ground in equipment in accordance with authority having jurisdiction or in absence of such requirements the National Electrical Code, ANSI/NFPA.
5. Provide a fused disconnect sized for the unit. Size fuses according to motor name plates and local electrical codes.
6. Connect power to the terminal strip as supplied on the inside of the panel box.

Water Supply

■ Install Water Piping

All water supplies contain some solids, dissolved gases or dissolved minerals. These may cause corrosion, deposition and/or fouling of equipment. To prevent these contaminants from impacting boiler performance, valve operation and general pipe longevity, each location must be analyzed and treated accordingly.

Adhere to the following for water piping installation:

1. Isolation valves and unions are recommended on both water connections for ease of service.
2. Install piping so that the boiler is not supporting any additional piping.
3. Install manual purging valves in all loops and zones. Install a pressure-reducing (automatic fill) valve in the cold water fill line to the boiler system. Check that the proposed operation of zone valves, zone circulator(s) and diverting valves will not isolate air separator(s) and/ or expansion tank(s) from the boiler. Clearance from hot water pipes to combustibles must be at least 6 inches (152 mm).
4. Pipe the water supply line to the lower opening on the back of the boiler. Water stop valve should be in line between the boiler and the first piece of equipment. Hot water outlet should be piped to process/equipment requiring hot water. Water makeup supply should be installed. Hot water inlet should be piped to the make-up water supply.

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5. Pipe the water safety valve carry piping from the outlet of the valve to a safe blow-off point.

➨ *NOTE: Do not alter water temperature/pressure gauge assembly in any way.*

6. Drain valve is connected to the lowest opening at bottom rear of boiler. Carry piping from the outlet of the valve to safe drain point. Provision should be made for easy access to drain valve of boiler.

➨ *NOTE: The water connection on the top of the boiler is the outlet connection. The water connection on the rear of the boiler is the inlet connection.*

7. Install filtration to remove particulates if appropriate.
8. Install bypass chemical feeder for corrosion inhibitor maintenance if appropriate.
9. Install corrosion coupon holder to assess corrosion inhibitor performance if appropriate.

➨ *NOTE: The boiler is provided with a drain valve connection and a drain valve.*

10. Heating system:
    - » *An automatic pressure activated water make up valve with back flow preventer.* It must be set to maintain required Net Positive Suction Head (NPSH) for re-circulating pumps, a positive system pressure at the highest point of at least 5-10 PSIG, and make up water valve should be designed to add water to the system at the outlet of the boiler and should not be fed directly into the boiler.
    - » *Air removal equipment, including an air separator and automatic breather valves, along with a functioning expansion tank* . Each must be designed to system specifications.
11. When used in conjunction with a refrigeration system, install the boiler so that the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler. If the boilers are connected to heating coils (located in air handling units where they may be exposed to refrigerated air circulation) such boiler piping systems must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

Water Chemistry Requirements

System water chemistry requirements are as follows:

- pH: Range of 8.5 - 10.5
- Oxygen: Less than 250 ppb (operating condition)
- Total Iron/Copper: Less than 5 ppm

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⚠ CAUTION

A large amount of improperly treated make-up water can cause premature failure of the heat exchanger resulting from scale build up. Scale build up will reduce the efficiency and useful life of the boiler and is not covered under warranty.

- Corrosion Inhibitor: Capable of maintaining iron corrosion rates <2 mpy. Due to changing environmental restrictions a non-heavy metal ALL ORGANIC inhibitor is recommended which is designed for multi metal systems including ferrous metals and yellow metals such as copper and brass.
- Chloride: Less than 250 ppm

Adhere to the following:

1. Refer to your water conditioning or chemical treatment supplier for analysis and recommendations for proper system conditions.
2. Follow a program with appropriate monitoring and maintenance of system water conditions as provided by your water conditioning or chemical treatment supplier.
3. Operate the boiler in a closed-loop system using water or water/glycol (not requiring a make-up water supply). A large amount of improperly treated make-up water can cause premature failure of the heat exchanger resulting from scale build up. Scale build up will reduce the efficiency and useful life of the boiler and is not covered under warranty.

■ Prevent Oxygen Contamination

There are several ways to prevent boiler water oxygen contamination:

- Minimize system leaks to minimize make up water requirement
- Do not use open tanks or fittings
- Do not use oxygen permeable materials anywhere in the water system
- Repair leaks in the system quickly
- Eliminate fittings wherever possible
- Use air elimination devices in system piping

■ Eliminate System Air

➨ *NOTE: There are no built-in boiler air eliminating features.*

Adhere to the following for air elimination:

1. The installation of an air separator and air eliminator (air vent) is required.
2. To prevent scale corrosion in boiler and associated piping, make up water must be kept to a minimum. This is best achieved by ensuring immediate repair of all leaks and that system pressure is maintained.
3. If a sealed diaphragm-type expansion tank is used, install an air eliminator in the hot water piping at the air separator.
4. If an air cushion type expansion tank is used, pipe tank directly into

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boiler supply.

5. On multi-zoned systems (or a system with both space and domestic water heating), air elimination must be provided either in the common piping or on every loop.

6. When the boiler is installed at a higher level than baseboard radiation (if used), air elimination must be provided directly above the unit.

Piping Specifications

For piping, the basic considerations are: the design temperature, the pressure retained by the pipe, the fluid in the pipe, the load resulting from thermal expansion or contraction, impact or shock loads imparted such as water hammer, external loads, wind loads and vibration from equipment.

Adhere to the following for piping installation:

1. Ensure the arrangement of the piping and its appurtenances takes into consideration the location of other structures and equipment adjacent to the piping, which may result in freezing interference and/or damage as a result of expansion, contraction, vibration, or other movements.

2. Consider the appropriate location and orientation of valves necessary for safe operation and isolation of the piping. Valves are used in piping systems to stop and start the flow of fluids, to regulate flow, to prevent the back flow, and to relieve excessive pressure build up in the piping.

3. Ensure all piping and piping components are suitable for the design temperatures, pressure and fluid used in the system.

4. Ensure all pipework is constructed from seamless mild steel pipe, Schedule 40 or Schedule 80 as required by code and/or application; or copper if system parameters allow.

5. During construction of the installation, ensure that no dirt, water, or residue from welding is left in the system.

6. Provide expansion joints or properly designed and sited loops to accommodate thermal expansion. Thermal expansion should be calculated using the maximum possible utilization fluid temperature, regardless of whether the pipe considered is in the feed or return circuit. Steel pipe will expand approximately 1 " per 100' over a 100° F temperature rise (1 mm per meter over 100 C rise).

7. Provide supports and anchors for all pipes where necessary to prevent undue stresses from being placed on items of equipment, including pumps, valves, and the boiler. Supports and anchors which will not interfere with thermal expansion should be chosen.

8. Cut screw threads carefully and accurately. If possible, new tools should be used. It is recommended that GR5 or higher tensile steel bolts be used for all flanged joints.

9. Use gaskets to make all flanged connections. Gasketing material must be

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The vent line connection on the gas pressure regulator must be piped to outdoor air by the installer in accordance with National Fuel Gas Code, ANSI Z223-1-1991 or latest addenda. In Canada, gas installations must be in accordance with the current CAN/CGA B149.1 and 2 and/or local codes.

⚠ CAUTION

Some soap used for leak testing is corrosive to certain types of metals. Use an appropriate leak test solution. Clean all piping thoroughly after completing the leak check.

⚠ WARNING

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Hot pipework and vessels must be adequately insulated with material suited to the temperature and application to prevent both heat loss and personnel injury.

suitable for use with the pressure, temperatures and fluids in the system. Ensure that all bolts are tightened evenly and to the torque recommended values provided by the gasket manufacturer.

10. Install high point bleeds at all high points in the system piping. 1/2" x 12" nipples welded in the top of the piping with ball valves and plugs attached are to be used.

11. Install all pipes with a pitch to facilitate draining and venting.

Insulation

After the appropriate system tests have been satisfactorily completed (see **Testing** section of this manual), all hot pipework and vessels must be adequately insulated with material suited to the temperature and application to prevent both heat loss and personnel injury. For inspection and maintenance purposes, leave pumps, flanges, valves and fittings uninsulated but suitably shielded for safety. Removable insulation may also be used over these components.

System Interfaces

Proper selection and installation of the components in the system will ensure proper and safe operation of the boiler. Consult Fulton representative or contact Fulton at (315) 298-5121.

■ Fill Connection

The system is usually filled from the lowest point, with the aid of a pump. On skid-mounted units, a fill connection is provided in the inlet piping to the pump.

Pressure Gauges

The range in which readings are expected to fall should comprise mid-scale on the pressure gauge chosen. Pressure gauges must be able to withstand overpressure equal to the rating of the safety relief valves, normally 100 psig.

➨ *NOTE: The Water temperature pressure gauge should not be altered in any way.*

Assembly of Multi-Skid Systems

Adhere to the following for multi-skid engineered systems:

1. Refer to the Fulton mechanical/electrical drawings during assembly.

2. Ensure that equipment orientation allows for operation interface and maintenance.

3. Align the skids as shown on the drawings ensuring that skid fasteners (skid joint angles) are matched. The skid joint angles are a matched set and the edges of the fasteners should be exactly aligned.

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➨ *NOTE: Do not bolt the skids to the housekeeping pad/floor until all of the piping has been reassembled and tightened.*

4. Ensure the skids are level and flat before fastening the skids together with the supplied bolts. The skids should be leveled front to back, side to side and corner to corner. Failure to properly level the skids will result in piping misalignment. A level or laser level should be used to verify skid alignment (when a standard level is used, the length should be appropriate for the skid). If assembling multi-component support stands, attach sections using the supplied bolts through the tank frame mounting plates. These should be hand tight until all of the piping is assembled. Note: skids are leveled at the factory using a laser level.
5. Connect the piping between the skids by matching the union connections and/or flange stamps and tightening. Refer to the mechanical drawing as necessary to confirm location of spool pieces etc. as the flange stamps are shown on the drawing in hexagonal callouts. The flange stamps should matched and aligned (the flange stamps should be directly across from one another. Rotating a flange will result in piping misalignment). Bolts should be hand tight until all of the piping is assembled. Refer to the appropriate instructions to tighten the flanges to the required torque specifications. Support pipe runs as required.
6. Ensure that a low point drain is installed in the piping.
7. Connect the conduit runs between the skids and tighten conduit connectors.
8. Locate the supplied wiring for the equipment and pull wiring through the appropriate conduit runs. Electrical wires are labeled for easy landing. Connect all wiring per the Fulton supplied electrical drawings.
9. If a header is supplied, mount the header as shown in the mechanical drawing.

➨ *NOTE: For piping supplied in sections, make up and connect hand tight until all sections are in place to ensure sections align properly. Sections are match marked for reassembly.*

10. Tighten all connections.
11. Pneumatically test the piping (at 15 psig maximum) prior to filling the systems.
12. Check bolts and connections for tightness after the first heat up cycle. Retorquing may be required.

Stack and Flue

An appropriately sized stack should be connected to the flue gas outlet at the boiler. The proper flue size and draft control is most important for proper burner operation. See Table 4.

Stack and chimney must be constructed from material that is rated for 1000 F

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Assure all electrical connections are powered down prior to attempting replacement or service of electrical components or connections of the equipment.

Cements for plastic pipe should be kept away from all sources of ignition. Proper ventilation should be maintained to reduce the hazard and to minimize breathing of cement vapors.

No shutoff of any kind may be placed between the safety relief valve and the equipment, or in the discharge pipe between such valve and the atmosphere. Doing so may cause accidental explosion from overpressure.

Discharge from safety relief valve must be configured so that there is no danger of scalding personnel or causing equipment damage. Provisions must be made to properly drain safety relief valve discharge piping.

For reasons of safety, the hot exhaust gas duct and chimney must be insulated or shielded within the locality of the heater in compliance with local codes and regulations.

△ CAUTION

The stack arrangement and draft conditions should be in accordance with the information in this manual for proper performance of the equipment.

⚠ WARNING

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Non-Fulton product information is for reference purposes only. No Fulton document may substitute for full review of documentation available from the component manufacturer.

△ CAUTION

Boilers damaged due to adverse water conditions are not covered by warranty.

The weight of all piping must be properly supported. Failure to support piping may result in equipment damage and/or system leakage.

Piping must take into consideration potential for freezing interference and/or damage as a result of expansion, contraction, vibration, or other movements.

Dirt, water, and/or other debris in the piping system after welding may result in equipment failure.

To maintain a reasonable temperature in the equipment area and ensure safety to personnel, the section of the chimney duct within the building should be insulated.

operating temperature. Check all local codes for requirements.

The flue must be as large or larger than the outlet on the vessel. Avoid flue piping and elbows by placing the equipment as close as possible to the chimney.

TABLE 4 - MINIMUM FLUE SIZES

Model	Minimum Flue Size inches (mm)
40	12 (305)
50	12 (305)
60	12 (305)
80	14 (356)
100	14 (356)
130	14 (356)
150	16 (406)

Adhere to the following for stack and flue installation (see Figure 2):

1. Ensure the stack rises continuously to the connection at the chimney and contains no more than two bends at 45 degree angles or less. If required, as a result of space limitations, one 90 degree elbow (or tee) can be fitted at the back of the vessel.
2. Ensure 2 feet (0.6 m) of straight, horizontal flue before any change in direction, fitting or draft regulator. This is to prevent potential pilot or main flame failures due to back pressure build up during ignition. Any alternative stack arrangement must supply negative 0.02 to 0.04"wc.
3. Ensure the run in the total distance of stack ducting, as measured in a straight line from the outlet of the boiler to the outlet of the stack, does not exceed 25% of the rise. With the exception of the duct run previously described, horizontal sections of ducting must be avoided and should not exceed 4 feet (1.2 m) total. See Figure 2.
4. Ensure the stack, chimney, and any components associated with the stack, such as heat reclaimers or assist fans, are constructed from material that is rated for a 1000 F (538 C) operating temperature.
5. Ensure the stack and chimney material complies with all applicable codes.
6. Make adequate provisions for the support of the weight of the chimney and stack to avoid having a load imparted to the outlet connection of the equipment.
7. Ensure the draft, when firing, is negative and constant. A reading of -0.02 to -0.04"wc (-0.508 to -1.016 mm) when the unit and stack are cold usually indicates sufficient draft. When the unit is running and the stack is hot, the draft should read -0.04 to -0.08 "wc (-1.016 to -1.524 mm) negative.
8. The installation of a draft regulator by the client/contractor is recommended at all installations. This will help to maintain the required draft. The placement of the draft regulator should be as shown in Figure 3. Insulate the section of the chimney duct within the building.

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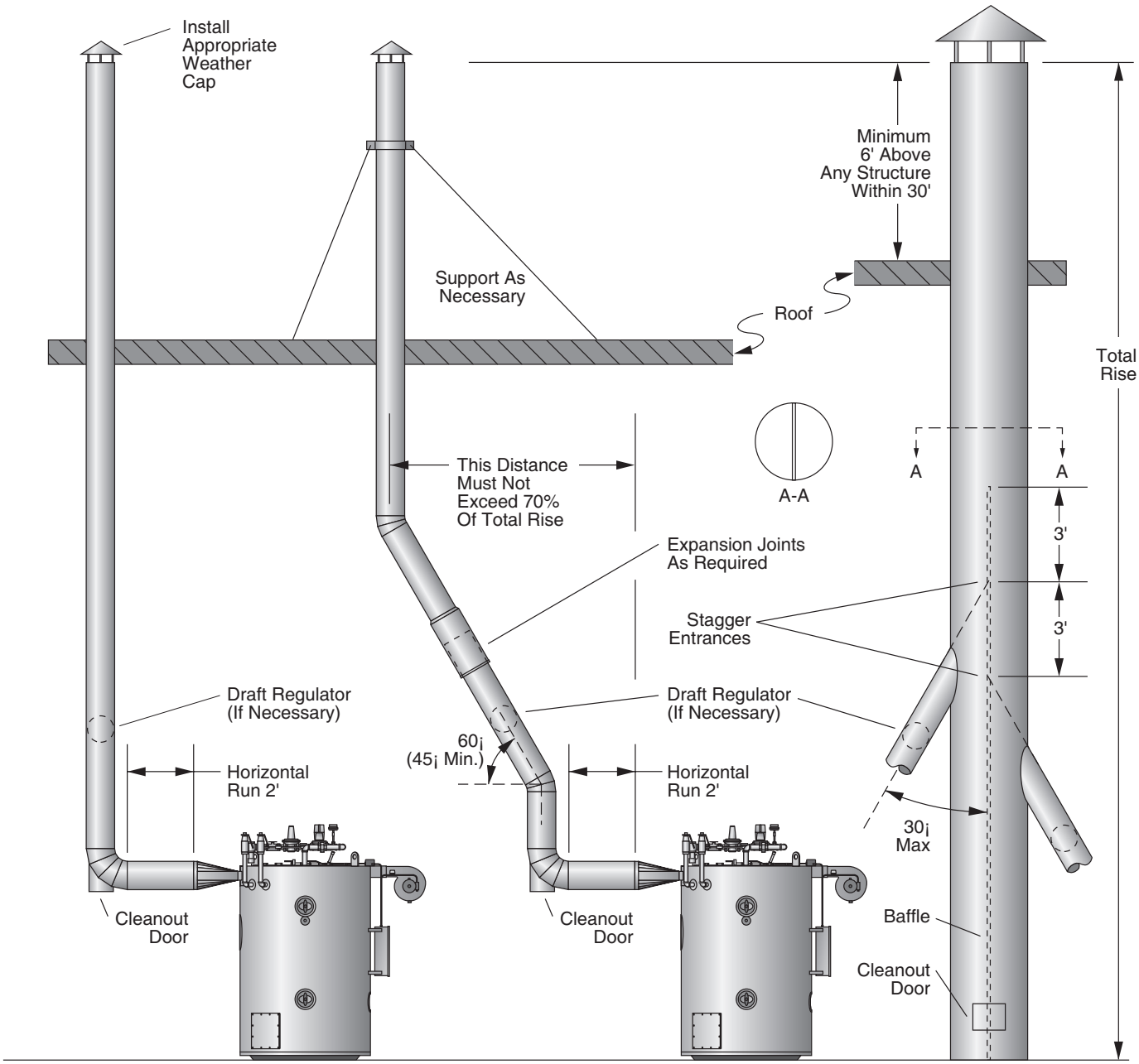

FIGURE 2 - TYPICAL STACK ARRANGEMENT

9. Concentration levels of only a few ppm of chlorine containing compounds in combustion air can produce serious corrosion of the flue over long periods of time. High chlorine containing compounds such as carbon tetrachloride or perchloroethylene would be prime suspects.

■ Exhaust Side Wall Venting

Boilers for which sidewall venting (Figure 4) may be utilized are propane, natural gas, or combination propane and natural gas sizes 10 to 30 HP.

Adhere to the following for installations requiring sidewall venting:

1. Flue vent piping must be pitched upward at ¼ in (6.35 mm) per one foot (3.048 m) of length.
2. An UL-approved draft fan must be installed to provide sufficient draft (-0.02 to -0.04" wc) to safely vent products of combustion.

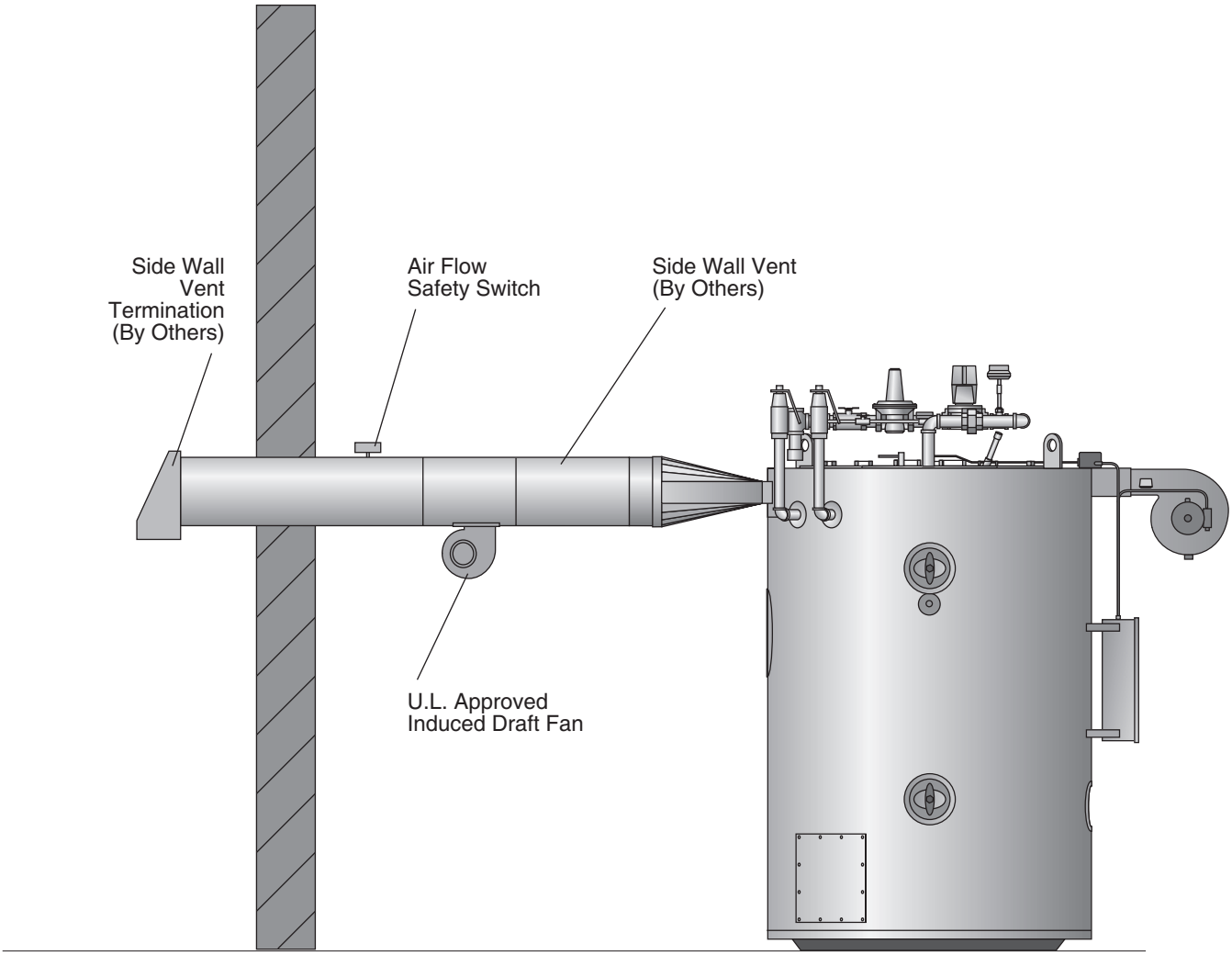

FIGURE 3 - TYPICAL SIDEWALL VENTING

3. The draft fan should be located as close to the flue outlet as possible.
4. Draft regulation sufficient to lower the draft to between -0.02 to -0.04 " wc may be required. The draft regulator must be between the boiler and the fan.
5. The draft fan shall have an air flow proving switch wired in series with the boiler air safety switch.
6. The sidewall vent total length from boiler exhaust to termination shall not exceed 35 feet (10.6 m) with 4 elbows maximum.

Testing

Upon completion of the installation, perform the following testing:

1. A pneumatic test of water piping not exceeding 15 psig.
2. Leak tests at all welds and joints to ensure that the system is free from leaks.

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⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/ professional codes and regulations.

Do not operate, or allow others to operate, service or repair this equipment unless you (they) fully understand all applicable sections of this manual and are qualified to operate/maintain the equipment.

Defective or improperly installed equipment is hazardous. Do not operate equipment which is defective or improperly installed.

Defective equipment can injure you or others. Do not operate equipment which is defective or has missing parts. Make sure all repairs or maintenance procedures are completed before using the equipment. Do not attempt repairs or any other maintenance work you do not understand.

△ CAUTION

Installation in accordance with the guidelines within the manual should be fully completed before performing the initial start-up; and start-up must be complete prior to putting the unit into service. Starting a unit without the proper piping, venting or electrical systems can be dangerous and may void the product warranty.

"Factory Trained Personnel" refers to someone who has attended a Fulton Service School specifically for the equipment covered in this manual.

Start-Up Preparation & Installation Review

Review the installation section of this manual carefully. Confirm accordance with the Installation guidelines, including:

1. You have read and followed all safety information.
2. The equipment area is in conformance with established boiler room requirements. Review national and local codes.
3. There are no obstructions left in the fluid circuit from pressure leak testing such as blanking plates in flanged joints.
4. Boiler is located with the proper clearances as shown in **Installation** section of this manual.
5. Relief valves have been properly piped to floor drains.
6. Flue gas from the boiler is properly vented.
7. Combustion air openings are not obstructed in any way and have adequate capacity.
8. There are no flammable liquids, materials or hazardous fumes present in the environment.
9. Nothing was damaged or knocked loose during shipment and installation. Inspect the main gas train and trim assembly to be sure they were not damaged during shipment or installation.
10. Local authorities where approval for start-up is required have been notified. In some localities, final inspection of services may be required.
11. Installation checklist is complete.

▸ FILL AND AIR REMOVAL PROCEDURE

1. Close combination shutoff/purge valve in supply, all drain cocks, the shutoff valve for the pressure reducing (fill) valve, and all manual air vents.
2. Open all other system shutoff valves and one of the zone valves, the vent on the combination shutoff / purge valve and the shutoff valve to the pressure-reducing (fill) valve.
3. Water will now begin to fill the system. Air will escape through the vent on the combination shutoff/ purge valve. Continue filling until a constant stream of water (no bubbling) is discharged from the vent.
4. Close the zone valve on the purged loop, and open the zone valve on the next loop to be purged. When all air has escaped and only water is discharged, close the zone valve. When all zones have been purged (one at a time), close the vent on the combination shutoff/purge valve.
5. At this point, the system has been initially filled. However, air pockets may still remain at high points in the system and in heating loops above the level of the combination shut/off purge valve. It is quite possible,

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depending on the particular system that all piping above the combination shutoff/purge valve still contains air. If manual vents are installed on the system high points, these should be opened to vent these locations. When only water is discharged from all vents, the initial purging is complete.

6. Open the combination shutoff/ purge valve (keep the vent closed). With the gas shutoff valve closed, turn on power to the boiler and operate the circulator. Circulate the system water for approximately 30 minutes to move all air to the automatic air separation point.

7. Again, open manual air vents at high points of heating loop until a constant stream of water is discharged from the vent. Close the vent and make sure it's watertight. Repeat procedure for all high points and for every zone.

8. Check temperature/pressure indicator reading, which should equal the pressure-reducing (fill) valve set pressure. No more water should be entering the system. Close the shutoff valve on the cold-water fill line.

9. Visually inspect all pipe joints and equipment connections for leaks. If necessary, drain system, repair leaks and refill/purge the system. If no pressure drop is detected for a period of two hours under pressure, the system may be considered watertight.

10. When purging is completed, make sure the following are open—combination shut-off/purge valve, shutoff valve to pressure reducing (fill valve), shutoff valve in cold water fill line, and shutoff valve in return line.

11. Make sure the following are closed - all drain cocks, the vent on the combination shutoff-purge valve, & all manual vents. Reset zone valves to normal mode of operation and turn off power to boiler.

12. Open fuel shutoff valve, allowing fuel to flow to the boiler.

Start-Up Service

If start-up service has been included in the order, the factory should be contacted after the installation has been successfully completed and approved by the client's representative or engineers. Where possible, contact the factory at least three weeks before a Fulton service engineer is required on site.

Consider the following in preparation for your on-site visit:

1. All procedures covered in manual sections **Start-Up Preparation** and **Fill the System**, including installation review, air testing of piping, pump alignment (where applicable), and filling the system must be completed before the service person's arrival.

2. Depending on the size of the system and the amount of service time contracted, start-up service includes firing the boiler, checking, verifying and adjusting all safety settings.

3. Careful preparation can expedite the commissioning of your boiler. Most delays can be avoided by following the instructions in this manual. Failure to complete required procedures properly can result in the need for further

⚠ WARNING

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△ CAUTION

Do not use this equipment if any part has been under water (or subjected to heavy rains/water if the equipment does not have NEMA 4 wiring, controls and instrumentation). Immediately call a qualified service technician to inspect the equipment and to replace any part of the control system and/or gas control(s) which have been under water.

Please read these instructions and post in an appropriate place near the equipment. Maintain in good legible condition.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

When opening any drains on the equipment or piping system, steps should be taken to avoid scalding/ burning of personnel due to hot fluids. Whenever possible, the system should be cooled prior to opening any drains.

Use only your hand to turn valve handles. Never use tools. If the handle will not turn by hand, don't try to repair. Forced or attempted repair may result in fire or explosion.

WHAT TO DO IF YOU SMELL GAS : Do not use matches, candles, flame or other sources of ignition to check for gas leaks. Do not try to light the appliance. Do not touch any electrical switch; do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

service time, at extra cost to the customer.

4. Service people will not commence start-up if there are obvious system deficiencies. However, start-up service in no way constitutes a system design check or approval of the installation.

5. In addition to commissioning the boiler, the service person will also familiarize heater room personnel with the operation of all Fulton equipment. Personnel must be qualified to understand the basic operation and function of controls.

Initial Start-Up

Adhere to the following:

1. Turn on the main power fuse switch.

2. Activate the boiler power ON switch, located on the side of the panel box.

➨ *NOTE: The Low Water Control will also be activated when the boiler is powered on. With the unit full of water, the Low Water Relay requires manual reset.*

3. If for any reason the water leaves the unit the Low Water Control will automatically turn the burner off, and if audible alarm is installed, alarm will activate.

■ Combustion

It is critical for all personnel to be familiar with start up, controls, and shutdown procedures.

▶ STARTING THE BURNER - GAS

1. Verify incoming gas pressure.

2. Open the manual gas cocks on the pilot and main lines on the gas head.

3. Switch on the main power to the burner. If the water level relay is equipped with a manual reset. If the boiler was in a low water condition, the manual reset button must be pressed.

4. Check motor rotation.

5. Start the burner by turning on the switch on the outside of the panel box. The blower motor will begin to deliver air into the furnace.

6. When sufficient air pressure has built up in the blower housing, the air switch located on the top side of the blower housing will make contact and after a seven-second delay, will allow the ignition transformer and pilot valve to operate. This creates pilot fire.

7. When the pilot flame is established, the flame rod or UV scanner senses the electrical current (microamps). The signal is transmitted to the protectorelay, which opens the main gas valve for full fire.

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➨ *NOTE: For new installations/burner has been disassembled, the burner may not fire upon first attempt because air must be cleared from gas lines. The burner protectorelay may go into lockout mode; allow a period of one minute to elapse, then repeat procedure for starting the burner.*

▶ STARTING THE BURNER - OIL

1. Open the oil line's shut-off valves.
2. Verify oil is present at the oil pump.
3. Switch on main power to burner. If the boiler was in a low water condition, the manual reset button must be pressed.
4. Start the burner by turning on the switch on the outside of the panel box. The blower motor will begin to deliver air into the furnace.
5. As the blower starts, the magnetic oil valve is energized, allowing the oil pump to deliver fuel for ignition.
6. If the protectorelay does not sense flame via the CAD cell or UV scanner located on the top of the burner in approximately 15 seconds, it will shut down the burner.

Flame Programmers

Refer to inserts provided.

Operating Controls

■ Water Relief Valve

The Water Relief Valve releases extra pressure.

■ Water Outlet Valve

The Water Outlet Valve serves as the isolation valve for the system.

■ Temperature Control

The Temperature Control is a digital indicating control used to turn the boiler on and off, and to control the firing rate when the boiler is modulated. The digital display will show both the boiler process temperature and the boiler setpoint.

■ Operating Temperature Aquastat

The Operating Temperature Aquastat controls the working temperature of the boiler. This is an ASME CSD-1 code control which will turn the boiler off when the water temperature exceeds its setpoint. It is an auto-reset control.

⚠ WARNING

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Do not attempt to start the equipment for any testing prior to filling and purging the vessel. A dry fire will seriously damage the equipment and may result in property damage or personnel injury and is not covered by warranty. In case of a dry firing event, shut off the fuel supply and allow the vessel to cool to room temperature before fluid is reintroduced to the pressure vessel.

⚠ CAUTION

A qualified installer, service agency or the gas supplier must perform installation and service on the fuel delivery system.

Before commissioning the equipment, verify with authorized personnel that the gas lines have been purged.

Never attempt to operate equipment that has failed to pass all the safety checks.

After checking controls by manual adjustment, make sure they are always reset to their proper settings. Contact your Fulton dealer before modifying the equipment.

⚠ WARNING

This boiler is equipped with an ignition device which automatically lights the burner. Do not try to light burner by hand.

Operating this equipment beyond its design limits can damage the equipment and can be dangerous. Do not operate the equipment outside of its limits. Do not try to upgrade the equipment performance through unapproved modifications. Unapproved modifications may cause injury, equipment damage, and will void the warranty.

Check daily that the equipment area is free and clear of any combustible materials, including flammable vapors and liquids.

Do not tamper with safety features provided by the operating controls.

Should overheating occur or the gas supply fails to shut off, manually shut off the gas supply external to the equipment .

△ CAUTION

Operation of the circulating pump for any amount of time without first bleeding will result in equipment damage.

For all systems containing boilers or unfired steam generators, the water chemistry in the boiler (generator) must be kept within required limits. Failure to do so may cause premature pressure vessel failure and poor steam quality and will void the warranty.

If any "Manual Reset" limit device trips DO NOT reset without determining and correcting the cause. (Manual Reset Limits may include: flame safeguard, high or low gas pressure, high temperature limit, low water).

Never tamper with low water (liquid level) cutoff sensors or circuitry.

■ High Limit Aquastat/High Temperature Limit

The High Limit Aquastat/High Temperature Limit prevents over-temperature conditions. This is an ASME CSD-1 code control which includes a manual reset feature for over-temperature. Press the manual reset button when the temperature drops to reset the control.

■ Air Safety Switch

This switch is controlled by the pressure of air entering the burner. This switch proves that the blower fan is delivering combustion air.

■ Probe Type Low Water Cut-Off

The Low Water Cut-Off shuts down the unit when the water level is too low, after a three-second time delay to prevent nuisance shut downs. Fulton boilers are equipped with ASME CSD-1 Code controls which include a manual reset feature on the burner low water cut off relay. Press the low water reset button to reset the control, and the boiler will start.

Optional Circulating Pump Switch

The fused switch that controls the circulating pump should be kept in the ON position at all times during boiler operation and non-operating mode of the boiler. It should be placed in the OFF position when repairs or adjustments must be made.

Cycle Testing

The boiler should be cycled tested and automatically allowed to go through its normal starting sequence several times to verify that all components are functioning properly. This will also verify that combustion is set properly so that boiler light off has a smooth transition from ignition to main flame.

A minimum of 10 cycles should be met without any flame failures, with combustion readings comparable to the factory test fire sheet and no interlocks causing the boiler to shutdown.

Before Leaving the Installation

1. Check all controls to insure they are operating properly. Cycle the boiler several times by raising and lowering operating temperature on the thermostat.
2. Make sure the installation complies with all applicable codes.
3. Turn switch to OFF position.

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⚠ WARNING

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Follow all proper lockout/tagout procedures for service.

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

Before beginning any maintenance, ensure area is free of any combustible materials and other dangers.

What to do if you smell gas:
Do not try to light the appliance.
Do not touch any electrical switch.
Do not use any phone in the building.
Leave building and contact gas supplier from neighbor's phone. If you cannot reach gas supplier, phone the fire department.

⚠ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Thermal Representative.

Daily Maintenance Schedule

Daily maintenance and inspection must include the following:

1. Observe operating temperature and general conditions.
2. Make sure that the flow of combustion and ventilating air to the boiler is not obstructed.
3. Ensure boiler area is free and clear of any combustible materials, including flammable vapors and liquids.

Weekly Maintenance Schedule

Weekly maintenance and inspection must include the following:

1. Check inlet gas pressure at the beginning of the gas train.
2. Observe the conditions of the main flame. A normal high fire flame shows an orange screen with a blue halo. In Low fire, the burner should display a reddish-orange glow.
3. Correct air adjustment is essential for the efficient operation of this boiler. If an adjustment to the combustion is necessary, the flue gas composition should be checked with a carbon dioxide (CO2) or oxygen (O2) analyzer to set conditions. Refer to **Procedure for Primary Air Adjustment/ Inspection and Procedure for Secondary Air Adjustment/Inspection** sections of this manual.

Monthly Maintenance Schedule

The following steps should be carried out monthly:

1. Make sure main power switch is off before starting work.
2. Test low gas pressure switch and high gas pressure switch, if applicable.
3. Clean water pump strainers (not standard).
4. Check scanner and ignition electrodes.
5. Check starter contacts. Burned or pitted contacts should be replaced. Do not use sand paper or file to clean.
6. View flame detection strength via the boiler control.
7. Test high-limit temperature control by reducing setting below the operating temperature. Burner should shut off. Return high limit to previous setting. Then press the manual reset.
8. Test operating temperature control by reducing temperature setting as necessary to check burner operation.

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Recommended Semi-Annual Maintenance Schedule

The following steps should be carried out semi-annually:

1. Clean the gas burner assembly:
    - » Disconnect the gas head from the burner by disconnecting the union. Withdraw the burner assembly and clean the ignition electrode.
    - » Check that the settings of the gap, if applicable, and ignition electrode are accurate.
    - » Reassemble the burner assembly and check the scanner setting.
    - » Check the combustion efficiency of the burner and adjust if necessary.
2. Check electrical controls and motors for correct operation.
3. Check water pump for correct operation.
4. Shut off the boiler completely and drain.
5. Replace hand hole gaskets as follows:
    - » Remove the hand hole assembly using a 1-1/4" tee handle wrench or 1-1/4" 1/2" drive socket wrench. See Figure 4. Remove the old gasket and thoroughly clean the surface on the boiler and the plate.

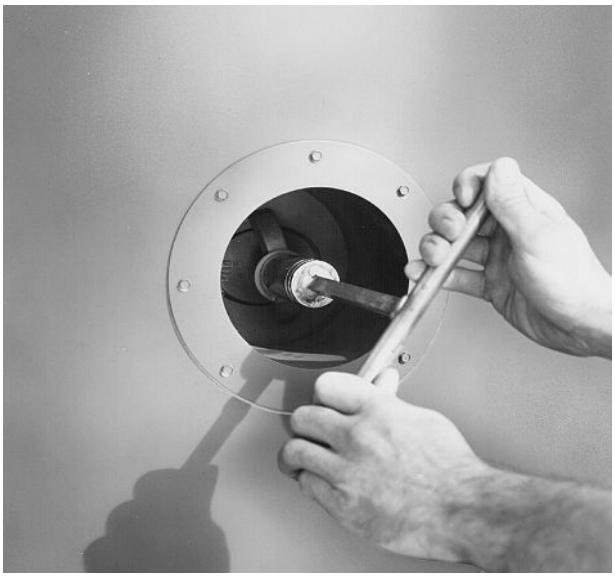

FIGURE 4 - REMOVE ASSEMBLY WITH TEE HANDLE WRENCH

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Never use open flame or other sources of ignition to check for gas leaks.

△ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Thermal Representative.

In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

Use caution when using any cleaning solutions. Refer to local regulations for proper cleaning solution disposal.

If the gasket leaks while pressure is being built up, tighten only enough to stop leakage. Never tighten more than necessary to prevent leakage. Excessive tightening may shorten the life of the gasket.

⚠ CAUTION

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In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

6. Fit the hand hole assembly as follows:
   - » Place the gasket on the hand hole plate and ensure that it is seating correctly. Do not use any grease, lubricant, or adhesive.
   - » Position the plate in the boiler. Set the yoke and tighten the securing nut sufficiently enough to provide a snug fit. Verify the position of the plate in the boiler, then make it hand tight and then snug with wrench about 1/4 turn. Do not compress excessively. See Figures 5 and 6.
   - » Refill the boiler with fresh water.

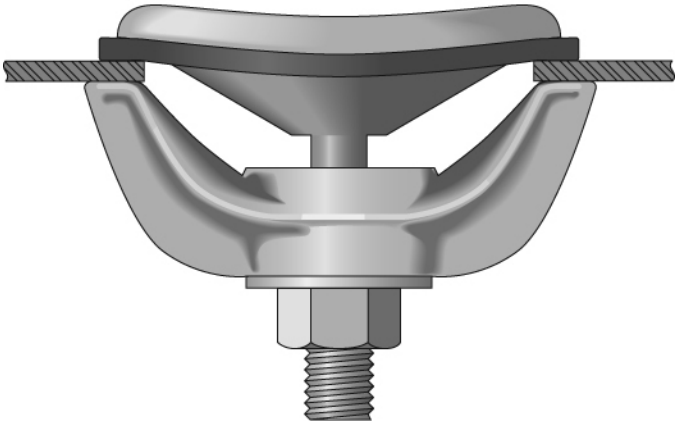

FIGURE 5 - CORRECT PRESSURE ON GASKET

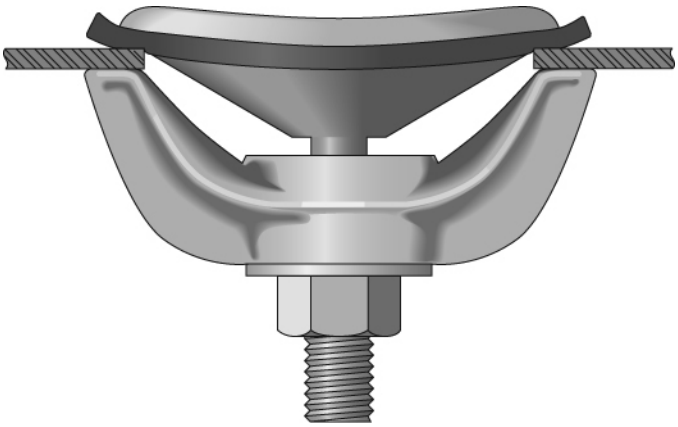

FIGURE 6 - OVER-COMPRESSED GASKET

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Recommended Annual Maintenance Schedule

The following steps should be carried out annually:

1. Have combustion (CO2, O2, CO) and input checked by appropriate personnel. See **Procedure for Primary Air Adjustment/Inspection and Procedure for Secondary Air Adjustment/Inspection** sections of this manual.
2. Clean flues as follows:
    - » Remove the burner and flue cover plate.
    - » Wire brush flue passages. See Figure 7.
    - » Remove clean-out plugs at lowest part of unit (See Figure 8) and clean the bottom of combustion chamber.
    - » Remove all soot from the top, and from the clean out plugs at the bottom, with a vacuum cleaner.
    - » Replace clean out plugs carefully so as not to damage insulation.

➨ *NOTE: Dirty flues can cause air flow restrictions resulting in poor combustion and loss of efficiency.*

FIGURE 7 - WIRE BRUSHING THE FLUE PASSAGES

FIGURE 8 - REMOVING CLEAN OUT PLUGS

△ CAUTION

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All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Thermal Representative.

In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

If flame and/or gas is permitted to exist in the blast tube area, backfiring and destruction of electrodes may result. Ensure primary air adjustment is adequate to avoid this condition.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Follow proper lockout / tag out procedures for the electrical, gas and water connections. Use caution when lifting heavy parts.

⚠ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Thermal Representative..

After a new Fulton Boiler has been in operation for several months, pieces of burned metal will be found in the space at the bottom of the boiler. These pieces of metal are the remains of a light gauge metal form which was used during manufacture for forming the boiler insulation. This is a normal condition and does not affect the efficiency or the life of the boiler in any way.

Procedure for Primary Air Adjustment/Inspection

The primary air adjustment control is located at the top righthand side of the burner assembly. This damper-type air controller is used to introduce air to the fuel supply of the burner. The purpose of the primary air adjustment is to proportionally divide the air to the center or outer fire chamber.

It is important to the combustion process to maintain proper air mixtures between the outer service and the center of the blast tube area. Fire should be on the outside wall and not the blast tube area. Damper positions are as follows:

- Open: Most of the air is forced down the blast tube, and less air is going down the outside wall of the deflector face and fire chamber.
- Closed: Less air is forced down the blast tube, and most of the air is going down the outside wall of the deflector face and fire chamber.

➨ *NOTE: If it is necessary to close the damper due to a rumbling fire, close it slowly and no more than 1/4th of the distance of the swing of the damper assembly.*

Perform inspections as follows:

1. Visually inspect down the blast tube. If heat, flames, or fumes are backing up through the burner plate area, the damper must be opened up.
2. Visually confirm, via the sight glass, that fire is completely covering the walls. If the fire is tunneling down or is not on the outside wall, efficiency will drop. If required, use a micro-amp meter to verify fire signal as damper is moved. Adjust as necessary.

Procedure for Secondary Air Adjustment/Inspection

The secondary air adjustment, or main air control, is located at the fan housing face. This control is used to supply the burner with excess air needed for good combustion.

It is important to ensure that the lowest level of excess oxygen is present, while still maintaining a high level of carbon dioxide and no carbon monoxide. It is best to measure the flue gas burn with the stack in excess of 420 F (216 C).

Perform inspections as follows:

1. Use an O2 or CO2 test kit to determine the percent of excess air in the combustion mixture. Adjust main air control as needed to reach optimal efficiencies. Generally a boiler stack area is used to measure the percent of oxygen and carbon dioxide in the fuel.

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2. Adhere to the following:

Gas-Fired Unit	It is a good policy to have 3.5-4.0% excess oxygen, which will provide 10.5-9.5% excess carbon dioxide.
Oil-Fired Unit	It is a good policy to have 4.0% excess oxygen, which will provide 11.0% excess carbon dioxide. Verify that carbon monoxide level is zero. To do this, use a Bacharach sniffer and CO tubes to prove a clean burn.

Note: Actual values may change when boiler is installed and connected to appropriate stack. Refer to factory test fire sheet for original factory settings.

3. To increase the oxygen in the burner, open air adjustment to right. To reduce the secondary air, move air adjustment to the left.

➨ *NOTE: Too much oxygen will blow the pilot out. Too little oxygen will make the boiler burn dirty.*

Procedure for Flame Scanner Adjustment

Flame scanner adjustments are made with the detectors installed and the burner running. It is essential to obtain optimum flame signal detection for safe and continual operation of the control relay.

■ Gas Unit

Perform adjustment as follows:

1. Close gas cocks on gas train assembly. This will prevent gas from going into the burner.
2. Turn boiler on while microampmeter is in place.
3. During the ignition trial period, determine if the microampmeter exceeds #1. If yes, it is likely picking up ignition interference and realignment is necessary. It may be necessary to place a reduced scanner orifice plug into the scanner eye area.
4. Repeat steps 1 - 3 until a reading of #1 or less is achieved on the microampmeter.
5. Reopen gas cocks and adjust the scanner signal response to maximum possible signal.

■ Oil Unit

Perform adjustment as follows:

1. Turn power to panel OFF.
2. Disconnect the hot wire to the oil valves. This will prevent the oil valves from opening.

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⚠ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Thermal Representative.

Ensure that the blower/gas train assembly is fully supported during removal/cleaning or burner, as the transition elbow will be removed.

⚠ WARNING

Extreme caution must be exercised when checking a failing transformer. They are capable of producing very high voltages which may result in personal injury and death.

3. With microampmeter in place, turn power to the panel ON.
4. During the ignition trial period, determine if the microampmeter exceeds #1. If yes, it is likely picking up ignition interference and realignment is necessary. It may be necessary to place a reduced scanner orifice plug into the scanner eye area.
5. Repeat steps 1 - 3 until a reading of #1 or less is achieved on the microampmeter.
6. Turn power OFF. Hook the wire up again, and turn power ON. Start boiler to ensure the safety light is off.

Procedure for Removing/Cleaning the Burner

Perform the following steps:

1. Remove all bolts that connect the transition elbow to the burner plate, and to the scroll tube.
2. Pull burner out of unit by flange.
3. Inspect burner and wipe off (do not scrub or use wire brush) any soot or foreign material that may have accumulated. If available, use compressed air to clear the burner. Wipe out the inside of the burner with a clean cloth.
4. Reverse removal steps for reinstallation of the burner assembly.
5. Test fire the boiler and use a combustion analyzer to ensure that the fuel/air ratio is set correctly throughout the range. Refer to the Fulton factory test fire sheet for combustion settings.

Procedure for Soot Cleaning

Perform the following:

1. Determine if flues are dirty by checking stack temperature with a stack thermometer. If temperatures are in excess of 600 F (315 C) while the boiler is operating, the flues are likely dirty/restricted in some other manner.

➨ *NOTE: Usually soot cleaning is performed annually, unless the burner setting has been altered and excessive soot has been produced as a result.*

2. Remove burner and flue cover plates.
3. Using a wire brush, carefully remove soot from flue passages.
4. Clean out plug at lowest part of unit and clean passages between ribs and bottom of combustion chamber.
5. Remove all soot with a vacuum cleaner. This may be carried out from the top and via the inspection doors at the bottom.
6. Replace clean-out plug carefully so as not to damage insulation.

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7. Replace burner and flue cover plates.

After All Repairs or Maintenance

1. Follow "Pre-Start Check List" and all Safety Checks.
2. Fire the boiler and perform combustion safety checks.
3. Analyze combustion throughout the range and verify proper operation of safety devices.

Boiler Lay-Up Procedure

The following information includes suggested protocol and guidelines for boiler and ancillary equipment lay-up. When working on this equipment, it is critical to follow all product warning and caution information available in the product installation and operation manual. All content herein is subject to change without prior notice. A water treatment professional must be consulted for procedures/requirements, and actual site conditions must be factored. Guidelines below are for the vessel only. For additional information regarding the steam boilers, control panels and accessories, please contact Fulton.

■ Waterside Protection

The best corrosion-control program of operating boilers and ancillary equipment can be completely offset by neglect during outages, as metal surfaces are often attacked and damaged by oxygen during shut-downs. Protection can be achieved by:

1. Excluding all air from the boiler and ancillary equipment (wet lay-up).
2. Keeping the surfaces completely dry (dry lay-up).

The choice between wet and dry lay-up depends on the length of time a boiler and ancillary equipment will be out of service. Wet lay-up is recommended for short outages (30 days or less); dry lay-up is recommended for longer periods. The wet method has the advantage of permitting the boiler to be returned to service on short notice. Dry lay-up is practical only if the unit can be drained while hot.

Boilers and ancillary equipment should be drained and inspected prior to any lay-up. When time does not allow for inspection, the boiler and ancillary equipment may be stored wet without draining if the chemical treatment is injected into the boiler before it comes offline.

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■ Dry Lay-Up

1. Secure fire equipment and close all steam stop and water feed valves.
2. Drain the boiler and ancillary equipment completely and dry all waterside surfaces by opening all handholes and manholes while the unit is still warm enough to vaporize all moisture (180 degrees F – 200 degrees F).
3. Inspect for scale and sediment deposits on waterside surfaces. Consider that a 0.1" scale deposit may increase fuel consumption as much as 16%. Cleaning should be done before final lay-up preparation.
4. Thoroughly dry internal surfaces with hot air. Fans and other air driven blowers can be used by directing them into the bottom handholes or manhole opening.
5. All areas that are not completely dry should be blown with dry compressed air. No steam or feedwater can be allowed to enter the boiler and ancillary equipment. Moisture on the waterside will cause oxygen corrosion to begin in a very short period of time and will ultimately cause serious corrosion problems.
6. Leave boiler and ancillary equipment open to atmosphere if boiler room is dry and well ventilated.
7. In damp boiler rooms or for periods exceeding the normal summer shut-down, one of three following commercial grade desiccants should be spread on water-tight wood or corrosion resistant trays.
    - Quick lime -- used at a rate of six pounds per 100 cu. ft. of boiler volume.
    - Silica gel -- used at a rate of eight pounds per 100 cu. ft. of boiler volume.
    - Activated alumina -- used at a rate of eight pounds per 100 cu. ft. of boiler volume.
8. Trays are to be placed on the top tubes of the boiler. All manholes, handholes, vents, and connections are to be blanked and tightly closed to seal the boiler and ancillary equipment.
9. Inspect every two months for evidence of active corrosion. Check the desiccant and regenerate or replace when necessary. Reseal and restore the boiler and ancillary equipment to proper conditions.

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■ Wet Lay Up

1. Drain boiler and ancillary equipment and thoroughly inspect for sediment and scale, and clean as in points 2 through 6 above.
2. Fill boiler and ancillary equipment completely using feedwater preheated to a minimum of 208 degrees F taking care to vent all air from boiler.
3. While filling, feed in treatment chemicals recommended by a reputable water treatment firm. Levels of approximately 300-500 parts per million (ppm) phenolphthalein (P) alkalinity and 100-150 ppm sulfite residual should be reached and maintained.
4. Fire boiler and ancillary equipment to ensure good mixing and vent boiler to purge the unit of air. All feed and blow down valves should be leak free to prevent loss of treated water or addition of untreated water. It is important to seal off and keep the unit air-tight since any air entering the boiler will promote corrosion.
5. Test the boiler water bi-monthly during the outage to ensure proper control levels are being maintained.
6. If a piece of equipment is not able to be isolated and airtight, a dry layup of that equipment may be necessary.

■ Fireside

Fireside lay-up procedures are designed to keep metal surfaces dry. Moisture, oxygen, and combustion residuals produce corrosion by forming acids that attack steel. Precautions taken during lay-up inhibit metal degradation and prolong boiler life.

Corrosion is a threat to a cold boiler regardless of fuel type. The common factor in all fuels is the level of impurities. While the boiler is still firing, the impurities may be thermally decomposed as they pass through the flame zone. The elements of the impurities combine into an assortment of different compounds. As the compounds stabilize, they may form either solid deposits on the tube surfaces or acidic liquids that corrode the metal.

Lay-up is a critical period for boiler maintenance and repair. It is important to clean fireside surfaces to maximize the amount of heat transfer. Consider that a 3/32" scale deposit on the fireside may increase fuel consumption by as much as 10.7%.

The deposits themselves may initiate 3) types of problems. First, as deposits form they may produce corrosion at the interface of the metal and deposit surface. Second, the deposit may trap fly-ash which adds to the bulk of the deposit surface. Third, fly-ash constituents such as iron, vanadium, and sodium may act with sulfur compounds to form highly corrosive, low ph deposits.

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■ Fireside Protection

1. When boiler is cool, thoroughly clean tubes and other fireside heating surfaces and scrape down to the bare metal. A metal surface below 300 degrees F with 10 ppm S03 present will be cool enough to cause condensation of sulfuric acid, opening the door to corrosion. Iron or vanadium will catalyze this reaction and intensify the corrosion.
2. Clean smoke box and other areas where soot may accumulate.
3. Swab or spray fireside with a neutral mineral oil for protection of surfaces.
4. If boiler room is damp, place trays of calcium chloride or unslaked lime in combustion chamber and replace when it becomes damp.

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Troubleshooting

Please refer to Troubleshooting tables that follow.

Troubleshooting Gas Fired Boilers

Problem	Potential Cause	Potential Remedy
Burner Cut-Off/ Ignition Failure/ Flame Failure	Power Supply	Check fuse or circuit; reset or replace, as necessary.
	Gas Supply	▪ Check to be sure main gas cock is not closed. Check coil in gas valve with OHM meter. Replace if faulty. Check gas regulator setting and readjust as necessary. Check inlet gas pressure and increase or decrease as necessary. ▪ Check for gas pressure and for intermittent supply problems. Gas pressure for natural gas should be 4 in to 11 in wc at the head of the train.*
	Ignition Electrodes	Check electrodes for carbon buildup and clean if necessary. Check for proper adjustment. Readjust if necessary. Check for cracks in porcelain; if found replace.
	Bad Air Switch	Check for bad air switch by jumpering the two air switch leads at the terminal block. If the boiler starts and runs with these terminals jumpered, the air switch should be replaced.
	Dirty or defective UV Scanner	Check for debris on flame scanner and clean or replace as needed. Ensure scanner is properly located.
	Transformer	Check voltage between transformer leads at terminal block to be sure transformer is being powered.
	Flame Safeguard Control	Check voltage between ignition terminal and neutral. Check must be made before control locks out on safety. If no power, replace control.
	Contact open on air safety switch	Adjust to proper setting
	Loose Wire Connection	Check connections to all components.
	Scanner wiring reversed at panel box	Change to correct terminals.
	Protectorelay	Check voltage between pilot terminal and ignition terminal. Check must be made before control locks out on safety. If zero voltage, clean relay contacts and recheck for power. If no power, replace control.

** For natural gas fired boilers. Refer to the test fire sheet for all other fuels.*

Troubleshooting Gas Fired Boilers		
Problem	**Potential Cause**	**Potential Remedy**
Poor Combustion	Refractories	Check refractories to see if they are cracked or broken in pieces. Replace as necessary.
	Not Enough Air/Build-Up on Fan Wheel (*Rich; Burner Hums*)	Check CO2/O2 levels. If rich, disassemble filter housing and gas train. Look inside inlet to the fan. If there is build-up on the fan blades, clean fan. Recheck the CO2/O2 and adjust gas valve as necessary for all combustion points.
	Fuel Valve Adjusted Too High (*Rich; Burner Hums*)	Check CO2/O2 levels. Check gas pressure at outlet of valve. If the pressure is too high, make an adjustment at the valve. Be sure to check all combustion points.
	Too Much Air *(Lean; Unstable Flame)*	Check fan discharge pressure. If too high, adjust damper. Check CO2/O2 levels and adjust gas valve as necessary. Be sure to check all combustion points.
	Gas Valve Adjusted Too Low *(Lean; Unstable Flame)*	Check CO2 and O2 levels. Check pressure at outlet of the valve. If too negative, adjust gas valve as necessary.
	Draft	Check draft with a gauge. Draft should be a -.02 in to -.04 in wc with burner off or -.04 in to -.06 in when operating. May need to install a barometric damper.
	Dirty Flue	Check flue for carbon buildup or blockage. Clean flue passages with brush.
	Negative Room Pressure	Make sure no exhaust fans are running in the boiler room.
Burner back fires	Refractories	Check refractories to see if they are cracked or broken in pieces. Replace as necessary.
	Ignition Electrodes	Check electrodes for carbon buildup and clean if necessary. Check for proper adjustment. Readjust if necessary. Check for cracks in porcelain; if found replace.
	UV Scanner	Check for debris on flame scanner and clean as needed. Check for proper location of detector.
	Draft	Check draft with a gauge. Draft should be a -.02 in to -.04 in wc with burner off or -.04 in to -.06 in when operating. May need to install a barometric damper.
	Negative Room Pressure	Make sure no exhaust fans are running in the boiler room.

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Troubleshooting Gas Fired Boilers		
Problem	**Potential Cause**	**Potential Remedy**
Boiler will not maintain temperature	Gas Supply	Check gas pressure coming into gas train. If low, maintain pressure contact gas company. Should be 7 in to 11 in wc /natural gas. Check coil in gas valve with AMP meter. Replace if bad. Check gas regulator setting and readjust as necessary.
	Dirty Flue	Check flue for carbon buildup or blockage. Clean flue passages with brush.
	Aquastat	If power is on, check across aquastats to verify power through the switch. If bad, replace.
	Scale Built up in boiler	Refer to Recommended Daily Maintenance section of this manual.
	Refractories	Check refractories to see if they are cracked or broken in pieces. Replace as necessary.
	Boiler Size	Boiler may be undersized.

Troubleshooting Oil Fired Boilers		
Problem	**Cause**	**Remedy**
Burner Cut Off/ Ignition Failure/ Flame Failure	Power Supply	Check fuse or circuit breaker and replace as necessary.
	Transformer	Check voltage between transformer leads at terminal block to be sure the terminal is being powered.
	Cad Cell	Check for ignition interference. To verify cad cell is working, place a lit candle in front of photo cell at the proper time.
	Protectorelay	Check voltage between pilot terminal and ignition terminal. Check must be made before control locks out for safety. If zero voltage, clean the relay contacts and recheck terminals for power. If no power, replace control.
	Oil Supply	Check oil level in supply tank to be sure it is not below intake line. Fill tank with oil. Check for clogged nozzle. Clean or replace.
	Ignition Electrodes	Check electrodes for carbon buildup and clean as necessary. Check for proper adjustment; readjust if necessary. Check for cracks in porcelain; replace if cracked.
	Primary air adjustment	Check air adjustment. Air may be blowing fire away from flame sensor.
	Oil Valve	Check voltage between oil valve leads at terminal block to be sure oil valve is getting power.
	Oil Pump	Check for clogged strainer or filter. Remove and clean. Check for slipping or broken coupling. Tighten or replace. Check for frozen pump shaft. Replace.
	Aquastat	If power is on, check across aquastats to verify power through the switch. If bad, replace.
	Loss of oil prime	Check all lines for possible air leak in intake line and tighten. Check for possible restricted intake line. Replace.
	Oil Nozzle	Check for clogged nozzle; clean or replace

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Troubleshooting Oil Fired Boilers

Problem	Cause	Remedy
Poor Combustion	Refractories	Check refractories to see if they are sooted, cracked or broken in places. Clean or replace as needed.
	S.S. Ring	Check to be sure ring is present and fits tight against the furnace wall.
	Oil Nozzle	Check for clogged nozzle; clean or replace.
	Primary air adjustment	Check air adjustment. Air may be blowing fire away from flame sensor.
	Secondary Air Adjustment	Check main air adjustment to see if it is loose. Adjust as needed and tighten plate in position. Check CO2 and O2 levels.
	Oil Pump	Check for clogged strainer or filter. Remove and clean. Check for slipping or broken coupling. Tighten or replace. Check for frozen pump shaft. Replace.
	Draft	Check draft with a gauge. Draft should be -0.02 to -0.04 inches of water column with burner off, or -0.04 to -0.06 when operating. May need to install barometric damper.
	Dirty Flue	Check flue for carbon buildup or blockage by using a stack thermometer placed within one foot of the stack leaving the boiler area. If stack temperature is in excess of 600 F while the boiler is operating, the flues are dirty. Clean as necessary.
Burner Back Fires	Refractories	Check refractories to see if they are sooted or broken in places. Clean or replace as needed.
	Ignition Electrodes	Check electrodes for carbon buildup and clean as necessary. Check for proper adjustment; readjust if necessary. Check for cracks in porcelain; replace if cracked.
	Primary Air Adjustment	Check air adjustment. Air may be blowing fire away from flame sensor.
	Oil Valve	Check for leaky oil valve and replace.
	Draft	Check draft with a gauge. Draft should be -0.02 to -0.04 inches of water column with burner off, or -0.04 to -0.06 when operating. May need to install barometric damper.
	Loss of Prime	Check all lines for possible air leak in intake line and tighten. Check for possible restricted intake line. Replace.

Troubleshooting Oil Fired Boilers		
Problem	**Cause**	**Remedy**
Boiler will not maintain pressure	Oil Supply	Check oil level in supply tank to be sure it is not below intake line. Fill tank with oil. Check for clogged nozzle. Clean or replace.
	Oil Nozzle	Check for clogged nozzle; clean or replace.
	Oil Valve	Check voltage between oil valve leads at terminal block to be sure oil valve is getting power.
	Oil Pump	Check for clogged strainer or filter. Remove and clean. Check for slipping or broken coupling. Tighten or replace. Check for frozen pump shaft. Replace.
	Aquastat	If power is on, check across aquastats to verify power through switch. If bad, replace.

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Standard Warranty for Fulton Boilers

Warranty Valid for Models ICS/FB-A, ICW, ICX/FB-F, VMP, VMPW, FB-S, FB-L, FB-W, ICT

Five (5) Year (60 Months) Material and Workmanship Warranty

The pressure vessel is covered against defective material or workmanship for a period of five (5) years from the date of shipment from the factory. Fulton will repair or replace F.O.B. factory any part of the equipment, as defined above, provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by Fulton. The commissioning agency must also successfully complete and return the equipment Installation and Operation Checklists to Fulton's Quality Assurance department. This warranty covers any failure caused by defective material or workmanship; however, waterside corrosion or scaling is not covered. Therefore, it is imperative that the boiler water management and chemistry be maintained as outlined in the Installation and Operation Manual.

Parts Warranty

Fulton will repair or replace F.O.B. factory any part of the equipment of our manufacture that is found to be defective in workmanship or material within one (1) year of shipment from the factory provided this equipment has been installed, operated and maintained by the buyer in accordance with approved practices and recommendations made by both Fulton and the component manufacturers and the commissioning agency has successfully completed and returned the equipment Installation and Operation Checklists to Fulton's Quality Assurance department.

General

Fulton shall be notified in writing as soon as any defect becomes apparent. This warranty does not include freight, handling or labor charges of any kind. These warranties are contingent upon the proper sizing, installation, operation and maintenance of the boiler and peripheral components and equipment. Warranties valid only if installed, operated, and maintained as outlined in the Fulton Installation and Operation Manual. No Sales Manager or other representative of Fulton other than the Quality Manager or an officer of the company has warranty authority. Fulton will not pay any charges unless they were pre-approved, in writing, by the Fulton Quality Manager. This warranty is exclusive and in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Fulton shall in no event be liable for any consequential or incidental damages arising in any way, including but not limited to any loss of profits or business, even if the Fulton Companies has been advised of the possibility of such damages. Fulton's liability shall never exceed the amount paid for the original equipment found to be defective. To activate the warranty for this product, the appropriate commissioning sheets must be completed and returned to the Fulton Quality Assurance department for review and approval.

Fulton®

Effective 09.01.2010

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Limited Warranty for VMP-W Boilers Effective 12/30/2022

Provided the boiler is installed, commissioned, controlled, operated, and maintained in accordance with Fulton's Installation, Operation and Maintenance Manual, and the Fulton Authorized Representative or Fulton Factory Technician has successfully completed and returned the equipment Installation and Operation Checklists to the Fulton Quality department, Fulton provides the following limited warranty:

PRESSURE VESSEL WARRANTY

The pressure vessel is warrantied for five (5) years from the date of shipment from the factory against failures determined by Fulton to be the result of defective materials or workmanship. If so determined, Fulton will repair, replace, exchange or credit, at Fulton's sole discretion, the pressure vessel, F.C.A. factory. Waterside corrosion or scaling is not covered. Failures outside of the ASME pressure vessel boundary are not covered under this section.

PARTS WARRANTY

Fulton will repair or replace F.C.A. factory any part of the equipment of our manufacture that is found to be defective in workmanship or material within eighteen (18) months of shipment from the factory or one (1) year from startup provided this equipment has been installed, operated, and maintained by the buyer in accordance with requirements in the manuals of Fulton and the component's manufacturer.

CONDITIONS OF WARRANTY

The warranty is valid for the original installation and original owner only. Any modifications, adjustments, repairs, or replacement parts to the equipment not authorized by Fulton will void this warranty.

Fulton shall be notified in writing as soon as any defect or failure becomes apparent. These can be emailed to warranty@fulton.com. Failure to do so may limit Fulton's obligations under this warranty or render the warranty invalid in whole or in part. No agent or representative of Fulton has authority to modify or alter the conditions of warranty. A formal Purchase Order is required prior to shipment of any replacement warranty item. This warranty does not include freight, handling, or labor charges.

To the extent not prohibited by law in the state, province, jurisdiction or country of purchase, this warranty and the remedies set forth are exclusive and in lieu of all other warranties, remedies, and conditions, whether oral, written, statutory, express, or implied, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. In no event or under any circumstances shall Fulton be liable for any consequential, incidental, special, punitive, or other indirect damages arising in any way including, but not limited to, loss of profits or business, even if Fulton has been advised of the possibility of such damages. Under no circumstances shall Fulton's liability exceed the amount paid to Fulton for the original equipment.

THIS LIMITED WARRANTY IS GOVERNED BY AND CONSTRUED UNDER THE LAWS OF THE STATE, COUNTRY, JURISDICTION, OR PROVINCE IN WHICH THE PRODUCT WAS ORIGINALLY SOLD BY FULTON. THE LIMITED WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT, OR MODIFY BUT ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT. OUTSIDE THE UNITED STATES AND CANADA AND TO THE EXTENT SUCH WARRANTIES, TERMS AND CONDITIONS CANNOT BE DISCLAIMED AND ARE PERMITTED BY APPLICABLE LAW, FULTON LIMITS THE DURATION AND REMEDIES OF SUCH WARRANTIES AND CONDITIONS TO EIGHTEEN (18) MONTHS OF SHIPMENT FROM THE FACTORY OR ONE (1) YEAR FROM STARTUP, WHICHEVER COMES FIRST. THIS LIMITED WARRANTY GIVES THE PURCHASER SPECIFIC LEGAL RIGHTS, AND THE PURCHASER MAY HAVE OTHER LEGAL RIGHTS, WHICH MAY VARY BY STATE, COUNTRY, JURISDICTION, OR PROVINCE.

⚠ WARNING

Use of non-factory authorized replacement parts is not recommended for this equipment. Use of non-factory authorized parts may jeopardize safety and system performance, and voids the product warranty.

Parts

Spare and replacement parts may be ordered from your local representative or through the Fulton Companies. When ordering replacement parts, please have the model number and serial number of your Fulton boiler ready. Factory-direct replacement parts must be used to ensure proper equipment operation and adherance with warranty requirements. Contact Fulton Companies at (315) 298-5121 for further information.

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The Fulton Companies
972 Centerville Road, Pulaski, NY 13142
Call: (315) 298-5121 • Fax: (315) 298-6390

www.fulton.com

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