WEIL-McLAIN®

94

Steam Boiler - Series 4

For use with Gas, Light Oil, and Gas with Light Oil Fired Burners

Boiler Manual

UL LISTED

⚠WARNING

Installation and service of the boiler must be performed by a qualified installer or service technician. Read all instructions, including this manual and all other information shipped with the boiler, before installation or operation. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.

Manual Part Number 550-100-157/0523

Contents

Tools

Table 1 Common tools needed

Tools Needed	Purpose
1/16" flat blade screwdriver	Wiring onto terminal blocks.
Phillips head screwdriver	Jacket posts and channels
5/16" wrench or socket	Sight glass and baffle assembly
11 mm wrench or socket	Cover plate bolts
3/4" wrench or socket	Burner mounting plate
15/16" wrench or socket	Castings to castings tie rod nuts
1-1/16" wrench or socket	Limit control
9/16" wrench	Pressure and temperature gauge
Flat head screwdriver	Sight glass
Pipe wrench	Water piping and plugs
Multimeter	Measurement readings on sensors and electrical components
Manometer (inclined or digital)	Measuring the gas pressure coming to the boiler
Combustion analyzer (digital preferred)	Combustion testing
Contact thermometer	Checking surface temperatures of the heat exchanger and pipes

Abbreviations

Table 2 Common abbreviations

Abbreviation	Description
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWG	American Wire Gauge
BTUH	British Thermal Unit per Hour
CFM	Cubic Feet Per Minute
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CP	Consumer Protection
DHW	Domestic Hot Water
HX	Heat Exchanger
LWCO	Low Water Cut-Off
MAWP	Maximum Allowable Working Pressure
MBH	Thousands of Btuh
NFPA	National Fire and Protection Agency
NIOSH	National Institute for Occupational Safety and Health
W.C.	Water Column

Section 1
Safety

This section is intended to provide safety information for installers and users.

Section Contents

Safety Signals

The following defined terms are used throughout this manual to bring attention to the presence of hazards or other important information.

⚠DANGER

Danger indicates the presence of hazards that will result in severe personal injury, death, or substantial property damage.

⚠WARNING

Warning indicates the presence of hazards that can result in severe personal injury, death, or substantial property damage.

⚠CAUTION

Caution indicates the presence of hazards that will or can result in minor personal injury or property damage.

NOTICE

Notice indicates additional information that may be related to property damage, but is not related to personal injury.

IMPORTANT

Important indicates additional information that is important, but is not related to personal injury or property damage.

Please Read Before Proceeding

⚠WARNING

Adhere to all following guidelines and instructions in this section. Failure to adhere to these guidelines can result in severe personal injury, death, or substantial property damage.

Installer: Read all instructions, including this manual and all other information shipped with the boiler, before installation. Perform steps in the order given. Consider piping and installation when determining boiler location.

Write the Consumer Protection (CP) number and serial number in the space provided on the Installation and Service Certificate on page 71. The CP number can be found on the boiler jacket.

Please include the boiler model number, CP number, and serial number when calling or writing about the boiler. The model number can be found on the boiler rating label.

User: This manual is for use only by a qualified heating installer or service technician. A qualified service technician should inspect and service this boiler at least once per year.

IMPORTANT

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Servicing a Boiler

- To avoid electric shock, disconnect all electrical supplies to the boiler before performing maintenance.
- To avoid a potential explosion, shut off the fuel supply to the boiler while servicing.
- To avoid severe burns, allow boiler to cool before performing maintenance.
- This boiler contains ceramic fiber and fiberglass materials. Refer to the warning and instructions on page 53.

1

Please Read Before Proceeding, continued

Boiler Operation

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur, or gas supply fail to shut off, do not turn off or disconnect electrical supply to pump. Shut off the gas supply at a location external to the appliance.

Boiler Water

- Since the heat exchanger is made of cast iron, the water chemistry must be checked. The system pH must be in the range of 7.0 to 8.5. Chemical treatment may be required.
- Before connecting the boiler, thoroughly flush the system to remove sediment. Install a strainer or other sediment removal equipment if necessary. The cast iron heat exchanger can be damaged by build-up or corrosion due to sediment.
- Do not use petroleum-based cleaning or sealing compounds in the boiler system. Gaskets and seals in the system may be damaged, which can result in substantial property damage.
- Continual fresh makeup water will reduce boiler life. Mineral buildup in the heat exchanger reduces heat transfer, overheats the cast iron heat exchanger, and causes failure. Addition of oxygen carried in by makeup water can cause internal corrosion. Leaks in the boiler or piping must be repaired at once to prevent makeup water. Use this boiler ONLY in a closed-loop system.
- Do not add cold water to a hot boiler. Thermal shock can cause the heat exchanger to crack.

Commonwealth of Massachusetts

When the boiler is installed within the Commonwealth of Massachusetts:

- This product must be installed by a licensed plumber or gas fitter.
- If antifreeze is used, a reduced pressure back-flow preventer device shall be used.

See page 38 for sidewall vent air installations.

Freeze Protection Fluids

NEVER use automotive or standard glycol antifreeze. Use antifreeze specifically made for hydronic systems; inhibited propylene glycol is recommended. Thoroughly clean and flush any replacement boiler system that has used glycol before installing the new 94 boiler.

Damage from Water Contact

⚠ DANGER

DO NOT attempt to operate any boiler if any part of the boiler, burner, or controls has been partially or fully sprayed with or submerged under water. The boiler must either be replaced or completely repaired and inspected. The boiler and all components must be in good condition and fully reliable before operation.

If these requirements are not met, operating the boiler will cause fire, explosion, and electrical shock hazards, leading to serious injury, death, or substantial property damage.

Saltwater damage: The immediate effects of saltwater damage are like those of freshwater, with electrical components shorting out and the removal of critical lubricants. However, salt and other contaminants left behind can lead to long term issues due to the conductive and corrosive nature of salt residue. WM Technologies equipment contaminated with saltwater or polluted water will no longer be covered under warranty and should be replaced.

Electrical damage: If any electrical component or wiring has, or is suspected to have come into contact with water, replace the boiler.

Frozen Water Damage

Power outages, unattended residences or buildings, boiler component failures, or other electrical system failures in cold weather could result in frozen plumbing and water damage in a matter of hours. Consult with a boiler contractor or a home security agent to take preventative actions, such as installing a security system that operates during power outages, senses low temperature, and initiates an effective action.

Section 2
Installation

This section is intended to provide installation instructions for qualified heating installers.

Section Contents

Prepare Boiler Location

Installation Compliance Requirements

- Local, state, provincial, and national codes, laws, regulations, and ordinances.
- National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition.
- Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances – ANSI/NFPA 211, latest edition.
- Installation of Oil Burning Equipment – ANSI/NFPA 31, latest edition.
- National Electrical Code – ANSI/NFPA 70, latest edition.
- Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers – ANSI/ASME CSD-1, latest edition.

IMPORTANT

The 94 Series 4 steam boiler met safe lighting and other performance criteria when the boiler underwent tests specified in UL 726 & UL 795, latest editions.

Checks Before Boiler Installation

1. Check for nearby connections to:
   - System water piping
   - Venting systems
   - Fuel supply
   - Electrical Power
   - Combustion and ventilation air supply
2. Check area around boiler. Remove any combustible materials, gasoline, and other flammable liquids and vapors.

⚠WARNING

Failure to keep boiler area clear and free of combustible materials, gasoline, and other flammable liquids and vapors can create an explosion hazard, which can result in severe personal injury, death, or substantial property damage.

3. Check the boiler location to ensure it protects the gas control system components from dripping or spraying water and rain during operation or service.
4. If a new boiler is replacing the existing boiler, check for and correct system problems:
   - System leaks causing oxygen corrosion or heat exchanger cracks from hard water deposits.
   - Incorrect expansion tank sizing.
   - Lack of freeze protection in boiler water.

Prepare Boiler Location, continued

Flooring and Foundation

The 94 boiler is approved for installation on combustible flooring, but must never be installed on carpeting.

⚠WARNING

Do not install the boiler on carpeting even if a foundation is used. Installing a boiler on carpeting can cause a fire, which can result in severe personal injury, death, or substantial property damage.

1. The boiler mounting surface must be level and suitable for the load.
2. Provide a solid foundation pad at least 4.0" (101.6 mm) above the floor if any of the following is true:
   - Floor can become flooded.
   - The floor is dirt, sand, gravel, or other loose material.
   - The boiler mounting area is severely uneven or sloped.
3. Foundation may be brick or concrete construction. The minimum foundation dimensions are listed in Table 3.
4. If flooding is possible, elevate the boiler sufficiently to prevent water from reaching the boiler.

Garage Installation

Take the following special precautions when installing the boiler in a garage.

- Mount the boiler at a height above the floor as specified in the latest edition of the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition, for U.S. installations.
- Locate or protect the boiler so it cannot be damaged by a moving vehicle.
- Ensure that the installation complies with all applicable codes.

Air Openings

Openings in floors, walls, ceilings, or roofs must be designed for fire stopping as required by local codes.

Figure 1 Boiler foundation, when required

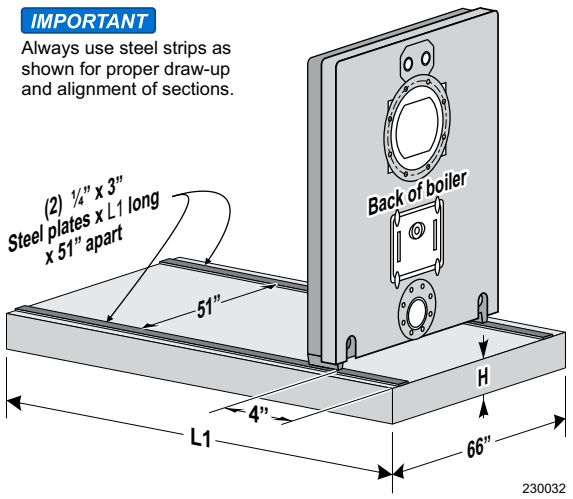


Table 3 Minimum foundation dimensions

Boiler Model	Length, L1 (inches)	Height, H (All)	Boiler Model	Length, L1 (inches)
1494	91	Consult burner manufacturer for required clearances.	2094	127
1594	97		2194	133
1694	103		2294	139
1794	109		2394	145
1894	115		2494	151
1994	121		2594	157

Vent pipe openings through combustible materials must be 3/8" (9.5 mm) larger in diameter than the vent pipe.

Air pipe openings should be 3/8" (9.5 mm) larger in diameter than the pipe or as required by the pipe manufacturer.

⚠WARNING

Pipe openings that do not have the required diameter can cause a fire, which can result in severe personal injury, death, or substantial property damage.

Provide air openings for combustion air and ventilation of the room. Follow the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition for the U.S.

Follow all applicable codes to size and verify size of the combustion and ventilation air openings into the space. See the Venting and Combustion Air sections starting on page 39 for required air openings and sizing.

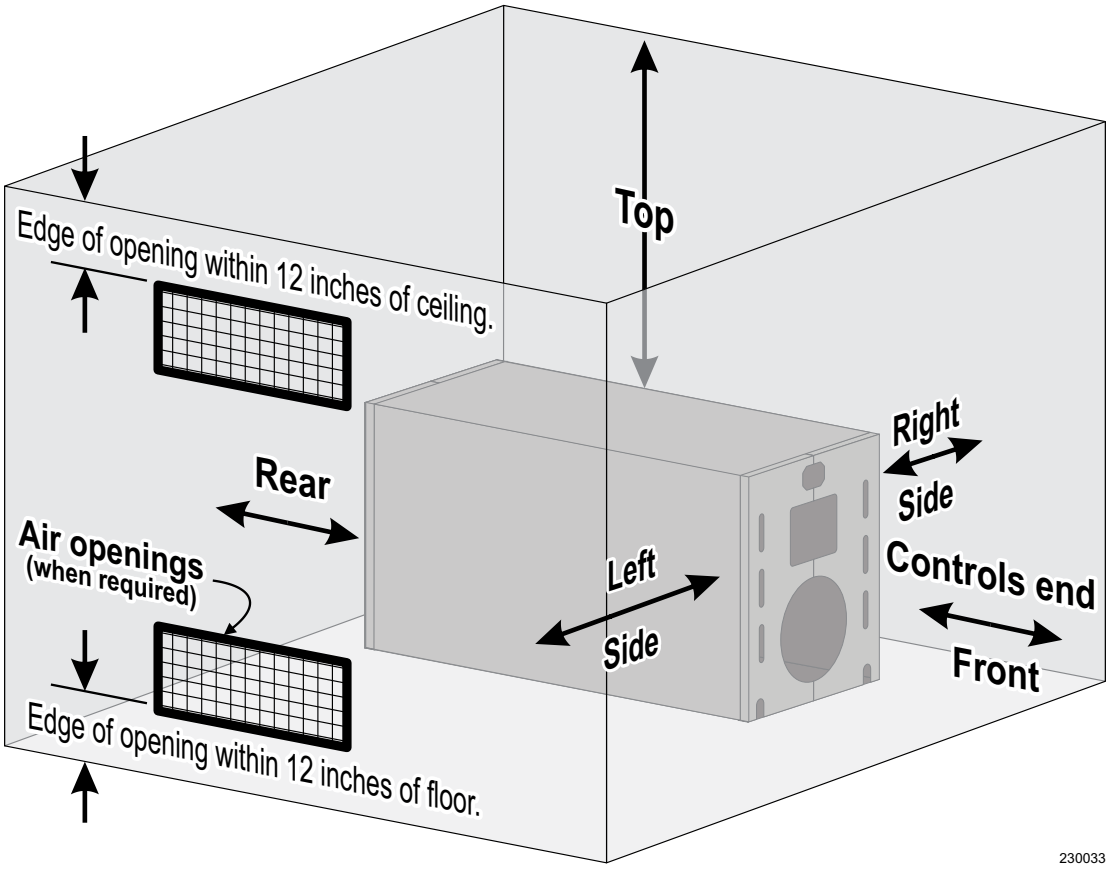
Clearances

There are minimum clearance requirements for the boiler from combustible surfaces. There are recommended service access clearances. See Figure 2 for all clearances.

IMPORTANT

Without the recommended minimum clearances for service access, it may not be possible to service the boiler without removing it from the space.

Figure 2 Clearances for 88 Boilers



Ensure that the installation complies with all state, local, and applicable codes.			
Clearance from:	Minimum clearances to combustible surfaces (inches)	Minimum allowable service clearances (inches)	Recommended minimum service access clearances (inches)
Controls end (Front)	48	48	48
Right side	6	44	44 (clean and remove tankless heater)
Left side	6	6	6
Flue	9	9	9*
Rear	9	50	50 (breeching)*
Top	24	24	24
Floor	0	0	0
Single-wall vent pipe	18	18	18
Double-wall vent pipe	Refer to vent pipe manufacturer's recommendations for vent pipe clearances.		

Note: Allow sufficient space for cleaning, servicing, and installing the burner. See burner literature for length and recommended service clearances.

*Flue pipe and breeching clearances take precedence over jacket clearances.

Prepare the Boiler

Removing a Packaged Boiler from the Crate

Leave the boiler in the crate pallet until ready to place in the final location. Follow all removal instructions.

IMPORTANT

Cables used for lifting are not provided by Weil-McLain.

⚠WARNING

Ensure the equipment and cables used for lifting are designed to handle the load. See Table 4 for approximate weights of section assemblies. Failure to comply can result in severe personal injury, death or substantial property damage.

1. Move the crate to a solid, level surface. The crate must be sitting securely on the ground.
2. Remove the top jacket panels and set aside until after piping installation.
3. Remove four lag screws from the shipping brackets.
4. Remove the boiler from the skid with a crane or a hoist. See Table 4 for lifting weight.
   - Crane: Hook middle of each cable to the eye of the crane.
   - Hoist: Hook middle of each cable to the hoist. Raise boiler off skid. Use pipe rollers under skid angles to roll the boiler.
5. Place 1/4" x 3" steel plates on the floor or foundation. Space them 51" apart as shown in Figure 1, page 8.
6. Place the boiler in the final position. If using a foundation, center the boiler on the foundation.
7. Level the boiler. Shim under legs if necessary.
8. Cut off the cables.

⚠WARNING

Cables are not intended for long-term use. Cables may corrode inside the boiler, weakening their lifting strength. Failure to remove cables can result in severe personal injury, death, or substantial property damage.

9. Inspect the block assembly for disjointed sections.
10. Check the gas-tight seal of the flue collector hood and clean out plates.
    a. Check inside the section assembly for any light passing through unsealed areas.

Table 4 Section assembly lifting weights

Boiler Model Number	Approximate Lifting Weight (lbs.)	Minimum Sling Length (Crane Hook to Boiler Lifting Lugs)
1494	13700	5' 0"
1594	14500	5' 0"
1694	15400	5' 0"
1794	16200	5' 0"
1894	17100	5' 0"
1994	17900	5' 6"
2094	18700	5' 6"
2194	19800	7' 6"
2294	20600	7' 6"
2394	21500	7' 6"
2494	22400	8' 0"
2594	23200	8' 0"

    b. Mark all unsealed areas and check for the following:
   - Damaged gaskets.
   - Displaced sealing rope.
   - Loose bolts or nuts.

    c. Correct all conditions and repeat the previous steps. If unsealed areas still exist, contact Tech Services before continuing with installation.
11. Proceed to page 16 and perform pressure testing.

Removing a Preassembled Block from the Crate

Leave the block assembly in the crate pallet until ready to place in the final location. Follow all removal instructions.

IMPORTANT

Cables used for lifting are not provided by Weil-McLain.

⚠WARNING

Ensure the equipment and cables used for lifting are designed to handle the load. See Table 4, page 10 for approximate weights of section assemblies. Failure to comply can result in severe personal injury, death or substantial property damage.

1. Move the crate to a solid, level surface. The crate must be sitting securely on the ground.
2. Remove four lag screws from the shipping brackets.
3. Remove the block assembly from the skid with a crane or a hoist. See Table 4, page 10 for lifting weight.
   - Crane: Attach free end of cables to the eye of the crane.
   - Hoist: Attach free end of cables to the hoist. Raise the block off the skid. Use pipe rollers under skid angles to roll the block.
4. Place 1/4" x 3" steel plates on the floor or foundation. Space them 51" apart as shown in Figure 1, page 8.
5. Place the boiler in the final position. If using a foundation, center the boiler on the foundation.
6. Level the boiler. Shim under legs if necessary.
7. Cut off the cables.

⚠WARNING

Cables are not intended for long-term use. Cables may corrode inside the boiler, weakening their lifting strength. Failure to remove cables can result in severe personal injury, death, or substantial property damage.

8. Inspect the block assembly for disjointed sections.
9. Check the gas-tight seal of the flue collector hood and clean out plates.
   a. Check inside the section assembly for any light passing through unsealed areas.
   b. Mark all unsealed areas and check for the following:
   - Damaged gaskets.
   - Displaced sealing rope.
   - Loose bolts or nuts.

   c. Correct all conditions and repeat the previous steps. If unsealed areas still exist, contact Tech Services before continuing with installation.

⚠WARNING

Gas-tight seal must be maintained to prevent possible flue gas leakage and carbon monoxide emissions. Leakage and emissions can result in severe personal injury or death.

10. Proceed to page 16 and perform pressure testing.

Boiler Assembly

Assembling the Block

⚠WARNING

Ensure sections are supported. Sections are top-heavy. Unbolted sections may fall if not supported, which can result in severe personal injury or death.

NOTICE

Machined port surfaces must remain clear of any adhesive properties. Adhesive in the seal pocket can damage the seal, which can result in substantial boiler and other property damage.

Prepare and position the back section:

1. Place 1/4" x 3" steel plates on the floor or foundation, spaced 51" apart. See Figure 1, page 8.
2. Apply 1/8" continuous bead of sealing rope adhesive in sealing rope grooves around section perimeter and flue-ways. See Figure 3 and Figure 4.
3. The boiler is supplied with two types of section sealing rope: uncoated rope, and coated rope with a narrow uncoated strip. Place the 5/8" rope in the rope grooves:
   a. Use the uncoated rope only on the flue-ways as shown in Figure 4.
   b. Use the coated rope around the perimeter and around the upper nipple port as shown in Figure 4. The uncoated side of the rope must be pressed into the adhesive as shown in order to obtain a proper adhesion.
   c. Use one continuous piece of the coated rope around the entire outside groove of the casting. Connect the coated rope at one of the top sides. Do not meet the two ends of the coated rope between the nipple port and flue-way area.
   d. Apply additional sealing rope adhesive where the two ends of the coated rope meet. This will ensure a leak-free joint.
4. Around curves, grasp rope at 1" intervals and push together. Do not stretch the rope.
5. Cut the rope as each section is completed.

⚠WARNING

Do not pre-cut rope. Gas-tight seal must be maintained to prevent possible flue gas leakage and carbon monoxide emissions. Failure to comply can result in severe personal injury or death.

Figure 3 Sealing rope adhesive

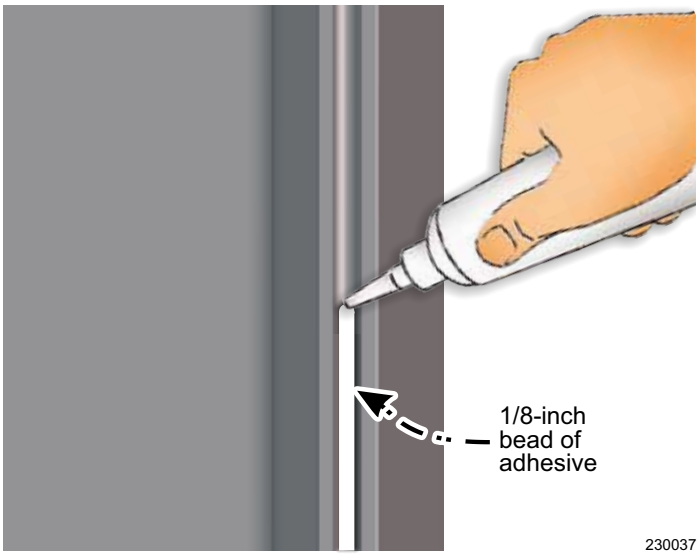
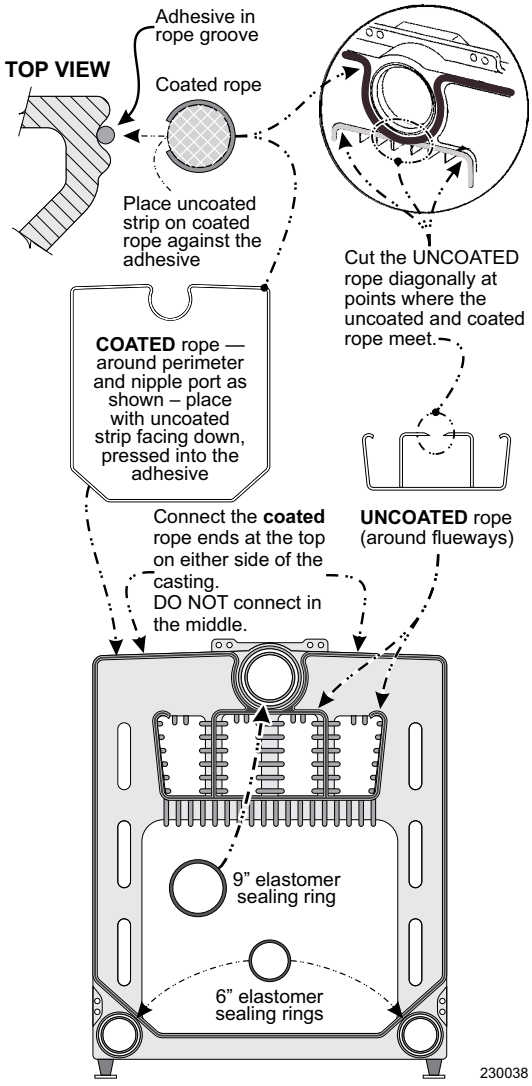


Figure 4 Sealing rope placement



Assembling the Block, continued

NOTICE

Do not use petroleum based cleaning or sealing compounds in the boiler system; usage can result in severe boiler damage and substantial property damage.

6. Remove any grit from port machined surfaces with a clean rag.
7. Place 9" and 6" sealing rings in appropriate port openings as shown in Figure 4, page 12. If sealing ring slips out of groove, stretch ring gently and reposition in groove.
8. Apply a continuous bead of silicone sealant no larger than 1/16" around entire outside edge of outer machined surface of port. Refer to Figure 5. *Do not* apply silicone sealant on, next to, or under the sealing ring.

NOTICE

Apply silicone sealant as specified to prevent unburned oil vapors from coming in contact with the sealing ring. Failure to comply can result in severe boiler damage and substantial property damage.

9. Hoist the back section upright.
10. Move the rear section into position on the steel rails.
    a. If using a foundation, the section should be 4" from the end of the foundation as shown in Figure 1, page 8.
11. Block under the flue-way outlet to hold the rear section upright in plumb position.

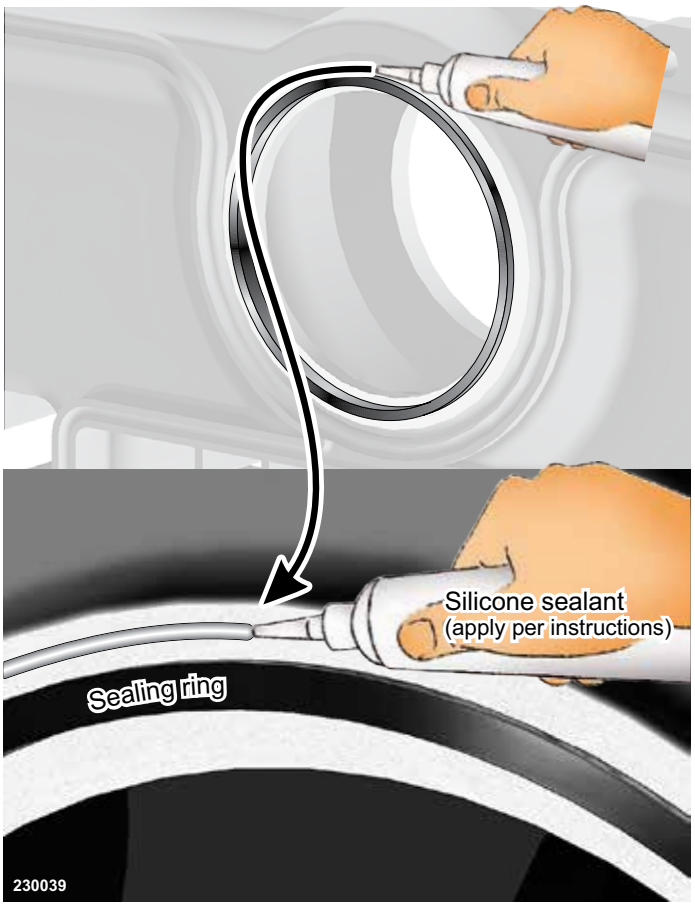
⚠CAUTION

The back section must be plumb before installing other sections to ensure correct block assembly.

12. The block can be removed after several sections have been installed and the assembly is stable.

(continued on the next page)

Figure 5 Silicone sealant



Boiler Assembly, continued

Assembling the Block, continued

Install the intermediate sections:

1. Remove and discard 3/8" diameter shipping tie rods.
2. Remove grit from port machined surfaces with clean rag.
3. Remove grit from tapped holes in all sections.
4. Position the intermediate section so aligning lugs fit into sockets of next section. See Figure 6.

IMPORTANT

Install tankless intermediate (TI) and supply intermediate sections (when used) in the order shown in Table 5, page 15.

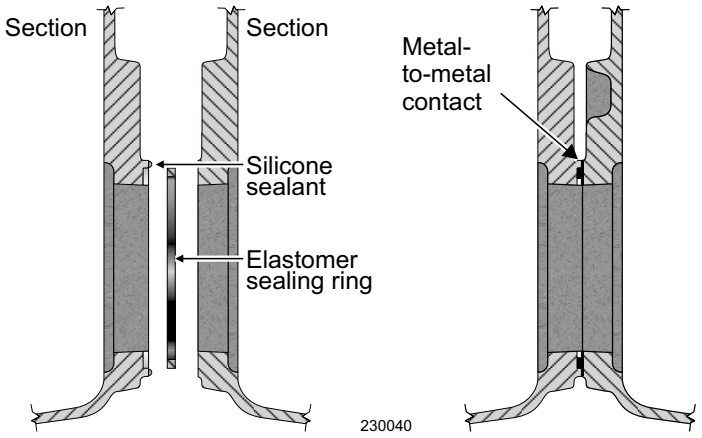
5. Draw the sections together until metal-to-metal contact is made around machined port openings as shown in Figure 6.
   a. Oil the threads on four draw rods. Install a washer and nut on the end to be tightened. Use only a nut on the other end.
   b. Uniformly draw the sections together, starting at the end with the washer and nut.

IMPORTANT

Leave an equal amount of thread on each end of the draw rod; this is needed to allow securing the jacket support brackets in place. To avoid jacket interference, the draw rods must not extend past the face of the front or back sections.

   c. Draw rods should be torqued to a range of 100 to 120 ft-lbs. *Do not* back off draw rods.
   d. Metal-to-metal contact will be achieved around port openings. See Figure 6. If gap occurs, it should be no greater than .032". Check with a feeler gauge.
   e. If the gap around the machined port opening exceeds .032", check for rope extending from rope grooves, dirt on port openings or sockets, or misaligned lugs. If corrections are made and a gap still exists, contact your WM Technologies distributor before continuing installation.

Figure 6 Sealing ring installation and port alignment



NOTICE

After erecting the first intermediate section, check both sections for plumb. Failure to plumb sections can cause misaligned piping and breeching, which can result in property damage.

⚠WARNING

A gas-tight seal prevents possible flue gas leakage and carbon monoxide emission. Failure to position sealing rope properly can prevent a gas-tight seal, which can result in severe personal injury or death.

6. Check each section for proper sealing rope position before proceeding to the next section.
7. Install remaining intermediate sections and front section using the same procedure in this section.

If using tankless heater (TI) sections:

- Install tankless heaters and gaskets or heater cover plates and gaskets. Use 3/8" x 3/4" studs, washers, and nuts.

Table 5 Section arrangement

Steam Boiler Models	Placement of special intermediate sections (TI and SI) Numbering from REAR to FRONT, beginning with rear section as section number 1 TI = Tankless Intermediate section SI = Supply Intermediate section								
	TI sections with tankless coil openings (number of coils)								SI sections with supply tappings
	1	2	3	4	5	6	7	8	
1494 S	6	4, 6	2, 4, 6	4, 6, 11, 13	2, 4, 6, 11, 13	2, 4, 6, 9, 11, 13	—	—	—
1594 S	6	4, 6	2, 4, 6	4, 6, 12, 14	2, 4, 6, 12, 14	2, 4, 6, 10, 12, 14	—	—	—
1694 S	6	4, 6	2, 4, 6	4, 6, 13, 15	2, 4, 6, 13, 15	2, 4, 6, 9, 11, 13	2, 4, 6, 9, 11, 13, 15	—	—
1794 S	7	5, 7	3, 5, 7	5, 7, 14, 16	3, 5, 7, 14, 16	3, 5, 7, 10, 12, 14	3, 5, 7, 10, 12, 14, 16	—	—
1894 S	8	6, 8	2, 4, 6	2, 4, 6, 8	2, 4, 6, 8, 15	2, 4, 6, 8, 15, 17	2, 4, 6, 8, 11, 13, 15	2, 4, 6, 8, 11, 13, 15, 17	—
1994 S	6	4, 6	2, 4, 6	4, 6, 9, 11	2, 4, 6, 9, 11	2, 4, 6, 9, 11, 16	2, 4, 6, 9, 11, 16, 18	2, 4, 6, 9, 11, 14, 16, 18	—
2094 S	6	4, 6	2, 4, 6	4, 6, 10, 12	2, 4, 6, 10, 12	2, 4, 6, 10, 12, 17	2, 4, 6, 10, 12, 17, 19	2, 4, 6, 10, 12, 15, 17, 19	—
2194 S	2	2, 9	2, 9, 11	2, 9, 11, 13	2, 9, 11, 13, 20	—	—	—	4, 6, 16, 18
2294 S	2	2, 10	2, 10, 12	2, 10, 12, 14	2, 10, 12, 14, 21	—	—	—	4, 6, 17, 19
2394 S	2	2, 9	2, 9, 11	2, 9, 11, 13	2, 9, 11, 13, 15	2, 9, 11, 13, 15, 22	—	—	4, 6, 18, 20
2494 S	8	2, 8	2, 8, 12	2, 8, 12, 14	2, 8, 12, 14, 16	2, 8, 12, 14, 16, 23	—	—	4, 6, 19, 21
2594 S	8	2, 8	2, 8, 11	2, 8, 11, 13	2, 8, 11, 13, 15	2, 8, 11, 13, 15, 17	2, 8, 11, 13, 15, 17, 24	—	4, 6, 20, 22

If the boiler was ordered with tankless coils, the heaters must be located on the right-hand side of the boiler. It is important to position the TI sections (where used) in the exact location in the boiler section assembly as shown above so the heater knockout openings in the jacket side panels will accommodate the heaters. If the TI sections and internal water heaters are not positioned in the boiler section assembly as shown above, the installer must cut openings in the jacket side panels to accommodate the heaters.

Boiler Assembly, continued

Boiler Connections for Pressure Testing

Install the boiler connections per the appropriate instructions below according to the boiler model.

Models 1494-2094:

1. Secure supply elbows and outlet gaskets to front and back sections.
   a. Use 5/8" x 3" studs, nuts, and washers.
   b. Thread the flat end of the studs into the sections.
2. Secure 6" NPT return opening counter flange and gasket to back section. Use 3/4" x 2" cap screws and washers.

Models 2194-2594:

1. Secure outlet cover plates and gaskets to front and back sections.
   a. The 3/4" tappings in plates should be at top.
   b. Use 5/8" x 1-3/4" bolts.
2. Secure 10" supply outlets and gaskets on top of "SI" sections, when used.
   a. Supply outlet installed close to boiler front should have 1-1/4" tapping facing front.
   b. Use 5/8" x 3" studs, nuts, and washers.
3. Secure 6" NPT return opening counter flange and gasket to back section using 3/4" x 2" hex head cap screws and washers.

Perform Hydrostatic Pressure Test

1. See Figure 7, page 17 for tapping locations.
2. Install a water pressure gauge for testing only.
   a. The pressure gauge must be able to handle the required test pressure stated in this section. Gauge maximum should be at least 1.5 times the test pressure.
   b. Install the pressure test gauge in the tapping specified in Figure 7, page 17.
3. Install an air vent in an upper tapping.
4. Install 3" close nipples and caps in washout tappings on the front section.
5. Prepare the rear section.
   a. Install a drain valve (furnished by installer) in one of the washout tappings on the rear section.
   b. Verify drain valve size per Figure 7, page 17.
   c. Install a 2" x 2-1/2" nipple and cap in the other washout tapping.
6. Plug or use blind flanges on remaining tappings.

NOTICE

Do not pressure test with any control installed. Damage to control can occur due to overpressure.

7. Fill the boiler with water. Vent all air.
8. Pressure test the boiler for at least 10 minutes at a pressure between 45 and 55 psig.

NOTICE

Do not exceed above test pressures by more than 10 psig.

⚠WARNING

Do not leave boiler unattended. Cold water fill could expand and cause excessive pressure, which can result in severe personal injury, death or substantial property damage.

9. Check for maintained gauge pressure and leaks. Repair any leaks immediately.

NOTICE

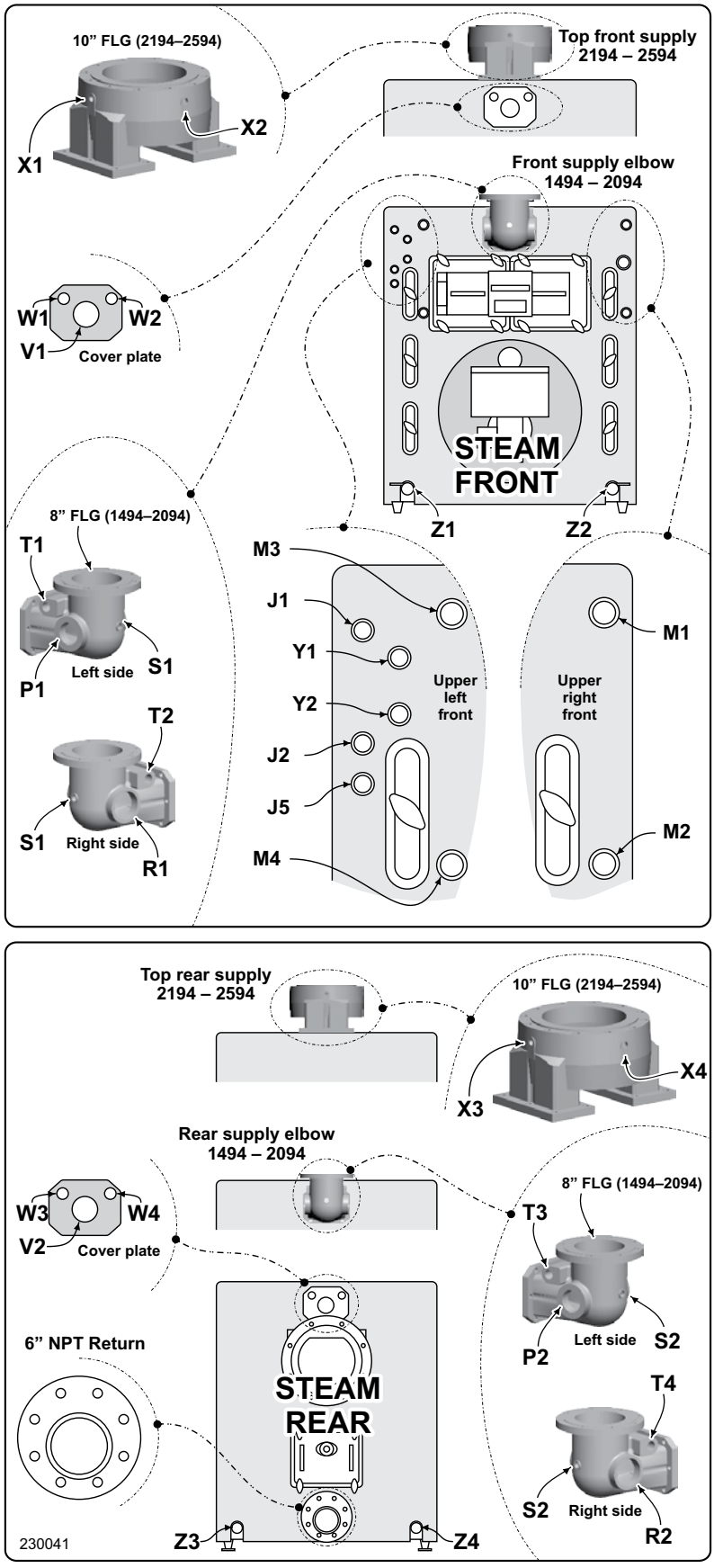
Leaks must be repaired at once. Failure to do so can damage boiler, resulting in substantial property damage.

NOTICE

Do not use petroleum-based cleaning or sealing compounds in boiler system. Using these compounds can cause severe damage to system components, resulting in substantial property damage.

10. Drain the boiler. Remove the air vent, boiler drain, and pressure gauge.
11. Remove plugs from tappings that will be used for controls and accessories.

Figure 7 Model 94 steam boiler control tappings



Location	Size	Function
J1	1/2	Pressure test gauge — *REMOVE AFTER HYDROSTATIC TEST*
J1 + J5	1/2	Gauge glass
J2	1/2	PLUG this tapping — not used
M3	1	PLUG this tapping — not used
M1 + M2 M3 + M4	1	Float-type low water cutoff, LWCO/ pump control, or LWCO/feeder combination.
P1	3	Skim tapping
P2	3	Steam pressure relief valve
R1	4	Skim tapping
R2	4	Steam pressure relief valve
S1	3/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
S2	3/4	Pressure controls (limit, operating, etc.)
T1 or T2	1-1/4	Pressure controls (limit, operating, etc.)
T3 or T4	1-1/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
V1 or V2	4	Steam pressure relief valve – or – Skim tapping
W1 or W2	3/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
W3 or W4	3/4	Pressure controls (limit, operating, etc.)
X1 & X2	1-1/4	PLUG these tappings — not used
X3 & X4	1-1/4	PLUG these tappings — not used
Y1 & Y2	3/8	Try cocks
Z1 or Z2	2	Cleanout tappings, front section. Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping.
Z3 or Z4	2	Cleanout or drain tappings, rear section. Install drain valve in one tapping, and 2" NPT x 2-1/2" length nipple and 2" NPT cap in the other tapping.
—	—	Low limit temperature control (when using tankless heaters). Locate in control tapping on one of the tankless heaters.

IMPORTANT

Controls and fittings must not obstruct cleanout openings or prevent required access to the boiler or components.

Boiler model	Minimum drain/ blow-off valve size
1494-2194	1-1/4"
2294-2594	2"

Boiler Assembly, continued

Connect Steam Boiler Piping

1. Hartford loop piping arrangement and wet return are required for steam boilers. Use the Hartford loop for both pumped-return and gravity-return systems.
2. Maintain a 24" minimum from waterline to bottom of header (86-3/4" from bottom of section).
3. When using a condensate receiver, feed pump must be energized by a boiler-mounted pump controller.
4. Install piping as shown on pages 19-20 for single boilers. See page 21 for additional requirements when piping multiple boilers.
5. Size return pipe as follows.
   a. Pumped return — Size return piping by pump.
   b. Gravity return — Size gravity return same as Hartford loop equalizer pipe size.
6. Install system drain valve in lowest part of return piping close to boiler. See Figure 7, page 17 for sizing.
7. Connect cold water fill piping as shown in Figure 8. Recommended valves and water meter are also shown, if used. Water meter will detect added makeup water, indicating leaks in the system.
8. Condensate return piping:
   a. Satisfactory operation of any steam heating system depends on an adequate return of condensate to maintain a steady water level.
   b. Avoid adding excessive amounts of raw makeup water.
   c. Where condensate return is not adequate, a low water cutoff with pump control, condensate receiver, and condensate boiler feed pump should be installed.
   d. See Figure 9 for piping and Table 6 for sizing.

Figure 8 Cold water fill piping

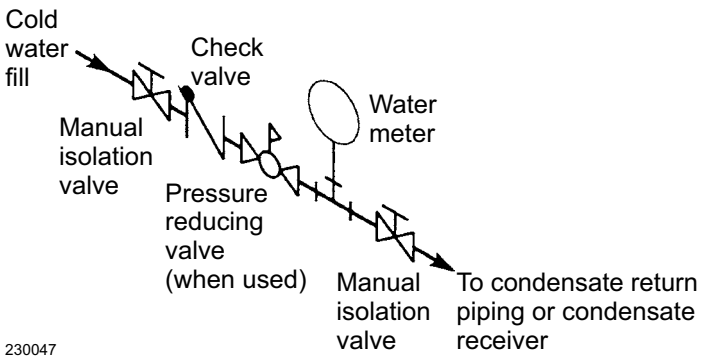


Figure 9 Condensate piping to boiler

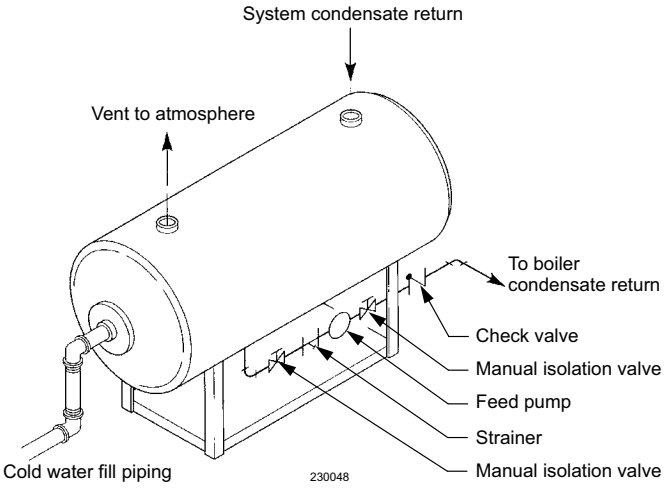


Table 6 Condensate receiver capacity requirements

Boiler Model Number	AHRI Gross Output (lbs steam per hour)	Gallons Condensate per hour	Minimum Condensate Receiver Capacity (gallons)*				Recommended condensate feed pump capacity GPM at 15 PSI
			15-minute boiler operation	30-minute boiler operation	45-minute boiler operation	60-minute boiler operation	
1494	3868	464	136	272	408	544	15.0
1594	4165	500	147	294	441	588	16.5
1694	4463	536	158	316	474	632	17.5
1794	4760	571	168	336	504	672	19.0
1894	5058	607	179	358	537	716	20.0
1994	5355	643	189	378	567	756	21.0
2094	5653	678	199	398	597	796	22 0
2194	5950	714	210	420	630	840	22.0
2294	6307	757	220	440	660	880	24.0
2394	6545	785	231	462	693	924	26.0
2494	6902	828	241	482	723	964	27.0
2594	7140	857	252	504	756	1,008	28.0

*Maximum time to when condensate returns to the boiler — the longer the time for condensate to return, the larger the receiver must be.

Steam Boiler Piping Guidelines

Piping system must be installed as shown, using pipe sizes shown. Pipe sizes shown are for two-pipe, pumped-return systems. Adjust pipe sizing as needed when connecting to gravity-return systems. Consult a local Weil-McLain distributor or sales office before installing alternate piping.

NOTICE

Install piping as shown. Improperly piped systems or undersized piping can contribute to erratic boiler operation and possible boiler or system damage.

NOTICE

The boiler header must always be at least 24" above the water line, as shown in all steam boiler piping diagrams. Installing the pipe lower will result in increased water carryover to the system, which can result in serious damage to system components and oxygen corrosion due to excess makeup water.

Hartford loop piping for all steam boilers:

1. Install the system supply pipe between the equalizer elbow and the last boiler riser pipe connection to the header; this assists in separating water from the steam as it turns upward into the steam supply pipe.
2. Locate the top of the Hartford loop return nipple at least 4" below the water line, as shown.

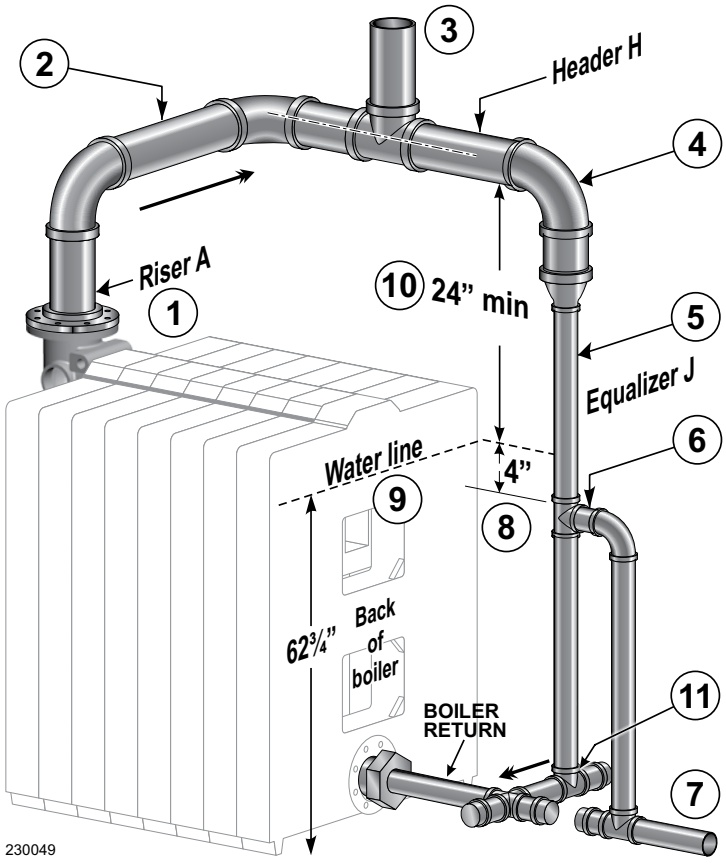
(continued on the next page)

Figure 10 Models 1494-2094 steam piping – two 8" risers required

Pipe Dimensions				
Model	Riser A	Riser B	Header H	Equalizer J
1494-1594	8"	8"	8"	4"
1694-2094	8"	8"	10"	4"

Legend – Figure 10

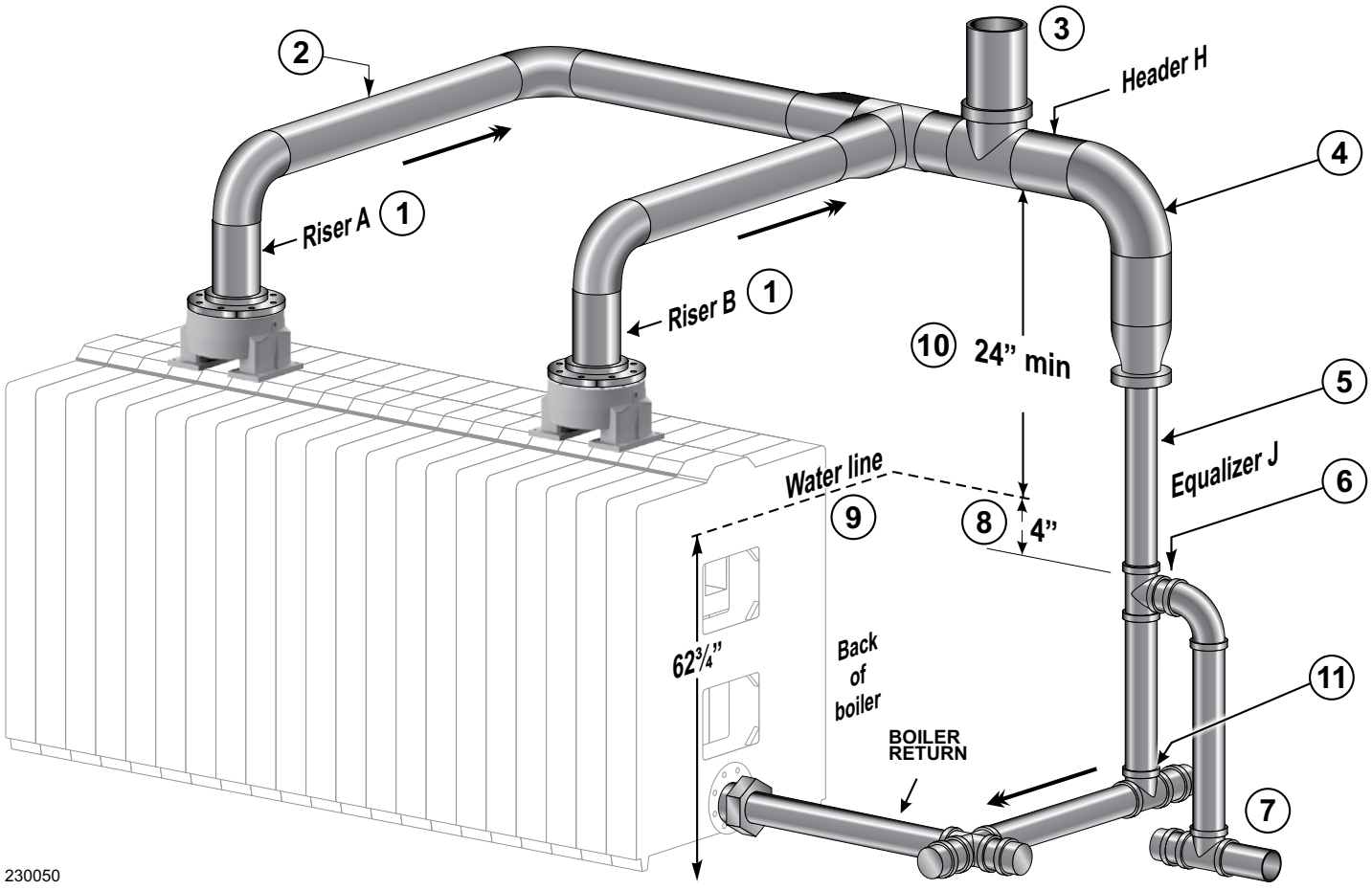
1. Riser pipes (one for each supply outlet)
2. Horizontal pipes needed to offset the header to allow for expansion and contraction of the header
3. Steam supply must be located between last riser connection and equalizer elbow
4. Equalizer elbow — full size or reducing
5. Equalizer pipe
6. Close nipple at Hartford loop tee to reduce water hammer potential
7. Condensate return line (gravity or pumped)
8. Pipe to provide 4 inches between water line and top of Hartford loop return nipple
9. Boiler water line — all automatic water level controls must be set to maintain this level
10. Minimum 24 inches between water line and bottom of header
11. Offset tee



Boiler Assembly, continued

Steam Boiler Piping Guidelines, continued

Figure 11 Models 2194-2594 steam piping – two 10" risers required

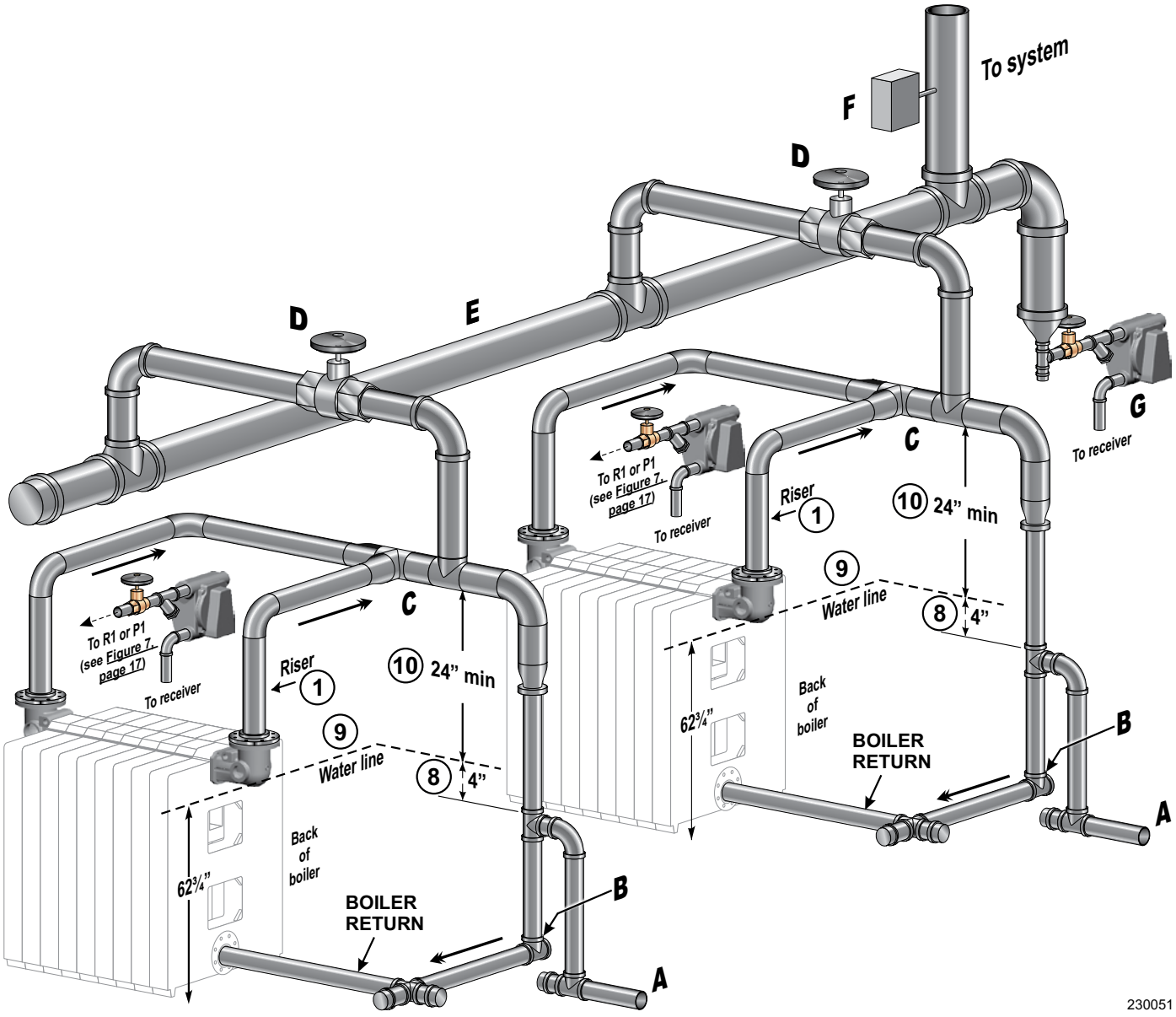


Pipe Dimensions				
Model	**Riser A**	**Riser B**	**Header H**	**Equalizer J**
2194-2594	10"	10"	12"	4"

Legend – Figure 11, and Figure 12, page 21

1. Riser pipes (one for each supply outlet)
2. Horizontal pipes needed to offset the header to allow for expansion and contraction of the header
3. Steam supply must be located between last riser connection and equalizer elbow
4. Equalizer elbow — full size or reducing
5. Equalizer pipe
6. Close nipple at Hartford loop tee to reduce water hammer potential
7. Condensate return line (gravity or pumped)
8. Pipe to provide 4 inches between water line and top of Hartford loop return nipple
9. Boiler water line — all automatic water level controls must be set to maintain this level
10. Minimum 24 inches between water line and bottom of header
11. Offset tee

Figure 12 Multiple steam boiler piping — gravity condensate return



A Pipe as shown for gravity return systems, connecting point A to the wet gravity return.

For pumped-return systems, install boiler water level control on each boiler with body mark at level indicated in Figure 38, page 30. Provide one of the following at point A:

1. Separate feed pumps and check valves for each boiler.
2. Single feed pump, with separate solenoid valve for each boiler.

B For pumped-return systems, install a combination float and thermostatic trap on each boiler to prevent flooding of one boiler while other boiler is firing. Install trap in skim tapping. Connect traps to condensate receiver.

Gravity-return systems are self-leveling if the wet returns are piped to the common system wet return.

C Install boiler piping as shown in the preceding pages of this manual.

D Install stop valves per ASME code requirements.

For pump-return systems, if using automatic steam valves, use only slow-opening automatic valves. Use a Weil-McLain Boiler Control System (such as a BCP panel) to open each steam valve automatically before firing burner.

E Construct common supply drop header with pipe size at least same size as largest boiler header size.

F Use one of the following:

1. A Weil-McLain Boiler Control System (such as a BCP panel) with header-mounted pressure control(s) to sequence boilers, or . . .
2. A steam pressure controller.

G Install drip line in common supply drop header.

- Gravity-return: Pipe drip line to wet return.
- Pumped-return: Use combination float and thermostatic trap and drain to condensate receiver.

Boiler Assembly, continued

Burner Mounting Plate Installation

The following instructions assume a burner mounting plate supplied with the boiler. For H-94 boilers, if a burner mounting plate was not ordered, the plate must be made according to burner requirements.

1. Thread two nuts on the rounded end of a 1/2" x 4-1/4" stud, locking them together to provide an area to grip. Screw the flat end of the stud in one of six holes around the opening.
2. Remove the two nuts from the stud in order to use them again on the next stud.
3. Repeat the previous two steps for the remaining five studs.
4. Apply 1/8" continuous bead of rope adhesive in groove around opening.
5. Position 0.500" silicone-coated rope in the groove.
   a. Cut the rope so the two ends meet in the groove at the top of the circular groove of the plate without stretching the rope. Do not overlap the rope.
   b. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
6. Install burner mounting plate with observation port at top of plate. Use 1/2" washers and nuts.

Front Observation Plate Installation

Install the front observation port assembly over the half-moon on burner mounting plate:

1. Apply 1/8" continuous bead of rope adhesive in groove on assembly.
2. Position 0.325" silicone-coated rope in the groove.
   a. Cut the rope so the two ends meet in the groove without stretching the rope. Do not overlap the rope.
   b. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
3. Secure assembly to plate with 1/4" x 3/4" flat-head machine screws.

Cleanout and Inspection Tappings

1. If cleanout and inspection tappings were ordered, use 1-1/2" brass countersunk plugs to plug the openings.
2. If using "TI" sections, install tankless or storage heaters and gaskets, or heater plates and gaskets. Use 3/8" cap screws.

Jacket Installation Guidelines

IMPORTANT

Read the following before installing other controls and trim.

1. These parts *must* be on the boiler before jacket installation:
   - Plugs for unused tappings
   - Supply and return piping and steam supply header, including supply elbows or top supply adapters
   - Tankless heaters (when used), tankless heater cover plates (when used)
2. These parts *may* be on the boiler before jacket installation:
   - Burner mounting plate
3. These parts must be *off* the boiler before jacket installation:
   - Cleanout plates and cleanout doors
   - Access panel
   - Flue collar
   - Breeching
   - Burner
   - Steam gauge
   - Limit control and low water cutoff
   - Gauge glass and gauge glass cocks, try cocks.
   - Drain cock
   - Tankless heater piping (when used)

Jacket Parts Removal and Inspection

NOTICE

DO NOT stand on the jacket at any time. Jacket panels will be damaged.

1. Locate jacket cartons.
2. Remove jacket parts from cartons as needed. Leave parts in cartons as long as possible to avoid damage.
3. Inspect all parts before installing.
4. Jacket parts are in the boxes listed in Figure 13, page 23.

Preparing Jacket Panels for Use

1. Determine which of the knockout openings in the jacket panels will be used from the control tapping table in Figure 7, page 17.
2. To remove a knockout disc, bend one side inward until it can be grasped with a pair of pliers. Bend the disc back and forth until it breaks loose.

NOTICE

The jacket side panels can be placed on either side of the boiler. If the boiler was ordered with tankless coils, the jacket side panels with tankless coil knockouts must be properly positioned ONLY on the right-hand side of the boiler.

Figure 13 Boiler jacket cartons and contents

Carton #	Description	Contents
94-EP	End panel	(1) RF front panel | (1) BA back panel | (8) brackets | (47) #10 x ½" type A sheet metal screws (8) #C-8616-5618 Tinnerman speed nuts | (8) 7/16" I.D. x 1 3/8" O.D. x .038" washers (8) 5/16-18 N.C. x 1½" round head screws
94A*	Side panel	(2) side panels Panel width suffix: A or AK = 30" | B or BK = 36" | C, CK or CKK = 42" | D, DK or DKK = 48" | E, EK or EKK = 54" [Note: suffix "K" means one (1) of the side panels has two (2) tankless heater openings; "CKK or DKK" indicates three (3) tankless openings and "EKK" indicates four (4) tankless openings]
94A	Top panel	(2) top panels [Suffix "0" indicates top panels have top out cutouts.]
94-SC	Splice channel carton	(2) side splice channels | (1) top splice channel | (8) brackets | (42) #10 x ½" type A sheet metal screws (8) 5/8"-11 N.C. hex nuts
* If the boiler was ordered with tankless coils, jacket side panels with tankless coil knockout openings will be furnished. It is important that the TI sections (where used) are positioned in the exact locations in the section assembly as shown in the boiler erecting instructions. See Table 5, page 15. If the TI sections and tankless coils are not positioned in the boiler section assembly as directed, the installer must cut openings in the jacket side panels to accommodate the coils.		

Carton Quantities														
Boiler Model	End Panel Cartons		Splice Channel Cartons	Side Panel Cartons				Top Panel Cartons						
	94-EP	94-SC	A	B	C	D	E	A	B	C	D	E	CO	EO
1494	1	1	-	-	2	-	-	-	-	2	-	-	-	-
1594	1	1	-	-	1	1	-	-	-	1	1	-	-	-
1694	1	1	-	-	1	-	1	-	-	1	-	1	-	-
1794	1	1	-	-	-	1	1	-	-	-	1	1	-	-
1894	1	1	-	-	-	-	2	-	-	-	-	2	-	-
1994	1	2	1	-	2	-	-	1	-	2	-	-	-	-
2094	1	2	-	1	2	-	-	-	1	2	-	-	-	-
2194	1	2	-	-	3	-	-	-	-	1	-	-	2	-
2294	1	2	-	-	2	1	-	-	-	-	1	-	2	-
2394	1	2	-	-	2	-	1	-	-	-	-	1	2	-
2494	1	2	-	-	1	1	1	-	-	-	1	-	1	1
2594	1	2	-	-	1	-	2	-	-	-	-	1	1	1

Boiler Assembly, continued

Installing Front and Rear Jacket Panels

1. Install jacket brackets on the tie rod lugs of the front and rear sections as shown in Inset A and Inset D of Figure 14, page 25.
   a. Front section brackets must point toward the front. Rear section brackets must point toward the rear.
   b. Slide one slot of the bracket over the tie rod.
   c. Secure each bracket using the provided 5/16" x 1-1/2" screw, washer, and Tinnerman nut as shown.
   d. Install one bracket to each side tie rod lug, and two brackets on the top tie rod lug of the front and rear sections, for a total of eight brackets (four on each section).
2. Place the right front jacket panel against the right side of the front section, with the jacket flanges over the mounting brackets.
3. Secure the panel to the brackets with #10 x 1/2" type A sheet metal screws on the right side and top.
4. Set the left front jacket panel in place and secure in the same way as the right panel.

IMPORTANT

Make sure the jacket panels have had all necessary knockouts removed and all holes are properly aligned.

5. Secure the left and right front panels together with the provided #10 x 1/2" screws.
6. Use the above procedure to install the jacket rear panels, starting with the left side panel.

Install Side Panel Brackets and Splice Channels

Each splice channel is attached to the brackets with four screws. See Figure 14, page 25. Boiler models 1494 through 1894 require one set of splice channels. Models 1994 through 2594 require two sets.

1. The brackets that secure the splice channels mount to the tie rod lugs as shown in Figure 14, page 25.
   a. Locate the brackets on the sections specified in Table 7.
   b. Brackets must be oriented as shown, with their edges point at one another. DO NOT loosen the existing tie rod nuts.

Table 7 Placement of support brackets — sections are numbered from back to front

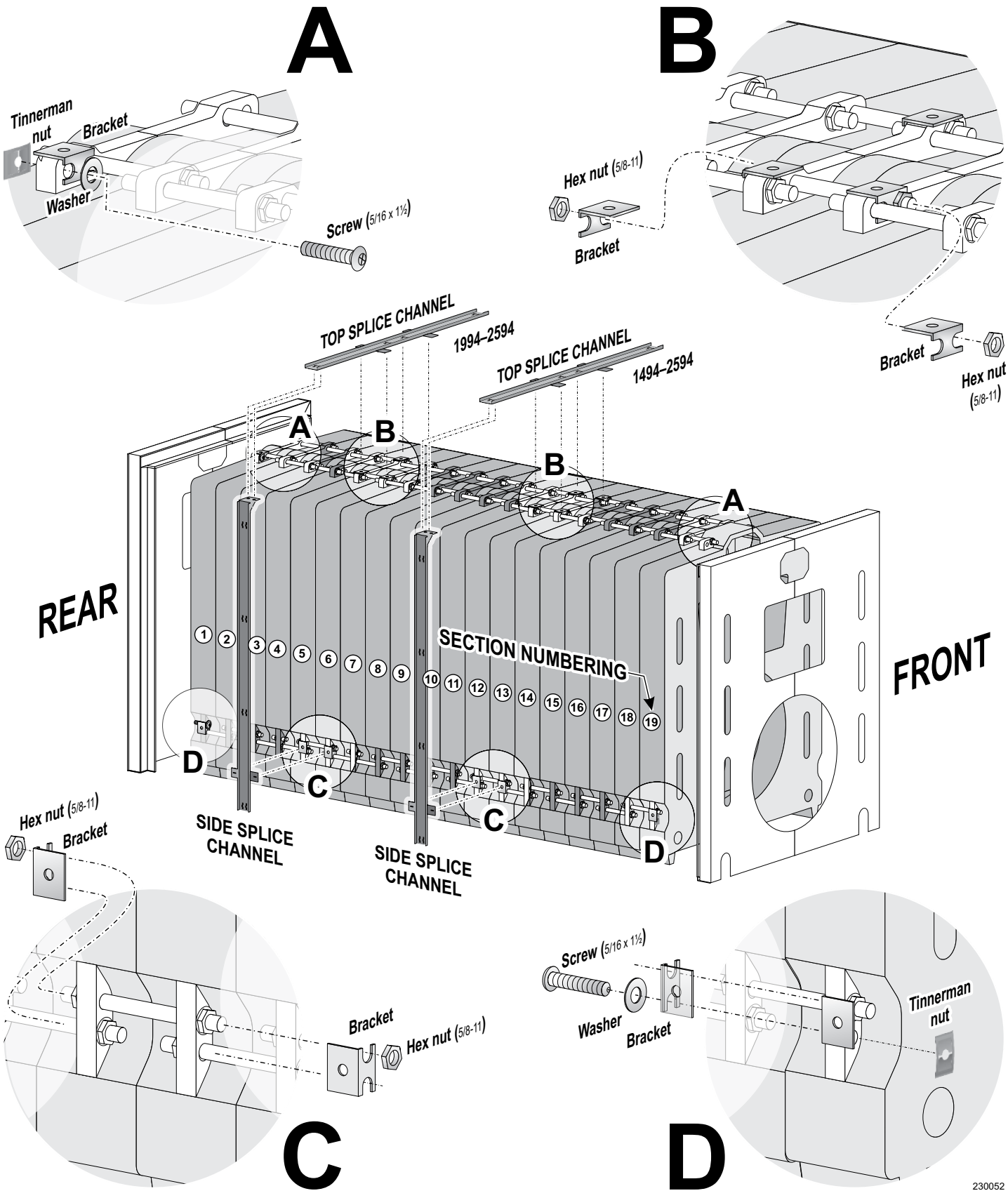
Boiler	Install brackets on sections:	Install brackets on sections:
1494	7 & 8	—
1595	7 & 8	—
1694	7 & 8	—
1794	8 & 9	—
1894	9 & 10	—
1994	7 & 8	12 & 13
2094	7 & 8	13 & 14
2194	7 & 8	14 & 15
2294	7 & 8	15 & 16
2394	7 & 8	16 & 17
2494	9 & 10	17 & 18
2594	9 & 10	18 & 19

   c. Secure the brackets with the supplied 5/8"-11 N.C. hex nuts.
   d. When completed, there will be four brackets on each section listed in Table 7.
2. Attach the left and right splice channels to the splice channel brackets using two #10 x 1/2" type A sheet metal screws.
3. Attach the top splice channel to the brackets and to the two side splice channels using eight #10 x 1/2" type A sheet metal screws.

Installing Side and Top Jacket Panels

1. Attach jacket side panels to front and rear panels and splice channels using the provided #10 x 1/2" type A sheet metal screws.
2. For boilers with tankless heaters or tankless heater openings in the sections, make sure to install the side panels with heater openings on the correct side.
3. Once the side panels are installed, install the top panels using #10 x 1/2" type A sheet metal screws.

Figure 14 Installation of jacket support brackets, support channels, and corners (piping and other components omitted for clarity)



Boiler Assembly, continued

Installing Front Cleanout Doors

See Figure 15, items K20 (cleanout door assembly), K22 (hinge for cleanout door), and K24 (hinge plate for cleanout door) for door installation.

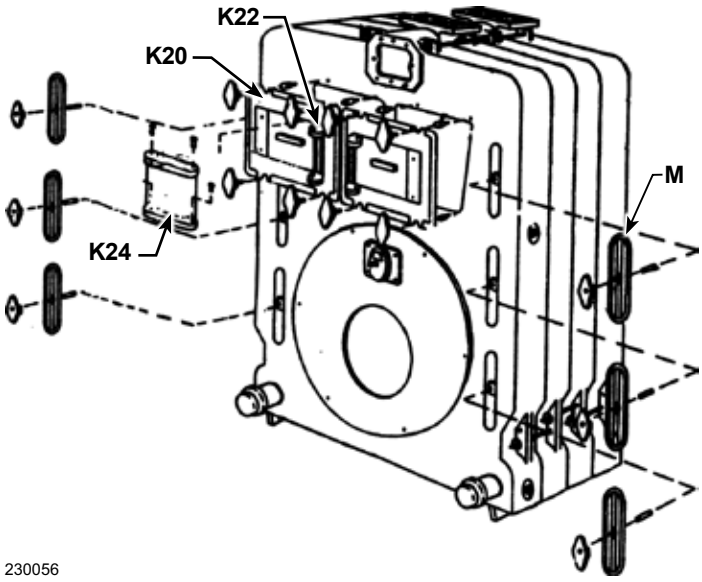
1. Apply a 1/8" continuous bead of rope adhesive in the grooves around the cleanout doors.
2. Position 0.325" silicone-coated rope in the groove.
   a. Cut the rope so the two ends meet in the groove at the top and center of each cleanout door without stretching the rope. Do not overlap the rope.
   b. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
3. Secure eight mounting studs in tapped holes located around cleanout openings.
4. Position cleanout door with hinge closest to centerline of front section over four studs.
5. Hand-tighten four wing nuts to secure door.
6. Attach cleanout door hinge plate to installed door. Use two hinge pins.
7. Attach other door to hinge plate with two hinge pins.
8. Close second door. Hand-tighten four wing nuts to secure door to section.
9. Affix boiler nameplate to hinge plate with two drive screws.

Installing Front Cleanout Plates

See Figure 15, Item M (cleanout plates).

1. Thread two 1/2" nuts on round end of 1/2" x 4-1/4" stud. Lock the nuts together.
2. Thread flat end of stud into tapped hole in one of the clean-out openings.
3. Remove nuts.
4. Repeat steps 1-3 for remaining five studs.
5. Apply 1/8" continuous bead of rope adhesive in groove around plates.
6. Position 0.325" silicone-coated rope in the groove.
   a. Cut the rope so the two ends meet in the groove at the top and center of each cleanout plate without stretching the rope. Do not overlap the rope.
   b. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
7. Insert a cleanout plate into each opening. Secure with hand-tightened wing nut.

Figure 15 Front section block assembly components



Installing the Flue Collar

See Figure 16, item D (flue collar assembly).

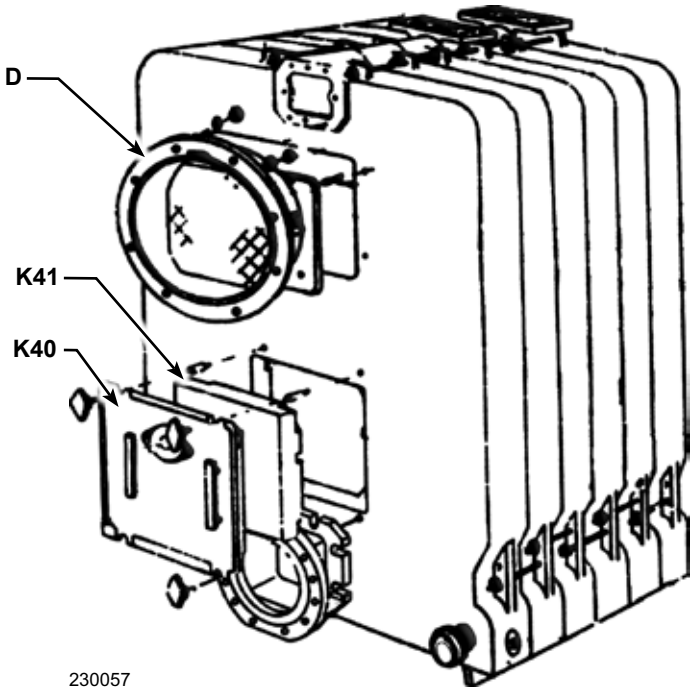
1. Thread two 1/2" nuts on round end of 1/2" x 4-1/4" stud. Lock nuts together.
2. Thread flat end of stud into tapped hole inside flue-way outlet.
3. Remove nuts.
4. Repeat steps 1-3 for the remaining three studs.
5. Apply 1/8" continuous bead of rope adhesive in groove around flue collar.
6. Position 1/2" uncoated sealing rope in groove, bringing the ends of rope together at the top and center of the rectangular plate. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
7. Position the flue collar over studs. The breeching damper handle must point up.
8. Tightly secure flue collar to rear section using 1/2" nuts and washers.

Installing the Back Access Door

See Figure 16, items K40 (back access door assembly) and K41(refractory shield for back access door).

1. Insert access door shield into back section opening.
2. Push against shield until it bottoms against stops.
3. Apply 1/8" continuous bead of rope adhesive in groove around back access door opening.
4. Position 0.325" silicone-coated rope in the groove.
   a. Cut the rope so the two ends meet in the groove at the top and center of the back access door without stretching the rope. Do not overlap the rope.
   b. Apply an ample amount of rope adhesive around the two ends to complete an air-tight seal.
5. Secure four mounting studs in holes around back access door opening.
6. Position access door assembly over studs.
7. Hand-tighten four nuts to secure access door.

Figure 16 Rear section block assembly components



Tankless Heaters

Hot Water Precautions

⚠ DANGER

Hot water can scald! Water heated to a temperature suitable for clothes washing, dish washing, and other sanitizing needs will scald and cause injury (Figure 21). If anyone using hot water in the building are children, elderly, infirm or physically handicapped persons, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions as listed below.

The Consumer Product Safety Commission and some states recommend domestic hot water temperature of 130°F or less.

When installing an automatic mixing valve, selection and installation must comply with valve manufacturer's recommendations and instructions.

Special precautions:

- Install an automatic mixing valve set according to the standards above.
- Use the lowest practical temperature setting.
- Check the water temperature immediately after the first heating cycle, and again after any adjustment is made.

Piping Tankless Heaters

1. Size piping no smaller than heater inlet and outlet.
2. Automatic mixing valve must be installed. See Figure 18. Follow the manufacturer's instructions.
3. Install and size flow regulating valves according to continuous draw of the heater. See Table 12. Follow manufacturer's instructions to install.
4. Operating control with small adjustable differential scale is recommended; install in the temperature control tapping in the heater plate.
5. Multiple tankless heaters (see Figure 22):
   a. Use a cold water supply header with individual risers to each heater.
   b. Use a hot water outlet header with individual risers to each heater.
   c. Size headers by increasing one pipe size for each additional heater.
   d. Do not pipe multiple heaters in series.
6. In hard water areas, soften cold domestic water supply to heaters to prevent lime build-up.

Figure 17 Hot water danger

Figure 18 Tankless heater piping

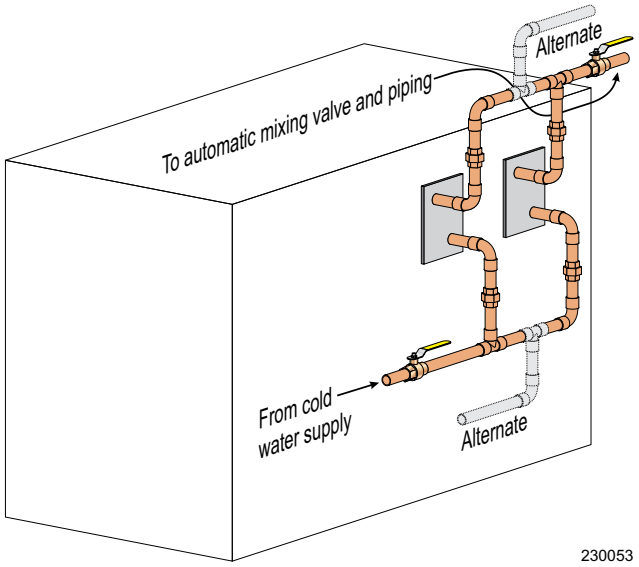


Table 8 Tankless heater ratings

Heater Number	Intermittent Draw* (GPM)	Continuous Draw* (GPM)**	Inlet and Outlet Tappings
590-921-910	9	11	3/4"

*Based on continuous draw with no recovery period.
**GPM is based on 40-140°F DHW with boiler water at 200°F.

C SA ® US
NSF/ANSI 372

Tankless water heaters for the 94 boilers have been tested and certified by CSA Group (certificate # 2552127).

Steam Boiler Controls

Installing the Controls

Install all controls as specified in the figures and tables on this page and pages 30-31.

⚠WARNING

Failure to properly install, pipe, and wire boiler controls can result in severe personal injury, death, or substantial property damage that is not covered by boiler warranty.

1. Install steam pressure operating and high limit controls and pressure gauge. See Figure 36, page 29.
2. Pressure limit control settings:
   a. Low – set according to design requirements.
   b. High – set at least 2 psi higher than low limit, 15 psi maximum.
3. Install water level controls and gauge glass per Figure 38, page 30.
   a. Fittings for controls to be furnished by others.
   b. If water level control is not shown in Figure 37, page 30, locate casting mark on control and install per manufacturer's instructions.

IMPORTANT

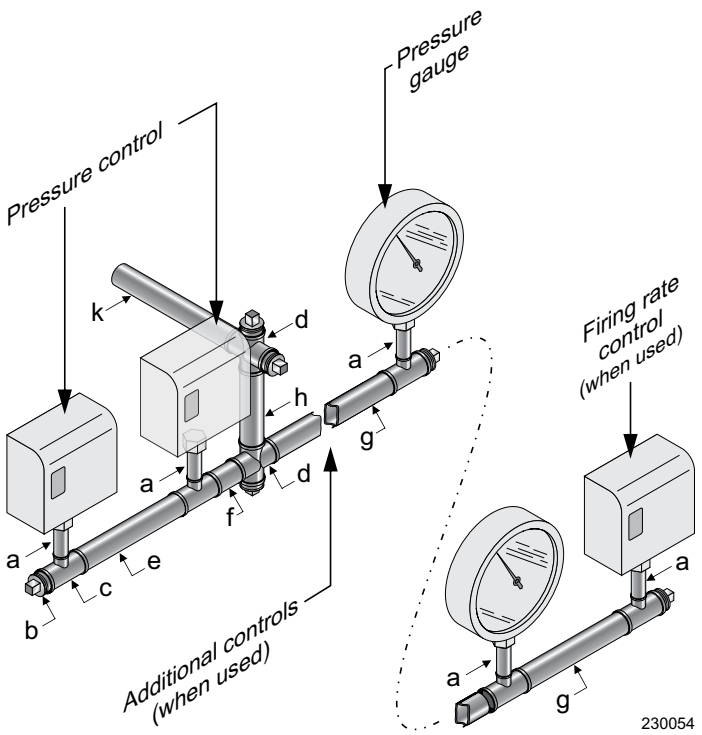
Do not use water level controls with quick hook-up fittings. Nuisance shutdowns will occur.

4. Install the relief valve(s) where shown in Figure 34 and Figure 35, page 29.
   a. Relief valve must be installed with spindle in vertical position.
   b. Do not make any other connection in the relief valve connection piping.

⚠WARNING

Pipe relief valve discharge through vertical piping to atmosphere. Use rigid material suitable for 375°F, threaded on one end only. Install drain pan elbow to drain condensate. Pipe near floor close to floor drain to eliminate potential severe burns. Do not pipe to any area where freezing could occur. Do not plug, valve, or place any obstruction in discharge line. Failure to comply can result in severe personal injury, death, or substantial property damage.

Figure 19 Steam control siphon and fittings



Manifold component sizing (Check local codes for sizing and cleanout requirements)			
Item	**Description**	**Size (inches)**	
		1494 – 2094	**2194 – 2594**
a	Nipple	1/2 x as needed	3/4 x as needed
b	Plug	1/2	3/4
c	Reducing tee	1/2 x 1/2 x 1/4	3/4 x 3/4 x 1/4
d	Cross	1/2	3/4
e	Nipple	1/2 x as needed	3/4 x as needed
f	Nipple	1/2 x as needed	3/4 x as needed
g	Nipple	1/2 x as needed	3/4 x as needed
h	Nipple	1/2 x CLOSE	3/4 x 4
k	Nipple	1/2 x 3 Add a 3/4 x 1/2 bushing at boiler connection	3/4 x 4

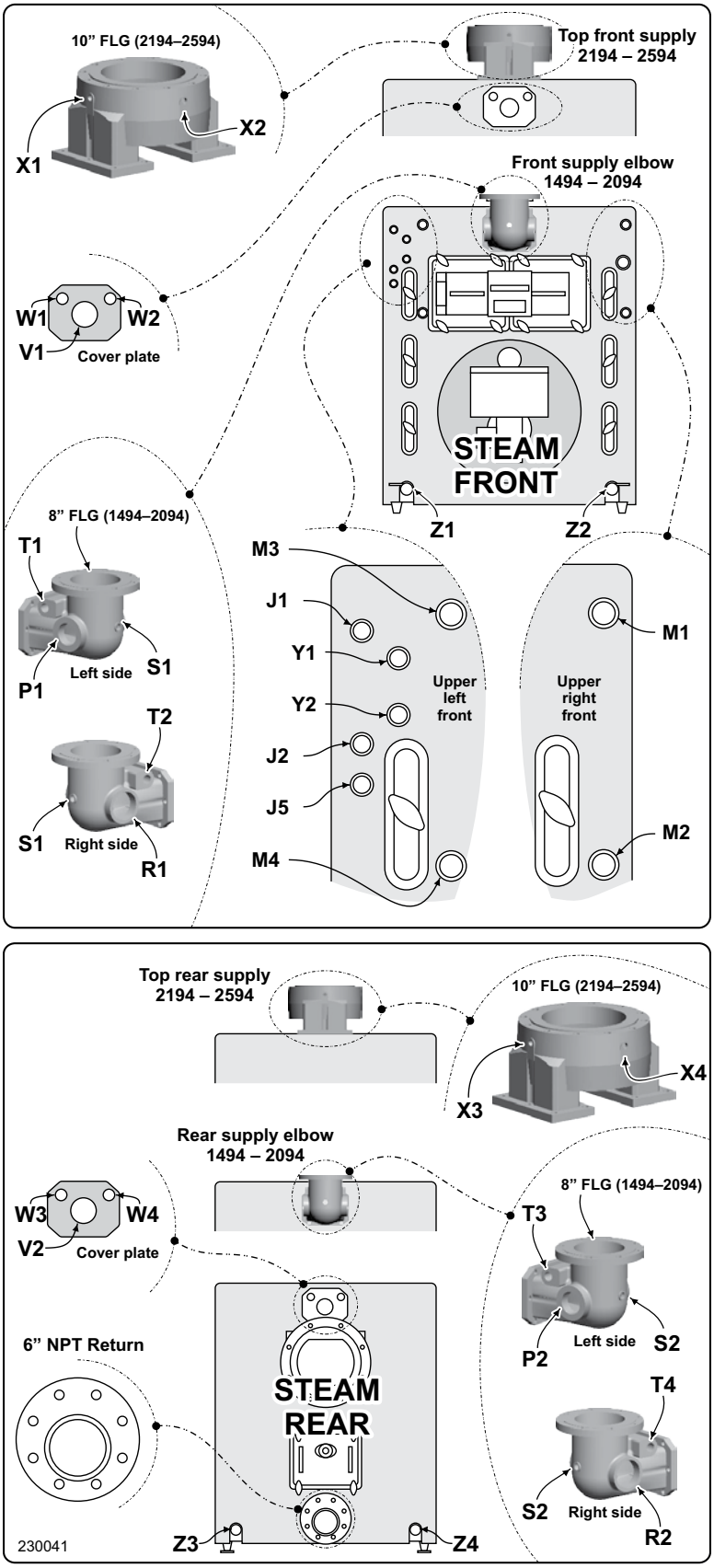
IMPORTANT

Controls and fittings must not obstruct cleanout openings or prevent required access to the boiler or components.

(continued on the next page)

Steam Boiler Controls, continued

Figure 20 Model 94 steam boiler control tappings



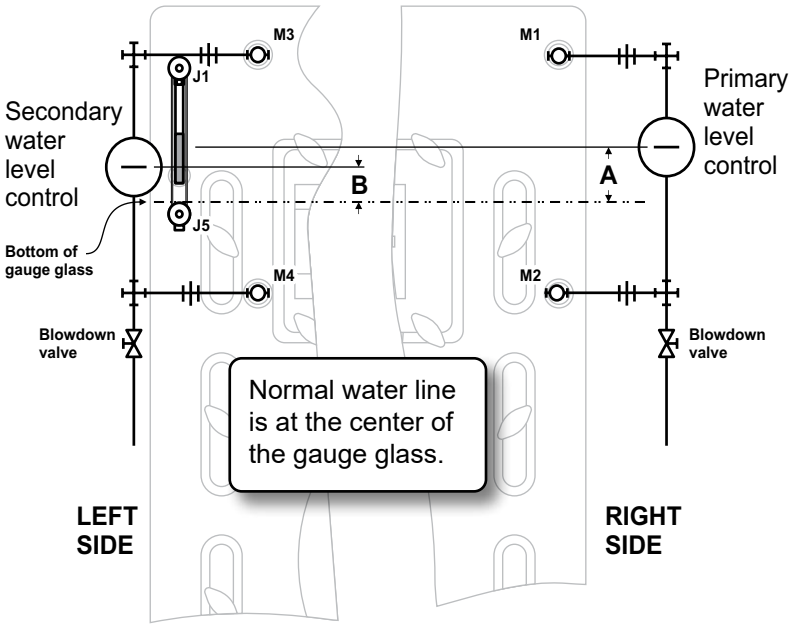
Location	Size	Function
J1 + J5	1/2	Gauge glass
J2	1/2	PLUG this tapping — not used
M3	1	PLUG this tapping — not used
M1 + M2	1	Float-type low water cutoff, LWCO/ pump control, or LWCO/feeder combination.
M3 + M4		
P1	3	Skim tapping
P2	3	Steam pressure relief valve
R1	4	Skim tapping
R2	4	Steam pressure relief valve
S1	3/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
S2	3/4	Pressure controls (limit, operating, etc.)
T1 or T2	1-1/4	Pressure controls (limit, operating, etc.)
T3 or T4	1-1/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
V1 or V2	4	Steam pressure relief valve – or – Skim tapping
W1 or W2	3/4	Steam pressure gauge – or – Pressure controls (limit, operating, etc.)
W3 or W4	3/4	Pressure controls (limit, operating, etc.)
X1 & X2	1-1/4	PLUG these tappings — not used
X3 & X4	1-1/4	PLUG these tappings — not used
Y1 & Y2	3/8	Try cocks
Z1 or Z2	2	Cleanout tappings, front section. Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping.
Z3 or Z4	2	Cleanout or drain tappings, rear section. Install drain valve in one tapping, and 2" NPT x 2-1/2" length nipple and 2" NPT cap in the other tapping.
—	—	Low limit temperature control (when using tankless heaters). Locate in control tapping on one of the tankless heaters.

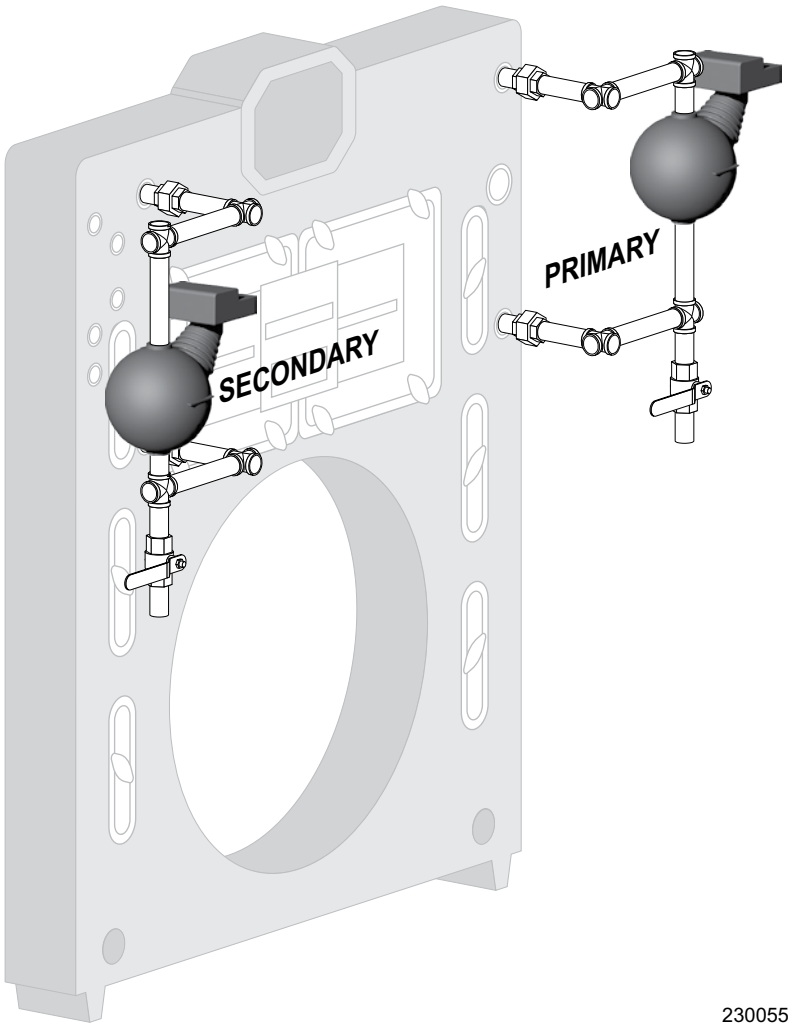
IMPORTANT

Controls and fittings must not obstruct cleanout openings or prevent required access to the boiler or components.

Boiler model	Minimum drain/ blow-off valve size
1494-2194	1-1/4"
2294-2594	2"

Figure 21 Water level control locations





230055

Primary Water Level Control	Casting line height above bottom of gauge glass	Backup Water Level Control	Casting line height above bottom of gauge glass
Note 1	**"A"**	Notes 1, 2	**"B"**
61, 63	1/4"	None	—
	1/2"	61, 63	1/4"
93, 193, 94 (Note 3)	2"	None	—
	2"	93, 193, 94	1/4"
	2"	61, 63	1/4"
	2"	51-2 (1494 to 1594 only) – or – 51-S-2 (all sizes)	1/4"
51-2 **51-S-2** (Note 3)	1"to 1-1/4"	None	—

Notes:

1. Other manufacturers' controls providing similar functions may be used if properly located and selected.
2. Use LWCO function only. Pump controller function must only be handled by the primary control.
3. When the pump control is used with a feedwater tank, install the pump control on the boiler and the makeup water feeder on the tank. Use a separate LWCO on the boiler when back-up is needed. Do not install a combination LWCO with feeder as a back-up control on boiler. The feeder will operate before the pump control operates.

Lowest Acceptable Operating Water Level 1/4" above bottom of Gauge Glass

Lowest Permissible Water Level 1" below visible portion of Gauge Glass

550-430-732_0113

Baffle Assembly and Installation

Boiler Baffle System

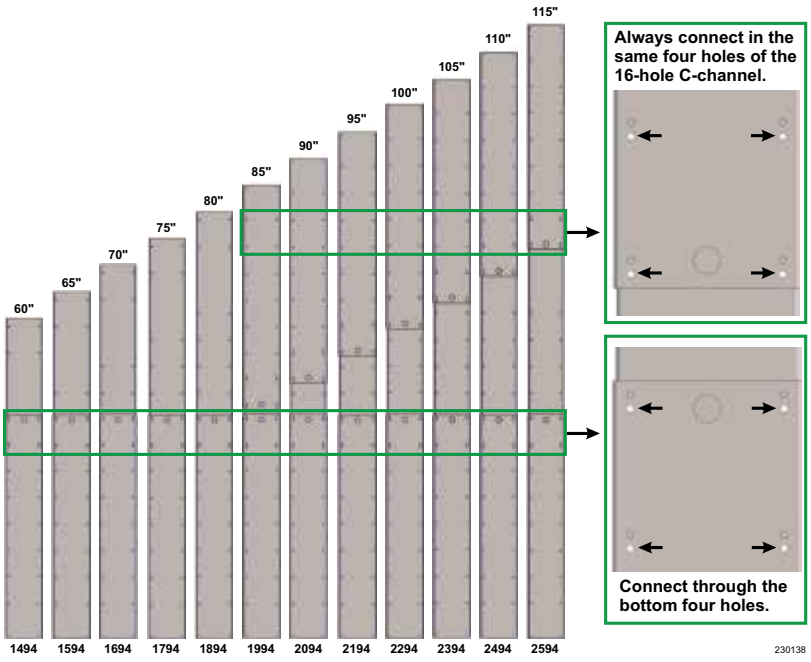
The 94 Series 4 baffle system is a combination of two types of baffles. The first baffle type is for the two 2nd flue-ways (outer), and the second baffle type is for the two 3rd flue-ways (inner). See Figure 23. The flue-way doors can only be opened one at a time. Baffle assembly and installation starts on either side of the boiler, then repeated on the other side of the boiler.

2nd flue-ways (outer):
A telescoping-style, elongated C-channel is inserted into the 2nd flue-ways across the third side fins from the bottom. See Figure 24, page 33.The 2nd flue-way baffle is designed to extend 5” for every 6”-wide intermediate section of the boiler. This baffle comes with hardware (two sheet metal screws, and either four or eight clevis pins) to telescope the mating C-channel parts into the proper length for each boiler size. See Figure 22 and Table 9.

3rd flue-ways (inner):
Left-hand and right-hand sub-assemblies are assembled together in the 3rd flue-ways to create a flat, rectangular plate assembly. See Figure 29, page 36. The assemblies are created in combinations of four, five, or seven rectangular plates at the center of each intermediate casting. These groups are connected together by four side rails to ensure a rectangular plate is at the center of each intermediate casting for the entire length of the boiler.

Each boiler size has a unique width of rectangular plate. Thus, the right-hand and left-hand sub-assemblies come with a range of connection holes to create the proper width of baffle for the boiler size. See Table 9 and Figure 27, page 35.

Figure 22 C-channel lengths for 2nd flue-way

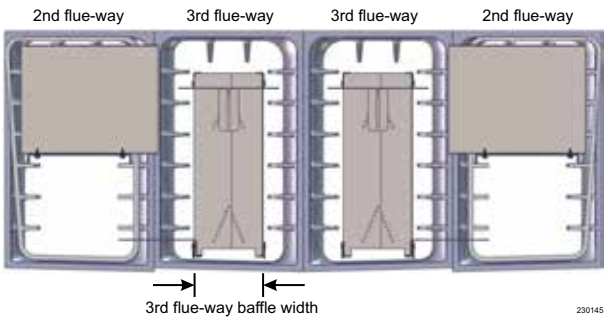


Connect the C-channel pieces through the four holes shown within each of the rectangular boxes above with four clevis pins.

Table 9 Baffle length and width chart

Boiler Size	2nd Flue-Way Baffle Length (inches)	3rd Flue-Way Baffle Width (inches)
1494	60	4.4
1594	65	4.2
1694	70	3.9
1794	75	3.6
1894	80	3.4
1994	85	3.1
2094	90	2.8
2194	95	2.6
2294	100	2.3
2394	105	2.0
2494	110	1.8
2594	115	1.5

Figure 23 Front view of completed baffle assembly



Installing the 2nd Flue-Way Baffles

Before installation, open either the left-hand or right-hand flue-way door to access the 2nd and 3rd flue-ways on that side. For boiler sizes 1994-2594, proceed to page 34.

Boilers 1494 through 1894

1. Identify the long C-channel piece with 16 smaller holes. This C-channel slides inside the other C-channel piece that has 22 smaller holes.
2. Use the information in Figure 22 and Table 9 on page 32 to identify which set of four holes will mate up between the two C-channels to create the length needed for the boiler size.
3. Mark all four holes on both C-channels with a paint dot next to it; this allows for identification throughout the assembly.
4. Insert the 16-hole C-channel on the side casting fins located at the third row from the bottom. Refer to Figure 24. Make sure the large 1" hole at the end faces the front of the boiler.
5. Once the marked holes are just outside of the boiler, bring the 22-hole C-channel up to the 16-hole C-channel already in the flue-way.
   a. Make sure the large 1" hole on the 22-hole C-channel is facing into the boiler.
   b. Line up the marked holes on both C-channels.
   c. Use four clevis pins from the baffle hardware bag to connect the two C-channels from the top through the marked holes.
   d. Install cotter pins under the C-channels.
6. Continue to slide the two C-channels together into the boiler until there is 1” of length protruding from the flue-way. See Figure 24.
7. Use a tape measure to confirm that the baffle is the correct length for the boiler size. Refer to Table 9, page 32.

NOTICE

Verify the baffles are the correct length for the boiler. An incorrect baffle length can adversely affect the performance of the boiler.

8. Insert the 10” x 7” blocker piece from the 3rd flue-way side on top of the C-channel with the bite holes facing down. Align the holes such that the blocker piece edge lands exactly halfway between the 2nd and 3rd flue-way entrances.

Figure 24 C-channels installed – boilers 1494-1894

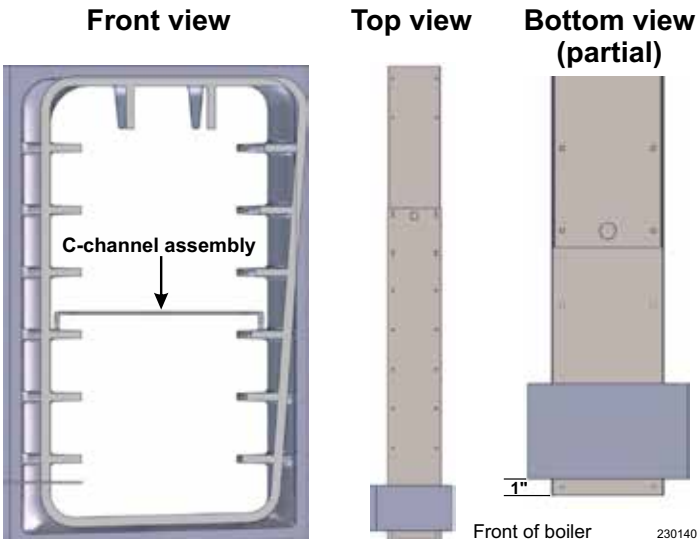
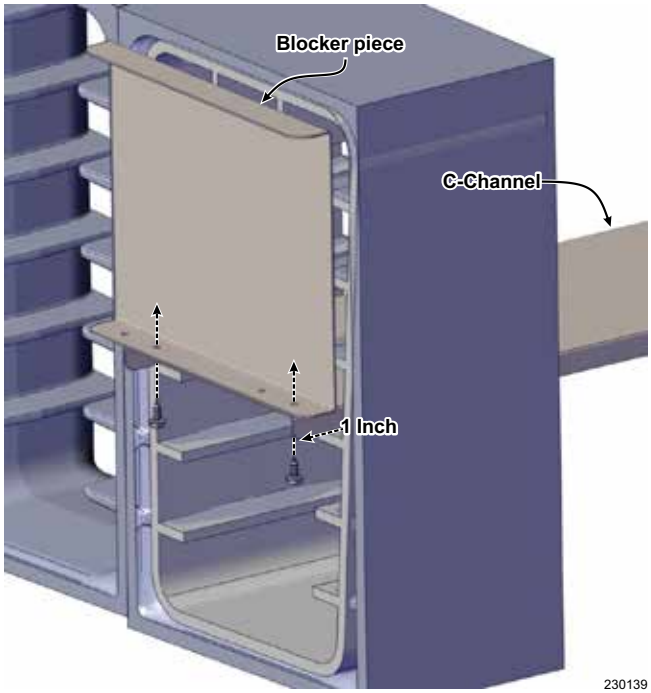


Figure 25 Blocker piece installation (right-hand side shown)



9. Secure the blocker piece to the C-channel with two sheet metal screws from the baffle hardware bag. See Figure 25.
   a. Insert the screws from underneath the C-channel piece through the holes.
   b. Screw into the bite holes of the blocker piece with a 5/16” nut driver or hex head wrench to create the final assembly as shown.
10. Proceed to the 3rd flue-way assembly instructions on page 35.

Baffle Assembly and Installation, continued

Installing the 2nd Flue-Way Baffles, cont.

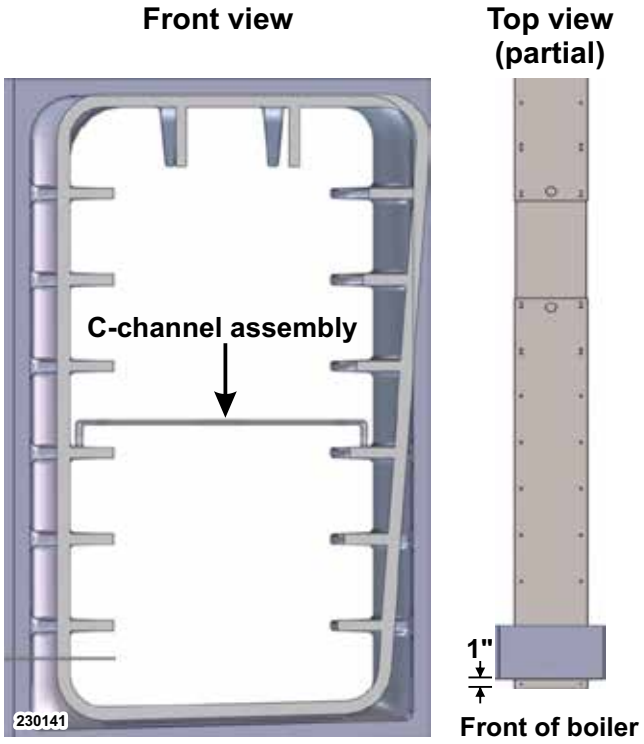
Before installation, open either the left-hand or right-hand flue-way door to access the 2nd and 3rd flue-ways on that side.

2

Boilers 1994 through 2594

1. Identify the long C-channel piece with 16 smaller holes. This C-channel slides inside the C-channel pieces with 22 smaller holes.
2. Identify which set of four holes will mate up between the two 22-hole and the 16-hole C-channels to create the length needed for the boiler size. Refer to Table 9, page 32
   a. Make sure the large 1" holes are facing towards the front of the boiler for the first 22-hole C-channel and the 16-hole C-channel.
   b. The large 1" hole on the second 22-hole C-channel must be facing the back of the boiler.
3. Mark all the mating holes on the C-channels with a paint dot next to them for identification throughout the assembly.
4. Insert the first 22-hole C-channel on the side casting fins located at the third row from the bottom. Make sure the large 1" hole at the end faces the front of the boiler.
5. Once the marked holes are just outside of the boiler, bring the 16-hole panel with the large 1” hole towards the front of the boiler up to the other C-channel.
6. Use four clevis pins from the baffle hardware bag to connect the two C-channels together through the marked holes. Insert the cotter pins.
7. Continue to slide the two C-channels together into the boiler until the marked holes are just outside of the boiler.
8. Bring the second 22-hole C-channel up to the boiler, with the 1” hole facing the back of the boiler.
9. Use four clevis pins from the baffle hardware bag to connect the second 22-hole and 16-hole C-channels together through the marked holes. Insert the cotter pins.
10. Slide all three C-channels together into the boiler until the last C-channel has 1" of length protruding from the flue-way. See Figure 26.

Figure 26 C-channels installed – boilers 1994-2594



11. Use a tape measure to confirm that the correct length of baffle was assembled for your boiler size. Refer to Table 9, page 32.

NOTICE

Verify the baffles are the correct length for the boiler. An incorrect baffle length can adversely affect the performance of the boiler.

12. Insert the 10” x 7” blocker piece from the 3rd flue-way side on top of the protruding C-channel with the bite holes facing down. Align the holes such that the blocker piece edge lands exactly halfway between the 2nd and 3rd flue-way entrances.
13. Secure the blocker piece to the protruding C-channel with the two sheet metal screws from the baffle hardware bag. See Figure 25, page 33
    a. Insert the screws from underneath the C-channel piece through the holes.
    b. Screw into the bite holes of the blocker piece with a 5/16” nut driver or hex head wrench to create the final assembly as shown.

Assembling the 3rd Flue-Way Baffles

1. Confirm the quantity of rectangular baffle plate configurations is correct for the boiler size. Refer to Figure 46, page 65.
2. Each boiler size requires a different width of baffle in the 3rd flue-way.
   a. Each rectangular configuration of baffles is shipped in a left and right half.
   b. The two halves are assembled together at the correct width for the boiler size.
   c. Use the four sheet metal screws for the assembly, with two screws at each end.
3. Align the correct holes on the rectangular face of the left and right halves of the baffle to create the required width for the boiler size. The left-hand side must be the front baffle. Refer to the figures on this page and Table 9, page 32.
4. The same "Λ" shape pattern of holes is created on the top and bottom of the baffles as the two halves are brought together.
5. Once the holes are aligned, screw in two sheet metal screws.
   a. These screws go in the bottom of the first and last baffle of the combination being assembled.
   b. The screw tips must always point in toward the other rectangular baffles to keep sharp points away from the ends.
6. Screw a sheet metal screw into the top of the last baffle of the combination being assembled. Ensure the point of the screw is pointing towards the other rectangular baffles.

(continued on the next page)

Figure 27 Baffle plate width holes per boiler size

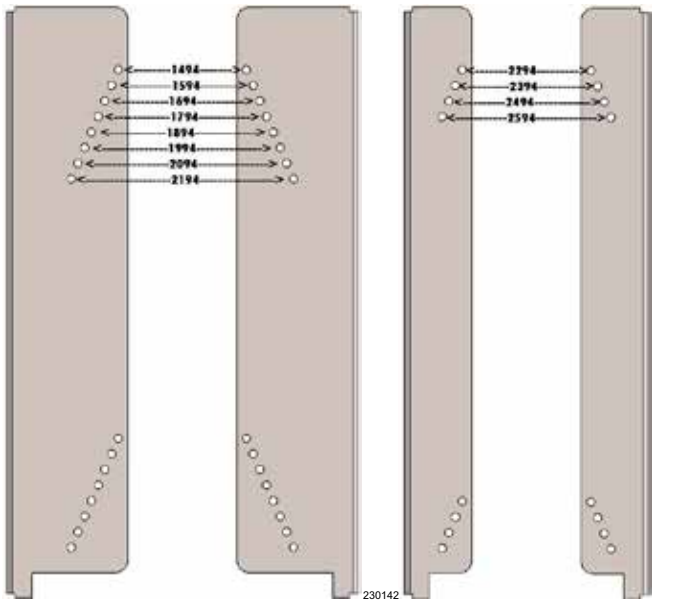
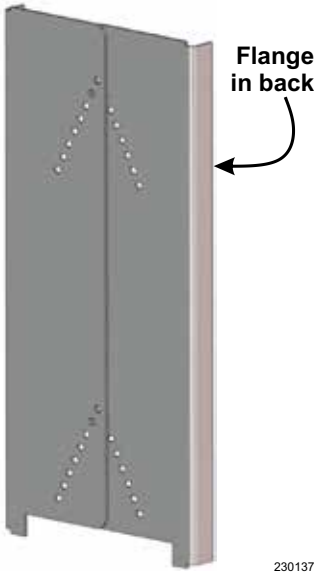


Figure 28 3rd flue-way baffle orientation

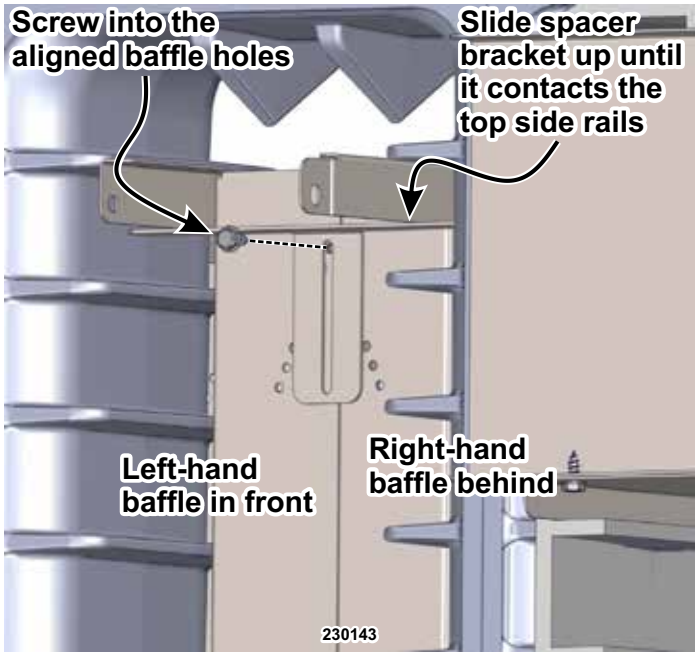


Baffle Assembly and Installation, continued

Assembling the 3rd Flue-Way Baffles, cont.

7. Complete the baffle assembly. Refer to Figure 29.
   a. Align the slot of the spacer bracket with the final hole assembly.
   b. Start the last sheet metal screw into the top of the front baffle.
   c. Slide the spacer bracket upwards until it comes in contact with the top side rails.
   d. Complete the threading of the sheet metal screw to complete the assembly.
   e. Confirm that the spacer bracket is firmly against the top side rails to help space the assembled baffle in the flue-way.
8. The remaining rectangular halves between the first and last rectangle baffles do not require screws. Once the two ends have been screwed together, the middle plates should be close to flush, and the halves should overlap without the need for any screws.
9. Once this first baffle combination has been assembled, measure the assembly width. Confirm the width of the assembled baffle matches the width in Table 9, page 32 for the boiler size.
10. Repeat steps 5-7 in this section for all remaining baffle half combinations that were shipped with the boiler.

Figure 29 Spacer bracket installation



Installing the 3rd Flue-Way Baffles

1. The 3rd flue-way assembled baffles come in combinations of four, five, and seven rectangular flat plates, with small side flanges affixed between four side rails.
2. The bottom of each baffle is indicated by the half-circle lifters spot-welded onto the side rails.
3. Confirm that the quantity of available assembled baffles matches the quantity of intermediate sections in the boiler.
   a. Example: A 2094 boiler has one front casting, one rear casting, and 18 intermediate castings. Therefore, a 2094 boiler requires 18 flat-plate baffles in the 3rd flue-ways.
4. Insert one baffle combination (four, five, or seven) into the 3rd flue-way at a time.
   a. Use four clevis pins to connect each additional flat plate baffle assembly through the mating holes at the end of each rail.
   b. Make sure to have the cotter pin end of the clevis pin to the inside of the baffle (see Figure 30).
   c. Insert cotter pins into the ends of the clevis pins.
5. Continue to insert and connect additional four, five, or seven baffle plate assemblies until the installed quantity matches the quantity of intermediate castings for the boiler size.
6. Once all flat plate baffles have been inserted and connected, retrieve the 3rd flue-way baffle locator bracket from the baffle hardware bag. See Figure 31.
   a. Use the 1/4" bolt and nut to connect the locator bracket to the lower right-hand rail hole connection on the right-hand side of the boiler, or the lower left-hand side rail hole connection on the left-hand side of the boiler.
   b. Only one locator bracket is required for each of the 3rd flue-ways.
   c. Push the entire 3rd flue-way baffle connected combination back until the locator bracket lands against the casting face that divides the 3rd and 2nd flue-ways. See Figure 32.
   d. There will be leftover locator brackets after assembly and installation. Only two locator brackets are required per boiler, one bracket for each 3rd flue-way. See Figure 32.
7. Close the flue-way door.

Figure 30 Clevis pin installation

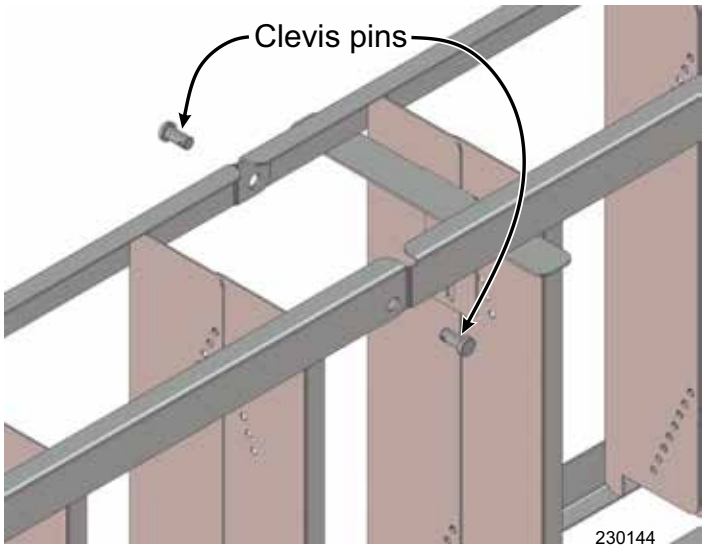


Figure 31 Locator bracket

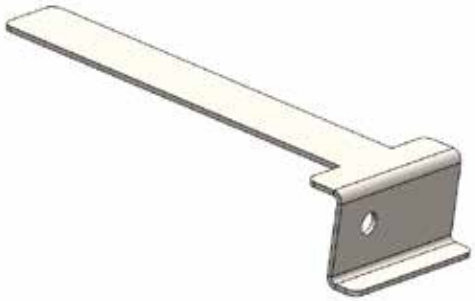
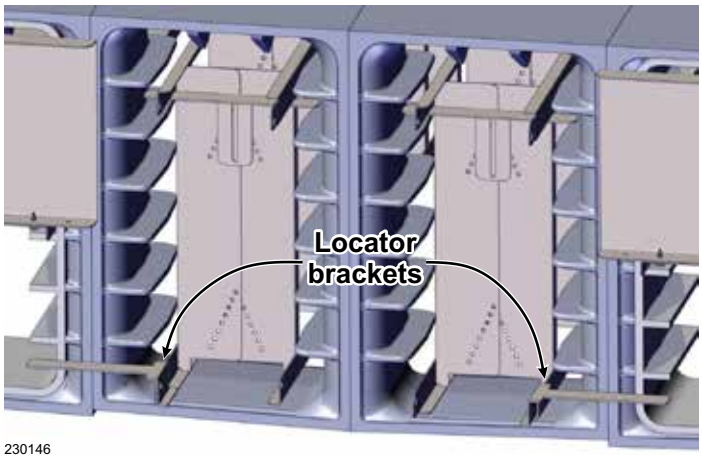


Figure 32 Front view with locator bracket



IMPORTANT

If only one side of the boiler has been completed, open the other flue-way door, and repeat the entire process for the 2nd and 3rd flue-way on the other side.

Commonwealth of Massachusetts Installations

Commonwealth of Massachusetts — When the boiler is installed within the Commonwealth of Massachusetts, the boiler must be installed by a licensed plumber or gas fitter. Read and comply with the instructions below.

1. **REQUIREMENTS:** For all sidewall horizontally-vented gas-fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than 7 feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

   a. **INSTALLATION OF CARBON MONOXIDE DETECTORS**. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
      - In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
      - In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

   b. **APPROVED CARBON MONOXIDE DETECTORS**. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

   c. **SIGNAGE**. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of 8 feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, “GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS.”

   d. **INSPECTION**. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.

2. **EXEMPTIONS**: The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:
   a. The equipment listed in Chapter 10 entitled “Equipment Not Required To Be Vented” in the most current edition of NFPA 54 as adopted by the Board; and
   b. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

3. **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED**. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:
   a. Detailed instructions for the installation of the venting system design or the venting system components; and
   b. A complete parts list for the venting system design or venting system.

4. **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED**. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies “special venting systems”, the following requirements shall be satisfied by the manufacturer:
   a. The referenced “special venting system” instructions shall be included with the appliance or equipment installation instructions; and
   b. The “special venting systems” shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

5. **INSTALLATION INSTRUCTIONS.** A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

Venting and Combustion Air - General

Code Compliance

Venting and combustion air piping installations must provide provisions in accordance with the section, “Air for Combustion and Ventilation,” of the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition, and applicable provisions of the local building codes.

⚠ DANGER

Inspect finished vent piping thoroughly to ensure all are airtight and comply with instructions in this manual and applicable codes. Verify that all air openings are correctly sized, unobstructed, and free of airborne contaminants. Failure to provide a properly installed vent system will cause severe personal injury or death.

Combustion Air Contamination

Provide combustion air openings or air inlet piping as described in this manual. See Table 10 for products and areas that may cause contaminated combustion air.

Dual Fuel Venting Requirements

⚠ WARNING

A venting system in a Dual Fuel installation should meet the requirements for both fuels. Failure to follow the vent system requirements specified in this manual can result in severe personal injury, death, or substantial property damage.

When the installation calls for a Dual Fuel burner, Gas and Oil, the vent system must be designed with the specific requirements of both fuels as specified in the Gas and Oil sections on pages 44-48.
The vent system must be certified to both UL 1738 and UL 641, and any local codes having jurisdiction. Contact your preferred vent supplier for available products.

Table 10 Corrosive contaminants and sources

Products to avoid
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes and cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid and muriatic acid
Cements and glues
Anti-static fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents
Adhesives used to fasten building products and other similar products
Excessive dust and dirt

Areas likely to have contaminants
Laundry and dry cleaning areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops

Venting and Combustion Air Options

Existing Category I Vent System

⚠WARNING

Follow all venting and piping instructions. Failure to follow all instructions can cause flue gas spillage and carbon monoxide emissions, which can result in severe personal injury or death.

For additional venting requirements, see page 45.

Removal of the previous boiler may cause an issue for the appliances that remain on the old common vent as the vent may be too large. The following test is intended to check for proper operation of the appliances remaining on the old common vent system.

Test Procedure for Existing Vent System

Perform this test when removing a boiler from the common venting system. The following steps shall be followed with each appliance remaining connected to the common venting system. Test each appliance separately while in operation. Ensure all other appliances connected to the common vent are not in operation. Seal any unused openings in the common venting system before proceeding with the test.

1. Visually inspect the venting system for proper size and horizontal pitch. Ensure there is no blockage, restriction, leakage, corrosion, or other deficiency that can cause an unsafe condition.
2. Close all building doors and windows as practical. Close all doors between the location of the appliances connected to the common venting system and other spaces of the building.
3. Turn on the clothes dryer and any other appliance not connected to the common venting system. Turn on all exhaust fans, except for a summer exhaust fan, and operate at maximum speed. Exhaust fans include range hoods and bathroom fans. Close fireplace dampers.
4. Place the appliance being inspected into operation. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after five minutes of main burner operation. Use the flame of a match or candle, or smoke from a smoke stick.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined here, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

Correct any improper operation of the common venting system so the installation conforms with the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition. When resizing any portion of the common venting system, approach the minimum size as determined using the appropriate tables in part 11 of the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition.

Room Air Openings

Combustion Air Provision

The 94 commercial boiler can use inside air if no contaminants are present in the boiler space. If contaminants are likely to be present, install the boiler as a direct vent appliance. Use the appropriate vent instructions in this manual.

The boiler room must be fitted with combustion air openings large enough to provide air for all appliances in the room. Use the following information to size the openings. Ensure the installation complies with all applicable codes and standards.

Sizing Combustion Air Openings

Air openings provide ventilation to prevent overheating of the boiler controls and boiler space. Air is also needed for other appliances located in the same space. Use the information in Figure 33, page 42 for air openings.

⚠WARNING

Air openings must be sized to handle all appliances and air movers, such as exhaust fans, using the air supply. Failure to comply can result in severe personal injury, death, or substantial property damage.

The sizing given in Figure 33, page 42 is based on the National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition. The sizing allows adequate air openings for gravity-vented gas appliances (Category I), in addition to the needs for the 94 boiler, provided the boiler room is not subjected to negative pressure due to exhaust fans or other mechanical ventilation devices.

The 94 commercial boiler has varying requirements for combustion and ventilation air, reflected by the special sizing instructions given in this manual. Refer to the National Fuel Gas Code for dealing with other conditions.

Free area and louvers

The free area of openings means the area after reduction for any installed louvers or grilles. Be sure to consider this reduction when sizing the air opening.

Special Considerations

Tight construction

The National Fuel Gas Code – ANSI Z223.1/NFPA 54, latest edition defines unusually tight construction where all of the following is true:

1. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings fitted with gaskets.
2. Weather-stripping has been added on windows and doors that are capable of being opened.
3. Caulking or sealants are applied to areas such as joints around windows and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical, and gas lines, and in other openings.

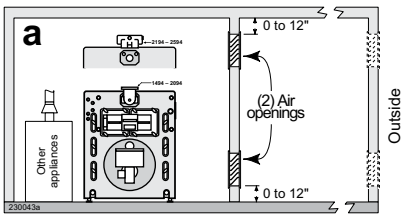
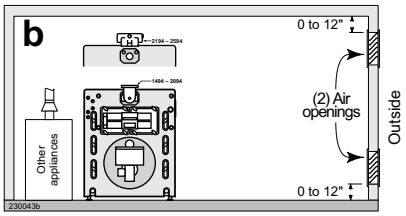
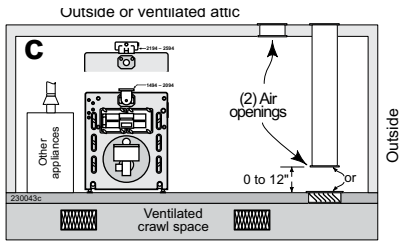
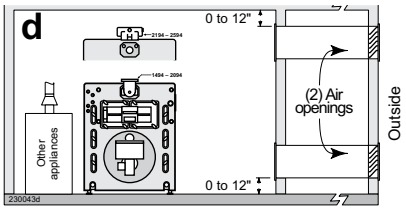
For buildings with such construction, provide air openings into the building from outside. Size the openings per the appropriate condition in Figure 33, page 42 if appliances are to use inside air for combustion and ventilation.

Exhaust fans and movers

The appliance space must never be under a negative pressure. Always provide air openings sized to the dimensions required for the firing rate of all appliances, with the ability to handle the air movement rate of the exhaust fans or air movers using air from the building or space.

Room Air Openings, continued

Figure 33 Minimum combustion air openings

Air openings The required air opening sizes below are FREE AREA, after reduction for louver obstruction. See the important below for large spaces.	**94 boiler WITH other appliances in the same room**	**94 boiler WITHOUT other appliances in the same room**
	Two openings, each at least: 1 square inch per 1,000 Btuh of all appliances in the room, but not less than 100 in^2.	Two openings, each at least: 1 square inch per 1,000 Btuh of all appliances in the room, but not less than 100 in^2.
	Two openings, each at least: 1 square inch per 2,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room	Two openings, each at least: 1 square inch per 2,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room
	Two openings, each at least: 1 square inch per 4,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room	Two openings, each at least: 1 square inch per 4,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room
	Two openings, each at least: 1 square inch per 2,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room	Two openings, each at least: 1 square inch per 2,000 Btuh of all appliances in the room -OR- One opening* at least: 1 square inch per 3,000 Btuh of all appliances in the room
* Requirements for using the single air opening option	A single combustion air opening can be used for cases b, c, or d above, sized as listed, provided that the following are met: • The single opening must communicate directly to open air outside of the building or to a space that communicates directly to the outside of the building. • The top of the opening must be within 12" of the ceiling. • The free area of the opening must be at least equal to the sum of the areas of all equipment vent connectors in the space.	
IMPORTANT *A special exception exists for large spaces. See the information to the right.*	No combustion air openings are needed when the boiler and other appliances are installed in a space with a volume no less than 50 cubic feet per 1,000 Btuh of all appliances in the space. The building must NOT be of tight construction. Calculation: Take the total inputs of all appliances in MBH (1,000s Btuh) and multiply by 50. The space volume must be equal to or greater than the total of this calculation. [Total appliances input in MBH x 50] ≥ space volume Example: For a total input of 1500 MBH (1,500,000 Btuh), the minimum space volume necessary would be 1500 x 50 = 75,000 cubic feet.	

Breeching and Venting

General Venting Information

Model 94 boilers operate with positive pressure. Adjust damper assembly during burner start-up to achieve 0.1" W.C. positive pressure at damper sample hole. See Figure 43, page 51.

⚠WARNING

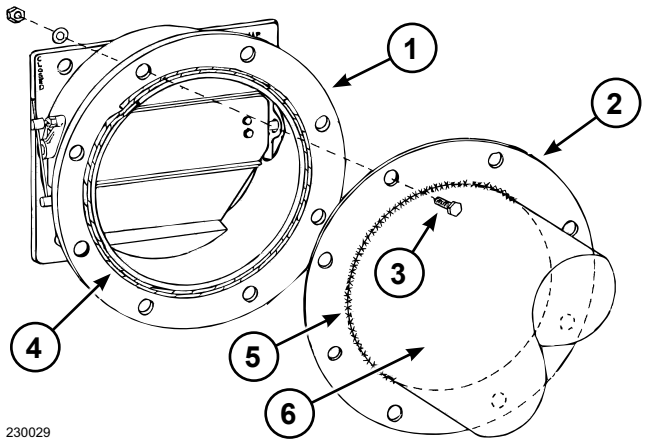
Seal the venting system gas-tight, and connect the breeching with welded seams and joints. Do not use conventional flue pipe as it could leak flue gases and carbon monoxide emissions through seams and joints, which can result in severe personal injury or death.

Construct Metal Breeching

Select material type and thickness in compliance with local codes. See Table 11 for minimum breeching diameter. Refer to ASHRAE Guide for chimney and breeching calculations and construction and lining.

1. 1494-2194 boilers – construct stub to attach breeching. Refer to Figure 34.
   a. Use 16 gauge or heavier steel breeching, 20" nominal diameter, and a minimum 6" length so damper can open.
   b. Unbolt the breeching counter flange from flue collar flange.
   c. Insert or butt the breeching stub against the counter flange so stub is square to flange. Stub must not extend past the face of the flange.
   d. Weld stub to flange gas-tight. Use caution when welding to avoid warping the flange.
   e. Make sure the sealing rope is intact on the flue collar flange.
   f. Attach the flange and stub assembly to the flue collar using provided 1/2" x 1-1/2" machine bolts and washers. The connection must be gas-tight.
2. 2294-2594 boilers – attach factory-supplied breeching adapter.
   a. The boiler is supplied with a flanged breeching adapter 22" diameter x 12" long.
   b. Make sure the sealing rope is intact on the flue collar flange.
   c. Attach the flange/stub assembly to the flue collar using provided 1/2" x 1-1/2" machine bolts and washers. The connection must be gas-tight.

Figure 34 Metal breeching, models 894-2194



1. Flue collar flange
2. Counter flange
3. Machine bolts, nuts, and washers, 1/2" x 1-1/2" (8 ea.)
4. Sealing rope, 3/8" diameter
5. Gas-tight weld to breeching adapter pipe
6. Breeching pipe, 20" diameter, minimum 6" long (by installer)

Table 11 Minimum breeching diameters

Boiler model	AHRI vent or liner diameter (inches)		Boiler flue collar dimensions (inches)
	Balanced draft*	Forced draft*	
1494	24**	18**	20 round, flanged
1594	24**	18**	20 round, flanged
1694	24**	18**	20 round, flanged
1794	24**	20	20 round, flanged
1894	27**	20	20 round, flanged
1994	27**	20	20 round, flanged
2094	27**	20	20 round, flanged
2194	27**	20	20 round, flanged
2294	27†	22	20 round, flanged†
2394	30†	22	20 round, flanged†
2494	30†	22	20 round, flanged†
2594	30†	22	20 round, flanged†

*See page 45 for gas venting, and page 48 for oil venting.
**Breeching can be reduced or increased to the size listed above after welding the counter flange to the adapter.
†Breeching size can be increased after the adapter if required for the application.

⚠WARNING

Long horizontal breechings, excessive tees and elbows, or other obstructions restricting combustion gas flow can result in condensation, flue gas leakage, and carbon monoxide emissions, which can result in severe personal injury or death.

Gas Venting Requirements — General

General Gas Venting Information

The 94 boilers operate with positive overfire pressure. Adjust the damper assembly during burner start-up to achieve 0.1" W.C. positive pressure at damper sample hole. See page 51 for more information.

Engineered Vent System

⚠WARNING

Conventional Category I flue pipe should not be used as it could leak flue gases, carbon monoxide emissions, and acidic condensate through seams and joints, which can result in severe personal injury or death.

The vent system for a Category I or III model 94 steam boiler is considered a designed and engineered vent system. This system should be designed by a professional using accepted engineering practices in accordance with local authority having jurisdiction.

See Table 12 for technical data for an engineered vent system. Weil-McLain recommends contacting your preferred vent supplier to provide design support.

Table 12 Technical data for sizing engineered vent system

Natural Gas Chart								
Boiler Model	**Input**	**Stack / Vent Flow Rate***	**Typical Flue Temperature***	**Damper Assembly Port Pressure**	**Category I**	**Category III**	**Boiler Flue Collar Diameter**	**Vent Connection and Minimum Vent Diameter**
	BTU/hr	CFM	°F	Inches W.C.	Inches W.C.	Inches W.C.	Inches	Inches
1494	4,550,000	1511	365-385	0.1	-0.1 to 0	0 to 0.1	20	18
1594	4,900,000	1627	365-385	0.1	-0.1 to 0	0 to 0.1	20	18
1694	5,250,000	1743	365-385	0.1	-0.1 to 0	0 to 0.1	20	18
1794	5,600,000	1859	365-385	0.1	-0.1 to 0	0 to 0.1	20	20
1894	5,950,000	1976	365-385	0.1	-0.1 to 0	0 to 0.1	20	20
1994	6,300,000	2092	365-385	0.1	-0.1 to 0	0 to 0.1	20	20
2094	6,650,000	2208	365-385	0.1	-0.1 to 0	0 to 0.1	20	20
2194	7,000,000	2324	365-385	0.1	-0.1 to 0	0 to 0.1	20	20
2294	7,350,000	2440	365-385	0.1	-0.1 to 0	0 to 0.1	20	22
2394	7,700,000	2557	365-385	0.1	-0.1 to 0	0 to 0.1	20	22
2494	8,050,000	2673	365-385	0.1	-0.1 to 0	0 to 0.1	20	22
2594	8,400,000	2789	365-385	0.1	-0.1 to 0	0 to 0.1	20	22

*Based on the unit operating at nominal conditions. This value can vary based on the installation location and the operating conditions.

Types of Gas Venting Systems

Category III venting: positive pressure and not likely to condense in the vent.
Boiler, breeching and vent operate at positive pressure. The entire engineered vent system must be rated for Category III venting. Ensure 0.1" positive pressure at test opening. The minimum vent height is 3 feet above roof or snow line, and in accordance to local codes that have jurisdiction. See Figure 35.

Category I venting: negative pressure and not likely to condense in the vent.
Boiler operates with positive pressure overfire. Chimney may provide excess draft, which may require the installation of a draft control device to minimize draft in accordance to local codes that have jurisdiction. The control must be set to maintain 0.1" positive pressure at the flue collar. The minimum vent height is 3 feet above roof or snow line, and in accordance to local codes that have jurisdiction. See Figure 36 and Figure 37.

Figure 35 Category III venting, single boiler (typical shown)

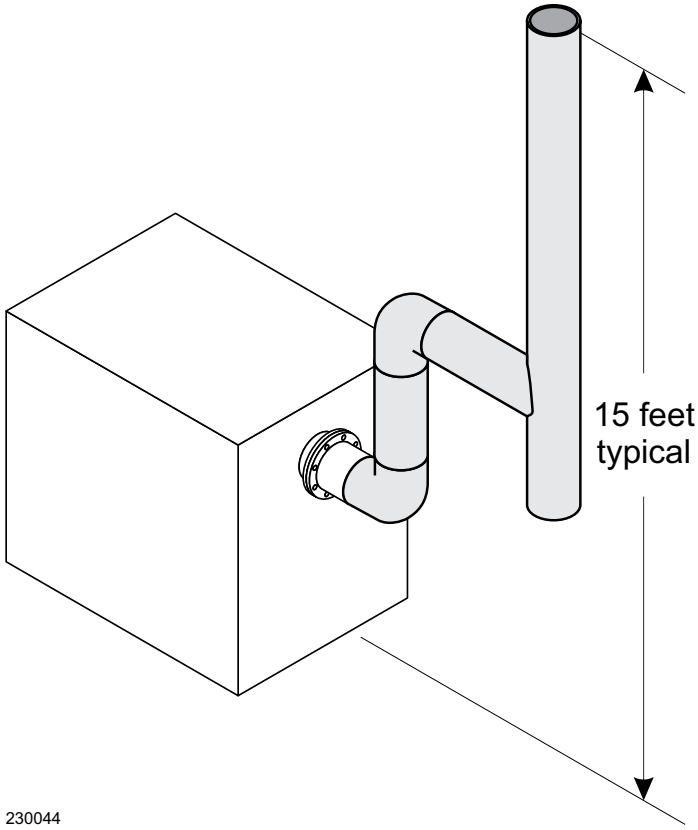


Figure 36 Category I venting, single boiler (typical shown)

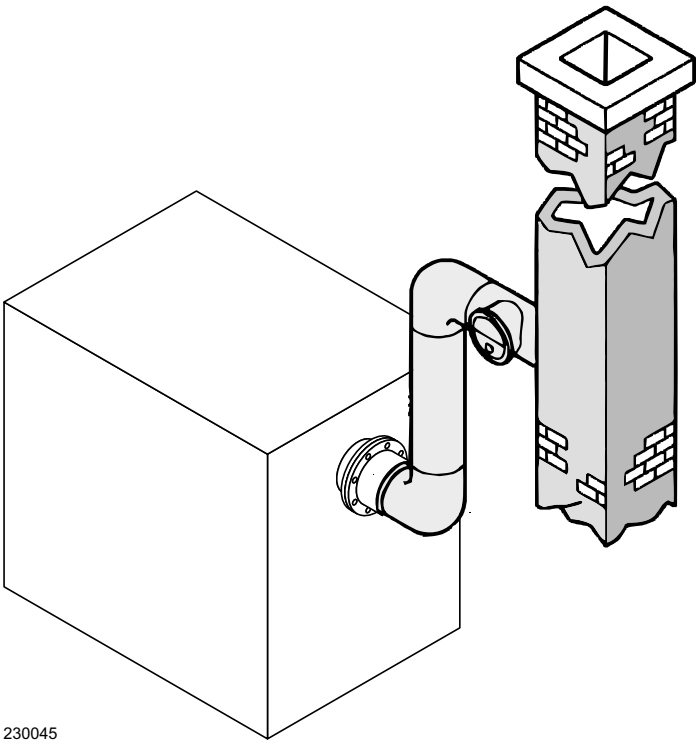
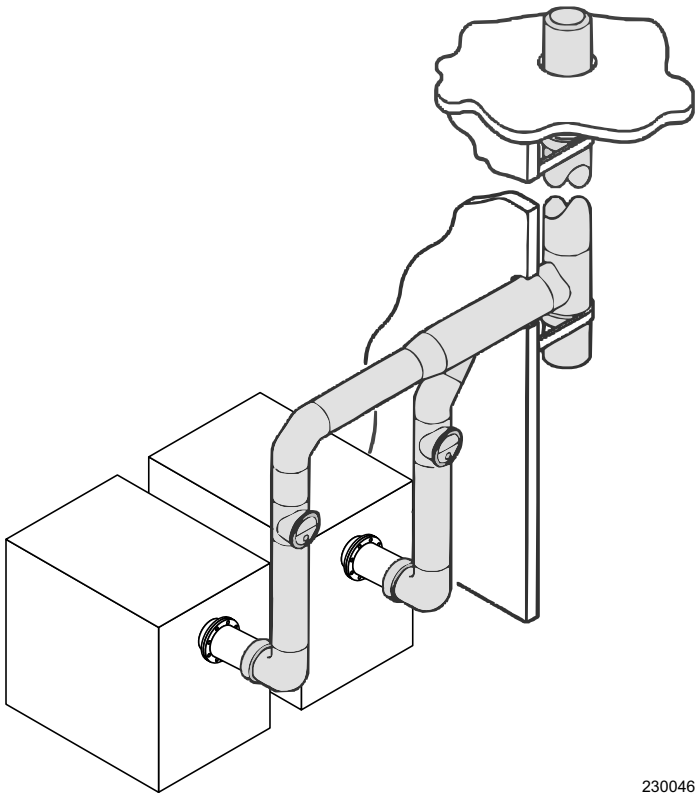


Figure 37 Category I venting, multiple boilers (typical shown)



Oil Venting Requirements

Using a Chimney

⚠WARNING

A chimney must be completely lined in accordance with Installation of Oil Burning Equipment – ANSI/NFPA 31, and Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances – ANSI/NFPA 211, latest editions, and any local codes having jurisdiction. Failure to comply could result in severe personal injury, death, or substantial property damage.

A chimney must be completely lined with a suitable lining, in accordance with Installation of Oil Burning Equipment – ANSI/NFPA 31, and Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances – ANSI/NFPA 211, latest editions, and any local codes having jurisdiction. The lining must be water-tight, with means to drain away condensate that is formed in the vent or chimney.

Only other natural draft / negative pressure rated appliances can be common vented with the boiler in an engineered vent system (by others) designed for such an application.

- The chimney liner rated vent material must be installed per the vent manufacturer's instructions.
- The chimney must be fitted with a sealed access opening through which the interior of the chimney can be inspected.
- The chimney and liner must be inspected at least once annually.

Vent Piping Materials

Due to the use of an oil burner for a 94 Series 4 steam boiler, vent material certified to UL 641 should be used. All alternate venting systems are at the discretion of the jurisdiction having authority.

⚠WARNING

DO NOT mix piping from different pipe manufacturers unless using adapters specifically designed for that purpose by the manufacturer. Failure to comply can result in severe personal injury, death, or substantial property damage.

General Oil Venting Information

Model 94 steam boilers operate with positive overfire pressure. Adjust the damper assembly during burner start-up to achieve 0.1" W.C. positive pressure at damper sample hole. See page 51 for more information.

Engineered Vent System

⚠WARNING

Conventional flue pipe should not be used as it could leak flue gases, carbon monoxide emissions through seams and joints, and corrode due to acidic condensate, which can result in severe personal injury or death.

The vent system for a model 94 steam boiler is considered a designed and engineered vent system. This system should be designed by a professional using accepted engineering practices in accordance with local authority having jurisdiction.

See Table 12 for technical data for an engineered vent system. Weil-McLain recommends contacting your preferred vent supplier to provide design support.

Table 13 Technical data for sizing engineered vent system

Oil Chart								
Boiler Model	**Input**	**Stack / Vent Flow Rate***	**Typical Flue Temperature***	**Damper Assembly Port Pressure**	**Category I**	**Category III**	**Boiler Flue Collar Diameter**	**Vent Connection and Minimum Vent Diameter**
	BTU/hr	CFM	°F	Inches W.C.	Inches W.C.	Inches W.C.	Inches	Inches
1494	4,550,000	1299	380-400	0.1	-0.1 to 0	0 to 0.1	20	18
1594	4,900,000	1399	380-400	0.1	-0.1 to 0	0 to 0.1	20	18
1694	5,250,000	1499	380-400	0.1	-0.1 to 0	0 to 0.1	20	18
1794	5,600,000	1599	380-400	0.1	-0.1 to 0	0 to 0.1	20	20
1894	5,950,000	1699	380-400	0.1	-0.1 to 0	0 to 0.1	20	20
1994	6,300,000	1799	380-400	0.1	-0.1 to 0	0 to 0.1	20	20
2094	6,650,000	1899	380-400	0.1	-0.1 to 0	0 to 0.1	20	20
2194	7,000,000	1999	380-400	0.1	-0.1 to 0	0 to 0.1	20	20
2294	7,350,000	2098	380-400	0.1	-0.1 to 0	0 to 0.1	20	22
2394	7,700,000	2199	380-400	0.1	-0.1 to 0	0 to 0.1	20	22
2494	8,050,000	2299	380-400	0.1	-0.1 to 0	0 to 0.1	20	22
2594	8,400,000	2399	380-400	0.1	-0.1 to 0	0 to 0.1	20	22

*Based on the unit operating at nominal conditions. This value can vary based on the installation location and the operating conditions.

Oil Venting Requirements, continued

Oil Venting System

Positive pressure venting:
Boiler, breeching and vent operate at positive pressure. The entire engineered vent system must be rated for positive pressure venting. Ensure 0.1" positive pressure at test opening. The minimum vent height is 3 feet above roof or snow line, and in accordance to local codes that have jurisdiction. See Figure 38.

Natural draft or negative pressure venting:
Boiler operates with positive pressure overfire. Chimney may provide excess draft, which may require the installation of a draft control device to minimize draft in accordance to local codes that have jurisdiction. The control must be set to maintain 0.1" positive pressure at the flue collar. The minimum vent height is 3 feet above roof or snow line, and in accordance to local codes that have jurisdiction. See Figure 39 and Figure 40.

Figure 38 Positive pressure venting, single boiler (typical shown)

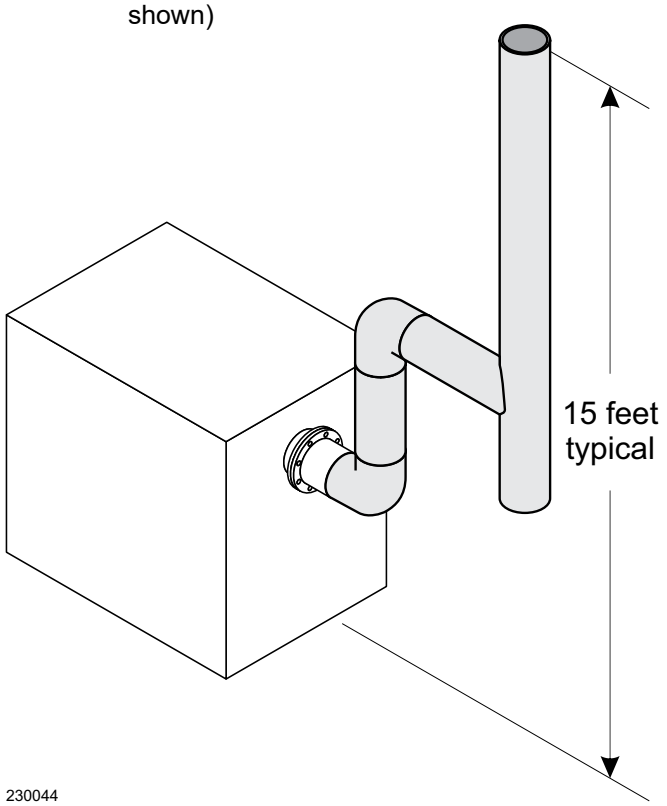


Figure 39 Negative draft / negative pressure venting, single boiler (typical shown)

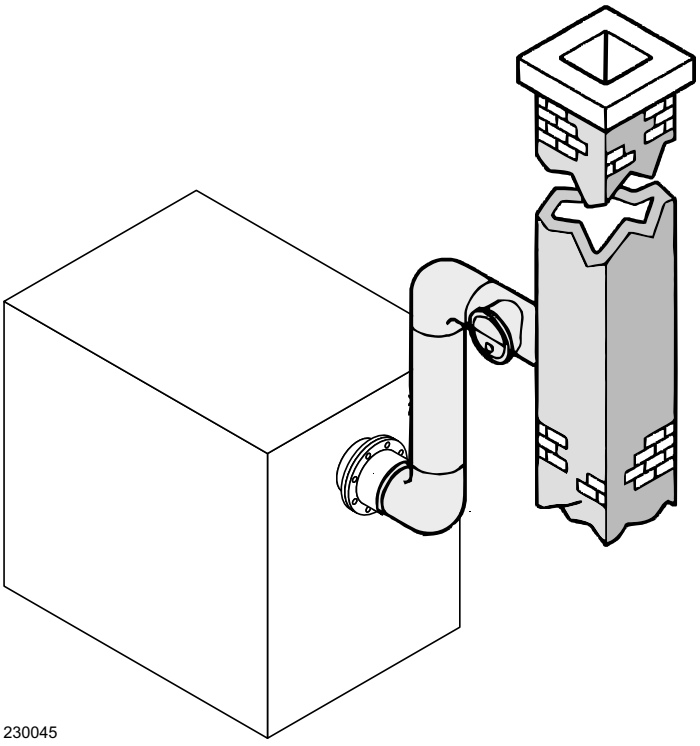
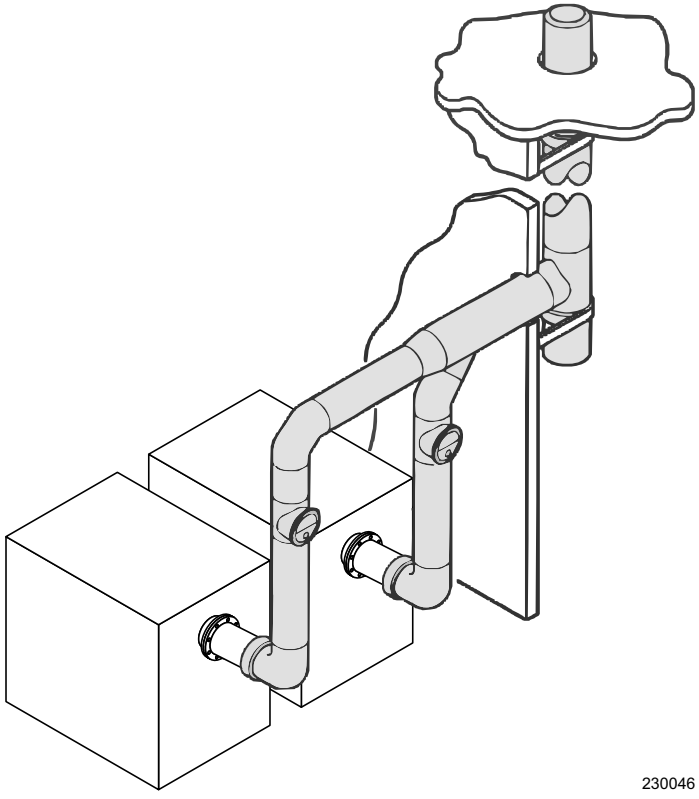


Figure 40 Negative draft / negative pressure venting, multiple boilers (typical shown)



Install Burner and Fill the System

Burner Installation

1. Unpack the burner.
2. Place the gasket around the air tube and against the burner mounting flange. If sealing rope is used, apply 1/8" continuous bead of rope adhesive around the burner mounting flange. Apply sealing rope over the adhesive to make a gas-tight seal.
3. Mount the burner into the opening in the burner mounting plate.

NOTICE

Maintain a gas-tight seal between the burner mounting flange and plate to prevent damage to the air tube.

IMPORTANT

If a boiler base is not utilized, the application burner specification and boiler manual dimensions should be reviewed for burner height to burner opening in the boiler. Some burner manufacturers may offer an optional inversion kit to invert the burner, allowing clearance to the floor.

4. Level the burner using burner support brackets where required; secure with furnished bolts.
5. Retain the burner information packet and keep with the boiler.

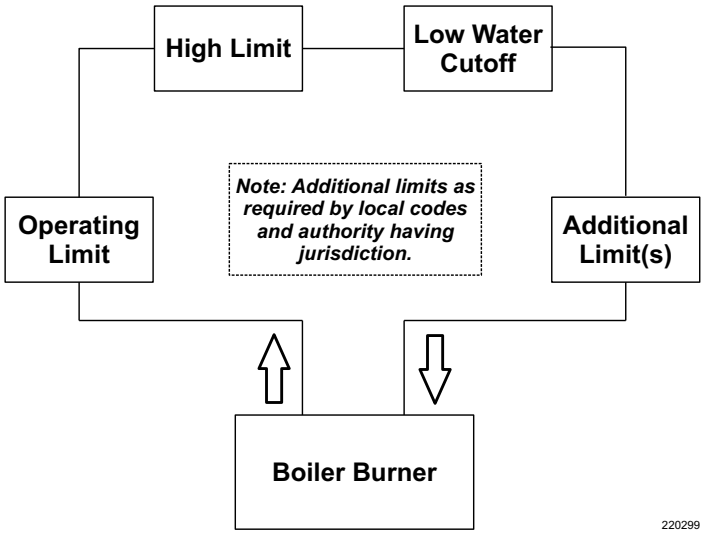
Wire the Burner and Boiler Controls

⚠WARNING

Electric shock hazard! Disconnect the power source before installing or servicing the boiler or burner. Failure to comply can cause severe personal injury or death.

1. Install all wiring in compliance with the National Electrical Code – ANSI/NFPA 70, latest edition, and any additional national, state, or local codes.
2. Follow the burner manual and wiring diagram found in burner information packet.
3. Use #14 AWG wire for operating and safety circuit wiring.
4. Where burner motor voltage differs from control voltage, supply proper voltage to each. Size fused disconnects and conductors per the National Electrical Code – ANSI/NFPA 70, latest edition.

Figure 41 Limit chain diagram



5. Ensure all manual and automatic reset controls are part of the same chain and are connected to the burner as directed by the burner manufacturer's instructions. Refer to Figure 7, page 17 for proper controls location and Figure 41 for same chain layout.
6. Check operation of the LWCO according to the instructions provided by the LWCO manufacturer.
7. Check operation of all limits according to the instructions provided by the limit manufacturer.

Fill the Steam Boiler

⚠WARNING

Do not use automotive, ethylene glycol or undiluted antifreeze. Failure to comply can result in severe personal injury, death, or substantial property damage.

NOTICE

Do not use petroleum-based cleaning or sealing compounds in boiler system. Using these compounds can cause severe damage to system components, resulting in substantial property damage.

1. Do not fill the boiler (except for a leakage test) until the boiler is ready to be fired.
2. Fill to normal waterline, halfway up gauge glass.
3. The recommend boiler water pH is 7.0 to 8.5.

Fuel Piping

Gas Piping

1. Consider these factors when sizing the gas piping:
   - Diameter and length of the gas supply piping.
   - Number of fittings.
   - Maximum gas consumption (including any possible future expansion).
   - Allowable loss in gas pressure from the gas meter outlet to the boiler.
   - Apply recognized engineering practices to size the piping.
2. See the burner manual and material list for the minimum inlet natural gas pressure required at the manual main shut-off valve.
3. Pipe dope must be resistant to corrosion by liquefied petroleum gases. Apply pipe dope sparingly and only to the male threads of pipe joints.
4. A ground joint union must be installed in the piping to provide for servicing. The supply piping must include a manual shut-off valve and sediment trap. See Figure 42.
5. Piping must be supported by hangers, not by the burner or its accessories.
6. Purge all air from the supply piping.
7. All gas piping must be tested for leaks after installation; use soap suds mixture only.

Fuel Oil Piping

⚠ DANGER

Fire Hazard – DO NOT use soldered fittings when installing fuel oil piping: No safe repair can be made.

⚠ WARNING

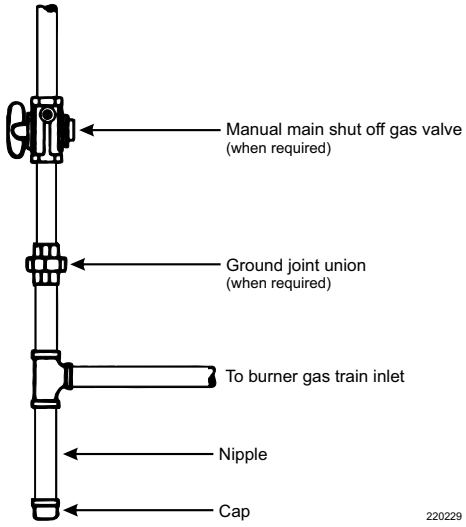
Oil flow must be prevented in case of oil line breakage. Failure to comply can cause fuel leakage or fire, which can result in severe personal injury, death, or substantial property damage.

⚠ CAUTION

Do not install an oil filter outside or close to an outside wall.

1. Prevent oil flow in case of oil line breakage.
   a. Use an anti-siphon device when any part of the oil tank is above burner level.
   b. Use a check valve in the suction line on the burner side of the manual shut-off valve nearest the tank when the top of the fuel oil tank is below burner level.
2. A two-pipe fuel oil piping system is required for all installations.
3. Supply and return lines must enter the tank from the top, extending within 4"-6" from the tank bottom.
4. Install the oil filter. Use an oil filter sized for the fuel pump suction gear capacity.
5. Use continuous copper tubing to reduce possible piping leaks and ensure a reliable seal when oil piping is buried.
6. Use flare fittings, not compression fittings.
7. Pipe dope must be resistant to corrosion of fuel oil. Apply pipe dope sparingly and only to the male threads of pipe joints.
8. Supply and return piping should be sized to design conditions, but not less than .50" outer diameter continuous copper tubing.
9. An auxiliary fuel oil pump is recommended when suction line lift exceeds 12 feet.
10. Install swing joints so they will tighten as the buried tank settles to prevent fuel line breakage.
11. Where iron pipe is required by local codes, make swing joints with nipples and elbows several inches long on both suction and return lines; locate close to the tank.
12. Install a manual shut-off valve in the suction line piping near the burner and where piping enters the building from the outside tank.
13. Pitch the suction line piping toward the fuel tank.
14. Provide a tee and plug at the highest point in the suction line to release air and aid in priming.

Figure 42 Gas supply piping



Final Adjustments

Adjust the Burner and Damper Assembly

NOTICE

Make final burner adjustments using combustion test equipment to assure proper operation. Do not fire boiler without water. Sections will overheat, damaging the boiler and resulting in substantial property damage.

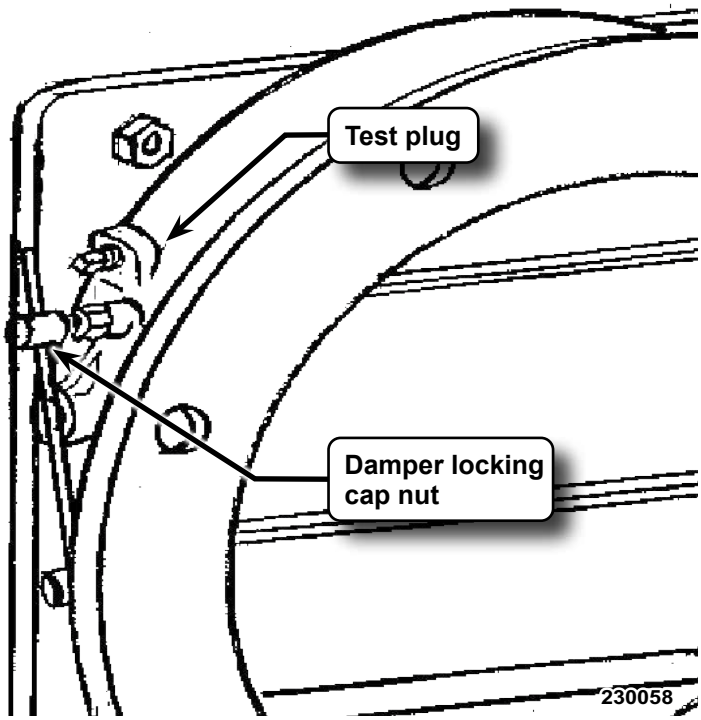
1. Lock flue damper OPEN. See Figure 43.
2. Refer to burner manual for start-up and service.
3. Let burner advance to high fire. Heat boiler to design conditions.
4. Using combustion test equipment, adjust burner:
   a. 12% (± .50%) CO_2 for No. 2 fuel oil, 0 smoke.
   b. 9%-10% CO_2 natural gas; CO in flue gas not to exceed 50 ppm (0.01%).
   c. Flue gas temperature no lower than 330°F.

IMPORTANT

On some applications, if draft conditions or burner characteristics cause the burner flame pattern to impinge on the combustion chamber wall, pinging sounds may come from the boiler. Adjust the burner if possible to redirect the flame. If this does not work, contact your boiler supplier or WM Technologies to obtain an optional combustion chamber kit. See the parts section starting on page 59 for ordering information.

5. Adjust the flue collar damper (Figure 43) to ensure 0.1" W.C. positive pressure at test opening. Take the 0.1" W.C. positive pressure reading while boiler is running at high fire rate.
6. Tighten screws to secure into position.
7. Plug test opening with the 1/8" plug provided with the flue collar and damper assembly.
8. Adjust barometric draft control (when used) to design conditions.
9. Repeat steps 4-6. Make adjustments as required.

Figure 43 Flue collar damper assembly



Final Adjustments, continued

Skim Steam Boilers

NOTICE

Clean all newly installed steam boilers to remove oil. Failure to properly clean the boiler can result in violent water level fluctuations, water passing into steam mains, or high maintenance costs on strainers, traps, and vents. Skim the boiler only. Do not clean old piping or leaks can occur.

NOTICE

Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to system components can result, causing substantial property damage.

1. Remove boiler piping connection from one of the following tappings: V1, V2, R1, or R2 (Figure 20, page 30). Install 4" skim piping from the tapping to a floor drain.
2. Raise waterline to midpoint of skim piping.
3. Fire burner to maintain temperature below steaming rate during skimming process.
4. Feed in water to maintain water level.
5. Cycle burner on and off as needed to prevent rise in steam pressure.
6. Continue skimming until discharge is clear. This may take several hours.
7. Drain the boiler at the cleanout tappings.
8. When boiler has cooled down but is still warm (not hot), flush all interior surfaces under full pressure until drain water runs clear.
9. Remove skim piping.
10. Reinstall boiler piping connection that was removed in Step 1.
11. Close drain cock.
12. Fill with fresh water to normal water line.
13. Start the burner and steam for 15 minutes to remove dissolved gases.
14. Stop the burner.
15. Check traps and air vents for proper operation.

Check the Boiler for Gas-Tight Seal

⚠WARNING

Boiler must be sealed gas-tight to prevent possible flue gas leakage and carbon monoxide emissions. Failure to comply can result in severe personal injury or death.

⚠WARNING

The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 53 of this manual. Failure to comply could result in severe personal injury.

1. Remove boiler jacket side and top panels.
2. Start the burner. Observe all sealing points and chalk mark any points that are not gas-tight.
3. To seal all areas marked with chalk:
   a. Use silicone sealant on section flue-ways.
   b. Check gaskets and sealing rope placement.
4. Reinstall all jacket panels.

Section 3
Maintenance

This section is intended to provide maintenance instructions and timing for the boiler.

Section Contents

Maintenance - General

⚠WARNING

Turn off power to the boiler before any service operation except as noted otherwise in this manual. Failure to turn off electrical power can cause electrical shock, which can result in severe personal injury or death.

Handling Ceramic Fiber Materials

⚠WARNING

The burner front plate and clean out plate gaskets contain ceramic fiber materials that have been identified as carcinogenic, or possibly carcinogenic, to humans. Follow all preventative measures in this section when handling these parts. Failure to comply can result in severe personal injury or death.

⚠WARNING

This product contains fiberglass jacket insulation and ceramic fiber materials in jacket insulation, burner front plate insulation and clean out plate gaskets. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation. Follow all preventative measures as stated in this section when handling these parts. Failure to comply can result in severe personal injury or death.

Ceramic fibers can be converted to cristobalite in very high temperature applications. The international Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)."

Use of an N95 respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions.

Preventative measures include the following:

- Avoid breathing in dust.
- Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Use an N95 respirator.
- Apply enough water to the combustion chamber lining or base insulation to prevent airborne dust.
- If replacement is necessary, remove combustion chamber lining or base insulation from the boiler and place into a plastic bag for disposal.
- Operations such as sawing, blowing, tear out, and spraying may generate airborne fiber concentration requiring additional protection.
- Wash potentially contaminated clothes separately from other clothing. Rinse the clothes washer thoroughly afterwards.

Current NIOSH recommendations can be found on the NIOSH website at www.cdc.gov/niosh/homepage.html. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.

NIOSH stated First Aid for contact or irritation:

- Eyes: Irrigate immediately
- Breathing: Fresh air

Perform Startup and Checkout

After any service procedure, verify operation of the boiler. Removing and installing components can change boiler behavior. Follow the complete procedure for boiler and system startup in this manual.

Annual Inspection

General Inspection Information

⚠WARNING

Shut off the fuel supply to the boiler while servicing to avoid a potential explosion, which can result in server personal injury, death, or substantial property damage.

⚠WARNING

Allow the boiler to cool before touching boiler surfaces or making contact with boiler water to prevent burns, which can result in severe personal injury or death.

⚠WARNING

Do not use solvents to clean any of the boiler components. The components could be damaged, causing unreliable or unsafe operation, which can result in severe personal injury, death, or substantial property damage.

The boiler should be inspected and started at the beginning of the heating season annually, only by a qualified service technician.

NOTICE

Failure to service and maintain the boiler and system could result in equipment failure.

Inspect the Boiler Area

1. Verify the boiler area is free of any combustible materials, gasoline, and other flammable vapors and liquids.
2. Verify the air intake area is free of any contaminants listed on page 39. Remove any contaminants that are present in the boiler intake air vicinity.

Inspect All Piping for Leaks

⚠WARNING

Eliminate all system or boiler leaks. Piping leaks can result in severe personal injury, death, or substantial property damage.

Inspect all water and gas piping. Look for signs of leaking lines. Correct any issues found. See pages 50 and 52 for checking gas lines.

Inspect the Boiler Interior

1. Remove all side jacket panels. Inspect the interior of the boiler
2. Visually inspect each casting for signs of combustion gas leaks.
3. Visually inspect each casting and the boiler room floor for signs of water leaks.
   a. If any signs of combustion gas or water leakage is present, repair the leak.
   b. To repair a leak, separate the heat exchanger at the leaking connection. Use the instructions in "Assembling the Block" on page 12 to repair any leaks. Refer to the Parts section starting on page 59 for replacement kit information.

Check Air Openings

1. Verify that combustion and ventilation air openings to the boiler room and building are open and unobstructed.
2. Check operation and wiring of automatic combustion air dampers, if used.
3. Verify the boiler vent discharge and air intake are clean and free of obstructions.

Boiler Service and Maintenance

Service and Maintenance Schedules

Service Technician *(use this manual for instructions)*	
Annual Start-up (also see the first-year inspection instructions)	**General:** ❑ Investigate reported issues. ❑ Inspect burner and flue-ways. ❑ Clean boiler heating surfaces and burner if necessary, following procedures provided in this manual. ❑ Check for water leaks in piping and at components. ❑ Check gas piping for leaks using soap suds mixture only. ❑ Check oil piping, tank, and components for signs of leakage. ❑ Inspect wiring and connections. ❑ Lubricate circulators and pumps as required; perform maintenance required for all system components. ❑ Check for indications of operating issues, such as excessive makeup water. ❑ Check control settings. ❑ Inspect control piping and LWCO. Clean if necessary, following procedures in this manual.
	Startup ❑ Follow procedures on page 35 to start-up boiler and test operation. ❑ Skim steam boilers as described on page 35. ❑ Test the low water cutoff by opening its blowdown valve to remove dirt, rust, and sediment. Verify that burner stops as the water level approaches the bottom of the water gauge glass. ❑ Verify operation of boiler and all controls. ❑ If operational issues are observed, correct the issues and restart.
	Review: ❑ Review with the owner

Owner Maintenance *(see the User Manual for instructions)*	
Daily	❑ Check the boiler area. ❑ Check air openings. ❑ Check pressure/temperature gauge. ❑ Verify the boiler is operating correctly. ❑ Check the water level in the gauge glass. ❑ Verify the boiler panels are securely in place.
Monthly	❑ Check the vent piping. ❑ Check the relief valve. ❑ Probe-type LWCO — test by pressing the test button. ❑ Float-type LWCO— blowdown and test by opening the blowdown valve.
Every 6 Months	❑ Check the boiler gas, oil, and water piping. ❑ Operate the relief valve.
End of Season	❑ Shut down the boiler (unless the boiler is used for domestic water or is required for other purposes). ❑ For long-term boiler shutdown, contact a qualified boiler service technician to shut down the boiler following the procedure in this manual.

⚠WARNING

Follow the service and maintenance procedures given throughout this manual and other literature shipped with the boiler. Failure to perform service and maintenance can cause damage to the boiler or system. Failure to follow the directions in this manual and component literature can result in severe personal injury, death, or substantial property damage.

Print or photocopy this page to keep an annual record

Boiler Service and Maintenance, continued

Cleaning Heating Surfaces and Flue-ways

NOTICE

Do not brush or vacuum the firebox or combustion chamber area of those boilers using fibrous combustion chamber material.

NOTICE

Do not use stick-type thermal bombs in this boiler.

Soot is an effective insulator that prevents flue gases from heating the boiler water as efficiently as possible. The frequency of cleaning will depend upon the fuel used, the burner adjustments, boiler temperature, draft conditions, and other job factors.

1. Remove top or side jacket panels.
2. Remove the flue-way opening covers.
3. Cover the burner and controls.
4. Using a wire flue brush, thoroughly brush the flue-ways at all angles.
5. Remove any soot or scale from the horizontal and vertical flue-ways.
6. Remove the access panel and enter the boiler to clean the combustion chamber with the special flue brushes provided.
7. Clean the base of the chimney using a vacuum cleaner or brush.
8. Replace the flue-way opening covers, access panels, and jacket panels. Ensure the original gas-tight seal is maintained.
9. If additional cleaning is required, follow the steps below.
   a. Replace access panels and start the boiler following all instructions in this manual.
   b. Heat the boiler water to 180°F, then turn the boiler off and disconnect electrical power and fuel supplies.
   c. Remove the flue-way opening covers.
   d. Use a garden sprayer or hose with nozzle and spray the sooted flue-ways with a fine mist of water.
   e. The soot will become loosened and fall to the floor of the firebox and around the horizontal flue-ways.
   f. Remove the loosened soot.

Cleaning the Water Side of the Boiler

1. If the water side of the boiler must be cleaned or inspected, open the blowdown valve and drain the boiler.
2. Hose the inside of the boiler with high pressure water to remove sludge and sediment, then flush.
3. Dry the boiler water side thoroughly, or refill with fresh water and heat to release dissolved gases. Follow the procedures in this manual for filling the system.

IMPORTANT

Repeated draining and filling of the boiler or the heating system can lead to the same consequences as adding too much makeup water, and is the worst with hard water.

Cleaning Float-Type Low Water Cut-offs

Accumulated sediment in the LWCO should be flushed out through a blow-off valve provided for this purpose; this should be done at least once a month during heating system operation.

Cleaning the Gauge Glass

1. Close the lower gauge glass cock and carefully open the petcock below the glass to blow water and sediment out of the gauge glass by steam pressure.
2. Then slowly open the lower gauge glass cock, allowing a small amount of water to flush out through the open petcock.
3. Close the petcock and fully open the lower gauge cock. The water level should immediately rise to its proper level.

⚠WARNING

If the gauge glass breaks, close off both gauge cocks and loosen the glass retaining nuts to remove the gauge glass. Replace broken gauge glass with a new gauge glass made of heavy-walled Pyrex. DO NOT use thin glass tubing. Failure to comply can result in severe personal injury, death, or substantial property damage.

Checking the Relief Valve

1. Manually open the safety valve once each year by pulling the valve lever or handle and allowing a small amount of steam to escape.
2. Be sure that the valve reseals properly and does not leak.
3. If the relief valve opens frequently or weeps, check the following possible causes.
   a. A closed-type expansion tank may be water-logged.
   b. Bladder or diaphragm-type expansion tanks may have a punctured membrane or may have incorrect charge pressure. Follow the tank manufacturer's instructions to troubleshoot and set charge pressure.
4. If the relief valve sticks or appears to be clogged, replace immediately.

Troubleshooting — Priming or Foaming

1. Foaming or priming in a steam boiler can cause large quantities of water to pass into the steam mains, resulting in violent fluctuations of water level in the gauge glass.
2. This trouble may be caused by dirt, oil, or other impurities in the boiler water, too high a boiler water level, a high overload on the boiler (i.e., the sudden release of boiler steam pressure into the mains by action of fast operating valves), or the addition of too much boiler water treatment.
3. With serious foaming or priming, stop the burner and decrease boiler load.
4. Alternately blowdown and slowly feed fresh water several times.
5. If trouble persists, it may be necessary to skim the boiler one or more times.

Boiler Service and Maintenance, continued

Seasonal Boiler Shutdown

NOTICE

Do not drain boiler during periods of shutdown unless exposed to freezing temperatures.

IMPORTANT

Boiler water does not have to be crystal clear for proper operation, but should be free of sludge or sediment.

If the boiler is shut down during severe winter weather, have the heating system inspected periodically, or thoroughly drain the heating and plumbing system per the instructions for long-term shutdown in the next section.

1. Turn off all power supplies to the boiler and its components.
2. Close all fuel valves.
3. Cover the burner to protect it from dust and dampness.
4. Open the boiler blowdown valve and flush until clear while under steam pressure.

Long-Term Boiler Shutdown

When the boiler and system must be drained for long-term shutdown, perform the following procedures.

1. Turn off all power to the boiler and its components.
2. Close all fuel valves.
3. Cover the burner to protect it from dust and dampness.
4. Clean all carbon, rust, and other deposits from the fire-side of the boiler heating surfaces in order to protect the boiler from the corrosive action of combustion deposits. Follow the procedure in this section under "Cleaning Heating Surfaces and Flue-ways."
5. Apply a thin coating of oil or grease to heating surfaces.
6. Drain the boiler and system as necessary.

Section 4
Parts

This section includes replacement parts and dimension information.

Section Contents

Miscellaneous Parts

See Table 14 for miscellaneous part numbers and descriptions for ordering purposes.

Ordering

Replacement parts must be purchased through a WM Technologies distributor. Specify the boiler model and size when ordering. Include the description and part number of the replacement part. Part numbers are found on www.weil-mclain.com and the following pages.

⚠CAUTION

Results from using parts that are modified, other manufactured, or not purchased through an authorized distributor are not covered by warranty. These parts may cause damage or impair operation.

Table 14 Miscellaneous parts and kits

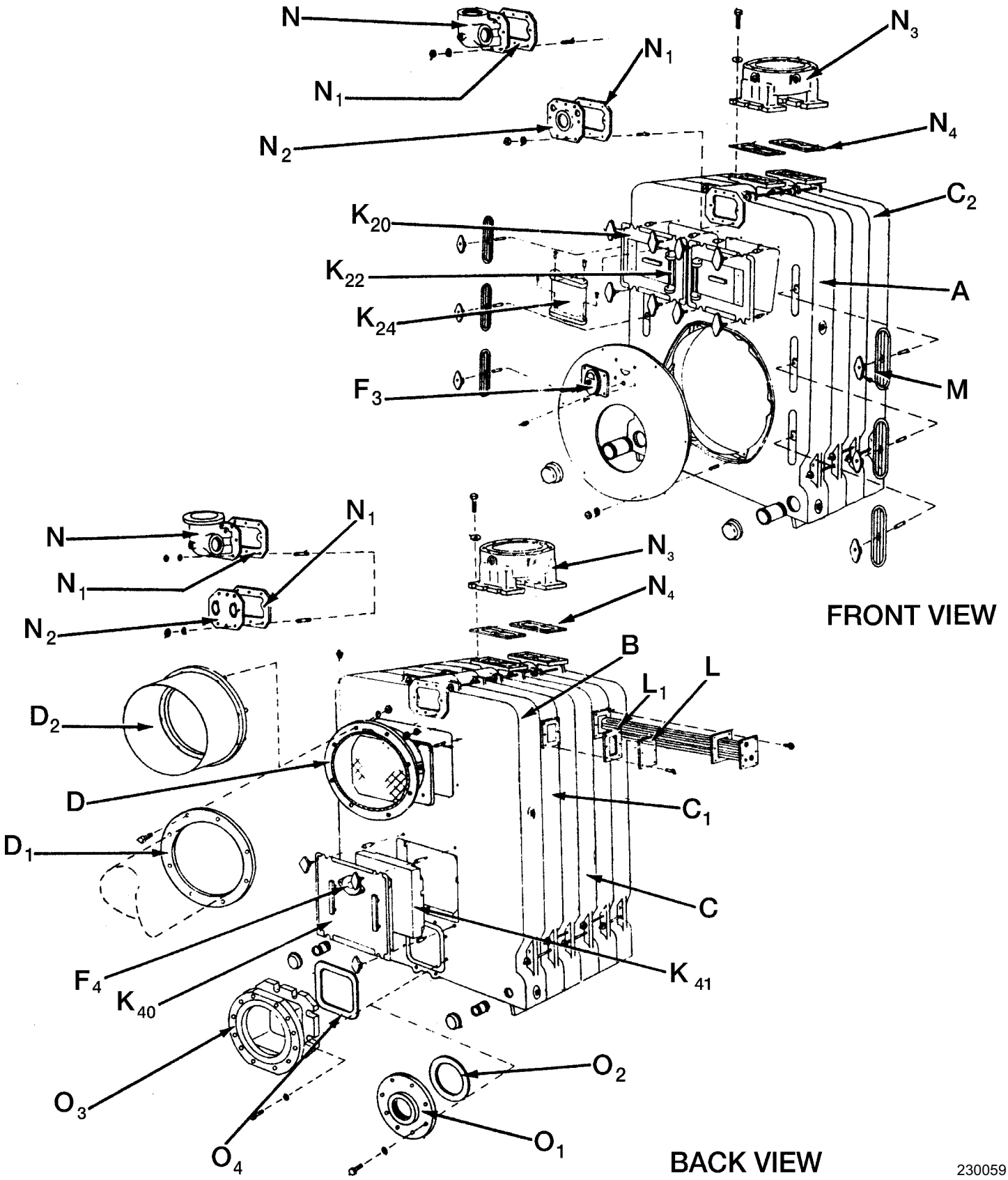
Description	Part Number
1/8" diameter sealing wick (3' for front observation port, 1' for relief plate, 1' for damper locking plate	590-735-145
3/8" diameter silicone coated sealing rope (6' for rear access shield, 2' for rear observation port, 2' for front observation port, 12' for draft hood counter flange, and 3' per cleanout plate	388-137-100
5/8" diameter sealing rope, 12' length, for flue-way perimeter	590-735-153
5/8" diameter partially silicone coated rope for firebox perimeter, 22' length	590-735-154
5/8" diameter fully coating silicone coated rope for the burner mounting plate, 17' length	590-735-261
5/8" hex nut (two per draw rod)	561-928-224
5/8" washer, plain, ASTM F-436 (one per draw rod)	562-248-710
6" bottom elastomer seal (two per joint)	592-800-007
9" top elastomer seal (one per joint)	592-800-005
Bolt, 5/8"-11 x 1-3/4" long	562-135-767
Construction adhesive for rope (11 oz. caulking tube)	591-641-850
Flue brush	591-706-185
Flue brush handle, flexible wire	591-706-226
Flue brush rod, 44"	591-706-222
Flue brush rod, 62"	591-706-223
Flue brush spacer, 48"	591-706-240
Mounting stud (four required for access door)	560-340-560
Mounting stud, 1/2"-13 x 2-1⁄8" long	560-340-560
Silicone sealant (RTV 700 or equivalent) (3 oz. tube) (approximately .47 oz. per joint)	591-638-851
Stud 1/2"-13 x 4-1/4" long	560-340-570
Stud, 1/2"-13 x 4-1/4" long	560-340-570
Stud, 5/8"-11 x 3" long	560-340-579
Wing nut assembly — with 3/8 x 1-1/4" stud (threads into mounting stud) (casting # 9256)	340-004-635
Wing Nut for cleanout with 1/2" tapping	330-060-700

Replacement Parts

Table 15 Parts and numbers for Figure 44, page 61

Item	Description	Part Number
A	Front section (casting # 9517)	318-102-508
B	Back section water & steam w/8" round return flange (casting # 9518)	318-102-518
B	Back section water only for 10" square return flange adapter (casting # 95218)	318-102-528
C	Regular intermediate section (casting # 9515)	318-102-538
C1	Tankless intermediate section (casting # 9516)	318-102-548
C2	Supply intermediate sections (casting # 9519)	318-102-578
	5/8" x 10" draw rod without nut (4 per joint) intermediate to intermediate	560-134-490
	5/8" x 11" draw rod without nut (4 per joint) front or back to intermediate	560-134-495
K40	Back access door assembly (includes door liner, handle and rope)	340-004-700
	Refractory liner for back access door	387-834-906
K41	Refractory shield for back access opening	387-834-905
M	Cleanout plate (casting # 9254)	330-061-000
K20	Cleanout door assembly 474, includes door, hinge plate, hinge, handle, liner and accessories	340-004-740
K22	Hinge for cleanout door (casting # 9254)	330-060-500
K24	Hinge plate for cleanout door (casting # 9253)	330-060-400
	Liner for cleanout door	590-524-867
L	Heater cover plate carton (includes cover plate, studs, nuts, and gasket)	387-800-500
L1	Gasket for heater cover plate	590-317-544
F3	Front observation port assembly #462 (includes bottom, intermediate, & top observation port plates, spring, rope, & sight glass)	340-004-621
	Front sight glass	591-419-198
F4	Back observation Port assembly (includes frame, rope, gasket, plugs, and sight glass)	385-600-099
	Back sight glass	591-419-199
	Gasket for back sight glass	590-317-580
D	Flue collar assembly 20" (includes flue collar w/flange, damper quadrant, damper, locking plate, swivel, bracket, counter flange, and rope	340-004-616
	Quadrant for flue collar	330-056-634
	Damper blade for flue collar	460-003-640
	Damper locking plate	563-530-784
D1	Counter flange for 20" flue	460-030-930
D2	Flue adapter, 22" welded steel	460-030-936
O1	Return flange reducer, 8" to 6" (includes hardware and gasket)	388-135-300
O2	Gasket for return flange reducer, round	590-317-572
O3	Return flange adapter, 10"	330-062-001
O4	Gasket for return flange adapter, rectangular	590-317-620
N	6" supply elbow tapped, water only (casting # 9246)	330-060-200
	8" supply elbow tapped, water only (casting # 9248)	330-060-300
	8" supply elbow tapped, steam only (casting # 92481)	330-060-310
N1	Gasket for supply outlet (2 required)	590-317-546
N2	Cover plate for supply outlet, 2" (casting # 9440)	330-062-005
N2	Cover plate for supply outlet, 4" (casting # 92140)	330-059-910
N3	Top supply outlet, 10" flanged (casting # 92410)	330-060-210
N4	Gasket for top supply outlet, 10" (2 required per fitting)	590-317-625
P	Tankless heater (when used) — heater, gasket, nuts and studs	590-921-910

Figure 44 Replacement boiler parts

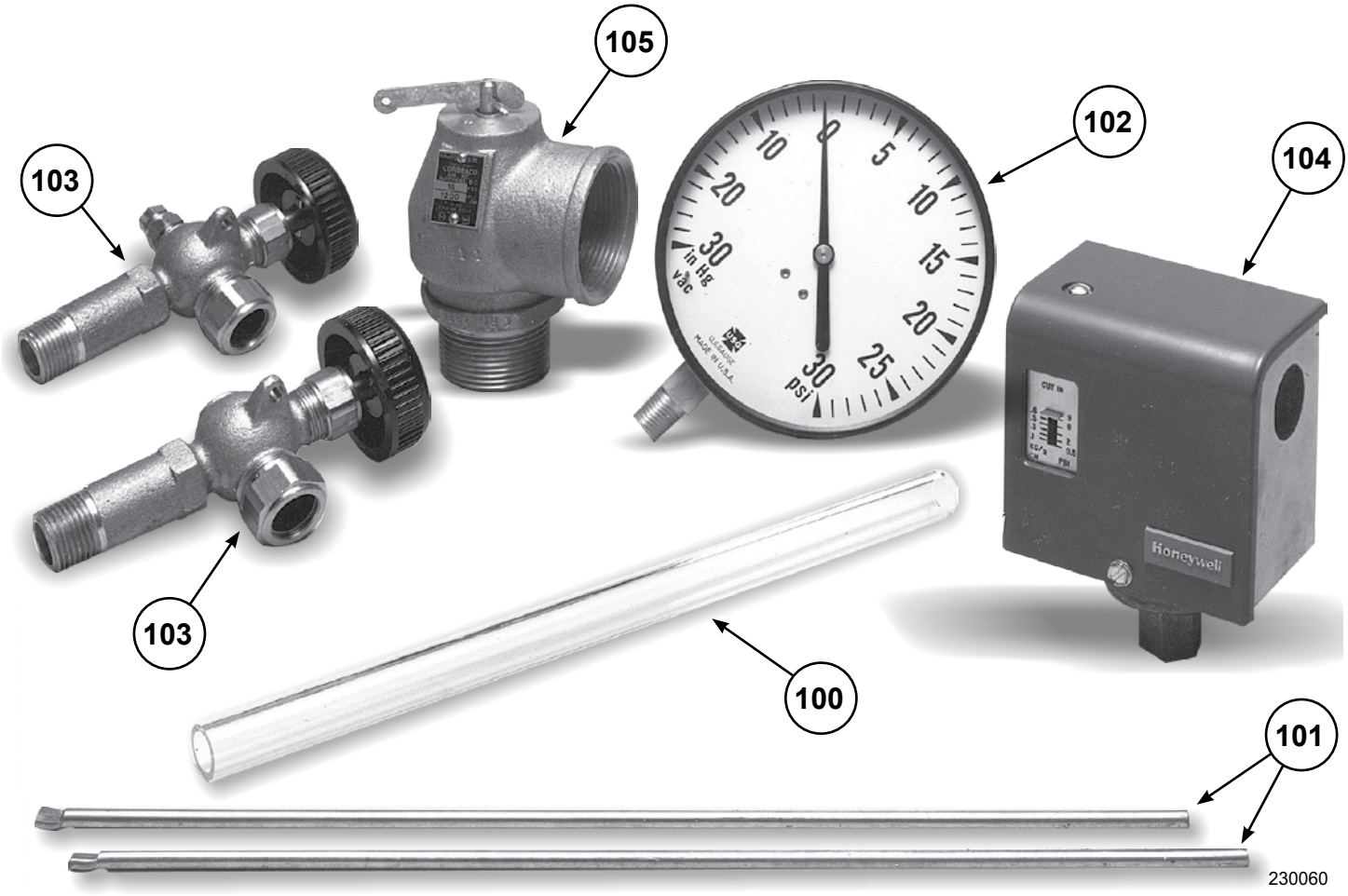


Replacement Parts, continued

Table 16 Parts and numbers for Figure 45, page 63

Item	Description	Manufacturer	Mfr. Part Number	Weil-McLain Part Number	Boiler Size with Quantity Needed											
					14	15	16	17	18	19	20	21	22	23	24	25
100	Gauge glass 5/8" diameter X 10-5/8" long	Weil-McLain	—	383-600-002	1	1	1	1	1	1	1	1	1	1	1	1
101	Gauge glass guards, 3/16" diameter X 12-1/2" long	Weil-McLain	—	563-334-595	1	1	1	1	1	1	1	1	1	1	1	1
102	Combination pressure-vacuum gauge, 0–30 psig, 0–30" Hg, 4-1/2" diameter, bottom connection, 1/4" NPT	Ametek	ASC500-5549	510-218-100	1	1	1	1	1	1	1	1	1	1	1	1
103*	Water gauge glass cocks, set 1/2" NPT, Male inlet	Conbraco	21-205-03W	510-218-145	1	1	1	1	1	1	1	1	1	1	1	1
104*	High pressure limit, 0 to 15 psig adjustable, subtractive differential 2 to 8 psig. Open on high pressure switch action.	Johnson Controls	P47EA-3D	510-312-135	2	2	2	2	2	2	2	2	2	2	2	2
		Honeywell	PA404A-1009													
105	Steam safety valve 1-1/2" inlet, 15 psig, side outlet, 1900 lbs/hr capacity	Conbraco	13-214-08	511-548-052	1	1				1						
	Steam safety valve 2" inlet, 15 psig, side outlet, 2500 lbs/hr capacity	Conbraco	12-205-08	511-548-056	1	1	2	2	2		1	1				
	Steam safety valve 2-1/2" inlet, 15 psig, side outlet, 3529 lbs/hr capacity	Conbraco	12-206-08	511-548-057						1	1	1	2	2	2	2
*Alternate components																

Figure 45 Gauges and valves



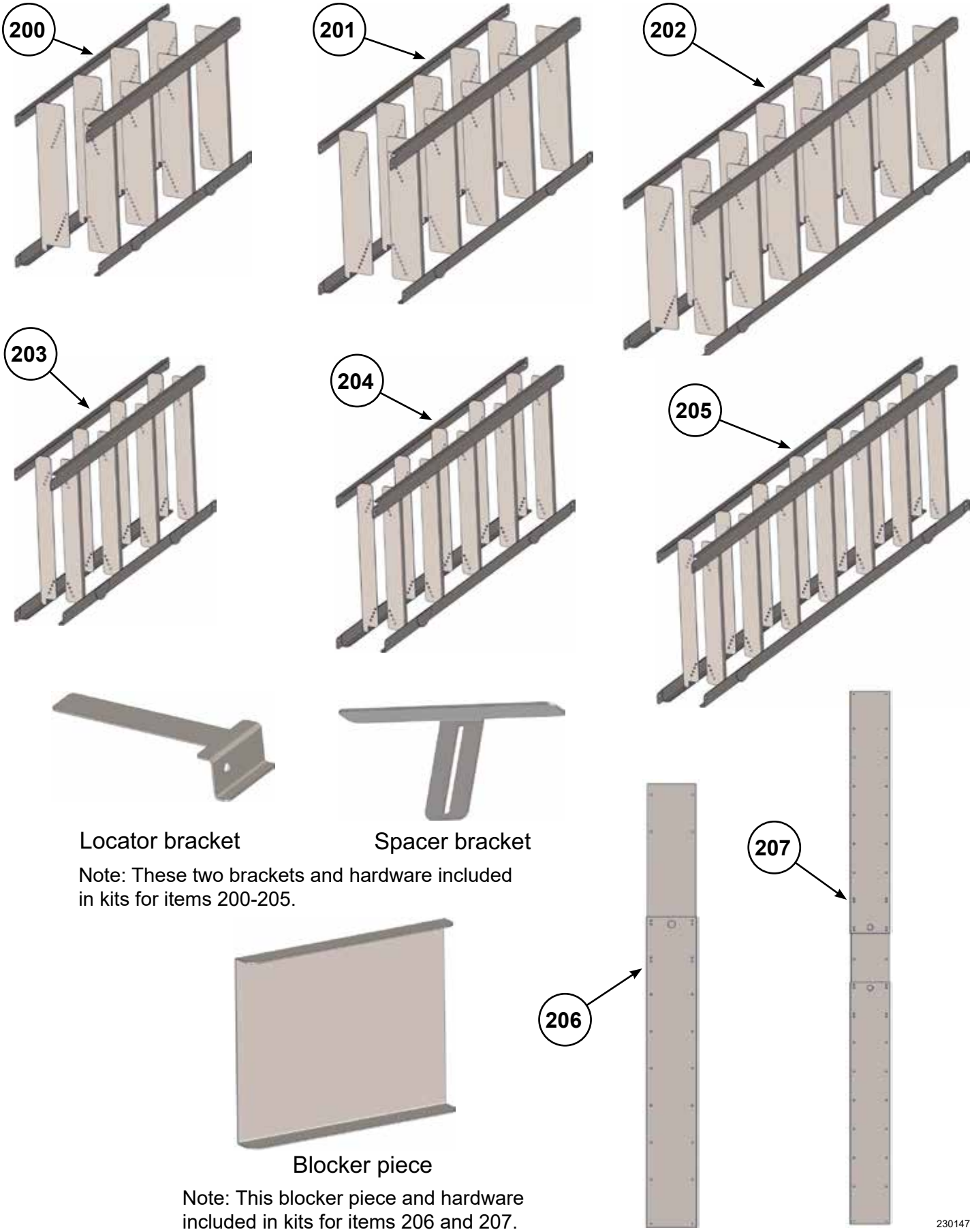
Replacement Parts, continued

Table 17 Parts, numbers, and quantities for Figure 46, page 65

Item	Description	Part Number
200	Baffle 24" Lg 3rd FW 1494-2194 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-000
201	Baffle 30" Lg 3rd FW 1494-2194 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-001
202	Baffle 42" Lg 3rd FW 1494-2194 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-002
203	Baffle 24" Lg 3rd FW 2294-2594 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-003
204	Baffle 30" Lg 3rd FW 2294-2594 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-004
205	Baffle 42" Lg 3rd FW 2294-2594 (left-hand baffle, right-hand baffle, locator bracket, spacer bracket, hardware)	388-137-005
206	Baffle 2nd FW 1494-1894 (16-hole channel, 22-hole channel, blocker piece, hardware)	388-137-006
207	Baffle 2nd FW 1994-2594 (16-hole channel, two 22-hole channels, blocker piece, hardware)	388-137-007

Boiler Size:		1494	1594	1694	1794	1894	1994	2094	2194	2294	2394	2494	2594
Intermediate Sections:		**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
4-Plate Baffle 3rd FW 1494-2194	388-137-000		2		2	1		1					
5-Plate Baffle 3rd FW 1494-2194	388-137-001	1	1			1	2		1				
7-Plate Baffle 3rd FW 1494-2194	388-137-002	1		2	1	1	1	2	2				
4-Plate Baffle 3rd FW 2294-2594	388-137-003									2		2	1
5-Plate Baffle 3rd FW 2294-2594	388-137-004									1			1
7-Plate Baffle 3rd FW 2294-2594	388-137-005									1	3	2	2
Baffle 2nd FW 1494-1894	388-137-006	1	1	1	1	1							
Baffle 2nd FW 1994-2594	388-137-007						1	1	1	1	1	1	1

Figure 46 Baffles



Note: These two brackets and hardware included in kits for items 200-205.

Note: This blocker piece and hardware included in kits for items 206 and 207.

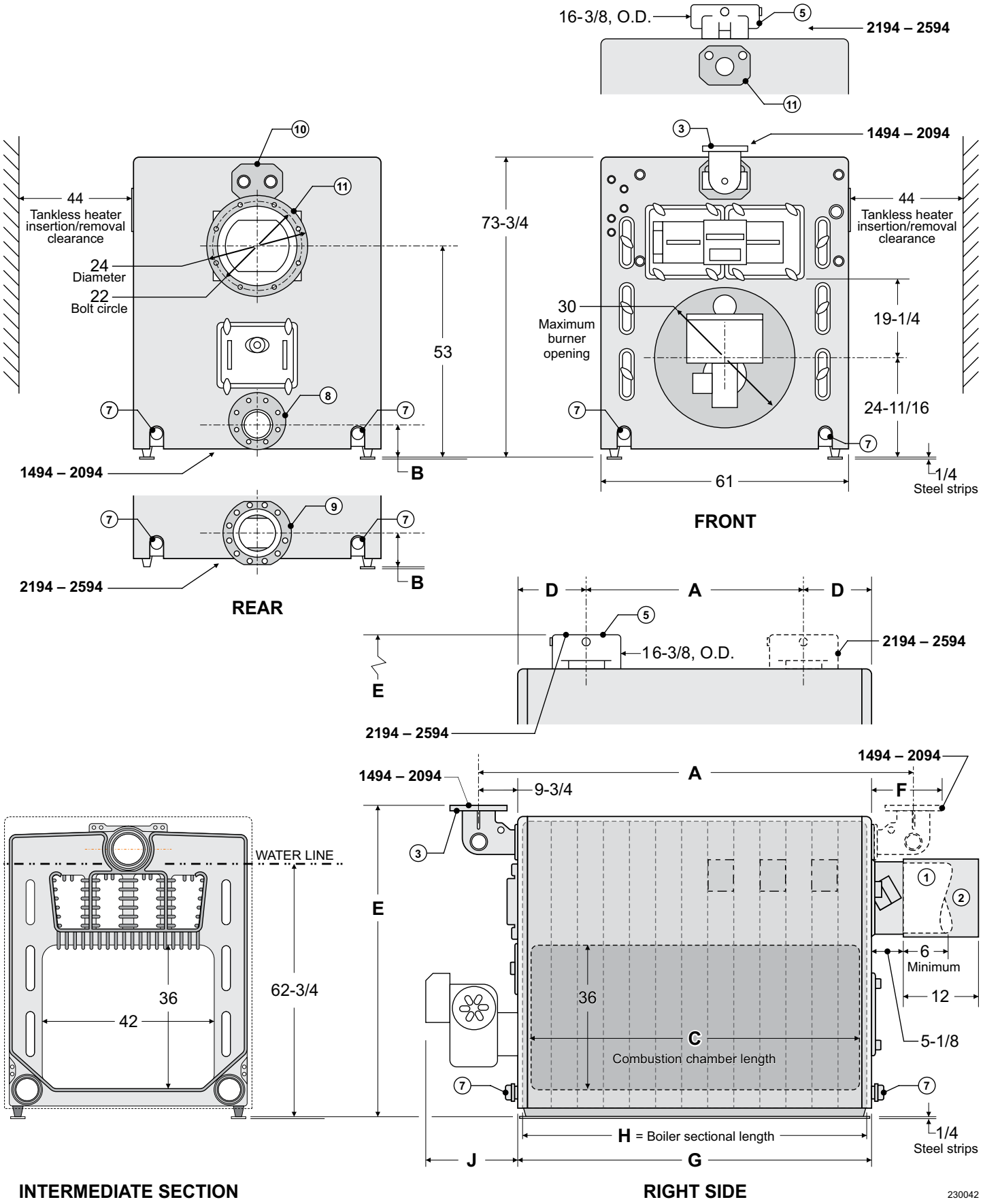
Dimensions

Table 18 Dimension information for Figure 47, page 67

Dimensions (inches)								
Model	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
1494	119-5/8	7-11/16	81	—	76	16-3/8	88-1/2	87
1594	125-5/8	7-11/16	87	—	76	16-3/8	94-1/2	93
1694	131-5/8	7-11/16	93	—	76	16-3/8	100-1/2	99
1794	119-5/8	7-11/16	99	—	76	16-3/8	106-1/2	105
1894	125-5/8	7-11/16	105	—	76	16-3/8	112-1/2	111
1994	131-5/8	7-11/16	111	—	76	16-3/8	118-1/2	117
2094	137-5/8	7-11/16	117	—	76	16-3/8	124-1/2	123
2194	143-5/8	7-11/16	123	21-1/4	82-1/2	—	130-1/2	129
2294	72	7-11/16	129	21-1/4	82-1/2	—	136-1/2	135
2394	84	7-11/16	135	21-1/4	82-1/2	—	142-1/2	141
2494	90	7-11/16	141	21-1/4	82-1/2	—	148-1/2	147
2594	96	7-11/16	147	21-1/4	82-1/2	—	154-1/2	153

Model	**Supply tappings (No. and size)**	**Return tappings (No. and size)**	**Burner lengths (Dimension J)**
1494	2 – 8"	1 – 6"	Refer to the burner specification and data sheet for dimensional information on the burner.
1594	2 – 8"	1 – 6"	
1694	2 – 8"	1 – 6"	
1794	2 – 8"	1 – 6"	
1894	2 – 8"	1 – 6"	
1994	2 – 8"	1 – 6"	
2094	2 – 8"	1 – 6"	
2194	2 – 10"	1 – 6"	
2294	2 – 10"	1 – 6"	
2394	2 – 10"	1 – 6"	
2494	2 – 10"	1 – 6"	
2594	2 – 10"	1 – 6"	
Note: All 6" are tapped, and all 8" and 10" are flanged.			

Figure 47 Dimensions



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Section 5
Service Information

Section Contents

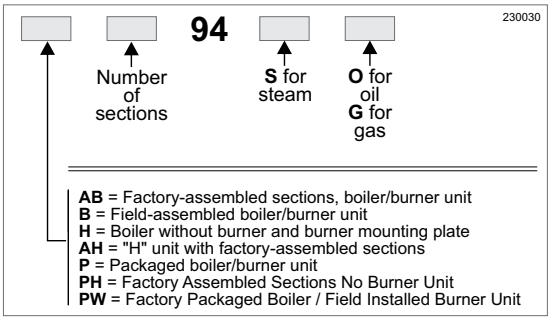
Ratings

Table 19 Ratings and engineering data

Model	Burner Capacity		Gas Ratings					Oil Ratings					Flue Outlet Dia.	Boiler Water Content	Boiler Shipping Weight (approx.)
	Input Oil GPH	Input Gas MBH	Gross Output MBH	Net AHRI Ratings MBH	Net Steam Ratings Sq. Ft.	Thermal Efficiency %	HP	Gross Output MBH	Net AHRI Ratings MBH	Net Steam Ratings Sq. Ft.	Thermal Efficiency %	HP	In.	Gallons	Lbs.
1494	32.5	4,550	3,731	3244	13518	82.0	111.5	3,868	3363	14013	85.0	115.5	20	440.7	15,698
1594	35.0	4,900	4,018	3494	14558	82.0	120.0	4,165	3622	15091	85.0	124.4	20	468.4	16,540
1694	37.5	5,250	4,305	3743	15598	82.0	128.6	4,463	3880	16168	85.0	133.3	20	496.2	17,382
1794	40.0	5,600	4,592	3993	16638	82.0	137.2	4,760	4139	17246	85.0	142.2	20	523.9	19,024
1894	42.5	5,950	4,879	4243	17678	82.0	145.8	5,058	4398	18324	85.0	151.1	20	551.6	19,866
1994	45.0	6,300	5,166	4492	18717	82.0	154.3	5,355	4657	19402	85.0	160.0	20	579.4	20,708
2094	47.5	6,650	5,453	4742	19757	82.0	162.9	5,653	4915	20480	85.0	168.9	20	607.1	21,550
2194	50.0	7,000	5,740	4991	20797	82.0	171.5	5,950	5174	21558	85.0	177.8	20	634.8	22,562
2294	53.0	7,350	6,027	5241	21837	82.0	180.1	6,307	5484	22851	85.0	188.4	20	662.6	23,429
2394	55.0	7,700	6,314	5490	22877	82.0	188.6	6,545	5691	23714	85.0	195.5	20	690.3	24,296
2494	58.0	8,050	6,601	5740	23917	82.0	197.2	6,902	6002	25007	85.0	206.2	20	718.0	25,163
2594	60.0	8,400	6,888	5990	24957	82.0	205.8	7,140	6209	25870	85.0	213.3	20	745.8	26,030
Notes	2, 3	2, 4	5, 6	7	—	7	—	5, 6	7	—	—	—	—	—	—

Notes

1. See the image below to specify complete model number.



2. Burner input based on maximum of 2,000 feet altitude. For other altitudes, consult a WM Technologies distributor.
3. No. 2 fuel oil — Commercial Standard Spec CS75-56. Heating value of oil = 140,000 Btu per gallon.
4. Gas pressure required at burner gas train inlet for rated burner input; based on 1,000 Btu per cubic foot natural gas, specific gravity of 0.60. Refer to burner manual for required pressure.
5. Gross AHRI ratings have been determined under the AHRI provision governing forced draft boiler-burner units.
6. Net AHRI ratings are based on net installed radiation of sufficient quantity for the requirements of the building.
   Nothing need be added for normal piping and pick-up.
   Water ratings are based on a piping and pick-up allowance of 1.15.
   An additional allowance should be made for gravity hot water systems or for unusual piping and pick-up loads. Consult the local WM Technologies distributor.
7. With .10" W.C. positive pressure at flue collar.

Maintenance Log

Date	High fire / Low Fire	O_2	CO	CO_2	Stack Temp	pH	Action	Technician

Installation and Service Certificate

Boiler Model:_____ Series:_____ Consumer Protection Number (CP):_____

Date Installed:_____ BTU Input:_____

- ❑ Installation instructions have been followed.
- ❑ Checkout sequence has been performed.
- ❑ Above information is certified to be correct.
- ❑ Information has been received and left with the owner or maintenance person.

Installer: _____ _____

(Company) (Phone)

_____ _____

(Address) (Installer's Signature)

Notes

WEIL-McLAIN®

WM Technologies, LLC
500 Blaine Street
Michigan City, IN 46360-2388
Telephone: (800) 654-2109
weil-mclain.com

Manual Part Number 550-100-157/0523