

**Series 3**  
**Water & steam boilers**  
for use with Gas, Light Oil, & Gas/Light Oil - Fired Burners

# Boiler Manual

- Installation
- Maintenance
- Startup
- Parts



*For additional information, refer to . .*

**Burner specification and data sheets**  
(for burners pre-tested with model 94 boilers)

**⚠ WARNING**

This manual must only be used by a qualified heating installer/service technician. Read all instructions before installing. Follow all instructions in proper order. Failure to comply could result in severe personal injury, death or substantial property damage.

**INSTALLER**

Consider piping and installation when determining boiler location. Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

**USER . . . .**

This manual is for use only by your qualified heating installer/service technician. Boiler and burner must be installed by a qualified service technician. We recommend regular service by a qualified service technician, at least annually.



# Read before proceeding

## Read before proceeding:

**⚠ WARNING** Read all instructions before installing. Failure to follow all instructions in proper order can cause severe personal injury, death or substantial property damage.

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

**⚠ WARNING** **Propane boilers only** — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade and the gas may no longer have an odor.

- Propane gas can accumulate at floor level. Smell near the floor for the gas odorant or any unusual odor. If you suspect a leak, do not attempt to light the burner.
- Use caution when attempting to light a propane burner (or pilot burner). This should be done by a qualified service technician, particularly if flame outages (or pilot outages) are common.
- Periodically check the odorant level of your gas.
- Inspect boiler and system at least yearly to make sure all gas piping is leak-tight.
- Consult your propane supplier regarding installation of a gas leak detector. There are some products on the market intended for this purpose. Your supplier may be able to suggest an appropriate device.

## Hazard Definitions

The terms defined below are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

**⚠ DANGER** Indicates presence of hazards that **will cause severe** personal injury, death or substantial property damage if ignored.

**⚠ WARNING** Indicates presence of hazards that **can cause severe** personal injury, death or substantial property damage if ignored.

**⚠ CAUTION** Indicates presence of hazards that **will or can cause minor** personal injury, death or substantial property damage if ignored.

**NOTICE** Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury.

## Controls:

**NOTICE** **One limit control** is supplied with the boiler. A second limit control must be supplied by the installer (field installed) to comply with current ASME Boiler and Pressure Vessel Code, Section IV.

## IMPORTANT

### When calling or writing about the boiler, please provide:

- **Boiler model number**
- **Series**
- **CP number**

This information is located on the boiler label/nameplate.



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# Before installing boiler

## Installation must comply with —

1. State, provincial and local plumbing, heating and electrical codes.
2. Regulations of servicing utilities.
3. ASME Section IV, Low Pressure Boiler and Pressure Vessel Code.
4. National Fuel Gas Code, ANSI/NFPA 54, when applicable.
5. National codes where applicable.

## Before selecting boiler location

1. Check for nearby connections to:
  - a. Fuel supply.
  - b. Electrical power.
  - c. System water or steam piping.
  - d. Venting systems — see page 31.
  - e. Combustion and ventilation air supply — see page 5.
2. Check area around boiler. Remove any combustible materials, gasoline and other flammable vapors and liquids.

**WARNING** Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death and substantial property damage.

## Provide clearance around boiler

1. Provide minimum clearances to combustible materials:
  - **Boiler top** — 24 inches.
  - **Boiler front** — 48 inches.
  - **Boiler flue** — 9 inches.
  - **Boiler rear** — 9 inches.
  - **Boiler sides** — 6 inches.
  - **Single-wall vent pipe** — 18 inches.
  - **Double-wall vent pipe** — refer to vent pipe manufacturer's recommendations for vent pipe clearances.
2. Boiler may be installed on combustible flooring.
3. See page 42 for boiler dimensions.

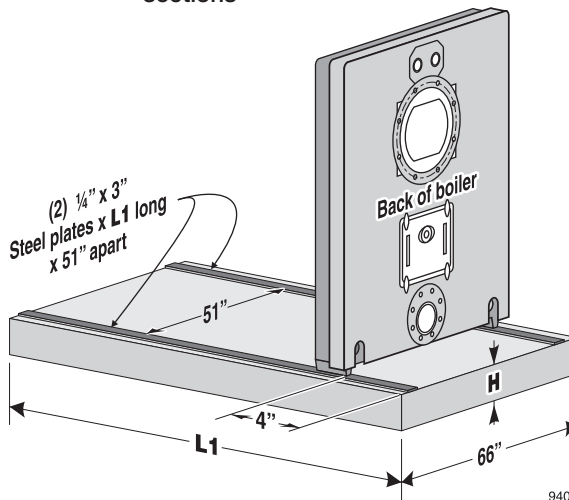
**NOTICE** Flue pipe/breeching clearances take precedence over jacket clearances. Follow local codes requirements for clearances. Increase clearances if necessary.

4. Provide minimum clearances for servicing:
  - **Right side** — for cleaning and for tankless heater insertion/removal — 44 inches.
  - **Rear** — for breeching — 50 inches.
  - Allow sufficient space on remaining sides for cleaning, servicing and burner installation. See burner literature for length and recommended service clearances.

## Lay a foundation, if needed

1. Floor construction and condition must be suitable for weight of boiler when filled with water. See page 42 for approximate boiler operating weight.
2. A level concrete or brick foundation, constructed per Figure 1 and Figure 2 is required when:
  - a. A floor could possibly become flooded.
  - b. Non-level conditions exist.
  - c. Boiler must be raised for burner clearance.

**Figure 1** Boiler foundation, when required — always use steel strips as shown for proper draw-up and alignment of sections



**Figure 2** Boiler foundation (see Figure 1) (boiler sections flush with one end of foundation, 4 inches from the other end)

Boiler model number	Length, L1 (inches)
894	55
994	61
1094	67
1194	73
1294	79
1394	85
1494	91
1594	97
1694	103
1794	109
1894	115
1994	121
2094	127
2194	133
2294	139
2394	145
2494	151
2594	157

<b>Height, H (inches)</b>	Gun-type burner: 2 inches min.
	Horizontal rotary or air atomizing burner: 7 inches min.
	Consult burner manufacturer for required clearances if burner is not supplied by Weil-McLain.

# Before installing boiler *(continued)*

## Combustion and ventilation air openings

### ⚠ WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion and prevent possibility of flue gas leakage and carbon monoxide emissions, causing severe personal injury or death.

Do not install an exhaust fan in boiler room. Incorrect burner operation can result.

When combustion and ventilation air enters through side wall openings, ensure that the openings comply with the requirements of Figure 3 and Figure 4.

Opening sizes must comply with state, provincial or local codes. In the absence of local requirements, use the National Fuel Gas Code, ANSI/NFPA 54). The following information is taken from ANSI/NFPA 54. For details and information not addressed below, refer to the standard.

## Combustion air openings to inside

### Required volume of interior spaces

ANSI/NFPA 54 allows combustion air to be supplied through openings to interior spaces **if the volume of the connected interior spaces meets the minimum volume required by the standard.**

The minimum volume of interior spaces can be taken as 50 cubic feet per 1,000 Btuh of all appliances in the spaces, or the minimum volume can be calculated using the formulas given in ANSI/NFPA 54. Exception: If the air infiltration rate for the spaces is known to be less than 0.40 air changes per hour, the minimum volume must be calculated as specified in the standard.

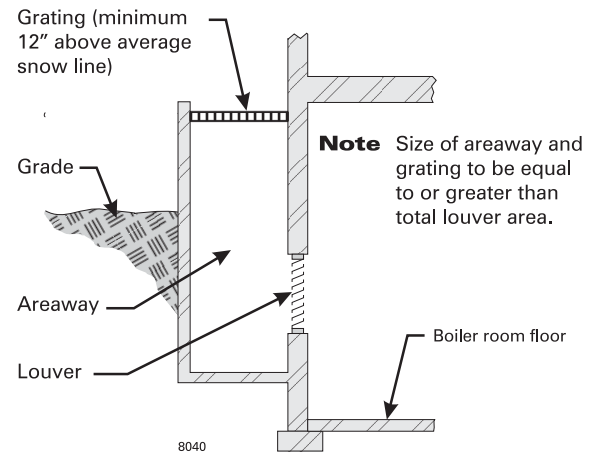
### Inside air opening sizes and locations

For spaces that provide the minimum volume required by ANSI/NFPA 54, the air openings must be sized per the following:

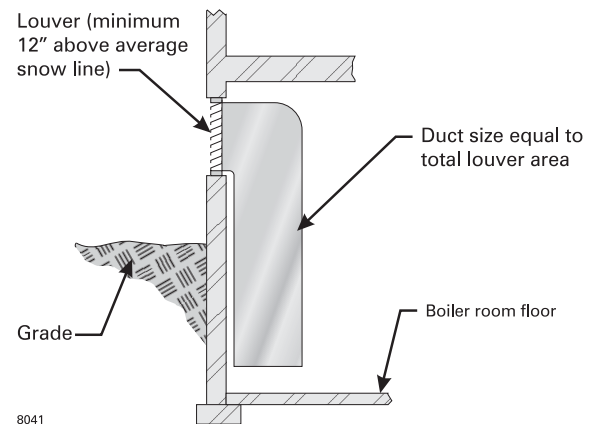
**Combining spaces on the same story** — Each opening shall have a minimum free area of 1 in<sup>2</sup>/1000 Btuh (2200 mm<sup>2</sup>/kW) of the total input rating of all appliances in the space but not less than 100 in<sup>2</sup> (0.06 m<sup>2</sup>). One opening shall commence within 12 inches (300 mm) of the top, and one opening shall commence within 12 inches (300 mm) of the bottom, of the enclosure. The minimum dimension of air openings shall be not less than 3 inches (80 mm).

**Combining spaces in different stories** — The volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one or more openings in doors or floors having a total minimum free area of 2 in<sup>2</sup>/1000 Btuh (4400 mm<sup>2</sup>/kW) of total input rating of all appliances.

**Figure 3** Combustion and ventilation air openings — Boiler room below grade



**Figure 4** Combustion and ventilation air openings — Boiler room partially or completely above grade



## Combustion air openings to outside

Outdoor combustion air can be taken through permanent openings (TWO or ONE), as described in the following. The minimum dimension of air openings shall not be less than 3 inches (80 mm).

### Outside openings: TWO permanent openings method

Two permanent openings, one commencing within 12 inches (300 mm) of the top and one commencing within 12 inches (300 mm) of the bottom of the enclosure shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces that



## Before installing boiler *(continued)*

freely communicate with the outdoors, as follows:

- Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in<sup>2</sup>/4000 Btuh (550 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.
- Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in<sup>2</sup>/2000Btuh (1100 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.

### Outside openings: ONE permanent opening method

One permanent opening, commencing within 12 inches (300 mm) of the top of the enclosure, shall be provided. The appliance shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 inches (150 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors and shall have a minimum free area of the following:

- (1) 1 in<sup>2</sup>/3000 Btu/hr (700 mm<sup>2</sup> per kW) of the total input rating of all appliances located in the enclosure, and . . .
- (2) Not less than the sum of the areas of all vent connectors in the space.

### Combustion air — combination indoor and outdoor openings

ANSI/NFPA 54 allows combustion air to be taken from a combination of openings to outside and to interior spaces. Follow all requirements of the standard to determine the minimum volume of interior spaces and to calculate minimum sizes of openings.

### Engineered Installations

Engineered combustion air installations shall provide an adequate supply of combustion, ventilation, and dilution air and shall be approved by the authority having jurisdiction.

### Mechanical Combustion Air Supply

Where all combustion air is provided by a mechanical air supply system, the combustion air shall be supplied from outdoors at the minimum rate of 0.35 ft<sup>3</sup>/minute per 1000 Btuh (0.034 m<sup>3</sup>/min per kW) for all appliances located within the space.

- Where exhaust fans are installed in the building, additional air shall be provided to replace the exhausted air.
- Each of the appliances served shall be interlocked to the mechanical air supply system to prevent main burner operation where the mechanical air supply system is not in operation.
- Where combustion air is provided by the building's mechanical ventilation system, the system shall provide the specified combustion air rate in addition to the required ventilation air.

### Louvers, Grilles, and Screens.

The required size of openings for combustion, ventilation, and dilution air shall be based on the **net free area** of each opening.

Where the free area through a design of louver or grille or screen is known, it shall be used in calculating the size opening required to provide the free area specified.

Where the louver and grille design and free area are not known, it shall be assumed that wood louvers will have 25 percent free area, and metal louvers and grilles will have 75 percent free area.

Non-motorized louvers and grilles shall be fixed in the open position.

### Minimum screen mesh size

Screens shall not be smaller than ¼ inch mesh.

### Motorized louvers

Motorized louvers shall be interlocked with the appliance so they are proven in the full open position prior to main burner ignition and during main burner operation. Means shall be proved to prevent the main burner from igniting should the louver fail to open during burner startup, and to shut down the main burner if the louvers close during burner operation.



# Set boiler in place

**▲WARNING** Ensure the equipment and cables used for lifting are designed to handle the load. See Figure 5 for approximate weights of model 94 section assemblies. Failure to comply can result in severe personal injury, death or substantial property damage.

**▲WARNING** The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on "Handling ceramic fiber and fiberglass materials," page 36 of this manual. Failure to comply could result in severe personal injury.

## For packaged boiler or assembled block assembly:

1. Packaged boilers only — Remove top jacket panels. Set aside until after boiler is piped.
2. Remove lag screws from shipping rails.
3. Remove boiler from skid. Cables are already attached to block assembly. See Figure 5 for lifting weight.
  - Using crane – attach free end of cables to eye of crane.
  - Using hoist – attach free end of cables to hoist. Raise boiler off skid. Use pipe rollers under steel skid angles to roll boiler.
4. Place ¼" x 3" steel plates on floor or foundation, spaced 51 inches apart, as shown in Figure 1, page 4.
5. Place boiler in final position. Place boiler on foundation (if used) as shown in Figure 1, page 4.
6. Level boiler. Shim under legs if necessary.
7. Cut off cables.

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

8. Inspect block assembly for disjointed sections.
  - a. Check inside section assembly for any light passing through unsealed areas.
  - b. Mark all unsealed areas.
  - c. At unsealed areas, check for:
    - Damaged gaskets.
    - Sealing rope not in place.
    - Loose bolts or nuts.
  - d. Correct all conditions and repeat step b. If unsealed areas still exist, contact your Weil-McLain distributor or sales office before continuing installation.
9. Check gas-tight seal of flue collector hood and cleanout plates.

**▲WARNING** Gas tight seal must be maintained to prevent possible flue gas leakage and carbon monoxide emissions, resulting in severe personal injury or death.

10. Proceed to "Perform hydrostatic pressure test," page 11.

**▲CAUTION** Do not raise or move assembled sections using a jack or forklift. This could cause the sections to shift, resulting in leaks.

**Figure 5** Section assembly lifting weights

Boiler model number	Approximate lifting weight (pounds)	Minimum sling length — (from crane hook to boiler lifting lugs)
894	8600	3' 6"
994	9500	3' 6"
1094	10300	4' 0"
1194	11200	4' 6"
1294	12000	5' 0"
1394	12800	5' 0"
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"

## Assembling the block

**WARNING** Sections are top heavy. Unbolted sections may fall if not supported, resulting in severe personal injury or death.

### Prepare the back section first

1. Place  $\frac{1}{4}$ " x 3" steel plates on the floor or foundation, spaced 51 inches apart, as shown in Figure 1, page 4.
2. Apply  $\frac{1}{8}$ " continuous bead of sealing rope adhesive in sealing rope grooves around section perimeter and around flueways — see Figure 6.

**WARNING** Do not get any adhesive on the machined port surfaces.

### Place sealing rope in grooves

1. Place  $\frac{5}{8}$ " coated and uncoated sealing rope in the rope grooves as shown in Figure 6.
2. See WARNING below — place coated rope and uncoated rope as described.
3. Around curves, grasp rope at 1" intervals and push together. **Do not stretch the rope.**

**WARNING** The boiler is supplied with **TWO** types of section sealing rope — uncoated and coated with a narrow uncoated strip.

Use the uncoated rope only on the flueways as shown in Figure 6.

Use the coated rope around the perimeter and around the upper nipple port as shown in Figure 6. The uncoated side of the rope must be pressed into the adhesive as shown in order to obtain a proper adhesion.

DO NOT pre-cut rope for sections. Cut rope as each section is placed.

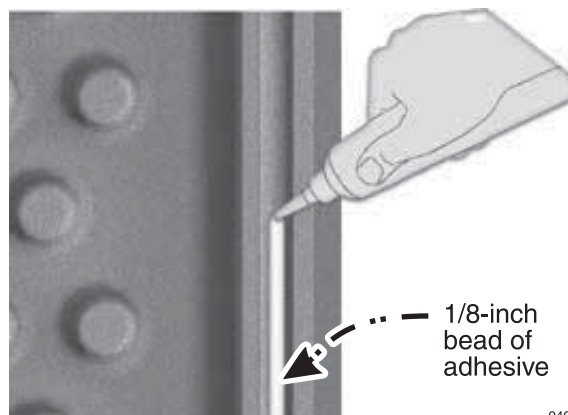
A gas-tight seal must be maintained to prevent possibility of flue gas leakage and carbon monoxide emissions, causing severe personal injury or death.

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

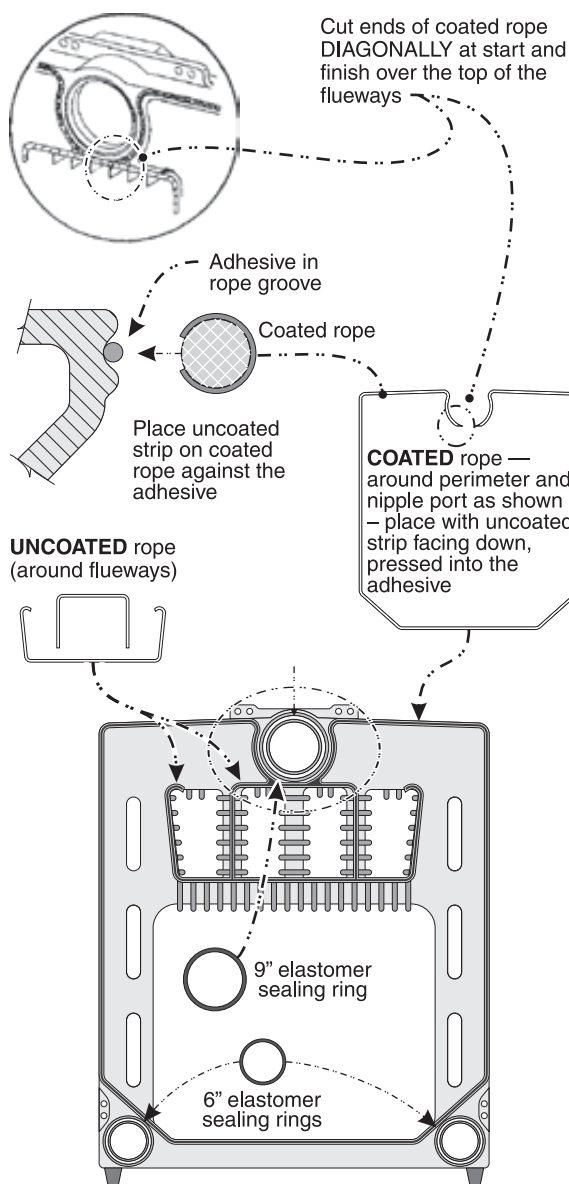
### Install nipple port sealing rings

1. Remove any grit from port machined surfaces with clean rag.
2. Place 9" and 6" sealing rings in appropriate port openings as shown in Figure 6, page 8. If sealing ring slips out of groove, stretch ring gently for several seconds, then reposition in groove.
3. Apply a continuous bead of silicone sealant no larger than  $\frac{1}{16}$ " around entire outside edge of the **outer** machined surface of the port. See Figure 7. **Do not apply silicone sealant on, next to or under sealing ring.**

Figure 6 Sealing rope installation



9405





## Assembling the block *(continued)*

**⚠ WARNING** Silicone sealant applied as specified above prevents unburned oil vapors from coming in contact with sealing ring. Vapor contact can damage rings, resulting in severe damage to boiler and substantial property damage.

### Raise the rear section upright

1. Hoist the back section upright.
2. Move rear section into position on the steel rails. The section should be 4 inches from the end of the foundation (if used) as shown in Figure 1, page 4.
3. Block under the flueway outlet to hold the rear section upright in plumb position.

**⚠ CAUTION** The back section must be plumb before installing other sections to ensure the block will assemble correctly.

4. The blocking under the flueway can be removed later, after several intermediate sections have been attached and the assembly is stable.
5. Install intermediate sections and front section as described on the following.

### Install intermediate sections

1. Remove and discard  $\frac{3}{8}$ " diameter shipping tie rods.
2. Remove grit from port machined surfaces with clean rag. Also remove grit from tapped holes in all sections.

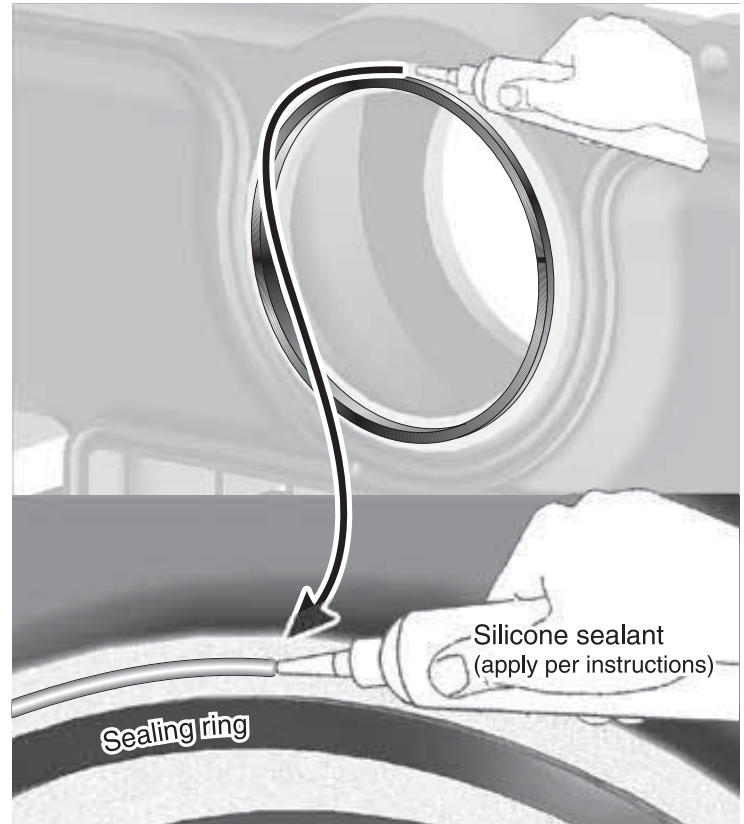
**⚠ WARNING** Do not use petroleum-based cleaning or sealing compounds in boiler system. Severe damage to system components can result, causing substantial property damage.

3. Position intermediate section so aligning lugs fit into sockets of next section. See Figure 8.
4. Draw sections together until metal-to-metal contact is made around machined port openings (see Figure 8):
  - a. Oil threads on (4)  $\frac{3}{8}$ " x 11" draw rods. Install washer and nut on end to be tightened. Use nut only on other end.
  - b. Uniformly draw sections together, starting at washer/nut end.

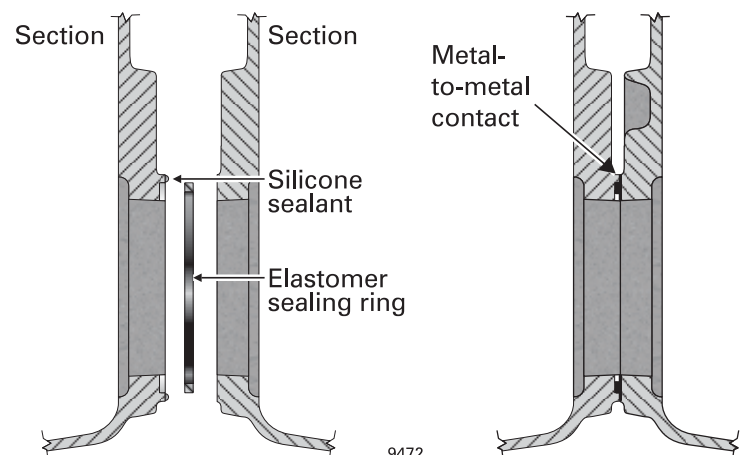
**NOTICE** Important — Leave an equal amount of thread on each end of the draw rod. This is needed to allow securing the jacket support brackets in place. The draw rods must not extend past the face of the front or back section, or they will interfere with the jacket.

- 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 8. If gap occurs, it should be no greater than .032". Check with feeler gauge.

**Figure 7** Applying silicone sealant around outsides of sealing rings (shown on 94 intermediate section upper nipple port)



**Figure 8** Sealing ring installation and port alignment, typical Weil-McLain cast iron section nipple port





# Assembling the block *(continued)*

- e. If, for any reason, the gap around 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 gap still exists, contact your Weil-McLain distributor or sales office before continuing installation.

- 6. Check each section for proper sealing rope position before proceeding to next section.

**⚠WARNING** Failure to position sealing rope properly can cause boiler to not seal gas-tight. Gas tight seal prevents possible flue gas leakage and carbon monoxide emissions, resulting in severe personal injury or death.

**⚠CAUTION** After erecting first intermediate section, check both sections for plumb. Repeat the check as each additional section is installed. Failure to plumb sections can cause misaligned piping and breeching, possibly resulting in property damage.

- 7. Install remaining intermediate sections and front section using the same procedure.

- 5. Repeat steps 1-5 for all remaining sections. NOTE — use 5/8" x 10" draw rods between intermediates. When used, install TI (tankless intermediate) and SI (supply intermediate) sections in the positions shown in Figure 9, page 10.

## 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.

**Figure 9** Section arrangement (location of TI and SI sections, numbered from REAR to FRONT of block assembly)

Boiler W = water S = steam	Placement of special intermediate sections (TI and SI) [numbering from REAR to FRONT, beginning with rear section as section number 1]								SI sections with supply tappings	
	TI sections with tankless coil openings									
	# of coils →	1	2	3	4	5	6	7		8
894 W or S	5	5, 7	3, 5, 7	—	—	—	—	—	—	—
994 W or S	6	6, 8	2, 4, 6	2, 4, 6, 8	—	—	—	—	—	—
1094 W or S	4	2, 4	2, 4, 7	2, 4, 7, 9	—	—	—	—	—	—
1194 W or S	4	2, 4	2, 4, 8	2, 4, 8, 10	—	—	—	—	—	—
1294 W or S	4	2, 4	2, 4, 9	2, 4, 9, 11	2, 4, 7, 9, 11	—	—	—	—	—
1394 W or S	5	3, 5	3, 5, 10	3, 5, 10, 12	3, 5, 8, 10, 12	—	—	—	—	—
1494 W or S	6	4, 6	2, 4, 6	4, 6, 11, 13	2, 4, 6, 11, 13	2, 4, 6, 9, 11, 13	—	—	—	—
1594 W or S	6	4, 6	2, 4, 6	4, 6, 12, 14	2, 4, 6, 12, 14	2, 4, 6, 10, 12, 14	—	—	—	—
1694 W or 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 W or 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 W or 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 W or 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 W or 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 W	6	4, 6	2, 4, 6	2, 4, 6, 9	2, 4, 6, 9, 11	2, 4, 6, 9, 11, 13	2, 4, 6, 9, 11, 13, 16	—	—	18, 20
2294 W	6	4, 6	2, 4, 6	2, 4, 6, 10	2, 4, 6, 10, 12	2, 4, 6, 10, 12, 14	2, 4, 6, 10, 12, 14, 17	—	—	19, 21
2394 W	6	4, 6	2, 4, 6	2, 4, 6, 9	2, 4, 6, 9, 11	2, 4, 6, 9, 11, 13	2, 4, 6, 9, 11, 13, 15	2, 4, 6, 9, 11, 13, 15, 18	—	20, 22
2494 W	8	6, 8	2, 4, 6	2, 4, 6, 8	2, 4, 6, 8, 12	2, 4, 6, 8, 12, 14	2, 4, 6, 8, 12, 14, 16	2, 4, 6, 8, 12, 14, 16, 19	—	21, 23
2594 W	8	6, 8	2, 4, 6	2, 4, 6, 8	2, 4, 6, 8, 11	2, 4, 6, 8, 11, 13	2, 4, 6, 8, 11, 13, 15	2, 4, 6, 8, 11, 13, 15, 17	—	22, 24
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.



# Perform hydrostatic pressure test

## Install boiler connections

### 894 – 1294 W

- Secure supply elbow and gasket to front section and supply outlet cover plate and gasket to back section.
  - Use  $\frac{5}{8}$ " x 3" studs, nuts, and washers.
  - Thread flat end of stud into section.
- Secure 6" NPT return opening counter flange and gasket to back section using  $\frac{3}{4}$ " x 2" cap screws and washers.

### 1394 – 2094 W

- Secure supply elbow and gasket to front section.
- Use  $\frac{5}{8}$ " x 3" studs, nuts, and washers.
- Thread flat end of stud into section.
- Secure supply outlet cover plate and gasket to back section.
- Use  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " bolts.
- Secure 8" pipe with standard 8" flange (not furnished) and gasket (furnished) to back section. Use  $\frac{3}{4}$ " x 2" cap screws and washers (furnished).

### 2194 – 2594 W

- Secure outlet cover plate with 3 holes ( $\frac{3}{4}$ " tapping on top) and gasket to front section.
- Secure outlet cover plate with 2 holes and gasket to back section.
- Use  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " bolts.
- Secure 10" supply outlets and gaskets on top of "SI" sections.
  - Supply outlet should have  $1\frac{1}{4}$ " tapping facing front.
  - Use  $\frac{5}{8}$ " x 3" studs, nuts, and washers.
- Secure 10" flanged return adapter and gasket to back section using  $\frac{3}{4}$ " x 2" hex head cap screws and washers.

### 894 S

- Secure supply elbow and outlet gasket to front section and supply outlet cover plate and gasket to back section.
  - Use  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " bolts.
- Secure 6" return opening counter flange and gasket to back section. Use  $\frac{3}{4}$ " x 2" cap screws and washers.

### 994 – 2094 S

- Secure supply elbows and outlet gaskets to front and back sections.
  - Use  $\frac{5}{8}$ " x 3" studs, nuts and washers.
  - Thread flat end of stud into section.
- Secure 6" NPT return opening counter flange and gasket to back section. Use  $\frac{3}{4}$ " x 2" cap screws and washers.

### 2194 – 2594 S

- Secure outlet cover plates and gaskets to front and back sections.
  - The  $\frac{3}{4}$ " tappings in plates should be at top.
  - Use  $\frac{5}{8}$ " x  $1\frac{3}{4}$ " bolts.

- Secure 10" supply outlets and gaskets on top of "SI" sections.
  - Supply outlet installed close to boiler front should have  $1\frac{1}{4}$ " tapping facing front.
  - Use  $\frac{5}{8}$ " x 3" studs, nuts, and washers.
- Secure 6" NPT return opening counter flange and gasket to back section using  $\frac{3}{4}$ " x 2" hex head cap screws and washers.

## Prepare boiler and test:

- See Figure 10 (water boilers) or Figure 11 (steam boilers) for tapping locations.
  - Install water pressure gauge — **for test only**. Be sure gauge can handle test pressure — see step 8 for required test pressure. Gauge range should be at least 1.5 times the test pressure. Install the pressure test gauge in the tapping specified in Figure 10 (water boilers) or Figure 11 (steam boilers).
  - Install an air vent in an upper tapping.
  - On front section: Install 3" close nipples and caps in washout tappings.
  - On rear section: Install drain valve (furnished by installer) in one of the washout tappings. (Verify drain valve size per Figure 15, page 15.) Install 2" x  $2\frac{1}{2}$ " nipple and cap in the other washout tapping.
  - Plug or use blind flanges on remaining tappings.
- CAUTION** Do not pressure test with any control installed. Damage to control can occur due to overpressure.
- Fill the boiler with water. Vent all air.
  - Pressure test at least 10 minutes at a pressure not less than the following:
    - Steam boiler: Between 45 and 55 psig.**
    - Water boiler: 1½ times maximum allowable working pressure (MAWP) stamped on the boiler nameplate, located on boiler jacket front panel.**

**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, resulting in severe personal injury, death or substantial property damage.

- Check for maintained gauge pressure and leaks. Repair if found.

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

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

- Drain boiler and remove air vent, boiler drain and gauge.
- Remove plugs from tappings that will be used for controls and accessories.

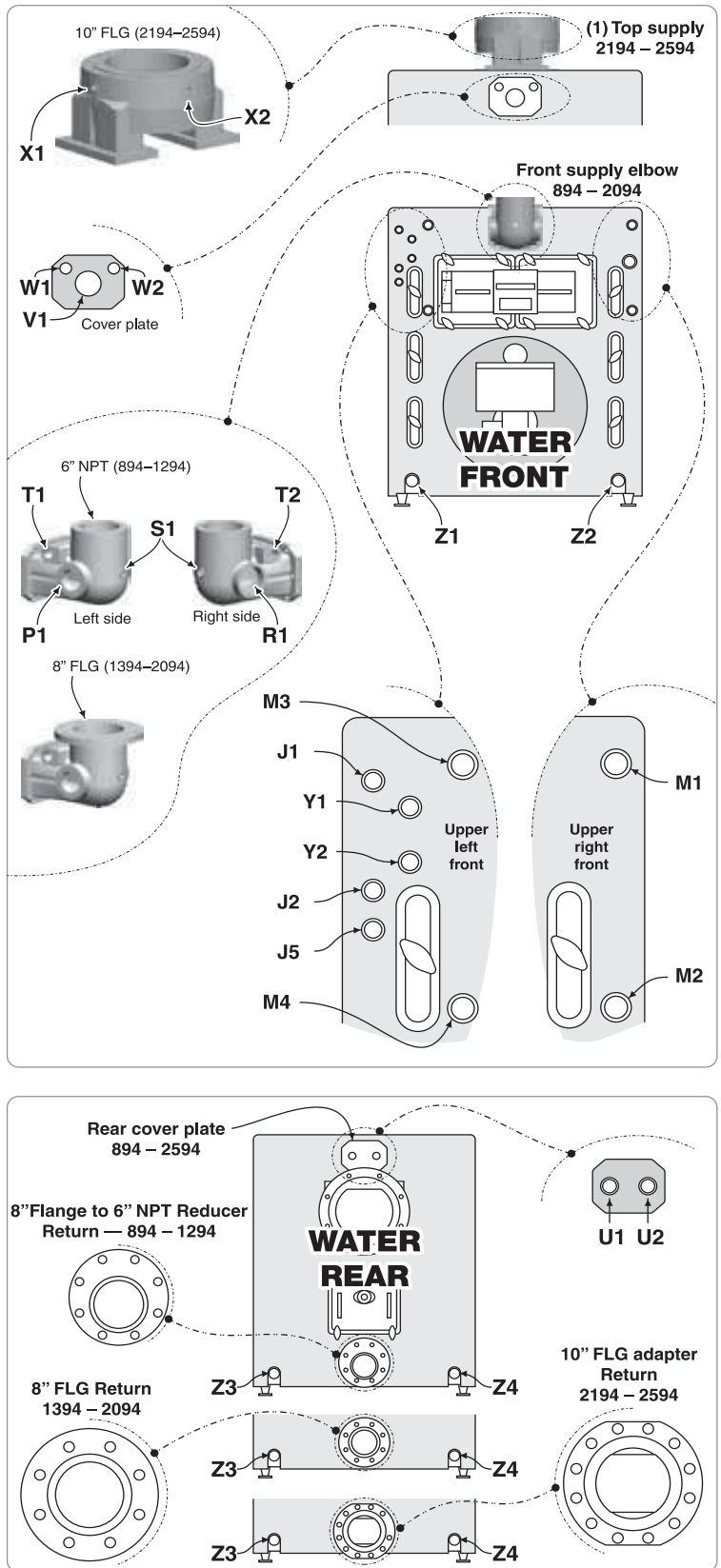


# Control tapping locations — water boilers

Figure 10 Model 94 water boiler control tappings

Item #	Function	Size (Inches NPT)
J1	<b>PRESSURE TEST GAUGE</b> — REMOVE AFTER HYDROSTATIC TEST	½
J1	Temperature control or limit	½
J2 & J5	PLUG these tappings — not used on water boilers	½
M3	Probe-type low water cutoff	1
M1 + M2	Float-type low water cutoff or LWCO/feeder combination	1
M3 + M4		
P1 or R1	Temperature control or limit	3
S1	P/T gauge or temperature gauge	¾
T1 or T2	Temperature control or limit — or — Air vent piping to compression tank	1¼
U1 & U2	<b>Pressure relief valve(s):</b> 894–2094: Install relief valve in one tapping and plug the other tapping 2194–2594: Install a relief valve in each tapping (2 relief valves required on these boilers)	2
V1	Temperature control or limit	4
W1 or W2	Temperature control or limit — or — P/T gauge or temperature gauge	¾
X1 or X2	Temperature control or limit — or — Air vent piping to compression tank	1¼
Y1 & Y2	PLUG this tapping — unless needed for a control	¾
Z1 or Z2	<b>Cleanout tappings</b> — Front section — Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping	2
Z3 or Z4	<b>Cleanout or drain tappings</b> — Rear section — Install drain valve in one tapping; install 2" NPT x 2½" length nipple and 2" NPT cap in the other	2
—	<b>Low limit control</b> (when using tankless heaters) — locate in control tapping on one of the tankless heaters	—

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



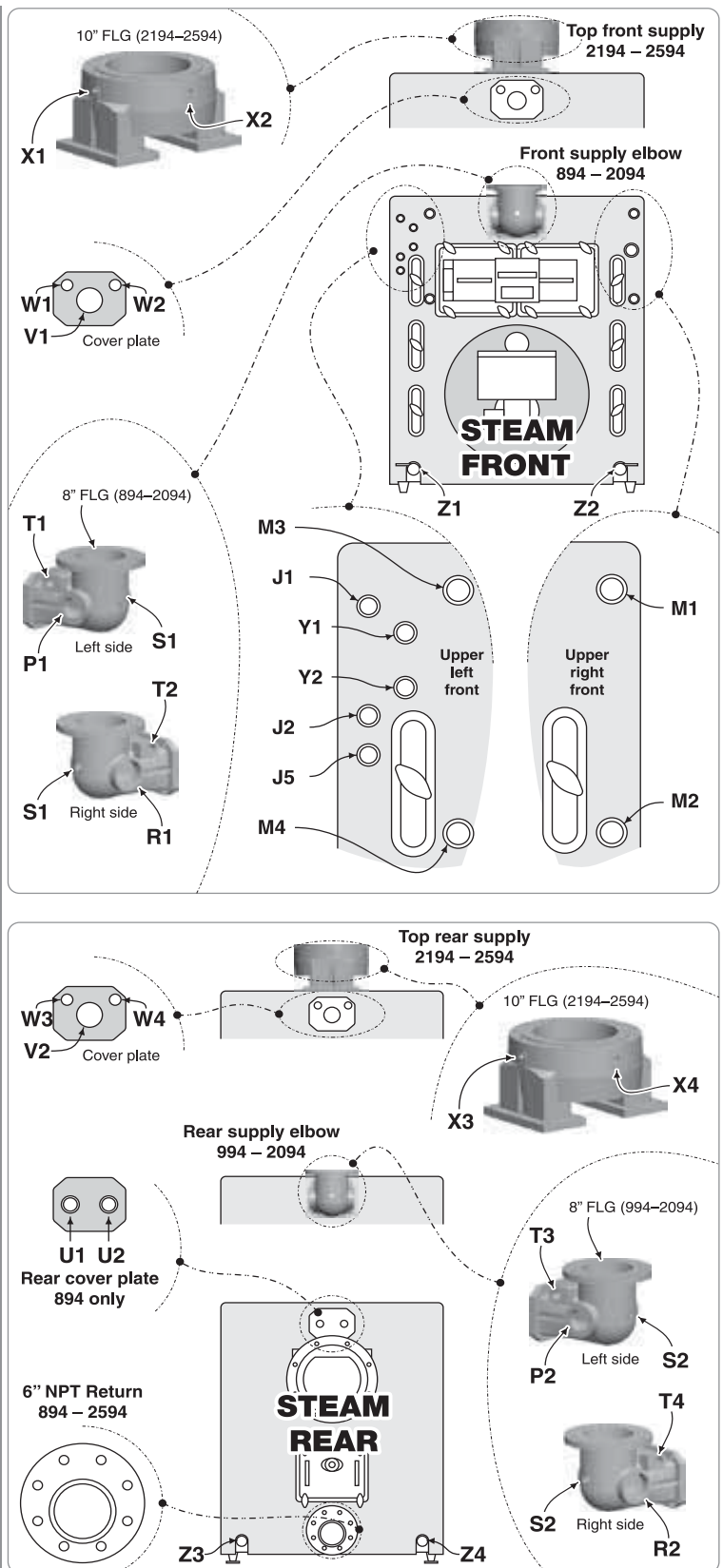


# Control tapping locations — steam boilers

Figure 11 Model 94 steam boiler control tappings

Item #	Function	Size (Inches NPT)
<b>J1</b>	<b>PRESSURE TEST GAUGE — REMOVE AFTER HYDROSTATIC TEST</b>	½
<b>J1 + J5</b>	Gauge glass	½
<b>J2</b>	PLUG this tapping — not used	½
<b>M3</b>	PLUG this tapping — not used	1
<b>M1 + M2</b> <b>M3 + M4</b>	Float-type low water cutoff, LWCO/pump control or LWCO/feeder combination	1
<b>P1</b>	Skim tapping	3
<b>P2</b>	Steam pressure relief valve	3
<b>R1</b>	Skim tapping	4
<b>R2</b>	Steam pressure relief valve	4
<b>S1</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	¾
<b>S2</b>	Pressure controls (limit, operating, etc.)	¾
<b>T1 or T2</b>	Pressure controls (limit, operating, etc.)	1¼
<b>T3 or T4</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	1¼
<b>U1 or U2</b>	Steam pressure relief valve — Install relief valve in one tapping and plug the other	2
<b>V1 or V2</b>	Steam pressure relief valve — or — Skim tapping	4
<b>W1 or W2</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	¾
<b>W3 or W4</b>	Pressure controls (limit, operating, etc.)	¾
<b>X1 &amp; X2</b>	PLUG these tappings — not used	1¼
<b>X3 &amp; X4</b>	PLUG these tappings — not used	1¼
<b>Y1 &amp; Y2</b>	Try cocks	¾
<b>Z1 or Z2</b>	Cleanout tappings — Front section — Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping	2
<b>Z3 or Z4</b>	Cleanout or drain tappings — Rear section — Install drain valve in one tapping; install 2" NPT x 2½" length nipple and 2" NPT cap in the other	2
—	Low limit temperature control (when using tankless heaters) — locate in control tapping on one of the tankless heaters	—

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





# Connect water boiler piping

## General water piping information

1. System water supply and return piping should be installed and piping connections attached to boiler before erecting jacket or installing controls.
2. Do not pipe in through supply and out through return. This creates reverse water flow through boiler that must not be used.
3. When installing in a system in which return water temperature can drop below 140°F, apply the by-pass piping with by-pass pump as shown in Figure 16, page 15.
4. When three-way valves are used for temperature modulation, install slow-opening valves to minimize the potential of boiler thermal shock.

## Install piping

Install piping as shown in Figure 12, page 14 and Figure 16, page 15 (if applicable) for single boilers. For multiple boilers, see Figure 17, page 15.

**CAUTION** Improperly piped systems or undersized piping can contribute to erratic boiler operation and possible boiler or system damage.

1. Connect supply and return piping:
  - a. Size according to tables below.
    - For **known flow rates or higher flow rate** (less than 20°F temperature rise) through boiler, see Figure 13.
    - For **unknown flow rates**, size piping per Figure 15, page 15, using 20°F temperature rise through boiler.

**WARNING** Flow at higher rates than shown in the tables in this manual for given pipe sizes can damage the boiler, causing substantial property damage.

- b. Locate circulator in supply piping.
  - c. For return piping, use full diameter pipe for 10 times that diameter before making any reduction. For example, a 4-inch return should not be reduced any closer to boiler return tapping than 40 inches.
  - d. Install system blow-off (drain) valve in lowest part of return piping close to boiler. ASME minimum size requirements are given in Figure 15, page 15.
2. Install expansion tank:
    - a. **Closed type** – connect to 1¼" tapping T1, T2 or X2 (see Figure 10, page 12). Use 1" NPT piping. Any horizontal piping must pitch up toward tank at least 1 inch per each 5 feet of piping.
    - b. **Diaphragm type** – Refer to tank manufacturer's literature for location. Install automatic air vent in 1¼" tapping T1, T2 or X2 (see Figure 10, page 12).
    - c. Connect cold water fill to expansion tank piping. Figure 12 shows typical piping when using a closed type tank. Connect to the same location as the expansion tank connects to the system when using a diaphragm type tank.
    - d. Also shown are recommended valves and water meter, when used. Water meter will detect added make-up water, indicating leaks in system.

Figure 12 Water boiler piping, typical

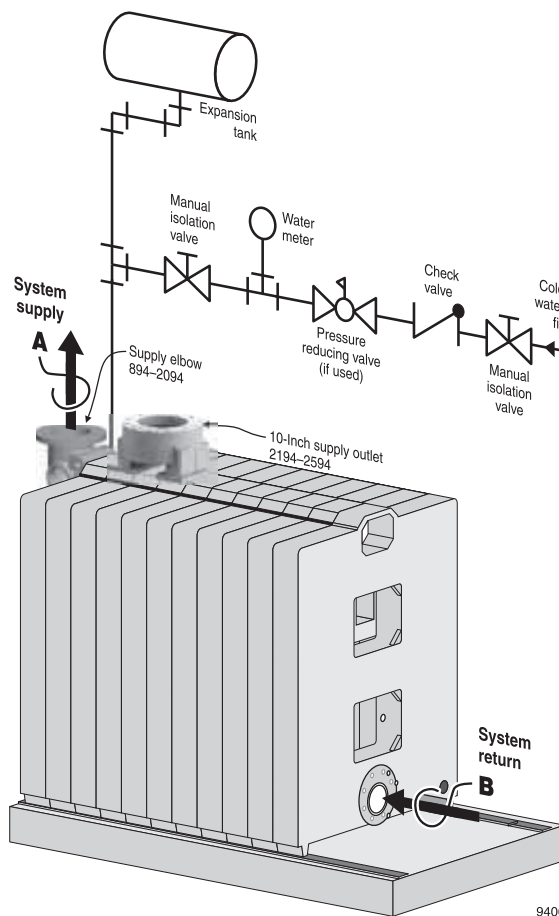


Figure 13 Recommended minimum pipe sizes for known flow rates (note 1)

Water flow rate, GPM	Supply pipe size A	Return pipe size B
up to 77	3"	3"
78 – 132	4"	4"
133 – 208	5"	5"
209 – 300	6"	6"
301 – 520	8"	8"
521 – 820	10"	10"

Note 1 High temperature rise through boiler is permissible when boiler piping connections are sized per this table. **Intermittent** flow at **high** velocities may damage any boiler.



# Connect water boiler piping *(continued)*

**Figure 14** Recommended minimum pipe sizes when flow rate is not known (see Figure 12, page 14) (note 1)

Boiler model	Supply pipe size A	Return pipe size B
894	5"	5"
994 – 1294	6"	6"
1394 – 2094	8"	8"
2194 – 2594	10"	10"

Note 1 Pipe sizes are based on a 20°F temperature rise through the boiler. For applications with higher flow rates (lower temperature rise), determine the flow rate and use Figure 13, page 14 to size the piping. DO NOT use flow rates in excess of 520 GPM through 894–2094 or 820 GPM through 2194–2594.

**Figure 15** ASME drain valve size

Boiler model	Minimum drain/blow-off valve size
894 – 994	1¼"
1094 – 2194	1½"
2294 – 2594	2"

## Piping multiple boilers

- See Figure 16. (Expansion tanks, relief valves and other accessories are required, but omitted from the illustration for simplicity.)
- The boiler piping circuits are referred to as the secondary circuits in the following.
- The legend for Figure 16 and boiler pump sizing recommendations follow:

**A** Size boiler pump GPM based on the following:

**a.** Temp rise = High limit temp – Return water temp

**b.** 
$$\text{GPM} = \frac{\text{Boiler Gross Output, Btuh}}{\text{Temperature rise} \times 500}$$

- Calculate only secondary (boiler) piping circuit resistance. Allow for head loss through the boiler equal to three 90 degree elbows of secondary pipe size.
- Operate each boiler and its pump with a Weil-McLain boiler control panel.
- Size secondary (boiler) circuit piping using the flow rate ranges given in Figure 15.

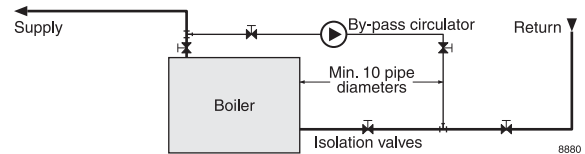
**B** Primary pump GPM and head calculation should not include secondary boiler circuits. Primary pump can operate continuously during heating season.

**C** Connection to primary circuit — Space 12" maximum or as close as practical.

**D** Check valve.

**E** Hand valve.

**Figure 16** By-pass piping for return water less than 140°F



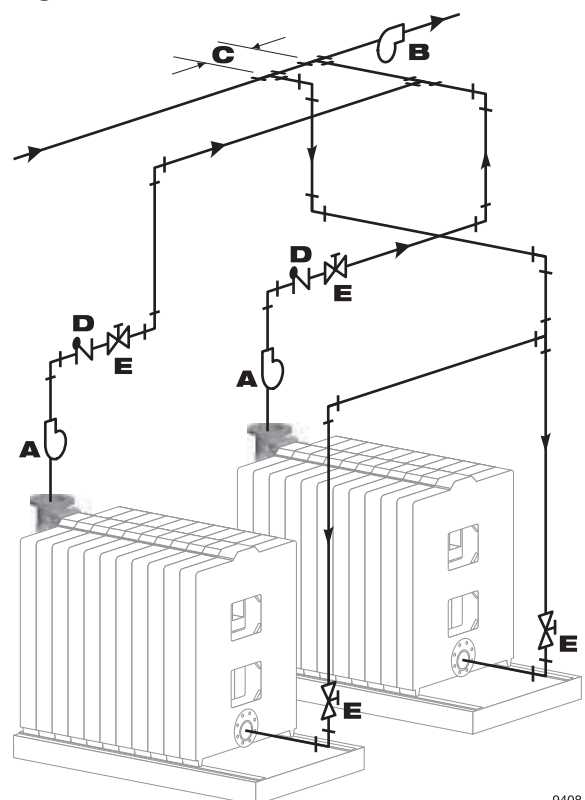
### By-pass circulator sizing:

- Size system circulator as required. Determine GPM and head requirements.
- Provide a by-pass circulator for EACH boiler. The flow rate for each by-pass circulator will be:

**Flow** = ¼ x (System circulator GPM) ÷ (# of boilers)

- All circulators must run at the same time.
- Example: For a 1,000,000 Btuh single boiler, with system temperature drop of 20°F:
  - System GPM = 1,000,000 ÷ 20 ÷ 500 = 100 GPM
  - By-pass GPM = ¼ x 100 GPM = 25 GPM
  - Determine by-pass circuit head loss for pipe size and fittings used.
- In most applications, a standard booster pump should be adequate.

**Figure 17** Multiple water boiler piping



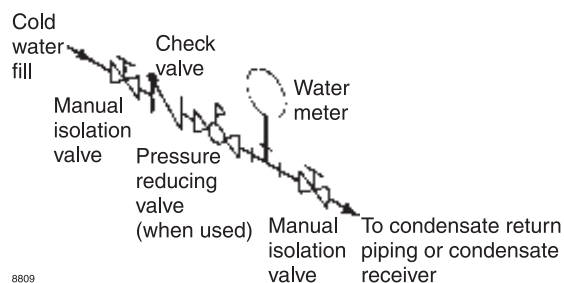


# Connect steam boiler piping

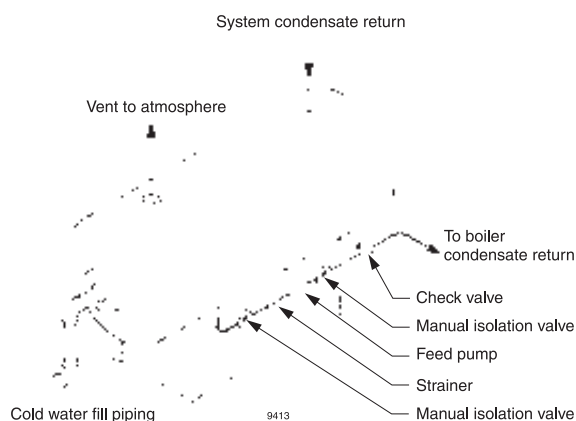
## General steam piping information:

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 24-inch minimum from waterline to bottom of header (86¾" from bottom of section).
3. When using condensate receiver, feed pump must be energized by boiler-mounted pump controller.
4. Install piping:
  - a. Install piping as shown on page 17 through page 18 for single boilers. See page 19 for additional requirements when piping multiple boilers.
  - b. Return pipe sizing.
    - Pumped return — Size return piping by pump.
    - Gravity return — Size gravity return same as Hartford loop equalizer pipe size.
  - c. Drain valve — Install system drain valve in lowest part of return piping close to boiler. See Figure 15, page 15, for sizing.
  - d. Cold water fill piping — Connect cold water fill piping as shown in Figure 18. Also shown are recommended valves and water meter, if used. Water meter will detect added makeup water, indicating leaks in system.
  - e. Condensate return piping:
    - Satisfactory operation of any steam heating system depends on adequate return of condensate to maintain steady water level.
    - Avoid adding excessive amounts of raw make-up water.
    - Where condensate return is not adequate, a low water cutoff with pump control, condensate receiver, and condensate boiler feed pump should be installed.
    - See Figure 19 for piping and Figure 20 for sizing.

**Figure 18** Cold water fill piping



**Figure 19** Condensate piping to boiler (see Figure 18 for cold water fill piping detail)



**Figure 20** Condensate receiver capacity requirements

Boiler model number	AHRI gross output (lbs steam per hour)	Gallons condensate per hour	Minimum condensate receiver capacity (gallons) (Note 1)				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	
894	2,028	244	74	148	222	296	8.0
994	2,320	279	84	168	252	336	9.0
1094	2,612	314	95	190	285	380	10.5
1194	2,904	349	105	210	315	420	12.0
1294	3,190	383	115	230	345	460	13.0
1394	3,480	418	126	252	378	504	14.0
1494	3,770	453	136	272	408	544	15.0
1594	4,070	489	147	294	441	588	16.5
1694	4,360	524	158	316	474	632	17.5
1794	4,650	559	168	336	504	672	19.0
1894	4,940	594	179	358	537	716	20.0
1994	5,230	628	189	378	567	756	21.0
2094	5,520	663	199	398	597	796	22.0
2194	5,810	698	210	420	630	840	22.0
2294	6,100	732	220	440	660	880	24.0
2394	6,390	767	231	462	693	924	26.0
2494	6,680	802	241	482	723	964	27.0
2594	6,970	837	252	504	756	1,008	28.0

Note 1 — Maximum time to when condensate returns to boiler — the longer the time for condensate to return, the larger the receiver must be.





# Connect steam boiler piping *(continued)*

**CAUTION** Improperly piped systems or undersized piping can contribute to erratic boiler operation and possible boiler or system damage. 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 local Weil-McLain distributor or sales office before installing alternate piping.

## Steam boiler piping guidelines

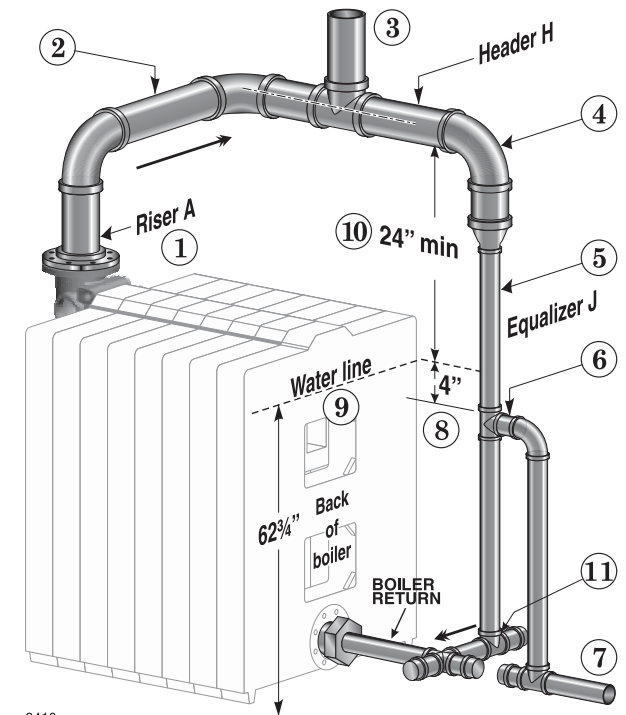
**Minimum height of header above water line must be 24 inches**

**WARNING** The boiler header must always be at least **24 inches** 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, resulting in potential serious damage to system components and oxygen corrosion due to excess make-up water.

## Hartford loop piping for all steam boilers

- You must 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.
- Locate the top of the Hartford loop return nipple at least 4 inches below the water line, as shown.

Figure 21 Model 894 steam (1 riser)



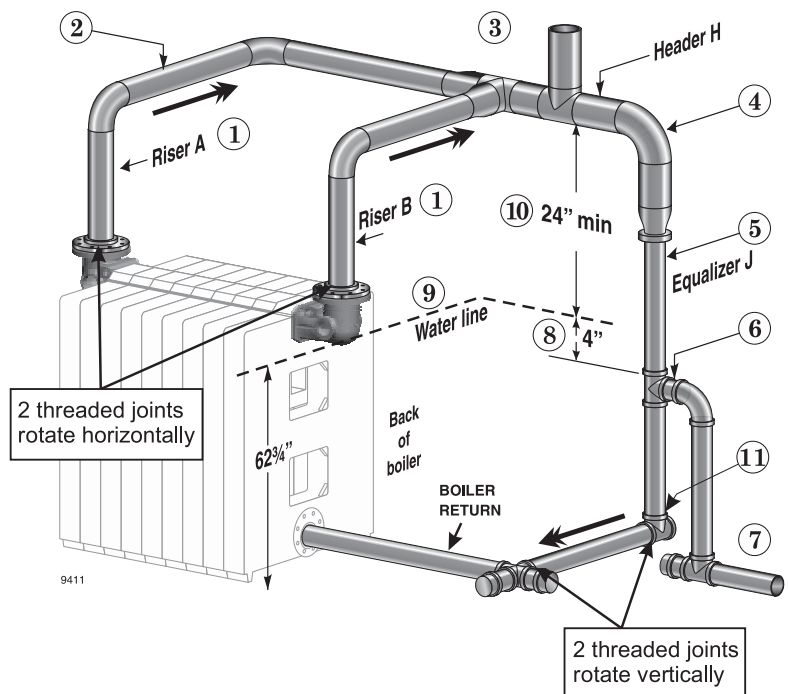
Pipe Dimensions	Model	Riser A	Header H	Equalizer J
	894	8"	8"	8"

## Drawing legend & notes

(Figure 21 through Figure 24)

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

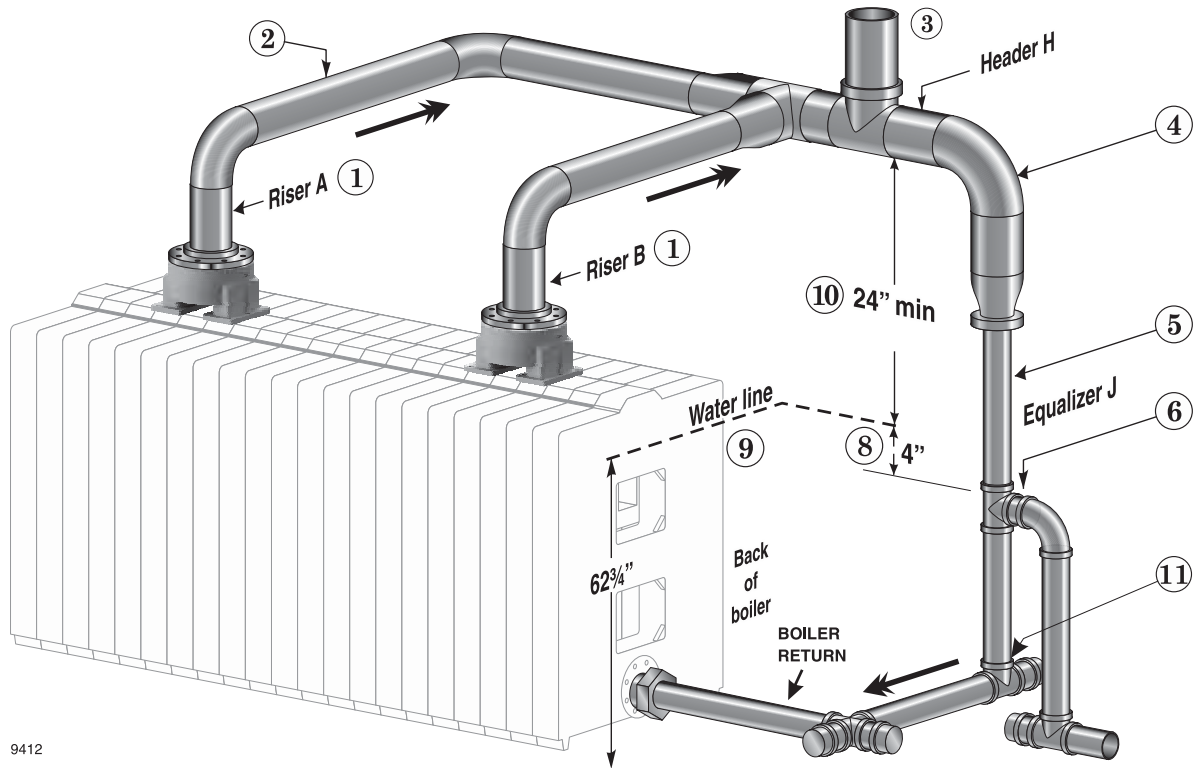
Figure 22 Model 994 through 2094 steam (2 8-inch risers required)



Pipe Dimensions	Model	Riser A	Riser B	Header H	Equalizer J
	994-1594	8"	8"	8"	8"
1694-2094	8"	8"	8"	10"	4"

## Connect steam boiler piping (continued)

Figure 23 Model 2194 through 2594 steam (2 10-inch risers required)



9412

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

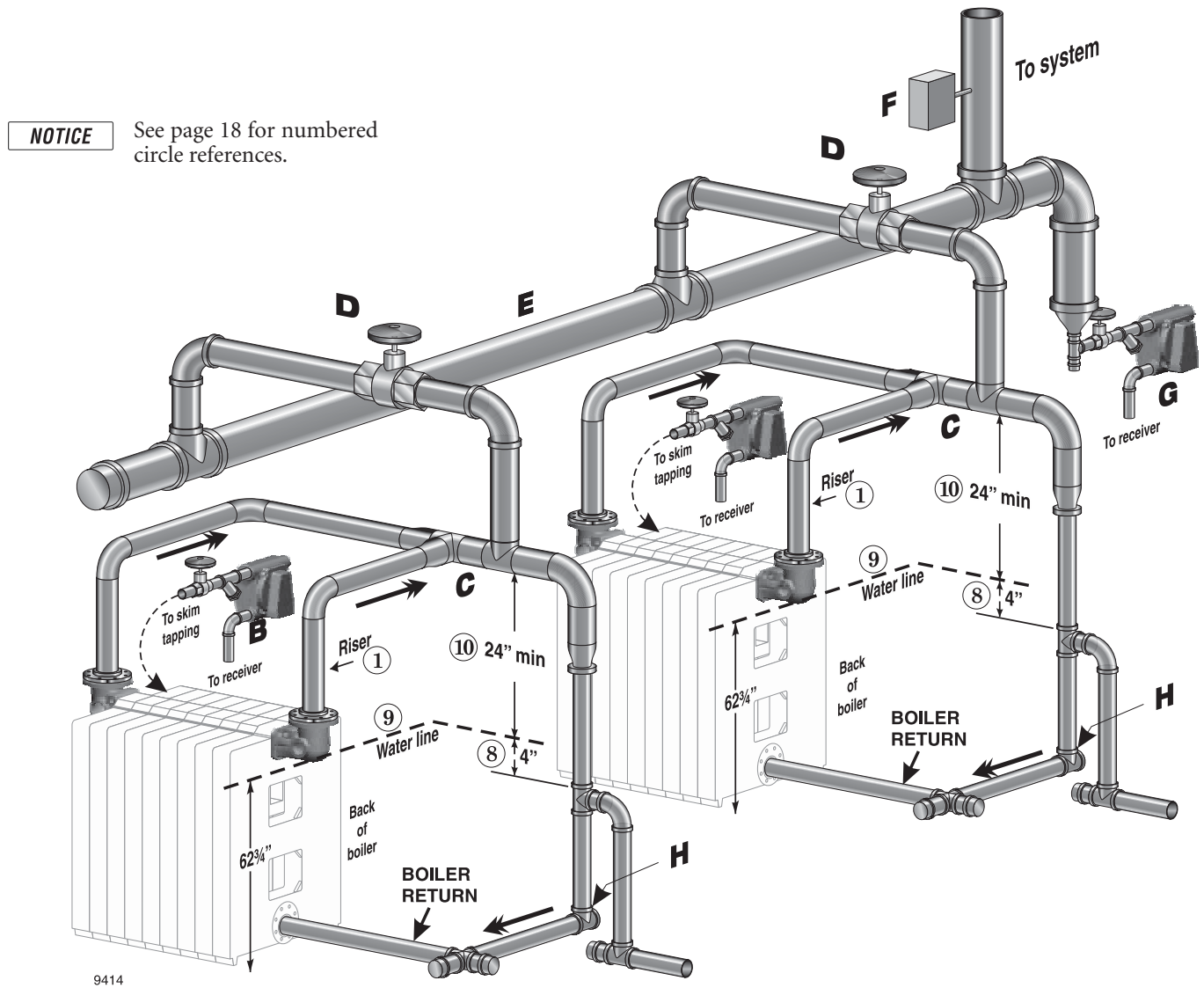
### Drawing legend & notes

(Figure 21 through Figure 24)

- 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

# Connect steam boiler piping (continued)

**Figure 24** 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 at point **A** either:
    - Separate feed pumps and check valves for each boiler, or . . .
    - 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-levelling 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:
- A Weil-McLain Boiler Control System (such as a BCP panel) with header-mounted pressure control(s) to sequence boilers, or . . .
  - 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.



# Complete block assembly & install jacket

## Before installing jacket

**WARNING** The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 36 of this manual. Failure to comply could result in severe personal injury.

**WARNING** The boiler must be pressure tested before proceeding with jacket installation. See page 11. Failure to comply could result in severe personal injury, death or substantial property damage.

**NOTICE** Read the following before installing other controls and trim:

### These parts **MUST** be ON the boiler:

1. Plugs for unused tappings.
2. Supply and return piping and steam supply header, including supply elbows or top supply adapters.
3. Tankless heaters (when used), tankless heater cover plates (when used).

### These parts **MAY** be on the boiler:

1. Burner mounting plate.

### These parts **MUST** be OFF the boiler:

1. Cleanout plates and cleanout doors.
2. Access panel.
3. Flue collar.
4. Breeching.
5. Burner.
6. Water or steam gauge.
7. Limit control and low water cutoff.
8. Gauge glass and gauge glass cocks, try cocks.
9. Drain cock.
10. Tankless heater piping (when used).

## Burner mounting plate

1. The following instructions assume a burner mounting plate supplied with the boiler. For H-94 boilers, if burner mounting plate was not ordered, the plate must be made according to burner requirements.
  - a. Thread two nuts on rounded end of ½" x 4¼" stud, locking them together. Screw flat end of stud in one of six holes around opening.
  - b. Remove nuts from stud and save.
  - c. Repeat for remaining five studs.
  - d. Apply ⅛" continuous bead of rope adhesive in groove around opening.
  - e. Position ½" sealing rope in groove. Overlap ends about 2 inches.
  - f. Install burner mounting plate with observation port at top of plate. Use ½" washers and nuts.

## Front observation plate

1. Install front observation port assembly over half-moon on burner mounting plate:
  - a. Apply ⅛" continuous bead of rope adhesive in groove on assembly.
  - b. Position ⅜" sealing rope in groove, overlapping ends at least 1 inch.
  - c. Secure assembly to plate with ¼" x ¾" flat-head machine screws.

## Cleanout and inspection tappings

1. If cleanout and inspection tappings were ordered, use 1½" brass countersunk plugs to plug openings.
2. If using "TI" sections, install tankless or storage heaters and gaskets, or heater plates and gaskets. Use ⅜" cap screws.

## Remove jacket parts from cartons and inspect

1. Locate jacket cartons.
2. Remove jacket parts from cartons as needed. Leave 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 25, page 21.

## Prepare jacket panels for use

1. Determine from the control tapping table (Figure 10, page 12 or Figure 11, page 13) which of the knockout openings in the jacket panels will be used.
2. To remove a knockout disc, bend one side inward until it can be grasped with a pair of pliers; then, bend the disc back and forth until it breaks loose.

**NOTICE** The **jacket side panels** are reversible and can be placed on either the left or right side of the boiler. If the boiler was ordered with tankless coils (supplied with intermediate sections with tankless coil openings), the jacket side panels with tankless coil knockouts must be properly positioned on the right-hand side of the boiler ONLY.



# Complete block assembly & install jacket *(continued)*

**Figure 25** Model 94 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

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
8	1	-	-	-	-	1	-	-	-	-	1	-	-	-
9	1	-	-	-	-	-	1	-	-	-	-	1	-	-
10	1	1	2	-	-	-	-	2	-	-	-	-	-	-
11	1	1	1	1	-	-	-	1	1	-	-	-	-	-
12	1	1	1	-	1	-	-	1	-	1	-	-	-	-
13	1	1	-	1	1	-	-	-	1	1	-	-	-	-
14	1	1	-	-	2	-	-	-	-	2	-	-	-	-
15	1	1	-	-	1	1	-	-	-	1	1	-	-	-
16	1	1	-	-	1	-	1	-	-	1	-	1	-	-
17	1	1	-	-	-	1	1	-	-	-	1	1	-	-
18	1	1	-	-	-	-	2	-	-	-	-	2	-	-
19	1	2	1	-	2	-	-	1	-	2	-	-	-	-
20	1	2	-	1	2	-	-	-	1	2	-	-	-	-
21 Steam	1	2	-	-	3	-	-	-	-	1	-	-	2	-
21 Water	1	2	-	-	3	-	-	-	-	2	-	-	1	-
22 Steam	1	2	-	-	2	1	-	-	-	-	1	-	2	-
22 Water	1	2	-	-	2	1	-	-	-	1	1	-	1	-
23 Steam	1	2	-	-	2	-	1	-	-	-	-	1	2	-
23 Water	1	2	-	-	2	-	1	-	-	1	-	1	1	-
24 Steam	1	2	-	-	1	1	1	-	-	-	1	-	1	1
24 Water	1	2	-	-	1	1	1	-	-	-	1	1	1	-
25 Steam	1	2	-	-	1	-	2	-	-	-	-	1	1	1
25 Water	1	2	-	-	1	-	2	-	-	-	-	2	1	-

\* If the boiler was ordered with tankless coil(s), jacket side panel(s) with tankless coil knockout openings will be furnished. It is important that the TI section(s) (where used) be positioned in the exact location(s) in the section assembly as shown in the boiler erecting instructions (see Figure 9, page 10) so the tankless coil knockout openings in the jacket side panel(s) will accommodate the tankless coil(s). If the TI section(s) and tankless coil(s) are not positioned in the boiler section assembly as directed, the installer must cut opening(s) in the jacket side panel(s) to accommodate the coil(s).



## Complete block assembly & install jacket *(continued)*

**WARNING** DO NOT loosen the tie rod nuts when installing jacket brackets. Brackets are attached using separate fasteners.

### Install front and rear jacket panel brackets

- See Figure 27.
- Install jacket brackets on the tie rod lugs of the front and rear sections as shown in inset A and inset B of Figure 27.
  - Front section brackets must point toward the front. Rear section brackets must point toward the rear.
  - Slide one slot of the bracket over the tie rod.
  - Secure each bracket using the provided  $\frac{5}{16}$ " x  $1\frac{1}{2}$ " screw, washer and Tinnerman nut as shown.
  - Install a bracket to each side tie rod lug and two on the top tie rod lug, totalling four brackets the front section and four brackets on the back section.

### Install front and rear jacket panels

- Place the right front jacket panel against the right side of the front section, with the jacket flanges over the mounting brackets.
- Secure with a #10 x  $\frac{1}{2}$ " type A sheet metal screw on the right side and top into the two brackets.
- Set the left front jacket panel in place and secure in the same way.

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

- Secure the left and right front panels together with the #10 x  $\frac{1}{2}$ " screws provided.
- Use the same procedure to install the jacket rear panels. Start with the left side panel, then the right side panel.

### Install brackets and side panel splice channels (1094–2594)

- Side panel brackets are not required for boiler sizes 894 and 994. Skip to the next section. See the following for 1094 through 2594 boilers.
- See Figure 27.
- Larger boilers use multiple side panels, requiring splice channels as shown in Figure 27.
  - Each splice channel is attached to the brackets with four screws as shown.
  - Boilers 1094 through 1894 require one set of splice channels. Boilers 1994 through 2594 require two sets.
- The brackets that secure the splice channels mount to the tie rod lugs as shown in Figure 27, using  $\frac{5}{8}$ "-11 N.C. hex nuts supplied.
  - Locate the brackets on the sections specified in Figure 26.
  - Brackets must be oriented as shown, with their edges point at one another. DO NOT loosen the existing tie rod nuts.

- When completed, there will be four brackets on each section listed in Figure 26.

**Figure 26** Place support brackets as listed below (sections are numbered from back to front) (see Figure 27)

Boiler	Install brackets on sections:	Install brackets on sections:
1094	5 & 6	—
1194	5 & 6	—
1294	4 & 5	—
1394	6 & 7	—
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

- Attach the left and right splice channels to the splice channel brackets using two (2) #10 x  $\frac{1}{2}$ " type A sheet metal screws provided.
- Attach the top splice channel to the brackets and to the two side splice channels using eight (8) #10 x  $\frac{1}{2}$ " type A sheet metal screws provided.

### Install side and top jacket panels

- Attach jacket side panels to front and rear panels and splice channels using #10 x  $\frac{1}{2}$ " type A sheet metal screws provided.

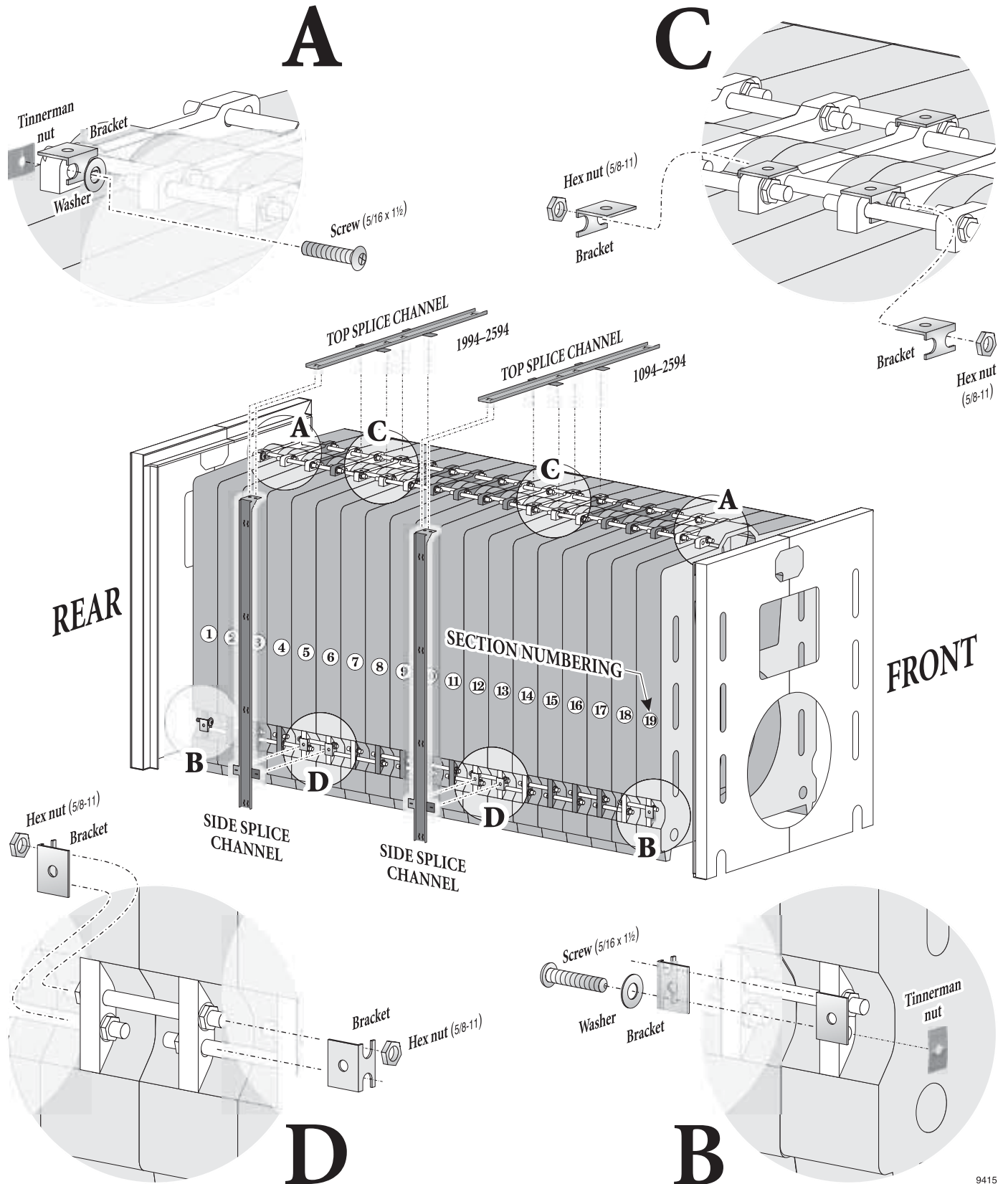
**CAUTION** DO NOT stand on the jacket at any time. Jacket panels will be damaged.

- 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.
- After jacket side panels are in stalled, install the jacket top panels using #10 x  $\frac{1}{2}$ " type A sheet metal screws provided.



# Complete block assembly & install jacket (continued)

Figure 27 Installing jacket support brackets, support channels and corners (piping and other components omitted for clarity)



# Complete block assembly & install jacket *(continued)*

## Install front cleanout doors

1. See Figure 28, items K20 (cleanout door assembly), K22 (hinge for cleanout door), K22 (hinge for cleanout door) and K24 (hinge plate for cleanout door).
2. Apply a  $\frac{1}{8}$ " continuous bead of rope adhesive in the grooves around the cleanout doors.
3. Position  $\frac{1}{2}$ " sealing rope in grooves, overlapping ends at least 1".
4. Secure 8 mounting studs in tapped holes located around cleanout openings.
5. Position cleanout door with hinge closest to centerline of front section over 4 studs.
6. Hand tighten 4 wing nuts to secure door to section.
7. Attach cleanout door hinge plate to installed door. Use two hinge pins.
8. Attach other door to hinge plate. Use two hinge pins.
9. Close second door. Hand tighten 4 wing nuts to secure door to section.
10. Affix boiler nameplate to hinge plate. Use 2 drive screws.

## Install front cleanout plates

1. See Figure 28, item M (cleanout plates).
2. Thread two  $\frac{1}{2}$ " nuts on round end of  $\frac{1}{2}$ " x  $4\frac{1}{4}$ " stud. Lock the nuts together.
3. Thread flat end of stud into tapped hole in one of the clean-out openings.
4. Remove nuts.
5. Repeat steps 1-3 for remaining 5 studs.
6. Apply  $\frac{1}{8}$ " continuous bead of rope adhesive in groove around plates.
7. Position  $\frac{3}{8}$ " sealing rope in groove, overlapping ends at least 1".
8. Insert a cleanout plate into each opening. Secure with hand-tightened wing nut.

## Install flue collar on rear section

1. See Figure 29, item D (flue collar assembly).
2. Thread two  $\frac{1}{2}$ " nuts on round end of  $\frac{1}{2}$ " x  $4\frac{1}{4}$ " stud. Lock nuts together.
3. Thread flat end of stud into tapped hole inside flueway outlet.
4. Remove nuts.
5. Repeat steps 1 through 3 for the remaining 3 studs.
6. Apply  $\frac{1}{8}$ " continuous bead of rope adhesive in groove around flue collar.
7. Position  $\frac{1}{2}$ " sealing rope in groove, overlapping ends at least 1".
8. Position flue collar over studs. The breeching damper handle must point up.
9. Tightly secure flue collar to rear section using  $\frac{1}{2}$ " nuts and washers.

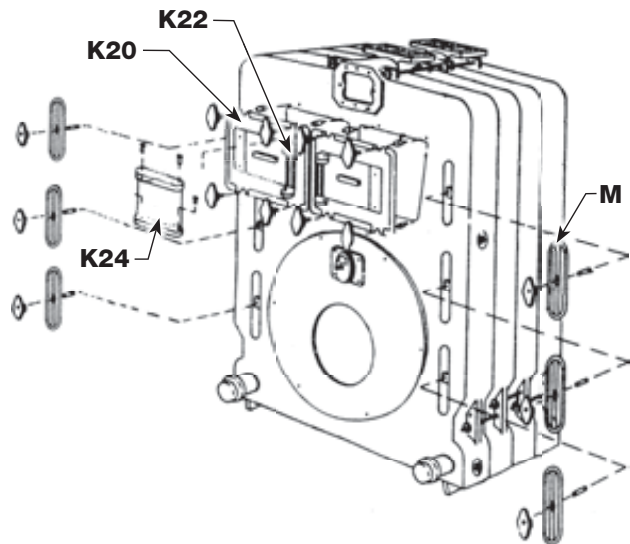
## Install back access door

1. See Figure 29, items K40 (back access door assembly) and

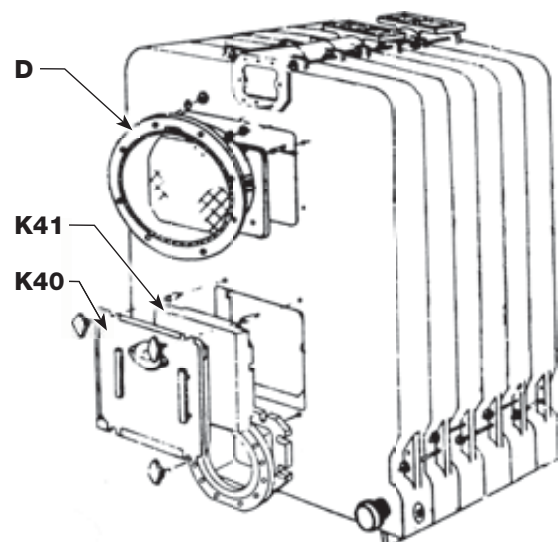
K41 (refractory shield for back access door).

2. Insert access door shield into opening in back section.
3. Push against shield until it bottoms against stops.
4. Apply  $\frac{1}{8}$ " continuous bead of rope adhesive in groove around back access door opening.
5. Position  $\frac{1}{2}$ " sealing rope in groove, overlapping ends at least 1".
6. Secure four mounting studs in holes around back access door opening.
7. Position access door assembly over studs.
8. Hand-tighten 4 nuts to secure access door.

**Figure 28** Front section block assembly components



**Figure 29** Rear section block assembly components





# Pipe tankless heaters

**⚠ DANGER** Hot water can scald!



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.

Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scald and cause injury.

Children, elderly, infirm or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:

- Install automatic mixing valve set according to those standards.
- Use lowest practical temperature setting.
- Check water temperature immediately after first heating cycle and after any adjustment.

## To pipe tankless heaters:

1. See Figure 31.
2. Size piping no smaller than heater inlet and outlet.
3. Automatic mixing valve must be installed. See Figure 31. Follow manufacturer's instructions to install.
4. Flow regulating valve must be installed. Size according to continuous draw of heater. See Figure 30. Follow manufacturer's instructions to install.
5. Operating control with small adjustable differential scale is recommended. Install in temperature control tapping in heater plate.
6. Multiple tankless heaters (see Figure 31):
  - a. Use cold water supply header with individual risers to each heater. Size header by increasing one pipe size for each additional heater.
  - b. Use hot water outlet header with individual risers to each heater. Size header by increasing one pipe size for each additional heater.
  - c. Do not pipe multiple heaters in series.
7. In hard water areas, soften cold domestic water supply to heaters to prevent lime build-up.

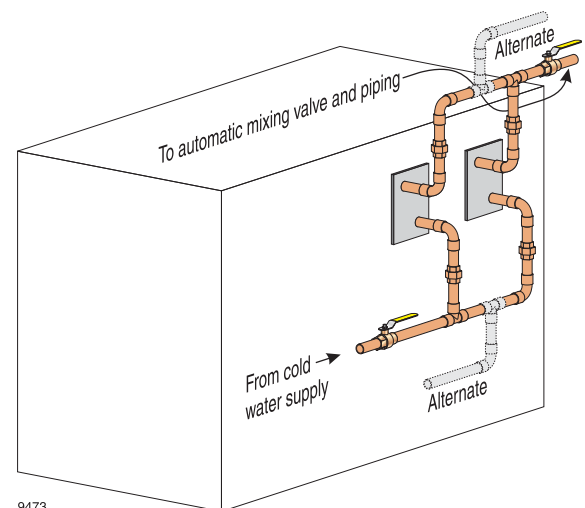
**Figure 30** Tankless heater ratings (Weil-McLain ratings)

Heater number	Intermittent draw – GPM (note 2)	Continuous draw GPM (notes 1, 2)	Inlet and outlet tappings
590-921-910	9	11	¾"
Note 1	GPM based on 40–140°F DHW with boiler water at 200°F.		
Note 2	Based on continuous draw with no recovery period.		



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

**Figure 31** Tankless Heater Piping





# Install water boiler controls

## Install controls:

1. Install furnished controls per Figure 32 and Figure 33, page 27.

**WARNING** Failure to properly install, pipe and wire boiler controls can result in severe damage to boiler, building and personnel; and is not covered by boiler warranty.

2. Relief valve must be installed with spindle in vertical position. Use fittings provided with boiler. Do not make any other connection in that piping.

**WARNING** Relief valve discharge line must be piped using rigid material suitable for 375°F, threaded one end, near floor close to drain to eliminate potential of severe burns. Do not pipe to any area where freezing could occur. Do not plug, valve or place any obstruction in discharge line.

3. When installing low water cut-off
  - a. Must be installed if boiler is located above radiation level.
  - b. May be required on water boilers by certain state, local or territorial codes or insurance companies.
  - c. Install low water cutoff designed for water installations where shown in Figure 32 and Figure 33, page 27.
  - d. Pipe float-type low water cut-off(s) with offset piping to prevent obstruction of boiler access and cleanout openings. See Figure 38, page 30.

**NOTICE** **One limit control** is supplied with the boiler. A second limit control must be supplied by the installer (field installed) to comply with current ASME Boiler and Pressure Vessel Code, Section IV.

4. Dual limit control settings:
  - a. **Low** – set according to design requirements.
  - b. **High** – at least 20° higher than low limit, 240°F maximum.
5. Install optional controls per control manufacturer's instructions.

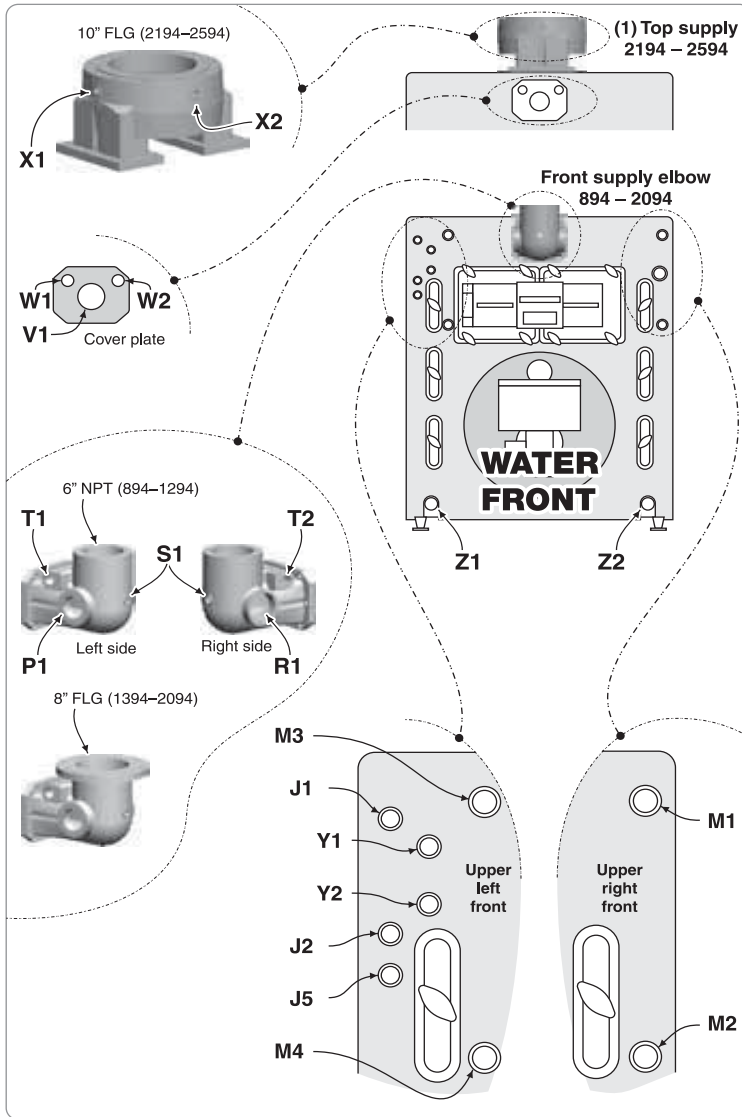
Figure 32 Model 94 water boiler control tappings

Item #	Function	Size (Inches NPT)
J1	Temperature control or limit	½
J2 & J5	PLUG these tappings — not used on water boilers	½
M3	Probe-type low water cutoff	1
M1 + M2	Float-type low water cutoff or LWCO/feeder combination (use offset piping as shown in Figure 38, page 30)	1
M3 + M4		
P1 or R1	Temperature control or limit	3
S1	P/T gauge or temperature gauge	¾
T1 or T2	Temperature control or limit — or — Air vent piping to compression tank	1¼
U1 & U2	Pressure relief valve(s): 894–2094: Install relief valve in one tapping and plug the other tapping 2194–2594: Install a relief valve in each tapping (2 relief valves required on these boilers)	2
V1	Temperature control or limit	4
W1 or W2	Temperature control or limit — or — P/T gauge or temperature gauge	¾
X1 or X2	Temperature control or limit — or — Air vent piping to compression tank	1¼
Y1 & Y2	PLUG this tapping — unless needed for a control	¾
Z1 or Z2	Cleanout tappings — Front section — Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping	2
Z3 or Z4	Cleanout or drain tappings — Rear section — Install drain valve in one tapping; install 2" NPT x 2½" length nipple and 2" NPT cap in the other	2
—	Low limit control (when using tankless heaters) — locate in control tapping on one of the tankless heaters	—

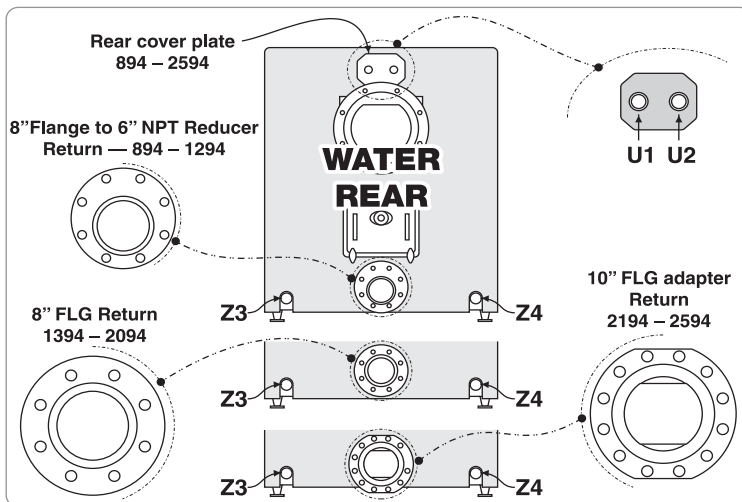


# Install water boiler controls *(continued)*

**Figure 33** Model 94 water boiler control tapings



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





# Install steam boiler controls

## Install controls:

1. Install controls where shown in Figure 34 and Figure 35, page 29.
2. Follow Figure 36, page 29 and Figure 38, page 30 for mounting operating controls and water level controls.

**WARNING** Failure to properly install, pipe and wire boiler controls can result in severe damage to boiler, building and personnel; and is not covered by boiler warranty.

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

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

## Install and pipe from relief valve

1. Install relief valve(s) where shown in Figure 34 and Figure 35, page 29.
2. Relief valve must be installed with spindle in vertical position.
3. 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 one end only. Install drain pan elbow to drain condensate. Pipe near floor close to floor drain to eliminate potential of severe burns. Do not pipe to any area where freezing could occur. Do not plug, valve or place any obstruction in discharge line.

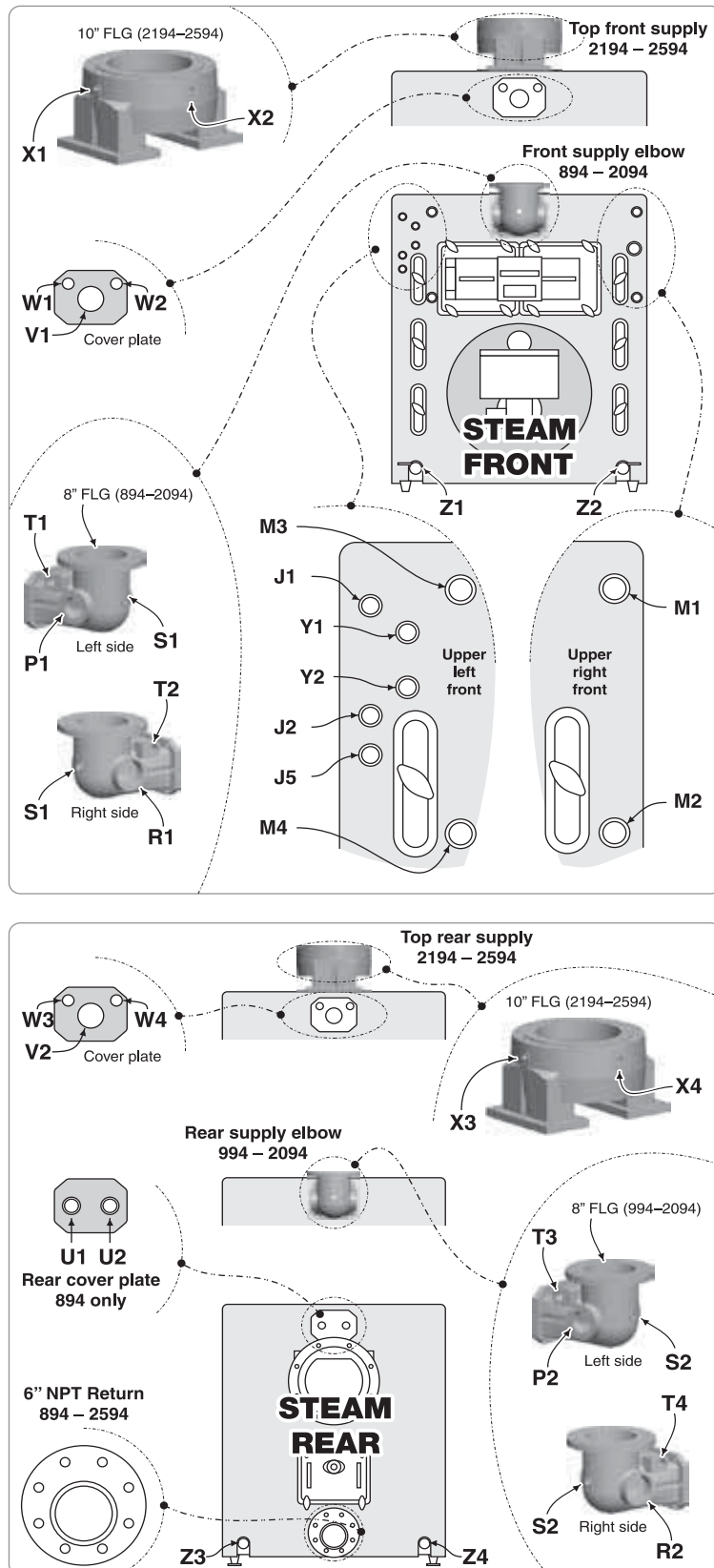
Figure 34 Model 94 steam boiler control tappings

Item #	Function	Size (Inches NPT)
<b>J1 + J5</b>	Gauge glass	½
<b>J2</b>	PLUG this tapping — not used	½
<b>M3</b>	PLUG this tapping — not used	1
<b>M1 + M2</b> <b>M3 + M4</b>	Float-type low water cutoff, LWCO/pump control or LWCO/feeder combination (see Figure 38, page 30)	1
<b>P1</b>	Skim tapping	3
<b>P2</b>	Steam pressure relief valve	3
<b>R1</b>	Skim tapping	4
<b>R2</b>	Steam pressure relief valve	4
<b>S1</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	¾
<b>S2</b>	Pressure controls (limit, operating, etc.)	¾
<b>T1 or T2</b>	Pressure controls (limit, operating, etc.)	1¼
<b>T3 or T4</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	1¼
<b>U1 or U2</b>	Steam pressure relief valve — Install relief valve in one tapping and plug the other	2
<b>V1 or V2</b>	Steam pressure relief valve — or — Skim tapping	4
<b>W1 or W2</b>	Steam pressure gauge — or — Pressure controls (limit, operating, etc.)	¾
<b>W3 or W4</b>	Pressure controls (limit, operating, etc.)	¾
<b>X1 &amp; X2</b>	PLUG these tappings — not used	1¼
<b>X3 &amp; X4</b>	PLUG these tappings — not used	1¼
<b>Y1 &amp; Y2</b>	Try cocks	¾
<b>Z1 or Z2</b>	Cleanout tappings — Front section — Install 2" NPT close nipple and 2" NPT cap in each cleanout tapping	2
<b>Z3 or Z4</b>	Cleanout or drain tappings — Rear section — Install drain valve in one tapping; install 2" NPT x 2½" length nipple and 2" NPT cap in the other	2
—	Low limit temperature control (when using tankless heaters) — locate in control tapping on one of the tankless heaters	—

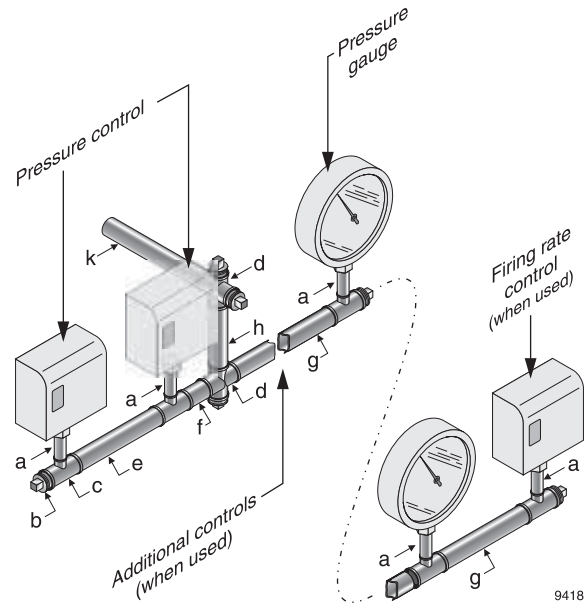


# Install steam boiler controls (continued)

**Figure 35 Model 94 steam boiler control tapings**



**Figure 36 Steam control siphon and fittings**



Manifold component sizing			
(Check local codes for sizing and cleanout requirements)			
Item	Description	Size (inches)	
		894 – 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

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



# Install steam boiler controls *(continued)*

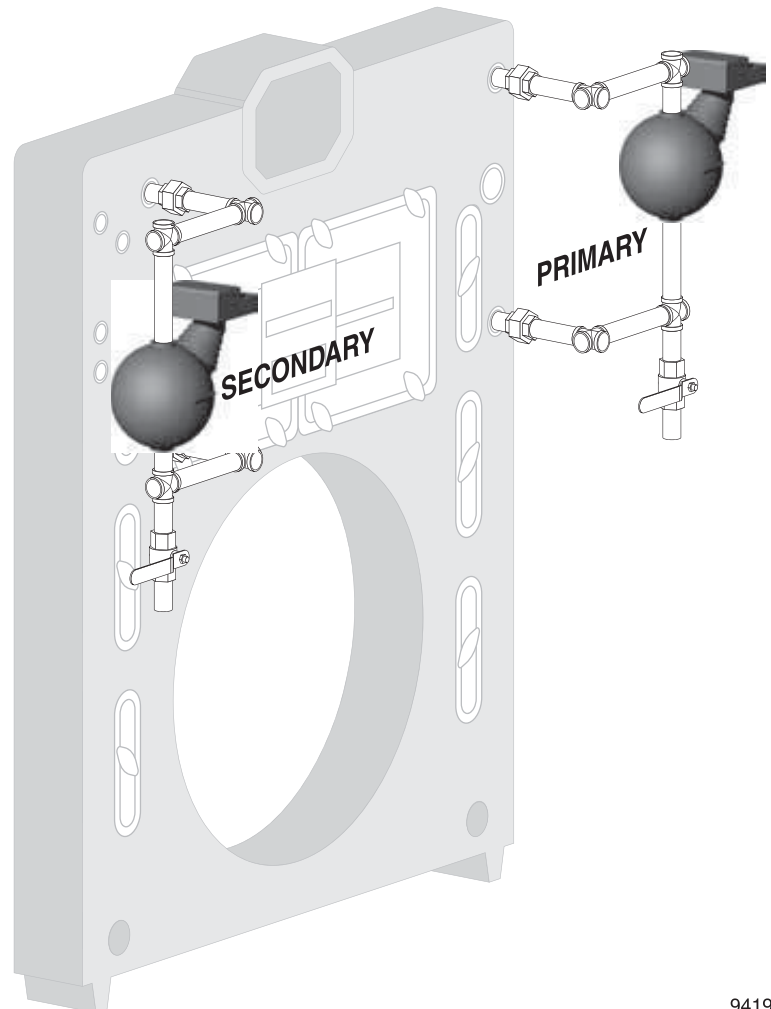
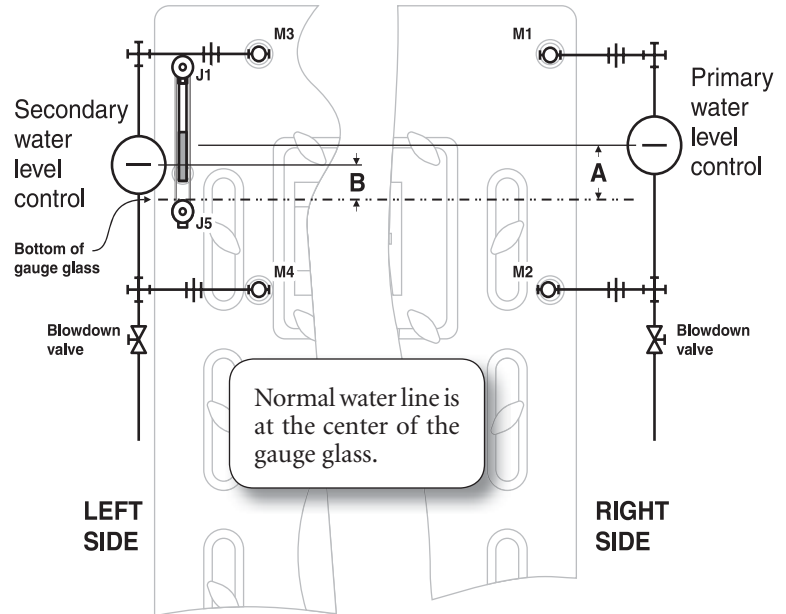
**Figure 37** Float-type water level control locations

Primary water level control	Casting line height above bottom of gauge glass	Back-up water level control	Casting line height above bottom of gauge glass
Note 1	"A"	Notes 1, 2	"B"
<b>61, 63</b>	¼"	<b>None</b>	—
	½"	<b>61, 63</b>	¼"
<b>93, 193, 94</b>  (Note 3)	2"	<b>None</b>	—
	2"	<b>93, 193, 94</b>	¼"
	2"	<b>61, 63</b>	¼"
	2"	<b>51-2</b> (894 to 1594 only)  — or —  <b>51-S-2</b> (all sizes)	¼"
<b>51-2</b> <b>51-S-2</b>  (Note 3)	1" to 1¼"	<b>None</b>	—

**Notes:**

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

**Figure 38** Water level control locations (see Figure 37)





# Connect breeching and venting systems

**WARNING** Seal the venting system gas-tight and connect the breeching with welded seams and joints to prevent leakage of combustion products into the boiler room. This is most important for forced draft vent systems. Conventional flue pipe should not be used as it could leak flue gases and carbon monoxide emissions through seams and joints, resulting in severe personal injury or death.

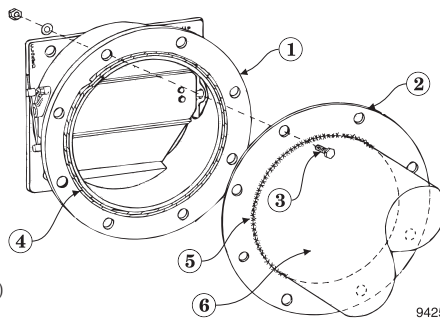
## General venting information

1. Model 94 boilers operate with positive overfire pressure. Adjust damper assembly (see Figure 44, page 35) during burner start-up to achieve 0.1" W.C. positive pressure at damper sample hole.

## Construct metal breeching:

1. 894-2194 boilers — construct "stub" to attach breeching:
  - a. Use steel breeching-16 ga. or heavier, 20" nominal diameter, minimum 6-inch length (so damper can open).
  - b. Unbolt the breeching counter flange from flue collar flange.
  - c. Insert or butt the breeching stub against 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 due to excessive heat accumulation.

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



- e. Make sure the sealing rope is intact on the flue collar flange.
  - f. Attach the flange/stub assembly to the flue collar using 1/2" x 1 1/2" machine bolts and washers provided. 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-inch diameter x 12 inches 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 1/2" x 1 1/2" machine bolts and washers provided. The connection must be gas-tight.
  3. See Figure 39 for minimum breeching diameter.
  4. Select material type and thickness in compliance with local codes.
  5. Refer to ASHRAE Guide for chimney and breeching calculations and construction and lining.

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

Figure 39 Minimum breeching diameter

Boiler model	AHRI vent or liner diameter (inches)		Boiler flue collar dimensions (inches)
	Balanced draft (note 4)	Forced draft (note 3)	
894	18 (note 1)	14 (note 1)	20 round, flanged
994	21 (note 1)	14 (note 1)	20 round, flanged
1094	21 (note 1)	16 (note 1)	20 round, flanged
1194	21 (note 1)	16 (note 1)	20 round, flanged
1294	21 (note 1)	16 (note 1)	20 round, flanged
1394	24 (note 1)	18 (note 1)	20 round, flanged
1494	24 (note 1)	18 (note 1)	20 round, flanged
1594	24 (note 1)	18 (note 1)	20 round, flanged
1694	24 (note 1)	18 (note 1)	20 round, flanged
1794	24 (note 1)	20	20 round, flanged
1894	27 (note 1)	20	20 round, flanged
1994	27 (note 1)	20	20 round, flanged
2094	27 (note 1)	20	20 round, flanged
2194	27 (note 1)	20	20 round, flanged
2294	27 (note 2)	22	20 round, flanged (note 2)
2394	30 (note 2)	22	20 round, flanged (note 2)
2494	30 (note 2)	22	20 round, flanged (note 2)
2594	30 (note 2)	22	20 round, flanged (note 2)

**Note 1** Boiler is supplied with a counter flange that must be welded to a 20-inch diameter x 6-inch minimum length adapter. The breeching can then be reduced or increased to the size listed above.

**Note 2** Boiler is supplied with a flanged adapter, 22-inch diameter, for connection to 22-inch diameter breeching. Breeching size can be increased after the adapter if required for the application.

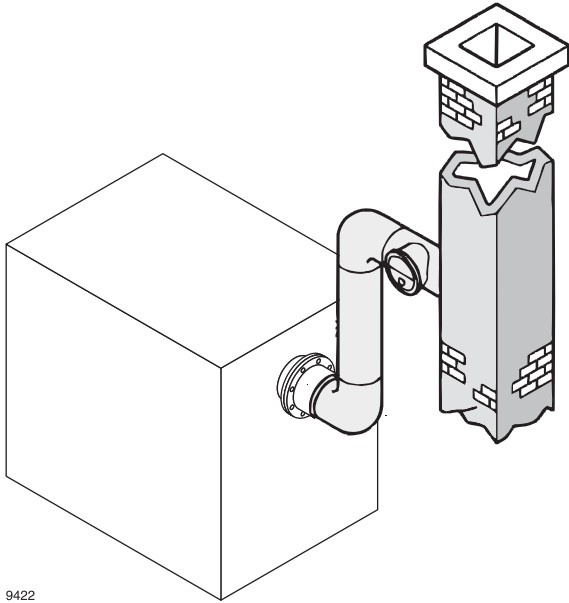
**Note 3** Forced draft — Boiler, breeching and stub vent operate at positive pressure. Entire system must be gas-tight to prevent leaks. Stub vent height must be limited to prevent negative draft with 3-foot minimum stub vent height above roof, 15-foot minimum overall height. See Figure 41 and Figure 42.

**Note 4** Balanced draft — Boiler operates with positive pressure overfire. Chimney may provide excess draft which may require a barometric draft control installed and set to provide minimum draft to maintain 0.1" positive pressure at flue collar. Minimum chimney height above roof is 3 feet. Minimum overall height is 20 feet. For other vent heights, use ASHRAE Guide for sizing. See Figure 40 and Figure 42.



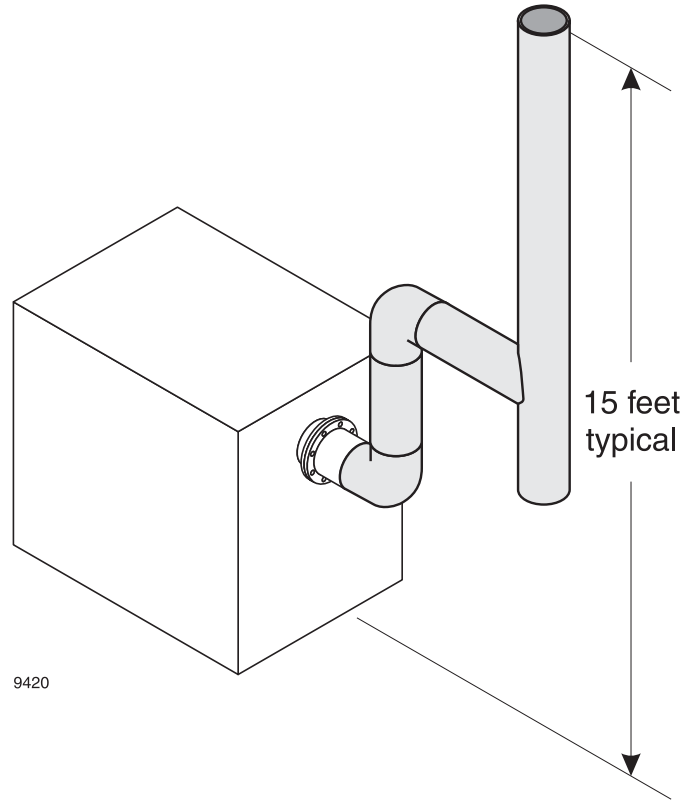
# Connect breeching and venting systems

**Figure 40** Conventional chimney — balanced draft with barometric draft control when required — single boiler



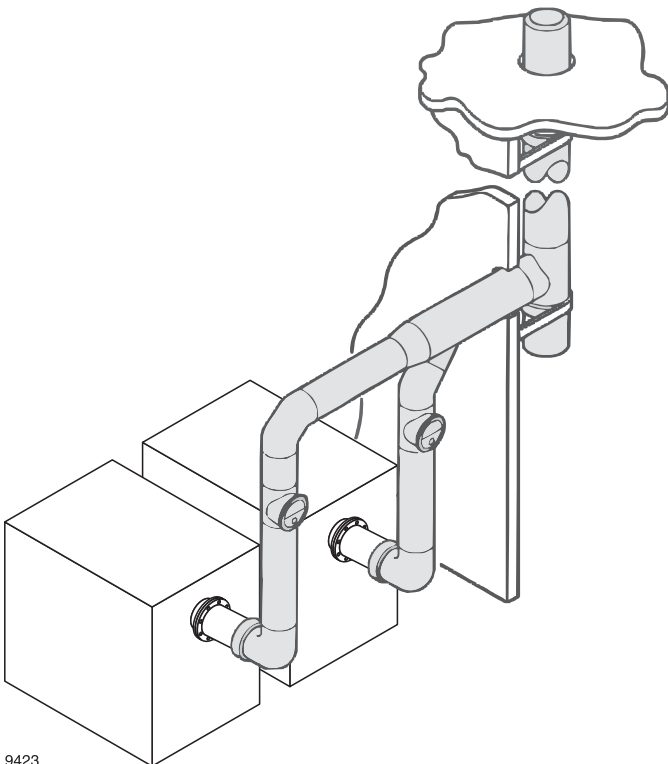
9422

**Figure 41** Stub vent — forced draft — single boiler



9420

**Figure 42** Conventional chimney — balanced draft with barometric draft control when required — multiple boilers



9423





# Install burner & wiring and fill system

## To install burner

1. Unpack burner.
2. Place gasket around air tube and against burner mounting flange. If sealing rope is used, apply  $\frac{1}{8}$ " continuous bead of rope adhesive around burner mounting flange and apply sealing rope to make gas-tight seal.
3. Mount burner into opening in burner mounting plate.

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

4. Level burner using burner support brackets where required.
5. Secure with furnished bolts.
6. Retain burner information packet. Keep with boiler.

## To wire burner and boiler controls

**WARNING** Electric shock hazard. Can cause severe personal injury or death if power source is not disconnected before installing or servicing boiler and burner.

1. Install all wiring in compliance with:
  - National Electrical Code ANSI/NFPA 70.
  - Any additional national, state, or local codes.
2. Follow 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 National Electrical Code ANSI/NFPA 70.

## Determine if water treatment is needed (water boilers only)

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

Continual make-up water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating cast iron and causing section failure.

For unusually hard water areas or low pH conditions (less than 7.0) consult local water treatment company. Provide a water softener for make-up water if hardness exceeds 7 grains.

## Freeze protection (when used) (water boilers only)

1. Use antifreeze especially made for hydronic systems. Inhibited propylene glycol is recommended.

**WARNING** Do not use automotive, ethylene glycol or undiluted antifreeze. Severe personal injury or death can result.

2. 50% solution provides protection to about -30°F.
3. Local codes may require back-flow preventer or actual disconnect from city water supply.
4. Determine quantity according to system water content. Boiler water content is listed in "Ratings," page 41. Percent of solution will affect sizing of heat distribution units, circulator and expansion tank.
5. Follow antifreeze manufacturer's instructions.

## To fill water boilers

1. Close manual air vents and drain cocks.
2. Fill to correct system pressure. Correct pressure will vary with each installation.
3. Starting on lowest floor, open air vents one at a time until water squirts out. Close vent. Repeat with remaining vents.
4. Refill boiler to correct pressure.

## To fill steam boilers

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

# Install fuel piping

## Gas piping

- In sizing the gas piping, the following factors should be considered:
  - 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.
- Minimum inlet natural gas pressure required at manual main shut-off valve — see the burner manual and material list.
- Follow good piping practices.
- Pipe joint compound (pipe dope) must be resistant to the corrosive action of liquefied petroleum gases and applied sparingly only to the male threads of pipe joints.
- 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 43.
- Piping must be supported by hangers, not by the burner or its accessories.
- Purge all air from the supply piping.
- All gas piping must be tested for leaks after installation. Use soap suds mixture only.

## Fuel oil piping

**⚠ DANGER** To prevent oil flow in case of oil line breakage:

- Use anti-syphon device when any part of the oil tank is above burner level.
- Use check valve in suction line on burner side of manual shut-off valve nearest tank when top of fuel oil tank is below burner level.

Failure to comply could result in fuel leakage or fire, causing potential severe personal injury, death or substantial property damage.

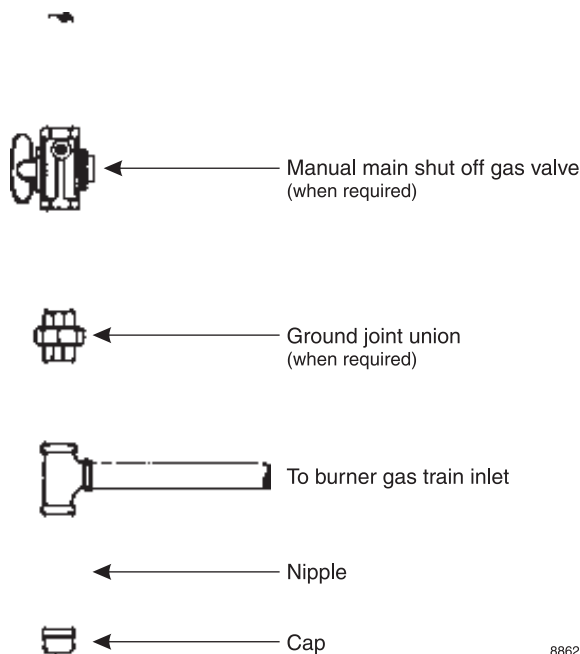
- A two-pipe fuel oil piping system is required for all installations.
- Supply and return lines must enter tank from top, extending to within 4 to 6 inches from bottom of tank.
- Use oil filter sized for fuel pump suction gear capacity.
- Install oil filter.

**⚠ CAUTION** Do not install filter outside or close to an outside wall.

- Use continuous copper tubing to reduce possible piping leaks and to ensure reliable seal when oil piping is buried.
- Use flare fittings, not compression fittings.

**⚠ DANGER** **Fire hazard** — DO NOT USE soldered fittings. No safe repair can be made.

**Figure 43** Gas supply piping



8862

- Follow good piping practices.
- Pipe joint compound (pipe dope) must be resistant to corrosive action of fuel oil. Apply sparingly only to male threads of pipe joints.
- Supply and return piping should be sized to design conditions, but not less than ½" O.D. continuous copper tubing.
- Auxiliary fuel oil pump is recommended when suction line lift exceeds 12 feet.
- Install swing joints so they will tighten as buried tank settles to prevent fuel line breakage.
- Where iron pipe is required by local codes, make swing joints with nipples and elbows several inches long on both suction and return line. Locate close to tank.
- Install manual shut-off valve in suction line piping near burner and where piping enters building from outside tank.
- Pitch suction line piping toward fuel tank.
- Provide tee and plug at highest point in suction line to release air from suction line and aid in priming.



# Make final adjustments

## Adjust burner and damper assembly:

1. Lock flue damper OPEN (Figure 44).

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

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 for:
  - a. 12% ( $\pm 1/4\%$ ) CO<sub>2</sub> for No. 2 fuel oil, 0 smoke.
  - b. 9 – 10% CO<sub>2</sub> natural gas; CO in flue gas not to exceed 50 ppm (0.01%).
  - c. **Flue gas temperature no lower than 330°F.**

**NOTICE** On some applications, if draft conditions or burner characteristics cause the burner flame pattern to impinge on the combustion chamber wall, you may notice pinging sounds from the boiler. Adjust the burner if possible to redirect the flame. If this does not work, contact your boiler supplier or Weil-McLain to obtain an optional combustion chamber kit (see page 44 for contents).

5. Adjust flue collar damper (Figure 44) to ensure 0.1" W.C. positive pressure at test opening.
6. Tighten screws to secure in position.
7. Plug test opening with  $1/8$ " plug provided with flue collar/damper assembly.
8. Adjust barometric draft control, when used, to design conditions.
9. Repeat steps 4 through 6. Adjust as required.

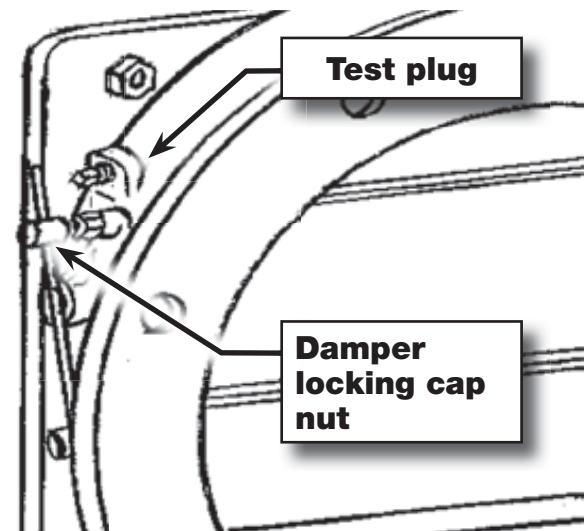
## Skim steam boilers:

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

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

1. Provide 4" skim piping from tapping to 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/OFF as needed to prevent rise in steam pressure.
6. Continue skimming until discharge is clear. This may take several hours.
7. Drain boiler at cleanout tapplings.
8. While boiler is warm, **but not hot**, flush all interior surfaces under full pressure until drain water runs clear.
9. Remove skim piping.

Figure 44 Flue collar/damper assembly



10. Re-insert plug at boiler skim tapping.
11. Close drain cock.
12. Fill with fresh water to normal water line.
13. Start burner and steam for 15 minutes to remove dissolved gases.
14. Stop burner.
15. Check traps and air vents for proper operation.

## Check boiler for gas-tight seal:

**WARNING** Boiler must be sealed gas-tight to prevent possible flue gas leakage and carbon monoxide emissions, resulting in severe personal injury or death.

1. Remove boiler jacket side and top panels.

**WARNING** The boiler contains ceramic fiber and fiberglass materials. Use care when handling these materials per instructions on page 38 of this manual. Failure to comply could result in severe personal injury.

2. Start burner. Observe all sealing points and chalk mark any not gas-tight.
3. To seal all chalk-marked areas:
  - a. Use silicone sealant on section flueways.
  - b. Check gaskets and sealing rope placement.
4. Reinstall all jacket panels.



# Handling ceramic fiber and fiberglass materials

## REMOVAL OF REFRACTORY OR CERAMIC INSULATION MATERIALS



The burner front plate and cleanout plates contain ceramic fiber materials. 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).":

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of 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. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining or base insulation to prevent airborne dust.
- Remove combustion chamber lining or base insulation from the boiler and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

### NIOSH stated First Aid.

- Eye: Irrigate immediately.
- Breathing: Fresh air.

## REMOVAL OR INSTALLATION OF FIBERGLASS WOOL:



This product contains fiberglass jacket insulation and ceramic fiber materials in jacket insulation, burner front plate insulation and cleanout plate gaskets. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation.

- Avoid breathing dust and contact with skin and eyes.
  - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for fiberglass wool at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
  - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- 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 clothes washer thoroughly.

### NIOSH stated First Aid.

- Eye: Irrigate immediately.
- Breathing: Fresh air.



# Maintenance and troubleshooting

Figure 45 Service and maintenance schedules

Service technician (see following pages for instructions)		Owner maintenance		
ANNUAL START-UP PROCEDURES <i>(or as required by conditions)</i>	<p><b>Inspection — all boilers</b></p> <ul style="list-style-type: none"> <li>• Discuss any reported problems with owner/operator.</li> <li>• Inspect burner and flueways.</li> <li>• Clean boiler heating surfaces and burner if necessary, following procedures provided in this manual.</li> <li>• Check for water leaks in piping and at components.</li> <li>• Check gas piping for leaks using soap suds mixture only.</li> <li>• Check oil piping, tank and components for signs of leakage.</li> <li>• Inspect wiring and connections.</li> <li>• Lubricate circulators and pumps as required; perform maintenance required for all system components.</li> </ul>	Daily	<ul style="list-style-type: none"> <li>• Inspect boiler area — must be free of combustible materials, gasoline and other flammable vapors or liquids.</li> <li>• Inspect combustion air openings.</li> <li>• Check pressure/temperature gauge (or pressure gauge).</li> <li>• Verify boiler is operating correctly.</li> <li>• Steam boilers — check water level in gauge glass.</li> </ul>	
	<p><b>Inspection — water boilers</b></p> <ul style="list-style-type: none"> <li>• Check system water pressure, system piping and expansion tank.</li> <li>• Open boiler drain cock to remove impurities that have settled to the bottom of the boiler. Refill to the correct working pressure.</li> <li>• Check system water chemistry, inhibitor level and antifreeze concentration, if used.</li> </ul>		Monthly	<ul style="list-style-type: none"> <li>• Inspect vent piping.</li> <li>• Inspect relief valve.</li> <li>• Water systems — inspect automatic air vents (if used).</li> <li>• Probe-type low water cut-off — test by pressing the test button.</li> <li>• Float-type low water cut-off — blowdown and test by opening its blowdown valve.</li> </ul>
	<p><b>Inspection — steam boilers</b></p> <ul style="list-style-type: none"> <li>• Check for indications of operating problems, excessive make-up, etc.</li> <li>• Check control settings.</li> <li>• Inspect control piping and low water cut-off(s). Clean if necessary, following procedures in this manual.</li> </ul>			Every 6 months
	<p><b>Start-up</b></p> <ul style="list-style-type: none"> <li>• Follow procedures on page 35 to start-up boiler and test operation.</li> <li>• Skim steam boilers as described on page 35.</li> <li>• 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.</li> <li>• Verify operation of boiler and all controls.</li> <li>• If operational problems are observed, correct the problems and re-start.</li> </ul>		End of season	
<p><b>Review</b></p> <ul style="list-style-type: none"> <li>• Review with owner.</li> </ul>				

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



## Maintenance and troubleshooting *(continued)*

### Read before proceeding



The boiler must be inspected, cleaned as necessary, started up and adjusted by a qualified boiler service technician.

**Electrical shock hazard** — Disconnect electrical supplies to the boiler before servicing.

**Explosion hazard** — Shut off the fuel supply to the boiler while servicing.

**Burn hazard** — Allow the boiler to cool before touching boiler surfaces or contacting boiler water.

The boiler area must be kept clear of combustible materials, gasoline or other flammable vapor or liquids.

Do not block the flow of air to the burner. Incomplete combustion, flue gas spillage and carbon monoxide emissions can occur.

Label all wires before disconnecting for service. Wiring errors can cause improper operation.

Verify proper operation of the boiler and system after servicing.

The boiler contains ceramic fiber and fiberglass materials. Follow the instructions on page 36.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

### Water chemistry and make-up



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

Leaks in the boiler and piping system must be repaired at once. If a leak is detected around a gasket (i.e. tankless heater, supply outlet, etc.) tighten evenly and only enough to stop the leak. Over-tightening can ruin a gasket.

The constant addition of makeup water may damage the boiler.

If serious leaks occur, stop the burner. Then gradually reduce boiler pressure or temperature. Do not attempt to make repairs while the boiler is hot or under pressure.

If the boiler or system are experiencing large amounts of makeup water, extreme foaming or priming, scale in the boiler, or internal corrosion or pitting, contact a company specializing in boiler water chemistry.

DO NOT try "homemade cures" or boiler "patent medicines" on the market under various trade names, as serious damage to the boiler, personnel, and property may result.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.



# Maintenance and troubleshooting *(continued)*

## Cleaning boiler heating surfaces and flueways

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

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

1. Soot is an effective insulator and 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.
2. Remove top or side jacket panel(s).
3. Remove the flueway opening cover(s).
4. Cover the burner and controls.
5. Using a wire flue brush, thoroughly brush the flueways at all angles.
6. Remove any soot or scale from the horizontal and/or vertical flueways, the boiler firebox.
7. Remove access panel and enter the boiler to clean combustion chamber with special flue brushes provided.
8. Clean the base of the chimney using a vacuum cleaner or brush.
9. Replace the flueway opening cover(s), access panels and jacket panel(s), making sure the original gas-tight seal is maintained.
10. If additional cleaning is required:
  - 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, disconnect electrical power and fuel supplies.
  - c. Remove the flueway opening covers.
  - d. Use a garden sprayer or connect a spray nozzle to a garden hose and spray the sooted flueways with a fine mist of water.
  - e. The soot will become loosened and fall to the floor of the firebox and around the horizontal flueways.
  - f. Remove the loosened soot.

## Seasonal boiler shutdown

**▲WARNING** DO NOT DRAIN BOILER during periods of shutdown unless exposed to freezing temperatures.

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

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. Steam boilers — open boiler blowdown valve and flush till clear while under steam pressure.
5. Water boilers — open the boiler drain cock to remove im-

purities. It may be necessary to drain several gallons of water until all traces of sediment are gone. Refill the boiler to the proper water level or pressure.

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

## Long-term boiler shutdown

1. When the boiler and system must be drained for long-term shutdown, perform the following procedures.
2. Turn off all power supplies to the boiler and its components.
3. Close all fuel valves.
4. Cover the burner to protect it from dust and dampness.
5. 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 manual under "Cleaning boiler heating surfaces."
6. Apply a thin coating of oil or grease to heating surfaces if the boiler is to remain out of service for an extended time.
7. Drain the boiler and system as necessary.

## To inspect water side of 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, following the procedures in this manual for filling the system.

**▲WARNING** Repeated draining and filling of the boiler and/or the heating system can lead to the same consequences as adding too much makeup water. This is worst where the makeup water is hard.

## Cleaning float-type low water cut-offs

1. Accumulated sediment in the low water cut-off should be flushed out through a blow-off valve provided for this purpose at least once each month of 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.
4. The water level should immediately rise to its proper level.



## Maintenance and troubleshooting *(continued)*

**⚠WARNING** If gauge glass breaks, close off both gauge cocks and loosen the glass retaining nuts to remove gauge glass. Replace broken gauge glass with new gauge glass made of heavy-walled Pyrex. DO NOT USE THIN GLASS TUBING.

### 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 sticks or appears to be clogged, replace immediately.

### Automatic air vents

1. With the system filled with water, loosen the air vent cap slowly so that particles of dirt or scale are not deposited on the valve seat by the escaping air.
2. Should dirt or scale lodge on the valve seat, causing it to leak, remove the cap and press the inner stem with a screwdriver or other tool to permit water to flush the valve seat clean.
3. Release the stem quickly and replace the cap.
4. For normal operation and venting, unscrew the cap at least two turns.

### Troubleshooting — steam boiler 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. Then 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.

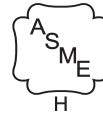
### Troubleshooting — relief valve opens frequently or weeps

1. Expansion tank may be water-logged in its closed type (air-head type)
2. Bladder or diaphragm-type expansion tank may have punctured membrane or may have incorrect charge pressure — follow tank manufacturer's instruction to troubleshoot and set charge pressure.



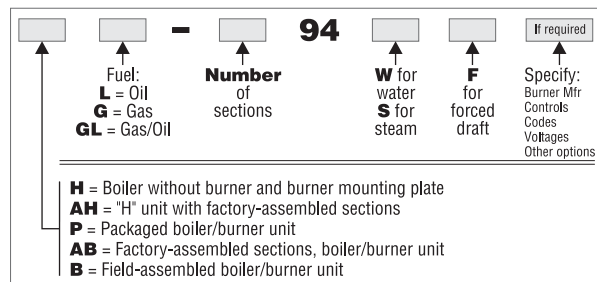


# Ratings



Boiler model number	AHRI Input		Gross Steam output	Gross Water output	Net AHRI ratings			Boiler H.P.	Steam				Water				Net firebox volume Cubic feet	Flue gas volume CFM	Draft loss through boiler Inches W.C.	Flue outlet diameter Inches	Boiler water content Gallons
	Light Oil	Gas	MBH	MBH	Steam Sq. Ft	Steam MBH	Water MBH		Combustion efficiency		Thermal efficiency		Combustion efficiency		Thermal efficiency						
	GPH	MBH	MBH	MBH	Sq. Ft	MBH	MBH		Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas					
Notes: 1, 8	2, 3	2, 4	5	5	7	7	7	—	%	%	%	%	%	%	%	%	—	6	—	—	—
894	17.6	2540	2040	2052	6598	1584	1784	60.6	83.7	81.2	82.7	80.3	84.0	81.4	83.2	80.7	45.40	1088	0.175	20	274.3
994	20.0	2887	2318	2357	7500	1800	2050	69.3	83.8	81.2	82.8	80.3	84.1	81.6	83.4	80.9	51.48	1242	0.215	20	302.0
1094	22.5	3247	2607	2656	8435	2024	2310	78.0	83.8	81.3	82.8	80.3	84.3	81.8	83.6	81.4	57.56	1397	0.255	20	329.8
1194	25.0	3608	2897	2957	9372	2249	2571	86.7	83.9	81.4	82.8	80.3	84.4	81.9	83.3	81.3	63.64	1555	0.295	20	357.5
1294	27.5	3969	3187	3259	10310	2474	2834	95.3	83.9	81.4	82.8	80.3	84.6	82.1	84.0	81.5	69.72	1710	0.335	20	385.2
1394	30.0	4330	3481	3562	11262	2703	3098	104.0	83.9	81.4	82.9	80.4	84.8	82.2	84.2	81.6	75.80	1866	0.375	20	413.0
1494	32.5	4691	3772	3867	12201	2928	3362	112.6	83.9	81.4	82.9	80.4	84.9	82.4	84.3	81.8	81.88	2020	0.415	20	440.7
1594	35.0	5052	4062	4172	13140	3154	3628	121.6	84.0	81.5	82.9	80.4	85.1	82.5	84.5	82.0	87.96	2175	0.455	20	468.4
1694	37.5	5412	4351	4478	14076	3378	3894	130.2	84.0	81.5	82.9	80.4	85.3	82.7	84.7	82.2	94.04	2325	0.485	20	496.2
1794	40.0	5773	4641	4786	15015	3604	4162	138.9	84.0	81.5	82.9	80.4	85.4	82.9	84.9	82.3	100.12	2480	0.525	20	523.9
1894	42.5	6134	4938	5095	15974	3834	4430	147.6	84.0	81.5	82.9	80.5	85.6	83.0	85.1	82.5	106.20	2640	0.565	20	551.6
1994	45.0	6495	5228	5404	16914	4059	4700	156.2	84.0	81.5	83.0	80.5	85.7	83.2	85.3	82.7	112.28	2795	0.605	20	579.4
2094	47.5	6856	5519	5716	17854	4285	4970	164.9	84.0	81.5	83.0	80.5	85.9	83.3	85.4	82.9	118.36	2945	0.650	20	607.1
2194	50.0	7216	5809	6028	18792	4510	5241	173.6	84.0	81.5	83.0	80.5	86.1	83.5	85.6	83.1	124.44	3120	0.750	20	634.8
2294	53.0	7649	6157	6404	19919	4781	5568	182.2	84.0	81.5	83.0	80.5	86.3	83.7	85.8	83.3	130.52	3255	0.850	20 *	662.6
2394	55.0	7938	6390	6655	20672	4961	5787	190.9	84.1	81.5	83.0	80.5	86.4	83.8	86.0	83.4	136.60	3410	0.950	20 *	690.3
2494	58.0	8371	6739	7034	21799	5232	6117	199.6	84.1	81.5	83.0	80.5	86.6	84.0	86.2	83.6	142.68	3565	1.050	20 *	718.0
2594	60.0	8660	6971	7288	22552	5413	6338	208.2	84.1	81.5	83.0	80.5	86.7	84.1	86.4	83.8	148.76	3730	1.150	20 *	745.8

1. See below to specify complete model number.



For T-intermediate sections(s) and tankless heater(s), add suffix "(number required) TIH"; for T-intermediate section(s) with cover plates only, add suffix "(number required) TIP".

2. Burner input based on maximum of 2,000 feet altitude. For other altitudes, consult Weil-McLain distributor/agent or sales office.

- No. 2 fuel oil — Commercial Standard Spec CS75-56. Heating value of oil = 140,000 Btu per gallon.  
No. 4 or No. 5 oil — Commercial Standard Spec CS75-56. Heating value of oil = 150,000 Btu per gallon.
- 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.
- Gross AHRI ratings have been determined under the AHRI provision governing forced draft boiler-burner units.
- Flue gas volume at outlet temperature.
- 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. Steam ratings are based on the following allowance of 1.288. An additional allowance should be made for gravity hot water systems or for unusual piping and pick-up loads. Consult local Weil-McLain distributor/agent or sales office.
- Water boilers tested for 80 PSIG, ASME water working pressure. Steam boilers tested for 15 PSIG, ASME steam working pressure.  
\* Models 2294–2594 are supplied with 22-inch adapter.



# Dimensions

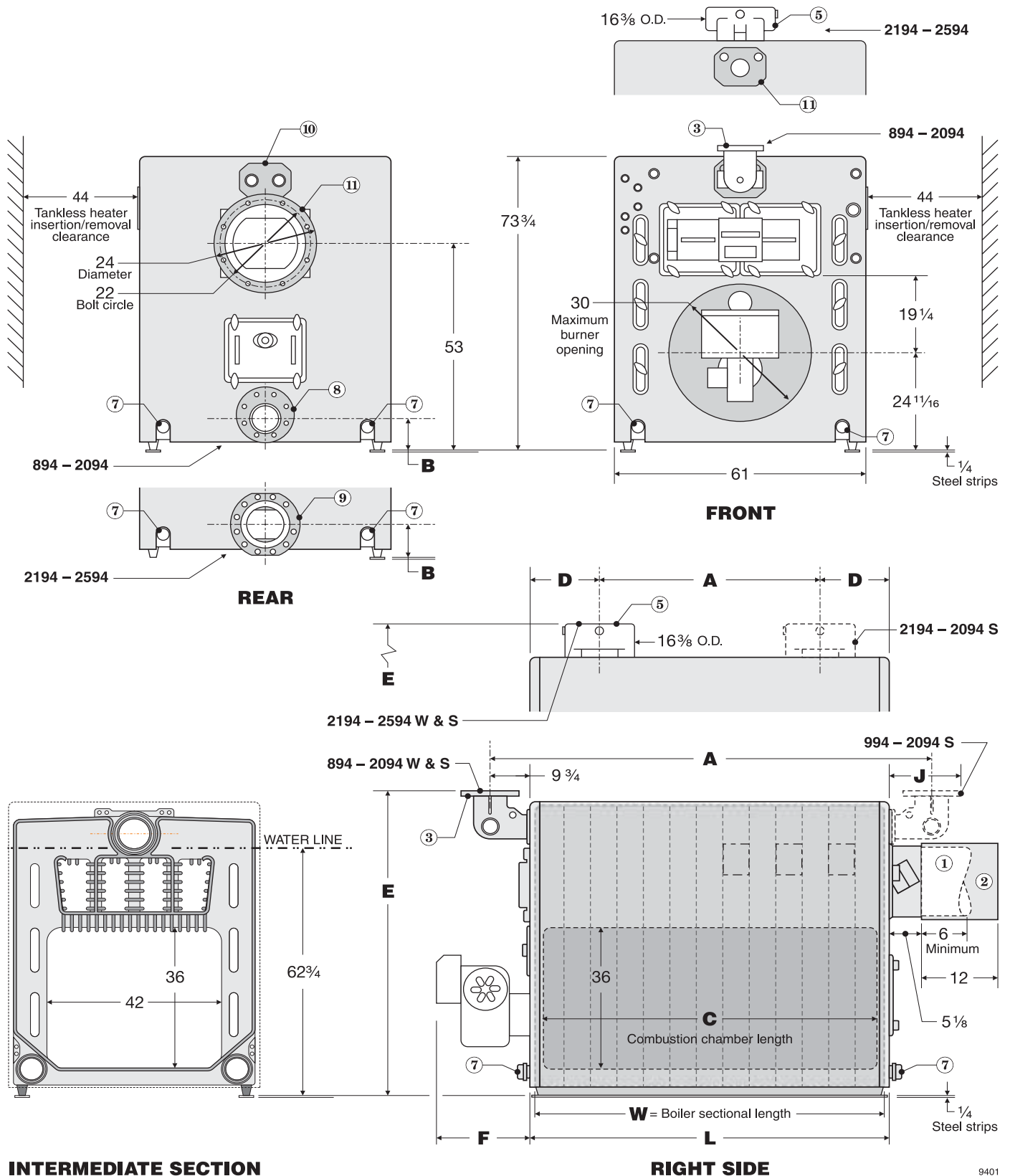
Dimensions (inches)										
Model	A (steam only)	B		C	D		E	J (steam only)	L	W
		Water	Steam		Water	Steam				
894	77 $\frac{5}{8}$	7 $\frac{1}{16}$	7 $\frac{1}{16}$	45	—	—	76	—	52 $\frac{1}{2}$	51
994	83 $\frac{5}{8}$	7 $\frac{1}{16}$	7 $\frac{1}{16}$	51	—	—	76	16 $\frac{3}{8}$	58 $\frac{1}{2}$	57
1094	89 $\frac{5}{8}$	7 $\frac{1}{16}$	7 $\frac{1}{16}$	57	—	—	76	16 $\frac{3}{8}$	64 $\frac{1}{2}$	63
1194	95 $\frac{5}{8}$	7 $\frac{1}{16}$	7 $\frac{1}{16}$	63	—	—	76	16 $\frac{3}{8}$	70 $\frac{1}{2}$	69
1294	107 $\frac{5}{8}$	7 $\frac{1}{16}$	7 $\frac{1}{16}$	69	—	—	76	16 $\frac{3}{8}$	76 $\frac{1}{2}$	75
1394	113 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	75	—	—	76	16 $\frac{3}{8}$	82 $\frac{1}{2}$	81
1494	119 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	81	—	—	76	16 $\frac{3}{8}$	88 $\frac{1}{2}$	87
1594	125 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	87	—	—	76	16 $\frac{3}{8}$	94 $\frac{1}{2}$	93
1694	131 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	93	—	—	76	16 $\frac{3}{8}$	100 $\frac{1}{2}$	99
1794	119 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	99	—	—	76	16 $\frac{3}{8}$	106 $\frac{1}{2}$	105
1894	125 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	105	—	—	76	16 $\frac{3}{8}$	112 $\frac{1}{2}$	111
1994	131 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	111	—	—	76	16 $\frac{3}{8}$	118 $\frac{1}{2}$	117
2094	137 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	117	—	—	76	16 $\frac{3}{8}$	124 $\frac{1}{2}$	123
2194	143 $\frac{5}{8}$	8 $\frac{3}{8}$	7 $\frac{1}{16}$	123	17 $\frac{1}{4}$	21 $\frac{1}{4}$	82 $\frac{1}{2}$	—	130 $\frac{1}{2}$	129
2294	72	8 $\frac{3}{8}$	7 $\frac{1}{16}$	129	17 $\frac{1}{4}$	21 $\frac{1}{4}$	82 $\frac{1}{2}$	—	136 $\frac{1}{2}$	135
2394	84	8 $\frac{3}{8}$	7 $\frac{1}{16}$	135	17 $\frac{1}{4}$	21 $\frac{1}{4}$	82 $\frac{1}{2}$	—	142 $\frac{1}{2}$	141
2494	90	8 $\frac{3}{8}$	7 $\frac{1}{16}$	141	17 $\frac{1}{4}$	21 $\frac{1}{4}$	82 $\frac{1}{2}$	—	148 $\frac{1}{2}$	147
2594	96	8 $\frac{3}{8}$	7 $\frac{1}{16}$	147	17 $\frac{1}{4}$	21 $\frac{1}{4}$	82 $\frac{1}{2}$	—	154 $\frac{1}{2}$	153

Model	Supply & return tapplings All 6" are tapped   All 8" and 10" are flanged				Burner lengths Dimension F
	Supply tapplings (No. & size)		Return tapplings (No. & size)		
	Steam	Water	Steam	Water	
894	1 - 8"	1 - 6"	1 - 6"	1 - 6"	Refer to burner specification and data sheet for dimensional information on the burner.
994	2 - 8"	1 - 6"	1 - 6"	1 - 6"	
1094	2 - 8"	1 - 6"	1 - 6"	1 - 6"	
1194	2 - 8"	1 - 6"	1 - 6"	1 - 6"	
1294	2 - 8"	1 - 6"	1 - 6"	1 - 6"	
1394	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1494	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1594	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1694	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1794	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1894	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
1994	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
2094	2 - 8"	1 - 8"	1 - 6"	1 - 8"	
2194	2 - 10"	1 - 10"	1 - 6"	1 - 10"	
2294	2 - 10"	1 - 10"	1 - 6"	1 - 10"	
2394	2 - 10"	1 - 10"	1 - 6"	1 - 10"	
2494	2 - 10"	1 - 10"	1 - 6"	1 - 10"	
2594	2 - 10"	1 - 10"	1 - 6"	1 - 10"	



# Dimensions *(continued)*

Figure 46 Dimensions (INCHES) (see lettered dimensions on opposite page)





# Parts

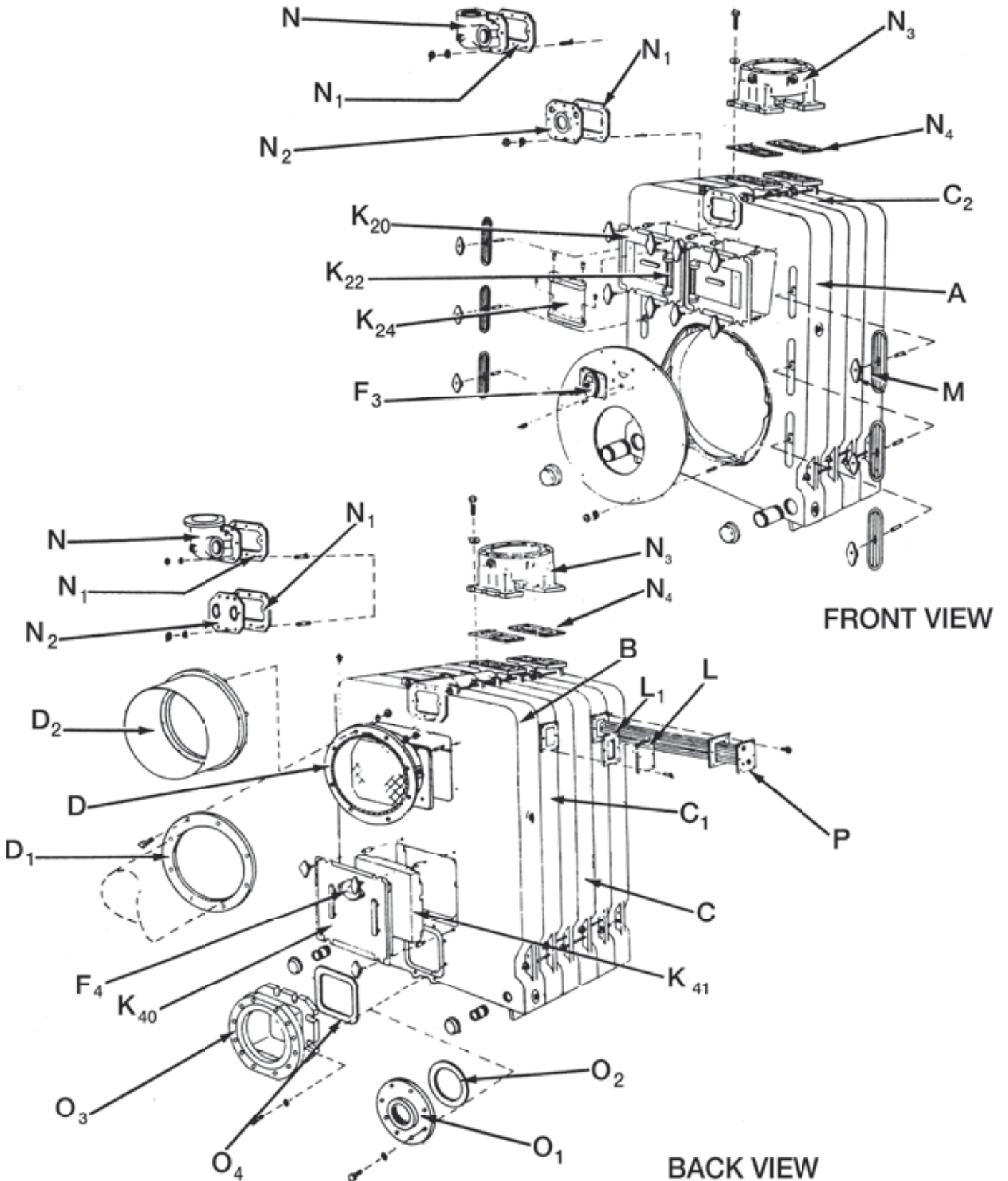
Item	Description	Part No.
A	Front section (casting # 9517)	318-102-508
B	Back section water & steam w/8" round return flange (casting # 9518)	318-102-518
B	Back section water only for 10" square return flange adapter (casting # 95218)	318-102-528
C	Regular intermediate section (casting # 9515)	318-102-538
C1	Tankless intermediate section (casting # 9516)	318-102-548
C2	Supply intermediate sections (casting # 9519)	318-102-578
	6" bottom elastomer seal (2 per joint)	592-800-007
	9" top elastomer seal (1 per joint)	592-800-005
	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
	5/8" hex nut (2 per draw rod)	561-928-224
	5/8" washer, plain, ASTM F-436 (1 per draw rod)	562-248-710
	Flue brush	591-706-185
	Flue brush rod, 44"	591-706-222
	Flue brush rod, 62"	591-706-223
	Flue brush spacer, 48"	591-706-240
	Flue brush handle, flexible wire	591-706-226
	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 sealing rope (6' for rear access shield, 2' for rear observation port, 2' for front observation port, 12' for draft hood counter flange, 3' per cleanout plate)	590-735-150
	5/8" diameter Silicone coated rope for firebox perimeter, 22' length	590-735-154
	5/8" diameter Sealing rope, 12' length, for flue way perimeter	590-735-153
	Construction adhesive for rope (11 oz. caulking tube)	591-641-850
	Silicone sealant (RTV 700 or equivalent) (3 oz. tube) (approximately .47 oz. per joint)	591-638-851
K40	Back access door assembly (includes door liner, handle and rope)	340-004-700
	Refractory liner for back access door	387-834-906
	Mounting stud (4 required for access door)	560-340-560
K41	Refractory shield for back access opening	387-834-905
M	Cleanout plate (casting # 9254)	330-061-000
	Wing Nut for cleanout with 1/2" tapping	330-060-700
	Stud 1/2"-13 x 4 1/4" long	560-340-570
K20	Cleanout door assembly 474, includes door, hinge, hinge plate, handle, liner and accessories	340-004-740

Item	Description	Part No.
	Wing nut assembly — with 3/8 x 1 1/4" stud (threads into mounting stud) (casting # 9256)	340-004-635
	Mounting stud, 1/2"-13 x 2 1/8" long	560-340-560
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 assy. #462 (includes bottom, intermediate, & top observation port plates, spring, rope, & sight glass)	340-004-620
	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, damper quadrant, 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
	Stud, 1/2"-13 x 4 1/4" long	560-340-570
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
	6" supply elbow tapped, water only (casting # 9246)	330-060-200
N	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
	Stud, 5/8"-11 x 3" long	560-340-579
N2	Cover plate for supply outlet, 2" (casting # 9440)	330-062-005
	Bolt, 5/8"-11 x 1 3/4" long	562-135-767
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



# Parts *(continued)*

Figure 47 Block assembly parts









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