GENERAL INSTRUCTIONS

If the boiler was ordered as a complete package, thoroughly check the boiler for any concealed damage. If the boiler was ordered as factory assembled or field assembled, open all boxes and check the contents against the packing lists. In the event of shortage or damage, notify the transportation company immediately.

Boiler must be installed in accordance with these instructions so as not to void our warranty. Boiler must also be installed in accordance with Section IV of the ASME Boiler and Pressure Vessel Code and any applicable governmental and insurance codes.

AIR SUPPLY FOR BOILER ROOM

Provisions must be made to supply sufficient air to the boiler room at all times for combustion, ventilation, operation of the barometric draft regulator (where used), and prevention of less-than-atmospheric air pressure in the boiler room. An opening to the outside with a free cross sectional area of at least 1 square inch per 7,000 BTUH burner firing rate is recommended (CSA requires 1 sq. in. per 5000 BTUH input). For each 1,000 feet above sea level, increase the fresh air opening by 4 per cent. The boiler room should be isolated from any area served by exhaust fans. **DO NOT INSTALL AN EXHAUST FAN IN THE BOILER ROOM.**

CHIMNEY OR VENT

(also refer to BREECHING ERECTION)

The No. 76 Boiler is designed for pressurized forced draft firing. The No. 76 Boiler for light oil application can also be fired with negative pressure in the firebox for natural chimney draft.

The boiler with pressurized firebox for forced draft firing can be used with a conventional chimney or stub vent. The boilers with negative pressure in the firebox can only be used with a natural draft chimney.

On multiple boiler installations using one chimney, consult Weil-McLain Application Engineering Department for additional venting information.

Forced Draft

When excess negative draft conditions can be expected to prevail in the breeching or when the chimney or stub vent height exceeds the published natural draft chimney height, install the barometric draft control, furnished with the boiler, in the breeching as close to the chimney as possible.

Natural Draft

Be sure the chimney is no smaller than the published height and cross sectional area. Where the cross sectional area or the height of the natural draft chimney is smaller than the published dimensions or where excessive resistance to the flow of combustion gases can be expected, it may be necessary to convert the installation to forced draft by purchasing and installing an induced draft fan.

The chimney must be at least the diameter indicated on the last page of these instructions under **RATINGS** to vent with natural draft.

BOILER FOUNDATION

A boiler foundation is recommended where the boiler room floor is not level or where the boiler room floor cannot support the weight of the boiler. Locate the boiler foundation to provide proper clearances for installation of the piping, burner, and internal water heater(s). Allow a minimum clearance of 22" from the back of the boiler for breeching erection. Allow 18" clearance to the left side for cleaning and for tankless heaters. Allow 26" clearance to the left side if storage heaters are used. A level concrete pad or curb foundation is suggested of the size shown in the table and FIGURE 1. The height of the boiler foundation should be at least 2".

If the boiler is to be installed directly over electrical wiring or telephone cables in conduit buried in the concrete floor of the boiler room, a 1" thick insulated mat covered with foil should be laid on the floor underneath the boiler sections, foil face up.

BOILER FOUNDATION SIZES			
BOILER NO.	L	BOILER NO.	L
476	24"	776	42"
576	30"	876	48"
676	36"	976	54"

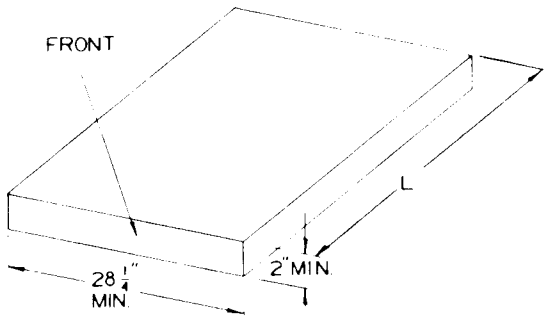


FIGURE 1

ASSEMBLED SECTIONS

If the boiler was ordered completely packaged or with the sections factory assembled, locate the unit on the boiler foundation or on the boiler room floor. After the boiler has been positioned, proceed to "HYDROSTATIC PRESSURE TEST OF BOILER."

SECTION ARRANGEMENT TABLE WITH INDIRECT WATER HEATERS

BOILER NO.	MAXIMUM NO. OF HEATERS	SECTION ASSEMBLY ALL HEATERS MUST BE ON LEFT SIDE OF BOILER
476W & S	1	F–TI–I–B
576W & S	2	F–TI–I–TI–B
676W & S	2	F–TI–I–TI–I–B
776W & S	3	F–TI–I–*–I–TI–B
876W & S	3	F–TI–I–TI–I–I–TI–B
976W & S	4	F–TI–I–TI–I–*–I–TI–B

F = Front Section; B = Back Section; I = Intermediate Section; TI = Intermediate Section with Tankless Heater Opening.

*A TI section can be located in this position instead of regular intermediate section, but installer must cut jacket side panel to accommodate heater opening—no knockout is provided.

SEALING ROPE

Listed in the SEALING ROPE USAGE TABLE are the places sealing rope must be used and the diameter and length of each piece. For expediency, the sealing rope can be pre-cut prior to starting the section assembly.

SEALING ROPE USAGE TABLE

NOMINAL DIAMETER OF SEALING ROPE	CUT LENGTHS	ROPE USAGE AND LOCATION
1/2"	98"	Perimeter of each Section
	42"	Drafthood Collar
	58"	Burner Mounting Plate
3/8"	12"	Observation Port Frame

SECTION ASSEMBLY

1. Prepare the back section for erecting the boiler.
   a. Lay back section on floor with ports facing up. Apply water-glass, as an adhesive, to the target wall area (i.e., back end of firebox) of the section. Press flexible refractory blanket into position (see Figure 6).
   b. Locate the back section on the boiler foundation shown in FIGURE 1. Screw a piece of 3" diameter pipe at least 22" long into the 3" return tapping in the back section. Block under the 3" pipe to hold the back section upright without additional support. These sections are top-heavy and will not stand individually without support. Make sure that the section remains plumb. The 3" diameter piece of pipe can be removed after several sections have been erected.
2. Sealing rope adhesive is in a caulking tube and must be used with a caulking gun. Make a 1/8" continuous bead of adhesive in the bottom of the curved sealing grooves located around the perimeter of the section.
3. Position the 1/2" by 98" long sealing rope on the section by starting at the cleanout opening (see FIGURE 2). Be sure the sealing rope is well seated at all points in the sealing grooves so that a gas-tight seal will be maintained between the sections. **DO NOT APPLY** adhesive to the opposing sealing grooves of the next boiler section.
4. Wipe the port openings with a clean rag to remove any grit from the machined surfaces. Do not use any cleaner that contains a petroleum base distillate (oil) to clean ports. Place the 7 1/2" and 3 1/2" elastomer sealing rings in the appropriate port openings (see FIGURE 2).
5. Combustion products and unburned oil vapors can cause failure of the elastomer sealing rings. After the elastomer sealing rings have been set in the port openings of the section, make a 1/8" diameter continuous bead of silicone sealant around the outside of the rings. Follow this procedure for each sealing ring installed (see FIGURE 3).
6. Prepare the port openings in an intermediate section. The "TI" intermediate sections (if used) must be installed in the order given in the SECTION ARRANGEMENT WITH INDIRECT WATER HEATERS table. Note that 18" clearance must be provided on the left side for cleaning and heater installation.
7. Discard the 3/8" diameter rods which are required only during shipment. These rods must not be used to draw the sections together.

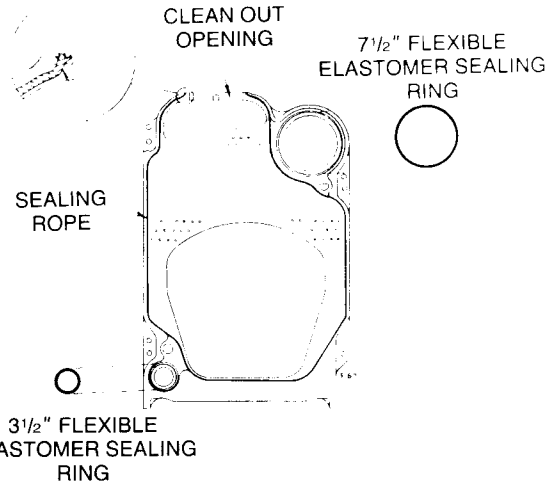


FIGURE 2

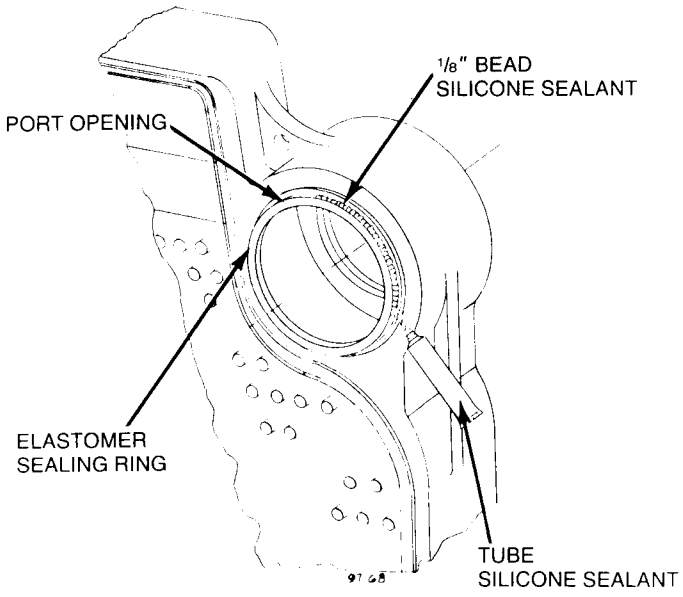


FIGURE 3

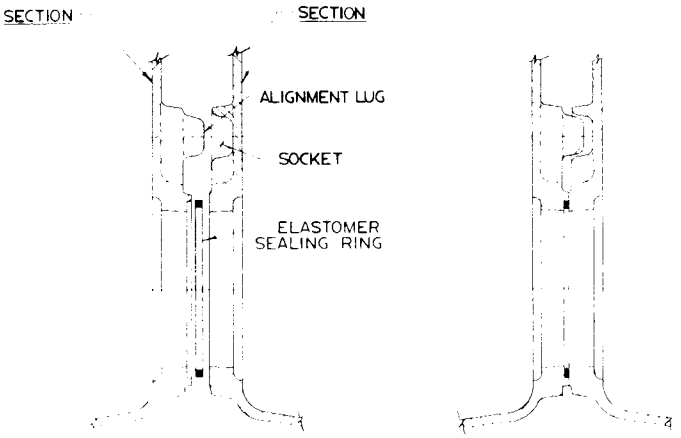


FIGURE 4

a. Position the intermediate section so that the aligning lugs will fit into the sockets of the section (see FIGURE 4). Oil the threads of four (4) of the draw rods (5/8" x 9") and slip them through the lugs on the top and sides of each section. Place a washer (only one washer per draw rod) under each nut to be tightened. Put a drop of oil between washer and nut.

b. Starting with the draw rods nearest the port openings, draw the sections together uniformly until the metal around the ports touch and the pads at the opposite corners touch. When properly pulled together the gap around the port openings should be less than 0.032". Check with a feeler gauge.

c. Do not continue to draw sections together after metal to metal contact has occurred. Do not "back off" the draw rod nuts.

8. Set the remaining boiler sections into position with the "TI" sections placed (if used) in the proper order given in the SECTION ARRANGEMENT table. Check the sealing rope seal of each section before proceeding to the next section. **The boiler must be sealed gas-tight.**

WARNING Use of chemical cleaners or sealants in any Weil-McLain boiler is not recommended. **IN PARTICULAR, PRODUCTS CONTAINING PETROLEUM DISTILLATES MUST NEVER BE USED IN TYPE 76 BOILERS!**

9. Four 1/2" x 4 1/4" studs are provided to secure the burner mounting plate to the front section (see FIGURE 6).
   a. Thread two 1/2" nuts on the rounded end of a 1/2" x 4 1/4" stud, locking them together, and thread the flat end of the stud into one of the four tapped holes located around the burner mounting plate opening in the front section.
   b. Remove the nuts from the stud.
   c. Repeat steps "a" and "b" for the remaining three studs.
   d. For BL-76 boilers, hang one refractory retainer (stainless steel plate) over each mounting stud.

10. Make a small continuous bead of sealing rope adhesive in the groove around the burner mounting plate opening in the front section. Position the 1/2" diameter by 58" long rope in the groove making sure the ends overlap at least 1" and install the burner mounting plate using the 1/2" washers and nuts provided. Make sure burner plate is installed with the round secondary air opening to the left (see FIGURE 6).

11. Make a small continuous bead of sealing rope adhesive in the bottom of the sealing groove located around the flange of the front observation port assembly. Position the 3/8" diameter by 12" long sealing rope in the sealing groove making sure the ends overlap at least 1". Install the front observation port assembly using the number 10—32 x 3/4" truss head screws provided (see FIGURE 6).

12. If the boiler was ordered with "TI" intermediate section(s), install the indirect water heater(s) and gasket(s) or heater opening cover plate(s) and gasket(s) using the 3/8" x 3/4" hex head screws and washers provided (see FIGURE 6).

13. Place a 1/4" x 1 1/2" carriage bolt in the cleanout opening as shown in FIGURE 6. Place a washer and nut over the bolt to hold it in place. Place the 10 1/2" x 17/8" cerafelt blanket insulation pieces against the cleanout plates. Mount the cleanout plate over the opening and bolt the cleanout plate in position (see FIGURE 6).

14. Repeat Step No. 13 for the remaining cleanout plates.

15. Make a small continuous bead of sealing rope adhesive in the bottom of the sealing groove around the perimeter of the draft hood collar. Position the 3/8" diameter by 42" long sealing rope in the groove on the draft hood collar making sure the ends of the rope overlap at least 1".

16. Position the draft hood collar to fit over the flueway outlet on the back section. Secure the draft hood collar to the back section using the 3/8" x 1" hex head cap screws and washers provided (see FIGURE 6).

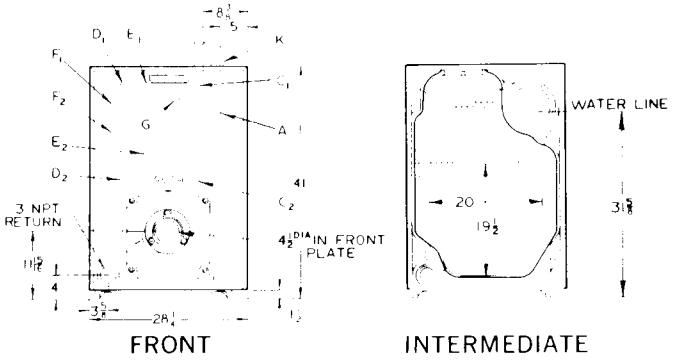


FIGURE 5

CONTROL TAPPINGS

Location	Size	Steam	Water
A	1 1/2"	Safety Valve and/or Skim Tapping	High Limit Control
B	1 1/2"	Safety Valve	Safety Relief Valve
C_1	1"	—	Combination High Limit and Low Limit Control
C_1 & C_2	1"	Water Level Controls	Low-Water Cutoff
D_1 & D_2*	1"	Water Level Controls	Low-Water Cutoff
E_1 & E_2	1/2"	Gauge Glass	—
F_1 & F_2*	3/8"	Try Cock Tappings	—
G	1/2"	Pressure Limit Control, Pressure Operating Control and Pressure Gauge	Combination Pressure-Temperature Gauge
H	3/4"	Drain	Drain
K	3/4"	—	Piping To Compression Tank or Automatic Air Vent

* Available on special request only.

HYDROSTATIC PRESSURE TEST OF BOILER

1. If the boiler was ordered with optional 1 1/2" cleanout and inspection openings on the sections, plug these tappings using the 1 1/2" brass plugs provided.

2. Install a drain cock (not supplied) in the 3/4" drain tapping (size to ASME Code requirements). Refer to the CONTROL TAPPING TABLE and FIGURE 5.

3. Install a water pressure gauge in one of the boiler tappings so the boiler water test pressure can be measured.

4. Install a bleed valve in boiler tapping K to vent air as the boiler is filled with water.

5. Plug all remaining boiler tappings, including the returns. Refer to the CONTROL TAPPING TABLE and FIGURE 5.

6. Fill the boiler with water and completely vent all air. Test the boiler with water pressure not exceeding 45 pounds per square inch or 1 1/2 times the boiler working pressure, whichever is greater.

WARNING Submit the boiler to this test for at least 10 minutes but for no longer than 30 minutes.

7. Thoroughly inspect the entire boiler for water leaks. At the end of the test period, look at the water pressure gauge and ascertain that the water test pressure has remained constant.

8. Drain the boiler and remove plugs from those tappings which will be used. Refer to the CONTROL TAPPING TABLE and FIGURE 5.

SUPPLY AND RETURN PIPING

It is recommended that the system supply and return piping be installed and the piping connections be attached to the boiler before erecting the jacket or installing the controls to avoid any possible damage to the jacket or controls. Recommended piping arrangements for No. 76 water and steam boilers are shown in FIGURES 7, 8 and 9. The minimum recommended pipe sizes are listed for each piping arrangement. The supply and return piping will not interfere with the erection of the boiler jacket.

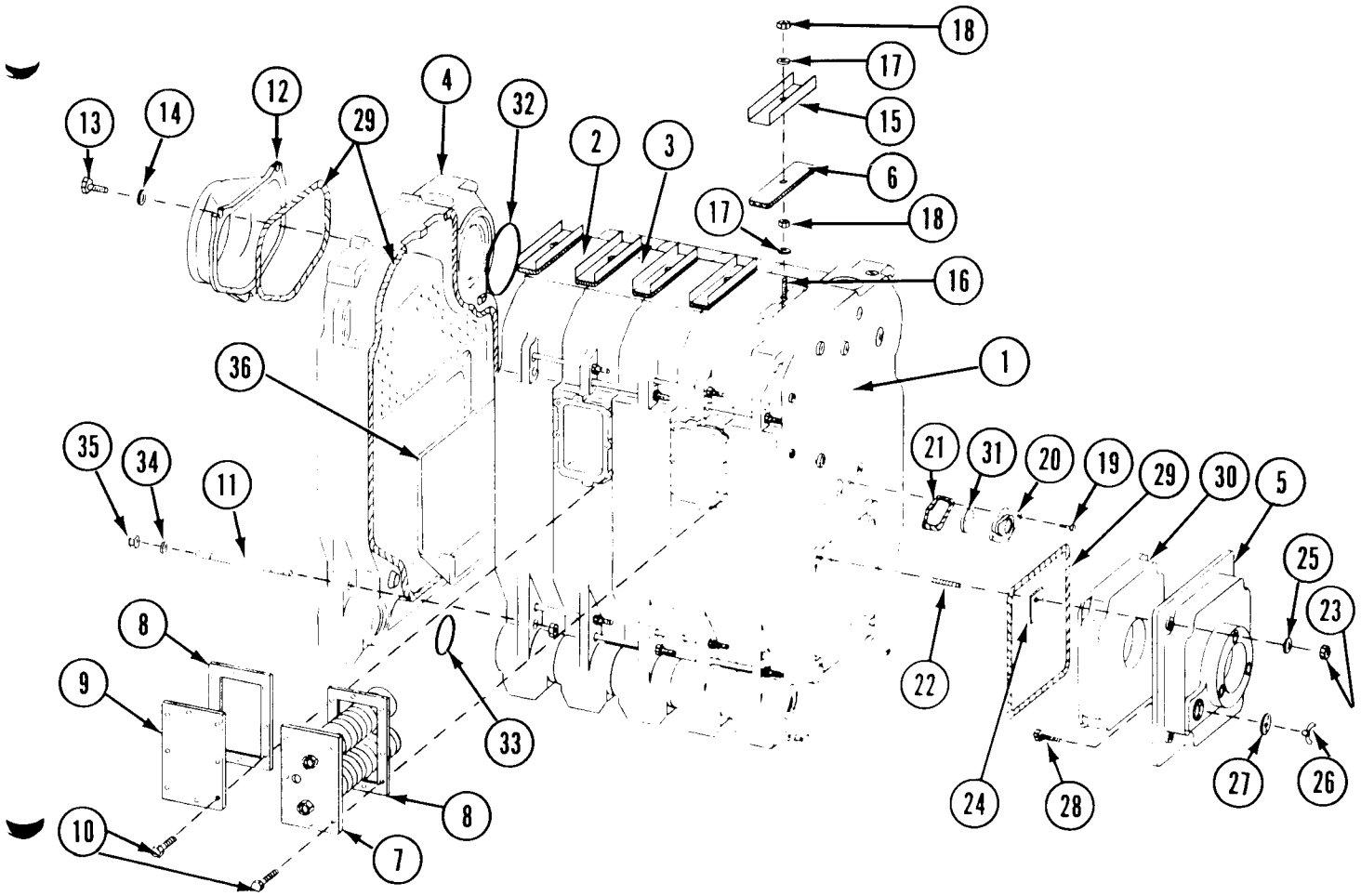


FIGURE 6

1. Front Section
2. Regular Intermediate Section
3. Tankless Intermediate Section
4. Back Section
5. Burner Mounting Plate
6. Cerafelt Blanket Insulation 10 1/2" x 17/8"
7. Tankless Heater
8. Tankless Heater or Heater Cover Plate Gasket
9. Heater Cover Plate
10. Cap Screw, 3/8" x 3/4"
11. Draw Rod, 5/8" x 9"
12. Draft Hood Collar
13. Cap Screw, 3/8" x 1"
14. Washer, 3/8"
15. Cleanout Plate
16. Carriage Bolt, 1/4" x 1 3/4"
17. Washer, 1/4"
18. Hex Nut, 1/4"
19. Observation Port Screw 10-32 x 3/4"
20. Observation Port Assembly
21. Sealing Rope, 3/8"
22. Stud, Tap End, 1/2" x 4 1/4"
23. Hex Nut, 1/2"
24. Retainer, Front Refractory
25. Washer, 1/2"
26. Wing Nut, 1/4"
27. Secondary Air Shutter
28. Machine Screw 1/4" x 1 1/2"
29. Sealing Rope 1/2"
*30. Front Plate Refractory
31. Clear Sight Glass 2" Dia. x 1/8"
32. 7 1/2" Square Cut Seal
33. 3 1/2" Square Cut Seal
34. Washer 5/8"
35. Hex Nut 5/8"
36. Insulated Combustion Chamber Back Piece

* For BG and BGL-76 boilers, refractory is cast into burner mounting plate.

RECOMMENDED PIPING CONNECTIONS FOR WATER BOILERS

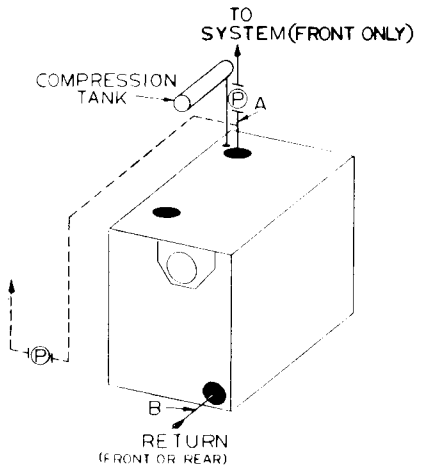


FIGURE 7

TABLE I
FOR KNOWN FLOW RATES*

WATER FLOW RATE GPM	SUPPLY PIPE SIZE A	RETURN PIPE SIZE B
To 9 GPM	1"	1"
10–16 GPM	1¼"	1¼"
17–21 GPM	1½"	1½"
22–35 GPM	2"	2"
36–50 GPM	2½"	2½"
51–76 GPM	3"	3"

*High temperature rise through boiler is permissible when boiler piping connections are sized using above Table 1. INTERMITTENT flow at HIGH velocities may damage any boiler.

TABLE II
FOR UNKNOWN FLOW RATES**

BOILER NUMBER	SUPPLY PIPE SIZE A	RETURN PIPE SIZE B
476 and 576	2"	2"
676 and 776	2½"	2½"
876 and 976	3"	3"

**All piping sizes are based upon 20° F. temperature rise through the boiler. For use of other temperature rises through the boiler (i.e. higher flow rates) determine the flow rate and use Table I for pipe sizes.

WATER BOILER SUGGESTED PIPING CONNECTIONS

WARNING Improper piping systems and/or undersized piping can contribute to erratic boiler operation and possible boiler damage. The piping system must be installed as illustrated using the recommended minimum pipe sizes for the respective boiler. Consult your Weil-McLain distributor, field salesman or field sales office, or Weil-McLain Applications Engineering Department before attempting to install any alternate piping systems or smaller than recommended pipe sizes.

FIGURE 7 and the accompanying tables show the recommended piping connections and minimum recommended pipe sizes for No. 76 water boilers. **Reverse water flow through the No. 76 water boiler is not recommended.** In most cases it is advisable to pump water away from the boiler by connecting the supply piping to the inlet side of the circulator, as illustrated in FIGURE 7.

The supply and return piping and the compression tank are not supplied with the boiler but should be installed as illustrated. Controls are not shown in FIGURE 7 in order to more clearly show the water boiler piping.

In sizing the supply and return piping, start with the minimum recommended pipe size and proceed at full diameter for 10 times that diameter before making any reduction. For example a 3" return should not be reduced any closer to the boiler return tapping than 30". Horizontal expansion tank piping must pitch upward at least 1" for each 5 feet of piping from the boiler to the tank.

Where system temperature modulation is achieved by means of three-way valves, care must be exercised in piping the system to protect the boiler from thermal shock which could result from returning room temperature water at high velocities to the hot boiler. Where three-way valves are employed, consult Weil-McLain Application Engineering Department for piping recommendations. Primary-secondary pumping is preferred.

RECOMMENDED PIPING CONNECTIONS FOR STEAM BOILERS

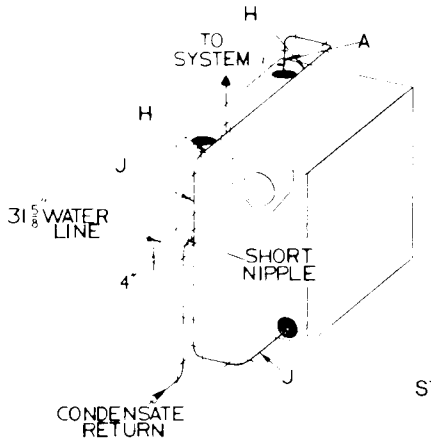


FIGURE 8

STEAM BOILER PIPING
476 AND 576

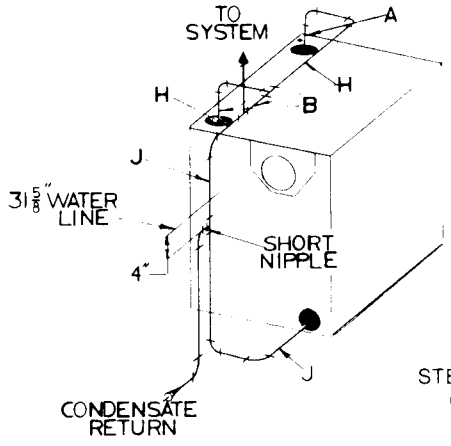


FIGURE 9

STEAM BOILER PIPING
676 THROUGH 976

Note: A minimum of 24" from the water line to the bottom of the header is recommended.

CONDENSATE RECEIVER CAPACITY

Boiler Number	Gross Output Pounds of Steam Per Hour	Gallons of Condensate Per Hour	Minimum Condensate Receiver Capacity				Recommended Maximum Condensate Feed Pump Capacity G.P.M. at 15 PSI
			15 Min. Boiler Operation	30 Min. Boiler Operation	45 Min. Boiler Operation	60 Min. Operation Boiler	
476	264	32	10	20	30	40	1.1
576R	323	38	11	22	33	44	1.2
576	336	41	12	24	36	48	1.4
676	408	49	15	30	45	60	1.6
776	480	58	18	36	54	72	1.9
876	552	67	20	40	60	80	2.2
976	624	75	23	46	69	92	2.5

STEAM BOILER PIPING
MINIMUM RECOMMENDED PIPE SIZES

Fig. No.	Boiler Size	Riser Pipe Size		Header* H	Equalizer J
		A	B		
8	476	3"		3"	1½"
8	576	3"		3"	1½"
9	676	2½"	2½"	4"	1½"
9	776	2½"	2½"	4"	1½
9	876	3"	3"	4"	2"
9	976	3"	3"	4"	2"

*24" Minimum from waterline to header.

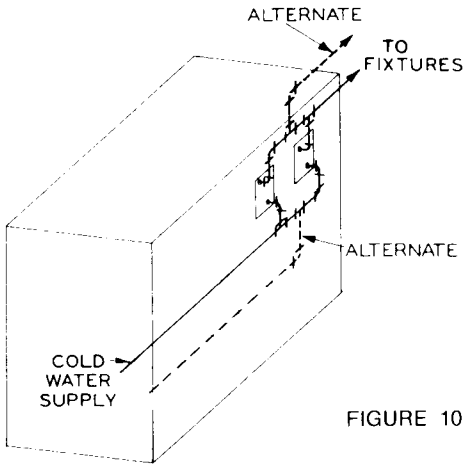


FIGURE 10

STEAM BOILER PIPING AND HEADERS SUGGESTED PIPING CONNECTIONS

WARNING Improper piping systems and/or undersized piping can contribute to erratic boiler operation and possible boiler damage. The piping systems must be installed as illustrated using the recommended minimum pipe sizes for the respective boiler. Consult your Weil-McLain distributor, field salesman or field sales office, or Weil-McLain Applications Engineering Department before attempting to install any alternate piping systems or smaller than recommended pipe sizes.

FIGURES 8 and 9 and the accompanying table show recommended piping connections and minimum recommended pipe sizes for No. 76 steam boilers. The supply and return steam piping is not supplied with No. 76 steam boilers but should be installed as illustrated. Controls (safety valve, low water cutoff, gauge glass, etc.) are not shown on the steam piping diagrams in order to more clearly show the steam piping and Hartford Loop. A minimum of 24" from the waterline to the header is recommended.

CAUTION The satisfactory operation of any steam heating boiler depends upon adequate return of condensate to the boiler to maintain a steady water level. In rambling buildings with extended system piping, nuisance shutdowns sometimes result when the condensate returning from the system lags behind the evaporation capacity of the boiler. To maintain a steady water line, avoid the introduction of excessive amounts of raw make-up water. To prevent nuisance shutdowns due to a temporary low water level, it is recommended that a low water cutoff and pump control, condensate receiver, and condensate boiler feed pump be installed. Refer to the Condensate Receiver Capacity Table for recommended receiver sizes and condensate feed pump capacity.

ATTACHING THE JACKET

The boiler should be pressure tested and the supply and return piping may be attached before the jacket is erected. Make sure that only the plugs and other accessories listed to this point in the instructions are mounted on the boiler. Follow the Jacket Erecting Instructions packed in the jacket carton for jacket installation procedures.

TANKLESS HEATER HOOK-UP

Where the boiler was ordered with tankless heater(s) it is recommended that the piping to and from the heater be sized no smaller than the heater inlet and outlet piping connections. The tankless heater piping should be installed as illustrated in FIGURE 10. Where the boiler was ordered with multiple tankless heaters, a cold water supply header with individual risers to each heater must be employed and the hot water out-

lets from each header must be headered. It is recommended that a flow regulating valve be installed in the cold water supply piping to each heater. Each flow regulating valve should be sized according to the intermittent draw rating of each tankless heater. Do not pipe multiple indirect water heaters in series. An automatic mixing valve may be installed in the domestic hot water supply piping from the heater(s) to regulate the domestic hot water temperature. Install the operating control in the control tapping in the heater plate. In hard water areas, it is advisable to soften the cold water to the heater(s).

DOMESTIC WATER HEATER CAPACITIES

TANKLESS HEATERS*			
Heater Number	**Intermittent Draw GPM 100° Average Temperature Rise	***Continuous Draw GPM 100° Temperature Rise	Inlet and Outlet Tappings
35-S-29	4.5 GPM	4.0 GPM	3/4"

STORAGE HEATERS*			
Heater Number	180° Heater Capacity Gallons 40°-140° Rise	212° Heater Capacity Gallons 40°-140° Rise	Inlet and Outlet Tappings
816	140 in 3 Hrs.	205 in 3 Hrs.	
Recommended Storage Tank	200-500 Gallons	250-500 Gallons	1"

* Weil-McLain Ratings
** Gallons of Water per min. heated from 40° to 140° with 200°F. boiler water temp.
*** Continuous Draw—no recovery period

STORAGE HEATER HOOK-UP

Where the boiler was ordered with storage heater(s), for best operation the domestic water storage tank should be located as high as possible above the storage heater(s). A vertical domestic water storage tank may be used if the bottom of the storage tank is located above the boiler. To maintain optimum gravity hot water circulation, the horizontal flow piping from the storage heater(s) to the tank must pitch upward at least 1 inch for each 10 feet of piping and the horizontal return piping from the storage tank to the heater(s) must pitch downward at least 1 inch for each 10 feet of piping. Use as few pipe fittings as possible so that the least possible resistance will be encountered. The STORAGE HEATER RATING table gives the storage heater capacities and the recommended storage tank size.

INSTALL BOILER CONTROLS

Steam Boiler:

A low water cutoff, safety valve, pressure gauge, gauge glass and cocks, blow down valve, and operating and limit pressure controls must be installed on this boiler to meet ASME code requirements.

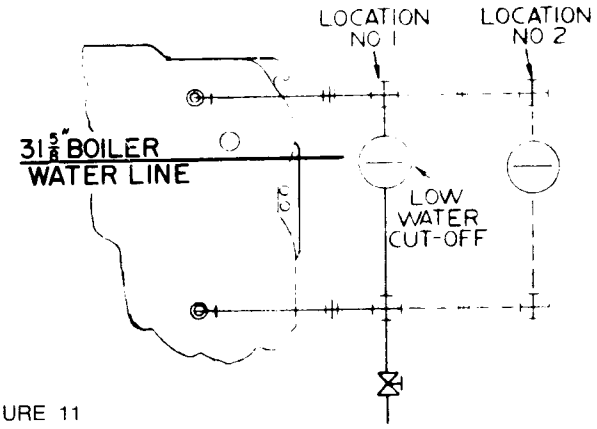


FIGURE 11

Recommended Locations For Low Water Cutoff, Water Feeders and Pump Controllers When Used on Weil-McLain Steam Boilers.*

LOCATION NO. 1		LOCATION NO. 2►	
Primary Water Level Control•	Casting Line Location Below Water Line Dim. A	First Back-up Water Control•	Casting Line Location Below Water Line Dim. A
150	2½"	–	–
61, 63	4½"	–	–
93 & 94	2¾"	–	–
51-2 & 51-S-2	3½"	–	–
247-2	3¼"	–	–
61 & 63	4¼"	61 & 63	4½"
93 & 94	2¾"	93† & 94†	4½"
150	2½"	150■	4½"
93 & 94	2¾"	61 & 63	4½"
150	2½"	61 & 63	4½"
93 & 94■	2¾"	247-2	4½"
93 & 94■	2¾"	51-2 & 51-S-2	4½"
150■	2½"	247-2	4½"
150■	2½"	51-2 & 51-S-2	4½"

• Other manufacturers controls providing similar function may be used provided they are properly located and are selected to handle the boiler evaporative capacity. Control locations as indicated above refer to the control body mark or line on the control body casting.
† Use low water cutoff function only, pump controller function should only be used on "highest" control location.
■ Use pump control function only, back-up controller to provide low water cut-off function, or low water cut-off and feeder function.
► If location No. 2 is not allowed by insuring agency, consult Weil-McLain technical service department for alternate location.

1. Install the steam safety valve in the proper tapping as indicated in the CONTROL TAPPING table and FIGURE 5.

WARNING To avoid water damage or scalding, the safety valve outlet must be piped to a floor drain or near to the floor. Do not pipe the safety valve discharge to any area where freezing temperatures could occur.

2. Install the low water cutoff (see FIGURE 11) in accordance with the CONTROL TAPPINGS Table and FIGURE 5. Where an optional low water cut-off, combination low water cut-off and feeder, or combination low water cut-off and pump control is employed, install the control in accordance with the CONTROL TAPPING table and FIGURE 5 using fittings (not furnished). If a low water cut-off is to be used that is not dimensionally diagrammed in FIGURE 11, locate the cast-on body mark of the control 2" below the normal water line. Do not use a water level control with quick hook-up fittings on any No. 76 steam boiler.

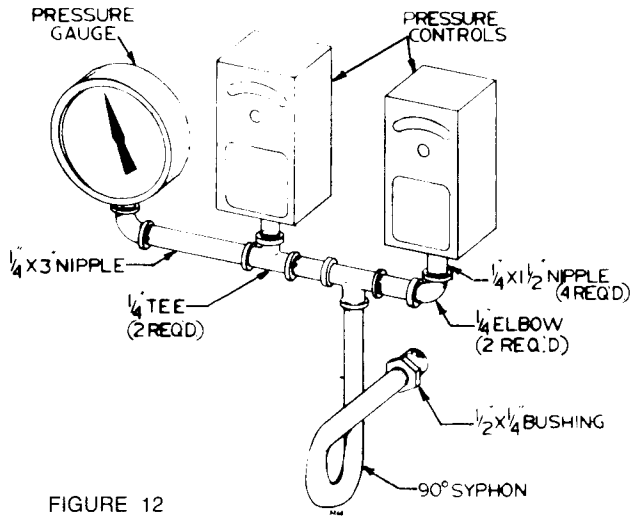


FIGURE 12

3. Install the gauge glass cocks, water gauge glass and gauge glass guards in accordance with the CONTROL TAPPING table and FIGURE 5.
4. Install the steam pressure operating and high limit controls and the pressure gauge in the proper tapping as indicated in the CONTROL TAPPING table and FIGURE 5. Use the pigtail syphon and fittings furnished (see FIGURE 12).
5. Install any additional or optional steam boiler controls according to the control manufacturer's instructions.

Two (2) pressure limit controls are furnished as standard equipment to perform low limit (operating) and high limit functions. The pressure limit control used as the operator should be set according to the design requirements of the system. The pressure limit control employed for the high limit function should be set at least 2 PSIG higher than the operating control setting, where possible (15 PSIG maximum allowable steam boiler pressure).

For additional information on the controls, refer to the control manufacturer's instructions.

Water Boiler:

1. Install the pressure relief valve in the proper tapping as indicated in the CONTROL TAPPINGS table and FIGURE 5.

WARNING To avoid water damage or scalding, the relief valve outlet must be piped to a floor drain or near to the floor. Do not pipe the relief valve discharge to any area where freezing temperatures could occur.

2. Install the pressure-temperature gauge as indicated in the CONTROL TAPPINGS table and FIGURE 5.
3. Where an optional 1" low water cut-off is employed, install the control in accordance with the CONTROL TAPPINGS table and FIGURE 5 using the fittings (not furnished). Refer to FIGURE 11 for positioning. If a low water cut-off is to be used that is not dimensionally diagrammed in FIGURE 11, refer to the separate manufacturer's instructions for locating the control.
4. Install the combination limit control as indicated in the CONTROL TAPPINGS table and FIGURE 5.
5. Install any additional limit controls in the proper tappings as indicated in the CONTROL TAPPING table and FIGURE 5.
6. Install any additional or optional water boiler controls according to the control manufacturer's instructions.

A combination low limit (operating) control and high limit control is furnished as standard equipment. The low limit (operating) control should be set according to the design requirements of the heating system. The high limit control should always be set at least 20°F higher than the low limit control setting, where possible (250°F maximum allowable boiler water temperature).

For additional information on the controls, refer to the control manufacturer's instructions.

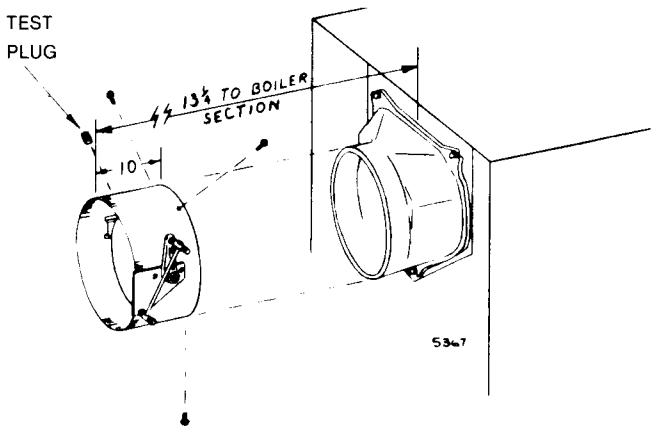


FIGURE 13

WARNING BREECHING ERECTION FOR FORCED DRAFT FIRING

(also refer to CHIMNEY)

The No. 76 boiler for forced draft firing differs from the No. 76 boiler for natural draft only by the addition of a manually adjusted flue collar adapter with built-in breeching damper (see Figure 13). Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions which restrict the flow of combustion gases should be avoided. The breeching damper, damper locking plate, and breeching damper handle are furnished as an assembly.

Slide the damper assembly over the smoke collar, making sure it is firmly set in place. Drill three holes and secure using three #10 bolts and nuts (see FIGURE 13).

Complete the installation of the breeching from the damper to the chimney or vent using the following procedure:

1. Fit a piece of full size heavy gauge steel breeching (same diameter as draft hood collar) over the damper. The force fit of the breeching onto the damper must be gas-tight and should be held together with several bolts or screws.
2. Refer to the last page of these instructions under No. 76 RATINGS and determine the minimum recommended breeching diameter for the size boiler being installed.

Use heavy gauge steel breeching which can be welded to connect from the chimney or vent to the piece of full sized breeching on the damper assembly.

WARNING The breeching must be gas-tight using welded seams and joints. Where the breeching diameter will be smaller than the diameter of the damper assembly, a tapered type reducing fitting which provides less resistance to flow of combustion gases is recommended.

BAROMETRIC FORCED DRAFT

In the event the boiler is connected to a high chimney which provides too much natural draft, install the barometric draft control furnished with the boiler in the breeching as close to the chimney as possible.

BREECHING ERECTION FOR NATURAL DRAFT FIRING

(also refer to CHIMNEY)

The No. 76 boiler for natural draft differs from the No. 76 boiler for forced draft firing only by the fact that a manually adjusted breeching damper is not used. Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions which restrict the flow of combustion gases should be avoided. Direct vertical venting from the flue collar to the outside will afford best performance at lowest total cost.

Use heavy gauge steel breeching to connect from the chimney or vent to the flue collar on the boiler. Install the barometric draft control in the breeching as close to the chimney as possible.

BURNER INSTALLATION

Carefully unpack the burner from its shipping container and check the contents. In case of shortage or damage, notify the transportation company immediately. **The envelope of papers enclosed with the burner is to be used, preserved, and turned over to the owner and/or the owner's representative.**

Slip the gasket over the end of the burner blast tube and push it forward until it engages the burner mounting flange. Insert the end of the burner blast tube into the opening in the burner mounting plate. Level the burner and firmly secure the burner mounting flange to the burner mounting plate using the bolts provided until a rigid installation is accomplished. A gas-tight seal must be maintained between the burner mounting flange and the burner mounting plate or damage to the burner air tube will result.

WARNING WIRING THE BOILER

All wiring should be installed in compliance with the rules of the National Electrical Code for installation in the U.S.A. or Canadian Electrical Code C22.2 Part 1 for Canadian installations, and any local, state, or insurance requirements or codes having jurisdiction. Operating and safety circuit wiring must be No. 14 gauge wire. Power supply wiring to the burner must be No. 14 gauge or heavier, as required, and shall have a properly sized fused disconnect switch. Where the burner motor electrical current requirements are for voltages other than the control electrical current requirements, be sure the proper voltage is supplied to the controls, the burner motor, and any auxiliary equipment.

Follow the separate burner manual and wiring diagram for wiring the burner and the boiler controls.

FUEL LINE PIPING

Refer to the separate Burner Installation and Service Manual and any local or national code requirements which may apply to sizing and installing the fuel line piping.

Gas Piping:

The minimum inlet natural gas pressure required at the manual main shut-off gas valve is listed in the Burner Installation and Service Manual shipped with the burner. The gas pressure is for standard burners and is based on 0.60 specific gravity natural gas.

For other type gases, or for burners with additional equipment in the gas control assembly, refer to the material list packaged with the burner for the minimum recommended inlet gas pressure.

A main gas pressure regulator and a pilot line gas pressure regulator are furnished as standard equipment. For propane gas, a lock-up gas pressure regulator (furnished by the gas supplier) must be installed at the storage tank and should provide lock-up pressures not exceeding 14 inches water column.

The gas piping must be sized to provide the minimum required inlet gas pressure at the manual main shut-off gas valve when the burner is operating at the rated input. Consult the local utility regarding gas pressure, piping pressure drops, and any local gas piping requirements.

The gas piping should be installed in accordance with the specifications of the National Board of Fire Underwriters or Natural Fuel Gas Code and any additional code requirements which may apply. A drip leg should be installed at the inlet of the gas connection to the burner. Where the local utility requires that the drip leg be extended all the way to the floor, place an appropriate length of pipe between the cap and tee. All gas piping should be tested for leaks after installation with air pressure or inert gas of at least three times the gas pressure that will be used.

Fuel Oil Piping:

The rules of the National Board of Fire Underwriters and any local or national code requirements which may apply should be followed in locating and installing the fuel oil tank and the fuel oil piping. A two-pipe fuel oil piping system is recommended when the bottom of the tank is below the burner.

WARNING If any part of the fuel oil tank is above the level of the burner, an anti-syphon device must be used to prevent the flow of oil in case of a break in the oil line. If the top of the fuel oil tank is below the level of the burner, use a check valve in the suction line on the burner side of the manual shut-off oil valve nearest the tank. An oil filter of the proper capacity is recommended for all installations.

Copper tubing should be used in preference to iron pipe as it has less possibility for leaks and does not scale off on the inside.

WARNING Flare type fittings are recommended.

The fuel oil piping from the tank to the burner should be sized no smaller than ½" O.D. copper tubing. Where the fuel oil tank is located a considerable distance from the burner, the fuel oil piping should be sized to reduce the friction loss. An auxiliary fuel oil pump is recommended if the fuel oil suction line exceeds the length or lift published by the fuel unit manufacturer.

Connections to buried tanks must be made with swing joints to prevent the fuel lines from breaking in case the tank settles. If the job requirements stipulate that iron pipe must be used, swing joints made with elbows and nipples several inches long should be used on both the suction and return lines and located as close as possible to the tank. The swing joints should be installed so they will tighten as the tank settles.

A manual shut-off oil valve should be provided in the suction line near the burner and either at the tank or near where the suction line enters the building from an outside tank. If manual shut-off oil valves are located in the return piping, a bypass relief to the tank with an oil pressure relief valve must be provided. The return line piping should be run to within 4 to 6 inches from the bottom of the tank.

Suction line piping should be pitched slightly toward the fuel storage tank whenever possible. Particular care should be exercised not to create an air trap in the suction line. There is always a slight amount of air in suspension in fuel oil and if traps are present, they will gradually fill with air and the fuel unit will lose its prime. It is good practice to provide a tee and plug at the highest point in the suction line to aid in priming the fuel unit.

WARNING — BOILER MUST BE SEALED GAS-TIGHT

For proper combustion efficiency and safety to the building occupants, **be sure the boiler is sealed gas-tight.**

For forced draft firing in order to test the boiler seal, remove jacket side and top panels. Shut off the breeching damper and start the burner, keeping it on prepurge. **Observe all sealing points and mark any that are not gas-tight.** Turn off the burner and open the breeching damper. Seal any areas that are not gas-tight by covering the outer surface of the sealing rope with silicone sealant. Replace the jacket panels.

For natural draft firing in order to test the boiler seal, CO_2 readings must be taken in the firebox and at the flue outlet. Lower readings at the flue outlet indicate infiltration of air into the firebox. Locate the area of leakage and seal by covering the outer surface of the sealing rope with silicone sealant.

CAUTION — BURNER AND BREECHING DAMPER ADJUSTMENT FOR FORCED DRAFT FIRING

Before firing the burner, lock the breeching damper in the open position. Start the burner and adjust the air band so that a clean yellow oil burner flame with slightly smoky tips or a clean gas flame is established.

Use combustion test instruments for final adjustment of the burner flame with the burner on high fire and the system water temperature raised to approximately the design conditions. A smoke reading of a trace to No. 1 on the Shell Bacharach scale is recommended with 11½ to 12½ percent CO_2 for No. 2 fuel oil. A CO_2 reading of 9 to 10 percent is recommended for natural gas. A test should be taken to assure that CO does not exceed .04 percent in the flue gases for gas firing.

For forced draft installations, when the burner is on high fire and adjusted to the above conditions, adjust the breeching damper to provide a positive pressure of approximately +0.10 inches water column measured at the test opening on the flue collar. Secure the breeching damper by tightening the damper control swivels. Use the ⅛" brass plug to close the test opening in the draft hood collar after adjusting the breeching damper.

Where excess negative draft conditions prevail in the breeching between the chimney or vent and the breeching damper, adjust the barometric draft control to provide approximately zero to −0.05 inches water column pressure between the breeching damper and the barometric control.

CAUTION — BURNER AND BAROMETRIC DAMPER ADJUSTMENT FOR NATURAL DRAFT FIRING

Start the burner and adjust the air band so that a clean yellow oil burner flame with slightly smoky tips or a clean gas flame is established.

Use combustion test instruments for final adjustment of the burner flame with the burner on high fire and the system water temperature raised to approximately the design conditions. A smoke reading of a trace to No. 1 on the Shell Bacharach scale is recommended with 11½ to 12½ percent CO_2 for No. 2 fuel oil. A CO_2 reading of 9 to 10 percent is recommended for natural gas. A test should be taken to assure that CO does not exceed .04 percent in the flue gases for gas firing.

When the burner is on and adjusted to the above combustion conditions, adjust the barometric draft control to provide −0.02 inches of negative draft overfire.

WARNING — CLEAN THE NEW STEAM BOILER

New steam boilers must be cleaned properly previous to or during the first few days of operation. Follow the cleaning recommendations listed in the START-UP, SERVICE AND MAINTENANCE INSTRUCTIONS. **Do not use chemical cleaners or PETROLEUM based products in this boiler!**

ADDITIONAL INSTRUCTIONS

Before leaving the job, make sure the unit checks electrically and the proper main burner flame is established. Be sure the thermostat heat anticipator is at the proper setting and the room thermostat or operating control is adjusted to provide the desired room temperature.

BOILER SERVICE AND MAINTENANCE

The boiler START-UP, SERVICE AND MAINTENANCE OPERATING INSTRUCTIONS contain information for the owner. Review this information with the owner and/or the owner's representative and be sure they receive all instructions.

NO. 76 RATINGS

Boiler Unit Number	I-B-R Burner Capacity △ Light Oil GPH **	I-B-R Burner Capacity △ Gas MBH ○	Gross I-B-R Output BTU/HR. †	Net I-B-R Ratings ‡ Steam Sq. Ft.	Steam BTU/Hr.	Water BTU/Hr.	Net Sq. Ft. Water ***	Boiler H.P.	Net Firebox Volume Cu.Ft.	Stack Gas Volume CFM ****	Draft Loss thru Boiler in H_2O ★	I-B-R Chimney ⊕ Natural Draft Size Inches	⊕ Natural Draft Height Feet	Forced Draft ★★ Min. Vent Dia. Inches
▲-476-*	2.35	350.0	264,000	825	198,000	229,600	1,530	7.9	4.25	147	.01	8x12	15	6
▲-576R-*	2.85	399.0	323,000	1,010	242,300	280,900	1,873	9.7	5.53	179	.02	8x12	15	7
▲-576-*	2.95	440.0	336,000	1,050	252,100	292,200	1,950	10.0	5.53	185	.02	8x12	15	7
▲-676-*	3.60	537.0	408,000	1,275	306,100	354,800	2,365	12.2	6.81	226	.03	12x12	17	7
▲-776-*	4.25	634.0	480,000	1,500	360,100	417,400	2,785	14.3	8.09	266	.04	12x12	19	7
▲-876-*	4.90	731.0	552,000	1,725	414,100	480,000	3,200	16.5	9.37	307	.05	12x12	21	8
▲-976-*	5.55	820.0	624,000	1,950	468,100	542,600	3,615	18.6	10.65	348	.06	12x16	24	8

▲ Substitute "BL" for light oil, "BGL" for gas-light oil, "BG" for gas, or "H" for boiler only for use with approved light oil burners. Add prefix "A" to designator for Factory-Assembled No. 76 (example: ABL).
NOTE: For gas and gas/oil burners only—476 and 576R boilers can be furnished only with Peabody Gordon-Piatt burners; 576 boilers can be furnished only with Power Flame burners. 576R boilers not available for light oil.

* Substitute "S" for steam, "W" for water. For T-Intermediate section(s) and tankless heater(s) add suffix "(number required)TIH"; for T-Intermediate section(s) with cover plate(s) only add suffix "(number required)TIP".

△ Burner input based on maximum of 2,000 ft. altitude—for other altitudes consult Weil-McLain Application Engineering Department.

** No. 2 fuel oil - Commercial Standard Spec. CS75-56, Heat value of oil - 140,000 BTU/G.

○ BGL Units are built to operate with gases of 1,000 BTU, 0.60 specific gravity. Minimum gas pressure required: 7.0 inches W.C. For other pressures and/or gases consult Application Engineering Department.

† At combustion condition of 12¼ ± ¼% CO_2.

‡ Net I-B-R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and 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 on an allowance of 1.333. An additional allowance should be made for gravity hot water systems or for unusual piping and pick-up loads. Consult Application Engineering Department.

*** Based on average water temperature of 170°F. in radiators.

**** Stack gas volume at outlet temperature.

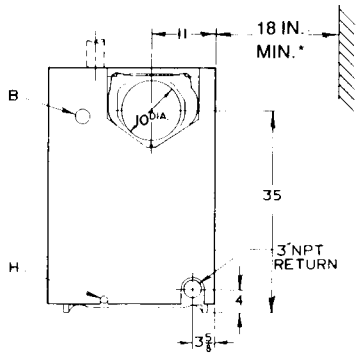
★ For light oil, natural draft: Draft overfire must be added to obtain draft required at flue collar. For light oil, gas and gas-light oil, forced draft: Add 0.10" W.C. for overfire pressure.

⊕ When chimney is lined with the largest standard clay chimney tile, the equivalent area is considered the same as the unlined chimney area.

★★ For forced draft firing, maximum positive pressure cannot exceed .100" W.C. at the flue collar.

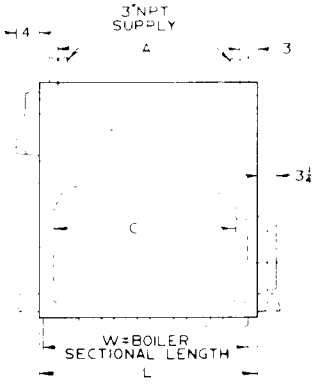
DIMENSIONS

NOTE: SEE CONTROL TAPPINGS TABLE AND FIGURE 5 FOR TAPPING INFORMATION

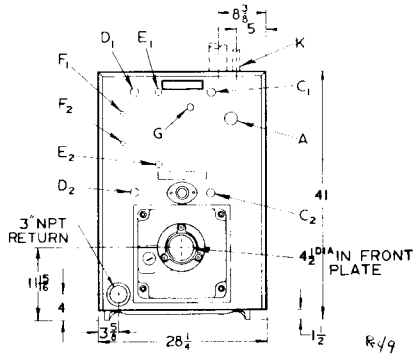


BACK

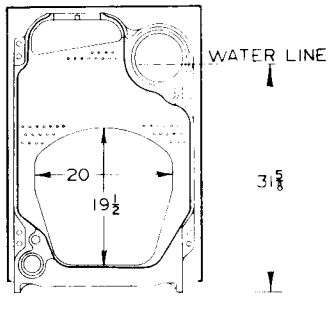
* 26 IN MINIMUM IF STORAGE HEATER IS USED



SIDE



FRONT



INTERMEDIATE

Boiler Number	Supply Tappings Number & Size	Return Tappings Number & Size	Dimensions (Inches) A	C	L	W
476	2—3"	2—3"	17¼	17½	24¼	22
576	2—3"	2—3"	23¼	23½	30¼	28
676	2—3"	2—3"	29¼	29½	36¼	34
776	2—3"	2—3"	35¼	35½	42¼	40
876	2—3"	2—3"	41¼	41½	48¼	46
976	2—3"	2—3"	47¼	47½	54¼	52