



Ultra Gas-fired water boiler

Installation Manual

Multiple-boiler systems with
Weil-McLain Easy-Fit[®] piping



- Selection data
- Installation
- Piping
- Water treatment

Ultra
with **PhD** PRECISION
HYDRONIC
DATA *technology*

WARNING

This manual must only be used by a qualified heating installer/service technician. Before installing, read all instructions, including this manual, the Ultra Boiler Manual and all applicable Supplements. Consider all connections to the boilers before selecting a location and layout. Failure to comply could result in severe personal injury, death or substantial property damage.

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Easy-Fit® Piping

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Hazard definitions

The following defined terms 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.

CAUTION

Indicates presence of hazards that will or can cause minor personal injury or property damage.

WARNING

Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.

NOTICE

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

Selection data

Controls

Weil-McLain offers an excellent selection of boiler sequencing controls. Refer to individual manuals for details.

Domestic hot water

Refer to Weil-McLain Piping Guides and PLUS Water Heater Manual and Ultra PLUS Supplement for suggested piping diagrams.

Venting and combustion air

DANGER

Ultra boilers must be vented individually. Combustion air must be piped to the boiler as well, but may be manifolded as shown on page 13. Follow Weil-McLain Ultra Boiler Venting Supplement and Boiler Manual plus information in this manual. Failure to comply will result in severe personal injury or death.

Additional considerations

1. Review the Ultra Boiler Manual and applicable supplements prior to designing and installing multiple-Ultra-boiler jobs.
2. Ultra boilers are design-certified for installation on combustible flooring (not carpet).
3. Ultra boilers are tested for 30 P.S.I. working pressure (higher pressure not available).
4. For systems requiring greater than 30 P.S.I. relief valve setting, install a heat exchanger to isolate the boilers from the main system. See page 12 for suggested piping.
5. Maximum operating temperature of each boiler is 190°F.

NOTICE

This manual provides general guidelines for piping and installation. Your installation must comply with all applicable local codes.

NOTICE

When using isolation valves on each boiler, some codes may require providing a low water control and additional limit for each boiler. If desired, consult the codes to determine if exclusion of the individual boiler isolation valves may allow the use of a single water level control and additional limit for the entire multiple boiler system.

Ratings and engineering data

Figure 1 Ratings and engineering data (see page 5 for notes)



Boilers in system Model Ultra –				Total AGA input	DOE Heating capacity	Boiler H.P.	Net water ratings		Common combustion air duct size	Foundation size			
										Side-to-side arrangement <i>(height 2" to 4")</i>		Back-to-back arrangement <i>(height 2" to 4")</i>	
										Length (inches)	Length (inches)	Length (inches)	Length (inches)
80	105	155	230	-	Note 1	-	Note 2		See Fig. 12, Page 13	Note 3			
2				160	142				80	56	23	27	48
	2			210	188				105				
		2		310	278	8.3	242	1611	155				
			2	460	414	12.3	360	2399	230				
3				240	213				120	85	23	56	48
	3			315	282				157				
		3		465	417	12.4	363	2417	232				
			3	690	621	18.5	540	3599	345				
4				320	284				160	114	24	56	49
	4			420	376				210				
		4		620	556	16.6	484	3223	310				
			4	920	828	24.7	720	4799	460				
5				400	355				200	143	24	85	49
	5			525	470				267				
		5		775	695	20.7	605	4028	387				
			5	1150	1035	30.9	900	5999	575				
6				480	426				240	172	24	85	49
	6			630	564				315				
		6		930	834	24.9	726	4834	465				
			6	1380	1242	37.1	1080	7199	690				
7				560	497				280	201	24	114	49
	7			735	658				367				
		7		1085	973	29.0	847	5640	542				
			7	1610	1449	43.2	1260	8399	805				
8				640	568				320	230	24	114	49
	8			840	752				420				
		8		1240	1112	33.2	968	6446	620				
			8	1840	1656	49.4	1440	9599	920				

Figure 1 Ratings and engineering data (continued)

NOTICE For simplicity, the table on page 4 lists only systems using multiples of the same Ultra boiler module. Any combination of Ultra boilers can be installed as a multiple boiler system.

Boiler Model Ultra –				Operating weight	Boiler water content	Total water flow rate, GPM		Individual vents required per boiler		Electrical service required
						Pounds per boiler	Gallons per boiler	20°F Rise GPM per boiler	40°F Rise GPM per boiler	
80	105	155	230	Note 4				Note 5		Note 6
X				139	0.7	7.1	3.6	1		5.0
	X			145	0.8	9.4	4.7	1		
		X		181	1.2	13.9	7.0	1		6.0
			X	192	1.6	20.7	10.4		1	

Water header piping

Determine the flow rate that the system header and other pipes will handle. Then use the table at right to determine the minimum pipe size. This table shows pipe sizing both for 350 and 500 milinches per foot head loss. Other pipe sizing using recognized engineering would be acceptable.

Pipe size (inches)	Maximum recommended water flow rate in pipe, GPM	
	350 milinches per foot heat loss	500 milinches per foot heat loss
1	6	7
1¼	13	16
1½	18	24
2	36	45
2½	61	75
3	114	140
4	236	290

Gas piping

See pages 14 and 15 for gas piping requirements and connections.

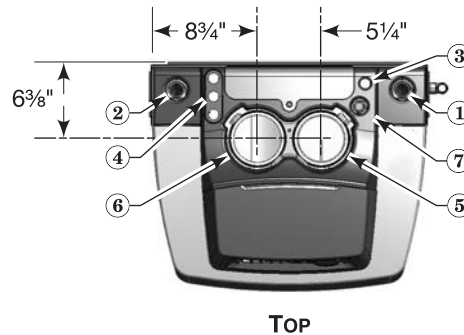
Notes

- Based on standard test procedures outlined by DOE for individual boilers.
- Net I=B=R ratings are based on piping and pickup allowance of 1.15. Consult Technical Services for other allowances.
- Foundation sizes above provide 6 inches between boilers and 2 inches from boiler to edge of foundation. Smaller foundations are possible with reduced service clearances. See Ultra Boiler Manual for details.
For side-to-side installations, see Figure 3, page 7.
For back-to-back installations, see Figure 4, page 7.
- Operating weight is the total weight, including water.
- Ultra-230 boilers can be vented with 3-inch vent instead of 4-inch, with the limitations described in the Ultra Boiler Vent Supplement. (Using the smaller vent pipe reduces maximum allowable run.)
All Ultra installations require a separate vent pipe and termination for each boiler. Vent piping cannot be manifolded. Install and terminate vents as described in the Ultra Boiler Vent Supplement.
Combustion air piping can be individually piped or manifolded, as described on page 13. See Ultra Boiler Vent Supplement for individual air piping.
- Total amp requirements include boiler circulators.

Dimensions

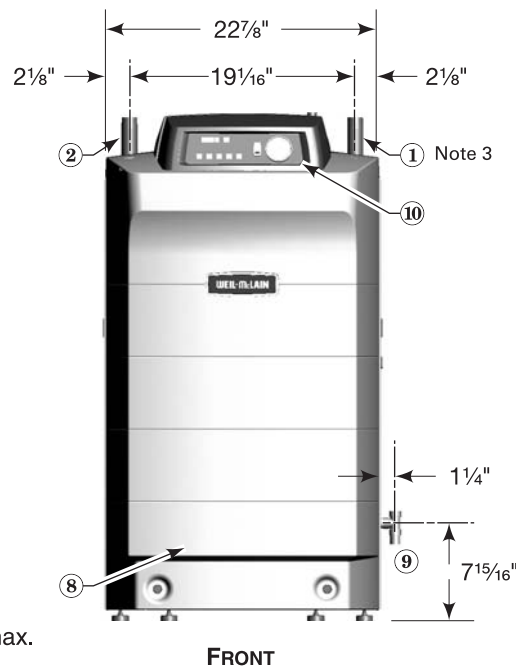
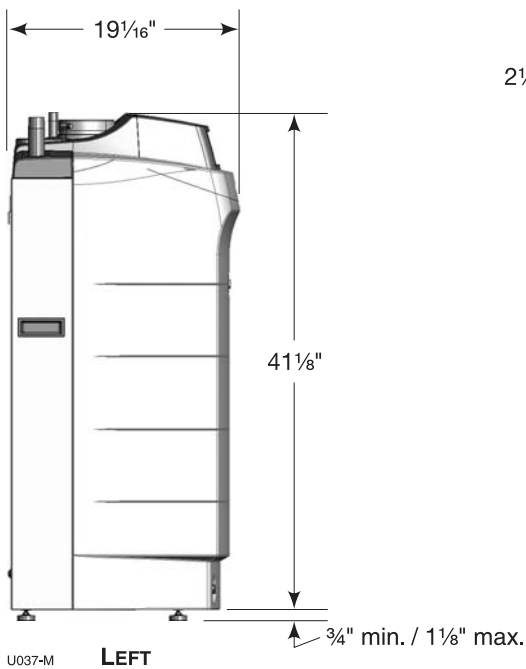
Figure 2 Dimensional data

- ① Supply connection (note 1)
- ② Return connection (note 1)
- ③ Low voltage wire opening
- ④ Electrical entrance openings
- ⑤ Vent connection:
-80, -105 & -155: 3" / -230: 4"



- ⑥ Air connection:
-80, -105 & -155: 3" / -230: 4"
- ⑦ Gas connection (note 1)
- ⑧ Drain valve (inside enclosure)
- ⑨ Condensate drain (1/2" PVC)
- ⑩ Pressure/temperature gauge

ALL DIMENSIONS IN INCHES



U037-M

Notes

1. Boiler supply and return tappings are both 1" NPT. Connect to headers with 1" pipe for Ultra-80 and Ultra-105; 1 1/4" pipe for Ultra-155 and Ultra-230. For wall-hung boilers, water piping and gas pipe can be routed through bottom of enclosure using wall-mounting kit.
2. Boiler circulator is shipped loose. Mount boiler circulator in connecting piping as shown in this manual. Boiler is shipped with 1" and 1 1/4" circulator flanges.
3. Relief valve is shipped loose. See Boiler Manual pages 14 and 15 for mounting details. Relief valve mounts on 3/4" street elbow connected to 1" x 1" x 3/4" tee on boiler supply pipe, as shown in manual.

Placement and mounting information

Placement, general

1. Locate multiple boilers in boiler room according to:
 - Figure 3 (side-to-side), or
 - Figure 4 (back-to-back).
 For wall mounting, see below.
2. Provide indicated clearances around boilers for access and servicing. If recommended dimensions are not possible, refer to Ultra Boiler Manual for minimum clearances. Also follow local codes.
3. Construct boiler foundation if boiler room floor is uneven or if there is a danger of flooding. Size foundation to allow for clearance and spacing dimensions shown in either Figure 3 or Figure 4.
4. Chalkline boiler locations on foundation or boiler room floor.
5. Uncrate, assemble and mount boilers according to Ultra Boiler Manual.
6. Provide clearance for installation of venting, air piping, gas piping, expansion tank, primary circulator and other accessories.

Figure 3 Side-to-side installation of multiple Ultra-80/-105/-155/-230 boilers

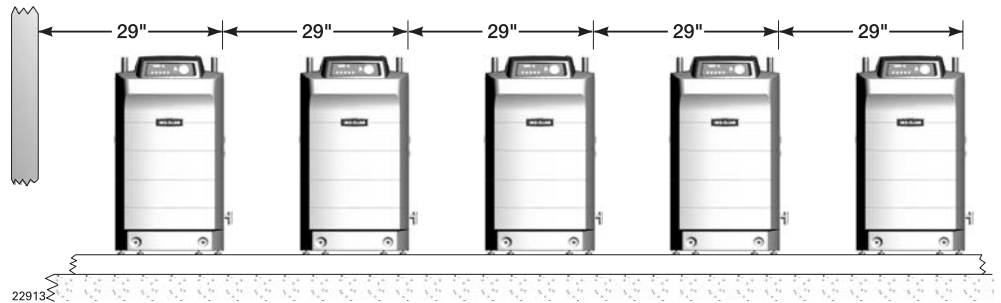
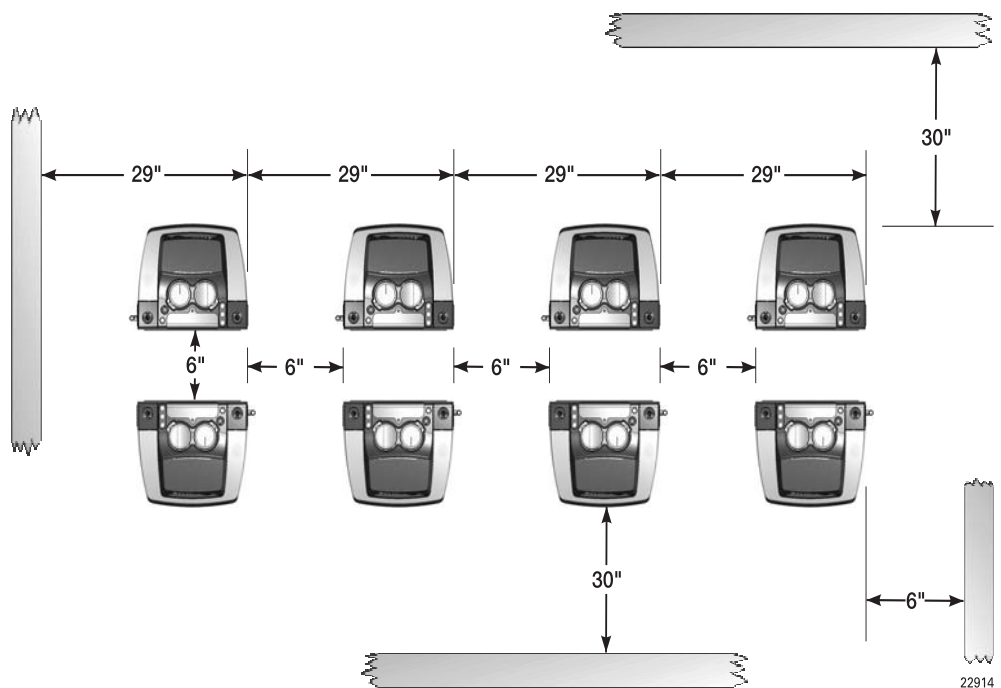


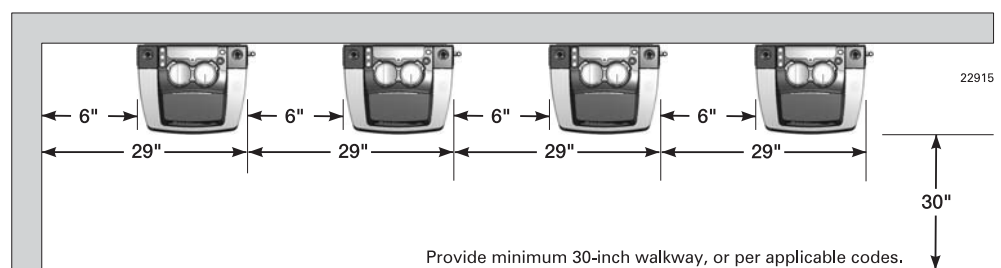
Figure 4 Back-to-back installation of multiple Ultra-80/-105/-155/-230 boilers



Wall mounting

1. Ultra boilers may be wall mounted, following the instructions in the Ultra Boiler Manual and the Wall Mounting Supplement.
2. When wall mounting boilers, provide approximately 6 inches between boilers for easy removal of boiler jacket door. See Figure 5.
3. Follow all applicable codes regarding piping, electrical connections and clearances.
4. When wall mounting boilers, verify the wall construction is suitable for the structural load.

Figure 5 Wall mounting multiple Ultra-80/-105/-155/-230 boilers



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Easy-Fit® Piping

Easy-Fit® Piping installation

1. Main header and Easy-Fit® Manifold pipe sizing.
 - a. New system:
Refer to Figure 1 on pages 4 and 5 for recommendations.
 - b. Replacing boilers in an existing system:
Without reducing size, connect system supply and return lines. Install tees or crosses for Easy-Fit® Manifolds as shown in Figure 6 or 7. Size manifolds to handle total connected boiler output as shown.
2. Provide connections in main header for Easy-Fit® Manifolds as close as possible to the midpoint of multiple boilers.
 - a. Use tees for four or less boilers, as in Figure 6.
 - b. Use either tees (Figure 6) or crosses (Figure 7) for five or more boilers.
3. Manifold placement:
 - a. To alternate spacing for supply and return lines to boilers, reverse the short-end and long-end of the Manifolds as shown in Figures 6 and 7.
 - b. Return Manifold must be on the return side of the main and Supply Manifold must be on the supply side of the main. Drawings in this manual show flow in system main from right to left. For system flowing left to right, reverse the locations of the Manifolds accordingly.
4. Connect from Easy-Fit® Manifold branches to boiler supply and return connections using 1¼" nominal copper tubing or steel pipe (maximum run 15').
5. Provide a flow/check valve in the supply piping of each boiler as shown in piping diagrams in this manual. Install an isolation valve on the supply and return of each boiler as shown. Some local codes may require the use of individual level controls and limits on each boiler when isolation valves are installed.
6. Install main system air eliminator and primary circulator in supply piping as shown in piping diagrams. Place expansion tank on suction side of system circulator as shown.
7. Install condensate drain line piping according to Ultra Boiler Manual. Condensate drain piping may be connected into a manifold before connection to a floor drain.
8. Install system accessories as shown in drawings.
9. For some applications, it may be necessary to install a heat exchanger as shown in Figure 11, page 12, to isolate the boilers from the system. See notes on page 12 for typical applications.
10. Piping recommendation drawings:
 - a. Figures 6 and 7 show details of Easy-Fit® Manifolds.
 - b. Figure 8 is a schematic piping drawing showing the locations of typical boiler piping and system piping, including limits and other devices often required by local codes.
 - c. Figures 9 and 10 are three-dimensional piping drawings of typical multiple boiler installation.
 - d. Figure 11 shows recommended piping when an isolating heat exchanger is needed.
11. If desired, other primary/secondary piping arrangements can be used.

Figure 6 Single-sided connection —
Maximum connected boiler output:
2-inch manifolds — 450 MBH
3-inch manifolds — 1400 MBH
4-inch manifolds — 2900 MBH

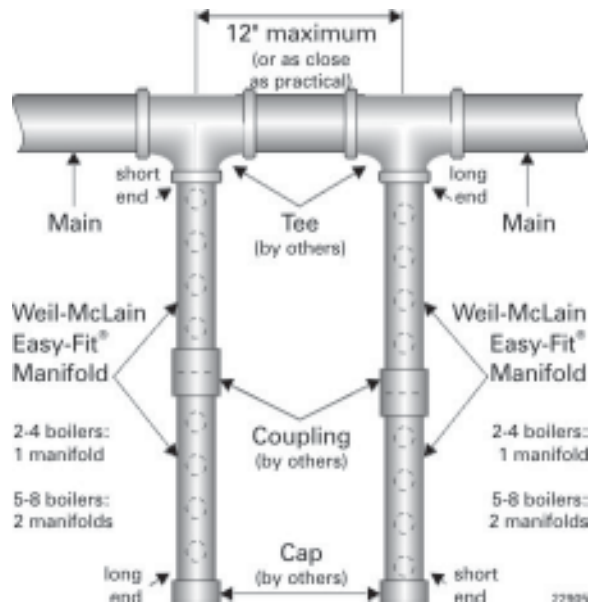
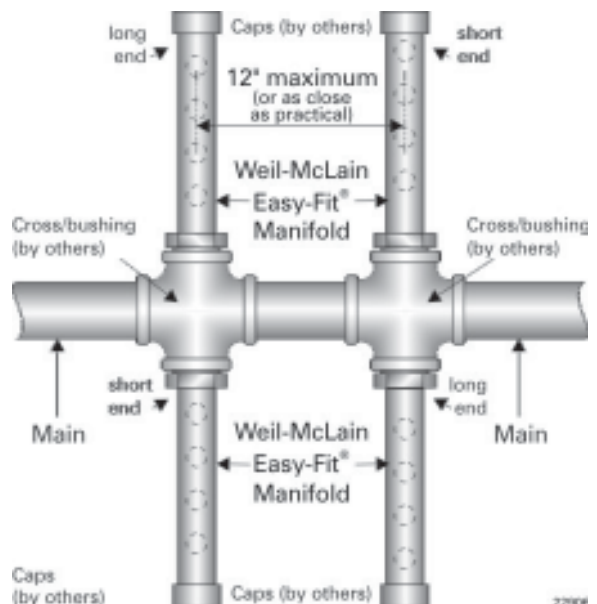


Figure 7 Double-sided connection —
Maximum boiler output (each side):
2-inch manifolds — 450 MBH
3-inch manifolds — 1400 MBH
4-inch manifolds — 2900 MBH



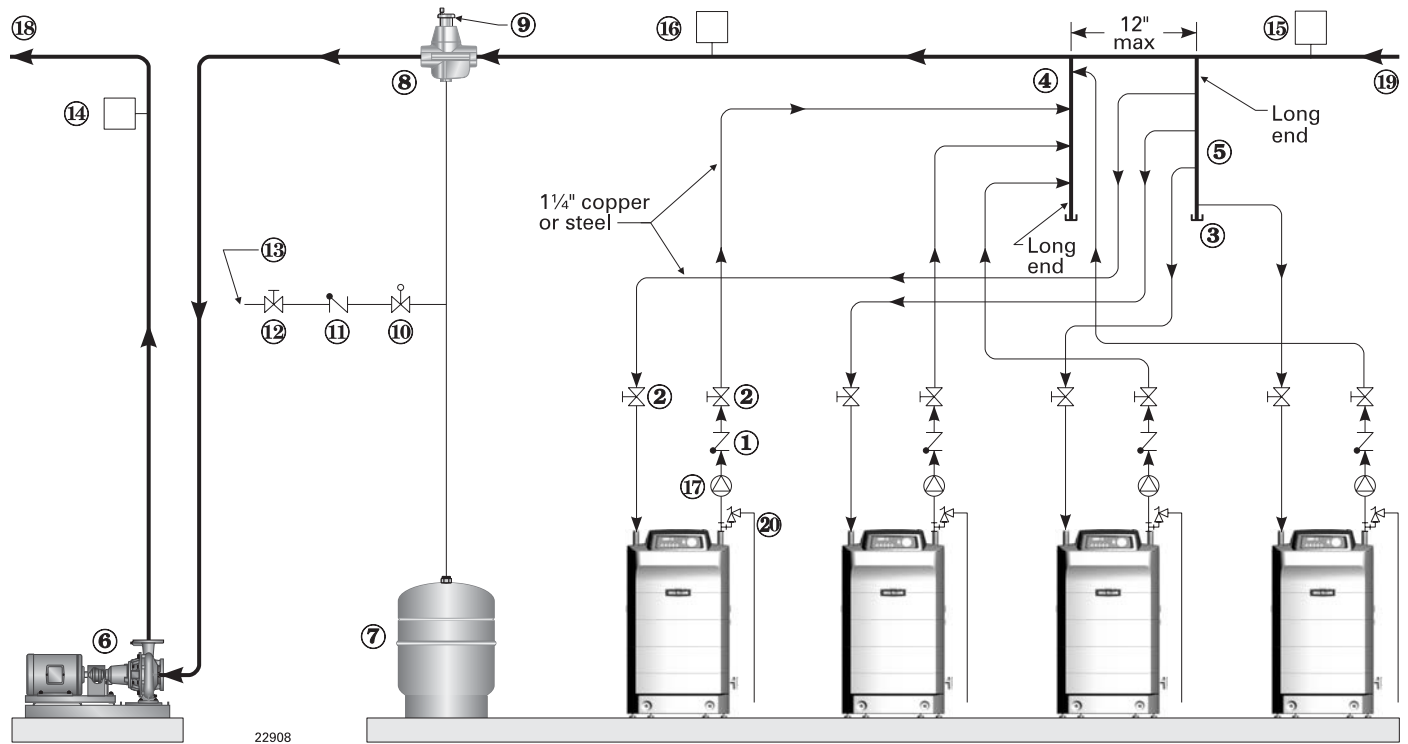
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Figure 8 Piping schematic — Typical piping for multiple Ultra boilers, using Weil-McLain Easy-Fit® Manifolds



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- | | | |
|--|--|--|
| <ul style="list-style-type: none"> 1 Flow/check valve (each boiler) 2 Isolation valves (when used) 3 Cap 4 Easy-Fit® Manifold (supply), sized per Fig. 6 or Fig. 7, page 8 5 Easy-Fit® Manifold (return), sized per Fig. 6 or Fig. 7, page 8 6 Primary circulator 7 Expansion tank (diaphragm type) | <ul style="list-style-type: none"> 8 System air eliminator 9 System automatic air vent 10 Pressure reducing valve 11 Check valve or backflow preventer, as required by applicable codes 12 Isolation valve 13 Cold water supply 14 Supply water temperature control (when used) | <ul style="list-style-type: none"> 15 Low water cutoff (when used) (place above primary header) 16 Water flow switch (when used) 17 Boiler circulator (each boiler) 18 System supply 19 System return 20 Boiler relief valve and discharge piping, installed per Ultra Boiler Manual |
|--|--|--|

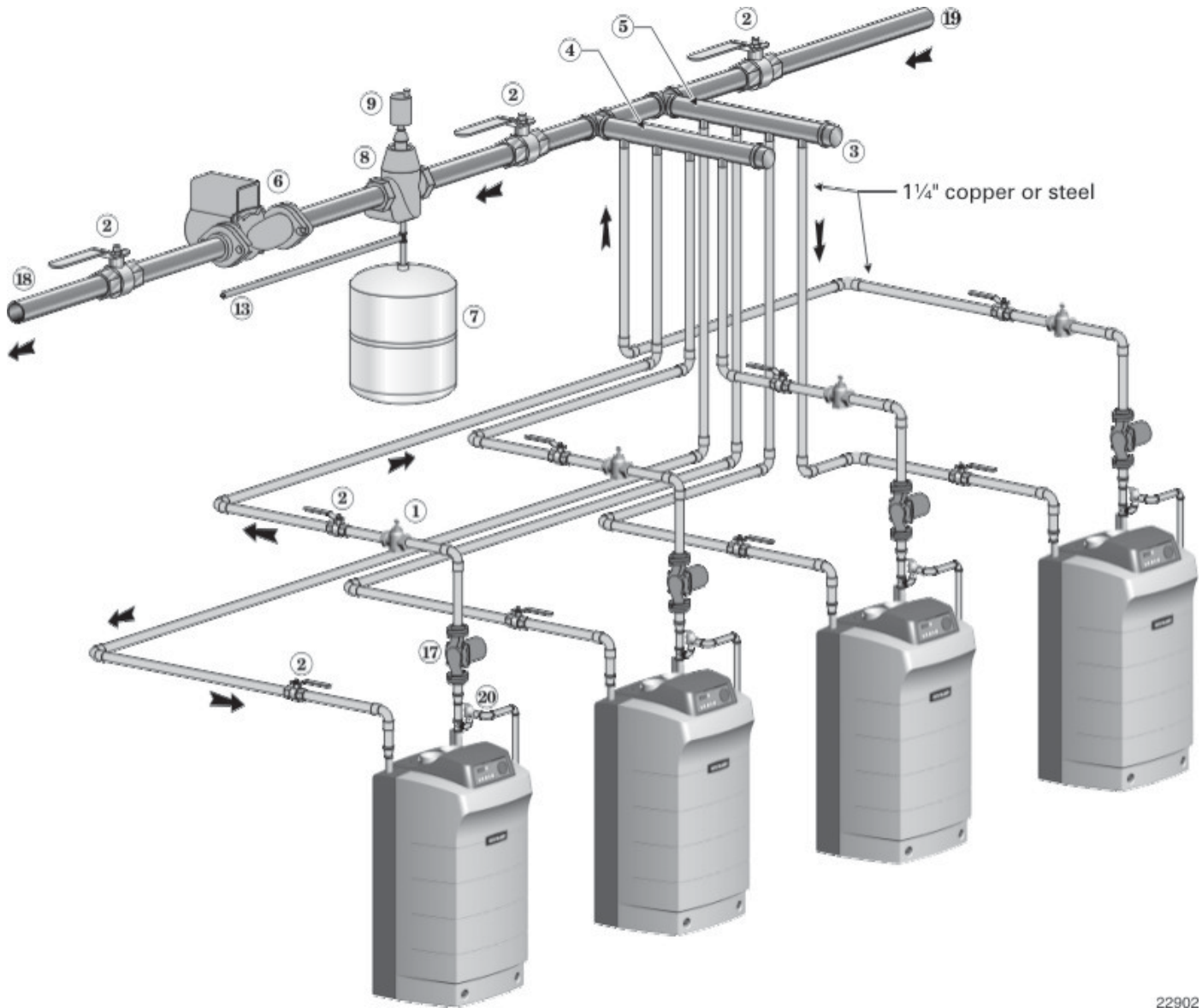
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NOTICE This manual provides general guidelines for piping and installation. Your installation must comply with all applicable local codes.

NOTICE When using isolation valves on each boiler, some codes may require providing a low water control and additional limit for each boiler. If desired, consult the codes to determine if exclusion of the individual boiler isolation valves may allow the use of a single water level control and additional limit for the entire multiple boiler system.

Easy-Fit® Piping (continued)

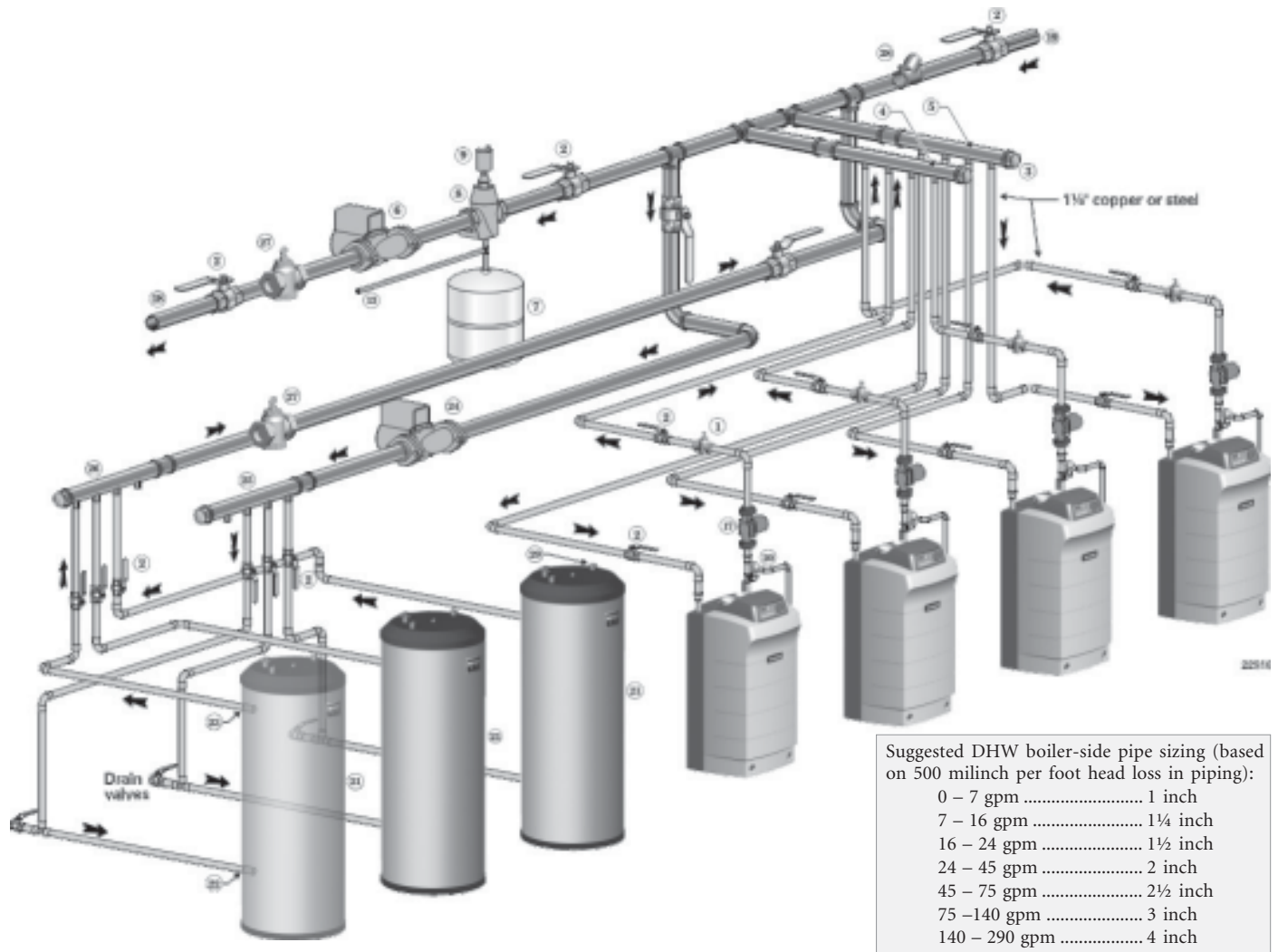
Figure 9 Typical piping for multiple Ultra boilers, using Weil-McLain Easy-Fit® Manifolds



- | | | |
|--|------------------------------------|---|
| 1 Flow/check valve (each boiler) | 6 Primary circulator | 18 System supply |
| 2 Isolation valves (when used) | 7 Expansion tank (diaphragm type) | 19 System return |
| 3 Caps | 8 System air eliminator | 20 Boiler relief valve and discharge piping,
installed per Ultra Boiler Manual |
| 4 Easy-Fit® Manifold (supply), sized per Fig. 6
or Fig. 7, page 8 | 9 System automatic air vent | |
| 5 Easy-Fit® Manifold (return), sized per Fig. 6
or Fig. 7, page 8 | 13 Cold water supply | |
| | 17 Boiler circulator (each boiler) | |

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Figure 10 Typical piping for multiple Ultra boilers, Weil-McLain Easy-Fit® Manifolds, and indirect water heaters

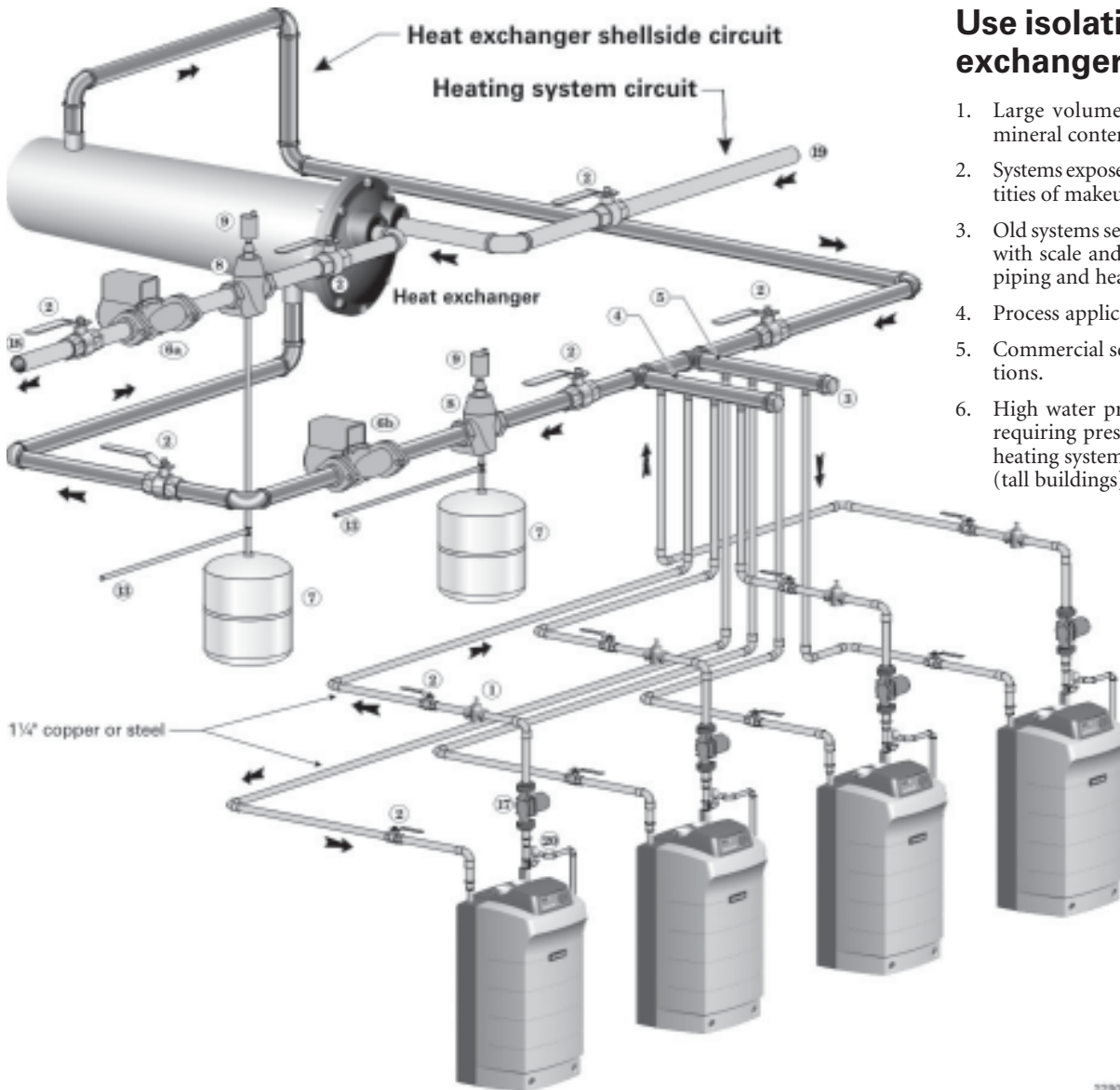


- | | | |
|--|---|---|
| <p>1 Flow/check valve (each boiler)</p> <p>2 Isolation valves (when used)</p> <p>3 Caps</p> <p>4 Easy-Fit® Manifold (supply), sized per Fig. 1 or Fig. 2, page 6</p> <p>5 Easy-Fit® Manifold (return), sized per Fig. 1 or Fig. 2, page 6</p> <p>6 Primary circulator</p> <p>7 Expansion tank (diaphragm type)</p> <p>8 System air eliminator</p> <p>9 System automatic air vent</p> <p>13 Cold water supply</p> | <p>17 Boiler circulator (each boiler)</p> <p>18 System supply</p> <p>19 System return</p> <p>20 Boiler relief valve and discharge piping, installed per Ultra Boiler Manual</p> <p>21 Indirect-fired storage water heaters (Weil-McLain PLUS Line shown) — Example is shown with reverse-return boiler-side piping using a single circulator. Alternate: each water heater could have its own circulator.</p> <p>22 Boiler water inlet</p> <p>23 Boiler water outlet</p> <p>24 DHW boiler-side circulator</p> | <p>25 DHW boiler-side supply Easy-Fit® Manifold</p> <p>26 DHW boiler-side return Easy-Fit® Manifold</p> <p>27 Flow/check valves (to prevent induced or gravity flow in heating system or DHW piping)</p> <p>28 Check valve to prevent heat migration in heating system</p> <p>29 See water heater manual for DHW piping — The DHW piping must also be manifolded together since the boiler-side piping is manifolded. If DHW heaters supply separate DHW circuits, provide an individual circulator for each water heater, and control each circulator by its water heater's aquastat.</p> |
|--|---|---|

NOTICE This piping is suggested only. The layout above should be controlled with a boiler sequencing panel that provides DHW operation as well. Wire the heating system circulator to operate only on call for heat. Alternatively, use the boiler sequencing panel to provide domestic priority by disabling the heating system circulator any time there is a DHW call for heat. The boiler circulators, item 17, must operate on any call for heat, whether heating system or DHW. Offset the DHW boiler-side supply and return manifolds as shown so the total run of pipe and fittings to each of the water heaters is approximately equal.

Easy-Fit® Piping (continued)

Figure 11 Typical piping for multiple Ultra boilers, using Weil-McLain Easy-Fit® Manifolds and heat exchanger



Use isolation heat exchanger for:

1. Large volume systems with high mineral content in water.
2. Systems exposed to untreated quantities of makeup water.
3. Old systems severely contaminated with scale and rust buildup inside piping and heat distribution units.
4. Process applications.
5. Commercial service water applications.
6. High water pressure applications, requiring pressure relief setting in heating system more than 30 PSIG (tall buildings). See notes below.

- 1** Flow/check valve (each boiler)
- 2** Isolation valves (when used)
- 3** Cap
- 4** Easy-Fit® Manifold (supply), sized per Fig. 6 or Fig. 7, page 8
- 5** Easy-Fit® Manifold (return), sized per Fig. 6 or Fig. 7, page 8
- 6a** Heating system circulator (exchanger tubeside)
- 6b** Heat exchanger shellside circulator
- 7** Expansion tanks (diaphragm type)
- 8** System air eliminator
- 9** System automatic air vent
- 13** Cold water supply connections
- 17** Boiler circulator (each boiler)
- 18** Heating system supply
- 19** Heating system return
- 20** Boiler relief valve and discharge piping, installed per Ultra Boiler Manual

Notes:

1. Contact heat exchanger manufacturer for heat exchanger shellside and tubeside piping and circulator requirements. Tubeside

flow and temperatures must meet heating system requirements.

2. Contact heat exchanger manufacturer for sizing heat exchanger.
3. Heat exchanger shellside circuit requires its own expansion tank as shown.
4. Heating system circuit requires its own expansion tank, as shown, plus its own relief valve set to protect heating system and heat exchanger piping and components.
5. When individual isolation valves are used, individual boiler and level controls may be required.

Combustion air & vent piping installation

Vent piping

1. Each boiler requires an individual vent pipe, installed and terminated per the Ultra Boiler Manual and Ultra Boiler Venting Supplements.
2. The vent pipes of multiple boilers must terminate on the same side of the building as their air inlet piping, and per all requirements of the Ultra Boiler Manual and Vent Supplements.

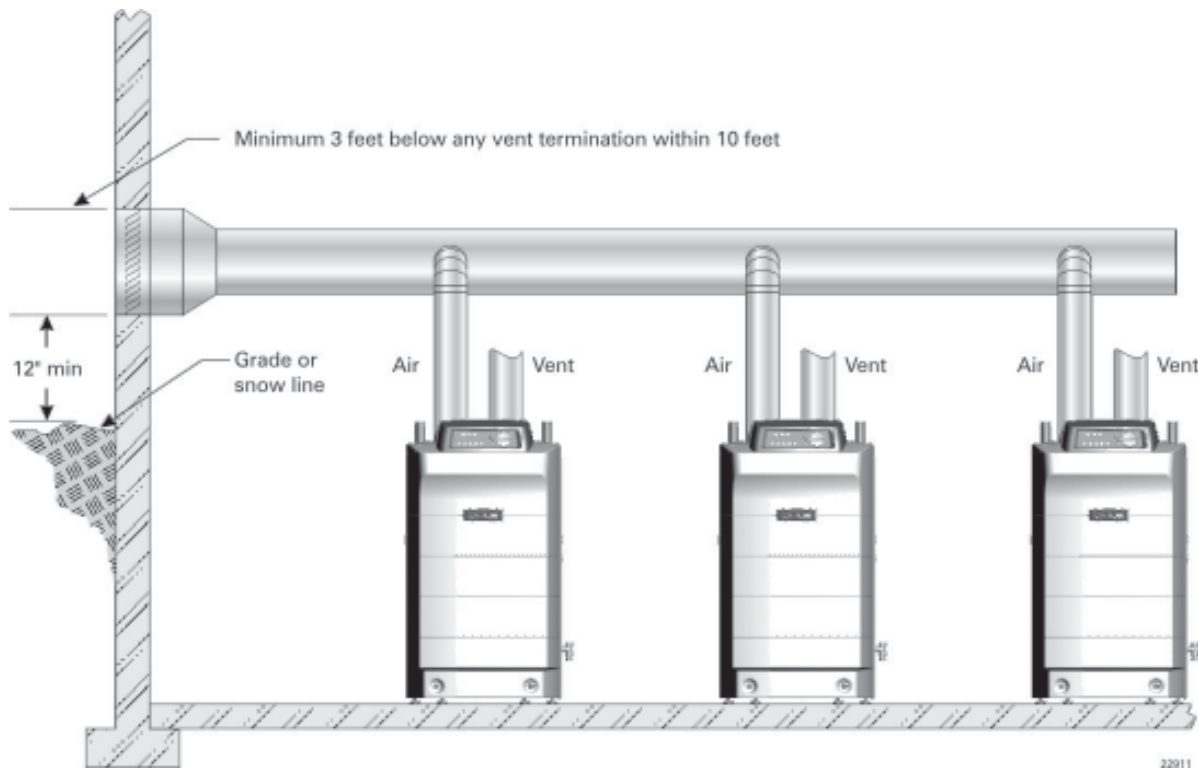
Combustion air piping

1. Provide combustion air piping to each boiler, following all requirements for installation and termination per the Ultra Boiler Manual and Ultra Boiler Venting Supplements.
2. Combustion air piping can be supplied from a common combustion air manifold, installed and terminated as shown in Figure 12, below.

Combustion air manifolds

1. When combustion air supplied from a common air manifold pipe as in Figure 12, size the common air duct and louver free area from the minimum free area given in Figure 1, pages 4 and 5.
2. All joints must be sealed.
3. The air inlet must be located:
 - at least 3 feet below any vent located within 10 feet.
 - the louver bottom must be 12 inches above grade or above the snow line.
4. Compensate for louver blockage when calculating free air openings. Refer to manufacturer's instructions for size. If unknown use:
 - a. Wood louvers — 20-25% free area.
 - b. Metal louvers or grilles — 60-75% free area.
5. Lock open louvers or interlock with boiler controls to open automatically with boiler operation.

Figure 12 Manifolding combustion air piping



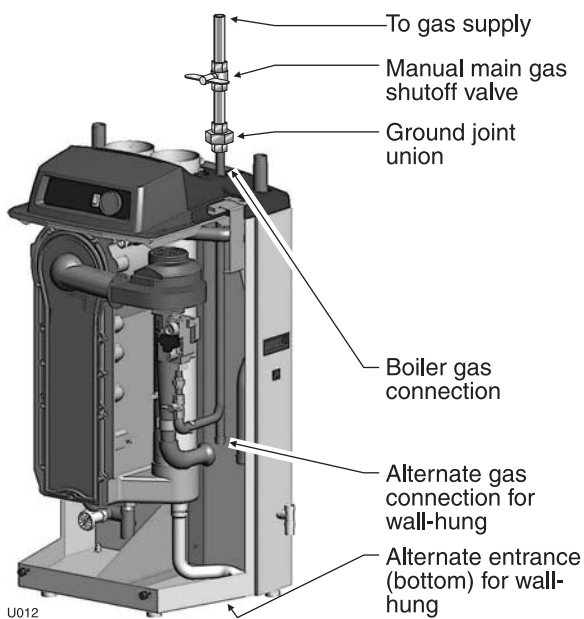
Gas piping

Connecting gas supply piping

1. Remove jacket front panel and refer to Figure 13 to pipe gas to boiler.
 - a. Install ground joint union for servicing, when required.
 - b. Install manual shutoff valve in gas supply piping outside boiler jacket when required by local codes or utility requirements.
 - c. In Canada — When using manual main shutoff valve, it must be identified by the installer.
2. Wall-mounted boilers
 - a. Refer to separate Ultra Boiler Wall-mounting instructions.
 - b. Gas connection may enter from the bottom of boiler as explained in the Wall-mounting instructions.
3. Support piping with hangers, not by boiler or its accessories.
4. Purge all air from gas supply piping.
5. Before placing boiler in operation, check boiler and its gas connection for leaks.
 - a. Close manual main shutoff valve during any pressure testing at less than 13" w.c.
 - b. Disconnect boiler and gas valve from gas supply piping during any pressure testing greater than 13" w.c.

WARNING Do not check for gas leaks with an open flame — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.

Figure 13 Connecting gas supply piping



6. Use pipe dope compatible with propane gases. Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

WARNING Failure to apply pipe dope as detailed above can result in severe personal injury, death or substantial property damage.

WARNING DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

WARNING Ultra boilers are shipped ready to fire natural gas ONLY. You must install the propane orifice if the boiler will be connected to propane. Failure to comply could result in severe personal injury, death or substantial property damage.

WARNING Use two wrenches when tightening gas piping at boiler, using one wrench to prevent the boiler gas line connection from turning. Failure to support the boiler gas connection pipe to prevent it from turning could damage components.

Common gas piping installation

1. Construct gas header for multiple boilers using Figure 14 and the sizing tables below. Refer to the National Fuel Gas Code for other conditions.
2. Provide manual shutoff gas valve and ground joint union as shown in Figures 13 and 14 for each boiler. When gas line enters from top of the boiler, the boiler internal gas piping provides a drip leg. See boiler manual for details.
3. A 3/4" NPT gas piping riser from header to boiler will be large enough for most jobs. Check pressure drop.
4. Size gas piping from meter outlet to entrance of gas header in accordance with Tables 1 and 2 below. For gases with other specific gravity or for different pressure drop or other pipe sizes, refer to the National Fuel Gas Code or applicable local codes.
Pipe lengths in Table 1 are equivalent length of straight pipe. Convert pipe fittings to equivalent lengths using data from Table 2.
5. Refer to page 14 of this manual and to the Ultra Boiler Manual for testing gas piping.

Figure 14 Common gas piping, with manifolded gas header

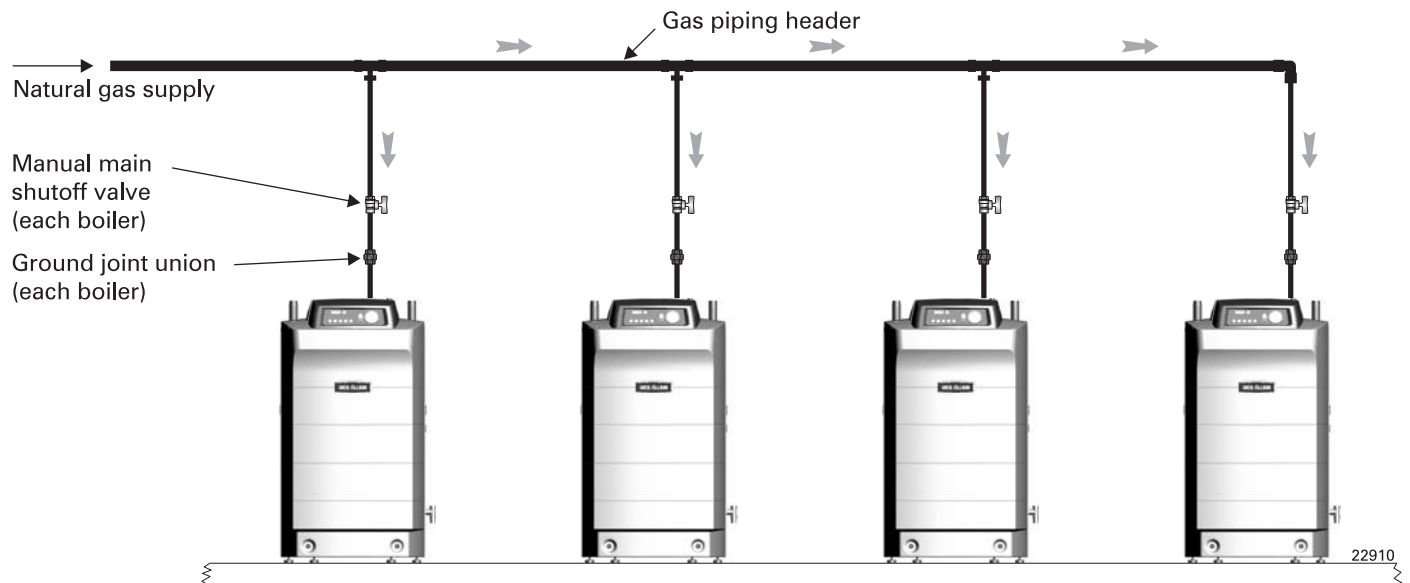


Table 1 Capacity of gas piping for gas at 0.60 specific gravity at a pressure drop of 0.30 inches w.c.

Gas pipe length, feet	Capacity (cubic feet per hour, 0.60 specific gravity)				
	1"	1¼"	1½"	2"	2½"
10	520	1050	1600	3050	4800
20	350	730	1100	2100	3300
30	285	590	890	1650	2700
40	245	500	760	1450	2300
50	215	440	670	1270	2000
75	175	360	545	1020	1650
100	150	305	460	870	1400
150	120	250	380	710	1130

Table 2 Equivalent lengths of straight pipe for typical gas line fittings

Pipe size inches	Equivalent length, feet	
	90° Elbow	Tee
1	2.62	5.24
1¼	3.45	6.90
1½	4.02	8.04
2	5.17	10.3
2½	6.16	12.3

Additional instructions

Air for boiler room ventilation

1. Follow instructions in Ultra Boiler Manual to ensure the boiler room provides sufficient air infiltration.

Wiring

1. Refer to boiler sequencing control instructions and Ultra Boiler Manual for wiring requirements.

Water treatment

WARNING

Multiple boilers used with large water volume systems will require water softening and conditioning. Consult a local water treatment company prior to installation for analysis and recommendations.

Initial fill water may contain enough minerals to produce damaging deposits. Additional untreated makeup water will increase scale buildup.

Contamination may also come from scale and rust buildup inside the piping and heat distribution units of an older boiler system replaced with small multiple boiler units. The result can lead to loss of efficiency and component failure.

1. Follow proper start-up procedure for flushing any contaminants from the entire system before initial fill.
2. Hot water systems should not require makeup water after initial fill. Use manual feed water systems or install a water meter to detect leaks.
3. Repair leaks — constant fill water will cause problems.
4. Refer to Ultra Boiler Manual for more information.