

Smith

CAST IRON BOILERS

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS



**STEAM OR WATER HEATING
PRESSURIZED FOR FIRING OIL, GAS
OR COMBINATION GAS/OIL**



**DESIGNED AND TESTED ACCORDING TO THE A.S.M.E. BOILER AND PRESSURE VESSEL CODE, SECTION IV FOR MAXIMUM ALLOWABLE WORKING PRESSURE.
STEAM - 15 PSIG, WATER - 80 PSIG**

TO INSTALLER

NOTE: READ THESE INSTRUCTIONS CAREFULLY. THEY WILL SAVE YOU VALUABLE TIME WHEN ASSEMBLING THE BOILER.

CAUTION: Do not use automotive anti-freeze in boiler waterways. If necessary to use anti-freeze, be sure to employ a preparation designed for hydronic heating systems such as ethylene or propylene glycol.

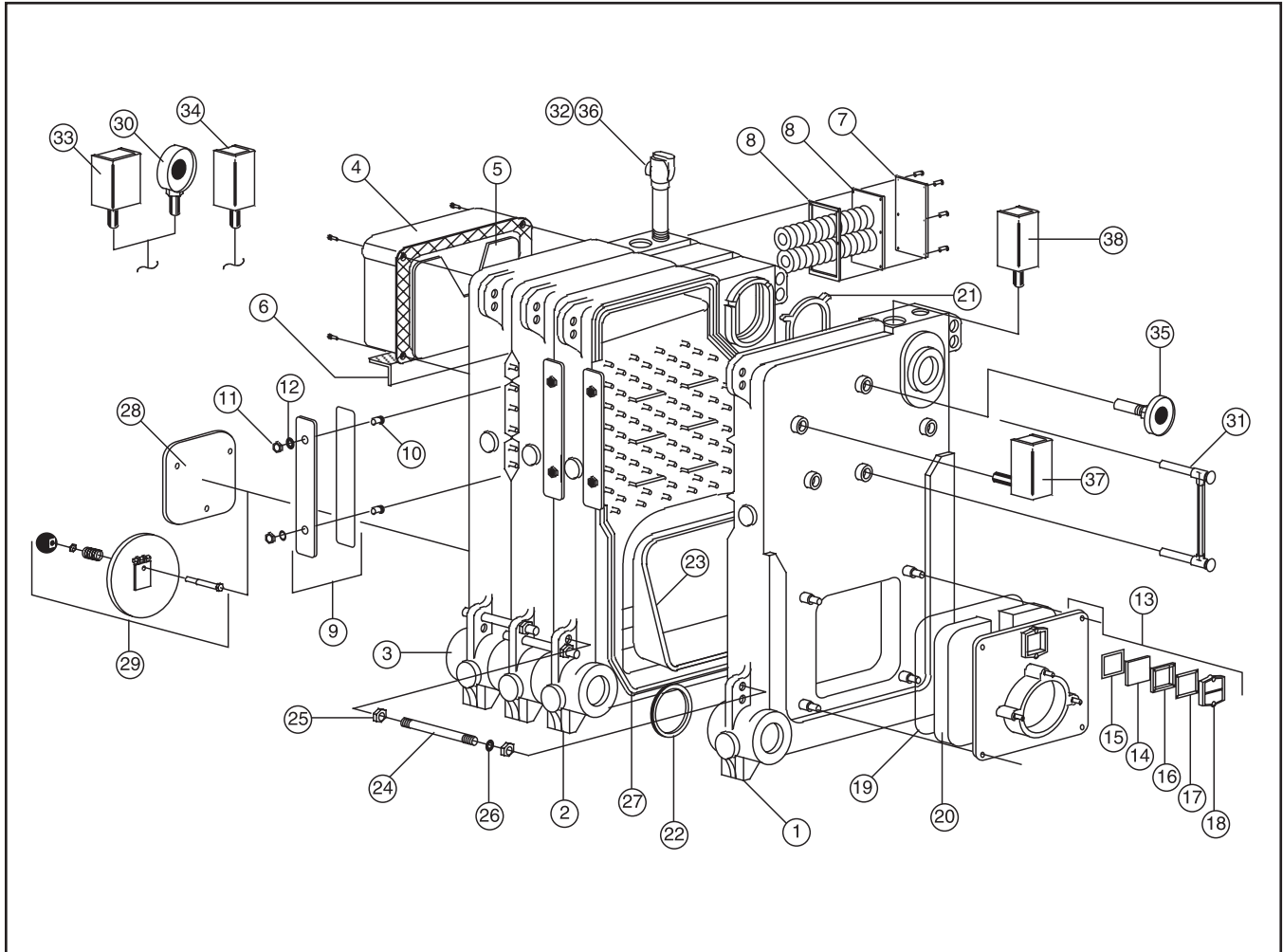
Water treatment is not recommended. This boiler uses gaskets to seal the ports of adjoining sections. These gaskets are made of a fluorocarbon elastomer (designation FKM) marketed under the brand name Viton. Consult a water treatment professional before adding any chemical to the boiler water. Any water treatment or anti-freeze added to the system must be compatible with the Viton gaskets.

THE SECTIONS OF THIS BOILER MUST BE ASSEMBLED TO THE PROPER TORQUE. READ INSTRUCTIONS

INSTALLER, THESE INSTRUCTIONS TO BE AFFIXED ADJACENT TO THE BOILER.
CONSUMER, RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE PURPOSES.

FOR JACKET ASSEMBLY AND BURNER SET UP SEE SEPARATE INSTRUCTIONS.

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS



SERIES 19HE REPLACEMENT PARTS

Ref #	Name of Part	Part No.
1	Front Section	3638
2	Plain Leg Section	3637
	Heater Leg Section	3641
3	Back Section	3639
<i>Smokehood Assembly includes: Smokehood, Slide Damper, Angle Bracket, and Hardware</i>		
4	7 in. Smokehood Assy. (3-5 Sect. for 19) (3-4 for 19A)	70338
	8 in. Smokehood Assy. (6 Sect. for 19) (5-6 Sect. for 19A)	70339
	9 in. Smokehood Assy. (7 Sect. 19 & 19A)	70340

Ref #	Name of Part	Part No.
	10 in. Smokehood Assy. (8-12 Sect. 19 & 19A)	70341
4A	Smokehood Tape	74300
5	Slide Damper Only	69370
6	Angle Bracket Only	69150
7	Tankless Cover Plate Assy (includes Studs, Nuts & Gasket)	70343
—	Tankless Cover Plate Stud	60104
—	Tankless Cover Plate Nut	60874
8	Tankless Cover Plate Gasket	60312
8A	Tankless Coil w/Gasket and Hardware	50634

19HE

SERIES 19HE REPLACEMENT PARTS

Ref #	Name of Part	Part No.
<i>Cleanout Cover Assembly includes: Cleanout Plate, Insulation, Rope and Hardware</i>		
9	Clean Out Cover Plate Assy	70590
—	Rope Seal (45 in.)	76538
—	Silicone Sealant 10.3oz	61924
10/11/12	C/O Cover Hardware Kit	21-1502
<i>Burner Mounting Plate Assembly includes: Mounting Plate with Observation Glass and Cover</i>		
13	Burner Mounting Plate Assy 6-1/8 in. Opening	70465
	Burner Mounting Plate Assy 7-3/4 in. Opening	70466
	Burner Mounting Plate Assy 9-1/8 in. Opening	70491
—	Burner Mounting Plate H'ware	71316
14	Observation Glass Only	60326
15	Observation Glass Gasket	60317
16	Observation Glass Gasket	60318
17	Observation Glass Holder	60314
—	Screws, Observation Glass	61757
18	Observation Cover Plate	3420
19	Rope Seal 1/4 in. x 4.75 ft.	78105
20	Burner Insulating Block	60434
	Burner Insulating Block (3-6 Sect. – Beckett)	60430
—	Burner Insulating Block H'ware	71268
21	Upper Port Gasket (Viton) 1 per Section	60339
22	Lower Port Gasket (Viton) 1 per Section	60340
23	Target Wall (3-6 Sect. only)	69761

Ref #	Name of Part	Part No.
24	5/8 in. x 9 in. Draw Rod	60101
25	5/8 in. Hex Nut	60877
26	5/8 in. Washer	62099
—	Flue Brush	60090
27	3/8 in. Rope (10 ft. 4 in. per sect.)	78100
—	Spray Adhesive	70492
28	Rear Observation Port Cover (3-6 Section)	3679
29	Rear Observation Port Assy (7-12 Section)	70614
—	Rear Observation Port H'ware	71301
Steam Trim and Controls		
30	3-1/2 in. Steam Gauge	60269
31	Gauge Glass 5/8 in. x 9-7/8 in.	61862
32	1 in. Steam Relief Valve (3-5 Sect. on 19 & 19A)	61982
	1-1/4 in. Steam Relief Valve (6-10 Sect. on 19) (6-8 Sect. on 19A)	61983
	1-1/2 in. Steam Relief Valve (11-12 Sect. on 19) (9-12 Sect. on 19A)	61984
33	PA404A Operating Control	50493
34	L4079B Limit Control	50495
Water Trim and Controls		
35	3-1/2 in. Theraltimeter	60290
36	3/4 in. Relief Valve (3-10 Sect. on 19) (3-8 Sect. on 19A)	61997
	1 in. Relief Valve (11-12 Sect. on 19) (9-11 Sect. on 19A)	61998
	1-1/4 in. Relief Valve (19A-12)	61999
37	L4006A Operating Control	50511
38	L4006E Limit Control	14-1001

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GENERAL INFORMATION

Series 19HE boilers are wet-base, extended surface, vertical flue design with integral cast flue gas collector for pressurized firing with oil, gas or combination power burners. Upper and lower port hydronic seals are of a special material resistant to petroleum products and compatible with ethylene and propylene based anti-freeze (non automotive type) which does not contain corrosion inhibitors to protect aluminum. The flue gas joints between sections, etc. are sealed using high temperature (2300°F) ceramic fiber rope. Access to the heating surface for cleaning is provided from the left hand side of the boiler through large cast iron cover plates. A slide damper is provided in the flue gas outlet for back pressure adjustment.

The boilers are supplied completely knocked down for field assembly, as factory assembled blocks of sections or completely packaged boiler-burner units. All items should be inspected for damage upon receipt, and any damage reported to the wholesaler and trucker. All components should be stored in a clean, dry area.

The boilers are conservatively rated for high efficiency performance with capability for down-firing to match connected load. The large OBROUND upper port provides transfer area above the water surface for dry steaming at full load.

BOILER LOCATION

The boiler must be installed on a smooth, level, non-combustible floor or pad as close to the chimney or vent location as possible to minimize breeching length. Allow clearance around the boiler for piping, service, maintenance, cleaning and tankless coil removal. Approximately 30 inches on the sides is a minimum (Check local code requirements). Do not install electrical conductors in floor or pad under boilers.

See Figure 1 for boiler floor pad requirements, and Table 1 for minimum required pad length.

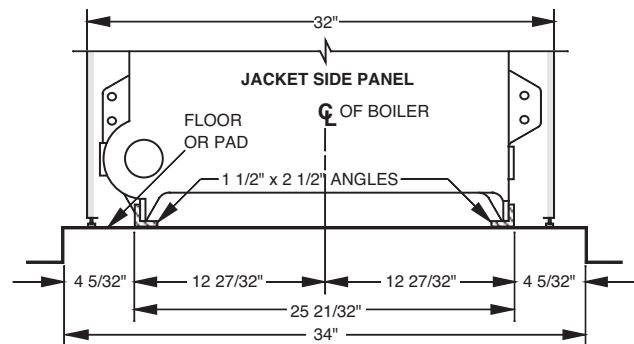
Table 1

Boiler No.	Min. Recommended Pad Length
19HE-3	30"
19HE-4	36"
19HE-5	42"
19HE-6	48"
19HE-7	54"
19HE-8	60"
19HE-9	66"
19HE-10	72"
19HE-11	78"
19HE-12	84"

CODES AND REGULATIONS

All work in connection with the boiler, burner and controls must be performed in strict accordance with requirements of state and local authorities having jurisdiction over boiler installations.

Figure 1



In the absence of such local requirements, the following should govern:

- A.S.M.E. Section IV - "Heating Boilers"
- A.S.M.E. Section VI - "Care and Operation of Boilers"
- ANSI/NFPA 31 - "Installation of Oil Burning Equipment"
- ANSI/Z223.1 - "National Fuel Gas Code"
- ANSI/NFPA 70 - "National Electrical Code"

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

COMBUSTION AND VENTILATION AIR

WARNING: This boiler must be supplied with combustion and ventilation air in accordance with the latest revision of Section 9.3, Air for Combustion & Ventilation, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 for gas boilers or ANSI/NFPA 31 Installation of Oil Burning Equipment for oil boilers. Canadian installations must comply with CAN/CSA B149.1 Natural Gas and Propane Installation Code for gas boilers or CSA B140.7 Oil Burning Equipment for oil boilers. All applicable local building codes must be adhered to. Failure to provide adequate combustion air for this boiler can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

To operate properly and safely this boiler requires a continuous supply of air for combustion. An adequate supply of air must be available to replace the air used by the combustion process. NEVER store objects on or around the boiler.

CAUTION: Never use an exhaust fan in the boiler room. The boiler room must never be under a negative pressure or improper burner operation will occur!

NOTE: If mechanical combustion air supply is required, the system must be approved by the local authorities, and should provide at least 30 CFM per gallon of oil and .35 CFM/1,000 BTU HR (.034 m³/min per kw) of gas input to the boilers.

All Air From Inside The Building

If the boiler is to be located in a confined space minimum clearances of **24 in., 610 mm** must be maintained between the boiler and any adjacent construction. When installed in a confined space, two permanent openings communicating with an additional room(s) are required. The combined volume of these spaces must have sufficient volume to meet the criteria for an unconfined space. The total air requirements of all fuel burning equipment or any type of exhaust fan must be considered when making this determination.

Each opening must have a minimum free area of **1 in²/1000 Btu/hr, 140 in²/GPH, 2200 mm²/kW** based on the total input rating of ALL fuel burning equipment in the confined area. Each opening must be no less than **100 in², 64,516 mm²** in size. The upper opening must be within **12 in., 305 mm** of, but not less than **3 in., 76 mm** from, the top of the enclosure.

The bottom opening must be within **12 in., 305 mm** of, but not less than **3 in., 76 mm** from, the bottom of the enclosure.

All Air From Outside The Building

When installed in a confined space **two** permanent openings communicating directly with, or by ducts to, the outdoors or spaces that freely communicate with the outdoors must be present. The upper opening must be within **12 in., 305 mm** of, but not less than **3 in., 76 mm** from, the top of the enclosure. The bottom opening must be within **12 in., 305 mm** of, but not less than **3 in., 76 mm** from, the bottom of the enclosure.

Where directly communicating with the outdoors or communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of **1 in²/4000 Btu/hr, 35 in²/GPH, 550 mm²/kW** of the total input rating of all of the equipment in the enclosure.

Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of **1 in²/2000 Btu/hr, 70 in²/GPH, 1100 mm²/kW** of the total input rating of all of the equipment in the enclosure. When ducts are used, they must have the same cross-sectional area as the free area of the opening to which they connect. When calculating the free area necessary to meet the make-up air requirements of the enclosure, consideration must be given to the blockage effects of louvers, grills and screens. Screens must have a minimum mesh size of **1/4 in, 6.4mm**. If the free area through a louver or grill is not known the louver or grille should be sized per Table 1.

Table 1 - Make-up Air Louver Sizing
Required Cross Sectional Louver Area (in²)

Input (MBH)	1/4", 6.4 mm Wire Screen		Metal Louvers 75% Free Area		Wooden Louvers 25% Free Area	
	in ²	cm ²	in ²	cm ²	in ²	cm ²
400	100	645	133	860	400	2581
600	150	968	200	1289	600	3871
800	200	1290	266	1720	800	5162
1000	250	1613	333	2148	1000	6452
1200	300	1936	400	2578	1200	7742
1400	350	2258	467	3007	1400	9033
1600	400	2581	533	3437	1600	10,323
1800	450	2903	600	3866	1800	11,614
2000	500	3226	666	4296	2000	12,904

Ventilation air, if required, must be in addition to the combustion air quantities called for above.

CHIMNEY & VENT PIPE CONNECTIONS

WARNING: The vent installation must be in accordance with the latest revision of Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 for gas boilers or ANSI/NFPA 31 Installation of Oil Burning Equipment for oil boilers and the ASHRAE Equipment Handbook on Venting. Canadian installations must comply with CAN/CSA B149.1 Natural Gas and Propane Installation Code for gas boilers or CSA B140.7 Oil Burning Equipment for oil boilers. All applicable local building codes must be adhered to. Improper venting of this boiler can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

CAUTION: The products of combustion from a 19HE must be safely vented to the outdoors while ensuring that the flue gases do not cool prematurely. It's critical that the chimney system be properly designed to handle the relatively cool flue gas temperatures. An oversized or uninsulated chimney will cause the moisture in the flue gases to condense resulting in damage to the chimney system unless it's specifically designed for condensate. If this is the case a suitable condensate drain must be used to protect the boiler from condensate.

NOTE: Our warranty does not cover corrosion damage to the boiler or its vent system caused by flue gas condensate!

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

Chimney Inspection & Sizing

If this boiler will be connected to a masonry chimney, a thorough inspection of the chimney must be performed. Ensure that the chimney is clean, properly constructed, lined and properly sized, see Figure 2. Table 2 lists the equivalent breeching and flue sizes required for the 19HE boilers.

Table 2 - Equivalent Breeching & Chimney Size

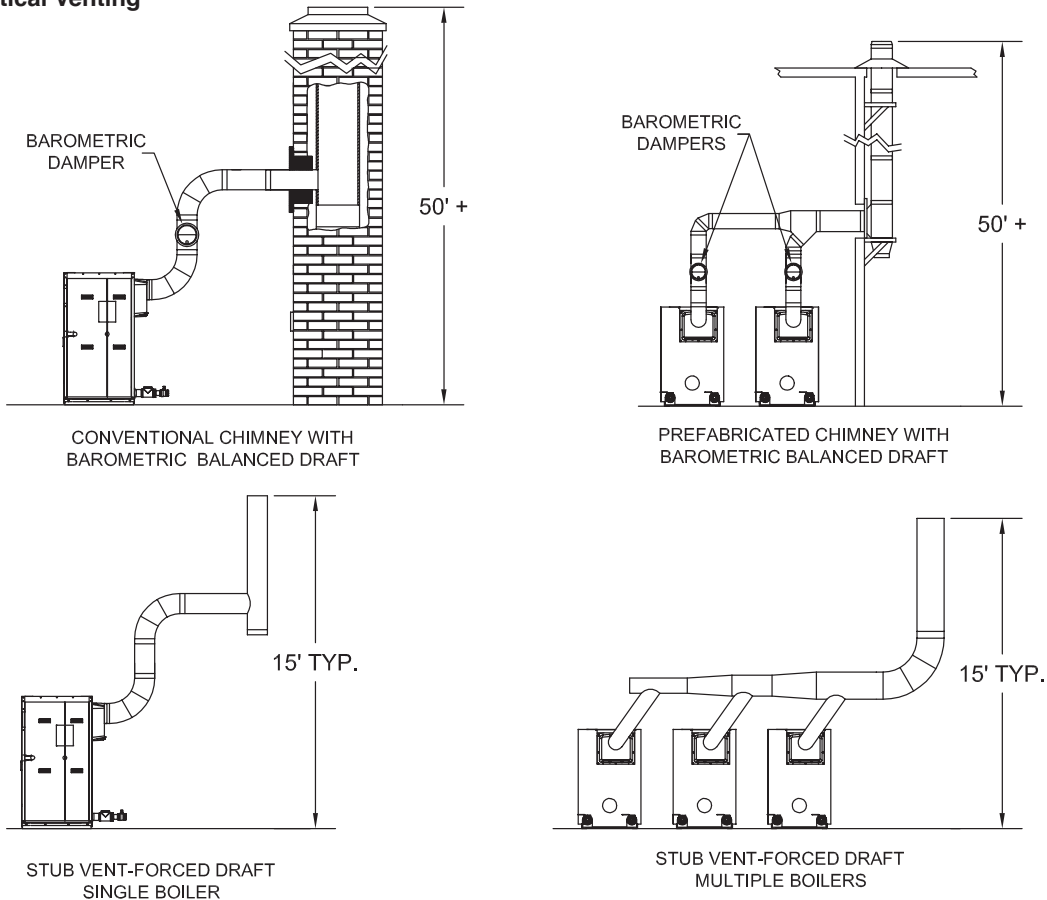
Boiler Size	Breeching Size		Chimney Size	
	in	mm	in	mm
19HE-3	7	178	7	178
19HE-4	7	178	7	178
19HE-5	8	203	8	203
19HE-6	8	203	8	203
19HE-7	9	229	9	229
19HE-8	10	254	10	254
19HE-9	10	254	10	254
19HE-10	10	254	10	254
19HE-11	12	305	12	305
19HE-12	12	305	12	305

Note: These sizes are based on a 20 foot chimney height.

The 19HE Series is designed for pressurized operation with a maximum back pressure of 0.10 in., 2.54 mm WC before the smoke hood slide damper. If the vent configuration results in a maximum back pressure greater than this, the burner capacity may have to be reduced. Contact the Smith Technical Service Department to verify the burner capacity.

The chimney must be able to provide 0.10 in. WC at the boiler outlet. If the chimney is 50 ft. or taller it may produce excessive draft (approx. - 0.25 in. WC) and a barometric draft regulator may be needed.

Figure 2- Vertical Venting



When more than one piece of combustion equipment is connected to the same chimney flue, the flue must be large enough to safely vent the combined output of all the equipment.

WARNING: If an appliance using any type of a mechanical draft system operating under positive pressure is connected to a chimney flue, never connect a Category I appliance to this flue. Doing so can result in the accumulation of carbon monoxide which can cause severe personal injury or death!

The breeching connection between boiler and chimney should be as direct as possible with the minimum number of elbows or bends. It should pitch upwards to the chimney at a rate of 1/4 inch per foot of horizontal run. Generally, the breeching and chimney should be the same diameter as the boiler outlet connection.

NOTE: 11 and 12 section uses adapter collar for connection to 12 in. diameter vent system. Transition collar provided by Smith.

For fuel conservation and stable burner performance, the vent connection from the boiler should not include a barometric draft control or other opening unless the venting system can develop an excessive draft, or is required by code.

Typically stack heights less than 50 ft will not require the use of a barometric damper.

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

VENT CONNECTIONS

WARNING: Never modify or alter any part of the boiler's smoke hood. This includes the removal or alteration of any baffles. Never install a vent pipe of a diameter smaller than that of the boiler smoke hood outlet. Failure to comply with this warning can result in severe personal injury or death.

Locate the boiler as close to the chimney as possible. Use the shortest, straightest vent connector possible for the installation. If horizontal runs exceed **5 ft., 1.5 m** they must be supported at **3 ft., 0.9 m** intervals with overhead hangers. Use a single wall stainless or single wall galvanized steel vent pipe the same diameter as the flue collar to connect the boiler to a masonry chimney. When using an approved metal chimney system use the appropriate vent connector. The vent connector should be sloped up toward the chimney at a minimum rate of **1/4 in/ft, 2 cm/m**. On masonry chimneys the connector must terminate flush with the inside of the chimney flue. Fasten each single wall vent connection with at least 3 corrosion resistant sheet metal screws.

The vent materials used in positive pressure vent systems must be certified to UL 1738 for installations in the United States, ULS636 for installations in Canada. The following manufactures have systems that meet these requirements:

Heat-Fab, Inc.
38 Hayward Street
Greenfield, MA 01301, (800) 772-0739.

Z-Flex U.S., Inc.
20 Commerce Park
North, Bedford, NH 03110-6911, (800) 654-5600.

Protech Systems Inc.
26 Gansevoort Street
Albany, NY 12202 (518) 463-7284

WARNING: Breeching under positive pressure must be certified to UL 1738 for installations in the United States, ULS636 for installations in Canada. Type B1 vent SHALL NOT be used. Failure to comply with this warning can result in severe personal injury or death.

Always provide a minimum clearance of 6 in., 152 mm between single wall metal vent pipe and all combustible materials.

WARNING: Failure to maintain minimum clearances between vent connectors and any combustible material can result in a fire causing extensive property damage, severe personal injury or death!

COMMON VENT SYSTEMS

If an existing boiler is removed from a common venting system, the common venting system may then be too large for the proper venting of the remaining appliances connected to it. At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

Au moment du retrait d'une chaudière existante, les mesures suivantes doivent être prises pour chaque appareil toujours raccordé au système d'évacuation commun et qui fonctionne alors que d'autres appareils toujours raccordés au système d'évacuation ne fonctionnent pas: système d'évacuation

- a) Seal any unused openings in the common venting system. Sceller toutes les ouvertures non utilisées du système d'évacuation.
- b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

Inspecter de façon visuelle le système d'évacuation pour déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.

- c) Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhaust, so they will operate at maximum speed. Do not operate a summer exhaust fan for a boiler installation. Close fireplace dampers.

Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace où les appareils toujours raccordés du système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sècheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.

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- d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously. Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Régler le thermostat de façon que l'appareil fonctionne de façon continue.
- e) Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.

Faire fonctionner le brûleur principal pendant 5 min ensuite, déterminer si le coupetirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allumette ou d'une chandelle ou la fumée d'une cigarette, d'un cigare ou d'une pipe.

- f) After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.

Une fois qu'il a été déterminé, selon la méthode indiquée cidessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.

- g) Any improper operation of the venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 or ANSI/NFPA 31 Installation of Oil Burning Equipment for oil burners. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix F in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and or CSA B149 Installation Codes.

Tout mauvais fonctionnement du système d'évacuation commun devrait être corrigé de façon que l'installation soit conforme au National Fuel Gas Code, ANSI Z223.1/ NFPA 54 et (ou) aux codes d'installation CAN/CGA-B149 or ANSI/NFPA 31 Installation of Oil Burning Equipment for oil burners. Si la grosseur d'une section du système d'évacuation doit être modifiée, le système devrait être modifié pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du National Fuel Gas Code, ANSI Z223.1/NFPA 54 et (ou) des codes d'installation CSA-B149.

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

ASSEMBLY OF SECTIONS

When boilers are delivered to the job site, each item should be inspected closely for possible shipping damage. Scars or nicks in the port sealing surfaces may allow leakage. **Do not attempt to use any section that has been damaged in the port seal area.**

When ready to commence assembly, recommended on a level pad, place the angle rails in position parallel with each other with the 2 in. legs on the floor and measuring 25-21/32 inches outside dimension. Be sure to align the center of the boiler with the center line of the pad. If no pad is provided, shim and grout under the angles to make them level and provide support along the full length. (See Figure 1) Clean hydronic gasket recesses and rope groove with a wire brush, taking care not to damage machine surface.

See Table 2 for proper location of sections.

Table 2 - Section Locations

3 SECT	F	H	B															
4 SECT	F	P	H	B														
5 SECT	F	H	P	H	B													
6 SECT	F	P	H	P	H	B												
7 SECT	F	H	P	H	P	H	B											
8 SECT	F	P	H	P	H	P	H	B										
9 SECT	F	P	H	P	H	P	H	P	B									
10 SECT	F	P	P	H	P	H	P	H	P	B								
11 SECT	F	P	P	P	H	P	H	P	H	P	B							
12 SECT	F	P	P	P	P	H	P	H	P	H	P	B						

F = Front Section

P = Plain intermediate section

H = Heater intermediate section-Optional, must be ordered.
If not required change to P.

B = Back Section

CAUTION: Due to the fact that the sections are top heavy, it is absolutely necessary that the back section be supported in such a manner as to prevent its falling and causing potential serious bodily injury while preparing to add the next section. One such way would be to insert a piece of 3 in. x 36 in. piping in the lower port.

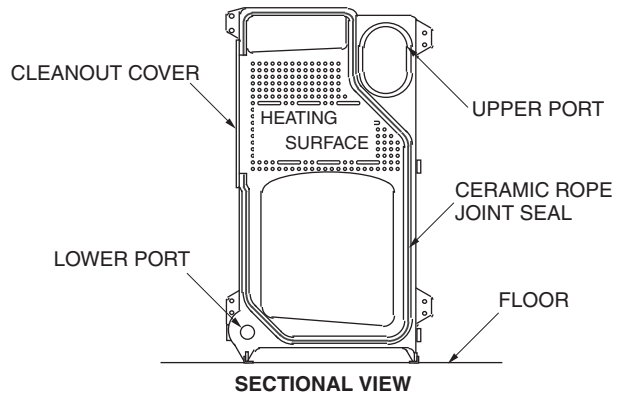
NOTE: Some sections may need shims under support feet to align with other sections.

Stand the back section in place with the feet on and in the angle iron rails. Support the section as required to prevent it from falling forward or rearward. Clean hydronic gasket recesses and rope groove with a stiff wire brush. Apply spray-on adhesive (supplied with the boiler) to rope groove to hold wicking in place during assembly.

CAUTION: Do not spray adhesive into the hydronic seal ports.

Apply a length of wicking avoiding bends and twists. Be sure ends extend past the cleanout cover opening. (See Figure 2) Place the upper and lower hydronic seals in the recessed section taking care not to dislodge the rope or the hydronic seals. Inspect the alignment of the sections through the open ports and, if properly aligned, install the draw rods with nuts drawn hand-tight. (See Figure 3) Plumb the sections before applying torque to the upper right and lower left draw rods. Maintain finger-tight torque on upper left and lower right draw rods.

Figure 2



IMPORTANT

The upper and lower ports should be drawn up metal to metal around the outside of the hydronic seal. Metal to metal conditions will not occur at any other location. Avoid excessive torque on upper left and lower right draw rods, which may warp the section. See Figure 3 for correct alignment of the seal.

Assemble additional sections as described above.

After draw rods are hand tight, torque as shown in Table 3.

Use anti-seize on draw rod and washer, **coating thread and washer on one end only**. Torque the draw rods from the end with anti-seize and washer. Follow the steps as described below. Do not completely tighten one side; gradually work each side using an alternating pattern until the correct torque is reached.

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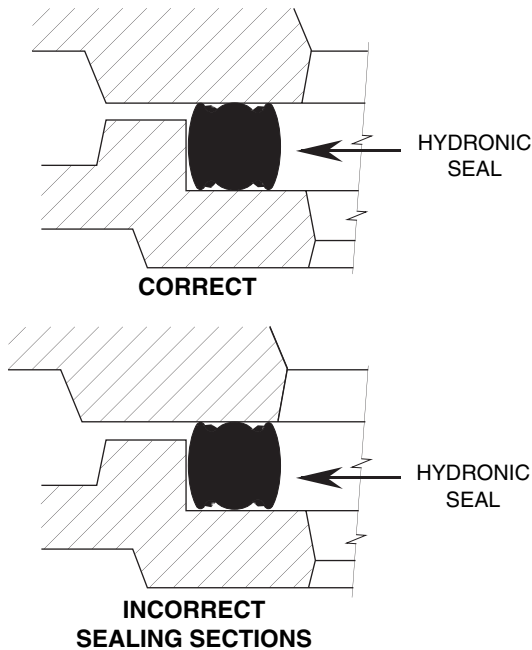
Table 3

STEP 1	UPPER RIGHT	5 FT. LBS.
STEP 2	LOWER LEFT	5 FT. LBS.
STEP 3	UPPER LEFT	5 FT. LBS.
STEP 4	LOWER RIGHT	5 FT. LBS.
STEP 5	UPPER RIGHT	25 FT. LBS.
STEP 6	LOWER LEFT	25 FT. LBS.
STEP 7	UPPER RIGHT	50 FT. LBS.
STEP 8	LOWER LEFT	50 FT. LBS.
STEP 9	UPPER LEFT	10 FT. LBS.
STEP 10	LOWER RIGHT	10 FT. LBS.

Prepare additional intermediate sections and install in the same manner described above. Be sure each section is properly sealed against water leakage and flue gas exfiltration. Be certain the angle rails remain level and provide support for each section as it is assembled. Check each section for vertical position.

When all sections, including the front section or back are in place, check all draw rods to insure iron-to-iron contact at ports. **DO NOT APPLY EXCESSIVE TORQUE.** See Table 3 for recommended torques.

Figure 3



HYDROSTATIC TEST

Plug tappings, fill boiler with water and vent air from top of boiler. Check for leaks. Leakage at seals may be due to misalignment of hydronic seals. Loosen draw rods, reposition seals and retest as above.

All completed boilers shall satisfactorily pass the hydrostatic tests as prescribed by A.S.M.E., Code Section IV.

1. Steam Boilers – The assembled boiler shall be subjected to a hydrostatic test of not less than 45 PSIG.

2. Water Boilers – The assembled boiler shall be subjected to a hydrostatic test pressure not less than 1-1/2 times the maximum allowable working pressure (81.5 PSIG).

3. The required test shall not exceed the test pressure by more than 10 PSI.

Excessive torque on draw rods may damage castings. Do not exceed the torque shown in Table 3.

In a cold environment, hydronic seals may not quickly conform to sealing surfaces when properly compressed. Under such conditions, hydrostatic testing with cold water might show weeping or leaking at the seals. To avoid this possibility, delay filling the boiler with cold water for a few hours after assembly, or use warm water, if available, for the tests.

If there is seepage about chaplets or minor leakage, consult the Smith Company representative for advice regarding A.S.M.E. Code approved repairs by peening or plugging.

STEAM PIPING

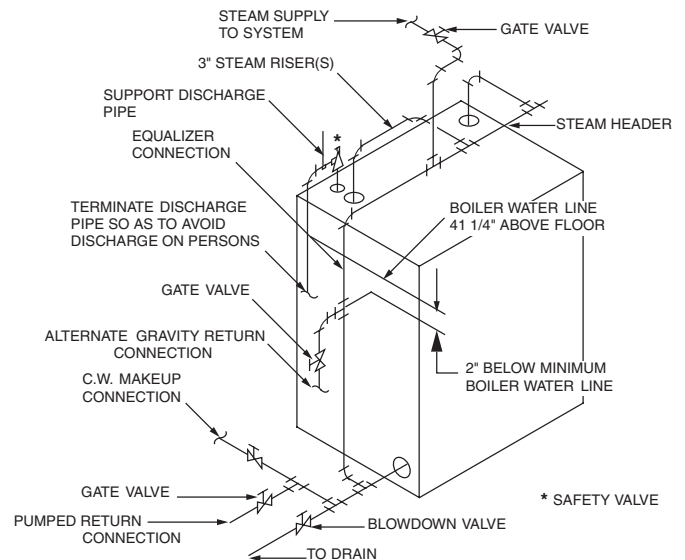
A steam piping schedule is shown in Table 4. Pitch piping to allow condensate to flow in the same direction as steam. Makeup water connections must be made to the return piping, not directly to the boiler. Install blow-down valves as required.

See Figure 4 for recommended acceptable steam piping arrangement.

Table 4

BOILER SIZE	NO. OF 3" RISERS	HEADER	EQUALIZER
3 THRU 5 SECTION	1	3"	1-1/2"
6 THRU 10 SECTION	2	4"	2"
11 AND 12 SECTION	2	5"	2-1/2"

Figure 4 - Typical Steam Piping Diagram



SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

Table 5

NUMBER OF SECTIONS	EVAPOR. RATE GPM	WATER 1" BELOW WATER LEVEL GAL.	MIN. FEED WATER PUMP RATE-GPM	CONDENSATE RECEIVER CAP.-GAL.
3	.61	1.4	1.22	12
4	.85	1.9	1.70	16
5	1.19	2.4	2.37	22
6	1.52	2.9	3.04	29
7	1.86	3.3	3.71	35
8	2.19	3.8	4.38	41
9	2.53	4.3	5.05	47
10	2.86	4.8	5.72	54
11	3.20	5.2	6.39	60
12	3.53	5.7	7.06	66

Feed water makeup requirements.

NOTE: These recommendations are considered normal for compact buildings on the basis of 80% receiver use. Where buildings are spread out, additional receiver capacity may be necessary because of the extended time required for condensation to return to the receiver.

WATER PIPING

See Figure 5 for acceptable water piping diagram. Table 6 gives pumping rate and supply & return sizing for standard installations.

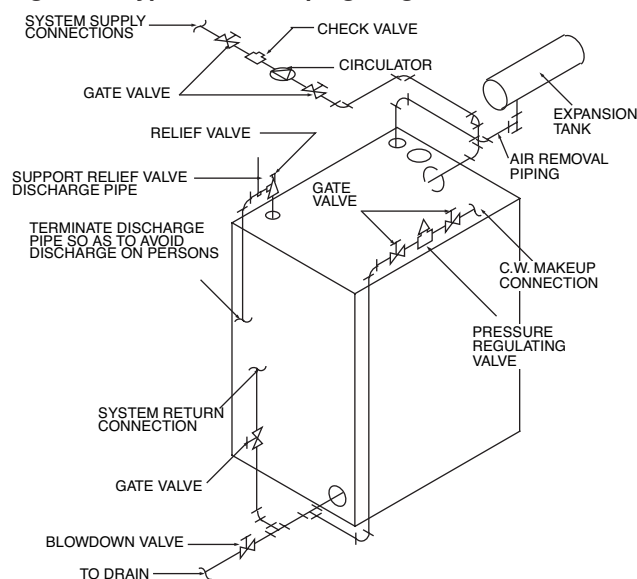
Table 6

BOILER SIZE	GPM	RETURN CONN.	SUPPLY CONN.
3	30	2"	2"
4	41	2"	2"
5	58	2-1/2"	2-1/2"
6	74	3"	3"
7	90	3"	3"
8	106	3"	3"
9	123	3"	3"
10	139	3"	3"
11	155	3"	4"
12	171	3"	4"

Based on 20°F system temperature drop.

NOTE: Boiler supplied with 4 in. water supply tapping and 3 in. return tapping.

Figure 5 - Typical Water Piping Diagram



TANKLESS HEATERS

Heater openings are provided for below-the-water-line tankless heater coils in all special intermediate sections when ordered. See Table 2 for the correct placement of these heater sections. Install the low limit temperature control in the 3/4 in. tap located in the center of the coil.

If the heater sections are installed in an order other than in Table 2 the jacket panels will not match.

See Figure 6 and Figure 7 for recommended SM9-18 single and/or dual piping arrangements.

SMOKE HOOD

Install smoke hood with the correct size smoke pipe connecting collar using the 5/16 in. x 1-1/2 in. studs and hex nuts in the back section. Apply self-adhesive insulating tape to smoke hood flange and damper angle. Fasten the slide damper in the open position for starting the burner adjustment process.

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

Figure 6 - Tankless Piping

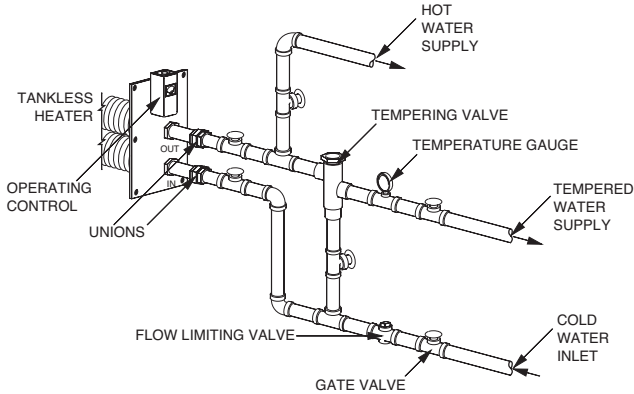
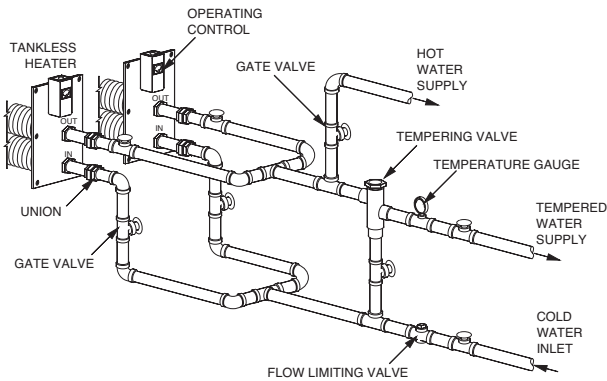


Figure 7 - Dual Tankless Piping



BURNER MOUNTING PLATE & TARGET WALL

The **target wall** used on 3-6 section boilers must be positioned with the flat side tight against the **rear casting** and with the bottom side resting on the **floor** of the combustion chamber. No glues or fasteners are used to secure the target wall.

Each boiler is provided with a cast iron burner mounting plate with an appropriate burner opening and tapped holes for studs to accommodate burner flange. The mounting plate is furnished with 1/4 in. diameter sealing rope and an insulation block which should be installed on the plate before placing the plate on the boiler. (See Figure 8)

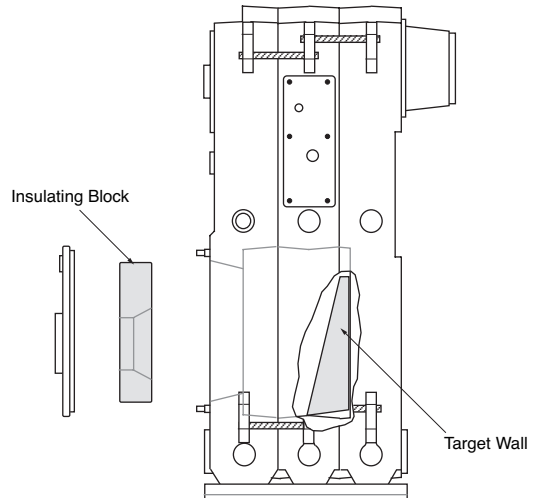
The sealing rope should be placed in the groove on the boiler side of the plate using adhesive to hold it in place. The insulation block has a burner opening and a cutout for the observation opening. Locate the block with the high temperature facing on the fire side in the opening in the front section. The burner mounting plate **insulating block** for Beckett burners is installed with the dished side facing **towards** the combustion chamber.

Attach the block to the plate with the four 1/4 in. x 5 in. machine screws and 1-1/2 in. O.D. washers, the washers on the insulation block side. At the time of burner installation, the hole in the insulation block may have to be enlarged.

NOTE: Tighten burner mounting plate screws evenly to slightly compress rope gasket. Overtightening will cause plate cracking at corners.

NOTE: Most large burners require support to the floor. See burner manufacturer's manual for such specifications if needed.

Figure 8



SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

CLEANOUT COVERS

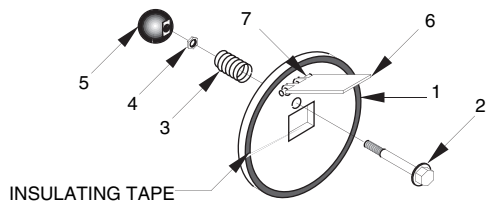
Be sure the rope seals are in place around the groove in the cleanout cover plate. Install the plates on the boiler sections carefully to insure proper sealing all around, using the special anchor bolt and hex head nuts. After periodic flue cleaning, replace nuts at 10 lbs. torque. Use Hi-Temp silicone caulk to seal covers air-tight.

REAR OBSERVATION PORTS 7-12 SECTIONS

INSTRUCTIONS FOR ASSEMBLY:

1. Locate steel "flapper door" (Item 6) as shown in Figure 9 below. Drive Item 7, "expansion pin", into hole in Item 1 to secure 6 in position.
2. Lift Item 6 up and install Item 2, "hex bolt".
3. Slide Item 3, "compression spring" over the hex bolt and screw Item 4 "hex nut" to hex bolt.
4. Screw Item 5, "ball knob" into position and lock location using Item 4 as a "jam" nut.
5. Adhere 24-1/2 in. insulating tape as shown to the inside of cast iron rear plate (Item 1).
Mount assembly to back section of boiler.
7. 3-6 section boilers use a solid cover which is installed the same way.

Figure 9



IMPORTANT: Item 6 must always be part of the assembly. Check condition twice a year and replace as needed.

CONTROL LOCATIONS

NOTE: Jacket front panel should be in place before controls on front of front section are installed.

Refer to Figure 11 showing locations recommended for steam and water boiler limit and operating controls. Note the requirement for an operating temperature control whenever a tank-less heater is called for. This is in addition to pressure limit controls and other operating controls on steam boilers.

NOTE: On steam boilers the 1 in. close nipple and 1 in. x 1/4 in. reducing coupling for operating control should be installed prior to jacket top panels.

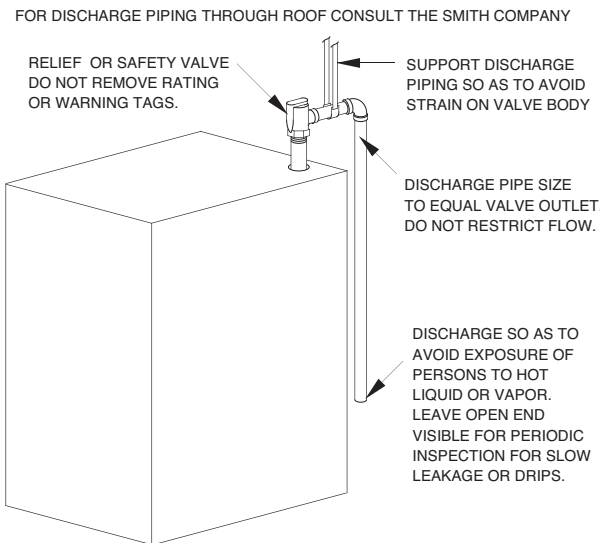
JACKET

Jacket assembly details are contained in a separate instruction booklet.

SAFETY AND RELIEF VALVES

Safety and relief valves sized on the output rating of each boiler size are furnished along with the necessary pipe and fittings for installation in the back section. The valve discharge connections should be piped to a location where people will not be exposed to hot vapor or liquid. Any discharge piping should be supported so as to prevent exerting any strain on the valve body by the weight of the piping. (See Figure 10)

Figure 10



Some state and local codes require steam safety valves be piped to the atmosphere outside the building.

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

CLEANING BOILER WATERWAYS

A. STEAM BOILERS

NOTE: The boiler should be cleaned before connecting system piping and installing steam trim.

1. Plug unused openings all around the boiler leaving a valved overflow pipe connected to the safety valve tapping. Also provide a valved blow-down connection to one of the bottom tappings.
2. The fuel burning equipment should be installed and made ready to operate in accordance with the burner instructions.
3. Fill the boiler with water to the middle of the upper port, adding a boiler cleaning compound, as recommended in A.S.M.E. Section VI.
4. Fire the boiler for at least one hour at a low rate to circulated the cleaning compound through the boiler.
5. Blow off surface of boiler water through skimmer connection or through safety valve opening by feeding clean water into the boiler through a bottom fill connection.
6. When the water coming off the surface runs clear, shut off the burner, close the top valve and open the bottom blow-down valve. If there is a slight steam pressure in the boiler, it will assist the blow-down.
7. When the sections have cooled after blow-down, flush the interior of the boiler from the top by introducing water from a hose through the top port. When the water runs clear, complete the system piping, install the steam trim and controls. Fill the boiler with clean water. Heat the boiler water to at least 180°F to release corrosive gases.

B. WATER BOILERS

NOTE: The system piping should be completed before cleaning the boiler.

1. Add an approved boiler compound. Follow the compound manufacturer's instructions for best results. Fill the system and vent air wherever necessary.
2. Heat the water to at least 180°F and circulate through all the piping system. After about one hour, drain the system thoroughly. Wash the interior of the boiler with a hose inserted through the top tapping. When blow-down water runs clean, allow boiler to cool, then fill the system with clean water.
3. Heat the water up to about 180°F and vent air as necessary to purge the system. The boiler is now ready to operate.

START UP AND MAINTENANCE INSTRUCTIONS

A. For best performance of the boiler, the following suggestions should be performed by a qualified boiler room technician, through a regular program of maintenance and adjustment to obtain the following.

1. Oil burner combustion: 11 - 12.5% CO₂, zero smoke, smooth lightoff and operation.

Gas burner combustion: 8.5 - 10.5% CO₂ with smooth lightoff and operation. Carbon Monoxide (CO) values under 50 ppm must be maintained in smoke head
2. Keep boiler fireside surface clean. Flue gas temperature reading above 450°F over boiler room temperature signals the start of soot accumulation. Inspect at least twice each year.
3. Steam boiler water condition should be observed. Unstable water line, system steam hammer indicate dirty water. Blow-down is recommended. However, the introduction of excess raw water to a steam boiler can result in the deposit of scale and inefficient operation of physical damage to the boiler.
4. Float operated and probe type low water cutoff devices should be maintained according to the instructions of the manufacturer.
5. Limit control function should be checked on a regular basis.
6. Flame safeguard controls should be checked regularly.

B. The products of combustion must be conducted to the outdoors by means of a metal connector of at least the same size as the boiler smokehood outlet and a chimney or stub-stack. The boiler is constructed for pressurized operation and the burners are selected for operation against a back pressure between .05 and .10 in. WC at the boiler outlet. If the actual conditions cause a back pressure in excess of 0.10 in. WC at the boiler outlet, consult Smith Cast Iron Boilers for verification of burner size. If the chimney has the ability to develop excess draft, a barometric draft control should be installed in the chimney. Check with the Smith representative for assistance.

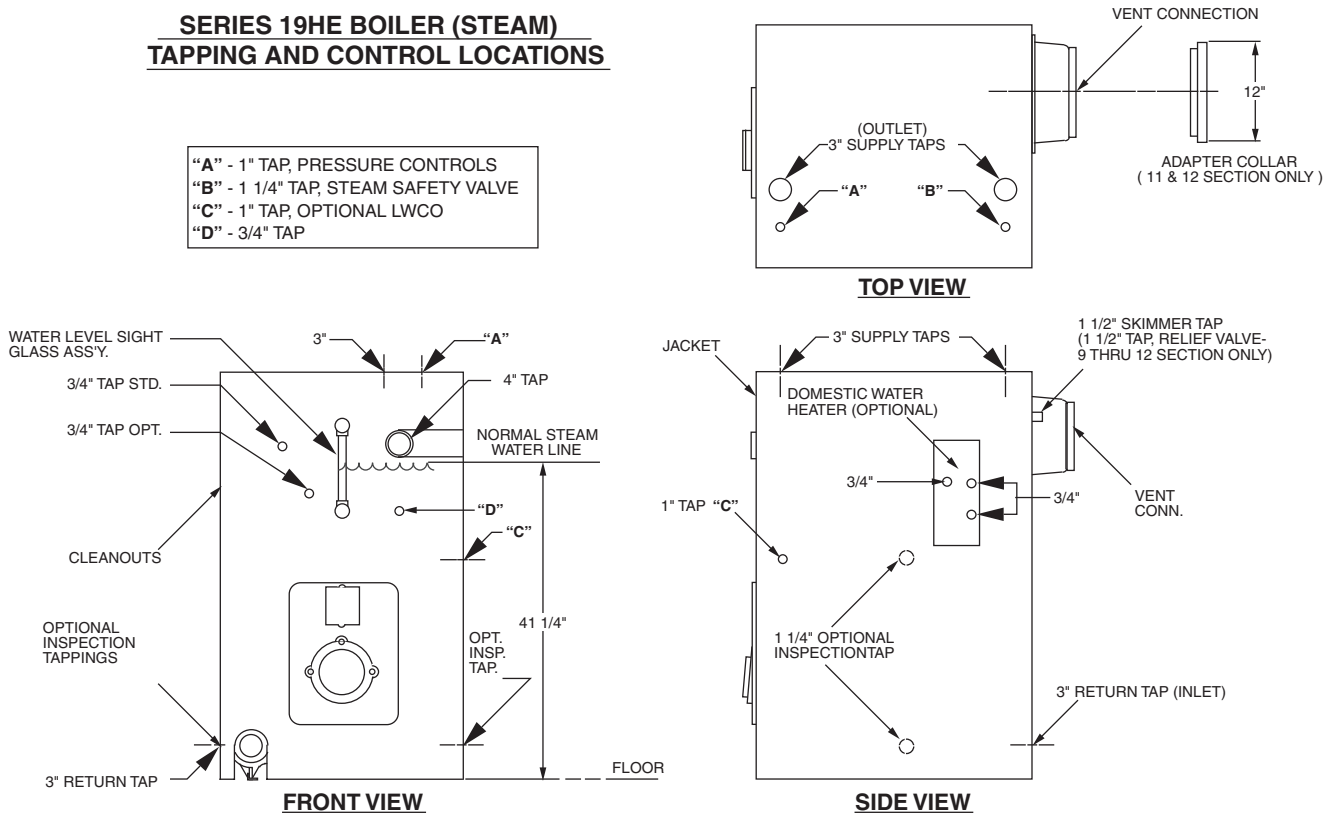
Boiler No.	Draft Loss (in. WC)	Overfire Pressure (in. WC)
19HE-3	0.18	0.28
19HE-4	0.18	0.28
19HE-5	0.20	0.30
19HE-6	0.23	0.33
19HE-7	0.26	0.36
19HE-8	0.29	0.39
19HE-9	0.32	0.42
19HE-10	0.35	0.45
19HE-11	0.38	0.48
19HE-12	0.41	0.51

SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

Figure 11 - Tapping and Control Locations

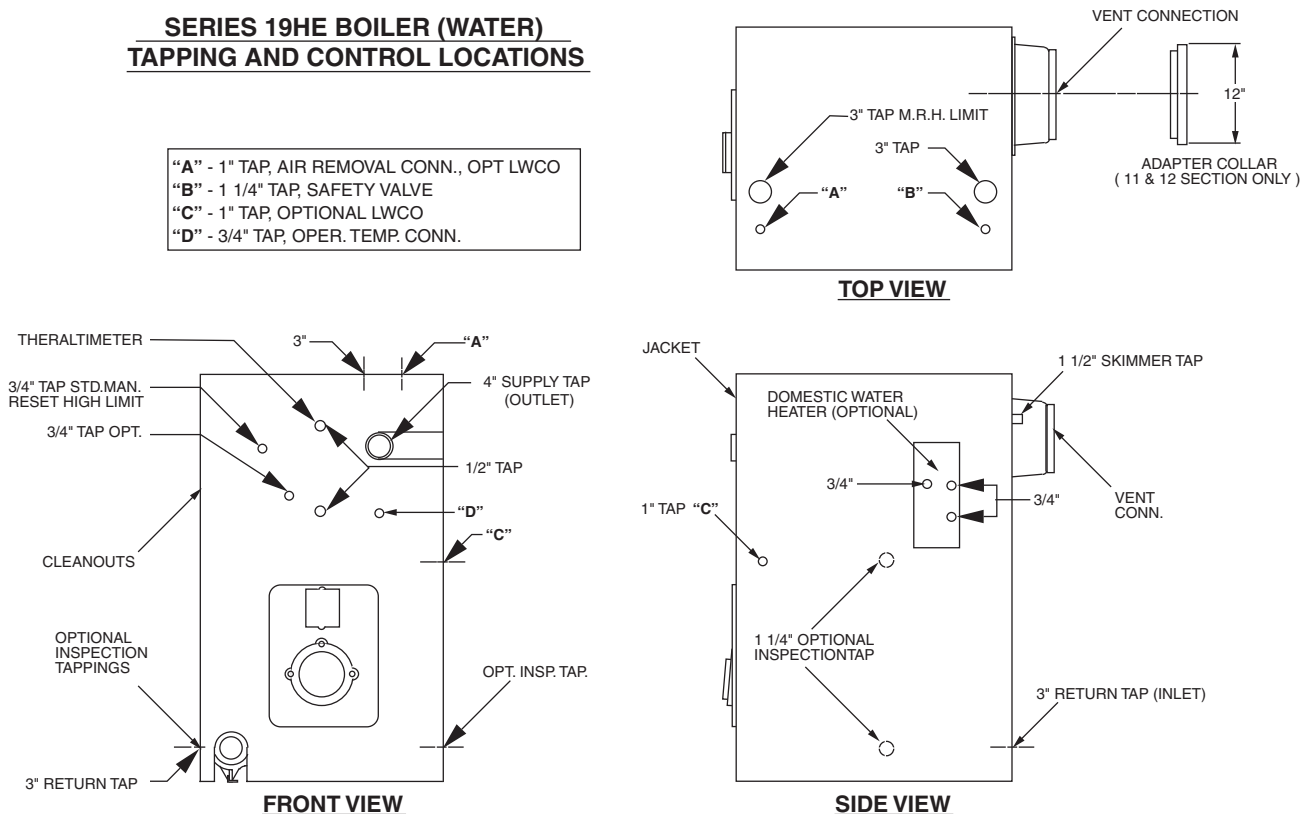
SERIES 19HE BOILER (STEAM) TAPPING AND CONTROL LOCATIONS

- "A" - 1" TAP, PRESSURE CONTROLS
- "B" - 1 1/4" TAP, STEAM SAFETY VALVE
- "C" - 1" TAP, OPTIONAL LWCO
- "D" - 3/4" TAP



SERIES 19HE BOILER (WATER) TAPPING AND CONTROL LOCATIONS

- "A" - 1" TAP, AIR REMOVAL CONN., OPT LWCO
- "B" - 1 1/4" TAP, SAFETY VALVE
- "C" - 1" TAP, OPTIONAL LWCO
- "D" - 3/4" TAP, OPER. TEMP. CONN.



SERIES 19HE BOILER INSTALLATION INSTRUCTIONS

WARNING

Any appliance that burns natural gas, propane gas, fuel oil, wood or coal is capable of producing carbon monoxide (CO).

Carbon Monoxide (CO) is a gas which is odorless, colorless and tasteless but is very toxic.

If your Smith boiler is not working properly, or is not vented properly, dangerous levels of CO may accumulate. CO is lighter than air and thus may travel throughout the building. **BRIEF EXPOSURE TO HIGH CONCENTRATIONS OF CO, OR PROLONGED EXPOSURE TO LESSER AMOUNTS OF CO MAY RESULT IN CARBON MONOXIDE POISONING.**

EXPOSURE CAN BE FATAL AND EXPOSURE TO HIGH CONCENTRATIONS MAY RESULT IN THE SUDDEN ONSET OF SYMPTOMS INCLUDING UNCONSCIOUSNESS.

Symptoms of CO poisoning include the following:

dizziness
headaches
nausea

vision problems
loss of muscle control
weakness

shortness of breath
unclear thinking
unconsciousness

The symptoms of CO poisoning are often confused with those of influenza, and the highest incidence of poisoning occurs at the onset of cold weather or during flu season. A victim may not experience any symptoms, only one symptom, or a few symptoms. Suspect the presence of carbon monoxide if symptoms tend to disappear when you leave your home.

The following signs may indicate the presence of carbon monoxide:

- Hot gases from appliance, venting system, pipes or chimney, escaping into the living space.
- Flames coming out around the appliance.
- Yellow colored flames in the appliance.
- Stale or smelly air.
- The presence of soot or carbon in or around the appliance.
- Very high unexplained humidity inside the building.

If any of the symptoms of CO poisoning occur, or if any of the signs of carbon monoxide are present, **VACATE THE PREMISES IMMEDIATELY AND CONTACT A QUALIFIED HEATING SERVICE COMPANY OR THE GAS COMPANY OR THE FIRE DEPARTMENT.**

To reduce the risk of CO poisoning, have your heating system "tuned up" by a licensed heating contractor or the gas company -- preferably before each heating season. Also have the service company check your chimney or vent pipes for blockage.

Your home should also be adequately ventilated, particularly if you have insulated your home.

ONLY QUALIFIED, LICENSED SERVICE CONTRACTORS SHOULD PERFORM WORK ON YOUR SMITH BOILER.

WARNING

Install, operate and maintain unit in accordance with manufacturer's instructions to avoid exposure to fuel substances or substances from incomplete combustion which can cause death or serious illness. The State of California has determined that these substances may cause cancer, birth defects, or other reproductive harm. Also, install and service this product to avoid exposure to airborne particles of glasswool fibers and/or ceramic fibers known to the State of California to cause cancer through inhalation.