



KSC IV STEAM SERIES 4 OIL-FIRED CAST IRON BOILER

MODELS

KSC-3090S

KSC-3090ST

KSC-4125S

KSC-4125ST

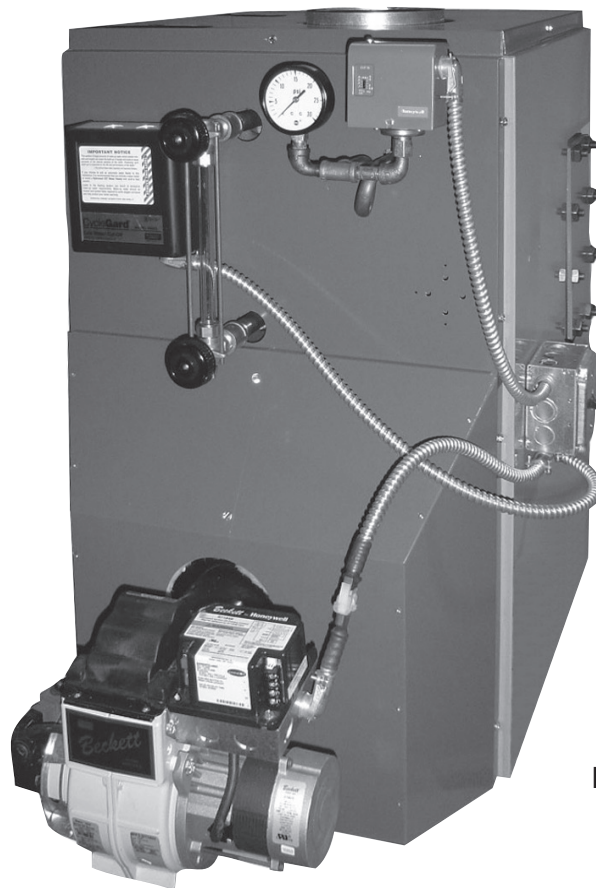
KSC-5185S

KSC-5185ST

KSC-6210S

KSC-6210ST

INSTALLATION, OPERATION & MAINTENANCE MANUAL



PATENT 7,823,544



Manufactured by:

ECR International, Inc.

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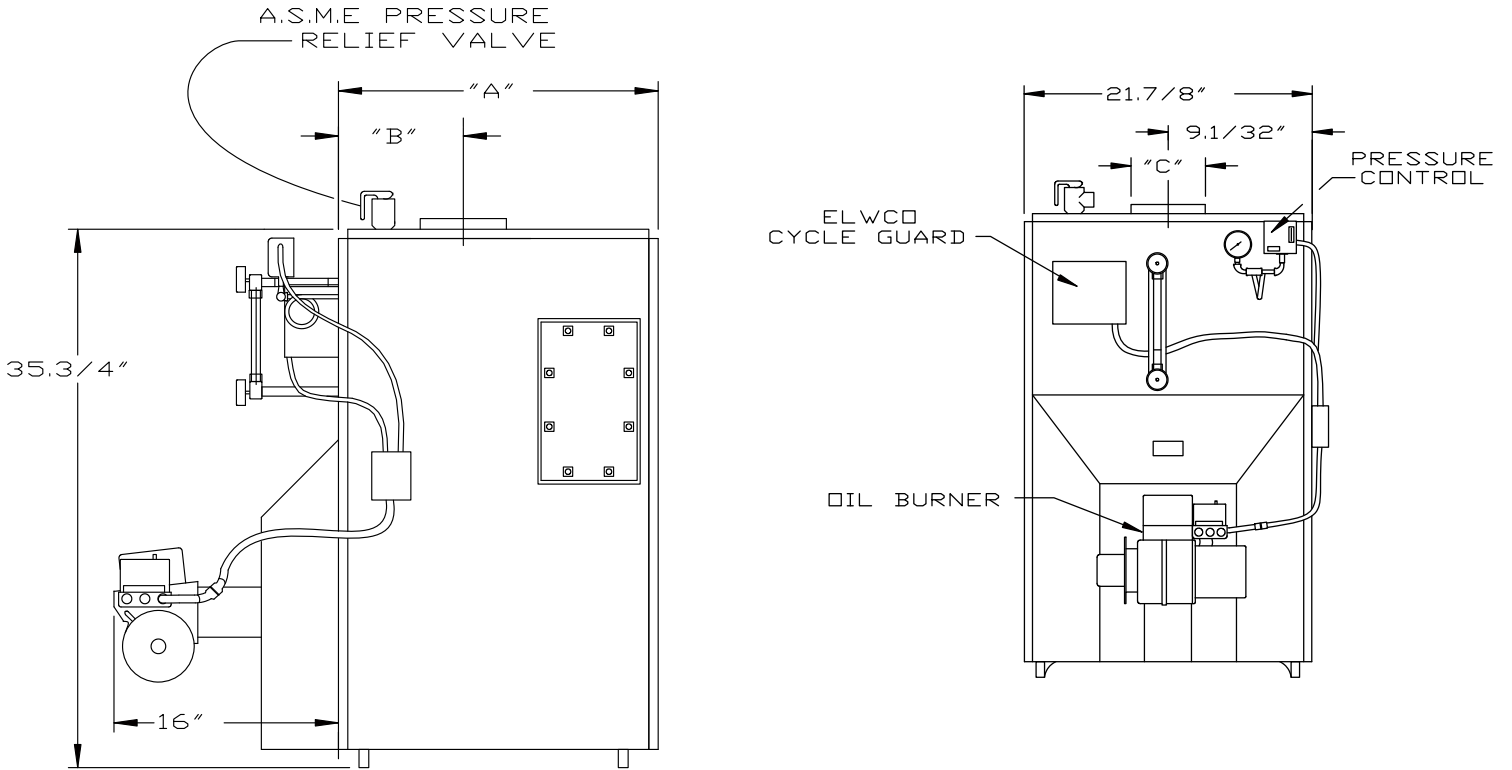


An ISO 9001-2008 Certified Company

P/N 240009805, Rev. B [03/2014]

DIMENSIONS

Figure #1



DIMENSIONS			
Boiler No.	Length of Flush Jacket	Front of Jacket to Center Line of Flue Outlet	Flue Outlet Diameter
	-A-	-B-	-C-
KSC-3090	$16\frac{3}{8}$ "	$6\frac{1}{2}$ "	6"
KSC-4125	$20\frac{1}{4}$ "	$8\frac{1}{2}$ "	6"
KSC-5185	$23\frac{5}{8}$ "	$10\frac{1}{4}$ "	7"
KSC-6210	$27\frac{1}{2}$ "	$8\frac{5}{16}$ "	8"

STANDARD EQUIPMENT: Crated boiler, flush jacket, oil burner, target wall/liner, safety valve, steam water level gauge, steam pressure gauge, steam pressure control, low water cut-off, drain valve, wiring harness, burner electric disconnect, plastic cover, 2" supply tapping, 1½" return tapping, skim port, and primary control.

(NOTE: For tankless heater units, add tankless hot water coil, and low limit control.)

RATINGS, DATA



RATINGS

Boiler Model Number		Oil Burner Input ⁽¹⁾		Heating Capacity MBH ⁽⁴⁾	Net AHRI Ratings ⁽³⁾		Min. Natural Draft Chimney Size		A.F.U.E. Rating ⁽⁴⁾
WITHOUT TANKLESS	WITH TANK-LESS	G.P.H.	MBH ⁽²⁾		Steam MBH	Sq. Ft. Steam	Round	Square	
KSC-3090S	KSC-3090ST	0.90	126	106	80	333	6	8"x8"x15'	82.0
KSC-4125S	KSC-4125ST	1.25	175	147	110	458	6	8"x8"x15'	82.0
KSC-5185S	KSC-5185ST	1.85	259	216	162	675	8	8"x8"x15'	82.0
KSC-6210S	KSC-6210ST	2.10	294	247	185	771	8	8"x8"x15'	82.0

NOTES:

- ⁽¹⁾ Burner input is based on an oil heating value of 140,000 Btu/gal.
- ⁽²⁾ MBH = 1000 Btu per hour [Btu = British Thermal Unit].
- ⁽³⁾ Net AHRI Steam Ratings based on piping and pick-up allowance of 1.333. Consult manufacturer before selecting boiler for installations having unusual piping and pick-up requirements, such as intermittent system operation, extensive piping, etc.
- ⁽⁴⁾ Heating Capacity and AFUE based on 13.0% CO₂ with 0.02" W.C. draft over fire and #1 smoke or less. Tested in accordance with U.S. Department of Energy test procedures.

TANKLESS WATER HEATER CAPACITIES

Boiler Model Number	Input Rate G.P.H.	Tankless Heater Number	Tankless Heater Capacity Intermittent Draw G.P.M.	Boiler Water Content (Gallons)	
				To Water Line	To LWCO Line
KSC-3090ST	0.90	L-24	2	11	8
KSC-4125ST	1.25	L-24	4½	13	9
KSC-5185ST	1.85	L-24	4½	15	10
KSC-6210ST	2.10	L-24	4½	17	11

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**KEEP THIS MANUAL NEAR BOILER
RETAIN FOR FUTURE REFERENCE**

SAFETY SYMBOLS

The following defined symbols are used throughout this manual to notify reader of potential hazards of varying risk levels.

DANGER

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information which should be followed to ensure proper installation and operation.

IMPORTANT: Read and understand the following instructions COMPLETELY before installing.

WARNING

Installations of boilers and venting shall be done only by qualified expert and in accordance with this manual. Installing or venting a boiler or any other gas appliance with improper methods or materials could result in serious injury or death due to fire or to asphyxiation from poisonous gases such as carbon monoxide which is odorless and invisible.

WARNING

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

Do not obstruct air openings to boiler room.

Modification, substitution or elimination of factory equipped, supplied or specified components could result in personal injury or the loss of life.

Owner - Installation and service of this boiler must be performed by a qualified installer.

Installer - Leave all instructions with the boiler for future reference.

When this product is installed in the Commonwealth of Massachusetts the installation must be performed by a Licensed Plumber or Licensed Gas Fitter.

PATENT 7,823,544

LOCATING THE BOILER

- Installations shall conform to the requirements of the authority having jurisdiction. Such applicable requirements take precedence over the general instructions of this manual.
- Where required by the authority having jurisdiction, the installation must conform to the American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME No. CSD-1.
- Locate boiler in front of final position before removing crate.
- Provide level solid base as near chimney as possible and centrally located with respect to heat distribution system as practical.
- Allow 24 inches in front, top and right hand side for servicing and cleaning, or removing tankless water heating coil.
- Recommend 24 inches be allowed in back of boiler for convenience when skimming hole is used.
- When installed in a utility room, the door should be wide enough to allow largest boiler part to enter, or to permit replacement of another appliance such as water heater.
- Install boiler such that oil ignition system components are protected from water (dripping, spraying, rain etc.) during appliance operation and service.

⚠ WARNING

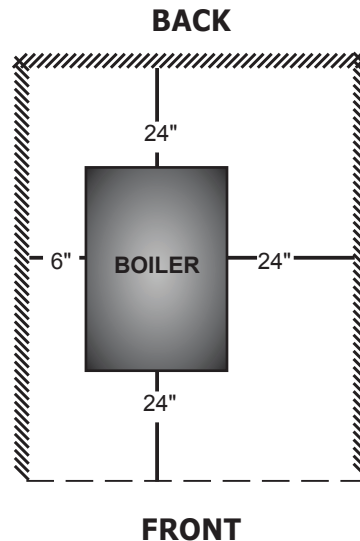
Fire hazard. Do not install boiler on combustible flooring or carpeting. Failure to follow these instructions could result in death or serious injury.

FOR INSTALLATION ON NON-COMBUSTIBLE FLOORS ONLY
Boiler must not be installed on carpeting or vinyl flooring.
Minimum clearances to combustible construction are:

TOP	24 IN.
FRONT	24 IN.
FLUE CONNECTOR	9 IN.
REAR	24 IN.
LEFT SIDE	6 IN.
RIGHT SIDE	24IN.

NOTE: Clearance for access should exceed fire protection clearance.

Figure #2 - Minimum Clearances To Combustible Construction (as seen from above)



⚠ WARNING

Asphyxiation, fire hazard. Do not obstruct air openings to combustion area. Follow instructions below, to maintain adequate combustion air.

COMBUSTION AIR REQUIREMENTS (Minimum Opening Requirement)

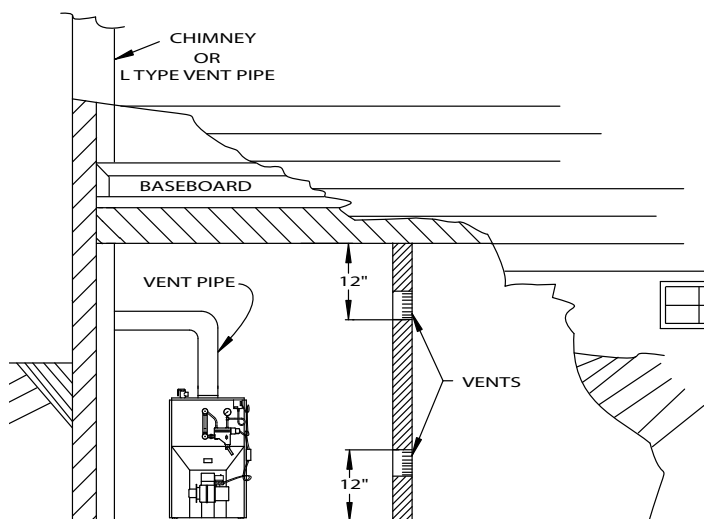
Input (Mbh)	Unconfined Area*		Confined Area**	
	Outside	Inside	Outside Combustion Air	
	Combustion Air 1 Sq.In./5000 BTU/Hr (Step 4)	Combustion Air 1 Sq. In./1000 BTU/ Hr (Min. 100 Sq. In.) (Figure #1)	Vertical Ducts 1 Sq. In./4000 BTU/Hr (Figures # 2 & #3)	Horizontal Ducts 1 Sq. In./2000 BTU/Hr (Figure # 4)
126	26	126	32	63
175	35	175	44	88
259	52	259	65	130
294	59	294	74	147

* A space whose volume is not less than 50 cubic feet per 1000 BTU/Hour of all appliances installed in that space (cubic feet of space = height x width x length)

** A space whose volume is less than 50 cubic feet per 1000 BTU/Hour of all appliances installed in that space (cubic feet of space = height x width x length)

1. Ventilation of boiler room must be adequate enough to provide sufficient air to properly support combustion, venting and maintain safe ambient temperatures under normal operating conditions.
2. When the boiler is located in an unconfined space in a building of conventional construction frame, masonry or metal, infiltration normally is adequate to provide air for combustion and ventilation. However, in any building which has been altered to conserve energy or to minimize infiltration, the boiler area should be considered as a confined space. If there is any doubt, install air supply provisions for combustion and ventilation in accordance with Chapter 5, Air for Combustion and Ventilation, of NFPA 31, Standard for the Installation of Oil Burning Equipment. The recommendations that follow, or applicable provisions of the local building codes.
3. When the boiler is installed in an unconfined space, in a building of unusually tight construction, air for combustion and room ventilation must be obtained from outdoors or from spaces freely communicating with the outdoors. A permanent opening or openings having a total free area of not less than 1 square inch per 5,000 BTU per hour of total input rating of all appliances shall be provided. Ducts may be used to convey make-up air from the outdoors and shall have the same cross-sectional area of the openings to which they are connected.
4. When air for combustion and room ventilation is from inside buildings, the confined space shall be provided with two permanent openings, one starting 12 inches from the top and one 12 inches from the bottom of the enclosed space. Each opening shall have a minimum free area of 1 square inch per 1,000 BTU per hour of the total input rating of all appliances in the enclosed space, but must not be less than 100 square inches. These openings must freely communicate with the interior areas having adequate infiltration from the outside. See **Figure #3**.

Figure #3



VENTILATION AND COMBUSTION AIR

5. When the boiler is installed in a confined space and all air is provided from the outdoors, the confined space shall be provided with two permanent openings, one commencing within 12 inches from the top and one commencing 12 inches from the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors. One of the following methods must be used to provide adequate air for ventilation and combustion.

- A. When directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 BTU per hour of total input rating of all equipment in the enclosure. **(Figure #4)**
- B. When communicating with the outdoors by means of vertical ducts, each opening shall have a minimum free area 1 square inch per 4,000 BTU per hour of total input rating of all appliances in the enclosed space. **(Figure #5)**
- C. If horizontal ducts are used, each opening shall have a minimum free area 1 square inch per 2,000 BTU per hour total input rating of all appliances in the enclosed space. **(Figure #6)**
- D. When ducts are used, they shall be of the same cross sectional area as the free area of the area of the openings to which they connect. The minimum dimension of rectangular air ducts shall not be less than 3 inches.
6. In calculating free area using louvers, grills or screens for the above, consideration shall be given to their blocking effect. Screens used shall not be smaller than 1/4 inch mesh. If the free area through a design of louver or grill is known, it should be used in calculating the size opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 20-25% free area and metal louvers and grills will have 60-75% free area. Louvers and grills shall be fixed in the open position or interlocked with the boiler so that they are opened automatically during boiler operation.

Figure #4

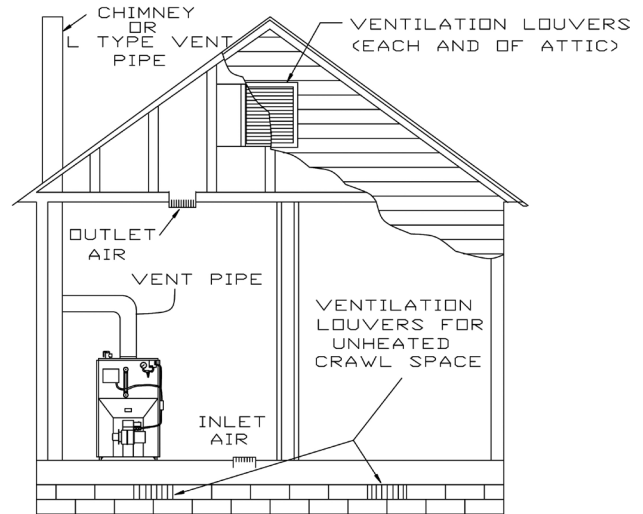


Figure #5

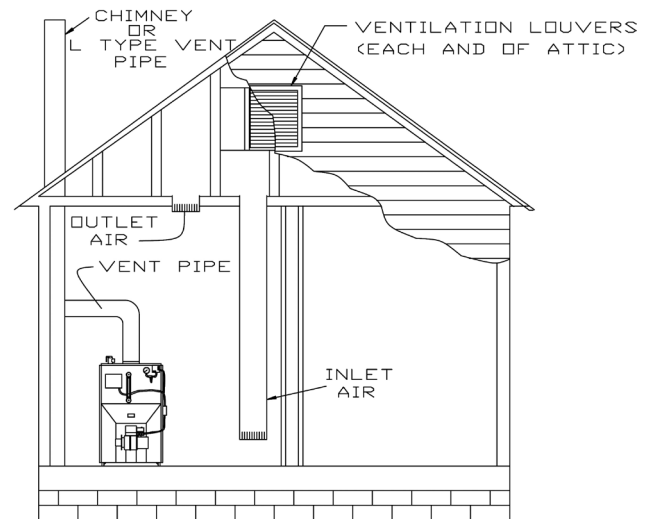
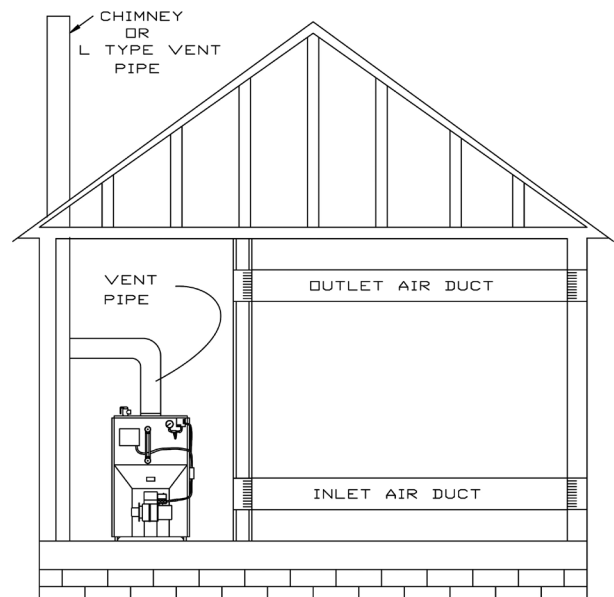


Figure #6



⚠ WARNING

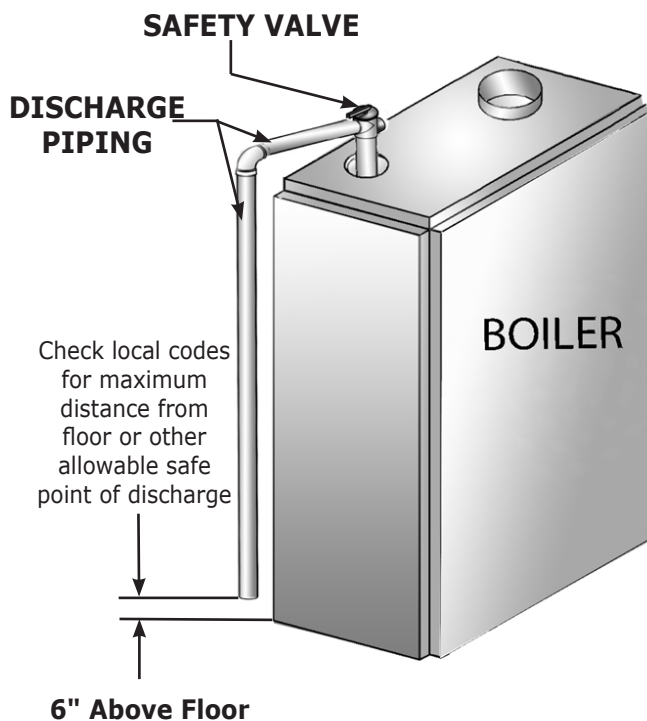
Burn or Scald Hazard. Discharge line shall be installed to safety valve outlet connection to avoid burns, scalding, or water damage due to discharge of steam and/or hot water during operation.

Discharge line shall:

- Connect to safety valve outlet. Piped down to safe point of disposal. Check local codes for maximum distance from floor or allowable safe point of discharge.
- Pipe size be of equal to or greater than of safety valve outlet over entire length of discharge line.
- Have no intervening shutoff valve between safety valve and discharge to atmosphere. Do not plug or place any obstruction in discharge line.
- Terminate freely to atmosphere where any discharge will be clearly visible and at no risk of freezing.
- Allow complete drainage of valve and discharge line.
 - Install safety valve with spindle in vertical position.
 - Do not install shutoff valve between boiler and safety valve.
 - Support safety valve discharge piping.
- Be short and straight as possible.
- Terminate with plain end, not threaded.
- Constructed of material suitable for exposure to temperatures of 375° F (191°C); or greater.

Refer to local codes and appropriate ASME Boiler and Pressure Vessel Code for additional installation requirements.

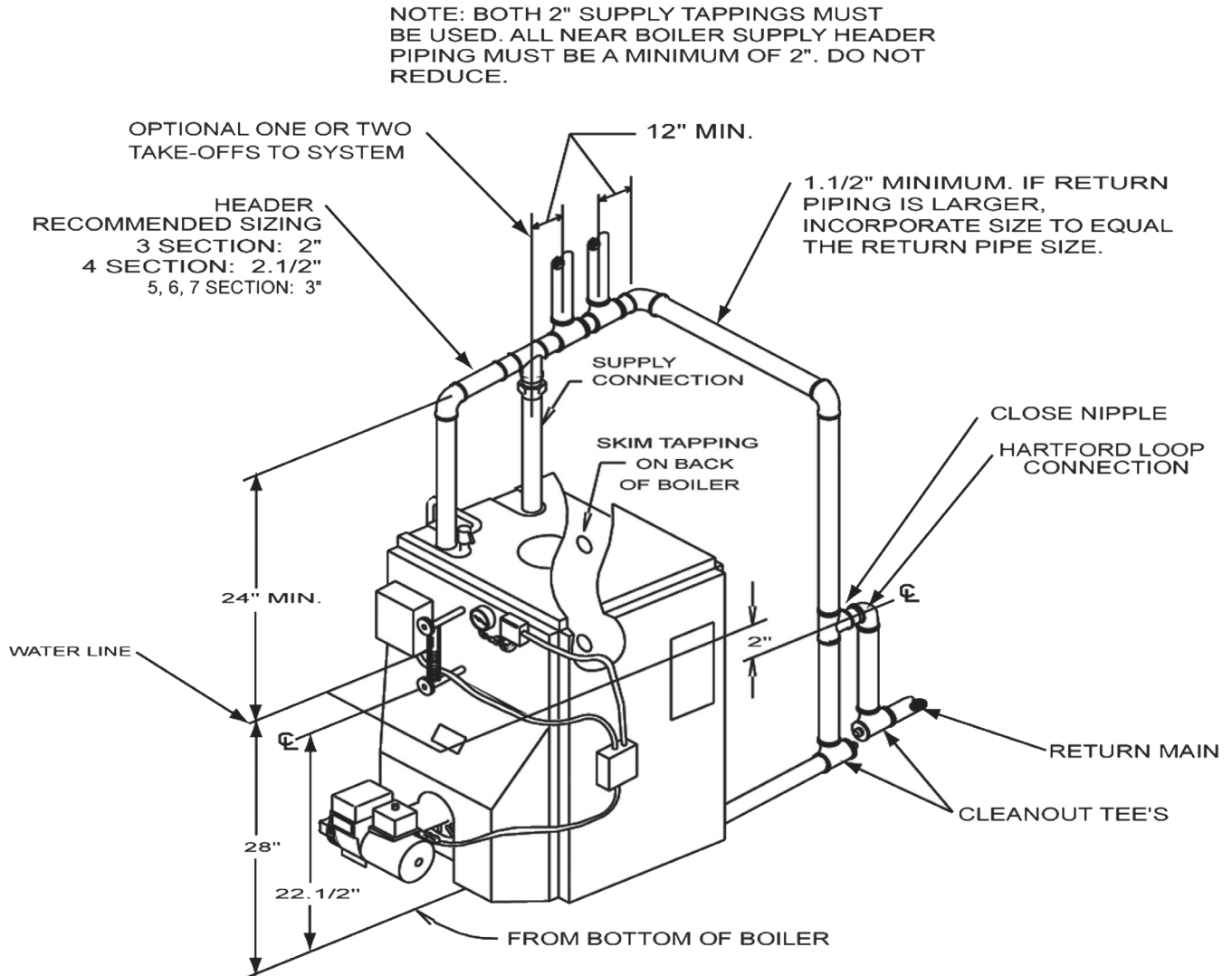
Figure 4 - Safety Valve



SUPPLY AND RETURN PIPING

1. Suggested piping for steam heating system can be seen in **Figure #7**. Actual piping may vary based on system design and local conditions.

Figure #7



SUPPLY AND RETURN PIPING

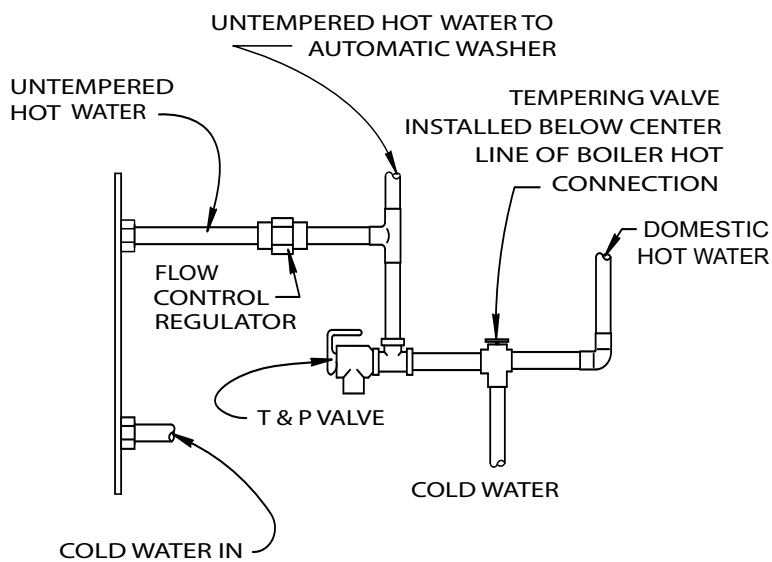
- See **Figure #8** for typical piping for domestic hot water heater.
 - Automatic mixing valve must be installed on tankless heater outlet. Install per valve manufacturer's instructions.
 - Install adjustable flow restrictor in cold water inlet due to varying water conditions.
- See **Figures #9** and **#10** for the suggested piping for a modular steam boiler.

⚠ DANGER

Water temperatures exceeding 125°F will cause severe burns instantly or death by scalding.

Figure #8

PIPING FOR BUILT-IN DOMESTIC HOT WATER HEATER



SUPPLY AND RETURN PIPING

Figure #9 SUGGESTED PIPING FOR MODULAR STEAM BOILERS - PUMPED RETURN

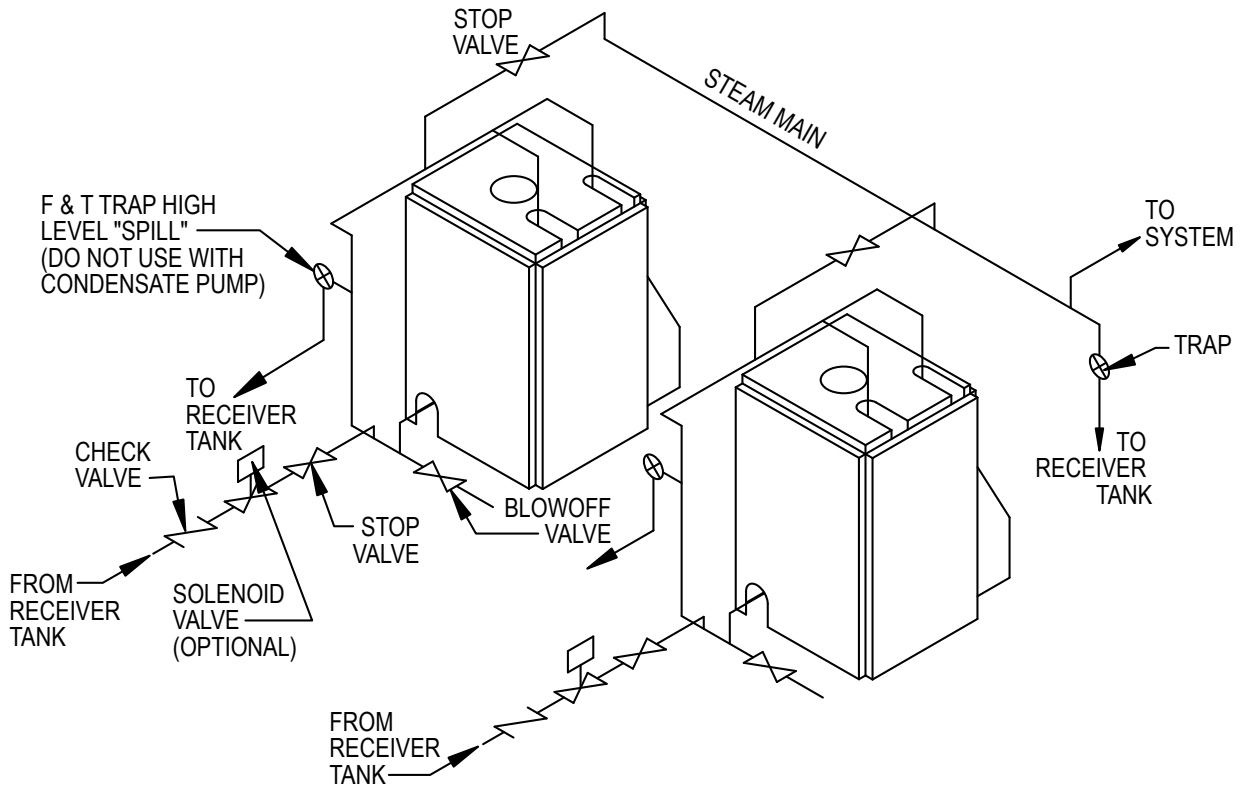
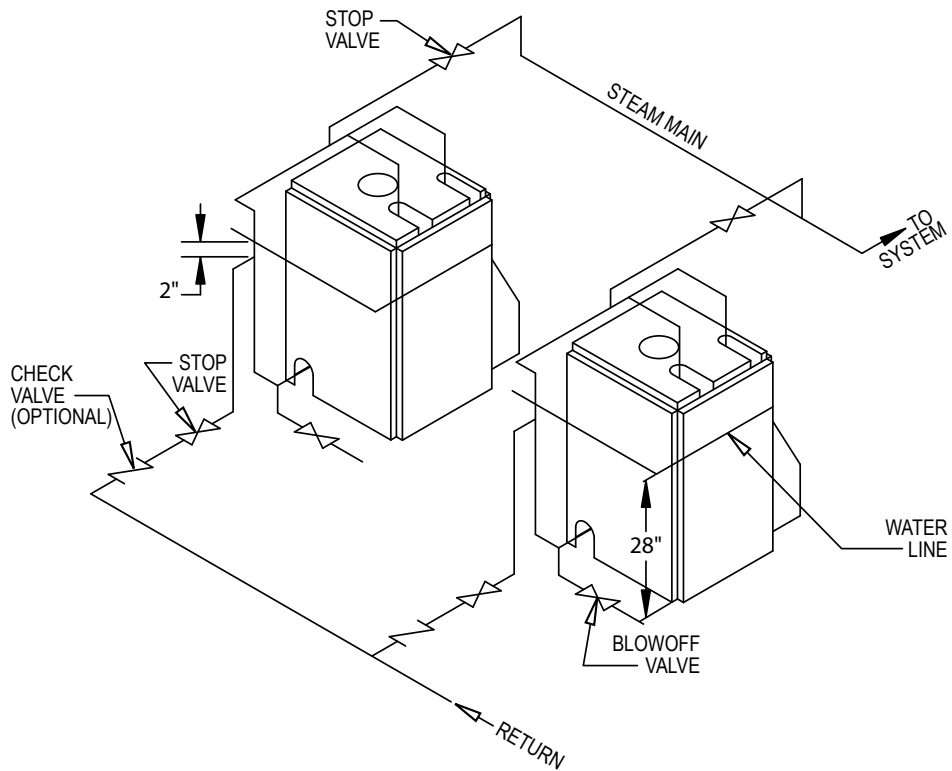


Figure #10 SUGGESTED PIPING FOR MODULAR STEAM BOILERS - GRAVITY RETURN



⚠ WARNING

Boiler is to be vented by natural draft and shall not be connected into any portion of mechanical draft operating system under positive pressure.

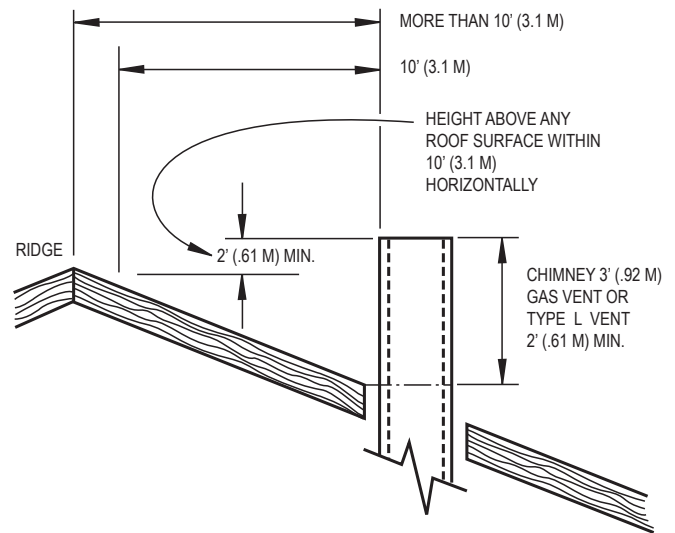
- Inspect chimney to make certain it is constructed according to the latest revision of the NFPA 211. Local regulations may differ from this code and should be checked. Where there is a conflict, the local code will prevail.
- Install boiler into chimney having a masonry or metallic chimney liner.
- Unlined chimney will have leaks that will cause poor chimney performance (no draft), and could result in positive pressure in the combustion chamber.
- Horizontal portions of venting system should not exceed 10 feet in length. Horizontal lengths over 10 ft. will have a negative effect on chimney performance.
- Extend chimney at least 2 ft. above any portion of building within 10 ft. Producing a -.02 inch W.C. draft in the combustion chamber. See **Figure #11**.
- See Ratings Table page 3 for recommended minimum chimney or vent sizes.
- Inadequate draft causes improper combustion, resulting in dirty flue ways and high fuel bills.
- Connect flue pipe same size as boiler outlet to chimney, sloping upward continuously toward the chimney approximately 1/4" per foot. Bolt or screw joints together to avoid sag.

If oil fired water heater is vented into same flue as boiler, provide separate hole into chimney whenever possible.

When this isn't possible, use "Y" connection in flue pipe, using separate draft regulator for each unit.

When chimney does not provide adequate draft to handle input from water heater and boiler simultaneously, wire units so only one will operate at a time, favoring water heater.

Figure #11



Tank Installation

- Install oil tank and piping in accordance with National Board of Fire Underwriters and local regulations.
- Oil storage tank, vent, fill pipe and caps should be as prescribed by local codes.
- In no case should vent pipe be smaller than 1¼" I.P.S. Fill pipe should not be less than 2" I.P.S.

Suction Line Installation

- Suction line from tank to burner should be one continuous piece of tubing to prevent air entering line.
- Suction line, must be ¾" O.D. copper tubing for runs of 50 feet or less, and ½" O.D. for longer runs.

Oil Line Installation

- Oil return line, same size as suction line, must be used on any installation where bottom of tank is below fuel unit of burner.
- Bury oil lines or protect from mechanical injury.
- Flare fittings on all oil lines are recommended. Compression fittings on suction line often allow air to be drawn into fuel pump, making it difficult to maintain oil pressure at nozzle.
- Do not run overhead fuel lines from tank to oil burner.

Fuel Pump Connections

- Fuel pump connections and by-pass should be made according to instructions attached to fuel pump.
- If tank is more than 20' from boiler, install two stage fuel unit in place of single stage pump supplied as standard equipment with burner.
- Verify rotation and speed are the same and pump is suitable for burner horsepower rating.

Install oil line filter and shut-off valve in the suction line. Install shut-off valves in both suction and return lines at the burner for convenience in servicing burner.

Allow extra tubing at burner so burner may be removed from boiler for cleaning without disconnecting tubing. An optional flexible oil line is available. See **Figures #12 - #13**.

Figure #12 Typical Installation Single Pipe Oil System

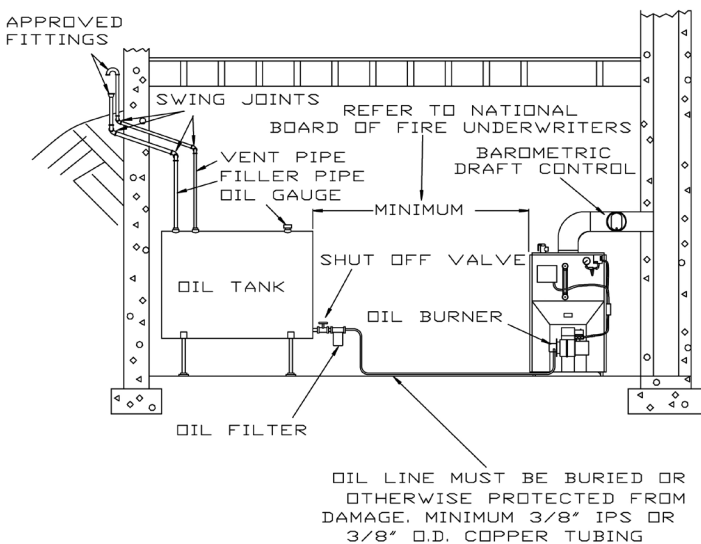
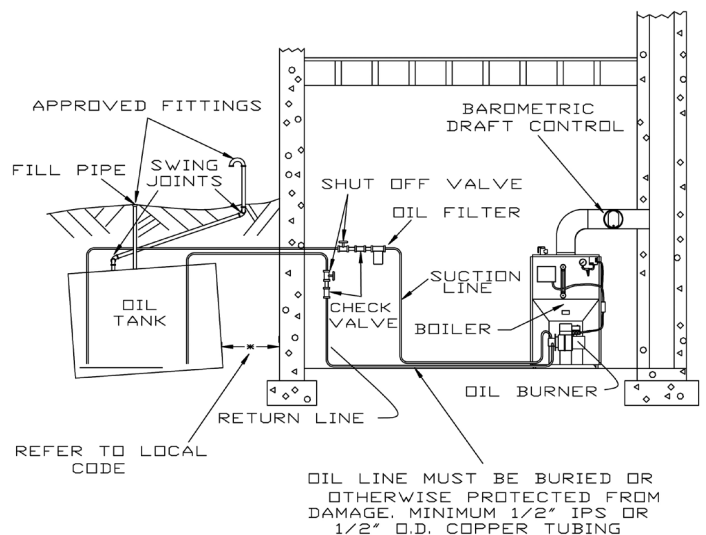


Figure #13 Typical Installation Two Pipe Oil System



WARNING

Electrical shock hazard. Turn OFF electrical power supply at service panel before making electrical connections. Failure to do so could result in death or serious injury.

Electrical wiring must conform with the latest revisions of the National Electrical Code, ANSI/NFPA No. 70, and/or local authority having jurisdiction.

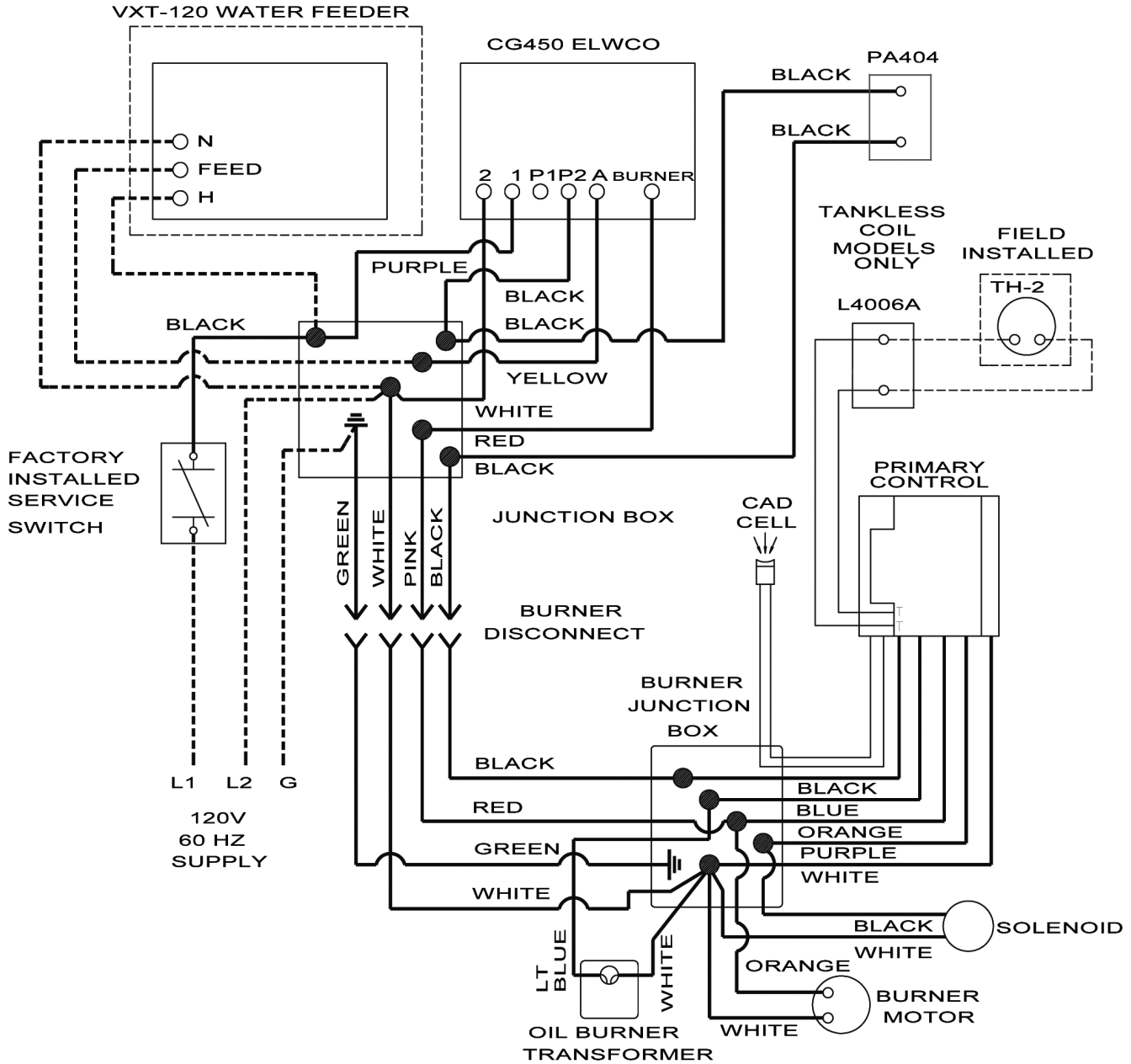
1. When an external electrical source is utilized, the boiler, when installed, **MUST BE** electrically grounded in accordance with these requirements.
2. Install a fused disconnect switch between boiler and meter at a convenient location.
3. When the boiler is equipped with self-energized controls, no outside source of electric power shall be connected to the circuit of this system. (See "Steam Wiring" on next page.)

Thermostat Installation

1. Thermostat should be installed on inside wall about four feet above floor.
2. **NEVER** install thermostat on outside wall.
3. Do not install thermostat where it will be affected by drafts, hot or cold pipes, sunlight, lighting fixtures, television, fireplaces, or chimneys.
4. Check thermostat operation by raising and lowering thermostat as required to start and stop burner.
5. Instructions for final adjustment of thermostat are packaged with thermostat (adjusting heating anticipator, calibration, etc.).

ELECTRICAL WIRING

STEAM WIRING W/BECKETT BURNER FIELD INSTALLED



COMPONENT CODING

TH-1	Thermostat (Millivolt)	MR-PS	Manual Reset Pressure Switch	CIR	Circulator
TH-2	Thermostat (24 Volt)	○	Control Terminal	ECO	Energy Cut-Off
TH-3	Thermostat (Line Voltage)	1K	Relay Coil	PSC	Pilot Safety Coil
TR-1	Transformer (120V/24V/40VA)	1K1	Relay Contacts	●	Wire Connection
TR-2	Transformer (120V/24V/50VA)	1K2	Relay Contacts	LWCO	Low Water Cut Off
LGV24	Volt Gas Valve	LS	Limit Switch	EFW	Electric Water Feeder
PS	Pressure Switch	MS	Manual Switch	PG	Power Generator

WIRING CODE

—————	Line Voltage By Factory
—————	Low Voltage By Factory
—————	Line Voltage By Installer
—————	Low Voltage By Installer

NOTE: Not all components listed are used in all control systems.

Sequence Of Operation

On call for heat, thermostat will actuate, completing the circuit to the boiler. In turn, the ignition systems are activated and ignition will begin.

In event of a low water condition, an automatic low water cut-off device will interrupt power between the low water cut-off and burner. Burner remains off until low water condition is corrected, (i.e., manually restore boiler water or utilize water feeder device which automatically restores water to its normal operating level).

Installer - Before putting boiler in operation, test mechanical low water cut-off device for proper operation. While burner is on, open blow-off valve located in lower portion of cut-off body. This will drain water quickly from cut-off body and break circuit to burner. If it does not, replace control.

⚠ DANGER

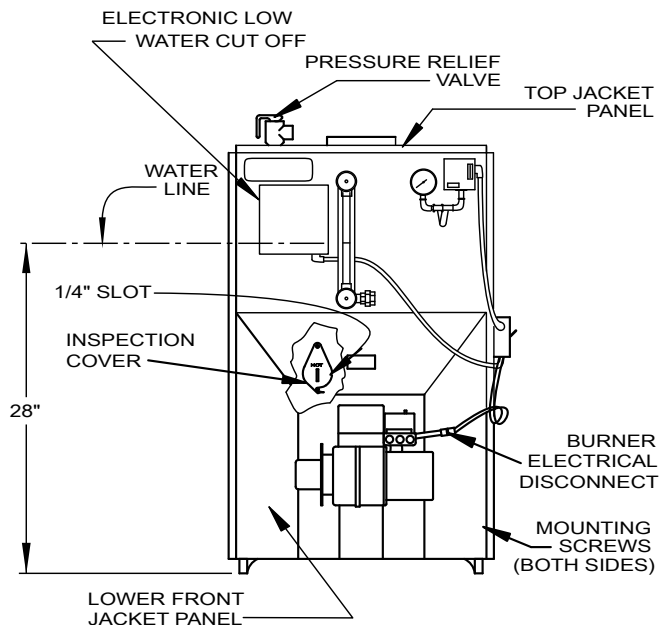
Water temperatures exceeding 125°F will cause severe burns instantly or death by scalding.

Refill boiler to its normal water line.

Operating Instructions

- Start of heating season have venting system inspected. Check vent pipe from boiler to chimney for signs of deterioration by rust or sagging joints. Repair if necessary.
- Remove vent pipe at base of chimney or flue and, using mirror, check for obstruction and verify compliance to latest revision of the NFPA 211.
- Operate lever of safety valve on boiler periodically to verify it is functioning properly. See **Figure #14**.
- Safety relief valve should open before steam pressure exceeds 15 psi. reading on the gauge. If this pressure is exceeded and safety relief valve leaks steam when boiler is operating at normal pressures, immediately replace. Corrosion can build up rapidly at valve seat and prevent its functioning as a safety device.

Figure #14



OPERATING INSTRUCTIONS

Start-Up And Adjustment Of Oil Burner

(See oil burner instructions for nozzle and electrode setting)

Do not set fire visually.

Instruments are only reliable method to determine proper air adjustments.

Improperly adjusted burner causes soot and high fuel bills because of incomplete combustion of the fuel oil. This may then require excessive boiler maintenance, service costs, and in some instances, house cleaning or redecorating.

Consult a qualified service mechanic to make proper adjustments with smoke tester, CO₂ indicator, and draft gauge. Bacharach or Dwyer test kits include these instruments.

1. Check oil burner nozzle to verify it is tight in adapter. Burner mounting bolts should be tight.

2. Check electrode setting, they may have been jarred out of position during transportation.
3. Lubricate burner motor if necessary.
4. Set room thermostat to call for heat, or jump thermostat contacts on boiler control.
5. Open all oil line valves.
6. Turn service switch on. Burner should start.
7. On one pipe fuel systems only, bleed pump as soon as burner starts. Allow oil to run until all traces of air in suction line disappear.
8. Turn "OFF" burner and install pressure gauge port on pump.
9. Start burner again and check oil pressure for 140 lbs. Adjust if necessary.

BECKETT AFG SETTINGS							
BOILER NO.	HEAD TYPE	HEAD SETTING	STATIC PLATE	NOZZLE	PUMP PRESSURE [PSI]	AIR BAND	AIR SHUTTER
KSC-3090	L1	--	3 ³ / ₈	0.75-60°B	150	1	3
KSC-4125	V1	0	2 ³ / ₄	1.10-60°B	140	1	8
KSC-5185	F12	--	2 ³ / ₄	1.50-70°B	150	2	10
KSC-6210	F16	--	--	1.75-70°B	145	2	10

* Boiler model number on rating plate includes suffix 'S' or 'ST'.

IMPORTANT: Check safety control circuit after burner adjustments have been made for satisfactory performance.

OPERATING INSTRUCTIONS

- A. Pressure Control - Remove cover and note pressure setting. With boiler operating, decrease setting. When setting is lower than boiler pressure, control will open and turn off boiler. After checking pressure control, reset control to original setting.
- B. Mechanical Low Water Cut-off - May be checked by opening blow-off valve on lower portion of cut-off body while boiler is running. This will drain water from boiler and break circuit to burner.

Refill boiler to its normal water line.

C. Primary Control and Flame Sensor - Check

- 1. **Flame Failure** - Simulate by shutting off oil supply with hand valve while burner is on. Sixty seconds after flameout, safety switch locks out, ignition stops, motor stops and oil valve - when used - closes. To restart, open oil supply valve and reset safety switch.
- 2. **Ignition Failure** - With burner off, close oil supply valve and run through start-up procedure. Safety switch should lock out as in flame failure.
- 3. **Power Failure** - Turn off main power supply switch while burner is operating. When burner stops, restore power and burner should start. If operation is not as described as above, check wiring and controls.

Preventative maintenance of oil fired boiler reduces operating costs. Boiler and vent pipe should be inspected for accumulation of soot or scale deposits periodically but at least once every year before start of each heating season. When soot is present on section walls and flueways, improper combustion will result, causing additional sooting and scaling until flueways are completely closed. To remove soot and scale from flueways, remove top jacket panel, top clean-out plate, open burner swing door. See **Figure #14**.

Opening Burner Swing Door

- 1. Turn off power to boiler and allow boiler to cool down.
- 2. Disconnect power cable at factory supplied burner electrical disconnect. See **Figure #14**.
- 3. Loosen screws on sides of lower front jacket panel. See **Figure 6**. Pull bottom part of lower front panel forward and lift lower front panel up and off boiler. See **Figure #14**.
- 4. Close oil valve and disconnect oil line from burner. See **Figures #12 - #13**.

IMPORTANT: Do not open swing door with oil line attached.

- 5. Remove nut from swing door stud on right hand side of door.
- 6. Swing open burner and door to left. Using flue brush, brush soot and scale into combustion space where it can be removed through swing door opening.

NOTICE

Use caution when vacuuming in chamber area. Damage to chamber could result.

Recommend replacing nozzle at start of each heating season. Lubricate burner motor and circulator motor - if required - with few drops of good grade of light motor oil. Do not over oil. Have qualified service person service burner and check controls and check electrodes for carbon or cracks in insulators. Burners should be adjusted to produce conditions shown in "*Startup and Adjustment of Oil Burner.*"

Closing The Burner Swing Door

- 1. Swing burner and door to right until insulation is slightly compressed and stud is exposed.
- 2. Attach nut to stud and tighten it until built in stop contacts mounting door.
- 3. Reconnect oil line to burner.
- 4. Replace lower jacket panel, and tighten screws.
- 5. Connect power cable at factory supplied burner electrical disconnect.
- 6. Turn on power to boiler and bleed oil line.

WARNING

Burn and scald hazard. Verify Boiler is off and cooled before performing maintenance. Have a qualified service agent perform maintenance. Failure to follow these instructions could result in death or serious injury.

Before seasonal start up it is advisable to have a qualified service agency check boiler for soot and scale in flues, change oil filter and nozzle, clean burner and re-adjust burner input rate to maintain proper operation and high operating efficiency.

On steam boilers verify boiler is filled to water line as indicated in **Figure #14**. Gauge valves should be normally open. To remove dirt from gauge glass petcock may be opened to flush out the glass.

Radiator valves on one-pipe steam system must be either wide open or tightly shut. Do not attempt to regulate room temperature by partially closing the radiator valve.

Air vents on steam radiators and the supply main release air from the system. If radiators do not heat satisfactorily, make sure the air vents are clean and operational.

The lever of the pressure relief valve on the boiler (**Figure #14**) should be operated periodically to make sure that it is functioning properly.

Safety valve should open before the steam pressure exceeds the 15 psi. reading on the gauge. (**Figure #14**) If this pressure is exceeded and the safety valve does not open, it must be replaced. If the safety valve leaks steam when the boiler is operating at normal pressures, it should be immediately replaced. Corrosion can build up rapidly at the valve seat and prevent its functioning as a safety device.

If the water in a steam boiler appears to be dirty or oily, or the water level in the gauge glass fluctuates considerably, the boiler should be cleaned. A competent service person will use approved cleaning compounds and properly clean and flush out the boiler. He/she should also clean or replace air vents and traps, clean flue passages and check for proper operation of all controls and safety devices.

The venting system should be inspected at the start of each heating season. Check the vent pipe from the boiler to the chimney for signs of deterioration by rust or sagging joints. Repair if necessary.

Impurities in boiler water of a steam boiler may cause foaming and an unsteady water line, or prevent steam generation. They may result in objectionable odors escaping from the vents on water boilers. This condition is caused by oil, grease, and sediment from pipe fittings collecting within the boiler and can be remedied only by giving the boiler a thorough cleaning.

BOILERS SHOULD BE CLEANED BY SKIMMING OR BLOWING DOWN.

NOTICE

Do not leave Boiler unattended during cleaning/skimming process.

Skimming Off Impurities

Some of the impurities in the boiler water will float on the water and must be skimmed off.

With the boiler empty and cool, slowly begin to add water. After water has entered boiler - never before - turn "on" oil burner and adjust water flow so that the water being added is kept just below boiling point. Avoid boiling and turbulence.

Gradually raise hot water level to skimming hole (**Figure #7**) installed on the rear section of the boiler being careful not to raise it above the opening of the hole. Skim until there are no impurities. Repeat the process if necessary.

Water may be checked to make sure it is free from oil by drawing off a sample at the skimming hole. If the sample is reasonably free from oil, it will not froth when boiled on stove. This test does not indicate the amount of sediment which may lay in the bottom of the boiler. It is therefore necessary that the boiler be further cleaned by "blowing down."

Blowing Down The Boiler

Before blowing down the boiler, fill it to the water line. Turn on burner and allow five pounds of steam pressure to build up. Run a temporary connection from one of the drain valves to a nearby sewer. Connect to a drain valve on the opposite end of the boiler from feed water inlet, if possible. Shut off the oil burner, open drain valve and blow down the entire contents of boiler.

Allow boiler to thoroughly cool and slowly refill to water line. Repeat as many times as required until blow off water is clear. Owner should blow down boiler at least once each month of the heating season.

Using Cleaning Compound

If an exceptional amount of dirt or sludge seems to be present in the boiler, a boiler cleaning compound made by a reputable manufacturer may be used according to the instructions of the manufacturer of the compound. When any type of cleaning compound is used, care must be taken to thoroughly flush all traces of the compound out of the boiler.

Following blow down allow the boiler to cool. Add fresh water slowly. Be certain to blow enough times as required to remove compounds from system.

The area around the boiler must be kept clear and free of combustible materials, gasoline and other flammable vapors and liquids.

The free flow of combustion and ventilation air to the boiler and boiler room must not be restricted or blocked.

Periodic inspection and tightening of the tankless heater/cover plate bolts will reduce the risk of leaks. See parts 3 and 5 under "*Coil and Cover Plate Replacement Parts.*"

Electronic Low Water Cut-Off

Operation of the probe and control should be checked, with the burner on, by draining the water via the drain on the bottom of the boiler. This will drain the water quickly from the boiler and break the circuit to the burner. If it does not inspect the probe for scaling. If scaling is present, clean off the probe, refill the boiler until the ELWCO is satisfied, and perform the check again.

It is suggested that a qualified service agency be employed to make an annual inspection of the boiler and heating system. They are experienced in making the inspections outlined above and, in the event repairs or corrections are necessary, can make the proper changes for safe operation of the boiler.

SERVICE CHECKLIST

Inspect Chimney and Flue Pipe	[X]	Controls and Safety Devices	[X]
Inspect and Clean Appliance	[X]	Nozzle-Size, Angle, Type	[*]
Inspect Oil Line - Size/Leaks	[X]	Pump Pressure/Vacuum	[*]
Inspect Electrical Connections	[X]	Line Voltage/Motor Amps	[*]
Install New Filter	[X]	Smoke Test	[*]
Room Make-up Air	[X]	Draft-Overfire/In Flue	[*]
Electrode Setting	[X]	CO ₂ or O ₂	[*]
Proper Light-Off (Hot & Cold)	[X]	Flue Gas Temperature	[*]

* Measure with instruments and record results below.

SERVICE RECORD											
Date	Nozzle			Pump Pressure PSI	Line Voltage	Motor Amps	Smoke#	Draft		CO ₂ or O ₂	Flue Temp °F
	Size	Angle	Type					O.F.	INF		

SERVICE RECORD

Date	Service Performed	Company Name & Tech Initials	Company Address & Phone #

IMPORTANT

In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases.

This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is not used for any space heating
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil.