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3. VENTING

A. CHIMNEY OR VENT

1. Inspect the existing chimney or vent system. Make sure it is in good condition. Inspect chimney liner and repair or replace if necessary.

2. The vent system and installation must be in accordance with Venting of Equipment chapter of the current edition of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54, or applicable provisions of the local building codes.

3. Chimney/Vent Operation: The vent system must be sized and installed to provide the draft needed to remove all combustion products. If the vent system does not provide enough draft, combustion products will spill into the building from the draft hood relief opening. If spillage of combustion products occurs, check the vent system, the combustion and ventilation openings and make sure the boiler room is never under negative pressure.

⚠ WARNING

Failure to provide adequate venting can result in severe personal injury or death.

4. Vent Connection to Boiler:
   a. Support the weight of the vent system independently of the boiler draft hood. The draft hood is not designed to carry structural loading.
   b. Provide support of the vent connector (breeching) at maximum 12 foot intervals to prevent sagging and to provide a minimum upward slope of 1/4" per foot.
   c. Do not connect the vent for this boiler into any vent system which operates with positive pressure.
   d. The vent connector must be single wall steel or Type B double wall vent pipe. The vent connector must be Type B double wall if it is located in or passes through cold areas. The vent connector must extend into, but not beyond, the inside wall of the chimney.

B. AUTOMATIC VENT DAMPER INSTALLATION – GENERAL

1. Do not use one vent damper to control two or more heating appliances. See Figure 3.1.

2. Follow these and the installation instructions included with the vent damper. Observe the cautions and warnings that accompany all instructions.

3. Provide minimum 6 inch (152 mm) clearance between automatic vent damper and combustible construction. Increase clearance if required by vent damper manufacturer's instructions. Provide adequate space for vent damper access and service.

4. The automatic vent damper can be mounted directly onto the draft hood outlet or in vent piping close to the boiler.

   See Figure 3.2 for installation with vent damper mounted in vertical position. See Figure 3.3 for installation with vent damper mounted in horizontal position. Mount the unit to avoid excessive heat on the operator or condensation drips into the operator.

Figure 3.1: Venting Multiple Appliances

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a. Orient the vent damper operator to facilitate connection of the vent damper harness to knockout on right side of boiler.

b. Orient vent damper direction arrow in direction of vent gas flow. Direction arrow must be visible from front of boiler.

⚠ CAUTION

Damper must be in open position when main burners are operating.

Le registre doit être en position ouverte lorsque le brûleur principal de l'appareil fonctionne.

Figure 3.2: Venting with Vent Damper in Vertical Position

C. BOILER REMOVAL FROM COMMON VENTING SYSTEM

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances connected to it.

At the time of removal of an existing boiler, follow these steps 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 de retirer une chaudière existante, il e important de suivre les étapes suivantes pour chac appareil raccordé au système d'évacuation commu sont en service, alors que les autres appareils demeurant raccordés au système d'évacuation commun ne sont pas en service :

a. Seal any unused openings in the common venting system.

Sceller toute ouverture du système d'évacuation commun non utilisée.

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.

Effectuer un contrôle visuel du système d'évacuation pour vérifier la taille et la pente horizontale et s'assurer qu'il n'existe aucun blocage ou obstruction, fuite, corrosion ni tout autre problème pouvant menacer la sécurité.

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 any clothes dryers and any appliance not connected to common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

Dans la mesure du possible, fermer toutes les portes et fenêtres de l'immeuble ainsi que toutes les portes entre l'espace dans lequel les appareils qui demeurent raccordés au système d'évacuation commun se trouvent et le reste de l'immeuble. Mettre en marche les sécheuses et tout autre appareil non raccordé au système d'évacuation commun. Mettre en marche tous les ventilateurs aspirant, tels que les hottes de cuisinière et les ventilateurs de salle de bain, en les faisant fonctionner à vitesse maximum. Ne pas faire fonctionner les ventilateurs aspirant d'été. Fermer les registres de foyers.

Figure 3.3: Venting with Vent Damper in Horizontal Position

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d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

   Mettre en service l'appareil à inspecter. Suivre les instructions concernant l'allumage. Régler le thermostat afin que l'appareil fonctionne sans arrêt.

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.

   Vérifier toute fuite à l'orifice de décharge du coupe-tirage après que le brûleur ait fonctionné pendant 5 minutes. Utiliser la flamme d'une allumette ou d'une chandelle ou encore 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 conditions of use.

   Après avoir établi que les résidus de combustion de chaque appareil qui demeure raccordé au système commun sont adéquatement évacués lorsque soumis au test décrit ci-dessus, remettre en place les portes, fenêtres, portes intérieures, ventilateurs aspirants, registres de foyer et appareils fonctionnant au gaz.

g. Any improper operation of the common ventir system should be corrected so that the installat conforms with the current edition of the *Natior Fuel Gas Code*, ANSI Z223.1/NFPA 54 and/or CAN/CSA B149.1, *Natural Gas and Propane Installation Code*. 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 the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 and/or CAN/CSA B149.1, *Natural Gas and Propane Installation Code*.

   Tout fonctionnement inadéquat du système d'évacuation commun doit être corrigé de manière à respecter les normes du **National Fuel Gas Code,** ANSI Z223.1/NFPA 54 et/ou des Codes d'installation CAN/ACG B149**.** Lorsqu'il est nécessaire de modifier les dimensions de toute portion du système d'évacuation commun, ces dernières doivent être modifiées de manière à respecter les dimensions minimums indiquées dans les tableaux du chapitre « Sizing of Category I Venting Systems » du **National Fuel Gas Code,** ANSI Z223.1/NFPA 54 ou des Codes d'installation CAN/ACG B149.

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4. BOILER PIPING

A. WATER BOILER PIPING – SINGLE BOILER

1. Refer to the *PB Heat Water Installation Survey and Hydronics Institute Residential Hydronic Heating Installation Design Guide*.

2. Figure 4.1 shows typical supply and return piping for a boiler system. If the system expansion tank is located on the boiler loop, it should be located on the supply side of the boiler with the system circulator pumping away from the expansion tank connection.

Figure 4.1

3. If the boiler is piped in a secondary loop separate from the system expansion tank, the boiler circulator should be located on the return side of the boiler pumping away from the common piping.

4. Return water should not reach the boiler return connection at less than 130°F under normal operating conditions. If the system return temperature is expected to be below 130°F the boiler should be piped in a secondary loop with a bypass arrangement to assure water returning to the boiler is above 130°F. For more information on bypass piping consult the *PB Heat Water Installation Survey*.

5. If the boiler and distribution system is used in conjunction with a refrigeration system, pipe the chilled medium in parallel with the boiler and provide isolation valves to prevent chilled water form entering the boiler. See Figure 4.2.

6. If the boiler is connected to a heating coil in a forced air combination heating and cooling system, install flow control valves to prevent gravity circulation of the boiler water during cooling cycles.

7. A hot water boiler installed above radiation level or as required by the Authority having jurisdiction, must be provided with a low water cut-off device either as part of the boiler or at the time of installation.

Figure 4.2: Piping to Isolate Boiler from Chilled Medium on Chiller Systems

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B. WATER BOILER PIPING – MULTIPLE BOILERS

Refer to the *PB Heat Water Installation Survey and Hydronics Institute Residential Hydronic Heating Installation Design Guide* for guidance on multiple boiler installations.

C. STEAM BOILER PIPING – SINGLE BOILERS

1. Refer to the *PB Heat Steam Installation Survey and Hydronics Institute Residential Hydronic Heating Installation Design Guide* for guidance.

2. Install steam supply pipes as shown in Figure 4.3 for Model 63-03 to 64-07 and Figure 4.4 for Model 64-08 to 64-12. The minimum quantity and size of supply pipes are indicated in Table 4.1.

Use Threaded Fittings for Manifold Piping

Figure 4.3: Steam Piping – Single Supply Connection

⚠ NOTICE

Use swing joints to attach to the header to avoid damage to the boiler due to thermal expansion and contraction of steam header pipe.

3. Pipe the steam header a minimum of 24" abov normal water line using swing joints to attach t risers into the steam header.

Use Threaded Fittings for Manifold Piping

Figure 4.4: Steam Piping – Dual Supply Connections

⚠ NOTICE

- **Do not use bushings or concentric reducers in the horizontal header piping. This will prevent water from dropping into the equalizer and cause water carryover into the steam piping.**
- **Do not reduce the size or number of steam supply risers below the minimum shown in Table 4.1. Insufficient or undersized risers can cause damage to the boiler.**
- **Do not use a bullhead tee to provide steam supply to the system. This will cause water carryover into the steam piping.**

4. Use threaded fittings for manifold piping to provide flexibility for thermal expansion.

5. Connect the equalizing line as shown in Figure 4.3 or 4.4 assuring that the reducing elbow is facing down and that any bushings are vertical to prevent water build-up in the steam header.

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6. The use of a Hartford Loop in all installations is recommended to ensure reliability of the system. A check is required on the pump discharge of all pumped return systems.

7. On pumped return systems, install a globe valve after the pump to allow throttling of the pump discharge. The pressure downstream of the boiler cock should be no more than 5 psig above the boiler operating pressure.

⚠ NOTICE

Always locate the steam supply take-off of the main header between the equalizer and the last boiler supply riser. Locating the steam supply between the risers will cause a bullhead tee and cause water carryover into the system.

8. Pipe the Hartford Loop such that the top of the close nipple is 2 to 4 inches below the boiler normal water line.

9. If the boiler feed pump discharge piping is elevated at any point above the boiler water line, install spring-loaded check valves at both the pump discharge and at the connection to the boiler.

Table 4.1: Steam Supply and Header Pipe Sizing

Boiler Model	Number of Supply Connections	Supply Size (NPS)	Header Size (NPS)	Equalizer Size (NPS)	Evaporation Rate (GPM)
63-03L	1	2	2	1-1/4	0.11
63-03	1	2	2	1-1/4	0.15
63-04L	1	2-1/2	2-1/2	1-1/4	0.19
	2*	2*			
63-04	1	2-1/2	2-1/2	1-1/4	0.23
	2*	2*			
63-05L	1	3	3	1-1/4	0.27
	2*	2*			
63-05	1	3	3	1-1/4	0.31
	2*	2*			
63-06	1	3	3	1-1/4	0.37
	2*	2-1/2*			
64-07	1	3	3	1-1/2	0.45
	2*	2-1/2*			
64-08	2	2-1/2	4	1-1/2	0.52
64-09	2	3	4	1-1/2	0.60
64-10	2	3	4	1-1/2	0.67
64-11	2	3	4	1-1/2	0.75
64-12	2	3	5	1-1/2	0.82

*Dual supplies may be used in lieu of larger single supply on 63-04L through 64-07 as indicated.

D. STEAM BOILER INDIRECT WATER HEATER PIPING

1. See Figure 4.5 for typical installation.

2. Install Boiler Water Temperature Limit Control in 1" Tee on supply connection (same side of boiler as low water cut-off). Set Limit at 160°F to avoid steam generation during periods when only the domestic water is calling for heat.

3. Install circulator and strainer in supply piping. Install check valve to prevent gravity circulation.

⚠ NOTICE

Maintain water level near normal water line to avoid steam generation during periods when only the domestic water is calling for heat.

Tank performance reduced when supplied by steam boiler.

Figure 4.5: Typical Steam Boiler Indirect Water Heater Piping

E. STEAM BOILER PIPING - MULTIPLE BOILERS

Refer to the *PB Heat Steam Installation Survey and Hydronics Institute Residential Hydronic Heating Installation Design Guide* for guidance on multiple boiler installations.

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5. FUEL PIPING

A. INSTALLATION

1. Pipe gas to the boiler in accordance with local codes. In the absence of local regulations refer to the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54.

2. Size and install the gas supply piping to provide a supply of gas sufficient to meet the maximum demand of all appliances without excessive pressure drop.

3. The rate of gas to be provided to the boiler can be determined by:

$$CFH = \frac{\text{Boiler Input } (BTU/HR)}{\text{Gas Heating Value } (BTU/FT^3)}$$

   Obtain the gas heating value of the gas from the gas supplier. As an alternative use Table 5.1.

4. Table 5.2 shows the maximum flow capacity of several pipe sizes based on 0.3 inches of water pressure drop. These values are based on a specific gravity of 0.60. Apply the factors indicated in Table 5.3 for gas with specific gravity other than 0.60 to obtain corrected capacities.

Table 5.2: Maximum Capacity of Pipe in CFH for a Pressure Drop of 0.3" of Water

Based on Specific Gravity of 0.60					
Pipe Length (Feet)	1/2" Pipe	3/4" Pipe	1" Pipe	1-1/4" Pipe	1-1/2" Pipe
10	132	278	520	1,050	1,600
20	92	190	350	730	1,100
30	73	152	285	590	890
40	63	130	245	500	760
50	56	115	215	440	670
60	50	105	195	400	610

Table 5.3: Maximum Capacity Correction Factors Specific Gravity other than 0.60

Specific Gravity	0.50	0.55	0.60	0.65	0.70	0.75
Correction Factor	1.10	1.04	1.00	0.96	0.93	0.90
Specific Gravity	0.80	0.85	0.90	1.00	1.10	1.20
Correction Factor	0.87	0.84	0.82	0.78	0.74	0.71
Specific Gravity	1.30	1.40	1.50	1.60	1.70	1.80
Correction Factor	0.68	0.66	0.63	0.61	0.59	0.58

B. OPERATION

1. Assure that the gas supply pressure to the boiler is regulated to 1/2 psi or less (approx. 13.5 inches of water).

2. Install a service valve, sediment trap, and ground joint union at the gas supply connection as shown in Figure 5.1.

⚠ CAUTION

Use a pipe joint sealing compound that is resistant to the action of liquefied petroleum gas. A non-resistant compound may lose sealing ability in the presence of this gas, resulting in a gas leak and fire or explosion potential.

Table 5.1: Gas Input & Valve Inlet

Model	Gas Input[1] (CFH)		Gas Valve Inlet[2] (NPT)	
	Nat. Gas	LP Gas	Nat. Gat	LP Gas
63-03L	88.5	35.4	1/2"	1/2"
63-03	118.0	47.2		
63-04L	147.5	59.0		
63-04	177.0	70.8		
63-05L	206.5	82.6	3/4"	3/4"
63-05	236.0	94.4		
63-06	287.5	115.0		
64-07	345.0	138.0		
64-08	399.0	159.6		
64-09	460.0	184.0	1"	
64-10	517.5	207.0		
64-11	575.0	230.0		
64-12	632.5	253.0		

1. Natural Gas Based on 1000 Btu./Cubic Foot, LP Gas Based on 2500 Btu./Cubic Foot.
2. See instructions for sizing gas supply piping.

3. Check piping for leaks. Use an approved gas detector or a non-corrosive leak detection fluid. If leaks are found, turn off all gas supply to the appliance and repair as necessary.

4. The boiler and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5kPa).

   The boiler must be isolated from the gas supply piping system by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).

⚠ CAUTION

Do not subject the boiler gas valve to pressure in excess of 1/2 psi (3.5 kPa). Doing so may damage the valve.

Figure 5.1

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5. Refer to table 5.4 for minimum supply pressure for the purpose of input adjustment.

Table 5.4: Minimum Supply Pressure Natural Gas

Model	Supply Pressure (in. Water)
63-03L	5.00
63-03	5.00
63-04L	5.00
63-04	5.00
63-05L	5.00
63-05	5.00
63-06	5.00
64-07	5.00
64-08	5.50
64-09	5.00
64-10	5.00
64-11	5.00
64-12	5.00

6. Install the boiler such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap clean out, control replacement, etc.)

7. The boiler and its gas connection must be leak tested before placing the boiler in operation.

Figure 5.2: Gas Train Manifold 63-03L Through 63-06

8. Typical gas train manifolds are illustrated in Fig 5.2 through 5.4.

Figure 5.3: Gas Train Manifold – 64-07/08

Figure 5.4: Gas Train Manifold – 64-09 Through 64-12

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6. CONTROLS & TRIM

A. STEAM BOILER CONTROLS & TRIM

1. Safety Valve:
   a. Pipe the boiler safety valve provided into the 3/4" tapping on the left side of the boiler as shown in Figure 6.1. Be sure that the relief valve is sized in accordance with local code requirements. In addition, be sure that the safety valve is designed constructed and stamped in accordance with the ASME Boiler and Pressure Vessel Code, Section IV.

Figure 6.1

   b. If it is necessary to use a boiler relief valve larger than 3/4" due to local codes, the relief valve should be piped in the boiler skim tapping. **Do not increase the pipe size between the boiler and the valve.**

   c. Pipe the discharge of the safety valve to a maximum of 12" from the floor. Pipe the outlet close to a floor drain.

2. Drain Valve:

   Install the 3/4" drain valve provided into the drain tapping on the right hand side of the boiler. Refer to Figure 6.2 for tapping location.

Figure 6.2: Steam Boiler Tapping Location

3. Low Water Cut-off (Level Control):
   a. **Float Type:** Install the float type low water cut-off (if provided) in conjunction with the gauge glass as shown in Figure 6.3.
   b. **Probe Type:** Install the optional probe type low water cut-off into the 3/4" tapping on the right side of the boiler. Refer to Figure 6.2 for tapping location. The supplied control incorporates a 60 second off cycle after a 15 minute on cycle. This feature allows the water level in the boiler to settle so that the probe can sense a true water level.

Figure 6.3: Gauge Glass & Low Water Cut-Off Installation

4. Gauge Glass:
   a. Install the gauge glass provided into two 1/2" tappings on the right side of the boiler. If a float type low water cut-off is used, it will be piped into these same fittings. See Figure 6.3 and 6.4 for examples of this installation.

Figure 6.4: Gauge Glass Installation

5. Pressure Gauge:
   a. Install the operating limit control and pressure gauge in the 3/4" tappings located on the right side of the boiler. Refer to Figure 6.2 for tapping location.

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6. Limit Control(s): (Figure 6.5)
   a. Install the operating limit control and pressure gauge in the 3/4" tappings located on the right side of the boiler.
   b. (64-09 through 64-12) Install a high limit control in the 3/4" tapping on the right side of the boiler.

Figure 6.5: Limit Control Installation

⚠ IMPORTANT

In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, water boilers are 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.**

B. WATER BOILER CONTROLS & TRIM

1. Safety Relief Valve:
   a. Pipe the boiler relief valve into the 3/4" tapping on the left side of the boiler as shown in Figure 6.6. Be sure that the relief valve is sized in accordance with local code requirements. In addition, be sure that the relief valve is designed constructed and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section IV.

Figure 6.6: Relief Valve Piping Water Boiler

   b. If it is necessary to use a boiler relief valve larger than 3/4" due to local codes, the relief valve should be piped in the boiler skim tapping. **Do not increase the size between the boiler and the valve.**

⚠ CAUTION

Do not install any valves or restrictions between the relief valve and the boiler. Be sure that the inlet to the relief valve is the same or smaller pipe size than the boiler connection.

   c. Pipe the discharge of the safety relief valve to a maximum of 12" from the floor. Pipe the relief outlet close to a floor drain.

⚠ CAUTION

Pipe the discharge of the relief valve away from any traffic area. Failure to do this may cause injury if the valve discharges.

⚠ CAUTION

Pipe the discharge of the relief valve using the full size of the discharge connection.

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2. Drain Valve:

   Install the 3/4" drain valve provided into the drain tapping on the right hand side of the boiler. Refer to Figure 6.7 for tapping location.

3. Pressure/Temperature Gauge:

   Install the pressure/temperature gauge (theraltimeter) supplied with the boiler into the 1/2" tapping located on the right side of the boiler. Refer to Figure 6.7 for tapping location.

4. Limit Control(s):

   a. Install the operating limit control provided in the 3/4" tapping located on the right side of the boiler. Refer to Figure 6.7 for tapping location.

   b. (64-09 through 64-12) Install a high limit control in the 3/4" tapping located above the operating limit control. Refer to Figure 6.7 for location.

Figure 6.7: Water Boiler Tapping Locations

5. Low Water Cut-off (Level Control)

   a. A hot water boiler installed above radiator or as required by the authority having juris must be provided with a low water cut-off device either as part of the boiler or at the time of installation.

   b. If a probe-type low water cut-off is used it should be piped into the boiler supply piping as shown in Figure 6.8.

Figure 6.8: Probe Low Water Cut-off Piping

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7. ELECTRICAL

A. CONNECT SUPPLY WIRING

1. All electrical wiring must be done in accordance with local codes. In the absence of local codes use ANSI/NFPA 70 "The National Electrical Code."

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

⚠ AVERTISSEMENT

Identifier tous les câbles avant de les débrancher au moment d'effectuer l'entretien des commandes. Des erreurs dans le raccordement des câbles d'alimentation peuvent causer un fonctionnement inadéquat et dangereux. Vérifier le bon fonctionnement après les travaux d'entretien.

2. The boiler must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code,* ANSI/NFPA 70 and/or the *Canadian Electrical Code* Part 1, CSA C22.1, Electrical Code.

3. The boiler is to be connected to a separate, permanently live electrical supply line with a fused disconnect switch.

B. MOUNT REMAINING CONTROLS

1. Steam Boilers – Mount the control transformer on the junction box as shown in Figure 7.1.

Figure 7.1: Steam Boilers

2. Mount the blocked vent switch in the rear of the boiler on the draft hood as shown in Figure 7.2.

Figure 7.2

3. Mount the flame rollout switch as shown in Figure 7.3.

Figure 7.3

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4. Mount the ignition module as shown in Figure 7.4.

Figure 7.4

C. INSTALL CONTROL WIRING

1. Wire the boiler according to the wiring diagram supplied with the boiler (in the Control Envelope). Figures 7.5 to 7.9 are provided for reference only.

2. Install all line voltage wiring in approved electrical conduit.

3. Do not install single pole switches, including safety controls, in the neutral leg.