

HIGHLANDER

WOOD-FIRED BOILER

OWNER'S MANUAL

IMPORTANT

READ OWNER'S MANUAL THOROUGHLY BEFORE INSTALLING BOILER OR LIGHTING FIRE.

CONSULT LOCAL AUTHORITIES IF IN DOUBT ABOUT YOUR LOCAL FIRE SAFETY REGULATIONS.

CONSULT LOCAL AUTHORITIES IF IN DOUBT ABOUT YOUR LOCAL FIRE SAFETY REGULATIONS.

ALL INSTALLATIONS MUST BE MADE IN ACCORDANCE WITH LOCAL AND STATE OR PROVINCIAL CODES WHICH MAY DIFFER FROM THIS MANUAL.

IMPROPER INSTALLATION WILL RESULT IN VOIDING OF WARRANTY.

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SPECIFICATIONS

Cabinet	Length	36"
	Width	22"
	Height	36"
Shipping Weight		600 lb.
Fire Box	Length	36"
	Width	16"
	Height	26"
Water Volume	US Gallons	26.10
	IMP. Gallons	21.73
	Liters	98.80
Heat Exchanger		3/16" & 12-gauge steel
Fire Box Door	Cast Iron	13" x 13"
Supply		1 1/4"
Return		1 1/4"
Smoke Pipe		7" Inside Diameter
Smoke pipe exit		Top
Output (max)		70,000 Btu/h
Fuel		Wood 30" logs maximum
Boiler Water Volume		26.0 U.S. gal.
Domestic Hot Water Coil		Optional
Electrical Rating:		Volts 120, 15 Amps
Expansion Tank Size (recommended)		12" Dia. x 36" min. size

NOTE – Keep this manual in a safe place for future reference. Follow manual carefully for the correct way to install and operate this unit.

CAUTION – Do not fire this unit until operating instructions have been read and fully understood.

INSTALL WOOD-FIRED BOILER ONLY ON A FLUE SYSTEM AND CHIMNEY THAT ARE IN GOOD CONDITION.

SAVE THESE INSTRUCTIONS

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1.0 OPERATING INSTRUCTIONS

1.1 INTRODUCTION

Congratulations on your purchase of the Highlander Wood-Fired Boiler. Developed in Atlantic Canada, this boiler has been designed to allow you to heat your home with wood, one of North America's most abundant fuels. The heat exchanger materials meet ASME (American Society of Mechanical Engineers) requirements for domestic boilers. Designed with you in mind, the Highlander will provide you with many years of safe and efficient central heating.

To ensure you have a clear understanding of the operating procedures of this boiler, please take the time to read the remainder of this section on operating procedures.

1.2 WOOD-BURNING

The boiler will burn most wood fuels; however it is recommended that only dry seasoned hardwood be used as much as possible since it affords cleaner, safer and more efficient operation. Burning seasoned hardwood will leave less ash, soot and creosote residue and will require fueling less often. Use smaller loads of wood on warmer days.

WARNING: **DO NOT** use chemicals or fluids to start the fire or during operation.
DO NOT burn driftwood or manufactured logs (compressed wood).

Before adding fuel to an existing fire turn up the thermostat for about five minutes or lift damper chain to hold damper fully open for about one minute before opening the loading door. This action will allow residual smoke to clear from the combustion chamber and reduce smoke entering the basement during refueling.

Twice daily refueling may be sufficient in modern well-insulated homes. However, we recommend that small fuel loads be added morning, noon and early evening and late evening, rather than large quantities infrequently. A small intense fire will burn more efficiently than a large smoldering fire in the boiler and will produce less creosote.

When refueling, the remaining coals should be raked to the front of the combustion chamber before adding any new fuel. New fuel shall be placed on and behind the hot coals. This will help create a more even and efficient burn. The operator should attempt to gauge fuel quantities with outdoor temperatures; a little practice will provide greater satisfaction and efficiency.

WARNING: This Boiler is not to be used with an automatic stoker.

Keep firing door tightly closed and maintain door seal in good condition.

CREOSOTE

Wood combustion is never 100% complete. Wood smoke always contains some unburned gases and a mixture of unburned tar-like liquids. A percentage of these materials will condense out on any cool surface, leaving a dark brown or black substance with an unpleasant acrid odour. This substance is commonly called creosote.

If these wood gases condense out on cool surfaces such as a cold chimney or a long smoke pipe they retain large amounts of water and will be very fluid. At higher temperatures the condensed creosote will resemble tar (thick and tacky).

Creosote generation is highest during low heat outputs common with long smoldering burns. Creosote generation is lowest during high heat outputs common with intense fires. It is recommended that a small intense fire be used for best results against creosote build up even though the boiler will require refueling more often.

Creosote generation is also higher when burning green wood. The moisture in the green wood absorbs the heat from the fire, cooling the fire below the point at which the creosote can be consumed. The low temperature smoke is then further cooled in the upper boiler chamber; smoke pipe and chimney allowing large amounts of creosote to form.

To reduce creosote build-up during periods of low heat requirements (i.e. Spring and Fall) it is recommended to fuel the boiler with smaller quantities of smaller diameter logs. Matching fuel loads and heat requirements will result in cleaner combustion and higher efficiency.

IN CASE A SERIOUS CREOSOTE FIRE BEGINS:

- a) Close the damper door by disconnecting chain.
- b) Close all draft regulators.
- c) Throw 1/2 lb. of coarse or table salt on the fire and close door immediately.
- d) Call the FIRE DEPARTMENT at once!

Have a firmly established Emergency Procedure in place for the handling of a flue fire.

1.3 STORAGE OF WOOD

Once cut, green wood dries (or seasons) quickly at first and then at a slower rate. When the wood has been cut to the proper length and split, it should be piled outside during the summer months. Place two poles on the ground to serve as rails to keep the firewood off the moist ground. Stack the wood so that both ends of the logs are exposed to the air if space is available, since more drying occurs through the cut ends than through the sides. This is true even with wood that has been split. The woodpile should be under cover so that it will not absorb moisture from the rain and snow before it is used, but still open on the sides and ends to the drying effect of the wind and sun. Store wood in neat, well-supported piles.

DO NOT store wood within installation clearances or within the space required for charging or ash removal.

1.4 MAXIMUM SOLID-FUEL CHARGE

The maximum level for a solid-fuel charge is the middle of the loading door or the level of the handle. **DO NOT** overfill or extreme over-heating may result, causing warpage or damage to the boiler. The boiler will accept whole or split logs up to 34" (864 mm) long but a 30" (762 mm) log length is recommended for convenience and ease in handling. Maximum damper gate opening is 11/16". Do not tamper or adjust to greater opening in an attempt to increase fire or over-firing and hazard may result.

1.5 MAINTENANCE

Some regular maintenance is necessary on the boiler. A good practice is to establish a routine for the storage of fuel, care of the appliance and firing techniques.

1.5.1 CLEANING

The boiler must be cleaned regularly to maintain top efficiency. The boiler needs cleaning more often when burning green wood or during long periods of low fire. When the boiler is first installed the heat exchanger should be checked visually from the firebox and smoke pipe hole every week to determine the rate at which creosote or ash is accumulating within the Boiler. Cleaning should be done whenever there is more than 1/4" of build-up on the heat exchanger or 3" of ash in the base. If the boiler is to be left unused for an extended period of time (more than one month) then the appliance should be cleaned of all ash and residual left from the burning of wood.

CLEANING PROCEDURE:

- 1) Make sure fire is completely out and the Boiler has cooled.
- 2) Remove the smoke pipe located on the top of the Boiler.
- 3) Remove the overhead baffle in the combustion chamber if necessary.
- 4) The heat exchanger is now accessible for cleaning.
- 5) Use the scraper provided to remove all soot and ash from the boiler heat exchanger and exposed surfaces.
- 6) Always check flue pipe for creosote or ash build-up in the pipe and clean if necessary.
- 7) Reinstall smoke pipe making sure that all joints are secured with at least 3 sheet metal screws. Also reinstall the overhead baffle.
- 8) Check chimney cleanout for ash build-up and remove any accumulation.
- 9) Residue may be removed from the firebox or left to be burned during the next fire. It is good practice to leave a layer of ash approximately one inch deep in the base of the firebox.

DISPOSAL OF ASHES

Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

WARNING – Ashes usually contain live dormant coals, which may burn for many hours after a recognizable flame has disappeared. Use extreme caution when handling and disposing ashes.

IMPORTANT – No other waste shall be placed in this container.

1.6 SAFETY

If the boiler overheats due to improper operation the following precautions should be taken:

- 1) **DO NOT** shut off power. The circulation pump must be kept running to disperse excessive heat.
- 2) Manually close the damper door by unhooking the chain.
- 3) Increase all thermostats in the house to maximum to help disperse excessive heat.
- 4) Excessive heat caused by extreme over-firing or a control malfunction may cause the relief valve to blow off water/steam into the firebox. Do not be alarmed. The relief valve will reseal when the excessive pressure has been released.
- 5) Do not add more fuel until you are certain that all controls are functioning properly and no damage has been done to the boiler.

WARNING – The maximum opening of the combustion air damper is preset at the factory. **DO NOT** adjust the stop or attempt to increase the combustion air by any means.

1.7 ELECTRICAL POWER FAILURE

If no one is home during a power failure, the safety bypass zone valve will automatically open and some gravity heating will take place. The damper door will automatically close but combustion air will continue to enter through the secondary air holes and a fire should be maintained. For optimum heating during a power failure follow the procedure listed below:

- 1) Manually open all zone valves and flow check valves to allow gravity flow to all areas (Check with your installer).
- 2) Place a coin under the damper flap in such a way that it will fall clear when power is restored and the damper motor operates.
- 3) Maintain a careful watch on the boiler water temperature. If it should exceed 200°F (95°C) close the damper door.
- 4) Do not leave the boiler unattended in this position.
- 5) Refuel frequently with a small load to maintain a small fire at 1/2 normal maximum volume.
- 6) Do not expect to maintain maximum comfort under no power conditions.
- 7) Do not allow anyone who is unfamiliar with the operation of the Boiler to attend it during a power failure.

1.8 HOMEOWNER CHECKLIST

- a) Keep area around the boiler clean and clear of combustibles.
- b) Use only dry wood. **DO NOT** burn garbage, gasoline, naphtha engine oil or any other combustible liquid.
- c) Remove ashes as directed.
- d) Watch for soot in smoke pipe – clean regularly.
- e) Clean Boiler heat exchanger regularly.
- f) Be aware of danger due to overfiring unit.
- g) Do not load above maximum loading level (middle of loading door) or overheating may result.
- h) This unit is NOT suitable for automatic stoking.
- i) Load carefully. Do not slam fuel against rear or sides of firebox. This may damage the brick lining. See diagram TW-6 to order and install replacement firebrick.
- j) Always observe the following minimum clearances to combustible materials;

Front	48"	(1220 mm)
One side	6"	(152 mm)
Opposite side and rear	24"	(610 mm)
Flue pipe	18"	(465 mm)
Floor	non-combustible.	
- k) Do not store solid fuel within the above clearances or within the space required for charging and ash removal.
- l) Keep firing door closed and maintain seals in good condition.
- m) Establish a routine for storage of fuel, care of the appliance and firing techniques.

2.0 INSTALLATION INSTRUCTIONS

2.1 INTRODUCTION TO INSTALLERS

Before installing this boiler, please read the following instruction manual carefully. This unit is designed to be a freestanding central heating boiler or as an add-on to operate in conjunction with existing hydronic heating systems to provide complete central heating in medium sized well-insulated homes. Before installing be sure unit is properly sized for the intended application. Warranty does not cover misapplication of unit.

Applicable Standards

The boiler must be installed in accordance with the requirements of the National Fire Protection Association codes, the Canadian Heating, Ventilation and Air Conditioning Code, The National Board of Fire Underwriters, and the C.S.A. Standards for solid fuel burning equipment as outlined in B365-01. In all cases consult your local authorities and fire insurance company for specific regulations.

2.2 UNCRATING

When you receive the boiler, check it carefully to ensure that all components are present and in good condition. If there has been any damage or loss in transportation, please notify the carrier and retailer at once.

NOTE: Some parts may be packed inside boiler firebox.

Inspect for the following:

- 1) Firebox/Heat exchanger
- 2) Poker/Coals rake
- 3) Cabinet
- 4) Barometric damper
- 5) Firebrick (Factory installed in base) See diagram TW-6 for detail.
- 6) Front insert
- 7) Overhead baffle
- 8) Cast door handle assembly
- 9) Controls package
- 10) Optional domestic hot water coil

Control Package includes:

- 1) Dual aquastat, 1/2" well
- 2) Single aquastat with 1/2" well
- 3) Damper Motor
- 4) N/O Zone valve, and fittings
- 5) Pressure relief valve
- 6) Tridicator
- 7) Transformer 120/24V
- 8) Wiring Harness and Parts
- 9) Black iron and copper fittings

2.3 LOCATING THE BOILER

The location of the boiler must be as close as possible to the tile-lined brick chimney or factory-built solid-fuel approved chimney (ULC S629). Keep in mind also the day-to-day operation and place of ease for fueling and cleaning.

To lighten the boiler for placement, all parts including firebrick and baffles can be removed.

It is important to provide adequate combustion air to the boiler. It may be necessary to add a ventilator to an exterior wall of a closed boiler room or an airtight basement.

The boiler must be installed so that the clearances on page 13 or those of local authorities are met. If the boiler must be installed on a combustible floor, a non-combustible base must be built as shown in diagram TW - 7. Two layers of hollow masonry block (4" thick) are placed at right angles to each other so that the ventilation holes of one layer are opposite to those of the other layer. Also for ember protection, there must be a minimum one layer of 26 ga galvanized metal beneath the masonry blocks. This base must extend beyond the boiler to a minimum distance of 18" (457 mm) in front and 8" (204 mm) on all sides.

With the location of the boiler selected the next step is to position the unit and proceed with assembly. If a noncombustible base is not required we recommend that the boiler be placed on masonry blocks (bricks or 8" concrete blocks) if space permits, to allow easier fueling and to keep the boiler above any possible water in the basement. These blocks should extend approximately 1" on all sides of the boiler to support the cabinet. Continue as follows:

- 1) Plan all plumbing and electrical runs so that flue pipe is easily removable for cleaning and to permit movement in the area as necessary.
- 2) Position masonry blocks and place the unit on top. Level the blocks as necessary.
- 3) Install the domestic coil if it is to be used, after removing the blank plate.
- 4) Set the loading door in place on the hinges.
- 5) Install aquastat wells, tridicator and pipe fittings using good quality pipe thread sealant or Teflon tape (diagram TW-8).
- 6) Set each side panel in place with bottom of panel hooking over boiler base rail angle. Top fits down over sides and boiler. A perfect fit may be attained without any retaining screws.
- 7) Install the draft damper motor using the mounting holes provided, and connect the chain to the damper and to the damper motor wheel. Leave the bottom chain link open so that it may be disconnected in an emergency.
- 8) Adjust chain length by squeezing or expanding links with pliers. Adjust the chain so that the damper is open to the maximum of 11/16" without putting any extra strain on the damper motor.
- 9) Install the aquastats and complete the wiring, plumbing, smoke pipe and fire extinguishing tube installations as shown in the appropriate electrical and plumbing diagrams.
- 10) **IMPORTANT:** Always test all functions under actual firing conditions before leaving the site. Test especially for correct operation of damper, limit and by-pass zone valve and circulator.

Note - If the boiler is installed above the radiation level, a low water cut off is required. It should be installed on pipe tees positioned at the supply and return points of the boiler.

Never leave start up to the homeowner. Explain the operations thoroughly to the operator.

2.4.1 COMBUSTION AIR SUPPLY

Air inlets of at least 200 square inches free area ($1.5 \text{ in}^2/1000 \text{ Btu}$) must be provided to the room occupied by the wood-fired or oil-fired boiler. These fresh air inlets must provide or allow free access of fresh outside air to the boiler. At no time, or under any circumstances can a wood or oil burning appliance, be starved of combustion air.

The appliance must at all times be able to maintain the approved stack draft. The barometric draft regulator must be installed on the boiler smoke pipe in the same room or at least in such a way that there is unrestricted free passage of air between the combustion air inlet to the boiler or burner and the barometric draft regulator.

It is important to provide adequate combustion air to the boiler. It may be necessary to add a ventilator to an exterior wall of a closed boiler room or an airtight basement.

Operating a wood or oil-fired appliance with inadequate combustion air could be hazardous.

2.4.2 FLUE PIPE & CHIMNEY

The boiler must be located to meet a minimum venting distance needed between the boiler and the flue. It should also be ducted so that there are a minimum number of elbows used. The flue pipe must be installed with a gradual rise of $1/2"$ or more per foot from the Boiler to the flue.

NEVER ALLOW THE SMOKE PIPE TO RUN DOWNHILL TO THE FLUE!

The smoke pipe and chimney should be at least 7" in diameter. The flue pipe or a chimney may be of different cross-sectional area than that of the appliance smoke pipe provided that sufficient draft is available at the appliance. Space must be provided around the smoke pipe and the back of the boiler to allow easy access for the purpose of cleaning. Smoke pipes must not be lighter than 24 gauge black steel. All flue pipe must be securely fastened with at least 3 sheet metal screws at every joint and properly supported.

Always meet or exceed flue pipe clearance specifications - 18" clearance from flue pipe to combustibles in all directions.

Connect the boiler only to an approved chimney suitable for solid fuel appliances and capable of venting the products of combustion. The chimney must be installed with proper clearances above roof and from adjacent structures and trees. If a masonry chimney is used it must be in good condition and be equipped with a tile liner. Flue thimble or flue pipe must not extend into the chimney flue, as it will reduce the draft.

Connect only to a flue or chimney capable of maintaining a negative draft of between .02" wc min. and .05" wc max. at all times and conditions. To maintain this draft, one or two draft regulators may be required. We recommend that the boiler be connected to its own chimney. However, two or more fuel fired appliances, other than fireplaces or incinerators, may be connected to the same chimney.

The National Standard of Canada, Installation Code for Solid-Fuel-Burning Appliances and Equipment, CSA-B365-01 clause 5.2.9 states that:

Two or more appliances shall not be connected to the same chimney flue unless:

- a) The appliances are located on the same storey;
- b) A negative pressure is maintained at the flue collar of each appliance;
- c) Each appliance is provided with a means to control the rate of flow of air or flue gases through the appliance combustion and heat exchanger chambers. Where limitations on flue pressure (draft) are contained in the manufacturer’s instructions, such means shall be capable of maintaining at the flue collar, the pressure specified by the appliance manufacture; **NOTE:** For the purpose of this Clause, draft controls include ash pit air control dampers, dampers or draft slides wherever located, over fire and flue pipe key dampers, and check draft controls located on or in the flue pipe;
- d) The flue pipes of the appliances are connected to a manifold as close to the chimney as practicable or directly to the chimney in the following order:
 - (i) If only solid fuel is used, the flue pipe from the smallest appliance shall be on top (downstream);
 - (ii) If different fuels are used as permitted in Clause 5.2.7, the oil flue pipe shall be on top (downstream); and the solid fuel flue pipe on the bottom (upstream); and
- e) The chimney flue is capable of venting the flue gas by natural draft when all appliances not interlocked to prevent simultaneous firing are firing at their maximum rate at the same time.

WARNING: If this setting is exceeded it could cause a solid fuel fire to burn out of control.

When installing a wood-burning appliance to an existing chimney carefully inspect entire chimney for the presence of old inlet holes, which may be improperly covered by metal caps or other unacceptable means. Fill any openings with brick and mortar to ensure no hazardous openings exist.

2.5 CLEARANCES

The boiler is to be installed in accordance with the National Building Code or local regulations. Allowances front and rear must be made for cleaning and servicing.

Minimum safety clearances to combustibles are:

Front	48"	1220 mm
One Side	6"	152 mm
Other Side (for rear access)	24"	610 mm
Rear	24"	610 mm
Above Wood-Fired Boiler	24"	610 mm
Flue Pipe to combustible, Boiler & electrical wiring	18"	457 mm
Floor		Non-Combustible

These clearances will also allow adequate combustion air to reach the boiler.

2.6 PLUMBING CONNECTIONS

There are only two differences between the installation of any conventional hot water heating system and those using a boiler – the safety override zone valve and the blow-down extinguishing system. A circulator of at least 5-G.P.M. capacity must be used in a system using the boiler to assure circulation of water. The recommended expansion tank size is 12” Dia. x 36”.

The normally open zone valve must be installed to allow a free flow of water in a power off situation. We recommend that the valve be placed as shown in diagram TW-1 or diagram TW-4. The override zone valve should be on the loop supplying the living area on the main floor level (i.e. kitchen – living room). The override loop for the safety shall have at least 30’5. of radiation above the wood boiler. Do not use basement loop for the safety override loop, as this will not provide gravity flow in a power out situation. This override loop must be capable of dissipating at least 10% of the estimated heat output of the boiler in the event that the circulation is reduced because of electrical power failure. The safety by-pass dump zone shall **NOT** run through any plastic piping. A deliberate manual action shall be required to make the override loop inoperative. The system is to be plumbed so that only a deliberate manual action can make the override loop inoperative.

When the wood boiler is not satisfying a call for heat the water temperature in the boiler will rise since the wood fire is still burning. When plumbing a wood boiler, ensure that the entire heating system can handle the higher temperatures that can be sometimes generated. If there is the possibility that the higher water temperatures can damage other parts of the heating system including, but not limited to, in-floor radiant piping, then measures should be taken to ensure that the water temperatures to these parts of the system are controlled. Controls such as thermostatic valves can control water supply temperature (i.e. ESBE Thermic By-pass Valve TV). Consult the manufacturer’s instructions for the maximum permissible water temperatures for in-floor radiant piping and/or other heating system parts.

The blow-down extinguishing system is installed to control the fire in case overheating causes excessive pressure in the pressure vessel. The relief valve, included, is threaded into the top of the pressure vessel and copper pipe is installed from its exhaust to the flange above the loading door on the firebox.

In addition to its ability to heat the home, this boiler is provided with a domestic coil position. A copper coil may be purchased with your boiler or added at a later date. It may be utilized as a single water heater or in conjunction with an oil, gas or electric heater.

ACTUAL FLOW & TEMPERATURE RATES MAY VARY FROM COIL SPECIFICATION.

2.6.1 FREE STANDING

Free Standing installation requires additional components, which are not included in the Highlander boiler kit. Check diagram TW-5 for additional required components.

In the freestanding or stand-alone system, the boiler is the sole source of central heating. In this system connect the piping as you would for any conventional hydronic heating system (using zone valves, circulator zoning or single zone or single zone flow check system). The boiler must not be installed as a gravity system, as the controls are not designed for this type of operation. When installing the boiler as a stand-alone system, the boiler may be wired in two ways. For the Stand-Alone wiring diagram, diagram TW-5, **a triple function aquastat and an additional transformer must be purchased separately** and installed in place of the dual aquastat supplied with the boiler. The only special piping needed is the connection of the special safety by-pass zone valve and blow down system as described above. For plumbing details see Fig. TW-4.

2.6.2 PARALLEL PIPING SYSTEM

In the PARALLEL SYSTEM the water is circulating between the two boilers by means of an auxiliary circulator. In this system the flow of water from the existing boiler (supply) is teed and piped to the return of the Highlander boiler. The return pipe to the existing boiler is teed, and piped to the outlet nipple of the Highlander boiler. Therefore the Highlander is maintaining heat in both boilers. If the Highlander is not being utilized the system warm return water is not keeping the wood boiler warm.

In the parallel system an auxiliary circulating pump keeps the temperature even between the two boilers. It is controlled by a separate aquastat on the Highlander boiler. When the water in the Highlander boiler is hotter than the set point of the single aquastat, the circulator comes on and circulates the hot water between the two units.

This system allows the domestic hot water coil in the existing boiler to supply the household with hot water without an additional coil in the Highlander boiler.

2.6.3 BOILER RETURN WATER TEMPERATURE

Steel boilers are very susceptible to corrosion caused by condensation of flue gases. In order to prevent this, the return water temperature must not fall below 140°F. Most hydronic systems are designed for a delta T of 20°F. Therefore, the low limit should be set at no lower than 170°F, which accounts for the -10°F differential of the triple aquastat. Heating systems that require lower temperatures such as cast iron radiators and radiant systems require some form of mixing device to ensure the return water is at or above 140°F. **The warranty will not be valid for steel boilers with return temperatures below 140°F.** For more information refer to B214-01 Installation Code for Hydronic Heating Systems (or equivalent).

2.7 CONTROL SYSTEM

The boiler control system serves the following functions:

- 1) Maintaining the boiler water temperature by controlling the combustion air entering the boiler. A double pole, double throw aquastat and the air damper control this function.
- 2) Protects the boiler from an overfire by overriding the home's thermostat and by putting any excess heat into the living area. Opening the "normally open by-pass zone valve" and turning on the circulator accomplish this.
- 3) To allow the boiler to operate as a gravity heating system in the event of a power failure, the "normally open by-pass zone valve" will automatically spring open in a power off situation.
- 4) boiler "BLOW-DOWN" fire extinguishing system. In the case of extreme over firing the pressure in the boiler will exceed 30 PSI. When this happens, a relief valve will open and allow steam to escape into the firebox area, damping the fire. See diagram TW-8 showing the fitting for the installation of the fire extinguishing system.

IMPORTANT: Upon completion of the installation, a change over from one fuel to the other shall not require manual adjustment of any controls other than the thermostat.

2.8 WIRING

The wiring diagrams for the controls on the boiler are shown in diagrams TW-2, TW-3B, TW-3EB and TW-3EHB. Do not rewire or change the function of the controls on an existing boiler when adding a boiler. The electrical systems of both boilers must be powered from a single branch circuit without exception.

NOTE: Most oil-fired boilers utilize a triple aquastat as shown in diagram TW-2. No rewiring is necessary in the oil boiler control.

To install the boiler as a free-standing unit see diagram TW-4.

NOTE: The aquastat may be marked "High" and "Low" opposite the diagrams. The diagrams are correct.

ALL ELECTRICAL WIRING MUST CONFORM TO NATIONAL AND LOCAL CODES.

2.9 DEALER INSTRUCTIONS TO HOMEOWNER

- 1) Keep area around unit clean.
- 2) Use DRY wood only. Hardwood is preferred.
- 3) Load carefully.
- 4) Load level no higher than center of door.
- 5) Remove ash regularly as directed.
- 6) Watch for soot build up in smoke pipe.
- 7) Realize the danger of extreme overheating due to overfiring.

- 8) Danger of flue fire if poor fuel or poor maintenance produces creosote buildup.
- 9) Operation of unit during power failure (i.e. manual operation of zone valves and flow check valves).
- 10) When shutting down for extended periods, clean unit thoroughly.
- 11) Apply a light coating of motor oil to inside of boiler and other exposed interior surfaces to protect against rust due to moisture from condensation.
- 12) Before reloading the boiler with wood, turn up the thermostat 2 to 3 minutes prior to loading to establish the draft.
- 13) When reloading rake the ashes toward the front and place the new fuel load toward the rear of the boiler.
- 14) If, under poor draft conditions smoke comes out of the door when reloading, the cast iron baffles may be moved forward on the ledge to allow a 3/4" gap behind the baffles. This will allow smoke over the smoldering embers to escape through the gap when the door is opened.

2.10 INSTALLERS FINAL CHECKLIST

PIPING INSPECTION

- 1) Boiler plumbed properly?
- 2) Is a 12" x 36" expansion tank or equivalent installed?
- 3) Normally open by-pass zone valve installed?
- 4) Does the normally open zone valve by-pass to the main living area loop?
- 5) Is the normally open zone valve on the most direct piping loop (fewest elbows)?

BOILER INSPECTION

- 1) Are clearances maintained?
- 2) Are all firebricks in place in the boiler?
- 3) Is the relief valve piped back into the combustion chamber?
- 4) Is the system full of water and air eliminated?
- 5) Are zone valves and piping located to prevented drips on controls?

WIRING INSPECTION

- 1) Is main disconnecting switch within view?
- 2) Wiring cables protected from heat and not touching hot surfaces?
- 3) Check normally open zone valve (should heat gravity zone when valve open).
- 4) Check settings on all aquastats.

FLUE AND SMOKE PIPE INSPECTION

- 1) Flue inner size equivalent to 7" round or larger?
- 2) Separate entry to flue for both solid-fuel and oil or gas smoke pipes?
- 3) Smoke pipe 24 gauge or better?
- 4) Smoke pipe secured by screws?
- 5) Draft regulator (if used) set at .05" wc maximum?
- 6) Clearances of smoke pipe 18" or better from combustible material?
Metal protection is recommended.

2.11 PARALLEL PLUMBING WIRING EXPLANATION

- a) The wood system neutral is connected to the oil boiler neutral.
- b) The line power for the wood boiler must come from the same power disconnect switch as the oil boiler.
- c) Single Aquastat (Honeywell L6006A1012)
Setting 160°F

This operates the circulation pump to circulate hot water between the two boilers when the wood boiler is in operation.

- d) Double Aquastat (Honeywell L6081A1010)
High Limit Left Side Setting 200°F

This is the wood high limit. If the water temperature in the wood boiler reaches 200°F the wood boiler air damper is closed and the safety by-pass zone valve is opened. The end switch on the safety by-pass zone valve makes a call for heat on the oil boiler triple aquastat, which starts the primary circulator.

- e) Double Aquastat (Honeywell L6081A1010)
Low Limit, Bottom Right Setting 170°F

This is used to maintain the wood boiler at the set temperature by opening and closing the wood boiler air damper.

- f) Double Aquastat (Honeywell L6081A1010, Only)
Differential, Top Right Setting 10°F

This is the temperature rise during the boiler operation corresponding to the Low limit setting.

- g) The triple aquastat on the oil boiler controls the oil boiler in the normal manner.

The safety by-pass zone is only shown in diagram TW-1. The safety by-pass dump zone should be plumbed from the wood boiler in the case of high limit condition or power outage. This will provide heat to the house by gravity flow. The dump zone should be to the largest living area and it should be an area above the wood boiler (for gravity flow during a power outage). Also this zone shall **NOT** have any plastic piping such as in-floor heat because the hot water from the wood boiler may damage the tubing.

The supply from the wood boiler should only be connected to the plumbing system after the primary circulator and in conjunction with a flow check valve on the wood supply line. This will not allow hot water to flow through the wood boiler when the secondary circulation pump is not in operation (no fire in wood boiler).

2.12 ADD-ON THERMOLEC WIRING EXPLANATION

- a) The wood system neutral is connected to the oil boiler neutral.
- b) The line power for the wood boiler must come from the same power disconnect switch as the oil boiler.
- c) Single Aquastat (Honeywell L6006A1012)
Setting 160°F.

This operates the circulation pump to circulate hot water between the two boilers when wood boiler is in operation and up to the temperature setting.

The normally open (N/O) contacts on the single aquastat should be connected to the secondary circulation pump between the wood and oil boilers (as shown in diagram TW-1). The same N/O contacts also energize a relay to open the circuits to the electric boiler's load management or dual energy sensor. The relay also opens the contacts to the electric boiler's circulator if this circulator is not the primary loop circulator. If the circulator is part of the primary plumbing loop than the circulator wiring should not be run through the relay.

If the wood boiler is up to temperature than the wood circulator will run. If there is a call for heat hot water from the wood boiler will satisfy the heating requirements. If the temperature in the wood boiler is below the single aquastat setting, then the existing boiler will operate to satisfy the heating requirement.

- d) Double Aquastat (Honeywell L6081A1010)
High Limit Left Side Setting 200°F.

This is the wood high limit. If the water temperature in the wood boiler reaches 200°F the wood boiler air damper closed and the safety by-pass zone valve is opened. The end switch on the safety by-pass zone valve makes a call for heat on the oil boiler triple aquastat, which starts the primary circulator. Metal – Brass 150°F.

- e) Double Aquastat (Honeywell L6081A1010)
Low Limit, Bottom Right Setting 170°F.

This is used to maintain the wood boiler at the set temperature by opening and closing the wood boiler air damper. Metal – Brass 150°F.

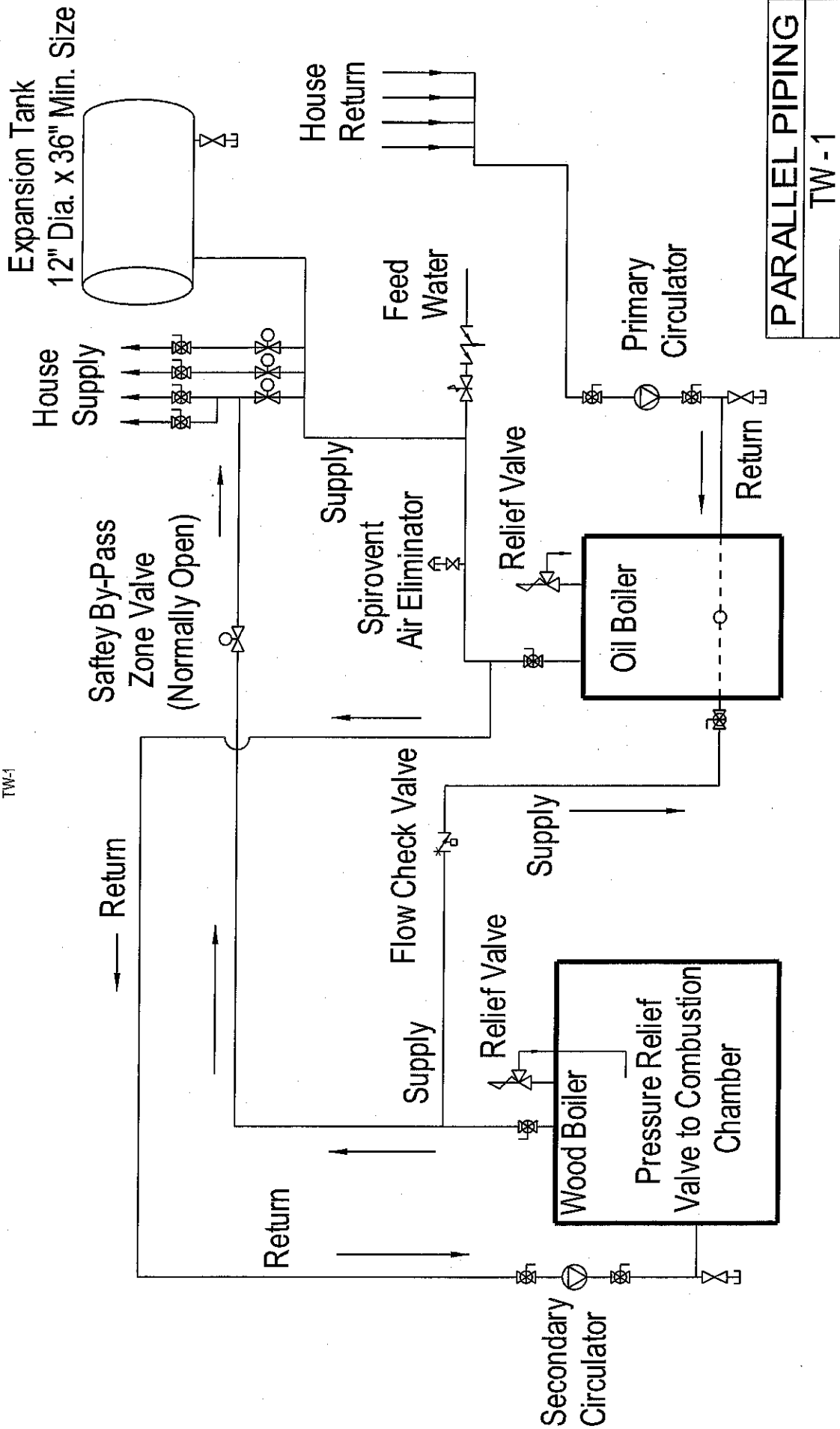
- f) Double Aquastat (Honeywell L6081A1010)
Differential Top Right Setting 10°F.

This is the temperature rise during the boiler operation corresponding to the Low limit setting.

The electric boiler controls will operate the boiler in the normal manner.

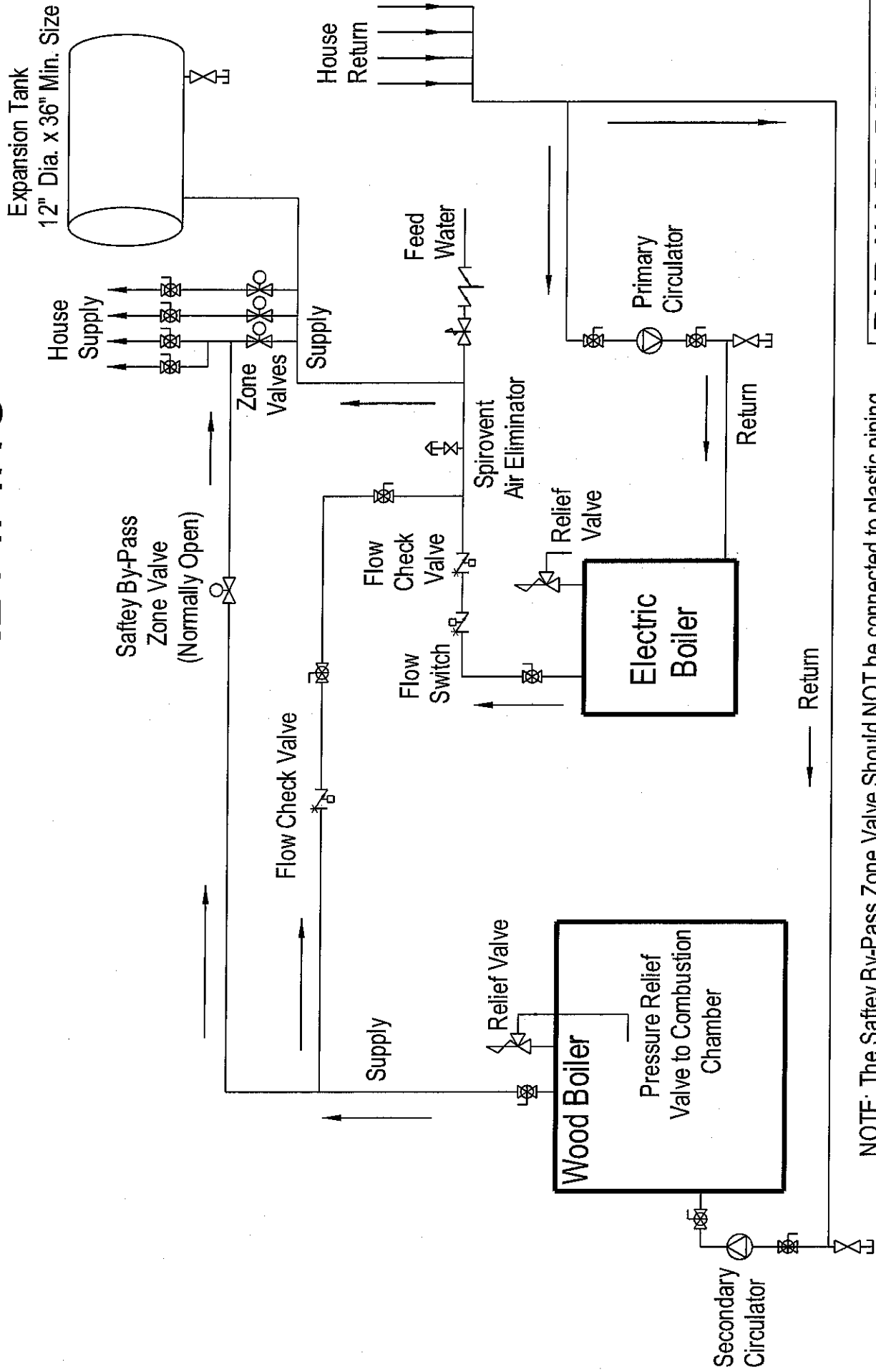
PARALLEL PIPING

TW-1



PARALLEL PIPING
TW-1

PARALLEL PIPING



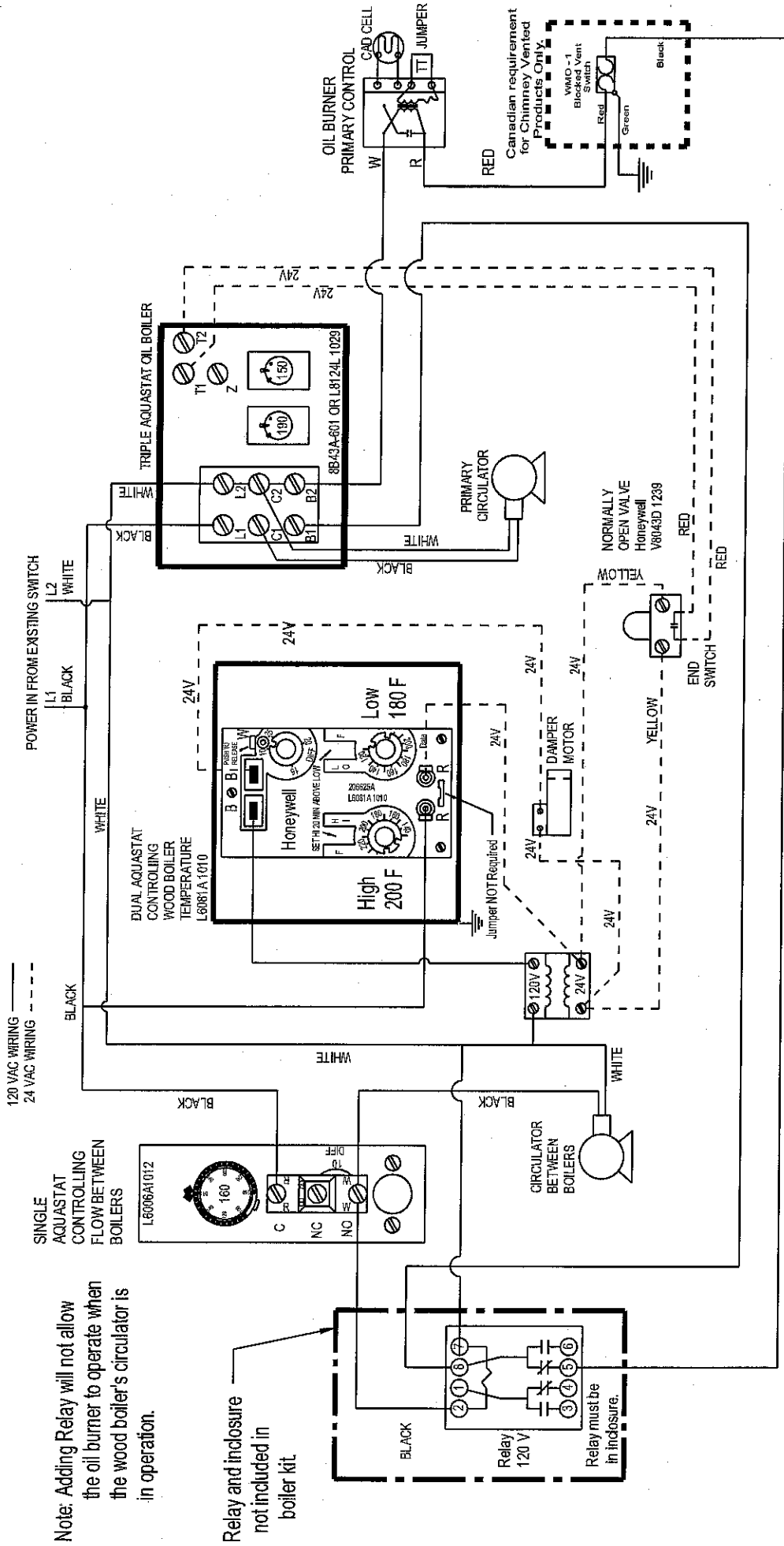
NOTE: The Safety By-Pass Zone Valve Should NOT be connected to plastic piping.

PARALLEL PIPING
TW - 1 EH

ALTERNATE WIRING DIAGRAM FOR HIGHLANDER WOOD BOILER PARALLEL INSTALLATION

Honeywell Single and Dual Aquastats on Wood Boiler

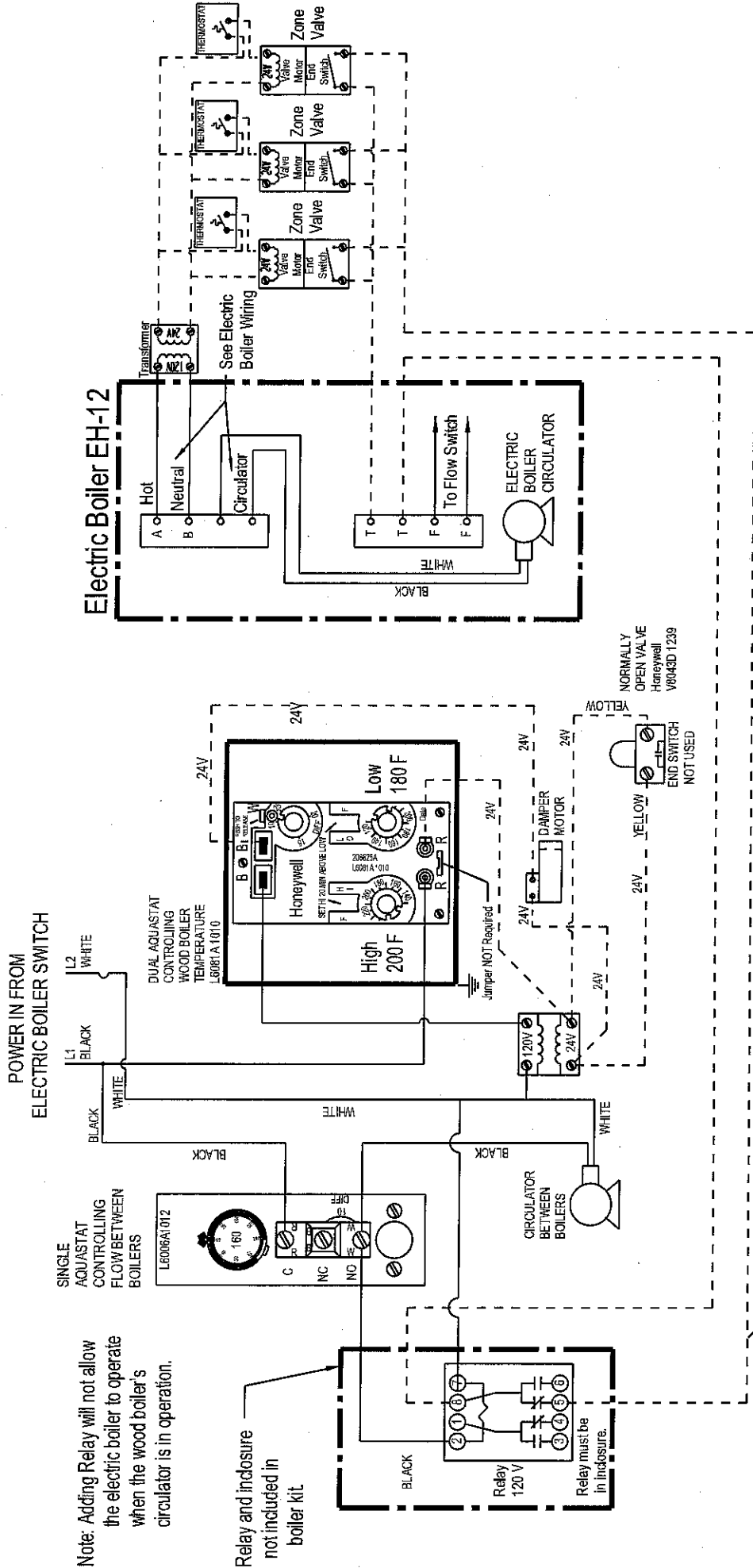
(USE COPPER CONDUCTORS ONLY)



PARALLEL INSTALLATION
TW-3B

WIRING DIAGRAM FOR HIGHLANDER WOOD BOILER PARALLEL INSTALLATION WITH ELECTRIC BOILER

(USE COPPER CONDUCTORS ONLY)



Note: Adding Relay will not allow the electric boiler to operate when the wood boiler's circulator is in operation.

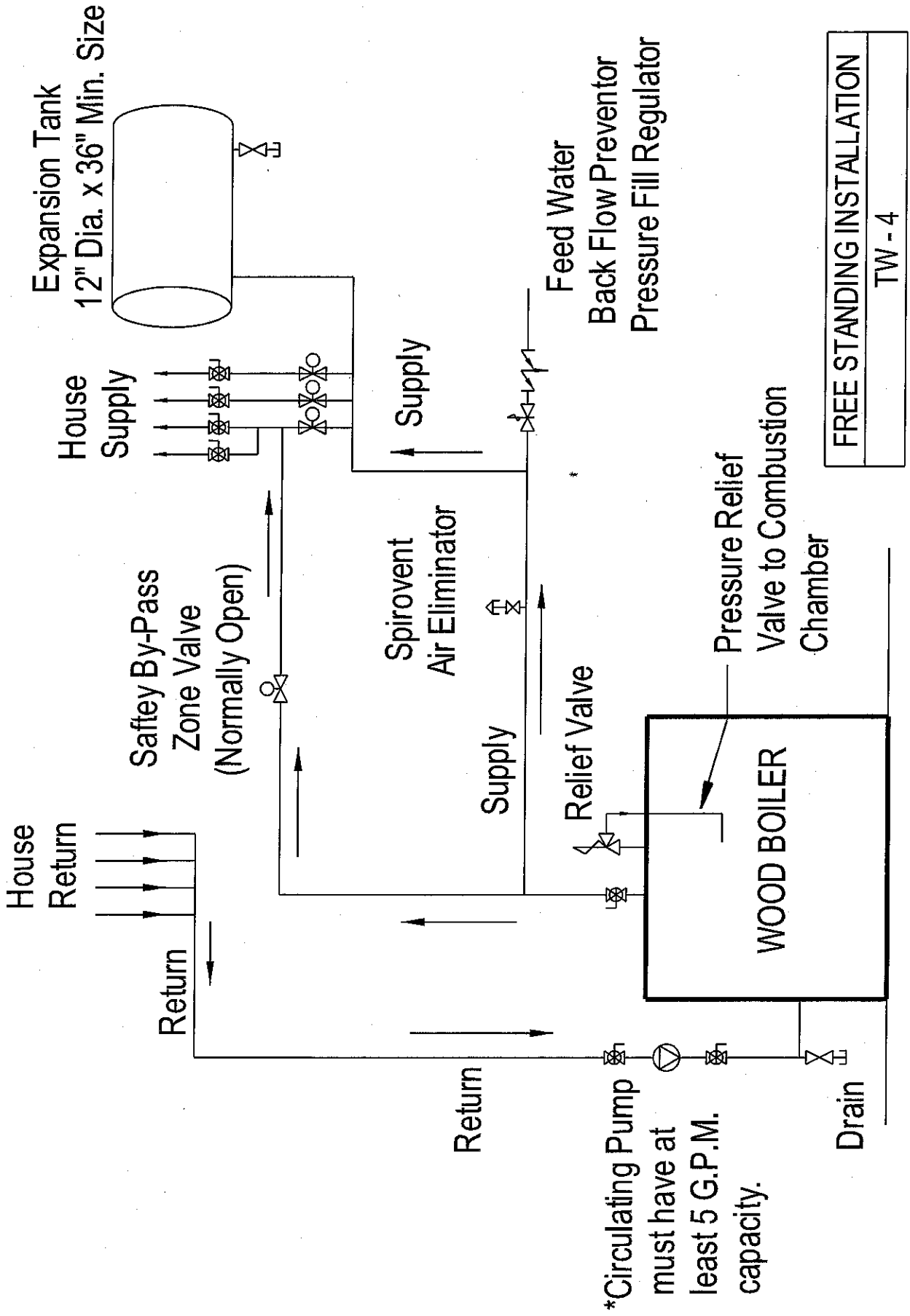
Relay and inclosure not included in boiler kit.

NOTE: All wiring in a junction box with 120 V wiring **MUST** be rated for high voltage (300V). This includes zone valve end switch wiring and T1 wiring to boiler.

PARALLEL INSTALLATION
TW-3 EH-B

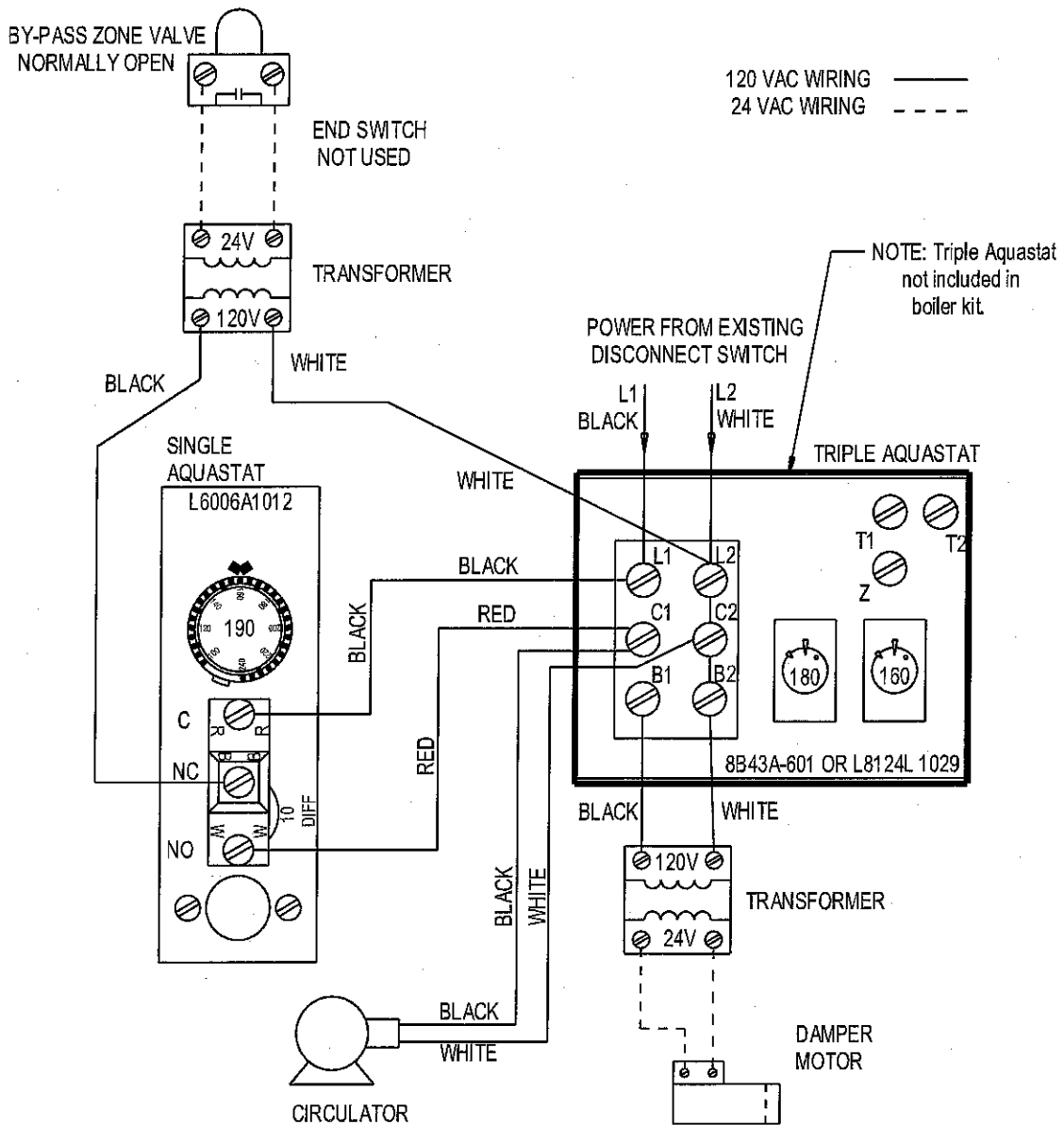
FREE STANDING PIPING DIAGRAM

TW-4



WIRING DIAGRAM HIGHLANDER WOOD BOILER FREE STANDING INSTALLATION

(USE COPPER CONDUCTORS ONLY)



FREE STANDING INSTALLATION

TW - 5

HEAT EXCHANGER DETAILS

DOMESTIC HOT
WATER COIL
(OPTIONAL)

HEAT EXCHANGER

BOILER IS SHOWN WITHOUT
THE FRONT FOR CLARITY

BAFFLE
LEDGE

BOARD
INSULATION

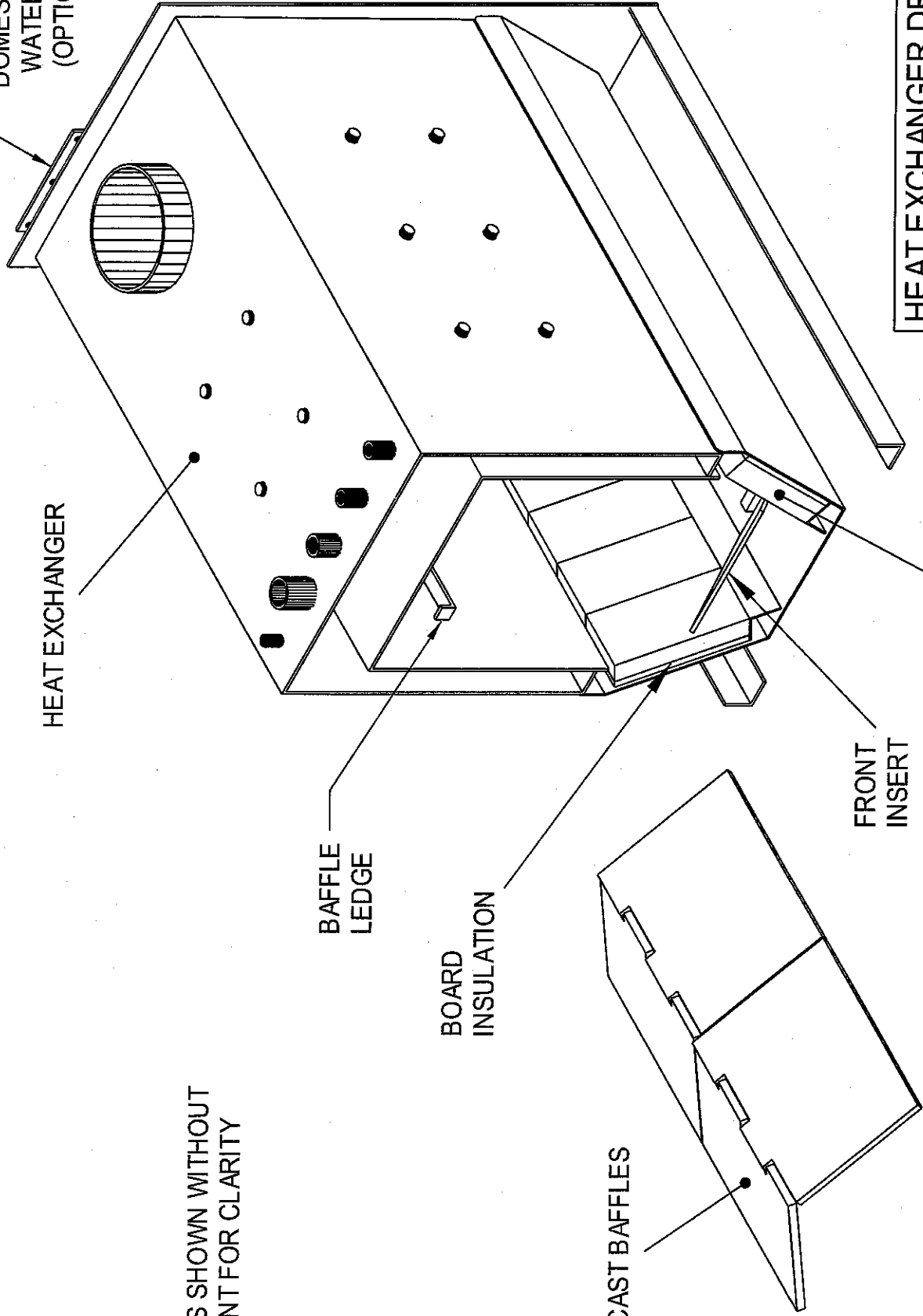
CAST BAFFLES

FRONT
INSERT

FIREBRICK

HEAT EXCHANGER DETAILS

TW - 6

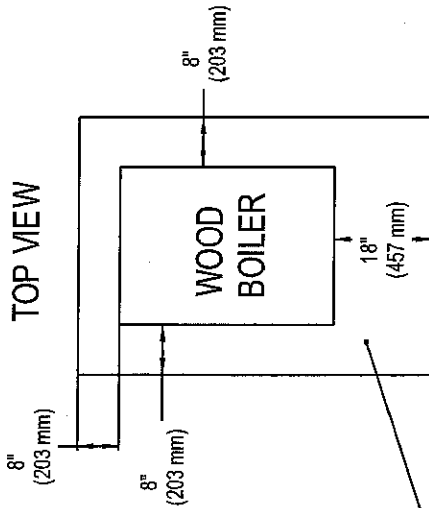
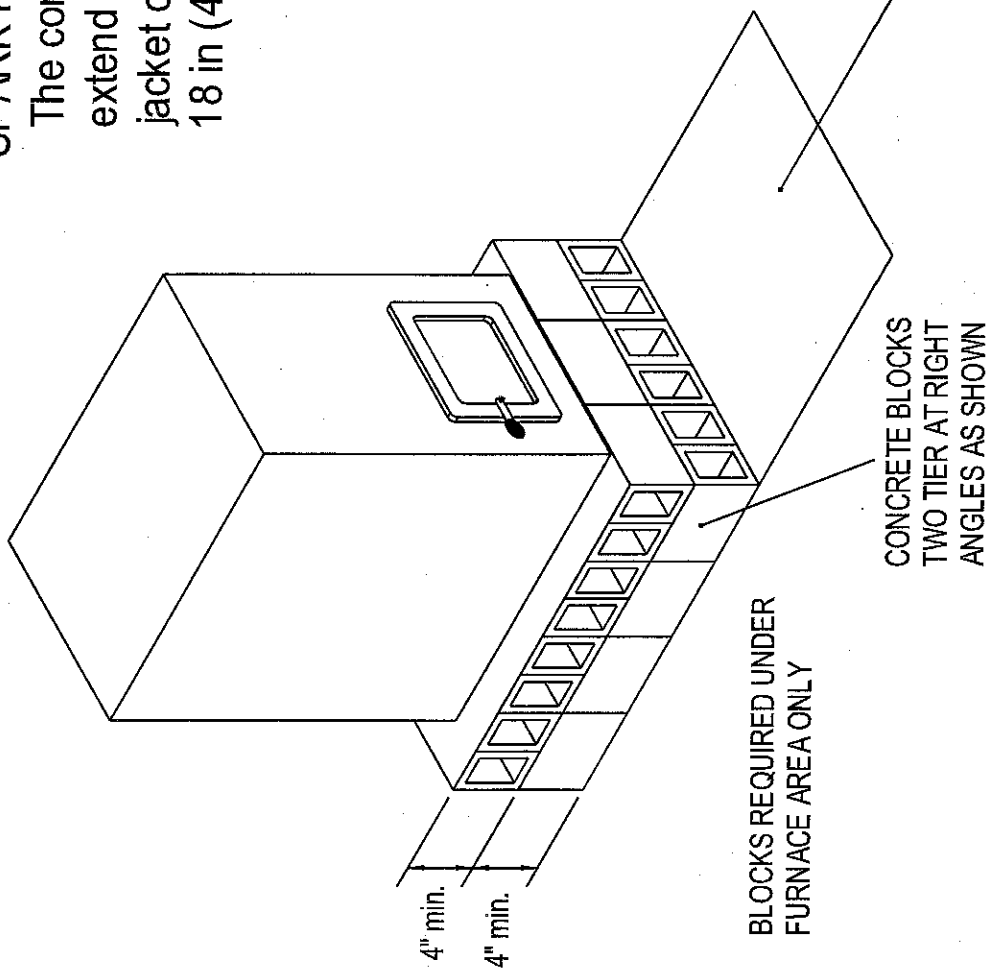


BASE FOR USE ON COMBUSTIBLE FLOOR

TW-7

SPARK PROTECTION PAD

The combustible floor protection pad should extend 8 in (203 mm) beyond the boiler jacket on the sides and back, and 18 in (457 mm) in the front.



NON-COMBUSTIBLE FLOOR
TW - 7

ACCESSORY LAYOUT

HOT WATER
COIL AT REAR
(OPTIONAL)

SMOKE PIPE

NOTE: CABINET AND FIREBOX DOOR NOT SHOWN

Fittings on the back of the boiler, not shown

1 - 1/4" System Return

1/2" Boiler Drain

1/4" THREAD - TRIDICATOR

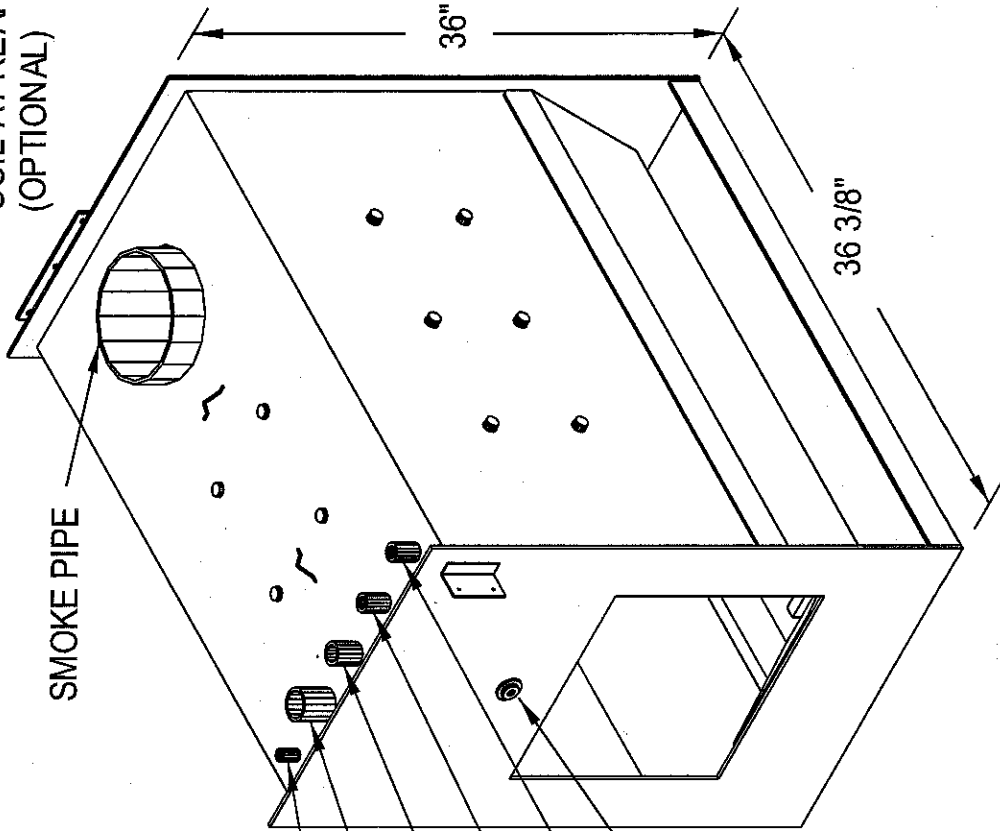
1 1/4" THREAD - SUPPLY TO HEATING SYSTEM

3/4" THREAD - PRESSURE RELIEF LOCATION

1/2" THREAD - DUAL AQUASTAT

1/2" THREAD - SINGLE AQUASTAT

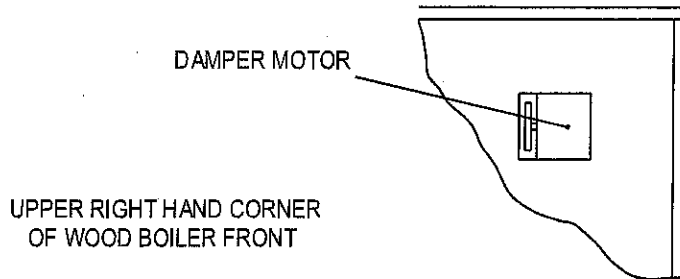
3/4" PRESSURE RELIEF DUMP FLANGE



ACCESSORY LAYOUT
TW - 8

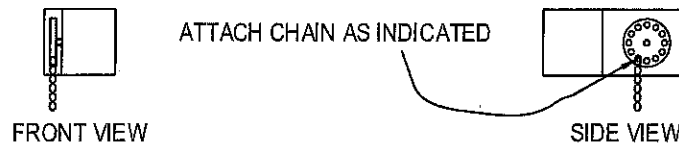
DAMPER MOTOR INSTALLATION

1. Attach the damper motor in the upper right corner of the boiler front panel with metal screws to the bracket as shown.

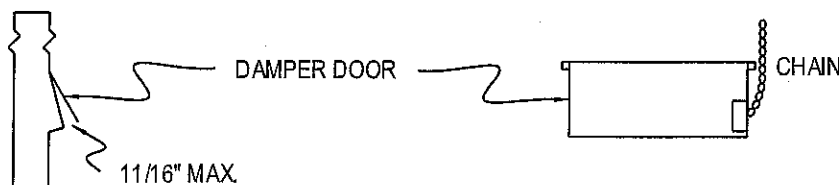


2. Attach the damper chain to the hole on the immediate left of the bottom hole in the motor wheel as shown below.

NOTE: Be certain to reclose the chain link when attaching the chain.



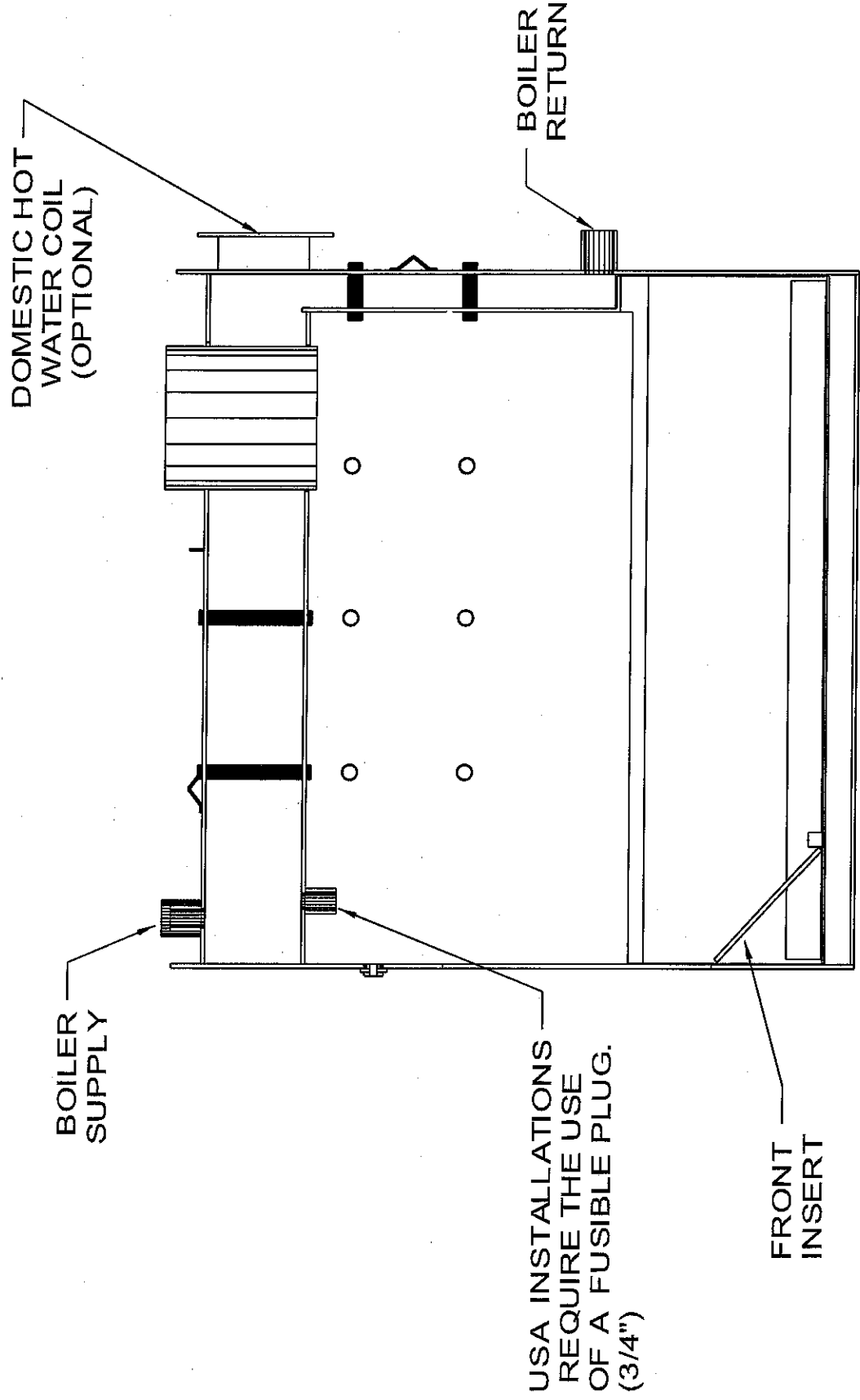
3. Attach the damper chain to the lift rod on the damper door using the link in the chain that permits the most direct chain connection between the bottom hole in the damper motor wheel and the lift rod on the damper door (when door is in the down position) Remove excess chain. The damper limit stop must limit the maximum damper opening to 11/16". See below. NOTE: As a final adjustment, the lift rod may be slightly bent up or down to ensure that the damper door closes completely when motor is in down position. Do not alter the damper limit stop setting for increased firing for any reason.



DAMPER MOTOR INSTALLATION

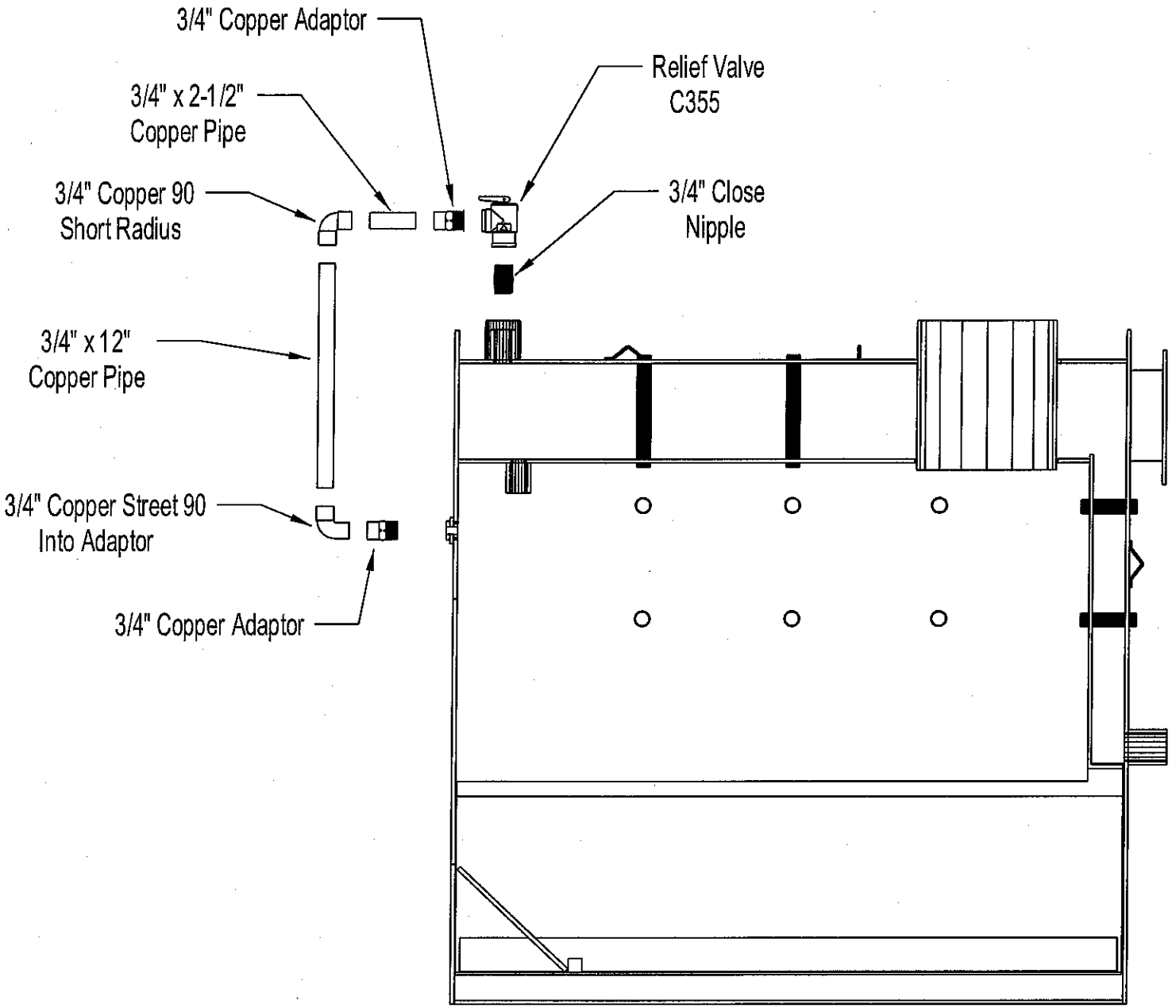
TW - 9

USA MODELS FUSIBLE PLUG



USA MODELS - FUSIBLE PLUG
TW-10

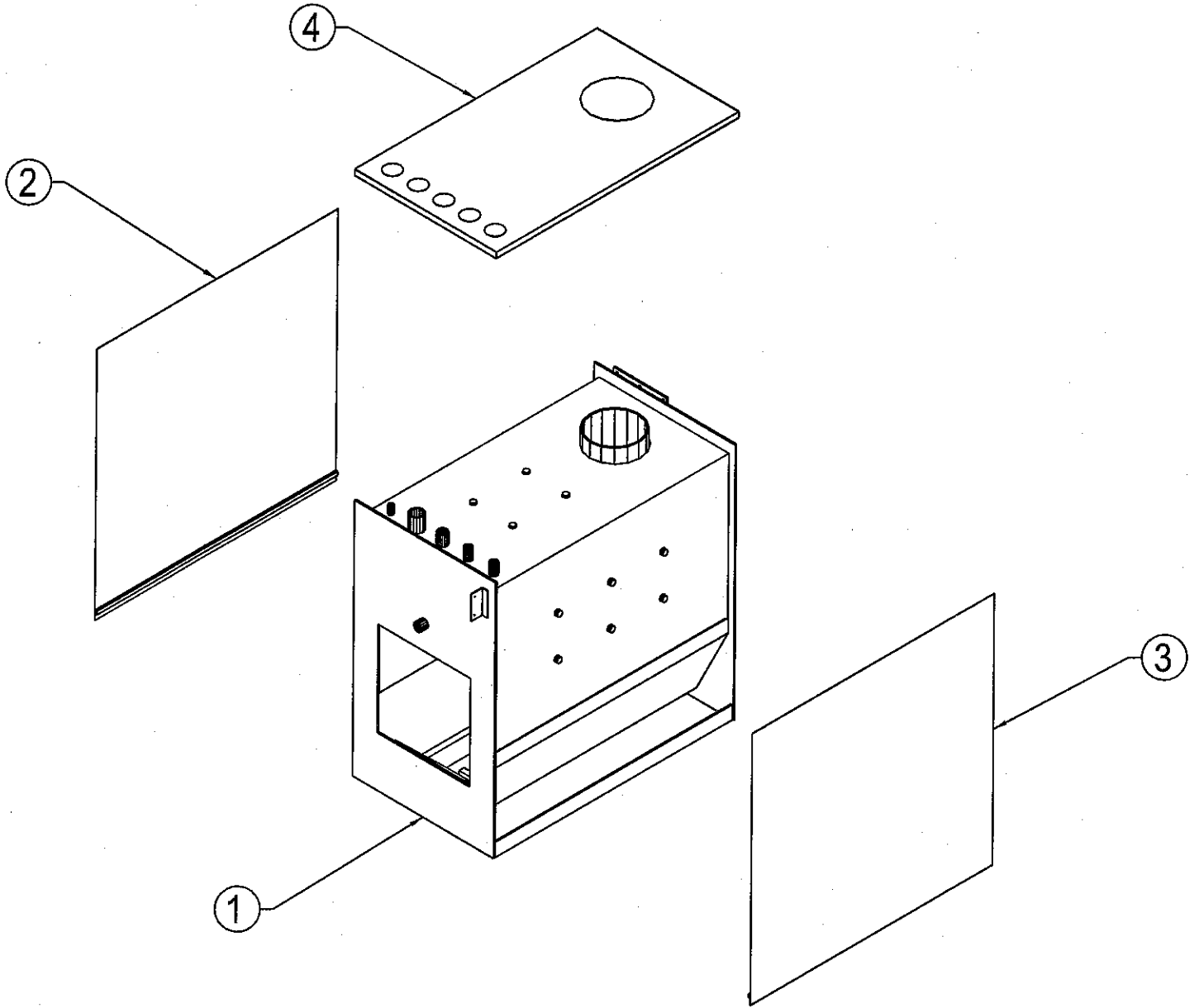
Pressure Relief Blow-Off System



BLOW DOWN EXTINGUISHING SYSTEM
TW - 11

HIGHLANDER PARTS LIST

TW2000PM
SC0.952 AUG 27



PARTS LIST
TW - 12

HIGHLANDER WOOD-FIRED BOILER		
Order No.	Item No.	Part Description
WTT-PV-0110-01	TW-2000-1A	Pressure Vessel
WTT-PV-U110-01	TW-2000-1B	Pressure Vessel (US)
WTT-CB-0010-00	TW-2000-2	Left Cabinet Panel
WTT-CB-0010-00	TW-2000-3	Right Cabinet Panel
WTT-CB-0020-00	TW-2000-4	Top Cabinet Panel
3CI-00-DOOR-01	TW-2000-5	Cast Door Assembly
3CI-00-FRAM-01	TW-2000-6	Cast Door Frame
3CI-00-LINR-00	TW-2000-7	Cast Door Liner
3CI-00-HNDL-00	TW-2000-8	Cast Door Handle
3SP-00-PLTD-00	TW-2000-9	Plated Door Handle Spring
3TC-05-K260-00	TW-2000-10	K-26 Domestic Hot Water Coil
3GK-00-COIL-03	TW-2000-11	Coil Gasket
A00-PV-0368-00	TW-2000-12	Coil Plate
3BR-00-SPLT-00	TW-2000-13	Fire Brick
3CI-00-BFFL-00	TW-2000-14	Cast Baffles
4AQ-00-1131-00	TW-2000-15	Dual Aquastat w/well L6006A1012
4AQ-00-11C6-00	TW-2000-16	Triple Aquastat L6081A1010