

Build an Outdoor Woodstove

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Build a Wood Fired Boiler By DEB Design

This project could be an option, if you are considering the purchase of an outdoor wood burning stove, but are concerned about the cost of commercial units. This stove will cost approximately \$2000 to build as specified using all new steel and components, however it can be built for much less, if salvaged materials are used. If you have a forced air heating system, you should also budget an additional \$300 - \$400, for the installation of a liquid to air heat exchanger to the plenum of your furnace. The costs of integration will vary, depending on your system design. This stove features:

- * A 20 cubic ft. firebox
- * A 200 gallon capacity water jacket
- * A large, water filled, loading door
- * Automatic thermostatic control of the water jacket temperature
- * A powered damper, draft control system
- * 12-24 hour burn times, between loadings
- * A baffled flue design providing optimum efficiency
- * A complete design requiring no additional housing
- * An open vent design, preventing the possibilities of dangerous pressures
- * The ability to burn any type of wood without the worry of creosote build-up and potential chimney fire

If desired the builder could also modify these plans by incorporating the following changes:

- * Increase the stove size
- * Use thicker or stainless steel.

Included in this plan set is:

- * A complete material list, including sources
- * Construction tips learned from the building of prototypes
- * Step by step construction drawings
- * Electrical and plumbing schematics
- * Start up and maintenance instructions

This project may seem challenging at first, but with time, patience, and consistent effort, you'll be able to build your own outdoor heating plant, to meet your home heating needs. You can then take comfort knowing that, your home heating bills can remain controllable.

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The following "Item Numbers" are noted on the plan drawings.

Item Number	Description	Specifications
1	Firebox Bottom	36" x 26" x 1/4" Flat Steel
2	Firebox Side	36" x 36" x 1/4" Flat Steel
3	Firebox Side	36" x 36" x 1/4" Flat Steel
4	Firebox Top	36" x 26" x 1/4" Flat Steel
5	Firebox Back	38" x 26" x 1/4" Flat Steel
6	Left Baffle Support	1"x 1/4"x 32" Flat Steel
7	Right Baffle Support	1"x 1/4"x 32" Flat Steel
8a	Water Jacket Front Top/Bottom	6"x 1/4"x 32" Flat Steel
8b	Water Jacket Front Top/Bottom	6"x 1/4"x 32" Flat Steel
8c	Water Jacket Front Sides	6"x 1/4"x 30" Flat Steel
8d	Water Jacket Front Sides	6"x 1/4"x 30" Flat Steel
9	Water Jacket Bottom	33" x 43" x 3/16" Flat Steel
10	Water Jacket Side	42" x 41" x 3/16" Flat Steel
11	Water Jacket Side	42" x 41" x 3/16" Flat Steel
12	Water Jacket Rear	32" x 42" x 3/16" Flat Steel
13	Top Support	1-1/2"x 1/8"x 42" Angle Iron
14	Flue Pipe (Base section)	8" Diameter x 8" High x 1/4" Thick Tubing
	Water Jacket Top	33" x 43" x 1/8"
16	Door Frame Top	1"x 1/4"x 25" Square Tube
17	Door Frame Bottom	1"x 1/4"x 25" Square Tube
18	Door Frame Side	1"x 1/4"x 35" Square Tube
19	Door Frame Side	1"x 1/4"x 35" Square Tube
20	Loading Door Back	34" x 24" x 3/16" Flat Steel
21	Loading Door Front	1"x 1/4"x 38" Flat Steel
22	Draft Way	6" x 6" x 8" Tube

	Door Gasket Channel (Side)	1"x 1/4"x 44" Flat Steel
	Door Gasket Channel (Side)	1"x 1/4"x 44" Flat Steel
	Upper Fire door Side	6"x26"x1/8" Flat Steel
	Lower Fire door Side	6"x26"x1/8" Flat Steel
	Fire Door Side (Top)	6"x 26"x1/8" Flat Steel
	Fire Door Side (Bottom)	6"x 26"x1/8" Flat Steel
	Fire Door Side	6"x 36"x1/8" Flat Steel
	Fire Door Side	6"x 36"x1/8" Flat Steel
	Upper Door Hinge Support	1-1/4"x1/4"x16" Square Tube
	Lower Door Hinge Support	1-1/2"x1/4"x16" Square Tube
	Upper door support	1-1/4"x1/4"x30" Square Tube
	Lower door support	1-1/2"x1/4"x30" Square Tube
	Door Hinge Plate	2"x1/4"x4" long Flat Steel
	Door Hinge Plate	2"x1/4"x4" long Flat Steel
	Door Hinge Plate	2"x1/4"x4" long Flat Steel
	Door Hinge Plate	2"x1/4"x4" long Flat Steel
	Fire door Handle	1-1/4"x 1/4"x 42" Square Tube
	Crank Screw	3/4-10 x 16" Long Threaded Rod
	Crank Handle Support	1"x 1/4"x 6" Flat Steel
	Inner Crank Screw Stop	3/4-13 Nut
	Inner Crank Screw Stop	3/4-13 Nut
	Inner Crank Screw Washer	3/4" Flat Washer
	Outer Crank Screw Washer	3/4" Flat Washer
	Outer Crank Screw Stop	3/4-13 Nut
	Outer Crank Screw Stop	3/4-13 Nut
	Door Screw to Crank Handle Adapter	3/4-10 Coupler Nut
	Crank Handle to Door Screw Bolt	1/4-20 Bolt/Nut
	Door Handle Bolt	7/16-18 x 4-1/2" Long Bolt
	Door Handle Roller (Optional)	3/8"x 2" Pipe Coupling

	Door Handle Lock Nut	7/16-18 Nut
	Door Handle Lock Nut	7/16-18 Nut
	Door Latch Support Standoff	1-1/4"x1/4"x4" Square Tube
	Door Latch Support	1-1/2"x 3/16"x 6"" Angle Iron
	Door Latch Nut	3/4-10 Coupler Nut
	Upper Door Hinge Pin	5/8 x 5" Machine Bolt
	Lower Door Hinge Pin	5/8 x 5" Machine Bolt
	Overflow/Fill Flange	1-1/4" Floor Flange
	Stove Water Inlet Flange	1-1/4" Floor Flange
	Stove Water Outlet Flange	1-1/4" Floor Flange
	Stove Water Inlet Flange Elbow	1-1/4" Street Elbow
	Stove Water Outlet Flange Elbow	1-1/4" Street Elbow
	Stove Water Inlet Bushing	1-1/4" x 1" Bushing
	Stove Water Outlet Bushing	1-1/4" x 1" Bushing
	Fill Tube Nipple	1" x 5" Pipe Nipple
	Fill Tube Tee	1" Pipe Tee
	Drain Coupler	3/4" Pipe Coupler
	Baffle	26"x 36"x 1/8"
	Flue Pipe (Top section)	8" Diameter x 36" High x 3/16" Thick Tubing
	Flue Cover	18" x 18" x 1/8"

Damper Parts List		
Quantity	Description	Specifications
1	Damper motor	Alliance Laundry Systems part # F380932
2	Motor housing	Weatherproof electrical boxes
4	Motor mounting screws	10-32x3/4"
2	Linkage mounting screw	1/4"x4" carriage bolt, nuts, and washers
1	Motor shaft connecting screw	6-32x1" stainless screw with locknut
5	Connecting screws	1/4"x 1" screws

1	Damper shaft adapter	1/4" threaded steel coupler
1	Connecting arm	1/8" x 1/2" x 2" metal flat stock
1	Damper	8" x 8" x 1/8" Flat Steel
2	Damper Hinge	1-1/4" x 6" Angle
1	Damper housing cover	1/8"x 12"x12" metal flat stock or similar
30'	Electrical wire	12 Gauge
10'	Flex-power wire sheathing	1/2"
3	Weatherproof connectors	1/2"
Other Materials		
2	PEX Tubing	1" ID x length to suit
-	Pipe Insulation for PEX Tubing	1" ID by 3/4" wall thickness
1	Corrugated Drain Line for the supply and return lines	6" ID x length to suit
1 pc.	Thermostat	Alliance Laundry Systems part # 504515
1 pc.	Hot Water Circulator Pump	Grainger part # 4PC90
1 pc.	Cast iron flange set for circulator pump	Grainger part # 4RC78 (1")
1 pc.	Digital Panel Thermometer	Grainger Part # 5XL18
3 pcs.	Floor Flange	1-1/4"
3 pcs.	Hose bib	1"
4 pcs.	Adapter	1 " PEX to 1" MTA
1 pc.	Gate valve for boiler drain	3/4 "
2 pcs.	Gate valves for boiler inlet/outlet lines (Optional)	1-1/4 "
20 ft.	Reinforced PVC hose	1 "
4 pcs.	Stainless hose clamps	1-1/4 "
2 pcs.	Junction box with cover	4"
2 pcs.	5/16 x 1/8 brass hose barb	Local hardware store
2 pcs.	1/8" Galvanized plug	Local hardware store
4 pcs.	Cable clamps	1-1/4"
1 pc.	Copper Tubing	3/4" x 16"

1 pc.	Copper Elbow	3/4"
1 pc.	Bushing	1" x 3/4" Galvanized Pipe
1 pc.	Pipe insulation	3/4" ID by 3/4" wall thickness
2 pcs.	Stove gasket kits	5/8" wide x 6' long (Available at most hardware stores, or building centers)
2 Rolls	Non-faced fiberglass insulation	3-1/2" thick x 16" wide
Miscellaneous electrical supplies for control circuitry from the house		
120'	Angle Iron for Stove Enclosure	1-1/4" x 1-1/4" x 1/8" Angle Iron
2 pcs.	Steel Panels for Stove Sides	18 gauge-size will vary
1 pc.	Steel Panel for Stove Enclosure	18 gauge-size will vary
1 pc.	Steel Panel for Stove Enclosure Rear	18 gauge-size will vary
2 Boxes	Panel Screws	1/2" long

Note: To find an Alliance Laundry Systems parts dealer near you, use the web form located at:

<http://www.speedqueen.com/vend/locator.htm>
Or contact Customer Service at 920.748.3121

To locate a Grainger branch store, please go here:
<http://www.grainger.com>

Or visit your local hardware store and ask if they have a catalog.

Compiled Steel List

Quantity	Size (L x W x Thickness)
1	38" x 26" x 1/4" Flat Steel
2	36" x 36" x 1/4" Flat Steel
2	36" x 26" x 1/4" Flat Steel
1	43" x 33" x 3/16" Flat Steel
1	42" x 32" x 3/16" Flat Steel
2	42" x 41" x 3/16" Flat Steel
2	34" x 24" x 3/16" Flat Steel
2	37"x 27"x3/16" Flat Steel
1	32" x 25" x 1/16" Flat Steel
1	43" x 33" x 1/8" Flat Steel
5	10' x 1" x 1/4" Flat Steel
1	12' x 4" x 1/8" Flat Steel
2	10' x 6" x 1/4" Flat Steel
1	8" x 8" x 5/16" Square Tube
1	36" x 8" x 5/16" Square Tube
1	8" x 6" x 5/16" Square Tube
1	5' x 1-1/2"x 1-1/2"x 1/8" Angle Iron
1	10' x 1-1/2"x 1/4" Square Tube
2	10' x 1"x 1/8" Square Tube
12	1-1/4"x 1-1/4"x 1/8"x 10' Angle Iron

Construction Tips

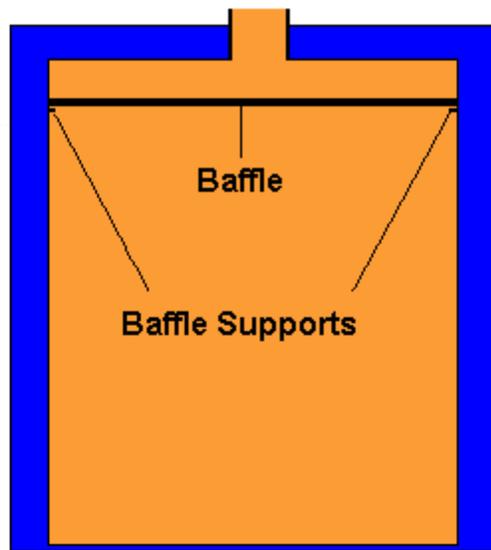
- 1) If you have access to a wire feed welder, try and use it, or better yet, if you don't know how to weld, have a friend do it for you. I used an arc welder, which did the job; however, a wire feed would have sped up the welding process.
- 2) Plan on a minimum of 100 hours to construct the firebox, jacket, and firedoor assemblies. This does not include water-testing/re-welding, insulating, or construction of the housing.
- 3) Take your time. Start many months before winter. Make it a fun project. Invite some friends over to help, especially to help rotate and handle the boiler as it takes shape. Completed, it will weigh a minimum of 1000 #.
- 4) I used c-clamps, a floor jack, and a cable hoist/puller, to help hold, and force components into position, for welding.
- 5) I used a chop saw to cut the flue pipe openings in the jacket top, and a circular saw with a 7 inch abrasive metal cut off blade for the firedoor, and similar cuts. Make sure the saw has a metal guard, as the sparks made from cutting metal, would quickly destroy a plastic guard.
- 6) Weld all fire box joints on both sides. If you use an arc welder with welding rods, grind off the slag at the end of the weld before starting the next rod. Remove all slag before watertesting, as it will conceal leaks. Be patient during all water-testing phases. This is the most important part of the construction. If water is able to leak into the firebox, the life of the stove will be severely shortened. Water leaking from the water jacket to the outside, is not as much of a threat, but a nuisance.
- 7) Place your completed boiler to the southeast of your house, if possible, with the loading door facing west. This will keep smoke away from your residence a majority of the time, and also tend to minimize smoke, during loading. If you plan to use your stove to heat a pool, plan the stove location so that exhaust smoke doesn't blow across the pool area.
- 8) This design was made to be placed outdoors, not in a shed. The loading door would have to be much smaller, if it were placed inside a building, as there would not be enough natural draft to keep smoke from pouring out of the firebox, during loading.
- 9) Use the following procedure to install pipe flanges:
 - a) Position the flange to the desired location
 - b) Mark the location of one of the flange mounting holes
 - c) Drill and tap the mounting hole for a ¼-20 bolt
 - d) Temporarily fasten the flange in place with a ¼-20 bolt
 - e) Carefully drill out and tap the flange hole directly across from the bolt
 - f) Carefully drill and tap the remaining two mounting holes
 - g) Mark the location of the threaded flange opening

- h) Remove the flange
- i) Remove the material from within the previously marked area
- k) Grind the mounting hole and flange-hole areas flat
- l) Apply a generous bead of silicone to the flange
- m) Carefully align the flange to the flange mounting holes
- n) Re-install the bolts
- o) Wipe off any excess silicone

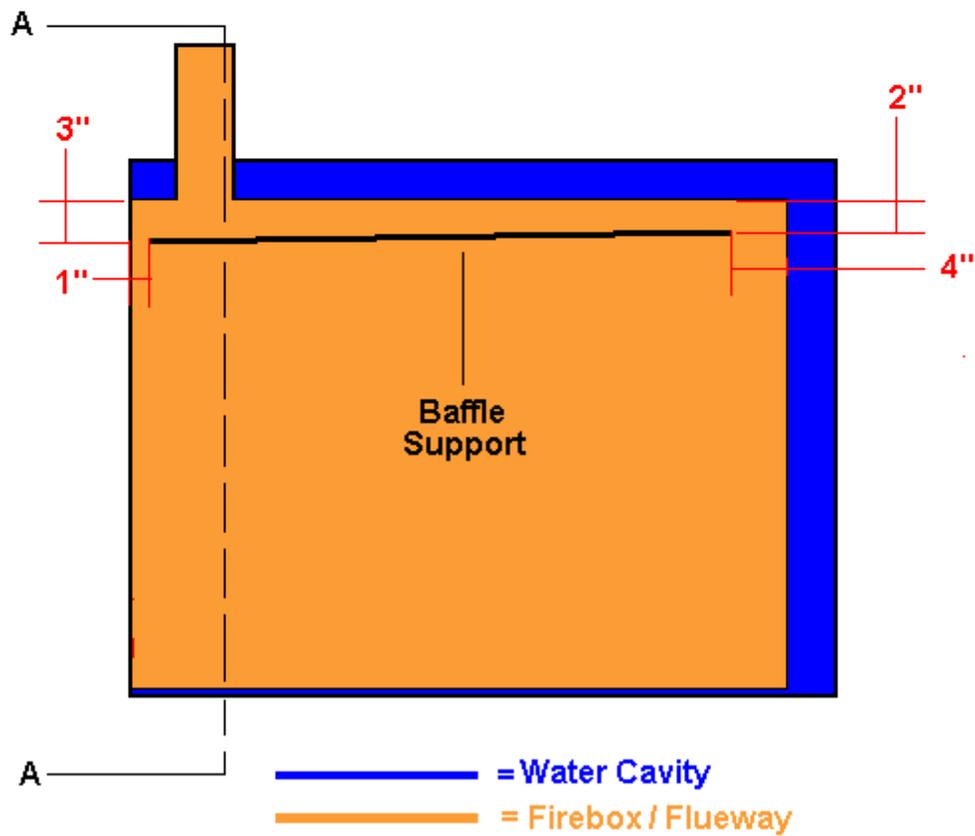
10) For the supply and return lines, use 1" plastic hose called PEX, which is readily available at building centers such as Menards. Use long enough lengths to eliminate underground splices. The tubing should be insulated with lengths of foam sleeves and encased in 6" PVC, non-perforated sewer pipe. Do not use black poly pipe as it cannot take the heat, and will eventually crack. The supply and return water lines should be buried at least 12" deep.

A Word about Safety

Project construction of this nature may require the use of cutting, shearing, drilling, welding, plumbing, and electrical tools. The use of these types of tools and the material handling methods described in this document can present risk to the health and well being of the builder. Please be aware that these risks exist and that the builder must take the necessary precautions to protect them self. Prior to the construction phase of any of this project, please make sure to read, and understand all power tool safety manuals, and observe them. Above all please work safely!!!!



Section AA





Install 1" hose barbs to upper fire door and water jacket elbows as shown. Install a length of 1" re-enforced vinyl hose between the door and stove inlet. Secure each end with hose clamps. Be sure to allow ample hose length so the door can open and close freely. Note: Submersing the end of the hose into hot water will soften it and make it easier to push onto the hose barb.



View of completed sheet metal installation to the stove housing front.



Place one of the damper hinge brackets to the side of the draft way, and mark the location of the holes. The bracket should be positioned approximately 3" back from the damper. Drill holes through the side of the draft way and then fasten the hinge bracket in position using screws or bolts. Repeat this process with the remaining hinge bracket.

Lay the damper and bracket assembly on top of and against the front of the flue way. Mark the location of the damper hinge pin holes on each of the hinge brackets. Remove the damper assembly and drill a $\frac{1}{4}$ " hole at each of the marked locations.

Using bolts or screws, secure the damper to the damper hinge brackets. The damper assembly must open freely.



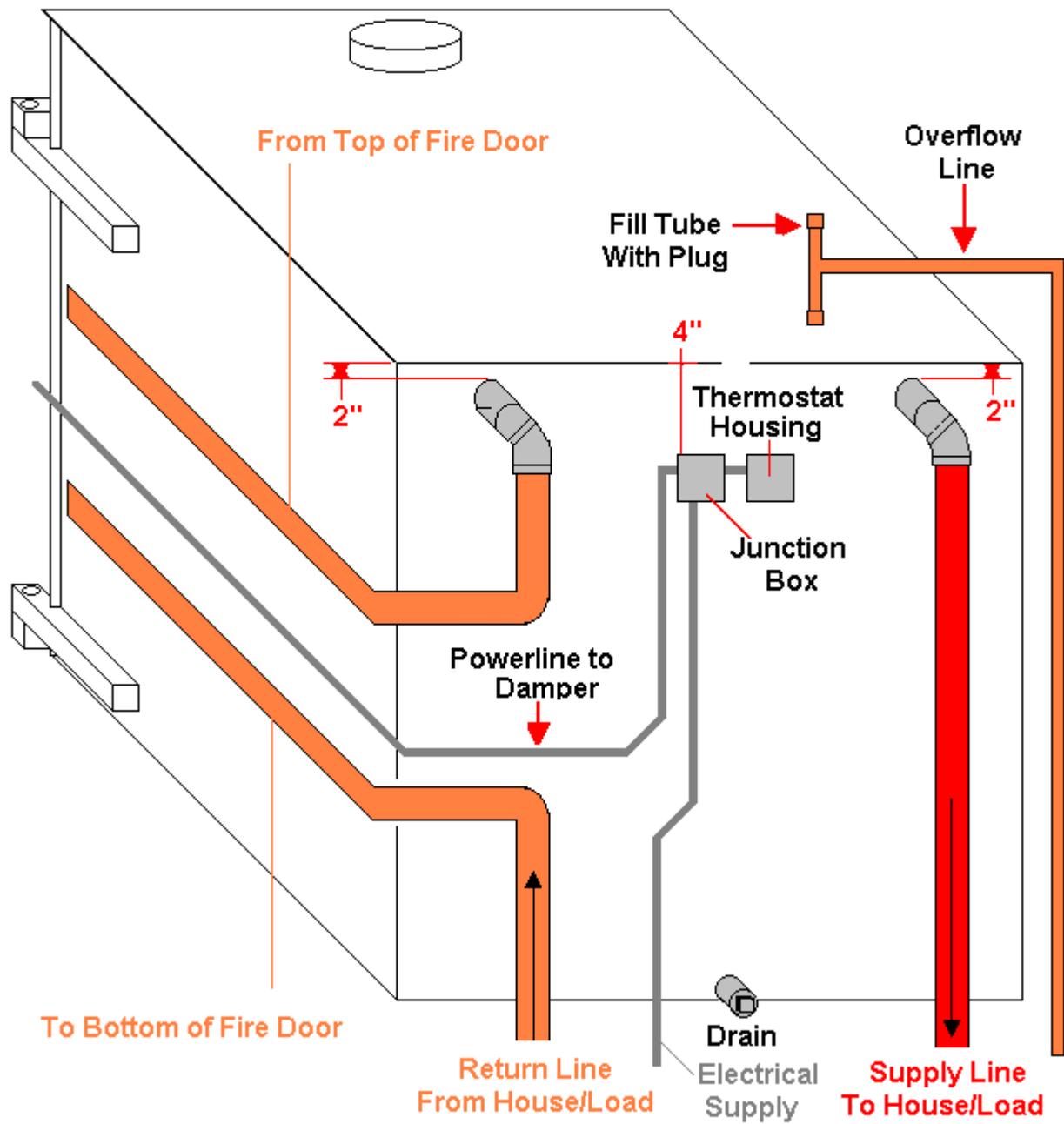
Here is a view of the transport process. Use appropriate tie down methods with the load before proceeding. Drive slowly and proceed with caution.



The 1" PEX tubing should be encased in sections of foam insulation and then taped together. The tubing should be taped along its entire encased length with duck tape. A strong rope should then be fished through the casing and attached to the water lines. The lines can then be pulled through the casing.

Note: If the water line length is greater than 30', please consider using twin casings or a single 8" casing. The potential curves in the casing combined with the stiffness of PEX can make it extremely difficult to pull twin lines through a 6' casing. Any electrical lines should also be pulled through at the same time.

Typical Water and Electrical Line Routing
Note: Your Stove Plan Plumbing May Vary Slightly





Test the stove systems

a) Water circulation circuit

**Fill the boiler completely with water, watching for leaks at all plumbing connections.

**Open all valves and turn on the pump. Watch for leaks. Let the pump run until all the air has been forced through the system. You'll be able to hear any air running through the lines in the house. If the circulator pump slowly loses prime, there may be a leak in the system. Once you are satisfied that there are no leaks, open the pipe cap slightly on the top of the door, to bleed out any remaining air from the fire door. Proceed to the next step.

b) Heat control circuit.

For safety sake, keep a cold water hose handy and the boiler fill-hole open!!!! Shovel a 1-inch layer of sand onto the base of the firebox. Turn on the damper power supply circuit. Install the baffle, build a small fire in the front of the firebox, and close the fire door. During the initial firing, continue to check all plumbing connections for water leaks. Reload the firebox as necessary. Take your time. It could initially take 1-2 hours for the boiler water to satisfy the thermostat at which time the damper motor will de-energize and the damper will close. You can observe the water temperature on the stove mounted digital thermostat, if

BOILER PLAN FREQUENTLY ASKED QUESTIONS AND ANSWERS

Question:

How does the outside wood stove/boiler built from this plan work?

Answer:

This stove is basically, a very large firebox that is completely surrounded by water. A thermostat on the boiler water jacket energizes and de-energizes a powered damper assembly, to maintain a constant boiler water temperature. A low wattage pump moves this heated water to the house and back.

Question:

What is the design of the delivery system that supplies the heated water to the house?

Answer:

I used 1-1/4" galvanized pipe that I obtained for free. Otherwise I would recommend, using 1" flexible copper or PEX tubing. Use long enough coil lengths to eliminate underground splices. The tubing should be well insulated with lengths of thick foam, pipe or fiberglass, insulation, or encased in 4" PVC, non-perforated sewer pipe, to keep moisture out of the pipe insulation. Do not use black poly pipe. It cannot take the heat, and will eventually crack. These supply and return waterlines, should be buried at least 12" deep.

Question:

How often do you have to fill the fire box?

Answer:

That will depend on the outside temperature, and the size and insulation properties of your house. With my house (2300 sq. ft. plus a full basement) here in Wis., I fill my stove twice a day using softwood, until the temperature gets down to 0 degrees Fahrenheit. At that point I burn hardwood, but still only load twice per day. When the temperature is at, or above 20 degrees, once per day is sufficient.

Question:

Can I use the boiler for other heating applications such as heating domestic hot water?

Answer:

Yes. It can be used to heat domestic hot water, a swimming pool as I do, or a hot tub/spa. This requires only a liquid to liquid heat exchanger, plans for, which are available from DEB Design.

Question:

I have a forced air furnace in my house. Can this stove work in this application?

Answer:

Yes. There are 3 main ways this boiler can be used with any existing furnace system:

- 1) In a hydronic (hot water system) the hot water could be pumped directly to the boiler distribution manifold, and delivered to the various zones of the system as dictated by the zone thermostats. This is the method I currently use.
- 2) In a hydronic system, a liquid to liquid heat exchanger could be installed. The wood boiler water would be pumped into the exchanger, which would then heat the house system water, when the zone thermostats open and allow water flow through the exchanger.
- 3) In a forced air system, the boiler water would be pumped continuously through a liquid to

liquid heat exchanger that is installed in the furnace plenum, just like an air conditioning "A" coil. A simple control is installed to keep the furnace burner off, if the boiler supply water is hot enough. Then, when the house thermostat calls for heat, only the furnace blower is energized. In methods 2 and 3, the exchangers serve two purposes:

1) Supply heat to the house heating circuit.

2) Supply heat to the wood boiler circuit, too prevent freezing when the boiler fire goes out, if no antifreeze is used.

DEB Design offers construction plans for a liquid to liquid heat exchanger. Liquid to air heat exchangers are available through most plumbing and heating retailers.

Question:

Does it take superhuman welding skills to weld this boiler? I am interested in building such an outdoor heating apparatus. I would like to know what welding skills are necessary as I am a novice.

Answer:

I feel average welding skills are required to complete this project. It is constructed from cold rolled steel with mostly long straight 90 deg. butt welds. If you don't have average skills, I recommend you have a qualified friend, or even a welding shop, weld it for you. For a budgetary quote, plan on 100 hours to complete the welding. Unfortunately, if you are considering paying someone to weld or build your stove, you might just as well purchase a commercially built stove.

Question:

How easy is it to change the plans? Could thicker steel be used? Can the plans be modified to include a slide out ash pan and grate system?

Answer:

This design is real flexible. The material list specifies the component sizes and assigns each piece a number. The plan drawings explain the assembly sequence, and show how the numbered pieces fit together. Using thicker steel would not be any problem. Extending the firebox length to 6', as an example, would involve adding 24" to the length of the appropriate pieces. This could take a bit of studying; however, it could be done. I once thought about installing an ash pan and did use a grate system, for a while. The grate didn't stand up very well, so I finally just left the ashes to serve as the bed. This has worked out quite well for me. I usually remove the ashes every 2 to 3 weeks. I do this prior to a reload session. I push the embers over to one side, and then shovel out half the box, and then repeat with the other half. Once done I refill the firebox. The residual embers easily restart the fire. It does get a bit smoky on occasion, but otherwise it's quite trouble free. If an ash pan/grate system was desired, I feel that one could be designed and installed, without too much trouble.

Question:

Some heaters use an insulated door instead of a water filled door. Wouldn't that be simpler?

Answer:

Yes, it probably would be simpler. I was concerned about safety, and insuring that no exterior boiler surfaces became hotter than the boiler water temperature. This also could be left to the builder's discretion.

Question:

What would be the life expectancy of the ¼" thick steel.

Answer:

That will depend on how leak free the fire box is made. The enemy here is rust, not heat. If the inside of the firebox stays moisture free, I would expect it to last many years. I also think that using a rust inhibitor (automotive) in the boiler water, would help promote a long boiler life.

Question:

The first thing that I was wondering is how do you fill your boiler with water? Do you fill it with a hose?

Answer:

I have a water supply line plumbed into the circuit, inside my house.

Question:

How many gallons do you think you fill each week?

Answer:

I usually only have to add a gallon per month or so.

Question:

Have you thought of installing anode rods similar to water heaters?

Answer:

No, but that's an excellent idea. They would need to be installed along either of the sides where there is enough depth.

Question:

Would four or five pieces of metal tubing run horizontally in the top of fire box be an easy way to improve efficiency?

Answer:

It might. There is any number of ways to improve the efficiency of the design. The plan, as built, was meant to be a starting point, for stove builders. More capable and advanced builders could easily add modifications of their own, but remember: **Simpler is better!**

Question:

In your design, your supply and return lines both go to or near the top of the boiler. Why don't you return to the bottom of the boiler?

Answer:

This method provides protection in the event of a major, door hose break. If the outlet is positioned properly, the boiler water level would only drop to 1" above the firebox, which would keep water above the thermostat level. This would then keep the stove from thermal run-away, and subsequent destruction, and/or possible fire.

Question:

Many commercially distributed wood boilers boast a firebrick lining in the firebox. Your plan doesn't. Do you recommend it for your boiler design?

Answer:

I don't know what the advantage of the firebrick would be in my design.

Question:

Do the plans show how to hook up the boiler to a forced air heating system?

Answer:

No, you should consult a heating contractor for that phase of the project.

Question:

I'm somewhat reluctant to build a boiler such as this as I'm not an experienced welder. What are your thoughts on this?

Answer:

You might want to consider Boiler Plan II. It's easier, and cheaper to build than Boiler Plan I and would provide you with valuable experience, should you ever want to build a more complex version.

Question:

What is the difference between a closed system and an open system?

Answer:

A closed loop system is not vented to the outside atmosphere (such as a hydronic heating system) while an open system is. DEB Design stoves plans use an open system.

Question:

What advantages and disadvantages does each have?

Answer:

The main advantages of a closed loop are:

- 1) There will be very little oxygen in the water, which can shorten heating system component lives. (Pumps, valves, etc.)
- 2) There won't be any evaporation of the boiler water.

The main advantage of an open system is that the components do not have to be as strong to withstand the higher pressures prevalent in a closed system.

Question:

Do you have any plans for a system that holds less water?

Answer:

No, but the plans can be easily modified by the builder.

Question:

Can you use a boiler to heat two buildings?

Answer:

Yes, all you do is run a plumbing (including pump and thermostat) loop from the boiler to the building to be heated.

Question:

Can this unit be setup, so that if the fire goes out the gas furnace will take over?

Answer:

Yes, a Plumber can assist with this

Question:

I currently have a 4,600 sq. ft. home with a 430 sq. ft. garage and a 16 by 30 ft. indoor swimming pool. We are using a 225,000 B.T.U gas boiler to heat our home. This boiler operates at 18 psi with an expansion tank. Will your wood boiler work with our present system with the gas boiler used only for a backup?

Answer:

I've estimated the DEB Design Boiler Plan I boiler at app. 125,000 BTUs. You'd need to use liquid to liquid heat exchangers to integrate the outside wood stove into your existing heating system. I've estimated the DEB Design exchanger plan design BTU rating at app. 50,000, so you'd need at least 5 of the exchangers and a large enough wood boiler to match your current stove capacity. (Plus a whole lot of wood to fuel it)

Question:

How large of a boiler will I need in the previous question?

Answer:

About twice the size of the plan design which has a 36 cubic ft. capacity firebox. (In theory)

Question:

Are the plans for Boiler I and Boiler II different size boilers?

Answer:

No, they have the same size firebox.

Question:

What are the BTU ratings of the plan boilers?

Answer:

Approximately 125,000 BTUs.

Question:

Do you ever or frequently have problems pushing water with your small ground Grunfos pump? Have you ever had the situation where your pump won't push air, but it will push water? Do you have any ideas as to why I am running into so much trouble with the pump quitting pumping the cycle?

Answer:

Yes, I've had the same problems with air in the lines, especially the first year, when I used poly pipe for supply and return lines. Leaks will cause this. Also, the Grunfos pump may not pump water up hill very well. A critical design element is the nipple length, shown on the "Side View" of Drawing 15. (Size the pipe nipple length to end 1" above the firebox) This creates a fluid locked water circuit, between the boiler supply and return outlets. Once all the air is purged from the lines, the Grunfos pump can "move" water continually, with out problems, as long as there are no major water leaks. If you don't construct the boiler return entry like this, you won't be able to use a Grunfos pump. You may need a stronger pump. (More electrical power consumption) In my own installation I placed an old jet pump ahead of the Grunfos pump that I use for purging air out of my system. (It also serves as a back up pump) I must always be careful to insure that at least 1 heat circuit is open; otherwise the pressure from the auxiliary pump will trip the high pressure relief valve on my natural gas commercial boiler (usually set at about 30#). As you can surmise, I have my heating systems integrated. Once all the air is purged from the system, the auxiliary pump is shut off, and the small circulating can pump just fine. If you are using a radiator as a heat exchanger, the auxiliary pump should be installed on the return side. This would insure that the radiator is not exposed to excessive pressure.

Question:

How do I seal around the chimney, high temp silicone?

Answer:

Use a chimney collar. This is a piece of steel that wraps tightly and fastens around the flue pipe. It flares down and out, a few inches. High temp sealant could be used to complete the seal between the collar and flue pipe.

Question:

In my heating application the forced air system is in the attic and I would want to use a coil in the air handler. Have you had any experience with pumping the water up to the second story

of a house?

Answer:

1) Yes, once all the air has been pumped out of a heating loop as you describe, a circulation pump is all that is needed. That's because the weight of the water in the return line draws the water up through the supply line through a siphoning action. The circulation pump specified in the plans should work just fine.

2) Another more economical option for forcing air out of any heating zone loop is to flush it out using the house supply water. All you need do is close the boiler supply valve and then fully open the house water supply valve. Since the boiler supply line is closed, the water will flow through the heat circuit and back to the boiler through the return line until all the air has been purged from the line.

Question:

Does it really take 100 hours to weld?

Answer

Yes, at least, plus many more hours to install, plumb, and troubleshoot. This project is not something you would want to hire done. If you are considering that, you should purchase a commercial version. It would be better to ask a family member or friend for help.

Question:

How much should I expect to pay for a good welder?

Answer:

If you must pay to have the welding done, you might as well just buy a commercial unit. I suggest you should shop around for someone willing to do the project as a side job rather than as a livelihood.

Question:

How long does it take to get the parts I would need?

Answer:

The steel can usually be ordered and picked up within a week's time. The remainder of the parts can be usually be obtained locally, or via UPS.

Question:

Are you still using the same unit in the plans? (Boiler Plan I)

Answer:

No, that stove was built in 1995, I am on the second revision (of sorts). The pallet burner is what I currently use.

Question:

What changes did you make on your current stove ?

Answer:

I did away with the extra baffle and changed the powered draft system so the stove is more efficient.

Question:

Do you wish you would had changed anything else?

Answer:

Yes, when I build another stove I would run the flue straight up from the top of the firebox and omit the horizontal section. I had originally built it that way to make it easier to install the boiler roof. I would also make sure to place the overflow pipe towards the south to prevent it

from freezing up!

Question:

How long has your current stove been in use?

Answer:

My current stove was built in September of 2002, and has been in use for at least 8 months every year since.

Question:

I'm considering buying and building the large boiler plan for the house and the smaller one for my workroom.

Answer:

I'd build just one big one and pipe the water to both locations. You will definitely need a liquid to air heat exchanger. Some stove builders have used truck radiators for this purpose.

Question:

I was thinking of installing this in a garage. Would this be inappropriate?

Answer:

These stoves are not meant to be installed indoors. The large size of the firebox doors would allow smoke to completely engulf the indoor space. One of the biggest reasons for the popularity of these stoves is their safety due to the outdoor placement.

Question:

Are the same controls used for all stove plans and if not can the plan 1's be "used" for plan 2's.

Answer:

The control systems specified are slightly different, but you could use the Boiler Plan I control system for any stove you build.

Question:

Can you give me with the overall firebox capacity of Boiler Plan I and II?

Answer:

Both plans have approximately the same firebox dimensions, yielding approximately 36 cubic feet of volume. Boiler Plan I is rectangular in design while Boiler Plan II is circular due to the use of drums and tanks for it's construction. If you have the appropriate raw materials, Plan II is a great way to economically get your feet wet in boiler stove construction. I used fiberglass construction insulation that I stripped the paper backing off of. It is shown on page 48 and 49 of the pallet burner plan. Any type of insulation can be used as long as it is not flammable including blown in types of insulation called cellulous. These are treated with fire retardant chemicals. You could weld up the insulation cavity leaving the top piece off and then mount the door to the stove (Or weld the insulation cavity onto the door after it is mounted). You could then pour the cellulous style insulation into the door cavity until filled and then install the top piece. You should make the top piece removable so additional insulation can be added later if it settles. (Be sure that a draft way is incorporated into the door insulation cavity.)

Question:

If I do not use a blower as shown in your plans, I assume I will need a damper door of some type. If that is correct, how would you activating the open/close of the door.

Answer:

The damper motor that is specified is actually used to activate the steam damper doors on

large steam heated tumblers. In that application, the motor shaft is coupled to a 1" diameter shaft. A small gauge chain is attached between the shaft and the damper doors. When the damper motor activates it draws the chain onto the shaft which pulls open the damper. The stove damper could be a simple 8" wide x 16" high plate that is hinged at the top and covers the draft way opening in the door. The damper could be weighted at the bottom to insure closure and have an arm that extends outward a few inches from the top. You could attach the chain to this arm and mount the damper motor and weatherproof enclosure directly above the damper motor. You would probably also want to install a positive stop to the damper door so that it only opens a few inches at the bottom. You might also be able to use a solenoid to accomplish the same task; however it has been my experience that the hard quick pull of solenoids can be hard on components and linkages.

Question:

Is it possible to use coal in these stoves?

Answer:

Though I've never tried it, using coal should not be a problem. The only thing that you would want to insure is that the loading door has a good seal with the firebox. If air is not cut off to the fire when the damper closes, the coal could burn out of control and overheat the water causing it to boil off. If this goes on for too long, too much water could evaporate to the point that the firebox becomes exposed. If this happens, the stove could be destroyed. (Welds tearing, steel warping, etc). I suggest that if you build a stove for this purpose, that you pay extra attention to the door seal areas. On the initial fire up, do not overload with coal until you are sure the fire can be properly controlled. (Or there is more of a load on the stove such as during colder weather).

Question:

I have your plans and in the process of building my stove. Not clear on how high the water level should be above the circulating pump fitting.

Answer:

The plans show a centerline dimension of 3" to the top of the stove. The water jacket of the stove should be filled to the top until or until it flows out the over flow. The assumption is that if you use 1" or 1-1/4" pipe for your supply line, that there will be at least 2-1/2" to 2-3/8" of water above the highest part of the outlet.

Question:

I just purchased a CD on how to construct a wood stove/boiler. Is there any way to print a copy of these plans from the downloaded program?

Answer:

Yes, if you have a printer hooked to your PC, you should be able to open the file and then send it to the printer. If you do not have a printer attached, you could possible email the file or transfer with a data storage device such as a CD, to someone with a printer. They could then print it from their PC using their printer.

Question:

I am interested in purchasing one of your CDs. I assume I will be able to produce shop drawings from this CD?

Answer:

The plan files are all Adobe Acrobat files. I do not know exactly what your shop drawing

requirements are but the files can easily be printed to a printer or drawing plotter. The plans are normally printed to a standard paper size of 8-1/2" x 11".

Question:

How long will the Pallet Burner take to burn up 12 pallets, before needing to be refilled?

Answer:

The time will vary depending on the following factors:

- 1) The average daily winter temperature of your location
- 2) The insulation properties of the building or house
- 3) The wind conditions of the location

The stove pictured in the plans was designed to heat a 2300 square foot house with the following conditions:

- 1) An outside temperature down to 0 degrees Fahrenheit
- 2) The house is 13 years old and is well insulated.
- 3) The wind speed averages up to 10 miles per hour.

If these conditions are exceeded, the stove will need to be loaded twice per day.

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