

GSERIES

GREENER, CLEANER HEATING SOLUTIONS

G100, G200, G400

EPA PHASE 2 QUALIFIED WOOD FURNACES

OPERATION AND MAINTENANCE MANUAL



Model:

Serial #:



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*RETAIN THIS MANUAL FOR FUTURE REFERENCE
DO NOT THROW AWAY*

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LIMITED WARRANTY

SteelTech Inc. Warrants to the original owner of the G Series outdoor furnace that it is free from defects in workmanship and material, which could cause a leak or malfunction of the tank, and against corrosion (if the instructions in the owners manual for water treatment and maintenance are followed) for The Life of the furnace toward the purchase of a new HeatMaster ss furnace, in the following pro-rated schedule.

Warranty schedule: coverage in the initial 5 years is 100%
Year 6-7 is 50%
Year 8-9 is 40%
Year 10-15 is 30%
Year 16-Life is 10%

In addition, all steel components including housing, legs, etc. have a pro-rated warranty for a period of 10 years with coverage reducing by 10% per year. **All firebrick used in the furnace is not warranted.** Any parts not manufactured by SteelTech Inc., that are used on the furnace – such as thermostats, limit switches, pumps, heat exchangers – carry their own manufacturer's warranty, normally one year. SteelTech Inc. will not be liable for the cost of shipping, replacement or repair of these parts.

If warranty requires removing or replacing of the furnace, SteelTech Inc. is not responsible for the cost of plumbing, replacement of antifreeze or water treatment, shipping cost or any other cost other than the replacement component or furnace. SteelTech Inc. always has the right to decide if a part or furnace will be repaired or replaced and will not be liable for any cost not authorized by a SteelTech Inc representative.

SteelTech Inc. does not warranty any damage caused due to negligence and deterioration due to lack of proper ongoing maintenance, physical damage caused by abuse or freeze up, power surges or unauthorized work or modifications to the furnace.

SteelTech Inc. is not liable for any damage or cost which may occur from or during the operation of the furnace or damage incurred due to any heating system failure. The purchaser assumes all responsibility for the care, maintenance and safe operation the furnace including adding of approved boiler treatment or water. SteelTech Inc does not warrant door gaskets, exterior paint or finish.

To qualify for warranty all instructions must be followed in operator's manual, **water must be tested and maintained a minimum of once per year**, and warranty registration must be on file at SteelTech Inc Ind. within 30 days of purchase along with a copy of the original invoice. **No warranty can be approved unless the warranty registration and water test verifications are on file at SteelTech Inc.'s office.**

The warranty can be violated by operating the furnace in a manner inconsistent with the owner's manual

SteelTech Inc Reserves the right to change conditions of warranty at any time.

WATER TREATMENT AND TESTING

Water Treatment Policy

To qualify for warranty water must be tested a minimum of once per year and water treatment added when necessary.

To test the water open the boiler drain located at the bottom of the rear of the furnace until the water runs clear. Fill one of the test bottles provided to you by your dealer and mail to our testing lab using the mailing carton and label provided with the bottle. Make sure to note if the furnace water contains any antifreeze or additional chemicals. If any adjustments need to be made to the water you will receive a report outlining what must be done. Take another sample and mail it to our test lab again to verify the recommended changes have been made.

Add the water treatment through the fill pipe located at the top of the furnace when initially filling the furnace with water or after testing, if needed. Ensure that all drains are closed. It is recommended that water treatment be added at a 1:200 ratio when initially firing the furnace and 1:300 after that. Additional treatment may have to be added for water with more severe properties or for systems with more chemically demanding requirements. Recommended operating pH level is 9 – 10.5. Recommended nitrite levels are 600-1000 ppm.

What Water Treatment Does

The water treatment used in outdoor furnaces are nitrate based water treatments which act as oxygen scavengers, neutralize harmful bacteria and harmful minerals and elements in your water to reduce scaling and corrosion in your furnace and plumbing system.

Test Parameters and What They Mean

Conductivity

Conductivity is a measurement of minerals in your furnace water. While it is common to have minerals in water, in excess minerals can cause many problems in hydronic systems including scaling and corrosion.

pH

pH is measurement of alkalinity (hard or soft water). For outdoor furnace water and the water treatment used in outdoor furnaces it is better to have your water a little harder than softer (recommended pH range is 9-10.5) as the active ingredients in the water treatment neutralize harder water easier than softer water

Nitrates

Nitrates tested for are a measurement of how much water treatment is in the water. Nitrates measured are active units of water treatment available to neutralize harmful elements in your furnace water. Nitrates also act to neutralize harmful bacteria that may build up in the furnace water over time.

Glycol

Inhibited glycol provides anti-corrosion elements and freeze protection for outdoor furnaces and is compatible with Outdoor Furnace Water Treatment. Because outdoor furnaces are open to the atmosphere systems and will have fresh water added occasionally, oxygen is always entering the system and will break down the glycol over time to create glycolic acid which will harm your furnace system. When this happens you will be required to drain and flush your furnace system. It is always suggested to use 100% virgin glycol instead of recycled glycol as it will break down

SAFETY PRECAUTIONS

Read and understand all precautions before operating the furnace.

ATTENTION: Save these instructions. Retain this manual as long as you own your G SERIES outdoor furnace. Carefully read and follow these directions.

ATTENTION: BURN WOOD ONLY. LOAD FUEL CAREFULLY OR DAMAGE MAY RESULT

ATTENTION: The person(s) operating this furnace must comply with all applicable local and state laws or other requirements,

ATTENTION: The person(s) operating this furnace are responsible to run it in such a way so that it does not cause a public or private nuisance. Consult with local authorities prior to installation to adhere to local laws and ordinances.

DANGER: Do not start fire with or burn garbage, gasoline, naptha, engine oil or other inappropriate materials. Only competent persons with a sound understanding of this heating method should operate this furnace. Improper firing could result in personal injury and/or damage to the unit and void warranty.

WARNING: All installations and operations of your G SERIES product must follow state, provincial, and local laws pertaining to operations, wiring, plumbing and building codes.

WARNING: All models operate at atmospheric pressure. DO NOT obstruct, block or plug the overflow vent tube in any way, which is located on top of the boiler .

CAUTION: Do not start or operate furnace without checking heating fluid. Furnace must be filled until heating fluid comes out of vent pipe on the top of the furnace.

CAUTION: Check for buried cables and utility lines before digging the trench to your furnace.

CAUTION: For safety and proper temperature control keep all doors closed during operation.

WARNING: When installing the furnace, the chimney should never be connected to a chimney flue serving another appliance

WARNING: Do not operate furnace in event of power failure

WARNING: Use caution when opening firebox and ash cleaning doors. Push bypass rod on front of furnace and slowly crack door open for at least 20 seconds before opening door.

WARNING: Risk of fire:

- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances
- Inspect and clean flues and chimney regularly

CAUTION: Hot Surfaces: Keep children away. Do not touch during operation.

FURNACE INSTALLATION GUIDE

Installation should be performed by a qualified installer and will comply with all requirements of the agency having jurisdiction.

Furnace Specifications			
	G100	G200	G400
Max BTU Output	120,000 BTU/hr	232,000 BTU/hr	350,000 BTU/hr
Heat Output (8 Hour Burn)	48,000 BTU/hr	111,500 BTU/hr	180,500 BTU/hr
Furnace Size (W x L x H)	36 x 56 x 74	48 x 72 x 79	51 x 84 x 86
Furnace Weight	1300 lbs	2400 lbs	3000 lbs
Firebox Dimensions (W x L x H)	18 x 18 x 31	28 x 29 x 34	28 x 40 x 39
Chimney Size	6"	6"	8"
Firebox Loading Door Size			
Water Capacity	100 gallons	195 gallons	250 gallons

LOCATION

Maintain adequate clearance of buildings and combustibles. Pile and store wood under shelter. Do not place or store wood within stove installation clearances or within the space required for charging and ash removal. For indoor installations where fans are used in the fuel storage area they should be installed so as to not create any negative pressure in the room where your G SERIES furnace is burning.

Contact all governing authorities in your area prior to installation.

When choosing the location of your furnace you should consider prevailing wind direction, distance from home and wood storage for refueling. Give consideration for any effect on your neighbors.

CLEARANCES TO COMBUSTIBLES

Whether installing your G SERIES furnace inside a building or outside the following clearances to combustibles must always be followed or damage and personal injury may result:

Minimum Clearance to Combustibles	
Furnace Roof to Ceiling (Indoor Installations)	6"
Side Walls	6"
Rear	6"
Front (Loading door)	24"

FURNACE INSTALLATION GUIDE

Installation should be performed by a qualified installer and will comply with all requirements of the agency having jurisdiction.

FURNACE FOUNDATION

Find the footprint of the furnace in the Appendix of this manual

Inspect the ground conditions that you intend to install your furnace on. A cement pad of 4-6" in thickness should be used. For outdoor installation, the furnace can also be placed on 4 cement blocks not less than 6" wide X 10" long and 3" thick. place your blocks so the legs will stand on the center of the blocks. Cement pads should be a little bigger than the actual furnace, with about a 4' extra length front and back so you have a solid working area. The furnace may be installed on a combustible floor provided a noncombustible material such as metal or masonry liner is used in the following areas:

- Underneath the furnace
- At least 16" in front of the furnace and 8" on each side of the firebox and lower combustion chamber doors.

TRENCH

SteelTech Inc recommends the trench to be 24" to 36" deep and wide enough to install your water lines. If possible, have a gradual slope in your trench to allow drainage away from your lines and out of trench bottom. Most insulated underground pipe has room for electrical wire in it. If it does not, place electrical supply in bottom of trench and cover with 6 inches of dirt. A minimum of R8 insulation value is recommended and a water tight vapor barrier such as PVC pipe or drain tile to encase your insulation is a must.



NOTE: If you are installing your water lines under an area where vehicles will cross, you should increase your depth of the trench and use a schedule pipe over your lines to reduce the pressure generated on the lines.

FURNACE INSTALLATION GUIDE

Installation should be performed by a qualified installer and will comply with all requirements of the agency having jurisdiction.

INDOOR INSTALLATION

Outside combustion air may be necessary if:

- The furnace does not draw steady, smells, rolls out smoke, is burning poorly or back drafts or if any of these symptoms are alleviated by opening a window.
- The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices that exhaust house air.
- There is excessive condensation on windows in the winter.
- A ventilation system is installed in the house

CHIMNEY

The chimney on your G Series outdoor furnace is a stainless steel double wall insulated chimney. It is attached to the furnace with a stainless steel adapter. When installing the furnace, the chimney should never be connected to a chimney flue serving another appliance. Make sure chimney, flue pipe and draft inducer fan stay clean and in good condition at all times.

ATTENTION: Before installing check with local building codes for information regarding chimney height and distances to adjacent buildings, etc. the top of the chimney must extend at least 3.0 feet above the highest point where it exits the roof and be at least 2.0 feet taller than any point of the roof within 10.0 feet. For a new chimney, use an insulated stainless steel system that conforms to type HT (High Temperature) requirements of UL 103 and ULC-S629 and complies with the requirements of Chapter 11 of NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances. The recommended chimney and adapter collar is listed below.

Furnace Chimney Size	
G100	6"
G200	6"
G400	8"

The chimney must be connected using a minimum 24g black or blued steel flue pipe and connector. The shorter the stove pipe connection the better. Make sure to follow local building codes.

Note: Incorrect chimney installation will void the warranty.

This is a forced air furnace but it is important that the chimney has good draft to further eliminate any smoke issues.

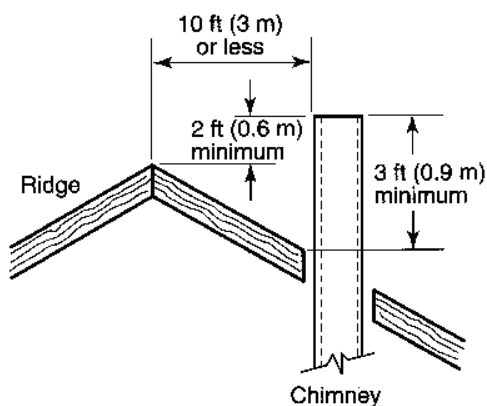
Note that using a smaller chimney may cause smoke issues and using a larger chimney may negatively affect furnace performance.

ATTENTION: CLEANING OF THE HEAT EXCHANGER, FLUE PIPE, CHIMNEY AND DRAFT INDUCER IS ESPECIALLY IMPORTANT AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS CAUSED BY ACCUMULATED ASH.

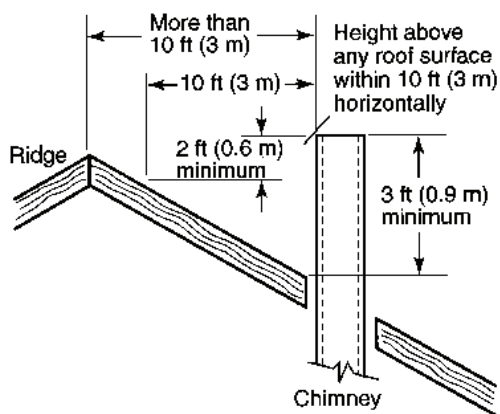
CHIMNEY INSTALLATION

Draft problems may occur because of incorrect chimney installation. Make sure to follow these simple rules to ensure proper performance and safety.

The basic rule is this: the top of the chimney must clear the roof penetration point (the upper edge) by at least 3 feet and must clear anything within a 10 foot radius by at least 2 feet. This includes: the peak of the house, parapet, dormer, chimney, or spire. See diagram below.



If the chimney terminates beyond 10 feet from the ridge of the roof it must clear the upper penetration of the roof by 3 feet. Notice that the flue still terminates 2 feet above the roof at the 10 foot perimeter:



COMBUSTION AIR

Fireplaces, other furnaces, clothes dryers, exhaust fans, and other appliances all draw air from the room in which they are located. Your G Series furnace adds to that draw, making it important to ensure there is an adequate source of fresh air to offset these demands. Otherwise, a negative pressure may be created in the room and starve combustion in the furnace.

1. Determine the volume of space (cubic feet) in the room. Include in the calculation adjacent rooms and areas not closed off by doors.

Volume (CF) = Length (ft) x Width (ft) x Height (ft)

2. Determine the air input requirements of all appliances in the space. Add the BTU output of all appliances and round the total to the nearest 1000 BTU per hour. Your G Series Furnace requires 85 CFM (cubic feet/minute).

3. Determine whether the space is 'confined' or 'unconfined' by dividing the total volume of the room by the total input requirements for all appliances in the room.

a. If the result is equal to or greater than 50 CF/1000 BTU per hour, then consider the space 'unconfined.'

b. If the result is less than 50 CF/1000 BTU per hour, then consider the space 'confined.'

4. For an 'unconfined' space in a conventionally constructed building, the fresh air infiltration through cracks around windows and doors NORMALLY provides adequate air for combustion and ventilation, and therefore no additional make up air is required.

5. For a 'confined' space or an 'unconfined' space in a building with unusually tight construction, an additional source of make up air is required. Please consult a HVAC professional to determine the best way to supply make up air for this type of installation.

Important: The furnace room must never be in a negative pressure condition. Negative pressure could result in smoke in the room.

WIRING

All wiring must conform to local codes. Use an electrical wire rated and approved for underground installations. ***This wiring can be placed in the same trench below the water lines.*** A qualified technician must perform the electrical portion of the installation.

See Page 22 for the furnace wiring diagram.

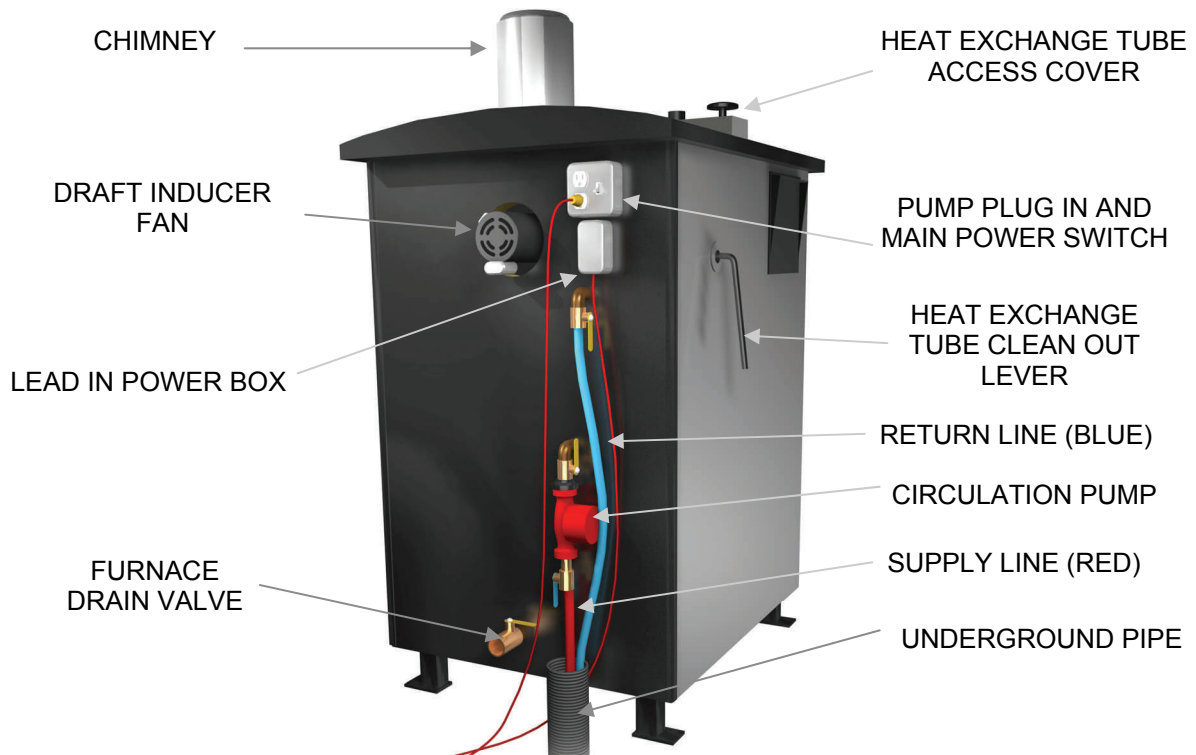
UNDERGROUND HYDRONIC LINES

Hydronic lines (hot water heating lines) whenever buried or encased in cement should not be spliced. Take the necessary steps to ensure they stay dry. This ensures that minimal heat loss occurs. Supply and return lines should be a minimum of ¾" diameter and have a rating of 100 PSI capacity at 180 degrees Fahrenheit. This pipe should be listed for potable water.

Hint: Mark your feed and return lines prior to covering and allow enough pipe above ground at both ends for a relaxed connection. Red lines are generally "hot" while blue are usually "cold".

FURNACE CONNECTION

Connections to the furnace are clearly marked. Return (from the house) are the top ports, Supply (to the house) are the bottom ports. The installation of isolation valves at both ends of the pump is recommended as well as a valve at the return line. This will allow you to shut off water supply if repairs or additional heating components are added to the system. Your main power is connected to the junction box at the back of furnace and should be connected by a qualified technician.



BUILDING CONNECTIONS

A hole large enough to accommodate the water lines, insulation and PVC piping through the wall is important. Attention to sealing this point on both sides is also important.

INTERIOR CONNECTIONS

You may require either a water-to-water (tube and shell or plate) or a water-to-air exchanger (rad) to transfer heat energy from the hot water your furnace has produced. Your plumber or dealer can design and install a system to best fit your needs. The following are examples of basic interior connections. SteelTech Inc. carry the necessary parts for installation.

It is important to note that when installing your piping system in your building that you should avoid installation methods that cause too great a restriction in the piping system. Examples of this are reducing pipe size, an excessive amount of joints and elbows, etc. This may build up enough pressure to damage your piping, heat exchangers or other parts of your furnace.

DISCLAIMER: *The following information in the interior connections are examples and suggestions only. When installing a furnace and its parts it is best to consult your local dealer or a qualified technician.*

WATER-TO-WATER HEAT EXCHANGERS

To maintain pressure in an existing boiler system while using an outdoor furnace a water-to-water heat exchanger is used. The water-to-water exchanger is installed in-line on the supply side of the existing pressurized boiler system.

FLAT PLATE EXCHANGER FOR PRESSURIZED BOILER SYSTEMS

Flat plate exchanger systems that are used with pressurized systems such as in floor heating systems help to heat the water going in to the pressurized system while keeping the two systems separate. Because an outdoor furnace is an open system (not pressurized) and the system tied in to in this type of application is pressurized it allows both systems to stay the same while being operational.

The water supplied by the outdoor furnace will heat the water in the pressurized system while the present heat source in the pressurized system (such as a boiler) can be used as a back up heat source in case of emergency or need for additional heat.

When connecting the furnace to an existing pressurized boiler system:

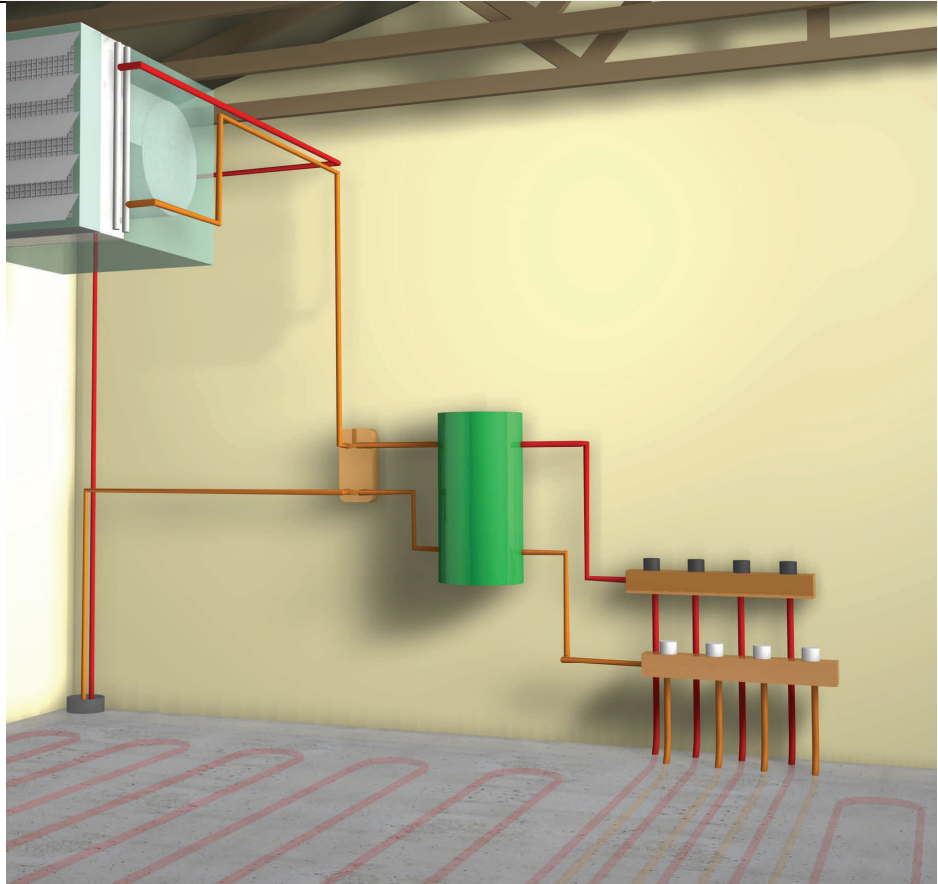
- the furnace must not be installed so that it interferes with normal heat delivery of the existing boiler system
- The furnace must be installed without affecting the operation of the electrical and mechanical safety controls of the original boiler
- Provide for a changeover from one fuel to the other without requiring manual adjustment of any controls or components other than the thermostats.
- Have provisions for preventing, or adequate water capacity within the boiler to prevent damage from loss of circulation due to electrical power failure.
- Be installed without changing the function of the controls or rewiring the original boiler. A wiring interconnection is permitted. The electrical system of both boiler shall be powered from a single branch circuit without exception.

Boiler Safety

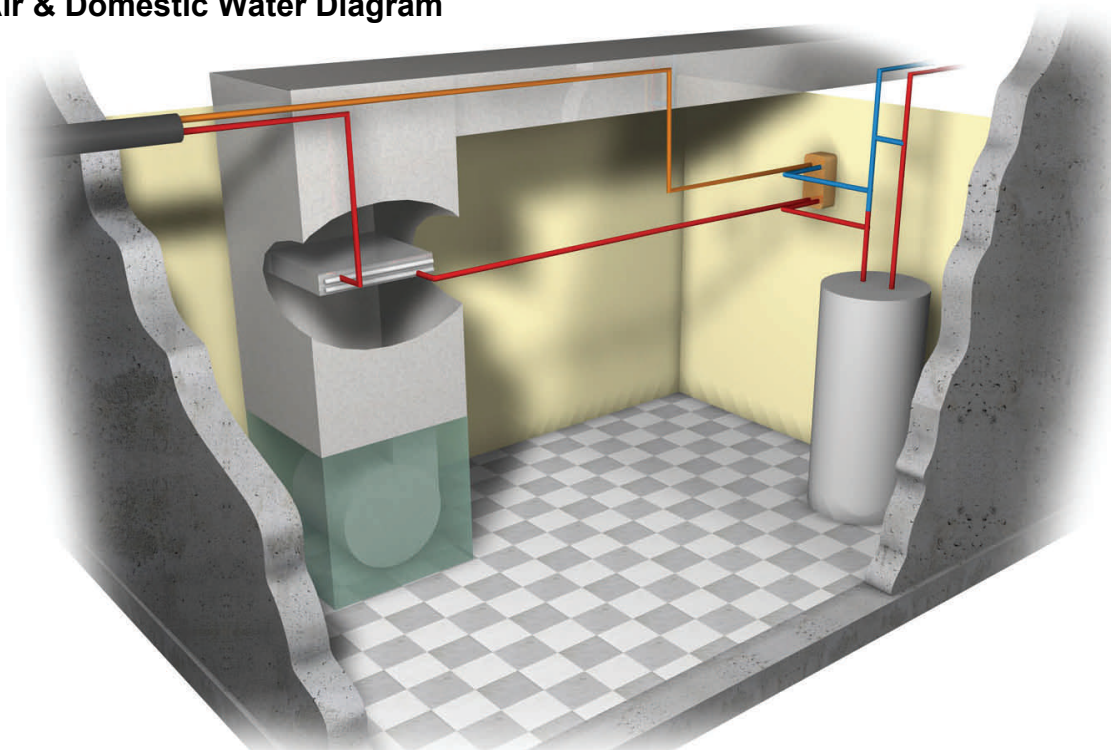
- Operate the boiler periodically to ensure that it will operate satisfactorily when needed.
- Do not relocate or bypass any of the safety controls in the original boiler installation
- The operation of the boiler must be verified for acceptable operation before and after installation of the add-on appliance by a gas fitter who is recognized by the regulatory authority
- Do not connect to any chimney or vent serving a gas appliance

Installation should comply with requirements of CAN/CSA-B365, and changes to the installation should comply with CSA B139 (for oil-fired boilers), C22.1 (for electric boilers), or CAN/CSA B149.2 (for gas fired boilers).

Boiler Diagram



Forced Air & Domestic Water Diagram



DOMESTIC HOT WATER

Flat plate exchanger systems used to pre heat domestic water tanks are generally more reactive to hot water demands than tube and shell systems. However tube and shell exchangers hold up better when hard water is present.

FORCED AIR FURNACE (WATER-TO-AIR EXCHANGER)

The water-to-air heat exchanger must be mounted so that air blows through the fins (coils). The exchanger should be mounted below the A/C coil if possible. The exchanger should be sized to fit existing duct work and should produce about as many BTU's as the existing heat source. An exchanger that produces too many BTU's will result in uneven heat and the fan stopping too quickly while a heat exchanger that is undersized will not produce the necessary BTU's. The heat exchanger can also be placed into the cold air portion of the duct work but it is not recommended because some furnaces have an overheat shut off if the fan overheats as a result of blowing hot instead of cold air.

It is important that the warm-air supply-duct system be constructed of metal in accordance with NFPA 90B-1993, 2-1.1 if the outlet-air temperature of a central furnace exceeds 250° F (121° C) when it is tested in accordance with the requirements for Simultaneous Firing in 56.4.1 and 56.4.2 of the standard. It is also important that the plenums installed to the furnaces be constructed of metal in accordance with NFPA 90B-1993, 2-1.3.

OPERATING THE FURNACE

FILLING THE FURNACE WITH WATER

Your furnace has a vent pipe that protrudes through the roof which is used to fill the furnace with water.

CAUTION: Do not fire furnace until it is filled with water. Allow furnace to run for 2 days and check system water levels and fittings for leaks. Take your initial water sample at this time and be sure that it is sent in.

IMPORTANT: To properly maintain your furnace test your water every year. Water treatment may need to be added or your furnace may need to be drained and flushed and water treatment added. For information on acquiring this product refer to your local dealer.

Hint: It is recommended that a fill valve be installed inline in the building you're heating with a shut off valve or one way check valve to prevent back flow. Filling the furnace with the inline valve pushes all the air towards the furnace and out of the vent. Because this furnace is an open system it is normal that water will have to be added annually, depending on the circumstances (6 to 10 gallons is not unusual).

Hint: If any part of the system is higher than the furnace a bleeder valve should be used to make sure all air is removed.

ATTENTION: Your water level will rise as the temperature of the water rises and fall as the water temperature falls. If your water level falls to a low level first check your water temperature before filling with water again.



FIRING THE FURNACE

These furnaces have been specifically designed to burn wood and as such, are not intended for burning any other fuels such as rubber, material treated with petroleum products, leaves, paper products, cardboard, plastic or garbage. Burning these fuels in your furnace will result in the warranty on the furnace being voided. Burn wood only. Load carefully or damage may result.

On starting an initial fire the use of less coarse wood and paper if required. Add heavier fuel gradually until a suitable fire is achieved. The furnace will continue to feed an air supply to the fire until your aqua stat shut off temperature is reached.

NOTE: Your furnace is equipped with a low temperature cut off feature. Anytime the water temperature drops low including first firing of the furnace you will need to activate the low temperature bypass function. The black button is located on the control panel. When pushed the furnace will allow the fan to kick on to start your fire.

ATTENTION: On the initial start up the water jacket will reach what is called the dew point. This creates a sweating inside the fire box which may last a couple of days and is normal.

OPERATING THE FURNACE

LOADING THE FURNACE

Before opening any door to the furnace:

1. Push the Furnace Bypass Rod in towards the furnace. This will open the smoke bypass so no smoke or flame exits the firebox door when you open it.
2. Crack the firebox door open to the safety catch for at least 20 seconds to allow the air draft to build out the chimney and prevent blow back.
3. Open door slowly while standing behind the door
4. Load wood carefully using the information and diagram on the following page.

WARNING: Risk of fire:

- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances
- Inspect and clean flues and chimney regularly

CAUTION: Hot Surfaces: Keep children away. Do not touch during operation.

CONTROLS AND SAFETY DEVICES

Furnace Control - Your Heatmaster ss G SERIES furnace uses a programmable control to maintain your water temperature by using an air damper control and draft inducer fan. The control is located around the corner to the left of the firebox door and requires no user programming or changes. The control displays the water temperature in your furnace, the damper air percentage and any alarm messages, if set off.

Air Damper - The damper air percentage is the amount of air being drawn through the furnace to stoke the fire. This feature keeps your furnace burn clean and hot while keeping your water temperature in the preferred range. The damper is located beneath the firebox loading door and is a mechanical part that opens or closes the air injection port.

Draft Inducer - The draft inducer fan is located at the rear of the furnace on the top and is used to draw air from the air damper through the furnace. The fan should be on whenever the air damper percentage is above 0% or when the furnace bypass is open.

Furnace Bypass Handle - Use the furnace bypass when ever the firebox loading door is open. The bypass handle is above and to the left of the firebox loading door and opens a direct exit out of the firebox through the chimney when ever pushed in toward the furnace. This will allow you to check your firebox, fuel and load your furnace without smoke spillage out of the firebox loading door.

CAUTION: Do not open any door before opening the furnace bypass. Damage to the furnace and personal injury may result.

High Limit Switch - The high limit cut off switch is used to ensure the furnace does not cause damage via runaway fire. It acts as a safety switch by cutting power off to the fan if the water temperature rises above 190 F.

Alarm LED Light - The LED alarm light is located above the furnace bypass handle and will blink red if the furnace smoke by pass is open, the furnace is low on water or if the water temperature is too low or too high. It is intended to warn the user of potential problems.

Low Temperature Bypass Button - The button is located on the control panel in the top right corner. Press the button to bypass the low temperature function of the control to fire the furnace from a cold start (First firing the furnace or when the water temperature has gone low).

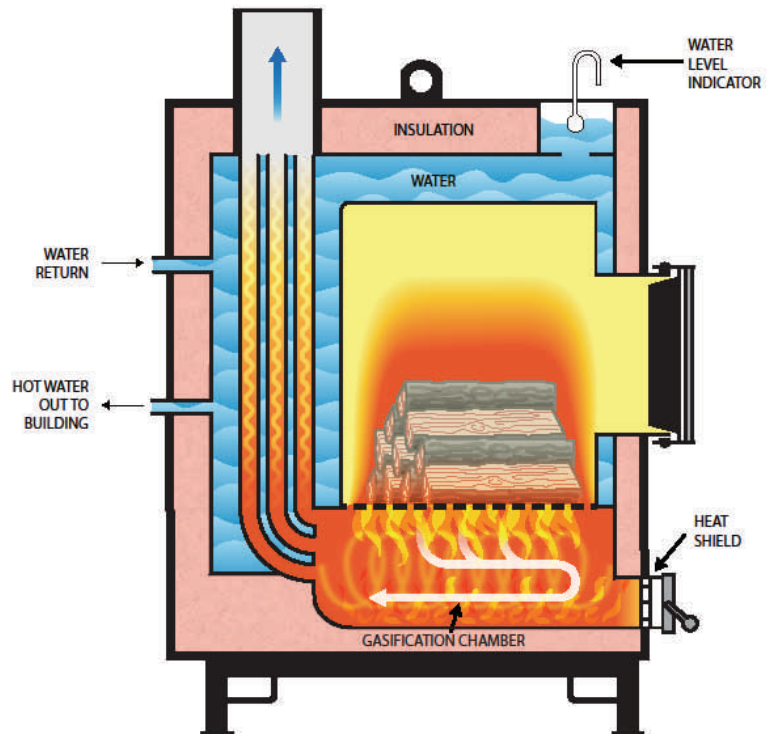
How the G-Series Gasification Outdoor Furnace Works

Steel Tech Inc is proud of it's reputation of producing innovative outdoor heating methods and our G Series outdoor furnaces are continuing that trend. They operate more efficiently with fewer emissions than other outdoor furnaces. The Heatmaster ss G Series wood furnaces use up to 50% less wood to create the same heat.

How It Works

Wood gas is generated in a high temperature reaction ($>700^{\circ}$) between the wood and a limited amount of oxygen. The heat and lack of oxygen "bakes" the wood, causing the gases in the wood to release in the form of carbon monoxide, hydrogen and carbon dioxide.

The wood gas mixture that is created in the firebox then gets forced through the base of the fire along with any ash that would come with it and burned at temperatures around 2000° in the gasification chamber. This creates a very hot, very clean burn helping you get the most out of your fuel. After the gas is burned, as much heat is extracted to the water jacket using the heat exchange tubes. Normal exit temperatures of the exhaust are 200-300 F.



The most notable indicator of effective gasification is the lack of smoke exiting the chimney. However, many times you will see white exhaust that dissipates quickly, which is steam from the wood in the firebox.

The gasification process creates longer burn times and can reduce wood consumption as much as 50% compared to a standard outdoor furnace..

Operating a gasification furnace requires:

1. **Log Sizing** - For ideal operation, log sizing should not exceed 6" to 8" in diameter. Exceeding the recommended sizing will result in doming (which only allows for the bottom and/or inside core of the log to burn) or bridging (the wood "hangs up" in the firebox and separates from the coal bed). Larger pieces of wood can be split to 6-8" pieces for use in gasification furnaces.
2. **Use seasoned wood** - It is always recommended to use dry seasoned wood (20-30% moisture, seasoned 1-2 years) when operating a gasification furnace with a minimal mix of green wood. If required to burn green or wet wood, always mix with a higher ratio of dry or seasoned wood.
3. **Stacking** - Using the Illustration to the right, first stack your primary wood on the coal bed lengthwise in the firebox so that as the wood gasifies and burns, the wood above it falls on top of the coal bed at the bottom of the firebox to continue the gasification process. Stack your secondary wood around the primary wood to fill the firebox, if necessary.

Improper wood sizing, stacking or excessive moisture content in the wood may result in the fire going out, improper burning or blockages in the ceramic brick not allowing for the gasification process in the combustion chamber and inefficient burning of the wood.

Very often, if the furnace is not keeping up to the heat load or the furnace is not burning properly, it can be attributed the 3 critical fuel factors mentioned above.

For more information on wood quality follow these links:

EPA's Burnwise Program- <http://www.epa.gov/burnwise>.

How to Use a Moisture Meter (Video)- <http://www.youtube.com/watch?v=jM2WGgRcnm0>

Split, Stack, Cover and Store (Video)- <http://www.youtube.com/watch?v=yo1--Zrh11s>

Wet Wood is a Waste brochure- <http://www.epa.gov/burnwise/pdfs/wetwoodwastebrochure.pdf>



CARE AND MAINTENANCE

To obtain the high levels of performance of your furnace, certain maintenance procedures are required periodically .

On a daily basis you need to:

- Ensure that all doors are closed and sealing properly. Adjust if necessary
- Check for creosote buildup in firebox and lower combustion chamber
- Check water level.
- Clean heat exchange tubes by aggressively pushing and pulling lever back and forth 5 times
- Check to make sure fan and control are functioning properly
- Check for embers or ashes laying on the ground around the furnace and dispose of them
- Make sure all covers and guards are in place securely.
- Make sure rear cover is securely on.
- Make sure the smoke bypass is closed (the handle should be out).

On a weekly basis you need to:

- Check for creosote build up in the heat transfer tubes and chimney. Removal of creosote may be necessary in mild weather. Load only enough wood to meet the heat draw for 12-16 hours to minimize creosote build up.
- Remove ash from Lower Combustion Chamber carefully using your ash rake. Dispose of ashes in a metal container away from the stove and wood pile.
- Inspect air inlet for creosote build up or blockage

NOTE: If you are burning a wood fuel that leaves quite a bit of ash you may need to clean your firebox out every 2-3 weeks to continue to get optimal performance from your furnace.

On a seasonal basis when furnace is not in use, you will have to:

- Remove all ashes and excess creosote from firebox, lower combustion chamber, heat exchange tubes and chimney.
- Inspect the firebox for leaks and that the brick is in good condition.
- Cover chimney and open door enough to allow air movement and reduction of condensation within the firebox.
- Make sure your water tank is full and have your water treatment tested and adjusted to manufacturer's specifications. See page 2 for exact specifications.
- Change your water filter cartridge and inspect all of your system for leaks.
- Tighten your firebox door by adjusting the hinges on each side of the door.

CARE AND MAINTENANCE

All covers and guards must in place at all times, except for maintenance or service. Care for the exterior of your furnace is minimal. The user must wash and remove ash and creosote regularly.

Ashes should be placed in a metal container with a tight fitting lid. The closed container should be placed on a non-combustible floor or on the ground well away from all combustible materials before 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.

Creosote – Formation and Need for Removal. When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire. The chimney and chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

CAUTION: Make certain that all electrical power to the furnace and components is shut off. It can be washed using water and a mild non abrasive cleaner suitable for painted surfaces.

ATTENTION: Avoid direct water pressure to electrical components and connections.

TROUBLESHOOTING

If the furnace is running but fails to bring water up to temperature:

1. Check fire.
2. Check fan for operation.
3. Check that the damper is open to allow air injection.
4. Check if the furnace is properly gasifying by opening the bottom door to the Lower Combustion chamber. A flame should be visible only for a short time after opening the door and glowing embers should be present. Keep arms, legs and head at least 3 feet from the opening.
5. Check to ensure the furnace is sized accurately according to heat demand.
6. Check fuel type. Poor quality fuel will not provide as many BTU's as high quality fuel.
7. Check water level of furnace.
8. Check for creosote blockage in the chimney and heat exchange tubes.
9. Check for power at furnace. Make sure control is running with no errors or alerts
10. Check to ensure all pumps in the system are running.
11. Check to make sure there are no leaks, hot/wet spots on your ground or breaks in the pipe or fittings which may cause the pipe to be saturated and lose its insulation value.
12. Check Temperature of water exiting furnace, entering the building being heated and before and after each heat exchanger. Large temperature drops signal large consumption of the BTU's produced by the furnace.

If the furnace water is hot but buildings do not have heat:

1. Check to ensure all pumps in the system are running.
 2. Check filter cartridge for flow blockage (if installed).
 3. Check for air in the system at the exchanger by bleeding off.
 4. Check for closed valves to ensure water flow.
- Check Temperature of water exiting furnace, entering the building being heated and before and after each heat exchanger. Large temperature drops signal large consumption of the BTU's produced by the furnace.

If the furnace overheats:

1. Close all air inlets and doors on the furnace
2. Retrieve as much heat as possible from system by turning thermostats up and opening windows until furnace cools down.
3. Check that all doors are closing properly and that door gasket is completely sealing.
2. Check that the damper plate is opening and closing properly. It should be completely closed when the furnace temperature is over 180 F.
3. Check water level.
4. Check to ensure all pumps in the system are running.

If the furnace has shut down:

1. Check to ensure that the unit has power.
2. Check to ensure the Furnace On/Off switch is in the On position.
3. Check the water temperature (furnace has a high temperature cut out of 190 degrees F. and turns on again at 140 degrees).
4. If all checks have not corrected the problem have a technician check the control panel.

If there is a runaway or chimney fire:

1. Make sure the firebox and ash pan doors are tightly closed.
2. Close all combustion air inlets on the furnace.

TROUBLESHOOTING

If there is a power failure:

1. Open all flow-check and zone valves in the system. Depending on the system design, this may allow convective circulation.
NOTE: This does not apply to gravity systems, as they have no flow-check valves and will continue to operate normally without electricity.
2. It is important to remember that the heating systems cannot dispose of a great deal of heat without the circulator(s) running. Avoid over-firing! **DO NOT LOAD LARGE AMOUNTS OF SOLID FUEL INTO THE FURNACE!** Fire the furnace cautiously until you are able to determine how quickly the heat system is able to absorb the heat being produced by the furnace.
3. When the power has returned, reset all flow-check and zone valves and resume normal operation of the system.

If there is smoke leaking out of the door

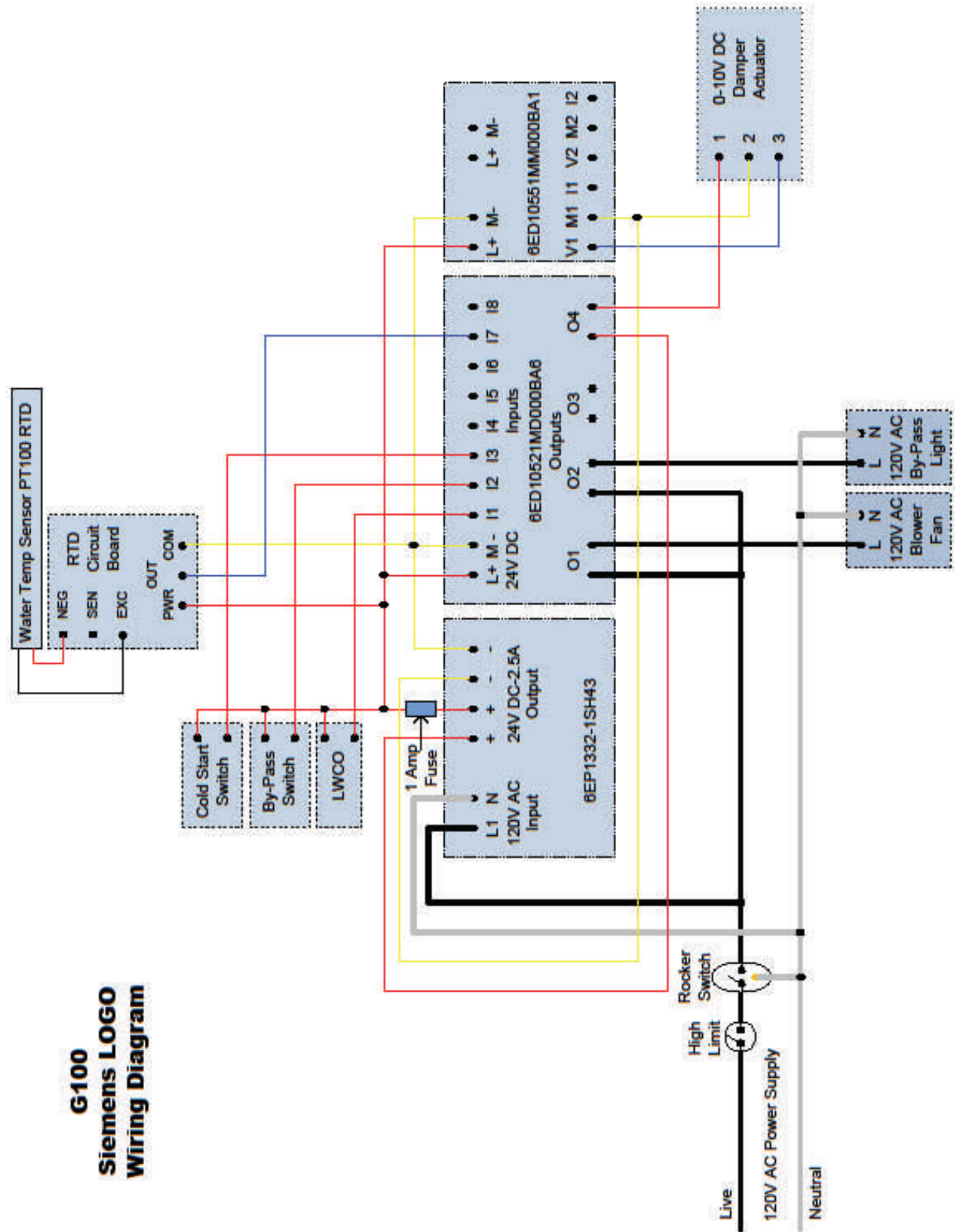
1. Check to ensure door is sealing properly.
2. If the seal is worn out it will have to be replaced.
3. The door may need to be adjusted. To do this loosen the Door Latch Bearings and Door Hinge and set the door so it seals tightly against the door jamb.

If the furnace has an excessive amount of creosote

1. Check to ensure the furnace is sized accurately according to heat demand. If the furnace is oversized it will idle and cause this. If the weather is warm or mild burn a small hot fire using small pieces of wood keeping only enough wood to last until your next burn time (generally 12 hour burn time is best). It will allow the furnace to burn more often with greater efficiency and have less fuel smoldering during idle creating less creosote.
2. Check moisture content in your wood fuel. Moisture content over 30% may cause creosote buildup. Recommended moisture content in your wood fuel is 18-30%.
3. If the chimney and/or heat exchange tubes become plugged with creosote it will be necessary to scrape the creosote out to obtain a proper burn in the firebox.

You are having to fill the furnace with water more then once a week or more then a few gallons of water per week and there is no obvious explanation

1. Check the temperature settings and gasket on the door and ash drawer to ensure the furnace is not over temperature and steaming. If water temperature reaches levels over 200 degrees Fahrenheit the water will steam and water loss will occur.
2. Check the perimeter of the furnace for water puddles collecting or dripping from the furnace.
3. Check all plumbing in the system to ensure there are no leaks.
4. If these checks have not provided an answer call your dealer.



CAUTIONARY MARKINGS

SteelTech Inc.

SOLID-FUEL FIRED FURNACE FOR USE WITH WOOD FUEL ONLY

Install and use only in accordance with the manufacturer's installation/operating instructions and local codes. If there are no applicable local codes, follow ANSI/NFPA 211 and NFPA 90B. Special precautions are required for passing the chimney through a combustible wall or ceiling. Refer to authorities having jurisdiction for proper installation. THE HEAT EXCHANGER, FLUE PIPE, AND CHIMNEY MUST BE CLEANED REGULARLY TO REMOVE ACCUMULATED CREOSOTE AND ASH. ENSURE THAT THE HEAT EXCHANGER, FLUE PIPE, AND CHIMNEY ARE CLEANED AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS. THE APPLIANCE, FLUE PIPE, AND CHIMNEY MUST BE IN GOOD CONDITION.

LOAD FUEL CAREFULLY OR DAMAGE MAY RESULT.

Chimney must be listed UL-103 HT or UL-C-862B residential all-fuel-type or tile-lined masonry. Flue connector pipe must be made of a minimum 24 MSG black steel. Install on a non-combustible floor. For Either Indoor or Outdoor Installation.

WARNING: EXPLOSIVE GASES.

Gases formed during solid-fuel combustion may cause a small explosion when the furnace is refueled. Always use your left hand to open the firebox door. Open the door SLOWLY and keep your face and body well away from the door until it is completely open.

MAXIMUM OPERATING TEMPERATURE 200° F MAXIMUM WORKING PRESSURE 0 psi
FOR SAFETY KEEP FIRING AND ASH PIT DOORS TIGHTLY CLOSED

DANGER! Risk of Fire or Explosion—Do not burn garbage, gasoline, drain oil, or other flammable liquids

WARNING! Risk of Fire

- Do not use chemicals to start unit/firing.
- Do not burn garbage, gasoline, fuel oil, or other flammable liquids or materials.
- Do not operate with fuel-loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspect and clean flue and chimney regularly.

CAUTION! Hot Surfaces

- Keep children, clothing, furniture and other combustible material out of the installation clearance area.
- DO NOT CONNECT THIS UNIT TO CHIMNEY FLUES THAT SERVES ANOTHER APPLIANCE.
- It is unsafe to adjust the flue draft lower than 0.05" W.C., or higher than 0.07" W.C.
- Do not touch during operation.
- This furnace requires fresh air for ventilation and must be installed as there are provisions for adequate combustion and ventilation air.

WHEN OPENING THE FIREBOX DOOR, carefully follow the below procedure to avoid spillage of smoke and products of combustion:

1. SLOWLY open the firebox doors so as to build up the draft.
2. This procedure will minimize smoke from escaping when the firebox door is opened.

IN THE EVENT OF LOSS OF ELECTRICAL POWER:

1. Open all flow-check and zone valves in the system. Depending on system design, this may allow convective circulation. NOTE: This does not apply to gravity systems, as they have no flow-check valves and will continue to operate normally without electricity.
2. It is important to remember that the heating systems cannot dispose of a great deal of heat without the circulator(s) running. Avoid over-firing! DO NOT LOAD LARGE AMOUNTS OF SOLID FUEL INTO THE FURNACE! Fire the furnace cautiously until you are able to determine how quickly the heat system is able to absorb the heat being produced by the furnace.
3. When the power has returned, reset all flow-check and zone valves and resume normal operation of the system.

IN THE EVENT OF RUMMAY FIRE:

1. Make sure the firebox door is tightly closed.
2. Close all the combustion air inlets on the furnace.

TO COOL AN OVERHEATED (OVER 850° F) FURNACE:

1. Turn off thermostat in your house to their highest temperature setting.
2. Open all hot water faucets.
3. Open all windows.
4. When furnace temperature has dropped below 160°, reverse the above steps.

INSTRUCTIONS FOR ADDING ON TO AN EXISTING BOILER SYSTEM

May be connected to an existing boiler system

- Operate the boiler periodically to ensure it will operate satisfactorily when needed
- Do not relocate or bypass any of the safety controls in the original boiler installation
- Caution: This equipment may only be installed by qualified personnel
- Disconnect electric power to both boilers before servicing
- Caution: Maintain combustion air supply to both boilers. Air starvation is dangerous. Provide a fresh air opening of at least 2,000 mm² (3 in²)

For unit specifications, see the plaque located directly on the furnace.

REFER TO OWNERS MANUAL

1series



Manufactured By: SteelTech Inc.
Wellesley, Massachusetts
Test Number: CAN/CSA B148.1-M11, UL 333-2004

Test Date: March 13-15, 2013
Certified as an ASHRAE Standard 154

Report # 12107-400000-001 Serial #: 1010

SteelTech Inc.

SOLID-FUEL FIRED FURNACE FOR USE WITH WOOD FUEL ONLY
FOURNEAU DE COMBUSTIBLE SOLIDE POUR USAGE AVEC BOIS SEULEMENT
Do not install within 18" (450 mm) of another furnace device
A ne pas installer à moins de 18 po (450 mm) d'un autre appareil

Model	Fuel Combustible	Heating Capacity (Output) (kW)
ST-180	Wood / Bois	150,000 BTU/Hr
ST-280	Wood / Bois	250,000 BTU/Hr

Clearances to Combustibles / Attributions aux combustibles	
Furnace Front to Ceiling (Indoor Installation) Plafond de four au plafond (Installation intérieure)	6" (152 mm)
Side Wall to side panel installation	6" (152 mm)
Floor / surface	6" (152 mm)
Front (Loading Door) / avant (chargement bois)	24" (610 mm)

ST-180	ST-280	ST-380	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Proudly Served &
Installed By:



HeartMaster

Name: _____

Address: _____

Phone: _____

Installation Date: _____

This unit should be inspected annually by a qualified technician

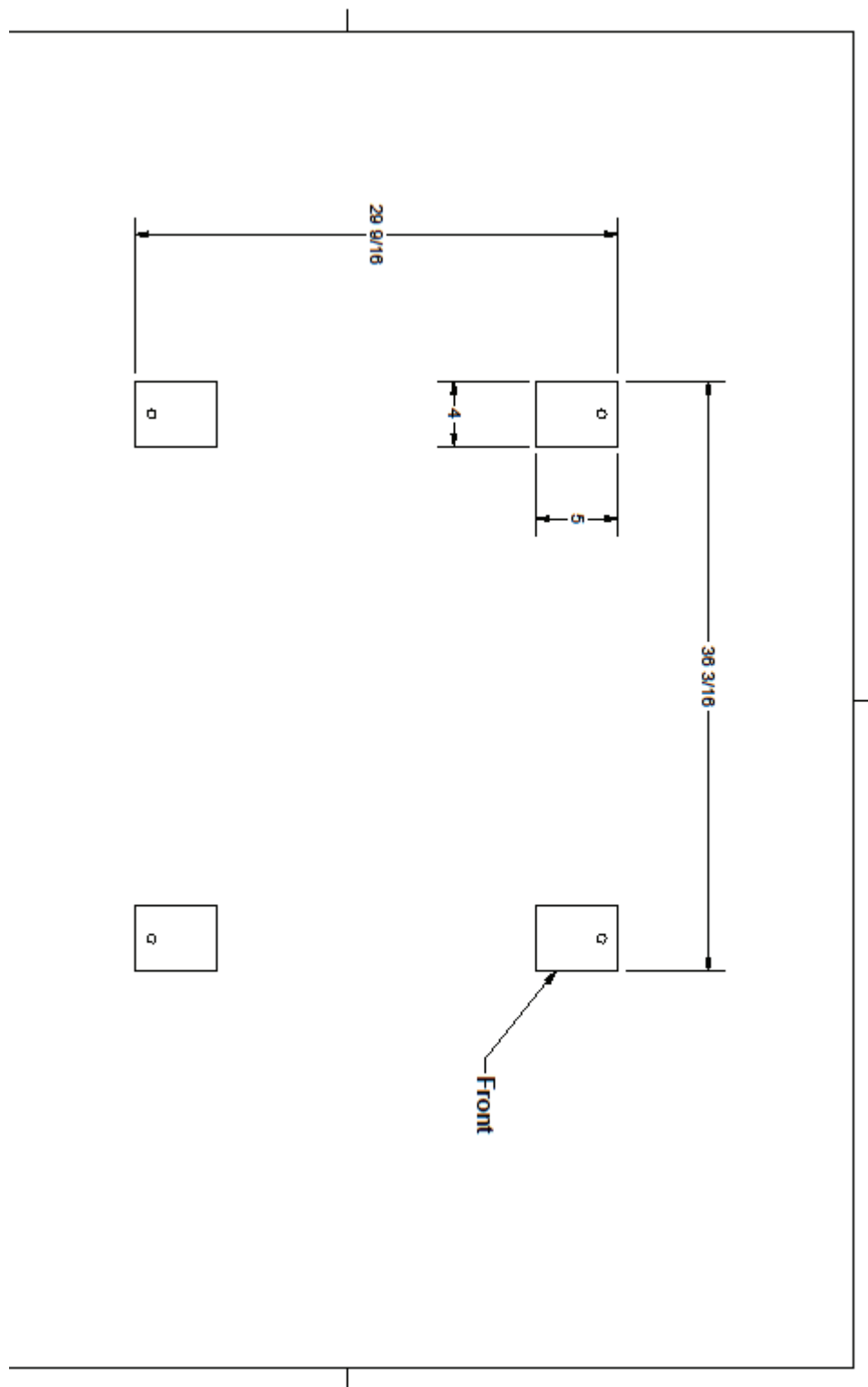
WARNING

▲ OPEN BYPASS BEFORE
OPENING DOOR

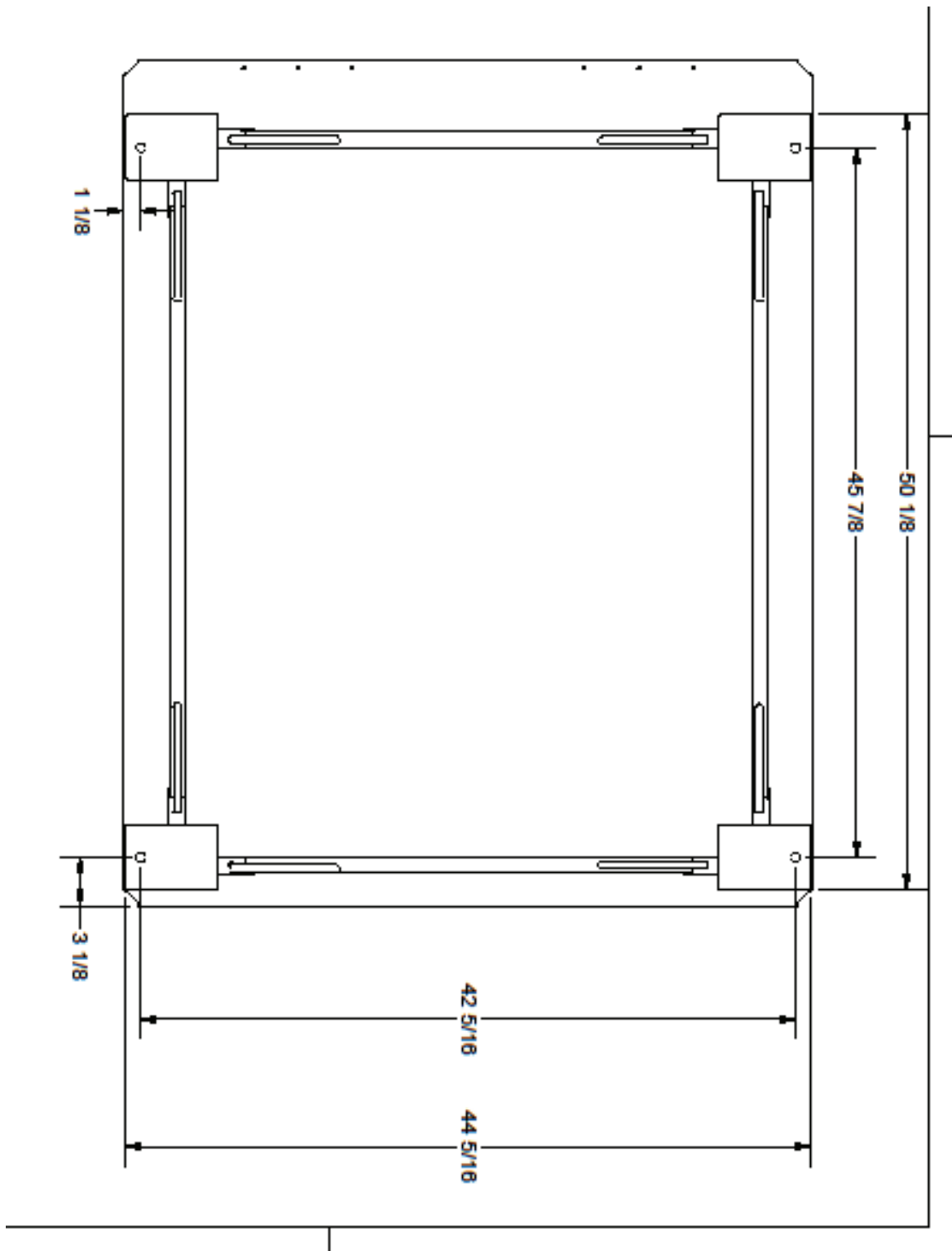
▲ DOOR MAY BE HOT

▲ DO NOT OPERATE IN
THE EVENT OF A
POWER FAILURE

G100 FOOTPRINT



G200 FOOTPRINT



G400 FOOTPRINT

