Masonry Heater Users Guide

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GREENSTONE HEAT

Thanks for taking the time to read this Greenstone Masonry Heater user's guide. Its contents will help ensure that you understand the optimal way to use your new heater and maximize its service life. Feel free to call or email us with any questions.

I. Essentials

1. **Your new masonry heater contains a lot of moisture**. It is imperative that the heater be thoroughly dried out before it is used at full capacity. To ensure proper grout and mortar drying time, your heater must be allowed to cure for a minimum of three weeks after the completion of installation.

2. Check the tables at the end of this guide for the amount of wood and the number of fires required. **Gradually increase the intensity of the fire each day until you reach full load.** This operation is very important because an overly fast evaporation can damage the internal structure of your heater.

3. Make sure the combustion air inlets and air wash on your door are open during all burns.

4. Be certain you are using very dry wood, with less than 18% moisture content. In order to get your firewood supply properly dried, it is ideal to split and stack your cord wood for **two years.**

5. It is recommended that you burn primarily hardwoods. Harder woods are denser, less resinous and create a fire that is hotter and cleaner burning.

6. Be sure you are not starving your fire of oxygen. Open your ash box air inlet and burn hot, rapid fires. Keep your firebox grate clean and open.

7. Make certain your fire is burning hot and fast before you start your heater's contraflow. You will generally need to allow 10 to 15 minutes to get the fire burning strong before you slide the damper handle in to activate the contraflow. Starting the contraflow too early will make the fire struggle to draw and cause it to burn slower and produce more soot.

8. Outside temperatures, wind direction, dryness and density of the wood will dictate how long you will need to leave the contra flow off. With time and experience, you will learn what a good time frame will be.

II. Firing Your Heater

1. Your heater is designed for the fire wood to be lighted from the top. Pile about three-quarters of the wood required in criss-cross fashion inside the fire box, larger logs on

the bottom, smaller logs toward the top. Place newspapers on top of this pile, and then add the remaining kindling. Fully open the air vents, damper and bypass before lighting the paper.

2. It is crucial that you wait until the fire is going well before closing the contraflow damper. Otherwise, smoke may flow into your home.

3. A heater can be fired, once, twice, or even three times a day depending upon the weather. The rule of thumb is to allow at least 6 hours between fires.

4. A rule of thumb that works well is, don't burn more than two full loads in a row. Allow a minimum of 6 hours to cool the heater down afterwards. It is more efficient to space your burns out throughout the day, as opposed to adding more wood to the fire before it goes out.

5. In general, after your fire has been burning for a couple of hours, parts of the thermal mass of the heater will max out their heat capture capacity. By adding more wood immediately, the heater starts to function more like a traditional wood stove by sending more of the heat up the flue.

6. By waiting a few hours between burns, you ensure a larger percentage of the heat will be captured and transferred slowly into your home.

7. Once warm the heater should, ideally, be kept warm all season.

8. Never light a large fire when the heater is cold.

9. Do not damper down your fire. That will starve the fire of oxygen causing lower combustion rates, lower temperatures and a less efficient, dirty burn. You do not want creosote build up on the inside of the heater.

III. <u>Cold Firing</u>

If your masonry heater has been out of use for longer than one week, it is important to preheat the heater, which is accomplished by firing about 50% of a full load of wood, before lighting a full load. Structural damage may occur if the heater is over heated very suddenly when starting from room temperature, which is known as thermal shock. (See warm-up procedures chart below.)

IV. <u>Using the Masonry Heater</u>

1. Your heater is designed for a rapidly burning fires, which means that the combustion air vents generally remain fully open at all times. Do **not** use the heater in a slow-burning mode (dampered down).

2. Do not burn artificial or eco-friendly fire logs in your heater. They often contain petroleum byproducts or wax which can build up on the inside of your heater.

3. Use regular cord wood Split logs with a maximum cross-section dimension of 4 to 5 inches are ideal for creating a clean burn and efficient heat transfer to your home.

4. Placing the smaller wood, kindling and paper on top of this load and lighting from the top greatly reduces emissions during the dirtiest part of a firing, which is the first 10 minutes or so. Lighting the load from the top of the pile yields a candle-like burn, allowing the firebox to heat up as the volatile gases are being more evenly released.

5. Take care in stacking your fire. A good "fuel load configuration" is well balanced and won't topple over prematurely. Allow a 1" airspace between pieces, placing the largest pieces first and the bottom row running "front to back" in the firebox.

V. What to Burn

Trees in the "hardest" list have the most energy per cord, while those in the "softest" list have the least energy per cord.

Hardest (long burning)	**Medium**	**Softest (**shorter burns)
Ironwood	Ash	Red Alder
Rock elm	Red elm	Hemlock
Hickory	Red Maple	Poplar
Oak	Tamarack	Pine
Sugar maple	Douglas fir	Basswood
Beech	White birch	Spruce
Yellow birch	Manitoba maple	Balsam

The trees listed at the bottom of the list are softer than the trees at the top of the list in each section.

VII. Bake Ovens

1. The maximum temperature in a white oven is around 350°F, when burning hard woods.

2. The maximum temperature in a black oven is about 500°F, when burning hard woods.

3. Harder woods are going to burn longer, usually around 2-3 hours. However, elevation, dryness of the wood and how the wood is stacked, will impact total burn time.

VIII. Heater Maintenance

1. Your heater needs to be properly maintained to operate at optimum level and ensure maximum safety.

2. With normal use, you will accumulate a small amount of soot and fly ash in the heat exchange channels. This can be effectively removed via the clean-out holes using a rod and brush designed for cleaning pellet stove chimneys or even a shop vac with a brush.

This will maintain proper air flow and better allow the stone to absorb heat from the fires. There are clean-out holes on either side of your heater, covered by a stone cap or small metal doors. Minimal recommended cleaning is once a year.

3. Have your chimney inspected and/or cleaned once a year by a professional chimney sweep.

4. Before each cold firing, check inside the fire box. Clean the inner walls as required. Open the clean-out openings and remove any soot and ashes. **Be careful** as ashes can remain hot for over 7 days. Use an approved ash bin and put hot ashes in a safe place outside the home. Let ashes cool down before putting them into the trash container.

5. Door springs are a safety mechanism to make sure the door closes when a fire is burning. Do not removing the spring from the door.

IX. Warranty

1. Your masonry heater is covered by a 2-year **conditional** warranty. This warranty is not transferable and applies to the original owner only. The warranty comes into effect on the **date of occupancy**. Use of the heater before the date of occupancy, notably during construction of the residence, will invalidate the warranty. Warranty claims must be made in writing to Greenstone within the conditional warranty period.

2. This warranty covers only replacement parts for which material or workmanship defects are found, provided that the product was used in accordance with the instructions in this manual, and it will not extend to any accidental damages, consequential or indirect. This warranty does not cover damages caused by misuse or non-continuous use of the heater, lack of maintenance, accident, abuse, negligence or alteration of the product.

3. This warranty does not cover the small cracks that may appear in the fire box, grout, mortar or shell as these are normal and do not affect the operation of the appliance.

General Information

X. What is a Masonry Heater?

A masonry heater is a vented heating system of largely masonry materials (soapstone and fire brick are common) weighing at least 1760 pounds excluding the chimney and masonry heater base. A masonry heater is designed to capture and store a substantial portion of the heat produced by a fire, which burns rapidly and rather completely at high temperatures in order to reduce unburned emissions. It is constructed of sufficient mass (i.e. weight) and surface area that under normal operating conditions, the external surface temperature of the masonry

heater does not exceed 200 degrees F, except in the immediate area surrounding the fuel loading door(s).

A masonry heater allows you to heat your home with wood in a unique way. Its main distinction is **the ability to store a large amount of heat**. This means that you can rapidly burn a large amount of wood without overheating your house. The heat is stored in the masonry thermal mass (the weight of the stone), and then slowly radiates into your house for the next 12 to 18 hours.

XI. Why Soapstone?

Soapstone (steatite) is a magnesium silicate that was formed under great pressure and intense heat millions of years ago. There is nothing quite like soapstone as **it possesses extraordinary heat retention and transfer properties.** Unlike other natural stones such as granite and marble, which can also store and radiate heat, soapstone has such **an unusually stable composition** that it can withstand direct flames indefinitely and be subjected to great fluctuation in temperature with little expansion or contraction. Simply put, it stores and transfers heat better.

XII. Why Greenstone?

Greenstone Heat is an American company with a material source and manufacturing capability in North America. In other words, we're local. There are several advantages to dealing with a local company.

- The first advantage is the opportunity for **creative and flexible design**. We can design and build a masonry heater to fit your individual situation.
- Secondly, we produce the highest quality soapstone masonry heaters available. Our designs, fit and finish are second to none.
- Third, your specific design is fabricated, assembled and installed by highly trained local masons within North America.
- This North American presence drastically cuts down the lead time necessary to design, fabricate, deliver and install your masonry heater.
- Finally, as a locally owned company can offer rapid, quality customer service.

XIII. The Benefits of Masonry Heaters

If you burn wood fairly rapidly, it is a clean fuel. If wood is burned too slowly, the fire will change from flaming to smoldering combustion. In smoldering combustion, the burning process is incomplete and produces tars, and atmospheric pollution increases dramatically. This is important if you are planning an energy-efficient house. With a masonry heater, the average energy demand of your house will be quite low. For most of the time, it may require only 1 to 2 kW of heat. For most conventional wood stoves, this is below their "critical burn rate", or the point where the fire starts to smolder. In other words, wood burning and energy efficient

houses don't really suit each other very well, unless you have some way to store heat so that your stove can operate in the "clean" range all of the time.

Because masonry heaters have a high thermal mass, they are energy efficient and environmentally friendly. Even if you need even a very small amount of heat, such as between seasons when you simply want to take off the chill, you simply burn a smaller fire–yet you still burn it quickly. In addition, the large surface of the heater is never too hot to touch. You have a premium radiant heating system with a comfort level that simply cannot be equaled by convection or forced air systems.

Radiant Heating and Convection Heating

We exchange heat with our surroundings through two main mechanisms: radiation and convection.

Radiant energy is physical energy transmitted through space by the propagation of an electromagnetic wave through any form of matter, by the interaction of the electromagnetic wave with matter. For example, how the sun on a calm day warms your face or skin.

Convection energy is the circulation of heat, especially the upward movement of warm air. For example, a forced air heater or furnace.

A good example: When you are outside in the spring on a calm, sunny day, you can wear a T-shirt even though the air temperature might be 55 or 60 º F. But step into the shade and you will start shivering within several minutes, even though the air temperature hasn't changed. The presence or absence of the sun changes your radiant environment dramatically. Similarly, even a slight breeze at these temperatures would change your convective environment. The word "draft" in this context immediately conjures up mental images of discomfort.
Radiant heat is electromagnetic energy, the same as visible light. The only difference is that it is in the infrared range of the spectrum, with a longer wavelength. Long wave infrared is more comfortable than short wave infrared. As the surface temperature of a radiating body gets higher, the wavelength of the radiant energy gets shorter, until eventually it is seen as a dull glowing red. This is the piercing heat you feel from a campfire as you get close to the charcoal bed.

With radiant heating systems, **the concept of air temperature assumes less importance.** This is a key point. Our conventional model of heating and comfort is based on forced air heating systems, where air temperature is all important: you need a thermostat that can regulate the air temperature to within a couple of degrees. With radiant heat, however, the comfort zone of air temperatures widens dramatically. Radiantly heated rooms are comfortable over a wider range of air temperatures.

XIV. <u>Other benefits of radiant heating systems</u>

Safety
Since a soapstone masonry heater is designed to operate with a relatively low surface temperature of 150 to 200°F, it is highly unlikely that such temperatures could cause skin burns or lead to spontaneous combustion of non-volatile substances. In other words, there is very

little fire hazard when the heater is operated in accordance with good practice as described in the user's guide.

Another important factor is the **firing strategy**. The daily fuel charge (you make a fire) is combusted rapidly by a single, brisk fire every 8 to 24 hours, leaving the firebox without residual coals after about 3 to 4 hours. If you fire your soapstone masonry heater in the evening you can go to bed calmly, knowing that there is no fire smoldering through the night.

Your health and less dust
Radiant heat is more comfortable as there is less air turbulence. In a conventional forced system, the air that you breathe is used as heating medium by cycling it through your furnace blower every few minutes. When you wake up in the morning with a "parched throat", you associate this with dry air. In fact, it is not dry air at all, but dust. Because furnace filters only get the larger particles, not the very fine dust that causes the most sensitivity, the furnace circulates very fine dust through out your house. When you add a humidifier, you are actually using moisture to help settle the dust out of the air.

Less stratification
The reason there is less need for air movement with a radiant heating system is that there is a much smaller temperature difference between the air at the ceiling and at the floor. The result is less overheating of upstairs rooms. Placing the radiant heating unit in the living space where it is needed is cost effective and energy efficient.

XV. Environmental Benefits

A sustainable technology
As sustainable construction becomes more main stream, many people are beginning to question not only the energy consumption of their houses and their lifestyles, but also wider effects, such as the amount of embodied energy in the house materials, and the amount of pollution that has been generated as a result.

While it is relatively new to North America, masonry heating is an ancient technology that dates back several hundred years in many of the colder regions of Europe and Asia. Its basic ingredients are earth and fire. Also, all of the materials in a heater can be recycled, if desired, and there are heaters in Europe that have been giving faithful service for over a hundred years.

Helping to reduce global warming
The most important environmental issue today is global warming and our emissions of greenhouse gases (mainly carbon dioxide). We are risking the well-being of future generations because of our consumption of fossil fuels. Every time that we fill our car with gas we add the equivalent of a hundred pound sack of carbon to the atmosphere in the form of carbon dioxide emissions from our tailpipe. Hydrocarbons have been sequestered in the earth for millions of years by the actions of plant life on the atmosphere. Through our consumption of fossil fuels we are returning this carbon into the atmosphere at a staggering rate. As North Americans, we are the worst culprits, consuming several times the world average per capita. To have any meaningful impact, we need to reduce our fossil fuel use by approximately seventy to ninety percent. Our transportation choices are limited — we can drive less, or get a more efficient

vehicle. We do, however, have a choice in how we heat our homes. It simply doesn't make sense to use valuable resources simply to make low grade heat.

Wood is a renewable resource
Provided that trees are grown on a sustainable basis, there is almost zero contribution to global warming when you burn wood. Plants use photosynthesis to store solar energy. Trees accomplish this by converting atmospheric carbon dioxide into stored carbohydrates such as cellulose. When a tree eventually dies, this carbon dioxide is returned to the atmosphere by the action of bacteria and fungi as the wood decomposes. Because this is a closed carbon cycle there is no net impact. When you burn wood, you are heating your house with stored solar energy and simply using a sped up version of this cycle. Proper use of wood as a heating fuel requires that it be harvested sustainably. As opposed to clear cutting, proper forestry practice requires thinning and culling to improve the stand.

XVI. Clearances

According to ASTM E 1602-94, minimum clearances for a masonry heater:

4" to combustible walls
2" to Class-A chimney
2" to combustible framing on heater foundation
8" to ceiling
16" to combustible materials in front of the glass door

*Please confirm the above clearances with your local building department. Do not place combustible house hold items within these areas.

XVII. Frequently Asked Questions

Q: *How can I get more heat?*
A: The masonry heater can be fired more than once a day if more heat is needed. Most of our clients burn one fire in the morning and another in the evening.

Q: *Why don't you make the firebox larger?*
A: The small size of the firebox is very intentional. These are the optimum size as the combustion in a large firebox is less efficient as the temperature is lower.

Q: *What is the difference between a masonry fireplace and a masonry heater?*
A: A Greenstone **masonry heater stores most of the energy** generated by a brisk fire in its thermal mass and releases it slowly into the room. A traditional **masonry fireplace stores very little energy**, which means that a significant part of the heat is vented out through the chimney.

Q. *Can I put a masonry heater into my existing house?*
A. Yes. Care must be taken to choose the proper location of the heater. The foundation and chimney and any structural modifications required should be an integral part of the decision.

Q. What if I have no experience in building a fire?

A. Good. You won't have any preconceived ideas! Follow the instructions in "Firing Your Heater" above. Thing to be especially careful about are:

1. Be certain that the damper and any other air supply is open before starting to lay your fire. Many heaters have two or three air supply sources. All need to be open.
2. When you lay the wood, make certain that there is about an inch of space between the logs. Lay the larger logs on the bottom horizontal to the door. Criss-cross the logs as you move up the stack.
3. You may want to weigh the quantity of wood you put in the firebox. The easiest way to do this is to weigh yourself on a bathroom scale without and with an armload of wood. The difference between the two weights is the weight of the firewood. Make a note of how many pieces of cord wood you need to have the right amount of wood.
4. Add kindling and newspaper to the top of stack. Or you can use manufactured fire starters.
5. Recheck to see that the air supplies are open.
6. Light the fire. Shut the door and start enjoying your wonderful fire!

Q. Can I build a "bottom-up" fire in my masonry heater?
A. Yes, you can. Your burn will be "dirtier" and the interior of the heater will collect more soot and creosote. You will need to clean your heater more often. Because of the increased soot and creosote, your heater will be less efficient than using a "top-down" fire, as recommended.

For more information please visit our website, call or email:

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Charts for Wood Loads

Initial Masonry Heater Start Up

Amount of Wood per Fire (Pounds)

Unit Weight	1st Fire	2nd Fire	3rd Fire	4th Fire	5th Fire	6th Fire	7th Fire	8th Fire	9th Fire
Up to 3500 lbs	10	12	14	16	18				
4500 lbs	10	13	16	19	22				
5000 lbs	10	14	18	22	25				
6000 lbs	10	15	20	25	30				
7000 lbs	10	16	22	28	35				
8000 lbs	10	13	16	19	22	25	28	31	35
9000 + lbs	10	14	18	22	28	32	36	40	44

* FLUE PIPE MUST REMAIN OPEN 24 HOURS A DAY DURING ENTIRE START UP / DRY OUT PHASE.
* MAXIMUM TWO FIRES PER DAY DURING START UP.

Regular Use

Amount of Wood per Fire (Pounds)

Unit Weight	Maximum Normal Firing	Minimum Normal Firing	Cold Firing
Up to 3500 lbs	25	8	13
4500 lbs	25	8	13
5000 lbs	30	10	15
6000 lbs	35	12	18
7000 lbs	40	13	20
8000 lbs	45	15	23
9000 + lbs	50	17	25

Note: The firewood's moisture content must be less than 18% and the logs' diameter must not exceed 5 inches.