

MASONRY HEATER FIRING INSTRUCTIONS

These instructions, followed properly, will instruct the user on the techniques to properly cure and then fire a masonry heater in regular operation. To begin, there are a few important factors to be aware of while living with and using a masonry heater as your primary heat source:

1. Draft.

If you consider each house a system, then the chimney draft (which drives the operation of the heater) is unique to each system. Draft strength is a function of many factors: elevation at building location, height and diameter of chimney stack, tightness of house, prevailing winds, atmospheric pressure, obstructions around top of chimney, and most importantly, the pressure differential between the outside of the house and inside the building envelope.

The strongest draft will be present when the outside temperatures are cold and the inside temps are warm, the building envelope is tight, the heater is in regular operation and the flue itself is warm.

The weakest draft will be present when the conditions inside and outside the home are closer together (either warm or cold), the building envelope is not tight (open windows or doors may be open), the heater is not in regular operation and the flue is not warm.

The operator of the heater needs to be aware of draft, so that when the heater fire is lit the presence of positive draft pressure has already been established. Otherwise, one will experience smoke leaking from the doors and clean outs and/or possible back drafting. However, draft is quite easy to test for and establish if necessary.

To test for draft: open a clean out door and light a match, holding it close to the edge of the opening. You want to see the flame bend in towards the channels inside, so the it is being drawn into the heater system. In time you begin to notice the relative strength of the draft through this simple test. If either a weak draft or no draft is present, then follow the next step to start it manually.

Manual start of draft: open a clean out door and insert either one of the following devices- a self lighting propane or mapp gas torch, an electric hair dryer set to the warmest setting, or a lit piece of crumpled newspaper. The torch or the blow dryer work best, as it's quite easy to set them and leave them to run for 5-10 minutes so that the stack temperature is raised as hotter gasses are forced through the system from the pressure of the torch or forced hot air from the hair dryer. After 5-10 minutes, one is ready to shut the clean out door and commence with the heater firing.

While it is very good to familiarize yourself with this process, it should really only be necessary every once in a while. For example, cold heater/cold house, dormant or ambient heater (previously unfired)/warmer outside conditions,

etc. This could mean the first firings of the season, or one in late spring after the heater has come out of daily operation. It could also mean returning to a colder house in mid winter when the heater has not been fired for some time.

You will find that after some trial and error, firing your heater is a very repeatable experience. You will more or less tune into its best function and find that it is easy to repeat the results each firing.

2. Cracking in the heater facing.

It is very likely that some hairline cracks will develop in the mortar joints of your heater facing. Some heater facing types tend to crack more than others, and every situation is a bit different. However, a good rule of thumb is to expect these cracks as normal as it's a rare occurrence that a heater doesn't get at least one hairline crack. They will emerge during the curing process and should not really develop further once the heater is fully cured and has been operation for a few months.

Masonry heaters undergo a lot of thermal stress and thermo-cycling. A heater builder could build a heater facing that would not crack but it would also be so insulated that it would not transfer heat and then not be a heater! We do our best to balance the risks and benefit factors between insulation (crack reduction) and heat transfer.

Any crack that opens upon firing wider than about an 1/8" inch is capable of being cosmetically repaired through a simple process.

Cracks in the facing do not mean that the heater is "broken" or "unsafe", or than your mason is inept. Please keep that in mind!

3. Firewood type and quality.

Firewood type and quality are critical to the proper performance of your heater. Many callbacks from clients have been solved very quickly after examining their firewood pile and discovering that the wood was not dry enough to support good combustion.

As rules of thumb, the user is looking for cordwood not more than 6" in diameter for larger heaters, and a bit smaller for smaller heaters. The wood should be around 20% moisture content, which means that it has been cut, split, stacked, and covered for a minimum of 9 month prior to use. The wood should have splits on the ends and have a slight ring to it when banged together.

Hardwoods are preferable, but in areas where not available then softwoods are able to be used. It will be necessary to burn a larger volume of softwoods to create the same BTU output, as the energy output is more a function of mass than volume, and softwoods are less dense than hardwoods.

4. Every heater is unique.

It is not possible to create a strict firing manual that would serve all heaters in all conditions. Every situation is unique: heaters have different fireboxes and overall design, they are built into homes with varying heat load requirements, fuel types vary regionally, user comfort levels differ, house pressurization and heater air systems are variable.

After studying and becoming comfortable with the basic guidelines offered here, the users' best teacher is their own observation. It is good practice to study the combustion inside the firebox and notice how it changes with fuel types, amounts and sizes, stacking techniques in the firebox, combustion air variables, etc. These will then effect duration and quality of the burn, heat output, bake oven temperatures (where applicable), etc. Another variable to watch and learn from is the gasses that come out of the chimney top, as you'll notice how their quality changes over the course of the burn. The cleanest burn should produce almost no visible smoke. Every burn will begin and end a bit more dirty, with the cleanest part of the fire during the middle.

After some use and observation most users find that the firing of a heater is not complicated at all, and that it is easy to get the same results time after time (repeatability). Sometimes the best way to start using a masonry heater for the first time is to accept that it is neither a common fireplace nor a cast iron woodstove, and that it has a unique method of firing that needs to be learned.

CURING A NEW MASONRY HEATER

Curing your newly constructed heater is a very important first step. There is really only one chance to do it properly, and if it is not done right the heater could be damaged permanently. A new heater is typically full of moisture from the construction process. This moisture needs to be driven out slowly, as it will be sent out of the heater through either movement of gases up the chimney stack or by "sweating" it through the heater facing. Sometimes a heater has been built in early summer, and has had several months to dry out before the fall heating season begins, and will contain relatively less moisture. Other times the heater is completed in the middle of the heating season and will have little time to air cure before use. Either way, follow these steps to cure the heater. Please try and be disciplined: one needs to resist the urge to load large fires at this point. Patience is key!

Notes on firing masonry heaters:

1. Combustion air systems: your new heater is equipped with one of two damper types that supply combustion air to the firebox. It may have a butterfly damper located under the firebox floor that allow air to enter from the heater's foundation, or it may have a door mounted to the front of the heater with a sliding lever to control amount of intake air. The butterfly damper control will be a small steel lever near the floor at the front of the heater. Before firing, the air intake damper must be opened. After firing, it will be closed.
2. Chimney shut-off dampers: your heater is equipped with either a sliding plate style damper mounted into the masonry or a butterfly type damper with a control arm extending through the masonry wall. If you have a sliding plate, the plate must be removed completely from the masonry. If you have a butterfly damper, the control must be placed in the open position before firing. The dampers will then be closed after all embers in the firebox have completely burned.

3. All fuel is typically loaded at once for a firing. Heaters are not gradually fed fuel and run all day (like a woodstove), but fired with a designed fuel load in more or less regular intervals.

4. Loading the firebox: There are many ways to load a firebox with a load of wood, and the user may experiment to see what works best for their heater, but here is the basic method. Place the pieces of cordwood over the sloped transitions on the sides of the firebox floor, leaving a channel over the grate. Fill this channel with crumbled newspaper, using about 4-6 pieces. Then add the kindling wood to the top of the newspaper. Normally, about 4-8 sticks approximately 1" x 12" in size will do. Next begin to add the cordwood. Put the first piece right over the kindling pile, and then start stacking the rest. The wood may be loaded in "log cabin" style, stacked first one way in a layer and then back the next, or it may all be place in one direction front to back. This can depend on firebox sizing, user preference, wood size, etc. It is important to leave a little space between the pieces of wood, about an inch is good. This allows oxygen to circulate around the fuel enabling combustion. A tab of newspaper should be left accessible to a match and the fire should be set of by lighting the newspaper.

Firing schedule for heater curing:

Day 1 to 3: Burn 5 pounds of kindling about every 12 hours. Leave dampers open during and after firing to allow all gases and moisture to escape.

Day 4: Moving to a 24 hour cycle at this point , add an additional 5 pounds of wood to fire, using regular cordwood split down to pieces about 3" in diameter. Leave dampers open during and after firing. It is important to split down the wood a little bit with the smaller fires. You do not want to put one large piece of cordwood down on top of the kindling pile, as the kindle will burn fast leaving the larger piece to sit and smolder. Fuel needs to be sized properly so that it burns down evenly.

Day 5-6: Add additional 5 pounds of wood to fire per day, so that on day 6 you are loading about 30 pounds of wood in the firebox. As the fuel load becomes progressively larger in size, you will not need to split down the cordwood as much. During normal operation only the largest pieces of wood will need split down. Leave damper open during and after firing.

Day 7-8: Add additional 5 pounds of wood to fire per day. At this point dampers may be closed when combustion is complete.

Day 9: Heater is generally cured at this point. The larger heaters, which have fireboxes designed for up to 60 pounds of fuel, may require a few more progressively larger fuel loads (5 pounds/day) before being loaded to full capacity. If you are not sure on the designed fuel load for your heater, ask your mason!

Daily Operation of the Heater

Once you have finished the curing process you are more or less on your way. There are a few things to keep in mind as you progress.

Firing Cycle:

The amount that you fire your heater depends on your heating requirements over the course of the colder season. During the early and late parts of the season, one fire every 24 hours may be typical. During mid-winter, two fires 12 hours apart may be the norm, while on the few coldest days the heater may be fired every 8 hours. The 8 hour firing cycle at the full designed wood load is the maximum output of your heater and your heater should not be pushed beyond that.

Risks of over-firing:

Imagine that your heater is like a new car. If you drive your new car at very high RPM (doing 65 MPH in second gear) then you are going to severely stress the engine and soon be in for some costly repairs. The fault is not the car but the way that it was operated.

A masonry heater is similar. You do not want to consistently over-fire it, or you risk damaging the firebox, any castings inside the core, and even snapping the cast iron hardware. The user needs to direct their focus to finding its "sweet spot", where it can be fired in daily intervals at its designed wood load or less. If you are over-firing a heater to fulfill the heating requirements of the house, then you need to use additional systems or complete an energy audit of the house.

If, after some use, you learn that to provide the BTU output for your home you need to burn 80 lbs of wood per day, then the desired approach would be to burn two fires with 40 lbs each.

While a heater is made of bricks and mortar and is in many respects "solid and strong", it is still capable of being broken and the user should be aware. If you call your mason back to the job because there have been damages to the heater then the mason may be very unhappy if the damages have come from over-firing, especially if the owner had been instructed to stay within the designed operation limits of the heater. It's a no-win situation for all involved. While these occurrences seldom happen, it's important to be aware that they are possible.

Maintenance:

Heaters require little in the way of maintenance in terms of short term cycles. The important steps to take are the cleaning out of interior flue channels through the soot doors, removal from ash from the ash box door (where applicable), and inspection of the bricks that line the firebox inner walls.

To clean out the interior channels, remove the cast iron covers of the soot doors, and insert the end of a flexible vacuum hose, directing it into the main parts of the channels and also the corners. This should only be done with a cold heater and should happen about two times per year. It's good to clean the channels at the beginning of the season, which gives one the opportunity to more or less inspect the heater before operation, and then the channels should be cleaned again about halfway through the season.

If you have a front mounted ash box/air intake door, then you'll need to open it and remove ashes from the ash pit under the fire box floor regularly. The exact interval that it will need cleaning out will depend on the size of the heater. Other heaters have an ash dump that runs into a masonry foundation, where the

center of the foundation is a massive ash pit. This should be cleaned out annually, either at the start or end of the firing season. There is space in there typically to contain several years' worth of ashes, but it is always a good idea to inspect and clean a bit more regularly.

Most of the larger heaters have a replaceable inner firebox wall liner, which means that the courses of firebrick lining the firebox are not bonded or tied into the surrounding masonry. This allows them to be replaced if necessary, as the firebox itself takes the most stress from the daily combustion and, over time, the bricks may spall or split. The refractory mortar may also degrade. The firebox lining may remain in perfect health for a very long time, or it may need some repairs after five to ten years, depending on use. If you find that your firebox walls are in need of repair, it's best to find a mason to complete the job, which will take a few hours. Instruct the mason that the lining may be removed without risking the integrity of the heater's core, and that the firebricks be replaced with medium duty firebrick laid in refractory mortar.

Best wishes for a warm winter!

Turtlerock Masonry Heat