



# Masonry Heaters



Masonry heaters are high efficiency wood burning devices that have been used for centuries in the cold regions of Europe and have only gained traction in North America in the past few decades. At heart, it is a very simple technology that uses basic materials such as clay, sand, and rock. The Cold Climate Housing Research Center uses a masonry heater to meet nearly 10% of its annual heating load.

## How it works

A masonry heater burns a charge of wood rapidly (for about two hours) and stores the heat in its large thermal mass (often around 4 tons) of stone, brick, ceramic, or similar solid medium. Because the wood is burned rapidly at very high temperatures, it burns clean and produces no creosote and few emissions (about the same as a pellet stove). The exhaust flue is carefully designed so that exhaust gases must travel through passageways in the thermal mass of the heater. In doing so, heat energy from the exhaust gas is transferred and stored in the thermal mass of the heater. In contrast, a traditional wood stove vents exhaust immediately. The thermal mass heats up to between 120-160 degrees, acting as a giant radiant panel by releasing heat slowly into the room over 16-24 hours to produce a cozy, even temperature.

## Energy Efficiency

Masonry heaters have a combustion efficiency of up to 85%, depending on the model and installation, compared to typ-



The masonry heater at CCHRC has 12,000 pounds of rock that absorb heat from the fire and radiate it into the room.

ical efficiency percentages in the high 70s for pellet stoves, low 70s for catalytic stoves and low 60s for non-catalytic stoves certified by the EPA, according to the EPA list of certified appliances at <http://www.epa.gov/compliance/monitoring/programs/caa/whcert.html>.

Masonry heaters can be designed to heat an entire home or specific zones of a home. An average size energy efficient home might require a heater with about 20,000 BTU/hour to meet whole-house heating needs. At a steady output of 20,000 BTU/hour, you would burn about 3,000 pounds of seasoned wood per month (a full cord of dense hardwood or 1.5-2 cords of softwood, depending

on the species). Even in a less efficient house, masonry heaters can offset a big chunk of space heating demand without using a lot of firewood.

## Fuel

Wood can be considered a renewable resource if harvested sustainably. When compared to all other traditional means of wood heating, masonry heaters extract the most energy possible from a piece of wood. In doing so, they also use less wood overall, which is important where firewood is a limited resource. Using acceptably dried wood (20% moisture content or lower) is cleaner and more efficient because less energy is lost in the process of vaporizing the excess moisture stored in the wood.

## Other uses

Some masonry heaters can be designed to include a coil for hydronic heating or domestic hot water. Water running through the coil is heated and can then be distributed throughout the house, transferred to a thermal storage tank, or used to heat domestic hot water via a heat exchanger.

Masonry heaters can also be adapted to include integral bake ovens and comforts such as a heated benches.

## Considerations

Building a masonry heater is a major project and a long-term investment, costing several times as much as a high-end wood stove.

The brick core of a masonry heater is

carefully engineered for performance and it typically takes a skilled mason to construct the heater to ensure that it drafts properly and can withstand the expansion and contraction of thousands of firing cycles. Since masonry heaters tend to be quite large, the best time to install one is during the construction of the house, where it can be easily incorporated into the home's design and heating requirements.

Although the initial cost may be higher, the tradeoff is that a masonry heater can easily last a lifetime, or even several life times, with minimal maintenance.

## More information

The Masonry Heater Association of North America publishes a Plans Portfolio with plans for 7 different heaters that have been tested. The site also has information on building code issues and contact information for manufacturers, designers, and professional heater builders in Alaska.

### Resources

For an in-depth video on retrofitting a masonry heater, visit the CCHRC Youtube page at [http://youtu.be/8xboI\\_-OCxQ](http://youtu.be/8xboI_-OCxQ).

Masonry Heater Association of North America:  
<http://www.mha-net.org>

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