



masonry stoves



Modern, stone-faced stove in the US.

what are they?

They're domestic wood-burning heating appliances with a firebox made of refractory (heat-resistant) fire bricks, and a system of flues within the stove, made from the same material. The entire stove will contain between one and five tonnes of masonry. A kachelofen (German), kakelugn (Swedish) or kakkellovn (Norwegian) is a type of masonry stove. Kachel means tile, so a kachelofen is a tiled stove. Masonry stove is a generic term that includes stoves without tiles.

The flue system - 3-9 metres long, with both vertical and horizontal lengths - is connected to a chimney. Heat travels through the flue system, is soaked up by the masonry and slowly released into the room. The temperature of the gases at the exit from the stove (i.e. at the base of the chimney) is typically 100-150°C, compared to 300-400°C with a wood stove. Masonry stoves minimise heat loss via the chimney, although you still need a warmish chimney to create a draw.

Masonry absorbs & re-emits so much heat that a fierce fire for a couple of hours is enough to heat your home all day. A system of air jets (basically, holes in the side of the firebox) bring oxygen to the combustion chamber for a clean burn. The air jets are not just at the bottom and front of the firebox, but also at the sides, back and top.

The 4 most common facing materials for the outside of a stove are: tiles; clay bricks; natural stone; clay- or lime-based render. All react well with heat, without cracking. The most common facing materials in North America are brick / stone; in Russia, brick / render; in Germany, tiles / stucco; and in Scandinavia, tiles / soapstone.

History: the Roman hypocaust was a massive stone structure with a firebox and flues under the floor. The masonry radiated heat for public baths, but required slaves to stoke the fire day and night. The modern masonry stove appeared in the 15th-

16th centuries, in central and eastern Europe. In the 17th-18th centuries, Scandinavian monarchs funded research into better stove design due to shortages of fuel. Europeans took the masonry stove idea to the US, and only now are they beginning to appear in western Europe, notably Spain, the UK and France.

Before fire bricks existed, engineering bricks with clay mortar were used; and before that, clay bricks and clay tiles. The inside of the firebox was re-plastered with clay plaster every year, to protect the bricks. Clay-based mortars containing ground porcelain were used between the bricks. Modern mortars are made from ground fire bricks mixed with clay powder, water glass (sodium silicate) and other materials - often secret (stove builders tend to have their own recipes).

what are the benefits?

In an ideal situation, a masonry stove should be able to burn 980g of material and leave only 20g of ash per 1kg of wood. Combustible gases don't ignite until they reach around 800°C - easily achievable in a masonry stove. By allowing abundant oxygen into the combustion chamber, masonry stoves can reach a combustion efficiency of 95-98% (a modern, clean-burning wood stove is around 80% efficient, and an old stove maybe 60%). Then there is heat transfer efficiency - i.e. how well the heat transfers into the room. Metal is denser than masonry, and its surface gets much hotter. Air molecules vibrate violently, causing many collisions near the stove. Lots of energy is used up heating the air. The surface of a masonry stove is cooler, and heat radiates out gently, avoiding the violent collisions between air molecules. Heat tends to move further through the air until it hits a solid surface, so you'll have warm walls, furniture and people, but relatively cool and fresh air. More benefits:



Cut-away showing one style of flueway.

masonry stoves



- They use wood - a renewable and carbon-neutral resource
- Their efficiency means less wood used and virtually no smoke emissions
- They don't break down. They are huge solid things that last generations - there are plenty of working stoves in Europe over 100 years old
- Independence - you don't have to rely on corporations for your heating and hot water
- Safety - if you have small children around, the surface is not too hot to touch
- Chimney doesn't have to be swept so often - virtually no tar, creosote and other pollutants

what can I do?

Using a stove: light a fire once a day, using 10-20kg of wood, allow it to burn fiercely for a couple of hours, then close the chimney damper to stop the air flow. Then it's the same as a normal wood-burning stove (but much less ash is produced).

Getting a stove: it's best to get an experienced professional to install your stove, but if you really want to do it yourself, do it alongside someone with experience, or attend a course. There needs to be a gap between the fire bricks and the facing - the bricks expand when heated, so they need space to expand into. Fire bricks, stone, metals, clay etc. have different rates of expansion and contraction, so the sizing / spacing of components is crucial. You don't want cracks that may allow carbon monoxide to escape. Also, combustible gases could become trapped in the flueways if they're not built correctly, and could cause an explosion when the stove is re-lit. It all comes down to common sense - masonry stoves have been used in Europe for a long time, and are perfectly safe if installed and used correctly.

A masonry stove represents a whole-house system - it will provide hot water too. A system for a 3-4 bedroom house can cost several thousand pounds, but is competitive with other whole-house systems built from scratch. It will use 3-4 tonnes of wood per year (based on 20kg of wood per day), and depending on the source / price of your wood, gives a payback time of around 5-6 years. Gas is cheap, but will rise in price as it begins to run out. Plus your stove will last a lifetime without any maintenance or repair bills.

A masonry stove will give you around 0.7-1kW of output per m² of exterior surface; a standard size



Typical eastern European tiled stove.

is around 5-6kW. A good installer will be HETAS registered, and will build, certify and test your stove. A stove is designed for a particular home, and will be unique. However, some builders have developed modular stoves that can be put together in a day, and are cheaper because of reduced labour costs. They won't be as efficient as an individually-designed stove though.

Appliances need to be Defra-approved, tested and certified for smoke-control areas. However, masonry stoves are unique, and not based on a model that can be tested. In Germany, if an installer has followed the design software, the stove is considered efficient enough to be certified. We hope that regulations change in this country to allow well-built masonry stoves everywhere.

A stove can emerge into a first-floor room, to heat upstairs as well; it can also include an oven and a hob for cooking; and the flueways can be diverted to heat an adjacent, very cosy bench.

resources

- see lowimpact.org/masonry-stoves for more info, advice, courses, links & books, including:
- Ken Matesz, *Masonry Heaters*
- David Lyle, *the Book of Masonry Stoves*
- kachelofenverband.com - Austrian Tile Stove Association
- mha-net.org - Masonry Heater Association of North America
- dnr.mo.gov/pubs/pub781.pdf - DIY manual
- envisioneer.net/stove.php - how to build a masonry stove from paving slabs

Feel free to upload, print and distribute this sheet as you see fit. 220+ topics on our website, each with introduction, books, courses, products, services, magazines, links, advice, articles, videos and tutorials.

Let's build a sustainable, non-corporate system.