W W W . C E R A M I C S T O V E . C O M

The Ceramic Stove Company

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Ceramic Stoves, (Kakelugn, kakkelovn, kachelofen)

The Ceramic Stove is currently enjoying a huge revival in the rest of Europe and Scandinavia (over 90% of new Finnish homes have a ceramic stove installed) and was introduced as a serious proposition in North America in 1982 and in the UK in 1991 by the Ceramic Stove Company.

This is because Ceramic Stoves :

- Are extremely efficient and benefit the environment
- Are aesthetically very pleasing
- Are available in a wide range of styles and can be built to customers' specifications
- Are simple and quick to operate
- Have a long life
- Provide fuel independence
- Burn very cleanly
- Have a lower surface temperature which improves air quality

What is a Ceramic Stove?

Ceramic stoves and ovens have been around for many hundreds of years and in Britain in the past all bread was baked this way. The name 'Kakkelovn' was derived from the tiles that were originally used to cover the stoves. These were cup shaped and placed on the stoves with the concave side facing out to increase the surface area.
Ceramic Stoves are found in many parts of Europe and Scandinavia, notably Bavaria, Poland, Austria, Switzerland, Russia, Sweden, Finland and Norway.

In the past, longer and colder winters made heating a matter of survival rather than comfort. In areas close to the Arctic Circle, the Ceramic Stove developed into a survival tool. It became a cooking appliance; you crawled inside to keep warm when washing and you slept on it. The inefficient open fireplace would have soon exhausted everyone, as it would have required too much wood and constant attention.

Ceramic Stoves are now used in millions of European and Scandinavian homes alongside central (convective) heating, the latter being used at a much reduced level and mainly to heat cold corners of the house. The Ceramic Stove is the principal source of high-quality heat permeating throughout the building. These systems save on precious fossil fuels, extend the life of the central heating system and reduce indoor pollution. Once you have become accustomed to this form of heating the central heating system plays a diminishing role and may even be dispensed with altogether.

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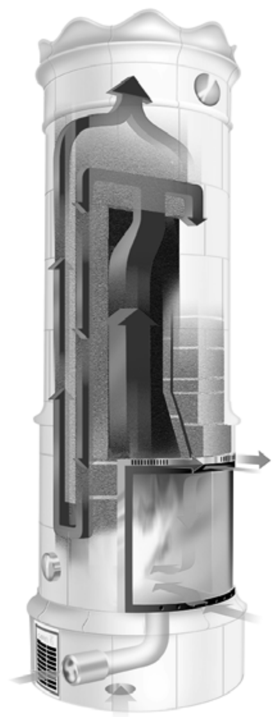
MEMBER OF THE ECOLOGICAL DESIGN ASSOCIATION, BRITISH BIOGEN,
ASSOCIATION FOR ENVIRONMENT-CONSCIOUS BUILDING 3/01

How do they work?

The Ceramic Stove is more efficient than any other wood burner as the energy produced in the combustion chamber is stored in the mass of the stove, then released over a twenty-four hour period. Two hours' burning is normally all that is required. The stove is never shut down on a 'slow burn' and is therefore always working at maximum efficiency.

This diagram shows the internal flue design of our Ceramic Stoves. This five-channel system produces the extremely efficient method of heating which is their trademark.
First the smoke goes up the centre channel before being divided and forced down the front two channels. It then passes back past the combustion chamber and is directed up the two rear channels which join at the top and vent into the chimney.
This keeps the heat within the stove and allows it to be absorbed before leaving via the chimney.
In the combustion chamber there is an effective 10-20kw. This is transferred to the room at between 1 and 6kw per hour.
Rapid heat may be obtained by employing the optional fan that directs cool air past the burning chamber directly into the room. This air may be supplied from outside or recirculated from within the room.
This design allows the stove to have an overall efficiency of up to 90%. An open fireplace, in contrast, achieves an efficiency of around 10% as most of the heat is lost up the chimney.



The smoke canals are made of high-density composite stone such as olivine, which has excellent heat absorption qualities and high heat storage capacity.

The stove may be connected to an existing chimney if it is conveniently located, to the rear of the chimney of an unused fireplace in an adjoining room, or to a new flue of not less than 6" internal diameter.

The radiant heat from the ceramic surface of the stove is at such a wavelength as to be the most pleasant to the human body. A Ceramic Stove actually improves the environment in your home by drawing in air to fuel its combustion process. As it does so, small particles of dust in the air are drawn in too.

All of our Ceramic stoves are fitted with a damper that cuts down the flue escape to the chimney by 80% once the fire has been allowed to go out. This is manually operated and means that the stove is not cooled by air passing through it (A 100% seal is not permitted by law).

It is not necessary to clean the ashes out of a wood burning stove before relighting. Unlike coal, wood does not require an underdraught. It will need emptying occasionally though, dependent upon usage.

A Ceramic Stove will sit happily in a room of modest dimensions whilst remaining an important feature or as a centrepiece for larger spaces. They have been used for generations to heat small sitting rooms, family rooms and bedrooms, public buildings and hotels, and more recently in conservatories, community halls, barns and garden structures such as pagodas.

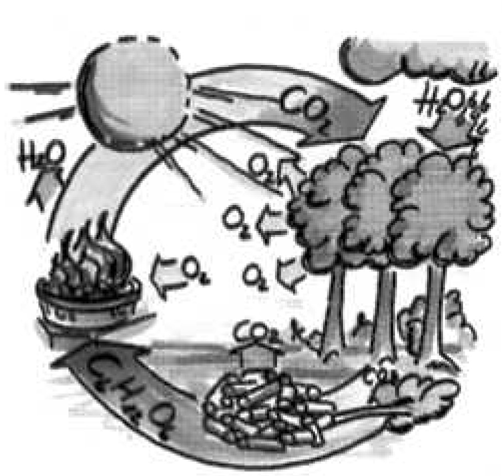
How to fire a Ceramic Stove

The firing technique for a Ceramic stove is quite different from conventional woodburning.
It is this difference which makes it so efficient.

Ceramic stoves can be viewed as storage heaters. Dry wood burnt fast once a day gives its energy to the stove which releases it slowly until it reaches ambient temperature or is fired again. Once the embers have died down completely, the top damper is closed to prevent any further heat loss up the chimney.

To burn wood so that the only by-products are steam and C02, high temperatures must be achieved, ideally between 900°C and 1100°C. At this temperature the wood flame is long, as the various distillates are burnt along its entire length. Therefore the flame should remain within the stove, as with a Ceramic Stove, and not up the chimney.

Flue gases on exiting the stove are below 200°C. If the gases are allowed to fall below 100°C they will produce condensation. This is true of all woodstoves, but with dirty combustion typical of many other stoves this contains corrosive creosote and soot as well.



Current scientific thinking is that burning wood in a stove as efficient as ours is actually better for the environment than leaving the wood to rot in the ground as the decomposition process releases the same pollutants as burning in a conventional stove.

If using managed timber, the C02 rating is zero.

The surface of a Ceramic Stove does not become hot enough to burn any residual particles of dust. The burning of even minute amounts of dust on metal surfaces releases pollutants into the atmosphere.
The surface of the stove should never be too hot to touch (care should be taken with the interior metal doors however, particularly with small children).

The threat of a chimney fire is virtually eliminated by burning small logs very quickly. The rapid and efficient combustion that takes place ensures that there is no combustible material going up the chimney. This is particularly comforting to people living in a timber-framed house or a thatched cottage.

When should the Ceramic Stove be fired?

As mentioned, the Ceramic Stove is more efficient than any other wood burner as the energy produced in the combustion chamber is stored, then released over a twenty-four hour period. Two hours' burning is normally all that is required. The stove is never shut down on a 'slow burn' and is therefore always working at maximum efficiency. Wood consumption should be about a basket of wood or 15 kilos per day.

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A particularly cold day can be catered for by lighting the stove again between regular firings.
This is because of the relatively high 'Mean Radiant Temperature' (see under *Considerations for heating a house*) that the stove will have already produced.

Another point to note is that the colder the house is allowed to become, the faster the stove will cool to reach ambient temperature. If the stove becomes cold on a cold day, it can be given a small boost to warm it up until the next main firing; even a smaller load will burn efficiently and most of the heat will be retained within the stove. Stove owners soon get to know their stoves and can easily gauge how much wood to burn and when.

As the wall of a ceramic stove is particularly thick compared to a conventional woodburner, the stove continues to warm up after the firing has ceased as the heat travels through the stone. The heat may take anything from 3/4 to 1 hour to get out, depending on the thickness of the stove wall, which will have been determined during the design process. An optional fan can be fitted to provide immediate heat whilst firing.

Where to place a Ceramic Stove

The stove should be set centrally if possible, in order to gain the maximum amount of radiant heat. It can be built to extend to the next floor and can be stoked from outside or from an adjoining space if one wants to avoid having the wood in the living room.

A Ceramic Stove is very tactile. It has been found that people naturally gravitate towards the stove and tend to caress the tiled surface. It is a good idea to choose the location with this in mind.

A solid foundation will be required for many of our stoves. Due to the wide range we have on offer the weight of our Ceramic Stoves vary considerably, but generally they are between 700kg and 1500kg.

The hearth will need to be of non-combustible material and project at least 150mm (6") on both sides and 300mm (12") to the front.

It is possible to heat several rooms from the same stove simply by choosing the location carefully.
The stove will heat any space in which it has an exposed surface, so if it is placed in the wall dividing two rooms it will heat both; if it is placed at the junction of two walls crossing over at the stove it could heat four. If it is built up through the ceiling it could heat upstairs as well, bearing in mind that the output has to be considered and a larger stove may be required or it may need more frequent firing.

Consideration should be given to siting a Ceramic Stove to ensure that its surfaces are fully exposed where possible. The heat output of a stove is calculated according to its surface area, mass and wall thickness and as much as 70% of its heat output is in radiant heat.

Directing this radiant heat into an unused space is counter-productive. Building the stove into a cupboard and placing walls around it would also dramatically affect its output. Stove design involves calculations that take into account expansion, contraction, air-tightness, flue lengths, firebox geometry and wall thickness.

Ceramic stoves behave somewhat organically as they heat and cool, which necessitates a certain amount of flexibility and space. Placing a heavy chimney directly on top of a stove, for example, may be detrimental to both the stove and the chimney. Where a stove rises through an upstairs floor it must be cleared by 100mm all round to conform to fire regulations. This however can be a big advantage, as controllable vents in this gap will allow convective heat upstairs at bedtime.

It is possible to construct stoves that perform more than one function although it must be said that as with all multipurpose appliances, a stove will generally perform better the fewer functions it fulfils. Without a doubt, the most efficient stoves are those that produce heat only, although they can be built with hotplates, ovens and water boilers for domestic hot water and radiator supply. In such cases the stove will act as the focal point for the whole house.

A popular system now gaining favour in Germany is a dual-purpose masonry heater that has a rapid response time and produces both hot convective air and long wave radiant heat. Like a typical Ceramic Stove it requires a short attendance time and burns the wood in optimum conditions, although the convective part has all the usual characteristics associated with hot metal surfaces.

Considerations for heating a house

Wood is a renewable source of stored solar energy and is non-polluting when burnt correctly. If incorrectly burnt, as in a slow-combustion stove, wood will cause serious pollution. The Ceramic Stove is designed to burn wood under optimum conditions and thus overcomes this problem.

There are two main forms of heat distribution systems for houses: convection and radiation. Convection systems (hot air) are a major cause of indoor pollution, as they require high air temperatures and large air movements that circulate dust, mites and other irritants. When these come into contact with hot metal surfaces they may burn and form toxins.

Air is an insulator, which means that it gains and loses heat reluctantly and if used for heating, must be maintained at relatively high temperatures within a narrow limit.

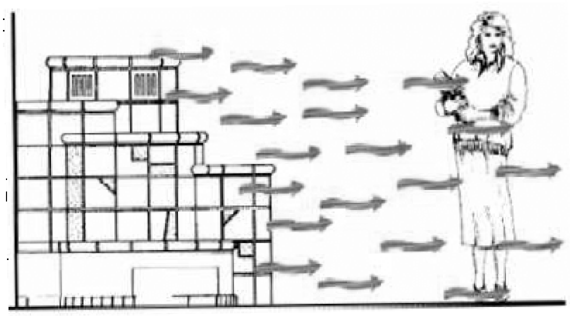
As it is the air that holds your heat ‘investment' it must be prevented from escaping from the building; this exacerbates the problem of indoor pollution, as air becomes stale and waste levels increase.

Another problem with warm air systems is condensation; the hotter air becomes, the more moisture it can hold. A sealed, occupied house can hold large amounts of moisture in the air from such activities as breathing, cooking and bathing. If this air comes Into contact with cold surfaces, it will condense and revert to water.
The answer to this is to insulate these surfaces, which has the added benefit of preventing conductive heat loss from the building. In the short term this would appear to be an excellent idea, but it presents three other problems:

Cold Bridging **Thermodynamic Instability** **Lack of Thermal Mass**

Cold bridging is a weakness in the warm envelope around windows, doors, roofing and flooring. Condensation concentrates at these sites and mould soon starts to grow. The answer to this problem is not always straightforward and often increases the cost of construction. It can also compromise the structural integrity of the building. The second and third problems are related in that the house becomes increasingly thermodynamically unstable.

In other words you are unable to put your heat investment into the fabric of the building. Lack of thermal mass means that the building as a whole ceases to radiate warmth back into itself. Also, any source of heat rises to the highest point or goes outside, thus increasingly complex control systems are required and air changes in the building must be carefully managed. The two requirements of heat retention and fresh air are incompatible as we attempt to introduce naturally cleansed air for the occupants of the building whilst retaining our expensive warmed air.



Radiant heating systems reduce these problems, as the air no longer becomes the sole means by which heat is transferred.
Radiation (Infrared) heats objects directly, even through space, as with the radiant heat from the sun heating the Earth after eight minutes' travelling time.

The answer to these problems lies in the lower surface temperature of Ceramic Stoves and heaters that produce much longer wave radiant heat that is considered very beneficial as it stimulates the circulation.

All warm-blooded animals lose heat through radiation; humans produce the equivalent of 100 watts when resting, of which 60% is given off through radiation depending on the clothing worn and the level of activity.
Where our bodies 'see' cold surfaces we feel uncomfortable so by raising the surface temperatures in a room we extend the range of air temperatures within which we feel warm and comfortable. This is known as the **Mean Radiant Temperature** (MRT) and once this has been raised in a house we can begin to ventilate more frequently and thus reduce indoor pollution levels.
If the walls have inherent mass, as in stone or concrete construction, these too begin to radiate heat: air being heated from a much larger surface area calms down and stops sweeping the dust off the floor and throwing it around the building.

Environmental considerations

As mentioned, stoves are used in millions of European and Scandinavian homes.. Here the plentiful wood-fired Ceramic Stoves in use provide a market for fuel wood, which ensures that forests are economically viable and continue to be planted. As fossil fuels become more scarce and expensive the stove will take an increasingly important role. Long term planning in these countries is second nature and heating in their colder climates is absolutely essential to survival.
The Swedish government is currently encouraging Swedes to use wood burning stoves and Ceramic Stoves in particular. They reason that wood, if managed properly, is a renewable resource unlike coal, gas or oil (it takes eleven years to replace pine or birch but millions of years to replace coal).

We have installed one of our Osier range of stoves in the Oxford EcoHouse, to complement its design as an example of an efficient and environmentally-friendly form of housing using the latest building materials and techniques.

When designing a new house that will incorporate a Ceramic Stove, three other factors should also be considered:

Passive solar heating **Effective insulation** **Ventilation**

Passive solar heating is very cost-effective and reliable and needs very little maintenance. Insulation should, where possible, be placed outside the basic structure of the house to take advantage of the thermal mass of the material used for construction (stone, brick, concrete etc.). Ventilation must be planned as there is a difference between ventilation and draught.

Ceramic Stoves, like people, need to breathe. Your house does not need to be hermetically sealed, as the heat from the stove will compensate for some cool air coming in. Fresh air is good for you! However, we should point out that effective insulation is important as heat that you've paid for is best kept indoors.

Finally, in these times when the only two forms of heat transference that are normally considered are radiation and convection we tend to forget the friendliest of all; conduction. Wherever the ceramic stove has been found in the world there have been people coming in from the cold to stand or sit against or even sleep on top of their stoves. Try doing that with a central heating boiler!

Wood sources

Fuel can be obtained from a variety of sources, including the following:

- Logs from your own or communal land.
- Logs from a local supplier.
- Coppiced wood from your own or communal land.
- Briquettes from a local supplier or mail order.
- Off cuts from a local sawmill or manufacturer.
- Discarded wooden packaging from local retailers.
- Briquettes formed from old newspapers.

Logs, whether home grown or from a local supplier must be dry and allowed to season for at least a year, preferably two. Wet, green wood will not burn efficiently and will produce excess tar and creosotes that will rapidly foul up the flue. Logs should be split to no greater than about 3" (75mm) diameter for maximum efficiency. The length depends on your firebox and could be as much as a metre.
Coppicing is an extremely efficient method of growing your own fuel and we have designed a firebox with this in mind. This firebox could also be incorporated into other stoves.

Possible suppliers:

Should you be considering coppicing, Steve Pickup can supply you with seedlings by mail order. Contact him at: The Willow Bank, Cefn Coch Gwyllt, Cemmaes Road, Machynlleth, Powys, Wales, SY20 8LU. Tel: 01650-511395.

Ian Donaldson, Glebe House, Meadow Lane, Denford, Kettering, Northamptonshire, NN14 4EH, Tel: 01832-732828 produces thatching spars and can supply faggots/bundles of small diameter hazel for firewood. Call or write for details.
Briquettes are a viable alternative to whole wood and can be obtained from a number of sources. Bagnalls Haulage Ltd, Station Yard, Station Road, Enslow, Oxfordshire, OX5 3AX will deliver their environmentally friendly EcoBlock by the pallet load anywhere in the country. The blocks are formed under high pressure and no glue or binder is used in their manufacture.
Write or telephone 01869-351150 for details.

Off-cuts and discarded (unrecyclable) wooden packaging is a useful fuel source as it will almost certainly be well seasoned and dry. The species used is not a problem as our stoves will happily burn any of them. All you need to do is cut the packaging into useable pieces, burn them and throw the nails out with the ashes.

We've tried newspaper briquettes formed in a press at home from soaked newsprint and whilst they burn well and get rid of all your old papers, making them is quite time-consuming.

The Company

As a company, we are corporate members of the Ecological Design Association and Association for Environment-Conscious Building.

All Ceramic stoves are hand-built on site in accordance with current Building Regulations, BS Codes of Practice 6461 & 8303, ASTM E 1602-94 where applicable and most are exempt from section 21 of the Clean Air Act 1993. Our own ‘Osier’ stove has patent protection.

Exemption from section 11(4) of the Clean Air Act 1956 and 1993 have been granted for many of our stoves and means that they can be used anywhere in the country. Imagine the glow of a real log fire in central London or any of the growing number of smokeless zones. All of our stoves sourced from Europe will have passed their stringent emission tests.

All our stoves are hand-built to order. At present we can get one to you in about four to eight weeks, according to the model, and perhaps less depending on schedules. If we have a rush of orders however, delivery and installation times will lengthen. If you have a building project underway please allow enough time for us to deliver on schedule.

Each stove is unique in that it will have been built specifically for you.

If you wish to specify your own design and/or tile pattern, we can accommodate your wishes within the constraints of manufacture.

Product range

The Ceramic Stove Company is able to supply stoves, cookstoves, ovens, hypocausts and hotwalls originating in countries from the Balkans to the Baltics, including Slovenia, Bavaria, Switzerland, Austria, Germany, Estonia, Latvia, Lithuania, Norway, Sweden and Finland.
All share similar characteristics, i.e. woodfired heat retention, but vary in style, appearance and function.

Specific information on any of the above can be provided upon request.

Our brochure pack provides examples of a wide range of styles from all over Europe. Please let us know if you have a style in mind that is not shown.

We are constantly expanding our range; we can also design, supply and build a variety of woodfired tiled or rendered cookstoves and ovens.

We can also build you a stove to your own specification.

We also have a website at

WWW.CERAMICSTOVE.COM

where you can see a number of examples of our ceramic stoves, as well as a wide variety of metallic/ceramic combination stoves, and wood burning bread and pizza ovens.

Prices

Please refer to the price list enclosed for price details.

Information and Ordering

For further information and ordering please contact the Ceramic Stove Company at the following address:

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Or by e-mail:
info@ceramicstove.com

or via our website:
www.ceramicstove.com

Appendix

Environmental Information

Table 1
Woodsmoke Emissions : grams of tar per kilogram of wood burned*

Ceramic Stoves	2.8	(very advanced fireboxes can achieve as little as 0.5)
Woodstoves (non catalytic)	15.3	
Woodstoves (EPA certified)	7.3	
Standard Open Fireplaces	17.3	

**Figures quoted by the United States Environmental Protection Agency*

Table 2
Comparative Efficiencies*

	Overall efficiency	Burning efficiency
Ceramic Stoves	80%	95%
Cast iron woodstoves	55%	40-50%
Open fireplaces	10%	35%

**Overall efficiency figures are taken from widely quoted figures in Europe and Scandinavia.*
Burning efficiency for Ceramic Stoves: MHA News
Other efficiencies from "Wood as Fuel": Forestry Commission

Table 3
Moisture Content of Wood – average species

	Water content G/kg of wood	Total available energy kW/kg	Maximum possible combustion temp ^{o}C	Extra required for same output
Very (oven) dry	100	4.5	1150	0%
2 year seasoned	200	4	1100	15%
1 year seasoned	350	3	1000	71%
Freshly felled	500	2.1	870	153%

The rule of thumb when buying wood is "Buy by the weight plus moisture content". By weight rather than volume is also a better way to average out the difference between soft and hardwoods. Bulk for bulk the latter takes up ¾ the volume of softwoods for the same output but will weigh about the same.

Now refer to Table 2 and remember that a Ceramic Stove always burns at maximum efficiency. Closing down a woodburner can halve its efficiency. This must be borne in mind when making calculations for a stove that is operated in this mode for part or most of the time.