



Natural Heritage Trust

Helping Communities Help Australia

An Australian Government Initiative

HOT

TIPS

for cleaner wood heating

This brochure is a guide on how to use your wood heater to maximise the heat obtained from your wood and reduce woodsmoke pollution.

The facts are clear

Many Australian households use woodheaters and open fireplaces for home heating. As a consequence, in some of our towns and cities, levels of winter air pollution are unacceptably high.

This pollution is made up of very small particles that can be taken directly into the lungs and contains a number of toxic and cancer causing agents.

Many people don't realize that smoke from their woodheaters and fireplaces can present a real hazard to their neighbours, causing physical discomfort for those with respiratory problems, especially older people and young children.

Australia's woodsmoke problem

Woodheaters and open fireplaces are often the major contributors to outdoor air pollution levels in cities and towns during winter. They are used extensively throughout Australia and their use varies quite dramatically from suburb to suburb and town to town. In some areas, over 60% of households use wood as their main fuel for home heating. Wood can be an efficient and economical way to heat your home. However, its use can lead to poor air quality.

One obvious feature of this poor air quality is the brown haze often seen over residential neighborhoods on clear, cold nights. Sometimes whole cities, such as Launceston or Armidale are affected. This haze is a result of temperature inversions, often combining with limited air movement leading to woodsmoke being trapped at ground level.



Managing a woodheater takes time, effort and planning. All woodheaters, when operated well, should produce heat without smoke. You can help to improve air quality in your local area and ensure your community breathes easier by operating your woodheater better.

This brochure offers advice about how to operate your woodheater to ensure you do not create an unhealthy environment for your neighbours and other community members.

The secret of successful burning:

When wood is completely burned, you are left with carbon dioxide and water vapour, which escape into the air, and an ash residue.

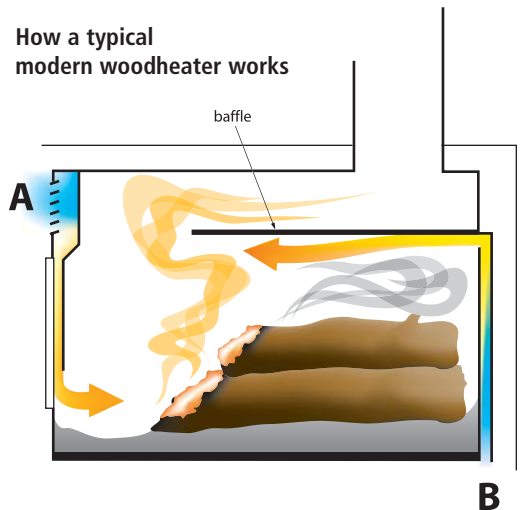
Complete combustion is important to the performance of your woodheater and to reduce woodsmoke. The following conditions are needed for your woodheater to achieve complete combustion:

- **dry, seasoned firewood;**
- **a fire that is hot enough;**
- **sufficient air flow to provide enough oxygen for combustion;**
- **sufficient mixing of air and the hot gases given off by the fire; and**
- **enough time for burning to be complete.**

If there is a lack of any or all of the above, incomplete burning will occur. You can tell if you have enough heat, air and mixing if the coals are glowing brightly and there are bright swirling flames. Dark, smoldering fuel and a lot of smoke in the firebox indicate incomplete burning.

Incomplete combustion will lead to the generation of toxic pollutants, such as particles and carbon monoxide, and also means you are wasting both wood and money.

How a typical modern woodheater works



Primary air [A] is drawn in through a sliding or hinged air control mechanism, usually above the door. The air is pre-heated before being directed down the inside of the door, helping to keep the glass clean. It then enters the base of the fire. This primary air supply determines how quickly the firewood burns.

Secondary air [B] is heated to a high temperature before entering the firebox just below the baffle. This air does not influence how fast the fire burns, but is critical in ensuring a strong flame and a clean burn, even when the heater is burning slowly.

Start out right:

When lighting a cold woodheater always use sufficient dry kindling to establish a good fire quickly. Place kindling and small wood in the firebox so that there is at least 2cm between each piece. This allows air to circulate freely and leads to faster combustion and cleaner burning.

As well as putting plenty of paper underneath, put two or three loosely crumpled sheets of newspaper on top of the wood when first lighting the heater. The paper will burn rapidly, heating the flue and creating a draught quickly.

It is also important to get the woodheater hot as quickly as possible. To do this the air controls should be left fully open for at least 20 minutes to create the right conditions for the wood to burn completely and cleanly right from the start. A hotter fire means there will be less smoke.

Always leave a bed of ash in the firebox on which to light the next fire, as this will assist burning.

Keep it burning brightly:

Wait for the fire to be fully established before adding extra fuel. Larger pieces of wood should only be added after a bed of coals has been established. If a woodheater is operating well 20 minutes after lighting or loading, there should be no visible smoke.

Open the air controls fully every time you add more firewood. Failure to do this can generate a lot of smoke. If there is a vigorous flame established when you add more firewood, then most of the smoke will be burnt before it reaches the flue preventing it from polluting the atmosphere. Burning this smoke means you are producing more heat, as well as reducing pollution.

After 20 minutes, when all the wood is burning fiercely, you may then turn down the controls to give a comfortable fire. If it begins to smoke you may need to open it up a little

- Use plenty of paper and small kindling
- Paper will produce a hotter fire more quickly than fire lighters
- Only use larger wood when a bed of coals has been established.

Managing your fire

Air flow is important for good combustion. Modern woodheaters are designed to warm the air before it enters the firebox. This stops the firebox from cooling and helps to burn the wood completely.

Most modern woodheaters draw their main air supply for combustion down the inside of the glass on the door. This constant supply of clean air helps the wood to burn efficiently and at a higher temperature. If a large log is loaded parallel to the door of the heater it will stop this air supply getting into the base of the fire, where it is needed for good combustion.

Packing your firebox too tightly will also cause it to smolder. This causes the worst woodsmoke pollution and is what your neighbours are most likely to complain about.

Another common mistake is to put a single large log on a fire to keep the fire going longer. This causes a lot of smoke because there is not enough surface area for good combustion.

If your woodheater is old, it may not have an effective air supply or it may have other design faults that mean that you may not be able to stop it from smoking. In this case, you may have to consider replacing it.

- **Do not block the incoming air supply with pieces of wood**
- **Do not pack the firebox too tightly**
- **Do not use wood too big to burn properly**
- **Do not use a single large log on the fire**
- **Replace your woodheater if it won't stop smoking**

Keep a flame burning at all times



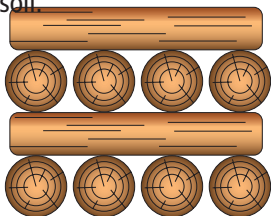
This sequence shows a well maintained fire. New pieces of seasoned wood are added only when a good bed of coals are established. This makes the fire burn efficiently producing less smoke and saving you money.

Use the right fuel for your woodheater

When purchasing your wood you should buy wood that is fully seasoned. You can test whether the wood is fully seasoned by striking two pieces together. Dry wood gives a sharp 'crack' while unseasoned wood sounds more like a dull 'thud'.

If you collect your own wood, or prefer to buy unseasoned wood, plan to get it a year ahead. It takes green wood at least one year to dry out sufficiently to ensure it will be fully seasoned. Some wood may take longer.

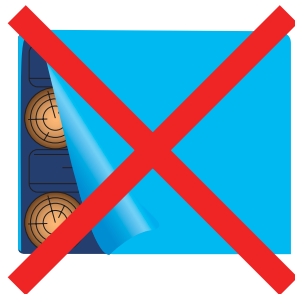
To season wood, split and open stack it in a criss-cross fashion to allow for maximum air circulation. A roof to prevent the rain from wetting the wood will speed drying, but ventilation is more important than cover. Do not totally cover the woodpile with plastic or a tarpaulin as this creates a high humidity environment, drawing moisture out of the soil.



It takes at least a year to season firewood properly. Well-seasoned firewood can give up to 40% more heat. Burning green wood may block your flue, causing fires. Check you flue and clean it regularly.

If the wood gets wet, keep it inside or on the porch for a day or two before using it. If it is already fully seasoned it will dry out quickly ready for use.

Freshly cut wood from living trees has a moisture content of around 50%. If cut to firewood lengths and stacked in the open it takes roughly 12 months for the moisture content to drop to good levels for burning - below 30%. Precise drying rates vary from one wood species to another and are climate dependent. Warm and windy conditions with low humidity are best.



Check your chimney or flue for smoke every now and then

Make it a habit to occasionally go outside and check your chimney or flue for smoke.

If, after 20 minutes of operation, there is continuous visible smoke from your chimney or flue, check that you are following the operating tips in this brochure.

With a little care, even the first few minutes after lighting the heater can be relatively smoke free. Try moving the logs in the heater to improve the air flow or adding a bit more newspaper to increase the draught.

Each model of heater will have certain ways of loading the fuel that give the cleanest burning. You will have to use trial and error to get the best arrangement for your heater.

If the smoke is black it means there is a lot of carbon, or soot, present. Black smoke suggests the fire is too hot, and may damage your heater or flue.

As well as inhibiting proper burning, the moisture and sap in unseasoned wood generates smoke and toxic pollutants. When you use unseasoned wood, a dark sticky substance known as creosote is produced that attaches to the walls of the flue. This will cause the flue to block up and can lead to fire in your flue. Creosote production can be minimised by burning at higher temperatures.

Smoke is wasted fuel so the more a heater smokes the more fuel is wasted.



Overnight Burning

Many people keep their woodheaters burning through the night when it is cold. To do this, they reduce the air flow and maintain a low flame.

If you do this you will need to inspect the flue and chimney regularly for tar and soot build-up. Clean it if necessary, as this will maintain the heater's capacity. A clogged flue decreases performance increasing heating costs and could catch on fire.

If you wish to keep the fire alight overnight, burn it on high for at least twenty minutes before retiring to bed, to ensure a good bed of coals is established and all gases are burnt off.

Don't put large pieces of wood in it that can't burn properly and only reduce the air flow to a level where there is no visible smoke.

Let your fire go out at night

To reduce the level of woodsmoke pollution in badly affected towns and cities it is strongly recommended that you do not burn your woodheater overnight on reduced air flow.

Even if your woodheater goes out after the family goes to bed, a well insulated house should still be warm in the morning.

It will cost only half as much to let your woodheater go out over night and run an electric heater in the morning for 2 hours, than to keep your woodheater alight for the night causing unnecessary smoke.



Selecting a new woodheater

When selecting a woodheater, the appropriate heat output for your house is important. Operating a woodheater that produces more heat than required will lead to increased heating costs, and create pollution for neighbours when operated on low air flow. It is better to operate a smaller woodheater at its full capacity than a larger one at a lower capacity.

Some design features that promote complete burning in your woodheater are:

- provision for preheating the incoming primary air to be directed through the active fire or the secondary air above the fire; and
- insulation of the flue as high as possible to minimise condensation fouling and assist both dispersion and air flow to the fire.

Before buying a new woodheater check with your supplier that it meets Australian Standards.



Preferably purchase a cleaner-burning woodheater, one that emits less than 2g of particle pollutants per 1kg of dry wood. For all new woodheaters a plate is required to be fixed to the heater stating its emission levels.

Check with your local Council before having your woodheater installed, as approval is required under building codes. Make sure the woodheater is properly installed in accordance with manufacturers' instructions.

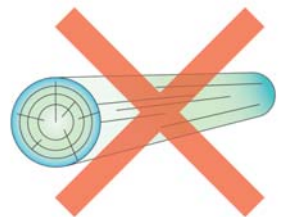
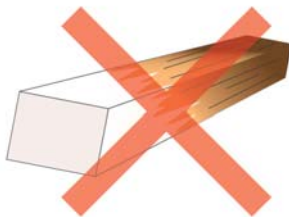
The installation of second hand woodheaters is not recommended. However if you should do this the heater must be certified to comply with Australian standards.

Don't burn rubbish or treated wood

Remember, your woodheater has been designed to burn firewood.

Plastics, such as bags and nappies, are especially bad to burn as they create unpleasant odours and toxic fumes. Burning these items are most likely to lead to complaints from neighbours. Burning these also reduces the performance of your woodheater.

Be careful not to use wood treated with copper-chromate-arsenate (the green colour in playground logs) as it releases poisonous fumes when burnt. Wood collected from the seashore is not suitable as it contains corrosive salts.



Don't burn garbage, painted or treated timber or particle board as these produce toxic fumes.

Ensure your flue is well designed and maintained

Make sure your flue or chimney is high enough to allow the combustion gases to disperse. If you are unsure if your chimney or flue meets minimum height requirements, check with an accredited installer or your local Council.

Do not fit a 'Chinamans cap' or any rain protector which restricts the upward flow of the hot gases. Fit only concentric rain excluders (shown here). If you have a cap on your flue and have tried other measures to reduce woodsmoke without success, try removing the cap.



Save money and insulate

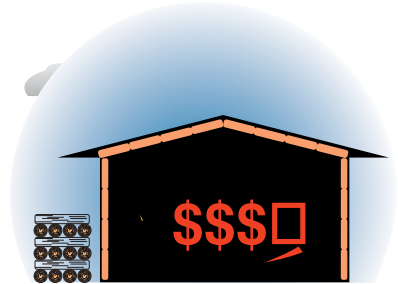
If your ceiling is uninsulated, between 30 and 40% of the heat from your woodheater is going straight through the roof. This means you need to burn more wood which costs more money and results in more air pollution.

If finance is a problem, do one room at a time beginning with the room with the woodheater in it. You will probably find the room stays warm enough that you can let your heater go out overnight without waking up to a cold house.

If your ceiling is already insulated check the insulation to ensure it is still adequate. Some types of insulation pack down or move over time and lose some of their insulating properties.

Other areas of heat loss are windows and doors. Thick curtains with pelmets and draught proofing around doors will also assist in maintaining heat in the house over night. Close the doors to any rooms you do not wish to heat.

If your house is well insulated it will be around 7°C warmer than an uninsulated house.



Avoid using your woodheater on poor air quality days

In some locations forecasted air pollution levels are reported during winter in the daily press. 50 micrograms of particles per cubic metre* of wood burnt is the accepted Australian Standard for particle pollution. Above 50ug/m³ the air quality forecast will be "poor".

At this level, particle pollution is likely to cause adverse health effects, especially among the elderly, the very young and sensitive groups such as those with lung disease, heart disease and asthma.

If the weather prediction is for levels of air pollution above 40ug/m³ you might think about using an alternative source of

heat, even if just for a night or two. Even well operated woodheaters emit some smoke during lighting and refueling. If you need to use your woodheater make sure you let it go out before you go to bed, rather than having it smolder overnight.

You may have some form of alternative heating such as oil, gas, or a fixed electric heater. Consider using these on those especially cold nights and mornings. Think seriously about topping up the gas cylinders or buying a few gallons of oil for the oil heater. These measures will help to reduce woodsmoke when high levels of pollution are forecast.

* ug/m³

Woodsmoke is an Environmental Nuisance

An environmental nuisance is any emission of a pollutant that may unreasonably interfere with a persons enjoyment of the environment or cause harm to the environment.

Some Councils have provisions for penalties against householders who cause an environmental nuisance by operating excessively smoky woodheaters. There may also be State or Territory regulations that impose penalties against householders who continue to operate woodheaters badly.

In some regions of Australia targeted education programs are being conducted to educate woodheater users in the better operation of their woodheaters.

Under these programs specially trained environmental health officers are on hand to assist householders with woodsmoke problems. You may wish to contact your local government Environmental Health Department or State Environment Protection Authority who may be able to assist you with information about programs in your area.

A woodsmoke training program has been developed by Department of the Environment and Heritage and is available for local government authorities wishing to increase their capacity to manage woodsmoke as an environmental nuisance.

Contact Department of the Environment and Heritage on (02) 6274 1641 for further information.



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Quick Tips to Reduce Woodsmoke

1. Always use properly seasoned dry wood in your woodheater
2. Get a hot fire going quickly with plenty of paper and small kindling
3. Keep air controls set high enough to keep your fire burning brightly
4. Only use larger pieces of wood when the fire is well established
5. Check your chimney or flue at least once every evening for smoke
6. Consider the well-being of your neighbours



Australian Government

Department of the Environment and Heritage

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