

# Solid Fuel Association Guide to Wood and Multifuel



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# Contents

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<b>Introduction</b>	<b>3</b>
<b>Hardwood versus Softwood</b>	<b>3</b>
<b>Typical Wood Usage</b>	<b>3</b>
<b>The Multifuel Option</b>	<b>3</b>
<b>Guide to Wood Types and their Uses</b>	<b>4</b>
<b>Preparation of Firewood</b>	<b>5</b>
<b>Moisture Content</b>	<b>5</b>
<b>Log Storage</b>	<b>5</b>
<b>The effect of moisture upon appliance efficiency</b>	<b>5</b>
<b>Potential Dangers from burning unseasoned wood</b>	<b>6</b>
<b>General Safety with Solid Fuel</b>	<b>6</b>
<b>How to burn wood safely and efficiently on a stove</b>	<b>7</b>
<b>Choosing firewood</b>	<b>8</b>

## Introduction

Coal merchants have always traditionally sold firewood alongside coal. However, renewed interest by consumers in burning wood, mainly in multifuel stoves, is stimulating a growing demand for wood fuel. This guide is designed to help people to select and burn firewood safely and efficiently.

Wood fuel can be divided into two main categories – “Hardwood” from deciduous trees and “Softwood” from conifers or evergreens.

## Hardwood versus Softwood

Hardwood is denser than softwood so has a higher heat content or calorific value. Typically, the heat content of softwood is little more than half as much as hardwood by volume.

Typical heat content of hardwood 2300kWh/m<sup>3</sup>  
(stacked)

Typical heat content of softwood 1,300kWh/m<sup>3</sup>  
(stacked)

Broadly speaking, around twice as many softwood logs as hardwood logs may be required to achieve the same heat output so more frequent refuelling will be necessary when burning softwood.

On the other hand, softwood tends to light more easily than hardwood and burns faster due to its resin content. It gives more immediate heat so is ideal for kindling and initial burning.



## Typical Wood Usage

A stove burning wood only and used for central heating in a typical three bedroomed house could burn 10-12m<sup>3</sup> of hardwood per year. However, during exceptionally cold weather, the customer could be using the best part of a cubic metre per week.

A dry stove used for heating one room will use considerably less (3-4m<sup>3</sup> per year)

For a multi-fuel appliance, the amount of wood required will vary according to the blend of wood and mineral fuel employed.

## The Multifuel Option

Multifuel stoves are by far the most popular choice for consumers wishing to burn wood.

The frequency of refuelling and the quantity of wood needed to maintain adequate heat output can be underestimated by newcomers to wood burning.

Fortunately, the calorific value of a mineral fuel such as anthracite is around four times that of wood and its heat output is more sustained. Therefore, the multifuel stove can provide the “best of both worlds” by allowing the wood burning enthusiast to also enjoy the practical benefits of coal such as reduced frequency of refuelling and overnight burning.



*A contemporary multifuel stove*

***For more information on coal and other solid mineral fuels, please see our publication “SFA Guide to Solid Mineral Fuels”. This can be downloaded at “[www.solidfuel.co.uk](http://www.solidfuel.co.uk)”***

# Guide to wood types and their uses



Modern kiln dried firewood production

## Commonly available wood types suitable for both open fires and closed appliances

Ash, Beech, Birch, Blackthorn, Elm, Eucalyptus, Hawthorn, Hazel, Hornbeam, Maple, Oak, Rowan, Sycamore, Wild Cherry, Willow, Alder, Apple, Pear, Holly.

## Common wood types prone to crackling and spitting suitable for closed appliances only (stoves and cookers)

Cedar, Douglas Fir, Horse Chestnut, Larch, Plane, Sweet Chestnut, Willow.

In general softwoods tend to be more prone to popping and spitting because of pockets of moisture or sap contained within the wood. The

risk will be reduced by effective seasoning or drying.

**Important Note: never leave an open fire unattended without a fireguard!**

## Other common wood types and their characteristics

Elder – Produces a thick acrid smoke.

Lime – A low quality fuel.

Pine species generally (including Leylandi) – Can form oily soot deposits in a chimney.

Poplar – Traditionally used for matchsticks, does not burn well and produces a lot of dark smoke even when seasoned. Okay for kindling.

Spruce – A low quality firewood for closed appliances only.

### Note:

Laburnum and Yew are poisonous so care must be exercised when using as firewood. Because of the contamination risk, they are not recommended for cookers. However, Yew in particular gives good heat in a stove.

## Recovered Wood

Recovered wood (joinery offcuts) should be clean, cut to length and not treated or painted. Chipboard, plywood and MDF should not be burnt as they contain chemical binders and adhesives which could produce emissions which adversely affect the inner surface of the chimney.

Please note that so called “tanalised” timber contains arsenic.

Species of wood	Density (solid) kg/m <sup>3</sup>	Heat content kWh/kg(btu/lb)	% moisture when green	Summers to season
Ash	674	4.1 (6,350)	35	1
Beech	690	4.3 (6,700)	45	1-2
Birch	662	4.1 (6,350)	45	1
Elm	540	3.6 (5,600)	60	2-3
Oak	770	4.5 (7,000)	50	2-3
Poplar	465	2.6 (4,100)	65	1
Pine/Fir	410	2.6 (4,100)	60	1

# Preparation of Firewood

## Moisture Content of wood

Trees vary enormously in moisture content when felled. In summer, up to 65% of the weight of newly felled timber can be water.

Forestry work continues all year round but for the domestic heating market, trees need to be felled ideally in winter and certainly by the end of March when the moisture content is at its lowest. Trees felled in summer will take much longer to season. Some species of trees felled in winter will be ready for use the following winter. The target moisture content is 20% or less (wet basis) and this is often specified by the appliance manufacturer. Firewood ready for burning should never contain more than 25% moisture.

Consistently low moisture content is also achieved by kiln drying.

## Log Storage

A log store of at least 1.5 m<sup>3</sup> is recommended where a property is heated by a log burning stove so that a standard delivery of 1m<sup>3</sup> can be accommodated when the store is still a quarter full. The store should be roofed and well ventilated on at least two sides.

Proprietary wood stores are available in various sizes.

Where the intention is to buy unseasoned “wet” or “green” wood, a much larger storage capacity will be required so that logs obtained one or two years previously can be properly stored for the duration of the seasoning process i.e. storage

capacity for three years supply of hardwood and two years for softwood will be required.

The logs should ideally be stored under cover and off the ground but open on at least two sides so that air can pass through. A sunny, windy location is ideal. The logs should ideally be no more than 10cm (4”) thick and cut to a convenient length for the stove or grate (Any logs with a diameter greater than 6” (150mm) should be split before storage).

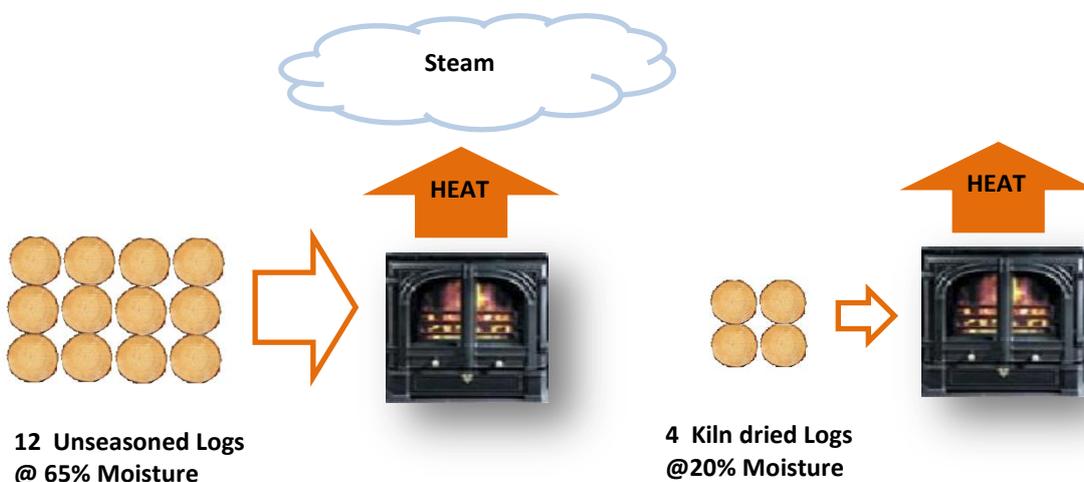
The logs will lose 10-25% of moisture a year in this way, depending on the type of tree. Some of the hard woods such as Beech, Elm and Oak require two if not three summers to season thoroughly.

Seasoned logs will typically have bark which comes away easily, splits across the grain and will create a hollow ringing sound when two logs are knocked together rather than the dull thud of wet wood.

## The effect of moisture upon appliance efficiency

It is very inefficient to burn inadequately seasoned logs because much of the heat produced as the wood burns will be required to drive off the moisture contained within the logs as steam.

You would need to burn around three times as many unseasoned logs to achieve the same heat output as well seasoned or kiln dried logs (see illustration below).



# Potential dangers from burning unseasoned wood

Burning unseasoned logs can result in two very serious problems associated with condensation in the chimney.

## Blockages and Chimney fires

Water vapour combines with other gases and particles going up the chimney and unless the chimney is kept warm, the condensation forms a creosote-like substance which hardens to form tar on the surface of chimney liners and may seep into brickwork in an unlined chimney. Wet logs cause the chimney to cool and so condensation occurs and a residue is formed.

This residue is brown or black and can be flaky, sticky, runny, tar-like or hardened and will sometimes be all of these in the same flue. The chimney may become completely blocked or the volatile residue can ignite causing a dangerous chimney fire.

## Corrosion

The excessive condensation from wet wood which normally forms in the upper part of the chimney is acidic in nature and will corrode the inner surface of a metal liner, eventually leading to perforation and failure of the liner.



150mm chimney liner blocked with deposits

## Chimney Sweeping

The chimney must be swept at least twice a year when logs are used and more often if they are constantly used.

A sound, unrestricted chimney flue is essential to the safe operation of the stove.

Always use an accredited chimney sweep, preferably a member of the National Association of Chimney Sweeps (NACS), the Guild of Master Sweeps (GMS) or The Association of Professional and Independent Chimney Sweeps (APICS)

### General Safety with Solid Fuel

There are three golden rules of safety with solid fuel.

#### 1. Adequate ventilation

Check the ventilation requirement for your stove and ensure existing vents are not blocked or covered.

#### 2. Regular cleaning and sweeping

On a multifuel stove, the ashpan should be checked and emptied every day.

Boiler flueways should be cleaned once a week.

The throat plate should be removed and cleaned every month.

The chimney should be swept at least twice per year.

#### 3. Correct fuel

Use only well-seasoned wood with a moisture content <25% and solid mineral fuel from an **approved coal merchant**.

### A note regarding grates

Wood on its own may be burnt on a solid flat bed. In this case, a one inch layer of ash may be left in the firebox to form a base for the next day's fire.

Mineral fuel burns hotter and must always be burnt on a grate.

# How to burn wood safely and efficiently on a stove

Open fires are still very popular and do create a very welcoming focal point for a room. However many people are turning to the more efficient wood burning or multifuel stove.

## Burning Wood on a Stove

Burning in a stove is controlled by adjusting the primary and secondary air supply. Manufacturers' recommendations regarding correct use of air controls should be observed but generally, when fresh logs are added to a stove, they should be burned fiercely with both primary and secondary air inlets fully open (see fig.1 below). The primary air intake can be closed off once the logs are almost completely charred and secondary air then used to control the rate of combustion (see fig.2 below). Correct burning minimises the creation of smoke, and therefore of tar. Visible smoke emission from the chimney is an indication that the logs are being burned inefficiently.

A stove should never be banked up with fresh logs for burning overnight. The fuel will burn slowly and inefficiently with heavy deposits of tar likely to form in the chimney (see fig.3 below).

At the end of the day, a bright fire which has turned wood into charcoal should be left with the

day's ash, secondary air open and no primary air.

A flue pipe thermometer is a useful aid to correct burning. The target flue pipe temperature is 250°C or above. A flue temperature below 100°C will cause severe levels of moisture within the chimney and lead to the formation of tarry deposits.



## Multifuel

Solid mineral fuel (coal and smokeless fuel) has higher heat content and a more sustained heat output than wood so can be a valuable complement to logs, particularly if overnight burning is required. If the intention is to burn a blend of wood and mineral fuel together, it is best to start burning logs once the fire has become well established with mineral fuel. It is best to avoid refuelling with logs and mineral fuel at the same time.

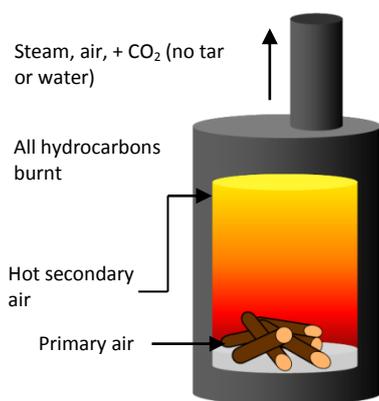
Fresh logs should *never* be added immediately prior to a period of slumbering (slow burning) or overnight burning. However, mineral fuel can be banked up for overnight burning and the air reduced once the coals are glowing.

Any wood added to the fire should be reduced to char before turning down the air supply.

## Efficient Wood Burning

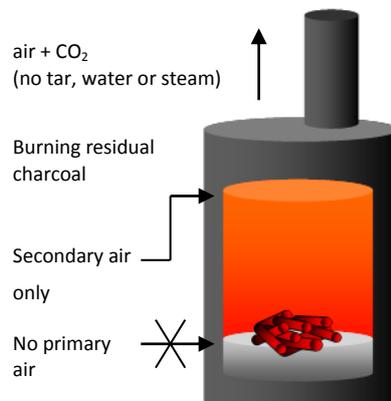
**Fig.1 Initial Lighting**

Efficient fast burn with plenty of air- little smoke



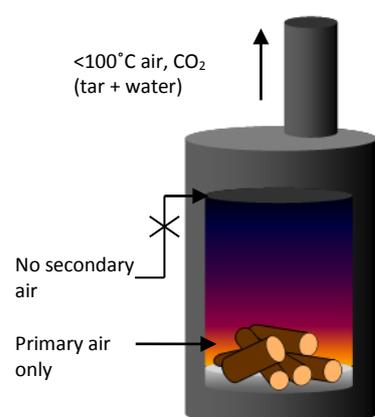
**Fig.2 Char Burn**

Efficient char burn, secondary air only - no smoke



**Fig.3 Inefficient**

Insufficient secondary air- fuel will burn slowly and inefficiently. Un-burnt hydrocarbons will create thick smoke and tarry deposits in the cool chimney.



# Choosing Firewood



## Checking the suitability of Firewood using a Moisture Gauge

A moisture gauge can be used to determine whether firewood is ready for burning.

When using a moisture meter, refer to the instruction manual. Make sure you know whether it gives a reading in 'wet basis' or 'dry basis'. Normal practice is to split a log and probe across the grain in the centre of the log to gauge the worst part of a log. Start with the thickest logs, if these 'pass' then it gives a good indication that the thinner ones will pass. A mixed load of different species is difficult to gauge.

Wood for the fire should have a moisture content of 25% or less (wet basis).

Bringing seasoned logs indoors for a few days before burning will help to achieve low moisture content.

**BUYER BEWARE** – We recommend that logs are bought by volume. If buying logs by weight, remember that unseasoned logs are much heavier than seasoned logs due to their water content – more could mean less!

**Always buy solid fuel from an Approved Coal Merchant**

**Phone 0845 601 4406 for details**

***www.coalmerchants.co.uk***



### **Solid Fuel Association**

For further information on any aspect of the installation and use of wood or other solid fuels, contact the SFA.

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