

# Burning Wood Safely

## ► Burning wood safely

The ownership and use of a solid fuel-fired appliance can be a rewarding experience. It may also be an attractive alternative for those who do not have ready access to other types of fuel.

Solid fuel heating appliances should always be installed by qualified professionals, who hold certificates indicating their training and expertise. All component parts, including stove and chimney, should be sold and installed as a unit.

This brochure focuses on free-standing wood stoves. Devices such as fireplace inserts, masonry fireplaces and pre-fabricated metal fireplaces are also specialized appliances and should be installed professionally for your safety.

Only stoves, chimneys and equipment certified by a recognized testing laboratory, such as ULC, CSA or Warnock Hersey Canada Ltd., should be installed. **Note:** where non-Canadian testing laboratories, such as ULI, are the certifying laboratory, ensure the units have been tested to Canadian standards.

You may require a building permit for any of these changes, so check with your local authority prior to installing a new unit, chimney or component parts. Also, advise your insurance broker of your plans prior to any changes, as they may affect your insurance policy.

## ► What happens when wood burns

In order to maximize safety and to derive the most benefit from any solid fuel-heating appliance, burn only well-seasoned, clean, untreated wood. Scraps of wood, especially those from residential use, may have been treated with chemicals that can damage the stove and create an unhealthy environment in the home.

Freshly cut wood is not a good choice either, since it is damp, difficult to ignite, does not properly sustain combustion and creates excessive amounts of creosote. As a general rule, wood properly stacked and stored in the spring will be ready to burn by fall. However, optimum value and performance is usually gained through seasoning the wood for a year.

The process of burning wood goes through four distinct phases that occur simultaneously under normal conditions:

- **Water Vaporization** - At temperatures up to 100 C (212 F), water in the wood is converted to vapour and evaporated. The energy required for this process is lost as a heat source.
- **Hydrocarbon Compound Vaporization** - Between 120 to 370 C (250 to 700 F), the chemical structure of the wood begins to break down, forming mixtures of hydrocarbon compounds in the form of liquid tar drops and combustible gases (smoke). Little or no heat is released during this phase.
- **Hydrocarbon Compound Ignition/Combustion** - Between 480 to 650 C (920 to 1,225 F), wood emits hydrocarbons in the form of tar droplets and gases that ignite when adequately heated.
- **Residual Charcoal Combustion** - At approximately 530 C (985 F), the remaining charcoal burns cleanly, following vaporization of the unstable wood components.

## ► What is creosote?

Creosote is an oily fluid released from wood tar during the burning process, and occurs as a result of incomplete combustion. Tar droplets composed mainly of hydrogen and carbon are formed through a number of conditions, such as inadequate temperatures for proper burning, insufficient oxygen, improper venting or incorrect flue sizing. You can reduce creosote buildup through efficient burning of properly seasoned fuel.

Temperature has a major impact on the rate of creosote buildup. The cold of the Canadian winter is a major influence on this. For added safety, and to reduce the potential for a serious creosote buildup, chimneys should be installed inside the home and meet ULC Standard S629M.

Other factors that may cause rapid creosote buildup are: over-sized appliances, slow fires, insulation breakdown in the appliance and cool chimneys.

## Creosote causes chimney fires

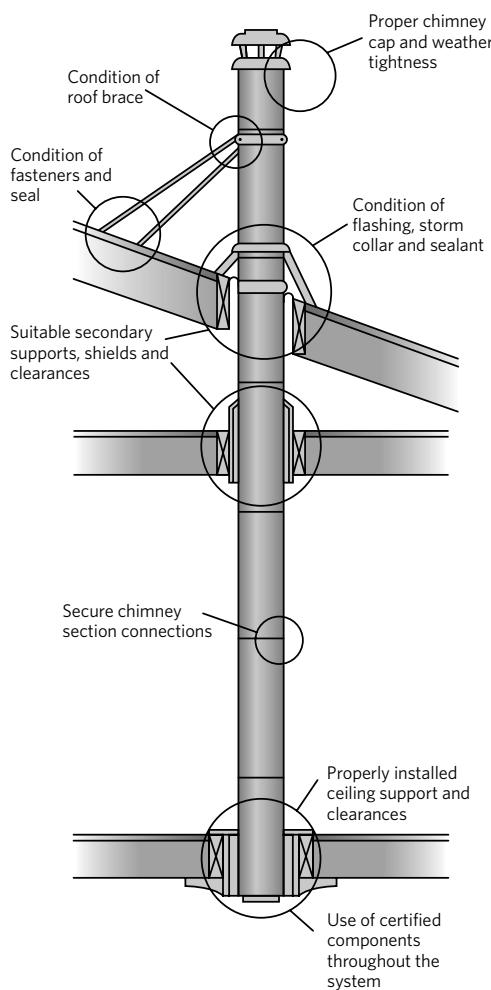
Creosote is flammable and, if ignited, can cause loss of life and property. Creosote deposits as small as 0.3 cm (1/8") can cause a chimney fire. Under the stress of a chimney fire, chimneys not meeting ULC Standard S629M may fail, causing loss of property. Chimney fires burn at temperatures exceeding 1,147 C (2,100 F).

The smell of burning tar, a roaring sound coming from the flue pipe or chimney, and sparks or flames coming from the chimney, are signs a serious creosote fire may be in progress. Immediately evacuate the home and contact the fire department.

**Note:** Only chimneys meeting ULC Standard S629M are designed to contain the heat and destructive force of such temperatures.

To prevent dangerous chimney fires, a qualified professional should check the stove, vent pipes and chimney at the start of the burning season. As mentioned previously, qualified professionals hold certificates indicating their specialized training and experience.

## Chimney components



## Operation

A professional should verify proper sizing of your heating unit. Retain the manufacturers' instruction manual(s) and rely on them to ensure safe operation of the unit.

Follow the manufacturer's guidelines for the proper burning of wood in your stove. As a general guide, the following may be noted:

### Cold start

- The objective is to quickly establish a hot, clean burning fire.
- The fire should be started using an adequate amount of crumpled newspaper and enough finely split wood (kindling) arranged in a criss-cross pattern to prevent collapse and smothering as the crumpled newspaper burns.
- The kindling load should be sufficient to pre-heat the chimney and the stove's internal surfaces.
- When the kindling is flaming, you may add larger kindling to the fire.
- Once the larger kindling has charred and a stable fire has been established, add firewood while leaving the combustion air controls open until the stove reaches its operating temperature.

### Hot start

- Live coals from an overnight fire will usually be available in the stove in the morning.
- Rake the live coals so they are near the combustion air inlets. If the stove is equipped with combustion air wash for the glass door, rake the live coals to the front of the firebox near the door.
- Place fresh wood behind and on top of the coals, taking care not to smother the coals.
- Leave the combustion air controls open until the stove reaches its operating temperature.

**Note:** It may be necessary to use newspaper and kindling if only a small number of coals remain.

## Protect your home

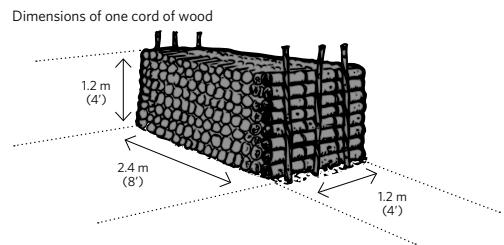
To increase your safety, your home should be equipped with smoke detectors, carbon monoxide detectors and fire extinguishers. Because of the wide variance in home design and safety equipment, these appliances should be installed according to local codes and as recommended by the manufacturer.

A qualified professional may be of assistance in determining proper placement, type of units and installation. Also, develop a fire escape plan for your home and practise it regularly.

## ► Types of wood

The fuel value of wood depends on its density, which is its dry weight for a specified volume. Wood density varies widely, however, the energy content for a unit of weight is very similar. In general, the higher the density of your firewood, the more usable heat that will be available.

Remember, while moisture adds weight to firewood, moisture has no fuel value and actually reduces the heating value since a large amount of heat energy is consumed evaporating the moisture. Wet wood also increases the fire hazard through increased creosote deposits. Always ensure your firewood is properly seasoned.



Common firewood	Heat content (million BTU/cord*)	Wet, Medium, Dry (when freshly cut)	Sparks	Smoke	Ease of Split
Oak	29	wet	few	little	well
Ash	24	dry	few	little	well
Elm	23	wet	few	moderate	extremely hard
Maple	23	wet	few	moderate	fair
Tamarack	23	medium	many	lots	fair
White Birch	22	wet	some	little	easy
Poplar	17	very wet	few	moderate	hard
Pine	17	dry	moderate	lots	well
Spruce (black or white)	16	dry	moderate	moderate/ lots	well
Fir	13	dry	many	moderate	easy

\*Cord measures 1.2 m x 1.2 m x 2.4 m (4' x 4' x 8') and has a volume of 3.56 cu. m (128 cu. ft.)

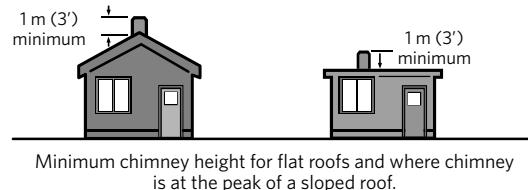
## ► Floor protection

A non-combustible floor pad is required to provide protection from sparks and from the effects of radiant heat on the floor underneath the stove. Floor pads should be installed according to the stove manufacturers' instructions or to the requirements of CAN/CSA-B365-M91.

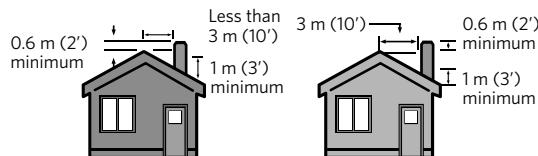
## ► Chimney heights

To increase safety and to reduce the potential of a backdraft, ensure that the chimney extends:

- at least 1 m (3') above its highest point of contact with the roof
- at least 0.6 m (2') above any roof line or object within a horizontal distance of 3 m (10')



Minimum chimney height for flat roofs and where chimney is at the peak of a sloped roof.



## ► Flue (stove) pipes

Flue pipes should be made of black steel. The flue pipe should be the same size as the flue collar on the stove, and should vent into a chimney flue that is also the same size as the flue collar.

Single wall flue pipe is, for the most part, untested. For this reason, and because of the need for a high standard of safety, flue piping should be obtained from a professional. Care should be taken to ensure the piping thickness meets the requirements of CAN/CSA-B365-M91.

**Note:** Tested and certified flue piping is available. Such flue piping will allow substantial clearance reductions in installations, to as little as 10 to 15 cm (4" to 6") clearance.

Black painted steel pipe is the most common acceptable flue piping. Unless the wood stove being used is an antique stove, flue dampers should not be allowed in the flue pipe. Flue dampers interfere with the operation of modern efficient wood stoves.

For safety, flue piping must be installed to ensure condensation flow is from the chimney to the stove (crimped end toward the appliance). Flue pipe connections should be held together using three metal screws.

## ► Primary safety hazards

### The human element

Even those heating systems that meet every installation requirement may cause a loss if safe burning practices are not followed, or if required maintenance and cleaning is not completed regularly. Safety requires ongoing vigilance and attention to safe practices when using solid fuel.

### Creosote

As little buildup of this substance as 0.3 cm (1/8") may result in a severe and devastating fire. Frequent checks need to be made, and cleaning as required is a must for safety.

### Pyrolysis

Pyrolysis is the chemical decomposition of combustible material, a process that carbonizes the material and allows it to burst into flame at very low heat. Because this process occurs within the material affected (through the action of the infrared rays emitted by the heating unit) and cannot be seen or felt, it is critical that all required clearances be maintained for the entire system: stove, flue pipes and chimney. Pyrolysis does not occur at a set rate.

It could take as little as three months to as long as 60 years to occur. Even the fact that an appliance has been in place and used for many years is no indication of safety of the installation.

Fire is devastating to those who experience it. Fire destroys personal property, irreplaceable objects and human lives.

## ► Safety tips

- Have your stove, chimney and equipment installed by a qualified professional to ensure the manufacturer's certified clearances and installation instructions are followed. Any installation requirements not addressed by the manufacturer's instructions should be installed according to the requirements of CAN/CSA-B365-M91 (Installation Code for Solid-Fuel-Burning Appliances and Equipment).
- Remove and place ashes in a covered metal container, stored outside and away from any combustible material.
- Burn only the fuel designated for your stove. Never use the stove to dispose of rubbish or waste, such as plastic, old newspapers, etc. The excessive heat created may damage your equipment or start a creosote fire.
- Never use any type of fire starter – use only crumpled paper and a match.
- Do not allow any modifications of any type to the system.
- Ensure, through the services of a qualified professional, that an adequate supply of fresh air is entering your home while the stove is in use.
- Ensure that combustible material such as curtains, furniture, fuel and paper are unable to reach the stove or venting system. Maintain the clearances required for installation safety.
- Keep matches and lighters out of children's reach.

**Note:** Wood burning appliances installed in mobile homes require certification for that use and must meet specific installation requirements.