Heating with Wood

by

S.A. Weeks, J.P. Lassoie and L.D. Baker
Cornell University, Ithaca, NY

Increasing costs and, in some cases, current or projected shortages of other fuels have increased interest in the use of wood as a heating fuel. The manufacturers and distributors of wood burning units have responded to the new interest in fuelwood with improved construction and efficiency in their combustion units.

Advantages

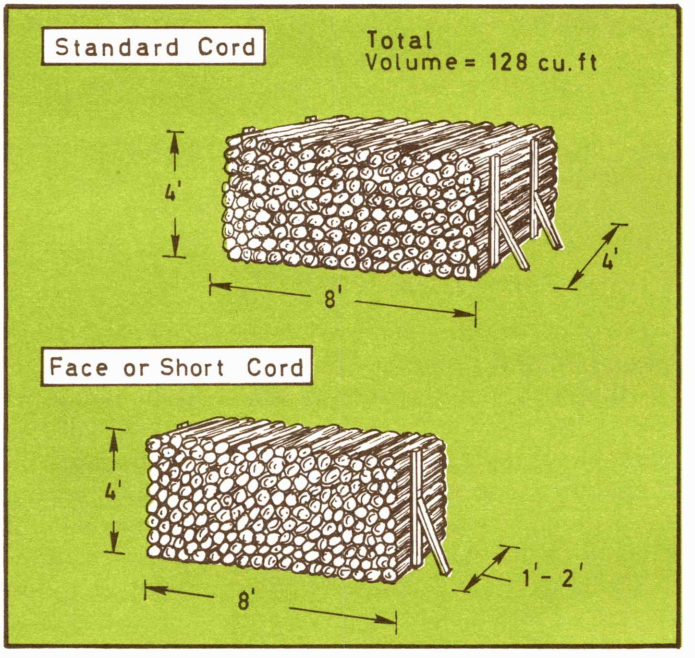
- Wood, unlike fossil fuels, is an ecologically sound and renewable natural resource.
- Wood burned as an alternate heating source adds a personal sense of independence and security.
- Wood you cut yourself is not likely to be as costly or as limited as fossil fuels.
- The heat value from an air-dried standard cord of several native hardwoods (such as hickory and oak), when burned in a modern, efficient woodburning unit, is nearly equal to 130 gallons of No. 2 fuel oil.
- Many forest improvement practices become economically attractive when wood is used as a fuel; thus the quality of woodlands is improved.
- Working up your own wood supply, stoking the fire, and relaxing in front of it often gives a sense of personal satisfaction.

Disadvantages

- Wood is bulky in relation to its heat content; therefore storage and handling can be a problem.
- Readying an adequate wood supply is hard work and can be dangerous.
- For best performance, wood must be properly seasoned (dried) which takes time and a proper storage area.
- A wood fire must be stoked and periodically adjusted for best results.
- Wood debris, various insects and fungi associated with wood decay are messy when brought into the house.
- Because wood is a "rediscovered" heating fuel, its improper use often results in poor heating and even chimney and house fires.
- Insulation and caulking may be a better long term investment than a wood stove and proper chimney installation.

Measurement Units

Fuelwood is either sold by weight, the load or the stack. There are various sized stacks and confusion often exists over the amount of wood in a "cord." A standard cord of wood is defined by law as a pile 4' high and 8' long made up of sticks 4' in length. A "face cord" is a pile 4' by 8' made up of sticks of any length (often either 12", 16", 18", or 20"). The amount of solid wood in the stack depends upon the size and straightness of the sticks and whether they are round or split. Thus, a standard cord may contain from 60 to 110 cubic feet of solid wood.



Wood dealers often eliminate the need to define a cord by selling wood by the load or by weight. Of course, the amount of wood in a "truck load" depends upon the type of vehicle. When buying wood by weight, don't buy water; that is, look for the driest wood possible.

Fuelwood Characteristics

The heat derived from the combustion of wood depends upon the concentration of woody materials, resins, ash and water. In general, the heaviest woods (hickories, oaks, locust), when seasoned, have the greatest heating value per cord. Lighter woods (aspen, basswood, willow) give about the same heat value per pound, but they give less heat per cord because they are less dense.

When considering the type of wood to burn, other important characteristics are:

- ease of splitting (apple, birch, maple, oak)
- ease of ignition (birch, cedar, pine)
- production of heavy smoke (cedar, spruce)
- sparking (cedar, hemlock)
- coaling qualities (apple, cherry, hickory, maple, oak).

Obtaining Fuelwood

For those who own a woodlot, cutting low value timber trees provides an economical fuel and improves the quality and value of the remaining trees. This is the least expensive means of obtaining fuelwood, but it takes a considerable amount of time and, often, the help of a professional forester. If one is energetic but does not own a woodlot, cutting and salvage rights can be obtained for federal, state and municipal lands. Local dumps and landfills are also a source. For those not wishing to invest their labor to obtain fuelwood, there are numerous fuelwood dealers available. In addition, industrial wood scraps can often be purchased directly from a sawmill or other wood-using business.

Fuelwood Preparation

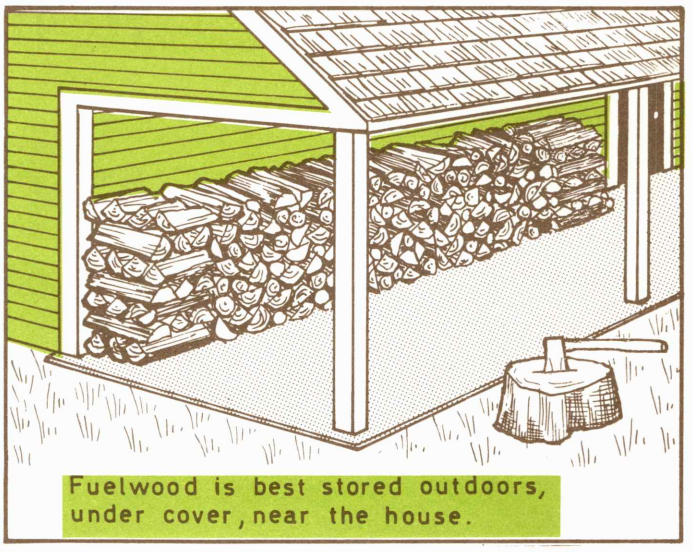
Some of the other factors that should be considered when preparing wood for burning are:

Cutting should be done at least six to nine months prior to burning. It often requires a chain saw which is perhaps the most hazardous operation connected with preparing wood. Keeping the leaves on summer-cut trees until they wither helps remove a great deal of moisture from the wood.

Splitting greatly reduces drying time, is often necessary for efficient handling and combustion and is best done when wood is frozen or green.

Stacking is necessary for proper drying of the wood and should be done immediately after splitting. Cover and allow for adequate air circulation.

Seasoning is necessary to reduce moisture content of the wood and assure proper combustion.



Fuelwood is best stored outdoors, under cover, near the house.

How Wood Burns

Wood burns in three phases — (1) Heat drives water from the wood. (This heat does not warm the stove or the room). (2) Charcoal and volatile gases are formed. The gases can produce 50% to 60% of the heat value of the wood; but they must be heated to about 1100° F and mixed with sufficient oxygen to burn. (3) Following the release of the volatile gases, the charcoal burns. These phases overlap so that all occur at the same time.

Efficiency

Because the volatile gases supply a majority of heat from the burning process, the range in efficiencies from fireplaces to air-tight stoves is great. Fireplaces, which are 10% efficient or less (that is, only 10% or less of the heat value available from the wood is released into the room), do not retain the gases long enough to burn them completely. Fireplaces modified with metal liners may improve this efficiency to, perhaps, 20%. Non-airtight stoves cannot be well controlled because of air leaks, but may still reach efficiencies of 40% to 50%.

Airtight stoves, that can precisely control draft, reach efficiencies in the 55 to 65% range. Although there are many designs of airtight stoves, a key consideration appears to be the control of air into the stove and, thus, control of the burning rate. At present, no particular airtight stove design is more efficient than any other.

Efficiency also depends on the skill of the operator as well as the stove and chimney design. Maximum efficiencies of wood burning devices are achieved only when they are operated with dry wood at nearly full capacity.

Considerations when Purchasing Stoves

Heat output range — Stoves may be rated in terms of the amount of space heated in cubic feet, number of rooms heated, or by some other method. Such ratings are difficult to compare, especially since the shape of the space has a great influence on heating effectiveness.

Stove wall thickness — Heavier walled stoves hold heat longer and last longer. Thin wall stoves cost less and are useful for temporary or emergency heating. Inspect thin wall stoves frequently.

Iron or steel — For years, cast iron has been considered the best material for stove construction. However, thicker plate steel stoves are now made and they have a life comparable to cast iron stoves.

Ease of Operation — Thermostatically controlled dampers, large loading doors, and easily removed ash containers are aids to convenient operation.

Radiant or circulating — Most stoves transfer heat to the room by radiating heat from the hot surface of the stove. A few manufacturers provide a double wall stove with air vents in the top and bottom of the outer wall. Air circulates between the walls of the stove by natural convection. Much of the heat produced by the stove is transferred to the room by the heated air. The outer surface of a circulating stove is not as hot as a radiant stove.

Quality of Construction — Inspect areas where air may leak due to: (1) loose fitting or warped doors, (2) poor joints or welds, or (3) cracks in cast iron. Sheet metal stoves with thin metal or sharp edges and cast iron stoves with thin spots or severely pitted castings are sometimes a problem.

Stove Clearances

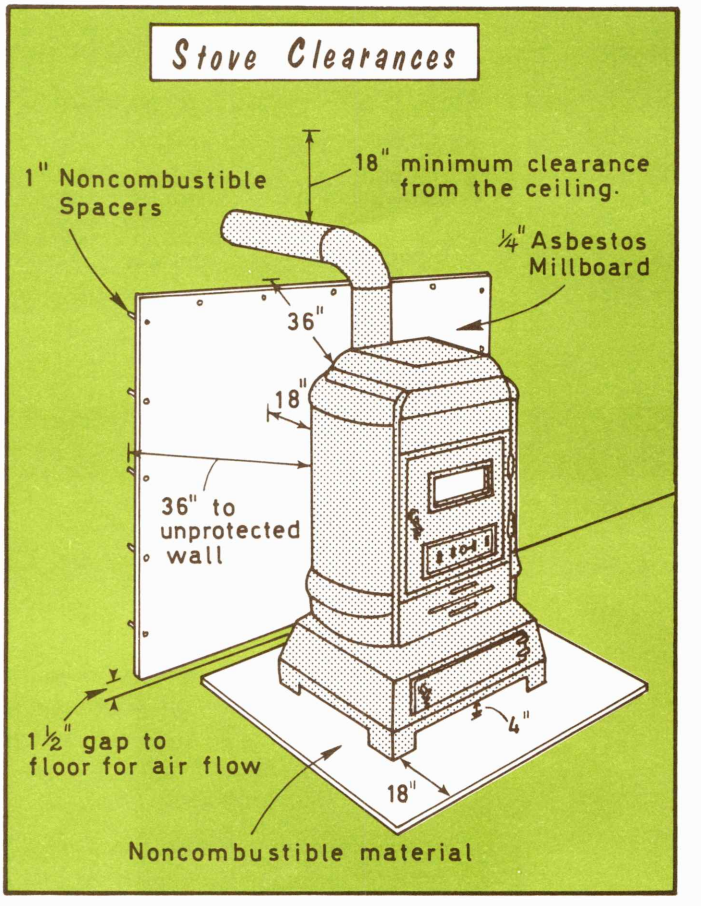
The National Fire Protection Association has recommended minimum clearances from combustible materials for various types of stoves (Table 1). The space behind the asbestos millboard or sheet metal is important because it allows air to circulate to keep the combustible material behind the protective panel cool.

Protect floors with a non-combustible floor covering extending at least 18 inches beyond the stove on the side by the door or opening. Floor protection on the other sides of the stove should extend from 6 to 12 inches beyond the sides of the stove. The base of the stove should be at least four inches above this floor protection. Suitable materials for floor protection are 24 gauge sheet metal, ¼" or thicker asbestos millboard covered with 24 gauge sheet metal, or mortared brick, stone, concrete or similar materials.

Table 1. Minimum Clearances from Combustible Walls and Ceilings*

Type of Protection	Stove Type		Stove Pipe
	Radiant	Circulating	
None	36"	12"	18"
1/4" Asbestos Millboard, spaced out 1"	18"	6"	12"
28 gage sheet metal, spaced out 1"	12"	4"	9"
28 gage sheet metal on 1/8" asbestos millboard, spaced out 1"	12"	4"	9"

*From National Fire Protection Association No. 89M, 1971.

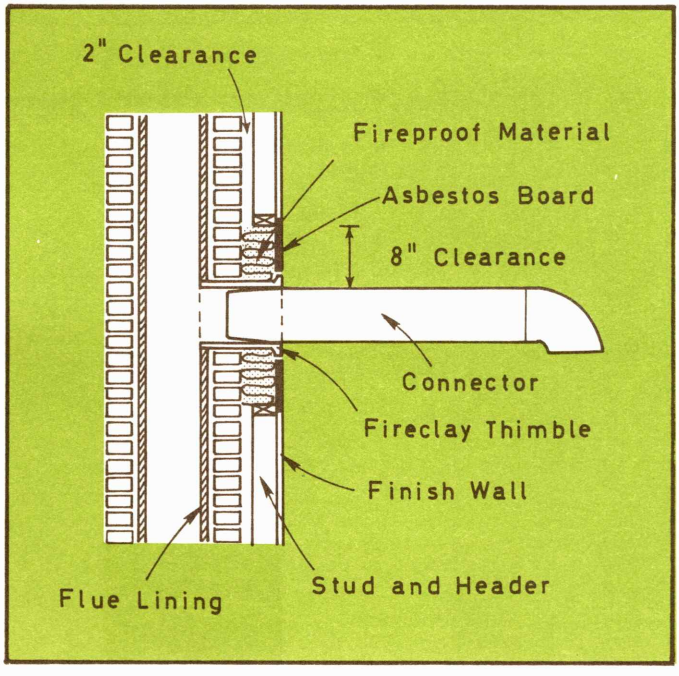


Chimney

Chimneys are constructed of either masonry or prefabricated metal. The metal chimneys have concentric walls with air spaces or insulation in between. The chimneys should have the label ALL FUEL from a recognized testing lab such as Underwriter's Laboratories (UL). Masonry chimneys may be brick, cinder block or stone. Tile flue liners are standard for masonry chimneys. Older chimneys often have no tile lining so check them carefully for leaks. It

is best to locate the chimney on an interior wall to maintain higher flue temperatures and thus to reduce the formation of creosote. Figure 1 illustrates one approved method for connecting the stove pipe to the chimney. The cost of metal pre-fab versus masonry chimneys depends a great deal upon the individual installation method which is used. Masonry chimneys usually have the longest life. Pre-fab chimneys with a stainless steel inner and outer lining have a longer life than those of galvanized sheet steel.

Figure 1. Chimney Connection



Creosote

When wood burns the combustion process is nev complete. The smoke usually contains unburned gases and a substance called creosote which may precipitate out on stove pipe and chimney linings. The amount of creosote condensing on the surfaces varies according to the density of the smoke, the temperature of the surface and the type and dryness of the wood being burned. Dense smoke from a smoldering fire carries the most unburned creosote.

Creosote deposits in chimneys will burn with intense heat. Stove pipes and chimney flues should be periodically inspected for creosote build-up. Clean with a wire brush or a bag containing chains and wire netting pulled up and down the chimney.

Reduce creosote build-up by (1) burning dry wood and by (2) stoking a hot fire each day for 15 to 30 minutes. The high temperature created by the fire will burn off the small amount of creosote formed daily.

Multiflues

Do not connect a wood stove to the same flue serving a fireplace because sparks and flue gases from the stove may enter the house through the open fireplace.

Room heaters, cook stoves, etc. should not be connected to a common flue because (1) flue gases and sparks may pass from one flue opening into another and (2) multiple connections sometimes cause a poor draft and unsatisfactory operation. If, despite these recommendations, two stoves are connected to the same chimney, the connections must enter the chimney at different elevations.

For more information on wood as a fuel, stove selection and installation, a larger, 24-page publication entitled "Burning Wood" is available for 75 cents from your county Cooperative Extension office or by writing: Cornell University, Mailing Room, 7 Research Park, Ithaca, N.Y. 14853.

A companion motion picture will be available in the late fall of 1978. Bookings may be arranged by writing: Media Services Film Library, Cornell University, 55 Judd Falls Road, Ithaca, N.Y. 14853.

Your county Cooperative Extension office has other materials and programs available to help you save energy through the safe burning of wood.

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