forestry & natural resources

MARKETING AND UTILIZATION

Wood for Home Heating

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Although fossil fuels and electricity are currently in good supply compared to ten years ago, the relatively high prices continue to focus attention on the use of wood for home heating. Wood may be burned in stoves and even furnaces to reduce fossil fuel bills during cold weather or to help warm homes in emergencies. Also, an occasional "cheery fire on the hearth" can bring families together. Regardless of the reasons for burning wood, the benefits received will depend upon your knowledge of wood as a fuel. This publication discusses the potentials of using wood for heating and enjoyment, as well as the purchasing, cutting, and storage of firewood.

How Good is Wood as a Fuel?

The evaluation of wood as a fuel is difficult for several reasons. The fuel value per unit volume depends on the species' weight and moisture content and is thus extremely variable. For the same volume, some types of wood may contain twice as much potential heat as others. The heating system in which wood is burned also affects the quantity of usable heat produced. Typical masonry fireplaces may recover only 10 percent of the available heat, while some of the better designed wood stoves are rated at an efficiency of 50 to 75 percent or higher.

To further complicate the evaluation of wood as a fuel, wood combustion occurs in consecutive overlapping stages. In the first stage, heat is absorbed by the fuel, and water in the wood is evaporated as steam. In the second stage, the volatile matter is liberated and burned. The volatiles ignite, burn, and give off heat at about 1,000°F. The third stage in combustion occurs when most of the volatile matter has been removed. The surface of the remaining residue (charcoal) reaches a glowing temperature and burns when oxygen from the air is brought in contact with it. This combustion exposes additional surface area until the entire mass is consumed. Each stage, and thus the amount of heat derived, is affected by variables such as wood moisture, stove efficiency, size and temperature of the fire, and type and location of the chimney.

Comparative Heat Values

To evaluate wood as a potential fuel, the heat values and burning efficiencies of the fossil fuels must be known. The heating value of No. 2 oil is about 140,000 BTU*/gallon, bituminous coal 13,000 BTU/pound, and natural gas 1,000 BTU/cubic feet. A kilowatt hour (KWH) of electricity is equivalent to 3,400 BTU. The actual usable heat derived from these different fuels will depend upon equipment design, operating conditions, and method of installation. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Systems Handbook estimates a 70 to 80 percent efficiency for fuel fired equipment. The conversion of electricity to heat is assumed to be 100 percent efficient.

A pound of oven dry wood of any species has a heating value of about 8,600 BTU. However, the available heat per pound of wood depends, in part, upon its moisture content when burned.

Freshly cut Indiana hardwoods commonly have a 75 percent moisture content on an oven-dry basis. That is, every pound of freshly cut wood contains .57 pounds of dry wood and .43 pounds of water. Therefore, the total available heat per pound of wood at 75 percent moisture content is 4,900 BTU (0.57 pounds x 8,600 BTU/pound). At a 50 percent burning efficiency, the usable heat is 2,450 BTU per pound. Air

*BTU or British Thermal Unit is the amount of heat required to raise the temperature of one pound of water 1°F.

dried firewood contains about 20 percent moisture or .83 pounds of dry wood and .17 pounds of water. The usable heat value is, then, 3,600 BTU per pound.

However, wood is normally not sold by the pound. Volume measurements such as the rick or cord are more common. The heavier air dried wood is per unit volume, the more heat it will produce for that volume. Therefore, a given volume of the heavyweight woods such as hickory, oak, or beech will produce more heat than the lightweight ones such as cottonwood, basswood, and willow. Table 1 gives the relative weights of different hardwoods common to Indiana.

To determine the economic relationship of wood to fossil fuels and electricity, see Table 2. Using heat (BTU's) as a basis of comparison, the three different classes of wood based on weight, the equivalent volume of fossil fuels, and electricity are given. To use the table, first determine the type (heavy, medium, or light) of wood and the current cost of fossil fuels. Multiply the fossil fuel costs times the appropriate energy equivalent figure in Table 2. This figure will give the approximate value of wood as compared to fossil fuels and electricity on a BTU basis, considering burning efficiencies. For example, one cord of heavy, air-dried hardwood is equal to 152 gallons of fuel oil or $190, if oil is priced at $1.25 per gallon. This figure is the fuel replacement cost, but the cost of buying and installing a wood burning stove to supplement or even replace the existing system has not been considered.

Table 1. Relative weights of different Indiana hardwoods.

Heavy	Intermediate	Light
Apple	Cherry	Aspen
Ash	Elm	Basswood
Beech	Gum	Box Elder
Birch, River	Hackberry	Buckeye
Dogwood	Maple, Soft	Butternut
Hickory	Sycamore	Catalpa
Ironwood		Cottonwood
Blue Beech		Sassafras
Locust		Yellow Poplar
Maple, Hard		Willow
Oak, White		
Oak, Red		
Persimmon		
Osage Orange		
Walnut		

Pay Back Period for a Wood Stove

A general idea of how long it will take for a wood stove to pay for itself can be obtained by referring to Table 2. Using the same technique as described earlier, determine the value of fossil fuel which will be replaced with wood in an average year. Subtract wood and other yearly costs from this figure, and then compare it to the cost of the stove, chimney, and other installation charges. You can probably save if the cost of the stove, chimney, installation, and other charges are recovered in the first year.

If you do not recover all or most of the wood burning equipment costs in the first year, a more precise figure on how long it will take to recover these costs can be determined. Figure 1 is a chart containing the step by step procedure for determining cost recovery according to two different situations. In Example 1, wood costs include only minor charges such as chain sharpening, saw maintenance, and gasoline for transportation. The wood supply is assumed to be free. In Example 2, the wood is purchased for $80.00 per cord, precut, and delivered.

In Example 1, where the wood costs are minimal, the stove pays for itself in about two years. However, in Example 2, where wood costs $80.00 per cord and increases annually $20.00 per cord, it will take slightly more than 3 years to pay off the cost of the stove.

Table 2. BTUs per air-dried cord of wood and fossil fuel equivalents for heavy, medium, and lightweight Indiana woods.

Wood class	Cord weight (air-dried)	BTUs per cord[1]	Energy Equivalent: Coal[2]	Oil[3]	Gas[4]	Electricity[5]
	pounds	millions	pounds	gallons	therms	KWH
Heavy	4400	16	1890	152	21	4706
Medium	3300	12	1420	114	16	3529
Light	2500	9	1056	86	12	2647

Burning Efficiency:
1 Based on wood at 50% burning efficiency = 3,600 usable BTU/pound (20% moisture content on oven-dry basis)
2 Based on coal at 65% burning efficiency = 8,450 usable BTU/pound
3 Based on oil at 75% burning efficiency = 105,000 usable BTU/gallon
4 Based on gas at 75% burning efficiency = 750,000 usable BTU/therm (1 therm = 1,000 cu. ft.)
5 Based on electricity at 100% burning efficiency = 3,400 usable BTU/KWH

	Example 1	Example 2
Step 1 Determine initial costs of the stove, stovepipe, chimney, installation, safety equipment, and other costs.	$ 750 initial cost	$ 750 initial cost
Step 2 Determine the fuel savings for the first year. Simply estimate the reduction in cost of your fuel bill, and subtract from this all firewood costs. Assume in each example that 300 fewer gallons of oil at $1.25 per gallon are consumed. This is equal to about 2 full cords of good heavy, air-dried hardwood. In example 1, assume that the wood is free and that the costs are only $10.00 per cord or the cost of cutting and transporting. In example 2, assume that the wood is purchased for $80.00 per cord for the first year and that the costs increase $20.00 per cord per year.	300 gallons oil × 1.25 dollars/gallon $ 375 -$10 per cord wood costs -$10 per cord wood costs $ 355 savings	300 gallons oil × 1.25 dollars/gallon $ 375 -$80 per cord wood costs -$80 per cord wood costs $ 215 savings
Step 3 Compare initial costs to the expected fuel savings. If savings exceed initial costs, the stove has paid for itself. Neither stove has paid for itself in these examples.	$ 750 initial costs -355 fuel savings $ 395 costs not recovered	$ 750 initial costs -215 fuel savings $ 535 costs not recovered
Step 4 Now determine fuel savings for the second year. Assume that purchased wood costs will increase $20.00 per cord per year and that fuel oil prices will increase at the rate of $.25 per gallon per year. Then discount each of the fuel savings by using the formula: $\frac{1}{(1+i)^{n-1}} \times$ (Fuel Savings) where i = interest rate in decimal form n = year of savings	300 gallons oil × 1.50 dollars/gallon $ 450 -$10 per cord wood costs -$10 per cord wood costs $ 430 savings *Discounted Savings* $\frac{1}{(1+0.1)^{2-1}} \times \$430 = \$390.91$	300 gallons oil × 1.50 dollars/gallon $ 450 -$100 per cord wood costs -$100 per cord wood costs $ 250 savings $\frac{1}{(1+0.1)^{2-1}} \times \$250 = \$227.27$
Step 5 In the second year for example 1, an additional $390.91 are saved. The total savings for the two-year period are nearly equal to the initial stove cost. Thus, the stove has paid for itself. In example 2, another $227.27 was saved in the second year of operation. In two years, a total of $442.27 has been saved. Thus, the total stove costs of $750 have not been recovered.	$ 355.00 (from Step 2) 390.91 (from Step 4) $ 745.91 Total savings	$ 215.00 (from Step 2) 227.27 (from Step 4) $ 442.27 Total savings
Step 6 Since the stove in example 2 has not yet paid for itself, Step 4 must be repeated. Wood costs increase another $20.00 per cord, and oil increases $.25 per gallon.		*Fuel Savings* 300 gallons oil ×1.75 dollars/gallon $ 525 -$120 per cord wood costs -$120 per cord wood costs $ 285 savings *Discounted Savings* $\frac{1}{(1+0.1)^{3-1}} \times \$285 = \$235.53$
Step 7 The savings in Step 6 for example 2 must be added to all previous savings. The total stove costs of $750 have nearly been recovered.		$ 215.00 savings for year one $ 227.27 discounted savings for year two $ 235.53 discounted savings for year three $ 677.80 Total savings
Step 8 Since the stove in example 2 has not yet paid for itself, Step 4 must be repeated again. Wood costs increase another $20.00 per cord, and oil increases $.25 per gallon.		*Fuel Savings* 300 gallons oil × 2.00 dollars/gallon $ 600 -$140 per cord wood costs -$140 per cord wood costs $ 320 savings *Discounted Savings* $\frac{1}{(1+0.1)^{4-1}} \times \$320 = \$240.42$
Step 9 The savings in Step 8 for example 2 must be added to all previous savings. The total stove costs of $750 have now been recovered.		$ 215.00 savings for year one $ 227.27 discounted savings for year two $ 235.53 discounted savings for year three $ 240.42 discounted savings for year four $ 918.22 Total savings

Figure 1. Procedure for determining cost recovery for a wood stove.

In addition to the economic figures, other factors must be considered when using wood as a source of fuel. On the positive side, a readily available wood supply will give most wood stove users a feeling of self sufficiency, and considerable savings can be made. Furthermore, by burning wood, American dollars are not being sent overseas, as is the case with much of the fuel oil used each year.

On the negative side, there are many inconveniences associated with burning wood. For example:

1. Wood is a bulky material, and room for storage is required.
2. Dirt, bark, and other debris fall from the wood as it is moved through the house or basement and into the stove. More dust may also accumulate in the house from wood burning than from fossil fuels or electricity.
3. Wood stoves need frequent refueling. You cannot turn on a valve or switch and then walk away.
4. Wood stoves tend to build up heat and then cool off as the fire dies down. A constant temperature is difficult to maintain.
5. Dried wood burns most efficiently. A full summer is required to thoroughly dry fuelwood after it is cut to length.
6. Cutting wood is time consuming and hard, physical work.
7. Much handling is involved in transporting wood from the tree or woodland to the stove or fireplace.

Efficiency of Woodburning Stoves and Fireplaces

The common masonry woodburning fireplace is highly inefficient. It is reported that only 10 percent of the actual heat available in wood is transmitted to the home. The remaining heat is lost in excess air passing out of the room through the chimney. A chimney damper, closed down as much as possible, will reduce the amount of air drawn from the room. Glass doors on the front of a fireplace will have a similar effect. A chimney located on an inside wall will retain some of the heat produced and transmit it to the home. A duct supplying air to the fire from outside the building will similarly conserve the warmest air in the room. Another study reports that the net efficiency of a fireplace decreases as outside temperature drops. Therefore, a fireplace is most efficient during cool but not cold weather, as in the fall and spring.

It is difficult to accurately delineate the efficiency levels of wood burning stoves and fireplaces. Efficiency is affected by such variables as operating conditions, temperature of the fire, type and location of chimney and fuel, as well as by stove design. However, some general efficiency figures can be presented. Prefabricated fireplaces which have metal walls and backs with space for air to circulate between the walls and fireplace setting have been reported to be about 20 percent efficient.

Generally, as the tightness of the stove, and thus the control over air entering the firebox, increases, so does the efficiency. Excess air simply encourages rapid burning and loss of heat up the chimney. The manner in which a stove is designed affects how air is brought into the firebox, and thus, the efficiency. Simple box type stoves (Franklin, pot bellied, or parlor stoves made of cast iron) are reported to be 30 percent efficient, while more sophisticated stove designs report efficiencies of up to 75 percent or sometimes higher. Commercial woodburning boilers generally recover about 65 percent of the available heat. Calculations in this publication are based on 50 percent efficiencies.

Buying Firewood

In most communities and rural areas firewood is generally available in the round or split to size. It may be purchased from and delivered by individuals in the business. Firewood ads are frequently seen in the classified section of local newspapers. Some sawmills and furniture manufacturers also sell wood residues for fuel.

When purchasing fuelwood, it is important to understand what and how much the seller will deliver. A common measure of small diameter wood suitable for fuel is the standard cord. A cord is a pile of wood, bark, and air spaces 4 feet high, 4 feet wide, and 8 feet long, or 128 cubic feet. The amount of wood received will vary somewhat with the way it is piled. A cord of loosely piled wood will contain less than a uniformly stacked one.

Firewood is frequently sold in quantities less than a cord. For example, the seller may deliver a face cord or rick. A rick is a pile of wood 4 feet high, 8 feet long, and of variable width. Figure 2 shows the differences in dimensions between a standard cord and a rick. Ricks are often sold as cords. Beware!

Wood is also sold by the pickup truckload. Trucks with the standard bed measuring about 5.5 feet by 8 feet by 20 inches deep, loaded level with the sides, will contain a little more than one-half cord. Some trucks have smaller beds 4 by 6 feet by 20 inches deep and will carry about 1/3 cord when filled level with the sides.

Wood can also be sold on a weight basis. Although little firewood is sold by weight in Indiana, it may be more logical as compared to selling by the rick, cord, or pickup load of wood. The amount of heat given off, and thus the value of wood for fuel, is directly proportional to the dry weight of wood. The more dry weight per given volume, the more heat that will be produced.

Table 3 gives the green moisture content of some common Indiana woods and the weight per cubic foot when green and when thoroughly air dried or at 20 percent moisture content. In the pulpwood industry, it is often assumed that a full cord of wood (128 cubic foot of wood, bark, and air space) with round, eight-foot bolts contains only 80 feet of solid wood. Since firewood is generally cut to much shorter lengths, split, and contains some small diameter material mixed in and is usually carefully piled, a cord may contain more than 80 cubic feet. Therefore, the weight of a cord of firewood can be determined by multiplying the weight per cubic foot (Table 3) times 80 or more cubic feet of solid wood per cord. The figures derived in this manner should serve only as estimates. The weight of wood (assuming uniform moisture content) varies widely, even within the same species. Therefore, it is best to develop weight data for each particular species on a local basis.

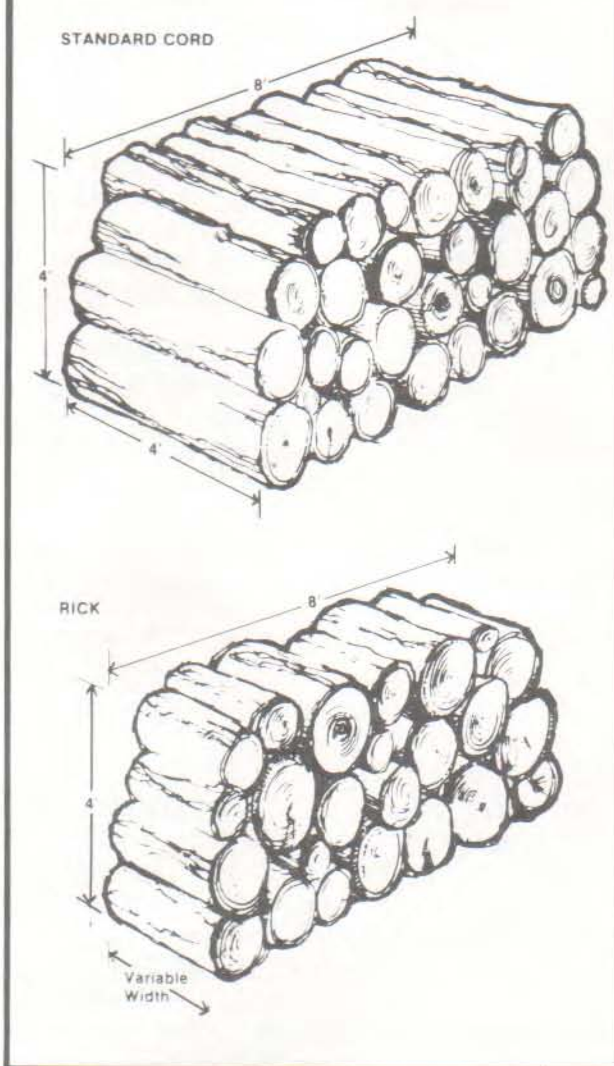


Figure 2. Dimensions of a standard cord and a rick.

Table 3. Moisture content and green and air-dried weight per cubic foot for some common Indiana woods.

Species	Moisture content	Weight per cubic foot of solid wood: Green	Weight per cubic foot of solid wood: Air-dried[1]
	(%)	(lb.)	(lb.)
White Ash	45	49.8	36.2
Basswood	107	41.3	20.6
Beech	64	57.3	36.8
Cherry	58	46.3	30.6
Cottonwood	153	50.5	20.6
A. Elm	94	55.7	30.0
Hackberry	63	49.8	31.8
Hickory	61	64.3	42.4
Black Locust	40	57.6	43.7
Soft Maple	78	48.9	28.7
Sugar Maple	69	59.0	36.8
Red Oak	75	59.0	35.6
White Oak	71	64.0	39.3
Sweetgum	108	59.7	30.0
Sycamore	122	63.7	30.0
Walnut	82	57.9	33.7
Yellow Poplar	95	48.7	26.2

[1] 20% moisture content on an oven-dry basis

Dry wood has a higher fuel value and may command a premium price. In some species with a high moisture content, the fuel value will nearly double by air drying. Look at the ends of the pieces to determine if the wood is dry. Seasoning checks (open splits) will be clearly evident on the ends of at least partially dried wood. These "checks" result from the natural shrinkage of wood as it dries. If the wood has been seasoned outside, it will be somewhat discolored. It should not smell sappy. The wood should be hard and sound. Decayed wood has a low fuel value and, when dried, will feel light and burn rapidly.

Cutting Firewood: Do's and Don'ts

Some people may prefer to cut their own firewood. With the advent of chain saws, wood cutting is not nearly as difficult as before, but it is probably more dangerous. Proper safety precautions should be exercised in felling trees and in the use of hand tools and power equipment.

Even in urban areas, wood is sometimes available for the asking. Check when you see a wooded lot being cleared or a shade tree being cut. The best time to look is after a severe storm. Many individuals own wooded property for recreational or investment purposes. Remove all dead and dying wood from these areas first, remembering to seek permission.

Forest land in Indiana frequently contains poorly formed cull trees and trees of undesirable species which are of little, if any, economic value. In fact, many forest landowners pay to have cull trees killed with herbicides to make room for the more desirable trees. In addition to the cull trees, such species as ironwood, blue beech, dogwood, and locust have little value to the lumber industry, and they too are usually removed to make room for more valuable trees. Trees of desirable species which are straight, sound, and relatively limb free may have greater value if left for future timber sales.

Another likely place to obtain fuelwood is from treetops left in a recently logged woods. These tops are as good for fuel as any other tree part. Recent research in southern Indiana shows that the average red or white oak that is 18 inches in diameter at 4.5 feet above the ground contains nearly 1,500 pounds of green wood and bark equal to or greater than 4 inches in diameter after all sawlog size material is removed. Therefore, about 270,000 dry standard cords of wood are available each year in Indiana just from tops left in harvesting oak sawtimber. It is estimated that about 40 percent of the 312 million board feet of lumber cut each year in Indiana is oak.

Much of the cull timber and logging residues are located in the heavily forested regions of central and southern Indiana.

Drying

To allow for proper drying, firewood should be cut at least one full summer before its anticipated use. Since smaller pieces of wood dry faster than large chunks, the wood should be cut and split to final dimensions as soon as possible. Pile the wood at least 6 inches off the ground to prevent decay and to allow proper drying of the bottom layers. To achieve the most rapid drying rate, the wood should be neatly piled in single rows fully exposed to the sun and wind. Fuelwood stored in damp, shaded places or damp basements will dry very slowly and may even decay. Covering the top of the pile will also encourage rapid drying. If polyethylene is used as a covering, it should not extend down over the sides of the pile since it will cut off air movement and thus slow the drying rate.

Wood should not be stored against the side of the buildings. Exposure to the wind and sun is limited in these areas, thus reducing the drying rate. Furthermore, wood stored close to buildings increases the risk of insect infestations or decay problems to the building.

Insects in Firewood

Termites are probably the best known insects which attack wood. They require moisture to live and use the wood as a source of food. They cannot survive for long in well-seasoned wood unless contact with the moist soil or another moisture source is made. Furthermore, the "reproductive area" for each colony is usually located in a nest beneath the surface of the ground. If termite-infested firewood is brought inside, there is little danger that a termite infestation of the home will result. However, firewood should not be stored next to a building, since termites can use the firewood as a "bridge" to gain entry into the building.

Carpenter ants are prevalent in trees as well as cut wood. They prefer cavities or decayed areas in the wood and can infest dry firewood. Since they normally do not infest sound wood, they are not a serious pest. If they are a problem in some pieces of firewood, they can normally be removed by cutting and splitting the wood to small sizes and then knocking the infested pieces together or by exposing the pieces to the weather.

Powder post beetles and other wood borers do attack some species of firewood, such as hickory and ash. Infestation of firewood properly used and stored for only one year is usually minimal. The powder post beetles which attack native Indiana hardwoods will not normally infect the softwood lumber commonly used in most newer homes. If a house is constructed from native hardwoods, there is a chance that it could be infested by powder post beetles from the firewood. To prevent any potential problems, do not store infested wood indoors. Adult beetles can emerge from wood at any time and reinfest structural timber.

Poisonous Wood?

Small pieces of wood or kindling, in combination with paper, are frequently used to get the fire started. Leftover scraps of lumber from building and construction sites are a convenient source of the materials. However, wood preserved with chemicals to prevent decay and insect attack is frequently used in portions of some buildings. Treated wood should not be used for home fuel because of the poisonous nature of preservatives. Wood treated with the common salt type preservatives is usually light to bright green or light brown. Other preservatives, such as pentachlorophenal, leave the wood oily. Creosote leaves wood dark brown to black.

Wood Ashes

Wood ashes have some value as a lawn and garden fertilizer. Native Indiana woods seldom contain over 1 percent ash on an oven dry basis, or about 36 pounds per cord of heavy, air-dried wood. This ash consists of 50 to 70 percent calcium or lime, 6 to 8 percent potassium, insignificant amounts of phosphorous, and no nitrogen. The use of 25 pounds of wood ash per 1,000 square feet on home gardens will meet potassium requirements and help maintain a pH of 6 to 7 when there is a trend towards acidic conditions.

Safety

Whenever a wood burning stove or fireplace is used, certain precautions should be taken. At least once a year, inspect the chimney for loose or fallen brick and cracked or broken flue lining. Chimneys and stovepipes should always be free of obstructions and the damper opened before starting the fire. Never use flammable liquids to start the fire.

For wood burning stoves, protect the floor, walls, and ceiling around the heater and flue pipe from excessive heat. The National Fire Prevention Association (NFPA) recommends a minimum clearance of 36 inches between most radiant type heating stoves and any combustible materials (wood covered by plaster is considered combustible). The stovepipe must be at least 18 inches from any combustible material, and special precautions must be taken when the pipe goes through a wall or ceiling. The 36 inch and 18 inch clearances can be reduced if the combustible materials are protected with a noncombustible covering such as 28 gauge sheet metal. However, any wall covering must be spaced out at least 1 inch from the wall and 1 inch above the floor to allow free air circulation between the covering and the wall.

When stoves are set on combustible floors, a noncombustible protective covering must be used. The covering should protect the floor from the heat of the fire and from hot coals falling out when fuel is added or ashes removed. The covering should extend 18 inches beyond the stove on the sides with doors or other potential openings and at least 12 inches on other sides.

It is important to remember that combustible materials can be ignited by heat being conducted through legs which support a wood burner or by steel plates used to "protect" walls, floors, etc. In all cases, follow local building codes and manufacturer's recommendations, and inform your insurance company when installing a wood burning device. After the device is installed, guard against complacency and carelessness.

For additional information on wood stove installation, consult the "Suggested Readings" at the end of this publication.

Another hazard with wood burning stoves and fireplaces is chimney fires. Chimney fires result when creosote deposits ignite and burn, usually during a very hot fire. Creosote deposits occur when unburned gases condense in stovepipes or chimneys. If a chimney fire does occur, limit the air supply to the fire. Discharge a fire extinguisher into the stove, and call the fire department. A multipurpose dry chemical (Class ABC) fire extinguisher is preferred. This type is appropriate for other home fires as well.

Creosote deposits can be removed form the prefabricated metal chimneys with specially manufactured wire brushes available from stove dealers and some hardware stores. Heavy chains or other weights in cloth bags worked up and down in square or rectangular masonry chimney can also be effective. Or special cleaning devices can be made using stiff brushes for individual chimneys. Chimney sweeps are also available for hire in many communities.

The amount of creosote which develops can also be reduced by burning dry wood in a small, hot fire rather than in a smoldering one. Refueling at frequent intervals helps. When refueling a stove, allow the fire to run hot for about 10 minutes to heat up the fuel and chimney. Short stovepipes and chimneys located on inside walls will heat up rapidly and thus help prevent creosote condensation.

Some woods burn explosively, creating dangerous flying sparks. The explosions are caused by the collection of gases, including steam, in the wood cells. When the gases cannot escape, the pressure causes the cells to explode, often with a loud report. For example, apple wood burns quietly, while mulberry and cedar pop and crackle. When a fireplace is being used, it is always best to keep a fire screen in place to prevent damage to floors and rugs and the potential for unwanted fires.

Summary

Wood can be a source of home heat at considerable savings compared to fossil fuels and electricity if a source is readily available for little or no cost and if the individual has the equipment and physical energy to cut and transport it. If cut and delivered wood has to be purchased, considerably less savings are evident. Wood varies tremendously in its heating ability, with the heavy hardwoods being the best to burn. Burning wood for home heat, unlike the fossil fuels and electricity, involves a lot of work, but it can make some homeowners self-sufficient.

Suggested Readings

"Using Coal and Wood Stoves Safely." National Fire Prevention Association, 470 Atlantic Ave., Boston, MA 02210, 12 pp. ($2.00 each)

"Wood Burning Quarterly and Home Energy Digest," 8009 34th Ave. S., Minneapolis, MN 55420 ($5.00/year)

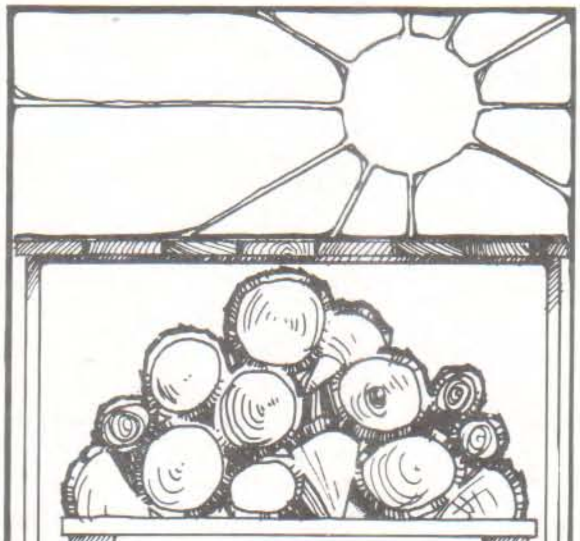
"The Woodburner's Encyclopedia," Vermont Crossroads Press, Box 333, Waitsfield, VT 05673, 162 pp. ($6.75 each)

"Residential Wood Stove Installation," Cooperative Extension Service publication FNR-100, Publications Mailing Room, 301 S. 2nd Street, Lafayette, IN 47905 1092 (free to Indiana residents*)

"Termite Control Before and After Construction," Cooperative Extension Service publication E-4, Publications Mailing Room, 301 S. 2nd Street, Lafayette, IN 47905 1092 (free to Indiana residents*)

"Powder Post Beetles," Cooperative Extension Service publication E-73, Publications Mailing Room, 301 S. 2nd Street, Lafayette, IN 47905 1092 (free to Indiana residents*)

*Out of state residents should request a price quotations from the Mailing Room for each publication ordered.



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