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Maine Woodburning Guide

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Maine Woodburning Guide

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1988

OF MAINE

John R. McKernan, Jr., Governor

ICE OF ENERGY RESOURCES
House Station 53
sta, Maine 04333
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Introduction

More than half of Maine households use wood as their primary or supplementary source of heat. Because about 90% of the State is forested, wood is likely to continue to play an important role in meeting a share of our energy needs.

Burning wood can be a satisfying and economical way of heating homes and workspaces. But woodburning, like all other forms of combustion, requires special care. Unlike other forms of home heating, woodburning usually depends on the person operating the heating unit to provide for his or her own safeguards.

Maine is particularly proud of its environment, including its clean air. Woodburning need not seriously harm air quality, provided certain suggestions are followed.

This publication is a general guide to woodburning. It contains five sections which are important for proper wood burning.

For more information contact your local Fire Official, Cooperative Extension Agent, the State Fire Marshal, State House Station #52, Augusta, ME 04333 (289-3473) or the Maine Office of Energy Resources, State House Station #53, Augusta, ME 04333 (289-6000).

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1 SAFE INSTALLATION

Maine law requires that when a woodburning device is installed professionally it must meet strict standards adopted by the State Fire Marshal's Office. (Professionals should obtain copies of these standards from that Office.) Everyone, however, should follow these safety standards if they are installing a coal stove, a wood stove or a combination unit. This publication provides the information you will need.

Certain Maine communities have ordinances governing the installation of wood and coal equipment. Always check with your local Fire Department and Building Inspector before attempting installation. It is also important to consult with your insurance company regarding any restrictions they may have on wood or coal-burning appliance installation. All installations in public buildings must meet standards set by the State Fire Marshal's office.

In Maine, no woodburning central heating equipment can be sold without the approval of the Oil and Solid Fuel Board. Central heating equipment is part of a system that carries the heat by ductwork or pipes to areas of the building for heating purposes. State approval means that the device must be "listed" by a laboratory such as Underwriter's Laboratory, the Energy Testing Laboratory of Maine, or another approved testing laboratory. Such listing requires that the device be accompanied by installation instructions, which should be followed.

Other woodburning devices are not required to be listed in Maine, but may be required to be approved in other states. They may, therefore, be accompanied by installation instructions, which should be followed. If there are no instructions, you should use the installation standards and instructions contained in this publication. Failure to observe proper clearances could be dangerous to you and your family.

Follow these guidelines when installing woodburning devices:

- Do not install your woodburning device in confined spaces, unless done in accordance with the listing and the manufacturer's instructions. The specified clearance should be maintained regardless of whether the enclosure is of combustible or noncombustible material.

- Do not install your woodburning device where gasoline or flammable vapors or gases may be present like in a residential garage.

- Install your woodburning device where the ventilation permits good fuel combustion, proper chimney draft and maintenance of safe temperature for its use.

- Always have an outside air supply in a building that is so tight that normal infiltration does not provide the necessary air.

- Always have stovepipe and chimneys designed, located and installed to permit ready access for inspection and cleaning.

- Use listed factory-built accessories such as heat exchangers, stove mats, floor pad and protection shields, and install them according to manufacturer's recommendations. If these accessories are not listed, check with your local Fire Department or the Fire Marshal's Office.

Clearances

There are a number of different types of woodburning appliances such as fireplace inserts, free standing fireplaces, and airtight and non-airtight stoves. Stoves can be classified as radiant or circulating. A circulating stove has two walls—an inner wall surrounding the firebox and an outer wall. The heated air rises, drawing cold air from the floor into the space between the inner and outer walls. Because the air circulates, the clearances for this type of stove can be less than for a radiant heater.

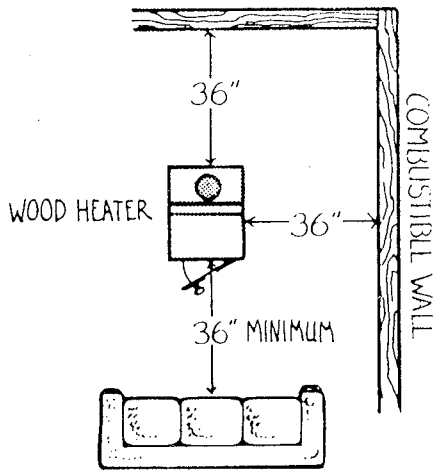
In a radiant stove, the heat is infrared energy which travels in unseen waves. Clearances are extremely important for radiant stoves, because the infrared energy radiates into combustible materials and changes their composition, lowering the temperature at which they can spontaneously combust. Since the changes cannot be seen, the proper clearances should be observed to prevent the possibility of fire.

Combustible materials include anything that can burn. Some examples are the wood box, magazine racks, furniture, draperies and wood paneling. Even plaster and sheetrock walls are combustible because of the wooden wall studs behind the plaster or sheetrock.

Heating Surfaces

Most stoves are made from steel or cast iron. There is virtually no difference between heavy steel and cast iron.

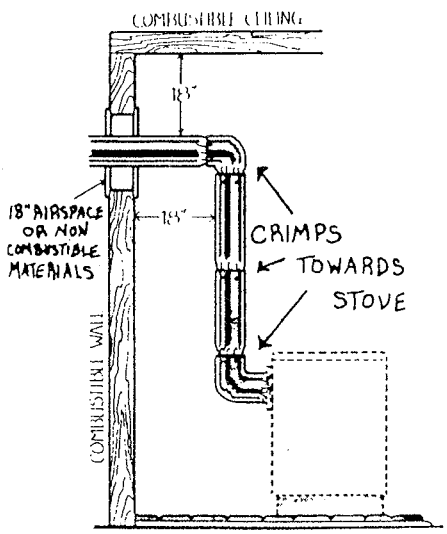
All heating surfaces of the stove should be a minimum of 36 inches from any combustible materials.



MINIMUM CLEARANCES FOR *UNLISTED* WOOD STOVE

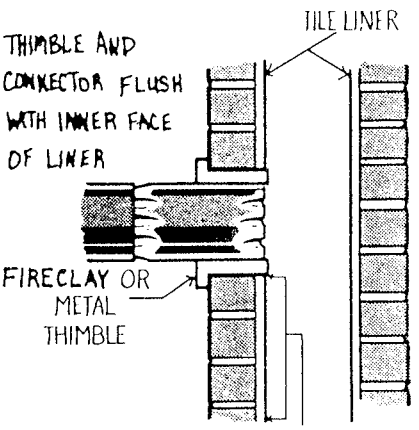
Stovepipe

Stovepipe is used to connect the woodstove to the chimney. It should be made from a minimum of 24 gauge steel. A clearance of 18 inches should be maintained between the stovepipe and any combustible material, including the ceiling.



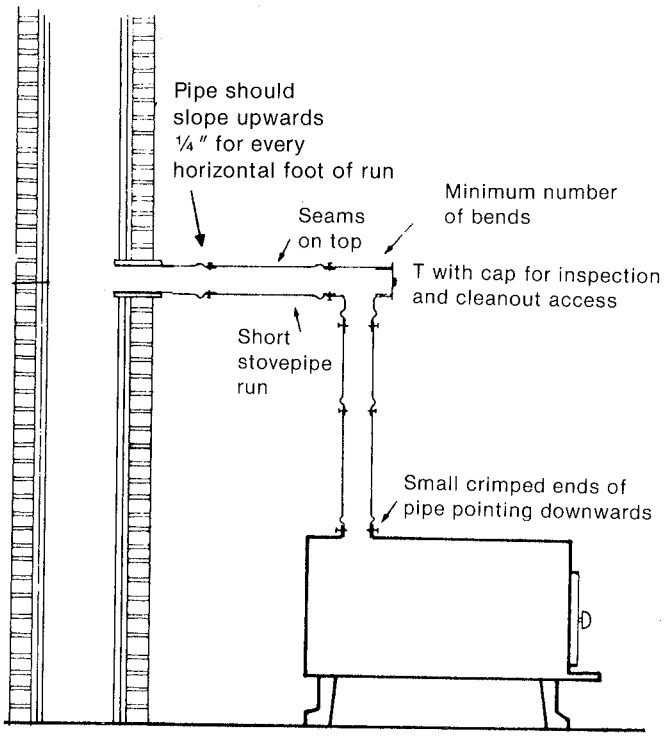
UNPROTECTED STOVEPIPE WITH 18" CLEARANCE TO COMBUSTIBLES

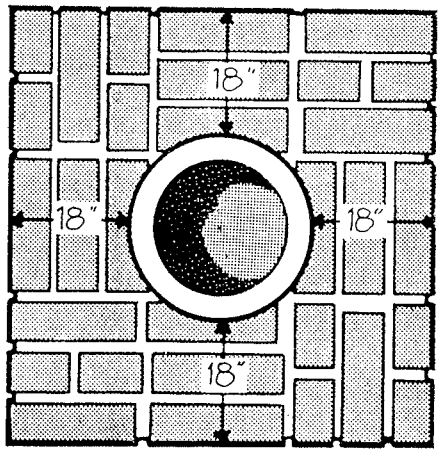
A ventilated metal or fireclay thimble should be used to pass a stovepipe through a non-combustible wall or into a chimney. Use a refractory cement to secure the thimble to the masonry. The thimble should extend to the inner surface of the chimney liner, but not beyond. The stovepipe should end flush with the inner end of the thimble.



THIMBLE

- Install stovepipe with a rise of ¼" for each foot of pipe in a horizontal run, with the highest point being at the thimble, or point of entry to the chimney.
- Overlap at least two inches of stovepipe at the joints with the crimped end pointing down to prevent creosote drips or leaks and secure the joint with three sheet metal screws. A fireproof sealant may be used in addition.
- Be sure the stovepipe fits snugly, including connections with the stove and thimble. The pipe must not stick into the chimney flue itself because this would hamper the draft.





THIMBLE OR CONNECTOR THROUGH COMBUSTIBLE WALL (MINIMUM 18" AIRSPACE OR NONCOMBUSTIBE MATERIAL ARDUND THIMBLE OR CONNECTOR)

Reducing Clearances

A woodburning device may be placed closer to combustible material by using a wall or ceiling protector. There are a number of different wall protectors that may be used. Listed wall protectors and brick walls can be aesthetically attractive. Sheet metal (24 gauge) can also be used.

There are two methods of passing a stovepipe through a combustible wall. All combustible material within 18 inches of the stovepipe should be removed and either left open or filled with a non-combustible material like bricks. A listed factory-built chimney may be used, if installed according to the conditions of the listing and the manufacturer's instructions.

Never pass a stovepipe through a roof, ceiling, closet or concealed area.

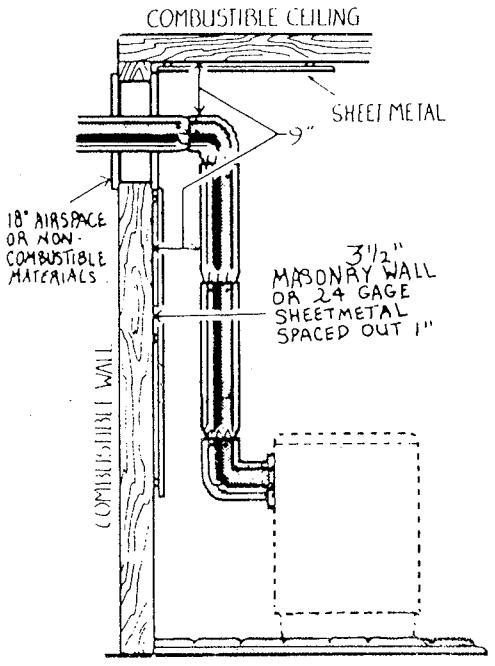
These general guidelines should be followed when installing stovepipe:

- Stovepipe should be as short as possible. Horizontal runs should be no longer than 75% of the vertical chimney height above the thimble where the connector pipe enters the chimney.

- Stovepipe should be as straight as possible. No more than 2 bends should be used. Additional bends could cause creosote to collect in the stovepipe or chimney, block flue gas flow, and increase the potential of fire.

- Use stovepipe that has a diameter as large as the flue collar where the pipe joins the stove.

Wall protectors should be spaced 1 inch out from the wall and 1 inch up from the floor. This allows air to circulate up and behind the protector to dissipate the heat. Spacers can be purchased or rubber washers, thin tubing, or electric insulators may be used. By using a wall or ceiling protector, the clearance for stovepipe may be reduced to 9 inches. Table 1 gives the maximum clearance reductions for various types of protectors.



CLEARANCE REDUCTION FOR STOVEPIPE

Floor Clearances

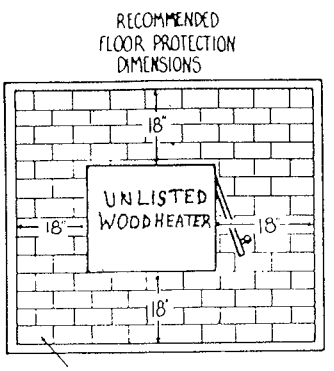
Any combustible floor must be protected. The floor protection required depends on the length of the stove's legs. Stoves with legs less than 2 inches in length must sit on a non-combustible floor. Stoves with legs 2-6 inches long need protection consisting of 4 inch hollow masonry laid to provide air circulation and covered with 24 gauge or thicker sheet metal. Stoves with legs longer than 6 inches need closely spaced 2 inch thick masonry units of brick, concrete or stone covered by at least 24 gauge sheet metal. The floor protection should extend at least 18 inches from all sides of the stove. Table 2 summarizes these clearances.

Table 1
MAXIMUM ALLOWABLE CLEARANCE REDUCTION FROM APPLIANCES
(For Listed and Unlisted Appliances)

Type of Protection	As Ceiling Protector	As Wall Protector
a. 3½" masonry wall—no ventilation	—	33%
b. ½" non-combustible insulation board over 1" glass fiber or mineral wool batts—no ventilation	50%	33%
c. Minimum 24 gauge sheet metal spaced out 1"	66%	50%
d. 3½" masonry wall spaced out 1"	—	66%
e. Listed prefabricated systems	Per manufacturer's specifications	

NOTES:

1. Clearances are measured from the nearest point on the surface of the appliance to the outer surface of the combustible material.
2. When using clearance reduction systems, no clearance is to be less than 12 inches. This applies to listed and unlisted appliances.



FLOOR PROTECTION
TOP VIEW

Table 2
FLOOR CLEARANCES

Length of Stove Legs	Floor Clearances & Protection
Less than 2 Inches	Fire resistant floor
2-6 Inches	Combustible floor protected by 4 inches of hollow masonry, laid to provide air circulation through the masonry layer covered with 24 gauge sheet metal.
Over 6 Inches	Combustible floor protected by 2 inch thick masonry, concrete or stone covered by or placed over a sheet of 24 gauge steel.

NOTE: All floor protection or non-combustible floors should extend at least 18 inches from all sides of the appliance.

Chimneys

There are several different types of chimneys—brick, stone, cinder block and factory built metal chimneys. Single walled metal chimneys are not acceptable, but double and triple walled factory-built metal chimneys are acceptable. Any single brick or cinder block chimney should be lined.

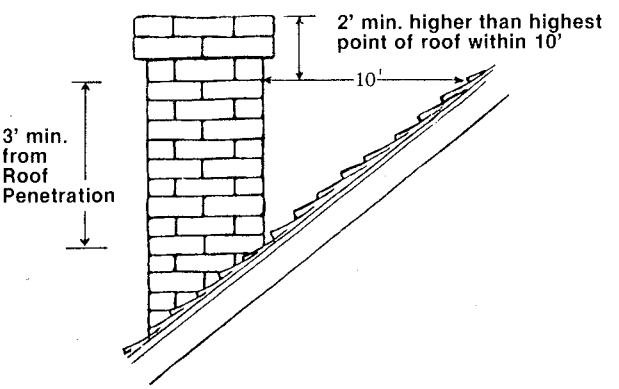
The condition of a chimney or fireplace should always be carefully evaluated before considering the installation of a woodburning appliance. Fix cracks, deteriorated mortar, and unsealed openings in any chimney before attaching a woodburning unit to it or before lighting a fire in a fireplace.

If you have a chimney built, the mason must follow the standards adopted by the State Fire Marshal's Office. If you are going to build your own chimney, you should also build it to the same standards to ensure your family's safety and to protect your property.

Masonry Chimney Installation Guidelines

Follow these general guidelines when installing a masonry chimney:

- Support the chimney on a properly designed foundation.
- Do not change the size or shape of the chimney within 6 inches above or below roof joists or rafters, where the chimney passes through the roof.
- Have cleanout openings with metal doors and frames to allow the door to be tightly closed when not in use.
- Have spaces between the chimney, floors and ceilings firestopped with non-combustible material.
- Make sure the chimney is proved tight by a smoke test.
- Make sure the chimney is lined with a fire clay or equivalent flue lining.
- Make sure the chimney extends at least 3 feet above the highest point where it passes through the roof of the building and at least 2 feet higher than any portion of the building within 10 feet.
  This will also provide the best draft for your system.



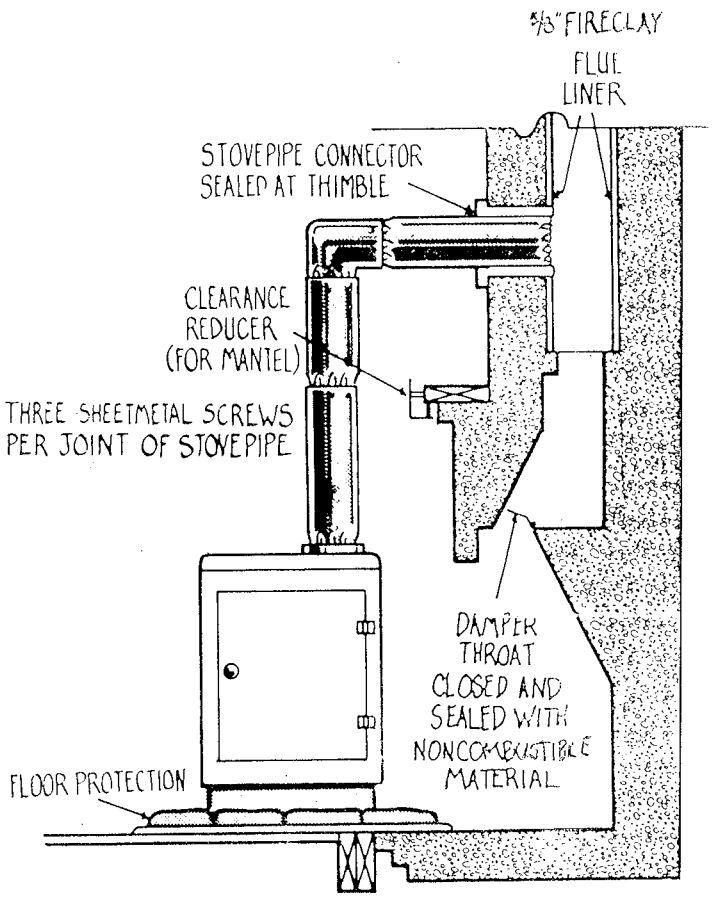
If you have a fireplace, make sure that the hearth is made of non-combustible material with no combustible material against the underside. Also, make sure that no woodwork or other combustible materials are placed within 6 inches of a fireplace opening.

Factory-Built Chimney Installation Guidelines

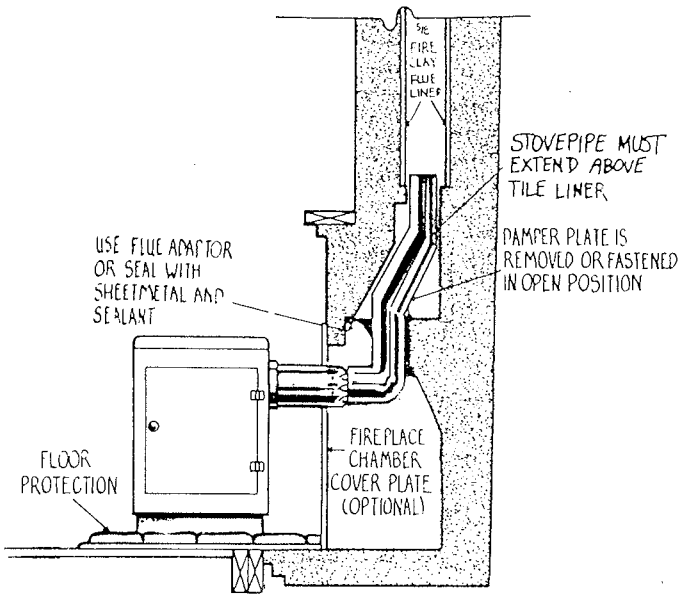
Any factory-built chimney must be listed to be sold in Maine. Carefully follow the manufacturer's installation instructions when installing these units.

Fireplace with Woodstove Connection

Connectinng a woodstove to an existing fireplace is one of the most common installations. There are 2 approved ways to make the connection. The first method is to use a thimble and connect the stovepipe directly into the chimney, closing the damper and sealing it with non-combustible materials.



The second method is to run the stovepipe up through the open damper and up into the lined chimney. The damper is removed or fastened open and the fireplace chamber is usually covered.



Multiple Connections

More than one woodburning appliance should not be connected to a common flue. A stovepipe should not be connected to a flue serving a fireplace or an oil furnace. They should have their own individual flues.

Installing more than one heating device on a common flue may result in sparks entering the house through a fireplace opening serving a woodstove elsewhere along the line. Both a fireplace opening and an oil furnace's barometric damper will furnish large quantities of air to their flues. In the event of a chimney fire, this will hamper any attempts to extinguish the fire by restricting the air flow to the flue.

Also, using a woodburning stove on a flue serving an oil furnace may reduce the efficiency of the oil furnace, due to the change in draft characteristics of the flue.

If two or more heating units are connected to the same chimney flue, despite the recommendations against doing so, the connectors must enter the chimney at different elevations, with the wood stove entering below the oil furnace.

Smoke Detectors

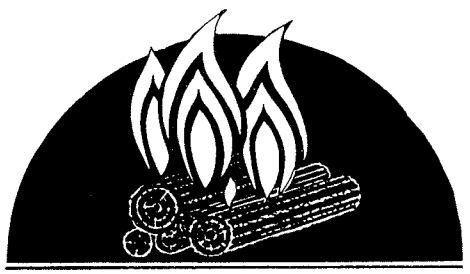
Every household should have at least one smoke detector. The smoke detector should be installed between the woodburning device and the bedrooms. Additional smoke detectors can

provide further warning to the occupants. Smoke detectors should be tested regularly to ensure that they are working properly.

Other Woodburning Applicances

The woodburning appliances listed below are not covered by these recommended standards. For information on their installation, refer to the appropriate agency.

Site Built Masonry & Flues & Fireplaces	State Fire Marshal's Office 289-3473
Wood Fueled Furnaces or Boilers	Oil & Solid Fuel Board 582-8723
Wood Burning Units with Water Jackets or Coils	Plumbing Code Enforcement Officers 289-3286
Listed Wood-fueled Mobile Home Heaters	State Manufactured Housing Board 289-2955 or State Fire Marshal's Office 289-3473
Listed Woodburning Stoves	The manufacturer's installation recommendations

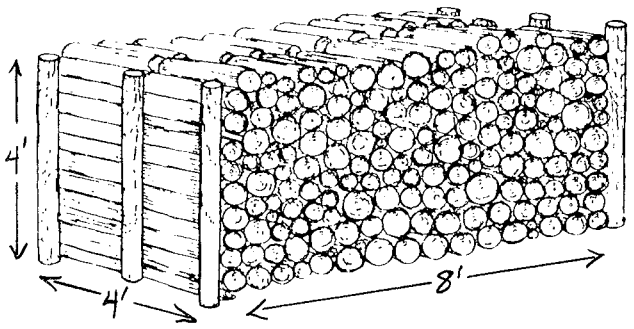


2 BUYING FIREWOOD

Being a knowledgeable firewood buyer will ensure that you get the most for your money. This section can help you in making a wise purchase.

Measurement

The traditional measure for wood is a cord. A standard cord is a stack of wood whose outside dimensions are 4 feet wide, 4 feet high and 8 feet long, or its equivalent. When neatly stacked, as illustrated below, a cord contains 128 cubic feet of wood. Any holes that will accommodate a piece of wood of the same average dimensions as those in the stack should be deducted from the measured volume.



Maine law requires that loose firewood be sold by the cubic foot or loose cord, unless other arrangements are made between the buyer and seller. A loose cord of wood in lengths of 12 to 16 inches is the amount of wood, bark and air contained in a space of 180 cubic feet. A loose cord of wood in lengths of 24 inches is the amount of wood, bark and air contained in a space of 195 cubic feet. When you neatly stack a loose cord of wood, it will come very close to equalling 128 cubic feet.

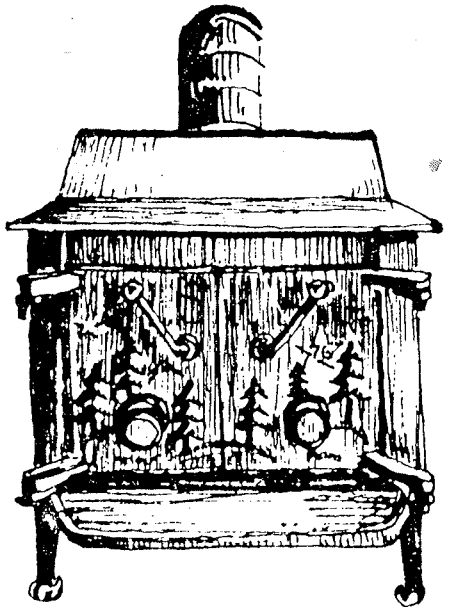
There are several other terms that you may hear to describe the measurement of firewood. The terms "load," "rick" and "pile" may not be used in Maine to legally advertise wood for sale.

It is very important that the buyer and seller agree on the firewood purchase. Maine law requires that firewood dealers provide each buyer with a delivery slip. The delivery slip should include:

- the name and address of the seller;
- the name and address of the buyer;
- the date delivered;
- the quantity delivered and the quantity upon which the price is based; if this differs from the delivered quantity;
- the price of the amount delivered; and
- the identity (species) and quantity of the wood as nearly as is commercially practicable, e.g. 35% oak, 25% maple, 25% beech, and 15% mixed hardwoods.

If you are home when the wood is delivered, do not be afraid to measure it on the truck. Remember that a cord of wood will not fit into most pick-up trucks.

Once the wood is neatly stacked, it can be measured. If you think that you were short-changed, contact the seller and try to reach an agreement. If that is unsuccessful, contact the Bureau of Weights and Measures in Augusta (289-2752). If necessary, you may also file a complaint with the Consumer Fraud and Antitrust Division of the Attorney General's Office (289-3661).



Heat Value

Different species of wood have different heat values. Generally speaking, the heavier or more dense the wood, the higher its heating value. Lighter or less dense wood will have a lower heating value. Table 3 compares the heat values for a number of species.

Table 3
Approximate Weight and Heat Values of Selected Cords of Wood

Species	Weight (pounds) Air-dry	Green	Available Heat units/cord of 90 solid cubic feet (in millions of BTU's) Air-dry	Green	Gallons of fuel oil equivalent to one Cord Air-dry Wood
Hickory	4,600	5,700	24.8	23.1	177
White Oak	4,300	5,600	23.9	22.4	170
Sugar Maple	3,900	5,000	21.8	20.4	155
Red Oak	3,900	5,800	21.7	19.6	155
Beech	3,900	5,000	20.9	19.7	149
Yellow Birch	4,000	5,100	20.9	19.4	149
White Ash	3,800	4,300	20.5	19.9	146
Paper Birch	3,800		18.2	16.7	130
Tamarack (Larch)	3,600	4,200	18.7	17.2	134
Red Maple	3,200	4,700	19.1	17.6	136
Gray Birch	3,500		17.5	16.1	125
Elm	3,100	4,400	17.7	15.8	126
Pitch Pine	3,200	4,900	18.5	16.4	132
Red Pine (Norway)	2,800	3,500	17.8	16.8	127
Red Spruce	2,600	3,000	15.0	14.2	107
Aspen (Poplar)	2,400	4,200	14.1	12.2	100
White Pine	2,700	3,500	14.2	12.9	107
Hemlock	2,600	4,400	15.0	12.8	107
Balsam Fir	2,200	3,700	13.5	11.5	96

*Based on data of Forest Products Laboratory, Madison, WI. Weights for air-dry and green wood and assuming 7,350 Btu's available per pound of dry wood with flue gases at 300 degrees F. From Bulletin 753, U.S.D.A.

Fuel oil equivalents are figures on the basis of 140,000 Btu's per gallon of oil.

If you purchase firewood, you will generally not have your choice of tree species. However, you should pay less for a cord of wood containing species of low heating value than you would for one containing species of high heating value.

If you are buying firewood, a cord of hardwood will generally provide you with more heat value than a cord of softwood. Many people like some softwood for kindling or for the "swing" seasons of fall and spring, when you simply want to take the chill off the house. If you cut your own firewood, cut both hardwood and softwood, in order to improve the remaining forest stand.

Most wood that you purchase will be green and have a fair amount of water in it. Be wary of advertisements for "seasoned" or "dry" wood. It takes at least 6 months of air drying for wood to be considered "dry". If the wood has not been cut and split, under cover and has not been drying for at least 6 months it will have much more moisture than the 20% considered air dried. You will pay more for dry wood—just be sure that it is "dry".

Firewood Characteristics

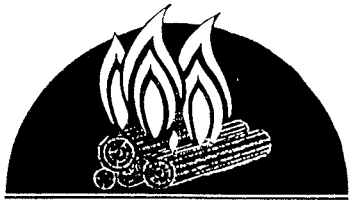
In addition to the types of wood to burn, other characteristics should be considered. These include:

- ease of splitting;
- ease of ignition and burning;
- the extent of smoking;
- the extent of sparking; and
- coaling qualities.

Table 4 gives the quality characteristics of some commonly burned woods.

Table 4
Quality Characteristics of Commonly Burned Woods

Species	Easy to Split	Ease of Starting	Heavy Smoke	Sparks	Coaling Qualities
Apple		poor	no	few	excellent
Ash	yes	fair	no	few	good
Beech	no	poor	no	few	good
Birch (white)	yes	good	no	moderate	good
Cherry	yes	poor	no	few	excellent
Cedar	yes	excellent	yes	many	poor
Elm	no	fair	medium	very few	good
Hemlock	yes	good	medium	many	poor
Hickory	yes	fair	no	moderate	excellent
Locusts	no	poor	no	very few	excellent
Maple (sugar)	yes	poor	no	few	excellent
Oak (red)	yes	poor	no	few	excellent
Pine (white)	yes	excellent	medium	moderate	poor
Spruce (Norway)	no	good	yes	moderate	poor
Tamarack (Larch)	yes	good	medium	many	poor
Willow	yes	fair	no	few	poor



3 EFFICIENT WOODBURNING

Wood smoke pollution is caused by the incomplete combustion of wood. Wood smoke contains over 100 different chemicals and compounds. Particles in the smoke can lodge deep in the lungs where they can cause or contribute to respiratory problems.

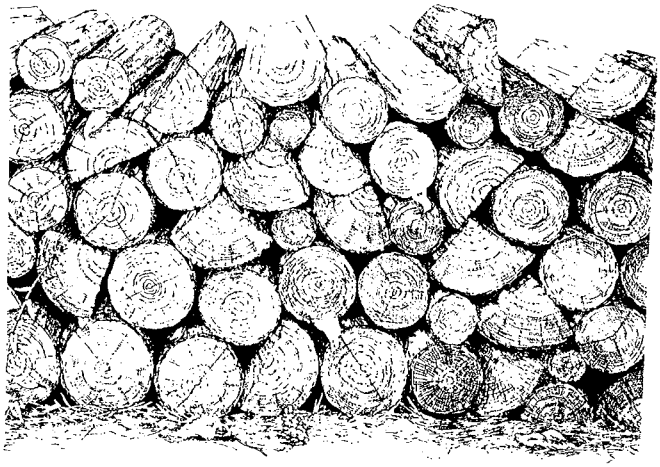
One group of these respirable particles is called polycyclic organic matter or POMS. POMS contain some chemicals that are known or suspected carcinogens.

Fortunately, the steps a woodburner can take to burn wood safely and more efficiently are the same steps that can help decrease wood smoke pollution.

Size your woodstove properly.

One of the biggest mistakes woodburners make is to size their woodstove too large for the space they intend to heat. You should take into account how well your home is insulated. A house with an average amount of insulation will lose about 45 Btu's per square foot per hour, while a house with many large windows may lose an additional 60%. A super insulated house may lose only 23 Btu's per square foot per hour.

A stove that is sized too large for the space to be heated will have to be over damped, a process that increases the safety hazards of fire from creosote and health problems from air pollution. A properly sized stove will be able to heat your desired space even on the coldest days.



Purchase more efficiently designed woodburning equipment.

Research is developing better designed fireboxes, drafts, catalytic combustors, and other woodburning device modifications that improve combustion and reduce woodsmoke pollution. When you purchase a new woodburning device, consider purchasing one that is better designed and more efficient than your present one.

Burn only the fuel your stove is designed to burn.

Certain fuels should not be burned in an ordinary stove, because they burn too hot for the stove design and can create a fire hazard. Coal must have both a primary and secondary air supply. The primary air supply must come from below the coal, whereas the primary air supply for wood comes in over the top of the fire. If your unit is designed to burn either wood or coal by changing grates or other modifications, then you can burn either fuel as long as you do the proper modifications before burning.

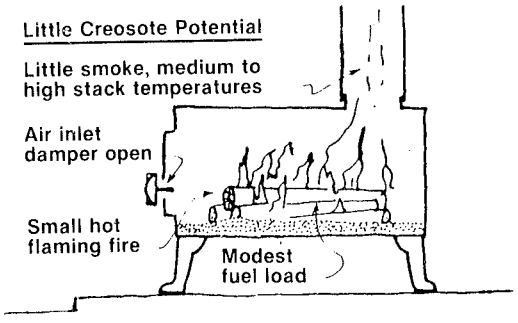
Trash should not be burned in a stove. In addition to increasing the chance of igniting a chimney fire, certain plastics and other trash emit harmful chemicals and gases.

Burn seasoned wood.

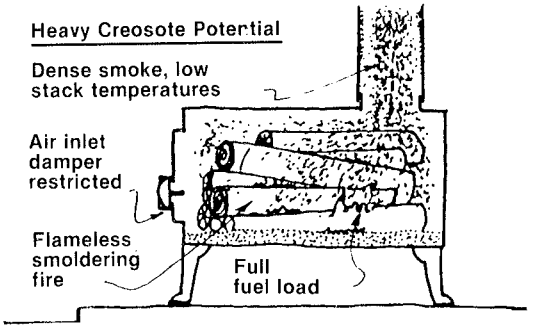
Wood burns in stages. First, the wood is heated to evaporate and drive off moisture. Green wood can contain up to 50% of its weight in water. The heat needed to drive off this water does not heat your stove or house, but is necessary before the volatile matter can be vaporized. These vapors contain over half of the heating value of the wood. Burning seasoned wood increases the efficiency of the combustion process, which helps decrease the amount of creosote buildup in your stovepipe and chimney.

Burn small hot fires.

A small hot fire decreases the amount of creosote and increases the efficiency of the combustion process, because the volatiles are burned more completely. A small hot fire produces fewer safety hazards and health problems than a fire that is over damped. Even though small hot fires mean more frequent loading and tending of the stove, the improved efficiency and decreased air pollution are worth the effort.



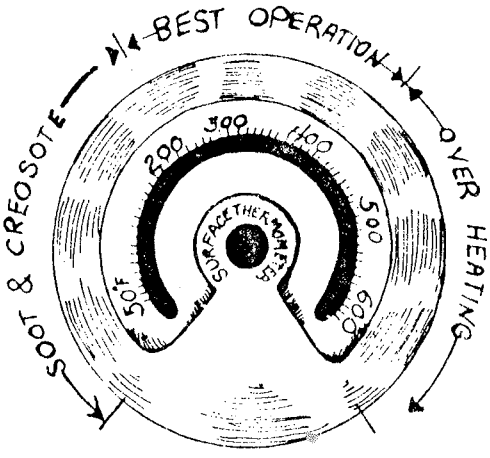
A smoldering fire has a heavy creosote potential. The wood is not burned efficiently and the safety hazards and health problems are much greater than with a small hot fire. The indoor air pollution can also be increased with a firebox packed with wood.



Whenever you load your stove always be sure that the flue and stovepipe dampers are open. Slowly open the firebox door to allow the fire to adjust to the increased air flow. This will also help carry smoke up the flue, instead of into the house.

Install a stack thermometer on the stove flue.

A stack thermometer can help you monitor the temperature of the gases as they leave the stove. The most efficient and least polluting temperature range for the gases is about 300 to 400° F.

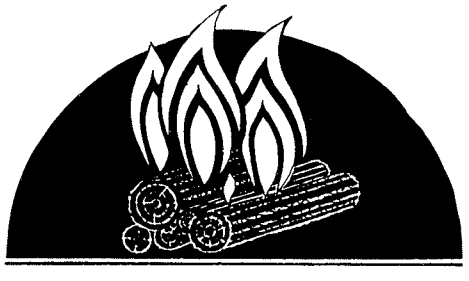


Remove excess ashes.

Excess ashes can clog your stove's air intake vents and decrease the amount of oxygen and turbulence required for efficient wood burning.

Weatherize your house.

Insulation, storm windows, weatherstripping, and caulking can all reduce energy consumption for woodburners. They also decrease the amount of wood required to heat your house, which will help decrease the amount of air pollution.



4 NEW EQUIPMENT DEVELOPMENTS

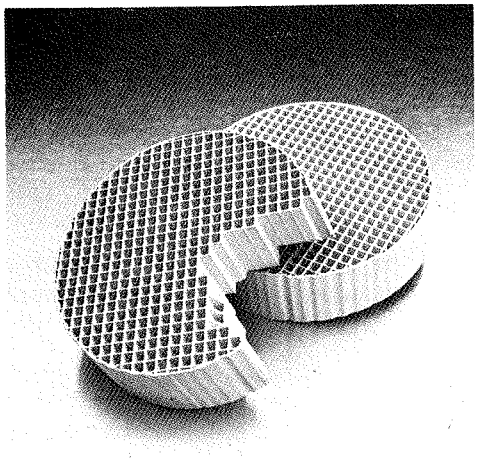
There are two new equipment developments making woodburning devices more efficient than those of the past. These are the stove's design and catalytic combustors.

Design Modifications

New generation stoves are using a variety of design modifications such as preheating the combustion air, using high temperature ceramics in the firebox or using secondary burn chambers to increase the efficiency of the woodburning device. All of these modifications are designed to improve the stove's combustion, thereby decreasing smoke pollution and creosote buildup.

Catalytic Combustors

A catalytic combustor is a honeycombed high temperature ceramic, about 6-8 inches in diameter and about 4-5 inches deep, which is coated with a catalyst. (A catalyst is something that speeds up a process, yet is not consumed by that process.) The catalytic combustor initiates a chemical reaction that causes smoke to ignite and burn at a temperature of about 500 degrees F, which is far below what is normally required.



How a Catalytic Combustor Works

A stove equipped with a catalytic combustor will contain these components:

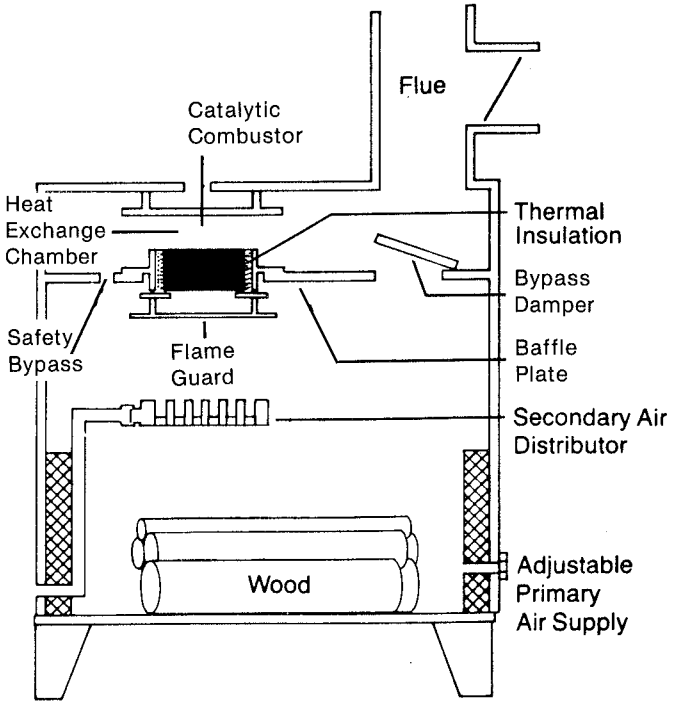
— a heat exchange chamber where the heat from the primary fire and that from the catalytic combustor is captured;

— a baffle plate that separates the firebox and the heat-exchange chamber. This plate holds the combustor, a bypass damper and a safety bypass;

— a small opening or safety bypass in the baffle that allows some smoke to pass around the combustor and into the flue, if the combustor becomes plugged;

— a bypass damper that provides a passage for smoke when a fire is first started, before it has reached a sufficient temperature to allow the catalytic combustor to work, and when fuel is added; and

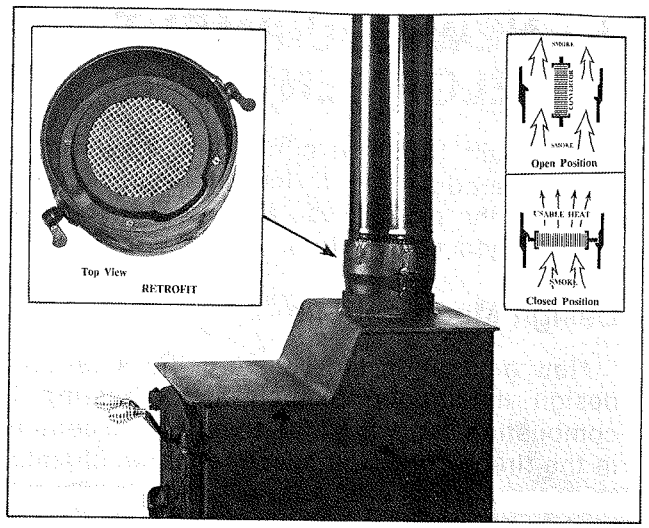
— a flame guard that protects the bottom of the combustor from direct flame damage and from impact during loading.



When a fire is first started, the bypass damper is pulled over the catalytic combustor to allow the smoke to go directly out the stovepipe. When the fire reaches a temperature hot enough to allow the combustor to function, the bypass damper is pulled off the combustor and the smoke is routed through it.

Once the catalyst is activated, the stove can be damped down and operated normally. When a slow burning fire is refueled, however, the catalyst must be reactivated by allowing the fire to burn hot for about 15 minutes.

Several items will plug the catalytic combustor if they are burned in the woodstove. These are driftwood, treated wood, artifical logs, coal, or anything containing lead, zinc, sulfur or plastics. Only natural wood should be burned in a stove equipped with a catalytic combustor.



Catalytic Maintenance

The catalytic combustor is basically self-cleaning, although it does require some maintenance. If ash collects on the face of the combustor, it can be cleaned off with a soft fiber brush like a paintbrush. The internal portion of the combustor, i.e. the honeycomb portion, should never be cleaned with anything.

A catalytic combustor must be replaced approximately every 3 years. Sluggish stove operation, creosote formation in the chimney, or more than a normal amount of smoke coming from the chimney indicate that a new combustor is required.

Catalytics and Woodstove Efficiency

Several independent laboratories have tested catalytic combustors. Their results are very promising and show conclusively that catalytic combustors improve stove efficiency while substantially decreasing woodsmoke pollution and creosote buildup.

Catalytic Combustor Retrofits

There are catalytic retrofit kits available on the market. These units have received mixed reviews from testing labs. It appears that they also improve stove efficiency and decrease woodsmoke pollution and creosote buildup, but not as much as a woodstove with a catalytic combustor designed in it. Retrofits range in cost from about $75 to $250.

5 CHIMNEY AND STOVEPIPE CLEANING

There are 2 major reasons for cleaning your chimney and stovepipe:

- To reduce the fire hazard by removing creosote deposits, and
- To maintain the efficiency of your wood-burning system.

Creosote

Creosote is a dark brown or black substance formed by the incomplete combustion of wood. The amount of creosote deposited depends on how dense the smoke and fumes from the fire are and on the temperature of the surface where the incompletely burned materials condense. Cool or cold surfaces will develop creosote more rapidly than warm ones.

Although at one time it was felt that burning green wood and softwoods would increase the amount of creosote, recent studies have shown that seasoned hardwoods burned in an airtight stove will produce substantial amounts of creosote.

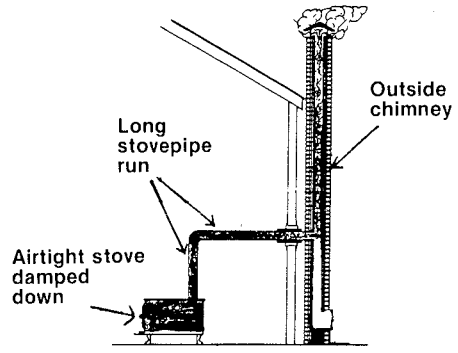
Dry wood should be burned because it will give off more heat content than green wood, since the green wood must be dried before it will ignite. Creosote buildup is, however, a function of how you burn your wood, rather than what you burn.

Creosote can take several forms. It can be watery, tar-like, flaky with one shiny side, or bubbly. Any part of your woodburning system from the stove itself to the chimney can collect creosote. You may have all the different forms of creosote in different parts of your system.

There are 3 things that add to creosote buildup:

- Outside chimneys, especially ones on the north side of the house, will be more susceptible to creosote formation than inside chimneys.
- Airtight stoves, especially if they are damped way down, will produce more creosote than non-airtight stoves.
- Long runs of stovepipe or a stovepipe with a number of bends will also increase the amount of creosote formation.

Virtually all residential woodburning creates creosote. Even wood-fired central heating systems will get a buildup of creosote. Some new central heating systems and woodstoves are designed to minimize creosote formation. But creosote buildup will require some form of regular cleaning.



Creosote Buildup

Your chimney and stovepipe should be cleaned any time the creosote buildup reaches ¼ inch in thickness. As an absolute minimum, your chimney and stovepipe should be cleaned once a year.

Springtime is a good time to clean your chimney and stovepipe before there is very much rain. Rain mixes with the creosote and forms caustic substances and tends to smooth out the creosote making it more difficult to remove.

There are several ways that you can detect a buildup of creosote, these are:

- Creosote dripping from stove pipe joints;
- Hearing a dull thump when the stovepipe is tapped, instead of a clear sharp noise;
- Visually checking through the cleanout tee or door or by using a flashlight and mirror to look up the chimney;
- Visually checking the chimney from the roof using a lightbulb or flashlight (as long as your chimney is not too tall); or
- Physically removing a section of stovepipe to check for creosote buildup.

Chimney and stovepipe cleaning.

If your chimney has a cleanout door or tee or if you can easily get inside your chimney (e.g. a chimney connected to a fireplace), you can probably clean it from the inside of your house. Otherwise, it will have to be cleaned from the outside. The stovepipe can often be disassembled and taken outside to clean. If you clean your chimney and stovepipe from the inside, make sure you cover the surrounding area with dust covers.

Cleaning devices

There are a number of cleaning devices on the market that can be used to clean your chimney and stovepipe. Steel bristled brushes can have either flat wire bristles or round bristles. If you have a masonry chimney, use a steel brush. You can get them in various sizes and shapes to fit your particular chimney. Flat wire bristles are able to dislodge more hard creosote than the round bristled ones.

A plastic brush should be used on a stainless steel or factory built chimney. A steel brush has the tendency to scour the metal, which can lead to faster deterioration by the caustic elements in the wood smoke.

There are also various types of plastic or steel scrapers that you might find useful for scraping hard to remove creosote. The general rule is to use steel devices on masonry chimneys and plastic on metal chimneys. You may have to experiment to determine what works best for you. Stove shops and most hardware stores carry an assortment of chimney and stovepipe cleaning devices.

Some brushes have loops at either end to enable ropes to be tied to each end of the brush. This will enable one person to pull the brush down, while another person can pull the brush up. Other brushes have a loop at one end where a weight can be tied, and others have a connector at the top where extension rods can be connected.

Some brushes are designed to make one pass through the chimney or stovepipe. With other brushes you will need to scrub up and down on one area at a time, until it is clean and then do the next section.

Make sure that you close off the bottom of the chimney, so that the dust will not fly all over your house. Be sure you wear protective clothing and a nose mask. Some of the components of creosote are carcinogenic, so you will want to protect yourself as much as possible. After you have finished cleaning your chimney and stovepipe, be sure to wash yourself thoroughly.

If you are cleaning from the roof, be sure that the ladder and your footholds are secure. If you have a very steep roof, tie a rope around your waist and secure it to something on the ground on the opposite side of the house.

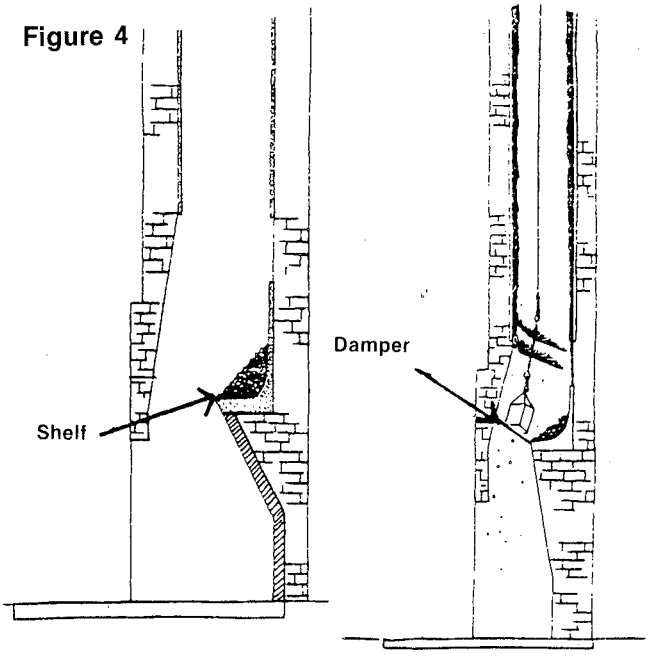
If your chimney is part of a fireplace, be sure to completely clean the shelf above the damper, where creosote tends to collect (Figure 4).

After you have cleaned the chimney, inspect it. If the chimney has many areas of hard shiny creosote that you cannot remove, it may be unfit for a woodburning device. If you have these types of deposits, you should have your chimney inspected by your local fire official or a reputable chimney sweep.

After you have cleaned your chimney, clean the stovepipe and the inside of your stove. You may find that you need different sized brushes or plastic brushes to do this. Scrape the stovepipe in the same manner as you did the chimney.

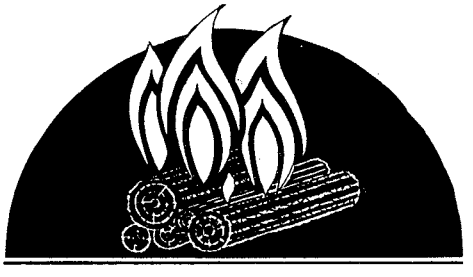
After you have cleaned your system, you should check for any leaks in your chimney. Start a fire, then take a wet rag and cover the top and bottom openings. If you have a leak, you should be able to spot the smoke.

Figure 4



Chimney sweeps

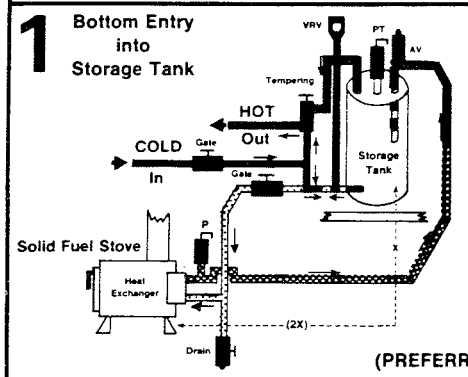
If you would prefer to have someone else clean your system, there are a number of chimney sweeps in the State. The best way to find a good chimney sweep is to talk to your woodburning friends, relatives, and neighbors and get their personal recommendation. You should, however, still check your sweep's credentials. A list of sweeps is available from OER.



HEATING WATER WITH A SOLID FUEL STOVE

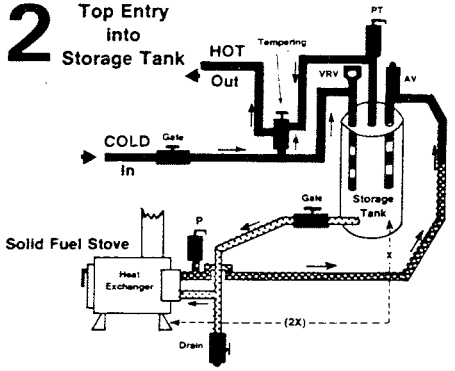
PASSIVE (THERMOSYPHON) SYSTEMS

1 Bottom Entry into Storage Tank



(PREFERRED)

2 Top Entry into Storage Tank



NOTES:

PASSIVE SYSTEM

- This type of system can be used when the cold water outlet on the storage tank is at least 1 foot higher in elevation than the hot water outlet of the heat exchanger for every 2 feet it is away. Keep the storage tank as close to and as high above the stove as possible.
- Keep the recirculation loop as straight and direct as possible. Try to keep a slant in the piping of the recirculation loop to avoid air pockets and to encourage the thermosyphon flow.
- All piping between the heat exchanger and the storage tank (and vice versa) must be a minimum of 3/4" in diameter.

LEGEND — NOTES

AIR VENT: Minimum 3/4" 150 lb. air vent designed to bleed air out of system. Air vents must be located at the highest point in the system.

CHECK VALVE: Minimum 3/4" check valve designed to allow water to flow in only one direction. It must be installed on a level plane with flow direction arrow running horizontally.

DRAIN: Minimum 3/4" drain valve with hose bib is designed to drain and clean sediment from the system. It is installed in the lowest point in the system.

GATE VALVE: Minimum 3/4" gate valve is designed to shut off water flow in the pipe.

HEAT EXCHANGER: Heat exchanger (sidearm heater) is designed to heat water within the stove. Many of these devices are factory installed while others are commercially available options to be added afterwards. Coil should be made of brass or stainless steel.

PRESSURE TEMPERATURE OR PRESSURE RELIEF VALVE: 150 lb., 210° pressure/temperature relief valve is the main safety feature in the system. A PT Valve must be installed through the top of the storage tank on all systems, and pumped systems require a P Valve within 2 feet of the stove. The discharge from all relief valves should be piped to a suitable location.

PUMP: 1/32 horsepower bronze or stainless steel circulating pump is designed to mechanically circulate water through the recirculation hoop.

RECIRCULATION LOOP: The recirculation loop is the piping between the heat exchanger and the storage tank and back to the heat exchanger. It is designed to have continuous heat flow to the storage tank when the stove is at an operating temperature. The layout of the loop is very important on passive systems (See Passive System Notes). Use copper or brass pipe. The diameter of the pipe must be the same size as the coil inlet and outlet.

AQUASTAT (Well Type): A make circuit type aquastat heat sensor is installed on the outlet end of the heat exchanger within 2 to 4 feet from the stove, to activate the circulating pump when the water temperature is above 100° F. A break circuit type aquastat is installed in the storage tank to stop the circulating pump when water is at maximum desired temperature (140° to 180° F).

SOLID FUEL STOVE: Wood or coal burning stove.

STORAGE TANK: The storage tank can be either a pre-heated tank or a direct heated tank relying on electric or gas supplemental heat.

TEMPERING VALVE: 3/4" tempering valve is designed to prevent super heated water from reaching any fixtures. The tempering valve is installed on the hot water line leaving the storage tank and is connected to the cold water line. The tempering valve must be below the top of the storage tank to prevent constant exposure to extreme heat.

COLD In: Water supply line to dwelling. Arrow in direction of flow.

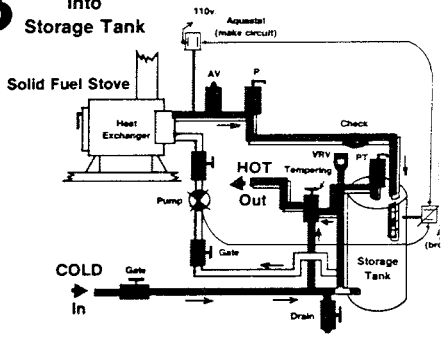
HOT Out: Hot water line to plumbing fixtures. Arrow in direction of flow.

VACUUM RELIEF VALVE: A vacuum relief valve is installed in the cold water supply line and should be at least 6 inches above the storage tank. It is designed to open and relieve any vacuum on the storage tank that would cause it to implode.

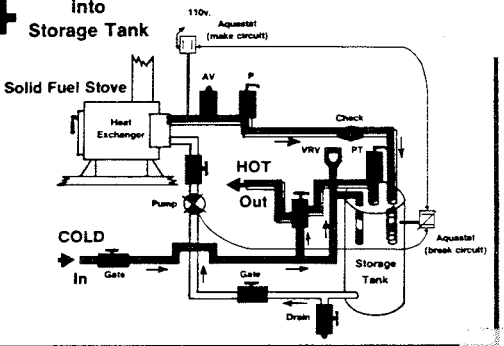
DIELECTRIC UNION: Dielectric unions should be used to join steel piping to copper piping. Without these unions electrolysis can break down the dissimilar pipes causing leakage. Disconnect these unions if the stove is used without water in the piping system to prevent melting the plastic insulator.

PUMPED SYSTEMS

3 Bottom Entry into Storage Tank



4 Top Entry into Storage Tank



NOTES:

PUMPED SYSTEMS

- This type of system must be used when:
  - (a) the storage tank is below the stove
  - (b) when the storage tank is above stove but less than 1 foot higher fo every 2 feet it is away
  - (c) if the recirculation loop is indirect and
  - (d) when more efficiency is needed due to higher demand.
- Needed in this type of system are: an electric pump to circulate the wate and two aquastats.
- Additional safety precautions are required in the event of pump failure o power outage.

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