Fireplaces and chimneys

For safety and liability reasons, I do not light a fire in any fireplace to check for proper operation, so the fireplace has not been checked for actual function in burning gas or solid fuels. Additionally, gas shutoff valves for gas fireplaces are not operated under any circumstances.

Fireplaces and chimneys should be inspected on at least an annual basis, and more often depending on usage. Inspection of the fireplace during the property inspection is limited to visible and accessible sections only. The inner reaches of the flue or chimney throat are relatively inaccessible, so the view from the fireplace or chimney is not adequate to discover possible deficiencies or damage, even with a strong light. I do not dismantle rain caps and spark arrestors on the chimney top to look inside the chimney flue.

Manufactured fireplaces are usually built for use with natural gas. Although some manufactured fireplaces are built for use with solid fuel, I can only verify approval for use with solid fuel if the manufacturer's installation instructions, approval statement, or use guidelines are available and state such approval. I am aware that many residents do burn solid fuel in the fireplace regardless of manufacturer instructions. If solid fuel is burned (and I emphatically recommend against it), do not burn pine or the various manufactured logs (see Figure 1) that are found at many stores; dry hardwoods are better, remembering that I still emphatically recommend against burning solid wood. Pine and manufactured logs typically burn hotter due to the sap present in the materials and typically will increase soot in the chimney.

If you notice soot above the fireplace (see Figure 2), there's a good possibility that your fires are too large for the fireplace or that the fireplace and chimney are not operating properly, creating poor drafting conditions (drafting is when the combustion gases and soot exit the structure through the chimney). Poor drafting can result in not only smoke and soot in the home, but dangerous gases as well, such as carbon monoxide.

Some newer fireplaces don't need a chimney. Instead they have what is called a direct vent. These vents typically are located at about three to five feet on exterior walls, which is unfortunate since they become very, very hot and have resulted in young children being serious burned. Therefore, I recommend having a protective cage installed over the direct vent (see Figure 3).

Direct-vent fireplaces usually are operated by a wall switch and have a solid glass window that cannot be opened. The glass window becomes extremely hot during operation, so protect the beautiful flames from

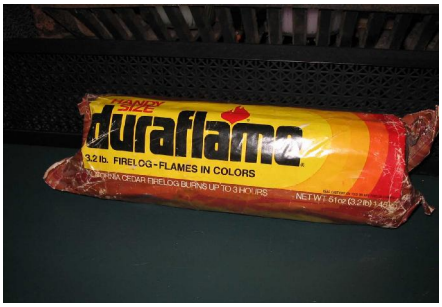

Figure 1. One of several types of manufactured wood logs.

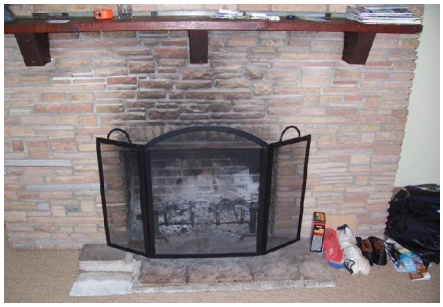
Figure 2. Soot above the fireplace can also indicate dangerous gases accumulating inside the home.

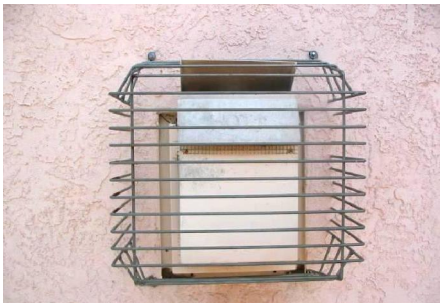
Figure 3. Wire cage installed over direct vent to protect against burns.

curious young children. Condensation sometimes forms on the glass of direct-vent fireplaces, particularly during the first few minutes of operation. According to Mr. Dale Feb, Executive Director of the Fireplace Investigation, Research, and Education Service (Moorpark, California), the white film includes sulfuric acid, produced during the combustion process. Sulfuric acid can permanently etch the glass and should be removed on a regular basis.

Vent-Free (unvented) fireplaces are typically designed to be installed in a fireplace (as an "insert") or in special fireboxes made to resemble a hearth. Unvented systems burn very hot and are specifically engineered to result in nearly complete fuel combustion—increasing energy efficiency (more of the fuel is converted to heat)—while decreasing byproducts like carbon monoxide and soot that are produced by other gas burning fireplaces. This is one reason they can safely be vent-free; however, as with all systems, they can fail, so make sure you have carbon monoxide alarms in your home.

Inspection, testing, or analysis of free-standing fireplaces, also called Franklin stoves, is not within the scope of a property inspection. Such fireplaces can be unique in their installation, operation, and maintenance. Ask the seller for any operation, maintenance, installation guides, receipts, and warranty information that might be available. You might also be able to download such guides from the manufacturer's web site.

The National Fire Protection Association and the Chimney Safety Institute of America recommend that fireplaces and chimneys receive a "Level II" inspection whenever real estate is sold or transferred. I agree with those distinguished associations, of course. From the Chimney Safety Institute of America:

> **Level II inspection**
>
> The addition of a new home heating appliance or a change in the type of fuel a homeowner is burning requires a Level II inspection. This type of inspection should also be completed upon the sale or transfer of a property or after an operating malfunction or external event that is likely to have caused damage to the chimney. The scope of a Level II inspection includes that of the Level I inspection plus the inspection of accessible portions of the attics, crawl spaces, and basements. It may also include a performance test, such as a smoke test or a pressure test, and possibly an interior chimney video inspection if recommended by the certified chimney sweep. Click here for helpful information on the other inspection levels of the Chimney Safety Institute of America. You can also use their web site to find a certified chimney sweep.

Recommendations

- Have a qualified fireplace professional inspect free-standing fireplaces before close of escrow.
- Ask the seller about the most recent inspection and have a qualified fireplace professional inspect the fireplace if it cannot be proven that it has been inspected within the past twelve months.
- Have a qualified fireplace professional inspect your fireplace and chimney at least annually.
- Use caution when the fireplace is in use, especially if children are present.
- Ask the seller for any manufacturer installation, user, safety, or operating guides for the fireplace.
- Have direct vents located on lower exterior walls protected against damage and touching.

Chimneys

What's inside a chimney?

How does it work?
What parts can a homeowner check?

One thing I have noticed over the years is that there are a lot of people who have fireplaces or stoves and would like to have a fire now and then, but never do because they think there is something wrong with the fireplace, stove, or chimney.
Chimneys are not particularly complicated, but most people don't really understand how they work. Knowing the basics will make sense of the whole process of building a successful and safe fire and how to avoid common chimney-related problems.
In later sections we will talk about appliances, stoves and fireplaces and what you need to know about them.

Types of Chimneys

Masonry Chimneys. What we usually picture when we think about chimneys is a masonry chimney: one constructed of brick, concrete blocks, or stone. But current building technology includes another major category, the factory-built chimney.

Factory-Built Chimneys. Builders and remodelers can now choose from a wide variety of chimneys constructed of metal and other materials. These chimneys are manufactured in a factory and assembled at the site. Among the more popular types of factory-built chimneys are:

* *Double-wall, mass-insulated chimneys*: Two layers of metal, generally stainless steel, with an insulative material between the layers of metal. Picture a pipe inside a larger pipe, with the space between the two packed with insulation.
* *Air-cooled chimneys:* Two or more layers of metal with air in between, constructed so that the air circulates between the layers, dissipating the heat.
* *Air-insulated chimneys:* Similar to the air-cooled design, except it is constructed for minimal movement of air between the layers, so the air acts as an insulator instead of drawing heat away.
* *Combinations:* Chimneys which incorporate a combination of mass-insulation, air-cooling and/or air insulating designs.

With so many types of chimneys to choose from, the question arises...
What type of chimney is the best?

There are advantages and limitations to each kind: Masonry chimneys incorporate traditional beauty that many homeowners want. Factory-built chimneys offer a non-masonry option that often proves easier to install, at a lower price. Some types of chimneys are designed only for appliances that burn certain fuels.
Determining the best type of chimney for *you* requires a complete picture of the specific appliances (fireplaces, wood stoves, furnaces, etc.) that the chimney must serve, and the specific venting requirements for those appliances.

For example, factory-built fireplaces often require specific types of factory-built chimneys, while most wood stoves can be connected to either a masonry chimney or certain types of factory-built chimneys.
If you plan to have a new chimney installed, first find out what type of chimney you need for your appliance. Check the owner's manual for wood stoves or factory-built fireplaces. Chimney requirements should be spelled out pretty clearly.

If you plan to install a new (or used) appliance into an existing chimney, you need to do the same thing. It could be disastrous, for example, to connect a wood stove into a chimney that is designed only for a certain type of fireplace. Don't assume that you have the right type of chimney. Find out for certain.

Anatomy of a Chimney

Here's a Tip:
If you can't find the manual, ask your local stove shop if they have a manual you can look at, or if it is possible to order one. If not, they might still be familiar enough with your model to offer some useful information.
A chimney, simply put, is a vertical tube designed to draw combustion products (smoke and gasses) from an appliance like a wood stove or fireplace to the atmosphere outside the house. Here are the basic parts:

Flues. Inside a chimney you'll find one or more vertical passageways called *flues*. Ideally, each appliance connected to the chimney (such as each fireplace, each furnace, each wood stove) has its own, separate flue. More than one flue might be contained in one masonry chimney. So if you have a furnace and a fireplace connected to the same chimney, there should be at least two vertical passageways up the inside of the chimney. *Metal factory-built chimneys, of course, contain only one passageway for venting combustion products, the inside of the pipe.*

Flue liners. In a modern masonry chimney, the inner wall of the flue is lined with some type of material, for safety, ease of cleaning, and improved performance. Among the most common types of liners are:
Terra-cotta. Baked clay liners, also called *terra-cotta* or *tile* liners, are generally about 5/8" thick, and look like two-foot long square, rectangular, or round tubes. They are cemented end-to-end up the inside of the flue to form a continuous, smooth lining. Terra cotta is not the only material used to make modular liner tubes. Some are composed of refractory cement, volcanic pumice, or a combination of fireproof materials.

* ***Other modular liners****:*
  Stainless Steel. Especially useful in re-lining existing chimneys (But used in new construction, as well), stainless steel liner systems incorporate a metal tube, rigid or flexible, with some type of insulation around it. The metal tube provides a continuous, even lining, and the insulation forms an additional layer of protection and helps keep the flue warm.
  Aluminum. Some installations of gas-fired equipment allow for the use of lower-cost aluminum liner systems. *Cast-in-place.* Cast-in-place liners are, in essence, a thick layer of a highly durable, insulative, cement-type material applied to the walls of the flue.
  One method (but not the only one) for installing a cast-in-place lining involves inserting a removable rubber tube the full length of the flue and pumping the liner material in. The tube is later removed, leaving a smooth-walled, cast-in-place flue liner.

Note: For a metal factory-built chimney, the inner wall of the chimney serves the purpose of a chimney liner.

* **Which is the Best Type of Liner?**
  This depends on many factors, including the type of appliance, the type of chimney, and its intended use, not to mention, who's answering the question! If you are planning to have a new chimney built, or considering having your chimney re-lined, get as much information as possible about the appliances you will be using on that chimney. Check the owner's manual to see if there are specific recommendations for or against certain types of chimneys or liners. Talk to the experts at your local stove shop, and talk to your chimney professional.
  Don't assume that any old liner is fine, or that the brick mason knows what type of liner is best. I

do not mean to be critical of masons and their work is certainly important, and a good mason is a true artist. But with new wood burning technology has come the need for new types of liners; and if you don't ask the people on the front lines, the ones who deal with the issue of selling theses appliances and making happy customers, you might end up with a chimney liner that is totally inadequate for your needs even though it might be a well-built one!

Current construction and safety standards require that *all* chimneys be lined. So if you think your chimney is *unlined*, or you are not sure, have your chimney checked by a chimney professional, and ask him/her what types of liners are appropriate for installation in your chimney.

Chimney Crown. The top of a masonry chimney is called the *crown*. It should be gently sloped toward the edge, causing rainwater to run off. The flue liners should extend above the crown at least two inches (maybe more, depending on the local building code), so you might be able to see the tops of the liners from the ground.

Cleanout door. At the base of each flue you should find a small, metal *cleanout door*. When your chimney professional cleans the flue, the soot and debris will be removed through this cleanout access. The exception is a fireplace, which needs no door, since the soot is cleaned out right at the fireplace opening. If you find a door in the cellar centered below the fireplace, it is probably an ash pit door. We will talk about that in the section on fireplaces.

Those are the basics. We will discuss other parts of chimneys as we cover relevant topics.

How Chimneys Work:

The purpose of a chimney is to take the combustion products (smoke and gasses) from the appliance to the atmosphere outside your home, and at the same time, to draw air for combustion into the appliance. This movement of combustion air and exhaust is called *draft*.

In essence, it is the difference in pressure between the air/gasses inside the chimney flue and the outside air that creates this movement. Warmer, lighter gasses in the flue tend to move upward.
To keep the pressure conditions favorable, we need a tall column of warm air inside the chimney, and cooler air outside. The warm air will tend to rise, drawing the exhaust from the appliance out. As air exits the chimney, fresh air for combustion is drawn into the appliance.

Factors affecting draft. Since draft is a measure of pressure, chimney draft is affected by pressure conditions in the house. Several factors come into play:

Adequate air. First, there must be adequate air movement into the house to make up for the air exiting through the chimney. If the house is very tightly insulated, the volume of air drawn up the flue will exceed the volume of air entering the house, and the house will gradually become depressurized. With lower pressure in the house than outside, there will be a tendency for air to be drawn into the house from all available openings, including down the chimney.

Air movement in the house. Second, air movement in the house must not interfere with the chimney. Picture a house with the upstairs windows open. Warm air in the house will exit through the open windows. The entire house then becomes like a big chimney. As air flows out through the windows upstairs, air is drawn from downstairs to replace it. This is called the *stack effect*, since the house acts like a *stack*, or chimney. Open windows upstairs are just one cause. A poorly-insulated roof, a drafty attic, a tall stairwell, or anything else that allows a considerable amount of heated air to exit the house upstairs could create a stack effect problem. If the *stack effect* is powerful enough, it will overcome the chimney's upward draft and pull replacement air (and smoke) into the house through the chimney.

Competition for available air. Third, there must not be too much competition from other devices in the house, such as exhaust fans or air-exchange systems. If something else is sucking the air out of the house, the chimney might not be powerful enough to overcome it, and exhaust might be drawn into the house from the chimney.

Proper chimney design. And finally, a chimney must be designed to accommodate the volume and type of exhaust being emitted by the appliances it serves. This involves correct sizing, adequate height, proper construction, and the use of appropriate building materials.
Since the chimney draft is affected by so many factors, draft problems can be complicated. We will cover diagnosis and correction of draft problems in the sections on fireplaces and stoves.

Chimney safety should be a concern for every homeowner. Each year, lives and property are lost due to improper care and maintenance of chimneys. You can check some parts of the chimney yourself. We will review those below. But other parts need to be checked by a professional.

Things you should know about your chimney

Is the chimney structurally sound?
Was it constructed properly?
Is it lined?
Is the lining in satisfactory condition?
Are the appliances properly installed?
Does it require cleaning?
What other maintenance is required?
Is there a chimney cap on the chimney?

Checking a Chimney

This is why you should have your chimney checked at least once each year by a chimney professional, and cleaned if necessary. In some cases, your chimney professional will advise more frequent visits. Since fire safety is involved, let's talk first about the services of a chimney professional; then we will cover things you can do yourself.

Hiring a Chimney Professional

In checking your chimney, a chimney professional can check all of the visible components of the chimney for damage, needed maintenance, and fire safety.

A chimney professional is trained to look for dangerous or questionable conditions that a homeowner could easily miss. The experience he/she brings to the process of checking the chimney is well worth the modest cost.

So what should you look for in choosing a chimney professional? Here are some specific things to consider before you hire someone:
In many areas there are few requirements (or none at all) for becoming a chimney professional. So the homeowner must be careful to pick a good, legitimate company.

There are many good, reputable companies that offer chimney services. A little bit of homework will help you pick one!

Things to ask about when choosing a chimney professional:

- **Training/Certification**
- **Explanation of Services**
- **Charges**
- **Insurance**
- **References**

Training. Ask what training the chimney professional has. How long has the company been in business? Some national organizations offer certification programs. So ask if the chimney professional is certified. And by whom? Call that organization and check.

Certification isn't a guarantee of great service and an un-certified chimney professional might be perfectly legitimate, but certification is a measure of the training the chimney professional has received, and something you can verify by calling the certifying agency. Fly-by-night companies aren't likely to go to the expense and effort of becoming certified.

Make sure you know up front exactly what services the chimney professional offers. And don't hesitate to ask questions regarding your particular concerns about your chimney.

Charges. Ask what the charges will be. Sometimes it is hard for a chimney professional to give you an exact quote, since every chimney is different. But most companies will have standard rates for checking the chimney, cleaning standard flues, and other basic services.

Insurance. For your own protection when hiring *any* contractor, whether it is a chimney professional or anyone else, you should ask about insurance. Liability coverage is a *must*. Remember, the safety of your home is at stake. And what if the contractor is injured on your property? Is this covered?

Reference. Ask for references! Call at least a couple of other homeowners who have hired this company, and see what they think. Did the contractor explain things to the homeowner's satisfaction? Did they do what they said they would do? Did they clean up afterwards? Were they punctual? Most people are happy to tell you about their experiences, good or bad, with contractors that they have hired.

Once you have found a good, reliable company, schedule a date to have your chimney checked, and ask to be put on the schedule for annual visits after that.

Things Homeowners Can Check

Things you can check

- **Condition of exterior chimney**
- **Chimney Cap: is there one?**
- **Leaks/Stains**
- **Cleanout doors/base of flue**
- **Visual check of flues**
- **Condition of appliances & pipes**
- **Here are some things you can check. (But this doesn't take the place of having the chimney checked by a professional.)**

Condition

First, take a look at the chimney. Is there anything visibly wrong with it? For masonry chimneys, look for loose or missing bricks, chipped bricks or masonry joints, cracks, holes, a leaning chimney, or anything else that doesn't look right. Use binoculars to check the chimney top. And if the chimney is exposed in the attic, don't forget to check it there, also.

For metal factory-built chimneys, look for corrosion, loose sections, bending, any movement in windy conditions, and stains.

Any visible damage to the outside of a chimney is cause to have the chimney checked by a professional. If the outside is damaged, the inside could be in even worse shape.

Chimney Cap

Is there a cap on the chimney? Water from rain and snow entering chimneys gradually damages the inside of a chimney. Joints between liner tiles gradually dissolve, and corrosive elements in exhaust from furnaces mix with water and slowly weaken the lining. Water pooling at the base damages the chimney structure. Freezing and thawing of water causes expansion damage. A good chimney cap reduces this damage by keeping most of the water out.

Caps with a screen mesh also keep animals out. Raccoons, squirrels, and birds often nest in chimneys. These animals can bring fleas and ticks into your home, as well as rabies, worms, and other diseases, and, of course, animals and their nests can clog the chimney.

And finally, a cap with a screen mesh helps keep sparks off the roof. So if you don't have one, it is a good investment. Look for a cap that carries a lifetime warranty, and ask your chimney professional for a copy of the warranty card for your files.

Types of chimney caps

Some masonry chimneys have brick, stone, or concrete caps, raised above the top of the flues on brick or stone legs. Metal caps are also available. Stainless steel and copper caps offers superior durability, and often incorporate a screen mesh to keep animals out and keep sparks off the roof. Most factory-built chimneys incorporate a cap specifically designed to fit that brand of chimney.

Leaks/Stains

Next, look for leaks or stains inside the house near the chimney. Peeling wallpaper, stains on the walls, and dampness near the chimney are sure signs of chimney problems. Sometimes these problems are caused by faulty roof flashing around the chimney. But sometimes the source is the *inside* of the chimney, and this can mean trouble. Missing or damaged flue liners, interior decay, or excessive condensation in the flue could be the culprit. Consult a chimney professional.

A note about condensation in flues:

Today's gas-fired appliances emit a considerable amount of water vapor. If not vented into a properly-sized flue, condensation in the chimney can become a serious hazard. If you have a gas-fired appliance connected to your chimney it is critical to have the chimney checked periodically by a chimney professional. Don't make the assumption that just because there is no smoke, there is no problem with the chimney. Odorless, colorless carbon monoxide fumes from improperly-vented gas appliances can be fatal.

Safety Alert:

Don't check a flue that's currently in use, such as a flue serving a wood stove that is lit or a furnace that is turned on. First, make sure the appliance is off. And remember wear gloves for protection. Open cleanout doors slowly! There may be a considerable buildup of soot at the base of the flue.

Base of the Flue

Take a look at the base of the chimney (look in the cellar, or for chimneys built up, the outside of the house, check the base outside, too). Look for one or more cleanout doors. Take a look inside the door. Using a small mirror and a flashlight, you can look up the flue from the bottom.

Some flues have bends in them, so you might not see all the way to the top. But take note of any buildup of soot or debris at the base of the flue, and on the flue walls as far up as you can see. But be aware that even if the base looks pretty clean, the rest of the flue isn't necessarily clean. Most of the action takes place from the appliance up. So the chimney might still need cleaning.

While you are looking up the flue, try to spot any holes, cracks, or separations. But don't panic if you see something that doesn't look right. It takes a trained eye to determine just what's going on in a chimney flue.

And lastly, you can check the condition of the appliances and connector pipes. Again, this doesn't take the place of a professional check, but it will give you some ideas, and questions to ask.

Safety Alert:
Wear protective clothing including eye and ear protection when looking up into chimneys.
Fireplaces. Check the brickwork for wear and breakage. Check the damper. It should open and close easily, without binding on anything. Look up into the smoke chamber, above the damper.
Does the smoke chamber look clean, or sooty? If there is any amount of soot up there, or if you haven't had your chimney cleaned recently, have it checked and cleaned if necessary.

Wood Stoves

Check the condition of the stovepipe leading to the chimney. If it is rusty, soft, or has holes in it, replace it. Do you see any soot, creosote, or signs of leakage on the outside of the stove or stovepipe anywhere? This could signal an improper installation, and problems with the operation of the stove.
Check both the inside and the outside of the stove for cracks, bulges, warping, rust, or other signs of damage or wear. Most stove doors have a rope-style gasket around the edge for a good seal. Is the gasket in good shape?
Safety Alert:
Pipes might be hot. Be careful!

Furnaces

Checking the internal components of a furnace is a job for a furnace technician. But you can check the connector pipe for signs of damage. Look for rust, soft spots, or leaks. Be careful not to touch any electrical components, or anything attached to the connector pipe. If you see anything amiss with the appliances or connector pipes, give your chimney professional a call and find out if immediate attention is warranted.

Here's a trick for checking flues:

Hold a small mirror in the base of the flue, and hold the flashlight so it is pointing at the mirror, from the same angle as your eyes. Then you'll be looking (in the mirror) at the spot that the flashlight is illuminating. You can move the mirror around to see different parts of the flue. It is the same principle as the coal miner's hat with a light on it. The light shines where you are looking. It takes some getting used to, but it works.

Chimney Fires

Chimney fires are serious! Temperatures in the chimney during a chimney fire can reach over 2000 degrees Fahrenheit – hot enough to destroy the chimney liner and possibly set the house on fire.
Some chimney fires go unnoticed by the homeowner. Others sound like a freight train running through the house, and display thirty- foot flames shooting from the chimney top. Either way, they are bad news

Things to do if you have a chimney fire:
Call the fire department
Get everybody out of the house
If you have a chimney fire extinguisher, use it.
Close stove air inlets on stoves and glass doors (if you have them) on fireplaces.
Have the chimney cleaned and checked by a chimney professional before you use it again.
Some people think a chimney fire is a good way to clean the flue. They are wrong! Starting a chimney fire deliberately is foolish and dangerous. You could burn your house down.
And even if the house survives, you could cause thousands of dollars of damage to the chimney lining, or create hidden fire damage. Most chimneys have combustible materials in direct contact with the exterior surface of the chimney. If the chimney fire doesn't catch them on fire, it might still scorch or bake these combustible materials, making them more likely to ignite next time. ...Or the time after that. Play it safe, and leave cleaning the chimney to a chimney professional.

How can you avoid chimney fires?
Learn to operate your fireplace or stove correctly, and follow a regular routine of chimney cleaning. Especially for wood stove users, proper operation and the use of correct fuel are essential. Long, slow burns or the use of green or wet wood can create dangerous creosote deposits very quickly, especially in older, less efficient stoves.
Creosote. *A product of incomplete combustion: deposits of unburned, flammable tar vapors from wood smoke. Sometimes it's crusty or flaky in texture, but often sticky or hard, like slag. Creosote deposits are often hard to remove from chimneys, and pose a serious fire hazard.*
Proper operation will not only reduce the risk of chimney fires, it will also increase the efficiency of the appliance, reduce pollution, and save wood.

Chimney Maintenance

At least once each year you should have your chimney checked and cleaned if necessary, by a chimney professional. If you heat with wood, or if special circumstances of your chimney system warrant it, it may be wise to have the chimney checked more frequently.
When's the best time to have the chimney checked? If you haven't had it done this year, then now! But for routine maintenance, early spring, after the heating season is over, is the best time. Chimney cleaning in the spring leaves the chimney free of corrosive and foul- smelling soot deposits during the hot, humid summer months. And in the fall, you will be ready for the cold weather.