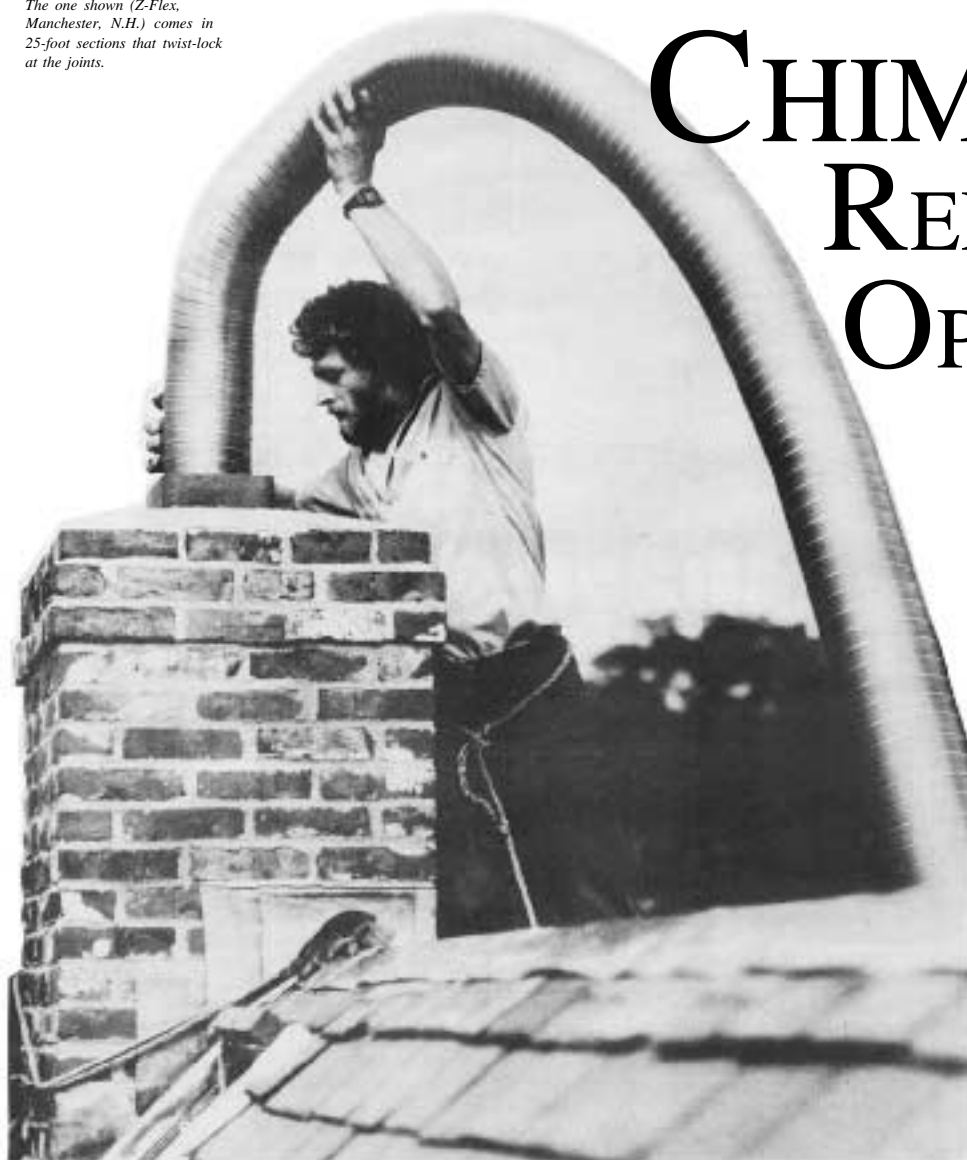


by Steven Maviglio

Flexible, stainless-steel pipe has become the first choice for relining chimneys with offsets. The one shown (Z-Flex, Manchester, N.H.) comes in 25-foot sections that twist-lock at the joints.

CHIMNEY RELINING OPTIONS



New flue systems offer safety, durability, and better stove performance.

Most homeowners find out the hard way about chimney relining: They have a chimney fire. Or their stove or fireplace wafts smoke into their living room on a regular basis.

Put simply, unlined chimneys are problem chimneys. First, they are safety risks: 2,100° Fahrenheit heat, sparks, and even flames can escape from a weak chimney through crumbling mortar and torch the surroundings fairly quickly. In addition, an unlined chimney can't be cleaned properly. Tar-like creosote can find its way into the smallest crevice in an unlined chimney, and become nearly impossible for a chimney sweep to remove. Furthermore, the new generation of airtight catalytic stoves need good draft. If the flue is too large (see sidebar on flue sizing) or too cold to vent combustion gases rapidly, smoke will inevitably puff back into the room on a regular basis.

"Think of the chimney as an exhaust system," says Martin Wawrla of Boatech, Inc., a flue-liner manufacturer. "High-efficiency stoves require high-efficiency chimneys, ones that can handle the amount and flow rates of heat from stoves. Old chimneys can't. It would be like trying to vent the emissions of a 1987 car with a Model T's exhaust system."

Clay Tile Impractical

Chimneys built in days before the Model T didn't have liners, and as a result, chimney fires were regular events. Most chimneys in New England homes that are 40 or more years old are unlined and, therefore, unsafe. Clay liners did not come into widespread use until the post-World War II building boom.

For new construction, terra-cotta clay tiles remain the most popular

type of liner. Masons like them because they are easy to install and widely available. But as an option for relining—lining an existing chimney—clay tile is usually the last choice.

Although the least expensive of all relining materials at about \$3 per foot, clay tiles are extremely difficult to install in an existing chimney unless it is extremely wide. Tiles must be lowered down the chimney one-by-one—a time-consuming, expensive chore requiring specialized equipment.

Each tile must be buttered with refractory mortar as well. It must then be set down perfectly on the tile below it—no easy task when working deep inside a tall chimney.

If the chimney has cracked tiles inside, or tiles with loose mortar, installing clay tiles becomes even more difficult. Existing tiles must be smashed and removed in their entirety.

This means breaking through the outer chimney. Most masons shy away from this type of job. Or they will charge at a rate that makes most of the other relining methods seem like bargains.

Steel Liners First Choice

The difficulty of installing clay tile has made relining with stainless-steel pipe the most common method of late. And for good reason: stainless steel is usually the easiest to work with, which cuts the time involved and thus the overall cost.

There are a number of options with stainless steel, beginning with the choice between *rigid* and *flexible* pipe. Rigid pipe is designed for straight chimneys. It costs about \$15 per foot for single-wall, 6-inch liner. Rigid pipe is available in many different diameters, and comes in sections ranging from 1- to 4-feet long.

These sections are screwed together and lowered down the chimney.

Seamless flexible pipe is more versatile, and the best choice for chimneys with offsets. It costs slightly more, but the extra material costs are quickly recovered in reduced installation time.

Both types of stainless liners should be tested minimally to the Underwriters Laboratories proposed standard for liners, UL-1777, which calls for testing to 1,700° Fahrenheit. Some manufacturers opt to have their liners tested to the higher temperature of 2,100° Fahrenheit to receive the designation of UL-1777 HT (for "high temperature"). This newer test approximates the temperature of a chimney fire. Since the chances are better than one-in-ten that the chimney will have to withstand a fire, it's better to invest in a liner that has been tested to 2,100° Fahrenheit and bears the HT label.

Another choice will be which type of stainless. Types 304, 316, and 321 are all fairly common. Most sweeps recommend type 321 since it is the most corrosion-resistant (important for coal burners) and can withstand high temperatures the best.

Installation of stainless-steel liners is a relatively simple procedure, but it takes a dozen jobs or so to achieve expertise. Basically the liner is centered and lowered down the middle of the chimney. The gap around the liner—which should measure at least 1 inch on all sides—is then filled with fire-resistant insulation.

Two types of insulation are used with stainless-steel liners. *Loose-fill* insulation, such as perlite, is mixed with water and then set around the liner. At least one brand (Protech, Albany, N.Y.) allows mixing directly into the bag of insulation, just like Kellogg's one-serving cereal boxes. The whole bag full of slurry is then poured around the liner (a damper plate prevents it from sliding out through the firebox).

Thermal blankets of ceramic fiber are also commonly used. These are wrapped around the liner, and the whole kit-and-kaboodle is then gently stuffed down the chimney.

Both types of insulation serve to keep the flue warm. This prevents creosote buildup and encourages good draft. It also prevents heat from being transferred to surrounding combustible materials.

Flexible For Offsets

Flexible pipe is available under many brand names such as Z-Flex (Manchester, N.H.), Housesaver (Copperfield Chimney Products, Fairfield, Iowa), and Vertinox (ProTech, Albany, N.Y.). In the past several years more brands of flexible pipe have been tested to the higher temperatures, and the introduction of more hardware and specialty fittings have made them easier to install. With these improvements, flexible pipe has become very popular with installers. It is their first choice for chimneys with offsets, since it can meander with ease around bends in the chimney. Although flexible pipe is corrugated, creosote does not hide in the curvatures any more than it adheres to the sides of straight liner.

With flexible pipe, the liner is lowered down the chimney by one installer. Another pulls the liner from the bottom of the chimney to help it through the offsets. The procedure can take as little as one hour.

Most steel-liner manufacturers offer

relatively short warranties, and therefore their durability has come into question. Nearly all relining experts, however, believe that steel liners have lifetimes of 20 years or more if cleaned regularly and not exposed to repeated chimney fires.

Since the chances are one-in-ten that the chimney will have to withstand a fire, it's better to invest in a liner that has been tested to 2,100° and bears the HT label.

However, steel liners are not recommended if trash will be burned in the stove or fireplace, or if chemical chimney cleaners will be used. Some steel liners—according to their manufacturers—should not be cleaned with steel brushes, which are said to weaken the metal. Polypropylene brushes, which nearly every sweep has, are preferred. All steel liners must be capped. This minimizes corrosion and wards off birds, raccoons, and other visitors in search of a summer home.

Pour it In

The alternatives to steel is poured masonry (or "thermal concrete") liners. Used widely in Europe, where coal burning is common, masonry reliners were introduced in America about six years ago and have become popular with relining installers.

There are a handful of different brands (see listing at end of article), and each has its own installation quirks. Installers of each system must be specially trained.

Generally, an inflatable, balloon-like rubber tube is set into the chimney and inflated to the desired flue size. Once in place, a masonry mixture of cement and insulation is pumped or poured around the balloon. The mixture hardens, and the balloon is then deflated and removed.

One company, Ahrens, uses a similar technique. But instead of a balloon, Ahrens lowers a steel bell the size of the flue down the chimney. The masonry insulation slurry is then poured down the flue. Once the bell is covered with the mixture, it is slowly winched up, with a vibrator inside the bell helping it make the journey. In its path, a smooth flue remains.

Masonry systems are the Cadillacs of liners, costing about \$40 per foot installed. For that price, your customer is assured of durability. Another advantage of these systems is that the cement will strengthen a borderline chimney, filling in voids and extending its life. Typical warranties on these systems are 20 years, but at least one manufacturer (American Chimney Lining Systems, Byron Center, Mich.) claims its liner "is so durable it probably will outlast the life of your house."

The jury is still out on that score. However, experience in Europe shows that a properly installed and regularly cleaned poured liner will last at least as

FLUE SIZE IS IMPORTANT

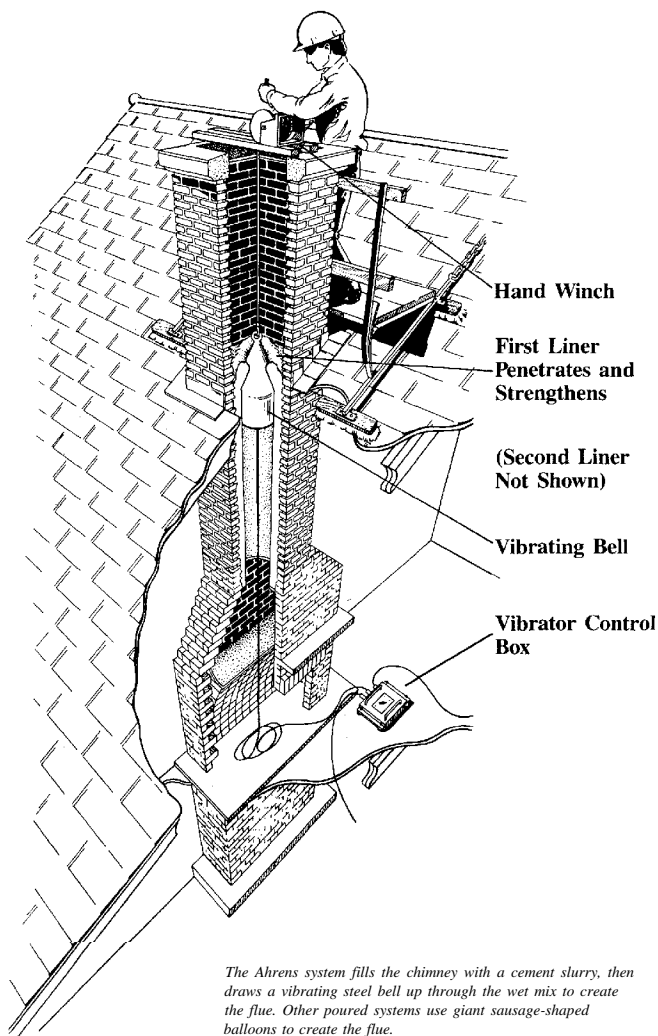
Oversized flues can create problems for wood stoves and fireplaces. In fact, many chimneys are relined for the sole purpose of making a stove perform more efficiently and not puff smoke back into the living room.

According to Dave Johnston of the National Chimney Sweep Guild, as a rule of thumb, the flue size should equal the diameter of the flue outlet on the stove. Most stoves have flue outlets of 6 or 8 inches.

To be safe, an 8-inch diameter is the best choice, since the homeowner might switch to another stove model sometime down the road. Some sweeps recommend undersizing for better performance but this is still controversial.

When using clay tiles, round tiles are preferred over rectangular and square types, because they enhance draft. Masons aren't particularly fond of them, however, since they like to roll off the roof during construction.

Figuring out the proper flue liner dimensions for a fireplace is somewhat more complicated, as it depends on the proportion of the firebox. As a general rule, the flue size should be 1/8 to 1/10 the size of the fireplace opening. For a typical New England fireplace, for example, that measures 36x48 inches, the opening would be 1,728 square inches. One-tenth of that is 172 square inches, which is the size of a 13x13-inch flue. ■



The Ahrens system fills the chimney with a cement slurry, then draws a vibrating steel bell up through the wet mix to create the flue. Other poured systems use giant sausage-shaped balloons to create the flue.



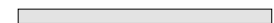
Two-foot sections of the Chintek liner (an American-made clone of the Iso-Kaern liner) are connected with metal collars and lowered down the chimney. The flue tile uses volcanic-pumice aggregate, and is insulated with a mixture of clay pellets and cement.

long as the stove vented into it.

One strong advantage of poured-cement liners is that the flue that is formed is smooth. Straight steel liners are installed in sections that must be screwed together. Over time, the joints can expand and trap creosote. This may lead to a chimney fire.



An inflatable, balloon-like rubber tube is set into the chimney and inflated to the desired flue size.



A Hybrid Approach

Poured cement and stainless steel are by far the most popular linings, but there is one more specialized type imported from Europe that is catching on among sweeps. The Iso-Kaern (Missouri Stove and Chimney, Sparta, Mo.) liner is made of volcanic pumice. It comes in sections, much like clay tiles.

Each piece is lowered down by rope in the chimney, with steel collars connecting each piece. Once positioned, clay-pellet insulation is mixed with Portland cement and poured around the liner.

One main advantage the Iso-Kaern system holds over poured masonry systems is that, if it cracks, it can be replaced without replacing the entire chimney. Like other masonry systems, it is durable.

Because the Iso-Kaern system requires a clearance of at least 1 inch between the old flue and new liner, it is best used with unlined chimneys or those with large clay liners. Material cost is about \$20 per foot; installed costs are about double that.

As noted previously, to reline a chimney properly takes skill gained with experience. If a steel liner is your choice, it's probably a smart idea to subcontract the work to a qualified chimney sweep. It will save you time and possibly the expense of a lawsuit down the line if a chimney fire gets out of control. Masonry liners must be installed by experts; every system available requires specialized equipment and factory-trained installers. ■

Steven Maviglio is a contributing editor at Wood • N • Energy magazine.

For supplier information about poured-in-place chimney liners mentioned in the article contact:

Ahrens Chimney Technique, Inc.

2000 Industrial Avenue
Sioux Falls, SD 57104
605/334-2827

American Chimney Lining Systems, Inc.

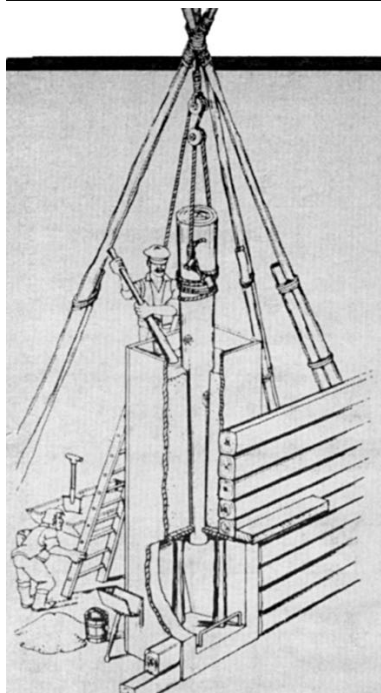
9797 Clyde Park, S.W.
Byron Center, MI 49315
616/878-3577

Chimney Relining International, Inc.

105 West Merrimack St.
PO Box 4035
Manchester, NH 03108
603/668-5195

Missouri Stove & Chimney

Highway 14 & Main
Sparta, MO 65753
417/278-3320



BACK IN 1880

If you were an English immigrant bound for America back in 1880, you might have consulted the Jan. 28, 1880 edition of *The Illustrated Carpenter and Builder*, where you would find instructions on how to construct and line a chimney. You'd discover that you'd need a strong back, a tall log, and enough imagination to fill in the gaps left by the guide.

The seventeenth-century publication recommended using "well trod and beaten clay," when possible, "well rammed down with a heavy branch or any other convenient rammer." It advised the use of a tall log to form the flue of the chimney, preferably "a straight tree trunk, of convenient length, having a diameter of 10 to 12 inches." One wonders how the ambitious chimney-builder would get the log into position, or keep it "precisely vertical." The directions also call for "carefully lifting the log up and out." In neither case does the guide make clear just how this maneuvering could be done.

There was an easier alternative, according to the article, which consisted of using stoneware drainpipe, if available. Besides being easier to work with, the pipe would not have to be removed.

—NEB