

The Basic Masonry Chimney

Wood heat may have lost some of the popularity it enjoyed during the oil crisis, but many builders still occasionally have a client who wants a wood stove in an addition or new home. If you put in a wood burner, you'll have two options for venting it—an insulated metal chimney or a masonry chimney.

Metal vs. Masonry

Both metal and masonry chimneys safely vent combustion gases if properly built. Therefore, which type to use should be decided by balancing cost and aesthetics.

Metal chimneys install quickly, but their material cost is high. The reverse is true of masonry—their material costs are low, but they're labor-intensive. Since these relative costs can vary a lot from job to job, on any given job, either alternative might be the less expensive.

Generally, however, masonry loses out financially on the more labor-intensive jobs. The most important single variable affecting the cost of a masonry chimney will usually be how much of it is exposed and requires finishing—the more finish time required, the higher the cost.

When it comes to aesthetics, masonry is the clear winner. A nicely finished masonry chimney can provide a strong design element that complements the room, whereas a metal chimney is inoffensive at best. So when the budget allows, a client will usually opt for masonry.

Efficiency is crucial to keeping masonry costs down. But too much concentration on speed comes at the expense of good detailing. And a lack of attention to details can produce a dangerous chimney.

Know Your Rules and Regulations

Regulations governing masonry chimneys vary depending on which building code your local jurisdiction recognizes. Before you decide how to detail a chimney, find out who has the final say in approving your construction methods. Then get your plans approved *before* you start. This will avoid embarrassing and expensive changes later.

If you're working on an existing home, you might also contact the client's insurance company for its approval. Most insurance companies have certain guidelines on wood stove installation and chimney construction.

For this article, I followed the guidelines from the latest National Fire Protection Association (NFPA) Publication 211, which covers residential chimneys (available for \$15.50 from NFPA, 1 Batterymarch Park, Quincy, MA 02296; 617/770-3000). Many model codes and local jurisdictions use this as a basis for their requirements. Some jurisdictions use guidelines that are more relaxed than the NFPA's. You should determine which standards govern your locale and design accordingly.

The NFPA makes no distinction between residential chimneys for woodstoves and residential chimneys that service central heating systems

such as oil or gas burners. The NFPA requirements are the same.

Masonry Chimney Basics

Certain components are basic to all masonry chimneys: a sturdy foundation; a clean-out door below the point at which the stove pipe enters the flue; a thimble connection to connect the stove pipe to the flue liner; a continuous flue liner of properly fired clay tiles; and surrounding masonry in the form of precast concrete chimney blocks and/or brick (see illustration, next page).

A Proper Foundation

A masonry chimney's support should always be independent of the building's structure, with its load transferred directly to the ground via a footing of masonry or reinforced concrete. In most cases, a concrete footing 30 inches square and 12 inches thick will support a chimney made of 16-inch-square precast blocks.

In new work, installing such a foundation seldom presents a problem. But when retrofitting a masonry chimney, you may have to remove a section of concrete floor to make room for an adequate footing. Resist the temptation to build directly on a concrete floor, as the soil beneath the slab may not have been compacted properly.

A Few Points About Flues

There's more to building a chimney than laying up blocks and dropping in a flue liner as you go.

To begin with, not all flue liners are equal. One of the best innovations I've seen in a long time are interlocking liner segments that have shiplapped male and female ends, as shown in inset A in illustration. The flanges at

the liner joints prevent creosote from passing through the joints and into the space between liners and blocks. In my area these liners are available in a 7-inch round size, along with preformed liner and matching thimble sections for the stove pipe connection. They are sized to fit inside a chimney made of 16-inch square precast chimney blocks with walls 4 inches thick. This size still leaves the required 1/2-inch air space. Flue liners are usually manufactured locally; given the extra convenience and safety the interlocking type provide, it's worth checking your local masonry suppliers for them.

Another important issue is the space between the liner and the surrounding masonry. The NFPA requires between 1/2 inch and 1 inch of unobstructed air space between liner and masonry. This space allows the liner to expand and contract without affecting the chimney. I've seen chimneys in which sand, zonolite, and even mortar filled this air space. In the case where mortar filled this space, it caused extensive cracks throughout the chimney.

The material used to adhere the sections together is also important. NFPA guidelines call for a non-water-soluble refractory cement. Water-soluble cements are forbidden because they require extensive heat to cure to the point where they can withstand life in a chimney, and while the joints close to the stove may get the needed temperatures, those near the chimney's top may not. Portland cement mixtures are not allowed either. However, a product called Heat Stop 50 (CMS Industries, Inc., 4524 Route 104, Williamson, NY 14589; 315/589-4131) meets the NFPA guidelines and works well.

Finally, you should provide a sheet metal "bond breaker" at the chimney

cap to keep the precast cap structurally independent of the flue liner, as shown in inset B in the illustration. If the mortar holding the chimney cap in place bonds with the flue liner, the expanding liner can lift the cap free of the chimney.

Bricks or Blocks?

The NFPA requires that residential masonry chimneys be constructed of a minimum 4 inches of *solid* masonry. Cored concrete cement block usually fails this requirement. Filling the cores solid with mortar probably satisfies the requirement, but this requires three to four times the amount of mortar, as well as the additional time it takes to fill each individual core.

I've found it works better to use what are called "solid" chimney blocks, which are actually 16-inch precast squares, 8 inches tall, with walls 4 inches thick and an 8-inch square vertical passage through the middle; each block makes up an 8-inch tall section of chimney. These blocks weigh a lot—over 100 pounds each. But proper scaffolding and a strong helper can make handling them a manageable proposition.

The other masonry option is brick. Brick looks great. But clients often flinch at the cost, which typically runs three to four times that of an equivalent chimney built of blocks. (The material cost roughly triples and the labor roughly quadruples.) However, if a client really wants the brick look, you can save some of this extra cost by building the exposed sections of the chimney with brick and the hidden sections with chimney blocks. You'll need to use bricks at least 4 inches wide.

Clearance to Combustibles

The NFPA calls for 2 inches of space between the chimney and any framing members, with firestopping in between made of noncombustible materials. The firestopping can be galvanized steel no thinner than 26 gauge or non-combustible sheet materials not more than 1/2 inch thick. This is one of the toughest details to provide for gracefully in the field, mainly because sheet metal, while fairly straightforward to install, often gives an unacceptable appearance.

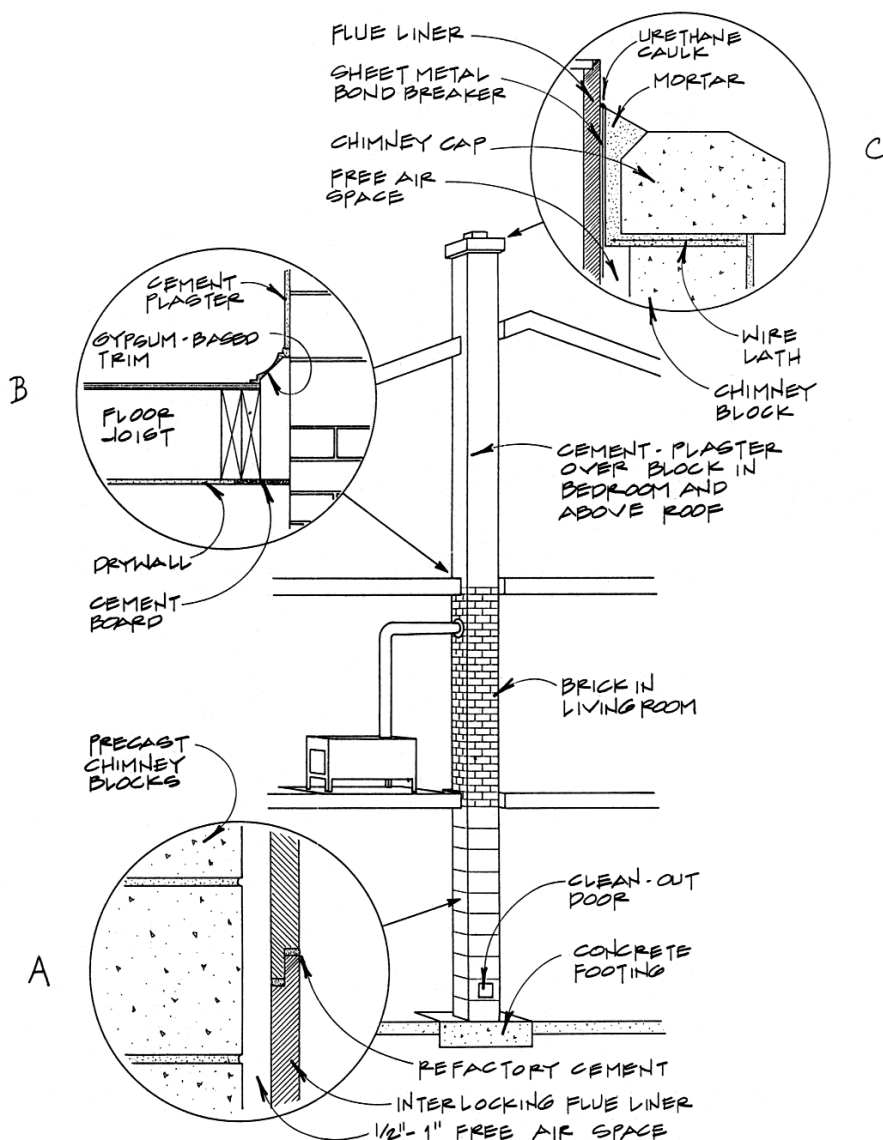
To examine the options, let's consider one of the more difficult firestopping scenarios—a chimney that passes through a ceiling that also serves as the floor to a finished room above, as shown in inset C in the illustration.

The ceiling. You can handle the ceiling detail in a number of ways. Stopping the ceiling wallboard 2 inches short of the chimney and finishing with 1/2-inch-thick cement board works well. Taping the joint between the wallboard and the cement board and finishing with joint compound provides an uninterrupted ceiling finish.

You can get the same result by conforming a piece of wire lath to the chimney/ceiling intersection and plastering over it to fill the gap. This works well to bridge the gap between a plastered chimney and a nearby wall.

Code-approved detailing with the right materials is the key to a safe and durable chimney

by Carl Hagstrom



Masonry Chimney Components.

A masonry chimney's basic requirements are the same whether it's built for a wood stove or central heating system. Key details are shown enlarged:

(A) **Flue liner.** Interlocking sections speed construction and prevent leakage of creosote. The mortar used to join flue tiles must use non-water-soluble refractory cement.

(B) **Wall and ceiling pass-throughs.** Gypsum-based trim and cement board offer two options for bridging the required 2-inch gap between chimney and combustible materials in framing, floor, and ceiling.

(C) **Chimney cap.** A layer of mortar bonds the precast cap to the blocks or bricks below and closes the gap between the cap and the flue liner. A sheet metal "bond breaker" allows the liner to expand and contract independently of the cap.

You can also use a noncombustible gypsum-based trim to bridge the gap between chimney and ceiling. Focal Point, Inc. (P.O. Box 93327, Atlanta, GA 30377-0327; 800/662-5550) offers a fireproof class-A-rated reinforced gypsum trim in a wide range of profiles.

The floor. The intersection of the chimney with the second story flooring offers fewer options. More often than not, the flooring material is wood or carpet. Again, sheet metal meets the NFPA firestopping requirement but lacks visual appeal. Noncombustible gypsum trim is the only aesthetically pleasing method I know of that meets NFPA guidelines. I would like to hear from readers who know of any acceptable alternatives (write c/o *The Journal*, Suite C1, 1233 Shelburne Rd., So. Burlington, Vt. 05403).

Chimney Finishes

Let's face it. Left alone, chimney blocks are ugly. Brick construction is one option we've already discussed, but its expense often makes it impractical. Facing the blocks with tile is another attractive option, but also expensive.

Plastering the block, however, works well and doesn't bust the budget. And placing a few accent tiles within the field of plaster can turn an otherwise bland chimney into an attractive design element.

All plaster work should be at least two coats thick and portland-cement-based. I prefer a premixed finish coat manufactured by Thoro System Products (7800 NW 38th St., Miami, FL 33166; 305/592-2081). It's available in a range of colors and has performed better for me than finish coats I've mixed on site using white portland cement.

Work—and Clients—That Last

Following the proper construction practices for interior masonry chimneys takes extra time and careful attention to detail. But it pays off in a special way. In addition to giving your product a greater life expectancy, a well-built chimney gives your client a greater life expectancy. Before building or subbing out a masonry chimney, take the time to find out what codes apply in your area, what is expected, and who expects it. Then make sure your masons understand what is required before bidding, and you'll avoid confusion, expense, and hard feelings later. ■

Bruce Conklin
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