Q&A

Q. Should I Use Salvaged Brick for a Chimney?

A client who is rehabilitating an older house wants my mason to build a new chimney top using bricks salvaged from both the interior and the exterior of a demolished mill building, circa 1850. Is there some visual rule — or simple test — to distinguish between the softer interior bricks and the more suitable exterior ones?

A. *John Carroll, a builder and mason living in Durham, N.C., responds:* As late as the mid-19th century, bricks were stacked and fired in temporary, site-built kilns, then sorted later. The ones closest to the fire — "clinker" bricks — were very hard, but often distorted and sometimes fused together. They were considered ugly and were mostly used where they wouldn't be seen — though nowadays they are valued for their dark, uneven color and irregular shape. "Face" bricks were located a little farther away from the fire, so they were hard and dense but retained their rectangular shape. These bricks were reserved for the exterior face of outside walls. The bricks farthest from the fire — "fill" bricks — were used on the inside of exterior walls and for partitions inside buildings.

In general, fill bricks are larger than face bricks and pinkish-orange or salmon in color. They have a softer surface than face bricks; when you strike them with a hammer, you'll hear a thud rather than the ping you would hear when hitting harder, denser face bricks. The biggest problem with fill bricks is that they are porous, so they soak up water and deteriorate rapidly when exposed to freeze/thaw cycles (see photo, below left).

Even if you can accurately distinguish between the face and fill bricks, though, I wouldn't recommend using either kind for an exterior chimney. Unlike exterior walls, which often have protective eaves and rakes to protect them, a chimney — at least the part above the roofline — is completely exposed to the weather. Here you should use modern face bricks. There are traditional styles available, yet they're manufactured under controlled conditions and laboratory-tested for water absorption. They're also much more consistent in quality. Save the old bricks for projects inside the building.

Be sure to match the mortar to the bricks. As a rule, mortar should never be stronger than the masonry units. If it is, any small stress on the structure will show up in the form of cracks and spalling in the bricks. Avoid modern masonry cement mortars, which are too hard, and use Portland cement and lime mortars instead (in most cases, you'll need to go to a masonry supply house to get the hydrated lime). To lay soft fill bricks inside a building, use Type O; if you're intent on using salvaged face bricks in an exterior application, use Type N (see chart, bottom left).

This garden wall was built with salvaged fill bricks. Over time, the porous bricks absorbed water, which eventually froze and expanded, causing the face of the bricks to spall.

Lime/Portland Cement Mortar Proportions by Volume

	Lime	Portland Cement	Sand
Type O	2	1	9
Type N	1	1	6

When laying salvaged brick, mix the mortar to the proportions shown here. A simple way to accurately measure out the ingredients is to use drywall mud buckets (a large bucket contains 4.5 gallons, a small bucket one gallon). To make a wheelbarrowfull of Type O mortar, first fill the large bucket twice with sand to measure 9 gallons; then fill the small bucket twice with lime and once with Portland cement.

Q. Leaks at H-Clips With Zip Sheathing

We recently installed a Zip System roof over roof trusses spaced 24 inches on-center. The lumberyard told us to install H-clips as for conventional sheathing, but after taping over all the seams between panels, we found that water leaked through the tape at almost every clip. Later I heard that the H-clips weren't needed in the first place. Are they required? And if they are, how do you prevent leaks?

A. *Chris Clark, product application engineer at Huber Engineered Woods (maker of Zip System roof and wall sheathing), responds:* You don't mention what thickness

Zip System sheathing you used, but the requirement for H-clips is dictated by code. Under the IBC, ½-inch PS-2 panels with a span rating of 32/16 can have an unsupported edge of up to 28 inches, while ⅝-inch 40/20 panels can span up to 32 inches. If you're fastening ½-inch or ⅝-inch Zip System roofing panels to rafters or trusses on the typical 16-inch or 24-inch spacing, H-clips aren't needed.

For 7/16-inch Zip System panels, Huber Engineered Woods requires panel edge support (blocking) or approved edge clips if the on-center spacing of the framing members exceeds 16 inches. Three specific edge clips have been approved by Huber for that application: the Simpson Strong-Tie PSCA7/16, the Simpson Strong-Tie PSCL7/16, and the Tamlyn PCS7/16. The use of any other brand or model clip will void all associated Zip System warranties.

In addition, it's important to use proper technique when taping over H-clips. The tape must be centered and adequate pressure applied on all sides of the clip to ensure a reliable seal. A video on taping over H-clips is available on the Zip System website.

Q. Fire Retardant in Spray Foam

According to a university researcher I spoke with recently, polyurethane spray foam formulated for use in California is required to contain from 5 percent to 10 percent flame retardant by weight, and the size of the state's market means that most other states get this same formulation. The researcher also claimed that flame retardants produce far more carbon monoxide and particulate smoke than untreated foam would, and are persistent and long-lasting in our bodies in an unburned state. Is it possible to avoid these problems by using foam without added fire retardants?

A. *Rick Duncan, technical director of the Spray Polyurethane Foam Alliance (SPFA), responds:* Like wood and many other building materials, foam plastic insulation is combustible and can give off particulate gases like carbon monoxide and hydrogen cyanide during a fire. At high concentrations, these gases pose an immediate threat to building occupants. For that reason, the ICC model building codes specify

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limits on flame spread and smoke development for foam plastics. Specific fire-performance requirements appear in Chapter 3 of the IRC and Section 2603 of the IBC.

While a few specially formulated foams may pass the fire test without flame retardants, most use phosphorus-based flame retardants to meet code. Getting the right mix is a balancing act, because the chemicals that slow flame spread can also increase the amount of smoke created during a fire.

Quantitatively, your source was in the right ballpark: The flame-retardant content of open-cell spray foam ranges from 15 percent to 25 percent of the B-side by volume, and from 5 to 10 percent in closed-cell foam.

Phosphorus-based flame retardants have undergone extensive industry and regulatory review, including scrutiny by the European Union. All are widely regarded as safe and nontoxic in the amounts used in SPF, and none are classified as carcinogenic, mutagenic, toxic to reproduction, environmentally persistent, or bio-accumulative. If you are concerned about a particular flame retardant, contact the foam manufacturer. Also, keep in mind that SPF flame retardants are entrained in solid polyurethane and are isolated from direct contact with building occupants.

As for fire performance, California's requirements are no different from those of other states that have adopted the I-codes. Since all spray-foam manufacturers formulate their products for a national market, there are no state-to-state variations. A few SPF manufacturers offer special high-density SPF formulations for soil stabilization and other underground applications. These uses are not subject to the same fire performance requirements as insulation and roofing foams, so they may not contain flame retardants. In any case, these specialty products should never be used for building applications.

GOT A QUESTION?

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