Brick Fixes

Afraid to tackle cracked bricks? Dye some mortar for a durable and invisible repair.

BY JOHN CARROLL

There are a lot of reasons people choose brick for a building material. It doesn't provide an endless buffet for termites or serve as a building site for carpenter ants. Woodpeckers do not delight in drilling holes in it. It's dimensionally stable, doesn't rot or burn, and never needs to be painted. With all these things going for it, though, brick has an Achilles heel: It's hard and inflexible, and it cracks under certain conditions.

Whether the cracks are caused by movement, insufficiently filled joints, or simply too many decades of being exposed to the weather, the owners of brick houses in Durham, N.C., often call me to fix them. The reason they call me is because I do more than slop mortar into the cracks. I make an effort to match the color of the existing mortar, and when bricks are cracked, I repair the cracks with mortar dyed to match the color of the bricks. I also prep the surface properly, use the correct mortar, and keep the joints as neat as possible. After packing the joints with mortar, I tool them to match the profile of the joints on the rest of the wall. My goal is always to make the cracks disappear.

Why brick cracks

Masonry structures crack for several reasons. The first is because the footing or slab the masonry rests on moves. (Many older houses don't even have what we'd consider footings today; the structural brick wall rests directly on the soil.) The first building material is not the footing but the soil that it bears on. Footings should be placed on virgin soil or soil that has been mechanically compacted to reach the proper bearing capacity.

Water can cause some otherwise sound soils to become soft and plastic, reducing their bearing capacity and resulting in differential settlement that cracks the footing. Saturated soil that freezes can push sections of a footing up, or it can push laterally on a below-grade masonry wall. Another problem is that structures such as foundation walls and retaining walls are often underbuilt. Masonry that's subjected to strong lateral forces, such as those imposed by soil, should be reinforced with steel.

A well-planned system to drain water away from the foundation is essential. But the work of even the most careful builder can be undone later by changes to the grade around the house. Landscaping that piles up mulch and dirt a few feet from the house often

CLEAN OUT THE OLD MORTAR

The first step in repairing a crack is to grind out the old mortar. Joints should be ground to a depth that's twice their width (usually ¾ in. to 1 in.). The tools I use depend on the hardness of the mortar and the bricks as well as the overall integrity of the wall. Old bricks can be fragile, and I work according to the maxim "First, do no harm." Mortar never comes out consistently. In the course of grinding and chiseling, the mortar farther back in the joint often breaks and crumbles. That's not a problem; I simply fill the deeper space with mortar during the next stage of the job, actually getting a better repair in those areas.

Use a rotary hammer on vertical joints. *With a generally sound wall, setting the tool in hammer-only mode and using a chisel bit makes quick work of mortar. If the wall is fragile, the chisel may be too aggressive. Instead, perforate the joint with a ¼-in. drill bit and the tool set in hammer-drill mode.*

A tuck-point grinder makes quick work of horizontal joints. *This 5-in. grinder uses a ¼-in.-thick blade to grind out most of the mortar in one pass. Its dust port attaches to a vacuum, which collects most of the dust. The grinder isn't for working on vertical joints because it would cut into the bricks above and below.*

Clean the drilled joints with a cold chisel. *Don't chisel straight in or you'll risk loosening the bricks. Rather than pounding the chisel, just tap it and take out a little mortar at a time to avoid damaging the wall.*

Vacuum out the loose material. *The new mortar won't stick well to loose crumbs. Use a crevice vac attachment to reach deep into the joints.*

Dampen the area to be patched. *Extremely dry masonry surfaces suck the moisture out of the mortar, preventing a proper cure. Spray the surface so that it's good and wet but not so that you inject a large amount of water behind the brick veneer. Let the surface dry so that the joints are still damp inside but there's no water on the surface of the bricks.*

holds water that soaks in and eventually causes cracks in footings and concrete slabs.

Steel lintels support brick as it passes over windows and doors. Steel that is too small for the span can deflect, causing cracks in the masonry above. In addition to sizing lintels correctly, it's important that they bear on the brick at each side of the opening and not be attached to the wood framing behind. Wood expands and contracts more than masonry. Fastening the lintel to the framing can cause cracks in the bricks.

Rusting lintels also can damage bricks. Steel expands as it rusts, lifting the masonry. The stair-shaped cracks that run up and away from the top corners of door and window openings are usually caused by this rust. The best way to avoid them is, once again, to manage the water. Lintels should be flashed carefully to keep them dry and to shed any water that gets behind the brick veneer.

Cracks are also caused by poor workmanship. Over the long haul, joints that are packed solid with mortar perform a lot better when exposed to the elements than joints that have voids under the surface. Although builders should take the steps described here to minimize movement in masonry structures, movement can't be eliminated completely. At least some movement is inevitable, so repairs will become necessary eventually.

Sizing up the job

When people call me to repair brickwork, my first task is to look closely at the area in question and decide whether the work is going to be cost-effective or even feasible. In general, I encounter three types of problems. The first is old mortar that's loose in spots and has some visible fissures and voids. In these cases, all that's needed is to grind out the mortar and repoint the joints.

The second type of problem occurs when the brickwork has moved and created cracks, some of which run through the bricks. In this case, the homeowner has to make a difficult decision. The only way to ensure that the brickwork won't crack again is to address the cause of the movement. Since this often involves replacing a lintel, or even repairing a footing, addressing the root cause can be very expensive. On the other hand, it may be reasonable to assume that a house that has been sitting in the same spot for fifty or more years has done all the settling it's going to do. Managing the water around the foundation may be enough to stop any further progress

MAKE THE MUD TO MATCH

A common mistake is mismatching the mortar color. Achieving a perfect match is hard; old mortar can display a range of shades, and sometimes it was dyed. Prior to the 1960s, portland-cement/lime mortars prevailed and tended to be light tan in color. Masonry-cement mortars have gained popularity since then and are generally gray but also come in white, tan, and buff. You can get a good match by making samples using mixes from different manufacturers and letting them harden for a week or so; mortar lightens as it dries.

When standard materials don't match, I bring a chunk of the mortar to Custom Match Colors (custom matchcorp.com), a local company with scores of powdered mortar dyes. If I get close to the existing color, then time, dust, pollen, and algae make small differences disappear.

Make samples to match mortars. *The author sets five or six samples that come close to matching the mortar in front of the wall, then stands back to see which matches best.*

Use Type N. *Type N mortar can be made by mixing 1 part Type N masonry cement with 2¼ to 3 parts sand; or by mixing 1 part portland cement, about 1 part hydrated lime, and the sand. Add dye according to the manufacturer's instructions.*

Mix a dry mortar. *Start with a small amount of water, and mix to make a moist but crumbly mixture. Add more water gradually, mixing until the material sticks together in a smooth glob.*

Place a ½-in.-thick layer of mortar on a hawk. *Shake and tap the hawk to help the mortar stick and not slide off. As it dries, mortar grabs the surface of the hawk. If the mortar is wet, spread it out so that it dries to a better consistency.*

Tool photos, facing page: Rodney Diaz

FILL THE JOINTS

To transfer the mud from the hawk to the wall, I use tuck pointers in several widths (¼ in., ⅜ in., ½ in., ⅝ in., and ¾ in.), choosing the widest that will fit in the joint I'm filling. When possible, I work directly from the hawk. But sometimes there are obstructions such as sills, or it's too close to the ground to hold the hawk, so I transfer the mud on the tuck pointer. I apply the mud in layers and allow each to set up a bit before applying the next. I continue until the joints are packed full.

For carrying the mortar to the joint, I use the tuck pointer to cut a ½-in. strip of mortar on the hawk. I make a long motion of pulling the mortar along the surface of the hawk. This adheres the mortar to the tuck pointer so that I can carry it to the joint without dropping it. I keep a 4-in. brick trowel handy for patting down and shaping the mortar on the hawk; this helps keep the pancake of mortar together and at the right thickness.

Different joints take different trowels. *While the tuck pointer's length is an advantage on horizontal joints, it can be a liability with the shorter vertical joints. A 4-in. brick trowel's shorter length is useful here.*

Work directly from the hawk if you can. *On long, straight runs, it's most efficient to set the edge of the hawk at the bottom of a horizontal joint and use the tuck pointer to push the mud directly into the joint.*

FINISH THE JOINTS

It's as important to match the profile of the repaired joints with those on the rest of house as it is to match the color. Mortar joints can be finished in several ways. To start, after setting up slightly, joints can simply be cut flush with the face of the bricks and then brushed with a soft brush to texture them and blend them into the edges of the bricks. They also can be raked back about ¼ in. from the surface. The joint raker is a special tool for this that helps to maintain a consistent joint depth, but you also can rake out the joint with a tuck pointer.

Fill the joints to the brim. *This packs the mortar in, helping to keep water out and to ensure that each brick is fully supported.*

Rake out the excess. *Many mortar joints are recessed from the face of the brick. A joint raker holds a common nail at the desired rake depth and uses the nail head to scrape out extra mortar.*

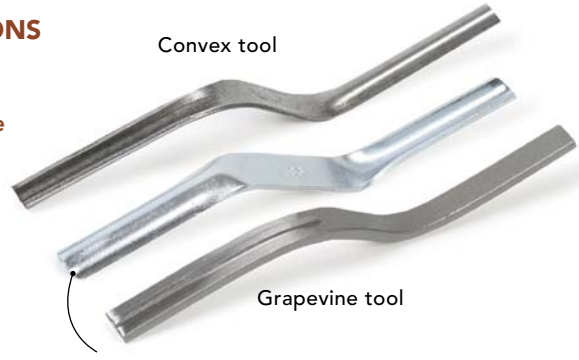
Tool the joint smooth. *To match these existing joints, all that's needed after raking is to smooth the mortar with a tuck pointer.*

Clean up. *After the final tooling, use a soft-bristle brush to remove any stray mortar.*

Shape as needed. *Matching an existing joint profile is a matter of using the correct tool. In this case, a grapevine tool is called for.*

FINISHING OPTIONS

A third way to finish joints is by using a jointing tool to shape the mortar. There are many different jointing tools that can mold joints to a variety of profiles, including concave, V-joint, weathered, beaded, and grapevine.



Tool photos, this page: Rodney Diaz

of the underlying cause, and simply repairing the masonry becomes acceptable. I've made many repairs in such cases that have held up well for over a decade.

The third type of problem is when the masonry is falling apart and can't be repaired. A common example is brick stairs that were built without a concrete footing. No amount of repointing can repair these crumbling structures, and I advise the homeowners that the best solution is to tear the whole thing out, dig and pour a proper footing, and build a new set of stairs. Brickwork on houses themselves rarely reaches this state because it's usually repaired before then.

I frequently encounter poorly done repairs. The mortar is often the wrong type and the wrong color. It's smeared on the face of the bricks and finished in a manner that doesn't come close to matching the joints on the rest of house. Cracks that run through bricks are simply filled with gray mortar. The repaired cracks might keep water out, but they are an eyesore. I often end up redoing these botched fixes as I work my way around the house repairing other cracks.

Use the right mortar

Mortar should be softer than the bricks so that small stresses are absorbed by the mortar rather than damaging the bricks. Before the late 19th century, mortar was very soft, consisting of lime and sand, and worked well with the soft bricks of the time. Beginning in the late 19th century, improved kilns and manufacturing techniques created harder bricks, and portland cement became commonly available. Modern mortar always contains portland cement and sand, which sets up harder than straight lime mortars. To improve workability and soften the mortar, masons add hydrated lime to the portland cement. In the 1920s, masonry cement came on the market. Masonry cement contains portland cement but uses proprietary ingredients in place of site-added lime.

Varying the ratio of portland cement and lime (or the proprietary ingredients in masonry cement) to the sand yields different classifications of mortar with different compressive strengths. Both portland-cement/lime mortar and masonry-cement mortar are classified in three types: M, S, and N, with Type M being the hardest and Type N the softest. An even softer mortar, Type O, is not available as a masonry-cement mortar and can be made only by mixing portland cement and lime. To repair cracks in brick walls, Type N is considered ideal for most buildings built after 1900. For historic buildings with soft bricks, Type O or lime mortar without portland cement is usually specified.

Type M, Type S, and straight portland-cement mortar with no lime shouldn't be used to repair cracks in brick walls. They are hard and inflexible, adhering to the bricks so tenaciously that the slightest movement can cause the bricks to split and spall. □

PATCHING CRACKS IN BRICKS

When a crack runs through a brick, many people think the solution is replacement. There are two problems with that, the first being finding a replacement brick. Even if a brick with the same pattern were available, the existing ones have weathered, and so a color match would be unlikely. The second problem is that removing an entire brick is invasive; especially on an older wall, one brick can lead to another and then to another. Instead, I fill cracked bricks with mortar dyed to match.

To make staining the mortar joints less likely, I wait until the day after repairing the joints to fill any cracks in the bricks. It's difficult to get an exact color match. There are often several shades and colors of bricks in the same wall, and in many cases, individual bricks are mottled with different shades and colors. Even if I don't match the color of each brick perfectly, using a color that matches some bricks in the wall goes a long way toward making the crack disappear and maintaining the bond pattern on the wall.

Find a dye that matches the lightest brick. *Darken the remaining mortar by adding black, red, and/or brown dye. This is not exact, but it approximates the colors of the darker bricks.*

Avoid smearing the dyed mortar on the joints. *Mortar can be packed into the cracked brick by hand or with a 2-in. margin trowel. That size trowel is slightly less than the height of the brick, so the crack can be filled without getting the dyed mud on the joints above and below the brick.*

Smear it out. *Once the crack is filled, use a 4-in. brick trowel or a margin trowel to spread out the excess mortar. This blends the dyed material with the face of the brick, making the repair less obvious.*

John Carroll is a mason and builder in Durham, N.C. He's the author of several books, including *The Complete Visual Guide to Building a House* (The Taunton Press, 2014). Photos by Andy Engel, except where noted.