

# Repointing Brick Masonry

by John Leeke

Mortar joints in brick masonry wear out. After 80 to 100 years, natural weathering erodes the mortar, especially soft lime mortar found in historic masonry. Stress from structural movement cracks the joints, letting in water, and eventually freeze-thaw cycles break down the mortar. You cannot reverse the aging process—only renew the outer layer by repointing.

A repointing job should last for another 100 years, but some jobs last only a year or two. Why? Often, the mortar is too strong. When it comes to early brick masonry, stronger is not necessarily better.

## Cement vs. Lime

Repointing jobs on historic buildings often fail because there are fundamental differences between modern and historic masonry.

**Setting time.** When a wall is laid up with today's cement mortar it cures quickly and develops nearly full strength within days or weeks.

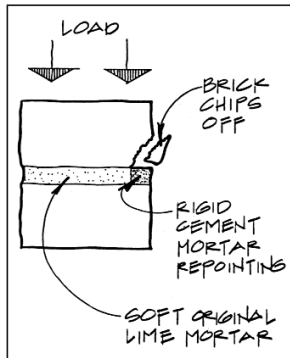


Figure 1. Stress differences between the compressible lime mortar and the rigid cement mortar at the surface cause the edges of the brick to chip.



Figure 2. The brick below the stone can be repointed, but the masonry above needs structural work since the bricks have cracked.

The brick in historic masonry buildings was laid in lime mortar, which cures slowly. Decades later some lime remains uncured.

**Flexibility.** Modern masonry is monolithic; it forms a solid, rigid mass. Cracks usually mean some sort of structural problem, and once cracks develop, they do not go away.

Lime mortar is flexible and small cracks heal themselves. The flexible mortar allows the masonry wall to change shape. Wind and changes in temperature can induce stress in the masonry, opening up cracks, but when the masonry is laid with lime mortar, air and water flow into the crack and react with the uncured lime. The lime hardens, filling in the crack and restoring the strength of the joint.

**Permeability.** When relatively impermeable cement mortar is used for repointing, water builds up within the wall or is forced to go through the bricks. Spalling surfaces are common when saturated bricks freeze.

An early masonry wall, on the other hand, "breathes" through the mortar joints. Moisture escapes through the mortar, not the brick. Because early masonry was sometimes more porous, it was important for the mortar joints to be as permeable as possible.

**Adhesion.** Modern cement mortar has greater adhesive strength than lime mortar, but that is not necessarily a good thing. The cement mortar glues the bricks together, and digging out cracked mortar is difficult because the mortar sticks so tenaciously to the brick.

When you're repointing a lime-mortar joint that hasn't already been repointed with cement, you'll appreciate lime's low adhesive strength. You can remove the mortar easily with a repointing chisel, and even brush loose brick clean and reuse them.

**Mortar strength.** Modern hard-fired bricks are bonded together with mortar that is almost as strong as the brick itself.

Lime mortar has less strength than cement mortar, and the mortar is more compatible with early masonry, which is often not as strong as today's masonry.

## Getting Ready To Repoint

Buildings from an earlier era may have been repointed somewhere along the line by a mason using Portland cement. Scrape beneath this layer, and you'll find lime.

**Test for lime.** A simple test tells you if the existing mortar is lime. Dig some mortar from deep within the joint, and mix it with vinegar. If the acidic vinegar reacts with basic lime and forms bubbles, you know it's a lime mortar.

**Match mortar strength.** When repointing you should try to match the strength of the mortar and the strength of the original masonry. High-strength Portland cement mor-

tars should only be used on masonry originally built with this type of mortar. Portland cement mortars weren't introduced until the 1890s, and even then, some masons were still using lime. Use lime on earlier buildings.

**Watch for problems.** If you're following on the heels of another mason's repointing work, and if that repointing was done with a cement mortar, you may find that problems have already developed.

In early brick masonry, gravity holds the bricks together—mortar holds them apart. Thin joints,  $\frac{1}{8}$ - to  $\frac{1}{4}$ -inch, are common. The mortar acts like a pad that evens out the stresses from brick to brick. If the bricks touch at any point, as they essentially do when adhesive cement mortar creates a bridge between the brick, localized stress can crack the masonry.

What typically happens is this. When just the outer  $\frac{3}{4}$  inch of mortar has been repointed with cement mortar, stress differences between the historic mortar and the modern surface layer spill over into the brick (see Figure 1, next page). When soft mortar in the back of the joint compresses, as it will when the masonry moves, the hard mortar at the front edge becomes a stress point. The stress can become great enough to chip off the outer edge of the brick. Movement can also crack the rigid mortar's bond with the brick, letting water into the joint.

## Should You Repoint?

I hope you're convinced lime mortar should be used when you're repointing historic buildings, but how do you know whether it's repointing you need, or more intensive structural work? Knowing when repointing is enough and when more extensive repairs are needed is important. An example from a recent project shows the difference.

The base of a Victorian chimney had several problems (see Figure 2). The vine growing out of a joint pointed to a moisture problem—the chimney was turning into a damp planter. A gutter leak above had accelerated the natural weathering that ages all mortar joints. Below the shaped stone, the damaged mortar could be repaired with repointing. Above the stone, however, damage was more extensive, and the cracked and broken brick needed to be replaced. Whenever you find that the masonry units themselves are cracked, you need structural work, not just repointing.

In next month's Restoration Primer I'll cover methods and tools for mortar removal and replacement. ■

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