Hydraulic Lime Mortar Contractor -- PA

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Mortar and Longevity: Will Our Buildings Stand the Test of Time?

Did you ever look closely at the exterior of brick or stone home, and see hairline cracks running up the wall? Or sometimes the mortar joints have lots of cracks running across them, so that the mortar looks like it could fall out in 3-inch sections. Even an old (or not so old) concrete block building, like a garage, can have joints cracking out all over the place.

Natural Hydraulic Lime Mortar

Whether your a homeowner, or someone in the building trades, you may have noticed mortar joint failure, and maybe you had a thought like, "What is going on here? I thought masonry was the best exterior-supposed to last forever!!!"

Isn't a stone home supposed to last forever?

What about the castles in Scotland and the palaces in Prussia??

We are stonemason's, and these are questions we have started to ask also. For us, our livelihood depends on the answers because we can already see cracked mortar joints in work we did 5 years ago! Could the mortar that we were trained to mix and use be flawed?

Why do patios and sidewalks crack so quickly-often in less than 10 years? Why does almost every stone, brick, or block building show cracks in just a few years after it's built? That's not the longevity we expect from using such historic and time-tested materials!

Materials scientists have been asking these same questions. After studying those castles in Scotland and masonry buildings all over the pre-modern world, the answers are starting to come out. Turns out the mortar we use today is not at all historic. Time has tested it, and it is failing the test.

A little construction history might help at this point. For at least 7,500 years, man had been using (roughly) the same process to make mortar: burn high-calcium limestone by layering wood and stones inside of a really fat chimney (kiln) and then lighting it on fire. The resulting burnt stones are then crushed and mixed with sand and water to make mortar. The burnt lime reacts with the water, causing it to get sticky and then harden, lasting for centuries or longer in between the stones in a wall.

This lime is called hydraulic lime because it hardens without the presence of air. Getting hard is a chemical reaction that is different from just drying out. It will get hard under water.

Now don't confuse hydraulic lime with hydrated lime. Hydrated lime is a different process, a different material altogether. Hydrated lime can't be used as the binder in mortar because it never gets hard. Hydraulic lime does.

Now, jump forward in the history of mortar to the late 1800's when various inventors began experimenting with new processes and materials for making cement. Portland cement, the almost exclusive binder and hardener in today's mortar, concrete and

stucco. It got its name from the Isle of Portland in the English Channel where limestone had been quarried for centuries and admired for its building qualities. By 1878, the British government had issued a standard for Portland cement, and in 1907, production began in the United States. It came to be the main ingredient in mortar and concrete throughout the country by the end of World War II.

Now, Portland cement has proven its superiority to hydraulic lime in many departments.

In the speed-of-getting-hard department: Portland's the champ.

In the waterproof department: no contest. Portland wins.

In the hardness department: Portland wins again.

Game over? Not yet.

As it turns out and according to research on the old hydraulic lime mortar, using Portland may be a strategic error. At least, as far as longevity is concerned.

It all boils down to the way we think about buildings and how they weather. Everyone knows that the point of a building is to keep out water, right? In recent decades research on building materials and techniques has gone farther and farther down the road of keeping out 100% of all moisture and all air. Now we are combating mold, air quality, and condensation problems.

But back to the Portland vs. hydraulic lime debate.

In the longevity department: no contest. Hydraulic lime wins. Hands down. Why?

Yes, Portland cement seals out water. Hydraulic lime allows water to penetrate. The problem is that most masonry units (like brick, stone, and block) absorb small amounts of moisture from the air and rain. Hydraulic lime acts like a wick to get that water back out-- FAST!! Portland won't let the water pass, trapping it in the wall where it does damage-cracking the joints and even the faces of the bricks or stones. That's why you see the faces of old brick buildings popping off. Repointing with Portland destroys the building-FAST!! Repointing an older building using portland cement starts the countdown to it's demise.

Yes, Portland cement is harder. But harder is also more brittle. Portland is fired at about 2,600 degrees Fahrenheit, as compared to hydraulic lime's 1,800 degrees. When you look at the two under a microscope, hydraulic lime particles are like plates that interlock; Portland's are like needles. Any movement in the building is going to make Portland crack all over the place, while the more flexible lime mortar can move with the building without cracking.

It gets better.

When you get down to the microscopic level, Portland cement has salts in it that actually degrade the mortar from the inside out. This stuff starts decomposing as soon as it gets hard!

You guessed it: hydraulic lime has a little secret of its own, and its not the kind that brings the wall down. Hydraulic lime has small amounts of free lime-lime that never reacted with the water in the beginning, after it was burned. This free lime actually dissolves in the water that is escaping out of the wall, and in the process it fills any

cracks that may have formed. The experts call it "autogenous healing." Like a lobster growing back its claw, I guess.

No wonder they used it for 7,000 years, Plus.

No wonder the historic restoration movement is switching from Portland-and-lime mortars to historic, hydraulic-lime mortars.

Hydraulic lime is still a bit hard to find in this country. To my knowledge it's not produced in the U.S. yet. What we use is imported from France. Different grades can be used to make plaster, stucco, lime paint, mortar, and even concrete.

So next time you're wanting you're chimney repointed, a stone or brick historic building restored, find a historic restorations contractor who knows about hydraulic lime. As a mason, the choice is clear to me. What's the point of building new or restoring the old, if our work is not going to stand the test of time?