

Consolidation of Old Mortar

About ten years ago one of my customers was restoring some deteriorated wood which was next to the foundation of his house, and in the course of this work quite a bit of the Clear Penetrating Epoxy Sealer™ (CPES™) ran onto the foundation itself. This was eighty-year old concrete of poor quality and the acid in the ground water had dissolved away much of the cement, leaving a material so soft that pieces the size of an egg could be broken in two with bare hands, and some pieces crushed in a single hand. In the course of cleaning up after finishing the wood restoration job he discovered that where the CPES had soaked into the old concrete and cured, the concrete could not be broken easily, and actually was much closer to a common brick in its strength, judged by the simple test of hitting it with a hammer. While it is impossible to place numerical values on the mechanical properties of any such material before or after treatment with CPES, the improvement is dramatic. Where the desired restoration is only cosmetic in nature and not a load-bearing element (whose treatment would require the oversight of a structural engineer), such treatment may be useful.

A few of my customers have used CPES on the bricks and mortar of their chimneys. Brick-and-mortar chimneys seem to have two common failings. The first is that, with age, the acids in the air (Sulfuric acid from our burning fossil fuel, mostly) react with the concrete to produce Calcium Sulfate which has somewhat more volume than the original cement mortar; thus, the mortar increases in volume. In extreme cases, where pollution is carried on the prevailing wind from one direction more than the others, the mortar on one side of the chimney will expand more than on the other sides. Thus, the chimney will lean in one direction. With rain, the degraded cement may dissolve somewhat, leaving a more porous crumbly sandy mortar. Treating this old mortar with CPES, according to my customers who have done it, glues the sand together better than it was, and impregnates the mortar with a hydrophobic resin system, reducing water absorption.

When treating a brick-and-mortar surface with CPES, a film of CPES is usually left on the brick surface. This can produce a surface which looks different from the original. If the freshly applied CPES is cleaned off the bricks the same day with our Epoxy Cleanup Solvent™, the bricks seem to regain their natural appearance. This is discussed in another note, Natural Wood Appearance, in the case of wood.

CPES can also prevent freeze-thaw damage to concrete or mortar. Water may be absorbed into porous material. If the temperature drops below freezing, the water may freeze into ice. The

volume of water increases when it freezes. This is why the ice cubes in your refrigerator rise up in the middle. When water in concrete freezes and the volume increases it cracks the concrete into many smaller pieces and the concrete crumbles away. This is called freeze-thaw damage. Brick-and-mortar chimneys experience freeze-thaw damage in climates where there is a daily or seasonal freeze-thaw cycle, as it can cause swelling, crumbling and deterioration of the mortar. CPES can protect against this for some time, perhaps a year or two. This was discovered by a customer in Finland, who had the product tested and certified by the VTT Institute (similar to our Underwriter's Laboratories). For the last ten years or so CPES has been used extensively for treatment of roadway or bridge deck surfaces. We have the test report and can send you a copy should you need the actual data.

I had occasion personally to repair the chimney on my own house. It was built in 1928 and had a low brick-and mortar chimney in the middle of the roof. There had developed over the last ten years a very occasional water leak which was staining the living room ceiling. A new foam roof with elastomer topcoat failed to handle the problem. I examined the chimney (which was painted on the outside and looked fine from a distance) and discovered that the mortar holding the bricks together on the inside at the top had become virtually sand, and in some places was completely gone, allowing wind-blown rain to penetrate in between the layers of brick. It seemed likely that this was the source of the leak.

I covered the chimney with a plastic tarp through the next winter and observed absolutely no leaks, confirming the theory that the failed mortar was the culprit and that the source of the leak had been identified. I allowed a few months of dry spring and summer weather, and then began the repair process by slowly pouring CPES over the bricks and mortar, but only as fast as it would soak in. I treated the old mortar cap and the first few bricks, a distance of eight to twelve inches. About two quarts of CPES were used.

I then allowed two weeks drying time. Less time could have been allowed but best mechanical strength in CPES-impregnated material is attained when sufficient time is allowed for complete drying.

The missing portions of mortar were filled in with Fill-It Epoxy Filler™. Some black pigment was mixed in with the filler, to give a grey cement color to the epoxy cap and somewhat darker inside the chimney, as if soot stained. I wanted the restoration job to look good for anyone passing by overhead.

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