Minimally Invasive Delamination Repairs

Cutting waste by eliminating partial or full-depth replacement

BY NELSON R. TONET

Until recently, the owner of a delaminated floor has had limited options—all with downsides. Full or partial replacement creates significant waste, and there is always a risk that delamination will recur. Epoxy injection can actually cause an uneven surface, as epoxy must be injected at high pressures and can displace delaminated concrete. These options are also costly and time consuming. But now, a waste-free, reliable, minimally invasive, cost-effective, and rapid repair solution is available for delaminated floors.

EASY FLOW

10 Minute Concrete Mender™ is a high-penetration, two-part hybrid polyurethane that fills voids and penetrates deeply into concrete surfaces at ambient pressures. It sets in 10 minutes to form a tough polymer that bonds to both surfaces of a delamination. After curing, the resin has a tensile strength of about 4000 psi (28 MPa), restores aggregate interlock (Microdoweling™ action), and allows dynamic load transfer under full traffic.

This unique resin system has a viscosity similar to water, allowing it to easily flow into holes that have been core drilled into the floor. Because it cures so quickly, the resin must be pumped to place large volumes in a short period of time. It requires, however, only 1 to 2 in. (25 to 50 mm) of head to push it along a delamination gap. Because of the resin's very low surface tension, it easily wets the surfaces and flows up to 10 ft (3 m) from an injection point—even with virtually no slope on the delamination. With the product's short cure time, it's also possible to check the floor by sounding less than 30 minutes after product placement.

INSTALLATION

Three mixing methods are possible. For large repairs, a small multi-component positive displacement gear pump can be used at placement rates of 1/2 to 1 gal./minute (2 to 4 L/minute). If sufficient product volumes can be placed by pouring, batch mixing in a pot is a possible option. When batch mixing, it's important to ensure that all of the mixed material can be placed in a few minutes to avoid wasting the mixed material. If desired, however, pot life can be extended by chilling the mixed resin. For smaller delaminations, a dual-cartridge applicator with a static mixer nozzle can be used for more controlled injection.

After the approximate boundaries of the delamination are located (normally by sounding with a hammer), 1.5 to 2 in. (38 to 50 mm) diameter cores are drilled to verify the depth and extent of the delaminated area (Fig. 1). The core holes can later be used to pump or pour resin into the delamination (Fig. 2). Several smaller holes, normally located at 3 to 4 ft (0.9 to 1.2 m) intervals away from each injection point, are also drilled into the field of the delamination to monitor the product's flow. To ensure that water isn't introduced into the delamination, all holes must be dry drilled.

When pumping or pouring the urethane into the delamination, the holes simply fill to the top as the material backs up when it can no longer flow into the delamination. Dry sand can be added to bring the resin

repair flush with the surface. Finally, the surface can be tooled to match the floor elevation. No other surface repair is needed, and no cleanup is required, as all of the material goes into the delamination. Even if there is an accidental overflow, the resin can be scraped off before it completely cures and, if necessary, the surface can be ground smooth with a rubbing brick or rotary grinder.

LESSONS

Several clients have used the discharge pressure from a vacuum cleaner to push the resin into the voids. This technique is quite effective when the delamination gaps are tight. Higher pressure, however, isn't recommended because leak paths may exist beyond the delamination

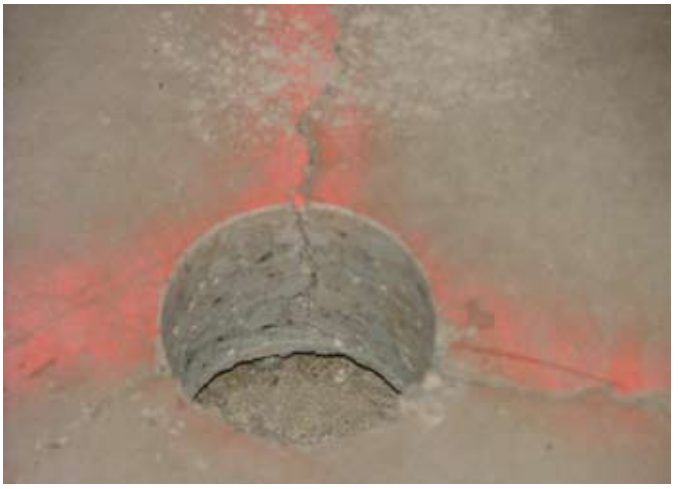

Fig. 1: After sounding with a hammer or other techniques to determine approximate locations, the delaminated area is verified with core-drilled holes

Fig. 2: The holes used to verify the delaminated areas are also used to introduce the two-part polyurethane. Other core holes, along with smaller holes drilled in the delaminated area, are used to bleed off air and verify that the product is filling the delamination

Fig. 3: Cores drilled after the repair is complete are used to verify that the repair was successful

and it's not possible to see where the product is going. Also, caution should be used when working on an elevated slab, as the resin could flow into the spaces below.

When drilling the core holes into the delamination, it's not uncommon to penetrate into the slab well below the delamination layer. Drilling out material below the delamination provides the advantage of creating resin studs when the delamination is repaired. These resin studs help glue slabs together as well as transfer shear across the delamination. If delaminations are very tight, it may be necessary to drill several holes into the slab and create several resin studs.

CHECK AGAIN

After the resin has cured, I recommend checking the installation by sounding the area. It's also common to take cores to ascertain the completeness of the injection (Fig. 3). If a void is found, it's a simple process to fill the void by drilling and filling additional holes where required. Even if some unfilled delaminations are found when the installation is checked, our clients have found that using a flowable resin for delamination repair is very cost effective, fast, and reliable.

Selected for reader interest by the editors.

—Express Polymers
CIRCLE 51

Nelson R. Tonet is President of Express Polymers, Morgan, PA. He has over 35 years of experience in the engineering and construction of conventional and nuclear power plants, industrial and commercial facilities, and transportation infrastructure projects. His public service has included appointment to various industry boards and authorities, service on technical committees, and election to public office. He has written and presented various technical papers at technical symposia.