

Repairing Bridge Deck Cracks

Epoxy bonding is an economical solution.



Close-up of cleaned concrete deck and trapped dust and debris in the cracks before being blown out clean with air.

There are three imperatives for repairing cracked bridge decks. First, determine if the cracks are structural or non-structural. Second, determine the chemical and waterproofing requirements of the concrete deck and structure. Third, determine whether the repairs will change the driving surface conditions.

If the deck only has a small number of cracks, it is usually best to select a low-pressure epoxy injection system for both nonstructural and structural cracks. These systems, if properly installed, may protect the deck beyond its normal wear surface life cycle.

Many times bridge decks have more cracks than is practical, from a cost and downtime perspective, to be repaired by crack injection. These are often referred to as “alligator” cracks or “spider webs.” The deck may be cracked through the entire depth of the concrete slab or cracked only in the unbonded concrete overlay. The typical approach to solving this problem is to replace the deck with new concrete.

There is a better way to stretch maintenance budgets, achieve favorable results, and, in the process, create chemical/waterproofing by bonding the deck into a single, monolithic structure to provide a safe driving surface. Epoxy bonding will require a modest maintenance budget compared to complete deck overlayment. Also, the contractor making the repairs only closes one lane in peak traffic hours. This keeps drivers happy.

The pour and weld method seals porous and non-porous concrete surfaces. Contractors deliver a final product that provides chemical- and waterproofing, bonding the cracked elements, corrosion protection for the reinforcing steel, and mitigating future deck spalling. When there are several nonstructural cracks on the bridge deck, Crown Polymers’ low-viscosity CrownWeld™ GF is an example of this type of product that has a proven service life.

Using this type of product requires some special considerations:

» Estimating Material Quantity

It is important to prepare a thorough inspection report. It must record crack widths, lengths, and depth. The epoxy will penetrate into cracks as small in width as 2 mils and fill any larger cracks and delaminated areas.

Ask your polymer sales representative for assistance. The manufacturer’s expertise can save the contractor money, time, and effort. Crown Polymers has developed a free estimating sheet and Excel estimating calculator program to assist in estimating the required amount of epoxy repair material.

» Surface Preparation

Proper surface preparation is always critically important. But preparation requirements may vary from project to project, depending on the condition of the deck. The final substrate surfaces must be clean, dry, sound, and free of all bond-inhibiting substances.

In many cases, using the welding repair method requires less surface preparation. Contractors first follow the cracks with the selected cleaning method. They can choose to shotblast or sandblast the cracked surface. Sandblasting is an effective cleaning method because the blasting nozzle is aimed directly into the crack.

After blasting, the contractor must remove any residue by blowing the surface with highpressure compressed air to remove loose particles and dust from the exposed open cracks. The contractor can also vacuum the residue. But this is slower and time is always an issue when closing traffic lanes.



On smooth surfaces, the mixture can be poured directly onto the cleaned concrete surface, covering the cracks.

When deck sealing is part of the process, dust-free shot-blasting may be the best cleaning method. Each offers advantages and disadvantages. Carefully considering the cleaning method can create savings of both time and money. Surface preparation is another area where a manufacturer representative can provide valuable insights.

» Mixing Product

It's important to have a thorough mixing effort. Manufacturers formulate the penetrating epoxy to an ultra-low viscosity between 50 and 75 cps, similar in appearance to a clear lime beverage. The polymer is 100% solids, non-shrinkage, non-flammable, solvent-free, and VOC-free.

To speed application, the epoxy components are pre-measured. The contractor first pours the "B" component into the "A" component. Then he uses a paint-mixing blade to blend the components for about one minute.

Mixing locations are usually as close as possible to the application area. When within walking distance, contractors use five-gallon pails to transport the material. When hauling the mixture longer distances, use a flatbed cart to prevent spills.

On relatively smooth surfaces, the contractor pours the mixture directly onto the cleaned concrete surface, covering the cracks. He then spreads the epoxy over the deck surface with squeegees and/or brooms, directing the material into all open voids. Depending on ambient temperature, the epoxy penetrates the deck in about 10 minutes. Contractors repeat the process when the epoxy travels deeper into the concrete deck to fill voids.



The Contractor spreads the epoxy over the deck surface with a broom or squeegee and directs the material into all open voids.

On rough and textured surfaces or concrete cracks that are less than 1/32-inch-wide, contractors back-roll the liquid epoxy with a short nap paint roller cover to help fill the cracks. The epoxy will penetrate downward into the cracks and displace air. As penetration occurs, workers broom or squeegee more epoxy over the surface to assure all cracks are adequately filled.

Once the epoxy has stopped its downward or lateral movement, it will back up in the crack and gel. When the epoxy continues to disappear and it is not leaking out of the underside of the deck, it is filling cavities around reinforcement steel, delamination voids, and unbonded concrete overlay sections.

» Sanding the Deck Surface

When the cracks are filled, and before the epoxy starts to gel, contractors broadcast the area with dry angular sand, 20-30 mesh. The sand broadcasting must be timed and spread evenly over the entire surface before the epoxy becomes tack-free and a dry layer is present. Allow the surface epoxy to become tack-free. Remove excess sand and the surface will be ready for traffic. **CS**



Floyd Dimmick Sr.
Technical Director
Crown Polymers

Floyd Dimmick Sr. is co-founder and technical director of Crown Polymers, a manufacturer of concrete repair products and decorative, institutional, educational, industrial, and commercial floor and wall systems. He is a member and was past chairman of polymer overlay committees of ACI and ASTM and may be reached at info@crownpolymers.com.

© 2009 Hanley Wood, LLC. All Rights Reserved. Reproduction or dissemination of "Repairing Bridge Deck Cracks" (Concrete Surfaces, Summer 2009, pages 33-35) is expressly prohibited without the written permission of Hanley Wood, LLC. Unauthorized use is prohibited. Crown Polymers is publishing "Repairing Bridge Deck Cracks" under license from Hanley Wood, LLC.

Call for the location of your nearest Crown Polymers representative.



Crown Polymers, LLC.
11111 Kiley Drive
Huntley, Illinois 60142