



## Polymer Overlays Extend Bridge Life

... by Lisa Harris .....

Engineers have tried different types of overlays to extend the life of existing bridge decks and decrease the permeability in the concrete without adding excessive dead load to the structure. The Kansas Department of Transportation (KDOT) has been applying two-coat broom and seed polymer concrete overlays. These involve the distribution of a polymer binder on a shot-blast-prepared bridge deck followed by broadcasting aggregates over the liquid polymer. KDOT's specifications are based on the AASHTO publication *Guide Specifications for Polymer Concrete Bridge Deck Overlays*, October 1995.



*The first coat of polymer is applied with a notched squeegee.*

Here are some Q's and A's about the technique:

### **What kind of surface preparation is needed before application?**

To achieve the desired results, deteriorated concrete must be removed and patched with suitable material. Bridge decks with cracking and a low amount of delamination are ideal candidates. However, any level of repair can be made as decided by the bridge owner. Cementitious patches should be allowed to cure for 28 days prior to placing the polymer concrete overlay. Typically polymer based patches can be overlaid much sooner.

Before placing the overlay, the bridge deck surface must be cleaned by shot blasting in order to produce the International Concrete Repair Institute (ICRI) Surface Preparation Level 6 to 7. Shot blasting cleans surface contaminants from the deck to leave the appropriate relief to allow bonding of the overlay. All dust and loose material left from the cleaning operation must be removed with an air blast using dry, oil free air or vacuum. Brooming is not acceptable; debris, moisture, and contaminants left on the deck will interfere with the bonding of the overlay.

### **How soon after preparing the deck must the polymer be applied?**

The first course of the polymer concrete overlay must be placed within 24 hours of the deck surface preparation. Follow the manufacturer's recommendations when mixing the epoxy components. The epoxy supplier's technical representative should be on the job site during the placement of both courses of the polymer concrete to ensure proper mixing, placement, and handling of the polymer.

Using a notched squeegee, the epoxy is applied over the prepared concrete bridge deck. Aggregate is distributed over the epoxy within 10 minutes of its application.

To ensure a good bond with the polymer, aggregates must be dust free and dry. Aggregates used in polymer concrete need to be hard and high quality such as Flint Rock found in Northeast Oklahoma. Other high quality aggregates that can be used include: basalt, silica, quartz and granite.

Two layers of epoxy and aggregate are alternately applied, resulting in an overlay approximately 0.25 to 0.375 inches thick. The ends of wearing surfaces and expansion joints are finished in such a way as to minimize bridge deck roughness, typically by additional shot blasting.

Cure time for each course will vary from 1 to 6.5 hours depending upon the temperature of the materials and bridge deck.

Polymer concrete overlays can often be completed during non-peak hours to minimize traffic disruption. Application of 400 sq. yds. per day is typical. The first course of the polymer concrete overlay is typically not opened to traffic.

### **What temperature range is recommended?**

Polymer concrete overlays should not be placed when the air temperature is expected to drop below 55 degrees F or when the deck temperature is expected to exceed 100 degrees F.

### **What kind of polymer does KDOT use?**

KDOT utilizes a Type III, 100 percent solids thermosetting, moisture-insensitive epoxy specifically formulated for use in polymer overlays.

### **Benefits of polymer concrete overlays**

Polymer concrete overlays costs slightly less than silica fume overlays, but they offer several advantages over silica fume overlays:

- Dead load is substantially less with polymer concrete overlays (5 pounds per square foot versus 18 pounds per square foot for silica fume).
- Offers a 100% waterproof barrier that seals the deck and existing cracks.
- Reduced traffic disruption.
- Extends the life of patched areas on decks.
- The integrity of the structure is preserved since polymer concrete overlays require only shot blasting preparation and not the use of aggressive and extensive milling like silica fume overlays.
- Provides a skid resistant wearing surface.
- Polymer concrete overlays can be expected to last from 10 to 25 years depending on traffic volumes.

### **Who can I contact for more information?**

David Meggers, P.E.,  
Research Development Engineer  
Kansas Dept of Transportation  
2300 Van Buren  
Topeka, Kansas 66611-1195  
(785) 291-3845  
dmeggers@ksdot.org

Mark Hoppe, P.E.,  
Bridge Team Leader  
Kansas Dept of Transportation  
700 SW Harrison, ESOB  
Topeka, Kansas 66603-3754  
(785) 296-3846  
Hoppe@ksdot.org

### **Idaho Contacts:**

Matt Farrar, P.E.  
Bridge Engineer  
Idaho Transportation Department  
3131 W. State St.  
Boise, ID 83707-1129  
(208) 334-8538  
matt.farrar@itd.idaho.gov

Clint Hoops, P.E.  
Materials Field Services Engineer  
Idaho Transportation Department  
3311 W. State St.  
Boise, ID 83707-1129  
(208) 334-4415  
clint.hoops@itd.idaho.gov