RESEARCH NOTES

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POLYMER CONCRETE BRIDGE DECK OVERLAYS
Deschutes River Bridge (Biggs) Maupin Bridge (Maupin)
Final Report

This report documents the construction and performance of two thin polymer concrete (with polyester/styrene resins) bridge deck overlays. The overlays were constructed in Biggs and Maupin, Oregon in June 1993. Construction of the overlays was less than ideal. The polymer concrete on both bridges has since delaminated resulting in blocks of loose material. Both overlays are scheduled for removal in the fall of 1995. Several aspects of the construction provided information that should be considered during construction of future polymer concrete overlays.

CONSTRUCTION CONCLUSIONS

The rate of production and the quality of the work improved dramatically when the contractor switched from hand mixing in a bucket to machine mixing in a mortar mixer. Bare spots or bumps at cold joints could be reduced by maintaining a continuous operation. The amount of mix produced also needs to be matched with the manpower available.

On separate occasions, rain and warm weather created delays during construction. One day, construction was delayed due to light rain. The materials cannot be applied on a damp surface. Light mist was dealt with by blow drying the deck, but a substantial rain storm stopped the project on another day. Warm weather may decrease the time for the polymer concrete to cure causing problems with aggregate sticking. Changes in air temperature and thus deck temperatures must be monitored. In some cases, the amount of catalyst may need to be adjusted to meet changing temperatures.

Extra work was required to maintain the grade at joints in order to provide a comfortable riding bridge deck. Feathering and extra layers should be used at joints where a significant amount of concrete is removed. Pre-leveling is also an option.

The gauge rakes used to spread the polymer concrete will wear down. The Transpo representative estimated that with his 2-hook rake, the hooks should be replaced every 2000 sq ft. If the hooks are not replaced, the overlay thickness will drop below the 1/4" thickness specified.

PERFORMANCE CONCLUSIONS

On Bridge #302 at Biggs, higher bond strengths corresponded with a small amount of overlay delamination. The areas where delamination was found could have been caused by inadequate deck preparation near the curb, contamination from material blowing off the sidewalk prior to primer application, and the removal of duct tape which weakened the polymer concrete and led to cracks along the centerline.

On Bridge #966 at Maupin, part of the delamination could be attributed to contamination of the primered deck caused by traffic and/or spills of the powdered product prior to mixing. Warm weather, which led to the adjustment of the catalyst, may have also contributed to the delamination.

Smaller areas of delamination could also have been caused by contamination of the primed deck. In addition, sand blasting done along the curb line may not have provided an adequate surface for the primer to stick. Delamination along the centerline of the bridge could be attributed to weakened polymer concrete due to duct tape removal which resulted in cracks that allowed water access. Traffic driving the edge before the cure was complete could also weaken the lap joint. Deep rake marks in the final lift, caused by rapid catalyzing of the polymers, built in failure points which could allow water to penetrate below the mat.

RECOMMENDATIONS FOR IMPLEMENTATION

We recommend that controlled field tests of polymer concrete (with polyester/styrene resins) be performed before these products are used extensively by ODOT. When the next polymer concrete overlay is constructed the following recommendations should be followed to aid proper placement:

a) Drains shall be temporarily covered to keep the slurry mix out.
b) All deck striping shall be removed prior to overlay construction.
c) The contractor shall be required to maintain a continuous delivery of materials to the bridge deck during overlay construction. The amount of material available for application should be evenly matched with the number of construction workers.
d) Joint repair shall include the removal of material 12 to 18 inches on each side of the joint. Heavy shot blasting or 1/4-inch diamond grinding shall be used for concrete removal around the joints. The material used to fill the joint shall be feathered in to provide a smooth riding surface.
e) Workers shall not be allowed to walk on the fresh overlay to broadcast the aggregate.
f) The aggregate shall be broadcast from a distance to provide uniform coverage and allow the wind to remove finer particles.
g) The overlay shall be feathered to zero inches at the drains to reduce the possibilities of standing water at the curb line.
h) Final raking shall be in the direction of traffic.
i) If edge tape (duct tape) is used, it shall be removed as soon as possible (if the mix sets up, edge tape removal may cause delamination).
j) Gauge rakes shall be checked and hooks replaced frequently to maintain the specified minimum thickness of overlay.

Recently, the final report for this research project was published. If you want additional information regarding this project or a copy of the report, please contact:

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