



SHORT REHAB

Contractor speeds through construction using rapid-setting concrete



Fig. 1 – While some sections of the historic Lewis & Clark bridge had to be completely replaced, much of the deck could be refurbished by applying a new concrete overlay. The repair will extend the life of the span another 25 years.



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After 18 months of partial closures, the Lewis & Clark Bridge is scheduled to completely reopen a full six months ahead of schedule in June. The general contractor, Max J. Kunej Co. of Spokane, Wash., will receive a \$55,000 bonus from the Washington State Department of Transportation (WSDOT) by using fewer full-weekend closures.

“This project presented us with a lot of unique challenges that were successfully addressed using highly innovative construction techniques,” said WSDOT Assistant Secretary John Conrad, “which ultimately saved the state both time and money.”

The use of a high-performance, rapid-setting, latex-modified concrete (RSLMC) overlay, supplied by the George L. Throop Co. of Pasadena, Calif., helped move the project ahead of schedule and under budget.

Built in 1929, the Lewis & Clark Bridge connects the communities of Longview, Wash., and Ranier, Ore. Seventy-five years of use had taken its toll on this bridge, and an extensive rehabilitation of the historic landmark was needed. While some sections of the deck had to be completely replaced, much of the surface could be refurbished by applying a new concrete overlay. According to

WSDOT officials, the repairs will extend the life of the bridge another 25 years.

WSDOT used the Max J. Kunej Co. to carry out the bridge rehabilitation. Up to 40,000 cars per day travel across the bridge, so closure time had to be restricted to late-night and weekend hours when only 5% of the bridge traffic would be affected. During closures, thousands of travelers were forced to use other bridges in Portland or Astoria—each a 100-mile detour—or the hourly Puget Island Ferry—a 50-mile detour.

WSDOT specified that the overlay obtain compressive strengths of 3,000 psi in four hours and 4,000 psi in 28 days. The RSLMC exceeded both requirements, obtaining 4,000 psi at four hours.

“The bridge is the only bridge crossing the Columbia River between Portland and Astoria, so it was critical to keep the bridge closures to a minimum,” said WSDOT area engineer Casey Liles.

Four hundred fifty cu yd of RSLMC was used to complete the 1,575-ft length of overlay during one weekend of work. The concrete was placed out of a mobile mix truck, which batches the concrete continuously as it is placed.

“When producing RSLMC, a mobile mixer is really the only way to go,” said Jeff Throop, vice president of the George L. Throop Co. “It gives the contractor complete control over the project, starting and stopping whenever he needs without wasting any material.”

The bridge was open to traffic on Monday morning at 5:30 a.m. “At a minimum, WSDOT saved nine days by using RSLMC instead of a slower setting concrete overlay,” noted Liles.

Closures cost the state thousands of dollars per hour for traffic rerouting, equipment use and labor, so there is great incentive to reduce them.

Although the material for RSLMC is more expensive than conventional concrete, overall



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Fig. 2 – The repairs were finished a full 10 days ahead of schedule.

cost savings results from reduced closure times. A 1998 Virginia Department of Transportation study on RSLMC showed a 26% savings by using RSLMC. Labor and materials for 1 sq yd of RSLMC costs \$96, compared with \$130 for a conventional portland cement concrete overlay, according to the report.

Liles estimated that a bridge closure costs WSDOT up to \$16,000 per day. That translates into savings well over \$100,000.

GENERATING SPEED

RSLMC is proportioned similarly to conventional concrete. It derives its unique properties from two key constituents: a rapid-setting cement and a latex-modifying admixture.

The rapid-setting cement is manufactured by CTS Cement Manufacturing and is known as Rapid Set Cement. This cement gives the concrete its high early strength. Like portland cement, it is hydraulic, meaning it reacts chemically with water to harden. However, its chemistry and fineness are different, giving Rapid Set Cement its unique properties.

The latex admixture is a styrenebutadiene polymer called Modifier A manufactured by Dow Reichhold. It is added in liquid form to the concrete along with the mix water. The admixture

improves concrete adhesion, prevents damage from freezing and thawing and significantly reduces chloride ion penetration. Chlorides are a major cause of internal reinforcement corrosion, leading to early concrete failures.

The latex reduces chloride ion penetration in RSLMC to levels generally below 1,000 coulombs at 28 days according to ASTM C 1202 testing conducted at Construction Technology Laboratories in Skokie, Ill. Concrete with chloride ion penetrability less than 1,000 coulombs is referred to as having “very low permeability,” according to ASTM.

SPREADING QUICKLY

The earliest RSLMC projects took place in 1991, although the material did not attain widespread use until the mid-1990s. Since then, hundreds of overlays and patches have been successfully completed on bridge decks and pavement surfaces. Transportation authorities in Pennsylvania, Virginia, New Jersey, Kentucky, Washington, D.C., and elsewhere have used RSLMC extensively.

One of the earlier large-scale RSLMC jobs took place in 1998, when 1,400 cu yd were used on the rehabilitation of the Brent Spence Bridge on I-75 between Lexington and Cincinnati. The Kentucky Department of Transportation used Intech Con-

tracting of Lexington, Ky., to place the concrete overlay. The repairs of the four-lane double-decker bridge across the Ohio River were finished a full 10 days ahead of schedule, reducing costs and public inconvenience.

Dozens of RSLMC jobs are successfully completed each year, saving transportation agencies days of closures and millions of dollars nationwide.

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