Breakthrough

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LMC-VE Concrete Opens Bridge Deck Overlays for Traffic Sooner

Business Issue

The thought of closing a lane on a major bridge in a metropolitan area is a headache for motorists and engineers alike. Now multiply that by three to seven days and maybe throw in a couple sporting events. The potential for traffic congestion goes through the roof. That's the reality of repairing bridge decks in major interchanges or in areas already at capacity during heavy traffic hours. It's also the reason MoDOT chose to explore the use of Latex Modified Concrete-Very high Early (LCM-VE) strength on two projects in the St. Louis area.

Figure 1 - Night operation on I-70, St. Charles County

Background

At present MoDOT specifications require a curing time for Bridge Deck Concrete Wearing Surface mixes of 3 days to 7 days, depending upon the type of concrete overlay used: Low Slump, Latex Modified or Silica Fume Concrete. In 1997, Virginia DOT was successful in using LCM-VE to repair and overlay two bridge decks and open them to traffic within three hours. As a trial placement, a closed ramp bridge on Interstate 70 near downtown St. Louis was chosen to verify how the process of quick repair. The trial placement consisted of hydroblasting the bridge to remove bad concrete and then applying a monolithic repair and overlay that could be opened as quickly as possible to traffic. Three different concrete overlays placed on the experimental bridge were compared; the LMC-VE, plus a Latex Modified Concrete High Early strength (LMC-HE, using Type III cement that would gain strength in 24-48 hours) and MoDOT's normal Type B2 bridge deck concrete. While poor condition of the existing deck negatively affected the hydroblasting, the LMC-VE performed well.

Approach

Following the trial placement the need arose to repair several bridge decks on I-270 in St. Louis County and I-70 in St. Charles County and get them open to traffic as quickly as possible. As the first contracted construction projects using LMC-VE overlays, Organizational Results staff observed and documented the effectiveness and feasibility of placing LMC-VE overlays on Missouri bridges. [1]

[1] Wenzlick, J.D., (2006). *Evaluation of Very High Early Strength Latex Modified Concrete Overlays.* Report OR 06.004, Missouri Department of Transportation, Jefferson City, MO, USA.

Project J6I1515, Rt. I-270, St. Louis County
The first two bridges were a twin structure with 5-lanes in each direction, northbound and southbound, with an average daily traffic (ADT) of 187,000. The bridges have a voided slab superstructure and had an existing 1 ¾" Low Slump concrete overlay. This bridge was planned to have a new Low Slump concrete overlay but the contractor, substituted LMC-VE. The other bridge on this project was a conventional deck on steel girders. It was hydroblasted just before the LMC-VE was placed.

Project J6I1444, Rt. I-70, St. Charles County
This project was to repair and overlay a 5-lane bridge on eastbound I-70 with an ADT of 83,000.

Figure 2 - LMC-VE overlays open to traffic on I-70, St. Charles County

Conclusions and Recommendations

- LMC-VE overlays provide a reliable driving surface and reduce user delays. Both study projects were completed overnight and open to traffic the following morning. LMC-VE overlays were ready for traffic within three to six hours of being placed. On projects with multiple lanes of heavy traffic, LMC-VE can accelerate the time between construction stages. In addition, if the decks do not require extensive repairs, hydroblasting can accelerate the time savings even more. However, LMC-HE with Type III cement is not recommended due to excessive shrinkage cracking discovered in the trial placements.

- Time savings can offset increased construction costs. The costs for the LMC-VE are 25 percent to 53 percent higher than conventional concrete bridge deck overlays. However, reduced traffic control and overall project time savings can offset those costs.

- Good, reliable bonding is essential to overlay performance. LMC-VE bridge deck overlays should be kept to a maximum thickness of 3". In addition, hydroblasting following milling is critical for a more irregular surface for better bonding to the concrete substrate.

For More Information

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