THE RIGHT CHOICE FOR RAPID RESTORATION?

WHY IS VERY EARLY STRENGTH LATEX MODIFIED CONCRETE

- Provides a wear resistant and durable surface
- Extends service life of bridge deck by upwards of 25 to 30 years and beyond on properly prepared and sound surface
- Only cementitious overlay that allows for waiving of clearance requirements around reinforcing steel, where otherwise required
- Can be used as a structural inlay in order to maintain deck grade
- Chemical properties allow for tenacious bond strength to properly prepared surface
- Dense and impervious to chemical and moisture intrusion
- Greater flexural strength than conventional portland cement concrete
- Lower water cement ratio than conventional concrete helps reduce the potential for plastic shrinkage cracking when proper curing and construction practices are followed
- Provides a wear resistant and durable surface
- Quality of HPLMC (with Type 1 or 2 Cement) has been proven in over 50 years of product use as overlay on bridge decks

“ON-CALL” DECK PRESERVATION IS GOLDEN FOR STAUNTON DISTRICT

By: Patrick Martens, PE

The Virginia Department of Transportation’s Staunton District engages in an innovative approach to repairing and preserving bridge decks through “on-call” contracting. Bridges within the district, including the heavily traveled I-81 corridor, through the western part of the state, are all part of this process to maintain and rehabilitate bridge decks.

The main north to south corridor through the district is on an aging part of the interstate system, built in the 1960s. This stretch of interstate has also seen significant increases in truck traffic through the years. Oh, and by the way, it is only two-lane traffic in each direction, meaning it is congested during the rush hour commute. No other process can provide the combination of removal, preparation, repair, and long lasting quality in such a short period of time as the “Fast Track” Hydrodemolition method paired with VESLMC. That is the real beauty of “Fast Track” Hydrodemolimation!

The Staunton District Bridge Office has been doing these “on-call” bridge repair contracts (including various overlays) for more than 20 years. Most of the bridge decks along the I-81 corridor were addressed with Latex Modified Concrete (LMC), Microsilica Concrete, and Epoxy Polymer wearing surfaces back in the 1990s. As these overlay systems reach their useful life, the district dilemma has become how to continue to maintain and preserve the system, while handling and not inconveniencing traffic – quite a balancing act. Pearce stated, “It’s the disadvantage of a two-lane northbound/southbound interstate system that has become a primary truck corridor.”

The bridges have met their match, however, through a combination of Fast Track Hydrodemolition technique (VDOT Type A) and Very Early Strength Latex Modified Concrete (VESLMC), within a contract that has been tailored through the years. The added twist is that the district, through its innovative approach to contracting, has figured out how to not only repair these decks and upgrade the wearing surfaces, but do so over a condensed nighttime operation, so as to limit traffic disruptions.

Prior to the use of hydrodemolition surface overlays through their “on-call” Maintenance and Repair contract, the bridge deck on the left has been recently rehabilitated, while the bridge deck on the right is still in need of repair.
preparation, the work scope would have been much more intense and tedious, not to mention more time consuming. In past projects using hydroconcrete, the contractor would have required, after the milling process, the need to sound and hand chip all the delaminated concrete, chipping down the joints and curblines, and an abrasive blast of the entire deck and cleaning, followed by deck watering. Plus, the milled surface would require brooming and a great amount of the overlay por to aid in bonding the overlay to the deck. By using a total surface hydrodemolition process, a robot with a calibrated waterjet finds the deck defects, selectively removes them, and roughens the surface to a condition requiring no grouting ahead of the overlay. The waterblasting also cleans the substrate and aids in the saturation process to ready the deck for the pour.

Hall oversees the selection of bridges on the project, picking out the priority bridge deck needs on a condition basis. Working with the prime contractor, the district sets up the needed decks for work. However, it is not just which bridge decks need repair, but how much money do they have to work with in their budget? You see, the money is somewhat open-ended. Funding for the project is contingent on the district’s operations fund available. If limited funds are available within the fiscal year, the number of bridges the crews can work on is reduced. If the funding source is prospering, then that opens up the program to be able to select and do more projects.

The traffic restrictions are fairly rigid, with single lane closure times typically permitted from 8:00 p.m. to 7:00 a.m. the following morning. That does not leave a lot of time to complete removals, plus have a rigid concrete overlay down, cured and opened up to traffic, before the morning rush hour.

With the restricted times, and the need to essentially subtract three hours for the curing time of the concrete, it limits the amount of available production time that the contractor can get in to prepare the surface. That is where the hydrodemolition process is critical to provide high production rates that address not only the selective removal of the bad concrete, but gives a great surface preparation for the overlay to grab to.

It has just been since 2015 where the “on-call” contract has incorporated the use of the Type A (Fast Track) hydrodemolition. The “on-call” process has included the repair of 42 bridges and 43,000 square yards of deck surfacing, with 20 of those bridges on the I-81 corridor, covering 17,000 square yards of bridge deck. That is a lot of nights, but an added convenience for crews is the drivers for the crews who trek through western Virginia during the daytime. “In the district we put a value on a flowing economy,” Pearce noted. “It’s the way to go with the constraints we are presented with,” he continued, with regard to the nighttime work. The “on-call” contractor who is awarded the project, through competitive bid, is contracted for one year. However, there is a clause that allows for both parties to extend the contract for a second year, if both the contractor and VDOT are acceptable. It also assures that there is satisfaction with production and performance from the owner’s perspective. The contract can also be extended for a third year, after which time a new contract is then bid out and awarded. Lanford Brothers Company, Roanoke, VA., has won the bid for the two most recently administered contracts (2015-17 and 2018-20) and the DOT has been very happy with the work done. “It affords us tremendous flexibility,” Pearce emphasized, with regard to managing bridge repair and preservation in the district. “The 2500 psi in three hours is the key, and the good, low permeability numbers,” Hall confirmed. “It really is one of the better preservation techniques out there that we use,” touting the combination of the shallow cutting (Type A) selective removal hydrodemolition with the VESLMC. “Implementing Type A Hydro has streamlined our process. I don’t think we’d be able to pull this off (otherwise) with our allowable work hours on I-81,” he added.

The hydrodemolition is done through a programmable robot that utilizes a high pressure water jet which is calibrated to selectively remove deteriorated and weathered concrete in the deck surface. A very important part of the Fast Track Hydrodemolition process though is to first cold mill and water blast the overlay from 1 to 2 inches down into the original deck prior to attempting the water blasting. The milling opens up the deck surface so that the waterjet can immediately engage in the cutting process. The main constraint is time according to Hall. “Plus, there is a lot of equipment. It gets pretty congested.” All the work is confined to the single lane of closure, so that one-lane traffic can still negotiate through the work zone.

A mobile mixer, supplied by the contractor, produces the VESLMC on site. The rapid hardening cement is a calcium sulfoaluminate (CSA) type cement, which is a specialty cement that is used where high early strength and weight reduction are desired. It works well with the latex emulsion to provide a very dense and well bonded mix, that should provide long term performance for 20 to 25 years of structural deck and wearing surface, and complete deck protection. After a three hour cure period, the overlay will generally achieve the necessary strength and be traffic ready. Hall indicated that a good maximum production that the contractor is comfortable with for a night of work is about 200 square yards, although they have surfaced up to 250 square yards and more. Part of figuring out the limit on production of a given night is dependent on joint locations and trying to get to a good stopping point on a bridge to minimize the cost of contractors joint work.

In addition to the new overlay, the contract work also takes care of needed joint work, joint elimination (when possible), and any projected full-depth deck repairs that may be anticipated. This is done prior to the hydrodemolition/overlay application.

Due to the success of the program, the district continues to support this process, and will be implementing its third iteration of the hydrodemolition/VESLMC contract coming up in 2021. And, it shows no signs of slowing down soon within the district. Other districts within VDOT also have been using this “on-call” process, or have the capability to.

Adam Matteo is the Assistant Structure and Bridge Engineer for VDOT. He notes that the state has been a big proponent for hydrodemolition technology. “The rapid adoption of the hydrodemolition technique has been welltimed for VDOT, as it is often the ideal treatment for Virginia’s bridges, given their average age and condition. By finding and removing compromised concrete or overlays, contractors can still negotiate through the work zone, removing contaminated concrete to a depth well beyond the chloride front, and providing an ideal surface for bonding. Hydrodemolition serves as an excellent preparation for the placement of concrete overlays.”

Virginia has also been using Latex Modified Concretes for about as long as they have been around (over 50 years), and VDOT is one of the leaders in the research and investigation of the performance of LMC, including the use of rapid hardening cements.

For more information on how to preserve your structures with the Fast Track method of Hydrodemolition and Latex Modified Concrete, CONTACT PAT MARTENS (636) 441-1376 pmartens@bridgepreservation.net

ASK ABOUT A LUNCH AND LEARN!