BRIDGE PRESERVATION & INSPECTION SERVICES

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TRY *FAST TRACK* HYDRODEMOLITION FOR WEEKEND WORK!

In very high traffic areas or where there is a premium on getting in and getting out, the "Fast Track" Hydrodemolition surface preparation process has proven to be a very popular method for many agencies. This is especially attractive on interstates, tollways, or in metropolitan areas, in general. It is very effective when the owner can allow for a weekend closure period, in order to maximize time spent on the deck. A bridge deck or lane can be shut down on a Friday evening, milling and hydrodemolition performed, and the overlay poured back with a Very Early Strength Latex Modified Concrete (VESLMC). With as little as a three-hour cure for the concrete, the lanes can be re-opened to traffic. Depending on the volume of work, the completed repairs can normally be accomplished within a window of 48 to 60 hours. This allows for a greater volume of work than what just an overnight lane closure provides. A contractor, with proper equipment and experience, can do as much as 1000 square yards of bridge deck (or more) in a single weekend. The traveling commuter can go home on a Friday night and upon returning to work on Monday morning be driving on a completely rehabilitated bridge deck and new overlay, with no inconvenience to their 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" Hydrodemolition!

WHY IS VERY EARLY STRENGTH LATEX MODIFIED CONCRETE THE RIGHT CHOICE FOR RAPID RESTORATION?

- Thin bonded (1 ½" minimum) overlay specifically designed for bridge decks
- Can be used as a structural inlay in order to maintain deck grade
- Only cementitious overlay that allows for waiving of clearance requirements around reinforcing steel, where exposed
- When combined with hydrodemolition surface preparation, acts monolithically with the existing bridge deck, and forms an attachment that helps the slab act as one structural unit
- 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
- Extends service life of bridge deck by upwards of 25 to 30 years and beyond on properly prepared and sound surface
- 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

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WATER WORKS
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CASE STUDY

YOU BUILD A BRIDGE FROM THE GROUND UP, BUT YOU PRESERVE IT FROM THE TOP DOWN. ISSUE 12 OCT 2020

"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 and hard to work on. So how to handle traffic and administer projects, all while not causing significant disruptions to traffic, can be quite the challenge.

District Bridge Engineer Rex Pearce, and District Bridge Maintenance Engineer Josh Hall, though, continue the "gold standard" for innovative and effective administration of an "On-Call Maintenance and Repair Contract" process in Virginia to deal with the deck repair needs within the corridor. The contract allows for work on various routes throughout the district but the I-81 corridor is an especially sensitive area that the contract targets heavily.

The district does an outstanding job of maintaining their bridge decks to a high standard already. The I-81 corridor has no deficient bridges on it, but the district is vigilant about upholding that quality. The decks worked on for rehab, will generally fall in a generally fair condition (NBI 5 or 6 range).

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 though 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

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Photo - VDOT's Staunton District makes improvements to the I-81 corridor with new Latex Modified Concrete 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.

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preparation, the work scope would have been much more intense and tedious, not to mention more time consuming. In past pre-hydro contracts, this 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 in of a grout ahead of the overlay pour 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 operation funds 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 get 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 so 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 the motorists and truckers 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 weakened concrete in the deck surface. A very important part of the Fast Track Hydrodemolition process though is to first cold mill any existing overlay from the bridge deck, plus mill 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.

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Photo - Type A hydrodemolition (Fast Track) allows for selective removal of the deteriorated concrete, leaving as much sound concrete as possible in the deck, and creating a very roughened profile. Existing patches within the deck, that are sound, can be left in place.

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The district does allow the cold milling work to be done in a separate operation before the hydrodemolition operation begins. Milled transitions in the approach are required for the temporary transition during this interim period. The advanced milling allows the contractor to then get a good head start on the lane, and immediately start the waterblasting on the night that the overlay is to be installed.

When hydroblasting does begin, the jet is calibrated in order to attain the selective removal hydrodemolition cut and profile desired. Vacuum collection of debris and water is done to quickly clean and expedite the surface preparation prior to the VESLMC installation. It is also imperative that the deck substrate is clean and well saturated out in front of the overlay pour.

Photo - Very Early Strength Latex Modified Concrete overlay completed during overnight hours on the bridge deck and approach slabs, should provide 20 to 25 years of extended service life.

"The main challenge is time constraints," 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 fast setting development are desired. It works well with the latex emulsion to provide a very dense and well bonded mix, that should provide upwards of 20 to 25 years of structural deck and wearing surface, and complete deck protection. After a three hour wet 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 had nights of 250 square yards and more. Part of figuring out the limit of production on a given night is dependent on joint locations and trying to get to a good stopping point on a bridge to minimize a construction joint when possible.

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 forge on with 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 well timed for VDOT, as it is often the ideal treatment for Virginia's bridges, given their average age and condition. By finding and removing compromised spots in the deck, 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,*

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