Hydro-Technologies, Inc. & Modified Concrete Suppliers, LLC

Maintaining and Preserving Bridge Decks using Fast Track Hydrodemolition Surface Preparation and Latex Modified Concrete Overlays

INDOT Hydro-Demolition and LMC Presentation

INDOT Central Office

February 11th, 2015

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Bridge Deck Preservation

- It is very cost effective to attain a minimum of 75 years of service life from a bridge deck.

- By placing Latex Modified Concrete Overlays on Hydrodemolition prepared bridge deck surfaces before decks becomes structurally deficient, 75 years of service life or more can be achieved.

- The use of Fast Track Hydrodemolition and Latex Modified Concrete Overlays will provide an owner with an economical, long lasting and very fast bridge deck preservation method.
Bridge Deck Preservation Strategies

**75 Year Bridge Decks**
- Year 1 – Construct New Bridge Deck
- Year 25 – Place LMC O/L #1 – Hydrodemolition
- Year 50 – Place LMC O/L #2 – Hydrodemolition
- Year 75 – Replace Bridge Deck (Third O/L ? = 100 years)

Hydrodemolition & LMC Use in the United States

North Carolina 2012 – 41 Projects = 279,881 sy

Pennsylvania = 850,000 sy in last 6 years

Ohio – over 1,000,000 sy of concrete overlays since 2000

WV, VA, TX, NY, MT, MA, MD, LA, IN, AK, MI, KY + others
Hydrodemolition Definition

- Hydrodemolition is a mechanical process by which deteriorated concrete is selectively removed utilizing a high pressure water jet.
- By rapid erosion with the high pressure water, the cement matrix and fine aggregates between the course aggregate is essentially washed away.
- By properly calibrating the hydrodemolition robot movements, concrete of uniform strength can be removed to a specified depth + unsound deteriorated concrete with one pass of the robot = Selective Removal.
Hydrodemolition Applications

- Surface preparation of the total area of bridge decks prior to placement of overlays.
- Surface preparation for patches in bridge decks.
- Full Depth Removals
- Slotting
- Selective portions of structures removed – bridges, shipping piers, factory’s, parking garages, nuclear power plants, tunnels.
Fast Track Hydrodemolition Surface

- Fast way to prepare a bridge deck surface for a concrete overlay.
- Selectively removes deteriorated concrete at variable depths.
- Highly rough and bondable surface.
- Reduces Chloride Ion concentrations in the deck.
- With proper milling, only sound concrete remains.
- Has 300% to 400% more bondable area than surface milling alone.
- Stone is not cut – aggregates are protruding.
- Exposes and cleans reinforcing steel. Will not damage or dislodge reinforcing steel.
Hydrodemolition Equipment

- Consists of Pump & Power Unit, Hydrodemolition Robot and Vacuum Truck.
- Can be readily mobilized to any project.
- Set up time is quick and relatively easy.
Hydrodemolition Pump Unit

- Receives water intake from either tankers, hydrant or directly from stream or lake.
- Filters and pressurizes water.
- Supplies water at 15,000 psi and 55 ga/min to the Hydrodemolition Robot.
Hydrodemolition Robot

- Computerized and Self-Propelled.
- Water from the power unit exits through a ¼” jet nozzle.
- Controls allow operator to control the removal depth of the concrete by adjusting the step of the machine and the glide of the water jet.
Hydrodemolition for LMC

2/11/2015

Hydrodemolition Vacall Unit

- Cleans and washes bridge deck surface.
- Removes all hydrodemolition debris and slurry.
The Fast Track Hydrodemolition/Modified Concrete Bridge Overlay Method

- Fastest and most cost effective way to overlay a bridge deck.
- A minimum of 25 years of service life will be attained by the overlay if surface is properly prepared and overlay is properly placed.
- Consists of 4 steps

The Fast Track Hydrodemolition/Modified Concrete Bridge Overlay Method

- Step 1 – Mechanical Milling of the Existing Bridge Deck Surface to a Specified Depth or to the Top Matt of Reinforcing Steel.
- Mill for depth – Cost Effective
- Mill to top mat of reinforcing steel.
The Fast Track Hydrodemolition/Modified Concrete Bridge Overlay Method

- Step 2 – Perform Total Surface Hydrodemolition.
- Hydro to get the bad concrete out below the milling line and to provide a highly bondable surface.
- Do not hydro for depth – not cost effective.
The Fast Track
Hydrodemolition/Modified Concrete Bridge Overlay Method

- Step 3 – Final Cleaning of the Bridge Deck Surface and Minor Hand Chipping in Areas Inaccessible to The Hydrodemolition Equipment.
- Clean closely behind the hydro robot.
- Do not leave loose debris or slurry on the bridge deck surface.
The Fast Track
Hydrodemolition/Modified Concrete Bridge Overlay Method

- Step 4 – Placement of Modified Concrete Overlay.
  - Place during optimum weather conditions.
  - Surface must be extremely clean and in a damp condition.

Latex Modified Concrete Characteristics

- LMC was specifically designed (1960's) for use as a thin bonded concrete bridge deck material. It’s quality has withstood the test of time.
- A LMC Overlay is a structural bridge deck repair that will extend the service life of a bridge deck for over 25 years when placed on a hydrodemolition prepared concrete surface.
- LMC is very adhesive and develops great bond strengths to the existing deck.
- LMC shields the underlying deck because it is very impervious.
- LMC has greater flexural strength than conventional concrete.
- LMC is very wear resistant and improves the skid resistance on bridge decks
- LMC has a very low water/cement ratio. This characteristic prevents shrinkage cracking from occurring in the overlay.
Latex Concrete Mix Design

- Fine Aggregate (Sand) - 1575 - 1855 lbs/cy
- Course Aggregate (# 8’s) - 1106 - 1386 lbs/cy
- Cement (7 bags) - 658 lbs/cy
- Latex Emulsion - 24.5 gal/cy
- Water - 17.5 gal/cy
- Maximum Air - 7%
- Slump - 4 to 6 in

** Cement = Type 1, Type 3 or Rapid Set

Latex Emulsion

- Suspension of tiny (.2 micron diam.) styrene-butadiene polymer particles in water, typically about 50% polymer solids.
- Styrene-butadiene polymers are known for their hydrophobicity or excellent water resistance.
- Polymer particles coalesce or fuse together when in intimate contact to form a highly waterproof polymer film.
- Essentially waterproofs concrete.
Fast Track Hydrodemolition Advantages

- **Speed** – A fast, productive and economical way to prepare a bridge deck for a Modified Concrete Overlay.
- **Quality** - Selectively removes delaminated concrete and avoids the unnecessary removal of sound concrete.
- **Removes** chloride contaminated concrete.
- **Will not damage** existing reinforcing steel. Actually cleans the steel.
- **Surface** has 300 % to 400 % more bondable area than a mechanical milled surface.
- **Cost Savings** - Long term service life and maintenance cost savings. Immediate traffic control and road user cost savings.
Jack hammer the method of yesterday

- Damage to rebars.
- Vibrations in the rebars cause long distance damage to the bond in the structure
- Causes new micro cracks.
- No selective removal.
- Labour intensive.
- Hand and arm vibrations
- Slow and noisy.
Micro cracks and no bond is shown on a thin section after use of a jackhammer.
Thin section sample after using Hydrodemolition showing no micro cracks

Questions / Contact Info

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