

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

present

## 25 Year Bridge Deck Repair & Preservation using Total Deck Surface Fast Track Hydrodemolition and Latex Modified Concrete Overlays

2017 Western Bridge Preservation Partnership  
Denver, CO

May 23, 2017











# 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. Used for 50 years.

# 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)

**Systematic Approach – utilize bridge deck inspections.**



# Hydrodemolition & LMC Use in the United States

North Carolina 2012 - 2015 – 68 Projects = 600,000 sy

Pennsylvania = 850,000 sy in last 6 years

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

OK, IA, VA, WV, IL, TX, MO, MT, MA, MD, LA, IN, MI, KY,  
AL, GA, AR, OK + others

# Hydrodemolition & LMC Specification

## Special Provisions

**Latex Concrete Bridge Deck Overlay**

**Fast Track Total Surface Selective Hydrodemolition**

- **SY Pay Items**
- **CY Pay Item for Variable Depth LMC – material costs only**
- **Selective Removal Hydrodemolition Robot Settings**

# Fast Track / Total Surface Hydrodemolition Bridge Deck Surface Preparation



# 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 coarse 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
- 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.
- Selective Removal Settings







Market St at 21st St 1/2  
Market St 3000 West 1  
Forest Park Ave 1 1/4

Amtrak  
MetroLink  
NEXT RIGHT

CHRISTIAN TALK RADIO  
91.5FM 132

The legal drinking age is **21**

*Thanks*  
for **NOT** providing  
alcohol to teens



Don'tServeTeens.gov







# 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.
- Oscillating Direct Impact Jet vs Rotating Spin Jet









STATE LAW  
NO ONE SHALL DRIVE  
OR OPERATE A MOTOR  
VEHICLE ON A  
BRIDGE OR VIADUCT

EXIT 30B  
Market St  
3000 West  
Vg. Rd.

EXIT 30  
Market St  
at 21st St  
EXIT ONLY

30



# Hydrodemolition Vacall Unit

- Cleans and washes bridge deck surface.
- Removes all hydrodemolition debris and slurry.







# The Fast Track Hydrodemolition/LMC 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.
- Measure to the Motar line
- Do not jackhammer under partially exposed reinforcing steel













# 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.

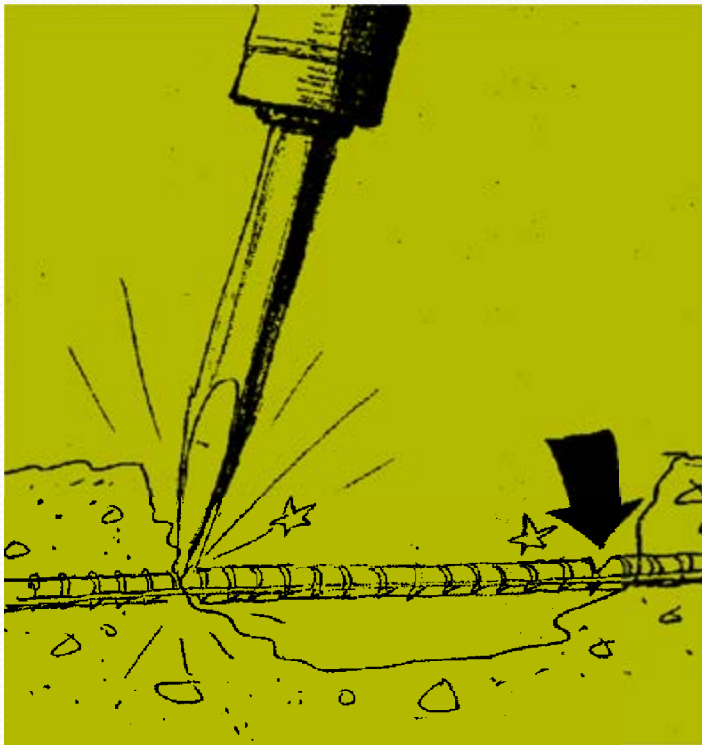


# Fast Track Hydrodemolition Advantages

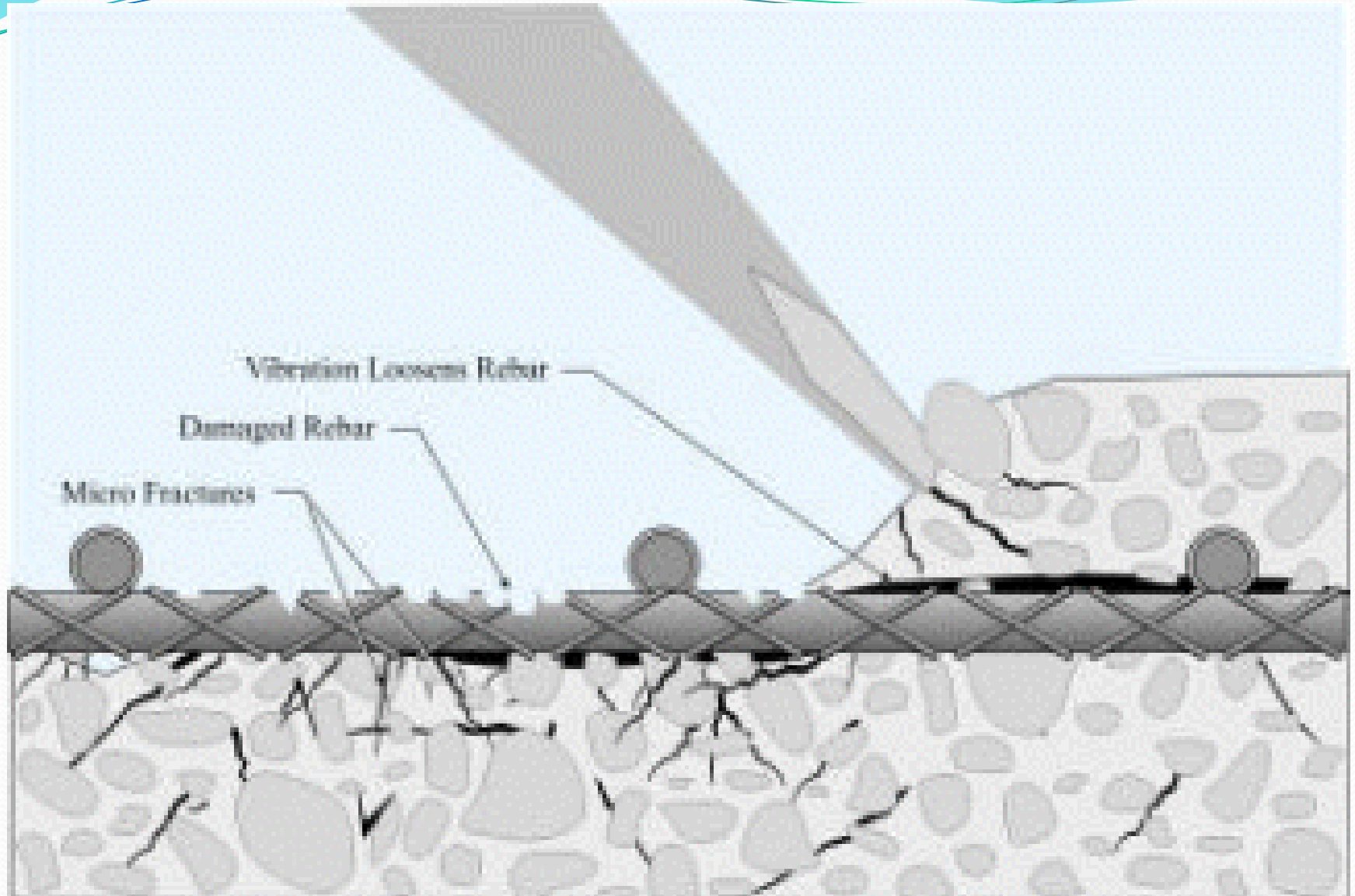
- **Speed** – A fast, productive and economical way to prepare a bridge deck for a Modified Concrete Overlay.
- **Quality** - Selectively removes delaminated concrete and avoids the unnecessary removal of sound concrete.
- **Removes** chloride contaminated concrete.
- **Will not damage** existing reinforcing 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.
- **Construction** - Replaces jackhammers. Lower Noise Levels. No fugitive dust. No micro-cracking of deck concrete.



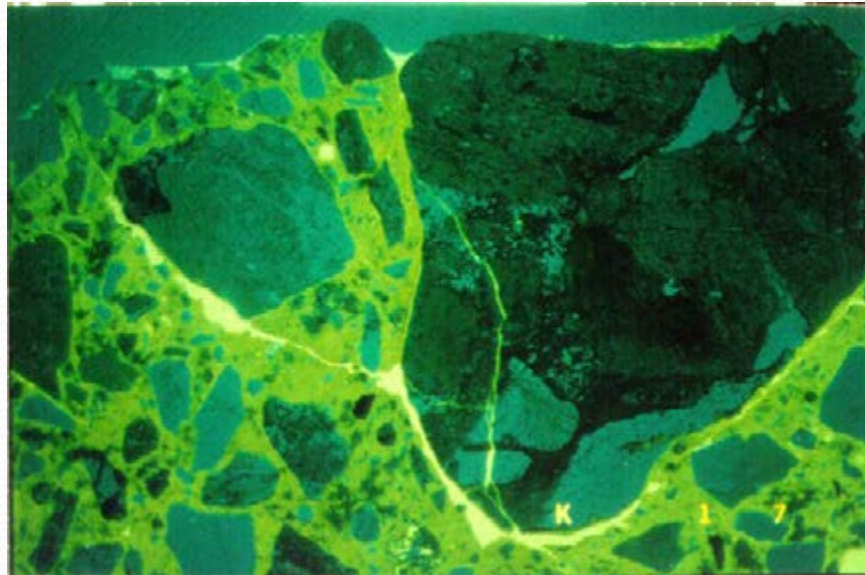
# Jack hammer the method of yesterday



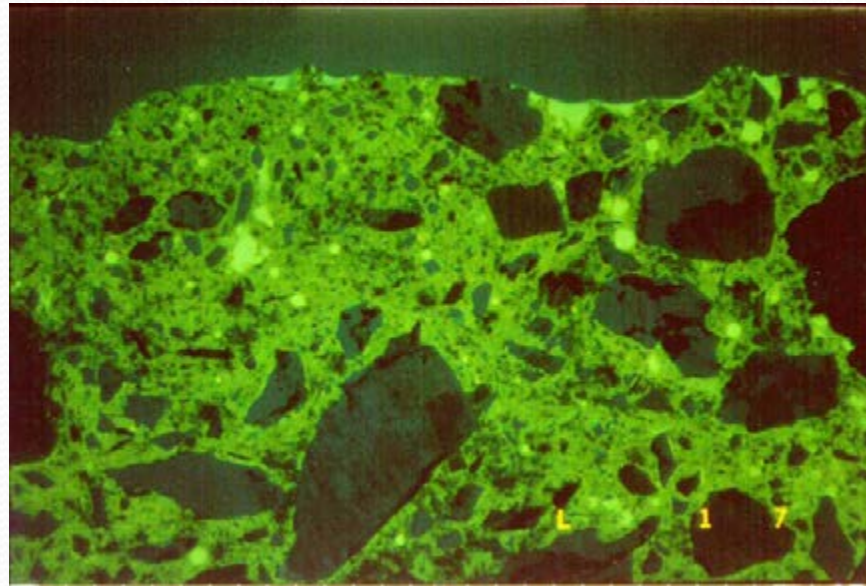
- Damage to rebars.
- Vibrations in the rebars cause long distance damage to the bond in the structure
- Causes new micro cracks.
- No selective removal.
- Labour intensive.
- Hand and arm vibrations
- Slow and noisy.



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





# 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  
(Can use Rapid Set Cement for weekend or overnight pours)
- Latex Emulsion - 24.5 gal/cy
- Water - 17.5 gal/cy - .45 w/c ratio
- 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.



We design dreams...

**Mavrik**  
FINE JEWELRY

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CRIS





M-11

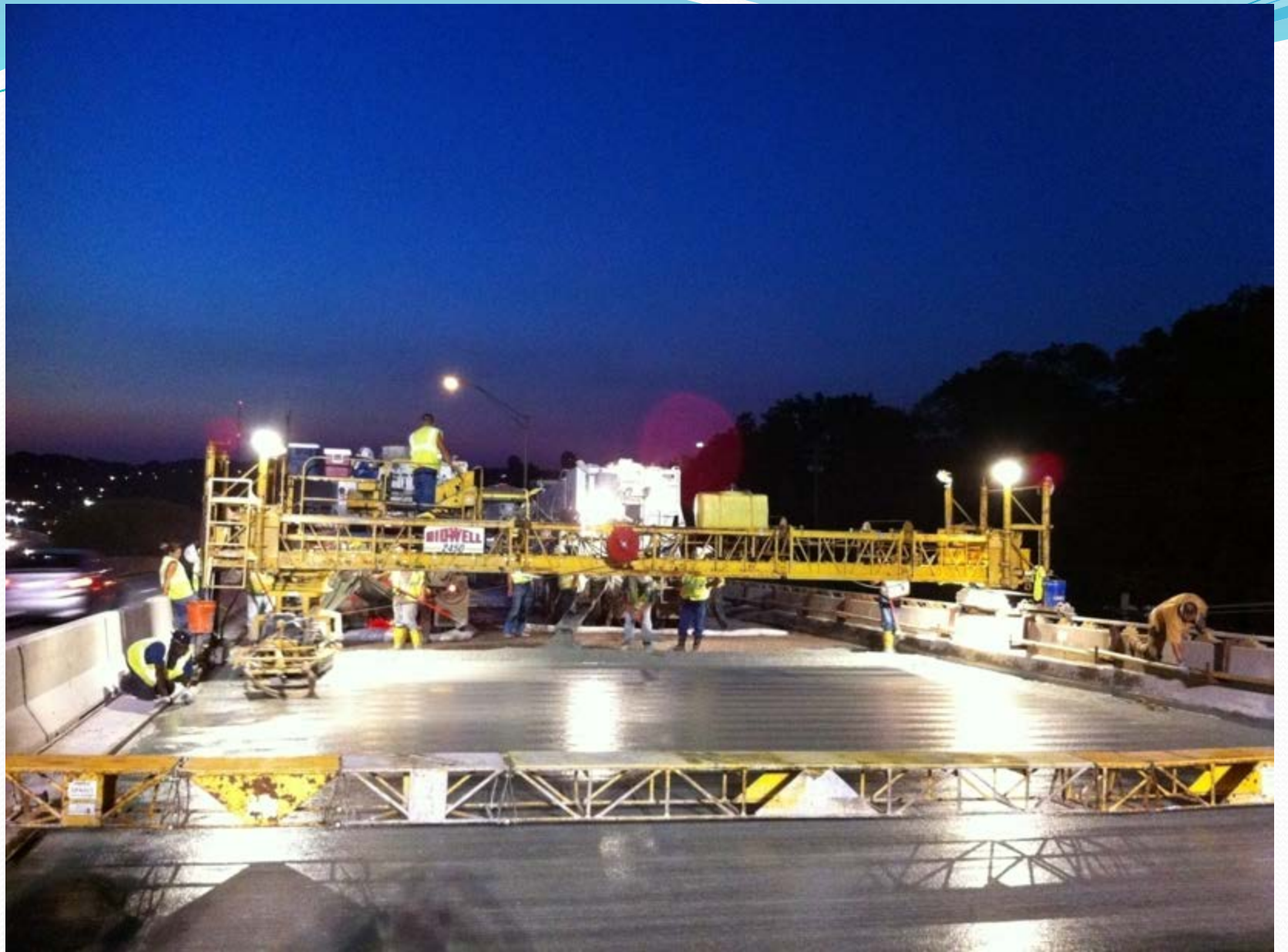
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# Very Early Strength Latex Modified Concrete

- Add very early strength hydraulic/portland cement to the LMC mix.
- Achieves compressive strengths of over 2,500 psi in 3 hours – traffic ready.
- Provides the same benefits as LMC overlays.
- VESLMC has been used on projects in the US since 1991.
- VESLMC is very impervious to chemicals that deteriorate standard concrete.
- VESLMC overlays result in better bonding and less cracking.
- A VESLMC Overlay placed on a Hydrodemolition prepared surface is the fastest construction method to preserve a bridge deck. Typically used on weekend and overnight projects.
- 20 years of additional service life is instantly added to your bridge deck.

## TYPICAL WEEKEND SCHEDULE:

### Friday

- 9:00 pm to 10:00 pm - Close roadway.
- 10:00 pm to 12:00 am - Remove Ex. O/L
- 12:00 am - Hydrodemolition

### Saturday

- 12:00 am to 12:00 pm - Hydrodemolition
- 12:00 pm to 12:00 am - VESLMC O/L

### Sunday

- 12:00 am to 4:00 am - Cure VESLMC O/L
- 4:00 am to 12:00 pm - Cleanup work area.
- 12:00 pm to 2:00 pm - Open roadway

# Questions / Contact Info

**Edward M. Liberati, PE**

**Hydro-Technologies, Inc.**

**Modified Concrete Suppliers, LLC**

- **Cell – (502)693-3253**
- **[eliberati@hughesgrp.com](mailto:eliberati@hughesgrp.com)**
- **We offer technical presentations, field demonstrations, simple plans, specification development and Professional Engineering Services.**