

DELAWARE MEMORIAL BRIDGE LARGEST UHPC DECK REHABILITATION PROJECT

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National Bridge Preservation Conference

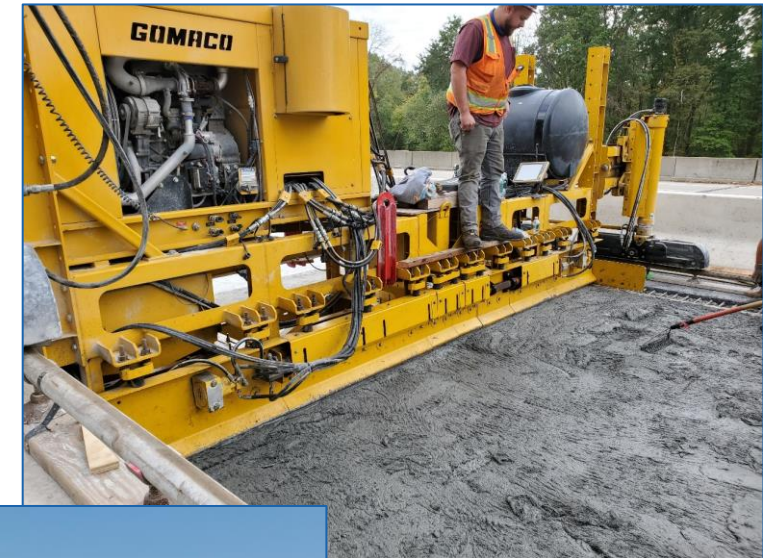


UHPC SOLUTIONS

NORTH AMERICA



- **Specialty Infrastructure Rehabilitation Contractor**
- **Our highly experienced workforce installs innovative repair materials with cutting edge equipment for:**
 - Bridge overlays
 - Field cast connections for precast bridge elements
 - Link slabs, shotcrete and other applications
- **Our Services include:**
 - National US Coverage
 - Mixing, transporting, placing and installing UHPC
 - Use commercially available UHPCs
- **Our Experience:**
 - 9 DOTs (NJ, NY, CT, DE, PA, DC, AL, IA, TX)
 - Over 6,200 yd³ UHPC installed in the US



WHAT IS UHPC?



- **UHPC** is an advanced cement-based composite material and NOT comparable to normal concrete
- Very **high strength, stiffness, bond development** and **post-tensile cracking** strength
- Compact **nano-matrix** and **internal steel fiber** reinforcement for added ductility
- Exceptional **durability** and **Impervious** to chlorides and water
- > 75 year life cycle
- Available as **self-consolidating** or **thixotropic** formulation for various applications

UHPC OVERLAYS



DELAWARE MEMORIAL BRIDGE



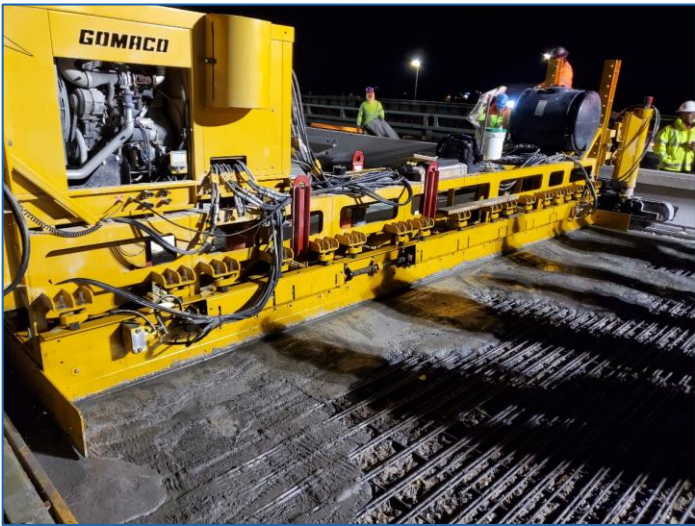
■ Size:

- Length: 10,800' (2 miles)
- 50,000 ADT (each direction)
- 4 lanes
- Connects I-295 between DE & NJ

■ Timeline:

- 1951: Structure 1
- 1968: Structure 2
- 1969: Structure 1 Deck Replacement
- 2018: Deck Assessment and Studies
- 2020: UHPC Overlay Pilot Project
- 2023: Full UHPC Deck Overlay

DELAWARE MEMORIAL BRIDGE – 2020 PILOT



DELAWARE MEMORIAL BRIDGE – NORTHBOUND STRUCTURE 2022 - 2023

- **Highlights:**

- \$71 Million
- 3 Phases in 2022/23
- 550,000 ft³
- Est. 4,700 yd³
- 2" Overlay
- Mechanical milling & hydrodemolition
- Simplified centerline joint



PHASE 1 - TWO OUTSIDE LANES FROM DELAWARE APPROACH TO MID POINT OF BRIDGE FALL 2022

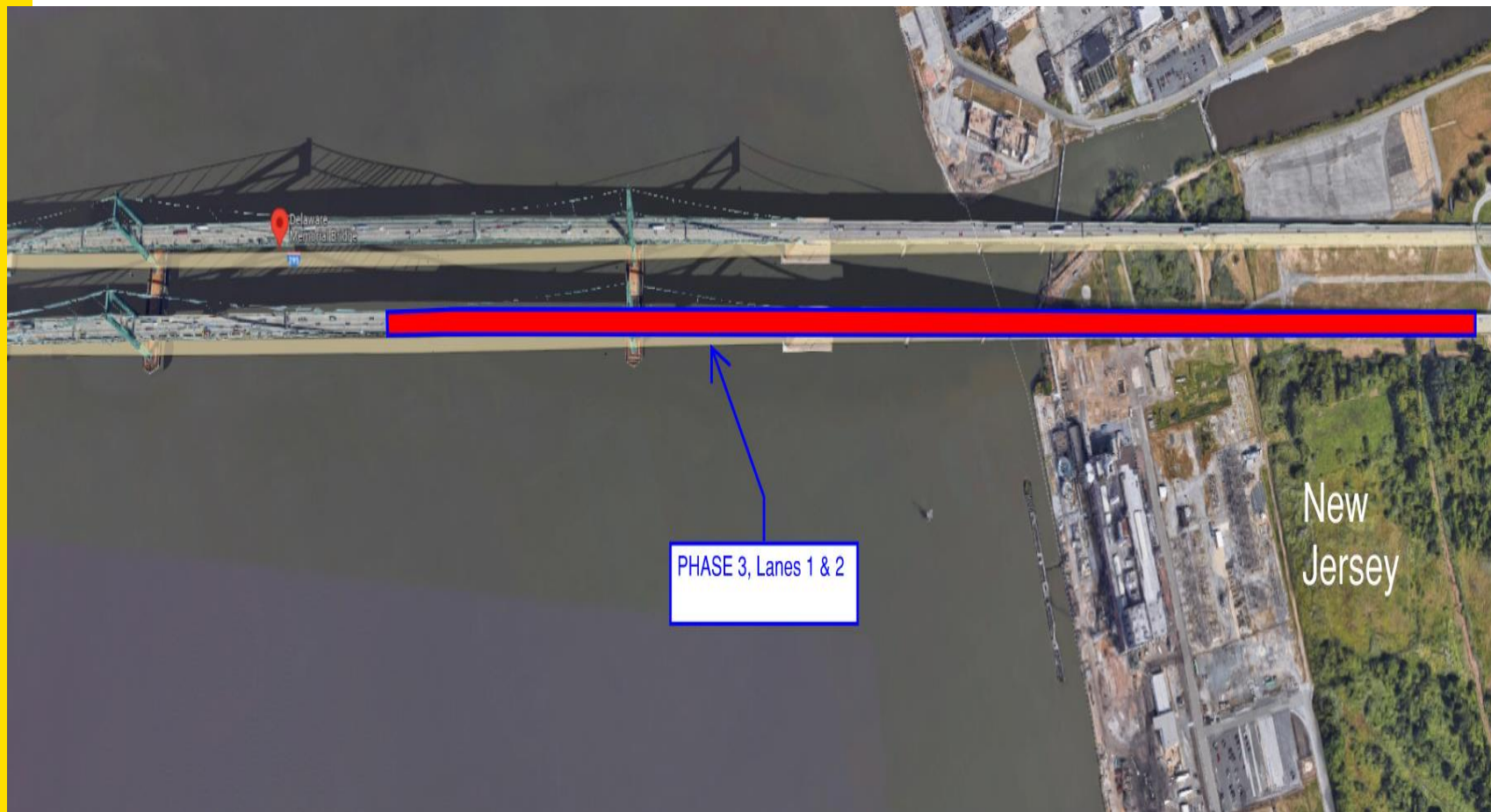


PHASE 2 - TWO INSIDE LANES ACROSS THE ENTIRE BRIDGE

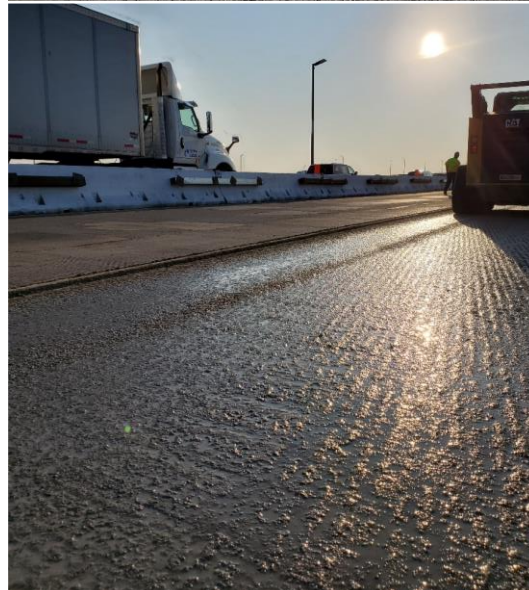
SPRING 2023



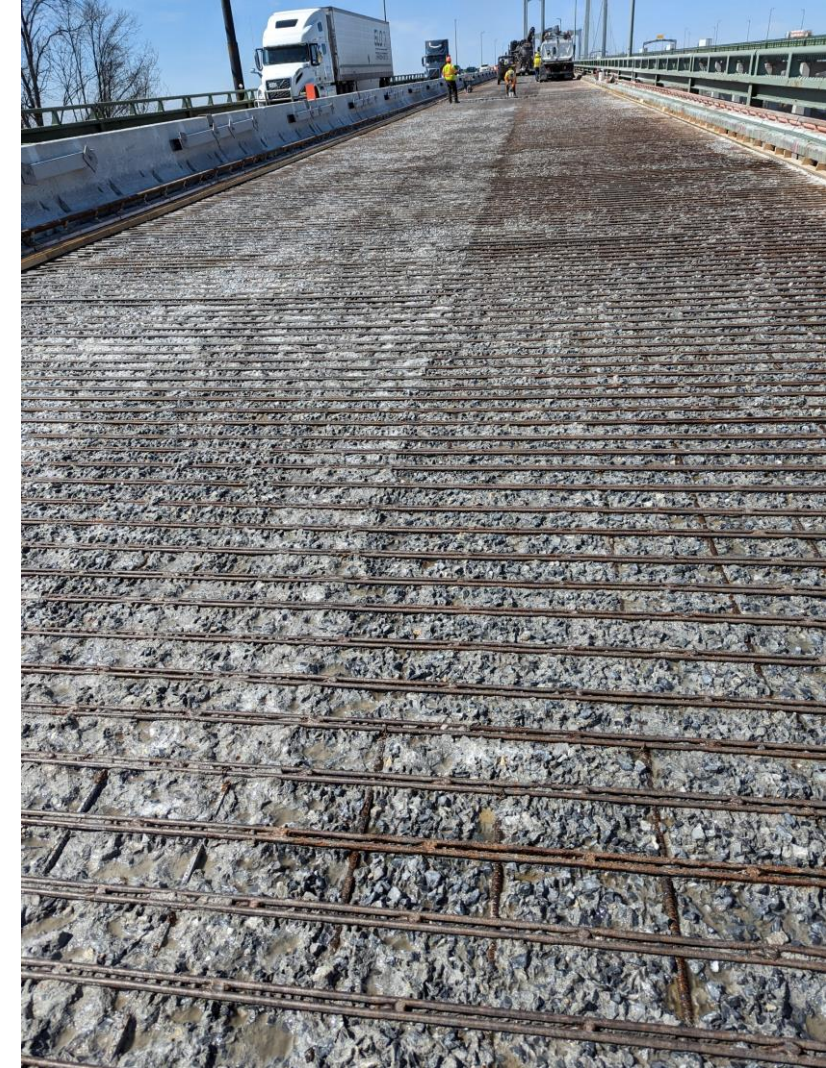
PHASE 3 - TWO INSIDE LANES FROM NEW JERSEY APPROACH TO MID POINT OF BRIDGE FALL 2023



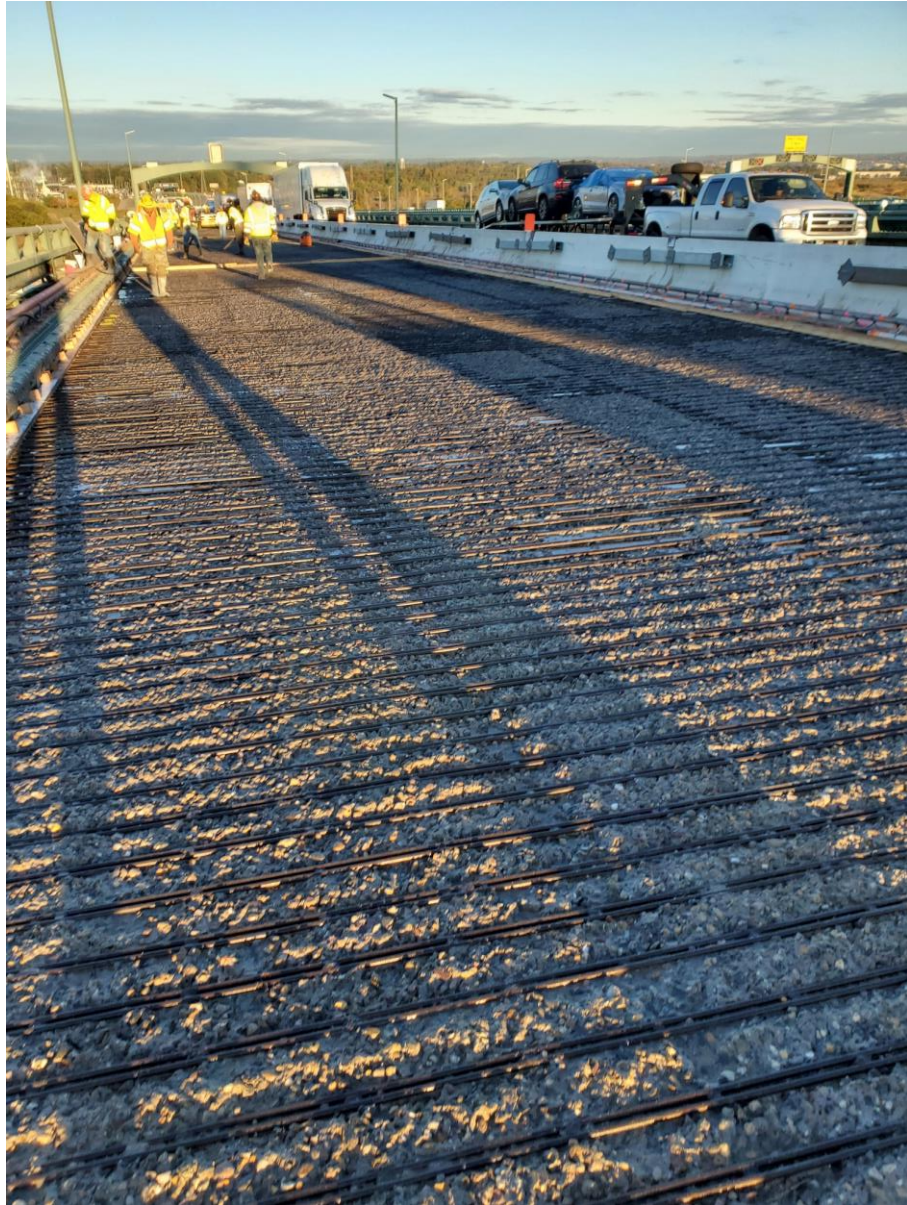
SURFACE PREPARATION – MECHANICAL MILLING



SURFACE PREPARATION - HYDRODEMOLITION



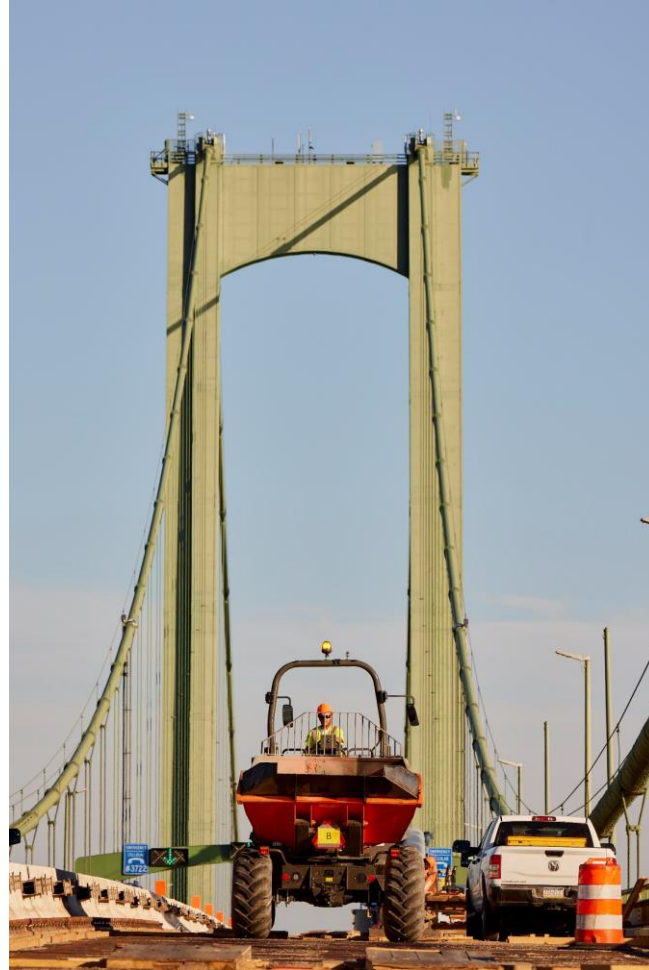
SURFACE PREPARATION – HYDRODEMOLITION



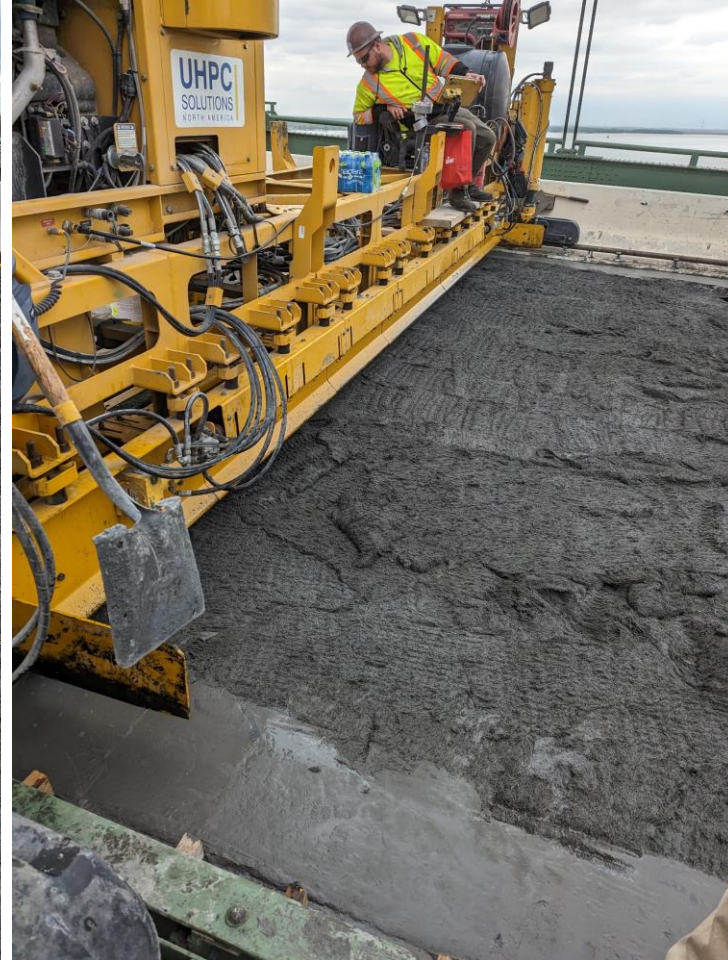
EFFICIENT MIXING



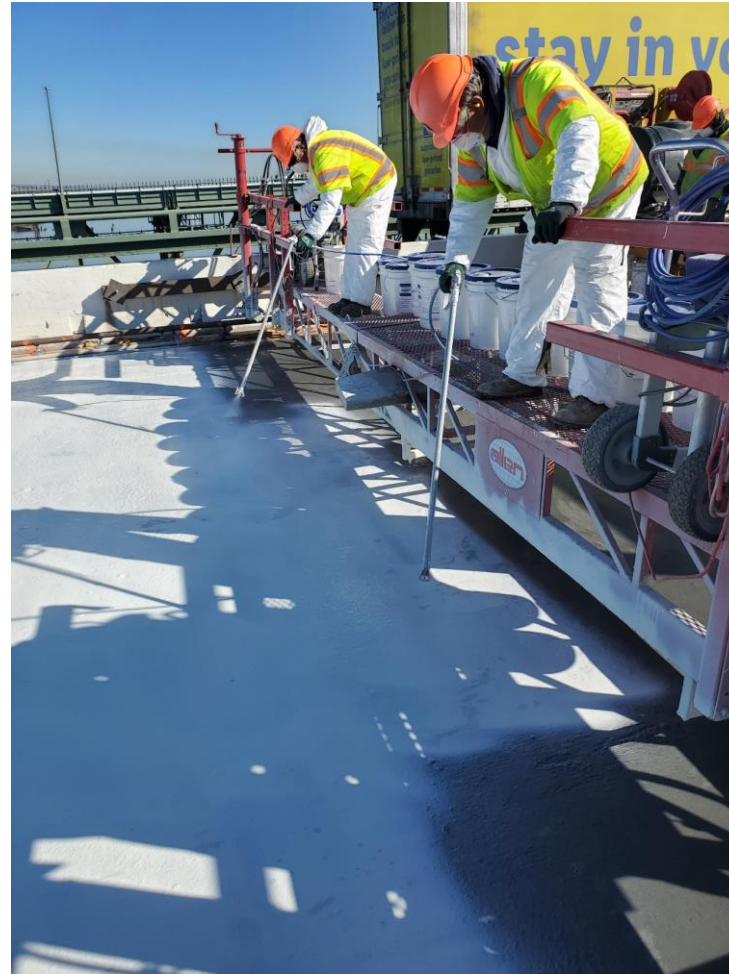
MATERIAL DELIVERY



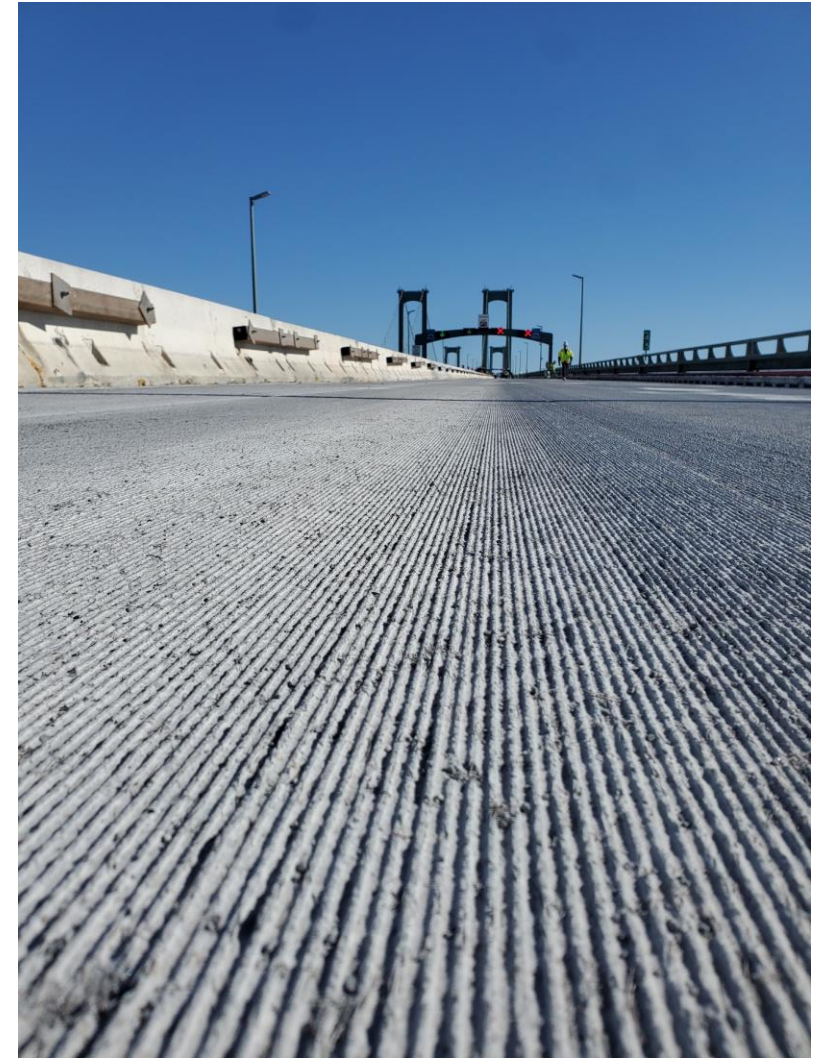
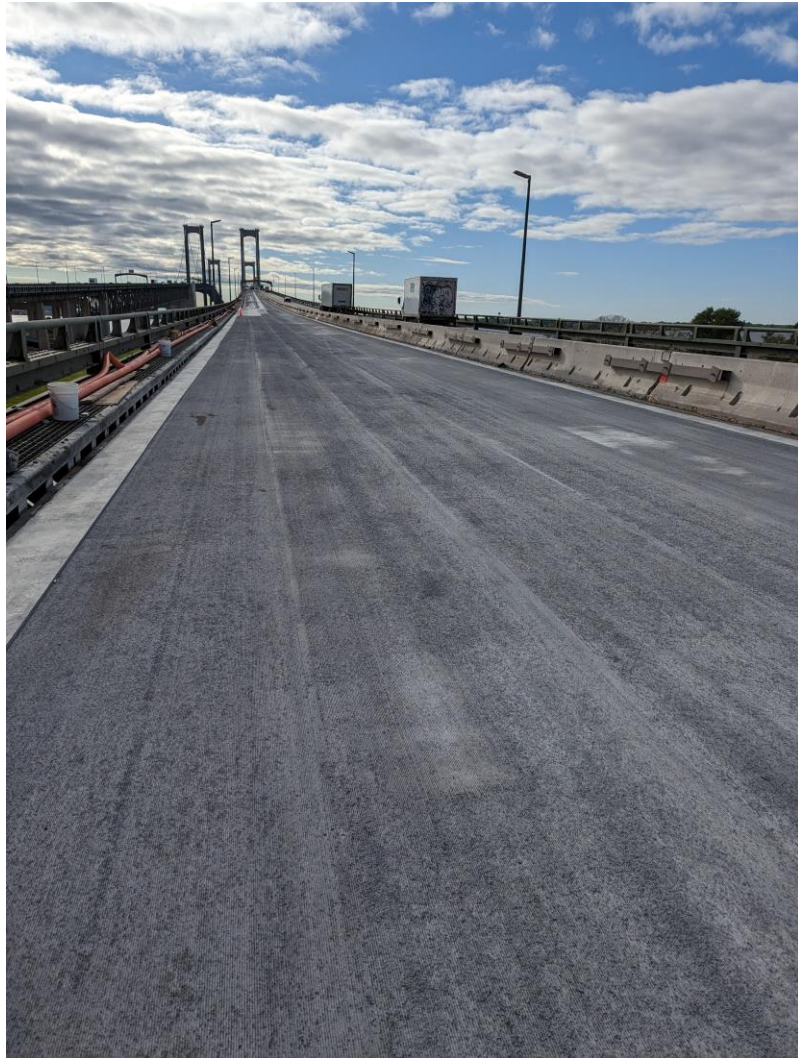
PLACEMENT METHOD



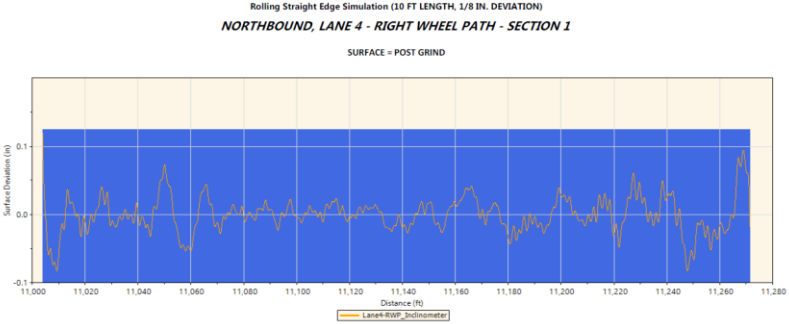
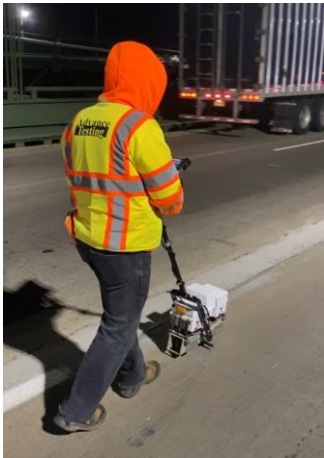
CURING



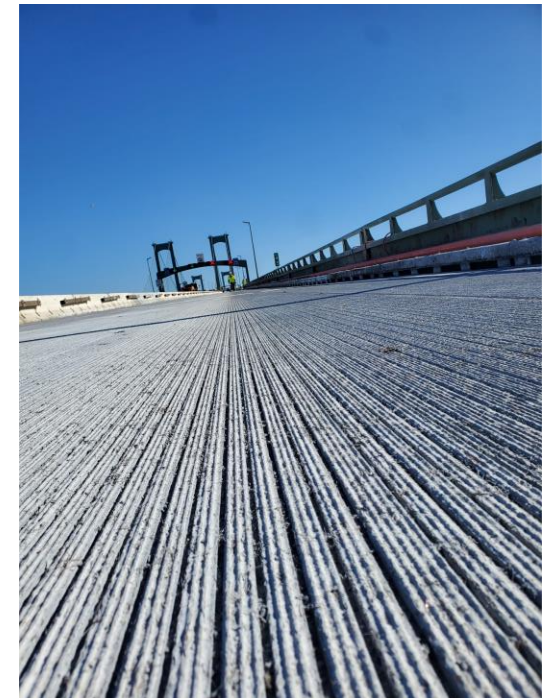
GRINDING



RIDEABILITY



GROOVING & FINISHED SURFACE



SOME CHALLENGES & SUCCESSES

1. Size of project & project timing
2. New construction methods
3. Equipment Procurement
4. Logistics of multiple operations
5. Working in 2 lanes
6. Weather impacts on rheology
7. Open gutter bridge structure



1. On-time completion
2. Maintained 3 lanes of traffic in both directions
3. New UHPC paving records: 124 yd³ installed in 6.5 hrs
4. Placed UHPC overlay at 4.5% slope without speed limit reduction
5. Plastic UHPC did not move due to vibrations from adjacent life traffic
6. UHPC can be removed with HD or milling

MANAGING RISKS

- Large scale projects still need verification
- Contractor & Supplier Verification
- Mock-ups
- Material Supply
- Storage of materials
- Scheduling of raw materials
- Specify yd^3 for material
- Specify yd^2 for installation



FUN FACTS BY THE NUMBERS

12,500,000 3800 eight
4700
FIVE 10
3,538 33,426
120 242,194
14,000,000 250002



CONCLUSION

- **Owner** took significant risk in being the first to pioneer a UHPC overlay of this scale
- **Designer** developed new specifications to further the UHPC industry
- **Material supplier** developed specific attributes to balance workability and setting time along with early strength gain that can hold up 6% slope
- **Contractor** developed innovative construction methods, equipment and processes to successfully complete this first of its kind large-scale UHPC overlay ahead of schedule.
- A properly installed UHPC overlay will provide owners with a **durable, long-lasting** bridge deck.



HOW CAN WE HELP

- Share our experiences
- Provide feedback on:
 - Constructability
 - Construction Methods
 - Specifications
 - Schedule
 - MPT
 - Conceptual pricing



The logo for UHPC SOLUTIONS NORTH AMERICA. The text "UHPC" is in a bold, blue, sans-serif font. A vertical yellow bar is positioned between "UHPC" and "SOLUTIONS". "SOLUTIONS" is in a larger, bold, blue, sans-serif font. Below "SOLUTIONS", the words "NORTH AMERICA" are written in a smaller, blue, sans-serif font, spaced out.

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NORTH AMERICA

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