

ULTRA-HIGH PERFORMANCE APPLICATIONS

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- Founded in 1979, Mixer Systems is North America's premier manufacturer of mixing and batching equipment for the concrete, glass, and environmental dust control industries.
- We are the only equipment supplier to offer four distinct mixers for the concrete market
 - Horizontal mixers
 - Turbin Mixers
 - Planetary Mixers
 - Twin Shaft
- Located in Pewaukee, WI – all manufacturing including controls and programs are done in-house and under one roof.



Horizontal Mixer



Turbin Mixer



Planetary Mixer



Twin Shaft Mixer

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
 - Accelerated Bridge Construction (ABC)
 - Hydrodemolition
 - Mixing, transporting, placing and installing UHPC



ULTRA-HIGH PERFORMANCE CONCRETE

Material Constituents



**Filler, Sand & Cement
(Premix)**



**Superplasticizers
(Admix)**



Water



**Steel Fibers
(2.0% – 3.25 %)**

- **UHPC** is an advanced cement-based composite material and **NOT** comparable to normal concrete
- Very **high strength**, **stiffness** and **tensile 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 IN NORTH AMERICA



Mars Hill Bridge, Iowa
First U.S. Highway Bridge using UHPC for precast UHPC girders



3 Bridges on RT 17B, New York
Waterproofing and strengthening UHPC overlay



SR-1 Bridges, Delaware
Waterproofing and strengthening UHPC overlay



Blackbird Creek Bridge, Delaware
Precast bridge-deck connections and waterproofing UHPC overlay

Multiple Projects in NY, DE, MO
- Largest US UHPC Project
- Bundled Projects

2006

2016

2017

2018

2019

2020

2021

2022

2 Bridges (NY & NH)

Mud Creek Bridge, Iowa
First structural UHPC Overlay in the U.S.



Floyd River Bridge, Iowa
First machine laid U.S. UHPC Overlay for waterproofing and strengthening of bridge deck



10 Bridges (DE, NJ, NY, IA, RI, IL)
Machine laid UHPC overlays for bridge deck repairs





- Mixer Systems provides total batching solutions based off client's mixing preference and output volume.
- Skid Mount plants typically handle 2.0 yard mixers or smaller – 40 yd³/30m³ per hour
 - Self contained units require only power, water, and air connections.
- BatchMaster plants typically have multiple mixers greater than 2.0 yards each – 100+ yd³/75+ m³ per hour



Skid Mount Batch Plant



BatchMaster



- Mixer Systems began working with cement suppliers and contractors to develop the best mixing action for UHPC.
- Many tests were conducted at our facility in Pewaukee comparing the speed, the quality, and the workability of the UHPC mix.
- The horizontal line of mixers was determined to be the best option for mixing – Model 54.
 - Capacity for 2.0 yd³ (54ft³)/1.5m³ (de-rated for UHPC by 50%)
 - Mix time approximately 15-20 minutes per batch ~ 4.0yd³/3.0m³ per hour



UHPC Solutions Model 54



Paddle Configuration





- Challenge – to meet UHPC Solutions requirement of a mobile batch plant capable of 20 yards of UHPC/hour while stationed on top of the Delaware Memorial Bridge.
- Solution - Two twin shaft 4.0 mixers, trailer mounted, capable of lifting 10' into the air to accommodate concrete buggy.



UHPC Solutions Twin Shaft 4.0



TS 4.0 on Trailer

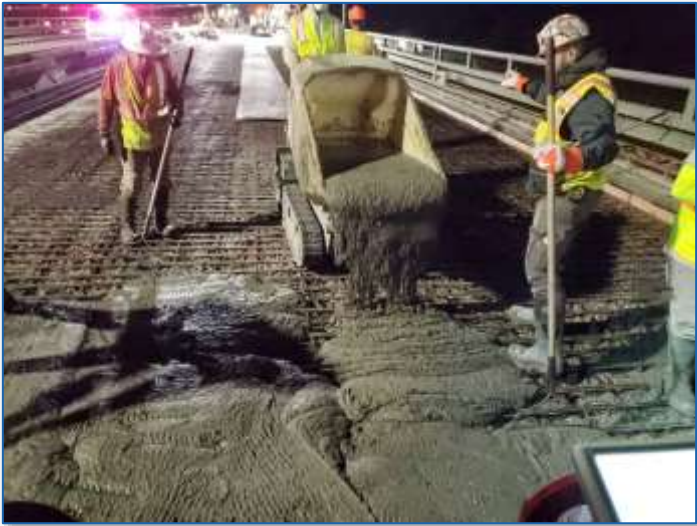
Trailer elevated 10'



DELAWARE MEMORIAL BRIDGE – PILOT (2020)



DELAWARE MEMORIAL BRIDGE - PILOT



DELAWARE MEMORIAL BRIDGE – NORTHBOUND STRUCTURE

2022 - 2023

- **Highlights:**

- \$71 Million
- 3 Phases in 2022/23
- Est. 4,700 yd³
- 2" Overlay
- Mechanical milling & hydrodemolition
- Simplified centerline joint
- Joint to Joint placement
- Traffic restrictions

- **Use Learnings to improve:**

- Mixing
- Transporting
- Placement
- Sequencing
- Schedule
- Traffic Management



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



PHASE 2 - TWO INSIDE LANES ACROSS THE ENTIRE BRIDGE

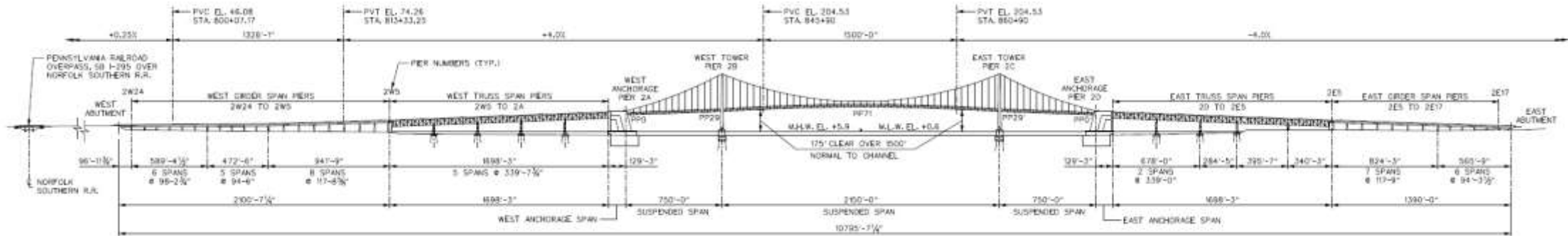
SPRING 2023



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



SCOPE – PHASE 1 (FALL 2022)



- **Length:**
 - ~ 5,400'
 - Excl. Pilot Project UHPC Sections
- **Area: 123,138 ft²**
- **Volume: 1,150 yd³**
- **Duration: Labor Day → Thanksgiving**



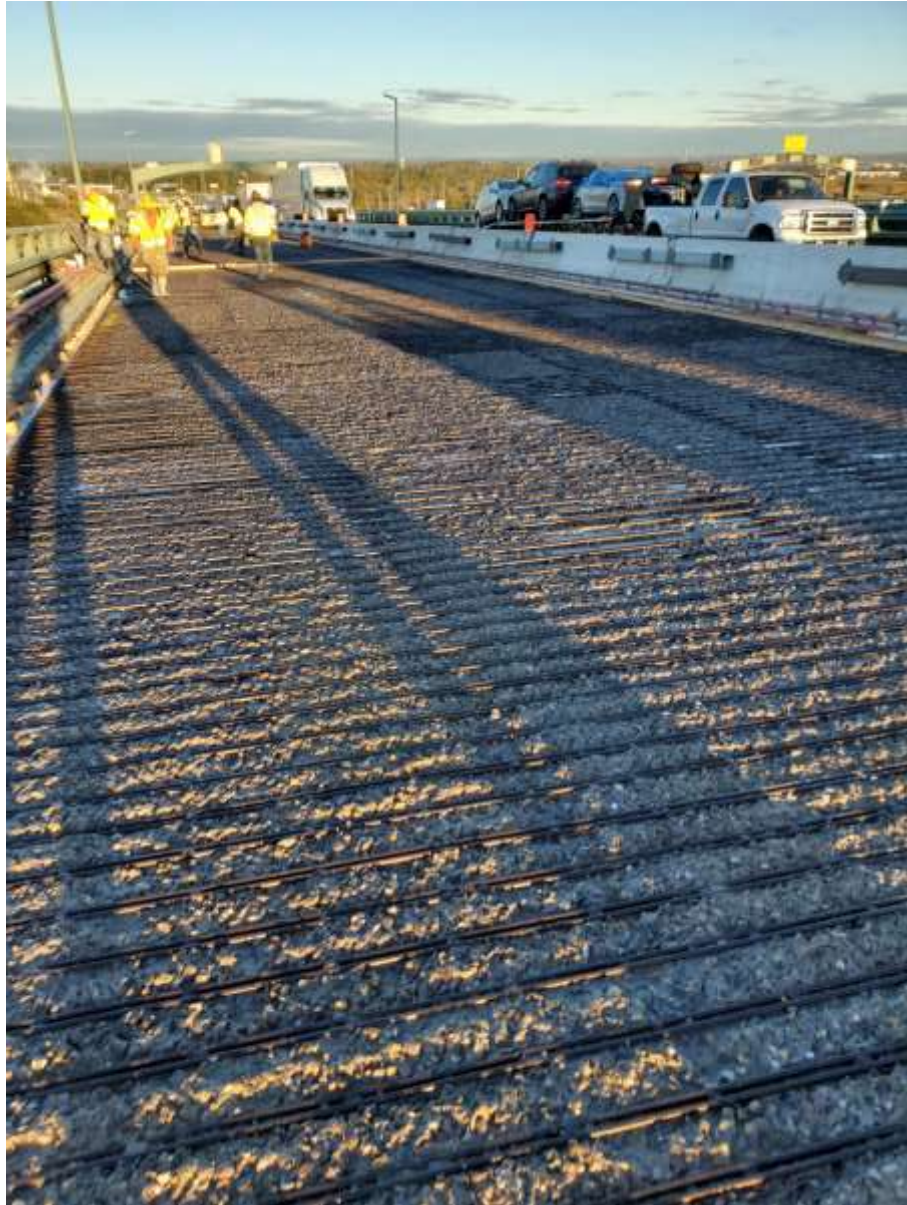
SURFACE PREPARATION – MECHANICAL MILLING



SURFACE PREPARATION – HYDRODEMOLITION



SURFACE PREPARATION – HYDRODEMOLITION



EFFICIENT MIXING



MATERIAL DELIVERY



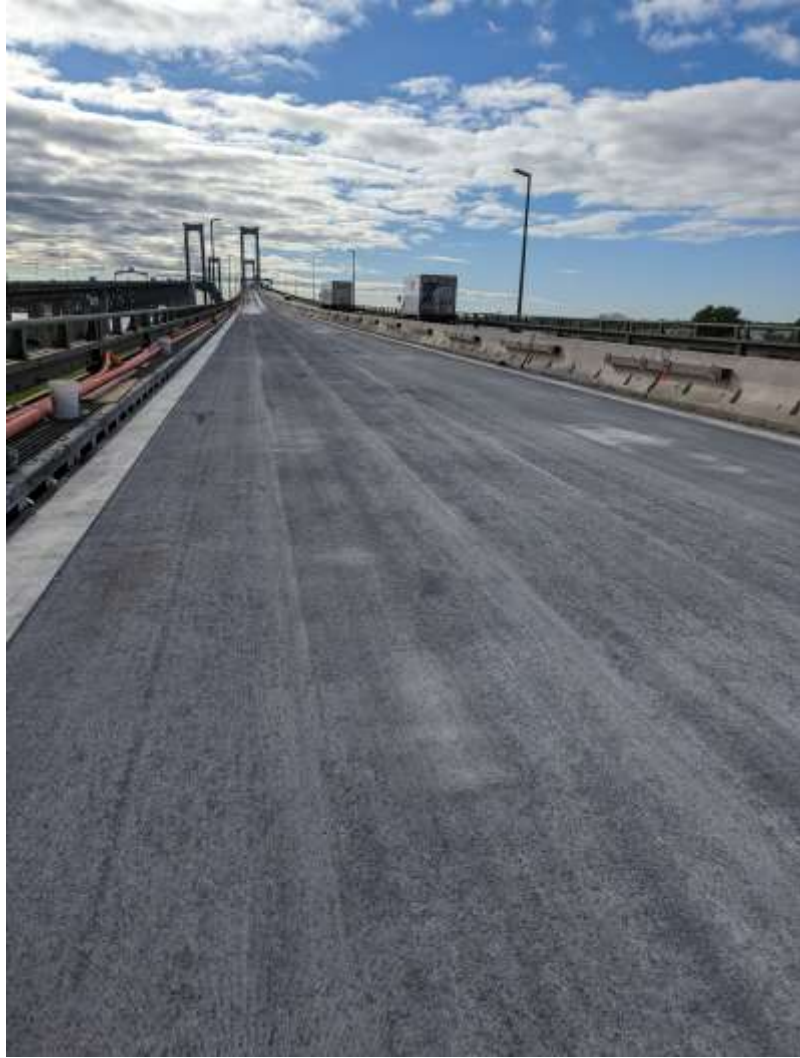
CONSOLIDATION



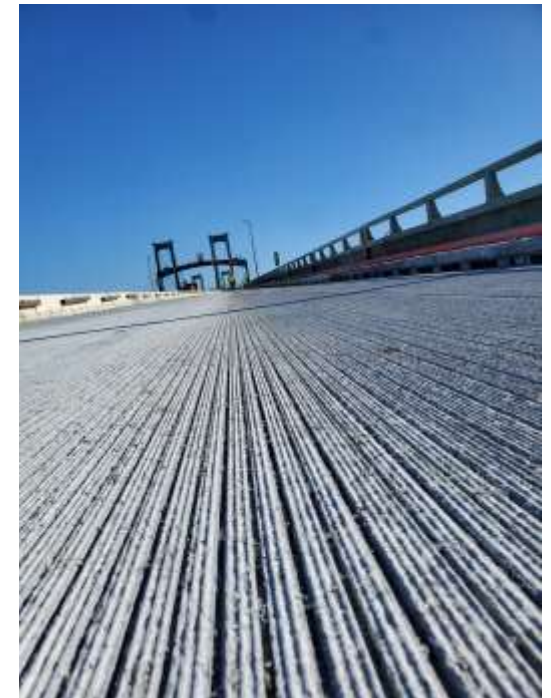
CURING



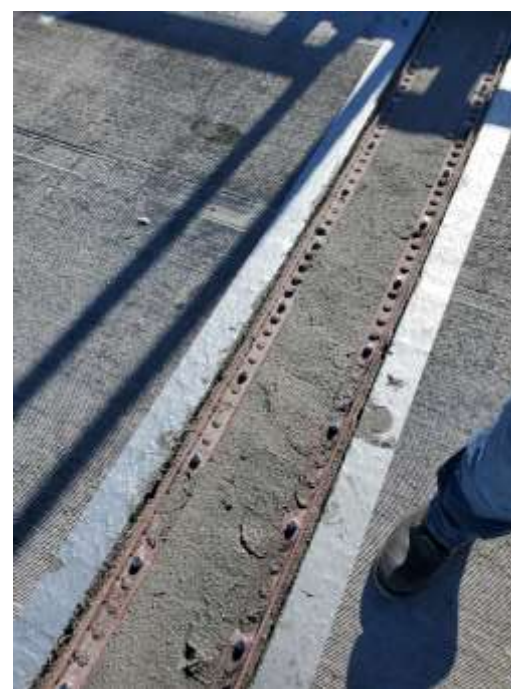
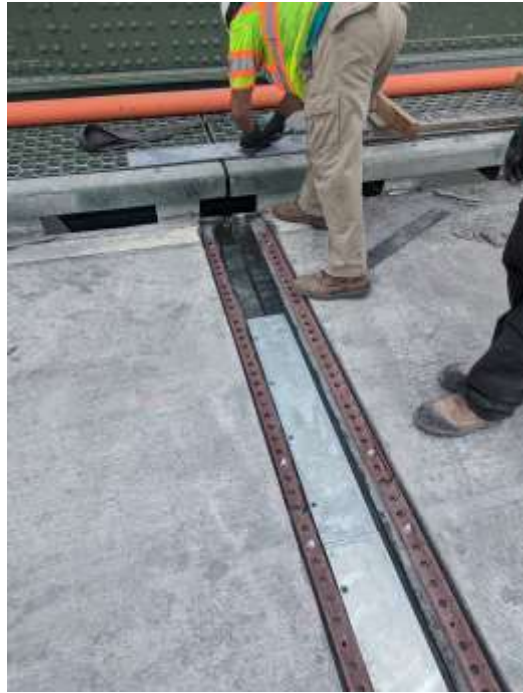
GRINDING



GROOVING & FINISHED SURFACE



POLYFLEX JOINTS



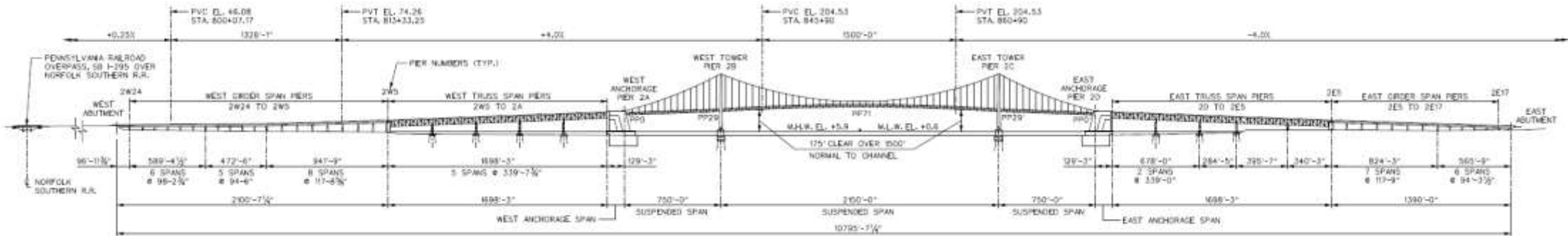
PHASE 1 - CHALLENGES & SUCCESSES

1. Shear size of project
2. New construction methods
3. Equipment Procurement
4. Logistics of multiple operations
5. Working in 2 lanes
6. Weather impacts on rheology

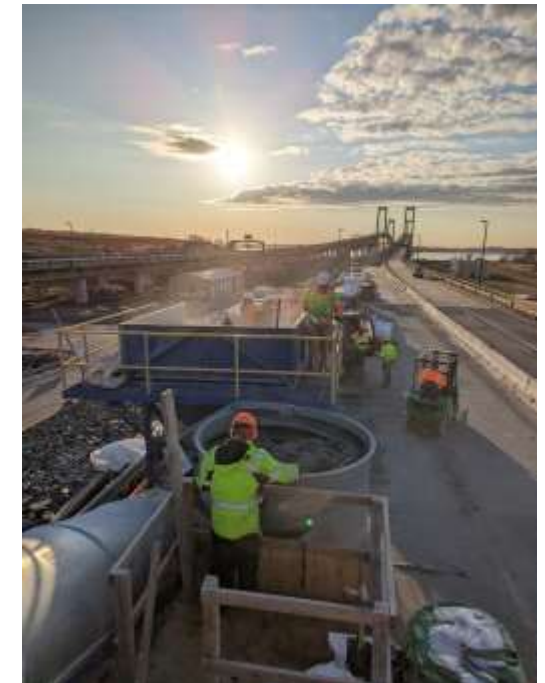


1. On-time completion
2. Maintained 3 lanes of traffic in both directions
3. New UHPC paving records: 124 yd³ installed in 6.5 hrs
4. Placed UHPC overlay at 4.5% slope without speed limit reduction

PHASE 2 (SPRING 2023)



- **Duration:** Feb. 1 → Memorial Day
- **Length:** ~ 10,800' (2 miles)
- **Area:** 255,000 ft²
- **Volume:** 2,382 yd³
- 24 UHPC placements in 31 days
- 74 polyflex joints
- Improved onsite logistics
- Revised sequencing of construction activities



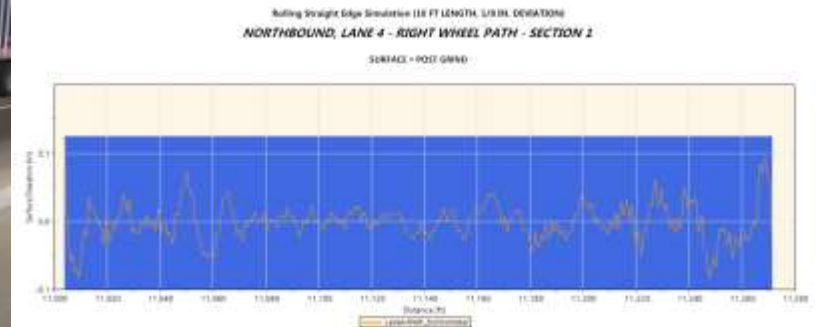
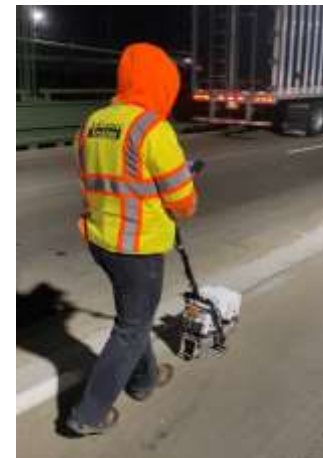
PHASE 2 – HYDRODEMOLITION



PHASE 2 – PLACEMENT METHOD



PHASE 2 - RIDEABILITY



BY THE NUMBERS



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