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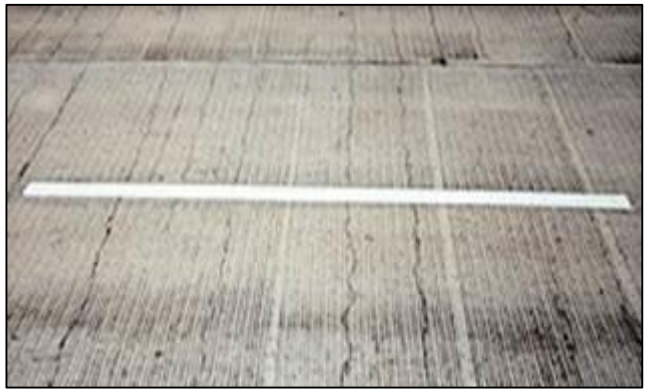
TODAY'S SOLUTIONS FOR TOMORROW'S PROBLEMS

Waterproofing Protection for Highway Bridges

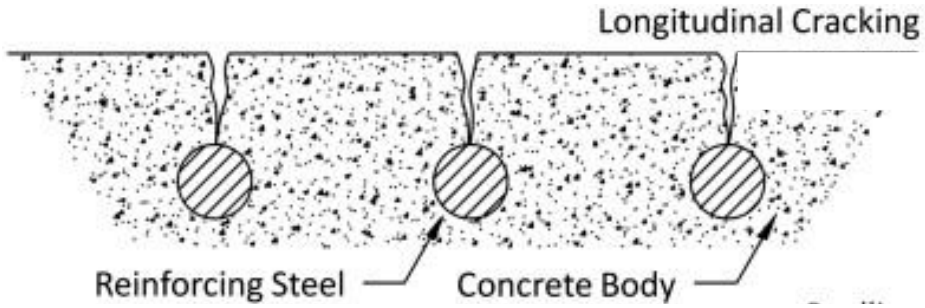
Are you familiar with these issues?

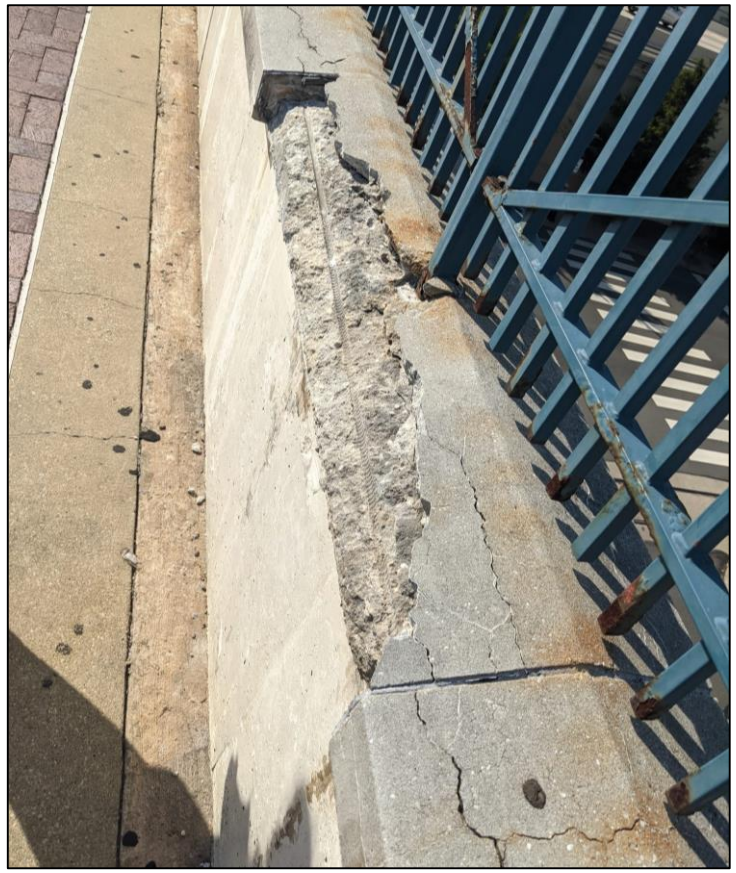
Deck Cracking



Efflorescence / Calcium Leaching

Longitudinal Cracking





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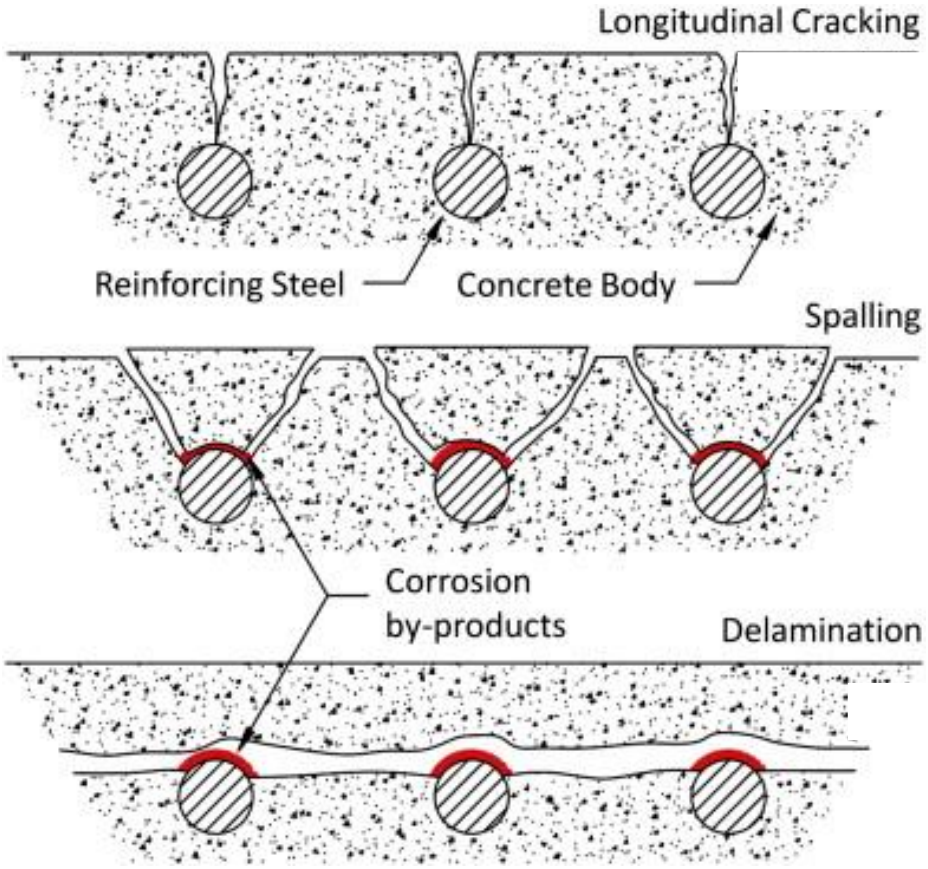
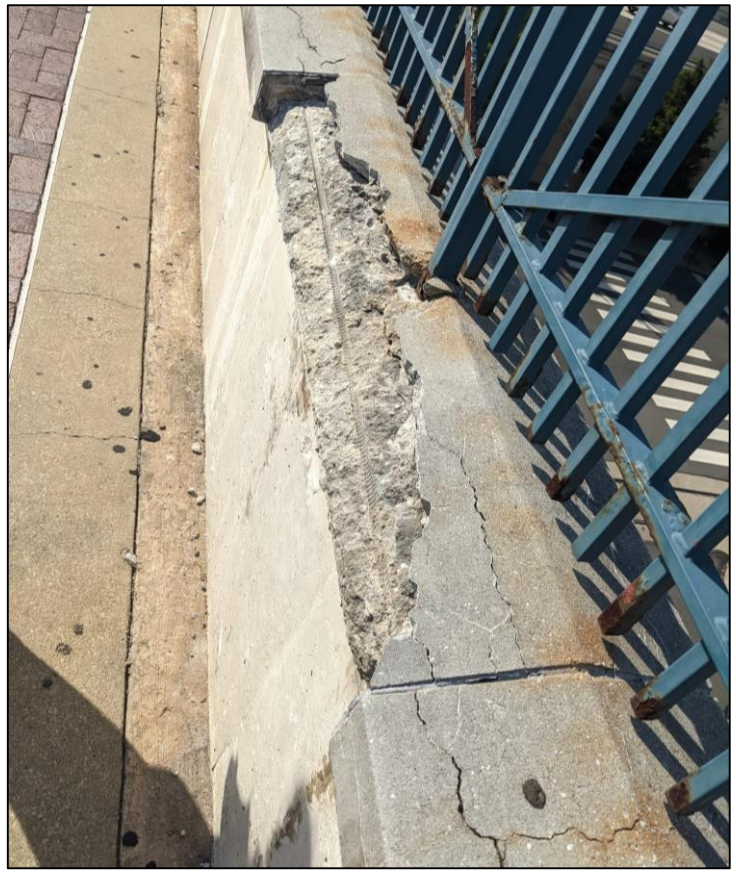
Longitudinal Cracking

Spalling

Delamination





Corrosion

Freeze – Thaw Issues

CAUSES OF CONCRETE DETERIORATION

CONCRETE PROTECTION

What are the main causes of the deterioration on concrete?

MAIN FACTORS CAUSING CONCRETE DETERIORATION

- Water/Moisture Penetration
- Calcium Hydroxide
- Chlorides
- Cracks

THEY CAUSE →

- Alkali-Carbonate Reaction (ACR)
- Alkali-Silica Reaction (ASR)
- Carbonation
- Chloride Attack
- Corrosion
- Efflorescence
- Freeze/Thaw Issues
- Spalling
- Water Penetration

SOLUTION →

- Deck Repair/Replacement

OR

- Protect Concrete to increase the service life of the structure

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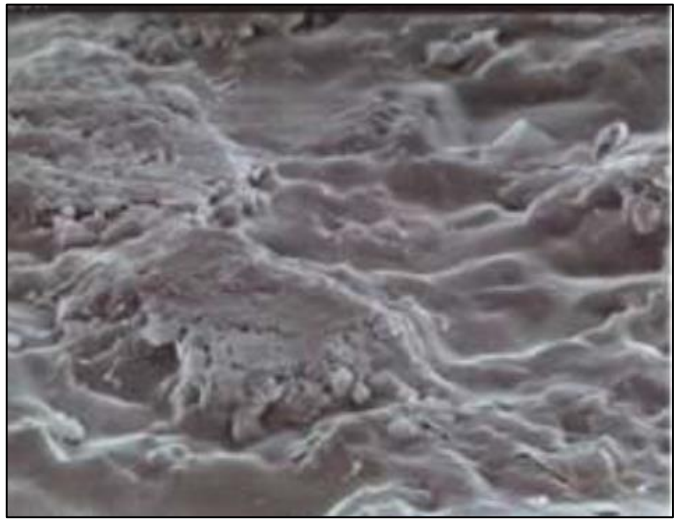
So … How will you choose to protect your concrete structure?

Innovative Technology: Integral Gel Waterproofing System



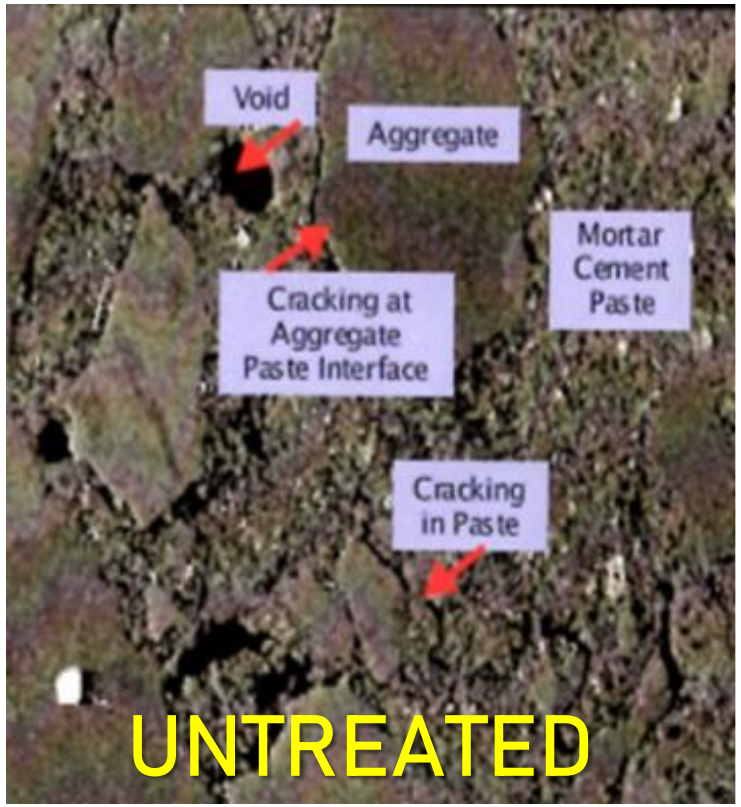
Alchemco **BridgeDECK Waterproofing Agent** produces a modified silicate gel material 'below the concrete surface' (*inside the concrete matrix*)

The gel is created by a chemical reaction between the calcium hydroxide that is present in the concrete (*as a by-product of cement's hydration*) and the chemical components of BridgeDECK Waterproofing Agent

By filling concrete porosity and cracks, the gel works as an integral waterproofing barrier that protects concrete from infiltration of water and water-soluble contaminants … especially de-icing salts.

Sub-Surface Gel Forming Technology

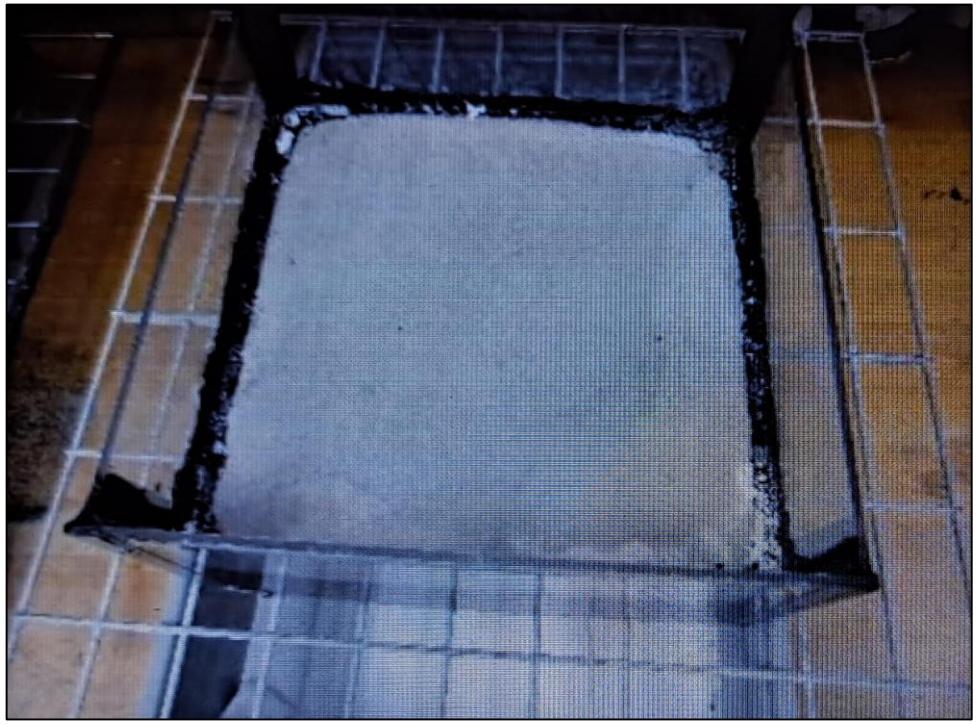
Demonstration of the gel formation that occurs inside the concrete



Close up view of concrete sections: untreated and treated

• 10 – Day Water Permeability Test Results

- *Testing Method: TSA 112 – 1995* (*done for Miami/Dade Roofing Approval*)



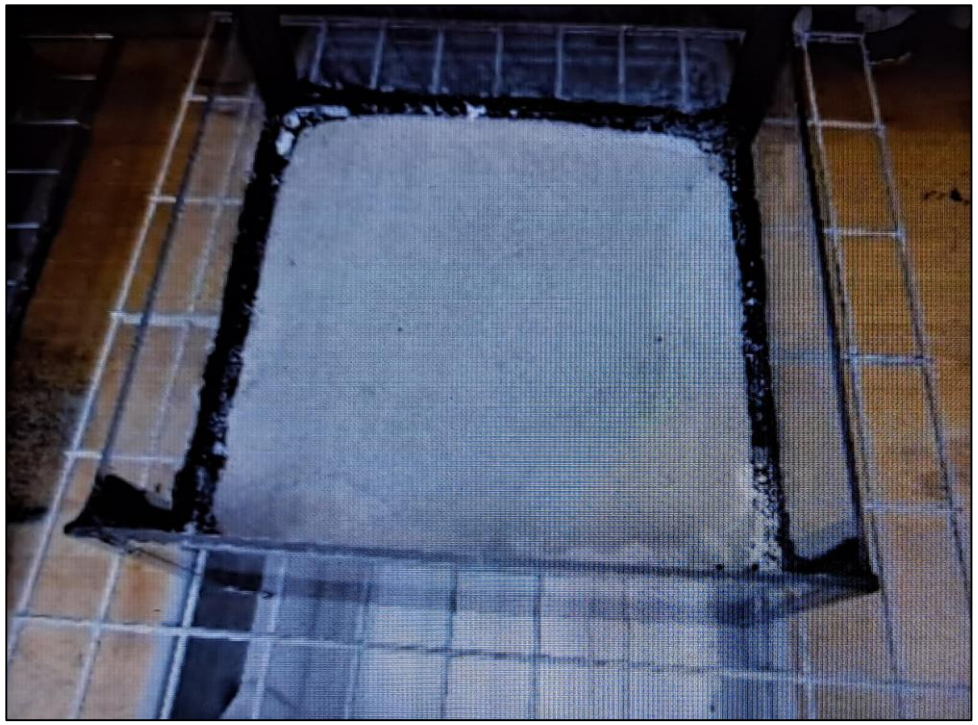
12” x 12” Concrete Slab 2” thick

3rd Party Testing done by Intertek Laboratories

- Poured two – 2” thick concrete slabs (12” x 12”) and let them cure for at least 14 days
- Encased the sides of the concrete slab with plexiglass, and sealed the edges
- Applied TC2500 Waterproofing System to the concrete slabs per Application Manual instructions
- Covered the concrete slab with a minimum 2” of water

Silanes

Writing Specifications –



12” x 12” Concrete Slab 2” thick

Plexiglass Walls with Water 2” Deep

10 – Day Water Permeability Test Results

Testing Method: TSA 112 - 1995

Dry Paper Towel

Water Permeability Test after 10 days

TEST RESULTS

TAS 112 - Permeability Test

SPECIMEN ID	EXPOSURE TIME	OBSERVATIONS
24 - 1	24 hours	No Leakage
24 - 2	24 hours	No Leakage

SPECIMEN ID	EXPOSURE TIME	OBSERVATIONS
72 - 1	72 hours	No Leakage
72 - 2	72 hours	No Leakage

SPECIMEN ID	EXPOSURE TIME	OBSERVATIONS
7 - 1	7 days	No Leakage
7 - 2	7 days	No Leakage

SPECIMEN ID	EXPOSURE TIME	OBSERVATIONS
10 - 1	10 days	No Leakage
10 - 2	10 days	No Leakage

Water Permeability Test Results

The chemical reaction (*gel formation*) is an ongoing process

1st Day – Original water leak thru the concrete slab

3rd Day - Gel formation inside the concrete slab has permanently sealed the crack and stopped the leak

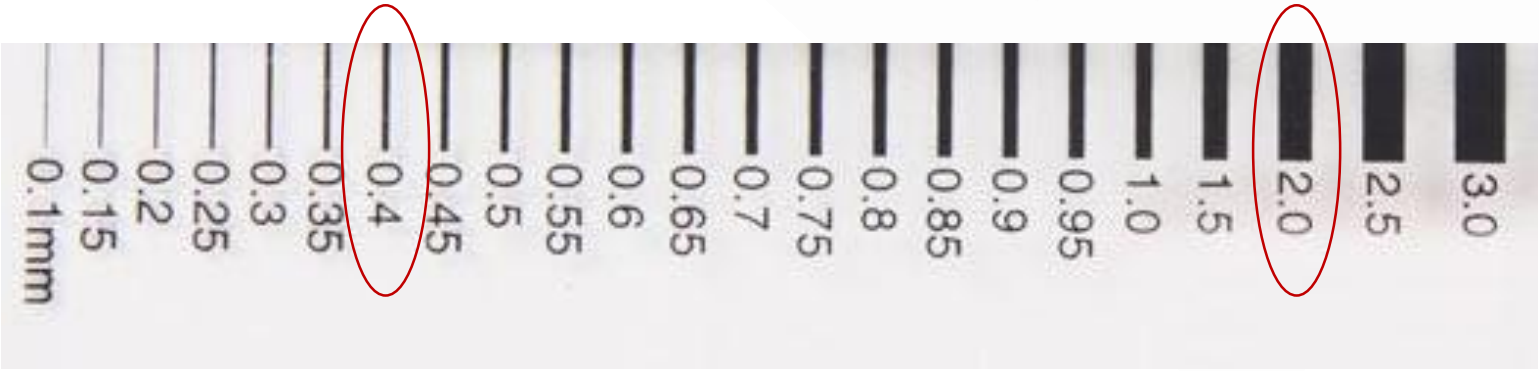
Crack Width Example

0.4 mm wide

Pencil Lead

2.0 mm wide

Car Key



Spray Applied
Gel Forming Waterproofing …

… approximate application rate
is 20,000 square feet per hour
when pumped directly from the drum

SILANES
Writing Specifications

Be Consistent – Application rates per % of Silane

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MODIFIED SILICATE GELS (*Integral*)
ARE INHERENTLY 'LONG-TERM' WATERPROOFING SOLUTIONS

- By creating a **sub-surface gel that fills all the cracks, voids, micro-fractures, etc**. in the concrete matrix … these systems protect both the concrete, and the steel reinforcement rods from damage caused by water & chemical intrusion. Since the waterproofing is inside the concrete, **it cannot be physically damaged**, delaminate or degrade due to UV exposure, etc.

- By **increasing the density & compressive strength of the concrete surface** (*approx. 30%*) … they make the drivable & walkable surfaces more durable.

- By leaving latent waterproofing chemicals in the concrete matrix … **it is able to seal future cracks** that form, since any new water intrusion will generate new gel formation (*to seal the new crack*)

- Because the sub-surface gel is vapor permeable, so it allows outgassing (***does not trap moisture***)

THE UNIQUENESS OF MODIFIED SILICATE GEL WATERPROOFING

No other product offering combines the:

- Ability to seal future cracks (*sustainability)*
- Proven performance in the field
- Quick traffic reopen
- Long re-application periods (*up to 25 years*)
- Cost effective … 'money saving' solution to water intrusion problems

IMPRESSIVE PHYSICAL CHARACTERISTICS

- *Can't be damaged or deteriorate* (*long-term solution*)
- *Densifies concrete* (*increases hardness/durability*)
- *Resistant to chloride ions, chemicals & hydrostatic pressure*
- *Allows outgassing = no trapped moisture* (*vapor permeable*)
- *VOC free … environmentally friendly* (*green*)
- *Potable water safe – UL Certified: NSF/ANSI 61*
- *Doesn't change the appearance of the structure*
- *Colorless & odorless … safe & easy to work with*

Provides great **'value'** to Transportation Departments

BRIDGE APPLICATION RATES

Faster Application = 'Shorter Lane Closure Times'

WATERPROOFING SYSTEM COMPARISON

(*after cleaning & prep work is done*)

BridgeDECK PROtectant

15-year 'material only' warranty

STEP ONE

- Spray Waterproofing
- Let dry & then Water

Very Short Downtime

15-year performance

BridgeDECK PROtectant Plus

20-year 'material only' warranty

STEP ONE

- Spray Waterproofing
- Let dry & then Water

STEP TWO

- Spray C&V Treatment
- Spray Accelerator
- Let dry & then Water

Short Downtime

20-year performance

BridgeDECK Waterproofing

25-year 'material only' warranty

STEP ONE

- Spray Waterproofing
- Let dry & then Water

STEP TWO

- Spray C&V Treatment
- Spray Accelerator
- Let dry & then Water

Short Downtime

25-year performance

Louisiana D.O.T. Bridge Test Site

Old Highway 61
St. Francisville, LA

LOUISIANA D.O.T. – Bridge Site
TechCrete 2500 Waterproofing Agent
February 2020

STEP ONE
Applying Waterproofing

Backpack Sprayer
applying 3,000 square feet per hour

LOUISIANA D.O.T. Bridge Application

OKLAHOMA D.O.T. – Bridge Site

BridgeDECK PROtectant Plus

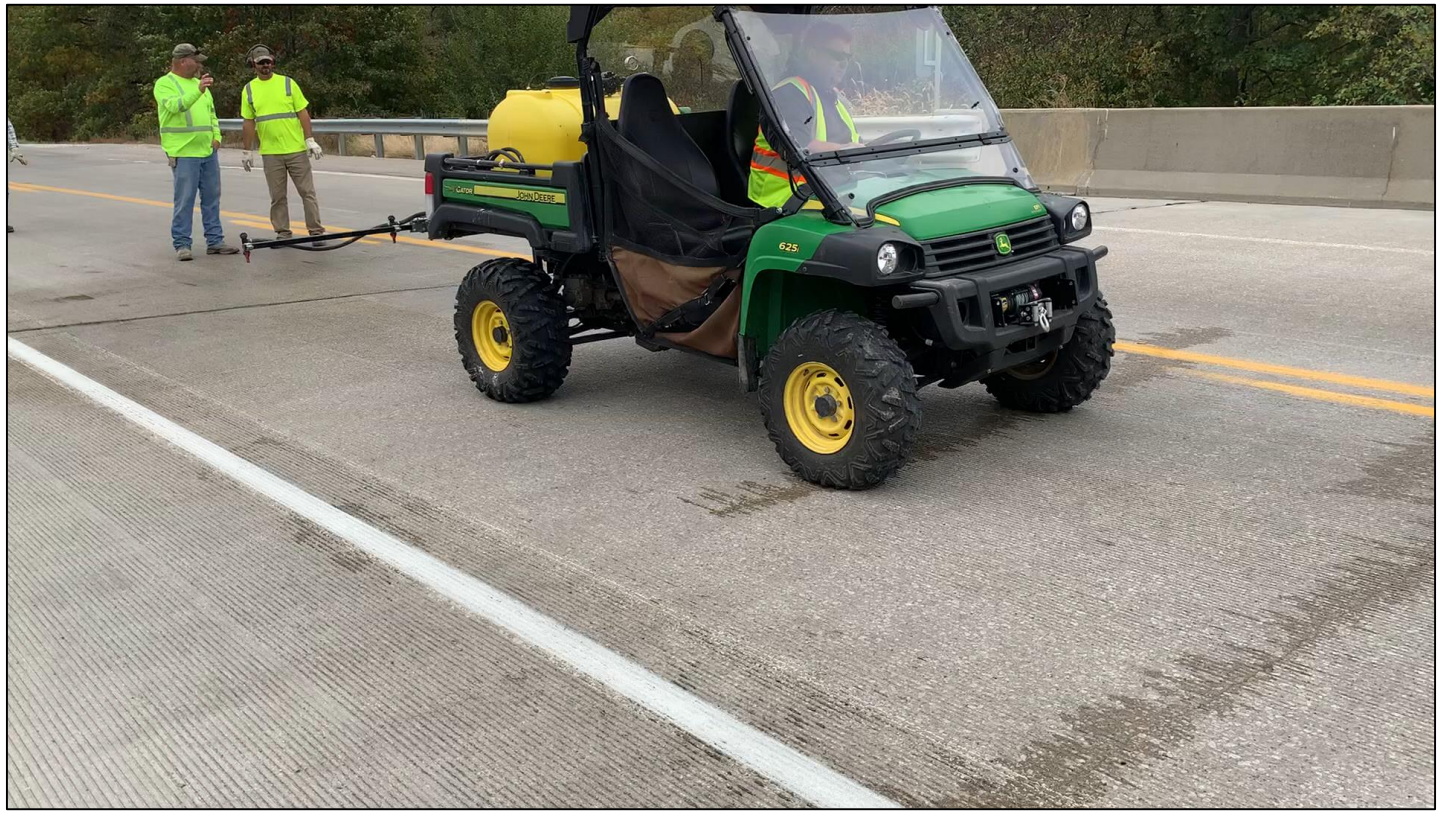
STEP ONE

Applying Waterproofing

Direct Spray

applying 20,000 square feet per hour

OKLAHOMA D.O.T. Bridge Application



IOWA D.O.T. Bridge Application

IOWA D.O.T. – Test Bridge Site

BridgeDECK Protectant Plus

STEP ONE

Applying Waterproofing

Spray Bar – Small Tractor

applying 30,000+ square feet per hour

FASTER APPLICATION
translates into
LESS DOWN TIME

APPLYING WATERPROOFING

Truck Mounted Spray Rig
applying 40,000+ square feet per hour

South Dakota D.O.T. Application: Hwy 12 - Millbank, SD

FASTER APPLICATION
translates into
LESS DOWN TIME

STEP ONE

Truck Mounted Spray Rig

Watering

South Dakota D.O.T. Application: Hwy 12 - Millbank, SD

Jersey Barrier Waterproofing Protection

Delaware D.O.T.

Jersey Barrier Waterproofing Protection

Delaware D.O.T.

Jersey Barrier Waterproofing Protection

Delaware D.O.T.

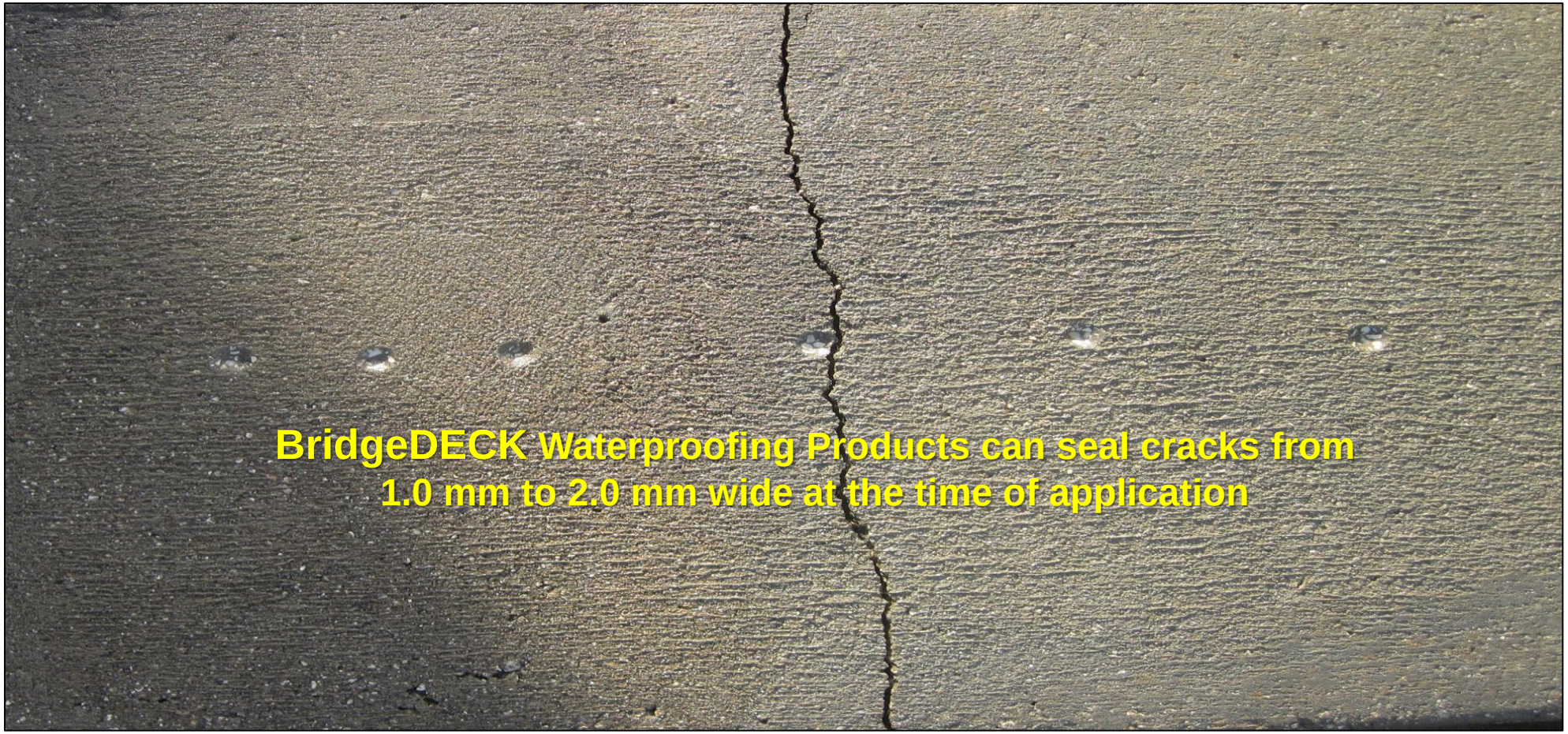
Jersey Barrier Waterproofing Protection

Delaware D.O.T.

Jersey Barrier Waterproofing Protection

Delaware D.O.T.

Unequaled Crack Sealing Capabilities



U.S. DEPARTMENT OF TRANSPORTATION

CONCERNS WHEN ANALYSING NEW TECHNOLOGIES

- Lane Closure – Time to Traffic? **Very short**
- Life Expectancy – How often do we have to reapply? **Up to 25 years**
- Modulus - Is it rigid or flexible? **Flexible Gel**
- Will it penetrate microcracks? (*viscosity*) **Yes**
- What are the preparation requirements? **Pressure Wash & Dry Surface**
- What is the temperature range for application? **40 degrees and rising**
- Cost **Low**
- Lifecycle Cost **Very low**

Alchemco Waterproofing Systems

Selected U.S. Bridge Projects

Spray Applied Waterproofing

Watering

WASHINGTON - D.O.T. Highway Bridge Application

Drying after Application

Drying after Watering

MINNESOTA - D.O.T. Highway Bridge Application

Moisture Content Testing

ITD Task Force Testing

ITD Task Force Testing

MINNESOTA - D.O.T. Application: Part of the TSP2 … ITD Task Force Project to Evaluate New Technologies

ILLINOIS - D.O.T. Application: Hwy 171 & I-55 – Summit, IL (*Chicago Metro*)

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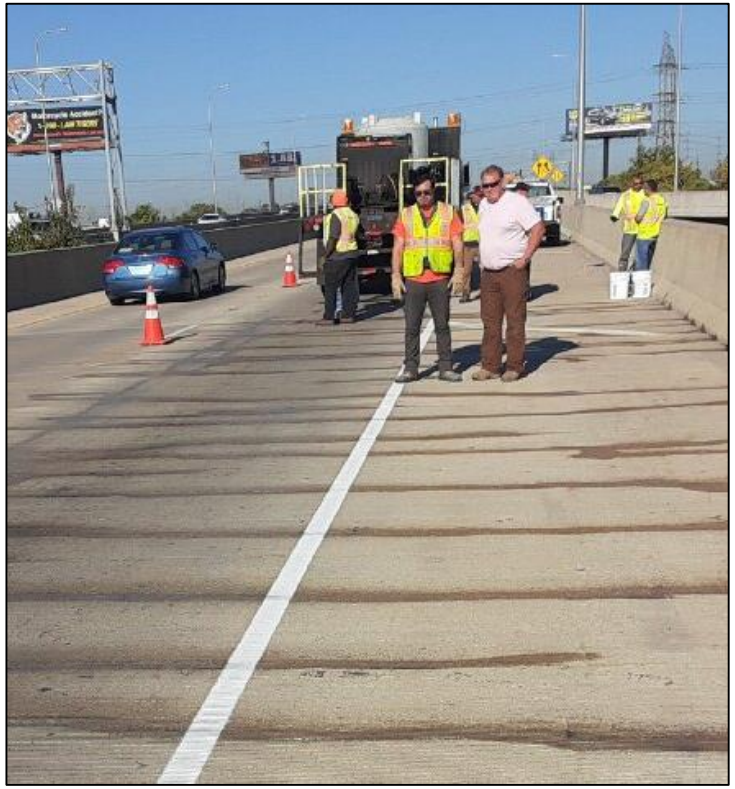
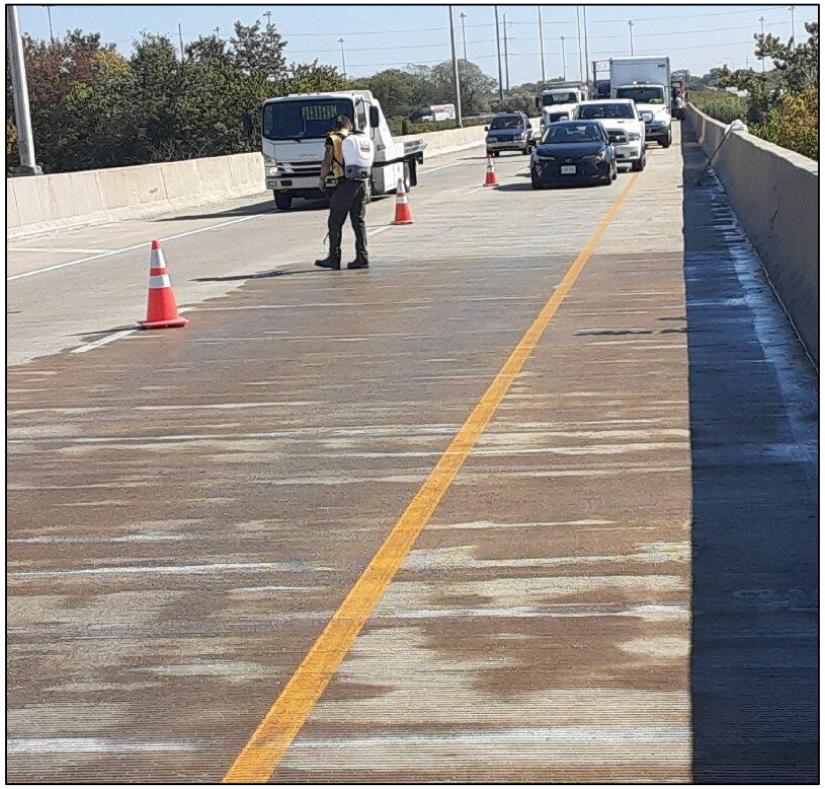
Crack Treatment



Spray Applied Waterproofing



Watering

ILLINOIS - D.O.T. Application: Hwy 171 & I-55 – Summit, IL (*Chicago Metro*)

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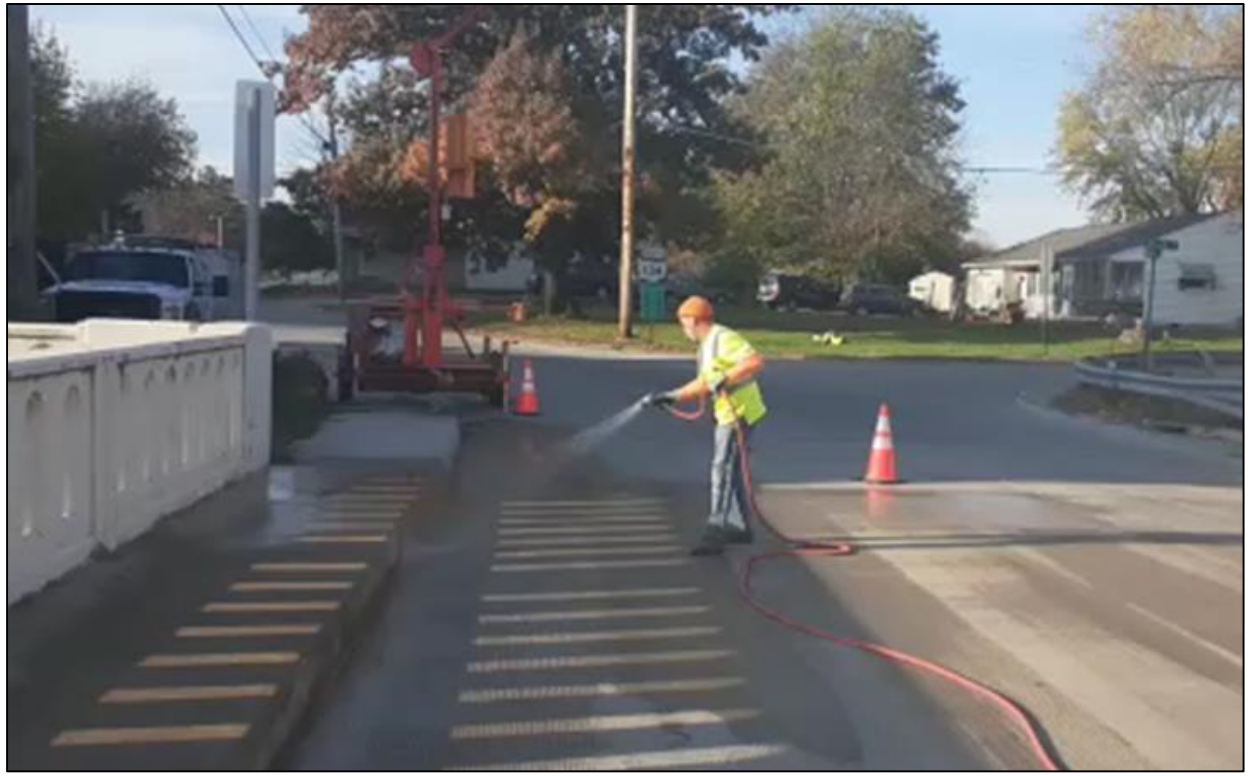
Cleaning & Prep

Spray Application out of 55-gallon drum



OHIO - Highway Bridge Applications

IOWA - Highway Bridge Application

IOWA - Highway Bridge Application

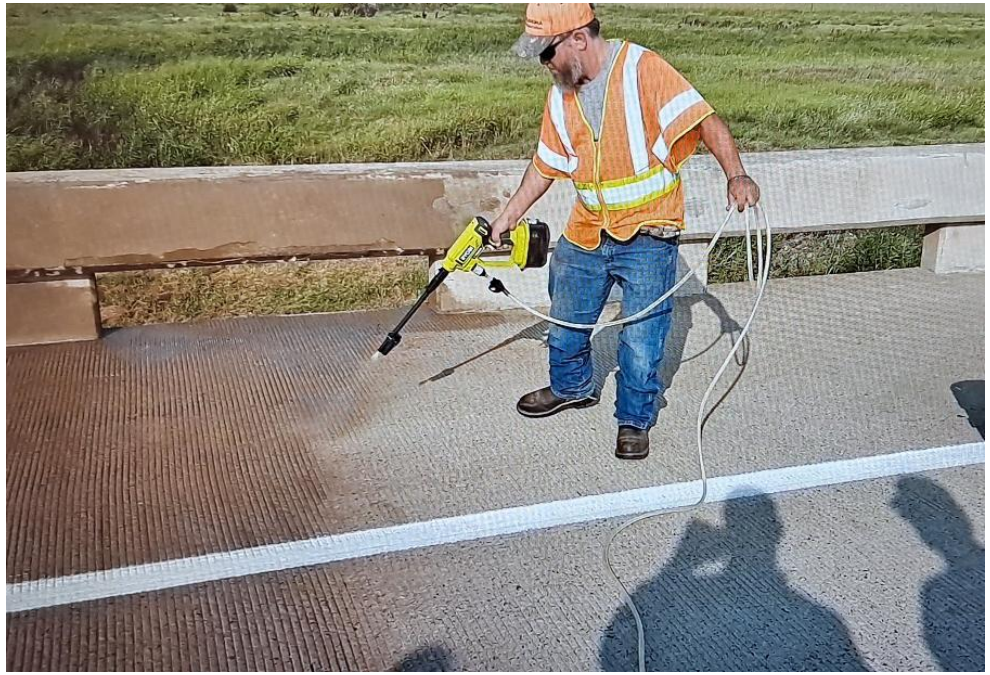
IOWA - Highway Bridge Application

Spray Applied Waterproofing

Watering

SOUTH DAKOTA - D.O.T. Application: Hwy 12 - Millbank, SD

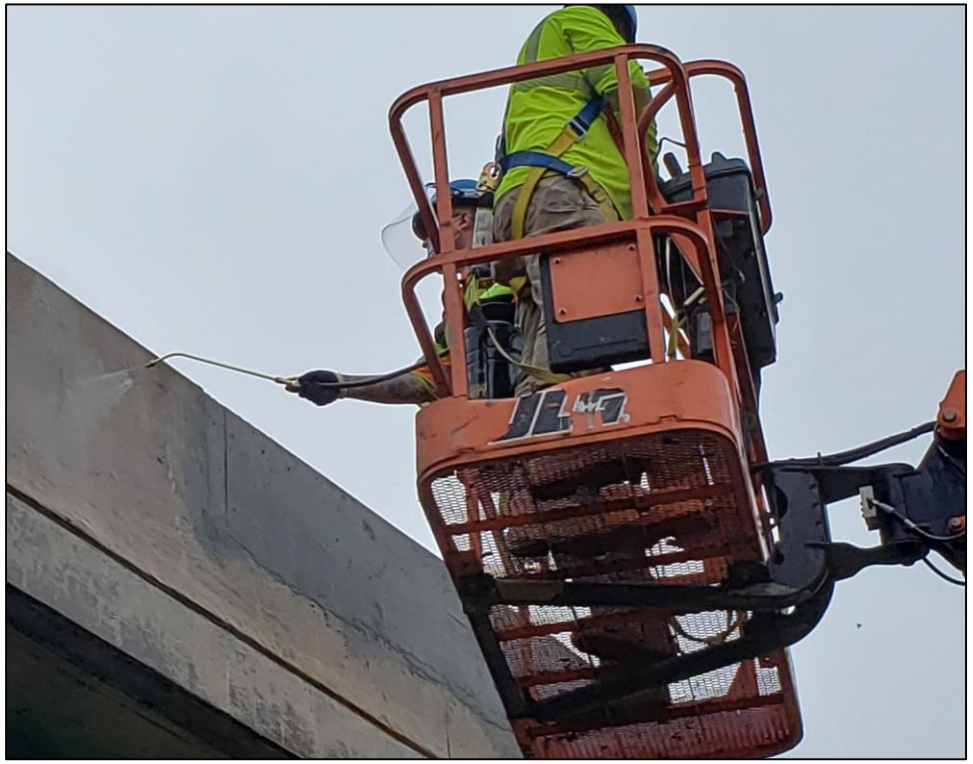
Spray Applied Waterproofing



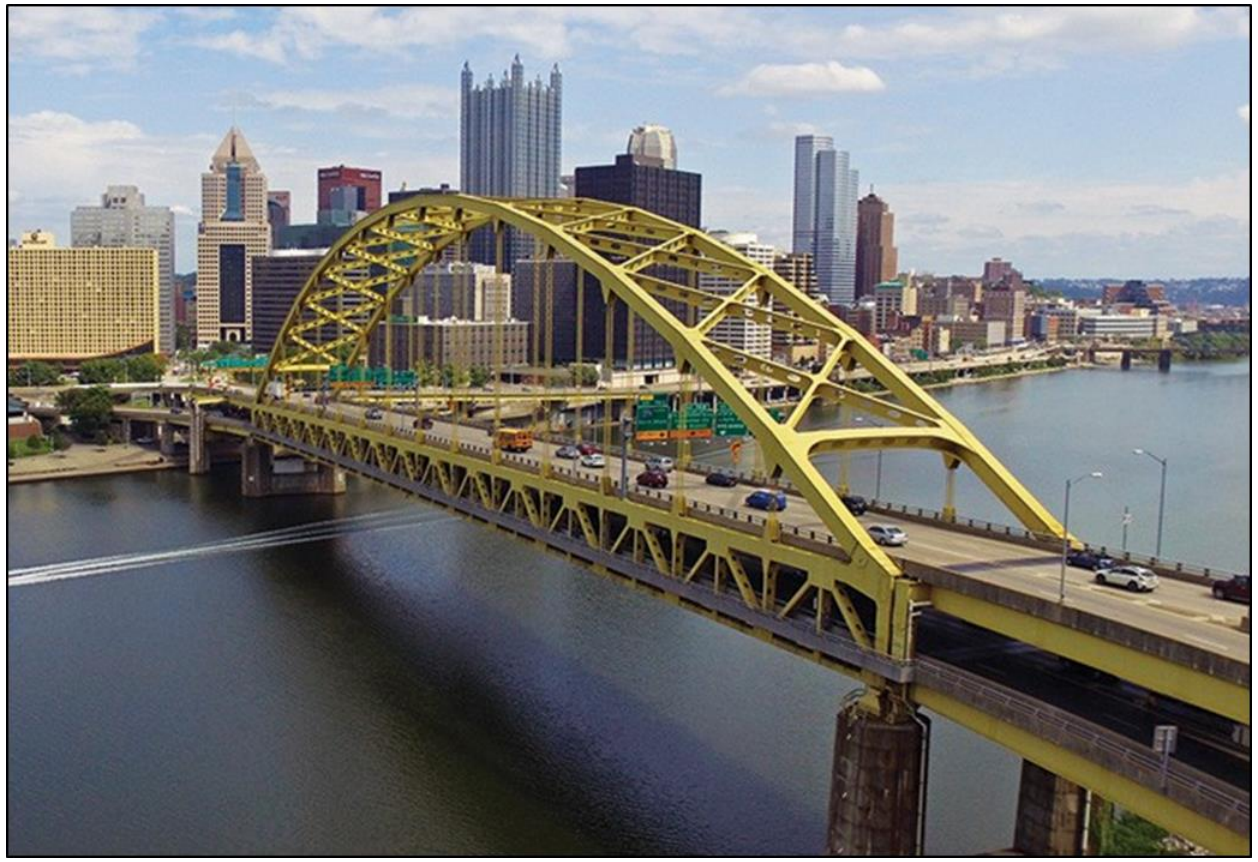
Water Truck

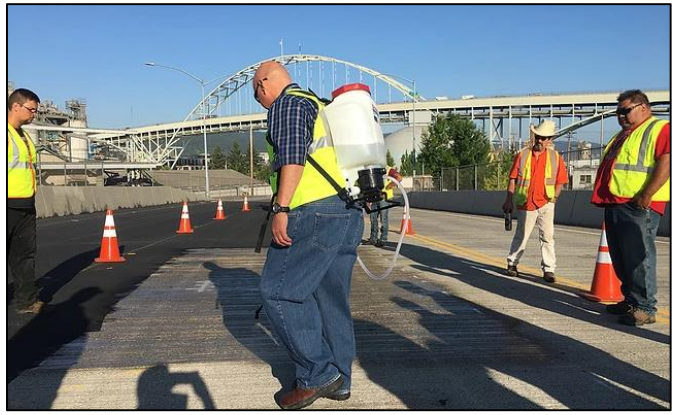
OKLAHOMA - D.O.T. Highway Bridge Application

DELAWARE - D.O.T. Application: Jersey Barrier Protection



DELAWARE - D.O.T. Application: Jersey Barrier Protection





PENNSYLVANIA - Fort Pitt Bridge

NEW JERSEY - D.O.T. Highway Bridge Applications

VIRGINIA - D.O.T. Highway Bridge Application

ARKANSAS - D.O.T. Highway Bridge Application

LOUISIANA - D.O.T. Highway Bridge Application

UPCOMING APPLICATIONS

- Oregon
- Texas
- Florida
- North Carolina
- Mississippi

QUESTIONS?

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TODAY'S SOLUTIONS FOR TOMORROW'S PROBLEMS