

Innovative Products, Methods, and Techniques Used for Deck Patching

*Presented at:
2016 AASHTO FP²
Midwest Bridge Preservation Partnership Conference
Milwaukee, Wisconsin
October 4, 2016*

**Presented by:
Tom Donnelly (Transpo); Brian Mintz (Phoscrete); Matt Ross (CTS)**

Literature Search

SHRP-S-344

**Concrete Bridge Protection and Rehabilitation:
Chemical and Physical Techniques**

**Rapid Concrete Bridge Deck
Protection, Repair
and Rehabilitation**

Michael M. Sprinkel
Angela R. Sellars
Virginia Transportation Research Council
Charlottesville, Virginia

Richard E. Weyers
Virginia Polytechnic Institute and State University
Blacksburg, Virginia



Strategic Highway Research Program
National Research Council
Washington, DC 1993

SHRP
1993

National Transportation Product Evaluation Program
**LABORATORY AND HORIZONTAL FIELD EVALUATIONS OF
RAPID SETTING PATCHING MATERIALS FOR PORTLAND
CEMENT CONCRETE**

June 2004 Product Submissions

NTPEP Report 9005.2

Report by:
Ohio Department of Transportation

Field Testing by:
Ohio Department of Transportation

Laboratory Testing by:
Kansas Department of Transportation
New York Department of Transportation



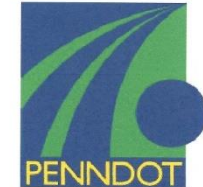
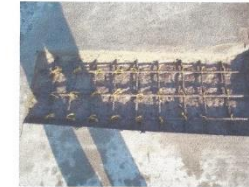
April 2007

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NTPEP
2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

PENNDOT RESEARCH



BRIDGE DECK PATCHING MATERIALS

Final Report

PennDOT/MAUTC Partnership, Work Order No. 10
Research Agreement No. 510401

June 2008

By N. M. Cervo and A. J. Schokker

PENNSTATE



The Thomas D. Larson
Pennsylvania Transportation Institute

The Pennsylvania State University
Transportation Research Building
University Park, PA 16802-4710
(814) 865-1891 www.pti.psu.edu

PennDOT
2008

Deck Patching – Systematic Approach

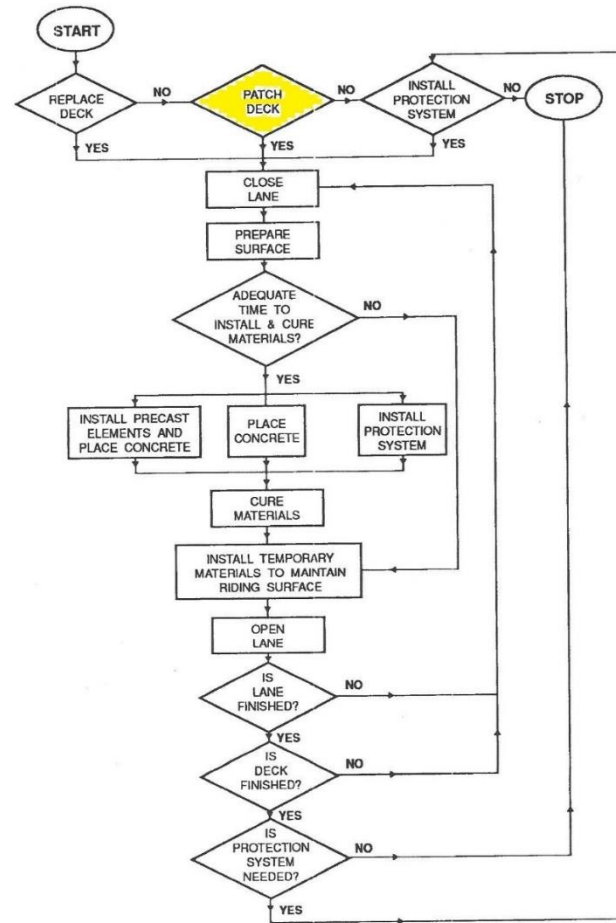


Figure 1.1 Flow diagram for rapid bridge deck treatment methods

Source:
"Rapid Concrete Bridge Deck Protection,
Repair and Rehabilitation"
- M. Sprinkel, A. Sellars, R. Weyers
- SHRP-S-344
- 1993
- 111 pgs.

Survey MWBPP's

- Iowa DOT
- Michigan DOT

Iowa DOT

District Repair Crews responses:

District 1:

We are using Rapid Set Concrete mix, we have some cracking issues but we like it for the most part. We don't patch during winter months unless it's an emergency then we'll use a product called MG crete.

District 4:

We use RAPID-SET concrete mix and haven't had any problems arise. We try not to patch during the winter months and have found that ACC patch works until the weather warms up.

District 5:

We also use Rapid Set with very few issues, we have had issues with other rapid setting concrete mixes. We try to do most of our patching before November and after March, depending on the weather conditions, there are some steps we have taken to do some patching in colder weather (hot water, warm the substrate/concrete, etc.) but we always try to adhere to the manufacturers recommendations. We have used other mixes successfully such as MG Krete between November and March but very limited.

District 6 :

Rapid set CTS is what we use. Have not had any problems with it. Pavement Mend SL Is a fall back material No problems with it either. Cost is higher. I had problems with other mixes in the IM491.20. I just avoid those products. We plan our work through the year to not have those occurrences in the cold months. Acc patch and Dura patch usually work to get us to warm weather.

Iowa DOT

District Crew Response Summary

District	Deck Program	Rapid Set	Time	Winter/Emergency	Issues
1	Yes	Yes	Mar-Oct	MgKrete	cracking
4	Yes	Yes	Mar-Oct	ACC	none
5	Yes	Yes	Mar-Oct	Hot H ₂ O;MgKrete	some
6	Yes	CTS;Pavemend	Mar-Oct	ACC/Durapatch	some

Michigan DOT

- **7 Regions**
- **Each Has At Least One Bridge Repair Crew**
 - **3 Regions Have Mobil Mixers**

Regional Process:

1. **Inspection & Scoping**
2. **Region Discussion**
3. **Prioritize (Hi,Med,Lo)**
4. **Crews Decide & Schedule**
 - **Moved Up, If Critical**
 - **Optimize Closure: Joints, Seal Cracks, Patch, etc.**

Michigan DOT

Central Office Support

7 Regions + >300 Locals

1. Assess Regions Needs

2. Education & Support

- Hands-On Training
- Spring Meetings
- Annual Meeting
- Summer Job-Site Support

2. Procurement

- Equipment
- Materials
 - Portland Cement
 - Materbuilders 1060
 - Transpo T-17

Industry Presentations



C T S Cement Manufacturing
Corporation



Transpo T-17 MMA Polymer Concrete

STEVE MARTIN JOHN CANDY
A JOHN HUGHES FILM
**PLANES, TRAINS
AND AUTOMOBILES**

ALL FLIGHTS CANCELLED... YOU'RE SCRE



Presented by:
Tom Donnelly (Transpo Industries)

Transpo T-17 MMA Polymer Concrete





Photo: Harley Colburn





Phoscrete Concrete Repair

Capabilities Briefing

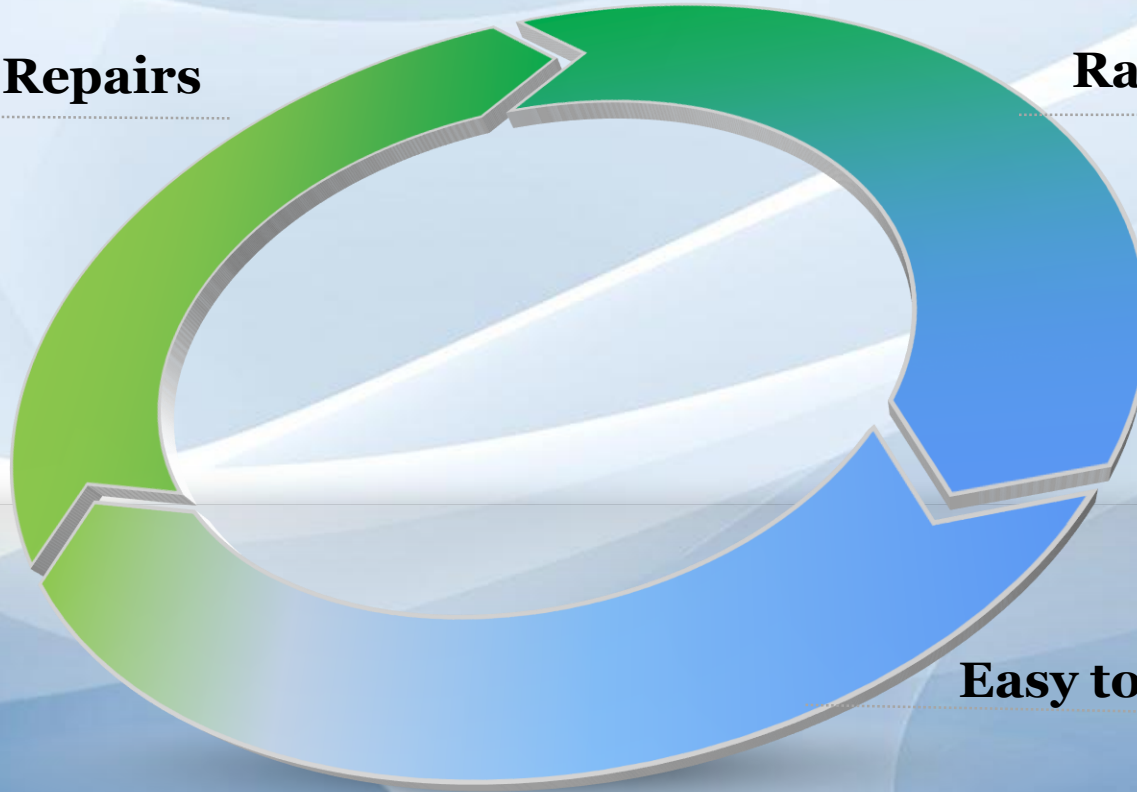


Fix It Once, Fix It For Good.

Fix it with Phoscrete!

Long-Lasting Repairs

Rapid Return to Service



Easy to Mix, Place, & Finish



Phoscrete with MALP+ Technology

7 Years Experience DOT Infrastructure Concrete Repair

1

Traffic-Ready in 1 Hour

2

No Sandblasting, Primers, Curing

3

Accepts Coatings after only 1 Hour

4

Works in Sub-Freezing Temperatures



Phoscrete HC Packaging

Horizontal/Castable

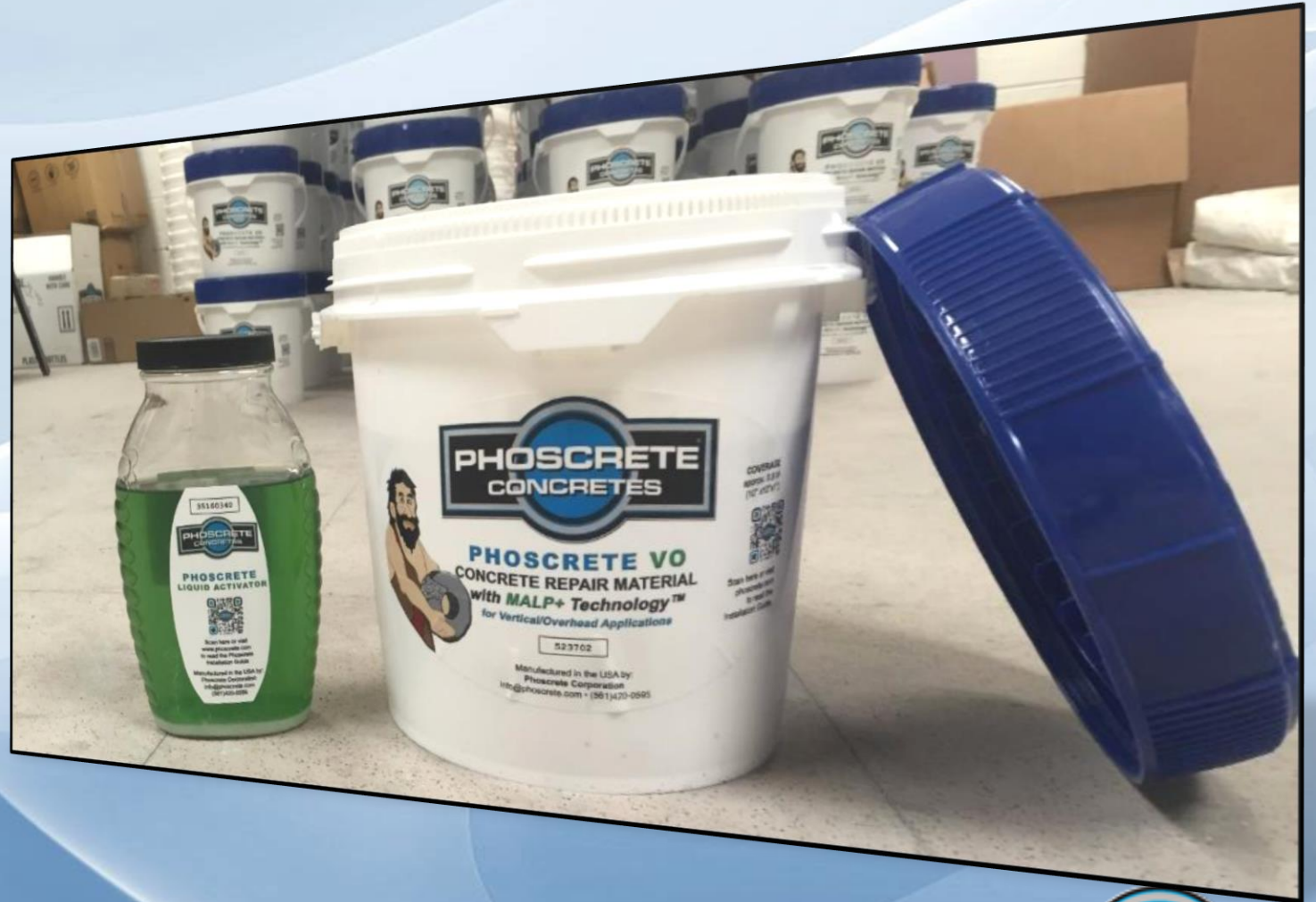
- **Phoscrete HC**
 - 50 lb. Dry Mix
 - 1 Gal. Liquid Activator
 - Mix in standard 5 gallon bucket
 - No water in mix



Phoscrete VO Packaging

Vertical/Overhead

- Phoscrete VO
- 11.3 lb. Pail
 - Liquid + Dry
 - Mix at location with battery-powered drill



Rapid Return to Service

Nevada DOT 5/12/2011

- I-15 Las Vegas
Strengths after
only [1] hour:
 - 4,000 psi
compressive
 - 1,500 psi bond
 - 400 psi flexural



Simple Site Preparation

WSDOT 6/16/2011

- Yakima, WA
 - NO Sandblasting
 - NO Primers
 - NO Curing Compounds
 - NO SSD



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Self-Consolidating Material

WSDOT 6/16/2011

- Yakima, WA
 - Use standard concrete finishing tools
 - Everything cleans up with water



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Phoscrete HC – Bridge Joint Nosing

WSDOT 7/5/2011

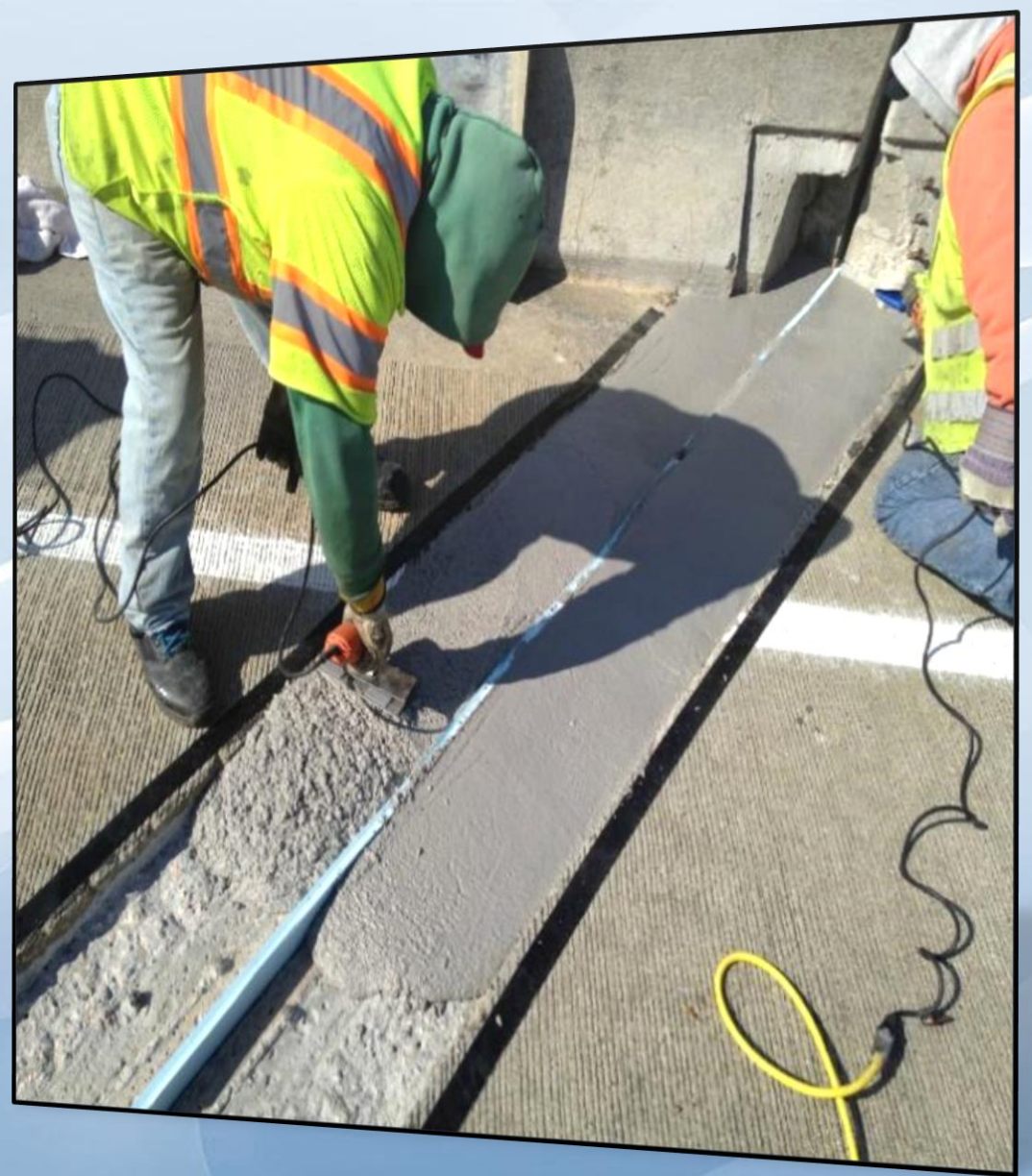
- I-5 Nisqually, WA
 - Resists Chloride Attack
 - No Shrinkage Cracking
 - Accepts Sealant after 1 hour



Phoscrete HC

Full Span Joint Rehab

- Ralph Hodges
- NCDOT
Rocky Mountain NC
3/25/2013



Phoscrete HC – Full Depth Repairs

WSDOT 4/5/10



Phoscrete HC – Form and Pour

USBR 1/18/2012

- Folsom Dam Spillway
 - Chemical and Mechanical Bond



Phoscrete HC – Highway Renewal

KYTC 10/9/2009

- I-65
Lexington
 - 10,000 Partial Depth Repairs
 - Freeze/Thaw and Salt-Scale Resistant



Phoscrete VO – Bridge Column

ICA 9/20/2012

- Tampa/Lithia
 - Stops Rust on Contact
 - Inhibits Halo Effect



Phoscrete VO – Bridge Beam

ICA 3/2/2012

- I-395-Miami
 - Hand pack and trowel finish



Phoscrete VO – Pre-Cast Panels

Bouygues - Miami Tunnel 7/27/2012



Phoscrete SG – Shotcrete/Gunite

MoDOT 1/5/2012

- 100/109 Bridge
St. Louis, MO
 - 1 cy per hour
application rate



Phoscrete SG – Bridge Repair

MoDOT 1/5/2012

- 100/109 Bridge
St. Louis, MO
 - Fiber-Reinforced
 - Low Rebound



Cold Weather Concrete Repairs

MoDOT 1/20/2012

- I-44 St. Louis
+28°F Ambient
Temperature
- No water in mix



Cold Weather Concrete Repairs

MassDOT 12/5/2014

- I-90
Worcester
+23°F Ambient
Temperature



Cold Weather Concrete Repairs

KYTC 2/4/2016

- US-27
Nicholasville,
KY

+34°F Ambient
Temperature



Fix It With Phoscrete!

We are available to answer any questions and discuss your application requirements.

Thank You!



Contact:

Phoscrete Corporation

265 S Federal Hwy, Suite 320
Deerfield Beach FL 33441

(561) 420-0595 main office
(561) 420-0599 fax

www.phoscrete.com
info@phoscrete.com





C T S Cement Manufacturing Corporation



Built Fast ... Built to Last

LowP for Bridge Deck Preservation

Advanced Concrete Technology

Rapid Set LowP Cement

- **Advanced Cement Technology for overlays and repairs**
- **Rapid Set LowP Cement requires only the addition of water and aggregates to produce a concrete with performance characteristics greater than any other cement based overlay concrete plus corrosion resistance.**

LOWP

- **Cement Technology that produce same “Life Cycle” performance characteristics as LMC, SFC RSLMC**
- **Improve Very Early Tensile Strength Gain - Latex and SFC Delay This**
- **Reduce Cement Paste**
- **Low Permeability – Low Porosity**
- **Rapid Bond Development**
- **Lower In-Place Unit Costs and “Cost to the Public” for Overlays and Repairs**

RT 95 Foxboro, MA



Full Depth Repairs



Concrete produced in Volumetric Mixer



Full Depth Patch Placement



LowP Bridge Deck Overlay being Placed



Bridge open to Traffic



Rapid Set LowP Structural Considerations

- **Early Strength Development**
 - 2 -3 Hour Early Tensile Strength Resists Movement Induced Cracking
 - Resume Construction or Traffic Sooner
- **Reduce Drying Shrinkage**
 - 2 to 3 Hours Wet Cure
- **Faster Monolithic Bond – Pull Off Tests in 24 Hours**
- **Permeability – 500 to 900 Coulombs at 56 days**
- **Freeze Thaw Resistance**

Wet Cure

- **Rapid Set LowP**

2 to 3 Hours

3000 psi Ready for Traffic

- **RSLMC**

3 to 4 Hours

3000 psi Ready for Traffic

- **LMC 3 Days Wet Cure**

- **SFC 7 Days Wet Cure**

- **Low Slump 1 Day**

- **Expect Shrinkage in LMC, SFC, LS concrete**

Rapid Set LowP Advanced Cement Technology

- **No Need For Latex – Less Cost and Handling**
- **Less Mobile Mixers Per Placement**
- **Less Cement Content - Less Shrinkage**
- **Concrete Cost Competitive with LMC**
- **In-Place Cost Less Than RSLMC, LMC, SFC**
- **Very Fast Tensile Strength Development**
- **Ready for Traffic in as Little as 2 Hours**

CTS Cement Manufacturing

Advanced Cement Technology

Thank You

Matthew W Ross P.E.
Regional Sales Manager - Midwest

Thank You!