2015 Michigan Bridge Conference
Bridge Deck Joint Replacement

Transportation Training Institute™

Presenter

Neal S. Carboneau, P.E.

Source: Better Roads

Credits

- Federal Highway Administration, FHWA
- Michigan Department of Transportation, MDOT
- Indiana Department of Transportation, INDOT
- Indiana Local Technical Assistance Program, LTAP, at Purdue University
- Joint Transportation Research Program, JTRP, at Purdue University
- Maine Department of Transportation
- National Center for Pavement Preservation
  Michigan State University

- Dow Corning
- D.S. Brown
- RJ Watson
- SSI
- Watson Bowman Acme

Source: JTRP

Goal of the Presentation

The understanding that joint repairs and replacement are complex topics with many variables.

- Give you the ability to find what you need
- Perspective on problematic areas
- Basic understanding of the processes
  - Help you decide if you want to add joint repair to your regular maintenance activities
  - Or contract out wider scale maintenance and repair activities

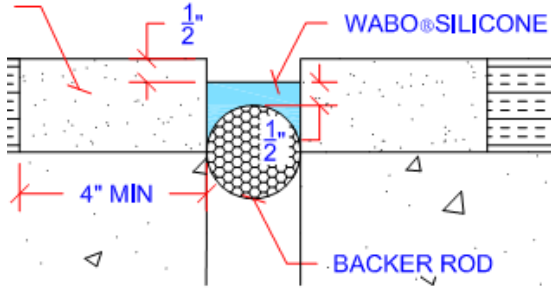
Bridge Deck Joint Replacement

- Definitions
- The Importance of Joint Maintenance
- Integrating Joint Maintenance in Bridge Management Plans
- Initial Considerations
- Using Your Own Forces
- Challenges
- Other Considerations
- Recommendations

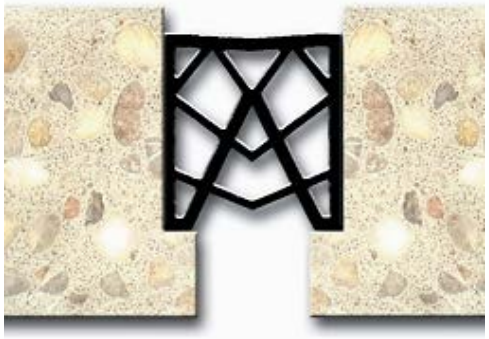
Source: JTRP

Definitions

- XJS System – Expansion Joint Sealing System
  - Polymer nosing material
  - Backer rod
  - Silicone joint sealant
- BS Joints – Type B Compression Seal



XJS Source: Watson Bowman Acme

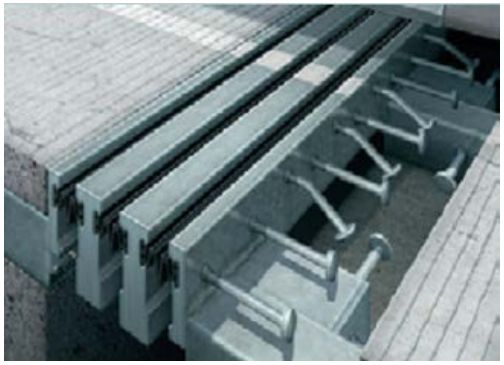


BS Source: Watson Bowman Acme

Definitions

- SS Joints – Strip Seal – “Gland”
- Modular Joints
- Finger Joints

SS Source: JTRP

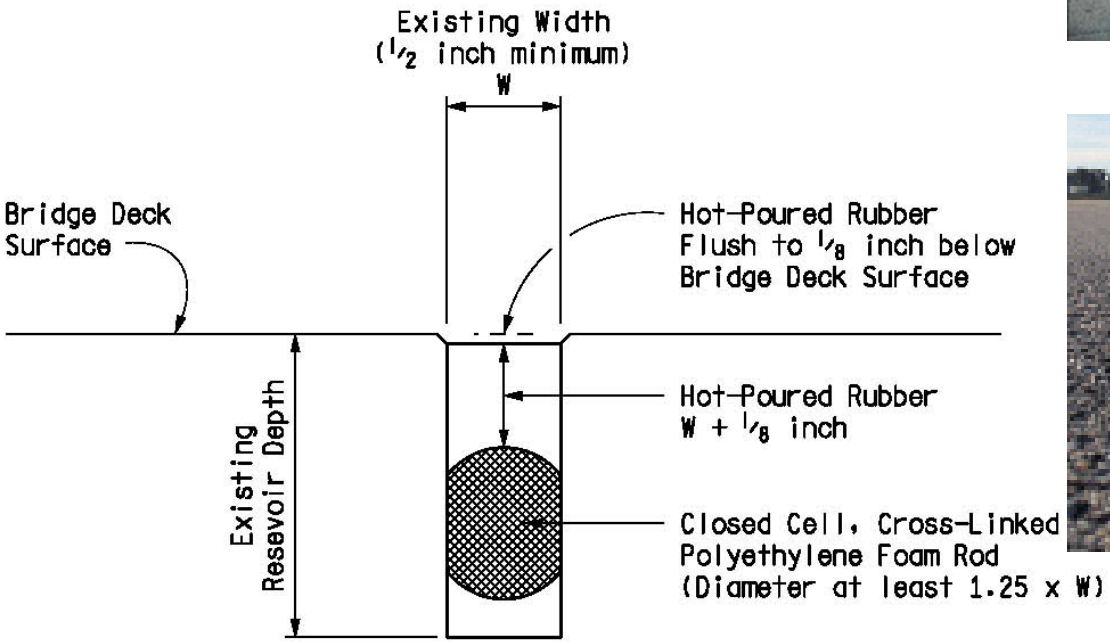


Modular Source:
DS Brown

Finger Source: Maine DOT
John Buxton

Definitions

- Hot Poured Sealants



Source: Michigan DOT

Source: FHWA

Source: Better Roads

Definitions
Hot Poured Sealants – Michigan DOT

SPECIAL PROVISION FOR RESEALING BRIDGE CONSTRUCTION JOINTS WITH LOW-MODULUS HOT-POURED RUBBER

(Capital Scheduled Maintenance) 12CT602(A035) C&T:APPR:JAB:KPK:11-08-11

This work consists of removing existing joint sealants, cleaning the joint, and sealing the joint with a low-modulus hot-poured joint sealant.

Provide hot-poured sealant meeting the requirements of subsection 914.04.A of the Standard Specifications for Construction. Provide backer rod meeting the requirements of subsection 914.04.B of the Standard Specifications for Construction.

Definitions

Low Modulus Silicone Sealants – Michigan DOT

SPECIAL PROVISION FOR RESEALING BRIDGE END JOINTS
WITH LOW-MODULUS SILCONE
12DS602(I145) APPR:ARB:CER:12-02-14

Materials. Provide solid, round, closed-cell, cross-linked polyethylene foam back rod meeting the requirements of ASTM D 5249, for Type 1. Select the silicone sealant from the pre-approved manufacturers in Table 1 or an Engineer approved equal:

Table 1: Silicone Sealant Manufacturers

Manufacturer	Product	Telephone
Dow Corning	888 Silicone Joint Sealant	(989) 496-7875
D.S. Brown	DBS 800 Silicone	(419) 257-3561
Sika Corporation	Sikasil-728 NS	(800) 933-7452

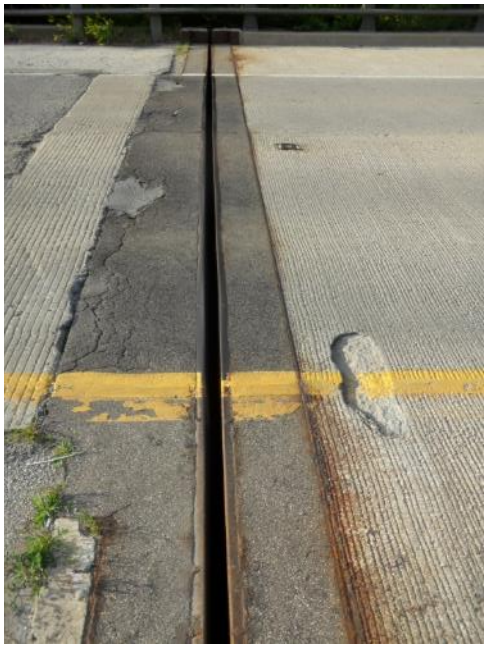
The Importance of Joint Maintenance

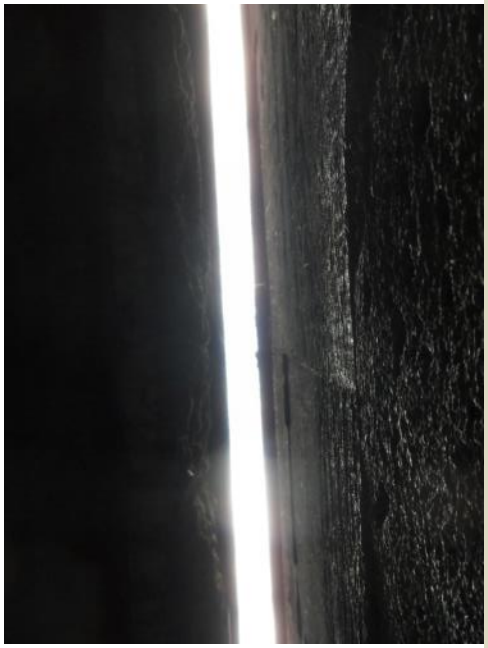
Strip seals are very sensitive to debris.

Source: JTRP

The Importance of Joint Maintenance

Neglected and un-repaired joints provide easy access to water and road salts.





Source: JTRP

The Importance of Joint Maintenance

Damage from the road salts

Source: JTRP

Integrating Joint Maintenance in Bridge Management Plans

Restricting the intrusion and impacts of road salts are major goals of bridge management plans

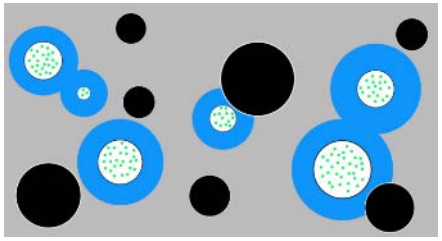
- Washing decks, drains, beams and beam seats
- Sealing cracks and decks
- Spot painting
- Cleaning and maintaining the integrity of the joint seals

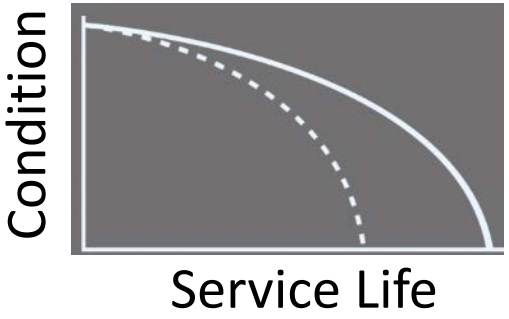
Source: JTRP

Integrating Joint Maintenance in Bridge Management Plans

- Recent LTAP and JTRP research on
  - Soy based sealers
  - Internal curing
  - High performance concrete mixtures
- Provide promising strategies to
  - Reduce the impacts of road salts
  - Increase structure longevity
  - Reduce the long term cost of the structures

Source: JTRP

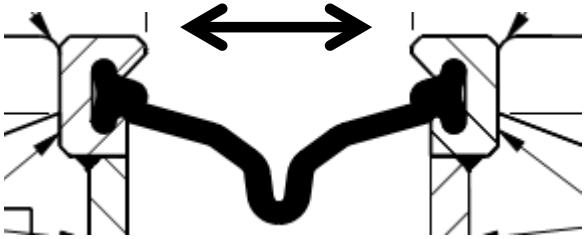




Initial Considerations

- Make field visits to determine specific joint conditions, types and dimensions.
- Review as built records for supplier and model information.
- Obtain joint expansion and contraction values.

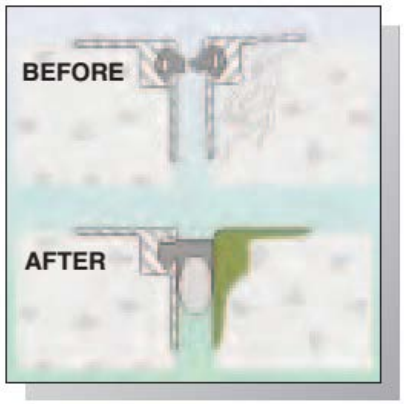
Source: Neal Carboneau



Initial Considerations

- Consult with engineers and product manufacturers for optimal solutions
- Consider
  - Time till next major rehab
  - Necessary life
  - Cost of repairs
  - Duration of repair activities
  - Cure times
- Expense of other activities can impact the cost of the operation
  - Detours
  - Overnight lane closures

SS replacement with XJS



Source: SSI

Initial Considerations

- Consider alternatives for
  - Contracting
  - Self Performance
- Will the work be part of regular maintenance operations
- Can a contract be created with enough work and time per location to make it economically feasible

Source: DS Brown

Initial Considerations

Can the work be combined with

other maintenance or repair activities

- Improve value and efficiency of contracting or self performed operations
- Reduce the number and duration of lane interruptions

Source: FHWA

Using Your Own Forces

Start by reviewing the resources

and talking with the experts

FHWA, MDOT, INDOT …

Standards, Specifications and Guidelines

- Installation Information
- Quality Control Information
- Potential Problem Areas

712 - Bridge Rehabilitation | Google

https://mdotwiki.state.mi.us/construction/index.php/712_-_Bridge_Rehabilitation,_Concrete

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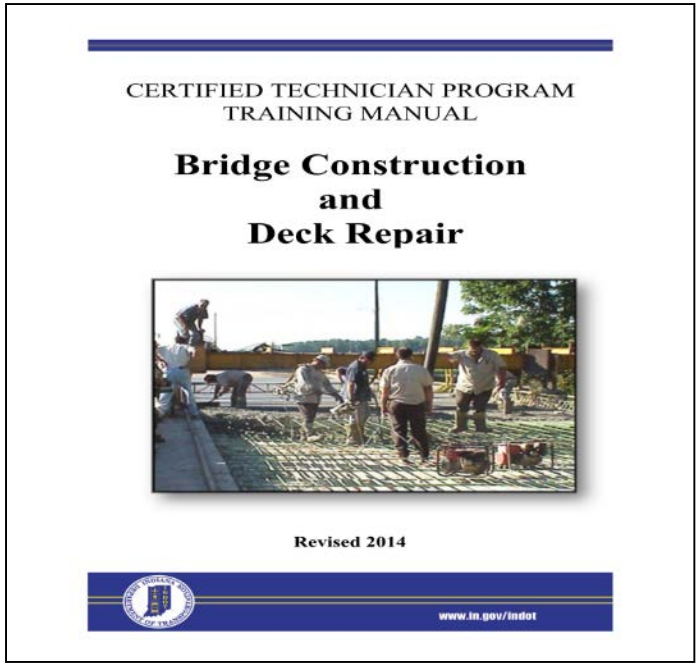
712 - Bridge Rehabilitation, Concrete

712

Bridge Rehabilitation - Concrete

2012 STANDARD SPECIFICATIONS FOR CONSTRUCTION - SECTION 712



Using Your Own Forces

Start by reviewing the resources and talking with the experts

- Product Manufacturers
  - Dow Corning
  - D.S. Brown
  - RJ Watson
  - SSI
  - Watson Bowman Acme
- Material procurement information
- Tool and equipment suggestions
- Typical workforce needs
- Training, certification and installation videos
- Safety considerations

Using Your Own Forces

Have the workforce properly trained for each activity

- Estimating, Budgeting, Procurement
- Construction Processes and Material Installation
- Targeted Safety Training
- Workzone Safety and Traffic Control Training

Source: Neal Carboneau

Using Your Own Forces

Calculating quantities and costs

Use caution with XJS System Quantities

- Depths, Nosing Quantities
- Consider irregularities
- Impacts of deterioration
- Partial mixtures and waste

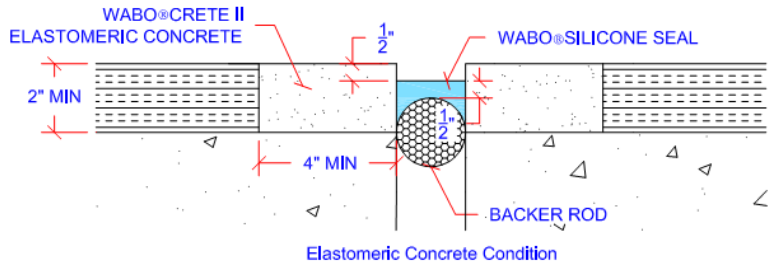
Source: SSI

Using Your Own Forces

Calculating quantities and costs

Use caution with XJS System Quantities

A 2”x4” Nosing x 30’ long
On 2 sides of the joint at
2 ends of the bridge has a
Volume of 6.7 cft.



Source: Watson Bowman Acme

If the joint is chipped out an average of 2.5” x 4.5”, the volume would be 9.4 cft. If you add 0.5 cft for waste and 0.5 cft loss in the drum and mixing, you might need 10.4 cft.

Using Your Own Forces

Calculating quantities and costs

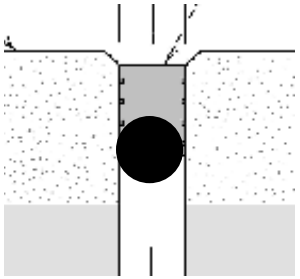
If you figured 6.7 cft and ordered 2 units with a volume of 5 cft, you could be short by 1 cft.

Source: SSI

The job would be stopped and you would have wished you ordered more. It would have been a small price to pay for a more material in case of an overrun compared to not being able to complete the joint while you were there.

Using Your Own Forces

Calculating quantities and costs



You can miss the silicone by even more $$ with slight variations in the width and depth of the backer rod

Source: SSI

Using Your Own Forces

Planning (with special considerations)

- Materials
  - Quantities, Procurement, Transportation, Temperatures
- Tools
  - Manufacturer Specific
  - Pry Bars, Brushes, Buckets …
- Equipment
  - Lifting Equipment (Pallets and Joints)
  - Oil Water Separators
  - Blasting Pots and Hoods
  - Torches, Welders

Using Your Own Forces

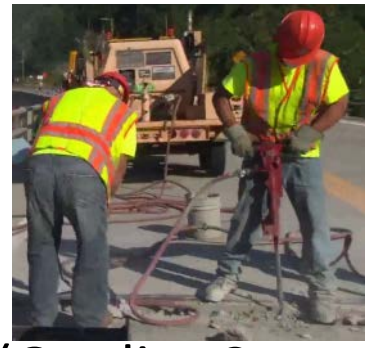
Planning (with special considerations)

- Cleanup and Disposal
  - Water
  - Solvents, Alcohol
- Safety Considerations
  - Fire
  - Medical Testing
  - Respirators
  - Safety Data Sheets
  - PPE
- Traffic Control

Source: Neal Carboneau

Using Your Own Forces

Operations

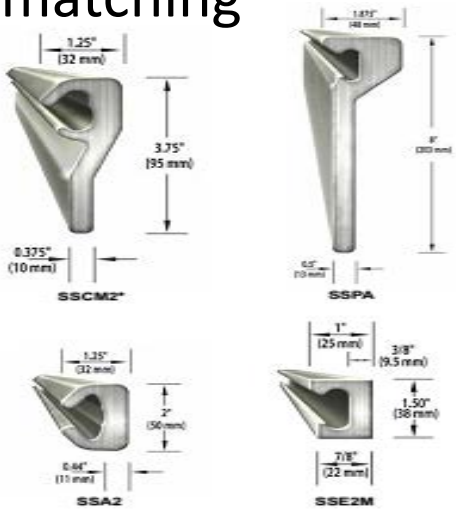


- Removal
- Cleaning
- Installation (Quality Control – Dimensions)
  - Temperature Sensitive (Ambient and Surface)
    - Materials (Cure)
    - Joints (Expansion and Contraction)
- Cure Time
- Restriction Removal

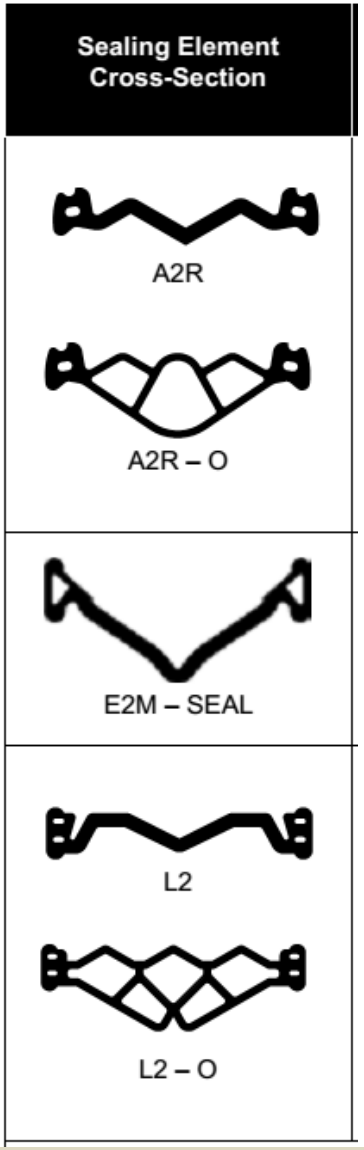
Source: DS Brown and SSI

Other Considerations

- Time Consuming Processes
  - Inspection
  - Determining the type of joint
    - Exact materials for matching
    - Record review
    - Samples
  - Acquisition times
  - Removals
  - Cure Times



Source: DS Brown



Other Considerations

- Small Quantity Premiums
- Traffic Control and Durations
- Splicing
  - Difficult
  - Prohibited by many DOTs
  - Phased with full length stored in initial phase

Source: JTRP

Other Considerations

- Mixing Types
  - XJS or Hot Pour in SS
- Design for Future Structures
- Design for Maintenance
- Elimination of Joints
  - Consult an Engineer

Source: SSI

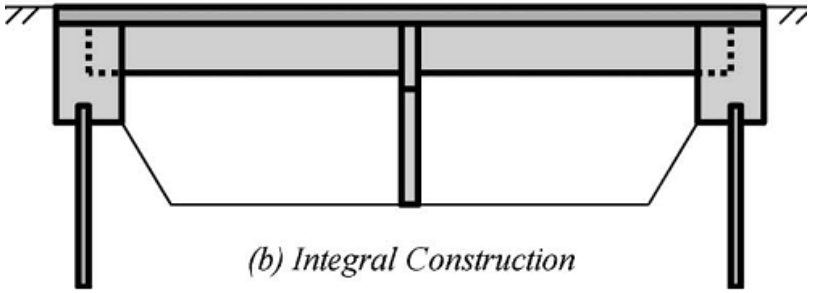


Figure 1.1: Methods of Construction

Joint Transportation Research Program Technical Report FHWA/IN/JTRP-2011/16

Recommendations

- Establish a regular preventative maintenance program
- Use asset management concepts and information to plan your program
- Get training on estimating, budgeting, workforce skill sets and associated safety practices

The concepts provided here are investments to reduce long term costs, lane restrictions, and associated user costs.

Source: JTRP

Bridge Deck Joint Replacement

- The Importance of Joint Maintenance
- Integrating Joint Maintenance in Bridge Management Plans
- Initial Considerations
- Using Your Own Forces
- Challenges
- Other Considerations
- Recommendations

Source: JTRP

Contact

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Resources

TTI Dropbox Link

To Bridge Joint Resources

http://goo.gl/T8p0KN

Resources

DS Brown

http://www.dsbrown.com/

RJ Watson, Inc.

http://www.rjwatson.com/

SSI XJS Website

http://www.ssicm.com/highway.php

Watson Bowman Acme

https://wbacorp.com/

Dow Corning® 902 RCS Joint Sealant and the X.J.S®tem - Video

http://www.youtube.com/watch?v=CONWRrULsXo

D.S. Brown New York State Delcrete Joint Work - Video

http://www.youtube.com/watch?v=ojSWLyu8_o8

Resources

NYSDOT SSI XJS Installation Information

https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/details/ssi-001.pdf

NYSDOT SSI XJS Design Details

https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/details/abj008.pdf

FHWA Bridge Preservation Guide

http://www.fhwa.dot.gov/bridge/preservation/guide/guide.pdf

FHWA Bridge Management Practices

http://www.fhwa.dot.gov/asset/hif12029/hif12029.pdf

Bridge Deck Joints, John Buxton, Maine DOT

http://www.pavementpreservation.org/wp-content/uploads/presentations/Buxton%20Joint%20Presentation.pdf

Bridge Preservation

http://tsp2bridge.pavementpreservation.org/technical/task-force-results/

Resources

INDOT Bridge Inspection Training (Certified Technicians)

http://www.in.gov/indot/2403.htm

MDOT Bridge Rehab Wiki Instructions

https://mdotwiki.state.mi.us/construction/index.php/712_-_Bridge_Rehabilitation,_Concrete

MDOT Special Provisions

http://mdotcf.state.mi.us/public/specprov/index.cfm?sy=439690

- Resealing Bridge Construction Joints With Low-Modulus Hot-Poured Rubber - 12CT602(A035)
- Resealing Bridge End Joints With Low-Modulus Silicone-12DS602(I145)

Michigan Bridge Capital Scheduled Maintenance Manual

https://www.michigan.gov/documents/mdot_CSM_Manual04_89342_7.pdf

Michigan Bridge Design Manual – New and Reconstruction

https://www.google.com/?gws_rd=ssl#q=michigan+bridge+design+manual+ch+7

Michigan Bridge Design Manual – Rehabilitation

http://mdotcf.state.mi.us/public/design/files/englishbridgemanual/ebdm12.pdf

Oman Systems, Inc – Unit Prices

http://www.omanco.com/index.asp

Resources

Joint Transportation Research Program, Purdue University

https://engineering.purdue.edu/JTRP

Indiana Local Technical Assistance Program

http://rebar.ecn.purdue.edu/LTAP1/Home/

Indiana using new concrete to increase bridge life span

http://www.purdue.edu/newsroom/releases/2013/Q1/indiana-using-new-concrete-to-increase-bridge-life-span.html

Internal Curing Video

http://www.youtube.com/embed/-y9y7g5eqBE

Concrete Construction Soy Sealer Article

http://www.concreteconstruction.net/sustainability/green-beans.aspx

Long Term Behavior of Integral Abutment Bridges

http://docs.lib.purdue.edu/jtrp/1486/

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