





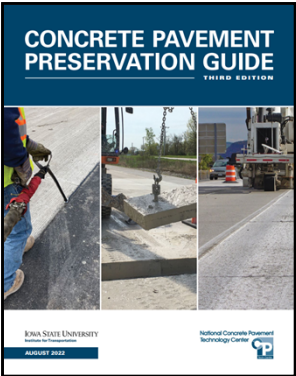

Lee Shepard  
Concrete Promotion Director

## Concrete Pavement Preservation





## Online Resources

## Concrete Pavement Preservation Guide 2022




- 3rd Edition
- Contains 12 Chapters on Preservation Techniques
- Focus on Repair Techniques - How to do it

[https://intrans.iastate.edu/app/uploads/2022/08/concrete\\_pvmt\\_preservation\\_guide\\_3rd\\_edition\\_web.pdf](https://intrans.iastate.edu/app/uploads/2022/08/concrete_pvmt_preservation_guide_3rd_edition_web.pdf)



## Distress Assessments & Solutions



**GUIDE FOR**  
**Concrete Pavement Distress Assessments and Solutions**  
**IDENTIFICATION, CAUSES, PREVENTION & REPAIR**

**DIVISION 1 – FULL DEPTH CONCRETE PAVEMENTS**


- Surface Defects
- Surface Delamination
- Material Related Cracks
- Transverse & Diagonal Cracking
- Longitudinal Cracking
- Corner Cracking
- Spalling
- Faulting
- Joint Warping and Curling
- Blowups
- Settlement and Heaves
- Subgrades & Base Support Conditions
- CRCP

**Google:**  
**CP Tech Center**  
**Distress Manual**  
**(pdf & ePub)**

**DIVISION 2 – CONCRETE OVERLAYS**

- Concrete Overlays, BCOA, BCOC, UBCOA, UBCOC
- Laboratory & Field Testing

[https://intrans.iastate.edu/app/uploads/2019/01/concrete\\_pvmt\\_distress\\_assessments\\_and\\_solutions\\_guide\\_w\\_cvr.pdf](https://intrans.iastate.edu/app/uploads/2019/01/concrete_pvmt_distress_assessments_and_solutions_guide_w_cvr.pdf)



## IaDOT Construction Manual App. 9-6

**Recommended Repairs for Cracking in PCC Pavements**

Defect	Orientation	Location	Description	Downed/Unusable	Recommended Repair
Plastic Shrinkage	Any	Anywhere	Partial-depth and more than 0.007 in. wide	Either	Do nothing
Uncontrolled Crack	Transverse	Mid-Panel	Full-Depth	Unusable	Seawatche and seal crack
Uncontrolled Crack	Transverse	Crosses or ends of transverse joint	Full-Depth	Unusable	Saw & seal crack. Epoxy sealed joint if uncracked
				Downed	Full depth repair or if cracks (up to 1/8" wide) to edge of slab, stop sawcut, saw & seal crack
Uncontrolled Crack	Transverse	Parallel to & within 5 ft. of joint	Full-Depth	Unusable	Saw and seal crack. Seal joint
				Downed	Full depth repair to replace crack and joint
Spalled surface or uncontrolled crack	Transverse	Anywhere	Spalling more than 20 ft. wide	Either	Partial-Depth Repair
Uncontrolled Crack	Longitudinal	Randomly oriented to & within 1 ft. of joint. May cross or end at longitudinal joint	Full-Depth	Either	Seawatche & seal the crack or cross with the crack. Epoxy sealed joint if uncracked
				Downed	Remove and replace panel or cross with crack
Uncontrolled Crack	Longitudinal	Parallel to & within 5 ft. of joint. May cross or end at longitudinal joint	Full-Depth, hairline, or spalled	Either	Remove and replace panel or cross with crack
				Downed	Close with crack
Spalled surface or uncontrolled crack	Longitudinal	Anywhere	Spalled	Either	Partial-Depth Repair
				Downed	Full-Depth Repair
Uncontrolled Crack	Diagonal	Anywhere	Full-Depth	Either	Full-Depth Repair
				Downed	Remove and replace panel
Uncontrolled Crack	Multiple per panel	Anywhere	Two or more full depth cracks crossing panel side to side or many joints	Either	Remove and replace panel
				Downed	Full-Depth Repair

Full-Depth repair for longitudinal joint. Partial-Depth repair for transverse joint. Cracks which meet or cross at a joint. Repairs should be made without use of Calcium Chloride unless early opening to traffic is necessary.

CR - longitudinal reinforcement. Sealed joint per wheel path provided into slabs across the crack. Slabs must be sealed to each other and the longitudinal joint. Seals with non-shrink, cement-based grout. Diamond grind if sealing is severe.

Appendix 9-6  
IaDOT Construction Manual

## National Highway Institute Online Training

### Course Description

*Concrete Pavement Preservation Series: Concrete Pavement Evaluation*

**PROGRAM AREA:** Pavements and Materials  
**COURSE NUMBER:** FHWA-NHI-131126B  
**Web-based Training (WBT)**

Calendar Year: 2023 | Length: 2 Hours | CEU: 0 Units | Price: \$0 Per Participant

**TRAINING LEVEL:** Intermediate  
**CLASS SIZE:** Minimum: 1 Maximum: 1

**COURSE DESCRIPTION:**  
 This training was prepared by the Transportation Curriculum Coordination Council (TCCC) in partnership with NHI to provide guidance on critical concrete pavement preservation issues. The training was sponsored by the FHWA and developed by the National Concrete Pavement Technology Center at Iowa State University in cooperation with FHWA.

This module discusses how preventative maintenance impacts pavement preservation, good candidates for preservation, and the benefits to pavement preservation. This module also describes the common procedures associated with conducting thorough pavement evaluations.

This module is part of the curriculum from the Concrete Pavement Preservation Series (FHWA-NHI-131126) which presents current guidelines and recommendations for the design, construction, and selection of cost-effective concrete pavement preservation strategies. The other Web-based training modules are:

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- NHI-131126 Concrete Pavement Preservation Series with downloadable version of the FHWA Concrete Pavement Preservation Guide
- NHI-13126A: Pavement Preservation Concepts
- NHI-13126B: Concrete Pavement Evaluation
- NHI-13126C: Slab Stabilization
- NHI-13126D: Partial-Depth Repairs
- NHI-13126E: Full-Depth Repairs
- NHI-13126F: Retrofitted Edge Drains
- NHI-13126G: Dowel Bar Retrofit
- NHI-13126H: Diamond Grinding and Grooving
- NHI-13126I: Joint Resealing and Crack Sealing
- NHI-13126J: Concrete Overlays
- NHI-13126K: Strategy Selection

**OUTCOMES:**  
 Upon completion of the course, participants will be able to:

- Describe the need for a thorough pavement evaluation
- Name the common pavement evaluation components
- Describe what information is obtained from each pavement evaluation component

[https://www.nhi.fhwa.dot.gov/course-search?course\\_no=131126B](https://www.nhi.fhwa.dot.gov/course-search?course_no=131126B)

## National Highway Institute Online Training

### Course Description

*Concrete Pavement Evaluation*

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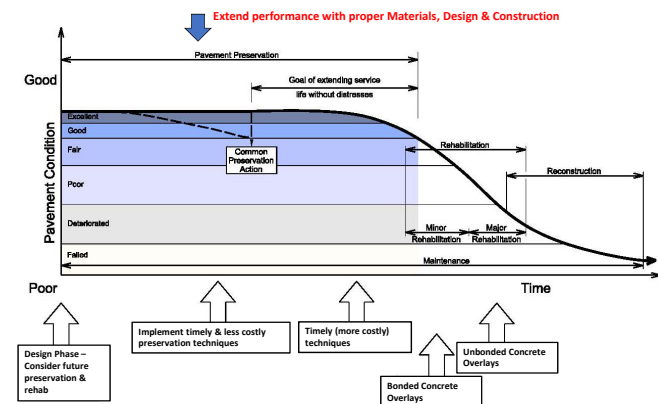
## What is Pavement Preservation?

- Network level, long-term strategy for enhancing pavement performance
- Concrete pavement preservation is a strategy of extending concrete pavement service life for as long as possible by arresting, greatly diminishing, or avoiding pavement deterioration processes.
- Goals accomplished with a collection of preventive maintenance treatments and a few minor rehabilitation and routine maintenance treatments

## What is *Preventive Maintenance*?

- Component of Pavement Preservation
- Cost effective treatments
- Applied to structurally sound pavements
- Maintain or improve functional condition
- Does not increase structural capacity

## Maintenance vs. Preservation



## Pavement Preservation Philosophy



Keeping good roads in good condition!



## Favorable Characteristics for Preservation

- Few or limited structural problems
- No materials-related distress
- Pavements in overall relatively good condition (minimal distress)



## Benefits of Pavement Preservation

- Higher customer satisfaction
  - Enhanced smoothness
  - Increased safety
  - Reduced traffic disruptions
- Improved network pavement condition
- Cost savings
- Enhanced sustainability
  - Positive economic, environmental, social impacts



## Concrete Pavement Preservation Treatments

- Slab stabilization
- Slab jacking
- Partial-depth repairs
- Full-depth repairs
- Retrofitted edge drains
- Dowel bar retrofit
- Cross stitching/Slot stitching
- Diamond grinding
- Diamond grooving
- Joint filling
- Crack sealing
- Thin concrete overlay



### Selection Factors for Pavement Preservation

- Existing pavement structure
- Existing pavement condition
- Current and future traffic
- Local climatic conditions
- Expected performance of the pavement
- Expected costs
- Construction considerations



### Use of Pavement Management Data in Preservation

- Help select suitable candidate pavements by “flagging” those pavements in “good” condition that would respond favorably to preservation
- Help identify feasible treatments through an agency’s historical tracking of the past performance of pavements with preservation treatments.
- Help select an appropriate treatment by knowing the performance impacts of the selected pavement preservation treatments.



### Typical Performance of Selected Preservation Treatments

Treatment	Typical Range of Performance
Partial-depth concrete patching	10 to 20+ years
Full-depth concrete patching	20+ years
Dowel bar retrofit	15 to 20+ years
Cross-stitching	10 to 20+ years
Diamond grinding	15 to 25+ years
Joint resealing	8 to 16+ years

Table 2.5 on p. 14



### Trigger/Limit Values for Preservation (JPCP)

Start Programming

Performance Indicator	Trigger Value	Limit Value	Repair
Trans. Cracking	1.5-2.5% of slabs cracked	5-15% of slabs cracked	Partial, Full, Dowel Bar Repairs
Joint Deterioration	2.0-4.0% of joints	15-20% of joints	Partial-Depth Repair
Joint Faulting	1/8 inch	3/8 – 1/2 inches*	Dowel Bar Retrofit
Roughness	90 in/mi	170 in/mi*	Diamond Grinding

\* CP Tech Center

Values Adapted from Table 3.2 Preservation Guide





## Concrete Pavement Preservation Treatments

- Slab stabilization
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## Cross Stitching

DS-15104  
(New)

**IOWADOT**  
DEVELOPMENTAL SPECIFICATIONS FOR  
CROSS STITCHING OF CONCRETE PAVEMENT

Effective Date  
February 21, 2023

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

**15104.01 DESCRIPTION.**  
Drill holes and anchor deformed tie bar reinforcement diagonally across cracks or longitudinal joints in concrete pavement in accordance with the details shown on the plans. Do not use on transverse cracks or joints.

**15104.02 MATERIALS.**

- A. **Reinforcing Steel.**  
Use an epoxy coated No. 6 deformed steel bar meeting Section 4151 of the Standard Specifications.
- B. **Epoxy Grout.**  
Use epoxy grout in accordance Materials IM\_05111\_Appendix A.

**15104.03 CONSTRUCTION.**

- A. **Equipment.**  
Use a five impact hydraulic drill with a tungsten carbide bit. Do not damage the surface or crack the concrete when drilling. Demonstrate the process prior to use on the repair pavement.
- B. **Drilling Notes.**
  1. Drill a 7/8 inch diameter hole transversely across the joint at an angle and distance as described in Table 15104.03-1.

**15104.04 METHOD OF MEASUREMENT.**  
The number of each installed cross-stitched tie bar location will be counted.

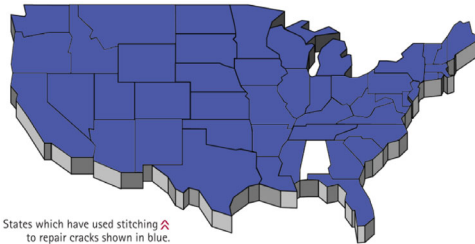
**15104.05 BASIS OF PAYMENT.**  
The Contractor will be paid the contract unit price for each installed cross-stitched bar. This price is full compensation for furnishing all materials, tools, labor, equipment and incidentals necessary to complete the work.

## Cross Stitching

States which have used stitching to repair cracks shown in blue.

## Cross Stitching

“nearly all states that properly maintain their concrete pavement have utilized some form of stitching in recent years”  
 – John Roberts, IGGA



## Benefits to Cross Stitching

- Improved load transfer
- Enhanced longevity
- Cost-Effective
- Reduced maintenance
- Increased safety
- Environmentally friendly
- Minimal traffic disruption
- Increased resilience
- Compatibility with other repairs



## Cross Stitching

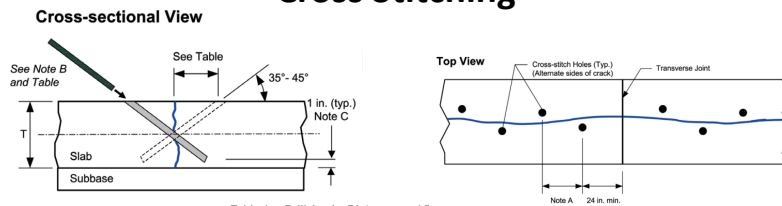
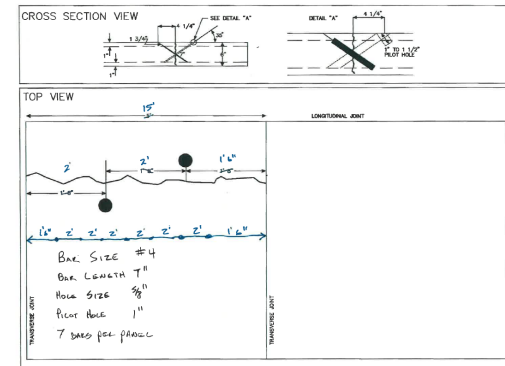


Table 1. – Drill Angle, Distance, and Bar Length by Slab Thickness

Angle	Slab Thickness (T) Inches				
	8	9	10	11	12
	Distance from Joint to Hole (D) inches				
35°	5.75	6.50	7.25	7.75	8.50
40°	-	-	-	6.50	7.25
45°	-	-	-	-	6.00
	Length of Bar (inches)				
35°	9.50	11.00	12.50	14.50	16.00
40°	-	-	-	12.50	14.00
45°	-	-	-	-	12.00



## Cross Stitching





### Cross Stitching



### Diamond Grinding

- Provides smooth riding surface
- Removes faulting of joints
- Does not significantly affect fatigue life
- Extends service life of well-designed pavements (+15 years)
- Costs less than asphalt overlay
- Enhances texture and skid resistance
- Reduces tire/pavement noise

### Diamond Grinding

- Design considerations
  - Get bids out early
  - Faster construction times = lower prices
  - Detours (if possible)
  - Type of aggregate (limestone vs gravel)
  - Roughness: does an IRI of 70 make sense?

Performance Indicator	Trigger Value	Limit Value	Repair
Trans. Cracking	1.5-2.5% of slabs cracked	5-15% of slabs cracked	Partial, Full, Dowel Bar Repairs
Joint Deterioration	2.0-4.0% of joints	15-20% of joints	Partial-Depth Repair
Joint Faulting	1/8 inch	3/8 – 1/2 inches*	Dowel Bar Retrofit
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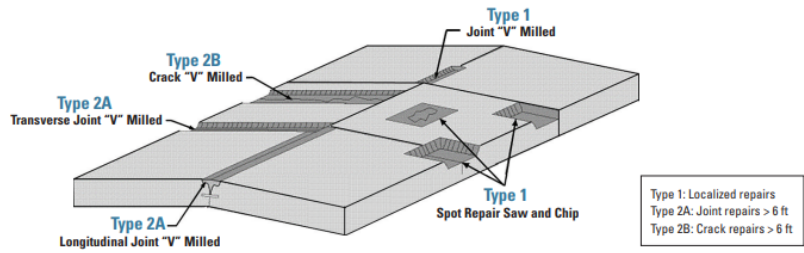
### Partial Depth Patching

- Long-lasting (10 – 20 years)
- Durable
- Cost-effective
- Improves ride quality
- Restores a well-defined uniform joint
- Fast construction times



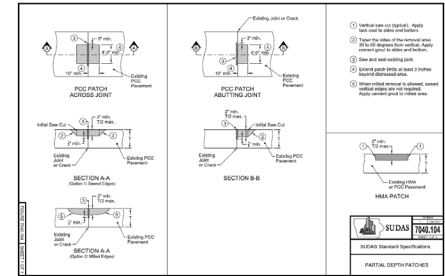


## Partial Depth Patching



## Partial Depth Patching

- Design considerations
  - Pavement evaluation
  - Patch size and location (tabulation)
  - Depth of repair
  - Use of fiber board for transverse joints when patching longitudinally
  - Open to traffic times
  - Traffic management
  - Working crack – is the panel rocking?



## Partial Depth Patching



**ConcreteState**

Upcoming Training

## Pavement Preservation for Local Roads

### CONCRETE PAVEMENT PRESERVATION FOR LOCAL ROADS WORKSHOP



## Cost \$100

(includes lunch)

**DATES**

**Tuesday, December 5, 2023**  
 Holiday Inn & Suites/Siemwena Event Center  
 7400 Hudson Road, Cedar Falls

**Wednesday, December 6, 2023**  
 The Current Autograph Collection Hotel  
 215 North Main Street, Davenport

**DESCRIPTION**

Provide guidance on the design, construction, and selection of various concrete pavement preservation treatments. Effective and timely pavement preservation increases the life of the pavement and extends the time before major rehabilitation or reconstruction is needed. **PDH available**

**SPEAKERS**

Dan King, P.E., National CP Tech Center  
 Todd Hanson, P.E., Iowa Department of Transportation  
 Lee Shepard, Iowa Concrete Paving Association

**AGENDA**

8:30 AM-9:00 AM	Registration	
9:00 AM-9:30 AM	Intro to Pavement Preservation	Dan King
9:30 AM-10:15 AM	Concrete Pavement Evaluation	Todd Hanson
10:15 AM-10:30 AM	Break	
10:30 AM-11:15 AM	Partial Depth Repair	Dan King
11:15 AM-11:45 AM	Full Depth Repair	Lee Shepard
11:45 AM-12:30 PM	Lunch provided	
12:30 PM-1:15 PM	Load Transfer Restoration	Todd Hanson
1:15 PM-2:00 PM	Diamond Grinding & Grooving	Lee Shepard
2:00 PM-2:30 PM	Joint Resealing & Crack Sealing	Dan King
2:30 PM-3:00 PM	Review and Discussion	

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IOWA CONCRETE PAVING ASSOCIATION





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# Questions?