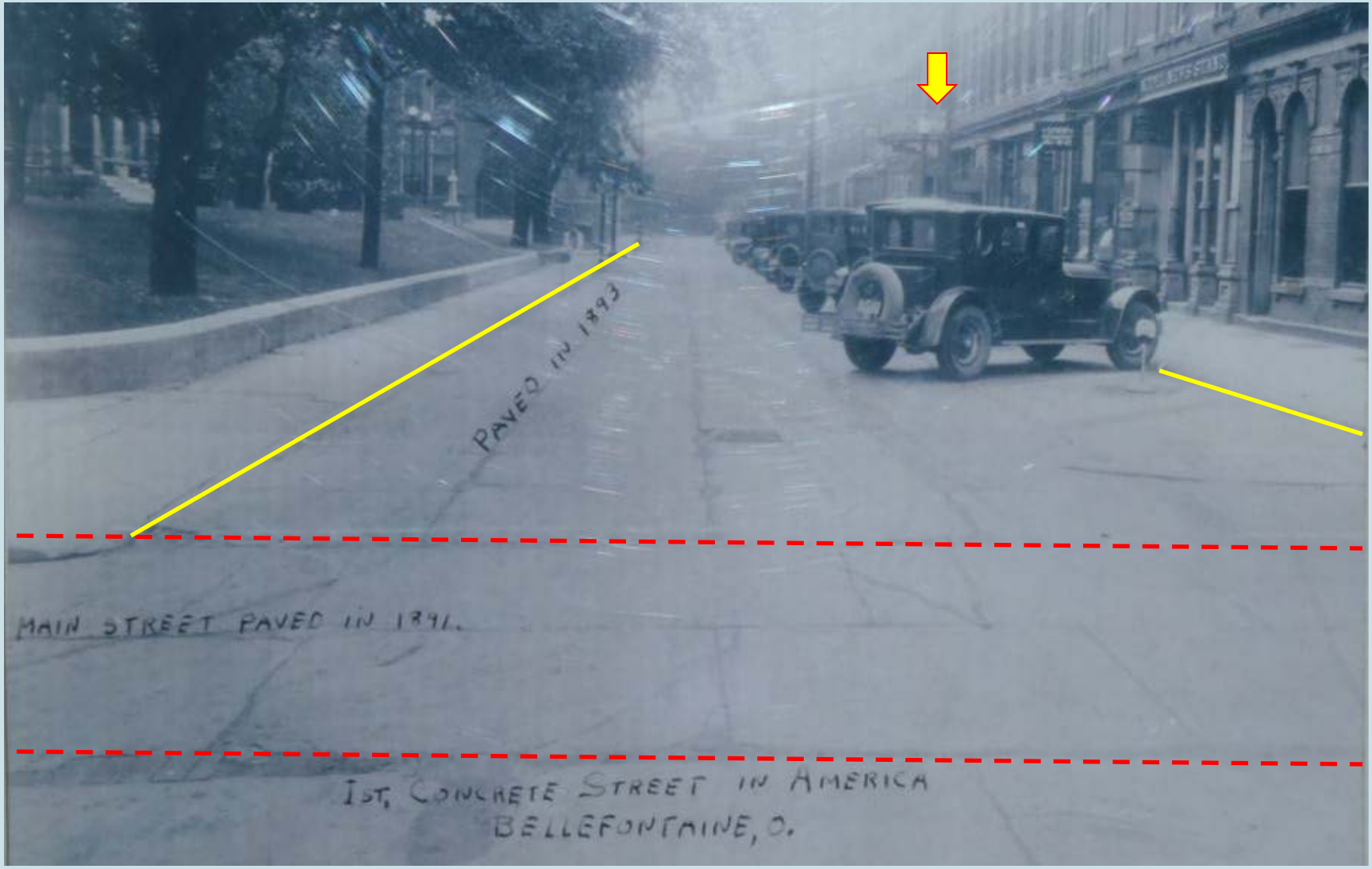
Concrete Pavement Preservation

Southeast Concrete Preservation Workshop
3-18-15

Larry Scofield
IGGA

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

Why Preserve Concrete Pavement! Bellefontaine, Ohio



Bellefontaine, Ohio 2012

120 Years Old

Preservation Can Work (123 Years)

Purpose of Concrete Pavement Preservation

- Used early when pavement has little deterioration.
  - Repairs isolated areas of distress.
  - Repairs some construction defects.
  - **Manages the rate of deterioration**

FHWA Performance Measures

Measure	Surface	Assessment					
IRI (in/mi)	**All Pavements**	Population Consideration					
		Population < 1 Million			Population ≥ 1 Million		
		Good	Fair	Poor	Good	Fair	Poor
		<95	95 - 170	>170	<95	95 - 220	>220
		No Population Considerations					
Cracking Percent	**Asphalt Jointed PCCP**	Good	Fair	Poor			
		<5	5 - 10	> 10			
Rutting (in)	**Asphalt**	No Population Considerations					
		Good	Fair	Poor			
		< 0.2	0.2-0.4	> 0.4			
Faulting (in)	**Jointed PCCP**	No Population Considerations					
		Good	Fair	Poor			
		< 0.05	0.05-0.15	> 0.15			
Cracking Percent	**CRCP**	No Population Considerations					
		Good	Fair	Poor			
		< 5	5 - 10	> 10			

Concrete Pavement Preservation

- First Level of Response for Deteriorating Concrete Pavements Should Always be Preservation
  - Best Value
  - Least Service Disruption
  - Increases Safety
  - Least Use of Non Renewable Resources
  - Ensures Customer Satisfaction

Favorable Characteristics for Preservation

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

Preservation Strategy Selection

Determining correct strategy is NOT complicated.

- Determine the cause of distress.
  - Structural, Functional , Material, Drainage
- Consider multiple perspectives
  - Ride Quality, Traffic, Noise, Maintenance Requirements, Lane-Condition Uniformity, Future Performance, Cost

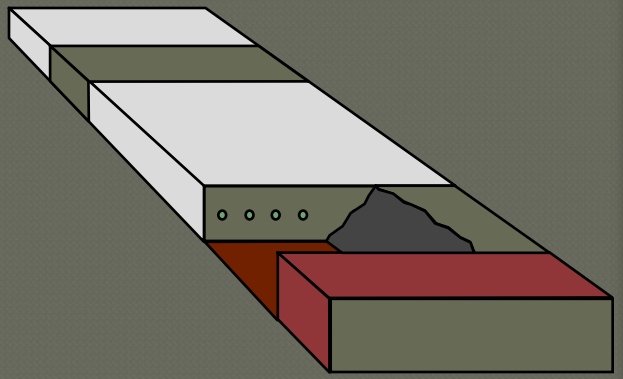
Concrete Pavement Preservation

- **CommonTreatments**
  - Full-depth repairs
  - Dowel bar retrofit
  - Diamond grinding
  - Partial-depth repair
  - Joint sealing
- **Growing Treatments**
  - Cross stitching
  - Thin Concrete Overlays
- **Less Common Treatments**
  - Slab stabilization
  - Retrofitted edge drains

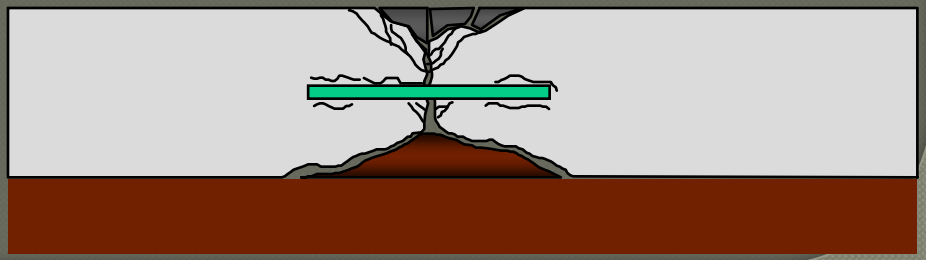
Full Depth Repairs

Full Depth Repairs

May also need to Stabilize Sub Base



If distress greater than 1/3 D



Slab Replacement

Precast Concrete Repairs

- Advantages
  - Better quality concrete
  - Controlled curing
  - Minimal weather impacts
  - Rapid opening
- Experience in CA, CO, MI, DE, MN, MO, TX, NJ, NY, IL, UT, VA
- Good performance to date

Partial Depth Repairs

National Concrete Pavement Technology Center

GUIDE FOR

PARTIAL-DEPTH REPAIR OF CONCRETE PAVEMENTS

April 2012

IOWA STATE UNIVERSITY
Institute for Transportation

Tech Center

Changes with New Guide

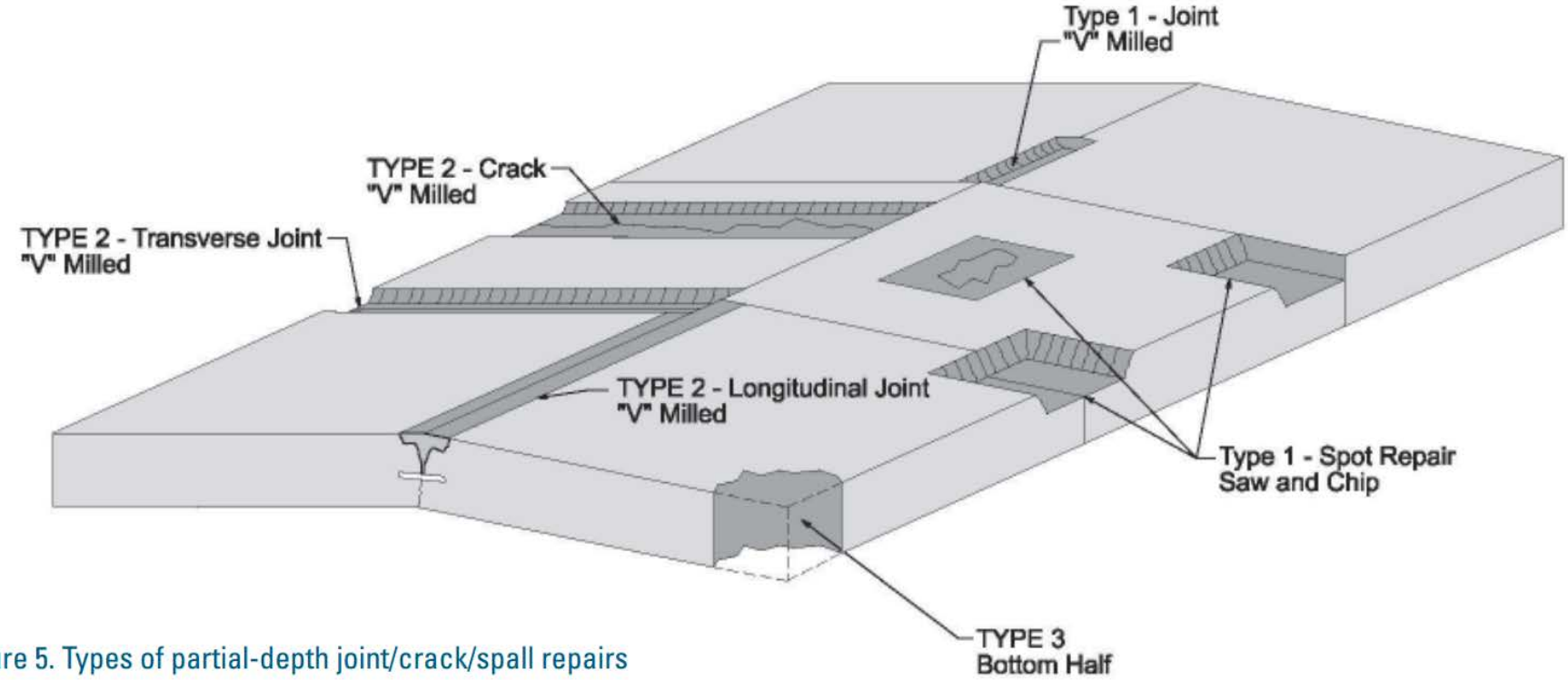
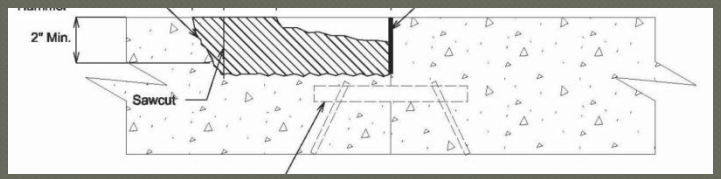
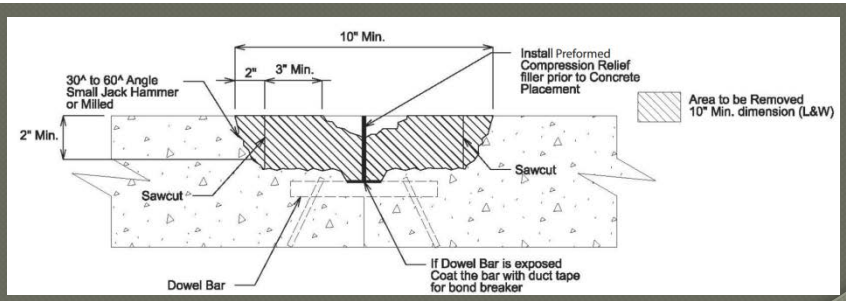


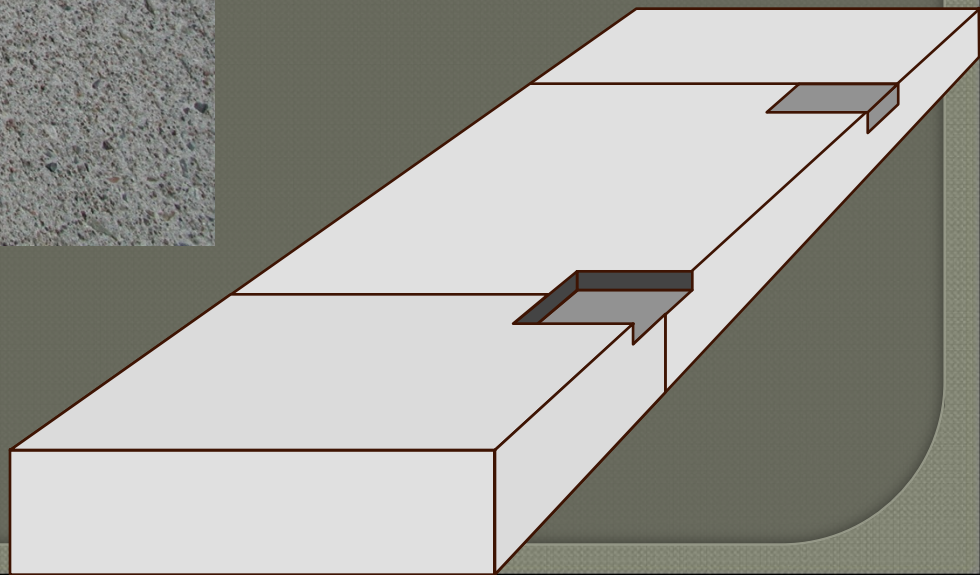
Figure 5. Types of partial-depth joint/crack/spall repairs





Partial Depth Repairs

If distress less than ~~1/3~~ D ½ D



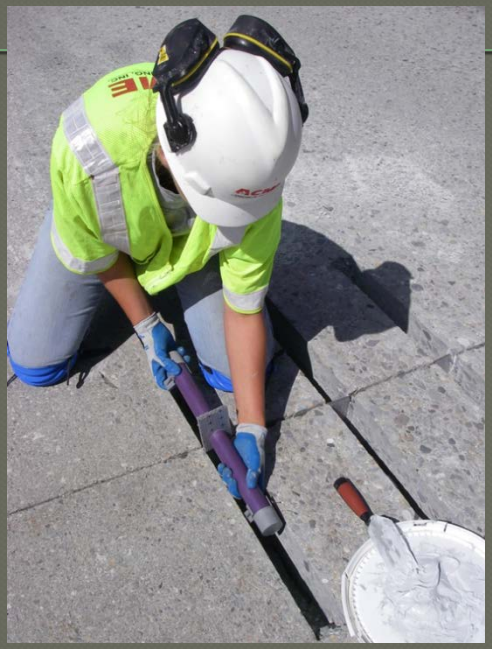
Partial Depth Repairs

- Removal and replacement of small, shallow areas of deteriorated concrete
- Expanded use as repair technique
- Greater use of milling for preparation
  - Productivity
  - Bonding
- New patching materials

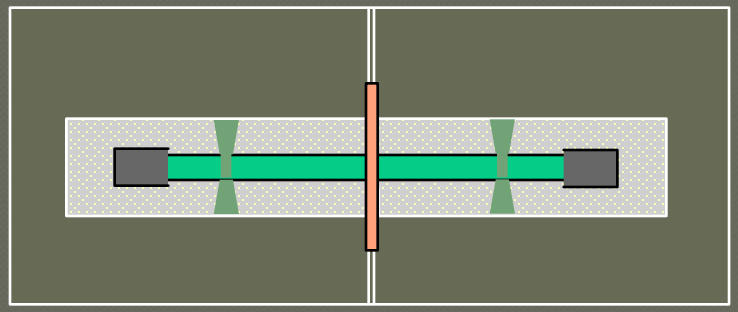
Dowel Bar Retrofit

Dowel Bar Retrofit

- Installation of dowel bars in existing joints to improve load transfer
- Increased use on cracks
- Focus on patching materials
  - Durability
  - Shrinkage

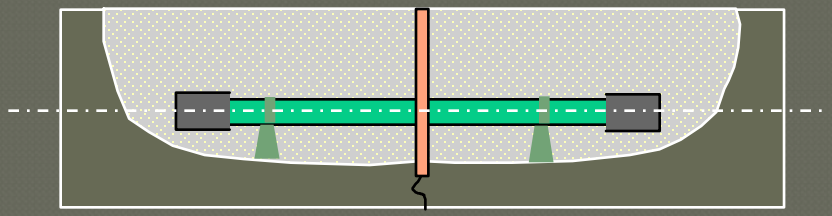


Dowel Bar Retrofit



Also need to:

Reseal Joints

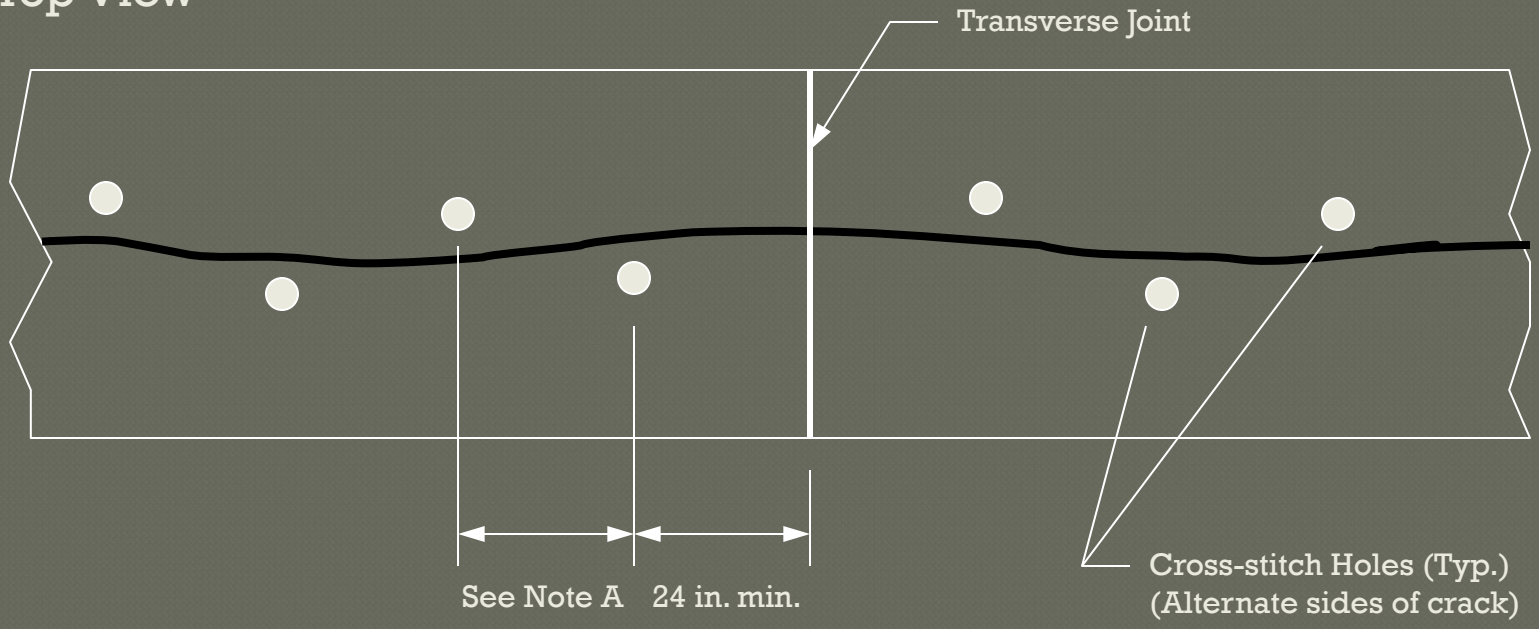


Cross Stitching

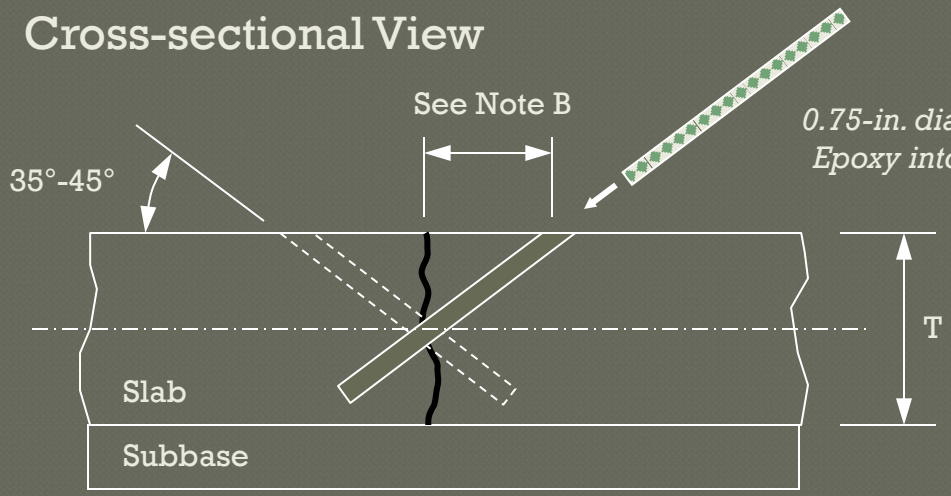
Cross Stitching

- Accepted treatment for
  - Early longitudinal cracks in new construction
  - Longitudinal cracks in older pavements
  - Misaligned tie bars
- Advantages:
  - Quick and easy to install
  - Less intrusive
- Good performance

Top View



Cross-sectional View

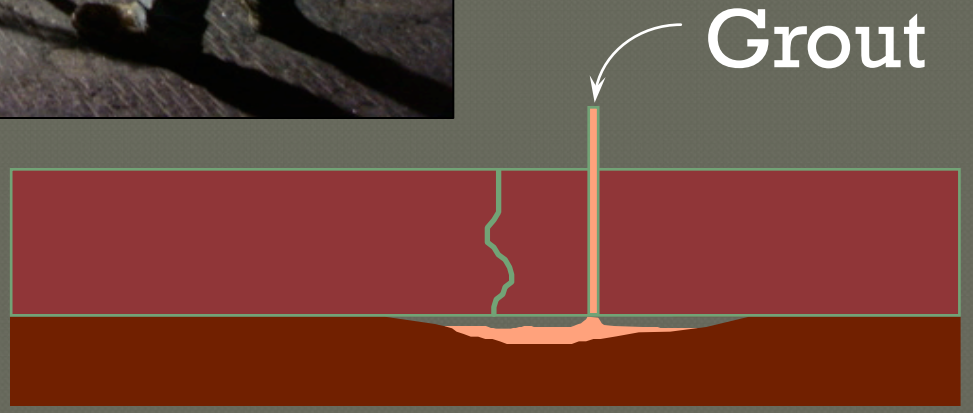


Note A: *Distance between holes is 24 in. for heavy traffic; 36 in. for light traffic*

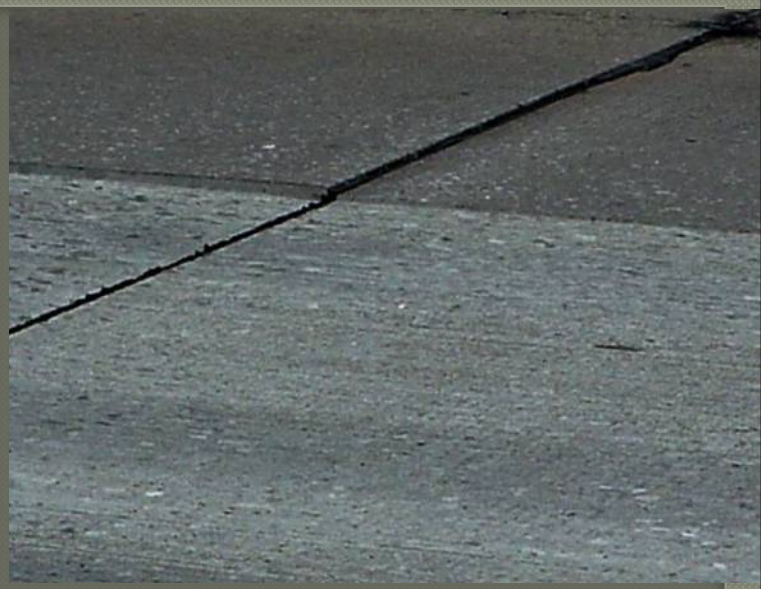
Note B: *Determine distance from longitudinal crack to hole based on slab thickness T and drill angle. Slabs less than 12 inches thick require a 35° insertion angle.*

Slab Stabilization / Jacking

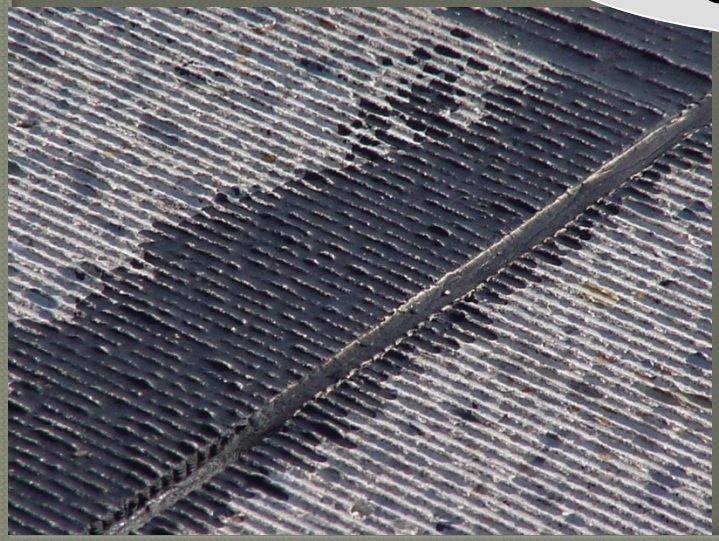
Slab Stabilization



Fill Void or Level Slab

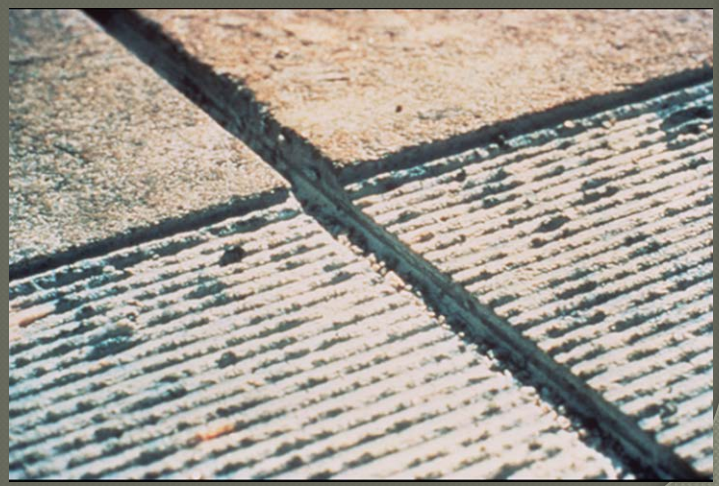


Grinding & Texturing Concrete



Grinding and Texturing

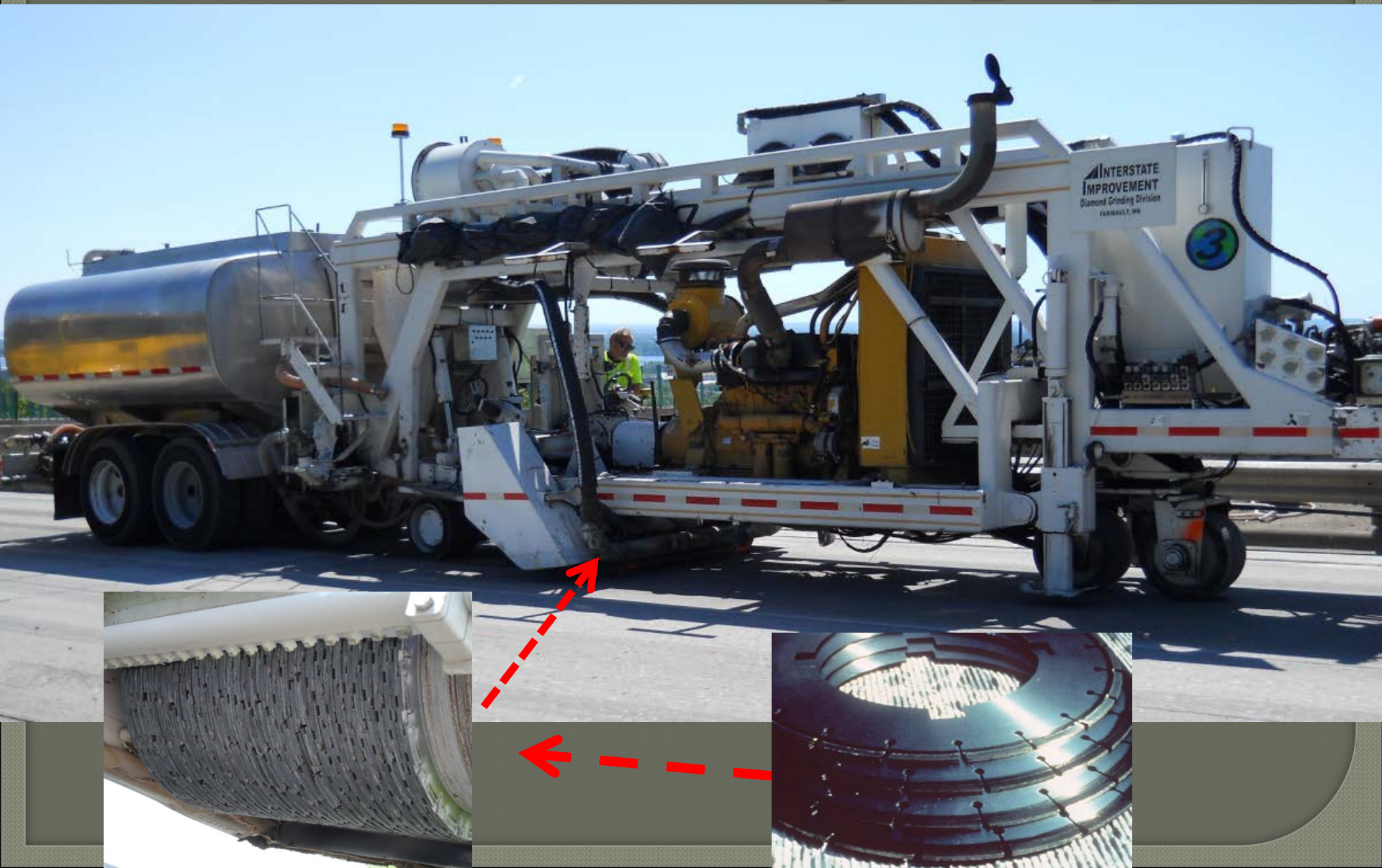
- Removal of thin layer of concrete to restore smoothness
- Important to concrete pavement preservation
- Diamond grinding types
  - Conventional
  - City street
  - NGCS



Diamond Grinding

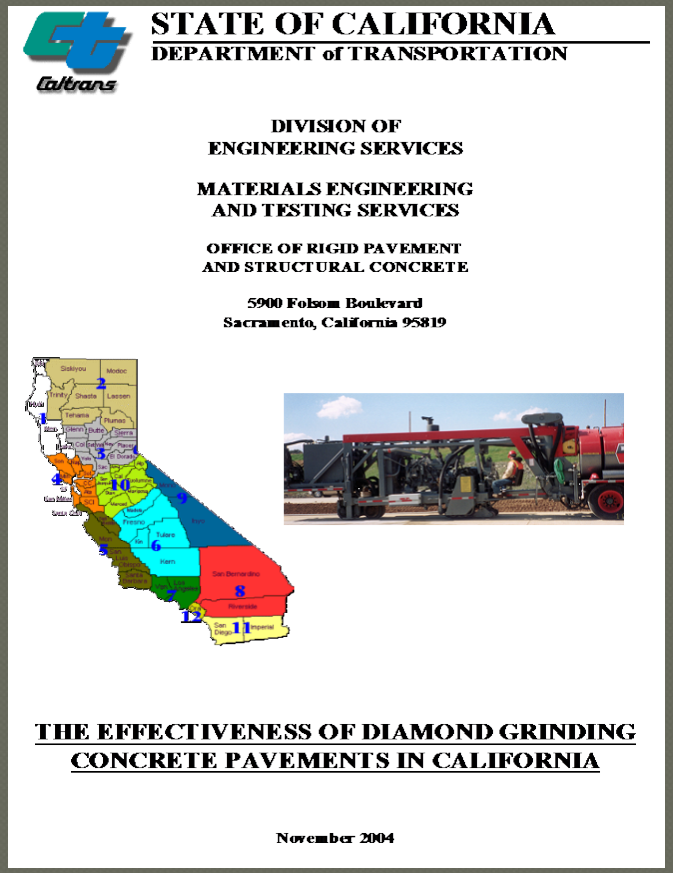
- Removes Faulting
- Improves Ride
- Improves Friction
- Reduces Noise

Diamond Grinding Equipment



Effectiveness of Diamond Grinding - CALTRANS

- CALTRANS has determined that the average life of a diamond ground pavement surface is 17 years and that a pavement can be ground at least three times without affecting pavement structurally. See ACPA-SW for full report



STATE OF CALIFORNIA
DEPARTMENT of TRANSPORTATION

DIVISION OF
ENGINEERING SERVICES

MATERIALS ENGINEERING
AND TESTING SERVICES

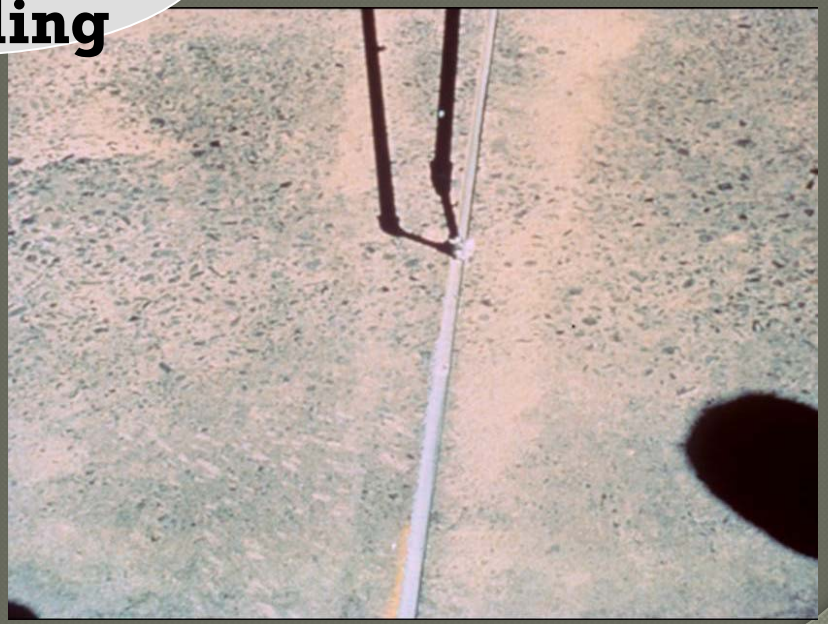
OFFICE OF RIGID PAVEMENT
AND STRUCTURAL CONCRETE

5900 Folsom Boulevard
Sacramento, California 95819

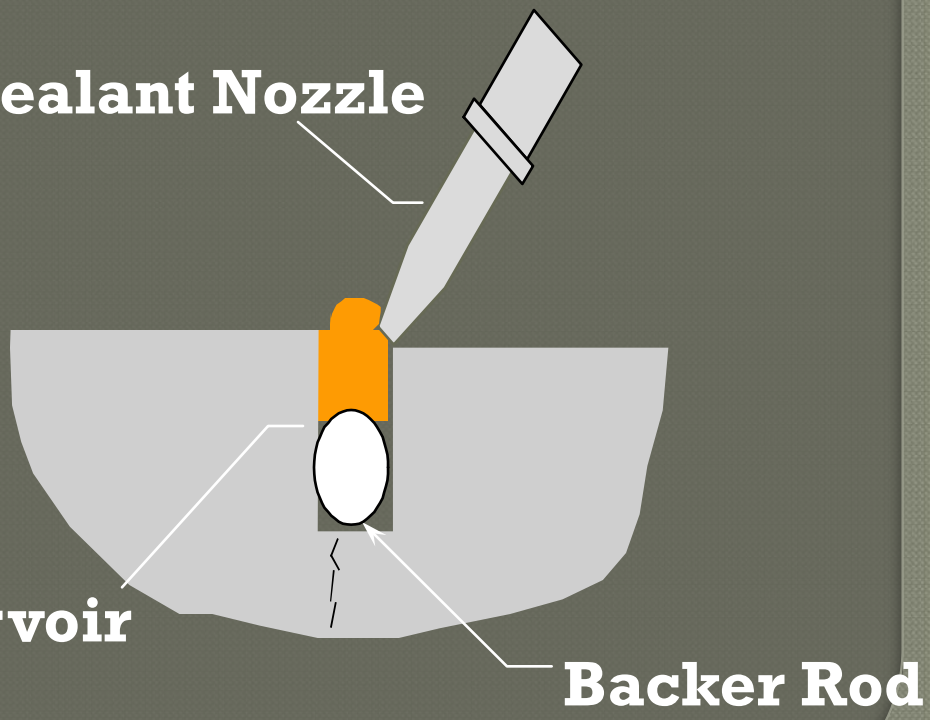
THE EFFECTIVENESS OF DIAMOND GRINDING
CONCRETE PAVEMENTS IN CALIFORNIA

November 2004

Joint and Crack Resealing



Sealing and Resealing



Is Sealant Cost Effective?

FHWA Sealant Effectiveness Study

CONCRETE PAVEMENT
CPTP
TECHNOLOGY PROGRAM

TechBrief

The Concrete Pavement Technology Program (CPTP) is an integrated, national effort to improve the long-term performance and cost-effectiveness of concrete pavements. Managed by the Federal Highway Administration through partnerships with State highway agencies, industry, and academia, CPTP's primary goals are to reduce congestion, improve safety, lower costs, improve performance, and foster innovation. The program was designed to produce user-friendly software, procedures, methods, guidelines, and other tools for use in materials selection, mixture proportioning, and the design, construction, and rehabilitation of concrete pavements.

www.tfhrc.gov/pavement/concrete

U.S. Department of Transportation
Federal Highway Administration

Performance of Sealed and Unsealed Concrete Pavement Joints

This TechBrief presents the results of a nationwide study of the effects of transverse joint sealing on performance of jointed plain concrete pavement (JPCP). This study was conducted to assess whether JPCP designs with unsealed transverse joints performed differently from JPCP designs with sealed transverse joints. Distress and deflection data were collected from 117 test sections at 26 experimental joint sealing projects located in 11 states. Performance of the pavement test sections with unsealed joints was compared with the performance of pavement test sections with one or more types of sealed joints.

BACKGROUND

The sealing of transverse joints in JPCP has been standard practice throughout much of the United States for many years. Its widespread use is due to the common belief that sealing joints improves concrete pavement performance in two ways: by reducing water infiltration into the pavement structure, thereby reducing the occurrence of moisture-related distresses such as pumping and faulting, and by preventing the infiltration of incompressibles (i.e., sand and small rocks) into the joints, thereby reducing the likelihood of pressure-related joint distresses such as joint spalling and blowups.

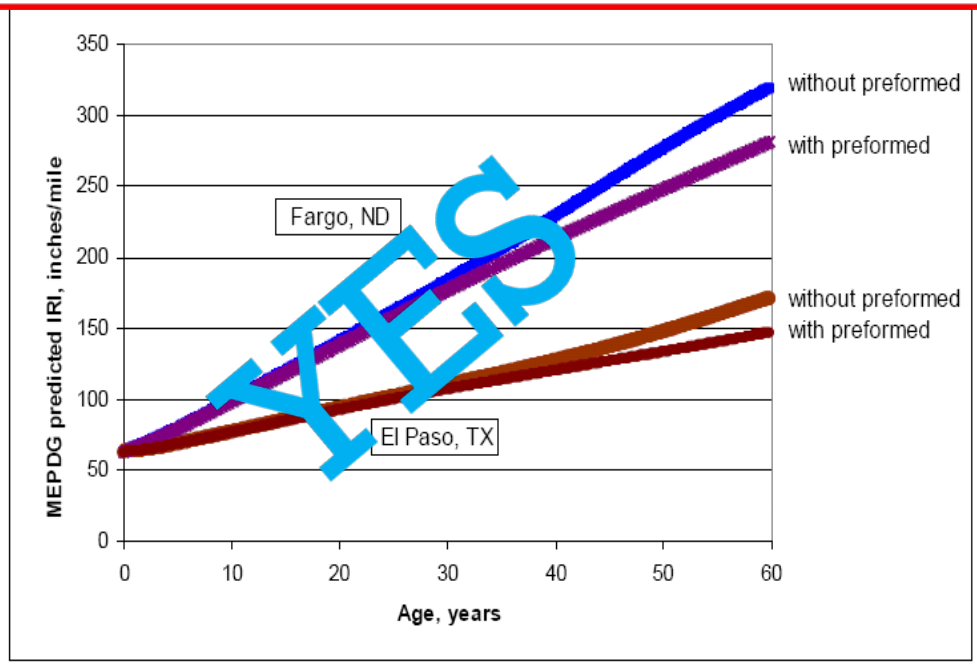
Transverse joints in jointed concrete pavement (JCP) are typically created by sawing an initial cut to force controlled cracking, followed by a second, wider saw cut to produce a reservoir for the joint sealant material. This traditional approach of sawing and sealing transverse contraction joints is estimated to account for between 2 and 7 percent of the initial construction cost of a new JCP. Moreover, these sealed transverse joints require resealing one or more times over the service life of the pavement, leading to additional costs in terms of labor, materials, operations, and lane closures.

Recently, several State departments of transportation (DOTs) have been questioning conventional transverse joint sawing and sealing practices. These agencies contend that the benefits derived from sealing do not offset the costs associated with the placement and continued upkeep of the sealant over the life of the pavement. As a result, they have been experimenting with different sawing and sealing alternatives, for example:

- Narrow unsealed joints, consisting of single saw cuts that are left unsealed.
- Narrow filled joints, consisting of single saw cuts that are filled with sealant that adheres to the sides and bottom of the saw cut.
- Narrow sealed joints, consisting of single saw cuts that contain a narrow backer rod and sealant material.

NO

AASHTO New Design Guide



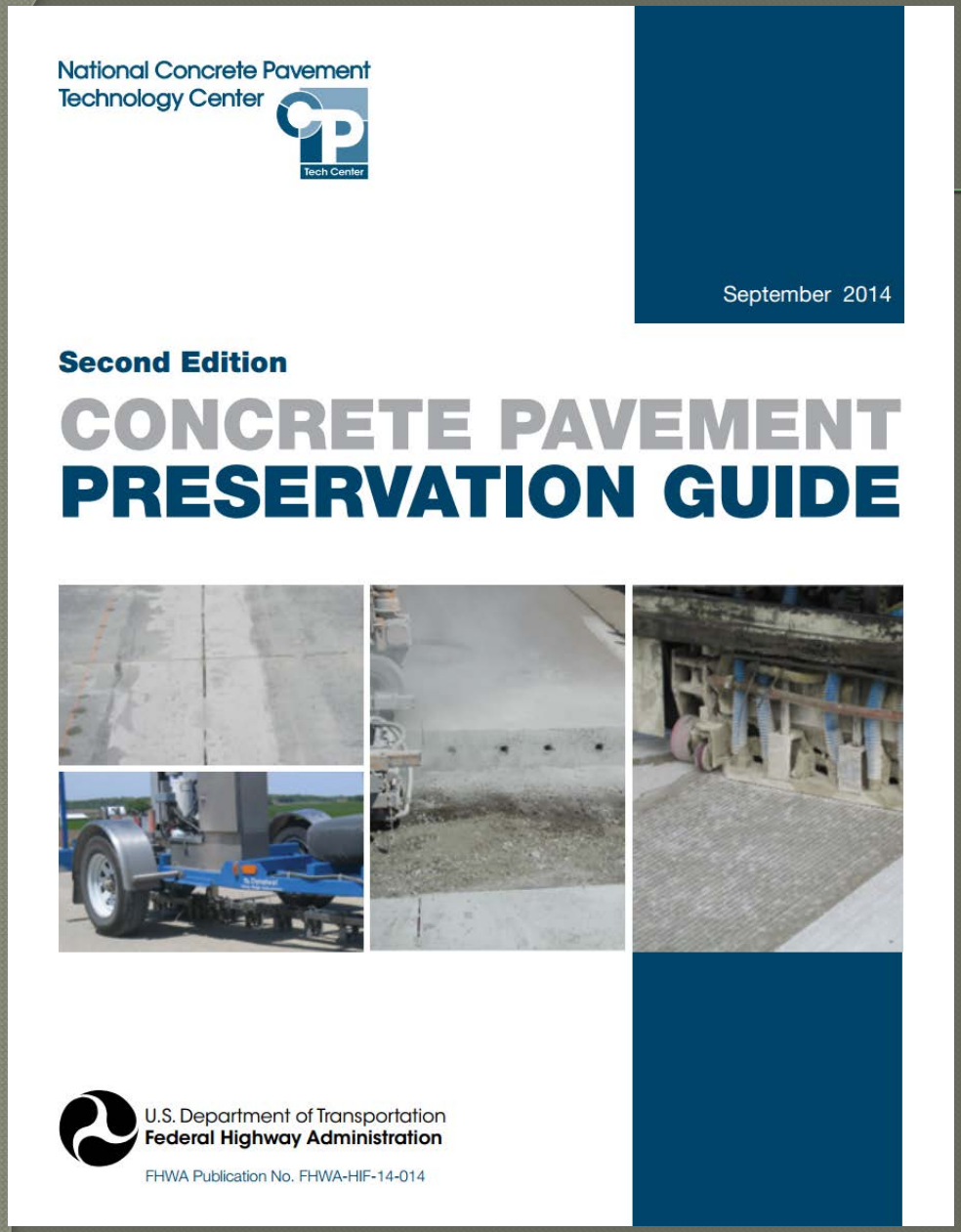
SHRP 2 Report: 5-6 years

20 Year Old Silicone Sealed Joint

Utility Cut Repairs

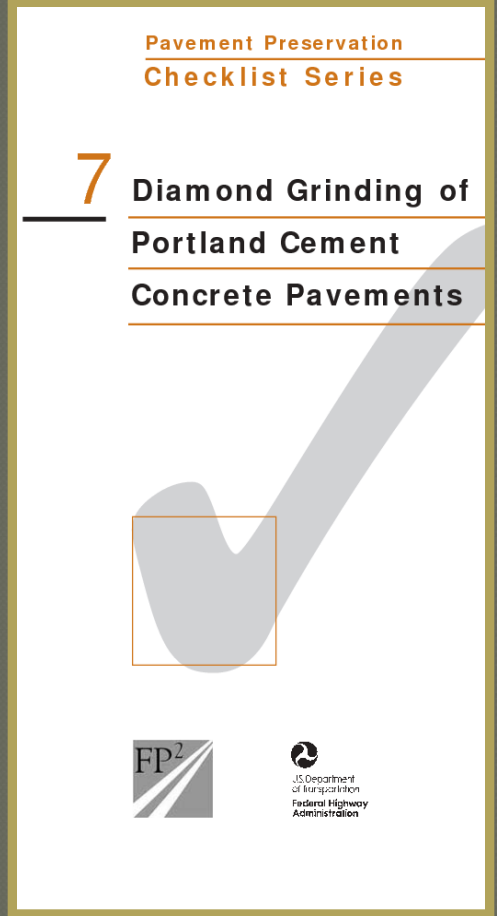
- Opening street to gain access to utilities
- On-going issue of returning pavement to good condition
- Guidance on:
  - Sizing cuts
  - Creating/removing
  - Jointing
  - Backfilling
  - Embedded steel
  - Opening to traffic

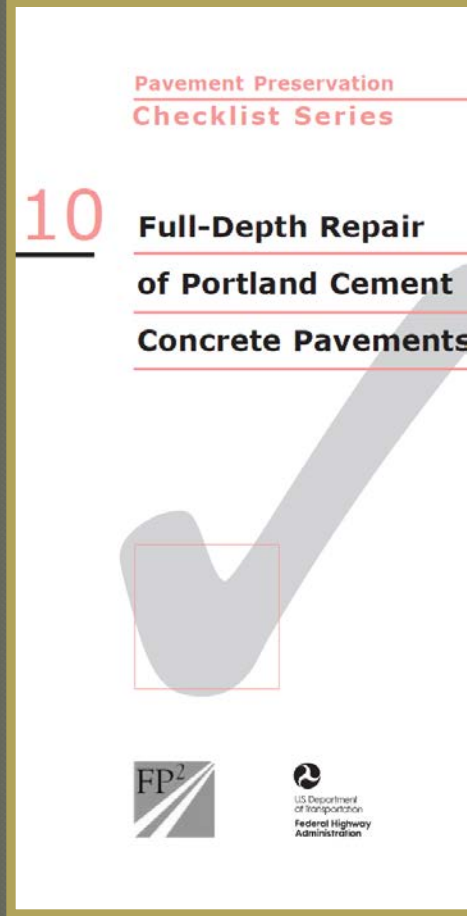
Concrete Pavement Preservation Manual



- Contains 12 Chapters on Preservation Techniques
- Added Overlay Chapter
- Working on 11 Training Modules and Instructor Guide
- Plan on 20 future workshops in next two years.
- Technical Assistance to State DOTs

Preservation Checklists



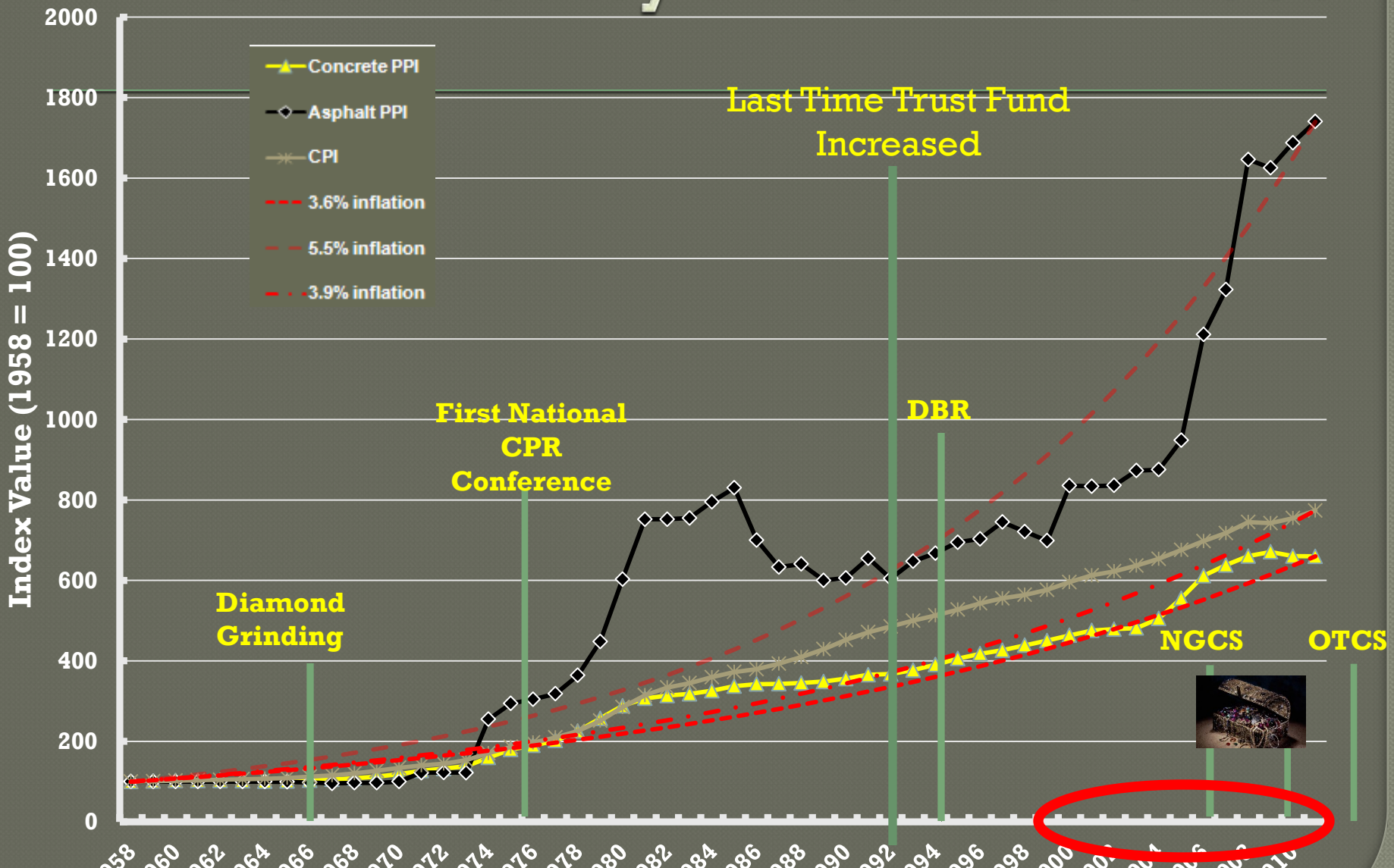


Finding Buried Treasure?

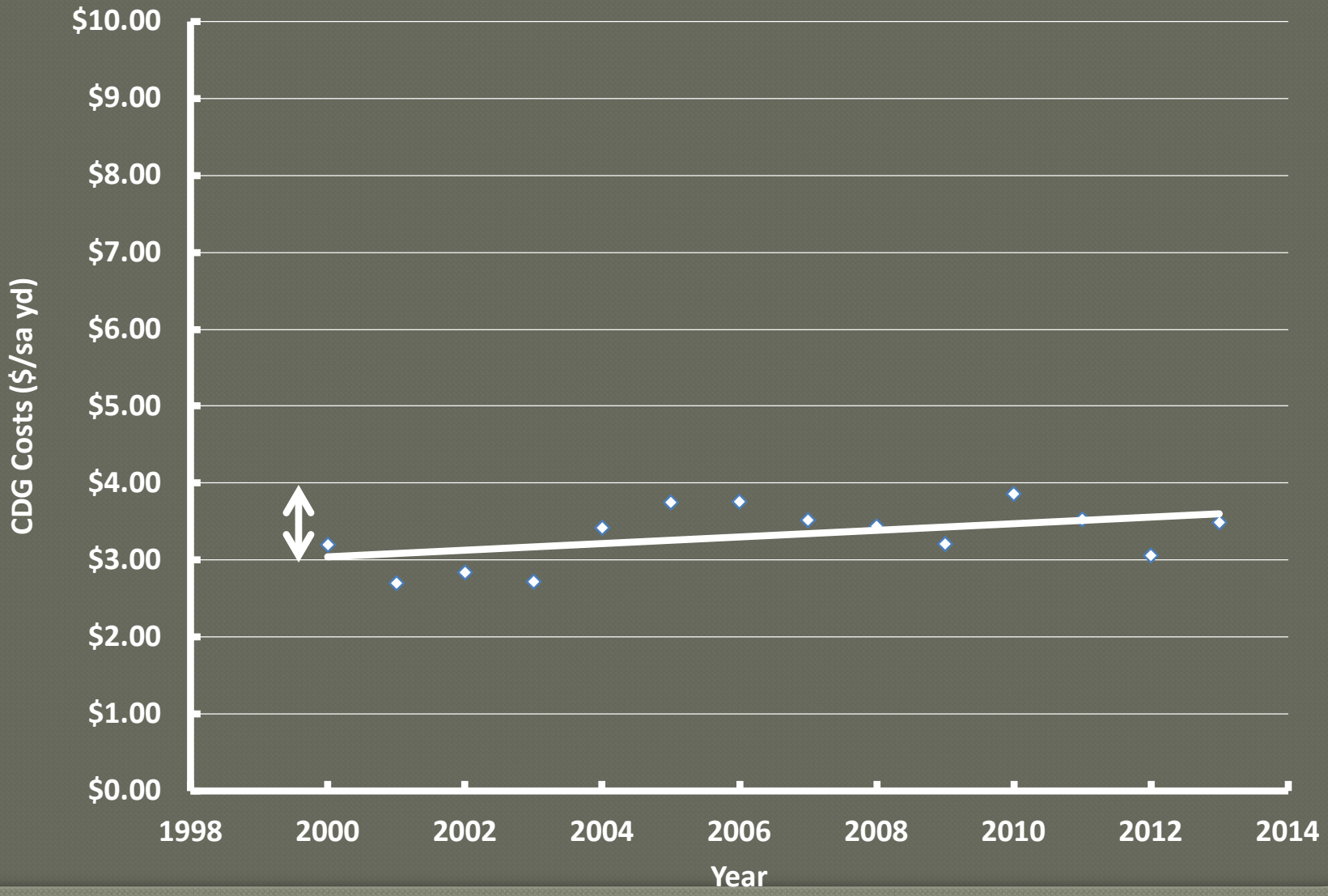
--What is Buried Treasure--

- A Pavement Preservation Technique that Uncovers and Renews Aged PCCP that has Been Overlaid with Asphalt due to Functional Requirements and Not Structural Issues
  - Functional Issues Consist of Noise, Friction, and Smoothness

Commodity Price Increases



National Average CDG Costs Over time



Thank You

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Visit Us on the Web

www.igga.net

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