

CONCRETE PAVEMENT PRESERVATION

Sustainable Solutions: Today & Tomorrow

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President of the Iowa Concrete Paving Association

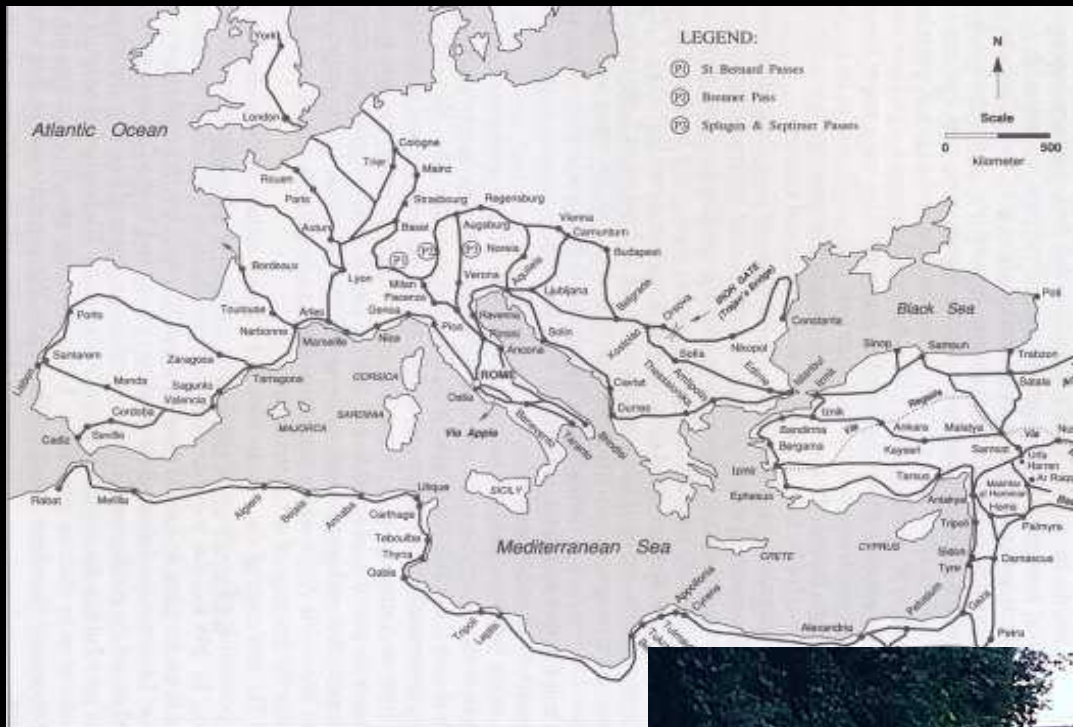
On behalf of the

ACPA CHAPTERS AND STATE PAVING ASSOCIATIONS

INTERNATIONAL GRINDING AND GROOVING ASSOCIATION



Appian Way – Roman Road





Eddyville Cemetery

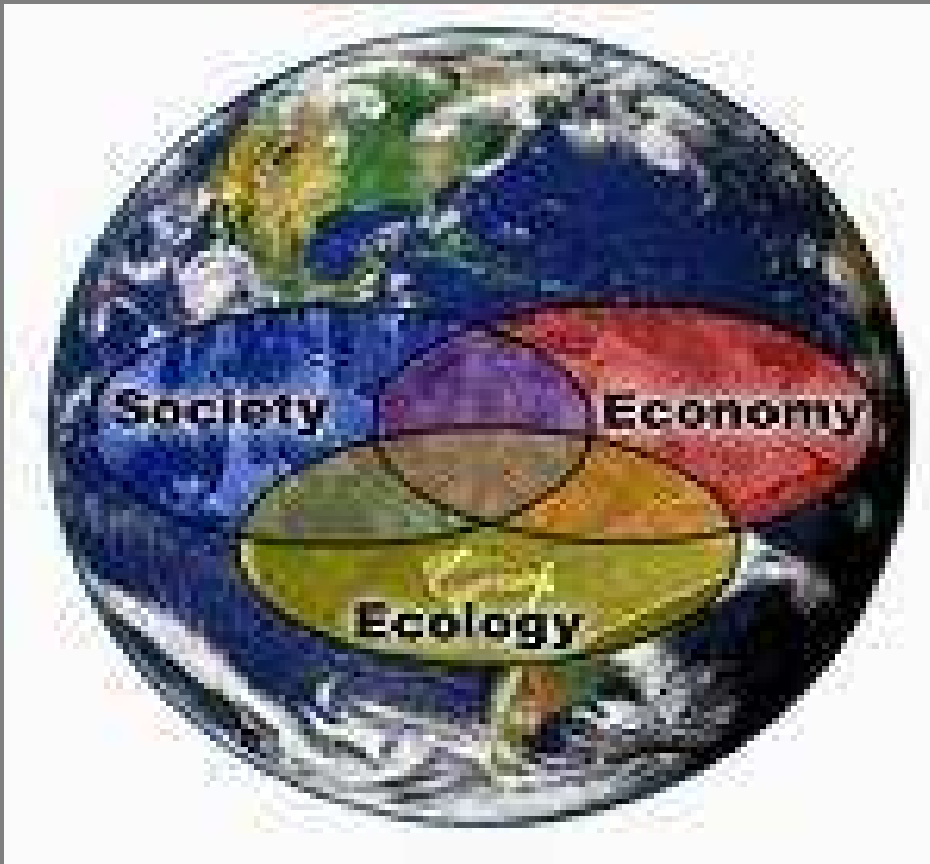


09/17/2009

THE CHALLENGE IN HAND



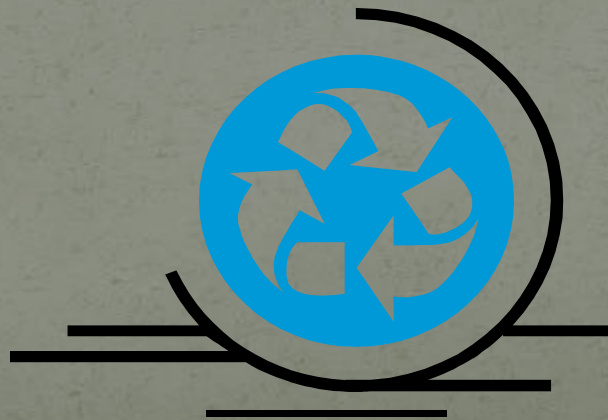
PRIORITIES HAVE SHIFTED



- *Minimal system expansion*
- *Maintain the present system*
- *Minimize traffic disruptions*
- *Increase safety*
- *Address operator comfort*
 - *Reduce Roughness*
 - *Reduce Noise*
- *Save money*
- *Protect the Environment*

SUSTAINABILITY = PRESERVATION

- *In the context of pavement systems, sustainable pavements are those that, from design through rehabilitation, use environmentally friendly materials and practices and enhance the public's economic well-being and general quality of life.*



THE NEED

- *Cost effective, environmentally friendly, engineered strategies to preserve and rehabilitate the aging roadway system.*



QUESTION



WHAT IF YOU COULD.....

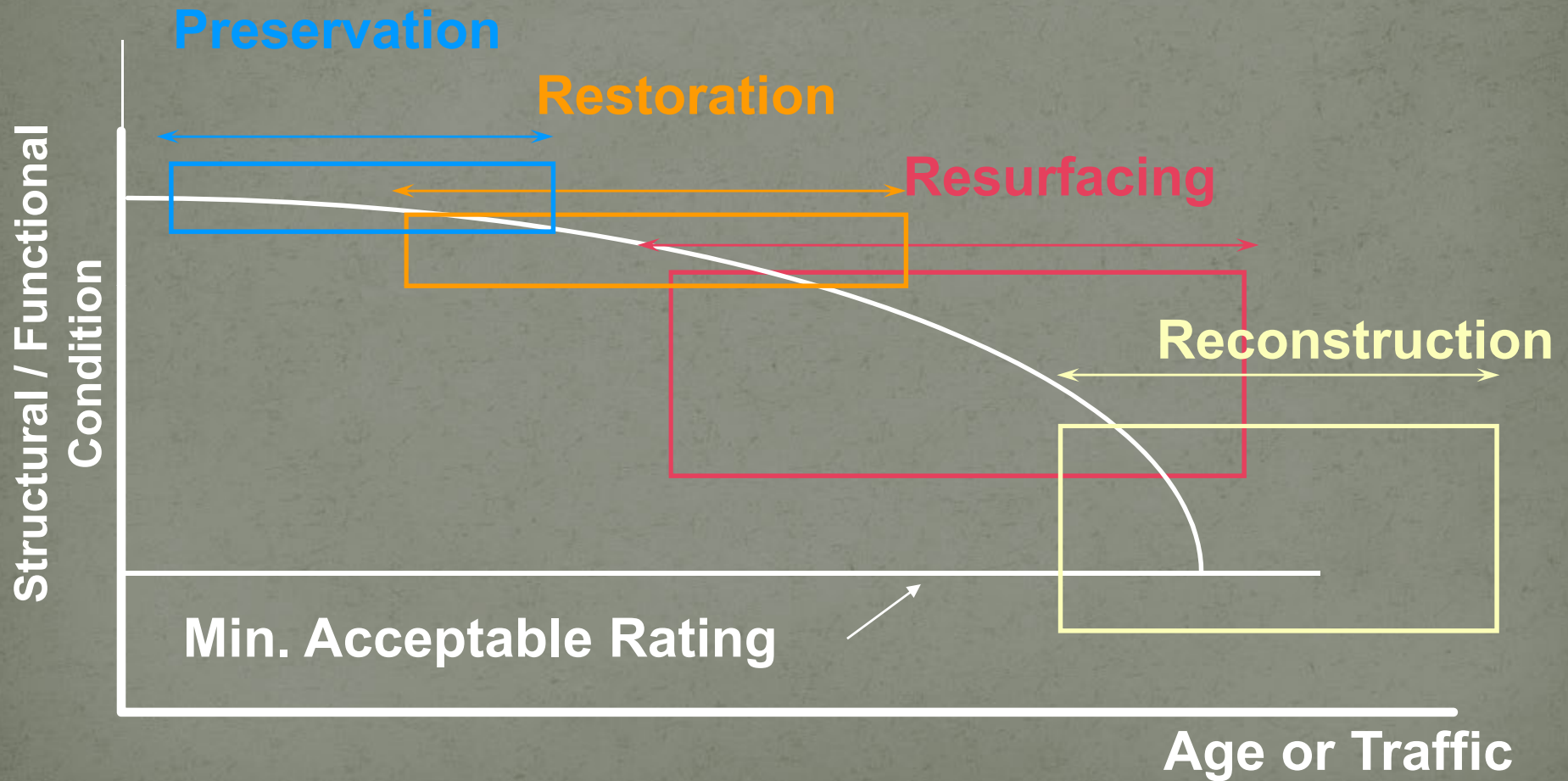
- *Restore or enhance pavement surface characteristics like smoothness, quiet ride, skid resistance, and reflectivity?*
- *Reduce wear and tear on vehicles from poor pavement surfaces?*
- *Rehabilitate pavements for a fraction of the cost of reconstruction?*
- *Preserve the remaining equity in existing pavements for another 30 to 40 years?*
- *Reduce “first use” of natural or manufactured materials?*
- *Reduce frequency and duration of work zones, ultimately reducing vehicle emissions due to work-zone related traffic delays?*

TOMORROW'S TECHNOLOGIES ARE HERE TODAY!

Transportation agencies already have access to a variety of sustainable, concrete-based pavement maintenance and repair solutions. What is needed is not necessarily new technologies or solutions, but a new, proactive mindset toward using them.



REHABILITATION TIMING



GOT CONCRETE?

We've got solutions for pavement preservation!



CONCRETE PAVEMENT RESTORATION - CPR

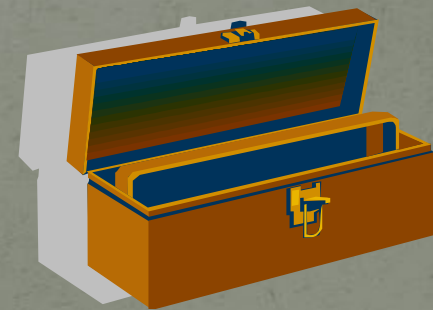


CALIFORNIA I-10



PCC PAVEMENT PRESERVATION TECHNIQUES

- *Slab stabilization/jacking*
- ✓ *Partial-depth repair*
- *Cross-stitching longitudinal cracks/joints*
- ✓ *Retrofitting dowels*
- *Full-depth repair*
- ✓ *Diamond grinding*
- *Joint & crack resealing*
- ✓ *PCC Overlays*

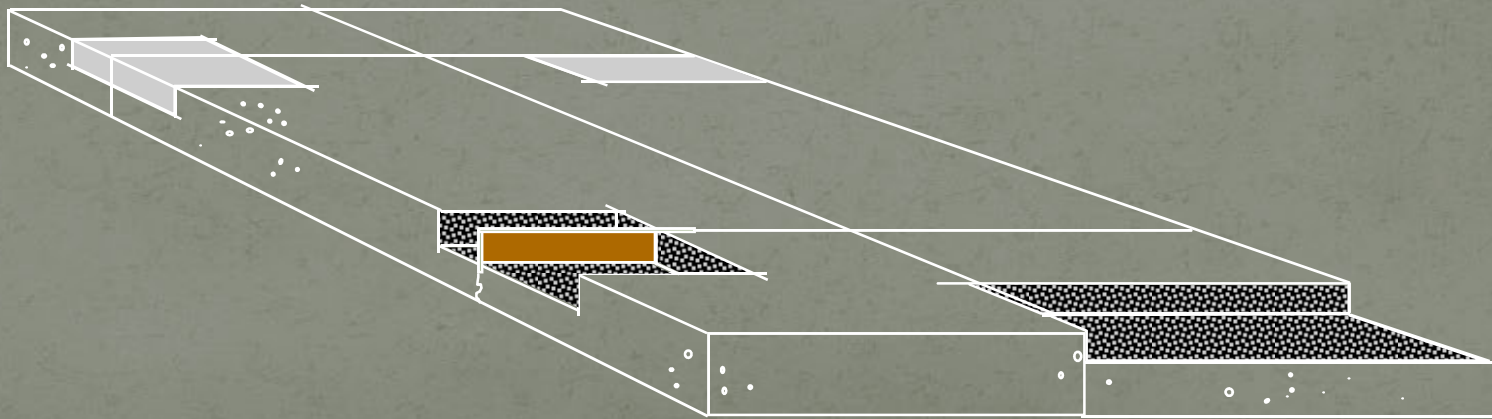


PARTIAL-DEPTH PATCHING



PARTIAL DEPTH REPAIRS

- *Repairs deterioration in the top 1/3 of the slab.*
- *Generally located at joints, but can be placed anywhere surface defects occur.*













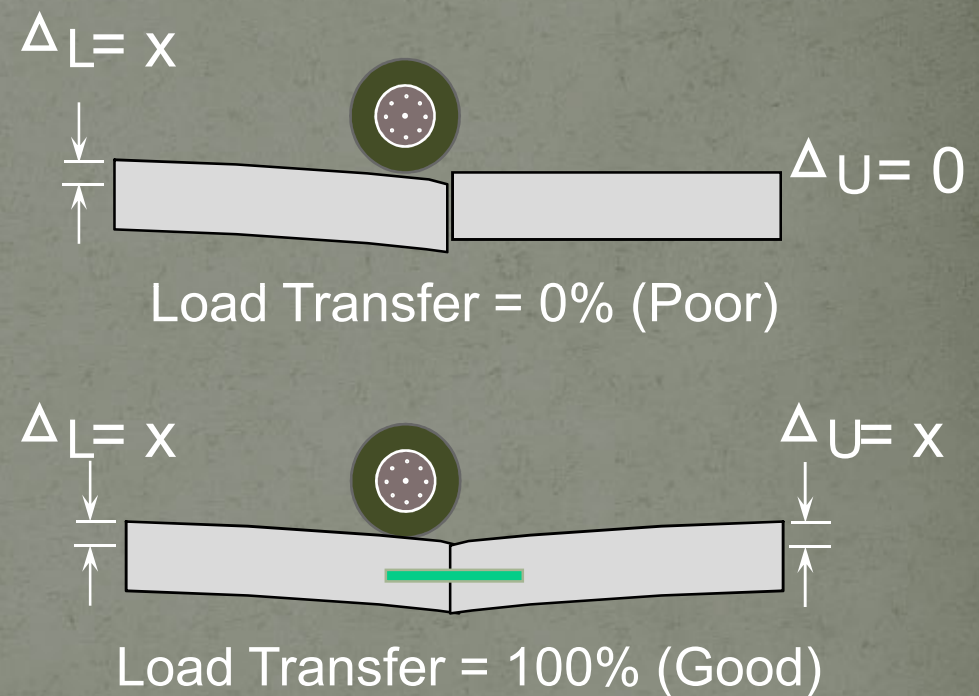
Older Longitudinal and Transverse
Partial Depth Repairs (1991) – MN I-35 SB near Duluth

LOAD TRANSFER RESTORATION – DOWEL BAR RETROFIT



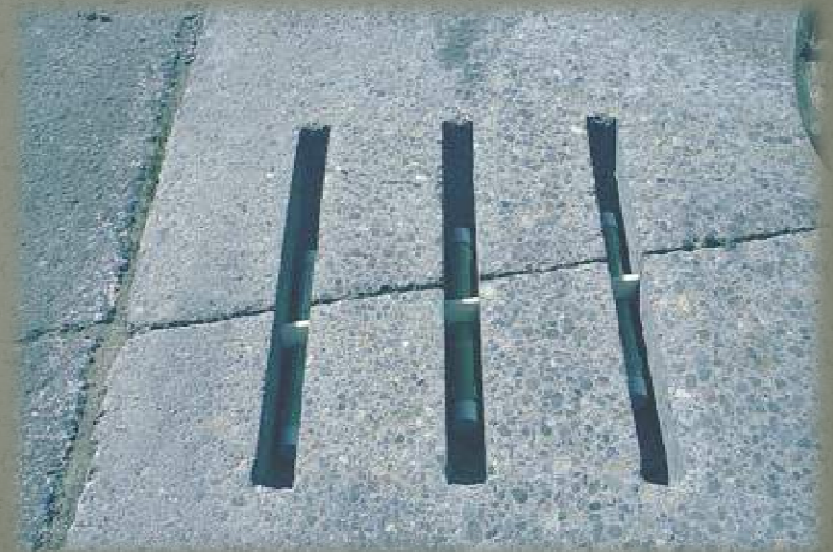
PURPOSE OF LOAD TRANSFER RESTORATION

- *Re-establish load-transfer across joints or cracks*
 - *Load-transfer is a slab's ability to transfer part of its load to its neighboring slab*
- *Used in JRC and JPC pavements to limit future faulting*



LOAD TRANSFER RESTORATION

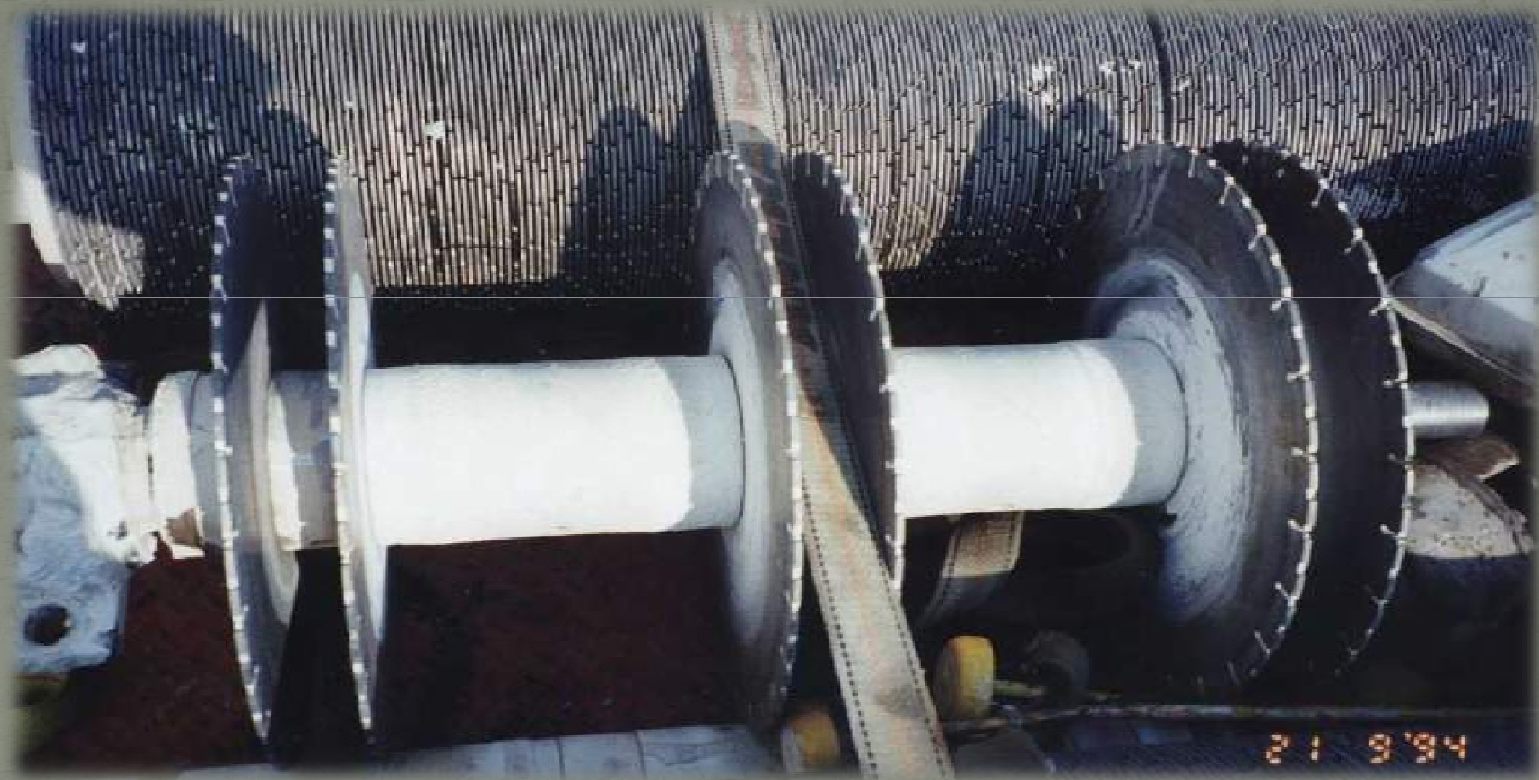
- *Placement of load transfer devices across joints or cracks of existing pavements*
- *Candidate projects*
 - *Poor load transfer (< 70 %)*
 - *Pumping*
 - *Faulting*
 - *Corner breaks*





SLOT CREATION

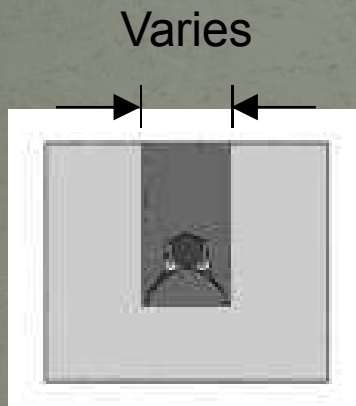
Close-Up of Sawblades



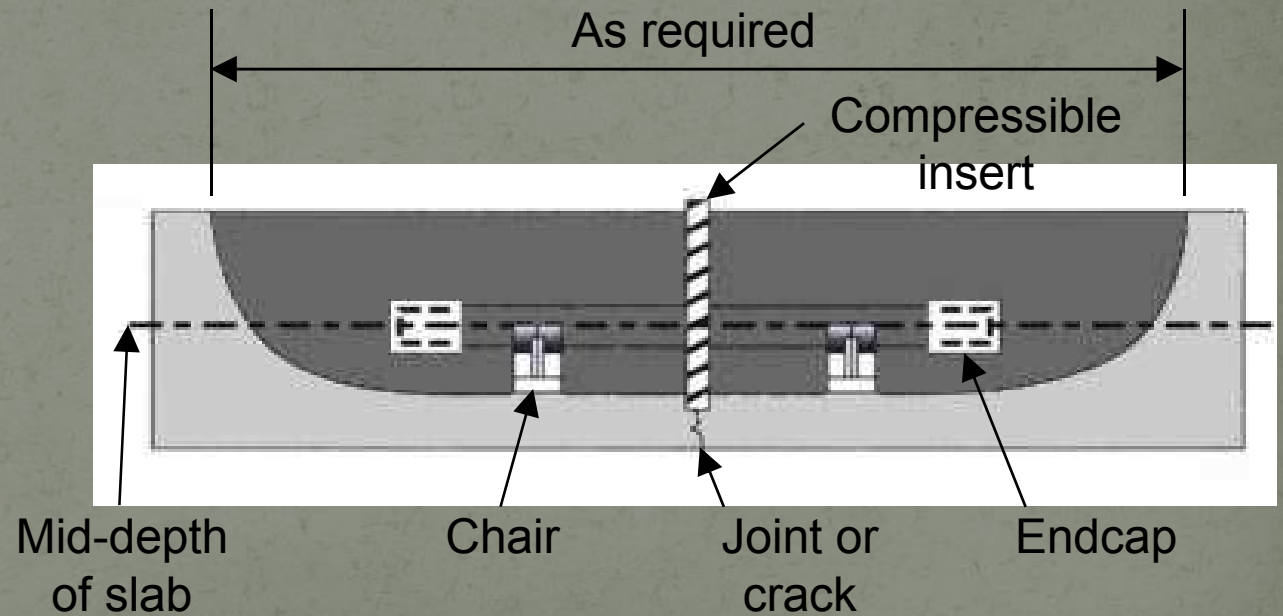


RETROFITTED DOWEL BAR

END VIEW



SIDE VIEW







WASHINGTON STATE DBR EXPERIENCE

- *DBR test section conducted in 1992*
- *Full-scale use of DBR began in 1993*
 - *Heavily faulted Interstate pavements*
 - *280 Ln-mi or 600,000 bars*



IGGA DBR PROJECT DATABASE

- *Individual project data which includes:*
 - *Project Location*
 - *Project Date*
 - *Number of bars installed*
- *Over 5.5 million bars installed since 1990*

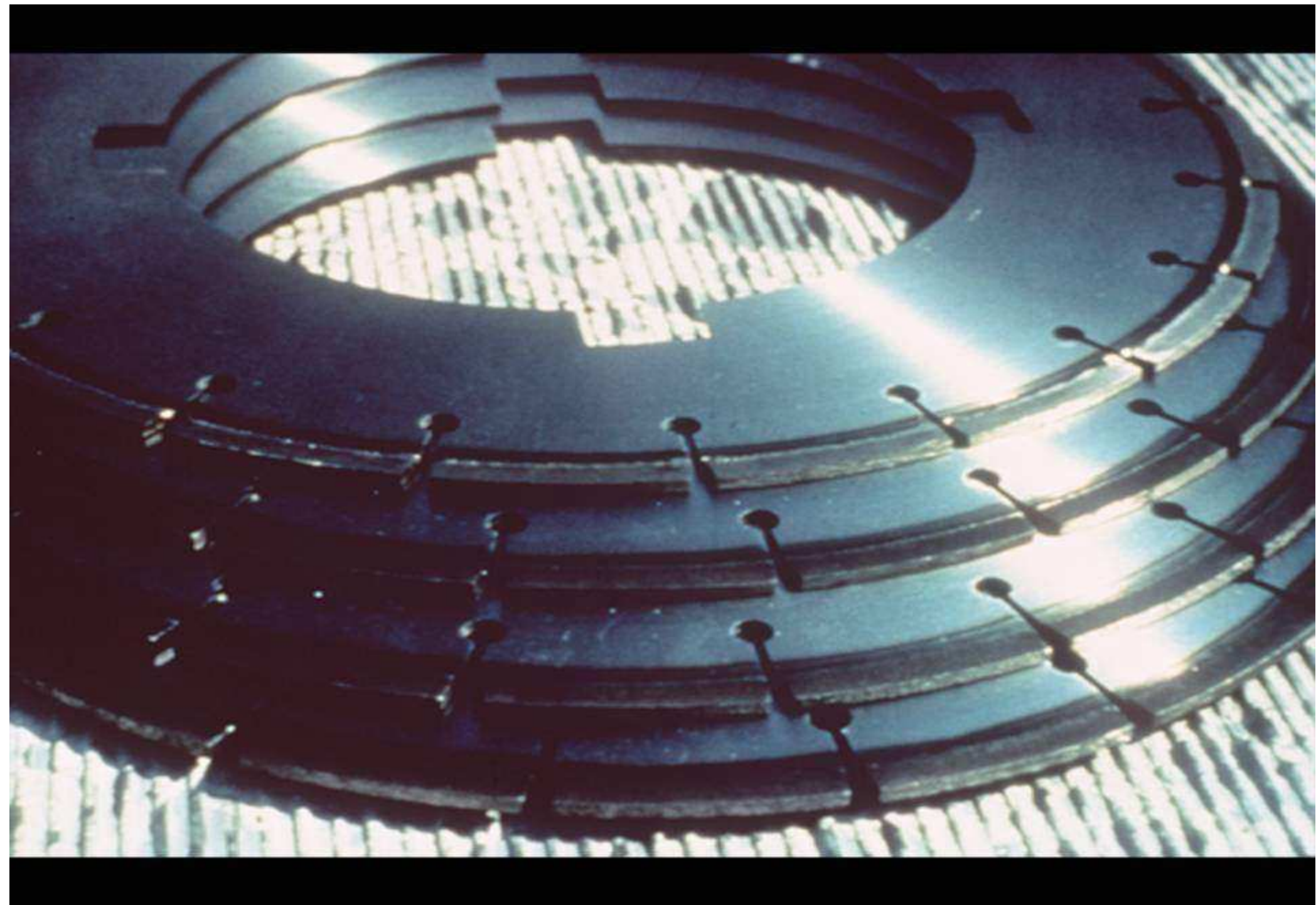
DIAMOND GRINDING



WHAT IS DIAMOND GRINDING?

- *Removal of thin surface layer of hardened PCC using closely spaced diamond saw blades*
- *Results in smooth, level pavement surface*
- *Longitudinal texture with desirable friction and low noise characteristics*
- *Frequently performed in conjunction with other CPR techniques, such as full-depth repair, dowel bar retrofit, and joint resealing*
- *Comprehensive part of any PCC Pavement Preservation program*





DIAMOND GRINDING



DIAMOND GRINDING

Grinding Process





DIAMOND GRINDING TRIVIA:

- *Diamond grinding was first used in California in 1965 on a 19-year old section of I-10 to eliminate significant faulting (Neal and Woodstrom 1976).*
- *In 1983, CPR was conducted on this same pavement section, including the use of additional grinding to restore the rideability and skid resistance of the surface. In 1997, the process was repeated.*
- *Since its first use in 1965, the use of diamond grinding has grown to become a major element of PCC pavement preservation.*

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 www.IGGA.net 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

ADVANTAGES OF DIAMOND GRINDING

- *Cost competitive*
- *Enhances surface friction and safety*
- *Can be accomplished during off-peak hours with short lane closures and without encroaching into adjacent lanes*
- *Grinding of one lane does not require grinding of the adjacent lane*
- *Does not affect overhead clearances underneath bridges*
- *Blends patching and other surface irregularities into a consistent, identical surface*
- *Provides a low noise surface texture!*

Diamond grinding can provide a 60% to 70% improvement over the pre-grind profile on average!



PAVEMENT PROBLEMS ADDRESSED



POLISHED SURFACE



WHEEL PATH RUTTING

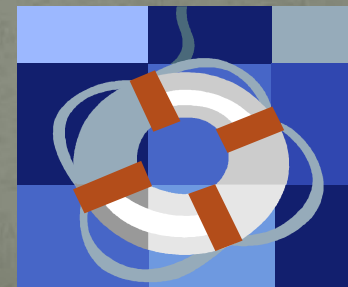


CURLING



SAFETY, SURFACE TEXTURE AND FRICTION

- *Increased macrotexture of diamond ground pavement surface provides for improved drainage of water at tire-pavement interface*
- *Longitudinal texture provides directional stability and reduces hydroplaning (side-force friction)
Grooves provide “escape route” for water trapped between tire and pavement surface*
- *In Wisconsin, overall accident rates for ground surfaces were 40% less than for un-ground surfaces over a 6-year period, 57% in wet weather conditions (Drakopoulos et al. 1998)*



UNACCEPTABLE NOISE LEVEL



NEXT GENERATION CONCRETE SURFACE (NGCS)







COSTS


- *Depends on —*
 - *Aggregate and PCC mix properties*
 - *Average depth of removal*
 - *Smoothness specifications*
 - *Size of the project*
 - *Work schedule*

Cost effective whether used alone or as part of a comprehensive CPR program. In most cases, the cost of diamond grinding is only about half the cost of bituminous overlay.

CONCRETE PAVEMENT PRESERVATION WORKSHOP

February 2008

Reference Manual

 U.S. Department of Transportation
Federal Highway Administration



Prepared for
Federal Highway Administration Office of Pavement Technology
400 7th Street AW
HPT 20
Washington, D.C. 20590

Prepared by
National Concrete Pavement Technology Center
at Iowa State University
2711 South Loop Drive, Suite 4700
Ames, IA 50010-8664

GOT ASPHALT?

(or concrete that needs to be resurfaced)?

We've got a concrete solution for that, too!



IOWA'S 2009 CONCRETE OVERLAY STORY

(203 TOTAL MILES)

- 41 Projects
 - 12 Stimuli
 - 5 Interstate/Primary Highways
 - 33 Secondary Roads
 - 3 Municipal Streets



Unbonded Resurfacing Family

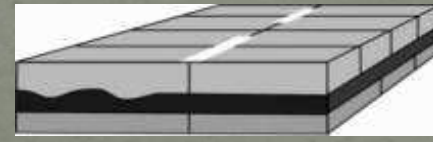
Unbonded Concrete
Resurfacing of
Concrete Pavements



Unbonded Concrete
Resurfacing of
Asphalt Pavements



Unbonded Concrete
Resurfacing of
Composite Pavements



Bonded Resurfacing Family

Bonded Concrete
Resurfacing of
Concrete Pavements



Bonded Concrete
Resurfacing of
Asphalt Pavements



Bonded Concrete
Resurfacing of
Composite Pavements



National Concrete Pavement
Technology Center



Guide to

CONCRETE OVERLAYS

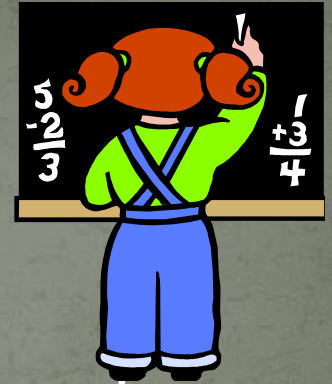
Sustainable Solutions for Resurfacing
and Rehabilitating Existing Pavements



A practical approach to understanding and successfully using concrete overlays, from selection to opening

Second Edition September 2008

SUMMARY



- *It's all about applying the right treatment to the right pavement "at the right time"*
- *There are many available rehabilitation treatments for PCC pavements*
- *Each solution has advantages and limitations*
- *Performance and cost vary with given conditions*
- *You are encouraged to take advantage of local contractor experience*

We all need to start pulling together to help keep our environment and transportation network healthy



CALL ON US AS YOUR RESOURCE FOR PAVEMENT PRESERVATION SOLUTIONS

INTERNATIONAL GROOVING AND GRINDING ASSOCIATION
IGGA.net

AMERICAN CONCRETE PAVEMENT ASSOCIATION
pavement.org

NATIONAL CP TECH CENTER
cptechcenter.org

