Southeast Pavement Preservation Partnership

Matt Ross P.E.
Penhall Company
May 13th, 2009
New Orleans, Louisiana

making life a little smoother

Concrete Pavement Preservation Techniques

Extending PCC Pavement Life With Preventive Maintenance

Rough Roads Ahead

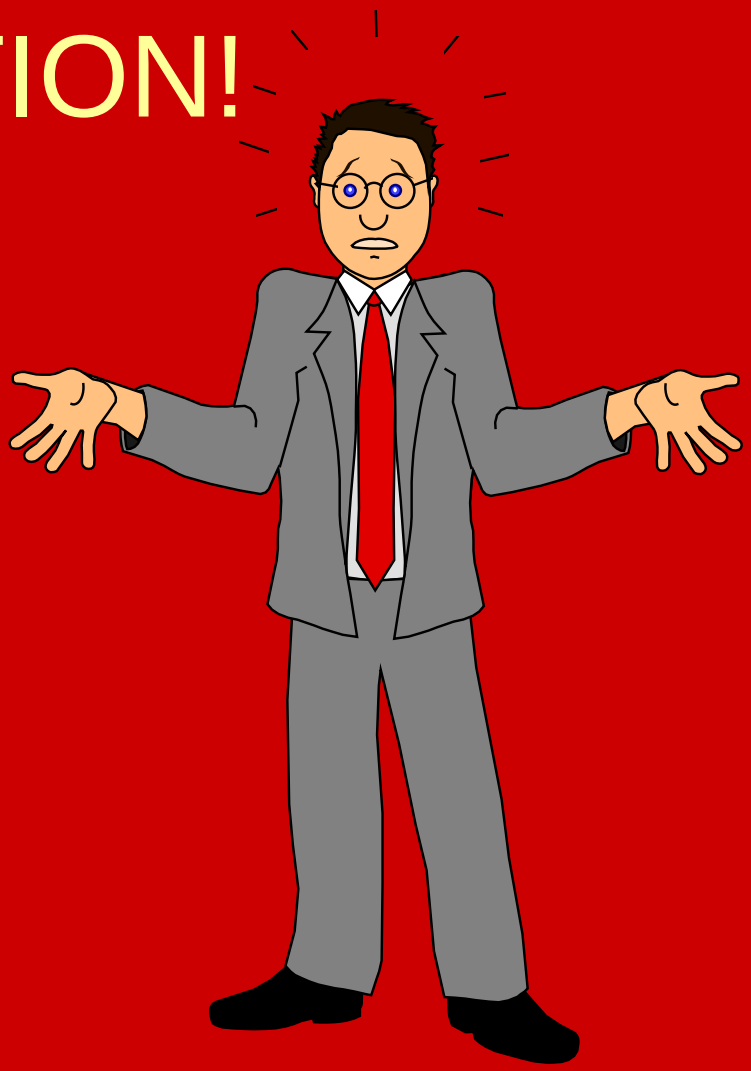
"The American people are paying for rough roads multiple times"

- Kirk T. Steudle, Director of the Michigan Department of Transportation

- It cost $1 to keep a road in good shape for every $7 you have to spend on reconstruction. It's another drag on the economy.

THE QUESTION!

Can we use Pavement Preservation to extend the life of our concrete pavement?



Sure

- But, you will usually perform these activities later in the pavements life and less often than alternative pavement materials.

Benefits of Preventive Maintenance

- Improved pavement condition
- Safer roads
- Lower life cycle costs
- Reduced congestion
- Increased customer satisfaction
- More cost effective use of funds

PCCP Preservation Techniques

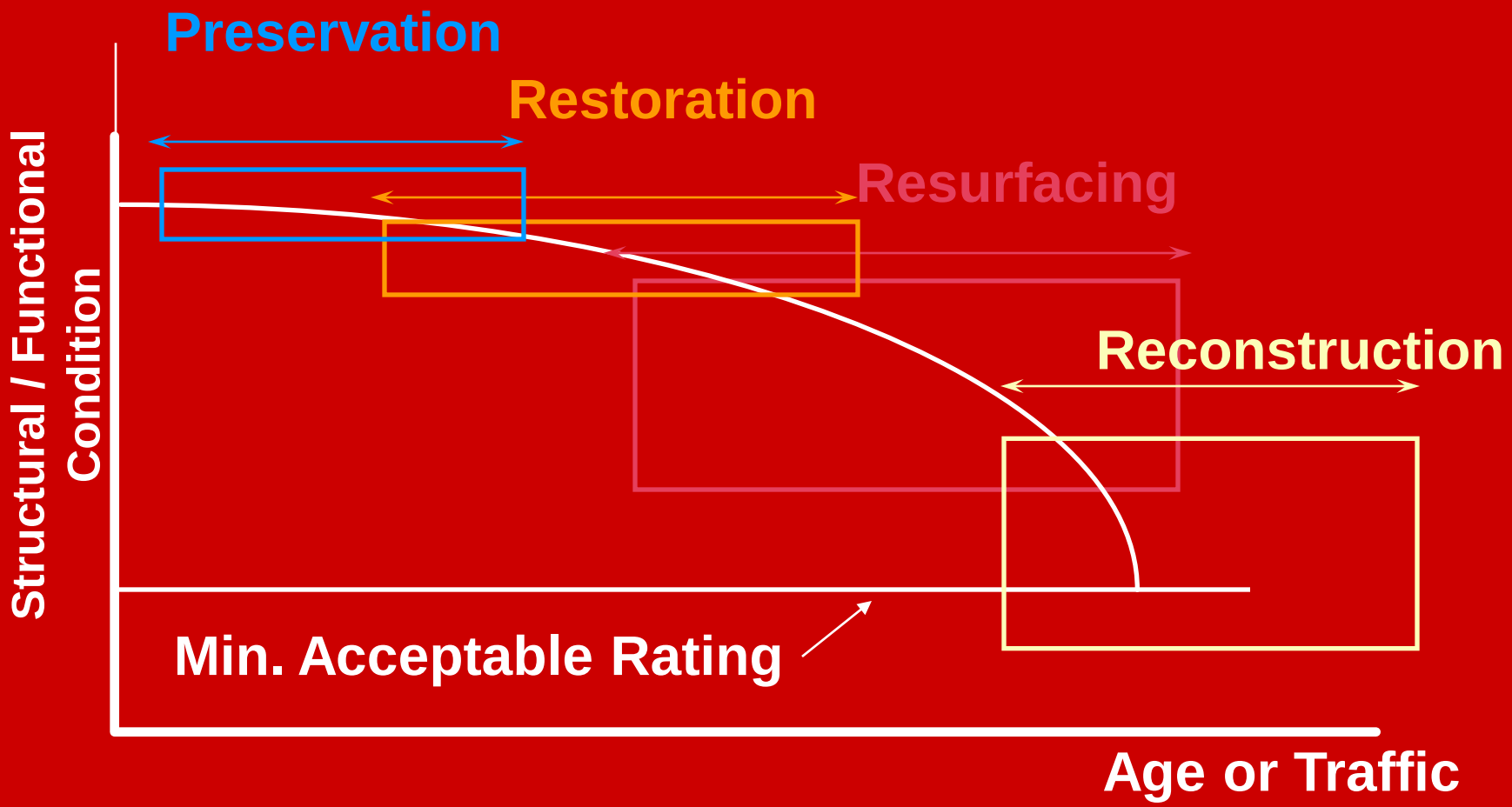
Concrete Pavement

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

How do *preventive* treatments differ from routine/reactive treatments?

Same treatments …different TIMING!

Rehabilitation Timing



Purpose of CPP

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

Expected Benefits

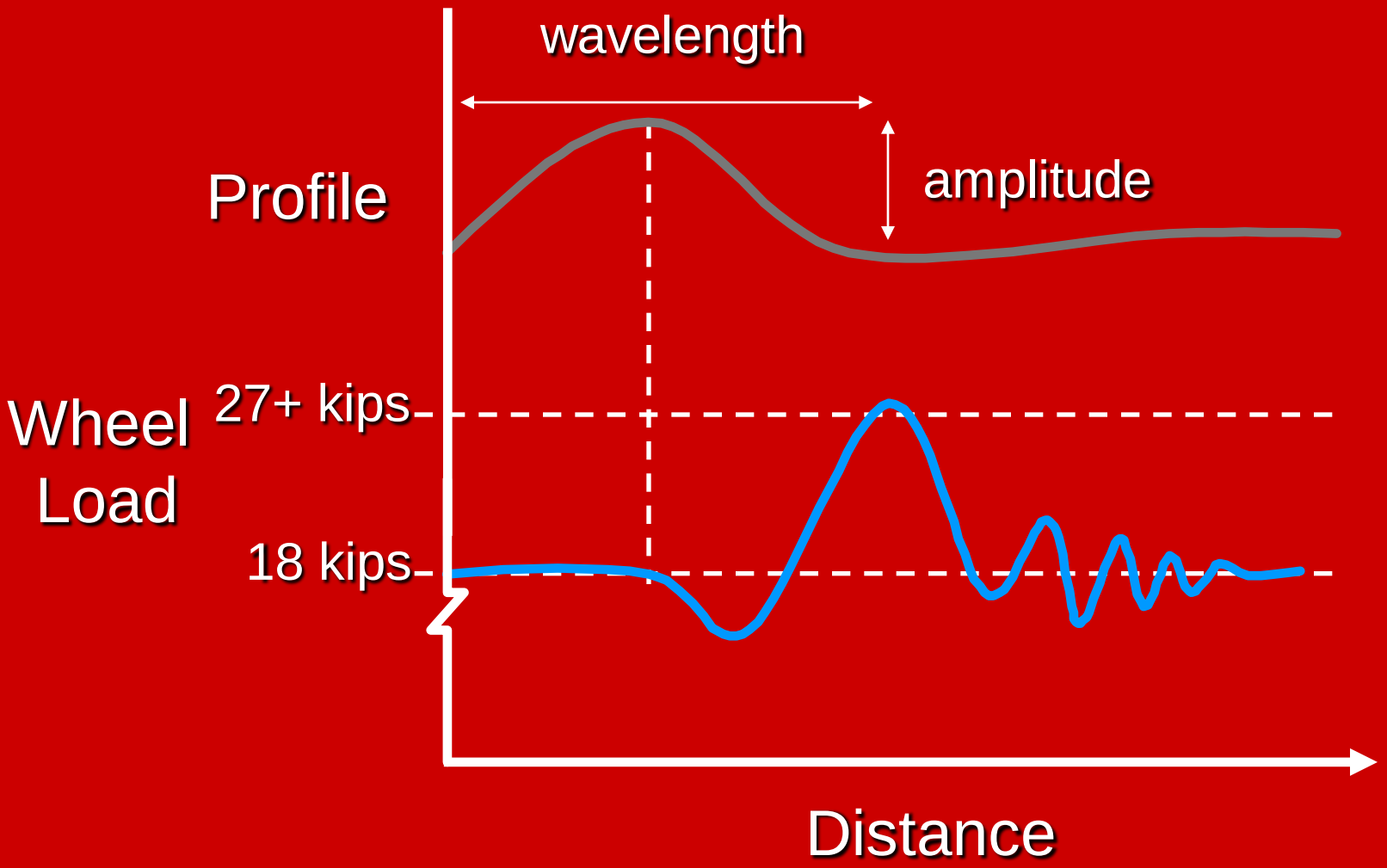
- Preservation of investment
  - Improved pavement performance
  - Long term cost savings/leveling
- Maintain a high level of service
  - Increased safety
  - Greater customer satisfaction

Preserving the Investment

- Keep water out!
- Reduce debris infiltration into joints or cracks
- Minimize dynamic loads

SMOOTH PAVEMENTS LAST LONGER!

Rough Pavement



Smooth Profile

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

Cutting Head

Diamond Grinding

Grinding Machine

Diamond Grinding

Grinding Process

Diamond Grinding

Finished Product

Diamond grinding can provide a 65% to 70% improvement over the pre-grind profile!

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!

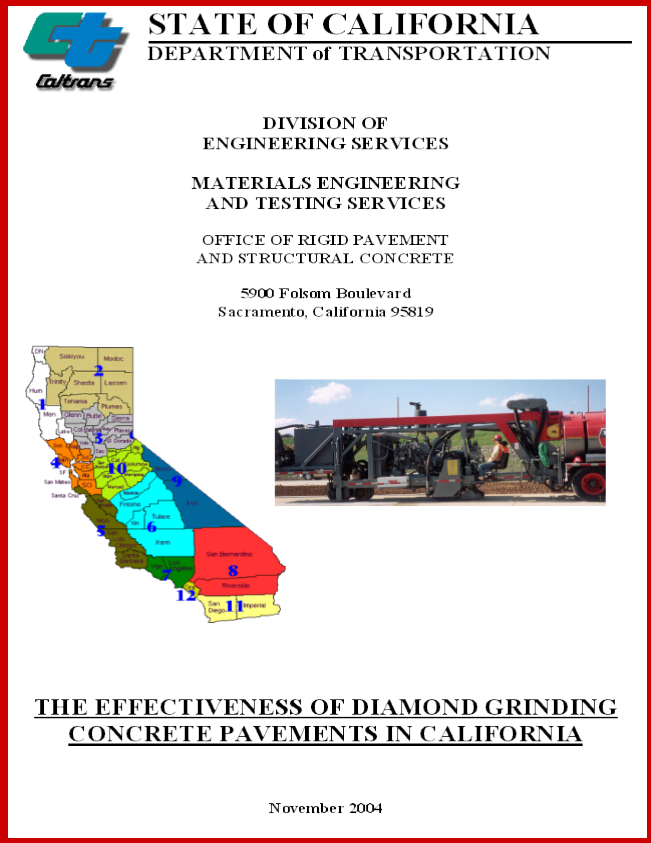
Noise Levels By Surface Type

104.9	**Random Transverse (Wisconsin)**
102.5	**Uniform Transverse (ADOT-3/4”)**
99.1	**Longitudinal (ADOT-3/4”)**
95.5	**Whisper Grind (CDG)**

Effectiveness of Diamond Grinding - CALTRANS

- Diamond grinding was first used in California in 1965 on a 19-year old section of I-10 to eliminate significant faulting

- 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 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

MODOT- Safer, Smoother, Sooner

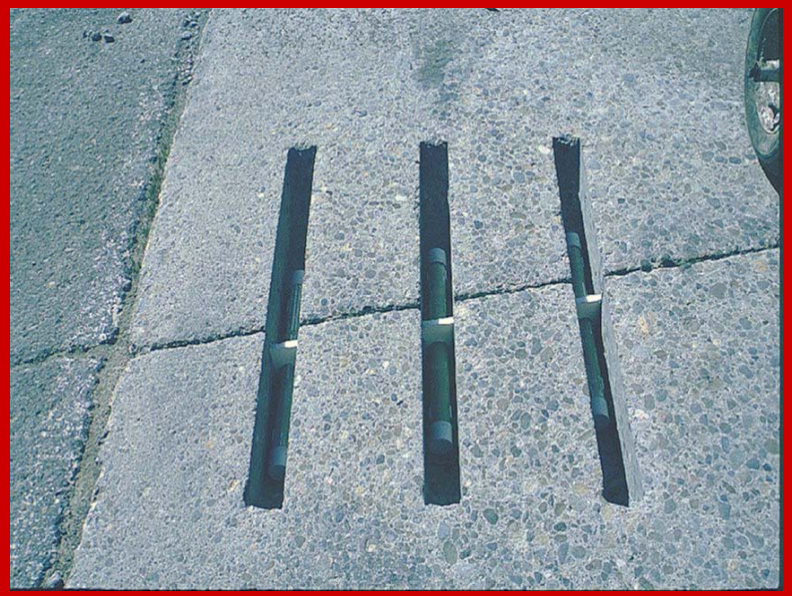
- MODOT initiates Safer, Smoother, Sooner program in 2005 – 2007
- The initiative invests $400 million on 2,200 miles
- Improve customer satisfaction through
  - Safer pavements
  - Smoother ride quality
  - Quiet ride quality
- Over 8,000,000 sq yds let
- See IGGA.Net for MODOT's BMP on diamond grinding new PCCP

LOAD TRANSFER RESTORATION

Dowel Bar Retrofit

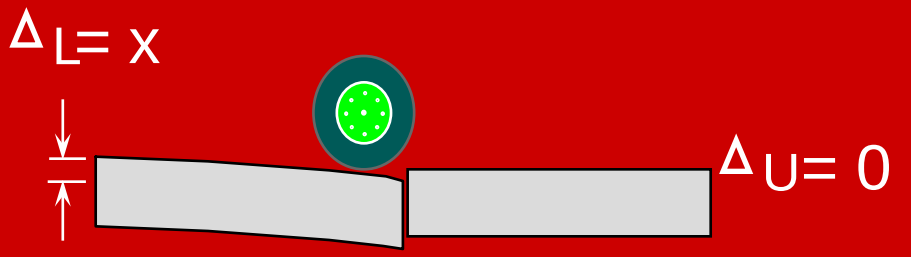
Load Transfer Restoration

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

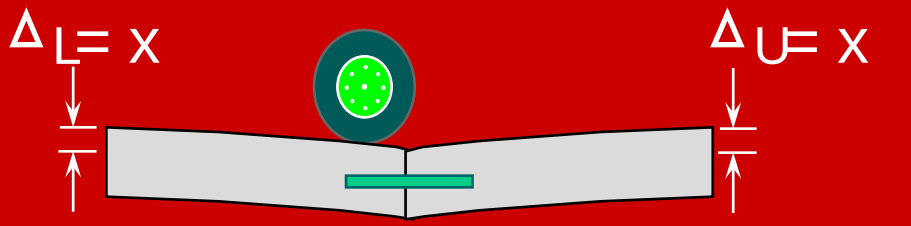


Purpose of Load Transfer Restoration

- Reestablish 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 = 0% (Poor)



Load Transfer = 100% (Good)


GEOTECHNICS LTD
ROAD TESTING UNIT
DYNATEST 8000
FALLING WEIGHT DEFLECTOMETER
Y9847

Performance of DBR Concrete Pavement Under HVS Loading by

CALTRANS, UC Davis and UC Berkeley

- Tested two retrofitted PCCPs under a Heavy Vehicle Simulator (HVS) aka accelerated loading frame
- HVS results demonstrated large improvement in LTE and decrease in vertical deflections
- DBR sections not damaged by HVS loading, unlike control section
- DBR less sensitive to temp changes than control section
- Total of 11,000,000 ESALS applied to DBR sections without failure occurring

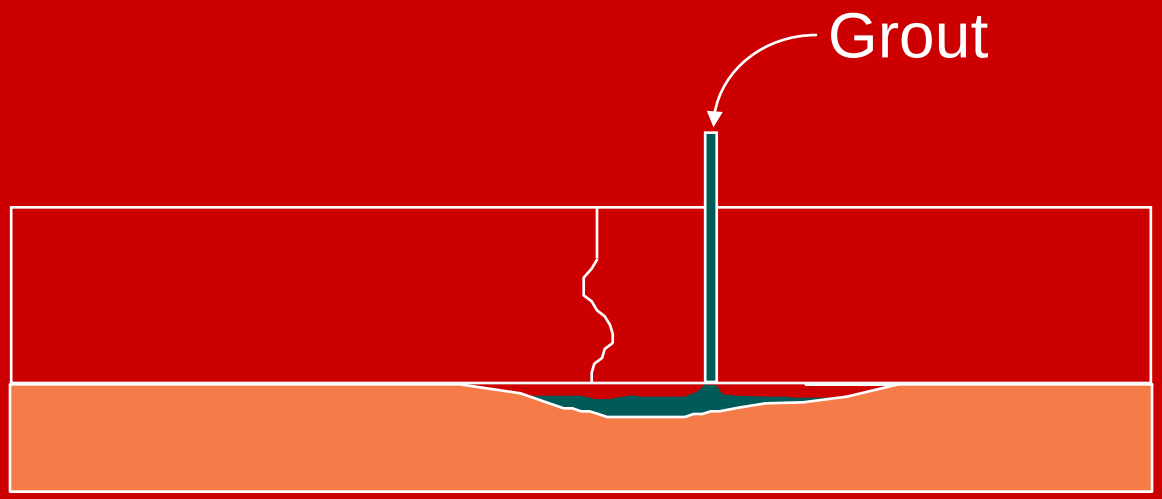
Ten-Year Performance of DBR Application … by WASHDOT

- First production DBR project completed in Washington in 1992
- WASHDOT has retrofitted 225 miles since 1992
- Subject DBR sections still maintain average LTE of 70% to 90%
- Determined that carbide roto-milling is NOT a viable alternative for diamond grinding
- Based on 10 yr results, DBR is considered a successful alternative for rehabilitation of aging PCCPs in WS

Undersealing/Slab Jacking

Undersealing

- Pressure insertion of flowable material (grout) beneath the PCC slab

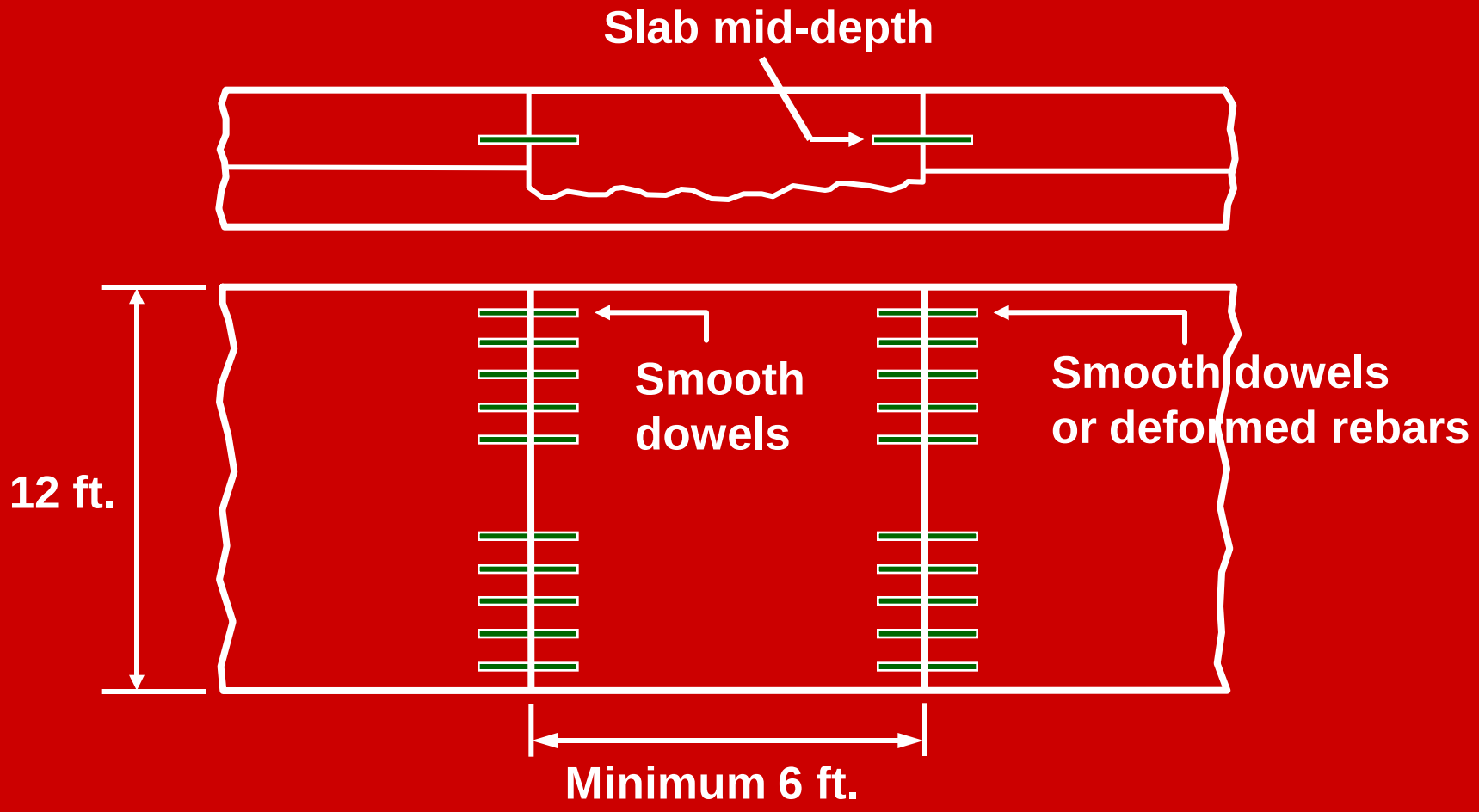


Performance

- Short- and long-term reductions in pavement deflections
- Most effective on pavements with little structural damage
- Cost effective alternative to remove and replace when slabs are in good condition

Full-Depth Patching Operations

Recommended Design JPCP



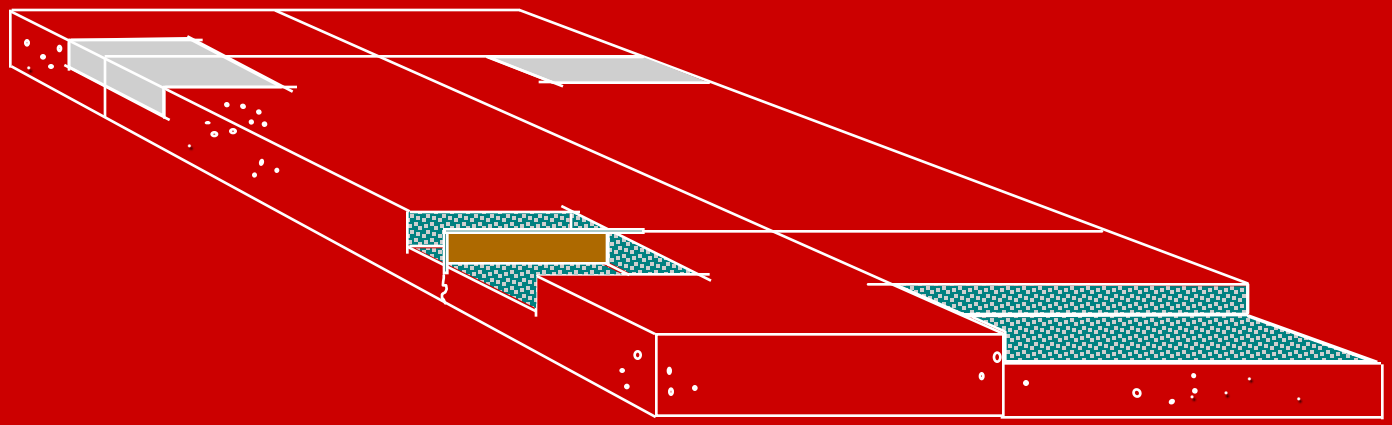
Performance of Full-Depth Repairs

- Can provide 20 or more years of service when properly designed and constructed
- High-early strength materials allow early opening to traffic and limited lane closures

Partial-Depth (Joint Spall) Patching Operations

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.



Application

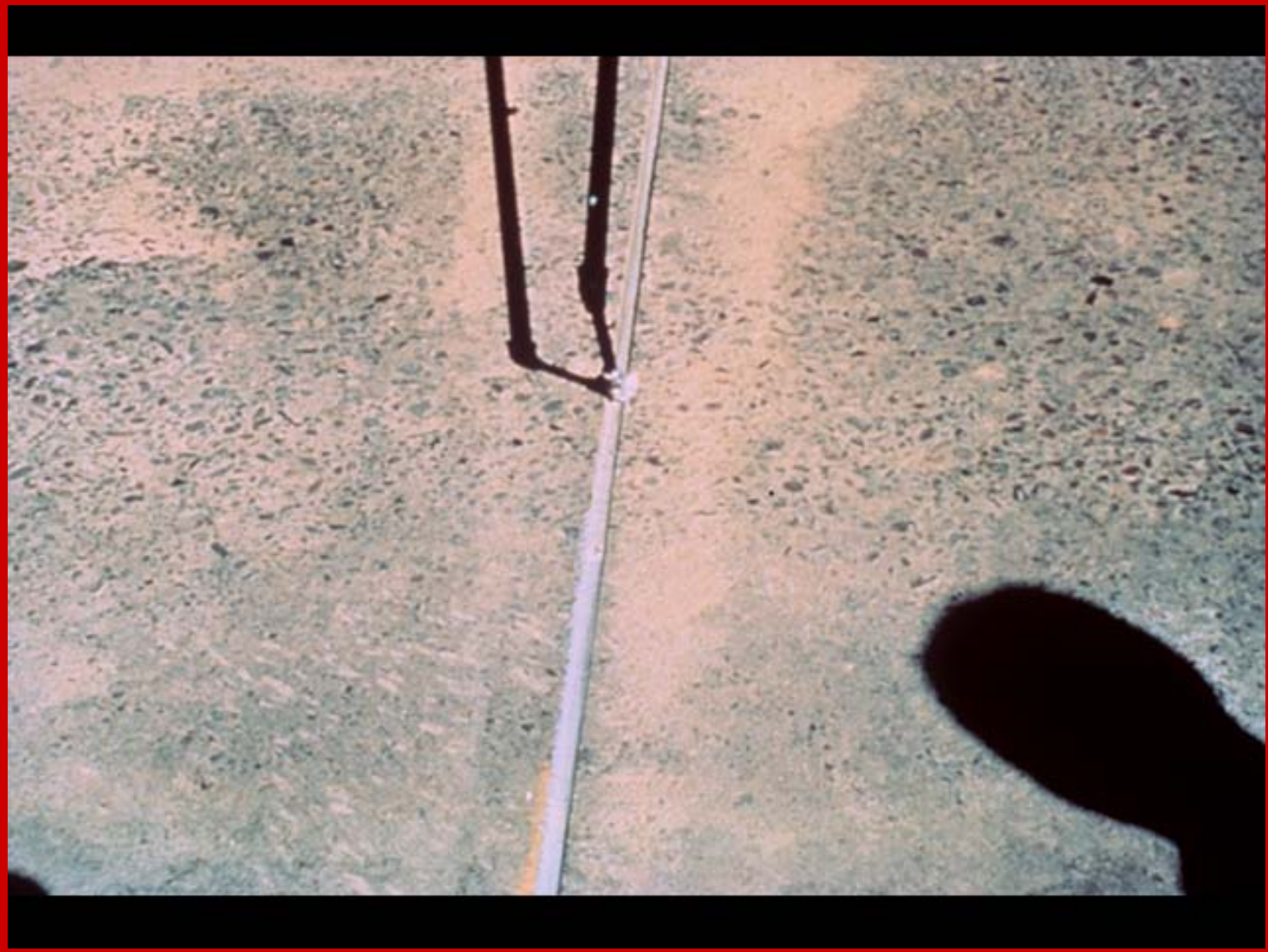
- Candidates for joint spall repair
  - Spalling caused by incompressibles in joint
  - Localized areas of scaling
- Not candidates for joint spall repair
  - Spalling caused by dowel lockup
  - Spalling at working cracks
  - Spalling caused by durability distress


Cherry St
CATERPILLAR
PA-105

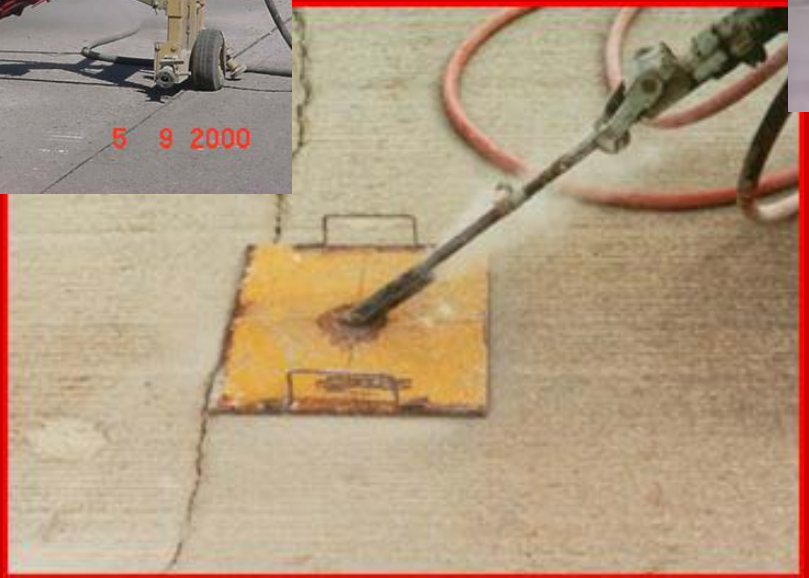
Trunk Highway 53 Ramp Duluth, MN - 1994

Joint/Crack Resealing

- Application of a sealant material in concrete pavement joints and cracks
- Purpose
  - Minimize moisture infiltration
  - Prevent intrusion of incompressibles
- Sealant Materials
  - Rubberized asphalt
  - Silicone



Cross-stitching longitudinal cracks/joints



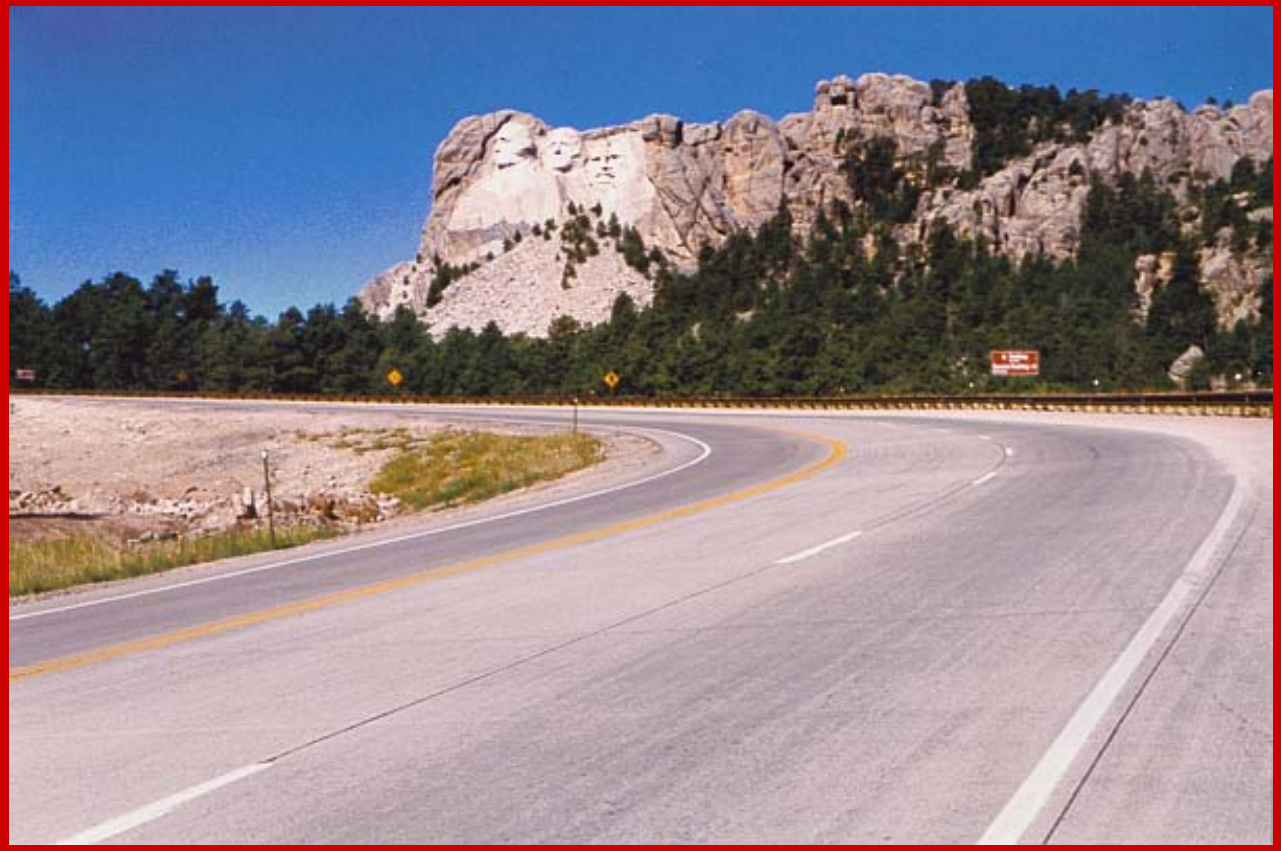
Good Candidate Pavements for Preventive Maintenance

- Minimal distress (extent and severity)
- Relatively young in age
- *Minor* functional problems
- Few historical problems with similar projects

When is it too late for preventive maintenance?

- Blow-ups
- Corner breaks
- Severely deteriorated cracks

Preventive Maintenance Concept



Keeping good roads in good condition!

Summary

- Many available treatments for PCC pavements
- Each has advantages and limitations
- Performance and cost vary with given conditions
- Applying the right treatment to the right pavement

- No universal method available
- Take advantage of local contractor experience
- ACPA and IGGA ready to assist

Visit Us on the Web

International Grooving and Grinding Association

- igga.net

American Concrete Pavement Association

- acpa.org