

California's Perspective on Concrete Preservation

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Introduction

- MTAG background
- Performance of:
 - Diamond grinding
 - Dowel bar retrofit
 - Full depth slab replacement with rapid set concrete (RSC)

MTAG

- Maintenance Technical Advisory Guide
 - Vol. II – Rigid Pavements
 - 1st Edition July 2006
 - 2nd Edition March 2008
 - Includes the following 8 chapters:
 - Introduction
 - Surface characteristics
 - Strategy selection
 - Joint resealing and crack sealing
 - Diamond grinding and grooving
 - Dowel bar retrofits
 - Isolated partial depth repair
 - Full depth repair including slab replacement

Diamond Grinding

Benefits

- Smoother pavement surfaces
- Longevity and life extension
- Better skid resistance [safety]
- Reduced noise levels at the tire-pavement interface
- Lower agency costs
- Lower user costs

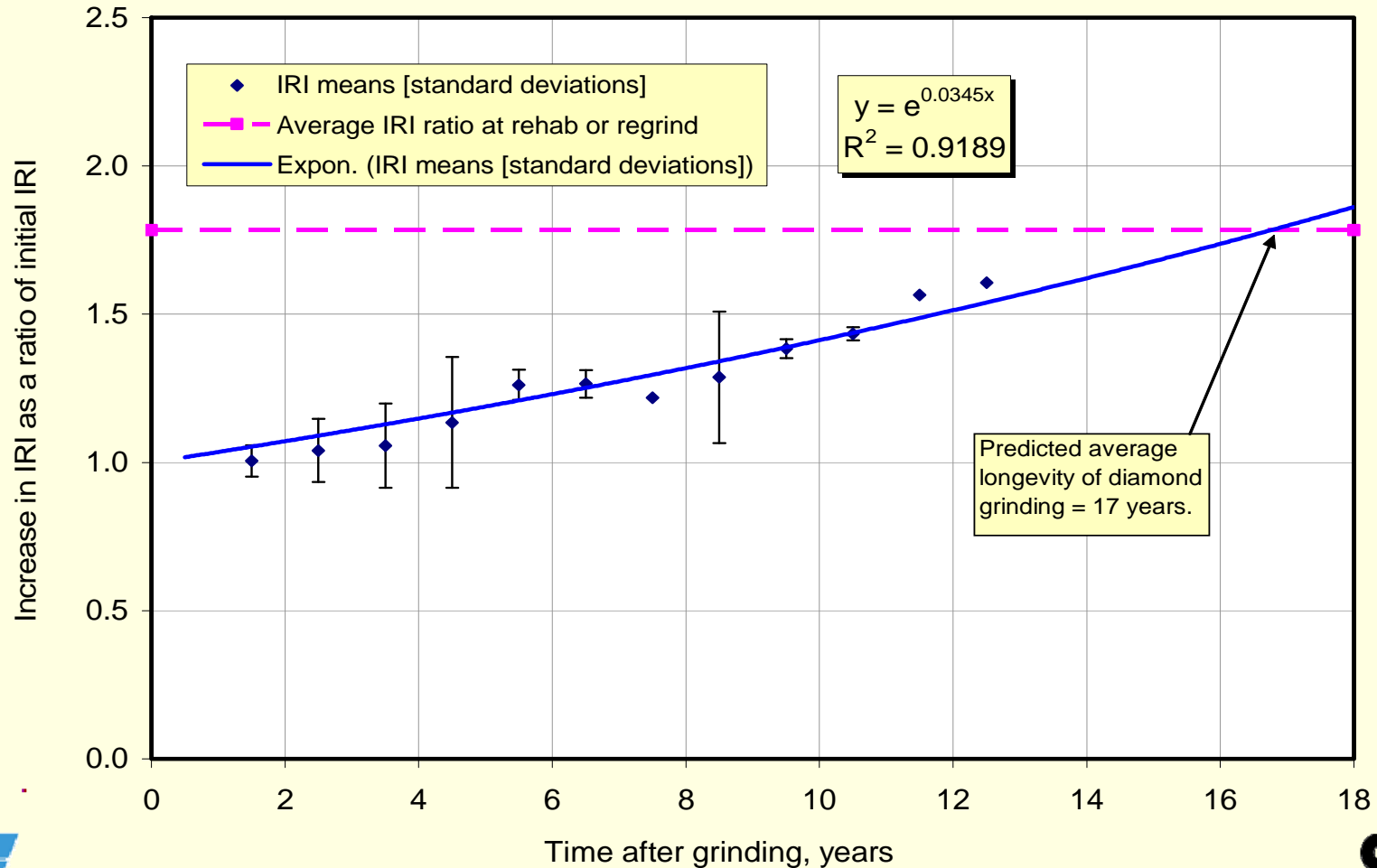
Diamond Grinding

Smoothness and Longevity

Smoothness

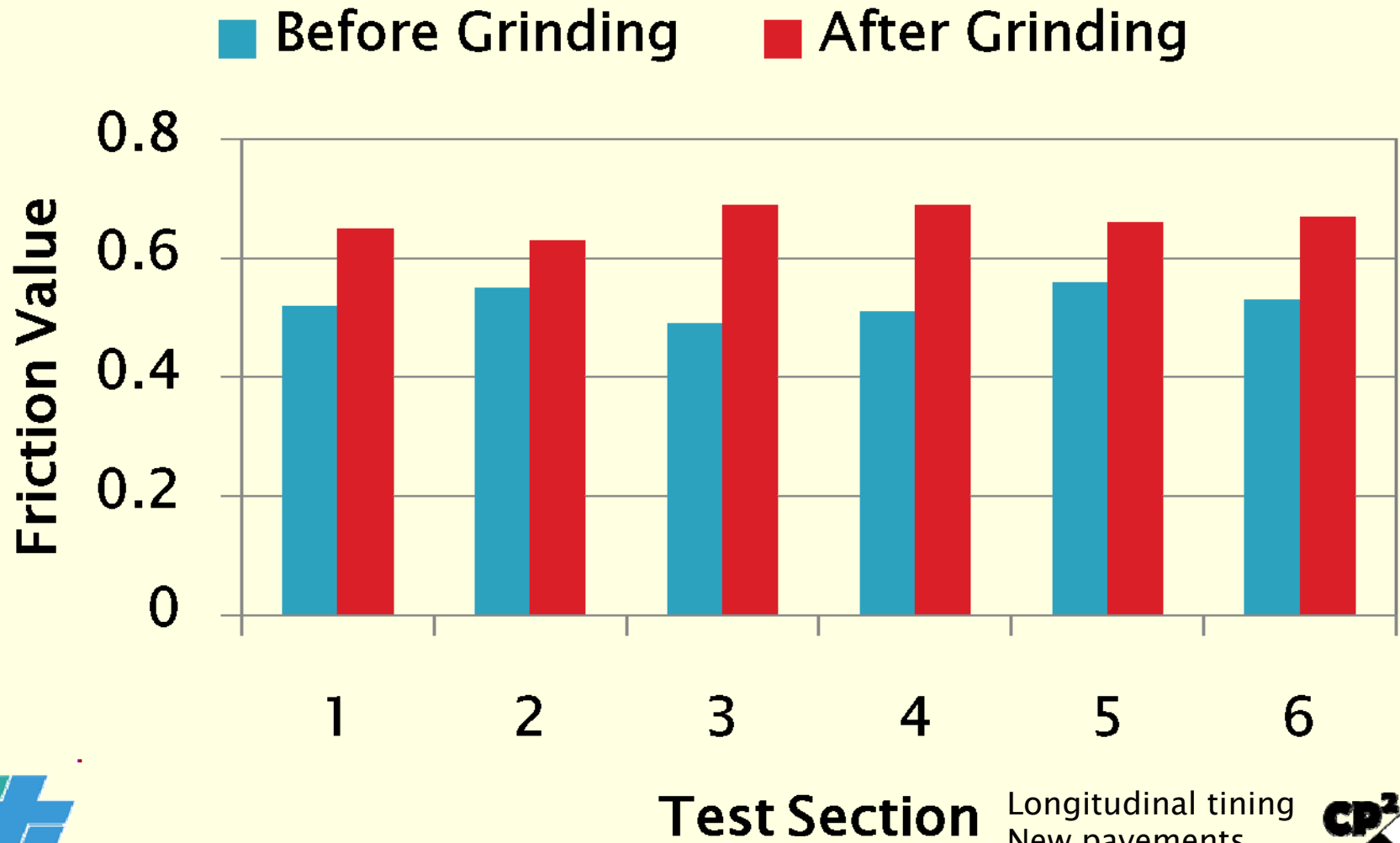
- Average IRI of 29 projects in California:
 - 165 in/mi (2.61 m/km) **before** planned grinding
 - 93 in/mi (1.46 m/km) **after** grinding
 - Before / after grinding ratio = $165.3 / 92.7 = 1.78$
- Average treatment life of 17 years before grinding or any other rehab is needed

Regression Equation for All 29 Sections Studied in California



Diamond Grinding

Friction



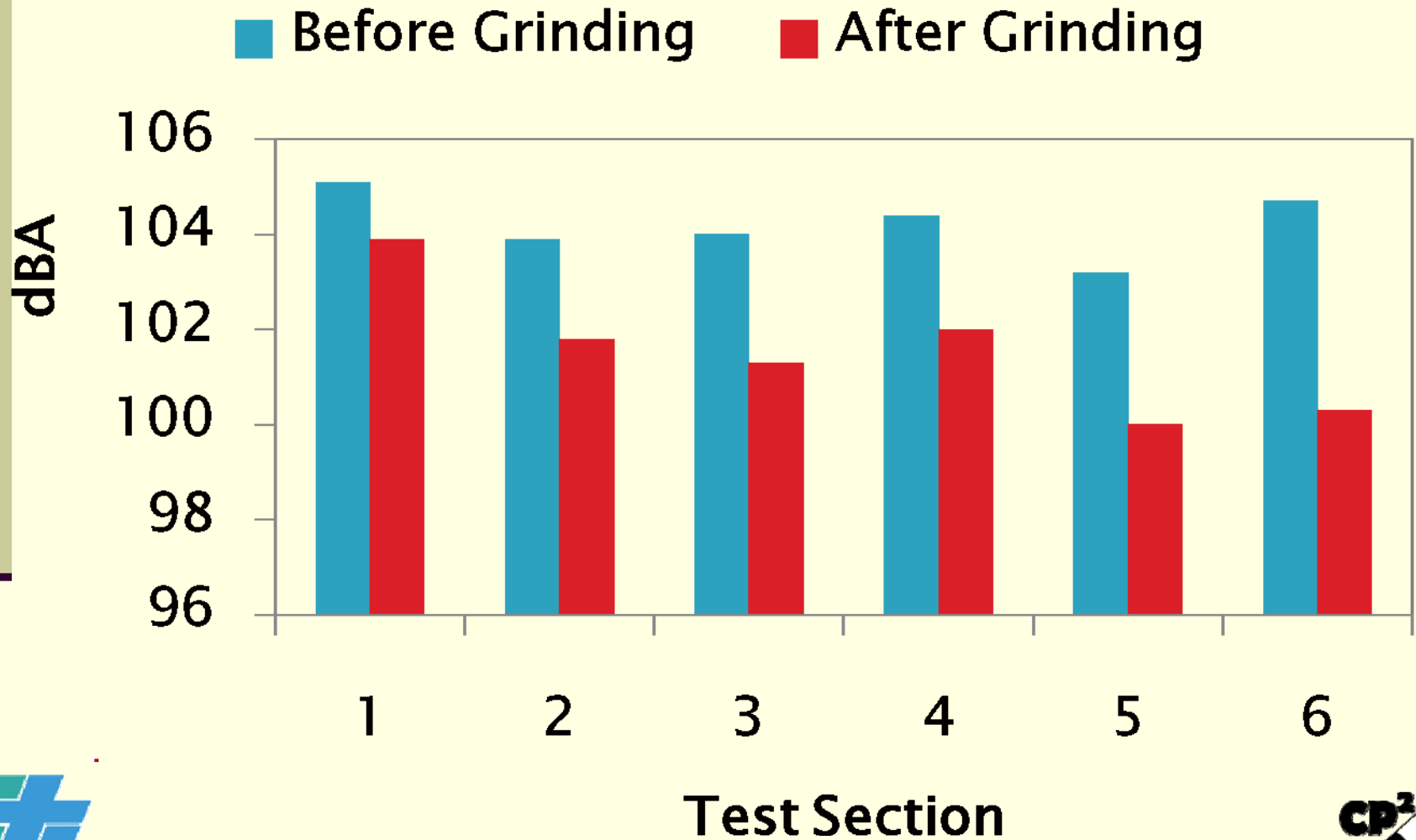
Longitudinal tining
New pavements

Noise Measurement

- On-board sound intensity (OBSI)
- Measurements made very close to tire-pavement interface (~5")



Diamond Grinding Noise Reduction



Diamond Grinding

Agency and User Costs

- Smoother roads = lower user costs.
- Estimated fuel savings (alone, not counting repairs etc.): \$25,000 per lane mile per year –
 - Based on 2002 fuel costs.
- Cost of diamond grinding: \$30,000 per lane mile –
 - Also based on 2002 grinding costs.
- Fuel cost savings: \$25,000 x up to 17 years = ~ \$200,000 - \$400,000.
- Therefore potential net savings = at least \$175,000 over expected life of treatment.

Diamond Grinding

Project Selection

PAVEMENT SHOULD BE:

- Structurally sound
- Good load transfer
- Limited spalling
- No evidence of material problems, e.g.
 - ASR
 - D-cracking
 - Soft aggregates

DBR Installation



- Restore load transfer
- Can be done in conjunction with diamond grinding



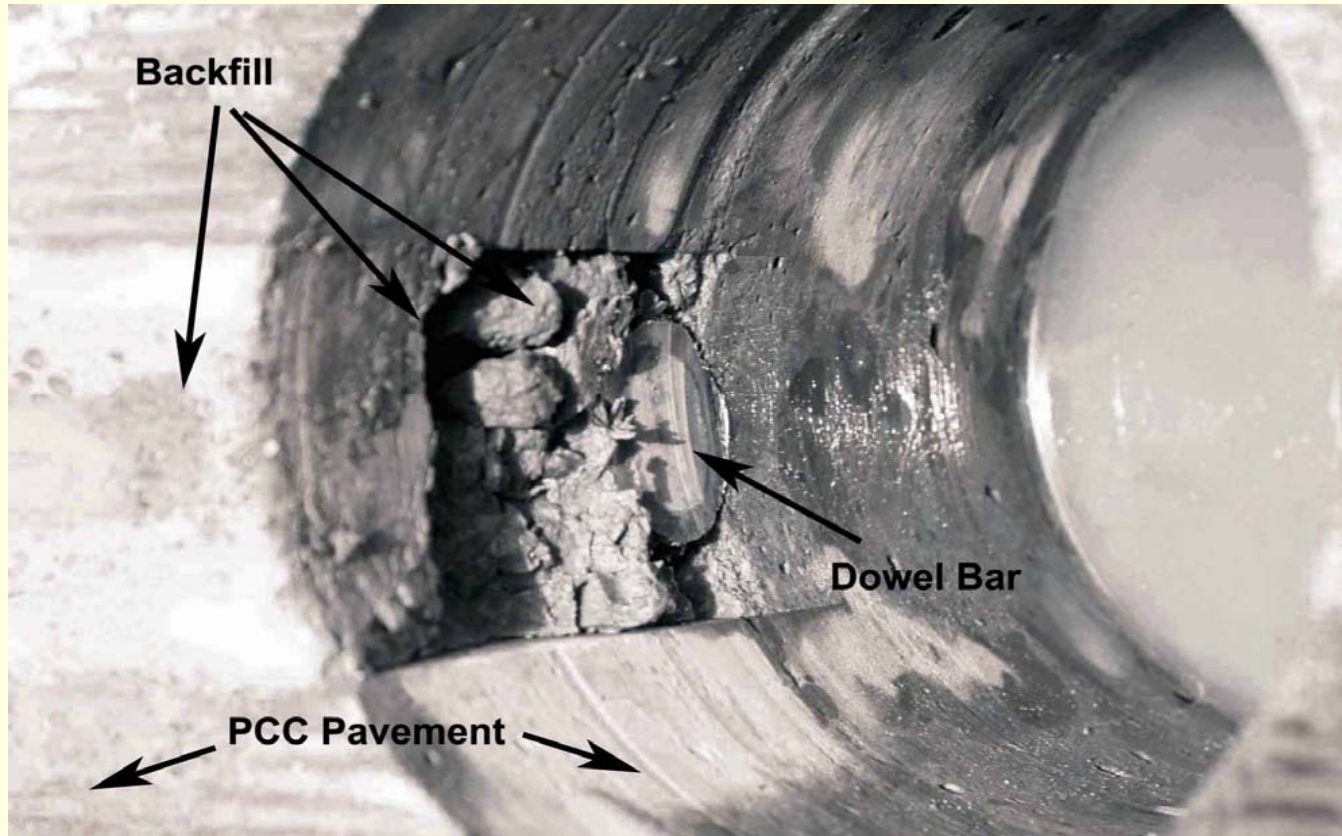
DBR

Performance

- 22,000 dowel bars placed 1999 on the:
 - I-10 freeway in Los Angeles County
- @ 11 bars per joint.
- After 9 years:
 - Less than 2% with any signs of distress

DBR

Installation Problems



DBR

Construction Considerations

- Performance related to construction:
 - Properly:
 - Clean slot — thoroughly !
 - Use gang saws
 - Align dowel bars — carefully !
- Consolidate grouting material

DBR

Project Selection

- Structural condition of slabs
 - Good or better
- Structural condition of the base
 - Low FWD deflections
- Measured load transfer efficiency
 - $\leq 60\%$ as measured by FWD
- Magnitude of faulting
 - Between 0.10 and 0.50 inches
- Condition of joints and cracks
 - No more than moderate severity spalling

Full Depth Slab Repair

Slab Replacement

- Use when isolated slab distresses are too severe to warrant other treatments



- ▶ May be combined with diamond grinding

Full Depth Slab Repair Construction

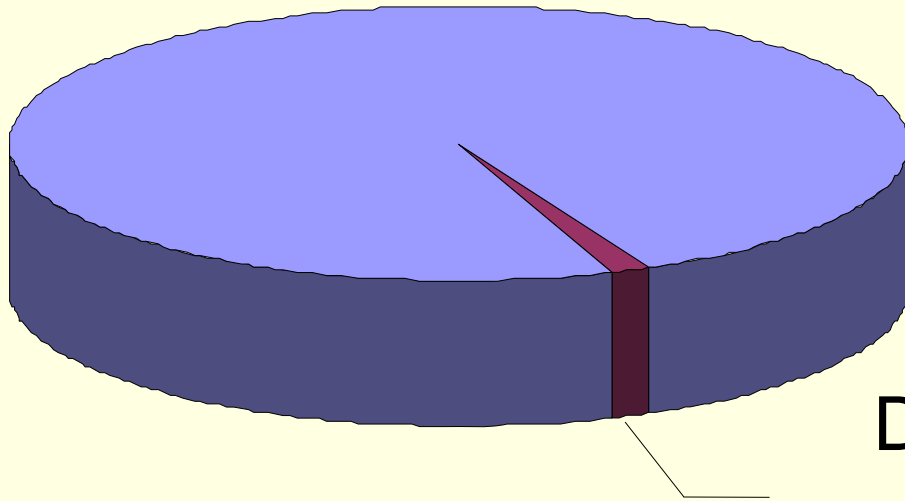
■ **Materials selection**

- Based on project's environmental, design, performance, and funding requirements
- Rapid strength concrete (RSC) commonly used
 - After placement, traffic can be back on facility in 4 hrs or less for night construction.

Slab Replacement

Estimated Number of Distressed
RSC Slabs on 15 California
Statewide Projects

Total No. of
Slabs
Placed: 5430



Distressed Slabs:
1.4%

Shrinkage cracks were the most prevalent
surface distresses in these slabs

Pavement Preservation Issues and Recommendations

- Further exploration needed to determine:
 - Optimum timing of preservation treatments
 - Key threshold distresses and values
 - Remaining life information for treatment selection
 - Structural integrity of cement bases
 - FWD testing, sometimes with destructive testing (cores), is often recommended

Questions?

