

Chapter 1

Introduction

From... Maintenance Technical
Advisory Guide (MTAG)

Presentation Outline

- Purpose of pavement preservation (PP)
- Definition of PP
- Components of PP Program
- PP Concept
- Essentials of PP Program
- Benefits of PP
- Rigid Pavement Performance in California
- Common Rigid Pavement Distresses
- Organization of the MTAG

Purpose of Pavement Preservation

- To keep good pavements in good or near new conditions by applying the right maintenance strategies that are cost-effective at the right time to extend pavement life and preserve investments.

Definition of Pavement Preservation

- A program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations (FHWA, 2005).

Components of Pavement Preservation Program

- Consists primarily of three components:
 - preventive maintenance
 - minor rehabilitation (restoration), and
 - some routine maintenance
- Does not include new pavements or pavements that require major rehabilitation or reconstruction.

Pavement Preservation Concept

- A proactive approach in maintaining the existing highways
- Addresses pavements while they are still in good condition and before the onset of serious damage
- Applying a cost-effective treatment at the right time to the right pavement to extend pavement life

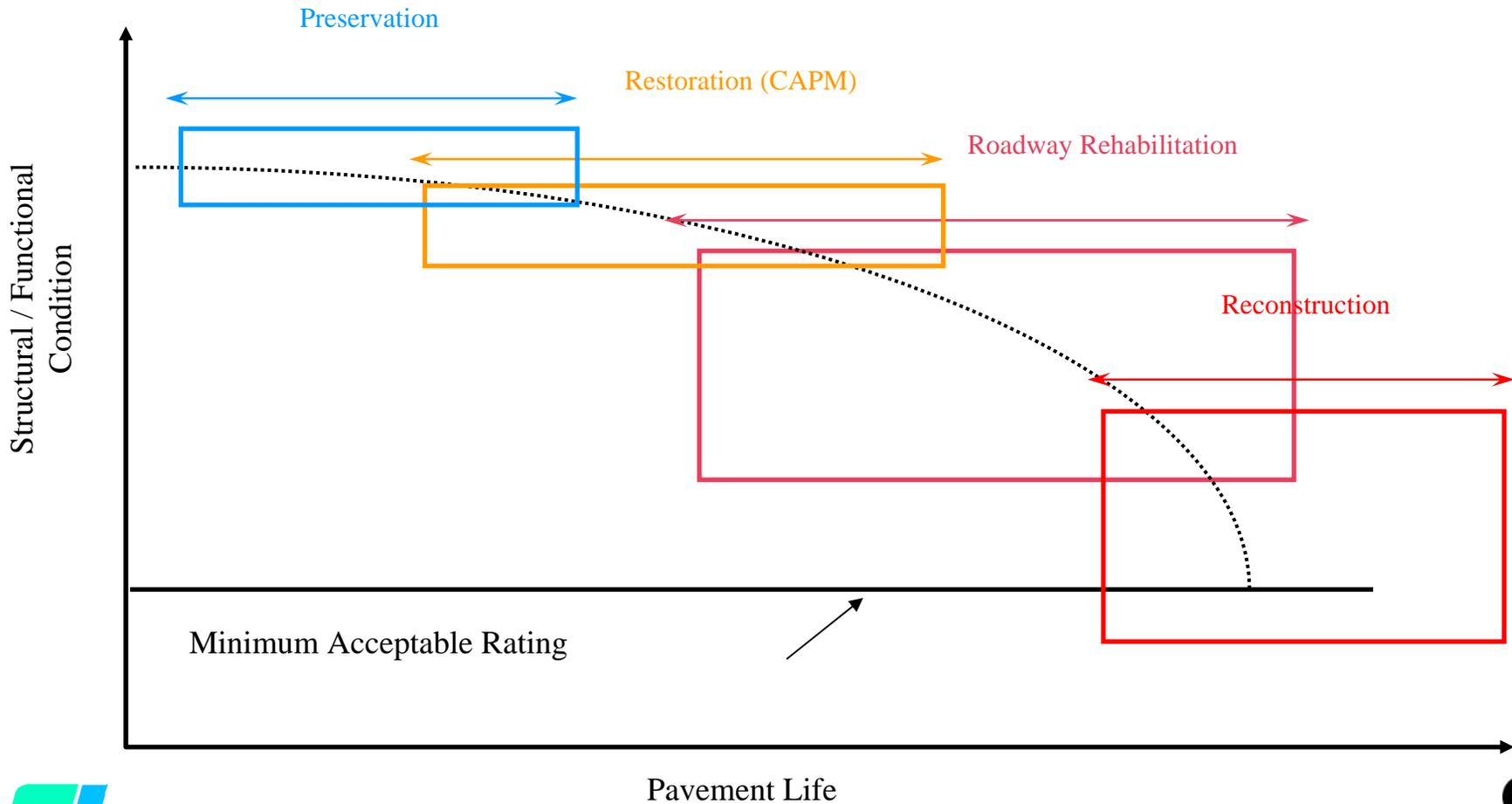
Essentials of Pavement Preservation Program

- Pavement preservation is an agency program
- An effective pavement preservation program include agency leadership and a dedicated annual budget, and support and input from staff in planning, finance, design, construction, materials, and maintenance

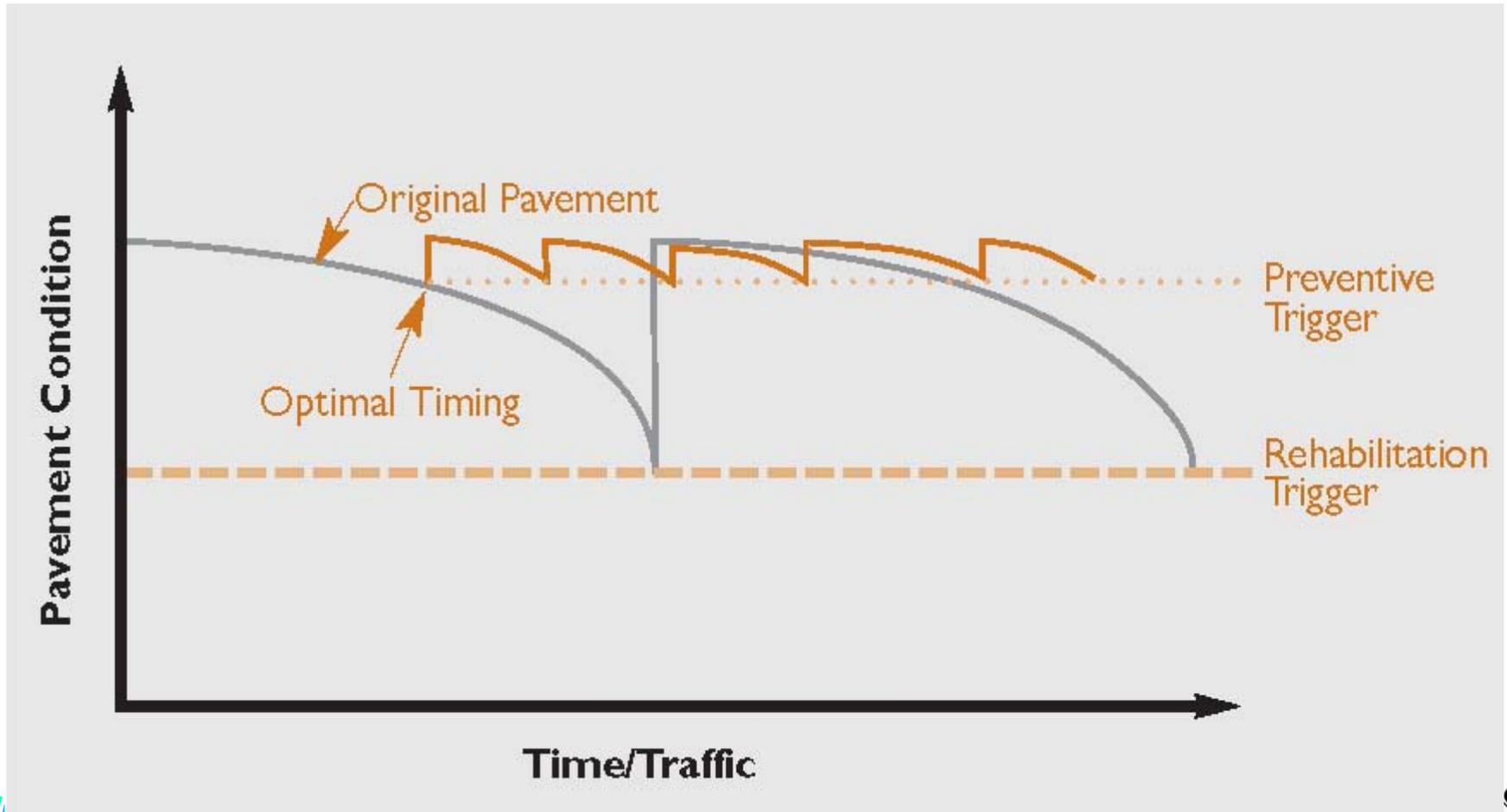
Benefits of Pavement Preservation

- Benefits of pavement preservation program:
 - preserving the roadway network
 - enhancing pavement performance
 - ensuring cost-effectiveness by extending pavement life, and
 - reducing user delays by avoiding rehabilitation or reconstruction.
- Some of these benefits may be noticed immediately and some may be realized over time

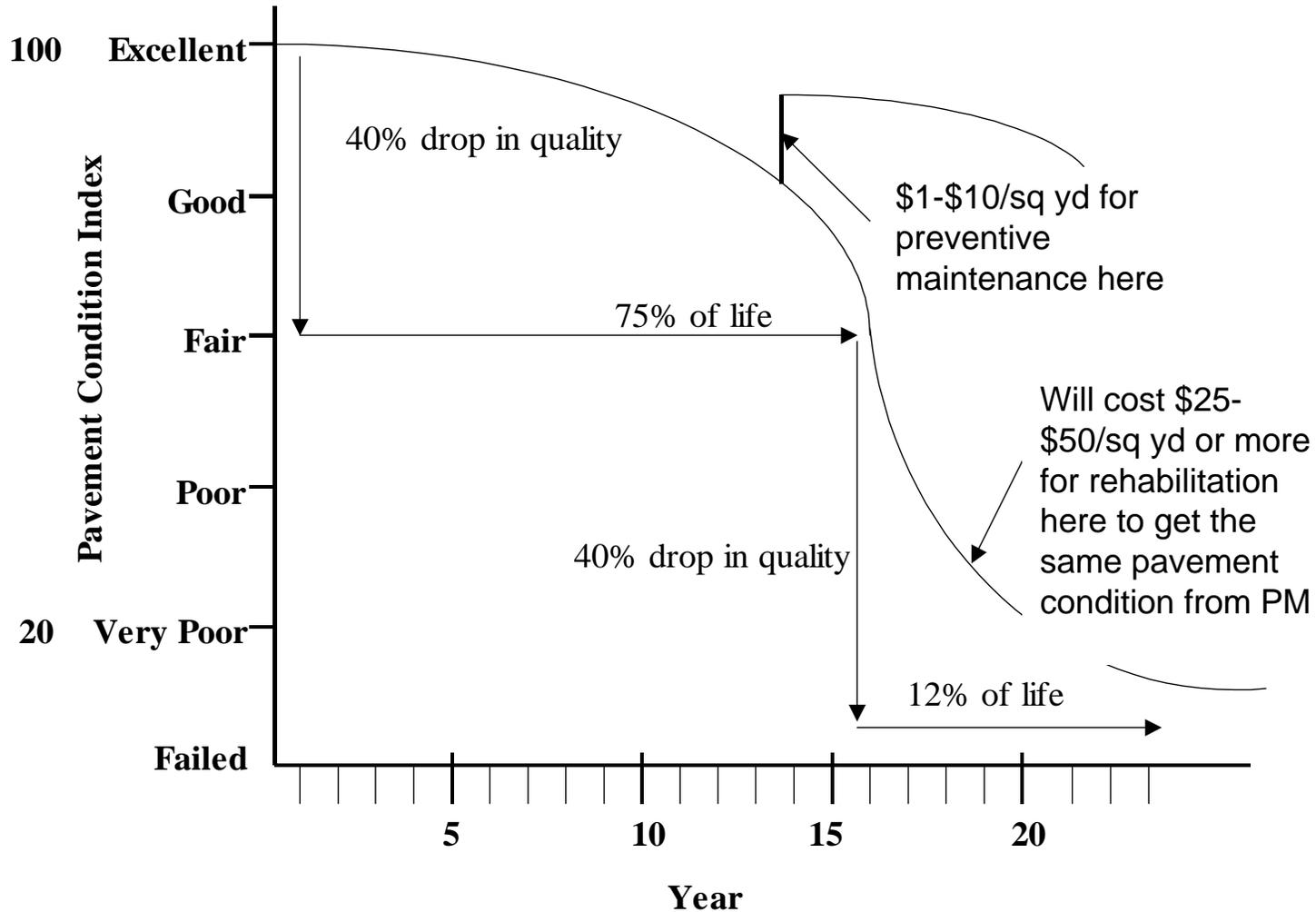
Typical Pavement Performance Curve



Importance of Timely Treatments



Cost Effects of Treatments



Rigid Pavement Performance in CA

- Design and Performance
 - Base support. Initially CTB; later LCB. CTPB and ATPB also used.
 - Slab thickness. In the 1950s, an 8-inch. Later 9-inch slab became common. Presently, 10-inch and even 12-inch thick slabs are used depending on projected traffic.
 - Dowels, tie bars, sealed joints were added in 2000.
- Causes of Rigid Pavement Deterioration
- Faulting Mechanism and Effort on Addressing Faulting

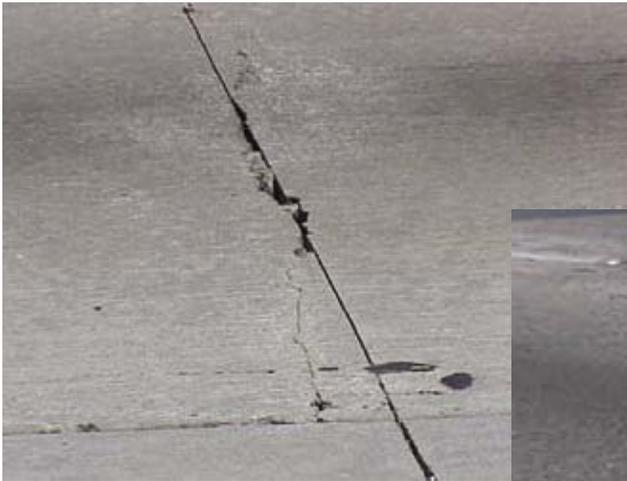
Common Rigid Pavement Distresses

- Joint Deficiencies and Cracking
 - Spalling
 - Faulting
 - Joint seal damage
 - Longitudinal cracks
 - Transverse cracks
 - Slab cracking
 - Corner break
 - Durability “D” cracking

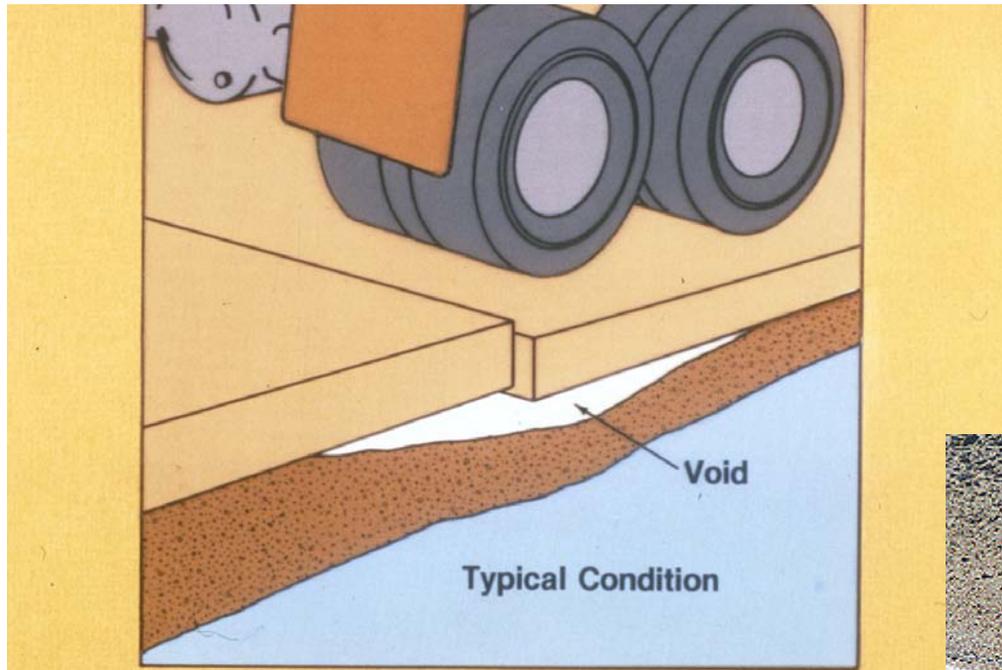
Common Rigid Pavement Distresses

- Surface Defects
 - Scaling
 - Surface polish/polished aggregate
 - Surface attrition
 - Popouts
- Other Miscellaneous Distresses
 - Blow-ups
 - Pumping and water seepage
 - Lane shoulder drop-off
 - Settlement

Spalling at the Joint



Faulting



Longitudinal Crack



Transverse Crack



Slab Cracking



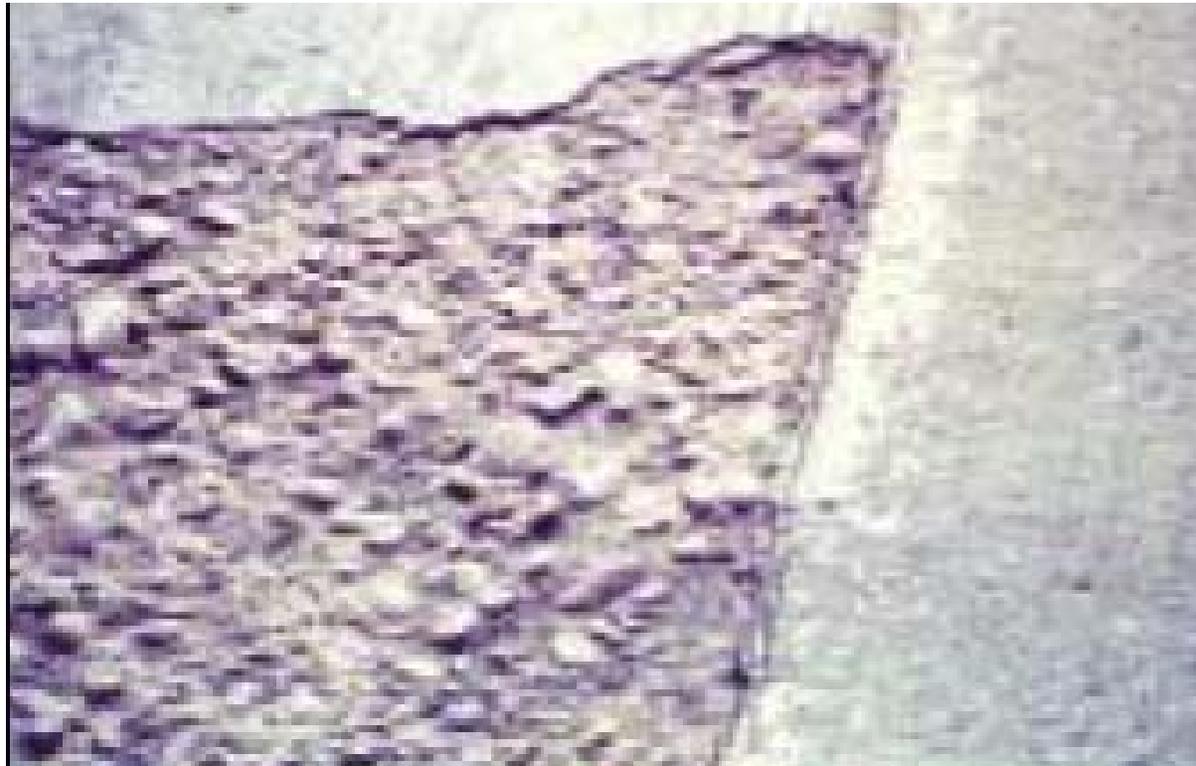
Corner Crack



"D" Cracking



Scaling



Surface Polish/Polished Aggregate



Severe Surface Abrasion with Third Stage Cracking



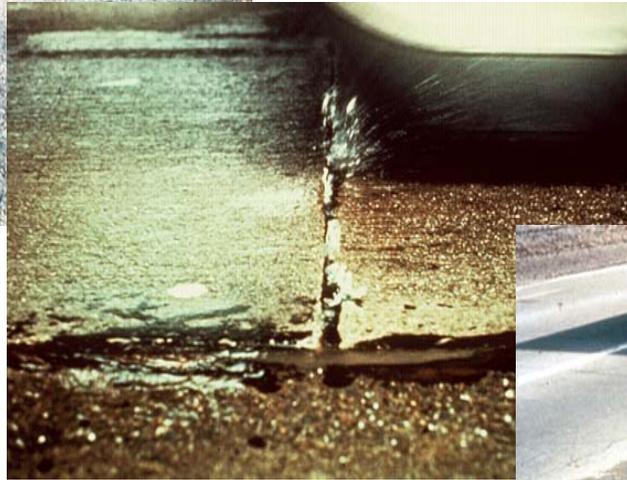
Popouts



Blow-ups



Pumping and Water Bleeding



Lane/Shoulder Drop-Off



Factors Affecting JPCP Distress

Distress Type	Primarily Traffic/Load	Primarily Climate/Materials
<i>Joint Deficiencies and Cracking</i>		
Spalling		X
Faulting	X	X
Joint Seal Damage	X	X
Longitudinal Cracking	X	X
Transverse Cracking	X	X
Slab Cracking	X	X
Corner Breaks/Cracks	X	
Durability “D” Cracking		X

Factors Affecting JPCP Distress

Distress Type	Primarily Traffic/Load	Primarily Climate/Materials
<i>Surface Defects</i>		
Scaling and Map Cracking		X
Surface Polish/Polished Aggregate	X	X
Surface Attrition	X	X
Popouts		X
<i>Miscellaneous Distresses</i>		
Blow-ups		X
Water Bleeding and Pumping	X	X
Lane-to-Shoulder Drop-off		X
Settlement	X	X

Functional Distresses and Possible Contributing Factors

Functional Distress	Contributing Factors *					
	Pavement Design	Load	Water	Temp.	Pavement Materials	Construct.
Roughness						
<i>Faulting</i> **	P	P	P	C	C	N
<i>Heave / swell</i> **	C	N	P	P	C	N
<i>Settlement</i> **	C	C	C	N	N	C
<i>Patch deterioration</i>	C	C	C	C	C	C
<u>Possible causes of roughness:</u> Poor load transfer, loss of support, subbase pumping, backfill settlement, freeze thaw and moisture related settlement/heave, curling and warping and poor construction practices.						
Surface Polishing	N	C	N	N	P	N
<u>Possible causes of surface polishing:</u> High volumes of traffic, poor surface texture, wide uniform tine spacing, wide joint reservoirs, and wheel path abrasion because of studded tires or chains.						
Noise	P	C	N	N	C	P
<u>Possible causes of noise:</u> High volumes of traffic, poor surface texture, wide-uniform tine spacing, wide joint reservoirs, and wheel path abrasion because of studded tires or chains.						
Surface Defects						
Scaling	N	N	C	C	P	P
<i>Popouts</i>	N	N	C	C	P	C
<i>Crazing</i>	N	N	N	C	C	P
<i>Plastic shrinkage cracks</i>	N	N	N	C	C	P
<u>Possible causes of surface defects:</u> Over-finishing the surface, poor concrete mixture, reactive aggregates, and poor curing practices.						

* P= Primary Factor C= Contributing Factor N= Negligible Factor

** Loss of support is an intermediary phase between the contributing factors and these distresses. Loss of support is affected by load, water and design factors.

Structural Distresses and Possible Contributing Factors

Structural Distress	Contributing Factors *					
	Pavement Design	Load	Water	Temp.	Pavement Materials	Construct.
Cracking **						
<i>Transverse</i>	P	P	N	C	C	P
<i>Longitudinal</i>	P	P	N	C	C	P
<i>Corner</i>	C	P	C	C	N	N
<i>Intersecting</i>	C	P	C	N	C	N
<u>Possible causes of cracking:</u> Fatigue, joint spacing too long, shallow or late joint sawing, base or edge restraint, loss of support, freeze-thaw and moisture related settlement/heave, dowel-bar lock-up, curling and warping.						
Joint/Crack Deterioration						
<i>Spalling</i>	C	C	N	C	P	C
<i>Pumping **</i>	C	P	P	N	C	N
<i>Blow-ups</i>	C	N	N	P	C	N
<i>Joint Seal Damage **</i>	C	C	C	C	P	C
<u>Possible causes of joint/crack deterioration:</u> Incompressibles in joint/crack, material durability problems, subbase pumping, dowel socketing or corrosion, keyway failure, metal or plastic inserts, rupture and corrosion of steel in JRCP, high reinforcing steel.						
Punchouts **						
<u>Possible causes of punchouts:</u> Loss of support, low steel content, inadequate concrete slab thickness, poor construction procedures.						
Durability						
<i>D-cracking</i>	N	N	P	C	P	N
<i>ASR</i>	N	N	P	C	P	N
<i>Freeze-thaw damage</i>	N	N	P	P	P	C
<u>Possible causes of durability distresses:</u> Poor aggregate quality, poor concrete mixture quality, water in the pavement structure.						

* P= Primary Factor C= Contributing Factor N= Negligible Factor

** Loss of support is an intermediary phase between the contributing factors and these distresses. Loss of support is affected by load, water and design factors.

Preservation Vs. Rehabilitation?

- Which ones are treated with PP?
 - Generally, functional distresses are good candidates for pavement preservation
- Which one require rehab?
 - Structural distresses are candidates for rehabilitation

Materials Considerations

- Concrete Constituent Materials
- Cementitious Repair Materials
- Specialty Repair Materials
- Bituminous Materials
- Sealants
- Dowel Bars and Tie Bars

Design Considerations

- Traffic
- Environment
 - Temperature
 - Moisture
 - Other factors
- Windows of Opportunities
- Traffic Control
- Item Codes

Organization of MTAG

- MTAG provides guidance on selecting the most appropriate strategies to address various pavement distresses described earlier by applying pavement preservation treatments
- Organization of Guide
 - Chapter 2 is on Surface characteristics
 - Chapter 3 presents a discussion on strategy selection
 - Chapters 4 through 8 describe various strategies in detail

Chapters Covered in MTAG 2nd Ed

Chapter	Topic
1	Introduction
2	Surface Characteristics
3	Strategy Selection
4	Joint Resealing and Crack Sealing
5	Diamond grinding and Grooving
6	Dowel Bar Retrofit
7	Isolated Partial Depth Concrete Repair
8	Full Depth Concrete Repair

Summary

Applying the Right treatment
to the Right pavement
at the Right time
is the Core of
Pavement Preservation

Thank You

Questions?