

Common Distresses on Rigid Pavements

From... Maintenance Technical
Advisory Guide (MTAG)

Fundamentals of Pavements

- Function of pavements
- Factors affecting pavement performance
 - Subgrade soil
 - Pavement materials characteristics
 - Traffic loading
 - Environment
 - Moisture; and
 - Temperature

Common Rigid Pavement Distresses

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

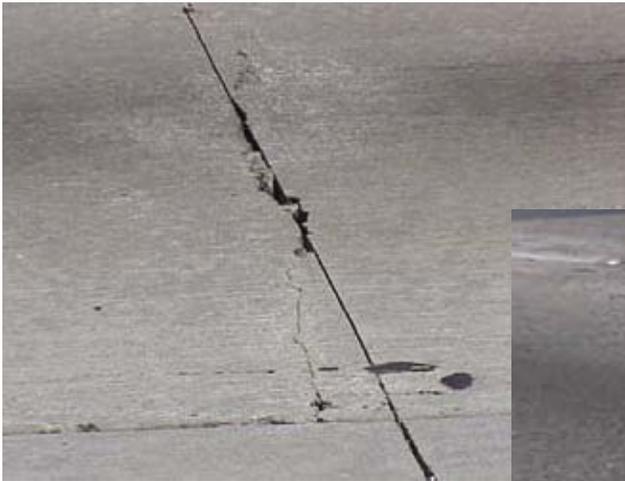
Common Rigid Pavement Distresses

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

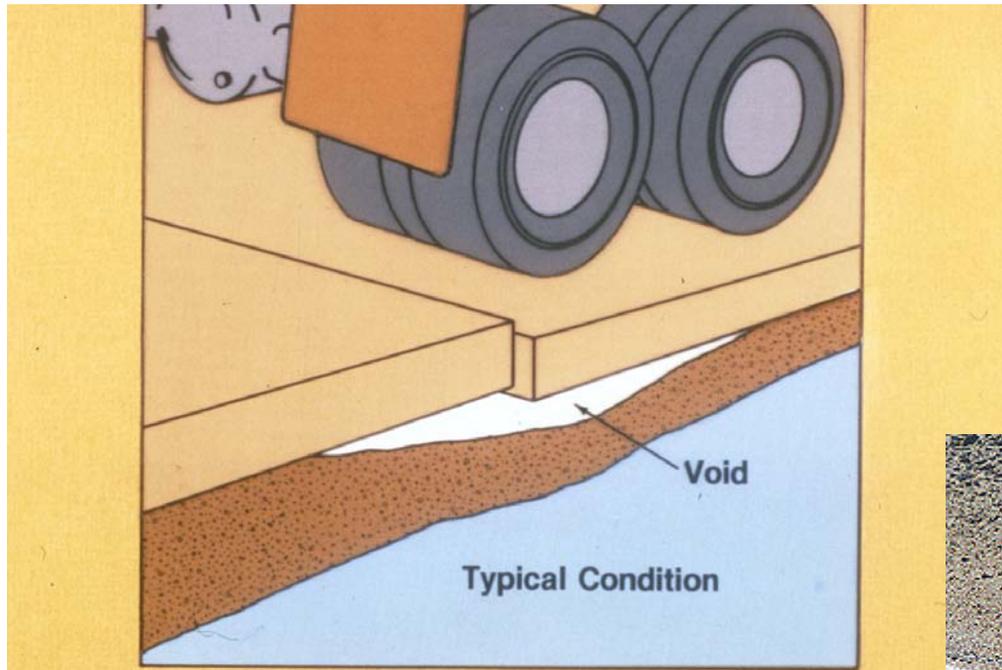
References

- “Slab Replacement Guidelines,” Caltrans, January 2003
- “Distress Identification Manual for the Long-Term Pavement Performance Program,” FHWA, June 2003

Spalling at the Joint



Faulting



Longitudinal Cracking



Transverse Cracking



Common Rigid Pavement Distresses

Slab Cracking



Common Rigid Pavement Distresses

Corner Cracking



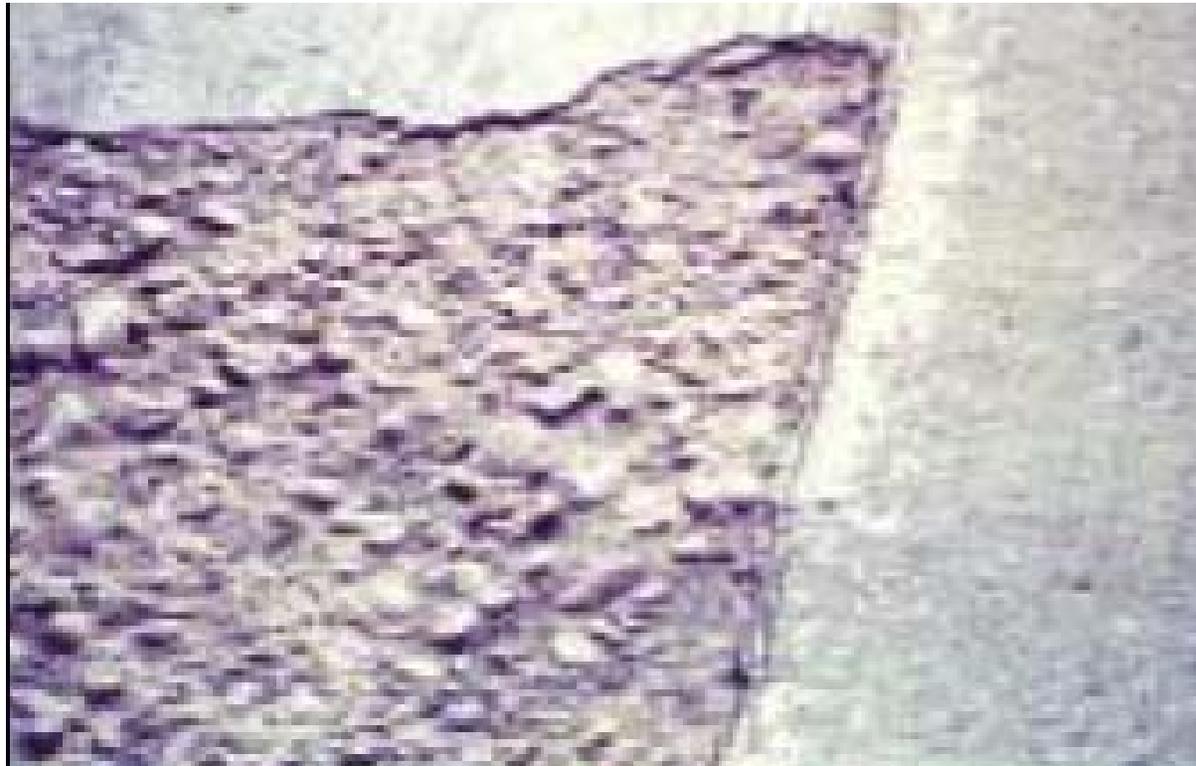
Common Rigid Pavement Distresses

"D" Cracking



Common Rigid Pavement Distresses

Scaling



Surface Polish/Polished Aggregate



Common Rigid Pavement Distresses

Severe Surface Abrasion with Third Stage Cracking



Common Rigid Pavement Distresses

Popouts

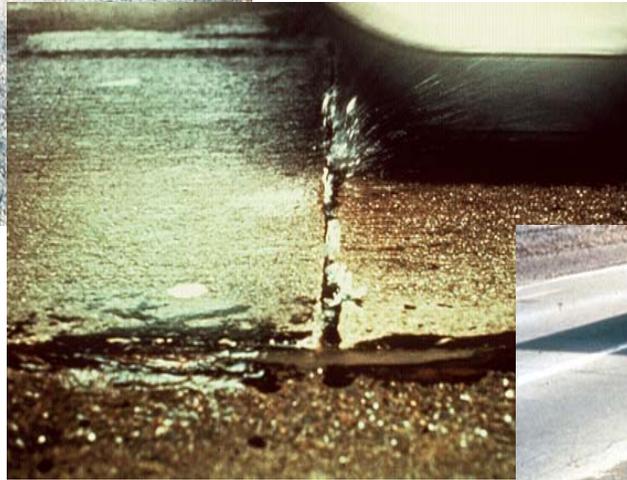


Common Rigid Pavement Distresses

Blow-ups



Pumping and Water Bleeding



Common Rigid Pavement Distresses

Lane/Shoulder Drop-Off



Settlement



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
Possible causes of cracking: 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
Possible causes of joint/crack deterioration: 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 **						
Possible causes of punchouts: 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
Possible causes of durability distresses: 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.

Summary

- 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

Thank You

Questions?