PCI CONCRETE SLAB SURVEY

Drawn from ASTM D6433 – 16 "Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys"

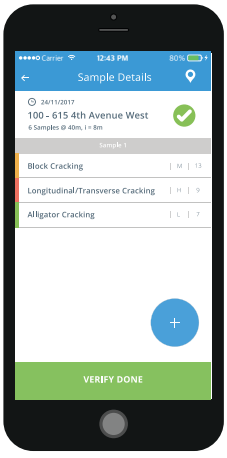
Version 2

March 16, 2016

EQUIPMENT REQUIRED

SAFETY GEAR

SURVEY WHEEL



SMARTPHONE

TotalPave

SURVEY STEPS

1. SELECT SECTION

- Press (+) button on main page of app
- Scroll map over section, press Select
- Enter Surface Type and Slab Width / Length if required

2. MARK SAMPLE

- Choose representative samples
- A sample is 20 contiguous slabs +/- 8 slabs
- If slabs width/length is greater than 8m, slabs are divided into imaginary slabs

3. WALK SAMPLE, RECORD DISTRESSES

- Only record distresses that are present inside sample area

IDENTIFYING A DISTRESS

CLASSIFY THE DISTRESS

- Based on visual assessment
- Use pictures in the manual

RATE SEVERITY

- Based on physical characteristics of the distress

MEASURE EXTENT

- Slab count

Blowups / Buckling

How to measure: Occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit slab expansion. When expansion cannot relieve enough pressure, a localized upward movement of the slab edges (buckling) or shattering will occur in the vicinity of the joint.

LOW SEVERITY

- Causes low-severity ride quality

MEDIUM SEVERITY

- Causes medium-severity ride quality

HIGH SEVERITY

- Causes high-severity ride quality

Corner Break

How to measure: Crack that intersects the joints at a distance less than or equal to one-half the slab length on both sides, measured from the corner of the slab. Corner break differs from a corner spall in that the crack extends vertically through the entire slab thickness, whereas a corner spall intersects the joint at an angle. For two or more breaks, the highest level of severity should be recorded.

LOW SEVERITY

- Break is defined by a low-severity crack <13 mm (1⁄2 in.),
- Cracks of any width with satisfactory filler

MEDIUM SEVERITY

- Nonfilled crack >13 mm and <50 mm (>1⁄2 in. and <2 in.)
- Nonfilled crack <50 mm (2 in.) with faulting <10 mm (3⁄8 in.)
- Filled crack with faulting <10 mm (3⁄8 in.)

HIGH SEVERITY

- Nonfilled crack >50 mm (2 in.)
- Filled or nonfilled crack with faulting >10 mm (3⁄8 in.)
- Area between the break and the joints, or both, is highly cracked

Divided Slab

How to measure: Slab is divided by cracks into four or more pieces due to overloading or inadequate support, or both. If all pieces or cracks are contained within a corner break, the distress is categorized as a severe corner break. If the divided slab is medium or high severity, no other distress is counted for that slab.

LOW SEVERITY

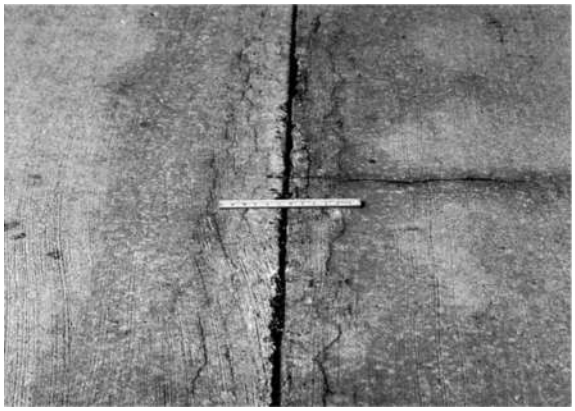
MEDIUM SEVERITY

HIGH SEVERITY

Severity of the Majority of Cracks	Number of Pieces in Cracked Slab		
	4 to 5	6 to 8	More than 8
L	L	L	M
M	L	M	H
H	M	H	H

Durability “D” Cracking

How to measure: Caused by freeze-thaw expansion of the large aggregate, which, over time, gradually breaks down the concrete. This distress usually appears as a pattern of cracks running parallel and close to a joint or linear crack. Since the concrete becomes saturated near joints and cracks, a dark-colored deposit can usually be found around fine “D” cracks.



LOW SEVERITY

- Cover less than 15 % of slab area. Most of the cracks are tight, but a few pieces may be loose and or missing

MEDIUM SEVERITY

- Cover less than 15 % of the area and most of the pieces are loose and or missing
- Cover more than 15 % of the area, most of the cracks are tight, but a few pieces may be loose and or missing

HIGH SEVERITY

- Cover more than 15 % of the area and most of the pieces have come out or could be removed easily

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Faulting

How to measure: Difference in elevation across a joint. Some common causes of faulting are: settlement, pumping or eroding of material under slab, curling of slab edges due to temperature changes.

LOW SEVERITY

MEDIUM SEVERITY

HIGH SEVERITY

Severity Level	Difference of Elevation
L	>3 and <10 mm (>⅛ and <⅜ in.)
M	>10 and <20 mm (>⅜ and <¾ in.)
H	>20 mm (>¾ in.)

Joint Seal Damage

How to measure: Any condition that enables soil or rocks to accumulate in the joints or allows significant water infiltration. Joint seal damage is not counted on a slab-by-slab basis but is rated based on the overall condition of the sealant over the entire area.

LOW SEVERITY

- Joint sealant is in generally good condition throughout section
- Few of the joints have sealer, which has debonded from, but is still in contact with, the joint edge

MEDIUM SEVERITY

- Joint sealant is in generally fair condition over the entire section
- Visible openings no more than 3 mm (1⁄8 in.)

HIGH SEVERITY

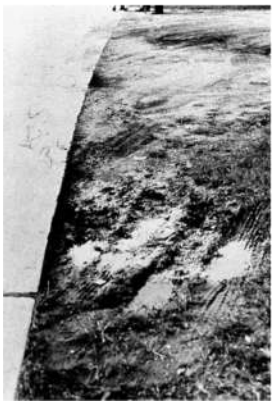
- Joint sealant is in generally poor condition over the entire section
- Sealant needs replacing and at least 10% of sealant is missing

Lane/Shoulder Drop-off

How to measure: Lane/shoulder drop-off is the difference between the settlement or erosion of the shoulder and the pavement travel-lane edge. The mean lane/shoulder drop-off is computed by averaging the maximum and minimum drop along the slab.

LOW SEVERITY

- The difference between the pavement edge and shoulder is >25 and ≤50 mm (>1 and ≤2 in.)



MEDIUM SEVERITY

- The difference in elevation is >50 and ≤100 mm (>2 and ≤4 in.)

HIGH SEVERITY

- The difference in elevation is >100 mm (>4 in.)

Linear Cracking

How to measure: Cracks dividing slab into two or three pieces. Slabs divided into four or more pieces are counted as divided slabs. Hairline cracks that are only a few feet long and do not extend across the entire slab, are counted as shrinkage cracks. Once the severity has been identified, the distress is recorded as one slab. If two medium- severity cracks are within one slab, the slab is counted as having one high-severity crack.

LOW SEVERITY

- Non-reinforced: Nonfilled4 cracks ≤13 mm (≤1⁄2 in.) or filled cracks of any width
- Reinforced: Nonfilled cracks ≥3 and <25 mm (≥1⁄8 to <1 in.) wide; filled crack of any width

MEDIUM SEVERITY

- Non-reinforced: >13 and ≤50 mm (>1⁄2 and ≤2 in.); ≤50 mm (2 in.) with faulting <10 mm (3⁄8 in.),
- Reinforced: ≥25 and <75 mm (≥1 and <3 in.); width ≤75 mm (3 in.) with ≤10 mm (3⁄8 in.) of faulting

HIGH SEVERITY

- Non-reinforced: : >50 mm (2 in.); filled or nonfilled crack of any width with faulting >10 mm (3⁄8 in.)
- Reinforced: >75 mm (3 in.); filled or nonfilled crack of any width with faulting >10 mm (3⁄8 in.)

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Large Patching (>0.5m² (5.5ft²))

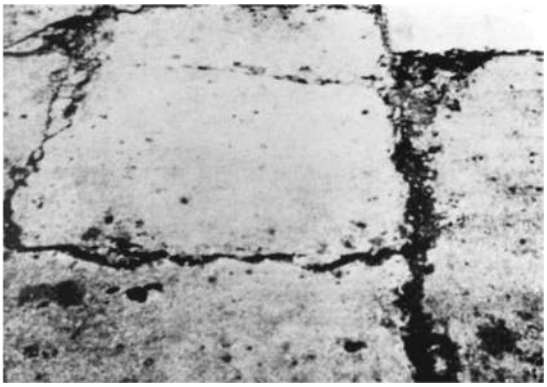
How to measure: Area where the original pavement has been removed and replaced by filler material. If a single slab has more than one severity level, it is counted as one slab with the higher severity level.

LOW SEVERITY

- Functioning well, with little or no deterioration

MEDIUM SEVERITY

- Moderately deteriorated, or moderate spalling can be seen around the edges, or both. Patch material can be dislodged with considerable effort



HIGH SEVERITY

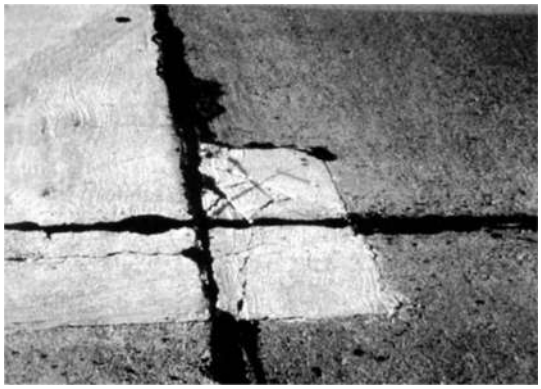
- Patch is badly deteriorated. The extent of the deterioration warrants replacement.

Small Patching (<0.5m² (5.5ft²))

How to measure: Area where the original pavement has been removed and replaced by filler material. If a single slab has more than one severity level, it is counted as one slab with the higher severity level.

LOW SEVERITY

- Functioning well, with little or no deterioration



MEDIUM SEVERITY

- Moderately deteriorated, or moderate spalling can be seen around the edges, or both. Patch material can be dislodged with considerable effort

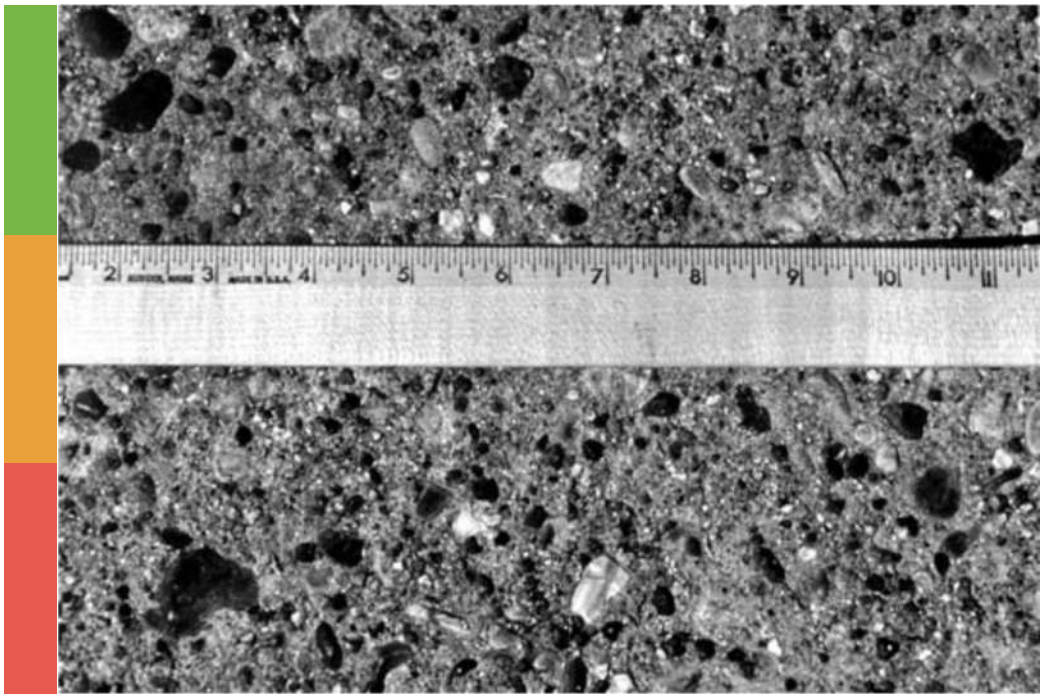
HIGH SEVERITY

- Patch is badly deteriorated. The extent of the deterioration warrants replacement.

TotalPave

Polished Aggregate

How to measure: The portion of aggregate extending above the asphalt matrix is either very small, or there are no rough or angular aggregate particles to provide good skid resistance.



SINGLE SEVERITY

- Polished aggregate is not rated by severity
- Degree of polishing should be clearly evident and significant in the slab
- Surface aggregate should be smooth to the touch

Popouts

How to measure: small piece of pavement that breaks loose from the surface due to freeze-thaw action combined with expansive aggregates. Popouts usually range in diameter from approximately 25 to 100 mm (1 to 4 in.) and in depth from 13 to 50 mm (1⁄2 to 2 in.).

SINGLE SEVERITY

- No degrees of severity are defined.
- Average popout density must exceed approximately three popouts/m2 over the entire slab area.

Pumping

How to measure: Ejection of material from the slab foundation through joints or cracks. Identified by surface stains and evidence of base or subgrade material on the pavement close to joints or cracks. One pumping joint between two slabs is counted as two slabs; however, if the remaining joints around the slab are also pumping, one slab is added per additional pumping joint.

SINGLE SEVERITY

- Not rated by severity

Punchout

How to measure: Localized area of the slab that is broken into pieces. The punchout can take many different shapes and forms, but it is usually defined by a crack and a joint. The distance between the join and the crack or two closely spaced cracks is ≤1.5 m (5 ft) wide. If a slab contains more than one punchout or a punchout and a crack, it is counted as shattered.

LOW SEVERITY

MEDIUM SEVERITY

HIGH SEVERITY

Severity of the Majority of Cracks	Number of Pieces		
	2 to 3	4 to 5	>5
L	L	L	M
M	L	M	H
H	M	H	H

Railroad Crossing

How to measure: Railroad crossing distress is characterized by depressions or bumps around the tracks. The number of slabs crossed by the railroad tracks is counted. Any large bump created by the tracks should be counted as part of the crossing.

LOW SEVERITY

- Causes low-severity ride quality

MEDIUM SEVERITY

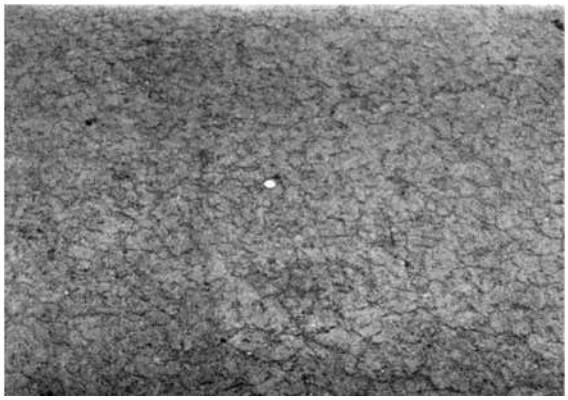
- Causes medium-severity ride quality

HIGH SEVERITY

- Causes high-severity ride quality

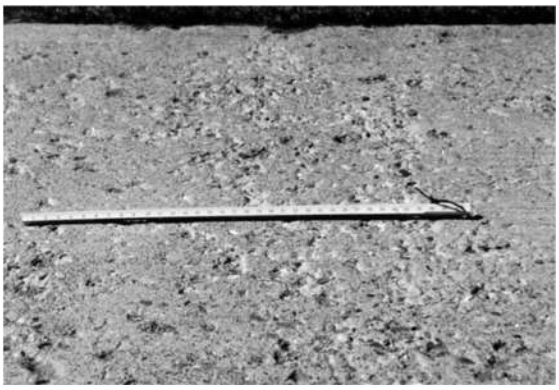
Scaling/Map Cracking/Crazing

How to measure: network of shallow, fine, or hairline cracks that extend only through the upper surface of the concrete. The cracks tend to intersect at angles of 120°. If scaling is caused by “D” cracking, it should be counted under that distress only. Low-severity crazing only should be counted if the potential for scaling appears to be imminent or a few small pieces come out.



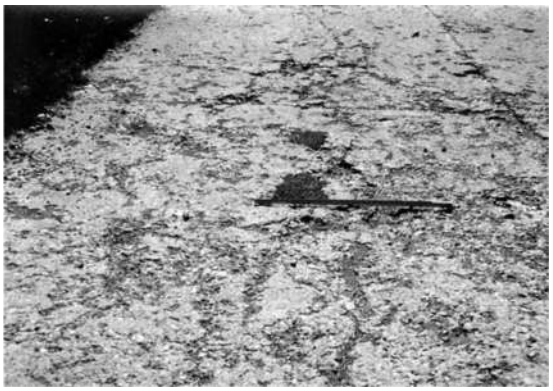
LOW SEVERITY

- Exists over most of the slab area
- Surface is in good condition, with only minor scaling present



MEDIUM SEVERITY

- Slab is scaled but less than 15 % of the slab is affected



HIGH SEVERITY

- Slab is scaled over more than 15% of its area

TotalPave

Shrinkage Cracks

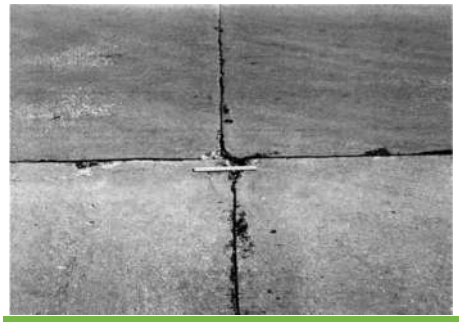
How to measure: Hairline cracks that usually are less than 2 m long and do not extend across the entire slab formed during curing. If any shrinkage cracks exist on a particular slab, the slab is counted as one slab with shrinkage cracks.

SINGLE SEVERITY

- No degrees of severity are defined. It is enough to indicate that shrinkage cracks are present

Spalling, Corner

How to measure: Breakdown of the slab within approximately 0.5 m (1.5 ft) of the corner. A corner spall differs from a corner break in that the spall usually angles downward to intersect the joint, whereas a break extends vertically through the slab corner. Spalls less than 130 mm (5 in.) from the crack to the corner on both sides should not be counted. Count the highest severity.



LOW SEVERITY

MEDIUM SEVERITY

HIGH SEVERITY

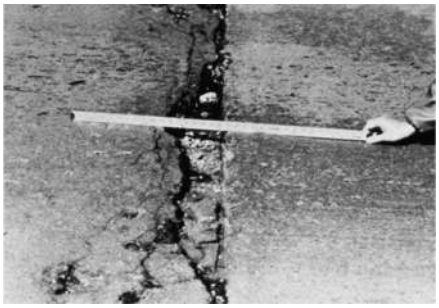
Depth of Spall	Dimensions of Sides of Spall	
	130 × 130 mm to 300 × 300 mm (5 × 5 in.) to (12 × 12 in.)	300 × 300 mm (>12 × 12 in.)
<25 mm (1 in.)	L	L
>25 to 50 mm (1 to 2 in.)	L	M
>50 mm (2 in.)	M	H

Spalling, Joint

How to measure: Breakdown of the slab edges within 0.5 m (1.5 ft) of the joint. If spall is along the edge of one slab, it is counted as one slab with joint spalling. If spalling is on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling also can occur along the edges of two adjacent slabs.

LOW SEVERITY

MEDIUM SEVERITY



HIGH SEVERITY

Spall Pieces	Width of Spall	Length of Spall <0.5 m (1.5 ft)	Length of Spall >0.5 m (1.5 ft)
Tight – cannot be removed easily (maybe a few pieces missing.	<100 mm (4 in.)	L	L
	>100 mm	L	L
Loose – can be removed and some pieces are missing; if most or all pieces are missing, spall is shallow, less than 25 mm (1 in.).	<100 mm	L	M
	>100 mm	L	M
Missing – most or all pieces have been removed.	<100 mm	L	M
	>100 mm	M	H