CONCRETE SURFACED AIRFIELDS

PAVER™ DISTRESS IDENTIFICATION MANUAL

DEVELOPED BY:

US ARMY CORPS OF ENGINEERS
ERDC-CERL

AMENDED BY:

AIR FORCE CIVIL ENGINEER CENTER
AFCEC/COAP

FOREWORD

The basic PAVER Distress Identification Manual contains definitions and measuring methods for determining the Pavement Condition Index of Concrete Surface Airfields. It implements STANAG 7181 ED 1 RD 1, *Standard Test Method for Airfield Pavement Condition Index (PCI) Surveys.*

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June 2009

Additions were made by AFCEC/COAP to facilitate the manual's usefulness in the performance of contingency Pavement Condition Index (PCI) surveys. These additions include:
- Definitions of 'Standard', 'Simplified' , and 'Cursory' type PCI surveys.
- A brief description of the PCI and Pavement Condition Rating Scales.
- Explanation of the purpose of the PCI survey in contingency scenarios.
- Step by step procedures for performing a 'Simplified' PCI.
- Table 1, Rigid Pavement (PCC) Individual Distress Deduct Values which can be used in lieu of the numerous “PCC Pavement Deduct Curves” contained in ASTM D5340-11.
- Table 2, Corrected Deduct Values for Rigid (PCC) Pavement Distresses which can be used in lieu of the “Corrected DVs for Jointed Rigid Airfield Pavements” chart contained in ASTM D5340-11.

August 2015

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OBJECTIVE AND SCOPE OF THIS MANUAL

The basic manual contains distress definitions and measurement methods for concrete surfaced airfields as originally developed by ERDC-CERL. With the AFCEC/COAP amendments, it is used to quantify the identified distresses with deduct values and to calculate the reportable Pavement Condition Index (PCI) and Pavement Condition Rating for each surveyed pavement section in a contingency scenario.

GENERAL GUIDANCE

Measuring.

1. Generally the highest severity of a given distress on a slab is counted for that slab.
2. Crack widths are measured between the vertical walls. Do not count spalling as part of the overall condition of the joint seal in the sampled area.

Slab Size.

1. Slabs must be at least ¼ the area of the typical slabs contained in the sample area to be counted. Distresses on slabs that are not counted are not recorded and included in the calculation of the sample's pavement condition index.
2. Panel replacements with smaller slabs are counted as one slab. For example, if an original 20' x 20' slab was replaced by four 10'x10' slabs, it would still be counted as one slab. If enough contiguously located panels have been replaced with smaller panels to meet a standard sample size, then a new section may be created.

FREQUENTLY OCCURRING PROBLEMS IN PAVEMENT DISTRESS IDENTIFICATION

Situation	Action	Remarks
1. Low severity scaling (i.e., crazing)	Count only if possible future scaling will occur within 2 to 3 years	
2. Joint seal damage	This is not counted on a slab-by-slab basis	A severity level based on the overall condition of the joint seal in the sample unit is assigned
3. Joint spall small enough to be filled during a joint seal repair	Do not record	
4. Medium or high severity intersecting crack (shattered slab)	No other distress should be counted	
5. Corner or joint spalling caused by “D” cracking	Only “D” cracking should be recorded	If spalls are caused by factors other than “D” cracking, record each factor separately
6. Crack repaired by a narrow patch (e.g. 100 to 250 millimeters wide)	Record only crack and not patch at appropriate severity level	
7. Original distress of patch more severe than patch itself	Original distress type should be recorded	If, for example, patch material present on scaled area of slab, only the scaling is counted
8. Hairline cracks that are only a few feet long and that do not extend across the entire slab	Should be rated as shrinkage cracks	
9. High severity Alkali-Silica Reaction (ASR)	No other distress should be counted.	

BLOWUP (61)*

Description

Blowups occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit expansion by the concrete slabs. The insufficient width is usually caused by infiltration of incompressible materials into the joint space. When expansion cannot relieve enough pressure, a localized upward movement of the slab edges (buckling) or shattering will occur at utility cuts and drainage inlets. This type of distress is almost always repaired immediately because of severe damage potential to aircraft. Blowups are included for reference when closed sections are being evaluated for reopening.

Severity Levels

L Buckling or shattering has not rendered the pavement inoperative, and only a slight amount of roughness exists.

M Buckling or shattering has not rendered the pavement inoperative, but a significant amount of roughness exists.

H Buckling or shattering has rendered the pavement inoperative.

(Note: For pavements to be considered operational, all foreign material from blowups must have been removed.)

How To Count

A blowup usually occurs at a transverse crack or joint. At a crack, it is counted as being in one slab, but at a joint, two slabs are affected and the distress should be recorded as occurring in two slabs.

**PAVER™ Distress Code*

HIGH MEDIUM LOW

61 BLOWUP

CORNER BREAK (62)

Description

A corner break is a 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. For example, a slab with dimensions of 25 by 25 feet (7 1/2 by 7 1/2 meters) that has a crack intersecting the joint 5 feet (1 1/2 meters) from the corner on one side and 17 feet (5 meters) on the other side is not considered a corner break; it is a diagonal crack. However, a crack that intersects 7 feet (2 meters) on one side and 10 feet (3 meters) on the other is considered a corner break. A corner break differs from a corner spall in that the crack extends vertically through the entire slab thickness, while a corner spall intersects the joint at an angle. Load repetition combined with loss of support and curling stresses cause corner breaks.

Severity Levels

L Crack has either no spalling or minor spalling (no FOD potential). If non-filled, it has a mean width less than approximately 1/8 inch (3 mm); a filled crack can be of any width, but the filler material must be in satisfactory condition. The area between the corner break and the joints is not cracked.

M One of the following conditions exists: (1) filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 1/8 inch (3 mm) and 1 inch (25 mm); (3) a filled crack is not spalled or only lightly spalled, but the filler is in unsatisfactory condition; (4) the area between the corner break and the joints is lightly cracked. Lightly cracked means one low severity crack dividing the corner into two pieces.

H One of the following conditions exists: (1) filled or non-filled crack is severely spalled, causing definite FOD potential; (2) a non-filled crack has a mean width greater than approximately 1 inch (25 mm), creating a tire damage potential; or (3) the area between the corner break and the joints is severely cracked.

How To Count

A distressed slab is recorded as one slab if it (1) contains a single corner break, (2) contains more than one break of a particular severity, or (3) contains two or more breaks of different severities. For two or more breaks, the highest level of severity should be recorded. For example, a slab containing both light and medium severity corner breaks should be counted as one slab with a medium severity corner break. Crack widths should be measured between vertical walls, not in spalled areas of the crack. If the corner break is faulted 1/8 inch (3 mm) or more, increase severity to the next higher level. If the corner is faulted more than 1/2 inch (13 mm), rate the corner break at high severity. If faulting in corner is incidental to faulting in the slab, rate faulting separately. The angle of crack into the slab is usually not evident at low severity. Unless the crack angle can be determined, to differentiate between the corner break and corner spall, use the following criteria. If the crack intersects both joints more than 2 feet (600 mm) from the corner, it is a corner break. If it is less than 2 feet, unless you can verify the crack is vertical, call it a spall.

HIGH

MEDIUM

LOW

62 CORNER BREAK

CRACKS (LONGITUDINAL, TRANSVERSE, AND DIAGONAL) (63)

Description

These cracks, which divide the slab into two or three pieces, are usually caused by a combination of load repetition, curling stresses, and shrinkage stresses. (For slabs divided into four or more pieces, see Shattered Slab/ Intersecting Cracks.) Low severity cracks are usually warping or friction related and are not considered major structural distresses. Medium or high severity cracks are usually working cracks and are considered major structural distresses.

Hairline cracks that are only a few feet long and do not extend across the entire slab are rated as shrinkage cracks.

Non-reinforced PCC Severity Levels

L Crack has no spalling or minor spalling (no FOD potential). If non-filled, it is less than 1/8 inch (3 mm) wide. A filled crack can be of any width, but its filler material must be in satisfactory condition; or the slab is divided into three pieces by low severity cracks.

M One of the following conditions exists: (1) a filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 1/8 inch (3 mm) and 1 inch (25 mm); (3) a filled crack has no spalling or minor spalling, but the filler is in unsatisfactory condition; or (4) the slab is divided into three pieces by two or more cracks, one of which is at least medium severity.

H One of the following conditions exists: (1) a filled or non-filled crack is severely spalled (definite FOD potential); (2) a non-filled crack has a mean width approximately greater than 1 inch (25 mm), creating tire damage potential, or (3) the slab is divided into three pieces by two or more cracks, one of which is at least high severity.

How To Count

Once the severity has been identified, the distress is recorded as one slab. If a crack is repaired by a narrow patch (e.g., 4 to 10 inches wide (100 to 250 mm)), only the crack and not the patch should be recorded at the appropriate severity level.

Cracks used to define and rate corner breaks, “D” cracks, patches, shrinkage cracks, and spalls are not recorded as L/T/D cracks.

HIGH

MEDIUM

LOW

63 CRACKS

CRACKS (LONGITUDINAL, TRANSVERSE, AND DIAGONAL) (63) (CONTINUED)

Reinforced Concrete Severity Levels

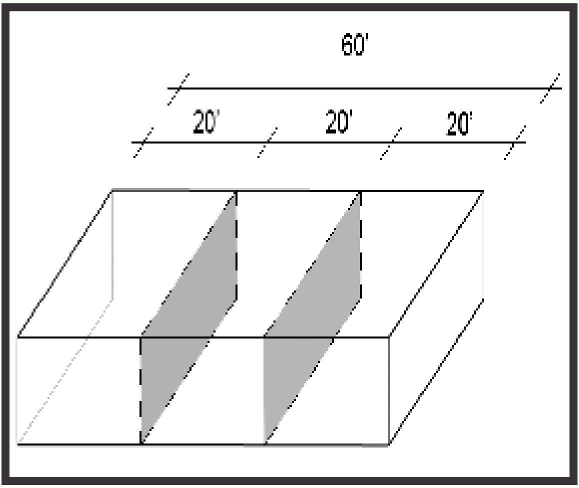
L (1) Non-filled crack, 1/8 inch (3 mm) to 1/2 inch (13 mm) wide, with no faulting or spalling; (2) filled or non-filled cracks of any width < 1/2 inch (13 mm), with low severity spalling; or (3) filled cracks of any width (filler satisfactory), with no faulting or spalling. (Note: Crack less than 1/8 inch (3 mm) wide with no spalling or faulting should be counted as shrinkage cracking.)

M (1) Non-filled cracks, 1/2 inch (13 mm) to 1 inch (25 mm) wide, no faulting or spalling; (2) filled cracks of any width, with faulting < 3/8 inch (10 mm) or medium severity spalling; or (3) non-filled cracks of width < 1 inch (25 mm) with faulting < 3/8 inch (10 mm) or medium severity spalling.

H (1) Non-filled cracks of width > 1 inch (25 mm); (2) non-filled cracks of any width, with faulting > 3/8 inch (10 mm) or medium severity spalling; or (3) filled cracks of any width, with faulting > 3/8 inch (10 mm) or high severity spalling.

How To Count

Once the severity has been identified, the distress is recorded as one slab. If a crack is repaired by a narrow patch (e.g., 4 to 10 inches wide (100 to 250 mm)), only the crack and not the patch should be recorded at the appropriate severity level. Slabs longer than 25 feet (8 meters) are divided into approximately equal length “slabs” having imaginary joints assumed to be in perfect condition.


60'
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20'
20'

DURABILITY ("D") CRACKING (64)

Description

Durability cracking is caused by the inability of the concrete to withstand environmental factors such as freeze-thaw cycles. It usually appears as a pattern of cracks running parallel to a joint or linear crack. A dark coloring can usually be seen around the fine durability cracks. This type of cracking may eventually lead to disintegration of the concrete within 1 to 2 feet (0.3 to 0.6 meters) of the joint or crack.

Severity Levels

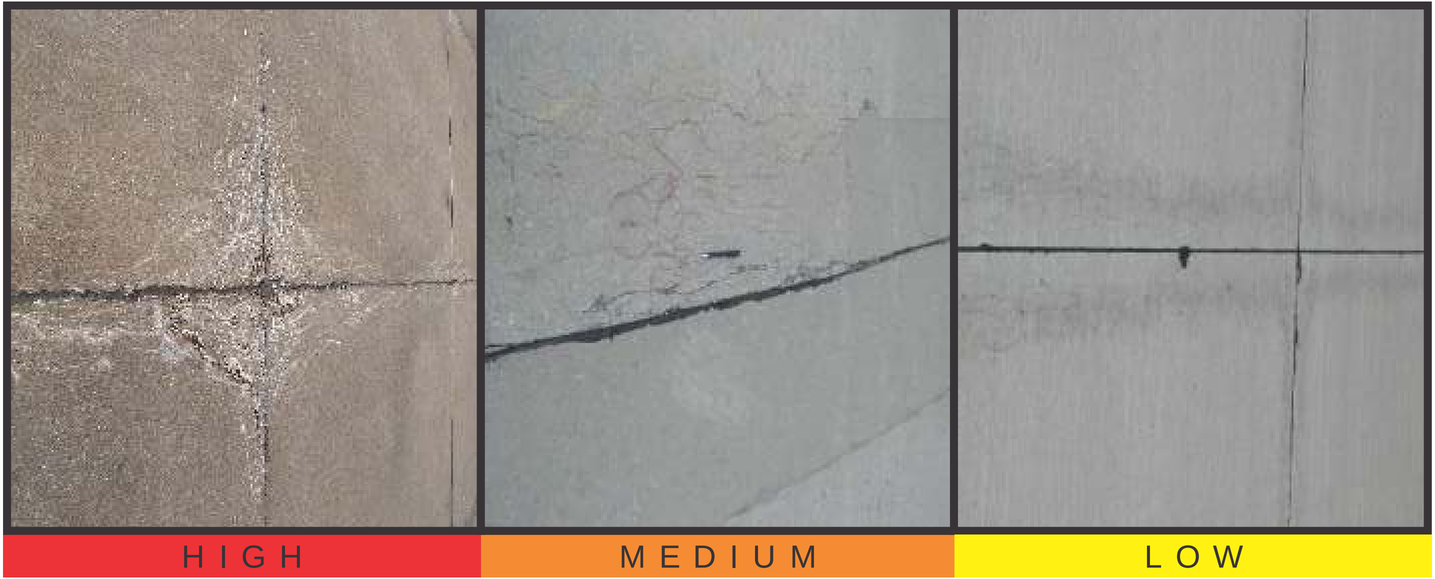
L "D" cracking is defined by hairline cracks occurring in a limited area of the slab, such as one or two corners along one joint. Little or no disintegration has occurred. No FOD potential.

M (1) "D" cracking has developed over a considerable amount of slab area with little or no disintegration or FOD potential; or (2) "D" cracking has occurred in a limited area of the slab, such as in one or two corners or along one joint, but pieces are missing and disintegration has occurred. Some FOD potential.

H "D" cracking has developed over a considerable amount of slab area with disintegration or FOD potential.

How To Count

When the distress is located and rated at one severity, it is counted as one slab. If more than one severity level is found, the slab is counted as having the higher severity distress. If "D" cracking is counted, scaling on the same slab should not be recorded.



64 DURABILITY

JOINT SEAL DAMAGE (65)

Description

Joint seal damage is any condition which enables soil or rocks to accumulate in the joints or allows significant infiltration of water. Accumulation of incompressible materials prevents the slabs from expanding and may result in buckling, shattering, or spalling. A pliable joint filler bonded to the edges of the slabs protects the joints from accumulation of materials and also prevents water from seeping down and softening the foundation supporting the slab. Typical types of joint seal damage are (a) stripping of joint sealant, (b) extrusion of joint sealant, (c) weed growth, (d) hardening of the filler (oxidation), (e) loss of bond to the slab edges, and (f) lack or absence of sealant in the joint.

Severity Levels

L Joint sealer is in generally good condition throughout the sample. Sealant is performing well, with only a minor amount of any of the above types of damage present. Joint seal damage is at low severity if a few of the joints have sealer which has debonded from, but is still in contact with, the joint edge. This condition exists if a knife blade can be inserted between the sealer and joint face without resistance.

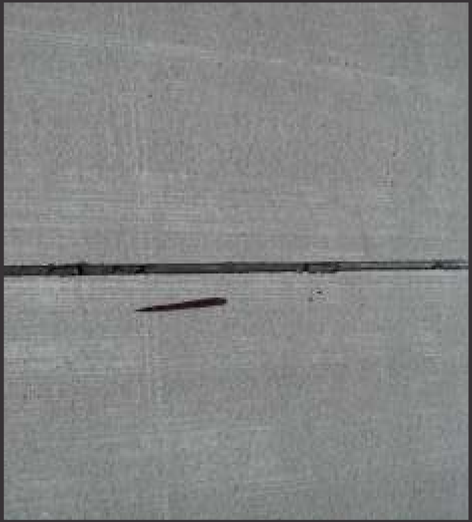
M Joint sealer is in generally fair condition over the entire surveyed section, with one or more of the above types of damage occurring to a moderate degree. Sealant needs replacement within 2 years. Joint seal damage is at medium severity if a few of the joints have any of the following conditions: (1) joint sealer is in place, but water access is possible through visible openings no more than 1/8 inch (3 mm) wide. If a knife blade cannot be inserted easily between sealer and joint face, this condition does not exist; (2) pumping debris are evident at the joint; (3) joint sealer is oxidized and 'lifeless' but pliable (like a rope), and generally fills the joint opening; or (4) vegetation in the joint is obvious, but does not obscure the joint opening.

H Joint sealer is in generally poor condition over the entire surveyed section, with one or more of the above types of damage occurring to a severe degree. Sealant needs immediate replacement. Joint seal damage is at high severity if 10% or more of the joint sealer exceeds limiting criteria listed above, or if 10% or more of sealer is missing.

How To Count

Joint seal damage is not counted on a slab-by-slab basis but is rated based on the overall condition of the sealant in the sample unit. Joint sealer is in satisfactory condition if it prevents entry of water into the joint, it has some elasticity, and if there is no vegetation growing between the sealer and joint face. Premolded sealer is rated using the same criteria as above except as follows: (1) premolded sealer must be elastic and must be firmly pressed against the joint walls; and (2) premolded sealer must be below the joint edge. If it extends above the surface, it can be caught by moving equipment such as snow plows or brooms and be pulled out of the joint. Premolded sealer is recorded at low severity if any part is visible above joint edge. It is at medium severity if 10% or more of the length is above joint edge or if any part is more than 1/2 inch (13 mm) above joint edge. It is at high severity if 20% or more is above joint edge or if any part is more than 1 inch (25 mm) above joint edge, or if 10% or more is missing. Rate joint sealer by joint segment. Sample unit rating is the same as the most severe rating held by at least 20% of segments rated. In rating oxidation, do not rate on appearance. Rate on resilience. Some joint sealer will have a very dull surface, and may even show surface cracks in the oxidized layer. If the sealer is performing satisfactorily and has good characteristics beneath the surface, it is satisfactory.

HIGH



MEDIUM

LOW

65 JOINT SEAL DAMAGE

PATCHING, SMALL (LESS THAN 5.5 FT^2 (0.5 M^2)) (66)

Description

A patch is an area where the original pavement has been removed and replaced by a filler material. For condition evaluation, patching is divided into two types: small (less than 5.5 square feet (0.5 square meters)) and large (over 5.5 square feet (0.5 square meters)). Large patches are described in the next section.

Severity Levels

L — Patch is functioning well, with little or no deterioration.

M — Patch has deteriorated, and/ or moderate spalling can be seen around the edges. Patch material can be dislodged, with considerable effort (minor FOD potential).

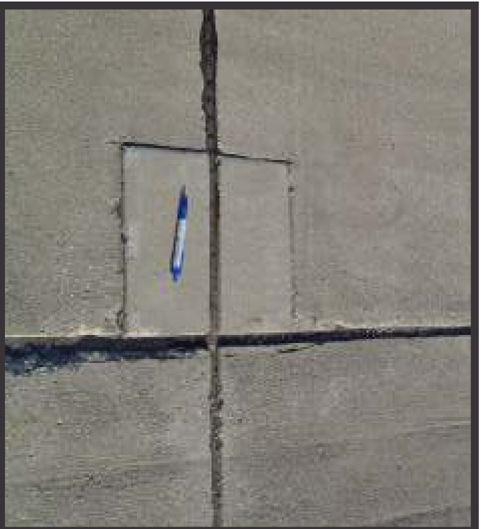
H — Patch has deteriorated, either by spalling around the patch or cracking within the patch, to a state which warrants replacement.

How To Measure

If one or more small patches having the same severity level are located in a slab, it is counted as one slab containing that distress. If more than one severity level occurs, it is counted as one slab with the higher severity level being recorded. If a crack is repaired by a narrow patch (e.g., 4 to 10 inches (100 to 250 mm) wide), only the crack and not the patch should be recorded at the appropriate severity level. If the original distress of a patch is more severe than the patch itself, the original distress type should be recorded.

HIGH

MEDIUM



LOW

66 PATCHING, SMALL

PATCHING, LARGE (OVER 5.5 FT^2 (0.5 M^2)) AND UTILITY CUT (67)

Description

Patching is the same as defined in the previous section. A utility cut is a patch that has replaced the original pavement because of placement of underground utilities. The severity levels of a utility cut are the same as those for regular patching.

Severity Levels

- **L** Patch is functioning well with very little or no deterioration.
- **M** Patch has deteriorated and/ or moderate spalling can be seen around the edges. Patch material can be dislodged with considerable effort, causing some FOD potential.
- **H** Patch has deteriorated to a state which causes considerable roughness and/ or high FOD potential. The extent of the deterioration warrants replacement of the patch.

How To Count

The criteria are the same as for small patches.

Replacement slabs are not considered patches. If there are a significant number of contiguously located replacement slabs, the replaced area should be identified as a separate pavement section. Generally, significant means are a area covering more than ¼ of the original pavement section.

HIGH

MEDIUM

LOW

67 PATCHING, LARGE

POPOUTS (68)

Description

A popout is a small piece of pavement that breaks loose from the surface due to freeze-thaw action in combination with expansive aggregates. Popouts usually range from approximately 1 inch (25 mm) to 4 inches (100 mm) in diameter and from 1/2 inch (13 mm) to 2 inches (50 mm) deep.

Severity Levels

No degrees of severity are defined for popouts. However, popouts must be extensive before they are counted as a distress; i.e., average popout density must exceed approximately three popouts per square yard (square meter) over the entire slab area.

How To Count

The density of the distress must be measured. If there is any doubt about the average being greater than three popouts per square yard (square meter), at least three, random, 1 square yard (1 square meter) areas should be checked. When the average is greater than this density, the slab is counted.

PUMPING (69)

Description

Pumping is the ejection of material by water through joints or cracks caused by deflection of the slab under passing loads. As the water is ejected, it carries particles of gravel, sand, clay, or silt and results in a progressive loss of pavement support. Surface staining and base or subgrade material on the pavement close to joints or cracks are evidence of pumping. Pumping near joints indicates poor joint sealer and loss of support which will lead to cracking under repeated loads. The joint seal must be identified as defective before pumping can be said to exist. Pumping can occur at cracks as well as joints.

Severity Levels

No degrees of severity are defined. It is sufficient to indicate that pumping exists.

How To Count

Slabs are counted as follows: 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.


69 PUMPING

SCALING (70)

Description

Surface deterioration caused by construction defects, material defects and environmental factors. Generally scaling is exhibited by delamination or disintegration of the slab surface to the depth of the defect.

Construction defects include: over-finishing, addition of water to the pavement surface during finishing, lack of curing, attempted surface repairs of fresh concrete with mortar. Generally this occurs over a portion of a slab.

Material defects include: inadequate air entrainment for the climate. Generally this occurs over several slabs that were affected by the concrete batches.

Environmental factors: freezing of concrete before adequate strength gained or thermal cycles from certain aircraft. Generally over a large area for freezing, and isolated areas for thermal effects.

Typically, the FOD from scaling is removed by sweeping, but the concrete will continue to scale until the affected depth is removed or expended.

Severity Levels

L Minimal loss of surface paste that poses no FOD hazard. No FOD potential.

M The loss of surface paste that poses some FOD potential including isolated fragments of loose mortar, exposure of the sides of coarse aggregate (less than 1/4 of the width of coarse aggregate), or evidence of coarse aggregate coming loose from the surface.

H The high severity is associated with low durability concrete that will continue to pose a high FOD hazard; normally the layer of surface mortar is observable at the perimeter of the scaled area, and is likely to continue to scale due to environmental or other factors. Indication of high severity FOD is that routine sweeping is not sufficient to avoid FOD issues.

How To Count

If two or more levels of severity exist on a slab, the slab is counted as one slab having the maximum level of severity. If “D” cracking or ASR is counted, scaling is not counted.

HIGH

MEDIUM

LOW

70 SCALING

SETTLEMENT OR FAULTING (71)

Description

Settlement or faulting is a difference of elevation at a joint or crack caused by upheaval or consolidation.

Severity Levels

Severity levels are defined by the difference in elevation across the fault and the associated decrease in ride quality and safety as severity increases.

Difference In Elevation

Severity	Runways/ Taxiways	Aprons
L	< 1/4 inch (< 6 mm)	1/8 – 1/2 inch (3 – 13 mm)
M	1/4 – 1/2 inch (6 – 13 mm)	1/2 - 1 inch (13 – 25 mm)
H	> 1/2 inch (> 13 mm)	> 1 inch (> 25 mm)

How To Count

In counting settlement, a fault between two slabs is counted as one slab. A straightedge or level should be used to aid in measuring the difference in elevation between the two slabs.

Construction-induced elevation differential is not rated in PCI procedures. Where construction differential exists, it can often be identified by the way the high side of the joint was rolled down by finishers (usually within 6 inches (150 mm) of the joint) to meet the low-slab elevation.

HIGH

MEDIUM

LOW

SHATTERED SLAB/ INTERSECTING CRACKS (72)

Description

Intersecting cracks are cracks that break the slab into four or more pieces because of overloading and/ or inadequate support. The high severity level of this distress type, as defined below, is referred to as a shattered slab. If all pieces or cracks are contained within a corner break, the distress is categorized as a severe corner break.

Severity Levels

L Slab is broken into four or five pieces predominantly defined by low severity cracks.

M (1) Slab is broken into four or five pieces with over 15 percent of the cracks of medium severity (no high severity cracks); or (2) slab is broken into six or more pieces with over 85 percent of the cracks of low severity.

H At this level of severity, the slab is called shattered: (1) slab is broken into four or five pieces with some or all of the cracks of high severity; (2) slab is broken into six or more pieces with over 15 percent of the cracks of medium or high severity.

How To Count

No other distress such as scaling, spalling, or durability cracking should be recorded if the slab is medium or high severity level, since the severity of this distress would affect the slab's rating substantially. Shrinkage cracks should not be counted in determining whether or not the slab is broken into four or more pieces.

HIGH

MEDIUM

LOW

72 SHATTERED SLAB

SHRINKAGE CRACKS (73)

Description

Shrinkage cracks are hairline cracks that are usually only a few feet long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab.

Severity Levels

No degrees of severity are defined. It is sufficient to indicate that shrinkage cracks exist.

How To Count

If one or more shrinkage cracks exist on one particular slab, the slab is counted as one slab with shrinkage cracks.

SPALLING (TRANSVERSE AND LONGITUDINAL JOINTS) (74)

Description

Joint spalling is the breakdown of the slab edges within 2 feet (60 mm) of the side of the joint. A joint spall usually does not extend vertically through the slab but intersects the joint at an angle. Spalling results from excessive stresses at the joint or crack caused by infiltration of incompressible materials or traffic loads. Weak concrete at the joint (caused by overworking) combined with traffic loads also causes spalling.

Frayed condition as used in this test method indicates material is no longer in place along a joint or crack. Spalling indicates material may or may not be missing along a joint or crack.

Severity Levels

	Spall Length	Description
L	< 2 feet (600 mm)	spall is broken into pieces or fragmented; little FOD or tire damage potential exists.
	> 2 feet (600 mm)	(a) spall is broken into no more than three pieces defined by low or medium severity cracks; little or no FOD potential exists; or (b) joint is lightly frayed; little or no FOD potential exists.
M	< 2 feet (600 mm)	spall is broken into pieces or fragmented, with some of the pieces loose or absent, causing considerable FOD or tire damage potential.
	> 2 feet (600 mm)	(a) spall is broken into more than three pieces defined by light or medium cracks; (b) spall is broken into no more than three pieces with one or more of the cracks being severe with some FOD potential existing; or (c) joint is moderately frayed, with some FOD potential.
H	> 2 feet (600 mm)	(1) spall is broken into more than three pieces defined by one or more high severity cracks with high FOD potential; or (2) joint is severely frayed, with high FOD potential.

How To Count

If the joint spall is located along the edge of one slab, it is counted as one slab with joint spalling. If spalling is located on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling can also occur along the edges of two adjacent slabs. If this is the case, each slab is counted as having joint spalling. If a joint spall is small enough to be filled during a joint seal repair, it should not be recorded.

HIGH

MEDIUM

LOW

74 SPALLING, JOINT

SPALLING (CORNER) (75)

Description

Corner spalling is the raveling or breakdown of the slab within approximately 2 feet (600 mm) of the corner. A corner spall differs from the corner break in that the spall angles downward to intersect the joint, while a break extends vertically through the slab.

Severity Levels

L One of the following conditions exists: (1) spall is broken into one or two pieces defined by low severity cracks (little or no FOD potential), (2) spall is defined by one medium severity crack (little or no FOD potential).

M One of the following conditions exists: (1) spall is broken into two or more pieces defined by medium severity crack(s), and a few small fragments may be absent or loose; (2) spall is defined by one severe, fragmented crack that may be accompanied by a few hairline cracks; or (3) spall has deteriorated to the point where loose material is causing some FOD potential.

H One of the following conditions exists: (1) spall is broken into two or more pieces defined by high severity fragmented crack(s), with loose or absent fragments; (2) pieces of the spall have been displaced to the extent that a tire damage hazard exists; or (3) spall has deteriorated to the point where loose material is causing high FOD potential.

How To Count

If one or more corner spalls having the same severity level are located in a slab, the slab is counted as one slab with corner spalling. If more than one severity level occurs, it is counted as one slab having the higher severity level.

A corner spall smaller than 3 inches (76 mm) wide, measured from the edge of the slab and filled with sealant, is not recorded.

HIGH

MEDIUM

LOW

75 SPALLING, CORNER

ALKALI SILICA REACTION (ASR) (76)

Description

ASR is caused by chemical reaction between alkalis and certain reactive silica minerals which form a gel. The gel absorbs water, causing expansion which may damage the concrete and adjacent structures. Alkalis are most often introduced by the portland cement within the pavement. ASR cracking may be accelerated by chemical pavement deicers.

Visual indicators that ASR may be present include:

1. Cracking of the concrete pavement (often in a map pattern)
2. White, brown, gray or other colored gel or staining may be present at the crack surface
3. Aggregate popouts
4. Increase in concrete volume (expansion) that may result in distortion of adjacent or integral structures or physical elements. Examples of expansion include shoving of asphalt pavements, light can tilting, slab faulting, joint misalignment, and extrusion of joint seals or expansion joint fillers.

Because ASR is material-dependent, ASR is generally present throughout the pavement section. Coring and concrete petrographic analysis is the only definitive method to confirm the presence of ASR. The following should be kept in mind when identifying the presence of ASR through visual inspection:

1. Generally ASR distresses are not observed in the first few years after construction. In contrast, plastic shrinkage cracking can occur the day of construction and is apparent within the first year.
2. ASR is differentiated from D-Cracking by the presence of cracking perpendicular to the joint face. D-Cracking predominantly develops as a series of parallel cracks to joint faces and linear cracking within the slab.
3. ASR is differentiated from Map Cracking/ Scaling by the presence of visual signs of expansion.

Severity Levels

L Minimal to no Foreign Object Damage (FOD) potential from cracks, joints or ASR related popouts; cracks at the surface are tight (predominantly 1 mm or less). Little to no evidence of movement in pavement or surrounding structures or elements.

M Some FOD potential; increased sweeping or other FOD removal methods may be required. May be evidence of slab movement and/ or some damage to adjacent structures or elements.

Medium ASR distress is differentiated from low by having one or more of the following: increased FOD potential, increased cracking of the slab, some fragments along cracks or at crack intersections present, surface popouts of concrete may occur, pattern of wider cracks (predominantly 1 mm or wider) that may be subdivided by tighter cracks.

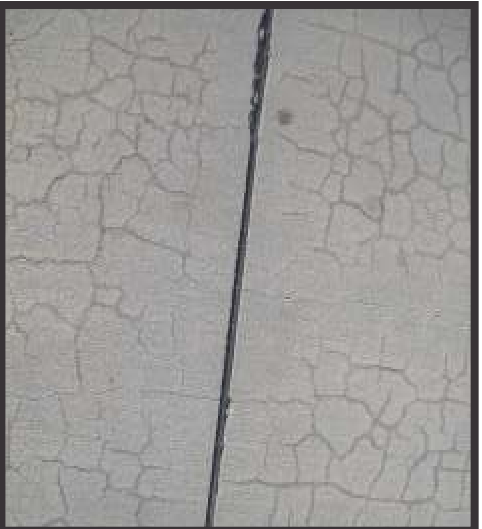
H One or both of the following exist: 1) Loose or missing concrete fragments which pose high FOD potential, 2) Slab surface integrity and function significantly degraded and pavement requires immediate repair; may also require repairs to adjacent structures or elements.

How To Count

No other distresses should be recorded if high severity ASR is recorded.

HIGH

MEDIUM



LOW

76 ASR

Pavement Condition Assessments

Pavement condition assessments may impact the reported capacity of an airfield and can make or break the mission for the operational community.

Pavement condition assessments are classified by AFCEC as ‘Standard’, ‘Simplified’ , or ‘Cursory’.

Although the evaluation methods are similar, the number of sample units inspected and procedures used greatly influence the reliability of the results.

A ‘Standard’ pavement condition survey denotes an assessment that is conducted IAW ASTM D5340-11, *Standard Test Method for Airport Pavement Condition Index Surveys,* with an appropriate number of sampling units in order to achieve a 95% confidence level. This is generally required for project level pavement inspections.

A ‘Simplified’ pavement condition survey denotes an assessment that is also conducted primarily IAW ASTM D5340-11, but with a reduced number of sampling units, as outlined in the ASTM as the ‘lesser sampling rate’. This will provide sufficient reliability for most contingency operations.

Pavement condition ratings reported in support of long term use (sustainment or permanent level evaluations) of the airfield should be determined using ‘Standard’ or ‘Simplified’ sampling methods and procedures.

A ‘Cursory’ pavement condition survey denotes an assessment in which the number of inspected sampling units fails to meet the minimum requirements in order to be considered either a ‘Standard’ or ‘Simplified’ pavement condition assessment. These are generally conducted to assess the suitability of the pavement surface for near term aircraft operations.

When ‘Cursory’ survey methods are used to determine and report the pavement condition, similarly to reports based upon a limited number of Dynamic Cone Penetrometer (DCP) tests, the evaluation should be considered an ‘expedient’ type evaluation and applicable only for limited and/or immediate use.

In most cases, the proposed mission and/or time available to perform the pavement assessment will determine the assessment method used.

Pavement Condition Index (PCI)

The results of a ‘Standard’ or ‘Simplified’ pavement condition assessment are reported as PCIs and Pavement Condition Ratings.

The PCI is a numerical scale (on a scale of 0 to 100 with 0 being the worst possible condition and 100 being the best possible condition) determined by a visual pavement survey, based on procedures in ASTM D5340-11, *Standard Test Method for Airport Pavement Condition Index Surveys*.

The Pavement Condition Rating is a verbal description of pavement condition as a function of the PCI value that varies from “failed” to “good”.

Standard/Simplified PCI Scale

Color Code	PCI	Rating
Green	86 – 100	Good
Bright Green	71 – 85	Satisfactory
Yellow	56 – 70	Fair
Rose	41 – 55	Poor
Red	26 – 40	Very Poor
Dark Red	11 – 25	Serious
Light Gray	0 - 10	Failed

The results of a ‘Cursory’ pavement condition assessment should be reported as a qualitative assessment of the pavement surface condition. If the results are to be presented in a tabular or map format, a 3-color scale should be used.

Cursory PCI Scale

71 to 100	Good
56 to 70	Fair
0 to 55	Poor

PCI ≤40 Reduces AGLs

The evaluator should narratively quantify the level of effort, and subsequent statistical reliability of pavement condition ratings reflected in evaluation reports.

When the pavement condition ratings that result from a 'Cursory' type pavement condition survey are listed and/or discussed in various sections, tables, and/or maps in the evaluation report, it should be clearly stated that they were estimated using cursory survey methods and were not determined using 'Standard' or 'Simplified' PCI procedures.

Regardless of the inspection method or assessment type used, the evaluator's most important task is to accurately identify and quantify the pavement distresses. Especially in contingency scenarios, one must consider the causes of the identified distresses and their impact on the structural or load-carrying capability of the pavement section. Specifically, if the assessment results in pavement condition rating of 'very poor' or below (PCI $\leq$ 40) its capability in terms of allowable gross load is reduced by 25%.

Particular attention should also be given to pavement distresses or other surface conditions that could present safety issues or cause operational limitations for the proposed mission aircraft; such as abrupt changes in surface elevation, sharp edges, ponding potential, excessive foreign object damage (FOD) material, or improper or inadequate surface repairs.

Locations of the distresses in relation to the proposed aircraft operations are also significant. For example, one blow-up located adjacent to the runway centerline could render the airfield unusable, while others located in areas that could be avoided during operations may have little or no impact. If a particular surface distress or condition indeed restricts or limits operations, its location and impact should be clearly addressed in the report.

Every evaluation is different, and ultimately it is up to the evaluator to exercise engineering judgment based upon the intended mission; keeping in mind that either the structural or surface condition can be of greater importance based upon the amount of time available for data collection.

Purpose of the Contingency PCI Survey

The purpose of a Pavement Condition Index (PCI) survey in contingency operations is three-fold.

First, a visual survey of the pavement surface can provide information on apparent structural integrity, operational condition, and projected performance to help identify potential pavement problems which would preclude aircraft operations.

Second, these ratings can impact the allowable gross load (AGL) or pass level computations . Specifically, if the section is rated very poor (PCI≤ 40) or below, the AGLs will be reduced by 25 percent.

Third, the PCI ratings, with supporting photographs, if accomplished prior to contingency operations, will serve as a baseline to assess any pavement damage caused by aircraft ground operations. This is important in the determination of costs or liabilities associated with aircraft deployments.

A thorough inspection of the pavement sections should be performed and the distress types, quantities, and severity levels should be identified. The inspection procedures are taken primarily from ASTM D5340-11. The sections should then be assigned overall condition ratings. Emphasis should be placed on structural- or foreign-object-damage- (FOD) related distresses.

PAVER and Field Inspector

Department of Defense (DOD) uses the computer based *PAVER* Pavement Maintenance Management System to manage M&R for its vast inventory of pavements. It uses inspection data and a PCI rating from zero (failed) to 100 (good) for consistently describing a pavement's condition and for predicting its M&R needs many years into the future.

PAVER software program provides pavement management capabilities to:

(1) Develop and organize the pavement inventory
(2) Assess the current condition of pavements
(3) Develop models to predict future conditions
(4) Report on past and future pavement performance
(5) Develop scenarios for M&R based on budget or condition requirements
(6) Plan projects

Field Inspector is a computer tablet-based software application for collecting pavement distress data and calculating real-time PCIs.

In contingency scenarios where *PAVER* software and automated data collection tools, such as *Field Inspector,* are not available or appropriate, one must use manual inspection methods to determine the PCIs for pavement surfaces.

Performing the PCI Survey

Step 1. Divide the Airfield into Branches and Sections

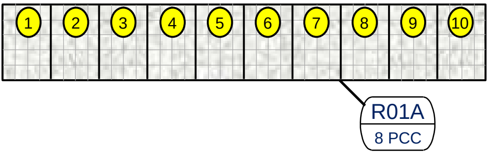
A branch is an identifiable part of the pavement network that is a single entity and has a distinct function. For example, runways, named taxiways, and apron areas are all separate branches.

A section is a subset of a branch. It is an area of pavement having a uniform pavement type, thickness, and condition; as well as the same pavement use, traffic type, construction history and subsurface layer structure.

Step 2. Subdivide Each Section into Sample Units

The deduct values prescribed in ASTM D5340-11 are based upon standard sample sizes. If one chooses to use sample sizes other than the standard sample sizes, then the distress densities must be adjusted.

The standard sample size for rigid pavements is a 20 contiguous slab area (± 8 slabs if the total number of slabs in the section is not evenly divisible by 20). If the pavement slabs in PCC have joint spacing greater than 25 ft, subdivide each slab into imaginary slabs. The imaginary slabs all should be less than or equal to 25 ft in length, and the imaginary joints dividing the slabs are assumed to be in perfect condition.



In this example, section R01A (200 slabs) is divided into 10 sample units, each containing 20 slabs.

Step 3. Inspect Randomly Selected Sample Units

The sample units to inspect are determined by a systematic random sampling technique. This means that the samples are selected such that they are distributed evenly throughout the section. The selected samples should be typical of the overall condition of the section being surveyed. Don't just look for areas of higher distress. If some areas are significantly better or worse than the overall area, then the original section should perhaps be broken into multiple sections and the new sections given conditions ratings based upon those distresses actually contained in each respective section. A significant difference is a change in the PCI of 15 or more, which results in a different pavement condition rating.

No pavement section is entirely consistent. Also surfaces in one sample unit may not have all of the types of distress found in the pavement section. The objective is to rate the condition that represents the majority of the pavement section. Small or isolated conditions should not influence the PCI rating, but they may adversely impact operations. It is useful to note these special conditions in the report so this information can be used in planning specific improvement projects. For example, some spot repairs may be required.

For contingency pavement evaluations, if the randomly selected sample unit is not typical of the pavement section, another sample unit should be chosen instead. A non-representative sample unit may be one that has an unusual or isolated distress such as a utility cut.

A sufficient number of samples should be surveyed in each section to obtain confidence in the PCIs that will ultimately be assigned to the sections. For contingency evaluations, the minimum number of sample units to be surveyed should be based upon the overall size of the section they represent. For a 'Simplified' PCI, the recommended minimum number of sample units to be surveyed based upon various section sizes are as follows:

Minimum Number of Samples to Survey

Section Size	Samples to Survey
1 to 5 Samples	1 Sample
6 to 10 Samples	2 Samples
11 to 15 Samples	3 Samples
16 to 40 Samples	4 Samples
> 40 Samples	10 %

In our example, section R01A contains 10 samples, so a minimum of two randomly selected sample areas should be surveyed.

One suggested method that can be used to select the sample units to inspect is:

a. Determine the number of sample units to inspect. In our example there are two samples to inspect.

b. Determine spacing interval by dividing the total number of samples contained in the pavement section by the number of samples to be inspected, and round to the next lowest whole number. In our example 10/2 = a spacing interval of 5.

c. Select the first sample unit to inspect at random, then use the spacing interval to evenly space the additional sample units to be inspected. The first sample selected for inspection should be a number between 1 and the determined spacing interval. In our example, a number between 1 and 5 should be selected, say 4.

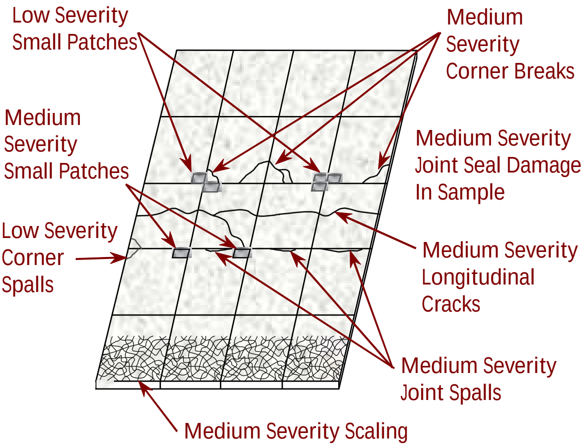
d. Select the remaining samples for inspection by using the calculated spacing interval. In our example, the second unit to inspect would be (4 + 5) = 9.

Step 4. Determine Deduct Values for All Distresses

A thorough survey should be performed of each selected sample area noting all distress types found, along with their severity levels and densities.

In the evaluation of rigid pavements, the density of the each distress is determined by the percentage of the slabs in the sample that contain the distress in relation to the total number of slabs in the sample area. If a given distress is found on one slab in the sample area, its density is recorded as 1 of 20 or 5%.

Example Sample Unit Inspection Results



20-Slab Sample Area... Distresses

Distress Type	Severity	Density
Longitudinal Cracks	Medium	4 slabs = 20%
Corner Breaks	Medium	3 slabs = 15%
Small Patches	Low	5 slabs = 25%
Scaling	Medium	4 slabs = 20%
Small Patches	Medium	2 slabs = 10%
Corner Spalls	Low	2 slabs = 10%
Joint Seal Damage	Medium	N/A
Joint Spalls	Medium	3 Slabs = 15%

Using the distress deduct value curves in ASTM D5340-11 or Table 1, Rigid Pavement (PCC) Individual Distress Deduct Values, a deduct value should be determined for each distress type and severity level combination noted during the survey. List the deduct values in descending order.

20-Slab Sample Area... Distresses

Distress Type	Severity	Density	Deduct Value
Longitudinal Cracks	Medium	20%	28
Corner Breaks	Medium	15%	20
Scaling	Medium	20%	17
Joint Spalls	Medium	15%	11
Joint Seal Damage	Medium	N/A	7
Small Patches	Medium	10%	6
Small Patches	Low	25%	4
Corner Spalls	Low	10%	4

Step 5. Compute Total Deduct Value for Sample

The deduct values determined for all distresses noted in the sample area should be totaled to compute the total deduct value (TDV) for the sample. Adding the deduct values together for our example sample area would result in a TDV of 97.

Step 6. Determine Max Corrected Deduct Value

Determine *m*, the maximum allowable number of distress deduct values that can be used to calculate the PCI for the surveyed sample, using the 'M' Chart or following formula:

$$m = 1 + (9/95)(100\text{-HDV})$$

HDV = highest individual deduct value

Note: This *m* number will always be equal to or less than 10.

In our example, the HDV is 28, so:

$$m = 1 + (9/95)(100-28) = 7.82$$

Our example sample had 8 identified distress deduct values. The first 7 deduct values can be used as calculated, but only 82% of the 8th deduct value can be used to determine the PCI.

If none or only one of the individual distress deduct values is greater than five, the total deduct value (TDV) is used to determine the PCI; otherwise, the maximum corrected deduct value (CDV) must be determined.

Enter the individual distress deduct values on line one of the chart below in descending order. Sum the deduct values and enter it under 'TDV'. Count the number of individual distress deduct values greater than five and enter it under 'q'.

Total Deduct Value

#	Deduct Values										TDV	q	CDV
1	28	20	17	11	7	6	4	3			96	6	
2													
3													
4													
5													
6													

Using the 'Corrected DVs for Jointed Rigid Airfield Pavements' chart in ASTM D5340-11 or Table 2, Corrected Deduct Values for Rigid (PCC) Pavement Distresses determine the CDV. In our example, a TDV 0f 96 with a 'q' of 6 yields a CDV of 62.

Corrected Deduct Value

#	Deduct Values										TDV	q	CDV
1	28	20	17	11	7	6	4	3			96	6	62
2													
3													
4													
5													
6													

Copy the deduct values on current line onto the next line, changing the smallest deduct value greater than five to five, as shown. Repeat this process until 'q' = 1. Again, using the appropriate CDV chart, determine the CDV for each line. Compare the CDVs for each line. The Maximum CDV is the largest value in the 'CDV' column. In our example, 66.

Maximum Corrected Deduct Value

#	Deduct Values										TDV	q	CDV
1	28	20	17	11	7	6	4	3			96	6	62
2	28	20	17	11	7	5	4	3			95	5	64
3	28	20	17	11	5	5	4	3			93	4	64
4	28	20	17	5	5	5	4	3			87	3	66
5	28	20	5	5	5	5	4	3			75	2	64
6	28	5	5	5	5	5	4	3			60	1	60

Step 7. Compute PCI for Each Sample

A pavement sample area with no distresses has a PCI of 100. For any given pavement sample 100 – Maximum CDV = PCI.

In our example the reported PCI = (100 – 66) = 34, which results in a rating of "Very Poor" . Because the PCI is $\leq$40, computed AGLs for this pavement section would be reduced by 25%.

Step 8. Compute PCI for Entire Section

The section PCI is determined by averaging the PCIs of all the samples surveyed in the section.

GENERAL DEFINITIONS

Crack spalling. Several crack related distresses reference the degree of spalling in determining the appropriate severity level to assign to the cracks. the following suggested descriptions apply:

Lightly spalled means no spall longer than 3 inches, no spall particles larger than 4 square inches, and less than 10% of the crack faces are spalled.

Moderately spalled means no spall longer than 6 inches and less than 50%of the crack segment is spalled.

Severely spalled means the crack segment is spalled beyond the condition listed in the medium spall definition.

Crack Filler. Several crack related distresses reference the condition of the crack filler or sealant in determining the appropriate severity level to assign to the cracks. the following suggested descriptions apply:

Satisfactory filled means that the crack filler is in generally good condition with no or only minor damage. the sealant may be debonded from the crack walls in places but it is still in contact with crack walls

Unsatisfactory filled means that th e crack filler is in generally fair to poor condition, and needs to be replaced within the next two years, if not sooner. there may be water penetration (visible gaps between the sealant and the crack walls), the sealant is oxidized or hardened, vegetation is present in the cracks, 10% or more of the sealant extends above the crack edges, or any part of the sealant extends more than ½ inch above the crack edges

if the crack sealant height has subsided more than ¼ inch, the crack should be rated at the next higher severity.

if the crack sealant height has subsided more than ½ inch, the crack should be rated as high severity.

Rigid Pavement (PCC) Individual Distress Deduct Values								
Distree Density %			5	10	15	20	25	30
61	Blow-Up	L	14	22	27	34	39	44
		M	32	43	48	54	58	64
		H	100	100	100	100	100	100
62	Corner Break	L	4	8	12	15	18	21
		M	8	15	20	24	28	32
		H	13	23	30	36	41	45
63	Long / Trans / Diag Cracks	L	5	9	11	13	15	17
		M	11	19	23	28	32	35
		H	15	25	33	39	45	50
64	Durability "D" Cracking	L	3	6	8	10	12	13
		M	10	16	21	25	27	30
		H	18	29	35	41	47	52
65	Joint Seal Damage	L	2	2	2	2	2	2
		M	7	7	7	7	7	7
		H	12	12	12	12	12	12
66	Small Patch (<5 SF)	L	1	1	2	3	4	5
		M	3	6	8	10	12	13
		H	7	11	14	17	20	22
67	Large Patch (>5 SF)	L	3	6	8	10	12	14
		M	12	16	21	24	26	30
		H	19	29	36	42	47	52
68	Popouts >3/SY	N/A	4	7	10	12	14	15
69	Pumping	ANY	5	10	14	18	23	26
70	Scaling	L	2	2	2	3	3	3
		M	5	10	14	17	21	23
		H	18	30	37	42	47	52
71	Settlement or Faulting	L	4	8	12	14	17	20
		M	8	14	19	24	27	30
		H	15	26	33	39	44	49
72	Intersecting Crack / Shattered Slab	L	10	17	22	26	30	33
		M	20	27	33	39	43	47
		H	30	40	46	52	56	61
73	Shrinkage Crack	ANY	2	2	3	3	4	4
74	Joint Spalling	L	2	3	5	6	7	8
		M	4	7	11	13	16	18
		H	13	21	25	29	32	34
75	Corner Spalling	L	2	4	6	7	8	10
		M	4	7	10	12	14	16
		H	5	10	13	16	19	23
76	Alkali Silica Reaction (ASR)	L	5	8	11	12	13	14
		M	14	23	28	32	35	37
		H	24	38	46	51	56	59

Rigid Pavement (PCC) Individual Distress Deduct Values													
35	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**
49	54	59	65	70	75	81	86	91	96	100	100	100	100
69	75	81	86	91	96	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100	100	100	100	100	100
23	25	27	29	31	33	35	37	38	39	40	41	41	42
35	39	42	45	48	51	54	56	59	62	65	67	70	73
50	54	58	62	65	69	72	75	79	82	84	87	89	91
18	19	20	20	20	21	21	22	22	22	22	22	22	22
37	40	43	45	47	49	50	52	53	54	55	56	57	58
54	58	62	65	68	71	73	75	77	79	81	82	83	84
14	15	16	17	18	19	20	20	21	21	22	22	22	22
32	35	37	38	40	42	43	44	45	46	47	48	49	50
56	60	64	67	70	73	76	78	81	83	84	86	87	88
2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	7	7	7	7	7	7	7	7	7	7	7	7	7
12	12	12	12	12	12	12	12	12	12	12	12	12	12
5	6	7	8	8	9	9	9	9	10	10	10	10	10
14	15	16	17	18	18	20	20	21	22	22	22	22	22
24	27	28	30	32	33	35	36	37	38	39	40	41	41
15	16	17	18	19	20	20	21	21	21	22	22	22	22
32	34	36	37	40	42	43	44	45	46	47	48	48	49
56	60	63	67	70	73	75	78	80	83	84	86	87	88
17	18	19	20	21	22	22	22	22	22	22	22	22	22
29	32	35	38	41	43	45	47	48	50	51	52	52	52
3	4	4	4	5	5	5	5	5	6	6	6	7	7
26	28	30	31	32	33	34	35	36	37	37	38	38	39
56	60	63	66	68	70	72	73	74	76	77	78	80	81
22	24	25	27	28	30	32	33	34	34	35	36	37	37
33	35	37	40	43	44	46	48	50	52	53	54	55	56
53	57	61	64	67	71	74	76	78	82	83	86	87	90
35	37	40	42	44	46	47	49	51	53	54	55	56	57
51	54	57	61	63	66	68	71	73	75	77	79	82	83
65	70	73	77	81	84	87	89	93	95	97	100	100	100
5	6	7	7	8	9	10	11	12	12	13	13	14	14
9	10	11	11	12	12	13	13	13	14	14	14	14	14
21	23	24	26	27	29	31	33	33	34	35	36	36	36
36	38	41	42	44	45	46	47	48	49	50	51	51	52
11	12	13	14	14	15	16	16	17	17	18	19	19	19
17	18	20	21	22	23	24	24	25	26	26	27	28	28
25	27	30	32	34	36	37	39	41	43	44	45	46	46
15	16	17	18	19	19	20	21	22	22	22	22	22	22
38	40	42	43	44	45	46	47	48	48	48	49	49	50
63	66	69	72	74	76	78	79	80	81	81	81	82	82

Corrected Deduct Values for Rigid (PCC) Pavement Distresses								
Total Deduct Value (TDV)	q = Number of distresses with deduct values greater than 5							
	1	2	3	4	5	6	7	8
1	1							
2	2							
3	3							
4	4							
5	5							
6	6							
7	7							
8	8							
9	9							
10	10	7						
11	11	8						
12	12	9						
13	13	10						
14	14	11						
15	15	12						
16	16	13						
17	17	14						
18	18	14	14					
19	19	15	14					
20	20	16	15					
21	21	17	15					
22	22	18	16					
23	23	19	17					
24	24	20	18					
25	25	20	18	16				
26	26	21	19	17				
27	27	22	20	18				
28	28	23	21	18				
29	29	24	21	19				
30	30	25	22	20				
31	31	25	22	21				
32	32	26	23	21				
33	33	27	24	22				
34	34	28	25	23				
35	35	29	25	24				
36	36	30	26	24				
37	37	31	27	25				
38	38	31	28	26				
39	39	32	29	26				
40	40	33	30	27				
41	41	34	30	28				
42	42	35	31	29				
43	43	36	32	30	29	28		
44	44	37	32	30	29	28		
45	45	38	33	31	30	29		

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Corrected Deduct Values for Rigid (PCC) Pavement Distresses								
Total Deduct Value (TDV)	q = Number of distresses with deduct values greater than 5							
	1	2	3	4	5	6	7	8
46	46	39	34	32	31	30		
47	47	40	35	33	32	31		
48	48	40	36	33	32	31		
49	49	41	36	34	33	32	31	30
50	50	42	37	35	34	33	32	31
51	51	43	38	35	34	33	32	31
52	52	44	38	36	35	34	33	32
53	53	45	39	37	36	35	33	32
54	54	46	40	37	36	35	34	33
55	55	46	41	38	37	36	35	34
56	56	47	42	39	38	37	36	34
57	57	48	43	40	39	37	36	35
58	58	49	43	40	39	38	37	35
59	59	50	44	41	40	39	38	36
60	60	51	45	42	41	40	39	37
61	61	52	46	43	42	40	40	37
62	62	53	47	43	42	41	40	38
63	63	54	47	44	43	42	41	39
64	64	55	48	45	43	42	41	39
65	65	55	49	46	44	43	42	40
66	66	56	50	46	45	44	42	40
67	67	57	51	47	46	44	43	41
68	68	58	51	48	46	45	43	42
69	69	59	52	48	47	46	44	42
70	70	60	53	49	47	46	44	43
71	71	61	54	50	48	47	45	43
72	72	62	55	50	48	47	46	44
73	73	63	56	51	49	48	47	45
74	74	64	56	51	50	49	47	45
75	75	64	57	52	51	49	48	46
76	76	65	58	53	52	50	48	46
77	77	66	58	54	52	51	49	47
78	78	67	59	55	53	51	49	47
79	79	68	60	56	54	52	50	48
80	80	69	61	56	55	53	51	49
81	81	70	62	57	55	53	51	49
82	82	70	63	58	56	54	52	50
83	83	71	64	58	57	55	53	51
84	84	72	65	59	57	55	53	51
85	85	73	65	60	58	56	54	52
86	86	74	65	60	58	56	54	52
87	87	74	66	61	59	57	55	53
88	88	75	67	62	60	57	55	53
89	89	76	68	62	60	58	56	54
90	90	77	69	63	61	59	57	55

Corrected Deduct Values for Rigid (PCC) Pavement Distresses								
Total Deduct Value (TDV)	q = Number of distresses with deduct values greater than 5							
	1	2	3	4	5	6	7	8
91	91	78	69	63	61	59	57	55
92	92	79	70	63	62	60	58	56
93	93	79	71	64	62	60	58	56
94	94	80	71	65	63	61	59	57
95	95	81	72	66	64	62	59	57
96	96	82	73	66	64	62	60	58
97	97	83	74	67	65	63	60	58
98	98	83	74	68	65	63	61	59
99	99	84	75	68	66	64	61	59
100	100	85	76	69	67	65	62	60
101		85	76	69	67	65	62	60
102		86	77	70	68	65	63	61
103		87	78	70	68	66	63	61
104		87	78	71	69	67	64	62
105		88	79	72	69	67	64	62
106		89	80	72	70	68	65	63
107		89	80	73	70	68	66	63
108		90	81	73	71	68	66	64
109		91	82	74	71	69	67	64
110		91	83	74	72	70	68	65
111		92	83	75	72	70	68	65
112		93	84	75	73	71	69	66
113		93	84	76	73	71	69	66
114		94	85	76	74	72	70	67
115		94	85	77	74	72	70	67
116		95	86	77	75	73	71	68
117		95	86	78	75	73	71	68
118		96	87	78	76	74	72	69
119		96	87	79	76	74	72	69
120		97	88	79	77	75	73	70
121		97	88	80	77	75	73	70
122		98	89	80	78	76	73	71
123		98	90	81	78	76	74	71
124		99	90	81	79	77	74	71
125		99	91	82	79	77	75	72
126		100	91	82	80	78	75	72
127			92	82	80	78	76	73
128			92	83	81	78	76	73
129			93	83	81	79	77	74
130			93	84	82	80	77	74
131			94	84	82	80	77	74
132			94	85	83	80	78	75
133			95	85	83	81	78	75
134			95	86	84	81	78	76
135			96	86	84	82	79	76

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Corrected Deduct Values for Rigid (PCC) Pavement Distresses

Total Deduct Value (TDV)	q = Number of distresses with deduct values greater than 5							
	1	2	3	4	5	6	7	8
136			96	86	84	82	79	76
137			96	87	85	83	80	77
138			97	87	85	83	80	77
139			97	88	86	83	81	78
140			98	88	86	84	81	78
141			98	88	86	84	82	78
142			98	89	87	85	82	79
143			98	89	87	85	82	79
144			99	90	87	85	82	79
145			99	90	88	86	83	80
146			99	91	88	86	83	80
147			100	91	89	87	84	81
148				91	89	87	84	81
149				92	89	87	84	81
150				92	90	88	85	82
151				92	90	88	85	82
152				93	91	88	85	82
153				93	91	89	86	83
154				94	92	89	86	83
155				94	92	90	87	83
156				94	92	90	87	84
157				95	93	90	87	84
158				95	93	91	88	84
159				95	93	91	88	85
160				96	94	91	88	85
161				96	94	92	89	85
162				96	94	92	89	86
163				96	94	92	89	86
164				97	95	93	90	87
165				97	95	93	90	87
166				97	95	93	90	87
167				97	95	93	90	87
168				98	96	94	91	88
169				98	96	94	91	88
170				98	97	94	91	88
171				99	97	95	92	89
172				99	97	95	92	89
173				99	97	95	92	89
174				99	97	95	92	89
175				99	98	96	93	89
176				100	98	96	93	90
177					98	96	93	90
178					98	96	93	90
179					99	97	94	90
180					99	97	95	91

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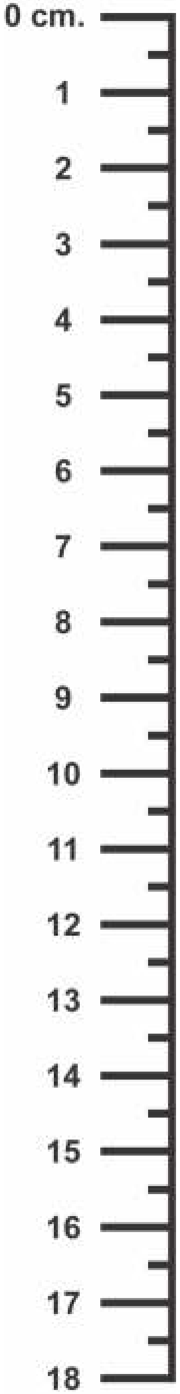
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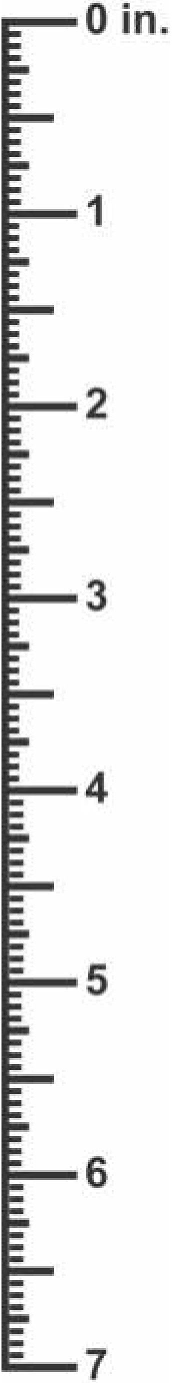
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