FLORIDA DEPARTMENT OF TRANSPORTATION

AVIATION OFFICE

AIRFIELD PAVEMENT INSPECTION REFERENCE MANUAL

March 2010

STATEWIDE PAVEMENT MANAGEMENT PROGRAM

PREFACE

This Airfield Pavement Inspection Reference Manual has been updated with the latest information from the FAA and the ASTM D5340-04. Additional distress pictures were added for clarity and easy of recognition for inspectors while on the field. In 1995, the Congress of the United States mandated that the Federal Aviation Administration (FAA) require, as a condition of Grant in Aid that airports should be prepared to present documentation of a Pavement Management Program (PMP) for airfield pavement that has been constructed, reconstructed, or repaired with Federal assistance. This PMP Airfield Pavement Inspection Manual has been developed by the Florida Department of Transportation Central Aviation Office to assist Florida airport owner/operators comply with the FAA airfield pavement inspection requirements. Periodic and systematic airfield pavement inspections serve to enhance and extend the useful life and provide for the safe use of various airfield pavements throughout the airport.

The Pavement Condition Index (PCI) method of documenting pavement conditions is the preferred choice of the FAA and was developed by the United States Army Corps of Engineers in the 1970s. This index allows for a systematic, standardized and objective assessment of pavement condition based on visual examination.

Use of Manual

Examples of various pavement distress types identified in this airfield pavement inspection manual are presented by name in alphabetical order to assist airfield pavement inspectors. The various illustrations, charts and supporting descriptive information descriptions are presented to aid in the identification, severity, location, extent, and probable cause of pavement distress for both flexible and rigid pavement types.

The systematic visual inspection system can be used to establish a Pavement Management Program that can be specifically tailored to meet the individual and specific pavement maintenance needs of a particular airport.

The majority of the photographs of various pavement conditions were collected and assembled specifically for the development of this Airfield Pavement Inspection Manual. A limited number of photographs are also presented and referenced that were developed by the U.S. Army Corps of Engineers for use in the Unified Facilities Criteria (UFC) O & M: Paver, Asphalt Surfaced Airfields Pavement Condition Index (PCI).

Disclaimer: This manual has been approved by the Florida Department of Transportation and is based on information from various sources. While reasonable care has been taken in preparing this document, no responsibility or liability is accepted for errors or fact or for any opinion expressed herein.

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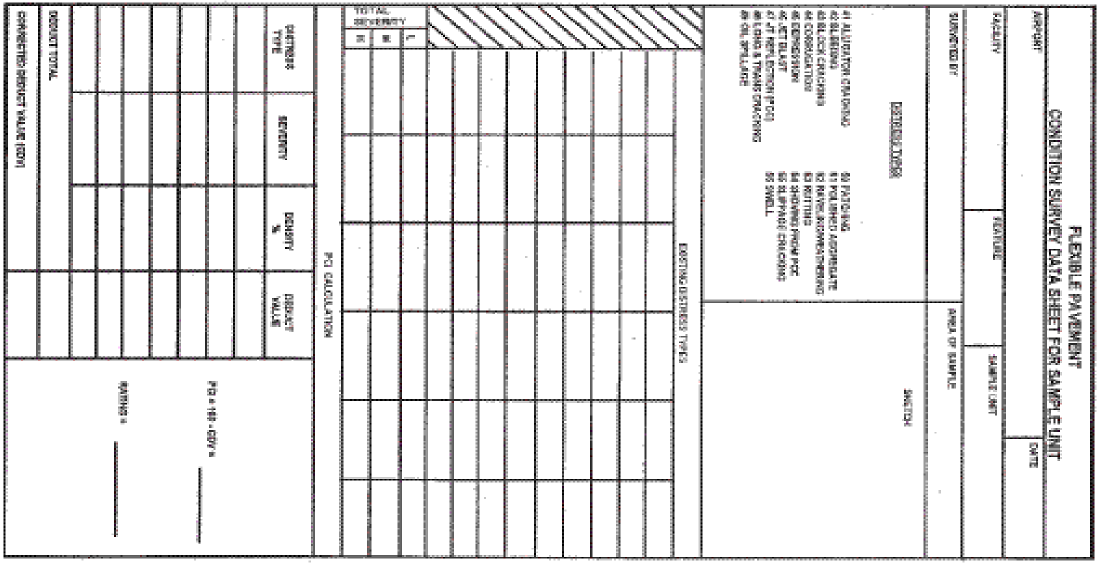
SURVEY DATA SHEET FOR ASPHALT PAVEMENT



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DISTRESS No. 1, ALLIGATOR CRACKING

Description: Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt surface under repeated traffic loading. The cracking initiates at the bottom of the asphalt surface (or stabilized base) where tensile stress and strain is highest under a wheel load. The cracks propagate to the surface initially as a series of parallel cracks. After repeated traffic loading, the cracks connect and form many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are less than 2-feet (0.6 meters) on the longest side.

Location: Alligator cracking occurs only in areas that are subjected to repeated traffic loadings, such as wheel paths. Therefore, it would not occur over an entire area unless the entire area was subjected to traffic loading.

Causation: Repeated dynamic loading on the asphalt surface that leads to fatigue failure of the asphalt causes the distress. Alligator cracking is considered a major structural distress.

Severity Levels:

1) Low (L). Fine, longitudinal hairline cracks running parallel to each other with no or only a few interconnecting cracks. The cracks are not spalled.
2) Medium (M). Further development of light alligator cracking into a pattern or network of cracks that may be lightly spalled.
3) High (H). Network or pattern cracking progressed so that pieces are well defined and spalled at the edges; some of the pieces rock under traffic.

Measurement: Alligator cracking is measured in square feet (meters) of surface area. The major difficulty in measuring Alligator distress is that two (2) or three (3) levels of severity often exist within the measured distressed area. If the different levels of severity cannot be easily divided, the entire area should be rated at the highest severity level present. If alligator cracking and rutting occur in the same area, each is recorded separately at its respective severity level.

<u>Note:</u> If alligator cracking and rutting occur in the same area, each is record separately as its respective severity level.

Low Severity Alligator Crack:
Fine, longitudinal hairline cracks.

Medium Severity:
Pattern or network of cracks

High Severity:
Pieces are well defines and spalled at edges.

DISTRESS No. 2, BLEEDING

Description: Bleeding is a film of bituminous material on the pavement surface that creates a shiny, glass-like; reflecting surface that usually becomes quite sticky.

Location: Bleeding can occur anywhere on the surface of the asphalt because it is caused by and during construction.

Causation: Bleeding is caused by excessive amounts of asphalt cement or tars in the mix and/or low air-void content. It occurs when asphalt fills the voids of the mix during hot weather and then expands onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt or tar will accumulate on the surface.

Severity Levels.
No degrees of severity are defined. Bleeding should be noted when it is extensive enough to cause a reduction in skid resistance

Measurement. Bleeding is measured in square feet (square meters) of surface area. If bleeding is counted, polished aggregate is not counted in the same area.

Bleeding – No severity level

DISTRESS No. 3, BLOCK CRACKING

Description: Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 1 x 1 foot to 10 x 10 feet (0.3m x 0.3m to 3m x 3 m).

Location: Block cracking normally occurs over a large proportion of pavement area but sometimes will occur in non-traffic areas. This type of distress differs from alligator cracking in that alligator cracks are caused by repeated traffic loadings and, therefore, are located only in traffic areas (i.e., wheel paths

Causation: Block cracking is caused mainly by shrinkage of the asphalt concrete (AC) and daily temperature cycling (which results in daily stress/strain cycling). It is not load-associated. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles

Severity Levels:

1) Low: Blocks are defined by cracks that are non-spalled (sides of the crack are vertical) or only lightly spalled, causing no FOD potential. Non-filled cracks have 1/4 inch (6.4 millimeters) or less mean width, and filled cracks have filler in satisfactory condition.
2) Medium: Blocks are defined by either: (1) filled or nonfilled cracks that are moderately spalled (some FOD potential); (2) nonfilled cracks that are not spalled or have only minor spalling (some FOD potential), but have a mean width greater than approximately ¼-inch (6.4 millimeters); or (3) filled cracks greater than ¼-inch that are not spalled or have only minor spalling (some FOD potential), but have filler in unsatisfactory condition.
3) High: Blocks are well defined by cracks that are severely spalled, causing a definite FOD potential.

Measurement: Block cracking is measured in square feet (square meters) of surface area. It usually occurs at one severity level in a given pavement section; however, any areas of the pavement section having distinctly different levels of severity should be measured and recorded separately. For asphalt pavements, not including AC over PCC, if block cracking is recorded, no longitudinal and transverse cracking should be recorded in the same area. For asphalt overlay over concrete, block cracking, joint reflection cracking, and longitudinal and transverse cracking reflected from old concrete should all be recorded separately.

Low severity:
Cracks that are non-spalled.

Medium severity:
moderately spalled
(Some FOD potential)

High Severity:
Cracks that are severely spalled.
FOD highly possible.

DISTRESS No 4, CORRUGATION

Description: Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals (usually less than 5 feet) (1.5 meters) along the pavement. The ridges are perpendicular to the traffic direction.

Location: Corrugation is not commonly found on airfield pavement and where found; it is perpendicular to the direction of plane taxiing and take-off.

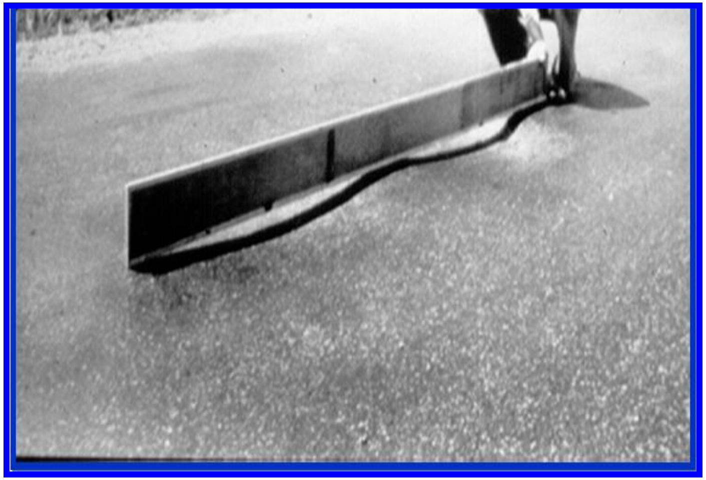
Causation: Traffic action combined with an unstable pavement surface or base usually causes this type of distress.

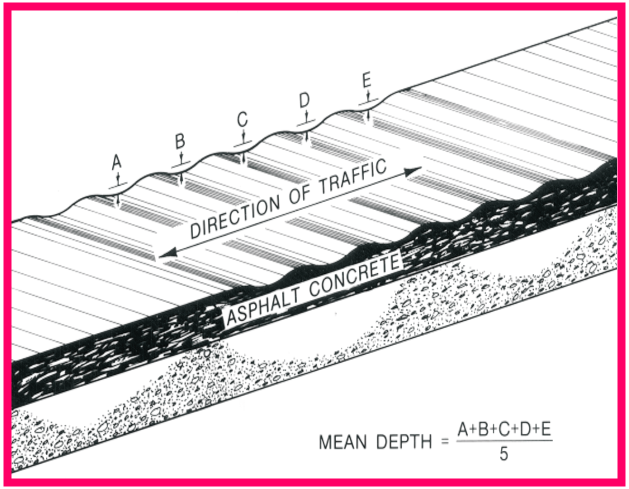
Severity Levels: (See table below)

1) Low. Corrugations are minor and do not significantly affect ride quality (see measurement criteria below).
2) Medium. Corrugations are noticeable and significantly affect ride quality (see measurement criteria below).
3) High. Corrugations are easily noticed and severely affect ride quality (see measurement criteria below).

Measurement: Corrugation is measured in square feet (square meters) of surface area. The mean elevation difference between the ridges and valleys of the corrugations indicates the level of severity. To determine the mean elevation difference, a 10-feet (3-meter) straightedge should be placed perpendicular to the corrugations so that the depth of the valleys can be measured in inches (millimeters). The mean depth is calculated from five such measurements.

Severity	Runways and High Speed Taxiways	Taxiways and Aprons
L	<1/4 inch	<1/2 inch
M	¼ to ½ inch	½ to 1 inch
H	> ½ inch	> 1 inch





Measurement and Observation – Calculating the mean depth and the standard method of measurement using the straight edge.

Low: corrugations are minor

Medium: Corrugations are noticeable.

High: Corrugations severally affect ride ability**.**

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DISTRESS No. 5, DEPRESSION

Description: Depressions are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement.

Location: Depression can occur anywhere on the pavement. In many instances, light depressions are not noticeable until after a rain, when ponding water creates “birdbath” areas; but the depressions can also be located without rain because of stains created by ponding water.

Causation: Depressions can be caused by settlement of the foundation soil or can be “built up” during construction. Depressions cause roughness and, when filled with water of sufficient depth, can cause hydroplaning of aircraft.

Severity Levels: (See table below)

1) Low Depression can be observed or located by stained areas, only slightly affects pavement riding quality, and may cause hydroplaning potential on runways.

2) Medium depression can be observed, moderately affects pavement riding quality, and causes hydroplaning potential on runways.

3) High depression can be readily observed, severely affects pavement riding quality, and causes definite hydroplaning potential.

Measurement: Depressions are measured in square feet (square meters) of surface area. The maximum depth of the depression determines the level of severity. This depth can be measured by placing a 10-feet (3-meters) straightedge across the depressed area and measuring the maximum depth in inches (millimeters). Depressions larger than 10 feet (3 meters) across must be measured by either visual estimation or direct measurement when filled with water.

Severity	Runways and High Speed Taxiways	Taxiways and Aprons
L	1/8 to ½ inch	½ to 1 inch
M	>½ to 1 inch	>1 to 2 inch
H	> I inch	> 2 inch


Low slightly affects pavement riding quality

Medium moderately affects pavement riding quality

High severity leads to ponding and can cause hydroplaning of aircraft.

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DISTRESS No. 6, JET BLAST EROSION

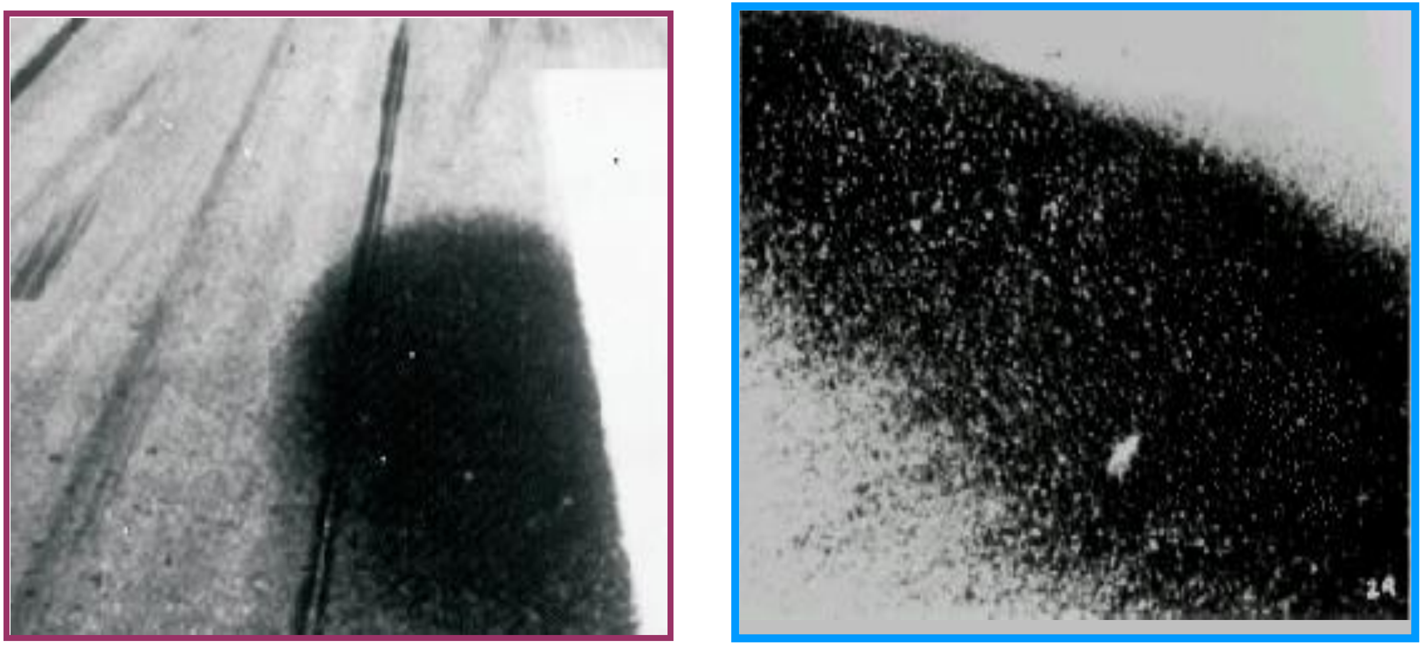
Description: Jet blast erosion causes darkened areas on the pavement surface when bituminous binder has been burned or carbonized; localized burned areas may vary in depth up to approximately 1/2 inch (12.7 millimeters).

Location: This distress type is most commonly found at the ends of runways where aircraft “spool up” before releasing brakes for takeoff.

Causation: The distress is caused by ram jet engines of military fighter aircraft and to a lesser extent by turbofan engines of commercial jets.

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that jet blast erosion exists

Measurement: Jet blast erosion is measured in square feet (square meters) of surface area.



Jet Blast Erosion – (**No severity**) common at the end of runways

DISTRESS No 7, JOINT REFLECTION CRACKING FROM PCC:

Description: This distress occurs only on pavements having an asphalt or tar surface over a PCC slab. This category of distress does not include reflection cracking from any other type of base (i.e., cement stabilized, lime stabilized); such cracks are listed as longitudinal and transverse cracks. Joint reflection cracking is pattern cracking and follows the underlying PCC pavement joint pattern. The pattern may be difficult to distinguish in early stages of reflection; however, it becomes noticeable when looking over a large expanse of pavement.

Location: Covers the entire asphalt pavement having an underlying PCC slab.

Causation: Joint-reflection cracking is caused mainly by movement of the PCC slab beneath the AC surface because of thermal and moisture changes; it is not load related. However, traffic loading may cause a breakdown of the AC near the crack, resulting in spalling and FOD potential. If the pavement is fragmented along a crack, the crack is said to be spalled. Knowledge of slab dimensions beneath the AC surface will help to identify these cracks.

Severity Levels:

1) Low. Cracks have only light spalling (little or no FOD potential) or no spalling and can be filled or nonfilled. If nonfilled, the cracks have a mean width of 1/4 inch (6.4 millimeters) or less. Filled cracks are of any width, but their filler material is in satisfactory condition.

2) Medium. One of the following conditions exists: (1) cracks are moderately spalled (some FOD potential) and can be either filled or nonfilled of any width; (2) filled cracks are not spalled or are only lightly spalled, but the filler is in unsatisfactory condition; (3) nonfilled cracks are not spalled or are only lightly spalled, but the mean crack width is greater than 1/4 inch (6.5 millimeters); or (4) light random cracking exists near the crack or at the corner of intersecting cracks.

3) High. Cracks are severely spalled (definite FOD potential) and can be either filled or nonfilled of any width

Measurement: Joint-reflection cracking is measured in linear feet (linear meters). The length and severity level of each crack should be identified and recorded. If the crack does not have the same severity level along its entire length, each portion should be recorded separately. For example, a crack that is 50 feet (15 meters) long may have 10 feet (3 meters) of high severity, 20 feet (6 meters) of medium severity, and 20 feet (6 meters) of light severity; these would all be recorded separately.

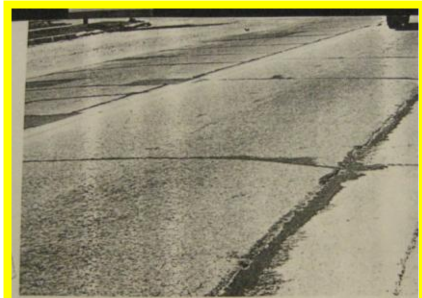


Figure II-21— Reflection crack

Joint reflection cracks may meander back and forth across the PCC joint


Joint reflection cracks follow straight lines

DISTRESS No. 8, LONGITUDINAL/TRANSVERSE CRACKING (NON-PCC JOINT REFLECTION)

Description: Longitudinal cracks are parallel to the pavement's center-line or laydown direction, while transverse cracks extend across the pavement at approximately right angles to the pavement's center line or direction of laydown.

Location: Covers the entire asphalt pavement.

Causation: They may be caused by (1) a poorly constructed paving lane joint; (2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt; or (3) a reflective crack caused by cracks beneath the surface course, including cracks in PCC slabs (but not at PCC joints). Transverse cracks may be caused by items 2 or 3 above. These types of cracks are not usually load-associated. If the pavement is fragmented along a crack, the crack is said to be spalled.

Severity Levels:

1) Low. Cracks have either minor spalling (little or no FOD potential) or no spalling. The cracks can be filled or nonfilled. Nonfilled cracks have a mean width of 1/4 inch (6.4 millimeters) or less; filled cracks are of any width, but their filler material is in satisfactory condition.

2) Medium. One of the following conditions exists: (1) cracks are moderately spalled (some FOD potential) and can be either filled or nonfilled of any width; (2) filled cracks are not spalled or are only lightly spalled, but the filler is in unsatisfactory condition; (3) nonfilled cracks are not spalled or are only lightly spalled, but mean crack width is greater than 1/4 inch (6.4 millimeters); or (4) lightly random cracking exists near the crack or at the corners of intersecting cracks.

3) High. Cracks are severely spalled, causing definite FOD potential. They can be either filled or nonfilled of any width.

Porous Friction Course Severity Levels.

Note: these severity levels are in addition to the existing definitions.

1) Low: Average raveled area around the crack is less than 1/4 inch (6.4 millimeters) wide.

2) Medium: Average raveled area around the crack is 1/4 inch (6.4 millimeters) to 1 inch (25.4 millimeters) wide

3) High: Average raveled area around the crack is greater than 1 inch (25.4 millimeters) wide

Measurement: Longitudinal and transverse cracks are measured in linear feet (linear meters). The length and severity of each crack should be identified and recorded. If the crack does not have the same severity level along its entire length, each portion of the crack having a different severity level should be recorded separately. For example, a crack that is 50 feet (15 meters) long may have 10 feet (3 meters) of high severity, 20 feet (6 meters) of medium severity, and 20 feet (6 meters) of light severity; these would all be recorded separately.

Low: The cracks appear the same either longitudinal or transverse to the runway

Medium are moderately spalled (some FOD potential)

High: Combination of both longitudinal and transverse

Secondary cracking connects the original L crack

DISTRESS No. 9, OIL SPILLAGE

Description: Oil spillage is the deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.

Location: Anywhere on the pavement where the condition of the distress is created by oil or fuel spills. Oil spills are typically found around fuel pumps and in parking areas.

Causation: The loosening of the binder material in the asphalt is caused by the reaction of the oil solvents. A stain is not necessarily a distress unless the binder has been softened and the material has been lost.

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that oil spillage exists.

Measurement: Oil spillage is measured in square feet (square meters) of surface area.

Oil Spillage (No **severity**)

DISTRESS No. 10, PATCHING & UTILITY CUT PATCH

Description: A patch is an area of pavement that has been replaced with a new material to repair an existing pavement. In order for a patch to be recorded as a distress, a patch must replace an original pavement section. A patch is considered a defect, regardless of how well it is performing.

Location: Anywhere on the pavement where there had been a cut and where there is evidence to determine that original pavement has been removed and replaced.

Causation: Utility repairs across pavement.

Severity Levels:

1) Low. Patch is in good condition and is performing satisfactorily.

2) Medium. Patch is somewhat deteriorated and affects riding quality to some extent. Moderate amount of distress is present within the patch or has FOD potential, or both.

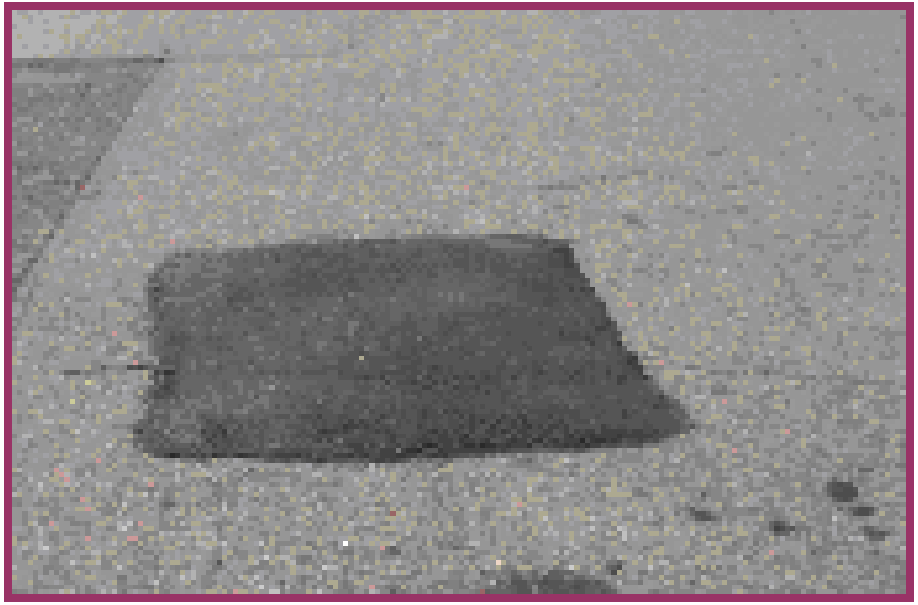
3) High. Patch is badly deteriorated and affects riding quality significantly or has high FOD potential. Patch needs replacement

The use of dense-graded AC patches in PFC surfaces causes a water damming effect at the patch that contributes to differential skid resistance of the surface. Low-severity, dense-graded patches should be rated as medium severity because of the differential friction problem. Medium- and high-severity patches are rated the same as above.

Measurement: Patching is measured in square feet (square meters) of surface area. However, if a single patch has areas of differing severity levels, these areas should be measured and recorded separately. For example, a 25-square-foot (2.3-square-meter) patch may have 10 square feet (1.0 square meter) of medium severity and 15-square-feet (1.4-square-meters) of light severity. These areas would be recorded separately. Any distress found in a patched area will not be recorded; however, its effects on the patch will be considered when determining the patch's severity level.

Low: good condition and is performing satisfactorily

Medium: Patch has deteriorated.



High: Patch is badly damaged.

DISTRESS No. 11, POLISHED AGGREGATE

Description: Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small or there are no rough or angular aggregate particles to provide good skid resistance. Existence of this type of distress is also indicated when the number on a skid resistance rating test is low or has dropped significantly from previous ratings.

Location: Heavy traffic or wheel-path areas.

Causation: Polished aggregate is caused by repeated traffic applications

Severity Levels: No degrees of severity are defined. However, the degree of polishing should be significant before it is included in the condition survey and rated as a defect.

Measurement: Polished aggregate is measured in square feet (square meters) of surface area.

NOTE: If bleeding is counted, polished aggregate is not counted in the same area.

Polished Aggregate: (**No severity**) the aggregate has to be smooth and polished.

DISTRESS No. 12, RAVELING/ WEATHERING

Description: Raveling and weathering are the wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt or tar binder. They may indicate that the asphalt binder has hardened significantly.

Location: Heavy traffic or wheel-path areas.

Causation: This is a materials related distress type often uniformly evident over large areas of pavement surface. If caused by construction, it may be found in lanes as from bad truckload mix, or in strips paralleling paving lanes.

Severity Levels:

1) Low. Aggregate or binder has started to wear away, causing little or no FOD potential

2) Medium. Aggregate and/or binder have worn away, causing some FOD potential. The surface texture is moderately rough and pitted.

3) High. Aggregate and/or binder have worn away, causing a high FOD potential. The surface texture is severely rough and pitted.

Note:

(a) L. In a square-yard representative sample, the number of aggregate pieces missing is between 5 and 20 and/or the number of missing aggregate clusters (when more than one adjoining aggregate piece is missing) does not exceed 1.

(b) M. In a square-yard representative sample, the number of aggregate pieces missing is between 21 and 40 and/or the number of missing aggregate clusters is greater than 1 but does not exceed 25 percent of the square-yard area.

(c) H. In a square-yard representative sample, the number of aggregate pieces missing is over 40 and/or the number of missing aggregate clusters is greater than 25 percent of the square-yard area.

Measurement: Raveling and weathering are measured in square feet (square meters) or surface area. Mechanical damage caused by hook drags, tire rims, or snow plows are counted as areas of high-severity raveling and weathering.

Porous Friction Course Severity Levels.

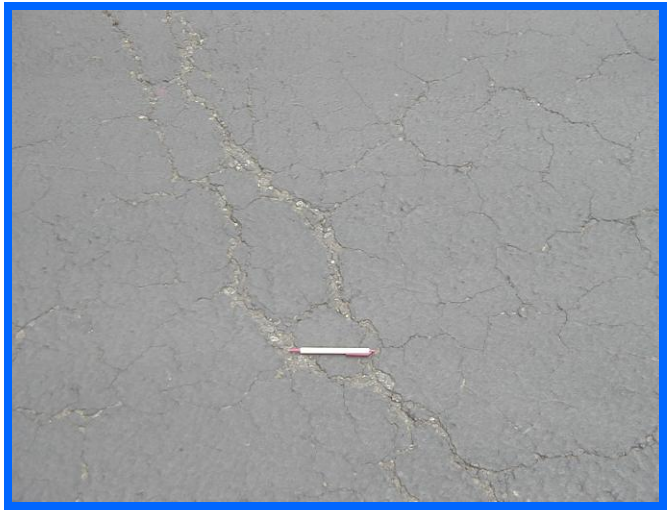
Low: In a square-yard representative sample, the number of aggregate pieces missing is between 5 and 20 and/or the number of missing aggregate clusters (when more than one adjoining aggregate piece is missing) does not exceed 1.

Medium: In a square-yard representative sample, the number of aggregate pieces missing is between 21 and 40 and/or the number of missing aggregate clusters is greater than 1 but does not exceed 25 percent of the square-yard area.

High: In a square-yard representative sample, the number of aggregate pieces missing is over 40 and/or the number of missing aggregate clusters is greater than 25 percent of the square yard area.

Summary Severity Table for Treatment Over Dense Mix (*)	
Severity Level	
Low severity	1) Scaled area is < 1%, e. g. less than 3.5 by 3.5 in./yd^2 (less tan 100 x 100 mm/m^2). 2) In case of cold tar where pattern cracking has developed, the tar surface cracks are < ¼ in. (6-mm) wide.
Medium Severity	1) Scaled is between 1 and 10%. 2) In case of cold tar where pattern cracking has developed , the tar surface cracks are **¼ in. (6-mm)** wide or greater.
High Severity	1) Scaled area is over 10%, e.g. over 11.5 x 11.5 in/yd^2 (over 300 x 300 mm/m^2). 2) In case of cold tar, the tar surface is peeling off.

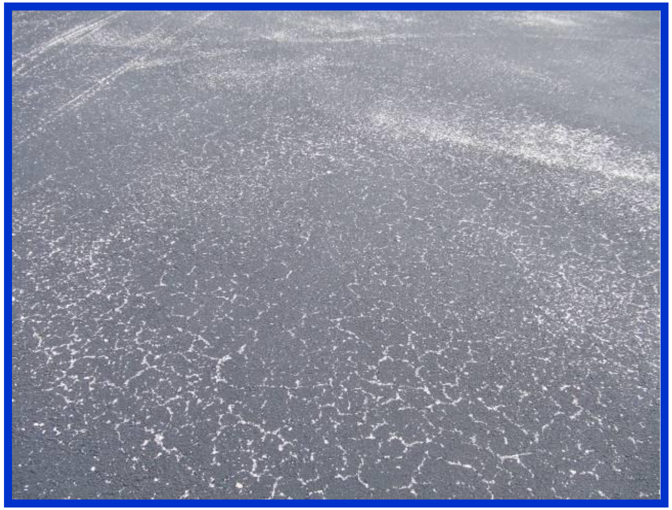
**** Slurry and Coal Tar Seal Coat***



Low: Binders and fines have eroded away

Medium: nearly 50% of surface aggregate has eroded away.



High: Nearly all the surface aggregate has eroded away.

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DISTRESS No. 13, RUTTING

Description: A rut is a surface depression in the wheel path. Pavement uplift may occur along the sides of the rut; however, in many instances ruts are noticeable only after a rainfall, when the wheel paths are filled with water.

Location: Rutting can occur over large expanses of pavement on aprons and taxiways where traffic is not channelized.

Causation: Rutting stems from a permanent deformation in any of the pavement layers or subgrade. It is usually caused by consolidation or lateral movement of the materials due to traffic loads. Significant rutting can lead to major structural failure of the pavement.

Severity Levels:

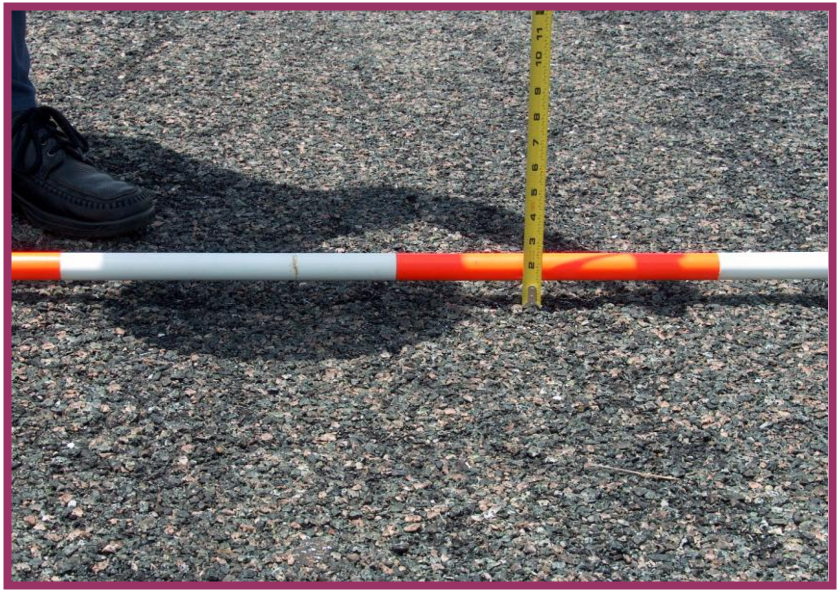
Mean Rut Depth Criteria

Severity	All Pavement Sections
L	< or = ¼ to ½ inch
M	> ½ inch to < or = 1 inch
H	> 1 inch

Measurement: Rutting is measured in square feet (square meters) of surface area, and its severity is determined by the depth of the rut. To determine the mean rut depth, a straightedge should be laid across the rut and the maximum depth measured. The mean depth in inches (millimeters) should be computed from measurements taken along the length of the rut. If alligator cracking and rutting occur in the same area, each is recorded at the respective severity level.

Low: locate by visual inspection and with straight edge.

Medium: mean depth exceeds ½-inch



High: mean depth > 1-inch.

DISTRESS No. 14, SHOVING FROM PCC SLABS

Description. PCC pavements occasionally increase in length at ends where they adjoin flexible pavements (commonly referred to as “pavement growth”). This “growth” shoves the asphalt- or tar-surfaced pavements, causing them to swell and crack. A gradual opening of the joints causes the PCC slab “growth” as they are filled with incompressible materials that prevent them from reclosing.

Location: This distress occurs at interface between flexible and rigid pavement.

Causation: The increase in length of the PCC pavements push the asphalt pavement that produces the short, abrupt wave in the pavement surface associated with shoving.

Severity Levels:

1) Low. A slight amount of shoving has occurred, with little effect on ride quality and no break-up of the asphalt pavement.

2) Medium. A significant amount of shoving has occurred, causing moderate roughness or break-up of the asphalt pavement.

3) High. A large amount of shoving has occurred, causing severe roughness or break-up of the asphalt pavement.

Measurement: Shoving is measured by determining the area in square feet (square meters) of the swell caused by shoving.

Low: common at the interface between rigid and flexible pavement.

Medium: Evidence of compression of the flexible pavement by rigid pavement is necessary.

High: severe roughness or breakup of asphalt pavement.

DISTRESS No.15, SLIPPAGE CRACKING

Description. Slippage cracks are crescent- or half-moon shaped cracks.

Location: This usually occurs when there is a low-strength surface mix or poor bond between the surface and next layer of pavement structure. Usually transverse to the direction of travel, having two ends pointed away from the direction of traffic.

Causation: They are produced when braking or turning wheels cause the pavement surface to slide and deform.

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that a slippage crack exists.

Measurement. Slippage cracking is measured in square feet (square meters) of surface area.

Slippage usually occurs when there is low strength surface mix or poor bond between the surface and next layer of pavement. (**No severity**)

DISTRESS No. 16, SWELLING

Description. Swell is characterized by an upward bulge in the pavement's surface – a long, gradual wave more than 10-ft (3-meter) long. A swell may occur sharply over a small area or as a longer, gradual wave. Either type of swell can be accompanied by surface cracking.

Location: This form of distress is not common in Florida due its cause and could be anywhere on the pavement.

Causation: A swell is usually caused by frost action in the subgrade or by swelling soil, but a small swell can also occur on the surface of an asphalt overlay (over PCC) as a result of a blow-up in the PCC slab.

Severity Levels.

1) Low. Swell is barely visible and has a minor effect on the pavement's ride quality as determined at the normal aircraft speed for the pavement section under consideration. (Low-severity swells may not always be observable, but their existence can be confirmed by driving a vehicle over the section at the normal aircraft speed. An upward acceleration will occur if the swell is present).

2) Medium. Swell can be observed without difficulty and has a significant effect on the pavement's ride quality as determined at the normal aircraft speed for the pavement section under consideration.

3) High. Swell can be readily observed and severely affects the pavement's ride quality at the normal aircraft speed for the pavement section under consideration.

Measurement: The surface area of the swell is measured in square feet (square meters). The severity rating should consider the type of pavement section (i.e., runway, taxiway, or apron). For example, a swell of sufficient magnitude to cause considerable roughness on a runway at high speeds would be rated as more severe than the same swell located on the apron or taxiway where the normal aircraft operating speeds are much lower. The following guidance is provided for runways:

Swell Criteria

Severity	Height Differential
Low	< ¾ inch (< 19 millimeters**)**
Medium	¾ to 1-1/2 inch (19 to 38 millimeters)
High	> 1-1/2 inch (> 38 millimeters)

Low: upward bulge < 1-1/2-inch high

Medium can be observed without difficulty

High can be readily observed and severely affects pavement ride ability

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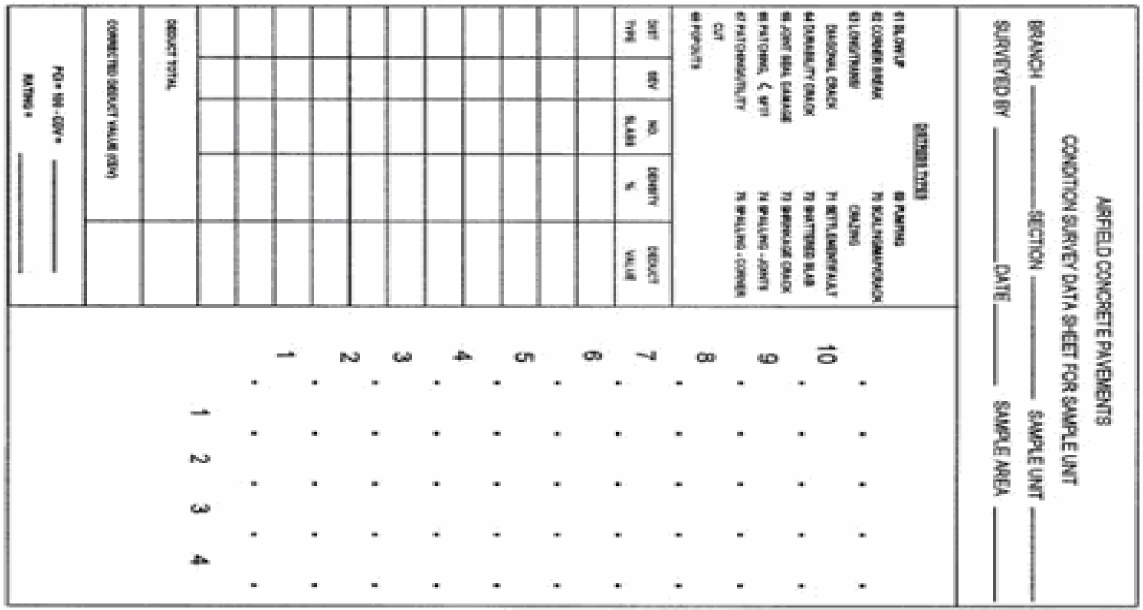
Chapter II

Distress in Jointed Rigid Pavement

- Blow up
- Corner Break
- Longitudinal, Transverse and Diagonal
- “D” Cracking
- Joint Seal Damage
- Patching
- Pop outs
- Pumping
- Scaling, Map Cracking, and Crazing
- Settlement or Faulting
- Shattered Slab/Intersecting Cracks
- Shrinkage Cracking
- Joint Spalling (Transverse & Longitudinal)
- Corner Spalling



Survey Data Sheet for Portland cement Concrete (PCC) Pavement.

For Rigid Pavements, the severity levels for the following distresses are not defined:

1) POPOUTS

2) PUMPING

3) SHRINKAGE CRACKING

(Source: ASTM D5340/ AC 150/ 5380)

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DISTRESS 1, BLOW UP

Description: Blowups occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit expansion of 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 in the vicinity of the joint. Blowups can also 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

Location: Often, Blowup appears at a transverse crack or joint. Usually at the slab edges (buckling) or shattering will occur in the vicinity of the joint. However, Blowups can also be seen at utility cuts and drainage inlets.

Causation: 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.

Severity Levels:

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

2) Medium buckling or shattering has not rendered the pavement inoperative, but a significant amount of rough ness exists.

3) High. Buckling or shattering has rendered the pavement inoperative.

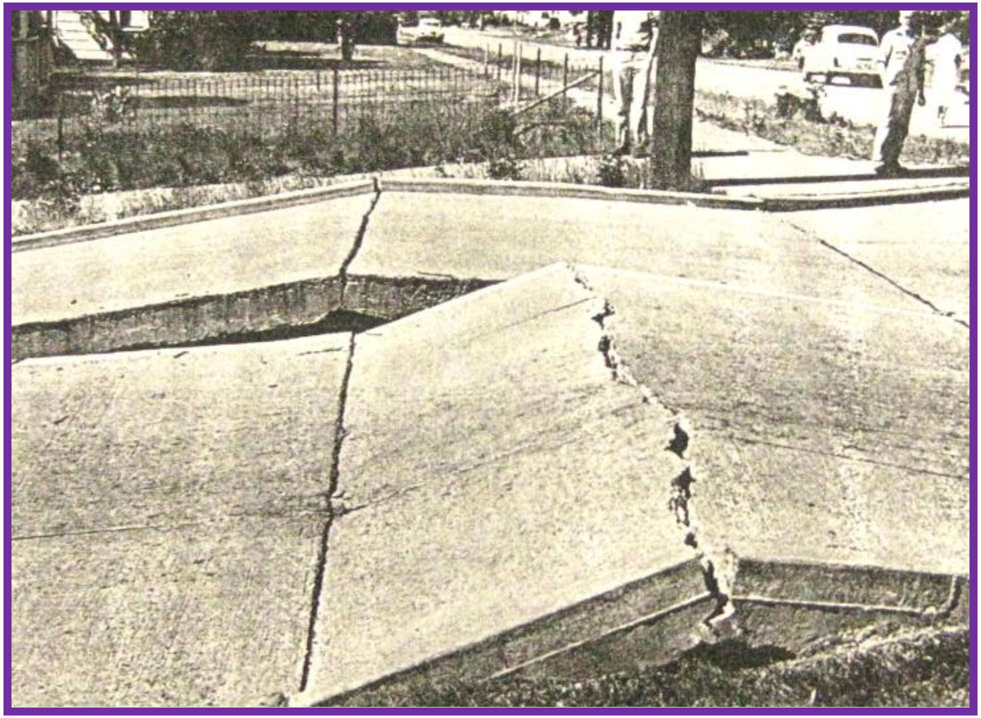
DIFFERENCE IN ELEVATION

Severity	Runways/High-Speed Taxiways	Taxiway /Aprons
L	<1/ 2 inch (12.7 mm)	¼ < 1 inch (6.4 mm < 25.4 mm)
M	½ to 1 inch (12.7 to 25.4 mm)	1 to 2 inch (25.4 mm to 50.8 mm)
H	INOPERATABLE	INOPERATABLE

Counting Procedure: 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 where two slabs are affected, the distress should be recorded as occurring in two slabs. Blowup can be recorded only if the distress has visually appeared on that slab. Severity may be different on adjacent slabs. If blowup has been repaired by patching, then its severity can be established by measuring the difference in elevation between the two slabs.

Low severity (a slight amount of roughness exists)

Medium severity (a significant amount of roughness exists)



High severity (the pavement is almost inoperative)

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DISTRESS 2, CORNER BREAK

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 (7.5 by 7.5 meters) that has a crack intersecting the joint 5 feet (1.5 meters) from the corner on one side and 17 feet (5.1 meters) on the other side is not considered a corner break; it is a diagonal crack. However, a crack that intersects 7 feet (2.1 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.

Location: Usually appear in the wheel path areas, such as runways and/or taxiways areas.

Causation: Load repetition combined with loss of support and curling stresses usually cause corner breaks. Curling stresses also cause corner breaks

Severity Levels:

1) Low. Crack has little or no spalling with no loose particles (no FOD potential). If non-filled, it has a mean width less than approximately 1/8 inch. 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.

2) Medium. One of the following conditions exists:
    - Filled or non-filled crack is moderately spalled with some loose particles (some FOD potential)
    - A non-filled crack has a mean width between 1/8 and 1 inch.
    - A filled crack is not spalled or only lightly spalled, but the filler is in unsatisfactory condition.
    - 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.

3) High. One of the following conditions exists:

- Filled or non-filled crack is severely spalled with loose and missing particles.
- A non-filled crack has a mean width greater than approximately 1 inch, creating tire damage potential.
- The area between the corner break and the joints is severely cracked.

Counting Procedure: The affected slab is recorded as one slab if it

- Contains a single corner break,
- Contains more than one break of a particular severity, or
- 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 corner break.

Low severity (little or no spalling, no FOD)

 

Medium severity (spalled, some FOD, dividing the corner into two pieces)

High severity (severely spalled with loose and missing particles)

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DISTRESS NO. 3, LONGITUDINAL, TRANSVERSE AND DIAGONAL

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.

Location: LONGITUDINAL **-** Along the center line;
TRANSVERSE **-** Perpendicular to the center lines;
DIAGONAL CRACKS **-** Usually, around or near the corner area

Causation: These cracks are usually caused by a combination of load repetition, curling stresses, and shrinkage stresses.

Severity Levels:

1) Low is characterized by:
   - Cracks have little or no spalling with no loose (FOD) particles.
   - If nonfilled**,** it is < 1/8" (or .13") wide.
   - A filled crack can be of any width, but its filler material must be in satisfactory condition.

2) Medium is characterized by one of the following conditions:
   - A filled or nonfilled crack is moderately spalled with some loose or missing particles.
   - A nonfilled crack has a mean width between 1/8 (or .13") and 1 inch.
   - A filled crack has no spalling or minor spalling, but the filler is in unsatisfactory condition.
   - The slab is divided into three pieces by low severity cracks

3) High: One of the following conditions exists:

- A filled or nonfilled crack is severely spalled with loose and missing particles.
- A nonfilled crack has a mean width approximately greater than 1 inch, creating tire damage potential.
- The slab is divided into three pieces by two or more cracks, one of which is at least of medium severity.

Counting Procedure: The distress is recorded as one slab once the severity has been identified.

Longitudinal crack

Low-severity (has little or no spalling, no FOD)


Medium-severity (moderately spalled, some FOD)

High-severity (Has a mean width approximately > 1”)

Transverse crack

Low-severity

Medium-severity

High-severity

Diagonal cracking

Low severity: little or no spalling, no FOD

Medium severity: spalled with some loose or missing particles. (FOD)

High severity: three pieces by two or more cracks, high severity, heavily FOD

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DISTRESS NO. 4, Durability or “D” CRACKING

Description: Durability or “D” 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 meter) of the joint or crack.

Location: It usually appears as a pattern of cracks running parallel to a joint or linear crack within 1 to 2 ft.

Causation: Durability cracking is caused by the concrete’s inability to withstand environmental factors such as freeze-thaw cycles., and also by the loss of material around a joint or corner.

Severity Levels:

1) Low. Hairline crack appears, usually, at a small area, such as one or two corners, and some time along one joint of slab(s). Pieces are defined by light cracks and cannot be removed (no FOD potential).

2) Medium. Has a considerable amount of “D” cracking with little or no disintegration. Some FOD potential appears at one or two corner(s).

3) High. “D” cracking has developed over a considerable amount of slab area (greater than approximately one-quarter of the slab area), and the pieces are well defined and can be removed easily (some FOD potential).

Counting Procedure: 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. For example, if light and medium durability cracking are located on one slab, the slab is counted as having medium only.

Low-severity “D” cracking

Medium-severity “D” **cracking (**occurring in limited area of slab)

High-severity “D” cracking ***(****pieces are well defined and can be removed easily (some FOD)*

DISTRESS NO. 5, JOINT SEAL DAMAGE

Description: Joint seal damage is any condition that 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. 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.

Location: At the joints between slabs

Causation: Accumulation of incompressible materials at the joints and joint sealant deterioration.

Severity Levels:

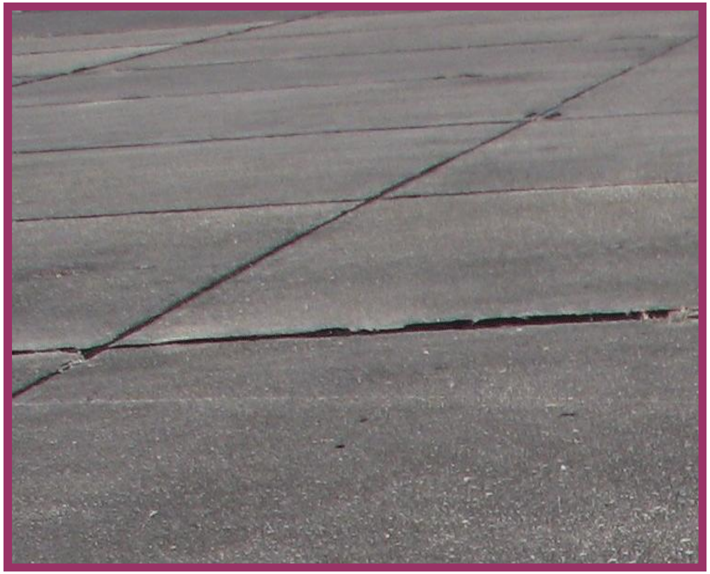
1) Low (L): Joint sealer is in generally good condition or very little damage throughout the section. Sealant is performing well with only a minor amount of any of the above types of damage present. A knife blade shouldn't easily insert between joint face and sealer

2) Medium (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 sealer is in place but slightly damaged. Also, a knife blade shouldn't easily insert between joint face and sealer

3) High (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. More than 10% of the sealer is missing.

Counting Procedure: Joint seal damage is not counted on a slab-by-slab basis, but it is rated based on the overall condition of the sealant over the entire sample unit.

ATTENTION: If more than 10% of the seal has been deformed but is still in place; rate its severity as low.



Low severity joint seal damage *(10% of the seal has been deformed but still in place)*

Medium-severity joint seal damage *(Joint sealer is in place but slightly damaged*)

High-severity joint seal damage *(complete loss of sealant; joint is filled with incompressible material)*

DISTRESS NO. 6, PATCHING, (SMALL LESS THAN 5 SQ FT)

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 square feet (1.5 square meters)) and large (over 5 square feet (1.5 square meters)). Large patches are described in the next section.

Location: Where the original pavement has been removed and replaced.

Causation: Removal of the existing materials

Severity Levels:

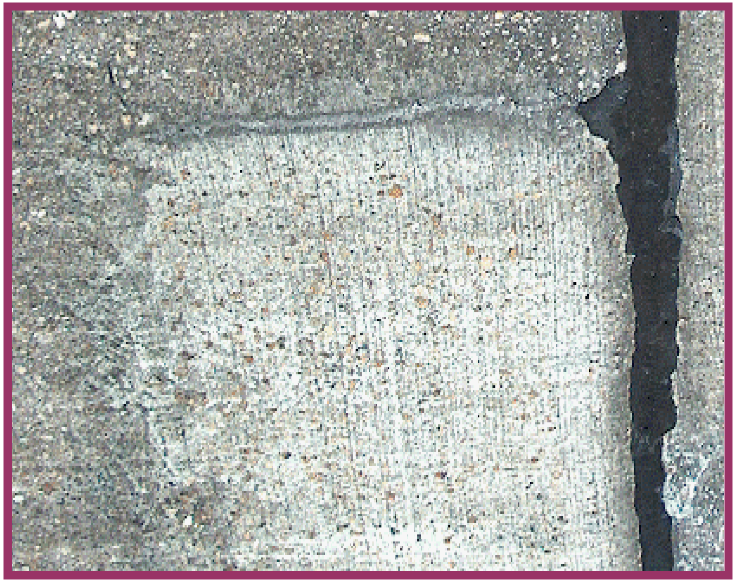
1) Low (L): Patch is functioning well with little or no deterioration.

2) Medium (M): Patch has deteriorated and/or moderate spalling, or both, can be seen around the edges. Patch material can be dislodged with considerable effort with some FOD potential.

3) High (H): Patch has deteriorated, either by spalling around the patch or cracking within the patch, to a state that warrants replacement.

Counting Procedure: 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 small patch (4 to 10” 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.

Low-severity small patch (little or no deterioration)



Medium-severity small patch *(moderate spalling)*

High-severity small patch (*by spalling around the patch or cracking)*

DISTRESS NO. 7, PATCHING, (LARGE OVER 5 SQ FT AND UTILITY CUT)

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.

Location: Could be anywhere, especially around the joints.

Causation: Removal of the existing materials

Severity Levels.

1) Low: Patch is functioning well with very little or no deterioration.

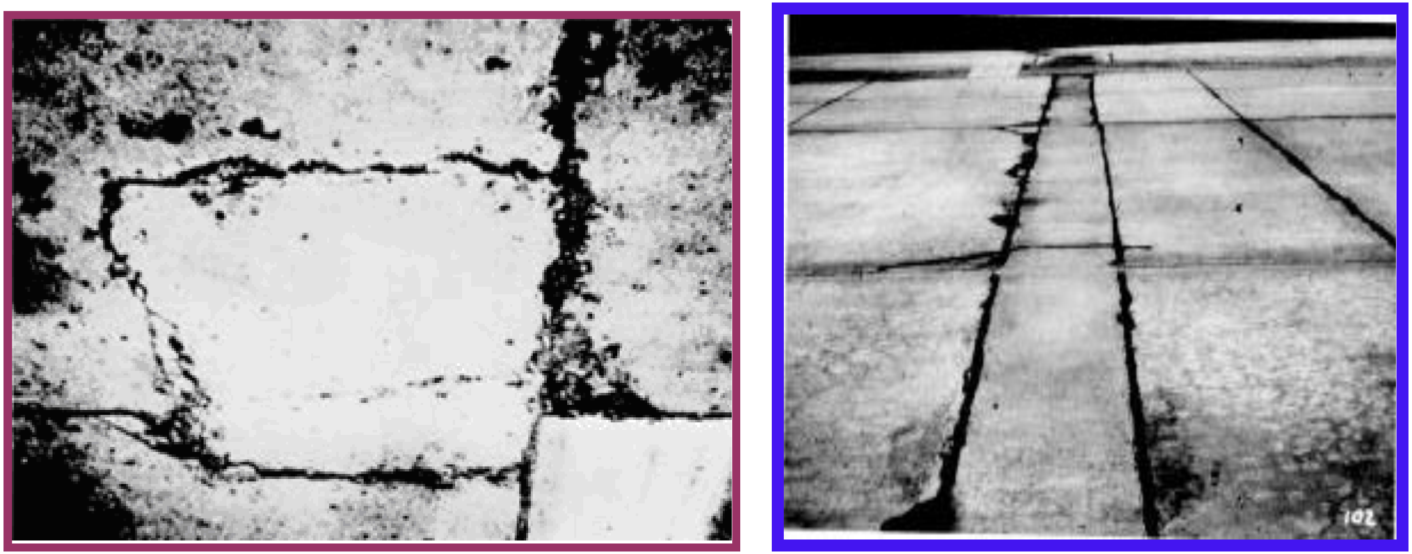
2) Medium: Patch is deteriorated and/or moderate spalling can be seen around the edges, hence some FOD potential. Patch material can be dislodged with considerable effort.

3) High: Patch has deteriorated to a state that causes considerable roughness with loose or easily ddislodged material producing FOD. The extent of the deterioration warrants replacement of the patch.

Counting Procedure: The criteria for counting are the same as for small patches.

Low-severity (little or no deterioration)

Medium-severity (deteriorated and/or some spalling)



High-severity patch ***(****The extent of the deterioration warrants replacement of the patch)*

DISTRESS NO. 8, POPOUTS

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 (25.4 millimeters) to 4 inches (102 millimeters) in diameter and from 1/2 inch (12.7 millimeters) to 2 inches (50.8 millimeters) deep.

Location: Could be anywhere

Causation: Caused by freeze-thaw action in combination with expansive aggregates

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

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

Pop-out *(**No degrees of severity**)*

DISTRESS NO. 9, PUMPING

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 that will lead to cracking under repeated loads

Location: Usually at the joints or cracks.

Causation: Caused by deflection of the slab under passing loads and also by poor joint sealer.

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

Counting Procedure: 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. (See Slab Count for Pumping)

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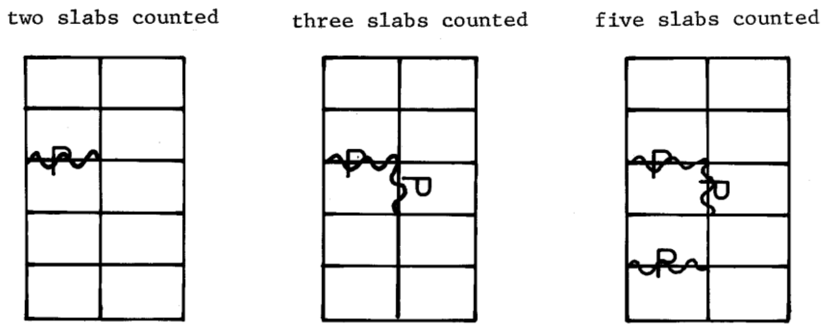
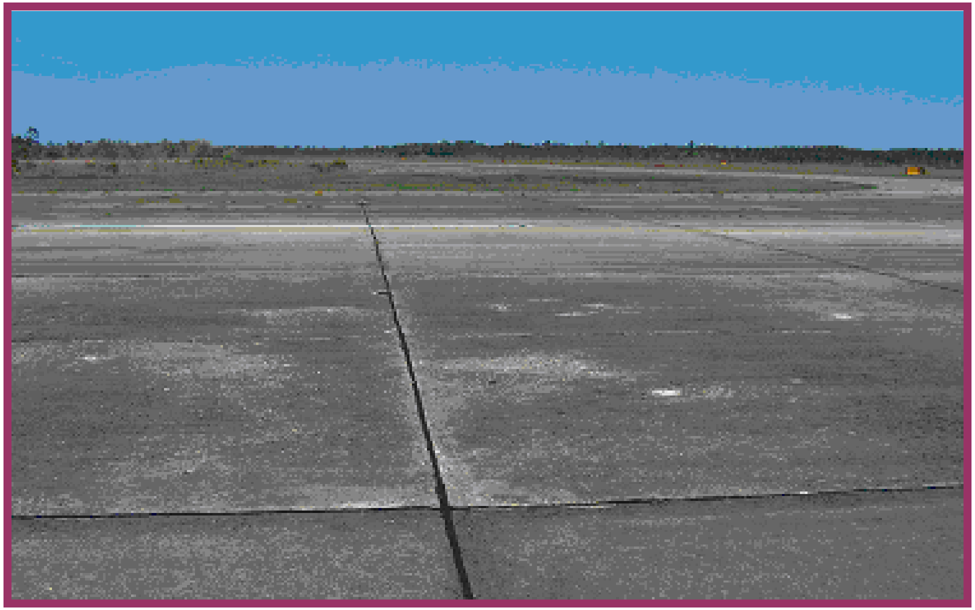


Slab count for pumping

Pumping (note fine material on surface that has been pumped



Pumping – (note stains on pavement)

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DISTRESS NO. 10, SCALING, MAP CRACKING, AND CRAZING

Description: Map cracking or crazing refers to a network of shallow, fine, or hairline cracks which extend only through the upper surface of the concrete. The cracks tend to intersect at angles of 120 degrees. Map cracking or crazing is usually caused by over finishing the concrete and may lead to scaling of the surface, that is the breakdown of the slab surface to a depth of approximately 1/4 inch (6.4 millimeters) to 1/2 inch (12.7 millimeters). Deicing salts, improper construction, freeze-thaw cycles, and poor aggregate may also cause scaling. Another recognized source of distress is the reaction between the alkalis (Na_2O and K_2O) in some cement and certain minerals in some aggregates. Products formed by the reaction between the alkalis and aggregate result in expansions that cause a breakdown in the concrete. This generally occurs throughout the slab and not just at joints where "D" cracking normally occurs.

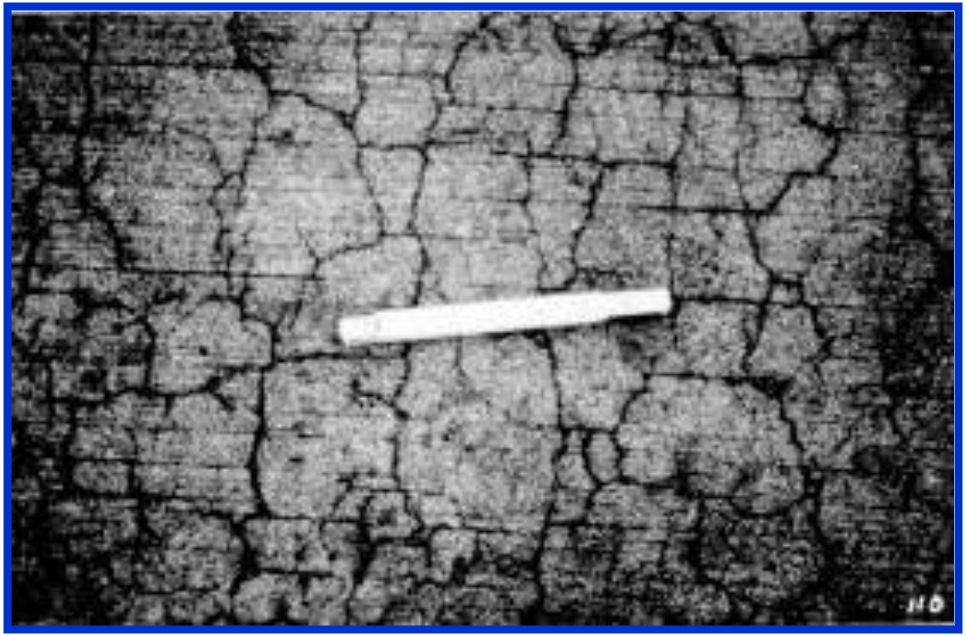
Location: Could be anywhere.

Causation: Map cracking or crazing is usually caused by over finishing the concrete and may lead to scaling of the surface, which is the breakdown of the slab surface to a depth of approximately ¼ to ½ inch. Deicing salts, improper construction, freeze-thaw cycles, and poor aggregate may also cause scaling.

Severity Levels.

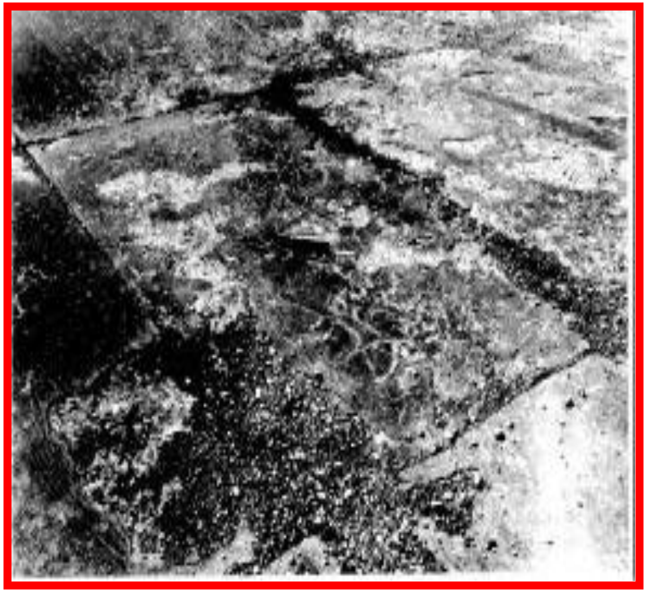
1) Low: Crazing or map cracking exists over most of the slab area. The surface is in good condition with no scaling**.** The low severity level is an indicator that scaling may develop in the future.
2) Medium: Slab is scaled over approximately 5 percent or less of the surface with some loose or missing material with FOD potential.
3) High: Slab is severely scaled with a large amount of loose or missing material. Usually, more than 5 percent of the surface is affected.

Counting Procedure: If two or more levels of severity exist on a slab, the slab is counted as one slab having the maximum level of severity. For example, if both low severity crazing and medium scaling exist on one slab, the slab is counted as one slab containing medium scaling.



Low-severity crazing *(over most of the slab area, but no scaling)*

Medium-severity scaling Slab is scaled over approximately 5 %, some FOD



High Severity Scaling (severely scaled, amount of loose or missing material, more than 5% of the surface is affected.

DISTRESS NO. 11, SETTLEMENT OR FAULTING

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

Location: Usually at the joint areas.

Causation: Settlement or fault could be caused by (i) Soft foundation creates settlement; (ii) Deterioration under the slab such as creation of voids; (iii) Pumping of subgrade soils; (iv) The temperature and moisture change create the curling between the slab's edges; (v) Caused by upheaval or consolidation; (vi) Heavy traffic can rapidly accelerate faulting; and (vii) Joints may fault due to settlement of an adjacent slab.

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	< ¼-inch (< 6.4 millimeters)	1/8 ≤ ½ inch (>3.2 ≤ 12.7 millimeters)
M	¼ to ½ inch (6.4 to 12.7 millimeters)	½ - 1 inch (12.7 – 25.4 millimeters)
H	> ½ inch (> 12.7 millimeters)	> 1 inch (< 25.4 millimeters)

Counting Procedure: 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.

Low-severity settlement, 3/4 “at the apron

Medium-severity settlement on apron >1/2 in.

High-severity settlement at the Runway (inoperable)

DISTRESS NO. 12, SHATTERED SLAB/INTERSECTING CRACKS

Description: Intersecting cracks are cracks that break slab into four or more pieces due to 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.

Location: At the slabs

Causation: Caused by overloading and/or inadequate support.

Severity Levels.

1) Low (L): Slab is broken into four or five pieces with most or all cracks of low severity.

2) Medium (M): Slab is broken into four or five pieces with at least 15% or more cracks are medium severity (no high severity cracks) or slab is broken into six or more pieces with at least 85% or more cracks are low severity

3) High (H): At this level of severity, the slab is called shattered. Slab is broken into four or five pieces with most of cracks are in high severity or slab is broken into six or more pieces with more than 15% of cracks are either medium or high severity.

Counting Procedure:

- **I**f a slab is rated as medium or high severity level shattered slab, then no other distress type should be counted in the slab.
- The deduct values for shattered slab distress are high since this condition is essentially failure; therefore, the counting of other distress types in the slab would tend to underrate the PCI of the sample unit.
- Shrinkage cracks should not be considered in deciding whether or not the slab is broken into 4 or more pieces.

Low-severity *(Slab is broken into four or five pieces)*

Medium-severity *(Slab is broken into four or five pieces with at least 5% or more cracks)*

High-severity *(Slab is broken into 6 or more pieces with over 15% cracks)*

DISTRESS NO. 13, SHRINKAGE CRACKING

Description: Shrinkage cracks are hairline cracks that are usually only a few feet long and do not extend across the entire slab.

Location: Normally starts at the edge of slabs.

Causation: They are formed during the setting and curing of the concrete and usually does 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.

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

ATTENTION: Shrinkage cracks are usually only a few feet long and do not extend across the entire slab.

Shrinkage crack (No severity) (Hairline cracks, few ft long, do not extend across the entire slab.)

DISTRESS NO. 14, JOINT SPALLING (TRANSVERSE & LONGITUDINAL)

Description: Joint spalling is the breakdown of the slab edges within 2 feet (0.6 meter) 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 and it is caused by infiltration of incompressible materials or traffic loads. Weak concrete at the joint (caused by overworking) combined with traffic loads is another cause of spalling.

Location: Joint spalling can also occur along the edges of two adjacent slabs

Causation: Spalling results from excessive stresses at the joint or crack caused by infiltration of incompressible materials or traffic load. The combination of the traffic load and weak concrete at the joint (caused by overworking) is another reason of spalling.

Severity Levels.

1) Low (L):
- Spall over 2 ft long:
  - Spall is broken into three pieces or less defined by low or medium severity cracks. (Could be rated as MEDIUM as well if there is some FOD)
  - Joint is lightly frayed either with little, if any, loose or missing material (FOD).
- Spall less than 2 ft long:
  - Broken into pieces or fragmented with little loose or missing material or tire damage potential.

******* *Lightly frayed means the upper edge of joint is broken away and less than 1" wide and has a* depth of less than ½".

2) Medium (M):

Spall over 2 ft long:

- Spall is broken into more than three pieces

- Spall is broken into three pieces or less with one or more of the cracks being severe with some loose or missing material.
  Joint is moderately frayed with some FOD.

Spall less than 2 ft long:

- Broken into pieces or fragmented with some of the pieces loose or absent with some tire damage potential, along with some FOD potential.

*** Moderately frayed means the upper edge of joint is broken away and wider than 1” wide and has a depth of more than ½”

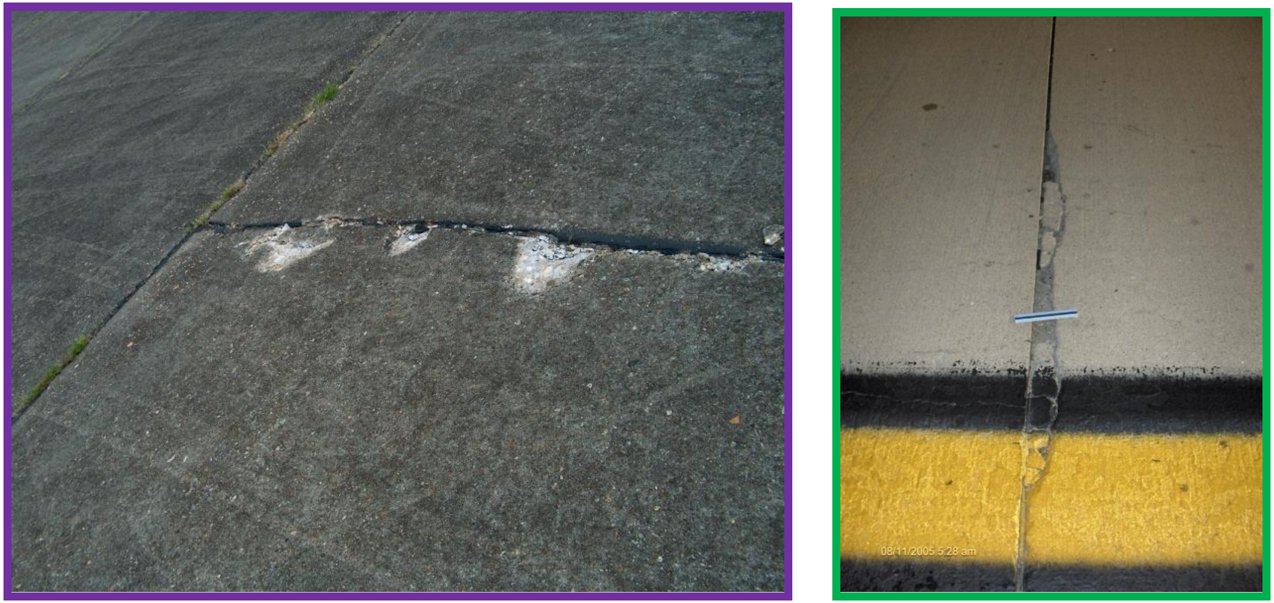
3) High (H):

Spall over 2 ft long:

- Spall is broken into more than three pieces, one or more with high severity cracks and some FOD potential. Also with high possibility of the pieces becoming dislodged. Joint is severely frayed with a large amount of loose or missing particles, along with high potential of FOD.

Attention: If less than 2 ft of the joint is lightly frayed, the spall should not be counted.

Counting Procedure: 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.



Low-severity joint spall *(Less than 2 ft long, spall is broken into three pieces or less)*

Medium-severity joint spall (Broken into pieces or fragmented with some FOD)

High-severity joint spall *(Joint is severely frayed with a large amount of loose, high potential of FOD)*

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DISTRESS NO. 15, CORNER SPALLING

Description: Corner spalling is the raveling or breakdown of the slab within approximately 2-feet (0.6-meter) 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.

Location: Within approximately 2-feet (0.6-meter) of the corner.

Causation: 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 is another cause of spalling.

Severity Levels:

1) Low: One of the following conditions exists:

    1) Spall is broken into one or two pieces with little or no FOD.

    2) Spall is defined by 1 medium severity crack with little or no FOD.

2) Medium: One of the following conditions exists:

    1) Spall is broken into ≥ pieces with medium-severity cracks and few loose or absent fragments.

    2) Spall is defined by 1 severe severity crack that may be accompanied by a few hairline cracks.

    3) Spall has deteriorated that loose material is causing some FOD potential.

3) High: One of the following conditions exists:

1) Spall is broken into ≥ 2 pieces with high-severity cracks and few loose or absent fragments.

2) Pieces of spall have been displaced to the point that may damages the tires.

3) Spall has deteriorated to the point that loosed materials are causing high FOD potential.

Counting Procedure: 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.

NOTE: A corner spall smaller than 3” wide, measured from the edge of the slab, and filled sealant is not recorded.

 

Low-severity corner spall

Medium-severity corner spall

High-severity corner spall

Chapter III

METHODS OF REPAIR

GENERAL. This chapter describes various methods airports can use to correct airfield pavement distress.

While these repair methods apply to specific types of distress and pavements, they should all take into account the possibility of foreign object damage (FOD) to aircraft. Untidy repair activities may leave potential FOD at or near the repair sites. Improperly constructed repairs may disintegrate and cause a FOD potential. All maintenance activities must include quality control monitoring to assure that repairs are conducted properly and clean-up activities undertaken to remove this potential. The current version of AC 150/5380-5, *Debris Hazards at Civil Airports,* provides additional guidance to help eliminate debris hazards associated with maintenance activities.

a. Visible evidence of excessive stress levels or environmental distress in pavement systems may include cracks, depressions, and other types of pavement distresses. The formation of distresses in airport pavements may severely affect the structural integrity; ride quality, and safety of airport pavements. To alleviate the effects of distresses and to improve the airport pavement serviceability, airports should adopt an effective and timely maintenance program and adequate repair procedures.

b. In all cases of pavement distress, the first step in rehabilitating a pavement is to determine the causes of distress. Then, the proper procedures for repair—which will not only correct the damage, but also prevent or retard its further occurrence—may be applied. Pavement repairs should be made as quickly as possible after the need for them arises to ensure continued and safe aircraft operations. Airports should perform repairs at early stages of distress, even when the distresses are considered minor. A delay in repairing pavements may allow minor distresses to progress into major failures. While deterioration of pavements due to traffic and adverse weather conditions cannot be completely prevented maintenance and repair programs can significantly reduce the rate of deterioration and minimize the damage.

c. Weather conditions may limit repair measures undertaken to prevent further pavement damage. For example, rehabilitation by crack filling is more effective in cool and dry weather conditions, whereas pothole patches, seal coats, and other surface treatments require warm, dry weather for best results. This does not mean that resurfacing work cannot be performed under cold and damp conditions or that crack filling cannot be done in warm weather. Rather, these repairs just require much greater care when made during such periods.

d. The minimum depth of repair for Portland cement concrete should be 2 inches (5 cm). Repairs made thinner than 2 inches (5 cm) usually deteriorate quickly on an airfield pavement. (Most distresses needing repair will extend at least 2 inches (5 cm) into the pavement.) Concrete pavement repairs which are thinner than 2 inches (5 cm) may benefit from the use of epoxy materials.

REPAIR METHODS FOR PORTLAND CEMENT CONCRETE PAVEMENTS

*a. **Crack Repair and Sealing.*** Sealing cracks prevents surface moisture from entering the pavement structure. This type of repair first requires establishing a properly shaped sealant reservoir, which should be done with a saw rather than with router equipment because routers use a mechanical impact to remove material and can cause micro-cracks in the concrete.

(1**) <u>Longitudinal, Transverse, and Diagonal Cracks</u>**. The procedures for repairing these types of cracks are as follows:

(a) Saw a groove to the width and depth recommended by the sealant manufacturer. The width needs to be sufficient to allow the material to stretch and contract with movement in the pavement. Common hot-pour materials typically require a width equal to the depth. Silicone materials typically require a width twice the dimension of the depth. The FAA does not recommend widths smaller than 3/8 inches (10 mm) because such widths are difficult to fill with sealant material.

(b) Sand blast both sides of the sealant reservoir, and clean it out with compressed air. The groove must be dry and free of dirt, dust, and other material that might prevent bonding of the sealant.

(c) Place a bond breaker at the proper depth to establish the joint sealant reservoir. Bond breakers are necessary to prevent bonding of the sealant material to the bottom of the crack. Improper bonding restricts the expansion and contraction of the sealant material and can cause premature failure. Backer rod is commonly used to prevent bonding and to establish the proper joint reservoir dimensions. Backer rod is an extruded, chemically inert; closed-cell polyethylene "rope" designed to effectively fill in the gaps in the joint. The backer rod is sized slightly larger than the width of the joint and is simply pushed to the desired depth.

(d) Fill the joint reservoir with sealant, recessing the sealant approximately ¼ inches (6 mm) below the pavement surface. Excess sealant on the pavement surface does not assist in sealing the crack and is prone to tracking and damage from wheels and snow removal equipment.

(2) **Corner Cracks.** Structural distress requires full-depth repairs. Corner cracks (cracking of the panel between two adjacent joints), cracks more than ¾-inches (19 mm) wide with spalling, cracks more than 1-1/2-inches (38 mm) wide, and/or cracks associated with loss of subgrade support typically signify the presence of structural distress. The procedures for repairing these types of cracks are as follows:

(a) Make full-depth saw cuts at constructed joints. The FAA recommends that full-depth cuts be made at a distance of at least 2 feet (60 cm) beyond the limits of the crack. Make the saw cuts so the repair area is rectangular when the repair is for wide cracks that transect a panel. For corner cracks, cut the repair area square.

(b) Use a jackhammer to remove material within the limits of the sawcuts. When using a tractor mounted hammer or removing the concrete by lifting, make a second saw cut inside the perimeter cuts to provide expansion. Remove by hand any loose materials that remain. During the repair, try to minimize any disturbance to the subgrade soils or base materials.

(c) Restore subgrade or subbase materials to the base elevation of the panel being repaired.

(d) Use tie-bars consisting of #4 deformed bars (#5 bars for pavements more than 12-inches (30 cm) thick) in the faces of the parent panel. Install by drilling into the face and using an epoxy-bonding agent. Use equidistant spacing of the bars, but do not install them more than 24-inches (60 cm) apart. When spacing bars, do not allow their ends to overlap with those of other tie-bars or dowels.

(e) Use dowel bars in the joint that parallels the direction of traffic. On aprons and areas where traffic may be oblique to joints, install dowels in both joint faces. Dowels are installed by drilling and spaced at least one bar spacing away from faces parallel to the dowel bar. Space dowel bar ends at least one bar spacing apart at corners of intersecting joints. Oil exposed dowel bar ends prior to backfilling with concrete.

(f) Install nonabsorbent board within the limits of the joint seal reservoirs along the adjacent concrete panels. When repairing multiple panels, restore the joint seal reservoirs with the nonabsorbent filler board.

(g) Backfill the repair area with concrete, being sure to consolidate the concrete along the limits of repair. Exercise caution when working adjacent to existing concrete faces during consolidation, and watch for segregation of the concrete.

(h) After the concrete cures, remove the filler board by sawing. Reinstall joint seal material.

(3) **"D" Cracking.** This type of distress usually requires repairing the complete slab since "D" cracking will normally reappear adjacent to the repaired areas. Temporary repairs can be made using the technique noted in paragraph 13.

(4) **Joint Seal Damage.** The sequence of operations for preparing joints for resealing is as follows:

(a) Use a joint plow or diamond saw blade to remove the joint sealing material to the full depth of the reservoir for contraction and construction joints. As a minimum, remove the joint sealant material to a depth sufficient to establish a proper shape factor for the new sealant material.

(b) When changing the material type of the joint seal, the FAA recommends removing old material from the reservoir by re-facing the sidewalls. Re-facing will result in a change to the reservoir shape factor (width to depth ratio). Consult the manufacturer of the replacement joint seal material about the recommended shape factor. If a saw is used to reface the joint, flush the joint with water immediately after sawing. Remove any remaining debris by sand blasting each face of the joint reservoir.

(c) If the same material will be used to replace the existing joint seal, clean the reservoir with high-pressure water or sand blasting.

(d) Immediately prior to sealing, blow out the joint with clean, oil-free compressed air to remove sand, dirt, and dust.

(e) Install new dry backer rod.

(f) Seal joints with hot or cold compounds. Sealants should be placed as noted in paragraph 13.

b. Disintegration. If not impeded in its early stages, disintegration can progress rapidly until the pavement requires complete rebuilding.

(5) **Scaling, Map Cracking, and Crazing**. This distress is often noticeable with little or no surface deterioration. Severe cases of scaling, map cracking, or crazing can produce considerable FOD, which can damage propellers and jet engines. If the distress is severe and produces FOD, the repair method is to remove the immediate surface and provide a thin bonded overlay. The procedures for repairing these types of distress are as follows:

(a) Make a vertical cut with a concrete saw 2 inches (5 cm) in depth and approximately 2 inches (5 cm) back of the affected area.

(b) Remove all unsound concrete until sound, intact material has been reached. Remove the unsound concrete with air hammers, pneumatic drills, shot blasters, or grinding equipment, and blow out the area with compressed air.

(c) Clean the area to be repaired with high-pressure water. Allow the patch area to dry completely if required by the patch material specification.

(d) Treat the surface with a grout mixture to ensure a good bond between the existing pavement and the new concrete. Apply the grout immediately before placing the patch mixture and spread with a stiff broom or brush to a depth of 1/16 inch (2 mm).

(e) If the repair crosses or abuts a working joint, place a thin strip of wood or metal coated with bond-breaking material in the joint groove, and tamp the new mixture into the old surface. The mix should be air-entrained and designed to produce a no slump concrete, which will require tamping to place in the patch.

(f) After edging the patch, finish it to a texture matching the adjacent area.

(g) After a proper cure period, fill any open joints with joint sealant prior to opening to traffic.

(6) **Joint Spalling and Corner Spalling**. The procedure for the repair of spalls is as follows:

(a) Make a vertical cut with a concrete saw 2 inches (5 cm) in depth and approximately 2 inches (5 cm) back of the spalled area.

(b) Remove all unsound concrete until sound, intact material has been reached. Break out the unsound concrete with air hammers or pneumatic drills and blow out the area with compressed air.

(c) Clean the area to be repaired with high-pressure water. Allow patch area to dry completely if required by the patch material specification.

(d) Treat the surface with a grout mixture to ensure a good bond between the existing pavement and the new concrete. Apply the grout immediately before placing the patch mixture and spread with a stiff broom or brush to a depth of 1/16 inch (2 mm).

(e) Place a thin strip of wood or metal coated with bond-breaking material in the joint groove and tarp the new mixture into the old surface. The mix should be air-entrained and designed to produce a no slump concrete, which will require tamping to place in the patch.

(f) After edging the patch, finish it to a texture matching the adjacent area.

(g) After a proper cure period, fill the open joint with joint sealant prior to opening to traffic.

(7**) <u>Blowups</u>.** Blowups may be repaired using the following procedures:

(a) Make a full-depth vertical cut with a concrete saw approximately 6 inches (15 cm) outside of each end of the broken area.

(b) Break out the concrete with pneumatic tools, and remove concrete down to the subbase/subgrade material.

(c) Add subbase material, if necessary, and compact.

(d) In reinforced pavement construction, use joint techniques to tie the new concrete to the old reinforced material. Dowel any replacement joints, and build them to joint specifications.

(e) Dampen the subgrade and the edges of the old grout.

(f) Place concrete on the area to be patched. Ready-mixed concrete may be used if it is satisfactory and can be obtained economically. Consider using a mixture providing high early strength in order to permit the earliest possible use.

(g) Finish the concrete so the surface texture approximates that of the existing pavement.

(h) Immediately after completing finishing operations, properly cure the surface with either a moist cure or a curing compound.

(8) **Shattered Slab**. A shattered slab requires replacing the full slab. Follow the same procedures used for blowup repairs except remove unstable subgrade materials and replace with select material. Correct poor drainage conditions by installing drains for removal of excess water.

(9**) Distortion**. If not too extensive, some forms of distortion, such as that caused by settlement, can be remedied by raising the slab to the original grade. Slab jacking procedures may be used to correct this type of distress. In slab jacking, a grout is pumped under pressure through holes cored in the pavement into the void under the pavement. This creates an upward pressure on the bottom of the slab in the area around the void. The upward pressure lessens as the distance from the grout hole increases. Thus, it is possible to raise one corner of a slab without raising the entire slab. Because of the special equipment and experience required, slab jacking is usually best performed by specialty contractors.

(10) **Loss of Skid Resistance**. Rehabilitation treatment includes resurfacing, milling, diamond grinding, shot peening, and surface cleaning. Grooving may be considered when a loss of skid resistance is observed. Grooving does not impact the surface texture but does provide a channel for water that becomes trapped between a pavement and the tire to escape. Grooving thus minimizes the potential for hydroplaning during wet conditions.

(11) **Polished Aggregate**. Since polished aggregate distress normally occurs over an extensive area,
Consider milling or diamond grinding the entire pavement surface. Concrete or bituminous resurfacing may also be used to correct this condition.

(12) **Contaminants**. Remove rubber deposits with high-pressure water or biodegradable chemicals.

(13) **Temporary Patching of Concrete Pavements**. Broken concrete areas can be patched with bituminous concrete as an interim measure. Full-depth bituminous repairs will interrupt the structural integrity of the rigid pavement and may lead to additional failures. Consequently, such full-depth repairs should be considered temporary, and corrective long-term

repairs should be scheduled. Temporary repair for corner cracks, diagonal cracks, blowups, and spalls can be made using the following procedures:

a. Make a vertical cut with a concrete saw completely through the slab.

b. Break out the concrete with pneumatic tools, and remove broken concrete down to the subbase/subgrade material.

c. Add subbase/subgrade material if required, and compact.

d. Apply a prime coat to the subbase material.

e. Apply a tack coat to the sides of the slab.

f. Place bituminous concrete in layers not exceeding 3 inches (75 mm).

g. Compact each layer with a vibratory-plate compactor, roller, or mechanical rammers. For partial-depth repairs, make a vertical cut approximately 3 inches (75 mm) deep, apply tack coat, and place bituminous concrete in one layer. Normal traffic may be permitted on bituminous patches immediately after completion of the patch.

REPAIR METHODS FOR BITUMINOUS CONCRETE PAVEMENTS.

a. **Crack Sealing**. Cracking takes many forms. In some cases, simple crack filling may be the proper corrective action. Some cracks, however, require complete removal of the cracked area and the installation of drainage.

(1) **Longitudinal, Transverse, Reflection, and Block Cracking**. Narrow cracks, less than 1/4 inch (6 mm), are too small to seal effectively. In areas where narrow cracks are present, a seal coat, slurry seal, or fog coat may be applied. Sawing or routing can also widen narrow cracks. Wide cracks, greater than 1/4 inch (6 mm), should be sealed using the following procedure:

(a) Clean out the crack with compressed air to remove all loose particles. If necessary, rout to widen the crack prior to utilizing compressed air. Also, address any required weed prevention.

(b) Fill cracks with a prepared crack sealer.

(2) **Alligator Cracking**. Permanent repairs by patching may be carried out as follows:

(a) Remove the surface and base as deep as necessary to reach a firm foundation. In some cases, a portion of the subgrade may also have to be removed. Use a power saw to make vertical square or rectangular cuts through the pavement.

(b) Replace base material with material equal to that removed, but if the base material has proved problematic, replace it with a more appropriate material. Compact each layer placed.

(c) Apply a tack coat to the vertical faces of the existing pavement.

(d) Place bituminous concrete and compact.

(e) If necessary, saw and seal the joints around the perimeter of the patch area.

(3) **Slippage Cracks**. One repair method commonly used for slippage cracks involves removing the affected area and patching with plant-mixed asphalt material. Specific steps are given below:

(a) Remove the affected area and at least 1 foot (30 cm) into the surrounding pavement. Make the cut faces straight and vertical. A power pavement saw makes a fast and neat cut.

(b) Clean the surface of the exposed underlying layer with brooms and compressed air.

(c) Apply a light tack coat.

(d) Place sufficient hot plant-mixed asphalt material in the cutout area to make the compacted surface the same grade as that of the surrounding pavement.

(e) Compact the asphalt mixture with steel-wheel or rubber-tire rollers until the surface is the same elevation as the surrounding pavement.

(4) **Disintegration**. If not impeded in its early stages, disintegration can progress rapidly until the pavement requires complete rebuilding. Sealer-rejuvenator products can be applied to retard disintegration. The products help reverse the aging process of the surface asphalt. Deterioration from raveling may also be impeded by applying a light fog seal or a slurry seal. The basic procedures for either surface treatment are as follows:

(a) Sweep the surface free of all dirt and loose aggregate material.

(b) Apply the surface treatment.

(c) Close to traffic until the seal has cured.

(5) **Distortion.** Repair techniques for distortion range from leveling the surface by filling with new material to completely removing of the affected area and replacing with new material. Cold milling can be employed prior to overlaying for many of these distresses.

(6) **Rutting**. The repair procedures are as follows:

(a) Determine the severity of the rutting with a straightedge or stringline. Outline the areas to be corrected on the pavement surface.

(b) Mill or grind down the identified area to provide a vertical face around the edge. The FAA recommends a minimum patch depth of 2 inches (5 cm).

(c) Thoroughly clean the entire area.

(d) Apply a light tack coat of asphalt emulsion to the area to receive asphalt material, including the vertical face of the patch area.

(e) Spread enough dense-graded asphalt concrete in the prepared area to bring it to the original grade when compacted. Deeper patches may require multiply lifts to allow proper compaction of each lift.

(f) Thoroughly compact the asphalt patch material with a roller or vibratory plate compactor.

(7**) Corrugation and Shoving**. The repair procedure for this type of distress is the same as for patch repair of alligator cracking.

(8) **Depressions.** The repair procedures are as follows:

(a) Determine the limits of the depression with a straightedge or stringline. Outline the depression on the pavement surface.

(b) Mill or grind down the area to provide a vertical face around the edge. The FAA recommends a minimum patch depth of 2 inches (5 cm).

(c) Thoroughly clean the entire area to be repaired.

(d) Apply a light tack coat of asphalt emulsion to the area to receive asphalt material, including the vertical face of the patch area.

(e) Spread enough bituminous concrete in the depression to bring it to the original grade when compacted. Deeper patches may require multiply lifts to allow proper compaction of each lift.

(f) If the pavement was not ground down, feather the edges of the patch by careful raking and manipulation of the material. However, in raking, take care to avoid segregation of the coarse and fine particles of the mixture. With additional effort, a more suitable and longer-lasting patch can result by vertically grinding the edges down or sawing and using a light jackhammer to create a vertical edge with no feathering and little raking required.

(g) Thoroughly compact the patch with a roller or vibratory-plate compactor.

d. Swelling. The repair procedure is the same as for patch repair of alligator cracking.

(9) **Loss of Skid Resistance**. Treatment for loss of skid resistance includes removal of excess asphalt, resurfacing, grooving to improve surface drainage, and removing of rubber deposits.

(10) **Bleeding**. A pavement milling or grinding machine may be used to remove the excess asphalt by milling off 1/8 inch to 1/4 inch (3 to 6 mm) of pavement. Repair procedures using hot sand or aggregate are as follows:

(a) Apply slag screenings, sand, or rock screenings to the affected area. Heat the aggregate to at least 300º F (150º C) and spread at the rate of 10 to 15 pounds per square yard (4 to 9 kg per m2).

(b) Immediately after spreading, roll with a rubber-tired roller.

(c) When the aggregate has cooled, broom off loose particles.

(d) Repeat the process if necessary.

(11) **Polished Aggregate**. One means of correcting this condition is to cover the surface with an aggregate seal coat. Grooving, milling, or diamond grinding the pavement surface are also useful techniques.

(12**) Fuel Spillage**. Permanent repairs for areas subjected to continuous fuel spillage consist of removal of the damaged pavement and replacement with Portland cement concrete or bituminous asphalt, and application of a coal-tar emulsion seal coat or other fuel-resistant coating.

(13) **Contaminants**. Rubber deposits may be removed by use of high-pressure water or biodegradable chemicals.

Chapter IV

Summary of Repair Options

PROBLEM	PROBABLE CAUSE	REPAIR
Crack and joint sealer missing or not bonded to slabs.	Faces of joints (cracks) not clean when filled; incorrect application temperature of sealer; wrong kind of seal material; improper joint width.	Remove old material sealer if extensive areas affected; sandblast joints and cracks; reseal properly.
Random cracking	Uncontrolled shrinkage (improper joint spacing); over stressed slabs; slab support lost; subgrade settlement; bitumen too hard or overheated in mix.	Seal newly formed cracks; replace subbase to establish support; if pavement being overloaded,
Surface scaling or breakup	**Rigid Pavement** - Overworked finishing operation; inadequate curing. **Flexible Pavement** - Overheated binder; poor aggregate gradation; insufficient binder; incorrect binder or aggregate; fuel spillage, stripping.	**Rigid Pavement** - Remove and replace replace panel; resurface with thin bonded concrete; resurface area with a bituminous concrete. **Flexible Pavement**- Apply seal coat; overlay.
PROBLEM	**PROBABLE CAUSE**	**REPAIR**
Joint (1) faulting or (2) spalling	(1) Variable support for un-bonded slabs; loss of load-transfer capability. (2) Incompressible matter in joint spaces; excessive joint finishing.	(1) Remove problem slab; replace slab (dowel to existing pavement). (2) Clean joint; refill with bituminous-sand mix; reseal.

Pumping	Saturated pavement foundation; lack of subbase.	Prevent entrance of water (correct the drainage problem); pump slurry under slabs to reseal; replace slabs and slab foundation; install drainage.
Surface irregularities (rutting, washboarding, birdbaths, undulations)	**Rigid Pavement** - Poor placing control; broken slabs; poor finishing. **Flexible Pavement**– Non-uniform settlement from inadequate compaction of pavement components or fill; unstable mix (poor aggregate gradation, too rich, etc.); poor laying control.	**Rigid Pavement** - Patch local areas, or overlay if widespread. **Flexible Pavement** - Patch local areas; apply leveling course; roto-mill.
PROBLEM	**PROBABLE CAUSE**	**REPAIR**
Bleeding of bituminous binder	Too much binder in mix (overly rich mix).	Scrape off excess material; blot with sand. NOTE: Bleeding is usually an indication that other surface deformities (rutting, washboarding, etc.) will occur.
Potholes	Water entering pavement structures; segregation in base course material.	Remove and replace base (and subbase if required); replace surface and seal.
Oxidation of bituminous binder	Lack of timely seal coat; binder overheated in mixing; wrong grade of asphalt for climate.	Apply seal coat; heater planer; resurface.

Map cracking, Crazing, alligator cracking	**Rigid Pavement**- Excessive surface finishing; Alkali-Aggregate Reactivity. **Flexible Pavement**- Overload; oxidized binder; under designed surface course (too thin).	**Rigid Pavement** - If surface deforms or breaks, resurface, grind. **Flexible Pavement**- Overlay; apply seal coat.
Popouts at joints	Dowel misaligned.	Fill popout hole with bituminous concrete or bituminous sand mix (if recurring, may require replacement of slabs).
PROBLEM	**PROBABLE CAUSE**	**REPAIR**
Slab blowup	Incompressible material in joints preventing slab from expanding; Alkali-Aggregate Reactivity.	Replace slab in blowup area; clean and reseal joints.
Slipperiness	**Rigid Pavement**- Improper finish (too smooth); improper type of curing membrane; excessive curing membrane; polished aggregate, rubber deposits. **Flexible Pavement**- Overly rich mix; poorly designed mix; polished aggregate; improperly applied seal coat; wrong kind of seal coat; rubber deposits.	**Rigid Pavement** - If finish too smooth, resurfacing required to provide texture; wire broom to remove curing membrane; grooving; remove rubber. **Flexible Pavement**- Apply textured seal coat; grooving; remove rubber.

Glossary

AC	Asphalt Concrete
ASTM	American Institute for Testing and Materials
FAA	Federal Aviation Administration
FAD	Florida Aviation Database
FDOT	Florida Department of Transportation
FOD	Foreign Object Damage
GPS	Global Positioning System
PCC	Portland cement Concrete
PCI	Pavement Condition Index
PMS	Pavement Management System
PMP	Statewide Pavement Management Program

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