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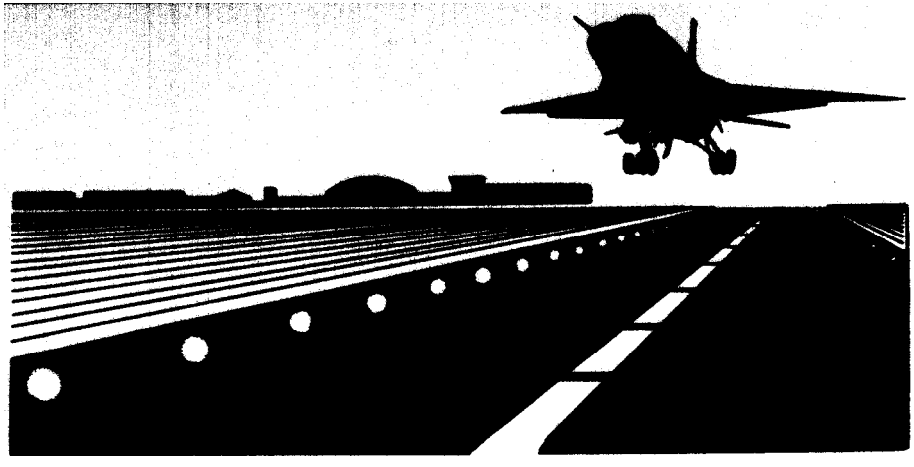

ASPHALT SURFACED AIRFIELDS

Maintenance & Repair Alternatives Pavement Condition Index (PCI) Field Manual

June 1989

S/N 0520-LP-173-0100

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This field manual contains maintenance and repair alternatives along with information on distress definitions and measuring methods for portland cement concrete airfields. These definitions and measuring methods are keyed to the determination of the Pavement Condition Index (PCI). This field manual was written for Engineers, Planners and Estimators, and Inspectors to be use on-site. Total list of field manuals:

No.	Title	Est. Compl. Date
MO-102	Maintenance and Repair of Surfaced Areas	09/89
MO-102.1	Asphalt Surfaced Roads & Parking Lots	04/89
MO-102.2	Jointed Concrete' Roads & Parking Lots	04/89
MO-102.3	Asphalt Surfaced Airfields	08/89
MO-102.4	Jointed Concrete Airfields	08/89
MO-102.5	Pavement Maintenance Management	08/90
MO-102.6	Asphalt Crack Repair	12/89
MO-102.7	Concrete Repair	03/90
MO-102.8	Asphalt Repair	12/90

FOREWORD

This field manual contains maintenance and repair alternatives along with information on distress definition and measuring methods for asphalt surfaced airfields. These definitions and measuring methods are keyed to the determination of the Pavement Condition Index (PCI) that will be explained in Manual, MO-102.5, "Pavements Maintenance Management" (scheduled for August 1990). The pavement condition rating is based on the PCI, which is a numerical indicator based on a scale of 0 to 100. The PCI measures the pavement's structural integrity and surface operational condition. The method presented is intended to accomplish pavement inspection in the most efficient and cost effective manner.

Recommendations or suggestions for modification, or additional information and instruction that will improve the publication and motivate its use, are invited and should be forwarded to the Commander, Naval Facilities Engineering Command (Attention: Code 163), 200 Stovall Street, Alexandria, VA 22332-2300. Telephone: Commercial (202) 325-0045.

This publication has been reviewed and is approved for certification as an official publication of this Command in accordance with SECNAV Instruction 5600.16.

CAPT, CEC, US NAVY
Assistant Commander for
Public Works Centers and Departments

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DEFINITIONS OF REPAIR OPTIONS
as used in this manual

1. Heater Scarify - 3/4 inch of the pavement is heated and scarified to provide a smooth, crack free surface. Can be used before overlaying to slow reflective cracking.

2. Overlay - An application of asphalt concrete over the existing surface to correct surface deficiencies and/or increase the load carrying capacity of the pavement.

3. Patching:
   Shallow - A stable, compacted leveling course is placed in depressions to level off the surface.

   Partial Depth - The deteriorated area of the asphalt surface course is removed and replaced.

   Full Depth - The deteriorated area of the asphalt surface course and the base course is removed and replaced. The subgrade should be recompacted.

4. Reconstruction - Complete replacement of the pavement.

5. Recycle - The reworking of a pavement structure or its component material to improve their performance and correct noted deficiencies.

6. Rejuvenator - An application of material which chemically reacts with the asphalt surface to revive the properties lost due to weathering.

7. Seal Cracks - Cracks are often routed to remove debris before sealing.

8. Surface Seal - An application of bituminous spray, such as a fog seal.

bb

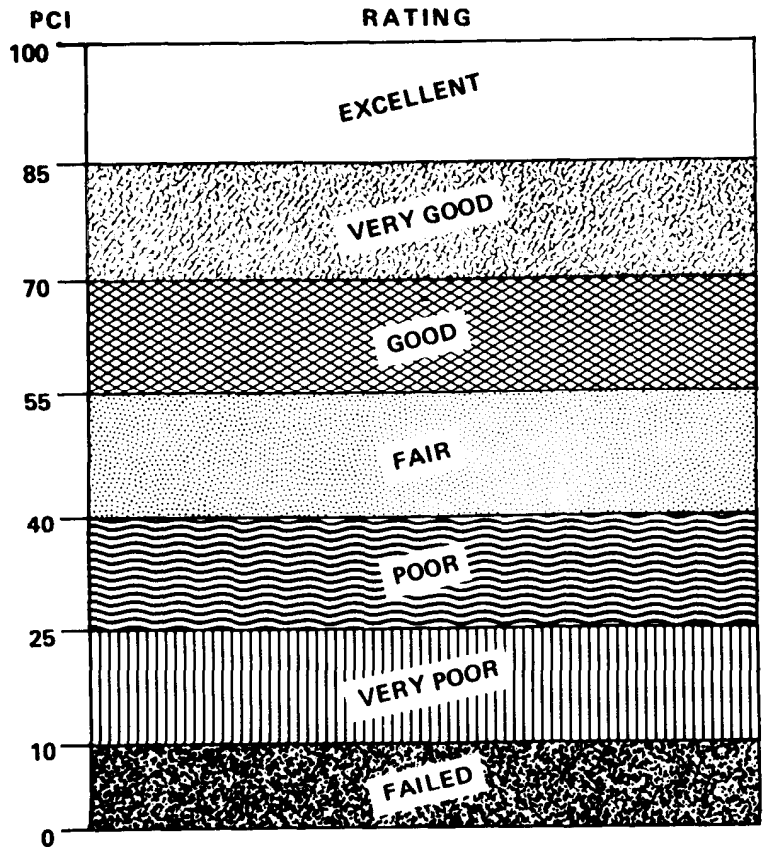

Figure 1. Pavement Condition Index

ALLIGATOR OR FATIGUE CRACKING

Description: Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt concrete 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, forming 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 (.6 meters) on the longest side.

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. (Pattern-type cracking which occurs over an entire area that is not subject to loading is rated as block cracking, which is not a load-associated distress.)

Alligator cracking is considered a major structural distress

Severity Levels:

L - Fine, longitudinal hairline cracks running parallel to each other with none or only a few interconnecting cracks. The cracks are not spalled. (Figures 2, 3, and 4)

M -Further development of light alligator cracking into a pattern or network of cracks that may be lightly spalled. (Figures 5 through 9)

H - Network or pattern cracking has progressed so that the pieces are well defined and spalled at the edges; some of the pieces rock under traffic. (Figure 10)

How to Measure: Alligator cracking is measured in square feet of surface area. The major difficulty in measuring this type of distress is that many times two or three levels of severity exist within one distressed area. If these portions can be easily distinguished from each other, they should be measured and recorded separately. However, 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.

Options for Repair:

L - Do nothing; Surface seal**; Overlay

M - Partial or full depth patch; Overlay; Reconstruct.

H - Partial or full depth patch; Overlay; Reconstruct.

** Navy policy does not allow rejuvenators or any type of surface seal to be used on runways.

Figure 2. Low severity alligator cracking

Figure 3. Low severity alligator cracking

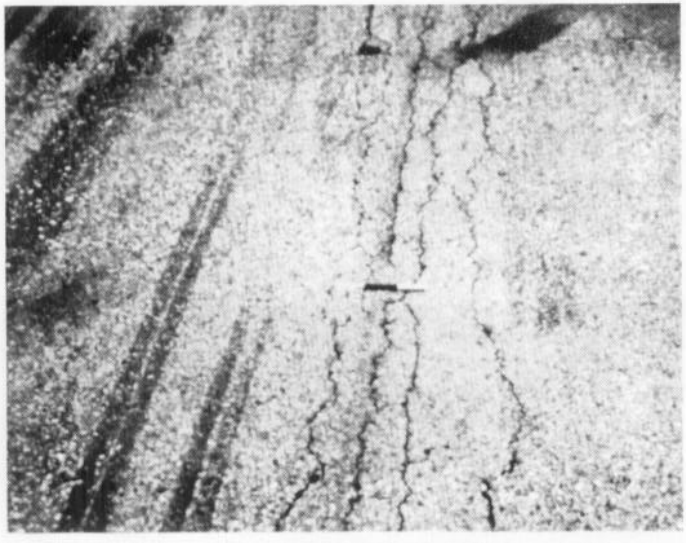

Figure 4. Low severity alligator cracking, approaching medium severity

Figure 5. Medium severity alligator cracking, (note the depression occurring with the cracking)

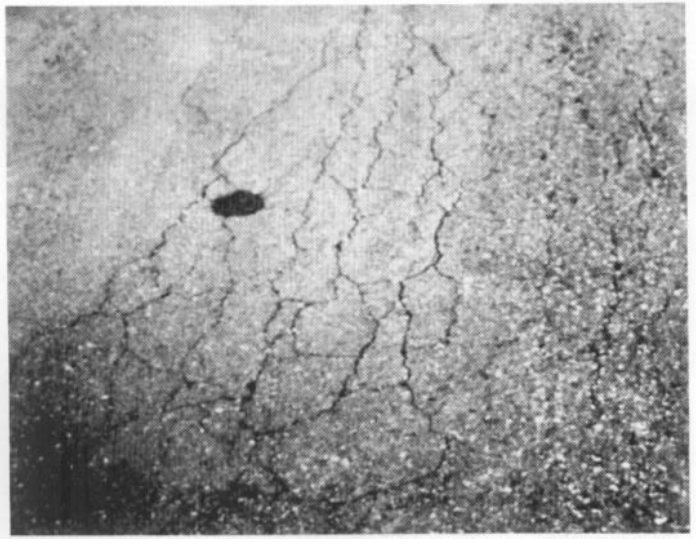

Figure 6. Medium severity alligator cracking

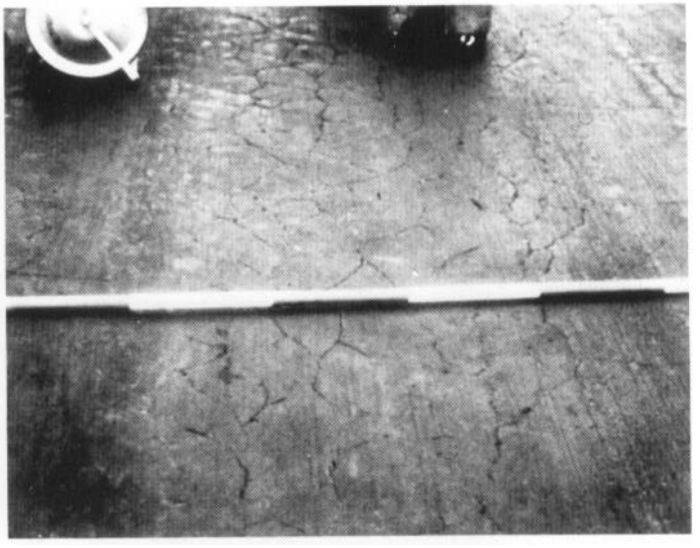

Figure 7. Medium severity alligator cracking

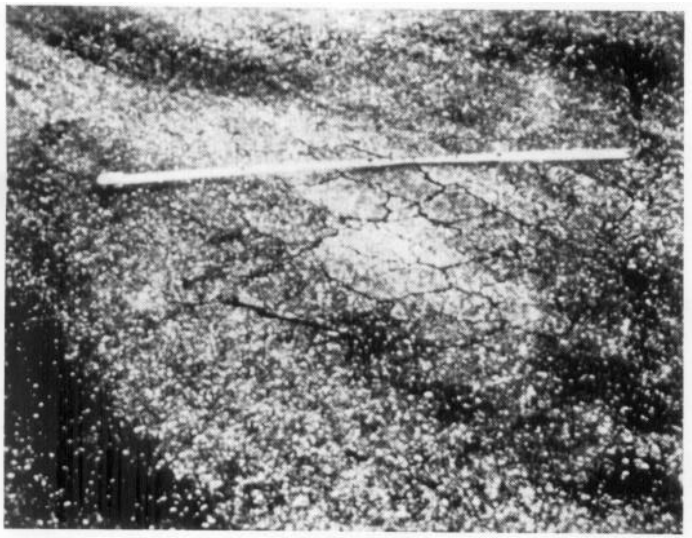

Figure 8. Medium severity alligator cracking, approaching high severity

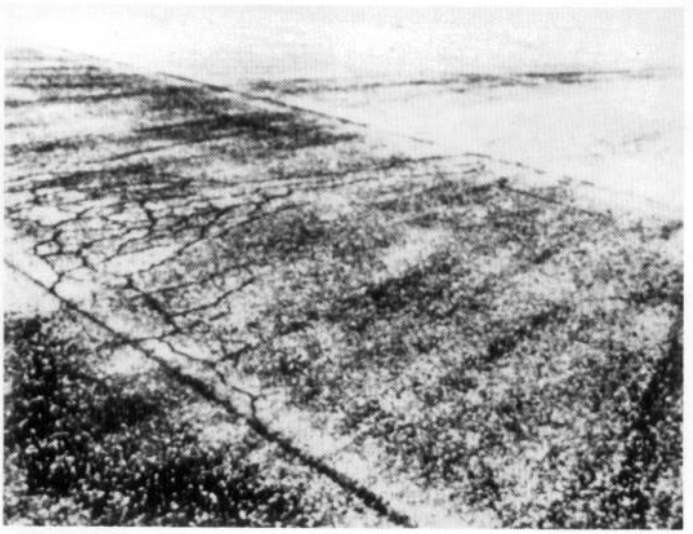

Figure 9. Medium seventy alligator cracking, approaching high severity

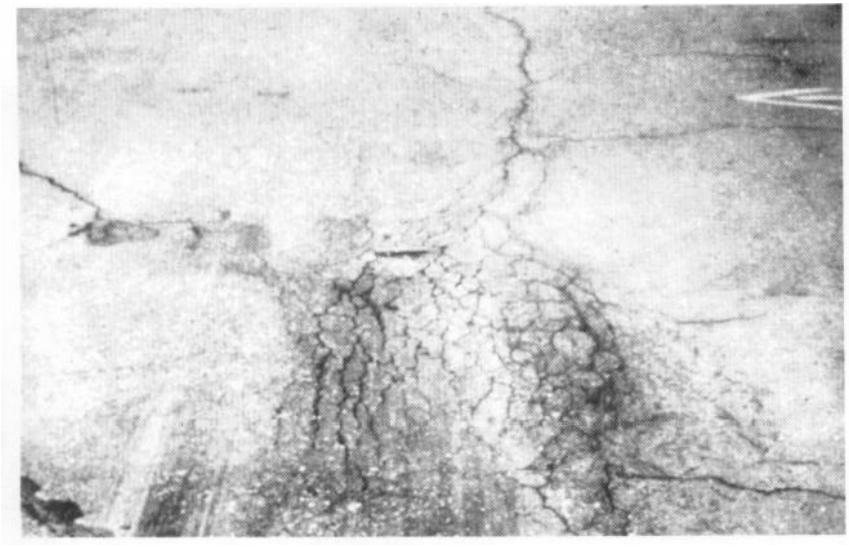

Figure 10. High severity alligator cracking

BLEEDING

Description: Bleeding is a film of bituminous material on the pavement surface which creates a shiny, glass-like, reflecting surface that usually becomes quite sticky. 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 out 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. (Figures 11 and 12)

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

Options for Repair: Do nothing; Apply heat, roll sand, and sweep loose material.

Bleeding 42

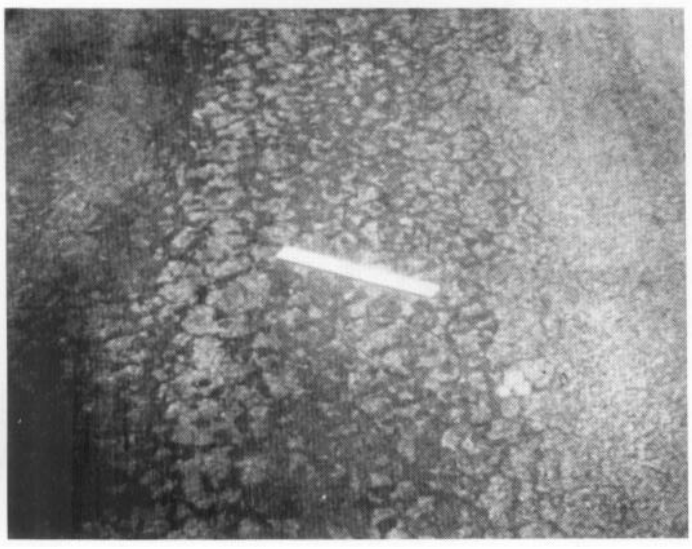

Figure 11. Bleeding

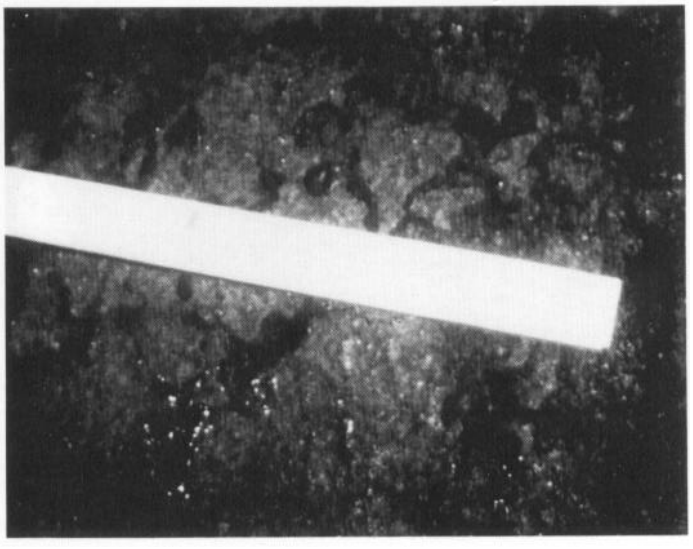

Figure 12. Close-up of figure 11

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 (.3m x .3m to 3m x 3m). Block cracking is caused mainly by shrinkage of the asphalt concrete 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. Block cracking normally occurs over a large proportion of pavement area, but sometimes will occur only in nontraffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles. Also unlike block cracks, alligator cracks are caused by repeated traffic loadings, and are therefore located only in traffic areas (i.e., wheel paths).

Severity Levels:

L - Blocks are defined by cracks that are nonspalled (sides of the crack are vertical) or only lightly spalled, causing no foreign object damage (FOD) potential. Nonfilled cracks have 1/4 inch (6.4 mm) or less mean width and filled cracks have filler in satisfactory condition. (Figures 13, 14, 15, and 16)

M -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 1/4 inch (6.4mm); or (3) filled cracks that are not spalled or have only minor spalling (some FOD potential), but have filler in unsatisfactory condition. (Figures 17 and 18)

H - Blocks are well-defined by cracks that are severely spalled, causing a definite FOD potential. (Figures 19, 20, and 21)

How to Measure: Block cracking is measured in square feet (sq m) 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, jointed reflection cracking, and longitudinal and transverse cracking reflected from old concrete should all be recorded separately.

Options for Repair:

L - Do nothing; Apply rejuvenator**.

M - Seal cracks: Apply rejuvenator**; Recycle surface; Heater scarify and overlay.

H - Seal cracks; Recycle surface; Heater scarify and overlay.

** Navy policy does not allow rejuvenators or any type of surface seal to be used on runways.

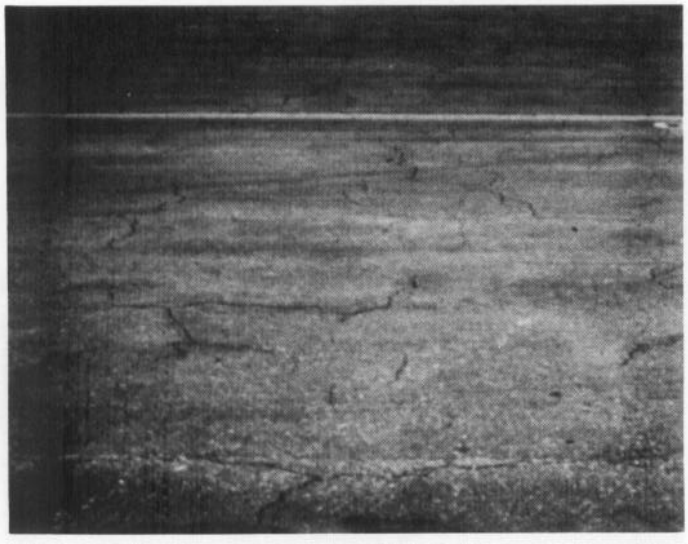

Figure 13. Low severity block cracking

Figure 14. Low severity block cracking, filled cracks

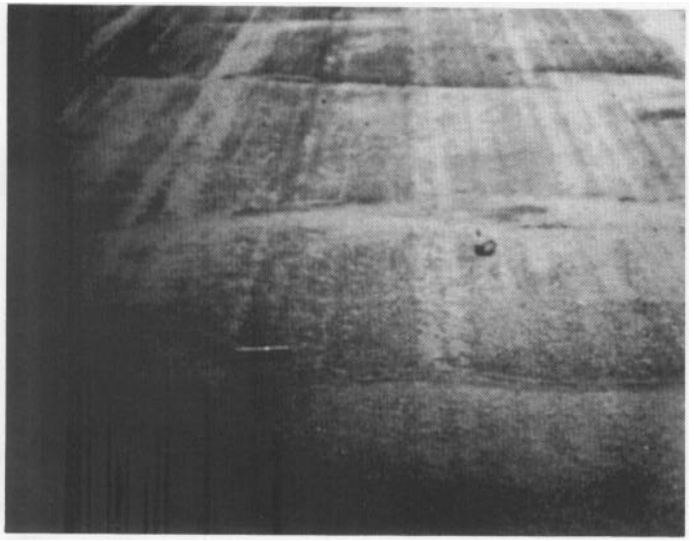

Figure 15. Low severity block cracking, filled cracks

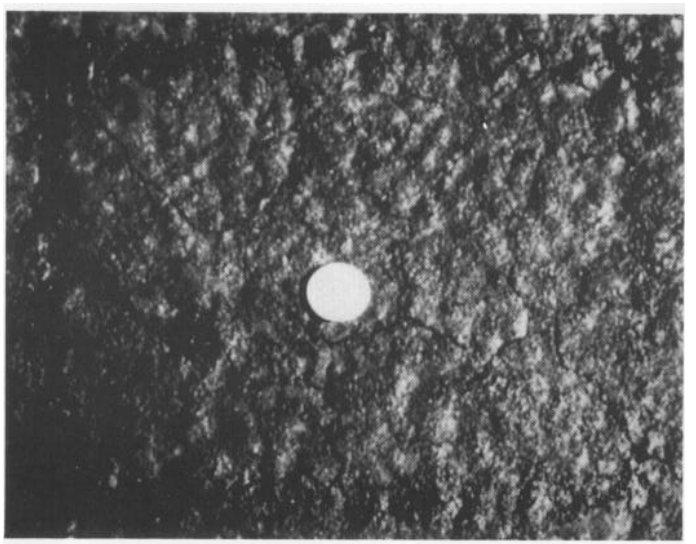

Figure 16. Low severity block cracking, small blocks defined by hairline cracks

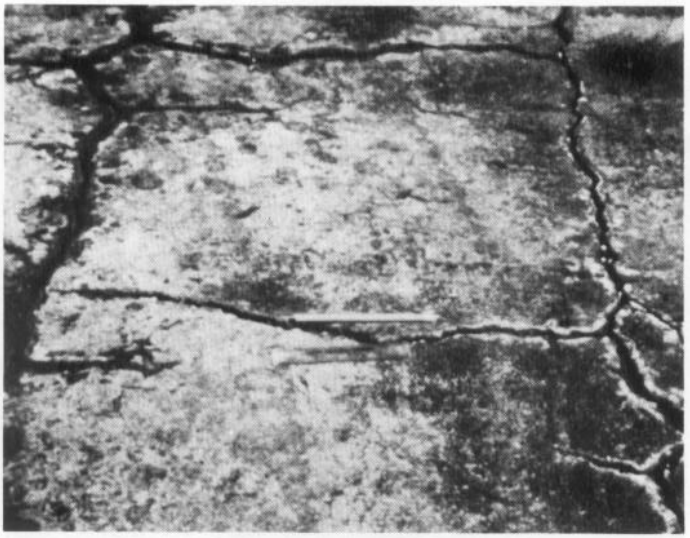

Figure 17. Medium severity block cracking

Figure 18. Medium severity block cracking

Figure 19. High severity block cracking

Figure 20. High severity block cracking

Figure 21. High severity block cracking

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 m) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress.

Severity Levels:

L - Corrugations are minor and do not significantly affect ride quality (see measurement criteria below). (Figure 22)

M -Corrugations are noticeable and significantly affect ride quality (see measurement criteria below). (Figure 23)

H -Corrugations are easily noticed and severely affect ride quality (see measurement criteria below). (Figure 24)

How to Measure: Corrugation is measured in square feet 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-foot straightedge should be placed perpendicular to the corrugations so that the depth of the valleys can be measured in inches (mm). The mean depth is calculated from five such measurements.

Severity	Runways and High Speed Taxiways	Taxiways and Aprons
L	<1/4 inch (<6.4 mm)	<1/2 inch (< 12.7 mm)
M	1/4-1/2 inch (6.4-12.7 mm)	1/2-1 inch (12.7-25.4 mm)
H	> 1/2 inch (> 12.7 mm)	> 1 inch (> 25.4 mm)

Some of the following pictures have been taken on roads and streets. Corrugation is not commonly found on airfield pavements.

Options for Repair:

L - Do nothing.

M - Reconstruct.

H - Reconstruct.

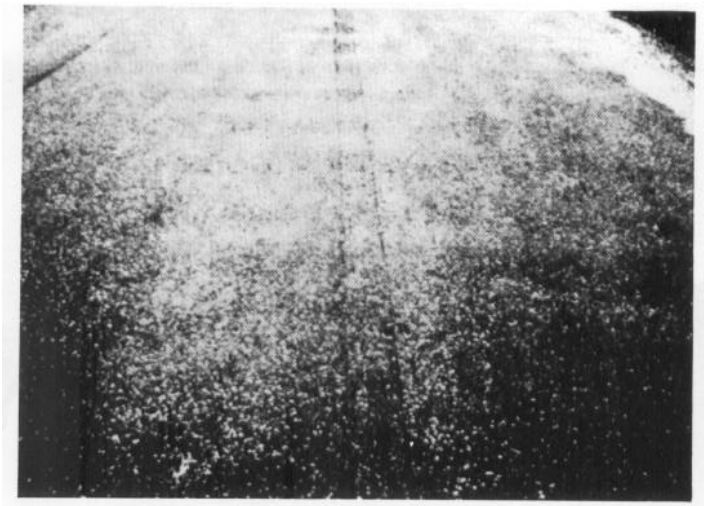

Figure 22. Low severity corrugation in the foreground, changing to medium and high in the background

Figure 23. Medium severity corrugation

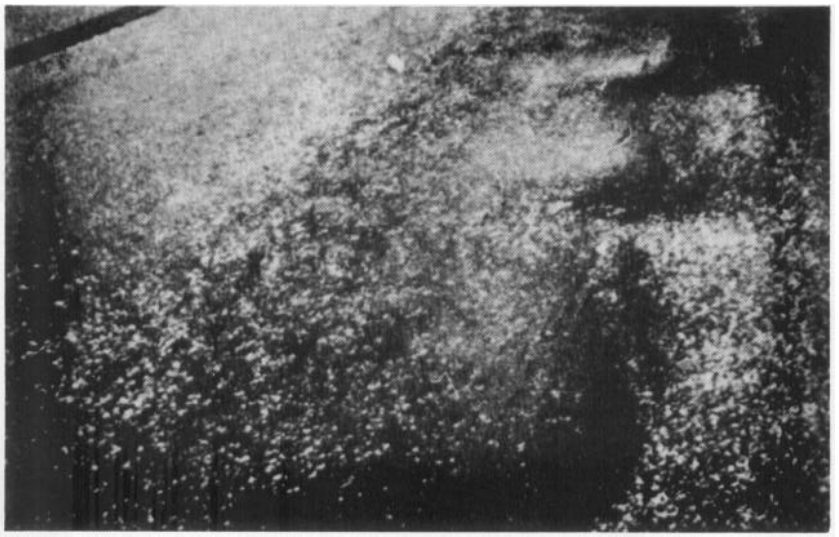

Figure 24. High severity corrugation

DEPRESSION

Description: Depressions are localized pavement surface areas having elevations slightly lower than those of the surrounding 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. 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, could cause hydroplaning of aircraft.

Severity Levels:

L - Depression can be observed or located by stained areas, only slightly affects pavement riding quality, and may cause hydroplaning potential on runways (see measurement criteria below). (Figure 25)

M -The depression can be observed, moderately affects pavement riding quality and causes hydroplaning potential on runways (see measurement criteria below). (Figures 26 and 27)

H -The depression can be readily observed, severely affects pavement riding quality, and causes definite hydroplaning potential (see measurement criteria below). (Figure 28)

How to Measure: Depressions are measured in square feet (sq m) of surface area. The maximum depth of the depression determines the level of severity. This depth can be measured by placing a 10 foot straightedge across the depressed area and measuring

the maximum depth in inches. Depressions larger than 10 feet (3 m) across must be measured by either visual estimation or direct measurement when filled with water.

Maximum Depth of Depression

Severity	Runways and High Speed Taxiways	Taxiways and Apron
L	1/8-1/2 inch (3.2mm-12.7mm)	1/2-1 inch (12.7mm-25.4mm)
M	>1/2-1 inch (12.7mm-25.4mm)	>1-2 inches (25.4mm-50.8mm)
H	>1 inch (>25.4mm)	>2 inches (>50.8mm)

Options for Repair:

L - Do nothing.

M - Shallow*, partial or full depth patch.

H - Shallow*, partial or full depth patch.

. Shallow patching should not be used on runways where FOD is a concern.

Figure 25. Low severity depression

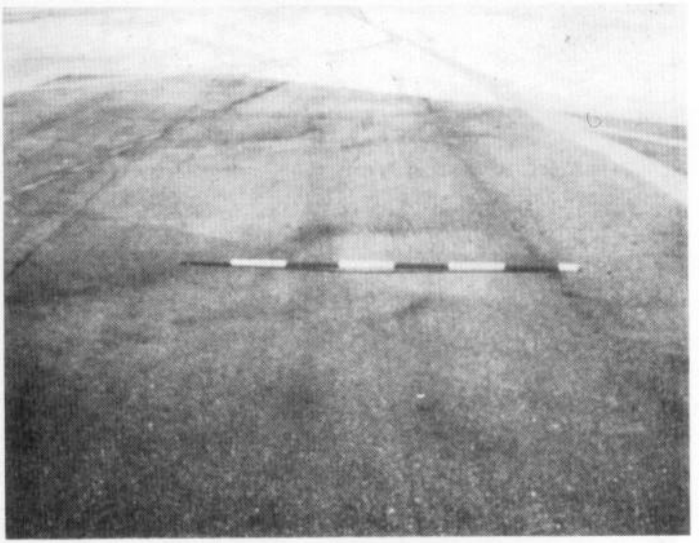

Figure 26. Medium severity depression (1 ½ inch)

Figure 27. Medium severity depression

Figure 28. High severity depression (2 inches)

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 (12.7mm).

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that jet blast erosion exists. (Figures 29 and 30)

How to Measure: Jet blast erosion is measured in square feet (sq m) of surface area.

Options for Repair: Do nothing; Partial depth patch; Apply rejuvenator**.

. * Navy policy does not allow rejuvenators or any type of surface seal to be used on runways.

Jet Blast 46

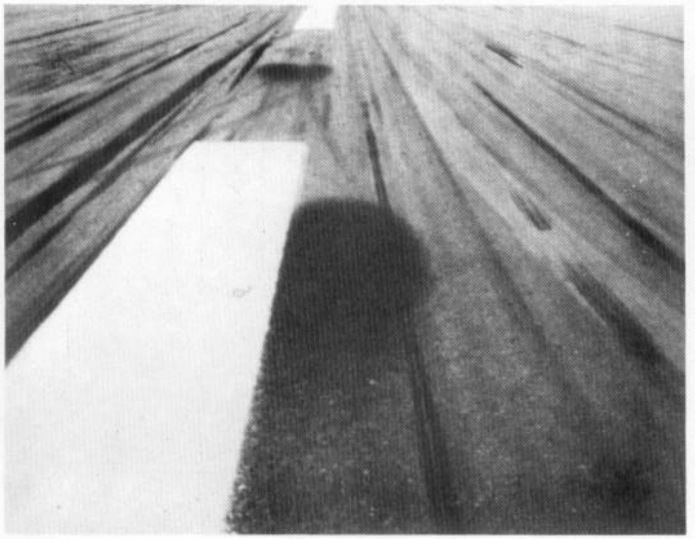

Figure 29. Jet blast erosion

Figure 30. Jet blast erosion

JOINT REFLECTION CRACKING FROM PCC (LONGITUDINAL AND TRANSVERSE)

Description: This distress occurs only on pavements having an asphalt or tar surface over a portland cement concrete (PCC) slab. This category 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 caused mainly by movement of the PCC slab beneath the asphalt concrete (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. A knowledge of slab dimensions beneath the AC surface will help to identify these cracks.

Joint Reflection 47

Severity Levels:

L - 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 (6.4mm) or less; filled cracks are of any width, but their filler material is in satisfactory condition. (Figures 31, 32, and 33)

M -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 (6.4 mm) or (4) light random cracking exists near the crack or at the corners of intersecting cracks. (Figures 34, 35, and 36)

H - Cracks are severely spalled (definite FOD potential) and can be either filled or nonfilled of any width. (Figure 37)

How to Measure:

Joint reflection cracking is measured in linear feet. 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 m) long may have 10 feet (3 m) of high severity, 20 feet (6 m) of medium severity, and 20 feet (6 m) of light severity; these would all be recorded separately.

Options for Repair:

L - Do nothing; Seal cracks over 1/8 inch (3.2mm).

M - Seal cracks; Partial depth patch.

H - Seal cracks; Partial depth patch. Reconstruct joint.

Figure 31. Low severity joint reflection cracking

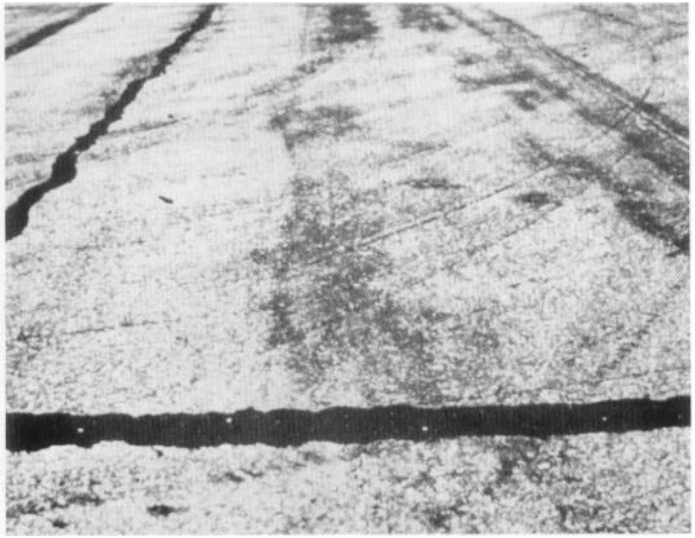

Figure 32. Low severity joint reflection cracking, filled crack

Figure 33. Low severity joint reflection cracking, nonfilled crack

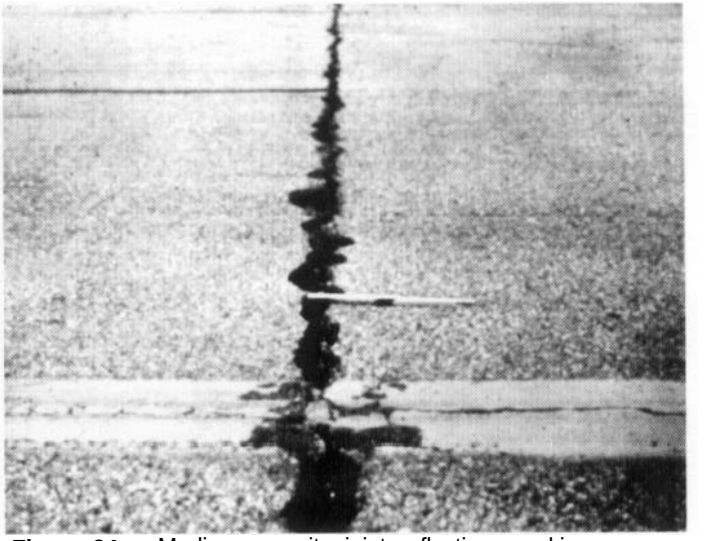

Figure 34. Medium severity joint reflection cracking

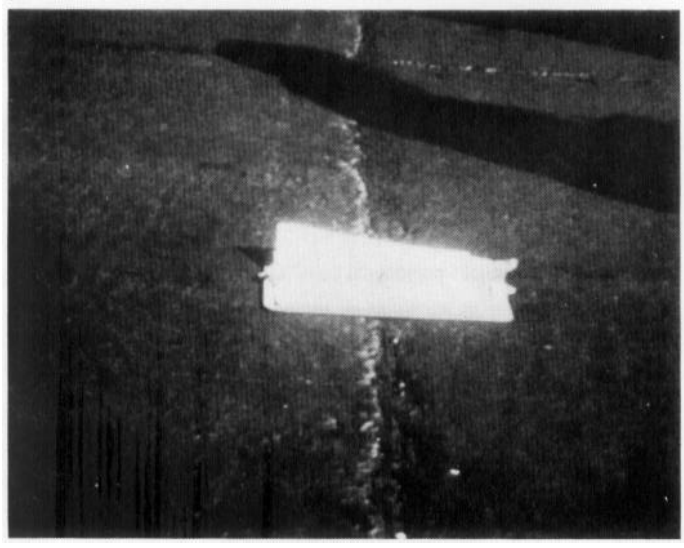

Figure 35. Medium severity joint reflection cracking

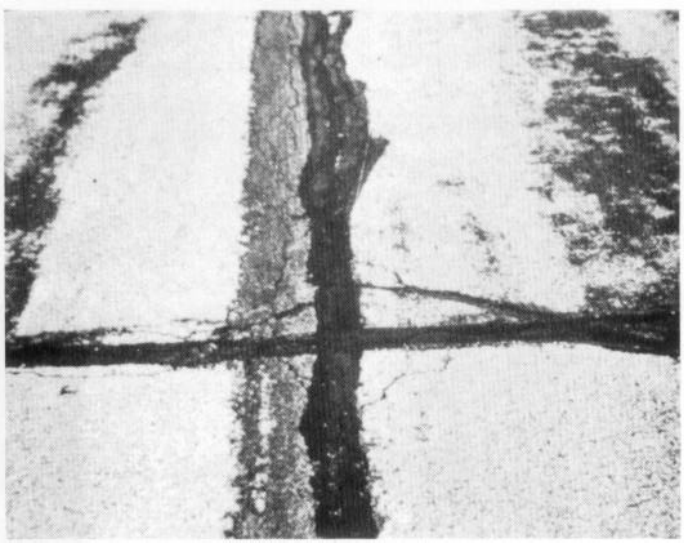

Figure 36. Medium severity joint reflection cracking

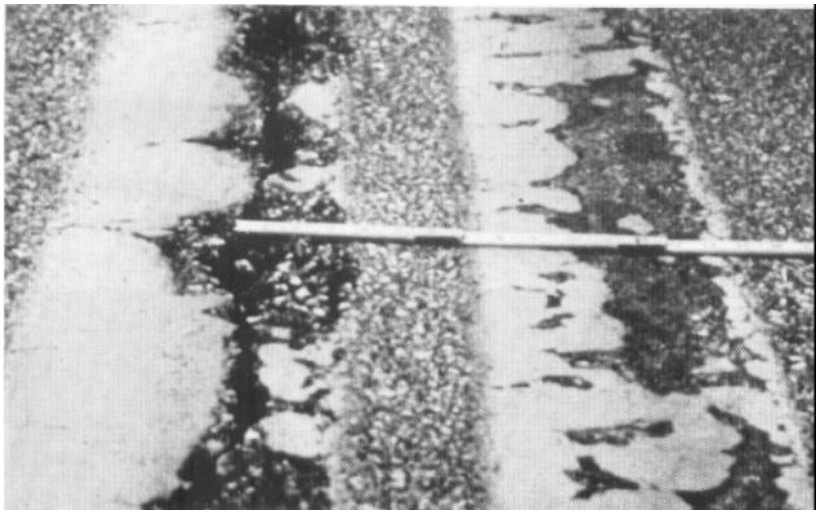

Figure 37. High severity joint reflection cracking

LONGITUDINAL AND TRANSVERSE CRACKING (NON-PCC JOINT REFLECTIVE)

Description: Longitudinal cracks are parallel to the pavement's centerline or laydown direction. 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 extend across the pavement at approximately right angles to the pavement centerline or direction of laydown. They 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:

L - 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 mm) or less; filled cracks are of any width, but their filler material is in satisfactory condition. (Figures 38 and 39)

M -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 mm); or (4) light random cracking exists near the crack or at the corners of intersecting cracks. (Figures 40, 41, and 42)

H -Cracks are severely spalled, causing definite FOD potential. They can be either filled or nonfilled of any width. (Figure 43)

Porous Friction Courses:

Severity Levels:

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

L - Average raveled area around the crack is less than 1/4 inch (6.4 mm) wide. (Figure 44)

M -Average raveled area around the crack is 1/4 inch (6.4 mm) to 1 inch (25.4 mm) wide. (Figure 45)

H -Average raveled area around the crack is greater than 1 inch (25.4 mm) wide. (Figure 46)

How to Measure:

Longitudinal and transverse cracks are measured in linear feet. 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 an example, see Joint Reflection Cracking.

Options for Repair:

L - Do nothing; Seal cracks over 1/8 inch (3.2mm); Apply rejuvenator**; Surface seal**.

M - Seal cracks.

H - Seal cracks; Partial depth patch.

* Navy policy does not allow rejuvenators or any type of surface seal to be used on runways.

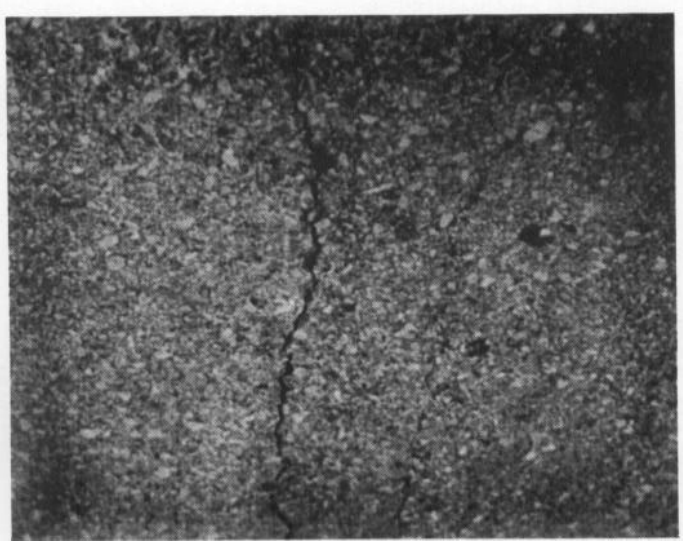

Figure 38. Low severity longitudinal crack

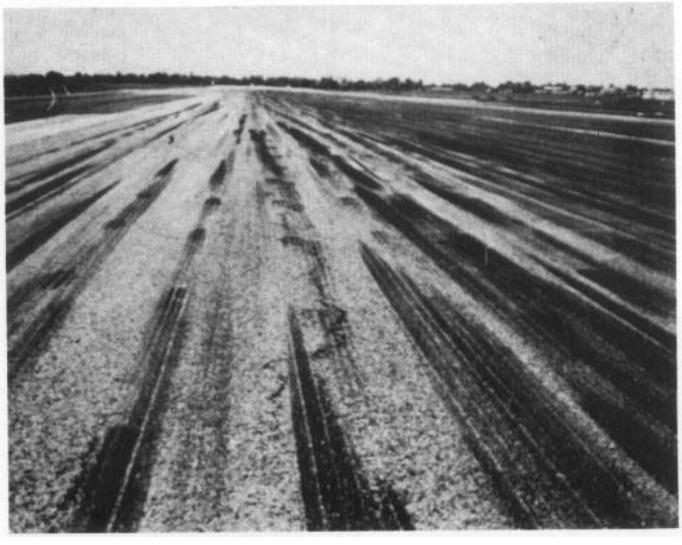

Figure 39. Low severity longitudinal cracks, approaching medium

Figure 40. Medium severity longitudinal construction joint crack

Figure 41. Medium severity longitudinal crack, (note the crack is reflective but not at the joint of slab)

Figure 42. Medium severity longitudinal crack

Figure 43. High seventy longitudinal crack

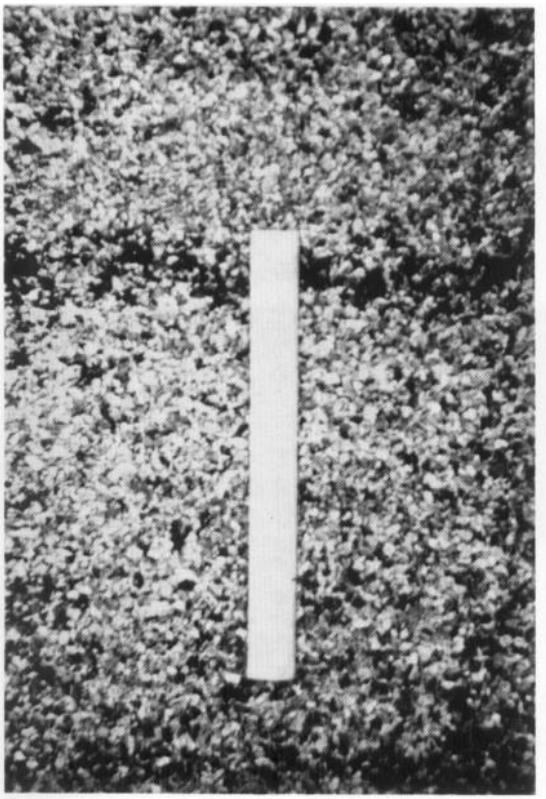

Figure 44. Low severity crack in porous friction course

Figure 45. Medium severity crack in porous friction course

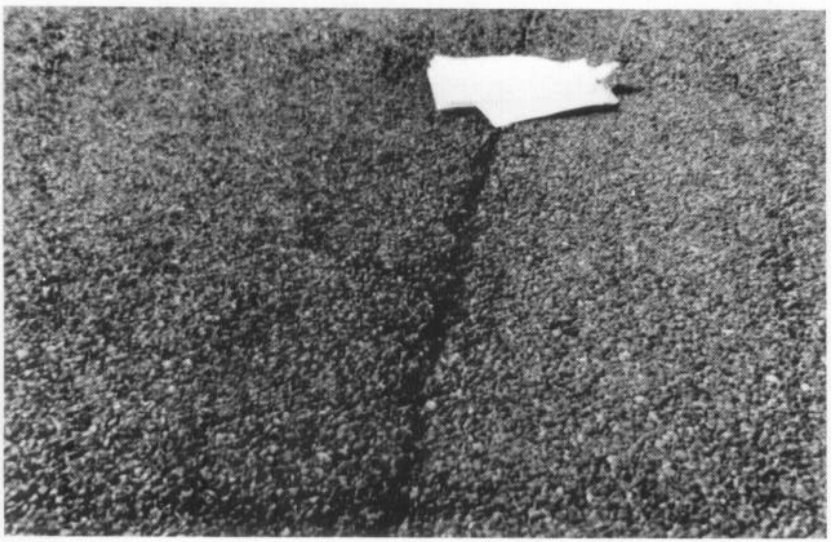

Figure 46. High seventy crack in porous friction course

OIL SPILLAGE

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

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that oil spillage exists. (Figures 47 and 48)

How to Measure: Oil spillage is measured in square feet of surface area.

Options for Repair: Do nothing: Partial or full depth patch.

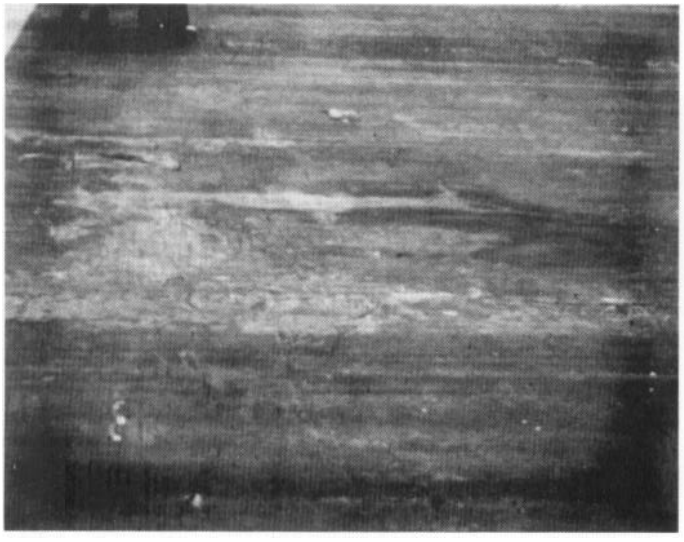

Figure 47. Oil spillage

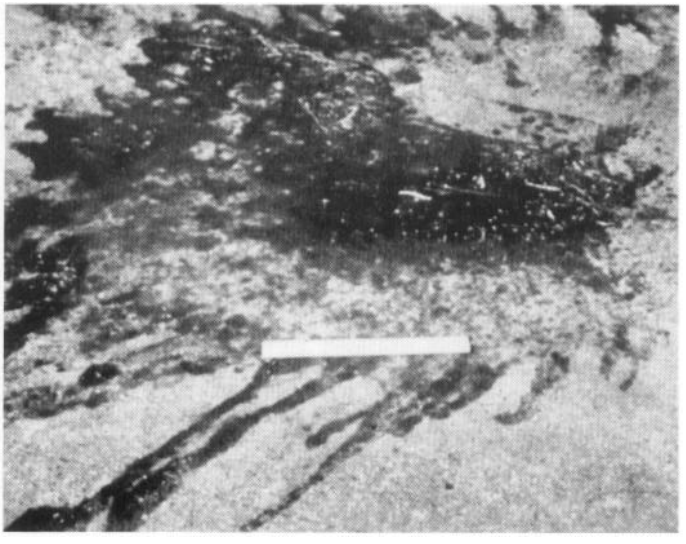

Figure 48. Oil spillage

PATCHING AND UTILITY CUT PATCH

Description: A patch is considered a defect, no matter how well it is performing.

Severity Levels:

L - Patch is in good condition and is performing satisfactorily. (Figures 49, 50, and 51)

M -Patch is somewhat deteriorated and affects riding quality to some extent. (Figure 52)

H - Patch is badly deteriorated and affects riding quality significantly or has high FOD potential. Patch soon needs replacement. (Figure 53)

Porous Friction Courses: The use of dense-graded AC patches in porous friction surfaces causes a water damming effect at the patch which contributes to differential skid resistance of the surface. Low severity dense-graded patches should be rated as medium severity due to the differential friction problem. Medium and high severity patches are rated the same as above.

How to Measure: Patching is measured in square feet 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 (7.5 sq m) patch may have 10 square feet (3.5 sq m) of medium severity and 15 square feet (4.5 sq m) of light severity. These areas would be recorded separately. Any distress found in a patched area will not be recorded; however, its effect on the patch will be considered when determining the patch's severity level.

Options for Repair:

L - Do nothing.

M - Seal cracks; Repair distress in patch; Replace patch.

H - Replace patch.

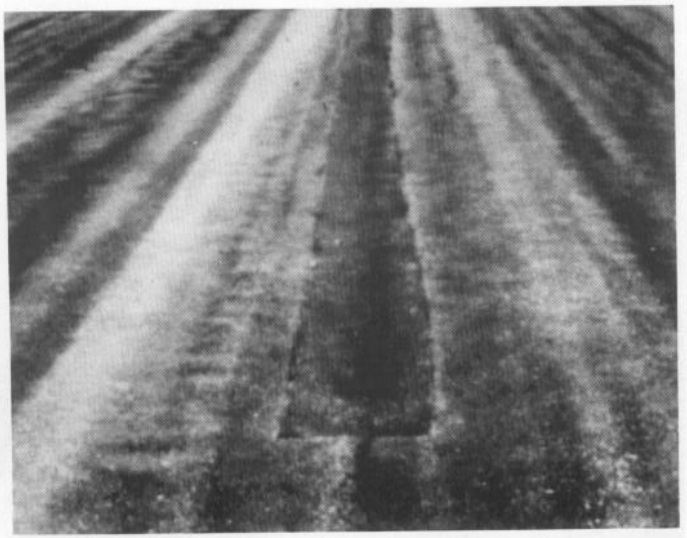

Figure 49. Low severity patch

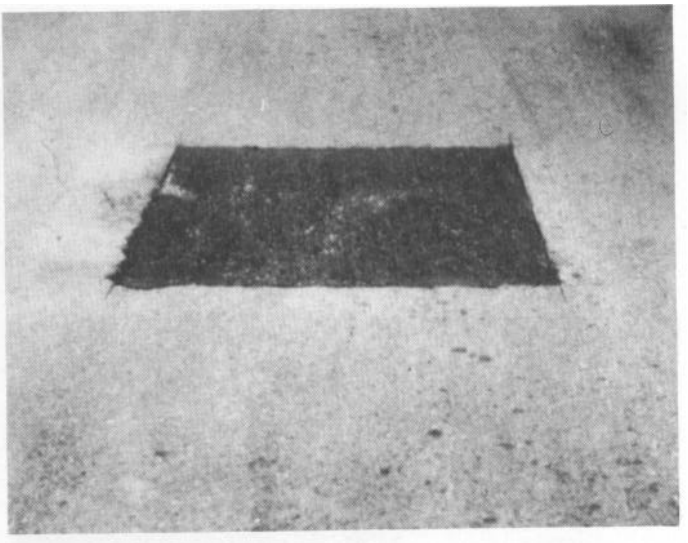

Figure 50. Low severity patch

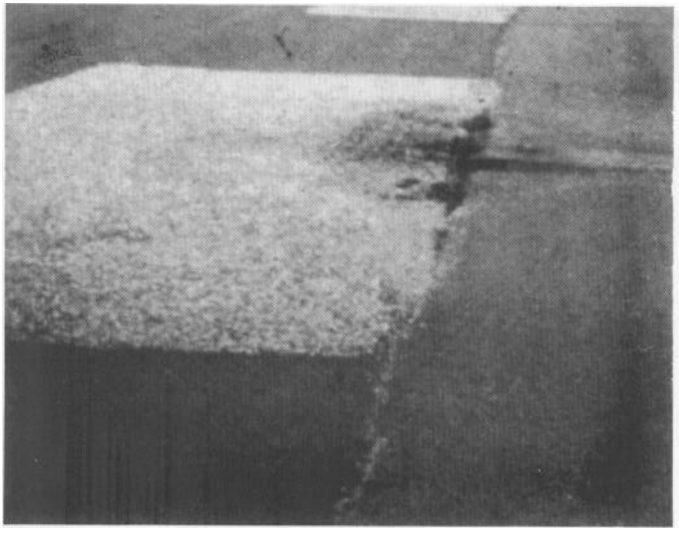

Figure 51. Low severity patch with medium severity portion

Figure 52. Medium severity patch

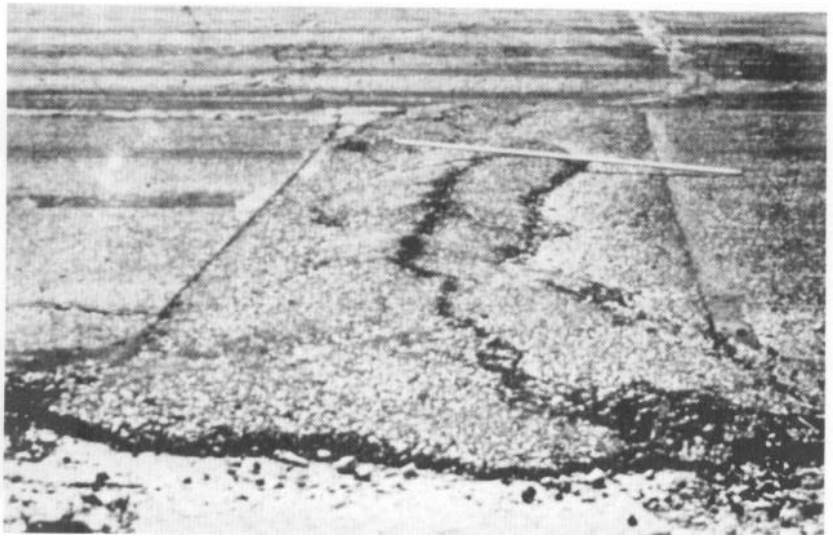

Figure 53. High severity patch

POLISHED AGGREGATE

Description: Aggregate polishing is caused by repeated traffic applications. 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.

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. (Figure 54)

How to Measure: Polished aggregate is measured in square feet (meters) of surface area. If bleeding is counted, polished aggregate is not counted in the same area.

Options for Repair: Do nothing; Overlay; Surface friction course.

Polished 51

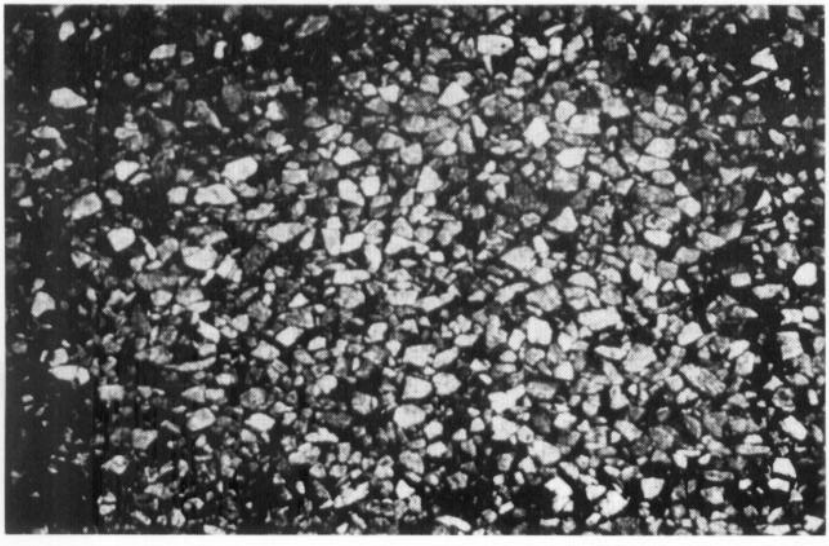

Figure 54. Polished aggregate

RAVELING AND 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.

Severity Levels:

L - Aggregate or binder has started to wear away, causing little or no FOD potential. (Figures 55, 56, and 57)

M - Aggregate and/or binder has worn away, causing some FOD potential. The surface texture is moderately rough and pitted. (Figure 58)

H - Aggregate and/or binder has worn away, causing a high FOD potential. The surface texture is severely rough and pitted. (Figures 59 and 60)

Porous Friction Courses: (Figures 61 and 62)

Severity Levels:

L - Most of the fine aggregate (passing the #4 sieve, i.e., less than 1/4 inch (6.4 mm), have been lost and only a few of the larger pieces have been dislodged, causing little or no foreign object damage (FOD) potential. (Figure 63)

Raveling 52

M -Fine aggregate is missing, and many of the larger pieces are dislodged. The surface is rough and pitted, but average depth of erosion is less than 1/4 inch (6.4 mm). Some FOD potential is present. (Figures 64 and 65)

H - Surface texture is very rough and pitted. Erosion of aggregate pieces exceeds 1/4 inch (6.4 mm) in depth, and definite FOD potential exists. (Figure 66)

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

Options for Repair:

L - Do nothing; Apply rejuvenator**; Surface seal**.

M - Apply rejuvenator; Surface seal.

H - Overlay; Recycle; Reconstruct.

** Navy policy does not allow rejuvenators or any type of surface seal to be used on runways.

Figure 55. Low severity raveling/weathering

Figure 56. Low severity raveling/weathering

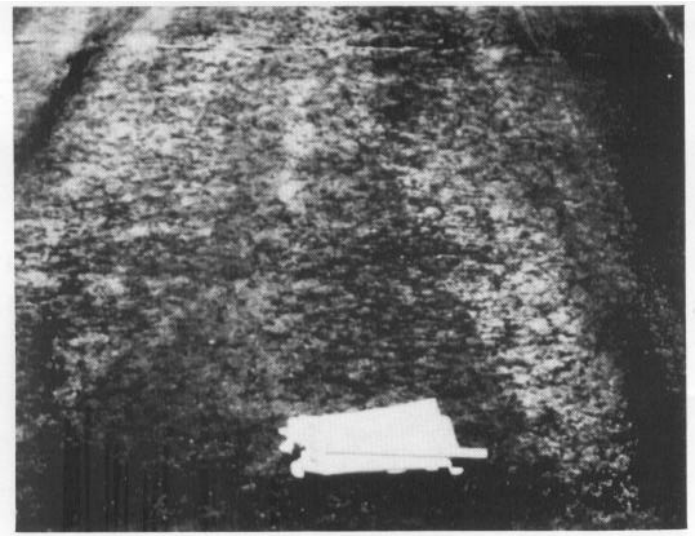

Figure 57. Low severity raveling/weathering, approaching medium severity

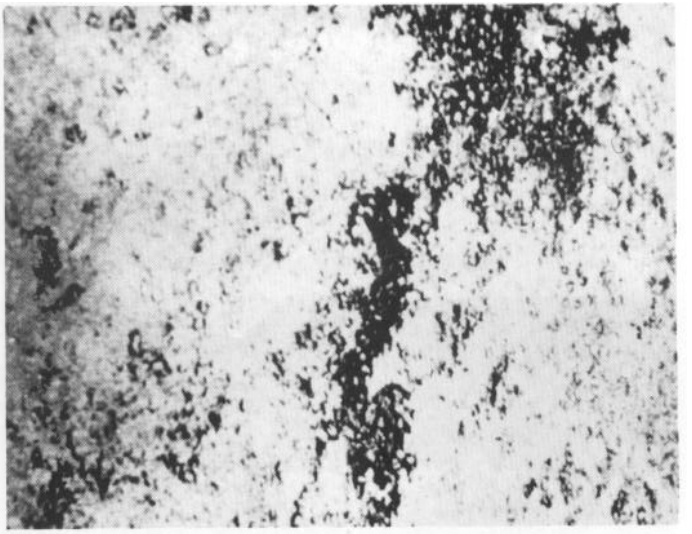

Figure 58. Medium severity raveling/weathering

Figure 59. High severity raveling/weathering

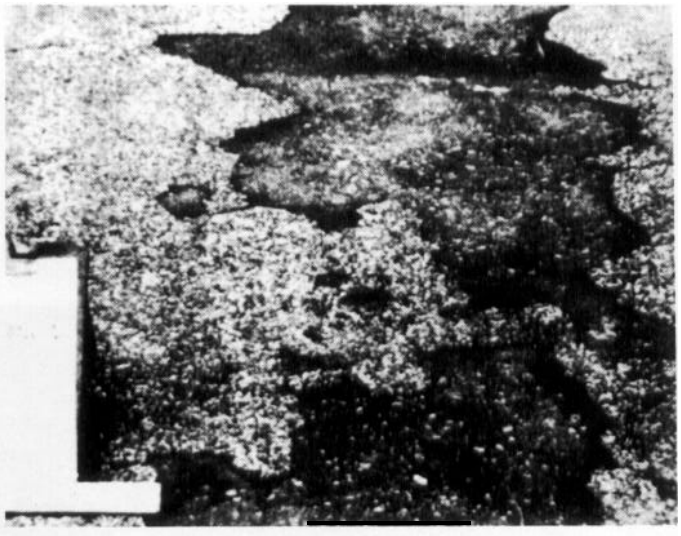

Figure 60. High severity raveling/weathering

Figure 61. Typical porous friction course surface with no raveling/weathering

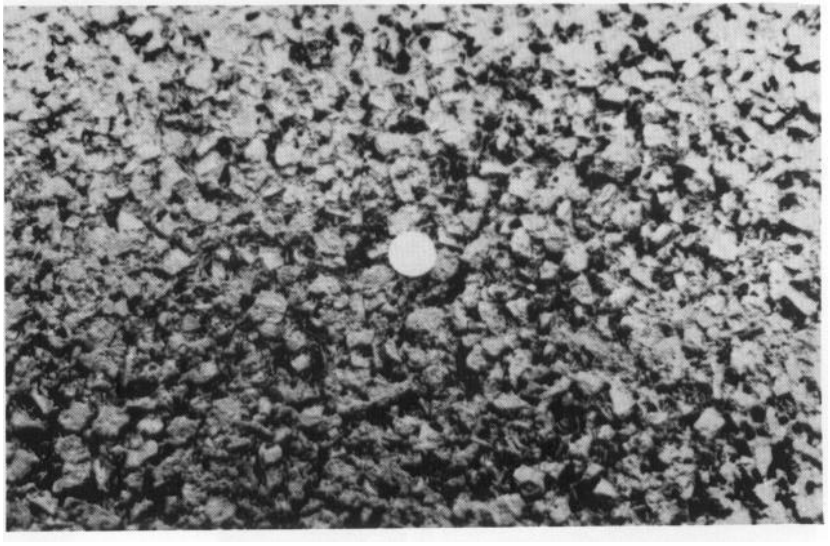

Figure 62. Typical porous friction course surface with no raveling/ weathering

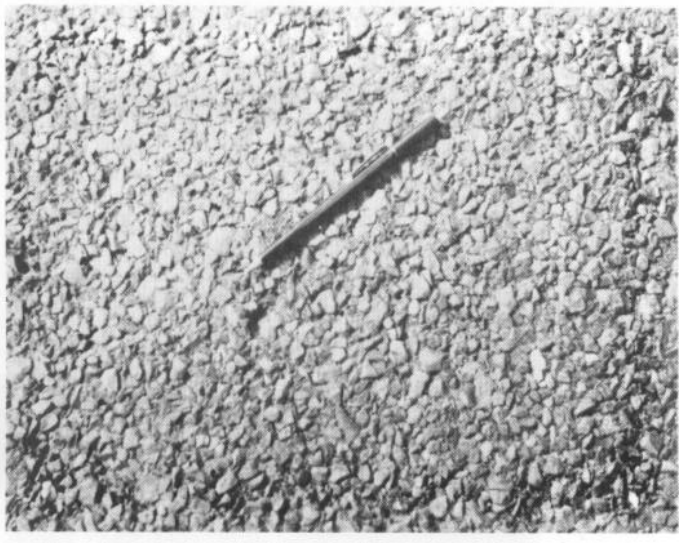

Figure 63. Low severity raveling/weathering on a porous friction course surface

Figure 64. Medium severity raveling/weathering on a porous friction course surface

Figure 65. Medium seventy raveling/ weathering showing rough and pitted surface

Figure 66. High severity raveling/weathering on a porous friction course surface

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. Rutting stems from a permanent deformation in any of the pavement layers or subgrade, 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	5 1/4-1/2 inch (< 6.4-12.7mm) (Figures 67 and 68)
M	>1/2 inch < 1 inch (> 12.7- < 25.4mm) (Figure 69)
H	>1 inch (> 25.4mm) (Figures 70 and 71)

How to Measure: Rutting is measured in square feet of surface area, and its severity is determined by the mean depth of the rut. To determine the mean rut depth, a straightedge should be laid across the rut and the depth measured. The mean depth in inches (mm) should be computed from measurements taken along the length of the rut.

Options for Repair:

L - Do nothing.

M - Shallow*, partial, or full depth patch; Partial or full depth patch and overlay.

H - Shallow*, partial or full depth patch; Partial or full depth patch and overlay.

*Shallow patching should not be used on runways where FOD is of concern.

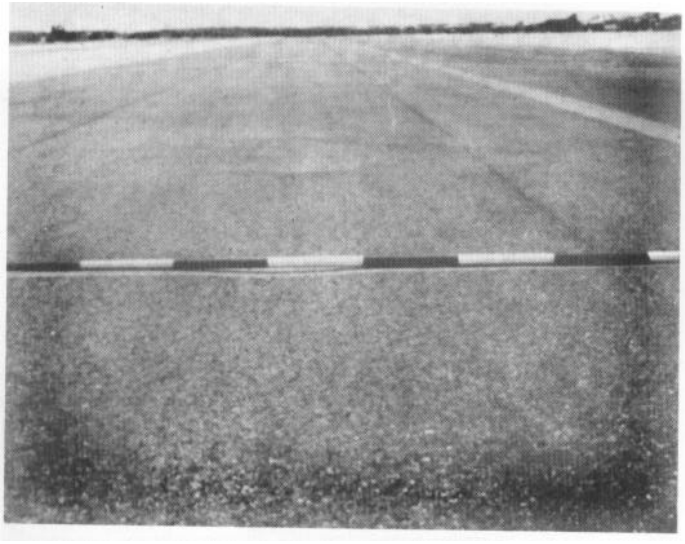

Figure 67. LOW severity rutting

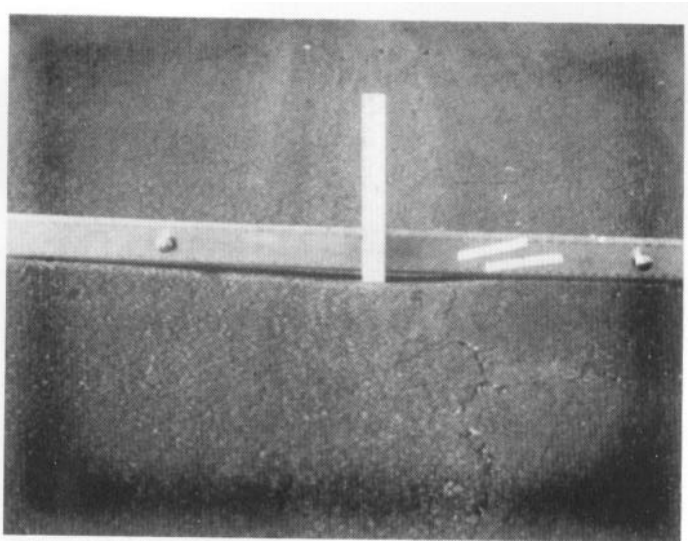

Figure 68. Low severity rutting

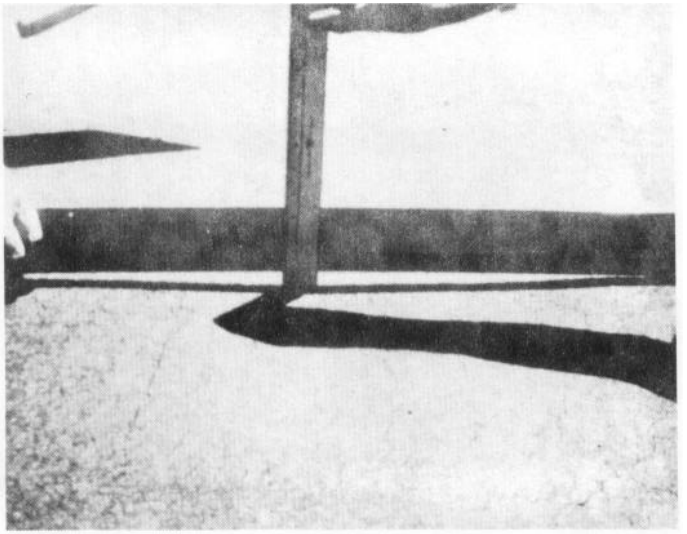

Figure 69. Medium severity rutting

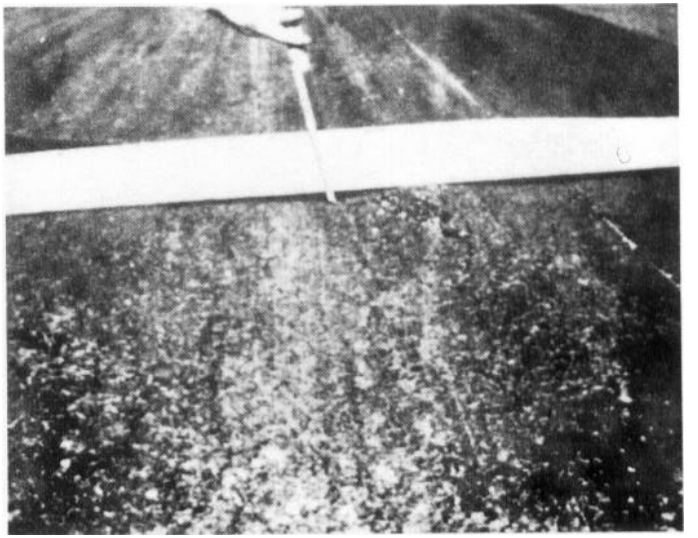

Figure 70. High severity rutting (note alligator cracking associated with rutting)

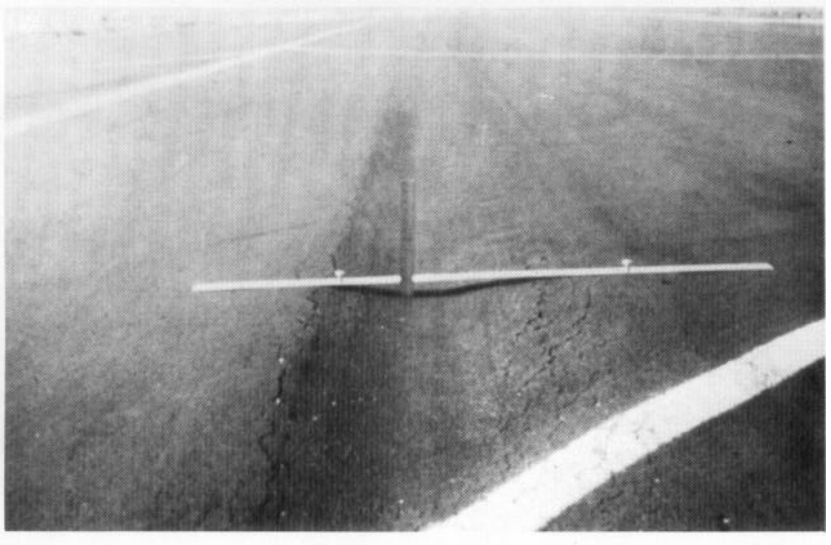

Figure 71. High seventy rutting

SHOVING OF ASPHALT PAVEMENT BY 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. The PCC slab "growth" is caused by a gradual opening up of the joints as they are filled with incompressible materials that prevent them from reclosing.

Severity Levels:

L - A slight amount of shoving has occurred, with little effect on ride quality and no break-up of the asphalt pavement. (Figure 72)

M -A significant amount of shoving has occurred, causing moderate roughness and little or no break-up of the asphalt pavement. (Figure 72)

H -A large amount of shoving has occurred, causing severe roughness or break-up of the asphalt pavement. (Figure 73)

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

Options for Repair:

L - Do nothing.

M - Partial depth patch; Full depth patch.

H - Partial depth patch; Full depth patch

Figure 72. This photograph shows a shove of low severity on the outside and medium severity in the middle

Figure 73. High severity shoving

SLIPPAGE CRACKING

Description: Slippage cracks are crescent- or half-moon shaped cracks having two ends pointed away from the direction of traffic. They are produced when braking or turning wheels cause the pavement surface to slide and deform. This usually occurs when there is a low strength surface mix or poor bond between the surface and next layer of pavement structure.

Severity Levels: No degrees of severity are defined. It is sufficient to indicate that a slippage crack exists. (Figures 74 and 75)

How to Measure: Slippage cracking is measured in square feet (square meters) of surface area.

Options for Repair: Do nothing; Partial or full depth patch.

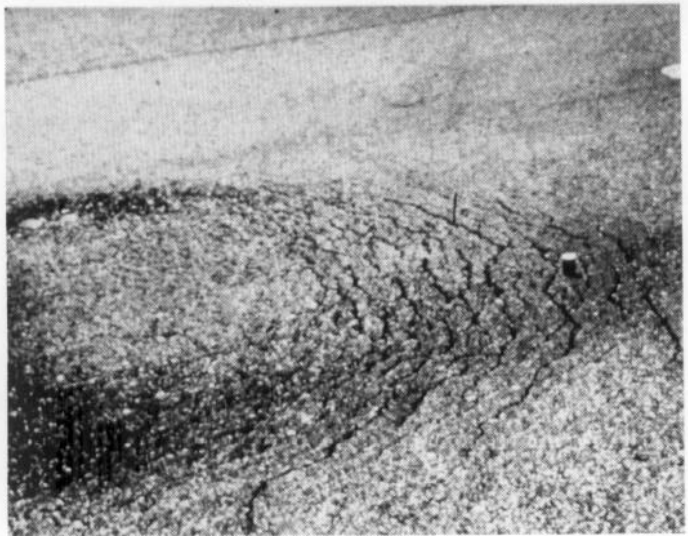

Figure 74. Slippage cracking

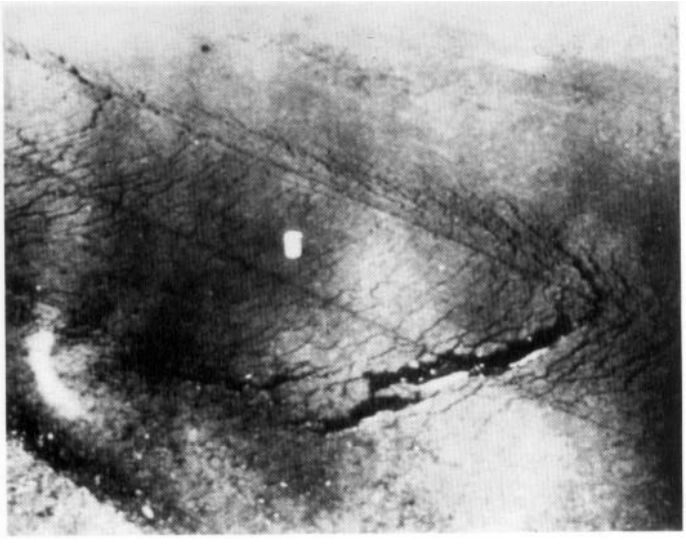

Figure 75. Slippage cracking

SWELL

Description: Swell is characterized by an upward bulge in the pavement's surface. 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. 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 blowup in the PCC slab.

Severity Levels:

L - 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.) (Figure 76)

M -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. (Figure 77)

H - Swell can be readily observed and severely affects the pavement's ride quality at the normal aircraft speed for the pavement section under consideration. (Figures 78 and 79)

Swelling 56

How to Measure: The surface area of the swell is measured in square feet (sq m). 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:

Severity	Height Differential
L	<3/4 inch (< 19mm)
M	3/4-1 1/2 inches (19-38mm)
H	>1 1/2 inch (>38mm)

Options for Repair:

L - Do nothing.

M - Reconstruct.

H - Reconstruct.

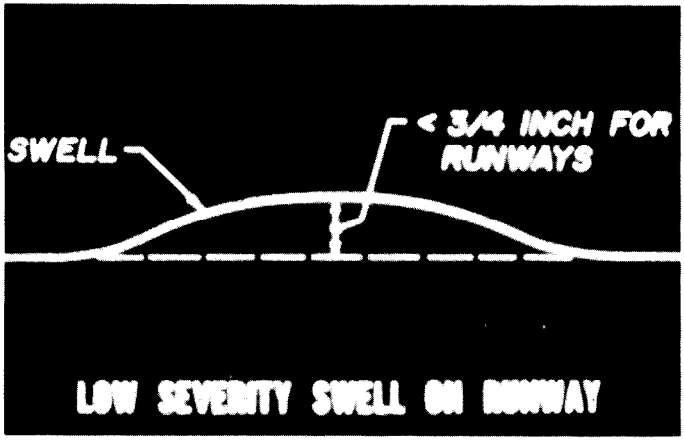

Figure 76. Low severity swell

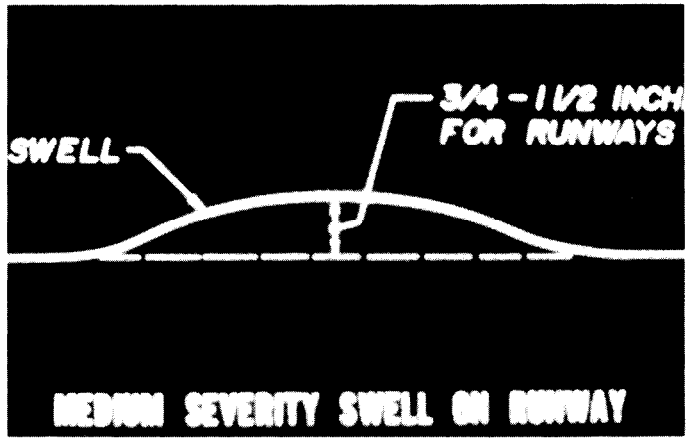

Figure 77. Medium severity swell

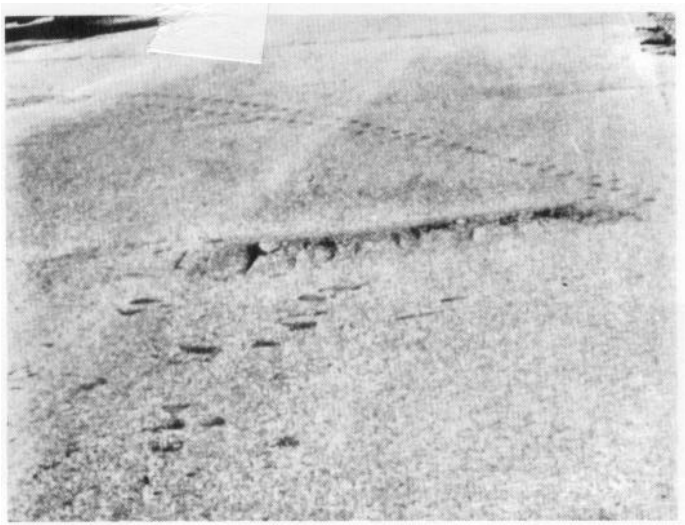

Figure 78. High severity swell

Figure 79. High severity swell