PAVEMENT CONDITION RATING SYSTEM

Prepared by

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April 2006

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Ohio Department of Transportation. This manual should only be used as a guide when rating pavements.

ACKNOWLEDGMENTS

This manual is a revision of the 2004 pavement condition rating manual, which was originally developed in 1998 under the project “A Review of PCR Methodology for the Ohio DOT,” State Job Number 14638(0). The original manual was prepared by Resource International, Inc. in cooperation with the Ohio Department of Transportation and the Federal Highway Administration. Most of the photographs have been revised and the original photographs are now in color.

This report was developed by the Ohio Department of Transportation’s Office of Pavement Engineering. Those individuals, in particular, who contributed valuable information and assistance throughout the making of this manual include: Andrew Williams, Richard Jones, Greg DeVol, Todd Martin, Michael Thompson, Justina Deurer, Roger Green, Aric Morse, and Dave Miller.

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PAVEMENT CONDITION RATING PROCEDURES

INTRODUCTION

The rating method is based upon visual inspection of pavement distress. Although the relationship between pavement distress and performance is not well defined, there is general agreement that the ability of a pavement to sustain traffic loads in a safe and smooth manner is adversely affected by the occurrence of observable distress. The rating method provides a procedure for uniformly identifying and describing, in terms of severity and extent, pavement distress. The mathematical expression for pavement condition rating (PCR) provides an index reflecting the composite effects of varying distress types, severity, and extent upon the overall condition of the pavement.

The model for computing PCR is based upon the summation of deduct points for each type of observable distress. Deduct values are a function of distress type, severity, and extent. Deduction for each distress type is calculated by multiplying distress weight times the weights for severity and extent of the distress. Distress weight is the maximum number of deductible points for each different distress type. The mathematical expression for PCR is as follows:

$$PCR = 100 - \sum_{I=1}^{n} Deduct_i \qquad (1)$$

Where:

n = number of observable distresses, and
Deduct = (Weight for distress) (Wt. for severity) (Wt. for Extent)

The Appendices A-F that follow describe various distresses for rigid, flexible, composite, and brick pavements and current guidelines for establishing their severity and extent. Three levels of severity (Low, Medium and High) and three levels of extent (Occasional, Frequent, and Extensive) are defined. The definition for distress type, severity, and extent must be followed closely and be clearly understood by field personnel if the rating method is to provide meaningful data. To illustrate the method for calculating PCR, consider the distress "Faulting" in a hypothetical jointed concrete pavement. If the severity of this distress in the pavement is "Medium" and extent is "Frequent", then, the deduct points for "Faulting" in the pavement would be equal to [(10) (0.7) (0.8)] or 5.6 (see Table on page 11 for the weights of this distress). If an extensive amount of medium severity "Surface Deterioration" is also observed the deduct points for this distress would be equal to [(10) (0.7) (1)] or 7.0. The PCR for the pavement based upon these 2 distresses would equal to:

$$PCR = 100 - (5.6 + 7.0) = 87.4 \qquad (2)$$

The deduct weights for each pavement type have been developed on the basis of the review of the rating methods developed in the United States, Europe, and Canada and the experience gained from the rating methods developed by the Resource staff as a result of studies conducted in this connection. Two premises were considered when assigning the weights:

1. Overlaying and/or rehabilitation of high type (multi-lane) roadways should be considered when the PCR drops within the range of 65 to 55.

2. Deteriorated pavements normally exhibit several different types of distress. Rarely is only a single type of distress observed for a particular pavement.

The first premise is useful in establishing a target value for the proper PCR of pavements that are in a certain state or condition. Roadways scheduled for rehabilitation and resurfacing have to be rated by the PCR procedure.

A Pavement Condition Rating (PCR) Scale was developed to describe the pavement condition using the PCR numbers calculated from Equation (1). This scale has a range from 0 to 100; a PCR of 100 represents a perfect pavement with no observable distress and a PCR of 0 represents a pavement with all distress present at their "High" levels of severity and "Extensive" levels of extent. Figure 1 illustrates the PCR Scale and the descriptive condition of a pavement associated with the various ranges of the PCR values.

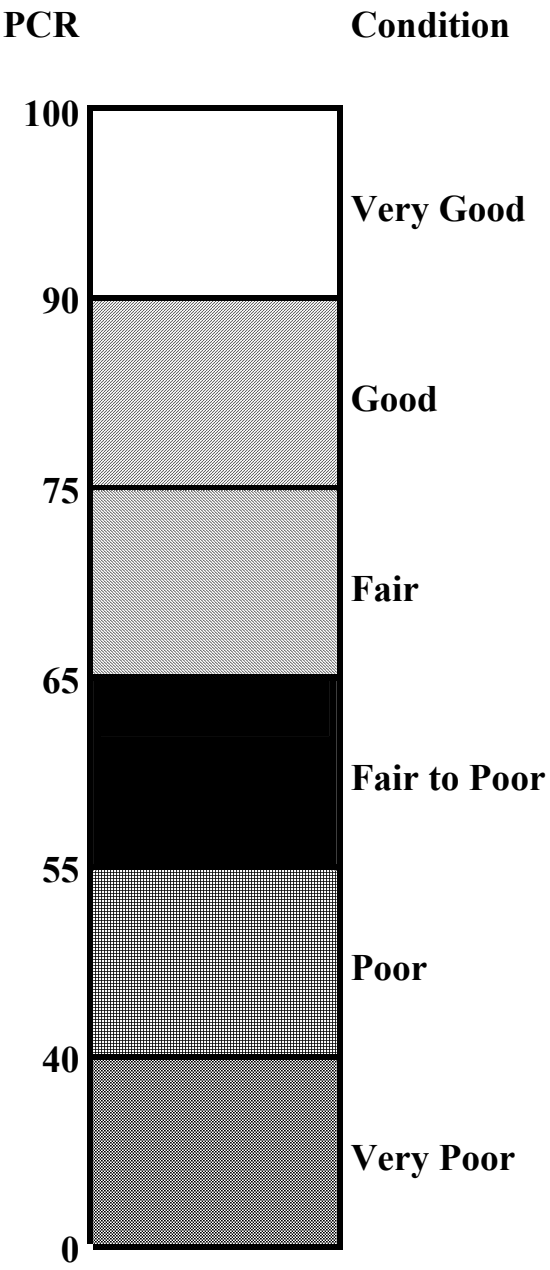

Figure 1. Pavement Condition Rating (PCR) Scale

FIELD MONITORING PROCEDURE

The pavement condition rating is intended to apply to the entire pavement section being monitored. Section lengths are established by the monitoring procedure, with the average length being from 3 to 5 km (2 to 3 miles). Directional lanes of multilane roadways are considered separate roadways by the monitoring procedure. On multilane roadways the heaviest traveled lane (usually the outside lane) should be rated. For two lane roadways, rating one direction is sufficient unless a significant difference in condition is observed between the two lanes. The monitoring procedure checks the variance of the Pavement Serviceability Index (PSI) within a section to limit section length. This limitation should produce sections that have a fairly constant visual condition. If a definite variation in condition is observed within a section, the section should then be subdivided for condition rating. Recording of visible distress for the PCR calculations involves three steps:

Step 1. The rating team (the rating team should consist of a Driver and a Rater) should ride the predetermined roadway section at a speed of about 60 km (40 MPH). During this step, readily visible distresses such as potholes, bleeding, settlement, faulting, spalling, and surface deterioration should be rated. Also the need for subdividing the section should be evaluated in step 1.

Step 2. A second pass along the roadway section should be made with stops at approximately 1.5 km (1 mile) intervals. For example, a 3 km (2-mile section) would require 2 stops to be made. At each stop the raters should evaluate the roadway by viewing 30 m (100') of the pavement. Close inspection of pavement cracking, crack sealing, rutting, raveling, joint spalling, D-cracking, and other visible distress should be made by viewing the pavement from the roadway shoulder.

Step 3. Complete the PCR form. The final rating form for the roadway section should represent the observed average of visible distress for the entire section. Separate rating forms based upon the step 1 observations and the individual stops made during step 2 are not required. However, raters may wish to use additional rating forms for each stop, simply for note keeping purposes.

PAVEMENT CONDITION RATING FORMS AND KEY FORMS

Note: The Key forms summarize data presented in Appendices A through F. These key forms will aid field personnel in establishing distress severity and extent while performing the PCR surveys.

Section:_____ **KEY** Date: _____

Log Mile: _____ to _____ **FLEXIBLE PAVEMENT CONDITION** Rated by: _____

Sta:_____ to_____ **RATING FORM** # of Utility Cuts _____

DISTRESS	Distress Weight	SEVERITY*			EXTENT**			STR ***
		L	M	H	O	F	E	
RAVELING	10	Slight Loss of Sand	Open Texture	Rough or pitted	<20%	20-50%	>50%	
BLEEDING	5	not rated	Bit and Agg visible	Black Surface	<10%	10-30%	>30%	
PATCHING	5	<1 ft^2.	<1 yd^2	>1 yd^2	<10/mile	10-20/mile	>20/mile	
DEBONDING	5	depth <1" area <1 yd^2	<1", >1 yd^2 >1",<1 yd^2	>1" and >1 yd^2	<5/mile	5-10/mile	>10/mile	
CRACK SEALING DEFIC.	5	Not considered			<50%	>50%	No Sealant	
RUTTING	10	1/8" - 3/8"	3/8" - 3/4"	> 3/4"	<20%	20-50%	>50%	
SETTLEMENTS	0	Noticeable effect on ride	Some Discomfort	Poor Ride	<2/mi	2-4/mi	>4/mi	
POTHOLES	10	depth <1" area <1 yd^2	<1", >1 yd^2 >1",<1 yd^2	>1" and >1 yd^2	<5/mile	5-10/mile	>10/mile	
WHEEL TRACK CRACKING	15	Single/multiple cracks <1/4"	Multiple cracks >1/4"	Alligator >1/4" Spalling with	<20%	20-50%	>50%	
BLOCK & TRANSVERSE CRACKING	10	> 6' X 6' or Transverse Crk.	6' x 6' to 3' x3'	< 3' x 3'	<20%	20-50%	>50%	
LONGITUDINAL CRACKING	5	Single, <1/4", no Spalling	single/multiple 1/4-1", some Spalling	Multiple, >1", Spalling	< 50' per 100'	50-150' per 100'	>150' per 100'	
EDGE CRACKING	10	Tight, <1/4"	>1/4", some Spalling	>1/4",moderate Spalling	<20%	20-50%	>50%	
THERMAL CRACKING	10	<1/4"	1/4-1"	>1"	CS > 200'	CS 75-200'	CS <75'	

*L = LOW **O = OCCASIONAL ***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.
M = MEDIUM F = FREQUENT
H = HIGH E = EXTENSIVE

Section: _____

Log mile: _____ to_____

Sta: _____ to_____

FLEXIBLE

Date: _____

Rated by: _____

# of Utility Cuts _____

PAVEMENT CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
RAVELING	10	0.3	0.6	1	0.5	0.8	1	
BLEEDING	5	0.8	0.8	1	0.6	0.9	1	
PATCHING	5	0.3	0.6	1	0.6	0.8	1	
DEBONDING	5	0.4	0.7	1	0.5	0.8	1	
CRACK SEALING DEFICIENCY	5	1	1	1	0.5	0.8	1	
RUTTING	10	0.3	0.7	1	0.6	0.8	1	
SETTLEMENT	0	0.0	0.0	0.0	0.0	0.0	0.0	
POTHOLES	10	0.4	0.8	1	0.5	0.8	1	
WHEEL TRACK CRACKING	15	0.4	0.7	1	0.5	0.7	1	
BLOCK AND TRANSVERSE CRACKING	10	0.4	0.7	1	0.5	0.7	1	
LONGITUDINAL CRACKING	5	0.4	0.7	1	0.5	0.7	1	
EDGE CRACKING	10	0.4	0.7	1	0.5	0.7	1	
THERMAL CRACKING	10	0.4	0.7	1	0.5	0.7	1	

*L = LOW **O = OCCASIONAL

M = MEDIUM F = FREQUENT

H = HIGH E = EXTENSIVE

TOTAL DEDUCT =

SUM OF STRUCTURAL DEDUCT ( ) =

100 - TOTAL DEDUCT = PCR =

KEY

Section:_____ Date: _____

Log Mile: _____ to _____

ASPHALT SURFACE LOCAL

Rated by: _____

Sta:_____ to_____

RATING FORM

of Utility Cuts _____

DISTRESS	Distress Weight	SEVERITY*			EXTENT**			STR ***
		L	M	H	O	F	E	
RAVELING	10	Slight Loss of Sand	Open Texture	Rough or Pitted	<20%	20-50%	>50%	
BLEEDING	5	not rated	Bitumen & Agg. Visible	Black Surface	<10%	10-30%	>30%	
PATCHING	5	<1 ft^2	<1 yd^2	>1 yd^2	<10/mile	10-20/mile	>20/mile	
SURFACE DISINTEGRATION / DEBONDING /POTHOLES	5	depth <1" area <1 yd^2	<1", >1 yd^2 >1",<1 yd^2	>1" and >1 yd^2	<5/mile	5-10/mile	>10/mile	
RUTTING	10	1/8" - 3/8"	3/8" - 3/4"	>3/4"	<20%	20-50%	>50%	
MAP CRACKING	5	5' x 5' to 9' x 9'	1' x '1 to 5' x 5'	< 1' x 1' or alligator	<20%	20-50%	>50%	
BASE FAILURE	10	Barely Noticeable Pitch & Roll	Noticeable Pitch & Roll, Jarring Bump	Severe Distortion, Poor Ride	<2/mi	2-5/mi	>5/mi	
SETTLEMENTS	5	Noticeable effect on ride	Some Discomfort	Poor Ride	<2/mi	2-4/mi	>4/mi	
TRANSVERSE CRACKS	10	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	CS>100'	100'<CS<50'	CS<50'	
WHEEL TRACK CRACKING	15	Single/multiple cracks <1/4"	Multiple cracks >1/4"	Alligator >1/4" Spalling	<20%	20-50%	>50%	
LONGITUDINAL CRACKING	5	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	<50' per 100	50 -150' per 100'	>150' per 100	
EDGE CRACKING	5	Tight, <1/4"	>1/4", some Spalling	>1/4",moderate Spalling	<20%	20-50%	>50%	
PRESSURE DAMAGE/ UPHEAVAL	5	bump <½", Barely Noticeable	½" -1", Fair Ride	>1", Poor Ride	<5/mile	5-10/mile	>10/mile	
CRACK SEALING DEFIC.	5	Not considered			<50%	>50%	No Sealant	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.

Section: _____

Log mile: _____to_____

Sta: _____ to_____

LOCAL

Date: _____

Rated by: _____

# of Utility Cuts _____

PAVEMENT CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
RAVELING	10	0.3	0.6	1	0.5	0.8	1	
BLEEDING	5	0.8	0.8	1	0.6	0.9	1	
PATCHING	5	0.3	0.6	1	0.6	0.8	1	
SURFACE DISINTEGRATION or DEBONDING	5	0.3	0.6	1	0.6	0.8	1	
RUTTING	10	0.3	0.7	1	0.6	0.8	1	
MAP CRACKING	5	0.2	0.6	1	0.4	0.8	1	
BASE FAILURE	10	0.6	0.8	1	0.7	0.9	1	
SETTLEMENTS	5	0.4	0.7	1	0.6	0.8	1	
TRANSVERSE CRACKS	10	0.4	0.7	1	0.5	0.7	1	
WHEEL TRACK CRACKING	15	0.4	0.7	1	0.5	0.7	1	
LONGITUDINAL CRACKING	5	0.2	0.6	1	0.4	0.8	1	
EDGE CRACKING	5	0.4	0.7	1	0.5	0.7	1	
PRESSURE DAMAGE/UPHEAVAL	5	0.4	0.6	1	0.5	0.8	1	
CRACK SEALING DEFICIENCY	5	1	1	1	0.5	0.8	1	

*L = LOW	**O = OCCASIONAL	TOTAL DEDUCT =	
M = MEDIUM	F = FREQUENT	SUM OF STRUCTURAL DEDUCT ( ) =	
H = HIGH	E = EXTENSIVE	**100 - TOTAL DEDUCT = PCR =**	

*** DEDUCT POINTS = DISTRESS WEIGHT X SEVERITY WT. X EXTENT WT.

REMARKS:

Section:_____ **KEY** Date: _____

Log Mile: _____ to _____ **COMPOSITE PAVEMENT CONDITION** Rated by: _____

Sta:_____ to_____ **RATING FORM** # of Utility Cuts: _____

DISTRESS	Distress Weight	SEVERITY*			EXTENT**			STR ***
		L	M	H	O	F	E	
RAVELING	10	Slight Loss of Sand	Open Texture	Rough or Pitted	<20%	20-50%	>50%	
BLEEDING	5	not rated	Bitumen & Agg. Visible	Black Surface	<10%	10-30%	>30%	
PATCHING	5	<1 ft^2	<1 yd^2	>1 yd^2	<10/mile	10-20/mile	>20/mile	
SURFACE DISINTEGRATION/ DEBONDING	5	depth <1" area <1 yd^2	<1", >1 yd^2 >1",<1 yd^2	depth >1" area >1 yd^2	<5/mile	5-10/mile	>10/mile	
RUTTING	10	1/8" - 3/8"	3/8" - 3/4"	>3/4"	<20%	20-50%	>50%	
PUMPING	10	Rater is certain of pumping			<10%	10-25%	>25%	
SHATTERED SLAB (Jointed Base)	10	Little Spall, No Faults	Moderate Faults	Distortion, Poor Ride	<2/mi	2-5/mi	>5/mi	
SETTLEMENTS	0	Noticeable effect on ride	Some Discomfort	Poor Ride	<2/mi	2-4/mi	>4/mi	
TRANSVERSE CRACKS (Unjointed Base)	20	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	CS>15'	10'<CS<15'	CS<10'	
JOINT REFLECTION CRACKS (Jointed Base)	12	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	<20%	20-50%	>50%	
INTERMEDIATE TRANSVERSE CRACKS (Jointed Base)	8	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	< 10% of the Slabs	10% - 30% of the Slabs	> 30% of the Slabs	
LONGITUDINAL CRACKING	5	<1/4", no spalling	1/4 - 1", >.5 spalled	>1", >.5 spalled	<50' per 100'	50 -150' per 100'	>150' per 100'	
PRESSURE DAMAGE/UPHEAVAL	5	bump <½", Good Ride	½-1", Fair Ride	>1", Poor Ride	<5/mile	5-10/mile	>10/mile	
CRACK SEAL DEFICIENCY	5	Not considered			< 50%	> 50%	no sealant	
CORNER BREAKS (Jointed Base))	10	NO DEPRESSION	DEPRESSION < 2"	DEPRESSION > 2"	< 4/mile	4 - 10/mile	> 10/mile	
PUNCHOUTS (Unjointed Base)	15	NOT RATED	DEPRESS < 2"	DEPRESS > 2"	< 4/mile	4 - 10/mile	> 10/mile	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.

Section: _____

COMPOSITE

Date: _____

Log mile: _____ to_____

Rated by: _____

Sta: _____ to_____

# of Utility Cuts: _____

PAVEMENT CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
RAVELING	10	0.3	0.6	1	0.5	0.8	1	
BLEEDING	5	0.8	0.8	1	0.6	0.9	1	
PATCHING	5	0.3	0.6	1	0.6	0.8	1	
SURFACE DISINTEGRATION or DEBONDING	5	0.3	0.6	1	0.6	0.8	1	
RUTTING	10	0.3	0.7	1	0.6	0.8	1	
PUMPING	10	1	1	1	0.3	0.7	1	
SHATTERED SLAB (Jointed Base)	10	0.6	0.8	1	0.7	0.9	1	
SETTLEMENTS	0	0.0	0.0	0.0	0.0	0.0	0.0	
TRANSVERSE CRACKS, (Unjointed Base)	20	0.2	0.6	1	0.4	0.8	1	
JOINT REFLECTION CRACKS (Jointed Base)	12	0.2	0.6	1	0.4	0.8	1	
INTERMEDIATE TRANSVERSE CRACKS (Jointed Base)	8	0.2	0.6	1	0.4	0.8	1	
LONGITUDINAL CRACKING	5	0.2	0.6	1	0.4	0.8	1	
PRESSURE DAMAGE/UPHEAVAL	5	0.4	0.6	1	0.5	0.8	1	
CRACK SEALING DEFICIENCY	5	1	1	1	0.5	0.8	1	
CORNER BREAKS (JOINTED BASE)	10	0.4	0.8	1	0.5	0.8	1	
PUNCHOUTS (UNJOINTED BASE)	15	.8	.8	1	0.5	0.8	1	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

TOTAL DEDUCT = _____

SUM OF STRUCTURAL DEDUCT ( ) = _____

100 - TOTAL DEDUCT = PCR = _____

*** DEDUCT POINTS = DISTRESS WEIGHT X SEVERITY WT. X EXTENT WT.

Section:_____ **KEY** Date: _____

Log Mile: _____to _____ **JOINTED CONCRETE PAVEMENT** Rated by: _____

Sta:_____ to_____ **CONDITION RATING FORM** # of Utility Cuts _____

DISTRESS	Distress Weight	SEVERITY WEIGHT*			EXTENT WEIGHT**			STR ***
		L	M	H	O	F	E	
SURFACE DETERIORATION	10	Aggregate visible	Loss of fine aggregate	Surface rough & pitted	< 20%	20 - 50%	> 50%	
LONGITUDINAL JOINT SPALLING	5	< 3"	3" - 6"	> 6"	<10%	10 - 30%	>30%	
PATCHING	10	<1 ft^2, no deterioration	<1 ft^2, deterioration	>1 ft^2	<10/mi	10-20/mi	>20/mi	
PUMPING	15	Rater is certain of pumping			<10%	10-25%	>25%	
FAULTING (Joints & Cracks)	10	<1/4"	1/4-1/2"	>½"	<20%	20-50%	>50%	
SETTLEMENTS	0	Noticeable effect on Ride	Some discomfort	Poor Ride	2/mi.	2-4/mi.	>4/mi.	
TRANSVERSE JOINT SPALLING	10	<4" wide	4-9" wide	>9" wide	<25%	25-75%	75%	
TRANSVERSE CRACKING (Plain Concrete)	15	Hairline	Hairline - 3/16"	> 3/16"	<10% of the slabs	10 to 30%	>30%	
PRESSURE DAMAGE	5	Not considered			<1/mi	1-3/mi	>3/mi	
TRANSVERSE CRACKING (Reinforced Concrete)	15	No failed Cracks	If Severity is Low, use		<25% slabs	25 to 75%	>75% slabs	
			1 failed Crack	>1 failed Crack	5 to 10%	10 to 30%	>30% slabs	
LONGITUDINAL CRACKING	10	Hairline	1/4-1"	>1"	<5%	5-20%	>20%	
CORNER BREAKS	10	<1/4"	1/4-1"	>1"	<4/mi	4-10/mi.	>10 mi.	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.

Section: _____

JOINTED

Date: _____

Log mile: _____ to_____

Rated by: _____

Sta: _____to_____

# of Utility Cuts: _____

PAVEMENT CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
SURFACE DETERIORATION	10	0.4	0.7	1	0.6	0.8	1	
LONGITUDINAL JOINT SPALLING	5	0.4	0.7	1	0.6	0.8	1	
PATCHING	10	0.4	0.7	1	0.5	0.8	1	
PUMPING	15	1	1	1	0.3	0.7	1	
FAULTING (JOINTS AND CRACKS)	10	0.4	0.7	1	0.5	0.8	1	
SETTLEMENTS	0	0.0	0.0	0.0	0.0	0.0	1	
TRANSVERSE JOINT SPALLING (CIRCLE IF D-CRACKED)	10	0.4	0.7	1	0.5	0.8	1	
TRANSVERSE CRACKING (Plain Concrete)	15	1	1	1	0.5	0.8	1	
PRESSURE DAMAGE	5	1	1	1	0.5	0.8	1	
TRANSVERSE CRACKING (Reinforced Concrete)	15	0.1	0.8	1	0.4	0.8	1	
LONGITUDINAL CRACKING	10	0.5	0.7	1	0.4	0.9	1	
CORNER BREAKS	10	0.4	0.8	1	0.5	0.8	1	

*L = LOW **O = OCCASIONAL

M = MEDIUM F = FREQUENT

H = HIGH E = EXTENSIVE

TOTAL DEDUCT = _____

SUM OF STRUCTURAL DEDUCT ( ) = _____

100 - TOTAL DEDUCT = PCR = _____

*** DEDUCT POINTS = DISTRESS WEIGHT X SEVERITY WT. X EXTENT WT.

Section:_____ Date: _____

Log Mile: _____ to _____ Rated by: _____

Sta:_____ to_____ # of Utility Cuts _____

KEY

CRC PAVEMENT CONDITION

RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WEIGHT*			EXTENT WEIGHT**			STR ***
		L	M	H	O	F	E	
SURFACE DETERIORATION	10	Aggregate visible	Loss of fine aggregate	Surface rough or pitted	<20%	20-50%	>50%	
POPOUTS	5	Not considered			<20%	20-50%	>50%	
PATCHING	5	<1 ft^2, no deterioration	<1 ft^2, deterioration	>1 ft^2	<10/mi	10-20/mi	>20/mi	
PUMPING	15	some staining, rater is certain of pumping		excessive staining	<10%	10-25%	>25%	
SETTLEMENTS & WAVES	10	Noticeable effect on Ride	Some discomfort	Poor Ride	<2/mi. (<20%)	2-4/mi 20-50%	>4/mi (>50%)	
TRANSVERSE CRACK SPACING	10	CS 3-5'	CS <3'	CS <3' Many cracks intersect	<20%	20-50%	>50%	
LONGITUDINAL CRACKING	10	Hairline	>1/4" - 1"	>1"	<5%	5-15%	>15%	
PUNCHOUTS & EDGE BREAKS	15	Not rated	cracks <1/4" depress <½"	depress >½" Breaking up	<2/mi.	2-5/mi	>5/mi	
SPALLING	15	<1", few pieces missing	1 - 4" wide, most pieces missing	>4" wide, most pieces missing	<20%	20-50%	>50%	
PRESSURE DAMAGE	5	Not considered			<1/mi.	1 - 3/mi.	>3/mi.	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.

Section: _____ Date: _____

Log mile: _____ to_____

Sta: _____ to_____

C R C

Rated by: _____

# of Utility Cuts _____

PAVEMENT CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
SURFACE DETERIORATION	10	0.4	0.7	1	0.5	0.8	1	
POPOUT	5	1	1	1	0.4	0.6	1	
PATCHING	5	0.4	0.7	1	0.5	0.8	1	
PUMPING	15	0.7	0.7	1	0.3	0.7	1	
SETTLEMENTS & WAVES	10	0.3	0.7	1	0.4	0.7	1	
TRANSVERSE CRACK SPACING	10	0.4	0.7	1	0.4	0.8	1	
LONGITUDINAL CRACKING	10	0.4	0.8	1	0.5	0.8	1	
PUNCHOUTS OR EDGE BREAKS	15	0	0.8	1	0.6	0.9	1	
SPALLING	15	0.3	0.6	1	0.5	0.8	1	
PRESSURE DAMAGE	5	1	1	1	0.7	0.9	1	

*L = LOW **O = OCCASIONAL

M = MEDIUM F = FREQUENT

H = HIGH E = EXTENSIVE

TOTAL DEDUCT =	
SUM OF STRUCTURAL DEDUCT ( ) =	
100 - TOTAL DEDUCT = PCR =	

*** DEDUCT POINTS = DISTRESS WEIGHT X SEVERITY WT. X EXTENT WT.

Section: _____ **KEY** Date: _____

Log mile: _____ to _____ **BRICK PAVER CONDITION** Rated by: _____

Sta: _____ to _____ **RATING FORM** # of Utility Cuts: _____

DISTRESS	Distress Weight	SEVERITY*			EXTENT**			STR ***
		L	M	H	O	F	E	
BRICK DETERIORATION	15	Some disintegration	Open texture / Rough. Area < 1 yd^2 exhibits breaks or loss of bricks	Most of surface is worn away. Areas > 1 yd^2 exhibit breaks or loss of bricks	<10%	10-30%	>30%	
DISCOLORATION	5	Rater is certain of Discoloration			<10%	10-30%	>30%	
PATCHING	10	<1 ft^2	<1 yd^2	>1 yd^2	<3/500ft	3-6/500ft	>6/500ft	
PUMPING	15	Rater is Certain of Pumping			<10%	10-25%	>25%	
RUTTING	20	<1"	1-3"	>3"	<20%	20-50%	>50%	
CORRUGATIONS	5	Noticeable effect on ride	Some Discomfort	Poor Ride	<10%	10-30%	>30%	
JOINT EROSION	10	<1/2"	1/2-3/4"	>3/4"	<20%	20-50%	>50%	
BRICK SETTLEMENT	20	Area < 2 ft^2, depth < 3", & Noticeable effect on ride	Area between 2 ft^2 & 1 yd^2, depth > 3", & Some discomfort	Area > 1 yd^2, depth > 3", & poor ride; or pumping	<2/500ft	2-5/500ft	>5/500ft	

*L = LOW
M = MEDIUM
H = HIGH

**O = OCCASIONAL
F = FREQUENT
E = EXTENSIVE

***STR = DISTRESS INCLUDED IN STRUCTURAL DEDUCT CALCULATIONS.

Section: _____ Date: _____

Log mile: _____ to_____ Rated by: _____

Sta: _____ to_____ # of Utility Cuts: _____

Brick

PAVER CONDITION RATING FORM

DISTRESS	DISTRESS WEIGHT	SEVERITY WT.*			EXTENT WT.**			DEDUCT POINTS***
		L	M	H	O	F	E	
BRICK DETERIORATION	15	0.4	0.7	1	0.5	0.8	1	
DISCOLORATION	5	1	1	1	0.4	0.7	1	
PATCHING	10	0.3	0.6	1	0.6	0.8	1	
PUMPING	15	1	1	1	0.3	0.7	1	
RUTTING	20	0.3	0.7	1	0.6	0.8	1	
CORRUGATIONS	5	0.3	0.7	1	0.4	0.7	1	
JOINT EROSION	10	0.4	0.7	1	0.5	0.8	1	
BRICK SETTLEMENT	20	0.4	0.7	1	0.6	0.8	1	

*L = LOW **O = OCCASIONAL

M = MEDIUM F = FREQUENT

H = HIGH E = EXTENSIVE

TOTAL DEDUCT =	
SUM OF STRUCTURAL DEDUCT ( ) =	
100 - TOTAL DEDUCT = PCR =	

*** DEDUCT POINTS = DISTRESS WEIGHT X SEVERITY WT. X EXTENT WT.

APPENDIX A

Description of Distresses in Flexible Pavements

FLEXIBLE PAVEMENT

Distress Type: **Raveling**

Description: Disintegration of the pavement from the surface downward due to the loss of aggregate particles. Raveling may occur as a result of asphalt binder aging, poor mixture quality, segregation, or insufficient compaction.

Severity Level:

Low-- Very little coarse aggregate has worn away. Loss of fine aggregate. Coarse aggregate exposed.

Medium-- Surface has an open texture and is moderately rough with considerable loss of fine aggregate and some coarse aggregate removed.

High-- Most of the surface aggregate has worn away or become dislodged. Surface is severely rough and pitted and may be completely removed in places.

Extent Level:

Occasional-- Less than 20 percent of the surface area is raveling.

Frequent-- Between 20 and 50 percent of the surface area is raveling.

Extensive-- More than 50 percent of the surface area is raveling.

Photo A-1. Raveling in Flexible Pavement, Medium Severity

Photo A-2. Raveling in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Bleeding**

Description: Bleeding or flushing is the presence of free asphalt binder on the pavement surface. Bleeding is caused by an excess amount of bituminous binder in the mixture and/or low air void content.

Severity Level: Only 2 severity levels are defined.

Medium-- both coarse aggregate and free bitumen are noticeable at the pavement surface.

High-- surface appears black with very little aggregate noticeable.

Extent Level: **O**ccasional-- less than 10 percent of the length exhibits bleeding.

Frequent-- between 10 and 30 percent of the length is bleeding.

Extensive-- bleeding occurs in more than 30 percent of the length.

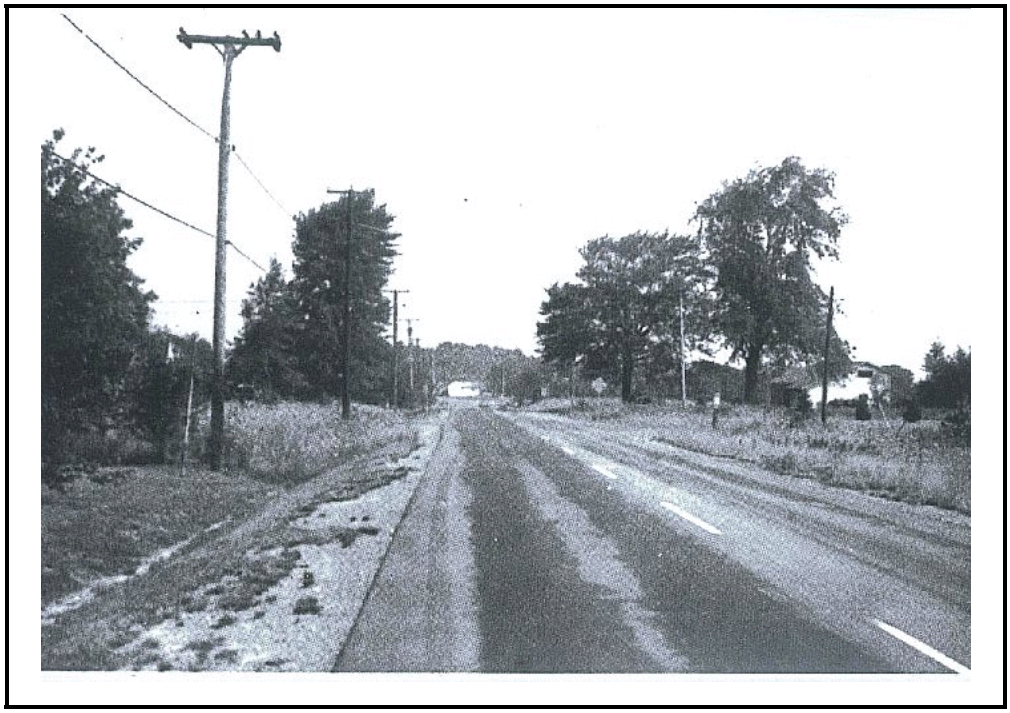

Photo A-3. Bleeding in Flexible Pavement, High Severity

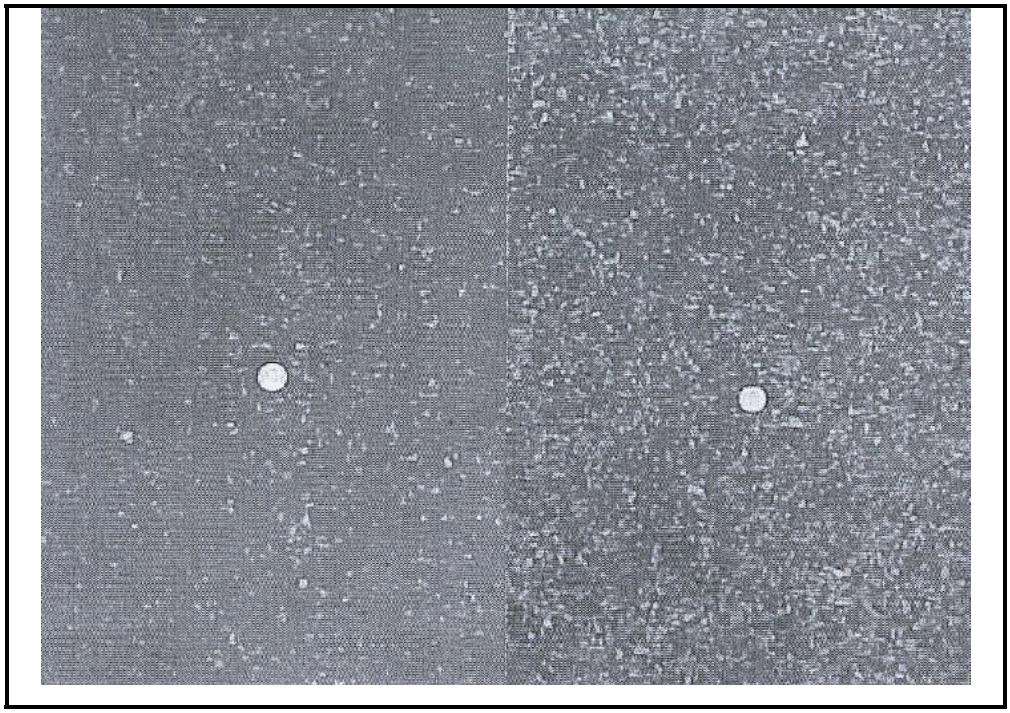

Photo A-4. Close-up view of Bleeding, High and Medium Severity
High Severity on left shows most aggregates covered with asphalt and Medium Severity on right shows less aggregates covered with asphalt

FLEXIBLE PAVEMENT

Distress Type: **Patching**

Description: Patching is either the placing of asphalt concrete on the surface of the existing pavement or the replacement of the existing pavement in small isolated areas.

Deductions shall be made for all patches present in the pavement which are the result of deterioration and/or maintenance since the last construction project.

Large patched areas [greater than 15 sq. yd. (12.5 m^2)], such as spot overlays or wedge courses, shall be rated for condition as a part of the existing pavement rather than as patches.

If more than one patch size is present, rate the severity of the size that exists in the largest quantity, and rate the extent of the total number of patches present.

Severity Level:

Low-- patch size < 1 sq. ft. (0.1 m^2).

Medium-- patch size < 1 sq. yd. (0.8 m^2).

High-- patch size > 1 sq. yd. (0.8 m^2).

Extent Level:

Occasional-- < 10 patches/mile (per 1.6 km).

Frequent-- 10 - 20 patches/mile (per 1.6 km).

Extensive-- > 20 patches/mile (per 1.6 km).

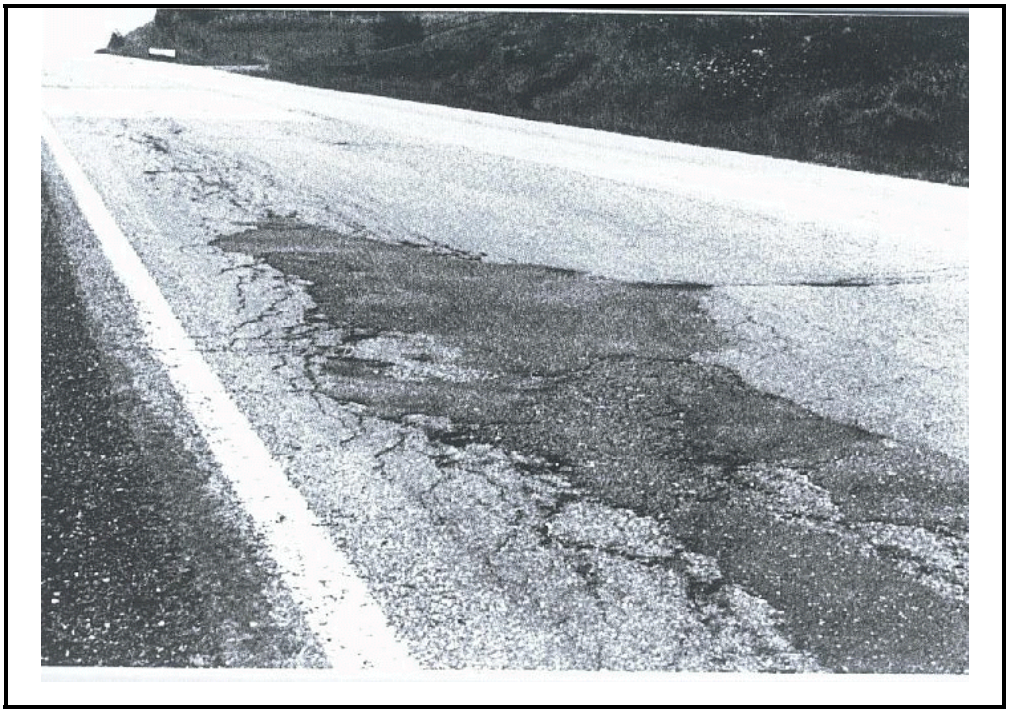

Photo A-5. Patching in Flexible Pavement, High Severity

Photo A-6. Patching in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Debonding**

Description: Loss of surface by debonding is the removal of the asphaltic surface layer from the underlying layer. The problem is most common with thin asphalt surface layers [less than 2 inches (50 mm)] and is caused by freeze-thaw action or poor bonding of the two layers during construction.

Severity Level: Use the following table to determine the severity levels:

Depth of Debonded Area	Debonded Area < 1 sq. yd. (0.8 m^2)	Debonded Area > 1 sq. yd. (0.8 m^2)
< 1" (25 mm)	Low	Medium
> 1" (25 mm)	Medium	High

Extent Level: **O**ccasional-- < 5 debonded areas/mile (per 1.6 km).

Frequent-- 5 - 10 debonded areas/mile (per 1.6 km).

Extensive-- > 10 debonded areas/mile (per 1.6 km).

Photo A-7. Debonding in Flexible Pavement, Medium Severity

FLEXIBLE PAVEMENT

Distress Type: **Crack Sealing Deficiency**

Description: Crack sealing deficiency is crack sealing which is no longer effective in preventing intrusion of water or cracks which have never been sealed. Unsealed cracks with an average width less than 1/4" may not be considered.

Severity Level: Severity levels are not considered.

Extent Level:

Occasional– Less than 50% of existing cracks are not effectively sealed.

Frequent– More than 50% of existing cracks are not effectively sealed.

Extensive– None of the existing cracks have been sealed, there is no sealant on the roadway.

Photo A-8. Crack Sealing Deficiency in Flexible Pavement, Unsealed Cracks

Photo A-9. Crack sealing Deficiency in Flexible Pavement, Cracks not sealed properly

FLEXIBLE PAVEMENT

Distress Type: **Rutting**

Description: Ruts are vertical deformations in the pavement surface along the wheel tracks. In severe cases pavement uplift may occur along the sides of the rut, but in most instances only a depression is noticeable. Rutting is caused by consolidation or lateral movement of any or all pavement layers, including subgrade, under traffic.

Severity Level: Rutting severity is based upon rut depth, as approximated visually.

Low--	Barely noticeable, depth between 1/8 inch and 3/8 inch.
Medium--	Readily noticeable, depth more than 3/8 inch, less than 3/4 inch.
High--	Readily noticeable, depth greater than 3/4 inch.

Extent Level:

Occasional--	Less than 20 percent of the section length is rutted.
Frequent--	Between 20 and 50 percent of the section length is rutted.
Extensive--	More than 50 percent of the section length is rutted.

Photo A-10. Rutting in Flexible Pavement, Medium Severity

Photo A-11. Rutting in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Settlement**

Description: Settlement is a dip in the longitudinal profile of the pavement surface. Settlement shall be considered a distress when it causes a noticeable effect upon riding quality. Settlement should not be confused with corrugation, which is another type of surface profile deficiency.

Severity Level: Severity is based upon the effect of the settlement on vehicle control when traveling along the roadway at 40 MPH (60 km/hour), as discussed in step 1 of the monitoring procedure.

Low-- noticeable effect upon ride, driver able to maintain vehicle control easily.

Medium-- some discomfort to passengers, driver able to maintain control with slight corrective action.

High-- definite effect upon ride quality, noticeable profile dip generally greater than 6 inches (150 mm). Poor ride, corrective action needed.

Extent Level: **O**ccasional-- less than 2 settlements/mile (per 1.6 km) of roadway.

Frequent-- 2 to 4 settlements/mile (per 1.6 km) of roadway.

Extensive-- more than 4 settlements/mile (per 1.6 km) of roadway.

Photo A-12. Settlement in Flexible Pavement, Low Severity

Photo A-13. Settlement in Flexible Pavement, Medium Severity

FLEXIBLE PAVEMENT

Distress Type: **Potholes**

Description: Potholes are bowl-shaped voids or depressions in the pavement surface. Potholes are localized failure areas which are usually caused by weak base or subgrade layers.

Severity Level: Use the following table to determine the severity levels:

Depth of Pothole	Pothole < 1 sq. yd. (0.8 m2)	Pothole > 1 sq. yd. (0.8 m2)
< 1" (25 mm)	Low	Medium
> 1" (25 mm)	Medium	High

Regardless of depth, potholes less than 6 inches (150 mm) in diameter shall be considered to be of low severity.

Extent Level: **O**ccasional-- < 5 potholes/mile (per 1.6 km).

Frequent-- 5 - 10 potholes/mile (per 1.6 km).

Extensive-- > 10 potholes/mile (per 1.6 km).

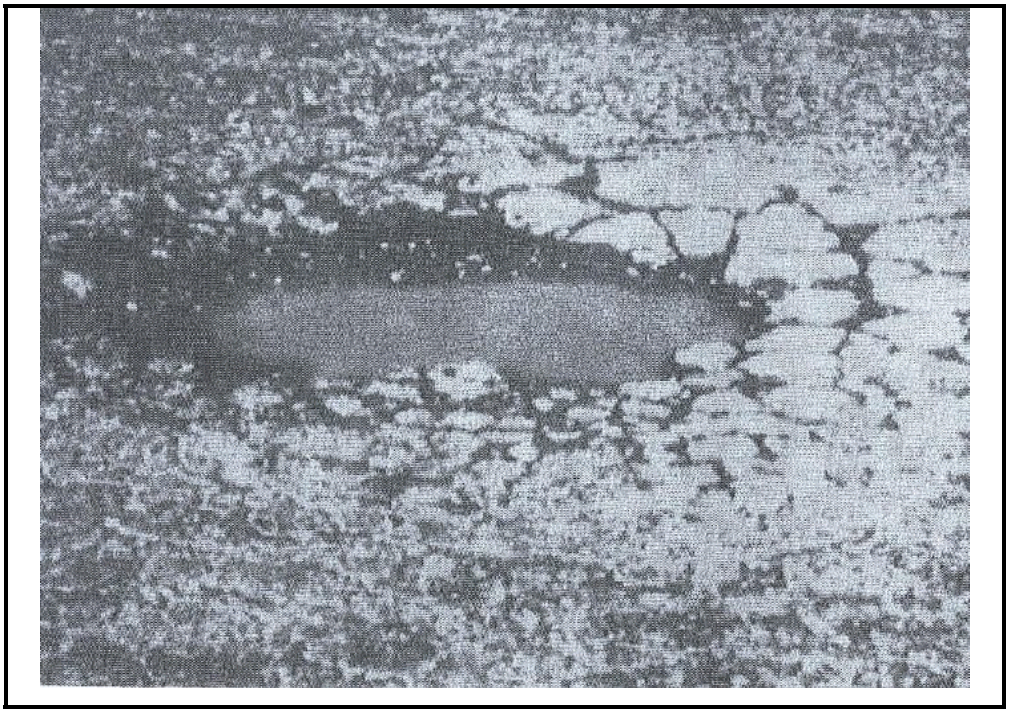

Photo A-14. Pothole in Flexible Pavement, Medium Severity

FLEXIBLE PAVEMENT

Distress Type: **Wheel Track Cracking**

Description: Cracks located within or near the wheel tracks are Wheel track cracks. For evaluation purposes each wheel track shall be considered 3 feet (1 m) in width. Wheel track cracking usually starts as intermittent, single longitudinal cracks progressing to multiple longitudinal cracking, and eventually interconnected or alligator cracking. Wheel track cracking usually results from fatigue failure of the asphaltic layer.

Wheel track cracking may exist on the outer edge of the pavement. If this is the case, both wheel track cracking and edge cracking should be rated and the appropriate deductions made.

Severity Level: Severity is based upon both crack width and multiplicity of the cracking. Both criteria must be satisfied when assigning severity level.

Low-- Single or intermittent multiple cracking with average crack width less than 1/4 inch (6 mm).

Medium-- Single or multiple cracking (may also include regions of intermittent alligator cracking) with average crack width greater than 1/4 inch (6 mm) with little spalling or loose pieces.

High-- Multiple cracking with extensive alligator cracking and rutting with a depth greater than 1/8 inch. Spalling is fairly common, with average crack width greater than 1/4 inch (6 mm), and some alligator blocks are easily removed.

Extent Level: Extent is based upon percentage of the wheel track length within the section which exhibits cracking.

Occasional-- Less than 20% of section affected.

Frequent-- Between 20 and 50% of section affected.

Extensive-- More than 50% of section affected.

Photo A-15. Wheel Track Cracking in Flexible Pavement, Med. Severity

Photo A-16. Wheel Track Cracking in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Block and Transverse Cracking**

Description: Block cracks are interconnected cracks which divide the pavement into large rectangular pieces or blocks. Block size may range from 3 ft. by 3 ft. (1 m by 1 m) upwards to 10 ft. by 10 ft. (3 m by 3 m). Transverse cracking is cracks at approximately right angles to the pavement centerline. The occurrence of both block and/or transverse cracking is usually related to thermal shrinkage of the asphalt binder. Binder age hardening is also related to formation of these crack types.

NOTE: *Transverse cracks that are not classified as thermal cracks (See Thermal Cracking, page A-26) and are not interconnected into a block pattern will be rated as Low Severity Block Cracking. Longitudinal Cracks that are intermittent and infrequent, and thus do not meet the criteria of Frequent or Extensive Longitudinal Cracking, will be rated as Low Severity Block Cracking.*

Severity Level:

Low-- Average size of block formed is greater than or equal to 6' x 6' or an occasional transverse crack that is not a thermal crack.

Medium-- Average size of block formed is greater than 3' x 3' but less than 6' x 6'.

High-- Average size of block formed is less than 3' x 3'.

Extent Level:

Occasional-- Less than 20 percent of the section length is affected by this distress.

Frequent-- Between 20 and 50 percent of this section length is affected by this distress.

Extensive-- Greater than 50 percent of the section length is affected by this distress.

Photo A-17. Block and Transverse Cracking in Flexible Pavement, Medium Severity

Photo A-18. Block and Transverse Cracking in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Longitudinal Cracking**

Description: Longitudinal cracks are those cracks formed parallel to the centerline of the roadway, and are the result of paving joints, widening joints which have reflected up through the layers of overlay, or the result of gear box segregation. Longitudinal cracking found in the wheel path should not be rated as longitudinal cracking, but instead as wheel track cracking.

Note: *Crack width is defined as the sum of all cracks if more than one is present at the location of measurement.*

Severity Level:

Low-- Single longitudinal crack with width less than 1/4" (6 mm) and no spalling.

Medium-- Single or multiple cracking 1/4"-1" (6 mm - 25 mm) with some spalling.

High-- Multiple cracking > 1" (25 mm) wide with much spalling.

Extent Level: Based upon the average linear feet of longitudinal cracking per station of 100 feet length (30 m).

Occasional– Less than 50 feet per station (15 m / 30 m)

Frequent-- Between 50 and 150 feet per station (15 and 45 m/30 m).

Extensive-- More than 150 feet per station (45 m/30 m). Complete reflective longitudinal cracking along the pavement centerline and edge [200 linear feet per station (60 linear m/ 30 m)] is termed extensive.

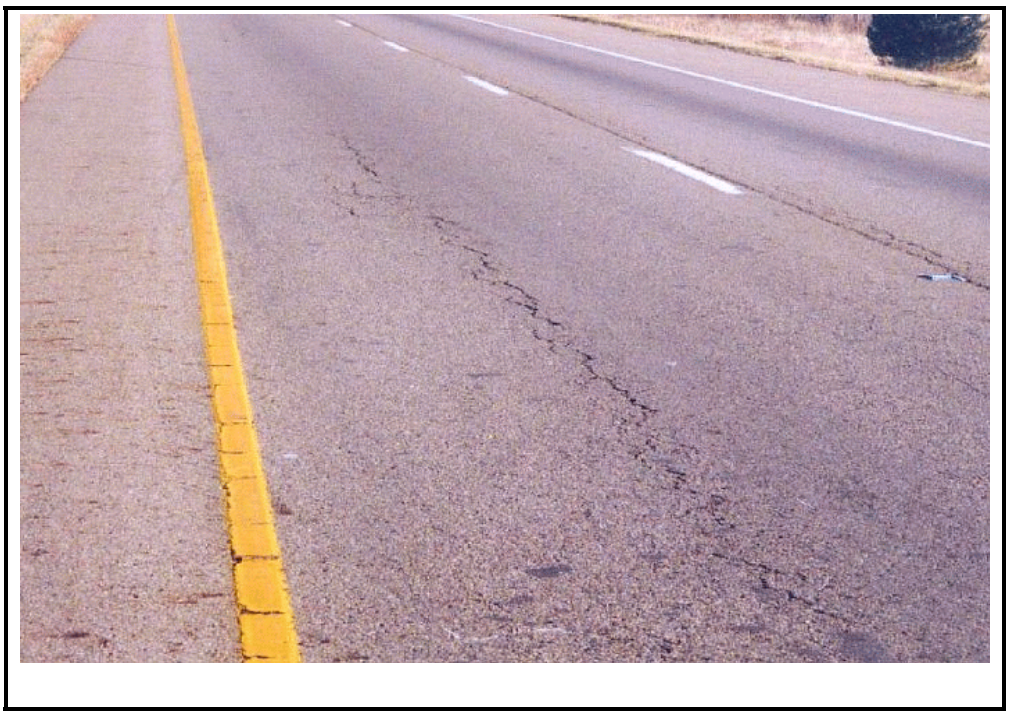

Photo A-19. Longitudinal Joint Cracking in Flexible Pavement, Medium Severity

Photo A-20. Longitudinal Joint Cracking in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Edge Cracking**

Description: Edge cracks are longitudinal or crescent shaped cracks found within 1 foot (0.3 m) of the pavement edge line. Edge cracking does not exist if the pavement is bordered by a shoulder or curb. For evaluation purposes, edge cracking will only be evaluated within 1 ft (0.3 m) to the left and the right of the paint line for roadway lanes larger than 10 ft (3 m). If the roadway lanes are 10 ft (3 m) wide, then edge cracking will be evaluated from the paint line to the edge of the pavement. If wheel track cracking is present in a 10 foot (3 m) lane, and it occurs within 1 foot (0.3 m) of the paint line, then both the wheel track cracking and the edge cracking should be rated.

Severity Level:

Low-- Tight cracks, width less than 1/4 inch (6 mm) with no break up or spalling.

Medium-- Crack width greater than 1/4 inch (6 mm) with some spalling.

High-- Multiple cracking with moderate spalling and average crack width greater than 1/4 inch (6 mm).

Extent Level:

Occasional-- Cracking occurs along less than 20 percent of the pavement edge within the section.

Frequent-- Cracking occurs along 20 to 50 percent of the pavement edge within the section.

Extensive-- Cracking occurs along more than 50 percent of the pavement edge within the section.

Photo A-21. Edge Cracking in Flexible Pavement, Medium Severity

Photo A-22. Edge Cracking in Flexible Pavement, High Severity

FLEXIBLE PAVEMENT

Distress Type: **Thermal Cracking**

Description: Thermal cracking is characterized as a series of evenly spaced cracks that are oriented perpendicular to the centerline of the roadway. Thermal cracks should be present from edge of pavement to edge of pavement. Thermal cracking is caused from repeated temperature cycling and aging of the pavement. As asphalt pavements are exposed to cold temperatures during the winter months, thermal stresses are produced since the asphalt binder contracts more than the aggregates. When temperature drops below the point where asphalt binder can remain elastic, thermal cracking is initiated.

Severity Level:

Low-- Average crack width less than 1/4 inch (6 mm), no spalling.

Medium-- Average crack opened or spalled to a width between 1/4 to 1 inch (6 mm to 25 mm) along at least half of its length.

High-- Average crack opened or spalled to a width greater than 1 inch (25mm) along at least half of its length.

Extent Level:

Occasional-- Average crack spacing (CS) is greater than 200 ft.

Frequent-- Average crack spacing (CS) is between 75 ft and 200 ft.

Extensive-- Average crack spacing (CS) is less than 75 ft.

Photo A-23. Thermal Cracking in Flexible Pavement, High Severity

APPENDIX B

Description of Distresses in Composite Pavements
[Composite Pavements have rigid bases (concrete or brick)
and asphaltic surfaces]

COMPOSITE PAVEMENT

Distress Type: **Raveling**

Description: Disintegration of the pavement from the surface downward due to the loss of aggregate particles. Raveling may occur as a result of asphalt binder aging, poor mixture quality segregation, or insufficient compaction.

Note: *Surfaces that are raveled and exhibit block and fatigue cracking should be rated as high severity raveling.*

Severity Level:

Low-- Very little coarse aggregate has worn away. Loss of fine aggregate. Coarse aggregate exposed.

Medium-- Surface has an open texture and is moderately rough with considerable loss of fine aggregate and some coarse aggregate removed.

High-- Most of the surface aggregate has worn away or become dislodged. Surface is severely rough and pitted and may be completely removed in places.

Extent Level:

Occasional-- Less than 20 percent of the surface area is raveling.

Frequent-- Between 20 and 50 percent of the surface area is raveling.

Extensive-- More than 50 percent of the surface area is raveling.

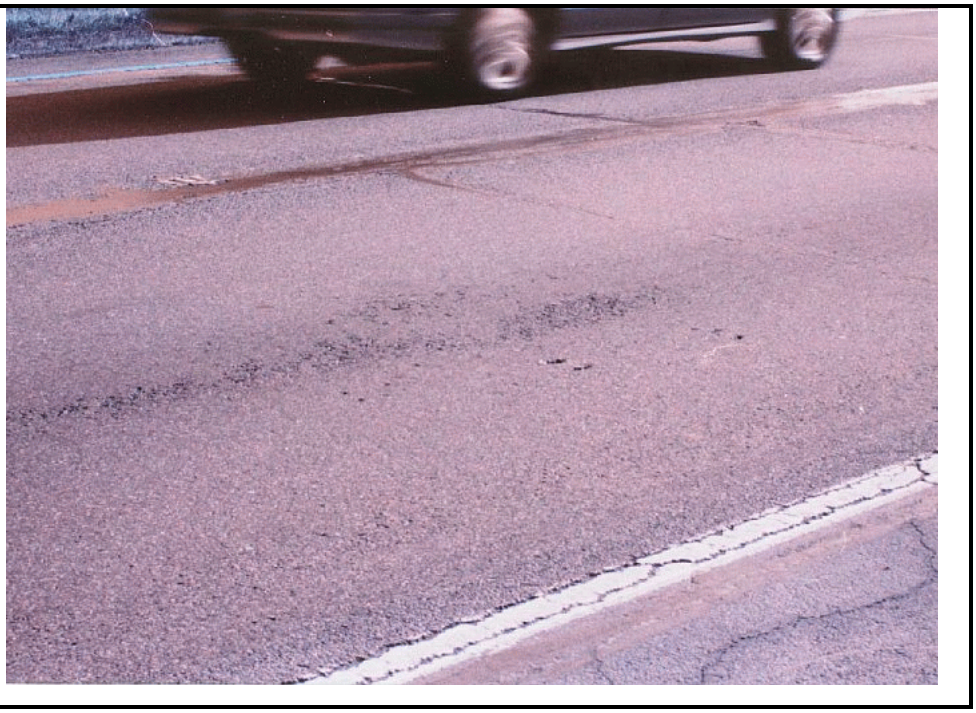

Photo B-1. Raveling in Composite Pavement, Medium Severity

Photo B-2. Raveling in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Bleeding**

Description: Bleeding or flushing is the presence of free asphalt binder on the pavement surface. Bleeding is caused by an excess amount of bituminous binder in the mixture and/or low air void content.

Severity Level: Only 2 severity levels are defined.

Medium-- Both coarse aggregate and free bitumen are noticeable at the pavement surface.

High-- Surface appears black with very little aggregate noticeable.

Extent Level: **O**ccasional-- Less than 10 percent of the length exhibits bleeding.

Frequent-- Between 10 and 30 percent of the length is bleeding.

Extensive-- Bleeding occurs in more than 30 percent of the length.

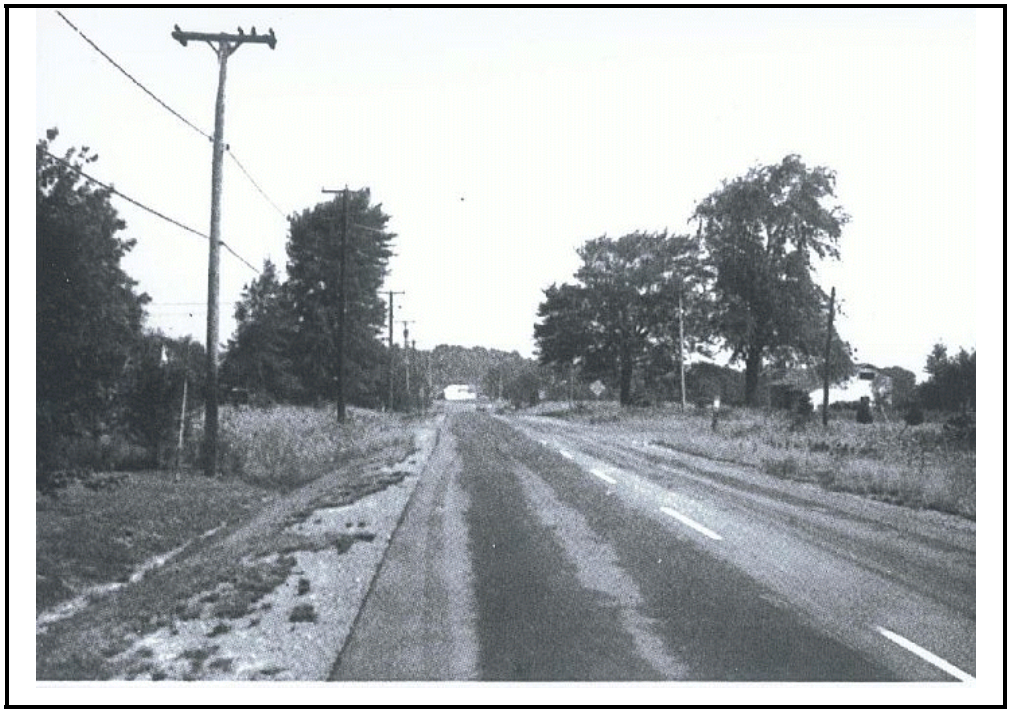

Photo B-3. Bleeding in Composite Pavement, High Severity

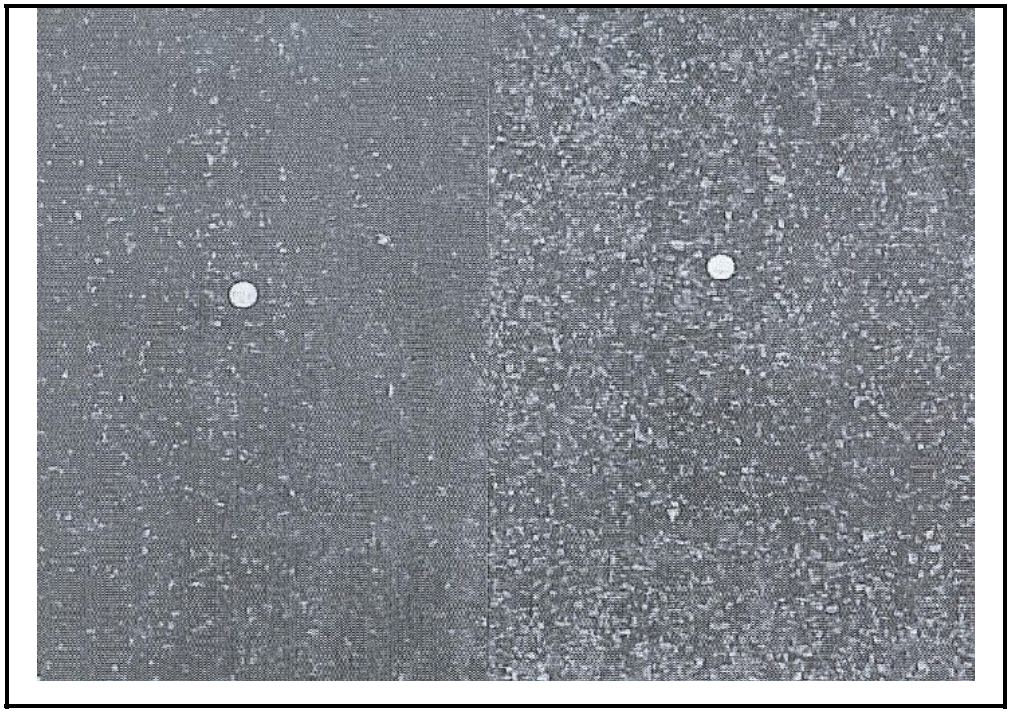

Photo B-4. Close-up view of Bleeding, High and Medium Severity
High Severity on left shows most aggregates covered with asphalt and Medium Severity on right shows less aggregates covered with asphalt

COMPOSITE PAVEMENT

Distress Type: **Patching**

Description: Patching is either the placing of asphalt concrete on the surface of the existing pavement or the replacement of the existing pavement in small isolated areas.

Deductions shall be made for all patches present in the pavement which are the result of deterioration and/or maintenance since the last construction project.

Large patched areas [greater than 15 S.Y. (12.5 m^2)], such as spot overlays or wedge courses, shall be rated for condition as a part of the existing pavement rather than as patches.

Severity Level:

Low-- patch size < 1 sq. ft. (0.1 m^2).

Medium-- patch size < 1 sq. yd. (0.8 m^2).

High-- patch size > 1 sq. yd. (0.8 m^2).

Extent Level:

Occasional-- < 10 patches/mile (per 1.6 km).

Frequent-- 10 - 20 patches/mile (per 1.6 km).

Extensive-- > 20 patches/mile (per 1.6 km).

Photo B-5. Patching in Composite Pavement, Medium Severity

Photo B-6. Patching in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Surface Disintegration or Debonding**

Description: Loss of surface by debonding is the removal of the asphaltic surface layer from the underlying layer. The problem is most common with thin asphalt surface layers [less than 2 inches (50 mm)] and is caused by freeze-thaw action or poor bonding of the two layers during construction.

Severity Level: Use the following table:

Depth of Debonded Area	Debonded Area < 1 sq. yd. (0.8 m^2)	Debonded Area > 1 sq. yd. (0.8 m^2)
< 1" (25 mm)	Low	Medium
> 1" (25 mm)	Medium	High

Extent Level: **O**ccasional-- <5 debonded areas per mile (1.6 km).

Frequent-- 5 - 10 debonded areas per mile (1.6 km).

Extensive-- >10 debonded areas per mile (1.6 km).

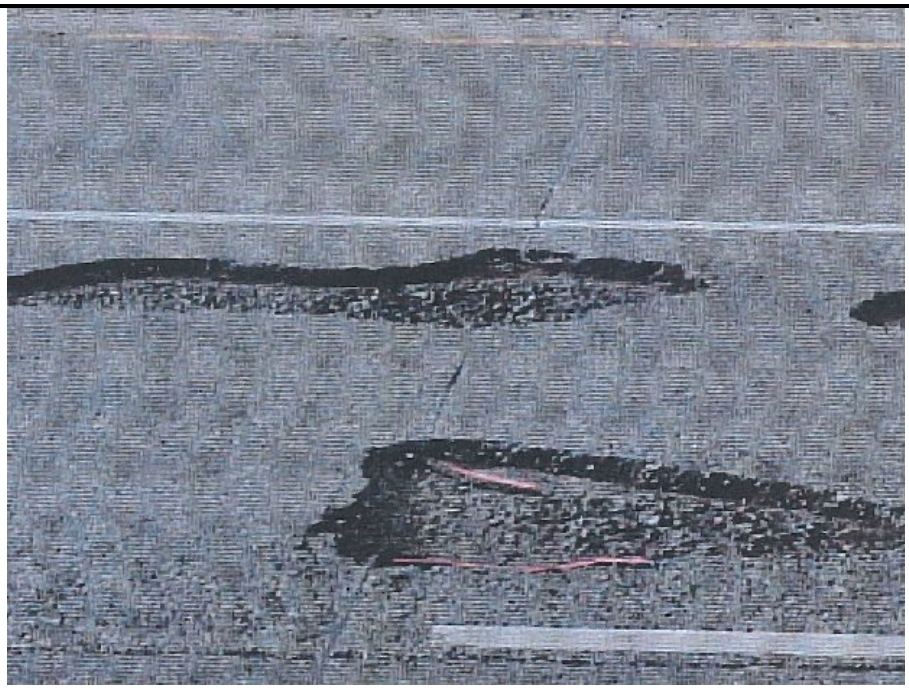

Photo B-7. Surface Disintegration in Composite Pavement

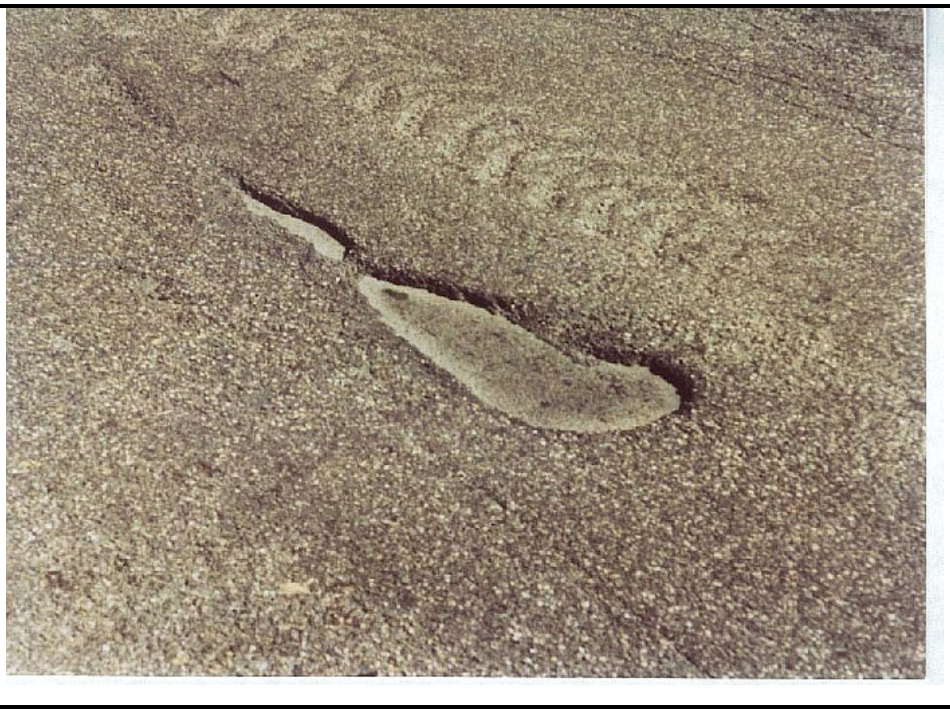

Photo B-8. Debonding in Composite Pavement, Medium Severity

COMPOSITE PAVEMENT

Distress Type: **Rutting**

Description: Ruts are vertical deformations in the pavement surface along the wheel tracks. In severe cases pavement uplift may occur along the sides of the rut, but in most instances only a depression is noticeable. Rutting is caused by consolidation or lateral movement of any or all pavement layers, including subgrade, under traffic.

Severity Level: Rutting severity is based upon rut depth, as approximated visually.

Low-- Barely noticeable, depth more than 1/8 inch, less than 3/8 inch.

Medium-- Readily noticeable, depth more than 3/8 inch, less than 3/4 inch.

High-- Readily noticeable, depth greater than 3/4 inch.

Extent Level: **O**ccasional-- Less than 20 percent of the section length is rutted.

Frequent-- Between 20 and 50 percent of the section length is rutted.

Extensive-- More than 50 percent of the section length is rutted.

Photo B-9. Rutting in Composite Pavement, Medium Severity

Photo B-10. Rutting in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Pumping**

Description: Pumping is the ejection of fine soil particles through pavement cracks, joints, or along pavement edges. Pumping can be identified by the presence of surface staining and base or subgrade material near joints or cracks. Shoulder disintegration at the pavement edge is often an indicator of pumping beneath the slab.

Severity Level: Severity levels are not considered. Rater must be certain of pumping.

Extent Level:

Occasional-- Less than 10 percent of the joints and cracks exhibit pumping.

Frequent-- 10 to 25 percent of the joints and cracks exhibit pumping.

Extensive-- More than 25 percent of the joints and cracks exhibit pumping.

Photo B-11. Pumping in Composite Pavement

Photo B-12. Pumping in Composite Pavement

COMPOSITE PAVEMENT

Distress Type: **Shattered Slab**

Description: Shattered slab is the breakup of the underlying rigid pavement made evident by surface reflection cracking and/or distortion. Reflection cracks in the asphaltic layer forming rectangular areas less than 5 ft. by 5 ft. (1.5 m by 1.5 m) may indicate that the underlying slab is broken up. Progressive deterioration will include distortion and faulting of the shattered area. This distress is caused by poor base support or fatigue of the concrete layer.

Severity Level:

Low-- Cracks defining the shattered area are tight [less than 1/8 inch (3mm) in width] with little or no spalling. There is no faulting of the shattered area.

Medium-- Crack width greater than 1/8 inch (3 mm) with some spalling. Moderate distortion which does effect ride quality somewhat.

High-- Severe distortion and poor ride quality over the shattered area.

Extent Level:

Occasional-- Less than 2 shattered slab areas/mile (per 1.6 km)) of section length.

Frequent-- Between 2 and 5 shattered slab areas/mile (per 1.6 km) of section length.

Extensive-- More than 5 shattered slab areas/mile (per 1.6 km) of section length.

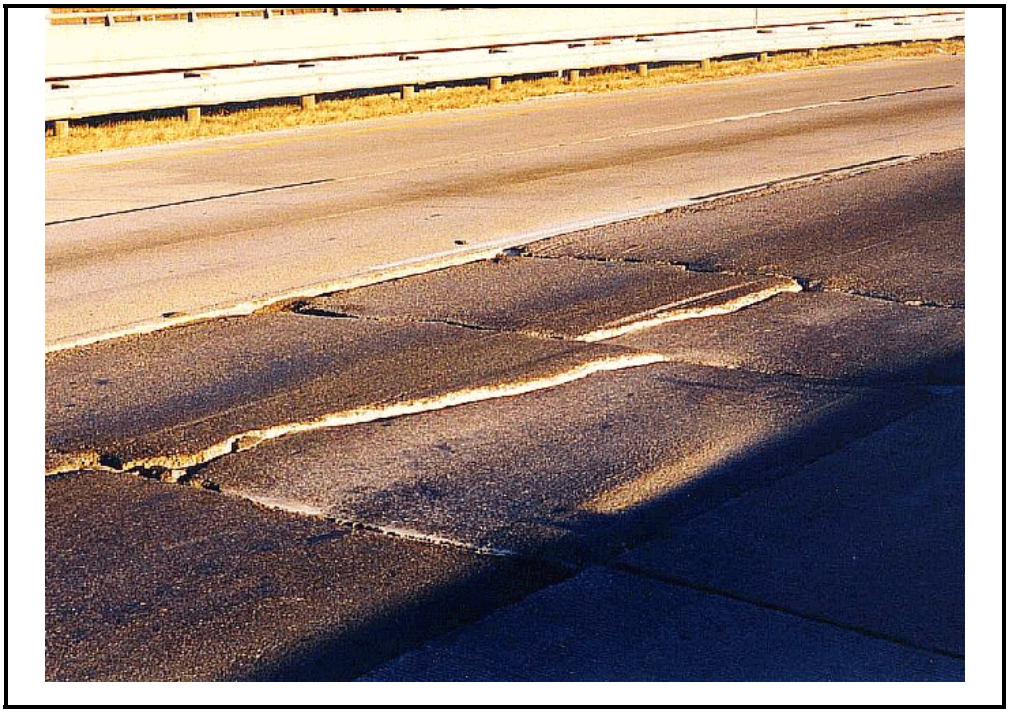

Photo B-13. Shattered Slab of Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Settlement**

Description: Settlement is a dip in the longitudinal profile of the pavement surface. Settlement shall be considered a distress when it causes a noticeable effect upon riding quality. Settlement should not be confused with corrugation, which is another type of surface profile deficiency.

Severity Level: Severity is based upon the effect of the settlement on vehicle control when traveling along the roadway at 40 MPH (60 km/hour), as discussed in step 1 of the monitoring procedure.

Low-- Noticeable effect upon ride, driver able to maintain vehicle control easily.

Medium-- Some discomfort to passengers, driver able to maintain control with slight corrective action.

High-- Definite effect upon ride quality, noticeable profile dip generally greater than 6 inches (150 mm). Poor ride, corrective action needed.

Extent Level: **O**ccasional-- Less than 2 settlements/mile (per 1.6 km) of roadway.

Frequent-- 2 to 4 settlements/mile (per 1.6 km) of roadway.

Extensive-- More than 4 settlements/mile (per 1.6 km) of roadway.

Photo B-14. Settlement in Composite Pavement, Medium Severity

COMPOSITE PAVEMENT

Distress Type: **Transverse Cracking** Error! Bookmark not defined.

Description: A crack or break at approximately right angles to the pavement centerline. For composite pavements where the rigid base layer does not have transverse joints (CRC pavements for instance) all transverse cracking is evaluated regardless of location. For jointed bases, a separate evaluation is made of reflective cracks at 1) the joints; and 2) other (non-joint) transverse cracking. Usually all underlying base cracks and joints are eventually reflected through the flexible surface. Additional transverse surface cracking may result from thermal shrinkage and age hardening of the asphaltic layer.

Note 1: *A significant amount of joint repair and bituminous overlay of Jointed Concrete (JC) pavement has been completed in Ohio. The repair method usually included removal of original pavement at the joint for ± 3 feet (1 m) in each adjacent slab and replacing it with an asphalt or concrete patch. For projects which contain this type of repair, both transverse joints will be evaluated if visible.*

Note 2: *Crack width is defined as the sum of all cracks if more than one is present at the location of measurement (measured as a continuous length from the beginning of the first crack to the end of the last crack).*

Note 3: *Crack and Seat and Break and Seat pavements should be rated as composite jointed.*

Severity Level: Unjointed Base or Jointed Base

Low-- Crack width less than 1/4 inch (6 mm) with no spalling or distortion along crack edges.

Medium-- Crack opened or spalled to a width between 1/4 and 1 inch (6 mm and 25 mm) over at least one half its length.

High-- Crack opened or spalled to a width greater than 1 inch (25 mm) over at least one half its length.

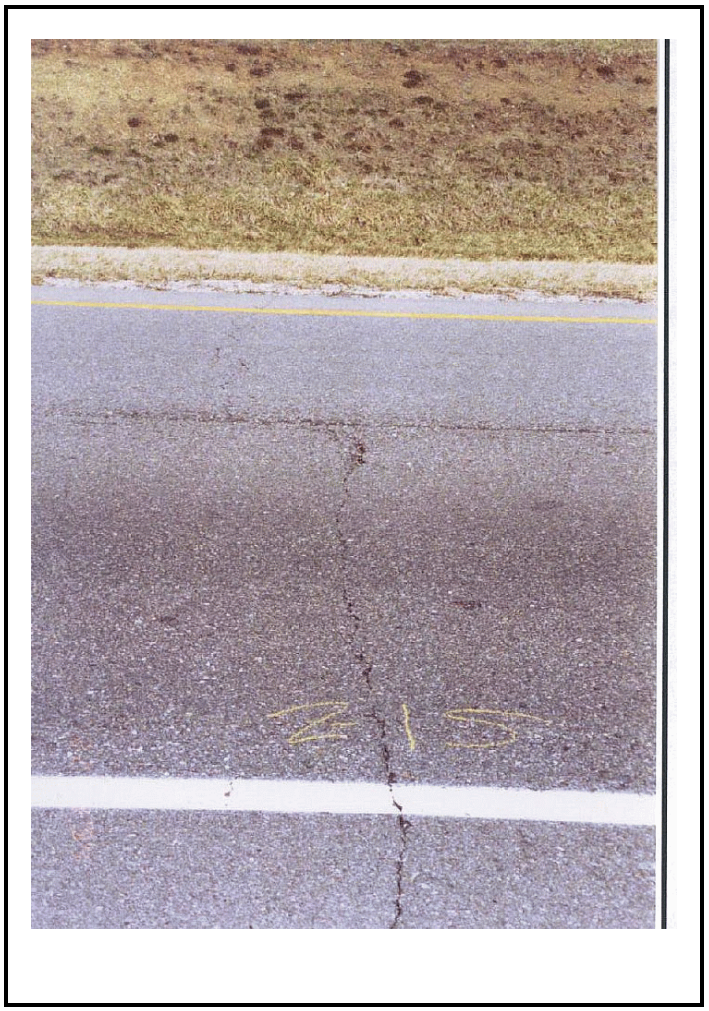

Photo B-15. Unjointed Base, Transverse Cracking in Composite Pavement, Low Severity

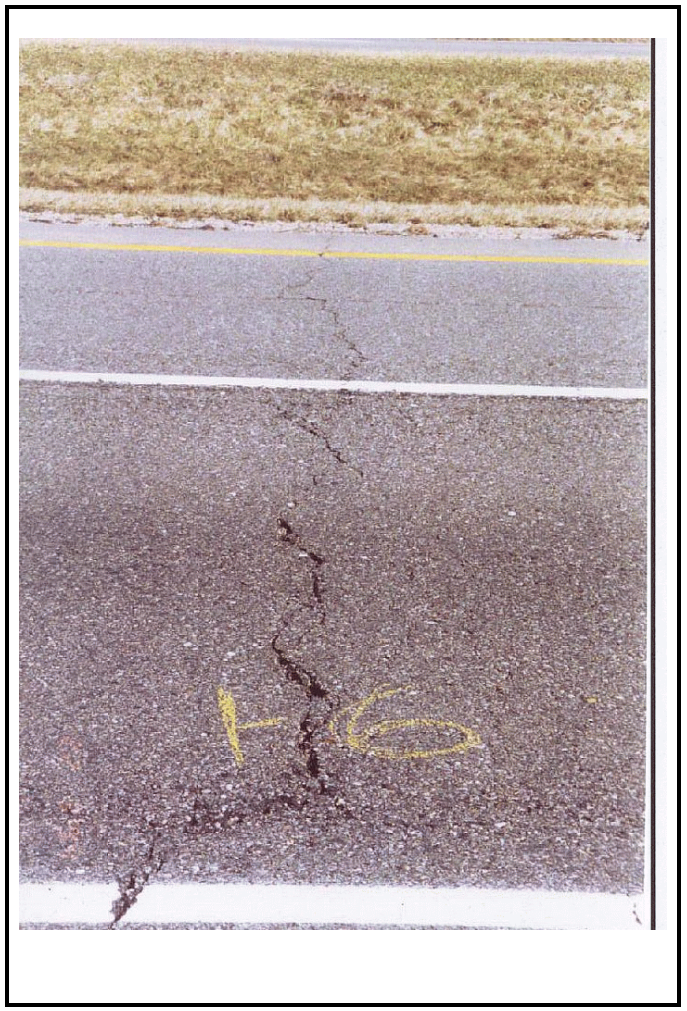

Photo B-16. Unjointed Base, Transverse Cracking in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Extent Level: **Unjointed Base**

Occasional-- Average transverse crack spacing greater than 15 feet (4.5 m).

Frequent-- Average transverse crack spacing greater than 10, less than 15 feet (3 to 4.5 m).

Extensive-- Average transverse crack spacing less than 10 feet (3 m).

Extent Level: **Jointed Base-Joint Reflection Cracks**

Extent is based upon the estimated percentage of transverse joint length which has reflected through the asphalt surface. Except for new pavements or overlays the extent will likely be extensive. Old joint and crack repairs should be recorded as joints and not as mid panel cracks. If the rater is uncertain as to whether a distress is a joint repair or a crack, rate the distress as a crack.

Note: *On pavements that have been sawed and sealed, once the opening has started to develop the crack should be denoted.*

Occasional-- Less than 20 percent.

Frequent-- Between 20 and 50 percent.

Extensive-- Greater than 50 percent.

Extent Level: **Jointed Base - Intermediate Transverse Cracking**

Occasional-- Less than 10 percent of the Slabs.

Frequent-- Between 10 and 30 percent of the Slabs.

Extensive-- Greater than 30 percent of the Slabs.

Photo B-17. Jointed Base, Reflection Cracking in Composite Pavement, Medium Severity

Photo B-18. Jointed Base, Reflection Cracking in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Longitudinal Cracking**

Description: A crack or break approximately parallel to the pavement centerline. Longitudinal joints and pavement edges of underlying rigid base usually reflect through the asphalt surface as a result of thermal movement in the underlying slab. Poor paving lane joint construction can also result in a longitudinal crack. All types of longitudinal cracking (random, centerline, edge, etc.) are included in this distress classification for composite pavements.

Note: *Crack width is defined as the sum of all cracks if more than one is present at the location of measurement.*

Low-- Crack width less than 1/4 inch (6 mm) with no spalling or distortion along crack edges.

Medium-- Crack opened or spalled to a width between 1/4 and 1 inch (6 mm and 25 mm) over at least one half its length.

High-- Crack opened or spalled to a width greater than 1 inch (25 mm) over at least one half its length.

Extent Level: Based upon the average linear feet of longitudinal cracking per station of 100 feet length (per 30 m).

Occasional-- Less than 50 feet per station (15 m/30 m).

Frequent-- Between 50 and 150 feet per station (15 and 45 m/30 m).

Extensive-- More than 150 feet per station (45 m/30 m). Complete reflective longitudinal cracking along the pavement centerline and edge [200 linear feet per station (60 linear m/ 30 m)] is termed extensive.

Photo B-19. Longitudinal Cracking in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Pressure Damage/Upheaval**

Description: Upheaval is a bump or hump in the pavement surface at a transverse joint or crack. The upheaval is a result of thermal expansion in the underlying concrete base creating compressive forces.

Severity Level:

Low-- Bump height less than ½ inch (13 mm), barely noticeable effect upon ride.

Medium-- Bump height ½ to 1 inch (13 to 25 mm) with a readily noticeable effect upon ride quality.

High-- Bump height greater than 1 inch (25 mm) severely reducing ride quality.

Extent Level:

Occasional-- Less than 5 upheavals/mile (per 1.6 km).

Frequent-- Between 5 and 10 upheavals/mile (per 1.6 km).

Extensive-- Greater than 10 upheavals/mile (per 1.6 km).

Photo B-20. Pressure Damage/Upheaval in Composite Pavement, Medium Severity

COMPOSITE PAVEMENT

Distress Type: **Crack Sealing Deficiency**

Description: Crack sealing deficiency is crack sealing which is no longer effective in preventing intrusion of water or cracks which have never been sealed. Unsealed cracks with an average width less than 1/4" may not be considered.

Severity Level: Severity levels are not considered.

Extent Level:

Occasional– Less than 50% of existing cracks are no longer effectively sealed.

Frequent– More than 50% of existing cracks are no longer effectively sealed.

Extensive– None of the existing cracks have been sealed, there is no sealant on the roadway.

Photo B-21. Crack Sealing Deficiency in Composite Pavement, Unsealed Cracks

Photo B-22. Crack Sealing Deficiency in Composite Pavement, Cracks not sealed properly

COMPOSITE PAVEMENT

Distress Type: **Corner Breaks - Jointed Base**

Description: A corner break is a crack that intersects any transverse reflective crack (joints or cracks) and a longitudinal edge diagonally. The leg size of the triangular break is usually greater than 12 inches (300 mm). Where any leg size is less than 12 inches (300 mm), rate the corner break as part of the crack it most nearly parallels.

Note: *If pumping is present at the location of the corner break, then the severity level of the corner break is automatically rated as high.*

Severity Level:

Low-- Corner break area shows no visible depression, rater is sure of corner break.

Medium-- Corner break area is depressed less than 2 inches.

High-- Corner break area is depressed more than 2 inches, or pumping exists.

Extent Level:

Occasional-- Less than or equal to 3 corner breaks/mile (per 1.6 m) of section length.

Frequent-- Between 4 and 10 corner breaks/mile (per 1.6 m) of section length.

Extensive-- More than 10 corner breaks/mile (per 1.6m) of section length.

Photo B-23. Corner Break in Composite Pavement, High Severity

COMPOSITE PAVEMENT

Distress Type: **Punchouts - Unjointed Base**

Description: A punchout is a cracked rectangular area usually along the outside pavement edge. A punchout requires formation of longitudinal crack (usually within the outer wheel track) which connects transverse cracks of the composite pavement. The rectangular punchout area thus is defined by 2 transverse cracks, the longitudinal crack, and the outside pavement edge. A punchout results from concrete that is over stressed because of short transverse crack spacing or poor support of the composite pavement. Punchout areas which have been patched should be evaluated as both patching and punchout.

Severity Level: This distress is rated only for Medium and High levels.

Medium-- Punchout area is depressed less than 2 inches.

High-- Punchout area is depressed more than 2 inch.

Extent Level: **O**ccasional-- Less than 2 punchouts/mile (per 1.6 m) of section length.

Frequent-- Between 2 and 5 punchouts/mile (per1.6 m) of section length.

Extensive-- More than 5 punchouts/mile (per 1.6 m) of section length.

Photo B-24. Punchouts in Composite Pavement, Low Severity

Photo B-25. Punchouts in Composite Pavement, Medium Severity Error!Bookmark not defined.

APPENDIX C

Description of Distresses in Jointed Reinforced Concrete or Jointed Plain Concrete Pavements (JRC/JPC Pavements)

JRC/JPC PAVEMENT

Distress Type: **Surface Deterioration**

Description: Disintegration or loss of concrete from the surface of the pavement, includes scaling, abrasion, popouts, and high steel. Scaling is the flaking away of the concrete surface. Abrasion is similar to scaling in that a loss of fine, surface aggregate occurs. Abrasion is usually a result of weathering and traffic wear and is normally confined to the wheel track area. Popouts are cone shaped holes in the pavement surface with aggregates at the bottom and are unrelated to joint or crack spalling. High Steel is found in locations where the steel reinforcing mat was misplaced in the upper 2" of the slab. Rusting of the high steel creates spalling in the slab directly above the high steel, usually exposing the steel to traffic and weather. Map cracking should be rated as part of surface deterioration.

Severity Level:

Low-- Very little aggregate is visible, or some popouts, or high steel.

Medium-- Surface has an open texture and is moderately rough with considerable loss of fine aggregate and some coarse aggregate removed.

High-- Surface rough or pitted.

Extent Level:

Occasional-- Less than 20 percent of the surface area affected; less than 2 high steel/mile (per 1.6km) if high steel is the only deterioration present.

Frequent-- Between 20 to 50 percent of the surface area affected; between 2 and 4 high steel/mile (per 1.6km) if high steel is the only deterioration present.

Extensive-- Equal to or greater than 50 percent of the surface area affected (this level includes continuous distress in both wheel tracks); greater than 4 high steel/mile (per 1.6km) if high steel is the only deterioration present.

Photo C-1. Surface Deterioration in Jointed Concrete Pavement, Medium Severity

Photo C-2. Surface Deterioration in Jointed Concrete Pavement, Popouts and High Steel

JRC/JPC PAVEMENT

Distress Type: **Longitudinal Joint Spalling**

Description: Longitudinal Joint Spalling is the cracking, breaking, chipping, or fraying of the concrete surface along the "as constructed" longitudinal joint.

Severity Level:

Low-- Total crack width less than 3 inches.

Medium-- Total crack width greater than 3 inches, less than 6 inches.

High-- Total crack width greater than 6 inches.

Extent Level:

Occasional-- Less than 10 percent of section length affected by distress.

Frequent– Between 10 and 30 percent of section length affected by distress.

Extensive-- Greater than 30 percent of section length affected by distress.

Photo C-3. Longitudinal Joint Spalling in Concrete Pavement, High Severity

JRC/JPC PAVEMENT

Distress Type: **Patching**

Description: Patching is either the placing of additional material on the surface of the existing pavement or the replacement of existing pavement in isolated areas.

Deductions shall be made for all patches present in the pavement which are made with asphalt concrete material and are the result of deterioration and/or maintenance since the last construction project.

No deductions shall be made for existing patches which consist of sound concrete. Where deterioration exists with a concrete repair, the deterioration shall be rated as part of the pavement.

Multiple patches found along a transverse joint or crack which do not interconnect shall be added together to represent the size of one patch.

Multiple patches found along a longitudinal joint or crack which do not interconnect, but are within the same slab, shall be added together to represent the size of one patch.

Severity Level:

Low-- Patch size <1 sq. ft. (0.1 m^2), and patches are not deteriorated.

Medium-- Patch size < 1 sq. ft (0.1 m^2), with deterioration present.

High-- Patch size > 1 sq. ft (0.1 m^2), regardless of deterioration.

Extent Level:

Occasional-- Less than 10 patches/mile (per 1.6 km).

Frequent-- Between 10 and 20 patches/per mile (1.6 km).

Extensive-- Greater than 20 patches/per mile (1.6 km).

Photo C-4. Patching in Jointed Concrete Pavement, Low Severity

Photo C-5. Patching in Jointed Concrete Pavement, High Severity

JRC/JPC PAVEMENT

Distress Type: **Pumping**

Description: Pumping is the ejection of fine soil particles through pavement cracks, joints, or along pavement edges. Pumping can be identified by the presence of surface staining and base or subgrade material near joints or cracks. Shoulder disintegration at the pavement edge is often an indicator of pumping beneath the slab.

Severity Level: Severity levels are not considered. Rater must be certain of pumping.

Extent Level:

Occasional-- Less than 10 of the joints and cracks exhibit pumping.

Frequent-- 10 to 25 percent of the joints and cracks exhibit pumping.

Extensive-- Greater than 25 percent of the joints and cracks exhibit pumping.

Photo C-6. Pumping in Jointed Concrete Pavement, High Severity

Photo C-7. Pumping in Jointed Concrete Pavement, Low Severity

JRC/JPC PAVEMENT

Distress Type: **Faulting**

Description: Faulting is the difference in elevation between abutting slabs at transverse joints or cracks. Faulting is usually caused by a pumping action of underlying fine grained materials, settlement of soft subgrade, or from curling or warping of slabs due to temperature and moisture gradients.

Note: *If transverse cracks are faulted, write the letter "C" on the rating form. If both cracks and joints are faulted, write the letter "B". Otherwise, faulting indicates only joints.*

Severity Level:

Low-- Less than 1/4 inch (6 mm) fault.

Medium— 1/4 to ½ inch (6 mm to 13 mm) fault.

High-- Greater than ½ inch (13 mm) fault.

Extent Level:

Occasional-- Faulting occurs along less than 20 percent of the joints and cracks.

Frequent-- Faulting occurs along 20 to 50 percent of the joints and cracks.

Extensive-- Greater than 50 percent of the joints and cracks are faulted.

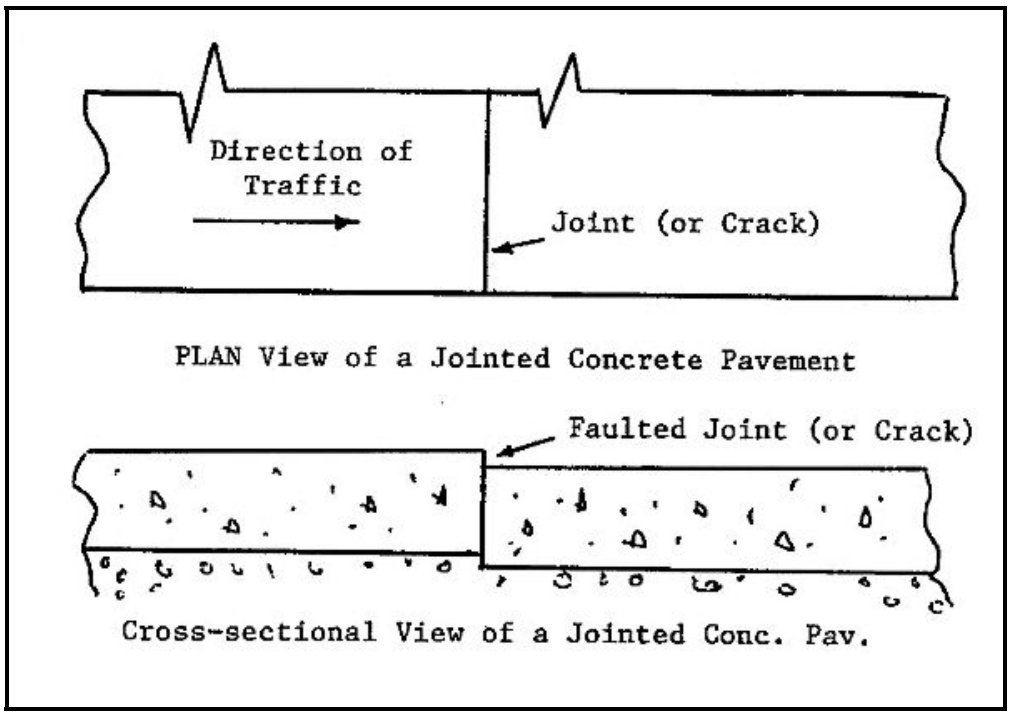

Photo C-8. Sketch showing Faulting in Jointed Concrete Pavement

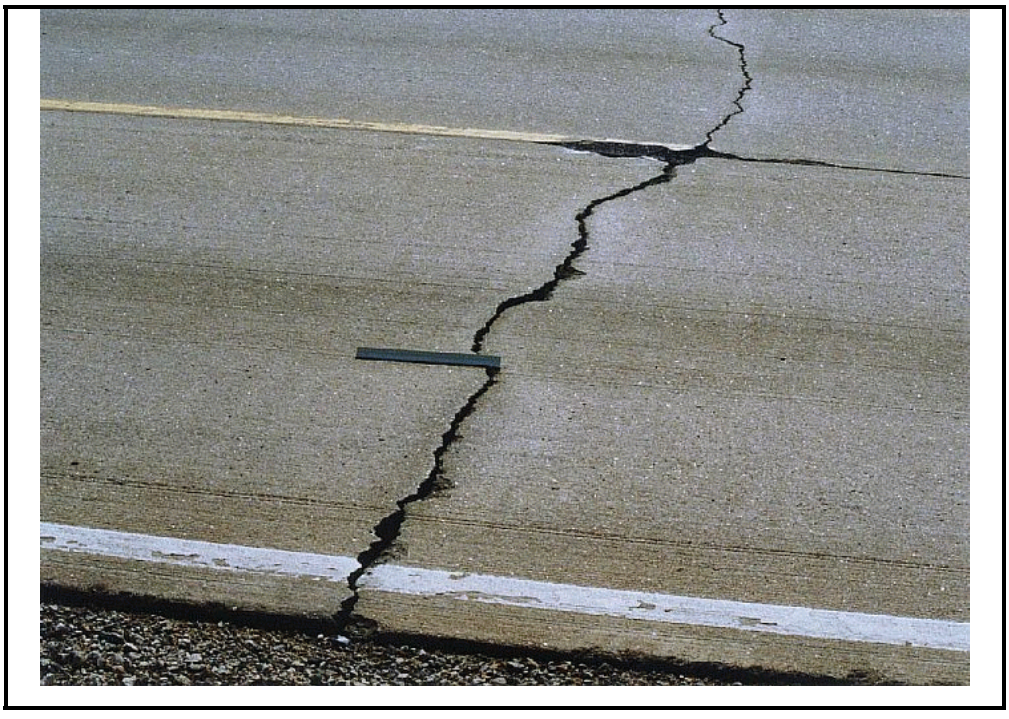

Photo C-9. Faulting in Jointed Concrete Pavement

JRC/JPC PAVEMENT

Distress Type: **Settlement**

Description: Settlement is a dip or depression in the longitudinal profile of the pavement surface. Settlement should be considered a distress when it causes a noticeable effect upon riding quality.

Severity Level: Severity is based upon the effect of the settlement or waves upon ride quality and vehicle control when traveling along the roadway at 40 MPH (60 km/hour, step 1 of the monitoring procedure).

Low-- Noticeable effect upon ride, driver able to maintain vehicle control easily.

Medium-- Some discomfort to passengers, driver able to maintain control with slight corrective action.

High-- Definite effect upon ride quality. Noticeable profile dips in settlement areas greater than 6 inches (150 mm). Waves cause rocking of vehicle similar to motion created at moderately faulted jointed crack pavements.

Extent Level: **O**ccasional-- Less than 2 settlement/mile (per 1.6 km) of roadway.

Frequent-- 2 to 4 settlement areas/mile (per 1.6 km) of roadway.

Extensive-- Greater than 4 settlements/mile (per 1.6 km) of roadway.

Photo C-10. Settlements in Jointed Concrete Pavement, Medium Severity

JRC/JPC PAVEMENT

Distress Type: **Transverse Joint Spalling**

Description: Joint spalling is the break up or disintegration of the concrete at longitudinal or transverse pavement joints. A spall normally does not extend vertically through the slab but rather intersects the joint at an angle. Often joint spalling is the result of durability ("D") cracking of the pavement. The rater is asked to indicate on the rating form if the joint spalling is a result of "D" cracking. Durability ("D") cracking is a series of fine crescent-shaped cracks in the concrete surface which usually runs parallel to a joint or major crack and curve across slab corners. Cracking pattern is normally concave in relation to slab corners or joints. D-cracking can eventually lead to disintegration and spalling of the concrete near the joints or corners of the slab.

Severity Level:

Low-- Spalls less than 4 inches (100 mm) wide, measured to the center of the joint, with loss of material, or spalls with no loss of material and no patching.

Medium-- Spalls 4 to 9 inches (100 mm to 225 mm) wide, measured to the center of the joint, with loss of material.

High-- Spalls greater than 9 inches (225 mm) wide, measured to the center of the joint, with loss of material.

Extent Level:

Occasional-- Less than 25 percent of the transverse joints are spalled.

Frequent-- Between 25 and 75 percent of the transverse joints are spalled.

Extensive-- More than 75 percent of the transverse joints are spalled.

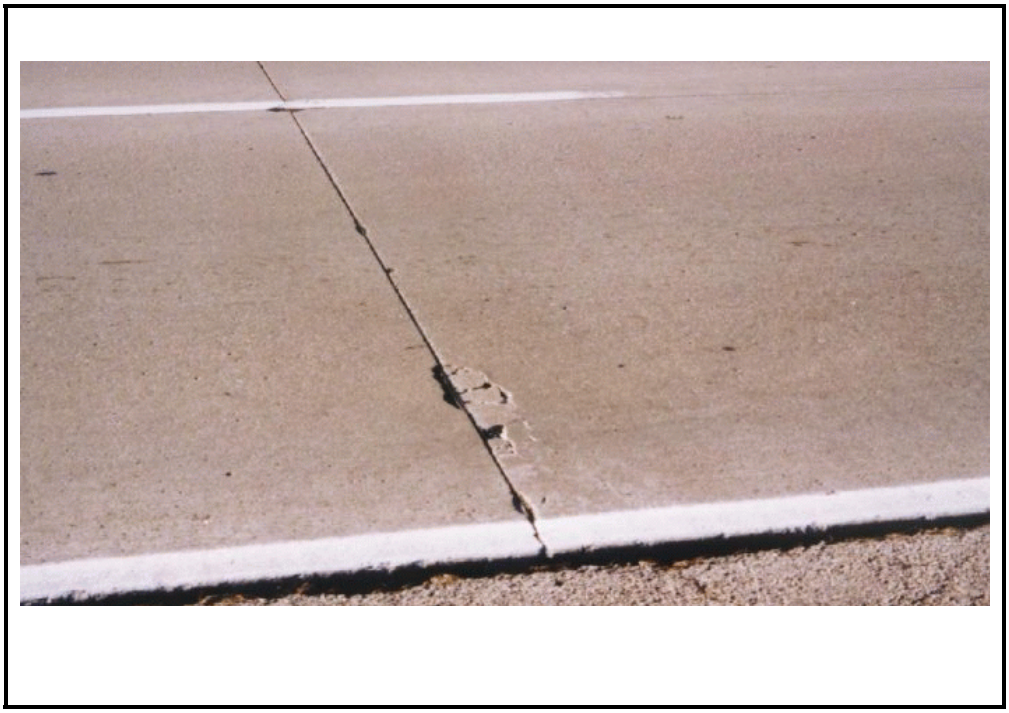

Photo C-11. Transverse Joint Spalling in Jointed Concrete Pavement, Low Severity

Photo C-12. Transverse Joint Spalling in Jointed Concrete Pavement, High Severity

JRC/JPC PAVEMENT

Distress Type: **Transverse Cracking - Plain Concrete** (Joint Spacing # 20 ft)

Description: A crack or break at approximately right angles to the pavement centerline. Transverse cracking could be caused by repeated heavy traffic loading, thermal and moisture gradients and subgrade settlement or consolidation.

If various crack widths are observed, rate the severity of the crack width that is most frequently observed. The severity rated indicates that the observed cracks are of the severity's specified width or wider for more than ½ of the length of the crack.

Cracks that do not extend the full lane width should not be rated.

Severity Level:

Low-- Hairline crack.

Medium-- Crack width is larger than hairline, but less than 3/16 inches.

High-- Crack width is greater than 3/16 inch.

.

Extent Level:

Occasional-- Less than 10 percent of the slabs are cracked at any severity.

Frequent-- Between 10 and 30 percent of the slabs are cracked at any severity.

Extensive-- Greater than 30 percent of the slabs are cracked at any severity.

Photo C-13. Transverse Cracking - Plain Concrete in Jointed Concrete Pavement, Medium Severity

JRC/JPC PAVEMENT

Distress Type: **Pressure Damage**

Description: Pressure damage may be spalling, crushing, or upheaval at transverse joints or cracks resulting from expansion of the concrete layer. Pressure induced spalling is differentiated from other joint spalling by the shape of the spalled area. Pressure spalls are usually 6 to 12 inches (150 to 300 mm) long measured from the crack or joint and up to 12 inches (300 mm) wide.

Severity Level: Separate severity levels for pressure damage spalling are not defined. All pressure damage spalling is considered severe since this distress may be a predictor of a more serious pressure distress (blow ups).

Extent Level: Extent is based upon the number of transverse joints which exhibit pressure damage spalling.

Occasional-- Less than 1/mile (per 1.6 km).

Frequent-- Between 1 and 3/mile (per 1.6 km).

Extensive-- More than 3/mile (per 1.6 km).

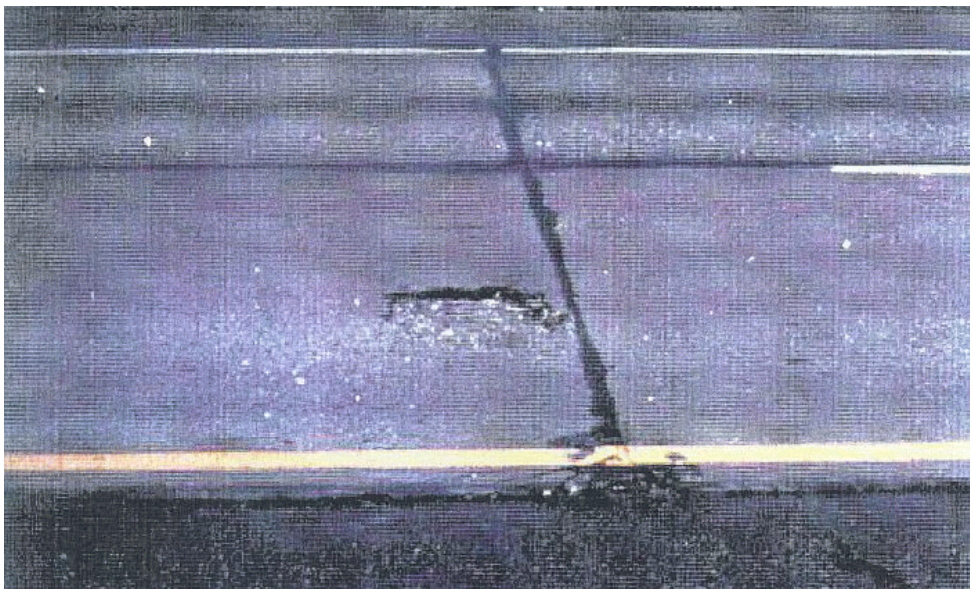

Photo C-14. Pressure Damage in Jointed Concrete Pavement

Photo C-15. Pressure Damage in Jointed Concrete Pavement

JRC/JPC PAVEMENT

Distress Type: **Transverse Cracking - Reinforced Concrete** (Joint Spacing > 20 ft)

Description: A crack or break at approximately right angles to the pavement centerline. Transverse cracks (hairline cracks) are expected in reinforced concrete pavements which have long transverse joint spacing. Additional transverse cracking could be caused by repeated heavy traffic loading, thermal and moisture gradients and subgrade settlement or consolidation. For reinforced concrete pavement, a failed crack is one that has a width greater than 3/16 inches for more than 1/4 of its length.

Cracks that do not extend the full lane width should not be rated.

Severity Level:

Low-- Full lane width cracks exist, however, none are failed cracks..

Medium-- 1 failed crack exists.

High-- More than one failed crack exists.

Extent Level: Use the following table to determine the extent levels:

Severity Level	Extent Level		
	Occasional	**Frequent**	**Extensive**
Low	< 25% of slabs	25 to 75 % of slabs	> 75% of slabs
Medium	5 to 10% of slabs	10 to 30% of slabs	> 30% of slabs
High	5 to 10% of slabs	10 to 30% of slabs	> 30% of slabs

Photo C-16. Transverse Cracking in Jointed Concrete Pavement, Low Severity

Photo C-17. Transverse Cracking in Jointed Concrete Pavement, High Severity

JRC/JPC PAVEMENT

Distress Type: **Longitudinal Cracking**

Description: A crack or break approximately parallel to the pavement centerline. This type of cracking is usually associated with subgrade settlement or insufficient bearing support.

Severity Level:

Low-- Hairline or tight cracks with little crack spalling.

Medium-- Crack opened or spall at the surface to a width of 1/4 inch to 1 inch (6 mm to 25 mm) over a distance equal to at least one-half the crack length.

High-- Crack opened or spalled at the surface to a width greater than 1 inch (25 mm) over a distance equal to at least one-half the crack length.

Extent Level:

Occasional-- Less than 5 percent of the slabs have longitudinal cracking.

Frequent-- Between 5 and 20 percent of the slabs have longitudinal cracking.

Extensive-- More than 20 percent of the slabs have longitudinal cracking.

Photo C-18. Longitudinal Cracking in Jointed Concrete Pavement, Medium Severity

Photo C-19. Longitudinal Cracking in Jointed Concrete Pavement, Medium Severity

JRC/JPC PAVEMENT

Distress Type: **Corner Breaks**

Description: A corner break is a crack that intersects transverse joints or cracks and a longitudinal edge diagonally. To be considered a corner break, the leg size of the triangular break must be greater than 12 inches (300 mm). Where the leg size is less than 12 inches (300 mm), the distress shall be rated as longitudinal joint spalling.

Severity Level:

Low-- Crack width less than 1/4 inch (6 mm) with no spalling or settlement of the broken area.

Medium-- Crack width between 1/4 inch to 1 inch (6 mm to 25 mm) with some spalling and minor settlement of the broken area.

High-- Crack width greater than 1 inch (25 mm) and/or much spalling and settlement of the broken area. High severity may also be identified by shattering of the broken area by formation of smaller pieces within the corner break area.

Extent Level:

Occasional-- Less than 4/mile (per 1.6 km).

Frequent-- Between 4 and 10/mile (per 1.6 km).

Extensive-- More than 10/mile (per 1.6 km).

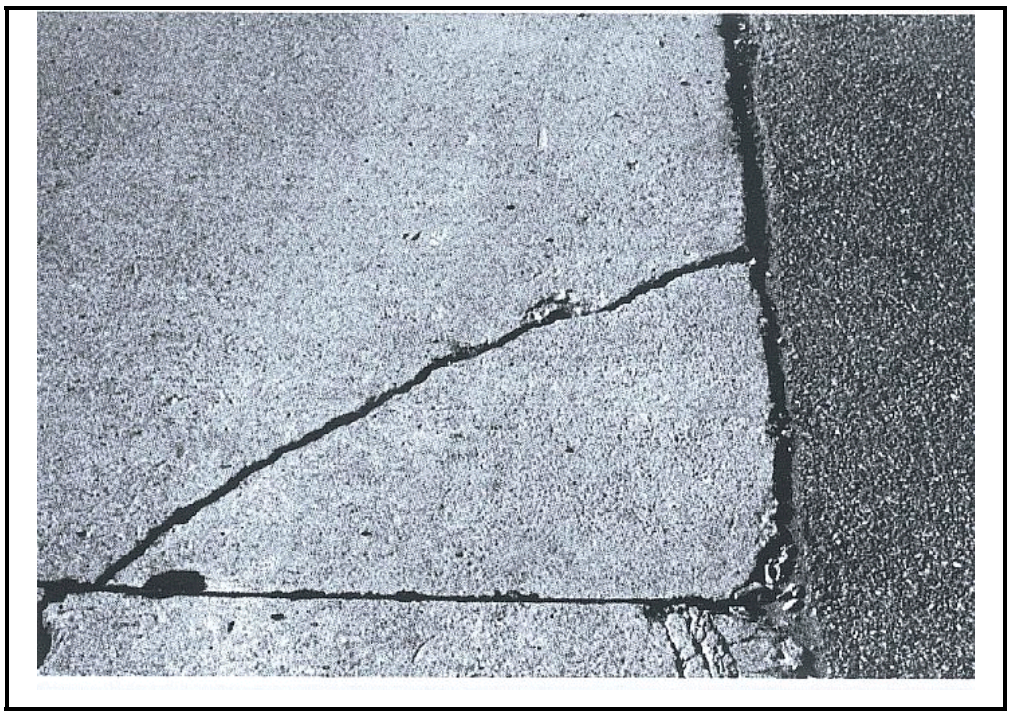

Photo C-20. Corner Break in Jointed Concrete Pavement, Medium Severity

Photo C-21. Corner Breaks in Jointed Concrete Pavement, High Severity

APPENDIX D

Description of Distresses in
Continuously Reinforced Concrete Pavements (CRCP)

CRC PAVEMENT

Distress Type: **Surface Deterioration**

Description: Disintegration or loss of concrete from the surface of the pavement. Includes scaling and abrasion. Scaling is the flaking away of the concrete surface. Abrasion is similar to scaling in that a loss of fine, surface aggregate occurs. Abrasion is usually a result of weathering and traffic wear and is normally confined to the wheel track area.

Severity Level:

Low-- Aggregate visible.

Medium-- Surface has an open texture and is moderately rough with considerable loss of fine aggregate and some coarse aggregate removed.

High-- Surface rough or pitted.

Extent Level:

Occasional-- Less than 20 percent of the surface area.

Frequent-- Between 20 and 50 percent of the surface area.

Extensive-- Equal to or greater than 50 percent of the surface area. This level includes continuous distress in both wheel tracks.

Photo D-1. Surface Deterioration in CRC Pavement, Medium Severity

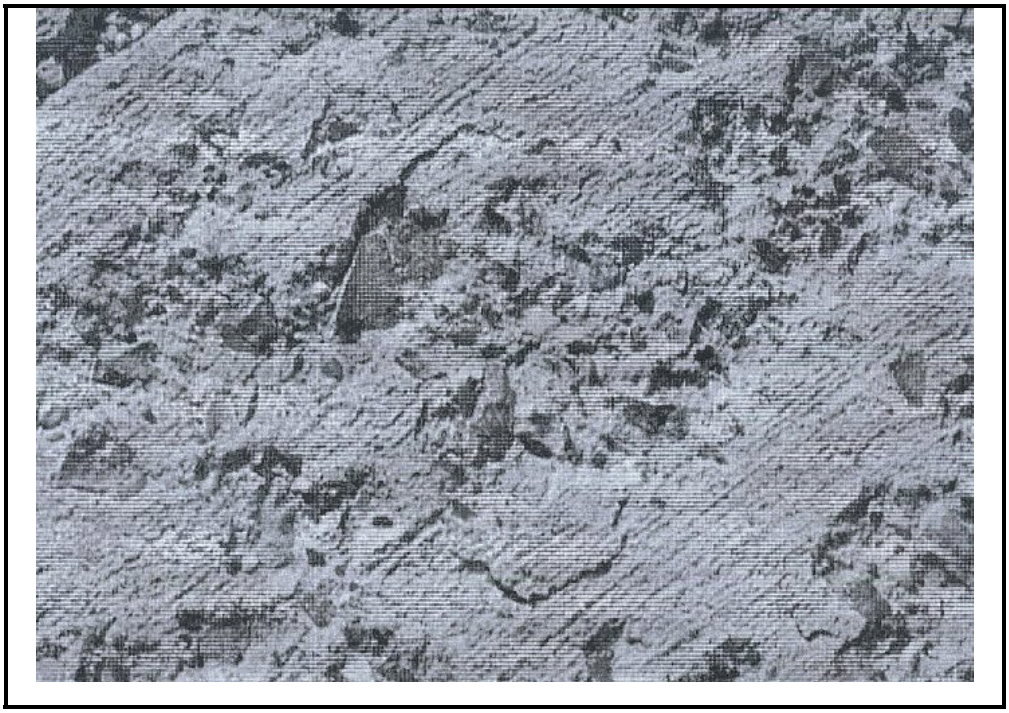

Photo D-2. Surface Deterioration in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Popouts**

Description: Cone shaped holes in the pavement surface with aggregates at the bottom and unrelated to joint or crack spalling. Aggregate quality is related to this type of distress. Popouts usually range from 1 to 4 inches (25 to 100 mm) in diameter and from ½ to 2 inches (13 to 50 mm) in depth.

Severity Level: Severity levels are not considered.

Extent Level: **O**ccasional-- Less than 20 percent of the area is affected.

Frequent-- Between 20 and 50 percent of the area is affected.

Extensive-- More than 50 percent of the area is affected.

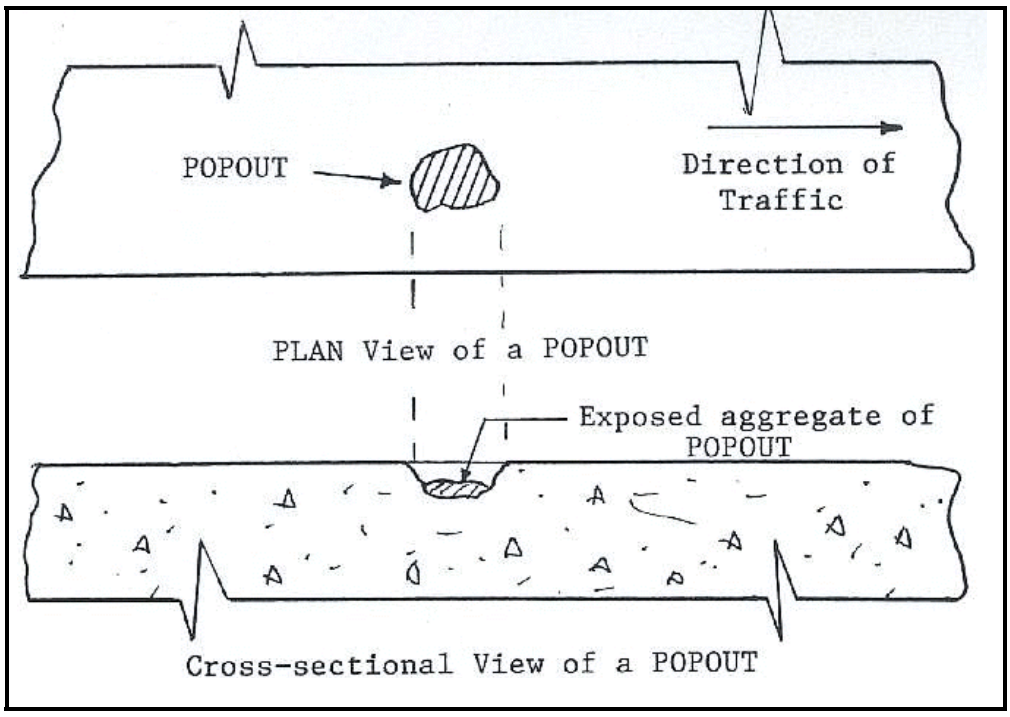

Photo D-3. Popout in CRC Pavement, Plan and Cross-section Views

Photo D-4. Popouts in CRC Pavement

CRC PAVEMENT

Distress Type: **Patching**

Description: Patching is either the placing of additional material on the surface of the existing pavement or the replacement of existing pavement in isolated areas.

Deductions shall be made for all patches present in the pavement which are made with asphalt concrete material and are the result of deterioration and/or maintenance since the last construction project.

No deductions shall be made for existing patches which consist of sound concrete. Where deterioration exists with a concrete repair, the deterioration shall be rated as part of the pavement.

Multiple patches found along a transverse joint or crack which do not interconnect shall be added together to represent the size of one patch.

Multiple patches found along a longitudinal joint or crack which do not interconnect, but are within the same slab, shall be added together to represent the size of one patch.

Severity Level:

Low-- Patch size <1 sq. ft. (0.1 m^2), and patches are not deteriorated.

Medium-- Patch size <1 sq. ft. (0.1 m^2)., with deterioration present.

High-- Patch size >1 sq. ft.(0.1 m^2), regardless of deterioration.

Extent Level:

Occasional-- <10 patches/mile (per 1.6 km).

Frequent-- 10 to 20 patches/mile (per 1.6 km).

Extensive-- >20 patches/mile (per 1.6 km).

Photo D-5. Patching in CRC Pavement, Low Severity

Photo D-6. Patching in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Pumping**

Description: Pumping is the ejection of fine soil particles through pavement cracks, joints, or along pavement edges. Pumping can be identified by the presence of surface staining and base or subgrade material near joints or cracks. Shoulder disintegration at the pavement edge is often an indicator of pumping beneath the slab.

Severity Level: Severity is based upon the rater's degree of certainty that pumping is occurring as indicated by visual evidence.

L & **M**-- Some staining of the surface around cracks or joints is noted. Rater is quite certain that pumping exists.

High-- Clear evidence that pumping exists. Excessive staining, medium severity or greater, faulting, corner breaks or punchouts. Rater is quite certain that pumping exists.

Extent Level: **O**ccasional-- Less than 10% of the joints and cracks exhibit pumping.

Frequent-- 10 to 25% of the joints and cracks exhibit pumping.

Extensive-- More than 25% of the joints and cracks exhibit pumping.

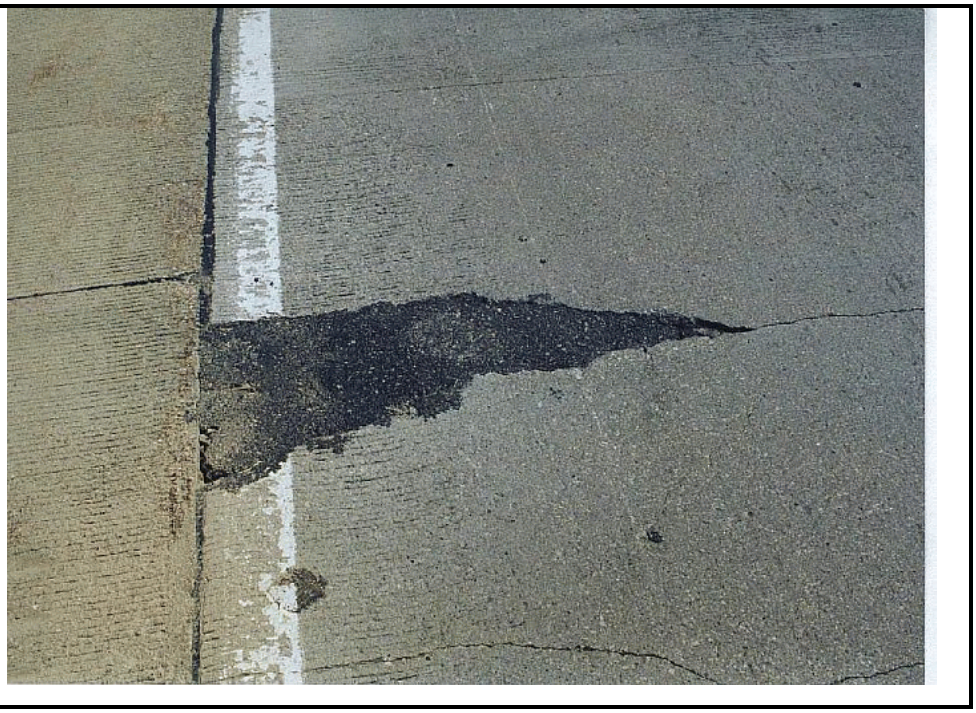

Photo D-7. Pumping in CRC Pavement, Medium Severity

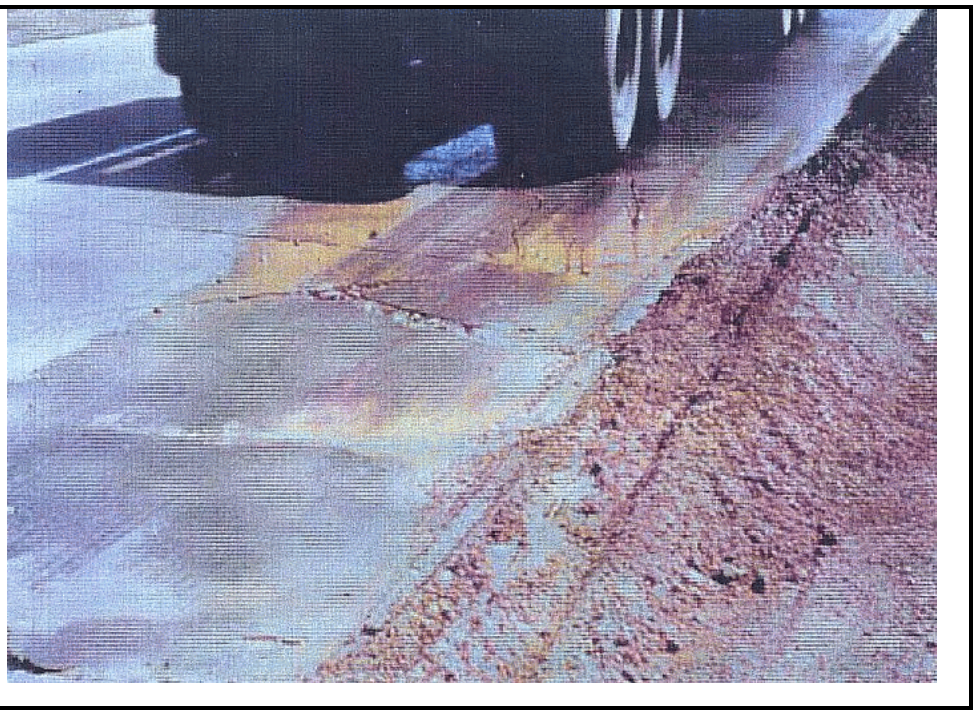

Photo D-8. Pumping in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Settlement and Waves**

Description: Because CRC pavements have short transverse crack spacing, these pavements can develop short waves or undulation as a result of poor support conditions, frost heave, or permanent deformation of the subgrade. Settlement is a dip or depression in the longitudinal profile of the pavement surface.

Severity Level: Severity is based upon the effect of the settlement or waves upon ride quality and vehicle control when traveling along the roadway at 40 MPH (60 km/hour, step 1 of the monitoring procedure).

Low-- Noticeable effect upon ride, driver able to maintain vehicle control easily.

Medium-- Some discomfort to passengers, driver able to maintain control with slight corrective action.

High-- Definite effect upon ride quality. Noticeable profile dips in settlement areas greater than 6 inches (150 mm). Waves cause rocking of vehicle similar to motion created at moderately faulted jointed crack pavements.

Extent Level:

Occasional-- Less than 2 settlements/mile (per 1.6 km) of roadway and/or wave along less than 20 percent of the section length.

Frequent-- 2 to 4 settlement areas/mile (per 1.6 km) of roadway and/or waves along 20 to 50 percent of the section length.

Extensive-- More than 4 settlement areas/mile (per 1.6 km) of roadway and/or waves along more than 50 percent of the section length.

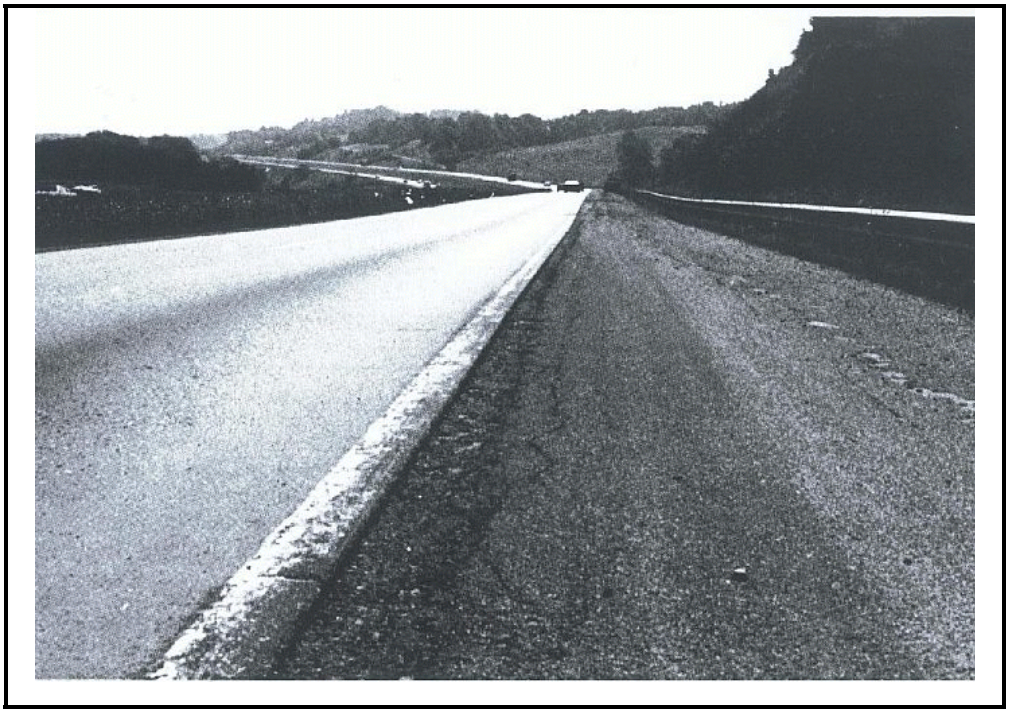

Photo D-9. Settlement in CRC Pavement

CRC PAVEMENT

Distress Type: **Transverse Crack Spacing**

Description: A crack at approximately right angles to the pavement centerline. Transverse cracking in CRC pavements is normal. The cracking is detrimental if the spacing is less than or greater than that associated with good CRC performance. Optimum CRC transverse crack spacing is about 5 to 8 feet (1.5 m 2.4 m).

Severity Level:

Low-- Average crack spacing greater than 3 feet (1 m).

Medium-- Average crack spacing less than 3 feet (1 m), with few intersecting cracks. Intersecting cracks are transverse cracks which do not cross the entire pavement width but intersect other transverse cracks.

High-- Average crack spacing less than 3 feet (1 m), with many intersecting cracks.

Extent Level: Extent is based upon the percentage of the section length having an undesirable transverse crack pattern.

Occasional-- Less than 20 percent.

Frequent-- Between 20 and 50 percent.

Extensive-- Greater than 50 percent.

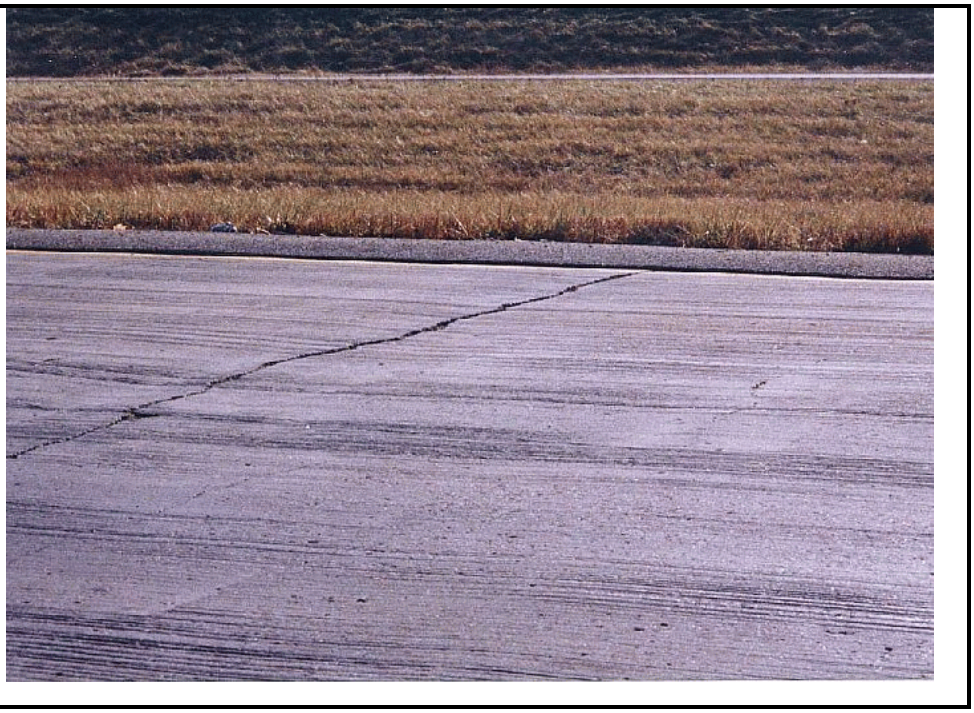

Photo D-10. Transverse Cracks in CRC Pavement, Low Severity

Photo D-11. Transverse Cracks in CRC Pavement, Medium Severity

CRC PAVEMENT

Distress Type: **Longitudinal Cracking**

Description: A crack or break approximately parallel to the pavement centerline. This type of cracking is usually associated with subgrade settlement or insufficient bearing support.

Severity Level:

Low-- Hairline or tight cracks with little crack spalling.

Medium-- Crack opened or spall at the surface to a width of 1/4 inch to 1 inch (6 to 25 mm) over a distance equal to at least one-half the crack length.

High-- Crack opened or spalled at the surface to a width greater than 1 inch (25 mm) over a distance equal to at least one-half the crack length.

Extent Level:

Occasional-- Longitudinal cracking occurs along less than 5 percent of the section length.

Frequent-- Longitudinal cracking occurs along from 5 to 15 percent of the section length.

Extensive-- Longitudinal cracking occurs along more than 15 percent of the section length.

Photo D-12. Longitudinal Cracking in CRC Pavement, Medium Severity

Photo D-13. Longitudinal Cracking in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Punchouts or Edge Breaks**

Description: A punchout or edge break is a cracked rectangular area usually along the outside pavement edge. A punchout requires formation of longitudinal crack (usually within the outer wheel track) which connects transverse cracks of the CRC pavement. The rectangular punchout area thus is defined by 2 transverse cracks, the longitudinal crack and the outside pavement edge. A punchout results from concrete that is over stressed because of short transverse crack spacing or poor support of the CRC pavement. Punchout areas which have been repaired should be evaluated for patching distress.

Severity Level: This distress is rated only for Medium and High levels.

Medium-- Crack width greater than 1/4 inch (6 mm) with some spalling. Punchout area may be depressed up to ½ inch (13 mm).

High-- Punchout area is depressed more than ½ inch (13 mm) and/or is breaking up or shattering.

Extent Level: **O**ccasional-- Fewer than 2 punchouts/mile (per 1.6 km) of section length.

Frequent-- Between 2 and 5 punchouts/mile (per 1.6 km) of section length.

Extensive-- More than 5 punchouts/mile (per 1.6 km) of section length.

Photo D-14. Punchouts in CRC Pavement, Medium Severity

Photo D-15. Punchouts in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Spalling**

Description: Spalling in CRC pavements is the break up or disintegration of the concrete at transverse cracks. A spall normally does not extend vertically through the entire concrete layer but intersects the transverse crack at an angle. This distress may be caused by the presence of high percentage of reinforcing steel in the pavement.

Severity Level:

Low-- < 1inch (25 mm), missing pieces.

Medium-- Distressed area 1 to 4 inch (25 to 100 mm) wide with most of the pieces missing.

High-- Distressed areas more than 4 inch (100 mm) wide with some or most of the pieces missing.

Extent Level: Extent of this distress is based upon the percentage of transverse cracks which have spalled.

Occasional-- Less than 20 percent of the cracks.

Frequent-- Between 20 and 50 percent of the cracks.

Extensive-- More than 50 percent of the cracks.

Photo D-16. Spalling in CRC Pavement, Medium Severity

Photo D-17. Spalling in CRC Pavement, High Severity

CRC PAVEMENT

Distress Type: **Pressure Damage**

Description: Pressure damage may be spalling, crushing, or upheaval at transverse joints or cracks resulting from expansion of the concrete layer. Pressure induced spalling is differentiated from other joint spalling by the shape of the spalled area. Pressure spalls are usually 6 to 12 inches (150 to 300 mm) long measured from the crack or joint and up to 12 inches (300 mm) wide.

Severity Level: Separate severity levels for pressure damage spalling are not defined. All pressure damage spalling is considered severe since this distress may be a predictor of more serious pressure distress (blow ups).

Extent Level: Extent is based upon the number of transverse joints which exhibit pressure damage spalling.

Occasional-- Less than 1 joint/mile (per 1.6 km).

Frequent-- Between 1 and 3 joints/mile (per 1.6 km).

Extensive-- More than 3 joints/mile (per 1.6 km).

Photo D-18. An Example of Pressure Damage in Jointed Concrete Pavement . Pressure Damage in CRCP is similar to as shown above.

APPENDIX E

Description of Distresses in Local Pavements

LOCAL PAVEMENT RATING RULES

Follow these rules when rating pavements in Local areas:

1. Rate all pavements using the Local Pavement rating form or the JRCP (Jointed Reinforced Concrete Pavement).

2. Do not rate concrete bus pads.

3. For undivided highways, rate the worst lane, regardless of direction. For divided highways, rate the worst lane in both directions of the highway.

4. Section breaks should be made under the following conditions:

    - Type of pavement changes
    - Visible municipal corporation limits (i.e. signs)
    - Change in roadway direction or misdirected streets
    - Noticeable condition changes that are larger than 0.25mi. in length for sections 1 mile or larger
    - For sections less than 1 mile in length, there should be no breaks made that are less than 0.1 miles in length
    - At the rater's discretion

5. A PCR rating of 100 denotes a newly constructed roadway, or one which is under construction at the time of rating.

6. In general, if multiple severities for any given distress are present within a section, rate the highest severity that is found in at least 30% of the section, and rate the extent of the total number of the distress found.

LOCAL PAVEMENT

Distress Type: **Raveling**

Description: Raveling is the disintegration of the pavement from the surface downward due to the loss of aggregate particles. Raveling may occur as a result of asphalt binder aging, poor mixture quality, segregation, or insufficient compaction.

Severity Level:

Low-- Very little coarse aggregate has worn away. Loss of fine aggregate. Coarse aggregate exposed.

Medium-- Surface has an open texture and is moderately rough with considerable loss of fine aggregate and some coarse aggregate removed.

High-- Most of the surface aggregate has worn away or become dislodged. Surface is severely rough and pitted and may be completely removed in places.

Extent Level:

Occasional-- Less than 20 percent of the surface area is raveling.

Frequent-- Between 20 and 50 percent of the surface area is raveling.

Extensive-- More than 50 percent of the surface area is raveling.

Photo E-1 . Raveling in Local Pavement, Medium Severity

Photo E-2 . Raveling in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Bleeding**

Description: Bleeding or flushing is the presence of free asphalt binder on the pavement surface. Bleeding is caused by an excess amount of bituminous binder in the mixture and/or low air void content.

Severity Level: Only 2 severity levels are defined.

Medium-- Both coarse aggregate and free bitumen are noticeable at the pavement surface.

High-- Surface appears black with very little aggregate noticeable.

Extent Level: **O**ccasional-- Less than 10 percent of the length exhibits bleeding.

Frequent-- Between 10 and 30 percent of the length is bleeding.

Extensive-- Bleeding occurs in more than 30 percent of the length.

Photo E-3 . Bleeding in Local Pavement, Medium Severity

Photo E-4 . Bleeding in Local Pavement, High Severity
High Severity shows most aggregates covered with asphalt.

LOCAL PAVEMENT

Distress Type: **Patching**

Description: Patching is either the placing of asphalt concrete on the surface of the existing pavement or the replacement of the existing pavement in small isolated areas.

Deductions shall be made for all patches present in the pavement which are the result of deterioration and/or maintenance since the last construction project. Utility cuts should not be rated as patches. If the rater is unsure whether a distress is a utility cut or a patch, the distress should be rated as a patch.

Large patched areas [greater than 15 sq. yd. (12.5 m^2)], such as spot overlays or wedge courses, shall be rated for condition as a part of the existing pavement rather than as patches.

If more than one patch size is present, rate the severity of the size that exists in the largest quantity, and rate the extent of the total number of patches present.

Severity Level:

Low-- Patch size < 1 sq. ft. (0.1 m^2).

Medium-- Patch size < 1 sq. yd. (0.8 m^2).

High-- Patch size > 1 sq. yd. (0.8 m^2).

Extent Level:

Occasional-- < 10 patches/mile (per 1.6 km).

Frequent-- 10 - 20 patches/mile (per 1.6 km).

Extensive-- > 20 patches/mile (per 1.6 km).

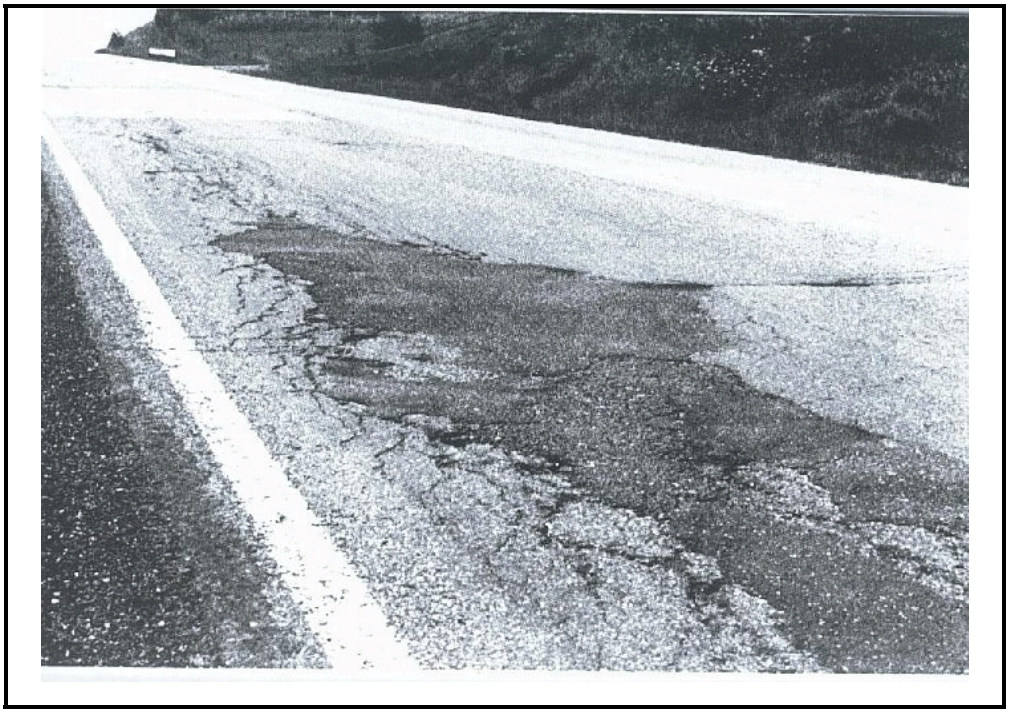

Photo E-5 . Patching in Local Pavement, High Severity

Photo E-6 . Patching in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Surface Disintegration/Debonding/Potholes**

Description: Loss of surface by debonding is the removal of the asphaltic surface layer from the underlying layer. The problem is most common with thin asphalt surface layers [less than 2 inches (50 mm)] and is caused by freeze-thaw action or poor bonding of the two layers during construction.

Potholes are bowl-shaped voids or depressions in the pavement surface. Potholes are localized failure areas which are usually caused by weak base or subgrade layers.

If more than one debonded area is present, rate the severity of the size that exists in the largest quantity, and rate the extent of the total number of debonded areas present.

Severity Level: Use the following table to determine the severity levels:

Depth of Debonded Area	**Debonded Area <1 sq. yd. (0.8 m^2)**	**Debonded Area >1 sq. yd. (0.8 m^2)**
< 1" (25 mm)	Low	Medium
> 1"(25 mm)	Medium	High

Regardless of depth, potholes less than 6 inches (150 mm) in diameter shall be considered to be of low severity.

Extent Level: **O**ccasional-- < 5 potholes/mile (per 1.6 km).

Frequent-- 5 - 10 potholes/mile (per 1.6 km).

Extensive-- > 10 potholes/mile (per 1.6 km).

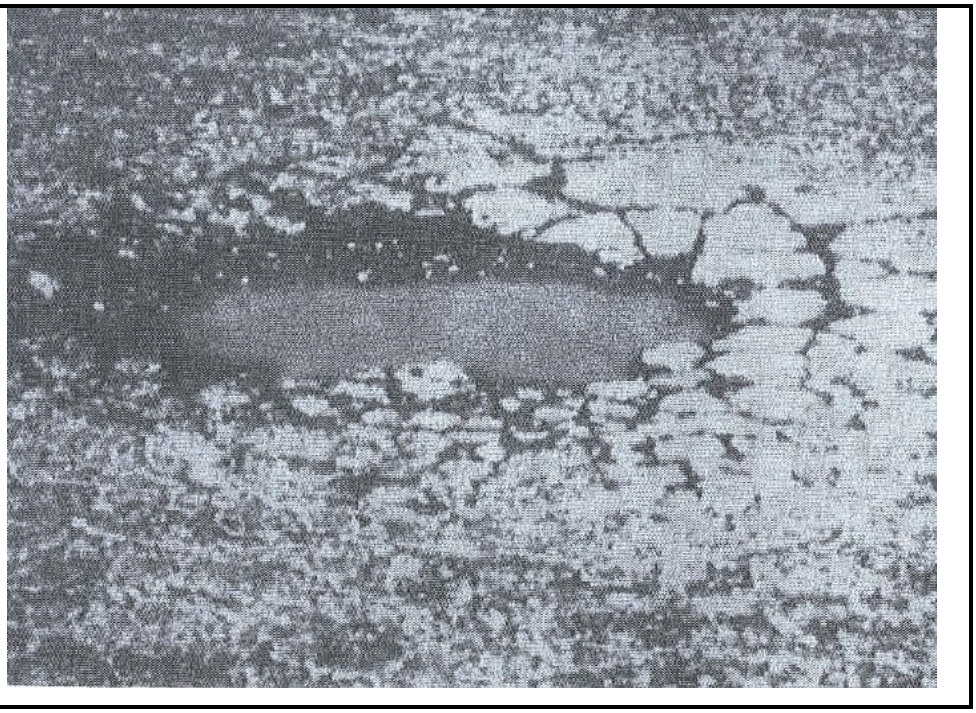

Photo E-7 . Pothole in Local Pavement, Medium Severity

Photo E-8 . Debonding in Local Pavement, Medium Severity

LOCAL PAVEMENT

Distress Type: **Rutting**

Description: Ruts are vertical deformations in the pavement surface along the wheel tracks. In severe cases pavement uplift may occur along the sides of the rut, but in most instances only a depression is noticeable. Rutting is caused by consolidation or lateral movement of any or all pavement layers, including subgrade, under traffic.

Severity Level: Rutting severity is based upon rut depth, as approximated visually.

Low--	Barely noticeable, depth between 1/8 inch and 3/8 inch.
Medium--	Readily noticeable, depth more than 3/8 inch, less than 3/4 inch.
High--	Definite effect upon vehicle control, depth greater than 3/4 inch.

Extent Level:

Occasional--	Less than 20 percent of the section length is rutted.
Frequent--	Between 20 and 50 percent of the section length is rutted.
Extensive--	More than 50 percent of the section length is rutted.

Photo E-9 . Rutting in Local Pavement, Medium Severity

Photo E-10 . Rutting in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Map Cracking**

Description: Map cracking consists of interconnected cracks that form a series of large polygon blocks which look, overall, like a map. The cracking appears to combine transverse and longitudinal cracks to form this map. This distress is most likely attributed to thermal contraction throughout the pavement due to temperature and age. Map cracking is not load induced, and can be found in various locations over the width of the pavement. Map cracking should not be confused with alligator cracking that is found in wheel track cracking. If map cracks exist in the wheel path, they should be rated as wheel track cracking.

Severity Level:

Low-- Average size of block formed is greater than 5' x 5', but less than 9' x 9'.

Medium-- Average size of block formed is greater than 1' x 1', but less than 5' x 5'.

High-- Average size of block formed is less than 1' x 1'; Multiple cracking with extensive alligator cracking, and some alligator blocks are easily removed.

Extent Level:

Occasional-- Less than 20 percent of the section length is affected by this distress.

Frequent-- Between 20 and 50 percent of this section length is affected by this distress.

Extensive-- Greater than 50 percent of the section length is affected by this distress.

Photo E-11 . Map Cracking in Local Pavement, Medium Severity

LOCAL PAVEMENT

Distress Type: **Base Failure**

Description: Base failure is any deviation of the pavement surface from its original shape (other than described for rutting). This deformation may take the form of bumps, dips, lipping or stepping at cracks, all of which give rise to pitch, roll and jarring drop in a moving vehicle. If pumping is identified (surface staining and base or subgrade material near joints of cracks) the severity level for base failure is automatically classified as high.

Severity Level:

Low-- Barely noticeable pitch and roll, and jarring bump or drop of vehicle while in motion.

Medium-- Noticeable pitch and roll, and harsh jarring bump or drop of vehicle while in motion.

High-- Continuous pitch and roll, and hard jarring bump or drop of vehicle while in motion; poor ride; Or pumping exists.

Extent Level:

Occasional-- Less than 2 isolated base failures/mile (per 1.6 km) of roadway, or less than 10% of the section length is continuous base failure.

Frequent-- 2 to 5 isolated base failures/mile (per 1.6 km) of roadway, or 10 - 30% of the section length is continuous base failure.

Extensive-- More than 5 isolated base failures/mile (per 1.6 km) of roadway, or greater than 30% of the section length is continuous base failure.

Photo E-12 . Base Failure in Local Pavement, High Severity

Photo E-13 . Base Failure in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Settlement**

Description: Settlement is a uniform dip in the longitudinal profile of the pavement surface. It is not caused by loading, and is found outside as well as inside the wheel path. Settlement shall be considered a distress when it causes a noticeable effect upon riding quality. Settlement should not be confused with corrugation, which is another type of surface profile deficiency.

Severity Level: Severity is based upon the effect of the settlement on vehicle control when traveling along the roadway at 40 MPH (60 km/hour), as discussed in step 1 of the monitoring procedure.

Low-- Noticeable effect upon ride, driver able to maintain vehicle control easily.

Medium-- Some discomfort to passengers, driver able to maintain control with slight corrective action.

High-- Definite effect upon ride quality, noticeable profile dip generally greater than 6 inches (150 mm). Poor ride, corrective action needed.

Extent Level: **O**ccasional-- Less than 2 settlements/mile (per 1.6 km) of roadway.

Frequent-- 2 to 4 settlements/mile (per 1.6 km) of roadway.

Extensive-- More than 4 settlements/mile (per 1.6 km) of roadway.

Photo E-14 . Settlement in Local Pavement, Low Severity

Photo E-15 . Settlement in Local Pavement, Medium Severity

LOCAL PAVEMENT

Distress Type: **Transverse Cracking**

Description: Transverse cracks are cracks found at approximately right angles to the pavement centerline. The occurrence of transverse cracking is usually related to thermal shrinkage of the asphalt binder. Binder age hardening is also related to formation of these crack types.

Severity Level:

Low-- Average crack width less than 1/4 inch (6 mm) with no spalling or distortion along crack edges.

Medium-- Average crack opened or spalled to a width between 1/4 to 1 inch (6 mm to 25 mm) along at least half its length.

High-- Average crack opened or spalled to a width greater than 1 inch (25 mm) along at least half its length.

Extent Level:

Occasional-- Average transverse crack spacing greater than 100 feet (30.5 m).

Frequent-- Average spacing 50 to 100 feet (15.25 to 30.5 m).

Extensive-- Average crack spacing less than 50 feet (15.25 m).

Note: *Average spacing infers the section length, divided by the total number of cracks within a given section. For example, if 10 cracks are found within a section that is 0.3 miles in length, then average crack spacing would be 158 ft and the extent level would be occasional.*

Photo E-16 . Transverse Cracking in Local Pavement, Low Severity

Photo E-17 . Transverse Cracking in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Wheel Track Cracking**

Description: Cracks located within or near the wheel tracks are Wheel track cracks. For evaluation purposes each wheel track shall be considered 3 feet (1 m) in width. Wheel track cracking usually starts as intermittent, single longitudinal cracks progressing to multiple longitudinal cracking, and eventually interconnected or alligator cracking. Wheel track cracking usually results from fatigue failure of the asphaltic layer.

Wheel track cracking may exist on the outer edge of the pavement. If this is the case, both wheel track cracking and edge cracking should be rated and the appropriate deductions made.

Severity Level: Severity is based upon both crack width and multiplicity of the cracking. Both criteria must be satisfied when assigning severity level.

Low-- Single or intermittent multiple cracking with average crack width less than 1/4 inch (6 mm).

Medium-- Single or multiple cracking (may also include regions of intermittent alligator cracking) with average crack width greater than 1/4 inch (6 mm) with little spalling or loose pieces.

High-- Multiple cracking with extensive alligator cracking and rutting with a depth greater than 1/8 inch. Spalling is fairly common, with average crack width greater than 1/4 inch (6 mm), and some alligator blocks are easily removed.

Extent Level: Extent is based upon percentage of the wheel track length within the section which exhibits cracking.

Occasional-- Less than 20% of section affected.

Frequent-- Between 20 and 50% of section affected.

Extensive-- More than 50% of section affected.

Photo E-18 . Wheel Track Cracking in Local Pavement, High Severity

Photo E-19 . Wheel Track Cracking in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Longitudinal Cracking**

Description: A crack or break approximately parallel to the pavement centerline. Longitudinal joints and pavement edges of underlying rigid base usually reflect through the asphalt surface as a result of thermal movement in the underlying slab. Poor paving lane joint construction can also result in a longitudinal crack. All types of longitudinal cracking (random, centerline, edge, etc.) are included in this distress classification.

Note: Crack width is defined as the sum of all cracks if multiple hairline cracks are found closely grouped together.

Severity Level:

Low-- Crack width less than 1/4 inch (6 mm) with no spalling or distortion along crack edges.

Medium-- Crack opened or spalled to a width between 1/4 and 1 inch (6 mm and 25 mm) over at least one half its length.

High-- Crack opened or spalled to a width greater than 1 inch (25 mm) over at least one half its length.

Extent Level: Based upon the average linear feet of longitudinal cracking per station of 100 feet length (30 m).

Occasional-- Less than 50 feet per station (15 m/30 m).

Frequent-- Between 50 and 150 feet per station (15 and 45 m/30 m).

Extensive-- More than 150 feet per station (45 m/30 m). Complete reflective longitudinal cracking along the pavement centerline and edge [200 linear feet per station (60 linear m/ 30 m)] is termed extensive.

Photo E-20 . Longitudinal Cracking in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Edge Cracking**

Description: Edge cracks are longitudinal or crescent shaped cracks found within 1 foot (0.3 m) of the pavement edge line. Edge cracking does not exist if the pavement is bordered by a shoulder or curb. For evaluation purposes, edge cracking will only be evaluated within 1 ft (0.3 m) to the left and the right of the paint line for roadway lanes larger than 10 ft (3 m). If the roadway lanes are 10 ft (3 m) wide, then edge cracking will be evaluated from the paint line to the edge of the pavement. If wheel track cracking is present in a 10 foot
(3 m) lane, and it occurs within 1 foot (0.3 m) of the paint line, then both the wheel track cracking and the edge cracking should be rated.

Severity Level:

Low-- Tight cracks, width less than 1/4 inch (6 mm) with no break up or spalling.

Medium-- Crack width greater than 1/4 inch (6 mm) with some spalling.

High-- Multiple cracking with moderate spalling and average crack width greater than 1/4 inch (6 mm).

Extent Level:

Occasional-- Cracking occurs along less than 20 percent of the pavement edge within the section.

Frequent-- Cracking occurs along 20 to 50 percent of the pavement edge within the section.

Extensive-- Cracking occurs along more than 50 percent of the pavement edge within the section.

Photo E-21 . Edge Cracking in Local Pavement, Medium Severity

Photo E-22 . Edge Cracking in Local Pavement, High Severity

LOCAL PAVEMENT

Distress Type: **Pressure Damage/Upheaval**

Description: Upheaval is a bump or hump in the pavement surface at a transverse joint or crack. The upheaval is a result of thermal expansion in the underlying concrete base creating compressive forces.

Severity Level:

Low-- Bump height less than ½ inch (13 mm), barely noticeable effect upon ride.

Medium-- Bump height ½ to 1 inch (13 to 25 mm) with a readily noticeable effect upon ride quality.

High-- Bump height greater than 1 inch (25 mm) severely reducing ride quality.

Extent Level:

Occasional-- < 5 upheavals/mile (per 1.6 km).

Frequent-- 5 - 10 upheavals/mile (per 1.6 km).

Extensive-- > 10 upheavals/mile (per 1.6 km).

Photo E-23 . Pressure Damage/Upheaval in Local Pavement, Medium Severity

LOCAL PAVEMENT

Distress Type: **Crack Sealing Deficiency**

Description: Crack sealing deficiency is crack sealing which is no longer effective in preventing intrusion of water or cracks which have never been sealed. Unsealed cracks with an average width less than 1/4" may not be considered.

Severity Level: Severity levels are not considered.

Extent Level:

Occasional– Less than 50% of existing cracks are not effectively sealed.

Frequent– More than 50% of existing cracks are not effectively sealed.

Extensive– None of the existing cracks have been sealed, there is no sealant on the roadway.

Photo E-24 . Crack Sealing Deficiency in Local Pavement, Unsealed Cracks

Photo E-25 . Crack sealing Deficiency in Local Pavement, Cracks not sealed sufficiently

LOCAL CURB AND SIDEWALK

Severity Level: Rate the worse curb and sidewalk on either side of the roadway. When rating the severity of curbs and sidewalks, record the severity of the curb/sidewalk that occurs in more than 50% of the total curb/sidewalk present.

Curbs Curbs have 4 rating categories:

Good– Curb is not cracked and in good shape

Fair– Curb has minimal cracking and minimal slumping, and is maintaining its function

Poor– Curb has multiple cracks with some loose or missing pieces and/or curb is even with the roadway. Functionality is impaired requiring immediate attention.

Not Applicable– Curb does not exist

Sidewalk Sidewalks need only to be present on one side of the roadway to be rated. Sidewalks have 4 rating categories:

Good– Sidewalk is not cracked and provides good, free pedestrian walk space.

Fair– Sidewalk has some minimal cracking and separation facilitating pedestrians.

Poor– Sidewalk has multiple cracks with spalling and loose or missing pieces requiring immediate maintenance or impeding pedestrian use.

Not Applicable– Sidewalk does not exist

**When filling out the form manually, the rater will utilize the three character field used for the rater's name on the PCR form for rating the curbs and sidewalk. The first character will be the rater's last name initial, the second character will be the severity of the curb, and the third will be the severity of the sidewalk.

Photo E-26 . Fair Sidewalk and Curb in Local Pavement

Photo E-27. Good Sidewalk and Curb in Local Pavement

APPENDIX F

Description of Distresses in Brick Pavers

BRICK PAVERS RATING RULES

Follow these rules when rating Brick Pavers:

1. Rate all brick pavers using the Brick Pavers rating form.

2. Do not rate concrete bus pads.

3. For undivided highways, rate the worst lane, regardless of direction. For divided highways, rate the worst lane in both directions of the highway.

4. Section breaks should be made under the following conditions:

    - Type of pavement changes
    - Visible municipal corporation limits (i.e. signs)
    - Change in roadway direction or misdirected streets
    - Noticeable condition changes
    - For sections less than 1 mile in length, there should be no breaks made that are less than 0.08 mile in length.
    - At the rater's discretion

5. A PCR rating of 100 denotes a roadway which is under construction at the time of rating.

6. In general, if multiple severities for any given distress are present within a section, rate the highest severity that is found in at least 30% of the section, and rate the extent of the total number of the distresses found.

BRICK PAVERS

Distress Type: **Brick Deterioration**

Description: Brick deterioration is the breaking up, disintegration¸ or loss of bricks. Breaks often occur on a corner or edge of the brick, and the pieces usually become dislodged and are removed from the paving surface. Broken bricks are also very likely to occur adjacent to manholes, valve boxes, and inlets. Brick disintegration is the loss of material on the bricks due to weathering. Loss of bricks is the event of whole bricks becoming dislodged from the paving surface.

Severity Level:

Low-- Some brick disintegration in which very little material has been worn away.

Medium-- The surface has an open texture and is moderately rough with considerable loss of material. Isolated areas less than 1 sq. yd exhibit breaks or even loss of bricks.

High-- Most of the surface material has worn away, leaving the paving surface severely rough and pitted. Isolated areas greater than 1 sq. yd exhibit breaks and loss of bricks.

Extent Level:

Occasional-- Less than 10 percent of the paving section exhibits brick deterioration.

Frequent-- Between 10 percent and 30 percent of the paving section exhibits brick deterioration.

Extensive-- More than 30 percent of the paving section exhibits brick deterioration.

Photo F-1. Brick Deterioration in Brick Pavers, Medium Severity

Photo F-2. Brick Deterioration in Brick Pavers, High Severity

BRICK PAVERS

Distress Type: **Discoloration**

Description: Discoloration in bricks is most often due to efflorescence. Efflorescence is a white coating developed by new bricks. This is minerals surfacing from within the brick material and can be cleaned off. Efflorescence is merely a cosmetic problem.

A pavement that exhibits different colors of bricks due to pavement repairs, utility repairs, or construction or supply related issues shall also be rated for discoloration.

Severity Level: Severity levels are not considered. Rater must be certain of discoloration.

Extent Level:

Occasional-- Less than 10 percent of the section length exhibits discoloration.

Frequent-- Between 10 and 30 percent of the section length exhibits discoloration.

Extensive-- Discoloration occurs on more than 30 percent of the section length.

Photo F-3. Discoloration on Brick Pavers

Photo F-4. Discoloration on Brick Pavers

BRICK PAVERS

Distress Type: **Patching**

Description: Patching is either the placing of asphalt concrete on the existing paving surface or the replacement of the existing brick in small isolated areas.

Deductions shall be made for all patches present on the paving surface which are the result of deterioration and/or maintenance since the last construction project.

Large patched areas [greater than 15 S.Y. (12.5 m^2)], such as spot overlays or wedge courses, shall be rated for condition as a part of the existing paving surface rather than as patches.

Severity Level:

Low-- patch size < 1 sq. ft. (0.1 m^2)

Medium-- patch size < 1 sq. yd. (0.8 m^2)

High-- patch size > 1 sq. yd. (0.8 m^2)

Extent Level:

Occasional-- < 3 patches/block (approx. 500 ft. or 152 meters)

Frequent-- 3-6 patches/block (approx. 500 ft. or 152 meters)

Extensive-- > 6 patches/block (approx. 500 ft. or 152 meters)

Photo F-5. Patching in Brick Pavers, High Severity

Photo F-6. Patching in Brick Pavers, High Severity

BRICK PAVERS

Distress Type: **Pumping**

Description: Pumping is the ejection of fine soil particles through cracks, joints, or along the edges of the brick paver. Pumping can be identified by the presence of surface staining and base or subgrade material near joints or cracks.

Severity Level: Severity levels are not considered. Rater must be certain of pumping.

Extent Level:

Occasional-- Less than 10 percent of the joints and cracks exhibit pumping.

Frequent-- 10 to 25 percent of the joints and cracks exhibit pumping.

Extensive-- More than 25 percent of the joints and cracks exhibit pumping.

Photo F-7. Pumping in Brick Pavers

Photo F-8. Pumping in Brick Pavers

BRICK PAVERS

Distress Type: **Rutting**

Description: Ruts are vertical deformations in the paving surface along the wheel tracks. In severe cases bricks may uplift along the sides of the rut, but in most instances only a depression is noticeable. Rutting is caused by consolidation or lateral movement of any or all paver layers, including subgrade, under traffic.

Severity:	**L**ow--	Barely noticeable, depth less than 1 inch.
	Medium--	Readily noticeable, depth between 1 inch and 3 inches.
	High--	Readily noticeable, depth greater than 3 inches.
Extent Level:	**O**ccasional--	Less than 20 percent of the section length is rutted.
	Frequent--	Between 20 and 50 percent of the section is rutted.
	Extensive--	More than 50 percent of the section is rutted.

Photo F-9. Rutting in Brick Pavers, Medium Severity

Photo F-10. Rutting in Brick Pavers, Low Severity

BRICK PAVERS

Distress Type: **Corrugations**

Description: Corrugations refers to the ride quality of various brick pavers. Pavers with very narrow and tight joints and a level surface may have a very smooth ride and minor traffic noise. Pavers with some settlement, open joints, and a rough, uneven surface can produce a very rough ride and significant traffic noise.

Severity:

Low-- Noticeable effect upon ride, but no significant reduction in comfort.

Medium-- Moderate ride discomfort is noticeable, slight noise irritation, driver able to maintain vehicle control easily.

High-- Vehicle vibration is severe, severe noise irritation, speed reduction is necessary for comfort and to maintain vehicle control.

Extent Level:

Occasional-- Less than 10 percent of the section length is affected by this distress.

Frequent-- Between 10 and 30 percent of the section length is affected by this distress.

Extensive-- Greater than 30 percent of the section length is affected by this distress.

Photo F-11. Corrugations in Brick Pavers, High Severity

Photo F-12. Corrugations in Brick Pavers, Low Severity

BRICK PAVERS

Distress Type: **Joint Erosion**

Description: Joint Erosion is the erosion of the joints, allowing water to collect between the bricks. Open joints may become filled with dirt, remain exposed, or be covered with vegetation.

Severity Level:

Low**--** Joint width less than 1/2”(12.7mm).

Medium-- Joint width between 1/2” to 3/4”(12.7mm to 25.4mm).

High-- Joint width greater than 3/4”(25.4mm).

Extent Level:

Occasional-- Joint Erosion occurs along less than 20 percent of the paving section.

Frequent-- Joint Erosion occurs along 20 to 50 percent of the paving section.

Extensive-- Joint Erosion occurs along more than 50 percent of the paving section.

Photo F-13. Joint Erosion in Brick Pavers, Medium Severity

Photo F-14. Joint Erosion in Brick Pavers, High Severity

BRICK PAVERS

Distress Type: **Brick Settlement**

Description: Settlement is a dip in the longitudinal profile of the paving surface. Settlements are localized depressed areas, which could be caused by utility repairs, base failures, poor drainage in flow lines, or poor compaction. The settled areas give rise to pitch, roll, and jarring drop in a moving vehicle. If pumping is identified, the severity level for settlement is automatically classified as high.

Severity Level:

Low-- Settlement has an area of less than 2 sq. ft and depth of less than 3". Barely noticeable pitch and roll, and jarring drop of vehicle while in motion.

Medium-- Settlement has an area between 2 sq. ft and 1 sq. yd and depth of greater than 3". There is a noticeable pitch and roll, and harsh jarring drop of vehicle while in motion.

High-- Settlement has an area of greater than 1 sq. yd. and depth of greater than 3". There is continuous pitch and roll, and hard jarring drop of vehicle while in motion; poor ride. Also high severity if the section exhibits low or medium severity settlement with pumping.

Extent Level:

Occasional-- Less than 2 settlements/block (approx. 500 feet) of roadway.

Frequent-- 2 to 4 settlements/block (approx. 500 feet) of roadway.

Extensive-- More than 4 settlements/block(approx. 500 feet) of roadway.

Photo F-15. Settlement in Brick Pavers, High Severity

Photo F-16. Settlement in Brick Pavers, High Severity