ATTACHMENT D

MDOT
PAVEMENT MANAGEMENT SYSTEM

CURRENT DISTRESS MANUAL

FOR SURVEYING
OF
PAVEMENT SURFACE IMAGES

(2006 - 2011 Data Collection Cycle)

Prepared by Pavement Management Unit
Construction & Technology Area

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This document describes the **Michigan Department of Transportation's (MDOT's)** surface distress type definitions and survey methods. MDOT collects surface images on one half of its trunk-line pavement network every year. The images are displayed on a computer screen by a Distress Survey program. Throughout this document, a computer screen of pavement surface images is referred to as a **Survey Screen**. The pavement surface distresses on a survey screen are observed and recorded by type, extent, and severity through a Distress Survey software. These data are called **Distress Survey Data**.

Distresses can be classified into two categories which are primary and secondary distresses. Throughout this document, a primary distress is called a **Principal Distress**. For most of the **Principal Distresses**, the secondary distresses around a **Principal Distress** are also observed and recorded. The secondary distresses are called the **Associated Distresses** of a **Principal Distress** and are usually measured by the length and width of their surface area. The **Associated Distresses** are used to estimate the severity level and/or extent of a **Principal Distress** and are also used in many applications for estimating fix costs and determining causes of pavement deteriorations. **Associated Distress** type is important information for analyzing causes of pavement deteriorations. Therefore, **Associated Distress** type is also recorded in certain instances.

The following abbreviations are used throughout this document and other PMS documents:

MDOT: Michigan Department of Transportation
PMS : Pavement Management System
PD : Principal Distress
PDs : Principal Distresses
AD : Associated Distress
ADs : Associated Distresses

This document provides a list of **PDs** to be recorded by the **PMS** of **MDOT**. For each **PD**, the following items are defined:

1. Title And Code

Each **PD** has a title and a unique 4-digit code. As an example, **Partial Width Patch (w)** designates the title of a **PD** that is assigned with a code **0326**. Throughout this and other **PMS** documents, the notation **PD<code #>** designates a **PD** identified by code <**code #>**. For the above example, **PD0326** designates **Partial Width Patch (w)**.

2. Definition

This defines the properties or qualifications of a **PD**.

3. Survey

This defines the method used to record a **PD** in a survey screen.

4. Severity / Extent

This defines the criteria for estimating the condition, severity and extent of a **PD** on a survey screen. Extent usually is the width of a distress area in the transverse direction and can be considered as a severity level of a **PD**. Thus, severity and extent are often interchangeable.

For a longitudinal-oriented **PD**, the extent in the longitudinal direction is the PD's length. This length can be computed directly from the location/linear referencing numbers used to identify the survey screens that enclose the **PD**. For this reason, the extent in the longitudinal direction will not be mentioned in this subject.

5. Associated Distress Matrix

This defines what **ADs** of a **PD** are to be recorded.

Each **PD** can have at most two **ADs** that are used to measure the severity level and extent of the **PD**. An **AD** consists of a title and several items for measuring **PD** severity (or extent). These items are referred to as distress severities. Two **ADs** of **PD0326** are presented below for demonstration purposes:

The First AD of PD0326:

This **AD** is shown below in table format. The title of this **AD** is **Transverse Length,** shown as the table header. This **AD** has 5 rows, each is the range of patch width in the transverse direction. Thus, this **AD** measures the extent of this **PD** in the transverse direction. However, the extent in the longitudinal direction can be also considered as severity of this **PD** because it indirectly indicates the range of distress area.

TRANSVERSE LENGTH
0 - 2 ft.
> 2 - 4 ft.
> 4 - 6 ft.
> 6 - 8 ft.
> 8 < 12 ft.

The Second AD of PD0326:

This **AD** is shown below in table format. The title of this **AD** is **CONDITION**, shown as the table header. This **AD** has 3 rows; each is a condition rating of the pavement within a patch. Thus, this **AD** measures the condition level of the **PD**.

CONDITION
GOOD
FAIR
POOR

The above two **ADs** of **PD0326** are combined into the following 2-dimensional table:

	CONDITION		
TRANSVERSE LENGTH	*GOOD*	*FAIR*	*POOR*
0 - 2 ft.			
>2 - 4 ft.			
>4 - 6 ft.			
>6 - 8 ft.			
>8 < 12 ft.			

The above 2-dimensional table is referred to as the **AD Matrix** of **PD0326**. When a **Partial Width Patch (w)** is identified, the surveyor must determine to which cell of the above **AD Matrix** the associated distresses belongs. The **Code** of this **PD** along with the **row** and **column** numbers of the identified cell are recorded into a data file. (For data file format, see both the last section of this document entitled **"Format Layout of Condition-Specific Data Within a Distress Survey File"** and the separate document, **File Formats of Location Referencing, Distress, and Sensor Data**) As an example, for a **Partial Width Patch (w)** that is 5 feet wide (in the transverse direction) and is in fair condition, **0326** is recorded as **PD** and **(3 , 2)** is recorded as its associated distresses. As mentioned previously, the extent of this **PD** in the longitudinal direction is the linear referencing length enclosing this **PD** and, therefore, is not part of the **AD Matrix**. The above explanations are applied to any **PD** that has a 2-dimensional **AD Matrix**.

Not every **PD** has two **ADs**. As an example, **PD0341** (**Delaminated Area**) has only one AD as shown below:

TRANSVERSE LENGTH
>0 - 2 ft.
>2 - 3 ft.
>3 - 6 ft.
>6 - 8 ft.
>8 - 12 ft.

The above **AD** is also referred to as the **AD Matrix** of PD0341**.** This AD Matrix measures the

extent (also severity) of this **PD** in the transverse direction, which is shown as the matrix title.

When a **Delaminated area** is identified, the surveyor must determine to which cell of the above **AD Matrix** the associated distress belongs. The Code of this **PD** along with the row number of the identified cell is recorded into a data file. As an example, for a **Delaminated area** that can be enclosed by a rectangle of width **7** feet in the transverse direction, **0341** is recorded as the **PD<code #>** and **(4, -1)** is recorded as its associated distress. The number **-1** is used to indicate that this **PD** has only one **AD.** The above explanations are applied to any **PD** that has only one **AD.**

Some **PDs** do not have an **AD**. As an example, **PD0405** (**Raveling**) is to have **0405** recorded as its **PD<code #>** and **(-1, -1)** recorded as its associated distress. **(-1,-1)** means that the **PD** does not have an **AD**. The above explanations are applied to any **PD** that does not have an **AD**.

6. ASSOCIATED DISTRESS TYPE

Some **PDs** require that a corresponding associated distress type be recorded. Similar to **AD** matrices, MDOT's system has three distinct **AD Type Tables** (displayed below and identified by unique code numbers – referenced later in this document) with each containing multiple AD Type descriptions from which a single one is selected per each PD.

AD 0083:

ASSOCIATED DISTRESS TYPE
Punched Area
None of Above

AD 0082:

ASSOCIATED DISTRESS TYPE
Associated Cracking
Irregular Surface
None of Above

AD 0081:

ASSOCIATED DISTRESS TYPE
D-Cracked

Map Cracking
Spalled
High Steel
Punch Out
Corner Crack
Delamination
None of Above

Remark: This Table revised from document used for 2000-2005 surveys by replacing "Reactive Aggregate" with "Map Cracking".

If **AD Type** identification is required for a **PD**, the surveyor shall utilize the appropriate **AD Table** above (as specified later in this document) and determine the proper cell of the Table to which the observed **AD Type** description belongs. The row number of the identified cell is recorded as **AD Type**. When multiple types of **AD** are observed, the surveyor shall record only the one that is present in the majority.

The data to be recorded for a **PD** are summarized below:

(1) **PD** Code
(2) Row Number of AD Matrix (-1 for not applicable)
(3) Column Number of AD Matrix (-1 for not applicable)
(4) Row Number of AD Type (-1 for not applicable)
(5) ID used to identify the survey screen that just encloses the beginning point of a **PD** (Or **AD** of a **PD**)
(6a) for a transverse-oriented PD, this is the same as (5).
(6b) for a longitudinal-oriented PD, this is the ID used to identify the survey screen that just misses the end point of a PD.

As previously mentioned, (5) and (6b) are used to compute the extent of a **PD** in the longitudinal direction (longitudinal length) through conversion to linear referencing units.

Before providing the detailed **PD** information, the **PD**s to be recorded are listed in **Table 1** for quick reference. Each row of this table has the following information for a **PD**:

Column 1 : PD Code
Column 2 : PD Title
Column 3 : Applicability of a PD to Rigid Pavement
Column 4 : Applicability of a PD to Flexible Pavement

Column 5 : Applicability of a PD to Composite Pavement
Column 6 : Applicability of a PD to CRC Pavement

TABLE 1
PRINCIPAL DISTRESSES (PD)
PD CODE, PD TITLE, AND APPLICABLE PAVEMENT TYPES

PD CODE	PD TITLE	RIGID	FLEX.	COMP.	CRCP
0103	TC (straight)	—	Yes	---	---
0104	TC (irregular)	—	Yes	---	---
0106	Transverse Joint	Yes	---	---	Yes
0110	TC		---	Yes	
0112	TC (open > 1/4 in.)	Yes	---	---	Yes
0113	TC	Yes	---	---	Yes
0114	Transverse Tear	—	Yes	Yes	---
0201	LC - left edge	---	Yes	Yes	---
0202	LC - center of lane	---	Yes	Yes	---
0203	LC - right edge	---	Yes	Yes	---
0204	LC - right WP	---	Yes	Yes	---
0205	LC - left WP	---	Yes	Yes	---
0208	L. Joint - left	Yes	---	---	Yes
0209	L. Joint - right	Yes	---	---	Yes
~~0220~~0234	Alligator Crack - right WP	---	Yes	---	---
~~0221~~0235	Alligator Crack - left WP	---	Yes	---	---
0227	LC (> 1/4 in.) - right WP	Yes	---	---	Yes
0228	LC (> 1/4 in.) - c. of lane	Yes	---	---	Yes
0229	LC (> 1/4 in.) - left WP	Yes	---	---	Yes
0230	LC - right WP	Yes	---	---	Yes
0231	LC - center of lane	Yes	---	---	Yes
0232	LC - left WP	Yes	—	—	Yes
0326	Partial Width Patch (W)	Yes	Yes	Yes	Yes
0327	Partial Width Patch (b)	Yes	Yes	Yes	Yes
0341	Delaminated Area	Yes	---	---	Yes
0342	Map Cracking	Yes	---	---	Yes
0343	High Steel	Yes	---	---	Yes

PD CODE	PD TITLE	RIGID	FLEX.	COMP.	CRCP
0344	**Shattered Area**	**Yes**	**---**		**Yes**
0345	**Block Cracking**	**---**	**Yes**	**---**	**---**
0346	**Refl. Shattered Area**	**---**	**---**	**Yes**	**---**
0402	**Popouts**	**Yes**	**---**	**---**	**Yes**
0403	**Scaling**	**Yes**	**---**	**---**	**Yes**
0405	**Raveling**	**---**	**Yes**	**Yes**	**---**
0406	**Flushing**	**---**	**Yes**	**Yes**	**---**
0501	**No-Distress Area**	**Yes**	**Yes**	**Yes**	**Yes**
0809	**New Pavement Type or New Survey Lane**	**Yes**	**Yes**	**Yes**	**Yes**
0908	**Not Surveyed**	**Yes**	**Yes**	**Yes**	**Yes**

Remark - This Table revised from document used for 2000-2005 surveys by:

1) Changing Code 0201 title from "LC- centerline" to "LC – left edge".
2) Changing Code 0203 title from "LC- edge" to "LC – right edge".
3) Changing Code 0342 title from "Reactive Aggregate" to "Map Cracking".
4) Changing Code 0809 from "New Pavement Type" to "New Pavement Type or New Survey Lane".

PRINCIPAL DISTRESSES

UNDER

THE CURRENT MDOT SURVEY SYSTEM

TRANSVERSE JOINT - PD0106

(Rigid & CRC Pavements)

DEFINITION:

A **Transverse Joint** (**TJ**) is a regularly spaced saw cut which has been sealed across the slab width.

The usual spacing between two **Transverse Joints** is 15, 27, 44, 72, or 99 feet. Note that **Transverse Joints** in **CRCP** may occur at occasional intervals around bridges.

SURVEY:

A **TJ** that has no associated distress shall not be recorded.

Record every observable **TJ** that has associated distress unless the pavement location can be identified as a **Shattered Area** (**PD0344**). In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one of PD per location.

SEVERITY / EXTENT:

The severity of a **Transverse Joint** is estimated by **Transverse Length** and **Maximum Width** of the associated distresses that occurs within 4 feet of the joint.

ASSOCIATED DISTRESS MATRIX: AD_{12} 0001 x 0011

	MAXIMUM WIDTH				
TRANSVERSE LENGTH	***No Distress***	***>0 - 1 ft.***	***>1 - 3 ft.***	***>3 - 6 ft.***	***>6 - 8 ft.***
No Distress		**xxxxxxxxx**	**xxxxxxxx**	**Xxxxxxxx**	**xxxxxxxx**
>0 - 1 ft.	**xxxxxxxx**				
>1 - 3 ft.	**xxxxxxxx**				
>3 - 6 ft.	**xxxxxxxx**				
>6 - 12 ft.	**xxxxxxxx**				

Note that cells marked with xxxxx are not applicable.

ASSOCIATED DISTRESS TYPE: AD_4 0081

TRANSVERSE TEAR - PD0114

(Flexible & Composite Pavements)

DEFINITION:

A **Transverse Tear** is a transverse-oriented short crack (4" to ½ of lane width) that appears in any location across the survey lane.

Note that any such short crack shall not be qualified as a **Transverse Tear** if it can be claimed as **AD** of other **PDs** such as **TC**, **LC**, **Alligator Crack**, and **Block Cracking** for flexible pavement or **TC**, **LC**, and **Reflective Shattered Area** for composite pavement.

SURVEY:

A Transverse Tear PD shall be recorded at locations where the above definition and constraints are observed. For a given mile point location (0.001 mile), if multiple unconnected **Transverse Tears** are present across the lane width (without presence of other PDs listed above), there shall be only one **Transverse Tear** record made for the mile point location.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

TC - PD0113 (Rigid & CRC Pavements)
TC - PD0110 (Composite Pavement)

DEFINITION:

TC stands for a **Transverse Crack** that meets the following criteria:
(1) It extends more in the transverse direction than the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees.
(2) It is visible for at least one half of the lane width.
(3) For **Rigid** and **CRC** pavements, it is not opened up more than 1/4".

SURVEY:

Record every observable **TC** unless the pavement location can be identified as a **Shattered Area** (**PD0344**) for rigid/CRC pavement or **Refl. Shattered Area** (**PD0346**) for composite pavement.

SEVERITY / EXTENT:

The severity of a **TC** is estimated by **Transverse Length** and **Maximum Width** of the associated distresses that occur within 4 feet of the **TC**. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_{12} 0004 x 0011

	MAXIMUM WIDTH				
TRANSVERSE LENGTH	***No Distress***	***>0 - 1 ft.***	***>1 - 3 ft.***	***>3 - 6 ft.***	***>6 - 8 ft.***
No Distress - No Seal		**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**
No Distress - Seal (full)		**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**
No Distress - Seal (part)		**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**
No Distress - Seal (open)		**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**	**xxxxxxxx**
>0 - 1 ft.	**Xxxxxxxx**				
>1 - 3 ft.	**Xxxxxxxx**				
>3 - 6 ft.	**Xxxxxxxx**				
>6 - 12 ft.	**Xxxxxxxx**				

Note that cells marked with xxxxx are not applicable.

ASSOCIATED DISTRESS TYPE: AD_4 0081 for PD0113 (Rigid & CRC pavements)
None for PD0110 (Composite pavement)

TC (straight) - PD0103
TC (irregular) - PD0104
(Flexible Pavement)

DEFINITION:

TC stands for a **Transverse Crack** that meets the following criteria:
(1) It extends more in the transverse direction than the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees.
(2) It must be visible for at least ½ of the lane width.
(3) For **TC (straight)**, crack must be straight for entire length and not change direction. For **TC (irregular)**, crack must change direction as it progresses across the lane.

SURVEY:

Record every observable **TC** unless the pavement area can be identified as a **Block Cracking** (**PD0345**).

SEVERITY / EXTENT:

The severity of a **TC** is estimated by **Transverse Length** & **Maximum Width** of the **ADs** that occur within 2 feet of the **TC**. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_{12} 0004 x 0012

	MAXIMUM WIDTH			
TRANSVERSE LENGTH	***No Distress***	***>0 - 1 ft.***	***>1 - 2 ft.***	***>2 - 4 ft.***
No Distress - No Seal		xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (full)		xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (part)		xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (open)		xxxxxxxx	xxxxxxxx	xxxxxxxx
>0 - 1 ft.	xxxxxxxx			
>1 - 3 ft.	xxxxxxxx			
>3 - 6 ft.	xxxxxxxx			
>6 - 12 ft.	xxxxxxxx			

Note that cells marked with xxxxx are not applicable.

ASSOCIATED DISTRESS TYPE: None

TC (open > 1/4 in.) - PD0112

(Rigid & CRC Pavements)

DEFINITION:

TC (open>1/4 in.) stands for a **Transverse Crack** that meets the following criteria:
(1) It extends more in the transverse direction than the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees.
(2) It is visible for at least one half of the lane width.
(3) It is opened up at least 1/4 in.

SURVEY:

Record every observable **TC (open> ¼ in.)** unless the pavement location can be identified as a **Shattered Area** (**PD0344**).

SEVERITY / EXTENT:

The severity of a **TC (open> ¼ in.)** is estimated by **Transverse Length** and **Maximum Width** of the associated distresses that occur within 4 feet of the TC. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_{12} 0004 x 0011

	MAXIMUM WIDTH				
TRANSVERSE LENGTH	***No Distress***	***>0 - 1 ft.***	***>1 - 3 ft.***	***>3 - 6 ft.***	***>6 - 8 ft.***
No Distress - No Seal		xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (full)		xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (part)		xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
No Distress - Seal (open)		xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
>0 - 1 ft.	xxxxxxxx				
>1 - 3 ft.	xxxxxxxx				
>3 - 6 ft.	xxxxxxxx				
>6 - 12 ft.	xxxxxxxx				

Note that cells marked with xxxxx are not applicable.

ASSOCIATED DISTRESS TYPE: AD_4 0081

L. JOINT (right) - PD0209
L. JOINT (left) - PD0208
(Rigid & CRC Pavements)

DEFINITION:

L. JOINT stands for **Longitudinal Joint**. The above two **PDs** are the right and left **Longitudinal Joints**, respectively, of the survey lane.

A **Longitudinal Joint** is the sawed or formed joint between two lanes or between the pavement lane and shoulder.

SURVEY:

A **Longitudinal Joint** that has no associated distress shall not be recorded.

Record every observable **Longitudinal Joint** that has associated distress unless the pavement area can be identified as a **Shattered Area** (**PD0344**).

SEVERITY / EXTENT:

The severity of a **Longitudinal Joint** is estimated by **Maximum Width** of the associated distresses that occur within 2 feet of the joint. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_1 0012

MAXIMUM WIDTH
No Distress
>0 - 1 ft.
>1 - 2 ft.
>2 - 4 ft.

ASSOCIATED DISTRESS TYPE: AD_4 0081

LC (right WP) - PD0230
LC (center of lane) - PD0231
LC (left WP) - PD0232
LC >1/4 in. (Right WP) - PD0227
LC >1/4 in. (C. of lane) - PD0228
LC >1/4 in. (Left WP) - PD0229
(Rigid & CRC Pavements)

DEFINITION:

LC is a **Longitudinal Crack** and (**>1/4 in.)** means (**open > 1/4 in.)**. Each of the above **PDs** is an **LC** in a location across the survey lane that meets the following criteria:

(1) It extends more in the longitudinal direction than the transverse direction. That is, the angle between the overall crack line and the edge line is less than 45 degrees.
(2) The crack is visible and continuous for at least 5 feet.
(3) For **PD0230** - **PD0232**, the crack is opened up **less than** 1/4 in.
(4) For **PD0227** - **PD0229**, the crack is opened up **at least** 1/4 in.

SURVEY:

Record every observable **LC** unless pavement location can be identified as a **Shattered Area** (**PD0344**). Note that each lane location can have at most one **LC** recorded.

SEVERITY / EXTENT:

The severity of a **LC** is estimated by **Maximum Width** of the associated distresses that occur within 2 feet of the **LC**. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_1 0013

MAXIMUM WIDTH
No Distress - No Seal
No Distress - Seal (full)
No Distress - Seal (part)
No Distress - Seal (open)
>0 - 1 ft.
>1 - 2 ft.
>2 - 4 ft.

ASSOCIATED DISTRESS TYPE: AD_4 0081

LC (left edge) - PD0201
LC (left WP) - PD0205
LC (center of lane) - PD0202
LC (right WP) - PD0204
LC (right edge) - PD0203

(Flexible & Composite Pavements)

DEFINITION:

LC designates **Longitudinal Crack**. Each of the above PDs is an LC for a designated location across the survey lane that meets the following criteria:

(1) It extends more the longitudinally than transversely. That is, the angle between the overall crack line and the edge line is less than 45 degrees.

(2) The crack is visible and continuous for at least 5 feet.

SURVEY:

Record every observable **LC** unless the pavement location can be identified as **Block Cracking (PD0345)** for flexible pavement or **Refl. Shattered Area** (**PD0346**) for composite pavement. Note that each lane location (right WP, left WP and centerline) can have at most one **LC** recorded, including those associated with **Alligator Crack (PD~~0220~~ 0234 and ~~0221~~ 0235),** if it is flexible pavement.

SEVERITY / EXTENT:

The severity of an **LC** is estimated by **Maximum Width** of the associated distresses that occur within 2 feet of the LC. In the case of intersecting transverse and longitudinal cracks and/or joints, an area of associated distress that may be identified with either the longitudinal or transverse PD shall be recorded for only one PD per location.

ASSOCIATED DISTRESS MATRIX: AD_1 0013

MAXIMUM WIDTH
No Distress - No Seal
No Distress - Seal (full)
No Distress - Seal (part)
No Distress - Seal (open)
>0 - 1 ft.
>1 - 2 ft.
>2 - 4 ft.

ASSOCIATED DISTRESS TYPE: None

Remark - This PD description revised from document used for 2000-2005 surveys by:

1) Changing Code 0201 title from “LC- centerline” to “LC – left edge”.
2) Changing Code 0203 title from “LC- edge” to “LC – right edge”.

ALLIGATOR CRACKING (right WP) - PD~~0220~~ 0234
ALLIGATOR CRACKING (left WP) - PD~~0221~~ 0235

(Flexible Pavement)

DEFINITION:

Alligator Cracking is two or more parallel longitudinal cracks (originating in a wheel path – WP) with transverse tears running between them, displaying a pattern similar to an alligator hide. **Alligator Cracking** may extend laterally to other lane locations as severity increases.

SURVEY:

An **Alligator Cracking** PD shall be recorded when the defined condition above is visible for at least 5 feet longitudinally along the pavement unless the location meets the condition definition for **Block Cracking** (**PD0345**). Each lane location (across the lane) may have at most one **LC** or **Alligator Cracking** record per longitudinal pavement location.

SEVERITY / EXTENT:

The severity of **Alligator Cracking** is estimated by the **Maximum Width** of all combined associated distresses occurring within 2 feet from the outermost of the parallel longitudinal cracks. Therefore, **Maximum Width** shall be at least the lateral distance between the two outermost longitudinal cracks (if all visible associated distresses are contained between them).

ASSOCIATED DISTRESS MATRIX: AD_1 ~~0015~~ 0016

MAXIMUM WIDTH
> 1 - 2 ft.
> 2 - 4 ft.
> 4 - 6 ft.

ASSOCIATED DISTRESS TYPE: None

*** Remark: This PD description revised from document used for 2000-2005 surveys:**
The previous matrix structure was 5 rows x 1 column; this new matrix has eliminated the first 2 rows that were in that previous matrix, to become now a 3 row x 1 column structure.

DELAMINATED AREA - PD 0341
MAP CRACKING - PD 0342
HIGH STEEL - PD 0343

(Rigid & CRC Pavements)

DEFINITION:

A **Delaminated Area** is an area that has the following characteristics:

(1) Pieces of concrete are broken out from the surface
(2) The pattern usually begins in a circular shape
(3) The depth must be at least 1" and may reach to the reinforcing steel.

A **Map Cracking** area is typically one with a honeycomb pattern of very tight cracks or intense short (0.5 - 1.0 ft) cracks.

A **High Steel** area shall have at least one of the following characteristics:

(1) Missing concrete observed in the pattern of the reinforcing steel, or
(2) Visible bare steel at the surface.

Note that any of the above PDs shall not be recorded at a given location if some other PD is observed. That is, if there is another observed PD at the same location, the location shall be recorded as that other PD, and the observed delaminated area, map cracked area, or high steel area shall instead be used to measure AD and AD Type (if required) for the other PD.

SURVEY:

A pavement location shall be recorded as a **Delaminated Area**, **Map Cracking** area, or **High Steel** area when the respective definitions above are observed (again, if no other PDs are present).

Note that consecutive, uninterrupted locations observed as any of these three PDs that have the same severity level shall be combined and recorded as one continuous area.

Occasionally, a surveyor may have difficulty judging whether the pavement in a down view survey screen meets the above definitions. The perspective view image must be used in such cases to assist with a decision.

SEVERITY / EXTENT:

The severity of these three **PDs** is estimated by the **Transverse Length** (width of the area in transverse direction) of the qualified area.

DELAMINATED AREA - PD 0341
MAP CRACKING - PD 0342
HIGH STEEL - PD 0343

(Rigid & CRC Pavements)

ASSOCIATED DISTRESS MATRIX: AD_1???? (Undefined yet for internal use)

TRANSVERSE LENGTH
>0 - 2 ft.
>2 - 3 ft.
>3 - 6 ft.
>6 - 8 ft.
>8 - 12 ft.

ASSOCIATED DISTRESS TYPE: None

*** Remark:** This PD description revised from document used for 2000-2005 surveys by changing Code 0342 title from "Reactive Aggregate" to "Map Cracking".

SHATTERED AREA - PD0344

(Rigid & CRC Pavements)

DEFINITION:

A **Shattered Area** typically has a pattern of diagonal and/or looping cracks which may intersect some or all transverse joints/cracks and longitudinal joints/cracks. Typically this distress is caused by a lack of sub-grade support, and is characterized by a broken pattern of multiple individual pavement pieces which may be depressed in relation to the surrounding pavement surface.

SURVEY:

A **Shattered Area** shall be recorded if observation of the pavement location meets the above definition.

Consecutive, uninterrupted pavement locations that meet this definition of a **Shattered Area** shall be combined and recorded as one **Shattered Area**.

Occasionally, a surveyor may have difficulty judging whether the pavement in a pavement down view survey screen meets the above definition. In such a case, the perspective view image must be utilized to assist with a decision.

Note that a pavement location cannot have any other PD recorded when a **Shattered Area** PD is identified.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: AD_4 0083

BLOCK CRACKING - PD0345

(Flexible Pavement)

DEFINITION:

A **Block Cracking** area is where transverse and longitudinal cracking have progressed to a point where blocks less than 12' by 12' in dimension are visible.

The shape of each block may be irregular because it depends on the form of the initial transverse cracking and later induced longitudinal cracking. Therefore, a pavement location shall also be considered as meeting the above definition if it is covered with long and/or short cracks and broken into irregular blocks.

SURVEY:

A **Block Cracking** area shall be recorded if the pavement location meets the above definition and is broken into at least **6** blocks.

Consecutive, uninterrupted pavement locations identified as **Block Cracking** areas shall be combined and recorded as one continuous **Block Cracking** area.

Occasionally, a surveyor may have difficulty judging whether the pavement in a survey screen meets the above definition. In such a case, the perspective view image must be viewed to assist with a decision.

Note that a pavement location cannot have any other PD recorded when a Block Cracking PD is identified.

SEVERITY: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

REFL. SHATTERED AREA - PD0346

(Composite Pavement)

DEFINITION:

The above title stands for **REFLECTIVE SHATTERED AREA**.

This is an area of cracking that reflects a deteriorated area in the underlying concrete pavement. This area has a pattern ranging from small "Y" shaped tears to looping cracks that outline large broken pieces.

SURVEY:

A **Reflective Shattered Area** shall be recorded for pavement locations that meet the above definition.

Consecutive, uninterrupted pavement locations that are identified as **Reflective Shattered Areas** shall be combined and recorded as one **Reflective Shattered Area**.

Occasionally, the surveyor may have difficulty judging whether or not a pavement location meets the above definitions from the down view image alone. In such a case, the surveyor must utilize the perspective view image to assist the decision.

Note that a pavement location cannot have any other PD recorded when a Reflective Shattered Area PD is identified.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

POPOUTS - PD0402

(Rigid & CRC Pavements)

DEFINITION:

A **Popout** is a void in the pavement surface caused by soft material or aggregate absorbing water and then "popping" out of the concrete upon freezing. **Popouts** are typically less than 2" in diameter and resemble a small bowl-shaped depression or crater in the pavement surface.

SURVEY:

A **Popouts** PD shall be recorded when an observed pavement location's average number of **Popouts** per linear foot is one or more.

Consecutive, uninterrupted pavement locations that are identified as **Popouts** areas shall be combined and recorded as one continuous **Popouts** area.

Note that other observed PDs are to be recorded regardless of the presence of **Popouts**.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

SCALING - PD0403

(Rigid & CRC Pavements)

DEFINITION:

An area of **Scaling** is one were the top (smooth finish) layer of concrete is separated and displaced from the aggregate, leaving aggregate exposed and creating a rough surface texture. In general, **Scaling** is caused by exposure, wear, over finishing of the mix, or too much water in the mix.

SURVEY:

A **Scaling** PD shall be recorded when a pavement location has more than 50% of its area covered by the condition stated in the above definition.

Consecutive, uninterrupted pavement locations that are identified as **Scaling** areas shall be combined and recorded as one continuous **Scaling** area.

Note that other observed PDs are to be recorded regardless of the presence of **Scaling**.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

RAVELING - PD0405

(Flexible & Composite Pavements)

DEFINITION:

An area of **Raveling** is one where, in more areas than just the wheel paths, the smooth surface has partially or entirely eroded away, leaving the aggregate in the bituminous mixture exposed and creating a rough surface texture.

Raveling may be caused by low asphalt content, mix segregation, or improper placement technique.

SURVEY:

A **Raveling** PD shall be recorded when the condition described in the above definition covers more than 50% of a pavement location's surface area.

Consecutive, uninterrupted pavement locations that are identified as **Raveling** areas shall be combined and recorded as one continuous **Raveling** area.

Note that other observed PDs are to be recorded regardless of the presence of **Raveling**.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

FLUSHING - PD0406

(Flexible & Composite Pavements)

DEFINITION:

A **Flushing** area is one where the pavement is noticeably darker due to asphalt cement being squeezed to the top of the pavement mixture and deposited on the surface. It usually occurs in the wheel paths and may appear shiny in the perspective view.

Flushing may result from too high an asphalt content for the mixture's void volume.

SURVEY:

A **Flushing** PD shall be recorded when more than 50% of a pavement location's surface area meets the above definition.

Consecutive, uninterrupted pavement locations that are identified as **Flushing** areas shall be combined and recorded as one continuous **Flushing** area.

Note that other observed PDs are to be recorded regardless of the presence of **Flushing**.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

PARTIAL WIDTH PATCH (w) - PD 0326
PARTIAL WIDTH PATCH (b) - PD 0327
(All Pavement Types)

DEFINITION:

The **(w)** and **(b)** in the above titles stand for **white patch (concrete)** and **black patch (asphalt)**, respectively.

A **Partial Width Patch** is a repaired section where the original pavement has been removed and replaced.

A **Partial Width Patch** must be narrower than the full-lane width, and can be any length in longitudinal direction.

SURVEY:

A **Partial Width Patch** PD shall be recorded when a pavement location meets the conditions defined above, with the following exception:

If there is another PD crossing through the patched area, the patch shall not be recorded as a **Partial Width Patch** but, instead, the distresses located within and around the patch shall be treated as AD of the other PD.

Otherwise, the distresses within a **Partial Width Patch** shall **exclusively** be used to estimate and record its condition (Good, Fair, or Poor).

Consecutive, uninterrupted pavement locations that are identified as **Partial Width Patch** areas having the same condition level (Good, Fair, or Poor) shall be combined and recorded as one continuous **Partial Width Patch** area.

SEVERITY / EXTENT:

The extent of a **Partial Width Patch** is the **Transverse Length** (width in the transverse direction across the lane) of the patch itself.

PARTIAL WITH PATCH (w) - PD 0326
PARTIAL WITH PATCH (b) - PD 0327
(All Pavement Types)

SEVERITY / EXTENT: continued

The pavement condition (**Good**, **Fair**, or **Poor**) of a **Partial Width Patch** shall be rated as follows:

GOOD: the patch is unbroken and has less than 3 feet of distresses.
FAIR: the patch is broken into 2 pieces by open cracks or has 3' - 6' of distresses.
POOR: the patch is open or broken into 3 or more pieces by open cracks or has more than 6' of distresses.

ASSOCIATED DISTRESS MATRIX: (unspecified yet for internal use)

	CONDITION		
TRANSVERSE LENGTH	*GOOD*	*FAIR*	*POOR*
0 - 2 ft.			
>2 - 4 ft.			
>4 - 6 ft.			
>6 - 8 ft.			
>8 ft.			

ASSOCIATED DISTRESS TYPE: None

*** Remark:** This AD matrix revised from document used for 2000-2005 surveys by changing last Transverse Length range description from ">8 ft. <12 ft." to ">8 ft.".

NOT SURVEYED - PD0908

(All Pavements)

DEFINITION:

A pavement section that cannot be surveyed due to construction, detouring, poor video images, etc.

SURVEY:

A **NOT SURVEYED** PD shall be recorded for pavement locations meeting the above definition.

Consecutive, uninterrupted pavement locations that are identified as **NOT SURVEYED** areas shall be combined and recorded as one continuous **NOT SURVEYED** area.

Other PDs shall not be recorded in **NOT SURVEYED** areas.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

NEW PAVEMENT TYPE or NEW SURVEY LANE - PD0809

(All Pavements)

DEFINITION:

An indicator of pavement location where the pavement type changes or where the image collection vehicle crosses into a different numbered survey lane (resulting from either an actual vehicle lane shift or from the addition or dropping of a thru lane in the pavement cross section that would redefine the vehicle's current lane number designation).

SURVEY:

This PD shall be recorded at the beginning point of either a pavement type or survey lane designation change. For a survey lane designation change caused by a lateral vehicle shift, the beginning point shall be recorded at the point where the pavement down view image is bisected by the lane line between the previous and new survey lanes.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None

NO DISTRESS - PD0501

(All Pavements)

DEFINITION:

A pavement section that has no observable distress as defined in this manual shall be recorded as a **NO DISTRESS** area.

SURVEY:

A **No Distress** PD shall be recorded at the beginning point of a pavement section meeting the condition stated above.

SEVERITY / EXTENT: None

ASSOCIATED DISTRESS MATRIX: None

ASSOCIATED DISTRESS TYPE: None