PAVEMENT MANAGEMENT INFORMATION SYSTEM

Rater's Manual

FOR FISCAL YEAR 2016

APR. 2015

Pavement Management Information System

Rater's Manual

Fiscal Year 2016

Texas Department of Transportation

April 15, 2015

Training Codes

Pavement Management Information System
Visual Rater Certification Training for:
Flexible Pavement: CON111
Concrete Pavement: CON110

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Foreword

The information in this manual defines the methods for conducting a visual pavement evaluation, as part of the Fiscal Year (FY) 2016 Pavement Management Information System (PMIS) survey. The purpose of the visual survey is to provide data concerning the condition of pavements which can be used by itself or in combination with ride quality, structural adequacy, skid resistance, climate, and traffic data to assist in describing the overall condition of the State-maintained highway system. The PMIS data can also be used to estimate overall pavement maintenance, rehabilitation, and reconstruction needs. PMIS data can also be used to project future needs and the effects of variable funding on pavement condition.

This manual has been developed for use during the FY 2016 PMIS Visual Rater Certification Classes conducted during the summer in various Districts.

Figure 1 – Pavement Distresses

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The condition of pavement surfaces is of interest to the Department since it serves as a direct method for describing the overall condition of the State-maintained highway system. Pavement condition is also an important indicator of the need for rehabilitation. Various types of instruments are used to determine the condition of pavement surfaces. These instruments measure ride quality, structural adequacy, and skid resistance. However, these instruments do not supply all of the information needed to accurately describe a pavement's condition. Thus, it is necessary to visually survey the pavement surface to assess the level of distress and to record these observations in an orderly and consistent method.

Raters Manual

This Rater's Manual defines the methods to be used for conducting visual evaluations of Flexible Pavement, Continuously Reinforced Concrete Pavement (CRCP), and Jointed Concrete Pavement (JCP) sections. The purpose of these evaluations is to provide information that can be used as follows:

1. To develop a numerical rating that describes the condition of the pavement surface. This rating must be consistent so that it is possible to fairly describe pavement condition across these geographical areas:

    a. Maintenance Section
    b. County
    c. District
    d. Statewide

2. To identify pavement sections with the highest need for rehabilitation and to estimate the funding required to restore these sections.

The annual PMIS survey currently consists of three separate surveys: a visual evaluation survey, a ride quality survey, and skid resistance. Other data, such as structural strength may be collected, however, it is not included in the current PMIS analysis procedures.

The Profiler/Rut Bars collect the ride data and the automated rutting data. For the annual data collection cycle the automated rutting data will be collected on all identified sections.

This Rater's Manual describes only the visual evaluation survey. For information on the ride quality, structural strength, and skid resistance surveys contact the Maintenance Division's Pavement Preservation Section (MNT/PPS).

Chapter 2 - PMIS Sections

Figure 3 – Begin Section Reference Marker

PMIS contains more than 195,000 data collection sections which, when combined, make up the entire network of State-maintained highways. On average the PMIS data collection sections are 0.5 mile in length, although some are longer and some are shorter. Locating a PMIS data collection section is the first step in conducting the visual evaluation.

Texas Reference Marker System

1. The Transportation Planning and Programming Division derived the initial Reference Marker Numbers (RMN's) for a highway by imposing a grid on a map of Texas (Figure 5). Grid axes are set on extreme western and northern points, where numbering begins with ten. The first RMN on the route matches the approximate grid location. Subsequent RMN's generally increase by two on non-Interstate.

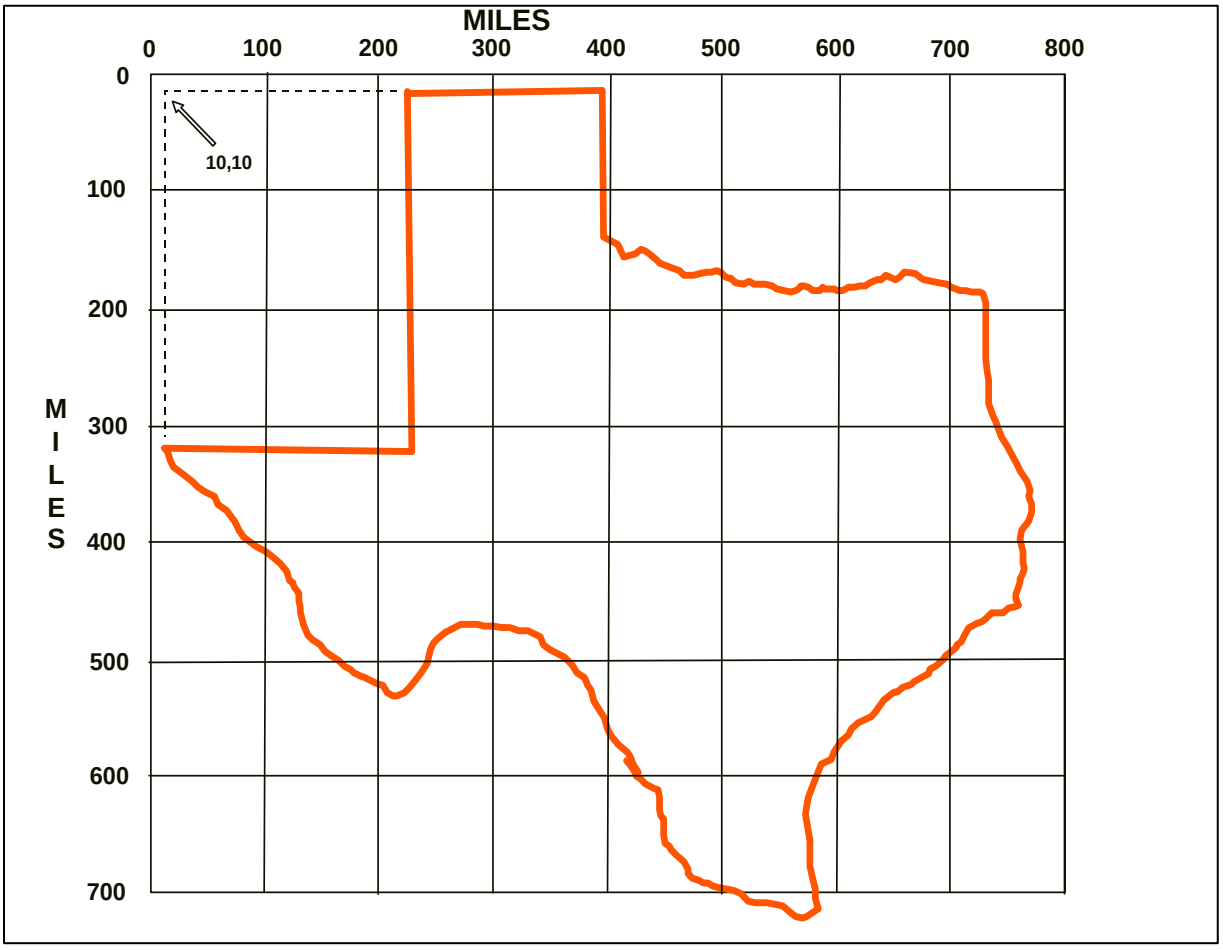

Figure 4 – Reference Marker Grid

2. RMN's increase north to south and west to east, depending on the highway's general direction (except north - south interstates, where numbers increase south to north).

ROUTE DESCRIPTION	RMN INCREASING
INTERSTATE HIGHWAYS	WEST TO EAST SOUTH TO NORTH
US HIGHWAYS	WEST TO EAST NORTH TO SOUTH
STATE HIGHWAYS	
FARM-TO-MARKET ROADS	
BUSINESS ROUTES	
CIRCULAR LOOPS AND SPURS	CLOCKWISE

Figure 5 – Route Directions

3. Non-Interstate highways do not begin with RMN 0 but some number closest to the grid value in (Figure 5). The numbers are continuous from the beginning of the route to the ending of the route. Thus, they do not reset to 0 at county lines (Figure 6).

Figure 6 - Non-Interstate Reference Markers

4. Interstate highway Reference Markers (RM's) are placed every mile on both main lanes of the roadbed (Figure 13). The first RMN at the beginning of the route on the western and southern ends is 0 and continues uninterrupted to the eastern or northern end (Figure 7).

Figure 7 - Interstate highway Reference Markers

5. All routes, regardless of length, must have at least one (1) Reference Marker.

6. For circular routes, the numbering shall be in a clockwise direction. The numbering shall begin with the first interchange west of an imaginary north-south line bisecting the circular route at a radial expressway, freeway, or Interstate route, or some other conspicuous landmark in the circular route near a south polar location.

   a. On Non-Interstate circular routes the reference marker begins with a number closest to the grid value and travel in the clockwise direction.

   b. On Interstate circular routes the reference marker begins with 0 and travel in a clockwise direction.

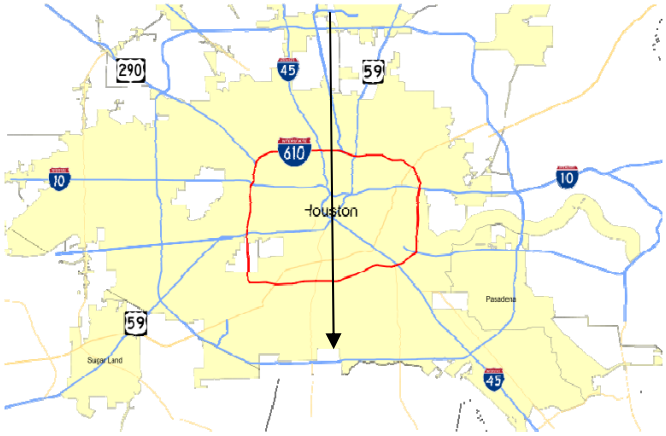

Figure 8 - Circular Routes

7. When a route is moved or realigned, the OLD highway section retains its RMN's. The NEW highway section will continue in succession with the same numbering scheme as the OLD highway section, plus a letter suffix. In the event that the OLD highway section is taken off system, the old marker posts are removed; but the NEW section will have a suffix added.

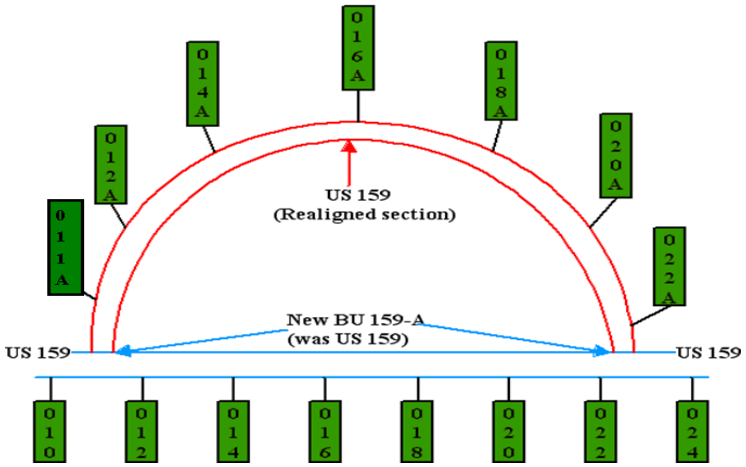

Figure 9 – Route Realignment

8. When one route is concurrent with another route, the RMN for the high order route shall be used (see Table 1). RMN's on major highways should continue uninterrupted. However, RMN's on minor highways may be interrupted at the end of the concurrent route. If concurrent highways have the same prefix, identify the major highway as that having the lower number (e.g. US 183 & US 190 would be rated as "US 183").

Figure 10 - Concurrent Highways

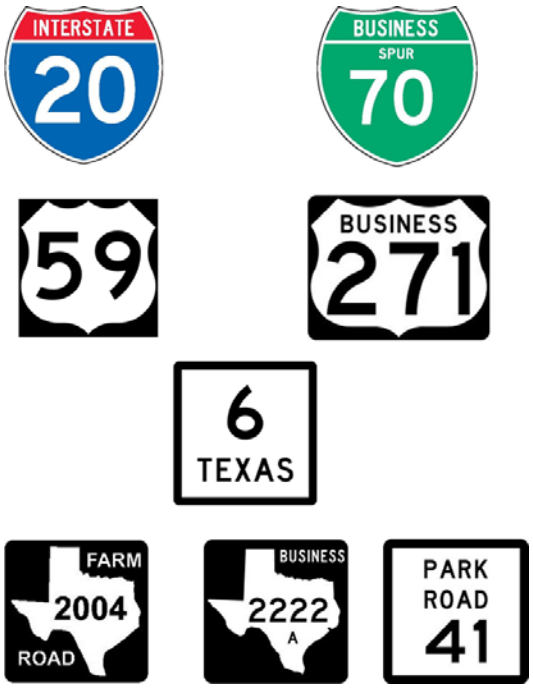

Figure 11 – Route Signs

Routes are ordered from major to minor as follows:

RANKING	ROUTE DESCRIPTION
1.	INTERSTATE HIGHWAY (IH)
2.	US HIGHWAY (US)
3.	STATE HIGHWAY (SH) INCLUDES NASA, OSR
4.	BUSINESS INTERSTATE (BI)
5.	BUSINESS US HIGHWAY (BU)
6.	BUSINESS STATE HIGHWAY (BS)
7.	FARM TO MARKET (FM)
8.	BUSINESS FARM TO MARKET (BF)
9.	PARK ROAD (PR)

Table 1 – Concurrent Highway Rankings

Locating Reference Markers

PMIS sections are identified by using Reference Markers (RM's). Non-Interstate RM's in most cases are located on the highway route sign post just below the Route sign (Figure 3). For consistency, RM's will be spaced at approximately 2-mile intervals on non-interstate highways, but this distance can vary. RM's on Interstate highways will be located at every mile in both directions (Figure 12).

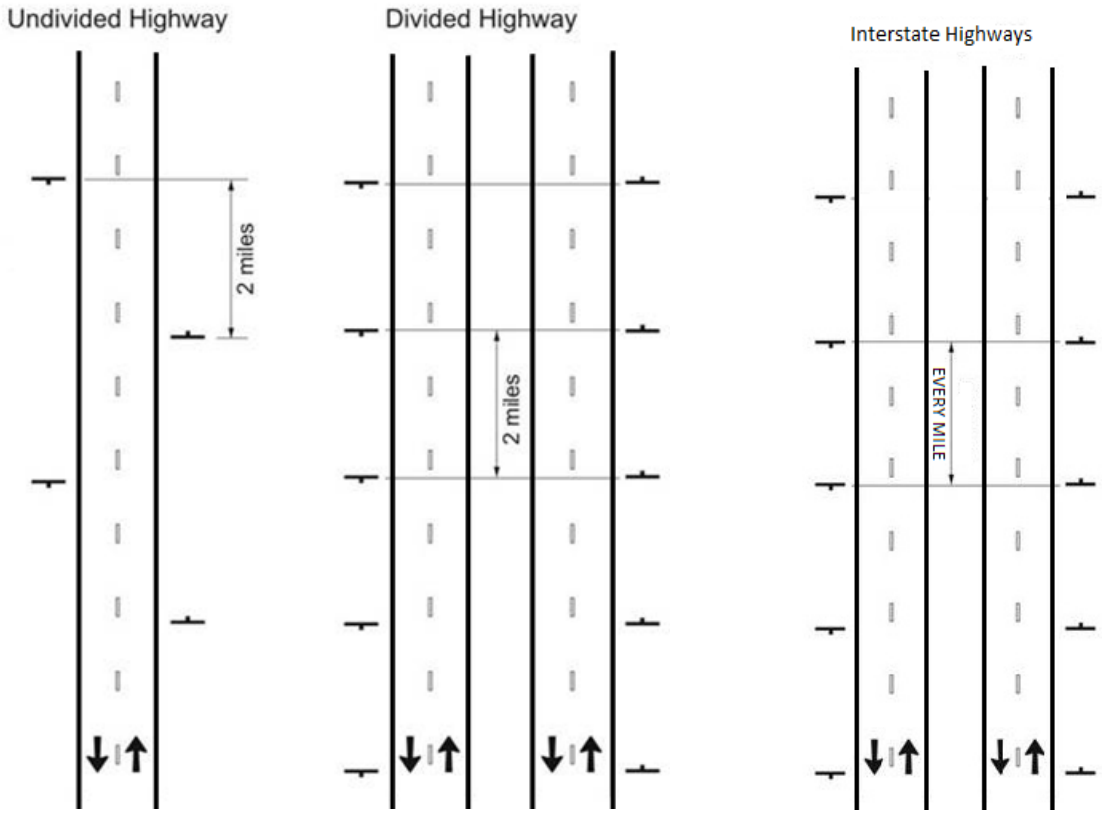

Figure 12 – Reference Maker Intervals

Direction of Increasing Reference Marker Numbers

While traveling on an east-west road, the RMN's will increase only while traveling EAST. This is true for all highways.

East Bound ⟶

While traveling on a north-south road, the RMN's will increase only while traveling SOUTH. This is true for all highways except Interstate highways, whose RMN's increase while traveling NORTH.

South Bound

↓

The RM rules may, at times, appear to be disregarded on some roads, especially the longer cross-state routes. For example, US 59 goes between Texarkana and Laredo, traveling slightly more north-south than west-east so traveling from Texarkana to Laredo the RMN's would be increasing. However, from Laredo to Houston, US 59 travels primarily west-east and the RMN's decrease instead of increase. The reason for this is that US 59 is considered to be a north-south route -- traveling east is assumed to be the same as traveling north, therefore the RMN's are observed to be decreasing.

North/South routes, with long east/west stretch

- US0059 in Laredo: This road goes due east/west in the city, but it is a north to south route, so the markers ascend from east to west in the city.

- US0067 in Brewster and Presidio Counties: This road goes due east/west for 30 miles, but it is a north to south route, so the markers ascend from east to west along this stretch.

West/East routes, with long south/north stretch

- US0062 in Childress and Cottle Counties: This road goes due south/north for 50 miles, but it is a west to east route, so the markers ascend from south to north along this piece.

If a road is found whose RM's do not seem to follow the rules listed above, please contact your District Pavement Management Information System Coordinator or District Pavement Engineer.

RM locations are maintained on Transportation Planning and Programming Division files, and it is essential to the current and future success of the Department's pavement management activities that RM's be consistently placed.

Additional Reference Marker Rules

1. Interstate Highway RM's are located to the right of both main lane roadbeds (i.e. one for the East- or North-bound main lanes and one for the West- or South-bound main lanes). (see Figure 12)

a. There may be incidents where the RM's are mounted on the center median concrete barrier in construction areas.

2. RM's for non-Interstate undivided highways alternate from one side of the road to the other approximately every 2.0 miles. RM's for non-Interstate divided highways should be on both sides of the highway. (see figure 12)

3. The RM system can (and does) have odd numbers on non-Interstate highways.

4. RMN's for Business Routes on north-south Interstate highways will increase in the southbound direction, even though RMN's on the main route will increase in the northbound direction! In all other cases, the direction of increasing RMN's will be the same on the Business Route as it will be for the main route.

PMIS Data Collection Sections

Figure 13 – Interstate Highway Reference Marker

PMIS Standard Report PMIS.201A (more commonly referred to as a section list) lists all of the PMIS data collection sections that must be rated during the survey. Figure 14 contains an excerpt from a Report PMIS.201A. For information on how to run a Report PMIS.201A, please refer to the "PMIS USER MANUAL," available from the Pavement Preservation Section of the Maintenance Division.

Locating PMIS Data Collection Sections

PMIS data collection sections rarely begin or end exactly at a RM. For example, one of the sections on FM0397, roadbed R or L in Williamson County, from RMN 554 +00.0 to RMN 554 +00.3. The beginning RMN '554 +00.0' indicates that the section begins 00.0 miles from RMN 554. The ending RMN '554 +00.3' indicates that the section ends 00.3 miles past RMN 554.

The ending RMN of '554 +00.3' demonstrates that RMN designations in PMIS consist of two parts: a RMN (e.g. '554'), and a displacement (e.g. '+00.3'). In '554 +00.3', the RMN '554' is the actual RMN that can be found in the field. The displacement '+00.3' indicates that the section ends 00.3 miles past RMN 554, in the direction of increasing RMN's. A displacement of '-00.3' would mean that the section ends 00.3 miles before RMN 554, if you were traveling in the direction of increasing RMN's.

It may be helpful to think of a RMN designation like '554 +00.3' as being 'RMN 554 plus 00.3 miles'. Also, RMN '554 -00.3' may be thought of as being 'RMN 554 minus 00.3 miles'. However, these suggestions would be applicable only if traveling in the direction of increasing RMN's.

Beginning RMN 454 -00.1 on BU0079B may indicate the highway starts at a 'T' intersection.

Note the following for the PMIS.201A report.

1. These reports can be submitted for one or multiple districts, various rating types, up to four counties, a responsible maintenance section, a highway system type, a particular highway, or one or various roadbed combinations.

2. The highways are in alphabetical, then numerical, order.

3. The roadbed order is K, R, L, A, X within each highway. It will also list all K's together, R's together, etc. see Figure 15.

4. All RMN's are listed in ascending order, including L and X roadbeds.

PMIS.201A
TEXAS DEPARTMENT OF TRANSPORTATION Sept. 01, 2013 08:39
PMIS PAVEMENT MANAGEMENT INFORMATION SYSTEM (PMIS)
PAVEMENT SECTIONS TO BE RATED
PAGE 1
RATING TYPE : VISUAL SECTIONS TO BE RATED
FISCAL YEAR : 201
RESPONSIBLE DISTRICT: 14 AUSTIN

COUNTY	RESP MSEC	HIGHWAY	RD BD	REFERENCE MARKERS BEGIN	END	PAVE LEN	AUTO TYPE	VISUAL	RIDE	RUTTING	DEFLECT	SKID	UNDER AUDIT	CONST
246 WILLIAMSON	12	BI0035L	K	0422 -00.2	0422 +00.0	0.2	05		X	X			X	
246 WILLIAMSON	12	BI0035L	K	0422 +00.0	0422 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0454 -00.1	0454 +00.0	0.1	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0454 +00.0	0454 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0454 +00.5	0454 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0456 +00.3	0456 +00.8	0.5	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0456 +00.8	0456 +01.3	0.5	05		X	X			X	
246 WILLIAMSON	13	BU0079B	K	0456 +01.3	0458 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0552 +00.0	0552 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0552 +00.5	0552 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0552 +01.0	0552 +01.5	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0554 +00.3	0554 +00.5	0.2	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0554 +00.5	0554 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	K	0554 +01.0	0556 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	R	0552 +01.5	0554 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	R	0554 +00.0	0554 +00.3	0.3	05		X	X			X	
246 WILLIAMSON	13	FM0397	L	0552 +01.5	0554 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FM0397	L	0554 +00.0	0554 +00.3	0.3	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0432 +00.0	0432 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0432 +00.5	0432 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0432 +01.0	0432 +01.5	0.5	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0432 +01.5	0434 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0434 +00.0	0434 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	FS0619	K	0434 +00.5	0434 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	IH0035	R	0250 +00.0	0250 +00.4	0.4	05		X	X			X	
246 WILLIAMSON	13	IH0035	R	0250 +00.4	0251 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	13	IH0035	R	0251 +00.0	0251 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	R	0251 +00.5	0252 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	R	0252 +00.0	0252 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	IH0035	R	0252 +00.5	0253 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	IH0035	R	0253 +00.0	0253 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0250 +00.0	0250 +00.4	0.4	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0250 +00.4	0251 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0251 +00.0	0251 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0251 +00.5	0252 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0252 +00.0	0252 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0252 +00.5	0253 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	12	IH0035	L	0253 +00.0	0253 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	A	0250 +00.4	0251 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	12	IH0035	A	0251 +00.0	0251 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	A	0251 +00.5	0252 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	A	0252 +00.0	0252 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	X	0250 +00.4	0251 +00.0	0.6	05		X	X			X	
246 WILLIAMSON	12	IH0035	X	0251 +00.0	0251 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	12	IH0035	X	0251 +00.5	0252 +00.0	0.5	05		X	X			X	
246 WILLIAMSON	13	US0079	R	0552 +00.0	0552 +00.5	0.5	05		X	X			X	
246 WILLIAMSON	13	US0079	R	0552 +00.5	0552 +01.0	0.5	05		X	X			X	
246 WILLIAMSON	13	US0079	R	0552 +01.0	0552 +01.5	0.5	05		X	X			X	
246 WILLIAMSON	13	US0079	R	0552 +01.5	0552 +01.7	0.2	05		X	X			X	

Figure 14 – Example List of Sections to be Rated (PMIS Standard Report PMIS.201A)

Defining the Rated Lane

When traveling across a PMIS section, rate the lane that has the most distress on each roadbed. For example, undivided highways have only one roadbed. Divided highways have two roadbeds, unless frontage roads are also present. Highways with frontage roads (such as most Interstate highways) may have as many as four roadbeds – rate the most distressed lane in each roadbed. The lane being rated can change from section to section while traveling down the road. For example, switch from lane K1 to K6, or vice-versa, when warranted. Report PMIS.201A lists all the roadbeds to be rated in each PMIS section.

When deciding which lane to rate, the distresses from worst to best (generally) are Failures, Alligator Cracking, Block Cracking, Patching, Longitudinal Cracking and Transverse Cracking.

Acceptable Lane Designation

PMIS accepts a two digit code for the roadbed and lane (one letter & one number) which identifies the rated lane. To select the proper code, face in the direction of increasing Reference Markers and refer to Figure 15. Accepted lane designations are K1 - K5 for increasing Reference Marker direction and K6 - K0 for decreasing Reference Marker direction on 'K' roadbeds. Accepted lane designations for roadbeds 'R', 'L', 'A', and 'X' are R1 - R0, L1 - L0, A1 - A0, and X1 - X0 respectively (Example: R1, R2, R3... R8, R9, R0). The lane designation system will accept a maximum of 10 lanes per roadbed.

Section Location Problems

In some cases, the number of roadbeds or surface type listed for a section on the PMIS.201A may be in error. If such a section is found, please contact your Pavement Management Information System Coordinator or the District Pavement Engineer. It is essential that such sections be identified and corrected through the Transportation Planning and Programming Division, to insure the accuracy of the PMIS and roadway inventory files.

If the section list is in error and shows the road as roadbed 'K', but roadbeds 'R' and 'L' exist in the field, rate the most distressed lane in either 'R' or 'L'. Then designate as the corresponding lane in the K roadbed (e.g. L1 would be designated as K6 and R1 would be designated as K1).

If the section list is in error and shows the road as roadbed 'L' and 'R', but roadbed 'K' exists in the field, rate the most distressed lane on the increasing reference marker side of the 'K' roadbed and the worst lane on the decreasing reference marker side of the 'K' roadbed. Then designate as the corresponding lane in the 'R' and 'L' roadbeds (e.g. K1 would be designated as R1 and K6 would be designated as L1).

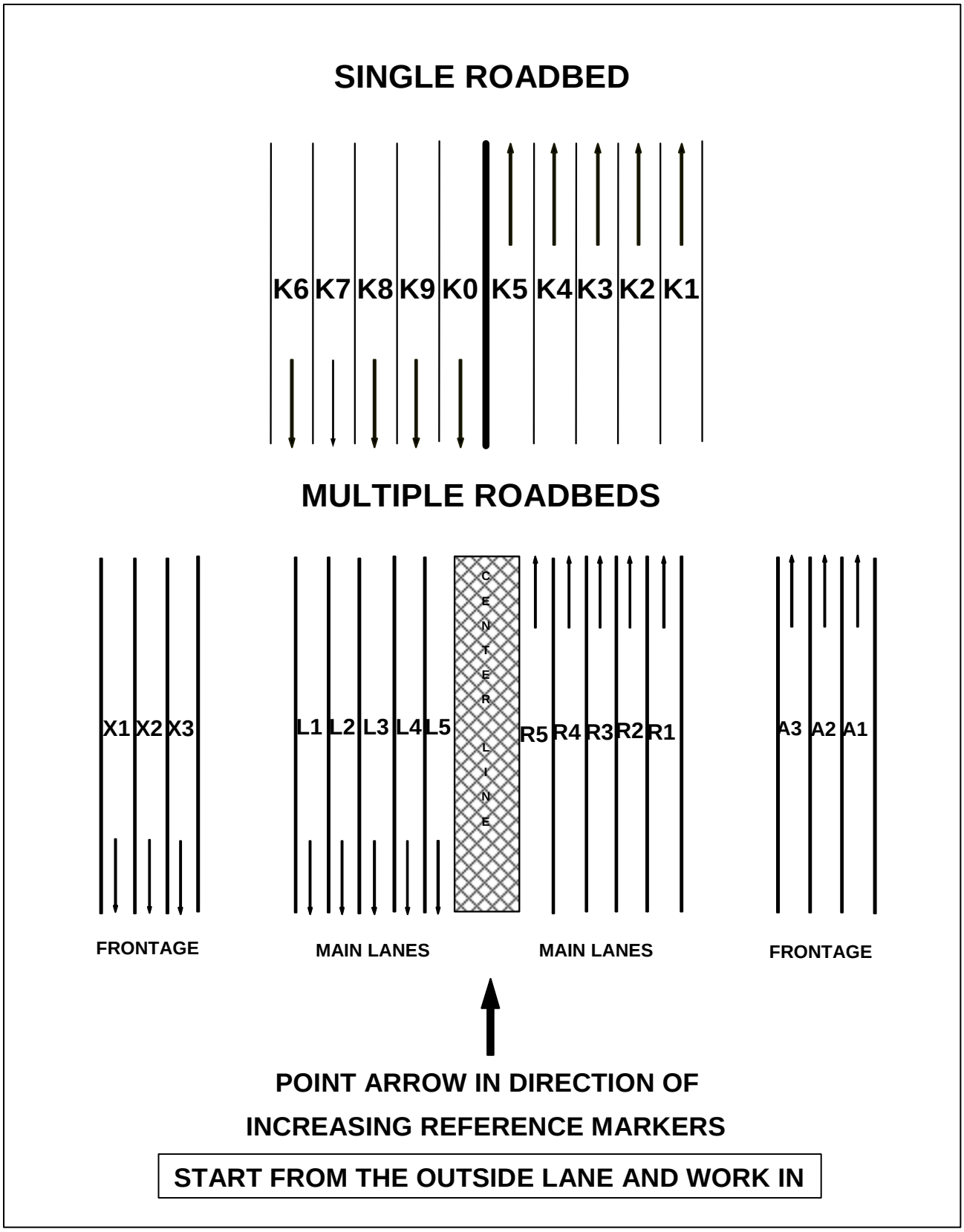

Figure 15 – Identifying the Rated Lane

Chapter 3 - VISUAL EVALUATIONS

Figure 16 – Sealed Longitudinal and Transverse Cracks

Prior to starting the PMIS visual survey, each District should run a Standard Report PMIS.201A or print the Automated Rating Forms. The Report PMIS.201A and the Automated Rating Forms will identify every section required for evaluation. Most of the PMIS sections will be 0.5 mile in length; however some sections may be longer or shorter.

Visual Evaluation Procedure

There are two methods of logging the data collected: 1) a Laptop computer programs, and 2) the Automated Rating Forms.

1. Laptop Computer Programs

   The best and most efficient method of data entry is the laptop computer. The 'VISRATE.EXE' program or the newer PMIS Raters Programs are designed for logging the visual distress data. These programs are available from the Maintenance Division's Pavement Preservation Section (MNT/PPS).

   Before utilizing these programs, a Section List File that contains the sections to be rated should be downloaded from the mainframe. The Section List File is created using a PMIS mainframe program and instructions for creating this file are in the "PMIS USER MANUAL." Refer to the Help screen in 'VISRATE.EXE' for instructions on how to use the Section List File and other general program use information.

   When the data has been keyed into the laptop, the output data file should be submitted to the PMIS database.

   * Save data to a memory drive (Thumb Drive) often after running section in case of system failure*

2. Automated Rating Forms

   Raters should fill out the Automated Rating Forms as a backup to the laptop program in case of data loss by computer malfunction.

   The PMIS has Automated Rating Forms that have much of the data preprinted on them. This should reduce some typographical errors. Refer to the "PMIS USER MANUAL" for producing these forms. Blank forms (1624A, 1625A, 1626A) are located in Appendix B for evaluating sections that have had a broad pavement type change requiring a different evaluation process.

   Examples of the forms are in Appendix B. **Use the Automated Rating Forms for all 'normal' PMIS visual data collection.**

   After the data has been entered on the forms it should be entered into the PMIS using Data Transactions Menu (On-Line). Refer to the "PMIS USER MANUAL" for instructions on how to enter visual data.

If any section is under construction for more than half its length, do not rate it and write 'under construction'. Under construction is defined as follows: If the roadbed is physically being worked on or is not accessible to the rater; or, the rater has knowledge of ensuing maintenance or rehabilitation. If utilizing the laptop program, use comment code 99.

The Visual Evaluation Procedures

The visual evaluation procedure depends on the type of pavement being rated. The two general rating procedures are for 1) Flexible pavements and 2) Rigid pavements. A list of specific pavement types, codes, and comment codes are located in Appendix B on the back of the blank forms.

On Flexible pavement the Raters should travel along the side of the road (with traffic, on the roadbed being rated) at no more than 15 miles per hour, rating the most severely distressed lane, viewing and logging all distresses. Rate only one lane at a time – do not combine ratings from two lanes.

The lane is rated from the outside edge of the edge stripe to the middle of the center stripe. If there is no edge stripe, rate to the predominant edge of the pavement.

If lanes wider than 12 feet are encountered, rate out to 12 feet from the lane stripe or center stripe. At the end of the each PMIS section, raters should enter their section ratings for all of the flexible pavement distress types.

On Rigid pavement sections Continuously Reinforced Concrete Pavement (CRCP) or Jointed Concrete Pavement (JCP) are rated using procedures in chapters 5 and 6. Raters should begin counting distress occurrences at one end of the section, traveling along the edge of the road (with traffic, on the roadbed being rated) at less than 15 miles per hour.

Rate only one lane at a time – do not combine ratings from two lanes. The lane is rated from the outside edge of the edge stripe to the middle of the center stripe.

If lanes wider than 12 feet are encountered, rate out to 12 feet from the lane stripe or center stripe. At the end of each PMIS section, raters should enter their section ratings for all CRCP or JCP distress types.

Safety Information:

Two raters should conduct ratings. One rater cannot see all the distresses and operate the vehicle safely. Both raters should always wear hard hats, reflective safety vests, and safety shoes whenever they are outside of the vehicle.

The rating vehicle should also be equipped with a flashing yellow light (mounted on top or inside of the vehicle) to be operating during the visual evaluation. The blue and yellow strobe combination is also acceptable for use in PMIS rating vehicles and may be desirable for greater visibility in high traffic volume areas.

Most of the rating should be conducted from the outside shoulder of the roadbed, but at times driving in the lane is necessary. When it is a necessity, be sure to move out of the lane when vehicles are approaching in your lane. On high traffic volume roads, it is sometimes best to rate while traffic is heavy and moving very slowly.

Do <u>Not</u> conduct visual evaluations in the rain.

Figure 17 – Rating in the rain

Chapter 4 - FLEXIBLE PAVEMENT

Figure 18 - Flexible Pavement

Flexible pavements are so named because the total pavement structure deflects, or flexes, under loading. A flexible pavement structure is typically composed of several layers of material. Each layer receives the loads from the above layer, spreads them out then passes on these loads to the next layer below.

Distress Types for Flexible Pavement Sections

1.	**RUTTING – SHALLOW (measured by automated rut-measuring device)**
2.	**RUTTING – DEEP (measured by automated rut-measuring device)**
3.	**PATCHING**
4.	**BLOCK CRACKING**
5.	**ALLIGATOR CRACKING**
6.	**LONGITUDINAL CRACKING**
7.	**TRANSVERSE CRACKING**
8.	**RAVELING**
9.	**FLUSHING**
10.	**FAILURES**

Table 2 – Flexible Pavement Distress Types

The rating consists of entering a one, two or three-digit number for each of these ten distress types. The numbers indicate either the area or the amount of each distress that was observed.

The following general guidelines may prove helpful when rating flexible pavement sections:

1. Distance can be measured by using a Distance Measurement Instrument (DMI) or lane stripes. Lane stripes are typically 10 feet long with 30 feet of space between them. As a result, it is 40 feet from the beginning of one stripe to the beginning of the next stripe. This is especially helpful when measuring the length of patches or overlaid areas.

2. Bridge deck surfaces should not be rated. The length of these surfaces should be subtracted from the total length of the section for distress calculation purposes. However, do not change the PMIS section length for sections that have bridges.

3. Do not rate concrete pavement encountered within a flexible pavement section. If the total length of concrete pavement is greater than half the length of the section, the section is rated as a rigid pavement section.

4. The terms ‘wide’ and ‘width’ refer to transverse (across the lane) measurements. The terms ‘long’ and ‘length’ refer to longitudinal (down the lane) measurements.

Rutting

Note: This method of measurement is used only when the automated measurement method is not able to accurately test the pavement or when a 'manual' audit is being performed.

A rut is a longitudinal surface depression in a wheel path (Figures 19 - 22). Rutting in the rated lane may be observed in one or both of the wheel paths.

Consolidation or lateral movement of the pavement materials due to traffic loads causes rutting. Significant amounts of rutting indicate that one or more of the pavement layers is inadequate. Rutting is indicative of a structural problem and may lead to the onset of serious structural failures.

How to Rate Rutting

Rutting is measured throughout the PMIS section using approved methods of measurement: automated rut-measuring devices Texas Module Vehicle (TMV) is used to collect Rut data. At a minimum a 6-foot straight edge or string is used for manual measuring evaluation. Each wheel path is measured separately, but added together to determine the total feet of rutting.

Rutting is rated by area and severity. Area of rutting is measured as a percent of the section's total wheel path area that is rutted. Severity of rutting is described in terms of rut depth.

Shallow Rutting is defined as 0.25 inch to 0.49 inch (Figure 19)

Deep Rutting is defined as 0.5 inch to 0.99 inch (Figure 20)

Severe Rutting is defined as 1.0 inch to 1.99 inches (Figure 21)

Failure Rutting Is defined as 2.0 inches or greater (Figure 22)

Figure 19 – Shallow Rutting

Figure 20 – Deep Rutting

Figure 21 – Severe Rutting

Figure 22 – Failed Rut

After assessing the total feet of deep rutting, use the "**RUTTING & ALLIGATOR CRACKING LOOK-UP TABLE**" on pages 26 or 110 to determine the percent deep rutting area. To use the table, look across the top for the length of the section, then go down that column until the total feet of deep rutting is found. Go across to the left to determine the percentage.

Acceptable Rating Values

Whole numbers (0 - 100%) & blank. PMIS will not accept a sum of shallow and deep rutting greater than 100%. Leave the columns blank or draw a line down the column if shallow rutting is not rated.

Special Cases

1. If rutting is 2.0 inches or greater, measure it's length and rate it as one or more failures. This rutting must be measured manually by the raters.

2. If the rut is less than 2.0 inches, other distress types within the rut are rated separately.

3. If deep rutting exists, then shallow rutting will generally exist adjacent to it.

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **RUTTING OR ALLIGATOR CRACKING**								
1	11	21	32	42	53	63	74	84	95
2	21	42	63	84	106	127	148	169	190
3	32	63	95	127	158	190	222	253	285
4	42	84	127	169	211	253	296	338	380
5	53	106	158	211	264	317	370	422	475
6	63	127	190	253	317	380	444	507	570
7	74	148	222	296	370	444	517	591	665
8	84	169	253	338	422	507	591	676	760
9	95	190	285	380	475	570	665	760	855
10	106	211	317	422	528	634	739	845	950
15	158	317	475	634	792	950	1109	1267	1426
20	211	422	634	845	1056	1267	1478	1690	1901
25	264	528	792	1056	1320	1584	1848	2112	2376
30	317	634	950	1267	1584	1901	2218	2534	2851
35	370	739	1109	1478	1848	2218	2587	2957	3326
40	422	845	1267	1690	2112	2534	2957	3379	3802
45	475	950	1426	1901	2376	2851	3326	3802	4277
50	528	1056	1584	2112	2640	3168	3696	4224	4752
55	581	1162	1742	2323	2904	3485	4066	4646	5227
60	634	1267	1901	2534	3168	3802	4435	5069	5702
65	686	1373	2059	2746	3432	4118	4805	5491	6178
70	739	1478	2218	2957	3696	4435	5174	5914	6653
75	792	1584	2376	3168	3960	4752	5544	6336	7128
80	845	1690	2534	3379	4224	5069	5914	6758	7603
85	898	1795	2693	3590	4488	5386	6283	7181	8078
90	950	1901	2851	3802	4752	5702	6653	7603	8554
95	1003	2006	3010	4013	5016	6019	7022	8026	9029
100	1056	2112	3168	4224	5280	6336	7392	8448	9504

Table 3 – Rutting and Alligator Cracking Look-Up Table

Patching

Patches are repairs made to pavement distress (Figure 23). The presence of patching indicates prior maintenance activity, and is thus used as a general measure of maintenance cost.

Figure 23 – Patching

How to Rate

Patching is rated according to the percentage of the rated lane's total surface area.

All patching is measured throughout the PMIS section and converted to full lane width patching. After assessing the total feet of full lane width patching, use the "**PATCHING & BLOCK CRACKING LOOK-UP TABLE** " on pages 30 or 111 to determine the percent patching area. To use the table, look across the top for the length of the section, then go down that column until the total feet of full lane width patching is found. Go across to the left to determine the percentage.

Acceptable Rating Values

Whole numbers (0 - 100%)

Special Cases for Patching:

1. Other distress types within the patch are rated separately.

2. If a patch meets all of the requirements listed under 'failures', then rate the patch as a failure. Do not rate it as a patch.

3. Level-ups, overlays, seal coats and strip seals are counted as a patch if:

   a. It does not cover the full width of the roadbed (excluding shoulders)

   b. It cover the full width of the roadbed (excluding shoulders), but is less than 500 feet long

   c. If it is longer than 500 feet then it is considered an overlay and not rated as patching

4. If an overlay i.e. full roadbed width greater than 500 feet long and starts in one PMIS section and continues into the next, it is not rated as a patch regardless of the length of overlay in the 'next' PMIS section.

5. Seal coats that cover the full width of the roadbed (excluding shoulders), but do not cover the center stripe, and are greater than 500 feet long, are considered an overlay and not rated as patching.

6. If a PMIS section has many patches that are too small to measure and convert to full lane width, estimate the percentage of the area covered by patching.

7. A patch on an overlay is rated as a patch. The overlay is still considered an overlay and not rated as a patch.

8. A **full lane width hotmix inlay longer than 500 feet is considered an overlay**. Inlays can be distinguished by a milled joint along at least one edge and shows a smooth planar surface expected from a laydown machine and roller.

9. On overlaid concrete pavement, if a concrete patch is encountered, ignore it.

10. Fog seals should only be rated as patching if rock is added to the seal.

11. Full roadbed width patches that are less than 500 feet long and laid adjacent to each other are considered patching, not an overlay.

Special Cases for Patching:

12. If less than 12” from the inside of the lane stripe and or the inside of the edge stripe of a lane and is longer than 500’ it is NOT RATED AS A PATCH but an overlay. (See Figure 24)

Figure 24 – Patching

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **PATCHING OR BLOCK CRACKING**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
15	79	158	238	317	396	475	554	634	713
20	106	211	317	422	528	634	739	845	950
25	132	264	396	528	660	792	924	1056	1188
30	158	317	475	634	792	950	1109	1267	1426
35	185	370	554	739	924	1109	1294	1478	1663
40	211	422	634	845	1056	1267	1478	1690	1901
45	238	475	713	950	1188	1426	1663	1901	2138
50	264	528	792	1056	1320	1584	1848	2112	2376
55	290	581	871	1162	1452	1742	2033	2323	2614
60	317	634	950	1267	1584	1901	2218	2534	2851
65	343	686	1030	1373	1716	2059	2402	2746	3089
70	370	739	1109	1478	1848	2218	2587	2957	3326
75	396	792	1188	1584	1980	2376	2772	3168	3564
80	422	845	1267	1690	2112	2534	2957	3379	3802
85	449	898	1346	1795	2244	2693	3142	3590	4039
90	475	950	1426	1901	2376	2851	3326	3802	4277
95	502	1003	1505	2006	2508	3010	3511	4013	4514
100	528	1056	1584	2112	2640	3168	3696	4224	4752

Table 4 – Patching and Block Cracking Look-Up Table

Block Cracking

Figure 25 — Block Cracking

These cracks form irregular blocks and are the result of age hardening of the asphalt coupled with shrinkage of the asphalt concrete or by shrinkage of cement- or lime-stabilized based courses during cold weather and is not load-associated.

Block cracking consists of interconnecting cracks that divide the pavement surface into approximately rectangular pieces, varying in size from 1 foot by 1 foot up to 10 feet by 10 feet (Figure 25 - 26). Although similar in appearance to alligator cracking, block cracks are much larger.

How to Rate Block Cracking

Block cracking is rated according to the percentage of the rated lane's total surface area. All block cracks, regardless of width, are rated.

All block cracking is measured throughout the PMIS section and converted to full lane width block cracking. After assessing the total feet of full lane width block cracking, use the "**PATCHING & BLOCK CRACKING LOOK-UP TABLE**" on pages 34 or 111 to determine the percent block cracking area. To use the table, look across the top for the length of the section, then go down that column until the total feet of full lane width block cracking is found. Go across to the left to determine the percentage.

Acceptable Rating Values

Whole numbers (0 - 100%) If alligator cracking rating value is 100%, PMIS will not accept a block cracking rating value greater than 50%.

Special Cases for Block Cracking:

1. Do not confuse block cracking with longitudinal and transverse cracking, especially on sections of overlaid concrete. This is called 'reflective' cracking and is rated as longitudinal and transverse cracking. Block cracks can be identified by their irregular shapes. Longitudinal and transverse cracks tend to be very straight, intersecting at near 90-degree angles.

2. If alligator and block cracking are seen together, the alligator cracking is restricted to the wheelpaths. When computing the area of block cracking in this case, subtract any wheelpath areas that contain alligator cracking. For example, if the entire lane contains block cracking, with alligator cracking in both wheelpaths, the rating is for 50% block cracking and 100% alligator cracking. This rating assumes that one wheelpath occupies 25% of the lane's total surface area.

Figure 26 – Block Cracking

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **PATCHING OR BLOCK CRACKING**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
15	79	158	238	317	396	475	554	634	713
20	106	211	317	422	528	634	739	845	950
25	132	264	396	528	660	792	924	1056	1188
30	158	317	475	634	792	950	1109	1267	1426
35	185	370	554	739	924	1109	1294	1478	1663
40	211	422	634	845	1056	1267	1478	1690	1901
45	238	475	713	950	1188	1426	1663	1901	2138
50	264	528	792	1056	1320	1584	1848	2112	2376
55	290	581	871	1162	1452	1742	2033	2323	2614
60	317	634	950	1267	1584	1901	2218	2534	2851
65	343	686	1030	1373	1716	2059	2402	2746	3089
70	370	739	1109	1478	1848	2218	2587	2957	3326
75	396	792	1188	1584	1980	2376	2772	3168	3564
80	422	845	1267	1690	2112	2534	2957	3379	3802
85	449	898	1346	1795	2244	2693	3142	3590	4039
90	475	950	1426	1901	2376	2851	3326	3802	4277
95	502	1003	1505	2006	2508	3010	3511	4013	4514
100	528	1056	1584	2112	2640	3168	3696	4224	4752

Table 5 – Patching and Block Cracking Look-Up Table

Alligator Cracking

Figure 27 – Alligator Cracking

Alligator cracking (**also known as Fatigue cracking, Wheel Path Cracking and Crocodile Cracking**) if formed whenever the pavement surface is repeatedly flexed under traffic loads that is initiated in the wheel paths. As a result, alligator cracking may indicate improper design or weak structural layers. Heavily loaded vehicles may also cause alligator cracking.

Alligator cracking consists of interconnecting cracks which form small, irregularly shaped blocks that resemble the patterns found on an alligator's skin (Figure 27). Blocks formed by alligator cracks are less than 1 foot by 1 foot. Larger blocks are rated as block cracking.

How to Rate Alligator Cracking

Rate the alligator cracking which occurs in the wheelpaths throughout the PMIS section, regardless of the crack's width. The rating value measures the percentage of the rated lane's total wheelpath area that is covered by alligator cracking.

After assessing the total feet of alligator cracking, use the "**RUTTING & ALLIGATOR CRACKING LOOK-UP TABLE**" on pages 37 or 110 to determine the percent alligator cracking area. To use the table, look across the top for the length of the section, then go down that column until the total feet of alligator cracking is found. Go across to the left to determine the percentage.

Acceptable Rating Values

Whole numbers (0 - 100%).

Special Cases for Alligator Cracking:

1. Alligator cracking in a rut or patch is rated as alligator cracking, unless the base layer is exposed or the rutting is 2.0 inches or greater. It will then be rated as a failure.

2. If alligator and block cracking are seen together, the alligator cracking is restricted to the wheel paths. When computing the area of block cracking in this case, subtract any wheel path areas that contain alligator cracking. For example, if the entire lane contains block cracking, with alligator cracking in both wheel paths, the rating is for 50% block cracking and 100% alligator cracking. This rating assumes that one wheel path occupies 25% of the lane's total surface area.

3. A single longitudinal crack in the wheel path, with small 'finger' type cracks protruding, is considered alligator cracking.

4. Alligator cracking is rated as a failure if the base layer is exposed, except that alligator cracking on a thin surface treatment pavement is not a failure if the base layer is exposed but in good condition.

5. If alligator cracking has sealed itself because of hot weather, rate it if there is obvious alligator cracking present.

6. Use Comment Code 60 or 61 when sealed cracks are encountered.

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **RUTTING OR ALLIGATOR CRACKING**								
1	11	21	32	42	53	63	74	84	95
2	21	42	63	84	106	127	148	169	190
3	32	63	95	127	158	190	222	253	285
4	42	84	127	169	211	253	296	338	380
5	53	106	158	211	264	317	370	422	475
6	63	127	190	253	317	380	444	507	570
7	74	148	222	296	370	444	517	591	665
8	84	169	253	338	422	507	591	676	760
9	95	190	285	380	475	570	665	760	855
10	106	211	317	422	528	634	739	845	950
15	158	317	475	634	792	950	1109	1267	1426
20	211	422	634	845	1056	1267	1478	1690	1901
25	264	528	792	1056	1320	1584	1848	2112	2376
30	317	634	950	1267	1584	1901	2218	2534	2851
35	370	739	1109	1478	1848	2218	2587	2957	3326
40	422	845	1267	1690	2112	2534	2957	3379	3802
45	475	950	1426	1901	2376	2851	3326	3802	4277
50	528	1056	1584	2112	2640	3168	3696	4224	4752
55	581	1162	1742	2323	2904	3485	4066	4646	5227
60	634	1267	1901	2534	3168	3802	4435	5069	5702
65	686	1373	2059	2746	3432	4118	4805	5491	6178
70	739	1478	2218	2957	3696	4435	5174	5914	6653
75	792	1584	2376	3168	3960	4752	5544	6336	7128
80	845	1690	2534	3379	4224	5069	5914	6758	7603
85	898	1795	2693	3590	4488	5386	6283	7181	8078
90	950	1901	2851	3802	4752	5702	6653	7603	8554
95	1003	2006	3010	4013	5016	6019	7022	8026	9029
100	1056	2112	3168	4224	5280	6336	7392	8448	9504

Table 6 – Rutting and Alligator Cracking Look-Up Table

Longitudinal Cracking

Figure 28 – Longitudinal Cracking

Longitudinal cracks may occur as a result of poorly constructed paving lane joints, thermal shrinkage, inadequate support or reflection from underlying layers. This differential movement beneath the surface is the primary cause of longitudinal cracking.

Longitudinal cracking consists of cracks or breaks that run approximately parallel to the pavement centerline (Figures 28, 29).

Edge cracks, joint or slab cracks, and reflective cracking on composite pavement (i.e. overlaid concrete pavement) may all be rated as longitudinal cracking.

How to Rate Longitudinal Cracking

Cracks which parallel the centerline may be rated as longitudinal cracks if they:

- are at least 1/8 inch wide (generally, can be seen while seated in the rating vehicle), or
- show evidence of spalling or pumping, or
- have been sealed

Longitudinal cracking is measured in terms of linear feet per station (i.e. average feet of cracking in each 100 feet of surface).

Measure all longitudinal cracks throughout the length of the PMIS section. After assessing the total feet of longitudinal cracking, use the "**LONGITUDINAL CRACKING LOOK-UP TABLE**" on pages 41 or 112 to determine the feet of longitudinal cracking per station. To use the table, look across the top for the length of the section, then go down that column until the total feet of longitudinal cracking is found. Go across to the left to determine the feet per station.

Acceptable Rating Values

Whole numbers (0 - 999 feet per station)

Special Cases for Longitudinal Cracking:

1. Longitudinal cracks on the edge stripe of a lane are to be rated at their full length.
2. Longitudinal cracks on the lane stripe are to be rated at 50% of their length. The other 50% is to be assigned to the adjacent lane.
3. Longitudinal joint or edge cracks (in which there may be two or more distinct cracks within a narrow area) are to be rated individually, not as one longitudinal crack.
4. Do <u>not</u> rate individually sealed longitudinal cracks that are covered with a seal coat.
5. Longitudinal cracking that is greater than 2.0 inches wide is to be rated as a failure. If the greater than 2-inch wide area is longer than 40 feet, rate it as multiple failures.
6. Longitudinal cracking that is faulted greater than 2.0 inches is to be rated as a failure. If the greater than 2-inch faulting area is longer than 40 feet, rate it as multiple failures.
7. Do <u>not</u> rate the longitudinal joint between the concrete curb and the pavement.
8. Self-sealed longitudinal cracks are to be rated.
9. <u>Use Comment Code 60 or 61 when sealed cracks are encountered.</u>

Figure 29 – Longitudinal Cracking

FEET PER STA.	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **LONGITUDINAL CRACKING**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
20	106	211	317	422	528	634	739	845	950
30	158	317	475	634	792	950	1109	1267	1426
40	211	422	634	845	1056	1267	1478	1690	1901
50	264	528	792	1056	1320	1584	1848	2112	2376
60	317	634	950	1267	1584	1901	2218	2534	2851
70	370	739	1109	1478	1848	2218	2587	2957	3326
80	422	845	1267	1690	2112	2534	2957	3379	3802
90	475	950	1426	1901	2376	2851	3326	3802	4277
100	528	1056	1584	2112	2640	3168	3696	4224	4752
110	581	1162	1742	2323	2904	3485	4066	4646	5227
120	634	1267	1901	2534	3168	3802	4435	5069	5702
130	686	1373	2059	2746	3432	4118	4805	5491	6178
140	739	1478	2218	2957	3696	4435	5174	5914	6653
150	792	1584	2376	3168	3960	4752	5544	6336	7128
160	845	1690	2534	3379	4224	5069	5914	6758	7603
170	898	1795	2693	3590	4488	5386	6283	7181	8078
180	950	1901	2851	3802	4752	5702	6653	7603	8554
190	1003	2006	3010	4013	5016	6019	7022	8026	9029
200	1056	2112	3168	4224	5280	6336	7392	8448	9504
↓ 999	5275	10549	15824	21099	26374	31648	36923	42198	47472

Table 7 – Longitudinal Cracking Look-Up Table

Transverse Cracking

Figure 30 – Transverse Cracking

Transverse cracking consists of cracks or breaks which travel at right angles to the pavement centerline (Figures 30, 31). Joint cracks and reflective cracks may also be rated as transverse cracking. Differential movement beneath the pavement surface usually causes transverse cracks. They may also be caused by surface shrinkage due to extreme temperature variations.

How to Rate Transverse Cracking

Cracks which are at right angles to the centerline may be rated as transverse cracks if they:

- are at least 1/8 inch wide (generally, can be seen while seated in the rating vehicle), or
- show evidence of spalling or pumping, or
- have been sealed

Transverse cracking is measured in terms of number per station (i.e. average number of cracks in each 100 feet of surface).

Count all transverse cracks throughout the length of the PMIS section. After assessing the total number of transverse cracks, use the "**TRANSVERSE CRACKING LOOK-UP TABLE**" on pages 45 or 113 to determine the number of transverse cracks per station. To use the table, look across the top for the length of the section, then go down that column until the total number of transverse cracks is found. Go across to the left to determine the number of cracks per station.

Acceptable Rating Values

Whole numbers (0 - 99 per station)

Special Cases for Transverse Cracking:

1. Transverse cracks that do not extend across the full lane width are counted as partial cracks. For example, a 6-foot crack on a 12-foot lane is counted as half a crack.
2. Joint cracks (in which there may be two or more distinct cracks within a narrow area) are to be rated individually, not as one transverse crack.
3. Do <u>not</u> rate individually sealed transverse cracks that are covered with a seal coat.
4. Self-sealed transverse cracks are to be rated.
5. <u>Use Comment Code 60 or 61 when sealed cracks are encountered.</u>

Figure 31 – Transverse Cracking

CRKS. PER STA.	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL NUMBER OF **TRANSVERSE CRACKS**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
11	58	116	174	232	290	348	407	465	523
12	63	127	190	253	317	380	444	507	570
13	69	137	206	275	343	412	480	549	618
14	74	148	222	296	370	444	517	591	665
15	79	158	238	317	396	475	554	634	713
16	84	169	253	338	422	507	591	676	760
17	90	180	269	359	449	539	628	718	808
18	95	190	285	380	475	570	665	760	855
19	100	201	301	401	502	602	702	803	903
20	106	211	317	422	528	634	739	845	950
↓ 99	535	1049	1564	2089	2614	3138	3663	4178	4703

Table 8 – Transverse Cracking Look-Up Table

Raveling

Raveling is the progressive disintegration of the surface due to dislodgment of aggregate particles (Figure 32).

How to Rate Raveling

Rate raveling that occurs anywhere in the lane. The rating code indicates the percent of the rated lane's total surface area. Enter the rating code, not the percentage.

RATING CODE		AMOUNT (PERCENT AREA)
0	NONE	0
1	LOW	1 – 10
2	MEDIUM	11 – 50
3	HIGH	> 50

Table 9 – Rating Codes for Raveling

Acceptable Rating Values

0, 1, 2, or 3

Figure 32 – Raveling

Flushing

Flushing is the presence of asphalt on the pavement surface (Figure 33).

How to Rate Flushing

Rate only flushing that occurs in the wheel paths. The rating code indicates the percent of the rated lane's total wheel path length. Enter the rating code, not the percentage.

RATING CODE		AMOUNT (PERCENT AREA)
0	NONE	0
1	LOW	1 - 10
2	MEDIUM	11 - 50
3	HIGH	> 50

Table 10 – Rating Codes for Flushing

Acceptable Rating Values

0, 1, 2, or 3

Figure 33 – Flushing

FAILURES

Figure 34 – Failed Patch

A failure is a localized section of pavement where the surface has been severely eroded, badly cracked, depressed, or severely shoved (Figures 34 - 36). Failures are important to rate because they identify specific structural deficiencies that may pose safety hazards.

How to Rate Failures

Failed areas longer than 40 feet are considered to be multiple failures. For example, a 70-foot failed area is rated as two failures. Only unrepaired failures are rated. If a failed area has been adequately patched, then it is rated as a patch. However, if a patched area meets the criteria for failures (listed above), the area is rated as a failure, not as a patch.

Raters should count the total number of failures observed along the entire section.

Acceptable Rating Values

Whole numbers (0 – 99) however, due to the severe nature of this distress type, PMIS will issue a warning statement if more than 10 failures are entered. In a 0.5-mile section the maximum possible number of failures is 66. (2640' ÷ 40' = 66)

Special Cases for Failures:

1. Severe alligator cracking is rated as a failure if the base layer is exposed.
2. Alligator cracking is rated as a failure if the base layer is exposed, except that alligator cracking on a thin surface treatment pavement is not a failure if the base layer is exposed but in good condition.
3. Rutting 2.0 inches or greater is rated as a failure. If that rutting is longer than 40 feet, rate it as multiple failures. This rutting must be measured manually by the raters.
4. There can be no more than one failure for each 40 feet of pavement.
5. Other distresses in the same area (transversely across the lane) as a failure are not rated.
6. Pavement edges that are eroding toward the centerline greater than 12 inches from the normal edge (or edge stripe) are rated as failures.
7. On overlaid concrete, reflective cracks that exhibit an obvious punchout underneath indicate a failed area.
8. Longitudinal cracking that is greater than 2.0 inches wide is to be rated as a failure. If the greater than 2-inch wide area is longer than 40 feet, rate it as multiple failures.
9. Longitudinal cracking that is faulted greater than 2.0 inches is to be rated as a failure. If the greater than 2-inch faulting area is longer than 40 feet, rate it as multiple failures.
10. On overlaid flexible or concrete pavements if the “overlay” is missing causing “potholes”, use the pothole size definition in Failures to determine failure rating.
11. Shoving is usually associated with rutting, use the FAILED RUT rule with serve shoving.

Potholes

Most potholes are formed due to fatigue of the road surface. As fatigue fractures develop into what is known as Alligator cracking, chunks of pavement between Alligator cracks are worked loose and eventually are picked out of the surface by continued traffic loads, thus forming a pothole.

Special Cases for Potholes:

1. Unrepaired potholes are not failures if the base layer is exposed but in good condition and is less than 2.0 inches in depth.

2. Unrepaired potholes greater than 4.0 inches but less than 12 inches in diameter and less than 2.0 inches in depth should not be rated as failures.

3. Three potholes greater than 4.0 inches but less than 12 inches in diameter and greater than 2.0 inches in depth in a section are counted as one failure.

4. Unrepaired potholes greater 12 inches in diameter and greater than 2.0 inches in depth with the base layer exposed are counted as one failure for each 40 feet of pavement.

Width/Length	Depth	Exposed Base	Distress Type
0” – 4”	**0” – 2”**	**Yes**	**None**
4” – 12”	**0” – 2”**	**Yes**	**Pothole**
12” or Greater	**2” or Greater**	**Yes**	**Failure**

Table 12 – Pothole Definition

Figure 35 - Thin Surface Treatment Not a Failure

Figure 36 Pothole with exposed base, Failure

Figure 37 – Failures

Figure 38 – Failures

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Chapter 5 - Continuously Reinforced Concrete Pavement (CRCP)

Figure 39 — Continuously Reinforced Concrete Pavement (CRCP) Highway System

Continuously Reinforced Concrete Pavement is a Portland cement concrete (PCC) pavement that has continuous longitudinal steel reinforcement and no intermediate transverse expansion or contraction joints. The pavement is allowed to crack in a random transverse cracking pattern and the cracks are held tightly together by the continuous steel reinforcement.

Distress Types for Continuously Reinforced Concrete Pavement (CRCP) Sections

1.	**SPALLED CRACKS**
2.	**PUNCHOUTS**
3.	**ASPHALT PATCHES**
4.	**CONCRETE PATCHES**
5.	**AVERAGE (TRANSVERSE) CRACK SPACING**

Table 13 – Distress Types for CRCP

The following general guidelines may prove helpful when rating CRCP pavement sections:

1. Distance can be measured by using a Distance Measurement Instrument (DMI) or lane stripes. Lane stripes are typically 10 feet long with 30 feet of space between them. As a result, it is 40 feet from the beginning of one stripe to the beginning of the next stripe. This is especially helpful when checking for average crack spacing as well as when rating punchouts or concrete patches.

2. Bridge deck surfaces should not be rated.

3. Do <u>not</u> rate flexible pavement encountered within a CRCP section. If the total length of flexible pavement is greater than half the length of the section, the section is rated as a flexible pavement section. If part of the section is flexible pavement (but less than half), rate obvious CRCP distresses that can be seen in the flexible pavement overlays or level-ups.

4. Do <u>not</u> rate JCP encountered within a CRCP section. If the total length of Jointed Concrete Pavement (JCP) is greater than half the length of the section, the section is rated as a JCP section.

5. The terms ‘wide’ and ‘width’ refer to transverse (across the lane) measurements. The terms ‘long’ and ‘length’ refer to longitudinal (down the lane) measurements.

6. A general rule while rating concrete pavement is ‘separate distresses are rated separately.’

Spalled Cracks

A spalled crack is a crack that shows signs of chipping on either side, along some or all of its width (Figure 38).

How to Rate Spalled Cracks

A spalled crack must display spalling (i.e. edge chipping or secondary cracking) of greater than 3.0 inches long (on either side of the crack) that covers greater than one foot of the cracks total width across the lane. Rate only the transverse cracks that have spalled. Spalled longitudinal cracks should not be rated.

Enter the total number of spalled cracks observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the left-hand column, then go across to the Average Crack Spacing column and find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

SECT. LEN.	Average Crack Spacing (Feet)																			
(Miles)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0.1	528	264	176	132	105	88	75	66	58	52	48	44	40	37	35	33	31	29	27	26
0.2	999	528	352	264	211	176	150	132	117	105	96	88	81	75	70	66	62	58	55	53
0.3	999	792	528	396	316	264	226	198	176	158	144	132	121	113	105	99	93	88	83	79
0.4	999	999	704	528	422	352	301	264	234	211	192	176	162	150	140	132	124	117	111	105
0.5	999	999	880	660	528	440	377	330	293	264	240	220	203	188	176	165	155	146	138	132
0.6	999	999	999	792	633	528	452	396	352	316	288	264	243	226	211	198	186	176	166	158
0.7	999	999	999	924	739	616	528	462	410	369	336	308	284	264	246	231	217	205	194	184
0.8	999	999	999	999	844	704	603	528	469	422	384	352	324	301	281	264	248	234	222	211

Table 17 – Maximum Values for Spalled Cracks

PMIS will issue a warning statement if more than 500 spalled cracks per mile are entered on the rating form. PMIS will issue an error message if the number of spalled cracks entered is greater than the maximum number of cracks that can exist (based on the section length and average crack spacing). <u>Example:</u> A 0.5 - mile section with a 6-foot average crack spacing can have a maximum of 440 cracks. Entering greater than 440 spalled cracks will cause an error message.

Special Cases

1. A transverse crack with many localized spalled areas may be rated as a spalled crack if the total width of spalling is greater than 1 foot.

2. If a spalled area is filled with asphalt rate the area as a spalled crack. Do <u>not</u> rate the area as a patch.

3. Do <u>not</u> rate a spalled crack which has been adequately repaired with concrete (a 'longer lasting' repair) unless the repair is spalled.

4. If an area is spalled between 2 cracks, rate the area as 2 spalled cracks if the width and length requirements are met.

Figure 40 – Spalled Cracks

Punchouts

A typical punchout is a full depth block of pavement formed when one longitudinal crack crosses two transverse cracks (Figure 39). Although usually rectangular in shape, some punchouts may appear in other shapes.

How to Rate Punchouts

Each of the boundaries of a punchout (except the slab edge, if present) must exhibit either severe spalling or faulting. 'Faulted' means that one edge of the crack is one-quarter-inch or greater higher than the other edge. Load transfer is the key to identifying severely spalled punchout edges. If it is obvious that the slab is not sustaining any of the traffic loads because of the crack, then that crack may be considered as being severely spalled. A punchout must be greater than 12 inches long or wide to be rated as a punchout. If a punchout is observed to be longer than 10 feet, then rate one punchout for each 10 feet of length.

Enter the total number of punchouts observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the top row, then go down to find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

Sect. Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Max. Value	10	20	30	40	50	60	70	80

Table 15 – Maximum Values for Punchouts

Due to the severe nature of this distress type, PMIS will issue a warning statement if more than 50 punchouts per mile are entered on the rating form. PMIS will issue an error message if the number of punchouts entered exceeds 100 per mile.

Special Cases for Punchouts:

1. If two spalled cracks join to form a triangular-shaped punchout, rate only the punchout. Do <u>not</u> rate the two spalled cracks.

2. If an asphalt or concrete patch area meets the criteria for rating as a punchout, rate the area as a punchout. Do <u>not</u> rate the area as a patch.

3. If an 'old' punchout less than 10 feet long has deteriorated into smaller punchouts, rate only the single 'old' punchout. If the 'old' punchout is greater than 10 feet, rate one punchout for every 10 feet of length.

4. If a crack is spalled outside a punchout rate both the punchout and the spalled crack.

5. Two separate punchouts within a 10-foot area are rated as two punchouts.

6. A 'popout' greater than 12 inches wide or long, and greater than 3 inches deep, is rated as a punchout.

7. A longitudinal crack greater than 1 inch wide is rated as a punchout. If the greater than 1-inch wide area is longer than 10 feet, rate one punchout for every 10 feet of length. The longitudinal crack must be greater than 12 inches long to be rated as a punchout.

8. A punchout that is filled in with asphalt (Figure 39, upper right) is rated as a punchout.

Figure 41 – Punchouts

Asphalt Patches

An asphalt patch is a localized area of asphalt concrete which has been placed to the full depth of the surrounding concrete slab, as a temporary method of correcting surface or structural defects (Figure 40).

How to Rate Asphalt Patches

Obviously it is impossible to determine the depth of a patch from a visual survey. Therefore, the following asphalt areas are not to be rated as asphalt patches:

1. Surface spalls or crack spalls
2. Overlays
3. Level-ups

Full-depth asphalt patches are usually cut into the slab, thus the patch is cleanly-shaped into either a square or a rectangle. An asphalt patch must be greater than 12 inches long (the average depth of a CRCP slab) to be rated as an asphalt patch. Width of the patch is not considered. However, long patches are rated as one patch for every 10 feet. For example, a 15-foot asphalt patch is rated as 2 asphalt patches.

Enter the total number of asphalt patches observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the top row, then go down to find the maximum value that can be entered without receiving errors. **This table is only for determining a maximum possible value to avoid errors in the data submission process.**

Sect. Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Max. Value	10	20	30	40	50	60	70	80

Table 16 – Maximum Values for Asphalt Patches

Due to the severe nature of this distress type, PMIS will issue a warning statement if more than 50 asphalt patches per mile are entered on the rating form. PMIS will issue an error message if the number of asphalt patches entered exceeds 100 per mile.

Special Cases for Asphalt Patching:

1. If an asphalt patch contains a spalled transverse crack, rate both the asphalt patch and the spalled crack.
2. If all of the edges of an asphalt patch exhibit spalling or faulting (i.e., meets the criteria for punchouts), rate the area as a punchout. Do not rate the area as an asphalt patch.

3. Keep track of the length covered by full-width asphalt level-ups and overlays. If the total length is greater than half the section length, rate the entire pavement section as a flexible pavement.

Figure 42 – Asphalt Patches

Concrete Patches

A concrete patch (a 'longer lasting' repair) is a localized area of newer concrete which has been placed to the full depth of the existing slab as a method of correcting surface or structural defects (Figures 41 & 42).

How to Rate Concrete Patches

Obviously it is impossible to determine the depth of a patch from a visual survey. However, full-depth concrete patches are usually cut into the slab, thus the patch is cleanly-shaped into either a square or a rectangle. Therefore, rate all cleanly-shaped square or rectangular concrete patches. Irregularly-shaped areas may have to be rated as either spalled cracks or punchouts, depending on their appearance.

A concrete patch must be greater than 12 inches long (the average depth of a CRCP slab) to be rated as a concrete patch. Width of the patch is not considered. However, long patches are rated as one patch for every 10 feet. For example, a 15-foot patch is rated as 2 concrete patches.

The following areas should <u>not</u> be rated as concrete patches:

1. Level-ups and overlays
2. Repaired spalls in good condition

Enter the total number of concrete patches observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the top row, then go down to find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

Sect. Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Max. Value	10	20	30	40	50	60	70	80

Table 17 – Maximum Values for Concrete Patches

Due to the severe nature of this distress type, PMIS will issue a warning statement if more than 50 concrete patches per mile are entered on the rating form. PMIS will issue an error message if the number of concrete patches entered exceeds 100 per mile.

Special Cases Concrete Patching:

1. If a concrete patch contains a spalled transverse crack, rate both the concrete patch and the spalled crack.

2. If a spalled transverse crack has been filled with concrete it is considered repaired, or a patch if it meets the criteria for concrete patching. (Figure 43)

3. If all of the edges of a concrete patch exhibit spalling or faulting (i.e. meets the criteria for punchouts), rate the area as a punchout. Do not rate the area as a concrete patch.

   a. If a punchout is less than half of a 10 foot patch rate both as one punchout and one patch.

4. If one patch has obviously been placed adjacent to an older patch, rate the area as one concrete patch if the total length is less than 10 feet. If the area is longer than 10 feet, rate one patch for every 10 feet of length.

5. A full lane width concrete patch that is longer than 80 feet and continuous pour is not rated as a concrete patch, but considered new pavement.

Figure 43 – Concrete Patches

Figure 44 – Concrete Patches

Average Crack Spacing

Average crack spacing is not, in itself, a pavement distress type (Figure 43). It is rated as a method of obtaining the percentage of transverse cracks that are spalled. However, average crack spacing is valuable as a measure of whether or not the CRCP slab is behaving as designed. A CRCP section with a small average crack spacing may deteriorate rapidly into a series of small punchouts if the proper corrective procedures are not applied.

How to Rate Average Crack Spacing

Use the lane stripe as a guide in measuring average crack spacing. In general it is best to count the total number of transverse cracks observed in two 200-foot areas (beginning and middle of the section), and average the results.

$$Average\ Crack\ Spacing\ = \frac{(2 \times\ 200'(Areas))}{(Total\ Number\ of\ Cracks\ )}$$

Acceptable Rating Values

The possible range of rating values is whole numbers 1 - 75. PMIS will issue an error message if an average crack spacing value of 0 feet or greater than 75 feet is entered.

Special Case Average Crack Spacing:

If there are no cracks found or average crack spacing is greater than 75 feet enter 75 on the rating sheet. An average crack spacing value greater than 10 is very rare.

Figure 45 – Average Crack Spacing

Chapter 6 - Jointed Concrete Pavement (JCP)

Figure 46 – Jointed Concrete Pavement (JCP) Highway System

Jointed plain concrete pavement uses contraction joints to control cracking and does not use any reinforcing steel. Transverse joint spacing is selected such that temperature and moisture stresses do not produce intermediate cracking between joints. This typically results in a spacing of between 15-75ft. Dowel bars are typically used at transverse joints to assist in load transfer. Tie bars are typically used at longitudinal joints.

Distress Types for Jointed Concrete Pavement (JCP) Sections

1.	**FAILED JOINTS AND CRACKS**
2.	**FAILURES**
3.	**SHATTERED (FAILED) SLABS**
4.	**SLABS WITH LONGITUDINAL CRACKS**
5.	**CONCRETE PATCHES**
6.	**APPARENT JOINT SPACING**

Table 18 – Distress Types for JCP

The following general guidelines may prove helpful when rating JCP sections:

1. Distance can be measured by using a Distance Measurement Instrument (DMI) or lane stripes. Lane stripes are typically 10 feet long with 30 feet of space between them. As a result, it is 40 feet from the beginning of one stripe to the beginning of the next stripe. This is especially helpful for checking apparent joint spacing or when measuring punchouts or concrete patches.

2. Bridge deck surfaces should not be rated.

3. Do not rate flexible pavement encountered within a JCP section. If the total length of flexible pavement is greater than half the length of the section, the section is rated as a flexible pavement section. If part of the section is flexible pavement (but less than half), rate obvious JCP distresses that can be seen in the flexible pavement overlays or level-ups.

4. Do not rate CRCP encountered within a JCP section. If the total length of CRCP is greater than half the length of the section, the section is rated as a CRCP section.

5. The terms ‘wide’ and ‘width’ refer to transverse (across the lane) measurements. The terms ‘long’ and ‘length’ refer to longitudinal (down the lane) measurements.

6. A general rule while rating concrete pavement is ‘separate distresses are rated separately.’

Failed Joints and Cracks

JCP transverse joint distresses are called 'failed joints and cracks' covers these distresses cover two major items: spalled joints and transverse cracks, and asphalt patches of spalled joints and transverse cracks (Figures 47 - 48).

How to Rate Failed Joints and Cracks

A failed joint or a spalled crack shows signs of chipping on either side, along some or all of its width. A failed joint or a spalled crack must display spalling (i.e., edge chipping or secondary cracking) of greater than 1.0 inch long (on either side) which covers greater than 1 foot of the crack's total width across the lane. Rate only those transverse cracks or joints that have spalled -- spalled longitudinal cracks should not be rated as failed.

The following types of joints and cracks should not be rated as failed:

1. Wide (long) joints

Enter the total number of failed joints and cracks observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the left-hand column, then go across to the Apparent Joint Spacing column and find the maximum value that can be entered without receiving errors. **This table is only for determining a maximum possible value to avoid errors in the data submission process.**

SECT. LEN.	Apparent Joint Spacing (Feet)																				
(Miles)	15	20	25	26	28	30	32	34	35	36	38	40	42	44	45	50	55	60	65	70
0.1	20	20	20	20	18	17	16	15	15	14	13	13	12	12	11	10	9	8	8	7
0.2	40	40	40	40	37	35	33	31	30	29	27	26	25	24	23	21	19	17	16	15
0.3	60	60	60	60	56	52	49	46	45	44	41	39	38	36	35	31	28	26	24	22
0.4	80	80	80	80	75	70	66	62	60	58	55	52	50	48	46	42	38	35	32	30
0.5	100	100	100	100	94	88	82	77	75	73	69	66	62	60	58	52	48	44	40	37
0.6	120	120	120	120	113	105	99	93	90	88	83	79	75	72	70	63	57	52	48	45
0.7	140	140	140	140	132	123	115	108	105	102	97	92	88	84	82	73	67	61	56	52
0.8	160	160	160	160	150	140	132	124	120	117	111	105	100	96	93	84	76	70	64	60

Table 12 – Maximum Values for Failed Joints and Cracks

PMIS will issue a warning statement if more than 100 failed joints and cracks per mile are entered on the rating form. PMIS will issue an error message if more than 200 failed joints per mile are entered. PMIS will also issue an error message if the number of failed joints and cracks entered is greater than the maximum number of joints or cracks that can exist (based on the section length and apparent joint spacing).

Special Cases Failed Joints and Cracks:

1. If a spalled joint (or crack) has been patched with asphalt concrete, it is rated as a failed joint or crack if the patching is less than or equal to 10 inches long.

2. If a joint (or apparent joint) has spalled on both slabs and both spalls are patched with asphalt or not, rate the area as two failures (one for each slab) only if each patch is greater than 10 inches long and greater than 12 inches wide. If either patch is less than or equal to 10 inches long and greater than 12 inches wide, rate the area as one failed joint and one failure. If both patches are less than or equal to 10 inches long and greater than 12 inches wide, rate the area as one failed joint.

3. If a spalled crack has been patched with asphalt and the patch is more than 10 inches long and greater than 12 inches wide, rate the area as a failure. Do not rate the area as a failed joint.

4. Do not rate a failed joint or crack which has been adequately repaired with concrete unless the repair is spalled.

Figure 47 – Failed Joint and Failures

Figure 48 – Failed Joint and Failures

Figure 49 – Failed Joints and Failures

Figure 50 – Wide (long) Joint (not a failure)

Shattered Slabs

A shattered slab is a slab that is so badly cracked that it warrants complete replacement (Figure 49).

How to Rate Shattered Slabs

If five or more failures are found, or if one or more failures cover more than half of a slab's area, rate the slab as a shattered slab.

1.	**CORNER BREAKS**
2.	**PUNCHOUTS**
3.	**ASPHALT PATCHES**
4.	**FAILED CONCRETE PATCHES**
5.	**D-CRACKING**
6.	**SPALLS (FILLED WITH ASPHALT OR NOT) > 10” LONG AND > 12” WIDE**
7.	**POPOUTS > 12” WIDE OR LONG AND > 3” DEEP**

Table 20 – Failures

Enter the total number of shattered slabs observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the left-hand column, then go across to the Apparent Joint Spacing column and find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

SECT. LEN.	Apparent Joint Spacing (Feet)												
(Miles)	15	20	25	30	35	40	45	50	55	60	65	70	75
0.1	10	10	10	10	10	10	10	10	9	8	8	7	7
0.2	20	20	20	20	20	20	20	20	19	17	16	15	14
0.3	30	30	30	30	30	30	30	30	28	26	24	22	21
0.4	40	40	40	40	40	40	40	40	38	35	32	30	28
0.5	50	50	50	50	50	50	50	50	48	44	40	37	35
0.6	60	60	60	60	60	60	60	60	57	52	48	45	42
0.7	70	70	70	70	70	70	70	70	67	61	56	52	49
0.8	80	80	80	80	80	80	80	80	76	70	64	60	56

Table 21 – Maximum Values for Shattered Slabs

PMIS will issue a warning statement if more than 50 shattered slabs per mile are entered on the rating form. PMIS will issue an error message if more than 100 shattered slabs per mile are entered. PMIS will also issue an error message if the number of shattered slabs entered is greater than the maximum number of slabs that can exist (based on the section length and apparent joint spacing).

Special Cases Shattered Slabs:

1. If five or more failed joints or cracks are found on a slab, rate the failed joints or cracks. Do not rate the slab as a shattered slab. Only failures are considered when deciding if a slab is shattered.

2. If a shattered slab is found, do not rate any other distress type on that slab -- this includes failures.

Figure 51 – Shattered Slab

Slabs with Longitudinal Cracks

A longitudinal crack is a crack that roughly parallels the roadbed centerline (Figure 50).

How to Rate Slabs with Longitudinal Cracks

If a severely spalled or faulted longitudinal crack travels from one transverse joint to the next transverse joint, or from one transverse joint to an edge joint and is over half the slabs length, then rate the slab as having a longitudinal crack. 'Severely spalled' means that the crack has chipped or cracked areas greater than 1.0 inch wide (on either side) for more than half of its length. 'Faulted' means that one edge of the crack is one-quarter-inch or greater higher than the other edge.

Enter the total number of slabs observed with longitudinal cracking.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the left-hand column, then go across to the Apparent Joint Spacing column and find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

SECT. LEN.	Apparent Joint Spacing (Feet)												
(Miles)	15	20	25	30	35	40	45	50	55	60	65	70	75
0.1	10	10	10	10	10	10	10	10	9	8	8	7	7
0.2	20	20	20	20	20	20	20	20	19	17	16	15	14
0.3	30	30	30	30	30	30	30	30	28	26	24	22	21
0.4	40	40	40	40	40	40	40	40	38	35	32	30	28
0.5	50	50	50	50	50	50	50	50	48	44	40	37	35
0.6	60	60	60	60	60	60	60	60	57	52	48	45	42
0.7	70	70	70	70	70	70	70	70	67	61	56	52	49
0.8	80	80	80	80	80	80	80	80	76	70	64	60	56

Table 22 – Maximum Values for Slabs with Longitudinal Cracks

PMIS will issue a warning statement if more than 50 slabs with longitudinal cracks per mile are entered on the rating form. PMIS will issue an error message if more than 100 slabs with longitudinal cracks per mile are entered. PMIS will also issue an error message if the number of slabs with longitudinal cracks entered is greater than the maximum number of slabs that can exist (based on the section length and apparent joint spacing).

Special Cases for Slabs with Longitudinal Cracks:

1. If several severely spalled or faulted sections of a longitudinal crack add up to over half its length, rate the slab as having a longitudinal crack.

2. If a slab is divided into several smaller slabs by 'apparent' joints (i.e. cleanly-defined transverse cracks) and a longitudinal crack with severe spalling or faulting travels from one apparent joint to the next, rate each slab as one slab with longitudinal cracking.

3. If a spalled longitudinal crack has been patched with asphalt, rate the asphalt area as a failure if the patch is greater than 10 inches wide and greater than 12 inches long. Even with the failure, the slab may still qualify for rating as having a longitudinal crack.

4. The number of longitudinal cracks in a slab does not affect the rating.

Figure 52 – Slab with Longitudinal Crack

Concrete Patches

A concrete patch (a 'longer lasting' repair) is a localized area of newer concrete which has been placed to the full depth of the existing slab as a method of correcting surface or structural defects (Figure 51).

How to Rate

It is impossible to determine the depth of a patch from a visual survey. However, full-depth concrete patches are usually cut into the slab, thus the patch is cleanly-shaped into either a square or a rectangle. Therefore, rate all cleanly-shaped square or rectangular concrete patches.

A concrete patch must be greater than 10 inches long (the average depth of a JCP slab) to be rated as a concrete patch. Width of the patch is not considered. However, long patches are rated as one patch for every 10 feet. For example, a 15-foot concrete patch is rated as 2 concrete patches.

The following areas are <u>not</u> rated as concrete patches:

1. Level-ups and overlays
2. Repaired spalls in good condition
3. A patched corner break in good condition

If a concrete patch has spalled or faulted edges all the way around (i.e., meets the criteria for failures), it is rated as a failure.

Enter the total number of concrete patches observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the top row, then go down to find the maximum value that can be entered without receiving errors. **This table is <u>only</u> for determining a maximum possible value to avoid errors in the data submission process.**

Sect. Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Max. Value	20	40	60	80	100	120	140	160

Table 23 – Maximum Values for Concrete Patches

Due to the severe nature of this distress type, PMIS will issue a warning statement if more than 100 concrete patches per mile are entered on the rating form. PMIS will issue an error message if the number of concrete patches entered exceeds 200 per mile.

Figure 53 – Concrete Patches

Special Cases

1. If a concrete patch crosses a joint or an apparent joint, and the joint remains, rate the area as two concrete patches. If the joint has been eliminated, rate the area as one concrete patch if the patch is less than 10 feet.

2. If an old concrete patch of a failed joint or crack is in bad condition, rate the area as a failed joint or crack. Do not rate the area as a concrete patch.

3. If one patch has obviously been placed adjacent to an older patch, rate the area as one concrete patch if the total length is less than 10 feet. If the area is longer than 10 feet, rate one patch for every 10 feet of length.

4. If a complete slab has been replaced do not rate the slab as concrete patches.

Apparent Joint Spacing

Some transverse cracks may become so wide (long) that they look and act like joints. The crack must be greater than ½ inch wide (long) across the complete width of the lane. These 'apparent' joints are important because they serve to divide the original slab into smaller units.

How to Rate

Apparent joint spacing is measured for 200 feet two times (at the beginning and middle) for each section; then average the results. Alternatively, the distance between joints can be measured several times while rating the section.

Acceptable Rating Values

Average apparent joint spacing may range between 15-75. PMIS will issue an error message for entries outside of this range.

Special Case

In some instances longer slabs (60 -75'joint spacing) the apparent joint spacing may vary due to design, weather and or traffic conditions. These slabs will likely divide into smaller slabs and will affect the average apparent joints spacing.

Figure 54 – Apparent Joint Spacing

Failures

Failures are localized areas in which traffic loads do not appear to be transferred across the reinforcing bars (Figures 52 – 59). Failures are typically areas of surface distortion or disintegration.

How to Rate Failures

1.	**CORNER BREAKS**
2.	**PUNCHOUTS**
3.	**ASPHALT PATCHES**
4.	**FAILED CONCRETE PATCHES**
5.	**D-CRACKING**
6.	**SPALLS (FILLED WITH ASPHALT OR NOT) > 10" LONG AND > 12" WIDE**
7.	**POPOUTS > 12" WIDE OR LONG AND > 3" DEEP**

Table 24 – Failures

A **Corner Break** is a crack (which may or may not be spalled or faulted) that travels from a joint to a slab edge. To be rated as a failure, the crack must intersect between 1 foot and half way across each edge, as illustrated in (Figures 53).

A **Punchout** is a block of pavement formed when one longitudinal crack crosses two transverse cracks. Although usually rectangular in shape, some punchouts may appear in other shapes (Figure 54).

Each of the boundaries of a punchout (except the slab edge, if present) must exhibit either spalling or faulting. If a punchout is observed to be longer than 10 feet, then rate one punchout for each 10 feet of length.

1.	**FULL-DEPTH PATCH**
2.	**SHALLOW-DEPTH PATCH OF A CORNER BREAK OR PUNCHOUT**
3.	**ASPHALT PATCH GREATER THAN 10 INCHES LONG AND GREATER THAN 12 INCHES WIDE, WHEN USED TO REPAIR A JOINT, TRANSVERSE CRACK, OR LONGITUDINAL CRACK**

Table 25 – Asphalt Patch Failures

Full-depth asphalt patches are usually cut into the slab, thus the patch is cleanly-shaped into either a square or a rectangle (Figure 55 - 56). An asphalt patch must be greater than 10 inches long (the average depth of a JCP slab) to be rated as a failure. Width of the patch is not considered. However, long patches are rated as one failure for every 10 feet. For example, a 15-foot asphalt patch is rated as 2 failures.

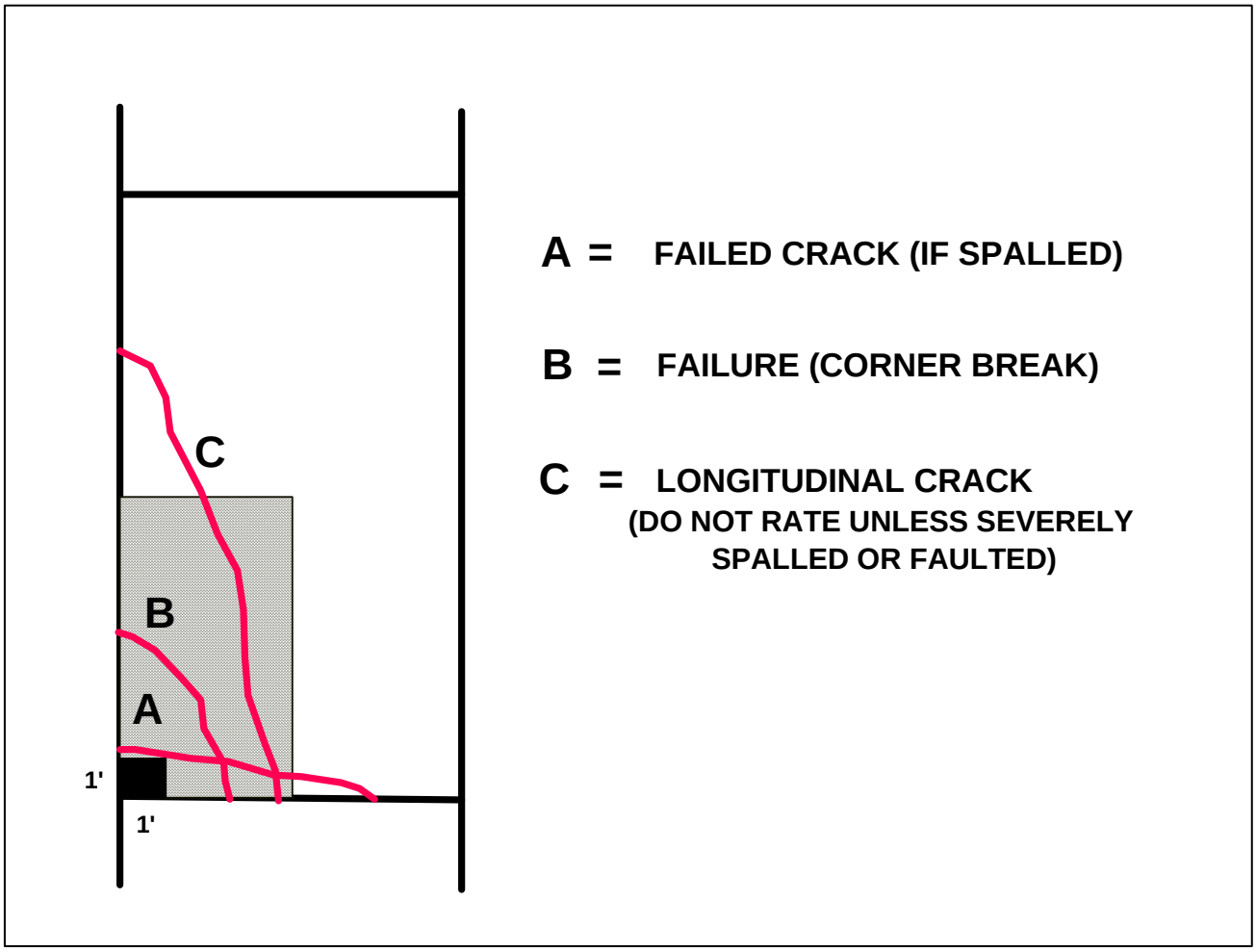

Figure 55 – Illustration of a Corner Break (and other similar cracks)

Shallow-depth asphalt patches of corner breaks and punchouts are usually irregularly shaped. Some of the asphalt may be shoved out of the patch, exposing the original concrete. Thin overlays and level-ups are not shallow-depth patches and thus are not rated as failures.

Concrete Patches that are spalled and/or faulted around all edges are rated as failures (punchouts) not as patches.

D-Cracking is a series of closely spaced crescent shaped hairline cracks which tend to cluster together along joints, slab edges and larger transverse/ longitudinal cracks (Figure 60 -61).

A **Popout** is a piece of pavement missing; forming a hole in the surface of concrete pavement. It can be round or oblong in shape (Figure 59).

Enter the total number of failures observed.

Acceptable Rating Values

Whole numbers 0 – maximum value (refer to table below). To determine the maximum value, find the section length in the top row, then go down to find the maximum value that can be entered without receiving errors. **This table is only for determining a maximum possible value to avoid errors in the data submission process.**

Sect. Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Max. Value	10	20	30	40	50	60	70	80

Table 26 – Maximum Values for Failures

Due to the severe nature of this distress type, PMIS will issue a warning statement if more than 50 failures per mile are entered on the rating form. PMIS will issue an error message if the number of failures entered exceeds 100 per mile.

Special Cases

1. If a crack extends less than 1 foot on either edge, do not rate it as a failure. However, it may qualify to be rated as a failed crack or a slab with longitudinal cracking.

2. If a crack extends more than halfway down the length of the slab edge, do not rate it as anything, unless it is spalled or faulted -- then rate it as one slab with a longitudinal crack.

3. If a joint has spalled on both slabs and both spalls are patched with asphalt, rate the area as two failures (one for each slab) only if each patch is greater than 10 inches long and greater than 12 inches wide. If either patch is less than or equal to 10 inches long and greater than12 inches wide, rate the area as one failed joint and one failure. If both patches are less than or equal to 10 inches long and greater than 12 inches wide, rate the area as one failed joint.

4. If a spalled crack has been patched with asphalt and the patch is greater than 10 inches long, rate the area as a failure. Do not rate the area as a failed crack.

5. If five or more failures are found on one slab, rate the slab as a shattered slab. Do not rate the individual failures.

6. If failures cover more than half of a slab's area, rate the area as one shattered slab.
7. A ‘popout’ greater than 12 inches wide or long and greater than 3 inches deep is rated as a failure.

Figure 56 – Failures (corner breaks)

Figure 57 – Failures (punchouts)

Figure 58 – Failures (asphalt patch)

Figure 59 – Failures (hodge podge)

Figure 60 – Pop-out and Corner Breaks

Figure 61 – Failure (D-cracking)

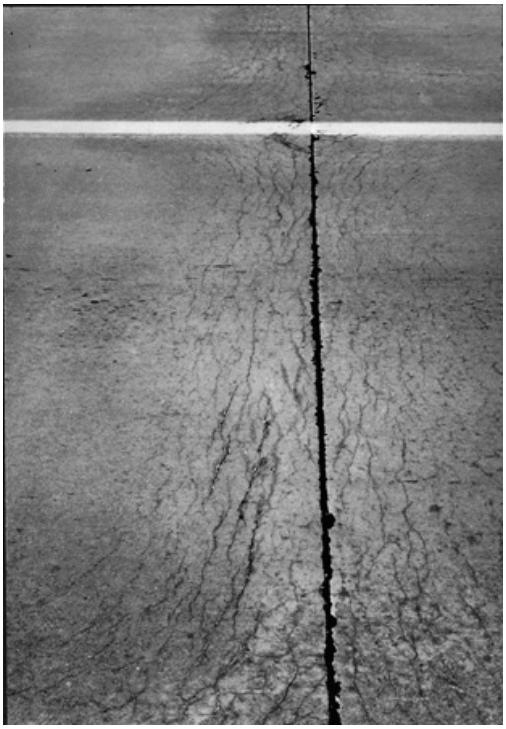

Figure 62 – D - Cracking

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Glossary

ACP

Acronym for **A**sphaltic **C**oncrete **P**avement (Detailed Pavement Types 4-10), also referred to as flexible pavement

Apparent Joint

A transverse cracks greater than ½ inch wide (long) across the complete width of the lane

Audit

A survey used to measure the precision and accuracy of the visual distress survey

Automated Rating Forms

Visual distress rating form produced by a PMIS report that includes the locations of the sections to be rated and spaces for logging the visual distress ratings

Automated Rutting

A computerized device mounted on a van that measures the depth of rutting in the pavement surface at highway speeds

Broad Pavement Type

Identifies the broad category of pavement, the three broad pavement types are:

- Asphaltic Concrete Pavement (ACP)
- Continuously Reinforced Concrete Pavement (CRCP)
- Jointed Concrete Pavement (JCP)

Comment Code

A two digit number used to identify section characteristics observed while rating. These codes are listed in Appendix B on the back of each rating form

County Number

A numerical value assigned (in alphabetical order) to each county in Texas. These are listed by district in Appendix A

CRCP

Acronym for **C**ontinuously **R**einforced **C**oncrete **P**avement (Detail Pavement Type 1)

Data Collection Section

A pavement segment that PMIS uses to summarize pavement evaluation and other pavement related data.

Displacement

The direction and distance (in tenths of a mile) from the Reference Marker

DMI

Acronym for **D**istance **M**easurement **I**nstrument; A device for measuring distances accurately

Faulting (ed)

The difference in elevation from one side of a crack to the other

Failed Joint

A failed joint or a spalled crack shows signs of chipping on either side, along some or all of its width

Fiscal Year

A 12-month period of time from September 1 to August 31, used for accounting purposes

Full Lane Width

The complete width of the lane being rated; from the center stripe to the edge stripe (or normal edge)

Full Roadbed Width

The complete width of the roadbed being rated; from edge stripe (or normal edge) to edge stripe; Does not include the shoulder

JCP

Acronym for **J**ointed **C**oncrete **P**avement (Detailed Pavement Types 2, 3)

Lane

Identifies the part of the roadbed that was rated; the lane is identified by a numeric code. On highways with multiple roadbeds the lane designation numbering will start with '1' from the outside lane in each roadbed. For a highway with a single roadbed the lane designation will number from '1 - 5' from the outside lane facing the increasing Reference Marker direction. They will number from '6 - 0' from the outside lane facing the decreasing Reference Marker direction.

Look-up Table

A table used to determine the percentage, feet per station or cracks per station of a distress. Input to the table is the section length, length (in feet) of distress, or number of cracks found

Pavement Type

Further describes a Broad Pavement Type

- 01 – Continuously Reinforced Concrete Pavement
- 02 – Jointed Reinforced Concrete Pavement
- 03 – Jointed Plain Concrete Pavement
- 04 – Thick Asphaltic Concrete Pavement (greater than 5-1/2")
- 05 – Intermediate Thickness Asphaltic Concrete Pavement(2-1/2" to 5-1/2")
- 06 – Thin Surfaced Flexible Base Pavement (less than 2-1/2")
- 07 – Asphalt Surfacing with Heavily Stabilized Base
- 08 – Overlaid and/or Widened Old Concrete Pavement
- 09 – Overlaid and/or Widened Old Flexible Pavement
- 10 – Thin Surfaced Flexible Base Pavement (Surface Treatment-Seal Coat Combination)

PMIS

Acronym for **P**avement **M**anagement **I**nformation **S**ystem

PMIS Coordinator

The district employee that is responsible for PMIS data collection and reporting activities

Popout

A piece of pavement missing; forming a hole in the surface of concrete pavement; can be round or oblong in shape

Pumping

Base fines are mixed with moisture that comes in through cracks then are forced to the surface through cracks (or joints) in the pavement due to repeated traffic loads. It shows up on the surface as a white powdery substance.

Profiler/ Rut Bar

A data collection system that measures vertical profile for ride quality and has a 5 sensor bar for measuring and reporting rutting summaries while traveling at highway speeds

Reference Marker

Official TxDOT location marker

Roadbed

An alpha code identifying separate roadbeds that constitute a highway; the codes that identify the roadbeds are:

- K – non-divided road
- R – right mainlane road
- L – Left mainlane road
- A – right frontage/service road
- X – left frontage/service road

Seal Coat

A method of patching pavement to seal cracks, increase skid resistance, etc

Shoving

The pavement in the wheelpath is depressed and the base that was under the pavement is displaced or moved to the edge of the lane resulting in a 'hump'

Slab Edge

The longitudinal side of the slab

Spalling

Chipping away of the pavement at the surface edges of a crack

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Appendix A – List of Districts and Counties

DISTRICT 1
(Paris)
60 Delta
75 Fannin
81 Franklin
92 Grayson
113 Hopkins
117 Hunt
139 Lamar
190 Rains
194 Red River

DISTRICT 2
(Fort Worth)
73 Erath
112 Hood
120 Jack
127 Johnson
182 Palo Pinto
184 Parker
213 Somervell
220 Tarrant
249 Wise

DISTRICT 3
(Wichita Falls)
5 Archer
12 Baylor
39 Clay
49 Cook
169 Montague
224 Throckmorton
243 Wichita
244 Wilbarger
252 Young

DISTRICT 4
(Amarillo)
6 Armstrong
33 Carson
56 Dallam
59 Deaf Smith
91 Gray
99 Hansford
104 Hartley
107 Hemphill
118 Hutchinson
148 Lipscomb
171 Moore
179 Ochiltree
180 Oldham
188 Potter
191 Randall
197 Roberts
211 Sherman

DISTRICT 5
(Lubbock)
9 Bailey
35 Castro
40 Cochran
54 Crosby
58 Dawson
78 Floyd
84 Gaines
86 Garza
96 Hale
111 Hockley
140 Lamb
152 Lubbock
153 Lynn
185 Parmer
219 Swisher
223 Terry
251 Yoakum

DISTRICT 6
(Odessa)
2 Andrews
52 Crane
69 Ector
151 Loving
156 Martin
165 Midland
186 Pecos
195 Reeves
222 Terrell
231 Upton
238 Ward
248 Winkler

DISTRICT 7
(San Angelo)
41 Coke
48 Concho
53 Crockett
70 Edwards
88 Glasscock
119 Irion
134 Kimble
164 Menard
192 Reagan
193 Real
200 Runnels
207 Schleicher
216 Sterling
218 Sutton
226 Tom Green

DISTRICT 8
(Abilene)
17 Borden
30 Callahan
77 Fisher
105 Haskell
115 Howard
128 Jones
132 Kent
168 Mitchell
177 Nolan
208 Scurry
209 Shackelford
217 Stonewall
221 Taylor

DISTRICT 9
(Waco)
14 Bell
18 Bosque
50 Coryell
74 Falls
98 Hamilton
110 Hill
147 Limestone
161 McLennan

DISTRICT 10
(Tyler)
1 Anderson
37 Cherokee
93 Gregg
108 Henderson
201 Rusk
212 Smith
234 Van Zandt
250 Wood

DISTRICT 11
(Lufkin)
3 Angelina
114 Houston
174 Nacogdoches
187 Polk
202 Sabine
203 San Augustine
204 San Jacinto
210 Shelby
228 Trinity

DISTRICT 12
(Houston)
20 Brazoria
80 Fort Bend
85 Galveston
102 Harris
170 Montgomery
237 Waller

DISTRICT 13
(Yoakum)
8 Austin
29 Calhoun
45 Colorado
62 DeWitt
76 Fayette
90 Gonzales
121 Jackson
143 Lavaca
158 Matagorda
235 Victoria
241 Wharton

DISTRICT 14
(Austin)
11 Bastrop
16 Blanco
27 Burnett
28 Caldwell
87 Gillespie
106 Hays
144 Lee
150 Llano
157 Mason
227 Travis
246 Williamson

DISTRICT 15
(San Antonio)
7 Atascosa
10 Bandera
15 Bexar
46 Comal
83 Frio
95 Guadalupe
131 Kendall
133 Kerr
162 McMullen
163 Medina
232 Uvalde
247 Wilson

DISTRICT 16
(Corpus Christi)
4 Aransas
13 Bee
89 Goliad
126 Jim Wells
129 Karnes
137 Kleberg
149 Live Oak
178 Nueces
196 Refugio
205 San Patricio

DISTRICT 17
(Bryan)
21 Brazos
26 Burleson
82 Freestone
94 Grimes
145 Leon
154 Madison
166 Milam
198 Robertson
236 Walker
239 Washington

DISTRICT 18
(Dallas)
43 Collin
57 Dallas
61 Denton
71 Ellis
130 Kaufman
175 Navarro
199 Rockwall

DISTRICT 19
(Atlanta)
19 Bowie
32 Camp
34 Cass
103 Harrison
155 Marion
172 Morris
183 Panola
225 Titus
230 Upshur

DISTRICT 20
(Beaumont)
36 Chambers
101 Hardin
122 Jasper
124 Jefferson
146 Liberty
176 Newton
181 Orange
229 Tyler

DISTRICT 21
(Pharr)
24 Brooks
31 Cameron
109 Hildago
125 Jim Hogg
66 Kenedy
214 Starr
245 Willacy
253 Zapata

DISTRICT 22
(Laredo)
64 Dimmit
67 Duval
136 Kinney
142 La Salle
159 Maverick
233 Val Verde
240 Webb
254 Zavala

DISTRICT 23
(Brownwood)
25 Brown
42 Coleman
47 Comanche
68 Eastland
141 Lampasas
160 McCulloch
167 Mills
206 San Saba
215 Stephens

DISTRICT 24
(El Paso)
22 Brewster
55 Culberson
72 El Paso
116 Hudspeth
123 Jeff Davis
189 Presidio

DISTRICT 25
(Childress)
23 Briscoe
38 Childress
44 Collingsworth
51 Cottle
63 Dickens
65 Donley
79 Foard
97 Hall
100 Hardeman
135 King
138 Knox
173 Motley
242 Wheeler

Appendix B – Rating Forms:

Automated Flexible, CRCP, JCP

Blank Flexible, CRCP, JCP

Pavement Types & Comment Codes

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PMIS.203D TEXAS DEPARTMENT OF TRANSPORTATION SEPTEMBER 1, 2014 11:41
PMIS PAVEMENT MANAGEMENT INFORMATION SYSTEM (PMIS)
AUTOMATED RATING FORM PAGE 1
FLEXIBLE PAVEMENT EVALUATION

DISTRICT NO. RATER 1 RATER 2 MONTH DAY YEAR

14 _____ _____ ___ ___ ___

COUNTY: 227 RUTTING
COUNTY NAME: TRAVIS SHALLOW DEEP PTH FAL BLK ALG LNG TRN RAV FLU
LIN
.25-.5 >.5-1.0 FT. NO.
SECT PVMNT INCHES INCHES PER PER
REFERENCE MARKER LENGTH CMNT TYPE % % % TOTAL % % 100' 100'
HIGHWAY FROM TO LANE OLD NEW CODE OLD NEW AREA AREA AREA NO. AREA AREA STA. STA.

IH0035 0222 +00.0 0222 +00.5 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0222 +00.5 0223 +00.0 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0223 +00.0 0223 +00.5 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0223 +00.5 0224 +00.0 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0224 +00.0 0224 +00.6 R _ 0.6 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0224 +00.6 0224 +00.7 R _ 0.1 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0224 +00.7 0225 +00.0 R _ 0.3 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0225 +00.0 0225 +00.5 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0225 +00.5 0225 +00.9 R _ 0.4 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0225 +00.9 0226 +00.0 R _ 0.1 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0226 +00.0 0226 +00.5 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CMNT:_____
IH0035 0226 +00.5 0227 +00.0 R _ 0.5 ___ __ 05 __ ___ ___ ___ __ ___ ___ ___ __ _ _

CONTINUOUS REINFORCED CONCRETE PAVEMENT EVALUATION

DISTRICT NO. RATER 1 RATER 2 MONTH DAY YEAR

12 _____ _____ ___ ___ ___

COUNTY: 102
COUNTY NAME: HARRIS

HIGHWAY	REFERENCE FROM	REFERENCE TO	SECT MARKER LANE	PVMNT LENGTH OLD	PVMNT LENGTH NEW	CMNT TYPE CODE	SPALL CRACK TOTAL OLD	PUNCH OUTS TOTAL NEW	ASPHT PATCH NO.	CONCR PATCH NO.	AVG CRACK SPACE NO.	CRACK TOTAL FEET
IH0610	0000 +00.0	0000 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0000 +00.5	0001 +00.0	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0001 +00.0	0001 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0002 +00.0	0002 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0002 +00.5	0003 +00.0	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0003 +00.0	0003 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0003 +00.5	0004 +00.0	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0004 +00.0	0004 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0004 +00.5	0004 +00.9	R _	0.4	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0006 +00.0	0006 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0006 +00.5	0007 +00.0	R _	0.5	___	__	01	01	___	___	___	___	__
CMNT:_____													
IH0610	0007 +00.0	0007 +00.5	R _	0.5	___	__	01	01	___	___	___	___	__

JOINTED CONCRETE PAVEMENT EVALUATION

DISTRICT NO. RATER 1 RATER 2 MONTH DAY YEAR

18 _____ _____ ___ ___ ___

COUNTY: 071 FAILD SLABS
COUNTY NAME: ELLIS JOINT WITH
AND SHATT LONG CONCR JOINT
CRACK FAILS SLABS CRACK PATCH SPACE
SECT PVMNT
REFERENCE MARKER LENGTH CMNT TYPE TOTAL TOTAL TOTAL TOTAL TOTAL
HIGHWAY FROM TO LANE OLD NEW CODE OLD NEW NO. NO. NO. NO. NO. FEET

IH0035E 0397 +00.3 0397 +00.8 R _ 0.5 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0397 +00.8 0398 +00.0 R _ 0.2 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0398 +00.0 0398 +00.4 R _ 0.4 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0398 +00.4 0399 +00.0 R _ 0.6 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0399 +00.0 0399 +00.5 R _ 0.5 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0399 +00.5 0400 +00.0 R _ 0.5 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0400 +00.0 0400 +00.5 R _ 0.5 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0400 +00.5 0401 +00.0 R _ 0.5 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0401 +00.0 0401 +00.4 R _ 0.4 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0401 +00.4 0401 +00.6 R _ 0.2 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0401 +00.6 0401 +00.9 R _ 0.3 ___ __ 02 __ ___ ___ ___ ___ ___ __

CMNT:_____
IH0035E 0401 +00.9 0402 +00.0 R _ 0.1 ___ __ 02 __ ___ ___ ___ ___ ___ __

Texas Department of Transportation

Form 1624A
Rev. 4/93
Previous versions are obsolete.

TEXAS PAVEMENT MANAGEMENT INFORMATION SYSTEM
FLEXIBLE PAVEMENT EVALUATION

SYSTEM – ID	CARD – ID	DIST. NO.	RATER 1	RATER 2	MONTH	DAY	YEAR
V I S 1 2 3	A I 4 5	6 7	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51	52 53	54 55	56 57

SYSTEM – ID (V I S / 1 2 3) **CARD – ID** (A 2 / 4 5)

SYSTEM – ID/CARD – ID should be entered in columns 1-5 of each data line.

LOCATION

- COUNTY NUMBER
- HIGHWAY: PREFIX, NUMBER, SUFFIX
- FROM: REFERENCE MARKER, SUFFIX, I +, DISPLACEMENT
- TO: REFERENCE MARKER, SUFFIX, I +, DISPLACEMENT
- ROADBED LANE
- SECTION LENGTH
- COMMENT CODE
- PAVEMENT TYPE

PAVEMENT DISTRESS

- RUTTING: SHALLOW (1/2"–1"), DEEP (➤1"–3"), % AREA
- PATCHING: % AREA
- FAILURES: TOTAL NO.
- CRACKING: BLOCK (% AREA), ALLIGATOR (% AREA), LONGITUDINAL (LIN. FT. PER 100' STA.), TRANSVERSE (NO. PER 100' STA.)
- RAVELING
- FLUSHING

COMMENTS/NOTES

NOTE:
Zeroes should be inserted in appropriate pavement distress column if no visual defect is noted.

Raveling and Flushing are optional fields.
0 – None
1 – Low
2 – Medium
3 – High

6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Texas Department of Transportation

Form 1625A
Rev. 4/93
Previous versions are obsolete.

TEXAS PAVEMENT MANAGEMENT INFORMATION SYSTEM
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT EVALUATION

SYSTEM – ID	CARD – ID	DIST. NO.	RATER 1	RATER 2	MONTH	DAY	YEAR
V I S	C I						
1 2 3	4 5	6 7	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51	52 53	54 55	56 57

SYSTEM – ID (V I S / 1 2 3) **CARD – ID** (C 2 / 4 5)

SYSTEM – ID/CARD – ID should be entered in columns 1-5 of each data line.

COMMENTS/NOTES

NOTE:
Zeroes should be inserted in appropriate pavement distress column if no visual defect is noted.

LOCATION															PAVEMENT DISTRESS					
	HIGHWAY		FROM				TO										PATCHES			
COUNTY NUMBER	PREFIX	NUMBER	SUFFIX	REFERENCE MARKER	SUFFIX	I +	DISPLACEMENT	REFERENCE MARKER	SUFFIX	I +	DISPLACEMENT	ROADBED LANE	SECTION LENGTH	COMMENT CODE	PAVEMENT TYPE	SPALLED CRACKS	PUNCHOUTS	ASPHALT	CONCRETE	AVERAGE CRACK SPACING
																TOTAL NO.	TOTAL NO.	TOTAL NO.	TOTAL NO.	FEET
															01					
															01					
															01					
															01					
															01					
															01					
															01					
															01					
															01					
															01					
6 7 8	9 10 11 12 13 14 15			16 17 18 19 20		21	22 23 24	25 26 27 28 29		30	31 32 33	34 35	36 37	38 39	40 41	42 43 44	45 46 47	48 49 50	51 52 53	54 55

Texas Department of Transportation

Form 1626A
Rev. 4/93
Previous versions are obsolete.

TEXAS PAVEMENT MANAGEMENT INFORMATION SYSTEM
JOINTED CONCRETE PAVEMENT EVALUATION

SYSTEM – ID	CARD – ID	DIST. NO.	RATER 1	RATER 2	MONTH	DAY	YEAR
V I S (1 2 3)	J I (4 5)	(6 7)	(8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29)	(30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51)	(52 53)	(54 55)	(56 57)

SYSTEM – ID (V I S / 1 2 3) **CARD – ID** (J 2 / 4 5)

SYSTEM – ID/CARD – ID should be entered in columns 1-5 of each data line.

LOCATION

- COUNTY NUMBER (6 7 8)
- HIGHWAY: PREFIX (9) | NUMBER (10 11 12 13 14) | SUFFIX (15)
- FROM: REFERENCE MARKER (16 17 18) | SUFFIX (19) | +/− (20) | DISPLACEMENT (21 22 23 24)
- TO: REFERENCE MARKER (25 26 27) | SUFFIX (28) | +/− (29) | DISPLACEMENT (30 31 32 33)
- ROADBED LANE (34 35)
- SECTION LENGTH (36 37)
- COMMENT CODE (38 39)
- PAVEMENT TYPE (40 41)

PAVEMENT DISTRESS

FAILED JOINTS AND CRACKS	FAILURES	SHATTERED SLABS	SLABS WITH LONGITUDINAL CRACKS	CONCRETE PATCHES	APPARENT JOINT SPACING
TOTAL NO. (42 43 44)	TOTAL NO. (45 46 47)	TOTAL NO. (48 49 50)	TOTAL NO. (51 52 53)	TOTAL NO. (54 55 56)	FEET (57 58)

COMMENTS/NOTES

NOTE:
Zeroes should be inserted in appropriate pavement distress column if no visual defect is noted.

(59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80)

Recycled Paper

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Pavement Types

Codes	Description
01	Continuously Reinforced Concrete Pavement
02	Jointed Reinforced Concrete Pavement
03	Jointed Plain Concrete Pavement
04	Thick Asphaltic Concrete Pavement (greater than 5-1/2”)
05	Intermediate Thickness Asphaltic Concrete Pavement (2-1/2” to 5-1/2”)
06	Thin Surfaced Flexible Base Pavement (less than 2-1/2”)
07	Asphalt Surfacing with Heavily Stabilized Base
08	Overlaid and/or Widened Old Concrete Pavement
09	Overlaid and/or Widened Old Flexible Pavement
10	Thin Surfaced Flexible Base Pavement (Surface Treatment-Seal Coat Combination)

Comment Codes

General	Description
00	No Comment
01	Concrete Pavement with Asphaltic Level-up
02	New Pavement
03	Multi-Functional Vehicle Data
Encroachment Issues	
12	Agricultural Encroachment
13	Advertisement Encroachment
Geometric Issues	
31	Improper Speed Signing of Curve
32	Improper Striping of No Passing Zone
Roadside Hazard Issues	
40	Roadside Hazard
41	Dangerous Sign Support
42	Dangerous Tree
43	Dangerous Slope
Bridge Issues	
50	Bridge
51	Narrow Bridge
52	Damaged Bridge Rail
53	Damaged Bridge Superstructure
Crack Sealing	
60	All Cracking is Sealed
61	Some Cracking is Sealed

Comment Codes (cont.)

TRM/PMIS Database Problems

70	Missing Reference Marker - Route Marker Sign in Place
71	Missing Route Marker Sign – Reference Marker in Place
72	Missing Reference Marker and Route Marker Sign
73	Divided Highway - Reference Markers Not Straight Across the Road From Each Other
74	DMI Distance Not Equal to Section Length
76	"K" Roadbed, Not "R" and "L"
77	"R" and "L" Roadbed, Not "K"
78	Reference Marker Number Incorrect
79	Reference Marker in Wrong Location

Pavement Failures

80	Rutting > 2" (No Exposed Base Material)
81	Rutting > 2" (Exposed Base Material)
82	Small (<12" X 12") Isolated Potholes
83	Isolated Short (1' – 20') Failed Areas
84	Isolated Long (20' – 40') Failed Areas
85	Continuous Long (>40') Failed Areas
86	Eroded Pavement Edges
87	Edge Drop Off
88	Severe Shoving
89	> 2" Wide Longitudinal Crack
90	> 2" Faulted Longitudinal Crack
91	Severe Alligator Cracking
92	Any Combination of Comment Codes 80-91

Under Construction

21 or 99	Section is under construction for more than ½ of its length

Appendix C – Flexible Pavement Look-Up Tables

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **RUTTING OR ALLIGATOR CRACKING**								
1	11	21	32	42	53	63	74	84	95
2	21	42	63	84	106	127	148	169	190
3	32	63	95	127	158	190	222	253	285
4	42	84	127	169	211	253	296	338	380
5	53	106	158	211	264	317	370	422	475
6	63	127	190	253	317	380	444	507	570
7	74	148	222	296	370	444	517	591	665
8	84	169	253	338	422	507	591	676	760
9	95	190	285	380	475	570	665	760	855
10	106	211	317	422	528	634	739	845	950
15	158	317	475	634	792	950	1109	1267	1426
20	211	422	634	845	1056	1267	1478	1690	1901
25	264	528	792	1056	1320	1584	1848	2112	2376
30	317	634	950	1267	1584	1901	2218	2534	2851
35	370	739	1109	1478	1848	2218	2587	2957	3326
40	422	845	1267	1690	2112	2534	2957	3379	3802
45	475	950	1426	1901	2376	2851	3326	3802	4277
50	528	1056	1584	2112	2640	3168	3696	4224	4752
55	581	1162	1742	2323	2904	3485	4066	4646	5227
60	634	1267	1901	2534	3168	3802	4435	5069	5702
65	686	1373	2059	2746	3432	4118	4805	5491	6178
70	739	1478	2218	2957	3696	4435	5174	5914	6653
75	792	1584	2376	3168	3960	4752	5544	6336	7128
80	845	1690	2534	3379	4224	5069	5914	6758	7603
85	898	1795	2693	3590	4488	5386	6283	7181	8078
90	950	1901	2851	3802	4752	5702	6653	7603	8554
95	1003	2006	3010	4013	5016	6019	7022	8026	9029
100	1056	2112	3168	4224	5280	6336	7392	8448	9504

Table 27 – Rutting and Alligator Look-Up Table

% AREA	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **PATCHING OR BLOCK CRACKING**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
15	79	158	238	317	396	475	554	634	713
20	106	211	317	422	528	634	739	845	950
25	132	264	396	528	660	792	924	1056	1188
30	158	317	475	634	792	950	1109	1267	1426
35	185	370	554	739	924	1109	1294	1478	1663
40	211	422	634	845	1056	1267	1478	1690	1901
45	238	475	713	950	1188	1426	1663	1901	2138
50	264	528	792	1056	1320	1584	1848	2112	2376
55	290	581	871	1162	1452	1742	2033	2323	2614
60	317	634	950	1267	1584	1901	2218	2534	2851
65	343	686	1030	1373	1716	2059	2402	2746	3089
70	370	739	1109	1478	1848	2218	2587	2957	3326
75	396	792	1188	1584	1980	2376	2772	3168	3564
80	422	845	1267	1690	2112	2534	2957	3379	3802
85	449	898	1346	1795	2244	2693	3142	3590	4039
90	475	950	1426	1901	2376	2851	3326	3802	4277
95	502	1003	1505	2006	2508	3010	3511	4013	4514
100	528	1056	1584	2112	2640	3168	3696	4224	4752

Table 28 – Patching and Block Cracking Look-Up Table

FEET PER STA.	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL FEET OF **LONGITUDINAL CRACKING**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
20	106	211	317	422	528	634	739	845	950
30	158	317	475	634	792	950	1109	1267	1426
40	211	422	634	845	1056	1267	1478	1690	1901
50	264	528	792	1056	1320	1584	1848	2112	2376
60	317	634	950	1267	1584	1901	2218	2534	2851
70	370	739	1109	1478	1848	2218	2587	2957	3326
80	422	845	1267	1690	2112	2534	2957	3379	3802
90	475	950	1426	1901	2376	2851	3326	3802	4277
100	528	1056	1584	2112	2640	3168	3696	4224	4752
110	581	1162	1742	2323	2904	3485	4066	4646	5227
120	634	1267	1901	2534	3168	3802	4435	5069	5702
130	686	1373	2059	2746	3432	4118	4805	5491	6178
140	739	1478	2218	2957	3696	4435	5174	5914	6653
150	792	1584	2376	3168	3960	4752	5544	6336	7128
160	845	1690	2534	3379	4224	5069	5914	6758	7603
170	898	1795	2693	3590	4488	5386	6283	7181	8078
180	950	1901	2851	3802	4752	5702	6653	7603	8554
190	1003	2006	3010	4013	5016	6019	7022	8026	9029
200	1056	2112	3168	4224	5280	6336	7392	8448	9504
↓ 999	5275	10549	15824	21099	26374	31648	36923	42198	47472

Table 29 – Longitudinal Cracking Look-Up Table

CRKS. PER STA.	SECTION LENGTH (Miles)								
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	TOTAL NUMBER OF **TRANSVERSE CRACKS**								
1	5	11	16	21	26	32	37	42	48
2	11	21	32	42	53	63	74	84	95
3	16	32	48	63	79	95	111	127	143
4	21	42	63	84	106	127	148	169	190
5	26	53	79	106	132	158	185	211	238
6	32	63	95	127	158	190	222	253	285
7	37	74	111	148	185	222	259	296	333
8	42	84	127	169	211	253	296	338	380
9	48	95	143	190	238	285	333	380	428
10	53	106	158	211	264	317	370	422	475
11	58	116	174	232	290	348	407	465	523
12	63	127	190	253	317	380	444	507	570
13	69	137	206	275	343	412	480	549	618
14	74	148	222	296	370	444	517	591	665
15	79	158	238	317	396	475	554	634	713
16	84	169	253	338	422	507	591	676	760
17	90	180	269	359	449	539	628	718	808
18	95	190	285	380	475	570	665	760	855
19	100	201	301	401	502	602	702	803	903
20	106	211	317	422	528	634	739	845	950
↓ 99	535	1049	1564	2089	2614	3138	3663	4178	4703

Table 30– Transverse Cracking Look-Up Table

Hummm, I wonder if this would qualify as a failure?

Figure 63 – Failure


Texas
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