

Louisiana DOTD

Distress Identification Protocols

General Guidelines for All Pavements

Introduction

This protocol defines the general terminology used to evaluate and summarize the pavement distresses and data requirements for all pavement types to support the pavement management requirements of Transportation Asset Management. This includes both the LADOTD's Pavement Management System and the Federal 23 CFR Part 490 requirements.

LADOTD reserves the right to modify the various distress identification protocols during a contract data collection period to adapt to required changes resulting from State or Federal laws or rule changes and changes to National Standards and Guidelines such as AASHTO Standards and Guidelines.

LADOTD reserves the right to identify exceptions to individual items or groups of items in these protocols with respect to new federal or state legislative requirements or updates in technology.

The (DCC) Data Collection Consultant shall report all mileage to three (3) decimals. (i.e. 0.104 miles.)

This protocol is one part of a three-part group of protocols. It shall be used in conjunction with *"Louisiana DOTD Distress Identification Protocols for Asphalt Pavements"* and *"Louisiana DOTD Distress Identification Protocols for Concrete Pavements"*.

Current Scope

The following tables provide an outline of the current Pavement Condition Measures for both the Pavement Management System project level requirements and the 23 CFR Part 490 Federal pavement condition network level requirements.

In the table below, the red shaded items are specific to fulfilling the Federal Part 490 requirement only. The unshaded items are measures that will support Pavement Management System or Safety Management efforts but are not relevant to Federal Part 490.

The green shaded items are shared by both the PMS and Federal Part 490 requirements; however, these items may be measured differently or used in a different manner by the PMS or for Federal Part 490 purposes. For instance, the LADOTD faulting measures are used to identify joints that exceed a threshold of 0.4 inches on (JCP) Jointed Concrete Pavements. When enough joints exceed this threshold, then a joint repair project is authorized for the project level assessment. For the Federal Part 490 faulting data, an average of the faulting over a 0.100 mile segment is submitted for the network level assessment of condition. These kinds of differences apply to cracking measures as well.

It should also be noted that LADOTD uses a wheelpath of 36-inches in fatigue cracking assessment while the Federal Part 490 wheelpath for fatigue cracking, reported via HPMS, is 39-inches.

Asphalt & Composite Pavements Pavement Condition Measures

Asphalt Pavement Distress Types	Composite Pavement Distress Types	Units of Measure
*DOTD Fatigue (Alligator) Cracking		Sq.Ft. (DOTD Wheelpath)
*HPMS Fatigue Cracking	*HPMS Fatigue Cracking	*Sq.Ft. (HPMS Wheelpath)
Longitudinal Cracking	Longitudinal Cracking	Linear Ft.
Transverse Cracking	Transverse Cracking	Linear Ft.
Patch\Patch Deterioration	Patch\Patch Deterioration	Sq. Ft. & Count
Potholes	Potholes	Sq. Ft. & Count
Rutting	Rutting	Inches
IRI	IRI	Inches / Mile
	Blowups	Sq. Ft. & Count
Fill Quantities	Fill Quantities	Cu. Ft.
High/Low Shoulder	High/Low Shoulder	Inches
Macrotexture	Macrotexture	Inches

*** HPMS Wheelpath = 39"; LADOTD Wheelpath = 36"**

Jointed & Continuously Reinforced Concrete Pavements Pavement Condition Measures

Jointed Concrete Pavement Distress Types	Continuously Reinforced Pavement Distress Types	Units of Measure
Longitudinal Cracking	Longitudinal Cracking	Linear Ft.
Transverse Cracking	Transverse Cracking	Linear Ft.
Patch\Patch Deterioration	Patch\Patch Deterioration	Sq. Ft. & Count
Blowups	Blowups	Sq. Ft. & Count
IRI	IRI	Inches / Mile
Faulting		Inches
	Punchouts	Sq. Ft. & Count
High/Low Shoulder	High/Low Shoulder	Inches
Macrotexture	Macrotexture	Inches

Terminology

LADOTD Pavement Types

Definition. This is an identification of the pavement surface types for both LADOTD Pavement Management System and Federal 23 CRF Part 490 purposes.

LADOTD shall provide Source Data with the existing pavement information outlining the expected location for each of the following pavement types. It should be noted that in some cases, pavement types can change. For instance, a previous jointed concrete pavement could have been overlaid with asphalt pavement and is now a composite pavement. In these cases, where a clear discrepancy is identified, the protocol provides the required procedure for the data collection vendor to follow:

LADOTD Asphalt Pavement (ASP)

Definition. A flexible pavement system made up of an asphalt surface placed on a raw soil, cement stabilized base, raw sand clay gravel, stabilized sand clay gravel, crushed stone, rubbilized pavement, or black (asphalt) base. This includes pavements with surface treatments such as chip seals, slurry seals, sand seals, and cape seals.

See Federal Asphalt Pavement (ASP-F) below for the Federal Part 490 network level pavement analysis type.

ASP shall represent the following HPMS Field Manual Item 49 Surface Types:

- 2 – “Bituminous”
- 6 – “Asphalt-Concrete (AC) Overlay over Existing AC Pavement”

LADOTD Composite Pavement (COM)

Definition. An asphalt pavement surface placed on an existing concrete pavement surface where the old existing concrete surface becomes the base. This includes subsequent overlays to composite pavements.

Com is not a Federal Part 490 network level pavement analysis type. See Federal Asphalt Pavement (ASP-F) below.

Com shall represent the following HPMS Field Manual Item 49 Surface Types:

- 7 – “AC Overlay over Existing Jointed Concrete Pavement”
- 8 – “AC (Bituminous Overlay over Existing CRCP)”

Federal Part 490 Asphalt Pavement (ASP-F)

Definition. Any pavement with an asphalt pavement surface. ASP-F includes both LADOTD ASP and LADOTD COM pavements.

The Federal Part 490 ASP-F shall represent the following HPMS Field Manual Item 49 Surface Types:

- 2 – “Bituminous”

- 6 – “Asphalt-Concrete (AC) Overlay over Existing AC Pavement”
- 7 – “AC Overlay over Existing Jointed Concrete Pavement”
- 8 – “AC (Bituminous Overlay over Existing CRCP)”

LADOTD Jointed Concrete Pavement (JCP)

Definition. A Portland cement concrete pavement that has transverse expansion joints at planned intervals.

JCP is a Federal Part 490 network level pavement analysis type.

JCP shall represent the following HPMS Field Manual Item 49 Surface Types:

- 3 – “JPCP – Jointed Plain Concrete Pavement (includes whitetopping)”
- 4 – “JRCP – Jointed Reinforced Concrete Pavement (includes whitetopping)”
- 9 – “Unbonded Jointed Concrete Overlay on PCC Pavement”
- 10 – “Bonded PCC Overlay on PCC Pavement”

LADOTD Continuously Reinforced Concrete Pavement (CRCP)

Definition. Portland cement concrete pavement with sufficient longitudinal reinforcement to control transverse crack spacing and openings, in lieu of transverse contraction joints, for accommodating concrete volume changes and load transfer.

CRCP is a Federal Part 490 network level pavement analysis type.

CRCP shall represent the following HPMS Field Manual Item 49 Surface Type:

- 5 – “CRCP – Continuously Reinforced Concrete Pavement”

LADOTD Brick (BRK)

Definition. A pavement comprised of an upper layer of individually placed bricks, concrete pavers, stones or similar materials.

Brick is not a Federal Part 490 network level pavement analysis type.

Brick shall represent the following HPMS Field Manual Item 49 Surface Type:

- 11 – “Other (e.g., plank, brick, cobblestone, etc.)”

LADOTD Gravel (GRV)

Definition. A surface comprised of unbound aggregate or stone.

Gravel is not a Federal Part 490 network level pavement analysis type.

Gravel shall represent the following HPMS Field Manual Item 49 Surface Type:

- 1 – “Unpaved”

The primary data to be collected for gravel sections is GPS and images (right of way and pavement).

Pavement Type Reporting

1. The pavement type provided by LADOTD to the DCC shall be used for pavement condition analysis with exceptions as follows.
 - a. When the pavement type is **obviously** different, the pavement distress analysis will be performed per the observed pavement type. (i.e., LADOTD indicates a JCP pavement, but the surface is COM).
 - b. When the pavement type is **possibly** different from the pavement type provided by LADOTD, LADOTD staff will be consulted to make the final decision.
 - c. For the Federal Part 490 analysis, the ASP-F designation shown above will be used.
2. In all cases, the data reported shall identify the final pavement type that was used for the data analysis.

Wheel Paths

LADOTD PMS Wheel Path

Definition. Two (2) longitudinal paths centered, depending on the data collection vehicle's wheel path spacing, approximately 34 inches in each direction from the centerline of the Analysis Lane, each measuring 36 inches in width.

Federal Part 490 Wheel Paths

Definition. Two (2) longitudinal paths centered, depending on the data collection vehicle's wheel path spacing, approximately 34 inches in each direction from the centerline of the Analysis Lane, each measuring 39 inches in width.

Primary Direction of Travel

Definition. The primary direction of travel is generally designated as south to north or west to east for Louisiana pavements. For Interstate pavements, the mile post signs represent increasing values in the primary direction of travel.

Analysis Lanes

Definition. The travel lane which carries traffic that is representative of the remainder of the lanes. It is generally considered to be a lane of travel that will continue "through the area". It is to be used to capture images for pavement analysis, pavement distress data and asset inventory along a segment of highway for both Pavement Management System project level analysis and Federal Part 490 network level analysis.

The various pavement distress data must come from the same analysis lane as the image data for a segment of highway.

Analysis Lane Exclusions

The following lanes consist of pavement surfaces that are Not part of the roadway considered representative lanes of the remainder of the travel lanes including, but not limited to, the following:

1. **Turn Lanes** – Separate lanes which allow vehicles to slow down and exit from their current direction of travel, with minimal disruption to the normal flow of traffic.
2. **Acceleration/Merge Lanes** – Separate lanes which allow vehicles to enter a highway with minimal disruption to the normal flow of traffic.
3. **Deceleration/Exit Lanes** – Separate lanes which allow vehicles to exit a highway with minimal disruption to the normal flow of traffic.
4. **Climbing Lanes** – Separate lanes which allow vehicles to negotiate a steep grade, while allowing the motoring public to pass in the travel lane.
5. **Ramps** – Separate lanes provide to allow vehicles to accelerate to or decelerate from high speeds on Interstates or other NHS high volume roadways. This does not include NHS Ramps that are classified as Bridges which are included for Bridge Analysis via the final MAP-21 rule.
6. **Weave Lane** – Separate lanes used for both entering and exiting the highway.
7. **HOV Lane** - A high-occupancy vehicle lane is a restricted traffic lane reserved at peak travel times or longer for the exclusive use of vehicles with a driver and one or more passengers.
8. **Shoulders** – paved sections of the roadway that are adjacent to the travel lane and are designated for temporary emergency parking.
9. **Rest Areas** – paved exit ramps that lead to an area that provides motorist with a safe place to park, use rest room service, and obtain other minor conveniences as necessary to refresh themselves.
10. **Crossovers** – these are lanes, often unpaved, connection divided highways or bridges that are provided for official emergency use only. They are not to be used by the general public unless directed to do so by emergency personnel.

Special Analysis Lane Exclusion - Designated Truck Lanes

Definition. This is a lane of travel that is specifically designated for travel by all large trucks, including 18-wheelers.

The FHWA acknowledged that pavement conditions measured in dedicated truck lanes and congested lanes may not be representative of the overall condition of pavements in all lanes.

These lanes will be excluded from inclusion in the Analysis Lane evaluation, per 23 CFR Part 490.309(b), and the adjacent lane will become the Analysis Lane.

Divided Highway

Definition. A roadway that has a physical barrier (e.g., concrete curbing, concrete wall, median, or other barrier) that separates multiple lanes of two opposing directions of traffic and has a minimum length of 0.300 miles.

1. The Analysis Lane for un-divided two lane, three lane, four lane and greater than four lane

highways, is the outer most travel lane in the primary direction of travel only, unless otherwise specified by LADOTD.

2. The Analysis Lanes for a divided highway is the outer most travel lane in each direction, unless otherwise specified by LADOTD.
3. The Analysis Lane Width will be identified prior to the start of each data collection cycle and will remain constant, and be part of the Quality Control checks, throughout the data collection cycle.

Analysis Lane Deviations

Definition. Occurs when the data collection vehicle is forced to abandon the analysis lane for an alternative lane of travel.

23 Part 490.309(b) allows other lanes to be used if the rightmost lane carries traffic that is not representative of the remainder of the lanes or is not readily accessible due to closure, excessive congestion, or other events impacting access.

1. Analysis Lane Deviations can occur due to various circumstances including, but not limited to:
 - a. Lane is Not readily accessible due to closure
 - b. Excessive congestion
 - c. Other events impacting access
 - d. Temporary blockage of the Analysis Lane
 - e. Construction Zones (see expanded definition below)
 - f. Passing of a slow-moving vehicle that is negatively affecting International Roughness Index (IRI) data collection.
2. The Lane Deviation flag, LANEDEV will be coded with a value of "1" for valid lane deviations in the Electronic Data file.
3. Lane Deviation reason will be recorded and reported.
 - a. All image data shall still be provided for all lane deviations.
4. All Analysis Lane Deviation distress data shall be collected and reported per **23 CFR Part 490.309(b)**.

Analysis Lane Deviation Exclusions

Definition. A lane deviation shall not be reported if the following circumstances occur:

1. If the analysis lane is ending and the data collection vehicle must merge into another lane, this is not a lane deviation.
2. If a travel lane is added to the right, and adjacent to the extended analysis lane, and does not appear to be an exit lane, then that newly added travel lane shall become the analysis lane.

Analysis Lane Zones – For Asphalt and Composite Pavements Only

Definition. Five (5) data analysis and crack classification zones will be established as follows for both the LADOTD PMS 36-inch wheel path and Federal Part 490 39-inch wheel path:

1. Zone 1 is between the left, or driver's side, outside wheel path edge and the lane edge at the adjacent lane.
2. Zone 2 is the left or driver's side wheel path.
3. Zone 3 is the space between the inside edges of the wheel paths.
4. Zone 4 is the right or passenger's side wheel path.
5. Zone 5 is between the right, or passenger's side, outside wheel path edge and the right lane edge.

Pavement Segment Analysis Lengths

Definition. The length of pavement, in an analysis lane, that the distress data will be evaluated for and summarized to. Generally, this will be a tenth (0.100) of a mile with exceptions for segments that aren't that long or end segments.

The data shall be continuously collected in a manner that will allow for reporting in nominally uniform pavement section lengths of 0.100 mile (528 feet); shorter pavement sections are permitted only at the beginning of a route, end of a route, at bridges, at locations where surface type changes or other locations where a pavement section length of 0.10 mile is not achievable. The maximum length of pavement sections shall not exceed 0.11 mile (580.8 feet)

Split Pavements

Definition. Occurs when the pavement type differs over the pavement segment analysis length.

1. All pavement distresses shall be rated, quantified, and reported with respect to the actual pavement type for the length of that pavement type.
2. The data shall be summarized based on the assigned pavement type that represents most of the pavement segment length.
 - a. Only the data that represents that majority pavement type will be used in the summary. The remaining data will be ignored for the other pavement distress data.

Construction Zones

Definition. A segment of highway that is under construction.

1. A segment of highway is considered under construction when signs identifying a construction zone are made of metal and are on metal poles which are set into the ground.
2. DO NOT rate, quantify, or report construction zone data when the following conditions exist:
 - a. Absence of the pavement surface (road is dirt/gravel)
 - b. Pavement surface has been partially or completely milled, cold planed or removed

- c. A forced lane deviation is in place to direct traffic around the Construction Zone.
 - d. The Construction Zone starting and ending locations will be reported in this instance.
3. If confusion exists as to whether a location is or is not a construction zone, submit the location to LADOTD QA/QC staff for review.
4. The Construction Zone flag, CONSTRZONE, will be coded with a value of “1” for valid Construction Zones in the Electronic Data Files, for each four thousandth 0.004 mile (21.21 foot) segment.
5. Always collect images in construction zones if the pavement, for the Analysis Lane in a construction zone, is clearly available for distress data capture, the operator is expected to capture the data for that pavement section.
 - a. The Construction Zone will not be reported in this instance.

Temporary Construction Zones

Definition. A segment of highway that has temporary construction warning signs shall not be considered a construction zone and distress data collection/quantification shall not be interrupted. These signs are usually comprised of a mesh material with a metal frame.

These temporary signs may be utilized during, but not limited to:

1. Moving maintenance operation (e.g. mowing, patching, etc.)
2. Debris or Litter removal

Bridges

Definition. A structure comprised of wood, metal, concrete or other materials, or a combination thereof, which enables a road, or highway, to cross an obstacle.

1. The Analysis Lane on a bridge will match the analysis lanes of undivided and divided pavements.
2. Capture pavement images, forward facing perspective images, right facing right-of-way images, pavement distress measures on all bridges.
 - a. Structures are to be included in the measurement of International Roughness Index (IRI).
3. The beginning of a bridge will be considered the first expansion joint, at the abutment, as the data collection vehicle is entering the bridge.
4. The ending of a bridge will be considered the last expansion joint, located at the far abutment, as the data collection is exiting the bridge.
5. The Bridge ID flag, BRIDGE, will be coded with a value of “1”, beginning 300 feet before the first expansion joint and extend to 300 feet past the last expansion joint, in the Electronic Data file, for each four thousandth 0.004 mile (21.21 foot) segment. When no bridge is present, the value of “0” will be coded. Each bridge should only have (1) one Bridge ID flag, “BRIDGE ‘.
6. The Bridge Count flag, N_Bridge, is the count of the bridges found within a tenth (0.100)

mile section, based on the count using first expansion joints, recorded in the Summary Data file, for each tenth (0.100) mile segment.

7. The Bridge International Roughness Index (IRI) flag, BIRIVALID, identifies valid Bridge IRI readings found within the tenth (0.100) mile section where the BRIDGE flag is coded "1".
 - a. BIRIVALID will be recorded in the Electronic Data file, for each four thousandth 0.004 mile (21.21 foot) segment. When no bridge is present, the default value of "0" will be coded.
 - b. In the Summary Data File, BIRIVALID will be the total count of the BIRIVALID readings recorded in the Electronic Data File for each tenth (0.100) mile segment.
8. The Pavement International Roughness Index (IRI) flag, IRIVALID, identifies valid IRI readings found within the tenth (0.100) mile section where the BRIDGE ID flag "BRIDGE" is coded "0".
 - a. In the Electronic Data File, IRIVALID will be coded "1" for each four thousandth 0.004 mile (21.21 foot) segment.
 - b. In the Summary Data File, IRIVALID will be the total count of the IRIVALID readings recorded in the Electronic Data File for each tenth (0.100) mile segment.

Tunnels

Definition. A structure which enables a road, or highway, to cross under an obstacle. In Louisiana tunnels cross under some type of water feature.

There are three (3) tunnels in the State of Louisiana.

- LRS-ID 283-09-1-010, located at log mile 3.420
- LRS-ID 062-02-1-010, located at log mile 0.600
- LRS-ID 065-30-1-010, located at log mile 0.800

The following items apply to tunnels:

1. An expansion joint/drain grate is found at each entrance/exit. These expansion joints/drain grates are considered to be the beginning/ending for the tunnels
2. The beginning and end location of the tunnel will be provided by LADOTD and will include the LRS-ID log mile and GPS data points
3. The Analysis Lane(s) on a tunnel, including data and image capture, will match the analysis lanes of undivided and divided pavements as established in this protocol.
4. For Tunnels, the Bridge ID flag, BRIDGE, will be coded with a value of "1", beginning 300 feet before the expansion joint/drain grate and extend to 300 feet past the last expansion joint/drain grate, in the Electronic Data file, for each four thousandth 0.004 mile (21.21 foot) segment. When no tunnel is present, the value of "0" will be coded. Each tunnel should only have (1) one Bridge ID flag, "BRIDGE".
5. For Tunnels, the Bridge Count flag, N_Bridge, is the count of the tunnels found within a tenth (0.100) mile section, based on the count using first expansion joint/drain grates, recorded in the Summary Data file, for each tenth (0.100) mile segment.

Railroad Crossings

Definition. An “at-grade” crossing where a highway and a railroad track intersect.

1. The Railroad Crossing flag, Railroad_Cross, will be coded with a value of “1” in the Electronic Data file.
2. In the Summary Data file, if any crossings are encountered within the tenth (0.100) mile segment, the Railroad_Cross value will also be coded with a value of “1”.
 - a. Railroad grade crossings are to be included in the measurement of International Roughness Index (IRI).

Condition Data Files & Data Reporting Requirements

Raw Data File

Definition. These are the original data source provided by the DCC for QA/QC on both the Electronic Data Files and the Summary Data Files. It will contain data at increments relative to the capabilities of the individual data collection technology, which will be generally termed “Raw Data” and will provide LADOTD with the opportunity to look at a more detailed level of data than the summary provided in the Electronic Data Files

Electronic Data File

Definition. Data files submitted by the DCC for Quality Analysis/Quality Control purposes.

- Normally electronic data is required in four thousandth 0.004 mile (21.21 foot) segments unless otherwise specified. This generally results in 25 data readings for each tenth (0.100) miles segment.

Summary Data File

Definition. Data files submitted by the DCC for Reporting purposes.

- Normally summary data is required in tenth (0.100) of a mile (528 feet) segments, except for the control section end segments or control sections that are less than a tenth (0.100) of a mile in total length, or unless otherwise specified.

Source Data Tables

Definition. Data files provided by LADOTD to the DCC containing historical data used to correlate against the new data captured. (i.e. pavement type.) These are provided to allow the DCC to evaluate against the collected data for accuracy (bias) purposes.

Data Dictionaries/Shells

Definition. The various file formats for both the required Electronic Data submittals, the Summary Data submittals, and any Additional Data submittals that don’t match the Electronic or Summary data formats.

Other General Measures & Reporting Requirements

Over-Runs / Under-Runs

Over-Runs

Definition. A field recorded (DMI) Distance Measuring Instrument length of the control section that exceeds the LADOTD supplied length in the data shell.

1. Applies to all analysis lanes, including those for divided highways.
2. Can legitimately occur due to various lane deviations, differences in length for divided highways, etc.
3. Over-Runs shall be submitted to LADOTD for review when the segments of the LRS-ID that Over-Run or exceed the length of the control section's limits found in the data shell table for that particular direction.
4. The Over-Run flag, `OVERRUN`, will be coded with a value of "1", for each new record created in the Electronic Data file.
5. LADOTD will review the submitted list of records and confirm if the Over-Runs should be approved or rejected.
6. If the Over-Run is rejected, the contractor shall recollect the data and images for the pavement.

Under-Runs

Definition. A field recorded (DMI) Distance Measuring Instrument length of the control section that does not reach the LADOTD supplied length in the data shell.

1. Applies to all analysis lanes, including those for divided highways.
2. Under-Runs shall be submitted to LADOTD for review when the segments of the LRS-ID that is shorter than the length of the control section's limits found in the data shell table for that particular direction.
3. The Under-Run flag, `UNDERRUN`, will be coded with a value of "1", for each record, originally provided in the Electronic Data file shell, that is left unpopulated.
4. LADOTD will review the submitted list of records and confirm if the Under-Run should be approved or rejected.
5. If the Under-Run is rejected, the contractor shall recollect the data and images for the pavement unless the "Lead Out" contains the necessary pavement data and images for correction.

Lead Ins / Lead Outs

Lead Ins

Definition. The data capture vehicle shall begin capturing data and images 0.100 miles (528 feet) prior to reaching the start of the LRS-ID.

Lead Outs

Definition. The data capture vehicle shall stop capturing data and images 0.100 miles (528 feet) after reaching the end of the LRS-ID.

1. Lead In and Lead Out data and images shall be delivered to LADOTD for QA/QC purposes; and can be used by the DCC for beginning/ending corrections as needed or for under-run corrections as needed.
2. Lead In and Lead Out data records will be identified with a flag.

High/Low Shoulders

Definition. A high or low shoulder is represented by the elevation difference between the right-side shoulder and pavement edge, regardless of the shoulder type.

1. This value will be measured in units of inches, to the nearest 0.04 of an inch (1 mm), or to the lowest measure that can be practically or reasonably achieved.
 - a. Where the "shoulder" is higher than the "pavement edge", the value will be reported as a positive (+) value.
 - b. Where the "shoulder" is lower than the "pavement edge", the value will be reported as a negative (-) value.
2. Shoulder data shall be summarized in section lengths of 0.004 miles (21.12 feet).
3. Shoulder data shall be averaged and reported for each tenth (0.100) mile increment.
 - a. The number of high shoulders exceeding (2) two inches, for each tenth (0.100) mile increment, shall be reported.
 - b. The number of low shoulders exceeding (-2) negative two inches, for each tenth (0.100) mile increment, shall be reported.

Pavement Grade Classification

1. Conformance to the most recent Highway Performance Monitoring System Field Manual (HPMS), or later version, is required.
2. Grade classifications shall be captured and reported per HPMS Item 45: Grades_A through Grades_F for all pavement sections as shown below.

Grade Classification	Percent Grade
A	0.0 – 0.4
B	0.5 – 2.4
C	2.5 – 4.4
D	4.5 – 6.4
E	6.5 – 8.4
F	8.5 or greater

3. The various grade classification data shall report in a separate Grade data table, per the data in the “Grade” Data Dictionary. This data shall be summarized to tenth (0.100) mile increments.

Vertical Curve Classification

1. Vertical Curve classifications shall be captured and the following table for all pavement sections.

Curve Classification	Degrees
A	Under 3.5 degrees (i.e., 0.061 radians)
B	3.5 – 5.4 degrees (i.e., 0.061 – 0.094 radians)
C	5.5 – 8.4 degrees (i.e., 0.096 – 0.147 radians)
D	8.5 – 13.9 degrees (i.e., 0.148 – 0.243 radians)
E	14.0 – 27.9 degrees (i.e., 0.244 – 0.487 radians)
F	28 degrees (i.e., 0.489 radians) or more

2. The various vertical curve classification data shall report in a separate Vertical Curve data table, per the data in the “Vertical Curve” Data Dictionary. This data shall be summarized to tenth (0.100) mile increments.

Pavement Horizontal Curve Classification

1. Conformance to Item 43 Curves A through F (Curve Classification), in the current Highway Performance Monitoring System Field Manual (HPMS) is required.
2. Horizontal Curve classifications shall be captured and reported for all pavement sections, as shown below.

Curve Classification	Degrees
A	Under 3.5 degrees (i.e., 0.061 radians)
B	3.5 – 5.4 degrees (i.e., 0.061 – 0.094 radians)
C	5.5 – 8.4 degrees (i.e., 0.096 – 0.147 radians)
D	8.5 – 13.9 degrees (i.e., 0.148 – 0.243 radians)
E	14.0 – 27.9 degrees (i.e., 0.244 – 0.487 radians)
F	28 degrees (i.e., 0.489 radians) or more

3. The various curve classification data shall be report in a separate Horizontal Curve data table, per the data in the “Horizontal Curve” Data Dictionary. This data shall be summarized to tenth (0.100) mile increments.

Macrotexture

LADOTD only intends to use Macrotexture data to provide appropriate information for Friction calculations. Macrotexture data, either 2D or 3D supplied, will only be acceptable if the data represents what would be found in the right wheel path.

1. Conformance to the current ASTM E1845-15 Standard Practice for Calculating Pavement Macrotexture Mean Profile Depth, or its replacement, is expected.
2. The Mean Profile Depth, the Root Mean Square and the Percentage of Valid Samples, for the right wheel path, for 100% of all pavements.
3. The sampling frequency shall comply with the current ASTM E1845-15 specification, or its replacement.
4. The Percentage of Valid Samples, as defined by the current ASTM E1845-15, or its replacement, must remain above 90% or the data shall be recollected.
5. The Mean Profile Depth and Root Mean Square shall be identified in units of inches to four (4) decimals.
6. Macrotexture data shall be summarized in section lengths of 0.004 miles (21.12 feet).
7. RMS, MPD & Percentage of Valid Samples shall be provided for each tenth (0.100) mile increment.

Skid Testing (Friction)

1. The skid testing measuring system shall consist of a trailer with test wheels towed by a vehicle, which is equipped with a data collection computer.
2. The data collected shall include friction values obtained according to the current ASTM E274, the *Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire*, or its replacement.
3. The friction values at all locations shall be obtained for two tire types, the standard rib (tread) tire, as prescribed in current ASTM E501 Standard Specification, or its replacement, and standard smooth (blank) tire as prescribed in current ASTM E524 Standard Specification, or its replacement.
4. Each wheel of the trailer shall be equipped with a transducer to measure the vertical and horizontal load experienced by the wheel. The trailer shall also be equipped with a water dispensing nozzles for each wheel, which will spray water onto the road surface ahead of each test to simulate wet weather conditions.
5. The Skid Testing measuring system shall have an annual certification of calibration and correlation conducted at a nationally recognized certified friction measuring system evaluation site such as Central/Western Field Test and Evaluation Center located in College Station, TX or Eastern Field Test and Evaluation Center located in East Liberty, OH.
6. Additional check runs, performed on local sites selected by LADOTD, will be performed to ensure proper calibration and accuracy of the system, in the event of any repairs having to be performed on the mechanical or electronics of the system while in the process of collecting data.

7. The Skid Testing measuring system will be linked to the (DCV) Data Collection Vehicle's DMI (Distance Measuring Instrument).
8. The test speed should be conducted at 40 mph within ± 1 mph where the speed limit is below 50 mph and at a speed of 50 mph within ± 1 mph where the speed limit is greater than 50 mph.
9. The testing frequency shall occur per the following intervals:
 - a. Five (5) tests per mile for a 0 to 1 mile long LRS-ID
 - b. Three (3) tests per mile for a 1 to 3 mile long LRS-ID
 - c. Two (2) test per mile for a 3 to 5 mile long LRS-ID
 - d. One (1) tests per mile for a greater than (>) 5 mile long LRS-ID
10. All bridge decks, that have a different surface material than the pavement prior to the bridge, will be tested separately, in accordance to its length, in the appropriate intervals that are described above.
11. When multiple skid testing units are used, it shall be demonstrated that all vehicles are calibrated to produce measurement differences 5% or less between units. This demonstration must be documented and reported in writing to the LADOTD. Each skid testing unit must be identified with a unique number and that number must accompany all data reported from that unit.
12. The Friction data shall be reported at the appropriate locations where it is collected, in a separate Friction data table, per the "Friction" Data Dictionary.

Distress Identification & Reporting Requirements

Pavement Distress Identification on Pavement Images

1. The following color codes, line work, and geometric shapes shall identify various pavement distresses on the pavement image, in a manner that allows LADOTD to turn the line work and geometric shapes on and off to view the underlying pavement image. This includes providing additional layers as needed for the Federal Part 490 data requirements.
2. Each rated distress shall be color coded for severity. The color codes shall be:
 - a. **Orange** for slight severity; this is cracking that is detected by the 3D technology, but is not easily visible;
 - b. **Green** for low severity;
 - c. **Yellow** for medium severity;
 - d. **Red** for high severity;
 - e. **Pink** for patching that is void of pavement distress (no cracking or any additional patching on the patch).

Fatigue (Alligator) Cracking

Each Crack that originates inside of the defined wheel path, or fatigue cracking zone, shall be

defined by lines that trace on top of, or adjacent to, the cracking. The line color shall be appropriately color coded to the severity of the distress.

Fatigue cracking shall be identified and calculated separately for both the PMS wheelpath of 36inches and the Federal Part 490 wheelpath of 39-inches.

- PMS fatigue cracking applies to ASP pavements only.
- Federal Part 490 fatigue cracking applies to both ASP and COM pavements.
- Cracking within a fatigue cracking zone shall also be identified by a surrounding geometric shape (square or rectangle) this is filled with horizontal pattern lines. The geometric shape and pattern lines shall be color coded appropriately to the severity level of the area of fatigue cracking that it represents. The pattern lines shall be spaced sufficiently such that the fatigue cracking is visible between the pattern lines.
- Separate geometric shapes, on separate layers, shall be used for the PMS fatigue cracking and the Federal Part 490 cracking.

Longitudinal and Transverse Cracking

PMS All Pavements Requirements. Longitudinal and Transverse cracking, excluding those that cross into an ASP fatigue cracking zones, shall be identified by a line that traces on top of, or adjacent to, the cracking. The line color shall be appropriately color coded to the severity of the distress. No geometric shape shall be used here.

Federal Concrete Pavement Requirements. The Federal Part 490 requirement for the HPMS submittal requires Transverse cracking for JCP only and Longitudinal cracking for CRCP only.

Separate line work, on separate layers, shall be used for the PMS Longitudinal and Transverse cracking and the Federal Part 490 Longitudinal and Transverse cracking.

Patching

Each Patch shall be clearly identified by a surrounding geometric shape (square, rectangle, triangle, circle, or oval) that is filled with pattern lines in a cross-hatch type pattern (pattern lines shall slope downward, from top right to bottom left). The geometric shape and pattern lines shall be color coded appropriately to the severity level of the patch that it represents. The pattern lines shall be spaced sufficiently such that the patch is visible between the pattern lines.

Potholes

Each pothole shall be clearly identified by a surrounding geometric shape (square, rectangle, triangle, circle, or oval) that is filled with pattern lines in a cross-hatch type pattern (pattern lines shall slope downward, from top right to bottom left). The geometric shape and pattern lines shall be color coded appropriately to the severity level of the pothole that it represents. The pattern lines shall be spaced sufficiently such that the pothole is visible between the pattern lines.

Punch Outs

Each punch out shall be clearly identified by a surrounding geometric shape (square, rectangle,

triangle, circle, or oval) that is filled with pattern lines in a cross-hatch type pattern (pattern lines shall slope downward, from top right to bottom left). The geometric shape and pattern lines shall be color coded appropriately to the severity level of the punch out that it represents. The pattern lines shall be spaced sufficiently such that the punch out is visible between the pattern lines.

Blowups

Each blowup shall be clearly identified by a surrounding geometric shape (square, rectangle, triangle, circle, or oval) that is filled with pattern lines in a cross-hatch type pattern (pattern lines shall slope downward, from top right to bottom left). The geometric shape and pattern lines shall be color coded appropriately to the severity level of the blowup that it represents. The pattern lines shall be spaced sufficiently such that the blowup is visible between the pattern lines.

Counts

In order to provide a means to easily count each patch, punch out, blowup or pothole a colored circle, that is filled with a double cross hatch pattern (pattern lines shall resemble a diamond pattern), shall be placed at the upper left corner of the geometric shape defining the distress. The color circle and pattern lines shall correspond to the severity of the patch, punch out, blowup or pothole. The pattern lines shall be spaced sufficiently such that the patch, punch out, blowup or pothole is visible between the pattern lines.

JCP Joint

Each concrete joint shall be clearly identified by a green circle filled with green vertical pattern lines. The vertical pattern lines shall be spaced sufficiently to allow the pavement joint to be visible between the pattern lines.

Rutting

Rutting **Shall Not** be identified on same pavement images as outlined above. Rutting shall be optionally displayed in a separate layer, or some other manner, that allows LADOTD to turn the geometric shapes on and off to view the underlying pavement image.

Rutting shall be clearly identified by a surrounding geometric shape (square, rectangle, triangle, circle, or oval) that is filled with pattern lines in a cross-hatch type pattern (pattern lines shall slope downward, from top right to bottom left). The geometric shape and pattern lines shall be color coded appropriately to the severity level of the rutting that it represents.