HPMS Pavement Data Reporting



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Introduction

- Basic record format & file structure
- Presentation of HPMS pavement data items and requirements (focus on TPM)
 - IRI, PSR, and distress data items

Sections Dataset File Structure

	Field Number	Field Name
	1	Year_Record
	2	State_Code
	3	Route_ID
	4	Begin_Point
	5	End_Point
Section	6 (Data_Item
	7	Section_Length
	8	Xalue_Numeric
	9	Value_Text
	10	Value_Date
	11	Comments (optional)

- Used to report the State's roadway attribute data (i.e., data items)
- Contains 11 data fields
 - o 7 required fields
 - o 3 item-dependent fields
 - o 1 optional field
- Data Types
 - o Numeric
 - o Text
 - Date (mm/yyyy)

Example Sections Dataset

```
Year_Record|State_Code|Route_ID|Begin_Point|End_Point|Data_Item|Section_Length|Value_Numeric|Value_Text|Value_Date|Comments
2009|41|000100200S00|0.75|5.32|AADT|0.75|14800|Factored `06 AADT||
2009|41|000100200S00|0.75|5.32|AADT|4.57|14700||4/2009|Est. AADT
2009|41|000100200S00|0.10|0.20|IRI|0.10|94||5/2008|
2009|41|000100200S00|0.20|0.30|IRI|0.10|66||4/2008|
2009|41|000100200S00|0.75|Through_Lanes|0.75|4|||
2009|41|000100200S00|0.75|5.32|Through_Lanes|4.57|4|||Widened in `08
```

Directional Pavement Metrics Reporting Options

- If pavement distress data is being reported independently for both directions of travel on divided Interstate roadways, then the following data items <u>shall be</u> <u>reported</u> for each direction:
 - o Urban Code
 - o Structure Type
 - o Route Number
 - o Directional Through Lanes



Single Direction Reporting



Interstate 90 (I-90) West

- Functional System, Facility Type, Ownership, NHS
- IRI/PSR, Rutting, Cracking
- Urban Code, Structure Type, Route Number, Directional Through Lanes

Interstate 90 (I-90) East

 Functional System, Facility Type, Ownership, NHS

Optional Bi-Directional Reporting



Interstate 90 (I-90) West

- Functional System, Facility Type, Ownership, NHS
- IRI/PSR, Rutting, Cracking
- Urban Code, Structure Type, Route Number, Directional Through Lanes

Interstate 90 (I-90) East

- Functional System, Facility Type, Ownership, NHS
- IRI/PSR, Rutting, Cracking
- Urban Code, Structure Type, Route Number, Directional Through Lanes 1-7

Pavement Condition Rule (PM2)

<u>Data Item</u>	<u>Roadway System</u>	<u>Extent</u>	Collection Cycle	Direction	
	Interstate (IS)	Full Extent	Annual	Inventory*	
IKI	Non-IS NHS	Full Extent	Biennial	Inventory	
Surface Type	Interstate (IS)	Full Extent	Annual	Inventory*	
	Non-IS NHS	Full Extent	Biennial	Inventory	
Dutting	Interstate (IS)	Full Extent	Annual	Inventory*	
Rutting	Non-IS NHS	Full Extent	Biennial	Inventory	
Faulting	Interstate (IS)	Full Extent	Annual	Inventory*	
Faulting	Non-IS NHS	Full Extent	Biennial	Inventory	
Cracking	Interstate (IS)	Full Extent	Annual	Inventory*	
Percent	Non-IS NHS	Full Extent	Biennial	Inventory	

*States can opt to report distress data independently for divided Interstate highway sections

Item 47: IRI (International Roughness Index)

• **Definition:** A statistic used to estimate the amount of roughness in a measured longitudinal profile

 Extent Requirement: All paved NHS and principal arterial system (PAS), and rural minor arterial Sample Panel roadway sections

- For Interstate sections, measured IRI shall be collected:
 - On an annual frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

- For **non-Interstate NHS** sections, measured IRI shall be collected:
 - On an biennial frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

- Optional reporting for rural major collectors, urban minor arterials and collectors roadways (i.e., sample sections)
- Report the average of right and left quarter-car IRI Mean Roughness Index (MRI)
- Include structures and railroad crossings in measurement
- Report existing IRI values until they can be replaced by newly measured values (no defaults/estimates)

Guidance:

- Use Value Text field (Field 9) to indicate why measured value has not been reported for NHS sections
- An estimated date can be provided when exact collection day within a month is unavailable month & year are required.
- Reported in inches per mile (integer)

Guidance:

• One of the following codes shall be reported to indicate restrictions to new data collection:

Code	Description
А	Construction – Roadway was under construction
В	Closure – Roadway was closed to traffic
С	Disaster – Roadway was located in an are declared as a disaster zone
D	Deterioration – Roadway was too deteriorated to measure and is designated as "Poor"
Е	Other – Section added to NHS post-data collection

Pertinent Fields to be Coded:

- Field 6 = Data Item ("IRI")
- Field 8 = Value Numeric
- Field 9 = Value Text ("A")
- Field 10 = Value Date

Example Record:

*2018|41|123A|0|0.10|**IRI**|0.10|94|**A**|5/2017|-----

*Indicates an NHS section where IRI was not collected in 2018

Item 48: PSR (Present Serviceability Rating)

- <u>Definition</u>: Present Serviceability Rating (PSR) for pavement condition
- Extent Requirement: NHS and paved rural major collectors, urban minor arterials and collector Sample Panel roadway sections where IRI is not available

Item 48: PSR NHS Coding

Pertinent Fields to be Coded:

- Field 6 = Data Item ("PSR")
- Field 8 = Value Numeric (e.g. '3.5')
- Field 9 = Value Text ("A", for speed <40 mph)
- Field 10 = Value Date (e.g. "10/2016")

Example Record:

2017 | 41 | 123A | 0 | 0.10 | **PSR** | 0.10 | **3.5** | **A** | **10/2016** | -----

Item 48: PSR (cont'd)

- For **NHS** sections where posted speed limit is less than 40 mph, measured PSR can be reported, and shall be collected as follows:
 - On an annual frequency for the Interstate;
 biennial frequency for the non-Interstate
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections <u>shall</u> <u>not exceed 0.11 mi.</u>

Item 48: PSR (cont'd)

- For **non-NHS** sections (i.e., where sample section reporting is required), measured PSR can be reported, and shall be collected as follows:
 - On a biennial frequency
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

Item 48: PSR (cont'd)

Guidance:

- Sufficiency ratings must be correlated to rating classes specified in Table 4.4 of the HPMS Field Manual
 - If rating info cannot be correlated or is unavailable, use those specified in Table 4.4
- Coded on scale of 0 (poor) to 5 (very good)
- Reported in tenths (e.g. 4.2)

Item 49: Surface Type

- **Definition**: Surface type on a given section
- Extent Requirement: All NHS and Sample Panel roadway sections

Item 49: Surface Type (cont'd)

- This data item shall be collected:
 - Annually for Interstate sections
 - o Biennially for all other sections
- This data item shall be reported on a:

 Full extent basis for NHS sections
 Sample section basis for non-NHS sections

Item 49: Surface Type (cont'd)

- For NHS sections, should be determined from visual inspection and construction records to the extent possible
- Preservation treatments (e.g., thin overlays, microsurfacing, etc.) of < 0.5 in. compacted material shall be excluded surface type determination

Item 49: Surface Type (cont'd)

Table 4.5: Pavement Data Requirements by Surface Type

Code	IRI	PSR	Rutting	Faulting	Cracking	Thickness	Thickness
					Percent	Rigid	Flexible
1 - Unpaved							
2 - Bituminous	in/mi	0.1-5.0	0.01"		Fatigue % area		0.5"
3 - JPCP (includes whitetopping)	in/mi	0.1-5.0		0.01"	% cracked slabs	0.5"	0.5" include for white- topping only
4 - JRCP (includes whitetopping)	in/mi	0.1-5.0		0.01"	% cracked slabs	0.5"	0.5" include for white- topping only
5 - CRCP	in/mi	0.1-5.0			Punchout/long. /patch % area	0.5"	
6 - Composite (AC / AC)	in/mi	0.1-5.0	0.01"		Fatigue % area		0.5"
7 - Composite (AC / JCP)	in/mi	0.1-5.0	0.01"		Fatigue % area	0.5"	0.5"
8 - Composite (Bituminous / CRCP)	in/mi	0.1-5.0	0.01"		Fatigue % area	0.5"	0.5"
9 - Composite (Unbonded JC / PCC)	in/mi	0.1-5.0		0.01"	% cracked slabs	0.5"	
10 - Composite (Bonded JC / PCC)	in/mi	0.1-5.0		0.01"	% cracked slabs	0.5"	
11 - Other (e.g., brick, cobblestone, etc.)	in/mi	0.1-5.0					

Item 50: Rutting

- **Definition:** A longitudinal surface depression in asphalt pavement
- Extent Requirement: All asphalt NHS and Sample Panel roadway sections



- For **Interstate** sections, measured values shall be collected:
 - On an annual frequency
 - On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For **non-Interstate NHS** sections, measured values shall be collected:
 - On an biennial frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For **non-NHS** sections (i.e., where sample section reporting is required), measured values shall be collected as follows:
 - o On a biennial frequency
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

Guidance:

- Report the average of rutting values collected in ulletboth wheelpaths
- Report for Surface Type codes '2', '6', '7', and '8'
- Use Value Text field (Field 9) to indicate why • measured value has not been reported for NHS sections
- An estimated date can be provided when exact collection day within a month is unavailablemonth & year are required.
- Reported as the average depth of ruts on a section \bullet to the nearest 0.01 inch 29

<u>Guidance</u>:

• One of the following codes shall be reported to indicate restrictions to new data collection:

Code	Description
А	Construction – Roadway was under construction
В	Closure – Roadway was closed to traffic
С	Disaster – Roadway was located in an are declared as a disaster zone
D	Deterioration – Roadway was too deteriorated to measure and is designated as "Poor"
Е	Other – Section added to NHS post-data collection

Item 51: Faulting

- <u>Definition</u>: A vertical misalignment of pavement joints in Portland Cement Concrete pavements (Jointed Concrete Pavement)
- Extent Requirement: All jointed-concrete NHS and Sample Panel roadway sections



- For **Interstate** sections, measured values shall be collected:
 - On an annual frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For **non-Interstate NHS** sections, measured values shall be collected:
 - On an biennial frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For non-NHS sections (i.e., where sample section reporting is required), measured values shall be collected as follows:
 - On a biennial frequency
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

- Report the average/mean absolute faulting in the right wheelpath of all joints in a section
- Report for Surface Type codes '3', '4', '9', and '10'
- Use Value Text field (Field 9) to indicate why measured value has not been reported for NHS sections
- An estimated date can be provided when exact collection day within a month is unavailable month & year are required.
- Reported as average/mean absolute vertical displacement to the nearest 0.01 inch

<u>Guidance</u>:

• One of the following codes shall be reported to indicate restrictions to new data collection:

Code	Description
А	Construction – Roadway was under construction
В	Closure – Roadway was closed to traffic
С	Disaster – Roadway was located in an are declared as a disaster zone
D	Deterioration – Roadway was too deteriorated to measure and is designated as "Poor"
Е	Other – Section added to NHS post-data collection

Item 52: Cracking Percent

- <u>Definition</u>: The percentage of pavement surface exhibiting cracking
- Extent Requirement: All NHS and Sample Panel roadway sections



http://www.photos-public-domain.com/wpcontent/uploads/2011/11/cracked-asphalt-pavement-190x190.jpg

- For **Interstate** sections, measured values shall be collected:
 - On an annual frequency
 - o On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For **non-Interstate NHS** sections, measured values shall be collected:
 - On an biennial frequency
 - On a full extent basis for the mainline highway
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.
 - For milepoint limits (i.e., sections) that are consistent with those reported for IRI

- For **non-NHS** sections (i.e., where sample section reporting is required), measured values shall be collected as follows:
 - On a biennial frequency
 - In the rightmost through lane or one consistent lane
 - In a manner that allows for reporting in uniform section lengths of 0.1 mi. (528 ft.); sections shall not exceed 0.11 mi.

- Report the percent of total section area that exhibits cracking to the nearest 1%
- Report for all Surface Type codes
- Use Value Text field (Field 9) to indicate why measured value has not been reported for NHS sections
- An estimated date can be provided when exact collection day within a month is unavailable month & year are required.

<u>Guidance</u>:

• One of the following codes shall be reported to indicate restrictions to new data collection:

Code	Description
А	Construction – Roadway was under construction
В	Closure – Roadway was closed to traffic
С	Disaster – Roadway was located in an are declared as a disaster zone
D	Deterioration – Roadway was too deteriorated to measure and is designated as "Poor"
Е	Other – Section added to NHS post-data collection

Guidance:

- For asphalt pavements:
 - Report the percentage of the total area exhibiting visible fatigue type cracking for all severity levels in the wheelpath; nonwheelpath-based cracking is not to be reported

Calculating for AC Surface Types:

Scenario:

- Section: 1 lane, length = 0.1 mi. (528 ft.), width = 12 ft.
- Fatigue cracking: 125 ft. (inside wheelpath), 200 ft. (outside wheelpath) **wheelpath* = 3.25 ft.
- 1. Fatigue Cracking Area Calculation:
 - (125 ft. + 200 ft.) * 3.25 ft. = 1,056.25 sq. ft.
- 2. Cracking Percent Calculation:
 - 1,056.25 sq. ft. / (528 ft. * 12) sq. ft. = .1667
 - .1667 * 100% = 16.67% (rounded to the nearest 1% = 17%)

Guidance:

- For jointed concrete pavements:
 - Report the percentage of slabs within the section that exhibit transverse cracking

Calculating for jointed concrete Surface Types :

Scenario:

- Section length = 0.1 mi.
- 4 slabs contain one or more transverse cracks extending for at least one-half the lane width
- 10 total slabs

Cracking Percent Calculation:

- 4 cracked slabs /10 total slabs = 0.4
- 0.4 * 100% = 40%

Guidance:

- For continuously reinforced concrete pavements:
 - Report the percentage of the area of the section exhibiting longitudinal cracking, punchouts, and/or patching; exclude transverse cracking

Calculating for CRCP Surface Types :

<u>Scenario</u>:

- Section: 1 lane, length = 0.10 mi. (528 ft.), width = 12 ft.
- 1 Punchout: Area = 20 sq. ft.
- 1 Longitudinal Crack: Length = 10 ft.
- 3 Patches: Area = 6 sq. ft./each
- 1. Distress Area Calculation:
 - 20 sq. ft. + (10 ft. * 1 ft.) + (3 * 6 sq. ft.) = 48 sq. ft.
- 2. Cracking Percent Calculation:
 - (48 sq. ft. / (528 ft. * 12 ft.)) = 0.00757
 - 0.00757 * 100% = 0.758% (rounded to the nearest 1% = 1%)

Conclusion

- Basic data item description & requirements:
 - HPMS Field Manual
 - <u>https://www.fhwa.dot.gov/policyinformation/hp</u> <u>ms/fieldmanual/</u>
- TPM process including HPMS data role: <u>https://www.fhwa.dot.gov/tpm/</u>