

## **National Performance Management Measures; Assessing Pavement Condition for the National Highway Performance Program and Bridge Condition for the National Highway Performance Program**

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**SUBJECT: Establishment of State DOT Targets for PM-2 Performance Measures  
[23 CFR 490]**

### **DESCRIPTION:**

The Federal Highway Administration (FHWA) final rule for the *National Performance Management Measures; Assessing Pavement Condition for the National Highway Performance Program and Bridge* was published in the Federal Register (82 FR 5886) on January 18, 2017 and became effective on February 17, 2017.

This final rule establishes a set of performance measures for State Departments of Transportation (State DOTs) and Metropolitan Planning Organizations (MPOs) to use as required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act.

The purpose of this final rule is to establish measures for State departments of transportation (State DOT) to use to carry out the National Highway Performance Program (NHPP) and to assess the condition of the following: Pavements on the National Highway System (NHS) (excluding the Interstate System), bridges carrying the NHS which includes on- and off-ramps connected to the NHS, and pavements on the Interstate System. The NHPP is a core Federal-aid highway program that provides support for the condition and performance of the NHS and the construction of new facilities on the NHS. The NHPP also ensures that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS. This final rule establishes regulations for the new performance aspects of the NHPP that address measures, targets, and reporting. The FHWA issues this final rule based on sec. 1203 of MAP-21, which identifies national transportation goals and requires the Secretary to promulgate rules to establish performance measures and standards in specified Federal-aid highway program areas.

State DOTs are required to establish targets in coordination with MPOs for all the measures in this rule by May 20, 2018. MPOs will have an additional 180 days beyond that date to either set their own targets or agree to the State DOT targets. In addition, State DOTs will need to report on performance at regular intervals. The first State DOT baseline performance period report is due October 1, 2018, for all measures in this rule.

## **DISCUSSION:**

1. PM-2 Performance Measures include:
  - Percentage of pavements on the Interstate System in Good condition
  - Percentage of pavements on the Interstate System in Poor condition
  - Percentage of pavements on the NHS (excluding the Interstate System) in Good condition
  - Percentage of pavements on the NHS (excluding the Interstate System) in Poor condition
  - Percentage of NHS bridge deck area classified as in Good condition
  - Percentage of NHS bridge deck area classified as in Poor condition.
2. State DOT 2- and 4-year targets are due May 20, 2018 and will also be reported to FHWA in the 2017 baseline report due October 2018. To satisfy coordination requirements [23 CFR 490.105(e)(2)], PennDOT has coordinated with Planning Partners in the development of the measures and selection of targets to ensure consistency, to the maximum extent practicable.

## **COORDINATION MEETINGS:**

1. A Transportation Asset Management Plan Steering Committee was formed in January 2017.
  - a. The committee is comprised of PennDOT Executive Management, staff from the Federal Highway Administration, the Pennsylvania Turnpike Commission, as well as PennDOT's Engineering Districts, Asset Management Division, Center for Program Development and Management, Bureau of Planning and Research, and Highway Safety and Traffic Operations Division.
  - b. The purpose is to manage and coordinate the development, submission, and implementation of the Transportation Asset Management Plan, and the pavement and bridge condition performance measures.
  - c. The Steering Committee met on January 4, 2017, February 6, 2017, September 21, 2017, October 31, 2017, November 13, 2017, December 21, 2017, and April 16, 2018.
2. A workshop was conducted on January 11<sup>th</sup> with PennDOT and FHWA Pennsylvania Division staff to identify future steps and requirements related to the Transportation Performance Management (TPM) rulemaking.
3. PennDOT provided status updates on the development of performance measure data, tools and methodologies to the Planning Partners. On October 18, 2017, PennDOT provided an overview of the performance measures and general approaches for target setting at the Planning Partners fall conference in State College. On a March 20, 2018 conference call, PennDOT provided a status update on the development of baseline measures and targets.
4. PennDOT conducted a May 9<sup>th</sup> webinar to review the State DOT targets with the Planning Partners.
5. PennDOT has worked to develop the *Pennsylvania Department of Transportation MAP-21 and*

*FAST Act Performance Management Road Map* to provide Planning Partners a resource on the performance measure requirements and calculations.

**ESTABLISHMENT OF STATE DOT TARGETS:**

Specific targets and informational resources are attached as follows:

<b><i>Attachment 1 Targets</i></b>	Baseline and target values for Pavements
<b><i>Attachment 2 Targets</i></b>	Baseline and target values for NHS Bridges

**ESTABLISHMENT OF MPO TARGETS:**

1. The MPOs must establish targets no later than 180 days after the respective State DOT(s) establishes (or amends in future) their targets (by November 16, 2018). The MPOs must establish targets by either:
  - Agreeing to plan and program projects so that they contribute toward the accomplishment of the relevant State DOT target for that performance measure; or
  - Committing to a quantifiable target for that performance measure for their metropolitan planning area.
2. PennDOT will be formally contacting each MPO regarding the above MPO target setting options. If the MPOs establish their own performance measure targets, they should coordinate with PennDOT on the selection of the targets in accordance with 23 U.S.C. 134(h)(2)(B)(i)(II) to ensure consistency, to the maximum extent practicable.
3. The MPOs must report baseline condition/performance and progress toward the achievement of their targets in the system performance report in the metropolitan transportation plan.

## Attachment 1: PM-2 Baseline and Target Values for Pavement Measures

### Interstate:

Measure	2017 Baseline	2019 2-year Target	2021 4-year Target
Percentage in Good Condition	67.2 %	N/A	60.0 %
Percentage in Poor Condition	0.4 %	N/A	2.0 %

### NHS Non-Interstate:

Measure	2017 Baseline	2019 2-year Target	2021 4-year Target
Percentage in Good Condition	36.8 %	35.0 %	33.0 %
Percentage in Poor Condition	2.3 %	4.0 %	5.0 %

### Definitions:

Pavement performance measures required for FHWA reporting include four distress components:

- International Roughness Index (IRI) – Quantifies how rough the pavement is by measuring the longitudinal profile of a traveled wheel track and generating a standardized roughness value in inches per mile.
- Cracking – Measures the percentage of pavement surface that is cracked.
- Rutting – Measures the depth of ruts (surface depression) in bituminous pavement in inches.
- Faulting – Quantifies the difference in elevation across transverse concrete pavement joints in inches.

These distress measurements translate to good, fair, or poor condition scores. The following table summarizes the pavement condition metrics for IRI, cracking percent, rutting, and faulting:

Rating	Good	Fair	Poor
IRI (inches/mile)	<95	95–170	>170
Cracking Percentage (%)	<5	CRCP: 5–10 Jointed: 5–15 Asphalt: 5–20	CRCP: >10 Jointed: >15 Asphalt: >20
Rutting (inches)	<0.20	0.20–0.40	>0.40
Faulting (inches)	<0.10	0.10–0.15	>0.15

- IRI and cracking apply to both bituminous and concrete pavements, while rutting is exclusively for bituminous and faulting is exclusively for concrete. Each one-tenth-mile pavement section is considered in good condition if all three of its distress components are rated as good, and in poor condition if two or more of its three distress components are rated as poor.
- 23 CFR part 490.315(a), Subpart C, requires that no more than 5 percent of a state’s NHS Interstate lane-miles be in poor pavement condition.
- PennDOT’s pavement condition target (its desired state of good repair) for NHS Interstate roadways mirrors the federal standard: no more than 5 percent of Pennsylvania’s NHS Interstate pavements shall be rated in poor condition.
- PennDOT’s pavement condition targets are consistent with its asset management objectives of maintaining the system at the desired state of good repair, managing to LLCC, and achieving national and state transportation goals.
- 23 CFR 490.313(b)(4)(i) requires the total mainline lane-miles of missing, invalid, or unresolved sections for Interstate System and non-Interstate NHS shall be limited to no more than 5 percent of the total lane miles. A section is missing if any one of the data requirements specified in 23 CFR 490.309 and 23 CFR 490.311(c) are not met or that reported section does not provide sufficient data to determine its Overall Condition.

**Methodology:**

- Since no historical data at tenth-mile increments exists, previously collected segment-level data for the years 2013-2016 was quantified and used to determine deterioration rates for each condition. For each segment, the change of each condition value was determined from 2013 to 2014, from 2014 to 2015, and from 2015 to 2016.
- If a value was missing for any year, no change was calculated. If a condition value equaled zero for any year, it was excluded based on the assumption that a significant repair (i.e., a project) had been completed. The change in condition for each year was averaged for each segment; the segment averages were then averaged to determine an overall deterioration rate for each condition.
- There are instances where there was incremental improvement from one year to the next for the conditions. This is attributed to minor maintenance and/or bias in the collection process. These values were included in the analysis. The overall deterioration rate was then increased by 3 percent to reflect the impact of inflation. Since minor maintenance is reflected in the deterioration rate, and our ability to continue to perform those activities is affected by inflation, as a worst case, the deterioration would increase proportionately to the decrease in spending power for this work.
- Where the segment average resulted in a negative number (i.e., the condition value improved over the three-year period), a value of zero was used for the segment average since deterioration was not reflected in that segment average value.
- The resultant deterioration rates are provided in the following table:

Condition	Interstate	NHS Non-Interstate
Faulting (inch)	0.00024	0.00153
Concrete Cracking	0.94%	0.89%
Rutting (inch)	0.00651	0.00890
Bituminous Cracking	0.56%	0.90%

- The appropriate deterioration rates were applied to each condition, and values for each tenth-mile

increment were determined for the years 2021, 2025, and 2029. These values reflect a state of “do nothing.”

- Based on data from MPMS, all projects programmed on the Interstate and NHS non-Interstate networks for the next four years (2018-2021) were compiled. The mileage of these programmed projects that affected pavements in good, fair, and poor condition was determined, and these proportions were projected over the next four-year period (2022-2025) and the following four-year period (2026-2029). Since the TYP is not fully developed beyond the first four years, projecting programmed mileage for the first four years is a better representation of the volume of work to be expected, assuming constant funding while reducing affected miles by 3 percent annual inflation.
- Given the mileages in good, fair, and poor condition, and the projected programmed miles in each condition, resultant mileages were determined for the years 2021, 2025, and 2029. The mileage with missing data was assumed constant over this duration.

## Attachment 2: PM-2 Baseline and Target Values for Bridge Measures

Measure	2017 Baseline	2019 2-year Target	2021 4-year Target
Percentage in Good Condition	25.6 %	25.8%	26.0 %
Percentage in Poor Condition	5.5 %	5.6%	6.0%

### Definitions:

Separate bridge structure condition ratings are collected for deck, superstructure, and substructure components during regular inspections using the National Bridge Inventory Standards. For culvert structures, only one condition rating is collected (the culvert rating). A rating of 9 to 0 on the FHWA condition scale is assigned to each component. Based on its score a component is given a good, fair, or poor condition score rating.

The FHWA scoring system for bridge condition metrics for deck, superstructure, substructure, and culvert components is summarized in the following table:

Rating	Good	Fair	Poor
Deck	≥7	5 or 6	≤4
Superstructure	≥7	5 or 6	≤4
Substructure	≥7	5 or 6	≤4
Culvert	≥7	5 or 6	≤4

- A structure's overall condition rating is determined by the lowest rating of its deck, superstructure, substructure, and/or culvert. If any of the components of a structure qualify as poor, the structure is rated as poor.
- 23 CFR 490.411(a) requires that no more than 10 percent of a state's total NHS bridges by deck area are in poor condition.
- PennDOT's bridge condition targets are consistent with its asset management objectives of maintaining the system at the desired state of good repair, managing to LLCC, and achieving national and state transportation goals.

### Methodology:

- Several different types of models have been created and run with historic data to determine the level of accuracy of the predictive models based on previous deterioration investigations.
- The outputs from the best performing models were combined and used in conjunction with historic trends to produce a short-term projection.