



**DEVELOPMENTAL SPECIFICATIONS  
FOR  
PRIMARY AND INTERSTATE PAVEMENT SMOOTHNESS**

**Effective Date  
December 20, 2016**

**THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

These specifications replace Section 2317 of the Standard Specifications.

**2317.01 GENERAL.**

Evaluate pavement smoothness for Interstate and Primary main line pavement surfaces, and other road surfaces included on Primary projects, except when specifically excluded or modified by the contract documents. Main line pavement is defined as permanent pavement for through lanes.

- A.** Index used for determining the pavement smoothness is the Mean Roughness Index (MRI) per segment as determined by latest version of the FHWA's software, ProVAL.
- B.** The other measure of pavement smoothness is the Area of Localized Roughness (ALR) based on a continuous MRI computed over a 25 foot distance as determined by latest version of ProVAL.
- C.** A pavement segment is defined as a continuous area of finished pavement 0.1 mile in length and one lane (10 to 12 foot nominal) in width. A partial segment may result from an interruption of the continuous pavement surface (in other words, bridge approaches, side road tie-ins, the completion of the daily paving operations, and so forth). Pay adjustments will be prorated for partial segments. If a segment is less than 100 feet in length and requires corrective work, Engineer will waive corrective work requirement for segment and instead assess a prorated disincentive. Contracting Authority will subject the segment to ALR correction in accordance with Table 2317.05-1

**2317.02 EQUIPMENT.**

- A.** Provide and operate an inertial profiler meeting the requirements of AASHTO M 328 and Materials I.M. 341, Appendix A. Ensure operator is trained and certified to operate profiler as required by the Contracting Authority.
- B.** For corrective work by diamond grinding, use grinding and texturing equipment meeting the requirements of Section 2532 of the Standard Specifications.

### **2317.03 TESTING AND EVALUATION.**

#### **A. Testing.**

1. Obtain profiles of both wheel paths for each lane according to procedures shown in Materials I.M. 341, Appendix A. Wheel paths are defined as 3 feet and 9 feet from the center line or lane line. Average the two wheel path profile indexes for each segment.
2. Engineer may use an inertial profiler, 10 foot straightedge, or other means to detect irregularities in excluded surface areas or areas outside the required wheel paths for required corrective action.
3. Test bridge approaches according to Section 2428 of the Standard Specifications.
4. Test pavement within 5 working days of completion of paving.
5. Paved shoulders will be excluded from smoothness testing. When used as a temporary driving surface, evaluate paved shoulders for ALR. Take corrective action for ALR greater than 250.0 inches/mile.

#### **B. Evaluation.**

1. Determine a MRI using the latest version of the ProVAL "Ride Quality" analysis and following procedures shown in Materials I.M. 341, Appendix A for each segment of finished pavement surface with a posted speed over 45 mph except for:
  - a. Roads intersecting the mainline pavement less than 600 feet in length.
  - b. Road connections 150 feet before an intersection that end at a stop sign (or a yield sign at roundabouts).
  - c. Twenty feet on either side of bridges, bridge approaches, existing EF joints, manholes, or water valve boxes in the lane that the obstruction is located.
  - d. Ramps and loops.
  - e. Bridge approaches (evaluated according to Section 2428 of the Standard Specifications).
  - f. Storage lanes, turn lanes, and other auxiliary lanes less than 1000 feet.
  - g. Pavement less than 8.5 feet in width.
  - h. Single lift pavement overlays 2 inches thick or less, unless the existing surface has been corrected by milling or scarification.
  - i. Single lift pavement overlays 2 inches thick or less placed directly on PCC pavement.
  - j. Paved shoulders.
  - k. Detour pavement.
  - l. Crossovers.
  - m. Individual sections of pavement less than 100 feet in length.
2. Determine ALR using the latest version of the ProVAL "Smoothness Assurance" analysis and following the procedures shown in Materials I.M. 341, Appendix A, for each segment of finished pavement surface with a posted or advisory speed over 35 mph except for:
  - a. Side road connections 150 feet before an intersection that end at a stop sign (or a yield sign at roundabouts).
  - b. Twenty feet on either side of bridges, bridge approaches, manholes, or water valve boxes in the lane that the obstruction is located.
  - c. Bridge approaches (evaluated according to Section 2428 of the Standard Specifications).
  - d. Pavement less than 8.5 feet in width.
  - e. Paved shoulders (unless used as a temporary driving surface).
  - f. Detour pavement.
  - g. Crossovers.
  - h. Individual sections of pavement less than 50 feet in length.

3. Engineer may determine and identify irregularities of 1/8 inch or more in 10 feet longitudinally for excluded surface areas or areas outside required wheel paths.
4. Submit final profile summary sheets to the Engineer within 14 calendar days following completion of paving on project. When testing is done at completion of paving on project, provide Engineer ProVal files along with profile summary sheets.

#### **2317.04 CORRECTIVE ACTIONS.**

##### **A. General.**

1. Pavement will be evaluated in 0.1 mile segments using inertial profiler, to determine pavement segments where corrective work or pay adjustments will be necessary.
2. Within each 0.1 mile segment, correct ALR greater than 250.0 Inches/mile regardless of MRI value. Take corrective action.
3. Separately identify ALR.
4. On lanes over 8.5 feet in width, for through traffic which requires matching the surface of new pavement to the surface of an existing pavement, determine MRI and ALR for the existing lane. Compare MRI values and ALR areas according to Materials I.M. 341, Appendix A. If MRI and ALR for new pavement are less than the MRI and ALR for the existing surface, no negative payment adjustment or correction for MRI or ALR will be required.

##### **B. MRI Correction.**

Correct 0.1 mile segments having an initial MRI greater than those tolerances shown in Article 2317.05. Correct these segments to reduce MRI to that shown in Tables 2317.05-2 and 2317.05-3. Contractor has the option to replace these segments. On segments where corrections are made, test entire 0.1 mile segment of pavement to verify that corrections have met the MRI as shown in Tables 2317.05-2 and 2317.05-3.

##### **C. ALR Correction.**

Correct ALR greater than those tolerances shown in Article 2317.05. Correct these segments to reduce the ALR to that shown in Table 2317.05-1. Contractor has the option to replace these areas. On segments where corrections are made, test entire 0.1 mile segment of pavement to verify corrections have met ALR level shown in Table 2317.05-1.

##### **D. Engineer Identified Irregularities.**

Correct areas over 1/8 inch in 10 feet identified by Engineer.

##### **E. Bridge Approach Sections.**

Correct bridge approach sections according to Section 2428 of the Standard Specifications.

##### **F. Corrective Work.**

When Contractor is not responsible for adjoining surface, ALR in the 20 feet at the end of a section will be reviewed by Engineer. Correct ALR determined to be under the control of Contractor and resulting from Contractor's operations. Correction of ALR determined to be beyond control of Contractor will be paid according to Article 1109.03, B of the Standard Specifications. Complete corrective work prior to determining pavement thickness. Do not use bush hammers or other impact devices.

##### **1. PCC Pavement.**

Make corrections using an approved profiling device or by removing and replacing pavement. Apply corrective methods to full lane width. Ensure, when completed, corrected area (full lane width) has uniform texture and appearance, with the beginning and ending of the corrected

area squared normal to centerline of paved surface. Where surface corrections are made, grooving will not be required.

**2. HMA Pavement.**

- a. Make corrections by diamond grinding, overlaying, replacing, or inlaying the area. If surface is corrected by diamond grinding, perform same work and use same equipment as specified for PCC pavement.
- b. If surface is corrected by overlay, replacement, or inlay; begin and end surface correction with a transverse saw cut normal to pavement lane lines or edge lines within any one area. Profile of surface shall be smooth with no bumps or dips at beginning or end of correction.
- c. Overlay correction shall be for entire pavement width. Pavement cross slope shall be maintained through corrected areas.

**G. Verification Testing.**

- 1. Engineer will perform verification testing to validate Contractor's certified quality control testing. If Engineer's verification test results validate Contractor's test results, Contractor's results will be used for acceptance. Disputes between Contractor's and Engineer's test results will be resolved according to Materials I.M. 341, Appendix A.
- 2. Engineer may test entire project length if it is determined Contractor's certified test results are inaccurate. Contractor will be charged for this work at a rate of \$800.00 per lane-mile, with a minimum charge of \$1500.00.
- 3. Furnishing inaccurate tests may result in decertification of Contractor's certified operator.

**2317.05 PAY ADJUSTMENTS.**

**A. General.**

- 1. Pay adjustments will be based on initial MRI determined for the segments prior to performing any corrective work. Areas excluded from Inertial profiler testing and bridges approaches will not be subject to price adjustments.
- 2. If Contractor elects to remove and replace segments, Contractor will be paid the price adjustment that corresponds to the initial index obtained on the pavement segments after replacement.
- 3. When the plans indicate an area of pavement shall be hand finished, the area will not be subject to reduced payment. However, the area shall be profiled and corrected as necessary to meet these specifications.

**B. Areas of Localized Roughness.**

Payment for areas of localized roughness will be adjusted as shown in Table 2317.05-1.

**Table 2317.05-1: Schedule for Adjustment Payment for Areas of Localized Roughness**

ALR in 25 Foot Continuous Mean International Roughness Index (MRI) Inches per mile	Dollars per foot of pavement length per lane
200.0 to 250.0	-30.00 or grind*
Greater than 250.0	Grind*

\*Correct these areas to below 200.0 inches per mile

**C. PCC Pavement.**

Payment for mean International Roughness Index for PCC pavement will be adjusted as shown in Table 2317.05-2.

**Table 2317.05-2: Schedule for Adjustment Payment for PCC Pavements**

Mean International Roughness Index (MRI) Inches per mile	Dollars per 0.1 mile segment per lane
Less than 55.0	1500.00
55.0 to 63.0	$11812.5 - 187.5 \times \text{MRI}$
63.0 to 75.0	0.00
75.0 to 90.0	$7500 - 100 \times \text{MRI}$ or grind*
Greater than 90.0	Grind*

\*Correct these areas to below 75.0 inches per mile

**D. HMA Pavement.**

The payment for mean International Roughness Index for HMA pavement will be adjusted as shown in Table 2317.05-3.

**Table 2317.05-3: Schedule for Adjustment Payment for HMA Pavements**

Mean International Roughness Index (MRI) Inches per mile	Dollars per 0.1 mile segment per lane
Less than 30.0	1500.00
30.0 to 39.0	$6500 - 166.6667 \times \text{MRI}$
39.0 to 75.0	0.00
75.0 to 90.0	$7500 - 100 \times \text{MRI}$ or grind*
Greater than 90.0	Grind*

\*Correct these areas to below 75.0 inches per mile