SS-15013
(Replaces SS-15011)

SUPPLEMENTAL SPECIFICATIONS FOR PRIMARY AND INTERSTATE PAVEMENT SMOOTHNESS

Effective Date
February 21, 2023

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL 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 all Interstate and Primary main line pavement surfaces, and all other road surfaces included on Primary projects, except when specifically excluded or modified by the contract documents. For non-Primary projects, do not evaluate pavement smoothness unless specified in the contract documents. If this specification is required by contract documents on non-Primary projects let by the Department, it will be added in its entirety. Selected portions of the specification will not be deleted.

A. Main line pavement is defined as all permanent pavement for through lanes.

B. The index used for determining the pavement smoothness is the Mean Roughness Index (MRI) per segment as determined by the latest version of the FHWA's software, ProVAL.

C. 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 the latest version of ProVAL.

D. 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, the Engineer will waive the corrective work requirement for the segment and instead assess a prorated disincentive. The Contracting Authority will still subject the segment to ALR correction in accordance with Table 2317.05-1 and Table 2317.05-2.

2317.02 EQUIPMENT.

A. Provide and operate an inertial profiler meeting the requirements of AASHTO M328 and Materials I.M. 341, Appendix A. Ensure the operator is trained and certified to operate the 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.

2317.03 TESTING AND EVALUATION.

A. Testing.

1. Obtain profiles of both wheel paths for each lane according to the procedures shown in Materials I.M. 341, Appendix A. The 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. The 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.

4. Test the 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 an MRI using the latest version of the ProVAL "Ride Quality" or "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 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).
- **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.
- **n.** Roundabouts

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, existing EF joints, or water valve boxes in the lane that the obstruction is located.
- **c.** Bridge approaches (evaluated according to Section 2428).
- **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. The Engineer may determine and identify irregularities of 1/8 inch or more in 10 feet longitudinally for excluded surface areas or areas outside the required wheel paths.

4. Submit all final profile summary sheets and all ALR graphs to the engineer within 14 calendar days following completion of paving on the project. If requested by the engineer, provide the ProVAL files. When all the testing is done at the completion of paving on the project, provide the engineer the ProVal files along with the profile summary sheets.

5. Submit all preliminary profile summary sheets on provided form (https://iowadot.gov/Construction_Materials/materialsforms/ProfileSummarySheet.xlsx) and final ProVAL compatible files to the Construction and Materials Bureau via email to smoothness.cmb@iowadot.us following completion of paving on the project.

2317.04 CORRECTIVE ACTIONS.

A. General.

1. Pavement will be evaluated in 0.1 mile segments using the inertial profiler, to determine pavement segments where corrective work or pay adjustments will be necessary.

2. Within each 0.1 mile segment, correct all ALR identified as grind in table 2317.05-1 or table 2317.05-2 regardless of the 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 the new pavement to the surface of an existing pavement, Determine the MRI and ALR for the existing lane. Compare the MRI values and ALR areas according to Materials I.M. 341, Appendix A. If the MRI and ALR for the 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 all 0.1 mile segments having an initial MRI of greater than those tolerances shown in Article 2317.05. Correct these segments to reduce the MRI to that shown in Table 2317.05-3 through Table 2317.05-6. The Contractor has the option to replace these segments. On segments where corrections are made, test the entire 0.1 mile segment of pavement to verify that corrections have met the MRI as shown in Table 2317.05-3 through Table 2317.05-6.

C. ALR Correction.

1. 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 or Table 231705-2. The Contractor has the option to replace these areas. On segments where corrections are made, test the entire 0.1 mile segment of pavement to verify that corrections have met ALR level shown in Table 2317.05-1 or Table 2317.05-2.

2. Provide the engineer an image file for each area of ALR greater than 250 Inches per mile. Use the 0.1 mile scale setting and label the file with the station location, lane, and direction.

D. Engineer Identified Irregularities.

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

E. Bridge Approach Sections.
Correct bridge approach sections according to Section 2428.

F. Corrective Work.

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

2. PCC Pavement.
On PCC pavement, make corrections using an approved profiling device or by removing and replacing the pavement. Apply corrective methods to the full lane width. Ensure, when completed, the corrected area (full lane width) has uniform texture and appearance, with the beginning and ending of the corrected area squared normal to centerline of the paved surface. Where surface corrections are made, grooving will not be required.

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

G. Verification Testing.

1. The Engineer will perform verification testing to validate the Contractor's certified quality control testing. If the Engineer's verification test results validate the Contractor's test results, the Contractor's results will be used for acceptance. Disputes between the Contractor's and Engineer's test results will be resolved according to Materials I.M. 341, Appendix A.

2. The Engineer may test the entire project length if it is determined that the Contractor certified test results are inaccurate, The 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 the Contractor's certified operator.

2317.05 PAY ADJUSTMENTS.

A. General.

1. Pay adjustments will be based on the 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 the Contractor elects to remove and replace the segments, the Contractor will be paid the price adjustment that corresponds to the initial index obtained on the pavement segments after replacement.

3. When the plans dictate that an area of pavement is to be hand finished, the area will not be subject to reduced payment. However, the area is to be profiled and corrected as necessary to meet these specifications.

B. Areas of Localized Roughness

The payment for areas of localized roughness will be adjusted as shown in Table 2317.05-1 and Table 2317.05-2.

Table 2317.05-1: Schedule for Adjustment Payment for Areas of Localized Roughness for Primary and Interstate Projects

ALR in 25 Foot Continuous MRI (inches per mile)	Dollars per foot of pavement length per lane
200.0 to 250.0	-30.00 or grind[1]
Greater than 250.0	Grind[1]
1. Correct these areas to below 200.0 inches per mile	

Table 2317.05-2: Schedule for Adjustment Payment for Areas of Localized Roughness for Non-Primary Projects

Segment Speed/Type	ALR in 25 Foot Continuous MRI (inches per mile)	Dollars per foot of pavement length per lane
Speed greater than 45mph	200.0 to 250.0	-15.00 or grind[1]
	Greater than 250.0	Grind[1]
	1. Correct these areas to below 200.0 inches per mile	
Speed less than or equal to 45mph or curbed	250.0 to 300.0	-15.00 or grind[2]
	Greater than 300.0	Grind[2]
	2. Correct these areas to below 250.0 inches per mile	

C. PCC Pavement.

The payment for MRI for PCC pavement will be adjusted as shown in Table 2317.05-3 and Table 2317.05-4.

Table 2317.05-3: Schedule for Adjustment Payment for PCC Pavements for Primary and Interstate Projects

MRI (inches per mile)	Dollars per 0.1 mile segment per lane	
	Design Thickness	
	Full Depth (>6")	Overlay (<=6")
Less than 47.5	1,500.00	1,250.00
47.5 to 57.5	8,625.00-150*MRI	5,226.596-133.2623*MRI
57.5 to 75	Unit Price	Unit Price
75 to 90	7,500.00-100*MRI (or grind[1])	6,250.00-83.333*MRI (or grind[1])
Greater than 90	Grind[1]	Grind[1]
1. Correct these areas below 75.0 inches per mile		

Table 2317.05-4: Schedule for Adjustment Payment for PCC Pavements for Non-Primary Projects

MRI (inches per mile)	Dollars per 0.1 mile segment per lane
Less than 60.0	300.00
60.0 to70.0	2,100.00-30*MRI
70.0 to 80.0	0.00
80.0 to 95.0	1,600.00-20*MRI or grind[1]
Greater than 95.0	Grind[1]
1. Correct these areas to below 80.0 inches per mile	

D. HMA Pavement.

The payment for MRI for HMA pavement will be adjusted as shown in Table 2317.05-5 and Table 2317.05-6.

Table 2317.05-5: Schedule for Adjustment Payment for HMA Pavements for Primary and Interstate Projects

MRI (inches per mile)	Dollars per 0.1 mile segment per lane	
	Design Thickness	
	Full Depth (>4")	Overlay (≤4")
Less than 29.84	1,500.00	1,250.00
29.84 to 39.22	6,271.915-159.915*MRI	5,226.596-133.2623*MRI
39.22 to 75	Unit Price	Unit Price
75 to 90	7,500.00-100*MRI or grind[1]	6,250.00-83.333*MRI or grind[1]
Greater than 90	Grind[1]	Grind[1]
1. Correct these areas below 75.0 inches per mile		

Table 2317.05-6: Schedule for Adjustment Payment for HMA Pavements for Non-Primary Projects

MRI (inches per mile)	Dollars per 0.1 mile segment per lane
Less than 35.0	300.00
35.0 to 45.0	1,350.00-30*MRI
45.0 to 80.0	0.00
80.0 to 95.0	1,600.00-20*MRI or grind[1]
Greater than 95.0	Grind[1]
1. Correct these areas to below 80.0 inches per mile	