

4015xx – RIDE QUALITY OF HOT-MIX ASPHALT PAVEMENT

Description

The purpose of this Special Provision is to modify the Standard Specification Section **401.13 Surface Requirements** to change the method of determining an acceptable riding surface. This Special Provision replaces the entire existing wording in Section 401.13.

The Contractor shall be responsible for providing smoothness characteristics that will meet the requirements of this Contract. The Contractor shall be responsible for providing equipment and performing testing in accordance with the processes and procedures in this Special Provision.

Equipment

The Contractor shall have available, at all times during paving operations, an approved 10' straightedge. The contractor shall also have available a high speed or lightweight inertial profiling system meeting the standards set forth in AASHTO MP11 – Inertial Profiler. The Contractor may opt to have a rolling 10' straightedge capable of isolating deviations greater than 1/8" in 10'.

Prior to the start of the project, the Contractor shall provide to the Engineer any and all certifications relevant to the proposed profiling system. Prior to use on the project, the inertial profiling equipment shall be calibrated and verified in the presence of the Engineer in accordance to the requirements described below under **Complete Verification Process**. Once the equipment has been accepted using this process, it shall be assessed at the start of each testing date using the "onsite" verification process described under **On Site Verification**. Only one piece of equipment will be approved for use on each project location.

Complete Verification Process

Calibration shall include both static and dynamic test verification. If the proposed equipment contains an automated calibration procedure that is similar to that described in this Section, it may be used in lieu of this process.

Static Calibration

Four calibration blocks, furnished by the Engineer, with thickness of 0.25", 0.50", 1.00", and 2.00" and a smooth base plate shall be used to verify the accuracy and repeatability of the height measurement sensors. The calibration verification is to be performed as follows:

1. Place the smooth base plate under the height sensor and zero the sensor reading.
2. Place the 0.25" block under the height sensor on top of the base plate. Conduct and record 10 measurements.

3. Remove the 0.25” block and replace it with the 0.50” block. Conduct and record 10 measurements.
4. Remove the 0.50” block and replace it with the 1.00” block. Conduct and record 10 measurements.
5. Remove the 1.00” block and replace it with the 2.00” block. Conduct and record 10 measurements.

The measurements conducted shall be provided to the Engineer as a printed report generated from the profiling system. The average of the absolute differences of the 10 measurements made for each gauge block must be less than 0.01” for the static calibration verification to be acceptable.

Dynamic testing shall be performed to ensure accuracy of the distance measuring equipment (DMI) and the system stability. The DMI shall be verified by the equipment testing a 1500’ segment of straight roadway. The operator of the inertial profiling system shall conduct and record DMI measurements three times. The absolute difference between the known distance and the measured distances shall not be more than 0.1%.

Inertial profiling equipment is equipped with a verification process known as the “Bounce Test”. This test shall be performed and a maximum deviation of 5 inches per mile will be deemed acceptable.

On Site Verification

Prior to each test date, a simple verification of the equipment calibration shall be performed. A segment of 528’ in length shall be marked out and tested to ensure DMI calibration is within 1% of the actual distance. For static verification, a 1” block shall be placed under the measurement sensor after placement of a base plate and zeroing of the sensor. The block used for calibration will be provided by the Engineer at the time of verification. If the measurement is within 0.05” of the plate thickness, then the equipment is approved for use on that testing date.

Project Classes

Projects are separated into different paving “Classes” based on the work proposed in the contract documents and any modifications. The required smoothness is dependent upon this Class. Classes are defined as follows:

Class I - A project is considered a Class I project if the Hot Mix Asphalt surface placed is the final lift of a full depth construction project. Full depth construction is considered to be a Hot Mix Asphalt wearing surface placed on an asphalt treated base / binder coarse on an aggregate or stabilized base structure.

Class 2 – A project is considered to be a Class 2 project if the Hot Mix Asphalt surface placed is the final lift of material placed on a rehabilitation project containing two smoothness opportunities. An action that is considered a smoothness opportunity includes roadway milling, placement of a leveling course, in place recycling, or placement of a lift of Hot Mix Asphalt. The surface lift of asphalt placed is included as one of the two smoothness opportunities.

Class 3 – A project is considered to be a Class 3 project if the Hot Mix Asphalt surface placed is the only smoothness opportunity provided by contract specifications, details, and modifications.

Testing

Cross Slope

After final rolling, the Contractor shall test the surface of each lift for proper cross slope. The Contractor shall have available at all times, and use appropriately, an approved 10' straightedge to be placed perpendicular to the centerline for checking cross slope. Deviations in the transverse direction shall not exceed ¼".

Profiling Requirements

The International Roughness Index (IRI) shall be used to quantify the overall smoothness of the project. The IRI shall be calculated for each wheel path using an automated system. Data collected for IRI calculation shall have longitudinal spacing no greater than 6". Wavelengths exceeding 300' shall be removed using long wavelength filters. The International Roughness Index shall be calculated and reported in 0.1mile (528') segments.

Testing shall be performed within 7 days of the completion of project paving operations. Results shall be provided to the Engineer within 5 working days of the completion of testing. Testing not completed within the referenced timeframe or results not received within the allotted time frame will incur a penalty of \$1000 per day assessed at the discretion of the Engineer.

Areas not subject to IRI testing for all Classes of projects include:

1. 50' before the first bridge deck expansion joint to 50' after the last expansion joint if the bridge deck is excluded from the HMA overlay.
2. 20' longitudinally from the center of an existing obstruction located and visible in the pavement surface such as a manhole or water main. Obstructions located within the test area shall be noted as an event on report printouts using an automated event marking system.
3. Shoulders, deceleration, and acceleration lanes.

The original surface for Class 3 projects shall be tested at no cost to the Department prior to performance of any paving operations and after notification to the Engineer of the testing schedule and approval of equipment in accordance to the equipment verification portion of this specification. Class 1 and Class 2 projects do not require initial testing. Results from initial

testing (for Class 3 projects) and final testing for all projects shall be submitted to the Engineer within 5 working days of test completion in the format specified by the Engineer. Three measurements shall be taken for each lane required to meet this specification. Testing shall be in accordance to the following procedures.

1. Clean the roadway path to be measured of all debris and other loose material. Ensure that the roadway surface is dry and free of any standing water.
2. Locate the start of the project limits and mark them to enable automatic start sensors to be activated.
3. Locate the end of the project limits and mark them to enable automatic stop sensors to be activated.
4. Locate any obstructions in the wheelpath / test area and mark them with reflective tape to enable automatic event marking.
5. Establish a pre-test length of a minimum of 150' prior to the start of the project limits.
6. Position the left wheelpath sensor 3' from the centerline of the roadway.
7. Attain a test speed that is within the manufacturers recommendations for the equipment and maintain that test speed throughout the test.
8. Provide the Department the plot of one profile trace and a summary report containing IRI values for each test performed.

Excessive deviations

All areas, whether subject to IRI testing or not, must be free of deviations in each wheelpath in the longitudinal direction. Deviations shall not exceed 1/8" within 10'. Deviations may be located using an inertial profiling system, a rolling 10' straightedge or a rigid 10' straightedge. All areas found to exceed the allowable tolerances shall be reported to the Engineer in summary form containing the following information; station, lane, wheelpath, and deviation size. Humps and depressions found to exceed these tolerances shall be corrected at no expense to the Department or have a penalty of \$200 per deviation or \$6,400.00, whichever is greater, assessed at the discretion of the Engineer.

Quality Assurance Testing

If the Engineer chooses to perform comparison testing with the Contractor, the Contractor shall provide a 1.5-mile lane closure at no cost to the Department. The lane closure shall be at either end of the project limits and will be determined on a project basis at the Engineer's discretion.

If comparison testing indicates a difference greater than 6 inches per mile in IRI measurements per 0.1 mile section, the Contractor and Engineer shall work to resolve the differences. If the differences cannot be resolved, the Contractor's equipment shall be rejected for use on the project and all data collected to that point will be deemed invalid for that contract. At that point, an alternative piece of testing equipment shall be proposed for use by the Contractor.

Acceptance and Payment

An IRI number in inches per mile will be used for each 0.1 mile (528') as the basis for acceptance and payment of the surface courses designated by each contract. The average value of the three test runs will be used as the IRI value for payment. Payment for each section will be calculated based on estimated tonnage calculated from plan thickness and widths using the average maximum theoretical density (rice) value for all surface mix used at that location. If the plan does not indicate the travel lane width, a default value of 12' will be used. Bonus / Penalty amounts will be assessed prior to payment adjustments resulting from other specifications. The formula used for tonnage estimation is:

$$\text{Estimated Tonnage} = [(528 * \text{Length} * \text{Thickness}) * (\text{Rice} * \text{Unit Weight of Water})] * 4.54 * 10^{-4}$$

$$\text{Bonus / Penalty} = \text{Est. Tonnage} * \text{Contract Unit Price} * (\text{Applicable Cost Adjustment} - 100)$$

Table A: Payment adjustments for Class 1 and Class 2 Projects

	Payment Adjustments	
IRI per 0.1 mile Section (inches Per Mile)	Class 1	Class 2
35.0 and under	0	0
35.1 – 50.0	0	0
50.1 – 65.0	0	0
65.1 – 75	0	0
75.1 – 95	0	0
>95.1	Corrective Action Required	Corrective Action Required

Class 3 projects will be paid based on the percent improvement for each 528' section from the average of the three initial profile traces taken prior to any work action as shown in the table below.

Table B: Payment Adjustments for Class 3 projects

Percent Improvement from Initial test	Payment Adjustments for Class 3 Projects
75 – 100%	0
50 – 74.9%	0
40 – 49.9%	0
30 – 39.9%	0
0 – 29.9%	Corrective Action Required