ITEM 402.00004201 - PAVEMENT RIDE QUALITY ADJUSTMENT LEVEL 1
ITEM 402.00005201 - PAVEMENT RIDE QUALITY ADJUSTMENT LEVEL 2

DESCRIPTION

Measure the ride quality of the finished riding surface using a calibrated inertial profiler. Report test results to the Engineer as an average International Roughness Index (IRI) for the left and right wheelpaths of each pavement-ride-quality (PRQ) lot.

For the purposes of this specification, the following terms are defined below.

Calibration. All procedures contained in Materials Method 24.1 shall be followed to ensure that each individual data collection device is operating properly.

International Roughness Index (IRI). An index computed from a longitudinal profile measurement reported in in/mi. IRI is computed according to the quarter-car model which indicates the amount of suspension travel that one wheel of a standard vehicle would experience when traveling over a longitudinal profile.

Measurement. The average determination of IRI along the reference lines (left and right wheelpaths) for the entire length of a single PRQ lot in the direction of traffic.

Multiple-Course. Two or more paving courses, excluding truing and leveling.

Pavement Ride Quality (PRQ) Lot. A PRQ lot is a continuous 200m section of pavement one lane wide, in areas shown in the contract documents as requiring pavement ride quality testing. Ride Quality testing is performed and payment adjustments are made separately for each PRQ lot.

Quarter-car Model. A mathematical model of one wheel (one quarter) of a car of a standard weight with a standard tire, standard spring rate, and standard damping as established in NCHRP Report 228.

Reference Lines. The imaginary lines the noncontact-height sensors trace along the pavement surface. The intended reference lines for all Quality Control (QC) and Quality Assurance (QA) tests are located approximately 0.9m to either side of the center line of the lane (left and right wheelpaths). The closer all tests are taken to the same reference lines, the less variability will occur between the results.

Single-Course. One paving course, excluding truing and leveling.

Test. The average of three consecutive measurements taken on the same day in the same PRQ lot by the same inertial profiler and operator.

Verification. All procedures contained in Materials Method 24.1 to be followed to ensure the test results produced by a profiler are within an acceptable variation of the true profile.

MATERIALS None Specified

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CONSTRUCTION DETAILS

Test and report the IRI of all new flexible pavement and HMA overlays of pavement and bridge decks except:

- sections less than 400m in length. A section is defined as a length which can be continuously paved.
- sections within 60m of any traffic control device or intersection,
- tapered sections less than a full lane-width,
- ramps with posted advisory speed less than 40 mph,
- 8m from concrete-surfaced bridge decks and approach slabs,
- Individual PRQ lots that contain castings, grates, frames or other similar objects embedded within the travel lane. Test and report IRI only of the wheelpath outside the area influenced by the obstructions
- shoulders, gore areas, turn-outs, turn-arounds, driveways, parking areas, other similar miscellaneous paving.

All new HMA, including the areas excluded from ride quality testing listed above, is subject to the provisions of §402-3.10 Surface Tolerance.

A. Inertial Profiler Requirements. An inertial profiler conforming to AASHTO M328. Provide profiler's manufacturers operating ranges for equipment. Provide manufacturer's recommended calibration method.

Alternative equipment types may be used as approved by the Director, Materials Bureau. Submit requests to use alternative equipment at least 14 days prior to the start of ride quality testing. Alternative equipment must meet the inertial profiler requirements to be approved.

B. Equipment Verification, Calibration, and Daily Control Section Testing.

1. **Verification.** Prior to using an inertial profiler on a Department contract, provide documentation that the profiler has been verified according to Materials Method 24.1.

2. **Calibration.** Calibrate the inertial profiler according to frequency and procedures given in Materials Method 24.1. Perform additional calibration procedures or increased frequency as recommended per profiler manufacturer.

3. **Daily Control Section Testing.** Create a control section at or near the contract site according to the procedures of Materials Method 24.1. Each day of quality control testing, perform one measurement on the control section. Record the results and track the performance of the inertial profiler in accordance with the procedures of Materials Method 24.1.

C. Ride Quality Measurements.

1. **Layout PRQ Lots.** Divide the surface-course pavement areas designated in the contract documents as requiring pavement ride quality testing, according to the following:
   - Divide pavement constructed into PRQ lots 200m long and one lane wide. PRQ lots may include pavement placed on more than one day.
   - Each PRQ lot must be continuous. A PRQ lot may not straddle areas not designated for ride quality testing.
   - Include pavement sections shorter than 100m located between a PRQ lot and an area not designated for ride quality testing or the end of the contract in the adjacent PRQ lot.

- Create separate PRQ lot for pavement sections at least 100m long, but less than 200m, located between a PRQ lot and an area not designated for ride quality testing or the end of the contract.
- Remaining areas at the end of a day's paving which are less than 200m long will be added to and tested with the adjacent pavement after it is constructed.

2. **Perform Ride Quality Testing.** Perform one test in every PRQ lot in accordance with Test Method NY 402-01F. Perform ride quality testing after the final surface course has been paved and compacted. Perform Ride Quality testing in accordance with ASTM E1926. The recording procedure shall begin automatically unless otherwise approved by the Engineer. Notify the Engineer at least 48 hours in advance of ride quality testing.

3. **Report Results.** Provide the following information to the Engineer by the end of the next work day.

   a. **IRI Testing Summary Report.** Provide an IRI testing summary report, consisting of a header and results table, to the Engineer as a printout and an electronic file on CD-R or USB flash drive

      1. **Header.** Include the following information in the report header.
         - Contract D-number
         - Date
         - Filter Settings
         - Operator
         - Vehicle ID#

      2. **IRI Results Table.** Provide a table consisting of 9 columns labeled as shown below and one row for each PRQ lot tested. Report all results in units of m/km calculated to the nearest 0.01m/km. The IRI should be generated using

PRQ lot #	Direction	Lane/ Ramp	Begin Station	End Station	Measurement 1		Measurement 2		Measurement 3		Test
					LWP	RWP	LWP	RWP	LWP	RWP	

      When multiple lanes/ramps are present in a report, the report will include notation clearly defining the location and naming convention of the lanes/ramps. The report should identify areas excluded from the analysis such as structures and obstructions in the wheelpath as defined by this specification.

      3. **Localized Roughness Analysis Report –** Select one of the measurements for each lane to be tested. The measurement selected will be used for the entire length of the lane. Using the Smoothness Assurance Module in the ProVal software, perform a short continuous analysis, using a segment length of 8m, ride quality index set to MRI (Mean Roughness Index), and a threshold of 2.0 m/km.

   b. **Profile Data.** Provide a copy of each profile, unfiltered in the electronic Name each file according to the following format.

      "XXXXXX_YYY_Z.ERD"

      XXXXXX - Reserve first six characters for the numerical portion of the contract number.

YYY - Separated from the first six characters by an underscore. Reserve the next three characters for the first lot number represented by the file.
Z - Separated from the previous three characters by an underscore. Reserve the last character for the number of the measurement (1, 2, or 3) represented by the file.
.ERD - Denotes the file as being in the proper format for evaluation.

D. Corrective Action. When directed to perform corrective action, present the proposed repair procedures to the Engineer for approval at least 48 hours before beginning the repair work. Pavement thickness, traffic volume, speed, location of repair, level of ride quality, and effectiveness of a proposed procedure will be primary considerations in determining the proposed procedure's acceptability. Repeat the QC testing for the repaired PRQ lot(s) after the repair is completed. The final tests will be used for payment.

METHOD OF MEASUREMENT

Quality payment adjustments will be measured in Quality Units.

- Determine Quality Units for each PRQ lot by using Table 1.
- For PRQ lots of a length different from 200m, adjust the number of Quality Units as follows:

$$\text{Quality Units} = \text{Quality Units from Table 1} \times \left(\frac{\text{length of PRQ lot (m)}}{200\text{ m}}\right)$$

- Determine the total number of Quality Units by summing the Quality Units from all PRQ lots.
- Determine Quality Unit deduction from Localized Roughness using Table 2.
- Contract Quality Units will be rounded to the nearest whole unit.

The Contractor shall submit a report listing

- The average IRI of the wheelpaths for each PRQ lot, the number of quality units per PRQ lot, and the quantity of areas failing localized roughness

Table 1
Determination of Quality Units

LEVEL 1		LEVEL 2		
PRQ lot IRI (m/km)	Quality Units	PRQ lot IRI (m/km)	Quality Units for Multiple-Course	Quality Units for Single-Course
< 0.6	10	< 0.75	10	5
0.6 – 0.85	5	0.75 – 1.0	5	2.5
0.86 – 1.10	0	1.01 -1.25	0	0
1.11 – 1.30	-5	1.26 – 1.45	-5	-2.5
1.31 – 1.50	-10	1.46 – 1.65	-10	-5
>1.50 (1)	-20	>1.65 (1)	-20	-10

(1) The Department will evaluate the lot to determine if corrective action will be required.

Table 2
Determination of Quality Units – Localized Roughness

LEVEL 1		LEVEL 2		
Segment IRI (m/km)	Quality Units	Segment IRI (m/km)	Quality Units for Multiple-Course	Quality Units for Single-Course
>2.0(1)	-2	>2.0 (1)	-2	-1

(1) The Department will evaluate the lot to determine if it will remain in place.

BASIS OF PAYMENT

Payment of Quality Units will be made based on the Index Price listed in the contract documents. The index price shown in the itemized proposal for each Quality Unit is considered the price bid. The unit price is not to be altered by the bidder. Include the cost for all labor, equipment and material to satisfactorily complete the work in the unit price bid for the appropriate surface course HMA Item.

Payment will be made under:

Item No.	**Item**	**Pay Unit**
402.00004201	Pavement Ride Quality Adjustment Level 1	Quality Units
402.00005201	Pavement Ride Quality Adjustment Level 2	Quality Units