

1.0 SCOPE

This standard covers the procedures for measuring pavement surface smoothness through the use of high-speed inertial profilers.

2.0 REFERENCE STANDARDS

AASHTO Standards

- M328 Inertial Profiler
- R57 Operating Inertial Profiling Systems
- R56 Certification of Inertial Profiling Systems

ASTM Standards

- E867 Terminology Relating to Vehicle-Pavement Systems
- E1926 Computing International Roughness Index of Roads from Longitudinal Profile Measurements

Federal Highway Administration (FHWA)

- HPMS Field Manual, Appendix E: Measuring Pavement Roughness

3.0 DEFINITIONS

International Roughness Index (IRI): IRI is a measure of irregularities in the pavement surface. It is quantified based on dynamic response of single suspension (known as the quarter-car simulation) of a real vehicle traveling along a wheel path of roadways. A mathematical model accumulates the displacements of the simulated suspension in metres per kilometre (m/km) or millimetre per metre (mm/m).

Outer Wheel Path: A longitudinal line parallel to the centerline of pavement located at approximately 0.8 m (between 0.7 to 0.9 m) from outer paint lines.

Inner Wheel Path: A longitudinal line parallel to the centerline of pavement located at approximately 2.9 m (between 2.8 and 3.0 m) from outer paint lines.

Section: 100 m length per lane of a pavement surface.

Localized Roughness (LR): An IRI value over a specified limit within a sub-section length of 7.6 m.

4.0 APPARATUS AND MATERIALS

4.1 Equipment

FHWA Class 2 Profilometer

Distance Measurement Instrument (DMI): Distance Measuring Instrument with a measurement accuracy of $\pm 0.1\%$ of linear distance.

5.0 PROFILER CERTIFICATION

The inertial profiler must be certified in accordance with *AASHTO R56 Certification of Inertial Profiling System*.

6.0 CALIBRATION VERIFICATION

The calibration verification procedures shall be in accordance with *AASHTO R57 Operating Inertial Profiling Systems* as per Table 6.1.


Table 6.1 – Calibration Verification Minimum Frequencies

Calibration Verification	Minimum Frequency
Longitudinal Verification of Calibration	Weekly
Vertical Verification of Calibration	Daily
Daily Measurement Control	Weekly

Maintain an ongoing record for the values established during each calibration verification.

7.0 GENERAL

The final smoothness measurements shall be taken after the Contractor has completed all main lanes paving and is not blocking any lanes or hindering measurement on a continuous basis at a consistent speed throughout the completed pavement surface.

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Pavement surface shall be measured in segments of 5000 m or less in length to maintain DMI accuracy. A speed of 80 km/h will be maintained throughout the testing whenever possible.

8.0 PROCEDURE

The operator shall discuss the particularities of the project with the Contractor before commencement of the test and document items listed in Section 9.0.

The operator shall drive over the entire test area to become familiar with the road alignment, surface condition, restrictions/obstacles, stationing and other features (bridge, culverts, railway crossings, manholes, water valves, etc.) that may hinder the measurement and results.

8.1 Documenting Reference Points

Mark and document the beginning and end of each bridge, railway crossing, manhole covers, water valves and other features.

8.2 Measuring Pavement Smoothness

The pavement Smoothness shall be measured in accordance with *AASHTO R57 Operating Inertial Profiling Systems* with the exception of the following:

- The Smoothness measurements shall be taken in the direction of traffic.
- The starting point shall be initiated via an electronic target sensor to ensure that stationing captured by the profiler exactly matches with the stationing on the road.
- The profiler speed shall be maintained between 30 and 80 km/h while collecting the Smoothness measurement.
- Ensure the lasers are aligned on wheel paths while taking the measurements.

8.3 Processing Profile Data

Process the profile data to produce results according to the appropriate Smoothness specification listed in the Contract.

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9.0 REPORTING RESULTS

The report shall be prepared and submitted to the Contract Administrator and shall include:

- Contract Number
- Project Location (PR/PTH)
- Location description, including control section, start km and end km based on control section
- Date of measurements
- Operator's name
- Pavement construction type (new construction, reconstruction or rehabilitation)
- Pre-construction surface type (gravel, AST, bituminous or concrete)
- Existing surface treatment (none i.e. straight overlay, mill AST or bituminous, pulverize, cold in-place recycle asphalt, full depth reclamation or rubblized concrete)
- The total thickness of the new surface
- List of reference points
- Lane measured
- Run Number
- Raw Data
- Processed Data on Documents provided by the Contract Administrator