
Standard Practice for

Accepting Pavement Ride Quality When Measured Using Inertial Profiling Systems

AASHTO Designation: R 54-14 (2022)¹

Technically Revised: 2014

Reviewed but Not Updated: 2022

Technical Subcommittee: 5a, Pavement Measurement



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1. SCOPE

- 1.1. This practice provides guidance and example specification language intended for use by Owner-Agencies in the development of specific contract language when requiring the measurement and evaluation of ride quality and compliance using inertial profiling systems (IPS) and the International Roughness Index (IRI) as the quality measure.
- 1.2. If any part of this practice is in conflict with references made, such as ASTM or AASHTO Standards, this practice takes precedence for its purposes.
- 1.3. The values stated are in U.S. Customary units and are to be regarded as the standard.
- 1.4. *This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this specification to establish appropriate safety and health practices and determine the applicability of regulatory limitations related to and prior to its use.*

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
 - [M 328](#), Inertial Profiler
 - [R 56](#), Certification of Inertial Profiling Systems
 - [R 57](#), Operating Inertial Profiling Systems
- 2.2. *ASTM Standards:*
 - [E867](#), Standard Terminology Relating to Vehicle-Pavement Systems
 - [E1926](#), Standard Practice for Computing International Roughness Index of Roads from Longitudinal Profile Measurements
- 2.3. *Other Document:*
 - Sayers, M. W. On the Calculation of International Roughness Index from Longitudinal Road Profile. In *Transportation Research Record 1501*. Transportation Research Board, National Research Council, Washington, DC, 1995, pp. 1–12.

3. TERMINOLOGY

3.1. Definitions:

3.1.1. *Inertial Profiling System (IPS)*—an inertial profiler that meets the requirements of [M 328](#) when combined with an operator.

3.1.2. *International Roughness Index (IRI)*—a statistic used to determine the amount of roughness in a measured longitudinal profile. The IRI is computed from a single longitudinal profile using a quarter-car simulation at 50 mph (Sayers 1995). Computer programs to calculate the IRI from a longitudinal profile are referenced in [ASTM E1926](#).

3.1.3. *line laser*—a line laser obtains a series of data points along a line, which is typically perpendicular to the travel direction, with the line typically being 4 in. long. A single, bridged elevation value is computed from this data.

3.1.4. *localized roughness*—any 25-ft segment of roadway that contributes disproportionately to the overall roughness index value. Areas of localized roughness are identified using a report of continuous IRI with a base length of 25 ft. This yields the IRI of every possible 25-ft segment. Any segment for which the continuous report exceeds a threshold IRI value is considered a defective segment requiring correction.

Note 1—The threshold IRI value in inches per mile should be determined by each Owner-Agency. A typical range of values for various highway types is shown in Table 1.

Table 1—Typical Threshold Values for Localized Roughness

Roadway Type	IRI (in./mile)
Interstate	140 to 160
State primary	150 to 170
State secondary	160 to 190

3.1.5. *longitudinal profile*—the vertical deviations of the pavement surface taken along a line in the direction of travel referenced to a horizontal datum.

3.1.6. *report interval*—the longitudinal distance between the outputs of a profile index value.

3.1.7. *roughness*— according to [ASTM E867](#), the deviation of a surface from a true planar surface with characteristic dimensions that affects vehicle dynamics, ride quality, dynamic loads, and drainage.

3.1.8. *Type A Roughness Measurement*—a test procedure to measure the longitudinal profile of a surface using an inertial profiler and to compute the profile index known as the IRI.

3.1.9. *Type B Roughness Measurement*—a test procedure to measure surface profile deviations using a straightedge.

4. SIGNIFICANCE AND USE

4.1. This example provides specification language for measuring and accepting ride quality on newly constructed paving projects using an IPS and the IRI quality measure. If an Owner-Agency elects to use some other ride quality index, the fundamental methodology described herein remains valid, but not the individual settings.

Note 2—The IPS should be verified on the same pavement surface type and texture as that being measured. When profiling pavements with rough macrotexture, a height sensor with a large