
Standard Practice for Operating Inertial Profiling Systems

AASHTO Designation: R 57-14 (2022)¹

Technically Revised: 2014

Reviewed but Not Updated: 2022

Technical Subcommittee: 5a, Pavement Measurement



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Operating Inertial Profiling Systems

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1. SCOPE

- 1.1. This practice describes the procedure for operating and verifying the calibration of an inertial profiling system. This practice is meant to be performed as a quality control/quality assurance (QC/QA) test for use with the appropriate smoothness specification for paving operations and for network-level data collection. It is not meant to be required as a QA procedure to monitor daily paving operations; however, it is recommended when inertial profiling systems are used for QC testing.
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2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- [M 328](#), Inertial Profiler
 - [R 56](#), Certification of 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
 - [E2560](#), Standard Specification for Data Format for Pavement Profile
- 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.
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3. TERMINOLOGY

- 3.1. *Definitions:*
- 3.1.1. *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](#).
- 3.1.2. *longitudinal profile*—the vertical deviations of the pavement surface taken along a line in the direction of travel referenced to a horizontal datum.
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- 3.1.3. *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.

4. SIGNIFICANCE AND USE

- 4.1. This practice outlines standard procedures for operating inertial profiling systems for project-level QC/QA determinations and for network-level data collection and analyses.

5. EQUIPMENT

- 5.1. *Minimum Requirements*—The inertial profiling system must meet all requirements and specifications found in [M 328](#) and must be currently certified in accordance with [R 56](#).
- Note 1**—For consistent pavement profile determination, maintain air pressure in the tires of the host vehicle according to the manufacturer’s specification. The host vehicle and all system components will be in good repair and proven to be within the manufacturer’s specifications. The operator of the inertial profiler shall have all tools and components necessary to adjust and operate the inertial profiler according to the manufacturer’s instructions.
- 5.2. *Repair, Adjustment, and Upgrade of Inertial Profilers:*
- 5.2.1. Major component repairs or replacement to an inertial profiler that would require the recertification of the equipment include, but are not limited to, the following:
- The accelerometer and its associated hardware;
 - The noncontact height sensor and its associated hardware;
 - Any printed circuit board necessary for the collection of raw sensor data or the processing of the inertial profiles;
 - Change of host vehicle in the case of permanently mounted equipment; or
 - Major repairs to the host vehicle.
- 5.2.2. The operator of the inertial profiler will be allowed to make minor adjustments to the equipment without having to complete the recertification process as long as the adjustments allow the equipment to fulfill the verification of calibration process in Section 5.3. Minor adjustments to the system include, but are not limited to, the following:
- Inspecting, resoldering, or replacing connectors;
 - Cleaning components, normal adjustments to power supply voltage levels as required by the manufacturer;
 - Setting software parameters and/or scale factors as required by the manufacturer in a routine calibration procedure; or
 - Mounting on different suitable host vehicle(s) in the case of portable equipment.
- 5.3. *Verifying Calibration*—The following verification procedure is required for an inertial profiler used for QA testing of smoothness of new construction and network-level profiling, and is recommended when an inertial profiler is to be used as a QC instrument on a daily basis.
- 5.3.1. *Standards:*
- 5.3.1.1. *Longitudinal:*
- 5.3.1.1.1. The longitudinal verification standard shall be a straight and level roadway test section of at least 528 ft in length with sufficient lead-in distance for the vehicle to attain a constant speed before the start of the test section and a safe stopping distance.