Standard Practice for

Assessment of Body Motion Cancellation in Transverse Pavement Profiling Systems

AASHTO Designation: PP 107-21[1]

First Published: 2021

Technical Subcommittee: 5a, Pavement Measurement

AASHTO

American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, D.C. 20004

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1. SCOPE

1.1. This practice describes the procedure to assess the accuracy and precision of the transverse pavement profiler (TPP) when the system is excited at the primary ride and wheel hop excitation frequencies. The particular specification which will be assessed is vehicle body motion error.

1.2. The minimum requirements focus on the need for accurate and repeatable transverse measurements for network- and project-level data collection.

1.3. If any part of this practice is in conflict with referenced documents, such as ASTM standards, this practice takes precedence for its purposes.

1.4. This standard practice is intended to be conducted in conjunction with three other standard practices to fully assess and certify the TPP in typical operating conditions. For static assessment, see PP 106; for ground reference and transverse width assessment, see PP 109; and for assessment of drift mitigation, see PP 108.

1.5. *This practice 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 practice to establish appropriate safety and health practices and determine the applicability of regulatory limitations related to and prior to its use.*

2. REFERENCED STANDARDS

2.1. *AASHTO Standards*:

- PP 106, Assessment of Static Performance in Transverse Pavement Profiling Systems
- PP 108, Assessment of Navigation Drift Mitigation in Transverse Pavement Profiling Systems
- PP 109, Assessment of Highway Performance of Transverse Pavement Profiling Systems
- PP 111, Definition of Terms Related to Transverse Pavement Profiling Systems and Ground Reference Equipment

2.2. *ISO Standards*:

- ISO 3650, Geometrical Product Specifications (GPS) – Length Standards – Gauge Blocks
- ISO 12781, Geometrical Product Specifications – Flatness Standards

2.3. *Other Document*:

- Smith, H., and J. Ferris. Calibration Surface Design and Validation for Terrain Measurement Systems. *Journal of Testing and Evaluation*, Vol. 38, No. 4. 2010, pp. 431–438. Available from http://doi.org/10.1520/JTE102513.

3. TERMINOLOGY

3.1. See PP 111 for definition of terms used in this standard practice.

3.2. Table 1 provides the physical parameter definitions, symbols, and default values to be used when administering this standard.

Table 1—Physical Parameter Definitions and Default Values

Physical Parameter	Symbol	Default Value(s)
Minimum Transverse Width of Test Section	W_{TS}	4.25 m (14 ft)
Excitation Board Length	L_e	1.28 ± 0.05 m (4.2 ± 0.2 ft)
Excitation Board Cleat Spacing	a	256.0 ± 5.0 mm (10.0 ± 0.2 in)
Excitation Board Cleat Width	w	90.0 ± 5.0 mm (3.5 ± 0.2 in)
Cleat Height and Base Board Height	h_e	9.0±1.0 mm (0.375±0.05 in)
TPP Operating Speed	v	9.0 ± 2.0 kph (5 ± 2 mph), 13.0 ± 2.0 kph (8 ± 2.0 mph), 18.5 ± 2.0 kph (12 ± 2 mph)
Minimum Flat Plate Length	l_p	1.2 m (4.0 ft)
Minimum Flat Plate Width	w_p	0.6 m (2.0 ft)
Minimum Flat Plate Thickness	t_p	10.0 mm (0.4 in)
Flat Plate Offset from Front Center of Excitation Board	d_p	TPP dependent
TPP Track Width of the Nearest Wheelset	w_t	TPP dependent
Minimum Number of Passes through the Test Section at Each Speed	n_p	2
Number of Measurements to Randomly Select	N_r	50

4. SIGNIFICANCE AND USE

4.1. Measured transverse profiles of road surfaces are used to extract pavement deformation parameters such as rut depth, cross slope, and edge/curb drop-off. The accuracy of the estimated pavement deformation parameters depends on the collected data accurately representing the transverse section of the road surface.

4.2. Requirements on the cancellation of vehicle body motion ensure that the TPP is effectively cancelling out the motion of the vehicle body and the resulting collected data accurately represents the road surface.

4.3. This practice outlines standard procedures for assessing the expected operational accuracy and precision of transverse pavement profilers when driving over rough road surfaces. The standard prescribes a procedure to evaluate the ability of the system to accurately represent a planar surface through multiple transverse profile measurements (a single point cloud) captured while the vehicle is subject to primary ride and roll excitations at a set range of speeds. Because the data are used for subsequent calculations for rut depth, cross slope, and edge/curb drop-off, tables of the necessary accuracy and precision for certification are provided in the form of bias and confidence intervals for each use.