

---

**Standard Practice for**

# **Assessment of Ground Reference Data for Transverse Pavement Profiling System Assessment**

---

**AASHTO Designation: PP 110-21<sup>1</sup>**

**First Published: 2021**

**Technical Subcommittee: 5a, Pavement Measurement**



**American Association of State Highway and Transportation Officials  
555 12<sup>th</sup> Street NW, Suite 1000  
Washington, DC 20004**

[This is a preview. Click here to purchase the full publication.](#)

# Assessment of Ground Reference Data for Transverse Pavement Profiling System Assessment

AASHTO Designation: PP 110-21<sup>1</sup>



First Published: 2021

Technical Subcommittee: 5a, Pavement Measurement

---

## 1. SCOPE

- 1.1. This practice describes the procedures used to assess ground reference data used in PP 109.
- 1.2. This practice describes the accuracy and precision analysis needed to ensure a ground reference equipment (GRE) system is collecting acceptable quality ground reference data. The accuracy and precision are evaluated using four surfaces: a certified straightedge, a bounding beam with gauge blocks, a road surface, and a macrotexture surface. The measures evaluated are: transverse, longitudinal, and vertical measurement error; transverse, longitudinal, and vertical measurement spacing; transverse straightness; and horizontal plane flatness.
- 1.3. It is necessary for all four surfaces to be measured and analyzed to ensure the GRE is capable of producing road surface measurements with accuracy that is acceptable for ground reference data in PP 109. To verify these accuracies are achieved for a road surface, a mix of certified smooth/flat surfaces (i.e., straightedge and gauge blocks) must be coupled with textured surfaces (e.g., macrotexture surface) with verifiable roughness and dimensions to ensure the GRE is correctly measuring road surfaces that have a nominal roughness.
- 1.4. If any part of this practice is in conflict with referenced documents, such as ASTM standards, this practice takes precedence for its purposes.
- 1.5. This test is designed to be conducted as the first steps in assessing a newly proposed ground reference data acquisition device and when acquiring ground reference data for PP 109.
- 1.6. 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 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

### 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 Straightedge Length and transverse width of the Road Surface	$L_{fs}$	4.0 m (13.1 ft)
Minimum Straightedge Width	$W_{fs}$	25 mm (1 in.)
Width of Transverse Bounding Beams	$w_b$	$40.0 \pm 2.0$ mm ( $1.5 \pm 0.1$ in.)
Vertical Height of Gauge Blocks	$h_{g,1}$ $h_{g,2}$	$75 \pm 2$ mm, $50 \pm 1$ mm, $25 \pm 1$ mm $25 \pm 1$ mm, $12 \pm 1$ mm, $6 \pm 1$ mm
Minimum Gauge Block Transverse Width	$w_g$	19.0 mm (0.75 in.)
Transverse Distance from the Base of the Gauge Block	$d_s$	25.0 mm (1 in.)
Longitudinal Length of the Road Surface	$L_s$	$0.5 \pm 0.05$ m ( $19.5 \pm 2$ in.)
Desired Transverse Locations of Gauge Blocks from the Transverse Centerline	$d_t$	$2.0 \pm 0.05$ m ( $78.75 \pm 2$ in.)
Longitudinal Length of the Macrotexture Surface	$l$	$150.0 \pm 5.0$ mm ( $6 \pm 0.2$ in.)
Transverse Width of the Macrotexture Surface	$w$	$150.0 \pm 5.0$ mm ( $6 \pm 0.2$ in.)
Minimum Longitudinal Length of Flat Plate	$L_p$	1.0 m (3.28 ft)
Minimum Transverse Width of Flat Plate	$W_p$	0.5 m (20 in.)
Longitudinal Offset of the Macrotexture Surface from a Reference Corner of a Flat Plate	$l_o$	$175.0 \pm 5.0$ mm ( $6.8 \pm 0.2$ in.)
Transverse Offset of the Macrotexture Surface from a Reference Corner of a Flat Plate	$w_o$	$25.0 \pm 5.0$ mm ( $1.0 \pm 0.2$ in.)
Measurement Error Longitudinal Grid Spacing	$l_g$	10.0 mm (0.4 in.)
Measurement Error Transverse Grid Spacing	$t_g$	10.0 mm (0.4 in.)
Number of Random Measurements to Select	$N_r$	100

### 4. SIGNIFICANCE AND USE

- 4.1. Accurate ground reference data are needed for assessment of transverse pavement profiling (TPP) systems. Ground reference data are needed to quantify the vertical measurement error present in TPP systems when collecting measurements for cross slope, rutting, and edge/curb detection. For specifics regarding the highway performance TPP assessment process and usage of ground reference data, see PP 109.
- 4.2. In PP 109, a road surface with a transverse width of  $L_{fs}$  and a longitudinal length of  $L_s$  shall be selected to test for accuracy and precision of a TPP system when measuring rutting, cross slope, and edges/curbs. For this segment of road surface, the process of collecting ground reference data using GRE is provided in detail in this standard practice.
- 4.3. This standard prescribes tests to evaluate the transverse spacing between measurements; total width of measurements; vertical resolution of the measurements; straightness of the transverse measurements; vertical, transverse, and longitudinal accuracy and precision; and error associated with measuring macrotexture. Since collected ground reference data shall be used to evaluate the accuracy and precision of TPP systems, a table of the necessary accuracy and precision