



Standard Practice for Simulating Profilograph Response to Longitudinal Profiles of Traveled Surfaces¹

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1. Scope

1.1 These practices cover the calculation of profilograph response to longitudinal profiles of traveled surface roughness.

1.2 These practices utilize computer simulations to obtain profilograph responses including: surface sensing wheel (recording wheel) vertical displacement, and reference platform wheels (supporting wheels) motions, as a function of distance.

1.3 These practices present standard profilograph simulations for use in the calculations.

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only and are not considered standard.

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

2. Referenced Documents

2.1 *ASTM Standards:*²

E950 Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference

E1274 Test Method for Measuring Pavement Roughness Using a Profilograph

3. Terminology

3.1 See Test Method **E1274**.

4. Summary of Practices

4.1 These practices use a measured profile (see Test Method **E950**) or a synthesized profile as part of a computer simulation

¹ This practice is under the jurisdiction of ASTM Committee **E17** on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee **E17.33** on Methodology for Analyzing Pavement Roughness.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

to obtain the response of the surface sensing wheel of a profilograph. The first practice uses a kinematic profilograph simulation model to obtain typical profilograph profiles as a function of distance. The second practice obtains the vertical displacement of the surface sensing wheel using the surface sensing wheel size, supporting wheel locations, and the spacing between the supporting wheels. The output is the continuous vertical motion of the surface sensing wheel of the simulated profilograph for a predetermined distance. The units are relative vertical movement (millimetres (inches)) at longitudinal surface profile location (metres (feet)). Pertinent information affecting the results must be noted.

5. Significance and Use

5.1 These practices provide a means for evaluating traveled surface-roughness characteristics directly from a measured profile. The calculated output values represent profilograph response to traveled surface roughness.

5.2 These practices provide pavement surface profiles to evaluate pavement condition using the profilograph index.

6. Apparatus

6.1 *Computer*—The computer is used to calculate the surface sensing wheel vertical displacement of a profilograph with twelve reference platform wheels in response to a traveled surface profile using a synthesized profile or a profile obtained in accordance with Test Method **E950** as the input. Filtering shall be provided to permit calculation (for example, butterworth low pass or moving average low pass filters).

6.2 *Data-Storage Device*—A data-storage device shall be provided for the reading of profiles and the recording and long-term storage of computed data. Profile data shall be scaled to maintain a resolution of 0.025 mm (0.001 in.) and to accommodate the full range of amplitudes encountered during normal profile-measuring operations. The device shall not contribute to the recorded data any noise amplitude larger than 0.025 mm (0.001 in.).

6.3 *Simulation Input*—Digital profile recordings of pavement surface profiles shall be obtained in accordance with Test Method **E950** or synthesized. The profile must be recorded at intervals no greater than 30.48 mm (1.2 in.). When more than one path of a traveled surface is measured, the recorded profile