



Designation: D 4694 – 96

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Method for Deflections with a Falling-Weight-Type Impulse Load Device¹

This standard is issued under the fixed designation D 4694; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the measurement of deflections of paved and unpaved surfaces with a falling-weight-type impulse load device. These devices are commonly referred to as falling-weight deflectometers or FWDs.

1.2 This test method describes the measurement of vertical deflection response of the surface to an impulse load applied to the pavement surface. Vertical deflections are measured on the load axis and at points spaced radially outward from the load axis.

NOTE 1—Subcommittee D04.39 is currently working on the development of a Precision and Bias statement. Therefore, the committee recommends that the results from this test method should not be used in a buying or selling relationship for construction materials or construction materials acceptance.

1.3 The values stated in SI units are to be regarded as the standard.

1.4 *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. A specific hazard statement is given in Section 6.*

2. Referenced Documents

2.1 ASTM Standards:

D 4695 Guide for General Pavement Deflection Measurements²

2.2 Strategic Highway Research Program:

Manual for FWD Testing in the Long Term Pavement Performance Study, Operational Field Guidelines, Version 2.0, February 1993

3. Summary of Test Method

3.1 This test method is a type of plate-bearing test. The load is a force pulse generated by a weight dropped on a buffer system and is transmitted through a plate resting on the

pavement surface. The test apparatus may be mounted in a vehicle or on a suitable trailer towed by a vehicle.

3.2 The vehicle is brought to a stop with the loading plate positioned over the desired test location. The plate and deflection sensors are lowered to the pavement surface. The weight is raised to the height that, when dropped, will impart the desired force to the pavement. The weight is dropped and the resulting vertical movement or deflection of the pavement surface is measured using suitable instrumentation. Multiple tests at the same or different heights of drop may be performed before the apparatus is then raised and moved to the next test site.

3.3 Peak pavement deflections at each measured location resulting from the force pulse are recorded in micrometres, millimetres, mils, or inches, as appropriate.

3.4 The peak force imparted by the falling weight is measured by a load cell and recorded, as the force in kN or lbf or mean stress (the load divided by the plate area) in kN/m² or psi as appropriate.

4. Significance and Use

4.1 This test method covers the determination of pavement surface deflections as a result of the application of an impulse load to the pavement surface. The resulting deflections are measured at the center of the applied load and at various distances away from the load. Deflections may be either correlated directly to pavement performance or used to determine the in-situ material characteristics of the pavement layers. Some uses of data include structural evaluation of load carrying capacity and determination of overlay thickness requirements for highway and airfield pavements.

5. Apparatus

5.1 *Instrumentation System*, conforming to the following general requirements:

5.1.1 *Instruments Exposed to the Elements* (outside the vehicle), shall be operable in the temperature range of – 10 to 50°C (10 to 120°F) and shall tolerate relatively high humidity, rain or spray, and all other adverse conditions such as dust, shock, or vibrations that may normally be encountered.

5.1.2 *Instruments Not Exposed to the Elements* (inside the vehicle), shall be operable in the temperature range of 5 to 40°C (40 to 105°F).

5.2 *Force-Generating Device* (falling “weight”), with a guide system. The force-generating device shall be capable of

¹ This test method is under the jurisdiction of ASTM Committee D-4 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.39 on Non-Destructive Testing of Pavement Structures.

Current edition approved Feb. 10, 1996. Published April 1996. Last previous edition D 4694 – 87 (1995) ε¹. Originally published as D 4694 – 87.

² *Annual Book of ASTM Standards*, Vol 04.03.