



Standard Test Method for Determining the Thickness of Bound Pavement Layers Using Short-Pulse Radar¹

This standard is issued under the fixed designation D4748; 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 nondestructive determination of the thickness of bound pavement layers using Ground Penetrating Radar (GPR).

1.2 This test method may not be suitable for application to pavements which exhibit increased conductivity due to the increased attenuation of the electromagnetic signal. Examples of scenarios which may cause this are: extremely moist or wet (saturated) pavements if free electrolytes are present and slag aggregate with high iron content.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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. Specific hazard statements are given in Section 11.*

2. Referenced Documents

2.1 ASTM Standards:²

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D6087 Test Method for Evaluating Asphalt-Covered Concrete Bridge Decks Using Ground Penetrating Radar

D6429 Guide for Selecting Surface Geophysical Methods

D6432 Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation

E1778 Terminology Relating to Pavement Distress

¹ This test method is under the jurisdiction of ASTM Committee E17 on Vehicle – Pavement Systems and is the direct responsibility of Subcommittee E17.41 on Pavement Testing and Evaluation.

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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.

3. Terminology

3.1 Definitions:

3.1.1 Definitions shall be in accordance with the terms and symbols given in Terminologies **D653** and **E1778**.

3.1.2 Additional definitions can be found in section 3.1.3 of Guide **D6432**, and in Ref (1).³

3.1.3 Additional definitions:

3.1.3.1 *bound pavement layer*—upper layers of a pavement structure consisting of aggregate materials mixed with cementitious binders such as bitumen or Portland cement paste. Examples of bound pavement layers include bituminous concrete, portland cement concrete, and stabilized bases. Bound pavement layers do not include granular base and subbase materials.

3.1.3.2 *unbound pavement layer*—lower layers of a pavement structure consisting of untreated aggregate materials such as sand, gravel, crushed stone, slag, and other stabilized materials. Unbound pavement layers include base, subbase and compacted subgrade.

4. Apparatus

4.1 The apparatus may consist of a vehicle or a cart that is equipped with the following:

4.1.1 One or more GPR antennas mounted on the vehicle, cart, or on a trailer

4.1.1.1 The antenna for this application typically has a center frequency that ranges from 1.0 to 2.6 GHz. A typical 1.0 GHz antenna usually has a resolution sufficient to determine a minimum layer thickness of 40 mm (1.5 in.) to an accuracy of ± 5.0 mm (± 0.2 in.). Antennas emitting short pulses containing a center frequency of 2.0 GHz and higher provide resolution sufficient for determination of a minimum layer thickness less than 25 mm (1.0 in.) to an accuracy of ± 2.5 mm (± 0.1 in.).

4.1.1.2 Two basic types of antenna systems are in use:

(1) Air-launched antennas that are specifically designed to radiate into the air and are to be used at some distance above the pavement surface, typically 20 to 50 cm (8 to 20 inches).

(2) Ground-coupled antennas that are specifically designed to operate in contact with the pavement surface.

³ The boldface numbers in parentheses refer to a list of references at the end of this standard.