



Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils¹

This standard is issued under the fixed designation D5778; 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 procedure for determining the point resistance during penetration of a conical-shaped penetrometer as it is advanced into subsurface soils at a steady rate.

1.2 This test method is also used to determine the frictional resistance of a cylindrical sleeve located behind the conical point as it is advanced through subsurface soils at a steady rate.

1.3 This test method applies to friction-cone penetrometers of the electric and electronic type. Field tests using mechanical-type penetrometers are covered elsewhere by Test Method [D3441](#).

1.4 This test method can be used to determine porewater pressures developed during the penetration, thus termed piezocone. Porewater pressure dissipation, after a push, can also be monitored for correlation to time rate of consolidation and permeability.

1.5 Additional sensors, such as inclinometer, seismic geophones (Test Methods [D7400](#)), resistivity, electrical conductivity, dielectric, and temperature sensors, may be included in the penetrometer to provide useful information. The use of an inclinometer is highly recommended since it will provide information on potentially damaging situations during the sounding process.

1.6 Cone penetration test data can be used to interpret subsurface stratigraphy, and through use of site specific correlations, they can provide data on engineering properties of soils intended for use in design and construction of earthworks and foundations for structures.

1.7 The values stated in SI units are to be regarded as standard. Within Section 13 on Calculations, SI units are considered the standard. Other commonly used units such as the inch-pound system are shown in brackets. The various data reported should be displayed in mutually compatible units as

agreed to by the client or user. Cone tip projected area is commonly referred to in square centimetres for convenience. The values stated in each system are not equivalents; therefore, each system shall be used independently of the other.

NOTE 1—This test method does not include hydraulic or pneumatic penetrometers. However, many of the procedural requirements herein could apply to those penetrometers. Also, offshore/marine CPT systems may have procedural differences because of the difficulties of testing in those environments (for example, tidal variations, salt water, waves). Mechanical CPT systems are covered under Test Method [D3441](#).

1.8 *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

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D3441 Test Method for Mechanical Cone Penetration Tests of Soil](#) (Withdrawn 2014)³

[D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)

[D7400 Test Methods for Downhole Seismic Testing](#)

[E4 Practices for Force Verification of Testing Machines](#)

3. Terminology

3.1 Definitions:

3.1.1 Definitions are in accordance with Terminology Convention ([D653](#)).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *apparent load transfer*—apparent resistance measured on either the cone or friction sleeve of an electronic cone penetrometer while that element is in a no-load condition but

¹ This test method is under the jurisdiction of ASTM Committee [D18](#) on Soil and Rock and is the direct responsibility of Subcommittee [D18.02](#) on Sampling and Related Field Testing for Soil Evaluations.

Current edition approved Jan. 1, 2012. Published February 2012. Originally approved in 1995. Last previous edition approved in 2007 as D5778–07. DOI: 10.1520/D5778-12.

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 The last approved version of this historical standard is referenced on www.astm.org.