



Standard Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes¹

This standard is issued under the fixed designation D1587/D1587M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers a procedure for using a thin-walled metal tube to recover intact soil samples suitable for laboratory tests of engineering properties, such as strength, compressibility, permeability, and density. This practice provides guidance on proper sampling equipment, procedures, and sample quality evaluation that are used to obtain intact samples suitable for laboratory testing.

1.2 This practice is limited to fine-grained soils that can be penetrated by the thin-walled tube. This sampling method is not recommended for sampling soils containing coarse sand, gravel, or larger size soil particles, cemented, or very hard soils. Other soil samplers may be used for sampling these soil types. Such samplers include driven split barrel samplers and soil coring devices (Test Methods [D1586](#), [D3550](#), and Practice [D6151](#)). For information on appropriate use of other soil samplers refer to Practice [D6169](#).

1.3 This practice is often used in conjunction with rotary drilling (Practice [D1452](#) and Guides [D5783](#) and [D6286](#)) or hollow-stem augers (Practice [D6151](#)). Subsurface geotechnical explorations should be reported in accordance with Practice [D5434](#). This practice discusses some aspects of sample preservation after the sampling event. For more information on preservation and transportation process of soil samples, consult Practice [D4220](#).

1.4 This practice may not address special considerations for environmental or marine sampling; consult Practices [D6169](#) and [D3213](#) for information on sampling for environmental and marine explorations.

1.5 Thin-walled tubes meeting requirements of [6.3](#) can also be used in piston samplers, or inner liners of double tube push or rotary-type soil core samplers (Pitcher barrel, Practice [D6169](#)). Piston samplers in Practice [D6519](#) use thin-walled tubes.

1.6 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice [D6026](#), unless superseded by this standard.

1.7 This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.8 The values stated in either inch-pound units or SI units presented in brackets are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.9 *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

- [A513/A513M Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing](#)
- [A519 Specification for Seamless Carbon and Alloy Steel Mechanical Tubing](#)
- [A787 Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing](#)
- [B733 Specification for Autocatalytic \(Electroless\) Nickel-Phosphorus Coatings on Metal](#)

¹ This practice 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 Nov. 15, 2015. Published December 2015. Originally approved in 1958. Last previous edition approved in 2012 as D1587 – 08 (2012) ^{ϵ 1}. DOI: 10.1520/D1587_D1587M-15.

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.

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D1452 Practice for Soil Exploration and Sampling by Auger Borings
- D1586 Test Method for Penetration Test (SPT) and Split-Barrel Sampling of Soils
- D2166 Test Method for Unconfined Compressive Strength of Cohesive Soil
- D2435 Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
- D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)
- D2850 Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils
- D3213 Practices for Handling, Storing, and Preparing Soft Intact Marine Soil
- D3550 Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils (Withdrawn 2016)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
- D4186 Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading
- D4220 Practices for Preserving and Transporting Soil Samples
- D4452 Practice for X-Ray Radiography of Soil Samples
- D4767 Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils
- D5434 Guide for Field Logging of Subsurface Explorations of Soil and Rock
- D5783 Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices
- D6026 Practice for Using Significant Digits in Geotechnical Data
- D6151 Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling

- D6169 Guide for Selection of Soil and Rock Sampling Devices Used With Drill Rigs for Environmental Investigations
- D6282 Guide for Direct Push Soil Sampling for Environmental Site Characterizations
- D6286 Guide for Selection of Drilling Methods for Environmental Site Characterization
- D6519 Practice for Sampling of Soil Using the Hydraulically Operated Stationary Piston Sampler

3. Terminology

3.1 Definitions:

3.1.1 For common definitions of terms in this standard, refer to Terminology D653.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *area ratio*, A_r , %, n —the ratio of the soil displaced by the sampler tube in proportion to the area of the sample expressed as a percentage (see Fig. 1).

3.2.2 *inside clearance ratio*, C_r , %, n —the ratio of the difference in the inside diameter of the tube, D_i , minus the inside diameter of the cutting edge, D_e , to the inside diameter of the tube, D_i expressed as a percentage (see Fig. 1).

3.2.3 *ovality*, n —the cross section of the tube that deviates from a perfect circle.

3.3 Symbols:

3.3.1 A_r —area ratio (see 3.2.1).

3.3.2 C_r —clearance ratio (see 3.2.2).

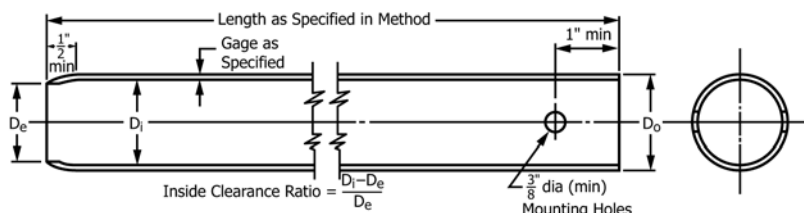
4. Summary of Practice

4.1 A relatively intact sample is obtained by pressing a thin-walled metal tube into the in-situ soil at the bottom of a boring, removing the soil-filled tube, and applying seals to the soil surfaces to prevent soil movement and moisture gain or loss.

5. Significance and Use

5.1 Thin-walled tube samples are used for obtaining intact specimens of fine-grained soils for laboratory tests to determine engineering properties of soils (strength, compressibility, permeability, and density). Fig. 2 shows the use of the sampler

³ The last approved version of this historical standard is referenced on www.astm.org.



$$\text{Area Ratio} = (D_o^2 - D_i^2) / D_i^2$$

NOTE 1—The sampling end of the tube is manufactured by rolling the end of the tube inward and then machine cutting the sampling diameter, D_e , on the inside of the rolled end of the tube.

NOTE 2—Minimum of two mounting holes on opposite sides for D_o smaller than 4 in. [100 mm]. Minimum of four mounting holes equally spaced for D_o equal to 4 in. [100 mm] and larger.

NOTE 3—Tube held with hardened set screws or other suitable means.

FIG. 1 Thin-Walled Dimensions for Measuring Tube Clearance Ratio, C_r (approximate metric equivalents not shown)