



Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils¹

This standard is issued under the fixed designation D3550; 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 procedure for thick wall, split barrel drive sampling of soil to obtain representative samples of soil for classification and laboratory testing. The sampler is considered to be a thick wall sampler with sharpened cutting shoe and ball check vent. The middle barrel section is often of split barrel design, but a solid barrel can be used and both may contain ring liners. The sampler is often driven, but can also be pushed in softer deposits. Penetration resistance data may be recorded. This standard uses procedures similar to Test Method **D1586** on Penetration Resistance and Split Barrel Sampling of Soils. However, in this practice, differing hammer weights, drop heights, and different size samplers are used, so the data must not be reported as conforming to Test Method **D1586** and cannot be used to determine Normalized penetration resistance data for sands in accordance with Practice **D6066**.

1.2 This practice involves use of rotary drilling equipment (Guide **D5783**, Practice **D6151**). Other drilling and sampling procedures (Guide **D6286**, Guide **D6169**) are available and may be more appropriate. Considerations for hand driving or shallow sampling without boreholes are not addressed. Sub-surface investigations should be recorded in accordance with practice Guide **D5434**. Soil samples should be classified in accordance with Practice **D2488**.

1.3 This practice may or may not provide a sample suitable for advanced laboratory tests such as shear or consolidation testing. It is up to the user to determine if the sample quality is suitable for advanced laboratory testing for engineering properties. Driven samples can be more easily disturbed than pushed samples such as the thin wall tube in accordance with Practice **D1587**. However, thin wall tubes cannot be used in harder soils. In cases where it has been established that the quality of the thick wall driven sample is adequate, this practice may provide shear and consolidation specimens that

can be used directly in the test apparatus without prior trimming. Some types of soils may gain or lose significant shear strength or compressibility, or both, as a result of sampling. In cases like these, suitable comparison tests should be made to evaluate the effect of sample disturbance on shear strength and compressibility.

1.4 This guide does not purport to comprehensively address all of the methods and the issues associated with soil sampling. Users should seek qualified professionals for the decisions as to the proper equipment and methods that would be most successful for their site investigation. Other methods may be available for monitoring soil sampling and qualified professionals should have flexibility to exercise judgement as to possible alternatives not covered in this guide. The practice is current at the time of issue, but new alternative and innovative methods may become available prior to revisions, therefore, users should consult with manufacturers or producers prior to specifying program requirements.

1.5 *This practice offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgement. 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.*

1.6 *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. The user must comply with prevalent regulatory codes, such as OSHA (Occupational Health and Safety Administration) guidelines while using this*

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.

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practice. For good safety practice, consult applicable OSHA regulations and other safety guides on drilling.²

2. Referenced Documents

2.1 ASTM Standards:³

- D1586** Test Method for Penetration Test (SPT) and Split-Barrel Sampling of Soils
- D1587** Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
- D2113** Practice for Rock Core Drilling and Sampling of Rock for Site Investigation
- D2216** Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- D2487** Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- D2488** Practice for Description and Identification of Soils (Visual-Manual Procedure)
- D3740** Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D4220** Practices for Preserving and Transporting Soil Samples
- 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
- D6066** Practice for Determining the Normalized Penetration Resistance of Sands for Evaluation of Liquefaction Potential
- 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
- D6286** Guide for Selection of Drilling Methods for Environmental Site Characterization

3. Significance and Use

3.1 This practice is used for general soil investigations where samples are required for identification and testing. Disturbed samples can be classified in accordance with Practice **D2487** and can be tested for moisture content, particle size, and Atterberg limits. The sampler can be equipped with stacked ring liners, which can be used directly for other laboratory tests.

3.2 The sampler can be driven with a hammer and the penetration resistance can be recorded. Numerous combinations of hammer size and drop height have been used in practice. Hammer size and drop height should be reported. Users of this practice have derived local correlations of

penetration resistance and engineering properties based on local conditions and a particular hammer system and sampler, however, the penetration resistance may differ from Test Method **D1586**.

3.3 The user should evaluate sample quality. The process of driving the sample may disturb the soil and change the engineering properties. In soft soils, use of the thin wall tube sampler (Practice **D1587**) will likely result in less disturbance. In harder soils, soil coring techniques may result in less disturbance; see Practice **D6151**, Guide **D6169**.

3.4 This standard addresses sampling in drill holes with drilling equipment. The sampler can be hand driven or driven in test pits without drilling equipment. If these special driving methods are used the sampling process should be reported.

4. Apparatus

4.1 *Drilling Equipment*—Any drilling equipment may be used that provides a reasonably clean hole before insertion of the sampler and that does not disturb the soil to be sampled (Guide **D6286**). Bottom discharge bits should be avoided as they could disturb the sampling interval. Side-discharge bits are preferable.

4.2 *Drive Weight Assembly*—Any drive weight assembly that will provide penetration in the range from 1 to 100 blows per foot (0.30-m) may be used. In soft soils, if the sample is desired for laboratory testing, the sample may be pushed to reduce disturbance.

4.3 *Ring-Lined Barrel Sampling Assembly*—This shall consist of a shoe, sample barrel, and waste barrel (extension), and head with check valve, vents, and threaded connector (Head) for drill rod, as shown in Fig. 1. Typical outside diameters of the barrel are 2, 2.5, 3, and 3 in. Fig. 1 is reproduced from the Diamond Drill Core Manufacturers Association⁴ to illustrate typical dimensions. Other sampler designs can be used as long as the sampler dimensions have similar proportions and are reported on the boring log. The total sampler assembly length is typically 2 ft (0.6 m). The length should be a whole number such as 2 ft (0.6 m) such that it is easy to record sampling depth intervals to the nearest 0.1 ft (5 cm).

4.4 *Ring-Lined Sampler*—Test specimens shall be obtained using a suitable split barrel or solid barrel lined on the inside with removable rings or liners. These rings or liners shall be thin-walled and shall conform to the size requirements of the particular laboratory test determinations employed. They shall fit snugly inside the sampler with no discernible free play in any direction. Rings are often brass, steel, or stainless steel, but can be made of any material of adequate strength and resistance to corrosion. The sampler may be sectionalized to allow end-to-end make-up of sections as necessary. Each section shall be designed so that addition or removal of sections will not loosen, permit movement, or otherwise adversely affect retention of the rings within the sampler. The sampler and rings shall be free of bumps, dents, scratches, rust, dirt, and corrosion.

² Drilling Safety Guide, National Drilling Association, 6089 Frantz Rd. Suite 101, Dublin, Ohio, 43017.

³ 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.

⁴ DCDMA Technical Manual, National Drilling Association, 6089 Frantz Rd. Suite 101, Dublin, Ohio 43017, 1991.