



Designation: D6640 – 21

Standard Practice for Collection and Handling of Soils Obtained in Core Barrel Samplers for Environmental Investigations¹

This standard is issued under the fixed designation D6640; 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 practice covers procedures for obtaining soils from core barrel samplers for chemical and physical analysis, with an emphasis on the collection and handling procedures that maintain the representativeness of the chemical contaminants of concern. Core barrel samplers are initially empty (hollow) until they are pushed into the ground to collect and retrieve a cylindrical soil sample with minimal disturbance. The selection of equipment and the sample handling procedures are dependent on the soil properties, the depth of sampling, and the general properties of the chemical contaminants of concern, that is, volatile organic compounds, semi-volatile organic compounds, and inorganic constituents. The sampling procedures described are designed to maintain representative concentrations of the contaminants regardless of their physical state(s), that is, solid, liquid, or gas.

1.2 This practice covers soil samplers used in Guide D6169 on soils and rock sampling and included in Guide D6232 for waste sampling. Guide D6169 provides additional information on samplers and procedures that will preserve representative contaminate concentrations. Guide D6282 is on direct-push soil samplers that are most frequently used for environmental work. Guide D4547 addresses special sampling of soils for volatile compounds. This standard does not include sediment samplers in Guide D4823, but the same principles may apply to handling of those cores. Guide D4700 includes information on shallow manual push soil samplers.

1.3 Five general types of core barrel samplers are discussed in this practice: split-barrel, soil corer, ring-lined barrel, thin-walled tube, and solid-barrel samplers.

1.4 This document does not cover all the core barrel devices that are available for the collection of soil samples.

1.5 The procedures described may or may not be applicable to handling of samples for assessing certain geotechnical properties, for example, soil porosity.

¹ This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.03 on Sampling Equipment.

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NOTE 1—Prior to commencement of any intrusive exploration, the site should be checked for underground utilities.

1.6 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026. Reporting of test results in units other than SI shall not be regarded as nonconformance with this standard.

1.7 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D1586 Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils
- D1587 Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes
- D3550 Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils
- D3694 Practices for Preparation of Sample Containers and for Preservation of Organic Constituents
- D4547 Guide for Sampling Waste and Soils for Volatile Organic Compounds
- D4687 Guide for General Planning of Waste Sampling
- D4700 Guide for Soil Sampling from the Vadose Zone
- D4823 Guide for Core Sampling Submerged, Unconsolidated Sediments

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.

- D5088** Practice for Decontamination of Field Equipment Used at Waste Sites
- D5681** Terminology for Waste and Waste Management
- D5784** Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water Quality Monitoring Devices
- D5792** Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
- D5875** Guide for Use of Cable-Tool Drilling and Sampling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices
- D5876** Guide for Use of Direct Rotary Wireline Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation of Subsurface Water-Quality Monitoring Devices
- D6026** Practice for Using Significant Digits and Data Records in Geotechnical Data
- D6051** Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities
- 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
- D6232** Guide for Selection of Sampling Equipment for Waste and Contaminated Media Data Collection Activities
- D6282** Guide for Direct Push Soil Sampling for Environmental Site Characterizations
- D6286** Guide for Selection of Drilling and Direct Push Methods for Geotechnical and Environmental Subsurface Site Characterization
- D8170** Guide for Using Disposable Handheld Soil Core Samplers for the Collection and Storage of Soil for Volatile Organic Analysis

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this standard, see Terminology **D5681**.

3.1.2 **PFAS**, *n*—per- and polyfluorinated alkyl substances: a group of man-made chemicals that includes PFOA (perfluorooctanoate acid), PFOS (perfluorooctane sulfonate), GenX, and many other chemicals.

3.1.2.1 *Discussion*—PFAS include thousands of fluorinated compounds that have been manufactured and used in a variety of industries around the globe, including in the United States, since the 1940s. PFAS are bioaccumulative and very persistent in the environment under natural conditions due to their strong carbon-fluorine bonds. PFAS can be found in consumer products (for example, stain and water repellants and nonstick cookware) and non-consumer products, including aqueous fire-fighting foams (AFFF) previously used at military and commercial airports. A common PFAS is polytetrafluorethylene (PTFE), which should be excluded from use when PFAS sampling is conducted.

4. Summary of Practice

4.1 Obtaining soil samples from the surface and subsurface for chemical and physical analysis often involves the advancement of a core barrel sampler into the ground. A core barrel sampler can be operated by hand or mechanically, and it may be of a closed or open design (Guides **D6169** and **D6282**). Once the core barrel has been filled, the sampler is recovered from the bore hole and the soil sample is handled appropriately for the chemical constituents of concern.

4.2 This practice describes collection and handling procedures used with four types of core barrel samplers. The standards related to data quality objectives (Practice **D5792**), equipment specifications (Guides **D6286**, **D6232**, **D6169**, **D4700**, and **D4823**), their limitations and advantages (Guides **D6282** and **D6232**), and the site-specific geological and hydrological data should be reviewed to determine the soil coring equipment that is best suited for a specific project.

5. Significance and Use

5.1 Often during environmental investigations, soils are analyzed after being collected from the surface, the vadose zone (Terminology **D653**), and sometimes from below the groundwater table to identify and quantify the presence of a chemical contaminant. A contaminant is a substance that is typically hazardous and either is not normally present or that occurs naturally but is of an uncharacteristically high concentration (Guide **D4687**). A three-dimensional spatial array of samples can often provide information as to the source and route(s) of migration of the contaminant. The resultant information is used to direct remedial and corrective actions or can be used for monitoring purposes. Obtaining a soil sample with a core barrel sampler involves driving this device into the ground and then retrieving it for sample processing. Several methods for advancing a core barrel are generally acceptable (for example, Test Method **D1586**; Practices **D1587**, **D3550**, and **D6151**; Guides **D5784**, **D5875**, **D5876**, **D6169**, and **D6282**). Drilling methods that use drilling fluids (liquids or air) should be avoided because they are more susceptible to cross-contamination (Guide **D6286**) (see 6.1.6).

5.2 If samples are to be collected for the determination of per- and poly-fluorinated alkyl substances (PFAS), all sampling equipment should be made of fluorine-free materials. Other considerations for PFAS sampling may exist but are beyond the scope of this standard.

6. Equipment Selection Criteria

6.1 Important criteria to consider when selecting a core barrel sampler for soil sampling are:

6.1.1 The materials that come into direct contact with the soil sample (barrel or barrel liner) should be compatible with the chemical or physical properties of the contaminant(s) of concern and the chemical properties of the soil. As a general rule, samples obtained for semi-volatile organic compound analysis can be obtained within a core barrel or core barrel liner that is composed of stainless steel, steel, or brass. When only inorganic constituents are of concern, a plastic core barrel liner would be more appropriate than the previously cited materials.