Designation: D6907 – 22

Standard Practice for Sampling Soils and Contaminated Media with Hand-Operated Bucket Augers[1]

This standard is issued under the fixed designation D6907; 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 describes the procedures and equipment used to collect surface and subsurface soil and contaminated media samples for chemical analysis using a hand-operated bucket auger (sometimes referred to as a barrel auger). Several types of bucket augers exist and are designed for sampling various types of soil. All bucket augers collect disturbed samples. Bucket augers can also be used to auger to the desired sampling depth and then, using a core-type sampler, collect a relatively undisturbed sample suitable for chemical analysis.

1.2 This practice does not cover the use of large 300 mm or greater diameter bucket augers mechanically operated by large drill rigs or similar equipment, such as those described in Practice D1452/D1452M, paragraph 5.2.4. Practice D1452/D1452M on auger borings refers to this hand auger included in Practice D6907 as a barrel auger.

1.3 Refer to Guides D4700 and D6232 for information on other hand samplers. The bucket auger is often used for shallow surface soil sampling, but there are many other types of handheld augers, flight, screw, rotary powered, and agricultural push tube samplers. Practice D1452/D1452M addresses larger powered solid stem flight auger systems.

1.4 This standard does not address soil samples obtained with mechanical drilling, direct push, and sonic machines (refer to Guides D6286/D6286M and D6169/D6169M) or for collecting cores from submerged sediments (Guide D4823).

1.5 This practice does not address sampling objectives (see Practice D5792), general sample planning (see Guide D4687), and sampling design (for example, where to collect samples and what depth to sample (see Guide D6044)). Sampling for volatile organic compounds (see Guide D4547), equipment cleaning and decontamination (see Practice D5088), sample handling after collection such as compositing and subsampling (see Guide D6051), and sample preservation (Guide D4220/D4220M) are used in this standard.

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 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 *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.*

1.9 *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]

D1452/D1452M Practice for Soil Exploration and Sampling by Auger Borings

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedures)

D4220/D4220M Practices for Preserving and Transporting Soil Samples

[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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[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.

*A Summary of Changes section appears at the end of this standard

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
D5088 Practice for Decontamination of Field Equipment Used at Waste Sites
D5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation
D5434 Guide for Field Logging of Subsurface Explorations of Soil and Rock (Withdrawn 2021)[3]
D5681 Terminology for Waste and Waste Management
D5792 Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
D6026 Practice for Using Significant Digits and Data Records in Geotechnical Data
D6044 Guide for Representative Sampling for Management of Waste and Contaminated Media
D6051 Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities
D6169/D6169M Guide for Selection of Subsurface Soil and Rock Sampling Devices for Environmental and Geotechnical Investigations
D6232 Guide for Selection of Sampling Equipment for Waste and Contaminated Media Data Collection Activities
D6286/D6286M Guide for Selection of Drilling and Direct Push Methods for Geotechnical and Environmental Subsurface Site Characterization

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, see Terminology D5681.

4. Summary of Practice

4.1 Typically, bucket augers are tubular devices with cutting bits on the bottom that are pushed and twisted into the media and removed when the tubular "bucket" section is full. The bore hole is advanced one bucket at a time. The practical depth of investigation using a bucket auger is related to the material being sampled.

4.2 When a sampling interval starting at the surface is to be sampled, the same auger can be used to collect all materials to the bottom of the interval. However, if discrete grab samples are to be collected to characterize multiple depths or a depth interval commences below the surface, a clean bucket auger or drive tube sampler should be used to collect the sample. The top material in a bucket should generally be discarded to minimize chances of cross-contamination of the sample from material that sloughs from the bore hole wall.

4.3 Bucket augers collect disturbed samples that are generally not suitable for analysis of volatile organic compounds. A core or tube-type sampler can be pushed into undisturbed soil at the bottom of an augured hole to collect a relatively undisturbed sample suitable for chemical analysis.

5. Significance and Use

5.1 Bucket augers (Fig. 1) are relatively inexpensive, readily available, available in different types depending on the media to be sampled, and most can be easily operated by one person. They collect a reasonably cylindrical but disturbed sample of surface or subsurface soil or waste. They are generally not suited for sampling gravelly or coarser soil and are unsuitable for sampling rock. There are other designs of hand augers, such as the Edelman auger, used to retrieve difficult materials such as waste, sands, peat, and mud.

5.2 Bucket augers are commonly used equipment because they are inexpensive to operate, especially compared to powered equipment (that is, direct push and drill rigs). When evaluated against screw augers (Guide D4700), bucket augers generally collect larger samples with less chance of mixing with soil from shallow depths because the sample is retained within the auger bucket. Bucket augers are commonly used to depths of 3 m but have been used to much greater depths depending upon the soil or waste characteristics. In general, bucket augers can maintain open holes in unsaturated soils and saturated clay soils below the water table. Saturated sands will cave below the water table and perched zones and cohesionless dry sands may also cave. The sampling depth is limited by the force required to rotate the auger and the depth at which the bore hole collapses (unless bore casings or liners are used).

5.3 Bucket augers may not be suitable for the collection of samples for determination of volatile organic compounds (VOCs) because the sample is disturbed and exposed to atmosphere during the collection process, which may lead to losses resulting in a chemically unrepresentative sample.

5.4 If VOC analysis is required, the bucket auger is used to reach the desired sample depth, a planer auger can be used to clean the base of the hole, and a hammered drive tube sampler (Fig. 2) can be used at the bottom of the hole. Drive tube samplers can be sealed and capped. Consult Guide D4547 on

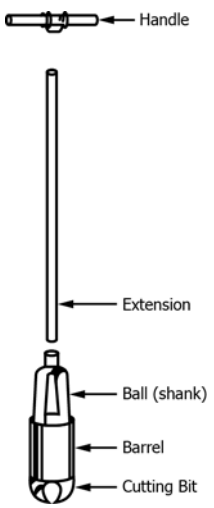

FIG. 1 Bucket Auger

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

FIG. 2 Soil Core Sampler System

practices for immediate subsampling of soil cores for VOCs. Drive tubes that are not full and contain disturbed material and are exposed to air may not provide accurate VOC data. For the best results, the core sample can be extruded from the tube and immediately subsampled.

6. Apparatus

6.1 *Bucket Augers:*

6.1.1 Bucket augers for soil sampling generally consist of a tubular auger head with cutting bits, an extension rod or rods, and a "T" handle (see Fig. 1). The auger is rotated using the "T" handle until the bucket is full. The sampler is then retrieved and emptied, and the process repeated.

6.1.2 The advantages and disadvantages of bucket augers are listed in Table 1.

6.1.3 Bucket augers are generally available with tungsten carbide hard surface carbon steel bits, stainless steel cylinder and carbon steel bail (shank), or in all stainless steel (see Fig. 1). Several types of bucket augers are described below. In use, bits should be kept sharp for efficient sampling.

TABLE 1 Hand-Operated Bucket Augers—Advantages and Limitations

Advantages	Limitations
Easy and quick for shallow subsurface samples	Collects only disturbed samples
Relatively inexpensive	May be inappropriate for sampling soils for volatile organic compounds destined for chemical analysis
Can be used in wide variety of soil types	Sampling depths generally limited to 1 to 3 m

6.1.4 *Regular Bucket Auger*—Used for ordinary soil and waste sampling and for creating a pilot hole from which subsequent undisturbed core samples can be collected at depth using a core sampler (see Fig. 3(a)).

6.1.5 *Sand Bucket Auger*—Designed for use in extremely dry, sandy soils. The bits are specially formed to retain loose sand by being close together (see Fig. 3(b)).

6.1.6 *Mud Bucket Auger*—Features an open cylinder design to facilitate easier removal of heavy, wet soil or clayey soil samples. Bits are spaced further apart than the regular auger to ease entry of sticky soils (see Fig. 3(c)).

6.1.7 *The Planer Auger*—Used to remove loose material from the bottom of an augered hole, prior to core sampling. It may also be used to collect samples of solid materials from the bottom of drums and tanks (see Fig. 3(d)).

6.1.8 *Dutch Auger*—Designed for collection of samples in heavily rooted, fibrous, or swampy areas (see Fig. 3(e)).

6.1.9 *Other*—Other types of augers include the Eijkelkamp Stony Auger for gravelly soils, the Post-Hole or Iwan Auger for cohesive soft or hard soils, and augers with reusable liners and closed tops to reduce contamination from sloughing sidewalls.

6.1.10 *Liners*—Bucket augers may include the ability to collect soil with interior plastic liners. The liner can be removed and capped to represent the sampled interval. Use HDPE or nonreactive liners if chemical analysis is required. PTFE liners are not recommended for use when collecting samples of per- and polyfluorinated alkyl substances (PFAS).

6.1.11 *Core Sampler*—The hammered core sampler (Fig. 2) can be used to get relatively intact soil samples at the base of the bucket auger hole. The steel tube has a sharpened cutting edge, and the tube can be designed to have an inner plastic liner.

7. Presampling

7.1 Samples should be collected in accordance with an appropriate work plan (see Practice D5283 and Guide D4687) and in accordance with the Data Quality Objectives (see Practice D5792). The plan should include a worker health and safety plan and safety section due to the hazards of sampling contaminated media.

7.2 Field personnel should be trained or be knowledgeable in the sampling procedures.

7.3 The type of auger(s) needed for sampling the site should be determined and obtained; see 6.1.1 – 6.1.9 for available types. All needed equipment and supplies (including pre-cleaned sample containers suitable for the analytes of interest) should be assembled and transported to the field site before sampling commences. Multiple augers should be taken to the site if field decontamination between sampling events is planned.

7.4 Sampling equipment should be cleaned prior to sampling (see Practice D5088).

7.5 Schedules should be prepared to coordinate sampling with staff, client, analytical laboratory, and regulatory agencies, if appropriate.