



# Standard Practice for Soil Exploration and Sampling by Auger Borings<sup>1</sup>

This standard is issued under the fixed designation D1452; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

## 1. Scope\*

1.1 This practice covers equipment and procedures for the use of earth augers in shallow depth geotechnical exploration. This practice does not apply to hollow-stem augers. Uses of hollow-stem auger drilling methods for geotechnical exploration are addressed in Test Method [D6151](#).

1.2 This practice does not include considerations for geoenvironmental site characteristics and installation of monitoring wells which are discussed in Guide [D5784](#).

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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values shall conform to the guidelines for significant digits and rounding established in Practice [D6026](#) unless superseded by this method.

1.5 *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.*

1.6 *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.*

<sup>1</sup> 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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## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

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

[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

[D2488](#) Practice for Description and Identification of Soils (Visual-Manual Procedure)

[D5434](#) Guide for Field Logging of Subsurface Explorations of Soil and Rock

[D4750](#) Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well) (Withdrawn 2010)<sup>3</sup>

[D5784](#) Guide for Use of Hollow-Stem Augers 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

## 3. Terminology

3.1 *Definitions*—For common definitions of terms in this standard, refer to Terminology [D653](#).

## 4. Significance and Use

4.1 Auger borings often provide the simplest method of soil exploration and sampling. They may be used for any purpose where disturbed samples can be used and are valuable in connection with groundwater level determination and indication of changes in strata and advancement of hole for split-barrel penetration tests and sampling (Test Method [D1586](#)) and

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

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

thin-walled tube sampling (Practice D1587). Equipment required is simple and readily available. Depths of auger explorations are, however, limited by groundwater conditions, soil characteristics, and the equipment used.

5. Apparatus

5.1 Hand-Operated Augers:

5.1.1 Helical Augers, (Fig. 1(a)) small lightweight augers generally available in sizes from 1 through 3 in. (25.4 through 76.2 mm).

5.1.1.1 Spiral-Type Auger, consisting of a flat thin metal strip, machine twisted to a spiral configuration of uniform pitch; having at one end, a sharpened or hardened point, with a means of attaching a shaft or extension at the opposite end.

5.1.1.2 Ship-Type Auger—Similar to a carpenter’s wood bit. It is generally forged from steel and machined to the desired size and configuration. It is normally provided with sharpened and hardened nibs at the point end and with an integral shaft extending through its length for attachment of a handle or extension at the opposite end.

5.1.2 Open Tubular Augers, (Fig. 1(b)) ranging in size from 1.5 through 8 in. (38.1 through 203.2 mm) and having the common characteristic of appearing essentially tubular when viewed from the digging end.

5.1.2.1 Orchard-Barrel Type, (Fig. 1(c)) consisting essentially of a tube having cutting lips or nibs hardened and sharpened to penetrate the formation on one end and an adaptor fitting for an extension or handle on the opposite end.

5.1.2.2 Open-Spiral Type, consisting of a flat thin metal strip that has been helically wound around a circular mandrel to form a spiral in which the flat faces of the strip are parallel to the axis of the augered hole. The lower helix edges are hard-faced to improve wear characteristics. The opposite end is fitted with an adaptor for extension.

5.1.2.3 Closed-Spiral Type—Nearly identical to the open-spiral type except the pitch of the helically wound spiral is much less than that of the open-spiral type.

5.1.3 Post-Hole Augers, generally 2 through 8 in. (50.8 through 203.2 mm), and having in common a means of blocking the escape of soil from the auger.

5.1.3.1 Clam-Shell Type, (Fig. 2(a)) consisting of two halves, hinged to allow opening and closing for alternately digging and retrieving. It is not usable deeper than about 3.5 ft (1.07 m).

5.1.3.2 Iwan Type, (Fig. 2(b)) consisting of two tubular steel segments, connected at the top to a common member to form a nearly complete tube, but with diametrically opposed openings. It is connected at the bottom by two radial blades pitched to serve as cutters which also block the escape of contained soil. Attachment of handle or extension is at the top connector.

5.2 Machine-Operated Augers:

5.2.1 Helical Augers, (Fig. 3(a)) generally 4 through 48 in. (101.6 through 1219 mm), consisting essentially of a center shaft fitted with a shank or socket for application of power, and having one to six complete 360° (6.28-rad) spirals for conveyance and storage of cut soil. Cutter bits and pilot bits are available in moderate and hard formation types and normally replaceable in the field. They are normally operated by heavy-duty, high-torque machines, designed for heavy construction work.

5.2.2 Stinger Augers, generally 3 through 30 in. (76.2 through 762 mm), are similar to the helical auger in 5.2.1, but lighter and generally smaller. They are commonly operated by light-duty machines for post and power pole holes.

5.2.3 Disk Augers, (Fig. 3(b)) generally 10 through 30 in. (254 through 762 mm), consisting essentially of a flat, steel disk with diametrically opposed segments removed and having a shank or socket located centrally for application of power. Replaceable cutter bits, located downward from the leading edges of the remaining disk, dig and load soil that is held on the disk by valves or shutters hinged at the disk in order to close the removed segments. The disk auger is specifically designed to be operated by machines having limited vertical clearance between spindle and ground surface.

5.2.4 Bucket Auger, (Fig. 3(c)) generally 12 through 48 in. (304.8 through 1219 mm), consisting essentially of a disk auger, without shank or socket, but hinge-mounted to the bottom of a steel tube or bucket of approximately the same diameter as the disk auger. A socket or shank for power application is located in the top center of the bucket diametral cross piece provided for the purpose.

5.3 Casing (when needed), consisting of pipe of slightly larger diameter than the auger used.

5.4 Accessory Equipment—Labels, field log sheets, sample jars, sealing wax, sample bags, and other necessary tools and supplies.

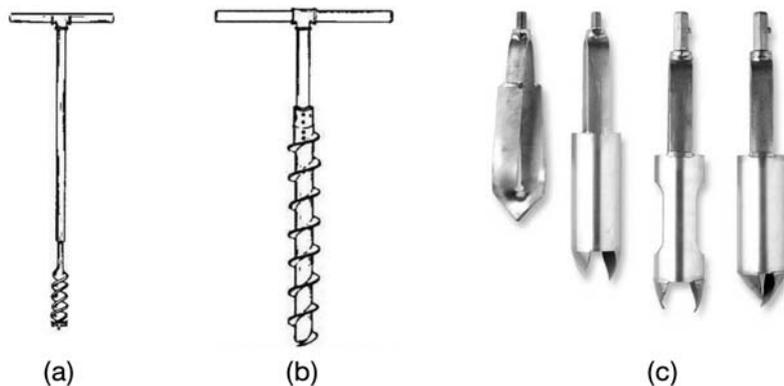


FIG. 1 Hand Augers

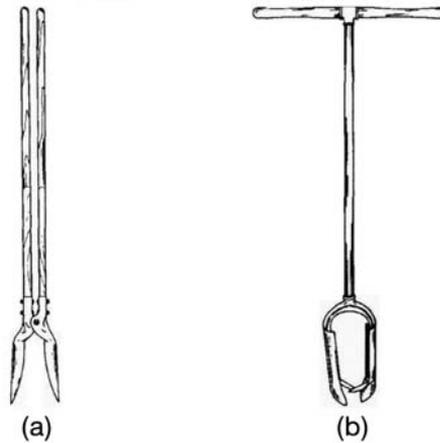


FIG. 2 Post-Hole Augers

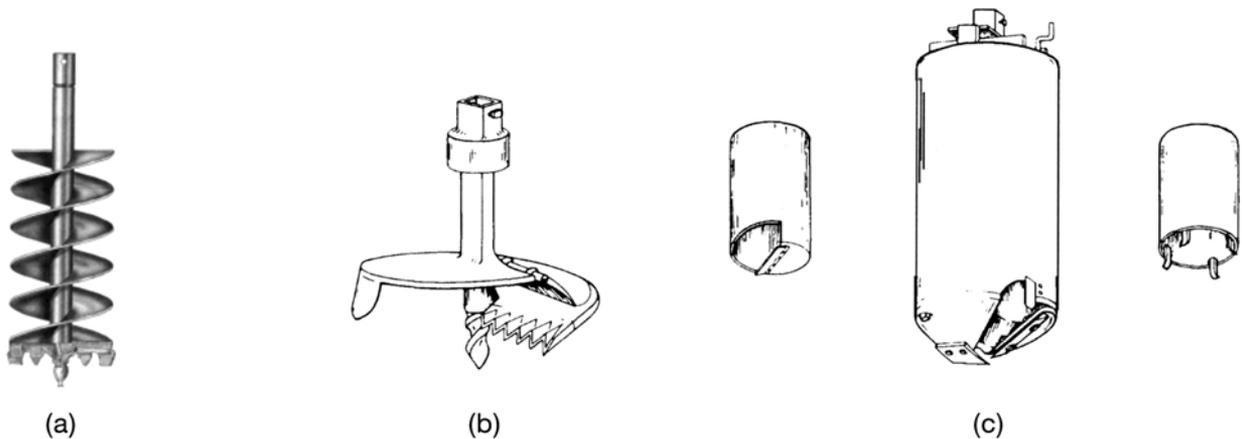


FIG. 3 Machine-Operated Augers

## 6. Procedure

6.1 Make the auger boring by rotating and advancing the desired distance into the soil. Withdraw the auger from the hole and remove the soil for examination and test. Return the empty auger to the hole and repeat the procedure. Continue the sequence until the required depth is reached.

6.2 Casing is required in unstable soil in which the bore hole fails to stay open and especially when the boring is extended below the groundwater level. The inside diameter of the casing must be slightly larger than the diameter of the auger used. The casing shall be driven to a depth not greater than the top of the next sample and shall be cleaned out by means of the auger. The auger can then be inserted into the bore hole and turned below the bottom of the casing to obtain a sample.

6.3 The soil auger can be used both for boring the hole and for bringing up disturbed samples of the soil encountered. The structure of a cohesive soil is completely destroyed and the moisture may be changed by the auger. Seal all samples in a jar or other airtight container and label appropriately. If more than one type of soil is picked up in the sample, prepare a separate container for each type of soil.

6.4 *Monitoring Water Level*—It is advisable to monitor groundwater levels, if present, in the drill hole during and after removal of the drilling equipment. Groundwater elevation should be measured and documented during drilling to include datum, date and time measured. Method or equipment used to determine depth of groundwater level, such as Test Method [D4750](#) should also be noted. If groundwater is not encountered or if the level is of doubtful reliability, such information should also be documented.

6.4.1 The user is cautioned that there are many factors which can influence borehole water level measurements and the interpretation of borehole water level measurements. These factors are not described or discussed in this practice. The interpretation and application of borehole water level information should be done by a trained specialist. Installation of piezometers should be considered where complex groundwater conditions prevail.

## 7. Data Sheet/Form

7.1 Report information in accordance with Guide [D5434](#). The data obtained in boring shall be recorded on the field logs and shall include the following:

- 7.1.1 Date of start and completion of boring,
- 7.1.2 Identifying number of boring,
- 7.1.3 Reference datum including direction and distance of boring relative to reference line of project or other suitable reference points,
- 7.1.4 Type and size of auger used in boring,
- 7.1.5 Depth of changes in strata,
- 7.1.6 Description of soil in each major stratum in accordance with Practice **D2488**,
- 7.1.7 Groundwater elevation and location of seepage zones, when found,

7.1.8 Datum, date and time of borehole water-level measurement and method or equipment used, and

7.1.9 Condition of augered hole upon removal of auger, that is, whether the hole remains open or the sides cave, when such can be observed.

## **8. Keywords**

8.1 auger borings; geotechnical exploration; sampling; soil explorations

## **APPENDIX**

### **(Nonmandatory Information)**

#### **X1. EXAMPLE DATA SHEET**

X1.1 **Fig. X1.** provides an example data sheet.



**SUMMARY OF CHANGES**

Committee D18 has identified the location of selected changes to this standard since the last issue (D1452 – 07a) that may impact the use of this standard. (Approved Feb. 15, 2009.)

- (1) Added Referenced Documents.  
(2) Added **Figs. 1-3**.

- (3) Other minor revisions throughout.

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