



# Standard Practice for Sampling Unconsolidated Solids in Drums or Similar Containers<sup>1</sup>

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## 1. Scope

1.1 This practice covers typical equipment and methods for collecting samples of unconsolidated solids in drums or similar containers. These methods are adapted specifically for sampling drums having a volume of 110 U.S. gal (416 L) or less. These methods are applicable to hazardous material, product, or waste. Specific sample collection and handling requirements should be described in the site-specific work plan.

1.2 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.

1.3 *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:<sup>2</sup>

- [C702 Practice for Reducing Samples of Aggregate to Testing Size](#)
- [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](#)
- [D6009 Guide for Sampling Waste Piles](#)
- [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](#)
- [D6063 Guide for Sampling of Drums and Similar Containers by Field Personnel](#)

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.02 on Sampling Techniques.

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<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.

- [D6311 Guide for Generation of Environmental Data Related to Waste Management Activities: Selection and Optimization of Sampling Design](#)
- [D6323 Guide for Laboratory Subsampling of Media Related to Waste Management Activities](#)
- [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](#)
- [D5451 Practice for Sampling Using a Trier Sampler](#)
- [E300 Practice for Sampling Industrial Chemicals](#)
- [D5633 Practice for Sampling with a Scoop](#)

### 2.2 NSC Document:

[Accident Prevention Manual for Industrial Operations, 1992<sup>3</sup>](#)

### 2.3 Government Documents:<sup>4</sup>

- [EPA/600/2-86/013 Drum Handling Practices at Hazardous Waste Sites, January 1986](#)
- [EPA/540/4-91/001 Soil Sampling and Analysis for Volatile Compounds, February 1991](#)
- [Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health \(NIOSH\), Occupational Safety and Health Administration \(OSHA\), U.S. Coast Guard \(USCG\), and U.S. Environmental Protection Agency \(EPA\), October 1985](#)

## 3. Terminology

### 3.1 Definitions:

3.1.1 *bonding*—touching the sample equipment to the drum to form an electrically conductive path to minimize potential electrical differences between the sampling equipment and the drum, reducing the buildup of static electricity.

3.1.2 *bung*—usually a 2-in. (5.1-cm) or 3/4-in. (1.3-cm) diameter threaded plug designed specifically to close a bung hole.

<sup>3</sup> Available from National Safety Council, P.O. Box 558, Itasca, IL 60143-0558.

<sup>4</sup> Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

3.1.3 *bung hole*—an opening in a barrel or drum through which it can be filled, emptied, or vented.

3.1.4 *deheading*—removal of the lid of a closed-head drum; usually accomplished with a drum deheader.

3.1.5 *drum*—a cylindrical non-bulk container of 5 to 110 U.S. gal (19 to 416 L) capacity.

3.1.6 *pail*—a small container, usually with a capacity of 5 U.S. gal. Pails typically have bungs or spouts, or the entire lid can be removed.

3.1.7 *paperwork*—all required site documentation, which may include the manifests, waste profiles, material safety data sheets (MSDS), site forms, sample labels, custody seals, and chain of custody forms.

3.1.8 *unconsolidated*—for solid material, the characteristic of being uncemented or uncompacted, or both, and separated easily into smaller particles.

3.1.9 *work plan*—a plan specific to a particular site; for conducting activities specified in the plan.

#### 4. Summary of Practice

4.1 The drum and its contents are inspected, and appropriate sampling equipment is selected. A clean sampling device is then used to auger, shovel, scoop, or core into the unconsolidated solid material to be sampled. The sample is collected and placed in a sample container. After use the sampling device is then either disposed of or cleaned and decontaminated before re-use.

#### 5. Significance and Use

5.1 This practice is intended for use in collecting samples of unconsolidated solid materials from drums or similar containers, including those that are unstable, ruptured, or compromised otherwise. Special handling procedures (for example, remote drum opening, over pressurized drum opening, drum deheading, etc.) are described in EPA/600/2-86/013 *Drum Handling Practices at Hazardous Waste Sites*.

#### 6. Interferences

6.1 The condition of the materials to be sampled and the condition and accessibility of the drums will have a significant impact on the selection of sampling equipment and techniques used to recover representative samples.

#### 7. Pre-Sampling

##### 7.1 *General Principles and Precautions:*

7.1.1 Samples should be collected in accordance with an appropriate work plan (Practice [D5283](#), and Guides [D4687](#), [D6044](#), [D6051](#), [D6063](#), and [D6311](#)). This plan must include a worker health and safety section because there are potential hazards associated with opening drums as well as potentially hazardous contents. See *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* for information on health and safety at hazardous waste sites.

7.1.2 Correct sampling procedures must be applied to the conditions as they are encountered. It is impossible to specify rigid rules describing the exact manner of sample collection because of unknowns associated with each solid sampling

situation. It is essential that the samples be collected by a trained and experienced sampler because of the various conditions under which drummed solids must be sampled.

7.1.3 To be able to make probability or confidence statements concerning the properties of a sampled lot, the sampling procedure must allow for some element of randomness in selection because of the possible variations in the material. The sampler should always be on the alert for possible biases arising from the use of a particular sampling device or from unexpected segregation within the material.

7.1.4 All auger, trier, thief, shovel and scoop methods may fail a prime sampling requirement: that of random selection of sample fractions. Scoops and shovels are limited to use at or near the top surface. Augers, triers, and thieves are normally inserted in a preset pattern. Particles on the bottom or along the sides of the drum may consequently never have an opportunity to be included in a sample. Sample particles should be selected by techniques that will minimize variation in measured characteristics between the available fractions and the resulting sample (Practice [C702](#)). Many of these disadvantages may be eliminated if the drum contents can be emptied onto a protected flat surface, allowing representative sampling of the disturbed pile using techniques described in Guides [D6009](#) and [D6323](#).

7.1.5 The “Degenerative Fractional Shoveling Technique” may be considered for representative sampling of the unconsolidated contents of drums or similar containers. If the investigation objectives require statistically representative data to define the average properties of drummed contents, the sampling technique used should ensure that every particle size and type is available for sampling. In the case of an open headed drum of unconsolidated solid materials, the total number of scoops or shovel fulls should be estimated for the materials based upon the volume of the loaded scoop or shovel being used, or the materials from the drum should be removed completely using a scoop or shovel, counting the number of scoop or shovel fulls required to do so. Material from the drum should be placed either on plastic sheeting or into another comparably sized clean drum. Based on the total number of scoop or shovel fulls removed, various scoop/shovels should be selected systematically or randomly to sample as the material is being returned to the original container. These sample portions/aliquots from the scoops or shovels, corresponding to the systematic or random numbers, should be placed into the sample containers, prior to homogenizing and subsampling the sample either in the field or laboratory. The number of portions/aliquots needed is a function of the container size, particle size, and sample size.

7.1.5.1 Alternate Shoveling and Fractional Shoveling techniques are fully described in Francis Pitard, “Pierre Guy’s Sampling Theory & Sampling Practice- Heterogeneity, Sampling Correctness and Statistical Process Control,” 2<sup>nd</sup> Ed., 1993, CRC Press.

7.1.6 The sampling equipment, sample preparation equipment, sample containers, etc. must be clean, dry, and inert to the material being sampled. All equipment shall be inspected before use to ensure that they are clear of obvious dirt and contamination and are in good working condition. Visible contamination shall be removed, and the equipment shall be