Designation: D 5679 – 95a

Standard Practice for Sampling Consolidated Solids in Drums or Similar Containers[1]

This standard is issued under the fixed designation D 5679; 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 typical equipment and methods for collecting samples of consolidated 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 the standard. The values given in parentheses are for information only.

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:*

C 702 Practice for Reducing Samples of Aggregate to Testing Size[2]

C 783 Practice for Core Sampling of Graphite Electrodes[3]

D 4547 Practice for Sampling Waste and Soils for Volatile Organics[4]

D 4687 Guide for General Planning of Waste Sampling[4]

D 4700 Guide for Soil Sampling from the Vadose Zone[5]

D 5088 Practice for the Decontamination of Field Equipment Used at Non-Radioactive Waste Sites[5]

D 5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning[4]

2.2 *NSC Document:*

Accident Prevention Manual for Industrial Operations, 1985[6]

2.3 *Government Documents:*[7]

Drum Handling Practices at Hazardous Waste Sites, EPA/600/2-86/013, January 1986

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 sampling 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 ¾-in. (1.3-cm) diameter threaded plug designed specifically to close a bung hole.

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

3.1.4 *consolidated*—the characteristic of being cemented or compacted, or both, and not separated easily into smaller particles.

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

3.1.6 *drum*—implies any drum, barrel, or non-bulk container of 5 to 110 U.S. gal (19 to 416 L) capacity.

3.1.7 *pail*—a small container, usually with a capacity of 5 U.S. gal (19 L). Pails typically have bungs or spouts, or the entire lid can be removed.

3.1.8 *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.

3.1.9 *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 device is then used to

[1] This practice is under the jurisdiction of ASTM Committee D-34 on Waste Management and is the direct responsibility of Subcommittee D34.01 on Sampling and Monitoring.

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[2] *Annual Book of ASTM Standards*, Vol 04.02.

[3] *Annual Book of ASTM Standards*, Vol 15.01.

[4] *Annual Book of ASTM Standards*, Vol 11.04.

[5] *Annual Book of ASTM Standards*, Vol 04.08.

[6] Available from National Safety Council, P.O. Box 558, Itasca, IL 60143-0558.

[7] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

auger, chisel, chip, or core into the consolidated solid material to be sampled. The sample is collected and placed in a sample container. The sampling device is then cleaned and decontaminated or disposed of.

5. Significance and Use

5.1 This practice is intended for use in collecting samples of consolidated or compacted materials from drums or similar containers, including those that are unstable, ruptured, or compromised otherwise. Special handling procedures (for example, remote drum opening, overpressurized drum opening, drum deheading, etc.) are described in *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.

7. Pre-Sampling

7.1 *General Principles and Precautions*:

7.1.1 Samples should be collected in accordance with an appropriate work plan (Practice D 5283 and Guide D 4687). 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 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 augering, chipping, or flaking sampling methods may fail a prime sampling requirement: that of random selection of sample fractions. 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 C 702).

7.1.5 The sampling equipment, sample preparation equipment, sample containers, etc. must be clean, dry, and inert to the material being sampled. All equipment, including sample containers, must be inspected before use to ensure that they are clear of obvious dirt and contamination and in good working condition. Visible contamination must be removed, and the equipment must be decontaminated with the appropriate rinse materials. Decontaminated sampling equipment should be protected from contamination. This may include, but not be limited to, storage in aluminum foil, plastic bags, polytetrafluoroethylene (PTFE) film, or other means of protection that will not impact the sample quality or intended analysis.

7.2 *Basic Pre-Sampling Practices*:

7.2.1 Review all paperwork.

7.2.2 Select the sampling equipment and sample containers appropriate for the material in the drum, as detailed in the work plan.

7.2.3 Enter the work zone.

7.2.4 Inspect all drums to be sampled visually. Note any abnormal conditions, including rust marks, stains, bulges, or other signs of pressurization or leaks that may require special handling. The work plan should define clearly the limiting conditions under which special handling procedures shall be initiated. See *Drum Handling Practices at Hazardous Waste Sites* for information on opening overpressurized drums and the use of remotely operated drum opening equipment.

7.2.5 Stage the drums to be sampled in a designated work area if they cannot be sampled in their current location. See *Drum Handling Practices at Hazardous Waste Sites* for further information on staging drums.

7.2.5.1 Move the drums to upright stable positions if necessary. Sufficient space shall be left between drums to prevent movement hazards.

7.2.5.2 Number or identify uniquely all drums to be sampled.

7.2.6 Perform a detailed inspection of individual drums.

7.2.6.1 Record all relevant information from the drum labels, markings, data sheets, etc. in the field log book or on forms specified in the work plan.

7.2.6.2 Make sure there are no discrepancies with existing paperwork.

7.2.7 Slowly loosen the ring that secures the lid or loosen the bung, allowing any pressure or vacuum to equalize.

7.2.7.1 *Precautionary Notes:*

(1) If the drum or pail appears to be under positive or negative pressure (that is, a slight lid bulge or dimple), control the release of pressure until it has equalized. For example, if the drum or pail is equipped with bungs, loosen the smaller bung first since doing so will make it easier to control the release of pressure.

(2) If the tope of the drum is dished inward (dimpled), it may "pop" when equalizing pressure, spraying the sampler with any material that is sitting on top of the drum.

(3) If there is evidence of a chemical reaction or sudden pressure buildup, the sampler should leave the area immediately and evaluate whether remote drum opening equipment should be used.

(4) For flammable or explosive materials, the drum and sampling equipment should be grounded if the generation of static electricity while opening or sampling the drum is a possibility. The drum and sampling equipment should be grounded to a ground stake or to an existing ground (building ground, grounded water pipes, etc.). New sampling equipment may have some residual static electrical charge due to the materials in which they are packed and shipped. The work plan should specify whether grounding is necessary. See *Accident*

Prevention Manual for Industrial Operations for information on grounding and bonding.

7.2.7.2 Drums should be opened, sampled, and closed individually to minimize the risk of exposure.

7.2.7.3 *Drums (or Pails) with Bungs*—Loosen the large bung slowly. Use non-sparking tools.

7.2.7.4 *Drums with Removable Lids*—Loosen the ring slowly with a manual wrench or air impact wrench. Use non-sparking tools.

7.2.7.5 *Pails with Removable Lids (Side-Lever Lock Ring)*—Release the lever slowly.

7.2.7.6 *Pails with Removable Lids (Snap-On)*—Pry the lid loose slowly with a pail lid opener.

7.2.8 Manual or remote puncturing or deheading will be required if the drum (or pail) has a stuck bung or the lid cannot be removed. See *Drum Handling Practices at Hazardous Waste Sites* for further information on manual or remote drum opening.

7.2.9 Any discrepancy discovered (such as evidence of free liquid) upon opening the drum should be recorded in the field log book.

7.3 *Sampling Equipment—Selection*:

7.3.1 Table 1 summarizes selection criteria for equipment by the material to be sampled.

7.3.2 *Sampling Equipment, Materials of Construction*—Sampling devices will usually be made of stainless steel, brass, aluminum, or plastic. Devices using permanent coatings or liners (such as PTFE) may be subject to abrasion, leading to contamination of the sample.

7.3.3 *Generic Equipment List*—A general list of equipment used for sampling consolidated solids follows:

7.3.3.1 Scoop.
7.3.3.2 Rotating corer.
7.3.3.3 Thin-wall tube sampler.
7.3.3.4 Chipper.
7.3.3.5 Hammer and chisel.
7.3.3.6 Auger.
7.3.3.7 Pry bars.
7.3.3.8 Wipes or cloths, or both.
7.3.3.9 Spatula.
7.3.3.10 Sample containers, lids, and liners.
7.3.3.11 Sample labels.
7.3.3.12 Chain of custody forms.
7.3.3.13 Field log books.
7.3.3.14 Sample cooler.
7.3.3.15 Ice or gel ice.
7.3.3.16 Grounding cables with alligator clips and emery cloth.

TABLE 1 Selection Criteria for Equipment

Equipment	ASTM Standard	Visually Homogeneous	Heterogeneous
Auger	D 4700	X[A]	X
Chipper, hammer, and chisel	...	X	X
Rotating corer	C 783	X	X
Thin-walled tube	D 4700	N[B]	...[C]

[A] X = equipment usually may be used with this type of waste.
[B] N = not equipment of choice but may be used (for example, a clay-like material).
[C] Equipment is probably not suitable.

7.3.3.17 Portable monitoring equipment (combustible gas indicator, organic vapor detector, radiation survey meter, etc.).

7.3.4 Equipment needed to open drums should be non-sparking (brass or beryllium copper) and include, but not be limited to, the following:

7.3.4.1 Bung wrenches (one straight and one bent),
7.3.4.2 Flathead screwdriver,
7.3.4.3 Breaker bar (½ in. (1.3 cm)),
7.3.4.4 Ratchet (½ in. (1.3 cm)),
7.3.4.5 Speed handle (½ in. (1.3 cm)),
7.3.4.6 Adjustable wrenches (10 and 12 in. (25 and 30 cm)).
7.3.4.7 Air impact wrench and sockets, and
7.3.4.8 Pail lid opener.

8. Sample Collection

8.1 *Basic Sampling Practices*:

8.1.1 Bond the sampling equipment to the drum, if specified in the work plan.

8.1.2 Note the physical characteristics, including any discrepancies (such as free liquid).

8.1.3 Collect the required number of samples from the drum.

8.1.3.1 See Practice D 4547 for the collection of samples for volatile analysis.

8.1.4 Place the collected material in a sample container.

8.1.5 Close the sample container.

8.1.6 Wipe the outside of the sample container. Dispose of the wipe cloth properly.

8.1.7 Record in the field log book all relevant conditions associated with the collection of each sample.

8.1.8 Fill out all required paperwork for each sample, as required by the work plan.

8.1.9 Complete and attach the label to the side of the sample container before or after sampling, as directed by the work plan. The sample label should include the following:

(1) Sample ID number,
(2) Name of sampler,
(3) Sampler's initials or signature,
(4) Date and time of sampling, and
(5) Sampling location.

8.1.9.1 The sample label can also include the following:

(1) Sampling information (for example, grab, composite, etc.),
(2) Preservative and preservation required,
(3) Special instructions, and
(4) Analysis request.

8.2 *Sampling Using a Rotating Corer*—The rotating corer can be as simple as a cylinder attached to an electric drill with the crown modified for cutting (see Fig. 1 and Practice C 783) or as complex as a double metal tube fitted onto a diamond-impregnated coring bit, mounted on a portable stand. The double metal tube corer mounted on a portable stand has the capability of collecting a full-depth core of the drum contents. This procedure describes the single metal tube corer attached to an electric drill.

8.2.1 *General Description*—The rotating corer is usually 1 to 1½ ft (0.3 to 0.5 m) long, with available diameters of approximately 2 to 6 in. (5.1 to 15.2 cm). The corer is driven by suitable equipment, such as a portable electric drill.

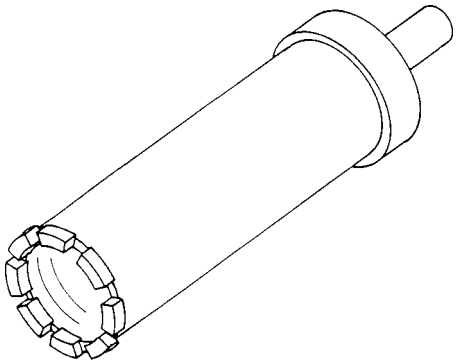

FIG. 1 Rotating Corer

8.2.2 *Operation and Use*—Place the coring apparatus over the area to be cored. Turn the coring mechanism on, and place the coring bit in continuous contact with the solid material by supplying uniform and continuous pressure. Continue the operation until the solid material is bored to the specified depth and the resulting core is forced into the tube. Withdraw the corer. Record the actual length of the core. The tube can be capped and transferred to the analytical laboratory. This is the desirable method for samples requiring volatile organics analysis. The sample core can also be extruded into a form-fitting sample container.

8.3 *Sampling with a Thin-Wall Tube Sampler*:

8.3.1 *General Description*—Thin-wall tube samplers may vary in diameter, length, and material of construction (see Fig. 2). The material to be sampled must be of a physical consistency (cohesive solid material) to be cored and retrieved with the tube. Materials with particles larger than one-third of the inner diameter of the tube should not be sampled with that particular device. The length of the tube will depend on the desired sampling depth (Guide D 4700). The tube is attached onto a length of solid or tubular rod. The upper end of this rod is threaded to accept a handle or extension rods. This sampler can be used to collect samples of consolidated clay-like materials.

8.3.2 *Operation and Use*—The sampler is pushed into the material to be sampled by applying downward force on the unit's handle. Once the sampler has reached the bottom of the sampling interval, it is twisted to break the continuity at the tip. The sampler is pulled from the material, and the sample material is extruded into the sample container. Samples are extruded by forcing a rod through the tube.

8.4 *Sampling with a Chipper*:

8.4.1 *General Description*—A hardened steel bit or knife is fitted to a pneumatic hammer (see Fig. 3). The hammer forces the bit or knife to break the consolidated material into chips, flakes, and chunks suitable for collection with a scoop. This method is not recommended for samples requiring volatile organics analysis.

8.4.2 *Operation and Use*—Insert the chipper into the drum. Place the chipping knife directly on the material to be sampled. Activate the pneumatic hammer. Break the consolidated material into manageably sized chips, flakes, and chunks. Remove the chipper. Collect a sample from the drum with a scoop, and transfer to the sample container.

NOTE 1—See 7.1.4 and the site work plan for information on selecting chipped particles for the sample.

8.5 *Sampling with a Hammer and Chisel*:

8.5.1 *General Description*—A hammer is used to impact a hardened steel chisel to break the consolidated material into chips, flakes, and chunks suitable for collection with a scoop.

8.5.2 *Operation and Use*—These tools are used as necessary to collect sample material from the drum. A hammer and chisel have been found useful in sampling drums for which surface sampling is required or particle size reduction is necessary. This method is not recommended for samples requiring volatile organics analysis.

NOTE 2—See 7.1.4 and the site work plan for information on selecting chipped particles for the sample.

8.6 *Sampling with an Auger*:

8.6.1 *General Description*—The screw or ship auger is essentially a small-diameter (for example, 1½-in. (3.8-cm)) wood auger from which the cutting side flanges and tip have been removed. The auger is welded onto a length of solid or tubular rod. The upper end of this rod is threaded to accept a handle or extension rods. An auger can be used for collecting a disturbed sample of consolidated material in drums (See Fig. 4 and Guide D 4700).

8.6.2 *Operation and Use*—The auger is rotated manually or with a power source into the material to be sampled. The operator may have to apply downward force to embed the auger; the auger screws itself into the material afterwards. The auger is advanced to its full length and then pulled up and removed. Material from the deepest interval is retained on the auger flights. Sample material can be collected from the flights using a spatula.

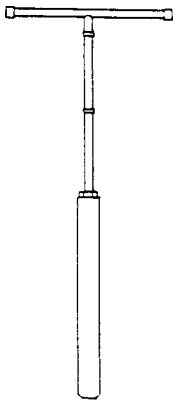

FIG. 2 Thin-Walled Tube

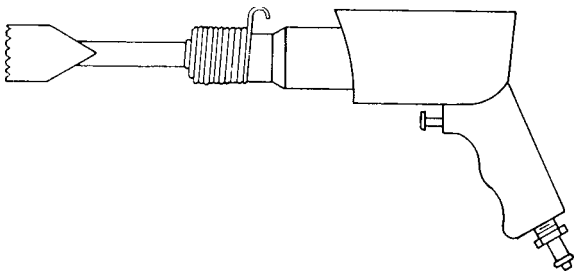

FIG. 3 Pneumatic Chipper

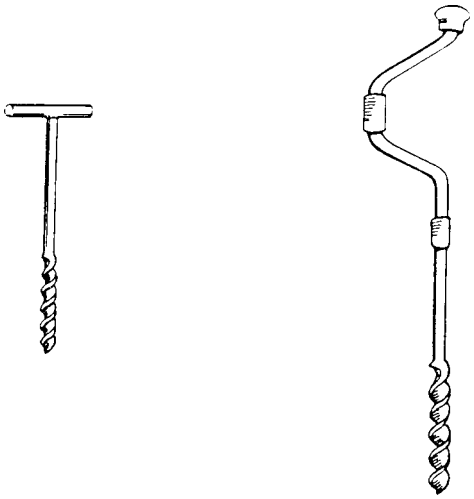

FIG. 4 Augers (Typical)

9. Post-Sampling

9.1 Remove all sampling equipment from the work zone.

9.2 Transfer all reusable equipment that was in contact with the waste to a pre-designated decontamination area. Decontaminate the equipment according to the protocol established in the work plan (Practice D 5088). Decontaminated sampling equipment should be protected from contamination. This may include, but not be limited to, storage in aluminum foil, plastic bags, PTFE film, or other means of protection that will not impact the sample quality or intended analysis.

9.3 Dispose of all used (disposable) contacting equipment.

10. Data Quality Objectives

10.1 The objectives for sampling and testing of consolidated solid material should be specified in the work plan.

11. Quality Control

11.1 Quality Control (QC) samples (for example, equipment blanks, trip blanks, and duplicates) must be collected as required by the work plan. These QC samples must be evaluated to provide a determination of the sampling quality and reliability of the resulting analytical data.

12. Keywords

12.1 auger; chipper; consolidated solids; hazardous waste; rotating corer sampling; thin-wall tube