Designation: D 6759 – 02

Standard Practice for Sampling Liquids Using Grab and Discrete Depth Samplers[1]

This standard is issued under the fixed designation D 6759; 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 sampling devices and procedures for collecting samples of liquids or sludges, or both, whose upper surface can be accessed by the suitable device. These devices may be used to sample tanks that have an appropriately sized and located sampling port.

1.2 This practice describes and discusses the advantages and limitations of the following commonly used equipment, some of which can be used for both grab and discrete depth sampling: dipper, liquid grab sampler, swing jar sampler, Bacon Bomb, Kemmerer sampler, Discrete Level sampler, liquid profiler, lidded sludge/water sampler, peristaltic pump, and the Syringe sampler.

1.3 This practice provides instructions on the use of these samplers.

1.4 This practice does not address sampling devices for collecting ground water.

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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 4687 Guide for General Planning of Waste Sampling
D 4840 Guide for Sample Chain of Custody Procedures
D 5088 Practice for Decontamination of Field Equipment Used at Non-Radioactive Waste Sites
D 5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation
D 5358 Practice for Sampling with a Dipper or Pond Sampler
D 5743 Practice for Sampling Single or Multilayered Liquids with or without Solids in Drums or Similar Containers
D 5753 Guide for Planning and Conducting Borehole Geophysical Logging
D 5792 Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
D 5956 Guide for Sampling Strategies for Heterogeneous Wastes
D 6044 Guide for Representative Sampling for Management of Waste and Contaminated Media
D 6051 Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities
D 6232 Guide for Selection of Sampling Equipment for Waste and Contaminated Media Data Collection Activities
D 6323 Guide for Laboratory Subsampling of Media Related to Waste Management Activities
D 6538 Guide for Sampling Wastewater With Automatic Samplers
D 6699 Practice for Sampling Liquids Using Bailers
E 856 Definitions of Terms and Abbreviations Relating to Physical and Chemical Characteristics of Refuse Derived Fuel

3. Terminology

3.1 *discrete depth sample*, *n*—sample obtained from a defined level within the liquid being sampled.

3.2 *grab sample*, *n*—individual sample collected over a period of time usually not exceeding 15 min and in such a manner as to be representative of conditions at the time of sampling. Grab samples are sometimes called individual or discrete samples.

3.3 *representative sample*, *n*—sample collected such that it reflects one or more characteristics of interest (as defined by the project objectives) of a population from which it was collected. **D 5956**

3.4 *sample*, *n*—portion of material taken from a larger quantity for the purpose of estimating properties or composition of the larger quantity. **E 856**

3.5 *sludge*, *n*—any mixture of solids that settles out of solution. Sludges contain liquids that are not apparent as free liquids (see Practice D 5743). **D 6323**

[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.

4. Significance and Use

4.1 Sampling at specified depth(s) within a liquid may be needed to confirm or rule out variations within a target population. This practice describes the design and operation of commercially available grab and discrete depth samplers for persons responsible for designing or implementing sampling programs, or both.

4.2 These sampling devices are used for sampling liquids in tanks, ponds, impoundments, and other open bodies of water. Some may be used from the edge or bank of the sampling site, whereas some can only be used from a platform, boat, or bridge over the sampling site. Some of the devices described are suitable for sampling slurries and sludges as well as aqueous and other liquids with few or no suspended solids.

4.3 Practice D 5743 provides guidance for sampling drums, tanks, or similar containers.

4.4 This practice does not address general guidelines for planning waste sampling activities (Guide D 4687), development of data quality objectives (Practice D 5792), the design of monitoring systems and determination of the number of samples to collect (Practice D 6311), in situ measurement of parameters of interest, data assessment and statistical interpretation of resultant data (Guide D 6233), sample preservation, sampling and field quality assurance (Guide D 5612), or the selection of sampling locations or obtaining a representative sample (Guide D 6044).

5. Pre-Sampling

5.1 Samples should be collected in accordance with an appropriate work plan (Practice D 5283 and Guide D 4687) and in accordance with the Data Quality Objectives (Practice D 5792). The plan should include a worker health and safety section because of the potential hazards associated with sampling wastes.[3]

5.2 All equipment shall be clean, dry, and compatible with the anticipated composition of the material being sampled (Practice D 5088). When sampling a hazardous material, if the exterior of the sample bottle or sampling apparatus contacts the hazardous material, it needs to be cleaned before subsequent steps, such as labelling or sample transfer, are taken.

5.3 For samplers with long handles, if high voltage electrical wires could come into contact with the handle, the handle should be made of nonconductive material, such as wood.

5.4 For guidance in obtaining a representative sample, see Guide D 6044.

5.5 For guidance in how to prepare composite samples and subsamples in the field, see Guide D 6051.

5.6 Some discrete samples can be taken using bailers (see Practice D 6699). Additional information on selecting sampling equipment, based on the sample matrix, and the constraints on the use of equipment, based on the physical and chemical properties of the equipment, can be found in Guide D 6232.

[3] *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication No. 85-115 (NTIS No. PB87-162855/LL), NIOSH, OSHA, USCG, EPA, October 1985.

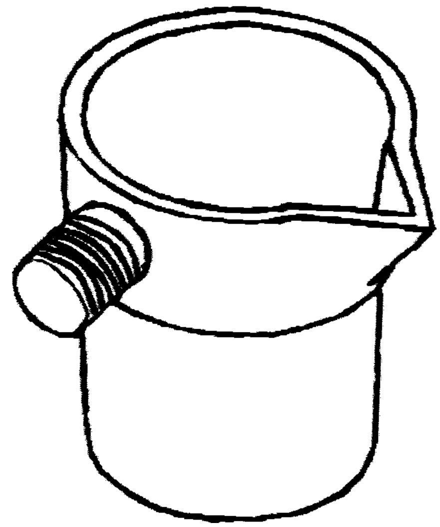

FIG. 1 Dipper

6. Sampling Equipment and Procedures

6.1 *Dipper*:

6.1.1 *Description*—A dipper can consist of a variety of pieces of equipment assembled in a manner to obtain a sample.

6.1.1.1 One type has an adjustable clamp attached to the end of a metal rod or tube, which may be extendable (see Fig. 1). The rod or tube forms the handle and the clamp is used to secure it to a beaker or other sample container.

6.1.1.2 Another type of device is made using a stainless steel tube clamped to a moveable bracket that is attached to a rigid handle. The angle of the cup to the handle is adjustable (Practice D 5358).

6.1.2 *Procedure*:

6.1.2.1 With the beaker facing downward, lower the dipper beaker into the liquid slowly until it is submerged. Try to cause a minimum of surface disturbance.

6.1.2.2 Rotate the beaker through 180°. If there is a current, the mouth of the beaker should face upstream during the rotation.

6.1.2.3 Allow the beaker to fill.

6.1.2.4 Slowly bring it to the surface.

6.1.2.5 Transfer the sample, usually by gently pouring the dipper's contents into a clean sample container.

6.1.3 *Advantages and Limitations*:

Advantages	Limitations
It is inexpensive.	It can be used to obtain only surface samples.
When attached to a rigid pole, it can reach to 4 m (10–13 ft) away from the person collecting samples.	Because the sample collection chamber is always open, it cannot obtain a sample containing the same strata proportions as the strata at the location being sampled.

6.2 *Liquid Grab Sampler*:

6.2.1 *Description*—A liquid grab sampler consists of a rigid handle with a bottle attached to one end. The bottle is sealed with a plunger that can be opened or closed by moving the cable that is attached to it (see Fig. 2).

6.2.2 *Procedure*—Assemble the liquid grab sampler per the manufacturer's instructions.

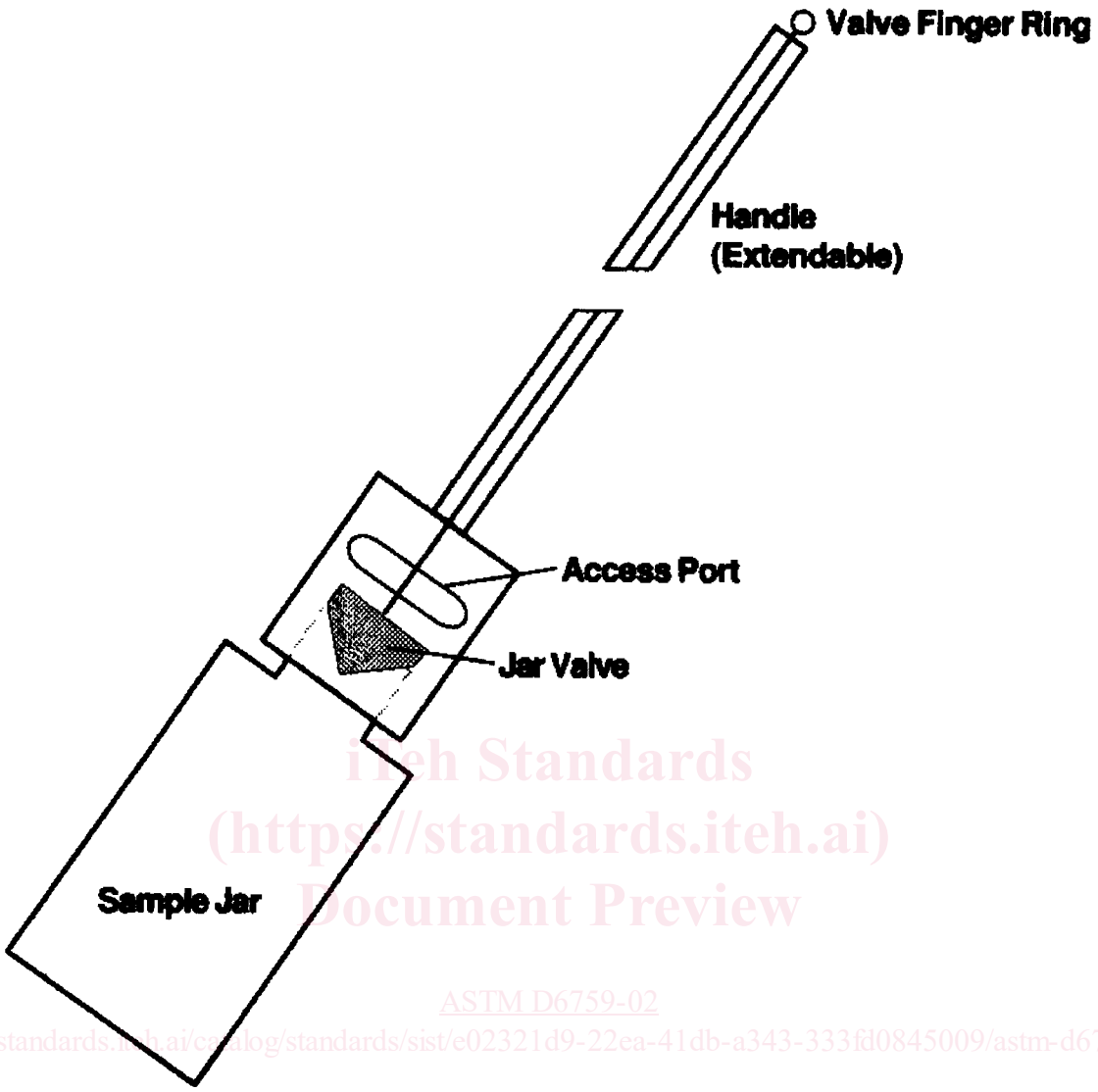

FIG. 2 Liquid Grab Sampler

6.2.2.1 When assembled, thread the bottle onto the grab sampler head and tighten by turning the bottle clockwise.

6.2.2.2 Submerge the sampler to the desired depth and pull the split key ring to allow liquid to enter the bottle.

6.2.2.3 Release the ring to close the bottle.

6.2.2.4 Raise the sampler from the liquid.

6.2.2.5 Remove the filled sample bottle and seal it.

6.2.2.6 Clean the outside surface of the sample bottle.

6.2.3 *Advantages and Limitations*:

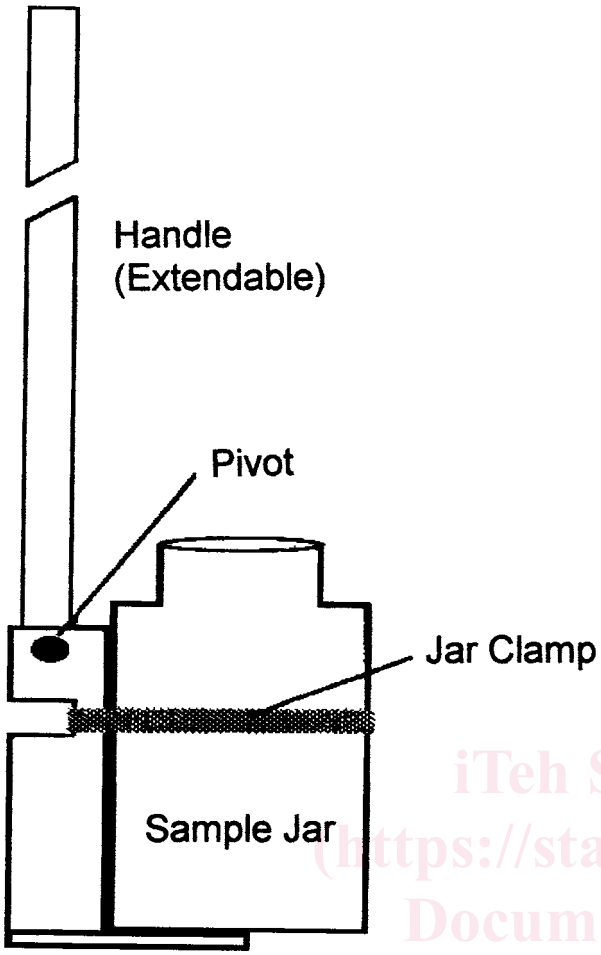

FIG. 3 Swing Jar Sampler

Advantages	Limitations
The sample jar is available commercially in a range of materials, providing the choice of one that is chemically inert to the contaminants of interest.	True depth of sample unknown unless device is vertically deployed.
Handles of various lengths can be used to obtain samples from different depths.	Not able to collect stratified samples of proper proportions.
The sample does not need to be transferred to another container for shipping.	Exterior of sample bottle needs cleaning after immersion in hazardous waste.
The sampler is not opened until the desired sampling depth is reached, that is, it can be used as a discrete depth sampler (see Practice D 6699).	

6.3 *Swing Jar Sampler*:

6.3.1 *Description*—This sampling device consists of a pole that screws into a bottle holder (see Fig. 3). The angle of the bottle with respect to the pole can be varied.

6.3.2 *Procedure*:

6.3.2.1 Select the bottle clamp that best fits the desired sample bottle.

6.3.2.2 Connect the pole to the bottle holder and turn it clockwise until snug.

6.3.2.3 Slide the clamp onto the bottle to a point midway between the bottle shoulder and heel.

6.3.2.4 Tighten the screw located in the inner pole screw threads of the bottle holder.

6.3.2.5 Lower the sampler into the liquid slowly with the bottle facing downward until it is submerged to cause minimal surface disturbance.

6.3.2.6 Rotate the bottle through 180°.

NOTE 1—If there is a current, the mouth of the bottle should face upstream during the rotation.

6.3.2.7 Allow the bottle to fill and slowly bring it to the surface.

6.3.2.8 Loosen the screw holding the bottle to the device.

6.3.2.9 Remove the bottle from the holder.

6.3.2.10 For transport to the laboratory, either seal the bottle and clean the exterior or transfer the bottle's contents into a clean sample container.

6.3.3 *Advantages and Limitations*:

Advantages	Limitations
The sampler can accommodate different sample bottle sizes up to 960 mL.	Not suitable for discrete depth sampling.
It allows collection from various angles, including vertical.	Exterior of sample bottle needs cleaning after immersion in hazardous waste.

6.4 *Bacon Bomb*:

6.4.1 *Description*—The Bacon Bomb sampler consists of a sealed hollow tube or chamber. It is attached to a primary cable/line, with length markings and an actuator rod (labeled Secondary Activation in Fig. 4) connected to a second line, which opens and closes the chamber's valves.

6.4.2 *Procedure*:

6.4.2.1 Measure and mark the support line or cable with the desired length or depth.

6.4.2.2 Close the chamber.

6.4.2.3 Lower the Bacon Bomb sampler using the primary support line or cable to the desired depth, as marked on the support line. Secure the line.

6.4.2.4 Open the chamber by pulling on the actuator rod line, thereby allowing the sampler to fill.

6.4.2.5 When the chamber is full, release the second line to close the sampler.

6.4.2.6 Return the sampler to the surface by raising the primary support line.

6.4.2.7 Transfer the contents of the Bacon Bomb sampler to a clean dry sample container. Hold the Bacon Bomb sampler over the sample container. Open the lower stopper by raising the actuator rod. Drain the contents into a clean sample container(s).

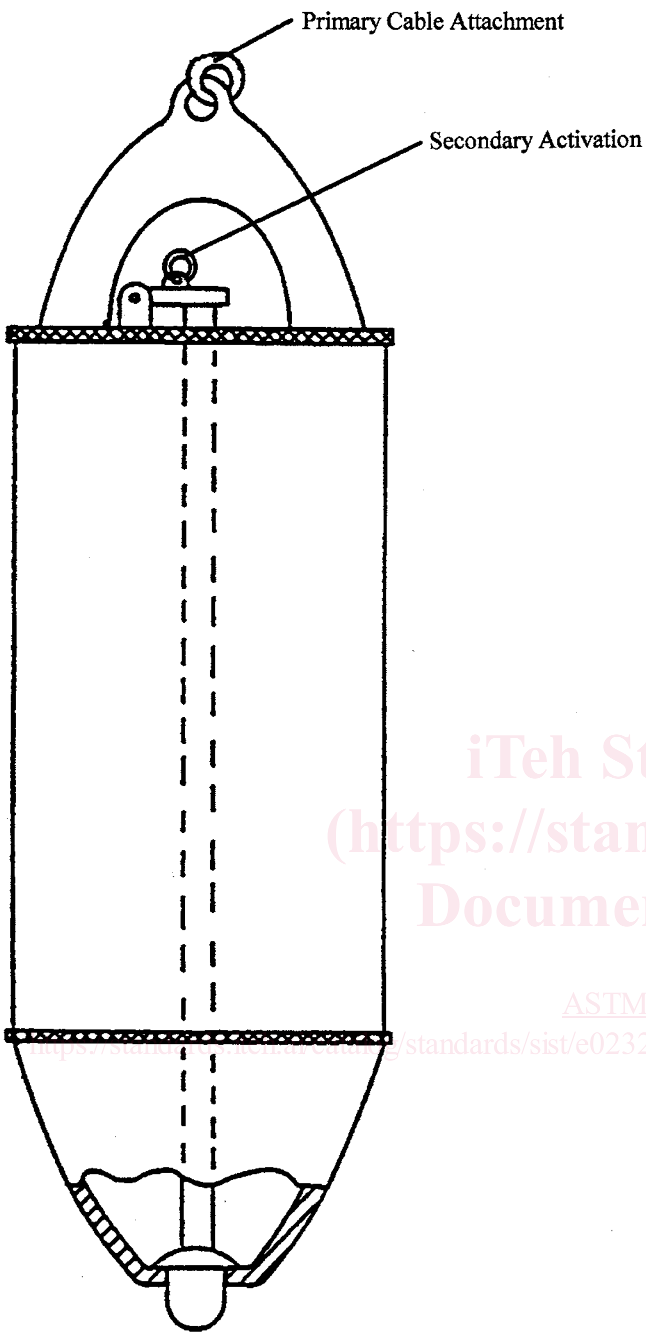

FIG. 4 Bacon Bomb

6.4.3 *Advantages and Limitations*:

Advantages	Limitations
Sampler is closed to the material being sampled until it has reached its intended depth, that is, it can be used as a discrete depth sampler.	The lowering and activation lines tend to cross each other during descent, which could allow sample collection to occur at the wrong depth.
It is available in 250-, 500- and 1000-mL volumes in both PTFE and type 302 stainless steel.	The commercially available stainless steel unit has a maximum capacity of 500 mL.
The stainless steel unit is effective for use in high viscosity non aqueous liquids, for example, oil.	PTFE device is expensive relative to stainless steel.
	Not effective in turbid sample media, according to the manufacturer.
	Slight leakage into the interior may occur with the stainless steel unit during descent, according to the manufacturer
	With viscous material, an excess of the material being sampled may adhere to the outside of the Bacon Bomb sampler.

6.5 *Syringe Sampler*:

6.5.1 *Description*—The Syringe sampler is a hollow tube type sampler with a bottom fill valve. A Syringe sampler normally consists of a piston assembly with a T-handle, safety locking nut, and control rod (PTFE-covered aluminum to facilitate operation of the piston), a piston body assembly, a sampling tube assembly, and a standard bottom valve or coring bottom (see Fig. 5).

6.5.2 *Procedure*:

6.5.2.1 Open the bottom valve.

6.5.2.2 Slowly lower the assembled sampler to the desired depth.

6.5.2.3 Raise the T-handle, drawing the sample into the sampler body.

6.5.2.4 Close the bottom valve by pressing the sampler down against the side or bottom of the container being sampled.

6.5.2.5 Raise the sampler to the surface using the support line.

6.5.2.6 Transfer the contents to a clean dry sample container. Hold the Syringe sampler over the sample container. Open the bottom valve and push down on the T-handle to extrude the sample into a clean sample container.

6.5.3 *Advantages and Limitations*:

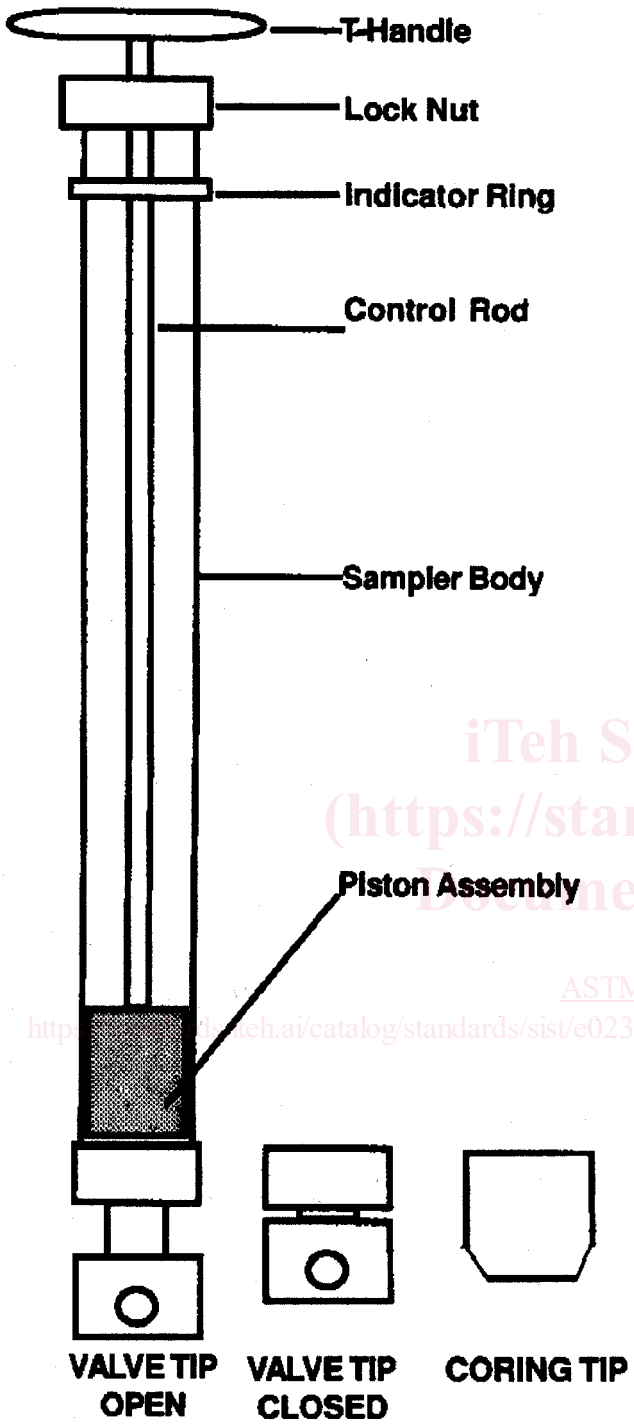

FIG. 5 Syringe Sampler

Advantages	Limitations
It can be used to sample highly viscous liquids, sludges, and tar-like substances.	The bottom of the syringe sample must be pushed against the bottom or side to close the bottom valve.
It can collect samples even when only a small amount remains at the bottom of a tank or drum.	With viscous material, more of the material being sampled may end up on the outside of the sampler than inside it
All sample contacting parts are made of PTFE.	
It is simple to use and decontaminate.	
May be used to depths of about 1.8 m (6 ft).	
Sampler is closed to the material being sampled until it has reached its intended depth, that is, it can be used as a discrete depth sampler.	

6.6 *Kemmerer Sampler*:

6.6.1 *Description*—The Kemmerer sampler consists of a cylinder with a stopper at each end. The ends of the cylinder are left open as the sampler is being lowered, in a vertical position, to allow free passage of liquid through the cylinder (see Fig. 6). The stoppers, usually rubber, are attached to a line or cable that runs through the cylinder. At the upper end of the line is a weight called a "messenger."

6.6.2 *Procedure*:

6.6.2.1 Measure and mark the support line or cable with the desired length or depth.

6.6.2.2 Open the stoppers at both ends of the collection cylinder.

6.6.2.3 Place clamps on the top of the ring to prevent the stoppers from falling and sealing the cylinder prematurely.

6.6.2.4 Keep the Kemmerer in a vertical position and slowly lower it to the intended depth.

6.6.2.5 Send the "messenger" down the line to release the clamps and close the stoppers.

6.6.2.6 Raise the Kemmerer sampler to the surface.

6.6.2.7 Transfer the sample to a clean, dry sample container. Position the Kemmer over the sample container, open the lower stopper, and drain the liquid into the clean sample container.

6.6.3 *Advantages and Limitations*:

Advantages	Limitations
It can be used as a discrete depth sampler.	PTFE device is expensive relative to stainless steel.
It is available in stainless steel, brass or PTFE in volumes up to 2 L.	It may be difficult to decontaminate.
There is little or no sample disturbance during sample collection.	If the line or cable that runs through the cylinder is a bungee type, it may become slack, which could cause a loss of sample.
	The device is open to the material being sampled.

6.7 *Discrete Level Sampler*:

6.7.1 *Description*—The Discrete Level sampler is a removable, cylindrical chamber fitted with manually operated