



Designation: D3987 – 12

## Standard Practice for Shake Extraction of Solid Waste with Water<sup>1</sup>

This standard is issued under the fixed designation D3987; 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.

### 1. Scope

1.1 This practice covers a procedure for leaching of solid waste to obtain an aqueous solution to be used to determine the constituents leached under the specified testing conditions.

1.2 This practice provides for the shaking of a known mass of waste with water of specified composition and the separation of the aqueous phase for analysis.

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

1.4 *This standard does not purport to address all of the safety problems, 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>

[C471M Test Methods for Chemical Analysis of Gypsum and Gypsum Products \(Metric\)](#)

[D75 Practice for Sampling Aggregates](#)

[D420 Guide to Site Characterization for Engineering Design and Construction Purposes \(Withdrawn 2011\)](#)<sup>3</sup>

[D1193 Specification for Reagent Water](#)

[D2216 Test Methods for Laboratory Determination of Water \(Moisture\) Content of Soil and Rock by Mass](#)

[D2234/D2234M Practice for Collection of a Gross Sample of Coal](#)

[D3370 Practices for Sampling Water from Closed Conduits](#)

[D5681 Terminology for Waste and Waste Management](#)

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.01.04 on Waste Leaching 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.

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

[E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process](#)

### 3. Definitions

3.1 For definitions of terms used in this practice, see Terminology [D5681](#).

### 4. Significance and Use

4.1 This practice is intended as a rapid means for obtaining an extract of solid waste. The extract may be used to estimate the release of constituents of the solid waste under the laboratory conditions described in this procedure.

4.2 This practice is not intended to provide an extract that is representative of the actual leachate produced from a solid waste in the field or to produce extracts to be used as the sole basis of engineering design.

4.3 This practice is not intended to simulate site-specific leaching conditions. It has not been demonstrated to simulate actual disposal site leaching conditions.

4.4 The intent of this practice is that the final pH of the extract reflects the interaction of the extractant with the buffering capacity of the solid waste.

4.5 The intent of this practice is that the water extraction simulates conditions where the solid waste is the dominant factor in determining the pH of the extract.

4.6 The practice produces an extract that is amenable to the determination of both major and minor constituents. When minor constituents are being determined, it is especially important that precautions are taken in sample storage and handling to avoid possible contamination of the samples.

4.7 The practice has not been tested for applicability to organic substances and volatile matter.

### 5. Apparatus

5.1 *Agitation Equipment*, of any type that rotates about a central axis at a rate of  $29 \pm 2$  r/min and mixes samples in an end-over-end fashion (see example equipment in [Fig. 1](#).)

NOTE 1—Modifications to the agitation technique (orientation or rate) could result in alteration of the degree of mixing or the rate of release of constituents as well as causing particle abrasion. As a result, the precision of the practice may also be influenced.

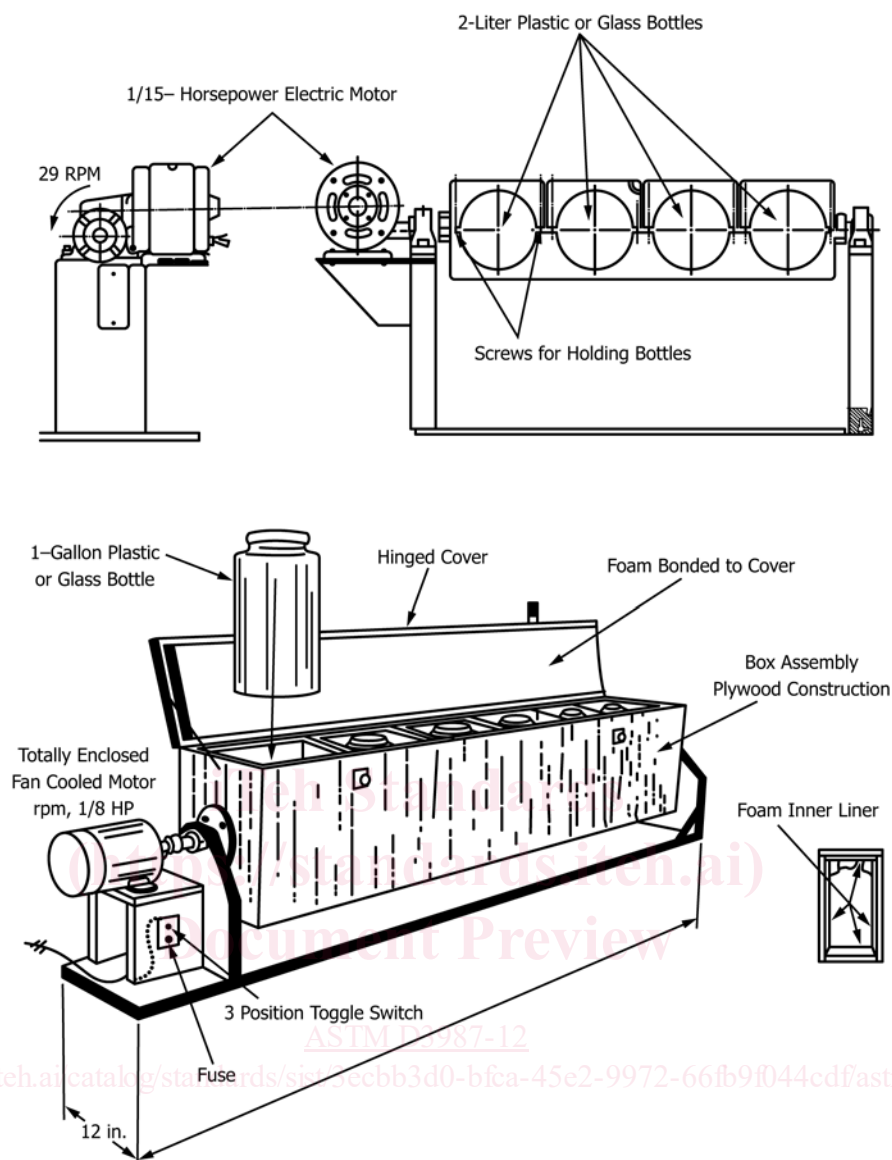


FIG. 1 Example Extractor

5.2 *Membrane Filter Assembly*—A borosilicate glass or stainless steel funnel with a flat, fritted base of the same material and membrane filters.

5.3 *Containers*, round, wide-mouth, of a composition suitable to the nature of the solid waste and the analyses to be performed, and constructed of materials that will not allow sorption of constituents of interest.

5.3.1 Containers should be of sufficient size to contain the mass of the solid sample plus the volume of extractant at a liquid-to-solid ratio of 20 mL/g, leaving approximately 10-20 % headspace for mixing. For example, 2-L (0.5 gal) containers may be used for 70-g (0.15 lb) samples with 1400 mL (0.37 gal) of extractant, while 4-L (1 gal) containers may be required for 140-g (0.30 lb) samples with 2800 mL (0.74 gal) of extractant.

5.3.2 Containers must have watertight closures.

5.3.3 Containers with venting mechanisms should be provided for samples where gases may be released.

NOTE 2—Allowing the container to vent generated gases has the potential to affect the concentrations of constituents in the extract.

5.3.4 Containers should be cleaned in a manner consistent with the analyses to be performed.

5.4 *Laboratory Balance*, capable of accurately measuring 0.01 g.

5.5 *pH Meter*, with temperature compensation, readability of 0.01 units and an accuracy of  $\pm 0.05$  units at 25°C.

## 6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.