



Designation: E828 – 81 (Reapproved 2004)<sup>ε1</sup>

## Standard Test Method for Designating the Size of RDF-3 From its Sieve Analysis<sup>1</sup>

This standard is issued under the fixed designation E828; 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.

<sup>ε1</sup> NOTE—Adjunct references were corrected editorially in May 2006.

### 1. Scope

1.1 This test method of designating the size of refuse-derived fuel from its sieve analysis is applicable to the classified light fraction (RDF-3) of shredded municipal or industrial waste materials less than 0.15 m (6 in.) in size.

1.2 The values stated in acceptable metric units are to be regarded as 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.* For more specific precautionary information see Section 7.

### 2. Referenced Documents

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

D2234/D2234M Practice for Collection of a Gross Sample of Coal

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 *ASTM Adjunct*:<sup>3</sup>

Graphical form, representing distribution of sizes of broken coal (8½ × 11 in. pad of 50 sheets)

### 3. Terminology

3.1 *Definitions*:

3.1.1 *air drying*—a process of partial drying of RDF-3 to bring its moisture content near to equilibrium with the atmosphere in the room in which the sieving is to take place.

3.1.2 *gross sample*—a sample representing a lot of RDF and composed of a number of increments on which neither reduction nor division has been performed.

3.1.3 *laboratory sample*—a representative portion of the gross sample delivered to the laboratory for further analysis.

3.1.4 *lot*—a large designated quantity of RDF-3.

3.1.5 *representative sample*—a sample collected in such a manner that it has characteristics equivalent to the material being sampled.

3.1.6 *sample division*—the process of extracting a smaller sample from a gross sample wherein the representative properties of the large sample are retained.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *refuse-derived fuel (RDF-3)*—a shredded fuel derived from municipal solid waste (MSW) that has been processed to remove metal, glass, and other inorganics. This material has a particle size such that 95 weight % passes through a 2-in. square-mesh screen.

NOTE 1—Other refuse-derived fuel may be classified as follows:

RDF-1—Wastes used as a fuel in as-discarded form.

RDF-2—Wastes processed to coarse particle size with or without ferrous metal separation.

RDF-4—Combustible waste processed into powder form, 95 weight % passing 10-mesh screening.

RDF-5—Combustible waste densified (compressed) into the form of pellets, slugs, cubettes, or briquettes.

RDF-6—Combustible waste processed into liquid fuel.

RDF-7—Combustible waste processed into gaseous fuel.

### 4. Summary of Test Method

4.1 This test method covers the separation of an RDF sample into defined size fractions and expressing those fractions as a weight percent of an air-dried sample.

### 5. Significance and Use

5.1 The purpose of this test method is to provide a means of designating the size classification of RDF-3 for use by consumers and producers of RDF-3.

### 6. Apparatus

6.1 *Sieves*:

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.03 on Treatment, Recovery and Reuse.

Current edition approved April 4, 2006. Published February 1982. DOI: 10.1520/E0828-81R04E01.

<sup>2</sup> 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.

<sup>3</sup> Pristine forms are available from ASTM International Headquarters. Order Adjunct ADJE0828. Original adjunct produced in 1982.

6.1.1 Use sieves conforming to Specification **E11**. For recommended sizes see **Table 1**.

6.1.1.1 For RDF-3 and larger than 50 mm (2 in.) screens having rectangular frames 0.6 to 0.7 m<sup>2</sup> (6 to 8 ft<sup>2</sup>) sieve area are satisfactory.

6.1.1.2 For RDF-3 50 mm (2 in.) or smaller, rectangular frames having 2 to 4 ft<sup>2</sup> (0.2 to 0.4 m<sup>2</sup>) sieve area are satisfactory.

6.1.1.3 For RDF-3 smaller than 0.01 m (0.5 in.), circular sieves 0.3 m (12 in.) or 0.2 m (8 in.) in diameter are satisfactory.

#### 6.2 Sieving Devices:

6.2.1 Hand sieving is permissible.

6.2.2 Sieving machines that provide the necessary agitation and tumbling action may be used. See **Annex A1** for recommended screen sizes and machines.

6.3 **Balance** (laboratory sample), having sufficient capacity to weigh the sample and container with a sensitivity of 0.5 g in 1000 g.

### 7. Precautions

7.1 Due to the origins of RDF-3 in municipal waste, common sense dictates that some precautions be observed when conducting tests on the samples. Recommended hygienic practices include use of gloves when handling RDF-3; wearing masks (NIOSH-approved type), especially while shredding RDF-3 samples; conducting tests under a negative pressure hood when possible; and washing hands before eating or smoking.

### 8. Sampling

8.1 Collect increments regularly and systematically so that the entire quantity of RDF sampled will be representative proportionately in the gross sample, and with such frequency that a gross sample of the required amount shall be collected. No sampling procedure shall be used that alters the particle size distribution.

8.2 Establish the sampling procedures to be used, the number and size of samples required to obtain a representative sample, and the method of division of the gross sample into the laboratory sample in accordance with an agreement between purchaser and supplier.

NOTE 2—The statistical methods described in Test Method **D2234/D2234M** may be applicable in determining the number and size of samples.

8.3 Division of the gross sample into the laboratory sample may be done by coning and quartering, riffing, or by other appropriate method.

8.4 The sample shall be approximately 2 kg (4.4 lb) in weight.

8.5 Air-dry the sample in a ventilated drying oven to constant weight at 10 to 15°C above the ambient temperature. (Calculate the loss in weight to percentage of moisture that shall constitute the air-dry loss in the sieve analysis sample.)

### 9. Procedure

9.1 Weigh the air-dried sample.

#### 9.2 Hand Sieving:

9.2.1 Starting with the sieve having the largest opening, sieve a portion of the RDF-3 in such an increment as will allow the individual pieces to be in direct contact with the meshes of the screen after the completion of shaking of each increment. In shaking, apply a vertical as well as horizontal motion in order to allow all small particles to pass through the openings, until no more material will pass. Hand fitting is not permitted.

9.2.2 Pass the material through successively smaller sieves in increments small enough to avoid matting of the material to the extent that the undersized material cannot reach and pass the screen.

9.2.3 Continue to shake the sieve after each increment is added until no significant amount of material passes through the screen.

#### 9.3 Machine Sieving:

9.3.1 When sieving machines are used, test their thoroughness of sieving by comparison with hand methods as described in **9.2**.

9.3.2 Stack the sieves progressively starting with the smallest aperture size, above the pan, to the largest aperture size at the top.

9.3.3 Introduce the air-dried sample above the largest screen in small enough increments such that matting of the material does not occur to an extent that prevents the undersize material from reaching and passing the screen. The amount of RDF-3 added to the top screen in any increment must not exceed one third of the volume of the screen, in order to prevent matting or blinding.

9.3.4 After adding each increment, assemble the pans or trays in the machine and turn on agitation for 10 min, or up to 15 min if necessary, to complete screening.

9.3.5 Inspect each screen for evidence of matting. If a screen is mostly or entirely covered with a mat, decrease the size of the initial increments such that no mat forms on any sieve, and repeat the tests.

9.3.6 When sieving of each increment is complete, promptly determine the weight of material remaining on each screen to

**TABLE 1 Recommended Sieve Sizes (ASTM E11 – 70)**

| For screening RDF-3 the following screen series is recommended: |                           |
|---|---------------------------|
| Standard (mm)   | Alternative (in. or mesh) |
| 100 mm  | 4 in.                     |
| 50 mm   | 2 in.                     |
| 25 mm   | 1 in.                     |
| 12.5 mm   | 1/2 in.                   |
| 6.3 mm  | 1/4 in.                   |
| 3.35 mm   | No. 6                     |
| 1.70 mm   | No. 12                    |
| 850 µm  | No. 20                    |
| 425 µm  | No. 40                    |
| The following intermediate screen sizes may be used as needed:  |                           |
| Standard (mm)   | Alternative (in. or mesh) |
| 75 mm   | 3 in.                     |
| 37.5 mm   | 1.5 in.                   |
| 19.0 mm   | 3/4 in.                   |
| 9.5 mm  | 3/8 in.                   |
| 4.75 mm   | No. 4                     |
| 2.36 mm   | No. 8                     |
| 1.18 mm   | No. 16                    |
| 600 µm  | No. 30                    |

the nearest 0.5 g. If more than one increment is sieved to pass the entire sample, add the incremental weights remaining on each sieve. If the sum of the weights show a loss of 2 % or more, reject the analysis and make another test using a second sample.

NOTE 3—In order to obtain a complete characterization of the size range of an RDF-3 sample, it is necessary that the number of sieves be such that no more than 25 % of the gross sample weight will be retained on any given sieve. The recommended screen series are listed in **Table 1**.

NOTE 4—The sand and glass contained in a sample of RDF-3 has a strong tendency to segregate from the light fraction. For this reason great care must be taken to include the entire sample in the sieve analysis. When a sample is divided, the sand will probably not divide equally into the sample portions. Samples may be divided for convenience in feeding the sieving apparatus, but the weights of all portions of the sample must be properly summed so that the entire sample has been included in the sieve analysis.

NOTE 5—Some abrasion and physical degradation of the sample by the screen can occur during the sieving operation. The analyst shall monitor and report his observations of any sample degradation.

**10. Report**

10.1 Report the weights of the size fractions as a percentage of the weight of the air-dried laboratory sample of RDF-3. Calculate to the nearest 0.5 % the percentages of the size fractions remaining on each sieve, and the percentage passing through the smallest aperture sieve. See sample report form in **Fig. 1**.

10.2 Record the results starting with the largest aperture size. If desirable, the percentage can also be reported on a cumulative basis, as cumulative percentage greater than size or cumulative percentage less than size where size refers to sieve aperture size or mesh number.

10.3 The sieve aperture defining the upper particle size limit shall be that sieve of the series with the smallest aperture size that will retain less than 5 % of the sample weight. This sieve size is the nominal top particle size (see **Annex A2** for definition).

10.4 The sieve aperture size defining the lower particle size limit shall be the smallest aperture sieve of the series which

| <b>REPORT OF SIEVE ANALYSIS OF RDF-3</b>   |                        |                 |            |                                |
|--|------------------------|-----------------|------------|--------------------------------|
| All weights in grams   |                        |                 |            |                                |
| Sample Identification no. _____  | <i>AIR DRY LOSS</i>    |                 |            |                                |
| Date sampled: _____  | Weight Before _____    |                 |            |                                |
| Sample rec'd. _____  | Weight After _____     |                 |            |                                |
| Source: _____  | Weight Loss _____      |                 |            |                                |
| _____  | % A-D Loss _____       |                 |            |                                |
| -----  |                        |                 |            |                                |
| Sieve No. (mm)   | Alternative (in. mesh) | Weight retained | % retained | % cumulative greater than size |
| 100 mm   | 4 in.                  | _____           | _____      | _____                          |
| 50 mm  | 2 in.                  | _____           | _____      | _____                          |
| 25 mm  | 1 in.                  | _____           | _____      | _____                          |
| 12.5 mm  | ½ in.                  | _____           | _____      | _____                          |
| 6.3 mm   | ¼ in.                  | _____           | _____      | _____                          |
| 3.35 mm  | No. 6                  | _____           | _____      | _____                          |
| 1.70 mm  | No. 12                 | _____           | _____      | _____                          |
| 850 µm   | No. 20                 | _____           | _____      | _____                          |
| 425 µm   | No. 40                 | _____           | _____      | _____                          |
| In pan through 425 µm  | No. 40                 | _____           | _____      | _____                          |
| (Total)  |                        | =====           | =====      | =====                          |
| <p>NOTE 1—Calculate percentages to the nearest 0.5 %.</p> <p>NOTE 2—If the sum of the weights shows a loss of over 2 %, reject the analysis and make another test.</p> <p>NOTE 3—Nominal top size sieve shall retain 1 % to 5 % of A-D sample weight. The nominal bottom size sieve shall allow no more than 15 % of A-D sample to pass.</p> |                        |                 |            |                                |
|  |                        |                 |            | Analyst: _____                 |
|  |                        |                 |            | Date: _____                    |

**FIG. 1 Sample Report Form**