



Designation: E 1037 – 84 (Reapproved 1996)^{ε1}

Standard Test Method for Measuring Particle Size Distribution of RDF-5¹

This standard is issued under the fixed designation E 1037; 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.

^{ε1} NOTE—Editorial changes were made throughout in October 1996.

1. Scope

1.1 This test method is used to determine the size distribution of a RDF-5 sample. Size is defined as the maximum length of the particle, where length is determined by the RDF-5 manufacturing process. That is, a pellet, cubette, or briquette all have a recognizable length. Fig. 1 displays the sizes and shapes of some RDF-5 particles.

1.2 An air dried RDF-5 sample is separated into categories of differing particle sizes. The size distribution is measured as the weight percentage of each size category. A graph of a function of the cumulative fraction of material by weight finer than particle size versus particle size is plotted. From this plot are taken values which describe the size distribution—the uniformity constant and the characteristic particle size.

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. Terminology

2.1 Definition:

2.1.1 *RDF-5*—solid fuel derived from municipal solid waste in which the processed combustible fraction is densified (compressed) into the form of pellets, cubettes or briquettes.

3. Significance and Use

3.1 The particle size distribution of RDF-5 strongly influences the storage and handling characteristics of the fuel. Small particles tend to block flow through storage bins and feed hoppers, although correct bin and hopper designs will alleviate this problem of blockage.

3.2 This test method of measuring size by hand allows accurate description of RDF-5 particle size distribution. Measurement by hand is superior to sieving techniques, wherein particles may be broken by the size separation technique itself. However, hand measurement is more time-consuming than sieving techniques.

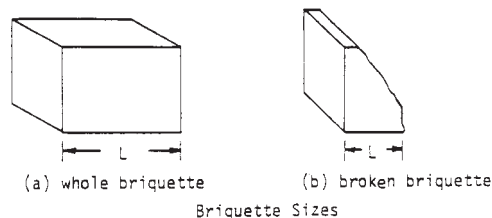
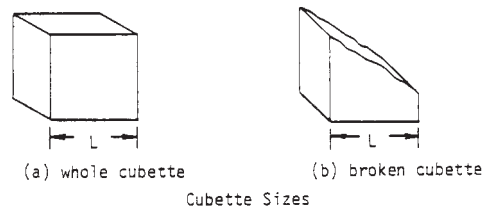


FIG. 1 RDF-5 Sizes

4. Apparatus

4.1 *Labelled Containers*, used to hold the particles which are separated by size. Appropriate containers are beakers or pans labelled " ≥ 70 mm", " ≥ 60 mm – < 70 mm", etc. The tare weight of each container shall be recorded to 0.1 g.

4.2 *Scale*, capable of weighing the sample and container with an accuracy of 0.1 g.

4.3 *Vernier Calipers*, a length-measuring instrument having an accuracy of 0.1 mm.

5. Procedure

5.1 The sample shall weigh 1.0 ± 0.1 kg (2.2 ± 0.2 lb) unless otherwise specified. Record the weight of the sample to the nearest 0.1 g.

5.2 Fig. 2 Beginning with the largest particles, measure the length of each particle in the sample. Separate the particles into

¹ This test method is under the jurisdiction of ASTM Committee D-34 on Waste Management and is the direct responsibility of Subcommittee D34.06 on Recovery and Reuse.

Current edition approved Dec. 28, 1984. Published June 1985.

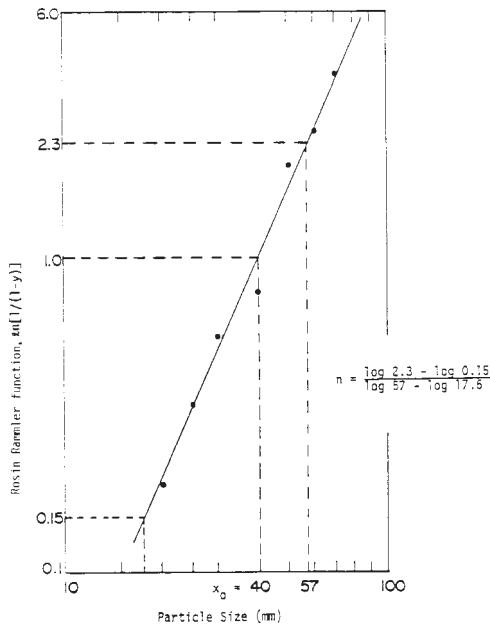


FIG. 2 Size Distribution Example—Test Number 1

containers labelled as the size categories of less than 10 mm, 10 to less than 20 mm, 20 to less than 30 mm, 30 to less than 40 mm, etc. as needed.

5.3 Record the weight of each size category to 0.1 g.

5.4 Add the weights of the size components. If this sum differs by more than 2 % from the sample weight recorded initially, then reject the analysis and begin another test.

5.5 Use the sum of the separate size categories as the total weight to determine weight percentages of each size fraction. If the weight percentage of any fraction is greater than or equal to 25 %, then separate that fraction into two portions of 5-mm size categories. Continue separating the size fraction into categories of 2.5 mm, 1.25 mm, etc., until the weight percentage of each fraction is less than 25 %.

6. Calculation

6.1 With each particle size for which there is data, calculate y , the cumulative fraction of the sample less than that particle size. This is found by summing the weight percentages of all fractions less than that size. Also calculate the value of the Rosin-Rammler function for each particle size, as follows:

$$\ln\left(\frac{1}{1-y}\right) \quad (1)$$

6.2 Plot $\ln[1/(1 - y)]$ versus particle size on log-log paper. Data points will yield a straight line.

6.3 Determine two values which characterize this line—the uniformity constant and the characteristic particle size. The uniformity constant, n , is defined as the slope of the line. The characteristic particle size, x_0 , is defined as the size at which 63.2 % of the particles (by weight) are smaller. The characteristic particle size is the size corresponding to $\ln[1/(1 - y)] = 1.0$. Fig. 2 is an example of this plot.

7. Report

7.1 Report the uniformity constant, n (a dimensionless number), and the characteristic particle, x_0 (millimeters).

8. Precision

8.1 Table 1 presents the results of intra- and inter-laboratory

TABLE 1 Results of Precision Testing

		Uniformity Constant	Characteristic Size
Intra-laboratory	Sample mean	2.42	3 g
	Standard deviation	0.16	2 mm
Inter-laboratory	Sample mean	2.65	36 mm
	Standard deviation	0.18	2 mm

precision testing. Intra-laboratory and inter-laboratory tests were performed on different populations of RDF-5.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).