Designation: E 830 – 87 (Reapproved 2004)

Standard Test Method for Ash in the Analysis Sample of Refuse-Derived Fuel[1]

This standard is issued under the fixed designation E 830; 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 test method covers determination of the ash content in the analysis sample of refuse-derived fuel (RDF). The results obtained can be applied as the weight percent ash in the proximate analysis and in the ultimate analysis.

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 specific precautionary statements see Section 6.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals

E 790 Test Method for Residual Moisture in a Refuse-Derived Fuel Analysis Sample

E 829 Practice for Preparing Refuse-Derived Fuel (RDF) Laboratory Samples for Analysis

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *refuse-derived fuel*—Solid forms of refuse-derived fuels from which appropriate analytical samples may be prepared are defined as follows in *ASTM STP 832*:[3]

RDF-1—Wastes used as a fuel in as-discarded form with only bulky wastes removed.

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

RDF-3—Combustible waste fraction processed to particle sizes, 95 % passing 2-in. square screening.

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

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

4. Summary of Test Method

4.1 Ash is determined by weighing the residue remaining after burning the prepared analysis sample under rigidly controlled conditions of sample weight, temperature, and furnace atmosphere.

5. Significance and Use

5.1 This test method is available to producers and users of RDF as a method of determining the weight percent of ash in the analysis sample.

6. Apparatus

6.1 *Electric Furnace*—For determination of the ash content of RDF, the furnace shall have adequate air ventilation and shall be capable of temperature regulation up to at least 750 ± 25°C. An air change rate of 1 to 4 furnace volumes of air per minute has been found adequate.

NOTE 1—It may be possible to reduce the rate of air flow below the suggested minimum without adversely affecting results of the ash determination.

6.2 *Porcelain Capsules*, about 22 mm (⅞ in.) in depth, and 44 mm (1¾ in.) in diameter, or similar containers.

NOTE 2—Weighing bottles of borosilicate glass may be safely used without deformation or softening at temperatures of 600°C or less.

7. Precautions

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

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[1] 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.

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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.

[3] *Thesaurus on Resource Recovery Terminology, ASTM STP 832*, ASTM, 1983, p. 72.

8. Sampling

8.1 The laboratory sample shall be obtained in accordance with sampling methods developed for materials of similar physical form.

8.2 The laboratory sample must be air-dried and particle size reduced to pass a 0.5-mm screen as described in Practice E 829.

9. Procedure

9.1 After thoroughly mixing the analysis sample analysis sample to provide the best possible mix of heavy fines with the milled fluff, transfer approximately 1 g of the sample to a tared, previously fired container (weighed to the nearest 0.1 mg) with a scoop or spatula. Quickly weigh sample and container to the nearest 0.1 mg. As an alternate method use the dried analysis sample from the residual moisture determination. See Test Method E 790.

9.2 Place the uncovered container containing the sample in the furnace at low temperature and gradually heat to ignition at such a rate as to avoid mechanical loss from too rapid expulsion of volatile matter.

9.3 Finish the ignition to constant weight 9±0.001 g/h) at 575 ± 25°C. It may be determined that a constant weight can be routinely established by allowing a sample to ash within the prescribed temperature range for a set period of time.

NOTE 3—Experience has shown that particles of glass and sand tend to sinter to each other and also to porcelain crucibles at temperatures close to 675°C. If laboratory conditions necessitate maintaining consistency in the maximum furnace temperature used for ash tests of other fuels, the ignition may be finished to constant weight (± 0.001 g/h) at a temperature of 725 ± 25°C. If this option is invoked, it should be also noted that prolonged exposure to high temperatures may actually result in changes in weight due to possible chemical reactions.

9.4 Cool in a desiccator over desiccant and weigh as soon as possible after the container and ash reach the temperature of the area in which weighing is performed.

10. Calculation

10.1 Calculate the ash percent in the analysis sample as follows:

$$\text{Ash as-determined, \%} = [(A - B)/C] \times 100 \quad (1)$$

where:

A = weight of container and ash residue, g,
B = weight of empty container, g, and
C = weight of ash analysis sample, g (includes residual moisture).

10.2 Use the numerical moisture value established by Test Method E 790 for converting ash data on the as-determined basis to the dry basis.

11. Report

11.1 Difficulty may be experienced in securing satisfactory check determinations of ash in the same or different laboratories for RDF rich in heavy fines. This is caused by siliceous matter such as glass and sand as well as a wide variety of other particles of different densities entrained in the milled RDF in nonuniform strata. When such a condition is anticipated or encountered, a paired set of determinations should be made, and the results reported as an average. If one determination of a paired set is accidentally ruined, another pair must be run. An off or unusual value does not constitute a ruined determination. In such cases, an additional set of duplicate determinations should be run and all values reported as an average of the two sets.

12. Precision and Bias

12.1 *Precision*:

12.1.1 The standard deviations of individual determinations in percent absolute are as follows:

Typical Average Value, %	Within-Laboratory, %	Between-Laboratories, %
20.0	0.6	1.3

12.1.2 These precision estimates are based on an interlaboratory study conducted in accordance with Practice E 180.

12.2 *Bias*—The bias of this test method can not be determined due to the lack of a recognized standard reference material.