



## Standard Definitions of Terms and Abbreviations Relating to Physical and Chemical Characteristics of Refuse Derived Fuel<sup>1</sup>

This standard is issued under the fixed designation E 856; 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.

**accuracy**—generally, a term used to indicate the reliability of a measurement, or an observation. Specifically, a measure of closeness of agreement between a test result and a recognized standard value. For example, the difference between the observed and a standard value for the sulfur content of a sample of refuse-derived fuel. This difference includes both random and systematic errors.

**air-drying**—a process of partial drying of refuse-derived fuel (RDF) to bring its moisture content near to equilibrium with the atmosphere in which further reduction, division, and characterization of the sample are to take place. In order to bring about this equilibrium, the RDF is usually subjected to drying under controlled temperature conditions ranging from 30 to 40°C.

**air-dry loss**—the decrease in sample mass due to air-drying. This decrease is presumed to be moisture.

**analysis sample**—final subsample prepared from the air-dried laboratory sample but reduced by passing through a mill with a 0.5-mm (0.02-in.) size or smaller final screen.

**as-determined basis**—analytical data obtained from the analysis sample after conditioning and preparation in accordance with Method E 829. As-determined basis data represent the numerical values obtained at the particular moisture and ash level in the sample at the time of analysis.

**ash**—the residue remaining after ignition of refuse-derived fuel determined by definite prescribed methods. The ash may not be identical in composition or quantity with the inorganic substances present in the refuse-derived fuel before ignition.

**as-received basis**—the test data calculated to the moisture condition of the sample as it arrived in the laboratory and before any laboratory processing or conditioning.

**bias**—a systematic error that is consistently negative or consistently positive. The mean of errors resulting from a series of observations which does not tend toward zero.

**calorific value**—the energy of combustion of a unit quantity of refuse-derived fuel. It may be expressed in kilojoules per

kilogram (kJ/kg), British thermal units per pound (Btu/lb), or calories per gram (cal/g) (obsolete).

**combustible**—that portion of the refuse-derived fuel sample which is consumed upon ignition exclusive of the moisture present in the sample.

**d-RDF**—abbreviation for densified refuse-derived fuel.

**dry, ash-free**—the test data calculated to a theoretical base of no moisture or ash associated with the sample.

**dry basis**—the test data calculated to a theoretical base of no moisture associated with the sample.

**duplicate analysis**—paired determinations on the same sample performed by one analyst at essentially the same time.

**gross calorific value**—the energy released by combustion of a unit quantity of refuse-derived fuel at constant volume or constant pressure in a suitable calorimeter under specified conditions such that all water in the products is in the liquid form. This is the measure of calorific value predominantly used in the United States. **Synonym:** higher heating value.

**gross sample**—a sample representing one lot, normally composed of a number of increments, on which neither reduction nor division has been performed.

**higher heating value (HHV)**—a synonym for gross calorific value.

**increment**—a portion of the lot collected by one individual manual or mechanical sampling operation and normally combined with other increments from the lot to make a gross sample.

**laboratory sample**—a representative portion of the gross sample received by the laboratory for analysis.

**lot**—a designated quantity of refuse-derived fuel that can be represented by a properly selected gross sample.

**lower heating value (LHV)**—a synonym for net calorific value.

**milling**—a reduction in particle size of refuse-derived fuel by shearing, cutting, or grinding to a suitable particle size for analysis and characterization (see **sample reduction**).

**net calorific value**—the energy released by combustion of a unit quantity of refuse-derived fuel at constant volume or constant pressure in a suitable calorimeter under specified conditions such that all water in the products remains in the gaseous form. The net calorific value is the lower heating

<sup>1</sup> These definitions are under the jurisdiction of ASTM Committee D34 on Waste Management and are the direct responsibility of Subcommittee D34.03 on Treatment.

Current edition approved Oct. 26, 1983. Published December 1983.

value that can be calculated from the gross calorific value by making a correction for the heat of vaporization of the water. This is the measure of calorific value in Europe but is rarely used in the United States. **Synonym:** lower heating value.

**noncombustible**—that fraction of a macrosample remaining after moisture and combustibles are driven off by heat and combustion. It is composed of metallic and glass particles in addition to the residue from the combustion of organic substances.

**precision**—a term used to indicate the capability of a person, an instrument, or a method to obtain reproducible results; specifically, a measure of the random error as expressed by the variance, the standard error, or a multiple of the standard error.

**proximate analysis**—the determination, by prescribed methods, of moisture, volatile matter, fixed carbon (by difference), and ash. Unless otherwise specified, the term proximate analysis does not include determinations of chemical elements or any determinations other than those named.

**refuse-derived fuel (RDF-3)**—refuse-derived fuel-3 (RDF-3) is defined as a shredded fuel derived from municipal solid waste (MSW) which has been processed to remove metal, glass, and other inorganic materials. 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 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 fuels.

RDF-7—Combustible waste processed into gaseous fuel.

**residual moisture**—the moisture content remaining in an RDF sample after it has been air-dried and milled down to an analysis sample.

**representative sample**—a sample collected in such a manner that it has characteristics equivalent to the lot.

**sample**—a portion of material taken from a larger quantity for the purpose of estimating properties or composition of the larger quantity. See **analysis sample, gross sample, laboratory sample, and representative sample.**

**sample division**—the process of obtaining a smaller sample from a larger sample so that the representative properties of the larger sample are retained. During this process it is assumed that no change in particle size or other characteristics occurs.

**sample preparation**—the process that includes drying, size reduction, division, and mixing of a laboratory sample for the purpose of obtaining an unbiased analysis sample.

**sample reduction**—the process whereby sample particle size is reduced without change in sample weight (see milling).

**standard deviation**—the square root of the variance.

**systematic error**—an error caused by undetected fundamental flaws in the test equipment by inadequate understanding of the theory underlying the measurement or by repetitious errors on the part of the analyst.

**total moisture**—the water contained in a sample. The determination of the total moisture is made by drying a sample under controlled conditions of temperature, time, and air flow. The determination may consist of a single-stage or a two-stage drying process.

**ultimate analysis**—the determination of the percentages of carbon, hydrogen, sulfur, nitrogen, chlorine, ash, and oxygen in a dry refuse-derived fuel sample. The percentage of oxygen may be obtained by difference between 100 % and the sum of the other determined elemental analyses.

**variance**—the mean square of deviations (or errors) of a set of observations; the sum of square deviations (or errors) of individual observations with respect to their arithmetic mean divided by the number of observations less one (degrees of freedom); the square of the standard deviation (or standard error).

**volatile matter**—those products, exclusive of moisture, given off by a material as gas or vapor, determined by definite prescribed methods.

*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).*