



Standard Practice for Fusibility of Refuse-Derived Fuel (RDF) Ash¹

This standard is issued under the fixed designation E953/E953M; 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 practice covers the observation of the temperatures at which triangular pyramids (cones) prepared from RDF ash attain and pass through certain stages of fusing and flow when heated at a specific rate in controlled, mildly-reducing, and oxidizing atmospheres.

1.2 The test method is empirical, and strict observance of the requirements and conditions is necessary to obtain reproducible temperatures and enable different laboratories to obtain concordant results.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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:*²

D5681 Terminology for Waste and Waste Management
E829 Practice for Preparing Refuse-Derived Fuel (RDF) Laboratory Samples for Analysis

3. Terminology

3.1 *Definitions and Symbols*—The critical temperature points to be observed are as follows, denoting the atmosphere used:

¹ This practice 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 Nov. 15, 2016. Published November 2016. Originally approved in 1983. Last previous edition approved in 2008 as E953/E953M – 08. DOI: 10.1520/E0953_E0953M-16.

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.

3.2 *initial deformation temperature, IT*—the temperature at which the first rounding of the apex of the cone occurs. Shrinking or warping of the cone is ignored if the tip remains sharp. In Fig. 1, the first cone shown is an unheated one; the second cone, IT, is a typical cone at the initial deformation stage.

3.3 *softening temperature, ST*—the temperature at which the cone has fused down to a spherical lump in which the height is equal to the width at the base as shown by the third cone, ST, in Fig. 1.

3.4 *hemispherical temperature, HT*—the temperature at which the cone has fused down to a hemispherical lump at which point the height is one half the width of the base as shown by the fourth cone, HT, in Fig. 1.

3.5 *fluid temperature, FT*—the temperature at which the fused mass has spread out in a nearly flat layer with a maximum height of 1.6 mm [$1/16$ in.] as shown in the fifth cone, FT, in Fig. 1.

3.6 For definitions of additional terms used in this test method, refer to Terminology D5681.

4. Significance and Use

4.1 The standard is available to producers and users of RDF to use in determining the fusibility of ash produced from RDF.

4.2 *Limitations of Ash Fusibility Data*—Ash fusibility data are too often over-interpreted. In practice, types of burning equipment, rate of burning, temperature and thickness of fire bed or ball, distribution of ash forming mineral matter in the RDF, and viscosity of the molten ash may influence ash behavior more than the ash fusibility characteristics determined by the laboratory test. Furthermore, conditions existing during applied combustion of RDF are so complex that they are impossible to duplicate completely in a small-scale laboratory test. Therefore, the analysis should be considered an empirical one and the data, at best, only qualitative.

5. Apparatus

5.1 *Furnace*—Any gas-fired or electric furnace conforming to the following requirements may be used.

5.1.1 The furnace shall be capable of maintaining a uniform temperature zone in which to heat the ash cones. This zone shall be such that the difference in the melting point of 12.7 mm [$1/2$ in.] pieces of pure gold wire when mounted in place of