



Standard Test Method for Gross Calorific and Ash Value of Waste Materials¹

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1. Scope

1.1 This test method covers the determination of the gross calorific value of waste materials by either an isoperibol, aneroid, air-jacketed isoperibol, or adiabatic bomb calorimeter using electronic temperature sensors, automatic calorimeter controllers, and subsequent analysis of the residue for ash. After calorific analysis, the bomb washings may be collected for subsequent elemental analysis.

1.2 The values stated in SI units are regarded as the standard.

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.* Specific hazard statements are given in Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*²

D121 Terminology of Coal and Coke

D240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

D1018 Test Method for Hydrogen In Petroleum Fractions

D1193 Specification for Reagent Water

D3177 Test Methods for Total Sulfur in the Analysis Sample of Coal and Coke (Withdrawn 2012)³

D4239 Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion

E144 Practice for Safe Use of Oxygen Combustion Bombs

3. Terminology

3.1 Definitions:

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, Recovery and Reuse.

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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 The last approved version of this historical standard is referenced on www.astm.org.

3.1.1 *calorific value*—the heat produced by combustion of a unit quantity of a specimen under specified conditions. It is expressed in this test method in joules per kilogram (J/kg). Calorific value may also be expressed in calories per gram (cal/g) or in the British thermal units per pound (Btu/lb), when required. The unit equivalents are given in Table 1.

3.1.2 *calorimeter*—as used in this test method, is not only the bomb and its contents, but it also includes the bucket, electronic temperature sensing devices, ignition leads, water, and stirrer when using water.

3.1.2.1 *adiabatic calorimeter*—a calorimeter that has a jacket temperature adjusted to follow the calorimeter temperature as closely as possibly so as to maintain zero thermal head.

3.1.2.2 *calorimeter jacket*—the insulating medium surrounding the calorimeter.

3.1.2.3 *isoperibol calorimeter*—the calorimeter has a jacket of uniform and constant temperature.

3.1.3 *gross calorific value (gross heat of combustion), Q_v (gross)*—the heat produced by combustion of unit quantity of a solid or liquid fuel when burned at constant volume in an oxygen bomb calorimeter under specified conditions with the resulting water condensed to a liquid.

3.1.4 *heat capacity*—the quantity of heat required to raise a system one degree in temperature either at constant volume or constant pressure.

3.1.5 *heat of formation*—the increase in heat content resulting from the formation of 1 mole of a substance from its elements at constant pressure.

3.1.6 *net calorific value (net heat of combustion at constant pressure), Q_p* —the heat produced by combustion of unit quantity of a solid or liquid fuel when burned at a constant pressure of 0.1 MPa (1 atm), under conditions such that all the water in the products remain in the form of vapor.

3.1.7 *static calorimeter*—a calorimeter without a thermostated jacket.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *corrected temperature rise*—the temperature of the calorimeter caused by the process that occurs inside the bomb, which is, the observed temperature change corrected for various effects.