



Standard Practice for Tonnage Calculation of Coal in a Stockpile¹

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1. Scope

1.1 This practice is used to calculate the mass (commonly expressed in tons) of coal in a storage pile using the volume of the stockpile by Test Method D 6172 and the density of the coal determined by Test Method D 6347/D 6347M.

1.2 This practice is applicable to all ranks of coal.

1.3 The user of this standard determines when the density values provided by the survey require an adjustment for moisture.

1.4 The values stated in either inch-pounds or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems can result in nonconformance with the specification.

1.5 *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. Referenced Documents

2.1 ASTM Standards:

- D 2013 Method of Preparing Coal Samples for Analysis²
- D 3173 Test Method for Moisture in the Analysis Sample of Coal and Coke²
- D 3180 Practice for Calculating Coal and Coke Analyses from As-Determined to Different Basis²
- D 3302 Test Method for Total Moisture in Coal²
- D 6172 Test Method for Determining the Volume of Bulk Materials Using Contours of Cross Sections Created by Direct Operator Compilation Using Photogrammetric Procedures²
- D 6347/D 6347M Test Method for Determination of Bulk Density of Coal Using Nuclear Backscatter Depth Density Methods²

¹ This practice is under the jurisdiction of ASTM Committee D-5 on Coal and Coke and is the direct responsibility of Subcommittee D05.07 on Physical Characteristics of Coal.

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² *Annual Book of ASTM Standards*, Vol 05.06.

3. Terminology

3.1 *Definitions*—There are no terms in this practice that require new or other than dictionary definitions.

4. Significance and Use

4.1 The physical inventory of tons of coal in a stockpile, as calculated by this practice, may be used for accounting and tax purposes.

4.2 The inventory results may be compared to other estimates of the inventory, such as:

4.2.1 Tons from a previous inventory less tons shipped or consumed.

4.2.2 Tons estimated to have been received (from conveyor, rail or truck weights) less tons shipped or consumed.

5. Procedure

5.1 Determine if the reported tonnage should be on an as-determined basis, or some other moisture adjusted basis. If the moisture content was determined on the density-measurement samples (see Test Method D 6347/D 6347M), then the density data (and the tonnage) can be calculated to a dry basis or to another moisture-containing basis.

5.1.1 Use Eq 1 or Eq 2 to adjust the as-determined density to a different moisture basis. The percent moisture determined in accordance with Test Methods D 3173, D 3302, or D 2013 in the samples collected according Test Method D 6347/D 6347M is used in Eq 1 or Eq 2.

5.1.2 Use Eq 1 to adjust the average density values to a dry basis:

$$D_{\text{dry}} = D_{\text{det}} \times \left(1 - \frac{M_{\text{det}}}{100}\right) \quad (1)$$

where:

D_{dry} = density in lb/ft³ (kg/m³) on a dry basis,

D_{det} = density in lb/ft³ (kg/m³) on an as-determined moisture basis, and

M_{det} = % moisture, as determined on the density sample.

5.1.3 Use Eq 2 to adjust the as-determined density values to some other moisture basis such as as-received, as-shipped, as-stockpiled, etc.

$$D_{\text{adj}} = D_{\text{det}} \times \left(\frac{100 - M_{\text{adj}}}{100 - M_{\text{det}}}\right) \quad (2)$$

where:

- D_{adj} = density in lb/ft³ (kg/m³) on a desired moisture basis,
 D_{det} = density in lb/ft³ (kg/m³) on an as-determined moisture basis, and
 M_{adj} = % moisture, at the desired moisture basis, and
 M_{det} = % moisture, as determined on the density sample.

5.2 Calculate the tons of coal in the stockpile using Eq 3:

$$T = \frac{D \cdot V}{t} \quad (3)$$

where:

- T = total stockpile tons,
 D = mean of density samples in lb/ft³ [kg/m³] (from Test Method D 6347/D 6347M),
 V = total volume of stockpile in ft³ [m³] (from Test Method D 6172), and
 t = 2000 lb/t (short ton) [1000 kg/Mg (metric tonne)].

6. Confidence Interval Calculation

6.1 A measurement is stated as a quantity, plus or minus some confidence interval, at some level of significance. In the case of volume, this translates to total volume (in ft³), plus or minus some tolerance factor (stated as percent of total volume), calculated at a significance level consistent with Annex A5 of Test Method D 6347/D 6347M.

6.2 The tolerance for the inventory results combines the tolerances, in %, of the density survey data and the volumetric data according to Eq 4:

$$C = \sqrt{D^2 + A^2} \quad (4)$$

where:

- C = combined tolerances of density and volume in %,
 D = tolerance of density test in percent (from Test Method D 6347/D 6347M), and
 A = tolerance of volumetric survey in percent (from Test Method D 6172).

7. Report

- 7.1 The minimum information to be reported is as follows:
 7.1.1 The owner(s) and location of the stockpile.
 7.1.2 The dates when the density and the volume were determined.
 7.1.3 Tons of coal in the stockpile as calculated by Eq 3.
 7.1.4 The density and volume values used in the calculations.
 7.1.5 The moisture defining the basis on which the density was calculated.
 7.1.6 The confidence interval in percent.

8. Precision and Bias

- 8.1 *Precision*—The precision of the result is given by Eq 4.
 8.2 *Bias*—Since there is no acceptable reference method for determining the bias for the procedure for tonnage, bias has not been determined.

9. Keywords

- 9.1 density; stockpile; tonnage; tons; volume

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