Designation: D291/D291M – 20

Standard Test Method for Bulk Density of Crushed Bituminous Coal[1]

This standard is issued under the fixed designation D291/D291M; 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 two procedures for determining the bulk density of crushed coal less than 37.5 mm [1.5 in.] in size, such as is charged into coke ovens, as follows:

1.1.1 *Procedure A*—The cone procedure for determining an uncompacted bulk density.

1.1.1.1 *Standard Method*—Procedure employs the use of a 115 mm [4.5 in.] chute opening and a measuring box having dimensions of 305 mm x 305 mm x 305 mm [12.0 in. x 12.0 in. x 12.0 in.].

1.1.1.2 *Alternate Method*—Procedure employs the use of a 203 mm [8.0 in.] chute opening and a measuring box having dimensions of 203 mm x 203 mm x 305 mm [8.0 in. x 8.0 in. x 12.0 in.] for coals with a total moisture greater than 7 %.

1.1.2 *Procedure B*—The dropped-coal procedure for determining a compacted bulk density, comparable to actual bulk densities attained in coke ovens.

1.2 This test method is not applicable to the testing of powdered coal as used in boiler plants, nor to the determination of the bulk density of coal in storage piles.

1.3 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D440 Test Method of Drop Shatter Test for Coal

D2234/D2234M Practice for Collection of a Gross Sample of Coal

D3038 Test Method for Drop Shatter Test for Coke

D3302/D3302M Test Method for Total Moisture in Coal

D4749 Test Method for Performing the Sieve Analysis of Coal and Designating Coal Size

3. Significance and Use

3.1 This test method concerns the compaction of crushed coal to determine either its compacted or uncompacted bulk density, for purposes such as charging coke ovens.

PROCEDURE A—CONE PROCEDURE FOR UNCOMPACTED BULK DENSITY

4. Apparatus

4.1 *Measuring Box:*

4.1.1 *Standard Method,* of rigid construction, having inside dimensions of 305 mm x 305 mm x 305 mm [12.0 in. x 12.0 in. x 12.0 in.], and a volume of 0.02873 m^3 ± 0.00008 m^3 [1.000 ft^3 ± .003 ft^3]. The exact volume of the box shall be determined by water calibration.

4.1.2 *Alternate Method,* of rigid construction, having the inside dimensions of 203 mm x 203 mm x 305 mm [8.0 in. x 8.0 in. x 12.0 in.], and a volume of 0.01257 m^3 ± .00003 m^3 [0.4444 ft^3 ± 0.0012 ft^3]. The exact volume of the box shall be determined by water calibration.

4.2 *Cone:*

4.2.1 *Standard Method,* conforming to Fig. 1 for filling the measuring box. This cone shall be 610 mm [24.0 in.] high and 510 mm [20.0 in.] in inside diameter at the top, with a circular opening 115 mm [4.5 in.] in diameter at the bottom. A slide valve consisting of a sliding-plate shutter and its supports shall be welded to the bottom of the cone in such a manner that the valve may be opened and closed with ease by removing or inserting the shutter in its supporting slides. The cone shall be

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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.

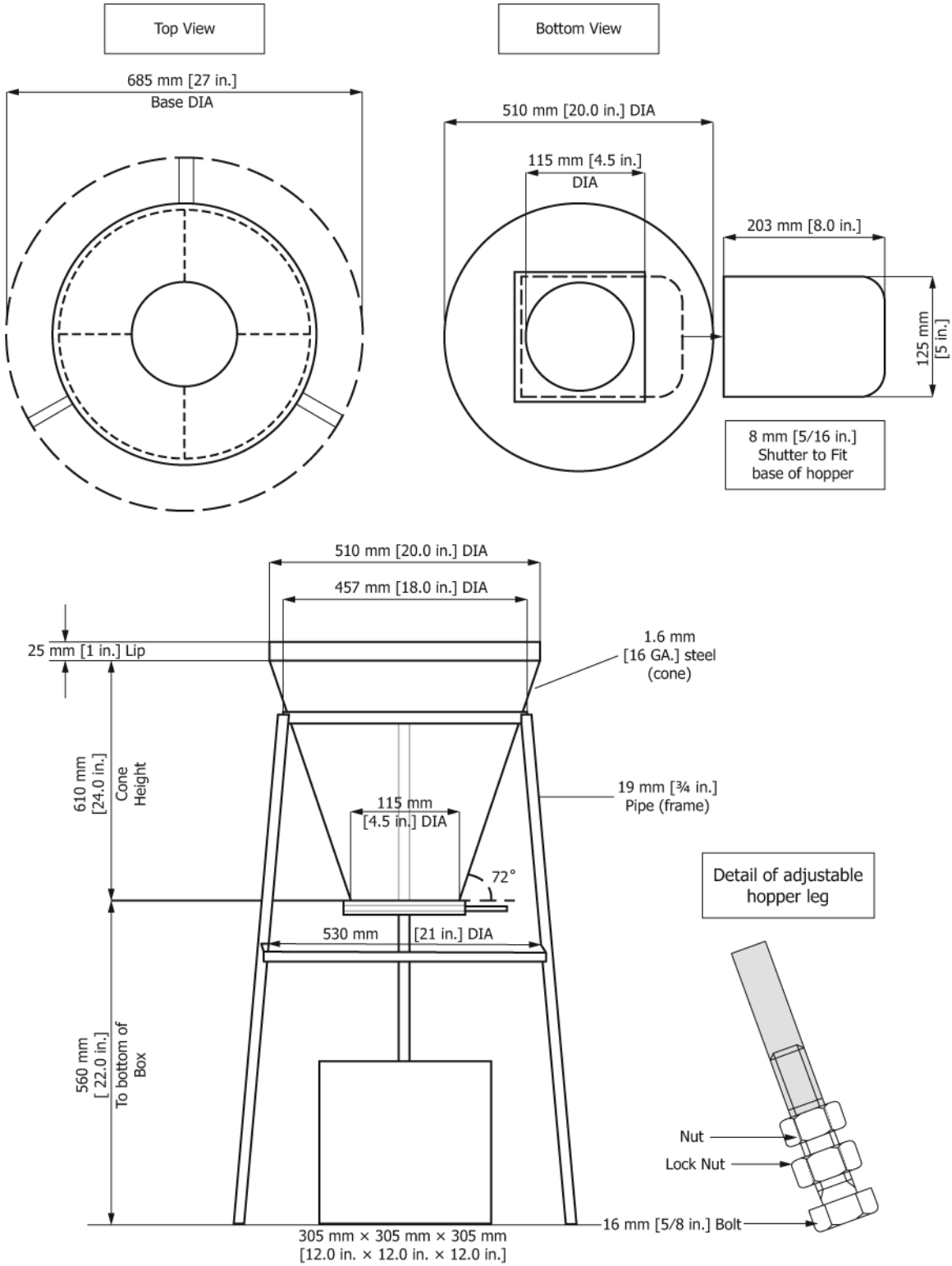

FIG. 1 Example of Apparatus for Cone Procedure: Standard Method

supported in a tripod frame having a circular opening at the top of 457 mm [18.0 in.] in diameter. This frame shall support the cone so that the top-side of the shutter shall be 560 mm [22.0 in.] from the inside bottom surface of the box. An example of the apparatus for the standard cone procedure is shown in Fig. 1.

4.2.2 *Alternate Method,* [3] conforming to Fig. 2 for filling the measuring box. This cone shall be 470 mm [18.5 in.] high and

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D05-2001. Contact ASTM Customer Service at service@astm.org.