



Designation: D440 – 07 (Reapproved 2019)<sup>ε1</sup>

## Standard Test Method of Drop Shatter Test for Coal<sup>1</sup>

This standard is issued under the fixed designation D440; 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.

<sup>ε1</sup> NOTE—Editorial changes were made throughout in December 2019.

### 1. Scope

1.1 This test method of drop shatter test<sup>2</sup> covers the determination of the relative size stability and its complement, the friability, of sized coal. It affords a means of indicating the ability of coal to withstand breakage when subjected to handling at the mine and during transit to the consumer. The test method is serviceable for ascertaining the similarity of coals in respect to size stability and friability rather than for determining values within narrow limits in order to emphasize their dissimilarity. This test method is considered applicable for testing a selected single size of different coals, for testing different single sizes of the same coal, and for mixed sizes of the same or different coals.

NOTE 1—By single sizes, it is meant those with fixed upper and lower sieve opening limits, selected from those designated in 4.2; and by mixed sizes, it is meant either “slack” or a mixture of two or more single sizes.

1.2 This test method appears best suited for measuring the relative resistance to breakage of the larger sizes of coal when handled in thin layers such as from loader to mine car, from loading boom to railroad car, from shovel to chute, etc. While it may not be so well adapted for measuring the liability to breakage of coal when handled in mass, as in unloading open-bottom cars, emptying bins, etc., it is believed that the test method will serve also to indicate the relative size stability of composite sizes of coal where, in commercial handling, the smaller sized pieces have a cushioning effect which tends to lessen the breakage of the larger pieces of coal.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.07 on Physical Characteristics of Coal.

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<sup>2</sup> For information concerning the development and utilization of this drop shatter test method for coal, the following references may be consulted:

Smith, C. M., “An Investigation of the Friability of Different Coals,” University of Illinois, Engineering Experiment Station, *Bulletin No. 196* UIBBA (1929); “The Friability of Illinois Coals,” University of Illinois, Engineering Experiment Station, *Bulletin No. 218* UIBBA (1930).

Yancey, H. F., and Zane, R. E., “Comparison of Methods for Determining the Friability of Coal,” U.S. Bureau of Mines, *Report of Investigations 3215* (1933).

Gilmore, R. E., Nicolls, J. H. H., and Connell, G. P., “Coal Friability Tests,” Canadian Department of Mines, Mines Branch, *No. 762* (1935).

1.3 The values stated in inch-pound units shall be regarded as the standard. Mass may be expressed in metric values.

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:<sup>3</sup>

D3038 Test Method for Drop Shatter Test for Coke

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

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E323 Specification for Perforated-Plate Sieves for Testing Purposes

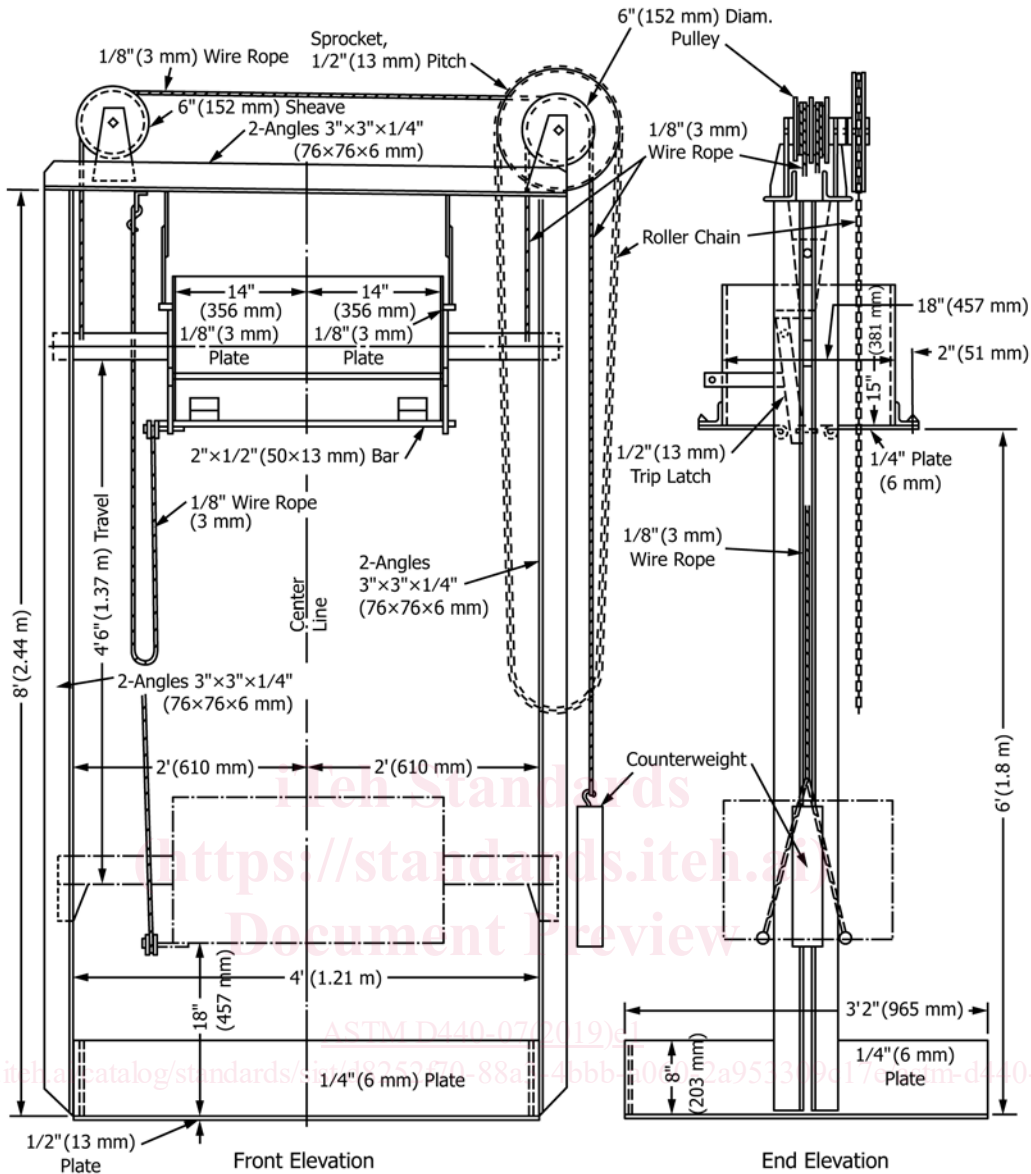
### 3. Significance and Use

3.1 The values determined in this test method, when evaluated in terms of pertinent experience with other coals, may be used as indications of the extent to which coal will break in conventional transit and handling beyond the point of sampling.

### 4. Apparatus

4.1 *Shatter Test Machine*, which is the same as that described and illustrated in Test Method D3038, shall consist of a box 18 in. (457 mm) in width, 28 in. (711 mm) in length, and approximately 15 in. (381 mm) in depth, supported above a rigidly mounted cast iron or steel plate not less than 1/2 in.

<sup>3</sup> 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.



NOTE 1—1 in. = 25.4 mm

FIG. 1 Shatter Test Machine

(12.7 mm) in thickness, 38 in. (965 mm) in width, and 48 in. (1219 mm) in length. The inside of the bottom of the box shall be 6 ft (1.83 m) above the plate. The bottom of the box shall consist of two doors hinged lengthwise and latched so that they will swing open freely and not impede the fall of the coal. Boards about 8 in. (200 mm) in height should be placed around the plate so that no coal is lost. To prevent the breakage of coal, which may occur while placing the sample into the box, the box shall be constructed so that it can be lowered to a convenient level; this is best done by means of a pulley and counterweight. A convenient form of shatter test machine is shown in Fig. 1.

4.2 Sieves—Round-hole sieves selected from the following sizes, 8 in., 6 in., 4 in., 3 in., 2 in., 1½ in., 1 in., ¾ in., ½ in., ¼ in., and ⅛ in., shall be used. These sieves shall conform to Specification E11 or Specification E323. Frames for the sieves

may be of either hardwood or metal, and may be square, rectangular, or circular. A nest comprising all the sieves in the series, with 2 ft (610 mm) square plates, that is, of 4 ft<sup>2</sup> (0.37 m<sup>2</sup>) area, is recommended, although plates with areas of 6 ft<sup>2</sup> to 9 ft<sup>2</sup> (0.56 m<sup>2</sup> to 0.84 m<sup>2</sup>), are suitable.

### 5. Samples

5.1 Collection of Gross Sample—Collect the gross sample in accordance with Sections 5 through 7 of Test Method D4749. In order that the entire quantity of the coal sampled will be represented proportionately in the gross sample, collect increments regularly and systematically. When testing coal as mined, take the sample at the mine before it is subjected to screening and to loading into cars at the tippie. When testing coals subsequent to mining, the sample may be taken at any stage in the transportation from the mine to the place at which