



Designation: D409/D409M – 24

Standard Test Method for Grindability of Coal by the Hardgrove-Machine Method¹

This standard is issued under the fixed designation D409/D409M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

This test method is structured into the following parts:

The body of the test method discusses the scope, referenced documents, significance and use, apparatus, gross samples, preparation of test samples, procedure, calculation and report, precision and bias, and keywords.

Annex A1 contains the method to obtain and prepare coal feedstock for potential use as HGI RMs (reference materials).

Annex A2 contains the method to divide and containerize the candidate HGI RMs (candidate HGI RMs) from the feedstock prepared in **Annex A1**.

Annex A3 contains the method for homogeneity testing of the candidate HGI RMs containerized in **Annex A2**.

Annex A4 contains the method for determining the Hardgrove grindability index (HGI) to be assigned to each lot of the candidate HGI RMs.

Annex A5 contains the method used to calibrate a Hardgrove grindability machine using the primary or secondary HGI RMs.

Annex A6 contains the method for determining the moisture content of the 1.18×0.60 mm (No. 16×30) test sample.

1. Scope

1.1 This test method² covers the determination of the relative grindability or ease of pulverization of coals in comparison with coals chosen as standards. A prepared and sized sample receives a definite amount of grinding energy in a miniature pulverizer, and the size consist of the pulverized product is determined by sieving. The resultant size consist is used to produce an index relative to the ease of grinding [Hardgrove Grindability Index (HGI)].

1.1.1 Some coals, such as some high-volatile bituminous, subbituminous, and lignite coals, can undergo physical change as the natural or seam moisture is released during handling and

preparation. This change is often sufficient to alter the grindability characteristics that will be reported when tested in the laboratory and could produce different indices dependent on the conditions of drying and the moisture level of the 1.18×0.60 mm (No. 16×30) (see Test Method **D4749**) materials used for the test. Therefore, the repeatability and reproducibility cited in this test method may not apply for these high-volatile bituminous, subbituminous, and lignite coals.

1.2 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.

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

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

¹ This test method is under the jurisdiction of ASTM Committee **D05** on Coal and Coke and is the direct responsibility of **D05.07** on Physical Characteristics of Coal.

Current edition approved July 1, 2024. Published July 2024. Originally approved in 1951. Last previous edition approved in 2016 as D409 – 16. DOI: 10.1520/D0409_D0409M-24.

² For information concerning the experimental work on which this test method is based, see paper by Hardgrove, R. M., “Grindability of Coal,” *Transactions, American Society of Mechanical Engineers*, Vol 54, F.S.P., p. 37, 1932.

D05.07 on Physical Characteristics of Coal is conducting ongoing investigations in regard to quality control during preparation, distribution, and use of standard reference materials and during preparation and testing of actual samples.