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Standard Guide for Sampling Plan and Core Sampling of Carbon Cathode Blocks Used in Aluminum Production¹

This standard is issued under the fixed designation D6354; 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 guide covers sampling of carbon cathode blocks used in the production of aluminum, and details procedures for taking test-samples from single cathode blocks. It covers equipment and procedures for obtaining samples from cathode blocks in a manner that does not destroy the cathode block or prevent its subsequent use as originally intended. However, the user must determine the subsequent use of the sampled cathode blocks. Preferred locations for taking samples from single units of cathode blocks are covered in this guide.

1.1.1 Information for sampling of shaped refractory products, in general, is given in ISO 5022. This standard details the statistical basis for sampling plans for acceptance testing of a consignment or lot. Cathode blocks used in the production of aluminum have specific requirements of sampling, and while the statistical basis for sampling given in ISO 5022 applies, further or modified requirements may also apply.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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.*

NOTE 1—The following ASTM standards are noted as sources of useful information: Test Methods C559, C611, C651, C747, C1025, C1039, and C1225.

2. Referenced Documents

2.1 ASTM Standards:²

C559 Test Method for Bulk Density by Physical Measurements of Manufactured Carbon and Graphite Articles

C611 Test Method for Electrical Resistivity of Manufactured Carbon and Graphite Articles at Room Temperature

C651 Test Method for Flexural Strength of Manufactured Carbon and Graphite Articles Using Four-Point Loading at Room Temperature

C747 Test Method for Moduli of Elasticity and Fundamental Frequencies of Carbon and Graphite Materials by Sonic Resonance

C1025 Test Method for Modulus of Rupture in Bending of Electrode Graphite

C1039 Test Methods for Apparent Porosity, Apparent Specific Gravity, and Bulk Density of Graphite Electrodes

C1225 Specification for Fiber-Cement Roofing Shingles, Shakes, and Slates

2.2 ISO Standards:³

ISO 8007-1 Carbonaceous materials used in the production of aluminum - Cathodic blocks - Sampling plan and sampling from single cathodic blocks

ISO 5022 Shaped refractory products - Sampling and acceptance testing

3. Terminology

3.1 Definitions: Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *block*—a carbon cathode, a single unit, cathode block, *n*—one manufactured unit used as a negative carbon electrode.

¹ This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.05 on Properties of Fuels, Petroleum Coke and Carbon Material.

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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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

*A Summary of Changes section appears at the end of this standard.

- 3.1.2 ~~sample~~—the portion of carbon obtained from a cathode ~~sample~~, *n*—a portion of carbon obtained from a cathode block.
- 3.1.3 ~~test specimen~~—an article prepared from a sample. ~~test specimen~~, *n*—a representative piece of a sample.

4. Significance and Use

4.1 Core sampling is an acceptable way of obtaining a test specimen without destroying the usefulness of a cathode block.

4.1.1 Test specimens obtained by this guide can be used by producers and users of cathode blocks for the purpose of conducting the tests in Note 1 to obtain comparative physical properties.

4.2 Sampling shall not weaken the cathode block or increase the likelihood of premature failure. Extreme care shall be exercised when taking vertically drilled samples.

5. Apparatus

5.1 *Core Drill Bit*, similar to that shown in Fig. 1, driven by suitable equipment. Use bits with cutting teeth coated with diamond or other extremely hard material.

6. Procedure

6.1 Sampling locations for cathode blocks that were vibrated, pressed, or extruded without a collector bar slot will differ from those cathode blocks that were formed with collector bar slots.

6.1.1 For cathode blocks without collector bar slots, samples shall be drilled from the part of the cathode block that will be machined out for the slot, as shown in Fig. 2. Care is to be taken to ensure that cores drilled vertical to the slot do not penetrate beyond the depth of the slot.

6.1.2 For cathode blocks with collector bar slots, samples shall be drilled from the cathode block, as shown in Fig. 3. If the user determines that cathode blocks with sample holes drilled in them cannot be used in the electrolysis process, then it will be necessary to obtain a number of cathode blocks with the extra length, as shown in Fig. 3. The extra length will then have to be removed prior to cathode block use.

6.2 Dimensions of a cored ~~test~~ sample will depend upon the test that is to be performed on the sample. The minimum dimension (usually the diameter) shall be at least three times the maximum particle size of the dry aggregate used in the manufacture of the cathode block. Reference should be made to the standards relating to the tests to be performed to ensure that the samples taken are to suitable dimensions.

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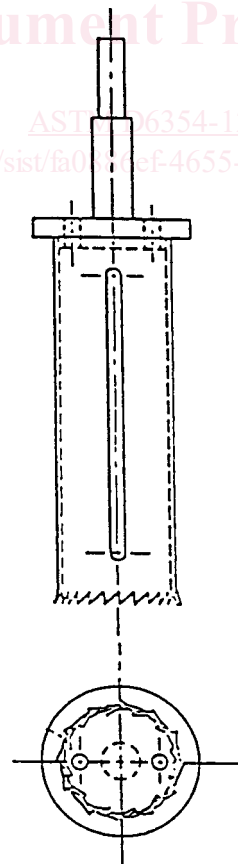


FIG. 1 Typical Core Drill Bit