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Standard Guide for Sampling Plan and Core Sampling for Prebaked Anodes Used in Aluminum Production¹

This standard is issued under the fixed designation D6353; 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.

^{ε1} NOTE—Subsection 7.1.5 was corrected editorially in February 2017.

1. Scope—Scope*

1.1 This guide covers sampling for prebaked carbon anodes used in the production of aluminum, and details procedures for taking test samples from anode blocks. It covers equipment and procedures for obtaining samples from anode blocks in a manner that does not destroy the block or prevent its subsequent use as originally intended. However, the user must determine the subsequent use of the sampled anode blocks. Preferred locations for taking samples from single units of anodes 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. Anodes used in the production of aluminum have specific requirements for sampling and while the statistical basis for sampling given in ISO 5022 applies, further or modified requirements may also apply.

1.1.2 Information for sampling of anodes for Al-metal production is given in ISO 8007-2. This standard details the statistical basis for sampling plans for acceptance testing of a consignment or lot.

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

NOTE 1—The following ASTM standards are noted as sources of useful information: Test Methods **D5502**, **D6120**, **D6744**, and **D6745**.

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, safety, health, and environmental 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 **E1225**.

1.4 *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

¹ This guide is under the jurisdiction of ASTM Committee **D02** on Petroleum Products, Liquid Fuels, 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.

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

~~D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants~~

~~E559D5502 Test Method for Bulk Apparent Density by Physical Measurements of Manufactured Carbon and Graphite Articles Anode and Cathode Carbon Used by the Aluminum Industry~~

~~E614D6120 Test Method for Electrical Resistivity of Manufactured Carbon and Graphite Articles Anode and Cathode Carbon Material at Room Temperature~~

~~E651 Test Method for Flexural Strength of Manufactured Carbon and Graphite Articles Using Four-Point Loading at Room Temperature~~

~~E747D6744 Test Method for Moduli of Elasticity and Fundamental Frequencies of Carbon and Graphite Materials by Sonic Resonance Determination of the Thermal Conductivity of Anode Carbons by the Guarded Heat Flow Meter Technique~~

~~E1025D6745 Test Method for Modulus of Rupture in Bending of Electrode Graphite Linear Thermal Expansion of Electrode Carbons~~

~~E1039 Test Methods for Apparent Porosity, Apparent Specific Gravity, and Bulk Density of Graphite Electrodes~~

~~E1225 Test Method for Thermal Conductivity of Solids Using the Guarded Comparative Longitudinal Heat Flow Technique~~

~~2.2 ISO Standards.³~~

~~ISO 5022 Shaped refractory products—Sampling and acceptance testing~~

~~ISO 8007-2 Carbonaceous materials used in the production of aluminium – Sampling plans and sampling from individual units – Part 2: Prebaked anodes~~

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this guide, refer to Terminology [D4175](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *block, n*—a carbon anode, a single unit.

3.2.2 *prebaked, n*—a baked carbon article or block.

3.2.3 *sample, n*—the portion of carbon obtained from an anode.

3.2.4 *test specimen, n*—an article prepared from a sample: a piece or portion of a sample used to make a test.

4. Significance and Use

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

4.1.1 Test specimen obtained by this guide can be used by producers and users of carbon anodes for the purpose of conducting the tests in [Note 1](#) to obtain comparative physical properties.

4.2 Sampling shall not weaken the anode or increase the likelihood of premature failure.

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 Examples of sampling locations for anode blocks of different sizes and designs are shown in [Fig. 2](#).

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

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

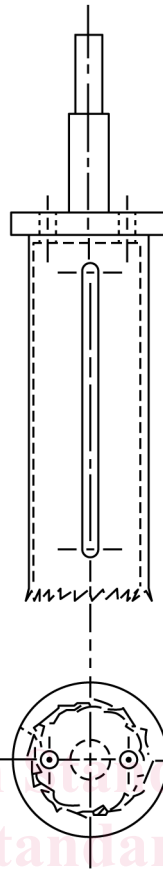


FIG. 1 Typical Core Drill Bit

6.2.1 The specific dimensions of the test specimens to be tested are normally given in the appropriate standard. Where a standard does not specify the dimensions of the test specimen, a diameter of 50 mm is recommended. The length of the test specimen should be at least one and a half times the diameter.

6.3 Place the core drill bit firmly against the anode block. Take care to maintain the bit vertical or horizontal and true. Do not stop until the bit is embedded to its full length. Compressed air can be used to cool the drill bit and remove dust during drilling. Do not use water or other liquid lubricants.

6.3.1 To remove the bit, pull and twist it out by hand, or carefully withdraw the drill bit while it is rotating. To remove the core sample, insert a wedge between it and the anode block until the core snaps off at the bottom of the hole.

7. Report

7.1 The sampling report shall include the following:

7.1.1 Names of producer and customer,

7.1.2 Manufacturer's identification of the lot or batch of anode blocks being sampled,

7.1.3 Reference to this guide and to the standards describing the tests to be carried out on the samples; guide,

7.1.4 Date and place of sampling; sampling,

7.1.5 If sampling according to a plan described in ISO 5022 or ISO 8007-2 or other standard, complete details of the sampling plan being followed should be given,