



# Standard Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition<sup>1</sup>

This standard is issued under the fixed designation E88; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

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

## 1. Scope

1.1 This practice covers the sampling, for the determination of chemical composition ([Note 1](#)) of nonferrous metals and alloys, excluding aluminum, in cast form for remelting or mechanical working.

1.1.1 Refer to Practice [E255](#) for copper and copper alloys.

**NOTE 1**—The selection of correct portions of material and the preparation of a representative sample from such portions are necessary prerequisites to every analysis, the analysis being of no value unless the sample actually represents the average composition of the material from which it was selected.

1.2 When agreed upon between the purchaser and the manufacturer, the heat sample and analysis may be accepted as representative of the composition of the metal. In such cases, each lot must be properly identified with the heats from which it was made.

1.3 This practice is intended to cover the general principles of sampling applicable to nonferrous metals in cast form and is not intended to supersede or replace existing specification requirements for sampling of a particular material.

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.5 *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.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee [E01](#) on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee [E01.05](#) on Cu, Pb, Zn, Cd, Sn, Be, their Alloys, and Related Metals.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials](#)

[E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition](#)

## 3. Terminology

3.1 For definitions of terms used in this practice, refer to Terminology [E135](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *portion, n*—the term “portion” is used in this practice to designate the selected ingots, slabs, etc., from which the sample is prepared.

3.2.2 *sample, n*—the term “sample” is used in this practice to designate the final form of the material submitted for analysis (drillings, millings, etc.). A representative sample may best be defined as a small part containing the same components in the same proportions as they occur in the relatively large mass of the original lot or lots of material.

## 4. Selection of Portion

4.1 A portion representative of the total shipment or lot shall be taken for sampling. This portion shall be so selected that a minimum wastage of material is incurred, consistent with the required accuracy in sampling.

4.2 The number of ingots, slabs, etc., selected to constitute this portion shall comply with the requirements of the ASTM specifications covering that particular material.

## 5. Preparation of Sample

5.1 Machinable materials shall be sampled by drilling, milling, or sawing. Materials that are too difficult to machine may be ground or crushed.

5.2 Machinable materials in form of bar, billet, ingot, slab, cake, etc., shall be sampled by drilling five holes approximately 1.27 cm (1/2 in.) in diameter at points equally spaced between the ends of the pieces along a diagonal line. The drilling shall be through the total thickness and, if necessary, drilled from both directions, top and bottom.

5.3 Alternatively, any of the forms mentioned in [5.2](#) may be milled or sawed at similar points through a section from side to center or through an entire cross-section of the piece.

5.4 Materials too difficult to be machined, commonly in lump form, shall be reduced in size by passing through a jaw or roll crusher or broken in a mortar to a particle size that will pass a No. 14 (1.40-mm) sieve.

## 6. Details of Sampling

6.1 The ingots, slabs, etc., selected for the preparation of the sample for chemical analysis, when testing for compliance with specifications, shall be cleaned, if necessary, to remove scale, dirt, oil, grease, etc.

6.2 The saw, drills, cutter, or other tools used for sampling shall be thoroughly cleaned prior to use. Depth of cut, speed of cutting, etc., shall be so regulated that excessive heating and consequent oxidation of the sample shall be avoided.

6.3 The chips obtained by milling, drilling, etc., should preferably be uniformly small in size. Very fine dust-like material should be avoided.

*NOTE 2*—To facilitate the preparation of chips of satisfactory size, V-shape chip-breaking grooves may be formed in the cutting edge of the tool by grinding or other convenient means at approximately right angles to the cutting edge. The spacing of the grooves may vary depending upon the tool and would have to be determined for each application. The grooves in adjacent cutting edges should be staggered.

6.4 Lubricants are not required in the sampling of the majority of casting metals and alloys. With certain alloys, lubrication may be necessary either to avoid excessive oxidation or dusting of the sample. In such cases, the choice and use of a satisfactory lubricant should be by mutual agreement between the manufacturer and the purchaser. Lubricants should be selected that do not alter or change the composition of the sample during contact. Lubricants should be completely removed as soon as possible after the sampling operation by the use of suitable solvents (such as ethyl ether, acetone, or alcohol) and drying.

6.5 Drillings, millings, or sawings, or nonmagnetic, nonferrous alloys shall be treated with a strong magnet to remove any particles of iron introduced in taking the sample. Carbide tools may be used, where practical, to minimize iron contamination. In the case of some metals, an acid dip may be required if low iron is critical.

6.6 Drillings, millings, sawings, or clippings shall be carefully examined, and any foreign material accidentally introduced in taking the sample shall be removed.

## 7. Size of Sample and Storage

7.1 Weight of the prepared sample shall comply with the sample requirements of the ASTM specification covering that particular material, but shall not be less than 100 g. The sample shall be divided into three equal parts, each of which shall be placed in a package and sealed; one for the seller, one for the purchaser, and one for an umpire.

7.2 Samples that are to be stored over long periods, or that are oxidized readily or otherwise altered in composition under varying atmospheric conditions, or that may become seriously contaminated in contact with paper or cardboard, should be kept in wide-mouth glass bottles having tight-fitting closures. In other cases tight, leak-proof, paper sample envelopes or cardboard cartons may be used to hold the sample.

## 8. Resampling

8.1 In case of dissatisfaction, either party may require that the material be resampled in the presence of representatives of the seller and the purchaser. The thoroughly mixed sample shall be divided into three equal parts, each of which shall be placed in a package and sealed: one for the seller, one for the purchaser, and one for an umpire.

## 9. Keywords

9.1 alloys; cast nonferrous metals; sampling

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