



Designation: B29 – 19

## Standard Specification for Refined Lead<sup>1</sup>

This standard is issued under the fixed designation B29; 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 U.S. Department of Defense.*

### 1. Scope

1.1 This specification covers refined lead in pig, block, or hog form.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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 become familiar with all hazards including those identified in the appropriate Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, 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 Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 The following documents of the issue in effect on the date of material purchase form a part of this specification to the extent referenced herein.

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

**E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications**

**E37 Test Methods for Chemical Analysis of Pig Lead**

**E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition**

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.02 on Refined Lead, Tin, Antimony, and Their Alloys.

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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.

### 3. Ordering Information

3.1 Orders for refined lead under this specification shall include the following information:

3.1.1 ASTM designation and year of issue,

3.1.2 Quantity (weight),

3.1.3 Name of material (for example, pure lead),

3.1.4 Size and shape (see Section 6),

3.1.5 Grade (see **Table 1** and accompanying notes), and

3.1.6 Certification or test report if specified (Section 13).

### 4. Materials and Manufacture

4.1 Lead shall be supplied in commercial standard forms or shapes requested by the purchaser in the following grades:

4.1.1 Low bismuth low silver pure lead,

4.1.2 Extra refined pure lead,

4.1.3 Refined pure lead,

4.1.4 Pure lead, and

4.1.5 Chemical copper lead.

4.2 The grades of lead listed in **4.1.1 – 4.1.5** shall be produced by any smelting and refining process from ore or recycled materials to meet the chemical requirements of this specification.

### 5. Composition

5.1 The lead shall conform to the requirements prescribed in **Table 1** and accompanying notes.

### 6. Sizes and Shapes

6.1 Pigs shall weigh up to a nominal 110 lb (50 kg).

6.2 Blocks or hogs shall be square or oblong and weigh up to 2530 lb (1150 kg).

### 7. Appearance

7.1 The lead shall be reasonably free from surface corrosion and adhering foreign material.

### 8. Lot

8.1 All lead of the same type produced and cast at one time shall constitute a lot for chemical analysis. Each pig or block of the lot shall bear a single identifying number that can be related to the manufacturing lot.

TABLE 1 Chemical Requirements<sup>A,B</sup>

Grade	Composition (Weight Percent)				
	Low Bismuth Low Silver Pure Lead, max <sup>C</sup>	Extra Refined Pure Lead, max <sup>D</sup>	Refined Pure Lead, max <sup>E</sup>	Pure Lead, max	Chemical- Copper Lead <sup>F</sup>
Sb	0.0005	0.0005	0.0005	0.001	0.001 max
As	0.0005	0.0005	0.0005	0.001	0.001 max
Sn	0.0005	0.0005	0.0005	0.001	0.001 max
Sb As and Sn	...	...	...	0.002	0.002 max
Cu	0.0010	0.0005	0.0010	0.0015	0.040–0.080
Ag	0.0010	0.0015	0.0075	0.010	0.020 max
Bi	0.0015	0.0075	0.025	0.05	0.025 max
Zn	0.0005	0.0002	0.001	0.001	0.001 max
Te	0.0001	0.0001	0.0002	...	...
Ni	0.0002	0.0002	0.0002	0.0005	0.002 max
Fe	0.0002	0.0005	0.001	0.001	0.002 max
Se	...	0.0005	0.0005	0.001	0.001 max
S	...	0.0005	0.001	0.002	0.001 max
Al	...	0.0005	0.0005	0.0005	0.0005 max
Cd	...	0.0002	0.0005	0.0005	0.0003 max
Lead (min) by difference	99.995	99.990	99.97	99.94	99.90
UNS Number	L50006	L50008	L50021	L50049	L51121

<sup>A</sup> The following applies to all specified limits in Table 1: For the purpose of determining conformance with this specification, an observed value obtained from the analysis shall be rounded off "to the nearest unit" in the last right hand place of figures used in expressing the limiting value, in accordance with the rounding method of Practice E29.

<sup>B</sup> By agreement between the purchaser and the supplier, analyses may be required and limits established for elements or compounds not specified in Table 1.

<sup>C</sup> This grade is intended for chemical applications where low silver and low bismuth contents are required. This is a common primary standard.

<sup>D</sup> This grade is intended for use where a 99.990 refined lead purity is required. It meets the requirements of BS/EN PB990R.

<sup>E</sup> This grade is intended for lead acid battery applications.

<sup>F</sup> This grade is intended for applications requiring corrosion protection and formability.

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## 9. Sampling for Chemical Analysis

9.1 The sample for chemical analysis shall be selected by one of the following methods:

9.1.1 Test samples taken from the lot during casting, or

9.1.2 Test samples taken from the final solidified cast product.

9.2 *Sampling for Lot Analysis*—The supplier may obtain samples from the lot of molten metal during casting. All or part of these samples may be cast into shapes suitable for use in spectrographic analytical methods. This is the preferred method for determining lot chemistry. The samples should be taken in such a way that they are representative of the material cast.

### 9.3 Sampling of Cast Product:

9.3.1 If the lead is in the form of standard pigs (Fig. 1), the sample for chemical analysis shall be taken in accordance with 9.3.3.1, 9.3.3.2, or 9.3.3.3. The method of sampling in 9.3 does not apply to alloys that exhibit segregation of alloy agents during casting. This means the calcium aluminum alloy are not to be sampled according to this procedure. The preferred method of determining lot chemistry for calcium aluminum lots is supplier sampling of quick frozen wafers during casting.

9.3.1.1 If the pigs differ in shape from those shown in Fig. 1 or the product is cast into blocks or hogs, the supplier and the purchaser shall agree mutually as to the method to be followed in sampling such shapes.

9.3.2 *Sampling Pig Lead*—A portion representative of the total shipment shall be selected at random for the final sample. For lots containing at least 100 000 lb (45 400 kg) of pig lead,

one pig shall be taken from every 20 000 lb (9080 kg). For smaller lots, a total of five pigs shall be taken.

9.3.3 *Sample Preparation*—Each pig shall be cleaned thoroughly to rid the surface of dirt or adhering foreign material prior to sampling by one of the following methods: sawing, drilling, or melting.

9.3.3.1 *Sawing*—The pigs selected shall be sawed completely through as illustrated in Fig. 1. The sawings from the pigs shall be mixed thoroughly and quartered, and the samples for analysis taken from the mixed material. The sawings must be free of extraneous material introduced from the saw blade. All sawings shall be treated with a strong magnet in order to remove iron introduced by sawing.

9.3.3.2 *Drilling*—The pigs shall be drilled at least halfway through from two opposite sides as illustrated in Fig. 2. A drill of about ½ in. (12.7 mm) in diameter shall be used. In drilling, the holes shall be spaced along a diagonal line from one corner of the pig to the other. Holes may be made in a single pig or in each of several pigs placed as illustrated in Fig. 2. The drillings shall be clipped into pieces not over ½ in. (12.7 mm) in length, mixed thoroughly, and treated with a strong magnet to remove iron introduced by drilling.

9.3.3.3 *Melting*—Whole pigs, portions of pigs produced by sawing, drillings, or sawings shall be melted in a clean vessel. The melting temperature must not exceed 685°F (363°C) to prevent excessive drossing. The lead must be stirred immediately prior to sampling. The molten lead shall be cast into shapes suitable for use in spectrographic analysis, cast into thin sample bars not to exceed ⅜ in. (9.5 mm) thick for sawing, or granulated by pouring into distilled water and drying the