



Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products¹

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1. Scope

1.1 This specification covers lead sheet, strip, and plate of various alloys intended for use in chemical plants, sound attenuation, roofing, vibration dampening, flashing and weather stripping, waterproofing, and radiation shielding.

1.2 The values stated in inch-pound units are to be regarded as 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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

B 29 Specification for Refined Lead²

E 8 Test Methods for Tension Testing of Metallic Materials³

E 10 Test Method for Brinell Hardness of Metallic Materials³

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials³

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁴

E 37 Test Methods for Chemical Analysis of Pig Lead⁵

E 87 Methods for Chemical Analysis of Lead, Tin, Antimony, and Their Alloys (Photometric Methods)⁶

E 112 Test Methods for Determining Average Grain Size³

3. Terminology Definitions

3.1 *lot*—shall consist of all the lead sheet, strip, or plate of the same alloy produced by one manufacturer and offered for

delivery at one time for sampling and inspection from one manufacturing or smelting heat.

3.2 *plate*—any product over 0.187 in. (4.75 mm) in thickness and over 10 in. (254 mm) in width.

3.3 *sheet*—products 0.187 in. (4.75 mm) and under in thickness and 24 in. (610 mm) or more in width.

3.4 *strip*—any product 0.187 in. (4.75 mm) and under in thickness and less than 24 in. (610 mm) in width.

4. Ordering Information

4.1 Orders for material to this specification shall include the following information:

4.1.1 Alloy (chemical composition) with variations specified.

4.1.2 Type (strip, sheet, or plate).

4.1.3 Condition including mechanical properties where applicable.

4.1.4 Dimensions.

4.1.5 Number of Pieces.

4.1.6 *Certification*—State if certification is required.

4.1.7 *Sampling*—Type of sampling required and whether samples product (check) analysis shall be furnished.

4.1.8 *Inspection Requirements*—If purchaser wishes to witness tests or inspection of material at the place of manufacture, the purchase order must so state indicating which tests or inspections are to be witnessed.

4.1.9 *Optional Requirements:*

4.1.9.1 *Strip and Sheet*—Whether to be furnished in coils or in cut straight lengths.

4.1.9.2 *Sheet and Plate*—Whether to be furnished in specially flattened condition.

4.1.9.3 *Wrought Products*—Minimum reduction required.

5. Materials and Manufacture

5.1 The lead sheet, strip, or plate shall be manufactured by rolling or extruding the product from a lead work piece of chemical composition specified in Table 1 or other specified composition. The work piece may be prepared by conventional casting into a mold or by continuous casting. Lead sheet or strip may also be produced by direct continuous casting to the desired thickness.

¹ 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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² *Annual Book of ASTM Standards*, Vol 02.04.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

⁶ Discontinued—see 1984 *Annual Book of ASTM Standards*, Vol 03.05.

TABLE 1 Chemical Requirements^{A,B}

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

^AThe 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 E 29.

^BBy agreement between the purchaser and the supplier, analyses may be required and limits established for elements or compounds not specified in Table 1.

^CThis grade is intended for chemical applications where low silver and low bismuth contents are required.

^DThis grade is intended for lead acid battery applications.

^EThis grade is intended for applications requiring corrosion protection and formability.

6. Chemical Composition

6.1 Lead sheet, strip, and plate shall conform to the chemical composition limits specified in the purchase order. The appropriate ASTM or UNS alloy may be designated where applicable. Table 1 lists the chemical requirements of several grades of lead for information purposes.

NOTE 1—Soft lead sheet, strip, and plate is generally produced from Specification B 29 grade copper-bearing lead.

6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product analysis variation in chemical composition specified in the purchase agreement or in the applicable alloy specification.

7. Mechanical Properties

7.1 The material shall conform to the mechanical properties specified in the purchase order by way of testing (see Section 12).

8. Dimensions, Mass, and Permissible Variations

8.1 Thickness:

8.1.1 *Sheet and Strip*—For sheet and strip up to 0.100 in. (2.54 mm), the variation in thickness shall not be more than + 0.008 in. (0.200 mm) or – 0.006 in. (0.130 mm) or any combination but not less than a range of 0.014 in. (0.330 mm) from the ordered thickness. For sheet and strip ordered in thickness over 0.100 in., the maximum variation shall not be more than $\pm 5\%$ of the thickness specified as shown in Table 2.

8.1.2 *Plate*—The plate shall not vary more than $\pm 5\%$ of the specified thickness as shown in Table 2.

TABLE 2 Permissible Thickness Variation

NOTE 1—For ordering information, lead 1 in. thick weighs approximately 60 lb/ft².

Specified Thickness, in.	Maximum Under, in.	Maximum Over, in.	Maximum Over Alternate, in. (see section 8.13 8.1.3)
0.015–0.100	0.005	0.005	
0.101–0.130	0.006	0.006	0.031
0.131–0.150	0.007	0.007	0.031
0.151–0.170	0.008	0.008	0.031
0.171–0.190	0.009	0.009	0.031
0.191–0.210	0.010	0.010	0.031
0.211–0.230	0.011	0.011	0.031
0.231–0.250	0.012	0.012	0.031
0.251–0.270	0.013	0.013	0.031
0.271–0.290	0.014	0.014	0.031
0.291–0.310	0.015	0.015	0.031
0.311–0.400	0.016	0.020	0.031
0.401–0.500	0.016	0.025	0.031
0.501–0.600	0.016	0.030	0.031
0.601–0.630	0.016	0.031	0.031
Above–0.630	0.016	0.031	0.031

8.1.3 *Alternative Thickness*—When specified, lead plate, as well as strip sheet over 0.100 in. (2.54 mm) shall not vary in thickness by more than + 0.031 in. (0.79 mm) and – 0 in. (0 mm).

8.1.4 Where specified and agreed to between manufacturer and purchaser, thickness variation looser or tighter than listed above may be applied.

8.2 Width and Length:

8.2.1 *Rolls*—lead sheet or strip in rolls shall not vary from the ordered width by more than + 0.250 in. (6.35 mm) or – 0.250 in. (6.35 mm) and for length of 25 ft (8 m) or less shall be within 0.2 % of the ordered length. For length greater than 25 ft (8 m), the length tolerance shall be negotiated between the producer and the buyer.

8.2.2 *Cut Pieces*—Lead sheet, strip, or plate in flat cut pieces shall not vary from the ordered length or width by more than ± 0.125 in. (3.18 mm).

8.2.3 *Slit Strip*—Slit strip in coils shall not vary from the ordered width by more than 0.062 in. (1.59 mm).

8.3 Straightness:

8.3.1 The edgewise curvature (depth of curvature) of flat strip, sheet, or plate shall not exceed 0.05 in. multiplied by the length in feet of the piece (0.04 mm multiplied by the length in centimeters).

8.3.2 Straightness of coiled strip material is subject to agreement between manufacturer and purchaser.

8.4 *Squareness*—For products of all thickness, the angle between adjacent sides shall be $90 \pm 15^\circ$ ($\frac{1}{16}$ in. in 24 in.), (1.59 mm in 610 mm). Alternatively, for cut length 10 ft (3 m) and less, the length of the diagonals from end to end shall be within 0.25 in. (6.2 mm) of each other.

8.5 *Flatness*—Flatness of the product sheet when specified shall be as agreed upon between manufacturer and purchaser.

8.6 Any special tolerance other than those specified in the above sections shall be agreed upon between manufacturer and purchaser.



9. Workmanship, Finish, and Appearance

9.1 The lead products shall be uniform in quality and hardness, smooth, commercially straight and flat, and free of injurious imperfections such as pits, dents, scratches, laminations, grit, foreign matter, porosity, or waves that may affect the serviceability of material.

10. Sampling

10.1 A lot shall not exceed 10 000 lb (4540 kg). A lot for alloys requiring mechanical testing shall be further limited to the sheet having the same total material reduction and heat treatment (as required) cycles from the same manufacturing or smelting heat.

10.1.1 *Identification*—All material shall be identified by lot number. Where material cannot be identified by heat, a lot shall consist of not more than 1000 lb (454 kg) in the same thickness and condition, except for plates weighing over 1000 lb, in which case the one piece shall constitute the lot.

10.2 *Test Material Selection*:

10.2.1 *Chemical Analysis*—Representative samples shall be taken either during pouring the casting prior to working or during subsequent processing, such as rolling or cutting.

10.2.1.1 Where required, a product (check) sample shall be taken and supplied to the purchaser. The analysis of the product sample is the responsibility of the purchaser.

10.2.2 *Mechanical Properties*—Samples of the material to provide test specimens for mechanical properties, hardness, and grain size shall be taken from such locations in a lot as to be representative of that lot.

10.3 *Number of Tests*:

10.3.1 *Chemical Analysis*—One test per lot.

10.3.2 *Hardness*—One test per lot.

10.3.3 *Grain Size*—One test per lot.

11. Specimen Preparation

11.1 Tension test specimens, if required, shall be taken in the direction of rolling from the material in the final condition of rolling and heat treatment or in the case of continuously cast sheet in the casting direction and “as cast” state.

11.1.1 Tension test specimens shall be any of the standard or subsize specimens shown in Test Methods E 8.

11.2 Hardness test specimens if required shall be taken from the material in the final condition of rolling and heat treatment. Tests shall use Rockwell “R” scale or 10 mm ball and 100 kg load Brinell test.

11.2.1 The minimum thickness of a sample for hardness testing shall be 10 times the depth of the impression. All hardness tests must be obtained within 24 h after the final processing for use.

12. Test Methods

12.1 The following test methods for determining chemical composition, mechanical properties, and other properties of the

material shall be determined in cases of disagreement in accordance with the following methods:

12.1.1 *Chemical Analysis*—Methods E 37 and E 87.

12.1.2 *Tension*—Test Methods E 8.

12.1.3 *Hardness*:

12.1.3.1 Rockwell “R” and Test Methods E 18.

12.1.3.2 Brinell and Test Method E 10.

12.1.4 *Grain Size*—Methods E 112.

13. Inspection

13.1 Inspection of the material shall be made as agreed upon by manufacturer and purchaser as part of the purchase contract.

14. Rejection and Rehearing

14.1 Material not conforming to any part of this specification or to authorized modifications, will be subject to rejection of the entire lot of material.

14.2 Retests for mechanical properties shall be permitted if performed within one week of final processing for use.

14.3 *Independent Tests*—In the event of a dispute arising as to the compliance of the lead alloy strip, sheet, or plate with the requirements set forth in this specification, the purchaser may require the submission of product (check) samples to an independent laboratory for testing. The costs of such testing shall be borne by the purchaser.

15. Certification

15.1 Upon request of the purchaser in a contract or order, a manufacturer’s certification that the material was manufactured and tested in accordance with this specification, together with a report of the actual test results from each lot, shall be furnished.

16. Product Marking

16.1 Each bundle or shipping container shall be marked with the name of the alloy, the condition, this specification number, the size, thickness, gross, net and tare weight, lot number, consignor and consignee address, contract or purchase order number, and any other such information as may be defined in the contract or order.

16.2 Lead plate over ½ in. thick, when required in the contract or purchase order, shall be marked along one edge with the alloy designation, manufacturer’s brand name, heat or lot number, and customer’s number. The markings shall be made with nonsoluble ink or point and shall be repeated at intervals of not greater than 3 ft along the edge of the plate.

17. Packaging and Package Marking

17.1 The purchaser must state in the order or contract any special packaging, crating, or transportation required.

18. Keywords

18.1 lead plate; lead sheet; lead strip; wrought lead



B 749 – 03

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