Designation: B 418 – 01

Standard Specification for Cast and Wrought Galvanic Zinc Anodes[1]

This standard is issued under the fixed designation B 418; 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.

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

1. Scope*

1.1 This specification covers cast and wrought galvanic zinc anodes for the cathodic protection of more noble metals and alloys in sea water, brackish water, or other saline electrolytes. Type I anodes are most commonly used for such applications. The Type I anode composition in this specification meets the chemical composition requirements of MIL-A-18001J.

1.2 Zinc anodes conforming to this specification may be used in other waters, electrolytes, backfills, and soils where experience has shown that the specified composition is efficient and reliable. Type II anodes are most commonly used for such applications.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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 (MSDS) 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 6 Specification for Zinc[2]

B 899 Terminology Relating to Non-ferrous Metals and Alloys[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance With Specifications[3]

E 527 Practice for Numbering Metals and Alloys (UNS)[4]

E 536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys[5]

2.2 *Military Standard:*

MIL-A-18001J Military Specification Anodes, Corrosion Preventative, Zinc, Slab Disc, and Rod Shaped[6]

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B 899.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cathodic protection*—reduction of corrosion by making the protected metal the cathode in a conducting medium by applying direct current.

3.2.2 *galvanic anode*—a metal electrode that sacrificially corrodes when coupled to a more noble metal in a conducting medium, and thereby supplies a protective electric current to the noble electrode.

3.2.3 *ribbon anode*, *n*—a long, continuous sacrificial anode shape, with a diamond, square, rectangular, oval, or other cross-section, most commonly made of zinc, magnesium or aluminum, having a core wire normally made of steel, that is usually supplied in coils or reels of 100 to 3600 ft depending upon size and cross-section.

3.2.4 *saline electrolyte*—a solution consisting of mainly the chlorides of the alkali metals.

4. Ordering Information

4.1 Orders for anodes under this specification shall include the following information:

4.1.1 ASTM designation and year of issue,

4.1.2 Type of anode material (see Table 1),

4.1.3 Quantity in pounds,

4.1.4 Number of anodes,

4.1.5 Size of anode and whether contains rod insert and if so, type of insert and whether contains bolt hole and if so, whether threaded.

[1] This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.04 on Zinc and Cadmium.

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[2] *Annual Book of ASTM Standards*, Vol 02.04.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 01.01.

[5] *Annual Book of ASTM Standards*, Vol 03.06.

[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

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

TABLE 1 Chemical Requirements[A]

Type (UNS)[B]	Aluminum, %	Cadmium, %	Iron, max, %	Lead, max, %	Copper, max, %	Others, Total, %	Zinc[C], %
Type I (Z32120)	0.1–0.5	0.025–0.07	0.005	0.006	0.005	0.1	remainder
Type II (Z13000)	0.005 max	0.003 max	0.0014	0.003	0.002	...	remainder

[A]The following applies to all specified limits in this table: For purposes of determining conformance with this specification, the observed value or calculated value obtained from analysis shall be rounded off to the nearest unit in the last right hand place of figures used in expressing the specified limit, in accordance with the rounding method of Practice E 29.
[B]UNS designations were established in accordance with Practice E 527.
[C]Determined arithmetically by difference.

4.1.6 Whether marking for identification is required including the marking patterns, if required, and
4.1.7 Whether certification is required.

5. Chemical Composition

5.1 The anode shall be made from Special High Grade zinc conforming to Specification B 6, with suitable alloying additions for Type I anodes. Composition of the anode alloy content shall conform to the limits prescribed in Table 1.

5.2 Evidence from laboratory tests shows that Type I composition may suffer intergranular corrosion. Susceptibility to intergranular corrosion increases with increasing temperature and is particularly severe above approximately 120°F (50°C). Intergranular corrosion can be avoided (at temperatures above about 120°F) with Type II composition, which must be made from special high-grade zinc with an iron content well below the 0.003 % maximum given in Specification B 6.

6. Methods of Chemical Analysis

6.1 The chemical compositions enumerated in this specification shall, in case of disagreement, be determined by methods mutually agreed upon or the methods listed in Table 2 approved for referee purposes by ASTM. Test Methods E 536 shall be used, except for Type II.

7. Bolt Holes and Threads

7.1 For anodes with integral inserts intended for attachment by bolting, it is recommended that a bolt-hole spacing of 6 in. (152 mm) or even multiples thereof be used.

7.2 Anodes with projecting rod inserts threaded for attachment by means of a bolted connection shall have Unified National Coarse threads.

8. Workmanship, Finish, and Appearance

8.1 The zinc anodes shall be free of flash, burrs, cracks, blow holes, and surface slag, consistent with good commercial practice. Cast anodes shall not have shrinkage cavities exceeding ¼ the depth of the anode or 1 in. (25.4 mm), whichever is smaller when measured from a straightedge placed diagonally across opposite edges of the anode. Drill holes and saw cuts for sampling shall not be cause for rejection unless they are severe enough to cause premature failure of the anode.

9. Sampling

9.1 The sample for chemical analysis shall be taken as follows:

9.1.1 *Selection of Portion*—A number of anodes shall be selected at random to give a representative sample of the lot. A lot shall consist of not more than 20 000 lb (9070 kg) of zinc anodes cast from a single melt or not more than 5000 lb (2268 kg) of anodes cast in a single 24-h period from more than one melt. The minimum number of anodes to be sampled shall be as specified in Table 3.

9.1.2 *Taking Sample for Chemical Analysis*—Each selected anode shall be sampled by drilling or machining with a nonferrous tool. The use of a drill with a tungsten carbide tip is recommended. The tool bit or drill shall not penetrate into the core material or a cored anode. The cuttings from all anodes in a lot shall be thoroughly mixed to form a uniform sample of not less than 50 g total.

10. Claims

10.1 Claims to be considered shall be made in writing to the manufacturer within 30 days of receipt of anodes at the purchaser's plant and the results of the purchaser's tests shall be given. The manufacturer shall be given one week from date of receipt of such claim to investigate his records and then shall agree either to satisfy the claim or send a representative to the plant of the purchaser.

11. Investigation of Claims

11.1 The inspector representing the manufacturer shall examine all pieces where physical defects are claimed. If agreement is not reached, the question of fact shall be submitted to a mutually agreeable umpire, whose decision shall be final.

11.2 On a question of chemical analysis, a sample shall be taken by the representatives of both the manufacturer and the purchaser as described in Section 4. The properly mixed and quartered sample shall be separated into three parts, each of which shall be placed in a sealed envelope, one for the manufacturer, one for the purchaser, and one for the umpire if

TABLE 2 Methods of Analysis

Method	ASTM Designation
Spectrochemical Analysis	
Chemical Analysis	
Chemical Analysis	Test Methods E 536

TABLE 3 Minimum Number of Anodes in Sample

Number of Anodes in Lot	Minimum Number of Anodes in Sample
1 to 500	2
500 to 1000	3
Each additional 1000 or part thereof	1

necessary. The manufacturer and the purchaser shall each make an analysis, and if the results do not establish or dismiss the claim to the satisfaction of both parties, the third sample shall be submitted to a mutually agreeable umpire, who shall determine the question of quality, and whose determination shall be final.

12. Rejection and Rehearing

12.1 The expenses of the manufacturer's representative and of the umpire shall be paid by the loser or divided in proportion to the concession in case of compromise. In case of rejection being established, damages shall be limited to the payment by the manufacturer of freight both ways for replacement of the rejected anodes with anodes conforming to this specification.

13. Product Marking

13.1 A manufacturer's identifying brand shall be cast, stamped, or displayed on at least one surface of each anode or package of anodes.

14. Keywords

14.1 cathodic protection; galvanic anodes; zinc; zinc anodes

SUMMARY OF CHANGES

This section contains the principal changes to the standard that have been incorporated since the last issue.

(1) Definition for ribbon anode added.