Designation: ~~B418 – 16~~ B418 – 16a

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

This standard is issued under the fixed designation B418; 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.

1. Scope*

1.1 This specification covers cast and wrought galvanic zinc anodes used for the cathodic protection of more noble metals and alloys in sea water, brackish water, other saline electrolytes, or other corrosive environments.

1.2 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-18001K.

1.3 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.

1.4 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.

1.5 *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 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 and health practices, and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B6 Specification for Zinc

B899 Terminology Relating to Non-ferrous Metals and Alloys

B949 Specification for General Requirements for Zinc and Zinc Alloy Products

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

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

E536 Test Methods for Chemical Analysis of Zinc and Zinc Alloys

2.2 *Military Standard:*[3]

MIL-A-18001K w/INT. AMENDMENT 3, 24 October 2007 Military Specification Anodes Sacrificial Zinc Alloy

2.3 *ISO Standards:*[4]

ISO 3815-1 Zinc and zinc alloys — Part 1: Analysis of solid samples by optical emission spectrometry

ISO 3815-2 Zinc and zinc alloys — Part 2: Analysis by inductively coupled plasma optical emission spectrometry

3. Terminology

3.1 Terms shall be defined in accordance with Terminology B899.

3.2 *Definitions of Terms Specific to This Standard:*

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

3.2.2 *galvanic anode, n*—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.

---

[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.

Current edition approved ~~May 1, 2016~~Oct. 1, 2016. Published ~~July 2016~~November 2016. Originally approved in 1964. Last previous edition approved in ~~2012~~2016 as ~~B418 – 12~~.B418 – 16. DOI: ~~10.1520/B0418-16.~~10.1520/B0418-16a.

[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.

[3] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

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

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

~~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.~~

3.2.3 *saline electrolyte, n*—a solution consisting of mainly the chlorides of the alkali metals.

4. Ordering Information

4.1 Orders for zinc anodes under this specification shall include information as specified in Specification B949.

4.2 Additional ordering information specific to this standard is as follows:

4.2.1 Type of anode material (see Table 1),

4.2.2 Number of anodes,

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

5. Chemical Requirements

5.1 The anode shall be made from Special High Grade zinc conforming to Specification B6, 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 B6.

5.3 Chemical requirement procedures shall be in compliance with the provisions of Specification B949.

6. Sampling for Chemical Analysis

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

6.1.1 *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 2.

6.1.2 *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.

6.1.3 Other sampling procedures shall be in compliance with the provisions of Specification B949.

7. Methods of Chemical Analysis

7.1 The chemical compositions enumerated in this specification shall, in case of disagreement, preferably be determined by methods mutually agreed upon or the methods listed in Table 3 (note: spectrochemical methods may include ISO 3815-1, ISO 3815-2) approved for referee purposes by ASTM. Test Methods E536 shall be used, except for Type II.

NOTE 1—Test Methods E536 is directly applicable, in an unmodified form, only to alloys 3, 5, and 7. ISO 3815-1 and ISO 3815-2 are generic methods applied to zinc and zinc alloys. Each of the methods may be modified and formatted for the alloy to be assayed. An experienced chemist, using suitable and/or traceable standards along with valid quality assurance techniques, will be able to perform and validate the methods and demonstrate acceptable precision and accuracy.

8. Bolt Holes and Threads

8.1 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.

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 E29.

[B] UNS designations were established in accordance with Practice E527.

[C] Determined arithmetically by difference.