Designation: ~~B339 – 12~~ B339 – 19

Standard Specification for Pig Tin[1]

This standard is issued under the fixed designation B339; 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 U.S. Department of Defense.

1. Scope

1.1 This specification covers refined tin in pig form recovered and cast from primary and secondary tin-bearing materials. One grade of tin metal is specified and is designated by the grade letter shown in Table 1.

1.2 The percent values of tin contained are to be regarded as the standard.

1.3 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.

1.4 *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~~ safety, health, and ~~health~~environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.5 *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 *ASTM Standards:*[2]

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E46 Test Methods for Chemical Analysis of Lead- and Tin-Base Solder (Withdrawn 1994)[3]
E51 Method for Spectrographic Analysis of Tin Alloys by the Powder Technique (Withdrawn 1983)[3]
E57 Methods for Chemical Analysis of White Metal Bearing Alloys (Withdrawn 1986)[3]
E88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *pig, n*—an oblong or square mass of metal that has been cast while still molten into a mold that gives the metal its particular shape.

4. Ordering Information

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

4.1.1 ASTM designation and year of issue,
4.1.2 Quantity in weight, metric tons or kilograms,
4.1.3 Shape and size,
4.1.4 Method of manufacturing (Section 5),
4.1.5 Chemistry (Section 6~~),~~) including grade,
4.1.6 Product marking (Section 16), and

[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.

Current edition approved ~~May 1, 2012~~Nov. 1, 2019. Published ~~August 2012~~November 2019. Originally approved in 1967. Last previous edition approved in ~~2010~~2012 as ~~B339 – 00 (2010).~~B339 – 12. DOI: ~~10.1520/B0339-12.~~10.1520/B0339-19.

[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] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Chemical Composition and Impurity Contents

Element	Composition, - wt%			
	Grade "A"	Grade ~~"B"~~"A" low Sb	Grade "A" for the Manufacture of Tinplate	Ultra Pure Grade
Tin, min	99.85	99.85	99.85	99.95
Antimony, max	0.04	0.015	0.04	0.005
Arsenic, max	0.05	0.05	0.05	0.005
Bismuth, max	0.030	0.030	0.030	0.015
Cadmium, max	0.001	0.001	0.001	0.001
Copper, max	0.04	0.04	0.04	0.005
Iron, max	0.010	0.010	0.010	0.010
~~Lead, max~~	~~0.05~~	~~0.5~~	~~0.010~~	~~0.001~~
Lead, max	0.05	0.05	0.010	0.001
Ni + Co, max	0.01	0.01	0.01	0.010
Sulfur, max	0.01	0.01	0.01	0.010
Zinc, max	0.005	0.005	0.005	0.005
Silver, max	0.01	0.01	0.01	0.010
Other impurities[A]			0.010	0.010

[A] Maximum per impurity not listed above.

4.1.7 Packaging (Section 17).

5. Materials and Manufacture

5.1 The refined tin shall be produced from primary, secondary, or a combination of tin-bearing materials to obtain the requirements of this specification.

5.2 The refined metal for Grade A or B tin may be manufactured by fire refining, vacuum refining, electrolytic or electrowinning refining methods, or a combination of these methods.

6. Chemical Composition

6.1 The tin shall conform to the requirements as to chemical composition prescribed in Table 1.

7. Methods of Chemical Analysis

7.1 An analysis of each lot shall be made by the supplier. The analysis shall be made from representative test samples obtained from the lot during pouring or from the final pig product. The chemical composition determined shall conform to the requirements of Table 1.

7.2 If a product analysis is desired by the purchaser, it shall be made in the purchaser's laboratory or elsewhere. Such analysis may be made by various methods including, but not limited to, wet chemical or spectrographic techniques.

8. Lot

8.1 All tin of Grade A or B produced and cast at one time shall constitute a lot for chemical analysis. Each pig of the lot shall bear a single identifying number that can be related to the manufacturing lot. This lot number can be cast, metal die stamped, or marked legibly upon each pig.

9. Workmanship, Finish, and Appearance

9.1 The manufacturer shall use care to have each lot of tin material as uniform in quality as possible.

9.2 The pigs shall be clean and reasonably free of adhering foreign material.

10. Sampling for Chemical Analysis

10.1 Care must be taken to ensure that the sample selected for testing is representative of the material. The method of sampling for chemical analysis shall be agreed upon mutually between the supplier and the purchaser and shall consist of one of the following methods:

10.1.1 Test samples taken from the lot during casting or

10.1.2 Test samples taken from the final solidified cast pig product.

10.2 *Sampling From the Lot During Casting*—The supplier may obtain representative chill cast samples from the lot of molten metal during casting. The shape of the cast sample shall be agreed upon by all parties concerned. The molten metal shall be mechanically stirred and dip samples taken. If the material is produced in a pot or kettle, the material shall be drossed, stirred, and dip samples taken. If the facility does not allow for dip sampling, the samples shall be taken at the beginning, at the middle, and at the end of the pour. The sampling ladle must be clean and heated and the molten metal cast into chilled molds which produce

forms suitable for instrument use, drilling of cast sample, or sawing of cast sample. Samples drawn at the producers plant shall be from a clean bath of metal with all dross having been removed.

10.3 *Sampling of Cast Pig Product:*

10.3.1 If the pigs are of standard form (see Fig. 1), the sample for chemical analysis shall be taken in accordance with 10.3.3.1, 10.3.3.2, or 10.3.3.4. If the pigs differ in shape and size from those shown in Fig. 1, the supplier and purchaser should agree mutually as to the method to follow in sampling such pigs.

10.3.2 *Sampling*—A portion representative of the total shipment shall be selected at random for the final sample. For lots containing at least 55 115 lb (25 000 kg) of pig tin, one pig shall be taken for every 10 000 lb (4530 kg) or part thereof. For smaller lots, five pigs shall be taken at random. In case of shipment lots less than five pigs, each pig shall be sampled at least once or as many times as may be necessary to provide a sufficient sample for analysis. A minimum of five pigs is preferred for sampling. If a shipment is comprised of batches identified by heat numbers, each heat should be sampled as a separate lot.

10.3.3 *Sample Preparation*—Each pig should 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.

10.3.3.1 *Sawing*—The pigs selected shall be sawed completely through as illustrated in Fig. 1 (one cut per pig) or shall be sawed half way across from both sides as illustrated in Fig. 2 and Fig. 3 (two cuts on each pig). The sawings from all 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 should be screened to remove any coagulated saw chips and treated with a strong magnet to remove iron introduced by sawing. No lubricant shall be used when sawing.

10.3.3.2 *Drilling*—The pigs shall be drilled all the way through the depth of pig as shown in Fig. 4 (one hole per pig) or drilled half way through the depth of pig from top and bottom as shown in Fig. 5 (two holes ½ depth per pig). A drill size of about ½ in. (12.7 mm) in diameter is preferred and in no instance shall the drill size be less than ⅜ in. (9.5 mm) in diameter. A standing drill or bench drill should be used whenever possible, as hand held drills are normally high speed, therefore creating problems with drill breakage. In drilling, the holes shall be spaced along a diagonal line from one corner of the pig to the opposite corner. No lubricant shall be used in drilling. The drillings shall be clipped into pieces not over ½ in. in length, mixed thoroughly, quartered, and treated with a strong magnet to remove iron introduced by the drilling.

10.3.3.3 The saws, drills, cutter, or other tools used for sampling shall be thoroughly cleaned prior to use. The cleaning of the test samples shall include machining the test pieces in several positions to remove oxidized surfaces not as specified in Fig. 1. Metal pieces so produced are not to be included in any sample. Whenever possible, it is preferred that the sampling tools used are not composed of material that could cause contamination. Tools made of iron may contaminate the tin sample if the iron particles embedded in the soft tin are not completely removed by magnetic separation.

10.3.3.4 *Melting*—Whole pigs or portions of pigs produced by sawing or drilling shall be melted under palm oil in a clean vessel and heated to the auto ignition point (600°F (316°C)) of palm oil, and must be stirred immediately prior to sampling. The molten tin shall be chill cast into shapes for use in the spectrographic analysis, or chill cast into thin sample bars not to exceed ⅜ in. (9.5 mm) thick for sawing. Residual palm oil in the surface should be removed in hot distilled water with a suitable detergent. For sample bars, saw cuts shall be made halfway across the bar from each side and staggered so they are 31⁄64 in. (12.5 mm) apart; the sawings so produced are treated in accordance with 10.3.3.1.

10.3.4 *Sample Size:*

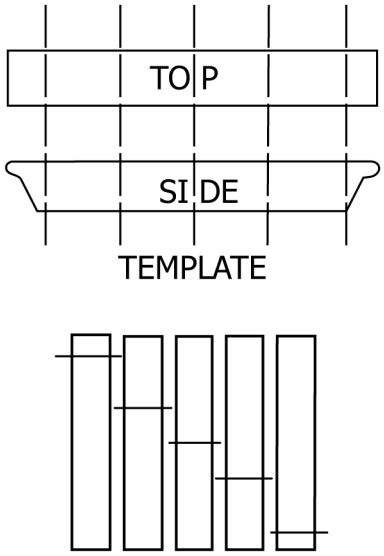

FIG. 1 Pig Tin Sampling Methods