



Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks¹

This standard is issued under the fixed designation B 19; 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 establishes the requirements for sheet, strip, plate, bar, and disks for the manufacture of ammunition of component parts thereof from alloy UNS C26000.

1.2 Values given in inch-pound units are the standard except for grain size which is stated in metric units. SI values given in parenthesis are for information only.

1.3 The following safety caveat pertains only to the test method described in Section 10 of this specification. *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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

B 154 Test Method for Mercurous Nitrate Test for Copper and Copper Alloys

B 248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B 846 Terminology for Copper and Copper Alloys

B 858 Test Method for Determination of Susceptibility to Stress Corrosion Cracking in Copper Alloys Using an Ammonia Vapor Test

E 3 Practice for Preparation of Metallographic Specimens

E 8 Test Methods for Tension Testing of Metallic Materials

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

E 112 Test Methods for Determining Average Grain Size

E 255 Practice for Sampling Copper and Copper Alloys for

Determination of Chemical Composition

E 478 Test Methods for Chemical Analysis of Copper Alloys

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *Federal Standards:*³

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

Fed. Std. No. 185 Identification Marking of Copper and Copper-Base Alloy Mill Products

2.3 *Military Standards:*³

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 Marking for Shipment and Storage

MIL-C-3993 Packaging of Copper and Copper-Base Alloy Mill Products

3. Terminology

3.1 *Definitions*—For standard terms related to copper and copper alloys, refer to Terminology **B 846**.

4. Ordering Information

4.1 Orders for products should include the following information:

4.1.1 ASTM designation and year of issue (for example, B19-XX),

4.1.2 Product form: sheet, strip, plate, bar, or disks (blanks),

4.1.3 Temper (Section 7),

4.1.4 Dimension: thickness, width, length,

4.1.5 How furnished: flat lengths, coils, or blanks,

4.1.6 Quantity: total weight each temper, form, and size, and

4.1.7 When severe drawing or deep cupping is required.

4.2 The following options are available and should be specified in the contract or purchase order when required:

4.2.1 Heat identification or traceability details,

4.2.2 Caliber or diameter of Type IV cups or disks (Section 11),

4.2.3 Mercurous Nitrate Test (Section 10),

4.2.4 Product Marking (Section 22),

4.2.5 On-site inspection (Section 13),

4.2.6 Certification (Section 20), and

4.2.7 Test Report (Mill) (Section 21).

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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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 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.

5. Material and Manufacture

5.1 Material:

5.1.1 The material of manufacture shall be a cast bar of copper alloy UNS C26000 of such purity, uniformity, and soundness as to be suitable for processing into the products prescribed herein.

5.2 Manufacturing:

5.2.1 The product shall be manufactured by such hot working, cold working, and annealing processes as to produce a uniform wrought structure in the specified temper for the finished product.

5.2.2 The products shall be furnished with slit edges unless otherwise specified.

5.3 In the event heat identification or traceability is required, the purchaser shall specify the details desired in the contract or purchase order.

NOTE 1—Because of the discontinued nature of the processing of castings into wrought products, it is not always practical to identify a specific casting analysis with a specific quantity of finished material.

6. Chemical Composition

6.1 The product material shall conform to the requirements prescribed in [Table 1](#).

6.1.1 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established and analysis required by agreement between manufacturer and purchaser.

6.2 Either copper or zinc may be taken as the difference between the sum of all elements analyzed and 100 %. Copper, when determined by difference, must conform to the requirements of [Table 1](#). When all elements in [Table 1](#) are analyzed, their sum shall be 99.7 % min.

7. Temper

7.1 Product tempers, as defined in Practice [B 601](#), shall be as follows:

7.1.1 *Rolled Product*: B 601, H01, H02, H03, H04, H06, H08, and H10.

7.1.2 *Annealed Product*: OS015, OS025, OS035, OS050, OS070, and OS100.

7.1.3 The purchaser should confer with the manufacturer or supplier for availability of product in a specific temper, form, and size.

8. Mechanical Property Requirements Mechanical Property Requirements

8.1 Materials furnished under this specification shall conform to the tension test requirements specified in this specification.

8.1.1 Rolled-to-temper material shall conform to the requirements specified in [Table 2](#).

8.1.2 Annealed material shall conform to the requirements specified in [Table 3](#).

TABLE 1 Chemical Requirements

Copper	Composition, %		Zinc	Bismuth
	Lead, max	Iron, max		
68.5 to 71.5	0.07	0.05	remainder	0.0059 max

TABLE 2 Tensile Strength Requirements for Rolled Tempers

NOTE 1—Plate is generally available in only the soft O60, quarter-hard H01, and half-hard H02 tempers. Required properties for other tempers shall be agreed upon between the manufacturer or supplier and the purchaser at time of placing the order or contract.

Temper Designation		Tensile Strength, ksi ^A (MPa)	
Standard	Former	min	max
H01	quarter hard	49 (340)	59 (405)
H02	half hard	57 (395)	67 (460)
H03	three-quarter hard	64 (440)	74 (510)
H04	hard	71 (490)	81 (560)
H06	extra hard	83 (570)	92 (635)
H08	spring	91 (625)	100 (690)
H10	extra spring	95 (655)	104 (720)

^A1 ksi = 1000 psi.

8.1.3 Material furnished as-hot rolled shall conform to the requirements specified in [Table 3](#).

9. Grain Size Requirements

9.1 Annealed sheet, strip, and bar furnished under this specification shall conform to the requirements specified in [Table 4](#).

9.2 Except for material ordered by the U.S. Government, annealed material to be used for the manufacture of cartridge brass cups and disks shall conform to the requirements of [Table 5](#).

9.3 Annealed plate, bar, and disks ordered by the U.S. Government shall meet the following requirements:

9.3.1 Material up to 0.500 in. (12.70 mm) in thickness inclusive, except material for 20 mm disks, shall be furnished to a grain size of 0.055 to 0.120 mm inclusive.

9.3.2 Material over 0.500 in. (12.70 mm) in thickness, except material for 20-mm disks, shall be furnished to a grain size of 0.070 to 0.150 mm inclusive.

9.3.3 Disks (blanks) of 20 mm and material for blanking 20-mm disks (blanks) shall be furnished to a grain size of 0.070 to 0.130 mm inclusive.

9.4 Material ordered as-hot rolled shall be furnished to a grain size as agreed upon between the manufacturer or supplier and the producer.

9.5 Material to be used for the manufacture of primer cup and primer anvils shall conform to the grain size requirements of [Table 6](#).

10. Mercurous Nitrate Test

10.1 When specified in the contract or purchase order, the product shall meet the requirements of Test Method [B 154](#).

10.1.1 Mercury is a recognized health hazard. Proper equipment for the detection and removal of vapors is recommended. The use of suitable gloves while testing is advised.

NOTE 2—Ammonia vapor test, Test Method [B 858](#), is a possible alternative to Test Method [B 154](#).

11. Dimensions, Mass, and Permissible Variations

11.1 The dimensions and tolerances covered by this specification, except as covered herein, shall be as specified in the current edition of Specification [B 248](#), with particular reference to Section [6](#) and the dimensional tables of that specification.

TABLE 3 Tension Test Requirements of Annealed and As-Hot Rolled Materials

NOTE 1—On annealed material under 0.020 in. (0.51 mm) in thickness, grain size only shall be specified.

Thickness, in. (mm)	Tensile Strength, min ksi ^A (MPa)	Elongation in 2 in. (50 mm), min, %
	annealed temper, OS025, 0.015– 0.035 mm nominal grain size	
0.020 to 0.050 (0.508 to 1.27), incl	45 (310)	40
Over 0.050 to 0.100 (1.27 to 2.54), incl	45 (310)	42
Over 0.100 to 0.150 (2.54 to 3.81), incl	45 (310)	45
Over 0.150 (3.81)	45 (310)	50
	annealed temper, OS070, 0.050– 0.100 mm nominal grain size	
0.020 to 0.050 (0.508 to 1.27), incl	44 (305)	45
Over 0.050 to 0.100 (1.27 to 2.54), incl	44 (305)	47
Over 0.100 to 0.150 (2.54 to 3.81), incl	44 (305)	50
Over 0.150 to 0.250 (3.81 to 6.35), incl	44 (305)	55
Over 0.250 to 0.500 (6.35 to 12.7), incl	43 (295)	55
Over 0.500 (12.7)	40 (275)	60
	as-hot rolled, M20	
0.250 to 0.500 (6.35 to 12.7), incl	43 (295)	55
Over 0.500 (12.7)	40 (275)	60

^A1 ksi = 1000 psi.

TABLE 4 Grain Size Requirements for Annealed Material

Temper	Nominal	Grain Size, mm	
		Min	Max
OS015	0.015	^A	0.025
OS025	0.025	0.015	0.035
OS035	0.035	0.025	0.050
OS050	0.050	0.035	0.070
OS070	0.070	0.050	0.100
OS100	0.100	0.060	0.150

^A No minimum grain size required, but the material shall be fully recrystallized.

TABLE 5 Grain Size Requirements for Material for Manufacture of Cartridge Brass Cups and Disks

Type	Temper	Grain Size, mm		Use
		Min	Max	
I	OS065	0.035	0.090	Strip for 0.30 and 0.45 caliber cups
II	OS110	0.080	0.140	Strips for 0.50 caliber cups
III	OS055	0.055	0.115	Disks 0.500 in. (12.7 mm) and under in thickness
IV	OS115	0.075	0.150	Disks over 0.500 in. (12.7 mm) in thickness

11.2 The diameter of the disks measured at the large end shall not vary from that specified in the order by more than the amounts shown in [Table 7](#).

11.3 Disks shall not vary in thickness by more than the amounts shown in [Table 8](#), except that disks for 20-mm cartridge cases shall be not less than the thickness specified and shall not exceed the specified thickness by more than 0.008 in. (0.20 mm) in the area 1 in. (25 mm) in diameter in the center of the disk.

11.4 Material to be used for the manufacture of primer cup and primer anvil shall conform to the dimensional tolerances requirements shown in [Table 6](#).

11.5 Special dimensional tolerances shall be as agreed upon between the manufacturer or supplier and the purchaser.

11.6 Straightness shall be determined by placing the piece on a level surface so that the arc or departure from straightness

is horizontal. The maximum depth of arc shall be measured to the nearest 1/32 in. (0.8 mm) by means of a straightedge and a steel scale.

12. Workmanship, Finish, and Appearance

12.1 Cartridge brass shall be free of defects, and it shall be well cleaned and free of dirt.

12.2 In addition to the above requirement, cartridge brass disks shall be free of oxidation, pinholes, surface splits, dirt inclusions, segregations, or any other defects. They shall be free of oil and grease, acid, dirt, grit of any kind, and shall be clean and bright.

13. Inspection

13.1 The manufacturer, or supplier, shall inspect and make tests necessary to verify the product furnished conforms to specification requirements.

13.2 Source inspection of the product by the purchaser may be agreed upon between the manufacturer, or supplier, and the purchaser as part of the purchase order. In such case, the nature of the facilities needed to satisfy the inspector representing the purchaser that the product is being furnished in accordance with the specification shall be included in the agreement. All tests and the inspection shall be conducted so as not to interfere unnecessarily with the operation of the works.

13.3 The manufacturer, or supplier, and the purchaser may conduct the final inspection simultaneously by mutual agreement.

14. Sampling

14.1 The lot size, portion size, and selection of pieces for materials purchased shall be as follows:

14.1.1 *Lot Size*—20 000 lb (9070 kg) or fraction thereof.

14.1.2 *Portion Size*—Pieces from at least ten individual lengths of the finished product. If the lot consists of less than the number of lengths indicated in the portion size, a piece shall be taken from each individual length.

14.2 For materials purchased by the U.S. Government, sampling shall be accomplished as follows:

TABLE 6 Dimensional Tolerances, Grain Size, and Temper of Brass for Primer Cup and Primer Anvils

Item	Size Case, caliber	Thickness, in. (mm)	Permissible Variation in Thickness Plus and Minus, in. (mm)	Standard Temper Designations	Nominal Grain Size, mm or Temper
Cup	0.50	0.035 (0.899)	0.0008 (0.020)	OS100	0.100 (OS100)
	0.45	0.018 (0.458) or 0.020 (0.508)	0.001 (0.025)	OS050	0.050 (OS050)
	7.62 mm	0.027 (0.686) or 0.029 (0.737)	0.0008 (0.020)	OS100	0.100 (OS100)
	5.56 mm	0.027 (0.686)	0.0005 (0.0125)	OS070	0.070 (OS070)
	0.30	0.027 (0.686)	0.0008 (0.020)	OS100	0.100 (OS100)
Anvil	0.30 carbine	0.020 (0.508)	0.001 (0.025)	OS070	0.070 (OS070)
	0.50	0.0485 (1.2315)	0.001 (0.025)	OS025	0.025 (OS025)
	0.45	0.038 (0.965)	0.001 (0.025)	H01	¼ hard (H01)
	7.62 mm	0.038 (0.965)	0.001 (0.025)	H01 or H02	¼ or ½ hard (H01 or H02)
	5.56 mm	0.038 (0.965)	0.001 (0.025)	H01 or H02	¼ or ½ hard (H01 or H02)
	0.30	0.038 (0.965)	0.001 (0.025)	H01 or H02	¼ or ½ hard (H01 or H02)
	0.30 carbine	0.034 (0.864)	0.001 (0.025)	H01	¼ hard (H01)

TABLE 7 Diameter Tolerances for Disks (Blanks)

Diameter, in. (mm)	Tolerances, in. (mm)	
	Plus	Minus
Up to 1 (25.4) incl	0.005 (0.127)	0
Over 1 to 3 (25.4 to 76.2) incl	0.010 (0.254)	0
Over 3 to 12 (76.2 to 305) incl	0.015 (0.381)	0
Over 12 to 14 (305 to 356) incl	0.020 (0.508)	0
Over 14 (356)	0.030 (0.762)	0

TABLE 8 Permissible Variation in Thickness of Disks (Blanks)

Thickness, in. (mm)	Permissible Variations in Thickness, in. (mm)	
	Plus	Minus
Up to 0.150 (3.81) incl	0.005 (0.127)	0
Over 0.150 to 0.300 (3.81 to 7.62) incl	0.006 (0.152)	0
Over 0.300 to 0.400 (7.62 to 10.16) incl	0.008 (0.203)	0
Over 0.400 to 0.600 (10.16 to 15.24) incl	0.015 (0.381)	0
Over 0.600 to 0.900 (15.24 to 22.86) incl	0.020 (0.508)	0
Over 0.900 (22.86)	0.030 (0.762)	0

14.2.1 The lot size, portion size, and selection of pieces shall conform to the sampling plan of **Table 9** for chemical analysis, for tension tests, for grain size determinations and for the mercurous nitrate test.

14.2.2 *Sampling for Visual and Dimensional Examination*—If the weight of each piece is more than 150 lb (68 kg), every piece shall be examined. If the weight of each

piece is 150 lb or less, a representative specimen shall be visually examined to determine compliance with the requirements of the contract for identification marking and workmanship, and shall be measured for compliance with the dimensional requirements of this specification and the contract.

14.3 When material is furnished in rolls or on reels or spools, the sample for examination shall be taken within 10 ft (3.0 m) of the outer end. If the sample is rejected due to handling marks, an additional 20 ft (6.1 m) shall be selected for examination.

14.4 *Chemical Analysis*—A sample for chemical analysis shall be taken and prepared in accordance with **Practice E 255**. Drilling, millings, etc., shall be taken in approximately equal weight from each of the sample pieces selected in accordance with **14.1.2** or **14.2.1** and combined into composite samples. The minimum weight of the composite sample that is to be divided into three equal parts shall be 150 g. The maximum number of samples from which a composite sample may be made shall be ten.

14.4.1 Instead of sampling in accordance with **Practice E 255**, the manufacturer shall have the option of determining conformance to chemical composition as follows: Conformance shall be determined by the manufacturer by analyzing samples taken at the time the castings are poured or samples taken from the semifinished product. If the manufacturer determines the chemical composition of the material during the course of manufacture, he shall not be required to sample and

TABLE 9 Sampling for U.S. Government Contracts

NOTE 1—If the number of original castings from which the material is processed is less than the number of samples specified, not more than one sample need be taken from each piece for chemical analysis. Similarly, if the number of individually processed master coils is less than the number of samples specified, not more than two samples need be taken from each master coil for tension and grain size testing.

Lot Size, lb	Chemical Analysis	Tension Test	Grain Size Test	Mercurous Nitrate Test
Plate, sheet, strip, and bar:				
up to 2000	2	2	5	...
2001 to 20 000	4	4	10	...
Disks:				
Up to 20 000	4	1	2	1
20 001 to 40 000	8	2	4	2
40 001 to 60 000	12	3	6	3
60 001 to 80 000	16	4	8	4
80 001 to 100 000	20	5	10	5

analyze the finished product. The number of samples taken for determination of chemical composition shall be as follows:

14.4.1.1 When samples are taken at the time the castings are poured, at least one sample shall be taken for each group of castings poured simultaneously from the same source of molten metal.

14.4.1.2 When samples are taken from the semi-finished product, a sample shall be taken to represent each 10 000 lb (4540 kg) or fraction thereof, except that not more than one sample shall be required per piece.

15. Number of Tests and Retests

15.1 Tests:

15.1.1 Chemical composition shall be determined as the per element average of results from at least two replicate analyses.

15.2 *Other Test*—Other tests shall be performed using the samples selected in accordance with 14.1.2 or 14.2, as appropriate. The required tests shall be made on each of the specimens so selected.

15.3 Retests:

15.3.1 When requested by the manufacturer or supplier, a retest may be permitted should test results obtained by the purchaser fail to conform with specification requirements.

15.3.2 Retesting shall be as directed in the product specification for the initial test(s) except that the number of test specimens shall be twice that required for the initial test.

15.3.3 Test results for all specimens shall conform to the product specification requirements in retest and failure to conform shall be cause for rejection of the entire lot.

16. Specimen Preparation

16.1 Chemical Analysis:

16.1.1 Preparation of the analytical specimen shall be the responsibility of the reporting laboratory.

16.2 Grain Size:

16.2.1 The test specimen shall be prepared in accordance with Practice E 3.

16.3 Tensile Test:

16.3.1 For tension testing, machined test specimens as specified in Test Methods E 8 shall be used. Specimens shall be taken so that the longitudinal axis of such specimens is parallel to the direction of rolling.

16.3.2 If the diameter of the disk is less than the minimum specimen length required for the performance of the test, specimens shall be taken from the original material for which the disks were blanked.

16.3.3 In the event that disks are to be annealed subsequent to blanking and the disk diameter will not provide the required specimen length, the necessary pieces of original material shall be prepared and annealed with the disks that these samples are to represent.

17. Test Methods

17.1 Chemical Analysis:

17.1.1 Chemical composition, in case of disagreement shall be determined as follows:

Element	Test Methods
Copper	E 478

Element	Test Methods
Lead	E 478 (AA)
Iron	E 478
Zinc	E 478 (Titrimetric)

17.1.2 Test methods for elements required by contractual or purchase order agreement shall be as agreed upon between the manufacturer and the purchaser.

18. Significance of Numerical Limits

18.1 For the purpose of determining compliance with the specified limits for requirements of the properties listed in the following table, an observed value or a calculated value shall be rounded as indicated in accordance with the rounding method of Practice E 29:

Property	Rounded Unit for Observed or Calculated Value
Chemical composition	nearest unit in the last right-hand significant digit used in expressing the limiting value
Hardness	
Electrical resistivity	
Electrical conductivity	
Tensile strength	Nearest ksi (5 MPa)
Yield Strength	
Elongation	nearest 1 %
Grain size	
Under 0.060 mm	nearest multiple of 0.005 mm
0.060 mm and over	nearest 0.01 mm

19. Rejection and Rehearing

19.1 Rejection:

19.1.1 Material that fails to conform to the requirements of this specification when inspected or tested by the purchaser or his agent may be rejected.

19.1.2 Samples that represent rejected material shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests, the producer or supplier may make claim for a rehearing with this time period.

19.1.3 Material that shows injurious defects during subsequent manufacturing operations may be rejected. If rejected, the producer or supplier shall be responsible only for replacement of the material to the purchaser. As much of the rejected original material as possible shall be returned to the producer or supplier.

19.1.4 For visual and dimensional examination of materials purchased by the U.S. Government, any sample unit having one or more defects shall be rejected.

19.2 Rehearing:

19.2.1 As a result of product rejection, the manufacturer or supplier may petition the purchaser for a retest to be conducted by the manufacturer, or supplier, and the purchaser.

19.2.2 Samples of the rejected product to be taken in accordance with the product specification and tested by both parties using the test method(s) specified in the product specification, or, alternatively, upon agreement of both parties, an independent laboratory may be selected for the test(s) using the specified test methods.

20. Certification

20.1 When specified in the contract or purchase order, the purchaser shall be furnished certification that samples representing each lot have been either tested or inspected as directed in this specification and requirements have been met.

21. Test Report

21.1 When specified in the contract or purchase order, a report of test results shall be furnished.

22. Product Marking

22.1 When specified in the contract or purchaser order, all material shall be properly marked for identification or classification with the name or brand of the producer, commercial designations, and specification information (that is, type, class, and so forth). The method of marking shall be at the manufacturer's option and may be made by stamping, stenciling, casting, rolled-raised lettering, tagging, or labeling, as suited to the product.

22.2 For U.S. Government applications, all material shall, when specified, be marked in accordance with **Fed. Std. No. 185** except that the ASTM specification number and the alloy number shall be used.

23. Keywords

23.1 bar; brass bar; brass disks (blanks); brass plate; brass sheet; brass strip; cartridge brass bar; cartridge brass disks (blanks); cartridge brass plate; cartridge brass sheet; cartridge brass strip; disks (blanks); plate; strip

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue B 19 – 01 that may impact the use of this standard. (Approved Mar. 1, 2005.)

(I) Sampling note for **Table 9** was revised.

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