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SUPERSEDING
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22 AUGUST 1946
JAN-G-439
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MILITARY SPECIFICATION

**COPPER ALLOY NUMBERS 210 (GILDING, 95%) AND
220 (COMMERCIAL BRONZE, 90%) SHEET AND STRIP**

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers copper alloy numbers 210 and 220 in sheet and strip form.

1.2 Classification.

1.2.1 Temper. Copper alloy numbers 210 and 220 shall be furnished in the following tempers, as specified (see 6.2):

- Annealed
- Cold rolled:
 - Quarter hard
 - Half hard
 - Three-quarter hard
 - Hard
 - Extra hard
 - Spring
 - Extra spring

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein.

SPECIFICATION

MILITARY
MIL-C- —Copper and Copper Base
003993 Alloy Mill Products,
Packaging of

STANDARDS

FEDERAL

**Fed. Std. No.—Tolerances for Copper
146 and Copper Base Alloy
Mill Products**

**FED. TEST —Metals; Test Methods
METHOD
STD. NO.
151**

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

MILITARY

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

**MIL-STD- —Marking for Shipment
129 and Storage**

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Chemical composition.

3.1.1 The material shall conform to the chemical requirements specified in table I.

3.1.2 Analysis shall be made regularly only for the elements specifically mentioned in table I. If, however, the presence of other

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TABLE I. Chemical composition

Copper alloy number	Copper, percent	Lead, max., percent	Iron, max., percent	Zinc, percent	Total other elements, max., percent
210.....	94.0-96.0	0.03	0.05	Remainder	0.10
220.....	89.0-91.0	.05	.05	Remainder	.10

elements is suspected or indicated in the course of routine analysis, further analysis shall be made to determine that the total of other elements is not in excess of the limits specified.

3.2 Tensile properties (rolled tempers only). Material in the rolled tempers shall conform to the tensile properties shown in table II.

TABLE II. Tensile properties, rolled tempers

Copper alloy number	Temper	Tensile strength, psi	
		Minimum	Maximum
210....	Quarter-hard.....	37,000	47,000
	Half-hard.....	42,000	52,000
	Three-quarter hard....	46,000	56,000
	Hard.....	50,000	59,000
	Extra hard.....	56,000	64,000
	Spring.....	60,000	68,000
220....	Extra Spring.....	61,000	69,000
	Quarter-hard.....	40,000	50,000
	Half-hard.....	47,000	57,000
	Three-quarter hard....	52,000	62,000
	Hard.....	57,000	66,000
	Extra hard.....	64,000	72,000
	Spring.....	69,000	77,000
	Extra spring.....	72,000	80,000

3.3 Grain size requirements. Material in the annealed temper shall conform to the grain size requirements shown in table III.

TABLE III. Grain size requirements

Grain size, millimeter		
Nominal	Minimum	Maximum
0.050	0.035	0.090
.035	.025	.050
.025	.015	.035
.015	a	.025

^a Although no minimum grain size is required, the material shall be fully recrystallized.

3.4 Dimensional tolerances. The following references of Federal Standard No. 146 shall apply:

Dimension	Reference
Thickness	1a(1)
Width	1a(2)
Length	1a(3), 1a(4)
Straightness	1a(5)

3.5 Identification Marking. Product identification marking, when specified, shall be in accordance with Federal Standard No. 185 (see 6.2 and 6.3).

3.6 Workmanship. The metal shall be free from oil, grease, oxidation, laminations, double metal, scale, chips, dirt or grit, dented or bent edges, pipes, slivers, laps, cracks, deep scratches, wrinkles, and other defects which will render the metal unsuitable for the purpose intended. The metal shall be clean and free from acid.

3.6.1 The metal shall be uniform in composition, anneal or temper, and free from kinks and warps.

3.6.2 Sheet and strip, when ordering for either shallow or deep cupping, shall not have directional properties which result in the formation of ears when the material is cupped.

4. QUALITY ASSURANCE PROVISIONS

4.1 The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specifica-

tion where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Lot. Unless otherwise specified in the contract or order, a lot shall consist of 10,000 pounds, or fraction thereof, of material of the same composition, form, temper, and size, submitted for inspection at one time.

4.3 Sampling. Samples taken for the purpose of the tests prescribed in this specification shall be selected in a manner that will represent correctly the material furnished and avoid needless destruction of finished material when samples representative of the material are available from other sources.

4.3.1 Sampling for chemical analysis. The number of samples specified in table IV shall be selected from different pieces in each lot. From each sample, not less than 2 ounces of clean millings, drillings, or clippings shall be obtained, placed in separate containers, and forwarded to a laboratory designated by the procuring agency for analysis.

TABLE IV. Sampling for chemical analysis

Pounds of material in lot	Number of samples ¹
Up to 5,000.....	2
5,001 to 10,000.....	4

¹If the number of original bars, billets, or cakes 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.

4.3.2 Sampling for tension test. Unless otherwise specified in the contract or order, two tension test specimens shall be taken from each lot and each shall be selected from a different piece unless the lot consists of one piece in which case one test specimen shall be sufficient.

4.3.3 Sampling for grain size determination. Unless otherwise specified in the contract or order, at least four sample pieces shall be selected from each lot for the test specified in 4.5.2.3 unless the lot is represented by less than four pieces. Not more than one sample shall be taken from the same piece.

4.3.4 Sampling for visual and dimensional examination. If the weight of each piece is more than 150 pounds, every piece shall be examined. If the weight of each piece is not over 150 pounds, sample pieces shall be selected as specified in 4.3.4.1 and 4.3.4.2.

4.3.4.1 Visual examination. From each lot of material composed of pieces weighing 150 pounds or less, a representative sample of material shall be selected in accordance with table V and shall be visually examined as specified in 4.4.2.1.

TABLE V. Sampling for visual and dimensional examination

AQL (approx.) = 1.5 percent defective

Number of pieces in lot	Number of sample units required of—
Up to 180....	Inspection Level III MIL-STD-105
181 to 500...	Inspection Level II MIL-STD-105
501 and over.	Inspection Level I MIL-STD-105

4.3.4.2 Dimensional examination. From each lot of material composed of pieces weighing 150 pounds or less, a representative sample shall be selected in accordance with table V and shall be measured as specified in 4.4.2.2. The samples selected for dimensional examination may be the same as those selected for visual examination.

4.3.4.3 When material is furnished in rolls or on reels or bucks, the sample for examination shall be taken from within 10 feet of the outer end.

4.4 Examination.

4.4.1 Pieces weighing over 150 pounds. Each piece in the lot shall be visually examined to determine compliance with the requirements for identification marking (see 3.5) and workmanship (see 3.6) and shall be measured for compliance with the dimensional requirements (see 3.4) of this specification. Straightness of each piece shall be determined as specified in 4.4.3.

4.4.2 Pieces weighing 150 pounds and under.

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4.4.2.1 Visual. Each sample unit selected in accordance with 4.3.4.1 shall be visually examined to determine compliance with the requirements for identification marking (see 3.5) and workmanship (see 3.6).

4.4.2.2 Dimensional. Each sample unit selected in accordance with 4.3.4.2 shall be measured to determine compliance with the dimensional requirements (see 3.4) of this specification. Straightness of each sample unit shall be determined as specified in 4.4.3.

4.4.3 Straightness. 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 $\frac{1}{32}$ inch by means of a straightedge and a steel scale.

4.4.4 Preparation for shipment. Examination of the packing and marking for shipment shall be made for conformance to the requirements of section 5.

4.5 Tests.

4.5.1 Tension test specimens. Tension test specimens shall be machined to the form and dimensions of type F2 of method 211 of Federal Test Method Standard No. 151. The longitudinal axis of the specimen shall be parallel to the direction of rolling or drawing.

4.5.2 Test procedures.

4.5.2.1 Chemical analysis. The samples selected and forwarded in accordance with 4.3.1 shall be analyzed by the wet chemical method in accordance with method 111 of Federal Test Method Standard No. 151 or the spectrographic method in accordance with method 112 of Fed. Test Method Std. No. 151 to determine conformance with 3.1. A single analysis of a composite sample may be made. In case of dispute, the analysis by the wet method (method 111) shall be the basis for acceptance.

4.5.2.2 Tension tests. All tension tests shall be conducted in accordance with method 211 of Fed. Test Method Std. No. 151.

4.5.2.3 Grain size determination. Grain

size shall be determined in accordance with method 312 of Fed. Test Method Std. No. 151.

4.6 Rejection.

4.6.1 Examination defects. Any sample unit having one or more defects shall be rejected. If the number of nonconforming sample units in the sample exceeds the acceptance number specified in table V for that sample size, the entire lot shall be rejected subject to the provisions on "Disposition of Nonconforming Product" of Standard MIL-STD-105.

4.6.2 Test failures. A lot shall be rejected for failure to meet any of the test requirements when tested in accordance with 4.5, subject to the provisions of the General Section of Fed. Test Method Std. No. 151.

5. PREPARATION FOR DELIVERY

5.1 Packing (see 6.3).

5.1.1 Levels A and B. The material shall be packed in accordance with Military Specification MIL-C-003993.

5.1.2 Level C. The products shall be separated by size, alloy, and temper, and packed for shipment in compliance with common carrier regulations applicable to that mode of transportation to insure safe delivery at destination at lowest transportation costs without assessment of penalty charges for improper packing.

5.2 Marking. In addition to any special marking required in the contract or order (see 6.2), marking for shipment shall be in accordance with Military Standard MIL-STD-129.

6. NOTES

6.1 Intended use. Material covered by this specification is used in primer and detonator cups for artillery ammunition and bombs and similar applications.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Alloy, temper, and size required (see 1.2).

- (c) Lengths, whether specific or stock lengths with or without ends (see 3.4).
- (d) When tolerances are required all plus or all minus (see 3.4).
- (e) When identification marking in accordance with Fed. Std. 185 is required (see 3.5).
- (f) Nature of application of the material, such as spinning or cupping (see 3.6).
- (g) Procedure for resubmission of rejected lots.
- (h) When a lot size other than 10,000 pounds is required (see 4.2).
- (i) Whether material is to be packed by Level A, B, or C (see 5.1).
- (j) Maximum gross weight of containers with contents.
- (k) Special marking, if required (see 5.2).

6.3 The requirements for item identification marking (see 3.5) and for packing and marking for shipment (see 5.1 and 5.2) specified herein apply to direct shipment for Government activities and apply also, where specified, to contracts or orders between the manufacturer and the Government prime contractor.

6.4 Definition of forms.

6.4.1 *Sheet*. Sheet, as covered by this specification, is a flat product up to and including 0.188 inch in thickness, and generally furnished with slit, slit and edge rolled, sheared, sawed, or machined edges in widths over 20 inches.

6.4.2 *Strip*. Strip, as covered by this specification, is a flat product, other than flat wire, up to and including 0.188 inch in thickness, and generally furnished with slit, slit and edge rolled, sheared, sawed, or machined edges in widths over 1 $\frac{1}{4}$ inch to 20 inches, inclusive.

TABLE VI. Approximate Rockwell hardness of rolled tempers

Copper alloy number	Temper	B scale ^a				Superficial 30-T scale ^a			
		0.020 to 0.036 in. thick, incl.		Over 0.036 in. thick		0.012 to 0.028 in. thick, incl.		Over 0.028 in. thick	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
210	Quarter-hard.....	20	48	24	52	34	51	37	54
	Half-hard.....	40	56	44	60	46	57	48	59
	Three-quarter hard.....	50	61	53	64	52	60	54	62
	Hard.....	57	64	60	67	57	62	59	64
	Extra hard.....	64	70	66	72	62	66	63	67
	Spring.....	68	73	70	75	64	68	65	69
	Extra spring.....	69	74	71	76	65	69	66	70
220	Quarter-hard.....	27	52	31	56	38	53	41	56
	Half-hard.....	50	63	53	66	52	61	54	63
	Three-quarter hard.....	59	68	62	71	58	64	60	66
	Hard.....	65	72	68	75	62	66	64	68
	Extra hard.....	72	77	74	79	67	71	68	72
	Spring.....	76	79	78	81	70	72	71	73
	Extra spring.....	78	81	80	83	71	73	72	74

^a Applies to metal 0.020 inch in thickness and over.

^b Applies to metal 0.012 inch in thickness and over.

6.5 The approximate Rockwell hardness for material in the rolled tempers is shown in table VI for information only.

6.6 The former names for the material covered by this specification are as follows:

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<i>Copper alloy number</i>	<i>Former commercial name</i>	<i>Former specification name</i>
210....	Gilding, 95%	Gilding metal (95/5 brass)
220....	Commercial bronze, 90%	Gilding metal (90/10 brass)

6.7 **Superseded specifications.** Copper alloy number 210 was formerly covered by Military Specification JAN-G-439 dated 31 December 1946; number 220 by JAN-G-383 dated 22 August 1946.

6.8 The chemical composition and mechanical properties of material covered by this specification are equivalent to the following ASTM designations:

<i>Copper alloy number</i>	<i>ASTM designation</i>
210.....	B36-61, alloy No. 1
220.....	B36-61, alloy No. 2

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture use, or sell any patented invention that may in any way be related thereto.

Custodians:

Army—MR
Navy—Ships
Air Force—MOAMA

Preparing activity:
Army—MR