

QQ-C-591E
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SUPERSEDING
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FEDERAL SPECIFICATION

COPPER-SILICON, COPPER-ZINC-SILICON, AND COPPER-NICKEL-SILICON
ALLOYS: ROD, WIRE, SHAPES, FORGINGS, AND FLAT
PRODUCTS (FLAT WIRE, STRIP, SHEET, BAR, AND PLATE)

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers copper-silicon,
copper-zinc-silicon and copper-nickel-silicon alloy rod, wire, shapes,
forgings, and flat products (flat wire, strip, sheet, bar and plate) intended
for resistance to stress corrosion.

1.2 Classification.

1.2.1 Compositions, forms, and tempers. The material covered by this
specification shall be one of the five compositions listed in table I, and
in the following forms and tempers, as specified (6.2). When temper is not
specified, these products shall be furnished in the half-hard temper, except
alloy number 647, which shall be furnished in the hard temper.

Forms:

Rod
Wire
Flat products with slit, sheared, sawed, or machined edges (strips,
sheet, and plate)
Flat products with finished edges (flat wire, strip, and bar)
Shapes
Forgings

FSC 9525, 9530, 9535, 9540

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Tempers:

As extruded
Soft
Eighth hard
Quarter hard
half hard
Three-quarter hard
Hard
Extra hard
Spring
Cold forming

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies).
Fed. Std. No. 146 - Tolerances for Copper and Copper Base Alloy Mill Products
Fed. Test Method Std. No. 151 - Metals; Test Methods
Fed. Std. No. 185 - Identification Marking of Copper and Copper Base Alloy Mill Products

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards, and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

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

Military Standards:

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

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specified issue is identified, the issue in effect on date of invitation for bids or requests for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

E 8 - Tension Testing of Metallic Materials

E 290 - Semi-Guided Bend Test for Ductility of Metallic Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Manufacture. The material shall be manufactured by either hot or cold working followed by such annealing as may be required to meet the requirements of this specification.

3.1.1 The flat products shall be furnished in straight lengths unless material in rolls, or on reels or bucks is specified in the contract or order.

3.2 Sheet and strip (for spinning or drawing). Sheet and strip, when ordered for spinning or drawing, shall be of such temper as specified in the contract or order (6.2).

3.3 Chemical composition.

3.3.1 The material shall conform to the chemical requirements shown in table I.

TABLE I. Chemical composition

Copper alloy number	Copper, percent	Silicon, percent	Manganese, maximum, percent	Zinc, maximum, percent	Iron, maximum, percent	Nickel percent	Lead percent	Copper plus sum of named elements, minimum, percent
647	Rem	0.40-0.8 ^{1/}	-	0.50	0.10	1.6-2.2	0.10 max	99.5
651	96.0 min	.8 -2.0 ^{1/}	0.7	1.5	.8	0.6 max	.05 max	99.5
655	94.8 min	2.8-3.8	1.5	1.5	.8	.6 max	.05 max	99.5
661	94.0 min	2.8-3.5	1.5	-	.25	-	.2-0.8	99.5
692	89.0-91.0	0.8-1.5	-	Rem	.05	-	.05 max	99.5

^{1/} A composition containing as high as 2.6 percent silicon is acceptable, provided that the percentage of iron remains as specified for this composition, and provided that the sum of other elements other than copper, silicon, and iron does not exceed 0.30 percent.

3.3.2 Analysis shall be made regularly only for the elements specifically mentioned in table I. If however, the presence of other elements is suspected, or indicated in the course of routing analysis, further analysis shall be made to determine that the total of other elements is not in excess of the limits specified.

3.4 Mechanical properties. The material shall conform to the mechanical properties shown in tables II, III, IV, and V for the respective tempers.

3.4.1 Bending properties. All wire up to and including 1/4 inch in diameter or distance between parallel surfaces shall withstand wrapping one full turn (360 degrees) around its own diameter or thickness and shall develop no cracks or flaws visible to the unaided eye. Bend tests shall not be made upon specimens which include brazed or welded joints.

TABLE II. Mechanical properties of rod

Copper alloy number, temper, and diameter or thickness in inches	Tensile strength min, psi	Yield strength[1] min, psi	Elongation[2] in 2 in. or 4 times diameter or thickness, min, percent
Copper alloy No. 647			
Cold forming -			
3/32 to 1/4, incl	60,000	50,000	10
Over 1/4 to 3/4, incl	55,000	45,000	10
Over 3/4 to 1-1/2, incl	50,000	40,000	10
Hard - Up to 1-1/2, incl	90,000	80,000	8
Over 1-1/2 to 2, incl	80,000	70,000	8
Copper alloy Nos. 651 and 692			
Soft	40,000	12,000	30
Half-hard - Up to 2, incl	55,000	20,000	12
Hard - Up to 2, incl	60,000	40,000	10
Extra hard - Up to 1/2, incl	85,000	55,000	6
Over 1/2 to 1, incl	75,000	45,000	8
Over 1 to 1-1/2, incl	75,000	40,000	8
Copper alloy Nos. 655 and 661			
Soft	52,000	15,000	35
Half-hard - Up to 2, incl	70,000	38,000	17
Hard - Up to 1/4, incl	90,000	55,000	8
Over 1/4 to 1, incl	90,000	52,000	15
Over 1 to 1-1/2, incl	80,000	45,000	20
Over 1-1/2 to 3, incl	70,000	38,000	20

[1] One-half percent extension under load.

[2] Not applicable to rod in sizes 1/4 inch and under (see 3.4.1). For all products a minimum gage length of 1 inch shall be used.

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TABLE III. Mechanical properties of flat products

Copper alloy number, form, temper, and thickness in inches	Tensile strength, min, psi	Yield strength[1] min, psi	Elongation[2] in 2 in. or 4 times thickness, min, percent
Copper alloy No. 647 -			
Bar, square			
Hard - 1/8 to 1 incl	90,000	80,000	8
Over 1 to 1-1/2 incl	80,000	70,000	8
Bar, rectangular			
Hard - Up to 1-1/2 thick, up to 2-1/2 wide	80,000	70,000	8
Sheet and strip			
Cold forming, light rolled - 0.010 to 0.250 thick, 1/2 to 18 wide	40,000	30,000	7
Cold forming, heavy rolled - 0.010 to 0.250 thick, 1/2 to 18 wide	55,000	50,000	2
Hard - 0.010 to 0.250 thick, 1/2 to 18 wide	80,000	65,000	3
Copper alloy Nos. 651 and 692			
Plate			
Soft - All sizes	40,000	12,000	30
Sheet, strip, flat wire, and bar			
Soft	40,000	12,000	30
Half-hard	47,000	20,000	12
Hard	60,000	35,000	8
Copper alloy No. 655 -			
Plate			
Soft - All sizes	50,000	15,000	35
Sheet, strip, flat wire, and bar			
Soft	50,000	15,000	35
Half-hard	70,000	40,000	10
Hard	80,000	60,000	5

[1] One-half percent extension under load.

[2] For all products, a minimum gage length of 1 inch shall be used.

TABLE IV. Mechanical properties of wire

Copper alloy number, shape, temper, and diameter or thickness in inches	Tensile strength, psi		Yield strength ^{1/} min., psi	Elongation ^{2/} in 4 times diameter or thickness, min., percent
	Minimum	Maximum		
Copper alloy No. 647 -				
Round, hexagonal, octagonal, and square				
Cold-forming - Up to 0.125, incl.	70,000	-	60,000	4
Over 0.125 to 0.375, incl	60,000	-	50,000	10
Over 0.375 to 0.750, incl	50,000	-	40,000	14
Hard - Up to 0.750, incl	90,000	-	80,000	5
Rectangular				
Cold forming - 0.020 to 0.100, incl thick, 0.100 - 1.000, incl., wide	50,000	-	40,000	4
Hard - 0.020 to 0.100, incl, thick, 0.100 - 1.000, incl, wide	90,000	-	70,000	5
Copper alloy Nos. 651 and 692 -				
Soft - all sizes	40,000	-	12,000	30
Eighth hard - up to 7/8, incl	50,000	65,000	20,000	20
Quarter hard - up to 7/8, incl	60,000	75,000	42,000	12
Half hard - up to 5/8, incl	70,000	85,000	50,000	10
Three-quarter hard - up to 1/2, incl	80,000	95,000	55,000	7
Hard - up to 7/16, incl	90,000	110,000	60,000	5
Spring - up to 1/4, incl	100,000	-	62,000	-

^{1/} One-half percent extension under load.

^{2/} Not applicable to wire 1/4 inch and under (see 3.4.1).

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TABLE V. Mechanical properties of forgings and shapes

Copper alloy number and form	Tensile strength, min., psi	Yield strength[1], min., psi	Elongation[2] in 2 in. or 4 times diameter or thickness, min., percent
Copper alloy Nos. 655 and 661 - Forgings[3]	50,000	15,000	30
All alloys - Shapes[4] - As agreed upon between manufacturer and contractor.			

[1] One-half percent extension under load.

[2] For all products, a minimum gage length of 1 inch shall be used.

[3] Unless otherwise specified in the contract or order, forgings shall conform to the mechanical properties specified. If other mechanical properties are required, they shall be as specified (see 6.2).

[4] When specified in the contract or order, shapes furnished in the soft temper, all sizes, in copper alloy numbers 655 and 661 shall have a minimum tensile strength of 45,000 psi, a minimum yield strength of 11,000 psi, and a minimum elongation of 35 percent.

3.5 Dimensional tolerances.

3.5.1 Forgings. When dimensional tolerances are not included in the contract or order, forgings shall not vary from the specified dimensions by more than plus or minus 3/16 inch on smooth forgings and plus or minus 1/16 inch on rough machined forgings.

3.5.2 Other forms. The following references of Fed. Std. No. 146 shall apply:

Form and dimension	Reference
1. Flat products with finished edges (bar, flat wire, and strip)	
Thickness:	
Copper alloy Nos. 647 and 655	2b(1)
Copper alloy Nos. 651 and 692	2a(1)
Width:	
Copper alloy Nos. 647 and 655	2b(2)
Copper alloy Nos. 651 and 692	2a(2)
Length	2a(3), 2b(3)
Schedule of lengths	2a(4), 2b(4)
Straightness	2a(5), 2b(5)
Standard edge contours	2a(6), 2b(6)
2. Flat products with unfinished edges (bar, plate, sheet, and strip)	
Thickness	1b(1)
Width	1b(2)
Length	1b(3)
Schedule of lengths	1b(4)
Straightness	1b(5)
3. Bar and rod, as extruded:	
Diameter or thickness	5b(1)
Straightness and length	5b(2)
4. Rod, cold drawn:	
Diameter:	
Copper alloy Nos. 647, 655, and 661	11b(1)
Copper alloy Nos. 651 and 692	11a(1)
Length	11a(2), 11b(2)
Schedule of lengths	11a(3), 11b(3)
Straightness	11a(4), 11b(4)
5. Shapes, as extruded	16
6. Wire:	
Diameter:	
Copper alloy No. 647	24b(1)
Copper alloy Nos. 651 and 692	24a(1)

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3.5.3 If, for special purposes, tolerances are required all plus or all minus it shall be so specified, and the tolerances permitted shall be doubled (6.2).

3.6 Identification marking. Item identification marking, when specified in the contract or order, shall be in accordance with Fed. Std. No. 185 (6.2 and 6.3).

3.7 Workmanship. The material shall be uniform in quality and the condition shall be clean, sound, smooth, and free from pipes, slivers, laps, cracks, twists, seams, scale, damaged ends or edges, buckles, and other defects, which, due to their nature, degree, or extent, detrimentally affect the serviceability for the intended parts.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that 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 the material of the same composition, form, size, and temper, 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 the other sources.

TABLE VI. Sampling for chemical analysis

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

[1] If 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.

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4.3.1 Sampling for chemical analysis. The number of samples specified in table VI shall be selected from different pieces in each lot. From each sample, not less than two ounces of clean millings, drillings, or clippings shall be obtained and placed in separate containers.

4.3.2 Sampling for mechanical property tests.

4.3.2.1 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. If the lot consists of only one piece, only one tension test specimen shall be taken.

4.3.2.2 Sampling for bend test. One sample shall be selected from each lot.

4.3.3 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 4.3.3.1 and 4.3.3.2.

4.3.3.1 Sampling for visual examination. From each lot of material composed of pieces weighing 150 pounds or less, a representative sample of material shall be selected from each lot in accordance with Inspection Level III, MIL-STD-105, acceptable quality level (AQL) of 1.5 percent, and shall be visually examined as specified in 4.4.2.1.

4.3.3.2 Sampling for dimensional examination. From each lot of material composed of pieces weighing 150 pounds or less, a representative sample shall be selected from each lot in accordance with Inspection Level III, MIL-STD-105, acceptable quality level (AQL) of 1.5 percent, 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.

4.3.3.3 When material is furnished in coils or rolls, or on reels or bucks, the sample for examination shall be taken from within 10 feet of the outer end. If the sample selected is rejected due to handling marks, an additional 20 feet shall be used for re-examination.

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 (3.6) and workmanship (3.7) and shall be measured for compliance with the dimensional requirements (3.5) of this specification. Straightness of each piece shall be determined as specified in 4.4.2.2.1.

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4.4.2 Pieces weighing 150 pounds and under.

4.4.2.1 Visual. Each sample unit selected in accordance with 4.3.3.1 shall be visually examined to determine compliance with the requirements for identification marking (3.6) and workmanship (3.7).

4.4.2.2 Dimensional. Each sample unit selected in accordance with 4.3.3.2 shall be measured to determine compliance with the dimensional requirements (3.5) of this specification. Straightness of each sample unit shall be determined as specified in 4.4.2.2.1.

4.4.2.2.1 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 or arc shall be measured to the nearest 1/32 inch by means of a straight edge and a steel scale.

4.4.3 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 Test specimens.

4.5.1.1 Tension tests.

4.5.1.1.1 Bar, rod, flat wire, forgings, and shapes.

4.5.1.1.1.1 Tension test specimens for bar, rod, flat wire, forgings, and shapes shall be tested in full size when practicable and the elongation measured in a gage length of four times the diameter of round specimens and of four times the minimum distance across flats of specimens other than round except that the gage length shall be not less than 1 inch. When a machined specimen becomes necessary, enough metal may be removed from the gage section to meet the limitations of the testing machine, or the specimen may be machined to the form and dimensions of a standard 0.500 inch diameter tension test specimen of figure 8, ASTM E 8. When such a specimen is used, the elongation shall be measured in a gage length of 2 inches.

4.5.1.1.1.2 For bar, rod, forgings, and shapes up to 1-1/2 inches in diameter or minimum thickness, the axis of the test specimen shall coincide with the central axis of the piece. For bar, rod, forgings, and shapes 1-1/2 inches and over in diameter or minimum thickness, when a machined specimen is used, the axis shall be located midway between the center and the surface of the piece.

4.5.1.1.2 Sheet, strip, and plate. Tension test specimens for sheet and strip and for plate up to 3/8 inch, inclusive, in thickness, shall be machined to the form and dimensions of a standard rectangular tension test specimen of sheet type, 1/2 inch wide (figure 6) of ASTM E 8. Tension test specimens for plate over 3/8 inch in thickness shall be machined to the form and dimensions of a standard rectangular tension test specimen of plate type, 1-1/2 inch wide (figure 6) of ASTM E 8, or in full section. The longitudinal axis of the specimen shall be parallel to the direction of rolling or drawing.

4.5.1.2 Bend test. Bend test specimens shall be bent in full section.

4.5.2 Test procedures.

4.5.2.1 Chemical analysis. Chemical analysis shall be made by the wet chemical method in accordance with method 111 or spectrochemical method in accordance with method 112 of Fed. Test Method Std. No. 151 to determine conformance with 3.3. 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 ASTM E 8.

4.5.2.2.1 Yield strength. The yield strength shall be determined by the extension under load method in accordance with ASTM E 8. The limiting extension shall be 0.005 inch-per-inch for all specified yield strength values.

4.5.2.3 Bend test. The wire shall be bent cold one full turn (360 degrees) around its own diameter or thickness in accordance with ASTM E 290.

4.6 Rejection.

4.6.1 Examination defects. Any sample unit having one or more defects shall be rejected. If the number of non-conforming sample units in the sample exceeds the acceptance number specified in 4.3.3.1 and 4.3.3.2 for that sample size, the entire lot shall be rejected subject to the provisions on "Disposition of Nonconforming Product" of 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 retest provision (section 4 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 MIL-C-3993.

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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 ensure safe delivery at destination at lowest transportation cost without assessment of penalty charges for improper packing.

5.2 Marking (see 6.3).

5.2.1 Civil agencies. In addition to any special marking required in the contract or order (6.2), marking for shipment shall be in accordance with Fed. Std. No. 123.

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

6. NOTES

6.1 Intended use.

6.1.1 Copper alloy No. 647 is intended for uses requiring high electrical conductivity or good corrosion resistance, or both, such as bolts, rivets, marine hardware, electrical connectors, and contact springs.

6.1.2 Copper alloy No. 651 is intended for cold-forming and cold-heading purposes.

6.1.3 Copper alloy 655 is intended for general use.

6.1.4 Copper alloy No. 661 is a leaded general purpose alloy which can be machined more readily than No. 651 or 655. Copper alloy No. 661 is not intended for cold heading or cold forming purposes.

6.1.5 Copper alloy No. 692 is intended for cold forming and cold heading suitable for fasteners, wood screws, or rivets.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Form, temper, alloy, and size of the material required (1.2.1).
- c. Whether material is required for spinning or drawing (3.2).
- d. The mechanical properties of shapes (table V).
- c. The character of the application of material, such as bending, forming, or shaping.
- f. The length required, whether exact, specific or stock lengths with or without ends (3.5).

- g. Corners or edges required if other than square or rounded are desired (3.5).
- h. When tolerances are required all plus or all minus (3.5.3).
- i. Whether material is to be furnished in flat lengths, or on reels or bucks, in coils or rolls (3.5 and 3.7).
- j. Whether material is to be packed by level A, B, or C (5.1).
- k. Special marking if required (3.6 and 5.2).
- l. Maximum gross weight of container.

6.3 The requirements for item identification marking (3.6) and for packing (5.1) and marking for shipment (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 Bar. A bar is a solid rectangular section, or one with two plane parallel surfaces and round or other simple regularly shaped edges, up to and including 12 inches in width and over 0.188 inch in thickness.

6.4.2 Rod. A rod is a round, hexagonal, or octagonal solid section furnished in straight lengths.

6.4.3 Shape. A shape is a solid section other than rectangular, square, or standard rod and wire sections. Shapes include such forms as angles, channels, bars, and material in bar form with other than square corners, round corners, rounded edges, or full-rounded edges.

6.4.4 Flat wire. Flat wire is a flat product up to and including 0.188 inch in thickness and up to and including 1-1/4 inch width with all surfaces rolled or drawn without previous slitting, shearing, or sawing. It may be furnished in straight lengths, or on spools, reels, or bucks.

6.4.5 Finished edge strip (see 6.4.8 (2)).

6.4.6 Plate. A plate is a flat rolled product over 3/16 inch (0.188 inch) in thickness and over 12 inches in width.

6.4.7 Sheet. A sheet is a flat rolled product up to and including 0.188 inch in thickness and over 20 inches in width.

6.4.8 Strip. A strip is a flat product, other than flat wire, up to and including 0.188 inch in thickness and generally furnished as follows:

- (1) With slit, sheared or slit and edge rolled edges in widths up to 20 inches, inclusive.
- (2) With finished drawn or rolled edges in widths over 1-1/4 inches to 12 inches, inclusive.

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6.4.9 Wire. A solid section, other than strip, furnished in coils, or on spools, reels, or bucks. Flat wire including square, however, may also be furnished in straight lengths.

6.5 Electrical conductivity. The electrical conductivity of copper alloy No. 647 in the hard temper (all available forms) conforming to this specification should be 26 to 44 percent IACS.

6.6 General information.

6.6.1 The thickness of plate, sheet, and strip should be stated in decimals of an inch.

6.6.2 Coiled rod, flat wire, or rolled sheet are generally more economical than material of the same cross section in straight or flat lengths.

6.7 Federal specifications do not include all types, classes or grades, etc., of the commodities indicated by the titles of the specifications, or which are commercially available, but are intended to cover the types, etc., which are suitable for Federal Government requirements.

MILITARY CUSTODIANS:

Army - MR
Navy - AS
Air Force - 84

Preparing activity:

Army - MR

Civil Agency Coordinating Activity:

Review activities:

Army - MR, EL,
Navy - SH, AS
DSA - IS

DC GOVT-DCG

User activities:

Army - GL
Air Force - 26

Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein. Price 15 cents each.