



Designation: B 30 – 05

Standard Specification for Copper Alloys in Ingot Form¹

This standard is issued under the fixed designation B 30; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for copper alloys in ingot form for remelting for the manufacturing of castings having the Copper Alloy UNS No. designation, commercial designations and nominal composition shown in [Table 1](#) and [Table 2](#).

1.2 A cross reference of Copper Alloy UNS Nos. and copper alloy casting specifications is given in [Table 3](#).

1.3 Inch-pound units are the standard. SI values given in parentheses are for information only.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:²

- [B 22](#) Specification for Bronze Castings for Bridges and Turntables
- [B 61](#) Specification for Steam or Valve Bronze Castings
- [B 62](#) Specification for Composition Bronze or Ounce Metal Castings
- [B 66](#) Specification for Bronze Castings for Steam Locomotive Wearing Parts
- [B 67](#) Specification for Car and Tender Journal Bearings, Lined³
- [B 148](#) Specification for Aluminum-Bronze Sand Castings
- [B 176](#) Specification for Copper-Alloy Die Castings
- [B 194](#) Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar
- [B 208](#) Practice for Preparing Tension Test Specimens for Copper Alloy Sand, Permanent Mold, Centrifugal, and Continuous Castings

- [B 271](#) Specification for Copper-Base Alloy Centrifugal Castings
- [B 369](#) Specification for Copper-Nickel Alloy Castings
- [B 427](#) Specification for Gear Bronze Alloy Castings
- [B 505/B 505M](#) Specification for Copper-Base Alloy Continuous Castings
- [B 584](#) Specification for Copper Alloy Sand Castings for General Applications
- [B 763](#) Specification for Copper Alloy Sand Castings for Valve Application
- [B 770](#) Specification for Copper-Beryllium Alloy Sand Castings for General Applications
- [B 806](#) Specification for Copper Alloy Permanent Mold Castings for General Applications
- [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 54](#) Test Methods for Chemical Analysis of Special Brasses and Bronzes³
- [E 62](#) Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)
- [E 76](#) Test Methods for Chemical Analysis of Nickel-Copper Alloys³
- [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 581](#) Test Methods for Chemical Analysis of Manganese-Copper Alloys

3. Ordering Information

3.1 Orders for ingot should include the following information:

- 3.1.1 ASTM designation and year of issue (for example, B 30 – 05),
- 3.1.2 Copper Alloy UNS No. (for example, C83450 and [Table 1](#), [Table 2](#), [Table 4](#), and [Table 5](#)),
- 3.1.3 Quantity; total weight, and
- 3.1.4 When purchase is for agencies of U.S. government.

3.2 The following options are available under this specification and shall be specified in the contract or purchase order when required:

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.05 on Castings and Ingots for Remelting.

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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 Withdrawn.

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

TABLE 1 Nominal Compositions

Alloy Name	Copper Alloy UNS No.	Previously Used Designation	Commercial Designation	Nominal Composition, %										
				Copper	Tin	Lead	Zinc	Nickel	Iron	Aluminum	Manganese	Silicon	Niobium	Bismuth
Leaded red brass	C83450	...		88	2.5	2	6.5	1	...	...	...	...	...	...
	C83600	4A	85-5-5-5 or No. 1 composition	85	5	5	5	...	...	...	...	...	...	...
	C83800	4B	commercial red brass, 83-4-6-7	83	4	6	7	...	...	...	...	...	...	...
Leaded semi-red brass	C84200	...	semi-red brass, 80-5-2-13	80	5	2	13	...	...	...	...	...	...	...
	C84400	5A	valve composition 81-3-7-9	81	3	7	9	...	...	...	...	...	...	...
	C84800	5B	semi-red brass, 76-2½-6½-15	76	2.5	6.5	15	...	...	...	...	...	...	...
Leaded yellow brass	C85200	6A	high-copper yellow brass	72	1	3	24	...	...	...	...	...	...	...
	C85400	6B	commercial No. 1 yellow brass	67	1	3	29	...	...	...	...	...	...	...
	C85700	6C	60-40 leaded yellow (naval) brass	61	1	1	37	...	...	...	...	...	...	...
Leaded high-strength yellow brass and high-strength yellow brass	C85800	...	die-cast yellow brass	62	1	1	36	...	...	...	...	...	...	...
	C86100	...	high-strength manganese bronze	67	...	...	21	...	3	5	4	...	...	...
	C86200	8B	high-strength manganese bronze	63	...	...	27	...	3	4	3	...	...	...
Leaded high-strength yellow brass and high-strength yellow brass	C86300	8C	high-strength manganese bronze	61	...	...	27	...	3	6	3	...	...	...
	C86400	7A	leaded manganese bronze	58	1	1	38	...	1	0.5	0.5	...	...	...
	C86500	8A	No. 1 manganese bronze	58	...	...	39	...	1	1	1	...	...	...
Silicon bronze	C86700	...	leaded manganese bronze	58	1	1	34	...	2	2	2	...	...	...
	C87300	...	silicon bronze	95	...	...	...	...	...	1	4	...	...	...
	C87400	13A	silicon brass	82	...	0.5	14	...	...	...	...	3.5	...	...
Silicon brass	C87500	13B	silicon brass	82	...	...	14	...	...	...	...	4	...	...
	C87600	...	silicon bronze	91	...	...	5	...	...	...	...	4	...	...
Silicon bronze	C87610	...	silicon bronze	92	...	...	4	...	...	...	...	4	...	...
	C87800	...	die-cast silicon brass	82	...	...	14	...	...	...	...	4	...	...
Silicon brass	C89320 ^A	...	lead-free bronze	89	6	...	...	...	...	...	...	...	...	...
Bismuth tin bronze	C89510 ^B	...	lead-free bronze	87	5.0	...	5.0	...	...	...	...	...	...	1.0
	C89520 ^C	...	lead-free brass	86	5.5	...	5	...	...	...	...	...	...	1.9
Bismuth selenium yellow brass	C89540 ^D	...	lead-free yellow brass	61	0.8	...	36	0.5	0.3	0.4	...	...	...	0.9
	C89836	...	lead-free bronze	89.5	5.5	...	3.0	...	...	...	...	...	...	2.0
Bismuth Bronze	C89844	...	cast bismuth brass	84.5	4	...	8	...	...	...	...	...	...	3
Tin bronze and leaded tin bronze	C90300	1B	88-8-0-4 or modified "G" bronze	88	8	...	4	...	...	...	...	...	...	...
	C90500	1A	88-10-0-2 or "G" bronze	88	10	...	2	...	...	...	...	...	...	...
High-lead tin bronze	C90700	...	89-11 gear bronze	89	11	...	...	...	...	...	...	...	...	...
	C90800	...	88-12 gear bronze	88	12	...	...	...	...	...	...	...	...	...
High-lead tin bronze	C91000	...	85-15 tin bronze	85	15	...	...	...	...	...	...	...	...	...
	C91100	...	84-16 tin bronze	84	16	...	...	...	...	...	...	...	...	...
High-lead tin bronze	C91300	...	81-19 tin bronze or bell metal	81	19	...	...	...	...	...	...	...	...	...
	C91600	...	nickel gear bronze	88	10.5	...	...	1.5	...	...	...	...	...	...
High-lead tin bronze	C91700	...	nickel gear bronze	86.5	12	...	...	1.5	...	...	...	...	...	...
	C92200	2A	steam or valve bronze-Navy "M"	88	6	1.5	4.5	...	...	...	...	...	...	...
High-lead tin bronze	C92210	...	...	88	5	2	4	1	...	...	...	...	...	...
	C92300	2B	87-8-1-4 Navy P-C	87	8	1	4	...	...	...	...	...	...	...
High-lead tin bronze	C92500	...	87-11-1-0-1 leaded gear bronze	87	11	1	...	1	...	...	...	...	...	...
	C92600	...	87-10-1-2 leaded tin bronze	87	10	1	2	...	...	...	...	...	...	...
High-lead tin bronze	C92700	...	88-10-2-0 leaded tin bronze	88	10	2	...	...	...	...	...	...	...	...
	C92800	...	79-16-5 leaded tin bronze	79	16	5	...	...	...	...	...	...	...	...
High-lead tin bronze	C92900	...	leaded gear bronze	84	10	2.5	...	3.5	...	...	...	...	...	...
	C93200	3B	83-7-7-3	83	7	7	3	...	...	...	...	...	...	...
High-lead tin bronze	C93400	...	84-8-8	84	8	8	...	...	...	...	...	...	...	...
	C93500	3C	85-5-9-1	85	5	9	1	...	...	...	...	...	...	...
High-lead tin bronze	C93600	...	81-7-12	81	7	12	...	...	...	...	...	...	...	...
	C93700	3A	80-10-10	80	10	10	...	...	...	...	...	...	...	...
High-lead tin bronze	C93800	3D	78-7-15	78	7	15	...	...	...	...	...	...	...	...
	C93900	...	77-6-16-1 high-lead-tin bronze	77	6	16	1	...	...	...	...	...	...	...
High-lead tin bronze	C94000	...	72-13-15	72	13	15	...	...	...	...	...	...	...	...
	C94100	...	journal bronze	75	5	18	2	...	...	...	...	...	...	...
High-lead tin bronze	C94300	...	71-5-24	71	5	24	...	...	...	...	...	...	...	...
	C94400	...	81-8-11	81	8	11	...	...	...	...	...	...	...	...
High-lead tin bronze	C94500	...	73-7-20	73	7	20	...	...	...	...	...	...	...	...
	C94700	...	nickel-tin bronze Grade "A"	88	5	...	2	5	...	...	...	...	...	...

TABLE 1 *Continued*

Alloy Name	Copper Alloy UNS No.	Previously Used Designation	Commercial Designation	Nominal Composition, %										
				Copper	Tin	Lead	Zinc	Nickel	Iron	Aluminum	Manganese	Silicon	Niobium	Bismuth
Aluminum bronze	C94800		lead nickel-tin bronze Grade "B"	87	5	1	2	5	...	...	...	...	...	...
	C94900		lead nickel-tin bronze Grade "C"	80	5	5	5	5	...	...	...	...	...	...
	C95200	9A	Grade A	88	...	...	...	...	3	9	...	...	...	...
	C95300	9B	Grade B	89	...	...	...	...	1	10	...	...	...	...
	C95400	9C	Grade C	86	...	...	...	...	4	10	...	...	...	...
	C95410			84	...	...	...	2	4	10	...	...	...	...
Silicon aluminum bronze	C95500	9D	Grade D	81	...	...	...	4	4	11	...	...	...	...
	C95520		nickel-aluminum bronze	78.5	...	...	...	5.5	5.0	11	...	...	...	...
Manganese aluminum bronze	C95600	9E	silicon-aluminum bronze	91	...	...	...	...	...	7	...	2	...	...
Nickel aluminum bronze	C95700	9F	manganese-aluminum bronze	75	...	...	...	2	3	8	12	...	...	...
	C95800		nickel-aluminum bronze	81	...	...	...	4.5	4	9	1.5	...	...	...
Aluminum bronze	C95900		aluminum bronze	82.5	...	...	...	...	4.5	13	...	...	...	...
Cupro-nickel	C96200		90-10 cupro-nickel	87	...	...	...	10	1.5	...	1	...	1	...
	C96400		70-30 cupro-nickel	66	...	...	...	30.5	0.5	...	1	...	1	...
Leaded nickel bronze	C96800		spinodal alloy	82	8	...	...	10	...	...	...	...	0.2	...
	C97300	10A	12 % lead nickel silver	57	2	9	20	12	...	...	...	...	...	...
	C97600	11A	20 % lead nickel silver	64	4	4	8	20	...	...	...	...	...	...
	C97800	11B	25 % lead nickel silver	66	5	2	2	25	...	...	...	...	...	...
Special alloys	C99400			87	...	...	4.4	3.0	3.0	1.6	...	1.0	...	...
	C99500			87	...	...	1.5	4.5	4.0	1.7	...	1.3	...	...
White brass	C99700			58	...	1.5	22.5	5.0	...	1.0	12	...	...	...
	C99750			58	...	1.0	20.0	1.0	20

^A Bismuth 5.0.
^B Selenium 0.5.
^C Selenium 0.9.
^D Selenium 0.03.

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TABLE 2 *Nominal Compositions*

Alloy Name	Copper Alloy UNS No.	Previous Designation	Copper	Nickel	Iron	Silicon	Beryllium	Cobalt	Chromium	Zirconium	Titanium	Manganese
Copper beryllium	C81400	70C	99.1	...	...	...	0.06	...	0.8	...	...	...
	C82000	10C	97	...	...	...	0.5	2.5	...	...	...	...
	C82200	3C, 14C	98	1.5	...	...	0.5	...	...	...	...	...
	C82400 ^A	165C, 165CT ^A	97.8	...	...	...	1.7	0.5	...	...	...	...
	C82500 ^A	20C, 20CT ^A	97.2	...	...	0.3	2.0	0.5	...	...	...	...
	C82510	21C	96.6	...	...	0.3	2.0	1.1	...	...	...	...
	C82600 ^A	245C, 245CT ^A	96.8	...	...	0.3	2.4	0.5	...	...	...	...
	C82800 ^A	275C, 275CT ^A	96.6	...	...	0.3	2.6	0.5	...	...	...	...
	C96700	72C	67.2	31.0	0.6	...	1.2	...	...	0.3	0.3	0.6

^A When fine grained castings are specified, 0.02–0.12 titanium is added.

3.2.1 Mechanical requirements, when specified in the purchase order (Section 7).

3.2.2 Nickel content in Copper Alloys UNS Nos. C90300, C90500, C92200, and C92300 (Table 4).

3.2.3 Weldability test for Copper Alloys UNS Nos. C96200 and C96400 (Section 7).

3.2.4 Lot consisting of ingots from more than a single heat or melt (Section 10.1.1).

3.2.5 Place of inspection (Section 14).

3.2.6 Type of ingot surface (5.1).

4. Material and Manufacture

4.1 *Material*—Any material may be used which when melted will produce an alloy of the required chemical composition and mechanical requirements.

4.2 *Manufacture*:

4.2.1 Any manufacturing process may be used that will yield ingot of uniform composition that is free of defects of a nature that would render the ingot unsuitable for remelting.

4.2.2 Each heat or lot of ingot shall maintain heat identification numbers.

5. Workmanship, Finish and Appearance

5.1 The ingots shall have the surface specified in the purchase order (3.2.6).

6. Chemical Composition

6.1 The ingot shall conform to the requirements given in Table 4 or Table 5 for the specified alloy. Ingot is an intermediate product, therefore the limits listed in Table 4 and Table 5 may be more restrictive than those applicable for cast products produced from the ingot after remelting.

NOTE 1—Table 5 contain the requirements for copper-beryllium alloys.

6.1.1 Since no recognized test method is known to be published, the determination of bismuth shall be subject to agreement between the manufacturer or supplier and the purchaser.

TABLE 3 Alloy/Specification Cross Reference

Copper Alloy UNS No.	ASTM Copper Alloy Casting Specification															
	B 22	B 30	B 61	B 62	B 66	B 67	B 148	B 176	B 271	B 369	B 427	B 505	B 584	B 763	B 770	B 806
C81400	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82000	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82200	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82400	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82500	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82510	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82600	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C82800	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C83450	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C83600	...	X	...	X	...	...	...	...	X	...	...	X	X	...	...	...
C83800	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C84200	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C84400	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C84800	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C85200	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C85400	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C85700	...	X	...	...	...	...	...	X	X	...	...	X	X	X	...	...
C85800	...	X	...	...	...	...	...	X	...	...	...	...	...	...	...	...
C86100	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C86200	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C86300	X	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C86400	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C86500	...	X	...	...	...	...	...	X	X	...	...	X	X	X	...	...
C86700	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C87300	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C87400	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C87500	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	X
C87600	...	X	...	...	...	...	...	...	X	...	...	...	X	X	...	...
C87610	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C87800	...	X	...	...	...	...	...	X	...	...	...	...	...	...	...	X
C89320	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C89510	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89520	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89540	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	X
C89836	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89844	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C90300	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C90500	X	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C90700	...	X	...	...	...	...	...	...	...	...	X	X	...	...	...	...
C90800	...	X	...	...	...	...	...	...	...	...	X	...	...	...	...	...
C91000	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C91100	X	X	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C91300	X	X	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C91600	...	X	...	...	...	...	...	...	...	...	X	...	...	...	...	...
C91700	...	X	...	...	...	...	...	...	...	...	X	...	...	...	...	...
C92200	...	X	X	...	...	...	...	...	X	...	...	X	X	...	...	...
C92210	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C92300	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C92500	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C92600	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C92700	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C92800	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C92900	...	X	...	...	...	...	...	...	...	...	X	X	...	...	...	...
C93200	...	X	...	...	X	...	...	...	X	...	...	X	X	X	...	...
C93400	...	X	...	...	X	...	...	...	...	...	...	X	...	...	...	...
C93500	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C93600	...	X	...	...	X	...	...	...	X	...	...	X	...	...	...	...
C93700	X	X	...	...	X	...	...	...	X	...	...	X	X	X	...	...
C93800	...	X	...	...	X	...	...	...	X	...	...	X	X	X	...	...
C93900	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C94000	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C94100	...	X	...	...	...	X	...	...	...	...	...	X	...	...	...	...
C94300	...	X	...	...	X	...	...	...	X	...	...	X	X	X	...	...
C94400	...	X	...	...	X	...	...	...	...	...	...	...	...	...	...	...
C94500	...	X	...	...	X	...	...	...	...	...	...	...	...	...	...	...
C94700	...	X	...	...	...	...	...	...	...	...	...	X	X	X	...	...
C94800	...	X	...	...	...	...	...	...	...	...	...	X	X	X	...	...
C94900	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C95200	...	X	...	...	...	...	X	...	X	...	...	X	...	X	...	...
C95300	...	X	...	...	...	...	X	...	X	...	...	X	...	X	...	X
C95400	...	X	...	...	X	...	X	...	X	...	...	X	...	X	...	X
C95410	...	X	...	...	...	...	X	...	X	...	...	X	...	X	...	X

TABLE 3 *Continued*

Copper Alloy UNS No.	ASTM Copper Alloy Casting Specification															
	B 22	B30	B 61	B 62	B 66	B 67	B 148	B 176	B 271	B 369	B 427	B505	B 584	B 763	B 770	B 806
C95500	...	X	...	...	...	...	X	...	X	...	...	X	...	X	...	X
C95520	...	X	...	...	...	...	X	...	X	...	...	X	...	...	...	...
C95600	...	X	...	...	...	...	X	...	...	...	...	...	...	X	...	...
C95700	...	X	...	...	...	...	X	...	...	...	...	X	...	...	...	...
C95800	...	X	...	...	...	...	X	...	X	...	...	X	...	X	...	X
C95900	...	X	...	...	...	...	X	...	X	...	...	X	...	...	...	...
C96200	...	X	...	...	...	...	...	...	...	X	...	...	...	...	...	...
C96400	...	X	...	...	...	...	...	...	...	X	...	X	...	...	...	...
C96700	...	X	...	...	...	...	...	...	...	...	...	...	...	...	X	...
C96800	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C97300	...	X	...	...	...	...	...	X	...	...	...	X	X	X	...	...
C97600	...	X	...	...	...	...	...	X	...	...	...	X	X	X	...	...
C97800	...	X	...	...	...	...	...	X	...	...	...	X	X	X	...	...
C99400	...	X	...	...	...	...	...	...	...	...	...	...	...	X	...	...
C99500	...	X	...	...	...	...	...	...	...	...	...	...	...	X	...	...
C99700	...	X	...	...	...	...	...	X	...	...	...	...	...	...	...	...
C99750	...	X	...	...	...	...	...	X	...	...	...	...	...	...	...	...

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

6.2 For alloys in which copper is designated as the remainder, copper may be taken as the difference between the sum of results for specified elements and 100 %.

7. Mechanical Properties

7.1 Ingot is an intermediate product intended for remelting by the purchaser, therefore, mechanical properties are not applicable.

NOTE 2—However, when specified in the purchase order, ingot when remelted and cast into tension test coupons shall meet the mechanical requirements of a specified casting specification. The place of remelting and testing shall be as agreed upon between the purchaser and the manufacturer. Mechanical requirements for those Copper Alloy UNS Numbers for which no mechanical requirements are given in the applicable casting specification shall be by agreement between the purchaser and the manufacturer.

7.2 **Table 3** provides a cross reference between the Copper Alloy UNS Nos. in this specification and the casting specifications in which they appear.

8. Performance Requirements

8.1 *Weldability*—When specified in the contract or purchase order, ingots produced from Copper Alloys No. C96200 and C96400 shall pass the weldability test requirements when subjected to test in accordance with the Weldability Test Section of Specification **B 369**.

9. Purchases for Agencies of the U.S. Government

9.1 When a purchase is specified in the contract or purchase order to be for an agency of the U.S. government, the material shall conform to the Special Government Requirements as stipulated in the Supplementary Requirements section.

10. Sampling

10.1 The lot size, portion size, and selection of portion pieces shall be as follows:

10.1.1 *Lot Size*—An inspection lot shall be all ingots subject to inspection which are produced from a single furnace charge during one casting period.

10.1.2 *Portion Size*—The portion size shall be not less than 100 lbs (45.5 kg).

10.1.3 *Selection of Portion Pieces*—The sample ingot(s) shall be randomly selected.

10.2 Chemical Analysis:

10.2.1 The sample for chemical analysis shall be taken in accordance with Practice **E 255** from the piece(s) selected in **10.1.2**. The minimum weight of the composite sample shall be 150 g.

10.2.2 Instead of sampling in accordance with Practice **E 255**, the manufacturer shall have the option of sampling at the time the ingots are poured and at least two samples shall be taken during the pouring period.

10.2.2.1 When chemical composition is determined during the course of manufacture, sampling and analysis of the finished product is not required.

10.3 Tension Testing:

10.3.1 Tension test coupons, when required by the purchase order, shall be cast to the form and dimensions of the applicable figure in Practice **B 208** as prescribed in the applicable casting specification.

10.3.2 Tension test coupons for those Copper Alloy UNS Nos. for which no applicable figure in Practice **B 208** is prescribed in the applicable casting specification shall be as agreed upon between the manufacturer or supplier and the purchaser.

11. Number of Tests and Retests

11.1 Tests:

11.1.1 *Chemical Analysis*—Chemical composition shall be determined as the average of results from at least two determinations for each element with a limiting value listed in **Table 4** or **Table 5** for the specified copper alloy.

11.1.2 *Weldability Test*—When required, Copper Alloy UNS Nos. C96200 and C96400 shall meet the requirements of the weldability test.

11.2 Retests:

TABLE 4 Ingot Chemical Requirements

Classification	Copper Alloy UNS No.	Composition, % max except as indicated														Corresponding ASTM Casting Specifications ^A
		Copper	Tin	Lead	Zinc	Iron	Anti-mony	Nickel (incl Cobalt)	Sulfur	Phosphorus	Aluminum	Manganese	Silicon	Bismuth	Other	
Leaded red brass	C83450	87.0–89.0	2.2–3.0	1.5–2.5	5.8–7.5	0.25	0.25	0.8–1.5	0.08	0.03	0.005	...	0.005		...	B 584 (C83450) B 763 (C83450)
	C83600	84.0–86.0 ^B	4.3–6.0	4.0–5.7	4.3–6.0	0.25	0.25	0.8	0.08	0.03	0.005		0.005			B 62 (C83600) B 271 (C83600) B 505 (C83600) B 584 (C83600)
	C83800	82.0–83.5 ^B	3.5–4.2	5.8–6.8	5.5–8.0	0.25	0.25	0.8	0.08	0.02	0.005		0.005			B 584 (C83800) B 271 (C83800) B 505 (C83800) B 763 (C83800)
Leaded semi-red brass	C84200	78.0–82.0	4.3–6.0	2.0–2.8	10.0–16.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005			B 505 (C84200)
	C84400	79.0–82.0 ^B	2.5–3.5	6.3–7.7	7.0–10.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005			B 584 (C84400) B 271 (C84400) B 505 (C84400) B 763 (C84400)
	C84800	75.0–76.7 ^B	2.3–3.0	5.5–6.7	13.0–16.0	0.35	0.25	0.8	0.08	0.02	0.005		0.005			B 584 (C84800) B 271 (C84800) B 505 (C84800) B 763 (C84800)
Leaded yellow brass	C85200	70.0–73.0	0.8–1.7	1.5–3.5	21.0–27.0	0.50	0.20	0.8	0.05	0.01	0.005		0.05			B 271 (C85200) B 584 (C85200) B 763 (C85200)
	C85400	66.0–69.0	0.50–1.5	1.5–3.5	25.0–31.0	0.50		0.8			0.005		0.05			B 271 (C85400) B 584 (C85400) B 763 (C85400)
	C85700	58.0–63.0	0.50–1.5	0.8–1.5	33.0–40.0	0.50		0.8			0.80		0.05			B 271 (C85700) B 176 (C85700) B 584 (C85700)
	C85710	58.0–63.0	1.0	1.0–2.5	32.0–39.0	0.8		1.0			0.20–0.8	0.50	0.05			B 763 (C85700) B 763 (C85710) B 584 (C85710)
	C85800	57.0 min ^C	1.5	1.5	31.0–41.0	0.50	0.05	0.50	0.05	0.01	0.50	0.25	0.25		0.05As	B 176
	C86100	66.0–68.0	0.10	0.10	remainder	2.0–4.0	...	...	...	...	4.5–5.5	2.5–5.0	...			
High-strength yellow brass	C86200	60.0–66.0	0.10	0.10	22.0–28.0	2.0–4.0		0.8			3.0–4.9	2.5–5.0				B 271 (C86200) B 505 (C86200) B 584 (C86200) B 763 (C86200)
	C86300	60.0–66.0	0.10	0.10	22.0–28.0	2.0–4.0		0.8			5.0–7.5	2.5–5.0				B 22 (C86300) B 271 (C86300) B 505 (C86300) B 584 (C86300) B 763 (C86300)
	C86400	56.0–62.0	0.50–1.0	0.50–1.3	34.0–42.0	0.40–2.0		0.8			0.50–1.5	0.10–1.0				B 271 (C86400) B 584 (C86400) B 763 (C86400)
	C86500	55.0–60.0	1.0	0.30	36.0–42.0	0.40–2.0		0.8			0.50–1.5	0.10–1.5				B 271 (C86500) B 176 (C86500) B 505 (C86500) B 584 (C86500) B 763 (C86500)
	C86700	55.0–60.0	1.5	0.50–1.5	30.0–38.0	1.0–3.0		0.8			1.0–3.0	1.0–3.5				B 584 (C86700) B 271 (C86700) B 763 (C86700)
	Silicon bronze and silicon brass	C87300	94.0 min		0.20	0.25	0.20						0.8–1.5	3.5–4.5			B 271 (C87300) B 584 (C87300) B 763 (C87300)
C87400		79.0 min ^C		1.0	12.0–16.0						0.5		2.5–4.0			B 271 (C87400) B 584 (C87400) B 763 (C87400)