



Designation: B 30 – 06a

## Standard Specification for Copper Alloys in Ingot Form<sup>1</sup>

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:<sup>2</sup>

- 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, Lined
- B 148** Specification for Aluminum-Bronze Sand Castings
- B 176** Specification for Copper-Alloy Die Castings<sup>3</sup>
- 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 Alloy Continuous Castings
- B 584** Specification for Copper Alloy Sand Castings for General Applications
- B 763** Specification for Copper Alloy Sand Castings for Valve Applications
- 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 Bronzes<sup>3</sup>
- E 62** Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)
- E 76** Test Methods for Chemical Analysis of Nickel-Copper Alloys<sup>3</sup>
- E 255** Practice for Sampling Copper and Copper Alloys for the 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:

<sup>1</sup> 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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<sup>2</sup> 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.

<sup>3</sup> 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	...	...	...
	C86700	...	leaded manganese bronze	58	1	1	34	...	2	2	2	...	...	...
Silicon bronze	C87300	...	silicon bronze	95	...	...	...	...	...	1	4	...	...	...
Silicon brass	C87400	13A	silicon brass	82	...	0.5	14	...	...	...	...	3.5	...	...
	C87500	13B	silicon brass	82	...	...	14	...	...	...	...	4	...	...
Silicon bronze	C87600	...	silicon bronze	91	...	...	5	...	...	...	...	4	...	...
	C87610	...	silicon bronze	92	...	...	4	...	...	...	...	4	...	...
Silicon brass	C87800	...	die-cast silicon brass	82	...	...	14	...	...	...	...	4	...	...
	C87850 <sup>A</sup>	...	Silicon brass	76	...	...	20.9	...	...	...	...	3	...	...
Bismuth tin bronze	C89320 <sup>B</sup>	...	lead-free bronze	89	6	...	...	...	...	...	...	...	...	...
Bismuth selenium brass	C89510 <sup>C</sup>	...	lead-free bronze	87	5.0	...	5.0	...	...	...	...	...	...	1.0
	C89520 <sup>D</sup>	...	lead-free brass	86	5.5	...	5	...	...	...	...	...	...	1.9
Bismuth selenium yellow brass	C89540 <sup>E</sup>	...	lead-free yellow brass	61	0.8	...	36	0.5	0.3	0.4	...	...	...	0.9
Bismuth red brass	C89833	...	Lead-free brass	89	5	...	3	...	...	...	...	...	...	2.2
Bismuth Bronze	C89836	...	lead-free bronze	89.5	5.5	...	3.0	...	...	...	...	...	...	2.0
Bismuth semi-red brass	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-leaded tin bronze	C90700	...	89-11 gear bronze	89	11	...	...	...	...	...	...	...	...	...
	C90800	...	88-12 gear bronze	88	12	...	...	...	...	...	...	...	...	...
	C91000	...	85-15 tin bronze	85	15	...	...	...	...	...	...	...	...	...
	C91100	...	84-16 tin bronze	84	16	...	...	...	...	...	...	...	...	...
	C91300	...	81-19 tin bronze or bell metal	81	19	...	...	...	...	...	...	...	...	...
	C91600	...	nickel gear bronze	88	10.5	...	...	1.5	...	...	...	...	...	...
	C91700	...	nickel gear bronze	86.5	12	...	...	1.5	...	...	...	...	...	...
	C92200	2A	steam or valve bronze-Navy "M"	88	6	1.5	4.5	...	...	...	...	...	...	...
	C92210	...	...	88	5	2	4	1	...	...	...	...	...	...
	C92300	2B	87-8-1-4 Navy P-C	87	8	1	4	...	...	...	...	...	...	...
	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	...	...	...	...	...	...	...
	C92700	...	88-10-2-0 leaded tin bronze	88	10	2	...	...	...	...	...	...	...	...
	C92800	...	79-16-5 leaded tin bronze	79	16	5	...	...	...	...	...	...	...	...
	C92900	...	leaded gear bronze	84	10	2.5	...	3.5	...	...	...	...	...	...
	C93200	3B	83-7-7-3	83	7	7	3	...	...	...	...	...	...	...
	C93400	...	84-8-8	84	8	8	...	...	...	...	...	...	...	...
C93500	3C	85-5-9-1	85	5	9	1	...	...	...	...	...	...	...	
C93600	...	81-7-12	81	7	12	...	...	...	...	...	...	...	...	
C93700	3A	80-10-10	80	10	10	...	...	...	...	...	...	...	...	
C93800	3D	78-7-15	78	7	15	...	...	...	...	...	...	...	...	
C93900	...	77-6-16-1 high-lead-tin bronze	77	6	16	1	...	...	...	...	...	...	...	
C94000	...	72-13-15	72	13	15	...	...	...	...	...	...	...	...	
C94100	...	journal bronze	75	5	18	2	...	...	...	...	...	...	...	
C94300	...	71-5-24	71	5	24	...	...	...	...	...	...	...	...	
C94400	...	81-8-11	81	8	11	...	...	...	...	...	...	...	...	
C94500	...	73-7-20	73	7	20	...	...	...	...	...	...	...	...	

**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
Nickel-tin bronze and leaded nickel tin bronze	C94700		nickel-tin bronze Grade "A"	88	5	...	2	5	...	...	...	...	...	...
	C94800		leaded nickel-tin bronze Grade "B"	87	5	1	2	5	...	...	...	...	...	...
	C94900		leaded nickel-tin bronze Grade "C"	80	5	5	5	5	...	...	...	...	...	...
Aluminum bronze	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	...	...	...	...
	C95500	9D	Grade D	81	...	...	...	4	4	11	...	...	...	...
	C95520		nickel-aluminum bronze	78.5	...	...	...	5.5	5.0	11	...	...	...	...
Silicon aluminum bronze	C95600	9E	silicon-aluminum bronze	91	...	...	...	...	7	...	2	...	...	...
Manganese aluminum bronze	C95700	9F	manganese-aluminum bronze	75	...	...	...	2	3	8	12	...	...	...
Nickel aluminum bronze	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	...
	C96800		spinodal alloy	82	8	...	...	10	...	...	...	...	0.2	...
Leaded nickel bronze	C97300	10A	12 % leaded nickel silver	57	2	9	20	12	...	...	...	...	...	...
	C97600	11A	20 % leaded nickel silver	64	4	4	8	20	...	...	...	...	...	...
	C97800	11B	25 % leaded 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	...	...	...

<sup>A</sup> Phosphorus 0.12.  
<sup>B</sup> Bismuth 5.0.  
<sup>C</sup> Selenium 0.5.  
<sup>D</sup> Selenium 0.9.  
<sup>E</sup> 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 <sup>A</sup>	165C, 165CT <sup>A</sup>	97.8	...	...	...	1.7	0.5	...	...	...	...
	C82500 <sup>A</sup>	20C, 20CT <sup>A</sup>	97.2	...	...	0.3	2.0	0.5	...	...	...	...
	C82510	21C	96.6	...	...	0.3	2.0	1.1	...	...	...	...
	C82600 <sup>A</sup>	245C, 245CT <sup>A</sup>	96.8	...	...	0.3	2.4	0.5	...	...	...	...
	C82800 <sup>A</sup>	275C, 275CT <sup>A</sup>	96.6	...	...	0.3	2.6	0.5	...	...	...	...
	C96700	72C	67.2	31.0	0.6	...	1.2	...	...	0.3	0.3	0.6

<sup>A</sup> 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

**TABLE 5 Chemical Requirements**

Classification	Copper Alloy UNS No.	Composition, % max except as indicated													
		Copper <sup>A</sup>	Beryllium	Cobalt	Nickel	Iron	Silicon	Zirconium	Titanium	Zinc	Chromium	Lead	Manganese	Aluminum	Tin
Copper beryllium <sup>B</sup>	C81400 remainder	0.05–0.10	...	...	...	...	...	...	...	...	0.6–1.0	...	...	...	...
	C82000 remainder	0.5–0.8	2.40–2.70	0.20	0.10	0.15	...	...	...	0.10	0.10	0.02	...	0.10	0.10
	C82200 remainder	0.40–0.8	0.30	1.0–2.0	...	...	...	...	...	...	...	...	...	...	...
	C82400 <sup>C</sup> remainder	1.65–1.85	0.20–0.65	0.20	0.20	...	...	...	...	0.10	0.10	0.02	...	0.15	0.10
	C82500 <sup>C</sup> remainder	1.95–2.25	0.35–0.70	0.20	0.25	0.20–0.35	...	...	...	0.10	0.10	0.02	...	0.15	0.10
	C82510 remainder	1.95–2.15	1.00–1.20	0.20	0.25	0.20–0.35	...	...	...	0.10	0.10	0.02	...	0.15	0.10
	C82600 <sup>C</sup> remainder	2.3–2.55	0.35–0.65	0.20	0.25	0.20–0.35	...	...	...	0.10	0.10	0.02	...	0.15	0.10
	C82800 <sup>C</sup> remainder	2.55–2.85	0.35–0.70	0.20	0.25	0.20–0.35	...	...	...	0.10	0.10	0.02	...	0.15	0.10
	C96700 remainder	1.10–1.20	...	29.0–33.0	0.40–1.0	0.15	0.15–0.35	0.15–0.35	...	...	...	0.01	0.40–1.0	...	...

<sup>A</sup> Copper plus sum of named elements, 99.5 %.

<sup>B</sup> Copper-beryllium alloys appear in Specification **B 770**, *Annual Book of ASTM Standards*, Vol 02.01.

<sup>C</sup> When fine grained castings are specified, 0.02–0.12 titanium is added for grain refinement, usually in the remelt ingot.

may be more restrictive than those applicable for cast products produced from the ingot after remelting.

NOTE 1—Table 5 contains 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 505M	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	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	...	...
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
C87850	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	X
C89320	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C89510	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89520	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89540	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	X
C89833	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89836	...	X	...	...	...	...	...	...	...	...	...	...	X	...	...	...
C89844	...	X	...	...	...	...	...	...	...	...	...	...	X	X	...	...
C90300	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C90500	...	X	...	...	...	...	...	...	X	...	...	X	X	X	...	...
C90700	...	X	...	...	...	...	...	...	...	...	X	X	...	...	...	...

**TABLE 5** *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 505M	B 584	B 763	B 770	B 806
C90800	...	X	...	...	...	...	...	...	...	...	X	...	...	...	...	...
C91000	...	X	...	...	...	...	...	...	...	...	...	X	...	...	...	...
C91100	X	X	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C91300	X	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
C95410	...	X	...	...	...	X	...	...	X	...	...	X	...	X	...	X
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	...	...	...	...	...	...	...

**TABLE 4** Ingot Chemical Requirements

Classification	Copper Alloy UNS No.	Composition, % max except as indicated														Corresponding ASTM Casting Specifications <sup>A</sup>
		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 <sup>B,C</sup>	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 <sup>B,C</sup>	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 <sup>B,C</sup>	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)

**TABLE 4 Continued**

Classification	Copper Alloy UNS No.	Composition, % max except as indicated														Corresponding ASTM Casting Specifications <sup>A</sup>
		Copper	Tin	Lead	Zinc	Iron	Anti-mony	Nickel (incl Cobalt)	Sulfur	Phosphorus	Aluminum	Manganese	Silicon	Bismuth	Other	
Leaded semi-red brass	C84200	78.0–82.0 <sup>B,C</sup>	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 <sup>B,C</sup>	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 <sup>B,C</sup>	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 <sup>B,D</sup>	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 <sup>B,E</sup>	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 <sup>B,F</sup>	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) B 763 (C85700)
	C85800	57.0 min <sup>B,F</sup>	1.5	1.5	31.0–41.0	0.50	0.05	0.50	0.05	0.01	0.50	0.25	0.25		0.05 As	B 763 (C85700) B 176 (C85710)
	C86100	66.0–68.0 <sup>B,G</sup>	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 <sup>B,G</sup>	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 <sup>B,G</sup>	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 <sup>B,G</sup>	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 <sup>B,G</sup>	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 <sup>B,G</sup>	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 <sup>H</sup>		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 <sup>I</sup>		1.0	12.0–16.0						0.5		2.5–4.0			B 271 (C87400) B 584 (C87400) B 763 (C87400)
	C87500	79.0 min <sup>H</sup>		0.50	12.0–16.0						0.50		3.0–5.0			B 271 (C87500) B 806 (C87500) B 763 (C87500)
	C87600	88.0 min <sup>H</sup>		0.50	4.0–7.0	0.20						0.25	3.5–5.5			B 584 (C87600) B 271 (C87600) B 763 (C87600)
	C87610	90.0 min <sup>H</sup>	...	0.20	3.0–5.0	0.20	...	...	...	...		0.25	3.0–5.0			B 584 (C87610) B 763 (C87610)
	C87800	80.0 min <sup>H</sup>	0.25	0.15	12.0–16.0	0.15	0.05	0.20	0.05	0.01	0.15	0.15	3.8–4.2		0.05 As 0.01 Mg	B 176 (C87800) B 806 (C87800)