The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE 463

REV. SEP81

Issued 1911-06
Revised 1981-09

Superseding J463 JUN76

Submitted for recognition as an American National Standard

WROUGHT COPPER AND COPPER ALLOYS

1. ***Scope—***This standard[1] describes the chemical, mechanical, and dimensional requirements for a wide range of wrought copper and copper alloys used in the automotive and related industries.

1.1 Wrought forms covered by this standard include sheet, strip, bar, plate, rod, wire, tube, and shapes; however, form required must be specified by purchaser.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of this specification to the extent specified herein.

2.1.1 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B248—Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B249—Specificaiton for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes
ASTM B250—Specification for General Requirements for Wrought Copper-Alloy Wire
ASTM B251—Specification for General Requirements for Wrougth Copper-Alloy Wire

3. ***Chemical and Mechanical Properties—***The chemical composition of products identified by the UNS designations shall conform to the limits shown in Table 1. Mechanical properties shall conform to limits shown in Table 2A (metric(si) units) or 2B (customary units).

3.1 Products shall be of uniform quality and free from defects (such as desegregation, pipes, nonmetallic inclusions, cracks, seams, laps, buckles, and die or roll marks) detrimental to their appearance, fabrication and/or performance in service.

3.2 Both inside and outside surfaces of tubing shall be clean and smooth.

3.3 Forgings shall not be brazed, soldered, welded, or ground to hide defects or to salvage defective products, unles specifically approved by the purchaser.

---

1. If none of the alloys listed herein include the characteristics required for a particular application, users are encouraged to consider alloy specifications listed in CDA Publication "Standards Handbook for Copper Alloy Wrought Mill Products," published by the Copper Development Association, 405 Lexington Avenue, New York, NY 10017, before creating specifications of their own.

QUESTIONS REGARDING THIS DOCUMENT: (412) 772-8512 FAX: (412) 776-0243
TO PLACE A DOCUMENT ORDER; (412) 776-4970 FAX: (412) 776-0790
SAE WEB ADDRESS http://www.sae.org

3.4 Necessary brazes in soft annealed copper wire shall be in accordance with best commercial practice.

4. ***Testing—***Unless otherwise specified all properties stated herein are based on latest methods of test published in the ASTM Standards.

5. ***Dimensional Tolerances—***Standard forms of products identified by the UNS designations shall conform to the dimensions specified by the purchaser, within the tolerance limits shown in Tables 4 - 11, the "key" for which is Table 3, "Index to Standard Product Tolerance Tables." Specified dimensions not covered by these tables shall be within the tolerance limits shown in ASTM B248 (plate, sheet, strip, and rolled bar), ATM B249 (rod, bar, and shapes), ASTM B250 (wire), and ASTM B251 (pipe and tube). (Note: the terms "refractory" and "nonrefractory" used in Table 3 are common in the copper industry, the first applying to alloys which, because of their hardness on abrasiveness, require dimensional tolerances greater than those established for nonrefractory alloys.)

TABLE 1—CHEMICAL COMPOSITIONS OF WROUGHT COPPER ALLOYS [a]

Copper Alloy UNS No.[b]	% by Weight, Maximum (Except where otherwise noted)											
	Cu	Fe	Zn	Pb	Sn	Mn	Ni	Al	Si	P	Be	Other Named Elements
C10200[c]	99.9 min	—	—	—	—	—	—	—	—	—	—	—
C11000[c]	99.9 min	—	—	—	—	—	—	—	—	—	—	—
C11100[c]	99.9 min	—	—	—	—	—	—	—	—	—	—	See Note d
C11300[c,e]	99.9 min[f]	—	—	—	—	—	—	—	—	—	—	Ag, .027 min (8)[g]
C11400[c,e]	99.9 min[f]	—	—	—	—	—	—	—	—	—	—	Ag, .034 min (10)[g]
C11500[c,e]	99.9 min[f]	—	—	—	—	—	—	—	—	—	—	Ag, .054 min (16)[g]
C11600[c,e]	99.9 min[f]	—	—	—	—	—	—	—	—	—	—	Ag, .085 min (25)[g]
C12000	99.9 min	—	—	—	—	—	—	—	—	.004–.012	—	—
C12200[h]	99.9 min	—	—	—	—	—	—	—	—	.015–.040	—	—
C14500[i]	99.9 min[j]	—	—	—	—	—	—	—	—	.004–.012[k]	—	Te, .40–.60
C14700	99.9 min[j]	—	—	—	—	—	—	—	—	—	—	S, .2–.5
C15000	99.8 min	—	—	—	—	—	—	—	—	—	—	Zr, .10–20
C16200	99.8 min	.02	—	—	—	—	—	—	—	—	—	Cd, .7–1.2
C17000	99.5 min[m]	Note n	—	—	—	—	Note n	—	—	—	1.6–1.8	Co[n]
C17200	99.5 min[m]	Note n	—	—	—	—	Note n	—	—	—	1.8–2.0	Co[n]
C17500	99.5 min[m]	.10	—	—	—	—	—	—	—	—	.40–.70	Co, 2.4–2.7
C17600	99.5 min[m]	—	—	—	—	—	—	—	—	—	.25–.50	Co, 1.4–1.7 Ag, .9–1.1
C18400	99.8 min[o]	.15	.70	—	—	—	—	—	.10	.05	—	As, .005 Cr, .40–1.2 Li, .05 Ca, .005
C18700	99.9 min[o]	—	—	.8–1.5	—	—	—	—	—	—	—	—
C19200	98.7 min	.8–1.2	—	—	—	—	—	—	—	.01–.04	—	—
C21000	94.0–96.0	.05	rem	.05	—	—	—	—	—	—	—	—
C22000	89.0–91.0	.05	rem	.05	—	—	—	—	—	—	—	—
C23000	84.0–86.0[p]	.05	rem	.05[p]	—	—	—	—	—	—	—	—
C24000	78.5–81.5	.05	rem	.05	—	—	—	—	—	—	—	—
C26000	68.5–71.5	.05	rem	.07	—	—	—	—	—	—	—	—
C26800	64.0–68.5	.05	rem	.15	—	—	—	—	—	—	—	—
C27000	63.0–68.5	.07	rem	.10	—	—	—	—	—	—	—	—
C33000	65.0–68.0	.07	rem	.20–.8[q]	—	—	—	—	—	—	—	—
C33100	65.0–68.0	.06	rem	.70–1.2	—	—	—	—	—	—	—	—
C34200	62.5–66.5	.10	rem	1.5–2.5	—	—	—	—	—	—	—	—
C34500	62.0–64.0	.10	rem	1.5–2.8	—	—	—	—	—	—	—	
C35000	59.0–64.0[r]	.10	rem	.8–1.4	—	—	—	—	—	—	—	—
C36000	60.0–63.0	.35	rem	2.5–3.7	—	—	—	—	—	—	—	—
C37700	58.0–62.0	.30	rem	1.5–2.5	—	—	—	—	—	—	—	—
C46400	59.0–62.0	.10	rem	.20	.50–1.0	—	—	—	—	—	—	—
C46500	59.0–62.0	.10	rem	.20	.50–1.0	—	—	—	—	—	—	As, .02–.10

ϕ *ed.* **TABLE 1—CHEMICAL COMPOSITIONS OF WROUGHT COPPER ALLOYS[a] (CONTINUED)**

Copper Alloy UNS No.[b]	% by Weight, Maximum (Except where otherwise noted)											
	Cu	Fe	Zn	Pb	Sn	Mn	Ni (incl. Co)	Al	Si	P	Be	Other Named Elements
C46600	59.0–62.0	.10	rem	.20	.50–1.0	—	—	—	—	—	—	Sb, .02–.10
C46700	59.0–62.0	.10	rem	.20	.50–1.0	—	—	—	—	0.2–.10	—	—
C51000	99.5 min[a]	.10	.30	.05	4.2–5.8	—	—	—	—	.03–.35	—	—
C51100	99.5 min[a]	.10	.30	.05	3.5–4.9	—	—	—	—	.03–.35	—	—
C52100	99.5 min[a]	.10	.20	.05	7.0–9.0	—	—	—	—	.03–.35	—	—
C52400	99.5 min[a]	.10	.20	.05	9.0–11.0	—	—	—	—	.03–.35	—	—
C54400	99.5 min[t]	.10	1.5–4.5	3.5–4.5	3.5–4.5	—	—	—	—	.01–.50	—	—
C60800	88.8–92.5[f]	.10	—	.10	—	—	—	5.0–6.5	—	—	—	As, .2–.35
C61300	88.5–91.5[f]	2.0–3.0	.05	.01	—	.15	—	6.0–7.5	—	.015	—	See Note v
C61400	88.0–92.5[f]	1.5–3.5	.20	.10	—	1.0	—	6.0–8.0	—	.015	—	—
C61800	86.9–91.0[f]	.50–1.5	.02	.02	—	—	—	8.5–11.0	.10	—	—	—
C62300	82.2–89.5[f]	2.0–4.0	—	—	.60	.50	1.0	8.5–11.0	.25	—	—	—
C62400	82.8–88.0[f]	2.0–4.5	—	—	.20	.30	—	10.0–11.5	.25	—	—	—
C63000	78.0–85.0[f]	2.0–4.0	.30	—	.20	1.5	4.0–5.5	9.0–11.0	.25	—	—	—
C64200	88.2–92.2[f]	.30	.50	.05	.20	.10	.25	6.3–7.6	1.5–2.2	—	—	As, .15
C65500	rem[f]	.8	1.5	.05	—	.50–1.3	.60	—	2.8–3.8	—	—	—
C67000	63.0–68.0	2.0–4.0	rem	.20	.50	2.5–5.0	—	3.0–6.0	—	—	—	—
C67300	58.0–63.0	.50	rem	.4–3.0	.30	2.0–3.5	.25	.25	.50–1.5	—	—	—
C67400	57.0–60.0	.35	rem	.50	.30	2.0–3.5	.25	.50–2.0	.50–1.5	—	—	—
C67500	57.0–60.0	.8–2.0	rem	.20	.50–1.5	.05–.50	—	.25	—	—	—	—
C70600	99.5 min[o]	1.0–1.8	1.0[u]	.05[u]	—	1.0	9.0–11.0	—	—	—	—	See Note u
C71000	99.5 min[o]	1.0	1.0	.05	—	1.0	19.0–23.0	—	—	—	—	—
C71500	99.5 min[o]	.40–.70	1.0[u]	.05[u]	—	1.0	29.0–33.0	—	—	—	—	See Note u
C75200	63.0–68.5	.25	rem	.10	—	.50	16.5–19.5	—	—	—	—	—
C77000	53.5–56.5	.25	rem	.10	—	.50	16.5–19.5	—	—	—	—	—

ϕ [a] These specification limits do not preclude the possible presence of other unnamed elements. However, analysis shall regularly be made only for the minor elements listed in the table, plus all major elements except one. The major element which is not analyzed shall be determined by difference between the sum of those elements analyzed and 100%. By agreement between manufacturer and purchaser, analysis may be required and limits established for elements not specified.

[b] Unified Numbering System. For cross reference to SAE, Former SAE, ASTM, and Former Trade Names, see SAE J461.

[c] These are high conductivity coppers which have in the annealed condition a minimum conductivity of 100% IACS.

[d] Small amounts of Cd or other elements may be added by agreement to improve resistance to softening at elevated temperatures.

[e] This includes Low Resistance Lake Copper and Electrolytic Copper.

[f] This includes Cu + Ag.

ϕ [g] Figures in parentheses are troy ounces per avoirdupois ton.

[h] This includes Oxygen-Free Copper which contains P in an amount agreed upon.

[i] This includes Oxygen-Free Tellurium Bearing Copper which contains P in an amount agreed upon.

[j] This includes Cu + Ag + Te.

ϕ [k] Other deoxidizers may be used as agreed upon, in which case P need not be present.

[l] This includes Cu +Ag + S.

ϕ [m] The value of Cu is exclusive of Ag.

[n] Ni + Co, 0.20% min.
Ni + Fe, + Co, 0.6% max.

[o] This includes copper plus elements with specified limits. Copper alloy UNS Nos. C70600 *ed.* (CA706), Cu + Ag, 86.5% min and C71500 (CA715), Cu + Ag, 65% min. Specific limits are defined as any numerical values, whether maximum only, minimum only or ranges.

ϕ [p] For pipe and tube, the Cu limit may be 83.0% minimum and the Pb 0.06% max.

[q] For tube over 5 in O.D., the Pb may be less than 0.20%.

[r] Copper 61.0% min for rod.

[s] This includes Cu + Sn + P.

[t] This includes Cu + Sn + P + Pb + Zn.

[u] When the product is for welding applications and so specified by the purchaser, Zn shall be 0.50% max, Pb 0.02% max, P 0.02% max, S 0.02% max, and C 0.05% max.

[v] When the product is for welding applications and so specified by the purchaser, Cr, Cd, *ed.* and Zr shall each be 0.05% max.

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS

Metric (SI) Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, mm		Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
									RF[b]		R30T[b]			
C10200 C11000 C11100 C11300 C11400 C11500 C11600 C12000 C12200	Plate, Sheet, Strip, and Rolled Bar	Soft Anneal	—		—	—	—	—	—	65	—	—	Note a	—
		Deep-Drawing Anneal	—		—	—	—	—	30	75	—	—	Note a	0.050
		Light Cold Rolled	—		220	275	—	—	40	82	—	49	—	—
		1/2 Hard[r]	—		225	315	—	—	77	80	43	57	—	—
		Hard[r]	—		285	360	—	—	86	93	54	62	—	—
		Spring[r]	—		345	400	—	—	91	97	60	66	—	—
		Extra Spring[r]	—		360	—	—	—	92	—	61	—	—	—
		Hot Rolled	—		205	260	—	—	—	75	—	41	—	—
		Hot Rolled and Annealed	—		205	260	—	—	—	65	—	31	—	—
					Type B Matl[u]			Type B[u]	Type A[s,u]					
C10200 C11000 C12000 C12200	Rod, Bar and Shapes	Soft Anneal	All Sizes[m]		—	255	—	25	—	65	—	—	—	—
		Hard	—/6.5[w]		345	—	—	—	68	95	—	—	—	—
			6.5/9.5[w]		310	—	—	10	68	95	—	—	—	—
			9.5/25[w]		275	—	—	12	68	95	—	—	—	—
			25/50[w]		240	—	—	15	68	95	—	—	—	—
			50/75[w]		230	—	—	15	68	95	—	—	—	—
			4.8/9.5[x]		290	—	—	12	68	95	—	—	—	—
			9.5/13[x]		275	—	—	12	68	95	—	—	—	—
			13/50[x]		230	—	—	15	68	95	—	—	—	—
			50/100[x]		220	—	—	15	68	95	—	—	—	—
			All Sizes[y]		220	—	—	15	—	—	—	—	—	—
			OD	Wall				In 50 mm			R15T[d]			
C10200 C12000 C12200	Tube	Soft Anneal	All Sizes	0.4/0.9	—	—	—	40[e]	—	—	—	60	0.040	—
			All Sizes	0.9/—	—	—	—	—	—	50[d]	—	—	0.040	—
		Light Anneal	All Sizes	0.4/0.9	—	—	—	—	—	—	—	65	—	0.040
			All Sizes	0.9/—	—	—	—	—	—	55[d]	—	—	—	0.040
											R30T[d]			
		Light Drawn	All Sizes	All Sizes	250	325	—	—	—	—	30	60	—	—
		Drawn	All Sizes	All Sizes	250	—	—	—	—	—	30	—	—	—
		Hard Drawn	—/25	0.5/3.0	310	—	—	—	—	—	55	—	—	—
			25/50	0.4/4.5	310	—	—	—	—	—	55	—	—	—
			50/100	1.5/6.5	310	—	—	—	—	—	55	—	—	—
			Size Section, mm Over/Thru					In 250 mm	RF[b]		R30T[b]			
C10200 C11000	Wire	Annealed	0.08/0.25		—	—	—	15	—	—	—	—	—	—
			0.25/0.50		—	—	—	20	—	—	—	—	—	—
			0.50/2.5		—	—	—	25	—	—	—	—	—	—
			2.5/7.5		—	—	—	30	—	—	—	—	—	—
			7.5/12		—	—	—	35	—	—	—	—	—	—
								In 4 × Dia						
C14500	Rod	1/2Hard[r]	1.6/6.5		260	—	205	8	—	—	—	—	—	—
			6.5/65		260	—	205	12	—	—	—	—	—	—
		Hard	1.6/6.5		330	—	275	4	—	—	—	—	—	—
			6.5/30		305	—	260	8	—	—	—	—	—	—
			30/50		275	—	240	8	—	—	—	—	—	—
C14700	Rod	1/2 Hard[r]	1.6/6.5			—	205	8	—	—	—	—	—	—
			6.5/65			—	205	12	—	—	—	—	—	—
		Hard[r]	1.6/6.5			—	275	4	—	—	—	—	—	—
			6.5/30			—	260	8	—	—	—	—	—	—
			30/50			—	240	8	—	—	—	—	—	—
C15000	Round Rod													

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy JNS No.[e]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 50 mm	Min	Max	Min	Max	Min	Max
				Type B Matl[u]				RB		R30T[b]			
C16200	Round Rod	Drawn	—/25	415	—	—	20	65	—	—	—	—	—
			25/50	380	—	—	25	60	—	—	—	—	—
			50/75	345	—	—	25	55	—	—	—	—	—
	Square, Rectangular and Hex Rod and Bar	Drawn	—/25	415	—	—	20	55	—	—	—	—	—
			25/—	345	—	—	20	50	—	—	—	—	—
	Forging	As Forged	—/25	415	—	—	20	55	—	—	—	—	—
			25/—	345	—	—	25	55	—	—	—	—	—
						0.2% Offset	In 50 mm[n]	RB[o,q]		R30T[p,q]		Elec Cond % IACS Min	Heat Treat h at 315°C
C17000	Strip	A Soft[l]	All Sizes	415	540	—	35	45	78	46	67	17	—
		1/4 Hard[l]	All Sizes	515	605	—	10	68	90	62	75	16	—
		1/2 Hard[l]	All Sizes	585	690	—	5	88	96	74	79	15	—
		Hard[l]	All Sizes	690	825	—	2	96	102	79	83	15	—
								RC[o,q]		R30N[p,q]			
		AT[y]	All Sizes	1035	—	885	3	33	—	53	—	22	3
		1/4 HT[y]	All Sizes	1100	—	930	2.5	35	—	55	—	22	2
		1/2 HT[y]	All Sizes	1170	—	1000	1	37	—	56	—	22	2
		HT[y]	All Sizes	1240	—	1070	1	39	—	59	—	22	2
		AM[z]	All Sizes	690	795	485 min 655 max	18	18	23	37	44	23	—
		1/4 HM[z]	All Sizes	760	860	550 min 725 max	15	21	26	42	47	23	—
		1/2 HM[z]	All Sizes	830	930	655 min 795 max	12	25	30	46	50	24	—
		HM[z]	All Sizes	930	1030	760 min 930 max	9	30	35	50	55	25	—
		XHM[z]	All Sizes	1100	1200	930 min 1100 max	2	32	36	52	56	24	—
								RB[o,q]		R30T[p,q]			
C17200	Strip	A (Soft)[l]	All Sizes	415	535	—	35	45	78	46	67	17	—
		1/4 Hard[l]	All Sizes	515	605	—	10	68	90	62	75	16	—
		1/2 Hard[l]	All Sizes	585	690	—	5	88	96	74	79	15	—
		Hard[l]	All Sizes	690	825	—	2	96	102	79	83	15	—
								RC[o,q]		R30N[p,q]			
		AT[y]	All Sizes	1140	1350	—	—	36	—	56	—	22	3
		1/4 Hard[y]	All Sizes	1200	1410	—	—	38	—	58	—	22	2
		1/2 Hard[y]	All Sizes	1770	1480	—	—	39	—	59	—	22	2
		HT[y]	All Sizes	1310	1520	—	—	40	—	60	—	22	2
								RB[o,q]					
	Rod and Bar	A (Soft)[l]	All Sizes	415	585	—	—	45	85	—	—	17	—
		Hard[l]	—/9.5	655	895	—	—	92	103	—	—	15	—
			9.5/25	620	825	—	—	91	102	—	—	15	—
			25/—	585	795	—	—	88	104	—	—	15	—
								RC[o,q]					
		AT[y]	All Sizes	1140	1310	—	—	36	40	—	—	22	3
		HT[y]	—/9.5	1280	1480	—	—	39	45	—	—	22	3
			9.5/25	1240	1450	—	—	38	44	—	—	22	2
			25/—	1200	1410	—	—	37	43	—	—	22	2

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Elec Cond, %IACS Min	Heat Treat h at 315°C
			Over/Thru	Min	Max	0.2% Offset	in 50 mm	Min	Max	Min	Max		
								RB[a,g]		R30T[a,g]			
C17500	Strip and Plate	A (Soft)[i]	All Sizes	—	380	140 min 205 max	20	20	45	29	45	20	—
		1/2 Hard[i]	All Sizes	415	515	345 min 485 max	5	65	76	60	67	25	—
		Hard[i]	All Sizes	485	585	415 min 550 max	2	78	88	69	75	25	—
		AT[y]	All Sizes	690	825	550 min 690 max	8	92	100	77	82	45	—
		1/2 HT[y] HT[y]	All Sizes	760	895	655 min 825 max	5	95	102	79	83	48	—
	Hot Worked Sizes, Forgings	A (Soft)[i]	All Sizes	—	380	140 min 205 max	20	20	45	—	—	20	—
		AT[y]	All Sizes	690	825	550 min 690 max	10	92	100	—	—	45	—
C17500 C17600	Rod, Bar Shapes and Tubing	A (Soft)[i]	All Sizes	240	380	140 min 205 max	20	25	45	—	—	20	—
		1/2 Hard	All Sizes	450	585	380 min 515 max	10	60	75	—	—	20	—
		AT[y]	All Sizes	690	825	550 min 690 max	10	92	100	—	—	45	—
		1/2 HT[y]	All Sizes	760	895	690 min 825 max	8	92	102	—	—	48	—
												Grain Size, mm	
						0.5% Ext Under Load		RB		R30T[b]		Min	Max
C18400	Rod (Round Only)	Drawn	—/25 25/50 50/75	450 415 380	— — —	— — —	15 15 15	75 70 65	— — —	— — —	— — —	— — —	— — —
	Rod (Hexagonal) and Bar	Drawn	—/25 25/—	450 380	— —	— —	15 15	70 65	— —	— —	— —	— —	— —
	Forgings	As Forged	—/25 25/50 50/—	450 380 380	— — —	— — —	15 15 15	72 70 65	— — —	— — —	— — —	— — —	— — —
C18700	Rod	1/2 Hard[f]	1.6/6.5 6.5/65	260 260	— —	205 205	8 12	— —	— —	— —	— —	— —	— —
		Hard	1.6/6.5 6.5/30 30/50	330 305 275	— — —	275 260 240	4 8 8	— — —	— — —	— — —	— — —	— — —	— — —
C19200	Tube	A (Soft) Light Drawn	All Sizes All Sizes	260 275	— —	80 240	— —	— —	— —	— —	— —	— —	— —
								RF[b]					
C21000	Plate, Sheet, Strip and Rolled Bar[i]	Annealed 0.050 mm 0.035 mm 0.025 mm 0.015 mm	— — — —	— — — —	— — — —	— — — —	— — — —	40 47 50 54	52 54 61 65	— — 1 7	4 7 17 23	0.035 0.025 0.015 Note 1	0.090 0.050 0.035 0.025
								RB[b]					
		1/4 Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	255	325	—	—	20 24 — —	48 52 — —	— — 34 37	— — 51 54	— — — —	— — — —

(Table continued on next page)

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load							
			Over/Thru	Min	Max		In 50 mm	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C21000	Plate, Sheet, Strip and Rolled Bar[d]	1/2 Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	290	360	—	—	40 44 — —	56 60 — —	— — 46 48	— — 57 59	— — — —	— — — —
		3/4 Hard	0.50/0.90 0.90/—	315	385	—	—	50 53	61 64	— —	— —	— —	— —
							In 4 × Dia or Thickness of Specimen						
		3/4 Hard	0.30/0.70 0.70/—	315	385	—	—	— —	— —	52 54	60 62	— —	— —
		Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	345	405	—	—	57 60 — —	64 67 — —	— — 57 59	— — 62 64	— — — —	— — — —
		Extra Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	385	440	—		64 66 — —	70 72 — —	— — 62 63	— — 66 67	— — — —	— — — —
		Spring	0.50/0.90 0.90/— 0.30/0.70 0.70/—	415	470	—	—	68 70 — —	73 75 — —	— — 64 65	— — 68 69	— — — —	— — — —
		Extra Spring	0.50/0.90 0.90/— 0.30/0.70 0.70/—	420	475	—	—	69 71 — —	74 76 — —	— — 65 66	— — 69 70	— — — —	— — — —
C22000	Plate, Sheet, Strip and Rolled Bar[d]							RF[b]					
		Annealed 0.050 mm 0.035 mm 0.025 mm 0.015 mm	— — — —	— — — —	— — — —	— — — —	— — — —	50 54 58 62	60 64 70 75	1 7 13 19	16 21 31 39	0.035 0.025 0.015 Note 1	0.090 0.050 0.035 0.025
								RB[b]					
		1/4 Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	275	345	—	—	27 31 — —	52 56 — —	— — 38 41	— — 53 56	— — — —	— — — —
		1/2 Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	325	395	—	—	50 53 — —	63 66 — —	— — 52 54	— — 61 63	— — — —	— — — —
		3/4 Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	360	425	—	—	59 62 — —	68 71 — —	— — 58 60	— — 64 66	— — — —	— — — —
		Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	395	455	—	—	65 68 — —	72 75 — —	— — 62 64	— — 66 68	— — — —	— — — —
		Extra Hard	0.50/0.90 0.90/— 0.30/0.70 0.70/—	440	495	—	—	72 74 — —	77 79 — —	— — 67 68	— — 71 72	— — — —	— — — —
		Spring	0.50/0.90 0.90/— 0.30/0.70 0.70/—	475	530	—	—	76 78 — —	79 81 — —	— — 70 71	— — 72 73	— — — —	— — — —
		Extra Spring	0.50/0.90 0.90/— 0.30/0.70 0.70/—	495	550	—	—	78 80 — —	81 83 — —	— — 71 72	— — 73 74	— — — —	— — — —

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm		Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
							0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru		Min	Max			Min	Max	Min	Max	Min	Max
			Wall Thickness						RF[b]		R30T[b]			
		Soft Anneal	—/1.1		—	—	—	—	—	—	—	30	0.025	0.060
			1.1/—		—	—	—	—	—	70	—	—	0.025	0.060
		Light Anneal	—/1.1		—	—	—	—	—	—	—	37	Note a	0.035
			1.1/—		—	—	—	—	—	78	—	—	Note a	0.035
C22000	Tube	Drawn (General Purpose)	All Sizes		275	—	—	—	—	—	38	—	—	—
			OD	Wall										
		Hard Drawn	—/100	0.5/6.5	360	—	—	—	—	—	55	—	—	—
			Size Section, mm											
			Over/Thru											
		Annealed												
		0.070 mm	—		—	—	—	—	53	60	6	16	0.050	0.100
		0.050 mm	—		—	—	—	—	56	63	10	20	0.035	0.070
		0.035 mm	—		—	—	—	—	58	66	13	24	0.025	0.050
		0.025 mm	—		—	—	—	—	60	72	16	34	0.015	0.035
		0.015 mm	—		—	—	—	—	62	79	19	48	Note a	0.025
									RB[b]					
		1/4 Hard	0.50/0.90		305	370	—	—	33	58	—	—	—	—
			0.90/—						37	62	—	—	—	—
			0.30/0.70						—	—	42	57	—	—
			0.70/—						—	—	45	60	—	—
		1/2 Hard	0.50/0.90		350	420	—	—	56	68	—	—	—	—
			0.90/—						59	71	—	—	—	—
			0.30/0.70						—	—	56	64	—	—
			0.70/—						—	—	58	66	—	—
	Sheet and Strip	3/4 Hard	0.50/0.90		395	460	—	—	66	73	—	—	—	—
			0.90/—						69	76	—	—	—	—
			0.30/0.70						—	—	63	68	—	—
			0.70/—						—	—	65	70	—	—
C23000		Hard	0.50/0.90		435	495	—	—	72	78	—	—	—	—
			0.90/—						74	80	—	—	—	—
			0.30/0.70						—	—	67	71	—	—
			0.70/—						—	—	68	72	—	—
		Extra Hard	0.50/0.90		495	550	—	—	78	83	—	—	—	—
		Extra Hard	0.90/—		495	550	—	—	80	85	—	—	—	—
			0.30/0.70						—	—	70	74	—	—
			0.70/—						—	—	71	75	—	—
		Spring	0.50/0.90		540	595	—	—	82	85	—	—	—	—
			0.90/—						84	87	—	—	—	—
			0.30/0.70						—	—	74	76	—	—
			0.70/—						—	—	75	77	—	—
		Extra Spring	0.50/0.90		565	620	—	—	84	87	—	—	—	—
			0.90/—						86	89	—	—	—	—
			0.30/0.70						—	—	75	77	—	—
			0.70/—						—	—	76	78	—	—
			Wall Thickness						RF[d]		R30T[d]			
		Soft Anneal	—/1.1		—	—	—	—	—	—	—	36	0.025	0.060
			1.1/—		—	—	—	—	—	75	—	—	0.025	0.060
	Tube	Light Anneal	—/1.1		—	—	—	—	—	—	—	39	Note a	0.035
			1.1/—		—	—	—	—	—	85	—	—	Note a	0.035
		Light Drawn[e]	All Sizes		305	400	—	—	—	—	43	75	—	—
		Drawn (General Purpose)	All Sizes		305	—	—	—	—	—	43	—	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[ce]	Form	Temper	Size Section, mm		Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
			OD	Wall					RF[b]		R30T[d]			
C23000	Tube	Hard Drawn	—/109	0.5/6.5	395	—	—	—	—	—	65	—	—	—
			Size Section, mm											
			Over/Thru											
		Annealed												
		0.070 mm	—		—	—	—	—	53	64	2	21	0.050	0.120
		0.050 mm	—		—	—	—	—	57	67	8	27	0.035	0.070
		0.035 mm	—		—	—	—	—	61	72	16	35	0.025	0.050
		0.025 mm	—		—	—	—	—	63	77	20	42	0.015	0.035
		0.015 mm	—		—	—	—	—	66	83	25	50	Note a	0.025
									RB[b]					
		1/4 Hard	0.50/0.90		330	400	—	—	38	61	—	—	—	—
			0.90/—						42	65	—	—	—	—
			0.30/0.70						—	—	42	57	—	—
			0.70/—						—	—	45	60	—	—
		1/2 Hard	0.50/0.90		380	450	—	—	59	70	—	—	—	—
			0.90/—						62	73	—	—	—	—
			0.30/0.70						—	—	56	64	—	—
			0.70/—						—	—	58	66	—	—
C24000	Sheet and Strip	3/4 Hard	0.50/0.90		420	490	—	—	69	76	—	—	—	—
			0.90/—						72	79	—	—	—	—
			0.30/0.70						—	—	63	68	—	—
			0.70/—						—	—	65	70	—	—
		Hard	0.50/0.90		470	530	—	—	76	82	—	—	—	—
			0.90/—						78	84	—	—	—	—
			0.30/0.70						—	—	68	72	—	—
			0.70/—						—	—	69	73	—	—
		Extra Hard	0.50/0.90		540	600	—	—	83	87	—	—	—	—
			0.90/—						85	89	—	—	—	—
			0.30/0.70						—	—	72	75	—	—
			0.70/—						—	—	73	76	—	—
		Spring	0.50/0.90		565	640	—	—	87	90	—	—	—	—
			0.90/—						89	92	—	—	—	—
			0.30/0.70						—	—	75	77	—	—
			0.70/—						—	—	76	78	—	—
		Extra Spring	0.50/0.90		615	670	—	—	88	91	—	—	—	—
			0.90/—						90	93	—	—	—	—
			0.30/0.70						—	—	76	78	—	—
			0.70/—						—	—	77	79	—	—
									RF[d]					
		Annealed												
		0.120 mm	—		—	—	—	—	50	62	—	21	0.070	—
		0.070 mm	—		—	—	—	—	52	67	3	27	0.050	0.120
		0.050 mm	—		—	—	—	—	61	73	20	35	0.035	0.070
		0.035 mm	—		—	—	—	—	65	76	25	38	0.025	0.050
		0.025 mm	—		—	—	—	—	67	79	27	42	0.015	0.035
		0.015 mm	—		—	—	—	—	72	85	33	50	Note 1	0.025
									RB[b]					
C26000	Plate[f], Sheet, Strip, Rolled Bar and Wire	1/4 Hard	0.50/0.90		340	405	—	—	40	61	—	—	—	—
			0.90/—						44	65	—	—	—	—
			0.30/0.70						—	—	43	57	—	—
			0.70/—						—	—	46	60	—	—
		1/2 Hard	0.50/0.90		395	460	—	—	60	74	—	—	—	—
			0.90/—						63	77	—	—	—	—
			0.30/0.70						—	—	56	66	—	—
			0.70/—						—	—	58	68	—	—
		3/4 Hard	0.50/0.90		440	510	—	—	72	70	—	—	—	—
			0.90/—						75	82	—	—	—	—
			0.30/0.70						—	—	65	70	—	—
			0.70/—						—	—	67	72	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, mm		Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
									RB[b]		R30T[d]			
C26000	Plate[t], Sheet, Strip, Rolled Bar and Wire	Hard	0.50/0.90		490	560	—	—	70	84	—	—	—	—
			0.90/—						81	86	—	—	—	—
			0.30/0.70						—	—	70	73	—	—
			0.70/—						—	—	71	74	—	—
		Extra Hard	0.50/0.90		570	635	—	—	85	89	—	—	—	—
			0.90/—						87	91	—	—	—	—
			0.30/0.70						—	—	74	76	—	—
			0.70/—						—	—	75	77	—	—
		Spring	0.50/0.90		625	690	—	—	89	92	—	—	—	—
			0.90/—						90	93	—	—	—	—
			0.30/0.70						—	—	76	78	—	—
			0.70/—						—	—	76	78	—	—
		Extra Spring	0.50/0.90		655	715	—	—	91	94	—	—	—	—
			0.90/—						92	95	—	—	—	—
			0.30/0.70						—	—	77	79	—	—
			0.70/—						—	—	77	79	—	—
	Tube		Wall Thickness						RF[b]					
		Soft Anneal	—/0.75		—	—	—	—	—	—	—	40	0.025	0.060
			0.75/—		—	—	—	—	—	80	—	—	0.025	0.060
		Light Anneal	—/0.75		—	—	—	—	—	—	—	60	Note a	0.035
			0.75/—		—	—	—	—	—	90	—	—	Note a	0.035
		Drawn (General Purpose)	All Sizes		370	—	—	—	—	—	53	—	—	—
			OD	Wall										
		Hard Drawn	—/100	0.5/6.5	455	—	—	—	—	—	70	—	—	—
C26800	Plate[t], Sheet, Strip and Rolled Bar		Size Section, mm											
			Over/Thru						RF[d]		R30T[b]			
		Annealed												
		0.120 mm	—		—	—	—	—	50	62	—	21	0.070	—
		0.070 mm	—		—	—	—	—	52	67	3	27	0.050	0.120
		0.050 mm	—		—	—	—	—	61	73	20	35	0.035	0.070
		0.035 mm	—		—	—	—	—	65	76	25	38	0.025	0.050
		0.025 mm	—		—	—	—	—	67	79	27	42	0.015	0.035
		0.015 mm	—		—	—	—	—	72	85	33	50	Note a	0.025
									RB[b]					
		1/4 Hard	0.50/0.90		340	405	—	—	40	61	—	—	—	—
			0.90/—						44	65	—	—	—	—
			0.30/0.70						—	—	43	57	—	—
			0.70/—						—	—	46	60	—	—
		1/2 Hard	0.50/0.90		380	450	—	—	57	71	—	—	—	—
			0.90/—						60	74	—	—	—	—
			0.30/0.70						—	—	54	64	—	—
			0.70/—						—	—	56	66	—	—
		3/4 Hard	0.50/0.90		425	495	—	—	70	77	—	—	—	—
			0.90/—						73	80	—	—	—	—
			0.30/0.70						—	—	65	69	—	—
			0.70/—						—	—	67	71	—	—
		Hard	0.50/0.90		470	540	—	—	76	82	—	—	—	—
			0.90/—						78	84	—	—	—	—
			0.30/0.70						—	—	68	72	—	—
			0.70/—						—	—	69	73	—	—
									RF[b]					
		Extra Hard	0.50/0.90		545	615	—	—	83	87	—	—	—	—
			0.90/—						85	90	—	—	—	—
			0.30/0.70						—	—	73	75	—	—
			0.70/—						—	—	74	76	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru	Min	Max			Min	Max	Min	Max	Min	Max
								RF[b]		R30T[b]			
C26800	Plate[f], Sheet, Strip and Rolled Bar	Spring	0.50/0.90	595	655	—	—	87	90	—	—	—	—
			0.90/—					89	92	—	—	—	—
			0.30/0.70					—	—	75	77	—	—
			0.70/—					—	—	76	78	—	—
		Extra Spring	0.50/0.90	620	685	—	—	88	91	—	—	—	—
			0.90/—					90	93	—	—	—	—
			0.30/0.70					—	—	76	78	—	—
			0.70/—					—	—	77	79	—	—
C27000	Wire	Annealed											
		0.100 mm	—	—	—	—	—	—	—	—	—	0.070	—
		0.070 mm	—	—	—	—	—	—	—	—	—	0.050	0.100
		0.050 mm	—	—	—	—	—	—	—	—	—	0.035	0.070
		0.035 mm	—	—	—	—	—	—	—	—	—	0.025	0.050
		0.025 mm	—	—	—	—	—	—	—	—	—	0.015	0.035
		0.015 mm	—	—	—	—	—	—	—	—	—	Note a	0.025
		1/8 Hard	—	345	450	—	—	—	—	—	—	—	—
		1/4 Hard	—	425	530	—	—	—	—	—	—	—	—
		1/2 Hard	—	545	650	—	—	—	—	—	—	—	—
		3/4 Hard	—	635	740	—	—	—	—	—	—	—	—
		Hard[h]	—	705	805	—	—	—	—	—	—	—	—
		Extra Hard[i]	—	795	890	—	—	—	—	—	—	—	—
		Spring[j]	—	825	—	—	—	—	—	—	—	—	—
C33000	Tube		Wall Thickness							R30T[d]			
		Soft Anneal	—/0.75	—	—	—	—	—	—	—	40	0.025	0.060
			0.75/—	—	—	—	—	—	80	—	—	0.025	0.060
		Light Anneal	—/0.75	—	—	—	—	—	—	—	60	Note a	0.035
			0.70/—	—	—	—	—	—	90	—	—	Note a	0.035
		Drawn (General Purpose)	All Sizes	370	—	—	—	—	—	53	—	—	—
			OD / Wall					RB[b]					
		Hard Drawn[g]	—/100 / 0.50/6.5	455	—	—	—	—	—	70	—	—	—
C33100	Tube		Wall Thickness					RF[d]					
		Soft Anneal	—/0.75	—	—	—	—	—	—	—	40	0.025	0.060
			0.75/—	—	—	—	—	—	80	—	—	0.025	0.060
		Light Anneal	—/0.75	—	—	—	—	—	—	—	60	Note a	0.035
			0.75/—	—	—	—	—	—	90	—	—	Note a	0.035
		Drawn (General Purpose)	All Sizes	370	—	—	—	—	—	53	—	—	—
			OD / Wall										
		Hard Drawn	—/100 / 0.50/6.5	455	—	—	—	—	—	70	—	—	—
C34200 C35000	Plate, Sheet, Strip and Rolled Bar		Over/Thru					RF[b]		R30T[b]			
		Annealed											
		0.070 mm	All Sizes	—	—	—	—	54	67	12	27	0.050	0.100
		0.050 mm	All Sizes	—	—	—	—	61	73	20	35	0.035	0.070
		0.035 mm	All Sizes	—	—	—	—	65	76	25	38	0.025	0.050
		0.025 mm	All Sizes	—	—	—	—	67	79	27	42	0.015	0.035
								RB[b]					
		1/4 Hard	All Sizes	340	405	—	—	40	65	43	60	—	—
		1/2 Hard	All Sizes	380	450	—	—	57	74	54	66	—	—
		Hard	All Sizes	470	540	—	—	76	84	68	73	—	—
		Extra Hard	All Sizes	545	615	—	—	83	89	73	76	—	—
C34500 C35000	Rod	Soft	—/12.5	315	—	110	20	—	—	—	—	—	—
			12.5/25	305	—	105	25	—	45	—	—	—	—
			25/50	275	—	105	30	—	45	—	—	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru	Min	Max			Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C34500 C35000	Rod	1/4 Hard	—/12.5	360	—	170	10	50	75	—	—	—	—
			12.5/25	345	—	140	15	40	70	—	—	—	—
			25/50	290	—	105	20	35	65	—	—	—	—
		1/2 Hard	—/12.5	395	—	170	7	60	80	—	—	—	—
			12.5/25	380	—	170	10	55	75	—	—	—	—
			25/50	345	—	140	15	40	70	—	—	—	—
C36000	Rod	Soft	—/25	330	—	140	15	—	—	—	—	—	—
			25/50	305	—	125	20	—	—	—	—	—	—
			50/—	275	—	105	25	—	—	—	—	—	—
		1/2 Hard	—/12.5	395	—	170	7	—	—	—	—	—	—
			12.5/25	380	—	170	10	—	—	—	—	—	—
			25/50	345	—	140	15	—	—	—	—	—	—
			50/100	310	—	105	20	—	—	—	—	—	—
			100/—	275	—	105	20	—	—	—	—	—	—
		Hard	1.5/5.0	550	—	310	—	—	—	—	—	—	—
			5.0/12.5	480	—	240	4	—	—	—	—	—	—
			12.5/20	450	—	205	6	—	—	—	—	—	—
			Thickness / Width										
	Flat Products	Soft	—/25 / —/150	305	—	125	20	—	—	—	—	—	—
			25/— / —/150	275	—	105	25	—	—	—	—	—	—
		1/2 Hard	—/12.5 / —/25	345	—	170	10	—	—	—	—	—	—
			—/12.5 / 25/150	310	—	115	15	—	—	—	—	—	—
			12.5/50 / —/50	310	—	115	20	—	—	—	—	—	—
			12.5/50 / 50/150	275	—	105	20	—	—	—	—	—	—
			50/— / 50/100	275	—	105	20	—	—	—	—	—	—
			Over/Thru										
C37700	Die Forgings	As Forged	—/38	345	—	125	25	—	—	—	—	—	—
			38/—	315	—	105	50	—	—	—	—	—	—
C46400 C46500 C46600 C46700	Rod and Bar	Soft	—/25	370	—	140	30	—	—	—	—	—	—
			25/50	360	—	140	30	—	—	—	—	—	—
			50/—	345	—	140	30	—	—	—	—	—	—
		1/4 Hard or Light Annealed	—/12.5	415	—	185	22	—	—	—	—	—	—
			12.5/25	415	—	185	25	—	—	—	—	—	—
			25/50	400	—	180	25	—	—	—	—	—	—
			50/75	270	—	170	25	—	—	—	—	—	—
			75/100	270	—	150	27	—	—	—	—	—	—
			100/—	270	—	150	30	—	—	—	—	—	—
		Hard	—/25	460	—	310	13	—	—	—	—	—	—
			25/50	425	—	255	18	—	—	—	—	—	—
	Shapes	As Extruded	All Sizes	360	—	140	30	—	—	—	—	—	—
C51000	Sheet and Strip	Soft	1.0/—	295	400	—	—	16	64	—	—	—	—
			0.75/—					—	—	32	59	—	—
			0.50/1.0					12	60	—	—	—	—
			0.25/0.75					—	—	24	53	—	—
		1/2 Hard	1.0/—	400	505	—	—	64	85	—	—	—	—
			0.75/—					—	—	59	73	—	—
			0.50/1.0					60	82	—	—	—	—
			0.25/0.75					—	—	53	69	—	—
		Hard	1.0/—	525	625	—	—	86	93	—	—	—	—
			0.75/—					—	—	73	78	—	—
			0.50/1.0					84	91	—	—	—	—
			0.25/0.75					—	—	71	75	—	—
		Extra Hard	1.0/—	605	710	—	—	92	96	—	—	—	—
			0.75/—					—	—	77	81	—	—
			0.50/1.0					89	95	—	—	—	—
			0.25/0.75					—	—	74	78	—	—
		Spring	1.0/—	655	760	—	—	94	98	—	—	—	—
			0.75/—					—	—	79	82	—	—
			0.50/1.0					92	97	—	—	—	—
			0.25/0.75					—	—	76	80	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C51000	Sheet and Strip	Extra Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	690	785	—	—	95 — 94* —	99 — 98 —	— 80 — 77	— 83 — 81	— — — —	— — — —
	Rod	Soft	—/6.5	275	400	—	—	—	—	—	—	—	—
		Hard	—/6.5 6.5/12.5 12.5/25 25/— 6.5/9.5 9.5/—	550 485 415 380 415 380	885 — — — — —	— — — — — —	— 13 15 18 10 15	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —
		Spring	—/0.65[aa]	860	—	—	—	—	—	—	—	—	—
		Spring	0.65/1.6[aa] 1.6/3.2[aa] 3.2/6.5[aa] 6.5/9.5[aa] 9.5/12.5[aa]	795 760 725 690 620	— — — — —	— — — — —	— — 3.5 5.0 9.0	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
	Wire for General Purposes	Soft	—	295	400	—	—	—	—	—	—	—	—
		1/4 Hard 1/2 Hard 3/4 Hard Hard	— — — —	415 550 660 745	525 670 795 885	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —
	Wire for Spring Purposes						In 50 mm						
		— — —	—/0.65 0.65/1.6 1.6/3.2	1000 930 845	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —
		— — —	3.2/6.5 6.5/9.5 9.5/12.5	860 825 720	— — —	— — —	— 5.0 9.0	— — —	— — —	— — —	— — —	— — —	— — —
C51100 C54400	Sheet and Strip	Soft	1.0/— 0.75/— 0.50/1.0 0.25/0.75	275	380	—	—	7 — 0 —	50 — 45 —	— 24 — 16	— 50 — 46	— — — —	— — — —
		1/2 Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	380	485	—	—	60 — 53 —	81 — 78 —	— 57 — 52	— 73 — 71	— — — —	— — — —
		Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	495	600	—	—	82 — 80 —	90 — 88 —	— 71 — 69	— 77 — 75	— — — —	— — — —
		Extra Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	580	685	—	—	88 — 86 —	94 — 92 —	— 75 — 73	— 80 — 78	— — — —	— — — —
		Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	625	725	—	—	90 — 88 —	96 — 94 —	— 77 — 75	— 81 — 79	— — — —	— — — —
		Extra Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	660	750	—	—	92 — 89 —	97 — 94 —	— 78 — 76	— 82 — 80	— — — —	— — — —
C52100	Sheet and Strip	Soft	1.0/— 0.75/—	365	460	—	—	29 —	70 —	— 38	— 68	— —	— —
							In 4 × Dia or Thickness of Specimen						
		Soft	0.50/1.0 0.25/0.75	365	460	—	—	20 —	66 —	— 27	— 62	— —	— —

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[aa]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru	Min	Max			Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C52100	Sheet and Strip	1/2 Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	475	580	—	—	76 — 69 —	91 — 88 —	— 67 — 63	— 78 — 75	— — — —	— — — —
		Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	585	690	—	—	91 — 89 —	97 — 95 —	— 76 — 73	— 81 — 80	— — — —	— — — —
		Extra Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	670	770	—	—	95 — 93 —	100 — 98 —	— 78 — 77	— 83 — 82	— — — —	— — — —
		Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	725	820	—	—	97 — 95 —	102 — 100 —	— 79 — 78	— 84 — 83	— — — —	— — — —
		Extra Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	760	840	—	—	98 — 96 —	103 — 101 —	— 80 — 79	— 84 — 83	— — — —	— — — —
C52400	Sheet and Strip	Soft	1.0/— 0.75/— 0.50/1.0 0.25/0.75	400	505	—	—	35 — 25 —	75 — — —	— 40 71 29	— 78 — 84	— — — —	— — — —
		1/2 Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	525	625	—	—	78 — 74 —	95 — 93 —	— 67 — 63	— 80 — 77	— — — —	— — — —
		Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	650	750	—	—	94 — 92 —	101 — 100 —	— 78 — 75	— 82 — 81	— — — —	— — — —
		Extra Hard	1.0/— 0.75/— 0.50/1.0 0.25/0.75	740	840	—	—	93 — 97 —	103 — 102 —	— 80 — 79	— 84 — 83	— — — —	— — — —
		Spring	1.0/— 0.75/— 0.50/1.0 0.25/0.75	795	890	—	—	99 — 98 —	104 — 103 —	— 81 — 80	— 85 — 84	— — — —	— — — —
		Extra Spring	1.0/— 0.75/—	825	915	—	—	100 —	105 —	— 82	— 86	— —	— —
		Extra Spring	0.50/1.0 0.25/0.75	825	915	—	—	99 —	104 —	— 81	— 85	— —	— —
C54400	Sheet and Strip	See C51100											
	Rod	Hard	1.5/6.5[bb] 6.5/12.5[bb] 12.5/25[bb] 25/—[bb]	450 415 380 345	— — — —	— — — —	8 10 12 15	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —
	Flat Products	Hard	6.5/9.5[cc] 9.5/—[cc]	380 345	— —	— —	10 15	— —	— —	— —	— —	— —	— —
C60800	Tube	Annealed	All Sizes	345	—	130	—	—	—	—	—	0.010	0.045
C61300	Plate[t], Sheet, Strip and Rolled Bar	Soft	Thickness / Width				In 50 mm			BHN 1000 kg			
			—/12.5 All	515	—	255	35	—	—	—	—	—	—
			12.5/50 All	495	—	210	35	—	—	—	—	—	—
			50/125 All	450	—	195	35	—	—	—	—	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[cc]	Form	Temper	Size Section, mm		Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
			Thickness	Width				In 50 mm	RB[b]		BHN 1000 kg			
C61400	Plate[t], Sheet, Strip and Rolled Bar	Soft	—/12.5	All	495	—	220	35	—	—	—	—	—	—
			12.5/50	All	485	—	205	35	—	—	—	—	—	—
			50/125	All	450	—	195	35	—	—	—	—	—	—
		Hard	—/12.5	All	550	—	310	25	—	—	—	—	—	—
			12.5/25	All	485	—	275	30	—	—	—	—	—	—
C61300	Rod and Bar	—	—/12.5		550	—	345	30	—	—	—	—	—	—
			12.5/25		515	—	310	30	—	—	—	—	—	—
			25/50		495	—	275	30	—	—	—	—	—	—
			50/75		485	—	240	30	—	—	—	—	—	—
									RB[b]		BHN 1000 kg			
C61400	Rod and Bar	—	—/12.5		550	—	275	30	—	—	—	—	—	—
			12.5/25		515	—	240	30	—	—	—	—	—	—
			25/50		485	—	220	30	—	—	—	—	—	—
			50/75		485	—	205	30	—	—	—	—	—	—
C61800	Rod	1/2 Hard	—/75		—	—	—	—	—	—	—	—	—	—
C62300	Rod and Bar	Drawn	—/12.5		620	—	310	12	90	—	155	—	—	—
			12.5/25		605	—	305	15	—	—	—	—	—	—
			25/—		580	—	275	15	—	—	—	—	—	—
			50/25		525	—	255	20	—	—	—	—	—	—
			75/—		515	—	205	20	—	—	—	—	—	—
	Shapes	—	All Sizes		—	—	205	20	—	—	—	—	—	—
											3000 kg			
	Forgings	As Forged	—/38		515	—	205	20	—	—	—	—	—	—
			38/—		495	—	195	25	—	—	—	—	—	—
C62400	Rod	As Extruded	All Sizes		550	—	310	7.0	—	—	175	—	—	—
	Forgings	As Forged	—		550	—	310	7.0	—	—	175	—	—	—
		Hardened and H_2O Quenched	—		—	—	—	—	—	—	240	—	—	—
		Hardened, H_2O Quenched and Tempered	—		600	—	—	8.0	—	—	179	—	—	—
											R30T[b]			
C63000	Rod and Bar	Annealed	12.5/25		690	—	345	5	—	—	—	—	—	—
			25/50		620	—	310	6	—	—	—	—	—	—
			50/100		585	—	295	10	—	—	—	—	—	—
	Shapes	As Extruded	All Sizes		585	—	295	10	—	—	—	—	—	—
C64200	Rod and Bar	Drawn	—/12.5		620	—	310	9	—	—	—	—	—	—
			12.5/25		585	—	310	12	—	—	—	—	—	—
			25/50		550	—	290	12	—	—	—	—	—	—
			50/75		515	—	240	15	—	—	—	—	—	—
											RF[b]			
C65500	Plate[t], Sheet, Strip and Rolled Bar	Annealed 0.070 mm	—		360	400	—	—	—	—	70	82	0.050	0.110
		Annealed 0.040 mm	—		380	440	—	—	—	—	76	93	Note 1	0.055
		1/4 Hard	—		425	495	—	—	65	60	—	—	—	—
		1/2 Hard[k]	—		490	560	—	—	79	91	—	—	—	—
		Hard[k]	—		600	670	—	—	88	96	—	—	—	—
		Extra Hard[k]	—		685	745	—	—	93	98	—	—	—	—
		Spring[k]	—		725	780	—	—	94	99	—	—	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[cc]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[e]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		RF[b]			
	Plate[t], Sheet, Strip and Rolled Bar	Hot Rolled	—	380	495	—	—	—	—	72	—	—	—
		Hot Rolled and Cold Rolled Finish	—	400	495	—	—	60	80	—	—	—	—
										R30T[b]			
C65500	Rod, Bar and Shapes	Soft	All Forms and Sizes	360	—	105	35	—	—	—	—	—	—
		1/4 Hard	All Forms and Sizes	380	—	165	25	—	—	—	—	—	—
		1/2 Hard	—/50[dd]	485	—	260	17	—	—	—	—	—	—
		Hard	—/6.5[dd]	585	—	345	8	—	—	—	—	—	—
			6.5/38[dd]	585	—	345	13	—	—	—	—	—	—
		Extra Hard	—/12.5[w]	690	—	380	7	—	—	—	—	—	—
	Rod	Soft	All Sizes	360	—	105	35	—	—	—	—	—	—
		Hard	—/25	450	—	265	20	—	—	—	—	—	—
			25/38	415	—	205	25	—	—	—	—	—	—
			38/75	380	—	165	27	—	—	—	—	—	—
C67000	Rod and Bar	Soft	All Sizes	585	—	310	10[v]	—	—	—	—	—	—
		1/2 Hard	All Sizes	725	—	415	7[v]	—	—	—	—	—	—
		Hard	All Sizes	795	—	470	5[v]	—	—	—	—	—	—
	Forgings	Soft	—	585	—	310	10	—	—	—	—	—	—
		1/2 Hard	—	675	—	345	7	—	—	—	—	—	—
		Hard	—	690	—	380	5	—	—	—	—	—	—
C67300	Rod and Bar	As Extruded	All Sizes	360	—	170	20	60	—	—	—	—	—
		Soft	All Sizes	360	—	170	20	50	—	—	—	—	—
		1/2 Hard[w]	—/25	450	—	275	12	70	—	—	—	—	—
			25/75	400	—	240	15	70	—	—	—	—	—
			75/—	360	—	205	18	65	—	—	—	—	—
		1/2 Hard[x]	All Sizes	415	—	205	20	70	—	—	—	—	—
		Hard[w]	—/25	485	—	345	10	70	—	—	—	—	—
			25/50	425	—	290	15	70	—	—	—	—	—
	Shapes	As Extruded	All Sizes	360	—	170	20	60	—	—	—	—	—
	Forgings	As Forged	—	360	—	170	20	60	—	—	—	—	—
		Forged and Heat Treated	—	475	—	240	12	70	—	—	—	—	—
C67400	Rod and Bar	As Extruded	All Sizes	485	—	235	12	75	—	—	—	—	—
		Extruded and Drawn	—/25	540	—	275	8	84	—	—	—	—	—
			25/50	515	—	275	10	80	—	—	—	—	—
			50/75	485	—	250	12	78	—	—	—	—	—
	Shapes	As Extruded	All Sizes	485	—	235	12	75	—	—	—	—	—
	Forgings	As Forged	—	450	—	205	15	75	—	—	—	—	—
C67500	Rod	Soft	All Sizes	380	—	150	20	—	—	—	—	—	—
		1/2 Hard	—/25	495	—	250	13	—	—	—	—	—	—
			25/65	485	—	240	15	—	—	—	—	—	—
			65/—	450	—	220	17	—	—	—	—	—	—
		Hard	—/25	550	—	385	8	—	—	—	—	—	—
			25/38	525	—	360	10	—	—	—	—	—	—
			38/65	505	—	330	12	—	—	—	—	—	—
			65/—	470	—	310	16	—	—	—	—	—	—

ed. TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Metric (SI) Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Elongation, Min %[c]		Hardness				Grain Size, mm	
							In 4 × Dia or Thickness of Specimen							
			Over/Thru	Min	Max	0.5% Ext Under Load			Min	Max	Min	Max	Min	Max
									RB[b]		R30T[b]			
C67500	Bar	Soft	All Sizes	380	—	150	20		—	—	—	—	—	—
		1/2 Hard	—/25	495	—	250	13		—	—	—	—	—	—
			25/65	485	—	240	15		—	—	—	—	—	—
			65/—	450	—	220	17		—	—	—	—	—	—
		Hard	—/25	550	—	385	8		—	—	—	—	—	—
			25/65	525	—	360	12		—	—	—	—	—	—
			65/—	505	—	330	16		—	—	—	—	—	—
	Shapes	Soft	All Sizes	470	—	310	20		—	—	—	—	—	—
							In 50 mm							
C70600	Condenser Tube Plate	—	—/65	275	—	105	30		—	—	—	—	—	—
	Tube	Annealed	—	275	—	105	—		—	—	—	—	—	—
		Light Drawn	—	310	—	240	—		—	—	—	—	—	—
							Hardness							
							Min	Max						
							RF[b]							
	Tube	Annealed	—	310	—	110	—	—	—	—	—	—	—	—
C71000	Plate[f], Sheet, Strip and Rolled Bar	Annealed	—	—	—	—	67	76	18	35	28	40	0.025	0.050
		0.035 mm	—	—	—	—	76	90	35	58	40	55	Note a	0.020
		0.015 mm												
		1/4 Hard	—	325	435	—	—	—	45	72	46	65	—	—
		1/2 Hard	—	385	485	—	—	—	64	78	59	69	—	—
		Hard	—	460	545	—	—	—	76	84	67	73	—	—
		Extra Hard	—	495	580	—	—	—	79	87	69	75	—	—
		Spring	—	525	600	—	—	—	82	88	71	75	—	—
							Elongation, Min %							
							In 50 mm							
	Condenser Tube Plate	—	—/65	345	—	140	35		—	—	—	—	—	—
			65/125	310	—	125	35		—	—	—	—	—	—
	Tube	Annealed	—	360	—	125	—		—	—	—	—	—	—
		Drawn and Stress Relieved	—/1.2 Wall	495	—	345	12		—	—	—	—	—	—
			1.2/— Wall	495	—	345	15		—	—	—	—	—	—
C71500							Hardness							
							Min	Max						
							RF[b]							
	Plate[f], Sheet, Strip and Rolled Bar	Annealed	—	—	—	—	70	85	23	45	31	46	0.025	0.050
		0.035 mm	—	—	—	—	74	93	37	63	40	58	Note a	0.025
		0.015 mm												
		1/4 Hard	—	400	485	—	—	—	67	81	61	71	—	—
		1/2 Hard	—	455	550	—	—	—	76	85	67	74	—	—
		Hard	—	515	605	—	—	—	83	89	72	76	—	—
		Extra Hard	—	550	635	—	—	—	85	91	73	77	—	—
		Spring	—	580	650	—	—	—	87	91	74	77	—	—

ϕ *ed.* **TABLE 2A—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)**

Metric (SI) Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, mm	Tensile Strength, MPa		Yield Strength, Min MPa	Hardness						Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	Min	Max	Min	Max	Min	Max	Min	Max
							RF[b]		RB[b]		R30T[b]			
C75200	Plate[t], Sheet, Strip and Rolled Bar	Annealed												
		0.070 mm	—	—	—	—	70	80	25	40	32	43	0.050	0.100
		0.035 mm	—	—	—	—	75	88	35	55	40	53	0.025	0.050
		0.015 mm	—	—	—	—	83	93	45	70	46	64	Note a	0.025
		1/4 Hard	—	400	495	—	—	—	50	75	49	67	—	—
		1/2 Hard	—	455	550	—	—	—	68	82	62	72	—	—
		Hard	—	540	625	—	—	—	80	90	70	76	—	—
		Extra Hard	—	595	675	—	—	—	87	94	74	79	—	—
		Spring	—	620	695	—	—	—	89	96	75	80	—	—
	Rod and Bar	Annealed												
		0.070 mm	—	—	—	—	—	—	—	—	—	—	0.050	0.100
		0.035 mm	—	—	—	—	—	—	—	—	—	—	0.025	0.050
		0.015 mm	—	—	—	—	—	—	—	—	—	—	—	0.030
		1/4 Hard	0.50/12.5[y]	415	550	—	—	—	—	—	—	—	—	—
		Hard	0.5/6.5[w]	550	690	—	—	—	—	—	—	—	—	—
			6.5/12.5[w]	480	620	—	—	—	—	—	—	—	—	—
			12.5/25[w]	450	555	—	—	—	—	—	—	—	—	—
			25/—[w]	415	550	—	—	—	—	—	—	—	—	—
			All Sizes[x]	470	605	—	—	—	—	—	—	—	—	—
C77000	Plate[t], Sheet, Strip and Rolled Bar	Annealed												
		0.070 mm	—	—	—	—	72	83	29	45	35	46	0.050	0.100
		0.035 mm	—	—	—	—	76	91	37	60	41	57	0.025	0.050
		0.015 mm	—	—	—	—	84	98	47	73	47	65	Note a	0.025
							RG[b]							
		1/4 Hard	—	475	600	—	23	62	70	88	63	75	—	—
		1/2 Hard	—	540	655	—	51	69	81	92	71	78	—	—
		Hard	—	635	740	—	67	76	90	96	76	80	—	—
		Extra Hard	—	705	795	—	73	80	95	99	79	82	—	—
		Spring	—	745	825	—	77	83	97	100	80	—	—	—
	Rod and Bar	Annealed												
		0.070 mm	—	—	—	—	—	—	—	—	—	—	0.050	0.100
		0.035 mm	—	—	—	—	—	—	—	—	—	—	0.025	0.050
		0.015 mm	—	—	—	—	—	—	—	—	—	—	—	0.030
		1/4 Hard	0.50/12.5[y]	515	655	—	—	—	—	—	—	—	—	—
		Hard	0.50/6.5[w]	620	700	—	—	—	—	—	—	—	—	—
			0.50/6.5[w]	550	690	—	—	—	—	—	—	—	—	—
			12.5/25[w]	515	655	—	—	—	—	—	—	—	—	—
			25/—[w]	485	620	—	—	—	—	—	—	—	—	—
			All Sizes[x]	515	655	—	—	—	—	—	—	—	—	—

[a] Although no minimum grain size is required, this material must be fully recrystallized.
[b] Values are approximate. F and B scales for metal 0.50 mm and over in thickness. 30T scale for metal 0.30 mm and over in thickness. (0.40 mm for annealed material to ASTM B36 and B122).
[c] In any case, a minimum gage length of 25 mm shall be used.
[d] Hardness values shall apply only to tubes having a wall thickness of 0.40 mm or over for annealed temper and 0.50 mm or over for drawn temper (0.30 mm for drawn temper to ASTM B135), to round tubes having an inside diameter of 8.0 mm or over, and to rectangular, including square, tubes having an inside major distance between parallel surfaces of 4.8 mm or over. For all other tubes, no Rockwell values shall apply. Hardness tests shall be made on the inside surface of the tube. When suitable equipment is not available for determining the specified hardness, other Rockwell scales and values may be specified, subject to agreement between purchaser and supplier.
[e] 3.2 to 22.0 mm outside diameter 0.75 to 1.1 mm wall.
[f] Generally available in round, hexagonal, and octagonal.
[g] Normally available in round only.
[h] Not generally available in sizes over 12.5 mm in diameter.
[i] Not generally available in sizes over 9.5 mm in diameter. Square and rectangular wire not generally available.
[j] Not generally available in sizes over 6.5 mm in diameter. Square and rectangular wire not generally available.
[k] Commercially supplied only as strip. Manufacturer should be consulted for sheet or plate.
[l] Capable of being hardened by further heat treatment.
[m] Rods and bars.
[n] Applicable to material 0.10 mm and over.
[o] Applicable to material 0.80 mm and over.
[p] Applicable to material 0.40 mm and over.
[q] When stated on contract or order, tension test shall be waived provided the strip meets the hardness requirement. In case of dispute, tension test shall be the basis for acceptance.
[r] Commonly supplied only as strip.
[s] 6.5 mm and over.
[t] Plate generally available only in annealed, quarter hard, and half hard.
[u] Type A material to listed hardness limits supplied unless otherwise specified.
[v] Cold finished.
[w] Rods only.
[x] Bars only.
[y] After heat treatment.
[z] After mill heat treatment.
[aa] Rounds only.
[bb] Rounds and hexagons.
[cc] Squares and rectangles.
[dd] Rods and square bars.
[ee] Unified Number System. For cross reference to SAE, former SAE, ASTM and former trade names, see SAE J461.

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 2 in	Min	Max	Min	Max	Min	Max
				Type B Matl[u]				RB		R30T[b]			
C16200	Rod (Round Only)	Drawn	—/1.0	60	—	—	20	65	—	—	—	—	—
			1.0/2.0	55	—	—	25	60	—	—	—	—	—
			2.0/3.0	50	—	—	25	55	—	—	—	—	—
	Bar (Square and Rectangular) and Rod (Hexagonal)	Drawn	—/1.0 Thick	60	—	—	20	55	—	—	—	—	—
			1.0/— Thick	50	—	—	25	50	—	—	—	—	—
	Forging	As Forged	—/1.0 Thick	60	—	—	20	55	—	—	—	—	—
			1.0/— Thick	50	—	—	25	50	—	—	—	—	—
						0.2% Offset	In 2 in[n]	RB[p,q]		R30T[p,q]		Elec Cond, % IACS Min	Heat Treat h at 600°F
		A (Soft)[l]	All Sizes	60	78	—	35	45	78	46	67	17	—
		1/4 Hard[l]	All Sizes	75	88	—	10	68	90	62	75	16	—
		1/2 Hard[l]	All Sizes	85	100	—	5	88	96	74	79	15	—
		Hard[l]	All Sizes	100	120	—	2	96	102	79	83	15	—
								RC[p,q]		R30N[p,q]			
		AT[y]	All Sizes	150	—	130 min	3	33	—	53	—	22	3
C17000	Strip	1/4 HT[y]	All Sizes	160	—	135 min	2.5	35	—	55	—	22	2
		1/2 HT[y]	All Sizes	170	—	145 min	1	37	—	56	—	22	2
		HT[y]	All Sizes	180	—	155 min	1	39	—	59	—	22	2
		AM[s]	All Sizes	100	115	70 min 95 max	18	18	23	37	44	23	—
		1/4 HM[s]	All Sizes	110	125	80 min 105 max	15	21	26	42	47	23	—
		1/2 HM[s]	All Sizes	120	135	95 min 115 max	12	25	30	46	50	24	—
		HM[s]	All Sizes	135	150	110 min 135 max	9	30	35	50	55	25	—
		XHM[s]	All Sizes	160	175	135 min 160 max	2	32	36	52	56	24	—
								RB[p,q]		R30T[p,q]			
		A (Soft)[l]	All Sizes	60	78	—	35	45	78	46	67	17	—
		1/4 Hard[l]	All Sizes	75	88	—	10	68	90	62	75	16	—
		1/2 Hard[l]	All Sizes	85	100	—	5	88	96	74	79	15	—
		Hard[l]	All Sizes	100	120	—	5	96	102	79	83	15	—
	Strip							RC[p,q]		R30N[p,q]			
		AT[y]	All Sizes	165	195	—	—	36	—	56	—	22	3
C17200		1/4 HT[y]	All Sizes	175	205	—	—	38	—	58	—	22	2
		1/2 HT[y]	All Sizes	185	215	—	—	39	—	59	—	22	2
		HT[y]	All Sizes	195	220	—	—	40	—	60	—	22	2
								RB[p,q]					
		A (Soft)[l]	All Sizes	60	85	—	—	45	85	—	—	17	—
	Rod and Bar	Hard[l]	—/.375	95	130	—	—	92	103	—	—	15	—
			.375/1.0	90	120	—	—	91	102	—	—	15	—
			1.0/—	85	115	—	—	88	104	—	—	15	—
								RC[p,q]					
		AT[y]	All Sizes	165	190	—	—	36	40	—	—	22	3

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Elec Cond, % IACS Min	Heat Treat h at 600°F
			Over/Thru	Min	Max	0.2% Offset	In 2 in[n]	Min	Max	Min	Max		
				Type B Matl[m]				RC[o,q]		R30N[p,q]			
C17200	Rod and Bar	HT[y]	—/.375 .375/1.0 1.0/—	185 180 175	215 210 205	— — —	— — —	39 38 37	45 44 43	— — —	— — —	22 22 22	3 2 2
				Min	Max		In 2 in	RB[o,q]		R30T[o,q]			
C17500	Strip and Plate	A (Soft)[l]	All Sizes	—	55	20 min 30 max	20	20	45	29	45	20	—
		1/2 Hard[l]	All Sizes	60	75	50 min 70 max	5	65	76	60	67	25	—
		Hard[l]	All Sizes	70	85	60 min 80 max	2	78	88	69	75	25	—
		AT[y]	All Sizes	100	120	80 min 100 max	8	92	100	77	82	45	—
		1/2 HT[y]	All Sizes	110	130	95 min 120 max	5	95	102	79	83	48	—
		HT[y]	All Sizes	110	130	95 min 120 max	5	95	102	79	83	48	—
	Hot Worked Sizes, Forgings	A (Soft)[l]	All Sizes	—	55	20 min 30 max	20	20	45	—	—	20	—
		AT[y]	All Sizes	100	120	80 min 100 max	10	92	100	—	—	45	—
										R30T[o,q]			
C17500 C17600	Rod, Bar Shapes and Tubing	A (Soft)[l]	All Sizes	35	55	20 min 30 max	20	25	45	—	—	20	—
		1/2 Hard	All Sizes	65	85	55 min 75 max	10	60	75	—	—	20	—
		AT[y]	All Sizes	100	120	80 min 100 max	10	92	100	—	—	45	—
		1/2 HT[y]	All Sizes	110	130	100 min 120 max	8	92	102	—	—	48	—
												Grain Size, mm	
						0.5% Ext Under Load		RB		R30T[b]		Min	Max
C18400	Round Rod	Drawn	—/1.0 1.0/2.0 2.0/3.0	65 60 55	— — —	— — —	15 15 15	75 70 65	— — —	— — —	— — —	— — —	— — —
	Rod (Hexagonal) and Bars	Drawn	—/1.0 Thick 1.0/— Thick	65 55	— —	— —	15 15	70 65	— —	— —	— —	— —	— —
	Forgings	As Forged	—/1.0 1.0/2.0 2.0/—	65 55 55	— — —	— — —	15 15 15	72 70 65	— — —	— — —	— — —	— — —	— — —
C18700	Rod	1/2 Hard[f]	.062/.250 .250/2.625	38 38	— —	30 30	8 12	— —	— —	— —	— —	— —	— —
		Hard	.062/.250 .250/1.250 1.250/2.000	48 44 40	— — —	40 38 35	4 8 8	— — —	— — —	— — —	— — —	— — —	— — —
C19200	Tube	A (Soft) Light Drawn	All Sizes All Sizes	38 40	— —	12 35	— —	— —	— —	— —	— —	— —	— —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 2 in	Min	Max	Min	Max	Min	Max
								RF[b]		R30T[b]			
C21000	Plate, Sheet, Strip and Rolled Bar[k]	Annealed 0.050 mm 0.035 mm 0.025 mm 0.015 mm	— — — —	— — — —	— — — —	— — — —	— — — —	40 47 50 54	52 54 61 65	— — 1 7	4 7 17 23	0.035 0.025 0.015 Note a	0.090 0.050 0.035 0.025
								RB[b]					
		1/4 Hard	.019/.036 .036/— .011/.028 .028/—	37	47	—	—	20 24 — —	48 52 — —	— — 34 37	— — 51 54	— — — —	— — — —
		1/2 Hard	.019/.036 .036/— .011/.028 .028/—	42	52	—	—	40 44 — —	56 60 — —	— — 46 48	— — 57 59	— — — —	— — — —
		3/4 Hard	.019/.036 .036/—	46	56	—	—	50 53	61 64	— —	— —	— —	— —
							In 4 × Dia or Thickness of Specimen						
		3/4 Hard	.011/.028 .028/—	46	56	—	—	— —	— —	52 54	60 62	— —	— —
		Hard	.019/.036 .036/— .011/.028 .028/—	50	59	—	—	57 60 — —	64 67 — —	— — 57 59	— — 62 64	— — — —	— — — —
		Extra Hard	.019/.036 .036/— .011/.028 .028/—	56	64	—	—	64 66 — —	70 72 — —	— — 62 63	— — 66 67	— — — —	— — — —
		Spring	.019/.036 .036/— .011/.028 .028/—	60	68	—	—	68 70 — —	73 75 — —	— — 64 65	— — 68 69	— — — —	— — — —
		Extra Spring	.019/.036 .036/— .011/.028 .028/—	61	69	—	—	69 71 — —	74 76 — —	— — 65 66	— — 69 70	— — — —	— — — —
								RF[b]					
C22000	Plate, Sheet, Strip and Rolled Bar[k]	Annealed 0.050 mm 0.035 mm 0.025 mm 0.015 mm	— — — —	— — — —	— — — —	— — — —	— — — —	50 54 58 62	60 64 70 75	1 7 13 19	16 21 31 39	0.035 0.025 0.015 Note a	0.090 0.050 0.035 0.025
								RB[b]					
		1/4 Hard	.019/.036 .036/— .011/.028 .028/—	40	50	—	—	27 31 — —	52 56 — —	— — 38 41	— — 53 56	— — — —	— — — —
		1/2 Hard	.019/.036 .036/— .011/.028 .028/—	47	57	—	—	50 53 — —	63 66 — —	— — 52 54	— — 61 63	— — — —	— — — —
		3/4 Hard	.019/.036 .036/— .011/.028 .028/—	52	62	—	—	59 62 — —	68 71 — —	— — 58 60	— — 64 66	— — — —	— — — —
		Hard	.019/.036 .036/— .011/.028 .028/—	57	66	—	—	65 68 — —	72 75 — —	— — 62 64	— — 66 68	— — — —	— — — —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[w]	Form	Temper	Size Section, in		Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
									RF[b]		R30T[b]			
C10200 C11000 C11100 C11300 C11400 C11500 C11600 C12000 C12200	Plate, Sheet, Strip and Rolled Bar	Soft Anneal	—		—	—	—	—	—	65	—	—	Note a	—
		Deep-Drawing Anneal	—		—	—	—	—	30	75	—	—	Note a	0.050
		Light Cold Rolled	—		32	40	—	—	40	82	—	49	—	—
		1/2 Hard[r]	—		37	46	—	—	77	89	43	57	—	—
		Hard[r]	—		43	52	—	—	86	93	54	62	—	—
		Spring[r]	—		50	58	—	—	91	97	60	66	—	—
		Extra Spring[r]	—		52	—	—	—	92	—	61	—	—	—
		Hot Rolled	—		30	38	—	—	—	75	—	41	—	—
		Hot Rolled and Annealed	—		30	38	—	—	—	65	—	31	—	—
					Type B Matl[n]			Type B[u]	Type A[s,u]					
C10200 C11000 C12000 C12200	Rod, Bar and Shapes	Soft Anneal	All Sizes[m]		—	37	—	25	—	65	—	—	—	—
		Hard	—/.250[w]		50	—	—	—	68	95	—	—	—	—
			.250/.375[w]		45	—	—	10	68	95	—	—	—	—
			.375/1.0[w]		40	—	—	12	68	95	—	—	—	—
			1.0/2.0[w]		35	—	—	15	68	95	—	—	—	—
			2.0/3.0[w]		33	—	—	15	68	95	—	—	—	—
			.188/.375[x]		42	—	—	12	68	95	—	—	—	—
			.375/.500[x]		40	—	—	12	68	95	—	—	—	—
			.500/2.0[x]		33	—	—	15	68	95	—	—	—	—
			2.0/4.0[x]		32	—	—	15	68	95	—	—	—	—
			All Sizes[y]		32	—	—	15	—	—	—	—	—	—
			OD	Wall				In 2 in			R15T[d]			
C10200 C12000 C12200	Tube	Soft Anneal	All Sizes	.014/.034	30	—	—	40[e]	—	—	—	60	0.040	—
			All Sizes	.034/—	—	—	—	—	—	50[d]	—	—	0.040	—
		Light Anneal	All Sizes	.014/.034	—	—	—	—	—	—	—	65	—	0.040
			All Sizes	.034/—	—	—	—	—	—	55[d]	—	—	—	0.040
											R30T[d]			
		Light Drawn	All Sizes	All Sizes	36	47	—	—	—	—	30	60	—	—
		Drawn	All Sizes	All Sizes	36	—	—	—	—	—	30	—	—	—
		Hard Drawn	—/1.0	.019/.120	45	—	—	—	—	—	55	—	—	—
			1.0/2.0	.034/.180	45	—	—	—	—	—	55	—	—	—
			2.0/4.0	.059/.250	45	—	—	—	—	—	55	—	—	—
			Size Section, in					In 10 in	RF[b]		R30T[b]			
C10200 C11000	Wire	Annealed	.0029/.0100 dia		—	—	—	15	—	—	—	—	—	—
			.0100/.0201 dia		—	—	—	20	—	—	—	—	—	—
			.0201/.1019 dia		—	—	—	25	—	—	—	—	—	—
			.1019/.2893 dia		—	—	—	30	—	—	—	—	—	—
			.2893/.4600 dia		—	—	—	35	—	—	—	—	—	—
								In 4 × Dia						
C14500	Rod	1/2 Hard[f]	.062/.250		38	—	30	8	—	—	—	—	—	—
			.250/2.625		38	—	30	12	—	—	—	—	—	—
		Hard	.062/.250		48	—	40	4	—	—	—	—	—	—
			.250/1.250		44	—	38	8	—	—	—	—	—	—
			1.250/2.000		40	—	35	8	—	—	—	—	—	—
C14700	Rod	1/2 Hard[f]	.062/.250		38	—	30	8	—	—	—	—	—	—
			.250/2.625		38	—	30	12	—	—	—	—	—	—
		Hard[g]	.062/.250		48	—	40	4	—	—	—	—	—	—
			.250/1.250		44	—	38	8	—	—	—	—	—	—
			1.250/2.000		40	—	35	8	—	—	—	—	—	—
C15000	Round Rod													

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ce]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C22000	Plate, Sheet, Strip and Rolled Bars[t]	Extra Hard	.019/.036 .036/— .011/.028 .028/—	64	72	—	—	72 74 — —	77 79 — —	— — 67 68	— — 71 72	— — — —	— — — —
		Spring	.019/.036 .036/— .011/.028 .028/—	69	77	—	—	76 78 — —	79 81 — —	— — 70 71	— — 72 73	— — — —	— — — —
		Extra Spring	.019/.036 .036/— .011/.028 .028/—	72	80	—	—	78 80 — —	81 83 — —	— — 71 72	— — 73 74	— — — —	— — — —
	Tube		Wall Thickness					RF[b]					
		Soft Anneal	—/.045 .045/—	— —	— —	— —	— —	— —	— 70	— —	30 —	0.025 0.025	0.060 0.060
		Light Anneal	—/.045 .045/—	— —	— —	— —	— —	— —	— 78	— —	37 —	Note a Note a	0.035 0.035
		Drawn (General Purpose)	All Sizes	40	—	—	—	—	—	38	—	—	—
		Hard Drawn	OD: —/4.0; Wall: .019/.250	52	—	—	—	—	—	55	—	—	—
C23000	Sheet and Strip	Annealed 0.070 mm 0.050 mm 0.035 mm 0.025 mm 0.015 mm	Size Section, in — — — — —	— — — — —	— — — — —	— — — — —	— — — — —	53 56 58 60 62	60 63 66 72 79	6 10 13 16 19	16 20 24 34 48	0.050 0.035 0.025 0.015 Note a	0.100 0.070 0.050 0.035 0.025
		1/4 Hard	.019/.036 .036/— .011/.028 .028/—	44	54	—	—	RB[b] 33 37 — —	58 62 — —	— — 42 45	— — 57 60	— — — —	— — — —
		1/2 Hard	.019/.036 .036/— .011/.028 .028/—	51	61	—	—	56 59 — —	68 71 — —	— — 56 58	— — 64 66	— — — —	— — — —
		3/4 Hard	.019/.036 .036/— .011/.028 .028/—	57	67	—	—	66 69 — —	73 76 — —	— — 63 65	— — 68 70	— — — —	— — — —
		Hard	.019/.036 .036/— .011/.028 .028/—	63	72	—	—	72 74 — —	78 80 — —	— — 67 68	— — 71 72	— — — —	— — — —
		Extra Hard	.019/.036 .036/—	72	80	—	—	78 80	83 85	— —	— —	— —	— —
		Extra Hard	.011/.028 .028/—	72	80	—	—	— —	— —	70 71	74 75	— —	— —
		Spring	.019/.036 .036/— .011/.028 .028/—	78	86	—	—	82 84 — —	85 87 — —	— — 74 75	— — 76 77	— — — —	— — — —
		Extra Spring	.019/.036 .036/— .011/.028 .028/—	82	90	—	—	84 86 — —	87 89 — —	— — 75 76	— — 77 78	— — — —	— — — —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru	Min	Max			Min	Max	Min	Max	Min	Max
			Wall Thickness					**RF[d]**		**R30T[d]**			
C23000	Tube	Soft Anneal	—/.045	—	—	—	—	—	—	—	36	0.025	0.060
			.045/—	—	—	—	—	—	75	—	—	0.025	0.060
		Light Anneal	—/.045	—	—	—	—	—	—	—	39	Note a	0.035
			.045/—	—	—	—	—	—	85	—	—	Note a	0.035
		Light Drawn[g]	All Sizes	44	58	—	—	—	—	43	75	—	—
		Drawn (General Purpose)	All Sizes	44	—	—	—	—	—	43	—	—	—
			OD / **Wall**					**RF[b]**					
		Hard Drawn	—/1.0 / .019/.120	57	—	—	—	—	—	65	—	—	—
			1.0/2.0 / .034/.180					—	—	65	—	—	—
			2.0/4.0 / .059/.250					—	—	65	—	—	—
			Size Section, in										
C24000	Sheet and Strip	Annealed 0.070 mm	—	—	—	—	—	53	64	2	21	0.050	0.120
		0.050 mm	—	—	—	—	—	57	67	8	27	0.035	0.070
		0.035 mm	—	—	—	—	—	61	72	16	35	0.025	0.050
		0.025 mm	—	—	—	—	—	63	77	20	42	0.015	0.035
		0.015 mm	—	—	—	—	—	66	83	25	50	Note a	0.025
								RB[b]					
		1/4 Hard	.019/.036	48	58	—	—	38	61	—	—	—	—
			.036/—					42	65	—	—	—	—
			.011/.028					—	—	42	57	—	—
			.028/—					—	—	45	60	—	—
		1/2 Hard	.019/.036	55	65	—	—	59	70	—	—	—	—
			.036/—					62	73	—	—	—	—
			.011/.028					—	—	56	64	—	—
			.028/—					—	—	58	66	—	—
		3/4 Hard	.019/.036	61	71	—	—	69	76	—	—	—	—
			.036/—					72	79	—	—	—	—
			.011/.028					—	—	63	68	—	—
			.028/—					—	—	65	70	—	—
		Hard	.019/.036	68	77	—	—	76	82	—	—	—	—
		Hard	.036/—	68	77	—	—	78	84	—	—	—	—
			.011/.028					—	—	68	72	—	—
			.028/—					—	—	69	73	—	—
		Extra Hard	.019/.036	78	87	—	—	83	87	—	—	—	—
			.036/—					85	89	—	—	—	—
			.011/.028					—	—	72	75	—	—
			.028/—					—	—	73	76	—	—
		Spring	.019/.036	85	93	—	—	87	90	—	—	—	—
			.036/—					89	92	—	—	—	—
			.011/.028					—	—	75	77	—	—
			.028/—					—	—	76	78	—	—
		Extra Spring	.019/.036	89	97	—	—	88	91	—	—	—	—
			.036/—					90	93	—	—	—	—
			.011/.028					—	—	76	78	—	—
			.028/—					—	—	77	79	—	—
								RF[d]					
C26000	Plate,[t] Sheet, Strip, Rolled Bar and Wire	Annealed 0.120 mm	—	—	—	—	—	50	62	—	21	0.070	—
		0.070 mm	—	—	—	—	—	52	67	3	27	0.050	0.120
		0.050 mm	—	—	—	—	—	61	73	20	35	0.035	0.070
		0.035 mm	—	—	—	—	—	65	76	25	38	0.025	0.050
		0.025 mm	—	—	—	—	—	67	79	27	42	0.015	0.035
		0.015 mm	—	—	—	—	—	72	85	33	50	Note a	0.025

(Table continued on next page)

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
						0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen						
			Over/Thru	Min	Max			Min	Max	Min	Max	Min	Max
								RB[b]		R30T[d]			
C26000	Plate,[t] Sheet, Strip, Rolled Bar and Wire	1/4 Hard	.019/.036 .036/— .011/.028 .028/—	49	59	—	—	40 44 — —	61 65 — —	— — 43 46	— — 57 60	— — — —	— — — —
		1/2 Hard	.019/.036 .036/— .011/.028 .028/—	57	67	—	—	60 63 — —	74 77 — —	— — 56 58	— — 66 68	— — — —	— — — —
		3/4 Hard	.019/.036 .036/— .011/.028 .028/—	64	74	—	—	72 75 — —	79 82 — —	— — 65 67	— — 70 72	— — — —	— — — —
		Hard	.019/.036 .036/— .011/.028 .028/—	71	81	—	—	79 81 — —	84 86 — —	— — 70 71	— — 73 74	— — — —	— — — —
		Extra Hard	.019/.036 .036/— .011/.028 .028/—	83	92	—	—	85 87 — —	89 91 — —	— — 74 75	— — 76 77	— — — —	— — — —
		Spring	.019/.036	91	100	—	—	89	92	—	—	—	—
		Spring	.036/— .011/.028 .028/—	91	100	—	—	90 — —	93 — —	— 76 76	— 78 78	— — —	— — —
		Extra Spring	.019/.036 .036/— .011/.028 .028/—	95	104	—	—	91 92 — —	94 95 — —	— — 77 77	— — 79 79	— — — —	— — — —
	Tube		Wall Thickness					RF[b]					
		Soft Anneal	—/.030 .030/—	— —	— —	— —	— —	— —	— 80	—	40 —	0.025 0.025	0.060 0.060
		Light Anneal	—/.030 .030/—	— —	— —	— —	— —	— —	— 90	—	60 —	Note a Note a	0.035 0.035
		Drawn (General Purpose)	All Sizes	54	—	—	—	—	—	53	—	—	—
			OD Wall										
		Hard Drawn	—/4.0 .019/.250	66	—	—	—	—	—	70	—	—	—
C26800	Plate,[t] Sheet, Strip and Rolled Bar		Size Section, in					RF[d]		R30T[b]			
		Annealed 0.120 mm 0.070 mm 0.050 mm 0.035 mm 0.025 mm 0.015 mm	— — — — — —	— — — — —	— — — — —	— — — — —	— — — — —	50 52 61 65 67 72	62 67 73 76 79 85	— 3 20 25 27 33	21 27 35 38 42 50	0.070 0.050 0.035 0.025 0.015 Note a	— 0.120 0.070 0.050 0.035 0.025
								RB[b]					
		1/4 Hard	.019/.036 .036/— .011/.028 .028/—	49	59	—	—	40 44 — —	61 65 — —	— — 43 46	— — 57 60	— — — —	— — — —
		1/2 Hard	.019/.036 .036/— .011/.028 .028/—	55	65	—	—	57 60 — —	71 74 — —	— — 54 56	— — 64 66	— — — —	— — — —
		3/4 Hard	.019/.036 .036/— .011/.028 .028/—	62	72	—	—	70 73 — —	77 80 — —	— — 65 67	— — 69 71	— — — —	— — — —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in		Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	in 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
									RB[b]		R30T[b]			
C26800	Plate,[t] Sheet, Strip and Rolled Bar	Hard	.019/.036		68	78	—	—	76	82	—	—	—	—
			.036/—						78	84	—	—	—	—
			.011/.028						—	—	68	72	—	—
			.028/—						—	—	69	73	—	—
		Extra Hard	.019/.036		79	89	—	—	83	87	—	—	—	—
			.036/—						85	90	—	—	—	—
		Extra Hard	.011/.028		79	89	—	—	—	—	73	75	—	—
			.028/—						—	—	74	76	—	—
		Spring	.019/.036		86	95	—	—	87	90	—	—	—	—
			.036/—						89	92	—	—	—	—
			.011/.028						—	—	75	77	—	—
			.028/—						—	—	76	78	—	—
		Extra Spring	.019/.036		90	99	—	—	88	91	—	—	—	—
			.036/—						90	93	—	—	—	—
			.011/.028						—	—	76	78	—	—
			.028/—						—	—	77	79	—	—
C27000	Wire	Annealed												
		0.100 mm	—		—	—	—	—	—	—	—	—	0.070	—
		0.070 mm	—		—	—	—	—	—	—	—	—	0.050	0.100
		0.050 mm	—		—	—	—	—	—	—	—	—	0.035	0.070
		0.035 mm	—		—	—	—	—	—	—	—	—	0.025	0.050
		0.025 mm	—		—	—	—	—	—	—	—	—	0.015	0.035
		0.015 mm	—		—	—	—	—	—	—	—	—	Note a	0.025
		1/8 Hard	—		50	65	—	—	—	—	—	—	—	—
		1/4 Hard	—		67	77	—	—	—	—	—	—	—	—
		1/2 Hard	—		79	94	—	—	—	—	—	—	—	—
		3/4 Hard	—		92	103	—	—	—	—	—	—	—	—
		Hard[b]	—		102	112	—	—	—	—	—	—	—	—
		Extra Hard[t]	—		115	129	—	—	—	—	—	—	—	—
		Spring[j]	—		120	—	—	—	—	—	—	—	—	—
			Wall Thickness						RF[d]		R30T[d]			
C33000	Tube	Soft Anneal	—/.030		—	—	—	—	—	—	—	40	0.025	0.060
			.030/—		—	—	—	—	—	80	—	—	0.025	0.060
		Light Anneal	—/.030		—	—	—	—	—	—	—	60	Note a	0.035
			.030/—		—	—	—	—	—	90	—	—	Note a	0.035
		Drawn (General Purpose)	All Sizes		54	—	—	—	—	—	53	—	—	—
			OD	Wall										
		Hard Drawn[z]	—/4.0	.019/.250	66	—	—	—	—	—	70	—	—	—
C33100	Tube		Wall Thickness											
		Soft Anneal	—/.030		—	—	—	—	—	—	—	40	0.025	0.060
			.030/—		—	—	—	—	—	80	—	—	0.025	0.060
		Light Anneal	—/.030		—	—	—	—	—	—	—	60	Note a	0.035
			.030/—		—	—	—	—	—	90	—	—	Note a	0.035
		Drawn (General Purpose)	All Sizes		54	—	—	—	—	—	53	—	—	—
			OD	Wall										
		Hard Drawn	—/4.0	.019/.250	66	—	—	—	—	—	70	—	—	—
C34200 C35000	Plate, Sheet, Strip and Rolled Bar								RF[b]		R30T[b]			
		Annealed												
		0.070 mm	All Sizes		—	—	—	—	54	67	12	27	0.050	0.100
		0.050 mm	All Sizes		—	—	—	—	61	73	20	35	0.035	0.070
		0.035 mm	All Sizes		—	—	—	—	65	76	25	38	0.025	0.050
		0.025 mm	All Sizes		—	—	—	—	67	79	27	42	0.015	0.035

(Table continued on next page)

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[a]	Form	Temper	Size Section, in		Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
									RB[b]		R30T[b]			
C34200 C35000	Plate, Sheet, Strip and Rolled Bar	1/4 Hard 1/2 Hard	All Sizes All Sizes		49 55	59 65	— —	— —	40 57	65 74	43 54	60 66	— —	— —
		Hard Extra Hard	All Sizes All Sizes		68 79	78 89	— —	— —	76 83	84 89	68 73	73 76	— —	— —
C34500 C35000	Rod	Soft	—/.50 .50/1.0 1.0/2.0		46 44 40	— — —	16 15 15	20 25 30	— — —	— 45 45	— — —	— — —	— — —	— — —
		1/4 Hard	—/.50 .50/1.0 1.0/2.0		52 50 42	— — —	25 20 15	10 15 20	50 40 35	75 70 65	— — —	— — —	— — —	— — —
		1/2 Hard	—/.50 .50/1.0 1.0/2.0		57 55 50	— — —	25 25 20	7 10 15	60 55 40	80 75 70	— — —	— — —	— — —	— — —
C36000	Rod	Soft	—/1.0 1.0/2.0 2.0/—		48 44 40	— — —	20 18 15	15 20 25	— — —	— — —	— — —	— — —	— — —	— — —
		1/2 Hard	—/.50 .50/1.0 1.0/2.0 2.0/4.0 4.0/—		57 55 50 45 42	— — — — —	25 25 20 15 15	7 10 15 20 20	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
		Hard	.061/.088 .088/.500 .500/.750		80 70 65	— — —	45 35 30	— 4 6	— — —	— — —	— — —	— — —	— — —	— — —
	Flat Products		Thickness	Width										
		Soft	—/1.0 1.0/—	—/6.0 6.0/—	44 40	— —	18 15	20 25	— —	— —	— —	— —	— —	— —
		1/2 Hard	—/.50 —/.50 .50/2.0 .50/2.0 2.0/—	—/1.0 1.0/6.0 —/2.0 2.0/6.0 2.0/4.0	50 45 45 40 40	— — — — —	25 17 17 15 15	10 15 20 20 20	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
C37700	Die Forgings		Over/Thru											
		As Forged	—/1.50 1.50/—		50 46	— —	18 15	25 20	— —	— —	— —	— —	— —	— —
C46400 C46500 C46600 C46700	Rod and Bar	Soft	—/1.0 1.0/2.0 2.0/—		54 52 50	— — —	20 20 20	30 30 30	— — —	— — —	— — —	— — —	— — —	— — —
		1/2 Hard or Light Annealed	—/.50 .50/1.0 1.0/2.0 2.0/3.0 3.0/4.0 4.0/—		60 60 58 54 54 54	— — — — — —	27 27 26 25 22 22	22 25 25 25 27 30	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —
		Hard	—/1.0 1.0/2.0		67 62	— —	45 37	13 18	— —	— —	— —	— —	— —	— —
	Shapes	As Extruded	All Sizes		52	—	20	30	—	—	—	—	—	—
C51000	Sheet and Strip	Soft	.039/— .029/— .019/.039 .009/.029		43	58	—	—	16 — 12 —	64 — 60 —	— 32 — 24	— 59 — 53	— — — —	— — — —
		1/2 Hard	.039/— .029/— .019/.039 .009/.029		58	73	—	—	64 — 60 —	85 — 82 —	— 59 — 53	— 73 — 69	— — — —	— — — —
		Hard	.039/— .029/— .019/.039 .009/.029		76	91	—	—	86 — 84 —	93 — 91 —	— 73 — 71	— 78 — 75	— — — —	— — — —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
	Sheet and Strip	Extra Hard	.039/— .029/— .019/.039 .009/.029	88	103	—	—	92 — 89 —	96 — 95 —	— 77 — 74	— 81 — 78	— — — —	— — — —
		Spring	.039/— .029/— .019/.039 .009/.029	95	110	—	—	94 — 92 —	98 — 97 —	— 79 — 76	— 82 — 80	— — — —	— — — —
		Extra Spring	.039/— .029/— .019/.039 .009/.029	100	114	—	—	95 — 94 —	99 — 98 —	— 80 — 77	— 83 — 81	— — — —	— — — —
	Rod	Soft	—/.249[aa]	40	58	—	—	—	—	—	—	—	—
		Hard	—/.249[bb] .249/.500[bb] .500/1.00[bb] 1.00/—[bb] .249/.375[cc] .375/—[cc]	80 70 60 55 60 55	128 — — — — —	— — — — — —	— 13 15 18 10 15	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —	— — — — — —
C51000		Spring	—/.025[s]	125	—	—	—	—	—	—	—	—	—
		Spring	.025/.062[aa] .062/.125[aa] .125/.250[aa] .250/.375[aa] .375/.500[aa]	115 110 105 100 90	— — — — —	— — — — —	— — 3.5 5.0 9.0	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
	Wire for General Purposes	Soft	—	43	58	—	—	—	—	—	—	—	—
		1/4 Hard 1/2 Hard 3/4 Hard Hard	— — — —	60 80 96 108	76 97 115 128	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —
	Wire for Spring Purposes						In 2 in						
		— — —	—/.025 .025/.062 .062/.125	145 135 130	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —
		— — —	.125/.250 .250/.375 .375/.500	125 120 105	— — —	— — —	— 5.0 9.0	— — —	— — —	— — —	— — —	— — —	— — —
C51100 C54400	Sheet and Strip	Soft	.039/— .029/— .019/.039 .009/.029	40	50	—	—	7 — 0 —	50 — 45 —	— 24 — 16	— 50 — 46	— — — —	— — — —
		1/2 Hard	.039/— .029/— .019/.039 .009/.029	55	70	—	—	60 — 53 —	81 — 78 —	— 57 — 52	— 73 — 71	— — — —	— — — —
		Hard	.039/— .029/— .019/.039 .009/.029	72	87	—	—	82 — 80 —	90 — 88 —	— 71 — 69	— 77 — 75	— — — —	— — — —
		Extra Hard	.039/— .029/— .019/.039 .009/.029	84	99	—	—	88 — 86 —	94 — 92 —	— 75 — 73	— 80 — 78	— — — —	— — — —
		Spring	.039/— .029/— .019/.039 .009/.029	91	105	—	—	90 — 88 —	96 — 94 —	— 77 — 75	— 81 — 79	— — — —	— — — —
		Extra Spring	.039/— .029/— .019/.039 .009/.029	96	109	—	—	92 — 89 —	97 — 94 —	— 78 — 76	— 82 — 80	— — — —	— — — —

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[aa]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 2 in	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C52100	Sheet and Strip	Soft	.039/— .029/—	53	67	—	—	29 —	70 —	— 38	— 68	— —	— —
		Soft	.019/.039 .009/.029	53	67	—	—	20 —	66 —	— 27	— 62	— —	— —
		1/2 Hard	.039/— .029/— .019/.039 .009/.029	69	84	—	—	76 — 69 —	91 — 88 —	— 67 — 63	— 78 — 75	— — — —	— — — —
		Hard	.039/— .029/— .019/.039 .009/.029	85	100	—	—	91 — 89 —	97 — 95 —	— 76 — 73	— 81 — 80	— — — —	— — — —
		Extra Hard	.039/— .029/— .019/.039 .009/.029	97	112	—	—	95 — 93 —	100 — 98 —	— 78 — 77	— 83 — 82	— — — —	— — — —
		Spring	.039/— .029/— .019/.039 .009/.029	105	119	—	—	97 — 95 —	102 — 100 —	— 79 — 78	— 84 — 83	— — — —	— — — —
		Extra Spring	.039/— .029/— .019/.039 .009/.029	110	122	—	—	98 — 96 —	103 — 101 —	— 80 — 79	— 84 — 83	— — — —	— — — —
C52400	Sheet and Strip	Soft	.039/— .029/— .019/.039 .009/.029	58	73	—	—	35 — 25 —	75 — 71 —	— 40 — 29	— 78 — 84	— — — —	— — — —
		1/2 Hard	.039/— .029/— .019/.039 .009/.029	76	91	—	—	78 — 74 —	95 — 93 —	— 67 — 63	— 80 — 77	— — — —	— — — —
		Hard	.039/— .029/— .019/.039 .009/.029	94	109	—	—	94 — 92 —	101 — 100 —	— 78 — 75	— 82 — 81	— — — —	— — — —
		Extra Hard	.039/— .029/— .019/.039 .009/.029	107	122	—	—	93 — 97 —	103 — 102 —	— 80 — 79	— 84 — 83	— — — —	— — — —
		Spring	.039/— .029/— .019/.039 .009/.029	115	129	—	—	99 — 98 —	104 — 103 —	— 81 — 80	— 85 — 84	— — — —	— — — —
		Extra Spring	.039/— .029/—	120	133	—	—	100 —	105 —	— 82	— 86	— —	— —
		Extra Spring	.019/.039 .009/.029	120	133	—	—	99 —	104 —	— 81	— 85	— —	— —
C54400	Sheet and Strip	See C51100											
	Rod	Hard	.061/.250[bb] .249/.500[bb] .500/1.0[bb] 1.0/—[bb]	65 60 55 50	— — — —	— — — —	In 4 × Dia or Thickness of Specimen 8 10 12 15	— — — —	— — — —	— — — —	— — — —	— — — —	— — — —
	Flat Products	Hard	.249/.375[cc] .375/—[cc]	55 50	— —	— —	10 15	— —	— —	— —	— —	— —	— —
C60800	Tube	Annealed	All Sizes	50	—	19	—	—	—	—	—	0.010	0.045

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in		Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru		Min	Max	0.5% Ext Under Load	In 2 in	Min	Max	Min	Max	Min	Max
C61300	Plate,[t] Sheet, Strip and Rolled Bar	Soft	Thickness	Width					RB[b]		BHN 1000 kg			
			—/.500	All Widths	75	—	36	35	—	—	—	—	—	—
			.500/2.0	All Widths	72	—	32	35	—	—	—	—	—	—
			2.0/5.0	All Widths	65	—	28	35	—	—	—	—	—	—
	Plate,[t] Sheet, Strip and Rolled Bar	Soft	Thickness	Width					RB[b]		BHN 1000 kg			
			—/.500	All Widths	72	—	32	35	—	—	—	—	—	—
			.500/2.0	All Widths	70	—	30	35	—	—	—	—	—	—
			2.0/5.0	All Widths	65	—	28	35	—	—	—	—	—	—
		Hard	—/.500	All Widths	80	—	45	25	—	—	—	—	—	—
			.500/1.0	All Widths	70	—	40	30	—	—	—	—	—	—
C61400			Size Section, in					In 4 × Dia						
	Rod and Bar	—	—/.500		80	—	40	30	—	—	—	—	—	—
			.500/1.0		75	—	35	30	—	—	—	—	—	—
			1.0/2.0		70	—	32	30	—	—	—	—	—	—
			2.0/3.0		70	—	30	30	—	—	—	—	—	—
C61800	Rod	1/2 Hard	—/3.0		—	—	—	—	—	—	—	—	—	—
C62300	Rod and Bar	Drawn	—/.500		90	—	45	12	90	—	155	—	—	—
			.500/1.0		88	—	44	15	—	—	—	—	—	—
			1.0/2.0		84	—	40	15	—	—	—	—	—	—
			2.0/3.0		76	—	37	20	—	—	—	—	—	—
			3.0/—		75	—	30	20	—	—	—	—	—	—
	Shapes	—	All Sizes		75	—	30	20	—	—	—	—	—	—
	Forgings	As Forged	—/1.5		75	—	30	20	—	—	—	—	—	—
			1.5/—		72	—	28	25	—	—	—	—	—	—
C62400	Rod	As Extruded	All Sizes		80	—	45	7.0	—	—	3000 kg 175	—	—	—
		As Forged	—		80	—	45	7.0	—	—	175	—	—	—
	Forgings	Hardened and H_2O Quenched	—		—	—	—	—	—	—	240	—	—	—
		Hardened, H_2O Quenched and Tempered	—		87	—	—	8.0	—	—	179	—	—	—
C63000	Rod and Bar	Annealed	.499/1.0		100	—	50	5	—	—	RF[b] —	—	—	—
			1.0/2.0		90	—	45	6	—	—	—	—	—	—
			2.0/4.0		85	—	42.5	10	—	—	—	—	—	—
	Shapes	As Extruded	All Sizes		85	—	42.5	10	—	—	—	—	—	—
C64200	Rod and Bar	Drawn	—/.500		90	—	45	9	—	—	—	—	—	—
			.500/1.0		85	—	45	12	—	—	—	—	—	—
			1.0/2.0		80	—	42	12	—	—	—	—	—	—
			2.0/3.0		75	—	35	15	—	—	—	—	—	—
C65500	Plate,[t] Sheet, Strip and Rolled Bar	Annealed 0.070 mm	—		52	58	—	—	—	—	70	82	0.050	0.110
		Annealed 0.040 mm	—		55	64	—	—	—	—	76	93	Note a	0.055
		1/4 Hard	—		62	72	—	—	65	80	—	—	—	—
		1/2 Hard[k]	—		71	81	—	—	79	91	—	—	—	—
		Hard[k]	—		87	97	—	—	88	96	—	—	—	—
		Extra Hard[k]	—		99	108	—	—	93	98	—	—	—	—
		Spring[k]	—		105	113	—	—	94	99	—	—	—	—
		Hot Rolled	—		55	72	—	—	—	—	72	—	—	—
		Hot Rolled and Cold Rolled Finish	—		58	72	—	—	60	80	—	—	—	—

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		RF[b]			
C65500	Rod, Bar and Shapes	Soft	All Forms and Sizes	52	—	15	35	—	—	—	—	—	—
		1/4 Hard	All Forms and Sizes	55	—	24	25	—	—	—	—	—	—
		1/2 Hard	—/2.0[dd]	70	—	38	17	—	—	—	—	—	—
		Hard	—/.250[dd]	85	—	50	8	—	—	—	—	—	—
			.250/1.500[dd]	85	—	50	13	—	—	—	—	—	—
		Extra Hard	—/.500[w]	100	—	55	7	—	—	—	—	—	—
	Bar	Soft	All Sizes	52	—	15	35	—	—	—	—	—	—
		Hard	—/1.0	65	—	38	20	—	—	—	—	—	—
			1.0/1.5	60	—	30	25	—	—	—	—	—	—
			1.5/3.0	55	—	24	27	—	—	—	—	—	—
C67000	Rod and Bar	Soft	All Sizes	85	—	45	10[v]	—	—	—	—	—	—
		1/2 Hard	All Sizes	105	—	60	7[v]	—	—	—	—	—	—
		Hard	All Sizes	115	—	68	5[v]	—	—	—	—	—	—
	Forgings	Soft	—	85	—	45	10	—	—	—	—	—	—
		1/2 Hard	—	93	—	50	7	—	—	—	—	—	—
		Hard	—	100	—	55	5	—	—	—	—	—	—
C67300	Rod and Bar	As Extruded	All Sizes	55	—	25	20	60	—	—	—	—	—
		Soft	All Sizes	55	—	25	20	50	—	—	—	—	—
		1/2 Hard[w]	—/1.0	65	—	40	12	70	—	—	—	—	—
										R30T[b]			
		1/2 Hard[w]	1.0/3.0	58	—	35	15	70	—	—	—	—	—
			3.0/—	55	—	30	18	65	—	—	—	—	—
		1/2 Hard[x]	All Sizes	60	—	30	20	70	—	—	—	—	—
		Hard[w]	—/1.0	70	—	50	10	70	—	—	—	—	—
			1.0/2.0	62	—	42	15	70	—	—	—	—	—
	Shapes	As Extruded	All Sizes	55	—	25	20	60	—	—	—	—	—
	Forgings	As Forged	—	55	—	25	20	60	—	—	—	—	—
		Forged and Heat Treated	—	69	—	35	12	70	—	—	—	—	—
C67400		As Extruded	All Sizes	70	—	34	12	75	—	—	—	—	—
	Rod and Bar	Extruded and Drawn	—/1.0	78	—	40	8	84	—	—	—	—	—
			1.0/2.0	75	—	40	10	80	—	—	—	—	—
			2.0/3.0	70	—	36	12	78	—	—	—	—	—
	Shapes	As Extruded	All Sizes	70	—	34	12	75	—	—	—	—	—
	Forgings	As Forged	—	65	—	30	15	75	—	—	—	—	—
C67500	Rod	Soft	All Sizes	55	—	22	20	—	—	—	—	—	—
		1/2 Hard	—/1.0	72	—	36	13	—	—	—	—	—	—
			1.0/2.5	70	—	35	15	—	—	—	—	—	—
			2.5/—	65	—	32	17	—	—	—	—	—	—
		Hard	—/1.0	80	—	56	8	—	—	—	—	—	—
			1.0/1.5	76	—	52	10	—	—	—	—	—	—
			1.5/2.5	73	—	48	12	—	—	—	—	—	—
			2.5/—	68	—	45	16	—	—	—	—	—	—

ed. TABLE 2B—MINIMUM MECHANICAL PROPERTIES OF WROUGHT COPPER ALLOYS (CONTINUED)

Customary Units

Copper or Copper Alloy UNS No.[ee]	Form	Temper	Size Section, in	Tensile Strength, ksi		Yield Strength, Min ksi	Elongation, Min %[c]	Hardness				Grain Size, mm	
			Over/Thru	Min	Max	0.5% Ext Under Load	In 4 × Dia or Thickness of Specimen	Min	Max	Min	Max	Min	Max
								RB[b]		R30T[b]			
C67500	Bar	Soft	All Sizes	55	—	22	20	—	—	—	—	—	—
		1/2 Hard	—/1.0	72	—	36	13	—	—	—	—	—	—
			1.0/2.5	70	—	35	15	—	—	—	—	—	—
			2.5/—	65	—	32	17	—	—	—	—	—	—
		Hard	—/1.0	76	—	52	8	—	—	—	—	—	—
			1.0/2.5	72	—	47	12	—	—	—	—	—	—
			2.5/—	68	—	45	16	—	—	—	—	—	—
	Shapes	Soft	All Sizes	55	—	22	20	—	—	—	—	—	—
							In 2 in						
C70600	Condenser Tube Plate	—	—/2.5	40	—	15	30	—	—	—	—	—	—
	Tube	Annealed	—	40	—	15	35	—	—	—	—	—	—
		Light Drawn	—	45	—	35	7	—	—	—	—	—	—
							Hardness						
							Min	Max					
							RF[b]						
	Tube	Annealed	—	45	—	16	—	—	—	—	—	—	—
C71000	Plate,[t] Sheet, Strip and Rolled Bar	Annealed											
		0.035 mm	—	—	—	—	67	76	18	35	28	40	0.025	0.050
		0.015 mm	—	—	—	—	76	90	35	58	40	55	Note a	0.020
		1/4 Hard	—	47	63	—	—	—	45	72	46	65	—	—
		1/2 Hard	—	56	70	—	—	—	64	78	59	69	—	—
		Hard	—	67	79	—	—	—	76	84	67	73	—	—
		Extra Hard	—	72	84	—	—	—	79	87	69	75	—	—
		Spring	—	76	87	—	—	—	82	88	71	75	—	—
							Elongation, Min %[c] In 2 in						
	Condenser Tube Plate	—	—/2.5	50	—	20	35	—	—	—	—	—	—
			2.5/5.0	45	—	18	35	—	—	—	—	—	—
	Tube	Annealed	—	52	—	18	—	—	—	—	—	—	—
		Drawn and Stress Relieved	—/.048 Wall	72	—	50	12	—	—	—	—	—	—
			.048/— Wall	72	—	50	15	—	—	—	—	—	—
C71500							Hardness						
							Min	Max					
							RF[b]						
	Plate,[t] Sheet, Strip and Rolled Bar	Annealed											
		0.035 mm	—	—	—	—	70	85	23	45	31	46	0.025	0.050
		0.015 mm	—	—	—	—	74	93	37	63	40	58	Note a	0.025
		1/4 Hard	—	58	72	—	—	—	67	81	61	71	—	—
		1/2 Hard	—	66	80	—	—	—	76	85	67	74	—	—
		Hard	—	75	88	—	—	—	83	89	72	76	—	—
		Extra Hard	—	80	92	—	—	—	85	91	73	77	—	—
		Spring	—	84	94	—	—	—	87	91	74	77	—	—