Chemical Compositions of SAE Alloy Steels—SAE J404j

SAE Standard
Last revised November 1977

THIS IS A PREPRINT WHICH IS SUBJECT TO REVISIONS AND CORRECTIONS. THE FINAL VERSION WILL APPEAR IN THE 1979 EDITION OF THE SAE HANDBOOK.

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LAND SEA AIR SPACE

PREPRINT

CHEMICAL COMPOSITIONS OF SAE ALLOY STEELS—SAE J404j

SAE Standard

Report of Iron and Steel Division approved June 1911 and last revised by Iron and Steel Technical Committee November 1977.

In 1941, the SAE Iron and Steel Division in collaboration with the American Iron and Steel Institute made a major change in the method of expressing composition ranges for the SAE steels. The plan, as now applied, is based in general on narrower ladle analysis ranges plus certain product (check)analysis allowances on individual samples, in place of the fixed ranges and limits without tolerances formerly provided for carbon and other elements in SAE steels (Ref. J408). To avoid the possibility of confusion and conflict between SAE and AISI steel designations, all proposed changes in compositions or additions or deletions of numbers will be coordinated between the two organizations.

TABLE 1A—ALLOY STEEL COMPOSITIONS[a]

UNS No.	SAE No.	Ladle Chemical Composition Limits, %									Corresponding AISI No.
		C	Mn	P	S	Si	Ni	Cr	Mo	V	
G13300	1330	0.28–0.33	1.60–1.90	0.035	0.040	0.15–0.30	—	—	—	—	1330
G13350	1335	0.33–0.38	1.60–1.90	0.035	0.040	0.15–0.30	—	—	—	—	1335
G13400	1340	0.38–0.43	1.60–1.90	0.035	0.040	0.15–0.30	—	—	—	—	1340
G13450	1345	0.43–0.48	1.60–1.90	0.035	0.040	0.15–0.30	—	—	—	—	1345
G40230	4023	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	4023
G40240	4024	0.20–0.25	0.70–0.90	0.035	0.035–0.050	0.15–0.30	—	—	0.20–0.30	—	4024
G40270	4027	0.25–0.30	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	4027
G40280	4028	0.25–0.30	0.70–0.90	0.035	0.035–0.050	0.15–0.30	—	—	0.20–0.30	—	4028
G40320	4032	0.30–0.35	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	—
G40370	4037	0.35–0.40	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	4037
G40420	4042	0.40–0.45	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	—
G40470	4047	0.45–0.50	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.20–0.30	—	4047
G41180	4118	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.30	—	0.40–0.60	0.08–0.15	—	4118
G41300	4130	0.28–0.33	0.40–0.60	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4130
G41350	4135	0.33–0.38	0.70–0.90	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	—
G41370	4137	0.35–0.40	0.70–0.90	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4137
G41400	4140	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4140
G41420	4142	0.40–0.45	0.75–1.00	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4142
G41450	4145	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4145
G41470	4147	0.45–0.50	0.75–1.00	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4147
G41500	4150	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.30	—	0.80–1.10	0.15–0.25	—	4150
G41610	4161	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	—	0.70–0.90	0.25–0.35	—	4161
G43200	4320	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.30	1.65–2.00	0.40–0.60	0.20–0.30	—	4320
G43400	4340	0.38–0.43	0.60–0.80	0.035	0.040	0.15–0.30	1.65–2.00	0.70–0.90	0.20–0.30	—	4340
G43406	E4340[b]	0.38–0.43	0.65–0.85	0.025	0.025	0.15–0.30	1.65–2.00	0.70–0.90	0.20–0.30	—	E4340
G44220	4422	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.35–0.45	—	—
G44270	4427	0.24–0.29	0.70–0.90	0.035	0.040	0.15–0.30	—	—	0.35–0.45	—	—
G46150	4615	0.13–0.18	0.45–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—	4615
G46170	4617	0.15–0.20	0.45–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—	—
G46200	4620	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—	4620
G46260	4626	0.24–0.29	0.45–0.65	0.035	0.04 max	0.15–0.30	0.70–1.00	—	0.15–0.25	—	4626
G47180	4718	0.16–0.21	0.70–0.90	—	—	—	0.90–1.20	0.35–0.55	0.30–0.40	—	4718
G47200	4720	0.17–0.22	0.50–0.70	0.035	0.040	0.15–0.30	0.90–1.20	0.35–0.55	0.15–0.25	—	4720
G48150	4815	0.13–0.18	0.40–0.60	0.035	0.040	0.15–0.30	3.25–3.75	—	0.20–0.30	—	4815
G48170	4817	0.15–0.20	0.40–0.60	0.035	0.040	0.15–0.30	3.25–3.75	—	0.20–0.30	—	4817
G48200	4820	0.18–0.23	0.50–0.70	0.035	0.040	0.15–0.30	3.25–3.75	—	0.20–0.30	—	4820
G50401	50B40	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.30	—	0.40–0.60	—	—	—
G50441	50B44	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	—	0.40–0.60	—	—	50B44
G50460	5046	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	—	0.20–0.35	—	—	—
G50461	50B46[c]	0.44–0.49	0.75–1.00	0.035	0.040	0.15–0.30	—	0.20–0.35	—	—	50B46
G50501	50B50[c]	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.30	—	0.40–0.60	—	—	50B50
G50600	5060	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	—	0.40–0.60	—	—	—
G50601	50B60[c]	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	—	0.40–0.60	—	—	50B60
G51150	5115	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	—
G51170	5117	0.15–0.20	0.70–0.90	0.040	0.040	0.20–0.35	—	0.70–0.90	—	—	5117
G51200	5120	0.17–0.22	0.70–0.90	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	5120
G51300	5130	0.28–0.33	0.70–0.90	0.035	0.040	0.15–0.30	—	0.80–1.10	—	—	5130
G51320	5132	0.30–0.35	0.60–0.80	0.035	0.040	0.15–0.30	—	0.75–1.00	—	—	5132
G51350	5135	0.33–0.38	0.60–0.80	0.035	0.040	0.15–0.30	—	0.80–1.05	—	—	5135
G51400	5140	0.38–0.43	0.70–0.90	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	5140
G51470	5147	0.46–0.51	0.70–0.95	0.035	0.040	0.15–0.30	—	0.85–1.15	—	—	5147
G51500	5150	0.48–0.53	0.70–0.90	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	5150
G51550	5155	0.51–0.59	0.70–0.90	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	5155
G51600	5160	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	5160
G51601	51B60[c]	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	—	0.70–0.90	—	—	51B60
G50986	50100[b]	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.30	—	0.40–0.60	—	—	—
G51986	51100[b]	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.30	—	0.90–1.15	—	—	E51100
G52986	52100[b]	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.30	—	1.30–1.60	—	—	E52100
G61180	6118	0.16–0.21	0.50–0.70	0.035	0.040	0.15–0.30	—	0.50–0.70	—	0.10–0.15	6118
G61500	6150	0.48–0.53	0.70–0.90	0.035	0.040	0.15–0.30	—	0.80–1.10	—	0.15 min	6150
G81150	8115	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.30	0.20–0.40	0.30–0.50	0.08–0.15	—	8115
G81451	81B45[c]	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	0.20–0.40	0.35–0.55	0.08–0.15	—	81B45

(Table continued on next page)

The φ symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

TABLE 1A—ALLOY STEEL COMPOSITIONS[a] (*continued*)

UNS No.	SAE No.	Ladle Chemical Composition Limits, %									Corresponding AISI No.
		C	Mn	P	S	Si	Ni	Cr	Mo	V	
G86150	8615	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8615
G86170	8617	0.15–0.20	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8617
G86200	8620	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8620
G86220	8622	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8622
G86250	8625	0.23–0.28	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8625
G86270	8627	0.25–0.30	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8627
G86300	8630	0.28–0.33	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8630
G86370	8637	0.35–0.40	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8637
G86400	8640	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8640
G86420	8642	0.40–0.45	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8642
G86450	8645	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8645
G86451	86B45[e]	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	—
G86500	8650	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	—
G86550	8655	0.51–0.59	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	8655
G86600	8660	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	—	—
G87200	8720	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	—	8720
G87400	8740	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	—	8740
G88220	8822	0.20–0.25	0.75–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.40–0.60	0.30–0.40	—	8822
G92540	9254	0.51–0.59	0.60–0.80	0.035	0.040	1.20–1.60	—	0.60–0.80	—	—	—
G92600	9260	0.56–0.64	0.75–1.00	0.035	0.040	1.80–2.20	—	—	—	—	9260
G93106	9310[b]	0.08–0.13	0.45–0.65	0.025	0.025	0.15–0.30	3.00–3.50	1.00–1.40	0.08–0.15	—	—
G94151	94B15[c]	0.13–0.18	0.75–1.00	0.035	0.040	0.15–0.30	0.30–0.60	0.30–0.50	0.08–0.15	—	—
G94171	94B17[c]	0.15–0.20	0.75–1.00	0.035	0.040	0.15–0.30	0.30–0.60	0.30–0.50	0.08–0.15	—	94B17
G94301	94B30	0.28–0.33	0.75–1.00	0.035	0.040	0.15–0.30	0.30–0.60	0.30–0.50	0.08–0.15	—	94B30

[a] For standard variations in composition limits, see Table 4 of SAE J409. Small quantities of certain elements which are not specified or required may be found in alloy steels. These elements are to be considered as incidental and are acceptable to the following maximum amount: copper to 0.35%, nickel to 0.25%, chromium to 0.20%, and molybdenum to 0.06%.

[b] Electric furnace steel.

[c] Boron content is 0.0005% min.

TABLE 1B—ALLOY STEEL PLATE COMPOSITIONS[a,b,c] (OPEN HEARTH AND BASIC OXYGEN)

UNS No.	SAE No.	Ladle Chemical Composition Limits, %								
		C	Mn	P max	S max	Si[d]	Ni	Cr	Mo	V
G13300	1330	0.27–0.34	1.50–1.90	0.035	0.040	0.15–0.30	—	—	—	—
G13350	1335	0.32–0.39	1.50–1.90	0.035	0.040	0.15–0.30	—	—	—	—
G13400	1340	0.36–0.44	1.50–1.90	0.035	0.040	0.15–0.30	—	—	—	—
G13450	1345	0.41–0.49	1.50–1.90	0.035	0.040	0.15–0.30	—	—	—	—
G41180	4118	0.17–0.23	0.60–0.90	0.035	0.040	0.15–0.30	—	0.40–0.65	0.08–0.15	—
G41300	4130	0.27–0.34	0.35–0.60	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G41350	4135	0.32–0.39	0.65–0.95	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G41370	4137	0.33–0.40	0.65–0.95	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G41400	4140	0.36–0.44	0.70–1.00	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G41420	4142	0.38–0.46	0.70–1.00	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G41450	4145	0.41–0.49	0.70–1.00	0.035	0.040	0.15–0.30	—	0.80–1.15	0.15–0.25	—
G43400	4340	0.36–0.44	0.55–0.80	0.035	0.040	0.15–0.30	1.65–2.00	0.60–0.90	0.20–0.30	—
G43406	E4340	0.37–0.44	0.60–0.85	0.025	0.025	0.15–0.30	1.65–2.00	0.65–0.90	0.20–0.30	—
G46150	4615	0.12–0.18	0.40–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—
G46170	4617	0.15–0.21	0.40–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—
G46200	4620	0.16–0.22	0.40–0.65	0.035	0.040	0.15–0.30	1.65–2.00	—	0.20–0.30	—
G51600	5160	0.54–0.65	0.70–1.00	0.035	0.040	0.15–0.30	—	0.60–0.90	—	—
G61500	6150	0.46–0.54	0.60–0.90	0.035	0.040	0.15–0.30	—	0.80–1.15	—	0.15 min
G86150	8615	0.12–0.18	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86170	8617	0.15–0.21	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86200	8620	0.17–0.23	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86220	8622	0.19–0.25	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86250	8625	0.22–0.29	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86270	8627	0.24–0.31	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86300	8630	0.27–0.34	0.60–0.90	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86370	8637	0.33–0.40	0.70–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86400	8640	0.36–0.44	0.70–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G86550	8655	0.49–0.60	0.70–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.15–0.25	—
G87420	8742	0.38–0.46	0.70–1.00	0.035	0.040	0.15–0.30	0.40–0.70	0.35–0.60	0.20–0.30	—

[a] Small quantities of certain elements not required may be found. These elements are to be considered as incidental and are acceptable to the following maximum amounts: copper to 0.35%, nickel to 0.25%, chromium to 0.20%, and molybdenum to 0.06%.

[b] When electric furnace steel is ordered, the carbon range is restricted 0.01%, manganese 0.05%, chromium 0.05% up to 1.25% incl. and 0.10% over 1.25%. The maximum phosphorus and sulfur is 0.025% each.

[c] Boron or lead may be added to these compositions.

[d] Silicon available in ranges of 0.10–0.20%, 0.20–0.30%, and 0.35% maximum (when carbon deoxidized) when so specified by the purchaser.