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

SURFACE VEHICLE STANDARD

SAE J404

REV. JUN2000

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Superseding J404 APR1994

Submitted for recognition as an American National Standard

Chemical Compositions of SAE Alloy Steels

1. ***Scope*—**In 1941, the SAE Iron and Steel Division in collaboration with the American Iron and Steel Institute (AISI) 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 (reference SAE J408).

ISTC Divison 1 has developed a procedure which allows for the maintenance of the grade list in this SAE Standard. This will involve conducting an industry-wide survey to solicit input. This survey will be conducted at a frequency deemed necessary by the technical committee. Criteria have been established for the addition to or deletion of grades from the grade table. A new grade will be considered if it meets standard SAE grade ranges, has a minimum usage or production of 225 tonnes/year (250 tons/year), and has the endorsement of at least two users or producers. New steel compositions will still be considered as Potential Standard (PS) steels, based on the guidelines provided in SAE J1081, until such time as production of the new steel achieves a level of production or usage qualifying it for consideration as a standard steel.

The deletion of a grade from the grade table will be by consensus based on the grade survey results. Deleted grades will be archived in SAE J1249 for future reference.

The compositions in this document may apply to open hearth and basic oxygen, or electric furnace steels. Grades shown in Table 1 with prefix letter E are normally made by the electric furnace process with maximum limits of 0.025% phosphorus and 0.025% sulfur. The nominal chemical limits or ranges in the compositions given in Table 1 are subject to standard variations in check analysis given in SAE J409. Since AISI is no longer issuing steel grade designations, all grades listed in this document are SAE grades.

Table 1 is applicable to billets, blooms, slabs, plates, wire rods, and hot-rolled and cold-finished bars.

SAE J404 is not applicable to the following product forms:

a. Structural shapes—Not normally furnished to alloy chemistries
b. Sheet and strip, hot-rolled and cold-rolled—Refer to ASTM A 506 and A 507
c. Seamless and welded mechanical tubing—Refer to ASTM A 513 and A 519

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SAE WEB ADDRESS http://www.sae.org

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 AE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J408—Methods of Sampling Steel for Chemical Analysis
SAE J409—Product Analysis—Permissible Variations from Specified Chemical Analysis of a Heat or Cast of Steel
SAE J1081—Potential Standard Steels
SAE J1249—Former SAE Standard and Former SAE EX-Steels
SAE Aerospace Material Specifications (AMS) Index

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

ASTM A 506—Specification for Steel Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, Regular Quality
ASTM A 507—Specification for Steel Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, Drawing Quality
ASTM A 513—Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A 519—Specification for Seamless Carbon and Alloy Steel Mechanical Tubing

3. Cross Index to Equivalent Grades and Government Specifications—Attention is called to the SAE Aerospace Material Specifications (AMS) Index which is published twice a year. This index gives a cross reference to AMS grades, SAE grades, AISI grades, and Government Specifications (MIL, QQS, and so on) for metals, alloys, and nonmetallic materials.

TABLE 1—ALLOY STEEL COMPOSITIONS(1)

UNS No.	SAE No.	Ladle Chemical Composition Limits, % C	Ladle Chemical Composition Limits, % Mn	Ladle Chemical Composition Limits, % P	Ladle Chemical Composition Limits, % S	Ladle Chemical Composition Limits, % Si	Ladle Chemical Composition Limits, % Ni	Ladle Chemical Composition Limits, % Cr	Ladle Chemical Composition Limits, % Mo	Ladle Chemical Composition Limits, % V
G13300	1330	0.28–0.33	1.60–1.80	0.030	0.040	0.15–0.35	—	—	—	—
G13350	1335	0.33–0.38	1.60–1.90	0.030	0.040	0.15–0.35	—	—	—	—
G13400	1340	0.38–0.43	1.60–1.90	0.030	0.040	0.15–0.35	—	—	—	—
G13450	1345	0.43–0.48	1.60-1.90	0.030	0.040	0.15-0.35	—	—	—	—
G40230	4023	0.20–0.25	0.70–0.90	0.030	0.040	0.15–0.35	—	—	0.20–0.30	—
G40270	4027	0.25–0.30	0.70–0.90	0.030	0.040	0.15–0.35	—	—	0.20–0.30	—
G40370	4037	0.35–0.40	0.70–0.90	0.030	0.040	0.15–0.35	—	—	0.20–0.30	—
G40470	4047	0.45–0.50	0.70–0.90	0.030	0.040	0.15–0.35	—	—	0.20–0.30	—
G41180	4118	0.18–0.23	0.70–0.90	0.030	0.040	0.15–0.35	—	0.40–0.60	0.08–0.15	—
G41200	4120	0.18–0.23	0.90–1.20	0.030	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
G41300	4130	0.28–0.33	0.40–0.60	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41350	4135	0.33–0.38	0.70–0.90	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41370	4137	0.35–0.40	0.70–0.90	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41400	4140	0.38–0.43	0.75–1.00	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41420	4142	0.40–0.45	0.75–1.00	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41450	4145	0.43–0.48	0.75–1.00	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G41500	4150	0.48–0.53	0.75–1.00	0.030	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
G43200	4320	0.17–0.22	0.45–0.65	0.030	0.040	0.15–0.35	1.65–2.00	0.40–0.60	0.20–0.30	—

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G43400	4340	0.38–0.43	0.60–0.80	0.030	0.040	0.15–0.35	1.65–2.00	0.70–0.90	0.20–0.30	—
G43406	E4340[2]	0.38–0.43	0.65–0.85	0.025	0.025	0.15–0.35	1.65–2.00	0.70–0.90	0.20–0.30	—
G46150	4615	0.13–0.18	0.45–0.65	0.030	0.040	0.15–0.35	1.65~2.00	—	0.20–0.30	—
G46170	4617	0.16–0.21	0.40–0.65	0.030	0.040	0.15–0.35	1.65–2.00	—	0.20–0.30	—
G46200	4620	0.17–0.22	0.45–0.65	0.030	0.040	0.15–0.35	1.65–2.00	—	0.20–0.30	—
G48200	4820	0.18–0.23	0.50–0.70	0.030	0.040	0.15–0.35	3.25–3.75	—	0.20–0.30	—
G50461	50B46[3]	0.44–0.49	0.75–1.00	0.030	0.040	0.15–0.35	0.20–0.35	—	—	—
G51150	5115	0.13–0.18	0.70–0 90	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G51200	5120	0.17–0.22	0.70–0.90	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G51300	5130	0.28–0.33	0.70–0.90	0.030	0.040	0.15–0.35	—	0.80–1.10	—	—
G51320	5132	0.30–0.35	0.60–0.80	0.030	0.040	0.15–0.35	—	0.75–1.00	—	—
G51400	5140	0.38–0.43	0.70–0.90	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G51500	5150	0.48–0.53	0.70–0.90	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G51600	5160	0.56–0.64	0.75–1.00	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G51601	51B60[3]	0.56–0.64	0.75–1.00	0.030	0.040	0.15–0.35	—	0.70–0.90	—	—
G52986	E52100[2]	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.35	—	1.30–1.60	—	—
G61500	6150	0.48–0.53	0.70–0.90	0.030	0.040	0.15–0.35	—	0.80–1.10	—	0.15 min
G86150	8615	0.16–0.18	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86170	8617	0.15–0.20	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86200	8620	0.18–0.23	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86220	8622	0.20–0.25	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86250	8625	0.23–0.28	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86270	8627	0.25–0.30	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86300	8630	0.28–0.33	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86370	8637	0.38–0.43	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86400	8640	0.38–0.43	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86450	8645	0.43–0.48	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G86550	8655	0.51–0.59	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G87200	8720	0.18–0.23	0.70–0.90	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	—
G87420	8740	0.40–0.45	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
G88220	8822	0.20–0.25	0.75–1.00	0.030	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.30–0.40	—
G92540	9254	0.51–0.59	0.60–0.80	0.030	0.040	1.20–1.60	—	0.60–0.80	—	—
G92590	9259	0.56–0.64	0.75–1.00	0.030	0.040	0.70–1.10	—	0.45–0.65	—	—
G92600	9260	0.56–0.64	0.75–1.00	0.030	0.040	1.80–2.20	—	—	—	—

1. 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 amounts: copper to 0.35%, nickel to 0.25%, chromium to 0.20%, and molybdenum to 0.06%. Lead - Alloy steels can be produced with a lead additon of 0.15 to 0.35% to improve machinability. Such steels are identified by inserting the letter "L" between the second and third numerals of the grade number, for example, 51L40.
   The analysis of the following elements shall be reported regardless of whether they are specified:
   Aluminum, Titanium, Niobium (Columbium), Vanadium. If the analysis of any of these elements is less than 0.008%, it may be reported as <0.008%.
2. Electric furnace steel.
3. Boron content is 0.0005 to 0.003%.

4. Notes

4.1 Marginal Indicia.—The change bar (l) located in the left margine is for the convenience of the user in locating areas where techncial revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

SAE IRON AND STEEL TECHNICAL COMMITTEE DIVISION 1—CARBON AND ALLOY STEELS