

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 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

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 J1268	Hardenability Bands for Carbon and Alloy H Steels
SAE J1868	Restricted Hardenability Bands for Selected Alloy Steels

SAE Aerospace Material Specifications (AMS) Index

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

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⁾ - CAST OR HEAT CHEMICAL RANGES

UNS No.	SAE No.	Chemical Composition Limits, % C	Chemical Composition Limits, % Mn	Chemical Composition Limits, % P	Chemical Composition Limits, % S	Chemical Composition Limits, % Si ⁽⁴⁾	Chemical Composition Limits, % Ni	Chemical Composition Limits, % Cr	Chemical Composition Limits, % Mo	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	—
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	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	—	—
G52985	52100	0.93-1.05	0.25-0.45	0.025	0.025	0.15-0.35	—	1.35-1.60	—	—
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

TABLE 1 - ALLOY STEEL COMPOSITIONS⁽¹⁾ - CAST OR HEAT CHEMICAL RANGES (CONTINUED)

UNS No.	SAE No.	Chemical Composition Limits, % C	Chemical Composition Limits, % Mn	Chemical Composition Limits, % P	Chemical Composition Limits, % S	Chemical Composition Limits, % Si ⁽⁴⁾	Chemical Composition Limits, % Ni	Chemical Composition Limits, % Cr	Chemical Composition Limits, % Mo	Chemical Composition Limits, % V
G86150	8615	0.13–0.18	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 3 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:

Element	
Cu	0.35% max
Ni	0.25% max
Cr	0.20% max
Mo	0.06% max

2. Electric furnace steel.
3. Boron content is 0.0005 to 0.003%.
4. When agreed by purchaser and supplier, other silicon ranges are permitted.
5. Lead - Alloy steels can be produced with a lead addition 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.
6. Table 1 lists default values for Phosphorus and Sulfur, Alternate levels shall be agreed upon between purchaser and supplier. Typical values for Flat Roll products: P = 0.030 max, S = 0.035 max. Typical values for ASTM Long Product: P = 0.040 max, S = 0.050 max
7. ELEMENTS TO BE REPORTED: The elements listed in the table below shall be reported regardless of whether they are specified:

ELEMENTS TO BE REPORTED
C, Mn, P, S, Si ⁽¹⁾ , Al ⁽²⁾ , Cu ⁽¹⁾ , Ni ⁽¹⁾ , Cr ⁽¹⁾ , Mo ⁽¹⁾ , Nb (Cb) ⁽²⁾ , Ti ⁽²⁾ , V ⁽²⁾ , B, N
1. When the amount of any one of these elements is less than 0.02%, that analysis may be reported as "<0.02%."
2. When the amount of these elements is less than 0.008%, that analysis may be reported as "<0.008%."
3. If specified by purchaser, As and Sb are to be reported.