SAE BAR COMPOSITIONS

REFERENCE ASTM A29 & SAE J403
Nonresulfurized Carbon Steels

SAE No.	C	Mn	P Max.	S Max.
1005	0.06 max	0.35 max	.040	.050
1006	0.08 max	0.25-0.40	.040	.050
1008	0.10 max	0.30-0.50	.040	.050
1010	0.08-0.13	0.30-0.60	.040	.050
1011	0.08-0.13	0.60-0.90	.040	.050
1012	0.10-0.15	0.30-0.60	.040	.050
1013	0.11-0.16	0.50-0.80	.040	.050
1015	0.13-0.18	0.30-0.60	.040	.050
1016	0.13-0.18	0.60-0.90	.040	.050
1017	0.15-0.20	0.30-0.60	.040	.050
1018	0.15-0.20	0.60-0.90	.040	.050
1019	0.15-0.20	0.70-1.00	.040	.050
1020	0.18-0.23	0.30-0.60	.040	.050
M1020	0.17-0.24	0.25-0.60	.040	.050
1021	0.18-0.23	0.60-0.90	.040	.050
1022	0.18-0.23	0.70-1.00	.040	.050
1023	0.20-0.25	0.30-0.60	.040	.050
1025	0.22-0.28	0.30-0.60	.040	.050
1026	0.22-0.28	0.60-0.90	.040	.050
1029	0.25-0.31	0.60-0.90	.040	.050
1030	0.28-0.34	0.60-0.90	.040	.050
1034	0.32-0.38	0.50-0.80	.040	.050
1035	0.32-0.38	0.60-0.90	.040	.050
1037	0.32-0.38	0.70-1.00	.040	.050
1038	0.35-0.42	0.60-0.90	.040	.050
1039	0.37-0.44	0.70-1.00	.040	.050
1040	0.37-0.44	0.60-0.90	.040	.050
1042	0.40-0.47	0.60-0.90	.040	.050
1043	0.40-0.47	0.70-1.00	.040	.050
1044	0.43-0.50	0.30-0.60	.040	.050
M1044	0.40-0.50	0.25-0.60	.040	.050
1045	0.43-0.50	0.60-0.90	.040	.050
1046	0.43-0.50	0.70-1.00	.040	.050
1049	0.46-0.53	0.60-0.90	.040	.050
1050	0.48-0.55	0.60-0.90	.040	.050
1053	0.48-0.55	0.70-1.00	.040	.050
1055	0.50-0.60	0.60-0.90	.040	.050
1059	0.55-0.65	0.50-0.80	.040	.050
1060	0.55-0.65	0.60-0.90	.040	.050
1064	0.60-0.70	0.50-0.80	.040	.050
1065	0.60-0.70	0.60-0.90	.040	.050
1069	0.65-0.75	0.40-0.70	.040	.050
1070	0.65-0.75	0.60-0.90	.040	.050
1071	0.65-0.70	0.75-1.05	.040	.050
1074	0.70-0.80	0.50-0.80	.040	.050
1075	0.70-0.80	0.40-0.70	.040	.050
1078	0.72-0.85	0.30-0.60	.040	.050
1080	0.75-0.88	0.60-0.90	.040	.050
1084	0.80-0.93	0.60-0.90	.040	.050
1086	0.80-0.93	0.30-0.50	.040	.050
1090	0.85-0.98	0.60-0.90	.040	.050
1095	0.90-1.03	0.30-0.50	.040	.050

*Prefix M denotes merchant quality grades with wider carbon and manganese ranges than standard steels.

When Silicon is required, the following ranges and limits are commonly used for basic oxygen steel grades:

Standard Steel Designation	Silicon Ranges or Limits
Up to 1015 incl	0.10 max.
1015 to 1025 incl	0.10 max., 0.10/0.20, or 0.15/0.35
Over 1025	0.10/0.20, or 0.15/0.35

When lead or copper are required, they are added elements to a standard steel. Lead is generally added in amounts ranging from 0.15 to 0.35%.

SAE BAR COMPOSITIONS

REFERENCE ASTM A29 & SAE J403
Nonresulfurized Carbon Steels
High Manganese Carbon Steel[1]

SAE No.	C	Mn	P Max.	S Max.
1513	0.10-0.16	1.10-1.40	.040	.050
1518	0.15-0.21	1.10-1.40	.040	.050
1522	0.18-0.24	1.10-1.40	.040	.050
1524	0.19-0.25	1.35-1.65	.040	.050
1525	0.23-0.29	0.80-1.10	.040	.050
1526	0.22-0.29	1.10-1.40	.040	.050
1527	0.22-0.29	1.20-1.50	.040	.050
1536	0.30-0.37	1.20-1.50	.040	.050
1541	0.36-0.44	1.35-1.65	.040	.050
1547	0.43-0.51	1.35-1.65	.040	.050
1548	0.44-0.52	1.10-1.40	.040	.050
1551	0.45-0.56	0.85-1.15	.040	.050
1552	0.47-0.55	1.20-1.50	.040	.050
1561	0.55-0.65	0.75-1.05	.040	.050
1566	0.60-0.71	0.85-1.15	.040	.050
1572	0.65-0.76	1.00-1.30	.040	.050

[1]Boron treated steels range 0.0005-0.003%. These grades are identified by inserting the letter "B" between the second and third numbers of the grade, for example: 15B41.

SAE BAR COMPOSITIONS

Resulfurized Carbon Steels
Heat Chemical Ranges and Limits

SAE No.*	C	Mn	P Max.	S Max.
1108	0.08-0.13	0.60-0.80	.040	.08-.13
1110	0.08-0.13	0.30-0.60	.040	.08-.13
1117	0.14-0.20	1.00-1.30	.040	.08-.13
1118	0.14-0.20	1.10-1.40	.040	.16-.23
1119	0.14-0.20	1.30-1.60	.040	.08-.13
1137	0.32-0.39	1.00-1.30	.040	.24-.33
1139	0.35-.450	1.35-1.65	.040	.13-.20
1140	0.37-.440	0.70-1.00	.040	.08-.13
1141	0.37-.450	1.35-1.65	.040	.08-.13
1144	0.40-.480	1.35-1.65	.040	.24-.33
1146	0.42-.490	0.70-1.00	.040	.04-.07
1146	0.42-.490	0.70-1.00	.040	.08-.13
1151	0.48-.550	0.70-1.00	.040	.08-.13

Rephosphorized and Resulfurized Carbon Steels
Heat Chemical Ranges and Limits

SAE No.*	C	Mn	P	S	Pb
1211	0.13 max.	0.60-0.90	.07-.12	.10-.15	—
1212	0.13 max.	0.70-1.00	.07-.12	.16-.23	—
1213	0.13 max.	0.70-1.00	.07-.12	.24-.33	—
12L13	0.13 max.	0.70-1.00	.07-.12	.24-.33	.15-.35
1215	0.09 max.	0.75-1.05	.04-.09	.26-.35	—
12L14	0.15 max.	0.85-1.15	.04-.09	.26-.35	.15-.35
12L15	0.09 max.	0.75-1.05	.04-.09	.26-.35	.15-.35

(Leadloy 300)

*All are basic oxygen steels.

When lead or copper are required, they are added elements to a standard steel. Lead is generally added in amounts ranging from 0.15 to 0.35%. Such a steel is identified by inserting the letter "L" between the second and third numbers of the AISI number (example: 12L14).

SAE BAR COMPOSITIONS

Standard Alloy Steels
Basic Oxygen and Electric Furnace

SAE No.*	C	Mn	Ni	Cr	Mo	Other Elements
MOLYBDENUM STEELS						
4012	.09-0.14	0.75-1.00	—	—	.15-.25	a, b
4023	.20-0.25	0.70-0.90	—	—	.20-.30	a, b
4024	.20-0.25	0.70-0.90	—	—	.20-.30	b, c
4027	.25-0.30	0.70-0.90	—	—	.20-.30	a, b
4028	.25-0.30	0.70-0.90	—	—	.20-.30	b, c
4032	.30-0.35	0.70-0.90	—	—	.20-.30	a, b
4037	.35-0.40	0.70-0.90	—	—	.20-.30	a, b
4042	.40-0.45	0.70-0.90	—	—	.20-.30	a, b
4047	.45-0.50	0.70-0.90	—	—	.20-.30	a, b
CHROMIUM—MOLYBDENUM STEELS						
4118	.18-0.23	0.70-0.90	—	0.40-0.60	.08-.15	a, b
4130	.28-0.33	0.40-0.60	—	0.80-1.10	.15-.25	a, b
4135	.33-0.38	0.70-0.90	—	0.80-1.10	.15-.25	a, b
4137	.35-0.40	0.70-0.90	—	0.80-1.10	.15-.25	a, b
4140	.38-0.43	0.75-1.00	—	0.80-1.10	.15-.25	a, b
4142	.40-0.45	0.75-1.00	—	0.80-1.10	.15-.25	a, b
4145	.43-0.48	0.75-1.00	—	0.80-1.10	.15-.25	a, b
4147	.45-0.50	0.75-1.00	—	0.80-1.10	.15-.25	a, b
4150	.48-0.53	0.75-1.00	—	0.80-1.10	.15-.25	a, b
4161	.56-0.64	0.75-1.00	—	0.70-0.90	.25-.35	a, b
NICKEL—CHROMIUM—MOLYBDENUM STEELS						
4320	.17-0.22	0.45-0.65	1.65-2.00	0.40-0.60	.20-.30	a, b
4340	.38-0.43	0.65-0.85	1.65-2.00	0.70-0.90	.20-.30	a, b
E4340	.38-0.43	0.65-0.85	1.65-2.00	0.70-0.90	.20-.30	a, b
NICKEL 1.75%—MOLYBDENUM 0.25% STEEL						
4615	.13-0.18	0.45-0.65	1.65-2.00	—	.20-.30	a, b
4620	.17-0.22	0.45-0.65	1.65-2.00	—	.20-.30	a, b
4621	.18-0.23	0.70-0.90	1.65-2.00	—	.20-.30	a, b
4626	.24-0.29	0.45-0.65	0.70-1.00	—	.15-.25	a, b
NICKEL 1.05%—CHROMIUM 0.45% MOLYBDENUM 0.20%						
4718	.16-0.21	0.70-0.90	0.90-1.20	0.35-0.55	.30-.40	a, b
4720	.17-0.22	0.50-0.70	0.90-1.20	0.35-0.55	.15-.25	a, b

* Prefix E denotes electric furnace steel; all other analyses are oxygen steels.
(a) Phosphorus content for basic oxygen process steel is .035%, for electric furnace steel, .025%, Sulfur content for basic oxygen process steel is .040%; for electric furnace steel, .025%.
(b) Silicon content is .15 to .35%.
(c) Sulfur content is .035 to .050%.

SAE BAR COMPOSITIONS

Standard Alloy Steels
Basic Oxygen and Electric Furnace

SAE No.*	C	Mn	Ni	Cr	Mo	Other Elements
CHROMIUM STEEL						
5017	.13-0.17	0.30-0.50	—	0.30-0.50	—	a, b
5046	.43-0.48	0.75-1.00	—	0.20-0.35	—	a, b
5115	.13-0.18	0.70-0.90	—	0.70-0.90	—	a, b
5117	.15-0.20	0.70-0.90	—	0.70-0.90	—	a, b
5120	.17-0.22	0.70-0.90	—	0.70-0.90	—	a, b
5130	.28-0.33	0.70-0.90	—	0.80-1.10	—	a, b
5132	.30-0.35	0.60-0.80	—	0.75-1.00	—	a, b
5135	.33-0.38	0.60-0.80	—	0.80-1.05	—	a, b
5140	.38-0.43	0.70-0.90	—	0.70-0.90	—	a, b
5145	.43-0.48	0.70-0.90	—	0.70-0.90	—	a, b
5147	.46-0.51	0.70-0.95	—	0.85-1.15	—	a, b
5150	.48-0.53	0.70-0.90	—	0.70-0.90	—	a, b
5155	.51-0.59	0.70-0.90	—	0.70-0.90	—	a, b
5160	.56-0.64	0.75-1.00	—	0.70-0.90	—	a, b
E50100	.98-1.10	0.25-0.45	—	0.40-0.60	—	a, b
E51100	.98-1.10	0.25-0.45	—	0.90-1.15	—	a, b
E52100	.98-1.10	0.25-0.45	—	1.30-1.60	—	a, b
CHROMIUM—VANADIUM STEELS						
6118	.16-0.21	0.50-0.70	—	0.50-0.70	.10-.15V	a, b
6150	.48-0.53	0.70-0.90	—	0.80-1.10	.15 min. V	a, b
NICKEL 0.55%—CHROMIUM 0.50% MOLYBDENUM 0.20%-0.30%						
8615	.13-0.18	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8617	.15-0.20	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8620	.18-0.23	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8622	.20-0.25	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8625	.23-0.28	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8627	.25-0.30	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8630	.28-0.33	0.70-0.90	0.40-0.70	0.40-0.60	.15-.25	a, b
8637	.35-0.40	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	a, b
8640	.38-0.43	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	a, b
8642	.40-0.45	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	a, b
8645	.43-0.48	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	a, b
8650	.48-0.53	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	—
8655	.51-0.59	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	a, b
8660	.56-0.64	0.75-1.00	0.40-0.70	0.40-0.60	.15-.25	—
8720	.18-0.23	0.70-0.90	0.40-0.70	0.40-0.60	.20-.30	a, b
8740	.38-0.43	0.75-1.00	0.40-0.70	0.40-0.60	.20-.30	a, b
8822	.20-0.25	0.75-1.00	0.40-0.70	0.40-0.60	.30-.40	a, b
9260	.56-0.64	0.75-1.00	—	—	—	a, c
NICKEL 3.25%—CHROMIUM 1.20% MOLYBDENUM 0.10%						
E9310	.07-.13	.40-.70	3.00-3.50	1.00-1.40	.08-.15	a, b

* Prefix E denotes electric furnace steel; all others are basic oxygen steels
(a) Phosphorus content for basic oxygen process steels is .035%; for electric furnace steel, .025%, Sulfur content for basic oxygen steels is .040%; for electric furnace steel, .025%.
SILICON CONTENT: (b) .15 to.35%; (c) 1.80-2.20.

SAE BAR COMPOSITIONS

Standard Alloy Steels
Basic Oxygen and Electric Furnace

STANDARD BORON STEELS
Boron content of 0.0005% to 0.003%

SAE No.	C	Mn	Si	Ni	Cr	Mo
50B40	.38-0.43	0.75-1.00	.15-.35	—	.40-.60	—
50B44	.43-0.48	0.75-1.00	.15-.35	—	.40-.60	—
50B46	.44-0.49	0.75-1.00	.15-.35	—	.25-.35	—
50B50	.48-0.53	0.75-1.00	.15-.35	—	.40-.60	—
50B60	.56-0.64	0.75-1.00	.15-.35	—	.40-.60	—
51B60	.56-0.64	0.75-1.00	.15-.35	—	.70-.90	—
81B45	.43-0.48	0.75-1.00	.15-.35	.20-.40	.35-.55	.08-.15
86B45	.43-0.48	0.75-1.00	.15-.35	.40-.70	.40-.60	.15-.25
94B15	.13-0.18	0.75-1.00	.15-.35	.30-.80	.30-.50	.08-.15
94B17	.15-0.20	0.75-1.00	.15-.35	.30-.80	.30-.50	.08-.15
94B30	.28-0.33	0.75-1.00	.15-.35	.30-.80	.30-.60	.08-.15

NOTE: Phosphorus is 0.35% max., sulfur, 0.040% max.

NOTES ON ALLOY STEELS

NOTE 1: Grades shown with prefix letter E are normally made by the electric furnace process. All others are normally manufactured by basic oxygen processes but may be manufactured by the electric furnace process with adjustments in phosphorus and sulfur.

NOTE 2: Phosphorus and sulfur limits for each process are:

Steel Making Process	Maximum Percent P	Maximum Percent S
Basic electric furnace	0.025	0.025
Basic oxygen	0.040	0.050

NOTE 3: Small quantities of certain elements are present in alloy steels which are not specified or required. Elements considered incidental which may be present to the following maximum amounts: copper, 0.35%; nickel, 0.25%; chromium, 0.20%; and molybdenum, 0.06%, per ASTM A304.

NOTE 4: Where minimum and maximum sulfur content is shown it is indicative of resulfurized steel.

NOTE 5: Standard alloy steels can be produced with a lead range of 0.15 to 0.35%. Such steels are identified by inserting the letter "L" between the second and third numerals of the SAE number (example: 41L40). Ladle analysis for lead is not determinable since lead is added to the ladle stream while ingot is poured.