~~Designation:A506–05~~ Designation: A506 – 12

Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled[1]

This standard is issued under the fixed designation A506; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers hot-rolled and cold-rolled alloy and structural alloy-steel sheet and strip. Alloy steel is furnished to chemical composition requirements and is intended primarily for general or miscellaneous use where bending and moderate forming is a requirement. Structural alloy steel is furnished to chemical composition requirements and to specific mechanical property requirements which may include tension tests, hardness tests, or other commonly accepted mechanical tests.

1.2 If material of a higher degree of uniformity of internal soundness and freedom from surface imperfections is required, reference should be made to Specification A507.

1.3 Alloy and structural alloy-steel sheet and strip are not produced to internal cleanliness requirements. Normally surface imperfections are not objectionable, and a good finish is not a prime requirement.

1.4 The formability of structural alloy steel decreases with increasing yield strength or hardness. Therefore, product design in relation to the mechanical properties of the grade used must be considered.

1.5 The material covered by this specification may be furnished in several conditions: heat treatments, surface conditions, and edges, as specified herein, in coils or cut lengths.

1.6 The values stated in inch-pound units are to be regarded as the standard. SI units are provided for information only.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A505 Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A507 Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *alloy steel*—alloy-steel sheet and strip furnished to chemical composition requirements and intended for general or miscellaneous applications where normal surface imperfections are not objectionable and a good finish is not the prime requirement.

3.1.2 *SAE*—Society of Automotive Engineers.

3.1.3 *standard steels*—steel chemical compositions defined as "standard" by SAE, shown in Table 1.

3.1.4 *steels other than standard*—steel chemical compositions other than those defined as "standard," and furnished to the composition limits shown in Table 2.

3.1.5 *structural alloy steel*—alloy-steel sheet and strip meeting the requirements of regular quality and also produced to specific mechanical property requirements.

4. General Requirements and Ordering Information

4.1 Material supplied to this specification shall conform to Specification A505, which includes the general requirements and establishes the rules for the ordering information that should be complied with when purchasing material to this specification.

4.2 In addition to the ordering information required by Specification A505, the following shall also be included:

4.2.1 Mechanical properties required for structural quality, when applicable,

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[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.19 on Steel Sheet and Strip.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

TABLE 1 Standard Steels Commonly Produced for Alloy-Steel Sheet and Strip

~~UNS Designation~~	~~SAE~~eel Designation No.	Chemical Composition Ranges and Limits, % (Heat Analysis)[A]								
		C	Mn	P	S	Si[B]	Ni	Cr	Mo	V
~~...~~	E3310	0.08–0.13	0.45–0.60	0.025	0.025	0.15–0.30	3.25–3.75	1.40–1.75	...	...
~~...~~	E3310[C]	0.08–0.13	0.45–0.60	0.025	0.025	0.15–0.30	3.25–3.75	1.40–1.75	...	...
~~G40120~~	4012	0.09–0.14	0.75–1.00	0.025	0.025	0.15–0.30	...	...	0.15–0.25	...
~~G40120~~	4012[C]	0.09–0.14	0.75–1.00	0.025	0.025	0.15–0.30	...	...	0.15–0.25	...
~~G41180~~	4118	0.18–0.23	0.70–0.90	0.025	0.025	0.15–0.30	...	0.40–0.60	0.08–0.15	...
~~G41300~~	4130	0.28–0.33	0.40–0.60	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41350~~	4135	0.33–0.38	0.70–0.90	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41370~~	4137	0.35–0.40	0.70–0.90	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41400~~	4140	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41420~~	4142	0.40–0.45	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41450~~	4145	0.43–0.48	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41470~~	4147	0.45–0.50	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41470~~	4147[C]	0.45–0.50	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G41500~~	4150	0.48–0.53	0.75–1.00	0.025	0.025	0.15–0.30	...	0.80–1.10	0.15–0.25	...
~~G43200~~	4320	0.17–0.22	0.45–0.65	0.025	0.025	0.15–0.30	1.65–2.00	0.40–0.60	0.20–0.30	...
~~G43400~~	4340	0.38–0.43	0.60–0.80	0.025	0.025	0.15–0.30	1.65–2.00	0.70–0.90	0.20–0.30	...
~~G43406~~	E4340	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	...
~~G45200~~	4520	0.18–0.23	0.45–0.65	0.025	0.025	0.15–0.30	...	...	0.45–0.60	...
~~G45200~~	4520[C]	0.18–0.23	0.45–0.65	0.025	0.025	0.15–0.30	...	...	0.45–0.60	...
~~G46150~~	4615	0.13–0.18	0.45–0.65	0.025	0.025	0.15–0.30	1.65–2.00	...	0.20–0.30	...
~~G46200~~	4620	0.17–0.22	0.45–0.65	0.025	0.025	0.15–0.30	1.65–2.00	...	0.20–0.30	...
~~G47180~~	4718	0.16–0.21	0.70–0.90	0.025	0.025	0.15–0.30	0.90–1.20	0.30–0.50	0.30–0.40	...
~~G48150~~	4815	0.13–0.18	0.40–0.60	0.025	0.025	0.15–0.30	3.25–3.75	...	0.20–0.30	...
~~G48200~~	4820	0.18–0.23	0.50–0.70	0.025	0.025	0.15–0.30	3.25–3.75	...	0.20–0.30	...
~~G50150~~	5015	0.12–0.17	0.30–0.50	0.025	0.025	0.15–0.30	...	0.30–0.50	...	...
~~G50460~~	5046	0.43–0.50	0.75–1.00	0.025	0.025	0.15–0.30	...	0.20–0.35	...	...
~~G51150~~	5115	0.13–0.18	0.70–0.90	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G51200~~	5120	0.17–0.22	0.70–0.90	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G51300~~	5130	0.28–0.33	0.70–0.90	0.025	0.025	0.15–0.30	...	0.80–1.10	...	...
~~G5132~~	5132	0.30–0.35	0.60–0.90	0.025	0.025	0.15–0.30	...	0.75–1.00	...	...
~~G5132~~	5132	0.30–0.35	0.60–0.80	0.025	0.025	0.15–0.30	...	0.75–1.00	...	...
~~G51400~~	5140	0.38–0.43	0.70–0.90	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G51500~~	5150	0.48–0.53	0.70–0.90	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G51600~~	5160	0.55–0.65	0.75–1.00	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G51600~~	5160	0.56–0.64	0.75–1.00	0.025	0.025	0.15–0.30	...	0.70–0.90	...	...
~~G15116~~	E51100	0.95–1.10	0.25–0.45	0.025	0.025	0.15–0.30	...	0.90–1.15	...	...
~~G15116~~	E51100[C]	0.95–1.10	0.25–0.45	0.025	0.025	0.15–0.30	...	0.90–1.15	...	...
~~G15216~~	E52100	0.95–1.10	0.25–0.45	0.025	0.025	0.15–0.30	...	1.30–1.60	...	...
~~G15216~~	E52100	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.30	...	1.30–1.60	...	...
~~G61500~~	6150	0.48–0.53	0.70–0.90	0.025	0.025	0.15–0.30	...	0.80–1.10	...	0.15 min
~~G61580~~	6158	0.55–0.62	0.70–1.10	0.025	0.025	0.15–0.30	...	0.90–1.20	...	0.10–0.20
~~G61580~~	6158[C]	0.55–0.62	0.70–1.10	0.025	0.025	0.15–0.30	...	0.90–1.20	...	0.10–0.20
~~G86150~~	8615	0.13–0.18	0.70–0.90	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86170~~	8617	0.15–0.20	0.70–0.90	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86200~~	8620	0.18–0.23	0.70–0.90	0.035	0.035	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86300~~	8630	0.28–0.33	0.70–0.90	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86400~~	8640	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86420~~	8642	0.40–0.45	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86420~~	8642[C]	0.40–0.45	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86450~~	8645	0.43–0.48	0.75–1.00	0.025	0.025	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	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86500~~	8650[C]	0.48–0.53	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86550~~	8655	0.50–0.60	0.75–100	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86550~~	8655	0.51–0.59	0.75–100	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.15–0.25	...
~~G86600~~	8660	0.55–0.65	0.75–1.00	0.025	0.025	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	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	...
~~G87350~~	8735	0.33–0.38	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	...
~~G87350~~	8735[C]	0.33–0.38	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	...
~~G87400~~	8740	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	...
~~G87400~~	8740[C]	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.30	0.40–0.70	0.40–0.60	0.20–0.30	...
~~G92600~~	9260	0.55–0.65	0.70–1.00	0.025	0.025	1.80–2.20	...	...	...	...
~~G92600~~	9260	0.56–0.64	0.75–1.00	0.025	0.025	1.80–2.20	...	...	...	...
~~G92620~~	9262	0.55–0.65	0.75–1.00	0.025	0.025	1.80–2.20	...	0.25–0.40	...	...
~~G92620~~	9262[C]	0.55–0.65	0.75–1.00	0.025	0.025	1.80–2.20	...	0.25–0.40	...	...
~~...~~	E9310	0.08–0.13	0.45–0.65	0.025	0.025	0.20–0.35	3.00–3.50	1.00–1.40	0.08–0.15	...
~~...~~	E9310[C]	0.08–0.13	0.45–0.65	0.025	0.025	0.20–0.35	3.00–3.50	1.00–1.40	0.08–0.15	...

[A] The chemical ranges and limits shown are subject to product analysis tolerances. See Specification A505.
[B] Other silicon ranges are available. Consult the producer.
[C] Not an S.A.E. Steel Designation.

4.2.2 Surface finish, if other than standard (see 8.1), and