



Designation: A506 – 16 (Reapproved 2021)

Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled¹

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 U.S. 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 standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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.

Current edition approved Sept. 1, 2021. Published September 2021. Originally approved in 1964. Last previous edition approved in 2016 as A506 – 16. DOI: 10.1520/A0506-16R21.

mentations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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 *Acronyms:*

3.1.1 *SAE*—Society of Automotive Engineers.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *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.

3.2.2 *standard steels*—steel chemical compositions defined as “standard” by SAE, shown in [Table 1](#).

3.2.3 *steels other than standard*—steel chemical compositions other than those defined as “standard,” and furnished to the composition limits shown in [Table 2](#).

3.2.4 *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.

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

Steel Designation No.	Chemical Composition Ranges and Limits, % (Heat Analysis) ^A								
	C	Mn	P	S	Si ^B	Ni	Cr	Mo	V
E3310 ^C	0.08–0.13	0.45–0.60	0.025	0.025	0.15–0.35	3.25–3.75	1.40–1.75	...	...
4012 ^C	0.09–0.14	0.75–1.00	0.025	0.025	0.15–0.35	...	...	0.15–0.25	...
4118	0.18–0.23	0.70–0.90	0.025	0.025	0.15–0.35	...	0.40–0.60	0.08–0.15	...
4130	0.28–0.33	0.40–0.60	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4135	0.33–0.38	0.70–0.90	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4137	0.35–0.40	0.70–0.90	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4140	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4142	0.40–0.45	0.75–1.00	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4145	0.43–0.48	0.75–1.00	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4147 ^C	0.45–0.50	0.75–1.00	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4150	0.48–0.53	0.75–1.00	0.025	0.025	0.15–0.35	...	0.80–1.10	0.15–0.25	...
4320	0.17–0.22	0.45–0.65	0.025	0.025	0.15–0.35	1.65–2.00	0.40–0.60	0.20–0.30	...
4340	0.38–0.43	0.60–0.80	0.025	0.025	0.15–0.35	1.65–2.00	0.70–0.90	0.20–0.30	...
E4340	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	...
4520 ^C	0.18–0.23	0.45–0.65	0.025	0.025	0.15–0.35	...	...	0.45–0.60	...
4615	0.13–0.18	0.45–0.65	0.025	0.025	0.15–0.35	1.65–2.00	...	0.20–0.30	...
4620	0.17–0.22	0.45–0.65	0.025	0.025	0.15–0.35	1.65–2.00	...	0.20–0.30	...
4718	0.16–0.21	0.70–0.90	0.025	0.025	0.15–0.35	0.90–1.20	0.30–0.50	0.30–0.40	...
4815	0.13–0.18	0.40–0.60	0.025	0.025	0.15–0.35	3.25–3.75	...	0.20–0.30	...
4820	0.18–0.23	0.50–0.70	0.025	0.025	0.15–0.35	3.25–3.75	...	0.20–0.30	...
5015	0.12–0.17	0.30–0.50	0.025	0.025	0.15–0.35	...	0.30–0.50	...	...
5046	0.43–0.50	0.75–1.00	0.025	0.025	0.15–0.35	...	0.20–0.35	...	...
5115	0.13–0.18	0.70–0.90	0.025	0.025	0.15–0.35	...	0.70–0.90	...	...
5120	0.17–0.22	0.70–0.90	0.025	0.025	0.15–0.35	...	0.70–0.90	...	...
5130	0.28–0.33	0.70–0.90	0.025	0.025	0.15–0.35	...	0.80–1.10	...	...
5132	0.30–0.35	0.60–0.80	0.025	0.025	0.15–0.35	...	0.75–1.00	...	...
5140	0.38–0.43	0.70–0.90	0.025	0.025	0.15–0.35	...	0.70–0.90	...	...
5150	0.48–0.53	0.70–0.90	0.025	0.025	0.15–0.35	...	0.70–0.90	...	...
5160	0.56–0.64	0.75–1.00	0.025	0.025	0.15–0.35	...	0.70–0.90	...	...
E51100 ^C	0.95–1.10	0.25–0.45	0.025	0.025	0.15–0.35	...	0.90–1.15	...	...
E52100	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.35	...	1.30–1.60	...	...
6150	0.48–0.53	0.70–0.90	0.025	0.025	0.15–0.35	...	0.80–1.10	...	0.15 min
6158 ^C	0.55–0.62	0.70–1.10	0.025	0.025	0.15–0.35	...	0.90–1.20	...	0.10–0.20
8615	0.13–0.18	0.70–0.90	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8617	0.15–0.20	0.70–0.90	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8620	0.18–0.23	0.70–0.90	0.035	0.035	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8630	0.28–0.33	0.70–0.90	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8640	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8642 ^C	0.40–0.45	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8645	0.43–0.48	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8650 ^C	0.48–0.53	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8655	0.51–0.59	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8660	0.55–0.65	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	...
8720	0.18–0.23	0.70–0.90	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	...
8735 ^C	0.33–0.38	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	...
8740 ^C	0.38–0.43	0.75–1.00	0.025	0.025	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	...
9260	0.56–0.64	0.75–1.00	0.025	0.025	1.80–2.20	...	...	...	...
9262 ^C	0.55–0.65	0.75–1.00	0.025	0.025	1.80–2.20	...	0.25–0.40	...	...
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 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,
- 4.2.2 Surface finish, if other than standard (see 8.1), and
- 4.2.3 Surface treatment, if other than standard (see 8.2).

5. Materials and Manufacture

5.1 *Rolling*—The material shall be furnished either hot-rolled or cold-rolled, as specified on the order.

5.2 Heat Treatment:

5.2.1 *Hot-Rolled*—Hot-rolled material shall be furnished in one of the following conditions, as specified on the order:

- 5.2.1.1 As-rolled,
- 5.2.1.2 Annealed,
- 5.2.1.3 Normalized, or
- 5.2.1.4 Normalized-and-tempered.

5.2.2 *Cold-Rolled*—Cold-rolled material shall be fully annealed after cold-rolling. (Temper, skin, or roller leveling for the control of flatness, which does not significantly affect the properties, may be performed after annealing.)

6. Chemical Requirements

6.1 The heat analysis shall conform to the requirements for the grade specified on the order.