



Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, Produced by Twin-Roll Casting Process¹

This standard is issued under the fixed designation A1083/A1083M; 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.

1. Scope

1.1 This specification covers cold-rolled, carbon, structural, and high-strength low-alloy, in coils and cut lengths produced by the twin-roll casting process.

1.2 Cold rolled steel sheet produced by the twin-roll casting process is available in the designations as listed in 4.1.

1.3 This specification does not apply to steel strip as described in Specification A109/A109M.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 *ASTM Standards*:²

A109/A109M Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

E18 Test Methods for Rockwell Hardness of Metallic Materials

E517 Test Method for Plastic Strain Ratio r for Sheet Metal
E646 Test Method for Tensile Strain-Hardening Exponents (n -Values) of Metallic Sheet Materials

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 For definitions of other terms used in this specification, refer to Terminology A941.

3.2 *aging, n* —loss of ductility with an increase in hardness, yield strength, and tensile strength that occurs when steel that has been slightly cold worked (such as by temper rolling) is stored for some time.

3.2.1 *Discussion*—Aging increases the tendency of a steel to exhibit stretcher strains and fluting.

4. Classification

4.1 Cold-rolled steel sheet is available in the following designations:

4.1.1 Commercial Steel (CS Types A, B, and D).

4.1.2 Drawing Steel (DS Types B and D).

4.1.3 Structural Steel (SS grades 25[170], 30[205], 33[230] Types 1 and 2, 40[275] Types 1 and 2, 50[340], 60[410], 70[480], and 80[550]).

4.1.4 High-Strength Low-Alloy Steel (HSLAS, in classes 1 and 2, in grades 45[310], 50[340], 55[380], 60[410], 65[450], 70[480] and 80[550]).

4.2 When required for HSLAS steels, limitations on the use of one or more of the microalloy elements, titanium, columbium, vanadium, or molybdenum, shall be specified on the order.

4.3 Cold-rolled steel sheet is supplied for either exposed or unexposed applications. Within the latter category, cold-rolled sheet is specified either “temper rolled” or “annealed last.” For details on processing, attributes and limitations, and inspection standards, refer to Specification A568/A568M.

5. Ordering Information

5.1 It is the purchaser’s responsibility to specify in the purchase order all ordering information necessary to describe the required material. Examples of such information include, but are not limited to, the following:

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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.

5.1.1 ASTM specification number and year of issue;

5.1.2 Name of material and designation (cold-rolled steel sheet) (include grade, type, and class, as appropriate, for CS, DS, SS, HSLAS, (see 4.1);

5.1.2.1 When a type is not specified for CS or DS, Type D will be furnished (see 4.1);

5.1.2.2 When a class is not specified for HSLAS, Class 1 will be furnished (see 4.1);

5.1.2.3 When a type is not specified for SS 33 [230] and SS 40 [275], Type 1 will be furnished (see 4.1);

5.1.3 Classification (either exposed, unexposed, temper rolled, or annealed last) (see 4.3);

5.1.4 Finish (see 9.1);

5.1.5 Oiled or not oiled, as required (see 9.1);

5.1.5.1 Unless otherwise specified, the sheet shall be oiled.

5.1.5.2 When required, specify the sheet to be furnished not oiled (dry).

5.1.6 Dimensions (thickness, width, and whether cut lengths or coils);

NOTE 1—Not all producers are capable of meeting all the limitations of the thickness tolerance tables in Specification **A568/A568M**. The purchaser should contact the producer regarding possible limitations prior to placing an order.

5.1.7 Coil size (must include inside diameter, outside diameter, and maximum weight);

5.1.8 Copper bearing steel (if required);

5.1.9 Quantity;

5.1.10 Application (part identification and description);

5.1.11 A report of heat analysis will be supplied, if requested, for CS, and DS. For materials with required mechanical properties, SS, and HSLAS, a report is required of heat analysis and mechanical properties as determined by the tension test, and

5.1.12 Special requirements (if any).

5.1.12.1 When the purchaser requires thickness tolerances for 3/8 in. [10 mm] minimum edge distance (see Supplementary Requirement in Specification **A568/A568M**), this requirement shall be specified in the purchase order or contract.

NOTE 2—A typical ordering description is as follows: ASTM A XXXX-XX, cold rolled steel sheet, CS Type A, exposed, matte finish, oiled, 0.035 by 30 in. by coil, ID 24 in., OD 48 in., max weight 15 000 lbs, 100 000 lb, for part No. 4560, Door Panel. Or ASTM A XXXXM-XX, cold-rolled steel sheet, SS grade 275, unexposed, matte finish, oiled, 0.88 mm by 760 mm by 2440 mm, 10 000 kg, for shelf bracket.

6. General Requirements for Delivery

6.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification **A568/A568M** unless otherwise provided herein.

7. Chemical Composition

7.1 The heat analysis of the steel shall conform to the chemical composition requirements of the appropriate designation shown in **Table 1** for CS, and DS, and in **Table 2** and **Table 3** for SS and HSLAS.

7.2 Each of the elements listed in **Table 1**, **Table 2**, and **Table 3** shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, report the analysis as <0.02 % or the actual determined value. When the amount of vanadium, columbium, or titanium is less than 0.008 %, report the analysis as <0.008 % or the actual determined value. When the amount of boron is less than 0.0005 %, report the analysis as <0.0005 % or the actual determined value.

7.3 Sheet steel grades defined by this specification are suitable for welding if appropriate welding conditions are selected. For certain welding processes, if more restrictive composition limits are desirable, they shall be specified at the time of inquiry and confirmed at the time of ordering.

8. Mechanical Properties

8.1 *CS and DS:*

8.1.1 Typical nonmandatory mechanical properties for CS, and DS, are shown in **Table 4**.

8.1.2 The material shall be capable of being bent, at room temperature, in any direction through 180° flat on itself without

TABLE 1 Chemical Composition^A
For Cold Rolled Steel Sheet Designations CS and DS

Designation	% Heat Analysis, Element Maximum Unless Otherwise Shown														
	C	Mn	P	S	Al	Si	Cu ^F	Ni	Cr ^B	Mo	V	Cb	Ti ^C	N	B
CS Type A ^{D, E}	0.10	0.70	0.030	0.035	...	...	0.50	0.20	0.15	0.06	0.008	0.008	0.025	...	...
CS Type B ^D	0.02 to 0.15	0.60	0.030	0.035	...	...	0.50	0.20	0.15	0.06	0.008	0.008	0.025	...	...
CS Type D ^{D, E}	0.15	0.80	0.10	0.035	...	...	0.50	0.30	0.30	0.15	0.008	0.008	0.025	...	...
DS Type B	0.02 to 0.15	0.50	0.020	0.030	...	...	0.50	0.20	0.15	0.06	0.008	0.008	0.025	...	...
DS Type D	0.15	0.60	0.030	0.035	...	...	0.50	0.30	0.30	0.15	0.008	0.008	0.025	...	...

^A Where an ellipsis (. . .) appears in the table, there is no requirement, but the analysis result shall be reported.

^B Chromium is permitted, at the producer's option, to 0.25 % maximum when the carbon content is less than or equal to 0.05 %.

^C For steels containing 0.02 % or more carbon, titanium is permitted at the producer's option, to the lesser of 3.4N + 1.5S or 0.025 %.

^D When an aluminum deoxidized steel is required for the application, it is permissible to order Commercial Steel (CS) to a minimum of 0.01 % total aluminum.

^E Specify Type B to avoid carbon levels below 0.02 %.

^F F When copper steel is specified, a minimum of 0.20% is required. When copper steel is not specified, the copper limit is a maximum requirement.

**TABLE 2 Chemical Composition^A
For Cold Rolled Steel Sheet Designations SS and HSLAS**

% Heat Analysis, Element Maximum Unless Otherwise Shown										
Designation	C	Mn	P	S	Al	Si	V	Cb	Ti	N
SS:^B										
Grade 25 [170]	0.20	0.60	0.035	0.035	...	...	0.008	0.008	0.025	...
Grade 30 [205]	0.20	0.60	0.035	0.035	...	...	0.008	0.008	0.025	...
Grade 33 [230]	0.20	0.60	0.035	0.035	...	...	0.008	0.008	0.025	...
Type 1										
Grade 33 [230]	0.15	0.60	0.20	0.035	...	...	0.008	0.008	0.025	...
Type 2										
Grade 40 [275]	0.20	1.35	0.035	0.035	...	...	0.008	0.008	0.025	...
Type 1										
Grade 40 [275]	0.15	0.60	0.20	0.035	...	...	0.008	0.008	0.025	...
Type 2										
Grade 45 [310]	0.20	1.35	0.070	0.025	0.08	0.60	0.08	0.08	0.025	0.030
Grade 50 [340]	0.20	1.35	0.035	0.035	...	...	0.08	0.08	0.025	...
Grade 60 [410]	0.20	1.35	0.035	0.035	...	...	0.08	0.08	0.025	...
Grade 70 [480]	0.20	1.35	0.035	0.035	...	...	0.08	0.08	0.025	...
Grade 80 [550]	0.20	1.35	0.035	0.035	...	...	0.08	0.08	0.025	...
HSLAS:^C										
Grade 45 [310]	.22	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 1							min	min	min	
Grade 45 [310]	0.15	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 2							min	min	min	
Grade 50 [340]	0.23	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 1							min	min	min	
Grade 50 [340]	0.15	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 2							min	min	min	
Grade 55 [380]	0.25	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 1							min	min	min	
Grade 55 [380]	0.15	1.35	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 2							min	min	min	
Grade 60 [410]	0.26	1.50	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 1							min	min	min	
Grade 60 [410]	0.15	1.50	0.04	0.04	...	...	0.005	0.005	0.005	...
Class 2							min	min	min	
Grade 65 [480]	0.26	1.50	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 1							min	min	min	
Grade 65 [450]	0.15	1.50	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 2							min	min	min	
Grade 70 [480]	0.26	1.65	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 1							min	min	min	
Grade 70 [550]	0.15	1.65	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 2							min	min	min	
Grade 80 [550]	0.26	1.65	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 1							min	min	min	
Grade 80 [550]	0.15	1.65	0.04	0.04	...	...	0.005	0.005	0.005	... ^D
Class 2							min	min	min	

^A Where an ellipsis (. . .) appears in the table, there is no requirement but the analysis shall be reported.

^B Titanium is permitted for SS designations, at the producer's option, to the lesser of 3.4N + 1.5S or 0.025 %.

^C HSLAS steels contain the strengthening elements columbium (niobium), vanadium, titanium, and molybdenum added singly or in combination. The minimum requirements only apply to the microalloy elements selected for strengthening of the steel.

^D The purchaser has the option of restricting the nitrogen content. It should be noted that, depending on the microalloying scheme (for example, use of vanadium) of the producer, nitrogen is permitted as a deliberate addition. Consideration should be made for the use of nitrogen binding elements (for example, vanadium, titanium).

cracking on the outside of the bent portion (see Section 14 of Test Methods and Definitions [A370](#)). The bend test is not a requirement of delivery. However, if testing is performed by the purchaser, material not conforming to the requirement shall be subject to rejection.

8.1.3 Sheet of these designations are subject to aging dependent upon processing factors such as the method of annealing (continuous annealing or box annealing), and chemical composition. For additional information on aging, see Appendix X1 of Specification [A568/A568M](#).

8.2 SS and HSLAS:

8.2.1 The available strength grades for SS, and HSLAS are shown in [Table 5](#).

8.2.2 Tension Tests:

8.2.2.1 *Requirements*—Material as represented by the test specimen shall conform to the mechanical property requirements specified in [Table 4](#). These requirements do not apply to the uncropped ends of unprocessed coils.

8.2.2.2 *Number of Tests*—Two tension tests shall be made from each heat or from each 50 tons [45 000 kg]. When the amount of finished material from a heat is less than 50 tons [45 000 kg], one test shall be made. When material rolled from heat

**TABLE 3 Chemical Requirements: Cu, Ni, Cr, and Mo for Structural Steels and High-Strength Low-Alloy Steels**

% Heat Analysis, Maximum Unless Otherwise Specified					
Designation	Limits	Cu ^{A,B}	Ni ^B	Cr ^{B,C}	Mo ^{B,C}
SS:					
All Grades	L	0.35	0.20	0.15	0.06
	H	0.50	0.30	0.30	0.16
HSLAS:					
All Grades	L	0.35	0.20	0.15	0.06
and Classes	H	0.50	0.30	0.30	0.16

^A When copper is specified, a minimum of 0.20 % is required. When copper steel is not specified, the copper limit is a maximum requirement.

^B B For limit H steels, the sum of copper, nickel, chromium, and molybdenum shall not exceed 1.00 % on heat analysis. When one or more of these elements are specified by the purchaser, the sum does not apply; in which case only the individual limits on the remaining elements shall apply.

^C C For limit H steels, the sum of chromium and molybdenum shall not exceed 0.32 % on heat analysis. When one or more of these elements are specified, the sum does not apply; in which case, only the individual limits on the remaining elements shall apply.

TABLE 4 Typical Ranges of Mechanical Properties^A (Nonmandatory)^B For Cold Rolled Steel Sheet Designations CS and DS

Designation	Yield Strength ^C		Elongation in 2 in. [50 mm] %	r_m Value ^D	n-Value ^E
	ksi	MPa			
CS Types A, B, and D	20 to 40	[140 to 275]	≥30	F	F
DS Types B and D	22 to 35	[150 to 240]	≥36	1.3 to 1.7	0.17 to 0.22

^A A These typical mechanical properties apply to the full range of steel sheet thicknesses. The yield strength tends to increase, the elongation decreases and some of the formability values tend to decrease as the sheet thickness decreases.

^B B The typical mechanical property values presented here are nonmandatory. They are provided to assist the purchaser in specifying a suitable steel for a given application. Values outside of these ranges are to be expected.

^C Yield Strength and elongation are measured in the longitudinal direction in accordance with Test Methods and Definitions A370.

^D Average plastic strain ratio (r_m value) as determined by Test Method E517.

^E The strain hardening exponent (n-value) as determined by Test Method E646.

^F No typical properties have been established.

differs 0.050 in. [1.27 mm] or more in thickness, one tension test shall be made from the thickest and thinnest material regardless of the weight represented.

8.2.2.3 Tension test specimens shall be taken at a point immediately adjacent to the material to be qualified.

8.2.2.4 Tension test specimens shall be taken from the full thickness of the sheet.

8.2.2.5 Tension test specimens shall be taken from a location approximately halfway between the center of the sheet and the edge of the material as rolled.

8.2.2.6 Tension test samples shall be taken with the lengthwise axis of the test specimen parallel to the rolling direction (longitudinal test).

8.2.2.7 *Test Method*—Yield strength shall be determined by either the 0.2 % offset method or the 0.5 % extension under load method unless otherwise specified.

8.3 Bending Properties:

8.3.1 Suggested minimum inside radii for cold bending are listed in Appendix X1 and are discussed in more detail in Specification A568/A568M (Section 6). Where a tighter bend

radius is required, where curved or offset bends are involved, or where stretching or drawing are also a consideration, the producer shall be consulted.

9. Finish and Appearance

9.1 Surface Finish:

9.1.1 Unless otherwise specified, the sheet shall have a matte finish. When required, specify the appropriate surface texture and condition. For additional information, see the Finish and Condition section of Specification A568/A568M. For additional information see “Finish and Condition” section of Specification A568/A568M.

10. Retests and Disposition of Non-Conforming Material

10.1 Retests, conducted with the requirements of Section 11.1 of Specification A568/A568M, are permitted when an unsatisfactory test result is suspected to be the consequence of the test method procedure.

10.2 Disposition of non-conforming material shall be subject to the requirements of Section 11.2 of Specification A568/A568M.

11. Certification

11.1 A report of heat analysis shall be supplied, if requested, for CS and DS steels. For material with required mechanical properties, SS and HSLAS a report is required of heat analysis and mechanical properties as determined by the tension test.

11.2 The report shall include the purchase order number, the ASTM designation number and year date, product designation, grade, type or class, as applicable, the heat number, and as required, heat analysis and mechanical properties as indicated by the tension test.

11.3 A signature is not required on the test report. However, the document shall clearly identify the organization submitting the report. Notwithstanding the absence of a signature, the organization submitting the report is responsible for the content of the report.

11.4 A Material Test Report, Certificate of Inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier’s facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier. Notwithstanding the absence of a signature, the organization submitting the EDI transmission is responsible for the content of the report.

12. Product Marking

12.1 In addition to the requirements of Specification A568/A568M, each lift or coil shall be marked with the designation shown on the order (CS (Type A, B, or D), DS (Type B or D), SS, or HSLAS. The designation shall be legibly stenciled on the top of each lift or shown on a tag attached to each coil or shipping unit.



**TABLE 5 Mechanical Property Requirements^A
For Cold Rolled Steel Sheet Designations SS and HSLAS**

Designation	Yield Strength, min		Tensile Strength, min		Elongation in 2 in. or 50 mm, min %
	ksi	[MPa]	ksi	[MPa]	
SS:					
Grade 25 [170]	25	[170]	42	[290]	26
Grade 30 [205]	30	[205]	45	[310]	24
Grade 33 [230]	33	[230]	48	[330]	22
Types 1 and 2					
Grade 40 [275]	40	[275]	52	[360]	20
Types 1 and 2					
Grade 45 [310]	45	[310]	60	[410]	20
Grade 50 [340]	50	[340]	65	[450]	18
Grade 60 [410]	60	[410]	75	[520]	12
Grade 70 [480]	70	[480]	85	[585]	6
Grade 80 [550]	80 ^B	[550]	82	[565]	^C
HSLAS:					
Grade 45 [310] Class 1	45	[310]	60	[410]	22
Grade 45 [310] Class 2	45	[310]	55	[380]	22
Grade 50 [340] Class 1	50	[340]	65	[450]	20
Grade 50 [340] Class 2	50	[340]	60	[410]	20
Grade 55 [380] Class 1	55	[380]	70	[480]	18
Grade 55 [380] Class 2	55	[380]	65	[450]	18
Grade 60 [410] Class 1	60	[410]	75	[520]	16
Grade 60 [410] Class 2	60	[410]	70	[480]	16
Grade 65 [450] Class 1	65	[450]	80	[550]	15
Grade 65 [450] Class 2	65	[450]	75	[520]	15
Grade 70 [480] Class 1	70	[480]	85	[585]	14
Grade 70 [480] Class 2	70	[480]	80	[550]	14
Grade 80 [550] Class 1	80	[550]	90	[620]	12
Grade 80 [550] Class 2	80	[550]	90	[620]	12

^A For coil products, testing by the producer is limited to the end of the coil. Mechanical properties throughout the coil shall comply with the minimum values specified.

^B On this full-hard product, the yield strength approaches the tensile strength and since there is no halt in the gage or drop in the beam, the yield point shall be taken as the yield stress at 0.5 % extension under load.

^C There is no requirement for elongation in 2 in. for SS Grade 80.

13. Keywords

13.1 carbon steel sheet; cold-rolled steel sheet; commercial steel; drawing steel; high-strength low-alloy steel; steel sheet; structural steel

APPENDIXES

X1. BENDING PROPERTIES

TABLE X1.1 Suggested Minimum Inside Radius for Cold Bending

NOTE 1—(*r*) Equals a radius equivalent to the steel thickness.

NOTE 2—The suggested radius should be used as a minimum for 90° bends in actual shop practice.

NOTE 3—Material which does not perform satisfactorily, when fabricated in accordance with the requirements, may be subject to rejection pending negotiation with the steel supplier.

Designation	Grade	Minimum Inside Radius for Cold Bending
Structural Steel	25 [170]	1/2 <i>t</i>
	30 [205]	1 <i>t</i>
	33 [230]	1 1/2 <i>t</i>
	40 [275]	2 <i>t</i>

	45 [310]	21/2 <i>t</i>	
	50 [340]	21/2 <i>t</i>	
	60 [410]	3 <i>t</i>	
	70 [480]	4 <i>t</i>	
	80 [550]	not applicable	
High- Strength Low-Alloy Steel		Class 1	Class 2
	45[310]	1 1/2 <i>t</i>	1 1/2 <i>t</i>
	50[340]	2 <i>t</i>	1 1/2 <i>t</i>
	55[380]	2 <i>t</i>	2 <i>t</i>
	60[410]	2 1/2 <i>t</i>	2 <i>t</i>
	65[450]	3 <i>t</i>	2 1/2 <i>t</i>
	70[480]	3 1/2 <i>t</i>	3 <i>t</i>
	80[550]	4 <i>t</i>	3.5 <i>t</i>

X2. RELATED ISO STANDARDS

The ISO standards listed below may be reviewed for comparison with this ASTM standard. The relationship between the standards may only be approximate; therefore, the respective standards should be consulted for actual requirements. Those who use these documents must determine which specifications address their needs.

ISO 3574 Cold-Reduced Carbon Steel Sheet of Commercial and Drawing Qualities

ISO 4997 Cold-Reduced Steel Sheet of Structural Quality

X3. HARDNESS PROPERTIES

TABLE X3.1 Typical Hardness Values

NOTE 1—The hardness values shown are at the time of shipment.

NOTE 2—Test for hardness shall be conducted in accordance with the requirements of Test Methods E18.

NOTE 3—The hardness values are Rockwell B scale as measured or converted from the appropriate Rockwell scales.

NOTE 4—The typical hardness values apply to the full range of steel sheet thickness. Hardness tends to increase as the steel sheet thickness decreases.

NOTE 5—Hardness testing is commonly used to assess the relative formability of various designations of uncoated steel sheet. This assessment done by many users is recognized to be only an approximation of the relative formability and therefore cannot be used as a specification requirement.

Designation	Hardness- Rockwell B Scale
CS Type A	70 or less
CS Type B	70 or less
CS Type D	70 or less
DS Type B	60 or less
DS Type D	60 or less

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