

CM#14

Table 2-5
Applicable ASTM Specifications
for Plates and Bars

carbon		ASTM signation	F_y Min. Yield Stress (ksi)	F_u Tensile Stress* (ksi)	Thickness of Plates and Bars, in.										
					to 0.75 incl.	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 6 incl.	over 6 to 8 incl.	over 8		
Carbon	A36		36	58-80											
	A529	Gr. 50	50	70-100											
		Gr. 55	55	70-100											
High-Strength Low- Alloy	A572	Gr. 42	42	60											
		Gr. 50	50	65											
		Gr. 55	55	70											
		Gr. 60	60	75											
		Gr. 65	65	80											
Corrosion Resistant High- Strength Low-Alloy	A242		42	63											
			46	67											
			50	70											
	A588		42	63											
			46	67											
Quenched and Tempered Alloy	A514*		90	100-130											
			100	110-130											
Quenched and Tempered Low-Alloy	A852*		70	90-110											
Quenched and Tempered Low-Alloy	A852*		70	90-110											

High strength Low
Alloy

Review of Table 2-5-CM-14-AISC-360-10.

- ☒ — Preferred material specification
☐ — Other applicable material specification, the availability of which should be confirmed prior to specification
☐ — Material specification does not apply

- * Minimum unless a range is shown.
 * Applicable to bars only above 1-in. thickness.
 * Available in plates only.

Table 2-5-CM#14

CM#15 A36 → up to 8" and over From 0.75" → 8" Check availability

2-50

Table 2-5
Applicable ASTM Specifications
for Plates and Bars

Steel Type	ASTM Designation		F_y Yield Stress ^a (ksi)	F_u Tensile Stress ^a (ksi)	Plates and Bars, in.									
					to 0.75 incl.	over 0.75 to 1.25 incl.	over 1.25 to 1.5 incl.	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.	over 6 to 8 incl.	over 8
Carbon	A36		32	58–80										
			36	58–80										
	A283 ^e	Gr. C	30	55–75					d					
		Gr. D	33	60–80					d					
	A529	Gr. 50	50	65–100		b	b	b	b	b				
		Gr. 55	55	70–100		c	c	c	c	c				
	A709	Gr. 36	36	58–80										

New item
Two Grades
added

Table 2-5-CM#15-Carbon steel.

- ^a Minimum, unless a range is shown.
- ^b Applicable for plates to 1 in. thickness and bars to 3½ in. thickness.
- ^c Applicable for plates to 1 in. thickness and bars to 3 in. thickness.
- ^d Thickness is not limited to 2 in. in ASTM A283 and thicker plates may be obtained but availability should be confirmed.
- ^e This specification is not a prequalified base metal per AWS D1.1/D1.1M:2015.
- ^f Applicable for plates to 3 in. thickness.
- ^g Applicable for plates to 1 in. thickness.

CM#15

2.50
Page

Table 2-5

Applicable ASTM Specifications for Plates and Bars

Steel Type	ASTM Designation		F_y Yield Stress ^a (ksi)	F_u Tensile Stress ^a (ksi)	Plates and Bars, in.									
					to 0.75 incl.	over 0.75 to 1.25 incl.	over 1.25 to 1.5 incl.	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.	over 6 to 8 incl.	over 8
High-Strength Low-Alloy	A572	Gr. 42	42	60										
		Gr. 50	50	65										
		Gr. 55	55	70										
		Gr. 60	60	75										
		Gr. 65	65	80										
	A709	Gr. 50	50	65										
	A1043 ^e	Gr. 36	36-52	58										
		Gr. 50	50-65	65										
	A1066 ^e	Gr. 50	50	65										
		Gr. 60	60	75										
		Gr. 65	65	80										
		Gr. 70	70	85										
		Gr. 80	80	90										

A709 & A1043^e and A1066^e were added

Grade 50 Gr 36
50

Grades 50 70
60 80
65

Table 2-5-CM#15-High strength steel.

CM # 15
Page
2-50

Table 2-5
Applicable ASTM Specifications
for Plates and Bars

Steel Type	ASTM Designation	F_y Yield Stress ^a (ksi)	F_u Tensile Stress ^a (ksi)	Plates and Bars, in.									
				to 0.75 incl.	over 0.75 to 1.25 incl.	over 1.25 to 1.5 incl.	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.	over 6 to 8 incl.	over 8
Corrosion Resistant High-Strength Low-Alloy	A242 ^e	42	63										
		46	67										
		50	70										
	A588	42 ^e	63										
		46 ^e	67										
		50	70										

■ = Preferred material specification.
 ■ = Other applicable material specification, the availability of which should be confirmed prior to specification.
 □ = Material specification does not apply.

No changes between CM# 14 & CM# 15

Table 2-5-CM#15-Corrosion resistance Steel.

Page 2-s1

CM#15

**Table 2-5 (continued)
Applicable ASTM Specifications
for Plates and Bars**

Steel Type	ASTM Designation	F _y Yield Stress* (ksi)	F _u Tensile Stress* (ksi)	Plates and Bars, in.									
				to 0.75 incl.	over 0.75 to 1.25 incl.	over 1.25 to 1.5 incl.	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.	over 6 to 8 incl.	over 8
Quenched and Tempered Alloy	A514 ^a	90	100-130										
		100	110-130										
Corrosion Resistant Quenched and Tempered Low-Alloy	Gr. 50W	50	70										
	Gr. HPS 50W	50	70										
	A709 Gr. HPS 70W	70	85-110										
	Gr. HPS 100W ^b	90	100-130										
		100	110-130										

■ = Preferred material specification.

□ = Other applicable material specification, the availability of which should be confirmed prior to specification.

□ = Material specification does not apply.

* Minimum, unless a range is shown.

* Applicable for plates to 1 in. thickness and bars to 3 1/2 in. thickness.

* Applicable for plates to 1 in. thickness and bars to 3 in. thickness.

* Thickness is not limited to 2 in. in ASTM A283 and thicker plates may be obtained but availability should be confirmed.

* This specification is not a prequalified base metal per AWS D1.1/D1.1M:2015.

* Applicable for plates to 3 in. thickness.

* Applicable for plates to 1 in. thickness.

For Quenched
and Tempered
Alloy

One item 514
Exists while

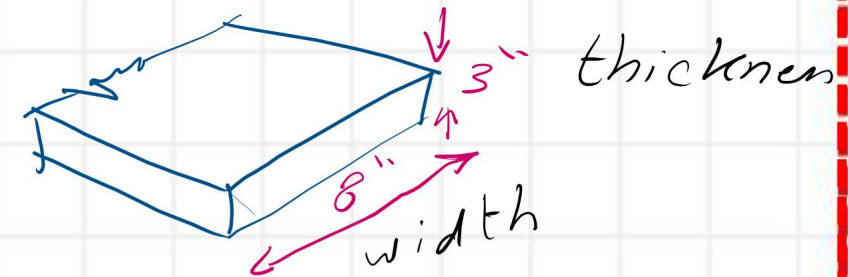
ASTM A 852
was removed

Complete new item
For A 709
with Four Grades
added

Table 2-5-CM#15-Corrosion resistance Steel-New items

P2.2. A Pl.3x8 of A514 steel is to be used as a tension member in a truss. What are the values of the yield stress, F_y , and ultimate tensile stress, F_u , to be used in the design of this member?

Practice problem 2.2 for A514 steel -CM#15



Solution

Based on CM #15

ASTM A 514

For 3"
plate
thickness

$F_y = 90$ ksi

$F_u = 110$ or 130 ksi

grade 90
Grade 100

Quenched
and tempered
alloy.

Steel Type	ASTM Designation	F_y Yield Stress* (ksi)	F_u Tensile Stress* (ksi)	Plates and Bars, in.							
				to 0.75 incl.	over 0.75 to 1.25 incl.	over 1.25 to 1.5 incl.	over 1.5 to 2 incl.	over 2 to 2.5 incl.	over 2.5 to 4 incl.	over 4 to 5 incl.	over 5 to 6 incl.
Quenched and Tempered Alloy	A514*	90	100-130								
		100	110-130								

CM #15 Steel Materials are tabulated-CM#15

(a) Hot-rolled structural shapes

ASTM A36/A36M
ASTM A529/A529M
ASTM A572/A572M
ASTM A588/A588M

(b) Hollow structural sections (HSS)

ASTM A53/A53M Grade B
ASTM A500/A500M
ASTM A501/A501M
ASTM A618/A618M

(c) Plates

ASTM A36/A36M → Carbon
ASTM A242/A242M
ASTM A283/A283M → Carbon
ASTM A514/A514M
ASTM A529/A529M → Carbon

(d) Bars

ASTM A36/A36M
ASTM A529/A529M

(e) Sheets

ASTM A606/A606M
ASTM A1011/A1011M SS, HSLAS, AND HSLAS-F

CrqL

: Corrosion
resistant
quenched

ASTM A709/A709M
ASTM A913/A913M
ASTM A992/A992M
ASTM A1043/A1043M

ASTM A847/A847M
ASTM A1065/A1065M
ASTM A1085/A1085M

Cr.H.S
Corrosion resistant
high strength

ASTM A572/A572M → H.S.L.a
ASTM A588/A588M
ASTM A709/A709M
ASTM A1043/A1043M
ASTM A1066/A1066M

Carbon Grade 36
H.S.L.a Grade 50

Gr 50W
Gr HPS 50W
Gr HPS 70W
Gr HPS 100W

CrqL

ASTM A data for different steel

quenched
and Tempered

Carbon

High strength L-alloy

*New specification**AISC 360 - 22*

**TABLE A3.1
Listed Materials**
New specs-360-22 data

Standard Designation	Permissible Grades/Strengths	Other Limitations
(c) Plates		
ASTM A36/A36M	<i>Imperial and metric combined</i>	–
ASTM A283/A283M	Gr. C or Gr. D	–
ASTM A514/A514M	–	See Note [b].
ASTM A529/A529M	Gr. 50 [345] or Gr. 55 [380]	–
ASTM A572/A572M	Gr. 42 [290], Gr. 50 [345], Gr. 55 [380], Gr. 60 [415], or Gr. 65 [450]	Type 1, 2, or 3
ASTM A588/A588M	–	–
ASTM A709/A709M	Gr. 36 [250], Gr. 50 [345], Gr. 50W [345W], HPS 50W [HPS345W], HPS 70W [HPS485W], or HPS 100W [HPS 690W]	–
– indicates no restriction applicable on grades/strengths or there are no limitations, as applicable ERW = electric resistance welded ^[a] ASTM A1085/A1085M material is only available in Grade A, therefore it is permitted to specify ASTM A1085/ A1085M without any grade designation. ^[b] For welded construction, the steel producer shall be contacted for recommendations on minimum and maximum preheat limits, and minimum and maximum heat input limits.		

New specification

AISC - 360-22

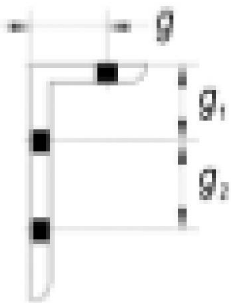
**TABLE A3.1 (continued)
Listed Materials**

Standard Designation	Permissible Grades/Strengths	Other Limitations
(c) Plates (cont'd)		
ASTM A1043/A1043M	Gr. 36 [250] or Gr. 50 [345]	–
ASTM A1066/A1066M	Gr. 50 [345], Gr. 60 [415], Gr. 65 [450], Gr. 70 [485], or Gr. 80 [550]	–
(d) Bars		
ASTM A36/A36M	–	–
ASTM A529/A529M	Gr. 50 [345] or Gr. 55 [380]	–
ASTM A572/A572M	Gr 42 [290], Gr. 50 [345], Gr. 55 [380], Gr. 60 [415], or Gr. 65 [450]	Type 1, 2, or 3
ASTM A709/A709M	Gr. 36 [250], Gr. 50 [345], 50W [345W], or HPS 50W [HPS345W]	–
(e) Sheet		
ASTM A606/A606M	Gr. 45 [310] or Gr. 50 [345]	Type 2, 4, or 5
ASTM A1011/A1011M	Gr. 30 [205] through Gr. 80 [550]	SS, HSLAS, HSLAS-F; all types and classes
– indicates no restriction applicable on grades/strengths or there are no limitations, as applicable ERW = electric resistance welded		

New specs-360-22 data for bars and sheets

Table 1-7A
Workable Gages in Angle Legs, in.

→ 1" → 8"

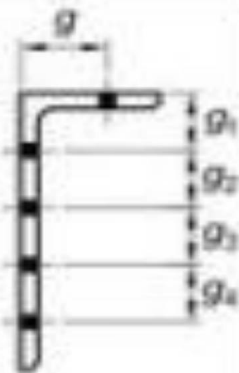
	Leg	8	7	6	5	4	3½	3	2½	2	1¾	1½	1⅜	1¼	1
	g	4½	4	3½	3	2½	2	1¾	1⅜	1⅛	1	7/8	7/8	3/4	5/8
	g ₁	3	2½	2¼	2										
	g ₂	3	3	2½	1¾										

Note: Other gages are permitted to suit specific requirements subject to clearances and edge distance limitations.

Workable Gages for angles based on CM#14

Prepared by Eng.Maged Kamel.

Table 1-7A
Workable Gages in Angle Legs, in.



Leg	12	10	8	7	6	5	4	3 1/2	3	2 1/2	2	1 3/4	1 1/2	1 3/8	1 1/4	1
g	6	5	4 1/2	4	3 1/2	3	2 1/2	2	1 3/4	1 3/8	1 1/8	1	7/8	7/8	3/4	5/8
g₁	3	3	3	2 1/2	2 1/4	2	—	—	—	—	—	—	—	—	—	—
g₂	2 1/2	2 1/2	3	3	2 1/2	2	—	—	—	—	—	—	—	—	—	—
g₃	2 1/2	2 1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
g₄	2 1/2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

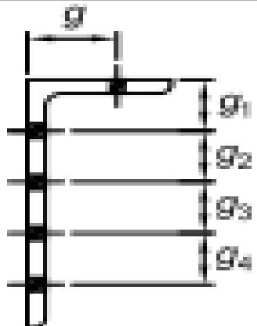
Note: Other gages are permitted to suit specific requirements subject to clearances and edge distance limitations.

Workable Gages for angles based on CM#15

Prepared by Eng. Maged Kamel.

*CM #16 → Same Table
as CM #15*

Table 1-7A
Workable Gages in Angle Legs, in.

	Leg	12	10	8	7	6	5	4	3½	3	2½	2	1¾	1½	1⅜	1¼	1
<i>g</i>	<i>g</i>	6	5	4½	4	3½	3	2½	2	1¾	1⅜	1⅛	1	⅞	⅞	¾	⅝
<i>g</i> ₁	<i>g</i> ₁	3	3	3	2½	2¼	2	—	—	—	—	—	—	—	—	—	—
<i>g</i> ₂	<i>g</i> ₂	2½	2½	3	3	2½	2	—	—	—	—	—	—	—	—	—	—
<i>g</i> ₃	<i>g</i> ₃	2½	2½	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>g</i> ₄	<i>g</i> ₄	2½	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: Other gages are permitted to suit specific requirements subject to clearances and edge distance limitations.

Workable Gages for angles based on CM#16

Carbon steel

Table 2-5 Applicable ASTM Specifications for Plates and Bars													
Steel Type	ASTM Designation		F_y Yield Stress ^[a] , ksi	F_u Tensile Stress ^[a] , ksi	Thickness, t , in.								
					to 0.75	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2	over 2 to 2.5	over 2.5 to 4	over 4 to 5	over 5 to 6	over 6 to 8
Carbon	A36/A36M		32	58–80									
			36	Connecting elements									
			36	All other applications									
	A283/ A283M ^[b]	Gr. C	30	55–75					[c]				
		Gr. D	33	60–80					[c]				
	A529/ A529M	Gr. 50	50	65–100		[d]	[d]	[d]	[d]	[d]			
		Gr. 55	55	70–100		[e]	[e]	[e]	[e]	[e]			
	A709/ A709M	Gr. 36	36	58–80									
		Gr. 42	42	60									

Table 2-5 based on CM#16-Carbon steel

CM#16 High strength low-alloy

Table 2-5
Applicable ASTM Specifications
for Plates and Bars

Steel Type	ASTM Designation	F_y Yield Stress ^[a] , ksi	F_u Tensile Stress ^[a] , ksi	Thickness, t , in.									
				to 0.75	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2	over 2 to 2.5	over 2.5 to 4	over 4 to 5	over 5 to 6	over 6 to 8	over 8
High-Strength Low-Alloy	A572/ A572M ^[f]	Gr. 42	42	60									
		Gr. 50 ^[a]	50	65									
		Gr. 55	55	70									
		Gr. 60 ^[b]	60	75									
		Gr. 65	65	80									
	A709/ A709M	Gr. 50	50	65									
	A1043/ A1043 ^[b]	Gr. 36	36–52	58									
		Gr. 50	50–65	65									
	A1066/ A1066M	Gr. 50	50	65									
		Gr. 60	60	75									
		Gr. 65	65	80									
		Gr. 70	70	85									
		Gr. 80	80	90									

Table 2-5 based on CM#16-High strength steel

CM#16 Corrosion resistance

Table 2-5
Applicable ASTM Specifications
for Plates and Bars

Steel Type	ASTM Designation	F_y , Yield Stress ^[a] , ksi	F_u , Tensile Stress ^[a] , ksi	Thickness, t , in.									
				to 0.75	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2	over 2 to 2.5	over 2.5 to 4	over 4 to 5	over 5 to 6	over 6 to 8	over 8
Corrosion Resistant High- Strength Low-Alloy	A588/A588M	42 ^[b]	63										
		46 ^[b]	67										
		50	70										
= Preferred material specification = Other applicable material specification, the availability of which should be confirmed prior to specification = Material specification does not apply													
Footnotes on facing page.													

Table 2-5 based on CM#16-corrosion resistant high strength steel

Table 2-5 (continued)
Applicable ASTM Specifications
for Plates and Bars

Steel Type	ASTM Designation		F_y , Yield Stress ^[a] , ksi	F_u , Tensile Stress ^[a] , ksi	Thickness, t , in.									
					to 0.75	over 0.75 to 1.25	over 1.25 to 1.5	over 1.5 to 2	over 2 to 2.5	over 2.5 to 4	over 4 to 5	over 5 to 6	over 6 to 8	over 8
Quenched and Tempered Alloy	A514/A514M ^[b]		90	100–130										
			100	110–130										
Corrosion Resistant Quenched and Tempered Low-Alloy	A709/ A709M	Gr. 50W	50	70										
		Gr. HPS 50W	50	70										
		Gr. HPS 70W	70	85–110										
		Gr. HPS 100W ^[c]	90	100–130										
			100	110–130										

■ = Preferred material specification

□ = Other applicable material specification, the availability of which should be confirmed prior to specification

□ = Material specification does not apply

Note: Referenced standards are intended to be the versions specified in AISC Specification Section A2.

^[a]Minimum, unless a range is shown.

^[b]This specification is not a prequalified base metal per AWS D1.1/D1.1M.

^[c]Thickness is not limited to 2 in. in ASTM A283/A283M and thicker plates may be obtained but availability should be confirmed.

^[d]Applicable for plates to 1 in. thickness and bars to 3½ in. thickness.

^[e]Applicable for plates to 1 in. thickness and bars to 3 in. thickness.

^[f]Type 1, 2, or 3 only as given in AISC Specification Table A3.1.

^[g]Round bars up to and including 11 in. in diameter are permitted.

^[h]Round bars up to and including 3½ in. in diameter are permitted.

CM #16

Quenched
and
Tempered
alloy

Corrosion
resistant
quenched
and

Tempered Low alloy

Quenched steel