

## ASTM SPECIFICATIONS

SPECIFICATION	A36	A36	A36	A36	A36	A131*
<b>Type of Steel</b>	Carbon	Carbon	Carbon	Carbon	Carbon	-
<b>Requirements for Delivery</b>	A6	A6	A6	A6	A6	-
<b>Tensile Strength (ksi)</b>	58/80	58/80	58/80	58/80	58/80	-
<b>Yield Strength (Min. ksi) (Yield Point if designated YP)</b>	36 YP	36 YP	36 YP	36 YP	36 YP over 4-8" incl.; 32 over 8"	-
<b>Spec. Thickness (Max. in.)</b>	$\frac{3}{4}$	$> \frac{3}{4}$ to 1 $\frac{1}{2}$	$> 1\frac{1}{2}$ to 2 $\frac{1}{2}$	$> 2\frac{1}{2}$ to 4	over 4	-
<b>ISG Plate Thickness (Max. in.)</b>	$\frac{3}{4}$	$> \frac{3}{4}$ to 1 $\frac{1}{2}$	$> 1\frac{1}{2}$ to 2 $\frac{1}{2}$	$> 2\frac{1}{2}$ to 4	18	-
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums					
<b>Carbon</b>	.25	.25	.26	.27	.29	-
<b>Manganese</b>	-	.80/1.20**	.80/1.20**	.85/1.20**	.85/1.20**	-
<b>Phosphorus</b>	.04	.04	.04	.04	.04	-
<b>Sulfur</b>	.05	.05	.05	.05	.05	-
<b>Silicon</b>	.40	.40	.15/.40	.15/.40	.15/.40	-
<b>Chromium</b>	-	-	-	-	-	-
<b>Nickel</b>	-	-	-	-	-	-
<b>Molybdenum</b>	-	-	-	-	-	-
<b>Copper</b>	.20 Min. when specified	.20 Min. when specified	.20 Min. when specified	.20 Min. when specified	.20 Min. when specified	-
<b>Other Elements</b>	-	-	-	-	-	-
<b>Heat Treatment Required</b>	-	-	-	-	-	-

\* A131 Grades are similar to ABS Grades shown on page 28-29.

\*\* For each reduction of 0.01% below the carbon maximum, an increase of 0.06% manganese above the specified maximum is permitted, up to 1.35%.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A202 Grade A	A202 Grade B	A203 Grade A	A203 Grade B	A203 Grade D	A203 Grade E
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	75/95	85/110	65/85	70/90	65/85	70/90
Yield Strength (Min. ksi) (Yield Point if designated YP)	45	47	37	40	37	40
Spec. Thickness (Max. in.)	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	2	2	6	6	4	4
Chemical Composition (%)	Unless a range is specified, individual values are maximums					
Carbon	.17	.25	.17 to 2" incl.; .20 over 2-4" incl.; .23 over 4-6" incl.	.21 to 2" incl.; .24 over 2-4" incl.; .25 over 4-6" incl.	.17 to 2" incl.; .20 over 2-4" incl.	.20 to 2" incl.; .23 over 2-4" incl.
Manganese	1.05/1.40	1.05/1.40	.70 to 2" incl.; .80 over 2-6" incl.	.70 to 2" incl.; .80 over 2-6" incl.	.70 to 2" incl.; .80 over 2-4" incl.	.70 to 2" incl.; .80 over 2-4" incl.
Phosphorus	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035
Silicon	.60/.90	.60/.90	.15/.40	.15/.40	.15/.40	.15/.40
Chromium	.35/.60	.35/.60	■	■	■	■
Nickel	■	■	2.10/2.50	2.10/2.50	3.25/3.75	3.25/3.75
Molybdenum	■	■	■	■	■	■
Copper	■	■	■	■	■	■
Other Elements	-	-	F/G/P	F/G/P	F/G/P	F/G/P
Heat Treatment Required	-	-	N	N	N	N

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A203 Grade F	A204 Grade A	A204 Grade B	A204 Grade C	A225† Grade C	A225† Grade D
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	80/100 to 2" incl.; 75/95 over 2"	65/85	70/90	75/95	105/135	80/105 to 3" incl.; 75/100 over 3"
Yield Strength (Min. ksi) (Yield Point if designated YP)	55 to 2" incl.; 50 over 2"	37	40	43	70	60 to 3" incl.; 55 over 3"
Spec. Thickness (Max. in.)	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	4	6	6	4	.58	6
Chemical Composition (%)	Unless a range is specified, individual values are maximums					
Carbon	.20 to 2" incl.; .23 over 2-4" incl.	.18 to 1" incl.; .21 over 1-2" incl.; .23 over 2-4" incl.; .25 over 4-6" incl.	.20 to 1" incl.; .23 over 1-2" incl.; .25 over 2-4" incl.; .27 over 4-6" incl.	.23 to 1" incl.; .26 over 1-2" incl.; .28 over 2-4" incl.	.25	.20
Manganese	.70 to 2" incl.; .80 over 2-4" incl.	.90	.90	.90	1.60	1.70
Phosphorus	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035
Silicon	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40	.10/.50
Chromium	■	■	■	■	■	■
Nickel	3.25/3.75	■	■	■	.40/.70	.40/.70
Molybdenum	■	.45/.60	.45/.60	.45/.60	■	■
Copper	■	■	■	■	■	■
Other Elements	F/G/P	-	-	-	.13/.18V	.10/.18V
Heat Treatment Required	Q&T	N over 1½**	N over 1½**	N over 1½**	N over 2" ISG Plate req. N all thicknesses	N

\* ISG Plate requires  $N \geq 5/16$ ".

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A242†▲ Type 1**	A283 Grade A	A283 Grade B	A283 Grade C	A283 Grade D
Type of Steel	Carbon	Carbon	Carbon	Carbon	Carbon
Requirements for Delivery	A6	A6	A6	A6	A6
Tensile Strength (ksi)	70 Min. to 3/4" incl.; 67 Min. over 3/4-1 1/2" incl.; 63 Min. over 1 1/2"	45/60	50/65	55/75	60/80
Yield Strength (Min. ksi) (Yield Point if designated YP)	50 YP to 3/4" incl.; 46 over 3/4-1 1/2" incl.; 42 over 1 1/2"	24 YP	27 YP	30 YP	33 YP
Spec. Thickness (Max. in.)	4	-	-	-	-
ISG Plate Thickness (Max. in.)	8	16	16	16	16
Chemical Composition (%)	Unless a range is specified, individual values are maximums				
Carbon	.15	.14	.17	.24	.27
Manganese	1.00	.90	.90	.90	.90
Phosphorus	.15*	.035	.035	.035	.035
Sulfur	.05	.04	.04	.04	.04
Silicon	-	.40 to 1.5" incl.; .15/.40 over 1.5"	.40 to 1.5" incl.; .15/.40 over 1.5"	.40 to 1.5" incl.; .15/.40 over 1.5"	.40 to 1.5" incl.; .15/.40 over 1.5"
Chromium	-	-	-	-	-
Nickel	-	-	-	-	-
Molybdenum	-	-	-	-	-
Copper	.20 Min.	.20 Min. when specified	.20 Min. when specified	.20 Min. when specified	.20 Min. when specified
Other Elements	-	-	-	-	-
Heat Treatment Required	-	-	-	-	-

\* Coatesville produces to .04 Max. Phosphorus.

\*\* ASTM G101 corrosion index minimum must also be met.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

▲ Also produced as Mayari-R®

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A285 Grade A	A285 Grade B	A285 Grade C	A299 Grade A	A299 Grade B	A302 Grade A	A302 Grade B
Type of Steel	Carbon	Carbon	Carbon	Carbon	Carbon	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	45/65	50/70	55/75	75/95	80/100	75/95	80/100
Yield Strength (Min. ksi) (Yield Point if designated YP)	24	27	30	42 to 1" incl.; 40 over 1"	47 to 1" incl.; 45 over 1"	45	50
Spec. Thickness (Max. in.)	2	2	2	-	-	-	-
ISG Plate Thickness (Max. in.)	2	2	2	8	8	6	6
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.17	.22	.28	.26 to 1" incl.; .28 over 1"	.28 to 1" incl.; .30 over 1"	.20 to 1" incl.; .23 over 1-2" incl.; .25 over 2"	.20 to 1" incl.; .23 over 1-2" incl.; .25 over 2"
Manganese	.90	.90	.90	.90/1.40 to 1" incl.; .90/1.50 over 1"	.90/1.40 to 1" incl.; .90/1.50 over 1"	.95/1.30	1.15/1.50
Phosphorus	.035	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035	.035
Silicon	■	■	■	.15/.40	.15/.40	.15/.40	.15/.40
Chromium	■	■	■	■	■	■	■
Nickel	■	■	■	■	■	■	■
Molybdenum	■	■	■	■	■	.45/.60	.45/.60
Copper	Either .20/.35 or .25 when specified	Either .20/.35 or .25 when specified	Either .20/.35 or .25 when specified	-	-	-	-
Other Elements	-	-	-	F/G/P	F/G/P	F/G/P	F/G/P
Heat Treatment Required	-	-	-	N over 2"	N over 2"	N over 2"*	N over 2"*

\* ISG Plate requires N 1" and under.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A302 Grade C	A302 Grade D	A353	A387*** Grade 11 Class 1	A387 Grade 12 Class 1	A387 Grade 21 Class 1	A387 Grade 21L Class 1	A387 Grade 22 Class 1
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	80/100	80/100	100/120	60/85	55/80	60/85	60/85	60/85
Yield Strength (Min. ksi) (Yield Point if designated YP)	50	50	75	35	33	30	30	30
Spec. Thickness (Max. in.)	-	-	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	10	12	1½**	6**	12**	12**	12**	12**
Chemical Composition (%)	Unless a range is specified, individual values are maximums							
Carbon	.20 to 1" incl.; .23 over 1-2" incl.; .25 over 2"	.20 to 1" incl.; .23 over 1-2" incl.; .25 over 2"	.13	.05/.17	.05/.17	.05/.15	.10	.05/.15
Manganese	1.15/1.50	1.15/1.50	.90	.40/.65	.40/.65	.30/.60	.30/.60	.30/.60
Phosphorus	.035	.035	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035	.035	.035
Silicon	.15/.40	.15/.40	.15/.40	.50/.80	.15/.40	.50	.50	.50
Chromium	■	■	■	1.00/1.50	.80/1.15	2.75/3.25	2.75/3.25	2.00/2.50
Nickel	.40/.70	.70/1.00	8.50/9.50	■	■	■	■	■
Molybdenum	.45/.60	.45/.60	■	.45/.65	.45/.60	.90/1.10	.90/1.10	.90/1.10
Copper	■	■	■	■	■	■	■	■
Other Elements	F/G/P	F/G/P	Mandatory TCVN	-	-	-	-	-
Heat Treatment Required	N over 2**	N over 2**	NN&T	Annealed or N&T	Annealed or N&T	Annealed or N&T	Annealed or N&T	Annealed or N&T

\* ISG Plate requires N 1" and under.

\*\* Consult ISG Plate for plates over thickness listed.

\*\*\* Consult ISG Plate for other A387 Grades not shown.

■ Restricted to ASTM A20 limits for unspecified elements.

[A387 Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A387** Grade 22L Class 1	A387 Grade 5 Class 1	A387 Grade 9 Class 1	A387 Grade 11 Class 2	A387 Grade 12 Class 2	A387 Grade 21 Class 2	A387 Grade 22 Class 2	A387 Grade 5 Class 2
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	60/85	60/85	60/85	75/100	65/85	75/100	75/100	75/100
Yield Strength (Min. ksi) (Yield Point if designated YP)	30	30	30	45	40	45	45	45
Spec. Thickness (Max. in.)	-	-	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	12*	6*	6*	6*	6*	12*	12*	6*
Chemical Composition (%)	Unless a range is specified, individual values are maximums							
Carbon	.10	.15	.15	.05/.17	.05/.17	.05/.15	.05/.15	.15
Manganese	.30/.60	.30/.60	.30/.60	.40/.65	.40/.65	.30/.60	.30/.60	.30/.60
Phosphorus	.035	.035	.030	.035	.035	.035	.035	.035
Sulfur	.035	.030	.030	.035	.035	.035	.035	.030
Silicon	.50	.50	1.00	.50/.80	.15/.40	.50	.50	.50
Chromium	2.00/2.50	4.00/6.00	8.00/10.00	1.00/1.50	.80/1.15	2.75/3.25	2.00/2.50	4.00/6.00
Nickel	■	■	■	■	■	■	■	■
Molybdenum	.90/1.10	.45/.65	.90/1.10	.45/.65	.45/.60	.90/1.10	.90/1.10	.45/.65
Copper	■	■	■	■	■	■	■	■
Other Elements	-	-	-	-	-	-	-	-
Heat Treatment Required	Annealed or N&T	Annealed or N&T	Annealed or N&T	N&T	N&T	N&T	N&T	N&T

\* Consult ISG Plate for plates over thickness listed.

\*\* Consult ISG Plate for other A387 grades not listed.

■ Restricted to ASTM A20 limits for unspecified elements.

[A387 Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A387 Grade 9 Class 2	A387 Grade 91 Class 2	A455	A514† Grade A	A514* Grade B	A514† Grade E	A514* Grade F	A514* Grade H
Type of Steel	Alloy	Alloy	Carbon	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A6	A6	A6	A6	A6
Tensile Strength (ksi)	75/100	85/110	75/95 to .375" incl.; 73/93 over .375-.580" incl.; 70/90 over .580- .750" incl.	110/130	110/130	110/130 to 2 <sup>1</sup> / <sub>2</sub> " incl.; 100/130 over 2 <sup>1</sup> / <sub>2</sub> - 6" incl.	110/130	110/130
Yield Strength (Min. ksi) (Yield Point if designated YP)	45	60	38 to .375" incl.; 37 over .375-.580" incl.; 35 over .580- .750" incl.	100	100	100 to 2 <sup>1</sup> / <sub>2</sub> " incl.; 90 over 2 <sup>1</sup> / <sub>2</sub> -6" incl.	100	100
Spec. Thickness (Max. in.)	-	-	<sup>3</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>	6	2 <sup>1</sup> / <sub>2</sub>	2
ISG Plate Thickness (Max. in.)	6*	6*	<sup>3</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>	6	2 <sup>1</sup> / <sub>2</sub>	2
Chemical Composition (%)	Unless a range is specified, individual values are maximums							
Carbon	.15	.08/.12	.33**	.15/.21	.12/.21	.12/.20	.10/.20	.12/.21
Manganese	.30/.60	.30/.60	.85/1.20	.80/1.10	.70/1.00	.40/.70	.60/1.00	.95/1.30
Phosphorus	.030	.020	.035	.035	.035	.035	.035	.035
Sulfur	.030	.010	.035	.035	.035	.035	.035	.035
Silicon	1.00	.20/.50	.10**	.40/.80	.20/.35	.20/.40	.15/.35	.20/.35
Chromium	8.00/10.00	8.00/9.50	■	.50/.80	.40/.65	1.40/2.00	.40/.65	.40/.65
Nickel	■	.40	■	-	-	-	.70/1.00	.30/.70
Molybdenum	.90/1.10	.85/1.05	■	.18/.28	.15/.25	.40/.60	.40/.60	.20/.30
Copper	■	■	■	-	-	-	.15/.50	-
Other Elements	-	.18/.25 V .06/.10 Cb .030/.070 N .04 Al	-	.05/.15 Zr (or Ce) .0025 B	.03/.08 V .01/.03 Ti .0005/.005 B	.01/.10 Ti .001/.005 B	.03/.08 V .0005/.006 B	.03/.08 V .0005/.005 B
Heat Treatment Required	N&T	N&T	-	Q&T	Q&T	Q&T	Q&T	Q&T

\* It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Therefore, ISG Plate recommends that careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade. Also, it is not recommended for service at temperatures lower than -50°F or higher than 800°F.

\*\* At the producer's option, silicon may be .40 Max. When silicon is .10 min., the carbon shall be .28 Max.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

■ Restricted to ASTM A20 limits for unspecified elements.

[A387 Brochure](#)

[A514 Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A514† Grade P	A514* Grade Q	A515 Grade 60	A515 Grade 65	A515 Grade 70	A516 Grade 55
<b>Type of Steel</b>	Alloy	Alloy	Carbon	Carbon	Carbon	Carbon
<b>Requirements for Delivery</b>	A6	A6	A20	A20	A20	A20
<b>Tensile Strength (ksi)</b>	110/130 to 2½" incl.; 100/130 over 2½"- 6" incl.	110/130 to 2½" incl.; 100/130 over 2½"- 6" incl.	60/80	65/85	70/90	55/75
<b>Yield Strength (Min. ksi) (Yield Strength designated YP)</b>	100 to 2½" incl.; 90 over 2½"-6" incl.	100 to 2½" incl.; 90 over 2½"-6" incl.	32	35	38	30
<b>Spec. Thickness (Max. in.)</b>	6	6	-	-	-	-
<b>ISG Plate Thickness (Max. in.)</b>	4	8	15	15	15	15
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums					
<b>Carbon</b>	.12/.21	.14/.21	.24 to 1" incl.; .27 over 1-2" incl.; .29 over 2-4" incl.; .31 over 4"	.28 to 1" incl.; .31 over 1-2" incl.; .33 over 2"	.31 to 1" incl.; .33 over 1-2" incl.; .35 over 2"	.18 to ½" incl.; .20 over ½"-2" incl.; .22 over 2-4" incl.; .24 over 4-8" incl.; .26 over 8"
<b>Manganese</b>	.45/.70	.95/1.30	.90	.90	1.20	.60/.90 to ½" incl.; .60/1.20 over ½"
<b>Phosphorus</b>	.035	.035	.035	.035	.035	.035
<b>Sulfur</b>	.035	.035	.035	.035	.035	.035
<b>Silicon</b>	.20/.35	.15/.35	.15/.40	.15/.40	.15/.40	.15/.40
<b>Chromium</b>	.85/1.20	1.00/1.50	■	■	■	■
<b>Nickel</b>	1.20/1.50	1.20/1.50	■	■	■	■
<b>Molybdenum</b>	.45/.60	.40/.60	■	■	■	■
<b>Copper</b>	-	-	■	■	■	■
<b>Other Elements</b>	.001/.005 B	.03/.08 V	C/G/P	C/G/P	C/G/P	F/G/P
<b>Heat Treatment Required</b>	Q&T	Q&T	N over 2"	N over 2"	N over 2"	N over 1½" or when Impact Tests required**

\* It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Therefore, ISG Plate recommends that careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade. Also, it is not recommended for service at temperatures lower than -50°F or higher than 800°F.

\*\* Unless otherwise specified by the purchaser and approved by ISG Plate.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

■ Restricted to ASTM A20 limits for unspecified elements.

[A514 Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A516 Grade 60	A516 Grade 65	A516 Grade 70	A517† Grade A	A517* Grade B	A517† Grade E	A517* Grade F
Type of Steel	Carbon	Carbon	Carbon	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	60/80	65/85	70/90	115/135	115/135	115/135 to 2½" incl.; 105/135 over 2½"- 6" incl.	115/135
Yield Strength (Min. ksi) (Yield Point if designated YP)	32	35	38	100	100	100 to 2½" incl.; 90 over 2½"-6" incl.	100
Spec. Thickness (Max. in.)	-	-	-	1¼	1¼	6	2½
ISG Plate Thickness (Max. in.)	15	15	15	1¼	1¼	6	2½
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.21 to ½" incl.; .23 over ½"-2" incl.; .25 over 2-4" incl.; .27 over 4"	.24 to ½" incl.; .26 over ½"-2" incl.; .28 over 2-4" incl.; .29 over 4"	.27 to ½" incl.; .28 over ½"-2" incl.; .30 over 2-4" incl.; .31 over 4"	.15/.21	.15/.21	.12/.20	.10/.20
Manganese	.60/.90 to to ½" incl.; .85/1.20 over ½"	.85/1.20	.85/1.20	.80/1.10	.70/1.00	.40/.70	.60/1.00
Phosphorus	.035	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035	.035
Silicon	.15/.40	.15/.40	.15/.40	.40/.80	.15/.35	.10/.40	.15/.35
Chromium	■	■	■	.50/.80	.40/.65	1.40/2.00	.40/.65
Nickel	■	■	■	■	■	■	.70/1.00
Molybdenum	■	■	■	.18/.28	.15/.25	.40/.60	.40/.60
Copper	■	■	■	■	■	■	.15/.50
Other Elements	F/G/P	F/G/P	F/G/P	.0025 B .05/.15 Zr (or Ce)	.03/.08 V .0005/.005 B .01/.03 Ti	.01/.10 Ti .001/.005 B	.0005/.006 B .03/.08 V
Heat Treatment Required	N over 1½" or when Impact Tests required**	N over 1½" or when Impact Tests required**	N over 1½" or when Impact Tests required**	Q&T TCVN	Q&T TCVN	Q&T TCVN	Q&T TCVN

\* It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Therefore, ISG Plate recommends that careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade. Also, it is not recommended for service at temperatures lower than -50°F or higher than 800°F.

\*\* Unless otherwise specified by the purchaser and approved by ISG Plate.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A517* Grade H	A517† Grade P	A517* Grade Q	A529 Grade 50	A529 Grade 55	A533 Type A Class 1	A533 Type B Class 1
Type of Steel	Alloy	Alloy	Alloy	Carbon	Carbon	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A6	A6	A20	A20
Tensile Strength (ksi)	115/135	115/135 to 2½" incl.; 105/135 over 2½"- 3.33" incl.	115/135 to 2½" incl.; 105/135 over 2½"- 6" incl.	70/100	70/100	80/100	80/100
Yield Strength (Min. ksi) (Yield Point if designated YP)	100	100 to 2½" incl.; 90 over 2½"- 3.33" incl.	100 to 2½" incl.; 90 over 2½"-6" incl.	50	55	50	50
Spec. Thickness (Max. in.)	2	4	6	1	1	-	-
ISG Plate Thickness (Max. in.)	2	3.33	8	1	1	6	12
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.12/.21	.12/.21	.14/.21	.27	.27	.25	.25
Manganese	.95/1.30	.45/.70	.95/1.30	1.35**	1.35**	1.15/1.50	1.15/1.50
Phosphorus	.035	.035	.035	.040	.040	.035	.035
Sulfur	.035	.035	.035	.050	.050	.035	.035
Silicon	.15/.35	.20/.35	.15/.35	.40	.40	.15/.40	.15/.40
Chromium	.40/.65	.85/1.20	1.00/1.50	-	-	■	■
Nickel	.30/.70	1.20/1.50	1.20/1.50	-	-	■	.40/.70
Molybdenum	.20/.30	.45/.60	.40/.60	-	-	.45/.60	.45/.60
Copper	■	■	■	.20 Min. when specified	.20 Min. when specified	■	■
Other Elements	.0005 Min. B .03/.08 V	.001/.005 B	.03/.08 V	-	-	F/G/P	F/G/P
Heat Treatment Required	Q&T TCVN	Q&T TCVN	Q&T TCVN	-	-	Q&T	Q&T

\* It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Therefore, ISG Plate recommends that careful consideration be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments of this grade. Also, it is not recommended for service at temperatures lower than -50°F or higher than 800°F.

\*\* Mn of 1.50 Max. is permitted with reduction of C Max. of 0.01% for each 0.05% increase in Mn.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

■ Restricted to ASTM A20 limits for unspecified elements.

[A516 Brochure](#)

[A517 Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A533 Type C Class 1	A533 Type D Class 1	A533 Type A Class 2	A533 Type B Class 2	A533 Type C Class 2	A533 Type D Class 2	A533 Type A Class 3
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	80/100	80/100	90/115	90/115	90/115	90/115	100/125
Yield Strength (Min. ksi) (Yield Point if designated YP)	50	50	70	70	70	70	83
Spec. Thickness (Max. in.)	-	-	-	-	-	-	2½
ISG Plate Thickness (Max. in.)	12	6	6	8	10	6	2½
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.25	.25	.25	.25	.25	.25	.25
Manganese	1.15/1.50	1.15/1.50	1.15/1.50	1.15/1.50	1.15/1.50	1.15/1.50	1.15/1.50
Phosphorus	.035	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.035	.035	.035
Silicon	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40
Chromium	■	■	■	■	■	■	■
Nickel	.70/1.00	.20/.40	-	.40/.70	.70/1.00	.20/.40	-
Molybdenum	.45/.60	.45/.60	.45/.60	.45/.60	.45/.60	.45/.60	.45/.60
Copper	■	■	■	■	■	■	■
Other Elements	F/G/P	F/G/P	F/G/P	F/G/P	F/G/P	F/G/P	F/G/P
Heat Treatment Required	Q&T	Q&T	Q&T	Q&T	Q&T	Q&T	Q&T

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A533 Type B Class 3	A533 Type C Class 3	A533 Type D Class 3	A537** Class 1▲	A537** Class 2▲▲	A537** Class 3	A542* Type A Class 1
<b>Type of Steel</b>	Alloy	Alloy	Alloy	Carbon	Carbon	Carbon	Alloy
<b>Requirements for Delivery</b>	A20	A20	A20	A20	A20	A20	A20
<b>Tensile Strength (ksi)</b>	100/125	100/125	100/125	70/90 to 2½" incl.; 65/85 over 2½"-4" incl.	80/100 to 2½" incl.; 75/95 over 2½"-4" incl.; 70/90 over 4-6" incl.	80/100 to 2½" incl.; 75/95 over 2½"-4" incl.; 70/90 over 4-6" incl.	105/125
<b>Yield Strength (Min. ksi) (Yield Point if designated YP)</b>	83	83	83	50 to 2½" incl.; 45 over 2½"- 4" incl.	60 to 2½" incl.; 55 over 2½"- 4" incl.; 46 over 4-6" incl.	55 to 2½" incl.; 50 over 2½"- 4" incl.; 40 over 4-6" incl.	85
<b>Spec. Thickness (Max. in.)</b>	2½	2½	2½	4	6	6	-
<b>ISG Plate Thickness (Max. in.)</b>	2½	2½	2½	4	6	6	8
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums						
<b>Carbon</b>	.25	.25	.25	.24	.24	.24	.15
<b>Manganese</b>	1.15/1.50	1.15/1.50	1.15/1.50	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½"	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½"	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½"	.30/.60
<b>Phosphorus</b>	.035	.035	.035	.035	.035	.035	.025
<b>Sulfur</b>	.035	.035	.035	.035	.035	.035	.025
<b>Silicon</b>	.15/.40	.15/.40	.15/.40	.15/.50	.15/.50	.15/.50	.50
<b>Chromium</b>	■	■	■	.25	.25	.25	2.00/2.50
<b>Nickel</b>	.40/.70	.70/1.00	.20/.40	.25	.25	.25	.40
<b>Molybdenum</b>	.45/.60	.45/.60	.45/.60	.08	.08	.08	.90/1.10
<b>Copper</b>	■	■	■	.35	.35	.35	.40
<b>Other Elements</b>	F/G/P	F/G/P	F/G/P	F/G/P	F/G/P	F/G/P	.03 V
<b>Heat Treatment Required</b>	Q&T	Q&T	Q&T	N	Q&T	Q&T	Q&T, QQ&T or NQ&T over 4"

\* Consult ISG Plate for other A542 Types not shown.

▲ Also produced as RQC-60 (N).

▲▲ Also produced as RQC-60 (Q&T).

\*\* When  $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$  is 0.57 or less, manganese maximum is 1.60% and Nickel maximum is 0.50%.

■ Restricted to ASTM A20 limits for unspecified elements.

**CONTINUED****ASTM SPECIFICATIONS**

<b>SPECIFICATION</b>	<b>A542 Type B Class 1</b>	<b>A542 Type C Class 1</b>	<b>A542 Type A Class 2</b>	<b>A542 Type B Class 2</b>	<b>A542 Type C Class 2</b>	<b>A542 Type A Class 3</b>	<b>A542 Type B Class 3</b>
<b>Type of Steel</b>	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
<b>Requirements for Delivery</b>	A20	A20	A20	A20	A20	A20	A20
<b>Tensile Strength (ksi)</b>	105/125	105/125	115/135	115/135	115/135	95/115	95/115
<b>Yield Strength (Min. ksi) (Yield Point if designated YP)</b>	85	85	100	100	100	75	75
<b>Spec. Thickness (Max. in.)</b>	-	-	-	-	-	-	-
<b>ISG Plate Thickness (Max. in.)</b>	8	8	8	8	8	8	8
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums						
<b>Carbon</b>	.11/.15	.10/.15	.15	.11/.15	.10/.15	.15	.11/.15
<b>Manganese</b>	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60
<b>Phosphorus</b>	.015	.025	.025	.015	.025	.025	.015
<b>Sulfur</b>	.015	.025	.025	.015	.025	.025	.015
<b>Silicon</b>	.50	.13	.50	.50	.13	.50	.50
<b>Chromium</b>	2.00/2.50	2.75/3.25	2.00/2.50	2.00/2.50	2.75/3.25	2.00/2.50	2.00/2.50
<b>Nickel</b>	.25	.25	.40	.25	.25	.40	.25
<b>Molybdenum</b>	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10
<b>Copper</b>	.25	.25	.40	.25	.25	.40	.25
<b>Other Elements</b>	.02 V	.20/.30 V .015/.035 Ti .001/.003 B	.03 V	.02 V	.20/.30 V .015/.035 Ti .001/.003 B	.03 V	.02 V
<b>Heat Treatment Required</b>	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A542 Type C Class 3	A542 Type A Class 4	A542 Type B Class 4	A542 Type C Class 4	A542 Type A Class 4a	A542 Type B Class 4a	A542 Type C Class 4a
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	95/115	85/110	85/110	85/110	85/110	85/110	85/110
Yield Strength (Min. ksi) (Yield Point if designated YP)	75	55	55	55	60	60	60
Spec. Thickness (Max. in.)	-	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	8	8	8	8	8	8	8
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.10/.15	.15	.11/.15	.10/.15	.15	.11/.15	.10/.15
Manganese	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60	.30/.60
Phosphorus	.025	.025	.015	.025	.025	.015	.025
Sulfur	.025	.025	.015	.025	.025	.015	.025
Silicon	.13	.50	.50	.13	.50	.50	.13
Chromium	2.75/3.25	2.00/2.50	2.00/2.50	2.75/3.25	2.00/2.50	2.00/2.50	2.75/3.25
Nickel	.25	.40	.25	.25	.40	.25	.25
Molybdenum	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10	.90/1.10
Copper	.25	.40	.25	.25	.40	.25	.25
Other Elements	.20/.30 V .015/.035 Ti .001/.003 B	.03 Max. V Mandatory TCVN	.02 Max. V Mandatory TCVN	.20/.30 V .015/.035 Ti .001/.003 B Mandatory TCVN	.03 Max. V Mandatory TCVN	.02 Max. V Mandatory TCVN	.20/.30 V .015/.035 Ti .001/.003 B Mandatory TCVN
Heat Treatment Required	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"	Q&T, QQ&T or NQ&T over 4"

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A543 Type B Class 1	A543 Type C Class 1	A543 Type B Class 2	A543 Type C Class 2	A543 Type B Class 3	A543 Type C Class 3	A553 Type 1
Type of Steel	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A20	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	105/125	105/125	115/135	115/135	90/115	90/115	100/120
Yield Strength (Min. ksi) (Yield Point if designated YP)	85	85	100	100	70	70	85
Spec. Thickness (Max. in.)	-	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	8*	8*	6*	6*	10*	10*	2*
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.20	.18	.20	.18	.20	.18	.13
Manganese	.40	.40	.40	.40	.40	.40	.90
Phosphorus	.020	.020	.020	.020	.020	.020	.035
Sulfur	.020	.020	.020	.020	.020	.020	.035
Silicon	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40	.15/.40**
Chromium	1.00/1.90	1.00/1.90	1.00/1.90	1.00/1.90	1.00/1.90	1.00/1.90	■
Nickel	2.25/4.00	2.00/3.50	2.25/4.00	2.00/3.50	2.25/4.00	2.00/3.50	8.50/9.50
Molybdenum	.20/.65	.20/.65	.20/.65	.20/.65	.20/.65	.20/.65	■
Copper	■	■	■	■	■	■	■
Other Elements	.03 V	.03 V	.03 V	.03 V	.03 V	.03 V	■
Heat Treatment Required	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T to 4" incl.; double Q&T or N and Q&T required over 4"	Q&T TCVN

\* Consult ISG Plate for plates over thickness listed.

\*\* Silicon may be less than 0.15% provided total aluminum is 0.030% or greater.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A562	A572† Grade 42 Type 2#	A572†▲ Grade 50 Type 2#	A572†▲ Grade 55 Type 2#	A572† Grade 60 Type 2#	A572† Grade 65 Type 2#	A573 Grade 58
Type of Steel	Alloy	HSLA	HSLA	HSLA	HSLA	HSLA	Carbon
Requirements for Delivery	A20	A6	A6	A6	A6	A6	A6
Tensile Strength (ksi)	55/75	60 Min.	65 Min.	70 Min.	75 Min.	80 Min.	58/71
Yield Strength (Min. ksi) (Yield Point if designated YP)	30	42 YP	50 YP	55 YP	60 YP	65 YP	32 YP
Spec. Thickness (Max. in.)	2	6	4	2	1¼	1¼	1½
ISG Plate Thickness (Max. in.)	2	refer to 18	refer to 12	refer to 4	refer to 9	refer to 8	1½
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.12	.21	.23	.25	.26 incl.; .23 over ½"- 1¼" incl.	.26 to ½"	.23
Manganese	1.20	1.35**	1.35**	1.35**	1.35** to ½" incl.; 1.65 Max. over ½"- 1¼" incl.	1.35 Max.***	.60/.90
Phosphorus	.035	.040	.04	.04	.04	.04	.035
Sulfur	.035	.050	.05	.05	.05	.05	.04
Silicon	.15/.50	.40 to 1½" incl.; .15/.40 over 1½"	.40 to 1½" incl.; .15/.40 over 1½"	.40 to 1½" incl.; .15/.40 over 1½"	.40	.40	.10/.35
Chromium	■	-	-	-	-	-	-
Nickel	■	-	-	-	-	-	-
Molybdenum	■	-	-	-	-	-	-
Copper	.15	-	-	-	-	-	-
Other Elements	Ti Min. 4XC	.01/.15 V	.01/.15 V	.01/.15 V	.01/.15 V	.01/.15 V	-
Heat Treatment Required	N	-	-	-	-	-	-

\*\* For each reduction of 0.01% below the specified carbon maximum, an increase of 0.06% manganese above the specified maximum is permitted up to 1.50%.

\*\*\* 1.65 Max. Mn permissible with reduction of carbon to .21 maximum.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

▲ Also produced as V-Star.®

# May also be produced as Type 1 with V replaced by .005/.05 Cb. Inquire with ISG Plate for Types 3 and 5.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A573 Grade 65	A573 Grade 70	A588†* Grade A	A588†▲▲* Grade B	A612†	A633† Grade A
Type of Steel	Carbon	Carbon	HSLA	HSLA	Carbon	HSLA
Requirements for Delivery	A6	A6	A6	A6	A20	A6
Tensile Strength (ksi)	65/77	70/90	70 Min. to 4" incl.; 67 Min. over 4-5" incl.; 63 Min. over 5-8" incl.	70 Min. to 4" incl.; 67 Min. over 4-5" incl.; 63 Min. over 5-8" incl.	83/105 to 1/2" incl.; 81/101 over 1/2 - 1" incl.	63/83
Yield Strength (Min. ksi) (Yield Point if designated YP)	35 YP	42 YP	50 YP to 4" incl.; 46 over 4-5" incl.; 42 over 5-8" incl.	50 YP to 4" incl.; 46 over 4-5" incl.; 42 over 5-8" incl.	50	42 YP
Spec. Thickness (Max. in.)	1 1/2	1 1/2	8	8	1 incl.	4
ISG Plate Thickness (Max. in.)	1 1/2	1 1/2	8	8	1 incl.	4
Chemical Composition (%)	Unless a range is specified, individual values are maximums					
Carbon	.24 to 1/2" incl.; .26 over 1/2-1 1/2" incl.	.27 to 1/2" incl.; .28 over 1/2-1 1/2" incl.	.19	.20	.25	.18
Manganese	.85/1.20	.85/1.20	.80/1.25**	.75/1.35**	1.00/1.50	1.00/1.35
Phosphorus	.035	.035	.04	.04	.035	.035
Sulfur	.04	.04	.05	.05	.025	.04
Silicon	.15/.40	.15/.40	.30/.65	.15/.50	.15/.50	.15/.50
Chromium	-	-	.40/.65	.40/.70	.25	-
Nickel	-	-	.40	.50	.25	-
Molybdenum	-	-	-	-	.08	-
Copper	-	-	.25/.40	.20/.40	.35	-
Other Elements	-	-	.02/.10 V	.01/.10 V	.08 V	.05 Cb
Heat Treatment Required	-	-	-	-	-	N

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

▲ Also produced as Cor-Ten® B.

▲▲ Also produced as Mayari-R50® and R60; refer other A588 grades to ISG Plate.

\* ASTM G101 corrosion index minimum must also be met.

\*\* For each 0.01% reduction below the specified maximum for carbon, an increase of 0.06% manganese above the specified maximum is permitted up to 1.50%.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A633† Grade C	A633 Grade D	A633† Grade E	A656† Grade 50 Type 3	A656†▲ Grade 50 Type 7	A656†▲ Grade 60 Type 7	A656†▲ Grade 70 Type 7
Type of Steel	HSLA	HSLA	HSLA	HSLA	HSLA	HSLA	HSLA
Requirements for Delivery	A6	A6	A6	A6	A6	A6	A6
Tensile Strength (ksi)	70/90 to 2½" incl.; 65/85 over 2½"-4" incl.	70/90 to 2½" incl.; 65/85 over 2½"-4" incl.	80/100 to 4" incl.; 75/95 over 4-6" incl.	60 Min.	60 Min.	70 Min.	80 Min.
Yield Strength (Min. ksi) (Yield Point if designated YP)	50 YP to 2½" incl.; 46 over 2½"-4" incl.	50 YP to 2½" incl.; 46 over 2½"-4" incl.	60 YP to 4" incl.; 55 over 4-6" incl.	50 YP	50 YP	60 YP	70 YP
Spec. Thickness (Max. in.)	4	4	6	2	2	1½	1
ISG Plate Thickness (Max. in.)	refer to 12	4	6	2	2	1½	1
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.20	.20	.22	.18	.18	.18	.18
Manganese	1.15/1.50; 1.60 if C is .18 Max.	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½"- 4" incl.	1.15/1.50	1.65	1.65	1.65	1.65
Phosphorus	.035	.035	.035	.025	.025	.025	.025
Sulfur	.04	.04	.04	.035	.035	.035	.035
Silicon	.15/.50	.15/.50	.15/.50	.60	.60	.60	.60
Chromium	-	.25	-	-	-	-	-
Nickel	-	.25	-	-	-	-	-
Molybdenum	-	.08	-	-	-	-	-
Copper	-	.35	-	-	-	-	-
Other Elements	.01/.05 Cb	-	.04/.11 V .03 N .05 Cb	.08 V .008/.15 Cb .020 N	.008/.15 V .008/.10 Cb .020 N .20 (Cb+V)	.008/.15 V .008/.10 Cb .020 N .20 (Cb+V)	.008/.15 V .008/.10 Cb .020 N .20 (Cb+V)
Heat Treatment Required	N	N	N Double N over 3"	-	-	-	-

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

▲ Also produced as BethStar.®

[BethStar Brochure](#)

## ASTM SPECIFICATIONS

SPECIFICATION	A656†▲▲ Grade 80 Type 7	A662 Grade A	A662 Grade B	A662 Grade C	A678 Grade A	A678▲▲▲ Grade B	A678 Grade C
Type of Steel	HSLA	Carbon	Carbon	Carbon	HSLA	HSLA	HSLA
Requirements for Delivery	A6	A20	A20	A20	A6*	A6*	A6*
Tensile Strength (ksi)	90 Min.	58/78	65/85	70/90	70/90	80/100	95/115 to 3/4" incl.; 90/110 over 3/4-1 1/2" incl.; 85/105 over 1 1/2-2" incl.
Yield Strength (Min. ksi) (Yield Point designated YP)	80 YP	40	40	43	50	60	75 to 3/4" incl.; 70 over 3/4-1 1/2" incl.; 65 over 1 1/2-2" incl.
Spec. Thickness (Max. in.)	3/4	-	-	-	1 1/2	2 1/2	2
ISG Plate Thickness (Max. in.)	3/4	2	2	2	1 1/2	2 1/2	2
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.18	.14	.19	.20	.16	.20	.22
Manganese	1.65	.90/1.35	.85/1.50	1.00/1.60	.90/1.50	.70/1.35 to 1 1/2" incl.; 1.00/1.60 over 1 1/2- 2 1/2" incl.	1.00/1.60
Phosphorus	.025	.035	.035	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035	.04	.04	.04
Silicon	.60	.15/.40	.15/.40	.15/.50	.15/.50	.15/.50	.20/.50
Chromium	-	■	■	■	.25	.25	.25
Nickel	-	■	■	■	.25	.25	.25
Molybdenum	-	■	■	■	.08	.08	.08
Copper	-	■	■	■	.35; .20 Min. when specified	.35; .20 Min. when specified	.35; .20 Min. when specified
Other Elements	.008/.15 V .008/.10 Cb .020 N .20 (Cb+V)	-	-	-	-	-	-
Heat Treatment Required	-	N	N over 1 1/2"	N over 1 1/2"	Q&T	Q&T	Q&T

\* Except one tension test required per each plate as heat treated.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

▲▲ Also produced as BethStar.®

▲▲▲ Also produced as RQC-60 (Q&T).

■ Restricted to ASTM A20 limits for unspecified elements.

**CONTINUED**

## ASTM SPECIFICATIONS

SPECIFICATION	A678† Grade D	A709** Grades	A709 Grade† HPS 50W	A709† Grade HPS 70W	A709†† Grade HPS 100W	A710†† Grade A Class 3
<b>Type of Steel</b>	HSLA	-	HSLA	HSLA	Alloy	Alloy
<b>Requirements for Delivery</b>	A6*	-	A6	A6	A6	A6
<b>Tensile Strength (ksi)</b>	90/110	-	70 Min.	85/110	110/130	85 Min. to 2" incl.; 75 Min. over 2-4" incl.; 70 Min. over 4-8" incl.
Yield Strength (Min. ksi) (Yield Point if designated YP)	75	-	50	70	100	80 to 1.25"; 75 over 1.25-2" incl.; 65 over 2-4" incl.; 60 over 4-8" incl.
<b>Spec. Thickness (Max. in.)</b>	3	-	4	4	2.5	-
<b>ISG Plate Thickness (Max. in.)</b>	3	-	4	4	2.5	8
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums					
<b>Carbon</b>	.22	-	.11	.11	.08	.07
<b>Manganese</b>	1.15/1.50	-	1.10/1.35	1.10/1.35	.95/1.50	.40/.70
<b>Phosphorus</b>	.035	-	.020	.020	.015	.025
<b>Sulfur</b>	.04	-	.006	.006	.006	.025
<b>Silicon</b>	.15/.50	-	.30/.50	.30/.50	.15/.35	.40
<b>Chromium</b>	.25	-	.45/.70	.45/.70	.40/.65	.60/.90
<b>Nickel</b>	.25	-	.25/.40	.25/.40	.65/1.00	.70/1.00
<b>Molybdenum</b>	.08	-	.02/.08	.02/.08	.40/.65	.15/.25
<b>Copper</b>	.35; .20 Min. when specified	-	.25/.40	.25/.40	.90/1.20	1.00/1.30
<b>Other Elements</b>	.04/.11 V .05 Cb .01/.03 N	-	.04/.08 V .010/.040 Al .015 N CT	.04/.08 V .010/.040 Al .015 N CT	.01/.03 Cb	.02 Min. Cb
<b>Heat Treatment Required</b>	Q&T	-	-	Q&T†††	Q&T	

\* Except one tension test required per each plate as heat treated.

\*\* See listing of all Bridge steel grades on page 44.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

†† It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief) or elevated temperature service. Also, post-weld heat treatment or elevated temperature service may degrade heat affected zone toughness. Therefore, ISG Plate recommends that careful consideration be given to these phenomena by competent welding engineers before application.

††† Is available as non-Q&T (TMCP) refer to ISG Plate.

[Spartan Brochure](#)

[HPS 70W Brochure](#)

[HPS 50W Brochure](#)

[HPS 100W Brochure](#)

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A724† Grade A	A724† Grade B	A724† Grade C	A736†† Grade A Class 3	A737† Grade B	A737† Grade C
Type of Steel	Carbon	Carbon	Carbon	Alloy	HSLA	HSLA
Requirements for Delivery	A20	A20	A20	A20	A20	A20
Tensile Strength (ksi)	90/110	95/115	90/110	85/105 to 2" incl.; 75/95 over 2-4" incl.; 70/90 over 4-8" incl.	70/90	80/100
Yield Strength (Min. ksi) (Yield Point if designated YP)	70	75	70	75 to 2" incl.; 65 over 2-4" incl.; 60 over 4-8" incl..	50	60
Spec. Thickness (Max. in.)	-	-	-	-	-	-
ISG Plate Thickness (Max. in.)	7/8	7/8	2	8	4	4
Chemical Composition (%)	Unless a range is specified, individual values are maximums					
Carbon	.18	.20	.22	.07	.20	.22
Manganese	1.00/1.60	1.00/1.60	1.10/1.60	.40/.70	1.15/1.50 1.60 Max. if C is .18 Max.	1.15/1.50
Phosphorus	.035	.035	.035	.025	.035	.035
Sulfur	.035	.035	.035	.025	.030	.030
Silicon	.55	.50	.20/.60	.40	.15/.50	.15/.50
Chromium	.25	.25	.25	.60/.90	■	■
Nickel	.25	.25	.25	.70/1.00	■	■
Molybdenum	.08	.08	.08	.15/.25	■	■
Copper	.35	.35	.35	1.00/1.30	■	■
Other Elements	.08 V	.08 V	.08 V .005 B	.02 Min. Cb	.05 Cb	.04/.11 V .03 N .05 Cb may be present
Heat Treatment Required	Q&T	Q&T	Q&T	Q&PHT	N	N

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

†† It is important to note that this grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief) or elevated temperature service. Also, post-weld heat treatment or elevated temperature service may degrade heat affected zone toughness. Therefore, ISG Plate recommends that careful consideration be given to these phenomena by competent welding engineers before application.

■ Restricted to ASTM A20 limits for unspecified elements.

CONTINUED

## ASTM SPECIFICATIONS

SPECIFICATION	A738† Grade A	A738† Grade B	A808†	A829 & A830**	A841† Grade A Class 1	A841† Grade B Class 1	A841† Grade A Class 2
Type of Steel	Carbon	Carbon	HSLA	-	HSLA	HSLA	HSLA
Requirements for Delivery	A20	A20	A6	-	A20	A20	A20
Tensile Strength (ksi)	75/95	85/102	65 Min. to 2" incl.; 60 Min. over 2-2½"	-	70/90 to 2½" incl.; 65/85 over 2½-4"	70/90 to 2½" incl.; 65/85 over 2½-4"	80/100 to 2½" incl.; 75/95 over 2½-4"
Yield Strength (Min. ksi) (Yield Point if designated YP)	45	60	50 to 1½" incl.; 46 over 1½-2" incl.; 42 over 2-2½" incl.	-	50 to 2½" incl.; 45 over 2½-4"	50 to 2½" incl.; 45 over 2½-4"	60 to 2½" incl.; 55 over 2½-4"
Spec. Thickness (Max. in.)	-	2½	2½	-	4	4	4
ISG Plate Thickness (Max. in.)	4	2½	2½	-	4	4	4
Chemical Composition (%)	Unless a range is specified, individual values are maximums						
Carbon	.24	.20	.12	-	.20	.15	.20
Manganese	1.50 to 2½" incl.; 1.60 over 2½"	.90/1.50	1.65	-	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½-4"	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½-4"	.70/1.35 to 1½" incl.; 1.00/1.60 over 1½-4"
Phosphorus	.035	.030	.035	-	.030	.030	.030
Sulfur	.035	.030	.04	-	.030	.025	.030
Silicon	.15/.50	.15/.55	.15/.50	-	.15/.50	.15/.50	.15/.50
Chromium	.25	.30	-	-	.25	.25	.25
Nickel	.50	.60	-	-	.25	.60	.25
Molybdenum	.08	.20 to 1.5" incl.; .30 Max. over 1.5"	-	-	.08	.30	.08
Copper	.35	.35	-	-	.35	.35	.35
Other Elements	.07 V .04 Cb when specified .08 (V+Cb)	.07 V .04 Cb .08 (V+Cb)	.10 V .02/.10 Cb .15 (V+Cb)	-	.06 V .03 Cb .02 Min. Al	.06 V .03 Cb .02 Min. Al	.06 V .03 Cb .02 Min. Al
Heat Treatment Required	N or Q&T to 2½" incl.; Q&T over 2½"	Q&T	-	-	TMCP LCVN	TMCP LCVN	TMCP LCVN

\*\* SAE or ASTM Grades, see pages 32-34.

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

**CONTINUED**

## ASTM SPECIFICATIONS

SPECIFICATION	A841† Grade B Class 2	A852†	A871† Grade 60 Type II#	A871† Grade 65 Type II#	A945† Grade 50	A945†▲ Grade 65	A1010* Grade 40	A1010* Grade 50
<b>Type of Steel</b>	HSLA	HSLA	HSLA	HSLA	HSLA	HSLA	Stainless	Stainless
<b>Requirements for Delivery</b>	A20	A6	A6	A6	A6	A6	A480	A480
<b>Tensile Strength (ksi)</b>	80/100 to 21/2" incl.; 75/95 over 21/2-4"	90/110	75 Min.	80 Min.	70/90	78/100	66 Min.	70 Min.
<b>Yield Strength (Min. ksi) (Yield Point if designated YP)</b>	60 to 21/2" incl.; 55 over 21/2-4"	70	60	65	50	65	40	50
<b>Spec. Thickness (Max. in.)</b>	4	4	-	-	2	11/4	1	1
<b>ISG Plate Thickness (Max. in.)</b>	4	4	11/4	3/4	2	11/4	4	4
<b>Chemical Composition (%)</b>	Unless a range is specified, individual values are maximums							
<b>Carbon</b>	.15	.19	.20	.20	.10	.10	.030	.030
<b>Manganese</b>	.70/1.35 to 11/2" incl.; 1.00/1.60 over 11/2-4"	.80/1.35	.75/1.35	.75/1.35	1.10/1.65	1.10/1.65	1.50	1.50
<b>Phosphorus</b>	.030	.035	.04	.04	.025	.025	.040	.040
<b>Sulfur</b>	.025	.040	.05	.05	.010	.010	.030	.030
<b>Silicon</b>	.15/.50	.20/.65	.15/.50	.15/.50	.10/.50	.10/.50	1.00	1.00
<b>Chromium</b>	.25	.40/.70	.40/.70	.40/.70	.20	.20	10.5/12.5	10.5/12.5
<b>Nickel</b>	.60	.50	.50	.50	.40	.40	1.50	1.50
<b>Molybdenum</b>	.30	-	-	-	.08	.08	-	-
<b>Copper</b>	.35	.20/.40	.20/.40	.20/.40	.35	.35	-	-
<b>Other Elements</b>	.06 V .03 Cb	.02/.10 V Mandatory LCVN	.01/.10 V F/G/P Mandatory LCVN	.01/.10 V F/G/P Mandatory LCVN	.10 V .05 Cb .08 Al F/G/P Mandatory LCVN	.10 V .05 Cb .08 Al F/G/P Mandatory LCVN	.030 N	.030 N
<b>Heat Treatment Required</b>	TMCP LCVN	Q&T	-	-	Coatesville may require N or Q&T	Coatesville may require Q&T	Tempered	Tempered

† Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

# Also available as Type I, III, IV. Inquire with ISG Plate.

\* Also available as Duracorr,® See page 37.

▲ Provided to the U.S. Navy as HSLA-65 with TCVN and additional chemical and mechanical requirements.