

**HARVARD STEEL<sup>+</sup>**  
focused on the **BUSINESS** of steel

## Welcome to **Harvard Steel.**

We're here to provide you with the steel you need ...  
*plus a whole lot more.*

We provide the *value of partnership for the business of steel.*

In fact, steel is only the beginning.

**Our customers are smart.**

**They need a smart partner;** a progressive-thinking steel / flat roll service center that promises and provides guidance and customized solutions; an inventory that gets you what you need when and where you need it, and the knowledge and experience that are vital to helping your business do steel business best.

**We want to be that partner.** We know what's important to you — we've built our business around it. We're ISO Certified, focused on quality, and uncompromising in our commitment to service and providing solutions that focus on your needs.

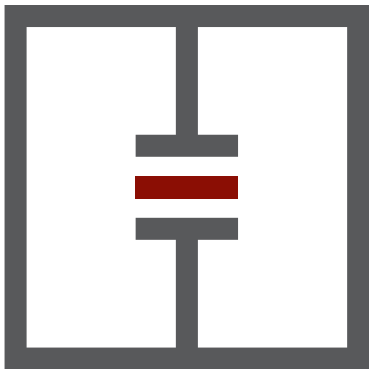
**We offer the following products in slit coil, leveled sheet and re-squared blanks.**

### **Type**

- Hot Rolled / Hot Rolled P&O
- Cold Rolled
- Hot Dipped Galvanized
- Galvannealed
- Electrogalvanized
- Aluminized

### **Grade**

- Commercial Steel (CS Type B)
- Drawing Steel (DS Type B)
- Graded (SS / HSLA)
- Extra Deep Drawing Steel (EDDS)



# Product Reference Guide

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# Gauge Chart

## Hot Rolled, P&O, Cold Rolled

Gauge No.	Thickness (Inches)			Lb. per Sq. Ft*
	Nominal	Ordering Limits		
		HR	CR	
3	0.239	.2281 to .2501	-	9.754
4	0.224	.2152 to .2332	-	9.376
5	0.209	.2002 to .2182	-	8.748
6	0.194	.1853 to .2033	-	8.125
7	0.179	.1713 to .1873	-	7.498
8	0.164	.1564 to .1724	-	6.875
9	0.150	.1415 to .1575	-	6.252
10	0.135	.1265 to .1425	.1285 to .1405	5.624
11	0.120	.1116 to .1276	.1136 to .1256	5.001
12	0.105	.0966 to .1126	.0986 to .1106	4.374
13	0.090	.0827 to .0967	.0847 to .0947	3.751
14	0.075	.0677 to .0817	.0697 to .0797	3.124
15	0.067	.0613 to .0733	.0623 to .0723	2.814
16	0.060	.0538 to .0658	.0548 to .0648	2.501
17	0.054	.0478 to .0598	.0498 to .0578	2.250
18	0.048	.0428 to .0528	.0438 to .0518	1.999
19	0.042	-	.0378 to .0458	1.748
20	0.036	-	.0329 to .0389	1.501
21	0.033	-	.0299 to .0359	1.376
22	0.030	-	.0269 to .0329	1.250
23	0.027	-	.0239 to .0299	1.125
24	0.024	-	.0209 to .0269	0.999
25	0.021	-	.0179 to .0239	0.874
26	0.018	-	.0159 to .0199	0.749
27	0.016	-	.0144 to .0184	0.686
28	0.015	-	.0129 to .0169	0.623

\*Based upon steel density of .2833 lbs./in<sup>3</sup>.

# Gauge Chart Galvanized

Gauge No.	Thickness (Inches)		Lb. Sq. Ft* G90 CTG.
	Nominal	Ordering Limits	
8	0.168	.1601 to .1760	6.852
9	0.153	.1452 to .1612	6.244
10	0.138	.1302 to .1462	5.632
11	0.123	.1153 to .1313	5.025
12	0.108	.1004 to .1164	4.417
13	0.093	.0854 to .1014	3.805
14	0.079	.0705 to .0865	3.197
15	0.071	.0650 to .0770	2.891
16	0.064	.0575 to .0695	2.585
17	0.058	.0525 to .0625	2.340
18	0.052	.0466 to .0566	2.100
19	0.046	.0406 to .0506	1.855
20	0.040	.0356 to .0436	1.610
21	0.037	.0326 to .0406	1.488
22	0.034	.0296 to .0376	1.365
23	0.031	.0266 to .0346	1.243
24	0.028	.0236 to .0316	1.120
25	0.025	.0207 to .0287	1.002
26	0.022	.0187 to .0247	0.880
27	0.020	.0172 to .0232	0.819
28	0.019	.0157 to .0217	0.757
29	0.017	.0142 to .0202	0.696
30	0.016	.0127 to .0187	0.635
31	0.014	.0112 to .0172	0.574
32	0.013	.0104 to .0164	0.541

\*based upon steel density of .2833 lbs./in.<sup>3</sup>  
based upon zinc density of .2580 lbs./in.<sup>3</sup>

Standard Manufacturer's Gauge designations are no longer officially recognized in the domestic steel industry which uses only decimals when referring to the thickness of flat rolled products. Most customers, especially service centers, still use gauge numbers as a reference to thickness in daily transactions.

# Coil Weight Calculator

LBS. Per Inch of Width-PW	Coil B.U. on 20" inside DIA.	Outside DIA. On 20" inside DIA.	Coil B.U. on 24" inside DIA.	Outside DIA. On 24" inside DIA.
150	6 1/2"	= 33"	5 3/4"	= 35 1/2"
170	7"	= 34"	6 1/4"	= 36 1/2"
185	7 1/2"	= 35"	6 3/4"	= 37 1/2"
200	8"	= 36"	7 1/4"	= 38 1/2"
215	8 1/2"	= 37"	7 3/4"	= 39 1/2"
230	9"	= 38"	8 1/4"	= 40 1/2"
250	9 1/2"	= 39"	8 5/8"	= 41 1/4"
265	10"	= 40"	9"	= 42"
285	10 1/2"	= 41"	9 1/4"	= 42 1/2"
300	11"	= 42"	10"	= 44"
325	11 1/2"	= 43"	10 1/2"	= 45"
345	12"	= 44"	11"	= 46"
365	12 1/2"	= 45"	11 1/2"	= 47"
385	13"	= 46"	12"	= 48"
410	13 1/2"	= 47"	12 5/8"	= 49 1/4"
420	14"	= 48"	12 7/8"	= 49 3/4"
445	14 1/2"	= 49"	13 3/8"	= 50 3/4"
465	15"	= 50"	13 3/4"	= 51 1/2"
490	15 1/2"	= 51"	14 3/8"	= 52 3/4"
510	16"	= 52"	14 3/4"	= 53 1/2"
535	16 1/2"	= 53"	15 3/8"	= 54 3/4"
560	17"	= 54"	15 7/8"	= 55 3/4"
580	17 1/2"	= 55"	16 1/4"	= 56 1/2"
610	18"	= 56"	16 7/8"	= 57 3/4"
630	18 1/2"	= 57"	17 1/4"	= 58 1/2"
660	19"	= 58"	17 3/4"	= 59 1/2"
685	19 1/2"	= 59"	18"	= 60"
710	20"	= 60"	18 3/4"	= 61 1/2"
740	20 1/2"	= 61"	19 1/4"	= 62 1/2"
765	21"	= 62"	19 3/4"	= 63 1/2"
795	21 1/2"	= 63"	20 1/4"	= 64 1/2"
820	22"	= 64"	20 3/4"	= 65 1/2"
855	22 1/2"	= 65"	21 1/4"	= 66 1/2"
880	23"	= 66"	21 3/4"	= 67 1/2"
910	23 1/2"	= 67"	22 1/4"	= 68 1/2"
940	24"	= 68"	22 3/4"	= 69 1/2"
970	24 1/2"	= 69"	23 1/4"	= 70 1/2"
1000	25"	= 70"	23 5/8"	= 71 1/4"
1030	25 1/2"	= 71"	24 1/8"	= 72 1/4"
1060	26"	= 72"	24 1/2"	= 73"
1090	26 1/2"	= 73"	25"	= 74"

- To calculate coil PW (pounds per inch of width), divide coil width into coil weight.
- To calculate coil outside diameter, refer to PW against inside diameter (20" or 24").
- To calculate coil weight, multiply PW x width.
- B.U. = Build Up (OD - ID / 2)

# Steel Sheet Designations

## Commercial Steel - CS (Hot Rolled, Cold Rolled, and Galvanized)

CS Type A, Carbon .10% max., allows use of ultra low carbon

CS Type B, Carbon .02% to .15%

CS Type C, Carbon .08% max., allows use of ultra low carbon but also higher phosphorus levels.

CS (No Type), Carbon .16% to .25% max.

### ASTM Specifications:\*

#### Specific

HR: ASTM A1011

CR: ASTM A1008

GV: ASTM A653

#### General

(A568)

(A568)

(A924)

\*These specifications replace the former Commercial Quality Grades. HR only (A659)

## Forming Steel - FS (Galvanized)

FS Type A, Carbon .10% max., does not allow use of interstitial-free steels, but does allow for ultra low carbon.

FS Type B, Carbon .02% to .10%

### ASTM Specifications:\*

#### Specific

GV: ASTM A653

#### General

(A924)

\*These specifications replace the former Drawing Quality Grades.

## Drawing Steel - DS (Hot Rolled and Cold Rolled)

DS Type A, Carbon .08% max., allows use of ultra low carbon.

DS Type B, Carbon .02% to .08%

### ASTM Specifications:\*

#### Specific

GV: ASTM A1011

CR: ASTM A1008

#### General

(A568)

(A568)

\*These specifications replace the former DQSK (AKDQ) Quality Grades.

## Deep Drawing Steel - DDS (Cold Rolled and Galvanized)

DDS, Carbon .06% max. (CR)

DDS, Type A .06% max. (GV)

DDS, Type C .02% max. (GV) but allows Phos .020% to .100%

### ASTM Specifications:

#### Specific

CR: ASTM A1008

GV: ASTM A653

#### General

(A568)

(A924)

## Extra Deep Drawing Steel - EDDS (Cold Rolled and Galvanized)

EDDS, Carbon .02% max. Mandates a fully stabilized, interstitial-free ultra low carbon steel.

### ASTM Specifications:

#### Specific

CR: ASTM A1008

GV: ASTM A653

#### General

(A568)

(A924)

# Standard Chemistries

These new chemistries were approved October 2008.

Steel Designation SAE NO.	Chemical Composition Limits, %			
	C	Mn	P max	S max
1003	0.02-0.06	0.35 max	0.03	0.035
1004	0.02-0.08	0.35 max	0.03	0.035
1005	0.06 max	0.35 max	0.03	0.035
1006	0.08 max	0.45 max	0.03	0.035
1007	0.02-0.10	0.50 max	0.03	0.035
1008	0.10 max	0.50 max	0.03	0.035
1009	0.15 max	0.60 max	0.03	0.035
1010	0.08-0.13	0.30-0.60	0.03	0.035
1012	0.10-0.15	0.30-0.60	0.03	0.035
1015	0.13-0.18	0.30-0.60	0.03	0.035
1016	0.13-0.18	0.60-0.90	0.03	0.035
1017	0.15-0.20	0.30-0.60	0.03	0.035
1018	0.15-0.20	0.60-0.90	0.03	0.035
1019	0.15-0.20	0.70-1.00	0.03	0.035
1020	0.18-0.23	0.30-0.60	0.03	0.035
1021	0.18-0.23	0.60-0.90	0.03	0.035
1022	0.18-0.23	0.70-1.00	0.03	0.035
1023	0.20-0.25	0.30-0.60	0.03	0.035
1025	0.22-0.28	0.30-0.60	0.03	0.035
1026	0.22-0.28	0.60-0.90	0.03	0.035
1030	0.28-0.34	0.60-0.90	0.03	0.035
1033	0.30-0.36	0.70-1.00	0.03	0.035
1035	0.32-0.38	0.60-0.90	0.03	0.035
1037	0.32-0.38	0.70-1.00	0.03	0.035
1038	0.35-0.42	0.60-0.90	0.03	0.035
1039	0.37-0.44	0.70-1.00	0.03	0.035
1040	0.37-0.44	0.60-0.90	0.03	0.035
1042	0.40-0.47	0.60-0.90	0.03	0.035
1043	0.40-0.47	0.70-1.00	0.03	0.035
1045	0.43-0.50	0.60-0.90	0.03	0.035
1046	0.43-0.50	0.70-1.00	0.03	0.035
1049	0.46-0.53	0.60-0.90	0.03	0.035
1050	0.48-0.55	0.60-0.90	0.03	0.035



# Typical Mechanical Properties

The values below are for reference only and are not to be used as material specifications (N/A - not applicable):

Property	CS	FS	DS	DDS	EDDS
<b>Hot Rolled</b>					
Yield strength (ksi)	28-42	N/A	25-35	N/A	N/A
Ultimate tensile strength (ksi)	45-55	N/A	40-50	N/A	N/A
Elongation (% in 2 inches)	20-36	N/A	35-45	N/A	N/A
Base metal hardness (Rockwell B)	45-75	N/A	45-68	N/A	N/A
<b>Cold Rolled</b>					
Yield strength (ksi)	25-40	N/A	20-29	17-29	15-25
Ultimate tensile strength (ksi)	35-50	N/A	35-46	32-44	30-43
Elongation (% in 2 inches)	25-40	N/A	38-46	38+	40+
Base metal hardness (Rockwell B)	40-60	N/A	30-50	30-50	25-45
rm Value	N/A	N/A	1.3-1.7	1.4-1.8	1.7-2.1
n-Value	N/A	N/A	.17-.22	.20-.25	.23-.27
<b>Galvanized</b>					
Yield strength (ksi)	35-49	25-38	N/A	20-35	15-25
Ultimate tensile strength (ksi)	47-57	42-50	N/A	30-45	25-40
Elongation (% in 2 inches)	23-37	33-43	N/A	32+	40+
Base metal hardness (Rockwell B)	50-65	45-58	N/A	25-40	20-35
rm Value	N/A	1.0-1.4	N/A	1.4-1.8	1.6-2.1
n-Value	N/A	.17-.21	N/A	.19-.24	.22-.27

# SAE J2340

## High Strength Low Alloy

## Required Mechanical Properties

SAE J2340 supersedes SAE J1392

SAE J2340 Grade Designation and Type	Yield Strength Mpa Min	Yield Strength Mpa Max	Tensile Strength Mpa Min	% Total Elongation Min Cold-Rolled	% Total Elongation Min Hot-Rolled
300 S	300	400	390	24	26
300X	300	400	370	24	28
300Y	300	400	400	21	25
340S	340	440	440	22	24
340X	340	440	410	22	25
340Y	340	440	440	20	24
380X	380	480	450	20	23
380Y	380	480	480	18	22
420X	420	520	490	18	22
420Y	420	520	520	16	19
490X	490	590	560	14	20
490Y	490	590	590	12	19
550X	550	680	620	12	18
550Y	550	680	650	12	18

**Type S:** High strength solution strengthened

(C-Mn-P-S—.13% max C, .100% max P, .020% max S.)

**Type X:** High Strength Low Alloy, niobium (columbium), titanium, vanadium (.005%

min when used) - .13% max C, .060% max P, .015% max S. 70 MPa difference between specified minimum yield and tensile strength.

**Type Y:** HSLA (same as Type X but 100 MPa difference between specified minimum yield and tensile strength and lower minimum elongation).

**Sub Type F:** Sulfide inclusion control for improved formability – may be specified by the F designation (e.g., SAE J2340 - 340XF).

To convert metric to English multiply by 145.

# Olson Chart

The steel service center industry commonly uses the Olson cup ductility test to determine the drawability of their products. This test can be helpful as an indicator of ductility but should be used as a reference only. Domestic steel producers of flat-rolled products do not recognize this test because of variances in testing equipment and procedures.

<b>Hot rolled</b>			
<b>Gauge</b>	<b>Commercial Steel - CS</b>	<b>Forming Steel- FS*</b>	<b>Drawing Steel - DS</b>
1/4"	605	645	655
5	600	640	650
6	600	640	650
7	590	630	645
8	580	620	640
9	570	610	630
10	560	600	630
11	550	590	600
12	530	570	590
13	510	550	570
14	490	530	550
15	480	520	540
16	460	500	520

<b>Cold Rolled</b>			
16	420	435	450
17	415	430	440
18	395	420	430
19	385	410	420
20	370	395	410
21	360	385	400
22	350	370	390
23	340	360	375
24	330	355	370
25	320	345	360
26	315	340	355
27	305	330	345
28	300	325	340

\*In 1998 ASTM discontinued Forming Steel (FS) for hot rolled (A621) and cold rolled (A619).

# Thickness Tolerances

## Thickness Tolerance - 3/8" (10mm) Cut Edge and 3/4" (19mm) Mill Edge Distance

Hot Rolled Specific width, inches (mm)	Thickness Tolerance, inch (mm), over only No tolerance under specified minimum thickness				
	.180(4.57) to under .230(5.84)	over .098(2.49) to under .180(4.57)	.071(1.80) thru .098(2.49)	.057(1.45) thru .071(1.80)	.051(1.37) thru .057(1.45)
over 12 thru 20	.014	.014	.012	.012	.01
over (300) thru (510)	(.36)	(.36)	(.30)	(.30)	(.25)
over 20 thru 40	.016	.014	.014	.012	.01
over (510) thru (1020)	(.41)	(.36)	(.36)	(.30)	(.25)
over 40 thru 48	.018	.016	.014	.012	.012
over (1020) thru (1220)	(.46)	(.41)	(.36)	(.30)	(.30)
over 48 thru 60	.02	.016	.014	.014	.012
over (1220) thru (1520)	(.51)	(.41)	(.36)	(.36)	(.30)
over 60 thru 72	.022	.016	.016	.014	.014
over (1520) thru (1830)	(.56)	(.41)	(.41)	(.36)	(.36)
over 72 over (1830)	.024	.016	.016	-	-
over (1830)	(.62)	(.41)	(.41)	-	-

## Thickness Tolerance - 3/8" (10mm) minimum Edge Distance

Cold Rolled Specific width, inches (mm)	Thickness Tolerance, inch (mm), over only No tolerance under specified minimum thickness				
	Over .098(2.49) thru .142(3.61)	Over .057(1.45) thru .098(2.49)	Over .039(.99) thru .098(1.45)	Over .019(.48) thru .039(.99)	.014(.36) thru .019(.48)
thru 72 (1,828.8)	.012(.30)	.010(.25)	.008(.20)	.006(.16)	.004(.10)
over 72 (1,828.8)	.014(.36)	.010(.25)	.008(.20)	.006(.16)	-

## Thickness Tolerance - 3/8" (10mm) minimum Edge Distance

Galvanized Specific width, inches (mm)	Thickness Tolerance, inch (mm), over only No tolerance under specified minimum thickness					
	Over 101 thru 177 (over 2.56 thru 4.49)	Over .075 thru .101 (over 1.90 thru 2.56)	Over .061 thru .075 (over 1.55 thru 1.90)	Over .043 thru .061 (over 1.09 thru 1.55)	Over .023 thru .043 (over .58 thru 1.09)	.023 thinner (.58 and thinner)
thru 32 (thru 812.8)	.016 (.41)	.014 (.36)	.012 (.31)	.01 (.26)	.008 (.21)	.006 (.16)
1 over 32 thru 40 (over 812.8 thru 1016.0)	.016 (.41)	.016 (.41)	.012 (.31)	.01 (.26)	.008 (.21)	.006 (.16)
over 40 thru 60 (over 1016.0 thru 1524.0)	.018 (.46)	.016 (.41)	.012 (.31)	.01 (.26)	.008 (.21)	.006 (.16)
over 60 thru 72 (over 812.8 thru 1016.0)	.018 (.46)	.018 (.46)	.012 (.31)	.01 (.26)	.008 (.21)	-

Note: These tables do not apply to the uncropped ends of Hot Rolled Unprocessed Sheet.

# Coating Weight Conversion

## Hot Dipped Galvanized

The following Table is a direct conversion chart to convert coating weight from g/m<sup>2</sup> to oz/ft<sup>2</sup> on a per-side basis. Note that, although a precise conversion between the metric categories (20G/20G, 40G/40G, etc.) and ASTM A653 "G" and "A" categories (G30, G60, etc.) cannot be made, a 90G/90G coating category (metric) is approximately equivalent to a G60 coating category (ASTM A 653) and a 60G/60G coating category is approximately equivalent to a G40 coating category (ASTM A 653). Remember that the ASTM categories do not require specific separate side coating weights. For customers that are familiar with descriptions of the coating in terms of thickness in micrometers, this Table also contains a conversion from g/m<sup>2</sup> to coating thickness in micrometers on a per-side basis. For example, a 70G/70G coating category requires 70 g/m<sup>2</sup> minimum on each side of the sheet. This is equal to 9.81 micrometers per side.

Coating Weights Per Side Grams/ Square Meter	Coating Weight Per Side Ounces/ Square Foot	Coating Thickness Per Side Micrometers
5	0.016	0.7
10	0.033	1.4
15	0.049	2.1
20	0.066	2.8
25	0.082	3.51
30	0.098	4.21
35	0.115	4.91
40	0.131	5.61
45	0.147	6.31
50	0.164	7.01
55	0.18	7.71
60	0.197	8.41
65	0.213	9.11
70	0.229	9.81
75	0.246	10.52
80	0.262	11.22
85	0.278	11.92
90	0.295	12.62
95	0.311	13.32
98	0.321	13.74
100	0.33	14.02

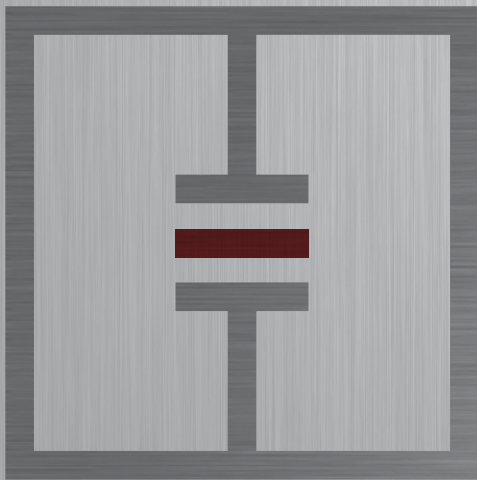
Conversion Factors  
 $\text{g/m}^2 = \text{oz/ft}^2 \times 305.15$   
 $\text{g/m}^2 = \mu\text{m} \times 7.133$

# Metric Conversions

The following list contains the common metric and other unit conversions that may be applicable for purposes of ordering sheet products.

	To convert from	To	Multiply by
<b>Length</b>	inches (in)	millimeters (mm)	25.4
	feet (ft)	meters (m)	0.030
<b>Weight</b>	ounces (oz)	grams (g)	28.350
	pounds (lb)	grams (g)	453.59
	pounds (lb)	kilograms (kg)	0.454
	pounds (lb)	metric tons	0.000
	tons	metric tons	0.907
	metric tons	kilograms (kg)	1000
<b>Coating Weight</b>	ounces/sq. ft. (oz/ft <sup>2</sup> )	grams/sq. meter (g/m <sup>2</sup> )	305.15
<b>Density</b>	pounds/cubic inch (lb/in <sup>3</sup> )	grams/cubic centimeter (g/cm <sup>3</sup> )	27.68
<b>Strength</b>	pounds/square inch (psi)	ksi (1000 psi)	0.001
	ksi	megapascals (MPa)	6.895
	pounds/square inch (psi)	megapascals (MPa)	0.007
	newtons/square millimeter (N/mm <sup>2</sup> )	megapascals (MPa)	1
	pounds/square inch (psi)	newtons/square millimeter (N/mm <sup>2</sup> )	0.007
	ksi	newtons/square millimeter (N/mm <sup>2</sup> )	6.895
	ksi	kilograms/square millimeter (kg/mm <sup>2</sup> )	0.704

To convert metric to English divide by number indicated.



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