

DANA STEEL is one of the biggest stockiest of Hot Dipped galvanized coils [GI], Prepainted c

Gauge numbers and thickness	ASTM A653
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Note 1) As of 1997, these standards were incorporated into ASTM A653.

- Comparative Coating Weights

Type of Coating	Coating Designation (Both Sides)				Minimum Coating Weight(g/m ²)
	ASTM	BS2989	DIN 17162	JIS G 3302	
Zinc	G235				720
	G210				640
		G600	600	Z60	600
	G185				560
	G165				500
		G450	450	Z45	450
	G140				430
	G115	G350	350	Z35	350
					300
	G90	G275	275	Z27	275
				Z25	250
				Z22	220
		G200	200	Z20	200
	G60			Z18	180
					150
	G40			Z12	120
		G100	100	Z10	100
					90
				Z08	80
			(Z06)	60	
				40	
	G01		001		

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ASTM (Old)

- Chemical Composition & Mechanical Properties

Type (Symbol)	Chemical compositions %					Yield Strength min., ksi	Tensile Strength min., ksi	Elongation min., %	180° Bending Diameter/Thickness (Base metal)	
	C	Mn	P	S	Cu					
Commercial quality (A526)	0.15	0.60	0.035	0.04	0.20	-	-	-	-	
Lock-forming quality (A527)	0.15	0.60	0.035	0.04	0.20	-	-	-	-	
Drawing quality (A528)	0.10	0.50	0.025	0.035	-	-	-	-	-	
Drawing quality special killed (A642)	0.10	0.50	0.025	0.03	-	-	-	-	-	
Structural quality (A446)	Grade A	0.20	-	0.04	0.04	0.20	33	45	20	1.5
	Grade B	0.20	-	0.10	0.04	0.20	37	52	18	2.0
	Grade C	0.25	-	0.10	0.04	0.20	40	55	16	2.5
	Grade D	0.40	-	0.20	0.04	0.20	50	65	12	-
	Grade E	0.20	-	0.04	0.04	0.20	80	82	-	-
	Grade F	0.50	-	0.04	0.04	0.20	50	70	12	-

ASTM A653 -97

Standard Specification for Steel Sheet, Zinc-Coated(Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-dip Process

- Base Metal Chemical and Mechanical Requirements

Commercial and Drawing Quality

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Designation	Chemical Composition, %					Mechanical Properties			
	C,max.	Mn,max.	P,max.	S,max.	Al,min.	Yield Point	Elongation	lm value	n value
						ksi(Mpa)	min. %		
CS Type A	0.10	0.60	0.030	0.035	***	25/55(170/380)	20	*	*
CS Type B	0.02-0.15	0.60	0.030	0.035	***	30/55(205/380)	20	*	*
CS Type	0.08	0.60	0.100	0.035	***	25/60(170/410)	15	*	*
FS Type A	0.10	0.50	0.020	0.035	***	25/45(170/310)	26	1.0/1.4	0.17/0.21
FS Type B	0.02-0.10	0.50	0.020	0.030	***	25/45(170/310)	26	1.0/1.4	0.17/0.21
DDS	0.06	0.50	0.020	0.025	0.01	20/35(140/240)	32	1.4/1.8	0.19/0.24
EDDS	0.02	0.40	0.020	0.025	0.01	15/25(105/170)	40	1.6/2.1	0.22/0.27

Structural Quality

Designation	Chemical Composition, %					Mechanical Properties		
	C, max.	Mn, max.	P, max.	S, max.	Al, min.	Tensile Strength, min	Yield Point	Elongation min.
						ksi (Mpa)	ksi (Mpa)	%
SS Grade								
Grade 33[230]	0.20	***	0.04	0.04	***	45 (310)	33 (230)	20
Grade 37[255]	0.20	***	0.10	0.04	***	52 (360)	37 (255)	18
Grade 40[275]	0.25	***	0.10	0.04	***	55 (380)	40 (275)	16
Grade50[340]Class1	0.40	***	0.20	0.04	***	65 (450)	50 (340)	12
Grade50[340]Class2	0.40	***	0.20	0.04	***	(***) (***)	50 (340)	12
Grade50[340]Class3	0.50	***	0.04	0.04	***	70 (480)	50 (340)	12
Grade 80[550]	0.20	***	0.04	0.04	***	82c (570)c	80 (550)	(***)
HSLAS Type A								
Grade 50[340]	0.20	1.20	***	0.035	***	60 (410)	50 (340)	20
Grade 60[410]	0.20	1.35	***	0.035	***	70 (480)	60 (410)	16
Grade 70[480]	0.20	1.65	***	0.035	***	80 (550)	70 (480)	12

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	Grade 80[550]	0.20	1.65	***	0.035	***	90 (620)	80 (550)	10
HSLAS Type B									
	Grade 50[340]	0.15	1.20	***	0.035	***	60 (410)	50 (340)	22
	Grade 60[410]	0.15	1.20	***	0.035	***	70 (480)	60 (410)	18
	Grade 70[480]	0.15	1.65	***	0.035	***	80 (550)	70 (550)	14
	Grade 80[550]	0.15	1.65	***	0.035	***	90 (620)	80 (550)	12

▪ **Weight of Coating**

Type	Coating Designation	Minimum Requirement					
		Triple-Spot Test				Single-Spot Test	
		Total Both Sides		One Side		Total Both Sides	
		oz/ft ²	g/m ²	oz/ft ²	g/m ²	oz/ft ²	g/m ²
Zinc	G360	3.60	1100	1.28	390	3.20	975
	G300	3.00	900	1.04	316	2.60	790
	G235	2.35	717	0.80	238	2.00	610
	G210	2.10	640	0.72	225	1.80	549
	G185	1.85	564	0.64	198	1.60	488
	G165	1.65	503	0.56	177	1.40	427
	G140	1.40	427	0.48	150	1.20	366
	G115	1.15	351	0.40	124	1.00	305
	G90	0.90	275	0.32	97	0.80	244
	G60	0.60	183	0.20	65	0.50	152
	G40	0.40	122	0.12	43	0.30	91
	G30	0.30	92	0.10	33	0.25	76
G01	no minimum			no minimum		no minimum	
Zinc-iron alloy	A60	0.60	183	0.20	65	0.50	152
	A40	0.40	122	0.12	43	0.30	91
	A25	0.25	76	0.08	27	0.20	61
	A01	No minimum		No minimum		No minimum	

▪ **Thickness Tolerances**

3/8 in. [10mm] Minimum Edge Distance

Specified Width, in.		Thickness Tolerance, Plus and Minus, in.					
		Specified Thickness, in.					
Over	Through	Through 0.023	Over 0.023 Through 0.043	Over 0.043 Through 0.061	Over 0.061 Through 0.075	Over 0.075 Through 0.101	Over 0.101 Through 0.187
-	32	0.003	0.004	0.005	0.006	0.007	0.008
32	40	0.003	0.004	0.005	0.006	0.008	0.008
40	60	0.003	0.004	0.005	0.006	0.008	0.009
60	72	-	0.004	0.005	0.006	0.009	0.009

Specified Width, mm		Thickness Tolerance, Plus and Minus, mm.					
		Specified Thickness, mm					
Over	Through	Through 0.4	Over 0.4 Through 1.0	Over 1.0 Through 1.5	Over 1.5 Through 2.0	Over 2.0 Through 2.5	Over 2.5 Through 5.0
-	1500	0.08	0.10	0.13	0.15	0.20	0.23
1500	-	***	0.10	0.13	0.15	0.23	0.23

1 in. [25mm] Minimum Edge Distance

Specified Width, in.	Thickness Tolerance, Plus and Minus, in.			
	Specified Thickness, in.			
	0.061 and thinner	Over 0.061 to 0.075 inclusive	Over 0.075 to 0.101 inclusive	Over 0.101 to 0.187 inclusive
To 0.40 inclusive	0.002	0.003	0.006	0.006
Over 0.40 to 60, inclusive	0.002	0.003	0.006	0.007
Over 0.60 to 72, inclusive	0.002	0.003	0.007	0.007

Specified Width, mm	Thickness Tolerance, Plus and Minus,mm.			
	Specified Thickness, mm			
	1.5 and thinner	Over 1.5 to 2.0, inclusive	Over 2.0 to 2.5, inclusive	Over 2.5 to 5.0, inclusive
To 1500, inclusive	0.05	0.08	0.15	0.18
Over 1500	0.05	0.08	0.18	0.18

- **Width Tolerances**(Coils and Cut Lengths, Not Resquared.)

Specified Width, in		Tolerance Over and Under Specified Width, in	Specified Width, mm		Tolerance Over Specified Width, No Tolerance Under, mm
Over	Through		Over	Through	
12	30	3/8	300	600	3
30	48	3/16	600	1200	5
48	60	1/4	1200	1500	6
60	72	5/16	1500	1800	8

Narrow Widths

Specified Width, in		Tolerance Over Specified Width, No Tolerance Under, in.		
Over	Through	From 2 Through 6	Over 6 Through 9	Over 9 Through 12
0.014	0.068	0.008	0.016	0.032
0.068	0.083	0.012	0.016	0.032
0.083	0.110	0.016	0.032	0.032
0.110	0.187	0.032	0.032	0.032

Specified Width, mm		Width Tolerance, Over and Under, mm
Over	Through	
50	100	0.3
100	200	0.4

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200	300	0.8
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- **Coating Bend Test**(Number of Pieces of Same Thickness Used in Coating Bend Test)

Ratio of the Inside Bend Diameter to thickness of the Specimen(Any Direction)						
Coating Designation	CS, FS, DDS, EDDS			SS, GradeB		
	Sheet Thickness			33	37	40
	Through 0.039in.	Over 0.039 Through 0.079 in.	Over 0.079 in.			
G235	2	3	3	3	3	3
G210	2	2	2	2	2	2 1/2
G185	2	2	2	2	2	2 1/2
G165	2	2	2	2	2	2 1/2
G140	1	1	2	2	2	2 1/2
G115	0	0	1	1 1/2	2	2 1/2
G90	0	0	1	1 1/2	2	2 1/2
G60	0	0	0	1 1/2	2	2 1/2
G40	0	0	0	1 1/2	2	2 1/2
G30	0	0	0	1 1/2	2	2 1/2
G01	0	0	0	1 1/2	2	2 1/2
	HSLAS Type AB		HSLAS Type B			
	50	60	50	60	70	80
G115	1 1/2	3	1	1	1 1/2	1 1/2
G90	1 1/2	3	1	1	1 1/2	1 1/2
G60	1 1/2	3	1	1	1 1/2	1 1/2
G40	1 1/2	3	1	1	1 1/2	1 1/2
G30	1 1/2	3	1	1	1 1/2	1 1/2
G01	1 1/2	3	1	1	1 1/2	1 1/2

- **Length Tolerances**(Cut Lengths, Not Resquared.)

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Specified Width, in		Tolerance Over Specified Width, No	Specified Width, mm		Tolerance Over Specified Width, No
Over	Through	Tolerance Under, in	Over	Through	Tolerance Under, mm
12	30	1/8			
30	60	1/4	300	1500	6
60	96	1/2	1500	3000	20
96	120	3/4			
120	156	1	3000	6000	35
156	192	1 1/4			
192	240	1 1/2	6000	-	45
240	-	1 3/4			

Narrow Widths

Specified Width, in		Tolerance Over Specified Length, No	Specified Length, mm		Tolerance Over Specified Length, No
Over	Through	Tolerance Under, in	Over	Through	Tolerance Under, mm
From 24	60	1/2	600	1500	15
60	120	3/4	1500	3000	20
120	240	1	3000	6000	25

- **Camber Tolerances**

For Coils Over 12 in. in Width			For Coils Over 300mm in Width		
Cut Length, ft		Camber Tolerance, in	Cut Length, mm		Camber Tolerance, mm
Over	Through		Over	Through	
-	4	1/8	-	1200	4

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4	6	3/16	1200	1800	5
6	8	1/4	1800	2400	6
8	10	5/16	2400	3000	8
10	12	3/8	3000	3700	10
12	14	1/2	3700	4300	13
14	16	5/8	4300	4900	16
16	18	3/4	4900	5500	19
18	20	7/8	5500	6000	22
20	30	1 1/4	6000	9000	32
30	40	1 1/2	9000	12200	38

Narrow Widths

The camber tolerance is 1/4 in. in any 8ft
The camber tolerance is 5.00mm. in any 2000mm

▪ Flatness Tolerances (Cut Lengths)

Specified Thickness, in.	Specified Width, in		Flatness Tolerance, in.	Specified Thickness, mm	Specified Width, mm		Flatness Tolerance, mm
	Over	Through			Over	Through	
Through 0.048	12	36	3/8	Through 1.0	300	900	10
	36	60	5/8		900	1500	15
	60	72	7/8		1500	...	20
Over 0.048	12	36	1/4	Over 1.0	300	900	8
	36	60	3/8		900	1500	10
	60	72	5/8		1500	1800	15
					1800	...	20

Flatness Tolerances Specified to Stretcher-Leveller Standard(Cut length)

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Specified Thickness, in.	Specified Width, in		Flatness
	Over	Through	Tolerance,in.
Over 0.019 through 0.032	Over 12 Through 36	Through 120, inclusive	1/4
	Wider or longer		3/8
Over 0.032	Over 12 Through 48	Through 120, inclusive	1/8
	Wider or longer		1/4
Specified Thickness,mm	Specified Width, mm		Flatness
	Over	Through	Tolerance,mm
0.35 through 0.8	Through 900	Through 3000	8
	Wider or longer		10
Over 0.8	Through 1200	Through 3000	5
	Wider or longer		8

- **Out-of-Square Tolerances** (Cut Lengths, Not Required For Coils Over 12 in. in Width)

The tolerance for cut lengths of all thicknesses and all sizes is 1/6 in. each 6 in. of width of fraction thereof.

The tolerance for cut lengths of all thicknesses and all sizes is 1.0mm in each 100mm of width of fraction thereof.

- **Required Tolerances**(Cut Lengths, Over 12 in. in Width)

Shall not exceed 1/16 in. for cut lengths up to and including 48 in. in width and including 120 in. in length. For cut lengths wider or longer, the applicable tolerance is 1/8 in.

Shall not exceed 1.6 mm for cut lengths up to and including 1200mm in width and including 3000mm. in length. For cut lengths wider or longer, the applicable tolerance is 3.2mm

▪ **Galvanized Sheet Gauge Numbers and Thickness**

Galvanized Sheet Gage No.	Thickness Equivalent for Galvanized Sheet Gage No. in	Thickness Equivalent for Galvanized Sheet Gage No. mm
13	0.0934	2.372
14	0.0785	1.994
15	0.0710	1.803
16	0.0635	1.613
17	0.0575	1.461
18	0.0516	1.311
19	0.0456	1.158
20	0.0396	1.006
21	0.0366	0.9296
22	0.0336	0.8534
23	0.0306	0.7772
24	0.0276	0.7010
25	0.0247	0.6274
26	0.0217	0.5512
27	0.0202	0.5131
28	0.0187	0.4750
29	0.0172	0.4369
30	0.0157	0.3988
31	0.0142	0.3607
32	0.0134	0.3404

EN 10142-95/10147-95

EN 10142-95 continuously Hot-dip Zinc Coated Low Carbon Steel Sheet and Strip for Cold Forming(Technical delivery conditions)

EN 10147-95 continuously Hot-dip Zinc Coated Low Carbon Steel Sheet and Strip (Technical delivery conditions)

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- **Base Metal Mechanical Requirements**

	Designation			Yield Strength Re N/mm ²	Tensile Strength Re N/mm ²	Elongation A80 %
	Steel Grade		Symbol for the Type of Hot-Dip Coating			
	Steel Name	Steel Number				
Cold Forming Quality	DX51D	1.0226	+Z	-	Max.500	Min.22
	DX51D	1.0226	+ZF			
	DX52D	1.0350	+Z	Max.300	Max.420	Min.26
	DX52D	1.0350	+ZF			
	DX53D	1.0355	+Z	Max.260	Max.380	Max.30
	DX53D	1.0355	+ZF			
	DX54D	1.0306	+Z	Max.220	Max.350	Max.36
	DX54D	1.0306	+ZF			
Structural Quality	S220GD	1.0241	+Z	Min.220	Min.300	Min.20
	S220GD	1.0241	+ZF			
	S250GD	1.0242	+Z	Min.250	Min.330	Min.19
	S250GD	1.0242	+ZF			
	S280GD	1.0244	+Z	Min.280	Min.360	Min.18
	S280GD	1.0244	+ZF			
	S320GD	1.0250	+Z	Min.320	Min.390	Min.17
	S320GD	1.0250	+ZF			
	S350GD	1.0529	+Z	Min.350	Min.420	Min.16
	S350GD	1.0529	+ZF			
	S550GD	1.0531	+Z	Min.550	Min.560	-
	S550GD	1.0531	+ZF			

- **Coating Mass(Total Both Sides)**

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Type	Coating	Minimum Coating Mass, g/m ² including both surfaces	
		Triple Spot Test	Single Spot Test
Zinc	100	100	85
	140	140	120
	200	200	170
	225	225	195
	275	275	235
	350	350	300
	450	450	385
Zinc-iron Alloy	600	600	510
	100	100	85
Zinc-iron Alloy	140	140	120

- **Coating Bend Test**(Mandrel Diameter in the Bend Test to Determine the Adhesion of the Coating)

Cold Forming Quality

Coating	Mandrel Diameter, D, in the Bend Test
100	0
140	
200	
225	
275	
350	1a
450	2a
600	

Structural Quality

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Steel Grade	Mandrel Diameter D for Coating							
	100	140	200	225	275	350	450	600
S220GD+Z	1a	1a	1a	1a	1a	1a	1a	2a
S220GD+ZF	1a	1a	-	-	-	-	-	-
S250GD+Z	1a	1a	1a	1a	1a	1a	1a	2a
S250GD+ZF	1a	1a	-	-	-	-	-	-
S280GD+Z	2a	2a	2a	2a	2a	2a	2a	3a
S280GD+ZF	2a	2a	-	-	-	-	-	-
S320GD+Z	3a	3a	3a	3a	3a	3a	3a	4a
S320GD+ZF	3a	3a	-	-	-	-	-	-
S350GD+Z	3a	3a	3a	3a	3a	3a	3a	4a
S350GD+ZF	3a	3a	-	-	-	-	-	-
S550GD+Z	-	-	-	-	-	-	-	-
S550GD+Z	-	-	-	-	-	-	-	-

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