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DURGRIP™

Hot dip galvanized sheet steel

Steel
Sheet



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DURGRIP™ Hot dip galvanized sheet steel
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NIPPON STEEL CORPORATION

DURGRIP™

DURGRIP hot-dip galvanized steel sheets are a familiar product that is deeply ingrained in our daily lives. This material has a long history of application that covers a wide range of fields, including building construction, civil engineering, electric appliances, automobiles and household articles.

DURGRIP, supported by many years of accumulated expertise and advanced production technologies related to hot-dip galvanized steel sheets, has gained a high reputation in these fields of application.

In addition to JIS products, NIPPON STEEL also supplies hot-dip galvanized steel sheets with its own proprietary standards and coating types in order to meet the most demanding user requirements.

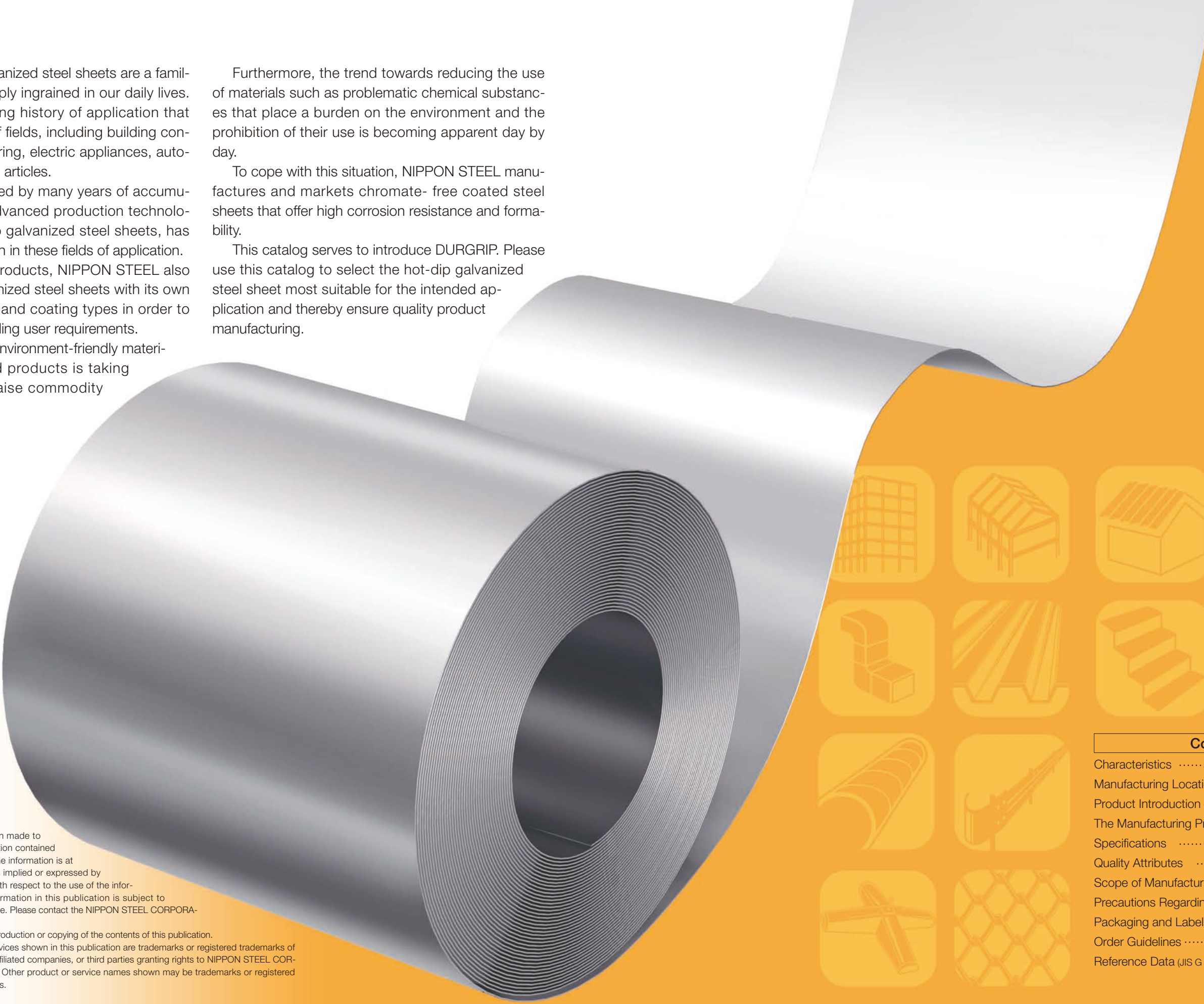
The application of environment-friendly materials in making finished products is taking root as a means to raise commodity values.

Furthermore, the trend towards reducing the use of materials such as problematic chemical substances that place a burden on the environment and the prohibition of their use is becoming apparent day by day.

To cope with this situation, NIPPON STEEL manufactures and markets chromate- free coated steel sheets that offer high corrosion resistance and formability.

This catalog serves to introduce DURGRIP. Please use this catalog to select the hot-dip galvanized steel sheet most suitable for the intended application and thereby ensure quality product manufacturing.

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Characteristics

DURGRIP™

1 Outstanding Corrosion-Resistance Properties

Long-term protection of the base metal is assured (excellent resistance to red rust).

Moreover, due of a special surface treatment during the zinc coating process, DURGRIP offers outstanding resistance to

3 Attractive Appearance

In addition to the conventional spangled products that have the fine luster characteristic of zinc, we can also supply zero-spangle products.

2 Excellent Adhesive Qualities of the Zinc Coating to Cope with the Severest Processing Conditions

Production by continuous hot-dip galvanizing lines ensures that the alloying layer is thin and that the adhesion of the zinc coating is extremely high.

Products that accurately meet application and processing conditions are available from our full range of standards and specifications.

DURGRIP™ (DURGRIP21 Chromate-Free Type)

1 Categorically Chrome-Free

DURGRIP21 is manufactured by providing a special coating film that contains no chromate.

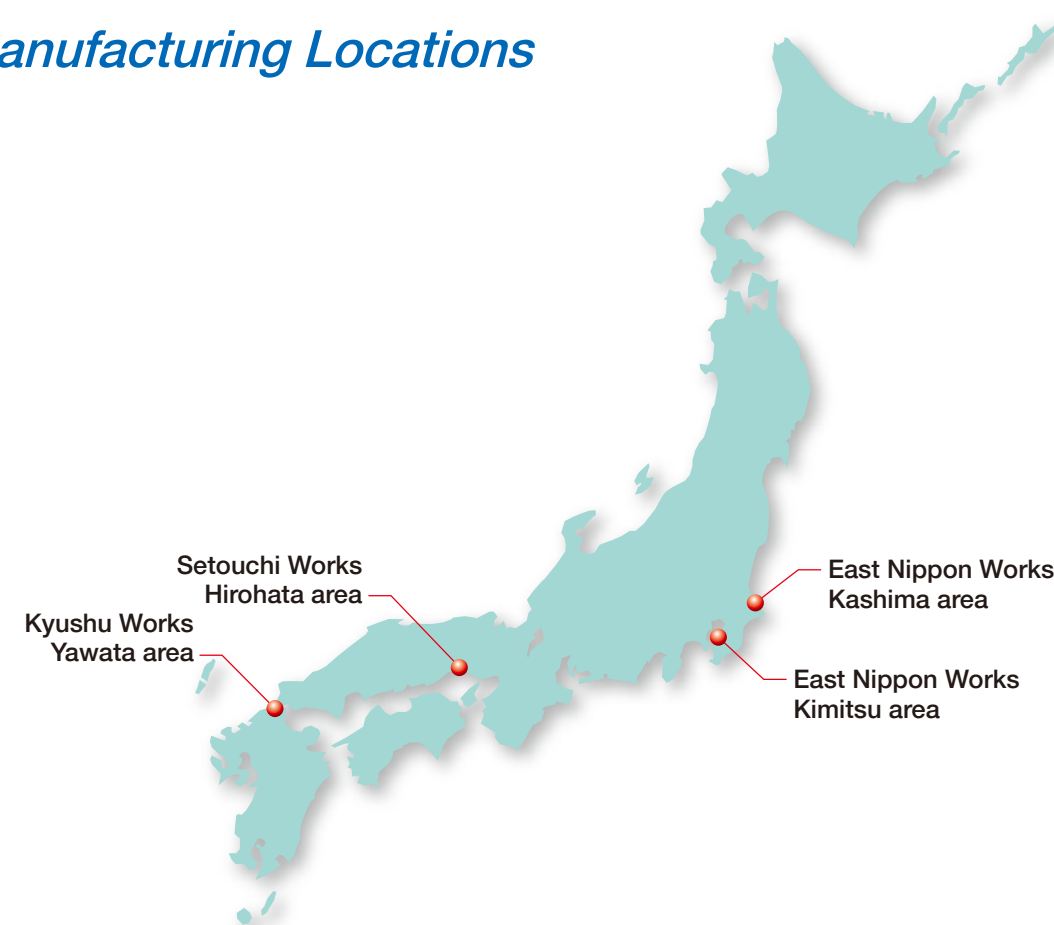
2 Excellent Corrosion Resistance and Coefficient Properties

Due to the effect of its special coating film, DURGRIP21 offers corrosion resistance and formability similar to conventional chromate-treated galvanized sheets.

→As the formability of the special coating film is similar to that of chromate, the molds are easily adjusted.

Moreover, DURGRIP21 offers not only improved corrosion resistance but also a lower dynamic friction coefficient and superior sliding properties compared to conventional chromate-treated galvanized sheets.

Manufacturing Locations



Product Introduction

Cross-Section Showing the Structure of DURGRIP

Hot-Dip Galvanized Sheet (DURGRIP)

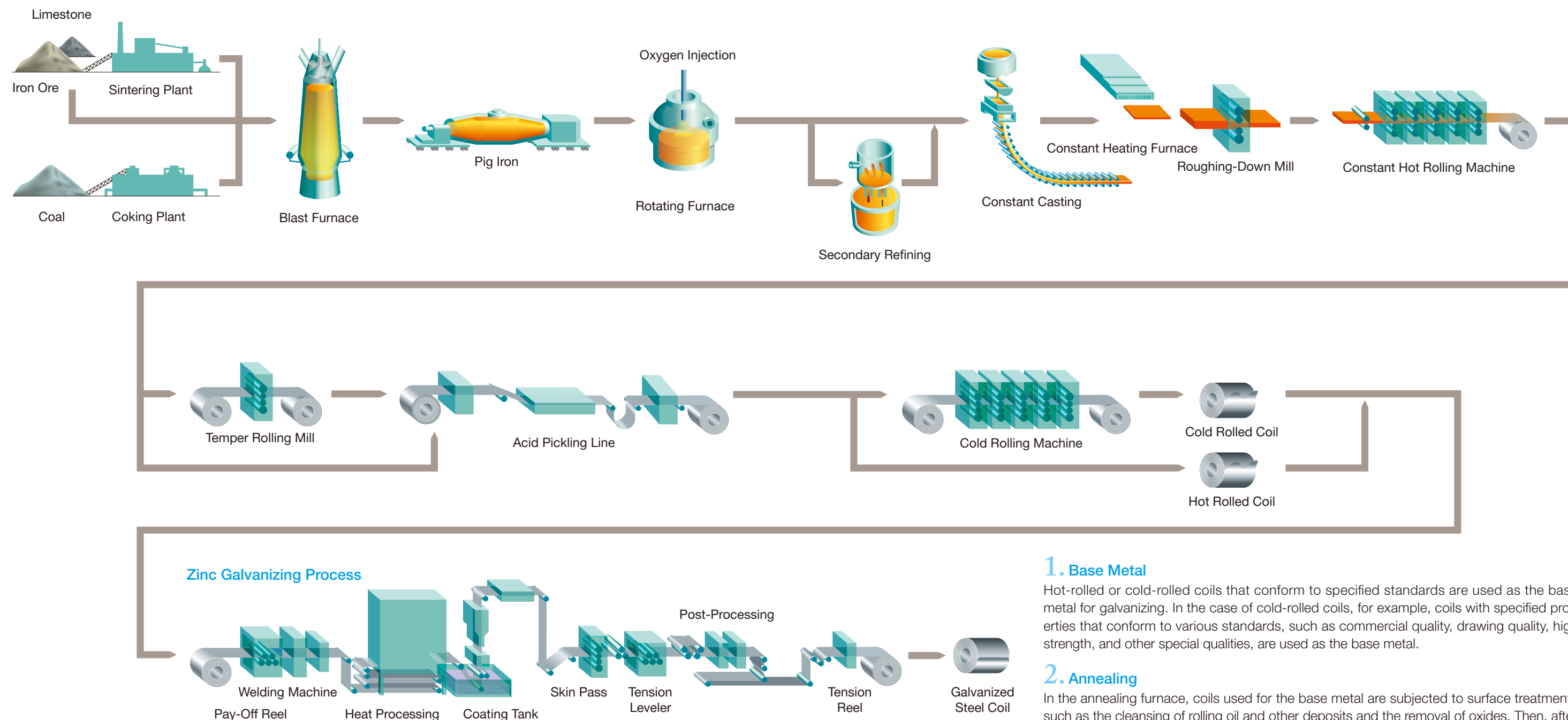
Hot-dip galvanizing layer
Base metal

Chromate-Free Hot-Dip Galvanized Sheet (DURGRIP21)

Special coating film
Hot-dip galvanizing layer
Base metal

The Manufacturing Process

The Process to Manufacture Galvanized Steel



1. Base Metal

Hot-rolled or cold-rolled coils that conform to specified standards are used as the base metal for galvanizing. In the case of cold-rolled coils, for example, coils with specified properties that conform to various standards, such as commercial quality, drawing quality, high strength, and other special qualities, are used as the base metal.

2. Annealing

In the annealing furnace, coils used for the base metal are subjected to surface treatments such as the cleansing of rolling oil and other deposits and the removal of oxides. Then, after being fully reheated, the coils undergo material property adjustments such as recrystallization.

3. Hot-Dip Galvanizing

After the surfaces of the base metal are cleaned, the coils are immersed in a molten zinc galvanizing tank to provide the zinc coating. The coating mass is adjusted by means of gas wiping immediately after hot-dip galvanizing.

4. Surface Treatment

The galvanized sheets are subjected to chromate treatment or chromate-free treatment for surface protection in a chemical treatment bath.

Specifications

Type (JIS Specifications)

Cold Rolled Base Metal Coils

Type		Designation	Nominal thickness (mm)	Type of coating			
				Z06-Z27	Z35, Z37	Z45	Z60
Commercial		SGCC	0.25≦t≦3.2	○	○	○	○
Drawing	Grade 1	SGCD1	0.40≦t≦2.3	○	—	—	—
	Grade 2	SGCD2	0.40≦t≦2.3	○	—	—	—
	Grade 3	SGCD3	0.60≦t≦2.3	○	—	—	—
	Grade 4 (non aging property)	SGCD4	0.60≦t≦2.3	○	—	—	—
Structural	340N-class	SGC340	0.25≦t≦3.2	○	○	○	○
	400N-class	SGC400	0.25≦t≦3.2	○	○	○	○
	440N-class	SGC440	0.25≦t≦3.2	○	○	○	○
	490N-class	SGC490	0.25≦t≦3.2	○	○	○	○
	570N-class	SGC570	0.25≦t≦2.0	○	○	○	○
Commercial, hard		SGCH	0.11≦t≦1.0	○	○	○	○

- Notes: ① Nominal thicknesses other than those listed in the above table may be agreed upon between the producer and purchaser.
- ② In the case of the use for roofing and outer structural panels, the designation in the above table shall be suffixed with R for the use for roofing and A for the use for outer structural panels. In this case, the nominal thickness and coating mass in the Table-a shall be applied. Meanwhile, Z35, Z37, Z45 and Z60 may be agreed upon between the producer and purchaser.
- ③ In the case of corrugated products fabricated according to JIS G 3316, the designation in the above table shall further be suffixed with W and the corrugated shape symbol. In this case, the nominal thickness and coating mass in the Table b shall be applied. Meanwhile, Z35, Z37, Z45 and Z60 may be agreed upon between the producer and purchaser.
- ④ Of the types in the above table, the commercial grade is used for corrugated products.
- ⑤ SGC570 and SGCH, please consult us in advance for every product.

Table a

Application	Nominal thickness (mm)	Coating mass designation
Roofing	0.35≦t≦1.0	Z25, Z27
	1.0<t	Z27
Outer structural panels	0.27≦t≦0.50	Z18, Z22, Z25, Z27
	0.50<t≦1.0	Z22, Z25, Z27
	1.0<t	Z27

Table b

Nominal thickness (mm)	Coating mass designation	References
0.11≦t<0.16	Z12	Special purpose use
0.16≦t<0.27		—
0.27≦t<0.30		Special purpose use
0.30≦t≦0.50	Z18, Z22, Z25, Z27	—
0.50<t≦1.0	Z22, Z25, Z27	—

Hot Rolled Base Metal Coils

Type		Designation	Nominal thickness (mm)	Type of coating		
				Z06-Z37	Z45	Z60
Commercial		SGHC	1.6≦t≦6.0	○	○	○
Drawing	340N-class	SGH340	1.6≦t≦6.0	○	○	○
	400N-class	SGH400	1.6≦t≦6.0	○	○	○
	440N-class	SGH440	1.6≦t≦6.0	○	○	○
	490N-class	SGH490	1.6≦t≦6.0	○	○	○
	540N-class	SGH540	1.6≦t≦6.0	○	○	○

Note: For nominal thicknesses of more than 1.6 mm and less than 3.2 mm and where a special hot rolled base metal has not been specified, we may choose to use a cold rolled base metal that fulfills the specifications of the equivalent hot rolled base metal.

Type (NIPPON STEEL Standards)

Cold Rolled Base Metal Coils

Type		Designation	Nominal thickness (mm)
Commercial		NSGCC	0.25≦t≦3.2
Drawing	Grade 1	NSGC270C	0.40≦t≦2.3
	Grade 2	NSGC270D	0.40≦t≦2.3
	Grade 3	NSGC270E	0.60≦t≦2.3
	Grade 4	NSGC270F	0.60≦t≦2.3
	Grade 5	NSGC270G	0.60≦t≦2.3
Structural	340N-class	NSGC340	0.25≦t≦3.2
	400N-class	NSGC400	0.25≦t≦3.2
	440N-class	NSGC440	0.25≦t≦3.2
	490N-class	NSGC490	0.25≦t≦3.2
	570N-class	NSGC570	0.25≦t≦2.0
Drawing, hard strength	340N-class	NSGC340R	0.40≦t≦3.2
	370N-class	NSGC370R	0.40≦t≦3.2
	390N-class	NSGC390R	0.40≦t≦3.2
	440N-class	NSGC440R	0.40≦t≦3.2
Drawing, high strength, bake-hardened type		NSGC340BH	0.40≦t≦3.2
Drawing, hard strength	340N-class	NSGC340E	0.40≦t≦3.2
	370N-class	NSGC370E	0.40≦t≦3.2
	390N-class	NSGC390E	0.40≦t≦3.2
	440N-class	NSGC440E	0.40≦t≦3.2

- Notes: ① In the case of specifying non-aging property for NSGC270E, NSGC270F and NSGC270G cut-length sheets and coils: NSGC270EN, NSGC270FN and NSGC270GN
- ② Nominal thicknesses other than those listed in the above table may be agreed upon between the producer and purchaser.
- ③ In the case of the use for roofing and outer structural panels, the designation in the above table shall be suffixed with R for the use for roofing and A for the use for outer structural panels and in both cases this shall only apply to NSGCC. In this case, the nominal thickness and coating mass in Table-a below shall be applied.
- ④ For NSGC570, please consult us in advance for each product order.

Table a

Application	Nominal thickness (mm)	Coating mass designation
Roofing	0.35≦t≦1.0	Z25, Z27
	1.0<t	Z27
Outer structural panels	0.27≦t≦0.50	Z18, Z22, Z25, Z27
	0.50<t≦1.0	Z22, Z25, Z27
	1.0<t	Z27

Specifications

Type (NIPPON STEEL Standards)

Hot Rolled Base Metal Coils

Type		Designation	Nominal thickness (mm)
Commercial		NSGHC	1.6≦t≦6.0
Drawing	Grade 1	NSGH270D	1.6≦t≦6.0
	Grade 2	NSGH270E	1.6≦t≦6.0
Structural	340N-class	NSGH340	1.6≦t≦6.0
	400N-class	NSGH400	1.6≦t≦6.0
	440N-class	NSGH440	1.6≦t≦6.0
	490N-class	NSGH490	1.6≦t≦6.0
	540N-class	NSGH540	1.6≦t≦6.0
Drawing, hard strength	310N-class	NSGH310N	1.6≦t≦6.0
	370N-class	NSGH370N	1.6≦t≦6.0
	400N-class	NSGH400N	1.6≦t≦6.0
	440N-class	NSGH440N	1.6≦t≦6.0
For use in steel pipes	270N-class	NSGHT270	1.6≦t≦5.0
	340N-class	NSGHT340	1.6≦t≦5.0
	410N-class	NSGHT410	1.6≦t≦5.0
	490N-class	NSGHT490	1.6≦t≦3.2

Notes: ①Nominal thickness values outside of the range specified herein can be set according to agreement between the producer and purchaser.
②For nominal thickness of less than 3.2 mm and where a special hot rolled base metal has not been specified, we may choose to use a cold rolled base metal that fulfills the specifications of the equivalent hot rolled base metal.

Coating Mass (JIS and NIPPON STEEL Standards)

Type of Coating	Coating mass (designation)	Minimum coating mass				
		Both sides (triple spot method)	Both sides (one spot method)	One side (triple spot method)	Obverse side (triple spot method)	Reverse side (triple spot method)
Equal coating on both sides (designation on both sides)	(Z06)	60	51	—	—	—
	Z08	80	68	—	—	—
	Z10	100	85	—	—	—
	Z12	120	102	—	—	—
	Z14	140	119	—	—	—
	Z18	180	153	—	—	—
	Z20	200	170	—	—	—
	Z22	220	187	—	—	—
	Z25	250	213	—	—	—
	Z27	275	234	—	—	—
	Z35	350	298	—	—	—
	Z37	370	315	—	—	—
	Z43	430	366	—	—	—
	Z45	450	383	—	—	—
	Z50	500	425	—	—	—
	Z60	600	510	—	—	—
Equal coating on both side (designation on one side)	Z90	—	765	450	—	—
	Z110	—	935	550	—	—
	(045)	—	—	—	30	30
	060	—	—	—	40	40
	075	—	—	—	50	50
	090	—	—	—	60	60
	105	—	—	—	70	70
	120	—	—	—	90	90

Note: ①Regarding the coating mass designation with parenthesis, please consult us in advance.
②NIPPON STEEL specifications shall apply to the following coating mass designations: Z43, Z50, Z90 Z110, 045, 060, 075, 090, 105 and 120.

Surface Finish (JIS, NIPPON STEEL Specifications)

Type	Designation
Regular spangle	R
Zero spangle (minimized spangle)	Z

Surface Treatments (JIS Standards)

Type	Designation
Chrome-free treatment	NC
Chromate treatment	C
No treatment	M

Surface Treatments (NIPPON STEEL Specifications)

Type	Designation
Chromate-free treatment (inorganic)	QM, IN
Chromate-free treatment (organic)	QF, UN, KN, KN2
Chromate-free treatment (organic, scratch-resistant)	QFK
Chromate-free lubricant treatment (organic)	QJL, FN, FN2
Conventional chromate treatment	C
Special chromate treatment	Y
Corrosion-resistant chromate treatment	E
No treatment	M

Note: The properties for the chromate free treatment differ depending on the designation, so please feel free to check with us when placing your order.

Specifications

Oiling
(JIS Standards)

Type	Designation
Oiled	O
Non-oiled	X

Oiling
(NIPPON STEEL
Specifications)

Type	Designation
Heavily oiled	H
Normally oiled	N
Lightly oiled	L
Non-oiled	X

Note: In the event that heavy or light oiling is specified, please consult NIPPON STEEL in advance.

Skin-Pass Rolling
(JIS Standards and NIPPON
STEEL Specifications)

Type	Designation
Specification for skin-pass rolling	S
No specification for skin-pass rolling	—

Size Tolerance (JIS and NIPPON STEEL Standards)

1. Thickness Tolerances

Thickness tolerance are applied to the total values of nominal plate thickness and corresponding coating thickness,

Nominal thickness	Width				
	W<630	630≤W<1,000	1,000≤W<1,250	1,250≤W<1,600	1,600≤W
t<0.25	±0.04	±0.04	±0.04	—	—
0.25≤t<0.40	±0.05	±0.05	±0.05	±0.06	—
0.40≤t<0.60	±0.06	±0.06	±0.06	±0.07	±0.08
0.60≤t<0.80	±0.07	±0.07	±0.07	±0.07	±0.08
0.80≤t<1.00	±0.07	±0.07	±0.08	±0.09	±0.10
1.00≤t<1.25	±0.08	±0.08	±0.09	±0.10	±0.12
1.25≤t<1.60	±0.09	±0.10	±0.11	±0.12	±0.14
1.60≤t<2.00	±0.11	±0.12	±0.13	±0.14	±0.16
2.00≤t<2.50	±0.13	±0.14	±0.15	±0.16	±0.18
2.50≤t<3.15	±0.15	±0.16	±0.17	±0.18	±0.21
3.15≤t	±0.17	±0.18	±0.20	±0.21	—

Note: Thickness shall be measured from an optimal spot 25 mm or more inside from the edge.

Base Metal (Hot-Rolled Coils)

Commercial quality using hot-rolled coils

Nominal thickness	Width			
	W<1,200	1,200≤W<1,500	1,500≤W<1,800	1,800≤W<2,300
1.60≤t<2.00	±0.17	±0.18	±0.19	±0.22 ^(*)
2.00≤t<2.50	±0.18	±0.20	±0.22	±0.26 ^(*)
2.50≤t<3.15	±0.20	±0.22	±0.25	±0.27
3.15≤t<4.00	±0.22	±0.24	±0.27	±0.28
4.00≤t<5.00	±0.25	±0.27	—	—
5.00≤t<6.00	±0.27	±0.29	—	—
6.00	±0.30	±0.31	—	—

(*) : This tolerance shall be applied to widths under 2,000 mm.

Notes: ① Thickness shall be measured from an optional spot 25 mm or more inside from the edge.

② For nominal thicknesses over 6 mm, please consult us in advance.

Base Metal (Hot-Rolled Coils)

Structural quality using hot-rolled coils

Nominal thickness	Width	
	W<1,600	1,600≤W<2,000
1.60≤t<2.00	±0.20	±0.24
2.00≤t<2.50	±0.21	±0.26
2.50≤t<3.15	±0.23	±0.30
3.15≤t<4.00	±0.25	±0.35
4.00≤t<5.00	±0.46	—
5.00≤t≤6.00	±0.51	—

Notes: ① Thickness shall be measured from an optional spot 25 mm or more inside from the edge.

② For nominal thicknesses over 6 mm, please consult us in advance.

2. Corresponding Coating Thickness

Coating mass designation	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25
Corresponding coating thickness	0.013	0.017	0.021	0.026	0.029	0.034	0.040	0.043	0.049
	Z27	Z35	Z37	Z43	Z45	Z50	Z60	Z90	Z110
	0.054	0.064	0.067	0.076	0.080	0.085	0.102	0.146	0.175

Coating mass designation	045	060	075	090	105	120
Corresponding coating thickness	0.012	0.016	0.022	0.026	0.028	0.034

Note: The corresponding coating thickness is calculated using a density of 7.1 g/m² and the calculated value is rounded down to the third decimal place according to JIS Z 8401.

3. Width Tolerances

Cut-Length Sheets and Coils

Classification of Width	Base Metal Classification of tolerance	In the case of using cold-rolled coils	In the case of using hot-rolled coils	
			A (mill edge)	B (cut edge)
W≤1,500		+7 0	+25 0	+10 0
1,500<W		+10 0		

Note: In the case of using hot-rolled coil base metal, “B” is commonly used as the classification of tolerance.

4. Length Tolerances

In the case of using cold-rolled coils	In the case of using hot-rolled coils
+15 0	+15 0

Specifications

Mechanical Properties (JIS Standards)

Base Metal (Cold-Rolled Coils)

Type		Designation	Tensile test								Bending test									
			Yield point (N/mm ²)	Tensile strength (N/mm ²)	Elongation (%)						Test piece (JIS)	Bending angle	Nominal thickness (mm)							
													t<1.6		1.6≤t<3.0		3.0≤t			
																			Nominal thickness (mm)	
					0.25≤t<0.40	0.40≤t<0.60	0.60≤t<1.0	1.0≤t<1.6	1.6≤t<2.5	2.5≤t			less than Z27	Z35, Z37	Z45, Z60	less than Z27	Z35, Z37	Z45, Z60	less than Z37	Z45, Z60
Commercial		SGCC	〈205≤〉	〈270≤〉	—	—	—	—	—	—	No. 5 rolling direction	180 degrees	1	1	2	1	2	2	2	2
Drawing	Grade 1	SGCD1	—	270≤	—	34≤	36≤	37≤	38≤	—			1	—	—	1	—	—	—	—
	Grade 2	SGCD2	—	270≤	—	36≤	38≤	39≤	40≤	—			0	—	—	0	—	—	—	—
	Grade 3	SGCD3	—	270≤	—	38≤	40≤	41≤	42≤	—			0	—	—	0	—	—	—	—
	Grade 4	SGCD4	—	270≤	—	40≤	42≤	43≤	44≤	—			0	—	—	0	—	—	—	—
Structural	340N-class	SGC340	245≤	340≤	(20≤)	20≤	20≤	20≤	20≤	20≤	No. 5 rolling direction or perpendicular to the rolling direction		1	1	2	1	1	2	2	3
	400N-class	SGC400	295≤	400≤	(18≤)	18≤	18≤	18≤	18≤	18≤			2	2	2	2	2	2	3	3
	440N-class	SGC440	335≤	440≤	(18≤)	18≤	18≤	18≤	18≤	18≤			3	3	3	3	3	3	3	3
	490N-class	SGC490	365≤	490≤	(16≤)	16≤	16≤	16≤	16≤	16≤			3	3	3	3	3	3	3	3
	570N-class	SGC570	560≤	570≤	—	—	—	—	—	—			—	—	—	—	—	—	—	—
Commercial, hard		SGCH	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

- Notes: ① The values represent the internal spacing of bend, expressed as the number of sheets of nominal thickness.
② The bend value shall be kept to a minimum unless specified otherwise.
③ The adhesiveness of the coating, unless otherwise specified, shall be evaluated using a different process to that used for testing the bend value.
④ The value in the parenthesis () may be agreed upon between the producer and purchaser.
⑤ The value in the parenthesis < > is for reference sake.
⑥ SGC570 and SGCH, please consult us in advance per every product.

Base Metal (Hot-Rolled Coils)

Type		Designation	Tensile test							Bending test						
			Yield point (N/mm ²)	Tensile strength (N/mm ²)	Elongation (%)					Test piece (JIS)	Bending angle	Nominal thickness (mm)				
					Nominal thickness (mm)							t<3.0		3.0≤t		
												Coating mass				
					1.6≤t<2.0	2.0≤t<2.5	2.5≤t<3.2	3.2≤t<4.0	4.0≤t≤6.0			less than Z27	Z35, Z37	Z45, Z60	less than Z37	Z45, Z60
Commercial		SGHC	〈205≤〉	〈270≤〉	—	—	—	—	—	No. 5 rolling direction	180 degrees	1	2	2	2	2
Structural	340N-class	SGH340	245≤	340≤	20≤	20≤	20≤	20≤	20≤	No. 5 rolling direction or perpendicular to the rolling direction		1	1	2	2	3
	400N-class	SGH400	295≤	400≤	18≤	18≤	18≤	18≤	18≤			2	2	2	3	3
	440N-class	SGH440	335≤	440≤	18≤	18≤	18≤	18≤	18≤			3	3	3	3	3
	490N-class	SGH490	365≤	490≤	16≤	16≤	16≤	16≤	16≤			3	3	3	3	3
	540N-class	SGH540	400≤	540≤	16≤	16≤	16≤	16≤	16≤			3	3	3	3	3

- Notes: ① The values represent the internal spacing of bend, expressed as the number of sheets of nominal thickness.
② The bend value shall be kept to a minimum unless specified otherwise.
③ The adhesiveness of the coating, unless otherwise specified, shall be evaluated using a different process to that used for testing the bend value.
④ The value in the parenthesis < > is for reference sake.

Specifications

Mechanical Properties (NIPPON STEEL Specifications)

Base Metal (Cold-Rolled Coils)

Type		Designation	Tensile test								Test piece (JIS)
			Yield point or yield resistance (N/mm ²)	Tensile strength (N/mm ²)	Elongation (%)						
					Nominal thickness (mm)						
					0.25≤t<0.40	0.40≤t<0.60	0.60≤t<1.0	1.0≤t<1.6	1.6≤t<2.5	2.5≤t	
Commercial		NSGCC	〈205≤〉	〈270≤〉	—	—	—	—	—	—	No. 5 rolling direction
Drawing	Grade 1	NSGC270C	—	270≤	—	34≤	36≤	37≤	38≤	39≤	
	Grade 2	NSGC270D	—	270≤	—	36≤	38≤	39≤	40≤	41≤	
	Grade 3	NSGC270E	—	270≤	—	38≤	41≤	43≤	44≤	44≤	
	Grade 4	NSGC270F	—	270≤	—	40≤	43≤	45≤	46≤	46≤	
	Grade 5	NSGC270G	—	270≤	—	43≤	46≤	48≤	49≤	49≤	
Structural	340N-class	NSGC340	245≤	340≤	20≤	20≤	20≤	20≤	20≤	20≤	
	400N-class	NSGC400	295≤	400≤	18≤	18≤	18≤	18≤	18≤	18≤	
	440N-class	NSGC440	335≤	440≤	18≤	18≤	18≤	18≤	18≤	18≤	
	490N-class	NSGC490	365≤	490≤	16≤	16≤	16≤	16≤	16≤	16≤	
	570N-class	NSGC570	560≤	570≤	—	—	—	—	—	—	

Type		Designation	Tensile test										Test piece (JIS)
			Yield point or yield resistance (N/mm ²)	Tensile strength (N/mm ²)	Paint bake- hardening amount [minimum value] (N/mm ²)	Elongation (%)							
						Nominal thickness (mm)							
						0.40≤t<0.60	0.60≤t<0.80	0.80≤t<1.0	1.0≤t<1.2	1.2≤t<1.6	1.6≤t<2.0	2.0≤t	
Drawing	340N-class	NSGC340R	185≦	340≦	—	32≦	34≦	35≦	36≦	37≦	38≦	39≦	No. 5 perpendicular to rolling direction
	370N-class	NSGC370R	205≦	370≦	—	31≦	33≦	34≦	35≦	36≦	37≦	38≦	
	390N-class	NSGC390R	225≦	390≦	—	29≦	31≦	32≦	33≦	34≦	35≦	36≦	
	440N-class	NSGC440R	265≦	440≦	—	27≦	29≦	30≦	30≦	31≦	31≦	32≦	
Bake-hardened, drawing, high-strength type		NSGC340BH	〈195≦〉	340≦	30	32≦	34≦	35≦	36≦	37≦	38≦	39≦	
Structural	340N-class	NSGC340E	165≦	340≦	—	32≦	34≦	35≦	36≦	37≦	—	—	
	370N-class	NSGC370E	205≦	370≦	—	31≦	33≦	34≦	35≦	36≦	—	—	
	390N-class	NSGC390E	225≦	390≦	—	29≦	31≦	32≦	33≦	34≦	—	—	
	440N-class	NSGC440E	265≦	440≦	—	27≦	29≦	30≦	30≦	31≦	—	—	

- Notes: ① The paint bake-hardening amount indicates the rise in yield point between before and after heat treatment at 170°C for 20 minutes, after application of 2% prestrain.
- ② The value in the parenthesis ⟨ ⟩ is for reference sake.
- ③ For NSGC270E, NSGC270F and NSGC270G for which non-aging property is specified, NIPPON STEEL guarantees non-aging property for six months after shipment from its manufacturing plants.
- ④ For commercial, drawing, structural and commercial/hard qualities with nominal thicknesses under 0.25 mm, the tensile test is as a rule not applied.
- ⑤ In the event of a customer wishing to order NSGC570, please consult with us in advance of every product order.

Specifications

Mechanical Properties (NIPPON STEEL Specifications)

Base Metal (Hot-Rolled Coils)

Type		Designation	Tensile test							Test piece (JIS)
			Yield point or yield resistance (N/mm ²)	Tensile strength (N/mm ²)	Elongation (%)					
					Nominal thickness (mm)					
					1.6≤t<2.0	2.0≤t<2.5	2.5≤t<3.2	3.2≤t<4.0	4.0≤t	
Commercial		NSGHC	〈205≤〉	〈270≤〉	—	—	—	—	—	No. 5 rolling direction
Drawing	Grade 1	NSGH270D	—	〈270≤〉	32≤	33≤	35≤	37≤	39≤	
	Grade 2	NSGH270E	—	〈270≤〉	33≤	35≤	37≤	39≤	41≤	
Structural	340N-class	NSGH340	245≤	340≤	20≤	20≤	20≤	20≤	20≤	
	400N-class	NSGH400	295≤	400≤	18≤	18≤	18≤	18≤	18≤	
	440N-class	NSGH440	335≤	440≤	18≤	18≤	18≤	18≤	18≤	
	490N-class	NSGH490	365≤	490≤	16≤	16≤	16≤	16≤	16≤	
	540N-class	NSGH540	400≤	540≤	16≤	16≤	16≤	16≤	16≤	
Automotive structural	310N-class	NSGH310N	〈185≤〉	310≤	33≤	34≤	36≤	38≤	40≤	
	370N-class	NSGH370N	225≤	370≤	32≤	33≤	35≤	36≤	37≤	
	400N-class	NSGH400N	255≤	400≤	31≤	32≤	34≤	35≤	36≤	
	440N-class	NSGH440N	305≤	440≤	29≤	30≤	32≤	33≤	34≤	

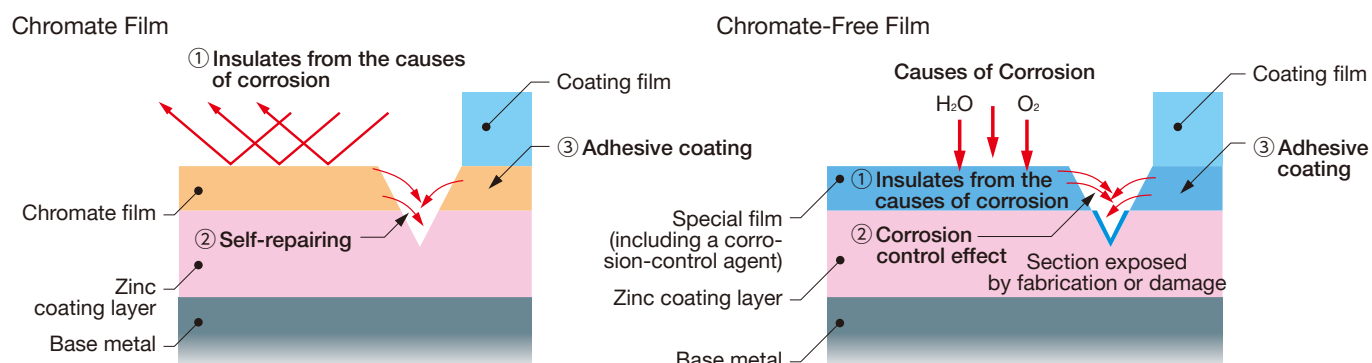
Note: The value in the parenthesis < > is for reference sake.

Type		Designation	Tensile test					Test piece (JIS)
			Yield point or yield resistance (N/mm ²)	Tensile strength (N/mm ²)	Elongation (%)			
					Nominal thickness (mm)			
					1.4≤t≤1.6	1.6<t≤3.0	3.0<t≤4.5	
Structural	270N-class	NSGHT270	—	270≤	30≤	32≤	35≤	No. 5 rolling direction
	340N-class	NSGHT340	—	340≤	25≤	27≤	30≤	
	410N-class	NSGHT410	—	410≤	20≤	22≤	25≤	
	490N-class	NSGHT490	—	490≤	15≤	18≤	20≤	

Quality Attributes

Corrosion-Resistant Structure of the Chromate Treatment Film and the Chromate-Free Treatment Film

Film Structure and Function



When the film suffers an abrasion, the aqueous hexavalent chrome is able to self-repair by melting and repairing the damaged section.

Structure of the Rust-Prevention Chromate-Free Film

The barrier effect, the ability to self-repair, the adhesive qualities of the coating - are some of the key characteristics of the chromate film and these have been replicated by the chromate-free special film, consisting of substances selected to replace the chromate film.

Effect of the Chromate Film

- Acts as a barrier
- Self-repairing functionality

The special film contains a corrosion resistant agent that has the same effect.

Protective Action of Zinc on Steel

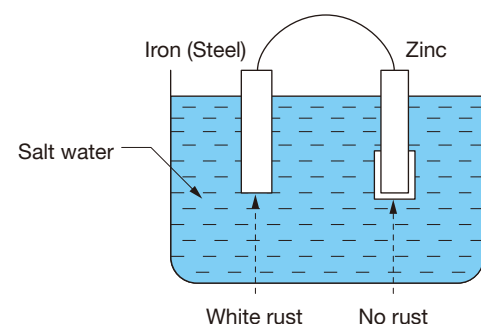
Iron (steel) is generally regarded as a product susceptible to "rust (corrosion)." However, rust in steel can be greatly inhibited by galvanizing. The reason for this is that electro-chemi-

cal protection (galvanic) action that works between steel and zinc is effective and the zinc itself is highly weather resistant and difficult to rust, as described below.

Galvanic Action and Weather Resistance

The following experiment shows that rusting (dissolution) of zinc precedes that of steel, thereby protecting steel from corrosion.

Fig. 1 Galvanic Action of Iron (Steel) and Zinc



When a steel plate and a zinc plate are linked using a lead wire and placed in a beaker containing an electrolytic solution (for example, salt water), the steel does not corrode and rust forms only on the zinc.

This is due to galvanic action by which some of the zinc dissolves in the salt water to produce zinc ions that flow from the zinc plate to the steel plate via the lead wire to prevent corrosion of the steel (known as galvanic action). In this way, the base steel sheet of the galvanized steel sheet is protected from corrosion.

While the zinc on the galvanized steel sheet protects the base metal steel sheet from corrosion by means of galvanic action, this is not the reason why galvanized sheets are in common use. Rather, it is due to the high corrosion resistance peculiar to galvanized sheets, in the case of outdoor applications, galvanized sheets offer corrosion resistance that is several times or even tens of times greater than ordinary steel sheets. That is, while zinc dissolves at a higher rate than steel, when exposed to ordinary atmosphere, zinc is slow to dissolve and difficult to corrode.

Research has been conducted for many years on the outdoor service life (the period of time before red rust appears) of galvanized sheets. In the case of galvanized sheets with a coating mass of 350 g/m², the approximate

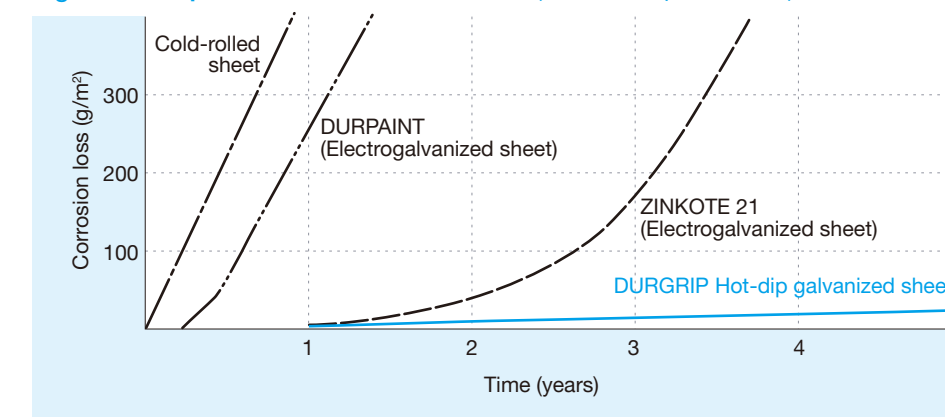
service life is 15~18 years in rural areas and 3~8 years in industrial areas. This clearly shows how long galvanized sheets can remain in use, compared to uncoated bare steel sheets.

Next, an example of weather resistance tests by outdoor exposure is shown in Fig. 2 (below).

It is clearly understood from the test results that the corrosion of galvanized steel sheets is 5 to 30 times slower than that of steel sheets.

As described above, galvanized sheets remain completely free of corrosion for a very long time in appropriate application environments. There were test results in which galvanized sheets showed no corrosion loss for several years in atmospheres of low humidity. This is thought to be due to the formation of a tight, extremely thin oxide film on the surface of galvanized sheets that becomes inactive under appropriate conditions (in fact, an extremely thin basic zinc carbonate is produced through interaction between water, carbon dioxide and air).

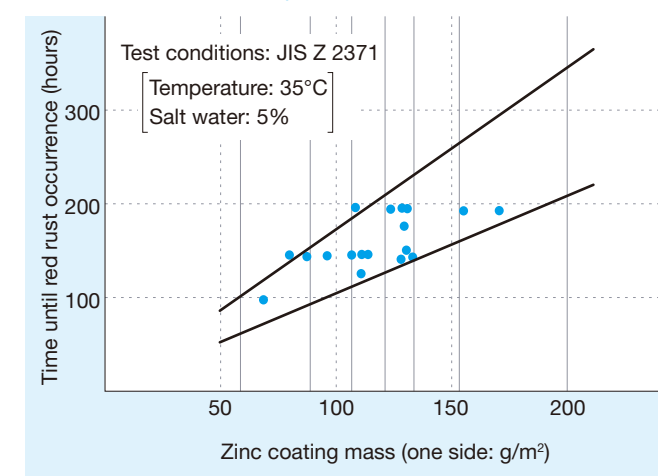
Fig. 2 Example of Weather Resistance (Outdoor Exposure Test)



Zinc Coating Mass and Corrosion Resistance

As the zinc coating mass increases, the corrosion resistance of galvanized sheets is improved (salt spray test), thereby protecting the base steel for longer periods. (see Fig. 3)

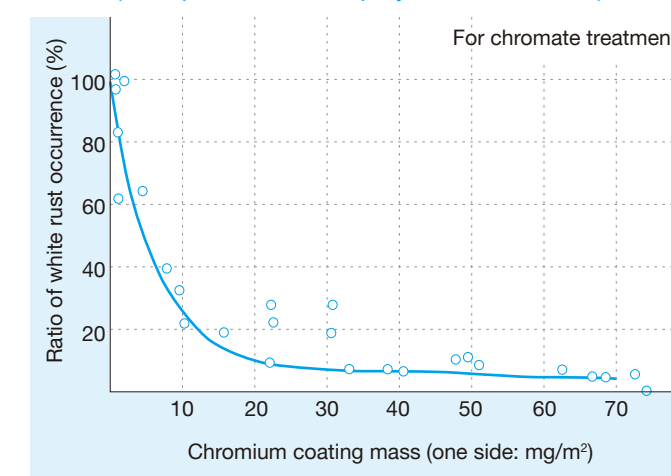
Fig. 3 Zinc Coating Mass and Time until Red Rust Occurrence (Salt Water Spray Test)



Chrome Coating Mass and Corrosion Resistance

Post processing of galvanized sheets is important in improving white rust resistance. The greater the mass of chrome coating applied to the chromate treatment film, the greater the white rust resistance. (see Fig. 4)

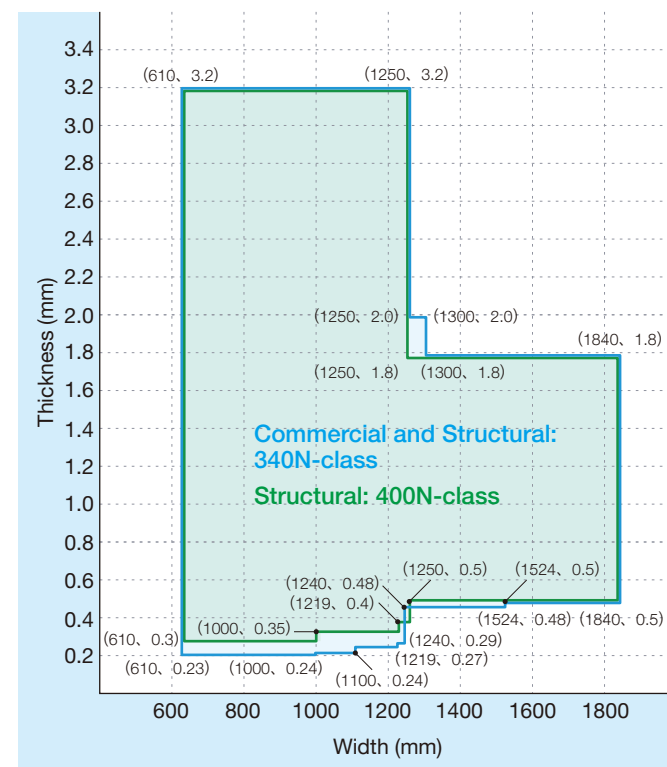
Fig. 4 Chromium Coating Mass and Ratio of White Rust Occurrence (Example: Salt Water Spray Test for 72 Hours)



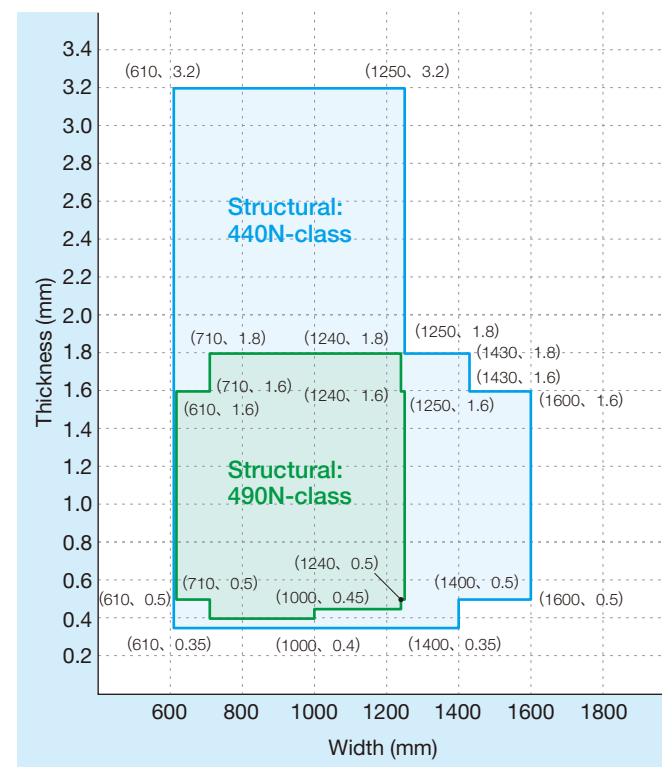
Scope of Manufacturing

Available Sizes for Nominal Thickness and Width

Commercial and Structural: 340N-class,
400N-class (base metal: cold-rolled coils)

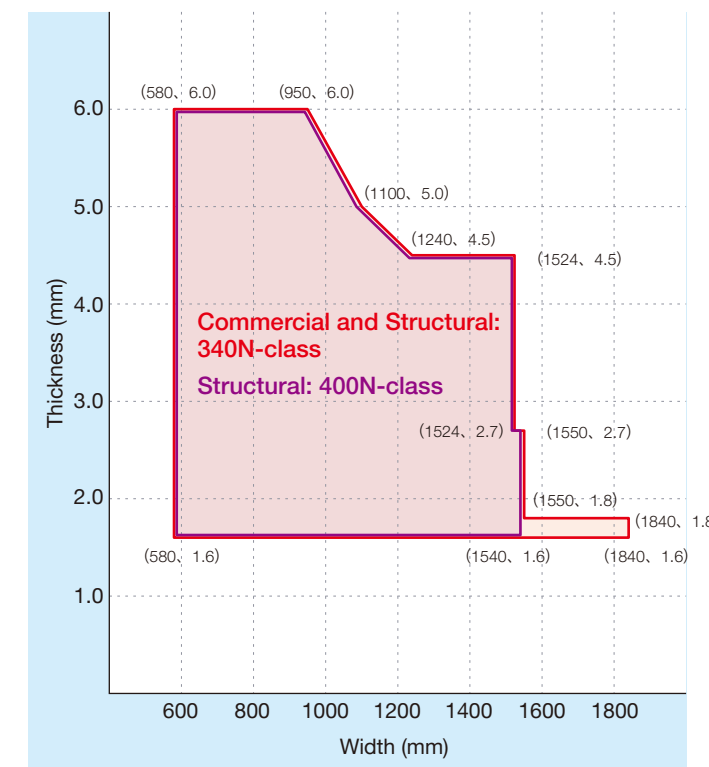


Structural: 440N-class,
490N-class (base metal: cold-rolled coils)

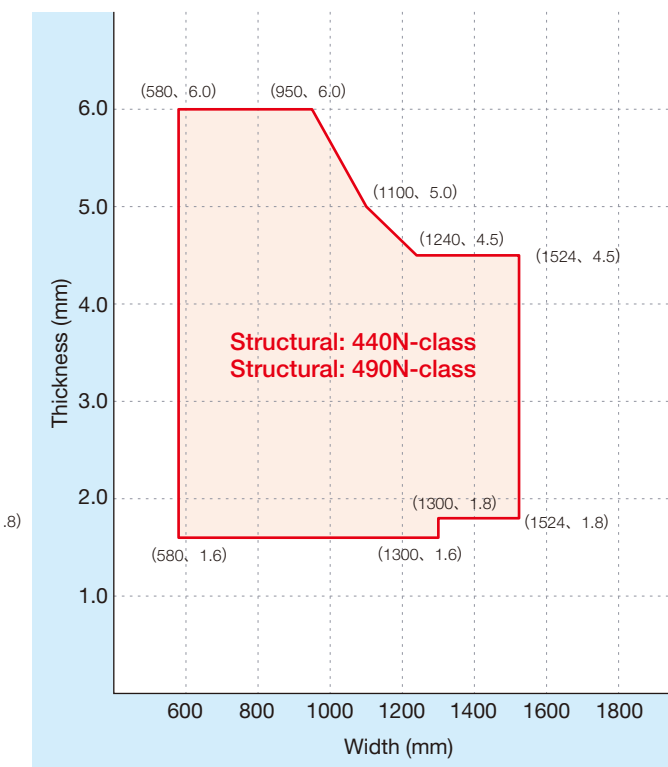


Note: Nominal sizes other than those listed below are available upon request,
so please consult us in advance of your order should you wish to request a size outside of the range specified herein.

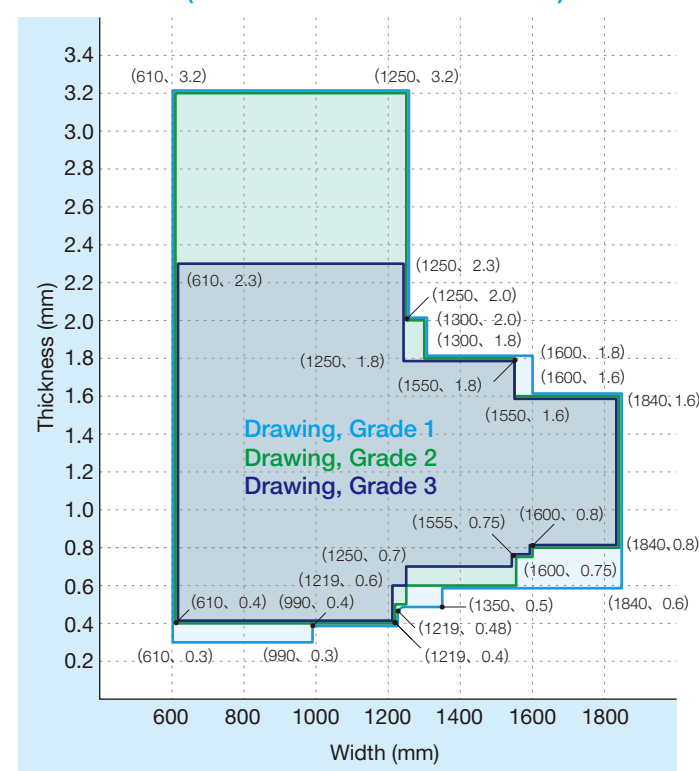
Commercial and Structural: 340N-class,
400N-class (base metal: hot-rolled coils)



Structural: 440N-class,
490N-class (base metal: hot-rolled coils)



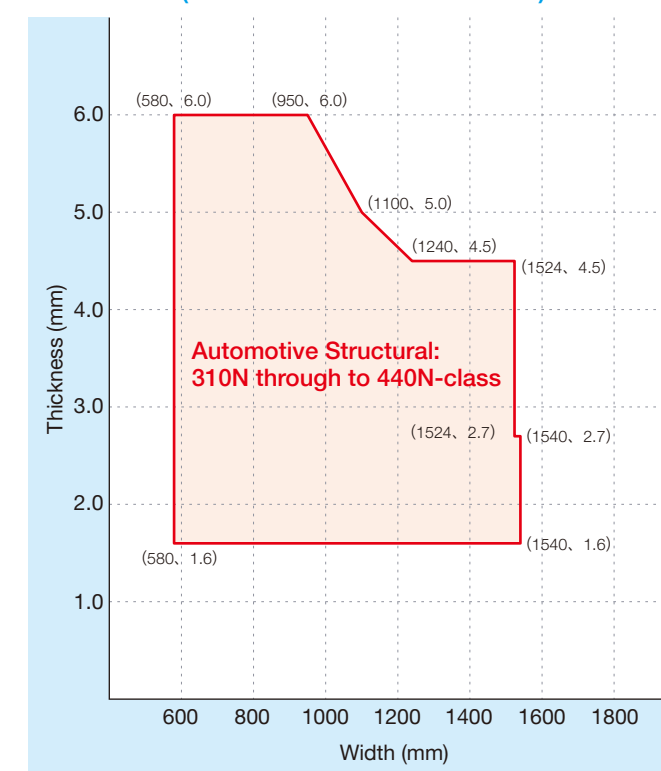
Drawing, Grade 1, Grade 2
and Grade 3 (base metal: cold-rolled coils)



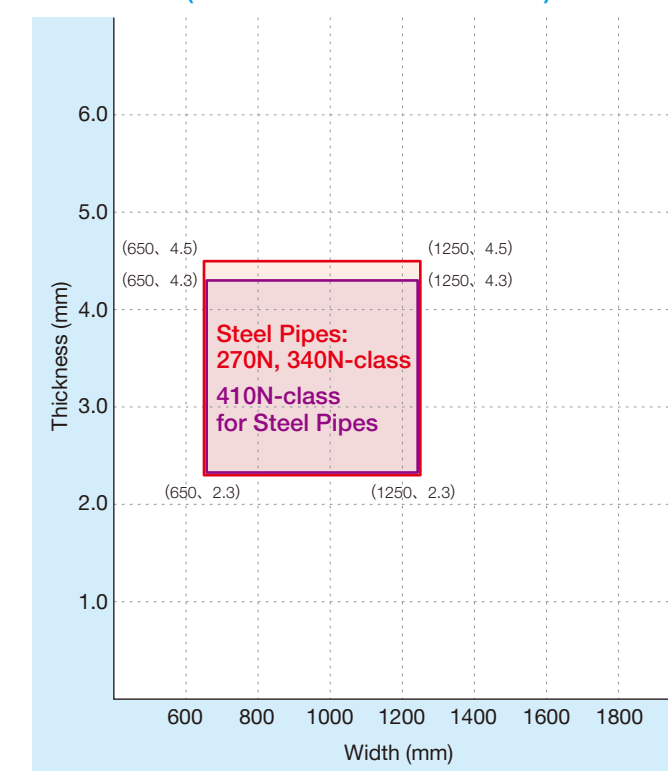
- Drawing, Grades 4 and 5 (base metal: cold-rolled coils)
- Commercial, Hard and Structural 570N-class
- Drawing, High Strength (incl. bake-hardening type): 340N through to 440N-class (base metal: cold-rolled coils)
- Deep Drawing, High Strength: 340 through to 440N-class (base metal: cold-rolled coils)

Regarding to the above products,
please consult us in advance per product order.

Automotive Structural: 310N through to
440N-class (base metal: hot-rolled coils)



Steel Pipes: 270N through to
410N-class (base metal: hot-rolled coils)



Precautions Regarding Use

When inappropriate handling and application methods are used, hot-dip galvanized sheet cannot demonstrate its characteristic properties. It is recommended that attention be paid to the following precautions regarding use.

Storage and Loading/Unloading

- ① Water leakage during loading/unloading and storage constitutes a cause of corrosion. Strictly avoid loading/unloading during rain and prevent exposure to seawater and dew condensation. Also, avoid storage in atmospheres of high humidity or sulfur-dioxide. Indoor storage under dry, clean conditions is recommended.
- ② Broken or torn packaging paper must be repaired.
- ③ When coils and cut-length sheets are stored in piles for an extended time, the coated surfaces may become blackened. Because of this, early application is recommended.

Warning !

- Falling and rolling coils are very dangerous, as is the collapse of piled sheets.
- To prevent such accidents during storage, due care should be paid to storing products in a stable, secure state. QFK type chromate-free treated sheets and chromate-free lubricated sheets have a lower friction coefficient and can more easily cause slippage than conventional chromate-treated sheets. Therefore, particular care should be paid to preventing the falling, rolling, or buckling of coils and the collapse of piled sheets.

Handling

- ① Handle products carefully so as not to damage coatings or surface-treatment films.
- ② Perspiration and fingerprints impair paint ability and corrosion resistance. If either occurs, appropriate post-treatment and repair are required.

Press Forming

- ① When applying severe press forming, there are cases in which the coating film is damaged. Prior confirmation is requested when such press forming is applied.
- ② In press forming, some types of extreme pressure additives contained in lubricating oil can cause melting and corrosion of the surface coating films and base metals. Prior confirmation is requested when such additives are used. Excessive damage to surface layers during press forming will adversely affect paint ability and corrosion resistance.

Attention !

- When removing (cutting) coil binding hoops (bands) for use, make certain that the end of the coil is directly beneath the coil center in order to prevent the end of the coil from sudden springing out of the coil end; or, be certain to conduct the removal in a place where safety can be assured and no danger is posed if the coil end were to spring out upon release.
- Coils are formed by winding flat sheets. When the binding hoops or other external forces that keep the sheet in coil form are removed and the coil end is freed, the coil end will spring outward to return to a flat state.

Further, there are also cases when the coil bindings become loose, allowing the coil to spring out.

Such cases may endanger nearby workers and cause damage, so careful attention must be paid when removing the coil binding hoops (bands).

Welding and Brazing

- ① In resistance welding, because the electrodes are soiled by the pick up of zinc, they should be properly maintained and replaced at regular intervals. In seam welding, the service life of electrodes can be extended by using a knurl-gear driving system.
- ② In welding, fumes consisting mainly of zinc oxides are generated.
Although the effect of these fumes will differ depending on the working environment, it is recommended that welding be conducted in a well-ventilated place.
- ③ In brazing, avoid high-temperature brazing using silver and other brazing fillers. Penetration of zinc alloy into crystal boundaries can occur, thereby causing brittle fracture in some cases.

Degreasing

- ① The use of weak alkaline-type and organic solvents and nonionic-type detergents is recommended for degreasing.
Some types of degreasing agents such as strong alkaline agents cause melting of the coating films and corrosion of the zinc. Prior confirmation is requested when such agents are used.
- ② In the case of degreasing at high temperatures (more than 60°C) or using ultrasonic cleaning, there are cases in which the coating film is damaged. Due care should be taken to prevent this.
- ③ Conduct sufficient drying after degreasing. Handling in an insufficiently dry state may cause the coating film to peel off.
- ④ In alkali ion cleaning, there are cases in which oily substances remaining in the cleaning water may adversely affect the coating film. Prior confirmation is requested when such cleaning is applied.

Painting

Types of paint and the method of application differ, so please be sure to contact us before the application of any paint coating.

Aging

Generally, steel sheets tend to show deterioration in quality over time.

For example: degraded formability, stretcher stains, and coil breaks. To avoid this, usage at the earliest possible time is recommended.

However, this problem can be avoided if products with aging resistance are selected.

Others

- ① Prior confirmation is requested when the product is to be exposed to high temperature conditions for a long time.
- ② Avoid using in acid and strong alkaline environments. (There are cases in which phosphate zinc and other chemical treatments used for treating the base steel sheets for painting can have high acidity and cause the film to melt.)

Packaging and Labeling

The finished product is packaged and shipped as per normal procedure for steel to ensure that it is handled and stored with care prior to its use. The external layer of packaging consists of a packaging label that contains details of the finished product that it is affixed to.

The Package Card is used when taking receipt of the product and confirming its condition. The information contained on the Package Card and labels is detailed herein.

Packaging Labels and Package Cards

Item	Packaging label	Notation method
Product name	Not shown	Product name is displayed
Class/Grade	Not shown	Class and grade of materials used are displayed
JIS certification mark, JIS certifying body, JIS certification number	Not shown	Only the applicable materials are displayed. These are not shown on the Package Card
Spec designation	Specification	The spec code for the finished product is displayed (see note below)
Weight	Weight	The weight is displayed
Dimensions	Dimensions	The dimensions are displayed
Number of sheets	Number of sheets	Only for cut sheets
Quantity	Net quantity	This is displayed depending on the contractual arrangements (actual quantity or estimated value)
Length	Length	Contractual estimate or specific coil length is displayed
Inspection number	Inspection number	Displayed on each package
Coil number	Coil number	Displayed for each production lot
Customer name	Not shown	The customer name is displayed
Company and works name	Not shown	(Location Name) WORKS (or AREA), NIPPON STEEL CORPORATION
Month and date of manufacture	—	The date of manufacture is displayed

Note: Notation Used for Specifications

For JIS Standards

JIS G 3302 SGCC : S Z C O(N)

① ② ③ ④ ⑤ ⑥

①: Spec number

②: Spec designation

③: Skin-pass code

④: Surface finish code

⑤: Surface treatment code

⑥: Oiling designation (when no oils are used, this is given the value X)

For NIPPON STEEL Specifications

NSGCC : S Z M O N

① ② ③ ④ ⑤ ⑥

①: Spec number

②: Skin-pass code

③: Surface finish code

④: Surface treatment code

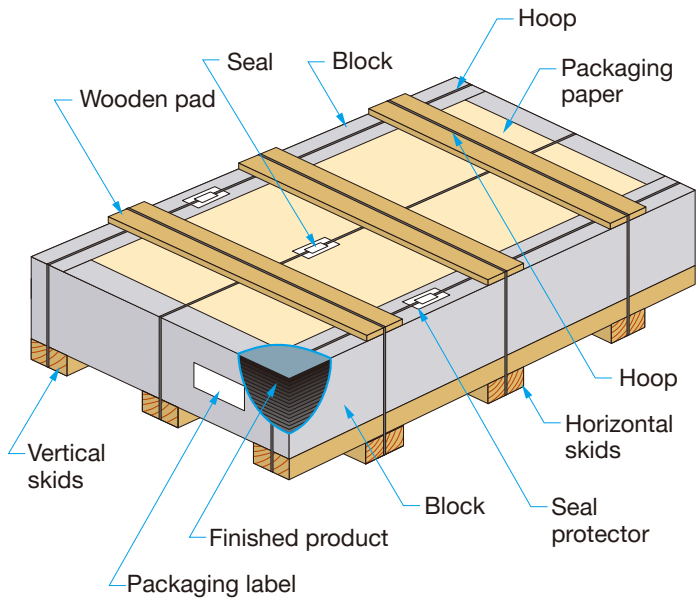
⑤: Oiling designation (when no oils are used, this is given the value X)

⑥: Code for the amount of oil to be applied

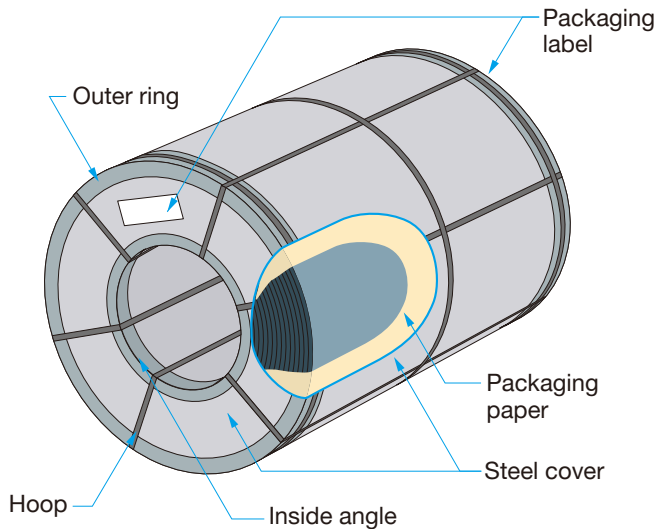
Note: In the event of no specific skin-pass being defined, all items following the surface finishing code are displayed on the left.

An Example of Packaging

Cut Steel Sheet Example



Coil Example



Example of a Packaging Label

DURGRIP*

SPECIFICATION

JIS G3302 SGCD2:Z NC X

SIZE

0.80 X 1075 X C

NET MASS (THEO) 5,050KG

GROSS MASS (THEO)

SHEETS

CAST NO.

CONTRACT NO.

CASE NO.

INSPECTION NO.

3100110

COIL NO.

209211500

NIPPON STEEL CORPORATION

WORKS (or AREA)

MADE IN JAPAN

JIS

JISQA

QA0307043

NIPPON STEEL U.S.A.

STEEL/A12303

G 2

*DURGRIP equal to SILVERZINC for Japanese use.

Order Guidelines

When placing an order, please confirm the following matters in accordance with the purpose of the order.

Specifications

Depending on the severity and method of the fabrication to be undertaken, choose the appropriate specification from those shown in this catalog.

Coating Mass

Select the most suitable coating mass according to the required corrosion resistance, application conditions, and fabrication methods.

Dimensions

The size of galvanized steel sheets (thickness, width and length) is the basic condition for product yield. Design the product referring the range of available sizes described in this catalog.

Sizes are available in 0.05 mm increments for thickness and 1 mm increments for width and length.

Coil

Select coils or cut-length sheets according to shear and fabrication conditions.

The selection of coils will effectively improve product yield by allowing continuous and automated operation. In the case of coils, however, some defective parts may unavoidably be included because their removal, based on inspection, is impossible.

Edge Finish

Please indicate if the order requires a milled edge or a slit edge.

Surface Treatment

Select the most suitable surface treatment from among those described in this catalog according to the treatment method after fabrication and the application conditions.

Oiling

The decision whether or not to apply rust-preventive oil can be made separately from the kind of surface treatment. Oiling is recommended in order to improve intermediate rust resistance, to mitigate fingerprints and damage during handling, and to maintain lubrication during press forming.

Meanwhile, oiling is indispensable for galvanized sheets lacking surface treatment.

Package Mass

Specify the package mass according to the local loading/unloading capacity and work efficiency.

The heavier the coil mass, the higher the work efficiency. In the case of coils, specify the maximum mass (unit minimum mass if necessary).

Internal and External Radii

In the case of coils, specify the inside and outside coil diameters according to the specifications of the uncoilers on the shearing line.

When selecting inside diameters, it is necessary to consider the occurrence of break and reel marks on the area of the inside diameter, depending on the thickness.

Dimensional Accuracy (Sheet thickness, width, length)

Dimensional accuracy of thickness, width and length is guaranteed within the range of sizes described in this catalog.

However, there are cases that require strict size specifications with respect to assembly accuracy and dimensional accuracy of the parts, depending on the application conditions of the finished products. In such cases, please consult us in advance to clarify your specifications.

Applications, Fabrication Methods and Other Issues

NIPPON STEEL implements quality control to better suit the intended application.

For that purpose, it is requested that the intended application, fabrication method, and any other requirements be clearly indicated.

Reference Data (JIS G 3302-2010 excerpt)

Size Indication System

- The sizes of cut-length sheets and coils shall be as shown as follows:
1. The thickness, width and length of cut-length sheets shall be indicated in millimeters.
 2. The thickness and width of coils shall be indicated in millimeters. However, if the mass of coil is to be indicated by theoretical mass, the length shall be indicated in meters.
 3. The thickness of cut-length sheets and coils shall be indicated in terms of the thickness of base metal before coating in millimeters, which shall be regarded as the nominal thickness.

Standard Sizes

The standard sizes of cut-length sheets and coils shall be as shown as indicated below. However, the standard nominal thickness of corrugated sheets and the standard width and length of corrugated sheets before corrugation shall be as given in the document Annex 2, and the standard length and finished width of corrugated sheets shall be as stated in the standard JIS G 3316.

Table 1 Standard Nominal Thickness (Unit: mm)

(0.27)	(0.30)	(0.35)	0.40	0.50		
0.60	0.70	0.80	0.90	1.0	1.2	
1.4	1.6	1.8	2.0	2.3	2.8	3.2
3.6	4.0	4.5	5.0	5.6	6.0	

Notes: 1. The figures in the parenthesis shall apply to coating mass designations Z18 or over.
2. The thicknesses of 0.65 mm and 0.75 mm may be regarded as the standard nominal thicknesses according to the agreement between the producer and purchaser.

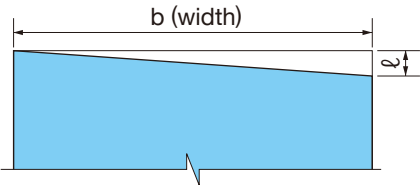
Table 2 Standard Width and Length of Cut-Length Sheets (Unit: mm)

Standard width	Standard length of cut-length sheet
762	1,829 2,134 2,438 2,743 3,048 3,353 3,658
914	1,829 2,134 2,438 2,743 3,048 3,353 3,658
1,000	2,000
1,219	2,438 3,048 3,658
1,524	3,048
1,829	3,658

Note: The coil width of 610 mm may be regarded as the standard width according to the agreement between the producer and purchaser.

Shapes

Fig. 1 Out-of-Square for Cut-Length Sheets



Out-of-square for cut-length sheets shall be expressed as $\lambda/b \times 100$ (%) and shall not exceed 1%.

Table 3 Maximum Camber (Base metal: cold-rolled coils) (Unit: mm)

Width	Length		
	Cut-length sheet		Coil
	Less than 2,000	More than 2,000	
Less than 630	4	4 per optional length of 2,000	
More than 630	2	2 per optional length of 2,000	

Reference Data (JIS G 3302-2010 Excerpt)

Table 4 Maximum Camber (Base metal: hot-rolled coils) (Unit: mm)

Width	Length			Coil
	Cut-length sheet			
	Less than 2500	More than 2500, less than 4000	More than 4000	
Less than 630	5	8	12	5 per optional length of 2,000
More than 630, less than 1,000	4	6	10	
More than 1,000	3	5	8	

Table 5 Flatness (Base metal: cold-rolled coils) (Unit: mm)

Width	Type		
	Bow	Edge wave	Center buckle
Less than 1,000	Less than 12	Less than 8	Less than 6
More than 1,000, less than 1,250	Less than 15	Less than 9	Less than 8
More than 1,250, less than 1,600	Less than 15	Less than 11	Less than 8
More than 1,600	Less than 20	Less than 13	Less than 9

Table 6 Flatness (Base metal: hot-rolled coils) (Unit: mm)

Thickness	Width			
	Less than 1,250	More than 1,250, less than 1,600	More than 1,600, less than 2,000	More than 2,000, less than 2,300
More than 1.60, less than 3.15	Less than 16	Less than 18	Less than 20	—
More than 3.15, less than 4.00	Less than 16	Less than 16	Less than 16	—
More than 4.00, less than 6.00	Less than 14	Less than 14	Less than 14	Less than 24
6.00	Less than 13	Less than 13	Less than 13	Less than 21

Note: The flatness shall be measured on a surface plate. The flatness is calculated by deducting the thickness of sheets and coils from the maximum distortion and shall apply to the upper side of sheets and coils.

Mass and Tolerances

Mass of cut-length sheets:

The mass of cut-length sheets shall be indicated, as a rule, in kilograms using theoretical mass.

Mass of coils:

The mass of coils shall be indicated in kilograms using either actual or theoretical mass.

Mass calculation method:

The method to calculate the mass of cut-length sheets and coils shall be as given in Table 7 according to nominal size and coating mass.

Table 7 Mass Calculation Method

Calculation procedure		Calculation method	No. of digits (calculated results)
Basic mass of base metal kg/mm·m ²		7.85 (thickness 1 mm - area 1 m ²)	—
Unit mass of base metal kg/m ²		Basic mass (mg/mm·m ²)×nominal thickness (mm)	Round off to 4-digit significant figures
Unit mass after coating kg/m ²		Unit mass of base metal (kg/m ²)+coating mass constant (table 8)	Round off to 4-digit significant figures
Cut-length sheet	Area of sheet m ²	Width (mm)×length (mm)×10 ⁻⁶	Round off to 4-digit significant figures
	Mass per sheet kg	Unit mass after coating (kg/m ²)×area (m ²)	Round off to 3-digit significant figures
	Mass per bundle kg	Mass per sheet (kg)×no. of sheets with identical sizes in a bundle	Rounded off to an integral value of kg
	Total mass kg	Lump sum of mass per bundle (kg)	Integral value of kg
Coil	Unit mass of coil kg/m	Unit mass after coating (kg/m ²)×width (mm)×10 ⁻³	Round off to 3-digit significant figures
	Mass per coil kg	Unit mass of coil (kg/m)×length (m)	Rounded off to an integral value of kg
	Total mass kg	Lump sum of mass per coil (kg)	Integral value of kg

Notes: 1. The number of sheets for which the bundled mass is specified shall be calculated by dividing the specified mass by a single sheet mass of identical shape, sizes and coating mass, to be rounded to an integral value.
2. The width used to calculate the area of corrugated sheets shall be the size before corrugation.

Table 8 Coating Mass Constants Used to Calculate Mass

Coating mass designation	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
Coating mass constant	0.090	0.120	0.150	0.183	0.203	0.244	0.285	0.305	0.350	0.381	0.458	0.481	0.565	0.722

Tolerances for Theoretical Mass of Cut-length Sheets

Tolerances for the theoretical mass of cut-length sheets shall be expressed in the percentage values which are obtainable by dividing the difference between the actual mass and the theoretical mass obtained using the mass calculation method by the theoretical mass and shall be as given in Table 9.

Table 9 Tolerances for Mass

Theoretical mass of a single lot (kg)	Tolerance (%)	Remarks
Less than 600	±10	A lot of sheets for the purpose of calculation shall consist of the sheets of identical material quality, shape, sizes and coating mass.
More than 600, less than 2,000	±7.5	
More than 2,000	±5	

Chemical Composition

Chemical compositions shall be specified as follows.

For cold-rolled base metal

Type designation	C	Mn	P	S
SGCC	Less than 0.15	Less than 0.80	Less than 0.05	Less than 0.05
SGCH	Less than 0.18	Less than 1.20	Less than 0.08	Less than 0.05
SGCD1	Less than 0.12	Less than 0.60	Less than 0.04	Less than 0.04
SGCD2	Less than 0.10	Less than 0.45	Less than 0.03	Less than 0.03
SGCD3	Less than 0.08	Less than 0.45	Less than 0.03	Less than 0.03
SGCD4	Less than 0.06	Less than 0.45	Less than 0.03	Less than 0.03
SGC340	Less than 0.25	Less than 1.70	Less than 0.20	Less than 0.05
SGC400	Less than 0.25	Less than 1.70	Less than 0.20	Less than 0.05
SGC440	Less than 0.25	Less than 2.00	Less than 0.20	Less than 0.05
SGC490	Less than 0.30	Less than 2.00	Less than 0.20	Less than 0.05
SGC570	Less than 0.30	Less than 2.50	Less than 0.20	Less than 0.05

For hot-rolled base metal

Type designation	C	Mn	P	S
SGHC	Less than 0.15	Less than 0.80	Less than 0.05	Less than 0.05
SGH340	Less than 0.25	Less than 1.70	Less than 0.20	Less than 0.05
SGH400	Less than 0.25	Less than 1.70	Less than 0.20	Less than 0.05
SGH440	Less than 0.25	Less than 2.00	Less than 0.20	Less than 0.05
SGH490	Less than 0.30	Less than 2.00	Less than 0.20	Less than 0.05
SGH540	Less than 0.30	Less than 2.50	Less than 0.20	Less than 0.05

Reference Data (JIS G 3302-2010 Excerpt)

Unit Mass of Cut-Length Sheets

(Unit: kg/m²)

Standard thickness (mm)	Coating mass designation													
	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
0.25	2.053	2.083	2.113	2.146	2.166	2.207	2.248	2.268	2.313	2.344	2.421	2.444	2.528	2.685
0.27	2.210	2.240	2.270	2.303	2.323	2.364	2.405	2.425	2.470	2.501	2.578	2.601	2.685	2.842
0.30	2.445	2.475	2.505	2.538	2.558	2.599	2.640	2.660	2.705	2.736	2.813	2.836	2.920	3.077
0.35	2.838	2.868	2.898	2.931	2.951	2.992	3.033	3.053	3.098	3.129	3.206	3.229	3.313	3.470
0.40	3.230	3.260	3.290	3.323	3.343	3.384	3.425	3.445	3.490	3.521	3.598	3.621	3.705	3.862
0.50	4.015	4.045	4.075	4.108	4.128	4.169	4.210	4.230	4.275	4.306	4.383	4.406	4.490	4.647
0.60	4.800	4.830	4.860	4.893	4.913	4.954	4.995	5.015	5.060	5.091	5.168	5.191	5.275	5.432
0.70	5.585	5.615	5.645	5.678	5.698	5.739	5.780	5.800	5.845	5.876	5.953	5.976	6.060	6.217
0.80	6.370	6.400	6.430	6.463	6.483	6.524	6.565	6.585	6.630	6.661	6.738	6.761	6.845	7.002
0.90	7.155	7.185	7.215	7.284	7.268	7.309	7.350	7.370	7.415	7.446	7.523	7.546	7.630	7.787
1.0	7.940	7.970	8.000	8.033	8.053	8.094	8.135	8.155	8.200	8.231	8.308	8.331	8.415	8.572
1.2	9.510	9.540	9.570	9.603	9.623	9.664	9.705	9.725	9.770	9.801	9.878	9.901	9.985	10.14
1.4	11.08	11.11	11.14	11.17	11.19	11.23	11.28	11.30	11.34	11.37	11.45	11.47	11.56	11.71
1.6	12.65	12.68	12.71	12.74	12.76	12.80	12.85	12.87	12.91	12.94	13.02	13.04	13.13	13.28
1.8	14.22	14.25	14.28	14.31	14.33	14.37	14.42	14.44	14.48	14.51	14.59	14.61	14.70	14.85
2.0	15.79	15.82	15.85	15.88	15.90	15.94	15.99	16.01	16.05	16.08	16.16	16.18	16.27	16.42
2.3	18.15	18.18	18.21	18.24	18.26	18.30	18.34	18.36	18.41	18.44	18.51	18.54	18.62	18.78
2.8	22.07	22.10	22.13	22.16	22.18	22.22	22.27	22.29	22.33	22.36	22.44	22.46	22.55	22.70
3.2	25.21	25.24	25.27	25.30	25.32	25.36	25.41	25.43	25.47	25.50	25.58	25.60	25.69	25.84
3.6	28.35	28.38	28.41	28.44	28.46	28.50	28.55	28.57	28.61	28.64	28.72	28.74	28.83	28.98
4.0	31.49	31.52	31.55	31.58	31.60	31.64	31.69	31.71	31.75	31.78	31.86	31.88	31.97	32.12
4.5	35.42	35.45	35.48	35.51	35.53	35.57	35.61	35.63	35.68	35.71	35.78	35.81	35.89	36.05
6.0	47.19	47.22	47.25	47.28	47.30	47.34	47.39	47.41	47.45	47.48	47.56	47.58	47.67	47.82

Notes: Unit mass of base metal (kg/m²) = Basic mass × Thickness (mm)
Basic mass = 7.85 (kg/mm·m²)
Unit mass of cut-length sheets (kg/m²) = Unit mass of base metal (kg/m²) + Coating mass constant

Coating Mass Constants Used to Calculate Mass

Coating mass designation	Z06	Z08	Z10	Z12	Z14	Z18	Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
Coating mass constant	0.090	0.120	0.150	0.183	0.203	0.244	0.285	0.305	0.350	0.381	0.458	0.481	0.565	0.722

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MEMO

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