

Domestic

- 01
Head Office

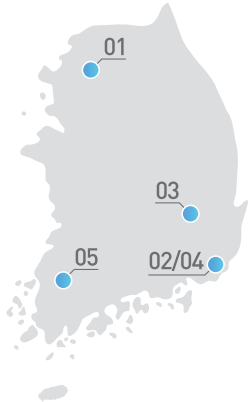
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- 03
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- 05
Coil Center in India

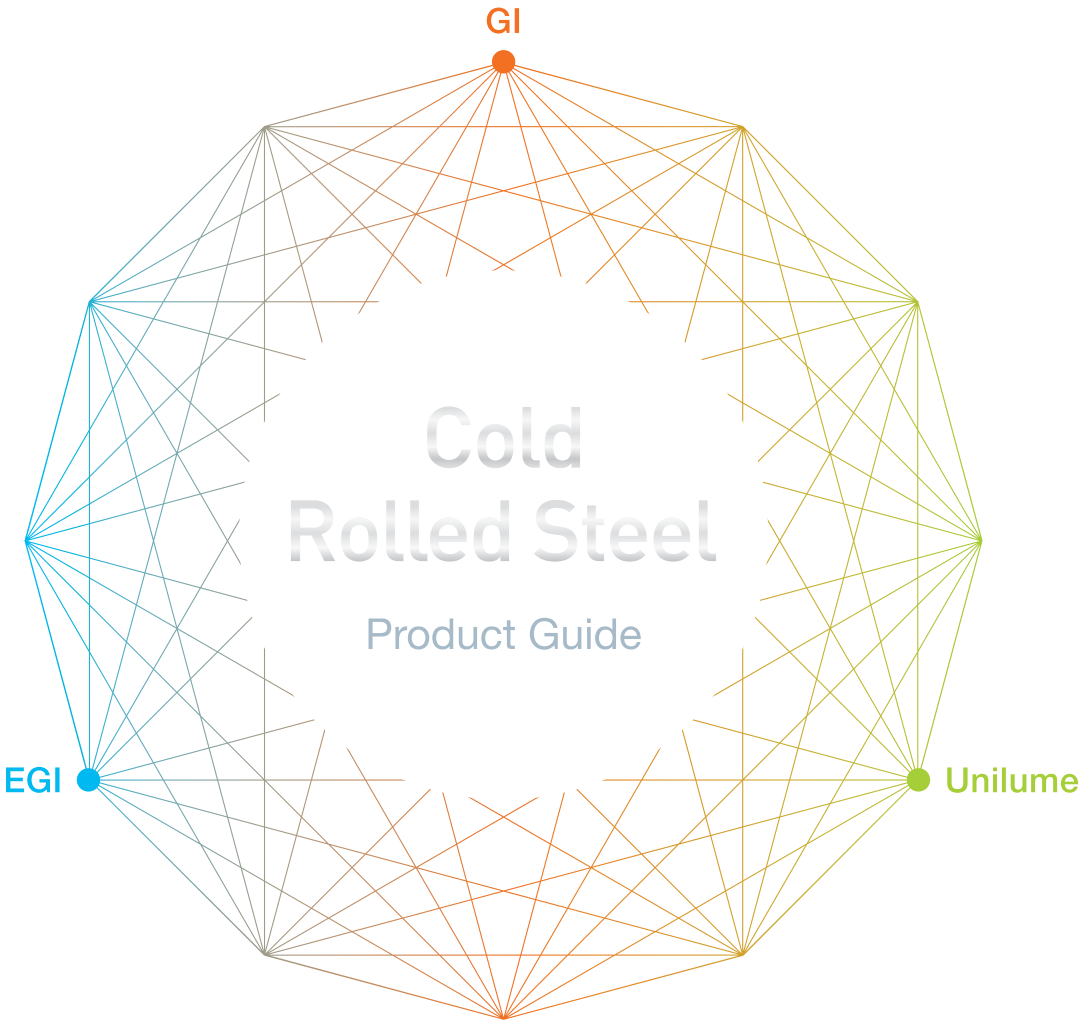
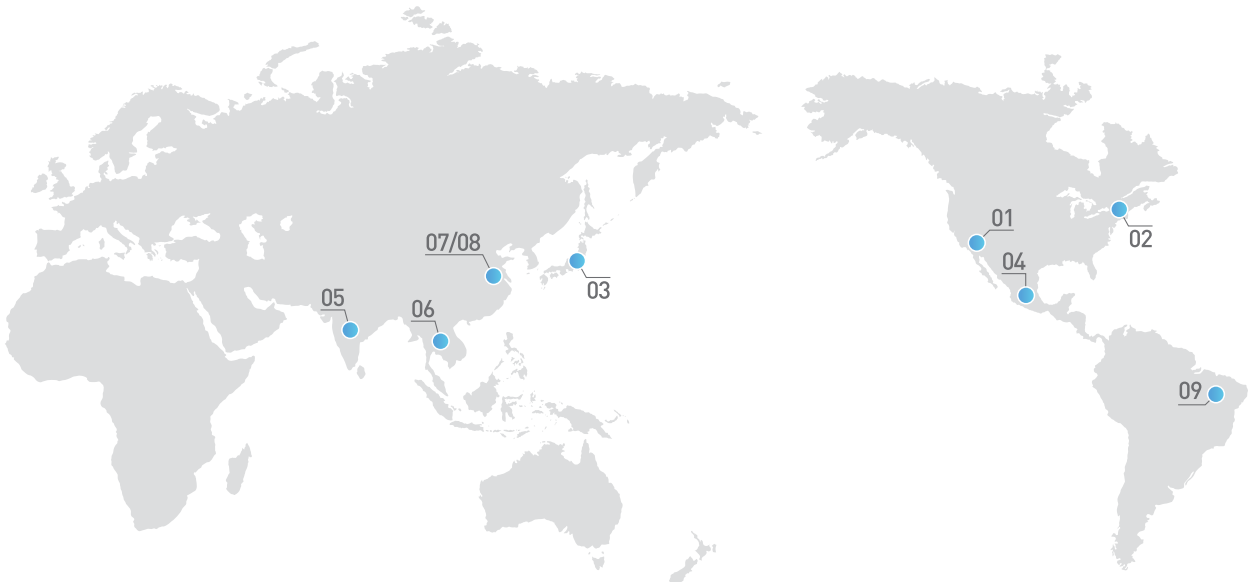
DONGKUK STEEL INDIA PVT LTD.
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- 09
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Tel : 55-85-3033-3800 Fax : 55-85-3033-3899



World Steel Developer

DONGKUK STEEL

A new world represented by steel –
Beautiful Finish, **DONGKUK STEEL**

Established in 1954, DONGKUK STEEL has taken the lead in Korea’s steel industry, producing cold rolled steel, galvanized steel, Galvalume (GL) steel, pre-painted steel, and high performance steel for over 60 years. Its technological progress and constant R&D have resulted in the introduction of a multitude of new and high-quality products. Today, the company is primed to become a world leader in the field of surface treatment, having recently completed the construction of new facilities and the Pickling Line and Tandem Cold Mill (PL-TCM).

With its belief in open and ethical management, it is contributing to the growth of the national economy while helping to create a more beautiful world. In the future, DONGKUK STEEL will continue heightening its enterprise value through continuous management innovations that will turn it into the “world’s best” steel company.

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Hot-Dip Galvanized Steel

GI

Hot-dipped galvanized steel sheets are processed by dipping cold-rolled products into a hot-dip galvanized pot and then plating them with zinc.

The zinc's "sacrificial anodes," result in excellent paintability and workability and extraordinary corrosion resistance.

In 1972, DONGKUK STEEL became the first Korean company to install a continuous galvanizing line; currently, we have four line in Korea.

These products are widely used in home appliances and building interiors and exteriors.

Continuous hot-dip Galvanizing

Continuous hot-dip Galvanizing

The galvanized steel plate of DONGKUK STEEL is produced by a continuous hot-dip galvanizing method in the state-of-the-art facilities. Its own know-how and technical capabilities that produced the galvanized products first in our country allows the selection of coating mass and production of outstanding quality products in all fields of industries from architectural materials to automobile and home appliance.



Workability

Workability

With raw materials deemed suitable for the characteristics of product and adjustment of flatness after uniform heat treatment with the continuous annealing line, the product with excellent formability is produced.

Type	CQ	DQ	DDQ
Hardness	50 ~ 60	45 ~ 55	30 ~ 40
Yield point (kg/mm ²)	25 ~ 35	20 ~ 30	12 ~ 30
Tensile strength (kg/mm ²)	35 ~ 45	30 ~ 40	28 ~ 33
Elongation (%)	30 ~ 38	34 ~ 42	40 ~ 48

Corrosion Resistance

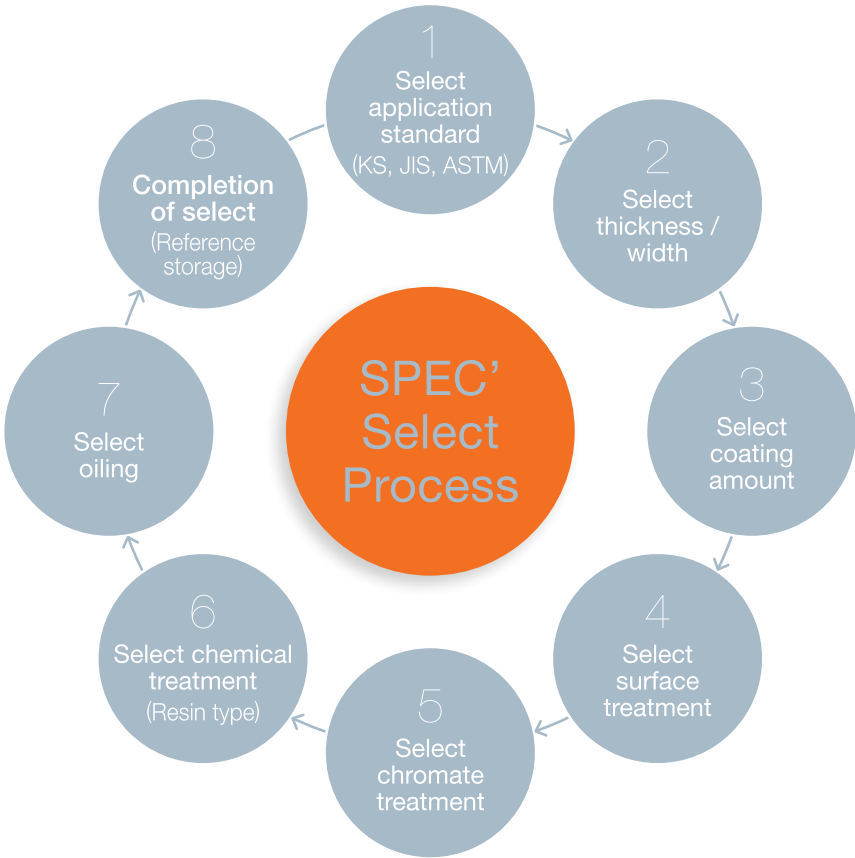
Corrosion Resistance

- The hot-dip galvanized steel plate is characterized to protect the Fe by the corrosion resistance of zinc itself and the effective sacrificial anode behavior of zinc.
- Chromate :
Protects the galvanized layer with meshed film by dehydration condensation reaction and hydrogen bonding by trivalent chromium compound to further improve the corrosion resistance. In particular, the chrome film contributes to corrosion resistance thanks to the self-healing effect by hexavalent chrome which is soluble, and a barrier effect by trivalent chrome which is insoluble.
- Organic / Inorganic resin treatment :
Able to produce differentiated products suitable for applications and purposes with organic / inorganic resin that has multiple functions such as formability, corrosion resistance, foam adhesion, etc.



SPEC' Select Process

SPEC' Select Process



* Reference storage after production input by combining the selection items by demand price.
* Possible to produce the product with the same quality for the product that has the production history through reference management by demand price.

Surface Treatment & Coating Thickness

Surface Treatment & Coating Thickness

Surface Treatment

Surface treatment	Characteristics	Applications
Zero Spangle (Minimized)	<ul style="list-style-type: none">· Fine crystal grain as zinc solidification inhibits crystal growth· Uniform surface	<ul style="list-style-type: none">· Furniture & office machine / home appliance internal or external plate / architectural materials
Extra Smooth	<ul style="list-style-type: none">· Carry out skin pass on zero spangle surface· Smooth surface and excellent paintability	<ul style="list-style-type: none">· Home appliance Pre-Coated Metal(PCM) material
Galvannealed	<ul style="list-style-type: none">· Maximization of weldability and paintability by Fe and Zn alloying	<ul style="list-style-type: none">· Internal / external plate of automobile, home appliance



Chemical Treatment



Oiling



Coating Thickness

Type		Non-alloying	Alloying
Coating Mass	Marking	Z08, Z10, Z12, Z18, Z20, Z22, Z25, Z27, Z35, Z45	F06, F08, F10, F12
3-points on both sides	Minimum coating	80, 100, 120, 180, 200, 220, 250, 270, 350, 450	60, 80, 100, 120
1-point on both sides	Minimum coating	68, 85, 102, 153, 170, 187, 213, 234, 298, 383	51, 68, 85, 102

Unit : g/m²

Standard Specification

Standard Specification

Classification

Classification	KS D 3506	JIS G 3302	ASTM A 653	EN 10142, 10147
Commercial quality	SGCC	SGCC	CS	DX51D
Lock forming quality	SGCD1	SGCD1	CS	DX51D
Drawing quality	SGCD2	SGCD2	FS	DX52D
Deep drawing quality	SGCD3	SGCD3	DDS	DX53D
Structural quality			EDDS	
Structural quality	SGC 340~570	SGC 340~570	GRADE 230~550	S220~ S550

* Only when using the cold rolling disk



Thickness Tolerances

Unit : mm

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	-



Mechanical Property

Classification	Type	Yield Point (N/mm²)	Tensile Strength (N/mm²)	Elongation (%)						Test Piece
				Thickness (mm)						
				0.25 ~0.40	0.40 ~0.60	0.60 ~1.0	1.0 ~1.6	1.6 ~2.5	2.5 ~Over	
KS D 3506 / JIS G 3302	SGCC									No.5 Cut In Rolling Direction
	SGCD1		270		34	36	37	38		
	SGCD2		270		36	38	39	40		
	SGCD3		270		38	40	41	42		
	SGC340	245	340	20	20	20	20	20	20	
	SGC400	295	400	18	18	18	18	18	18	
	SGC440	335	440	18	18	18	18	18	18	
	SGC490	365	490	16	16	16	16	16	16	
	SGC570	560	570							
ASTM	CS Type A	170/380		20						Cu shall not exceed 0.50% on heat analysis
	CS Type B	205/380		20						
	CS Type C	170/410		15						
	FS Type A	170/310		26						
	FS Type B	170/310		26						
	DDS	140/240		32						
	EDDS	105/170		40						
	Gr230(Gr-A)	230	310	20						
	Gr255(Gr-B)	255	360	18						
	Gr275(Gr-C)	275	380	16						
	Gr340 C1(Gr-D)	340	450	12						
	Gr340 C3(Gr-F)	340	480	12						
	Gr550(Gr-E)	550	570							



Width & Length Tolerances

Unit : mm

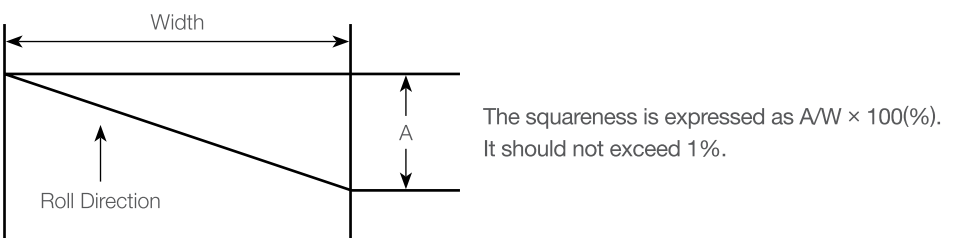
Width Tolerances		Length Tolerances
When using the cold rolling disk		When using the cold rolling disk
W ≤ 1,500 0, +7	W > 1,500 0, +10	0, +15

Flatness

Unit : mm

Width	Wave	Edge Wave	Center Wave
W < 1,000	Less than 12	Less than 8	Less than 6
1,000 ≤ W < 1,250	Less than 15	Less than 9	Less than 8
1,600 > W ≥ 1,250	Less than 15	Less than 10	Less than 8
W ≥ 1,600	Less than 20	Less than 13	Less than 9

Out of square Tolerances

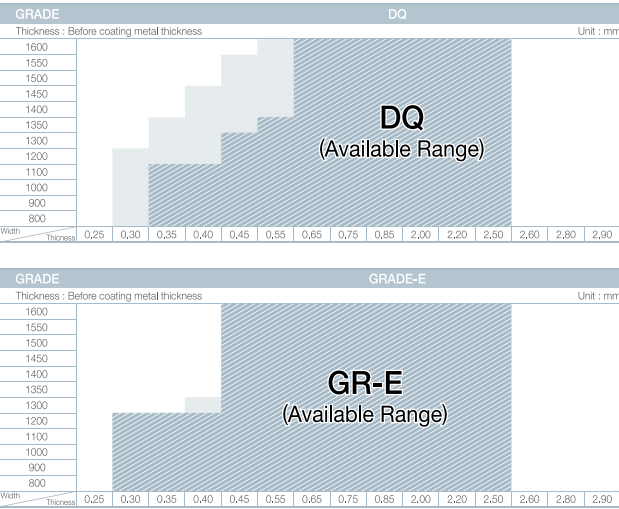
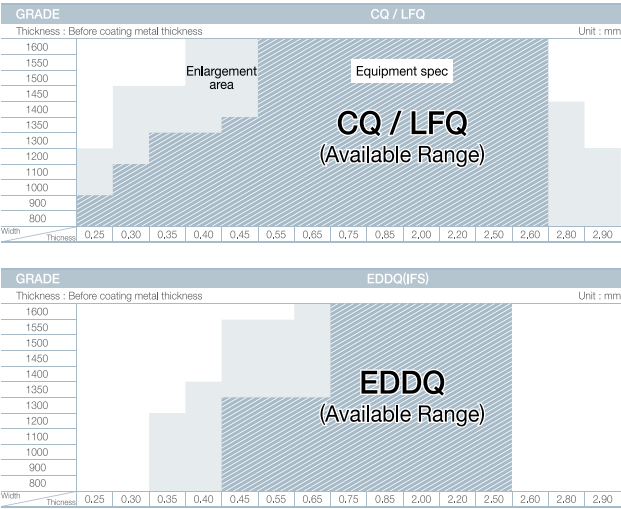


Our various specification and size range allows rational selection possible

Specification & Available size range

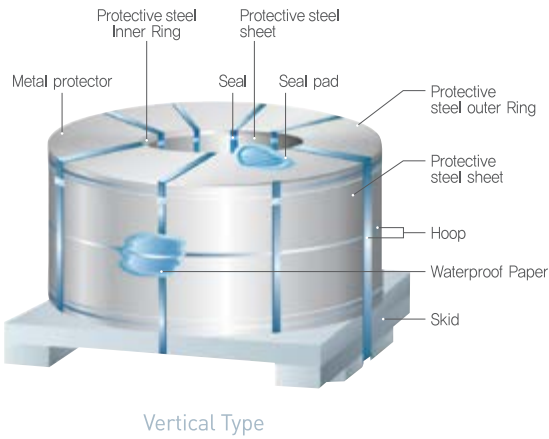
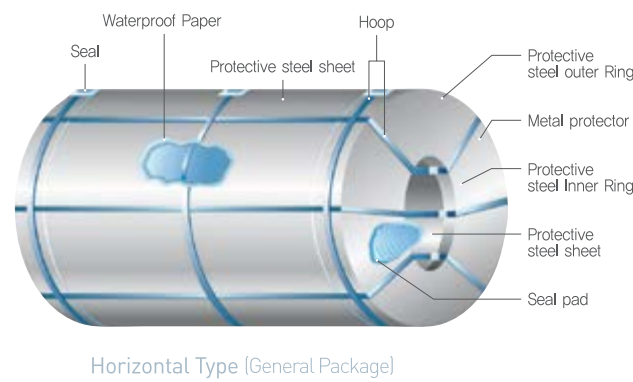
Specification

Production Capacity	920,000 ton/year	Steel grade	CQ, LFQ, DQ, DDQ, EDDQ, Gr-A, B, C, D, E
Thickness	0.23 ~ 2.9 mm	Coating thickness-both side	80 ~ 600 g/m ²
Width	600 ~ 1,600 mm	I.D of Coil	508 / 610 mm
Length	600 ~ 5,000 mm	O.D of Coil	2,300 mm (Max)
Unit coil weight	35 ton (Max)	Main product	GI, GA, G/L

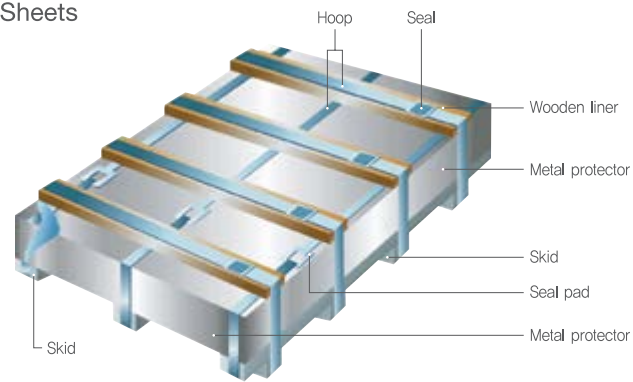


Standard Packing

Coils

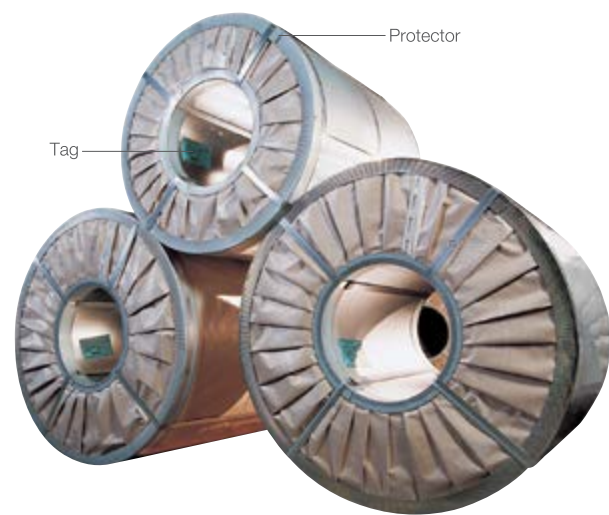


Sheets



Marking

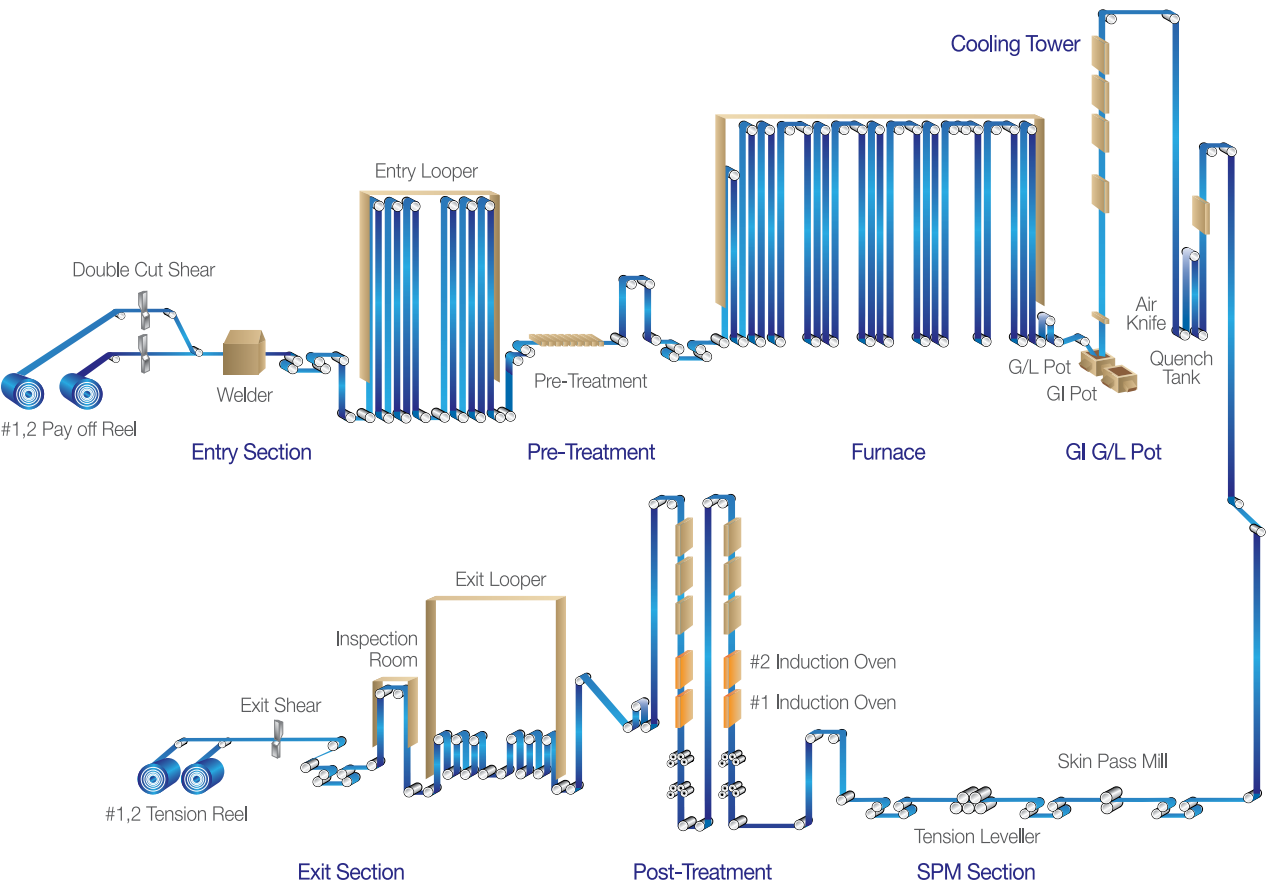
A paper sticker is affixed on the side of each package, which shows its corresponding order number, destination, specifications, size, net weight and package number. Of course, DONGKUK STEEL will apply other marking required by customers, to their complete satisfaction.



Tag Marking

- Domestic
 - 1. Steel type 2. Dimension 3. Inspection No.
 - 4. Client 5. Product code 6. Weight
- Export
 - 1. P/O 2. Destination 3. SPEC 4. SPEC 5. Size
 - 6. N.Wt 7. M/O No. 8. PKG. NO Made in KOREA

GI Production Process



Process Terminology

Type	Main Function	Type	Main Function
Pay Off Reel	• Releasing the coil for continuous work	Skin Pass Mill	• Controlling the spangle on the surface
Double Cut Shear	• Cutting to weld two coils	Oiler	• Granting anti-rust by oil treatment
Welder	• Connecting the leading coil and the following coil for continuous work	T/Leveller	• Correcting the shape of the strip
Entry Looper	• Storing the entry coil	Roll Coater	• Grating function by post-treatment such as Chromate, Non-Cr resin, Galva-clean resin, etc.
Pre-Treatment	• Removing rolled oil and other impurities	Oven	• Hardening the chemicals after surface treatment
Furnace	• Adjusting the material characteristics of a strip by heat treatment	Exit Looper	• Storage equipment for coil on exit
Pot & Air Knife	• Adjusting coating mass by jet air knife	Inspection Room	• Inspecting the appearance and properties of a product
Cooling Tower	• Strip cooling	Exit Shear	• Cutting the coil by the required unit coil weight
Quench Tank	• A tank for strip cooling	Tension Reel	• Reeling the coil by the required unit coil weight

Cautions for Handling GI

Cautions for Ordering

When you place an order, please pay attention to the following:

- Order spec
 - 1. Material 2. Thickness 3. Width 4. Length
- Requirement
 - 1. Coating mass 2. Surface treatment method 3. Finishing method 4. Coil inner diameter/coil package unit weight
- Quantity • Purpose • Packing & Marking type • Delivery
- Inspection condition except for factory inspection • Others

Cautions for Handling

- Storage and Handling
 - Rust-proof
 - The products should be loaded on the skid in a dry room.
 - If stored in a humid place for a prolonged period or wet by rain due to outdoor storage, rust may form.
 - For rainy seasons, products stored outside should be covered with vinyl to protect from rain and need to ventilate frequently to prevent rust formation.
 - Long term storage
 - The galvanized steel sheet may occur hardening in case of long term storage (more than 3 months).
 - This may cause damage or defect of the molding in case of press and molding work.
 - The loss of product by improper storage or handling may be out of our warranty range.
- Cautions for Transportation
 - When transporting, the product should be covered to protect from rain.
 - To avoid damage of the product from the chain, wire, fastener in case of a sudden stop or start, add a rubber sheet for buffing and angle when loading to protect the product.
 - Pay attention to damage of the product by crushing or impact by forklift or crane when loading/unloading.
 - Customers need to check the penetration of rain, crushing or breakage during transportation when loading/unloading.
- Precautions
 - When degreasing, use neutral or weak alkali degreasing agent and dry immediately after washing. (Strong alkali degreasing agent may damage the galvanizing layer and reduce corrosion resistance.)
 - When unpacking, wear protective equipment to avoid injuries.



Electrolytic Galvanized Steel

EGI



Electro-Galvanized Steel Sheet/Coil is a product, which has an enhanced corrosion-resistant characteristic through an electrolytic galvanizing process to Cold Rolled Steel.

Unlike Hot-Dip Galvanized Steel, it has less amount of zinc coated but retains corrosion resistance due to its evenness of the coating; and since the coating process does not involve any heat, it preserves the base metals properties of superior formability, paintability and weldability.

The EGI’s top quality guarantees its ability in any processing and painting

Workability

Workability

Unlike Hot-Dipped Galvanized Steel, the base metal of the Electro-Galvanized Steel is less affected by the heat and therefore, it is able to retain its formability.



Thickness mm(in)	Type of Steel	Treatment	Tensile Strength kg/mm²(psi)	Elongation %, min	Erichsen Value mm(in)	Conical Cup Value mm(in)
0.8	Cold-rolled Sheet	-	32 (45,500)	38.1	10.59 (0.4169)	37.9 (1.49)
(0.0315)	EG Sheet	Phosphate	33 (46,900)	39.0	10.90 (0.4291)	37.0 (1.46)
1.0	Cold-rolled Sheet	-	33 (46,900)	40.0	10.95 (0.4311)	45.7 (1.80)
(0.0394)	EG Sheet	Phosphate	34 (48,400)	40.5	11.30 (0.4449)	45.1 (1.78)
1.2	Cold-rolled Sheet	-	33 (46,900)	40.4	11.24 (0.4425)	46.0 (1.81)
(0.0472)	EG Sheet	Phosphate	34 (48,400)	40.7	11.95 (0.4705)	45.5 (1.79)

* Conical cup diameter is 50mm (1.97 in) for sheets 0.8mm 0.0315 thick and 60mm (2.3622 in) for sheets 1.0mm (0.0394 in) and 1.2mm (0.0472 in) thick, commercial quality.

Paintability

Paintability

Free from any spangles and pin-holes, the Electro-Galvanized Steel has a flawless surface that is most ideal for any type of painting.
(Additional surface treatments are available for further enhancement of paintability.)



Electrolytic coating of zinc has an ultimate result in corrosion resistance

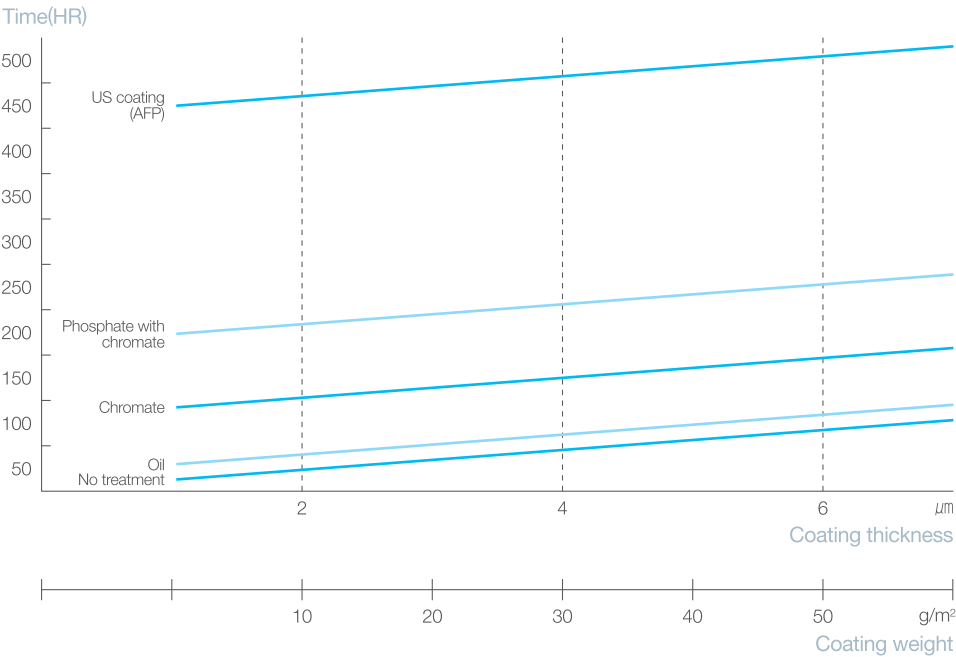
Corrosion Resistance

Corrosion Resistance

The EGI’s evenly coated zinc enhances its resistance to any type of corrosion.
[Additional surface treatments are available for further enhancement of corrosion resistance.]



Red rust generation in salt spray test (Nacl, 5%)



* The test is conducted by DONGKUK STEEL laboratory.
* Coating weight is gram per side.

Weldability

Weldability

Among all coated steel, the EGI has the highest weldability due to minimum amount of zinc being coated.



Spot Welding Condition

Type of Steel	Pressure kg(lb)	Current Time cycle	Welding Current ka	Tensile Strength kg(lb)
Cold-rolled Sheet	150~200 (331~441)	8~10	8.0~9.0	530 (1,168)
EG Sheet without Chemical Treatment	200~300 (441~561)	8~10	8.0~10.0	620 (1,367)
Phosphate EG Sheet	220~300 (485~561)	8~11	9.0~12.0	510 (1,124)
Chromate EG Sheet	200~300 (441~561)	8~11	8.0~11.0	550 (1,213)

* Test samples are 0.8mm(0.0315 in) in thickness, with 30g/m² (0.1 oz/ft) of zinc coating per surface, commercial quality.

Seam Welding Condition

Chemical Treatment	Thickness mm(in)	Width of Electrode tip w, mm(in)	Pressure kg(lb)	Time cycle (on-off)	Current ka	Speed m/min. (ft/min)
Phosphate EG Sheet	0.8(0.0315)	4.5(0.1772)	300~500 (661~1,102)	3-2	15~20	1.5~2.0 (4,921~6,562)
	1.2(0.0472)	5.5(0.2165)	450~600 (992~1,323)	4-2-1	17~20	1.7(5,577)
	1.6(0.0630)	6.5(0.2559)	500~650 (1,102~1,433)	5-1~2	18~22	1.3(4,265)
Chromate EG Sheet	0.8(0.0315)	4.5(0.1772)	200~400 (441~882)	3-2	14~20	1.5~2.0 (4,921~6,562)
	1.2(0.0472)	5.5(0.2165)	300~400 (661~882)	4-2~3	16~21	1.6(5,249)
	1.6(0.0630)	6.5(0.2559)	400~500 (882~1,102)	4-5~2	18~22	1.5(4,921)

* The weight of zinc coating is 20g/m² (0.07 oz/ft²) per surface, commercial quality.



There are various surface treatment available for your requirement

Surface Treatments/Code

Surface Treatments

- Chromated
- Phosphated
- Anti-finger print(AFP)
- Oiled

* You can select from coating weigth control, chromated, phosphated, anti-finger print, chrome-free, oiling, accordingly to your usage.



Surface Treatments Code

Symbol	Treatment	
MX	Zinc	
MO	Zinc + Oil	
PX	Phosphate	
PO	Phosphate + Oil	
CX	Chromate	
CO	Chromate + Oil	
PCX	Phosphate + Chromaterinse + Dry	
PCO	Phosphate + Chromaterinse + Oil	
PCF	Phosphate + Chrome free + Dry	
CFA	Chrome free AFP	
ICA	Conductivity AFP	
Oil	0.5 - 3 g/m²	Single side
Chromate	2 - 5 mg/m²	Single side
Phosphate	1.5 - 2.0 g/m²	Single side
AFP	0.8 - 1.5 μm	Single side

Zinc Coating Mass

Zinc Coating Mass

Standard coating mass (one side) g/m²	Minimum coating mass (one side) g/m²		Coating mass symbol
	In case of coating of same thickness	In case of coating of different thickness	
10	8.5	8	E08
20	17	16	E16
30	25.5	24	E24
40	34	32	E32
50	42.5	40	E40



Our various specification and size range allows rational selection possible

Specification & Available size range

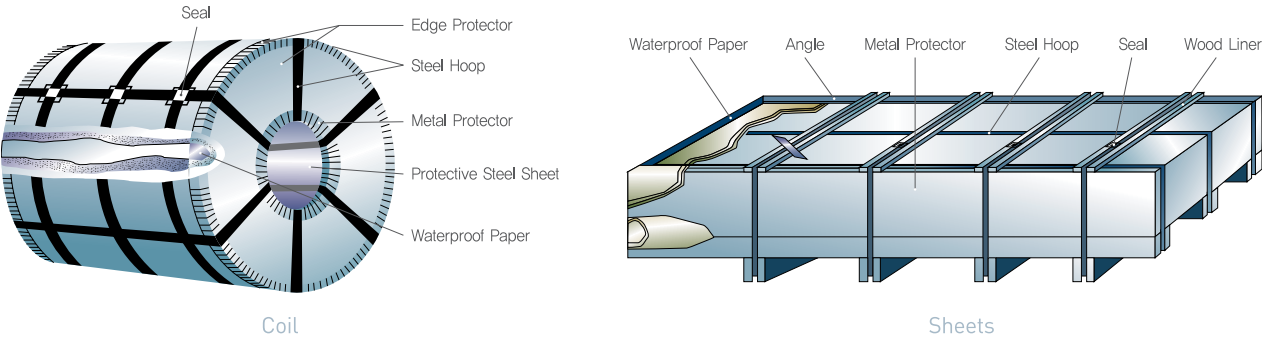
Specification

Production Capacity	420,000 ton/year
Thickness	0.3 mm (0.012 in) to 2.0 mm (0.078 in)
Width	600 mm (23.62 in) to 1,350 mm (53.14 in)
Length	400 mm (15.75 in) to 5,000 mm (196.85 in)
Coating Weights	both side coating 6 -100g/m ² (0.0196 - 0.328 oz/ft ²)
I.D of Coil	508 mm (Mi)
O.D of Coil	2,040 mm (Max)
Coil wt	22.5 M/T (Max)

Thickness and Width

Commercial Steel	Standard Width mm(in)	Standard Thickness, mm(in)											
		0.3 (0.012)	0.4 (0.016)	0.45 (0.018)	0.5 (0.020)	0.6 (0.024)	0.7 (0.028)	0.8 (0.031)	1 (0.039)	1.2 (0.047)	1.4 (0.055)	1.6 (0.063)	
Commercial Quality for General use	762(30)												
	914(36)												
	1,000(39.37)												
	1,219(48)												
	1,250(49.21)												

Standard Packing



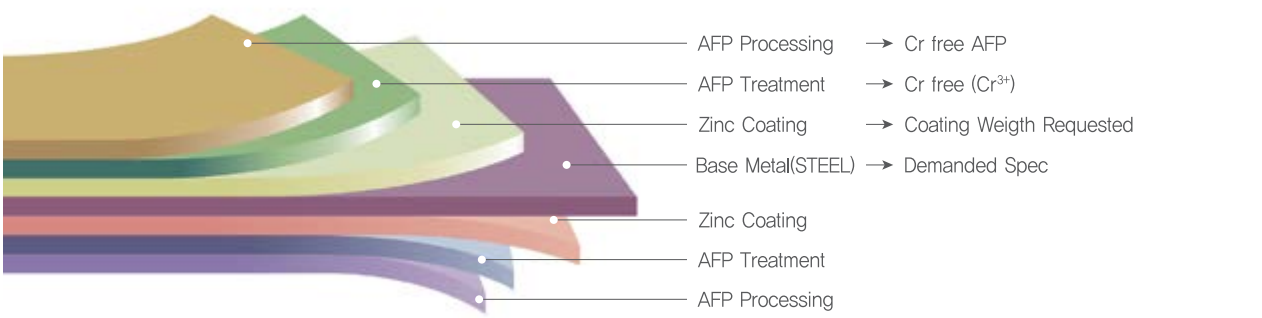
Chromium-free AFP

Chromium-free AFP Products

Production Gauge

Item	Strip Gauge [MM]	CS DS DDS Width	0.3 ~ 1.6 0.6 ~ 1.6 0.6 ~ 1.6 600 ~ 1,350
	Inner Diameter [I.D.]	Input side Output side	470 ~ 520 508
	Coil Wt [TON]	Input side Output side	0 ~ 22.5 0 ~ 22.5

Product Structure



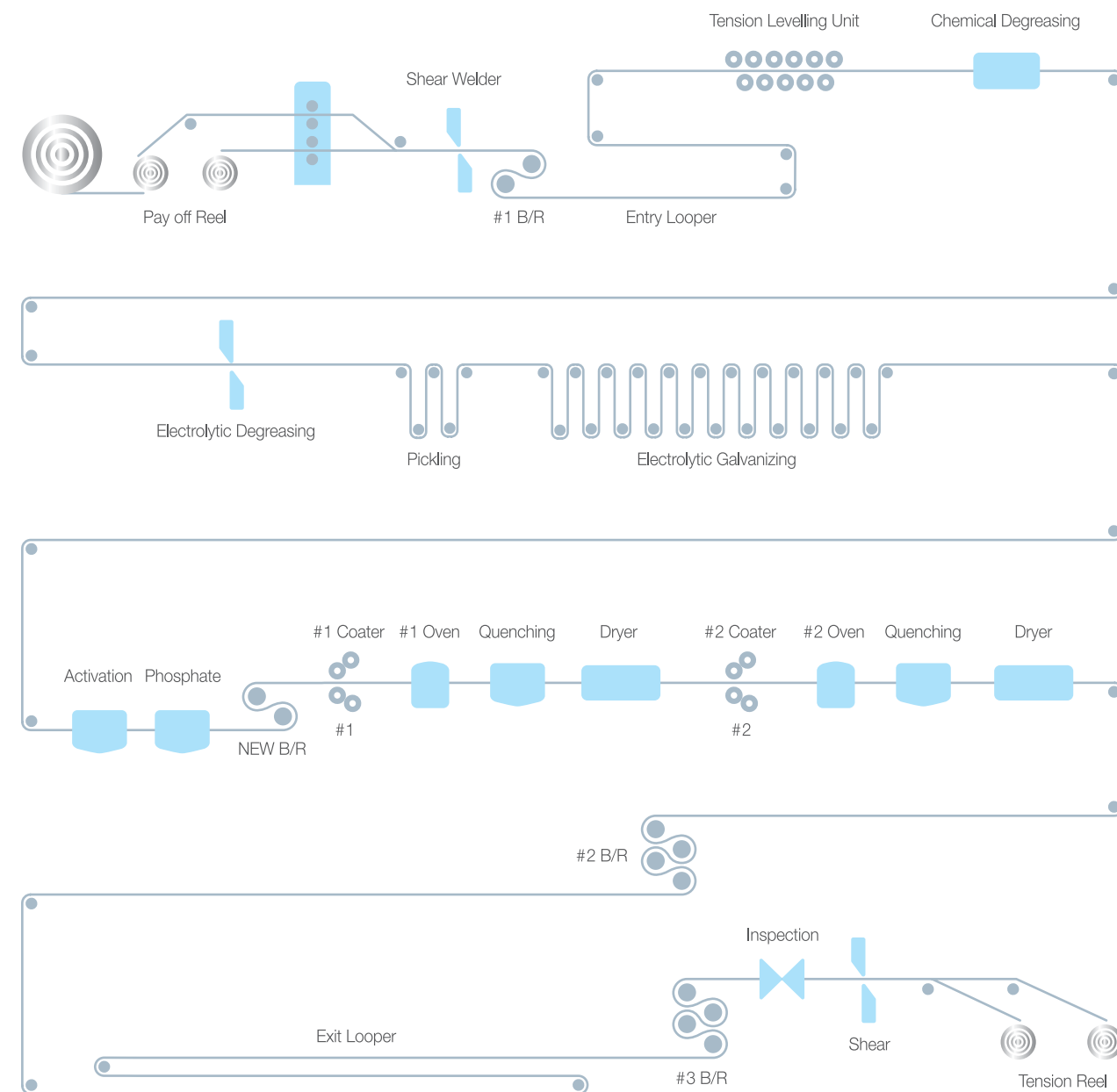
Product Features

- Application of hexavalent chromium alternative material**
 - Develop trivalent chromium, a stable material, as the main component.
(Add etching agent, reducing agent, level agent, etc.) : Cr(VI)-free, non-toxic chromate.
 - Superior corrosion resistance : Secure same corrosion resistance level of existing products.
- Environment-friendly products**
 - Environment-friendly products harmless to humans and environmental pollution preventive.
 - Actively corresponds to environmental regulations of Europe and other leading countries.

Application

Home Appliance, furniture, industrial machinery, and others

EGI Production Process



Cautions for Handling EGI

Cautions for Handling

- Always load or store products on a skid.
 - Damage such as dent could occur if the coil is stored on uneven surface without being placed on a skid.
- Make sure the truck beds are padded with rubber pad during the transportation and covered with canvas when raining.
 - A slightest vibration can cause abrasion-marks on the coil.
- Always store the coils indoor to prevent sweating which could result in rusting. When outdoor storage is unavoidable, make sure to cover the coils with canvas.
 - When the moisture permeates through the coils, it can cause rust during the storage.
- Be careful of scratch and other contamination when handling the coils.
 - Due to the thinness of its coating, a slight impact may cause surface damage.
- It is most ideal to use AFP treated when the surface condition is critical.
 - Because, compare to other surface treatments, AFP has the strongest protection against any surface damages or contaminations.



Aluminum-Zinc
Alloy Coated
Steel

Unilume



Unilume steel is the result of an ideal alloy of aluminum and zinc.

It consists of aluminum (55% in weight ratio but 80% in surface volume ratio), zinc (43.4% in weight), and silicone (1.6% in weight ratio) so it has both aluminum-unique corrosion-resistance and heat resistance and zinc-unique "galvanic behavior".

Durability

Durability



Humidity Test

Type	Specimen		Result
	Coating wt	Thickness	
Unilume	150g/m ²	40μ (Both)	No red oxidation rust after 35,300 Hr run
Galvanized	275g/m ²	40μ (Both)	Red oxidation rust before 6,000 Hr run

* Condition : Exposed surface change under relative humidity 100% × 60℃

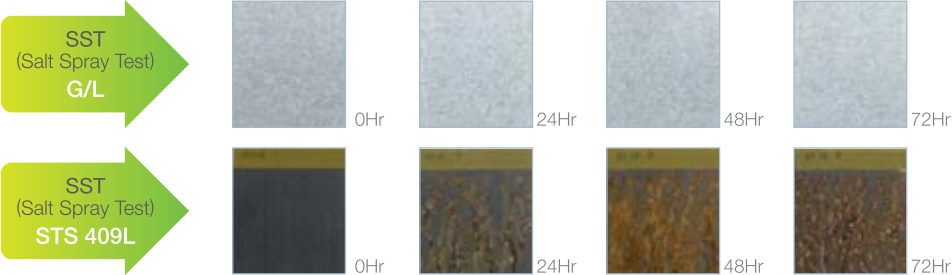
Type	22 Cycle		75 Cycle		116 Cycle	
	Red rust (%)	External appearance	Red rust (%)	External appearance	Red rust (%)	External appearance
Galvanized	1	Red rust at cut section	100	—	100	—
Al-coated	0	Traces of red rust at cut section	10	Red rust at cut section	20	Rust at cut section & Bends
Unilume	0	Bright surface	0	Dark surface	0	Red rust at cut section

* Condition : Water-vapor box × 55℃ environment, 2 Hr-dry after exposing of 22 hours (1 Cycle)

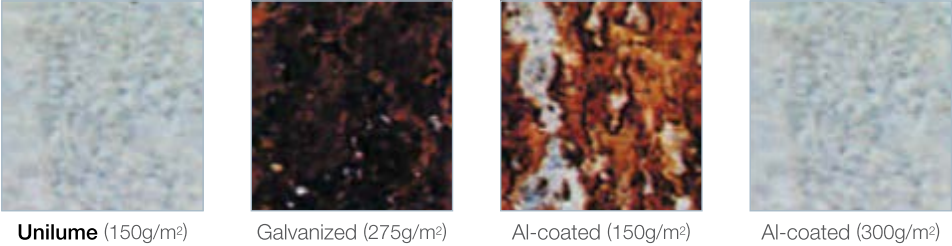
Salt Spray Test

Type	Coating wt		Number of hours before visible red rust
Unilume	150g/m ²	40μ (Both)	5,500 Hr
Galvanized	275g/m ²	40μ (Both)	300 Hr

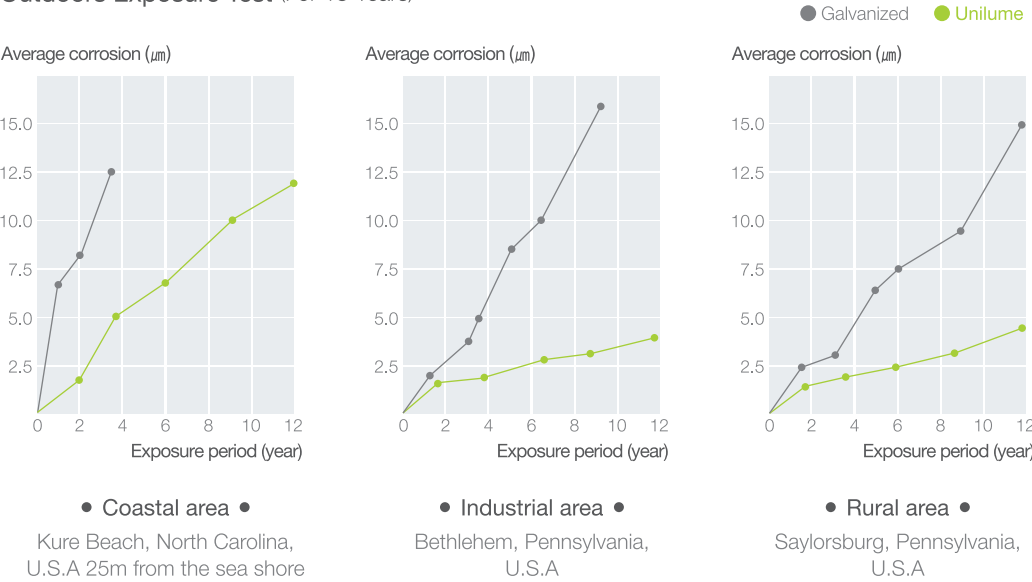
* Condition : Conforming to ASTM B117-73



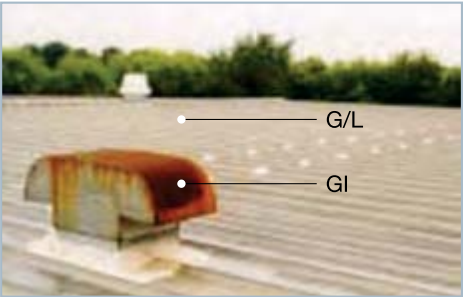
Salt Spray Test (3,200Hr Test)



Outdoors Exposure Test (For 13 Years)

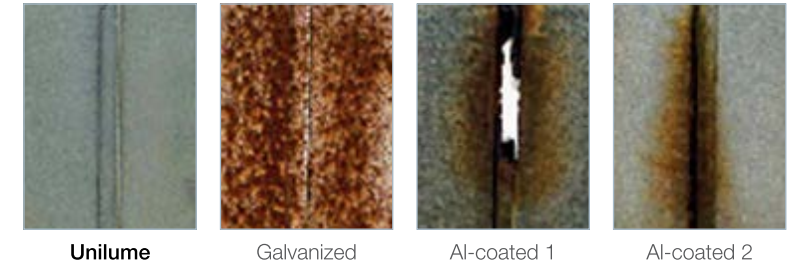


G/L roof 20 years at light industrial area

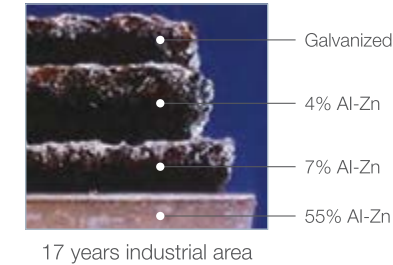


25 years compare with G/L roof and GI roof vent

10 years at 25m beach



Edge Condition



Heat-Resistance

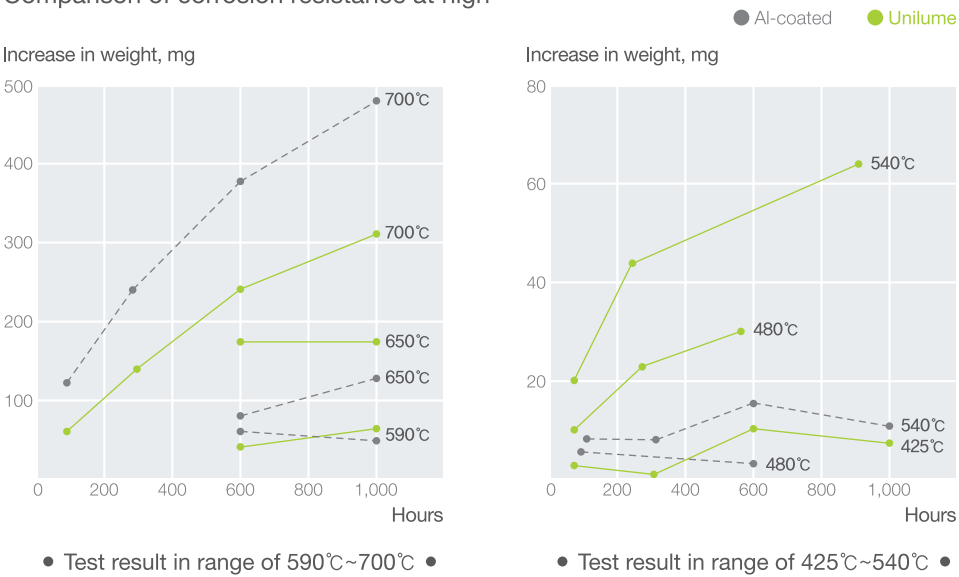


Heat-Resistance

Heat-resistance of Unilume is far superior to that of galvanized, and almost equal to characteristics of Al-coated steel.

- Galvanized : Recommendable temperature ; 230℃ & under, Discoloration at 250℃
- **Unilume : No discoloration even for durable use at 315℃**

Comparison of corrosion resistance at high



- Temperature range 480℃~540℃ Unilume < Al-coated
- Temperature range 590℃~650℃ Unilume = Al-coated
- Temperature range 700℃ & Over Unilume > Al-coated



Weldability



Weldability

Spot Welding Condition

Thickness	Pressure (kg)	Cooling time (Cycle=1/60 sec.)	Welding current			Electrode Tip Diameter (mm)
			Current (kA)	Current time	Maintenance time	
0.4	100	4	5.0	10	30	4.5
0.5	150	4	5.4	10	30	5.0
0.6	200	4	5.7	10	30	5.0
0.8	200	4	7.0	10	30	5.0
1.0	250	6	8.0	14	40	6.35
1.1	250	6	8.2	14	40	6.35
1.5	300	6	9.0	14	40	6.35

* Legend : 1 differential current; 4kA, Current time; 8 cycles, Squeeze time; 40 cycles (time : cycle)

Seam Welding Condition

Thickness	Electrode portion (mm)	Electrode thickness	Pressure (kg)	Current (A)	Welding time ≈ 1/60 sec		Welding speed (mm/min)
					Heating	Cooling	
0.4	12.7R	9.53	300	14,500	2	2	1,500
0.6	12.7R	9.53	400	16,000	3	2	1,500
0.8	6.35R	12.7	450	21,500	4	2	1,500
1.2	6.35R	12.7	500	22,000	4	2	1,500

* Intermittent current is recommended rather than continuous current.

Workability



Workability

Unilume has the same characteristics with galvanized steel sheet in workability & formability, and especially, micro crack at forming section is much less than galvanized steel sheet. Therefore, Unilume has excellent durability at forming section.

Adhesion of coating layer

OQ criteria

Bending	OT-Bending	No Peel Off
Lock-forming	Good	No Peel Off
Impact Test	Good	No Peel Off

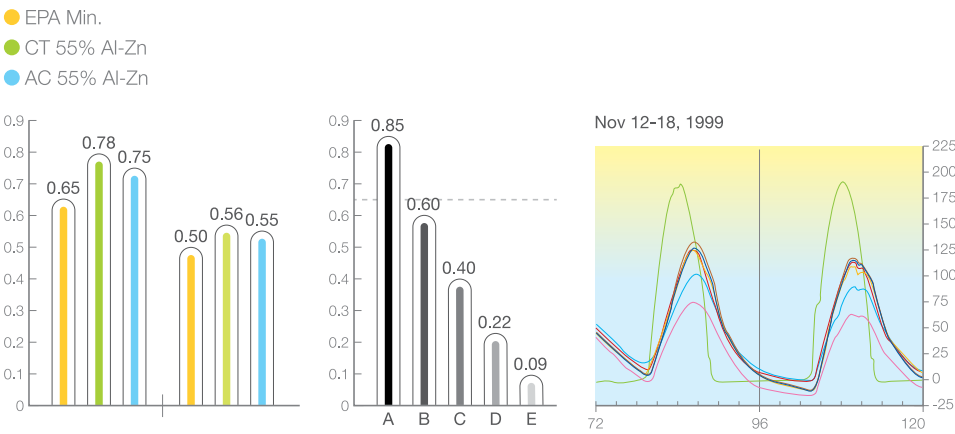
Heat-Reflexibility

Heat-Reflexibility

Unilume's heat reflexivity almost doubles that of galvanized steel so it has an energy saving effect if it is used in roofing and panelling without painting.

Comparison of heat transmission

Material	Heat-transmission (h/watt/m²)
Al-coated : 300g/m²	40
Unilume : 150g/m²	65
Galvanized : 275g/m²	120
Asbestos cement	150



Paintability

Paintability

Unilume can be painted without pre-treatment or weathering when used for signboard or general purpose, due to its superior adhesive strength between zinc layer and paint, unlike galvanized steel which requires weathering or pre-treatment.

Production Availability

Specification & Available size range

Size Availability

Thickness	0.3 ~ 2.5 mm
Width	600 ~ 1,600 mm
Length	600 ~ 5,000 mm
Unit coil weight	35 ton (Max)
I.D of Coil	508 / 610 mm

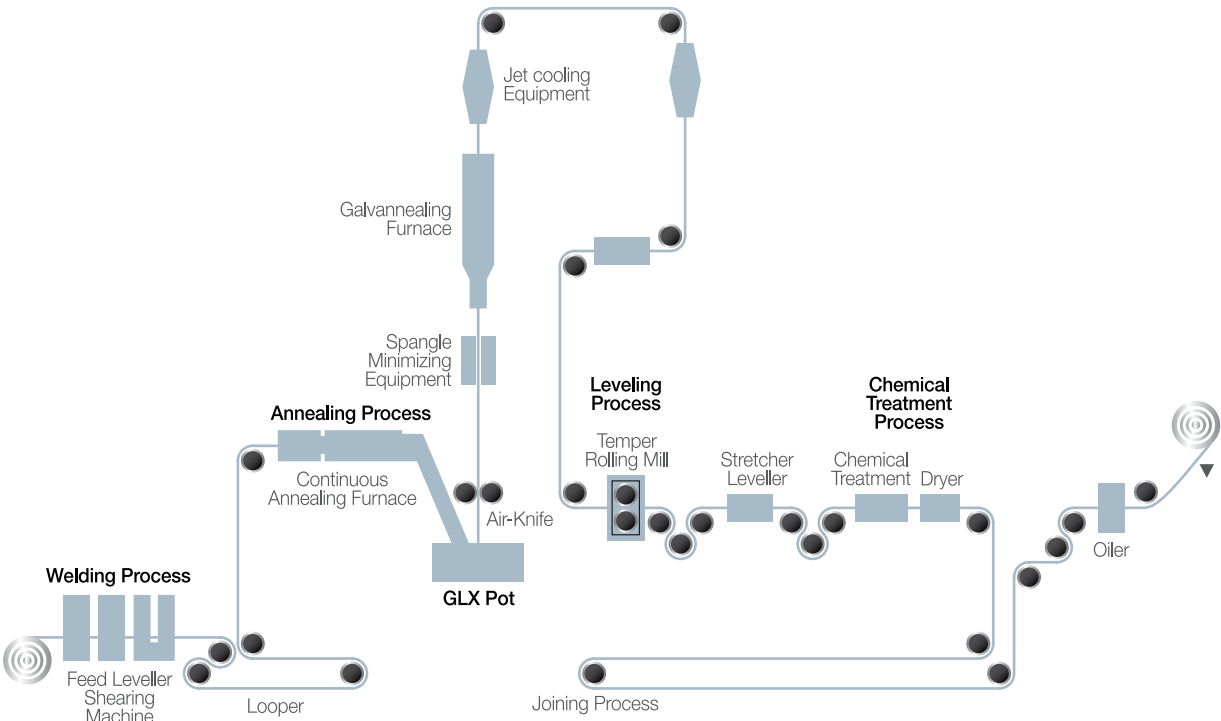
Coating Weight

Al · Zn Alloy Coating Weight	Coating Thickness
90g/m²	24μ
100g/m²	26μ
120g/m²	32μ
150g/m²	40μ
200g/m²	52μ

Surface Treatment

- Chromated
- Anti Finger Printed
- Oiled
- Cleanlume
- Lubricant Unilume
- Cr-Free

Unilume Production Process



We will spread a new horizon in the agricultural pipe market with reliable and excellent quality

Galvalume Pipe



Galvalume Pipe

With excellent quality properties, Japan substituted more than 70% of agricultural pipe production with galvalume pipe from the existing galvanized pipe since 1999.

Galvalume pipe is high endurable alloying steel sheet with aluminum (55%) and zinc which has considerably outstanding durability 3 times than galvanized steel sheet.

In addition, it had stronger alloying properties than single metal and special coating processing for agricultural pipe material.

Galvalume pipe was developed first in USA in 1976 and produced stably more than 9 million ton annually and in Korea, DONGKUK STEEL started a commercial production in 1986 and now 4 manufacturers are producing it.

Examples	Application
Agriculture	Vinyl greenhouse, cattle shed, silo, agricultural storage warehouse, dryer
Architecture	Roof and exterior wall of Architecture building, frame of assembly housing (The only coating steel sheet with excellent durability, used for roof and wall side without painting)

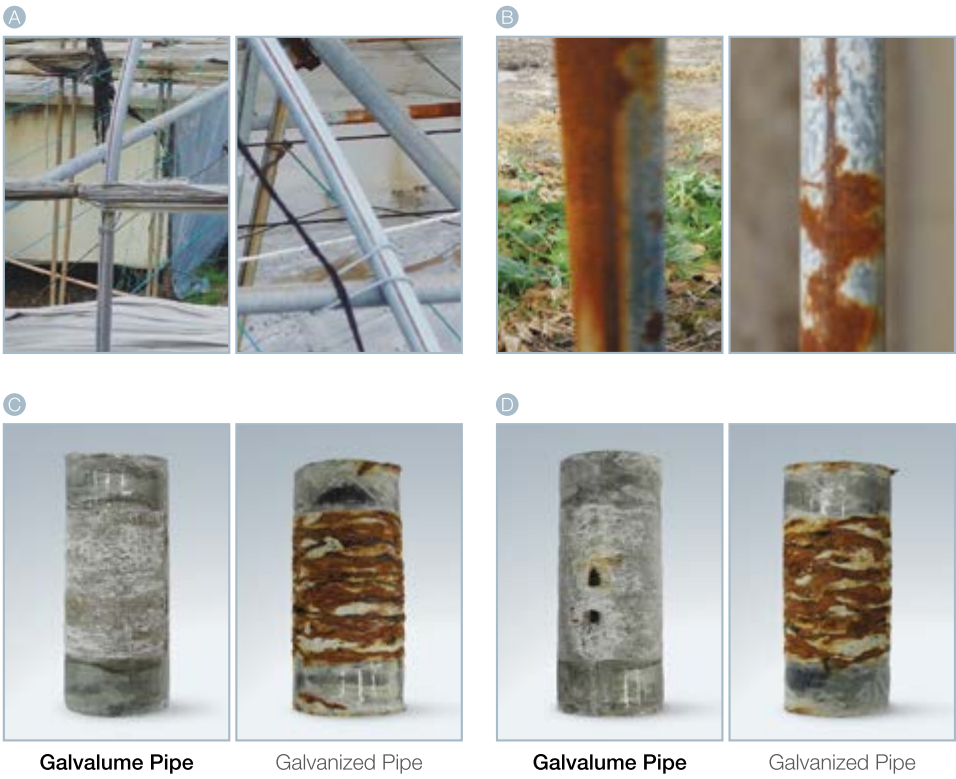
Examples	Application
Automobile	Muffler, fuel tank, exhaust pipe, body air cleaner cover under truck
General industry	Large wave steel pipe for sewage, water heater, heat exchanger, dryer, waste incinerator, boiler, duct

Corrosion Resistance

Corrosion Resistance

The galvalume pipe does not allow the rust of the welding area to spread to the surrounding area. The agricultural pipe is characterized to be the occurrence of corrosion in the linear type at the welding area first and spread to the surrounding area.

The existing galvanized pipe spreads the red rust faster 3 times to the galvalume pipe.



- A Red rust at welding area of pipe for house installation (Galvanized Pipe)
- B Spread of red rust at welding area of pipe for house installation to the surrounding area (Galvanized Pipe)
- C Corrosion resistance for salt water of pipe at non-welding area (500 hrs)
- D Corrosion resistance for salt water of pipe at welding area (500 hrs)

Durability

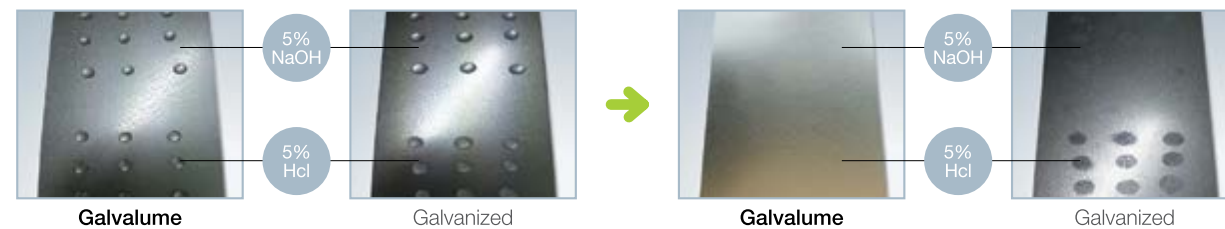
Durability

The fertilizer and agricultural chemicals contain alkali components such as lime but mainly acid components and often the effective chemicals contain sulfate which is a strong acid. Likewise, due to the use of fertilizer and agricultural chemicals, in the vinyl greenhouse, the corrosive environment with acid and alkali components and humidity is formed and thus within several years, there is a possibility that red rust is generated.

The galvalume pipe contains lots of acid-resistant aluminum and the special polyester coating film has excellent durability for alkali, which is suitable for the corrosive environment in the vinyl greenhouse.

Photos of result of acid-resistance and alkali-resistance tests and other chemical tests and test conditions

Chemical test for galvanized steel sheet

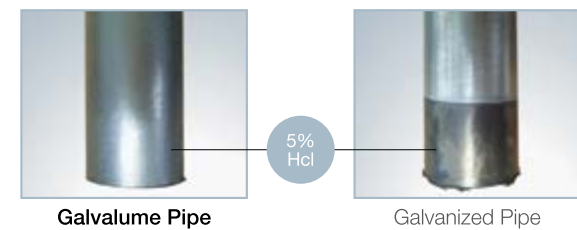


Result of chemical test for galvanized steel sheet

Chemical test for pipe



Result of chemical test for pipe (HCl 5%, 30 minutes)



Result of chemical test for pipe (NaOH 5%, 30 minutes)



High Strength

High Strength

The most major problem of red rust is a tear but in case of snow or strong wind, it may cause the vinyl greenhouse to collapse.

Change of mechanical property of pipe by occurrence of red rust

Pipe Area	Red Rust Area	Bending Stress Reduction	Remarks
Welding area	25%	No change	<ul style="list-style-type: none"> Sample pipe for test Remove the coating layer by chemical corrosion as much as the area of red rust occurrence No change of steel thickness using the inhibitor of Fe reaction
	50%	No change	
	100%	No change	
All	25%	0.5%	<ul style="list-style-type: none"> Thickness ratio of coating layer in pipe thickness 1 ~ 1.5% level (1.6t pipe single side) Compare the bending stress with normal pipe by 90° bending
	50%	2.0%	

* The red rust occurs by loss of coating layer and the exposure of Fe, and the initial red rust does not affect the strength as it has little change in thickness.

Change of mechanical property by reduction of thickness of pipe

Reduction of Average Thickness	Bending Stress Reduction	Remarks
5%	7%	<ul style="list-style-type: none"> Sample pipe for test Measure the reduction of weight by the forced corrosion with strong acid Uneven corrosion occurs locally Compare the bending stress with normal pipe by 90° bending
10%	16%	
30%	42%	

* Over time, the red rust is spread to the surrounding area and as the rust of the outer section peels off, the pipe's thickness becomes thinner and the thickness is greatly reduced locally. In case of snow or strong wind, the stress will be concentrated to this area which may cause the vinyl greenhouse to collapse.

Bending Test

