By EFTCG
NORDIC
STEEL

+90 216 594 50 30

info@eftcg.com

Ferhatpaşa Mahallesi
Akdal Sokak No:5, Ataşehir / İSTANBUL

Areas of salt damage

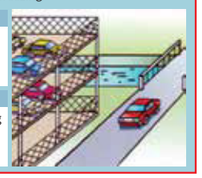
1. Areas within 2 km of a coast line: Environments subject to flying particles of sea salt (seawater mist)
2. Highways, bridges and surrounding areas in cold regions: Environments where agents used to melt ice and snow are dispersed to prevent freezing

<Target Applications>

Multi-storied parking garages, factory buildings, plants, warehouses, bridges, highway- and railway-related facilities, other civil engineering/building steel structures

<Steel Products for Applications>

Light-gauge steel shapes, pipes (square, round), steel backing materials for ceiling, cable racks, deck plates, steel fences, ducts, various panel members, gratings



Facilities and compost plants related to agriculture and dairy farm

1. Environments subject to high humidity and temperature, where temperature differences are large and condensation is likely to occur
2. Environments with a strong alkaline atmosphere and where gases are generated from livestock feed, manure, etc.

<Target Applications>

Agricultural houses, cattle sheds (henhouse, cowhouse, pigsty), compost houses and plants

<Steel Products for Applications>

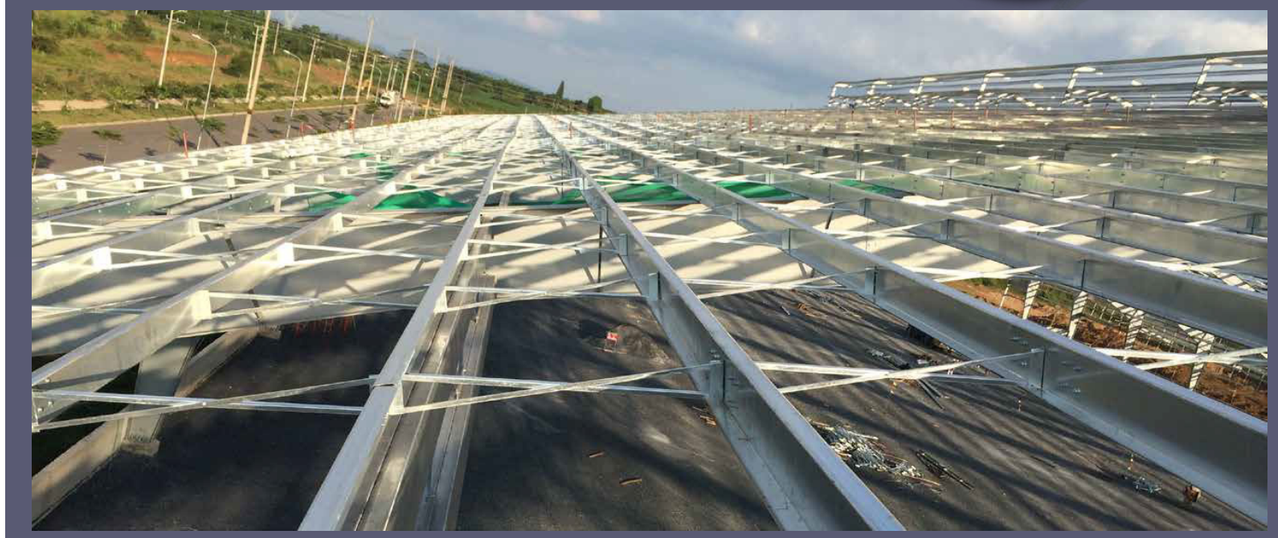
Light-gauge shapes, pipes (round, square), steel backing materials for ceiling, cable racks, deck plates, steel fences, ducts, various panel members

By EFTCG
NORDIC
STEEL

Silver180™

Silver180™ is very highly Corrosion - Resistant hot dip coated steel sheet that has a coating layer of Zinc, Aluminum, and Magnesium.

Long life up to:
- 300% better than ZincAlum
- 10 times better than Zinc



Silver180™

Contents

Exceptional Resistance to Rust !

Superior corrosion resistance in chloride and ammonia environments

Self-repairing protection for cut edges and scratch

An alternative to aluminium or stainless

Environmentally friendly

Silver180™ is a pre-coated steel sheet that can be used in a wide variety of fields and applications due to its following features.

1. Superior corrosion resistance

In corrosion resistance¤, Silver180™ upto 10 times stronger than galvanized steel sheet and 3 times much better than Zinc Aluminum alloy coated steel sheet.

¤ estimated by salt spray test

2. Superior scratch resistance and self-repairing protection for cut edges

Silver180™ has better scratch resistance and self-repairing protection for cut edges than ordinary hot dip galvanized steel sheet.

3. Replacement for stainless steel and aluminium (surface-treated in their final shapes)

With its attribute to withstand severely corrosive environments, Silver180™ can replace stainless steel & aluminium products and thus enable customers to streamline manufacturing processes.

4. Resource-saving and Environment-friendly

Silver180™ can be called a resource - saving product since it lasts long and provides excellent corrosion resistance with relatively light coating.
Silver180™ can also be called an environment-friendly product since it satisfies requirements of such environmental regulations as RoHS and ELV *.

* Please specify "chromium-free" treatment

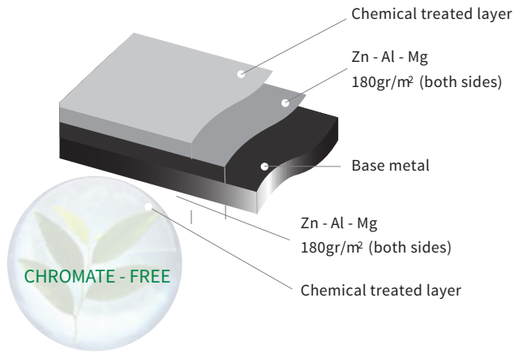
Silver180™

(for Roof, Wall, Purlin)

The corrosion resistance of Silver180™ is enhanced by the composite effect of adding aluminum & magnesium to the conventional zinc coating.

Product Description:

Base Metal Thickness (mm)	Total Coating Thickness (mm)
0.45	0.5
0.75	0.8
1.45	1.5
1.85	1.9
2.35	2.4
2.95	3.0
3.95	4.0



Recommended End Use

- Silver180™ application Environments that Require Higher Corrosion/Alkaline Resistance.
- Application for Rafters(NordicHybrid), Purlins,Girts, Sag Arrestors,Flange Bracing,Roofing,Mezzanine Decking,Valley Gutter for Industrial & Commercial construction.It is especially"The Right Material"for Chicke n/ Cow Sheds, Animal Feed/ Fertilizer/ G arbag e Treatment, Concrete contact & Close to Sea/ Ocean projects

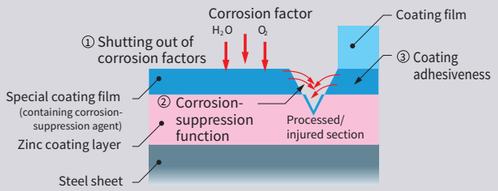
Purlin & Sag Arrestor with Silver180™ Coating

Girts with Silver180 ™ Coating

Corrosion Resistance Mechanism of Coating Film

Structure and Function of Coating Films

Coating Film



Corrosion Resistance Mechanism of Coating Film
Coating film uses substances selected because they provide the characteristic featu res of coated film such as its barrier effect, selfrestorative function and paint adhesiveness. Coating sheet has been realized by use of this special coating film.

Function of Coating Film
- Barrier effect
- Self restoration function

Effects similar to those offered by special coating film containing corrosion-suppression agent

Typical Applications

Using Silver180™ coating:

NordicHybrid

Roofing

NordicDeck (Mezzanine decking)

Sag Arrestor/ Purlin

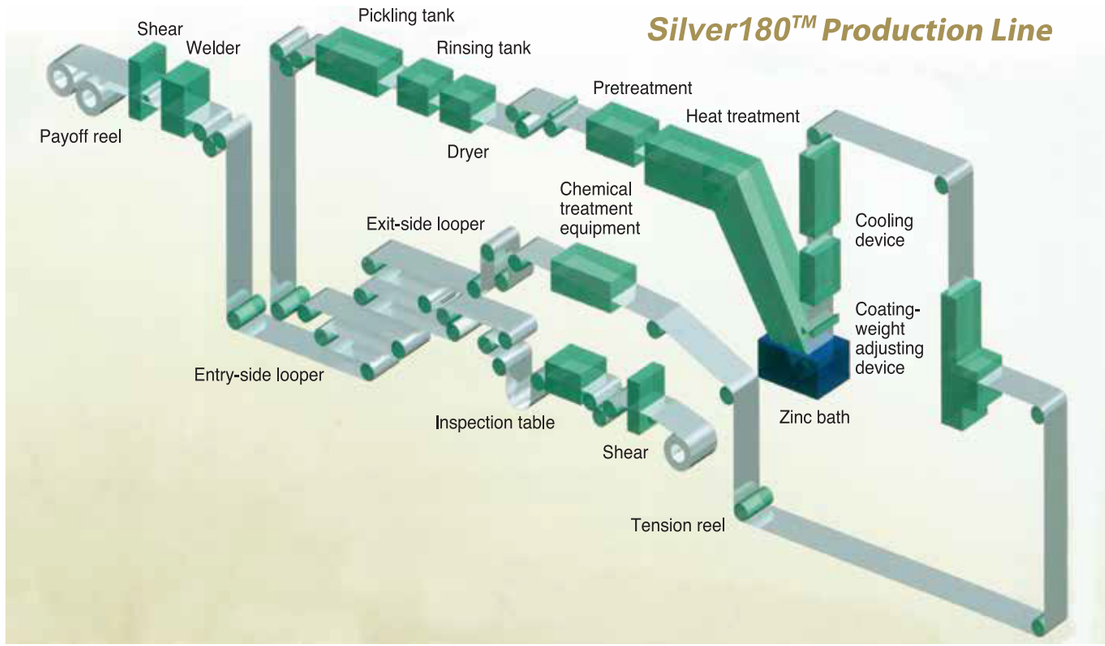
Flange Bracing

Valley Gutter

Galvanizing pot

Purlins

Manufacturing Processes



Chicken / Cow Sheds

Animal Feed

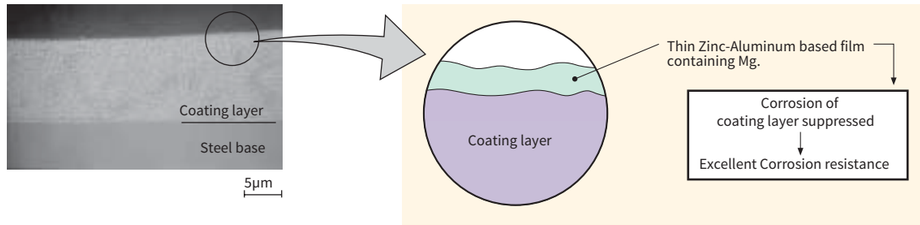
Fertilizer

Close to Sea / Ocean / Acid Rain

1. Corrosion Resistance Mechanism of Silver180™

Corrosion resistance mechanism

Mg and Al in the coating layer combine to form a fine, tightly adhered protective film. This thin surface structure suppresses the corrosion of the Silver180™ coating, thus effectively enhancing overall corrosion resistance.



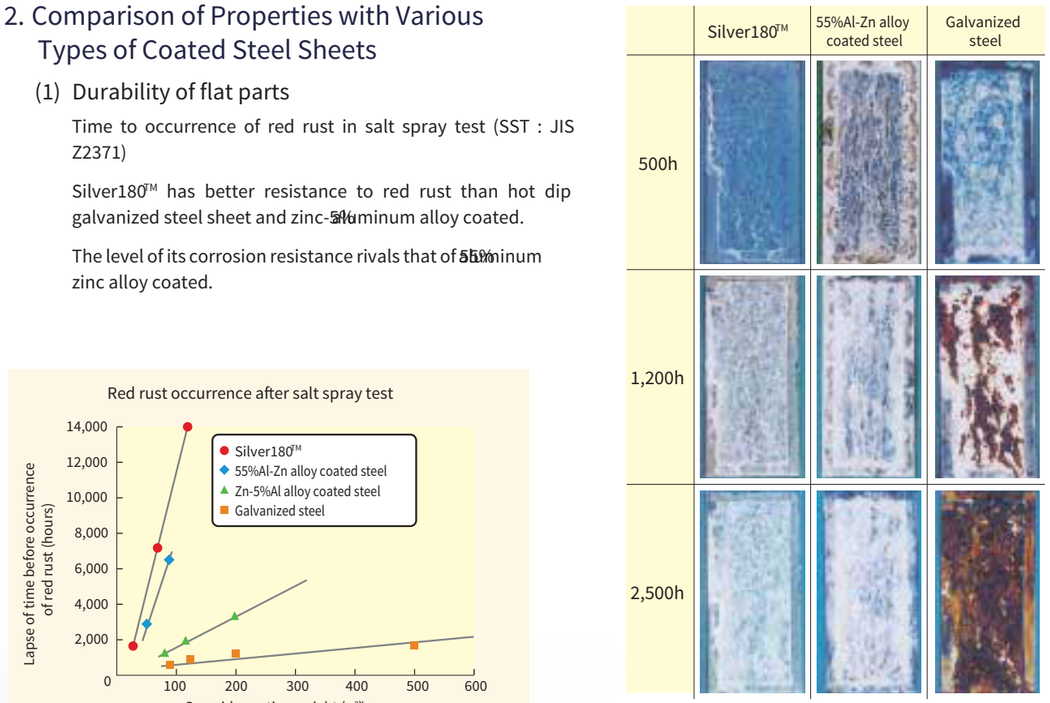
2. Comparison of Properties with Various Types of Coated Steel Sheets

(1) Durability of flat parts

Time to occurrence of red rust in salt spray test (SST : JIS Z2371)

Silver180™ has better resistance to red rust than hot dip galvanized steel sheet and zinc-5%aluminum alloy coated.

The level of its corrosion resistance rivals that of 55%aluminum zinc alloy coated.

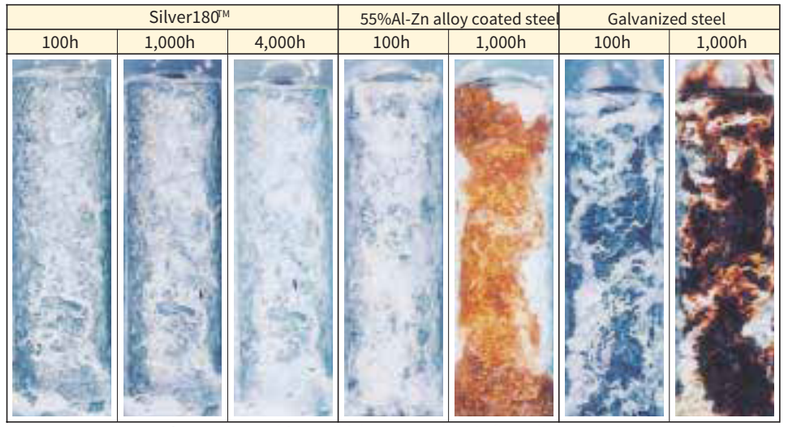


Appearances of specimens after salt spray test
(Coating weight : 90gr/m² (one side), untreated)

Purlins/Girts with Silver180™ Coating
Nike Shoes Factory (Can Sport - Taiwan) - 46,000m²

(2) Appearances of processed parts in a salt spray test (SST)

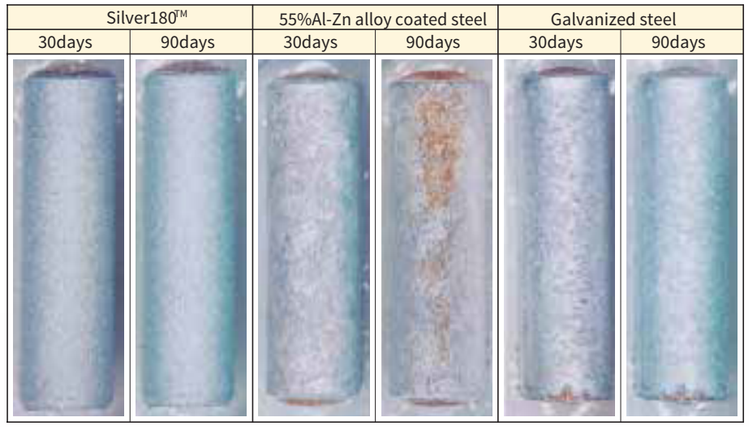
The photos show the occurrence of red rust on 1-mm-thick processed parts in salt spray test (SST).
Due to its excellent ability to prevent corrosion, Silver180™ has better resistance to red rust on processed parts than 55%aluminum-zinc alloy coated steel sheet.



Appearances of 1-mm-thick processed part after salt spray test
(Thickness 1mm,180°bending, thickness : 3.2mm, 120/120gr/ m², untreated)

(3) Appearances of processed parts after outdoor exposure test

Silver180™ shows excellent corrosion resistance even in processed parts.



Appearances of 1-mm-thick processed part after 90-day exposure tests
(Thickness 1mm,180°bending, thickness : 3.2mm, 120/120gr/m², untreated)

Waste Treatment –Severe Corrosion (Urea, Ammonia, etc)

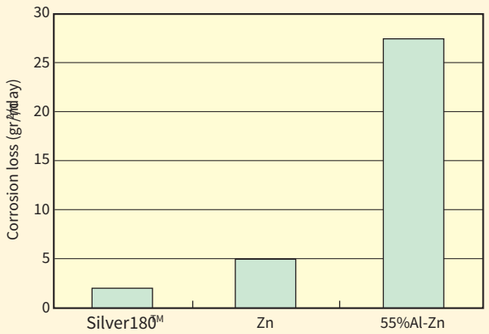
Roofing/Pulins/Sag Arrestor/Valley gutter with Silver180™ Coating
Vietnam Waste Solution (California - USA)

3. Anti-Chemical Performance

(1) Ammonia resistance

Silver180™ resistance to ammonia is better than that of hot-dip 55% aluminum-zinc alloy coated steel sheet.

Corrosion loss of three types of coated steel sheets in ammonia water



- **Materials tested**

	Type of coating	Coating weight	Substrate	Post-treatment
Silver180™	Zn - Al - Mg	90gr/m² (one side)	Soft steel	Untreated
55%Al-Zn alloy coasted steel	55%Al-Zn	80gr/m² (one side)	Soft steel	Untreated
Galvanized steel	Zn	90gr/m² (one side)	Soft steel	Untreated

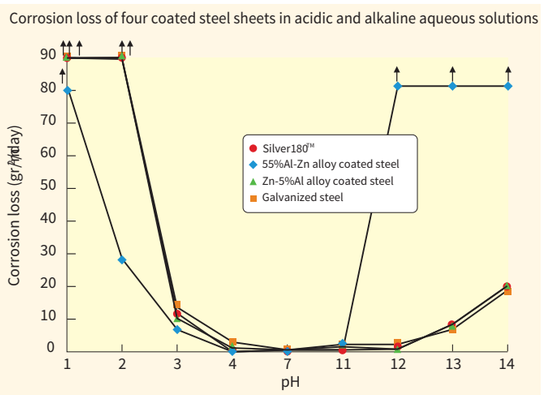
- **Testing conditions**

After immersion for 24 hours in 5% ammonia water a 22°C, the corrosion loss was measured. The cut ends and the rear surfaces of the test piece were sealed

(2) Resistance to chemicals (corrosion in Acidic and Alkaline aqueous solutions)

In Acidic and Alkaline aqueous solutions, Silver180™ shows the same corrosion behavior as zinc-based coated steel sheet.

Corrosion loss of four coated steel sheets in acidic and alkaline aqueous solutions



- **Materials tested**

	Type of coating	Coating weight	Substrate	Post-treatment
Silver180™	Zn - Al - Mg	90gr/m² (one side)	Soft steel	Untreated
55%Al-Zn alloy coasted steel	55%Al-Zn	80gr/m² (one side)	Soft steel	Untreated
Galvanized steel	Zn	90gr/m² (one side)	Soft steel	Untreated

Garbage Treatment Facility

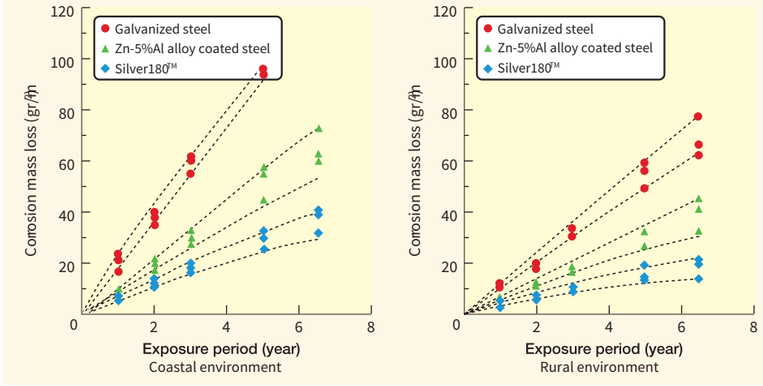
- **Testing method**

- Solution: Starting with an aqueous solution containing 1gr/liter Na_2SO_4 as the base mix, its pH was varied from 1 to 14 by adding H_2SO_4 on the acidic side and NaOH on the alkaline side.
- To measure corrosion loss test pieces (n=3) were immersed for 24 hours in a solution adjusted to each pH at 30°C, and the corrosion loss was determined. Ends and bottom surface of the test pieces were sealed.

4. Outdoor Exposure Test Results

According to results of exposure tests conductted over a period of approximately seven years, Silver180™ is fourtimes as corrosion resistant as galvanized steel sheet. Since corrosion mass loss of zinc-aluminum coated steel sheet tends to lessen over time, the superiority of Silver180™ in this respect is likely to become more pronounced in subsequent years.

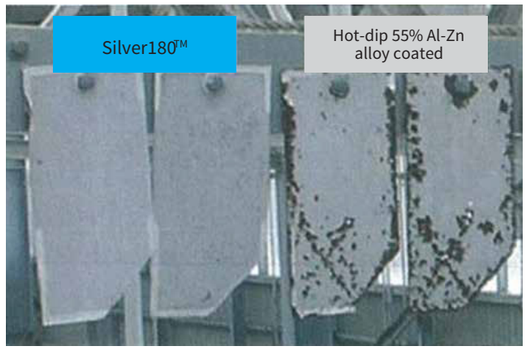
Corrosion loss in coating layer by outdoor exposure test



- **Outdoor exposure test site**

	Exposure site
Coastal environment (approx. 30 m from the seashore)	Okinawa Prefecture Nakagusuku mura
Rural environment	Gunma Prefecture Kiryu city

5. Closed Compost House Test Result (5 years)



Exposure test in a compost house

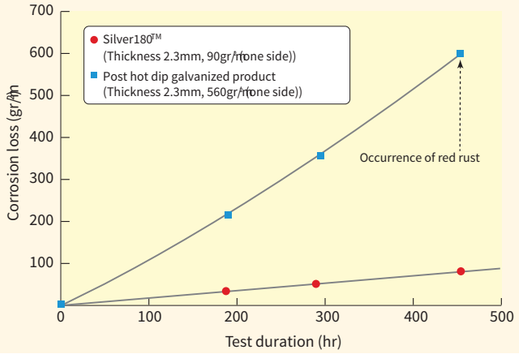
Silver180™ showed better corrosion resistance than hot-dip 55% Al-Zn alloy coated sheet.
(No red rust occurred in any of the flat sections bent sections, and cut edge

	Flat part	2t bent sections	Cut edge
Silver180™ K27 ZG treatment			
Hot-dip 55% Al-Zn alloy coated AZ150 Organic chromate treatment			Red rust occurred.

6. Resistance to Acid & Acid - Rain

Silver180™ shows better corrosion resistance than post hot dip galvanized products in a sulfur dioxide (sulfurous acid gas) environment.

Corrosion loss of Silver180™ and post hot dip galvanized products in sulfur dioxide tests



Sulfur dioxide test conditions

Sulfur dioxide concentration : 100 ppm
Testing temperature : 40°C
Relative humidity : 98% or more
(conforms to JIS H8502)

Silver180™	Post hot dip galvanized products
	

Appearances after 450 hours of sulfur dioxide test

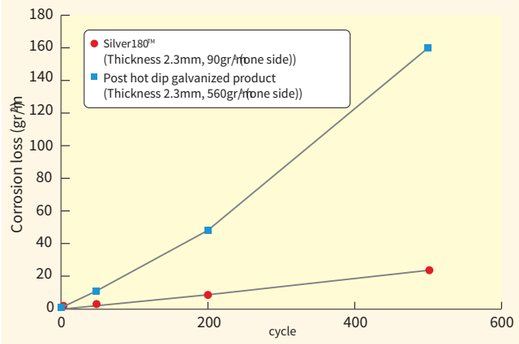
10mm

Silver180™ shows better corrosion resistance than post hot dip galvanized products in acid-rain environment.

- Acid rain simulated combined-cycle corrosion test conditions

① : Spraying (0.1%NaCl+H_2SO_4), 1hr, 35°C, pH: 4
② : Drying, 4hrs, 50°C, relative humidity 30
③ : Moisture, 3hrs, 50°C, relative humidity 98

Corrosion loss of Silver180™ and post hot dip galvanized products in acid rain simulated combined-cycle corrosion test



- **Corrosion rate of Silver180™** and post hot dip galvanized products in acid rain simulated combined-cycle corrosion test

	Corrosion rate
Silver180™	0.05gr/m²/cycle
Post hot dip galvanized aproducts	0.35gr/m²/cycle

Note : Mean value at 500 cycles

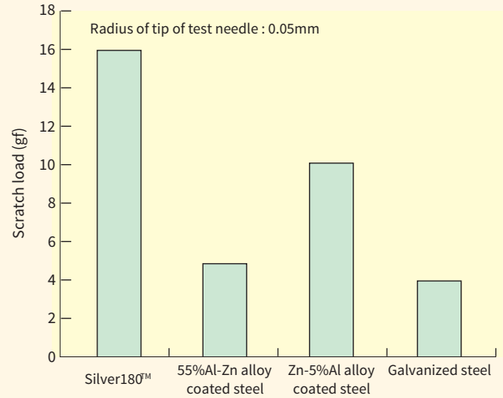
- **Materials tested**

Classification	Type of coating	Coating weight	Substrate	Post-treatment
Silver180™	Zn - Al - Mg	90gr/m² (one side)	Soft Steel	Untreated
Post hot dip galvanized products	Zn	560gr/m² (one side)	Soft Steel	Untreated

7. Scratch resistance of the coating layer

Silver180™ has harder coating layer than hot dip galvanized steel sheet or hot dip 55%aluminum-zinc alloy coated steel sheet, which gives it better scratch resistance and allows it to be used in applications that are subject to scratching and repeated friction during process ing.

Scratch resistance of various types of coated steel sheets (scratch test)



NordicDek (Mezzanine Decking with Silver180™ **Coating)**

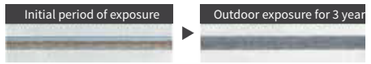
How the scratching load was measured A sapphire testing needle having a tip radius of 0.05mm was pressed vertically against the test piece with a force of 0.0196-0.196 N (2-20gf). The needle scratched across the test piece for a distance of 20mm. After the surface was visually examined for anyscratching, and the minimum load that produced scratching was taken as the scratching load.

<Reference> Hardness of the coating layer (Vickers hardness (Hv) : measurement examples)

Silver180™	140 ~ 160Hv
55%Al-Zn alloy coated steel	100 ~ 110Hv
Zn-5%Al alloy coated steel	80 ~ 100Hv
Galvanized steel	55 ~ 65Hv

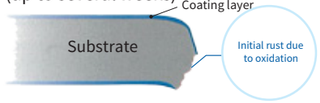
8. Mechanism of corrosion resistance on cut edge

Excellent corrosion resistance is achieved on cut edge parts by covering the ends with a fine zinc-based protective film that contains Al and Mg leaching from the coating layer.



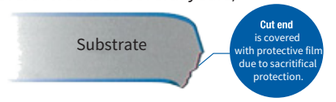
(Thickness: 3.2 mm, coating weight: 150/150 g/m², post-treatment: chromate 50 mg/m²
Note: The color and the speed of change in color depend on sheet thicknesses and exposure environments (region, installation location, aspect, etc.).

Initial exposure period
(up to several weeks)



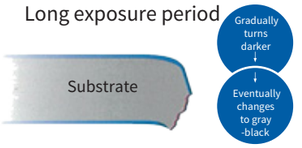
The exposed cut edge of substrate is oxidized due to rain, condensation, etc.

Intermediate exposure period
(several weeks to several years)

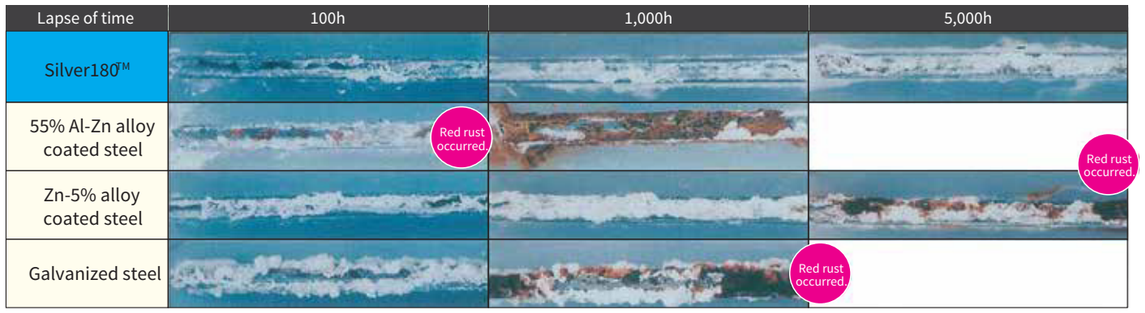


The fine zinc-based protective film containing Mg covers the cut edge with leaching of Zn, Al, and Mg from the coating layers.

Long exposure period



Silver180™ shows better red-rust resistance (durability) on cut edge than any other coated steel sheet.



5mm

Appearances of cut edges after salt spray test (Thickness: 3.2 mm, coating weight: 120/120 g/m, untreated)