



ZAM

Hot-dip Zinc-Aluminium-Magnesium
Coated steel sheet

2. What is ZAM coating

ZAM

Hot-dip Zinc 91%-Aluminium 6%-Magnesium 3%
coated steel sheet

2. What is **ZAM** coating?

Modern hot-dip ZINC coatings

Coating Composition	Standard ZINC	ZAM	Alu Zinc (Zincalume)	Galfan
Zinc	100%	91%	45%	95%
Aluminium	-	6%	55%	5%
Magnesium	-	3%	-	-

2.1. ZAM Development – U.S.A.

1985 Original Research – Bethlehem, U.S.A.

Objective to develop protection superior than 100% Zinc.

Resulted in

(A) 55% Aluminium, 45% Zinc Coating now known as Aluzinc, Zincalume, Galvalume.

(B) 91% Zinc, 6% Aluminium, 3% Magnesium – ZAM

Although ZAM showed superior corrosion resistance, the price of Magnesium was high in 1980's and so 55% Aluminium, 45% Zinc, or Zincalume type coating system was licenced to more than 21 steel mills.

2.2. ZAM Development - Nisshin Steel

- 1990's Nisshin Steel of Japan continued development of ZAM.
- 1996 Commercial Trial Samples of ZAM produced by Nisshin Steel
- 2000 Official launch of Nisshin Steel 's ZAM production line
- 2003 Two new magnesium production facilities in China
- 2004 ZAM production typically 22,000MT per month, or 280,000MT p.a. Majority used in Japan e.g. Steel framed houses.
- 2005 ZAM production to be expanded to 30,000MT per month, or 360,000MT p.a.

Nisshin Steel's total coated steel production of ZAM, Galvanised, Galvalume, etc is 300,000MT per month, or 3.6 million MT p.a.

2.3 ZAM Corrosion Resistance

◆ Corrosion resistance mechanism of ZAM

Mg and Al in the coating layer combine to form a fine, tightly adhered protective film. This thin dual layer surface structuring suppresses corrosion of the ZAM coating, affectively enhancing overall corrosion resistance.

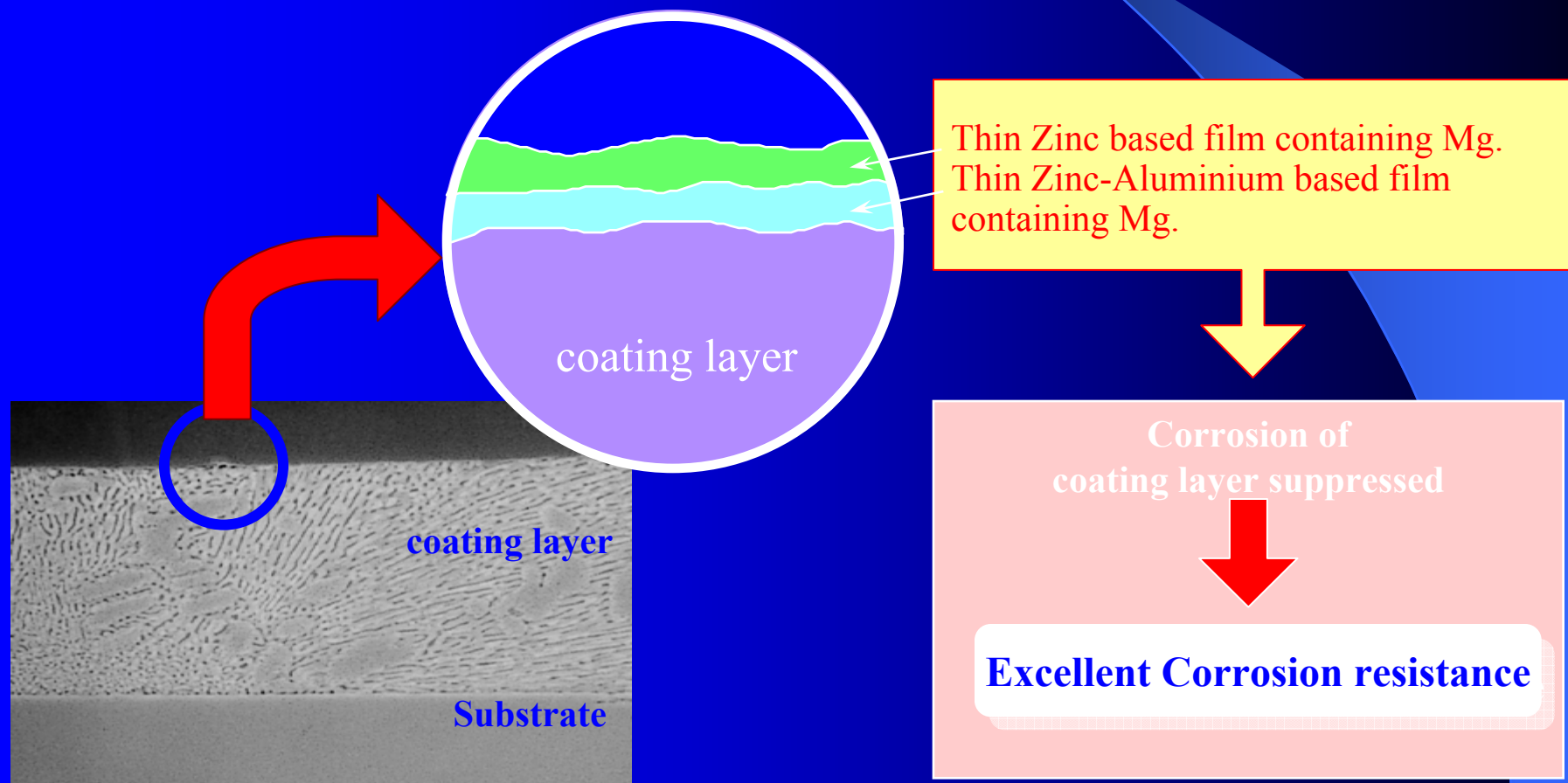


Photo : Cross section of coating layer

2.4 What size is it available in?

◆ Production range

- Sheet thickness : 0.25mm to 6.0mm
- Sheet width : 600mm to 1350mm
- Tensile strength : G250 → G550
- Coating weight : 70 → 290 g/m² (both sides)

ZAM : 290g/ m² much better than Z600 Zinc in most applications

- Chemical treatment and oil-coated finishes

Chemical treatment
High-corrosion resistant chromate
Chromium-free treatment
untreated

Type of oil-coated
Oil-coated
No oil-coated

- Substrate: Same as conventional hot-dip galvanised steel sheet



3. What is special about ZAM?

3.1 ZAM Durability

◆ ZAM Durability

1. Superior corrosion resistance

In corrosion resistance, ZAM is more durable than galvanised steel and better than Zinc Aluminium coated steel sheet. Its performance exceeds Z450 ZINC coating in most application.

2. Superior cut edge corrosion resistance

3. Superior scratch resistance

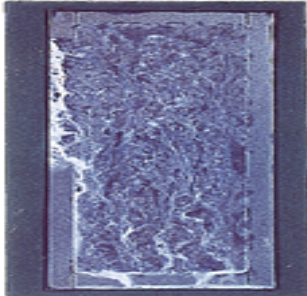

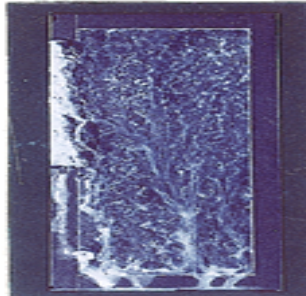
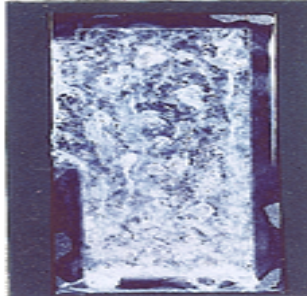
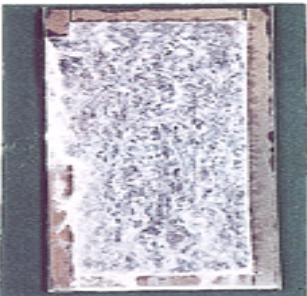
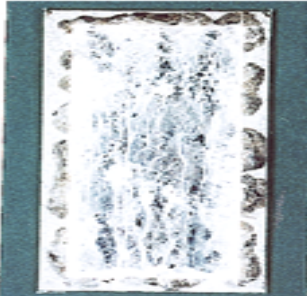
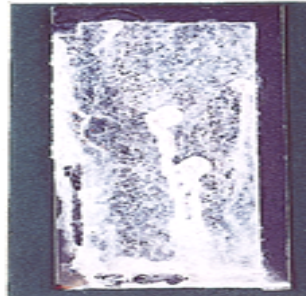
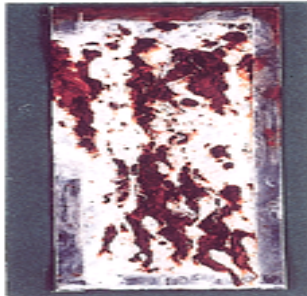
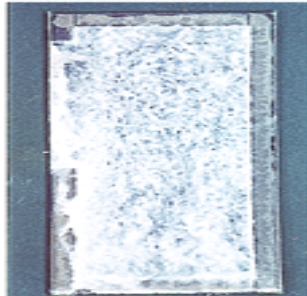
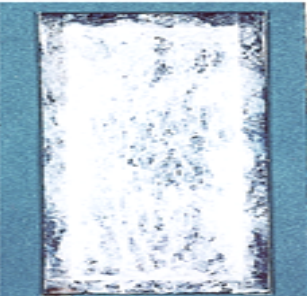
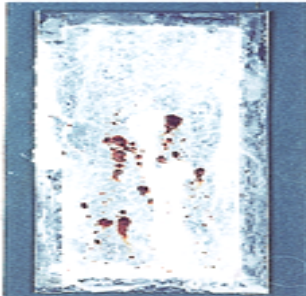
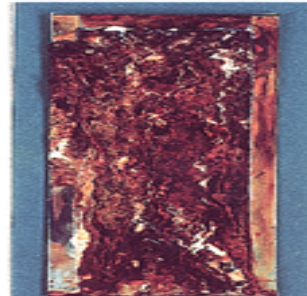
ZAM has better scratch resistance than hot dip galvanised steel sheet.

4. Replacement for post hot dip galvanised products (surface-treated in their final shapes)

With its ability to withstand severely corrosive environments, ZAM can replace post hot dip galvanised products and eliminate certain manufacturing processes.

3.2 Salt Spray Test

◆Appearances of specimens after salt spray test

	ZAM	55%Al-Zn	Zn-5%Al	Zinc
500 h				
1200 h				
2500 h				

(Coating weight : 90/90 g/m², untreated)

3.3 Cut Edge Corrosion Resistance

◆Corrosion resistance on cut end

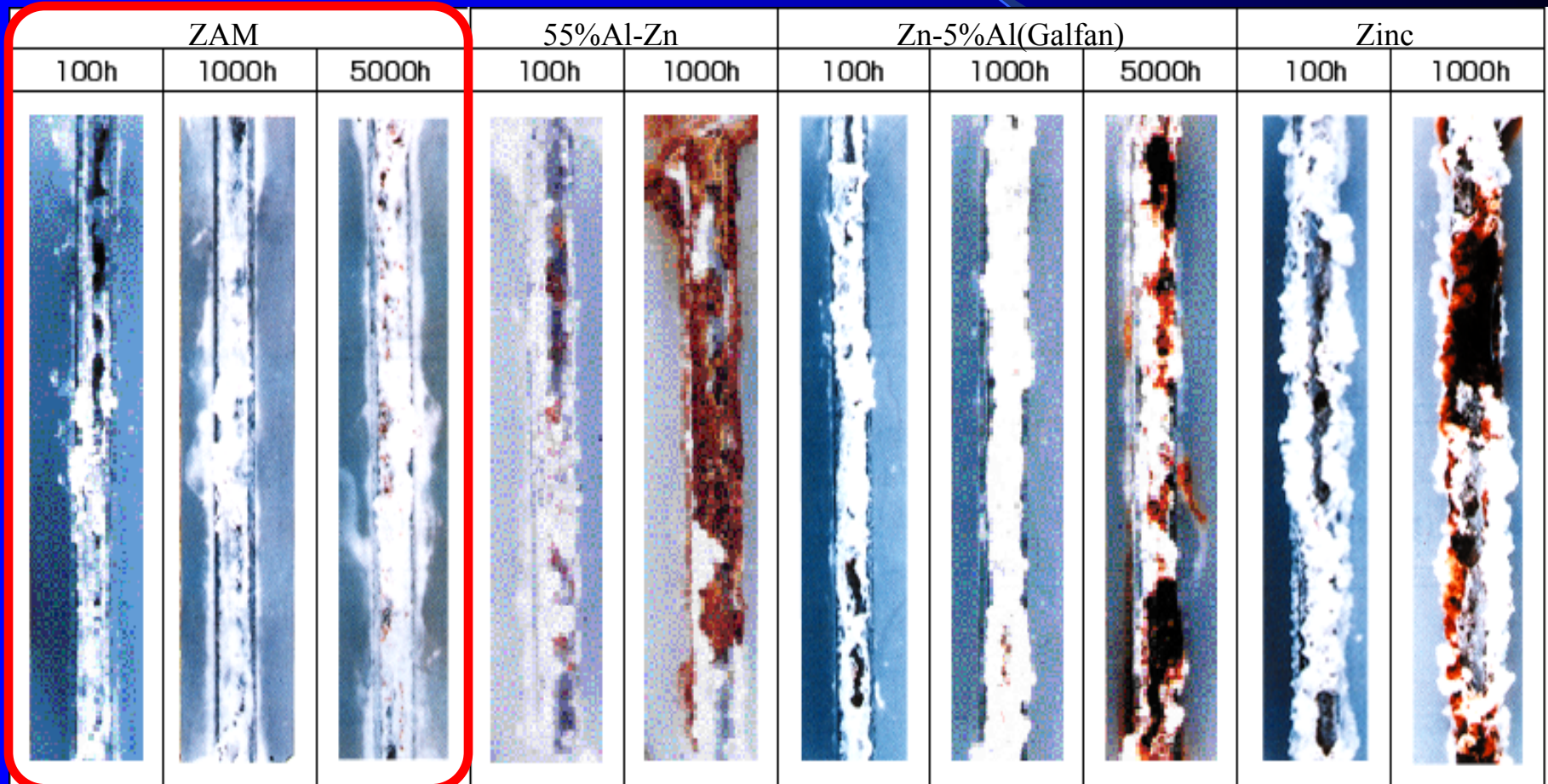


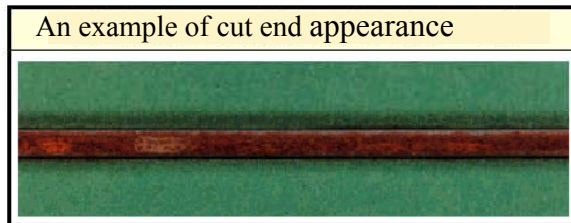
Photo : Appearances of cut ends after salt spray test
(Thickness : 3.2mm, Coating weight : 120/120g/m², untreated)

5mm

3.4 Cut Edge Appearance

◆ Appearance change of cut end (after 3 years)

Appearance of cut end after outdoor exposure test



Thickness : 3.2mm

Coating mass : 150/150g/m²

Chromate treatment : 50mg/m²

(Several weeks ~ Several months)

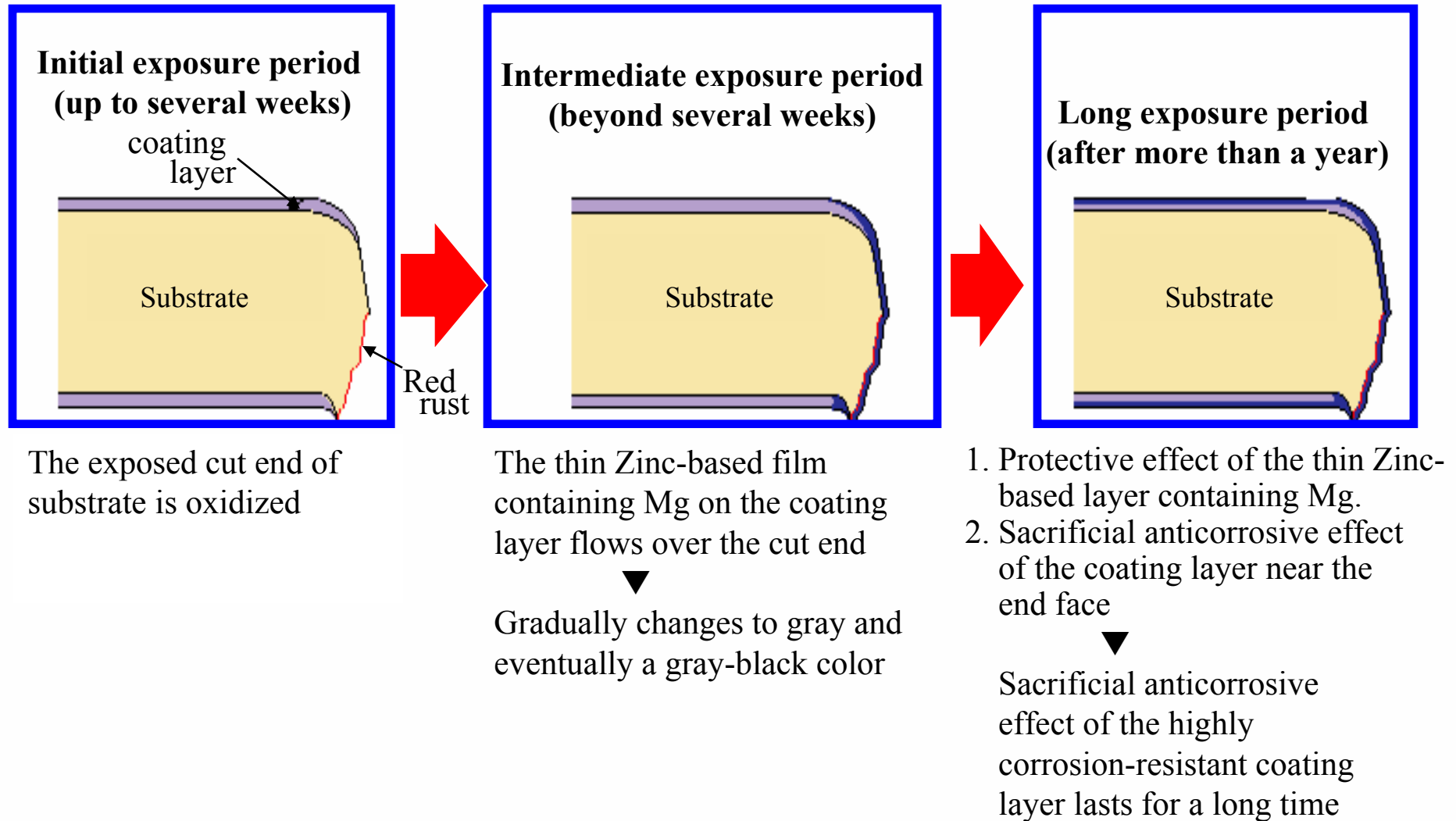


Location	after 3 years
Snowy area	
Coastal area	
Rural area	
Industrial area Beside seashore	
Industrial area Beside seashore	
Subtropical area Beside seashore	

3.5 How does it work? –











Mechanism of Corrosion Resistance

◆ Mechanism of corrosion resistance on cut end



3.6 Comparison to Z560 Hot Dip Zinc

- ◆ The results of a corrosion resistance comparison with post hot dip galvanized products
"ZAM" shows better corrosion resistance in a salt-damage environment than hot dip galvanised (HDZ55) sheet.

	500h	1000h	2000h	3000h	4000h
ZAM thickness:2.3 mm coating weight: 90 g/m ² (one side)					
Post hot dip galvanised products (HDZ55) Thickness 2.3 mm Coating weight: 560g/m ² (one side)					

Surface appearance (flat part) of various coated steel sheets in salt spray test

20mm
|-----|

3.7 How does it look aged?

In some environments, the surface colour will change to a dull grey colour as a part of its natural protection process.

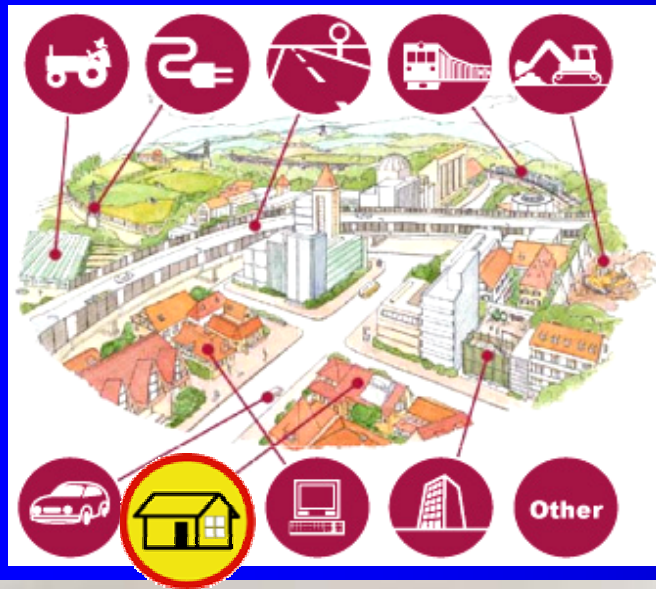
4. What is it good for?

4.1 Severe Environments

4.2 Salt Spray Exposure

4.3 Long term durability
in aggressive environments

4.4 Housing

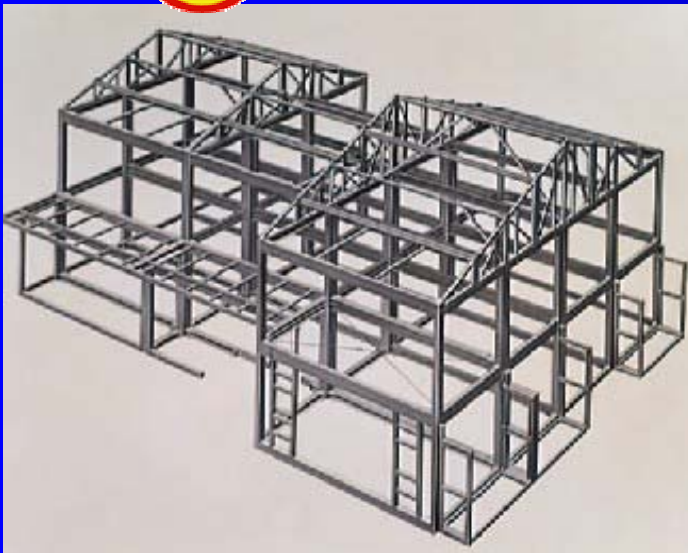


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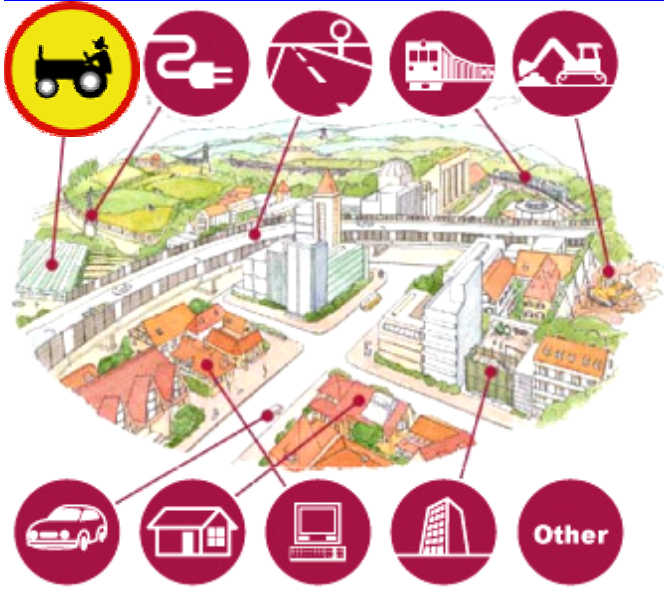
*0.55 G550 290gsm coating

*0.75 G550 290gsm coating

*0.95 G550 290gsm coating



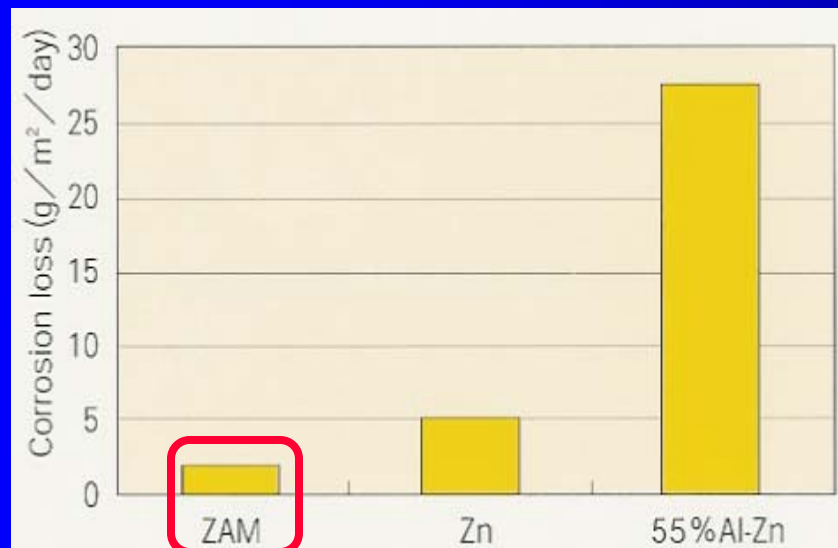
4.5 Agriculture



4.6:1 Resistance to Ammonia

ZAM has better ammonia resistance than hot dip galvanised steel sheet or 55% aluminium-Zinc alloy coated steel sheet.

Test results (1)



Test state

After immersion for 24 hours in 5% ammonia water at 22 °C, the corrosion loss was measured

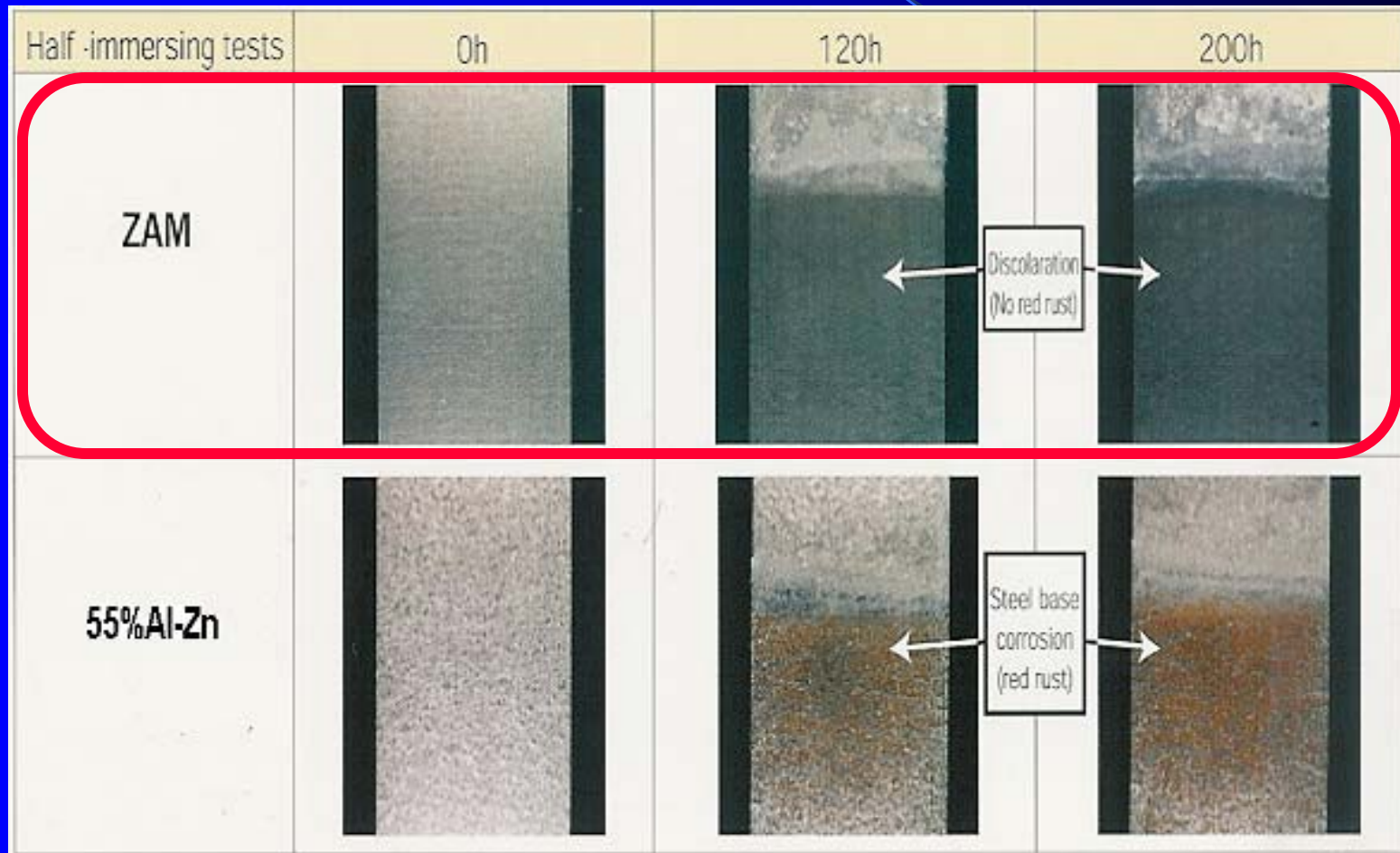
Corrosion loss of different types of coated steel sheet in ammonia water

Materials tested

Type of coating	Coating weight	Material	Post-treatment
ZAM(Zn-6%Al-3%Mg)	90g/m ² (one side)	Soft steel	Untreated
Zn	90g/m ² (one side)	Soft steel	Untreated
55%Al-Zn	AZ150 (90g/m ² (one side))	Soft steel	Untreated

4.6:2 Resistance to Ammonia

Test results (2)



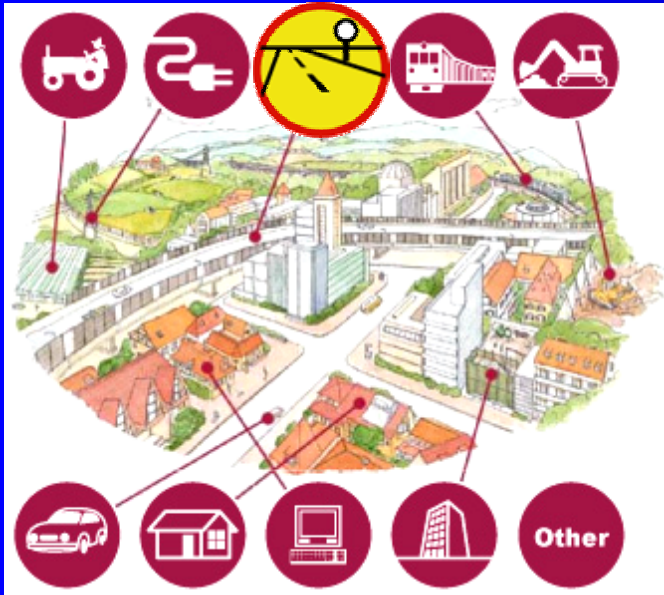
4.7 Commercial Building



***Flashing for tilt slab concrete buildings**



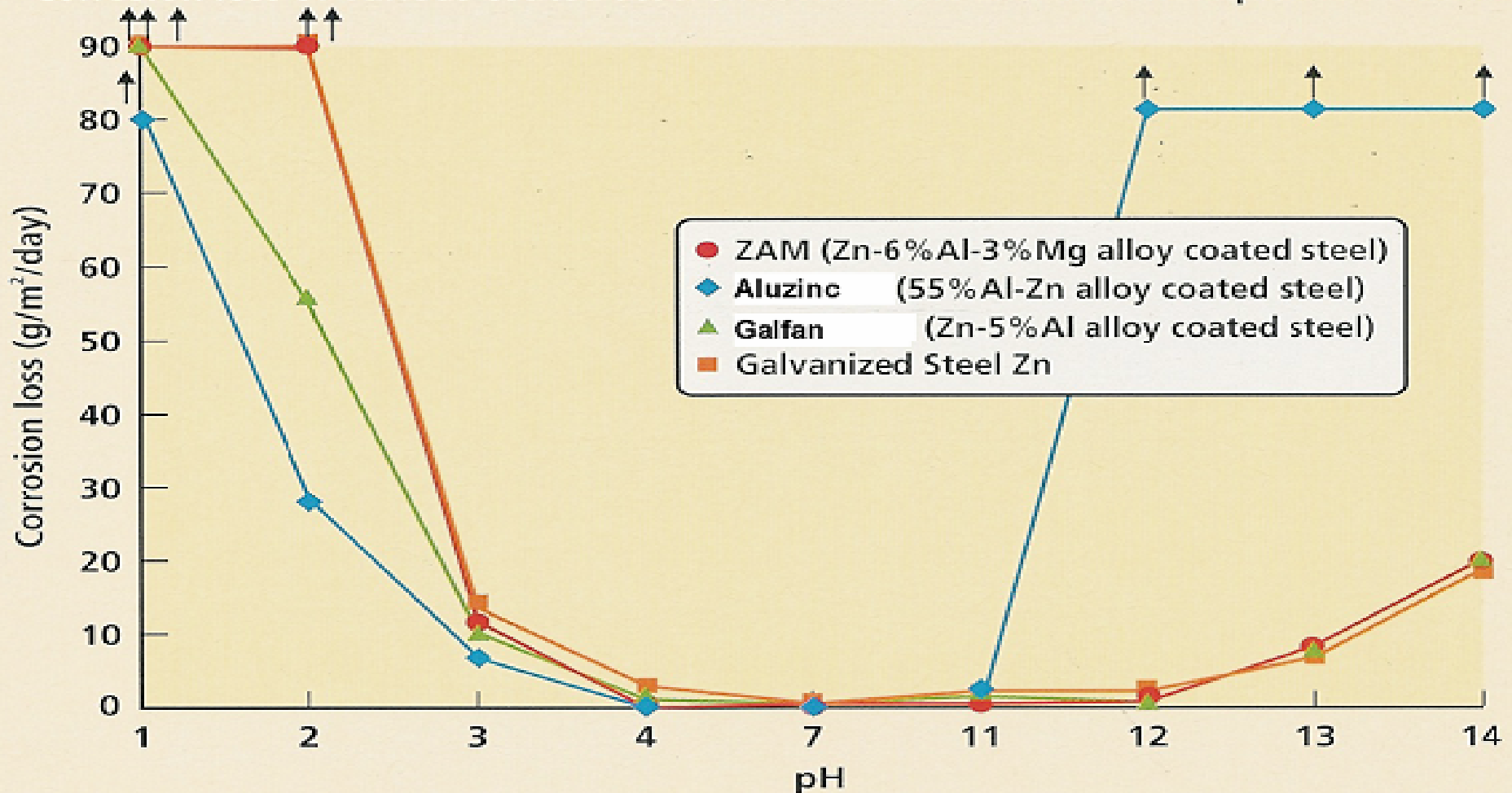
4.8 Road and Concrete



4.9 Resistance to Concrete

ZAM has better concrete resistance than other hot-dip galvanised steel sheets and Zinc-5%Aluminium alloy coated steel sheet. ZAM can be used for parts that come in contact with concrete with good durability.

Corrosion loss of various coated steel sheet in acidic and alkaline aqueous solutions



4.10 Pre-paint for Severe Environment



4.11 Fasteners

- * Due to its high ZINC content, ZAM has good corrosion resistance around fasteners.
- * Compared to Aluminium Zinc systems, ZAM has superior long term performance with stainless steel fasteners.

5. Where to get ZAM?

*Contact on MetalForming Technologies

+64 9 307 0411 or **info@metalformingtech.com**

* Price about 10% more than

AZ150 Zinc-Aluminium or Z275 Zinc product

for ZAM with 290gsm Coating

(Performance – Exceeds Z450 Zinc)

6.0 Questions