

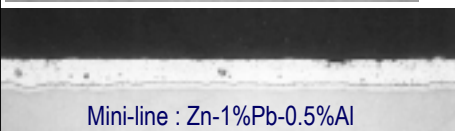
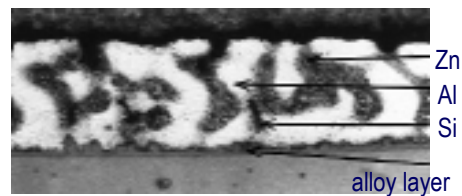
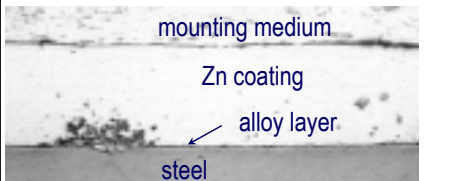
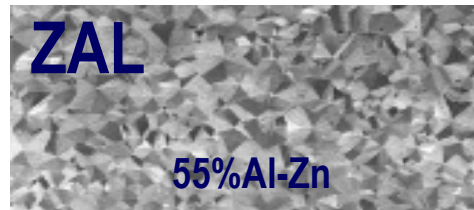
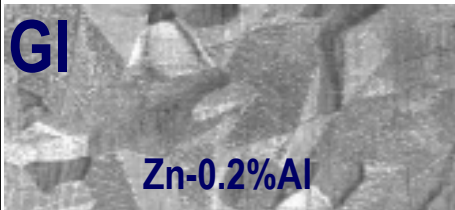


12th August 2008
Corrosion Performance of 55%Al-Zn Coated Steel

Dr Bryan Shedden

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Galvanized Steel and 55%Al-Zn Coated Steel



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Lifetime of coated steel

Depends on:

Coating type; Coating thickness; Environment type

Estimate by laboratory accelerated tests

Measure by very long term exposure of test panels



Predict from mass loss measurements

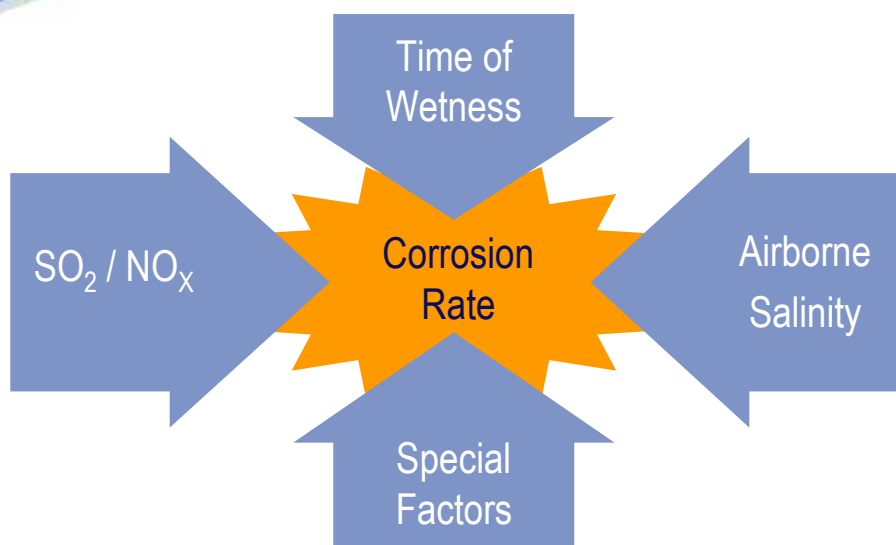
Confirm

by observing long term performance of buildings

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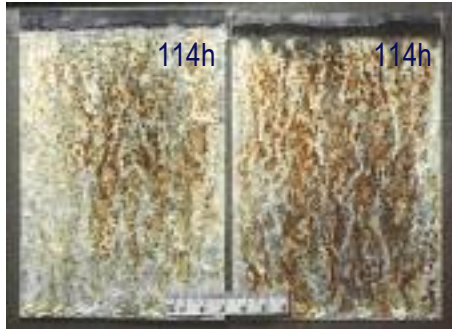
Atmospheric exposure



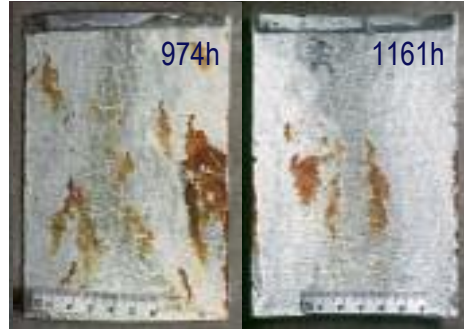
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Laboratory accelerated tests - salt spray



Z18 galvanized steel (mini-line)



AS100 ABADI® steel

AS100 life = 10X GI life in salt spray test

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Ref. SRL2002/048 5

Laboratory accelerated tests - salt spray



Z14 galvanized steel

Red rust after ... 397h



AS70 coated steel

2005h 5X GI life

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Laboratory accelerated tests - salt spray

Z14 + resin

0.5 mm



141h

AS50 INTERIOR® steel

0.4 mm



161h

0.8 mm



161h

1.0 mm



161h

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Atmospheric exposure tests

- **Indonesia**
 - Cilegon
 - Merak
- **Singapore**
- **Malaysia**
- **Thailand**
- **Vietnam**
- **China**
- **Australia**
- **New Zealand**
- **USA**
- **Future:** India



~35 years experience
broad range of environments
~20,000 test panels



Bellambi Point, Australia



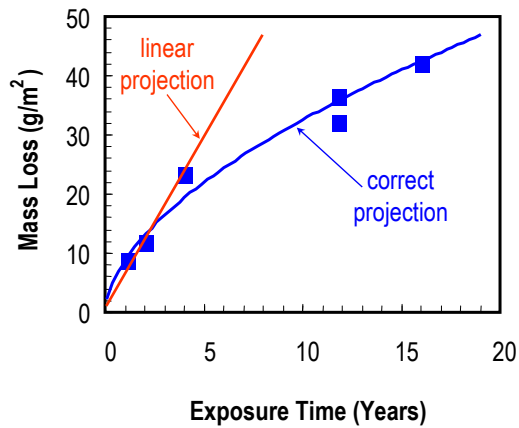
Map Ta Phut, Thailand

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Mass loss exposure tests

mild marine test site



Rate of mass loss decreases with time

Data for up to 17 years exposure

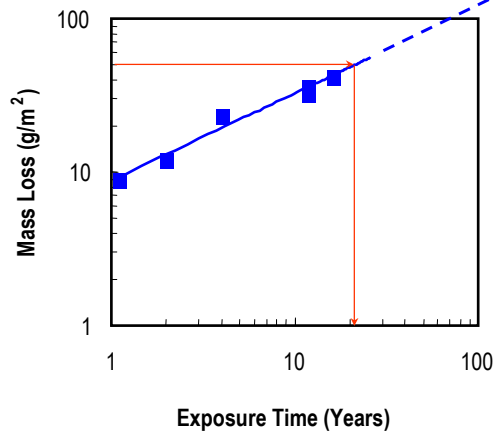
Many panels still on exposure (up to 25 years old)

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Predicting expected life from mass loss data

mild marine test site



$$M = At^B$$

Straight line on log-log graph

The expected life is the time required to corrode all of the original coating.

Extrapolate to a mass loss equal to the original coating mass and read off the time required to reach it.

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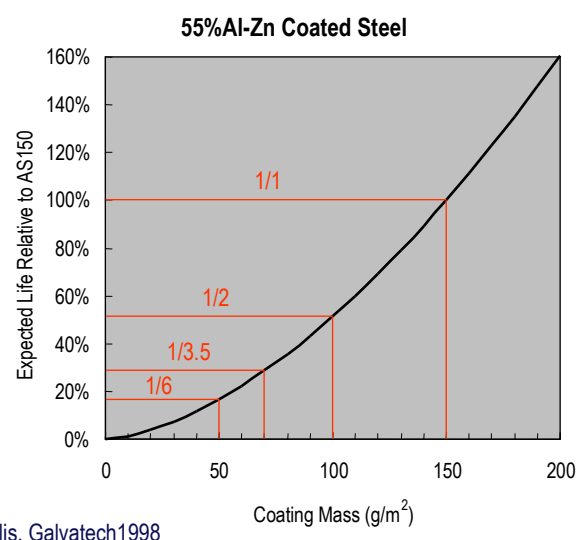
10

Effect of coating mass on expected life

$$M = At^B$$

↓

$$t = (M/A)^{1/B}$$



From data available in D.J.Willis, Galvatech1998

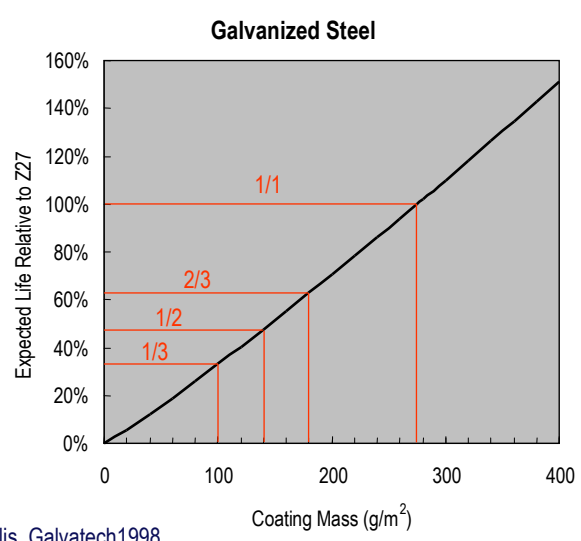
File Reference: g:\IndoCoating Conference

Effect of coating mass on expected life

$$M = At^B$$

↓

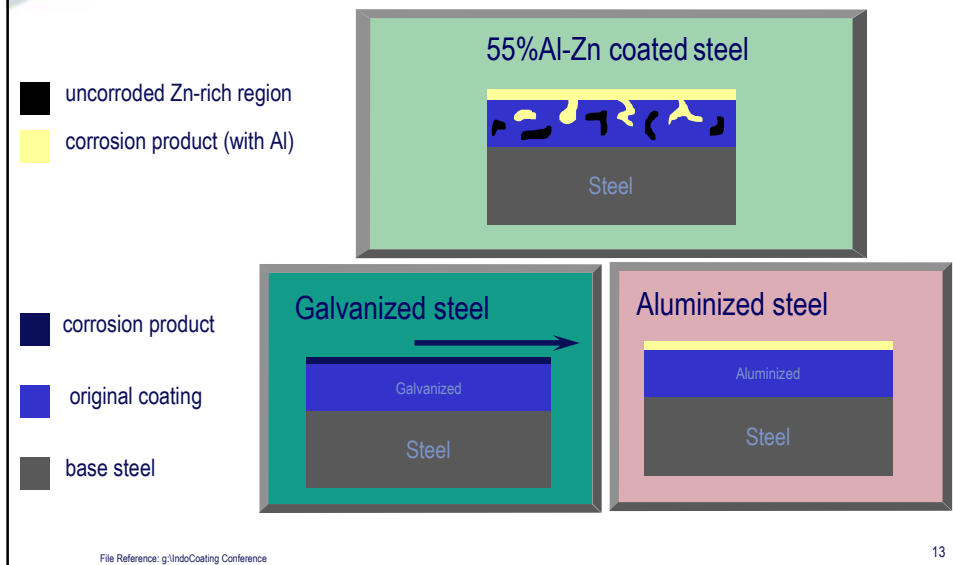
$$t = (M/A)^{1/B}$$



From data available in D.J.Willis, Galvatech1998

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Atmospheric Corrosion Mechanism

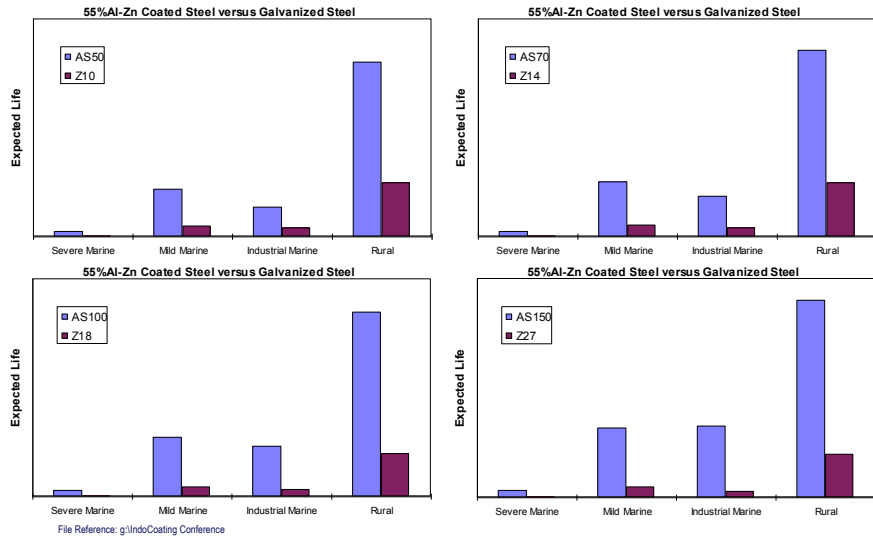


How long will it last?

- We provide a 15 year warranty against perforation for AS150 ZINCALUME® steel roofing in most environments of Indonesia
- This warranty figure incorporates a “safety factor” to allow for variations in quality of installation and design issues
- AS150 is likely to resist perforation for 30 years in typical environments of Indonesia, except for severe environments
- Using the “safety factor” approach, the graph in slide 11 indicates:
 - AZ100 should resist perforation for 15 years
 - AZ70 should resist perforation for 8 years
 - AZ50 should resist perforation for 5 yearswhen used for roofing applications and in accordance with BlueScope Steel recommendations on installation, detailing and maintenance

Comparisons with equivalent galvanized steel

“equivalent” = equal coating thickness & similar markets



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Long term exposure tests

Industrial Marine Exposure
Port Kembla, Australia



AS100 after 6 years

Z14 after 5 years

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Long term exposure tests

Severe Marine Exposure
Bellambi Point, Australia



AS100 after 6 years



Z14 after 5 years

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Long term building performance in Australia

17 years
marine
environment



ZINCALUME® steel



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18

Long term building performance in Australia

ZINCALUME® steel

20 Years

industrial marine
environment

Galvanized steel



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Long term building performance in Australia

ZINCALUME® steel roof – 18 years
urban environment



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Long term building performance in acid rain environments

- The long-term performance of 55%Al-Zn coated steel roofing has been extensively surveyed in North America and Europe
- The results of this survey are freely available from www.steelroofing.com
- North America and Europe have acid rain environments with similar levels of pollution to some parts of Asia, such as Jakarta
- The performance of 55%Al-Zn coated steel was consistently superior to equivalent galvanized steel
- Coating classes of AS150 and higher were projected to give 40+ years life without major maintenance

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Revised SNI standard for 55%Al-Zn coated steel

- SNI 4096:2007 published December 2007 (supersedes 1996 edition)
- AS50, AS70 and AS100 coating classes were added
- Commonly used coating classes are now in the standard

Coating Class	Minimum 55%Al-Zn Coating Mass (g/m ²)		
	Double-sided Triple-spot-average	Double-sided Single spot	Single-sided Single spot
AS200	200	180	80
AS150	150	135	60
AS100	100	90	40
AS70	70	63	28
AS50	50	45	20

90%TSA

40%TSA

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Conclusion

- 55%Al-Zn coated steel has superior corrosion performance to equivalent galvanized steel
- This superiority is maintained even at low coating masses such as AS50 and AS70
- This conclusion is supported by the results of ...
 - accelerated laboratory testing,
 - predictions from mass loss testing,
 - long-term exposure testing, and
 - long-term building surveys
- These excellent results apply to the environmental conditions experienced with roofing products in a broad range of locations in Asia and Australia
- These findings were used during the review of SNI 4096:1996, culminating in the addition of AS50, AS70 and AS100 coating classes to the 2007 edition of the standard