

GalvInfo Center

Inquiries about Construction and
Appliance Applications of Zinc-
Containing Coated Steel Sheet
Trends and Implications

Presented at Galvatech '04
April 4-7, 2004
Chicago, Ill



GalvInfo Center

A zinc-coated steel sheet technical information center managed by ILZRO and cosponsored by the steel, paint and zinc industries.

GalvInfo Center

Objectives

- ◆ Provide technical assistance to users and potential users of zinc and zinc-alloy coated steel sheet
- ◆ Broaden the understanding of the user community about behavior and performance of coated steel sheet
- ◆ Assist with growing the markets for zinc and zinc-alloy coated steel sheet



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- ◆ American Zinc Association
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- ◆ PPG
- ◆ Steelscape
- ◆ The Techs
- ◆ USS-POSCO



GalvInfo Center Inquiry Topics - 2003

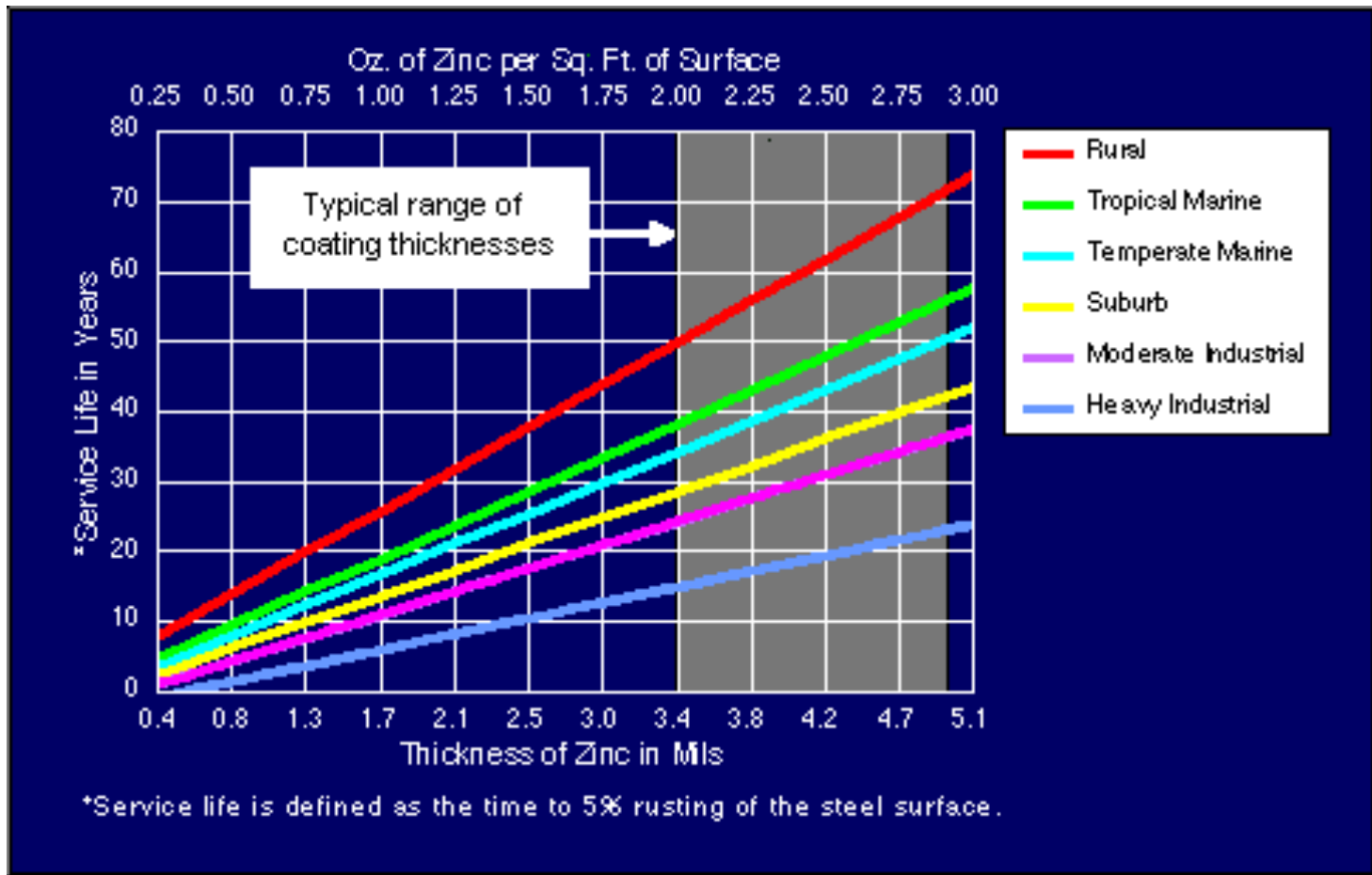
Construction 83%	Corrosion 47%	Service Life 35%	In the atmosphere - 9%
			In buildings - 8%
			With treated wood - 8%
			In concrete - 4%
			Galvanic contact - 4%
			In soil - 2%
	Various 12%	Storage stain - 6%	
		Salt spray resistance - 4%	
		Zinc runoff - 2%	
	Appearance 20%	Phosphatizing - 6%	
		Painting issues - 6%	
		Dulling and others - 8%	
	Weldability 11%	General - 5%	
Galvalume - 2%			
Phosphatized - 2%			
To stainless - 2%			
General 6%	Coating thickness - 4%		
	Fire ratings - 2%		
Appliance 17%	Coatings 11%	Salt spray testing - 2.5%	
		HDG versus EG versus Galvalume - 2.5%	
		Coating weight versus performance - 2%	
		Heat resistance - 2%	
		Prepaint - 2%	
Formability - 2%; Specifications - 2%; Passivation - 2%			

Corrosion Inquiries

- ◆ Service life
 - Atmospheric (indoors & outdoors)
 - In concrete
 - In contact with treated wood
 - Dissimilar metal contact
 - In soil and marine environments
- ◆ Storage stain & salt spray
- ◆ Zinc runoff



Atmospheric Service Life



Atmospheric - Indoors



Source: CSSBI

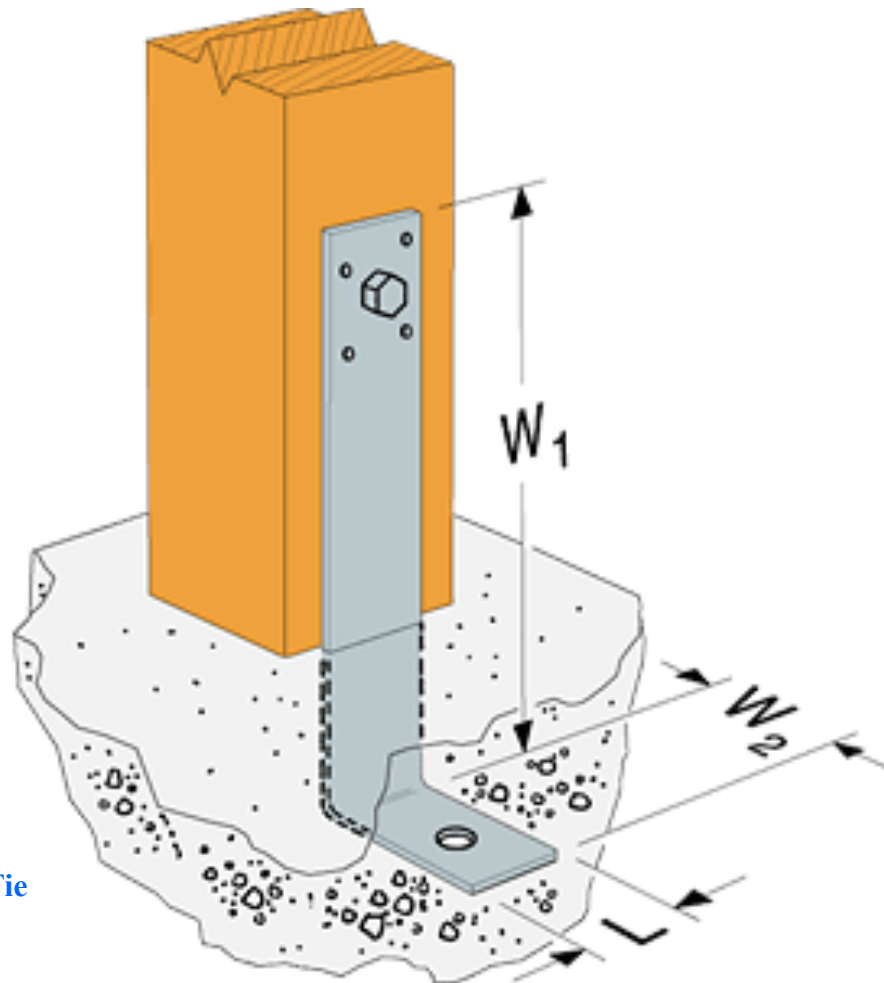


Atmospheric - Indoors

- ◆ Galvanize for lightweight steel framing (LSF)
 - Corrosion rate < 0.1 microns/year
- ◆ Necessity for G90 for indoor use?
 - Study LSF use in actual buildings
 - Develop database - life vs. environment
- ◆ Use of lighter coating weights in appliances and electronic cabinetry



Contact with Concrete



Source: SIMPSON Strong-Tie

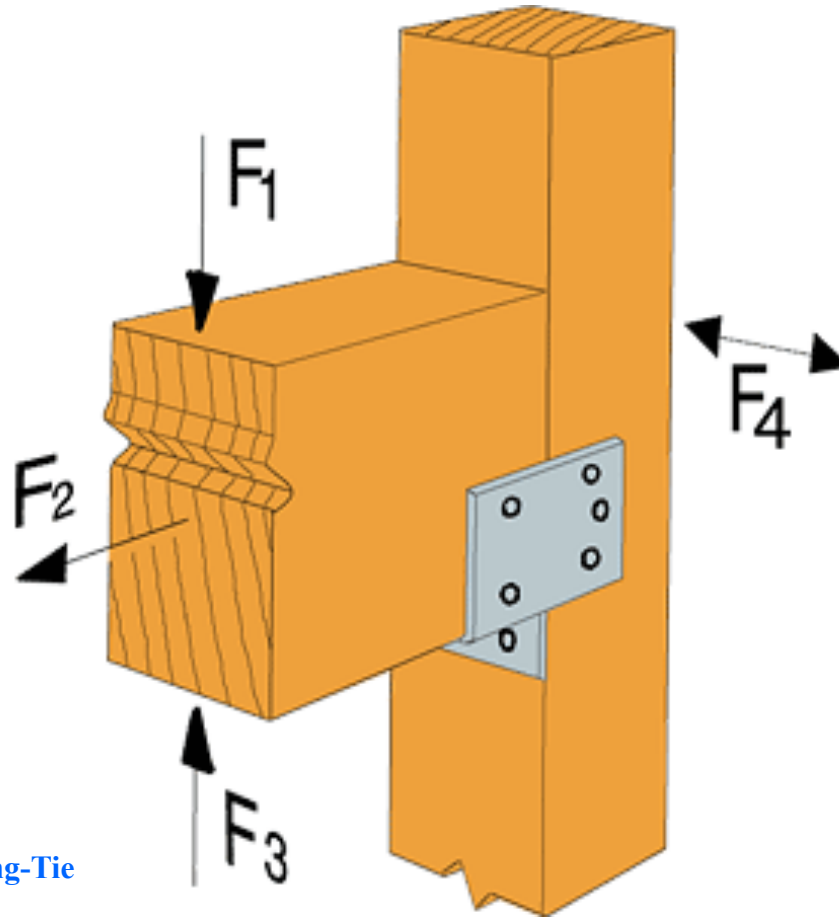


Contact with Concrete

- ◆ Corrosion rate of galvanize imbedded in concrete is <0.1 microns/year if:
 - Water/cement ratio <0.6
 - Chloride content $<1\%$
- ◆ Not widely understood that chemistry of concrete can affect galvanize life
- ◆ Advise no contact between 55% Al-Zn coated sheet and concrete



Contact with Treated Wood



Source: SIMPSON Strong-Tie



Contact with Treated Wood

- ◆ Wood preservative change results in increased corrosion of galvanized connectors
 - CCA-C changed to ACQ-C, ACQ-D, CBA-A, CA-B
- ◆ AC-D and CA-B over twice as corrosive as CCA-C due to higher Cu content
- ◆ G60 and G90 satisfactory in past
- ◆ Move to G185 or to stainless steel
- ◆ Study required to reduce corrosiveness of new treatments



Dissimilar Metal Contact

Galvanic Corrosion Rates - Zinc Coupled to Other Common Metals

Coupled Alloy	Galvanic Corrosion Rate ($\mu\text{m}/\text{yr}$)		
	Rural	Urban	Marine
Zinc freely exposed	0.5	2.4	1.3
Mild steel	3.0	3.3	3.9
Stainless Steel	1.1	1.8	2.0
Copper	2.2	2.0	3.2
Aluminum	0.4	1.1	1.1



Soil & Marine Environments



Soil & Marine Environments

◆ Soil

- Inhomogeneous - data not available for many situations
- Most recent large study - 1955

◆ Marine

- Large variability in corrosion rates depending on location and water type
- Heaviest coating weights recommended



Storage Stain



Storage Stain

- ◆ Storage stain is zinc hydroxide
- ◆ Most calls about how to remove
 - White stain - superficial and removable
 - Black stain - damages coating
- ◆ If removed - metallic sheen lost
- ◆ Many rejections for aesthetic reasons
- ◆ Restoration treatment needs to be found



Salt Spray Testing

- ◆ GalvInfoNote #15 covers most FAQs
- ◆ Does not predict service life
- ◆ Questions on hours to red rust versus coating thickness



Zinc Runoff



Zinc Runoff

- ◆ Some localities have adopted EPA guidelines on zinc levels in runoff water as regulations
- ◆ Runoff model under study - results being presented at this conference
- ◆ Indications are zinc levels drop before water reaches streams



Appearance Inquiries

- ◆ Bonderized (phosphatized) galvanize
 - Being used in unpainted state - despite uneven gray appearance
 - Need to develop a prepainted product that has Bonderized look
- ◆ How to dull metallic sheen of galvanize
- ◆ How to paint weathered/rusted galvanize



Weldability

- ◆ How does arc welding of 55% Al-Zn differ from that of galvanize
- ◆ How to solder phosphatized galvanize
- ◆ How does spot welding affect corrosion resistance of galvanize
- ◆ GalvInfoNote on Weldability to be issued



Passivation

- ◆ Issue of hexavalent chromium becoming important
 - Cr bearing passivation cannot be guaranteed free of Cr^{+6}
- ◆ Demand for chromium-free passivation treatments will increase sharply



Other Inquiries

- ◆ Temperature resistance of galvanize
- ◆ Use of 55% Al-Zn in cooking appliances
- ◆ Fire ratings
- ◆ Clarification of specifications
- ◆ Formability issues
- ◆ Where to purchase coated sheet



Summary

- ◆ Data base-actual corrosion of LSF
- ◆ Guide to coating weight selection of LSF
- ◆ Guide to use of galvanize in concrete
- ◆ Complete study of corrosiveness of new wood preservatives
- ◆ Better methods of removing white rust
- ◆ Finalize zinc runoff studies
- ◆ Market for low-gloss architectural panels
- ◆ Deploy chrome-free passivation
- ◆ Obtain fire ratings for buildings using LSF



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