SEBPP

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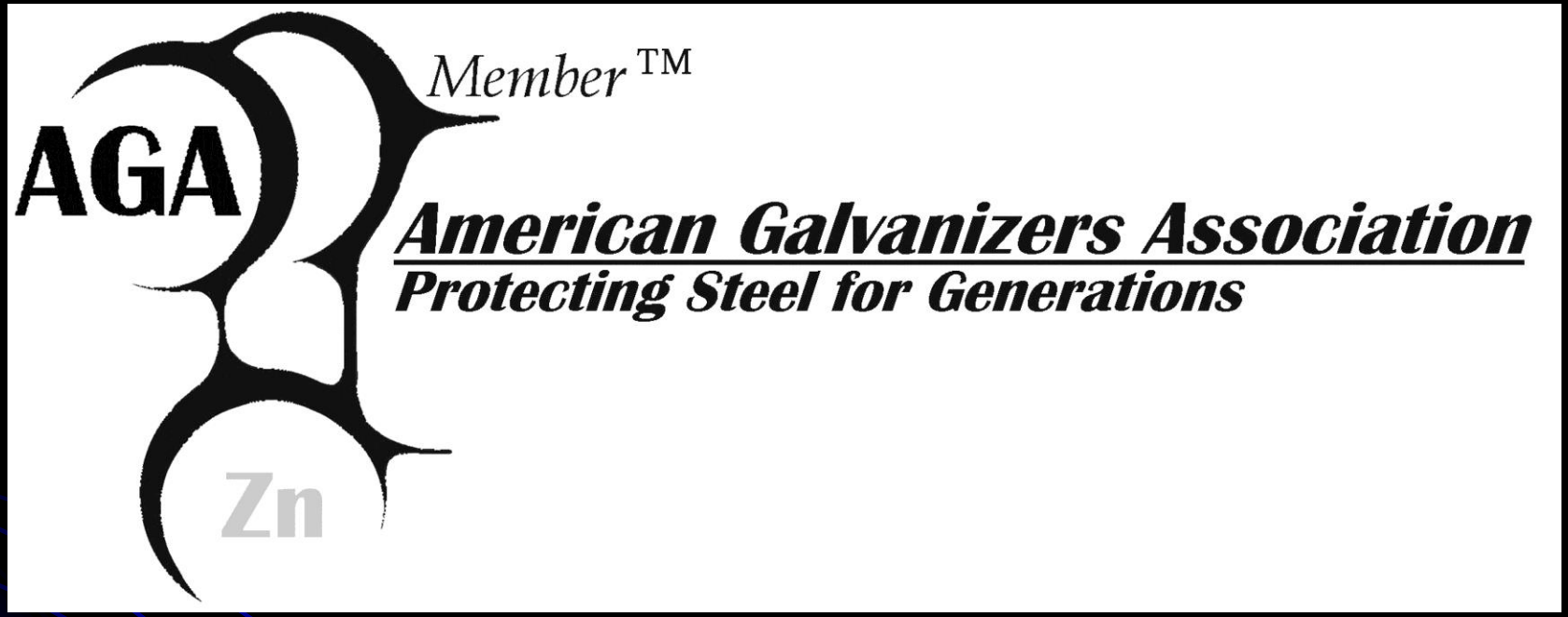
815-693-4242


Member ™
AGA
American Galvanizers Association
Protecting Steel for Generations
Zn

The Corrosion Problem

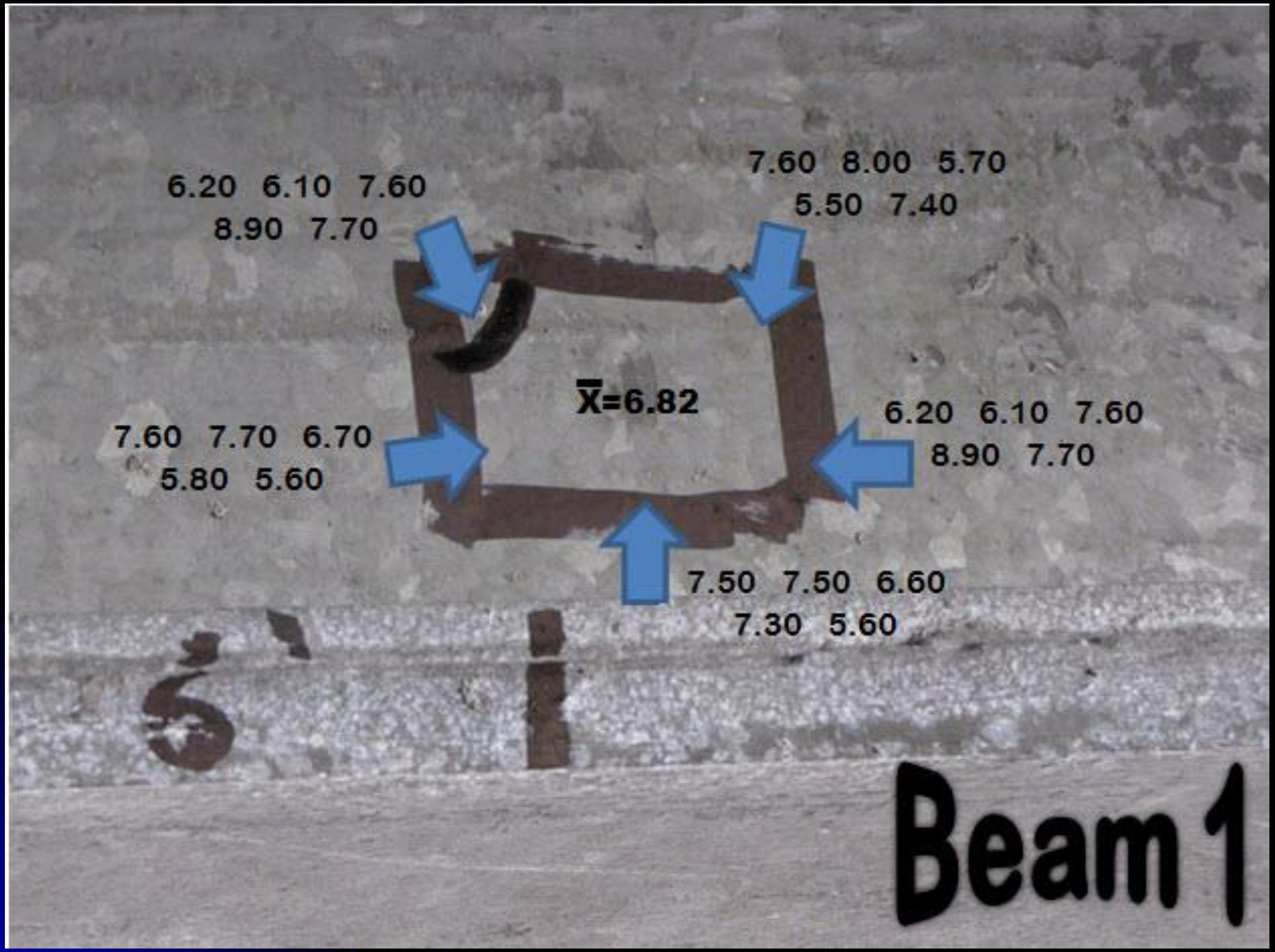
25-30% could be eliminated if adequate corrosion protection systems were employed


Clark Ave
1
nois Ave.
1 3/4


got rust?*

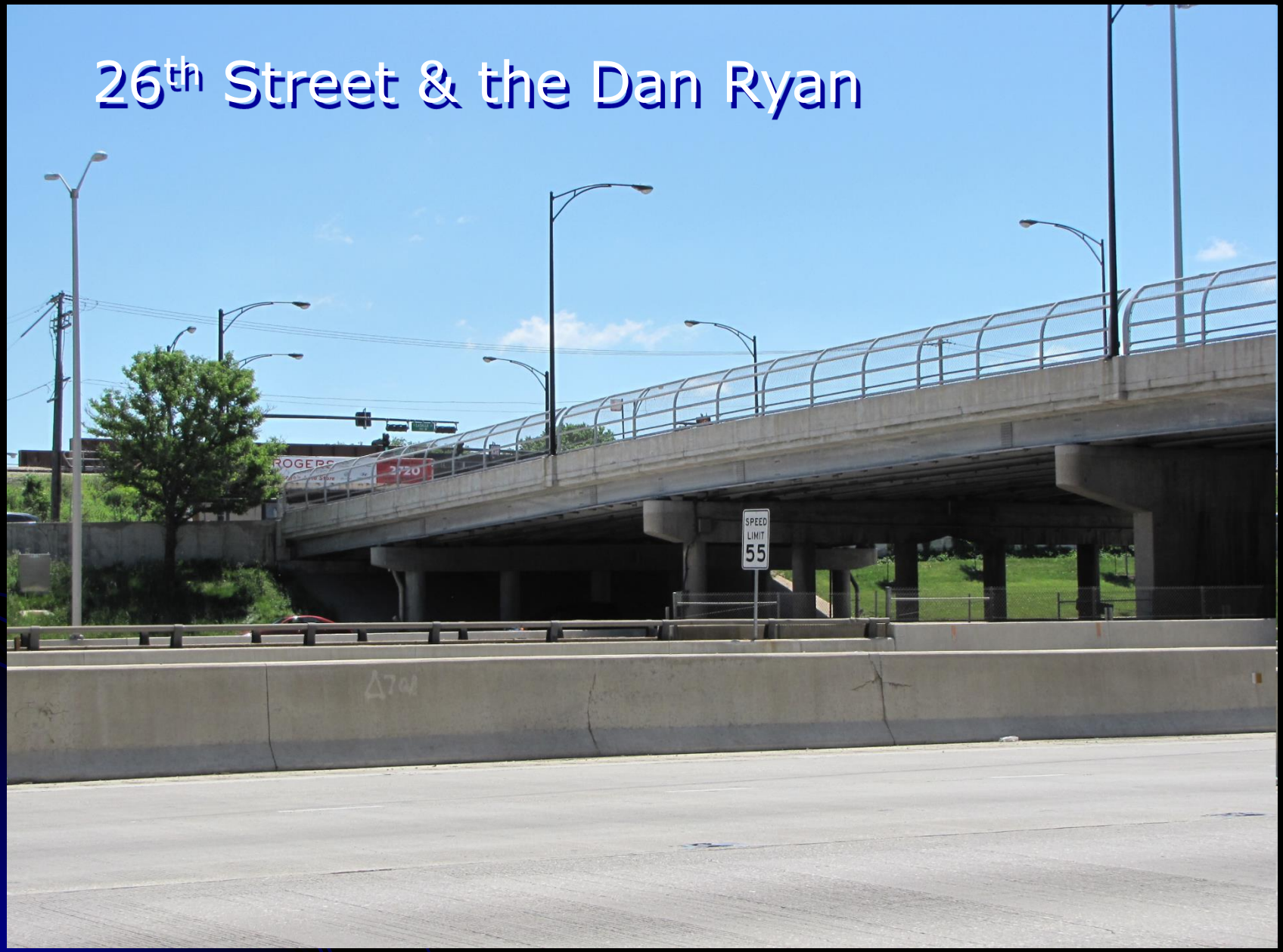
Weathering Steel

I-69 Bridge


6.20 6.10 7.60
8.90 7.70
7.60 8.00 5.70
5.50 7.40
$\bar{X}$=6.82
7.60 7.70 6.70
5.80 5.60
6.20 6.10 7.60
8.90 7.70
7.50 7.50 6.60
7.30 5.60
Beam 1

Ford County – 00N, 2350E

26th Street & the Dan Ryan



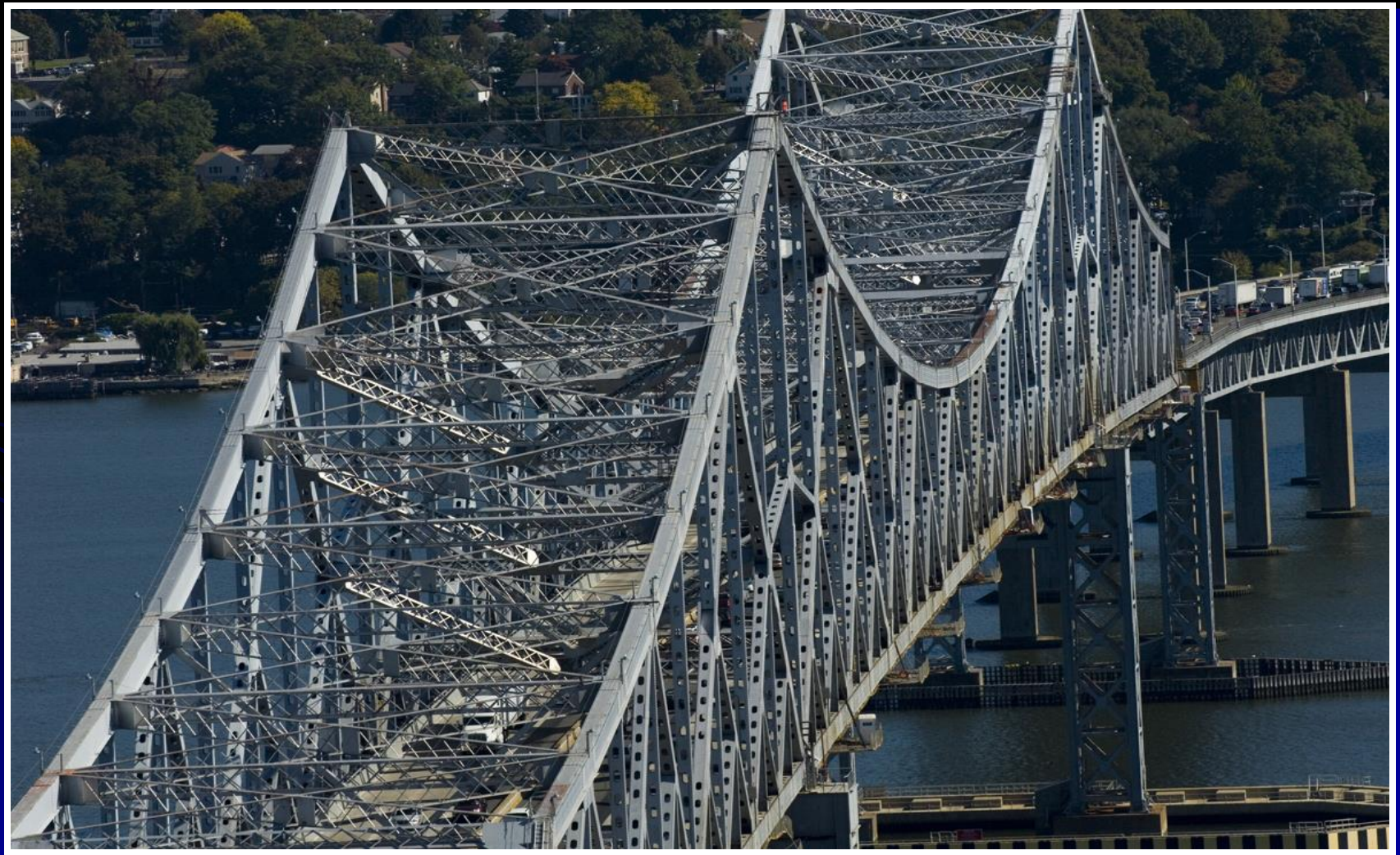
New Galvanized Bridges in Chicago

- 35th Street & Dan Ryan 362 Tons
- 51 Street & Dan Ryan 349 Tons
- Douglas Lake Connection 1444 Tons
- 57th Street & Dan Ryan 346 Tons
- 67th Street & Dan Ryan 403 Tons
- Michigan Ave over I-94 234 Tons
- 91st Street & Dan Ryan 234 Tons
- 26th Street & Dan Ryan 194 Tons

CTA , IL Toll Road, IDOT & Counties

Over 50 Million Pounds of Bridges were Galvanized in Illinois in last 5 years.

Tappenzee Bridge



Tappenzee Bridge

Michigan/MI-102 Bridge Rail

Date Galvanized
2007

Components Galvanized
Guide rails

Environment
Urban

Location
Detroit, MI


Michigan/M-102 Bridge - Detroit, MI

Michigan / MI-102 Bridge Rail


Richland County Bridge
13FT-2IN

Knox County, OH - Before

Knox County, OH - After

At a Cost of
$350 Billion per Year

The Solution

Barrier Protection

Cathodic Protection

Galvanic Series of Metals

ZINC = ANODE

STEEL = CATHODE

This arrangement of metals determines what metal will be the anode and cathode when the two are put in a electrolytic cell (arrangement dependent on salt water as electrolyte).

Sacrificial Zinc Anodes

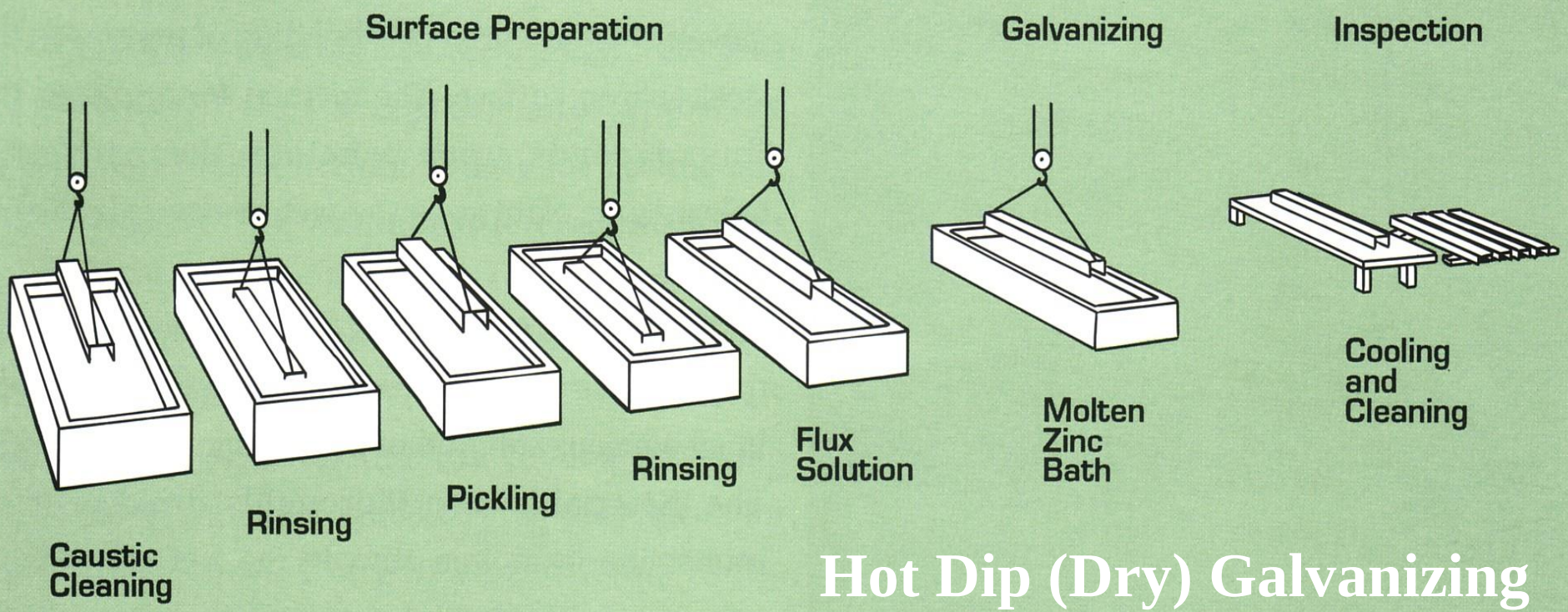
Zinc Patina

Zinc Carbonate

Zinc Hydroxide

Zinc Oxide

Zinc

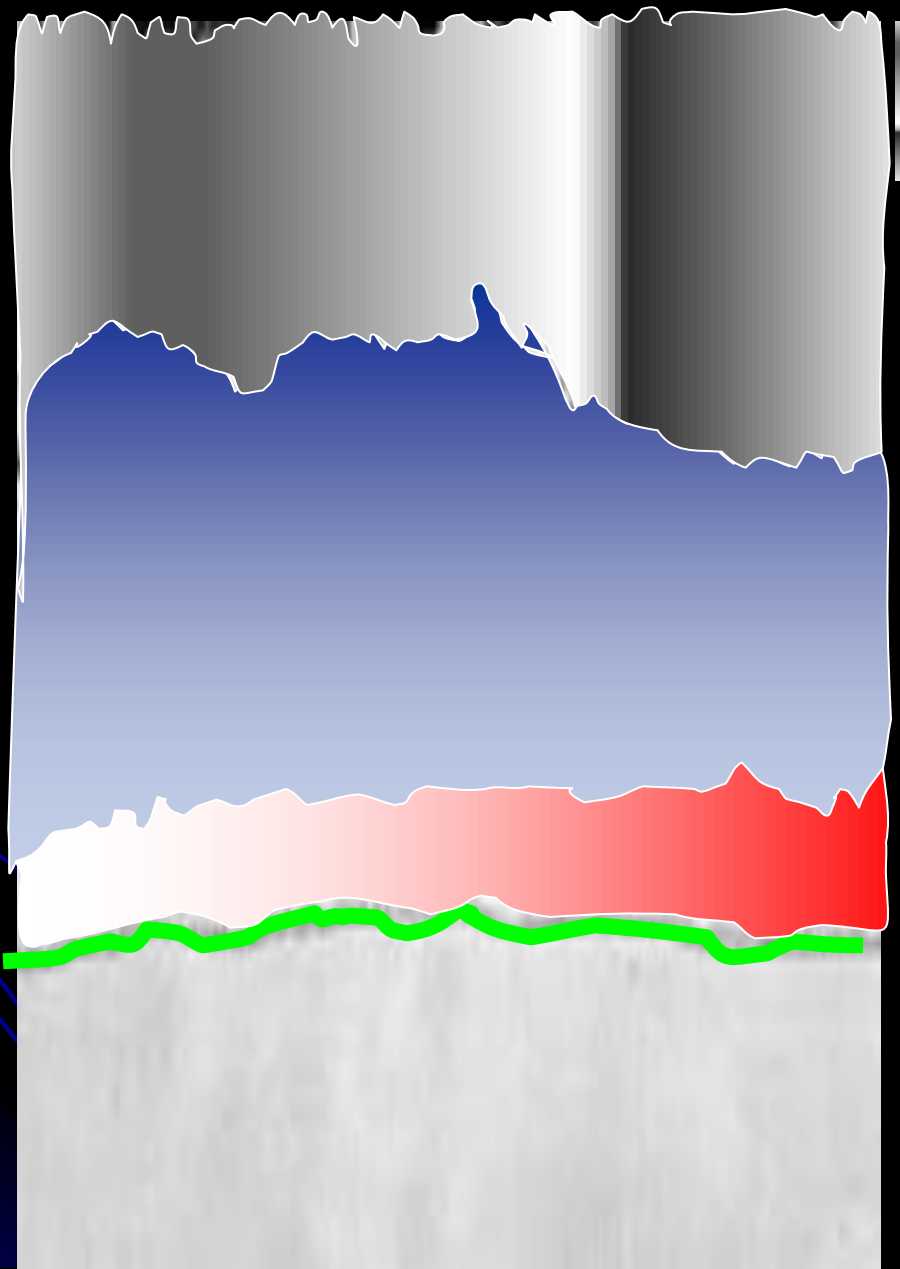


Hot Dip (Dry) Galvanizing

HDG Process: Inspection

- Steel is inspected after galvanizing to verify conformance to specs
- Visual inspection to identify any surface defects
- Magnetic thickness gauge to check coating thickness

Metallurgical Bond



Eta

Zeta

Delta

Gamma

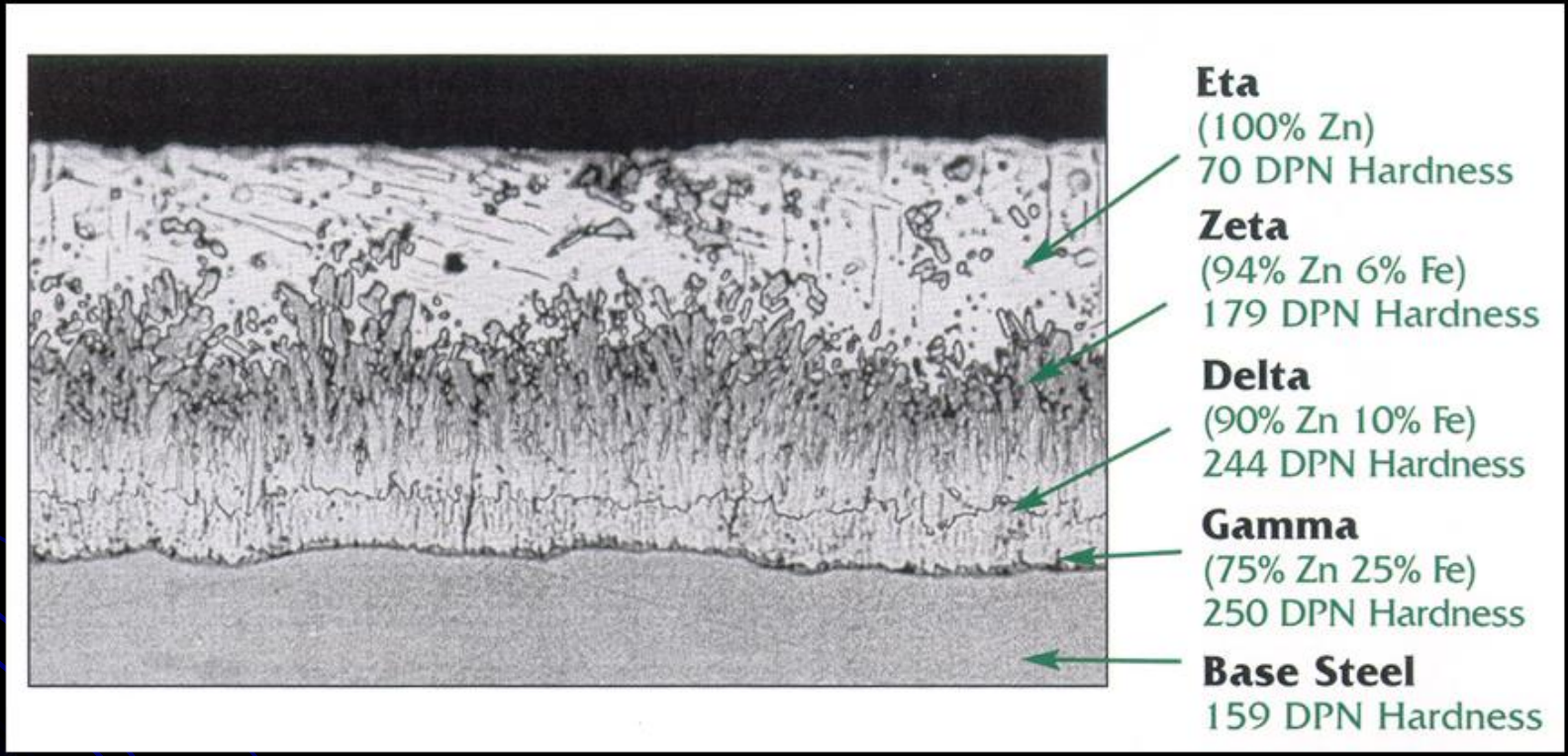
100% Zinc

94% Zinc
6% Iron

90% Zinc
10% Iron

75% Zinc
25% Iron

Metallurgical Bond



Adhesion = 3600 psi

Abrasion Resistance

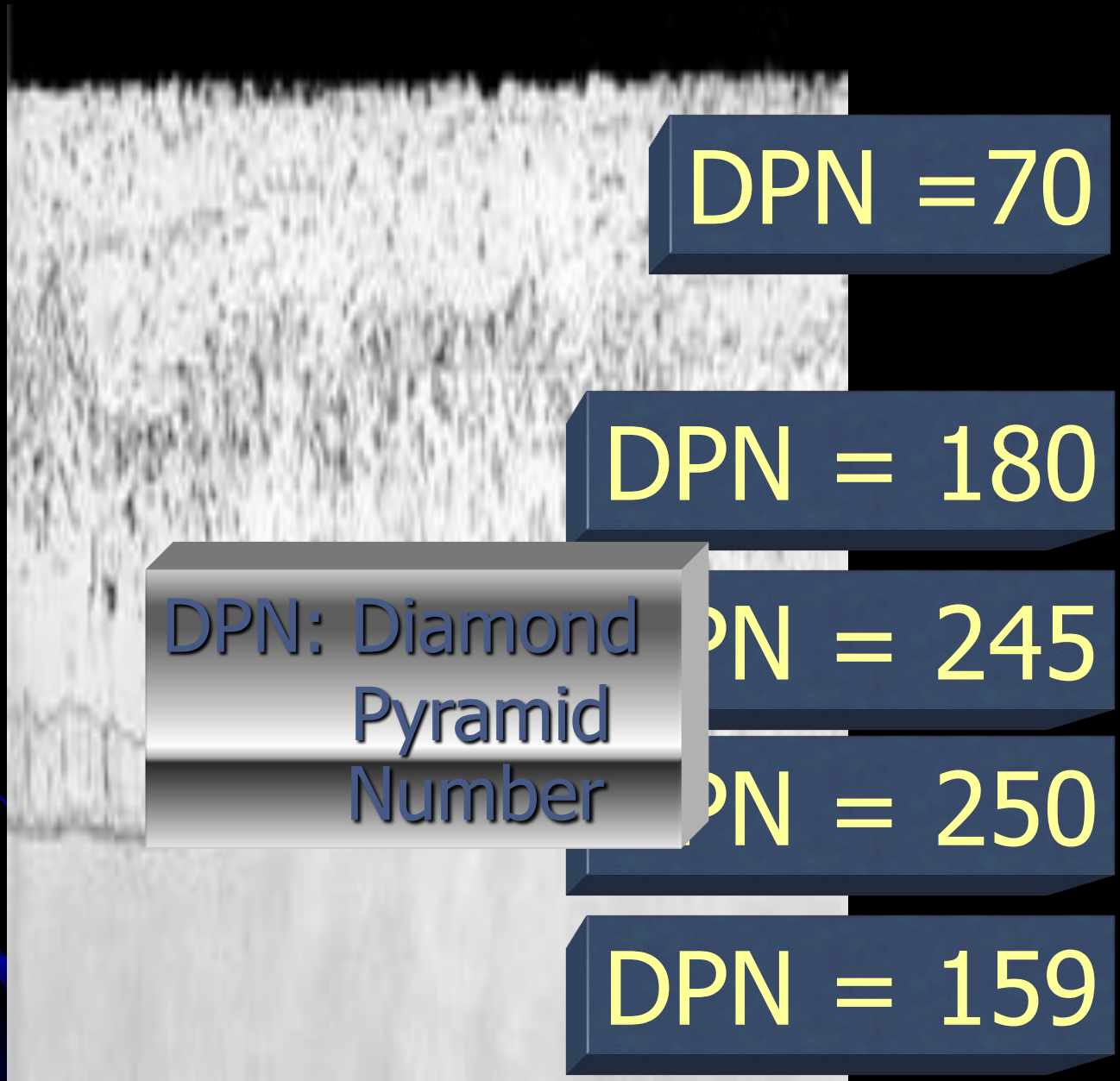
Eta

Zeta

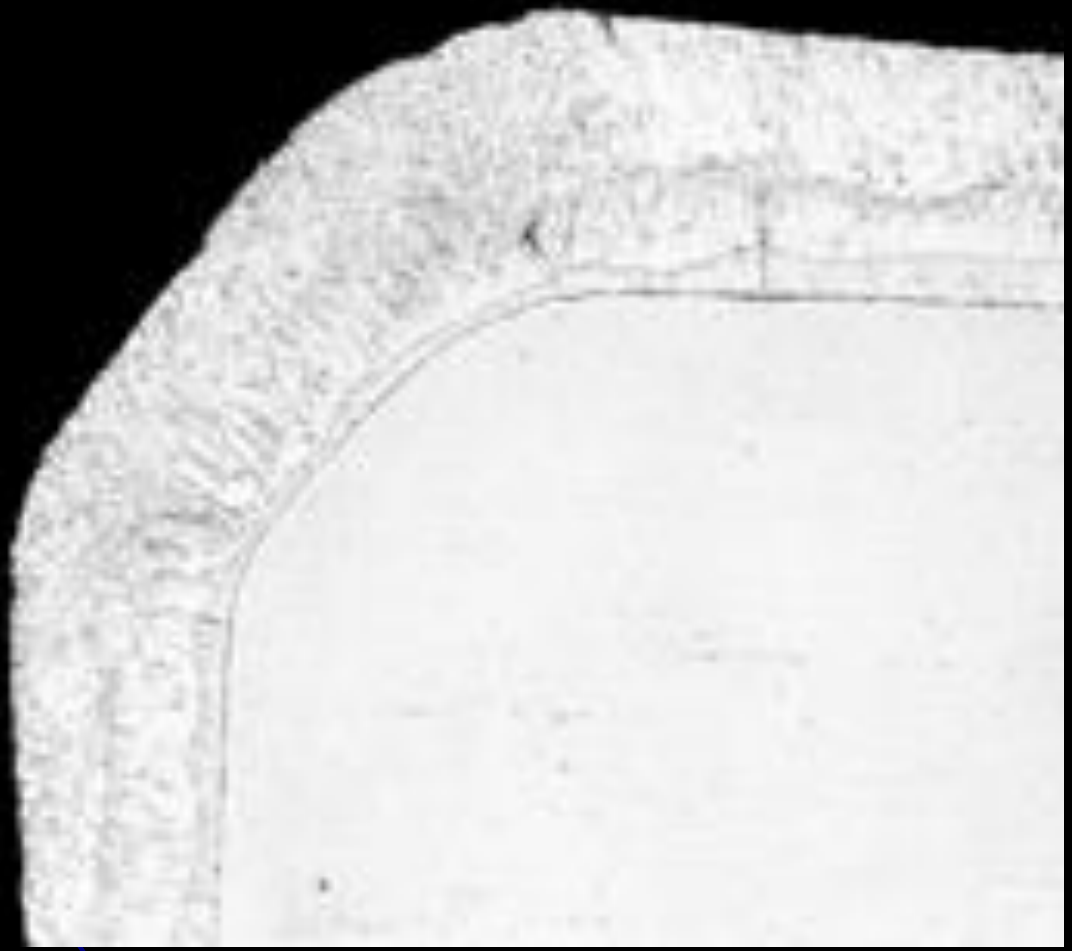
Delta

Gamma

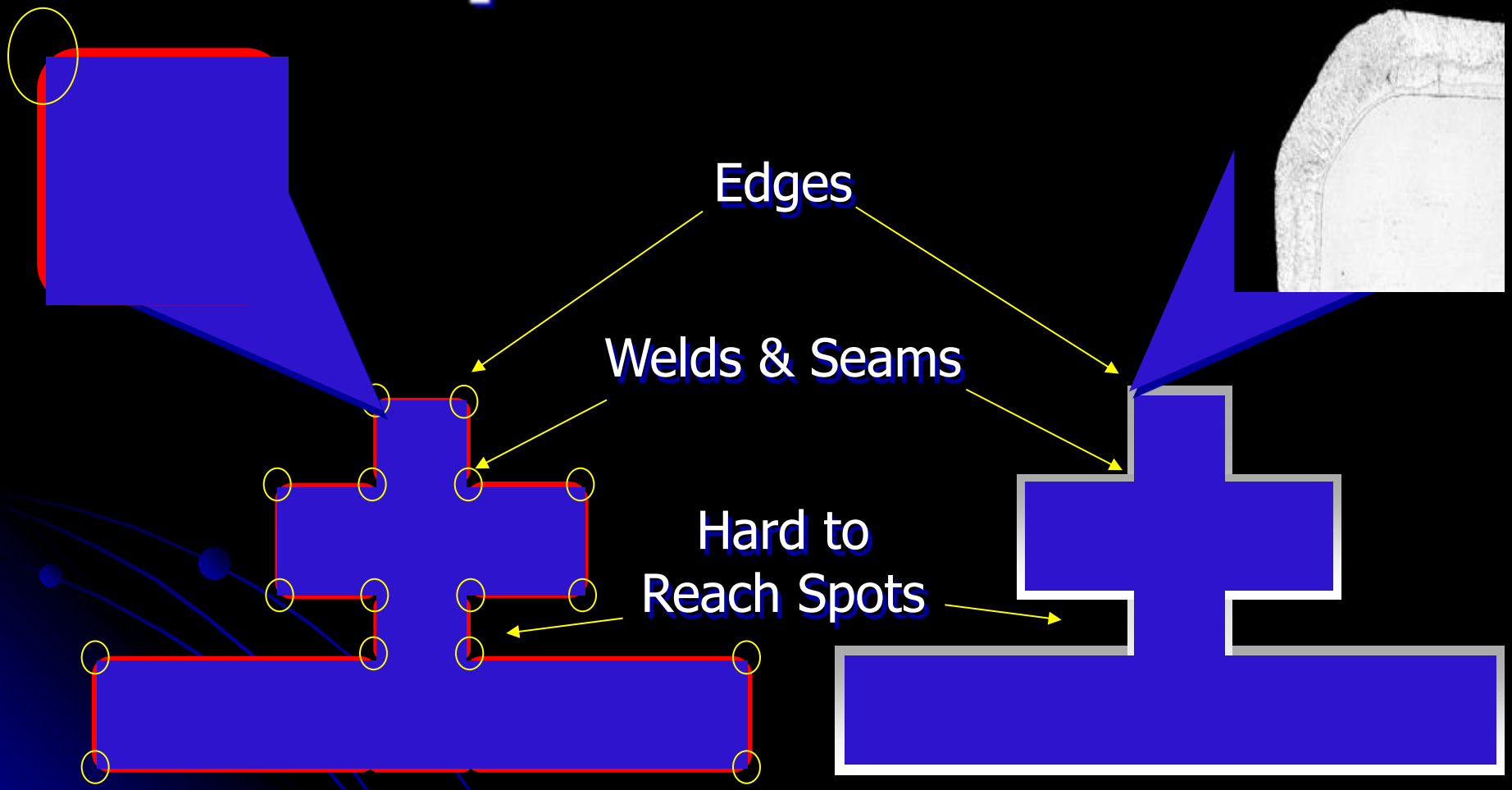
Steel



Edge Protection



Complete Protection



Typical Spray Application

Hot-Dip Galvanizing


VOCs
No Volatile Organic Compound's

It’s Recyclable

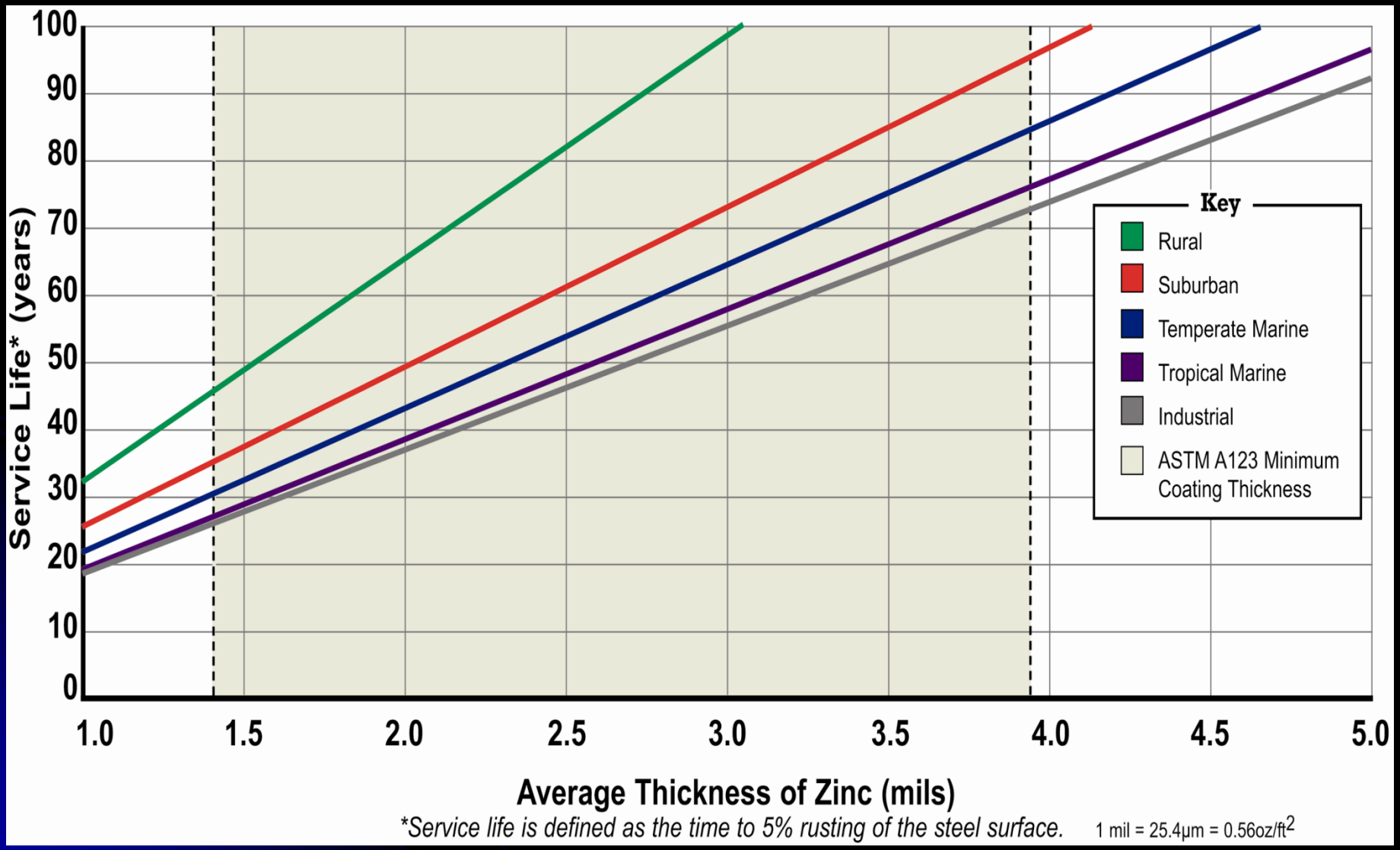
Sustainability: Galvanizing is Green

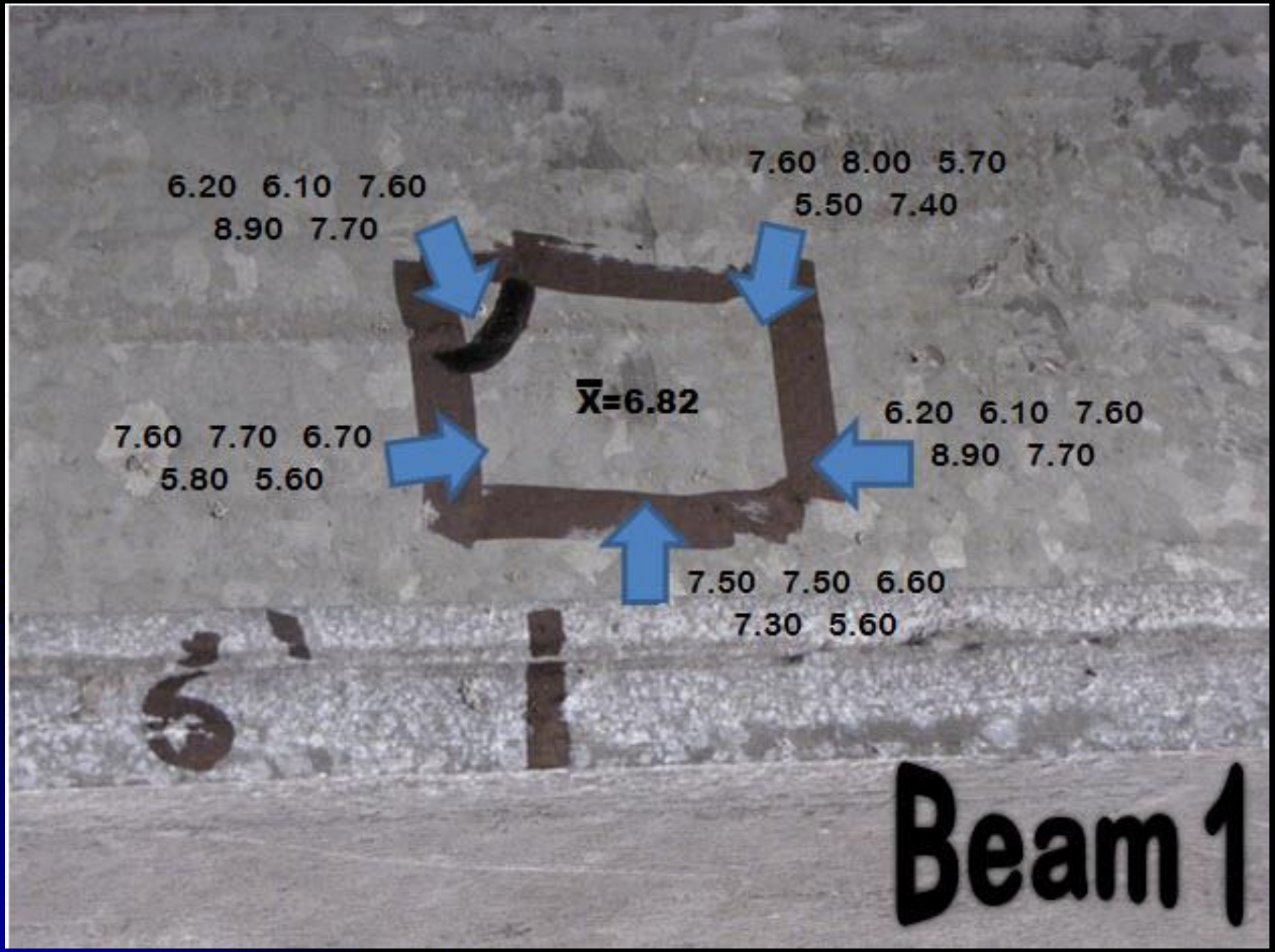
- Zinc and steel are 100% recyclable
  - Properties of zinc (and steel) do not degrade with reprocessing
  - Zinc is a natural element in the Earth's crust
  - Recycled content contributes to LEED
- Galvanizing's maintenance-free durability ensures no additional energy, materials, or emissions during use

Zinc Coating Life Predictor

- Anticipates service life
- Program performs calculations
  - Statistical methods
  - Neural network technology
  - Worldwide corrosion database
- Atmospheric categories
  - Rural
  - Suburban
  - Temperate marine
  - Tropical marine
  - Industrial

Estimated Service Life of HDG

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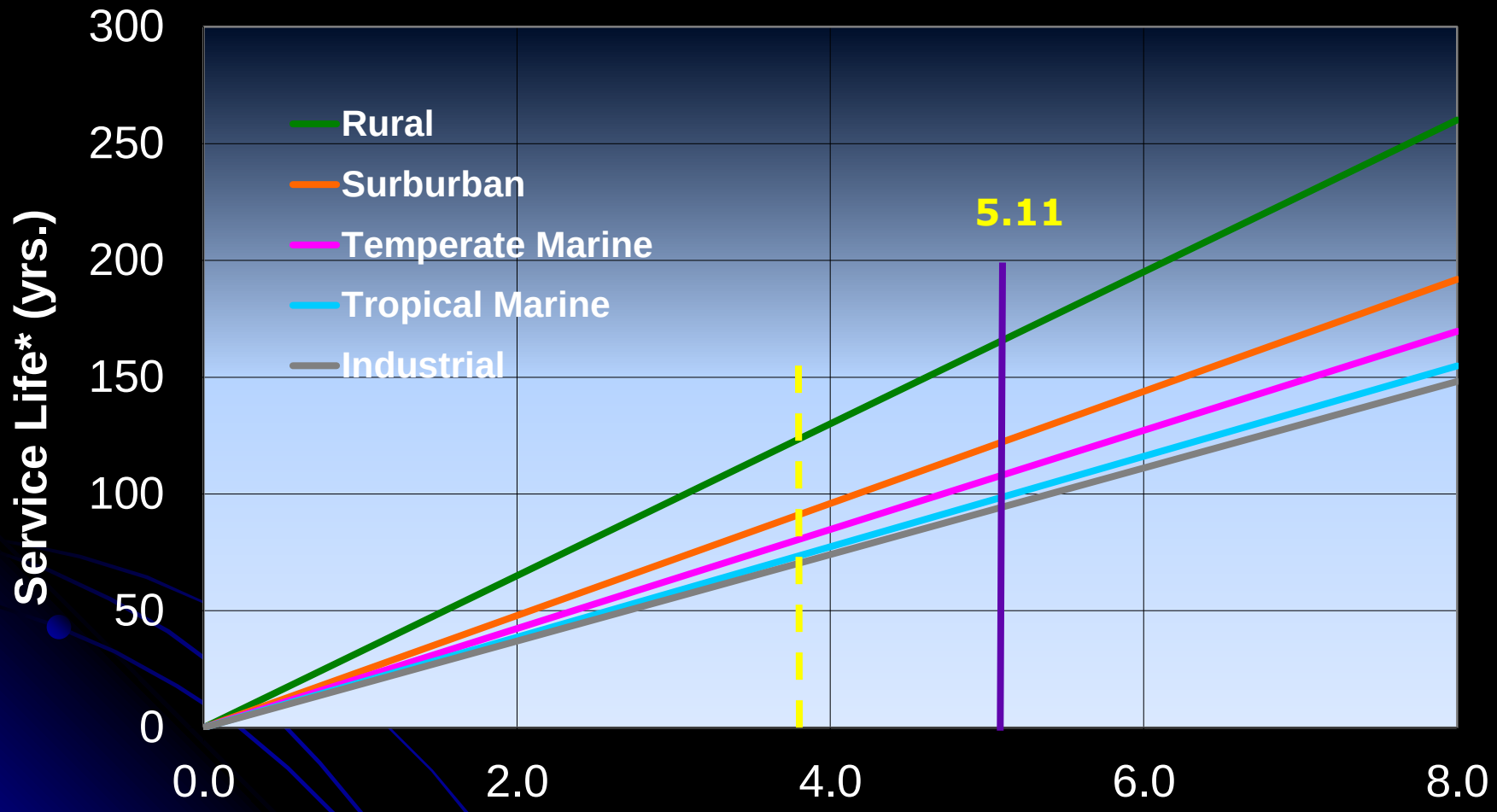


*Service Life is defined as the time to 5% rusting of the steel surface

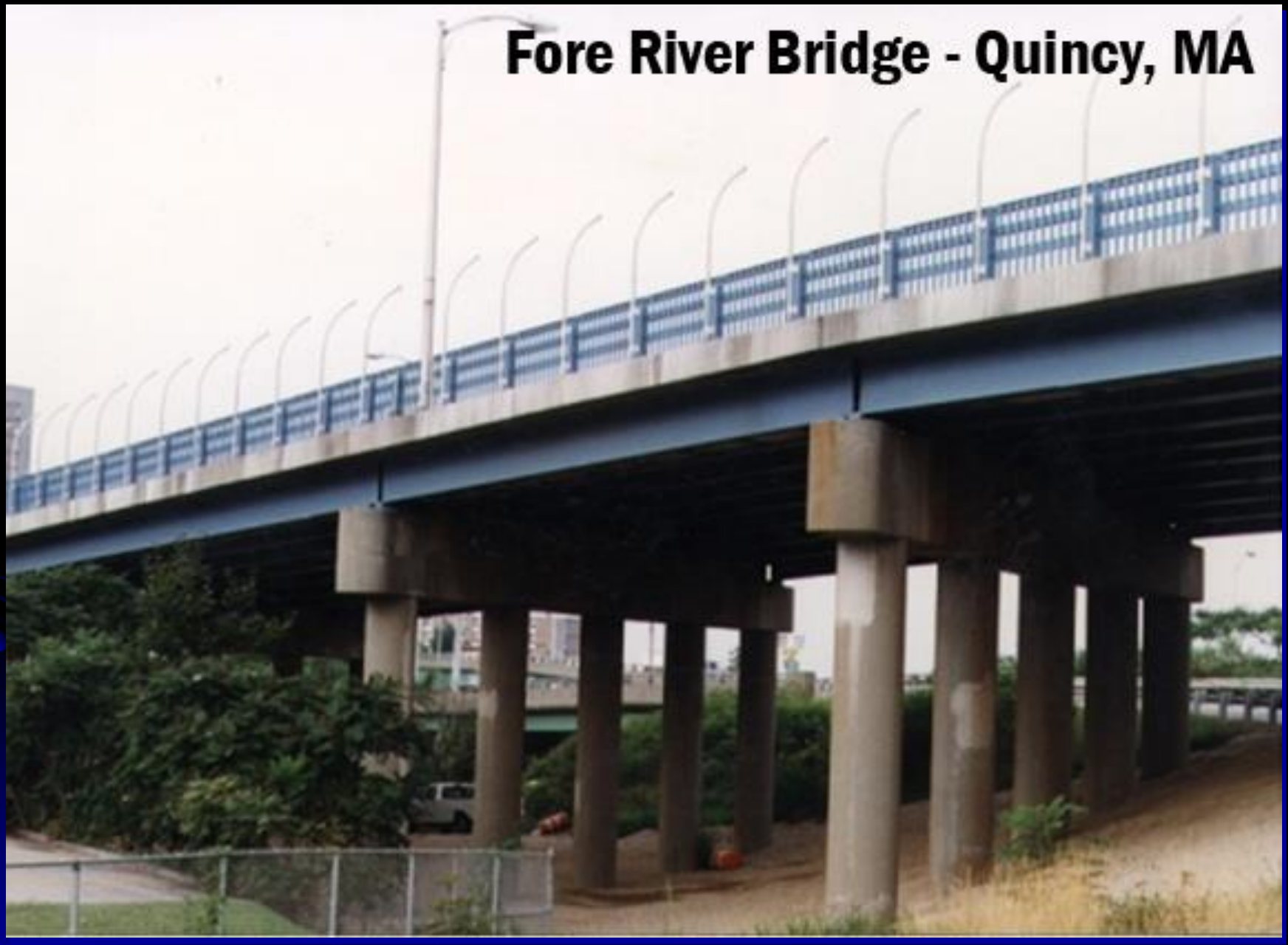
Note: 1 oz./ft^2 ~ 1.8 mils

Real-world Applications

ASTM D 6386

Standard Practice for Preparation of Zinc (Hot-Dip) Galvanized Coated Iron & Steel Product & Hardware Surfaces for Painting


Maine DOT Bridge - Maine


Fore River Bridge - Quincy, MA

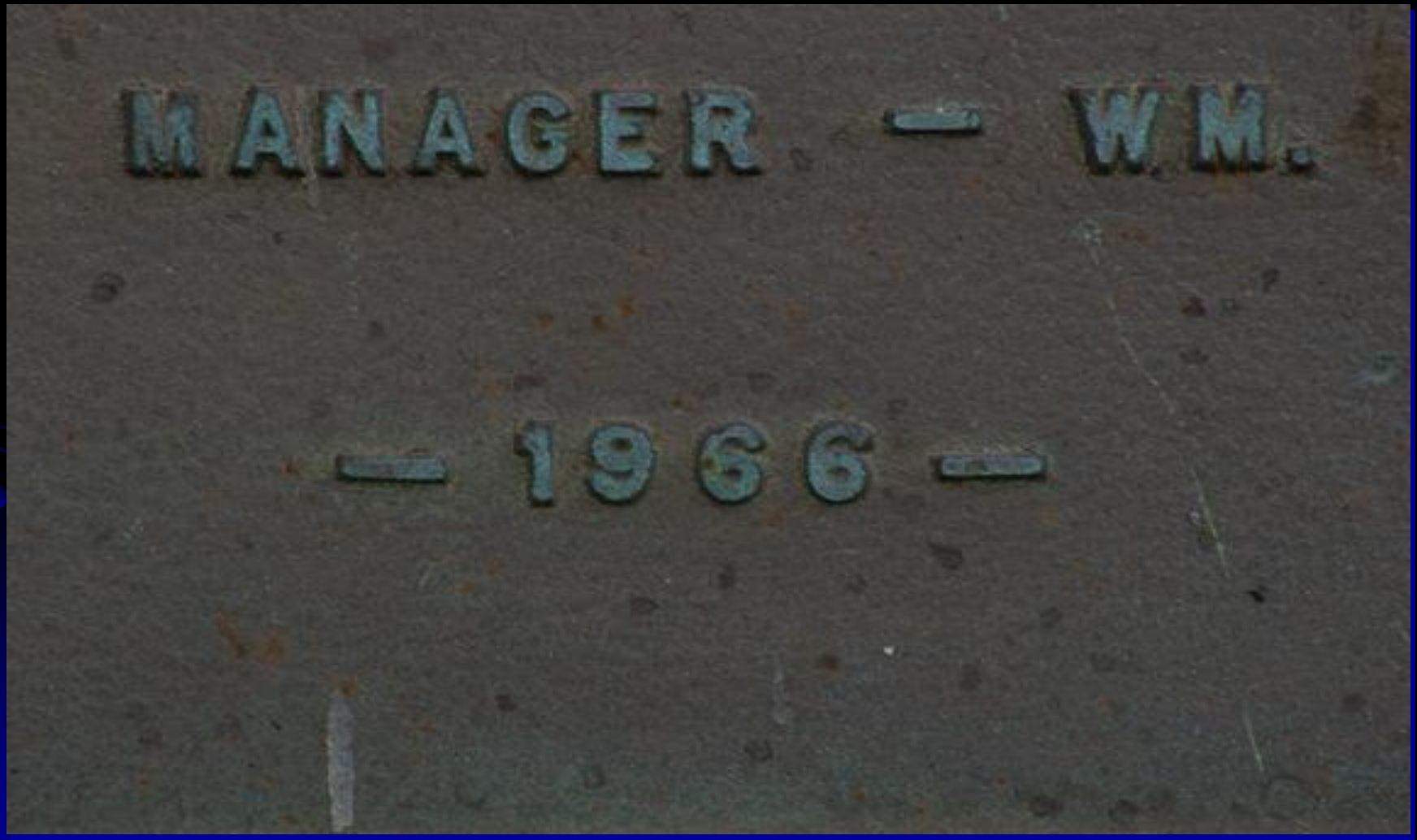

ANTHONY


Butler County Bridge - Ohio

Stark County – Pro Football Hall of Fame Bridge


Stears Bayou Bridge

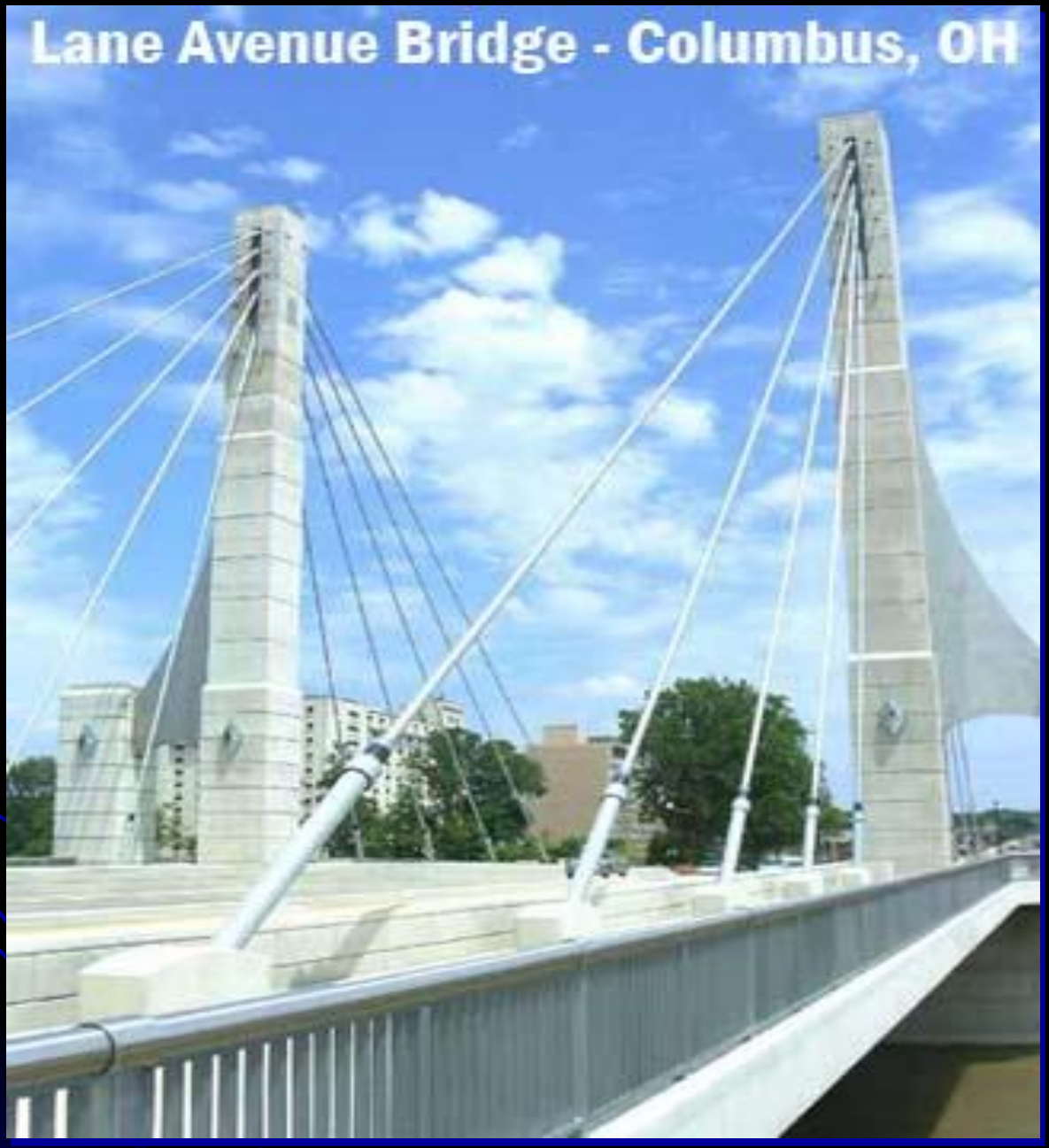
Stearns Bayou Bridge



Stearns Bayou Bridge


Spring Lake Bridge MI

Dick Vale Bridge Peru, ME


Lane Avenue Bridge - Columbus, OH


Montgomery County -Maryland

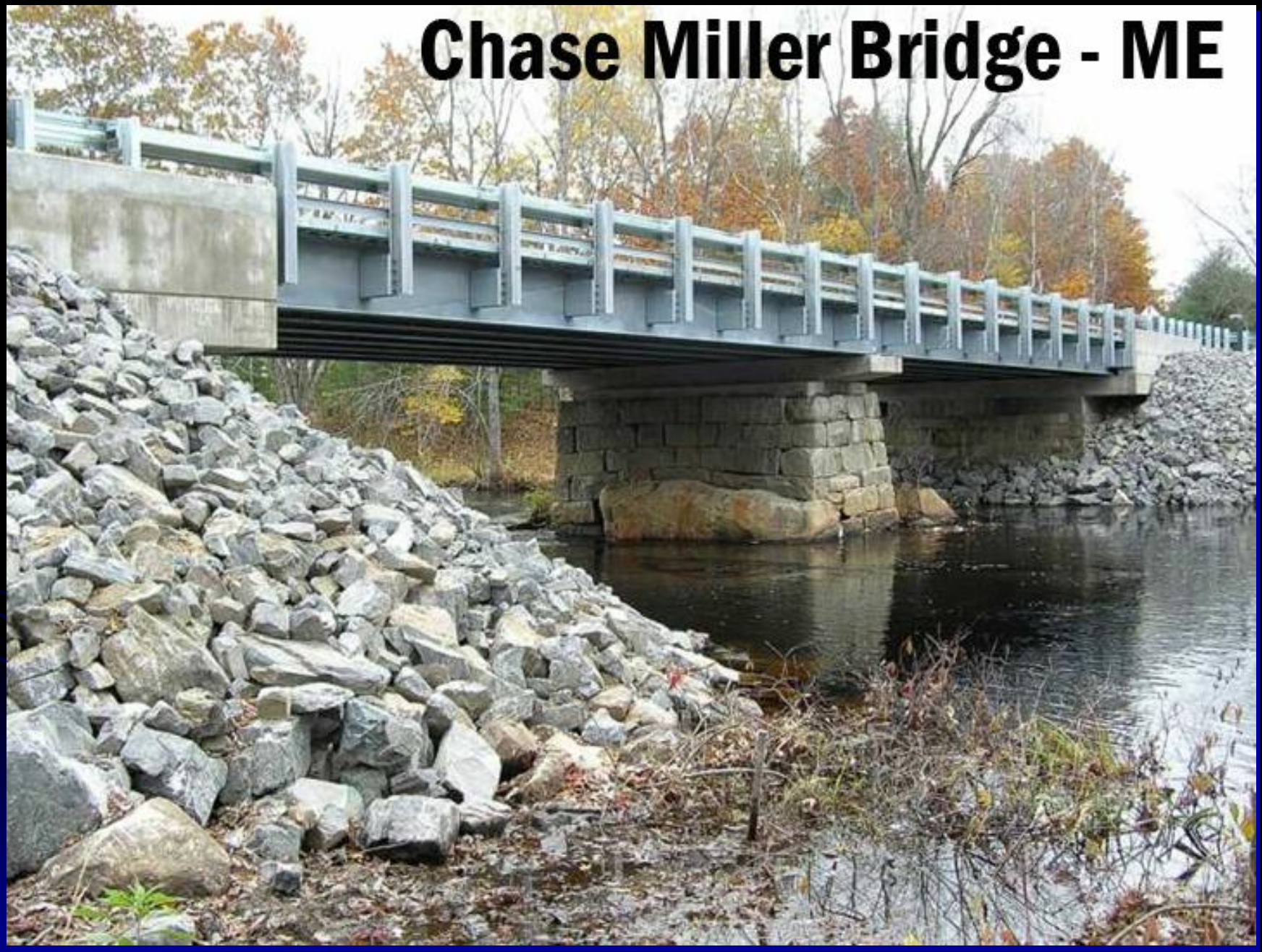
7th Avenue Light Rail Transit

Date Galvanized
2005

Components Galvanized
Columns, arms, light posts, handrails, benches, hardware

Environment
Urban

Location
Calgary, AB


Chase Miller Bridge - ME


Fallowfield Township – Washington County PA


Bryants Bridge – Saratoga County N. Y.


Multi-Span Bridge - Puerto Rico

Hot-Dip Galvanizing Costs Less Lasts Longer

SEBPP

April 3,2013

The Cost of Corrosion Protection

- Initial cost will always factor into decision
- Life-cycle cost analysis is more complete
  - Includes all future maintenance costs
  - Provides total cost of the project over its life
- Life-cycle cost calculation automated online at www.galvanizeit.org/galvanizingcost/

Quantitative Analysis

- Data Sources:
  - Paint – 2008 KTA Tator paper
    - Nationwide survey of the paint industry
    - Presented at NACE 2009
  - Galvanizing – 2008 AGA Industry Survey
- Project Parameters
  - Standard mix of steel (structural, tubing, plate)
  - 30,000 ft^2 project
  - Moderately industrial environment

Initial Cost Parameters

- Paint
  - Material (one- or two-pack product, number of coats, etc)
  - Shop cleaning labor
  - Shop/field application
  - Field labor
- Galvanizing
  - Process is inclusive of all cleaning, material, and labor

Initial Cost

Inorganic Zinc	$1.35	$40,410
Hot-Dip Galvanizing	$1.60	$48,000
Inorganic Zinc/Epoxy	$2.16	$64,800
Acrylic WB Primer/ Acrylic WB Intermediate/ Acrylic WB Topcoat	$2.55	$76,620
Inorganic Zinc Primer/ Epoxy/ Polyurethane Topcoat	$3.17	$94,950

Life-Cycle Cost

- Maintenance costs calculated on a practical maintenance cycle (vs. ideal)
  - Unique to each paint system
  - Manufacturer recommended cycles provided in the KTA Tator paper
- NACE model for NFV and NPV calculations
  - 2% inflation; 4% interest
- 60-year life
- Maintenance repaint at 5% rust

Life-Cycle Cost ($/ft^2) 60-Year Life

Hot-Dip Galvanizing	$1.60
Inorganic Zinc	$5.16
Inorganic Zinc/Epoxy	$8.07
Inorganic Zinc Primer/Epoxy Intermediate/ Polyurethane Topcoat	$10.04
Acrylic WB Primer/ Acrylic WB Intermediate/ Acrylic WB Topcoat	$14.82

Total Cost of 60-Year Project

Hot-Dip Galvanizing	$48,000
Inorganic Zinc	$154,800
Inorganic Zinc/Epoxy	$242,100
Inorganic Zinc Primer/ Epoxy/ Polyurethane	$301,200
Acrylic WB Primer/ Acrylic WB Intermediate/ Acrylic WB Topcoat	$444,600

AGA Resources

1-800-HOT-SPEC
(800.468.7732)

aga@galvanizeit.org

www.galvanizeit.org

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Thank You!

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