

Southeast Bridge Preservation Partnership

April 23–25, 2012
Sheraton Gateway Hotel
Atlanta, Georgia

Long Term Bridge Preservation via Coating Systems

Eric S. Kline
KTA-Tator Inc.
115 Technology Drive
Pittsburgh, PA 15275
(412) 788-1300
<http://www.kta.com>

What will be covered:

- ▶ Risk management is at issue.
- ▶ Cost management is at issue.
- ▶ We can't just overcoat everything.
- ▶ What is overcoating anyway?
- ▶ Spot repair vs. zone painting.
- ▶ Advantages and disadvantages of overcoating.
- ▶ How to control performance risk?
- ▶ How to determine the cost risk?
 - Data collection
 - Visual appearance
 - Coating thickness
 - Coating adhesion
- ▶ Adoption of strategy for risk management.

Some Recent Cost Data

Lead Paint ~ \$12.00 sf to \$13.00 sf

Cleaning (55%) = \$6.60 sf to \$7.15 sf

Painting (45%) = \$5.40 sf to \$5.85 sf

No lead ~ \$10 sf

Cleaning (55%) \$5.50 sf

Painting (45%) \$4.50 sf

Costs (Cont)

- ▶ No Lead Zone painting \$20 sf = ~\$2.00 sf
- ▶ No lead Spot painting \$20/ each sf treated = \$2.00 sf
- ▶ Figured as follows:
- ▶ If a bridge is 100 feet long and if five feet on the beam ends was coated. The average cost across the entire beam is \$2.00 sf.

Likewise:

- ▶ If a bridge was 10% rusted in spots we would average \$2.00 sf across the entire beam

If cost alone was the only factor...

- ▶ ...almost every bridge would receive some sort of spot or zone treatment?
- ▶ What's all the complexity about coatings?

What is “Overcoating” vs “Repainting”?

Overcoating: Application of coating materials over an existing coating in order to extend its service life, including use of the appropriate cleaning methods.

VS

Repaint: Complete removal of the existing coating system followed by application of a new coating system (including appropriate cleaning methods).

Spot Repair vs Zone Painting?

Spot repair: A procedure entailing surface cleaning of isolated corrosion or paint breakdown areas using appropriate cleaning methods, and subsequent coating of these areas and likely a full cosmetic coat for appearance.

Zone painting: A procedure entailing surface preparation using appropriate cleaning methods and painting of a defined area of a structure. Zone painting may involve (a) many spot repairs within a defined area or (b) removal of all coating in a defined area, followed by application of a new coating system to that area plus a cosmetic top coat.

Spot Repair



Access and MPT Expenses Can Be So High that
“Terminal Paint Maintenance” is attractive.

Spot Painting Decisions per se are easy
enough?

Smaller Isolated Spots Would Benefit Big Time
From a Touch-Up.

How do the cost of access and traffic control
affect the matter?

Terminal Maintenance...
Means that the most
expensive coatings project
will occur.

Zone Painting



Rusting Steel – SSPC VIS2



Disbonding Coating



Development of an Overcoating Strategy

To control both the Cost and Performance risk

Data Collection

Data Interpretation

Risk Management

Adoption of a Strategy which “fits” our needs

Performance and Cost Risk Data Interpretation

1. Use a decision matrix to develop a maintenance strategy
 - A. See sample decision matrix in SSPC-TU3
 - a) Appendix A, Table 1 (p 10-58)

Decision Matrix Example

TABLE 1
RISK OF SALVAGING EXISTING COATING BASED ON ADHESION/THICKNESS CHARACTERISTICS

ADHESION CLASSIFICATION			COATING THICKNESS		
ASTM D 3359 Method B* * (using 5 mm guide)	Percentage Removed	ASTM D 3359 Method A	< 10 mils (< 254 μm)	10-20 mils (254-508 μm)	> 20 mils (> 508 μm)
5B	0%	5A	OK	OK	OK
4B	1% to 5%	4A	OK	OK	OK
3B	6% to 15%	3A	OK	OK	OK
2B	16% to 35%	2A	LR	LR	MR
1B	36% to 65%	1A	MR	HR	HR
0B	> 65%	0A	NO	NO	NO

OK = essentially no risk
 LR = low risk
 MR = moderate risk
 HR = high risk
 NO = integrity too poor to salvage

* Method B is not recommended for use on films above 5 mils in thickness unless otherwise agreed upon between the contracting parties.

SSPC-TU3, p 10-58

Data Collection

Development of an Overcoating Strategy

Data Collection

1. How does the current coating look?
 - A. Percentage rusted or otherwise distressed
 - a) Blisters
 - b) Peeling
 - B. Use SSPC Vis 2 to characterize
2. How thick is the coating in place?
 - A. Number of coating layers in place
3. How well is it adhered?
 - A. X cut tests
 - B. Cross hatch tests
 - C. Adhesion Test Dollies
4. What is the condition of the substrate?

Data Collection

1. How does the current coating look?

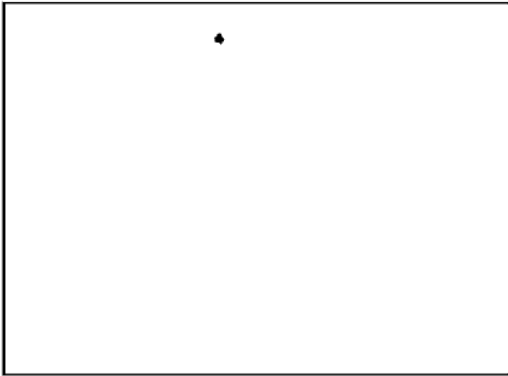
A. Percentage rusted or otherwise distressed

- Blisters
- Disbonding/Peeling

B. Use SSPC Vis 2 to characterize

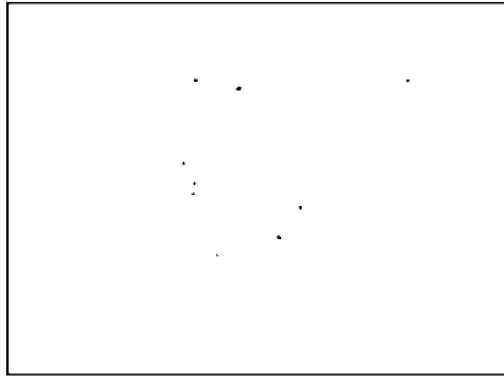
- SSPC-VIS 2 – Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces

SPOT RUSTING



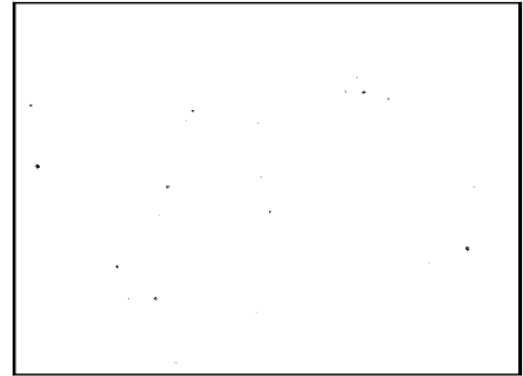
Rust Grade 9-S, 0.03% Rusted

GENERAL RUSTING

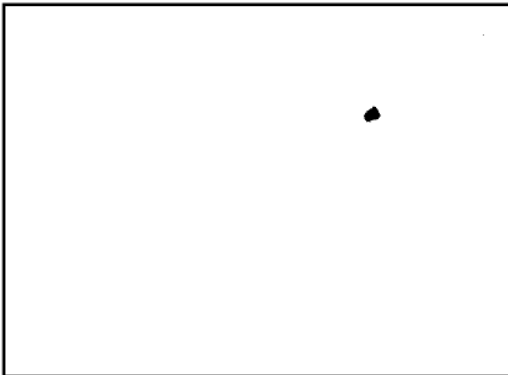


Rust Grade 9-G, 0.03% Rusted

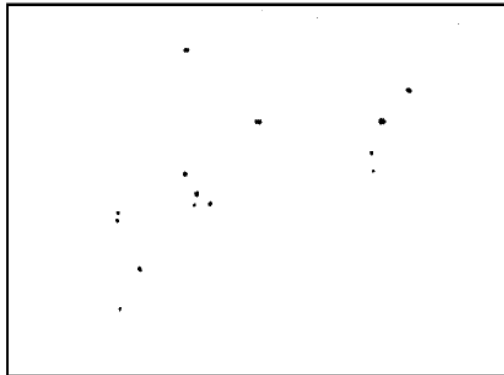
PINPOINT RUSTING



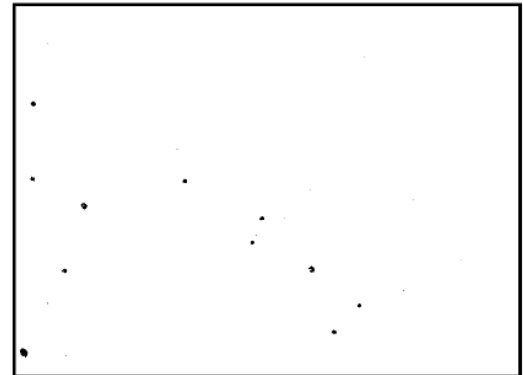
Rust Grade 9-P, 0.03% Rusted



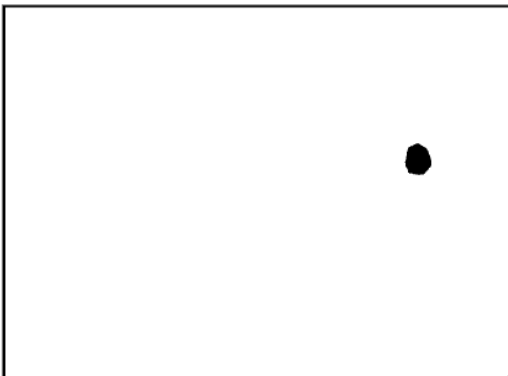
Rust Grade 8-S, 0.1% Rusted



Rust Grade 8-G, 0.1% Rusted



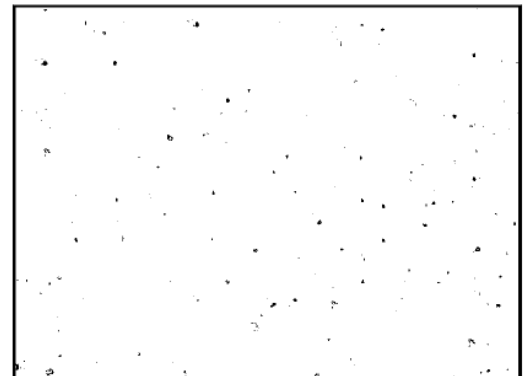
Rust Grade 8-P, 0.1% Rusted



Rust Grade 7-S, 0.3% Rusted



Rust Grade 7-G, 0.3% Rusted

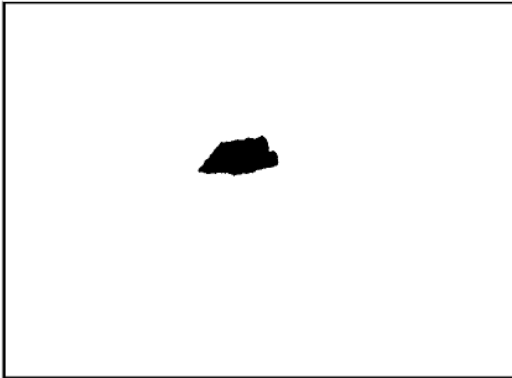


Rust Grade 7-P, 0.3% Rusted

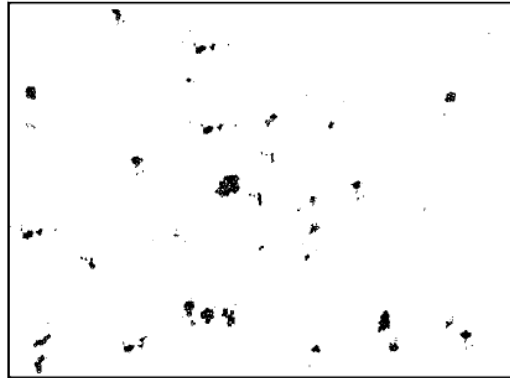
SPOT RUSTING

GENERAL RUSTING

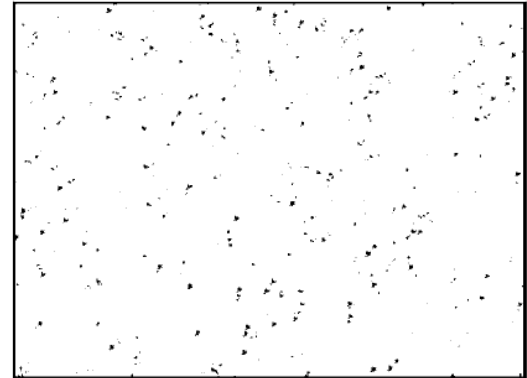
PINPOINT RUSTING



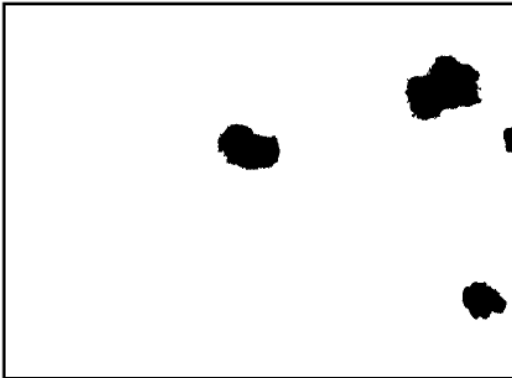
Rust Grade 6-S, 1% Rusted



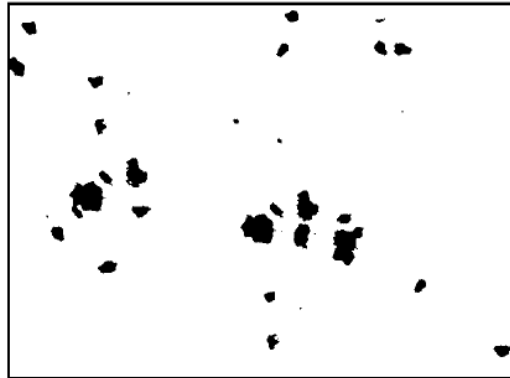
Rust Grade 6-G, 1% Rusted



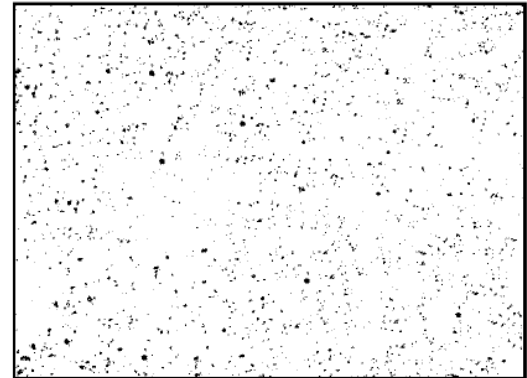
Rust Grade 6-P, 1% Rusted



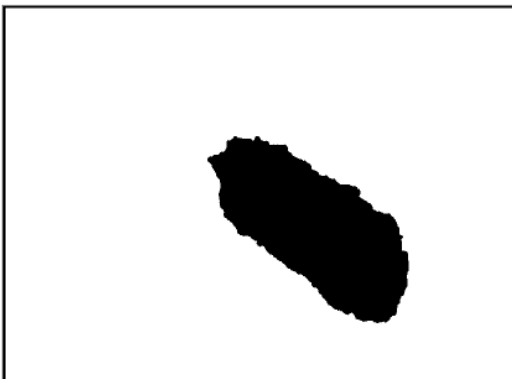
Rust Grade 5-S, 3% Rusted



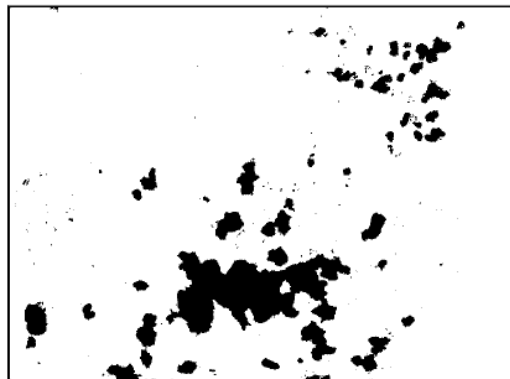
Rust Grade 5-G, 3% Rusted



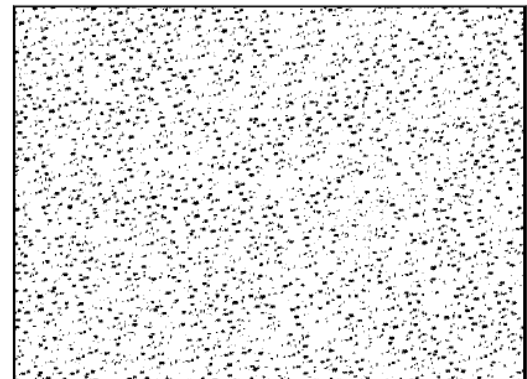
Rust Grade 5-P, 3% Rusted



Rust Grade 4-S, 10% Rusted



Rust Grade 4-G, 10% Rusted



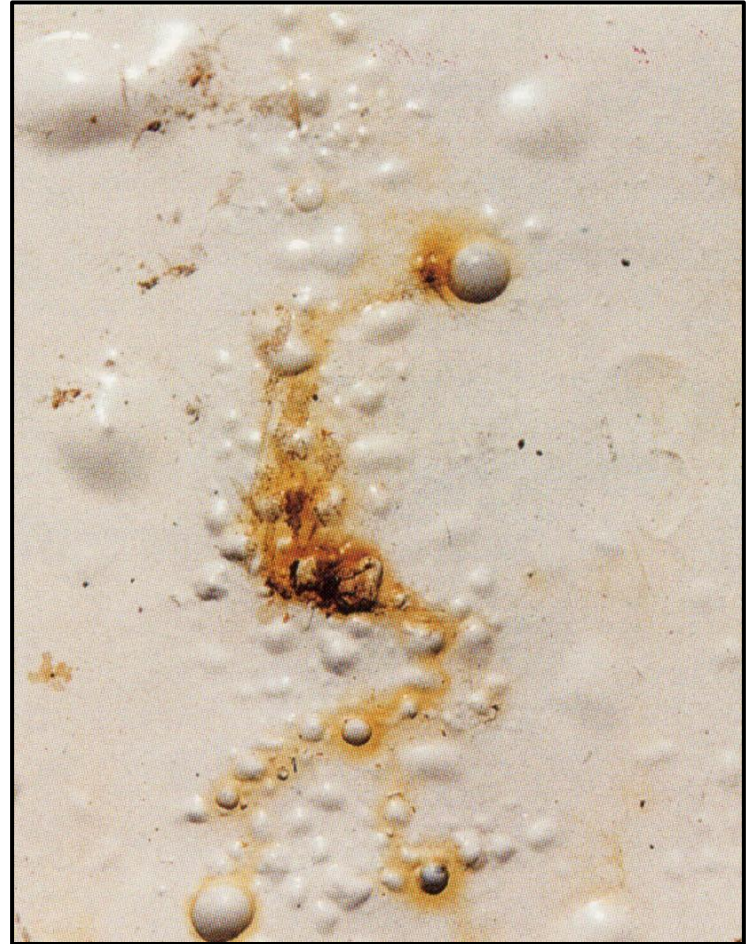
Rust Grade 4-P, 10% Rusted

11b

Disbonding/Peeling Paint



Blistering Paint



Disbonding/Peeling Paint



Visual Appearance – XX% per SSPC-VIS 2



Data Collection

How thick is the existing coating

Dry Film Thickness Gage



Tooke Gage



Data Collection

Coating Adhesion:

There are but two different tests that are normally used:

1. ASTM D3359 – 09 Standard Test Methods for Measuring Adhesion by Tape Test

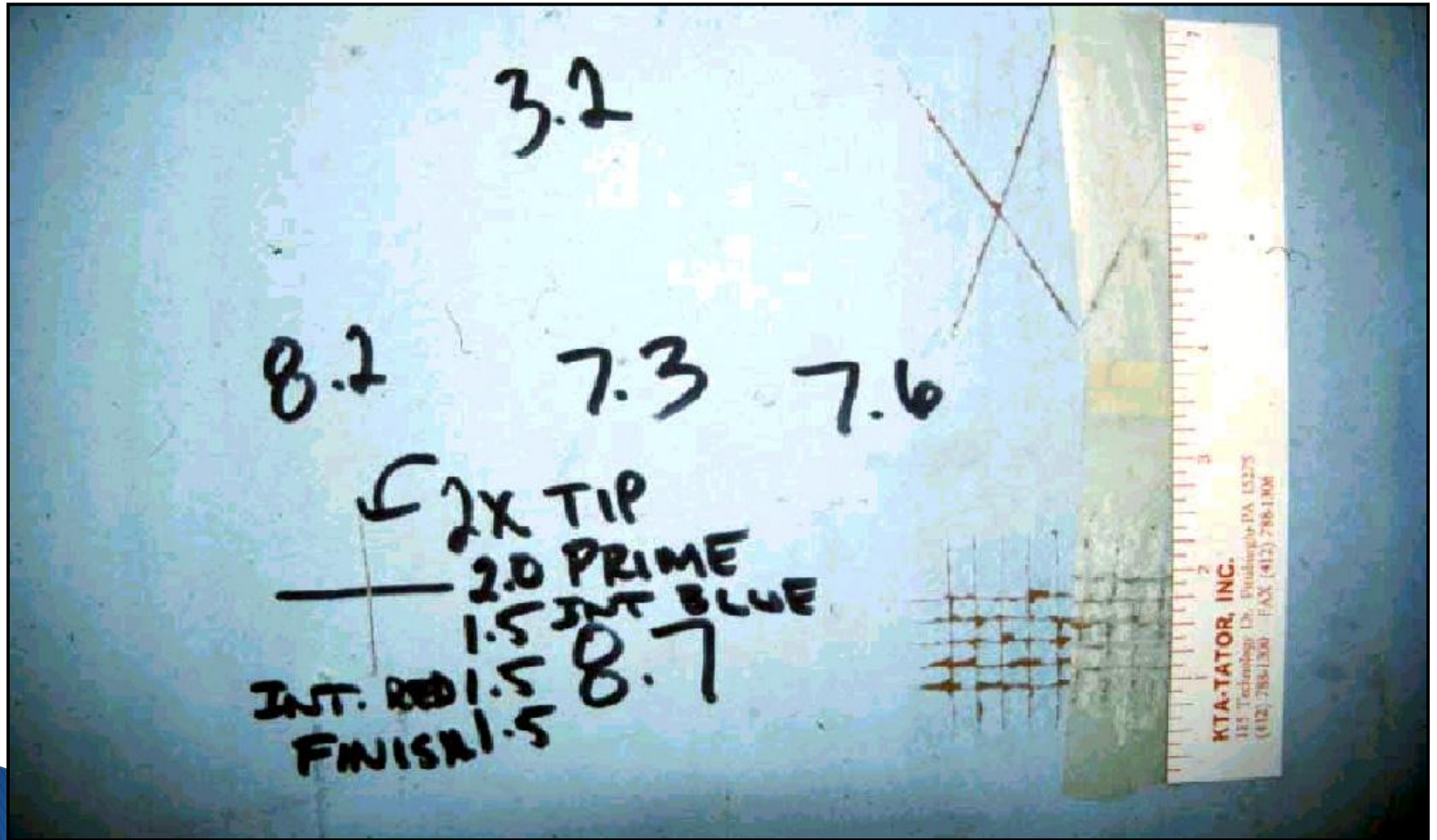
- Method A X cut tests

- Method B Cross hatch tests

2. ASTM D4541 – 09 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

- Test dollies

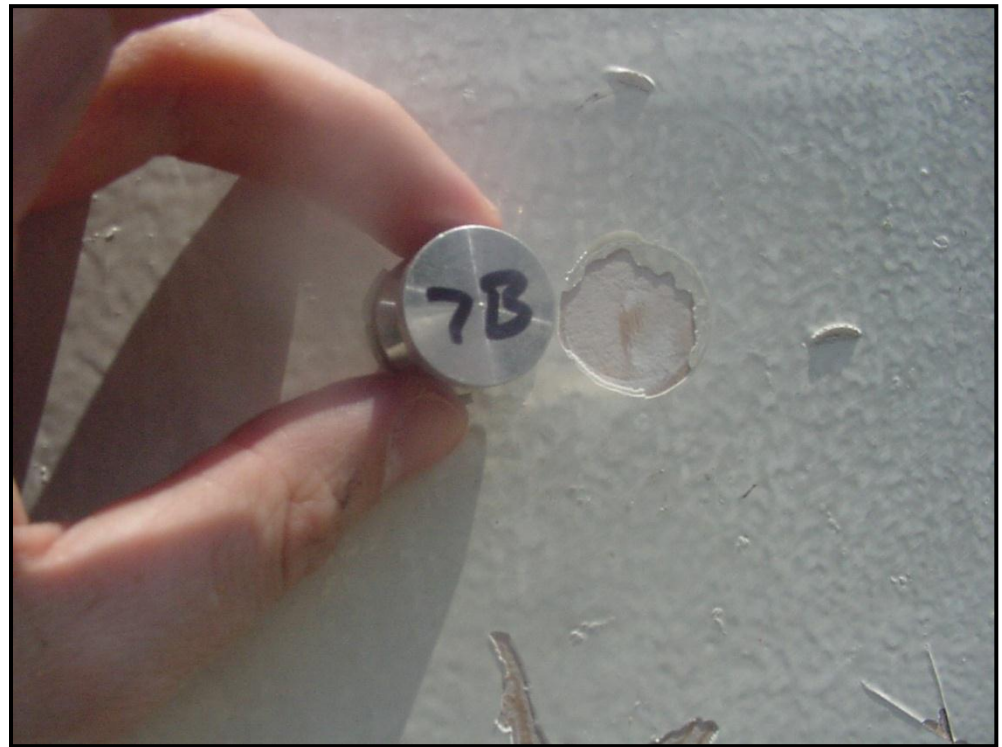
Putting All The Data Together



Adhesion Tester



Test Dollie



ASTM D 4541



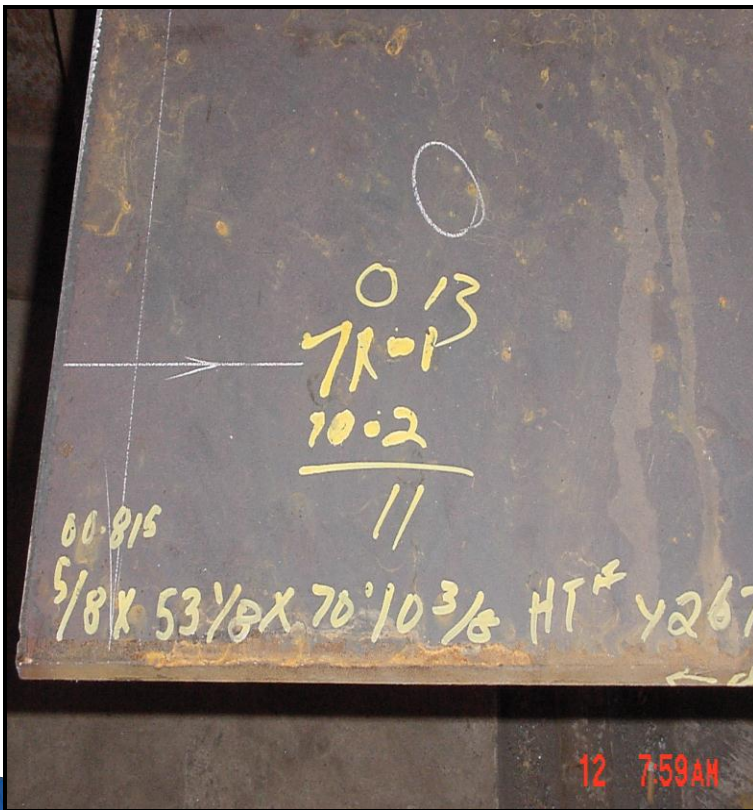
Data Collection

What is the condition of the substrate?

Mill Scale

vs

Blast Cleaned Surface



Data Interpretation

Development of an Overcoating Strategy

Data Interpretation Suggestions

Maintenance Strategy Illustration:

- ▶ When there is more than 16% of the surface requiring surface preparation effort, overcoating is not an option.
- ▶ Spot or Zone cleaning and overcoating are viable options when a little- or-no-risk-of-failure condition exists i.e., there is no more than 5% rust and the total coating film thickness is less than 25 mils.
- ▶ Note that the AASHTO, Guide For Painting Steel Structures, 1994 indicates that when the surface preparation area exceeds 15–20 percent of the total surface area, the economics are such that total removal of lead paint on bridges is the most viable option.

Risk Management

Development of an Overcoating Strategy

After We Select a Strategy, Then More “Risk Management”

Test maintenance strategy

Test patch application

Test to assess coating compatibility, appearance and adhesion

Risk Management

Test Maintenance Strategy on typical surfaces to be overcoated

Having a solid, well developed, tested Maintenance Strategy is a critical part of risk management

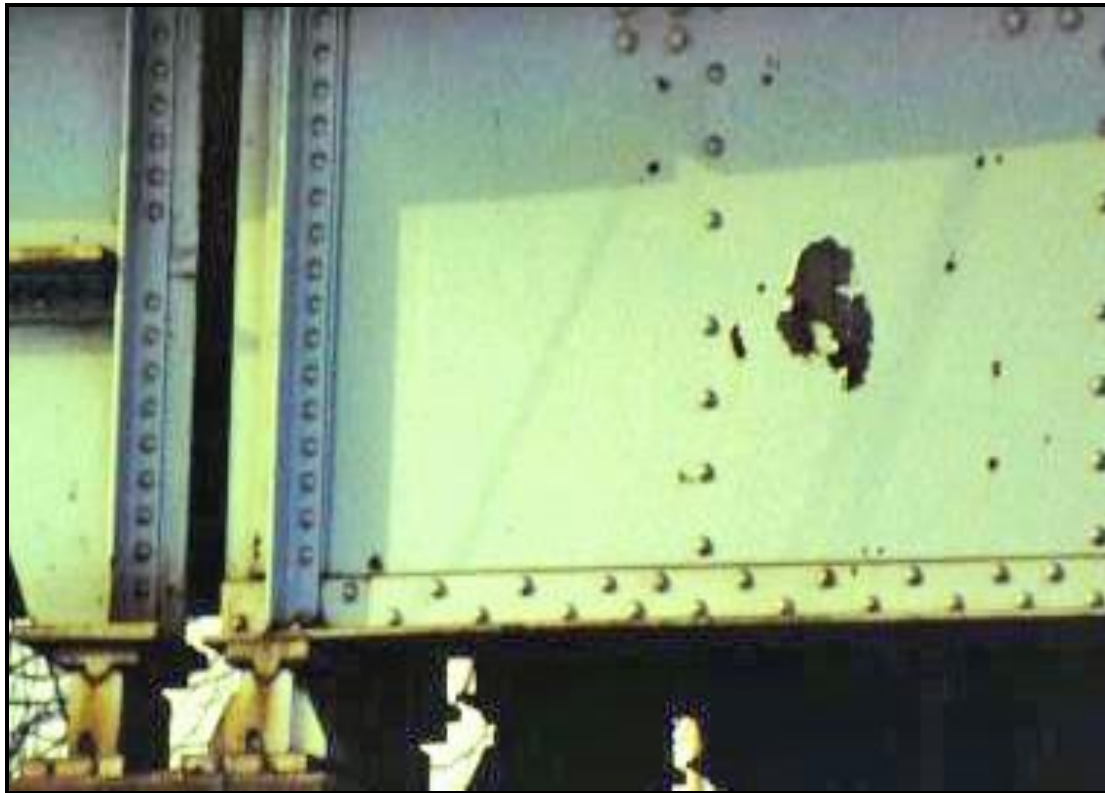
Risk Management

Select test locations for evaluation that properly characterize differences in configuration and exposure; i.e. vertical vs. horizontal surfaces and sheltered vs. unsheltered exposure.

Test patches are described in ASTM D 5064, and SSPC-Guide 9, Section 6.2.2, and SSPC-TU 3, section 3.4.4.

Compatibility Issues

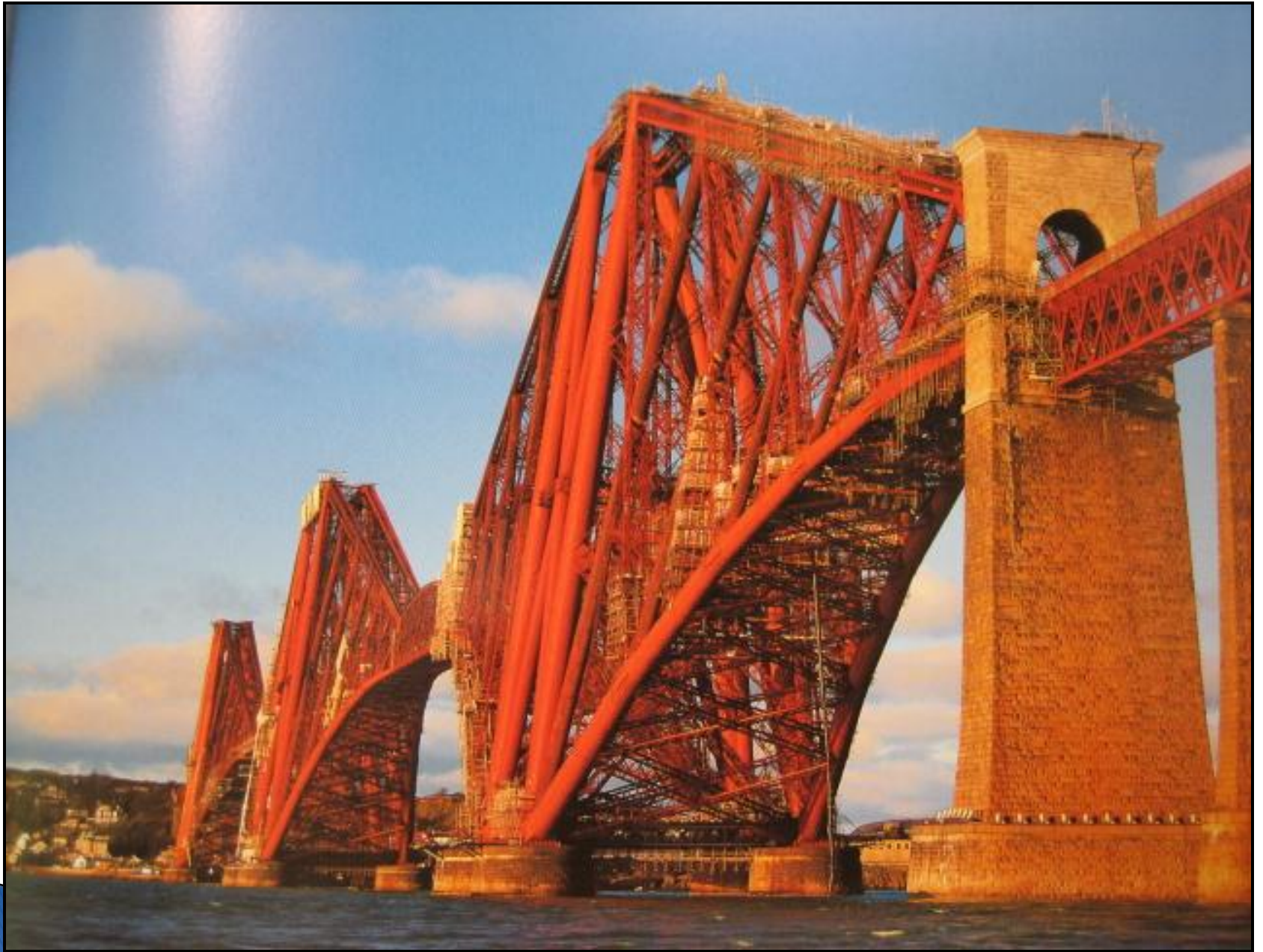
Blisters, Lifting, Cracking



Conclusion

- ▶ Bridge preservation via overcoating creates a risk of failure that is higher than repainting because of the unknowns presented by the old coating.
- ▶ The Overcoatability of the existing coating system can be assessed to determine the risk of early rusting or disbonding and the resultant poor appearance and possible corrosion damage to the substrate.

**Can this bridge be
successfully preserved via
coatings?**

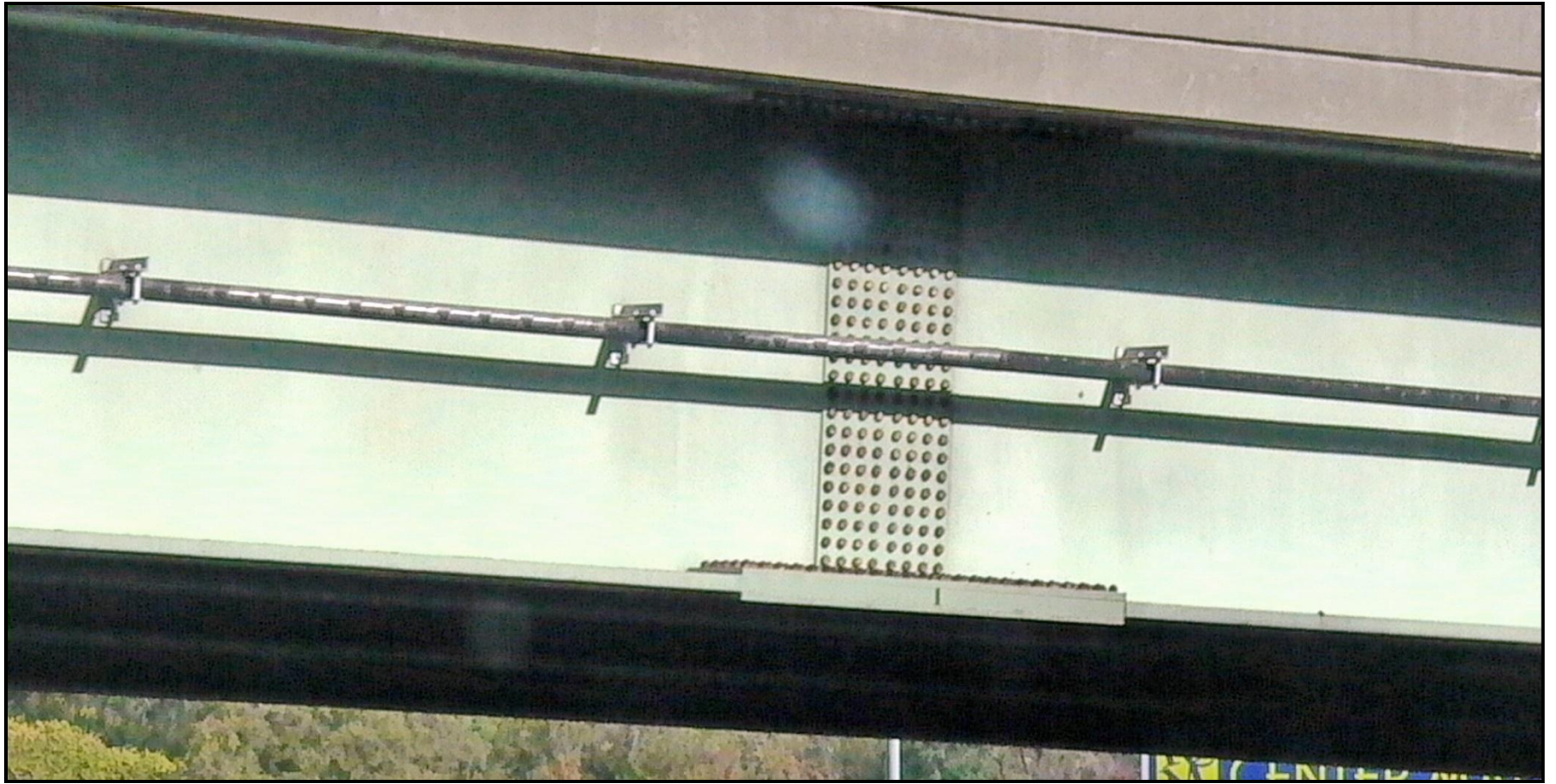












Questions?