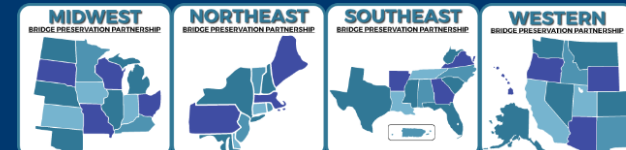


Single Coat Organic Zinc Rich Paint for Bridge Preservation

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54-Year-Old Single Coat Organic Zinc Bridge in Switzerland



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Single Coat Organic Zinc Bridges in Norway



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Single Coat Organic Zinc Systems

- Some of these formulations are unchanged for over 50 years!
- Dozens of OZ bridges through the world
- Many up to 50+ years without any maintenance
- Used in over 100 countries in various environments
- Excellent in coastal areas
- NTPEP testing in progress (single coat organic zinc)

- Environmentally friendly - sustainable - low TOC solution
- UV Resistant!
- Indefinitely Reloadable without abrasive blast
- True Cathodic Protection & depletion rate comparable to HDG
- DFT of 4-6 mils => 25-35 years protection in coastal areas, 50+ years other environments
- Conforms to Class B Slip Coefficient

- Flexible – No cracking, flaking, crevices, nor delamination
- Weldable NO toxic fumes
- Easy & fast application, high RH tolerance, 1-component, ...
- Unlimited shelf-life
- Frequently used in multi-coat systems as well

Zinc Coatings: Some of these OZ Coatings have:

- One component product so no mixing of chemicals or pouring the powdered zinc into the bucket required
- Very fast airless application and can be applied as a stand-alone system
- Very high electrical potentials 1118 mV = good cathodic protection
- This gives the OZ layer a 'throwing power' of up to 9/16 inches from where the zinc layer ends

High electrical potential of Film Galvanizing:



Zinc rich paint



Single Coat OZ

Electrical potential of OZ:

Minimum – 840 mV is necessary to have good cathodic protection

Produces over-1100 mV



ASTM D823

CONDUCTIVITY DETERMINATION OF ZINC FOR PROOF OF CATHODIC PROTECTION

- Prepare a film by drawdown (ASTM D823) or brush application on a substrate that is not conductive. Glass and Mylar® are two examples of substrate material that have been used successfully. The prepared films should be approximately 4"x 6".
- Thoroughly mix the material as per the manufacturer's instructions. To ensure suspension of zinc pigment, the sample should be agitated immediately before each application.
- The samples should be prepared at film thicknesses that encompass the application requirements of the material, or as agreed upon. To accommodate different types of application, the coating can be applied at various film thicknesses. If required, more than one layer can be applied.
- Permit the prepared films to dry at ambient laboratory conditions of approximately 73°F for 7 days, or as agreed, prior to the conductivity evaluation.
- A power source is put in contact with the topside of the coating and a connection for the reading device, a multi-meter, is placed on the top surface of the coating film at a distance of about 4" from the power connection. The power supply was set at approximately 6V. A baseline voltage determination should be obtained across the surface of the selected substrates using the same technique to confirm that there is no conductivity of the material. Neither the uncoated glass nor the uncoated Mylar® panel registered any voltage. Record the distance of the multimeter contact from the attachment of the power source.
- The reading from the multimeter is reported as the measurable voltage across the surface (conductivity reading).
- Five measurements are obtained, and the reported value is the average of the five readings.
- Measurements are obtained on uncoated steel panels to verify the function of the test protocol. Steel is conductive and should not be used for the actual testing of the zinc conductivity.
- Note that no calculations based on per unit area are performed since the paths between the zinc particles are not limited to a direct path and could occur anywhere within the 4" x 6" film.

Zinc Coatings: Single Coat Organic Zinc Rich System

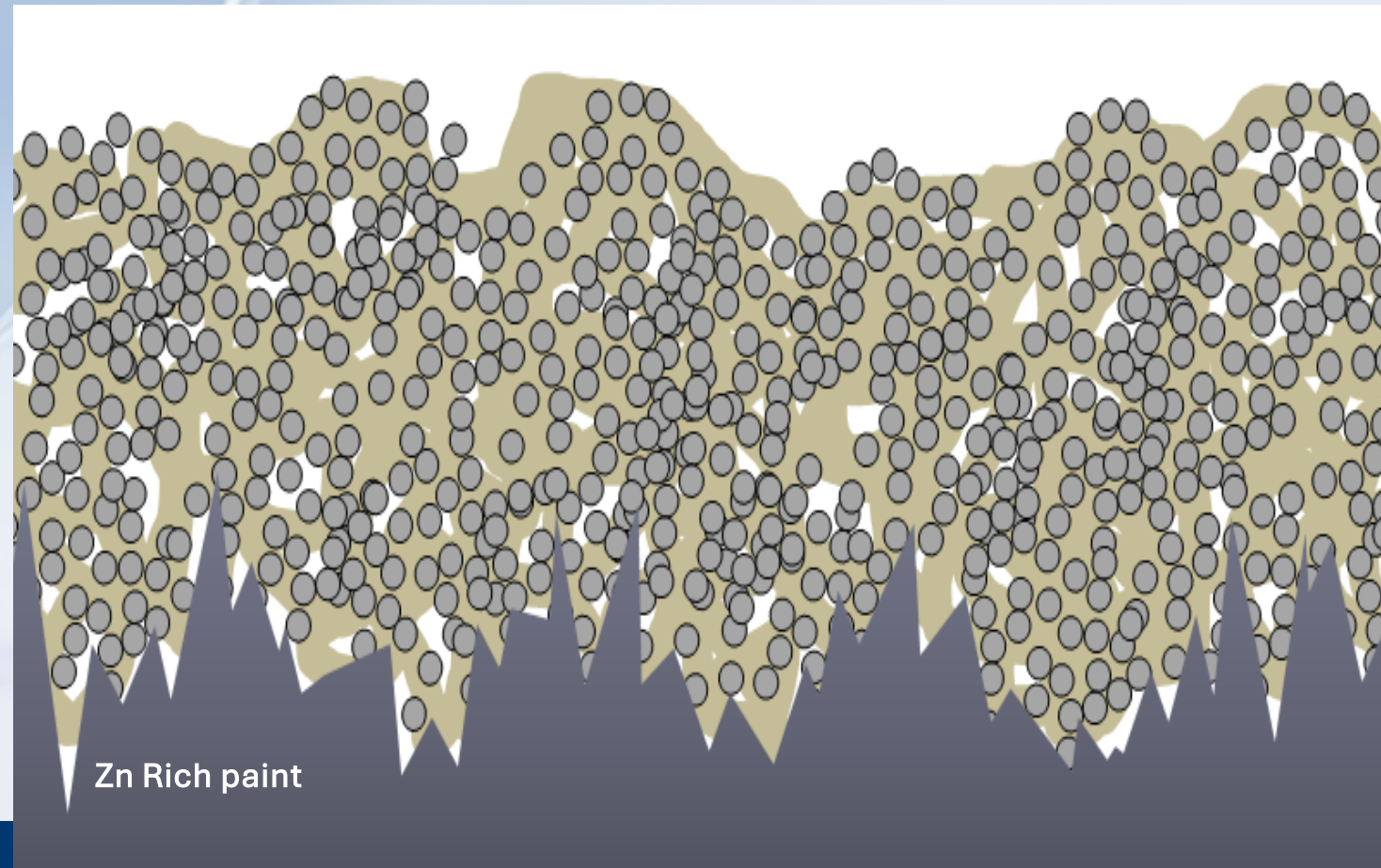
- Depletion-rate is similar to that of hot dip galvanizing coatings
- Can be applied up to 10.0 mils with no mud cracking, and 5.0 mils gives 25 – 35 years durability

A look at Single Coat organic Zinc Rich Systems:

- OZ is used globally on bridges, ships, transmission towers and in many other industries.
- It is rated to ISO 12944 - C5 (Very High) which is a minimum durability of 25 years when applied at 5 mils.
- C5 is a coastal rating, so on **inland** structures the durability can be 50 years or more.
- It can be coated with polyurethanes or acrylics for cosmetic finishes.

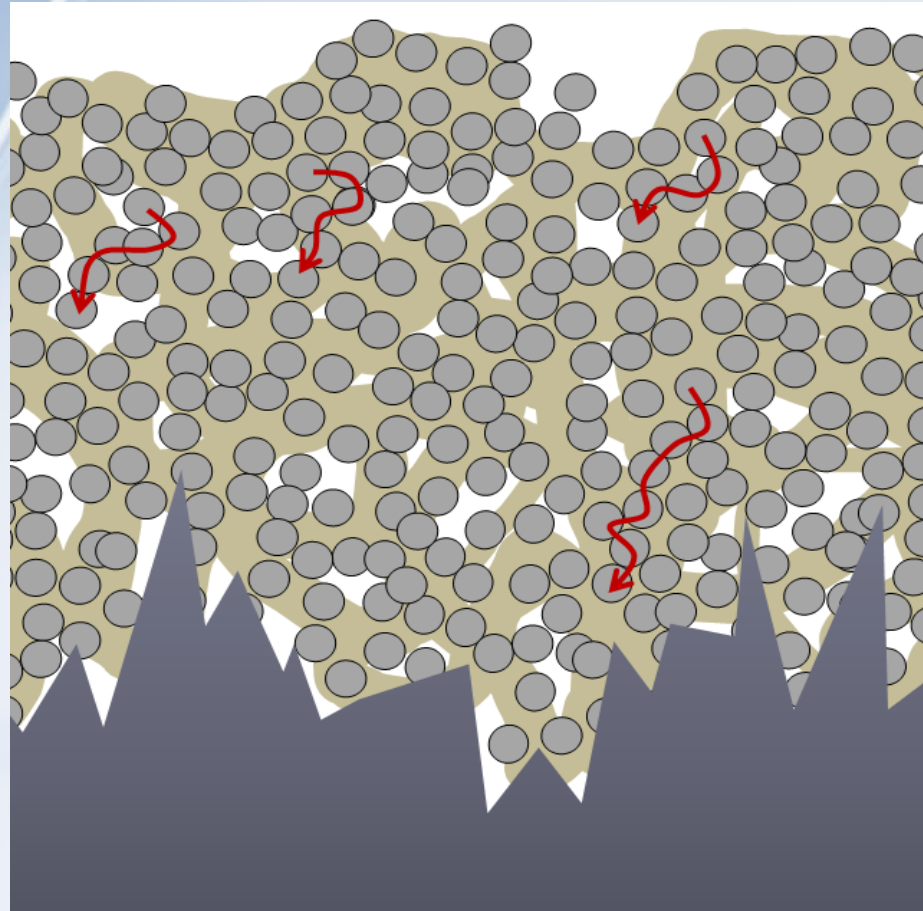
ZRP CHARACTERISTICS:

A look at the typical ZRP system: zinc particles



ZRP CHARACTERISTICS:

Larger zinc particle sizes:



Larger zinc particles = more interstitial spaces between the particles = broken current flow

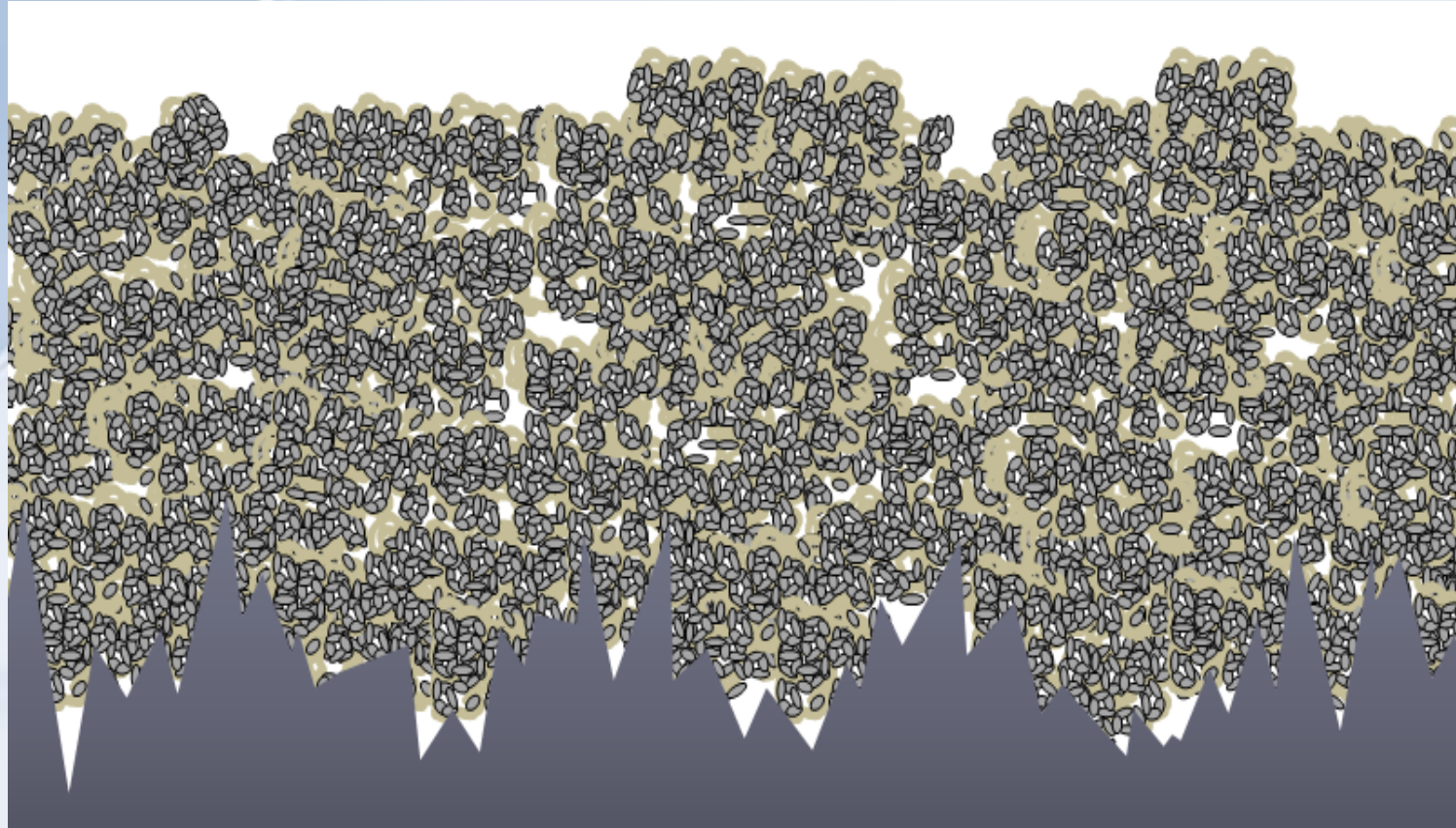


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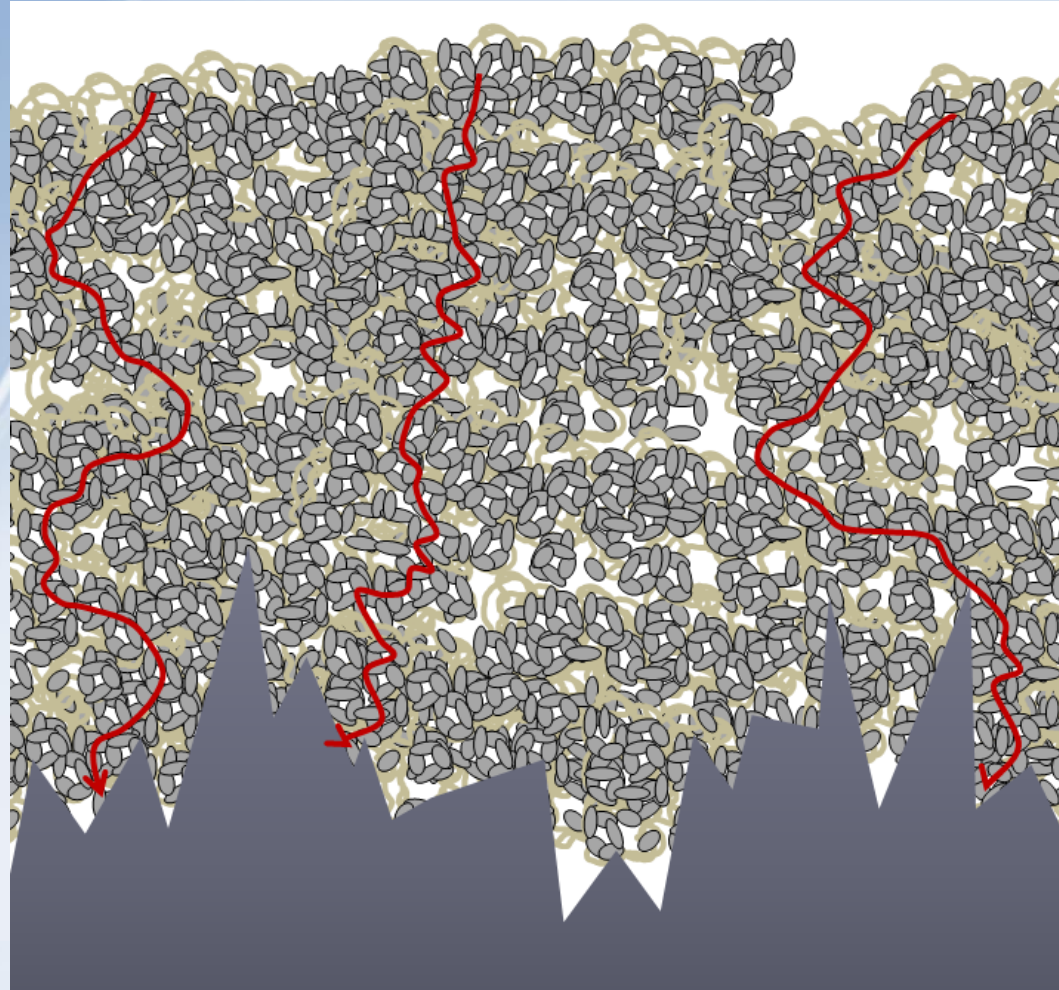
ZINGA CHARACTERISTICS:

A look at High Zinc Loaded OZ: Has much finer zinc particles



More pure zinc present in the same space = higher densities = higher protective voltages

OZ WITH MUCH SMALLER ATOMIZED ZINC PARTICLE SIZES



Smaller zinc particles = no interstitial spaces between the particles = unbroken current flow
This gives the same behavior as HDG where the current flows from the surface of the zinc.

APPLICATION:

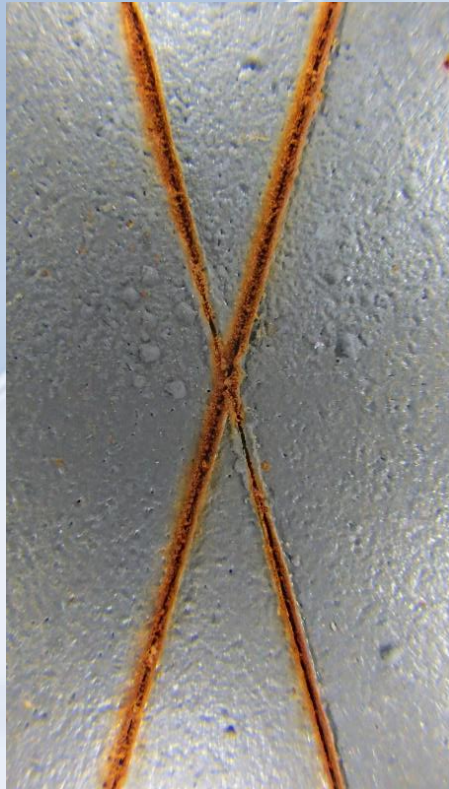
- Some OZ's re-liquifies when more OZ is applied on top of the existing OZ coating even after 50 years
- Stripe-coating becomes part of the main coat as a result of reliquification
- The entire steel structure becomes fully cathodic protected with no missed areas
- No delamination between the layers, extremely fine particle of the zinc ensure good penetration inside bolted joints

What are the conditions during application?

- Some of the OZ's perform much better than the typical OZ paints, and is not affected by many ambient conditions
- Paints cannot normally be applied above RH70% whereas some OZ's can be applied up to RH95%
- Some OZ's can be applied even if it is going to rain within an hour, as the rainwater simply seals it faster
- Some OZ's can be applied at temperatures of 104° F where it dries hard within 10 minutes, and in cold areas it can be applied at 5° F

TYPICAL ZRP WITH EPOXY BINDER AND SINGLE COAT OZ WITH MIN OF 96% ZINC IN THE DRY FILM

Immersion testing:



Typical Zinc rich paint



Single Coat OZ

After 7 days exposure to salt water immersion. The X-scribe has been cut through to the steel surface

FILM GALVANIZING COATING:

Characteristics:

- Toxicity
 - Composed of non-toxic elements
(Green Label from Singapore Environment Council)
 - Can be used in contact with potable water
 - > Tested according AS-NSZ 4020 & NSF/ANSI/CAN 61
- Unlimited shelf life
- Almost indefinite pot life (no skin on surface after first use, if can well closed)
- Excellent and indefinite UV resistance



Bridge cables on Kalvoya Bridge, Norway



Braithwaite potable water tanks in UK

SINGLE COAT OZ TESTING:

Reaction to fire:

SGS Yarsley Technical Services (United Kingdom)

Test on fire propagation on OZ (BS 476 part 6 and part 7)

OZ obtained some of the best possible result

“In accordance with the Flame Spread Classification given in the Standard and reproduced above, the results show that the material has a Class 0 surface.”

Efectis (The Netherlands)

Classification of reaction to fire performance on FG
(EN 13501-1:2007 + A1:2009)

OZ obtained best rating

“The product, FG 2 x 90 µm DFT, coating on steel, in relation to its reaction to fire behavior is classified:

Reaction to fire classification: B – s1, d0”



The European experts in fire safety

SLIP COEFFICIENT:

KTA TATOR (USA)

Test on the friction coefficient of OZ (ASTM A325)

The slip coefficient of this ZRP is 0.53

Slip coefficient HDG: 3.1

“The primer exhibited a slip coefficient of 0.52 and passed the 1,000-hour Creep Deformation test.

RTA Roads & Traffic Authority (New Zealand)

Test on the friction coefficient of this ZRP is (AS4100:1998)



Examples of Single Coat OZ Bridges



Biloxi Bridge in Mississippi

Biloxi Bridge on the 110 interstate being coated with SCOZ



Email from the Mississippi DOT on Single Coat Organic Zinc for the Biloxi Bridge I-110 over the Biloxi Back Bay

From: Battey, Randy [mailto:rbattey@mdot.ms.gov]
Sent: Tuesday, June 04, 2013 12:20 PM
To: Bill
Subject: RE: Application

Bill,

I inspected the I-110 bridge over the Biloxi Back Bay that had ----- applied to 25% of the approach spans approximately 10 years ago and it looks as good today as it did immediately after construction. My District Engineer and Bridge Maintenance folks were very happy with it and wished we could have done the whole bridge with it, but when they looked into it apparently there were some proprietary or made in the USA issues that federal highway would not participate in.

Randy
Randy Battey, P.E.
Assistant Chief Engineer – Operations Mississippi Department of Transportation

Biloxi Bridge SCOZ application:



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I was on this bridge in June 2023

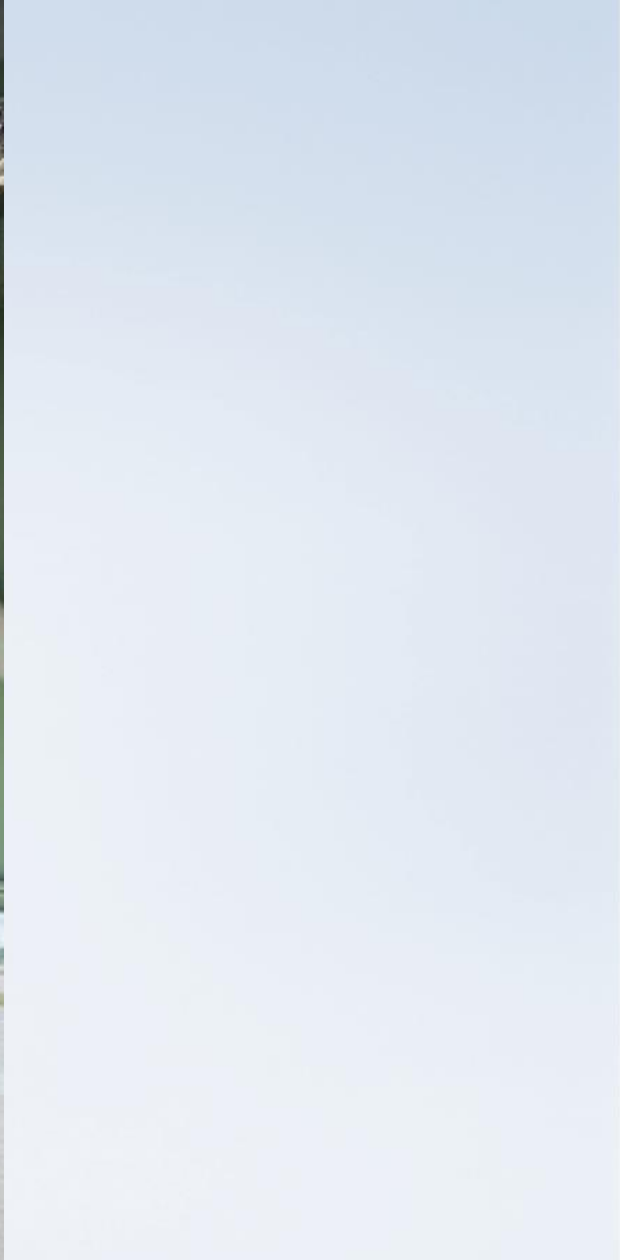


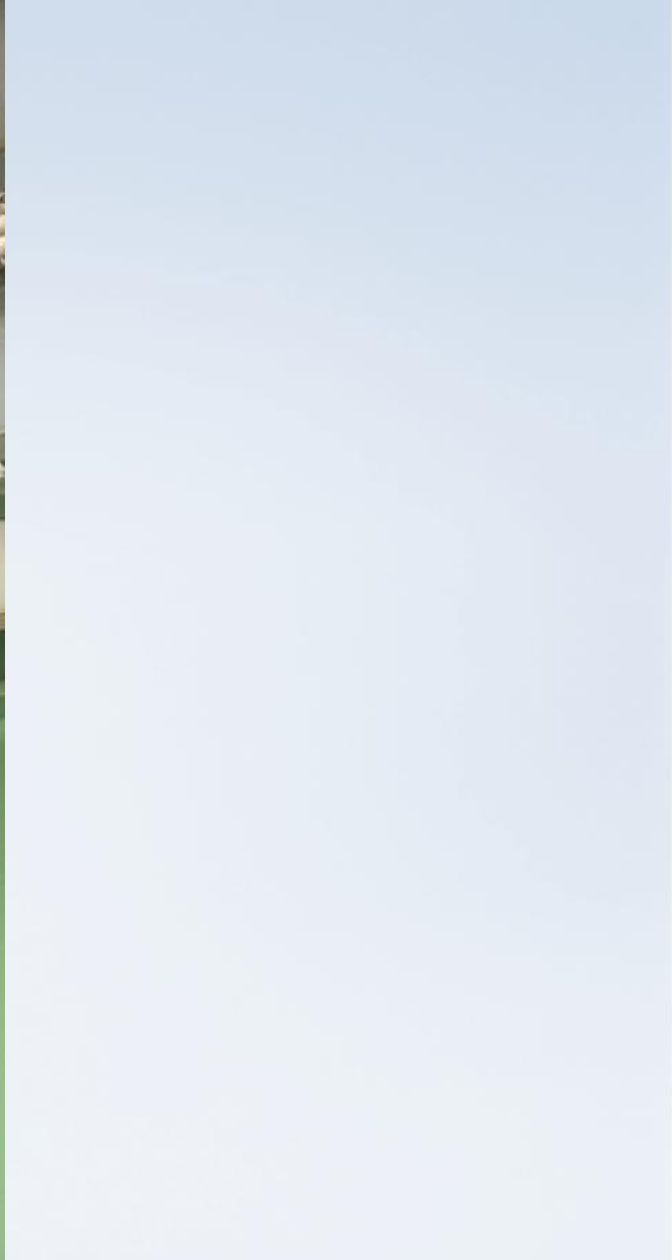
Biloxi I-110 Bridge – June 2023





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The 'Kalvoya Bridge' in Norway over 46 years old



The 'Kalvoya Bridge' in Norway



EXAMPLES:

Single Coat OZ bridges:



Pull-off testing on the Kalvoya Bridge after 30 years = 1624 psi

SINGLE COAT OZ BRIDGE IN NORWAY I WAS ON 8/14/2023









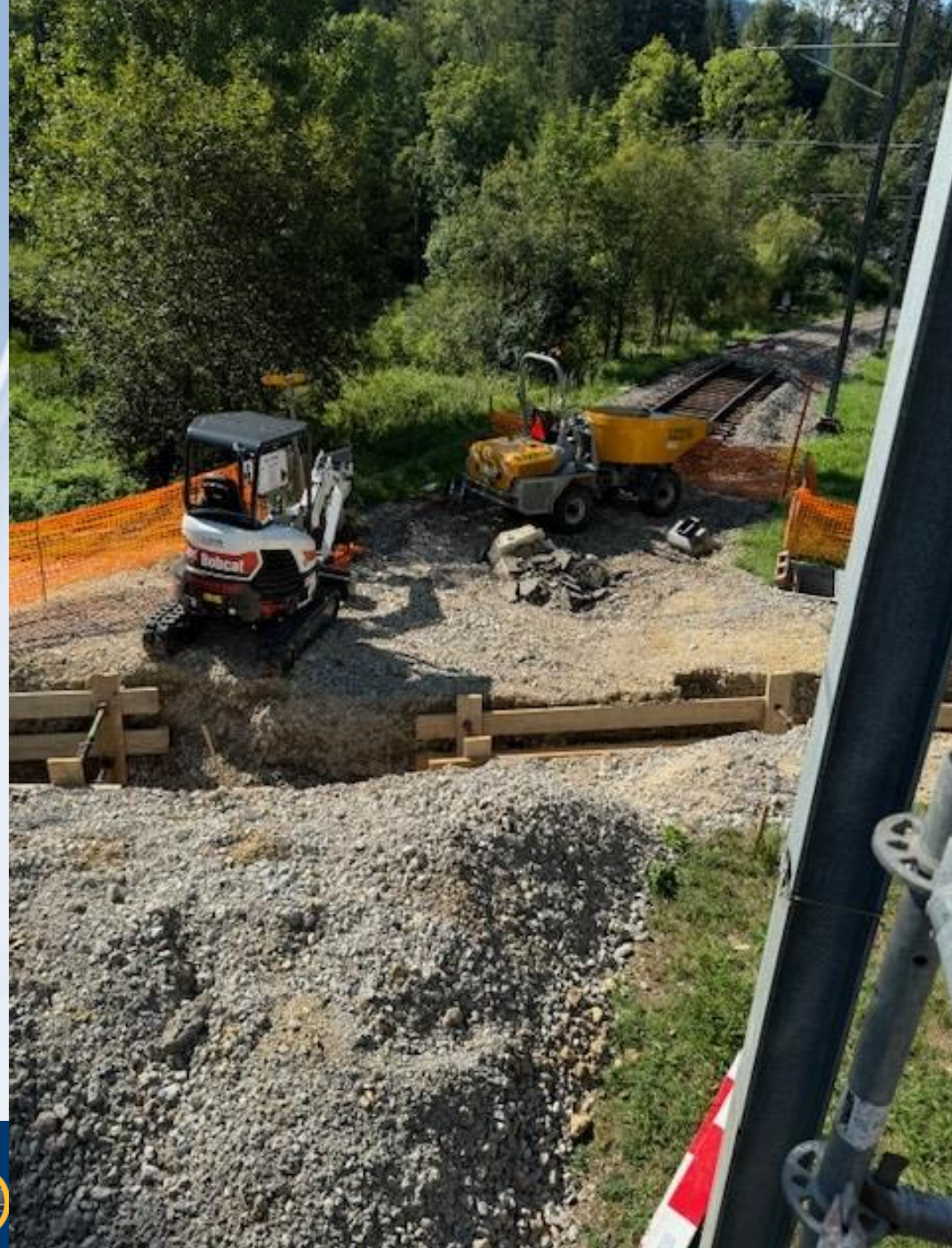
54 years old Single Coat OZ Bridge in Switzerland



54 years old Single Coat OZ in Switzerland



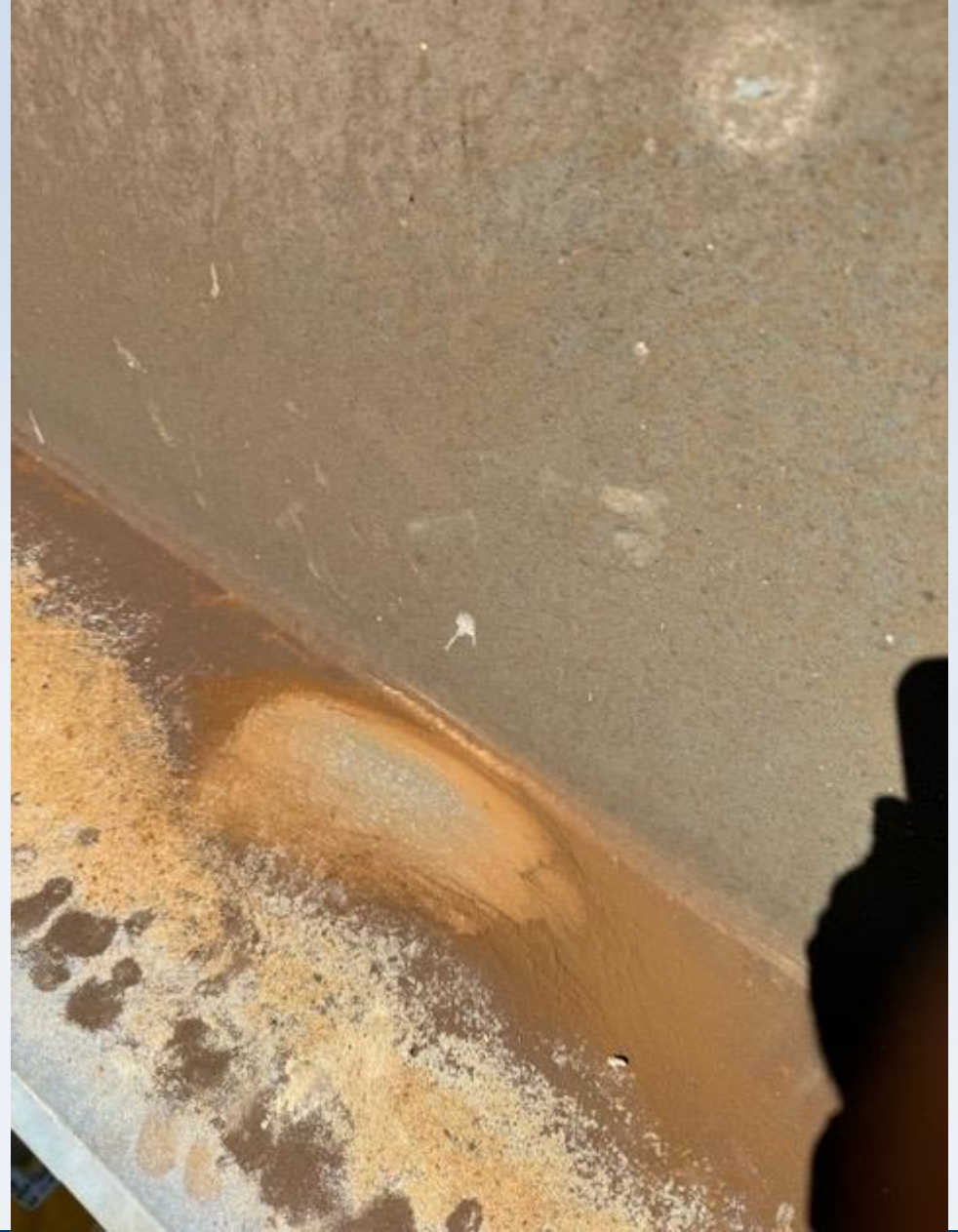










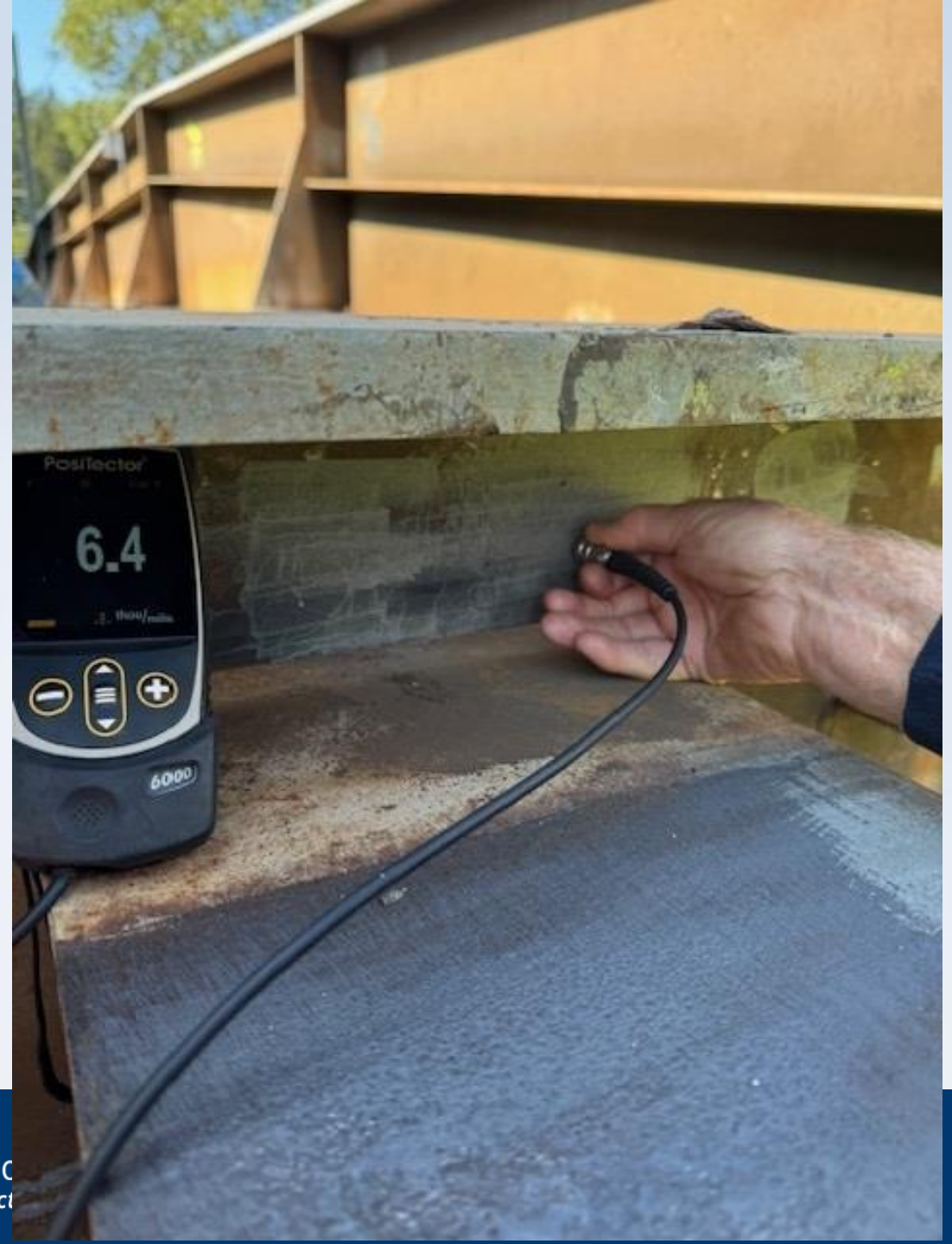




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6.2 Mils



6.1 Mils



7.6 Mils



Edges not Stripe coating – Corrosion





EXAMPLES:

Film Galvanized bridges:



The 'Seims Bridge' in Norway after 30 years of service. Both the inner and outer faces are in perfect condition.

EXAMPLES:



The massive new Zhougang Bridge in Beijing, China

Approximately $\frac{1}{4}$ Of this Bridge has Single Coat OZ



The 'Özalp Bridge' in Turkey – 4th longest bridge in the world

EXAMPLES:



The 'Ozmangazi Bridge' under construction



EXAMPLES:



The 'Newark Marina Bridge' in England straddles the entrance to the boating marina.
OZ + PU coating system

EXAMPLES: SINGLE COAT OZ BRIDGES



The 'Hoga Bridge' in Norway

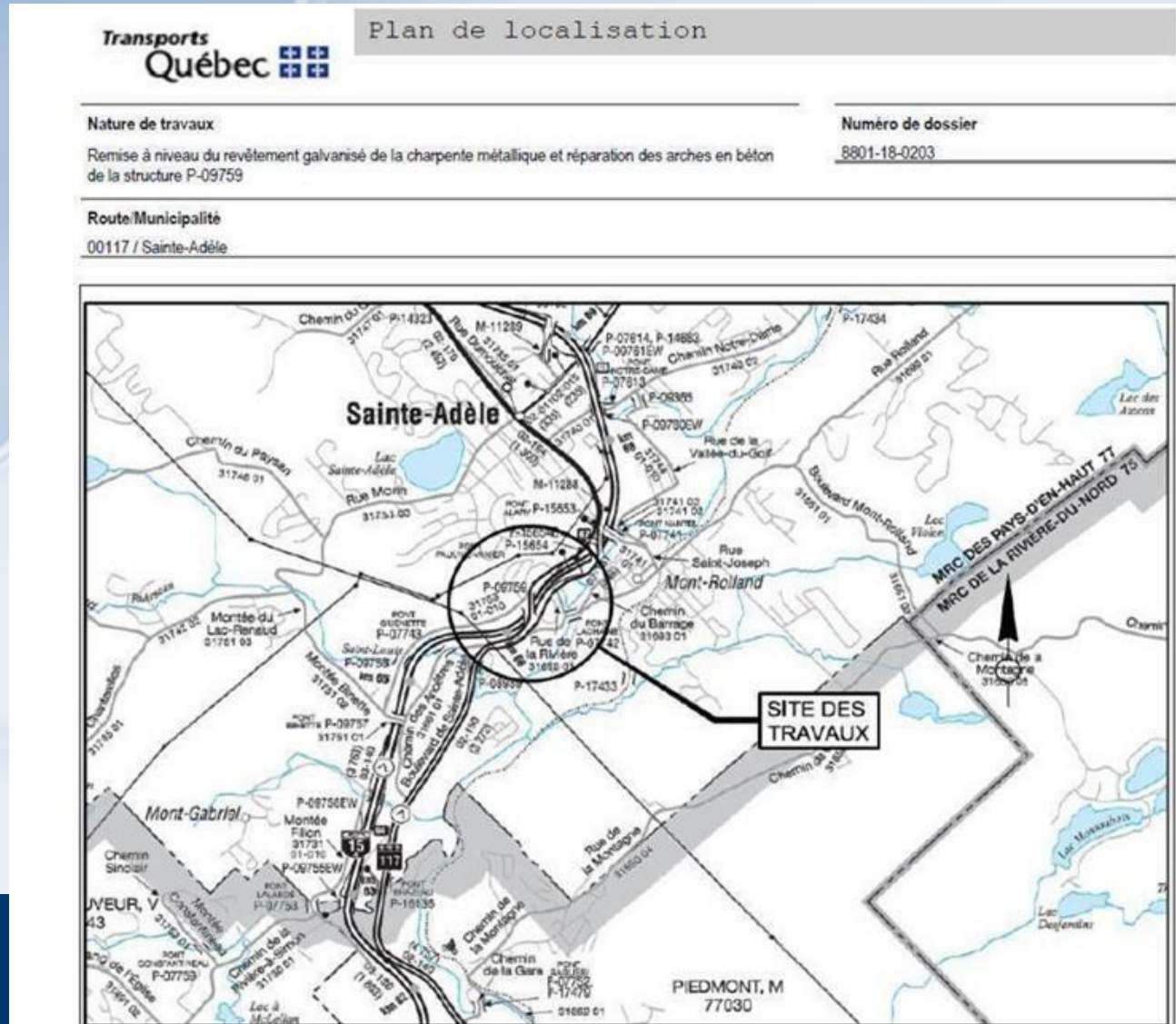


A close-up after 30 years

Thermal Spray + Single Coat OZ Duplex => one of the best Protection of Steel Bridges:

- OZ is an excellent sealer, and depletes preferentially to TSZ
- TSZ + OZ Duplex = Anode-on-Anode Duplex for new bridges
- OZ for rehab of in-service bridges (Single Coat Organic Zinc)
- TSZ won't physically degrade, nor the underneath steel corrode

Example of FG ST-ADELE BRIDGE QC, CANADA



ST-ADELE BRIDGE QC, CANADA





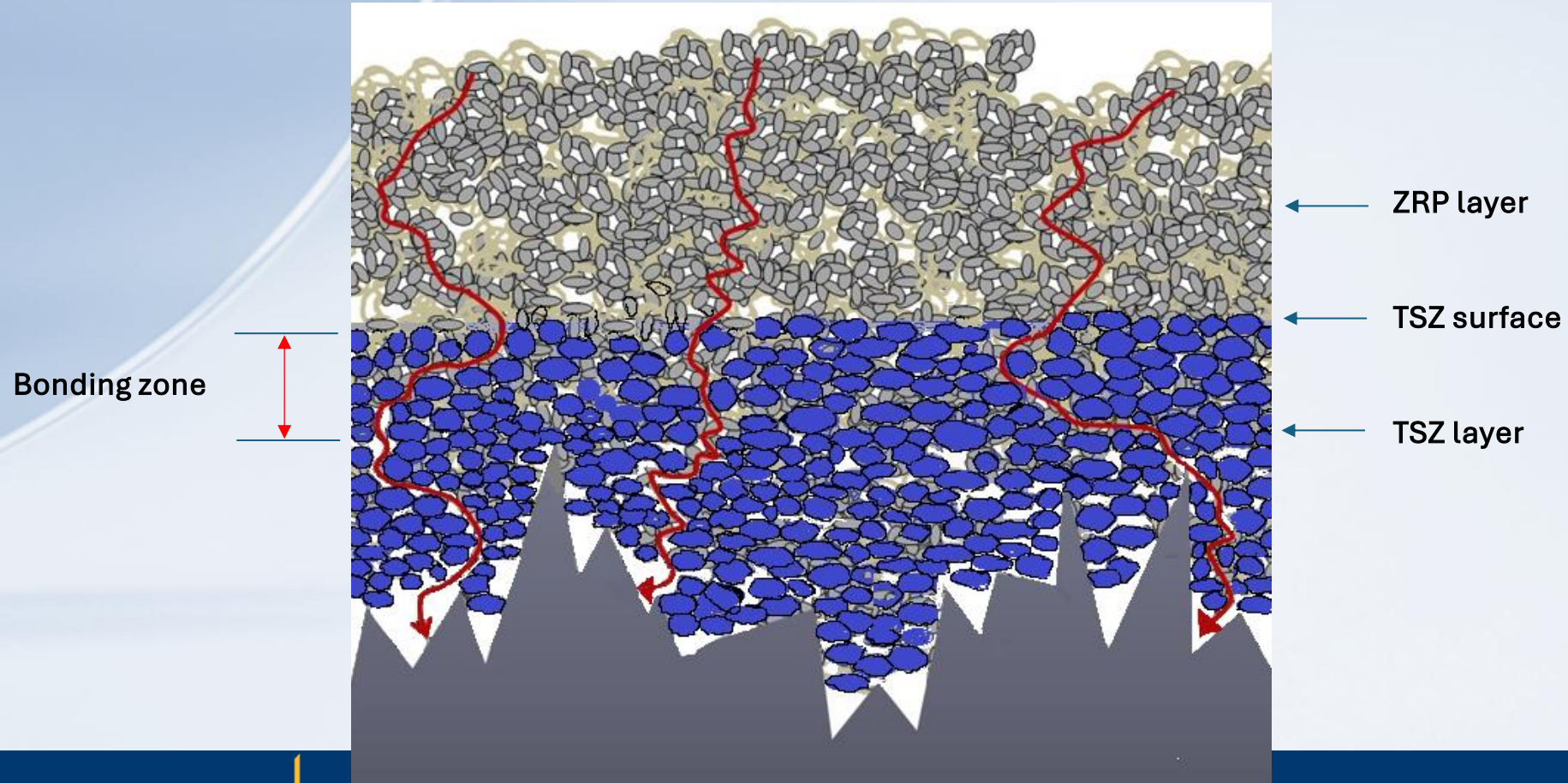




Refurbished in 2019 with TSZ and OZ



Why is Single Coat Organic Zinc one of the best sealer for TSZ?





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zinc association

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<https://www.zinc.org>

Example of FG ST-ADELE BRIDGE QC, CANADA

