

**massDOT**

# Structural Steel: Best Practices of Coatings

Presented to:

## NESMEA

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# GPI

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**GPI**

## Discussion Topics

- Bridge Coatings Best Practices
- Specifications
- Inspection Value
- Material Testing Value
- Questions / Discussion



**Bridge Coating Best Practices:**

- **Bridge Coat. Mat'ls**
- Exist. Lead Paint
- Coating Mat'l Types
- Current Paint Systems
- Weathering Steel
- Galvanizing
- Metallizing
- Regulations

# Bridge Coating Materials

- **Legacy paint systems are no longer an option**
- **Past research has guided industry material choices**
  - **Thorough steel cleaning**
  - **Sacrificial primers**
  - **Multi-coat systems**
  - **Not always “paint”**

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## Existing Lead Based Paint

- Protective coatings are the predominant method of corrosion control on steel bridges.
- The majority of bridges painted prior to 1990 contain lead based paint.
- Lead has been associated with serious health problems when exposure reaches certain threshold levels.
- Most bridge maintenance projects include removal of lead based paint (Hazardous Waste)

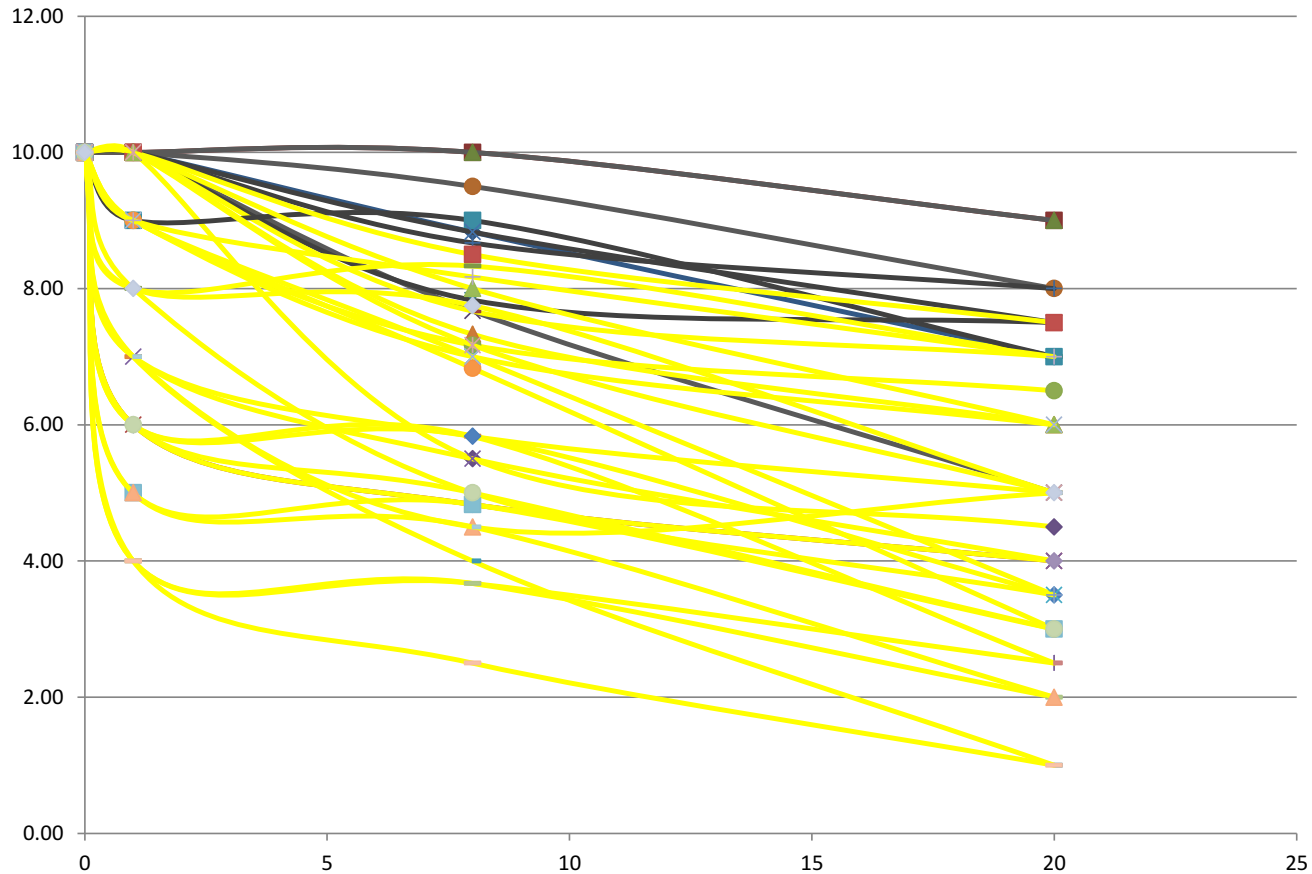


# Coating Material Types

Structural Steel: Best Practices of Coatings

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# Current Paint Systems

- Longer lasting systems are the most widely used
- Zinc-Epoxy-Urethane coating system
- Organic vs. Inorganic Zinc Primers
- Moisture Cured Products
- Galvanizing and TSM systems



Bridge Coating Best Practices:

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# Weathering Steel

- Corrosion protection through natural oxidation of specific steel alloys
- Patina becomes a more stable surface layer
- Cost effective approach, little or no premium above painted steel
- Should not be used in moist environments, and requires special detailing practices





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# Weathering Steel



**Localized laminar corrosion of weathering steelwork below deck joint (Pre-blast).**



**Localized area of 100% section loss and deep pitting uncovered during blasting operations. Painting contract has provisions for repair.**



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# Galvanizing

- Hot dipping of steel in molten zinc
- Provides very good corrosion protection
- Limitations as to member length. Current limitations are about 100'
- Cost premium, more costly than weathering steel
- Very effective in areas where weathering steel limitations exist
- Not easy to paint over



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# Metallizing

- Application of molten zinc or zinc/aluminum mixture through thermal spray or electric arc spray
- Very good corrosion protection
- Cost premium over paint systems, but superior life cycle costs





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# Regulations

- **Clean Air Act - Limits airborne lead emissions.**
- **Clean Water Act - Prohibits any discharge of lead into surface waters of the United States.**
- **Resource Conservation and Recovery Act - Classifies Lead as a hazardous waste. Governs generation and disposal of hazardous wastes.**
- **OSHA Lead Standard in Construction (29 CFR 1926.62) - Governs worker health and safety for all construction projects involving lead.**

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# Regulations Drive Practices

- **Worker protection is required**
- **Public protection is required**
- **Waste management is required**
  - **Waste reduction**
  - **Waste handling and disposal**





**Specifications:**

- **Performance Based Specification**
- New Construction
- Bridge Maintenance

# Performance Based Specification

- **Currently utilized by MassDOT**
- **Allows for Contractor Innovation**
- **Requires Performance Evaluation and Thorough Review of Contractor Submittals**
- **Job Specific Coating Selection**



**Specification Best Practices**

- Performance Based Specification
- **New Construction**
- Bridge Maintenance

# New Bridge Construction Coating Specification

- **Current MassDOT Bridge Manual direction:**
  1. **Weathering Steel (non Marine)**
  2. **Galvanizing (Marine)**
  - 2A. **Metallizing (Marine - large pieces)**
  3. **Paint (High Maintenance)**
- **QPL is good starting point, but not end all**
- **Field touch-up should be addressed**
- **Top coat in shop or field**



Specification Best Practices

- Performance Based Specification
- New Construction
- **Bridge Maintenance**

# Bridge Maintenance Coating Specification

- Hazardous Waste Handling and Storage
- Laydown area should be identified.
- Structural Steel Repairs
  - Bolted Connections
  - Repair Damage
  - Slip Critical Coatings



**Inspection Value**

- **Inspection**
- Shop and Field Inspection
- Cost and Value

# Inspection

- Contractor typically required to perform QC
- QC Ultimately responsible for quality
- QC Reports direct to management
- Owner typically would provide verification
- Trust but verify



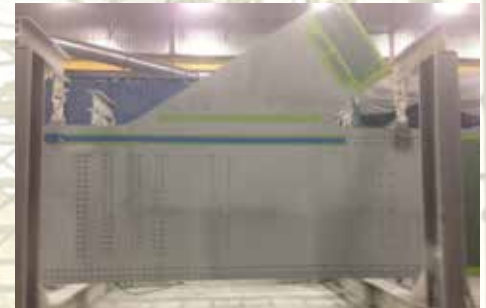


**Inspection Value**

- Inspection
- **Shop and Field Inspection**
- Cost and Value

# Shop and Field Inspection

- **Shop**
  - Controlled environment
  - Bolt-up/handling damage
  - Field Touch Up
  - Dedicated paint inspector not always provided
- **Field**
  - Lead exposure concerns
  - Many Variables
    - Weather
    - Inaccessible areas
    - Other work
    - Ex. steel condition
  - Dedicated paint inspector typically provided



**Inspection Value**

- Inspection
- Shop and Field Inspection
- **Cost and Value**

# Cost of Inspection

- **Cost of QC Inspection is negligible**
- **Cost of Inspection is 10-20% of construction**
- **Value of Quality Assurance:**
  - **Sense of contractor responsibility for quality**
  - **Reassurance in investment**
  - **Reduce future maintenance**
  - **Accountability of all parties**





Testing Value

- **NEPCOAT List**
- Material Certifications
- Testing Programs
- For Consideration



# NEPCOAT List

- **Northeast Protective Coatings Committee**
- **DOT and bridge specific qualified product list**
- **Multiple lists available, application dependent**
- **Still need job specifics, not just QPL**
- **Independent testing and acceptance criteria**
- **NTPEP process (AASHTO)**



**Testing Value**

- NEPCOAT List
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# Material Certifications

- **Various documents available:**
  - **Letter from Coating Manufacturer**
  - **Verification of testing**
  - **Independent test results**
  - **Certificate of Compliance**



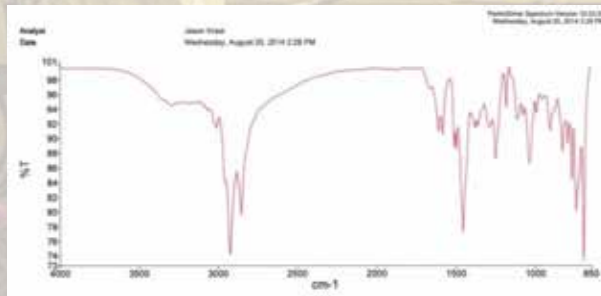


### Testing Value

- NEPCOAT List
- Material Certifications
- **Testing Programs**
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# Coatings Testing Programs

- **Varies State to State**
- **Manufacturer's certifications**
- **Qualified Product List (QPL)**
- **Sampled and tested per batch**
- **Field sampled and tested per project**
- **Random sampling and testing**



**Testing Value**

- NEPCOAT List
- Material Certifications
- Testing Programs
- **For Consideration**

# For Consideration

- **What are we testing for?**
  - **% Solids and Viscosity**
  - **Some states are doing IRs**
- **Random sampling**
  - **Due to batch sizes, one sample per batch is not always representative.**
  - **Replace testing with Material Certs.**
  - **Random samples pulled from job sites, retained, and independently tested**



## In Summary

- **Best Coating Materials**
  - **Weathering Steel / Galv or Metalizing / Paint**
- **Best Coating Project Specifications**
  - **Job Specific Performance Spec**
- **Best Inspection Practices**
  - **Independent Verification**
- **Best Material Testing Practices**
  - **Independent Test and Field Sample**

# Questions/Discussion

- **Questions**
- **Comments**
- **Items for discussion**

