New Jersey Turnpike Authority
P.O. Box 5042, Woodbridge, NJ 07095

October 18, 2023

Document Change Announcement

2016 Standard Supplementary Specifications

Metallization of New Weathering Steel

DCA2023SS-14

Subject: Revisions to

Section 440 Metallization for New Weathering Steel, Subsection 440.01 Description Subsection 440.02 Materials, Subsection 440.03 Methods of Construction, Subsection 440.04 Measurement, Subsection 440.05 Payment
Section 913 Paints and Coatings, Subsection 913.10 Metallizing Wire

Description of Change:
This DCA adds a specification for metallizing the ends of new weathering steel beams.

Notice to New Jersey Turnpike Authority Staff and Design Consultants
Effective immediately, changes must be implemented in all applicable projects that have not entered Phase C development within one month following the date of this DCA. Contact your New Jersey Turnpike Authority Project Manager for instruction.

The revisions may be accessed on the Authority's webpage: https://www.njta.com/doing-business/professional-services

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Distribution: Senior Staff Engineering, Law, Maintenance & Operations Depts., All Prequalified Consultant Firms, File

NOTE: The following language is ADDED to the latest version of the 2016 Standard Supplementary Specifications.

DIVISION 400 – STRUCTURES

The following Section is added:

SECTION 440 – METALLIZING NEW WEATHERING STEEL

440.01 Description

This work shall consist of metallizing new weathering steel stringers including furnishing all materials, equipment, labor, and other essentials necessary to accomplish surface preparation and shop application of thermal spray metallizing to portions of the new weathering steel stringers, for a distance of one-and-half (1.5) times the beam depth or five (5) feet from the beam end, whichever is greater, or as specified in the Plans. Also included in this work is the shop application of a paint system over the metallized coating where specified in the Plans. Diaphragms within the limits of metallized stringer limits shall either be metallized or galvanized as specified in the Plans.

440.02 Materials

Materials shall conform to the following Sections and Subsections:

ZINC COATING (GALVANIZING)	909.11
PAINTS AND COATINGS	913
METALLIZING WIRE	913.10

440.03 Methods of Construction

(A) References

The Contractor shall comply with the most recent version of the following laws, codes, standards, and regulations for work under this Section.

(1) Surface Preparation, Metallizing and Painting Application

a) American Society for Testing Materials

1. ASTM B833: Standard Specifications for Zinc Wire for Thermal Spraying (Metallizing)
2. ASTM D4285-83 (2006): Standard Test Method for Indicating Oil or Water in Compressed Air
3. ASTM D4417-03: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
4. ASTM D4541: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
5. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM F3125/F3125M Standard Specification for High Strength Structural Bolts and Assemblies, Steel And Alloy Steel, Heat Treated,120 ksi and 150 ksi Minimum Tensile Strength

b) Code of Federal Regulations (CFR)

1. 29 CFR1926 Occupational Safety and Health Regulations for the Construction Industry

c) The Society for Protective Coatings (Formerly SSPC)

1. SSPC Painting Manual Volume 1 Good Painting Practice, and SSPC Painting Manual Volume 2 Systems & Specifications, 2008 Edition (or most recent editions). These volumes contain applicable standards, standard procedures, methods, specifications, guides, technology updates, technology reports, and technology guides. See Supplementary Specification Subparagraph 411.09(B)(24) for requirements.
2. SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
3. SSPC-VIS 3 Visual Standard for Hand and Power Tool Cleaned Steel
4. SSPC-CS 23.00/AWS C2.23M/NACE No. 12 – Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel
5. SSPC-PA 17, Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
6. SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.

d) Equipment and Coating Manufacturer's Published Instructions

Follow the manufacturer's instructions.

e) United States Department of Labor, Material Safety Sheets (MSDS)

File the MSDS sheets, storage and handling of materials shall be in accordance with MSDS sheets.

f) American National Standards Institute/American Welding Society

1. ANSI/AWS C2.25/C2.25M – Specification for Solid and Composite Wires, and Ceramic Rods for Thermal Spraying
2. AWS C2.16/C2.16M – Guide for Thermal-Spray Operator Qualification Programs
3. ANSI/AWS C2.25/C2.25M Specification for Thermal Spray Feedstock – Wire and Rods

(2) **CONTAINMENT, WORKER, AND ENVIRONMENTAL PROTECTION**

a) Code of Federal Regulations

1. 29 CFR 1926 Occupational Safety and Health Regulations for Construction
2. 29 CFR 1926.20 General Safety and Health Provisions
3. 29 CFR 1926.21 Safety Training and Education
4. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
5. 29 CFR 1910.134 Respiratory Protection
6. 29 CFR 1926.353 Ventilation and Protection in Welding, Cutting, and Heating
7. 29 CFR 1926.400-417 Electrical Safety

8. 40 CFR 50 National Primary and Secondary Ambient Air Quality Standards
9. 40 CFR 58 Ambient Air Quality Surveillance
10. 40 CFR 204 Noise Control Regulations for Air Compressors
11. 40 CFR 355 Emergency Planning and Notification
12. 40 CFR 265.16 Personal Training
13. 40 CFR 302 Designation, Reportable, Quantities and Notification
14. 40CFR 355 Emergency Planning and Notification
15. 49 CFR 171-179 Hazardous Materials Transportation Act (HMTA)

b) American Industrial Hygiene Association (AIHA)

1. American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH) Certification

c) American National Standard Institute (ANSI) A10.10

1. Safety requirements for temporary and portable space heating devices & equipment

(B) Qualifications and Experience

The Contractor shall submit documentation to the Engineer providing evidence of the qualifications and experience of the proposed supervisors and as required by this Subsection.

(1) Experience

The fabricator performing the shop metallizing and painting shall have satisfactorily performed a minimum of three (3) previous projects involving abrasive blast cleaning, metallizing, and paint application. At least one project within the past two (2) years shall have involved a bridge or similar industrial-type application.

The Contractor shall submit applicator experience and certification to the Resident Engineer for approval.

(2) QUALIFICATION

All metallizing applicators shall be qualified in accordance with ANSI/AWS C2.16/C2.16M.

(C) Working Drawings

The Contractor shall submit a Metallizing Plan which includes written procedures for the shop application of metallizing, the brand name and type of metallizing wire and application equipment to be used, methods of surface preparation and types of equipment and materials that will be used to prepare surfaces to receive metallizing. Additionally, any solvents proposed for solvent cleaning shall be identified and MSDS provided. The personnel qualifications shall be per Subsection 440.04. The Contractor shall also submit Quality Control plans for metallization. The working drawings shall also include the repairs procedures required if any damage is caused after the application of metallization due to lifting and delivery operation.

Proof that the metallizing wire complies with ASTM B833 and ANSI/AWS C2.25/C2.25M shall also be provided along with wire diameter used, lot number and manufacturing dates.

The Contractor shall provide a certificate of the chemical composition of the proposed metallizing wire from the metallizing wire manufacturer.

(D) General

The surface preparation and metallizing shall be according to SSPC-CS 23.00/AWS C2.23/NACE No. 12: Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel, except as modified herein. In the event of a conflict, the requirements of this specification shall govern.

If diaphragms are galvanized, work shall be per Subsection 909.11 with faying surface requirements per the Contract Plans.

(E) Surface Preparation and Metallizing Equipment

The Contractor shall provide surface preparation and metallizing equipment as needed to perform the work as specified herein.

Metallizing application equipment shall be portable electric arc thermal spray units that are set up, adjusted, and operated in accordance with the manufacturer's written instructions.

All cleaning equipment shall include gages capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air or water as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order. Diesel or gasoline-powered equipment shall be positioned or vented in a manner to prevent the deposition of combustion contaminants on any part of the structure.

Hand tools, power tools, pressure washing, water jetting, abrasive blast cleaning equipment, and spray equipment shall be of suitable size and capacity to perform the work required. Appropriate filters, traps and dryers shall be provided for the compressed air used for abrasive blast cleaning and spray application.

The surface to be metallized shall be prepared in the following order:

1. Prior to blast cleaning, all flame cut edges shall be ground to remove hardened steel and any sharp or irregular shapes.
2. All steel surfaces to be metallized shall be near white metal blast cleaned in accordance with SSPC-SP 10 using dry abrasive blast cleaning methods.
3. If hackles, burrs, or slivers in the base metal are visible on the steel surface after blast cleaning, the Contractor shall remove them by grinding followed by re-blast cleaning.

Blast cleaning abrasives shall be of the size and grade that will produce a uniform angular surface profile depth of 3.5 to 5 mils (89 to 127 microns). If the metallizing wire manufacturer's profile requirements are more restrictive, the Contractor shall comply with those requirements. For recycled abrasives, an appropriate operating mix shall be maintained to control the profile within these limits.

The average surface profile shall be determined each workday with a minimum frequency of one location per every 200 sq ft (18.6 sq m) per piece of equipment. All surfaces, including flame cut edges, shall be tested in accordance with SSPC-PA 17. Surface profile replica tape or electronic profilometer shall be used. The tape shall be retained and included with Quality Control reports. Single measurements less than 3.5 mils (89 microns) are unacceptable. In that event, additional testing shall be done to determine the limits of the deficient area and, if it is not isolated, work will be suspended. The Contractor shall submit a plan for making the necessary adjustments to ensure that the specified surface profile is achieved on all surfaces. Work shall not resume until written acceptance is provided.

Prepared surfaces shall meet the requirements of SSPC-SP 10 immediately prior to metallizing and shall be metallized within six (6) hours of blast cleaning. If rust appears or bare steel has been exposed for more than six (6) hours, the affected area shall be re-blasted at no additional cost to the Authority. The diaphragm connection/faying surfaces shall not be metallized.

All dust and surface preparation residue on steel surfaces shall be removed prior to metallizing.

The quality of surface preparation and cleaning of surface dust and debris shall be accepted by the Authority's representative prior to metallizing.

The Authority has the right to reject any work that was performed without adequate provision for Quality Assurance observations to accept the degree of cleaning. Rejected metallizing work shall be

removed and replaced at no additional cost to the Authority. The Contractor shall submit the removal methods for Engineers approval.

(F) Test Areas (Sections)

Prior to proceeding with production work on the project, the Contractor shall prepare test sections of at least ten (10) square feet (0.93 sq. m). More than one test section may be needed to represent the various design configurations of the structure. The test section(s) shall be blast cleaned and metallized in accordance with the requirements specified herein using the same equipment, materials and procedures that will be used for the production.

During the blast cleaning and metallizing of the test section(s), in the presence of the Authority's representative, the Contractor shall perform all quality control tests and inspections required by this specification including complete documentation. In addition, the Contractor shall allow sufficient time for the Authority to perform any or all quality assurance tests and inspections desired.

Production work shall not proceed until the Authority agrees that the blast cleaning and metallizing, along with the quality control testing, inspection, and documentation are acceptable. Any changes to the materials, procedures and production will result in performing a new test, approved by the Authority.

(G) Protective Coverings And Damage

The Contractor shall apply protective coverings to all surfaces of the structural steel that are not scheduled for surface preparation and metallizing. The coverings shall be maintained and remain in place until the work is completed and then shall be removed prior to shipping.

Metallized or metallized and painted surfaces damaged by any Contractor's operation shall be repaired, and re-metallized and/or re-painted, as directed by the Authority, at no additional cost to the Authority.

(H) Ambient Condition

Surfaces prepared for metallizing shall be free of moisture and other contaminants. The Contractor shall control operations to ensure that dust, dirt, or moisture are not present on the surfaces where work will take place. The surface temperature shall be at least 5°F (3°C) above the dew point during final surface preparation operations, and the application of metallizing. Metallizing shall only be applied when the surface and air temperatures are above 32°F (0°C). Metallizing shall not be applied in rain, wind, snow, fog, or mist. Ambient conditions shall be maintained during the drying period as specified by the manufacturer.

(I) Compressed Air Cleanliness

Prior to using compressed air for abrasive blast cleaning, blowing down surfaces, and metallizing applications, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D4285. The tests shall be conducted at least one time per shift for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air. The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the contaminated compressed air. Contaminated work shall be repaired at no additional cost to the Authority.

(J) Solvent Cleaning

All traces of oil, grease and other detrimental contaminants on the steel surfaces to be metallized shall be removed by solvent cleaning in accordance with SSPC-SP 1. The brand name of proposed cleaning solvent(s) and/or proprietary chemical cleaners including manufacturers' product data sheet and MSDS shall be submitted for acceptance prior to use.

Under no circumstances shall blast cleaning be performed in areas containing surface contaminants or in areas where solvent cleaning has not been accepted. Rejected surfaces shall be re-cleaned to the specified requirements at no additional cost to the Authority.

(K) Abrasives

Abrasive blast cleaning shall be performed using either expendable abrasives or recyclable steel grit abrasives. Expendable abrasives shall be used one time and discarded. The abrasive shall be angular in shape. Acceptable angular-shaped abrasives include, but are not limited to, aluminum oxide, steel grit, and crushed slag. Silica sand shall not be used. Steel shot and other abrasives producing a rounded surface profile are not acceptable, even if mixed with angular grit abrasives.

Abrasive suppliers shall provide written certification that expendable abrasives and recyclable steel grit abrasives meet the requirements of SSPC-AB 1 and AB 3, respectively. Abrasive suppliers shall certify that abrasives are not oil contaminated and shall have a water extract pH value within the range of 6 to 8. On a daily basis, the Contractor shall verify that recycled abrasives are free of oil and contamination by performing a vial test in accordance with SSPC-AB 2.

All surfaces that are found to have been prepared using abrasives not meeting the SSPC-AB 1, AB 2, or AB 3 requirements, as applicable, are oil contaminated or have a pH outside the specified range, shall be solvent cleaned or low-pressure water cleaned, and re-blast cleaned at no cost to the Authority.

(L) Daily Metallizing Operator-Equipment Qualification - Bend Tests

Unless directed otherwise, each day that metallizing will be applied, the Contractor shall perform bend testing prior to beginning production work. For each metallizing applicator, five carbon steel coupons measuring 2 inch wide x 8 inch long x 0.05 inch (50mm x400 mm x 1.3 mm) thick shall be blast cleaned using the same equipment and abrasive used for the production work. Each applicator shall apply the metallizing to five coupons in accordance with the requirements of this Specification to a dry film thickness of 8.0 to 12.0 mils (200 to 300 microns). 180 degree bend testing shall be performed on all five coupons using a 13mm (1/2″) mandrel in accordance with the requirements and acceptance criteria of SSPC-CS 23/AWS C2.23M/NACE 12. Minor cracks that cannot be lifted from the substrate with a knife blade are acceptable. If lifting occurs on any coupon, the surface preparation and/or metallizing process shall be modified until acceptable results are achieved before proceeding with production work.

(M) Application of Metallizing

The application shall be done in overlapping passes in a cross-hatch pattern (i.e., the second set of overlapping passes shall be applied at right angles to the first set of overlapping passes) to ensure uniform coverage. The gun shall be held at such a distance from the work surfaces that the metal is still molten on impact. The metallizing shall be applied as a continuous film of uniform thickness, firmly adherent, and free from thin spots, misses, lumps or blisters, and have a fine sprayed texture. Thin spots and misses shall be re-metallized. If touch-up metallizing or the application of additional metallizing to previously applied metallizing does not occur within 24 hours, the surface of the metallizing shall be brushed off blast cleaned according to SSPC-SP7 to remove oxidation and surface contaminants prior to the application of additional metallizing. The final appearance of the metallizing shall be uniform without excessive blotchiness or contrast in color. If the surface does not have a uniform appearance, remove and replace the metallizing at no cost to the Authority. If the configuration of the surface being metallized does not allow for a proper gun-to-work piece standoff distance, the Contractor shall notify the Authority.

Areas on the bottom flanges of stringers that will bear on sole/load plates shall not be metallized. Additionally, areas along each flange that will receive field weldments to connect bearing components shall not be metallized. Blast clean and apply a prime coat of paint only to these areas.

Unless required by the Plans, the top of the top flanges of stringers and end diaphragms shall not be metallized. Blast clean and apply a prime coat of paint only to these areas.

(N) Metallizing Thickness And Adhesion

The thickness of the metallizing shall be 8.0 to 12.0 mils (200 to 300 microns). Thickness shall be measured as specified by SSPC-PA 2 (use a Type 2 Electronic Gauge only).

Adhesion testing of metallizing applied each day shall be determined with a self-adjusting adhesion tester in accordance with ASTM D4541. Unless otherwise directed by the Authority, a minimum of one test shall be conducted for every 500 sq ft (46 sq m) of the metallized surface. If any of the tests exhibit less than 700 psi (4.83 MPa), additional tests shall be conducted to determine the extent of the deficient material. All deficient metallizing shall be removed by blast cleaning and re-applied at no additional cost to the Authority.

At the discretion of the Authority, a representative blast cleaned test panel (or steel companion panel approximately 12-inch x 12-inch x ¼ inch thick) can be metallized at the same time each 500 sq ft (46 sq m) of surface area, or portion thereof, is metallized. Adhesion testing can be performed on the companion panel rather than on the structure. If the adhesion tests on the panels are acceptable, the metallizing on the structure is considered acceptable and testing on the structure is not required. If adhesion testing of the panels fails, testing shall be conducted on the structure. If adhesion testing on the structure is acceptable, the metallizing on the structure is considered acceptable. If tests on the structure are unacceptable, complete removal of the failing metallizing and re-metallizing in accordance with the specifications shall be performed at no additional cost to the Authority.

(O) Application Of Paint Systems Over Metallizing

Where painting over the metallizing is specified, a three-coat system conforming to the requirements of Subsection 411.06 shall be used, subject to the manufacturer's requirements for application over a metallized surface. Paint shall not be applied to the diaphragm connection faying surfaces, at bearing locations and top of top flanges of diaphragms and stringer.

[Designer must update the Supplementary Specification for painting accordingly.]

(P) Touch-up To Completed Coating System

The Contractor shall repair all damaged and/or unacceptable areas of the completed coating system (all metallizing and paint layers) prior to shipment as defined below. The same process shall be followed for the repair of shipping, handling, and erection damage.

Damage to the metallizing and/or paint that does not expose the substrate shall be prepared by solvent cleaning in accordance with SSPC-SP 1 followed by power tool cleaning in accordance with SSPC-SP 3 to remove loose material. For the repair of damaged metallizing that exposes the substrate, the surface shall be spot blast cleaned in accordance with SSPC-SP 10. If blast cleaning cannot be performed, as authorized by the Authority, the damage shall be spot power tool cleaned to SSPC-SP 11.

The metallizing and/or paint surrounding each repair area shall be feathered for 1 to 2 inches (25 to 50 mm) to provide a smooth, tapered transition into the existing intact material. The surrounding intact paint shall be roughened to promote the adhesion of the repair coats.

Damage to metallizing extending to the substrate shall be repaired. For metallizing, it is critical that all remnants of sealer or paint have been removed from the porosity of the metallizing before applying new metallizing or an adhesion failure can occur. If it is no longer feasible to apply metallizing, spot-apply an organic zinc primer meeting the requirements of Paragraph 411.05(F). After priming, apply the same intermediate and finish coats used on the surrounding steel. If the damage does not expose the substrate, only the affected paint coat(s) shall be applied.

(Q) Surface Preparation Of Galvanized Fasteners

All ASTM F3125, Grade A325, high-strength steel bolts, nuts and washers used to connect metallized components shall be hot dip galvanized according to ASTM A153.

(R) Shipping and Handling

The Contractor shall take special care in handling the steel in the shop and when loading for shipment. Metallized and/or painted steel shall not be moved or handled until sufficient cure time

has elapsed to prevent handling damage. During shipping, the steel shall be insulated from the moving apparatus (i.e., chains, cables, hooks, clamps, etc.) by softeners approved by the Authority. The apparatus used to hoist the steel shall be padded. The steel shall be placed on wood dunnage and spaced in such a manner that no rubbing will occur during shipment that could damage the paint or metallizing.

440.04 Measurement

Metallizing of new weathering structural steel, including the surface preparation and the test section, will not be measured for payment.

Painting of new metallized structural steel will not be measured for payment.

440.05 Payment

No separate payment will be made for metallizing the new weathering structural steel, but the costs thereof will be considered incidental to the associated structural steel or prefabricated superstructure unit items.

No separate payment will be made for the development and implementation of the Metallizing Plan, but the costs thereof will be considered incidental to the associated structural steel or prefabricated superstructure unit items.

Working drawings and other submittals listed in this Section and as required for this Contract, shall be submitted in accordance with Subsection 104.08.

Separate payment for the painting of new metallized structural steel will not be made.

SECTION 913 - PAINTS AND COATINGS

The following Subsection is added:

913.10 Metallizing Wire

All thermal spray feedstock (metallizing wire) shall be products of a single manufacturer and meet the thermal spray equipment manufacturer's specifications.

The metallizing wire shall consist of 85/15 zinc/aluminum complying with ASTM B833 and ANSI/AWS C2.25/C2.25M.