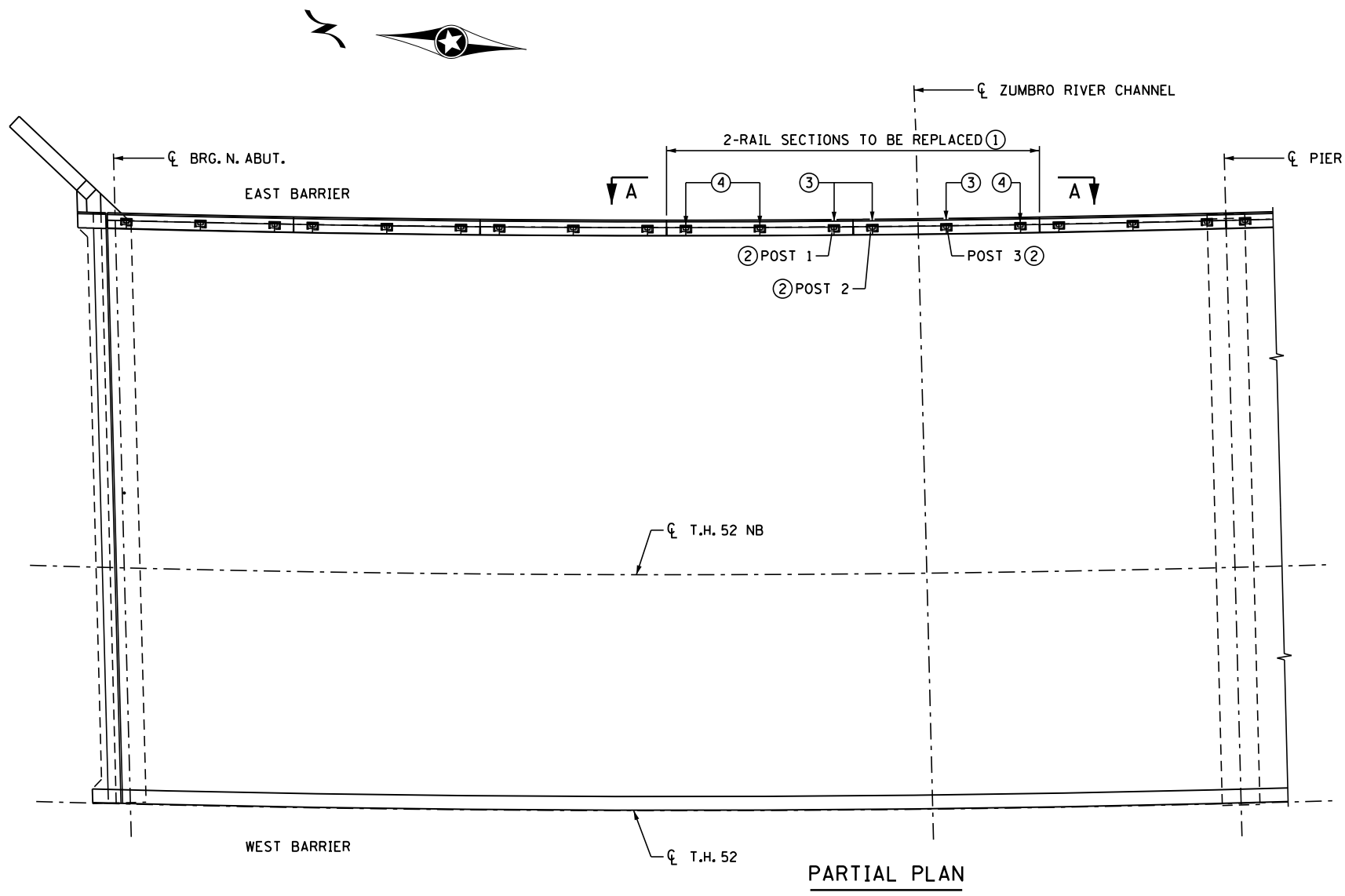


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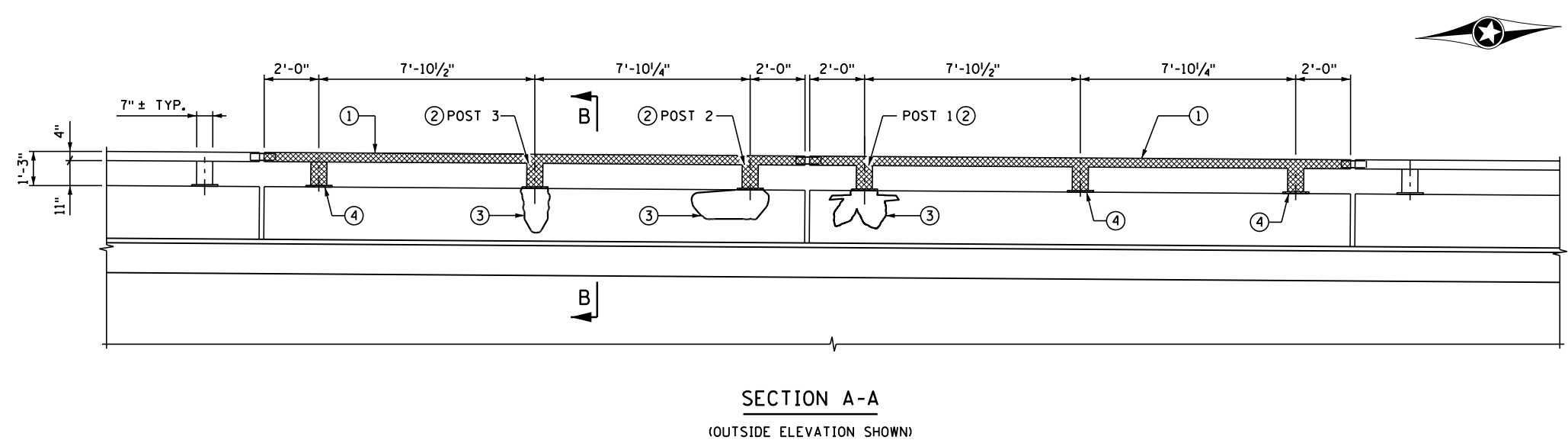
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SCHEDULE OF QUANTITIES FOR RAILING REPAIR		
ITEM	UNIT	QUANTITY
RAILS HSS 10 x 4 x 1/4 x 19'-8 3/4" ± (2 REQ'D.)	POUNDS	883
POSTS HSS 7 x 5 x 5/16 x 10 1/4" (6 REQ'D.)	POUNDS	120
BASE PLATE 3/4 x 9 1/2 x 1'-4" (3 REQ'D.)	POUNDS	97
BASE PLATE 3/4 x 9 1/2 x 2'-0" (3 REQ'D.)	POUNDS	146
1/8" DIA. x 1'-2 1/2" MIN. THREADED ANCHOR ROD	EACH	12

NOTES

- THE 2018 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.
- PLAN OF BRIDGE NO. 55058 IS AVAILABLE AT THE MINNESOTA DEPARTMENT OF TRANSPORTATION.
- SEE SHEET 2 FOR SECTION B-B.
- ☒ DENOTES REMOVAL OF T-1 RAILING AND REMOVAL OF 6 POSTS AND 6 BASE PLATES.
 - ① REMOVE EXISTING DAMAGED T-1 RAILING, REPLACE WITH NEW T-1 RAILING, TO BE FABRICATED BY A MNDOT APPROVED FABRICATOR. SEE SHEET NO. 2 FOR DETAILS.
 - ② PROVIDE NEW BASE PLATE FOR MODIFIED ANCHOR ROD LAYOUT AT POST "1", POST "2", & POST "3" SHOWN ON PLAN. NEW ANCHOR RODS TO BE POST INSTALLED GALVANIZED THREADED RODS USING AN APPROVED EPOXY. SEE SHEET NO. 2 FOR DETAILS FOR "BASE PLATE (TYPE 2)" AND ANCHORAGE'S.
 - ③ WITH RAILING SECTIONS REMOVED INSPECT CONCRETE FOR SOUNDNESS BETWEEN THE FRONT AND BACK ANCHORS AT EACH ANCHOR ROD LAYOUT. REMOVE UNSOUND CONCRETE AND CUT OFF DAMAGED ANCHOR RODS APPROXIMATELY 2" BELOW THE SURFACE AT POSTS MARKED 1, 2 & 3. REMOVE UNSOUND CONCRETE AND PATCH USING AN APPROVED GROUT MATERIAL. SEE SECTION B-B ON SHEET 2.
 - ④ PROVIDE NEW BASE PLATE FOR EXISTING ANCHOR ROD LAYOUT TO REMAIN AND RE-USE. SEE "BASE PLATE (TYPE 1)" DETAIL ON SHEET NO. 2. INSPECT CONCRETE FOR SOUNDNESS. FABRICATOR TO FIELD VERIFY THE ANCHOR ROD SPACING'S AND LAYOUT (VIA TEMPLATE OR OTHER) FOR USE IN FABRICATING NEW T-1 RAIL SECTIONS. ACCURATE FABRICATION IS NEEDED TO ENSURE PROPER FIELD FIT UP WITH EXISTING ANCHOR RODS TO BE RE-USED. COORDINATE FIELD VERIFICATION SITE VISIT WITH MNDOT DISTRICT STAFF.



LIST OF SHEETS	
	DESCRIPTION
1	BARRIER REPAIR
2	STRUCTURAL TUBE RAILING (DESIGN T-1) REPAIR

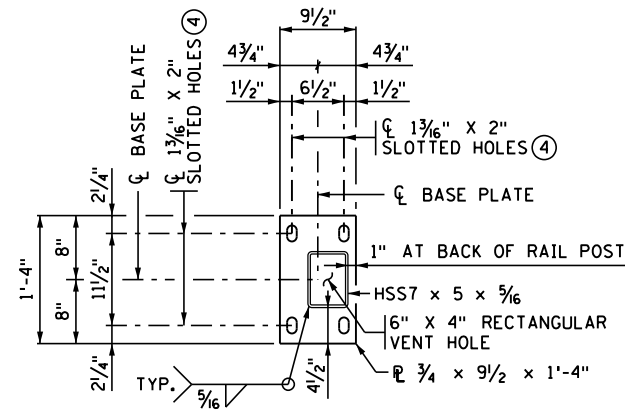
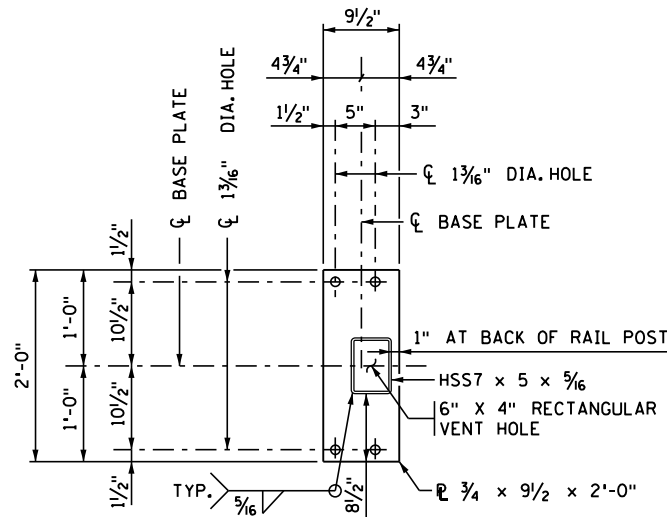
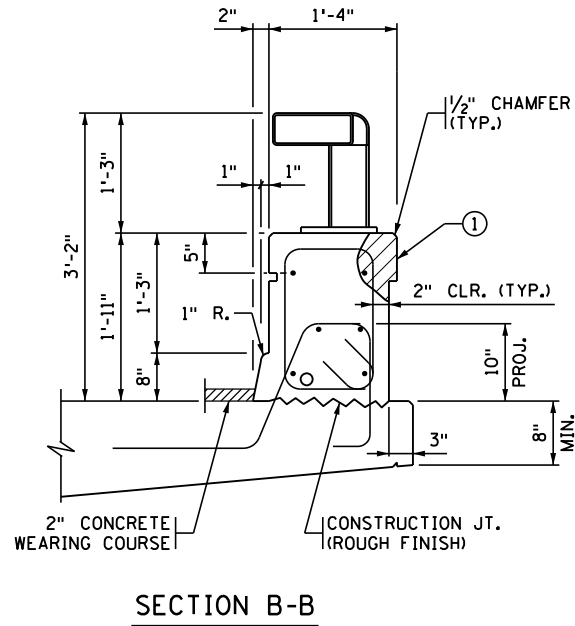
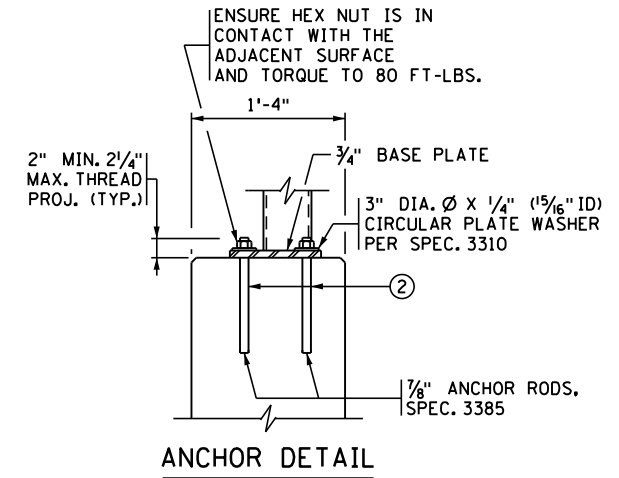
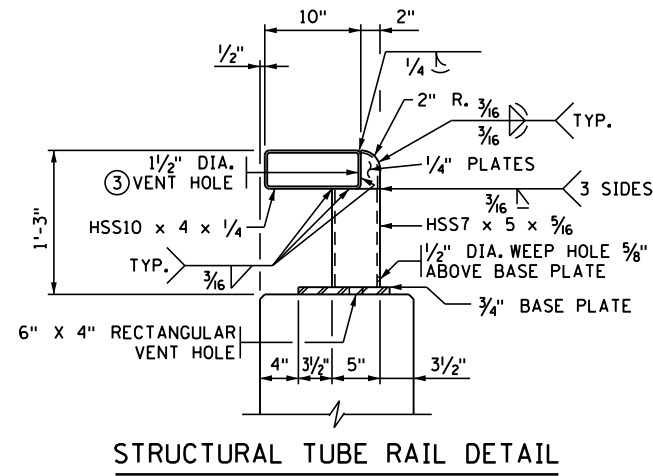
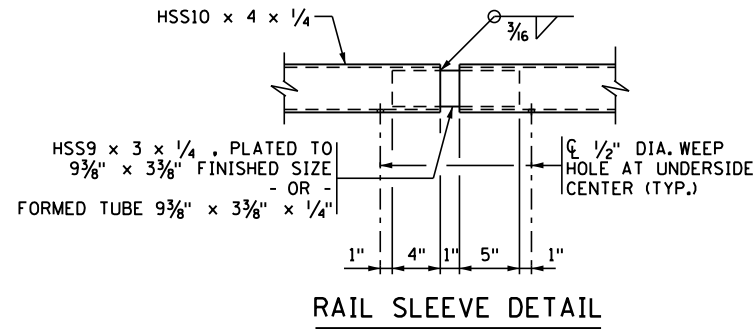
REV. NO.	DATE	REVISION DESCRIPTION	APPROVED

CERTIFIED BY _____
 LICENSED PROFESSIONAL ENGINEER DATE _____
 NAME: KARL A. JOHNSON LIC. NO. 51284

TITLE: **BARRIER REPAIR**

DES: JAB DR: WEH APPROVED: _____
 CHK: DPF CHK: RLS
 SHEET NO. 1 OF 2 SHEETS

BRIDGE NO. 55058



GENERAL NOTES

PROVIDE CORRECT ALIGNMENT FOR ANCHORAGES BY PLACING THEM ACCURATELY AND NORMAL TO GRADE.

INSTALL RAIL POSTS NORMAL TO GRADE.

PROVIDE STRUCTURAL STEEL AND PLATE WASHERS IN ACCORDANCE WITH SPEC. 3310. PROVIDE STRUCTURAL TUBES PER ASTM A500, GRADE B IN ACCORDANCE WITH SPEC. 3361.

GALVANIZE BOLTS, NUTS, AND WASHERS IN ACCORDANCE WITH SPEC. 3392.

GALVANIZE ALL OTHER STRUCTURAL STEEL IN ACCORDANCE WITH SPEC. 3394, AFTER FABRICATION.

SEE SPECIAL PROVISIONS FOR PAINT REQUIREMENTS.

SEE SHEET 1 FOR LOCATION OF SECTION B-B.

- ① REMOVE UNSOUND CONCRETE AND PATCH WITH APPROVED GROUT MATERIAL. DOWEL IN ADHESIVE ANCHORS CONSISTING OF #3 BARS OR LARGER WHERE NEEDED. USE AN APPROVED ADHESIVE WITH A MINIMUM CHARACTERISTIC BOND STRENGTH IN UNCRACKED CONCRETE OF 1.0 KSI. DO NOT DRILL THROUGH REINFORCEMENT IF ENCOUNTERED. MAINTAIN A MINIMUM COVER OF 2" ON ALL DOWELS."
- ② ADHESIVE ANCHORAGE WITH 7/8" DIA. ANCHOR ROD PER SPEC. 3385 TYPE C WITH HEX NUT AND WASHER. PROVIDE AN ADHESIVE WITH A MINIMUM CHARACTERISTIC BOND STRENGTH IN UNCRACKED CONCRETE OF 1.5 KSI. EMBED THE ANCHORAGE NO LESS THAN 12" REGARDLESS OF CHARACTERISTIC BOND STRENGTH. DRILL THROUGH REINFORCEMENT (IF ENCOUNTERED) TO ACHIEVE MINIMUM EMBEDMENT. PROOF LOAD TO 9.7 KIPS. ENSURE HEX NUT IS IN CONTACT WITH THE ADJACENT SURFACE AND TORQUE TO 80 FT-LBS, UNLESS A HIGHER TORQUE IS RECOMMENDED BY THE MANUFACTURER. PREPARE AND CLEAN HOLE IN ACCORDANCE WITH MANUFACTURERS PRINTED INSTALLATION INSTRUCTIONS. USE A THREADED ROD WITH A MINIMUM LENGTH OF 14.5".
- ③ CENTER HOLE 1/4" FROM TOP OF TUBE.
- ④ FIELD VERIFY EXISTING ANCHOR ROD SPACING AT ALL LOCATIONS OF "BASE PLATE (TYPE 1)" AND ADJUST SLOTTED HOLE SPACING AS REQUIRED.

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CERTIFIED BY _____
LICENSED PROFESSIONAL ENGINEER DATE _____
NAME: KARL A. JOHNSON LIC. NO. 51284

TITLE: STRUCTURAL TUBE RAILING (DESIGN T-1) REPAIR

DES: JAB DR: WEH APPROVED: _____
CHK: DPF CHK: RLS
SHEET NO. 2 OF 2 SHEETS

BRIDGE NO. 55058

INDEX TO DIVISION SB

DIVISION SB

<u>Section No.</u>	<u>Item</u>	<u>Page No.</u>
SB-1	Metal Railing ("Duplex Coated" using Hot-dipped Galvanizing and Paint Coating).....	1-SB

BRIDGE PLANS

The plans for this project, consisting of the sheets tabulated below.

<u>BRIDGE NO.</u>	<u>TOTAL SHEETS</u>	<u>SHEET NO.</u>	<u>DATE OF APPROVAL</u>
55058	2	1-2	5/21/20

New or revised sheets were approved as listed below:

<u>BRIDGE NO.</u>	<u>SHEET NO.</u>	<u>DATE OF APPROVAL</u>
-------------------	------------------	-------------------------

I hereby certify that the Special Provisions for bridge construction (Division SB) contained in this Proposal were prepared by me or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

(Karl A. Johnson)

Date: _____ Lic. No. 51284

SB-1 Metal Railing ("Duplex Coated" using Hot-dipped Galvanizing and Paint Coating)

Furnish, coat, and install metal railing, including all anchorages and fittings, in accordance with the applicable provisions of 2402, "Steel Bridge Construction," 2433, "Structure Renovation," 2471, "Structural Metals," 2478, "Organic Zinc-Rich Paint System," ASTM D6386," the plans and the following. The Contractor and the sub-contractors are responsible for communicating all applicable specifications, special provisions, standards, and requirements to all subcontractors.

A. Engineer

Engineer, as used herein, when relating to shop fabrication and coatings, shall mean the Department's Bridge Engineer.

B. Materials

Ensure all materials conform to the plan details. If not specified, ensure all steel complies with 3306, "Low-Carbon Structural Steel," except pipe and pipe sleeves, which complies with 3362, "Structural Steel Pipe". Ensure nuts and washers meet 3391, "Fasteners," and galvanize in accordance with 3392, "Galvanized Hardware," or electroplate in accordance with ASTM B633, Type III, SC 4.

D. Fabrication and Inspection Requirements

Fabricator shall supply QA/QC documentation verifying that all fabricated railing components are within the necessary tolerances for proper fit up and installation of the railing, including measurements between railing base plates that indicate that the as fabricated base plate hole locations are within $\frac{1}{8}$ inch of the specified plan dimensions, based on the plan specified rail post spacing.

Fabricate all metal railing in accordance with 2471, "Structural Metals," the plan, and the welding code AWS D1.1-Structural Welding Code-Steel. Submit Welding Procedure Specifications (WPSs) to the Engineer for approval prior to the start of fabrication.

Prior to fabrication, submit a Quality Manual (QM) and fabrication drawings that are acceptable to the Engineer. Any work started prior to receiving approved drawings, WPSs, and a QM, is subject to 1512, "Unacceptable and Unauthorized Work". Give the Engineer at least 5 working days' notice prior to beginning work so that Quality Assurance (QA) inspection may be provided.

Mark all metal railing components during fabrication with individual piece marks. Identify the marking and its location on the Shop Drawings. Identify the proper location on the bridge for all piece marks on an Erection Drawings [with Shop Drawing submittal]. All markings should not be readily visible to the public when the railing is in the installed position. Ensure all piece marks are durable markings which will be readily visible after galvanizing [e.g. welded numbers/letters with 1-1½ inch height]. Ensure markings represent good workmanship as to not degrade the aesthetics of the product. For standard post/rail designs, mark post pieces near the bottom of the post [near the base plate] on the exterior post side and mark railing panels on the bottom side of the bottom rail. For special rail designs, mark railing panels and posts in locations which are underneath or toward the exterior of the bridge in locations which minimize their view. Identify/tag bundled pieces, prior to shipping/storage, with the following identification information: individual piece marks included in bundle, bridge and/or project number(s), fabricator name.

The Department QA shop inspections are not intended to supplement or replace the Fabricator's Quality Control (QC). The Contractor is ultimately responsible for the correction of errors and faulty workmanship or for the replacement of nonconforming materials.

The Fabricator will visually inspect all parts of the fabrication and have the inspections documented by QC personnel. The Fabricator will ensure that the rail meets a straightness tolerance of $\frac{1}{8}$ inch in 10 ft. The Fabricator will perform and document any Nondestructive Testing required by the Contract Documents using an ASNT-TC-1A Level II qualified inspector.

Document parts found to be in nonconformance by using a Nonconformance Report form (NCR), and describe in detail the fabrication error and the proposed repair procedure(s) in accordance with the QM. Repair(s) performed are subject to the written approval of the Engineer.

E. Galvanizing Requirements performed by the Galvanizing Applicator

Galvanize all railing material in accordance with 3394, "Galvanized Structural Shapes," after fabrication and then paint (Duplex Coat) using the methods described in this document.

Pre-Galvanized Procedure(s):

1. Calibrate dry film thickness gauges in accordance with SSPC-PA 2-Measurement of Dry Coating Thickness with Magnetic Gauges.
2. Prepare all fabricated material surfaces by abrasive blast cleaning to a minimum of SSPC-SP 6/NACE No. 3-Commercial Blast Cleaning prior to galvanizing.
3. Purchase Order(s) shall identify which specific items are to be duplex coated and which materials to be galvanized are reactive (e.g. 3309, "High-Strength Low-Alloy Structural Steel," etc.).

Galvanizing Procedure(s):

Galvanize per 3394, "Galvanized Structural Shapes," ASTM D6386, and this specification. All products supplied using this specification have higher aesthetic expectations than standard galvanized products. Produce the final product to comply with its intended use as an "architectural" railing with heightened aesthetics and/or visual qualities.

1. Process all metal railing to be galvanized utilizing a "dry" kettle. Preflux the metal railing prior to the galvanizing bath using an aqueous tank of zinc chloride/ammonium chloride. Do not use a "top flux" blanket on the molten zinc bath.
2. Air cool the metal railing to ambient temperature before handling for shipment and/or storage. Do not quench the metal railing or apply any post-galvanizing treatments.
3. Lumps, projections, globules, high spots, drip lines, heavy deposits, blisters, black and bare areas, blisters, flux deposits, thin spots, dross inclusions, etc., are considered unacceptable. Repair unacceptable zinc coatings in accordance with the Galvanizer's approved QM. Zinc, which will interfere with the "intended use of the product", will not be permitted.
4. Repair galvanized material that does not meet the requirements of this specification, ASTM D6386, and/or 3394, "Galvanized Structural Shapes," in accordance with the Galvanizer's QM.
5. Store galvanized metal railing in a manner that will prevent the formation of "white-rust" or wet storage staining. "White rust" or staining of the galvanize coating is not acceptable.

6. The Galvanizer shall provide the Engineer with all galvanizing process-related Quality Control documents which demonstrate compliance to this specification and referenced specifications prior to shipment of the galvanized product.
7. The Galvanizer will ensure the metal railings meet a straightness tolerance of $\frac{1}{8}$ inch in 10 ft prior to any subsequent coating applications.
8. It is the Galvanizer's responsibility to provide the Engineer with advanced notification of at least 5 working days of intent to galvanize so that the Engineer can perform a QA audit.

F. Coating Requirements performed by the Paint Coating Applicator

This portion of the specification documents specific criteria that paint coated components must conform to in order to meet the quality and intent of the finished product.

Apply the paint intermediate and top coats using the applicable provisions of 2478, "Organic Zinc-Rich Paint System." Do not use the primer coat on galvanized surfaces unless approved in the QM repair procedure.

1. Perform preparation of galvanized surfaces prior to application of paint in accordance with SSPC SP16 "Brush-off Blast Cleaning of Non-Ferrous Metals," and ASTM D6386, "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting."

Inspect brush-off blasted surfaces for fins or tears, or any surface that shows that the galvanized coating has been damaged. Repair damaged areas using approved procedures in accordance with the applicator's QM. Repair surface of insufficient galvanize coating Dry Film Thickness (DFT) readings using the approved painting applicator's QM repair procedure.

The QAI or Engineer will inspect the surface preparation as it is done, after its completion, or review the QM documentation, or any combination of the three. Notify the QAI or the Engineer at least 5 working days before beginning surface preparation.

Match the color of the finish coat to AMS-STD-595A Color No. 14066 (Forest Green), with a semi-gloss finish.

1. Coat all sweep blasted galvanized railing with the subsequent coat(s) within the time frame defined in ASTM D6386, Sect. 5.4.1, or within the same 8-hour shift, maintaining manufacturer defined control and environmental conditions. The painting applicator's QC personnel shall document that all parameters were followed.
2. Apply all coating material in accordance with the contract documents and the manufacturer's Product Data Sheet (PDS) and application guides for the material and system specified.
3. Ensure coating material(s) meet the requirements of 3520, "Zinc-Rich Paint Systems" and that the color of the intermediate coat presents a distinct contrast from other applied coatings.
4. Accomplish QC inspections of coated products with an observer with normal color vision in a "well lighted" area during each coating phase and prior to final acceptance.

Well-lighted: A minimum of 50-foot candles (fc), with 200-foot candles recommended. Use a light meter capable of reading in fc to verify the adequacy of the lighting and ensure a record is kept.

Handling and Shipping by the Paint Coating Applicator of Duplex Coated Metal Railing:

DO NOT move or handle the coated metal railing until the coating dries as defined in the Product Data Sheet of the manufacturer of the paint coating. The paint Applicator will document the environmental conditions related to the time it takes to define cure, in the QC form. Protect completed metal railing during handling and shipping to eliminate damage to the coating.

Any damaged coated surfaces, identified through either Quality Control or Quality Assurance inspections as being unacceptable, either after the application of the paint coating or during handling of the coated components, is subject to the provisions of 1512, "Unacceptable and Unauthorized Work". Also refer to section H.

Storage of Coated Metal Railings:

Store all completed coated metal railing in accordance with 1606, "Storage of Materials," and the following:

Provide the Engineer with advance notification of at least 5 working days of intent to ship, so that the Engineer can perform a QA audit prior to shipping.

G. Construction Requirements

The provisions of Section G apply to field installation performed by District Maintenance Forces.

SPECIAL ALERT: All hardware, fasteners, anchorage nut, washer, and threaded rod stick out, used to install metal railings in the field will no longer be required to be field coated after installation per 2478.3.H, "Fasteners" or 2479.3.H, "Fasteners". Install and do not apply intermediate and finish coat.

Provide the Engineer with a QA/QC plan that will be used to ensure that the cast-in-place anchorages are installed in the correct location using templates or other means ensuring that the exposed threads of the anchorages will not be damaged or contaminated and that the anchorages will not be displaced or allowed to move during concrete placement.

If cast-in-place anchorages have been installed in the forms, but prior to placing the barrier concrete, the Contractor shall provide written documentation verifying that all of the anchorages are within the necessary tolerances to place the tubular railing without modifying the railing base plate configuration.

Adjust the steel posts to obtain the grade and alignment as shown in the plans using the following method:

Shim the steel posts with galvanized steel shims or washers to the proper grade and alignment, not to exceed $\frac{1}{4}$ inch of shim height. Before attaching the nuts, **coat the entire surface between the base plate and concrete rail with an approved "Silicone Joint Sealant," as found on the Department's Approved Products website.** Tighten the anchor rod nuts (as per section "C"-Anchorages) and neatly smooth the caulk around the perimeter of the railpost base plate.



Ground all metal railings. Install all electrical grounding in accordance with the applicable provisions of 2557, "Fencing," and the National Electrical Code. Clamp or braze the ground wires to the grounding device, then practicably route and attach to the nearest rail by clamping, brazing, or any other approved means that will provide a permanent positive connection. If rail has non-continuous sections, use a #6 AWG solid copper wire to connect adjacent railing panels.

If the bridge does not include exposed electrical equipment, then ground the rails at points directly below or adjacent to the railing at all abutment corners. Ensure the grounding system consists of a #6 AWG solid copper wire connected to the railing which in turn is connected to a copper coated steel rod having a nominal diameter of $\frac{5}{8}$ inch or more and a minimum length of 8 ft installed to an elevation approximately flush with the ground surface.

If the bridge includes exposed electrical equipment, such as roadway lighting, traffic signals, variable message signs, surveillance cameras, or ramp metering, then bond the railing grounding system to the exposed electrical equipment grounding system. Refer to the electrical plans and electrical special provisions for details regarding bonding multiple electrical grounding systems.

H. Coating Repairs

H.1 Shop (prior to receiving at job site)

Any damaged coated surfaces, identified by the Engineer as being unacceptable is subject to the provisions of 1512, "Unacceptable and Unauthorized Work", and will be replaced or repaired. Submit a Non-conformance repair plan to the Engineer for acceptance. Once accepted in writing by the Engineer, perform repairs using the accepted methods and procedures authorized by the Engineer.

Coating damage is classified in two extent types:

Type 1 – damage is any type of abrasion that caused a surface imperfection not exposing the galvanized surface or exposes an area of galvanized surface that is smaller than 1 square inch in size. This damage may be repaired in the shop using an accepted Non-conformance repair plan as stated above (i.e. abrade the damaged area and apply an intermediate and finish coat per 2478, "Organic Zinc-Rich Paint System." (Note: Alkyd Enamels will not be allowed as a repair. Aerosol spray paint is not an acceptable repair procedure.)

Type 2 – damage is any type of surface imperfection that exposes the galvanized surface larger than 1 square inch and/or exposed base metal in an area larger than $\frac{1}{2}$ square inch. Repair this damage in the shop using an accepted Non-conformance repair plan.

H.2 Field (once received at the job site)

Any damaged coated surfaces, identified by the Project Engineer as being unacceptable is subject to the provisions of 1512, "Unacceptable and Unauthorized Work", and will be replaced or repaired. Submit a Non-conformance repair plan to the Project Engineer for acceptance. Once accepted in writing by the Project Engineer, perform repairs using the accepted methods and procedures authorized by the Project Engineer.

Coating damage is classified in two extent types:

Type 1 – damage is any type of abrasion that caused a surface imperfection not exposing the galvanized surface or exposes an area of galvanized surface that is less than 1 square inch in size. This damage may be repaired in the field or the shop using an accepted Non-conformance repair plan as stated above (i.e. abrade the damaged area and apply an intermediate and finish coat per 2478, "Organic Zinc-Rich Paint System." (Note: Alkyd Enamels will not be allowed as a repair. Aerosol spray paint is not an acceptable repair procedure.)

Bridge 55058
May 21, 2020

Type 2 – damage is any type of surface imperfection that exposes the galvanized surface larger than 1 square inch and/or exposed base metal in an area larger than $\frac{1}{2}$ square inch. Remove sections of damaged rail from the site and repair in the Paint Applicator's application facility. (Repair the damaged area utilizing an accepted NCR.)