MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**ORNAMENTAL STEEL FENCE ON STRUCTURE**

BRG:JJA 1 of 4 APPR:SCK:REL:08-29-23

**a. Description.** This work consists furnishing, fabricating, coating, and erecting the ornamental steel pedestrian fencing and anti-climb shield on a bridge as shown on the plans and as specified herein.

**b. Materials.** Furnish fencing and railing materials in accordance with sections 907 and 908 of the Standard Specifications for Construction, and as specified herein.

1. Tube. Use hollow structural sections (HSS) in accordance with subsection 908.09.B of the Standard Specifications for Construction. Testing in accordance with *ASTM E436* will be omitted. Acceptance of the tube will be by a general certification.

2. Bar. Use solid bar in accordance with *ASTM A36/A36M*.

3. Channels. Use channel sections in accordance with *ASTM A36/A36M*.

4. Anchor Studs, Nuts and Washers. Use anchor studs, nuts, and washers in accordance with subsection 908.09.C of the Standard Specifications for Construction and galvanize in accordance with *ASTM A153/A153M*.

5. Plates and Angles. Use plate material in accordance with *ASTM A36/A36M*.

6. Hardware. Use hardware for rail connections in accordance with the plans and subsection 908.09.C of the Standard Specifications for Construction.

7. Powder Coating. Use a powder coating system in accordance with the requirements of Table 1 on all steel parts with the exception of anchor bolts and related anchor bolt hardware. Ensure the fence is galvanized and then powder coated with first an epoxy and followed with polyester (refer to plans for color) in accordance with the manufacturer’s recommendations. Ensure the epoxy and polyester coating are from one manufacturer.

8. Welding. Welding will be in accordance with *AASHTO/AWS D1.1 Structural Welding Code - Steel*.

**c. Construction.** Construct the railing to the dimensions shown on the plans and in accordance with subsection 808.03 of the Standard Specifications for Construction. Prior to galvanizing, grind all sharp edges to a minimum 3/32 inch radius and drill all required holes.

After fabrication, galvanize structural members and hardware in accordance with subsection 707.03.D.20 of the Standard Specifications for Construction.

After galvanization, pretreat galvanized steel with a coating manufacturer recommended zinc phosphate solution then apply the powder coating with a thickness as recommended by the coating manufacturer. Use color number shown on the plans.

Submit shop drawings to the Engineer for review and approval prior to fabrication. Do not begin fabrication until the Engineer has approved the shop drawings. In addition, submit the following information to the Engineer for approval prior to shop drawing submittal:

1. Name, location and contact information where powder coating of fence and mesh will be performed.

2. Quality control (QC) program established and followed by the firm performing powder coating operations.

3. Powder coating plan, including identification of the powder coating materials used (and manufacturer), specific cleaning, surface preparation, pre-heating, powder coating application, curing, shop and field coating repair, handling, and storage processes.

4. Product data and Material Safety Data Sheet (MSDS) sheets for all pretreatment solutions, powder coating, and coating repair materials.

Do not store galvanized material outdoors and protect from moisture. Prepare hot-dip galvanized surfaces in accordance with *ASTM D7803* and the powder coating plan approved by the Engineer. Clean and prepare steel surfaces in accordance with *ASTM D7803 Section 5* and provide thermal pretreatment in accordance with *ASTM D7803 Section 6*.

Notify the Engineer of all surface cleaning and preparation activities and provide the Engineer the opportunity to perform quality assurance inspection at the completion of the surface cleaning and preparation activities but prior to beginning the powder coating application.

After surface preparation is completed, apply powder coatings in accordance with the powder coating manufacturer’s recommendations, the approved powder coating plan and as follows:

5. Pre-heat sufficiently to prevent pin holes from forming in the finished coating system.

6. Apply and cure the epoxy coating using the coating manufacturer’s recommendations. Apply the epoxy coating at a minimum thickness of 2 mils.

7. Apply and cure the polyester coating using the coating manufacturer’s recommendation.

Perform testing in accordance with the approved QC program. Visually inspect powder coating for unacceptable surface imperfections. Verify through testing that the epoxy primer coating and polyester finish coating are a minimum 2 mils each in thickness. Verify through testing that the finish coat provides a minimum hardness value of H in accordance with *ASTM D3363*. Verify through testing that the adhesion for the complete two component coating system is not less than 400 psi in accordance with *ASTM D4541*. Perform solvent cure test in accordance with the *Powder Coating Institute Test Procedure #8*. Document the results of all testing in a QC report and submit to the Engineer for approval. Provide access to the Engineer to witness testing. Failure to satisfy testing requirements is cause for rejection by the Engineer.

Repair damage to the galvanization and the coating in accordance with subsection 716.03.E of the Standard Specifications for Construction. Cost of the repairs will be the responsibility of the Contractor.

The polyester coating must conform to the requirements in Table 1:

**Table 1: Coating Requirements**

|  |  |  |
| --- | --- | --- |
| Test Property | Test Method | Specification Limits |
| Abrasion | *ASTM D1044* Tabor Abraser CS-10, 1000 gm load, 1000 cycles | 100 mg max weight loss |
| Adhesion | *ASTM D3359* Initial & 1000 hr, Method A | Rating 5A |
| Gloss | *ASTM D523* Initial, 500 hr, 1000 hr | 90 percent @ 60 degrees  60 percent @ 60 degrees |
| Hardness | *ASTM D3363* | 2H – No Gouge |
| Impact | *ASTM D2794* | Pass 9 N m |
| Salt Spray Resistance | *ASTM B117 ASTM D1654*  1000 hr unscribed 400 hr scribed | Table 2, Rating 10  Table 2, Rating 10 |
| Weather Resistance | *ASTM G152*  102 minutes light at 63 (±3)°C black panel temperature followed by 18 minutes light and water spray air temperature not controlled as Table X1.1 Cycle 1a | No Film Failure |
| Infrared Spectrogram | Equipment Manufacturer’s Procedure | Match Original |
| Flexibility | 6.35 mm Mandrel 180 degrees bend in 1 sec, cured per manufacturer’s recommendations | No breaks, flaking or cracks. Tested with a Q-panel with no cracking |
| Thickness | *ASTM D7091* | 2 mils minimum |
| Humidity | *ASTM D2247* 1000 hr | No blistering |
| ∆ E Color Change | *ASTM D5894* Initial, 1000 hr *ASTM D2244* | <2.0 |

The coating manufacturer will furnish certification and test results that the material and work complies with the applicable specifications.

Protect components and assemblies from damage in accordance with the manufacturer’s recommendations. Repair damaged components to the satisfaction of the Engineer. If satisfactory repairs cannot be made, replace damaged components. All costs associated with repairing and replacing damaged components will be borne by the Contractor. Do not deliver assemblies or components to the site until the Engineer approves the QC report.

Install post base plates level with the top of the concrete barrier and in accordance with the plans. Install the fence in accordance with the manufacturer’s recommendations and as shown on the plans.

Provide manufacturer’s standard limited warranty that its ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering, and corroding for a period of 15 years from the date of purchase.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

**Pay Item Pay Unit**

Fence, Structure, Ornamental Foot

**Fence, Structure, Ornamental** will be measured by the foot along the centerline of the fencing and anti-climb shield, and includes posts, and all other supporting, connecting, and auxiliary elements for the erection of the fencing, anti-climb shields and gaps.