

**Supplemental Specification  
2017 Standard Specification Book**

**SECTION 02824**

**FENCE ON STRUCTURE**

**Add Section 02824**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Chain link fencing installed on parapets, walls, curbs, and other structures.
- B. Ornamental fencing installed on parapets, walls, and other structures.

**1.2 RELATED SECTIONS Not Used**

**1.3 REFERENCES**

- A. AASHTO M 111: Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
- B. AASHTO M 270: Structural Steel for Bridges
- C. ASTM A 36: Carbon Structural Steel
- D. ASTM A 153: Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- E. ASTM A 307: Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
- F. ASTM A 392: Zinc-Coated Steel Chain Link Fence Fabric
- G. ASTM A 491: Aluminum-Coated Steel Chain Link Fence Fabric
- H. ASTM A 500: Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
- I. ASTM A 563: Carbon and Alloy Steel Nuts
- J. ASTM A 824: Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence

- K. ASTM A 1085: Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
- L. ASTM B 117: Operating Salt Spray (Fog) Apparatus
- M. ASTM D 523: Specular Gloss
- N. ASTM D 714: Evaluating Degree of Blistering in Paints
- O. ASTM D 1654: Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- P. ASTM D 2240: Rubber Property – Durometer Hardness
- Q. ASTM D 2244: Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- R. ASTM D 2794: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
- S. ASTM D 3359: Rating Adhesion by Tape Test
- T. ASTM D 7803: Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating
- U. ASTM F 436: Hardened Steel Washers Inch and Metric Dimensions
- V. ASTM F 668: Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric
- W. ASTM F 844: Washers, Steel, Plain (Flat), Unhardened for General Use
- X. ASTM F 1083: Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
- Y. ASTM F 1554: Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- Z. AWS D1.1 Structural Welding Code – Steel

#### **1.4 DEFINITIONS**

**Not Used**

## 1.5 SUBMITTALS

- A. Certified mill test report (MTR) for all structural steel.
  - 1. Seven calendar days before delivery to site, including materials manufactured outside of the United States.
  - 2. Clearly indicate country of origin on MTR.
- B. Manufacturer's product data sheets and recommended installation instructions.
- C. Material Safety Data Sheets.

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. Anchor Bolt Assembly
  - 1. Headed Anchor Bolt according to ASTM F 1554 Grade 55.
  - 2. Nuts according to ASTM A 563.
  - 3. Washers according to ASTM F 436.
  - 4. Galvanize according to ASTM A 153.
- B. Fasteners
  - 1. Bolts according to ASTM A 307, Grade A.
  - 2. Nuts according to ASTM A 563.
  - 3. Washers according to ASTM F 844 or ASTM F 436.
  - 4. Carriage bolts
    - a. Use ASTM A 307, Grade A.
  - 5. Galvanize according to ASTM A 153.
- C. Neoprene Pad
  - 1. Use neoprene pad with a Shore A durometer of 50-60 according to ASTM D 2240.
- D. Structural Steel
  - 1. Use structural steel conforming to AASHTO M 270 Grade 50 for plates.
  - 2. Use structural steel conforming to ASTM A 500, Grade B for hollow sections and steel pipe.
    - a. Not including fence post, top rails, and horizontal braces.
  - 3. Use structural steel conforming to ASTM A 36 for angles, channels and bar.
  - 4. Weld according to AWS D1.1.
  - 5. Galvanize after fabrication according to AASHTO M 111.

## **2.2 CHAIN LINK FENCING**

- A. Fence Posts
  - 1. Use steel pipe conforming to ASTM F 1083 High Strength Grade, Schedule 40.
- B. Top Rail and Horizontal Brace
  - 1. Use steel pipe conforming to ASTM F 1083 High Strength Grade, Schedule 40.
- C. Expansion Rail
  - 1. Use steel pipe conforming to ASTM F 1083 Regular Strength Grade, Schedule 40.
- D. Chain Link Fence Fabric
  - 1. Use 9 gauge wire.
  - 2. Openings in the fabric are not to exceed 2 inch in any direction.
  - 3. Use one piece fabric widths.
  - 4. Use knuckled selvage at bottom.
  - 5. Use twisted and barbed selvage at the top.
  - 6. Provide either Type I zinc-coated steel or Type II aluminum-coated steel fence fabric as specified in ASTM A 392 and ASTM A 491.
- E. Tension Wire
  - 1. Use 7 gauge steel tension wire according to ASTM A 824.
    - a. Use Type II coating.
- F. Miscellaneous hardware, fittings and appurtenances
  - 1. Manufacture to industry standards, commercial quality and suitable to the purpose used.
  - 2. Galvanize after fabrication according to AASHTO M 111.

## **2.3 ORNAMENTAL FENCING**

- A. Fabrication
  - 1. Fabricate posts and pickets so that they are plumb after installation.
  - 2. Fabricate horizontal rails, so they are parallel to roadway profile after installation.
  - 3. Panels are permitted to be fabricated within 0.5 percent of plumb.

## 2.4 HANDRAIL

- A. Use steel pipe conforming to ASTM A 500 Grade B/C or ASTM A 1085, Grade A.
- B. Steel Plates
  - 1. Conforming to ASTM A 36.
- C. U-Bolt
  - 1. Conforming to ASTM A 307.
  - 2. Galvanize according to ASTM A 153.
- D. Remove all burrs, sharp edges and corners.
- E. Galvanize after fabrication according to AASHTO M 111.

## 2.5 COATINGS

- A. Paint exposed elements when shown.
  - 1. Apply polymer coating over galvanized surface on fence components including nuts, bolts, washers, fittings and appurtenances. Refer to ASTM F 668.
  - 2. Use a field applied liquid polymer coating approved by the fence manufacturer for elements that are not practical to apply polymer coating in factory,
- B. Powder coat exposed elements when shown.
  - 1. Prepare surfaces to receive powder coating according to ASTM D 7803.
  - 2. Apply powder coat over galvanized surface on fence components including nuts, bolts, washers, fittings and appurtenances meeting the requirements in Table 1.
  - 3. Use a field applied liquid polymer coating for items not feasible to powder coat before installation.

<b>Table 1 – Powder Coating Requirements</b>		
<b>Quality Characteristics</b>	<b>ASTM Test Method</b>	<b>Performance Requirements</b>
Adhesion	D 3359 – Method B	5B rating
Corrosion Resistance	B 117, D 714 and D 1654	Corrosion resistance over 1,500 hours (scribed per D 1654; failure mode is accumulation of 1/8" coating loss from scribe or medium # 8 blisters)
Impact Resistance	D 2794	Impact resistance over 60 inch lb (forward impact using 0.625" ball)
Color/Gloss	D 2244 and D 523 (60° Method)	Weathering resistance over 1,000 hours (failure mode is 60% loss of gloss or color variance of more than 2 delta-E color units)

## **PART 3 EXECUTION**

### **3.1 DELIVERY, HANDLING, AND STORAGE**

- A. Check materials upon delivery to verify that no damage occurred during shipping.
- B. Store materials in such a manner to provide proper ventilation and drainage and to protect against damage, weather, vandalism, and theft.

### **3.2 CHAIN LINK FENCE ON STRUCTURE**

- A. Install anchor assembly
  - 1. Cast anchor assembly in structural concrete as shown.
  - 2. Hold anchor bolts in correct location and plumb.
    - a. Embedded material required to maintain anchor bolt position are to be epoxy coated or galvanized.
- B. Fence framework installation
  - 1. Install neoprene pad, base plate and post as shown.
    - a. Verify post is plumb within a tolerance of 1 1/2 inch over 9 foot length.
    - b. Snug tight anchor bolts and peen ends of bolt to prevent loosening.
  - 2. Install horizontal brace and truss rod in brace panels and at terminal posts as shown.

3. Install top rail through the post caps and form a continuous brace from end to end of each stretch of fence.
    - a. Splice top rail using top rail sleeve.
    - b. Secure to the terminal post by a brace band and rail end.
    - c. Provide expansion couplers as recommended by the fence manufacturer.
  4. Fit post with post caps and line post caps as applicable. Snugly fit fittings over posts.
- C. Tension Wire
1. Stretch taut, independently and before the fabric, between the terminal posts and secure to the terminal post using a brace band.
  2. Secure to each line post with a tie wire.
- D. Install chain link fabric
1. Install the fabric on the side of the posts as shown.
  2. Attach fabric to the terminal post by threading the stretcher bar through the fabric.
  3. Secure the stretcher bar to the end post with tension bands and  $\frac{5}{16}$  inch carriage bolts spaced no greater than 12 inch on center.
    - a. Install with the head on the fabric side of the fence. Peen all bolts to prevent removal of the nut.
  4. Stretch fabric taut and free of sag, except where shown.
    - a. Leave slack in fabric by stretching taut and backing off 2 inch before securing fabric to post where fence crosses deck expansion joint.
  5. Secure fabric to each post with tie wires spaced no greater than 12 inch.
  6. Secure fabric to top rail and horizontal brace with tie wires spaced no greater than 18 inch.
  7. Secure fabric to tension wire with hog rings spaced no greater than 18 inch.
- E. Install handrail when shown.
1. Handrail to match the profile of the associated pedestrian facility.
- F. Bend tie wires to prevent hazard to persons or apparel.
- G. Touch up fence components with a liquid polymer touch up coating approved by the fence manufacturer.

### 3.3 ORNAMENTAL FENCE ON STRUCTURE

- A. Install anchor assembly
  - 1. Cast anchor assembly in structural concrete as shown.
  - 2. Hold anchor bolts in correct location and plumb.
    - a. Embedded material required to maintain anchor bolt position are to be epoxy coated or galvanized.
  
- B Fence framework installation
  - 1. Install neoprene pad, base plate and post as shown.
    - a. Verify post is plumb within a tolerance of 1<sup>1</sup>/<sub>2</sub> inch over 9 foot length.
    - b. Snug tight anchor bolts and peen ends of bolt to prevent loosening.
  - 2. Connect fence panels to posts.
  
- C. Touch up fence components with a liquid polymer touch up coating approved by the fence manufacturer.

END OF SECTION