

X2200018 ORNAMENTAL FENCE (LCDOT)

Effective: January 1, 2007

Revised: March 11, 2020

Description: This work shall consist of furnishing and installing a steel fence, gates and accessories as shown on the plans.

Materials:

- A. The steel material for the fence framework (i.e., tubular pickets, rails and posts) shall meet the following:
 - I. Galvanized after forming:
 - a. Conform to the requirements of ASTM A1011/1011M
 - b. Minimum yield strength of 50,000 psi.
 - c. The exterior shall be hot-dip galvanized with a 0.45 oz/ft² minimum zinc weight.
 - d. The interior surface shall be coated with a minimum 81% normal zinc pigmented coating, 0.3 mils minimum thickness.
 - II. Galvanized prior forming
 - a. Conform to the requirements of ASTM A924/A924M
 - b. Minimum yield strength of 50,000 psi.
 - c. The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft², Coating Designation G-90.
- B. The manufactured galvanized framework shall be subjected to a thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a zinc-rich thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be as specified on the standard drawing included in the plans. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in the following table.

Quality Characteristics	ASTM Test Method	Performance Requirements
<i>Adhesion</i>	<i>D3359 – Method B</i>	<i>Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).</i>
<i>Corrosion Resistance</i>	<i>B117 & D1654</i>	<i>Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).</i>
<i>Impact Resistance</i>	<i>D2794</i>	<i>Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).</i>
<i>Weathering Resistance</i>	<i>D822, D2244, D523 (60° Method)</i>	<i>Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).</i>

Table 1 – Coating Performance Requirements

- C. The material for the fence pickets shall be 1" square x 16 gauge tubing. The cross-sectional shape of the rails shall conform to the manufacturer's design with outside cross section dimensions of 1.75" square and a minimum thickness of 14 gauge. Picket holes in the horizontal rail shall be spaced 4.98" on center. The picket retaining rods shall be made of 0.125" diameter galvanized steel. The minimum post size shall be 2½" square x 12 gauge. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.

The manufacturer's literature (or shop drawings and specifications) shall be submitted to the Engineer prior to ordering the fence. The ornamental fence, as shown on LCDOT standards LC6600, LC6601 and LC6602, and as specified herein, is an industrial quality ornamental steel fence system. The drawings and dimensions were furnished by one manufacturer. An equivalent fence system may be proposed for substitution. The Engineer is the sole judge of what is an equivalent substitution.

General: Installation of the fence shall be according to the applicable portions of Section 664 [Chain Link Fence] of the "Standard Specifications", except as follows:

1. Dimensions and design details are as shown on the plans.
2. At some locations, the fencing shall be attached to concrete retaining walls. The attachment methods shall conform to the requirements of the "AASHTO LRFD (Load and Resistance Factor Design) Bridge Design Specifications" (AASHTO 2007) Section 13, "Railings". The allowable attachment methods include coring the concrete to 9" depth and grouting the fence posts in the holes or using mounting brackets and anchors.
3. Fence post installation in soil shall be done using concrete footings as shown on the plans.

Fence Fabrication:

- A. The pickets, rails and posts shall be pre-cut to specified lengths. The horizontal rails shall be pre-punched to accept the pickets.
- B. The grommets shall be inserted into the pre-punched holes in the rails and the pickets shall be inserted through the grommets so that the pre-drilled picket holes align with the internal upper raceway of the horizontal rails. (Note: This can best be accomplished by using an alignment template.) Retaining rods shall be inserted into each horizontal rail so that they pass through the predrilled holes in each picket completing the panel assembly.
- C. The completed panels shall be capable of supporting a 600lb load (applied at midspan) without any permanent deformation. Panels with rings shall be biasable to a 12.5% change in grade. Panels without rings shall be biasable to a 25% change in grade.
- D. Gates shall be fabricated using the same components as the fence system. The panel material and gate ends will have the same outside cross section dimensions as the horizontal rail. All rail and upright intersections shall be joined by welding. Picket and rail intersections shall be joined by welding or the same retaining rod used for the panel assembly.

Installation:

The fence posts shall be set according to the spacing shown in Table 2, $\pm\frac{1}{2}$ " , depending on the nominal span specified.

Span	6' Nominal (67 $\frac{3}{4}$ " Rail)				8' Nominal (92 $\frac{5}{8}$ " Rail)			
Post Size	2 $\frac{1}{2}$ "	3"	2 $\frac{1}{2}$ "	3"	2 $\frac{1}{2}$ "	3"	2 $\frac{1}{2}$ "	3"
Bracket Type	Standard (BB301)		Angle (BB304)		Standard (BB301)		Angle (BB304)	
Post Settings $\pm\frac{1}{2}$ " o.c.	71 $\frac{1}{2}$ "	72"	73"	73 $\frac{1}{2}$ "	96"	96 $\frac{1}{2}$ "	97 $\frac{1}{2}$ "	98"

Table 2 – Post Spacing Requirements

For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. For fencing installed in soil, posts shall be set in concrete footings having a minimum depth of 36" as shown on LCDOT standards LC6000, LC6601 or LC6602 included in the plans.

For fence installed on top of a concrete retaining wall, posts shall be set by methods such as plated posts or grouted core-drilled footings. The anchor method shall conform to the requirements of the "AASHTO LRFD (Load and Resistance Factor Design) Bridge Design Specifications" (AASHTO 2007), Section 13, "Railings". The Contractor shall provide shop drawings of the anchor method to the Engineer for review and approval.

FENCE INSTALLATION MAINTENANCE

When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces:

- 1) Remove all metal shavings from cut area.
- 2) Apply custom finish paint matching fence color.

GATE INSTALLATION

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out to out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application, weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations

Gate posts shall be spaced according to the gate openings specified in the construction plans. The fence panels shall be attached to the posts using mechanically fastened panel brackets supplied by the manufacturer.

Method of Measurement: Ornamental Fence will be measured for payment in feet along the top of the fence from center to center of the end posts.

Basis of Payment: This work will be paid for at the contract unit price per foot for ORNAMENTAL FENCE. *The unit price shall include furnishing and installing the fence, including all fence connections, connection to a retaining wall (where required), concrete foundations, fence openings and gates (where indicated) and electric grounding. The unit price shall also include all equipment, materials and labor required to install the fence.*