

Item No. 704
Metal Beam Guard Railing

704.1 Description

This item shall consist of furnishing metal beam guard railing consisting of 1 line of metal beam rail element supported on timber or steel posts. Metal beam guard railing shall be constructed with materials and work quality as indicated or approved by the Engineer.

704.2 Materials

(1) Rail Elements

The rail elements, end shoes or terminal anchors shall be of the deep beam type fabricated to develop continuous beam strength and shall consist of a metal plate or sheet formed into a beam not less than 12 inches wide and 3 inches deep as indicated. The beam shall be free from warp. When tested with a straight edge or string along either edge of a 12 1/2 foot sectional length of beam, the maximum deviation of the beam edges from the straight edge shall not exceed 1/2 inch at any point. The steel for the rail elements shall conform to AASHTO M-180. The rail shall be 12 gauge (0.1046 ± 0.008 inch) or as indicated.

The rail element may be galvanized before or after fabrication in accordance with the requirements of ASTM A 123 or A 525, whichever is applicable, except that the galvanized coating shall not be less than 1.8 ounces per square foot of double exposed surface (single spot test).

Rail elements shall contain not more than 0.04 percent phosphorous nor more than 0.05 percent sulfur.

(2) Posts

The posts shall be either timber or steel as indicated and shall meet one of the following requirements:

Timber posts and spacers, where required, shall be Southern Yellow Pine. All posts shall be round. Posts shall not be less than 7 inches in diameter. The diameter shall be determined by means of a circumference-diameter tape. The average diameter at the base of the dome shall not exceed the specified diameter by more than 1 inch. The diameter at the butt of any post shall not exceed the diameter at the base of the dome of that post by more than 2 inches. The supplier shall stencil on the butt of each post the nominal diameter of the top 7 inches. The stenciled numeral shall be 1 inch high. The length of the posts shall not vary more than 1 inch from the specified length. They shall be of the length indicated; the bottom and the top shall be fabricated as indicated.

All posts shall be domed at the top. The dome shall be approximately hemispherical in shape and the radius of the dome of each post shall be 1/2 the diameter of the posts at the base of the domed portion. The dome shall be smooth and the distance from the top of the dome to the base of the dome shall not vary more than 1 inch at any location. The posts shall be machine peeled and trimmed of all knots and knobs and shall be free from defects such as injurious ring shakes, unsound or loose knots or other defects which might impair their strength and durability. Sound knots will be permitted provided they are not in clusters and they do not exceed 1/3 of the small diameter or least dimension. Any defect or combination of defects which would be more injurious than the maximum allowable knot will not be permitted. A line drawn from the center of each end of the post shall not fall outside the center of the post at any point more than 1 1/4 required, shall be bored and cut to dimensions indicated before being treated. They shall be treated with 0.4 pounds/cubic foot, dry pentachlorophenol treatment or ACA by assay. Posts and spacers, where required, shall be painted with two coats of good quality aluminum paint after the guard rail is erected unless otherwise indicated.

Steel posts and spacers, where required, shall be of the rolled sections as indicated. The posts and spacers, where required, shall be structural steel conforming to ASTM A 36. The top of all posts shall be beveled or square as required by detail and drilled or punched for bolts for rail attachments.

Steel posts and spacers, where required, shall be galvanized and shall conform to ASTM A 123.

Fittings shall consist of bolts, nuts and washers and shall conform to the details indicated and shall comply with the requirements as specified herein.

All bolts and nuts used with galvanized steel rail shall be made by either the open hearth or electric furnace process and shall conform to ASTM A 307. They shall be hot-dip galvanized to conform to ASTM A 153, Class C or D.

Unless otherwise indicated, the concrete for terminal anchor posts or for embedment or other posts in concrete, where required, shall meet the requirements for Class A Concrete, as specified in Item No. 403, "Concrete for Structures" and subsequent Special Provisions thereto. The rail element for the terminal anchor section shall be of the same materials as the rail element used throughout the project.

704.3 Sampling and Testing

A sample of the rail and terminal section may be taken for each project or for each shipment to a project. Samples of bolts and nuts may also be required. All samples shall be furnished to the City free of charge. The plate or sheet shall be sampled and tested in accordance with the requirements of ASTM E-8. For galvanized articles, the

weight of the zinc coating shall be determined by stripping in accordance with ASTM A 90.

The uniformity of the zinc coating shall be determined by visual inspection. If, in the opinion of the Engineer, visual examination is not conclusive, the uniformity of the coating may be determined by magnetic thickness gauge measurement in accordance with ASTM Designation: E 376 or by the Preece Test as described in ASTM Designation: A 239. When the Preece Test is used, all items designated in ASTM A 153 as Class B-2, B-3, C and D shall withstand a minimum of 4 one minute dips; all other items shall withstand a minimum of 6 one minute dips.

The cleaned area shall be coated with 2 coats of zinc dust compound meeting Federal Specification 0-G-98 (stick only), applied in accordance with the manufacturer's recommendations.

704.4 Construction Methods

The posts shall be set plumb and firm to the line and grade indicated. Unless the plans call for setting in concrete, the posts shall be backfilled by thoroughly tamping the material in 4 inch layers. The rail elements shall be erected to produce a smooth, continuous rail paralleling the line and grade of the roadway surface or as indicated. The rail elements shall be joined end to end by bolts and lapped in the direction of traffic in the lane adjoining the guard fence. When indicated, the rail elements shall be curved before erection. Holes for special details may be field drilled or punched, when approved by the Engineer.

After erection, all parts of galvanized steel posts, spacers where required, bolts and rail elements on which the galvanizing has become scratched, chipped or otherwise damaged shall be thoroughly cleaned by wire brushing the damaged area to remove all loose, cracked or bruised spelter coating. The cleaned area shall be painted with 2 coats of zinc dust-zinc oxide compound conforming to the requirements of Federal Specification TT-P-641b in accordance with the manufacturer's recommendations.

When fabrication is done after galvanizing and where indicated, the cut edges and bolt holes shall be cleaned by brushing and the cleaned area shall be painted with 2 coats of zinc dust-zinc oxide compound conforming to the requirements of the Federal Specification TT-P-641b or shall be repaired by application of galvanizing repair compounds in accordance with the manufacturer's recommendations.

No painting of galvanized steel rail members will be required.

704.5 Measurement

This item will be measured by the linear foot of rail, complete in place, measurement being made upon the face of the rail in place, from center to center of end posts, from terminal anchor sections or, in the case of structure railing connection, from the points

indicated except as follows: Where bids are requested for "Terminal Anchor Sections", measurement will be made as each section, complete in place, each section consisting of a terminal anchor post and one 25 foot rail element, as indicated.

704.6 Payment

The work performed and material furnished as prescribed by this item, measured as provided under "Measurement" will be paid for at the unit price bid for "Metal Beam Guard Railing" or "Metal Beam Guard Railing, Terminal Anchor Sections", which price shall be full compensation for furnishing all materials, including necessary boring for preparation, hauling and erection and galvanizing of same; for setting posts in concrete when specified and spacers where required and for all labor, tools, equipment and incidentals necessary to complete the work, including driving posts, excavating, backfilling and disposing of surplus materials.

Payment will be made under one of the following:

Pay Item No. 704: Metal Beam Guard Railing Per Linear Foot.

Pay Item No. 704-T: Metal Beam Guard Railing, Per Each.
Terminal Anchor Sections

End