

## 709 RAILING

### 709.01 DESCRIPTION

Work shall consist of furnishing, fabricating, preparing, assembling, finishing, and erecting all railings, posts, connections, anchors, and all other work incidental thereto as shown in the contract documents.

### 709.02 MATERIALS

Pipe railing – [809.04](#) standard weight

Steel for railings – [815.01\(A\)](#)

Neoprene Pads – [822.02\(C\)](#)

Galvanizing – [811.07](#)

Steel Anchor Bolts, Nuts, Washers – [815.01\(H\)](#)

### 709.03 FABRICATION

(A) **STEEL RAILING.** Bridge railing shall be fabricated to the dimensions shown in the contract documents. Fabrication shall conform to the requirements of [706](#). Railing shall be galvanized unless otherwise specified in the contract documents.

Loading, transportation, unloading, and field storage of guide rail elements shall be conducted so as to avoid injury and deformation of the railing elements. Damaged pieces shall be repaired or replaced at the Contractor's expense.

Special care shall be exercised and protective shimming, wrapping, or other means shall be employed to protect galvanized surfaces from mechanical damage due to handling, storing, or erecting procedures.

(B) **PIPE HANDRAIL.** Handrails shall be fabricated to the dimensions as shown in the contract documents. Handrails shall be fabricated by welding all joints. All welded joints shall be welded all around and ground flush with the pipe to present a smooth even finish. Immediately after fabrication the handrail shall be thoroughly cleaned in accordance with [707.06](#) and given 1 coat of shop paint meeting the requirements of [811.03\(A\)](#).

### 709.04 ERECTION

#### (A) GENERAL.

- (1) **Anchor Bolts.** Anchor bolts shall be accurately set with suitable rigid templates before placing concrete and shall be in accordance with approved location diagrams prepared by the railing fabricator. Bolts shall be securely fastened to prevent displacement during concreting operations. The anchor bolts shall protrude sufficiently from the surface of the concrete so that when the post is in place all threads of the nut are engaged.
- (2) **Base.** Railing posts and anchor bolts shall be set normal to grade. When post bases are to be set on concrete, the concrete surfaces shall be monolithically finished to

correct elevations and parallel to grade. Building up by grouting under the base shall not be done. Before erection, the areas of concrete upon which posts are to be set shall be dressed by grinding or rubbing to true plane surfaces as to the extent necessary for proper seating to the posts. If the areas of concrete upon which posts are to be set are low, full size shims of the same material as the post shall be used to bring the post to correct elevation. When post bases are to be set on stone masonry, full size shims of the same material as the post shall be used to obtain proper alignment. Posts or shims shall be set on a 1/4 inch neoprene pad.

- (3) Alignment. Railing posts and rails shall be erected and carefully aligned before anchor nuts and rail bolts or set screws are tightened. In final adjustment, no post shall deviate more than 1/8 inch from true alignment and there shall be no abrupt breaks in alignment at any location.

**(B) STEEL RAILING.**

- (1) Damaged Pieces. Prior to erection, and after erection, all parts shall be inspected for damage and for chipped or marred coatings. Pieces warped, deformed, or with substantial galvanized areas damaged to bare steel, as determined by the Chief Engineer, will be rejected and the Contractor shall replace such damaged parts with parts meeting these specifications at his sole expense. Marred or chipped areas in the galvanizing such as scratches extending nearly to bare steel, raw edges, spotting, etc., considered to be minor from an aesthetic or corrosion standpoint as determined by the Chief Engineer, shall be properly cleaned and carefully touched up with a zinc rich paint containing not less than 93 percent zinc by weight. The color of the touchup paint shall be a silver-gray which will blend with galvanized surfaces. Yellow-green shades of zinc paint will not be permitted. Surface scratches will not require touchup.
- (2) Alignment. After the railing has been set in place, it shall be adjusted until the top rail is parallel to the curb line of the roadway and has no irregularities apparent to the eye. If the clearance provided by the field holes is inadequate to permit proper adjustment, the field holes shall be reamed in the adjusted position. The adjustment of the railing shall assure that at every post, the top rail shall not depart more than 1/8 inch vertically or horizontally from the required line parallel to the center line of the roadway or to the lines and grades shown in the contract documents. The cost of any necessary adjustment shall be included in the unit price for railing.

**(C) PIPE HANDRAIL.**

- (1) Sleeve Installation. The pipe handrail shall be fastened to the concrete by making provisions at the time of pouring the concrete for steel pipe sleeves, capped at the bottom, of dimensions as shown in the contract documents. These sleeves shall be set vertical, shall be suitably plugged so that concrete and dirt cannot enter the sleeves and shall be checked for plumb position after concrete has been poured and finished.
- (2) Handrail Installation. After the concrete has set, the upright posts of the handrail shall be inserted in the sleeves in a vertical position and braced so that there will be equal clearance all around between pipe and sleeves. Molten lead then shall be carefully poured into the void between pipe and sleeve and allowed to set for 2

hours. After this time if the railing appears securely fastened at all points, bracing may be removed.

- (3) Anchorage to Masonry. Where handrails are to be fastened to a masonry wall, anchorage shall consist of a steel plate fastened to the wall with four expansion bolts as shown on the plans.
- (4) Painting. After the handrail has been erected, it shall be painted in accordance with the requirements of [707](#) with black paint meeting the requirements of [811.05\(E\)](#). All painting will be included in the contract unit price for the handrail.

#### **709.05 MEASURE AND PAYMENT**

The unit of measure for the various items of Railing listed in the Schedule of Prices will be the linear foot measured along the railing from out to out of end posts or end details excluding any openings exceeding 6 inches.

The actual number of linear feet furnished and erected, complete in place, will be paid for at the contract unit price per linear foot, which payment will include all labor, materials, tools, equipment and incidentals necessary to complete the work.