

- (g) **Concrete Filler:** Floors with open bottom flanges shall be provided with bottom forms of metal or wood to retain the concrete filler.

If metal form strips are used, they shall fit tightly to bottom flanges of floor units and be placed in short lengths extending approximately 1 inch beyond the edge of each support. The form shall be such as will result in the adequate bearing of the slab on the support.

Concrete shall be placed and cured in accordance with the requirements of Section 404 and thoroughly consolidated by vibrating the steel grid floor. The vibrating device and manner in which it is operated shall be subject to the approval of the Engineer.

- (h) **Painting:** Steel grid Flooring furnished without galvanizing but with a shop coat of paint, shall be painted in accordance with the requirements of Section 411.

If a structural steel plate is used on the bottom of a filled floor, the bottom surface of the plate shall be painted in accordance with the requirements of Section 411.

409.04—Measurement and Payment.

Steel grid floors will be measured in square feet of surface area, complete-in-place, and will be paid for at the contract unit price per square foot.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Steel grid floor	Square foot

SECTION 410—RAILINGS AND PARAPETS

410.01—Description.

This work shall consist of furnishing and installing railings, bridge median barriers, and concrete parapets reasonably true to the line, grade, and dimensions shown on the plans or as established by the Engineer.

410.02—Materials.

- (a) **Concrete** shall conform to the requirements of Section 217. In the event the Contractor places concrete by the extrusion method, the slump may be

less than 2 inches, the air content shall be no less than 4 percent and coarse aggregate shall be no less than No. 7.

- (b) **Steel reinforcement** shall conform to the requirements of Section 223.
- (c) **Steel for metal parapets** shall conform to the requirements of Section 226.
- (d) **Hydraulic cement mortar and grout** shall be nonshrinking and shall conform to the requirements of Section 218.
- (e) **Aluminum railings and materials** shall conform to the requirements of Section 229.
- (f) **Anchor bolts** shall conform to the requirements of Section 226.

410.03—Procedures.

- (a) **Post Alignment:** Posts shall be normal with respect to the profile grade and plumb in the transverse direction regardless of the cross slope.
- (b) **Metal Railings:** Fabrication and erection shall be performed in accordance with the requirements of Section 407. Working drawings shall be furnished in accordance with the requirements of Section 407. In welded railing, exposed joints shall be finished by grinding or filing to give a neat appearance.

When alternate metal railings are permitted, bridges under any one contract shall have the same type of railing.

Metal railings shall be carefully adjusted prior to being fixed in place to ensure proper matching at abutting joints and correct alignment and camber throughout their length. Holes for field connections shall be drilled wherever possible with railing in place at the proper grade and alignment.

Abutment ends of metal rails and metal parapets shall be grounded. Grounding shall be accomplished by using a No. 6 AWG, bare or insulated, stranded copper conductor securely affixed to end units and ground rods. Ground rods and other grounding material shall conform to the requirements of Section 238 and shall be installed in accordance with the requirements of Section 705. Movable joints of metal railings and metal parapets shall be bonded internally wherever possible. Ground wire shall pass through bridge parapets and backwalls in 1-inch PVC conduit to a point 4 to 8 inches below the finished grade and attached to a ground rod at least 10 feet in length. Each run of wire shall be provided with a 4-inch exposed loop.

1. **Painting:** Steel or iron railing that is not galvanized shall be given one shop coat and three field coats of paint after erection. Painting shall be in accordance with the requirements of Section 411.
2. **Anchorage:** Metal-railing anchorages in concrete shall be placed in accordance with the requirements of Sections 404 and 408.
3. **Aluminum railings:** Components of railing shall be designed for adequate structural strength. Castings shall have a thickness of at least 1/4 inch, and other units shall have a thickness of at least 3/16 inch.

Aluminum in contact with concrete shall be coated with an approved aluminum-impregnated caulking compound. Aluminum surfaces in contact with metals other than stainless or galvanized steel shall be insulated with approved materials.

- (c) **Concrete Railings, Bridge Median Barriers, and Parapets:** Concrete railings or parapets shall not be placed until centering or falsework for the span has been released, rendering the span self-supporting.

Railings, bridge median barriers, and parapets shall be constructed in accordance with the requirements of Section 404, for the class of concrete specified on the plans, and shall be given a Class I finish. Care shall be taken to secure smooth and tight-fitting forms that can be rigidly held to line and grade and removed without damage to concrete. Concrete Parapets and Median Barriers shall be constructed within an allowable tolerance of $\pm 1/2$ inch for overall depth and overall width, $\pm 1/4$ inch for the width of the upper portion of the barrier, and $\pm 1/4$ inch per 10 feet for horizontal alignment.

Forms for concrete railing shall be fabricated of single-width boards lined with approved material. Form joints in plane surfaces will not be permitted.

Moldings, panel work, and bevel strips shall be constructed with neatly mitered joints. Corners in finished work shall be true, sharp, clean cut, and free from cracks, spalls, or other defects.

Reinforcing steel shall be placed in accordance with the requirements of Section 406.

Expansion joints shall be constructed so as to permit freedom of movement. After all other work is completed, loose or thin shells of mortar likely to spall under movement shall be removed from expansion joints by means of a sharp chisel.

In the event the Contractor elects to construct railing, parapet or median barrier by the extrusion method, construction shall conform to the following:

1. In the event the bridge deck needs to be widened or additional reinforcing steel placed in the railing, parapet or median barrier to accommodate the extrusion machine, the Contractor shall submit all necessary details for approval. Cost for widening the bridge deck or placement of additional reinforcing steel shall be at the Contractor's expense.
2. The extrusion machine shall be equipped with internal vibrators to consolidate concrete along the face and adjacent joints in one complete pass of the machine. This shall be accomplished in such a manner that a minimum of hand finishing will be required to produce a dense homogenous finish, free from voids and honeycomb.
3. When the plans require horizontal drains in the railing, parapet or median barrier, the Contractor shall submit his proposed method of forming drains to the Engineer for approval.
4. Deflection and expansion joints shall be grooved in accordance with the plans immediately after the extrusion process and all required saw cutting shall be completed the same day the concrete is placed.

410.04—Measurement and Payment.

Railing will be measured in linear feet along the centerline of the top rail between the extremities of each railing, without deductions for breaks or interruptions. When railing is not a pay item, the cost thereof shall be included in the price for other appropriate items. When a pay item, railing will be paid for at the contract unit price per linear foot. This price shall include furnishing rails, rail posts, post bearing pads, anchor assemblies, and sleeves; furnishing and installing grounding materials; painting; galvanizing; reinforcing steel necessary; and concrete where applicable.

Parapets will be measured in linear feet along the face of the parapet, and **bridge median barriers** will be measured in linear feet along the barrier centerline. Parapets and bridge median barriers will be paid for at the contract unit price per linear foot. This price shall include furnishing and installing materials designated above the bridge deck surface, including anchorage material and reinforcing steel.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Railing (Type)	Linear foot
Parapet (Type)	Linear foot
Bridge median barrier (Type)	Linear foot