

Payment for this item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
704XX00	Prestressed Concrete Beam (<i>type</i>)	Linear Foot

SECTION 705

BRIDGE RAILING

705.01 Description. This work shall consist of the furnishings and erection of bridge railing of cast-in-place concrete, precast concrete, aluminum, steel, or other specified materials, or a combination of these materials on bridges, walls, or incidental structures as shown on the plans.

Unless otherwise stated, bridge railing shall include that portion of the structure erected on and above the bridge deck, curb or sidewalk, or above the top of retaining walls for the protection of traffic and pedestrians.

Bridge railing shall be constructed in accordance with the details shown on the plans and shall include the necessary devices for anchoring or attaching the railing to the main structure.

MATERIALS

705.02 Concrete Railing Wall and Barrier Parapet. Concrete shall not be less than Class 4000 unless otherwise

specified and shall conform to the requirements of Sections **701** and **702**. Reinforcing steel shall conform to the requirements of Section **703**.

Concrete for Light-weight Concrete Bridge Barrier Parapet shall be manufactured from light-weight coarse aggregate sources approved by the Research and Materials Laboratory. Concrete shall obtain a 28-day design compressive strength equal to or greater than Class 4000 and weigh 3100 ± 50 pounds per cubic yard.

705.03 Precast Bridge Barrier Parapet. Concrete for Precast Bridge Parapet shall be not less than Class 4000 and shall conform to Sections **701** and **702**. Reinforcing steel shall conform to the requirements of Section **703**. Precast sections shall be cast to the dimensions shown on the plans. All installation hardware consisting of bolts, nuts, washers, inserts, and rods shall be galvanized in accordance with AASHTO M 111 (ASTM A 123) or AASHTO M 232 (ASTM A 153) as applicable.

705.04 Galvanized Steel Railing and Steel Handrail.

A. Post and Rail. Each fabricated steel post assembly shall conform to the same general appearances as the railing shown in the plans. The Contractor shall prepare and submit shop drawings showing complete details of all parts of the Post and Rail conforming to the requirements of Section **725**. Unless otherwise shown on the plans, all steel rail and post components shall conform to the requirements of AASHTO M 270 (ASTM A 709), Grade 36. Rail caps shall conform to the requirements of ASTM A 245, Grade C. All required hardware including bolts, nuts, screws, etc, shall conform to the requirements of Subsection **705.06**.

B. Galvanizing. The steel posts and railing shall be hot dipped galvanized in accordance with the current AASHTO M 111 (ASTM A 123) or AASHTO M 232 (ASTM A 153) as applicable.

C. Cut Ends of Galvanized Steel Railing. After grinding smooth, the cut ends of galvanized steel railing shall be given two coats of a zinc rich paint meeting the require-

ments of Federal Specification TT-P-641 or an equal material approved by the Engineer.

705.05 Aluminum Railing.

A. Extruded Aluminum. Aluminum alloy extruded rails, posts, bases, expansion bars, etc. shall conform to ASTM B 221, Alloy 6061, Condition T6.

B. Cast Aluminum. Cast Aluminum railing post and other items for permanent mold castings shall conform to ASTM B 108, Alloy G70B, Condition T61, except that the elongation in two inches shall be not less than 8%.

705.06 Stainless Steel Bolts, Nuts, Set Screws, and Washers. Galvanized steel or aluminum rail shall be fabricated with stainless steel hardware meeting the requirements of ASTM A 276, Grade 305.

CONSTRUCTION REQUIREMENTS

705.07 General. The railing shall be of the type specified and shall be constructed in accordance with the details shown on the plans and in conformance with the requirements herein. It shall be constructed to the alignment, grade and camber designated on the plans. Shop fabricated railing shall be of such uniformity as to insure good joints and continuous lines after erection on the structure. Any appreciable amount of cutting, bending, or adjusting required during erection to produce a reasonable fit will be cause for rejection of the railing. Unless otherwise provided, railing shall not be placed until after the falsework for the span has been released. During erection of the railing, care shall be exercised to insure proper functioning of expansion joints.

Unless otherwise shown on the plans or directed by the Engineer, railing posts shall be erected vertically, with tops of posts parallel to the roadway grade shown on the plans.

A. Metal Railing. The fabrication and erection of steel

railing shall conform to the pertinent provisions of Section **709**, and to the requirements of this specification. Fabrication of aluminum railings shall be in accordance with Division 1, Section 11 of the current AASHTO *Standard Specifications for Highway Bridges*. Splicing of rail members will generally be near railing posts and will be permitted only as shown on the plans. Working drawings are required for metal railing in accordance with Subsection **105.02** of these specifications.

All components of metal railing shall be carefully handled and stored in order to avoid scratching, marring, denting or otherwise damaging the railing. Aluminum members shall be separated from concrete or steel by methods called for on the plans; or if not shown on the plans, the separation shall be by an elastomeric sheet 1/16 inch thick, durometer 60, that meets the requirements of AASHTO M 251.

All welding of steel railing shall be done in accordance with the requirements of the current ANSI/AASHTO/AWS D 1.5 *Bridge Welding Code*. All welding of aluminum railing shall conform to Section 10 of the current AWS D1.2 *Structural Welding Code - Aluminum*.

B. Concrete Bridge Railing Wall and Barrier Parapet.

The construction of the concrete railing wall and barrier parapet shall conform to the requirements of Section **702**. Extreme care shall be exercised in the construction of railing forms in order that true grade and alignment of railing or barrier members will be obtained and no concrete shall be placed until the forms have been inspected and approved by the Engineer. Any portion of the concrete railing wall or barrier parapet that is not constructed to true grade and alignment and cannot be satisfactorily corrected, in the opinion of the Engineer, shall be removed and reconstructed at the Contractor's expense.

At the option of the Contractor, the concrete bridge rail

curb base or barrier parapets may be slip formed. The method of slip forming the concrete shall be submitted to the Engineer for approval. A 1 1/2 inch extension of the concrete slab is required if the Contractor elects to slip form the concrete bridge rail curb base or barrier parapets. No additional reinforcing steel is required, and the payment for the concrete in the slab will be for the quantity shown on the plans.

C. Rail Surface Finish. The Contractor shall provide either a rubbed finish or a Final Surface Finish as specified in Subsection **702.25**.

705.08 Method of Measurement. Bridge railing of all types will be measured by the linear foot of railing including all posts and spaces between posts, complete in place and accepted by the Engineer.

The portion of the structure to be included in cast in place bridge railing shall be that portion above the top of the deck, curb, or sidewalk, but excluding all reinforcing steel in concrete members which shall be measured for payment as prescribed under Section **703**.

Precast Bridge Barrier Parapet shall be measured by the linear foot in place and shall include all the portion above the top of the deck, curb, or sidewalk including the reinforcing steel.

705.09 Basis of Payment. Bridge Railing will be paid for at the contract unit price for the type railing shown on the plans or in the proposal, complete in place and measured as prescribed in Subsection **705.08**. This price and payment shall be full compensation for preparing and furnishing shop drawings, furnishing, preparing, and placing all concrete, expansion joint material, structural steel, metal castings, pipe, hardware, anchor bolts, and all other materials required in the finished railing, except reinforcing steel in cast-in-place concrete members, and for all labor, tools, equipment, galvanizing, and incidentals necessary to complete the work in accor-

dance with the plans and these specifications.

All non-prestressed reinforcing steel in concrete members will be paid for under the provisions of Section **703**.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
7051000	Concrete Bridge Barrier Parapet	Linear Foot
7051005	Precast Concrete Barrier Parapet	Linear Foot
7051010	Concrete Bridge Barrier Parapet (Lightweight)	Linear Foot
7051100	Concrete Bridge Median Barrier	Linear Foot
7053000	Steel Bridge Railing	Linear Foot
70540XX	Concrete Bridge Railing Wall (<i><u>type or height</u></i>)	Linear Foot
7055010	Steel Handrail	Linear Foot
7055100	Metal Bicycle Handrail	Linear Foot

SECTION 706

WOOD PRODUCTS FOR USE IN HIGHWAY CONSTRUCTION

706.01 Description. This specification governs treated and untreated wood products for use in highway construction and pertains only to such products that become part of the completed work. Wood products for erection purposes such as falsework, forms, bracing, sheeting etc. shall be furnished by the Contractor without specification and direct compensation.