

SECTION 507 - RAILINGS

507.01 Description. This work includes furnishing and installing railings *|
for bridges, wingwalls, retaining walls or other locations designated *|
according to the contract. The contract plans shall designate the metal *|
bridge railing as aluminum bridge railing or steel bridge railing. The metal *|
bridge railing shall conform to the details shown in the contract. |

507.02 Materials. Materials shall conform to the following: |

Zinc-coated Pipe and Fittings 707.10 |

Aluminum Bridge Railing 710.09

Steel Bridge Railing 710.10

Concrete for concrete railings shall be Class A conforming to Section |
601 - Structural Concrete. |

Reinforcing steel shall conform to Section 602 - Reinforcing Steel. |

507.03 Construction Requirements. The Contractor shall construct the *|
railings according to the details shown in the contract. *|

The line and grade of the railing shall be true to that shown in the *|
contract. The line and grade of the railing shall not follow the unevenness *|
in the surface. The Contractor shall construct the posts vertically. The *|
Contractor shall not install the railings on concrete structures until the *|
Contractor has removed the falsework and backfills required are in place. *|

(A) Zinc-coated Iron Pipe Railings. The Contractor shall build the *|
zinc-coated iron pipe railing straight and true to line and grade. The *|
Contractor shall weld and ground the joints smooth. Welding shall *|
conform to Subsection 501.03(D) - Shop Work and Fabrication. |

The Contractor shall repair damaged zinc-coated surfaces according *|
to Subsection 501.03(G) - Zinc-Coating. |

(B) Concrete Railing. The Contractor shall not place concrete railings *|
until the Contractor has released the centering of falsework for the *|
span, rendering the span self-supporting. *|

The Contractor shall construct the portion of the railing or *|
parapet that the Contractor will cast-in-place according to Section 503 *|
- Concrete Structures. The Contractor shall secure smooth and tight *|
fitting forms so that the Contractor can hold rigidly in line and grade *|
and remove without damage to the concrete. *|

The Contractor shall make the forms from single width boards or *|
line the forms with suitable material accepted by the Engineer. The *|
Engineer will not permit form joints in plane surfaces. *|

The Contractor shall construct the moldings, panel work and bevel strips with neatly mitered joints. Corners in the finished work shall be true, sharp and clean cut and shall be free from cracks, spalls, or other defects.

The Contractor shall give the surface of concrete railings a Class 2 Surface Finish as specified in Section 503 - Concrete Structures.

The Contractor shall construct the expansion joints to permit freedom of movement. After the Contractor completes the other work, the Contractor shall remove carefully loose or thin shells of mortar likely to spall under movement from expansion joints. The Contractor shall remove them with a sharp chisel.

The Contractor shall consider concrete parapet under metal bridge railing and end posts as concrete railing and shall conform to this section.

(C) Metal Bridge Railings.

(1) **Storage of Materials.** The Contractor shall store the metal bridge railing materials at the accepted work site off the ground on platforms, pallets or other supports. The Contractor shall keep these materials free from grease and dirt and protect these materials from moisture until the Contractor has installed the railings properly. The Engineer will not permit the contact of aluminum rails with dissimilar metal.

(2) **Condition of Materials.** Railing materials must be straight before the Contractor installs or works on the railing materials. The Contractor shall straighten the material, if necessary, by methods that shall not damage the appearance or body of the metal. Sharp kinks and bends will be cause for rejection of the material.

-- The portions of the work exposed to view shall be finished commercial grade.

(3) **Layout.** Spacing of posts shall be according to the contract. The Contractor shall bend the bridge rails to the proper radius on the curves. The Contractor shall furnish and install such full-sized shims to cover the entire post base according to the contract. The Contractor shall submit shop drawings for acceptance before the Contractor makes the rails.

(4) Fabrication and Erection.

(a) **General.** Joining of the material shall be according to the contract. The Contractor shall adjust the railings carefully to insure proper matching at abutting joints and correct alignment, curvature and camber throughout their

length. The Contractor shall make the railing on curves or return bends to a smooth curve throughout the length of the curve as specified above. The Contractor shall make the shims required for aligning aluminum posts from fully annealed aluminum alloy known commercially as 1100-0(2S-0) and conforming to Federal Specifications QQ-A-250/1E. The Contractor shall cover the exposed ends of bridge rail with an accepted type of terminal cap or seal.

(b) Bending. To ease bending, the Contractor may heat the materials no more than four hundred (400) degrees Fahrenheit in less than thirty (30) minutes.

(c) Cutting. The Contractor may shear, saw, or mill the material of 0.5-inch thickness or less. Cut edges shall be true, smooth and free from burrs or ragged breaks. The Contractor shall fillet the re-entrant cuts by drilling before cutting. The Engineer will not permit torch or flame cutting.

(D) Drilling and Punching Holes. The Contractor shall drill the bolt holes to finished size or sub-punched smaller than nominal diameter of the fastener and ream to finished size. Sub-punched holes shall be smaller than the finished hole by at least quarter (1/4) the thickness of the piece. The finished diameter of holes shall be no greater than one hundred five (105) percent of the nominal diameter of the fastener, except as specified below:

Slotted bolt holes may be fifty (50) percent greater in size than nominal bolt diameter provided. The holes shall not exceed nominal bolt diameters by more than 0.5 inch. Holes must be clean-cut, without torn or ragged edges. The Contractor shall remove the burrs on outside surfaces. Poor matching of holes will be cause for rejection.

Reamed holes shall be cylindrical and perpendicular to the members.

Where practicable, the Contractor shall direct the reamers mechanically. The Contractor shall ream and drill with twist drills. If required by contract, the Contractor shall separate the assembled parts for removal of burrs caused by drilling. The Contractor shall assemble the connecting parts requiring holes and hold the connecting parts securely together while the Contractor reams or drills. The Contractor shall matchmark the connecting parts.

(E) Accuracy of Holes. The Contractor shall punch the holes, full size or subpunched, so that after assembling (before reaming), the Contractor may enter a cylindrical pin one-eighth (1/8) inch smaller in diameter than the nominal size of the punched hole perpendicularly to the face of the member into at least seventy-five (75) percent of the contiguous holes in the same planes without drifting. If the Contractor does not meet this requirement, the Engineer will reject the badly punched

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pieces. Holes not passing a pin three-sixteenth (3/16) inch smaller in diameter than the nominal size of the punched holes, will be cause for rejection. Subdrilled holes shall meet the above requirements. In a continuous group of reamed or drilled holes, eighty-five (85) percent of such holes shall have no offset greater than one thirty-secondth (1/32) inch between adjacent thicknesses of the metal involved.

(F) **Drifting.** Drifting during assembly shall be only that required to bring the parts into position and not be sufficient to enlarge the holes or distort the metal.

(G) **Bolting.** The Contractor shall protect those portions of the anchor bolts exposed above the finish line of concrete suitably by wrappings, grease or heavy oil during the pouring of concrete. The Contractor shall draw the heads and nuts tight against the work with a suitable wrench. On beveled surfaces, the Contractor shall use the beveled washers to give full bearing to both the head and nut.

507.04 Method of Measurement. The Engineer will measure railings of the various types by the linear foot. The Engineer will make the measurement along the centerline and from end to end of the railing.

The Engineer will not measure railings of the various types when contracted on a lump sum basis.

507.05 Basis of Payment. The Engineer will pay for the accepted quantities of railings at the contract lump sum price or linear foot shown in the proposal.

The price shall be full compensation for furnishing and placing entrance posts, pylons and other items integral with the railing, portion of the railing steel that extends into the slab or beams, furnishing materials, labors, equipment and tools and incidentals necessary to complete the work.

The Engineer will make payment under:

Pay Item	Pay Unit
Metal Bridge Railing	Linear Foot
Metal Bridge Railing (___ Lin. Ft.)	Lump Sum
Zinc-coated Iron Pipe Railing	Linear Foot
Zinc-coated Iron Pipe Railing (___ Lin. Ft.)	Lump Sum
Concrete Railing	Linear Foot
Concrete Railing (___ Lin. Ft.)	Lump Sum

The Engineer will pay for portions of slab or beam bars that project into the railing according to Section 602 - Reinforcing Steel.