

**Section 807. GUARDRAIL, GUARDRAIL TERMINALS AND MISCELLANEOUS POSTS**

**807.01 Description.** This work consists of constructing, reconstructing and erecting guardrail, guard posts, guide posts, guardrail terminals, guardrail anchorages and mailbox posts, including excavation, backfill and disposal of surplus materials.

**807.02 Materials.** Materials shall meet the following requirements.

|  |     |
|--|-----|
| Sound Earth .....                          | 205 |
| Guardrail Beam Elements and Hardware ..... | 908 |
| Reflectors .....                           | 908 |
| Steel Posts .....                          | 908 |
| Wood Posts .....                           | 912 |

**807.03 Construction.**

A. **Grading and Drainage.** Before constructing beam guardrail, grade the shoulder and berm to a typical cross section to provide drainage. Grading for approach guardrail terminals shall be to class A slope tolerances.

All excess material shall be removed and disposed of according to subsection 205.03.P, or spread thinly over the roadway slopes. Excess material spread on slopes shall not kill roadside vegetation or block drainage.

B. **Placing Posts and Blocks.** Posts shall be driven or set in augured holes. Posts placed within 3 inches of existing culverts shall be set in augured holes. The bottoms of augured holes shall be thoroughly rammed so that the posts will have a stable foundation. A tolerance of ± 3 inches will be permitted in the depth of the holes for posts. The exposed portions of the posts shall be of the dimensions shown on the plans. The posts shall be plumb, and the holes backfilled with sound earth thoroughly rammed in 12- inch maximum layers.

When placed by driving, the posts shall be driven plumb, to the depth and in the position shown on the plans, without damage to the posts. Posts which are damaged during driving that would prevent proper functioning of the guardrail in any way shall be removed and replaced with sound posts. Driving operations shall not damage nearby structures, shoulders, or slopes.

All posts in a given run of guardrail shall be of the same material, except where the plans require wood posts. No burning or welding will be permitted in the field.

C. **Guardrail Beam Elements, Blocks and Hardware.** The beam guardrail shall be erected to produce a smooth alignment, conforming to the intended line and grade.

The beam elements and blocks shall be bolted to each post. The beam element splices shall be made by lapping in the direction of traffic. Splices shall be made only at posts. No burning or welding will be permitted in the field. Where the guardrail is on a curve with a radius between 165 and 1000 feet, all splice bolts shall be tightened before attaching to the posts.

Beam elements shall be shop bent for curves with a radius of 150 feet or less. The element shall be bent to the radius shown on the plans. Each shop bent curved beam element, shall be identified by a metal tag or permanent marking showing the radius of curvature to the

nearest 5 feet, or by permanent marking of the individual beam elements, as shown on Standard Plan R-60 Series.

Bolt lengths shown on the plans are based on the standard dimensions given for the materials and do not include manufacturer's tolerances. All bolts shall be drawn tight and shall be sufficiently long to be at least flush with the nuts. When using wood posts, bolts for Types BD and TD guardrail shall not extend more than  $\frac{1}{2}$  inch beyond the nuts. Bolts for other types of guardrail shall not extend more than  $1\frac{1}{2}$  inch beyond the nuts.

- D. **Repair of Wood Posts and Blocks.** Cuts, holes, and injuries to the surface of posts and blocks which occur after pressure treatment shall be field-treated according to subsection 912.04.
- E. **Repair of Damaged Galvanized Surface.** Beam elements, steel posts, and fittings on which the zinc coating has been damaged in transporting, handling, or erection shall be repaired by the Contractor without cost to the Department. The damaged area shall be repaired according to subsection 716.03.E.
- F. **Guardrail Terminals and Anchorages.** For guardrail terminals, field drilling of galvanized beam elements for attaching terminal end shoes and anchor plates will be permitted. Install the reflectorized obstacle marker panel on the nose of each terminal according to the manufacturer's specifications.

For structure anchorages, bolt holes through concrete shall be sleeved or core drilled. Care shall be taken to avoid spalling concrete during the coring process. Should spalling occur, any loosened concrete shall be removed before installing the bolt. Concrete fragments shall also be removed.

- G. **Incomplete Guardrail Installations.** The Contractor shall have five calendar days to complete a continuous section of guardrail (including structure anchorages and guardrail terminals or bridge thrie beam retrofit guardrail) starting from the time of removal (if upgrading) or when new installation begins.

Before sections of guardrail are removed or new installations are begun, the Contractor must have materials on the project site to complete the work. The materials on site shall include all guardrail material, endings, structure anchorages, and bridge thrie beam retrofit material. Existing guardrail shall be left in place until all preparatory work (widening, embankment and other construction items) has been completed. Shoulder construction including HMA surfacing and gravel placement shall be coordinated and expedited where guardrail removal and replacement is necessary, to minimize the exposure to the unprotected area.

If a guardrail section cannot be completely removed or installed by the end of the working day, such that the exposed beam element ending would face oncoming traffic, the Contractor shall temporarily attach an approach terminal Type 2 impact head (Standard Plan R-62 Series). At the end of an incomplete thrie-beam rail section, the Contractor shall temporarily install a thrie-beam transition (Standard Plan R-60 Series) and one 12.5 foot length of W-beam rail (Standard Plan R-60 Series). For both thrie-beam and W-beam rail sections, a Type 2 impact head shall be slipped over the end of the last W-beam section and the rail shall be temporarily bolted to the last post using a  $\frac{3}{8}$  by 10 inch bolt with washers. At the first post down stream from the impact head, the guardrail shall not be bolted to the post or blocked out. All bolts shall be installed and tightened. A cable

assembly and strut will not be required. Attaching the impact head does not waive the five day completion requirement.

An impact head shall be attached regardless of the beam guardrail type.

If bridge approach guardrail cannot properly be attached to the bridge railing or connected to the bridge thrie beam retrofit guardrail, the free end of the rail shall be fitted with the appropriate special end shoe or thrie beam terminal connector and temporarily attached to the bridge rail as follows.

1. An exposed thrie beam retrofit beam ending that faces oncoming traffic shall be fitted with a thrie beam terminal connector and the terminal connector shall be attached to the reinforced concrete railing. All splice bolts shall be installed and tightened. The terminal connector shall be secured to the railing with a minimum of one bolt extending completely through the railing following the detail on Standard Plan R-67 Series.
2. Bridge approach guardrail that is not properly attached to the bridge railing shall be temporarily attached to a portion of reinforced concrete railing according to Standard Plan R-67 Series except that only one bolt will be required to secure the special end shoe or the thrie beam terminal connector to the railing. All splice bolts shall be installed and tightened. The rail shall be extended a minimum of 3 feet 6 inches onto the bridge. If approved by the Engineer this temporary attachment may remain beyond the five day requirement stipulated above.
3. If the area of incomplete or removed guardrail is not behind a delineated line of traffic control devices already in place for other work, then the Contractor shall install a lighted W21-5 (shoulder work) sign and lighted (steady-burn) plastic drum spaced at 100-foot maximum intervals or as directed by the Engineer, to delineate the incomplete portion of the guardrail section during the time it is exposed to traffic. The plastic drums shall be placed as near the edge of the shoulder as practical. Other traffic control devices may be required by the contract or as directed by the Engineer.

- H. **Temporary Beam Guardrail and Temporary Guardrail Terminals.** Temporary beam guardrail and temporary guardrail terminals shall be constructed according to the specifications for beam guardrail and guardrail terminals except that salvaged or new materials may be used. Salvaged materials shall be in a condition approved by the Engineer before being used.

When temporary beam guardrail and temporary guardrail terminals are no longer required, the guardrail and terminals shall be removed and the post holes backfilled and compacted in 12-inch maximum lifts to prevent settlement. The materials shall become the property of the Contractor and shall be disassembled and removed from the project.

- I. **Salvaging Beam Guardrail.** Remove the existing single or multiple beam guardrail and posts, backfill and compact the post holes in 12-inch maximum lifts. Deliver the beam elements to locations designated in the contract documents, and stack the beams in a neat and orderly manner. Beam elements shall be stacked in their shortest lengths. Unless otherwise designated in the contract documents, posts and hardware will become the property of the Contractor.
- J. **Mailbox Posts.** This work consists of removing existing mailbox supports and mailboxes and relocating them during construction staging. Existing newspaper boxes and supports that interfere with construction shall be removed and stored for the property owner's future

installation. The Contractor shall maintain serviceability of the existing mailbox and support during all stages of construction. A new post shall be installed at the permanent location after construction activities are completed. The existing mailbox shall be attached securely to the post and the existing support shall be disposed of at the property owners option. Mailbox posts shall be set in the ground so that the top shall be approximately 4 feet above the surface of the shoulder of the road or mailbox turnout. The exact height will be determined by the Engineer. The posts shall be as shown on Standard Plan R-74 Series and sawed so that the top of the post is level. Alternate mailbox support designs meeting the performance criteria of NCHRP Report 350 may be used as approved by the Engineer.

- K. **Guard Posts and Guide Posts.** Guard posts and guide posts shall conform to the details shown on the plans and shall be placed by driving or setting in augured holes as specified for guardrail posts under subsection 807.03.B.

**807.04 Measurement and Payment.**

| <b>Contract Item (Pay Item)</b>               | <b>Pay Unit</b> |
|---|-----------------|
| Guardrail, Curved, Type ___                   | Foot            |
| Guardrail, Type ___                           | Foot            |
| Guardrail, Backed, Det ___                    | Each            |
| Guardrail Post, Culv                          | Each            |
| Guardrail Post, Furn, ___ inch                | Each            |
| Guardrail Approach Terminal, Type ___         | Each            |
| Guardrail Departing Terminal, Type ___        | Each            |
| Guardrail Anchorage, Bridge, Det ___          | Each            |
| Guardrail Anchorage, Median                   | Each            |
| Guardrail Buffered End                        | Each            |
| Guardrail Reflector                           | Each            |
| Guardrail, Type ___ , Temp                    | Foot            |
| Guardrail Approach Terminal, Type ___ , Temp  | Each            |
| Guardrail Departing Terminal, Type ___ , Temp | Each            |
| Guardrail Anchorage, Bridge, Det ___ , Temp   | Each            |
| Guardrail, Salv                               | Foot            |
| Guardrail, Multiple, Salv                     | Foot            |
| Post, Mailbox                                 | Each            |
| Post, Wood Guard                              | Each            |
| Post, Wood Guide                              | Each            |

- A. Blading off the ridge and disposing of excess material will not be paid for separately but will be included in other items of work.

**B. Guardrail.**

1. **Guardrail, Curved; Guardrail;** and **Guardrail, Temp** will be measured along the face of the rail, excluding terminals, end shoes and W-beam backed guardrail spanning culverts. **Guardrail, Curved** shall include portions of **Guardrail** in which the beam element has been shop bent to a radius of 150 feet or less.
2. Payment for **Guardrail** includes furnishing and placing guardrail posts, blocks, and miscellaneous hardware except **Guardrail Reflectors** will be measured and paid for separately.

3. Payment for **Guardrail, Backed** of the detail specified includes all beam elements, hardware, posts, and spacer blocks needed to construct the span detailed on the plans.
4. Payment for the items **Guardrail, Temp**; **Guardrail Approach Terminal, Temp**; and **Guardrail Departing Terminal, Temp** include the removal of **Guardrail, Temp** and terminals and backfilling the post holes.
5. **Guardrail, Salvage** and **Guardrail, Multiple, Salvage** will be measured along the face (one face for multiple beams) of the rail, including terminals and end shoes.
6. Furnishing, installing, and removing temporary impact heads, temporary three-beam transition elements, temporary W-beam elements, temporary connections to the bridge railings, and all traffic control items described for incomplete guardrail installations in subsection 807.03.G.3 will not be paid for separately, but will be included in the related pay item of **Guardrail**.

C. **Guardrail Terminals.**

1. The portion of guardrail to be classified as terminal will be shown on the plans.
2. Payment for **Guardrail Approach Terminal** includes all proprietary and standard elements and hardware required for installation including obstacle marker panel. **Guardrail Approach Terminal** will be measured and paid for as individual units. The portion of the guardrail classified as approach terminal will be as shown on the plans.
3. **Guardrail Departing Terminal** includes the terminal end shoes.
4. Terminal end shoes will not be paid for separately, but will be included in the payment for **Guardrail Approach Terminal**.

D. **Miscellaneous Posts.**

1. Payment for the item **Post, Mailbox** includes removing and relocating the existing mailbox support during construction activities, maintaining serviceability, placing a new post (standard) at the permanent location after construction activities are completed, removing the mailbox from the old support and attaching it firmly to the new post, and disposing of the old support. Payment to remove, and store existing newspaper boxes and supports are included in the item of **Posts, Mailbox** and will not be paid for separately. The Contractor shall give the affected property owner the option of disposing of the old support.
2. **Guardrail Post, Culv** includes payment for all labor and materials required to construct posts on box or slab culverts as shown on Standard Plan R-73 Series.