Item 540
Metal Beam Guard Fence

1. DESCRIPTION

Furnish, install, replace, or adjust metal beam guard fence consisting of metal beam rail elements, hardware, blocks, and support posts.

2. MATERIALS

Provide samples of metal beam rail elements, terminal sections, bolts, and nuts for compliance testing according to Tex-708-I and Tex-713-I to verify physical and chemical properties meet AASHTO M 180 when directed.

Obtain materials at the locations shown on the plans when the plans designate that the Department will furnish materials.

2.1. Metal Beam Rail Elements. Furnish new metal beam rail elements, transitions, anchor sections, and terminals that meet the requirements of Table 1 and are from a manufacturer on the Department’s MPL of rail element manufacturers.

Type I or II is required, unless otherwise shown on the plans. Base metal for metal beam rail elements must not contain more than 0.04% phosphorous or more than 0.05% sulfur.

Warped or deformed rail elements will be rejected.

### Table 1

<table>
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<tr>
<th>Specification</th>
<th>Rail Element Requirements</th>
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| Class         | A— Base metal nominal thickness 0.105 in.  
                | B— Base metal nominal thickness 0.135 in.  |
| Type          | I— Zinc-coated 1.80 oz. per square foot minimum single-spot.  
                | II— Zinc-coated 3.60 oz. per square foot minimum single-spot.  
                | IV— Weathering Steel (required when shown on the plans).  |
| Shape         | W-Beam  
                | Thrie Beam  
                | W-Beam to Thrie Beam Transition  |
| Markings      | Permanently mark each metal beam rail element with the information required in AASHTO M 180. In addition, permanently mark all curved sections of metal beam rail element with the radius of the curved section in the format “R=XX ft.” Markings must be on the back of the metal beam rail section away from traffic and visible after erection. |

2.2. Posts. Furnish new round timber, rectangular timber, or rolled steel section posts in accordance with details shown on the plans and the following requirements:

2.2.1. Timber Posts. Meet the requirements of DMS-7200, “Timber Posts and Blocks for Metal Beam Guard Fence.” Purchase from a manufacturer or supplier on the Department’s MPL of timber treating plants and suppliers.

2.2.2. Steel Posts. Provide rolled sections conforming to the material requirements of ASTM A36. Drill or punch posts for standard rail attachment as shown on the plans. Galvanize according to Item 445, “Galvanizing.” Low-fill culvert posts may be fabricated as galvanized “blanks” with the rail hole and the final height field fabricated. Treat all exposed post surfaces caused by the field fabrication in accordance with Section 445.3.5., “Repairs.”
2.3. **Blocks.** Furnish new rectangular timber or composite blocks in accordance with details shown on the plans and the following requirements:

2.3.1. **Timber.** Meet the requirements of DMS-7200, “Timber Posts and Blocks for Metal Beam Guard Fence.” Purchase from a manufacturer or supplier on the Department’s MPL of timber treating plants and suppliers.

2.3.2. **Composite.** Meet the requirements of DMS-7210, “Composite Material Posts and Blocks for Metal Beam Guard Fence.” Purchase from a manufacturer on the Department’s MPL of composite material blocks and posts.

2.4. **Fittings.** Furnish new fittings (bolts, nuts, and washers) according to the details shown on the plans and galvanized according to Item 445, “Galvanizing.”

2.5. **Terminal Connectors.** Furnish new terminal connectors, where required, meeting the material and galvanizing requirements specified for metal beam rail elements.

2.6. **Concrete.** Furnish concrete for terminal anchor posts meeting the requirements for Class A concrete as required in Item 421, “Hydraulic Cement Concrete.”

2.7. **Curb.** If indicated in the details, furnish the curb shown with metal beam guard fence transition as required by Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter.”

2.8. **Terminal Anchor Posts.** Furnish new terminal anchor posts from steel conforming to the material requirements of ASTM A36. Fabricate posts according to Item 441, “Steel Structures.” Galvanize terminal anchor posts after fabrication according to Item 445, “Galvanizing.”

2.9. **Driveway Terminal Anchor Posts.** Furnish new terminal anchor posts from steel conforming to the material requirements of ASTM A36. Fabricate posts according to Item 441, “Steel Structures.” Galvanize terminal anchor posts after fabrication according to Item 445, “Galvanizing.”

2.10. **Downstream Anchor Posts.** Furnish new terminal anchor posts consisting of new rectangular timber and new steel foundation tubes according to details shown on the plans.

2.11. **Downstream Anchor Hardware.** Furnish new hardware (brackets, plates, struts, cable, etc.) according to the details shown on the plans and galvanized according to Item 445, “Galvanizing.”

2.12. **Controlled Released Terminal (CRT) Posts.** Furnish new CRT posts according to the details shown on the plans and conforming to the requirements of DMS-7200, “Timber Posts and Blocks for Metal Beam Guard Fence.” Purchase from a manufacturer or supplier on the Department’s MPL of timber treating plants and suppliers.

3. **CONSTRUCTION**

Install posts and rail elements according to details shown on the plans.

3.1. **Posts.** Install posts by either drilling or driving.

3.1.1. **Drilling.** Drill holes and set posts plumb and firm to the line and grade shown. Backfill posts by thoroughly compacting material to the density of adjacent undisturbed material.

3.1.2. **Driving.** Drive posts plumb with approved power hammers (steam, compressed air, vibratory, or diesel) or gravity hammers to the line and grade shown while preventing damage to the post. Use pilot holes when required and approved. Determine the size and depth of pilot holes based on results of the first few posts driven. Thoroughly tamp loosened soil around the post, fill voids with suitable material, and thoroughly compact to the density of adjacent undisturbed material.
3.2. **Rail Elements.** Erect metal beam rail elements to produce a smooth, continuous rail paralleling the line and grade of the roadway surface or as shown on the plans. Bolt rail elements end-to-end and lap splices in the direction of traffic. Field-drill or punch holes in rail elements for special details, only when approved.

3.3. **Short Radius.** Special rail fabrication with a required radius must be as shown on the plans.

3.4. **Terminal Anchor Posts.** Embed terminal anchor posts in concrete, unless otherwise shown on the plans.

3.5. **Galvanizing Repair.** Repair all parts of galvanized steel posts, washers, bolts, and rail elements after erection where galvanizing has become scratched, chipped, or otherwise damaged. Repair in accordance with Section 445.3.5., “Repairs.”

3.6. **Guardrail Adjustment.** Work includes vertical adjustment, horizontal shift, and overlap of the rail element to meet the detail shown on the plans.

3.7. **Curb.** If indicated in the details, construct the curb shown with metal beam guard fence transition as required by Item 529, “Concrete Curb, Gutter, and Combined Curb and Gutter.”

3.8. **Driveway Terminal Anchor Posts.** Embed terminal anchor posts in concrete, unless otherwise shown on the plans.

### 4. MEASUREMENT

4.1. **Guard Fence.** Measurement will be by the foot of fence. Fence will be measured on the face of the rail in place, from center-to-center of end splice locations.

4.2. **Terminal Anchor Sections.** Measurement will be by each section, complete in place, consisting of a terminal anchor post and one 25-ft. section of rail element.

4.3. **Transitions.** Transitions for rail connection will be measured by each transition.

4.4. **Short Radius.** Measurement will be by the foot to the nearest whole foot along the face of the rail in place, from beginning of radius (first CRT post) to the end of radius.

4.5. **Driveway Terminal Anchor Section.** Measurement will be by each section, complete in place, consisting of a driveway terminal anchor post and one 6-ft. section of rail element.

4.6. **Downstream Anchor Terminal.** Measurement will be by each section, complete in place, consisting of one W-Beam end section, 2 downstream anchor posts, and one rail section.

4.7. **Long Span System.** Measurement will be by the foot of fence. Fence will be measured on the face of the rail, in place, between the first CRT and last CRT posts in the system.

### 5. PAYMENT

The work performed and material furnished in accordance with this Item and measured as provided under “Measurement” will be paid at the unit price bid for “Metal W-Beam Guard Fence” of the post type specified; “Metal Thrie Beam Guard Fence” of the post type specified; “Terminal Anchor Section”; “Metal Beam Guard Fence Transition” of the type specified; “Metal W-Beam Guard Fence Adjustment”; “Metal Thrie Beam Guard Fence Adjustment”; “Terminal Anchor Section Adjustment”; “Transition Adjustment”; “Short Radius”; “Driveway Terminal Anchor Section”; “Downstream Anchor Terminal”; or “Metal Beam Guard Fence (Long Span System).” When weathering steel is required, Type IV will be specified.

Samples furnished to the Department for testing purposes, special backfill materials, and concrete curbs will not be paid directly but are subsidiary to this Item.
5.1. **Guard Fence.** The price bid for “Metal W-Beam Guard Fence” or “Metal Thrie Beam Guard Fence” is full compensation for materials, hauling, erection, setting posts in concrete, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.

5.2. **Terminal Anchor Section.** When a separate bid item is specified, the price bid for “Terminal Anchor Section” is full compensation for furnishing the rail element, anchor assembly, terminal anchor post, and foundations; installing the rail element anchor assembly and the terminal anchor post and foundations; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.3. **Transition.** The price bid for “Metal Beam Guard Fence Transition” is full compensation for furnishing nested sections of Thrie Beam; nested sections of W-Beam; Thrie Beam to W-Beam transitional rail piece, posts, concrete, curb, and connections to W-Beam guard fence and bridge rails; Thrie Beam terminal connectors; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.4. **Guardrail Adjustment.** The price bid for “Metal W-Beam Guard Fence Adjustment,” “Metal Thrie Beam Guard Fence Adjustment,” “Terminal Anchor Section Adjustment,” and “Transition Adjustment” is full compensation for furnishing materials not supplied by the Department, drilling holes in posts, hauling, erection, blocks, excavation, backfill, cleaning, salvaging materials, setting rail element anchor assembly and terminal anchor post, removal of rail element, concrete, curb, equipment, labor, tools, and incidentals.

5.5. **Short Radius.** The price bid for “Short Radius” is full compensation for furnishing special rail fabricated metal beam guard fence, CRT posts, steel posts, sand barrels, end terminal, cable anchor, materials, hauling, erection, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.

5.6. **Driveway Terminal Anchor Section.** The price bid for “Driveway Terminal Anchor Section” is full compensation for furnishing the rail element, driveway anchor assembly, driveway terminal anchor post, and foundations; installing the rail element anchor assembly and the driveway terminal anchor post and foundations; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.7. **Downstream Anchor Terminal.** The price bid for “Downstream Anchor Terminal” is full compensation for furnishing the rail element, W-Beam end section, guardrail anchor bracket, shelf angle bracket, channel strut, downstream anchor posts, breakaway cable terminal (BCT) cable anchor assembly, and foundations; installing the BCT cable anchor assembly and the downstream anchor post and foundations; excavation and backfilling; and equipment, labor, tools, and incidentals.

5.8. **Long Span System.** The price bid for “Metal Beam Guard Fence (Long Span System)” is full compensation for furnishing the rail element, CRT posts, materials, hauling, erection, blocks, driving posts, excavating, backfilling, equipment, labor, tools, and incidentals.