

## SECTION 505

### GUARDRAIL AND STEEL MEDIAN BARRIERS

#### I. GENERAL

##### 1.1 DESCRIPTION OF WORK

This work shall consist of furnishing and constructing guardrail and steel median barriers and installing or reusing galvanized guardrail in accordance with the plans and these specifications and in reasonably close conformity to the lines and grades shown on the Plans or as designated by the Owner.

##### 1.2 MATERIALS

- A. Materials for guardrail components shall conform to the requirements of VDOT Section 221.
- B. Materials for median barriers and posts shall conform to the requirements of the Contract Documents. Posts may be furnished with as many as six holes so that posts for installation of standard guardrail and steel median barrier may be used interchangeably.
- C. Concrete shall be Class A3 conforming to the requirements of Section 200 except that mixing by hand for guardrail terminal posts will be permitted.
- D. Materials for reinforcing steel shall conform to the requirements of Section 200.
- E. Materials for delineators shall conform to the requirements of VDOT Section 235.

##### 1.3 SUBMITTALS

Submittals shall be made by the Contractor in accordance with the procedures set forth in Section 105 and as described below:

- A. The Contractor shall furnish copies of the manufacturer's specifications and details for installations indicated on the Drawings, Standard Details, and the VDOT Road and Bridge Standards, latest edition, listing specific materials proposed.
- B. The Contractor shall furnish the Owner with an affidavit stating that products to be installed on this project comply with specification requirements.

#### II. EXECUTION

##### 2.1 PROCEDURES

The use of more than one type of post on a continuous line of guardrail will not be permitted.

Rail and elements shall be erected and aligned in a manner that will result in a smooth, continuous, taut installation. **Installation shall not result in the cross section of the rail or other elements**

**being kinked or crimped. Damaged rail or other elements will be rejected and replaced by the Contractor at no additional cost to the Owner.**

Guardrail delineators shall be installed in accordance with the requirements of VDOT Section 702.03. Spring cable end assemblies (compensating device) shall be provided with a permanent match mark (hacksaw cut or file mark) on the bolt shaft or spring stop and shall be referenced to the outer assembly to denote the neutral position. Cable slack shall be eliminated by tightening the steel turnbuckle cable assembly at the end opposite the compensating device until the device is compressed 3 1/2 inches. Cables with a compensating device at each end shall be tightened such that neither end indicates less than the required tension. The assembly shall remain compressed for at least 2 weeks and then loosened, and each cable shall be readjusted to the same required tension. The required tension shall be determined by tightening the turnbuckle at the end opposite the compensating device and displacing the match mark in accordance with the following:

<u>Ambient Air Temperature (deg F)</u>	<u>Match Mark Displacement (in)</u>	<u>Required Tension (lb)</u>
0-19	3 1/2	1,575
20-39	3	1,350
40-59	2 1/2	1,125
60-79	2	900
80-99	1	675
100-120	1	450

Anchor assemblies shall be installed on firm earthen foundations, backfilled with suitable material in 4 to 6-inch layers, and thoroughly compacted by tamping or rodding. Stress loads shall not be placed on anchor assemblies until concrete has cured for at least 28 days or has attained a compressive strength of at least 3,000 psi as determined by field control cylinders in accordance with the requirements of VDOT Section 404.03.

On beam guardrail anchors, nuts on anchor bolts shall be tightened to a snug tight fit as defined in VDOT Section 407.06 to ensure flush contact between the beam and concrete base throughout the length of the anchor assembly.

Postholes shall be backfilled to the ground line with approved material placed in layers not more than 4 inches in height. Each layer shall be compacted by tamping.

Steel posts may be driven provided the method used will not damage the posts.

Concrete posts that are chipped or cracked will be rejected.

Wood posts shall be sawn to the dimensions shown on the plans within a tolerance of 2 percent for length and 1/4-inch scant. Wood posts may be driven, but posts that are damaged during installation shall be replaced at the Contractor's expense. If it is necessary to saw off the tops of wood posts to achieve a uniform and neat appearance, the amount sawed off shall be not more than 3 inches. Tops of sawed posts shall be brush coated with three heavy applications of the preservative used in treating the posts. Each application shall be given sufficient time to penetrate the wood.

Painting wood posts will not be required. Dirt and other foreign matter shall be removed after installation.

Galvanized items shall be handled and stored in accordance with the requirements of VDOT Section 233. After erection, the threaded portion of fittings with fasteners and cut ends of bolts and galvanized surfaces that have been abraded or damaged shall be repaired in accordance with the requirements of VDOT Section 233.03.

Reuse guardrail that has maintained its original shape and is suitable for reuse may be used. When necessary, reuse guardrail shall be rebored to the dimensions shown on the standard drawings. Reuse guardrail that is damaged or lost because of the Contractor's negligence shall be replaced at the Contractor's expense.

Reuse guardrail posts and blockouts may be used provided they conform to the requirements of the standard drawings and these specifications.

The Contractor shall ensure that guardrail and barriers are kept clean during application of fertilizer, lime, tack coats, primer, or other material that cannot be readily cleaned from the guardrail or barrier.

The Contractor shall have a trained guardrail installer on guardrail installation who has a current certificate of training from a VDOT approved guardrail installing training course.

### **III. MEASUREMENT FOR PAYMENT**

#### **3.1 GENERAL**

- A. Measurement will be made on the basis of completion of the Work in accordance with the Contract Documents and this Section.
- B. Measurement of quantities will be made by the Contractor in the presence of the Owner.
- C. The term "Each" when used as an item of payment will mean complete payment for the Work described in the Contract Documents.
- D. The word "Lump Sum" when used as an item of payment will mean complete payment for work described in the item, including all materials, labor, and equipment necessary to complete the work in accordance with the Contract Documents.
- E. The term "Complete in Place" will mean that the item of work shall be furnished and installed in accordance with the Contract Documents complete with all appurtenances necessary for the item to be used for its intended function. Testing and acceptable results shall be included.

#### **3.2 MEASUREMENT OF QUANTITIES**

- A. Guardrail will be measured in linear feet and will be paid for at the contract unit price per linear foot including hardware. Guardrail that is mounted flush to a structure will be measured along the length of the guardrail from the center of the bolt group. Shop-curved or field-curved guardrail installed on a radius of 150 feet or less will be measured in linear feet of radial steel beam guardrail or radial steel median barrier.

The price for reuse guardrail shall include transporting and storing; repairing and installing salvaged guardrail beam; and furnishing and placing guardrail posts, blockouts, and hardware.

- B. Steel median barriers will be measured in linear feet from center to center of end posts and will be paid for at the contract unit price per linear foot.
- C. Intermediate anchorage assemblies will be measured in units of each and will be paid for at the contract unit price per each.
- D. Terminal treatment for beam guardrail that terminates in back of the ditch line will be measured in linear feet along the regular guardrail section from center of end post (center of bolt group when guardrail is mounted flush to a structure) to the ditch line. The terminal section in back of the ditch line will be measured from the ditch line to center of end post.
- E. Terminal treatment (or beam guardrail, cable guardrail, and steel median barriers terminating on the roadway side of the ditch line will be measured in units of each and will be paid for at the contract unit price per each.
- F. Reuse guardrail terminal will be measured in units of each or linear foot for the standard and type specified and will be paid for at the contract unit price per each or linear foot for the standard and type specified. This price shall include transporting and storing; repairing and installing salvaged beam; and furnishing and placing guardrail post, blockouts, concrete, and hardware.
- G. Fixed object attachments for guardrail will be measured in units of each and will be paid for at the contract unit price per each. This price shall include furnishing and installing guardrail connectors, rubrail, and additional posts with blockouts and providing holes to facilitate attachment.
- H. Special design guardrail bridge attachments will not be measured for payment but will be paid for at the contract lump sum price per structure. This price shall include furnishing and installing terminal connectors and additional posts with blockouts.
- I. Cable barricades will be measured in units of each and will be paid for at the contract unit price per each. This price shall include furnishing and installing posts, cable, signs, and padlocks.

When specified as a separate bid item, guardrail terminal site preparation will be measured in units of each per site and will be paid for at the contract unit price per each site.

The price for guardrail terminal site preparation shall include clearing and grubbing; for providing, hauling, and placing fill material; benching existing slopes and restoration of site including seeding.

These prices shall include excavating; backfilling holes; installing delineators; repairing damaged surfaces; furnishing, galvanizing, and erecting units; furnishing concrete anchor assemblies; and preboring.

- J. Bull nose barrier will be measured and paid for in units of each, complete in place, which price shall include furnishing and placing, foundation soil tubes, concrete, polystyrene sheeting, welded wire fabric, posts, radial guardrail, blockouts, hardware and delineators. This price shall be full compensation for all labor, materials, tools and equipment necessary to complete the work.

### 3.3 PAY ITEMS

Measurement will be as specified in paragraph 3.2 and as indicated on the Bid Form. Payments shall be made under:

- A. Guardrail (Standard) will be paid for at the unit price bid per linear foot
- B. Reuse guardrail (Standard) will be paid for at the unit price bid per linear foot.
- C. Radial guardrail (Standard) will be paid for at the unit price bid per linear foot.
- D. Guardrail terminal (Standard and type) will be paid for at the unit price bid per linear foot or each.
- E. Intermediate anchorage assembly will be paid for at the unit price bid per each.
- F. Median barrier (Standard) will be paid for at the unit price bid per linear foot.
- G. Radial median barrier (Standard) will be paid for at the unit price bid per linear foot.
- H. Median barrier terminal (Standard and type) will be paid for at the unit price bid per each.
- I. Cable barricade (Standard) will be paid for at the unit price bid per each.
- J. Fixed object attachment (Standard) will be paid for at the unit price bid per each.
- K. Special design guardrail bridge attachment (B or Str. No.) will be paid for at the unit price bid per Lump Sum.
- L. Reuse guardrail terminal (Standard and type) will be paid for at the unit price bid per linear foot or each.
- M. Guardrail terminal site preparation (Standard) will be paid for at the unit price bid per each.
- N. Bull nose barrier will be paid for at the unit price bid per each.

End of Section