

**COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION MEMORANDUM**

GENERAL SUBJECT:	<u>GUARDRAIL REPAIR, REPLACEMENT AND UPGRADE GUIDELINES</u>	NUMBER:	<u>CD-2001-9</u>
		SUPERSEDES:	<u>CD-98-8</u>
SPECIFIC SUBJECT:	<u>I & I M</u>	DATE:	<u>October 29, 2001</u>

Original w/Signature on file in Construction Division

**C. F. GEE
CONSTRUCTION ENGINEER**

DIRECTED TO - DISTRICT ADMINISTRATORS

The attached INSTRUCTIONAL AND INFORMATION MEMORANDUM for GUARDRAIL REPAIR, REPLACEMENT AND UPGRADE GUIDELINES dated October 22, 2001 is also CONSTRUCTION DIVISION MEMORANDUM 2001-9.

This memorandum is for your records. Please be guided accordingly.

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C: Mr. Charles D. Nottingham
Mr. Claude D. Garver, Jr.
Mr. Andrew V. Bailey II
Mr. C. F. Gee
Assistant Commissioners
Division Administrators
District Construction Engineers
District Maintenance Engineers
District Materials Engineers
District Equal Opportunity Managers
District Contract Administrators
Resident Engineers
Project Engineers
Project Inspectors
Federal Highway Administration
Virginia Department of Minority Business Enterprise
Virginia Road and Transportation Builders Association
Old Dominion Contractors Association
Virginia Asphalt Association
Virginia Aggregates Association Inc.
American Concrete Pavement Association
Virginia Ready-Mixed Concrete Association
Precast Concrete Association of Virginia

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: GUARDRAIL REPAIR, REPLACEMENT AND UPGRADE GUIDELINES	NUMBER: LD-01 (D) 220.1 TE - 305 CD - 2001 -9
SPECIFIC SUBJECT:	DATE: OCTOBER 22, 2001
	SUPERSEDES: LD-98 (D) 220 TE - 290 CD - 98 - 8
LOCATION AND DESIGN DIVISION APPROVAL: <i>Mohammad Mirshahi, PE</i>	CONSTRUCTION DIVISION APPROVAL: <i>C. F. Gee</i>
TRAFFIC ENGINEERING DIVISION APPROVAL: <i>Ilna O. Kastenhofer</i>	MAINTENANCE DIVISION APPROVAL: <i>D.R. Liston</i>

Changes are shaded.

CURRENT REVISION

- Standard GR-8 (Weak Post) Guardrail has been revised to meet NCHRP 350 Crash Test Requirements and is approved for use on all classifications of roadways.
- Instructions have been revised for replacing damaged sections of Standard GR-8 (Weak Post) Guardrail.
- New pay items have been added for revised designs that include "NCHRP 350 TL-3" designation.

EFFECTIVE DATE

- These instructions are effective upon receipt.

POLICY

Existing substandard guardrail systems and components shall be upgraded to the latest standard in accordance with current VDOT Road and Bridge Standards and this memorandum for the following situations:

- When located within the project limits of a construction project.
 - When guardrail needs to be repaired/replaced under a maintenance project (e.g. guardrail, pavement, etc.).
 - When located within the project limits of transportation improvements associated with permitted land development projects.
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GUARDRAIL TERMINAL DAMAGE

When terminal damage occurs, a site investigation shall be made to determine whether the terminal should be repaired, replaced or eliminated. If a gap exists between two runs of guardrail and it is approximately 60 meters (200 feet) \pm , closing the gap by continuing the run of guardrail is recommended, thereby eliminating the need for a terminal. If a cut slope is within approximately 60 meters (200 feet) \pm of the location of the terminal, the guardrail shall be extended to the cut slope and a cut slope terminal (Std. GR-6) should be used. If an extensive amount of grading would be required for site preparation to install a flared terminal (Std. GR-7), consideration should be given to using a parallel terminal (Std. GR-9) that does not require as extensive site preparation.

Before replacing a damaged or substandard terminal, the location of the existing terminal should be checked to see if it adequately shields the hazard for which it was installed. In some cases it may be necessary to extend the guardrail to better shield the hazard or to provide for a more suitable site that would not require grading.

- **Breakaway Cable Terminals (BCTs)**

BCT's had concrete footings for the first two posts, did not have the metal strut at ground level between the first two posts and all posts were not breakaway.

Completely replace BCT's with new NCHRP 350 approved terminals whenever they are damaged or if they are within the limits of a construction or maintenance project.

- **Modified Eccentric Loading Terminals (MELTs)**

The MELT provided a 1.2-meter (4-foot) offset, a 1.5-meter (5-foot) flat area behind the first post, a metal strut at ground level between the first two wooden breakaway posts.

If the MELT (Std. GR-7) is improperly installed or when damage includes the nose assembly and first two posts, replace with new NCHRP 350 approved terminals (revised Std. GR-7) such as the SRT-350, FLEAT 350, REGENT or other approved NCHRP 350 product. When replacing substandard Std. GR-7 terminals, make sure that the section of rail and posts adjoining the new terminal installation is at the proper height.

If the installation site does not provide at least 22.8 meters (75 feet) of clear run-out path beyond the length of need point of the barrier (exclusive of the terminal), a parallel terminal (Std. GR-9) shall be used instead of a flared terminal (Std. GR-7).

- **Strong Post Turned-down Terminals (Std. GR-5s)**

All turned-down strong post terminals should have already been removed from roadways on the National Highway System. Any that have not been removed shall be removed immediately.

When these terminals that may remain on non-NHS roadways are damaged, they shall be replaced with NCHRP 350 approved terminals.

- **Weak Post Turned-down Terminals (Std. GR-8, Type IIs)**

Since no weak post terminals have been approved in accordance with NCHRP 350 for use in run-on locations, any of these terminals that are damaged shall be replaced with NCHRP 350 approved strong post terminals incorporating the appropriate transition required between a strong post terminal and weak post guardrail (in accordance with VDOT Road and Bridge Standards), regardless of the design speed of the roadway.

Any weak post run-on terminals within the limits of a construction project shall be upgraded as part of the project.

For run-off locations, turned down terminals incorporating a concrete anchor (Std. GR-8, type I or II) or terminals buried in the cut slope (Std. GR-6) are acceptable, regardless of the design speed of the roadway; however, the Type I and II terminals shall be outside of the clear zone of opposing traffic on two-way roadways. This includes existing installations in locations with design speeds greater than 70 km/h (45 mph) for which new installation of weak post guardrail must be in accordance with the new approved TL-3 weak post design.

FIXED OBJECT ATTACHMENTS (FOAs)

Whenever a substandard fixed object attachment is damaged, it shall be replaced or upgraded with current Road and Bridge Standard fixed object attachments including the nesting of the rail, shortened post spacings and rubrail.

When substandard FOAs exist within the limits of construction projects or when replacement is required under a guardrail maintenance project, they shall be replaced in accordance with the current VDOT Road and Bridge Standard.

W-BEAM GUARDRAIL

Any guardrail that is equal to or greater than 75 mm (three inches) higher or lower than the standard for the system being used shall be reset.

- **Weak post W-beam Guardrail (Std. GR-8)**

Damaged sections of weak post w-beam guardrail (Std. GR-8) shall be replaced with the new Std. GR-8 which meets NCHRP 350 Test Level 3 criteria. This new design can therefore be used even for speeds greater than 70 km/h (45 mph). This design places the splices at mid-span between the posts, uses longer posts, raises the height of the top rail and incorporates a back-up plate at each post.

Existing weak post W-beam within the limits of a reconstruction or maintenance project shall be upgraded to the new design. When reusing rail, the height of the rail shall be installed to meet the current VDOT Road and Bridge Standards.

- **Strong Post W-beam with 3.81 m (12' 6") Post Spacings and no blackout (Std. GR-1)**

Existing strong post guardrail (Std. GR-1) and end terminals within the project limits of a construction project should always be replaced with a new NCHRP 350 approved system.

When damaged, the extent of damage should govern repair/replacement. If the total run of guardrail is 60 meters (200 feet)±, the entire run shall be replaced with strong post (Std. GR-2) guardrail.

For sections of guardrail that are longer than 60 meters (200 feet), if more than 60% of the entire run has been damaged, the entire run shall be replaced with strong post (Std. GR-2) guardrail. If less than 60% of the entire run has been damaged, the damaged section should be replaced with strong post (Std. GR-2) guardrail.

- **Strong Post W-beam Guardrail with Steel Posts (Std. GR-2)**

When damaged, replace in kind in accordance with current standards; however, steel blockouts and rectangular washers, if they were previously used, shall be eliminated. Washers should still, however, be retained or added to the last 15 meters (50 feet) of a trailing end to provide end anchorage on the run-off end of a one-way roadway. Discard the steel blockouts and use routed 150x150x360 mm (6"x6") wood or composite blockouts. When existing 150x200x360 mm (6x8) wood or composite blockouts are replaced during repairs, the blockouts shall include routing to prevent blockouts from rotating.

When existing undamaged sections are left in place, steel blockouts must comply with NCHRP 230 requirements. A back-up plate of 300 mm (12") long W-beam guardrail (no washers) is to be provided at each non-splice post.

When posts are removed and reused they should be reused only if they are 1.83 m (6'0") in length and standard wood or composite blockouts are used. When resetting rail, the height of the rail should be measured to ensure it meets the current Road and Bridge Standards.

CABLE GUARDRAIL (STANDARD GR-3) DAMAGE

When damaged, replace in kind in accordance with current VDOT Road and Bridge Standards (Standard GR-3).

NEW PAY ITEMS

ITEM CODE	DESCRIPTION	ITEM UNIT
13290	Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13292	Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13294	Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13291	Radial Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13293	Radial Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13295	Radial Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13298	Radial Guardrail GR-8C (NCHRP 350 TL-3)	Linear Feet/Meters