

Roadway Departure Technical Brief No. 3

Roadside Safety Systems Damage Assessment



Tennessee

CATEGORY: Maintenance

ISSUE: When a longitudinal barrier, barrier terminal, or crash cushion is damaged in a crash to the extent that it will no longer function, it must be repaired or replaced in a timely manner. Since it is seldom practical to make immediate repairs, guidelines for temporary measures are desirable.

OBJECTIVE: To provide general guidelines for maintenance personnel and contractors for scheduling repairs to significantly damaged barriers, terminals, and crash cushions and to suggest temporary precautions that should be implemented until the damaged safety feature can be restored to its original condition.

METHODOLOGY: Some examples of hardware damage that would make barrier, barrier terminals, or crash cushions ineffective in a second crash will be noted. For each of these situations, warning signs, delineation, and/or temporary shielding will be suggested.

Three cases in which the effectiveness of safety hardware has been lost will be discussed, including a longitudinal barrier, a W-beam end terminal, and a crash cushion. For each of these cases, appropriate warning signs and delineation, temporary shielding, and permanent repair or replacement will be suggested.



U.S. Department of Transportation
Federal Highway Administration



EXPECTED RESULTS:

Provide repair personnel with information that will allow them to evaluate barrier and terminal damage and to schedule appropriate repair, removal, upgrades, or redesign.



LONGITUDINAL BARRIER

Extent of Damage: If the barrier has been penetrated as a result of physical separation (rupture) of the rail element, or if the rail elements (or cables) are on the ground, it is obvious that any subsequent impacts would also result in penetration behind the rail.

Immediate Actions: Motorists must be alerted to the hazard as soon as practical. In most cases, appropriate action includes the installation of warning signs (e.g., SHOULDER CLOSED AHEAD) and the placement of reflective cones, barrels, or barricades in advance of and along the damaged section of rail.

Temporary Shielding: In most instances, precast concrete barrier may be the most effective way to prevent vehicles from striking the hazard originally shielded by the damaged barrier. Water-filled or temporary steel barriers have also been used by some States. However, the use of temporary positive shielding is normally limited to locations where three conditions exist: (1) additional crashes at the same location are likely due to site conditions and/or past crash history, (2) any such crashes are likely to have severe consequences to the driver or others, and (3) complete repair/replacement will take several weeks or longer.



W-BEAM TERMINALS

Extent of damage: Virtually all W-beam terminals provide anchorage for the barrier by connecting the rail element to a ground anchor system using a steel cable. If the end post is broken, the rail has no redirection capability and cannot retain or redirect a vehicle impacting near the beginning (or end) of a barrier run. Additionally, the damaged end treatment may allow the rail to slice into the passenger compartment of a vehicle involved in a second impact.

Immediate Actions: Motorists must again be alerted to the potential hazard by signing and delineation. Any delineation, such as cones, barrels, or barricades, should be introduced in advance of the damaged terminal. If the rail is kinked or otherwise presents a potential spearing hazard, it may be advisable to remove enough post bolts so the end of the rail rests on the ground.

Temporary Shielding: Unless there is a high likelihood of an additional impact before repairs can be made, temporary shielding of the damaged end may not be cost-effective. If a decision is made to shield the damaged end, a modified sand barrel array (in conjunction with the actions noted above) will normally be adequate.



CRASH CUSHION

Extent of Damage: The most common use for crash cushions is to shield fixed objects in the gore areas of high-speed roadways. Crash damage to these safety appurtenances can range from minor (resulting from glancing or low-speed impacts) to major (resulting from high speed head-on type crashes). Appropriate response to crash cushion damage depends on the extent of any remaining energy-absorbing capability and the degree of hazard presented by the damaged unit.

Immediate Actions: Since crash cushions are most commonly used in crash-prone locations, delineation directing motorists away from the exposed hazard is critical. The use of a series of cones, barrels, or barricades in a Vee-shaped configuration is recommended for immediate implementation.

Temporary Shielding: Unless the crash cushion can be restored or replaced quickly, the hazard should be temporarily shielded. The most cost-effective method is usually a sand barrel array. If the crash cushion still has some residual capacity (as in the case of some self-restoring attenuators) a reduced sand barrel array may be appropriate. However, if the crash cushion is destroyed, a sand barrel array designed for the full design speed of the highway should be deployed. In this case, additional delineation would not usually be needed.

