

Technical Note TN147

Recommended Interim Treatment for Crash-Damaged Public Domain Steel Beam Guardrail Infrastructure

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1 Purpose

This Technical Note provides guidance to road safety barrier practitioners who assess crash damaged public domain steel beam guardrail and/or end treatments. The guidance includes:

- items to address in the post-crash assessment
- definitions for 'significant damage' and 'minor damage'
- actions to take after assessing damage, and
- guidance on appropriate interim treatments.

The following elements are out of scope:

- proprietary longitudinal road safety barriers
- proprietary end treatments, and
- bridge barriers.

2 Background

Public domain steel beam guardrail has been widely used as a road safety barrier on Transport and Main Roads' roads. The role of this guardrail is typically to shield occupants of errant vehicles from a roadside hazard. If impacted again, a damaged guardrail (and/or end treatments) may elevate the injury risk to vehicle occupants on impact and may also be ineffective at shielding vehicles from the roadside hazard(s).

Public domain steel beam guardrail and proprietary non-mash tested barrier systems are no longer accepted for use on new Transport and Main Roads projects or installations on Transport and Main Roads' roads. However, maintaining existing public domain steel barrier system is acceptable where repairs and replacements can reasonably and readily be undertaken. For further information, refer to Transport and Main Roads' [Approved products and registered suppliers](#) web page.

End treatments for steel beam guardrail include both public domain and proprietary systems. Their role is to mitigate the risk of impact with the end of the guardrail as well as anchor the guardrail. If the anchorage is compromised, then the performance of the longitudinal barrier may also be compromised.

Note: 'Public domain steel beam guardrail infrastructure' may also be referred to as 'the guardrail', or 'public domain guardrail' in this document.

3 Assessment of barrier damage

If public domain steel beam guardrail is damaged, a barrier assessment needs to be undertaken. This assessment is to understand the extent of damage and any repair works. It should be noted that in some instances where the majority of the system has been compromised, it may be more economical to consider replacement of the whole system.

Assessment of the guardrail must be undertaken by a person experienced in road safety barriers as soon as practicable after the crash. Subject to a post-crash assessment, any damage to the guardrail is to be repaired immediately.

The following are to be determined:

- Did the device function in the manner intended?
- Would it be appropriate to repair the device and place it back in service?
- Should the whole device be replaced with the same type of road safety barrier system?
- Should the type of road safety barrier system be changed?

It is recognised that it is not always possible to undertake repairs immediately, and that there may be situations where infrastructure remains unrepaired for a limited time. In these situations, consideration of the potential need for interim measures is required.

4 Interim treatments

This section describes the interim treatments for public domain systems, depending where in the system the damage is located and then the damage severity.

For the purposes of the assessment, the damage severity is categorised as either:

- Significant, or
- minor.

If the practitioner is in any doubt about whether the damage is significant or minor, then the damage shall be assumed, for the purpose of this guidance, to be significant. This judgment call should be included in the assessment documentation.

4.1 Public domain longitudinal steel beam guardrail and transition sections

This section provides guidance on interim treatments for damage to longitudinal steel beam guardrail and/or transition sections.

4.1.1 Significant damage

Significant damage to a longitudinal steel beam guardrail and/or transition can compromise the performance of the road safety barrier system, if a secondary impact occurs.

Significant damage is (but is not limited to) when:

- the deflection of any component over any 8 metre section of longitudinal barrier is greater than 225 mm
- the height to the top of rail has dropped more than 50 mm below the original height to the top of rail
- any post is missing, broken, torn, otherwise detached from the longitudinal rail, or losing soil support
- more than one splice bolt is missing, damaged or torn through the longitudinal rail, and/or
- the rail is torn.

The following actions are recommended in the instance where longitudinal steel beam guardrail and/or transition sections have sustained significant damage.

Actions

- Remove barrier elements that project into the traffic path / shoulder.
- Document why repairs are not being effected immediately.
- Delineate using temporary delineation, comprising no fewer than three bollards spaced 5 m apart.
- Prioritise and undertake repairs according to assessment of residual risk (length and severity of exposed roadside hazard, speed, traffic volume and geometric configuration).
- Speed reduction signs, temporary road safety barriers and BARRIER DAMAGED AHEAD signs should not be used (refer Section 5).

4.1.2 Minor damage

Lesser damages that do not meet the criteria for 'significant damage' are generally considered 'minor damage'. Minor damage is unlikely to compromise the performance of the road safety barrier system if subjected to a secondary impact.

The following actions are recommended in the instance where longitudinal steel beam guardrail (mid-span) and/or transition sections have sustained only minor damage.

Action

- Document assessment, do nothing immediately, schedule maintenance to align with other programmed construction.

4.2 End treatments for public domain W beam guardrail

End treatments are high risk elements of any guardrail system. Impacts with these components carry increased likelihood of variation in in-service impact performance. Hence, end treatments are expected to be less tolerant of damage than mid span barrier rail.

This section provides guidance on appropriate interim treatments for damage sustained to end treatments for W beam guardrail (public domain), based on the significance of the damage to the system.

4.2.1 Significant damage

Significant damage to end treatments is expected to compromise the performance of the road safety barrier system, if subjected to a secondary impact.

Significant damage is (but is not limited to) when:

- any tear or kink in the rail occurs within the length of the terminal downstream of the impact head
- any post is missing, broken, torn, otherwise detached from the longitudinal rail, or losing soil support
- damage to any post or breakaway mechanism occurs

- splice bolts are missing, and/or
- anchor cable, lag bolts or bearing plates are missing.

The following actions are recommended in the instance where the end treatment has sustained significant damage.

Actions

- Remove barrier elements that project into the traffic path / shoulder.
- Document why repairs are not being effected immediately.
- Delineate as follows:
 - Form the taper to guide traffic away from the obstruction using cones or bollards spaced 3–5 m apart and supplement these with one or two temporary hazard markers (T5 5 or T5 Q02).
- Prioritise and undertake repairs according to assessment of residual risk (length and severity of exposed roadside hazard, speed, traffic volume and geometric configuration).

4.2.2 Minor damage

Other lesser damages are generally considered to be minor damage. Minor damage is unlikely to compromise the performance of the end treatment if subjected to a secondary impact.

The following actions are recommended in the instance where the end treatment sustained only minor damage.

Action

- Document assessment, do nothing immediately, schedule maintenance to align with other programmed construction.

5 Rationale

Localised speed restrictions should not generally be implemented (where workers are not present).

The rationale being:

- Short lengths of reduced posted speed limits are generally ineffective – experience has shown that there is very limited change in vehicle speed when it is evident to drivers that the through carriageway width is unaffected.
- An ineffective risk mitigation measure diminishes the credibility of speed limits where they are used to manage more significant risks, and
- There is an increased collision risk resulting from the differential speed between the few compliant vehicles and most non-compliant vehicles.

Short lengths of temporary barriers should not generally be deployed. The rationale being:

- The practice of deploying a short length of water filled plastic barrier units, is not regarded as a 'make safe' in terms of barrier performance. Full scale crash testing, to demonstrate satisfactory performance in these circumstances, has not been undertaken.
- Particularly at high speed, short lengths of water filled plastic barrier units are unlikely to provide any meaningful re directive capacity for most impacts. Longer lengths are not expected to perform any better.
- The cost and risk to workers in installing, inspecting and maintaining (for example, keeping them full of water) a string of temporary water filled plastic barrier units in a high-speed environment, is expected to exceed any (unquantified but probably marginal) reduction in impact risk.
- Other more elaborate solutions involving more robust temporary barrier systems (being concrete or pinned steel barriers) that would come closer to a 'make safe', are likely to prove impractical for several reasons (deployment time, provision of suitable end treatments, requirement for pavement anchorages).

Guardrail Damage Ahead (TC1735_1 and TC1735_2) signage should not be used.

The use of this sign has been discontinued, as it does not convey to drivers what action is expected of them, and the inclusion of an action message such as 'don't run off the road here' simply reflects a goal that drivers have at any other location on the road network.

6 Related documents

The documents listed in Table 6.1 provide further information to that contained in this Technical Note.

Table 6.1 – Related documents

Publisher / Author	Document Title
Department of Transport and Main Roads	Road Planning and Design Manual 2nd Edition Volume 3 Part 6
Department of Transport and Main Roads	TMR Accepted Road Safety Barrier Systems and Devices
Department of Transport and Main Roads	MASH FAQs
Department of Transport and Main Roads	MASH Decision Tree
US Department of Transportation – Federal Highway Administration	FHWA Report no. FHWA SA 08 002 (U.S. D.O.T., 2008)
National Technical Reports Library – US Department of Commerce	NCHRP Report 656 (Transportation Research Board, 2010)
The National Academies of Sciences Engineering Medicine	NCHRP Project 22 – 28 (WIP): Criteria for Restoration of Longitudinal Barriers – Phase II
Standards Australia / Standards New Zealand	AS/NZS 3845.1 Road Safety Barrier Systems and Devices – Part 1: Road Safety Barrier Systems AS/NZS 3845.2 Road Safety Barrier Systems and Devices – Part 2: Road Safety Devices

