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

July 2015
1 Background

This Technical Note is intended to give guidance to road safety barrier practitioners who are required to manage crash-damaged public domain steel beam guardrail infrastructure, including both longitudinal barrier and end treatments.

Public domain steel beam guardrail is a road safety barrier, the role of which is (typically) to shield the occupants of errant vehicles from a roadside hazard.

Approach 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 itself AND to provide anchorage for the guardrail. Departure end terminals provide anchorage only. If the anchorage is compromised, then the performance of the longitudinal barrier may also be compromised.

Hence, damaged guardrail infrastructure may present an elevated risk of injury to the occupants of vehicles in case of impact. Damaged infrastructure may not function as intended, and may constitute an additional risk to vehicle occupants in itself.

As such, subject to post-crash assessment (refer AS/NZS 3845:1999 commentary cl.B2.6), any damage to steel beam guardrail and/or a steel beam guardrail end treatment should be repaired immediately. However, it is recognised that repairs cannot always be undertaken immediately and that the infrastructure may remain unrepaired for a limited time.

Guidance for consistent interim treatment measures is provided. This guidance differentiates between elements of a public domain guardrail system as follows:

- mid-span longitudinal steel beam guardrail and transition sections
- end treatments.

Out of scope

- proprietary longitudinal road safety barriers
- crash cushions.
2 Mid-span longitudinal steel beam guardrail and transition sections (public domain)

<table>
<thead>
<tr>
<th>Significant damage (Refer Note) which is expected to compromise the performance of the road safety barrier if subjected to a secondary impact.</th>
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</thead>
</table>
| Actions | • Remove barrier elements that project into the traffic path/shoulder.  
• Document why repairs are not being effected immediately.  
• Delineate using temporary delineation, comprising not less 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).  
• Temporary road safety barriers, speed reduction signs and BARRIER DAMAGED AHEAD signs should not generally be used. See Section 4 below. |

<table>
<thead>
<tr>
<th>Minor damage which is unlikely to compromise the performance of the road safety barrier if subjected to a secondary impact.</th>
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<tbody>
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<td>Action</td>
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Note: Definition of significant damage

For the purposes of this Technical Note, significant damage to longitudinal steel beam guardrail and transition includes (but is not limited to) any of the following:

• more than 225 mm deflection of any component over any 8 m section of longitudinal barrier
• height to top of rail more than 50 mm below original height to top of rail
• any post missing, broken, torn or otherwise detached from the longitudinal rail
• more than one splice bolt missing, damaged or torn through the longitudinal rail
• rail torn.

Other lesser damages are generally considered to be minor damage for the purposes of this Technical Note.

If the practitioner is in any doubt about whether the damage is significant or insignificant, then the damage shall be assumed, for the purpose of this guidance, to be significant. This should be documented in the assessment documentation.
3 End treatments for W-beam guardrail (public domain & proprietary)

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.

<table>
<thead>
<tr>
<th>Significant damage (Refer Note) which is expected to compromise the performance of the end treatment if subjected to a secondary impact.</th>
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<tr>
<td><strong>Actions</strong></td>
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<tr>
<td>• Remove barrier elements that project into the traffic path/shoulder.</td>
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<td>• Document why repairs are not being effected immediately.</td>
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<td>• Delineate as follows:</td>
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<td>- 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)</td>
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<tr>
<td>• Prioritise and undertake repairs according to assessment of residual risk (length and severity of exposed roadside hazard, speed, traffic volume and geometric configuration).</td>
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</table>

**Minor damage which is unlikely to compromise the performance of the end treatment if subjected to a secondary impact.**

**Action**

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

**Note: Definition of significant damage (end terminals)**

For the purposes of this Technical Note, significant damage to end treatments includes (but is not limited to) any of the following:

- any tear or kink in the rail within the length of the terminal downstream of the impact head
- any post missing, broken, torn or otherwise detached from the longitudinal rail
- damage to any post or breakaway mechanism
- missing splice bolts
- missing anchor cable, lag bolts or bearing plate.
4 Supporting rationale

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

- Short lengths of reduced posted speed limits are 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.

- There is an increased collision risk resulting from the differential speed between the few compliant vehicles and majority non-compliant vehicles.

Temporary barriers should not generally be deployed.

- 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 are unlikely to provide any meaningful redirective 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’ outcome are likely to prove impractical for a number of reasons (deployment time, provision of suitable end treatments, requirement for pavement anchorages).

Damaged Guardrail 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.

5 Resources

- *Road Planning and Design Manual* 2nd Edition Volume 3 Part 6, QTMR (QTMR, August 2014)

- *Road Safety Barrier Systems, End Treatments and Other Related Road Safety Devices* (QTMR, November 2014)

- FHWA Report no. FHWA-SA-08-002 (U.S. D.O.T., 2008)

- NCHRP Report 656 (Transportation Research Board, 2010)

- NCHRP Project 22–28 (WIP): Criteria for Restoration of Longitudinal Barriers – Phase II