

technical memorandum

road safety hardware series



Frequently Asked Questions - Barriers & Terminals TM-2000 October 2012

Purpose

To provide a list of frequently asked questions with answers in regard to road safety barrier systems, terminals and crash cushions. This technical memorandum will be updated periodically as questions are asked and answered.

FAQ

A. Testing Requirements

1. What is the required standard for testing of road safety hardware to be used on the State highway network ?

From 1 November 2012, the nominal standard for testing of road safety hardware systems installed on the State highway network is the AASHTO Manual for Assessing Safety Hardware (MASH-1). This document supersedes the National Cooperative Highway Research Project Report 350 (NCHRP350).

All new road safety hardware that is developed or significant variants of existing systems must be tested and evaluated according to MASH-1.

2. What about existing road safety hardware systems ?

Unless otherwise stated in M23 (as published on the NZ Transport Agency website and updated periodically), all road safety hardware currently accepted under the NCHRP Report 350 criteria does not need to be retested to MASH criteria. These systems may remain in place and may continue to be manufactured and installed.

B. Timber Posts and Blockouts

1. When a median post with blockout on both sides transitions to separate posts with individual blockouts is there a minimum distance required between the posts ?

This situation requires a drawing to ensure that the approach side and transition are aligned such that the departure is tapered. Any required transition (from single sided to back-to-back guardrail) should be long enough to give a taper that does not result in any 2 posts being hard up against each other. Sufficient room must be provided behind posts to allow fitment and tightening of the post bolt nuts.

2. Can a median post have a different number of blockouts on either side ?

Yes, but no more than 2 blockouts may be used on either side of the timber post.

A square washer and M16 nut is to be used at the post face and an M16 nut (**no washer**) at the rail face. The recommended fixing is to use a length of M16 galvanised threaded rod of sufficient length such that 2 to 4 full threads are visible beyond the post side nut once the joint is tightened.

3. What is the maximum number of blockouts that can be used on one post and what is the recommended fixing detail at the rail and back of post ?

The maximum number of timber blockouts that may be used on a single guardrail post is two (2). More than this number can result in unacceptable rotation (leaning) of the guardrail post.

A square washer and M16 nut is to be used at the post face and an M16 nut (**no washer**) at the rail face. The recommended fixing is to use a length of M16 galvanised threaded rod of sufficient length such that 2 to 4 full threads are visible beyond the post side nut once the joint is tightened.

If more than 2 posts with 2 blockouts each are required at a particular site to avoid an obstacle, consideration should be given to the use of nested guardrail to allow a post (or two) to be left out.

4. Is there an allowable amount of shakes/splits in a timber post/blockout that is acceptable before it is rejected ?

The number is less important than their extent. No split should extend across more than one third of the width of the timber block. Do not use a timber guardrail post or blockout that has any split in the same plane as, or a plane parallel to the bolt hole and extending from the top of the post or blockout to within 75mm of the bolt hole.

AS/NZS 3845:1999 specifies that the timber used for manufacture of timber posts and blockouts is to be "run of mill" Pinus Radiata preservative treated to hazard level H4 in accordance with AS1604. The timber supplier will have this standard and should be supplying as per this standard.

5. In a median situation, what is the maximum amount of post bolt that can protrude from the face of the guardrail ?

The post bolt (or threaded rod, if multiple blockouts) should be of such length that there are 2 to 4 full threads showing beyond the nut once the bolted joints has been correctly tightened. More than this may constitute a snagging hazard.

6. In many instances a full 200mm blockout will result in the rail being too close to traffic, what is the minimum thickness blockout that can be used in a 100Km/h speed zone ?

Minimum blockout thickness is 200mm. If this cannot be accommodated, the design must be revised or an alternative guardrail system used. If the issue is isolated, a post may be omitted and nested guardrail used.

7. Can timber blockouts be used in lieu of steel (median situation connecting to concrete) in a 10m transition TL4 if it is too wide with modified steel blockouts ?

No. Refer to NZ Transport Agency Standard Drawing RSB-5 for the correct detailing of a semi-rigid barrier transition to a concrete median barrier.

The designer must take account of median geometry when designing all transitions.

8. Is it necessary to use extra posts on rail connecting to a Buried in Backslope Anchor ?

Yes, the standard practice is to connect a W-Beam steel guardrail system to a buried in backslope concrete anchor block using a TL-4 Thrie-Beam transition. Refer to NZ Transport Agency Standard Drawing RSB-1 for the correct detailing of a buried-in-backslope anchor installation.

C. Terminals

1. Why do I need to install a terminal on a guardrail ?

All road safety barrier systems require an anchorage system to function as intended. Un-anchored barrier systems are not acceptable. All road safety barrier systems accepted for installation on the State highway network have a crashworthy terminal as part of the supplied system. Only terminal end treatments listed in NZ Transport Agency Specification M23 may be used on State highway installations. If unsure, contact the National Manager Traffic and Safety.

In addition, there is a public domain buried-in-backslope anchor which may be used where appropriate. NZ Transport Agency Standard Drawing RSB-1 (Buried-in-Backslope Terminal) is available on the NZ Transport Agency website.

2. Can I use a “fishtail” or “rolled end fitting” on the end of the W-Beam guardrail ?

No, experience has demonstrated that both of these guardrail ends can easily penetrate vehicles and are unforgiving towards motorcyclists. Only terminal end treatments listed in NZ Transport Agency Specification M23 may be used on State highway installations. If unsure, contact the National Manager Traffic and Safety.

3. Is there a standard terminal for use on curved guardrail installations at minor intersections to ensure sufficient barrier anchorage ?

Yes, refer to NZ Transport Agency Standard Drawing RSB-2 for the correct detailing of a curved strong post timber W-Beam guardrail terminal for use in this situation. For proprietary barrier systems, contact the supplier to confirm that an NZ Transport Agency accepted detail is available.

D. Crash Cushions

No frequently asked questions at this time

E. Transitions

1. What transition is to be used between W-Beam or Thrie-Beam systems when connecting to concrete barriers ?

NZ Transport Agency Standard Drawing RSB-5 details the standard transition from a timber post W-Beam guardrail system to a concrete barrier (or anchor block) using a TL-4 Thrie-Beam transition.

2. How do you transition from W-Beam on a bridge approach to Thrie-Beam across the bridge ?

The NZ Transport Agency Standard Drawing RSB-5 (W-Beam to Thrie-Beam transition) can be used, with the nested section and posts 1 and 3 omitted. A backing piece is required at post 4.

3. Does a 10m transition to concrete need to be straight or can it be slightly curved ?

The layout of all transitions should be such that the transition is straight and meets the associated concrete barrier in line. Curving of approach or departure barrier should not start until one full length beyond the transition.

F. Deflection and nesting

1. Is there a schematic that shows nesting when one or two posts are missing ?

Yes, refer NZ Transport Agency Standard Drawing RSB-4

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2. Is there a preference to use nesting or extra posts to reduce deflection, and what is the percentage deflection reduction with each method ?

For all public domain systems, the nominal deflection may be assumed to decrease by approximately 25% as the post spacing is reduced (i.e. posts brought closer together). For example, for W-Beam guardrail on timber post and blockout at 1905mm post spacing, the nominal deflection @ TL-3 is approx. 1000mm. If the post spacing is halved to 953mm, the deflection may be assumed to be in the order of 750mm. **Note that this is based on empirical analysis of tested system deflections and real-world performance may differ.**

For proprietary systems, consult the system manufacturer/supplier.

3. What are the tolerances for height and location for timber post guardrail installations ?

The top of the guardrail shall be within ± 20 mm of the specified level and ± 50 mm of the specified post location shown of the design drawings (refer AS/NZS3845, clause 2.4.4).

4. Should timber posts be vertical or perpendicular to the ground when it is sloping or undulating ?

Timber posts should generally be installed vertical with the guardrail parallel to the carriageway surface. Carriageway shoulders should be graded at 1V:10H (or no steeper than 1V:6H) where safety barrier are to be installed.

G. Miscellaneous

1. Should I use U-bolts or cast-in brackets ?

Only cast-in brackets are to be used both on bridge decks and for individual cast in situ footings and foundations on the bridge approaches. U-bolts may not be used as they are non-frangible and often result in damage to the surrounding concrete in a barrier impact.

NZ Transport Agency Standard Drawing B-1 (Guardrail Holding Down Details) shows details of the accepted holding down hardware for W-Beam and Thrie-Beam Bridge Barrier systems detailed in drawings B-1 thru 4, B-6 and B-7 for use on State highway structures. These drawings are available on the NZ Transport Agency website.

2. If side mounted posts are used along with top mounted posts on the same concrete structure, do all 3 post flange holes need to be populated ?

Generally yes, though the ultimate responsibility rests with the designer to ensure that the fixings for the proposed barrier system comply with the load capacity requirements of the NZ Transport Agency Bridge Manual (or equivalent local authority requirements).

3. If cast-in brackets cannot be used with side mounted post, what fixing should be used ?

Cast-in brackets may be used with side mounted posts if correctly detailed during design and installed during casting of the deck. If cast-in brackets have not been specified or supplied, then 3 or more cast-in sockets of sufficient capacity should be provided.

Irrespective of the mounting, it is the responsibility of the designer to ensure that the fixings for the proposed barrier system comply with the load capacity requirements of the NZ Transport Agency Bridge Manual (or equivalent local authority requirements).

4. Curved guardrail at an intersection to minor road. Should weakened post system with no blockouts be used ?

Refer to NZ Transport Agency Standard Drawing RSB-2 (available [here](#)) for the correct layout and configuration of a curved terminal installation. Note that only strong post timber W-Beam guardrail may be installed in this situation, proprietary systems may not be used.

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5. Drilling or enlarging holes on site. What is the best or acceptable procedure including the cold galvanising after ?

On-site modification of factory formed guardrail and associated componentry should be avoided wherever possible. Only if such work is unavoidable should the hole in question be formed or enlarged by drilling. No holes shall be formed or enlarged using oxy-acetylene equipment (so-called “gas-axe”) or similar flame cutting methods.

Once formed, the hole shall be carefully filed to remove any rough edges or drilling swarf and painted with a single pack zinc-rich primer that meets AS/NZS 3750.9.

Endorsed by: National Traffic & Safety Manager