RamShield® Median

MASH TL3 Compliant W-Beam Barrier

SafeDirection
CRASH BARRIER SOLUTIONS

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Version	Date	Revisions
04	February 2026	Updated format.

Leading Safety

Successfully crash tested to MASH Test Level 3

Complies with AS/NZS 3845.1:2015 Road safety barrier systems and devices

Safe vehicle containment and redirection

Prevents dangerous head-on collisions

Superior Design

Narrow system width – just 320 mm

Same C-post profile as RamShield® Low Deflection

Simple rail to post connection

Low Deflection

Recorded MASH TL3 deflection < 1.0 m

Suitable for narrow medians

Compatibility

Features standard w-beams manufactured by Safe Direction

Same system height and system width as the Gregory Median End Terminal (GMET)

Standard 2 m post spacing

Available with BikerShield® motorcycle protection barrier

Fast Assembly

Fewer parts

Strong section C-post suitable for driving into stiff ground conditions

Rail splices positioned mid-span between C-posts to facilitate rapid installation

1.0 Introduction

RamShield® Median is the latest innovation and advancement in w-beam guardrail barrier designs. Developed by Safe Direction, RamShield® Median has been full-scale crash tested to MASH Test Level 3.

RamShield® Median features strong section C-posts supporting back-to-back w-beam, providing safe vehicle containment and redirection when impacted from either side of the system.

Designed for narrow medians and the prevention of dangerous head-on collisions, RamShield® Median introduces patented technology into the w-beam release mechanism. This results in low deflection and fewer components.

The w-beam rail splices of RamShield® Median are positioned mid-span between posts, providing ease of access for installation contractors and facilitating rapid assembly.

2.0 Specifications

Crash Test Compliance	MASH Test Level 3
MASH TL3 Dynamic Deflection	0.99 m
MASH TL3 Working Width	1.28 m
System Width	320 mm
System Height	800 mm
Post Embedment Depth	890 mm
Post Spacing	2.0 m centres
Post Section	150 x 110 x 4.3 mm
Post Length	1660 mm
Post Mass	21 kg
System Mass	33 kg per metre
System Finish	Hot dip galvanised in accordance with AS/NZS 4680
Compatible End Terminal	Gregory Median End Terminal (GMET)

3.0 How RamShield® Median Works

RamShield® Median achieves a controlled redirection of errant vehicles by releasing the w-beam guardrail from the post at an optimal load to retain rail height, limit dynamic deflection and to allow the post to collapse without tripping the vehicle.

The separation of the rail from the post is achieved by a release tab incorporated into the post. The tab controls the release of the rail within the impact zone providing stable vehicle containment and redirection with minimal vehicle roll.

RamShield® Median uses standard w-beam guardrail and standard fasteners meaning there is minimal risk of inadvertent use of non-compliant items.

Upon release of the w-beam rail, the C-posts collapse upon impact, yielding proximate to the ground surface. This release and collapse mechanism makes RamShield® Median suitable for use in stiff soils and deep asphalt applications.

The sectional strength of the C-post limits barrier deflection, an important design consideration for narrow medians.

The working mechanism of RamShield® Median is a patented concept designed and developed by Safe Direction. The concept is the latest innovation in w-beam guardrail designs and sets a new benchmark in simplicity and performance.

4.0 Crash Test Performance

RamShield® Median has been fully crash tested and evaluated according to the specifications for Test Level 3 (TL3) of the AASHTO Manual for Assessing Safety Hardware (MASH). The MASH specification is an update to and supersedes NCHRP Report 350 for the purposes of evaluating new safety hardware devices.

MASH is also the basis of testing procedures for road safety systems as stated in *AS/NZS 3845.1: 2015 Road Safety Barrier System and Devices.*

The introduction of MASH follows changes to the vehicle fleet, researching of real-life impact conditions and updated criteria for evaluating barrier performance.

RamShield® Median has been assessed as a longitudinal barrier, designed to contain, redirect, and shield vehicles from roadside obstacles. The MASH TL3 crash test matrix for a longitudinal barrier requires the following impacts:

- 2270 kg pick-up travelling at 100 km/h and 25 degrees (156.4 kJ).
- 1100 kg passenger car travelling at 100 km/h and 25 degrees (75.8 kJ).

Impacts performed with the pick-up truck (2270P) evaluates barrier strength and the potential for the vehicle to override the crash barrier system or rollover during redirection.

Impacts performed with the passenger car (1100C) investigates the potential for the vehicle to underride the crash barrier system and wheel snag. This impact also assesses occupant risk, including impact velocities and head-slap.

Table 1: RamShield® Median Crash Test Results.

Impact Condition	Post Spacing	Dynamic Deflection
1100 kg passenger car, 100 km/h and 25 degrees	2.0 m centres	0.71 m
2270 kg pick-up truck, 100 km/h and 25 degrees	2.0 m centres	0.99 m

5.0 Material Traceability

Safe Direction operates a quality management system, independently certified to the requirements of ISO 9001:2015. A multi-stepped procedure is used by Safe Direction to verify the compliance of the material used in the production of RamShield® Median C-posts and w-beam guardrail to AS/NZS 1594.

Mill certificates and independent third-party laboratory test results are verified against Australian Standard guidelines recording the steel heat numbers, mechanical results and chemical composition. Safe Direction product is then stamped during manufacture with a 4-digit number providing industry-leading traceability to the steel heat number. The format for stamping w-beam guardrails is:

Example: SD 9419 350 27

Where: SD = product from Safe Direction
9419 = the last 4 digits of the heat no.
350 = steel grade (i.e. HA 350)
27 = base metal thickness (i.e 2.7 mm

TEST CERTIFICATE BLUESCOPE STEEL

CHEMICAL ANALYSIS

Percentage of element by mass (L=Cast, P=Product, -S=Soluble, -T=Total, CF=Chemical Formula, n=Min, x=Max)

Item No	Heat / Unit No	NATA Lab	L/P	C	P	Mn	Si	S	Ni	Cr	Mo	Cu	Al-T
0010	6709419	0632	L	.157	.019	.74	<.005	.015	.016	.035	.004	.042	.034

Item No	Heat / Unit No	NATA Lab	L/P	Ti	B-T	N	Nb	Sn	V	CF1	CF2	CF3
0010	6709419	0632	L	<.002	<.0003	.0045	.001	.002	<.003	.29	.10	.00

CF1=C+ (MN/6) + ((CR+MO+V)/5) + ((CU+NI)/15) CF2=NI + CR + CU + MO CF3=NB + TI + V

MECHANICAL TESTING

Tensile AS 1391

Item No	Heat No	Tested Unit	NATA Lab	Cat	Loc	THICK mm	ReH MPa	Rm MPa	Lo mm	ELONGN %
0010	6709419	1H1F9690	0631	B	LQF	2.70	420	520	80	25
0010	6709419	1H1F9845	0631	B	LQF	2.70	390	500	80	22

ITEMS COVERED BY THIS CERTIFICATE

Item No	Heat No	Ordered Dimensions (mm)	No of Units	Mass (Tonnes)	Unit Identities
0010	6709419	740.0X2.70XCOIL	6	24.030	1H1H9291AA 1H1H9291BA 1H1H9291CA 1H1H9291DA 1H1H9292AA 1H1H9292CA

6.0 Design Considerations

6.1 Offset from the Traffic Lane

Road safety barriers should be located (e.g. offset, lateral position) as far as possible from the edge of the traffic lane as site conditions permit but within the limits described below. This enables errant drivers to recover and regain control of the vehicle, minimising the frequency of barrier impacts. Wider offsets can reduce nuisance impacts on the barrier and enable disabled vehicles to be free of the traffic lanes on a high-speed road, therefore reducing the risk of secondary crashes.

Providing a consistent barrier offset is especially important for long lengths of continuous barrier. Consistent barrier design creates a uniform view, while frequent changes in barrier offset can mislead drivers and negatively impact decisions while driving, especially in adverse visibility conditions.

The offset is measured from the edge of the traffic lane to the face of the w beam barrier.

The offset needs to ensure that the available stopping sight distance and intersection sight distance are not impeded. Increased offsets allow vehicles to stand clear of the adjacent traffic lane after an impact if the vehicle is disabled and for maintenance activities. The practicality and costs of maintenance of a barrier and the areas on both sides of the barrier should be considered along with Occupational Health & Safety implications.

The recommended offsets to barriers are detailed in Table 2. It is recommended that barriers must not be closer than 0.5 m from traffic lanes on rural roads to minimise nuisance hits. Similarly, the minimum offset on urban roads is 0.3 m.

Table 2: Recommended Offset Distances. Source: Table 6.5 Austroads Guide to Road Design Part 6.

	Rural High Speed [1, 3]	Rural Low Speed	Urban Freeways [3]	Urban Roads [2]
Desirable	4.0 – 6.0 m	3.0 – 6.0 m	4.0 – 6.0 m	2.5 – 3.0 m
Minimum	3.0 m	2.5 m	3.0 m	1.0 m

Notes:
1. *Operating speed greater than or equal to 80 km/h.*
2. *The offset may be governed by the required offset to kerbs.*
3. *Adoption of widths less than 3 m shall include assessment of desired operating practices, including emergency response, maintenance and police enforcement.*

6.2 Flaring

Generally, there should be uniform clearance between traffic and roadside features, particularly in urban areas where there are many roadside features. Uniform alignment enhances road safety by providing the driver with a certain level of expectation, thus reducing driver concern for and reaction to the roadside features and barriers.

6.3 Advance Grading

It is recommended that the area in advance of RamShield® Median be limited to a grading of 10H:1V to ensure that the vehicle's suspension is neither extended nor compressed at the moment of impact with the barrier.

6.4 Clearance to Hazards

The system should be installed with sufficient clearance behind the barrier to allow for the expected deflection of the system.

Dynamic deflection is the maximum lateral displacement of the barrier during a vehicle impact. When a vehicle strikes a barrier, the dynamic deflection varies according to the characteristics of the impacting vehicle, including vehicle mass, impact speed, angle of impact and the characteristics of the barrier system.

The MASH TL3 impact condition (2270 kg pick-up truck travelling at 100 km/h and 25 degrees) has been developed to represent 'worst case impact scenario'.

When installed in a narrow median, possible encroachment into the adjacent traffic lane should be considered as shown in Figure 1.

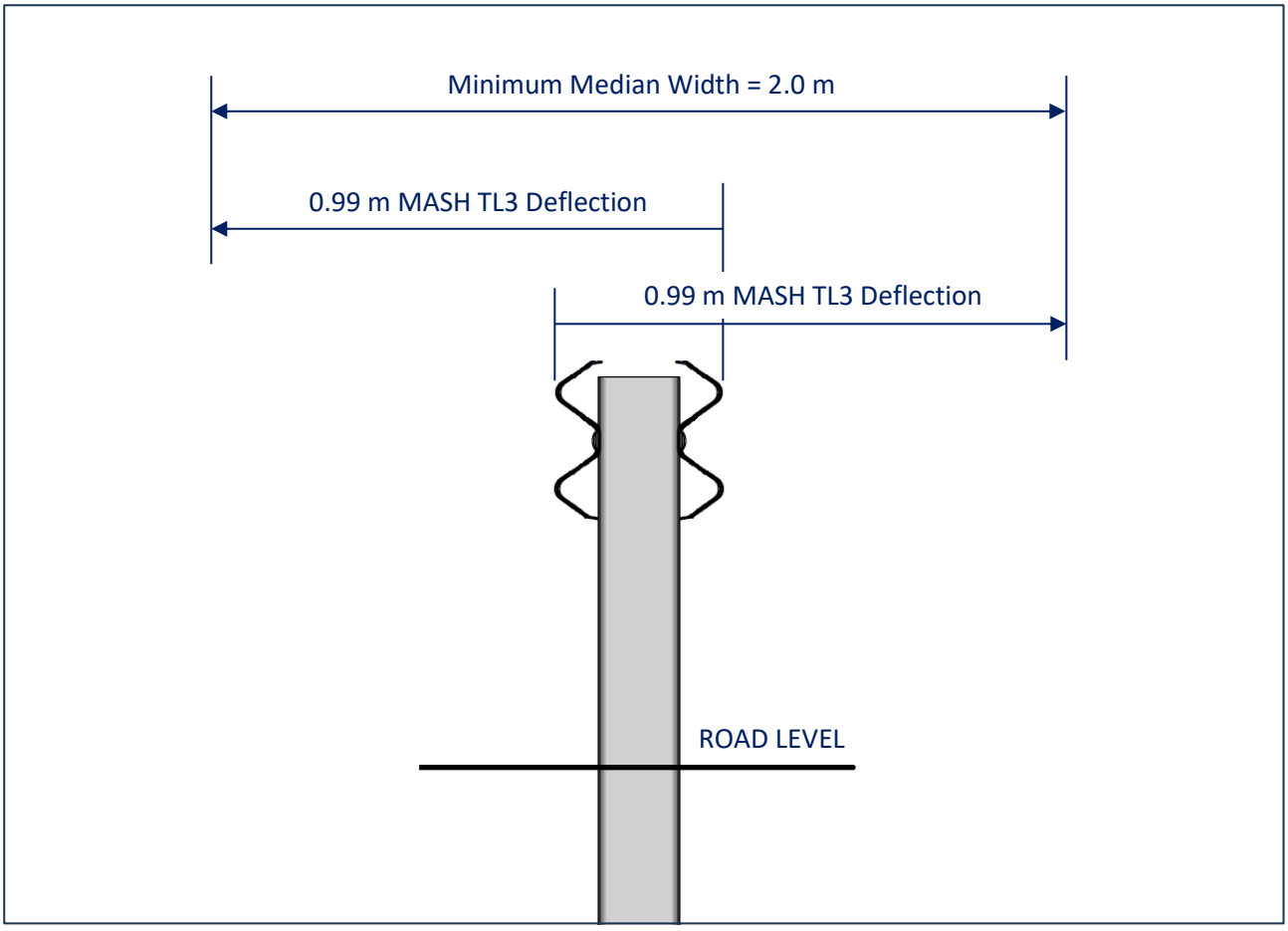


Figure 1: RamShield® Median Installation in a Narrow Median.

6.5 Placement in Rock or Asphaltic Concrete

The rail release mechanism and performance of RamShield® Median differs from traditional barrier designs. Traditional posts will absorb some crash energy through post rotation in the surrounding soil prior to fully yielding. Setting these posts in deep lift asphalt or rock may compromise the performance of the system.

The patented RamShield® tab regulates the forces required to release the w-beam rail during a vehicle collision. The RamShield® Median C-posts will typically yield by bending proximate to ground level.

Restraining the RamShield® Median C-posts below ground level does not adversely affect the rail release mechanism.

Therefore, acceptable foundation pavement conditions for the installation of the RamShield® Median C-posts includes the following:

- Narrow holes drilled into rock.
- Deep lift asphaltic concrete.
- Asphaltic concrete over granular pavement.
- Flush seal over granular pavement.
- Unsealed compacted formation.

Please consult with Safe Direction when rock is encountered, and full post embedment depth cannot be achieved.

6.6 Minimum Installation Length

The crash tested length of RamShield® Median was 34 m plus the end terminals. This crash tested length is not meant to reflect the minimum installation length but rather is intended to comply with the requirements of MASH which requires crash test installation lengths to be long enough to minimise the influence of the end terminals in providing safe vehicle containment and redirection.

It is recommended, where space permits, to install continuous safety barrier rather than designing a barrier to shield a specific hazard. A continuous safety barrier aims to protect the entire roadside and prevent head-on collisions.

At constrained sites where continuous barrier is not achievable, a shorter length barrier may be installed. In these circumstances it is recommended that the guidelines of *Austroads Safety Barrier Assessment Panel – Technical Advice SBTA 21-002* be referenced.

6.7 Kerbs

Crash testing is typically performed on level terrain. Whilst it is preferable that in-service installations replicate crash test conditions, it is often necessary to provide kerbing to facilitate drainage.

The installation of barriers behind kerbs may affect the vehicle trajectory and safe containment and redirection.

Current guidelines for installation behind kerbs have been developed through bumper trajectory analysis. This analysis may not thoroughly evaluate vehicle and barrier interaction including vehicle stability through the course of the impact and the potential for vehicles to under-ride or over-ride the barrier system.

Safe Direction has performed a series of MASH TL3 simulated impacts on RamShield® variants installed immediately behind a mountable SF kerb. The SF kerb is widely used on the NSW classified road network and is regarded as the steepest of the mountable kerb types used throughout Australia thereby representing 'worst practical condition' to evaluate the potential for vehicle launching.

Two (2) w-beam configurations were evaluated for each vehicle type:

1. Measuring the 800 mm height of w-beam rail from road level, and

2. Measuring the 800 mm height of w-beam rail from top of kerb.

The results of the 2270 kg pick-up truck impacts (MASH 3-11) demonstrated improved vehicle stability during containment and redirection when measuring the 800 mm height of w-beam rail from top of kerb.

Therefore, Safe Direction recommends measuring the system height of all RamShield® w-beam variants from top of kerb, regardless of the barrier offset behind the kerb as shown in Figure 2.

This methodology also ensures that the end terminals, which often feature posts with frangible connections, are correctly installed with the post hinge positioned at the ground line.

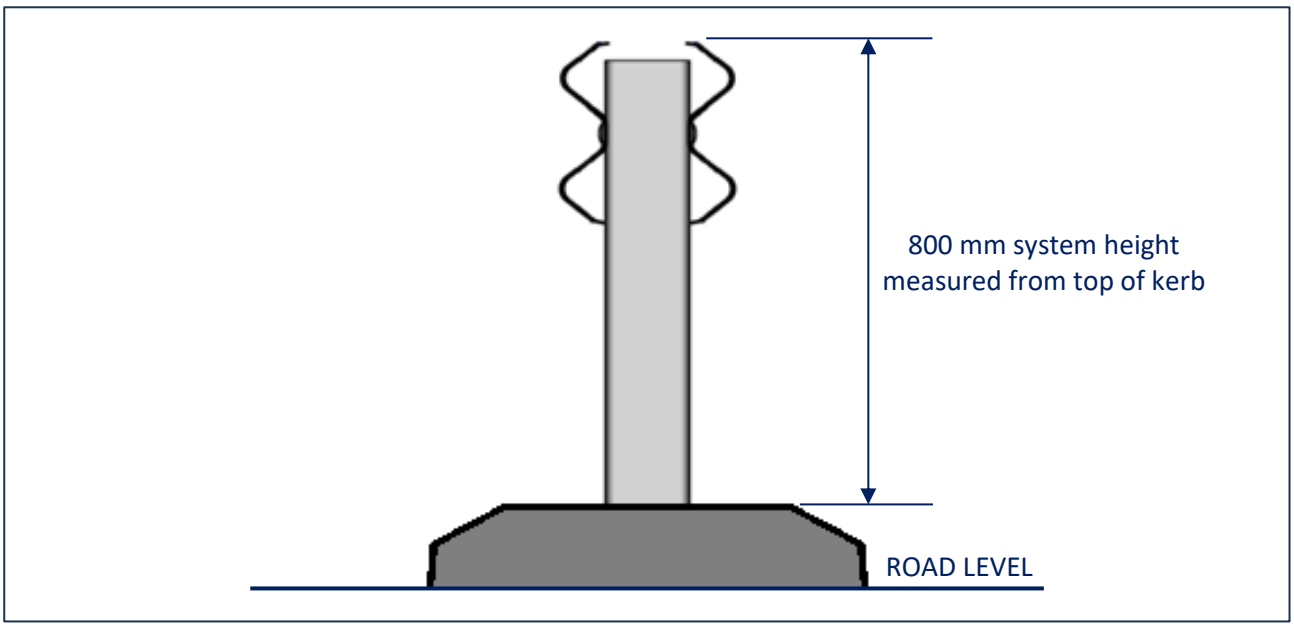


Figure 2: RamShield® Median, Recommended Installation Behind a Mountable Kerb.

6.8 Installation on Curves

In the field, straight sections of w-beam can be used to form a horizontal radius of 45 m or greater. When a radius of less than 45 m is required, the w-beam rails are required to be factory curved.

There are no limitations regarding crest or sag vertical curves for the assembly of w-beam guardrail. Designers should refer to state road agency specifications for vertical alignment design guidelines. The minimum radius for crest vertical curvature is usually governed by sight distance requirements. Sag curves are generally designed as large as economically possible using the comfort criterion as a minimum.

6.9 Gregory Median End Terminal (GMET)

Guardrail end terminals reduce the severity of an impact near or at the end of the system. They are also designed to anchor the w-beam guardrail system and introduce the necessary tensile and flexural strength required for safe vehicle containment and re-direction throughout the length-of-need section.

The Gregory Median End Terminal (GMET) is an energy-absorbing median end terminal designed for direct attachment to back-to-back w-beam guardrail, including RamShield® Median and has been successfully crash tested in accordance with MASH Test Level 3.

The GMET is classified as a gating, re-directive terminal. Gating terminals are designed to allow vehicles impacting near the beginning or nose of the system to safely pass through the unit and travel behind the terminal.

The design of the GMET comprises slotted w-beam guardrails supported by C-posts. The system has a total length of 13.43 m, measured from the ground anchor post to the connection with the downstream w-beam median barrier.

The w-beam guardrails of the GMET are connected directly to the C-post (i.e. without blocking pieces) matching the system width of RamShield® Median. The w-beam rail assemblies of the GMET are positioned 800 mm above road level matching the installation height of RamShield® Median. The GMET therefore connects directly to RamShield® Median without the requirement for a taper or transition.

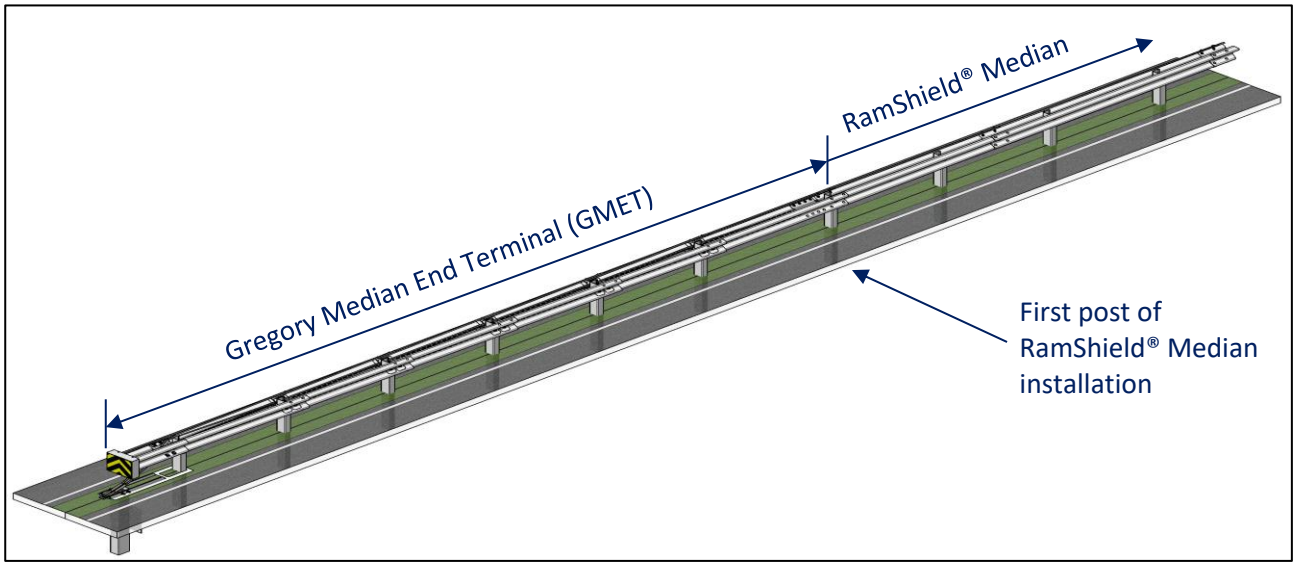


Figure 3: Gregory Median End Terminal (GMET).

Figure 4: Gregory Median End Terminal (GMET).

6.10 Attachment of BikerShield™ Motorcycle Protection

BikerShield™ is a motorcyclist safety barrier system designed to reduce the impact severity for riders when colliding with a roadside w-beam guardrail barrier.

BikerShield™ is positioned below the w-beam guardrail panel and prevents a dismounted motorcyclist from contacting the supporting posts of the guardrail barrier.

BikerShield™ provides safe rider containment and redirection through the combination of spring mounting brackets and lightweight, corrugated beams. The spring brackets attach directly to the w-beam guardrail mid-span between posts and absorb the impact energy of the sliding rider.

The position of BikerShield™ beneath the w-beam guardrail prevents rider contact with the posts and provides forgiving containment and redirection.

The attachment of the BikerShield™ mounting bracket to the guardrail beam provides vertical alignment and eliminates a potential snag point for a sliding dismounted rider.

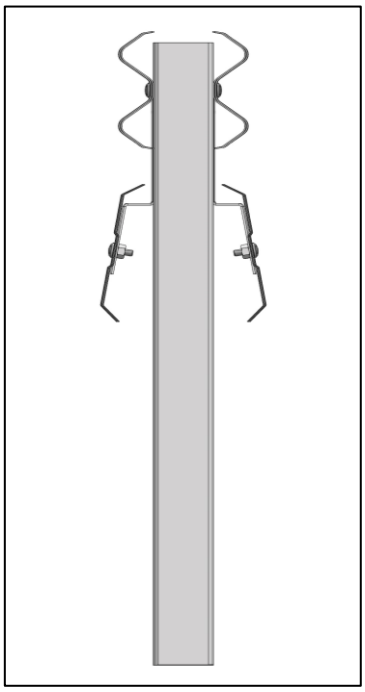


Figure 5: BikerShield™ Alignment.

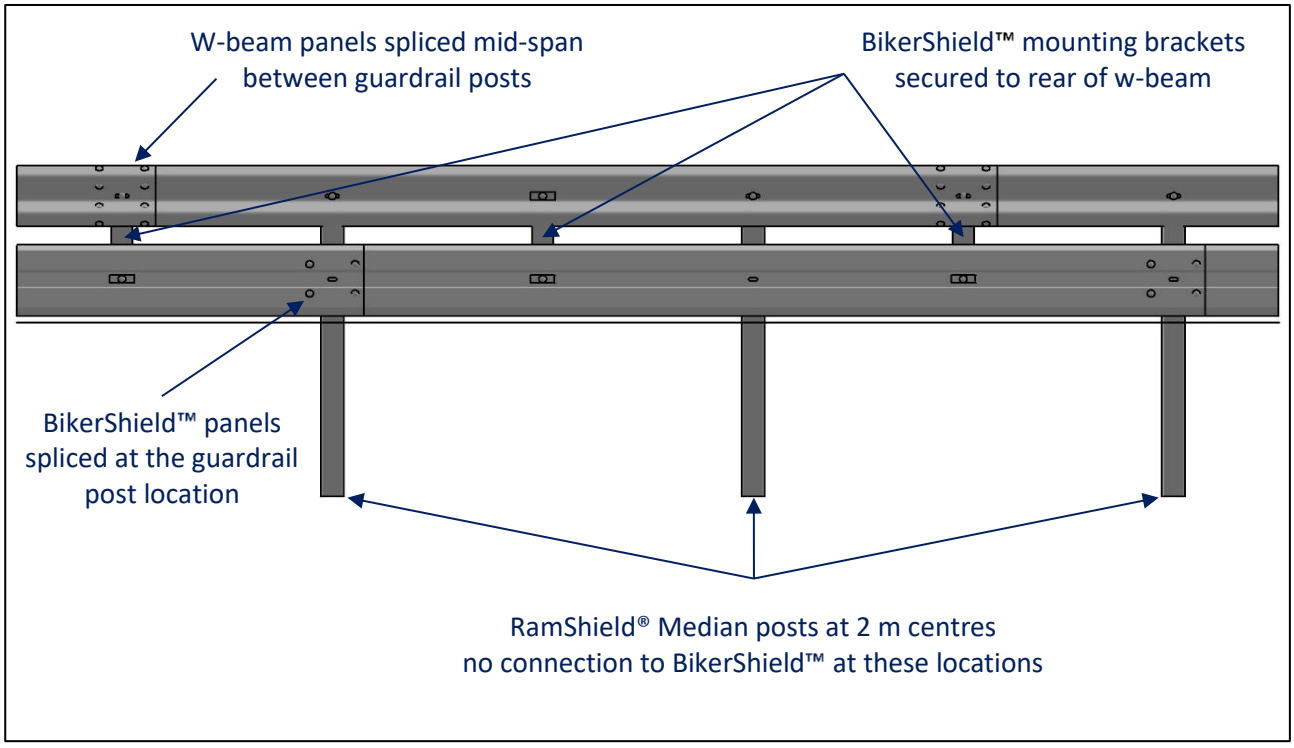


Figure 6: Attachment of BikerShield™ to RamShield® Median.

6.11 Design Life

The durability of the finished hot dip galvanized coating is a function of the environment to which the article is exposed. According to industry standards, hot-dip galvanized coatings can last up to 50 years in rural environments and up to 25 years in more corrosive environments, such as coastal regions. These estimates are based on average environmental conditions, and the actual lifespan of a galvanized coating will depend on the specific conditions it is exposed to.

Example: The RamShield® Median C-Post has a thickness of 4.3 mm. Hot dip galvanising will provide a minimum average coating thickness of 70 µm. When installed in a C3 environment, the coating will provide approximately 33 years until first maintenance.

Table 3: Coating Thicknesses, AS/NZS 4680

Article Thickness, mm	Average Coating Thickness, µm	Average Coating Mass, g/m²
≤ 1.5	45	320
> 1.5 ≤ 3	55	390
> 3 ≤ 6	70	500
> 6	80	600

Table 4: Corrosivity Classifications, AS 4312

Corrosivity Category	
CX	Severe Surf Shoreline
C5	Surf Seashore
C4	Calm Seashore
C3	Coastal
C2	Arid/Urban Inland
C1	Dry Indoors

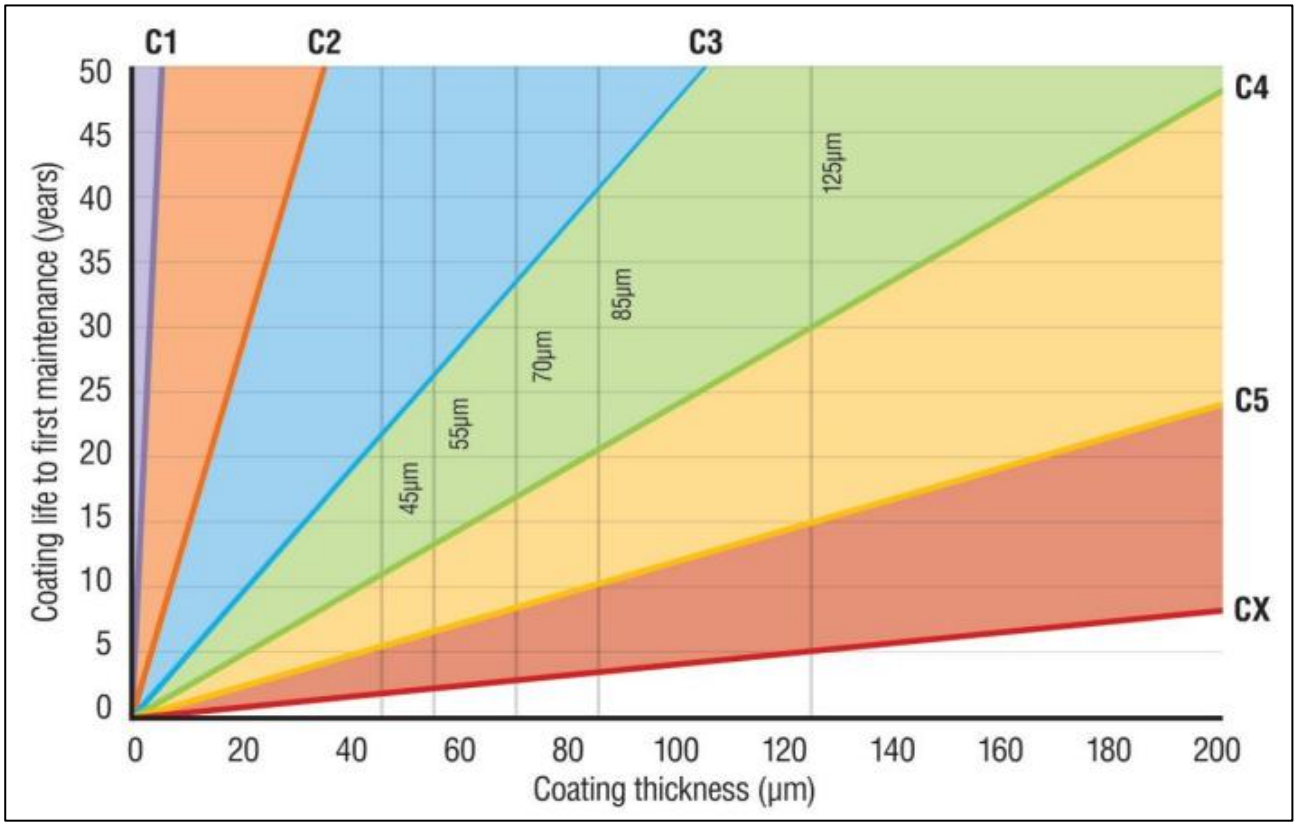
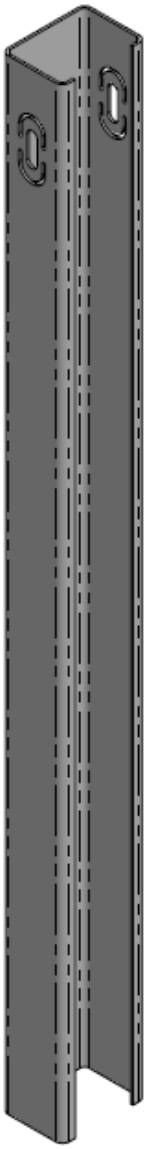
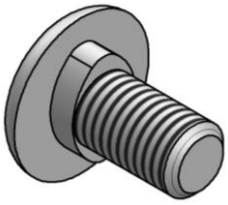


Figure 7: Calculated Corrosivity Rates for Hot Dip Galvanised Coatings, AS/NZS 2312.2.

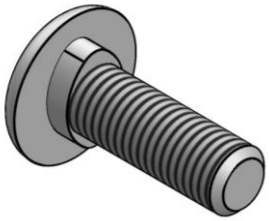
7.0 Component Identification (not to scale)



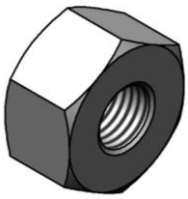
RamShield® Median C-Post
21 kg



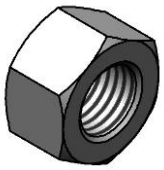
M16 x 32 mm
Mushroom Head Bolt



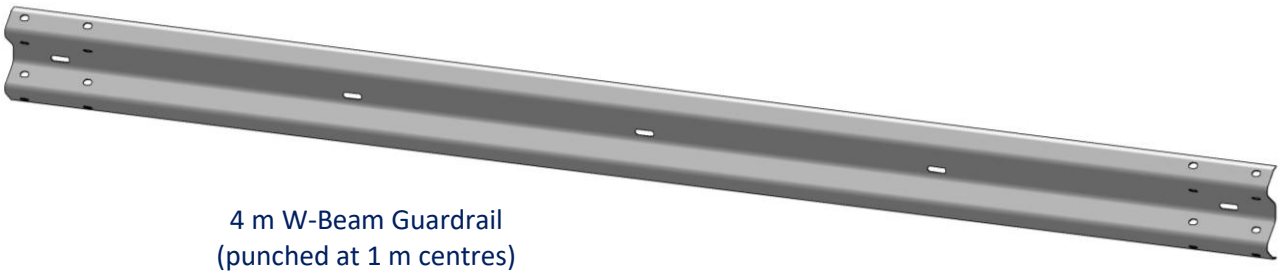
M16 x 50 mm
Mushroom Head Bolt



M16 Oversize Nut



M16 Standard Nut



4 m W-Beam Guardrail
(punched at 1 m centres)
45 kg

8.0 Tools Required

Tools required for the installation of RamShield® Median are the same as those used for the installation of all RamShield® variants. This includes:

- Post driving equipment or auger.
- Battery drill driver with 32 mm attachment.
- Hand socket with 24 mm attachment.
- Metal snips.
- String line.
- Tape measure.
- Hammer.
- 12 mm diameter pinch bar.
- Slings or chains.

8.1 Recommended PPE

It is recommended that the following personal protective equipment (PPE) be provided for the safe installation of RamShield® Median:

- Safety footwear.
- Gloves.
- Hearing protection.
- High visibility clothing.

- PPE as required for the use of post driving equipment or auger.

9.0 Site Establishment

9.1 Traffic Control

Prior to the commencement of any work, the site should be evaluated for risks to workers, pedestrians and other road users. The establishment of traffic control should provide safe travel for passing vehicles and/or pedestrians and appropriately protect workers near the roadside.

9.2 Underground Services

The installation of RamShield® Median requires the supporting C-posts to be embedded into the ground. Prior to the installation of posts an investigation for potential underground hazards is recommended.

9.3 Overhead Obstructions

The site should be evaluated for potential overhead instructions that may present a risk during the installation process. These obstructions typically include power lines, signage or trees.

9.4 Unloading Exclusion Zone

Only appropriate load-rated slings and chains should be used for the safe unloading of product. It is recommended that an exclusion zone be maintained around the unloading process. This provides distance between moving machinery and workers in the event that goods or the machinery move unexpectedly.

Unloading and the storing of the product on a level surface is recommended. Storing product adjacent to the installation area eliminates the requirement for workers to carry items over long distances.

10.0 Installation Sequence

The major steps in the installation of RamShield® Median are as follows:

- Set-out.
- Installing the leading terminal.
- Installing the RamShield® Median C-posts.
- Attachment of the w-beam guardrail.
- Installing the departure terminal.

10.1 Set-Out

It is recommended that a string line be used to establish the alignment of the post locations. When establishing the post locations, take care to note the following:

- RamShield® Median does not use offset blocks.
- The standard post spacing of RamShield® Median is 2.0 m.
- The w-beam guardrail panels are punched at 1 m centres to ensure rail splices are positioned mid-span between posts.
- The RamShield® Median posts are not to be installed within the end terminal region.

10.2 C-Post Installation

Potential Hazards: *Use of post driving equipment or auger, contact with underground hazards, excessive noise, hand injury from pinch points and injury from movements and posture.*

Recommended Control Measures: *Observe the safe work instructions as per machinery requirements, ensure the area has been inspected for underground hazards, wear appropriate hearing protection, wear gloves and observe correct techniques when lifting (bend at the knees).*

The C-posts may be installed by:

- Driving with an appropriate driving head to the required depth, approximately 890 mm, or
- Auguring a minimum 200 mm diameter hole approximately 890 mm deep, placing the post in the hole and backfilling. The backfill material is to be placed in 150 mm lifts and compacted with tamping equipment.

Once installed, the top of the C-post should measure 770 mm above ground level.

When a lateral force of 1 kN is applied in any direction within the top 200 mm of an installed post but before the rail is secured, the movement of the post at ground level must be not more than 3 mm.

10.3 Attaching the W-Beam Guardrails

Potential Hazards: *Injury from movements and posture, hand injury from pinch points, strain to wrists from tightening bolts and excessive noise from use of impact driver.*

Recommended Control Measures: *Observe correct techniques when lifting rails (bend at the knees), wear gloves, use a pinch bar to align holes, use an impact drill to tighten bolts and wear appropriate hearing protection.*

W-beam guardrails manufactured by Safe Direction are punched at 1 m centres providing compatibility with all RamShield® variants.

The rails should be positioned ensuring the rail splice is located mid-span between the C-posts.

The rails are secured to the C-posts using a M16 x 50 mm mushroom head bolt and nut. The nut is tightened using a hand socket and 24 mm attachment.

The guardrail lap is orientated so that the leading edge of the splice is shielded from the nearside approaching traffic. Rails are spliced together mid-span between the C-posts using eight (8) standard M16 x 32 mm mushroom head bolts and oversize nuts. The oversize nuts are tightened using a battery drill driver and 32 mm attachment.

The use of a pinch bar will assist in aligning the splice holes as the bolts are inserted. The use of a driving pin to elongate the splice holes is NOT permitted.

There is no torque requirement for the tightening of the post bolts or splice bolts. They should be tightened to a snug position.

Once secured to the C-posts, the finishing height of the guardrail will be approximately 30 mm above the top of the C-posts.

Note: *A M16 x 32 mm mushroom head bolt may be used as an alternative to secure the rails to the posts.*

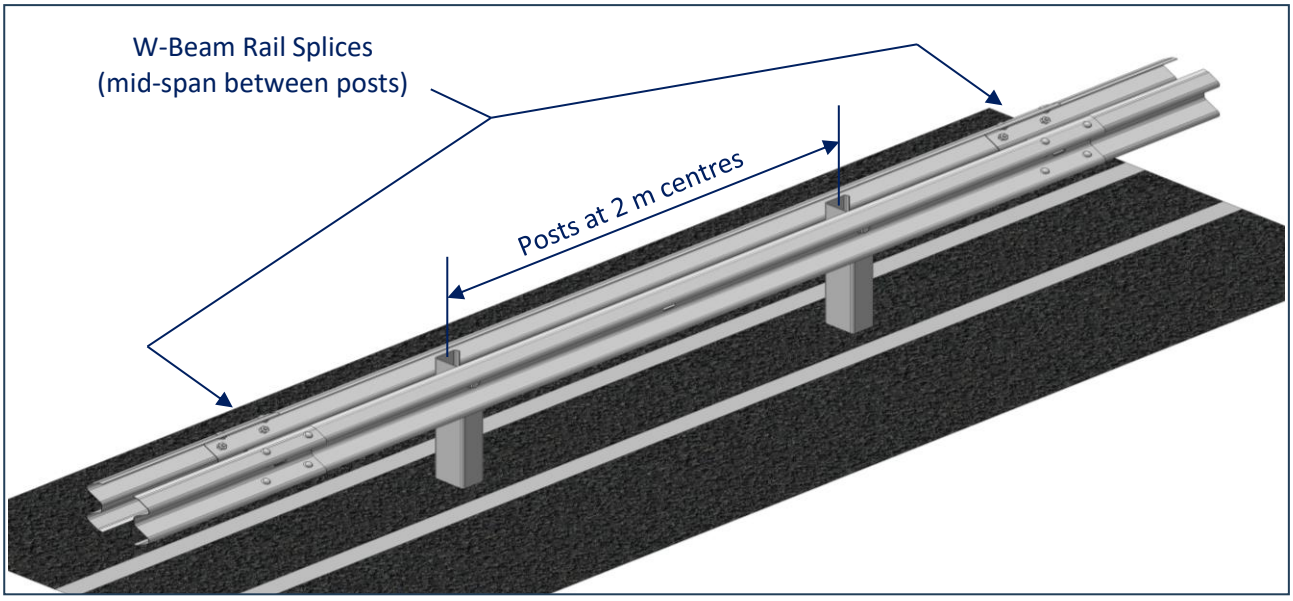


Figure 8: RamShield® Median Assembly.

11.0 Recommended Installation Tolerances

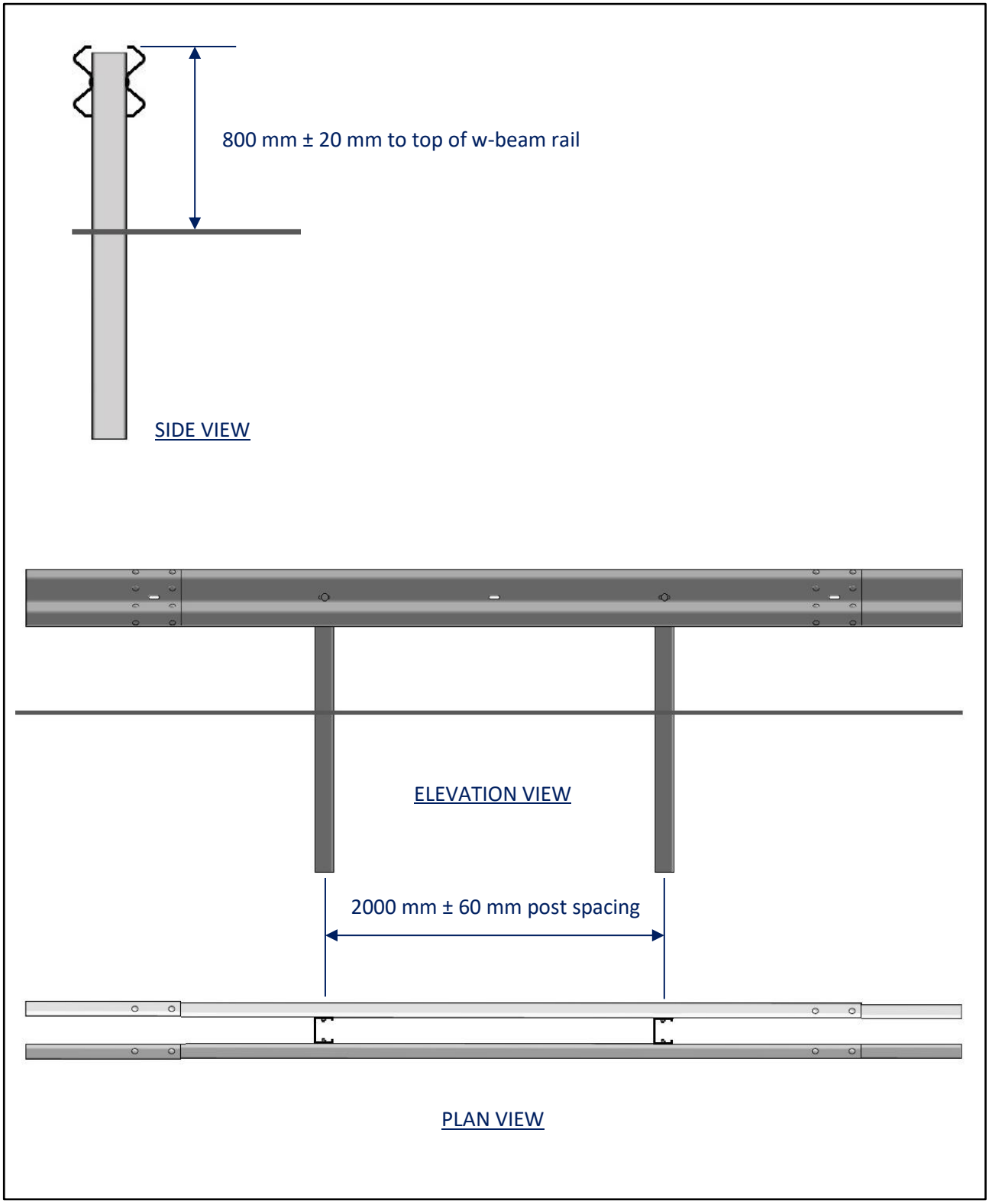


Figure 9: Recommended Installation Tolerances.

RamShield® Median Inspection Form

Inspection Date	
Client	
Project Reference	
Name of Inspector	
Company	

❑ Yes ❑ No	The system is suitably anchored with end terminals.
❑ Yes ❑ No	The posts spacing does not exceed 2.0 m centres.
❑ Yes ❑ No	The height measured to the top of the posts is 770 mm ± 20 mm.
❑ Yes ❑ No	The height measured to the top of the w-beam rails is 800 mm ± 20 mm.
❑ Yes ❑ No	The w-beam rail is secured to each post with one (1) M16 mushroom head bolt & standard nut.
❑ Yes ❑ No	The w-beam rails are spliced with eight (8) M16 x 32 mm mushroom head bolt & oversized nuts.
❑ Yes ❑ No	The w-beam splices are positioned mid-span between posts.
❑ Yes ❑ No	The w-beam rail lap is orientated so that the leading edge of the splice is shielded from approaching traffic.
❑ Yes ❑ No	All bolts are tightened.
❑ Yes ❑ No	The fill material around the posts is suitably compacted.
❑ Yes ❑ No	Any minor damage to the galvanised finish is repaired using two coats of an organic zinc rich paint.
❑ Yes ❑ No	The area around the barrier is free of debris.

Comments/Notes

12.0 Maintenance

RamShield® Median is a low maintenance barrier. Except for repairs due to impacts, it is recommended that an annual inspection be undertaken to assess the following:

- Debris has not accumulated around the barrier which may impede the function of the barrier.
- Vegetation around the barrier is appropriately maintained.
- Nuisance impacts have not gone undetected.
- The end terminals are free from damage.

12.1 Bushfire Damage

RamShield® Median is constructed from hot dip galvanised steel components. The performance of hot dip galvanised components when subjected to a fire depends upon numerous factors such as flame duration, flame intensity and the characteristics of the galvanised finish.

Bushfires can produce high temperatures, however exposure of roadside structures to maximum flame intensity is generally for a short duration as the fire front moves forward. The combination of the reflectivity of the galvanised surface and the heat sink provided by the mass of the steel to which the hot dip galvanising is applied has shown galvanised steel to provide excellent performance during bushfires.

If it is observed that a bushfire has caused damage to the galvanised coating it is recommended that these item(s) be replaced.

13.0 Repair

In the event of a vehicle impact, damage to the barrier is to be assessed in accordance with Table 6. Typically, impacts with RamShield® Median will require replacement of damaged sections of rails and posts. It is recommended that new bolts be used where rails and posts have been replaced.

Additional tools required for repair include:

- Acetylene torch to cut away damaged rail.
- Heavy duty chain to remove damaged posts.
- Sledge hammer.
- Post extractor.

Similar to the installation sequence, it is recommended that the guidelines contained in Section 9.0 be observed in the establishment of traffic control and an unloading exclusion zone in addition to investigation for underground services and overhead obstructions.

13.1 Removal of Damaged Posts

Potential Hazards: *Hand injury from pinch points, hand injury from damaged edges and injury from sudden movement as the posts are released.*

Recommended Control Measures: *Wear gloves and maintain an appropriate exclusion zone around the post until removed.*

Damaged posts should be removed using an appropriate post extractor. Once the damaged post is removed, the ground material should be suitably compacted before a replacement post is installed.

Upstream and downstream posts outside of the impact area should also be inspected for movement and the surrounding ground material recompacted if required.

13.2 Removal of Damaged Rails

Potential Hazards: *hand injury from pinch points, hand injury from damaged edges, injury from sudden movement as rails are released and excessive noise from use of impact drill.*

Recommended Control Measures: *Wear gloves and wear appropriate hearing protection.*

Using an impact drill, remove the splice bolts at the rail connection. Rails that have twisted or bent during impact may need to be cut into manageable sections using an acetylene torch.

13.3 Material Disposal

RamShield® Median features an all steel construction. Damaged items may be recycled.

13.4 Dismantling

RamShield® Median is designed for permanent installations. Dismantling will only be required for permanent removal or following an impact.

The dismantling sequence should follow the installation sequence in reverse observing the same *Potential Hazards* and *Recommended Control Measures*.

When removing damaged C-Posts the ground material should be suitably compacted before a replacement post is installed.

Table 5: Damage Assessment Guidelines.

Type of Damage	Description of the Damage	Remedial Action
Damage to the galvanised coating on the posts.	The sum total of the damaged area does not exceed 60 cm^2 (0.5 % of the total surface area) and no individual damaged area exceeds 40 cm^2.	An organic zinc rich paint is to be applied to the repair area in two coats.
	The sum total of the damaged area exceeds 60 cm^2 (0.5% of the total surface area) or an individual damaged area exceeds 40cm^2.	The post is to be replaced.
Damage to the galvanised coating on the rails.	The sum total of the damaged area does not exceed 200 cm^2 and no individual damaged area exceeds 40 cm^2.	An organic zinc rich paint is to be applied to the repair area in two coats.
	The sum total of the damaged area exceeds 200 cm^2 or an individual damaged area exceeds 40 cm^2.	The rail is to be replaced.
Damage to the posts.	The post is bent.	The post is to be replaced.
Damage to the post tab.	The post tab has distorted and released the post bolt.	The post is to be replaced.
Damage to the rails.	The rail is dented, twisted or flattened.	The rail is to be replaced.
	There are nicks in any part of the rail.	
	The slots in the rail are distorted.	
Damage to bolts.	The body of the bolt is distorted.	The bolt is to be replaced.
	The thread of the bolt is damaged.	
Disturbance of material around the posts.	The material around a post is loose.	The material is to be suitably compacted.

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