INTRODUCTION AND REFERENCES

This hardware summary manual has been prepared to assist organisations and individuals who interact with road safety barrier systems and devices. The technical details within this manual have been extracted from the respective product, installation and technical manuals of each system/device.

For more detailed information, refer to the individual manuals for each product or contact the System Supplier.

The information, commentary and details provided in this manual are collected from a variety of reliable sources however the System Owner/Supplier, and formally issued and endorsed material must still be used as reference material for products. Do not utilise a system/device listed in this manual without first consulting the System Owner/System Supplier and obtaining the correct and most recent documentation for the product.

This manual is prepared with the intention of providing basic outline detail on all permanent road safety barrier systems accepted for use by Waka Kotahi NZ Transport Agency.

DOCUMENT REFERENCES

- AS/NZS 3845 Part 2:2017
- NZTA M23
- NZTA M23 Interim acceptance notices
- AUSTROADS Part 6: Roadside Design, Safety & Barriers
- AUSTROADS Part 3: Geometric Design
- American Association of Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH)

The Transport Agency is part of, and contributes to, the Road to Zero safety strategy. Road to Zero is the government’s strategy to guide improvements in road safety over the period 2020–2030. The strategy’s vision is to stop people being killed or seriously injured on our roads. This means that no death or serious injury while travelling on our roads is acceptable.

For more information visit www.transport.govt.nz/zero
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<th>Definition</th>
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<td><strong>Aesthetic Barrier</strong></td>
<td>A road safety barrier with improved aesthetics compared to other barrier types but reduced safety performance and/or lacking a crashworthy end terminal</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Public Domain</td>
<td>A road safety barrier system that is not the subject of patent or other intellectual property rights within Australia and New Zealand. Note: These systems are also referred to as non-proprietary road safety barrier systems</td>
</tr>
<tr>
<td>RCA</td>
<td>Road Controlling Authority that has control of the road, sometimes referred to as Road Authority</td>
</tr>
<tr>
<td>Redirective</td>
<td>The ability of a barrier system to redirect an impacting vehicle away from the barrier without barrier pocketing or rupture</td>
</tr>
<tr>
<td>Ribbon Strength</td>
<td>The longitudinal strength of a barrier system to provide crash energy containment and redirection</td>
</tr>
<tr>
<td>Rigid Barrier</td>
<td>Barrier system that has no deflection under impact. Higher impact energy transmitted to vehicle and occupants</td>
</tr>
<tr>
<td>Semi-Rigid Barrier</td>
<td>Barrier systems which deflect during re-direction. Impact energy to vehicle and occupants is less than for a rigid system but greater than a flexible system</td>
</tr>
<tr>
<td>Shy Line</td>
<td>The distance from the edge of the travelled way outside of which the start of a roadside object (e.g. barrier) will not cause a driver to change their vehicles lateral placement or speed</td>
</tr>
<tr>
<td>Sight/ Anti-Gawk Screens</td>
<td>Screens to shield visual distractions from passing drivers</td>
</tr>
<tr>
<td>Slope</td>
<td>The relative steepness of the terrain expressed as a ratio or percentage</td>
</tr>
<tr>
<td>System Installer</td>
<td>The entity that installs the system</td>
</tr>
<tr>
<td>System Owner</td>
<td>The entity that has the property rights to the road safety hardware system through their ownership of the patent</td>
</tr>
<tr>
<td>System Supplier</td>
<td>The entity that supplies the system or device</td>
</tr>
<tr>
<td>Test Level (TL)</td>
<td>A set of prescribed test conditions, defined in terms of vehicular mass, impact speed and angle that defines the crash energy</td>
</tr>
<tr>
<td>Uni-directional application</td>
<td>One-way traffic. E.g. Barrier hardware that cannot be hit by opposing traffic</td>
</tr>
<tr>
<td>Vaulting</td>
<td>Abrupt upward movement of an impacting vehicle</td>
</tr>
<tr>
<td>Wear and tear</td>
<td>Damage that naturally and inevitably occurs as a result of normal use or aging</td>
</tr>
<tr>
<td>Working Width</td>
<td>The minimum width that is required to prevent an impacting design vehicle from colliding with an object behind a road safety barrier system. This includes both the dynamic deflection of the road safety barrier (if any) and the extra width to allow for the roll (vertical rotation) of an impacting vehicle</td>
</tr>
<tr>
<td>WRSB</td>
<td>Wire Rope Safety Barrier, a flexible barrier system</td>
</tr>
</tbody>
</table>
The following general notes apply to all flexible barriers:

- Anchor and line post concrete foundations for Wire Rope Safety Barrier (WRSB) systems require sufficient strength from supporting soil to perform as designed. This must be confirmed by the Installation Designer prior to confirming the foundation type and confirmed with pull-out tests as per the System Supplier’s recommendations.

- Currently all compliant WRSB systems available in NZ have been tested to NCHRP 350 TL-4 only.

- WRSB cables that are under tension must be de-tensioned prior to cutting.

- Drive-by system inspections are recommended at least monthly, and hands-on inspections are recommended at least yearly.

- All WRSB systems must be checked after impacts to ensure that the tension is maintained.

- In accordance with NZTA letter to industry dated 16 April 2019 all WRSB are expected to transition to MASH compliant products as these become available.
## SUMMARY

**SYSTEM SUPPLIER:** CSP Pacific ([http://www.csppacific.co.nz](http://www.csppacific.co.nz))

**TEST LEVEL / CONDITIONS:** NCHRP 350 TL-4

**PRODUCT MANUAL:** [Click for product manual download](#)

**FOR USE WITH** Armorwire Terminal End (A.T.E)

**STATUS** Accepted

## TECHNICAL INFORMATION

### DIMENSIONS
- Cable heights (to centre of cable): TL-4: 790 mm, 770 mm, 650 mm and 530 mm (± 25 mm)
- Cable: 19 mm 3 x 7 strand, pre-stretched by 35%
- Post spacing: 3 m

### MINIMUM LENGTH
Minimum barrier length is 114 m and represents the distance between the upstream and downstream Length of Need of the terminal ends. i.e. excludes the 8 m of Armorwire Terminal End (A.T.E) cable at each end

### DEFLECTION
1.54 m (at 3 m post spacing, based on NCHRP 350 TL-3 test)

### WORKING WIDTH
- 1.54 m (at 3 m post spacing, based on NCHRP 350 TL-3 test)
- 2.15 m (at 3 m post spacing, based on NCHRP 350 TL-4 test)

### FOOTINGS
- Default footing: Concrete footings 300 mm diameter, 750 mm deep
- Alternate footing #1: Concrete footings as per NZ Transport Agency TAN #16-18
- Alternate footing #2: Proprietary driven socket may be used through both barrier and terminal length where the ground conditions have been demonstrated to meet or exceed AASHTO Standard Soil. Site specific acceptance is required from the RCA with the site recorded in RAMM for maintenance purposes

### CLEAR AREA
6 m x 22.5 m clear area directly behind the A.T.E to enable system to gate if impacted

### GRADE OR PLACEMENT RESTRICTIONS
- A maximum slope of 10H:1V is preferable. On slopes greater than this, advice should be followed from the Road Controlling Authority’s guidelines
- Offset to hinge point = 1 m minimum

### OTHER RESTRICTIONS / CONSIDERATIONS
- Used in both median and roadside situations in either orientation as long as the slot arrangement is consistent
- Maximum flare is 30:1
- The four line posts between the terminal end ‘trigger’ post and the Armorwire cable barrier must always be at 2 m spacing
- Armorwire bolt down post is available (site specific acceptance required from RCA)
- Length of need is met at Post 5 for the system
- Minimum allowable horizontal curve is 200 m radius
- Minimum allowable vertical sag is 2400 m radius
- Refer also to general notes for flexible barriers
# BRIFEN 4 CABLE WIRE ROPE SAFETY BARRIER (WRSB)

**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Steelgal <a href="http://www.steelgal.co.nz">http://www.steelgal.co.nz</a></th>
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<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-4</td>
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<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Brifen cast in or surface mounted anchor</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- Cable heights (to centre of cable): 930 mm, 780 mm, 630 mm and 480 mm
- Cable: Pre-stretched 19 mm 4 x 7 strand
- Post spacing: 3.2 m

### MINIMUM LENGTH
60 m between points of redirection

### WORKING WIDTH
Not available

### DEFLECTION
2.21 m at 3.2 m post spacing (based on NCHRP 350 TL-4 test)

### FOOTINGS
- Default footing: Concrete footings 250 mm diameter, 750 mm deep
- Alternate footing #1: Concrete footings as per NZ Transport Agency TAN #16-18

### CLEAR AREA
6 m wide by 22.5 m long from terminal nose

### GRADE OR PLACEMENT RESTRICTIONS
- A maximum slope of 10H:1V is preferable. On slopes greater than this, advice should be followed from the RCA’s guidelines
- Offset to hinge point = 1 m minimum

### OTHER RESTRICTIONS / CONSIDERATIONS
- For roadside situations use Z shaped posts and in medians use S shaped posts
- Point of redirection is 11.2 m from the anchor.
- Minimum installation radius is 200 m unless site specific acceptance is sought (and given) by the Lead Safety Advisor (Roads & Roadsides)
- Minimum vertical sag curve is 3000 m
- For Brifen WRSB systems installed pre-2014: the anchor blocks are required to be upgraded to TL-3 tested specification if impacted, or installation is being upgraded or modified
- Refer also to general notes for flexible barriers
## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ <a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-4</td>
</tr>
<tr>
<td>PRODUCT MANUAL</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>12 m long NCHRP 350 TL3 tested anchor system</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- Cable heights (to centre of cable): 720 mm, 640 mm, 560 mm and 480 mm
- Steel Wire Rope: 19.0 mm Diameter 3x7 strands
- Post spacing: up to 3.0 m

### MINIMUM LENGTH
The recommended minimum length of a Safence installation is 40 m between points of redirection.

### WORKING WIDTH
Not available

### DEFLECTION
1.60m at 3m post spacing (based on NCHRP 350 TL-3 test)

### FOOTINGS
- Default footing: Concrete footings 300 mm diameter, 750 mm deep
- Alternate footing #1: Concrete footings as per NZ Transport Agency TAN #16-18
- Alternate footing #2: Proprietary driven socket may be used through both barrier and terminal length where the ground conditions have been demonstrated to meet or exceed AASHTO Standard Soil. Site specific acceptance is required from the RCA with the site recorded in RAMM for maintenance purposes

### CLEAR AREA
6 m wide by 22.5 m long from terminal nose

### GRADE OR PLACEMENT RESTRICTIONS
- Steepest gradient: 1V:10H
- Offset to hinge point = 1 m minimum

### OTHER RESTRICTIONS / CONSIDERATIONS
- The maximum allowable post spacing for this system is 3.0 m. Closer post spacings are acceptable in order to accommodate installation on curves
- The recommended maximum run length of a Safence installation is 1200 m
- Minimum allowable sag vertical curve for wire rope barriers is 30 m
- Point of redirection is 12.6 m from the anchor
- Minimum allowable curve is 150 m radius
- Refer also to general notes for flexible barriers
SEMI-RIGID BARRIERS

The following general notes apply to all semi-rigid barriers:

- Semi-rigid barrier posts require sufficient strength from the supporting soil to function as required and remain at the correct height. If it is determined that soil conditions on site are not equivalent to the as-tested requirements, alternative installation options will need to be considered. These options will depend on the circumstances but may require input from the System Owner or RCA.

- Accepted M23-compliant W-beam end terminals must be used to terminate and anchor W-beam barriers, except where the W-beam is transitioned to a rigid barrier using an accepted transition.

- W-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 ribs within 2m.

- Thrie-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 or more ribs within 2m.

- Can be used for long term or temporary work area protection.

- Where the barrier posts damage the ground surface, creating potential for water ingress, this must be rectified e.g. by sealing with a granular and bitumen mixture.
## EZY-GUARD 4 W-BEAM GUARDRAIL

### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ <a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>M23-compliant W-beam end terminals (e.g. SoftStop W-beam terminal)</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### TECHNICAL INFORMATION

| DIMENSIONS                | • Z-Post Length: 1650 mm (embedment depth 873 mm)                      |
|                           | • System Width: 200 mm                                                |
|                           | • Rail Height: 790 mm                                                 |
|                           | • Post spacing: 1.905 m                                               |
| MINIMUM LENGTH            | 34.3 m (excluding terminals)                                          |
| DEFLECTION                | 1.65 m                                                                 |
| WORKING WIDTH             | 1.65 m                                                                 |
| WEIGHT                    | • Post mass: 12.5 kg (2 posts required per guardrail panel)            |
|                           | • W-beam guardrail: 47 kg (per panel)                                 |
| GRADE OR PLACEMENT        | A maximum approach and cross slope of 1V:10H is preferable. On slopes|
| RESTRICTIONS              | greater than this, approval is required from the RCA                 |
| OTHER RESTRICTIONS /      | • Ezy-Guard 4 can be used for curves with radius ranging from 5 m to   |
| CONSIDERATIONS            | 45 m. Curves in excess of 45 m do not require shop curving as the rail|
|                           | can be field installed to suit. If the curve is less than 25 m, refer |
|                           | to NZTA technical note TM-2008                                       |
|                           | • All new installations of Ezy-Guard are to be of the Ezy-Guard 4 W-   |
|                           | beam barrier system variant only                                      |
|                           | • This system can be installed on the roadside or in the median (double-|
|                           | sided variant).                                                       |
|                           | • The Ezy-Lift carriage may be used with this system where the road   |
|                           | surface has been overlaid                                              |
|                           | • Refer also to general notes for semi-rigid barriers                 |
# NU-GUARD® 31 W-BEAM GUARDRAIL

## SUMMARY

**SYSTEM SUPPLIER:** CSP Pacific [http://www.csppacific.co.nz](http://www.csppacific.co.nz)

**TEST LEVEL / CONDITIONS:** MASH TL-3

**PRODUCT MANUAL:** [Click for product manual download](#)

**FOR USE WITH**

M23-compliant W-beam end terminals (e.g. MAX-Tension W-beam terminal)

**STATUS**

Accepted

## TECHNICAL INFORMATION

### DIMENSIONS

- Post Length: 1980 mm
- System Width: 0.61 mm
- System Height: 787 mm
- Post spacing: 1.905 m

### MINIMUM LENGTH

34.3 m (excluding terminals)

### DEFLECTION

1.30 m

### WORKING WIDTH

1.33 m at MASH TL-3

### WEIGHT

- Post: 14.78 kg (2 posts required per guardrail panel)
- W-beam guardrail: 47 kg

### GRADE OR PLACEMENT RESTRICTIONS

A maximum approach and cross slope of 1V:10H is preferable. On slopes greater than this, approval is required from the RCA

### OTHER RESTRICTIONS / CONSIDERATIONS

- For radii below 25 m, refer to NZTA technical note TM-2008
- Transitions to other barrier types available
- From December 2017, all Nu-Guard 31 installations must have top of post 10mm below top edge of W-beam element. Existing installations with the posts above the W-beam may be retrospectively adjusted to new configuration. Top of W-beam element unchanged at 790mm
- This system can be installed on the roadside or in the median
- Refer also to general notes for semi-rigid barriers
## RAMSHIELD® W-BEAM GUARDRAIL

### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Steelgal NZ Ltd <a href="http://www.steelgal.co.nz/">http://www.steelgal.co.nz/</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>M23-compliant W-beam end terminals (e.g. MSKT (MASH Sequentially Kinking Terminal – Steel post variant) W-beam terminal</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### TECHNICAL INFORMATION

| DIMENSIONS | • Post Length: 1560 mm System Width: 183 mm  
|            | • System Height: 800 mm Post spacing: 1.905 m |
| MINIMUM LENGTH | 66m (excluding terminals) |
| DEFLECTION | 1.56 m |
| WORKING WIDTH | 1.63 m |
| WEIGHT | • Post: 15 kg (2 posts required per guardrail panel)  
|            | • W-beam guardrail: 47 kg |
| GRADE OR PLACEMENT RESTRICTIONS | A maximum approach and cross slope of 1V:10H is preferable. On slopes greater than this, approval is required from the road controlling authority |
| OTHER RESTRICTIONS / CONSIDERATIONS | • Any increase in height to match W-beam terminal end must occur over a minimum of 2 lengths (7.62 m)  
|            | • For radii below 25 m, refer to NZTA technical note TM-2008  
|            | • Transitions to other barrier types available  
|            | • This system can be installed on the roadside or in the median (single sided). The system has been crash tested to MASH TL3 testing criteria.  
|            | • Refer also to general notes for semi-rigid barriers |
## EZY-GUARD HC THRIE-BEAM GUARDRAIL

### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ <a href="http://www.ingalcivil.co.nz">www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3 and TL-4</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>A suitable W-beam terminal can be used in conjunction with an appropriate transition to provide a crashworthy terminal and anchorage</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### TECHNICAL INFORMATION

#### DIMENSIONS

- Z-Post length: 2000 mm (The Z-post embedment depth is 1030 mm)
- System Width: 245 mm
- Rail Height: 980 mm
- Post spacing: 2000 mm

#### MINIMUM LENGTH

MASH TL-4 system 26 m (excluding transitions and terminals)

#### DEFLECTION

- 1.16 m (MASH TL-3)
- 1.77 m (MASH TL-4)

#### WORKING WIDTH

- 1.16 m (MASH TL-3)
- 2.46 m at (MASH TL-4)

#### WEIGHT

- Post mass: 19.5 kg (2 posts required per guardrail panel)
- Thrie-beam guardrail: 72 kg (per panel)

#### GRADE OR PLACEMENT RESTRICTIONS

A maximum approach and cross slope of 1V:10H is preferable. On slopes greater than this, approval is required from the road controlling authority

#### WORKING WIDTH

Roll allowance to be calculated in accordance with Austroads Part 6

#### OTHER RESTRICTIONS / CONSIDERATIONS

- Accepted transitions must be used to connect the Ezy Guard HC barrier system to adjoining W-beam barrier and/or terminals
- This system can be installed on the roadside or in the median (double-sided variant).
- Refer also to general notes for semi-rigid barriers
### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Public domain (open source) - no specific supplier</th>
</tr>
</thead>
</table>
| TEST LEVEL / CONDITIONS: | - TL-4: minimum height 915 mm  
- TL-5: minimum height 1070 mm |
| FOR USE WITH | Used as either median barriers (doubled sided) or roadside (single sided) barriers with appropriate transition to semi-rigid barriers (RSB-5) |
| ACCEPTANCE NOTICE | Accepted |

### TECHNICAL INFORMATION

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>Refer to M23 Appendix B (refer also AASHTO SGM10a-b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEIGHT</td>
<td>915 kg per lineal metre (approximate, for median TL-4)</td>
</tr>
</tbody>
</table>
| MINIMUM LENGTH | - Minimum unit length: 6 m  
- Minimum installation length: 24 m  
- Maximum barrier length between anchor footings: 60 m |
| DEFLECTION | Rigid system – designed to facilitate 0.0 m deflection |

| OTHER RESTRICTIONS / CONSIDERATIONS | For additional details refer to NZ Transport Agency M23 Appendix B  
- Specification for slip formed variant provided as Appendix D of this Specification  
- Reinforcing steel shall be grade 500E or 500N conforming to AS/NZS 4671 and increased from 15 mm to 16 mm  
- Concrete used in the construction shall comply with the requirements of NZS 3109 and shall be manufactured in accordance with NZS 3104  
- The minimum concrete cover depth is 50mm  
- 28-day compressive strength 30 MPa  
- The barrier may be cast-in-place, slip formed or pre cast. All precast segments or cast-in-place segments less than 12 m in length must be joined to adjacent sections by at least three 25 mm diameter steel dowels (TL4), at least four 25 mm diameter steel dowels (TLS), or an equivalent joining method accepted by the RCA  
- Open joints should be provided at least every 60 m, although 6 m is more common  
- A 3 m long 250 mm deep reinforced anchor footing must be provided at both ends, and at least every 60 m, to properly secure the barrier  
- “Pin and loop” or other temporary concrete barrier joint configurations are not accepted for use as permanent barriers (also note these are semi-rigid, not rigid barriers) |

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**RIGID ROADSIDE & MEDIAN BARRIERS**

**F-SHAPE CONCRETE BARRIER**
# VGAN 300 ALUMINIUM BRIDGE BARRIER

## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Steelgal <a href="http://www.steelgal.co.nz">www.steelgal.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-3 and TL-4</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Transition available to TL-4 Thrie-beam and then on to standard 12g W-beam guardrail systems</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- Post Spacing: 3.0 m centres
- System Height: 1.07 m
- Minimum plinth width: 450 mm

### WEIGHT
- 25.4 kg per lineal metre

### MINIMUM LENGTH
- Minimum length of the bridge parapet is as follows:
  - 15 m for TL-3
  - 30 m for TL-4

### GRADE OR PLACEMENT RESTRICTIONS
- Cannot be used where pedestrian protection has to meet the NZ Building Code unless appropriate mesh affixed to traffic face of system and RCA accepts height of system as being appropriate for application

### DEFLECTION
- Nominal system deflection is 300 mm at NCHRP 350 TL-4

### OTHER RESTRICTIONS / CONSIDERATIONS
- Mesh infill option available for pedestrian anti-climb protection
- The minimum horizontal curvature without pre-curving of main rails is 150 m. Smaller radii can be accommodated with pre-curving
- The manufacturer’s connection detail in conjunction with the NZ Transport Agency standard transition detail (RSB-5) must be used to connect the VGAN 300 Aluminium Bridge Barrier system to a semi-rigid road safety barrier on the structure approach
- Where parapet meshing is required to meet Building Code and or road controlling authority requirements, the manufacturer’s detail must be used, or an alternative fixing agreed
- Classed as a rigid performance level 4 barrier system in terms of the NZ Transport Agency Bridge Manual
AESTHETIC BARRIERS

The following general notes apply to all aesthetic barriers:

- Aesthetic barrier systems comprise timber facings over steel rails and steel posts. The timber facings result in more visually appealing systems than those using steel components.

- Aesthetic barrier systems are considered suitable for use on local road networks with vehicle operating speeds up to 70 km/h (equivalent to NCHRP Report 350 TL-2 crash test conditions) at the discretion of the road controlling authority.

- Currently no MASH or NCHRP 350 crash tested end terminal is available for aesthetic barrier systems.

- Not for use on the state highway network.

- Aesthetic barrier systems are terminated using a proprietary sloping end which should be flared away from traffic, wherever possible, to mitigate risk of end-on impact. The terminal end should be flared away from the road at least 300 mm. Whenever practical consider extending the rail and terminal end to achieve a greater flare.
## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>TERTU Equipements S.A.S.  <a href="http://www.tertu.com">www.tertu.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-2 (Tested to EN1317 N2 – 1500 kg car at 110 km/h and 20°)</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td>Contact System Supplier</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Tested with a proprietary 4 m sloping end anchored to the ground</td>
</tr>
<tr>
<td>STATUS</td>
<td>Not for use on state highways without site specific acceptance from Lead Safety Advisor (Roads &amp; Roadsides)</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS

- Post Spacing: 4 m (4M) or 2 m (4MS2)
- Rail Height: 700 mm ± 20 mm above ground level height

### MINIMUM LENGTH

60 m (excluding terminals)

### OTHER RESTRICTIONS / CONSIDERATIONS

- Posts can be moved along the rail without affecting the rail integrity, if required to avoid underground services, boulders or tree roots, on installation
- The Lograil 4M and 4MS2 systems are terminated using a proprietary 4 m sloping end which should be flared away from traffic, wherever possible, to mitigate risk of end-on impact. Recommended installation is that the terminal end should be flared away from the road at least 300 mm. Whenever practical consider extending the rail and terminal end to achieve a greater flare
- Handrail systems can be added at any height required for cyclists and pedestrians at discretion of road controlling authority
- Back masks for the rail and posts are available to cover steel components at the rear of the Lograil
- Refer also to general notes for aesthetic barriers
# TIMBER FACED GUARDRAIL G4M AND G2M

## SUMMARY

**SYSTEM SUPPLIER:** Commodore Trading [www.guardrailnz.com](http://www.guardrailnz.com)

**TEST LEVEL / CONDITIONS:** NCHRP 350 TL-2 (Tested to EN1317 N2 – 1500 kg car at 110 km/h and 20°)

**PRODUCT MANUAL:** [Click for product manual download](#)

**FOR USE WITH**

Attaches to C100 anchor with terminal end rail

**STATUS**

Not for use on state highways without site specific acceptance from Lead Safety Advisor (Roads & Roadsides)

## TECHNICAL INFORMATION

### DIMENSIONS

- Post Spacing: 4 m or 2 m
- Rail Height: 700 mm ± 20 mm above ground level height

### MINIMUM LENGTH

60 m (excluding terminals)

### OTHER RESTRICTIONS / CONSIDERATIONS

- Posts can be moved along the rail without affecting the rail integrity, if required to avoid underground services, boulders or tree roots, on installation
- The Timber Faced Guardrail G4m & G2m is terminated using a proprietary sloping end which should be flared away from traffic, wherever possible, to mitigate risk of end-on impact
- Recommended installation is that the terminal end should be flared away from the road at least 300 mm. Whenever practical consider extending the rail and terminal end to achieve a greater flare
- Handrail systems can be added at any height required for cyclists and pedestrians at discretion of road controlling authority
- Back masks for the rail and posts are available to cover steel components at the rear of the Timber Faced Guardrail
- Refer also to general notes for aesthetic barriers
### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Commodore Trading <a href="http://www.guardrailnz.com">www.guardrailnz.com</a></th>
</tr>
</thead>
</table>
| TEST LEVEL / CONDITIONS: | NCHRP 350 TL-2  
Tested to EN1317 N2 – 1500 kg car at 110 km/h and 20° with 1.5, 2, 3, 4 & 6 m post spacing  
Tested as EN1317 H1 – 10000 kg truck at 70 km/h and 15° with 1.5 m post spacing |
| PRODUCT MANUAL: | [Click for product manual download](#) |
| FOR USE WITH | Tested with a proprietary sloping end anchored to the ground |
| STATUS | Not for use on state highways without site specific acceptance from Lead Safety Advisor (Roads & Roadsides) |

### TECHNICAL INFORMATION

| DIMENSIONS | • Post Spacing: 1.5, 2, 3 or 6 m  
• Rail Height: 781 mm ± 20 mm above ground level height |
| MINIMUM LENGTH | 84 m (excluding terminals) |
| OTHER RESTRICTIONS / CONSIDERATIONS | Refer to general notes for aesthetic barriers |
## CONTINUOUS MOTORCYCLIST PROTECTION SYSTEMS (CMPS)

### BIKER-SHIELD™ MOTORCYCLIST PROTECTION RAIL

<table>
<thead>
<tr>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYSTEM SUPPLIER:</strong></td>
</tr>
<tr>
<td><strong>TEST LEVEL / CONDITIONS:</strong></td>
</tr>
<tr>
<td><strong>PRODUCT MANUAL:</strong></td>
</tr>
<tr>
<td><strong>FOR USE WITH</strong></td>
</tr>
<tr>
<td><strong>ACCEPTANCE NOTICE</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TECHNICAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIMENSIONS</strong></td>
</tr>
<tr>
<td>- Splice joint spacing: 3.81 m</td>
</tr>
<tr>
<td>- Bracket spacing: 1.905 m (midspan)</td>
</tr>
<tr>
<td><strong>MINIMUM LENGTH</strong></td>
</tr>
<tr>
<td>Minimum length of installation should match associated installation of supporting W-beam system</td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
</tr>
<tr>
<td>5.90 kg per metre</td>
</tr>
<tr>
<td><strong>PERFORMANCE</strong></td>
</tr>
<tr>
<td>Dummy tested to EN1317-8 Impact Severity Level 2 for following tests:</td>
</tr>
<tr>
<td>- TM 1.60: Dummy to post, 60 km/h 30° angle of impact</td>
</tr>
<tr>
<td>- TM 3.60: Dummy to point on barrier midway between posts, 60 km/h 30° angle of impact</td>
</tr>
<tr>
<td>Tested to MASH TL3: 1,100 kg car at 100 km/h and 25° angle of impact</td>
</tr>
<tr>
<td><strong>OTHER RESTRICTIONS / CONSIDERATIONS</strong></td>
</tr>
<tr>
<td>- Quick installation on new or retrofit projects</td>
</tr>
<tr>
<td>- Rail must be clear of the ground underneath</td>
</tr>
<tr>
<td>- Mounting bracket allows limited height adjustment for uneven/obstructed terrain</td>
</tr>
<tr>
<td>- Kerbs and other drainage features may affect performance</td>
</tr>
<tr>
<td>- A BIKER-SHIELD™ bullnose must be installed on the leading and trailing end of the system</td>
</tr>
<tr>
<td>- It is recommended that BIKER-SHIELD™ not be installed within the guardrail end terminal section</td>
</tr>
<tr>
<td>- May be retrofitted to Strong Post and Nu-Guard 31 W-beam barrier systems with site specific sign off by the Lead Safety Advisor (Roads &amp; Roadsides)</td>
</tr>
</tbody>
</table>
## INGAL MOTORCYCLIST PROTECTION RAIL

### SUMMARY

**SYSTEM SUPPLIER:** Ingal Civil NZ [http://www.ingalcivil.co.nz](http://www.ingalcivil.co.nz)

**TEST LEVEL / CONDITIONS:** Continuous Motorcyclist Protection System (CMPS) under AS/NZS3845.1:2015

**PRODUCT MANUAL:** [Click for product manual download](#)

**FOR USE WITH**

- Ingal Ezy-Guard W-beam barrier systems and Strong Post Timber W-beam (SGR04B). May also be fitted to Nu-Guard 31 W-beam barrier if accepted by the RCA

**ACCEPTANCE NOTICE**

- Accepted

### TECHNICAL INFORMATION

#### DIMENSIONS

- Splice joint spacing: 3.81 m
- Bracket spacing: 1.905 m
- Rail height above ground: 60 mm clearance underneath

#### MINIMUM LENGTH

Minimum length of installation should match associated installation of supporting W-beam system

#### WEIGHT

- 4.65 kg per metre

#### PERFORMANCE

Tested to EN1317-8 Impact Severity Level 1 for following tests:

- TM 1.60: Dummy to post, 60 km/h 30° angle of impact
- TM 3.60: Dummy to point on barrier midway between posts, 60 km/h 30° angle of impact. TB11: 900 kg car at 100 km/h and 20° angle of impact
- TB32: 1,500 kg car at 110 km/h and 20° angle of impact

#### OTHER RESTRICTIONS / CONSIDERATIONS

- Quick installation on new or retrofit projects
- Kerbs and other drainage features may affect performance
- Special post bracket allows for easy height adjustment for uneven/obstructed terrain
- 60mm height allows for easy drainage of the road
- Can be applied to curved W-beam with radii down to 26m. For lower radii pre-curved rail is available
- The motorcyclist rail can be assembled and raised without the need to modify the existing W-beam barrier system
- The rail height ensures a uniform distance from the ground throughout the run and compensating for uneven terrain and height differences in the existing barriers
- Each end of the run must be terminated with an MPR Terminal End
- May be retrofitted to Strong Post and Nu-Guard 31 W-beam barrier systems with site specific sign off by the Lead Safety Advisor (Roads & Roadsides)
# W-BEAM END TERMINALS

## MSKT END TERMINAL

### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Steelgal <a href="http://www.steelgal.co.nz">www.steelgal.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>W-beam guardrail</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### TECHNICAL INFORMATION

#### DIMENSIONS

- Length: 14.29 m (TL-3)
- Rail height: 790 mm
- Post spacing: 1905 mm centres

#### POINT OF REDIRECTION

Length of need measured from point of redirection at Post #3

#### CLEAR AREA

6 m x 22.5 m clear area to enable the system to gate if impacted downstream from head

#### GRADE OR PLACEMENT RESTRICTIONS

- Maximum approach and cross slope of 10H:1V
- Terminal grading in accordance with NZTA RSB-3

#### OTHER RESTRICTIONS / CONSIDERATIONS

- The primary mechanism for dissipation of end impact energy is through extrusion of the W-beam element. Extruded rail is flattened and spools out the back of the barrier, away from the road
- First rail used must be a special kinking rail with slotted holes
- 600 mm maximum flare at impact head
- Any reduction in height to match W-beam barrier must occur over a minimum of 2 lengths (7.62 m)
- W-beam splices at mid-span of the posts
- Drive-by system inspections are recommended at least monthly, and hands-on inspections are recommended at least yearly
### MAX-Tension END TERMINAL SYSTEM

**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>CSP Pacific <a href="http://www.csppacific.co.nz">http://www.csppacific.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td>Click for product manual download</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>W-beam guardrail</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

**TECHNICAL INFORMATION**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• TL-3 length: 16.77 m</td>
<td></td>
</tr>
<tr>
<td>• TL-2 length: 7.89 m</td>
<td>(not for state highway use)</td>
</tr>
<tr>
<td>• System width: 180 mm</td>
<td></td>
</tr>
<tr>
<td>• System height: 787 mm</td>
<td></td>
</tr>
<tr>
<td>• Post Spacing: Generally, 1905mm centres except posts 0-1 (1619 mm), posts 1-2 (953 mm) and posts 5-6 (1848 mm)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POINT OF REDIRECTION</th>
<th>Length of need measured from point of redirection at post #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEAR AREA</td>
<td>6 m x 22.5 m clear area to enable the system to gate if impacted downstream from head</td>
</tr>
</tbody>
</table>

**GRADE OR PLACEMENT RESTRICTIONS**

- Maximum approach and cross slope of 10H:1V
- Flared or tangential terminal layouts acceptable
- Terminal grading in accordance with NZTA RSB-3

**OTHER RESTRICTIONS / CONSIDERATIONS**

- Deceleration is controlled by friction developed in the tension cables and by cutting the downstream guardrail panels
- 610 mm maximum flare at impact head
- The frequency of drive-by inspections is dependent on the traffic volume and the impact history of the system. Drive-by inspections are recommended at least monthly
- Hands-on inspections are recommended at least yearly
- W-beam splices at mid-span of the posts
- Drive-by system inspections are recommended at least monthly, and hands-on inspections are recommended at least twice yearly
## SYSTEM SUPPLIER:
Ingal Civil NZ [http://www.ingalcivil.co.nz](http://www.ingalcivil.co.nz)

## TEST LEVEL / CONDITIONS:
MASH TL-3

## PRODUCT MANUAL:
[Click for product manual download](#)

## FOR USE WITH
W-beam guardrail

## STATUS
Accepted

## TECHNICAL INFORMATION

### DIMENSIONS
- **TL-3** length: 15.48 m
- **TL-2** length: 7.89 m (not for state highway use)
- System width: 180 mm  
  System height: 787 mm
- Post Spacing: 1905 mm centres

### POINT OF REDIRECTION
Length of need measured from point of redirection at Post #3

### CLEAR AREA
6m x 22.5m clear area to enable the system to gate if impacted downstream from head

### GRADE OR PLACEMENT RESTRICTIONS
- Maximum approach and cross slope of 10H:1V
- Flared or tangential terminal layouts acceptable
- Terminal grading in accordance with NZTA RSB-3

### OTHER RESTRICTIONS / CONSIDERATIONS
- The primary mechanism for dissipation of end impact energy is through anchorage and extrusion of the W-beam element. Extruded rail is flattened and maintains connection to unit
- The frequency of drive-by inspections is dependent on the traffic volume and the impact history of the system. Drive-by inspections are recommended at least monthly. Hands-on inspections are recommended at least yearly
- W-beam splices at mid-span of the posts
- The SoftStop End Terminal can be assembled with a flare to offset the head 600 mm for the TL-3 system (300 mm for the TL-2 system). The flare must be over the length of the system. The maximum flare rate is 1:25
SUMMARY

SYSTEM SUPPLIER: Open source – no specific supplier, however similar proprietary versions are available to match with proprietary W-beam barrier systems

TEST LEVEL / CONDITIONS: NCHRP 350 TL-3

FOR USE WITH Public domain or proprietary W-beam barrier systems in curved installations or as termination into low-risk side road or access

STATUS Accepted

Side roads or driveways commonly intersect a highway close to the end of a bridge or other immovable, restrictive feature which prevent barrier length of need being achieved. In many of these situations, it is not practical to change the site conditions by relocating the intersecting roadway further away from the bridge end in order to allow room for a standard approach guardrail. Therefore, a curved guardrail installation which would substantially improve the safety at these sites is required. Research undertaken by Washington State Department of Transportation and the Federal Highway Administration (FHWA) has resulted in improved curved guardrail designs from which the NZ Transport Agency Curved Guardrail Terminal has been developed.

The RSB-2A curved W-beam guardrail is a continuous guardrail variation of RSB-2.

TECHNICAL INFORMATION

DIMENSIONS

- Curved W-beam radii: 5 m, 10 m, 15 m, 20 m, 25 m
- Post Spacing: 1905 mm centres

CLEAR AREA

A minimum clear area of 22 m X 6 m with a maximum slope of 6H:1V is to be provided behind the curved rail

GRADE OR PLACEMENT RESTRICTIONS

The approach grading is 10H:1V or flatter and is to be maintained free of obstructions

OTHER RESTRICTIONS / CONSIDERATIONS

- A substandard clear area requires the approval of the RCA. For state highways this is the NZ Transport Agency Regional Safety Engineer
- Factory (or "shop") curved W-beam guardrail is to be used for all curved guardrail elements
- Sight distances must be maintained in accordance with the Austroads Guide to Road Design
- These designs are most appropriate for use on low volume highways
- Where the approach speed on the side road is exceeds 70 km/h, accepted Test Level 3 end terminals should be installed where practicable
- The location of the apex posts depends on the most likely directions of impact
- The rail at the apex posts is not bolted through but sits on shelf angles to maintain the correct height
- At least one intermediate anchor will be required, with two required for the continuous variation
- The standard detail given for RSB-2/ RSB-2A is applicable to non-proprietary timber post semi-rigid W-beam barrier systems only. For proprietary semi-rigid guardrail systems, refer to the System Supplier to confirm if equivalent NZ Transport Agency accepted details are available
TRAILING TERMINAL

SUMMARY

SYSTEM SUPPLIER: Open source – no specific supplier. Proprietary variants available

TEST LEVEL / CONDITIONS: N/A (non-crashworthy, anchorage only)

FOR USE WITH Only to be used to anchor the end of a semi-rigid W-beam barrier system

STATUS Accepted

TECHNICAL INFORMATION

DIMENSIONS

- Length of terminal: 3.81 m
- System Height: 706 mm for public domain or 787 mm for proprietary variants
- Post Depth: varies
- Post Spacing: 1905 mm

OTHER RESTRICTIONS / CONSIDERATIONS

- The purpose of the Trailing Terminal is to anchor the end of a flexible rail system to keep the tensile strength in the rail
- Trailing Terminals are not crashworthy terminals when struck head-on, since they are not designed to absorb energy or break away. They must not be installed where there is a likelihood they could be impacted head-on by an errant vehicle except in special cases for low volume, low speed situations where this has been accepted by the RCA
- Minor site grading may be necessary for guardrail installations beyond the edge of the shoulder to prevent the steel posts from extending more than 100 mm above the ground
- The Curved Trailing End Terminal (CTT) should be used as the default. The Straight Trailing End Terminal (STT) should only be used where space constraints prevent use of a CTT
- Bullnose required on CTT and STT; rolled end fitting not allowed
- The CTT has an offset at the bullnose of 335 mm
CRASH CUSHIONS

The following general notes apply to all crash cushions:

- Connecting hardware must be kept in good condition and the hardware replaced if it is damaged, including the barrier unit(s) where these are integral. Modification of any kind, including cutting or welding is not acceptable.

- Bi-directional applications must utilize an accepted bi-directional transition configuration. The barrier system will be considered non-compliant if an appropriate end treatment or transition component is not fitted.

- A clear area of 6 m laterally by 22.5 m longitudinally, as shown in NZ Transport Agency drawing RSB-3 is required for every end treatment. Note that a longitudinal safety zone is also required in CoPTTM and in some cases this may exceed the clear area requirement.

- Site specific grading may be necessary to ensure that there are no “humps” or “hollows” that may significantly alter the impacting vehicle’s stability, reduce surface friction between the barrier and the ground or substantially alter the barrier height in relation to the ground.

- End treatments should not be installed immediately in front of or behind kerbs.

- End treatments must be checked frequently for damage and connection condition with any faults corrected in a timely manner.

- Provide delineation as per TCD Rule requirements.

- The end treatment must be inspected after each impact and where appropriate pulled out to its original length. Depending on the impact and type of end treatment, components may get damaged and need replacement.
## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Safe Barriers Pty Ltd [<a href="http://www.safebarriers.com">www.safebarriers.com</a>]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td>Contact supplier</td>
</tr>
<tr>
<td>FOR USE WITH:</td>
<td>F-shape rigid concrete barriers</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- Width: 590 mm
- Length: 5.9 m
- Height: 890 mm

### WEIGHT
- 1051 kg

### GRADE OR PLACEMENT RESTRICTIONS
- 6.1 m x 1.0 m x 250 mm depth non-reinforced concrete or 6.0 m x 800 mm x 190 mm depth reinforced concrete
- Hazard free area 3 metres downstream of the crash cushion and 12 metres laterally must be provided
- Side slope shall not exceed 8%

### OTHER RESTRICTIONS / CONSIDERATIONS
- Requires an anchoring system approved by the System Owner
- A transition to adjacent rigid F-shape barriers is required if a reverse-angle impact is possible. Transition hardware is available from the System Supplier
# QUADGUARD M10

## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ <a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Permanent concrete barriers</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS

- Width: 610 mm
- Length: 6.71 m
- Height: 817 mm

### WEIGHT

- Not supplied

### GRADE OR PLACEMENT RESTRICTIONS

- Should be assembled on an existing or freshly placed and cured concrete base (Min 28 MPa and 150 mm min depth). The foundation surface shall have a light broom finish
- Hazard free area 3.1 m downstream and 11 m laterally to be provided
- Cross-slope shall not exceed 8% and should not twist more than 2% over the length of the system

### OTHER RESTRICTIONS / CONSIDERATIONS

- Requires an anchoring system approved by the System Owner
- Transitions to adjacent barriers are available from the System Supplier
- Visual drive-by inspections are recommended at least once a month. Walk-up inspections are recommended at least once a year
**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ <a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>Up to NCHRP TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Permanent or temporary concrete barriers</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

**TECHNICAL INFORMATION**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>Available in seven widths: 610 mm, 760 mm, 915 mm, 1219 mm, 1755 mm, 2285 mm, 3200 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEIGHT</td>
<td>Varies with configuration</td>
</tr>
</tbody>
</table>
| GRADE OR PLACEMENT RESTRICTIONS | • Should be assembled only on an existing or freshly placed and cured concrete base (28 MPa minimum)  
• May be assembled on a non-reinforced concrete roadway (minimum 200 mm thick)  
• Cross-slope shall not exceed 8% and should not twist more than 2% over the length of the system  
• The foundation surface shall have a light broom finish |
| OTHER RESTRICTIONS / CONSIDERATIONS | • The system must be anchored  
• As a general rule, selection of the narrowest width that adequately shields the hazard is recommended  
• System length is specified by the number of bays the system includes. The number of bays required is a function of the design speed of the roadway, as specified in the product manual  
• When there is an existing guardrail or median barrier at the site, the backup (anchor) of the Quad-Guard System should tie into it when possible  
• Visual drive-by inspections are recommended at least once a month. Walk-up inspections are recommended at least once a year for Quad-Guard systems on asphalt  
• Some components may be reusable following a crash |
## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Tauren Barriers Ltd [<a href="http://www.taurenbarriers.co.nz">http://www.taurenbarriers.co.nz</a>]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>MASH TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td>Contact supplier</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>W-beam and permanent or temporary concrete barriers</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- TL-3: 6.55 m long, 609.6 mm wide, 840 mm high
- TL-2: 4.12 m long, 609.6 mm wide, 840 mm high

### WEIGHT
- TL-3: 1570 kg (for attenuators only)
- TL-2: 1120 kg (for attenuators only)

### GRADE OR PLACEMENT RESTRICTIONS
- Foundations must be a flat surface with longitudinal and cross slopes of 10:1 or less
- Smart Cushion impact units should not be located over drainage basins or expansion joints
- Portland cement concrete foundation pads are preferred for permanent installations. Asphaltic concrete foundation pads of appropriate thickness may be used for temporary installations

### OTHER RESTRICTIONS / CONSIDERATIONS
- The Smart Cushion side panels can move rearward beyond the end of the attenuator up to 760 mm upon impact. This area is known as the travel zone and must not be obstructed
- Barriers that are wider than 610 mm (excepting F-Shape barriers with base widths up to 700 mm) and/or have reverse direction traffic require a transition as per the supplier’s recommendations
# TRACC Crash Attenuation Cushion

## Summary

<table>
<thead>
<tr>
<th>System</th>
<th>Test Level</th>
<th>Width</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRACC</td>
<td>3</td>
<td>610mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>ShorTRACC</td>
<td>2</td>
<td>610mm</td>
<td>4.3m</td>
</tr>
<tr>
<td>WideTRACC - B</td>
<td>3</td>
<td>1470mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>WideTRACC - L</td>
<td>3</td>
<td>1040mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>WideTRACC - R</td>
<td>3</td>
<td>1040mm</td>
<td>6.5m</td>
</tr>
</tbody>
</table>

** The width of the WideTRACC – B can be further increased by adding wing extensions on both sides. The extensions will add 710mm of length and 175mm of system width per extension added.

*** The width of the WideTRACC – L and – R can be further increased by adding wing extensions on one side. The extensions will add 710mm of length and 87mm of system width per extension added.

## Technical Information

### Dimensions

<table>
<thead>
<tr>
<th>System</th>
<th>Test Level</th>
<th>Width</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRACC</td>
<td>3</td>
<td>610mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>ShorTRACC</td>
<td>2</td>
<td>610mm</td>
<td>4.3m</td>
</tr>
<tr>
<td>WideTRACC - B</td>
<td>3</td>
<td>1470mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>WideTRACC - L</td>
<td>3</td>
<td>1040mm</td>
<td>6.5m</td>
</tr>
<tr>
<td>WideTRACC - R</td>
<td>3</td>
<td>1040mm</td>
<td>6.5m</td>
</tr>
</tbody>
</table>

### Weight

Varies with configuration

### Grade or Placement Restrictions

It is recommended that the TRACC system should not be placed directly behind a raised kerb. The approach area in front of the system should slope at a rate no greater than 10H:1V in the direction of traffic flow. The cross slope should be no more than 12H:1V

### Other Restrictions / Considerations

- The TRACC can be anchored to a combination of asphalt, concrete and compacted sub base.
- A plastic nose cone that is supplied with the system should be attached to the front of the TRACC.
- TRACC units are delivered pre-assembled to site to facilitate rapid installation and minimise disruption to traffic flow.
- Installation of the TRACC system and its transitions depends on the traffic pattern and the backup structure at the particular location. Unidirectional traffic (one side or both) requires no transition provided opposing traffic cannot impact the unit.
- TRACC systems can be lifted as complete units.
- Holes should be drilled 40mm less than the overall length of the anchor studs to ensure proper embedment to the foundation.
- Field repair is to be limited to minor end-on impacts that stroke the system less than 1350mm.
- Some components may be reusable following a crash.
### UNIVERSAL TAU-II

**SUMMARY**

<table>
<thead>
<tr>
<th><strong>SYSTEM SUPPLIER:</strong></th>
<th>CSP Pacific <a href="http://www.csppacific.co.nz">http://www.csppacific.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST LEVEL / CONDITIONS:</strong></td>
<td>NCHRP 350 TL-2 and TL-3</td>
</tr>
<tr>
<td><strong>PRODUCT MANUAL:</strong></td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td><strong>FOR USE WITH:</strong></td>
<td>Concrete, W-beam and Thrie-beam</td>
</tr>
<tr>
<td><strong>STATUS:</strong></td>
<td>Accepted</td>
</tr>
</tbody>
</table>

**TECHNICAL INFORMATION**

| **DIMENSIONS** | • TL-3: length: 8 bays. 7.2 5m (P.C.B Backstop) or 7.75 m (Compact Backstop)  
• TL-2: length: 4 bays. 3.78 m (P.C.B Backstop) or 4.28 m (Compact Backstop)  
• 762 mm width  
• 829 mm height |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WEIGHT</strong></td>
<td>Varies with configuration</td>
</tr>
<tr>
<td><strong>GRADE OR PLACEMENT RESTRICTIONS</strong></td>
<td>Cross slopes of up to 8% (5 degrees) can be accommodated with the standard hardware and with the instructions provided with the system. If there are cross slopes in excess of 8%, contact CSP Pacific to obtain engineering advice and assistance</td>
</tr>
</tbody>
</table>
| **OTHER RESTRICTIONS / CONSIDERATIONS** | • The accepted anchoring foundation is a solid concrete pad over the length of the system  
• The concrete foundation must be a minimum of 150 mm thick, reinforced 28 MPa Portland Cement Concrete (PCC) or 200 mm non-reinforced 28 MPa PCC  
• All kerbs, islands and elevated objects greater than 100 mm high that would be beneath, beside or less than 15 m in front of a TAU-II crash cushion should be removed prior to installation  
• Details for transitions to concrete, W-beam and Thrie-beam are available from CSP Pacific  
• Hazard widths: 1000 mm – 2440 mm max  
• Design speeds: 50 km/h – 100 km/h  
• An anchoring package is supplied with the TAU-II system and contains the necessary threaded rods and epoxy needed to install the system  
• Some components may be reusable following a crash |
# RAPTOR CRASH CUSHION

## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ [<a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a>]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-1</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td>[Click for product manual download]</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Used as an attenuator to shield poles and trees in dangerous locations</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Raptor 300 length: 2460 m</td>
<td></td>
</tr>
<tr>
<td>Raptor 600 length: 2760 mm</td>
<td></td>
</tr>
<tr>
<td>System Widths: 1150 mm</td>
<td></td>
</tr>
<tr>
<td>System Heights: 1050 mm</td>
<td></td>
</tr>
</tbody>
</table>

| WEIGHT                               | Weight Per Shell: 110 kg                  |

<table>
<thead>
<tr>
<th>OTHER RESTRICTIONS / CONSIDERATIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Two sizes available; Raptor 300 and Raptor 600</td>
<td></td>
</tr>
<tr>
<td>The Raptor can be placed on any foundation</td>
<td></td>
</tr>
<tr>
<td>The Raptor must always be parallel to the direction of travel</td>
<td></td>
</tr>
<tr>
<td>When a utility pole protected by a Raptor is impacted head on with a 900 kg vehicle at 80 km/h, the impacting vehicle is brought to a controlled stop. When impacted side on at the same speed, the Raptor redirects the impacting vehicle by up to 20 degrees in a safe manner</td>
<td></td>
</tr>
<tr>
<td>Used when it is not economically practical to go out and relocate or remove potential hazards such as utility poles and trees</td>
<td></td>
</tr>
</tbody>
</table>
# MEDIAN GATE SYSTEMS

## ARMORGUARD GATE STEEL MEDIAN GATE SYSTEM

### SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>CSP Pacific <a href="http://www.csppacific.co.nz">http://www.csppacific.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Attaches to permanent concrete barrier</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### TECHNICAL INFORMATION

**DIMENSIONS**
- Unit Length: 8, 12 and 16 m
- Width: 700 mm
- Height: 830 mm

**MINIMUM LENGTH**
- 8 m

**DEFLECTION**
- Minimum in-service impact deflection of up to 0.6 m should be allowed for irrespective of configuration

**GRADE OR PLACEMENT RESTRICTIONS**
- Maximum site gradient limits of 3% (1V:33H) apply to both side slope and longitudinal slopes at the proposed installation location which must be within a straight alignment

**OTHER RESTRICTIONS / CONSIDERATIONS**
- Suitable as a permanent or temporary work area barrier where emergency vehicles, maintenance crews and emergency evacuation access may be needed
- Assembled at installation point or offsite
- Hinges from either end, can be unpinned for complete removal
- Must be within a straight alignment of both carriageway and safety barrier
- The maximum clear opening is 16 m
- Transitions available to most rigid barrier systems
- Manually operated opening system
- Both ends of the F-shape concrete median barrier (attached to the gate system) must have base thickening and additional end reinforcement to tolerate the anchorage loads imposed by an impact with the gate system
- The installation designer (not the system supplier) must write a standard operating procedure (SOP) for each installation to ensure safe operation of the gate. The SOP must include clear indication of the site gradients and require opening of the gate at the upslope end only, with a suitable restraint system detailed
# BG800 Gate

## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil Products <a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-3</td>
</tr>
<tr>
<td>PRODUCT MANUAL:</td>
<td><a href="#">Click for product manual download</a></td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>The BG800 Gate Steel Median Gate System installation may only be installed between anchored BG800 &quot;gate post&quot; connecting sections transitioning to anchored lengths of BG800 steel median barrier or F-shape concrete median barrier.</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## TECHNICAL INFORMATION

### DIMENSIONS
- Unit Length: 3 and 6 m modular units
- Width: 540 mm
- Height: 915 mm

### MINIMUM LENGTH
- 6 m (minimum opening 4.7 m, maximum opening 28.7 m)

### WEIGHT
- 135 kg per metre

### DEFLECTION
- 1.16 m (NCHRP 350 TL-3: 2000 kg at 100 km/h and 25°)

### GRADE OR PLACEMENT RESTRICTIONS
- BG800 Gate should not be installed where there are ditches or kerbs that may affect operation of the gate. It is recommended that the gate is installed on straight sections, but slight curves can be accommodated.
- The BG800 Gate works on slopes, but it is recommended that the cross fall does not exceed 5% (1V:20H) to allow controlled manual operation.
- The BG800 Gate requires anchoring with sufficient strength from the supporting ground conditions, to allow the gate to perform as tested. A foundation that conforms with the system supplier’s guidance is required.

### OTHER RESTRICTIONS / CONSIDERATIONS
- All installations require site specific acceptance on a case-by-case basis from the NZ Transport Agency Lead Safety Advisor (Roads & Roadsides) to ensure safe operation.
- The BG800 Gate can be utilised as a permanent or temporary application.
- The BG800 Gate can be impacted from either side of the barrier with no difference in performance levels. Therefore, the barrier can be used in both median and road side situations in either orientation.
- Connections from the BG800 Gate to other types of barriers are possible (e.g. thrie beam, w-beam, F-shape).
- As the gate is anchored at the full height terminal/gate post no strength is required from adjoining barrier for the system performance.
- Drive-by system inspections are recommended at least monthly, and hands-on inspections are recommended at least yearly.
- The installation designer (not the system supplier) must write a standard operating procedure (SOP) for each installation to ensure safe operation of the gate. The SOP must include clear indication of the site gradients and require opening of the gate at the upslope end only, with a suitable restraint system detailed.
# IRONMAN MEDIAN GATE STEEL MEDIAN GATE SYSTEM

## SUMMARY

**SYSTEM SUPPLIER:** Road Safety and Rentals Ltd [http://www.roadsafetyandrentals.co.nz](http://www.roadsafetyandrentals.co.nz)  
**TEST LEVEL / CONDITIONS:** NCHRP 350 TL-2 and TL-3  
**PRODUCT MANUAL:** Contact supplier  
**FOR USE WITH** The Ironman Median Gate System may only be installed between anchored lengths of F-shape concrete median barrier.  
**STATUS** Accepted  

## TECHNICAL INFORMATION

### DIMENSIONS
- Unit Length: 4 m, 8 m or 12 m  
- Width: 530 mm  
- Height: 820 mm  

### WEIGHT
- 400 kg (4 m Length)  
- 800 kg (8 m Length)  
- 1200 kg (12 m Length)  

### MINIMUM LENGTH
- 4 m  

### GRADE OR PLACEMENT RESTRICTIONS
- Maximum site gradient limits of 3% (1V:33H) apply to both side slope and longitudinal slopes at the proposed installation location which must be within a straight alignment  

### DEFLECTION
- Impact deflection of up to 0.6m  

### OTHER RESTRICTIONS / CONSIDERATIONS
- Provides a method for emergency access or construction access in rigid barriers  
- The maximum length of any Ironman Median Gate System installation is 25.31 m with a clear opening of 20.57 m (5-unit configuration)  
- The Ironman can be deployed as a free-standing system or used with a range of end treatments  
- All installations require site specific acceptance on a case-by-case basis from the NZ Transport Agency Lead Safety Advisor (Roads & Roadsides) to ensure safe operation  
- Both ends of the F-shape concrete median barrier must have base thickening and additional end reinforcement to tolerate the anchorage loads imposed by an impact with the gate system  
- The F-shape barrier installation must be integral with, or structurally connected to, the concrete anchor foundations for the Ironman Median Gate steel transition sections  
- The installation designer (not the system supplier) must write a standard operating procedure (SOP) written for each installation to ensure safe operation of the gate. The SOP must include clear indication of the site gradients and require opening of the gate at the upslope end only, with a suitable restraint system detailed
TRANSITIONS

NZ TRANSPORT AGENCY SEMI-RIGID TO RIGID THRIE-BEAM TRANSITION

SUMMARY

SYSTEM SUPPLIER: Open source – no specific supplier
TEST LEVEL / CONDITIONS: NCHRP 350 TL-4
FOR USE WITH Transition from W-beam (semi-rigid) barrier to Thrie-beam (semi-rigid) or concrete (rigid) barrier
STATUS Accepted

TECHNICAL INFORMATION

OTHER RESTRICTIONS / CONSIDERATIONS

- The rigid barrier for a median system must extend beyond the hazard (e.g. bridge pier or gantry leg) by a minimum of 18m in both directions
- The minimum transition length for W-beam to concrete is 10.0m
- All transition posts to be steel with modified blockouts as per NZ Transport Agency drawing B3
- Where proper post embedment cannot be achieved, standard ‘I’ beam bridge steel posts on steel base plates (as per Appendix B NZ Transport Agency Bridge Manual) can be bolted to a concrete beam
- Posts 7 & 8 need to have backing pieces
- Trailing transitions installed on roads divided by median barrier may have the entire nested Thrie-Beam section with posts 1 thru 6 omitted
- Thrie-beam structure connector to be fixed using 6 x grade 8.8/S M24 bolts through 30mm diameter holes in concrete barrier with a full bolt pattern backing plate (16mm thick 250MPa PL) for cast-in bracket, refer to NZ Transport Agency standard detail B8-2
- For Thrie-beam across structures refer to NZ Transport Agency drawing B3
- On state highway projects where the design guidance given above cannot be applied for any particular reason, the proposed solution and supporting rationale should be referred to the local NZ Transport Agency Principal Safety Engineer for resolution or escalation
**WIRE ROPE SAFETY BARRIER (WRSB) TRANSITIONS**

**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Open source – no specific supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-3</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>Transition from a wire rope safety barrier (WRSB) to a W-beam (semi-rigid) or Concrete F-shape (rigid) barrier</td>
</tr>
<tr>
<td>STATUS</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

**TECHNICAL INFORMATION**

- The WRSB transition provides transition from a WRSB to a W-beam (semi-rigid) or Concrete F-shape (rigid) barrier in median and side protection situations, such as approaching a bridge structure or sign gantry.
- The problem of transitioning from WRSB to rigid barrier systems is commonly encountered where structural elements, such as bridge parapets/piers or gantry supports, are placed in close proximity to the travelled way, either in a median or shoulder/verge situation.
<table>
<thead>
<tr>
<th>Shoulder/Verge:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o WRSB to W-beam (Drawing RSB-7a)</td>
</tr>
<tr>
<td>o WRSB to Concrete F-shape (Drawing RSB-7b)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Median:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o WRSB to Concrete F-shape (Drawing RSB-7c)</td>
</tr>
</tbody>
</table>

- The transition advice (above) should be followed unless approval of any alternative solution has been given by the Lead Safety Advisor (Roads & Roadsides).
- The point of redirection of the WRSB median system must be positioned to provide protection for an errant vehicle departure angle of 15°.
- The rigid barrier for a median system must extend beyond the hazard (e.g. bridge pier or gantry leg) by a minimum of 18m in both directions.
- Initial 825mm offset from the semi-rigid barrier system to the WRSB system.
- On state highway projects where the design guidance given above cannot be applied, the proposed solution and supporting rationale should be referred to the local NZTA Principal Safety Engineer for resolution or escalation.
LEGACY PRODUCTS

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LEGACY FLEXIBLE BARRIERS

SAFENCE SLOPE WRSB

The Safence Slope Barrier is a four-cable wire rope barrier system designed specifically for retrofit installations on sloping shoulders. It has been tested in accordance with European Standard EN1317 Parts 1 & 2 testing criteria which are lower than the current NZ Transport Agency requirement of NCHRP 350 TL-3 for side protection.

This system is a non-standard system considered appropriate for retro-fit situations where shoulder widths are limited, but a side protection barrier is desired. A standard wire rope barrier system must be used for all new sites and retrofit sites where shoulder width can reasonably be provided.

TECHNICAL INFORMATION

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>Steel Wire Rope: Right Hand Lay, 19.0 mm Diameter 3x7 strands (1 x 3.15 mm + 6 x 3.0 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posts: 2100 mm long</td>
</tr>
<tr>
<td></td>
<td>Cable Heights: Varies with road geometry</td>
</tr>
<tr>
<td>MINIMUM LENGTH</td>
<td>The recommended minimum length of a Slopefence installation is 40 m</td>
</tr>
<tr>
<td>DEFLECTION</td>
<td>TB32: 2m – 1500 kg large car impacting at an angle of 20° and a nominal speed of 110 km/h (Tested under EN-1317)</td>
</tr>
<tr>
<td>WORKING WIDTH</td>
<td>1.85 m (containment level EN-1317 N2)</td>
</tr>
<tr>
<td>GRADE OR PLACEMENT RESTRICTIONS</td>
<td>Steepest gradient: 1V:2H</td>
</tr>
<tr>
<td>FOOTINGS</td>
<td>Default footing: Driven post</td>
</tr>
<tr>
<td>OTHER RESTRICTIONS / CONSIDERATIONS</td>
<td>Only to be considered for retro-fit situations where shoulder widths are limited, but a side protection barrier is desired</td>
</tr>
<tr>
<td></td>
<td>Designed specifically for installation on sloping shoulders as a side protection system on retrofit projects</td>
</tr>
<tr>
<td></td>
<td>Because the European Standard EN1317 Parts 1 &amp; 2 testing criteria is lower than those of NCHRP 350 Test Level 3, site specific approval is required from the Lead Safety Advisor (Roads &amp; Roadsides) prior to specification or installation</td>
</tr>
<tr>
<td></td>
<td>Used for constrained environments only</td>
</tr>
<tr>
<td></td>
<td>The minimum allowable curve is 200 m radius</td>
</tr>
<tr>
<td></td>
<td>Refer also to general notes for flexible barriers</td>
</tr>
</tbody>
</table>
SUMMARY

SYSTEM SUPPLIER: Public domain (open source) - no specific supplier

TEST LEVEL / CONDITIONS: NCHRP 350 TL-3

FOR USE WITH: Attaches to compatible end terminals or transition barriers (generally transitioning into a Thrie-beam)

STATUS: Legacy system; repair use only, not for new state highway installations

Strong Post Timber W-beam guardrail is a common type of longitudinal barrier in use along local roads and state highways. It is a public domain (non-proprietary) system.

The wood or plastic blockouts reduce or minimise a vehicle snagging on the posts upon impact. In addition, a blockout may be used to increase the offset of guardrail with an obstacle such as a kerb. The posts’ primary purpose is to maintain the height of the guardrail during the initial stages of post deflection.

Strong Post Timber W-beam guardrail is a legacy system and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing barrier system is viable or necessary.

TECHNICAL INFORMATION

DIMENSIONS
- 1905 mm post spacing
- 550 mm height (to centre of W-beam).

MINIMUM LENGTH
Minimum installation length (excluding end treatments): 30.48 m (8 lengths)

DEFLECTION
800 mm

OTHER RESTRICTIONS / CONSIDERATIONS
- W-beam guardrails must be anchored and terminated using a suitable end treatment
- 2 x 16d nails per blockout to prevent rotation
- Barrier post offset to hinge point = 1 m (600 mm minimum)
- W-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 ribs within 2 m
- Limited ability of the system to contain and redirect modern vehicles that have a higher centre of gravity, along with the increased weight of those vehicles.

FURTHER READING / REFERENCES

Refer to AASHTO 2-Space W-beam Guardrail (RWM02a-b) for details of W-beam element.
# STEEL POST THRIEBEAM GUARDRAIL (MODIFIED BLOCKOUT) (SGR09B)

## SUMMARY

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Public domain (open source) - no specific supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL-4</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>A suitable W-beam terminal can be used in conjunction with an appropriate transition to provide a crashworthy terminal and anchorage</td>
</tr>
<tr>
<td>STATUS</td>
<td>Legacy system; repair use only, not for new state highway installations (except as part of RSB-5 transition) Site specific acceptance required for use on structures – refer M23 Appendix B for details</td>
</tr>
</tbody>
</table>

“Modified Thrie-beam” (SGR09b) is a modified version of the standard SGR09c Thrie-beam with modified (notched) blockouts. It is a public domain (non-proprietary) system.

The SGR09b uses steel I-section posts with steel I-section blockouts and is a NCHRP 350 TL-4 barrier.

Strong post Thrie-beam guard rails should be used in locations where there is at least 600 mm of available deflection space.

## TECHNICAL INFORMATION

### DIMENSIONS

- 2000 mm post spacing
- 4000 mm rail length
- 610 mm height (to centre of Thrie-beam).

### MINIMUM LENGTH

Minimum installation length (excluding end treatments): 32 m (8 lengths)

### DEFLECTION

900 mm (NCHRP 350 TL4)

### OTHER RESTRICTIONS / CONSIDERATIONS

- Increased level of performance compared to W-beam, especially for vehicles up to 8 tonne gross
- Barrier post offset to hinge point = 1 m (600 mm minimum)
- Thrie-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 ribs within 2m
- Modified Thrie-beam on baseplate mounted posts is the minimum system acceptable for use on state highway structures. Refer M23 Appendix B for details
- Modified Thrie-beam blockouts must be compliant with the AASHTO PW803 detail and fabricated from either:
  - rolled steel section conforming to either W360x32.9 or M360x25.6 section profiles defined in AASHTO M160M, or
  - welded steel plate to the same dimensions and strengths (continuous fillet welds with minimum 6 mm leg length, Cat SP to AS/NZS1554.1)
- The “notch” must be correctly formed with no rib or residual web material remaining behind the traffic face flange, to ensure the system operates as tested
- Modified Thrie-beam blockouts of reduced depth (< 350 mm) may be used if accepted by the RCA, however the full “notch” must be present.

## FURTHER READING / REFERENCES

Refer to AASHTO Strong Post Thrie-beam Guardrail (SGR09b) for details of Thrie-beam system.
STRONGPOST W-BEAM DOUBLE-SIDED GUARDRAIL (SGM04B)

System Supplier: Public domain (open source) - no specific supplier

Test Level / Conditions: NCHRP 350 TL-3

For Use With: Attaches to compatible end terminals or transition barriers (generally transitioning into a Thrie-beam)

Status: Legacy system; repair use only, not for new state highway installations

Strong Post Timber W-beam median barriers were generally used in locations where a maximum dynamic deflection of 600 mm or less was acceptable. It is a public domain (non-proprietary) system.

The SGM04b uses timber posts with wooden blockouts and is a NCHRP 350 TL-3 barrier.

Strong Post Timber W-beam median barrier is a legacy system and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing barrier system is viable or necessary.

**Technical Information**

| Dimensions       | 1905 mm post spacing  
|                  | 500 mm height (to centre of W-beam) |
| Minimum Length   | Minimum installation length (excluding end treatments): 30.48 m (8 lengths) |
| Deflection       | 800 mm |
| Other Restrictions / Considerations | W-beam barriers must be anchored and terminated using a suitable end treatment  
|                  | 2 x 16d nails used on each side to prevent block rotation  
|                  | W-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 ribs within 2 m  
|                  | Limited ability of the system to contain and redirect modern vehicles that have a higher centre of gravity, along with the increased weight of those vehicles. |

Further Reading / References

Refer to AASHTO 2-Space W-beam Guardrail (RWM02a-b) for details of W-beam element.
STEEL POST THRIE-BEAM DOUBLE-SIDED GUARDRAIL (MODIFIED BLOCKOUT) (SGM09B)

SUMMARY

SYSTEM SUPPLIER: Public domain (open source) - no specific supplier

TEST LEVEL / CONDITIONS: NCHRP 350 TL-4

FOR USE WITH A suitable W-beam terminal can be used in conjunction with an appropriate transition to provide a crashworthy terminal and anchorage

STATUS Legacy System; repair use only, not for new state highway installations

"Modified Thrie-beam" (SGR09b) is a modified version of the standard SGR09c Thrie-beam with modified (notched) blockouts. It is a public domain (non-proprietary) system.

The SGR09b uses steel I-section posts with steel I-section blockouts and is a NCHRP 350 TL-4 barrier. Strong post Thrie-beam guard rails should be used in locations where there is at least 500 mm of available deflection space.

TECHNICAL INFORMATION

DIMENSIONS
- 2000 mm post spacing
- 4000 mm rail length
- 610 mm height (to centre of Thrie-beam).

MINIMUM LENGTH Minimum installation length (excluding end treatments): 32 m (8 lengths)

DEFLECTION 900 mm

OTHER RESTRICTIONS / CONSIDERATIONS
- Increased level of performance compared to W-beam, especially for vehicles up to 8 tonne gross
- Thrie-beam guardrail element may be considered serviceable after damage to a single rib, but non-serviceable if there is damage to 2 ribs within 2m
- Modified Thrie-beam on baseplate mounted posts is the minimum system acceptable for use on state highway structures. Refer M23 Appendix B for details
- Modified Thrie-beam blockouts must be compliant with the AASHTO PWB03 detail and fabricated from either:
  - rolled steel section conforming to either W360x32.9 or M360x25.6 section profiles defined in AASHTO M160M, or
  - welded steel plate to the same dimensions and strengths (continuous fillet welds with minimum 6 mm leg length, Cat SP to AS/NZS1554.1)
- The “notch” must be correctly formed with no rib or residual web material remaining behind the traffic face flange, to ensure the system operates as tested
- Modified Thrie-beam blockouts of reduced depth (< 350 mm) may be used if accepted by the RCA, however the full “notch” must be present.

FURTHER READING / REFERENCES

Refer to AASHTO 2-Space W-beam Guardrail (RWM02a-b) for details of W-beam element.
LEGACY W-BEAM END TERMINALS

ET2000 PLUS END TERMINAL SYSTEM

**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Ingal Civil NZ [<a href="http://www.ingalcivil.co.nz">http://www.ingalcivil.co.nz</a>]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL3</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>W-beam guardrail</td>
</tr>
<tr>
<td>STATUS</td>
<td>Legacy System; repair use only, not for new state highway installations</td>
</tr>
</tbody>
</table>

The ET-2000 PLUS guardrail end terminal is used to absorb the kinetic energy of an impacting vehicle at a controlled rate. Upon impact, the extruder head travels horizontally along the guardrail beams, flattening the W-profile of the beam and extruding the flattened section away from the traffic face. The system was used in New Zealand as an end terminal for permanent road safety barrier systems for over 10 years. The ET-2000 PLUS End Terminal system, comprising of SYT Posts, was tested in accordance with NCHRP Report 350 TL-3.

The ET-2000 PLUS guardrail end terminal is a legacy system and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing terminal is viable or necessary.

**TECHNICAL INFORMATION**

**DIMENSIONS**

- Length: 15.24 m (TL-3)
- Length: 7.62 m (TL-2)
- Post Height: 730 mm +/- 20 mm above ground level
- SYT Post Spacing: 1905 mm centres.

**WEIGHT**

- TL3 Package Mass: 540 kg

**POINT OF REDIRECTION**

Length of need measured from point of redirection at Post #3

**CLEAR AREA**

6 m x 22.5 m clear area to enable the system to gate if impacted downstream from head

**GRADE OR PLACEMENT RESTRICTIONS**

- Maximum approach and cross slope of 10H:1V
- When installed at the end of guardrail following a curved alignment (offsets measured to the face of the rail):
  - Outside of Curve:
    - Maximum offset 610 mm from the curve
  - Inside of Curve:
    - Maximum offset 305 mm (curve radius of 300 m or less)
    - Maximum offset 610 mm (curve radius greater than 300 m)
- Must not be installed in front, on top of or behind a kerb
- Terminal grading in accordance with NZTA RSB-3.

**OTHER RESTRICTIONS / CONSIDERATIONS**

- The first two posts from the end of the terminal have no blockout.
**FLEAT-350 & SKT-350 END TERMINALS**

**SUMMARY**

<table>
<thead>
<tr>
<th>SYSTEM SUPPLIER:</th>
<th>Steelgal [<a href="http://www.steelgal.co.nz">www.steelgal.co.nz</a>]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST LEVEL / CONDITIONS:</td>
<td>NCHRP 350 TL3</td>
</tr>
<tr>
<td>FOR USE WITH</td>
<td>W-beam guardrail</td>
</tr>
<tr>
<td>STATUS</td>
<td>Legacy System; repair use only, not for new state highway installations</td>
</tr>
</tbody>
</table>

The FLEAT-350 is a flared-only, energy absorbing end terminal that meets NCHRP 350 TL-3. When impacted, the extruded guardrail curls toward the traffic face.

The SKT-350 is a tangential-only, sequential kinking end terminal that meets NCHRP 350 TL-3. When impacted, the extruded guardrail curls behind the barrier line.

The SKT-SP and FLEAT-SP were accepted variants of the SKT/ FLEAT 350 end terminals, using steel breakaway posts rather than timber posts.

The FLEAT-MT was a median terminal variation of the FLEAT 350 end terminal. It was available with wood or steel post options.

The FLEAT-350/SP/MT and SKT-350/SP guardrail end terminals are legacy systems and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing terminal is viable or necessary.

**TECHNICAL INFORMATION**

| DIMENSIONS          | • TL3: 11.43 m  
|                     | • TL2: 7.6 m  
|                     | • Post Spacing: 1905 mm centres |
| MINIMUM LENGTH      | • TL-3 system (100 km/h) 11.43 m  
|                     | • TL-2 System (70 km/h) 7.6 m |
| GRADE OR PLACEMENT RESTRICTIONS | • A maximum approach and cross slope of 10H:1V  
|                     | • Terminal grading in accordance with NZTA RSB-3 |
| POINT OF REDIRECTION | Length of need measured from point of redirection at Post #3 |
| CLEAR AREA          | 6m x 22.5m clear area to enable the system to gate if impacted downstream from head |
| OTHER RESTRICTIONS / CONSIDERATIONS | • Drive-by system inspections are recommended at least monthly, and hands-on inspections are recommended at least yearly  
|                     | • Breakaway posts may be wood or steel, both are tested to NCHRP 350  
| FLEAT-350           | • First rail used must be a special kinking rail with slotted holes  
|                     | • 760 to 1220 mm offset needed for NCHRP 350 TL-3  
|                     | • 500 to 820 mm offset needed for NCHRP 350 TL-2  
| SKT-350             | • First rail used must be a special kinking rail with slotted holes. |
X-350 END TERMINAL SYSTEM

The X-350 End Terminal system is a re-directive guardrail terminal end that could be used in tangent or flared (up to 1200 mm) installations. A median variant was also available.

The X-350 End Terminal system could be installed in the following configurations:

- Single-sided, installation height of 705 mm (X-350), breakaway timber or steel posts
- Single-sided, installation height of 790 mm (X-350:31), breakaway steel posts only
- Median (double-sided), installation height of 705 mm (X-350 Median), breakaway timber or steel posts
- Median (double-sided), installation height of 790 mm (X-350:31 Median) breakaway steel posts only.

The X-350 is considered redirective from post #1 but is classed as a gating terminal due to presence of ground strut upstream of post #1.

X-350 guardrail end terminals (all variants) are legacy systems and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing terminal is viable or necessary.

### TECHNICAL INFORMATION

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>Length: 11.43 m (3 rails)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height (to top of W-beam): 705 mm or 790 mm to suit guardrail system.</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>Impact Head weight: 25 kg</td>
</tr>
<tr>
<td>GRADE OR PLACEMENT RESTRICTIONS</td>
<td>Maximum approach and cross slope of 10H:1V</td>
</tr>
<tr>
<td></td>
<td>Flared or tangential terminal layouts acceptable</td>
</tr>
<tr>
<td></td>
<td>Terminal grading in accordance with NZTA RSB-3.</td>
</tr>
<tr>
<td>POINT OF REDIRECTION</td>
<td>Length of need measured from point of redirection at Post #1</td>
</tr>
<tr>
<td>CLEAR AREA</td>
<td>6 m x 22.5 m clear area to enable the system to gate if impacted downstream from head</td>
</tr>
<tr>
<td>OTHER RESTRICTIONS / CONSIDERATIONS</td>
<td>Site specific grading must be provided in accordance with NZTA detail RSB-3 to ensure that there are no “humps” or “hollows” that may significantly alter stability of the impacting vehicle</td>
</tr>
<tr>
<td></td>
<td>Impact force held in tension</td>
</tr>
<tr>
<td></td>
<td>Gating and Re-directive system</td>
</tr>
<tr>
<td></td>
<td>0 – 1200 mm offset for all variations of the end terminal</td>
</tr>
<tr>
<td></td>
<td>When a X-350 End Terminal is installed in a trailing/exit location, where the terminal head is facing away from the direction the vehicle is travelling, the splice joins at rails 1, 2 and 3 of the terminal must be lapped against the direction of adjacent traffic so the terminal can operate correctly</td>
</tr>
<tr>
<td></td>
<td>Nut protectors are available</td>
</tr>
<tr>
<td></td>
<td>Plastic front-end cover is available for both roadside and median terminal ends.</td>
</tr>
</tbody>
</table>
This non-gating and re-directive end treatment was developed as an end treatment for W-beam barrier where the road is transitioning from cut to fill. The buried in backslope anchor requires a TL-4 transition to connect the anchor block to the guardrail (refer NZTA Standard Detail RSB-5). In areas of cut sections on the roadway, or where the road is transitioning from cut to fill, it is sometimes possible to terminate a W-beam guardrail installation by burying the anchor block at the end in the backslope. When properly designed and located this system provides full shielding of the identified hazard, eliminates the possibility of any end-on impact with the terminal, and minimises the likelihood of the vehicle passing behind the rail.

Due to the criticality of the ground conditions to the safe performance of the Buried In Backslope anchor, a site specific acceptance is require for its use. Application for use must include geotechnical assessment of the ground conditions at the proposed location, including consideration of the system specific requirements (ability to form the necessary excavation for construction, competency of soil/rock, erosion risk, etc.). The Installation Designer must satisfy themselves that the ground into which the anchor is to be installed is capable of supporting the anchor block under the design impact loads imposed.

**TECHNICAL INFORMATION**

**DIMENSIONS**

Barrier height (to centre): 610mm

**MINIMUM LENGTH**

Minimum transition length: 10m

**GRADE OR PLACEMENT RESTRICTIONS**

- The natural backslope needs to be reasonably close to the beginning or end of the semi-rigid barrier system
- The approach grading should provide an unobstructed guardrail contact face at the correct height
- The grading through the transition length should not ramp the vehicle.

**OTHER RESTRICTIONS / CONSIDERATIONS**

- This end treatment is only to be considered where the ground conditions are suitable and shoulder width is limited, but a side protection barrier is desired
- The steepness of the backslope covers the end of the barrier. The ideal slope is one that is near-vertical; a slope with too little angle could act as a ramp and allow the vehicle to bypass the barrier
- The slope effectively becomes an extension of the barrier face so the errant vehicle can’t get behind the terminal
- Concrete anchor block must have a minimum strength of 28MPa
- The Installation Designer must mitigate erosion of the backslope in the design
- The standard transition (RSB-5) should be substantially exposed to at least Post 2 and present the correct barrier height of 610 mm to the centre of the Thrie-beam guardrail
- The anchorage of the system must be able to develop the full tensile strength of the W-beam
- Ground conditions are critical; anchor block must be embedded in competent natural soil/rock. Backfilling over a concrete block will be considered a non-compliant installation
- Do not use where there is a risk of erosion exposing the concrete block over time
- Careful consideration needs to be given to foreslope, backslope and ditch configurations. Ideally used at locations where a natural backslope is reasonably close to point where barrier is introduced.
LEGACY CRASH CUSHIONS

CAT 350 CRASH CUSHION

SUMMARY

SYSTEM SUPPLIER: Ingal Civil NZ [http://www.ingalcivil.co.nz]

TEST LEVEL / CONDITIONS: NCHRP 350 TL-3

FOR USE WITH CAT 350™ can be used as a longitudinal barrier end treatment and as a crash cushion either in the median or on the shoulder

STATUS Legacy System; repair use only, not for new state highway installations

CAT 350 crash cushion is an energy absorbing attenuator available for use where blunt ends of rigid barriers and fixed objects are in the median or on the shoulder. This system is a three-stage system using energy absorbing W-beam elements, breakaway wood posts and a cable anchorage system. The W-beam element is a slotted W-beam that telescopes backward during impact. The shearing of the steel rail between the slots as the sections are moved back dissipates the kinetic energy of impact.

The CAT-350 end treatment is a legacy system and may not be installed on new state highway projects. Existing installations may be repaired/maintained until replacement with a higher performing terminal is viable or necessary.

TECHNICAL INFORMATION

DIMENSIONS

- 9.52 m system length
- 610 mm width
- 705 mm height (to top of barrier).

CLEAR AREA 6 m x 22.5 m clear area to enable the system to gate if impacted downstream from the head

OTHER RESTRICTIONS / CONSIDERATIONS

- Used as a longitudinal barrier end treatment and as a crash cushion either in the median or on the shoulder
- Various post and post/sleeve options are available
- Available in weathering steel
- Requires no concrete pads, foundations or deadmen anchors
- Functions as either a unidirectional and bidirectional device
- Length of Need begins at Post #4 from the nose.