



TEMPORARY BARRIERS



ROAD SAFETY RENTAL





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Introduction

What is a Temporary Safety Barrier?

Temporary safety barriers are installed at worksites along roadways to protect workers from passing traffic and vehicle occupants from hazards within the worksite.

The Worksite Safety Traffic Management Code of Practice (2010) defines safety barriers as barriers which:

- Physically separate the work area and the roadway,
- Will inhibit penetration by an errant vehicle; and
- Will have vehicle redirection properties.

Saferoads is regarded as an industry expert in the safety barrier sector and has designed and manufactures four industry leading barriers.

Whilst our HV2, Ironman Hybrid and T-Lok Barrier are specifically designed for road conditions, our Rubber Guard and Big Blockout barriers act as a delineation barrier, shielding or simply for lower speed and offline sections of work areas that require separation from pedestrians or ongoing traffic.

Applications for MASH Tested Barriers

Saferoads MASH tested temporary barriers can be used in many applications.

Some examples are:

- Road maintenance
- Road construction
- Lane closures
- Road resurfacing
- Detours
- Bridge repairs



HV2



Ironman Hybrid



T-Lok



Rubber T-Lok

Applications for Non-Tested Barriers

Saferoads Rubber Guard and Big Blockout non-tested barriers are ideal for the following applications:

- Sporting venues
- Events
- Festivals
- Construction sites/internal delineation



Rubber Guard
Barrier



BIG Blockout

Test Level (TL) Explained

Road safety barrier systems are intended to safely redirect the majority of vehicles that unintentionally leave the roadway. The Austroads Safety Barrier Assessment Panel (ASBAP) assesses the crash worthiness and suitability of tested road safety barrier systems and devices for deployment on roads managed by Australian / New Zealand road agencies in line with AS/NZS 3845.

Test Level (TL) Containment Comparisons

Test Level	MASH (Containment)
TL1	1,100kg & 2,270kg at 50km/h at 25° angle impact
TL2	1,100kg & 2,270kg at 70km/h at 25° angle impact
TL3	1,100kg & 2,270kg at 100km/h at 25° angle impact
TL4	1,100kg & 2,270kg at 100km/h at 25° angle impact 10,000kg at 90km/h at 15° angle impact
TL5	1,100kg & 2,270kg at 100km/h at 25° angle impact 36,000kg at 80km/h at 15° angle impact

Compare our MASH Tested Barriers

				
	HV2 Barrier	Ironman Hybrid Barrier	T-Lok Barrier	Rubber T-Lok
Effective Length	5.8m	4.15m	3.66m/5.49m	3.66m/5.49m
Height	900mm	813mm	810mm	810mm
Width	450mm	546mm	610mm	610mm
Weight per unit	2088kg	925kg	2600kg / 3900kg	2600kg / 3900kg
Successfully Tested to	MASH TL-4	MASH TL-2	MASH TL-3	MASH TL-3
ASBAP Approved	100 km/h	70 km/h	100 km/h	100 km/h
Deflection	1.47m MASH TL-3 2.37m MASH TL-4	1.49m MASH TL-2	1.27m MASH TL-3	1.76m MASH TL-3
High Containment	✓	x	✓	✓
Economical to Transport	✓	✓	x	x
Durable	✓	✓	x	✓

Minimum Radius

Minimum Radius	HV2	Ironman Hybrid	Ironman Hybrid With Wedge	T-Lok/ Rubber T-Lok	Without Wedge	With Wedge
	80m	78m	10m	3.66	30m	8m
			5.49	46m	12m	

Length of Need

Length of Need (LON) is defined as the total length of a longitudinal barrier needed to shield an area of concern. It is also described as that part of a longitudinal barrier or terminal designed to contain or redirect an errant vehicle. The beginning of the length of need (BLON) is the start of the MASH barrier installation where the barrier will redirect the vehicle, the end of the length of need (ELON) is the point at which the barrier will no longer redirect the vehicle, with the area between being the designated work zone.

End Treatments

Temporary barrier deployments require an end treatment. These are crash cushions designed to be attached to the end of safety barrier alignment in order to absorb the impact of vehicle collisions. There are a range of different end treatment options available;

- **Unanchored** - which move with the force of the collision
- **Non-redirectional** - which aren't designed to divert a colliding vehicle
- **Non-gating** - which won't envelope the vehicle
- **Fully re-directional** - which divert a colliding vehicle to a safer location



SLED End Terminal



Quadguard M10 CZ



Why Choose Saferoads to Supply Temporary Barriers?

Improving public safety through ongoing innovation

Saferoads are the premier suppliers of innovative road safety barriers, with over 30 years experience in this space. Our passion is the design, research and development of temporary barriers that will provide better, safer solutions for our customers. We pride ourselves on being pioneers and leaders in road safety technology.

Don't take our word for it...

What our customers are saying

"A comment from our customer who has been installing barriers for 20 years was that this is the best and quickest barrier he had ever used."

"The Rubber Guard Barrier is a breakthrough product offering our customers a sustainable, recycled alternative for on-site delineation."



David Russell
National Hire Manager CSP Pacific
Product: HV2 Barrier



Chris Jakstas
General Foreman Bild Group
Product: Rubber Guard Barrier

Why Choose Road Safety Rental to Hire Temporary Barriers?

The Work Zone Specialists

We are a dedicated team with a passion for road safety and reducing Australia's road toll. The team at Road Safety Rental don't just supply the equipment - our multidisciplinary team of engineers, health and safety specialists, project managers and installation/operations experts will make sure your project runs safely and efficiently. Road Safety Rental specialise in the deployment of temporary barriers to ensure the safety of construction and infrastructure works, so you can rely on our expertise and continue your project with confidence.

Don't take our word for it...

What our customers are saying

"Road Safety Rental made the entire process easy and well managed. Their great communication created peace of mind and ability to carry on with other aspects of the project without concern around barriers."

"The Road Safety Rental team did a fantastic job installing 400 metres of Ironman Hybrid Barrier on our Burwood Highway project during night works, despite a very tight window and great standard of safety and quality."



Daniel Tribe
TRN Group
Product: T-Lok Barrier



Ruan Dippenaar
Project Engineer Fulton Hogan
Product: Ironman Hybrid Barrier

HV2 Barrier

With patented hybrid technology and unique connectors, the HV2 Barrier offers high containment and low deflection upon impact.

With no time-consuming anchoring required, this barrier has been successfully tested to MASH TL-4. The HV2 Barrier is the first and only unanchored steel barrier to successfully be crash tested to MASH TL-4. This temporary crash barrier is approved by the Austroads Safety Barrier Assessment Panel (ASBAP) to 100km/h.

The patented hybrid technology and unique connectors allow this freestanding, temporary longitudinal barrier system to offer high containment and low deflection, while remaining economical to transport and deploy.

- **ASBAP approval to 100km/h**
- Freestanding barrier
- High containment
- Safe redirection
- Superior speed of deployment and retrieval
- No anchoring required
- Maintenance free
- Multiple end treatments can be used; approved with SLED and QuadGuard M10 CZ
- Sight / debris screen - bolt on
- Durable
- Economical to transport
- Lightweight

Specifications

Product code	F1304028	Successfully Tested To	MASH TL-4
Effective Length	5.8m	ASBAP Approval	Approved
Height	900mm	MASH TL-3 Deflection	1.47M
Width	450mm	MASH TL-4 Deflection	2.37M
Weight	2088kg	Amount Transportable Per Semi Truck	10 Units – 58m
Weight Per Metre	360kg		

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Technical Notes

Limitations

Saferoads HV2 Barriers have been tested to MASH TL-4 requirements. Installations not in accordance with the manufacturer's instruction manual or impacts outside of MASH TL-4 testing may result in unpredictable performance.

To ensure adequate performance in the event of an impact, the HV2 Barrier must be deployed and maintained in accordance with the manufacturer's instruction manual and local authority guidelines - see <https://www.saferoads.com.au/hv2-barrier>

Impacts that exceed the design capabilities described in the manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in MASH relative to structural adequacy, occupant risk and vehicle trajectory factors.

Higher than reported deflections can be expected outside the LON section.

Barrier Segments

A HV2 safety barrier installation is constructed from a series of individual barrier segments. Each segment is constructed from steel with concrete ballast.

Barrier segments should not be stacked for transport, and can be stacked two high during storage. Appropriate bearers should be used between layers.

Connectors

Barrier segments are connected by an integrated, interlocking joiner, which simply slides together when barriers are lowered into position. These connectors are bi-directional, allowing barriers to be installed in either orientation.



Anchoring

No anchoring required.

Lifting

Barrier segments feature three integrated lifting points. Barriers can be safely lifted from the centre lifting point, or the outer two lifting points.

Minimum Deployment

HV2 Barrier installations require a minimum deployment length of 98.6m (17 segments of HV2 Barriers) plus the required end treatments, to safely contain and redirect at MASH TL-3.

For MASH TL-4 the minimum deployment is 278m (48 segments of HV2 Barriers) plus the required end treatments.

End Treatments

HV2 Barrier installations require appropriate end treatments to ensure occupant safety in the event of an impact to the end of the system.

The QuadGuard Crash Cushion M10 CZ has been successfully tested with the HV2 safety barrier using a HV2 transition. This configuration requires anchoring of the end terminal and transition to the ground. Refer to the HV2 product manual on the Saferoads website.

The SLED water filled crash cushion with transition kit has been successfully tested with the HV2 safety barrier (approved to 80km/h). This configuration does not require any anchoring to the ground and is completely freestanding.

Refer to the HV2 product manual on the Saferoads website.

Length of Need

QuadGuard M10 CZ Crash Cushions

When using QuadGuard M10 CZ Crash Cushions to protect the ends of the system, the LON begins and ends at the first fender panel of the QuadGuard next to the yellow nose for MASH TL-3 deployments. Refer to the QuadGuard M10 manufacturers manual for further information.

SLED End Terminals

When using SLED crash cushions to protect the ends of the system, the length of need begins in from the front of the SLED and ends 36.6m (120ft) upstream from the end of the last T-Lok Barrier, 27m (88.5ft) from the beginning or end of the system for MASH TL-3 deployment.

Site Considerations

While Saferoads HV2 Barrier can be installed on most worksites, there are some limitations. HV2 safety barrier should not be installed if there is:

- Curvature tighter than 80m radius
- Cross slope steeper than 5%
- Longitudinal slope steeper than 5%
- Crest sharper than 5%
- Ditch sharper than 5%
- Kerbs or similar obstacles restricting deflection

Deployment

Barriers are to be deployed or demobilised, one barrier at a time. Barriers are never to be lifted in multiple barrier lifts.

Barrier segments feature three integrated lifting points. Barriers can be safely lifted from the centre lifting point, or the outer two lifting points. An appropriate jib should be used if deploying with a forklift or Manitou and barriers to be lifted with rated chains. Please note: If deploying with SLED End Treatment, a SLED to HV2 transition kit is required.

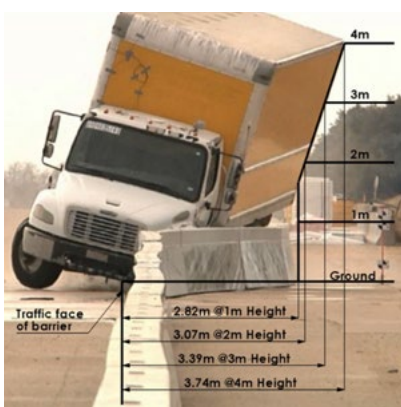
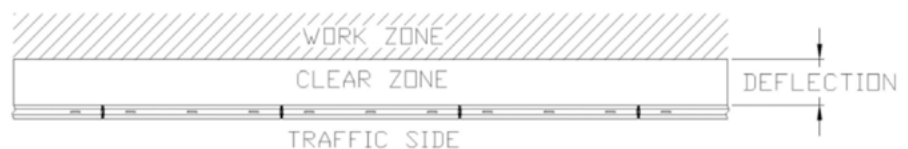
Before beginning deployment, ensure there is adequate traffic management, and whenever possible personnel should remain on the non-traffic side of the installation. Also ensure appropriate / certified lifting equipment is used and inspected / operated by competent personnel.

1. Beginning at the upstream end of the installation, unload the first barrier segment and place in the correct position. Orientation is not important as segments are bidirectional.
2. Working downstream of the first barrier segment, unload the second barrier segment and align the connectors while lowering the segment into position. The connection is made in the top 200mm of the barriers. Remain cautious of potential pinch and crush points when lowering and connecting barriers.
3. Repeat until all barrier segments are placed into the correct position and joined to adjoining barrier segments.

System Deflection & Working Width

A sufficient clear zone must be allocated between the HV2 Barrier and the work zone to allow for deflection of the barrier during an impact. The tested deflections are shown in the below table.

Test Level	Vehicle	Speed	Angle	Deflection
TL3	2,270kg	100km/h	25°	1.47m
TL4	10,000kg	90km/h	15°	2.37m



The working width is the distance between the traffic face of the barrier before impact and the maximum lateral position of any major part of the barrier or vehicle after impact.

MASH TL-3 – 2,270kg Pickup

The TL-3 working width is a constant 1.81m as the vehicle does not roll over the top of the barrier.

MASH TL-4 – 10,000kg Truck

The image to the left shows the working width of the TL-4 truck at 1m intervals above the ground. The working width varies depending on the height of the work-zone that requires protection.

Ironman Hybrid Barrier

Saferoads Ironman Hybrid Barrier functions as an unanchored longitudinal barrier to prevent errant vehicles from penetrating, vaulting, or under-riding.

Impacting vehicles are redirected at a shallow angle in the vicinity of the impact area, thereby reducing the potential for dangerous secondary impacts. The Ironman Hybrid Barrier absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle.

Saferoads Ironman Hybrid Barrier provides several unique advantages over traditional portable concrete barriers and pinned steel barriers. Its lightweight and stackable design offers transport cost savings when compared to traditional concrete barriers. When using wedges, the barrier allows for a deployment radius as tight as 10m, ensuring it follows the required alignment.

Successfully crash tested to MASH TL-2 this steel barrier has an Austroads Safety Barrier Assessment Panel (ASBAP) approval to 70km/h.

- **ASBAP approval to 70km/h**
- Safe, consistent and reliable redirection
- Maintenance free
- Durable
- Energy-absorbing with low deflection
- Quick and easy deployment and retrieval
- No anchoring required
- Economical to transport
- Easily repaired after design impacts
- May be re-used without repair after TL-2 70km/h or less impacts, pending inspection of impacted units
- Can be deployed with Steel Wedge (engineered angle pieces) to accommodate tight radius projects
- Steel wedge has ASBAP approval to 60km/h

Specifications

Product code	F1302000	Weight Per Metre	225kg
Effective Length	4.15m	Successfully Tested To	MASH TL-2
Height	813mm	ASBAP Approval To	70km/h
Width	546mm	MASH TL-2 Deflection	1.49M
Weight	925kg	Amount Transportable Per Semi Truck	24 Units – 99.6m

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Ironman Hybrid Steel Wedge

Radius Solution for Ironman Hybrid Barriers

Saferoads have developed a bespoke custom Ironman Hybrid steel wedge that enables the Ironman Hybrid Barriers to be deployed at a tighter radius, without compromise on worksite protection. The Ironman steel wedge is incorporated in-between individual Ironman Hybrid temporary barriers, allowing placement at a tighter radii. This improves safety and efficiency during construction periods and staged intersection deployments. The steel wedge has ASBAP Approval to 60km/h.

How does the steel wedge work?

The Ironman Hybrid freestanding barrier is deployed by connecting individual barrier segments that interlock. The wedge fits and connects between these joints. The Saferoads steel wedge allows the deployment of the Ironman Hybrid Barriers on a tighter radius by adding the wedge piece in between barrier sections. Two connecting pins are required at each joint where a wedge is used. Spacers are also omitted.

The wedge can be used in the left or right orientation to enable the barriers to curve left or right. The Ironman Steel Wedge has a single lifting point and weigh 80kg each.

What angles can be achieved with the steel wedge?

The Ironman Hybrid Barrier can achieve a 78m radius, with a standard maximum 3 degrees angle at each joint. The steel wedge allows each joint to be deployed at an angle from 4 degrees, up to 26 degrees, enabling a deployment radius as tight as 10m when steel wedges are used in-between each Ironman Hybrid barrier.

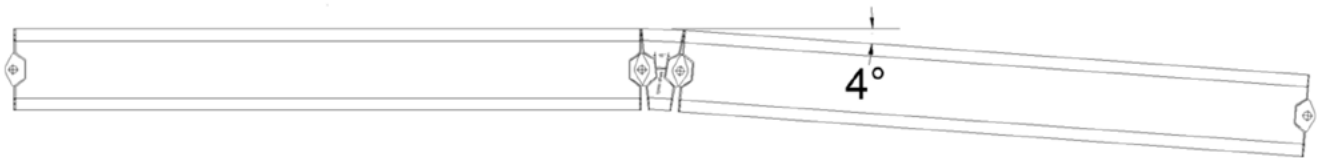


Figure 1: Plan view of two barriers laid out with the wedge at 4 degrees

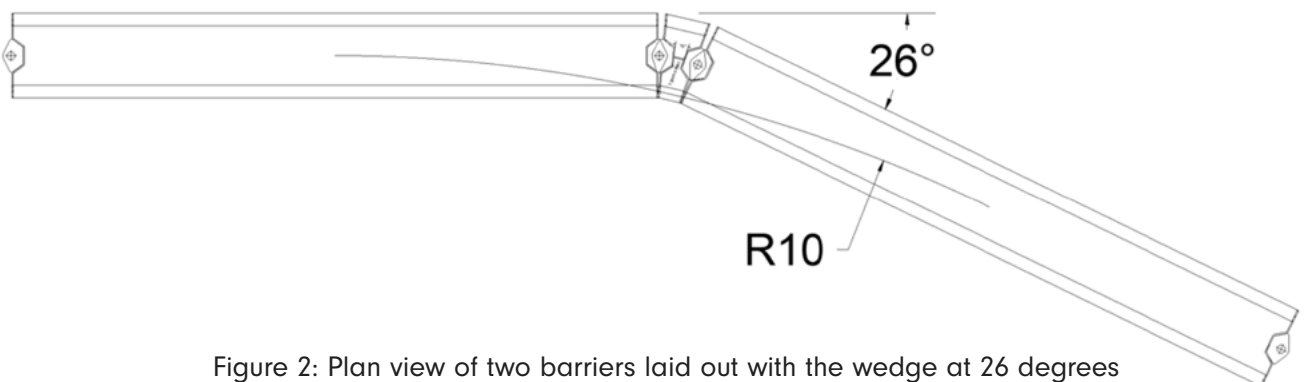


Figure 2: Plan view of two barriers laid out with the wedge at 26 degrees

Technical Notes

Limitations

Saferoads Ironman Hybrid Barriers have been tested to MASH TL-2 requirements. Installations not in accordance with the manufacturer's instruction manual or impacts outside of MASH TL-2 testing may result in unpredictable performance.

To ensure adequate performance in the event of an impact, the Ironman Hybrid Barrier must be deployed and maintained in accordance with the manufacturer's instruction manual and local authority guidelines –

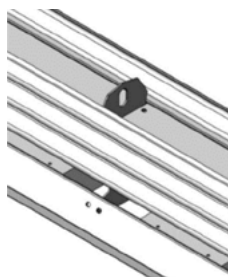
see <https://www.saferoads.com.au/ironman-hybrid-barrier>

Impacts that exceed the design capabilities described in the manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in MASH relative to structural adequacy, occupant risk and vehicle trajectory factors.

Higher than reported deflections can be expected outside the LON section.

Barrier Segments

Installed Length	4.15m
Segment Width	546mm
Segment Height	813mm
Weight	925kg



An Ironman Hybrid Barrier installation is constructed from a series of individual barrier segments. Each segment is constructed from steel with four concrete ballast blocks attached to the underside of the barrier. The dimensions of each segment are shown in the table to the left.

The ends of each section are constructed with knuckles that interlock with those of other segments. The end knuckles are vertically aligned to accept a steel connecting pin. The pin securely joins the sections for maximum impact performance. The sections can swivel at the pin for easy positioning around work areas.

Limiting deflection spacers are to be installed to reduce the deflection and movement in the joints, they may only be omitted where a tighter radius deployment is required.

The Ironman Hybrid Barrier is constructed in a unique shape. The sloping ribbed side walls interact with an impacting vehicle in a way that resists penetration, vaulting, and under-riding. Each section contains four concrete ballast blocks that are contained between the bottom rub rails providing weight and stability to reduce the deflection of the freestanding barrier.

Barrier segments feature a central integrated lifting point. Barriers can be safely lifted from the centre lifting point.

The Ironman Hybrid Barrier is designed to accept a barrier stacked on top for storage and freighting purposes.

Saferoads recommends stacking Ironman Hybrid Barriers no more than two high for transport. During storage, Ironman Hybrid Barriers should be placed in a tapered fashion, a maximum of three barriers high in the front and back rows, and four high in the middle rows (refer to image).



Anchoring

No anchoring required.

Lifting

Barrier segments feature a central integrated lifting point. Barriers can be safely lifted from the centre lifting point.

Minimum Deployment

Ironman Hybrid Safety Barrier installations require a minimum deployment length of 57.5m, 11 segments of Hybrid Barriers plus 2 TL-2 SLED end treatments, to safely contain and redirect at MASH TL-2.

End Treatments

Ironman Hybrid Barrier installations require appropriate end treatments to ensure occupant safety in the event of an impact to the end of the system.

The SLED water filled crash cushion with transition kit has been successfully tested with the Ironman Hybrid Barrier (approved to 70km/h). This configuration does not require any anchoring to the ground and is completely freestanding. Refer to the Ironman Hybrid product manual on the Saferoads website.

Length of Need

Saferoads Ironman Hybrid Barrier installations utilise SLED TL-2 end treatments to ensure occupant safety in the event of an impact to the end of a barrier installation. The LON begins at the joint between the fourth and fifth Hybrid Barrier, 22.5m downstream from the nose of the SLED. ELON is 22.5m upstream from the downstream end of the system.

Site Considerations

While Saferoads Ironman Hybrid Barrier can be installed on most worksites, there are some limitations. Ironman Hybrid Barriers should not be installed if there is:

- Curvature tighter than 78 radius, unless using the steel wedge, then a minimum radius of 10m for speeds of 60km/h or less
- Cross slope steeper than 5%
- Longitudinal slope steeper than 5%
- Crest sharper than 5%
- Ditch sharper than 5%
- Kerbs or similar obstacles restricting the deflection

Deployment

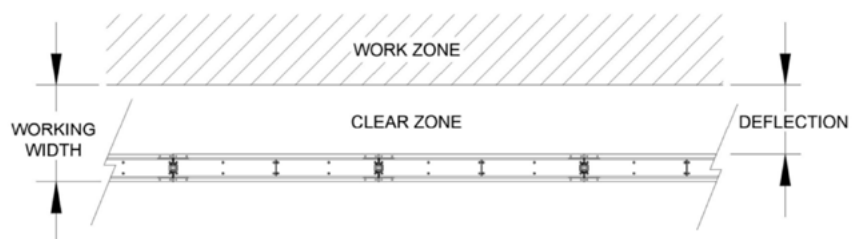
Before beginning deployment, ensure there is adequate traffic management, and whenever possible personnel should remain on the non-traffic side of the installation. Also ensure appropriate lifting equipment is used and operated by competent personnel.

1. Beginning at the upstream end of the installation, unload the first barrier segment and place in the correct position.
2. Working downstream of the first barrier segment, unload the second barrier segment, place the spacer on the first barrier, it will sit on the knuckles of the bulkhead.
3. Manoeuvre the next barrier into position. Remain cautious of potential pinch and crush points when lowering and connecting barriers.
4. Bring barrier segments together with care.
5. Insert the Connecting Pin.
6. Repeat until all barrier segments are placed into the correct position and joined to adjacent barrier segments.
7. A SLED transition strap is required to attach a standard SLED transition panel to the Ironman Hybrid Barrier. Three bolts are to be removed at the quarter bulkhead. Use the strap to mark and then drill the fourth hole (18mm dia.).
8. Attach the transition strap with M16x50mm mushroom head galvanised bolts.
9. The SLED transition panel is attached to the Hybrid transition strap using three M16x30mm hex bolts.
10. For installing the SLED end terminal refer to the SLED manual.

System Deflection & Working Width

A sufficient clear zone must be allocated between the Ironman Hybrid Barrier and the work zone to allow for deflection of the barrier during an impact. The crash tested deflection for a TL-2 impact, 2,270kg pickup at 70km/h at 25 degrees is 1.49m.

The working width, which includes the barrier width plus the deflection is 2.04m.



The table right shows the deflection and working width for impacts along the LON. These results are taken from MASH TL-2 compliant impacts using a 2270kg pickup.

Speed	70km/h
Angle of Impact	25°
Deflection	1.49m
Working Width	2.04m

T-Lok Barrier

The T-Lok Barrier is a precast concrete, temporary redirective longitudinal barrier with ASBAP approval to 100km/h.

Impacting vehicles are redirected at a shallow angle, thereby reducing the potential for dangerous secondary impacts. Saferoads T-Lok Barrier absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle. Saferoads T-Lok Barriers now come in two models, the original 'T-Lok' and the new 'Rubber T-Lok'. Both variants are available in 3.66m or 5.49m lengths.

The new Rubber T-Lok Barrier is manufactured using a mixture of crumb rubber from end of life tyres and concrete, to produce a product that improves safety and combats waste. The inclusion of recycled rubber enhances the flexibility and durability of the T-Lok Barrier resulting in better energy absorption, enhanced safety and increased barrier lifespan. They are able to absorb impacts with less damage to the concrete which helps to lengthen their usable life. Saferoads T-Lok Barriers have achieved MASH TL-3 as redirecting longitudinal safety barriers for speeds up to 100km/h.

- **ASBAP approval to 100km/h**
- Energy-absorbing
- Quick and easy deployment and retrieval
- Economical
- No anchoring required
- 1.27m deflection
- Sight / debris screen options bolt on (standard or holypan)
- Multiple end treatments can be used
- Can be deployed with Steel Wedge (engineered angle pieces) to accommodate tight radius deployments
- Steel wedge has ASBAP approval to 60km/h

Specifications

Model	T-Lok		Rubber T-Lok	
	3.66m	5.49m	3.66m	5.49m
Product Code	F1303000	F1303001	F1303000-2	F1303001-2
Effective Length	3.66m	5.49m	3.66m	5.49m
Height	810m	810m	810m	810m
Width	610m	610m	610m	610m
Weight	2600kg	3900kg	2600kg	3900kg
Weight Per Metre	722kg	722kg	722kg	722kg
Successfully Tested To	MASH TL-3	MASH TL-3	MASH TL-3	MASH TL-3
ASBAP Approval To	100km/h	100km/h	100km/h	100km/h
MASH TL-3 Deflection	1.27m	1.27m	1.76m	1.76m
Amount Transportable Per Semi Truck	9 Units – 32.94m	6 Units – 32.94m	9 Units – 32.94m	6 Units – 32.94m

T-Lok Approved by





Rubber T-Lok Approved by



Government of South Australia
Department for Infrastructure
and Transport

T-Lok Steel Wedge

Radius Solution for T-Lok Barriers

Saferoads have developed an innovative traffic delineation and worksite protection solution that is able to provide a continuous temporary traffic barrier deployment at a tight radius. The Saferoads T-Lok Steel Wedge incorporates a steel wedge piece which can be used in-between individual T-Lok freestanding temporary concrete barriers to facilitate placement at tighter radii. This innovation provides a vast improvement in safety during construction periods, and improved efficiency with staged intersection deployment.

The steel wedge has ASBAP approval to 60km/h. It enables the 3.66m barrier to be deployed on a radius as tight as 8m and the 5.49m barrier on a radius as tight as 12m. This is compared to a 30m radius for 3.66m barriers without the steel wedge, a significant advantage for worksite safety on intersections and roundabouts.

How does the steel wedge work?

The Saferoads T-Lok Barrier consists of a series of individual concrete barrier sections. The barrier ends comprise "T" and "C" connectors that interlock during deployment. The wedge fits and connects between the joints with ease.

Saferoads steel wedge enables the standard T-Lok Barriers to be deployed at a tighter radius by adding a wedge piece in between the T and C connectors. The plates used to construct the steel wedge are 12mm thick grade 350, the same steel used in T-Lok Barrier connectors. The steel wedges are fully welded and are as strong as the C and T connectors, to ensure the barriers connections are not compromised when the steel wedges are used. The steel wedges are a substantial unit, weighing approximately 60kg.



What angles can be achieved with the steel wedge?

Angles from 6 up to 32 degrees are achievable with the steel wedge. It can be used in either orientation up to enable the barriers to curve left or right regardless of the C and T orientation. This design is all that is needed for left or right curves, starting with either a C or T connector. The steel wedges should only be used where traffic speeds are restricted to 60km/h or below. The deflection where wedges are used should be conservatively set at 5m, and the distance to excavation should be 4m.

The 3.6m T-Lok Barriers can achieve a 30m radius, with a standard maximum 7 degrees angle at each joint. The steel wedges allows each joint to be deployed at an angle from 6 degrees (Figure 1) up to 32 degrees (Figure 2), enabling a deployment radius as tight as 8m when steel wedges are used in between each T-Lok Barrier.

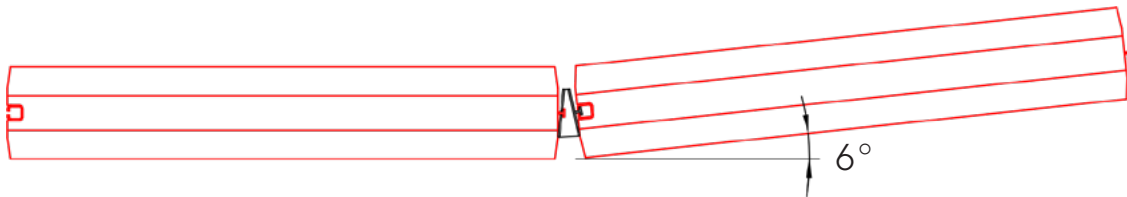


Figure 1: Plan view of two barriers laid out with the wedge at 6 degrees

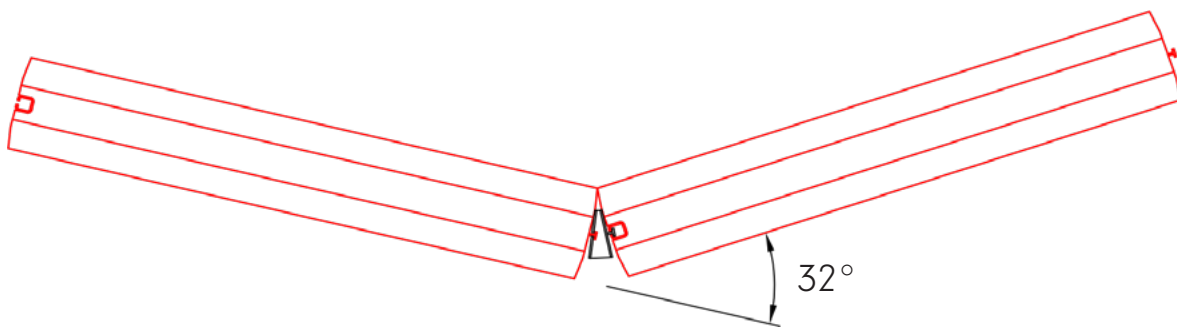


Figure 2: plan view of two barriers laid out with the wedge at 32 degrees

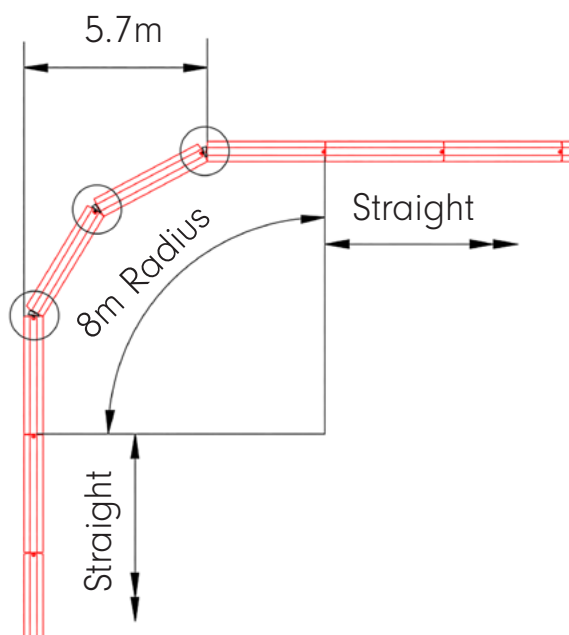


Figure 3: plan view of barriers laid out with the wedge at 90 degrees

Technical Notes

Limitations

Saferoads T-Lok Barriers have been tested to MASH TL-3 requirements. Installations not in accordance with the manufacturer's instruction manual or impacts outside of MASH TL-3 testing may result in unpredictable performance.

To ensure adequate performance in the event of an impact, the T-Lok Barrier must be deployed and maintained in accordance with the manufacturer's instruction manual and local authority guidelines – see <https://www.saferoads.com.au/t-lok-barrier>

Impacts that exceed the design capabilities described in the manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in MASH relative to structural adequacy, occupant risk and vehicle trajectory factors.

Higher than reported deflections can be expected outside the LON section.

Barrier Segments

T-Lok temporary barrier deployments consist of a series of individual precast concrete barrier segments. Barrier segments should not be stacked for transport, and can be stacked two high during storage. Appropriate bearers should be used between layers.

Connectors

T-Lok Barrier ends comprise of "T" and "C" connectors that interlock during deployment.

Anchoring

No anchoring required.

For installations with anchored crash cushions, anchor plates are required to anchor the concrete barriers to the pavement. Please refer to End Treatment section for further information.

Lifting

Each T-Lok Barrier segment is fitted with two 5,000kg rated swift lifts placed at either end of each module. When slinging it is of great importance to adhere to the following points to avoid lifting lug failure.

Prior to attempting any lift, inspect barriers for any cracking of the concrete through the lifting points, or corrosion or fatigue in the swift lift fitting. **DO NOT LIFT THE BARRIER WITH SWIFT LIFTS** if any evidence of corrosion or fatigue is found in the Swift Lift fittings or cracking of the concrete is found through the lifting points, the barrier must then be lifted from beneath.

Lifting procedure with swift lifts

- Lift only one T-Lok segment at a time.
- If binding of the connection occurs, stop lift and readjust sling gear to level the barrier.
- Sling angle 60° maximum.
- Chain/sling length SL= 3.5m (two tied to one ring). Shorter slings than recommended will overload lifting lugs.

- Lifting to be vertical only.

If these conditions cannot be met, we recommend using an approved spreader bar, ensuring to understand and follow the spreader bar manufacturer's guidelines.

When using the spreader bar method, care should be taken to ensure the spreader bar manufacturer's guidelines are clearly understood and followed.

When using the Saferoads tested lifting cradle, the following steps should be understood and applied:

- Ensure all relevant safety regulations are met.
- Attach the lifting cradle to crane using suitable slinging equipment with S.W.L rating to 5,000Kg.
- Lower lifting cradle over barrier ensuring bottom plate is maneuvered into lower drainage port (i.e. bottom edge of the barrier).
- Ensure the upper portion of the lifting cradle is positioned fully over the barrier top.
- Begin lifting.

If these conditions cannot be met, we recommend using an approved spreader bar, ensuring to understand and follow the spreader bar manufacturer's guidelines.

Minimum Deployment

The minimum deployment length of a T-Lok Barrier installation is 20m when using crash cushions and 58.5m when using freestanding water filled terminals.

End Treatments

T-Lok Barrier installations require appropriate end treatments to ensure occupant safety in the event of an impact to the end of the system.

T-Lok Barriers are approved for use with multiple end treatments, including SLED waterfilled end terminals (up to 80km/h). These end treatments do not require any anchoring to the ground and are completely freestanding. The QuadGuard M10 CZ crash cushions are also approved for use with T-Lok Barrier (up to 100km/h). As these terminals require tethering to the pavement, they will offer the shortest T-Lok MASH barrier deployment. Please refer to the T-Lok product manual on the Saferoads website for further information.

Length of Need

QuadGuard M10 CZ Crash Cushions

When using QuadGuard M10 CZ Crash Cushions to protect the ends of the system, the LON begins and ends at the first fender panel of the QuadGuard next to the yellow nose for MASH TL-3 deployments. Refer to the QuadGuard M10 manufacturers manual for further information.

SLED End Terminals

When using SLED crash cushions to protect the ends of the system, the length of need begins in from the front of the SLED and ends 36.6m (120ft) upstream from the end of the last T-Lok Barrier, 27m (88.5ft) from the beginning or end of the system for MASH TL-3 deployment. Refer to the SLED manual for more information.

Site Considerations

Certain conditions may affect the performance of Saferoads T-Lok Barriers. Since every job site is unique, the designer needs to consider the following conditions when incorporating T-Lok Barriers in the design. T-Lok Barriers should not be installed if there is:

- Cross slope steeper than 5%
- Longitudinal slope steeper than 5%
- Crest sharper than 5%
- Ditch sharper than 5%
- Kerbs or similar obstacles restricting the deflection nearby
- Trenches or excavations nearby

Deployment

Before beginning deployment, ensure there is adequate traffic management, and whenever possible personnel should remain on the non-traffic side of the installation. Also ensure appropriate lifting equipment is used and operated by competent personnel.

1. Beginning at the upstream end of the installation, unload the first barrier segment and place in the correct position.
2. Working downstream of the first barrier segment, unload the second barrier segment and align the T&C connectors while lowering the segment into position. Remain cautious of potential pinch and crush points when lowering and connecting barriers.
3. Repeat until all barrier segments are placed into the correct position and joined to adjacent barrier segments.
4. Install terminals as per the approved traffic plan.
5. Note that connection is easier when sliding the C-connector over the T-connector.

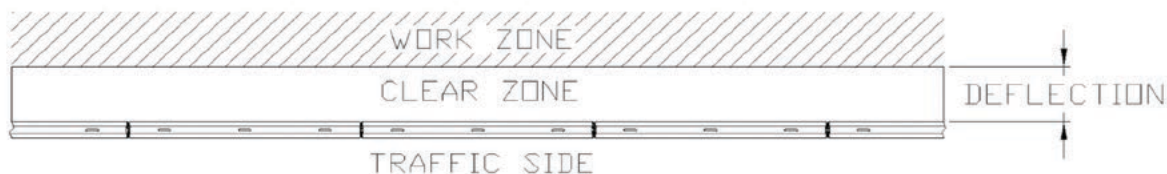
System Deflection & Working Width

Enough clear zone must be allocated between the T-Lok Barrier and the work zone to allow for deflection of the barrier during an impact. The crash tested deflection for a MASH TL-3, 2,270kg pickup impacting the barriers at 25 degrees at 100km/h is:

T-Lok MASH TL-3 Deflection - 1.27m

Rubber T-Lok MASH TL-3 Deflection - 1.76m

As the Rubber T-Lok's deflection is slightly higher than the original, only one type of barrier should be deployed in the one length of barrier.



The working width is the distance between the traffic face of the barrier before impact and the maximum lateral position of any major part of the barrier or vehicle after impact. The crash tested working width for a MASH TL-3, 2,270kg Pickup impacting the barrier at 25 degrees at 100km/h is shown below. The working width is the deflection plus the width of the barrier (Deflection + 0.61m)

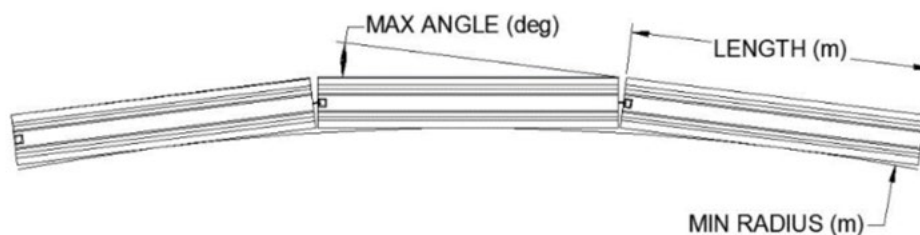
T-Lok MASH TL-3 Working Width - 1.88m

Rubber T-Lok MASH TL-3 Working Width - 2.37m

Curves

The ends of each section are constructed with the unique T&C connection design that interlocks each segment together. The sections can swivel up to 7 degrees at the connection for easy positioning around work areas or following road contours. A steel wedge can be installed, enabling the radius as tight as 8m. The Steel Wedge has ASBAP approval to 60km/h.

Type	Barrier Length (m)	Max. Angle (deg.)	Min. Radius (m)	Min Radius with Steel Wedge* (m)
MASH	5.49	7	46	12
	3.66	7	30	8



SLED End Terminal

Designed to shield the ends of a variety of temporary barriers from collisions, the SLED End Terminal is a durable, water filled and anchor free system.

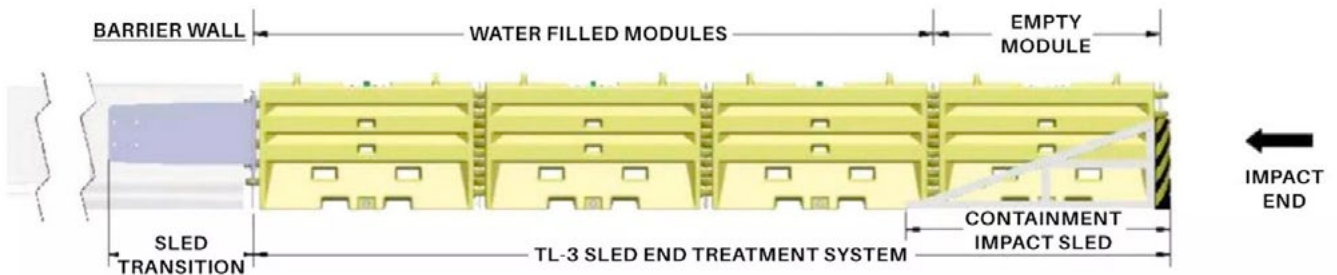
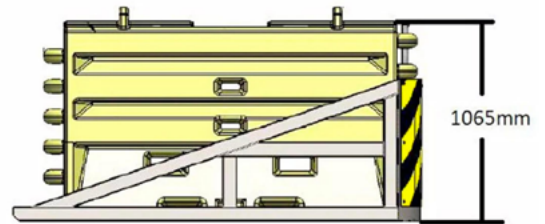
The Sentry Longitudinal Energy Dissipater (SLED) end terminal is a narrow, non re-directive gating crash cushion. SLED is designed to shield the end of all concrete temporary barriers. The unique design incorporates four internal steel cables, which help envelop the impacting vehicle - reducing the possibility of secondary accidents.

This end terminal has an Austroads Safety Barrier Assessment Panel (ASBAP) approval to 80km/h.

- **ASBAP approved to 80km/h**
- Successfully tested to MASH TL-3
- Fast deployment and retrieval
- No anchoring required
- Water filled
- Non re-directive
- Can be used in 40, 60 and 80km/h zones (by adding or reducing modules)

Specifications

Product code	F1304016
TL-3 Length	7.7m
Width	685mm
Height	1066mm
Successfully Tested To	100km/h
ASBAP Approval To	80km/h
Material	UV Stabilized Polyethylene
Fill	Water
After Impact	Easily Replaced
Tested To	MASH TL-3
Reusable	Nose and Transition Can Be Reused After Most Impacts



Approved by





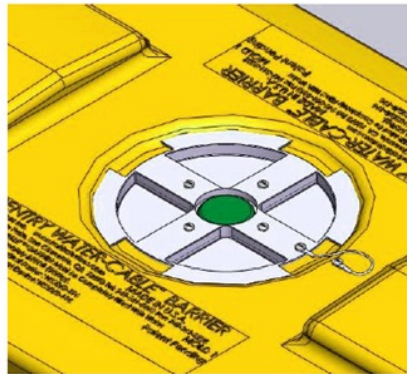
Technical Notes

System Design

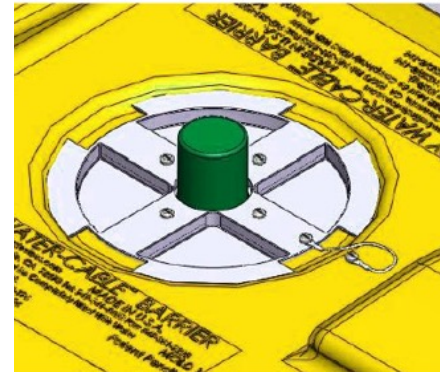
The SLED End Terminal is a gating, non-redirective end terminal designed to shield the end of Type F concrete or steel temporary barriers. Impacting vehicles are brought to a controlled stop, minimising the risk of dangerous secondary impacts. The SLED End Terminal absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle. SLED End Terminal provides several unique advantages over other end terminals:

- High level of energy absorption
- No anchoring to pavement required
- Short length
- Three different length options for speed ratings
 - 50km/h, 70km/h & 100km/h
- Economical to transport and deploy

A SLED End Terminal installation is comprised of a series of individual water filled sections constructed of high-density polyethylene. Steel cables are moulded into the barrier for tensile strength, plus one non filled section and a steel containment impact sled at the front and a steel transition assembly at the rear. Each filled section has a water capacity of 834 litres and features a large 200mm diameter fill hole for easy and fast filling. A water level indicator is fitted to the cover of this hole to show whether the section is filled correctly. Each section also has a centrally located moulded in buttress thread for easy draining.



Water level indicator in full "DOWN" position
- Wall is not filled to correct capacity. It is necessary to add water.



Water level indicator in full "UP" position
- Wall is filled to correct capacity.

At the end of each section are knuckles which contain vertically concentric holes. These knuckles interlock with the adjacent section and a galvanised steel "T" pin is installed through them to securely attach sections together. To ensure pins are installed properly there is also a safety keeper r-clip to be installed at the bottom.

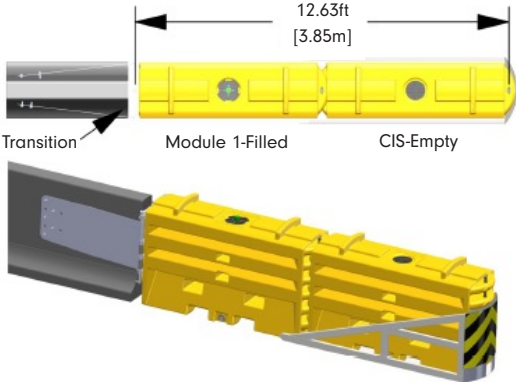
The HDPE plastic is durable and recyclable and will not crack or corrode over time. It will also break up into large pieces on impact, which do not pose a threat to bystanders. Terminal sections are made of yellow plastic. The end nose section is almost identical to the other sections but has large holes to ensure it is not filled with water.

Attached to this section is a galvanised steel impact containment sled designed to contain the barriers during an end on impact. The steel sled is tethered to the concrete barrier by the series of steel cables moulded inside the plastic sections. The steel transition assembly installs between the rear most section and the concrete or steel longitudinal barriers.

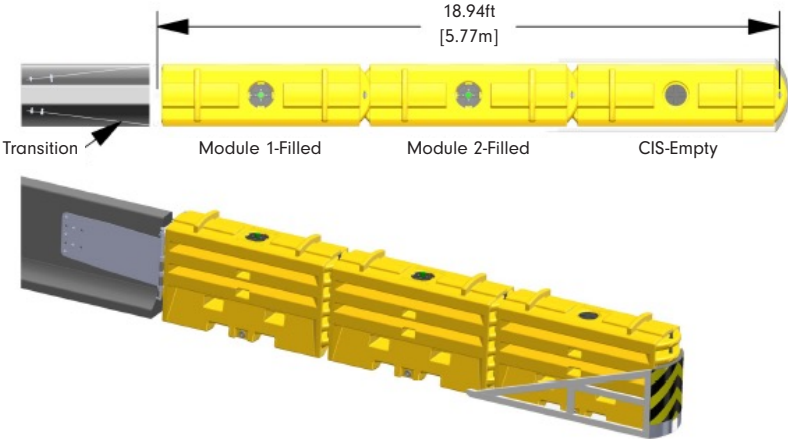
The SLED is available in three lengths for low speed urban areas, collector roads and highways

Speed Configuration

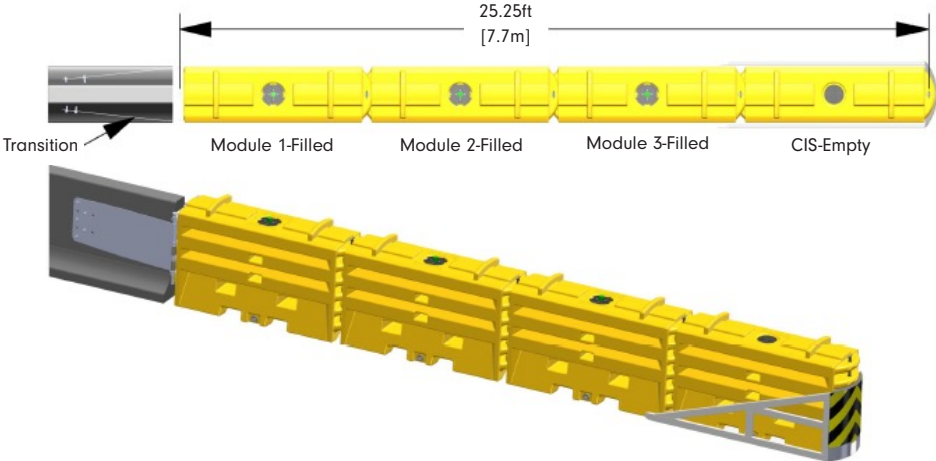
TL-1 Configuration up to 50km/h (31 mph)



TL-2 Configuration up to 70km/h (43 mph)

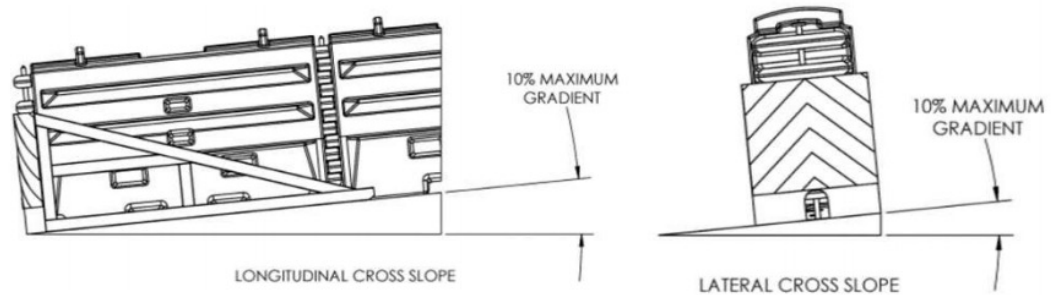


TL-3 Configuration up to 100km/h (62 mph)



Applications & Approved Barriers

The SLED End Terminal can be used for temporary installations in Australia. The SLED End Terminal is designed to be used in applications where the cross-fall will be less than 10 degrees (1.75m drop for every 10m of run).



Approved by ASBAP to 80km/h with the following barriers:

- HV2 Barrier
- T-Lok Barrier
- Rubber T-Lok Barrier
- All other concrete barriers (J-J Hooks, Delta Bloc, Pin and Loop)

Approved by ASBAP to 70km/h with:

- Ironman Hybrid Barrier

Crash Testing

SLED End Terminal is a crash worthy barrier system that has been thoroughly tested to AS/NZS 3845.1:2015 and MASH testing procedures. SLED End Terminal has been successfully tested as an end terminal up to 100km/h (MASH TL-3). Note the maximum approved speed in Australia is 80km/h. Two shorter length SLED options have been crash tested for speed ratings of 50km/h and 70km/h.

Limitations

The SLED End Terminal has been tested and passed AS/NZS 3845.1:2015 and MASH test criteria. The SLED End Terminal is capable of decelerating errant vehicles up to 2270 kg at speeds up to 100 km/h and angles of 25 degrees (TL-3). To ensure adequate performance in the event of an impact, the SLED End Terminal must be deployed and maintained in accordance with the manufacturer's instructions and local authority guidelines. Impacts that exceed the design capabilities described in this manual (vehicle weight, speed and impact angle) may not result in acceptable crash performance as described in AS/NZS 3845.1:2015 and MASH relative to structural adequacy, occupant risk and vehicle trajectory factors.

Deployment

For more information on site considerations, lifting, length of need, installation, retrieval, etc, please refer to the product manual on the Saferoads website.

QuadGuard M10 CZ End Terminal

The QuadGuard M10 CZ is a non-gating, fully re-directive end terminal made from durable galvanised steel. The system is designed to telescopically deform rearward to absorb the energy of impact in the case of head on collisions.

When impacted from the side, the modular design system of the QuadGuard End Terminal option safely re-directs errant vehicles. As such, these systems offer superior protection and safety for worksites.

This end terminal has an Austroads Safety Barrier Assessment Panel (ASBAP) approval to 100km/h.

- **ASBAP approved to 100km/h**
- Non-gating and fully re-directive behind nose cone
- 80% reusability after most impacts
- Successfully tested to MASH TL-3
- Durable
- Maintenance free
- Easy to reinstate and repair (after most impacts)
- Also available in 80km/h/"4-bay" configuration
- USA designed and manufactured

Specifications

TL-3 Length	6740mm (excl transitions)
Width	System: 610mm Plate: 1050mm
Height	817mm
Successfully Tested To	100km/h
ASBAP Approved To	100km/h
Material	Galvanised Steel
Fill	Energy Absorbing Cartridges
After Impact	Easily Repaired & Reinstated
Tested To	MASH TL-3
Reusable	80% Reusable after most impacts

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Technical Notes

System Design

The QuadGuard M10 CZ is a highly efficient, redirective, nongating crash cushion for hazards ranging in width from 610mm to 915mm. It consists of crushable, energy absorbing cartridges surrounded by a framework of Quad-Beam panels. The QuadGuard M10 CZ utilises two types of cartridges in a "staged" configuration to address both lighter cars and heavier, high centre of gravity vehicles. The modular design allows the system length to be tailored to the design speed of a site. To determine the appropriate length system for a given design speed, please refer to the product manual on the Road Safety Rental website.

Applications & Approved Barriers

The QuadGuard M10CZ End Terminal can be used for temporary installations in Australia.

Approved by ASBAP to 100km/h with the following barriers:

- HV2 Barrier
- T-Lok Barrier
- Rubber T-Lok Barrier

Crash Testing

The six bay QuadGuard M10 CZ has successfully passed the MASH TL-3 with both the light car and pickup truck at speeds up to 100 km/h, at angles up to 20 degrees. During head on impacts, the QuadGuard telescopes rearward and crushes to absorb the energy of impact. When impacted from the side, it safely redirects the vehicle back toward its original travel path and away from the hazard.

Limitations

The six bay QuadGuard M10 CZ has been tested and evaluated per the recommendations of the MASH guidelines for TL-3 terminals and crash cushions. The impact conditions recommended in this guideline are intended to encompass the majority but not all, of the possible in-service collisions. Properly installed and maintained, the QuadGuard is capable of performing its function of stopping or containing and redirecting the test vehicles in a predictable and safe manner under the nominal MASH TL-3 terminal and crash cushion impact conditions of:

Vehicles:

Small car and pickup mass: 1100 and 2270 kg

Speed: 100 km/h

Angle: 15 degrees for small vehicle 20 degrees for pickup

Impact conditions which differ from those described in MASH test matrix for non-gating, redirecting crash cushions may result in different crash results than those encountered in testing.

Deployment

For more information on site considerations, lifting, length of need, installation, retrieval, etc, please refer to the product manual on the Road Safety Rental website.

Rubber Guard Barrier

The Rubber Guard barrier was developed for non-tested applications such as internal worksites, low speed or offline sections of work areas that require separation for pedestrians or vehicles. These barriers also lend themselves to event management solutions, such as road closures.

Customers can rest assured that by choosing Rubber Guard Barrier, they are reducing the carbon footprint of the project. The manufacturing process of Rubber Guard removes tyres from landfill, reducing emissions, whilst also saving on water wastage and pollution caused by filling and draining waste water from plastic water filled barrier options.

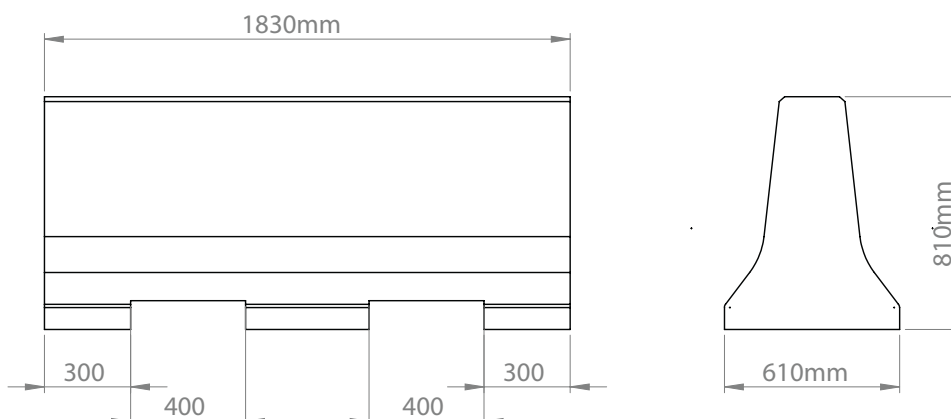
Saferoads Rubber Guard Barrier is superior to other barriers as the rubber increases the durability of the barrier. It will not crack or break, increasing its lifespan. It is efficient to deploy using a forklift, and does not need to be filled with water once on-site.

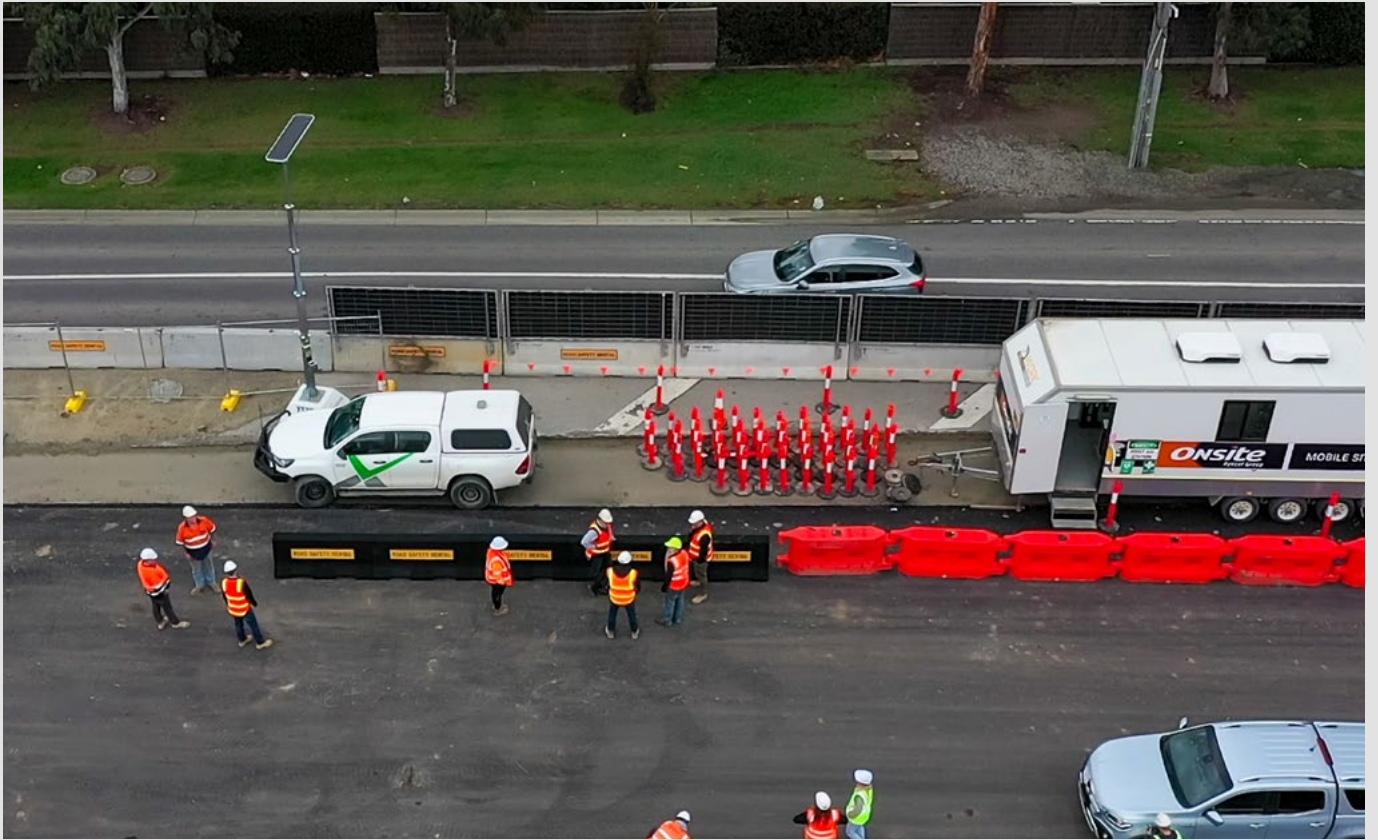
The Rubber Guard is a barrier manufactured using recycled rubber. Each barrier weighs approximately 400kg, made up of 85% recycled rubber crumb and 15% binder, recycling 56 passenger tyres per barrier.

- Manufactured locally using 85% recycled rubber crumb
- Combats waste, reduces landfill emissions and contributes to a circular economy
- Fast, efficient deployment and reduced OH&S risks
- Increased barrier lifespan
- Does not need to be filled with water, avoiding the need to dispose of waste water

Specifications

Length	1.83m
Height	810mm
Width	610mm
Weight	400kg (consisting of 340kg rubber and 60kg binder)
Weight per Metre	216kg
Amount Transportable Per Semi Truck	56





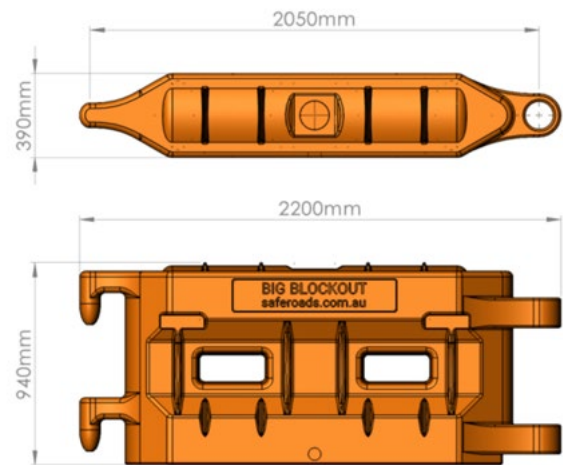
BIG Blockout Barrier

Saferoads BIG Blockout is a non-tested pedestrian barrier, designed to redirect foot traffic and protect pedestrians from hazards such as worksites. Since they are water filled and stackable, they are lightweight when empty and easy to transport and install. Saferoads BIG Blockout Barriers are Australian made using high quality UV stabilised LLDPE.

BIG Blockout Barriers are rotationally moulded - a superior one-piece manufacturing process. The result is a seamless barrier with an 8mm wall thickness, featuring high impact absorption and excellent resistance to punctures and tearing. BIG Blockout Barriers have the strength, flexibility and high temperature resistance required for the unforgiving Australian climate.

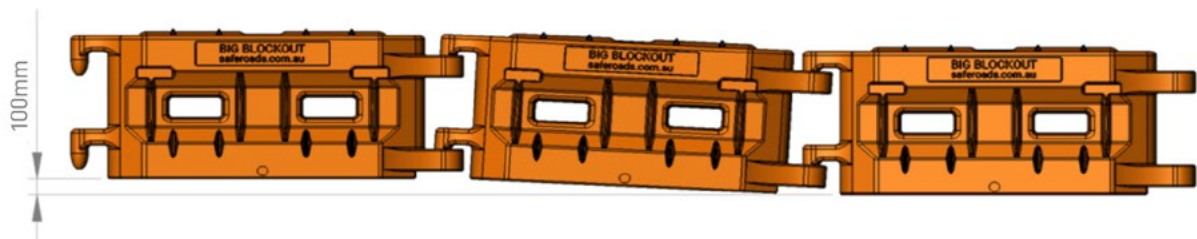
Specifications

Height	940mm
Overall Length	2200mm
Installed Length	2050mm
Width	390mm
Weight (empty)	38kg
Weight (full)	488kg
Water Ballast	450L
Walls Thickness	8mm
Material	LLDPE
Colour	Orange
Construction	Rotationally Moulded



Site Considerations

Barriers can be arranged to step up slopes and follow undulating ground, (see below), a step up of 100mm is achievable over the length of one barrier.





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