

PRODUCT MANUAL



W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019

Contents

| | |
|--|----|
| Preface | 2 |
| Introduction | 2 |
| Applications..... | 2 |
| Limitations..... | 3 |
| Testing..... | 3 |
| Barrier Segments..... | 3 |
| Minimum Deployment | 6 |
| End Treatment..... | 6 |
| Length of Need..... | 6 |
| Quadguard Crash Cushions | 6 |
| SLED End Terminals | 6 |
| Tapering Barriers outside the Clear Zone | 6 |
| Deployment Options..... | 7 |
| System Deflection | 8 |
| Working Width..... | 9 |
| Site Considerations | 10 |
| Barrier Deployment | 10 |
| QuadGuard Crash Cushion Deployment..... | 11 |
| SLED Crash Cushion Deployment..... | 12 |
| Maintenance and Repair..... | 13 |
| Safe Work Method Statement | 14 |



Preface

For optimum performance, Saferoads HV2 Safety Barrier must be designed, installed and maintained as per this manual. Please thoroughly review and understand this manual before using HV2 Safety Barrier.

Local requirements may also impose restrictions. Please refer to local governing body for further information.

If more information is required, please contact Saferoads:

Websites: www.saferoads.com.au or www.hv2barrier.com

Australia: 1800 060 672

USA: (859) 469 0364

International: +61 3 5945 6600

Email: sales@saferoads.com.au

Introduction

Saferoads HV2 Safety Barrier is a free standing temporary longitudinal barrier system successfully crash tested to MASH TL-3 & MASH TL-4.

The patented hybrid technology, and unique connectors, allow Saferoads HV2 Safety Barrier to offer high containment and low deflection, while remaining economical to transport and deploy, with no time-consuming anchoring required.

Saferoads HV2 Safety Barrier provides several unique advantages over other temporary barrier systems including:

- High containment
- Low deflection
- Safe, consistent and reliable redirection
- Fast deployment and retrieval
- No anchoring required
- No loose parts
- Economical to transport
- Maintenance free
- Durable

Applications

Saferoads HV2 Safety Barrier is tested to provide positive protection of work sites by safely redirecting errant vehicles up to 22,000lbs (10,000kg) at 15° and 56mph (90km/h), or 5,000lbs (2,270kg) at 25° and 62mph (100km/h). This allows HV2 Safety Barrier to be suitable for use on any roadside work zone from highways to low speed local streets.

Since the HV2 Safety Barrier is free standing, it can be used on any firm surface including concrete, asphalt, spray seal, unsealed compound pavements, and uniform natural surfaces.



W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019
Page 2

Limitations

Saferoads HV2 Safety Barrier has been tested up to MASH TL-3 & MASH TL-4 requirements, as required by FHWA. Installations not in accordance with this manual or impacts outside of MASH TL-3 & MASH TL-4 testing, may result in unpredictable performance.

Testing

Saferoads HV2 Safety Barrier has successfully passed a variety of tests to ensure compliance with MASH requirements, including:

- MASH 4-10 (1,100C) – Test No. 690902-SFR7
- MASH 4-11 (2,270P) – Test No. 690902-SFR6
- MASH 4-12 (10,000S) – Test No. 690902-SFR8
- MASH 3-21 (2,270P) – Test No. 132266.01 Reverse Transition with Pinned Crash Cushion
- MASH 3-11 (2,270P) – Test No. 132266.3-11 BLON with SLED
- MASH 3-44 (2,270P) – Test No. 132266.3-44 CIP with SLED

Barrier Segments

A HV2 Safety Barrier installation is constructed from a series of individual barrier segments. Each segment is constructed from steel with concrete ballasting. The dimensions of each segment are:

| | |
|------------------|--------------------|
| Installed length | 19ft (5,800mm) |
| Segment length | 19ft 2in (5,846mm) |
| Segment width | 18in (450mm) |
| Segment height | 35in (900mm) |
| Weight | 4600lbs (2,088kg) |



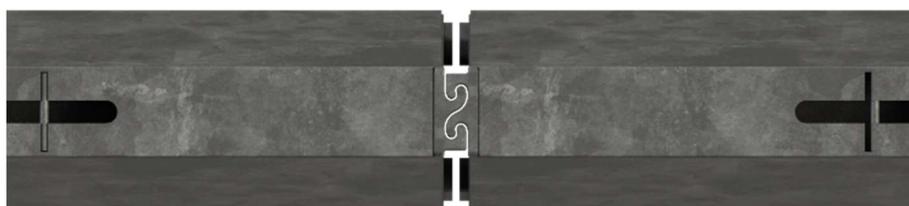
W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019
Page 3

Barrier segments are fastened by an integrated, interlocking joiner, which simply slides together when barriers are lowered into position.



These connectors are bidirectional, allowing barriers to be installed in either orientation.



W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019
Page 4

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



Barrier segments can be stacked for storage or transport, but appropriate bearers should be used between layers.



W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019
Page 5

Minimum Deployment

HV2 Safety Barrier installations require a minimum deployment length of 323.5ft/98.6m (17no. HV2 Barriers) plus the required end treatments, to safely contain and redirect at MASH TL3.

For MASH TL-4 the minimum Deployment is 912ft/278m (48no. HV2 Barriers) plus the required end treatments.

End Treatment

HV2 Safety Barrier installations require appropriate end treatments to ensure occupant safety in the event of an impact to the end of the system. HV2 Safety Barrier can be used with any approved end treatment, including QuadGuard Crash Cushion with Transition, SLED Crash Cushion with Transition Kit, or tapering the barriers outside the Clear Zone with no end terminal attached.

The QuadGuard Crash Cushion 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 page 11 for deployment details.

The SLED Water Filled Crash Cushion with Transition Kit has been successfully tested with the HV2 Safety Barrier. This configuration does not require any anchoring to the ground and is completely freestanding. Refer to page 12 for deployment details.

Length of Need

Quadguard Crash Cushions

When using QuadGuard Crash Cushions to protect the ends of the system, the length of need begins and ends at the first fender panel of the QuadGuard next to the Yellow Nose for MASH TL-3 Deployments.

For MASH TL-4 Deployments the length of need begins at the joint between the first and second HV2 Barriers and ends 164ft/50m upstream from the nose of the trailing Quadguard.

Please refer to the QuadGuard product manual for further information.

SLED End Terminals

When using SLED crash cushions to protect the ends of the system, the length of need begins and ends midway along the 3rd HV2 Safety Barrier segment, 74ft/22.5m from the beginning or end of the system for MASH TL-3 Deployment.

For MASH TL-4 Deployments the length of need begins and ends 164ft/50m in from the ends of the SLED End Terminals.

Note a SLED to HV2 Transition Kit is required, see pages 12 and 13 for detail.

Tapering Barriers outside the Clear Zone

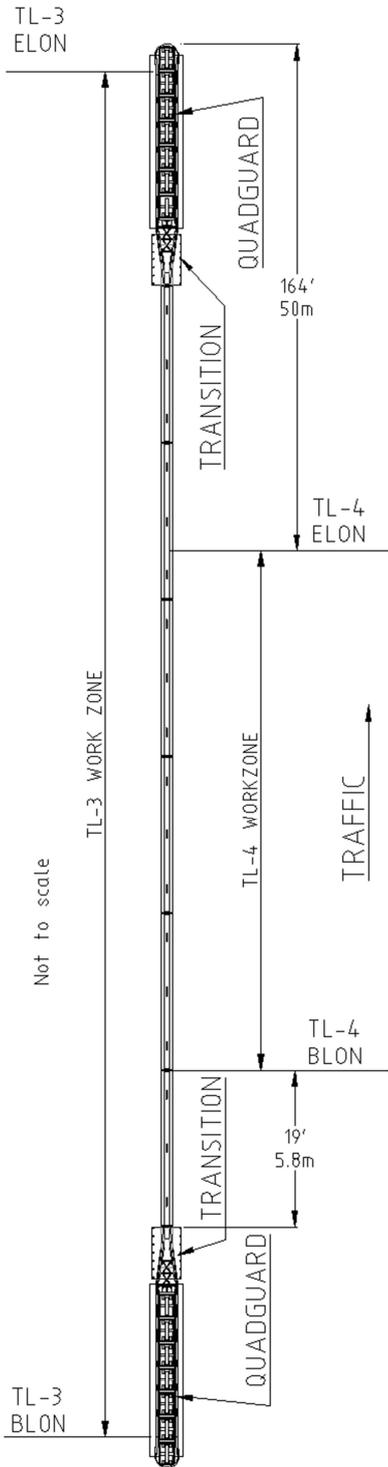
When tapering HV2 Safety Barrier outside the Clear Zone, the length of need begins and ends 164ft/50m from the ends of the system for a MASH TL-3 Deployment.

For MASH TL-4 Deployments the length of need begins 164ft/50m from the end of the system

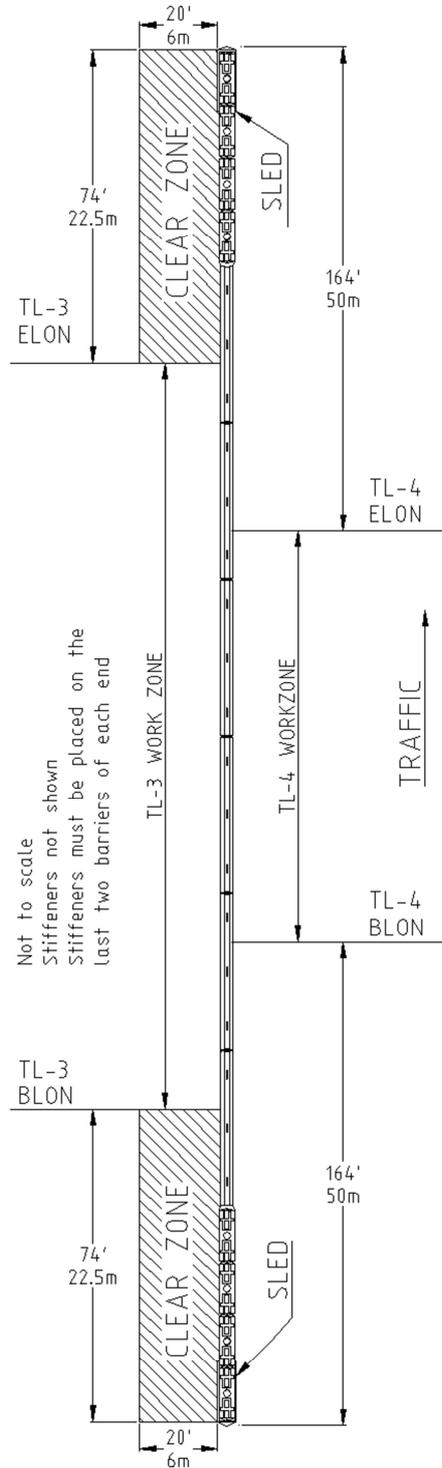


Deployment Options

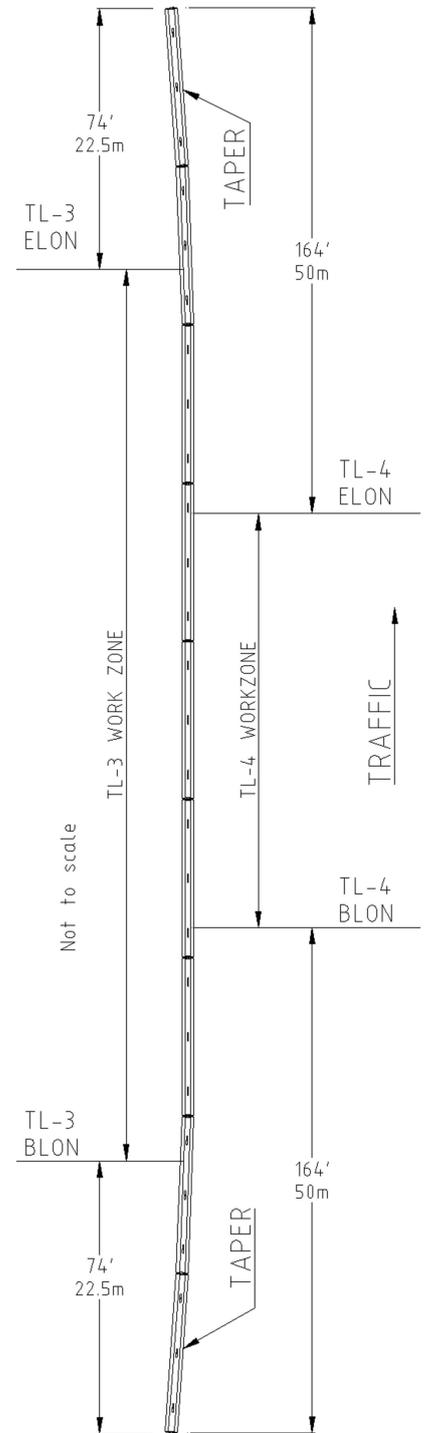
QUADGUARD



SLED

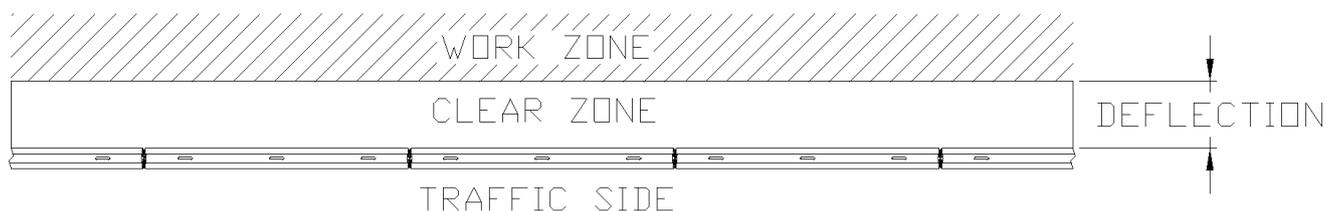


TAPER



System Deflection

A sufficient clear zone must be allocated between the HV2 Safety Barrier and the work zone to allow for deflection of the barrier during an impact. The below tables show the estimated deflection during an impact, and are based on a combination of crash testing and interpolation.



TL3 - 5,000lbs (2,270kg) vehicle

| Speed | 25° | 20° | 15° | 10° | 5° |
|--------------------|----------------------------------|---------------------|---------------------|---------------------|-----------------|
| 62mph (100km/h) | 4ft 10in ¹ (1.47m) | 3ft 11in (1.18m) | 2ft 11in (0.88m) | 2ft (0.59m) | 1ft (0.30m) |
| 56mph (90km/h) | 4ft 5in (1.33m) | 3ft 7in (1.07m) | 2ft 8in (0.8m) | 1ft 10in (0.54m) | 11in (0.27m) |
| 50mph (80km/h) | 3ft 11in (1.18m) | 3ft 2in (0.95m) | 2ft 4in (0.71m) | 1ft 7in (0.48m) | 10in (0.24m) |
| 43mph (70km/h) | 3ft 5in (1.03m) | 2ft 9in (0.83m) | 2ft 1in (0.62m) | 1ft 5in (0.42m) | 9in (0.21m) |
| 37mph (60km/h) | 2ft 11in (0.89m) | 2ft 4in (0.71m) | 1ft 9in (0.53m) | 1ft 3in (0.36m) | 8in (0.18m) |
| 31mph (50km/h) | 2ft 6in (0.74m) | 2ft (0.59m) | 1ft 6in (0.44m) | 1ft (0.30m) | 6in (0.15m) |
| 25mph (40km/h) | 2ft (0.59m) | 1ft 7in (0.48m) | 1ft 3in (0.36m) | 10in (0.24m) | 5in (0.12m) |

¹Crash Tested Result

TL4 - 22,000lbs (10,000kg) vehicle:

| Speed | 15° | 10° | 5° |
|-----------------|----------------------------------|---------------------|--------------------|
| 56mph (90km/h) | 7ft 10in ¹ (2.37m) | 5ft 3in (1.58m) | 2ft 8in (0.79m) |
| 50mph (80km/h) | 7ft (2.11m) | 4ft 8in (1.41m) | 2ft 4in (0.71m) |
| 43mph (70km/h) | 6ft 1in (1.85m) | 4ft 1in (1.23m) | 2ft 1in (0.62m) |
| 37mph (60km/h) | 5ft 3in (1.58m) | 3ft 6in (1.06m) | 1ft 9in (0.53m) |
| 31 mph (50km/h) | 4ft 4in (1.32m) | 2ft 11in (0.88m) | 1ft 6in (0.44m) |
| 25mph (40km/h) | 3ft 6in (1.06m) | 2ft 4in (0.71m) | 1ft 2in (0.35m) |

¹Crash Tested Result



Working Width

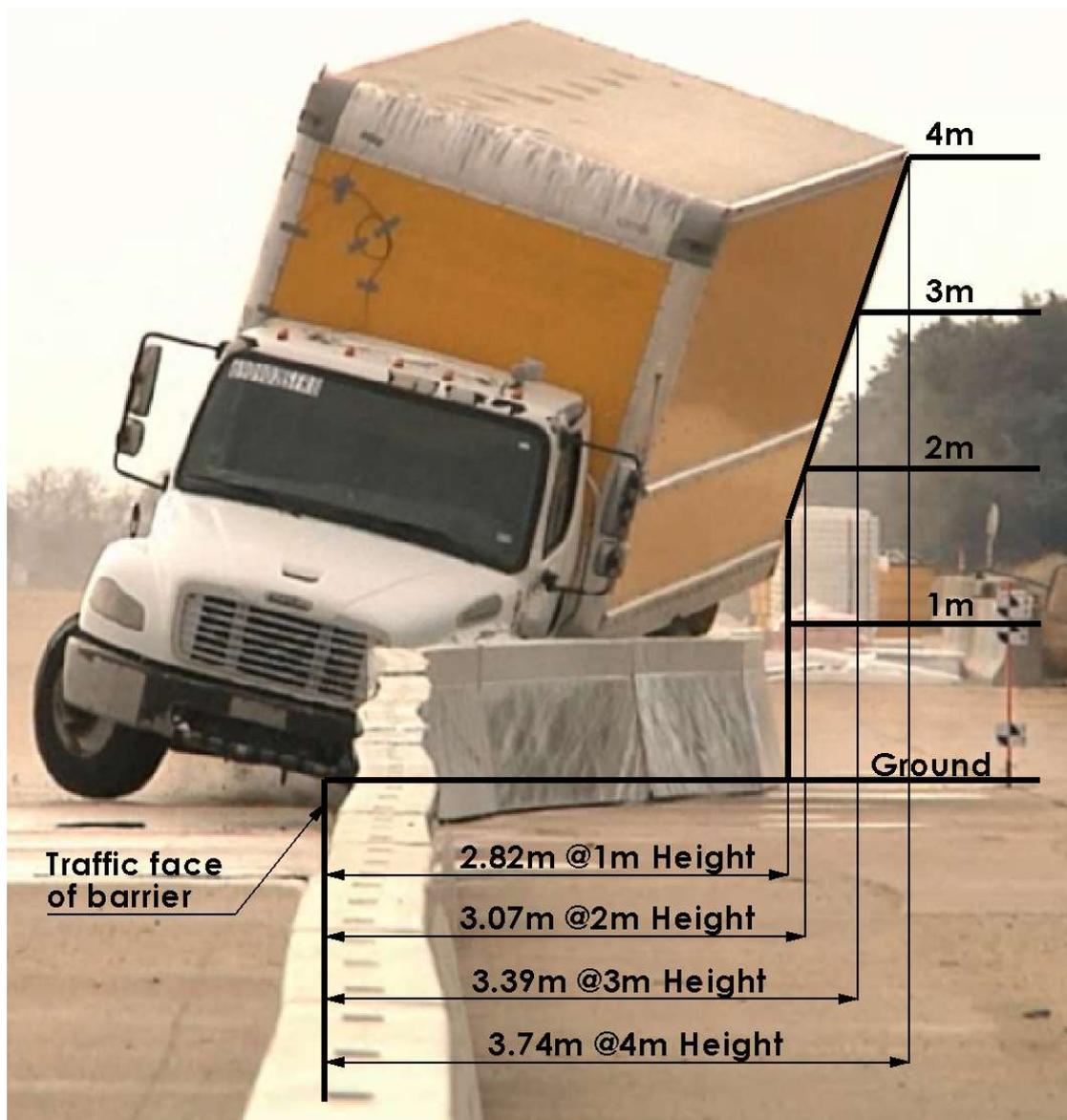
The Working Width is the distance between the traffic face of the barrier before impact and the maximum lateral position of any major part of the barrier or vehicle after impact.

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 below image 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.



Site Considerations

While Saferoads HV2 Safety Barrier can be installed on most worksites, some obstacles must be avoided. HV2 Safety Barrier should not be installed if there is:

- Curvature tighter than 262ft (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

For more information please contact Saferoads or the relevant road authority.

Barrier 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. 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 adjacent barrier segments.
4. For installing an end terminal refer to the relevant deployment section below.



QuadGuard Crash Cushion Deployment

When deploying the system with a QuadGuard Crash Cushion, a HV2 Transition must be used between the QuadGuard and the end HV2 Barrier segment. A 24in (610mm) QuadGuard (model number QS2406) should be used.

1. Replace the side panels (part number 2760141-0000) between the rearmost fender panels and the tension strut backup of the QuadGuard with the HV2 Transition. This transition can remain attached to the QuadGuard, including during transport.



QuadGuard parts excluded for clarity

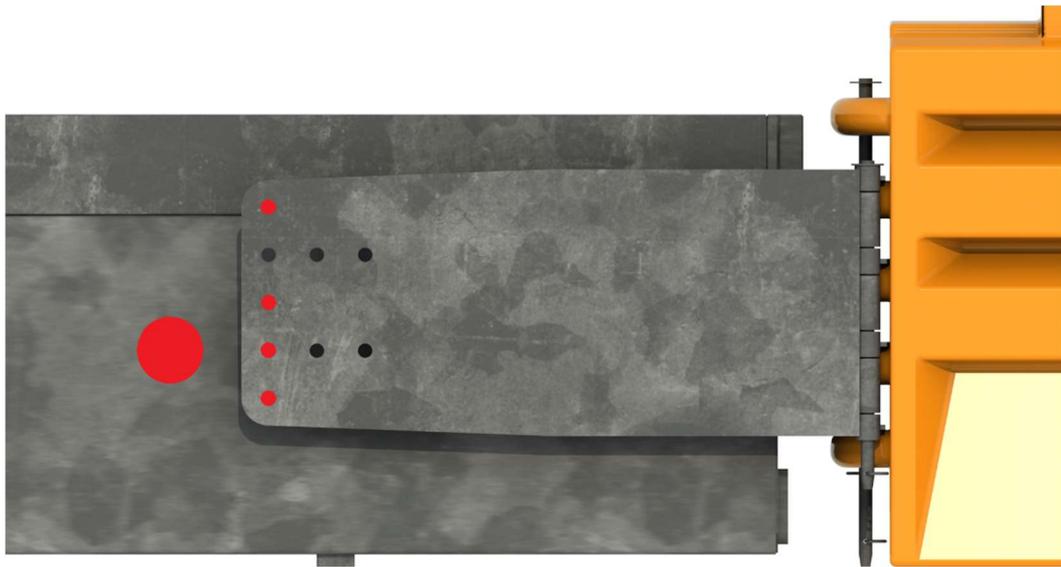
2. Align the connectors of the HV2 Transition with the connectors of the end HV2 Barrier segment while lowering the QuadGuard and HV2 Transition assembly into position.
3. Anchor both the HV2 Transition and the QuadGuard. The HV2 Transition should be anchored using Hilti HIT-RE 500 V3 epoxy or equivalent. QuadGuard should be anchored according to the QuadGuard product manual.

| Surface | Minimum Foundation Depth | Anchor |
|-------------------------|--|---|
| Concrete | 6in (150mm) Concrete | 7in (180mm) Stud 5.5in (140mm) Embedment |
| Asphalt Over PCC | 3in (76mm) Asphalt 3in (76mm) Concrete | 18in (460mm) Stud 16.5in (420mm) Embedment |
| Asphalt Over Subbase | 6in (150mm) Asphalt 6in (150mm) Compacted Subbase | 18in (460mm) Stud 16.5in (420mm) Embedment |
| Asphalt | 8in (200mm) Asphalt | 18in (460mm) Stud 16.5in (420mm) Embedment |

SLED Crash Cushion Deployment

When deploying the system with a SLED Crash Cushion, the generic SLED Transition must be used to connect the SLED to the end HV2 Barrier segment. A SLED to HV2 Transition kit is also required that includes 2no. 3.6m Stiffening beams for the first 2 HV2 Barrier joints adjacent to the SLED.

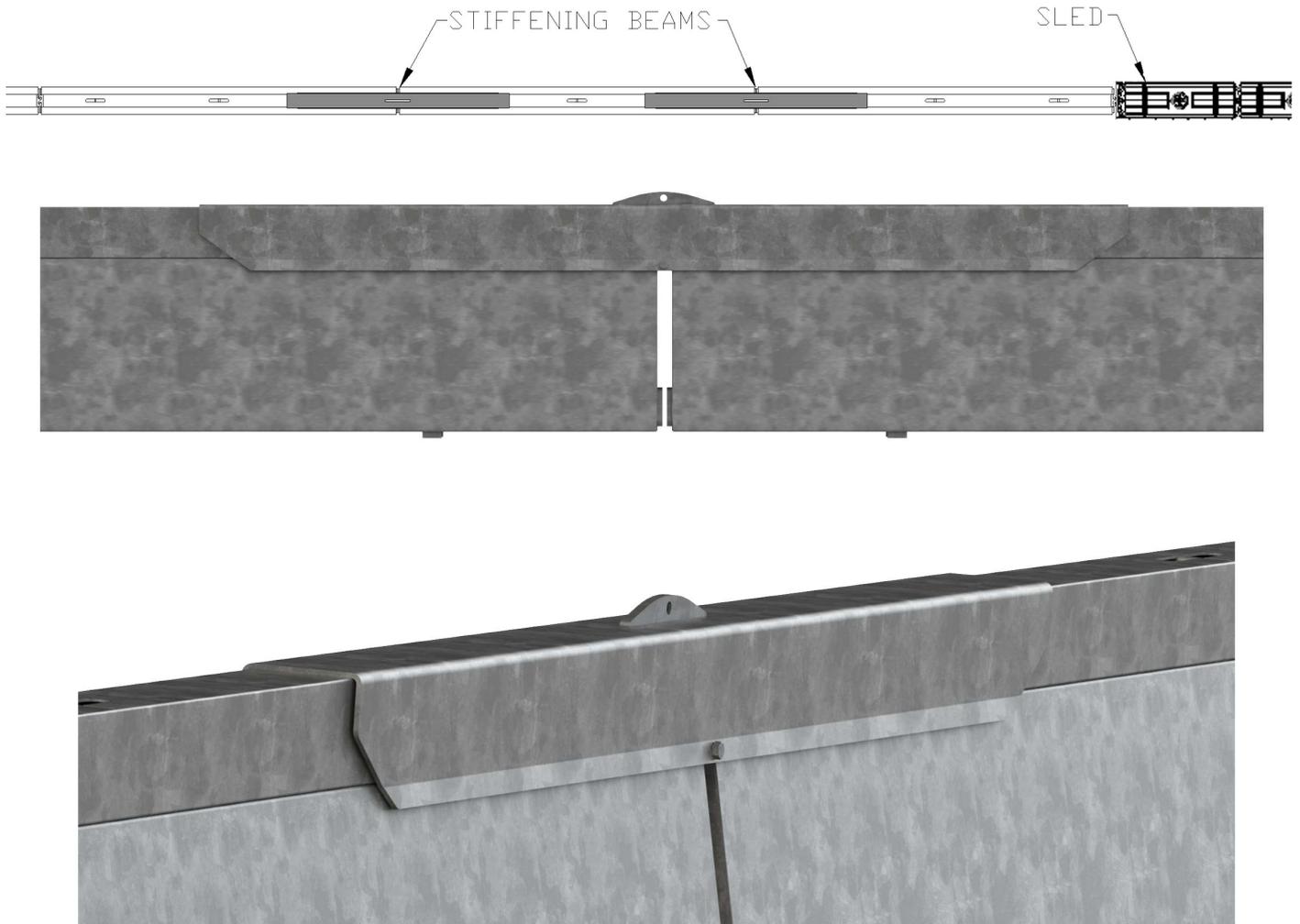
1. Assemble the SLED transition according to the SLED product manual, and position at the end of the system.
2. Clamp the transition panels to the end HV2 Barrier segment and using the transition panels as a template, drill four $\frac{3}{4}$ " (20mm) holes through both sides of the HV2 Barrier. The below diagram shows the recommended hole pattern. A 4" (100mm) access hole should also be cut through one side of the barrier in the approximate position shown. This hole should be on the work zone side of the barrier where possible.



3. Attach the transition panels to the HV2 Barrier using eight $\frac{3}{4}$ "-10 x 3" hex head bolts and nuts. The hex heads are to be on the outside face of the transition plates.
4. Deploy the remaining SLED components according to the SLED product manual.



5. The SLED Transition Kit includes 2 stiffening beams, the 3.6m long U-shaped beams shall be installed at the first 2 HV2 Barrier joints adjacent to the SLED Crash Cushions. A single ¾"-10 x 11" hex head Bolt secures each Beam in place, installed in the centre of the beam under the HV2 Connectors through the gap between the Barriers. Washers are to be installed each end and a Nyloc Nut is to be used.



Maintenance and Repair

No ongoing maintenance is required for the Saferoads HV2 Safety Barrier. Barriers should be inspected regularly, and any damaged segments should be replaced immediately. Damaged barrier segments can be removed and replaced from between undamaged segments. Repair of barriers is not recommended.



W www.saferoads.com.au
T +61 3 5945 6600
E sales@saferoads.com.au

USA Version 1.5
May 2019
Page 13

Safe Work Method Statement

| Activity | Hazard Identified | Controls Required | Risk Before Controls | Person Responsible | Residual Risk | Sign Off |
|----------------------|------------------------------------|--|----------------------|--------------------|---------------|----------|
| Lifting HV2 Segments | Lifting equipment failure | Ensure machinery and operators are appropriately certified. Ensure all equipment is in good, working and tagged condition. | M | | L | |
| | Contact with overhead services | Ensure there are no hazards above the area. If unsure arrange a spotter. | H | | L | |
| | Contact with people or property | Ensure hazards are cleared from area, and do not use lifting equipment in adverse weather. | M | | L | |
| Placing HV2 Segments | Crushing under or between segments | Where possible personnel should be away from area. If personnel are required body parts should be clear when lowering and joining barrier segments. Appropriate PPE should also be worn. | M | | L | |
| | Arriving or departing worksite | Abide by worksite speed limits and transport routes. Ensure nearby personnel are wearing high-vis clothing. | L | | L | |
| Attending worksite | Environmental hazards | Personnel should wear appropriate clothing and foot wear for environmental conditions. | L | | L | |
| | Excess noise | Where required personnel should wear appropriate hearing protection. | M | | L | |
| | Falling items or debris | Where required personnel should wear appropriate protective gear such as helmets, boots and eye protection. | M | | L | |

