



# SLED End Terminal



*Plastic Water Filled  
Road Safety End Terminal  
for Temporary Road Works  
80Km/h*

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Product Manual

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# SLED End Terminal

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## Important Introductory Notes

Proper design, deployment and maintenance of the SLED End Terminal is essential to assure maximum performance.

It is critical for any users of the SLED End Terminal to be fully familiar with the manufacturer's instructions for use.

Take the time to review this manual including the Limitations and Warnings thoroughly before performing the necessary work.

Do not attempt to install any end terminal without the proper plans and installation manual from the manufacturer or approval from the relevant Road Authority.

If you need additional information, or have questions about the SLED End Terminal, please call:

**Saferoads PL Customer Service Department  
on 1800 060 672.**

## System Overview

SLED End Terminal provides several unique advantages over other end terminals:

- High level of energy absorption
- No anchoring to pavement required
- Short length
- Economical to transport and deploy

SLED End Terminal is a crash worthy barrier system that has been thoroughly tested to AS/NZS 3845:1999 and MASH testing procedures.

SLED End Terminal has been successfully tested as an end terminal up to 100km/h (TL-3)

Note the maximum approved speed is 80km/h.

## Function

SLED End Terminal is a gating, non-redirective end terminal designed to shield the end of permanent and portable barriers made of concrete.

Impacting vehicles are brought to a controlled stop, minimizing the risk of dangerous secondary impacts. SLED End Terminal absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle.

**SLED must be installed in accordance with AUSTRROADS and state road authority Safety Barrier Acceptance conditions.**

# SLED End Terminal

## System Design

### Construction

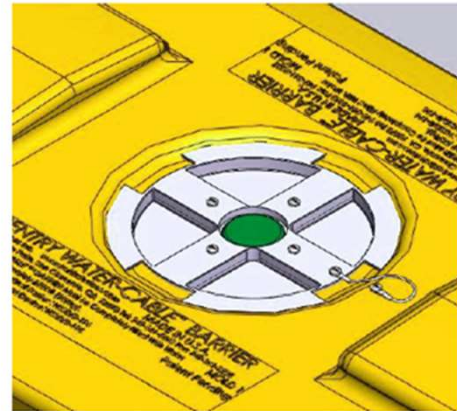
A SLED End Terminal installation is constructed from a series of 3 individual water filled sections constructed of high density polyethylene with steel cables molded into the barrier for tensile strength, plus one non filled section, a steel containment impact sled and a steel transition assembly. Each filled section has a water capacity of 834 litres and features a large 200mm diameter fill hole for easy filling. A water level indicator is fitted to the cover of this hole to show whether the section is filled correctly (figure 1). Each section also has a centrally located molded in Buttress thread for easy draining.

At the end of each section are knuckles which contain vertically concentric holes. These knuckles interlock with the adjacent section and a galvanized steel T pin is installed through them to securely attach sections together. To ensure pins are installed properly there is also a safety keeper pin to be installed at the bottom. Sections can rotate around this pin for easy positioning around work areas.

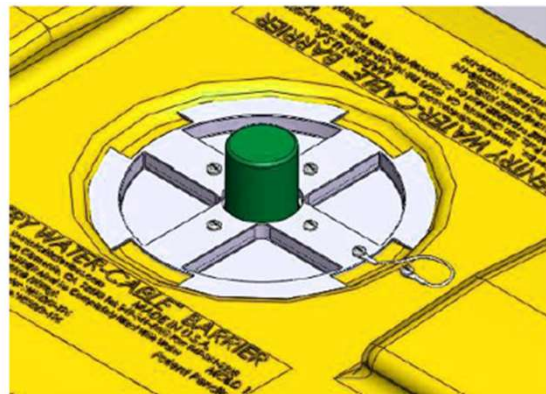
The HDPE plastic is durable and recyclable and will not crack or corrode over time. It will also break up into large pieces on impact, which do not pose a threat to bystanders. Terminal sections are made of yellow plastic.

The end nose section is almost identical to the other sections but is not filled with water. Attached to this section is a galvanized steel impact containment sled designed to contain the barriers during an end impact. The steel sled is tethered to the concrete barrier by the series of steel cables molded inside the sections.

The steel transition assembly installs between the rear most section and the concrete barrier.



*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*

**Figure 1**  
**Water Indicator**

INSTALLED LENGTH	7920mm
SYSTEM HEIGHT	1084mm
SYSTEM WIDTH	690mm
WEIGHT PER MODULE EMPTY	73kg
WEIGHT PER MODULE FULL	907kg

# SLED End Terminal

## System Design

### Application

The SLED End Terminal can be used for Temporary installations only.

In order to design the most appropriate SLED End Terminal for a given site, this manual supplies some basic application information about the SLED End Terminal and details its performance when tested to AS/NZS 3845:1999 and MASH.

For further assistance, please contact: **Saferoads Customer Service Department on 1800 060 672.**

### System Differentiation

All SLED End Terminal sections are yellow, and contain internal molded in steel cables. Any other color, or product without internal molded in cables, will not qualify as a SLED End Terminal product.

### Transport and storage

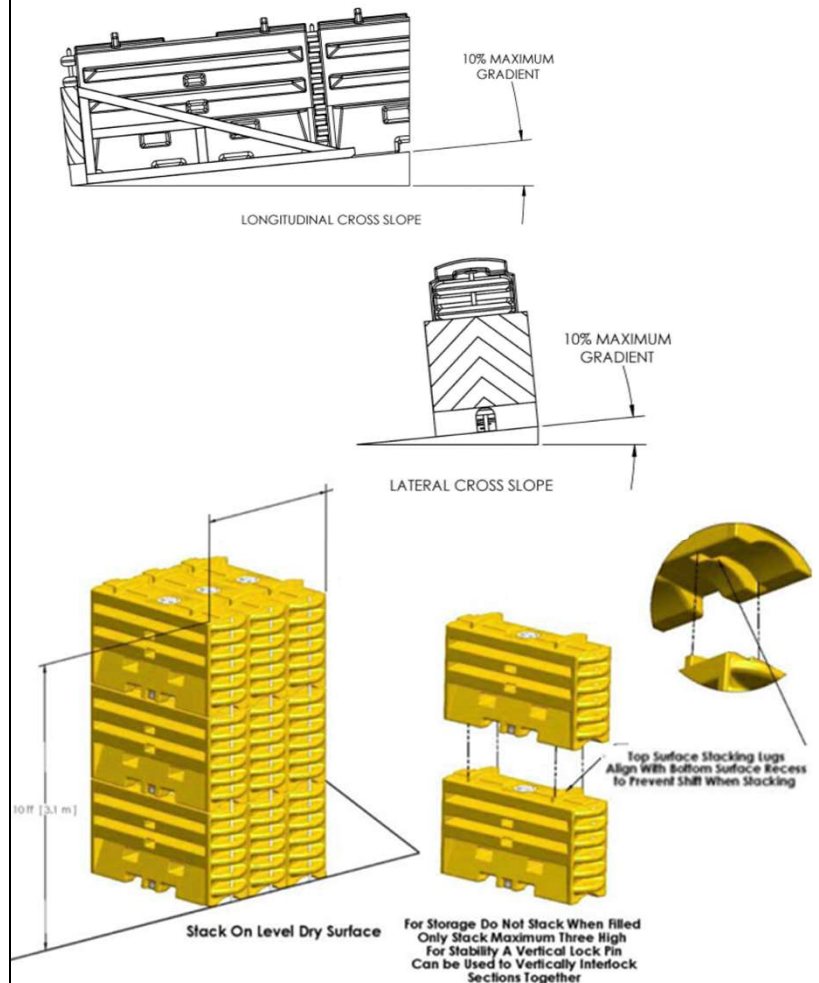
Sections should not be lifted from the molded in cables. Sections can be moved either empty or full using a forklift. For bulk transport and storage sections should be emptied. sections may be stacked up to 3 high and are held in place by lugs and recesses on the top and bottom of each section. Long T pins may also be used to further secure sections. sections should only be stacked empty and straps should also be used to secure sections together. Refer to figure 2.

## Surface

Since the SLED End Terminal is free standing and does not require anchoring the foundation is only required to hold the weight of the barriers. Acceptable foundations include concrete, asphalt and Sprayed sealed pavements. Foundations should be free of rough surfaces such as pot holes, loose soil, rocks etc. especially under the barriers and within the deflection zone. Kerbs should not be in front of, or within the deflection zone of the barrier system.

## Slopes

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). Refer to figure 2.



**Figure 2**  
**Slopes and Stacking**

# SLED End Terminal

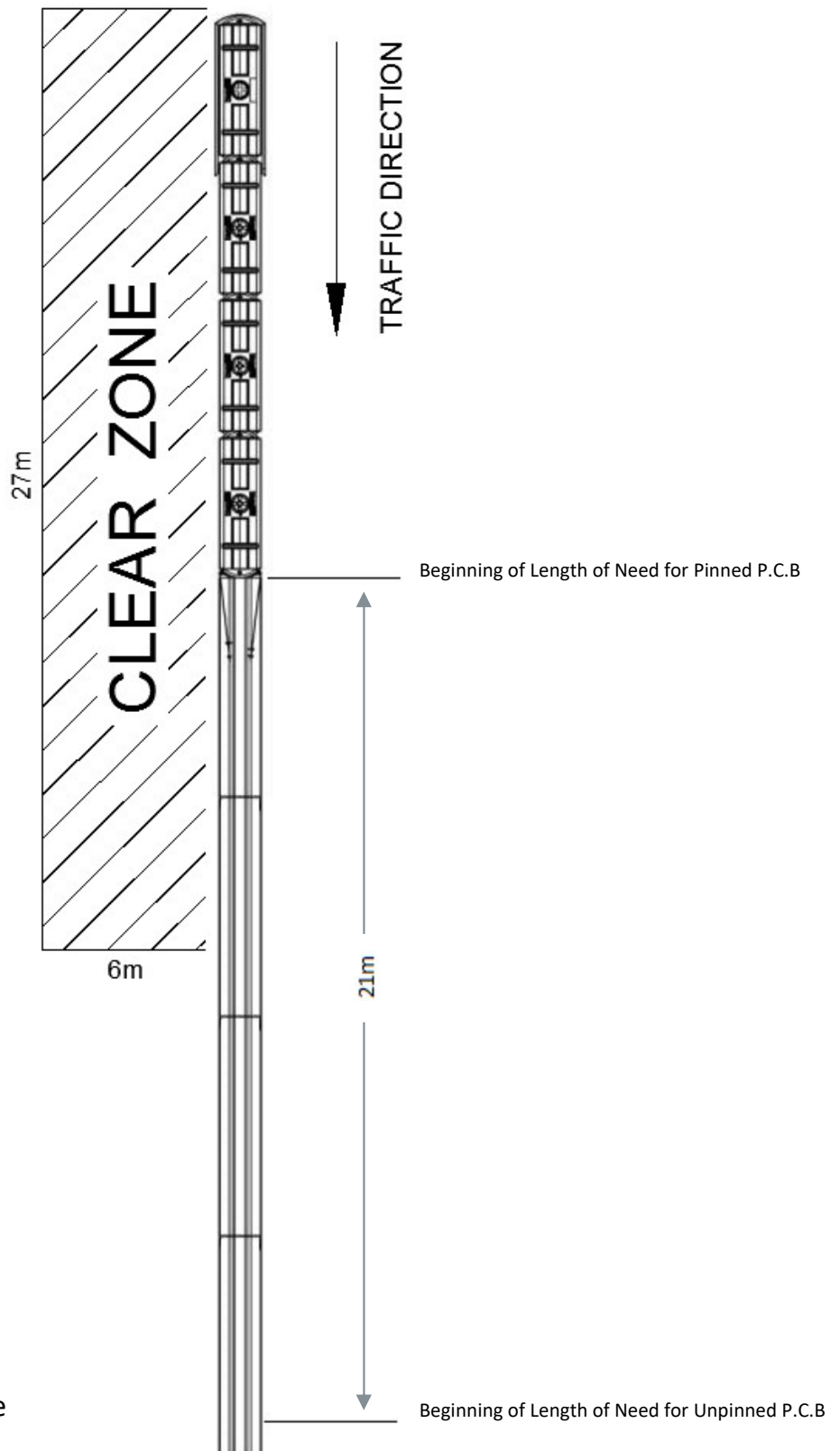
## System Design

### Length of Need for Pinned Portable Concrete Barrier

The beginning of length of need of a pinned portable concrete barrier is the beginning of the first portable concrete barrier as shown in the illustration.

### Length of Need for Unpinned Portable Concrete Barrier

The beginning of length of need of an unpinned concrete barrier is 21m from the beginning of the first portable concrete barrier as shown in the illustration.





# SLED End Terminal

## Installation

### Preparation

Begin preparing for the installation by thoroughly reviewing the specified terminal location, layout and orientation as per the approved traffic management plan.

A visual inspection should be carried out to confirm the suitability of all segments. Should visible damage be evident in any segments, they should be sent for inspection and repair prior to use.

**Caution: Refer the minimum installed lengths as illustrated in this manual to ensure compliance to AS/NZS 3845:1999 and MASH.**

### WARNING!

The correct safety equipment and approved traffic management must be used as required for any installation of the SLED End Terminal.

### Required Tools

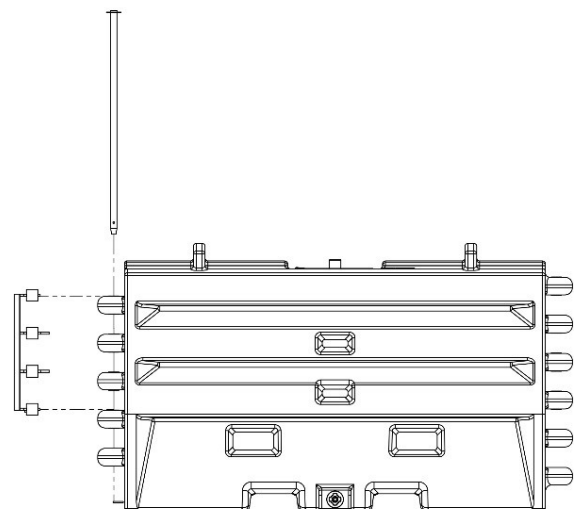
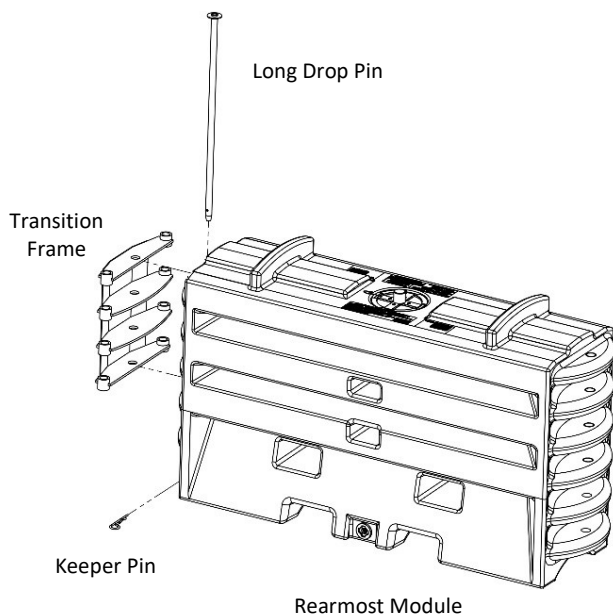
For a typical installation, the recommended tools and equipment are:

1. SLED End Terminal Installation Manual.
2. Traffic control plan and approval.
3. Traffic control equipment (as required).

4. Fluted concrete drill bit 20mm diameter, 200mm minimum length
5. Rebar cutting drill bit 20mm diameter, 200mm minimum length
6. Rebar cutter
7. Rotational hammer drill
8. Torque wrench
9. Impact wrench
10. Sockets ¾" – 2"
11. Ratchet and extensions
12. Shifter
13. Hammer
14. Pry bars

### Deployment

1. Begin deployment at the concrete barrier. Work from the non-traffic side of the installation whenever possible. Unload segments from the transport vehicle using safe lifting and movement procedures.
2. Install the transition frame on the rearmost section of the terminal so that the top rib of the transition frame sits on the highest knuckle of the module. Align center holes of the transition frame and the knuckles of the module.

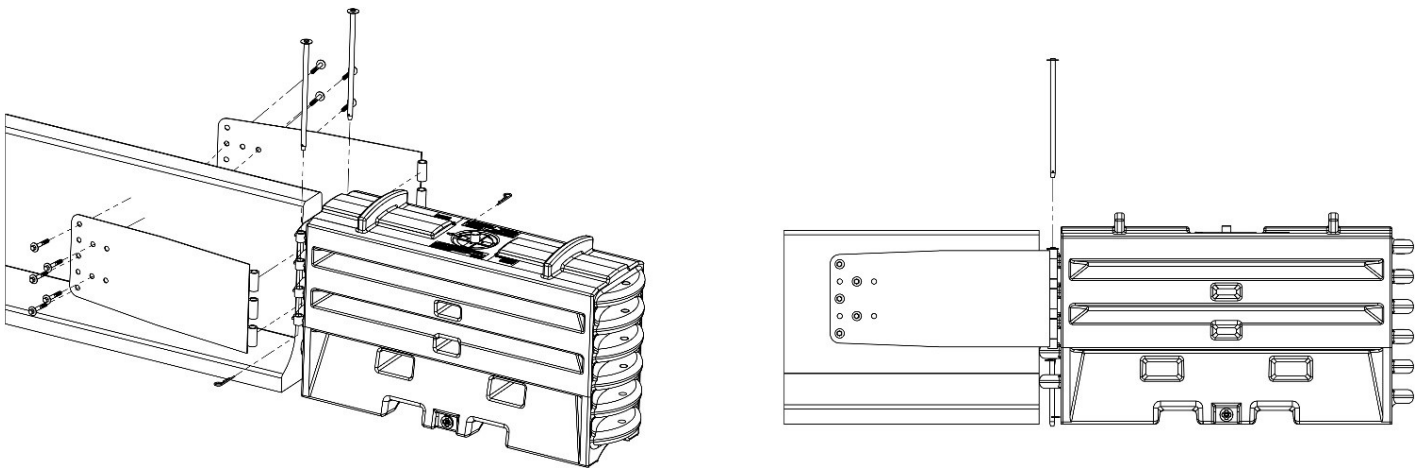


*Figure 3 – Transition Frame*

# SLED End Terminal

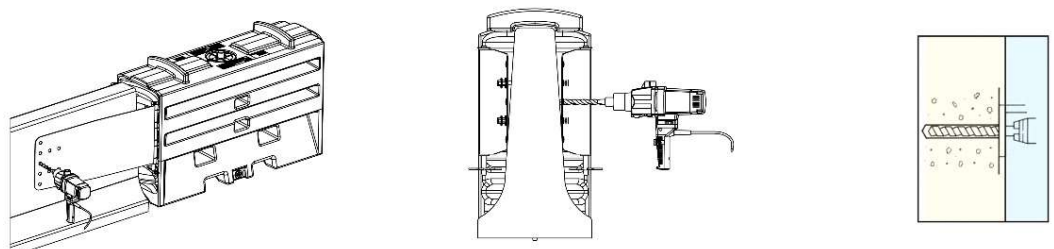
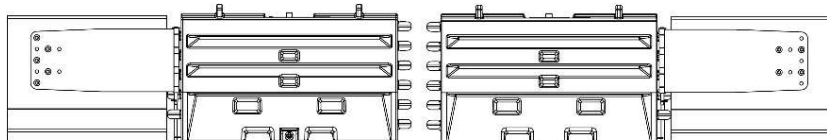
## Deployment (continued)

3. Insert the long drop pin through the center holes of the transition frame and the module knuckles until the long drop pin is fully bottomed out.
4. Align the module and frame with the barrier leaving approximately 100mm between the module knuckles and the face of the barrier.
5. Secure the long drop pin by inserting the keeper pin (R-clip) through the small hole near the bottom of the long drop pin.
6. Align the transition panel hinges with the transition frame hinges.
7. Install the two short drop pins, one on the left and one on the right, from the top until the pins have fully bottomed out. Secure the short drop pins by inserting the keeper pins (R-clips) through the small hole near the bottom of each short drop pin (figure 4). The hinges should now freely rotate.



*Figure 4 – Hinge Panels*

8. Rotate the transition panels till they contact the barrier. Panels may not sit flush on barrier.
9. Locate the anchoring holes that are to be drilled into the barrier wall. A minimum of 8 anchor bolts are required. To prevent bolts from colliding in the barrier wall 5 bolts are used on one side and 4 on the other. Once holes are located use a rotary hammer drill with the appropriate drill bit to drill into the barrier the total length of the anchor bolt. Clear holes of debris. (Figure 5).

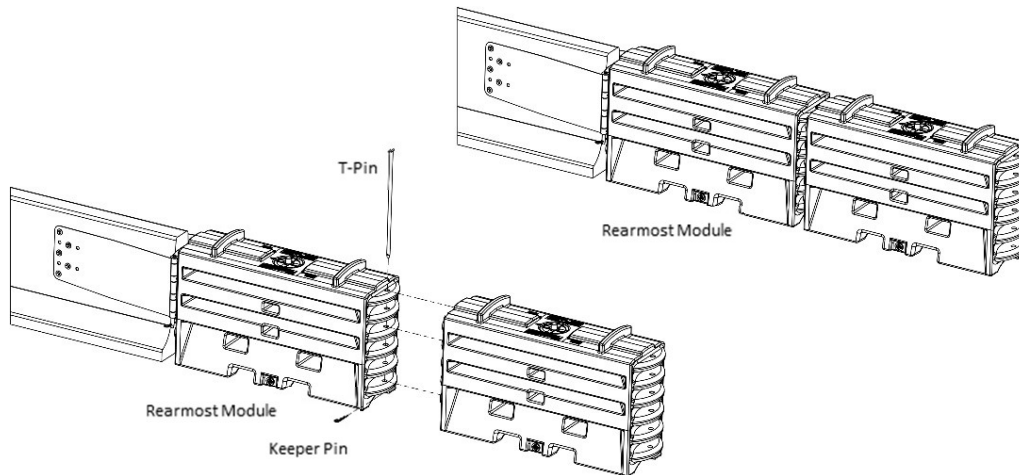




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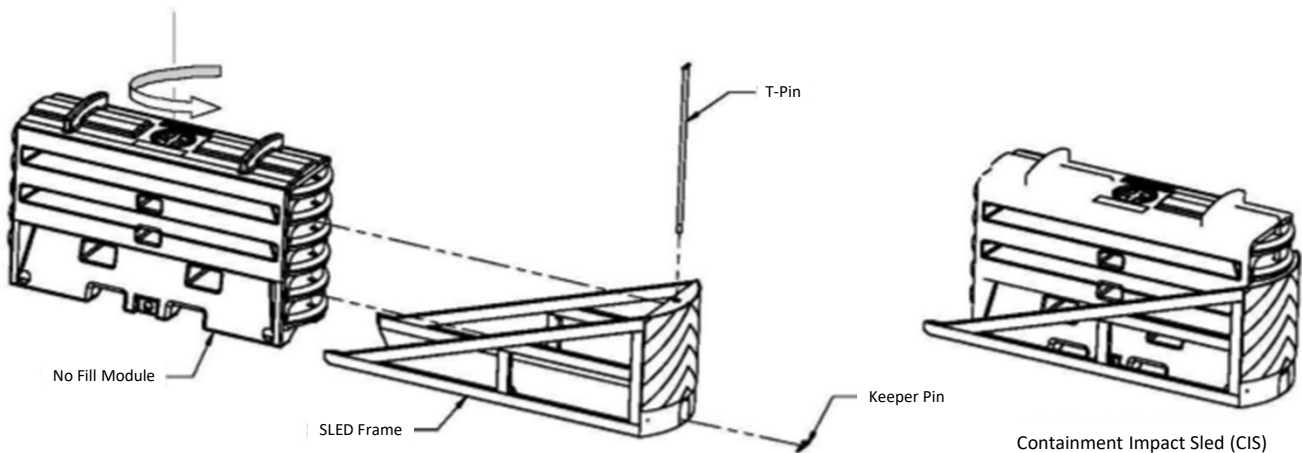
## Deployment (continued)

10. Place an anchor bolt in each hole. Use a hammer to drive the anchor bolts into the barrier wall.
11. Use the torque wrench and torque the expanding anchor bolts to 100ft-lbs. Once all bolts are properly torqued remove the clamp.
12. Position the next yellow water filled module so the knuckles and connecting bolts are aligned. Be sure to mate a 6 knuckle end to a 5 knuckle end. Insert the T-Pin from the top until the T-Pin contacts the ground. Secure the connection between modules by inserting the keeper pin (R-Clip) through the small hole near the bottom of the T-Pin. (Figure 6)



**Figure 6 – Water Filled Modules**

13. Repeat step 12 with the third module.
14. The containment impact sled (CIS) comes preassembled with a yellow no fill module, T-Pin, keeper pin and SLED frame. Position the CIS so the knuckles and holes on the no fill module align with the previously installed module. If the CIS and previous module have the same number of knuckles the no fill module will need to be rotated within the CIS frame by removing the keeper and T-Pins, rotating the no fill module, and reinstalling both pins. (Figure 7).

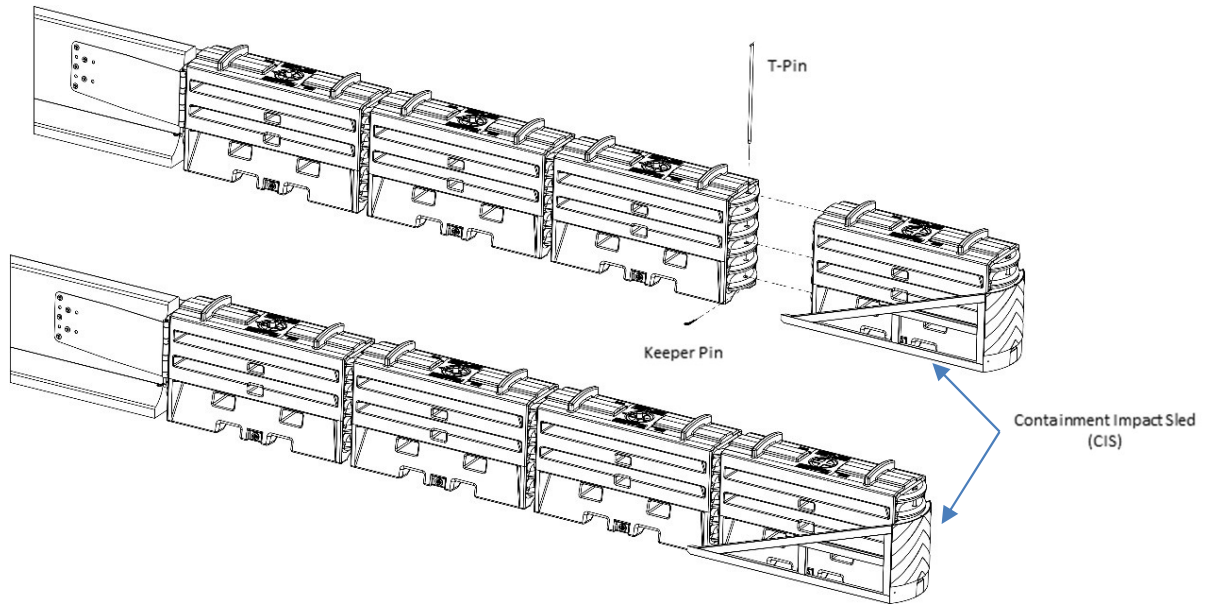


**Figure 7 – Containment Impact Sled**

# SLED End Terminal

## Deployment (continued)

15. Install the T-pin from the top. Secure the connection between the modules but inserting the keeper pin (R-Clip) through the small hole near the bottom of the T-Pin. Note the CIS frame will slide under the front most water filled module by approximately 100mm. (Figure 8).



*Figure 8 – Containment Impact Sled Module*

16. Before filling double check all connections and the alignment of the transition, the water filled modules and the containment impact sled.
17. Make sure that the buttress thread drain plugs are installed and secure in each water filled module. Remove the water level indicator cap and fill each of the water filled modules with water. Ensure suitable antifreeze solution is used if required. Replace the water level indicator cap. The module is full when the water level indicator is fully extended. Fill all modules except the no fill module in the impact containment sled. The no fill module has 6 open drain holes to ensure it does not hold water.

# SLED End Terminal

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## Retrieval

1. Remove the drain plugs from each module and allow water to drain.
2. Remove the keeper pins and T-Pins from containment impact sled and using appropriate techniques remove the containment impact sled.
3. Remove the keeper pins and T-Pins from the remaining modules and remove the modules.
4. Remove the bolts, keeper pins and T-Pins from the transition panels and remove the panels.
5. Remove the keeper pin and T-Pin from the transition frame. Remove the transition frame and module.

## Maintenance and repair

While installed there should be periodic checking of the water level. There is no other scheduled maintenance.

In a major impact any severely damaged sections should be removed and replaced. Mild damaged may be able to be repaired.

A plastic repair kit is available from Saferoads with a patch and welding rod made of the same material as the SLED End Terminal. Patching holes or cracks should be done on clean dry surfaces with any paint or added finish removed.

A small butane or propane torch is used to apply heat to the plastic rod. The rod should be melted to the patch and the barrier to bond them together. The torch temperature should be between 250-290°C and the head should be held between 6-13mm from the weld surface. Care should be taken to ensure only desired plastic is melted.

**Repairing cracks and holes does not return the plastic to its original strength.**

Only minor repairs to ensure water tightness should be attempted and repairs should be monitored for a short period after the repair to ensure their quality.

## Antifreeze

In colder climates it is desirable that the water not freeze. In this case an appropriate anti freeze should be used. Local restrictions and environmental impact should be considered when selecting an appropriate anti freeze and care must be taken when draining barriers.

## Limitations and Warnings

The SLED End Terminal has been tested and passed AS/NZS 3845:1999 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 (Test Level 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 3845:1999 and MASH relative to structural adequacy, occupant risk and vehicle trajectory factors.

# SLED End Terminal

## Safe Working Method Statement

Activity	Hazard Identified	Control Required	Assessed Risk before Controls	Person Responsible	Residual Risk Score	Installer/ Operator Sign Off
Unloading and setting out the SLED End Terminal		Site to provide instructions as to location for barriers to be installed in accordance with the approved traffic management plan and or the approved method of compliance	L		L	
		SLED End Terminal to be installed in accordance with the SLED End Terminal installation manual	L		L	
		Traffic management to be supplied by the site to ensure general public and vehicles stay clear of any lifting zone				
	Truck tips over	Set up on a firm, level surface	M		L	
		Out riggers are to be used and use spacers to provide level surface	M		L	
	Driver falls	Driver to only work over 2m if wearing suitable fall arrest equipment, and to use steps or ladder to access equipment or barriers above this height	M		L	
Hazard due to weather conditions		Weather conditions must be assessed prior to commencing placement of SLED End Terminal. Do not commence work where wind, rain, heat, cold or other adverse conditions exist.	L		L	
	Personnel crushed by load	Driver/operator must not get in between load and another solid object	M		L	
		If required barricade off the work area				
Crushing body while raising/lowering Sentry Water Cable		Operator is to ensure all site personnel stay clear of the SLED 350 End Terminal	M		L	
Crushing of pinch points between SLED End Terminal connections		Operator is to ensure hands, fingers and other body parts are to be clear when connecting two barriers together	L		L	
		Hands, fingers and other body parts to be kept clear when installing or lowering connection pins	L		L	
Injury to pedestrians or collisions with vehicles		Abide by highway speed limits	L		L	
		Give way to other traffic	L		L	
Leaving the site of workzone		If congested area ask for spotter or traffic controller to guide	L		L	

**Hazard Rating Assessment H - High Risk M - Medium Risk L - Low Risk**

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# SLED End Terminal

Hazard Identified	Control Required	Assessed Risk before Controls	Person Responsible	Residual Risk Score	Installer/ Operator Sign Off
Refused Entry to site for lack of PPE	Ensure all delivery drivers are aware of site PPE requirements and are wearing them (eg long sleeve top, reflector vests, helmets, eye and hearing protection, safety shoes)	M		L	
All cranes to be maintained and certificates to be available	Cranes have valid certificates and operator to have appropriate qualifications to operate crane Lifting chains to be in good, serviced and tagged condition	M		L	
Contact with overhead services	Always "look up and live" Stick to designated routes Never operate cranes without assessing potential for overhead services If uncertain arrange for a spotter	H		L	
Injury to pedestrians or collisions with vehicles	Abide by highway speed limits Give way to other traffic Always ask for controller to provide traffic management to ensure safe off loading Ensure all delivery trucks have flashing light, reverse alarm and are in roadworthy condition. These checks must be completed prior to start of work	M		L	

**Hazard Rating Assessment H - High Risk M - Medium Risk L - Low Risk**

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