

PRODUCT MANUAL



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Version 7.0
November 2021

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Preface

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

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

If more information is required, please contact Saferoads:

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Introduction

Saferoads T-Lok MASH Barrier functions as a portable longitudinal barrier to prevent errant vehicles from penetrating, vaulting, or under riding. Traffic is kept from entering the work area or from hitting exposed objects or excavations. Unlike cones or barricades, Saferoads T-Lok MASH Barrier provides positive protection for roadside workers.

Impacting vehicles are redirected at a shallow angle, thereby reducing the potential for dangerous secondary impacts. Saferoads T-Lok MASH Barrier absorbs impact energy and cushions vehicular impacts while significantly reducing the risk to occupants of the impacting vehicle.

Saferoads T-Lok MASH Barrier provides several unique advantages over traditional portable concrete barriers, or other styles of portable safety barriers including:

- ◆ Energy-absorbing
- ◆ Quick and easy deployment and retrieval
- ◆ Economical
- ◆ Variety of end terminal options

Saferoads T-Lok MASH Barrier has been thoroughly tested to NCHRP 350 and MASH testing procedures.

Saferoads T-Lok MASH Barrier has achieved MASH Test Level 3 (TL-3) as a redirecting longitudinal safety barrier for speeds up to 100km/h.

T-Lok Australian Patent #2009353352



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Applications

The Saferoads T-Lok MASH Barrier can be used in many applications.

Some examples are:

- ◆ General road maintenance performed by road authorities, contractors, local municipalities etc.
- ◆ Road construction
- ◆ Lane closures
- ◆ Toll plazas
- ◆ Road resurfacing
- ◆ Excavation or culvert protection
- ◆ Detours or diversions
- ◆ Bridge repairs
- ◆ Median or verge installations

Limitations

Saferoads T-Lok MASH Barrier has been tested to MASH TL-3 requirements. Installations not in accordance with this manual or impacts outside of MASH TL-3 testing may result in unpredictable performance.

NCHRP-350 vs MASH

The T-Lok Barrier has 2 versions. The original T-Lok 350 and the new T-Lok MASH.

The T-Lok MASH has been improved with only 2 changes:

- The T and C connectors reduced in length.
- The concrete chamfered at the end faces.

The above changes have made it easier to connect the barriers during deployment and increased the angle at each joint for tighter radius deployments.

NOTE: The 2 systems (350 and MASH) should not be deployed together in the one length of Barriers.



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Construction

The Saferoads T-Lok MASH Barrier is constructed from a series of individual barrier sections.

The ends of each section are constructed with a Male “T” and a Female “C” Connection that interlock. See Figure 1 for examples of T-Lok MASH Barrier ends.

Their unique design allows for easy assembly as well as angled adjustment to achieve up to 7 degrees direction change at each joint for tapers and curves (See page 9 Figure 4).



Figure 1

Identifying T-Lok MASH Barriers

T-Lok MASH barriers are identified by the “T-Lok MASH” symbol stenciled on the side of the barrier as per the example below. All other barriers are considered 350 tested barriers.

T - LOK MASH
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System Design

In order to design the most appropriate Saferoads T-Lok MASH Barrier System for a given site, this manual helps to answer the following questions:

- ◆ Is the Saferoads T-Lok MASH Barrier appropriate for my site?
- ◆ What is the application? What warrants use of the Saferoads T-Lok MASH Barrier?
- ◆ How long must the barrier be? Refer to the length of need and beginning of length of need for Saferoads T-Lok MASH Barrier installation options.
- ◆ What is the likely dynamic deflection of the barrier if the barrier is impacted, and what width is required for the correct functioning of the system?
- ◆ Are there curves, slopes or kerbs present which may not suit the Saferoads T-Lok MASH Barrier?
- ◆ Is a fully tested end treatment available to suit my particular requirement? Refer to end terminal section of this manual.

The purpose of this manual is to supply some basic application information about the Saferoads T-Lok Barrier and to detail its performance when tested to NCHRP 350 and MASH.

Local Authority Approvals and Guidelines for Temporary barriers should be consulted and take precedence over the recommendations in this manual.

Minimum Deployment

The minimum deployment length of a T-Lok Barrier installation should be 20m when using Crash Cushions and 58.5m when using freestanding Water filled terminals.

End Treatment

A terminal is defined by MASH as:

“A device designed to treat the end of a longitudinal barrier. A terminal may function by (1) decelerating a vehicle to a safe stop within a relatively short distance, (2) permitting controlled vehicle penetration behind the device, (3) containing and redirecting the vehicle, or (4) a combination of (1), (2) and (3).”

The Saferoads T-Lok Barrier has been crash tested to MASH as a Test Level 3 (TL3/100km/h [62mph]) redirective longitudinal barrier.

The QuadGuard M10 CZ end terminal or approved equivalent is approved for work zone posted speeds up to 100 km/h. As this terminal requires tethering to the pavement, it will offer the shortest Saferoads T-Lok MASH Barrier deployment.

Length of Need

Length of Need (L.O.N) 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 (B.L.O.N) is the start of the T-Lok MASH Barrier installation where the barrier will redirect the vehicle, the end of the length of need (E.L.O.N) is the point at which the Barrier will no longer redirect the vehicle, with the area between being the designated work zone.



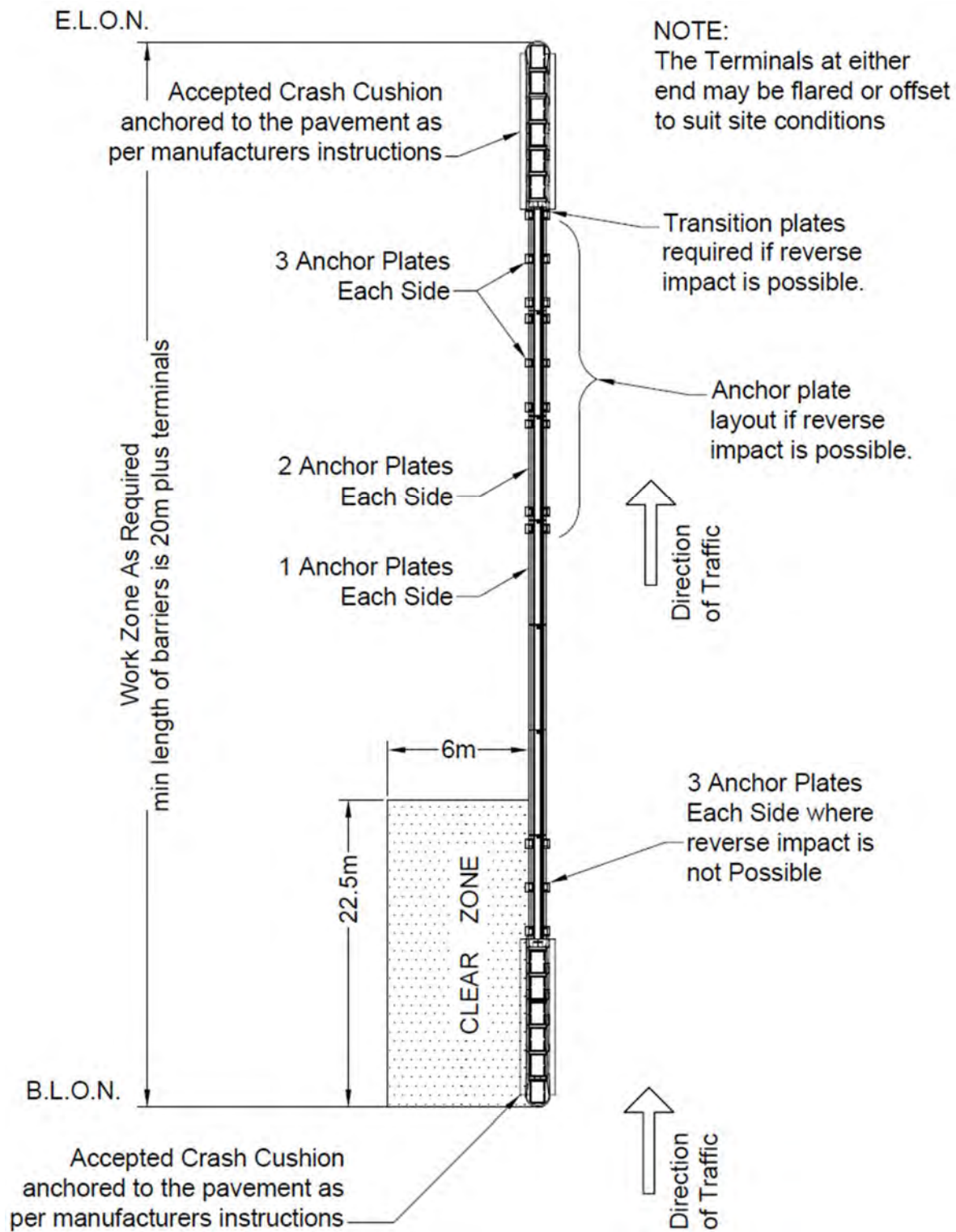
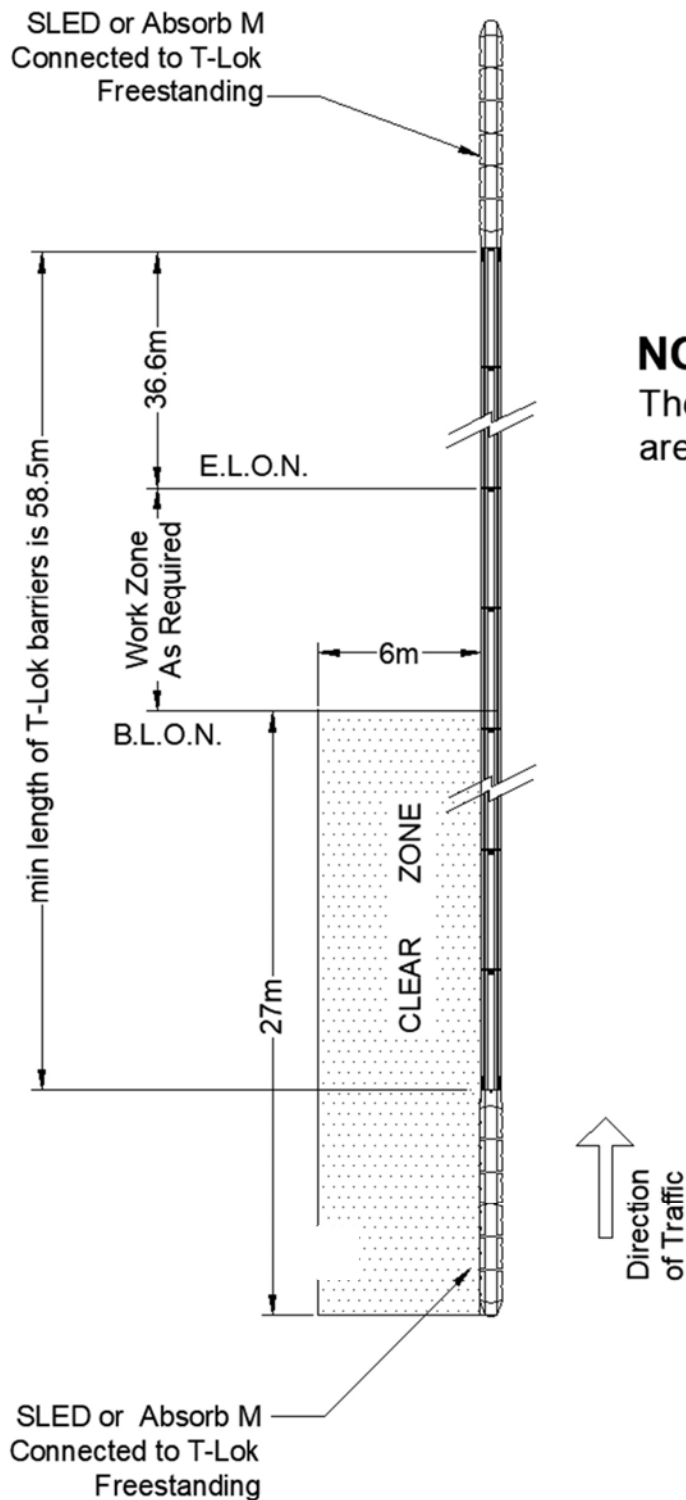


Figure 2



NOTE:

The SLED and Absorb M are approved to 80km/h

Figure 3

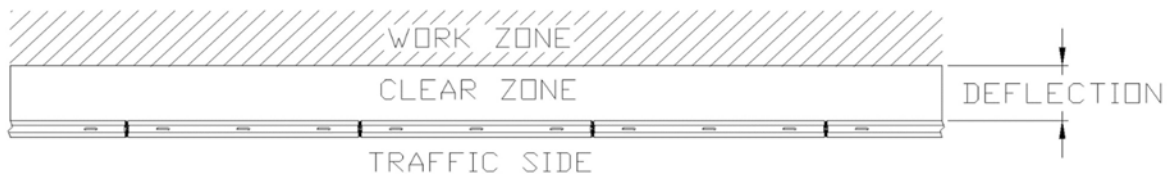


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System Deflection

Enough clear zone must be allocated between the T-Lok MASH 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 Barrier at 25 degrees at 100km/h was 1.27m.



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.

The Crash Tested Working Width for a MASH TL-3, 2,270kg Pickup impacting the Barrier at 25 degrees at 100km/h is 1.88m. The Working Width is the Deflection plus the width of the Barrier (Deflection + 0.61m)



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Site Considerations

Certain conditions may affect the performance of the Saferoads T-Lok MASH Barrier. Since every job site is unique, the designer needs to consider the following conditions when incorporating the Saferoads T-Lok MASH Barrier in the design.

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. See Figure 4 and the table below for detail on T-Lok 350 vs. T-Lok MASH maximum angles and minimum radii deployments.

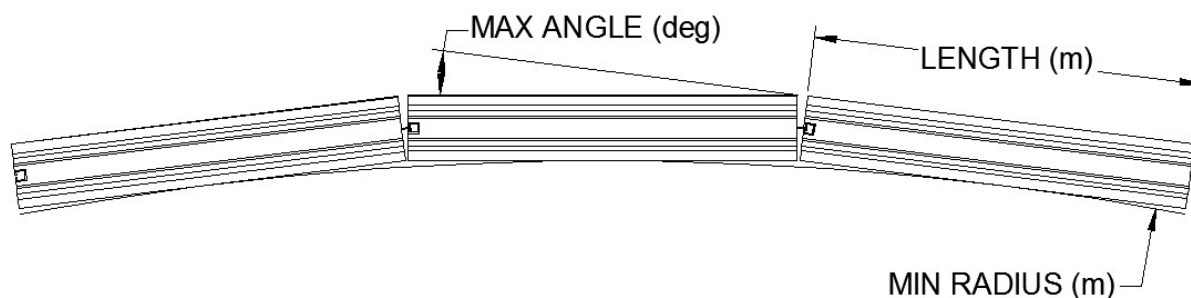


Figure 4

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

*Refer to page 13 for details of the Steel Wedge



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Slopes

The Saferoads T-Lok MASH Barrier can be placed on cross slopes up to 5% (3 deg.) and on longitudinal slopes up to 5% (3 deg.) See Figure 5.

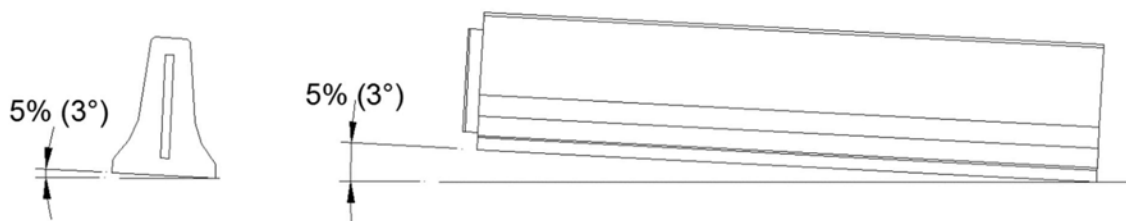


Figure 5

Crest

The Saferoads T-Lok Barrier has the ability to conform to a crest up to 20:1 (See Figure 6). Please note the maximum longitudinal slope in Figure 5.

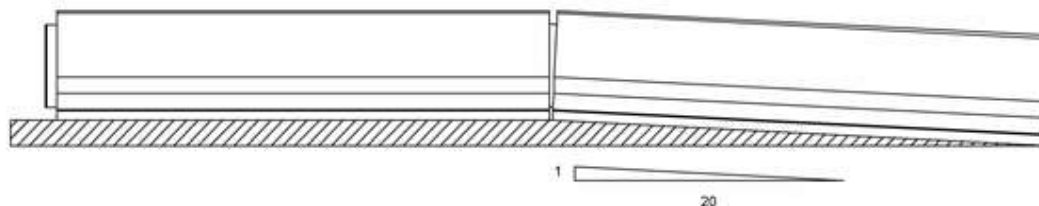


Figure 6

Ditch

The Saferoads T-Lok Barrier has the ability to conform to a ditch up to 20:1 (See Figure 7). Please note the maximum longitudinal slope in Figure 5.

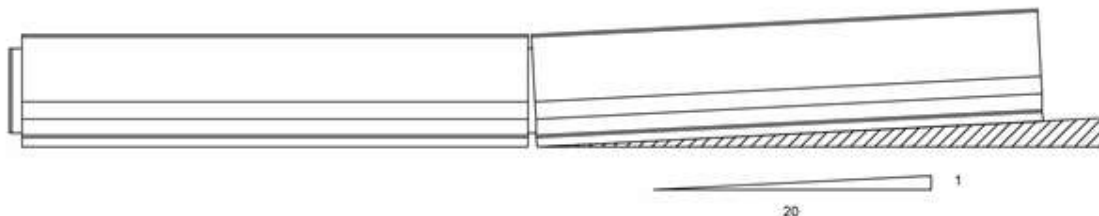


Figure 7



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Kerbs

The Saferoads T-Lok MASH Barrier should NOT be placed directly against a kerb that can prevent its lateral movement (See Figure 8). The Saferoads MASH T-Lok Barrier should not be placed on top of a kerb or placed where a kerb is within the expected deflection zone of the barrier (See Figure 9).

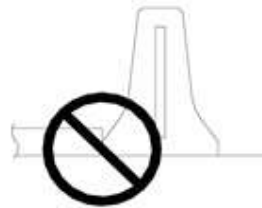


Figure 8

Trenches

The Saferoads T-Lok MASH Barrier should NOT be placed next to trenches or excavations where the necessary deflection of the system in the event of an impact may result in barrier falling into the Trench or excavation. Reference to safe working width is detailed on page 9.



Figure 9

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.
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



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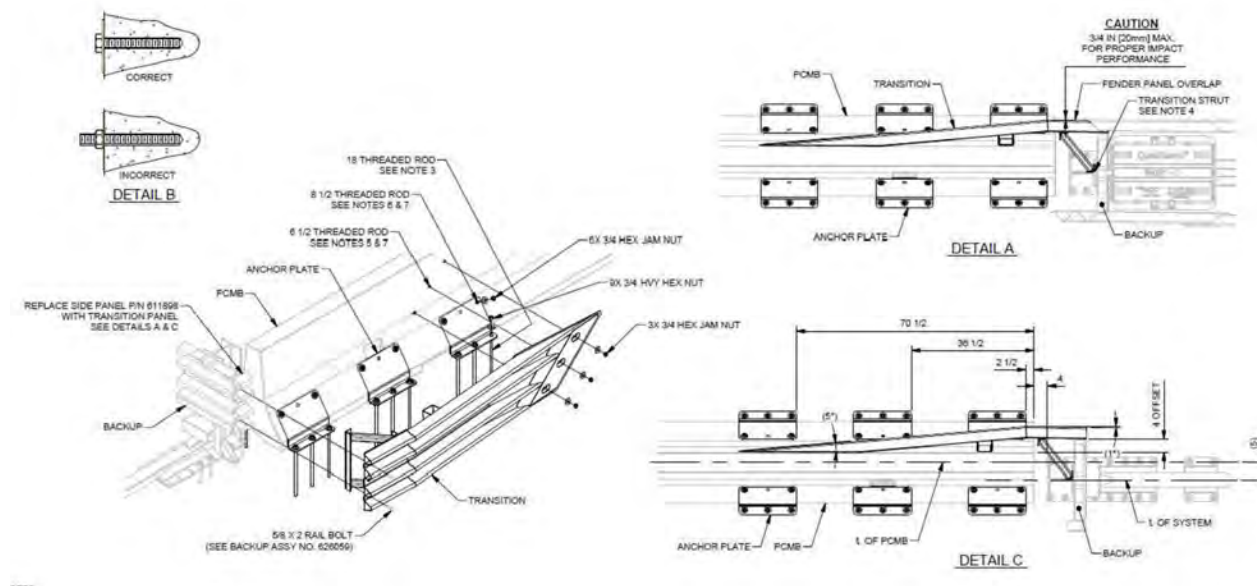
Anchoring Procedure

For installations with Anchored Crash Cushions, anchor plates are required to anchor the Concrete Barriers to the pavement. Refer to Figure 2 on page 6, where no reverse impact is possible, 3 plates are required each side of the Concrete barrier next to the Crash cushion.

Where a Reverse impact is possible 18 anchor plates are required, spaced as shown over the 4 adjacent barriers to the Crash Cushion.

Two PCB bolts attach each plate to the Barrier and 3 Anchors to the surface. The length of the Anchors varies, see below for Concrete or Asphalt surfaces.

A Transition is required if traffic can impact the rear of the Crash Cushion, refer below for Quadguard M10 example, for other approved Crash Cushions please refer to their specific manual for detail.



Anchors

Concrete Surface - M20 Galvanized x 180mm Allthread

Grade 8.8, M20 Gal nuts & washers

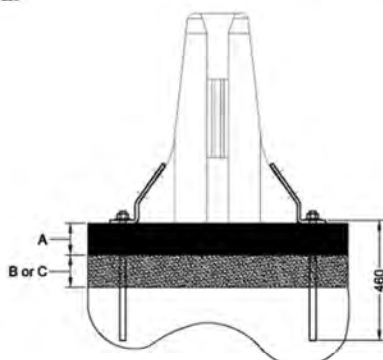
Asphalt Surface - M20 x Galvanized x 460mm Allthread

Grade 8.8, M20 Gal nuts & washers

PCB Anchors - M20 Galvanized x 180mm Allthread Grade

8.8, M20 Gal nuts & washers

Epoxy - Polyester Injection Resin Kit



A	B	C
75mm	75mm	---
150mm	---	150mm
200mm	---	---

Materials:

- A. Asphalt or 28 MPA minimum concrete
- B. 28 MPA minimum concrete
- C. Sub-Base prepared and compacted class 2 aggregate 95% compaction, minimum layer



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T-Lok Steel Wedge

Saferoads have developed a bespoke custom Steel Wedge that enables the Standard T-Lok Barriers to be deployed at a tighter radius. The 3.6m T-Lok Barriers can achieve a 30m Radius, with a standard maximum 7 degrees angle at each joint. The Steel Wedge allows each joint to be deployed at an angle from 6 degrees (figure 10) up to 32 degrees (figure 11), enabling a deployment radius as tight as 8m when Steel Wedges are used in-between each T-Lok barrier

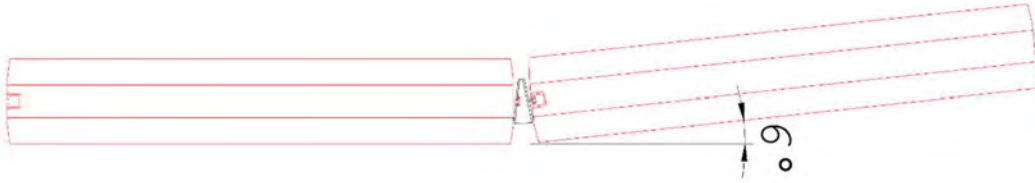


Figure 10: Plan view of 2 Barriers laid out with the Wedge at 6 degrees

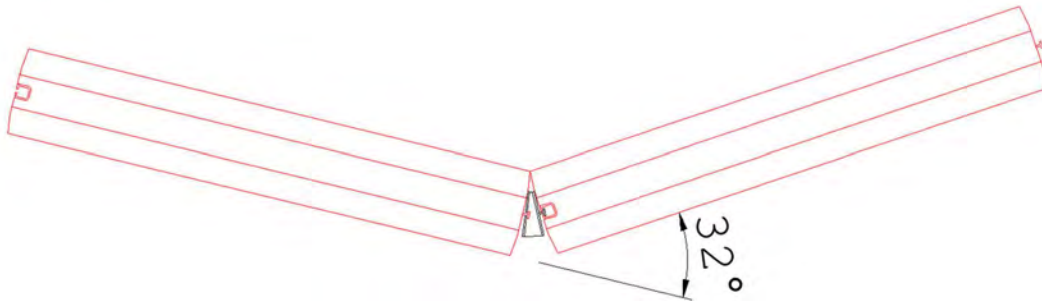


Figure 11: plan view of 2 Barriers laid out with the Wedge at 32 degrees

All angles in between 6 and 32 degrees are achievable. The Wedge can be used either way up (turned upside down) to enable the barriers to curve left or right regardless of the C and T orientation. This one design is all that is needed for left or right curves, starting with either a C or T connector.

The Wedges have lifting points at each end and weigh 60kg each.

The Wedges should only be used where Traffic Speeds are restricted to 60km/h or below and Screens should not be affixed to Barriers with Wedges connected to them.

The Deflection where Wedges are used should be conservatively set at 5m. Distance to Excavation should be 4m.

Please refer to Saferoads for further Guidance for the advantages and proper use of the T-Lok Wedges.



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Maintenance and Repair

No ongoing maintenance is required for the Saferoads T-Lok MASH Barriers. Barriers should be inspected regularly and any segments with cracking or damage connectors should be disposed of. Damaged barrier segments can be removed and replaced from between undamaged segments. Repair of barriers is not recommended.

Important Notes Regarding Lifting

Each T-Lok Barrier segment is fitted with 2x 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 barrier for any signs of cracking in concrete or corrosion or fatigue in Swift Lift fitting.

DO NOT LIFT BARRIER WITH SWIFT LIFTS if any evidence of fatigue, corrosion or cracking is found. 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 as per Figure 12.
- ◆ Chain/sling length SL= 3.5m (2 of 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 the use of an approved spreader bar see Figures 13a and 13b, or T-Lok Lifting Cradle, Figures 13c, d and e.

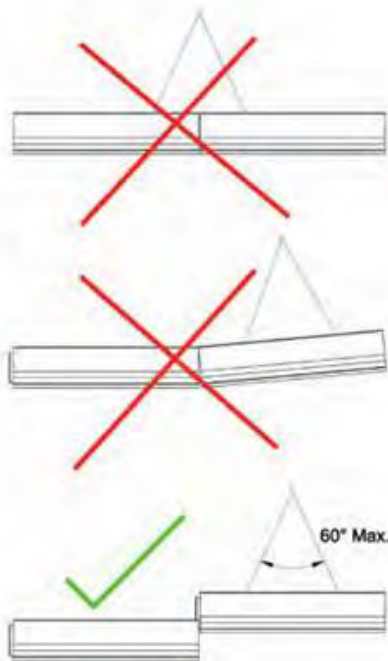


Figure 12



Figure 13a



Figure 13b



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Figure 13c



Figure 13d



Figure 13e

When using the Spreader Bar method (see Figure 13a) care should be taken to ensure the spreader bar manufacturer's guidelines are clearly understood and followed.

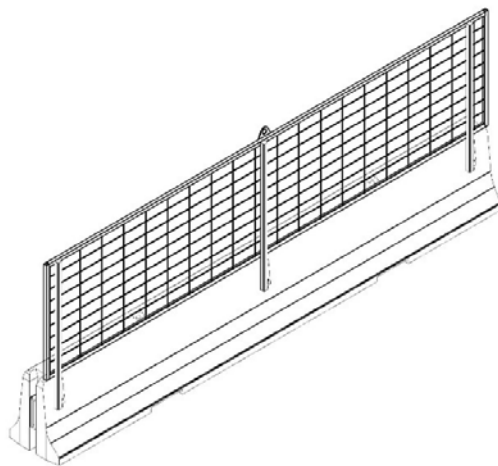
When using the Saferoads tested lifting cradle, the following steps should be understood and applied:

- ◆ 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

The fully tested Saferoads Lifting Cradle is solely designed and manufactured for exclusive use with the Saferoads T-Lok barrier only and should not be used for any other purpose.

Anti-Debris/Gawk Screen

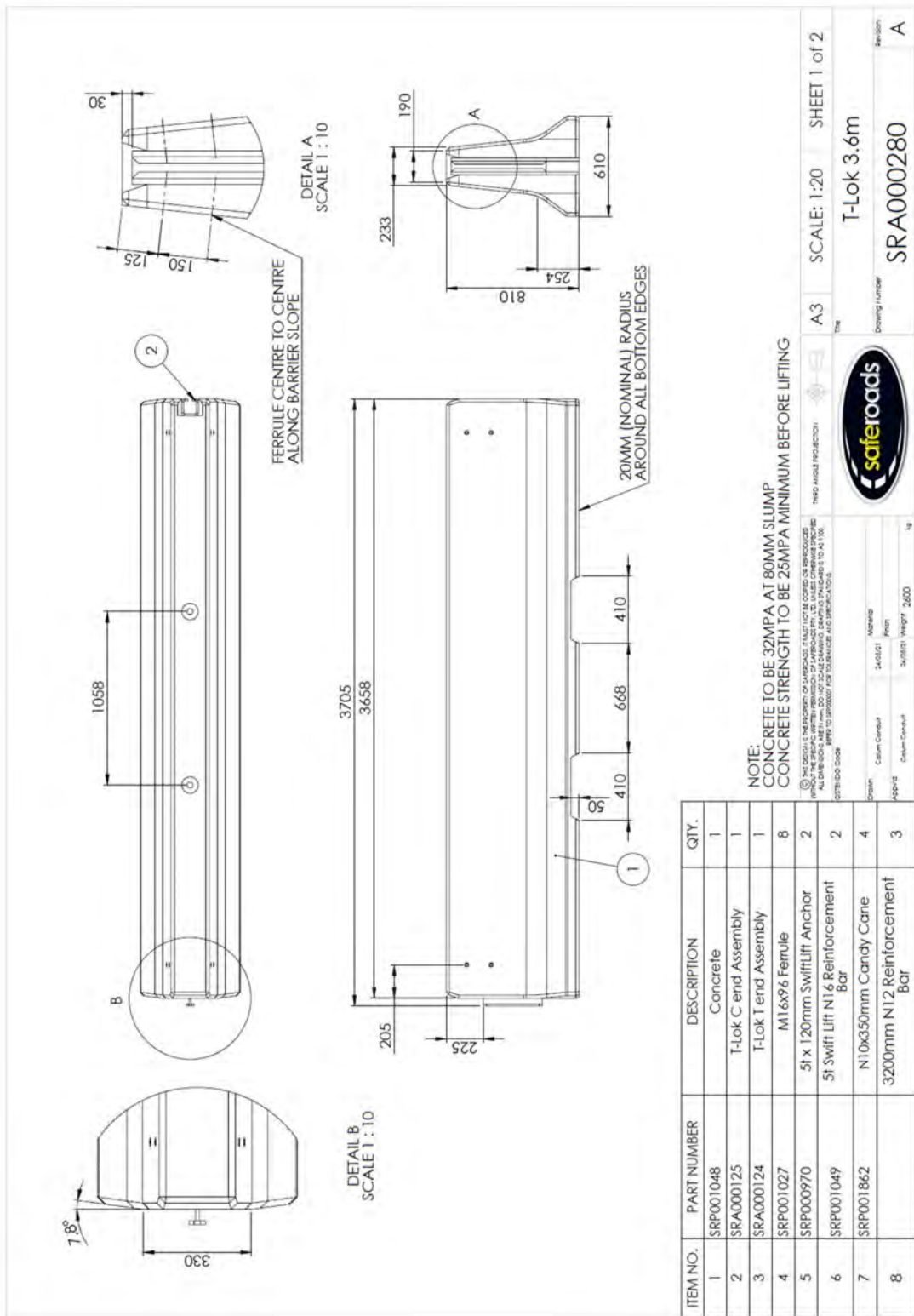
Use only panels supplied by Saferoads on the T-Lok MASH barrier. Check Local Authority Approvals.



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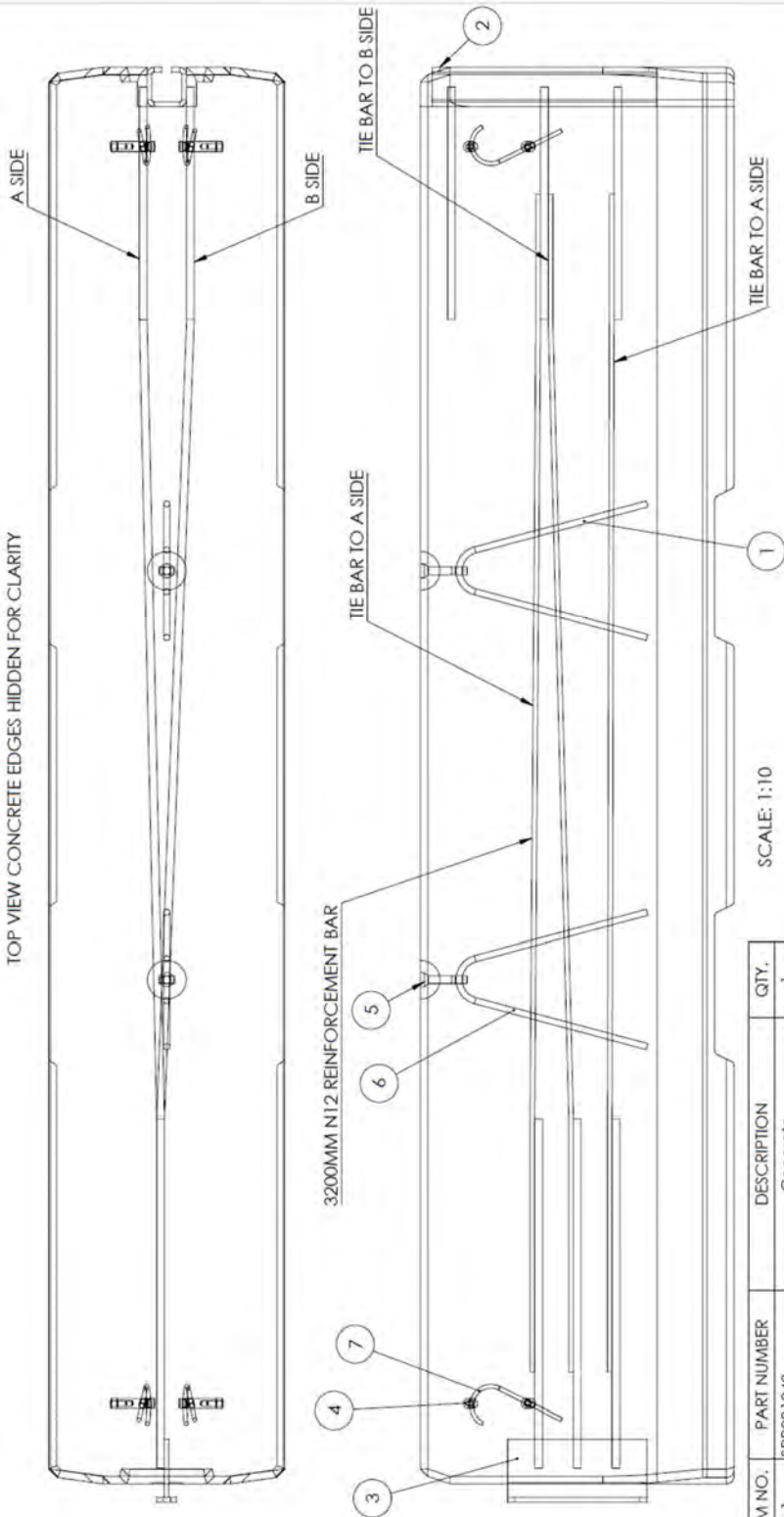
Engineering Drawings



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TOP VIEW CONCRETE EDGES HIDDEN FOR CLARITY



SCALE: 1:10

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	SRP001048	Concrete	1
2	SRA000125	T-Lok C end Assembly	1
3	SRA000124	T-Lok T end Assembly	1
4	SRP001027	M16x96 Female	8
5	SRP000970	51 x 120mm SwiftLift Anchor	2
6	SRP001049	51 Swift Lift N16 Reinforcement Bar	2
7	SRP001862	N10x350mm Candy Cane	4
8		3200mm N12 Reinforcement Bar	3

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THINK AHEAD PROTECTION



A3

SCALE: 1:20

SHEET 2 of 2



T-Lok 3.6m

SRA000280

Version

A

Weight

2600

kg



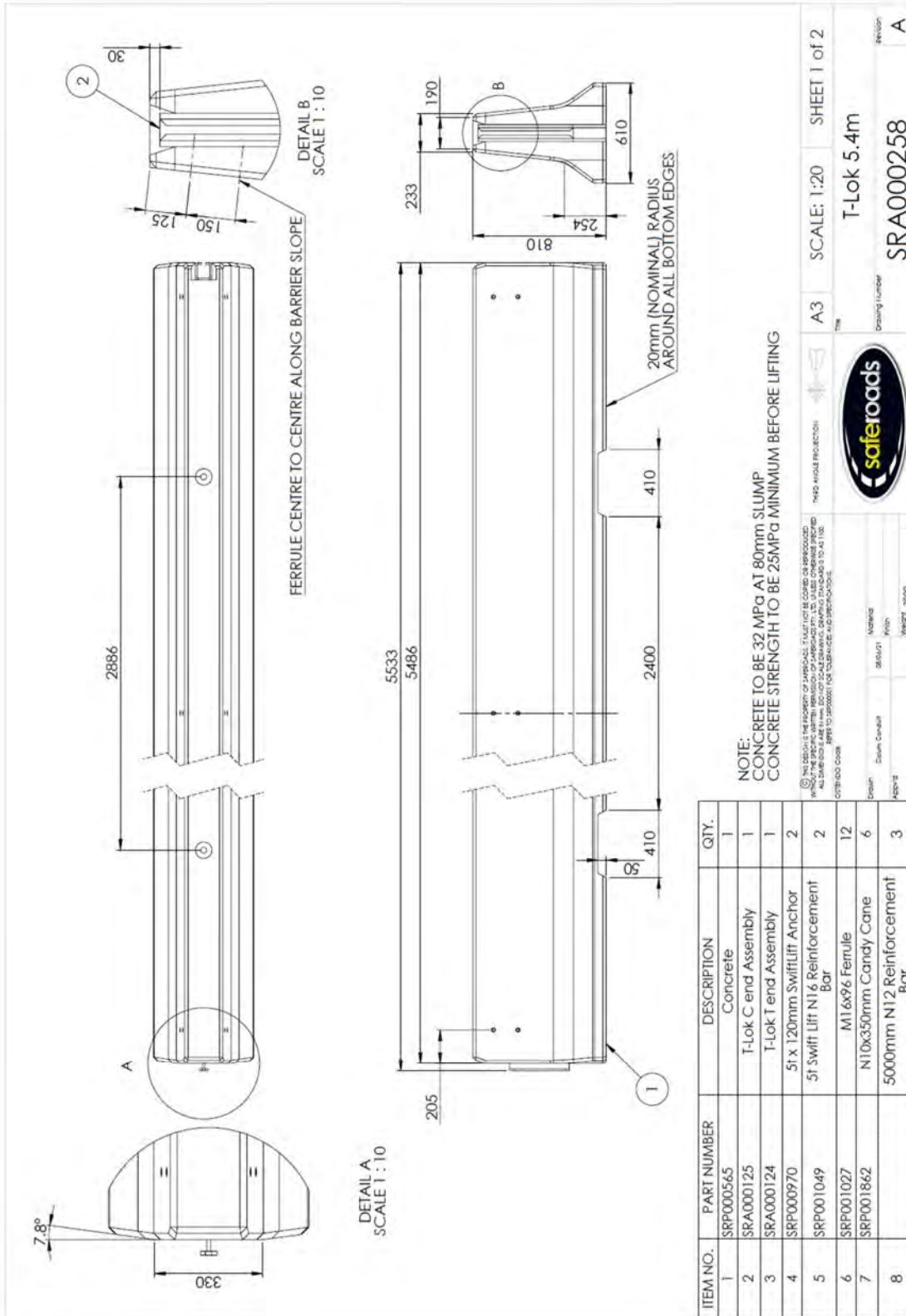
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Organ	Calcium Compound	28 Oct 21	Molarity
Organ			Final
Organ			Initial

HEAD AND NECK PROJECTIONS



Drawing Number

SRA000258

Revision

A

Safe Work Method Statement

Activity	Hazard Identified	Controls Required	Risk Before Controls	Person Responsible	Residual Risk	Sign Off
Arriving on Site	Refused entry to site for lack of PPE	Ensure all delivery drivers are aware of the site PPE requirements and are wearing correct PPE (e.g. long sleeve top, reflector vests, helmets, eye and hearing protection, safety shoes)				
	All cranes to be maintained and certificates to be available	Cranes have valid certificates and operator to have appropriate qualifications to operate crane				
		Lifted chains to be in good, serviced and tagged condition				
		Always "LOOK UP AND LIVE"				
	Contact with overhead services	Stick to designated routes				
		Never operate crane without assessing potential for overhead services				
		If uncertain arrange for a spotter				
		Abide by highway speed limits				
		Give way to other traffic				
	Injury to pedestrians or collisions with vehicles	Always ask traffic controller to provide traffic management to ensure safe offloading				
		Ensure all delivery trucks have flashing light and reverse alarm and are in roadworthy condition. These checks must be completed prior to start of work				



Activity	Hazard Identified	Controls Required	Risk Before Controls	Person Responsible	Residual Risk	Sign Off
Unloading and setting out the T-Lok Barrier	Refused entry to site for lack of PPE	Site to provide instructions as location for barriers to be installed in accordance with the approved traffic management plan and or the approved method of compliance	L		L	
		T-Lok to be installed in accordance with T-Lok Manual	L		L	
		Traffic management to be supplied by the site to ensure general public and vehicles stay clear of any lifting zone	H		L	
	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 T-Lok Barrier. Do not commence work where wind, rain, heat, cold or other inclement 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	H		L	
	Crushing body while raising/lowering barrier	Operator is to ensure all site personnel stay clear of the barrier	M		L	
Leaving the site	Crushing of pinch points between connections	Instruct crew 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 collision with vehicles	Abide by highway speed limits	L		L	
		Give way to other traffic	L		L	
		If congested area, ask for spotter or traffic controller to guide	L		L	