TALL42™

Movable Barrier System

MASH TL3 Compliant

MASH TL4 Compliant

SafeDirection
CRASH BARRIER SOLUTIONS

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Leading Safety

Successfully crash tested to MASH Test Level 3 and Test Level 4

Complies with AS/NZS 3845.1:2015 Road safety barrier systems and devices

Prevents dangerous crossover vehicle accidents

Superior Design

Easily Reconfigure Traffic Lanes

42” (1067mm) system height designed to contain high-centre-of-gravity vehicles

Compatible with the MASH TL3 compliant QUASH™ Crash Cushion

Compatible with the movable barrier transfer machine

The T-shape design facilitates ease of transfer through the machine, adapting to road contours

Does not require ground anchoring

Can be placed on asphalt or concrete

Suitable for median or verge applications

Operates in all weather conditions

Suitable for Permanent Installations

Provides contraflow during peak traffic periods reducing congestion

Separates dedicated transit lanes

Increases bridge traffic capacity

Suitable for Workzone Installations

Re-open traffic lanes during non-work periods

Increase the work area for construction crews

Reduce construction times

1.0 Introduction

TALL42™ is a freestanding, movable concrete barrier system designed to be used with a transfer machine that can reposition the barrier, altering the traffic lane configuration. Developed by Moovop Inc. of Canada, TALL42™ has been full-scale crash tested to MASH Test Level 4 and Test Level 3.

TALL42™ has been specifically designed for contraflow applications for installation on high-volume traffic roadways allowing road owners to increase lane capacity during peak periods. In addition, TALL42™ may be deployed on construction projects reducing lane closures during non-work periods.

The simple design of TALL42™ consists of 1117mm (44”) long elements measuring 1067mm (42”) high, linked together with connecting pins. Each element is just 457mm (18”) wide ensuring minimal encroachment into adjacent traffic lanes. The pin connection provides up to 20-degree movement between elements, achieving a minimum horizontal radius of 10.1m.

The T-top shape allows the TALL42™ units to be lifted and gently set down by the transfer machine with an offset distance up to 9.1m. The transfer machine can reposition 1km of TALL42™ barrier in just 8 minutes.

TALL42™ is compatible with the MASH TL3 crash tested QUASH™ Crash Cushion providing a MASH compliant end-to-end solution. QUASH™ is a water filled barrier manufactured to the same shape of TALL42™ allowing the entire safety barrier system to pass through the transfer machine.

2.0 Specifications

Unit Length	44” (1118mm)
Unit Height	42” (1067mm)
Unit Width	18” (457mm)
Unit Mass	765 kg
MASH TL3 Dynamic Deflection	1300 mm
MASH TL3 Working Width	1757 mm
MASH TL4 Dynamic Deflection	1530 mm
MASH TL4 Working Width	1987 mm
Lateral Transfer	1.8m to 9.1m
Minimum Turn Radius	10.1 m
Minimum Angle Between Units	20 degrees

3.0 Crash Test Performance

TALL42™ has been fully crash tested and evaluated according to the specifications for Test Level 4 (TL4) and Test Level 3 (TL3) of the AASHTO Manual for Assessing Safety Hardware (MASH). The MASH specification is an update to and supersedes NCHRP Report 350 for the purposes of evaluating new safety hardware devices.

MASH is also the basis of testing procedures for road safety systems as stated in *AS/NZS 3845.1: 2015 Road Safety Barrier System and Devices.*

The introduction of MASH follows changes to the vehicle fleet, researching of real-life impact conditions and updated criteria for evaluating barrier performance.

The MASH TL4 crash test matrix requires the following three (3) impacts:

- 10,000kg rigid truck travelling at 90km/h and 15° (209.3kJ).
- 2270kg pick-up truck travelling at 100km/h and 25° (156.4kJ).
- 1100kg passenger car travelling at 100km/h and 25° (75.8kJ).

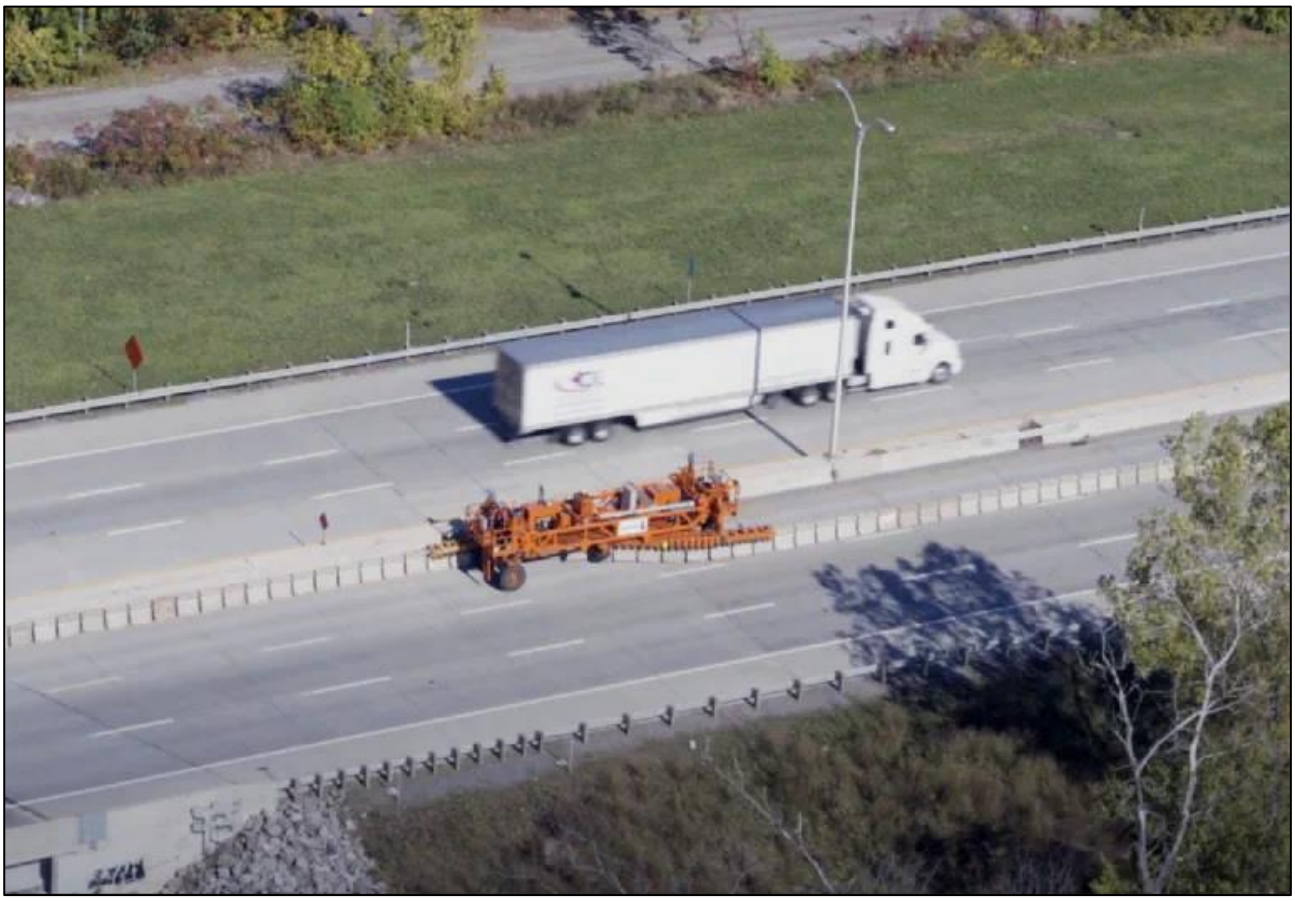
4.0 Reconfiguring Traffic Lanes

TALL42™ is specifically designed to reconfigure traffic lanes, reducing congestion and improving the efficiency of existing road corridors. Unlike contraflows that rely upon bollards or flashing lights, TALL42™ provides positive protection, demonstrating safe vehicle containment and redirection in accordance with MASH TL4 and TL3.

The reconfiguring of traffic lanes is undertaken using a transfer machine that lifts the interconnected TALL42™ units and repositions them as required by site geometry requirements. The transfer machine also prepositions the QUASH™ crash cushion maintaining a MASH compliant end-to-end safety barrier system.

For permanent locations, TALL42™ can be repositioned to meet peak traffic demands, increasing roadway capacity and reducing travel times. The system height of TALL42™ reduces headlight glare into adjacent traffic lanes and provides driver confidence.

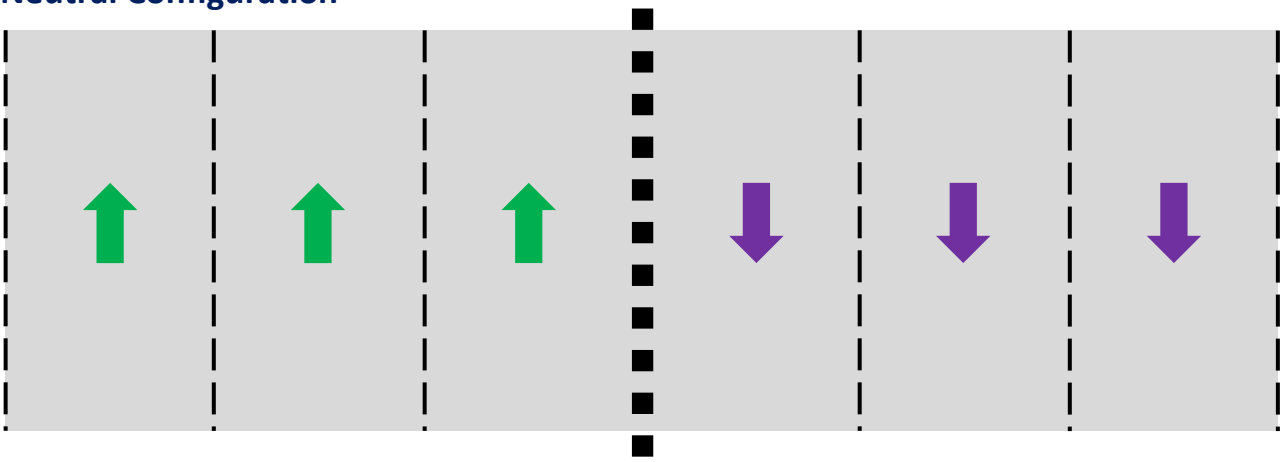
For temporary locations, TALL42™ reduces construction time and minimises disruption to traffic with lanes closed to traffic during working hours that can be reopened during non-work periods. In addition, the rapid repositioning of the barrier allows contractors to more effectively manage changing traffic patterns and the progress of construction throughout the site.



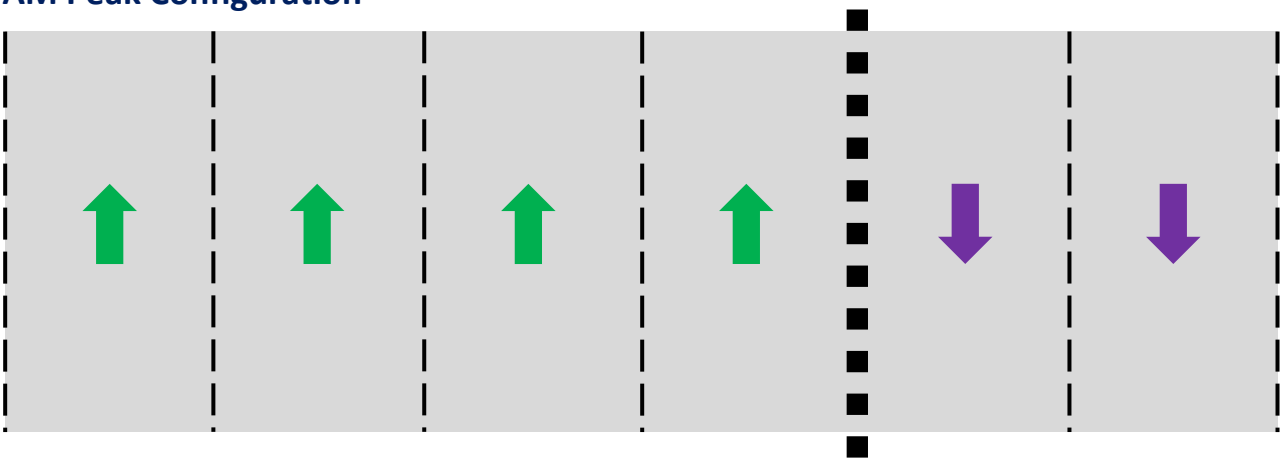
4.1 Existing Undivided Roadway

■ ■ ■ ■ TALL42™ Movable Barrier

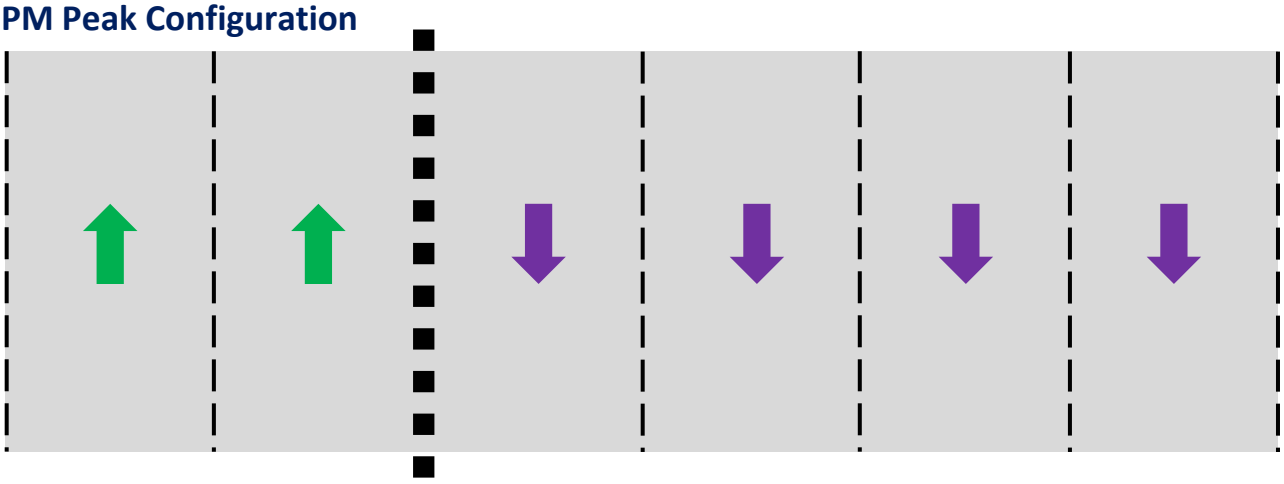
Neutral Configuration



AM Peak Configuration



PM Peak Configuration

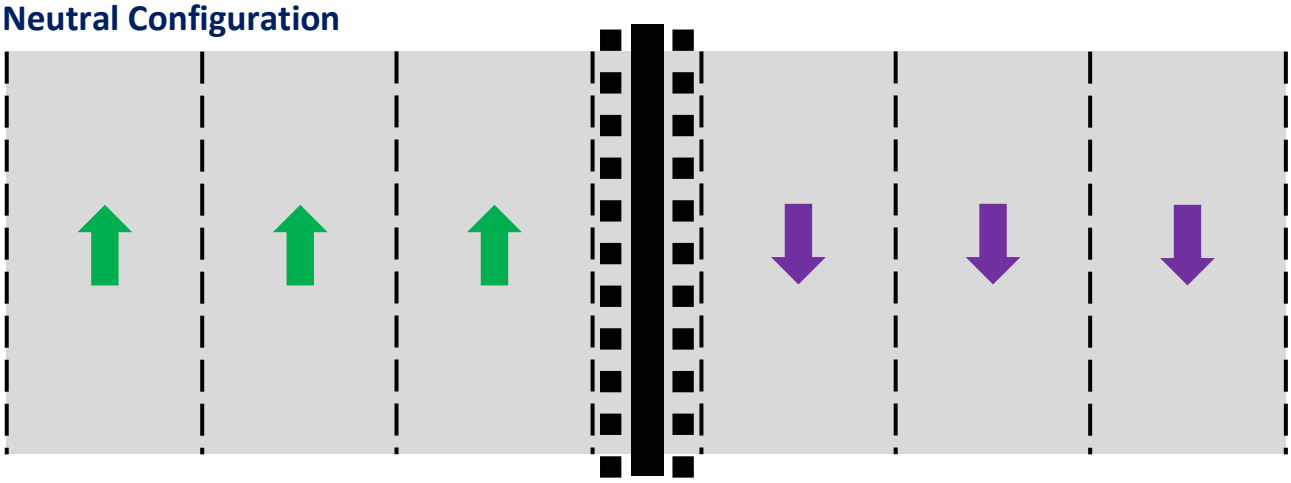


4.2 Existing Divided Roadway

■ ■ ■ ■ TALL42™ Movable Barrier

Permanent Barrier

Neutral Configuration



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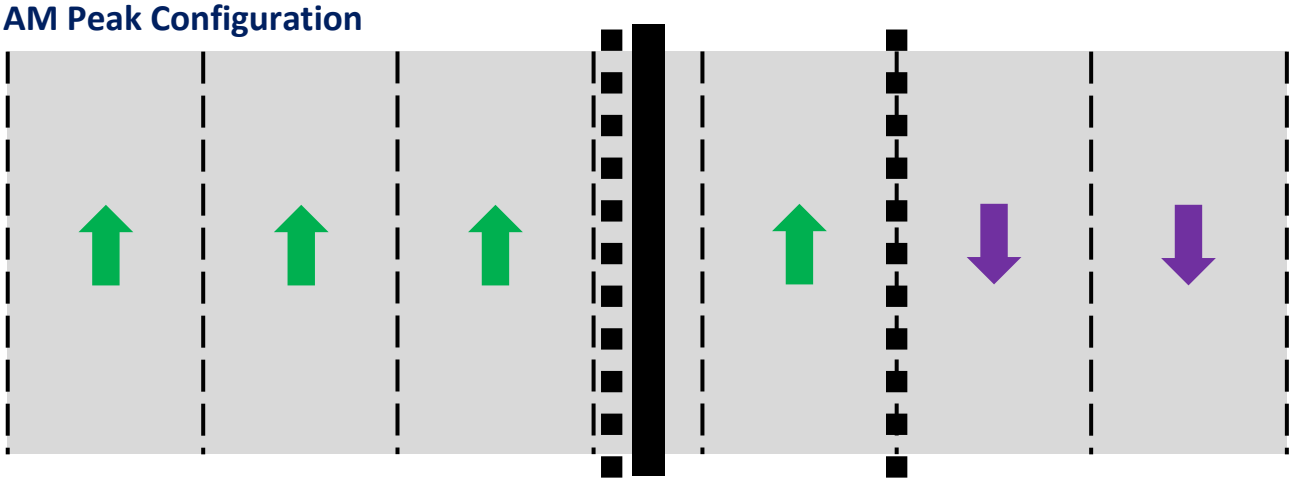
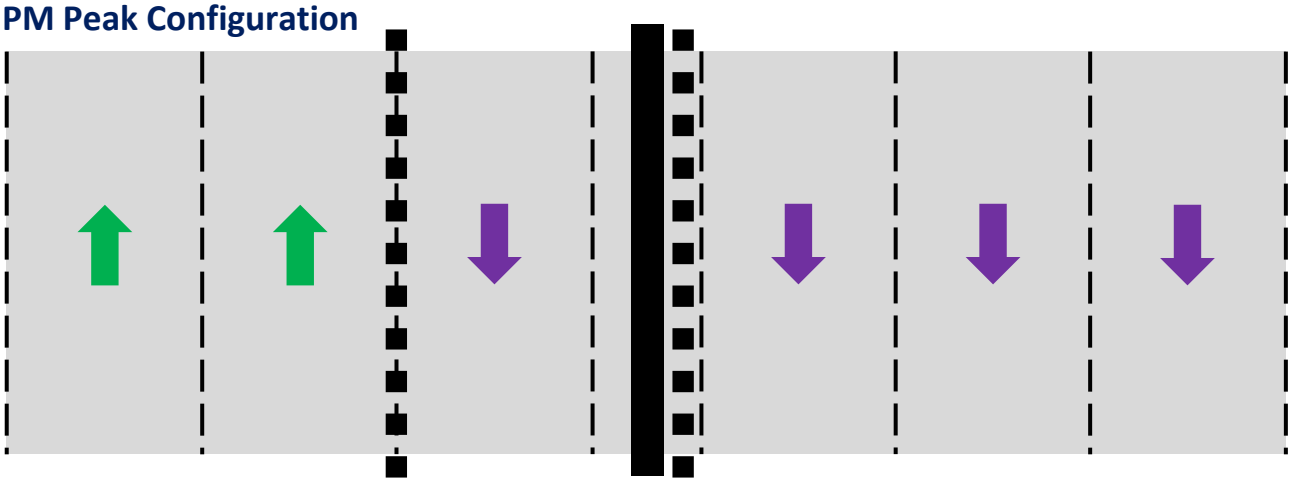


PM Peak Configuration



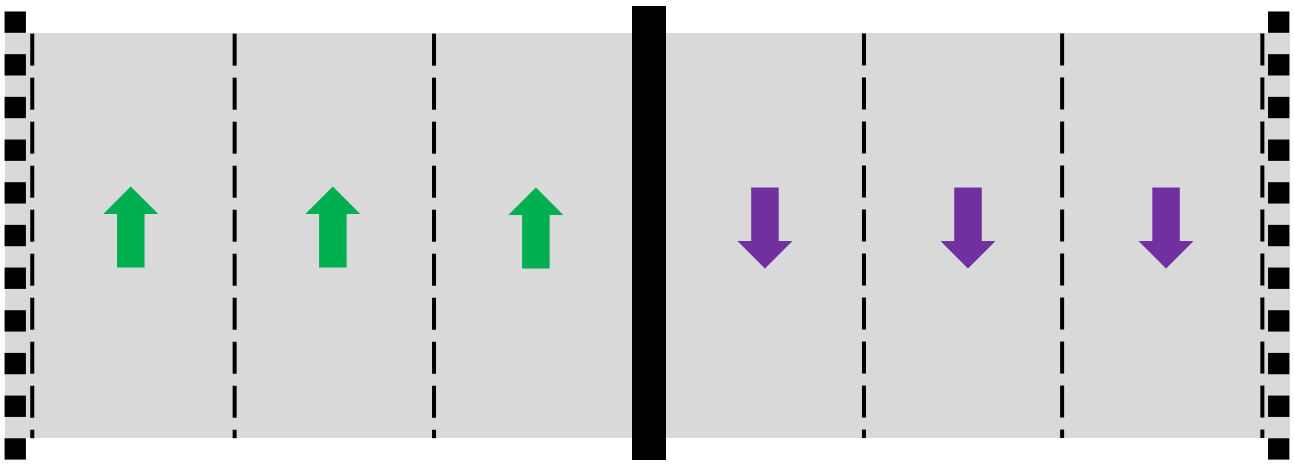
4.3 Workzone Areas

TALL42™ Movable Barrier

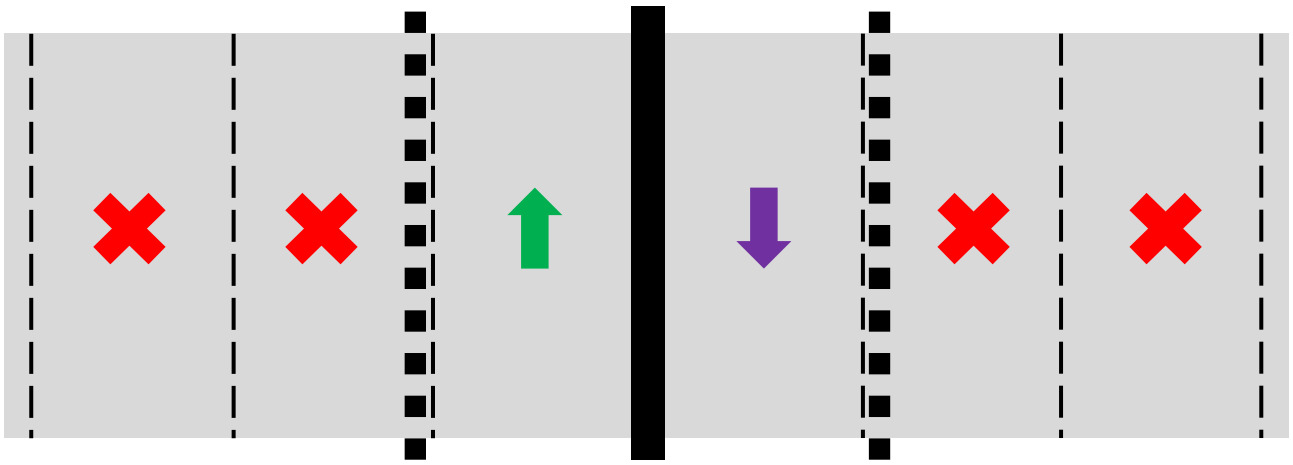
Permanent Barrier

Workzone Area

Day Configuration

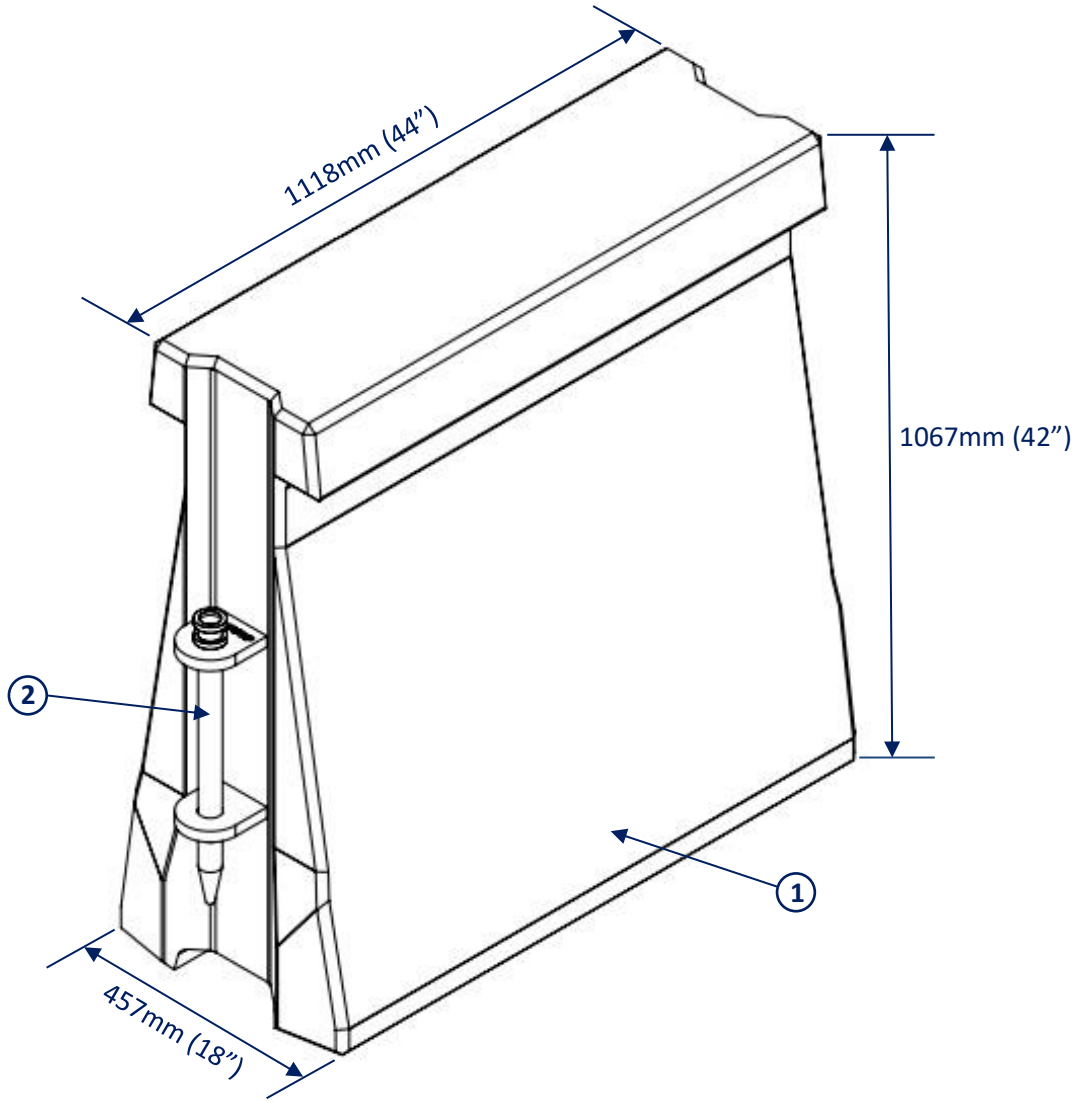


Night Configuration



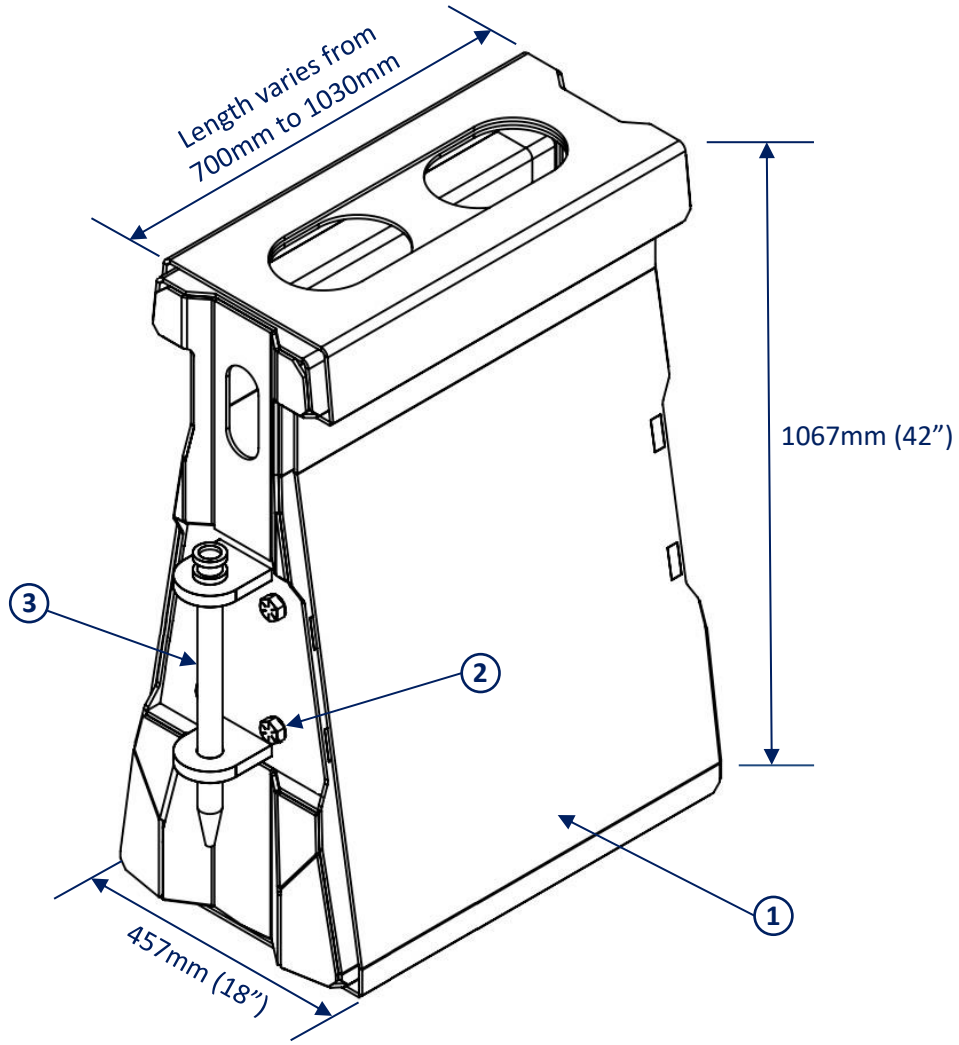
5.0 Component Identification

5.1 Concrete Unit



Item	Description	Quantity
1	Concrete Unit	1
2	Connecting Pin	1

5.2 Variable Length Unit



1

Item	Description	Quantity
1	Variable Length Unit with Internal Hydraulic Cylinder	1
2	7/8” Fasteners	8
3	Connecting Pin	1

6.0 Transportation & Storage

The design of the TALL42™ units facilitates ease of handling and storage. Using a lifting jig and forklift, two (2) units at a time may be lifted as shown in Figure 1.

Figure 1: Forklift Handling of TALL42™ Units

The units may be transported on a flatbed trailer as shown in Figure 2.

Figure 2: Loading of TALL42™ Units

The TALL42™ units are designed to be easily stackable to minimise storage space. Units may be stacked up to three (3) units high in a staggered pattern as shown in Figure 3. The ground material must be level and suitably compacted to ensure stability of the units. It is recommended that the connecting pins remain secured to the units, avoiding misplacement.

Figure 3: Stacking of TALL42™ Units

7.0 Site Preparation

TALL42™ is a freestanding, movable barrier system that is placed directly onto the ground surface. The ground surface must be firm and free from debris that may impede the safe function of the system. The longitudinal and cross slope of the ground surface must me less than 10%.

7.1 Tools Required

Tools required for the installation of TALL42™ includes:

- Tape measure.
- Pry bar.
- Marker pen.

7.2 Recommended PPE

It is recommended that the following personal protective equipment (PPE) be provided for the safe installation of TALL42™:

- Safety footwear.
- Gloves.
- High visibility clothing.
- Hard hat.
- Safety eyewear.

7.3 Traffic Control

Prior to the commencement of any work, the site should be evaluated for risks to workers, pedestrians and other road users. The establishment of traffic control should provide safe travel for passing vehicles and/or pedestrians and appropriately protect workers near the roadside.

7.4 Unloading Exclusion Zone

It is recommended that an exclusion zone be maintained around the unloading process. This provides distance between moving machinery and workers in the event that goods or the machinery move unexpectedly. Unloading and the storing of the product on a level surface is recommended.

7.5 Variable Barrier Length Sections

The TALL42™ system requires variable length sections to facilitate smooth passage through the transfer machine and accommodate roadway alignment variations.

The variable length barriers are manufactured from steel and comprise two (2) parts connected by a hydraulic cylinder allowing the segment to expand and contract. Their position within the TALL42™ barrier system is predetermined by Safe Direction and is dependent upon the overall length of the barrier system and roadway alignment.

The variable length barrier sections are installed and connected in the same manner as the concrete barrier units.

Figure 4: Variable Barrier Length Sections

8.0 TALL42™ Installation

8.1 Installation of the TALL42™ Units

It is recommended that a ground worker signal the forklift operator and guide the positioning and alignment of the TALL42™ units. The use of a forklift and jig will allow two (2) units to be lifted, reducing installation time.

Align the units ensuring the slotted flanges align with the hole flanges as shown in Figure 5.

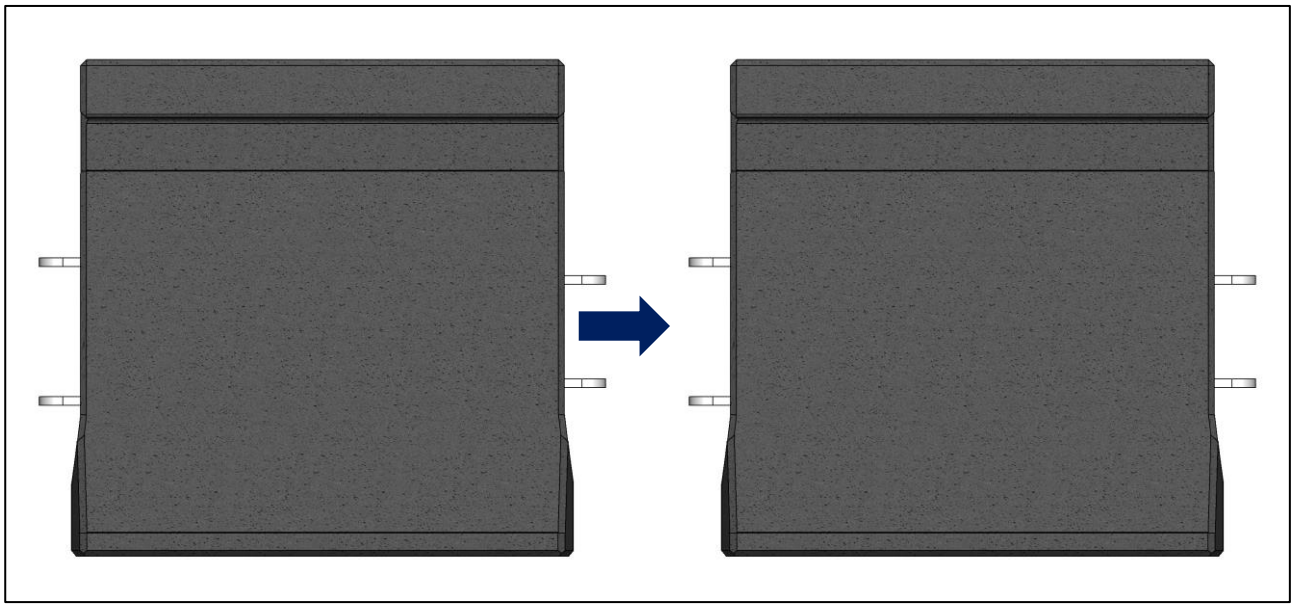
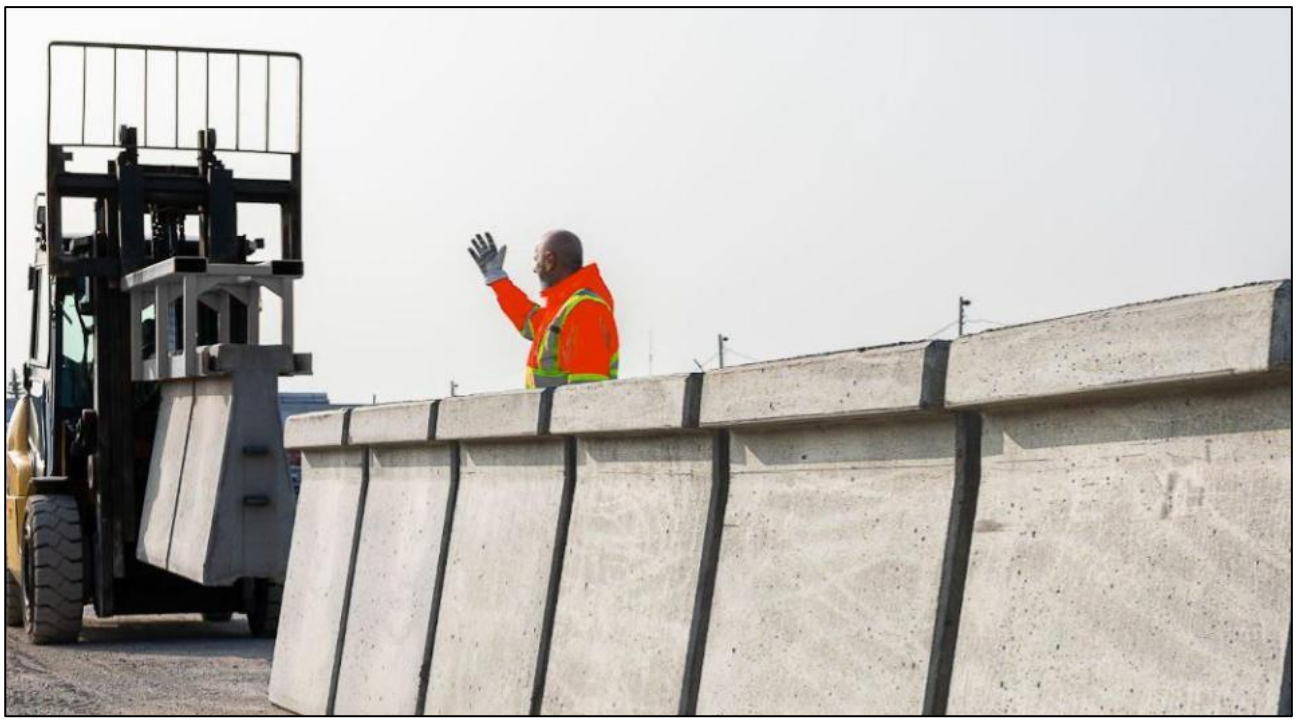


Figure 5: Alignment of TALL42™ Units



When the barrier sections are properly aligned, connect the flanges of the units with the connection pin. The pin should be fully engaged with the ring of the pin seated on the top flange. A pry bar may be used to adjust the alignment of the TALL42™ units to ensure the pin is fully engaged.

Figure 6: Insertion of Connecting Pin

Figure 7: Using a Pry Bar to Adjust Barrier Alignment

8.2 Attachment of QUASH™ Crash Cushions

The QUASH™ Crash Cushion System is a high performance non-redirective, gating crash cushion designed to shield the blunt end of the TALL42™ movable concrete barrier.

QUASH™ has been specifically designed for rapid deployment and ease of installation and does not require anchoring to the road foundation. The simple design of QUASH™ consists of a nose piece, absorption cells and an end transition for connection to the downstream TALL42™ barrier, all linked together with connecting pins.

The preassembled absorption cells are filled with water reducing the severity of end-on impacts. The cells feature convenient dual lifting points and may be handled empty or filled. The self-centring J-slot hinge ensures QUASH™ remains correctly aligned with the TALL42™ movable barrier system as it passes through the transfer machine.

The attachment of the QUASH™ Crash Cushion System is required whenever the end of the TALL42™ barrier can be impacted end-on by an errant vehicle. This includes both ends of an undivided roadway and median applications.

Please refer to the Safe Direction QUASH™ Product Manual for installation guidelines.

Figure 8: QUASH™ Crash Cushion

TALL42™ Inspection Form

Inspection Date	
Client	
Project Reference	
Name of Inspector	
Company	

❑ Yes ❑ No	The longitudinal grade and cross slope of the ground surface is less than 10%.
❑ Yes ❑ No	The area adjacent to the barrier is free of debris.
❑ Yes ❑ No	The barrier has been correctly aligned with the roadway.
❑ Yes ❑ No	The connecting flanges of each unit is correctly aligned.
❑ Yes ❑ No	Each unit is secured with a connecting pin.
❑ Yes ❑ No	The ring stopper of each connecting pin is in contact with the flange.
❑ Yes ❑ No	A QUASH™ Crash Cushion is secured to the leading end of the system.
❑ Yes ❑ No	A QUASH™ Crash Cushion is secured to the trailing end of the system when the TALL42™ barrier is installed in the median or undivided roadway.
❑ Yes ❑ No	The QUASH™ Crash Cushion has been installed in accordance with Safe Direction Product Manual guidelines.
Variable Length Barrier Sections	
❑ Yes ❑ No	Variable length barrier sections have been positioned in accordance with Safe Direction guidelines.
❑ Yes ❑ No	The two sections of the variable length barrier are unobstructed to facilitate compression and expansion of the hydraulic cylinder.
❑ Yes ❑ No	There are no visible leaks of the hydraulic cylinder.

Comments/Notes

9.0 Maintenance

Walk-up inspections are recommended (with appropriate traffic control) to inspect the following:

- There are no impacts that have caused damage to the system.
- All units are secured with connecting pins.
- The alignment of the TALL42™ barrier follows the roadway.
- The area adjacent to the TALL42™ barrier is free of debris.
- There are no missing elements.
- The ends of the TALL42™ barrier are appropriately shielded with the QUASH™ Crash Cushion.

10.0 Dismantling and Relocation

The dismantling of TALL42™ follows the installation sequence in reverse. Prior to dismantling of the TALL42™ system it is recommended that appropriate traffic control be established. The removal of the connection pins will typically require a pry bar to adjust the barrier alignment.

The QUASH™ transition piece may remain attached to the last element of the TALL42™ barrier when relocating.

11.0 Damage Assessment

Damage to a temporary concrete barrier must be suitably assessed to ensure vehicle impact performance is not compromised. Industry guidelines[1] recommended for the evaluation of TALL42™ are documented in Table 1.

Hairline cracks are defined as having a crack width of less than 0.08 mm, which is barely perceptible to the naked eye. These cracks usually develop due to plastic shrinkage of the concrete. These cracks are shallow and unopened and offer very little room to repair, with a low viscosity liquid being the only possible method of repair. These cracks do not affect the structural integrity of the concrete barrier. Therefore, a concrete barrier exhibiting only multiple hairline cracks is acceptable for further use.

Cracks assessed as acceptable can be repaired using a pressure-injected epoxy, gravity-fed sealant, and surface sealant. Injecting epoxy resin is the best technique for filling cracks on a vertical surface such as a barrier wall. Injection of epoxy resin can seal cracks as fine as 0.05 mm in width. Using an epoxy resin of low viscosity enables the resin to penetrate the full depth of the crack at working pressure.

[1] Development of Guidelines for Inspection, Repair, and Use of Portable Concrete Barriers—Volume 1: Technical Report 0-7059-R1-Vol1, Texas A&M Institute

Table 1: TALL42™ Damage Assessment Guidelines

Type of Damage	Description of the Damage	Remedial Action
Spalling	There is no exposure of reinforcement	The unit may be used
	There is exposure of the reinforcement	The unit is to be replaced.
Cracking	Hairline cracking	The unit may be used
	The unit has one (1) crack with a width that does not exceed 6mm	The unit must be repaired
	The unit has multiple cracks whose summed width dimensions do not exceed 6mm.	
	The crack exceeds 6mm or the reinforcement is exposed	The unit is to be replaced
Damage to Connections	The connecting flange is damaged	The unit is to be replaced
	The connection between units has rotated more than 20 degrees	
Damage to the Connection Pin	The connection pin is bent	The pin is to be replaced
Damage to the Variable Barrier Length Section	The unit is dented preventing expansion and contracting movement of the inner and outer shell	The unit is to be replaced.
	There are signs of leaks from the hydraulic cylinder	

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☎ 1300 063 220 sales@safedirection.com.au

ABN 53 156 459 684

safedirection.com.au