

QUASH™

Portable Crash Cushion



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Leading Safety

Successfully crash tested to MASH Test Level 3

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

Superior Design

Convenient dual lifting points

Can be lifted with elements full or empty

Identical absorption elements

No internal corrodible elements

Short installation length

Compatibility

Designed for attachment to TALL42™ movable concrete barrier

The self-centring J-slot hinge ensures the QUASH™ remains correctly aligned with TALL42™

Remains connected to TALL42™ as it passes through the transfer machine.

Fast Assembly

Minimal components providing ease of handling

Does not require ground anchoring

Can be placed on asphalt or concrete



QUASH™

1.0 Introduction

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. Developed by Moovop Inc. of Canada, QUASH™ has been full-scale crash tested to MASH Test Level 3.

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.

QUASH™ is manufactured from linear low-density polyethylene offering excellent impact resistance and high tensile strength. The internal areas of the cells are free from corrodible components.

2.0 Specifications

Crash Test Compliance	MASH Test Level 3
System Length	7300 mm
System Height	1067mm (42")
System Width	610mm (24")
Element Mass (empty)	63.5 kg
Element Mass (full)	515 kg
Element Volume	450 litres
System Volume	2250 litres
System Mass (empty)	480 kg
System Mass (full)	2730 kg

3.0 Design Considerations

3.1 Barrier Identification

Each QUASH™ absorption cell is stamped providing traceability to a batch number and date of manufacture.

3.2 Design Life

The typical design life of a QUASH™ absorption cell is up to 20 years. The absorption cells QUASH™ are manufactured from UV stabilised linear low-density polyethylene offering excellent impact resistance and high tensile strength. The internal areas of the cells are free from corrodible components.

3.3 Operating Temperature Range

QUASH™ may be deployed in warm and cold weather conditions. The safe operating temperature for the crash cushion to retain its full structural integrity under impact conditions is -20° C to +60° C

In areas where cold weather could cause the water contained in the QUASH™ Crash Cushion cells to freeze, an antifreeze solution may be added. Please contact Safe Direction for details.

3.4 Visual Indicators of Deterioration

Several reliable visual cues can indicate deterioration in low-density polyethylene (LDPE). These signs are well-recognised in plastics engineering and appear as the material undergoes thermal, UV, or mechanical degradation.

Cells should be monitored if early spider-crazing is observed around the fill ports. Cells should be replaced if any of the following conditions are observed:

- Any cracks exceeding 30 to 50mm appear at corners or impact faces.
- Chalking layer is thicker than 0.5mm and wipes off as powder.
- Wall thinning >20% from abrasion or weathering (visible translucency).
- Discolouration to a uniform pale white/grey (UV stabilisers exhausted).

4.0 Crash Test Performance

QUASH™ has been fully crash tested and evaluated according to the specifications for 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 QUASH™ crash cushion is classified as gating, non-re-directive. Gating crash cushions are designed to allow vehicles impacting near the beginning or nose of the system to safely pass through the unit and travel behind the cushion.

Non-redirective crash cushions are designed to safely accommodate most vehicles striking the front of the cushion but have no capability to redirect vehicles impacting near the rear of the device.

As a result, most non-redirective cushions are designed to be wider than the hazard to be shielded and are typically only deployed in temporary applications where posted speeds are reduced and the risk of high-energy impacts are lower.

MASH TL3 crash testing is performed with a 1100kg passenger car (1100C) and 2270kg pick-up truck (2270P) travelling at 100km/h. Impacts with the 1100C primarily assesses occupant risk while the 2270P impacts evaluate the structural adequacy of the crash cushion.



2270kg Pick-up Truck

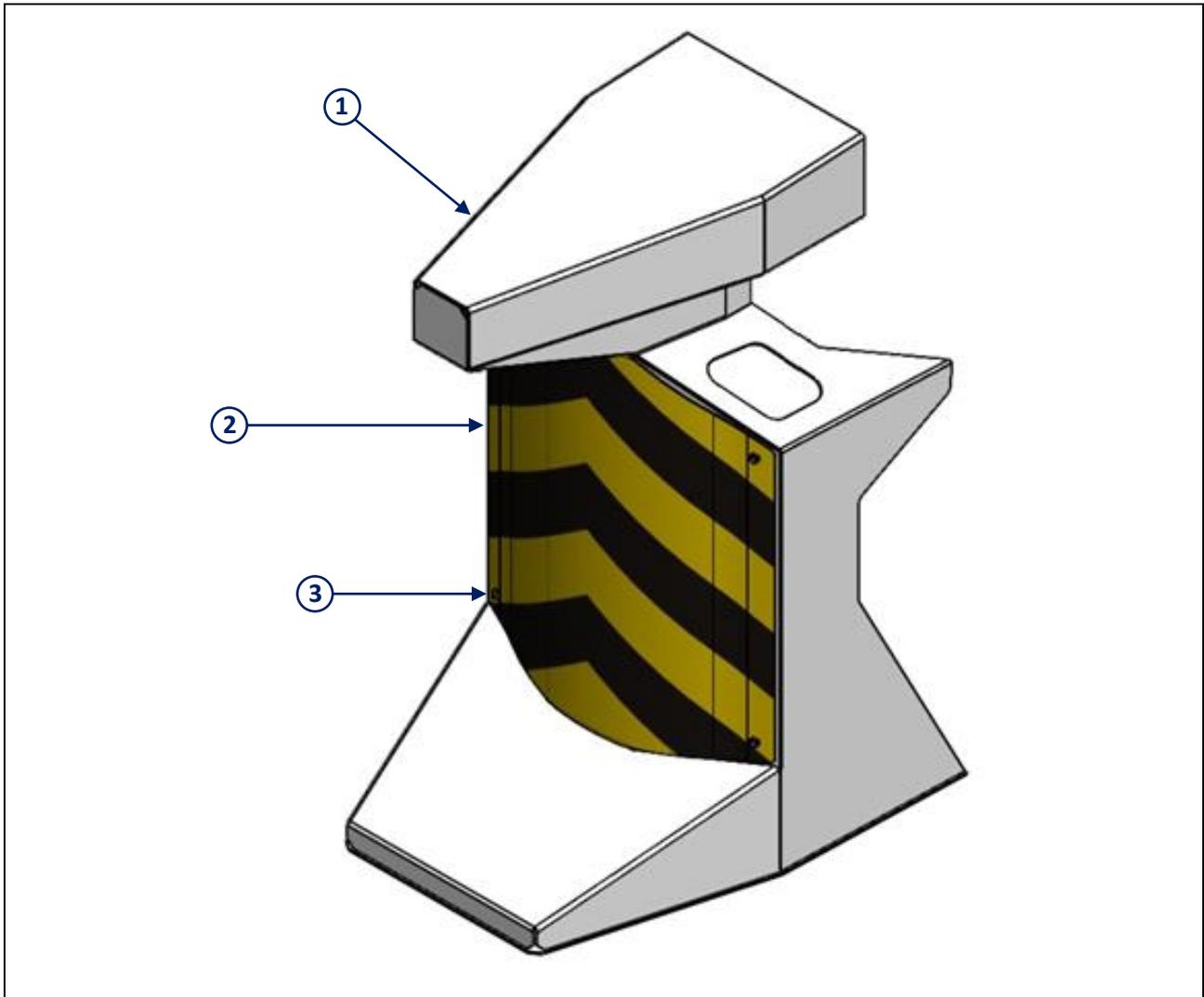


1100kg Passenger Car

5.0 Component Identification

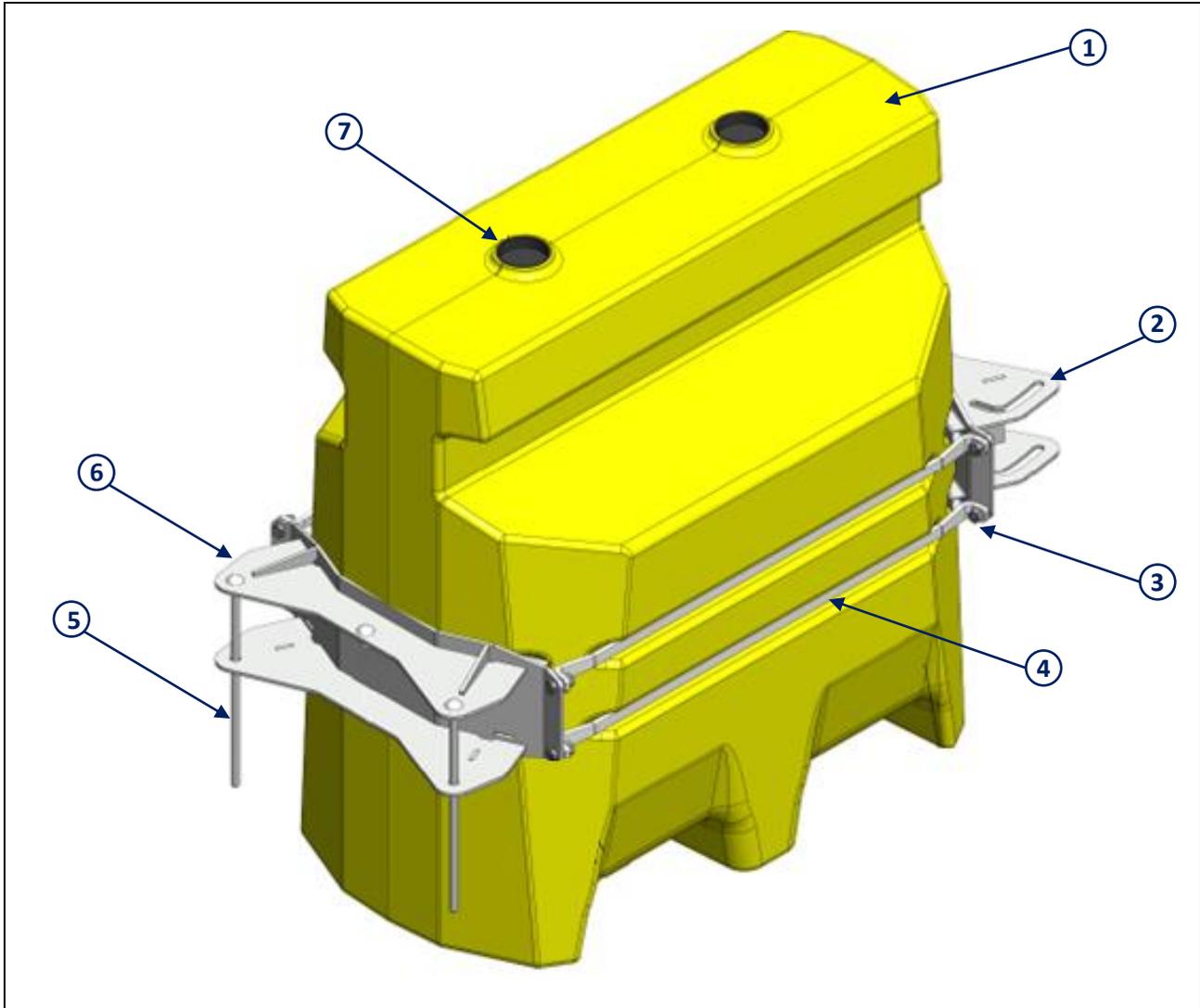
Only parts supplied or specified by Safe Direction shall be used in the assembly of the QUASH™ crash cushion. The use of non-genuine parts may result in product failure causing serious injury or death.

5.1 Nose Piece



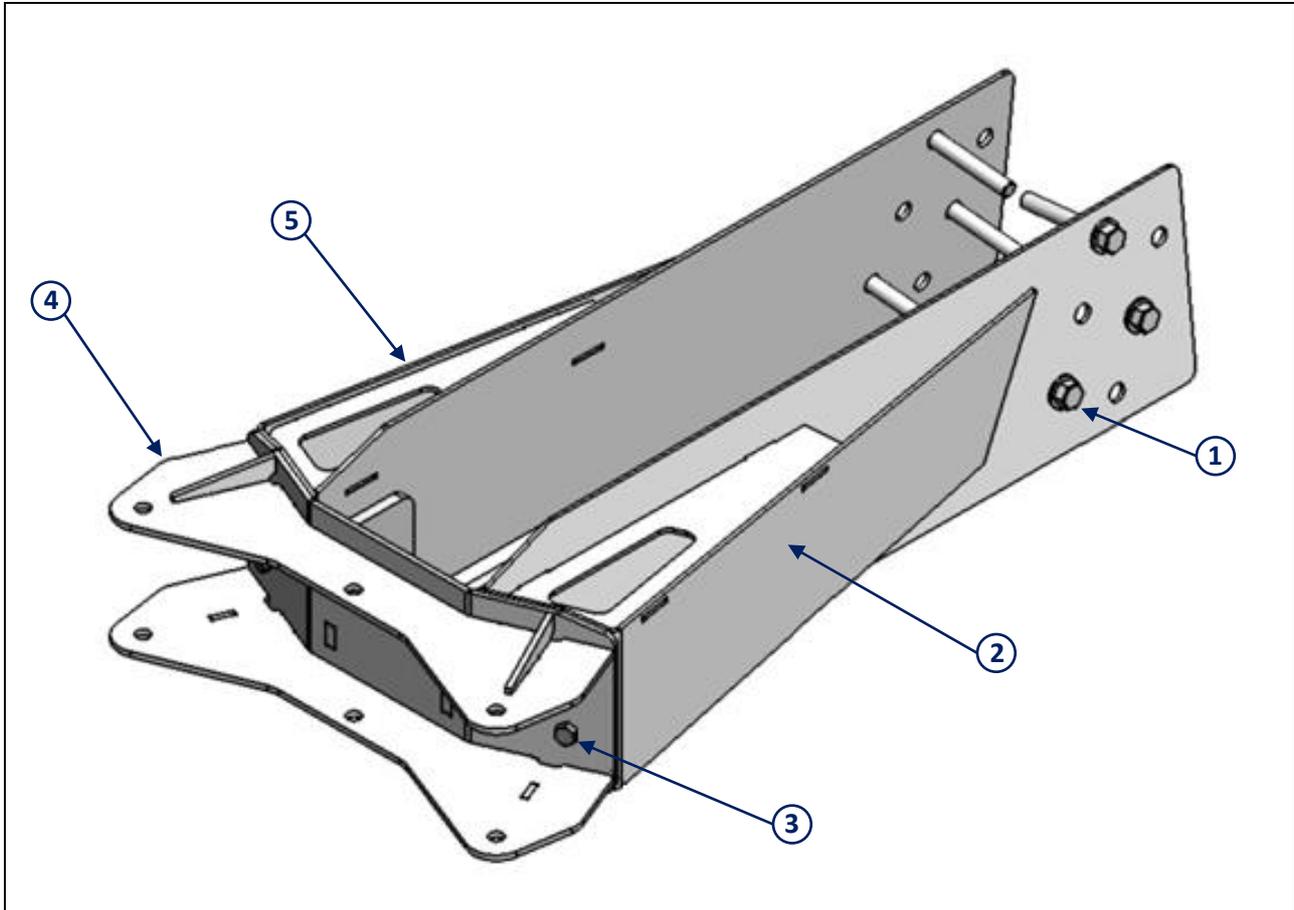
Item	Description	Quantity
1	Nose Piece Welded Assembly	1
2	Nose Piece Delineation (as per state road agency specifications)	1
3	1/4" Hex Screw & Nut	4

5.2 Absorption Cell



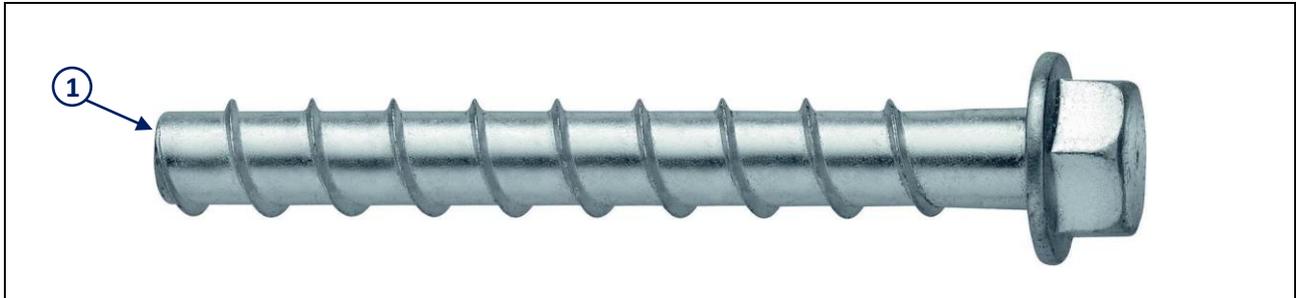
Item	Description	Quantity
1	Absorption Cell	1
2	Flange Assembly J Side	1
3	1/2" Hex Screw & Nut	8
4	Flange Side Bar	4
5	Flange Pin	2
6	Flange Assembly Hole Side	1
7	Plastic Cap	2

5.3 Transition Piece



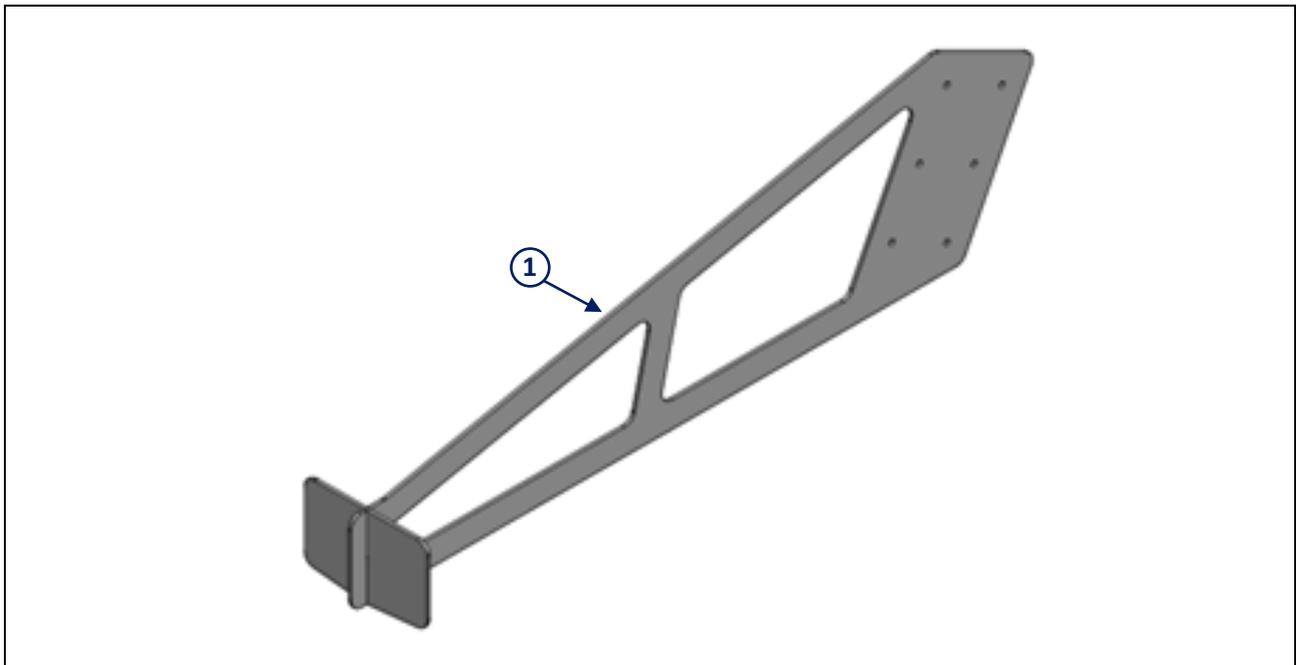
Item	Description	Quantity
1	M16 Anchor Bolt	6
2	Transition Left Plate Assembly	1
3	1/2" Hex Screw, Nut & Washer	4
4	Transition Front Plate Assembly	1
5	Transition Right Plate Assembly	1

5.4 Transition Anchors



Item	Description	Quantity
1	M16 x 100mm Anchor Bolt	6

5.5 Transition Drilling Template



Item	Description	Quantity
1	Transition Drilling Template	1

6.0 Transportation & Storage

The design of the QUASH™ absorption cells facilitates ease of handling and storage. The cells may be lifted and moved when empty or filled using appropriate lifting equipment. The cells feature dual lifting points located at the top of each element and at the side as shown in Figure 1.

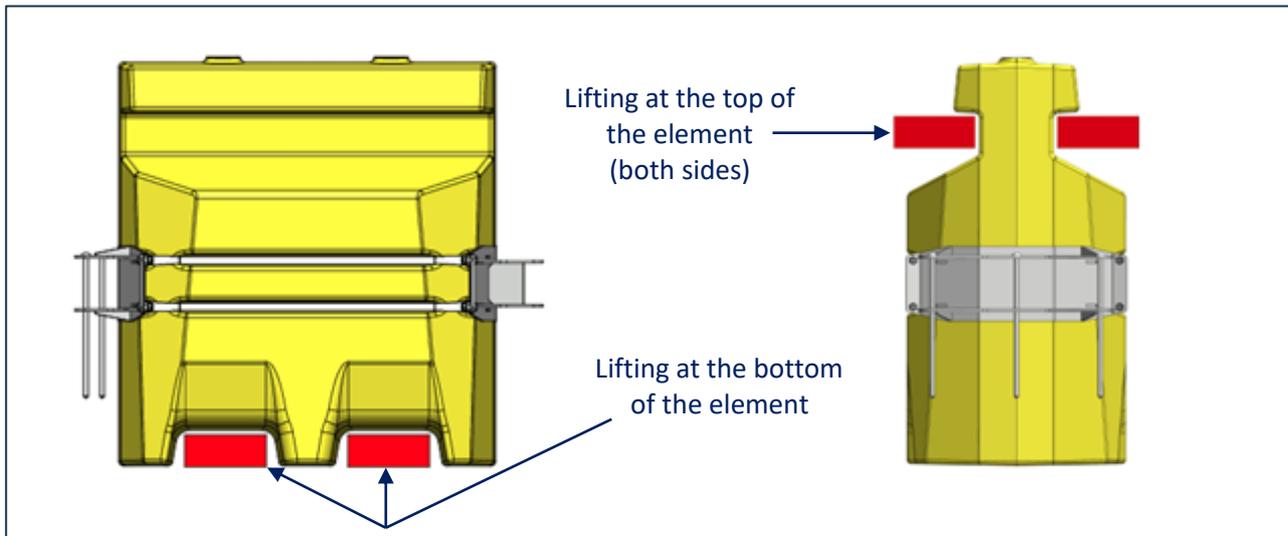


Figure 1: Lifting of Absorption Cells

If lifting using a forklift, the tines must fully engage the cells, particularly if the cells are filled to avoid damage.



Figure 2: Bottom Lifting of Absorption Cells



Figure 3: Top Lifting of Absorption Cells

When the absorption cells are full, they should not be stacked on top of each other to avoid damage. If the cells are empty, they may be grouped together in bundles of up to four (4) to facilitate transportation and handling as shown in Figure 4.

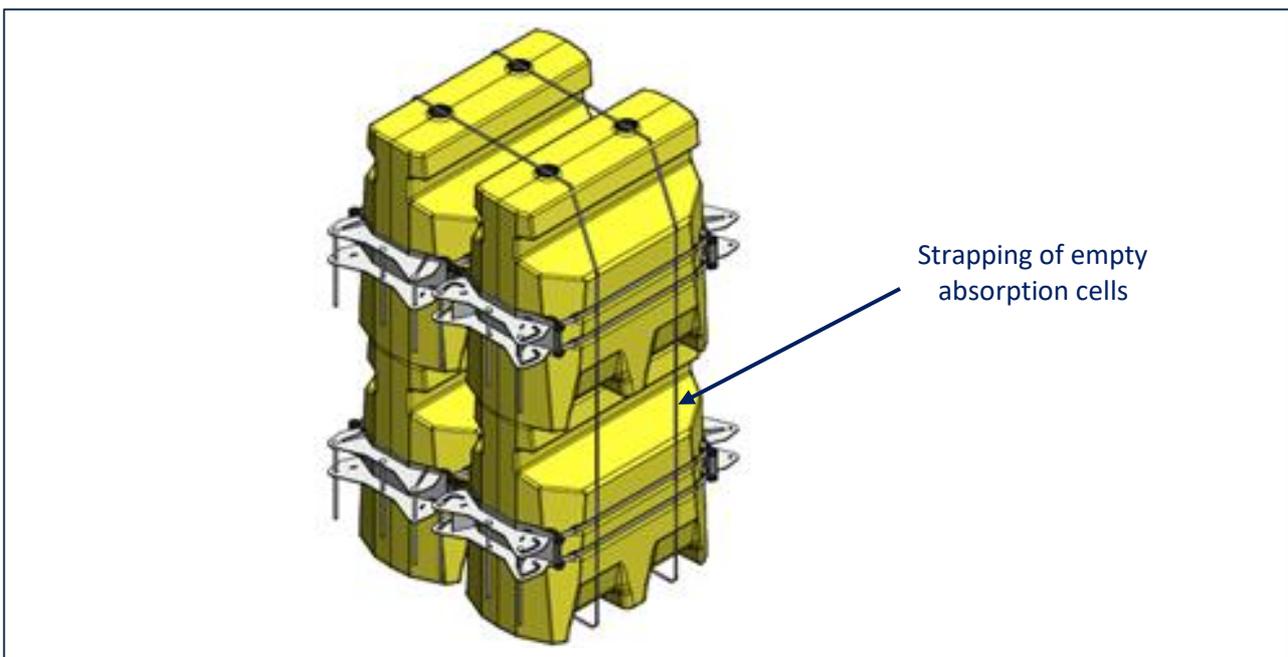


Figure 4: Bundling of Empty Absorption Cells for Transportation

The design of the QUASH™ absorption cells facilitates ease of stacking to minimise storage space. Empty cells may be stacked up to three (3) units high in a staggered pattern as shown in Figure 5.



Warning: the units must not be stacked unless empty.

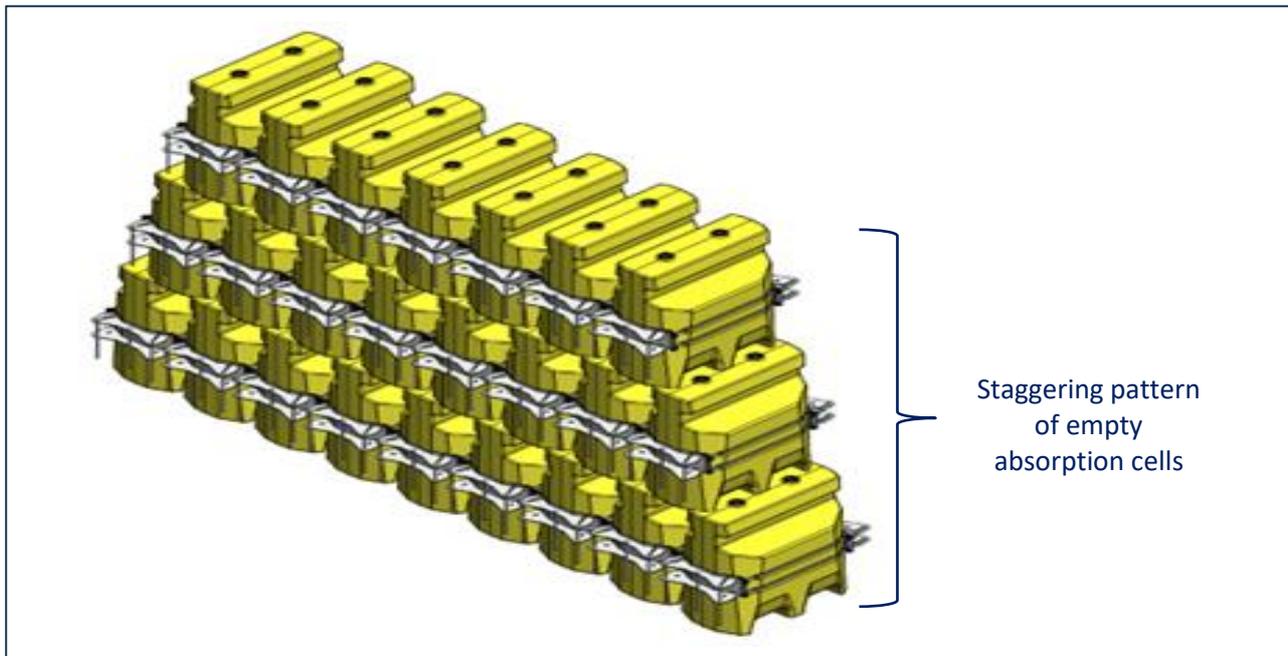


Figure 5: Stacking of Empty Absorption Cells

The QUASH™ metal nose pieces may be transported and stacked as shown in Figure 6.

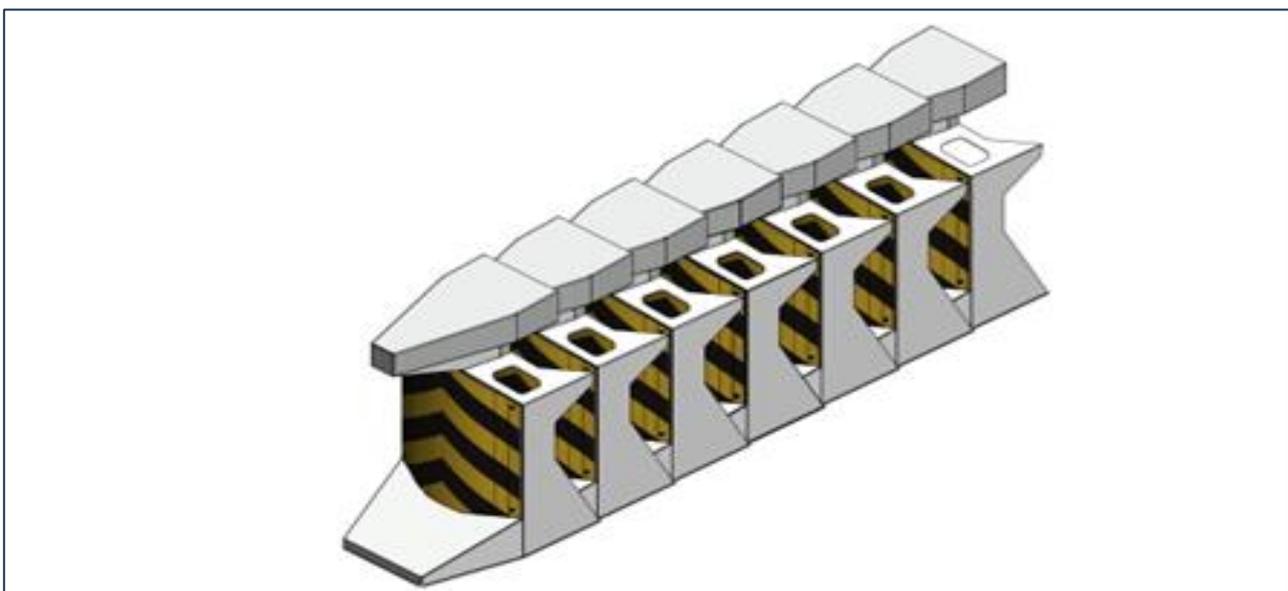


Figure 6: Transporting and Storage of Nose Pieces

7.0 Site Preparation

The QUASH™ crash cushion is a freestanding unit 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 be less than 10%.

7.1 Tools Required

Tools required for the installation of QUASH™ includes:

- Tape measure.
- Pliers.
- Marker pen.
- Transition template.
- Torque wrench.
- Hammer drill.
- Impact wrench.

7.2 Recommended PPE

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

- Safety footwear.
- Gloves.
- Hearing protection.
- High visibility clothing.
- Dust mask.
- 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.

8.0 QUASH™ Installation

8.1 Installation of the Transition

The QUASH™ connects to the downstream TALL42™ movable barrier using a transition element. Mark a line on the face of the TALL42™ barrier 380mm above ground level as shown in Figure 7.

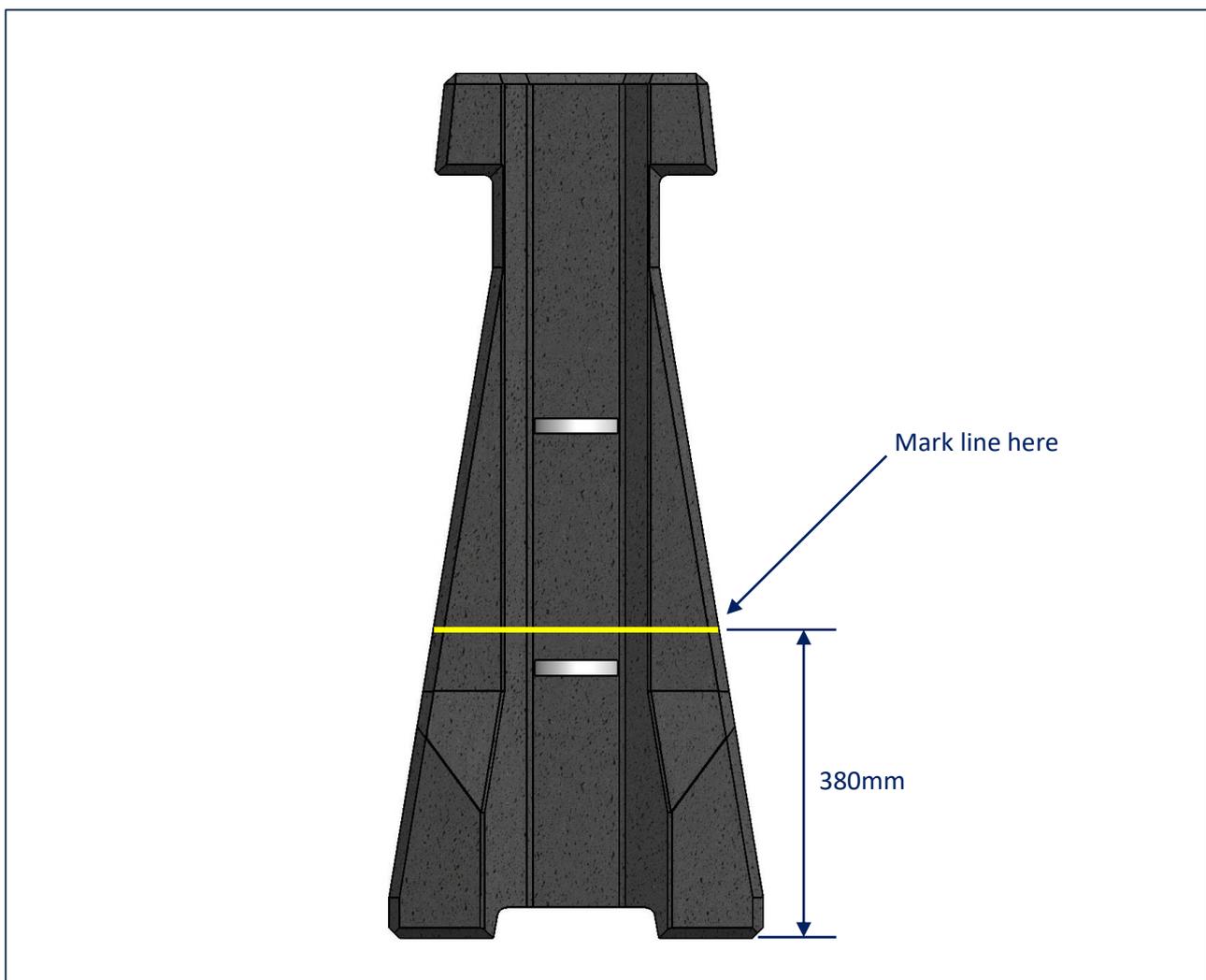


Figure 7: Marking of the Downstream TALL42™ Barrier

The transition template is used to identify the transition anchor positions on the downstream TALL42™ barrier. Position the template against the front face and side of the downstream barrier as shown in Figure 8, ensuring the side plate of the template is parallel to the longitudinal axis of the TALL42™ barrier.

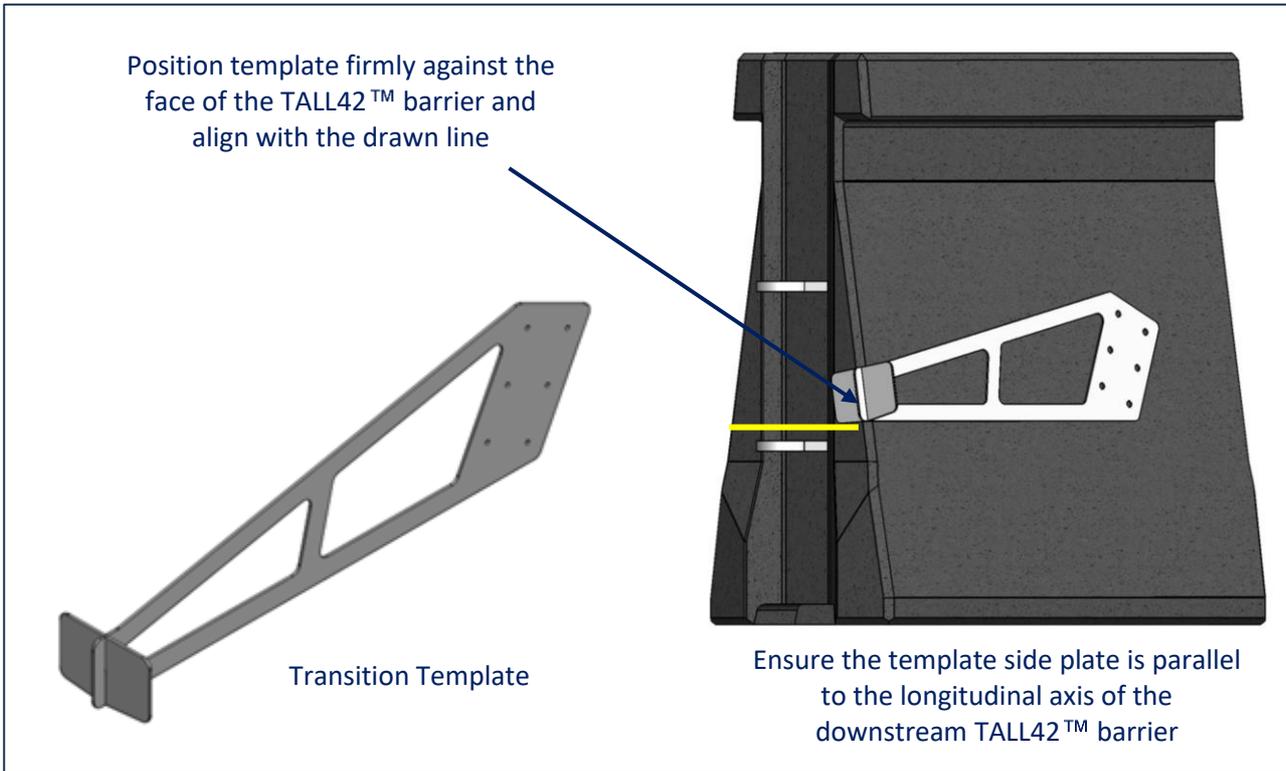


Figure 8: Positioning of the Transition Template

The transition template features six (6) anchor holes incorporating two (2) anchoring pattern options. The anchor holes may use either of the three (3) hole patterns as shown in Figure 9. This arrangement provides an alternative in the event reinforcement is encountered during drilling.

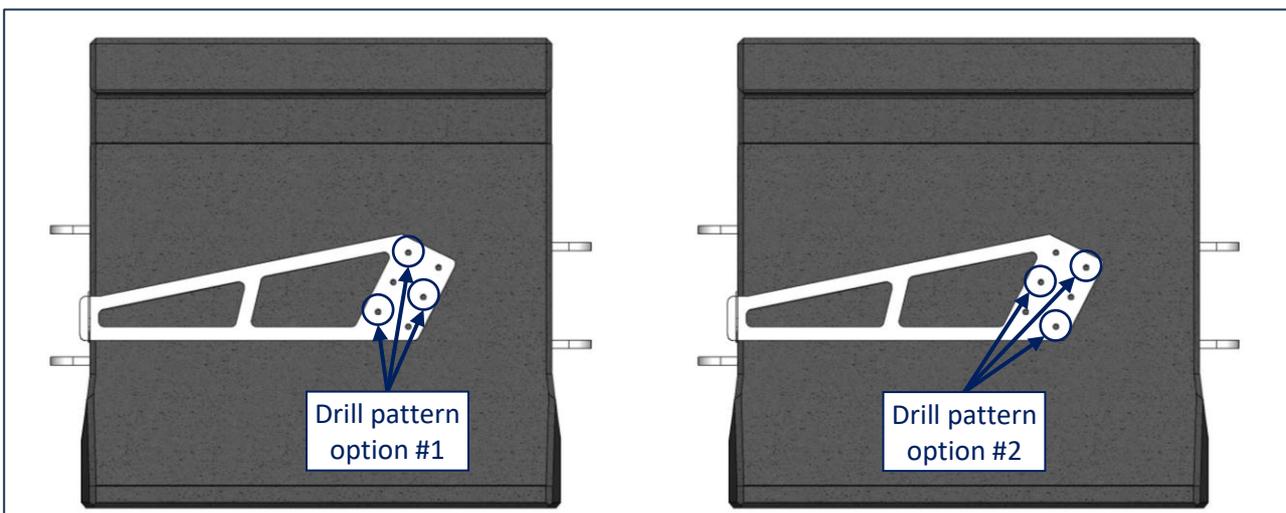


Figure 9: Anchor Hole Pattern Options

Mark the selected hole pattern on each side of the TALL42™ barrier, remove the transition template and drill the three (3) anchors holes on each side using a 16mm diameter masonry drill to a depth of 100mm. Thoroughly clean the holes using a hand pump or compressed air as shown in Figure 10.

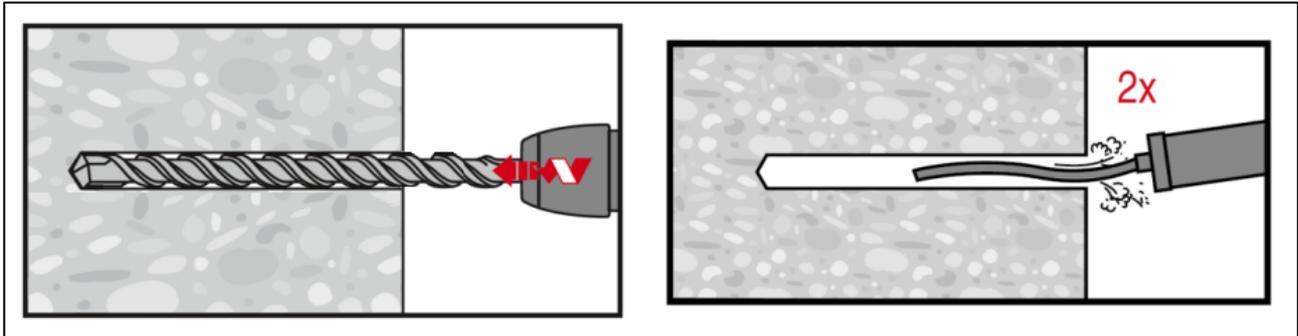


Figure 10: Anchor Hole Drilling for Transition

Position the left-hand transition piece on the TALL42™ barrier and secure using the M16 x 100mm screw anchors as supplied by Safe Direction. Fully tighten using an impact wrench and 24mm socket. Repeat this process for the right-hand transition piece.

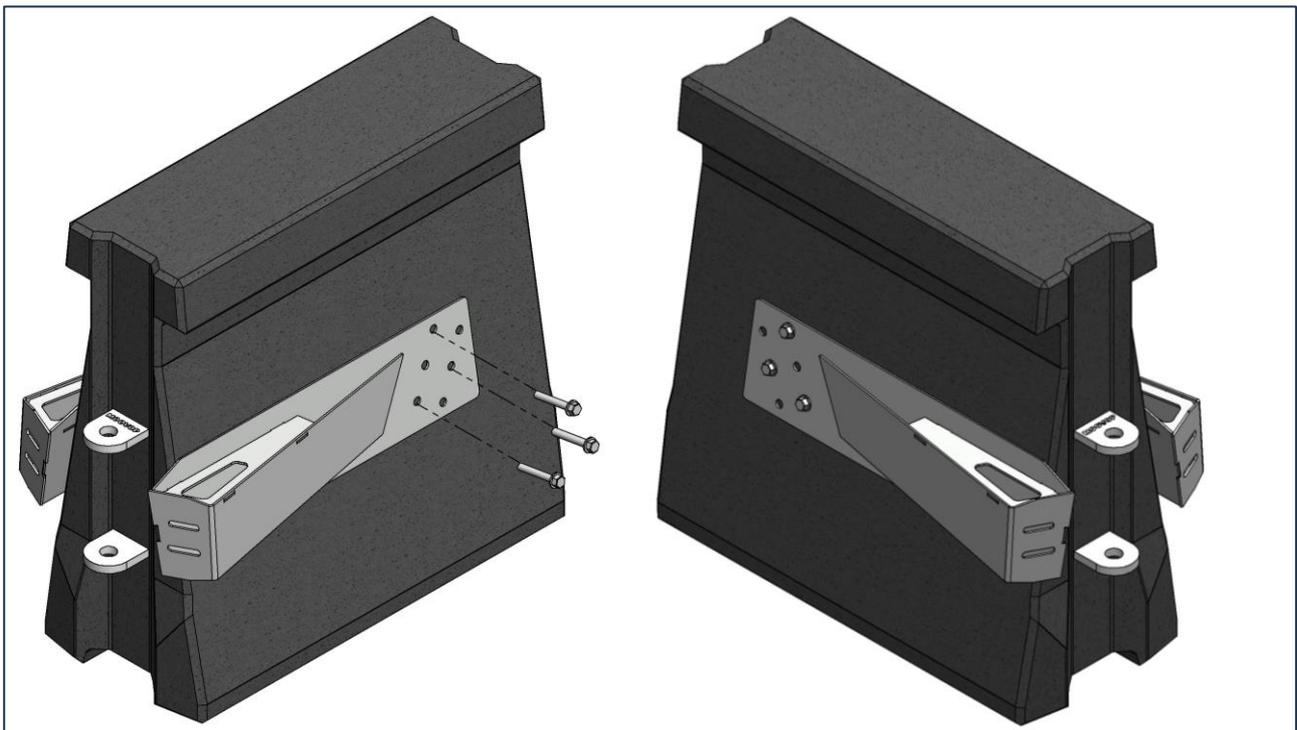


Figure 11: Attachment of Transition Pieces

Attach the front piece to both sides of the transition using the provided bolts, nuts and washers. These fasteners should be tightened to 88Nm. When the front piece is secured, the front piece stoppers should be contacting the front face of the downstream TALL42™ barrier as shown in Figure 12.

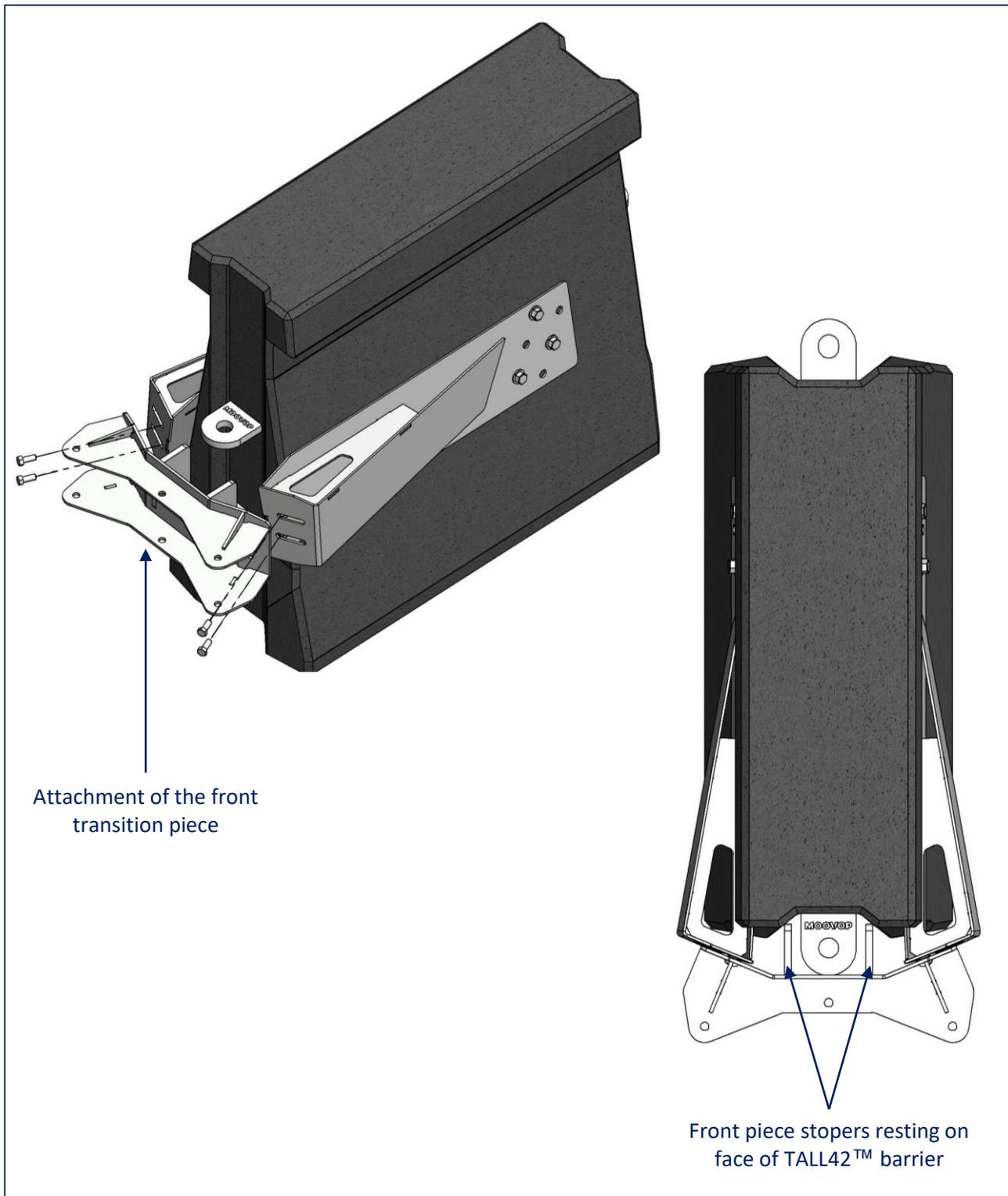


Figure 12: Attachment of the Front Transition Piece

8.2 Absorption Cells Installation

The absorption cells are orientated with the J slots facing towards the transition as shown in Figure 13.

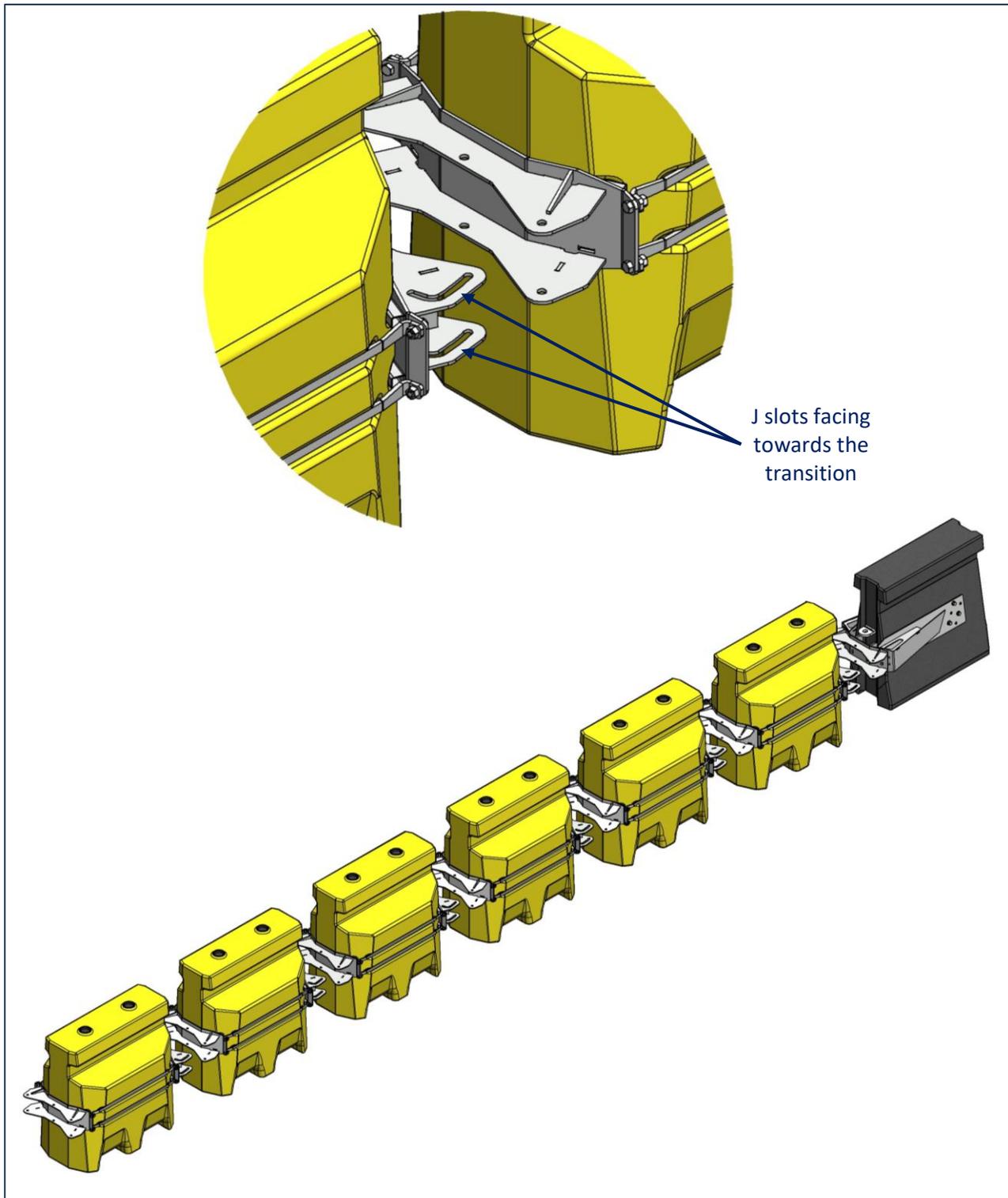


Figure 13: Absorption Cell Orientation

Connect the rear absorption cell to the transition, then each subsequent cell to each other with two (2) pins per connection as shown in Figure 14. Ensure that the centre of all absorption cells are aligned.

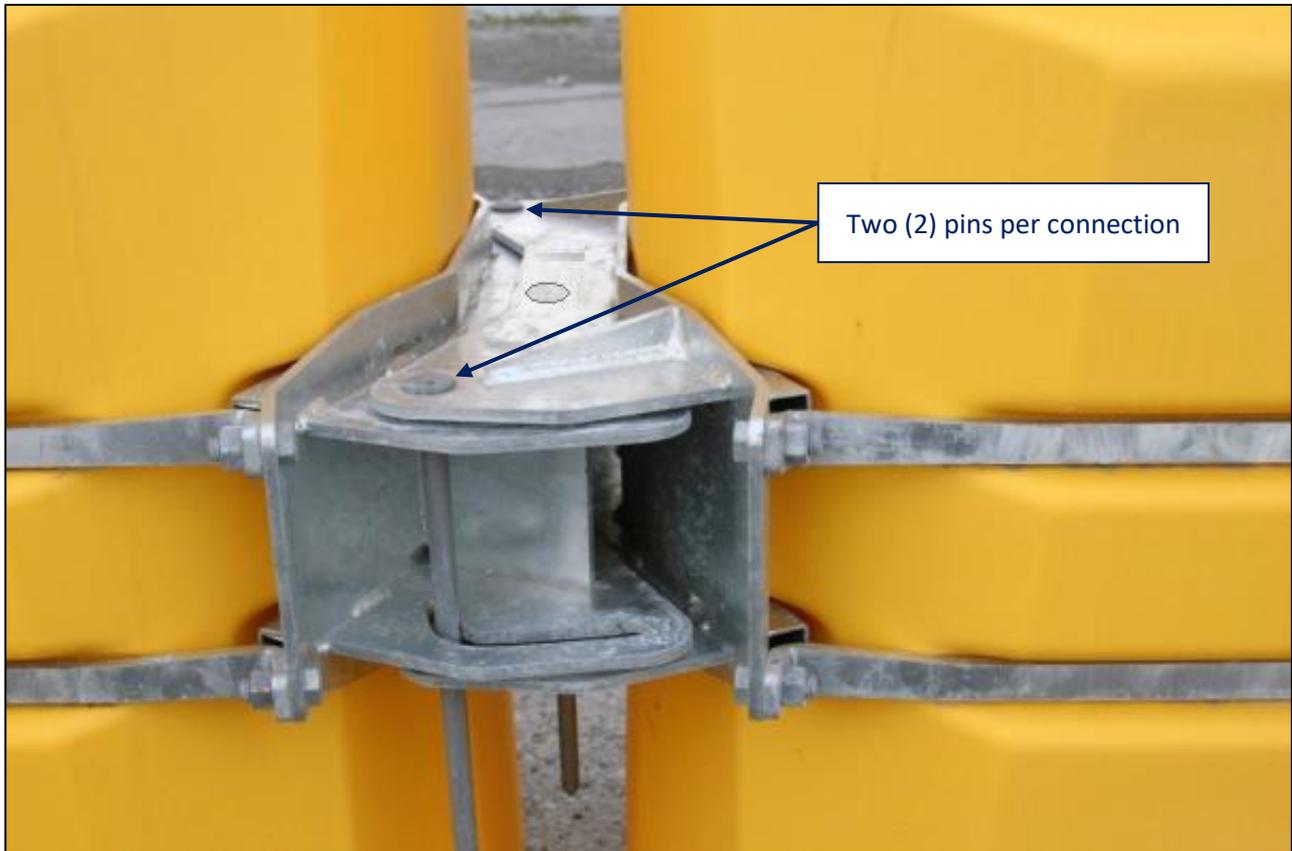


Figure 14: Insertion of Connection Pins

Fill all absorption cells with water to within 25mm of the fill holes, with the exception of the first cell. In extreme environments, anti-freeze solution may be added. Contact Safe Direction for details.

The first cell **must** remain empty as shown in Figure 15.

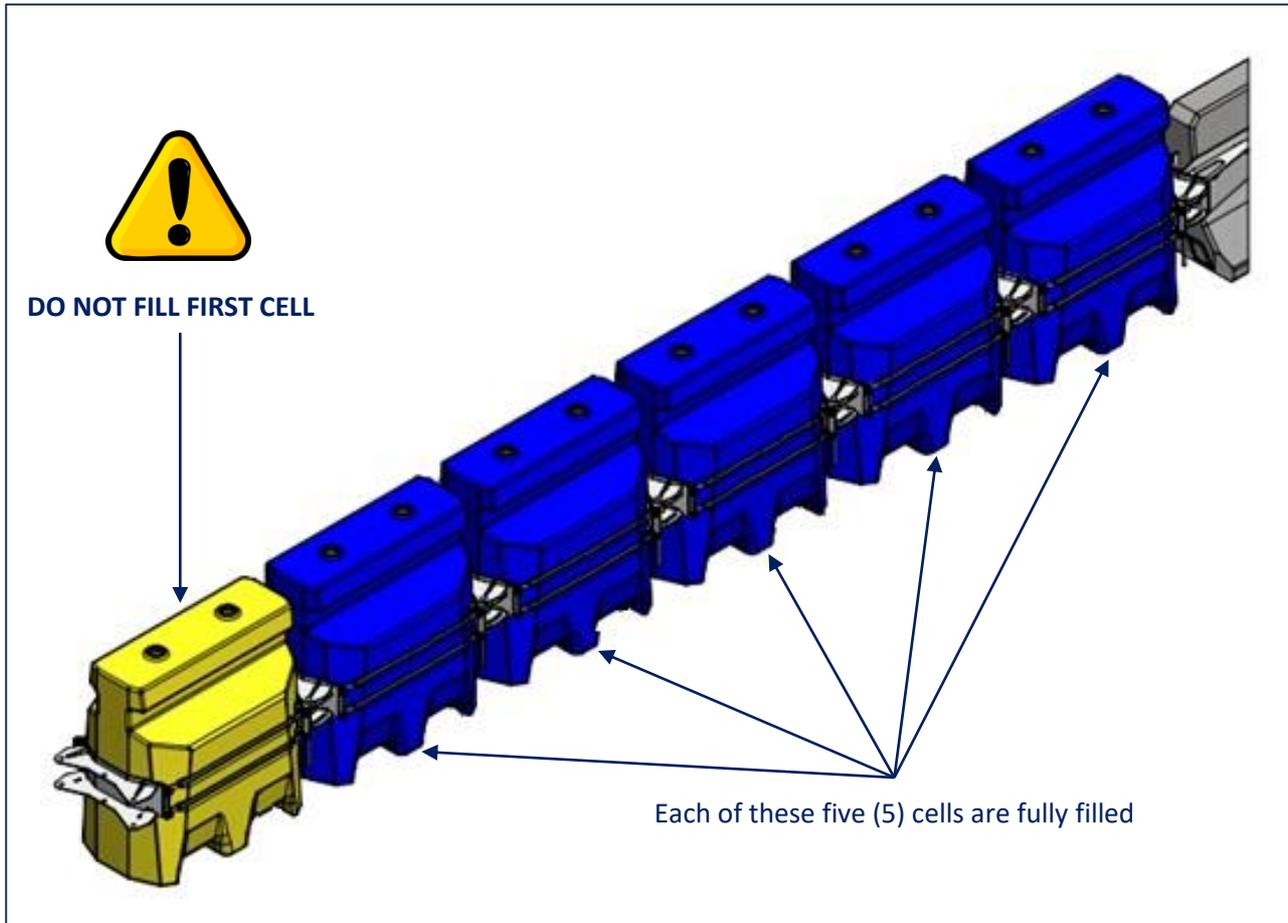


Figure 15: Filling of Absorption Cells

8.3 Nose Piece Installation

Working behind the nose piece assembly and using pliers, install the four (4) snap-in nuts (as supplied by Safe Direction) into the four (4) square holes located on the nose piece assembly. The delineation plate is then attached using the four (4) supplied bolts, securing to the snap-in nuts.

Delineation options are available as per state road agency specifications.

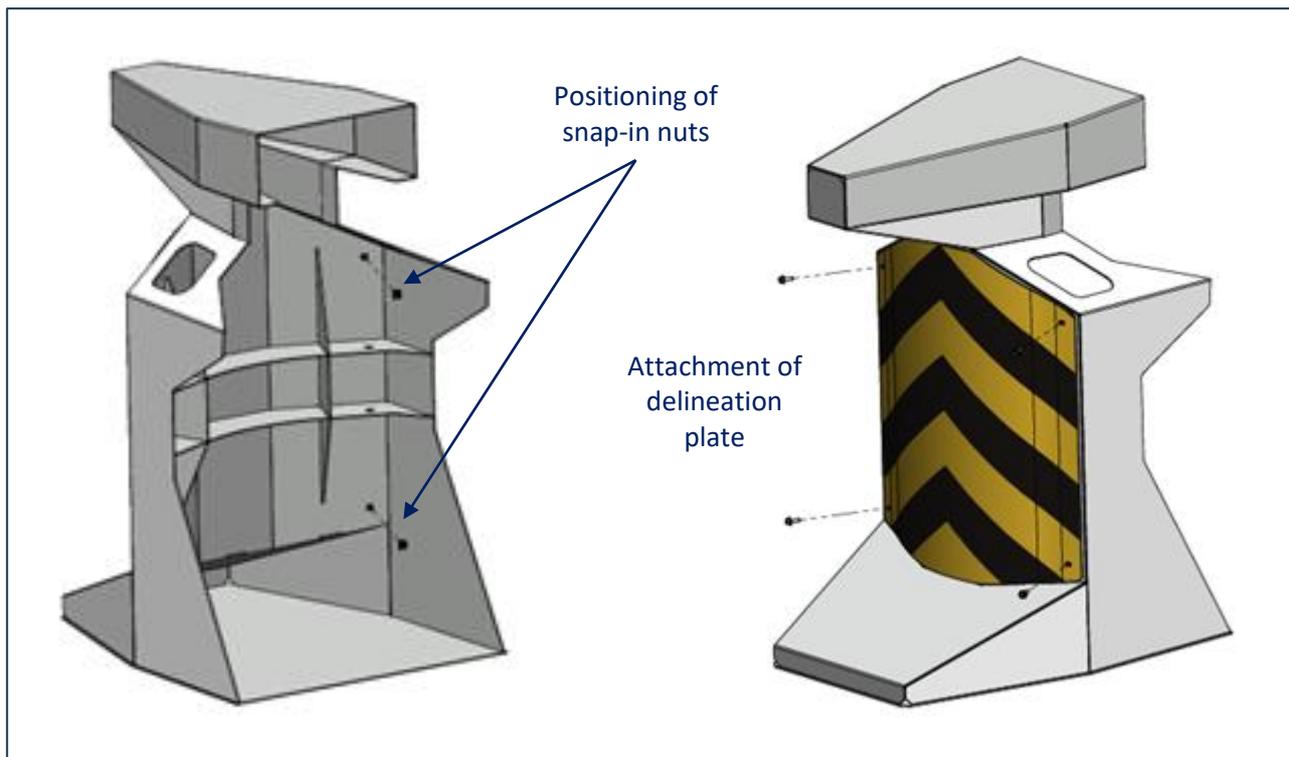


Figure 16: Nose Piece Delineation

Slide the nose piece towards the first absorption cell until the holes in the nose piece align with the holes of the absorption cell flange and connect using two (2) pins.

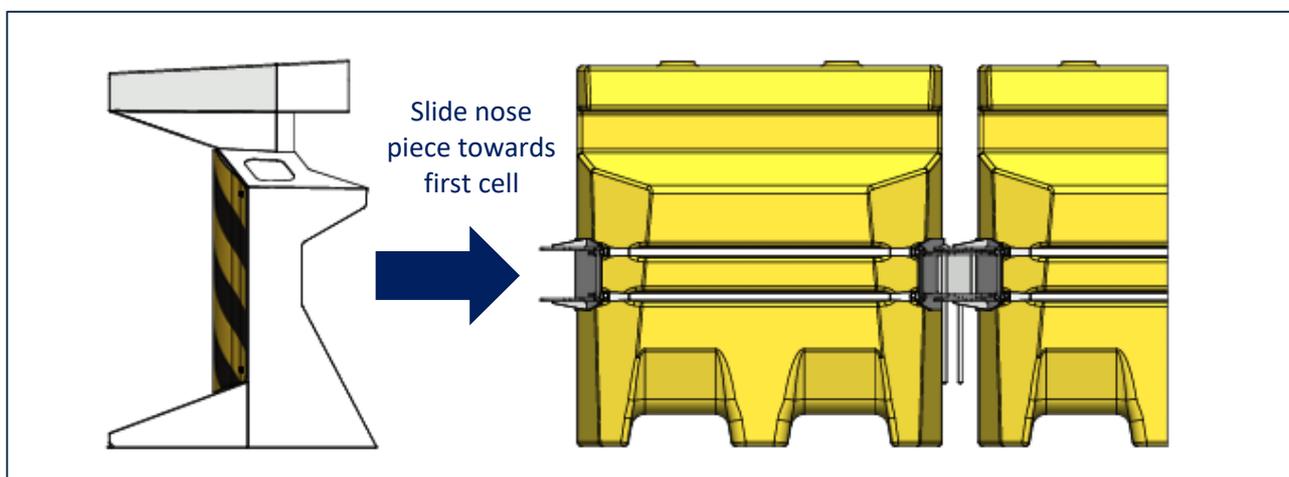


Figure 17: Positioning of Nose Piece

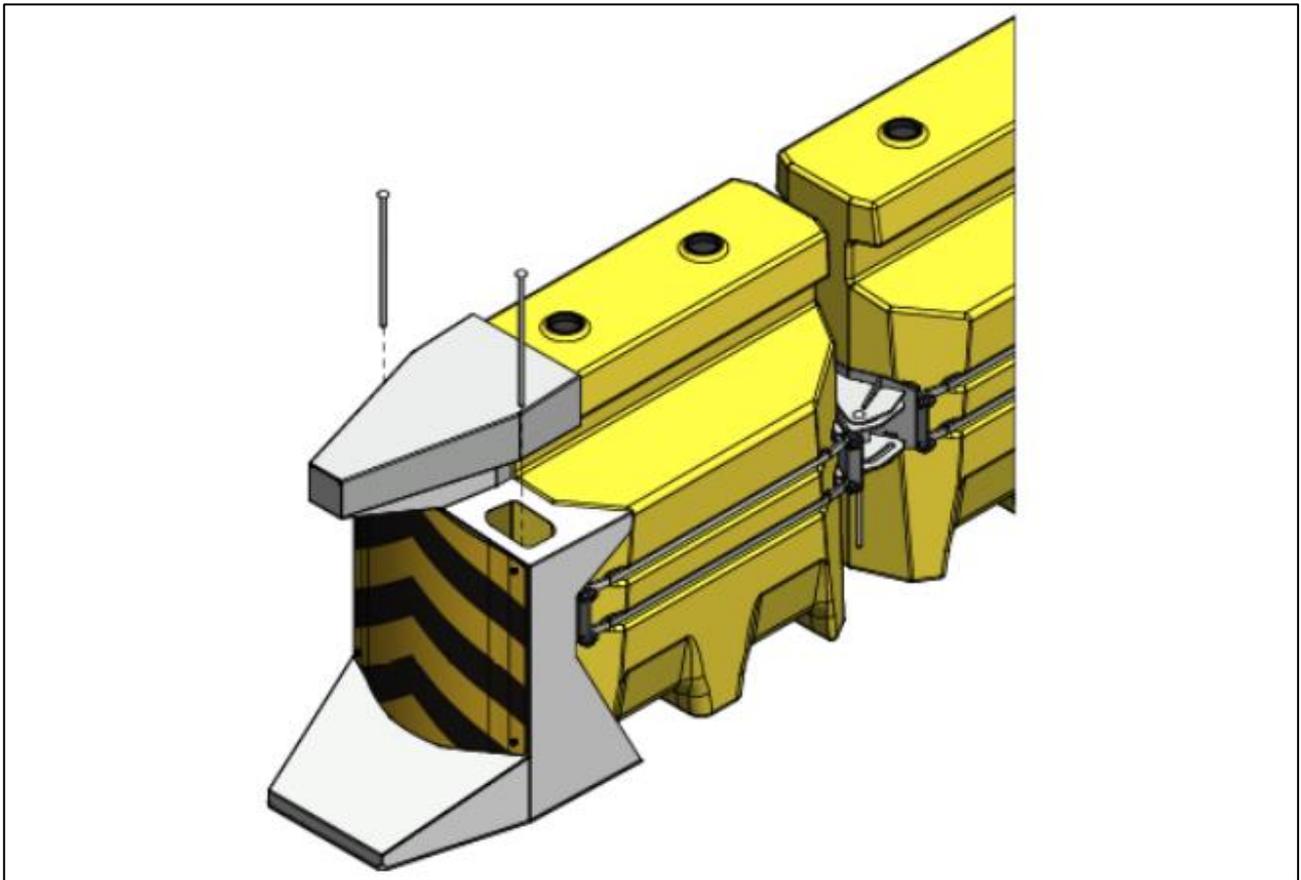


Figure 18: Securing the Nose Piece

8.4 Installation Tolerances

The height difference between adjacent units should not exceed 10mm.



QUASH™ Inspection Form

Inspection Date	
Client	
Project Reference	
Name of Inspector	
Company	

General	
<input type="checkbox"/> Yes <input type="checkbox"/> No	The longitudinal grade and cross slope of the ground surface is less than 10%.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The area adjacent to the cushion is free of debris.
Transition	
<input type="checkbox"/> Yes <input type="checkbox"/> No	The transition is positioned 380mm above ground level.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The transition side panels are parallel with the downstream TALL42™ barrier
<input type="checkbox"/> Yes <input type="checkbox"/> No	The transition front piece stoppers are resting against the face of the downstream TALL42™ barrier.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The transition front piece is secured to the side pieces with four (4) bolts/nuts/washers.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The transition is secured to both sides of the downstream TALL42™ barrier with three (3) anchors.
<input type="checkbox"/> Yes <input type="checkbox"/> No	All fasteners and anchors are fully tightened.
Absorption Cells	
<input type="checkbox"/> Yes <input type="checkbox"/> No	The configuration comprises six (6) absorption cells.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The front absorption cell is empty.
<input type="checkbox"/> Yes <input type="checkbox"/> No	With the exception of the front cell, all absorption cells are filled with water to within 25mm of the fill holes.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The fill caps (2 per cell) have been secured.
<input type="checkbox"/> Yes <input type="checkbox"/> No	All absorption cell side bars are secure.
<input type="checkbox"/> Yes <input type="checkbox"/> No	All absorption cells have been inspected for damage and there are no leaks.
<input type="checkbox"/> Yes <input type="checkbox"/> No	Each absorption cell is secured with two (2) pins.
<input type="checkbox"/> Yes <input type="checkbox"/> No	The centreline of the absorption cells are aligned with the downstream TALL42™ barrier.

9.0 Maintenance

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

- The absorption cells water level is within 25mm of the fill holes.
- The front unit is empty.
- There are no missing elements.
- There are no impacts that have caused damage to the system.
- The area adjacent to the cushion is free of debris.
- All bolts, including the transition anchors are tight.
- The centreline of the absorption cells are correctly aligned with the downstream TALL4™2 barrier.

10.0 Repair

Repairs to the QUASH™ crash cushion are limited to the following:

- The absorption cell side bars may loosen over time. These may be re-tightened and re-positioned within the side grooves of the absorption cells.
- Bent flange pins may be straightened provided they can properly connect the absorption cells.
- Bent flanges may be straightened provided they can properly connect the absorption cells.
- A dented nose piece may be reused provided it can properly connect to the first absorption cell.

Damage to an absorption cell that prevents water from being filled to within 25mm of the fill holes, must be replaced. No patching of an absorption cell is permitted. All missing caps must be replaced.

11.0 Dismantling and Relocation

The QUASH™ crash cushion may be relocated with full or empty absorption cells.

Remove the flange pins from the flange assembly to disengage each absorption cell and the front nose piece.

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



SafeDirection

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