MOOVOP

Installation and Maintenance Manual

QUASH™ CRASH CUSHION SYSTEM
FOR PORTABLE AND PERMANENT BARRIERS

MASH Test Level 2 & 3 Compliant
(TL-2 & TL-3)

Safety Warning

Road work operations involve risks that must be known and controlled by the personnel assigned to the work. A proper traffic control plan shall be established and implemented before installing this product.

This user manual shall be read and understood by all personnel assigned to the installation of this product before proceeding. It should also be available for reference during installation.

Proper personal protective equipment shall be used to install this product, including, but not limited to: hard hats, hearing protection, safety eyewear, dust masks, high visibility clothing, protective gloves and steel-toe boots.

Limited 1-year Warranty

Limited Warranty. Subject to the exclusions and terms and conditions set forth below, MOOVOP Inc. ("MOOVOP") warrants its Quash™ Crash Barrier Cushion System ("Product") to be free from defects in material and workmanship for a period of one (1) year from the date of receipt of Product by the purchaser from MOOVOP (the "Warranty"). The Warranty applies only when Product is installed and operated within the parameters set out in the Product User Manual, as revised from time to time, the American Association of Highway and Transportation Officials ("AASHTO") Roadside Design Guide, as revised from time to time, and in accordance with applicable federal, state and local laws, regulations and ordinances as revised from time to time.

Additional Exclusions. MOOVOP will not be responsible under the Warranty for any failure of Product that results from external causes, including, without limitation, accident, misuse, acts of God or nature, physical damage, exposure to adverse or hazardous chemicals or other substances, use of reactive or harsh cleaning agents, environmental conditions, vandalism, fire, induced vibration, animal or insect activity, fault or negligence of purchaser, any end user of Product and/or any third party not engaged by MOOVOP, improper or unauthorized use, installation, handling, storage, alteration, maintenance or service, or failure to comply with any applicable standards, codes, recommendations, Product specification sheets, or written instructions of MOOVOP, use of Product with products, processes or materials supplied by a third party, or any other occurrences beyond MOOVOP's reasonable control. The Warranty also excludes labor and equipment required to remove and/or (re)install Product or any other parts or mechanisms.

While MOOVOP has tested some of its products pursuant to the AASHTO Manual for Assessing Safety Hardware ("MASH") in an ISO certified laboratory, those results are achieved under controlled conditions and only determine how such tested products perform under standard MASH laboratory conditions. Accordingly, such results cannot be relied upon as a reflection of real world outcomes. FOR THE AVOIDANCE OF DOUBT, TO THE MAXIMUM EXTENT PERMITTED UNDER APPLICABLE LAW, MOOVOP SHALL NOT BE RESPONSIBLE FOR ANY INJURY TO OR DEATH OF A PERSON OR DAMAGE TO OR LOSS OF PROPERTY FROM ANY CAUSE WHATSOEVER, INCLUDING, WITHOUT LIMITATION, THAT RESULTING FROM COLLISION OR OTHER IMPACT WITH PRODUCT BY VEHICLES, OTHER OBJECTS OR PERSONS.

Claims; Exclusive Remedy. A Warranty claim regarding Product must be submitted in writing within ninety (90) days of discovery of the alleged defect or failure to an authorized MOOVOP post-sales or customer service representative; provided, however, that in any case, such written Warranty claim must be received by MOOVOP during the one (1) year Warranty period specified above. Product may be required, at purchaser's sole risk and expense, to be returned to MOOVOP for inspection and verification of non-conformance by MOOVOP, but no Product will be accepted for inspection, verification or return unless accompanied by a "return authorization number" which can be obtained only from an authorized MOOVOP post-sales or customer service representative. Any claim under the Warranty by the purchaser must also be

supported by adequate written records of operating history, maintenance and testing and such records provided to MOOVOP as part of any such claim. If MOOVOP determines (acting reasonably) that Product fails to comply with the terms of the Warranty, MOOVOP, in its sole discretion, will either repair or replace Product with the same or a functionally equivalent product; provided, however, that if MOOVOP is unable to, using commercially reasonable efforts, timely repair or replace Product with a functionally equivalent product, MOOVOP reserves the right to refund the original purchase price to purchaser instead. The Warranty extends only to Product as delivered to, and is for the sole and exclusive benefit of, the original purchaser of Product. The Warranty may not be transferred or assigned by such original purchaser to any other party. The repair or replacement of any Product (or refund of the original purchase price) is the sole and exclusive remedy for failure of Product to comply with the terms of the Warranty and does not extend the Warranty period. In the case of a successful claim, MOOVOP shall bear the cost of shipment of repaired or replacement Product(s) back to the purchaser.

THE FOREGOING WARRANTY TERMS ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, AND MOOVOP EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, RELATING DIRECTLY OR INDIRECTLY TO PRODUCT, WHETHER ORAL, WRITTEN, OR ARISING BY COURSE OF DEALING OR USAGE OF TRADE, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR INFRINGEMENT.

Limitation of Liability. The total liability of MOOVOP with respect to any and all claims of any kind, whether in contract, warranty, tort (including negligence), strict liability or otherwise, arising out of or in connection with, or resulting from, MOOVOP's performance or breach of the Warranty, shall in no event exceed the original purchase price allocable to the Product that gave rise to the claim, and any and all such liability shall terminate upon the expiration of the one (1) year Warranty period specified above.

No Consequential Damages. IN NO EVENT SHALL MOOVOP BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR PUNITIVE DAMAGES, EVEN IF INFORMED OF THE POSSIBILITY OF SUCH DAMAGES, WHETHER AS THE RESULT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR ANY OTHER THEORY, INCLUDING, WITHOUT LIMITATION, LABOR OR EQUIPMENT REQUIRED TO REMOVE AND/OR REINSTALL ORIGINAL OR REPLACEMENT PARTS, LOSS OF TIME, PROFITS OR REVENUES, LACK OR LOSS OF PRODUCTIVITY, INTEREST CHARGES OR COST OF CAPITAL, COST OF SUBSTITUTE EQUIPMENT, SYSTEMS, SERVICES OR DOWNTIME COSTS, DAMAGE TO OR LOSS OF USE OF PROPERTY OR EQUIPMENT OR ANY INCONVENIENCE ARISING OUT OF ANY BREACH OF THE WARRANTY OR OBLIGATIONS UNDER THE WARRANTY.

Modification or Discontinuation. MOOVOP reserves the right to modify or discontinue the Warranty without notice; provided, however, that any such modification or discontinuance shall only be effective with respect to any Product purchased after the date of such modification or discontinuance, as applicable.

Table of Contents

1. Quash™ Crash Cushion System Overview

Moovop Inc.
4295 Boul St-Elzear W, Laval,
QC, Canada, H7P 4J3
450-978-1818
www.moovop.com

The Quash™ Crash Cushion System is a high-performance non-redirective, gating crash cushion designed to protect the end of portable and permanent road barriers. This system meets all the requirements set out in the latest crash testing standards defined in the *Manual for Assessing Safety Hardware (MASH), Second Edition* (2016) by the American Association of State Highway and Transportation Officials (AASHTO) for TL-2 and TL-3. It is designed to safely contain or control impacting vehicles while preventing vaulting or under-riding of the crash cushion.

The system consists of a nose piece, absorption cells, and an end transition to the barrier, all linked together with connecting pins. The end transition, compatible with a wide array of portable and permanent road barriers, necessitates adherence to specified width criteria: 9½ to 13¾ inches at a height of 15 inches from ground level, with a maximum width of 24 inches. Depending on the TL-3 or TL-2 configuration, specific absorption cells are filled with water or antifreeze solution when used below freezing temperatures. Each absorption cell comes pre-assembled with connecting flanges.

The system has a nominal 42-in. (1067 mm) height, 24-in. (610 mm) width, and an overall length of 24 ft. (7.3 m) for the TL-3 configuration and 16.7 ft. (5.1 m) for the TL-2 configuration. Each absorption cell has a 44-in. (1118 mm) nominal length.

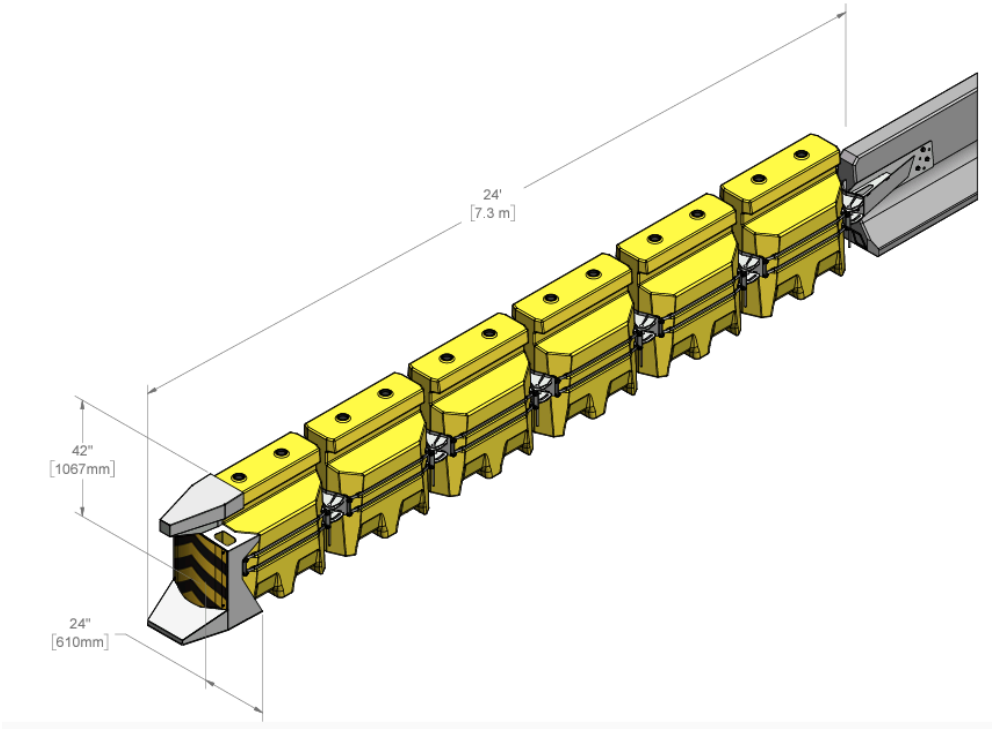


Figure 1.1: Quash™ Crash Cushion in TL-3 Configuration

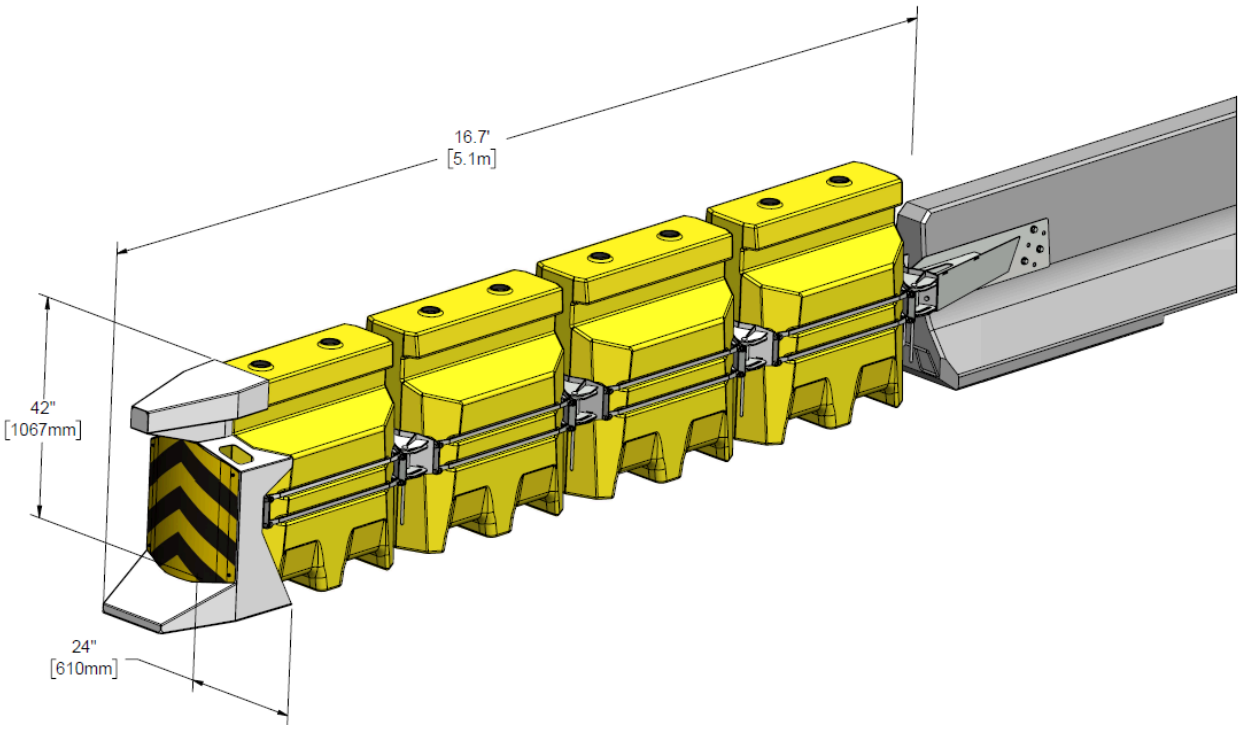


Figure 1.2: Quash™ Crash Cushion in TL-2 Configuration

2. System Configuration Details

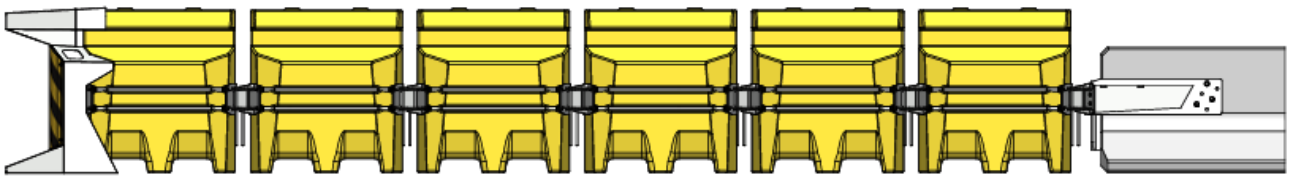


Figure 2.1: Quash™ Crash Cushion Configuration Arrangement for TL-3

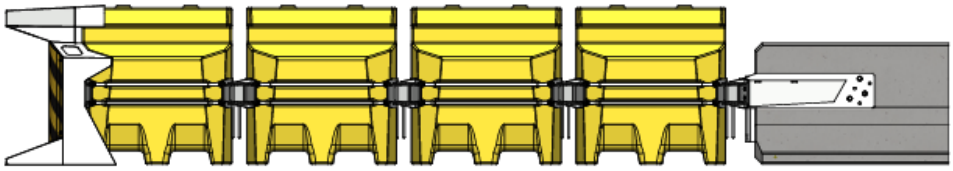


Figure 2.2: Quash™ Crash Cushion Configuration Arrangement for TL-2

Table 2.1: Quash™ Crash Cushion Configuration Specifications

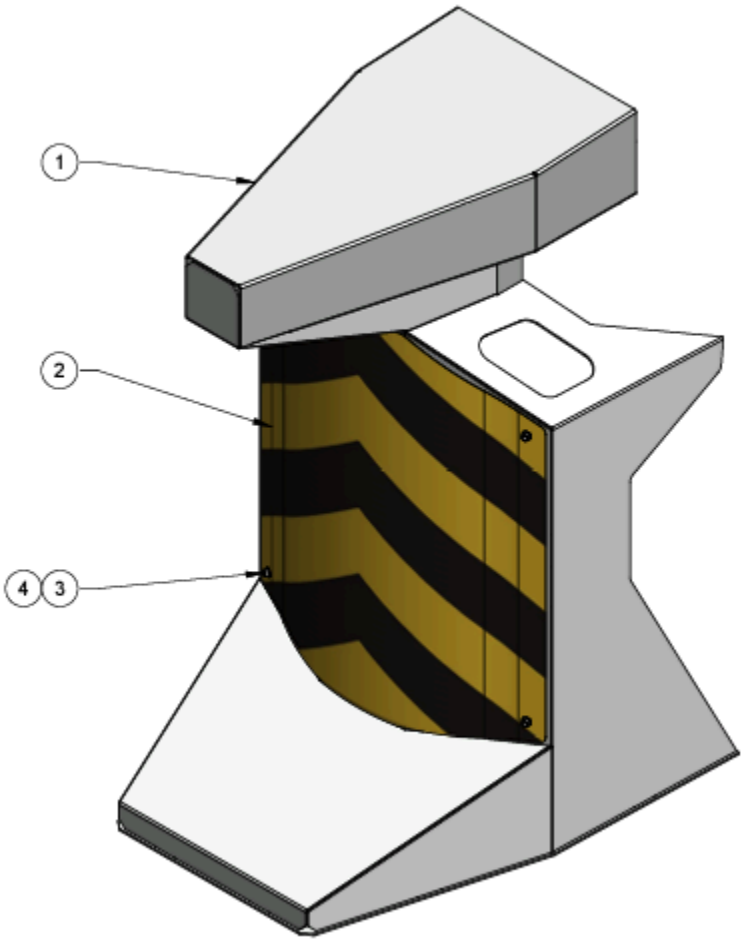
	MASH TL-2	MASH TL-3
Design Speed	43 mph (70 km/h)	62 mph (100 km/h)
Overall Installed Length	16.7 ft. (5.1 m)	24 ft. (7.3 m)
Overall Height	42 in. (1067 mm)	
Overall Width	24 in. (610 mm)	
Approx. Volume Per Full Element	119 gal. (450 L)	
Approx. Filling Capacity Per System	403 gal. (1525 L)	594 gal. (2250 L)
Approx. Empty Element Weight	140 lbs. (63.5 kg)	
Approx. Weight Per System (Empty)	779 lbs. (354 kg)	1058 lbs. (481 kg)
Approx. Weight Per System (Filled With Water)	4134 lbs. (1879 kg)	6008 lbs. (2731 kg)

3. Parts Identification

Warning: Only use parts specified by MOOVOP Inc. for use with the Quash™ Crash Cushion System. The use of other non-specified parts is prohibited and could result in severe injury or death.

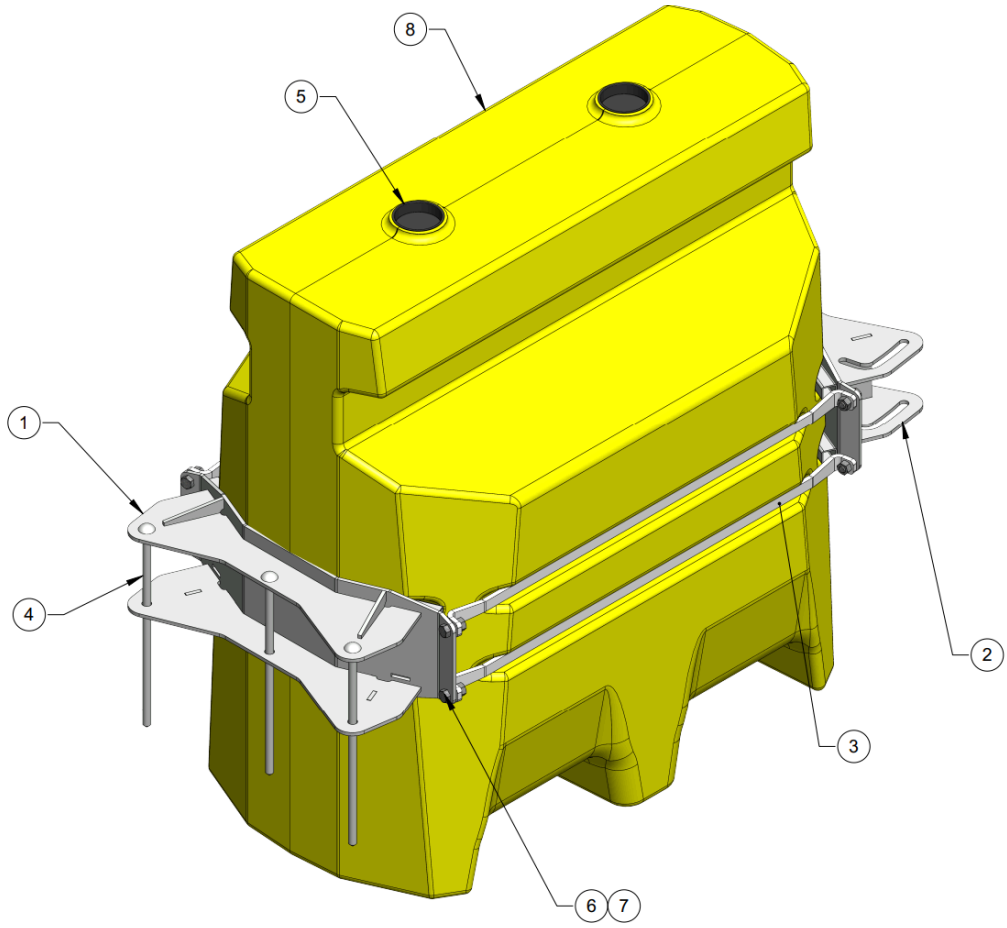
3.1 Nose Piece

ITEM	PART NUMBER	DESCRIPTION	QTY
-	Q600-100002-000	NOSE PIECE ASSEMBLY	1

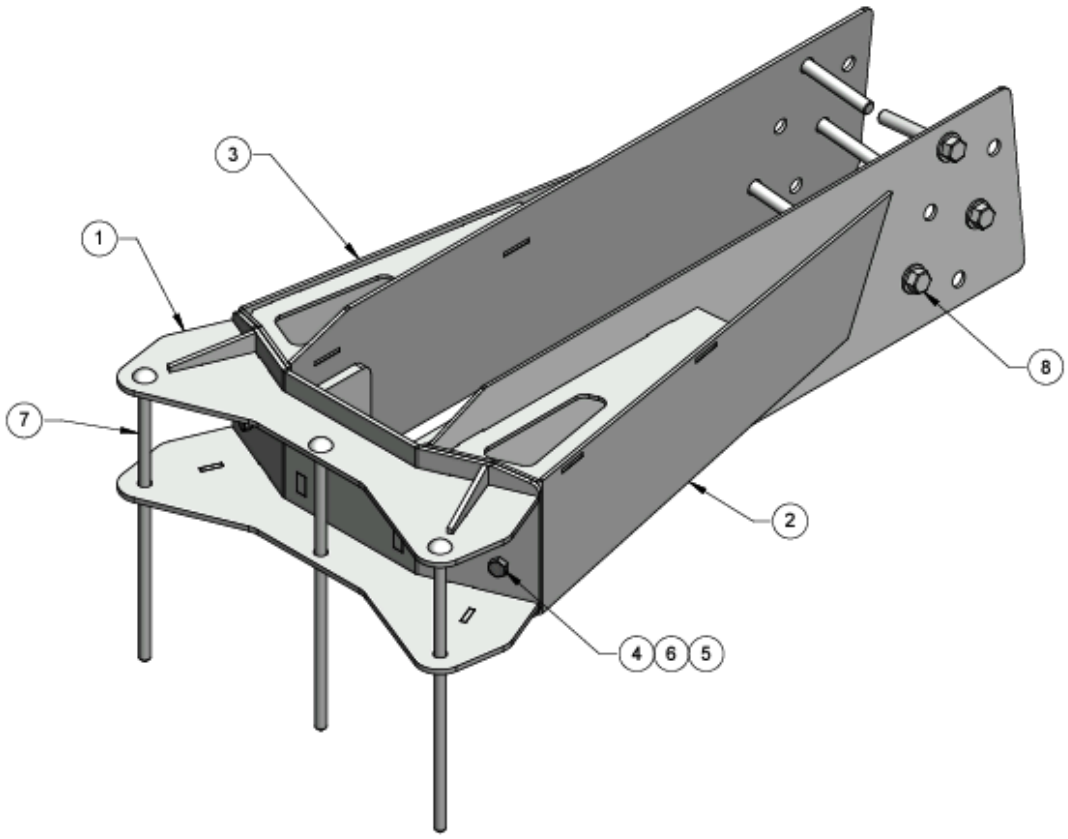


1	Q600-100003-000	NOSE PIECE WELDED ASSEMBLY	1
2	Q400-100018-000	DELINEATION PANEL PLATE (Delineation sticker not included)	1
3	Q200-900079-406	SCREW, HEX 1/4-20UNC X ¾ in., 18-8 SS, FLANGED AND SERRATED	4
4	Q400-910077-001	NUT, SNAP-IN 1/4-20UNC, 18-8 SS	4

3.2 Absorption Cell

ITEM	PART NUMBER	DESCRIPTION	QTY
-	Q600-100000-000	ABSORPTION CELL ASSEMBLY	1
			
1	Q600-100001-000	FLANGE ASSEMBLY HOLE SIDE	1
2	Q600-100001-001	FLANGE ASSEMBLY J SIDE	1
3	Q400-100001-000	FLANGE SIDE BAR	4
4	Q400-100009-000	FLANGE PIN	3*
5	Q200-000045-000	3-in. DIAMETER PLASTIC CAP	2
6	Q200-900150-112	SCREW, HEX 1/2-13UNC X 1-1/4 in., GALVANIZED STEEL, GR2	8
7	Q200-910150-130	NUT, HEX 1/2-13UNC, GALVANIZED STEEL, TOP LOCKNUT, GR2	8
8	Q400-100000-000	ABSORPTION CELL	1
* Only two pins are needed to connect the nose piece to the first absorption cell in any configuration.			

3.3 Transition Piece

ITEM	PART NUMBER	DESCRIPTION	QTY
-	Q600-100004-000	TRANSITION ASSEMBLY	1
			
1	Q600-100005-000	TRANSITION FRONT PLATE ASSEMBLY	1
2	Q600-100006-000	TRANSITION LEFT PLATE ASSEMBLY	1
3	Q600-100006-001	TRANSITION RIGHT PLATE ASSEMBLY	1
4	Q200-900150-112	SCREW, HEX 1/2-13UNC X 1-1/4 in., GALVANIZED STEEL, GR2	4
5	Q200-920100-100	WASHER, ½ in., GALVANIZED STEEL	4
6	Q200-910150-130	NUT, HEX 1/2-13UNC, GALVANIZED STEEL, TOP LOCKNUT, GR2	4
7	Q400-100009-000	FLANGE PIN	3
8	Q200-000014-000	HILTI KH-EZ 5/8 in. X 4 in. ANCHOR	6

4. Recommendations for Transportation and Storage

The Quash™ absorption cells are designed to be manipulated as easily as possible to facilitate installation. They can be moved when empty or filled, using proper lifting equipment and using either the lifting points on the side of the cells or the top of the element as shown in the figure below:

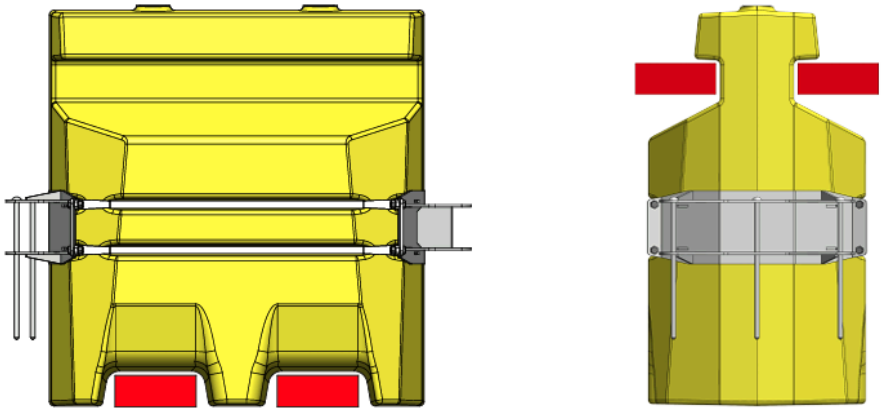


Figure 4.1: Recommended Lifting Methods for Quash™ Absorption Cells

It is important to make sure that the lifting equipment uses all the lifting area available, especially when the absorption cells are full, to avoid any risk of damaging them.

When the absorption cells are full, they should not be stacked on top of each other in order to avoid any risk of damaging them. However, when empty, they can be grouped together in bundles of 4 to facilitate transportation and handling:

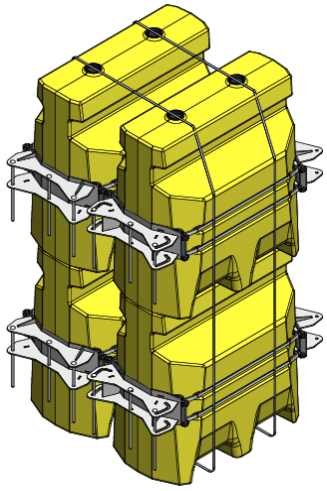


Figure 4.2: Recommended Bundling Method for Transporting Empty Quash™ Absorption Cells

Also, the Quash™ absorption cells are designed to be easily stackable to facilitate storage. They can be stacked up to three high in a staggered pattern in order to save storage space:

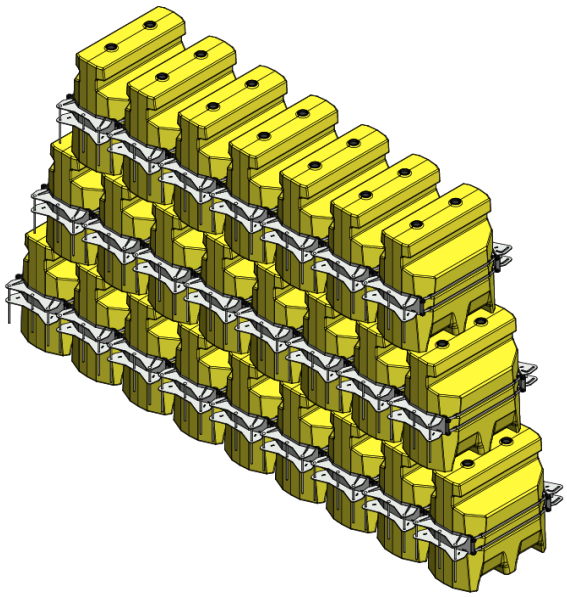


Figure 4.3: Recommended Storage Method for Empty Quash™ Absorption Cells

WARNING: DO NOT STACK ABSORPTION CELLS IF NOT EMPTY

Finally, nose pieces can also be stacked within each other to save storage and shipping space:

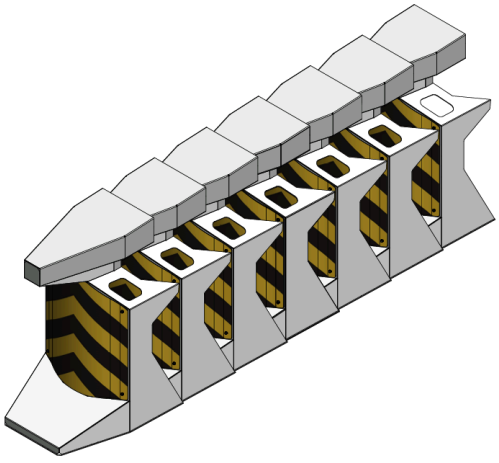


Figure 4.4: Recommended Storage and Transportation Method for Quash™ Nose Piece

5. System Assembly and Disassembly

Warning: Before starting the installation of the Quash™ Crash Cushion System, a proper traffic control plan shall be established and implemented to ensure the safety of all workers in accordance with local requirements and regulations. Furthermore, it is imperative for all concerned personnel to understand all the installation steps for the Quash™ Crash Cushion System before attempting the installation of this product. The ground surface must be solid, free of any debris or obstacle, and the longitudinal and cross slopes must be less than 10% in accordance with the AASHTO Roadside Design Guide.

5.1 Required Tools and Material

Note: This section represents general recommendations and should not be considered as an exhaustive list of required tools and resources for installation. Depending on the specific installation conditions of each installation, more or fewer tools and resources may be required.

Hand Tools:

- Tape Measure
- Marking Pen/Paint
- Transition Jigging Tool (Q600-100012-000)
- Pliers
- 3/4 in. (19 mm) Wrench
- 1/4 in. Drive Torque Wrench w/ 3/8 in. (10 mm) Drive Socket
- 1/2 in. Drive Torque Wrench w/ 3/4 in. (19 mm) and 15/16 in. (24 mm) Drive Sockets

Power Tools:

- Hammer Drill w/ 5/8 in. x 6 in. (16 mm x 150 mm) Concrete Drill Bit
- Impact Wrench (Pneumatic or Electric) w/ 15/16 in. (24 mm) Drive Socket

Top Handling Clamps:

- Top handling forklift clamp (Q100-700004-000)
- Top handling scissor clamp (Q100-700016-000)

Material:

- Anti-seize material to be applied to fasteners
- To fill cells, use water only if the temperature is within the acceptable limits; otherwise, use an antifreeze solution to prevent freezing. A flexible hose with a maximum 3-in. (76 mm) outer diameter shall be used to fill elements. See Appendix B of this document for more information regarding the use of antifreeze solution.

5.2 Transition Installation

1 - Before proceeding with the installation of the transition in front of the shield object, ensure that the end treatment width meets the following specifications: it should fall within the range of 9½ to 13¾ inches at a height of 15 inches from ground level, and its maximum width should not exceed 24 inches. Proceed to the leading edge of the concrete barrier, where the crash cushion will be installed, and mark a line 15 inches (381 mm) from the ground using a tape measure and a marking pen.

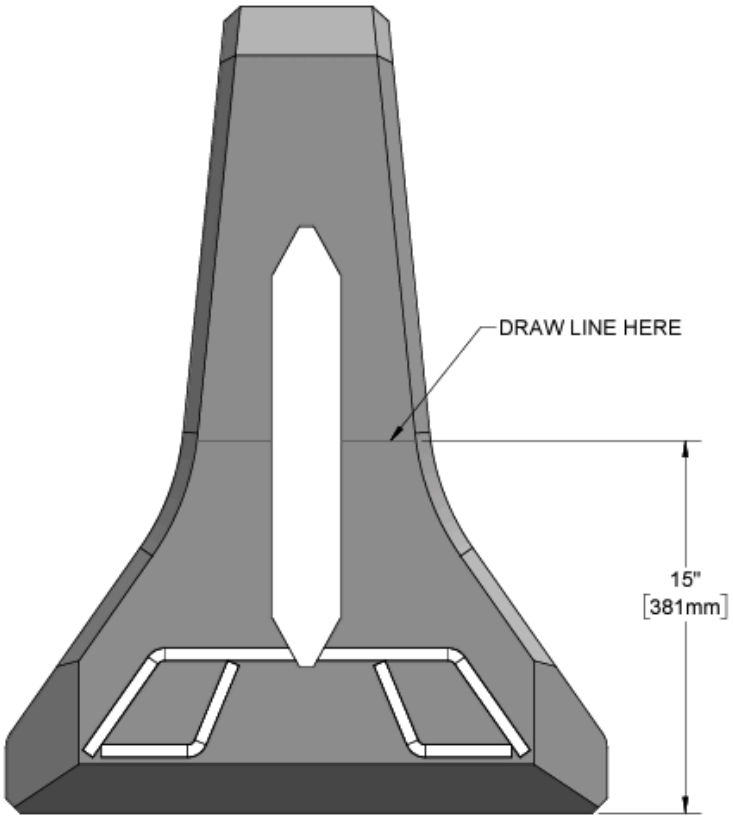


Figure 5.2.1: Quash™ Line on Barrier, 15 in. from the Ground

2 - Use the transition jigging tool to identify the anchor positions on the barrier. Place it on the left side of the concrete barrier; the small plate of the jig should rest firmly on the front of the barrier, and the big plate should rest firmly on its side. The bottom of the transition should line up with the previously drawn line on the front of the barrier. Additionally, the bottom edge of the jigging template should be parallel to the longitudinal axis of the barrier.

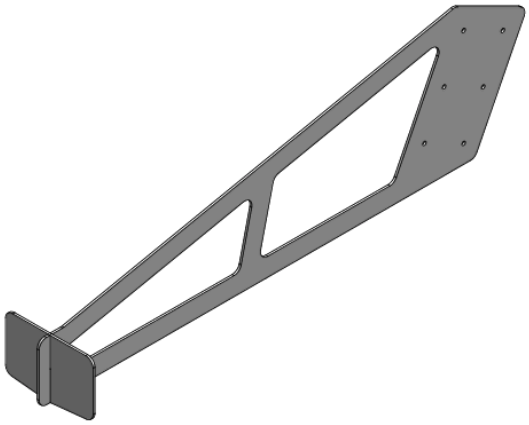


Figure 5.2.2: Quash™ Transition Jigging tool (Part #: Q600-100012-000)

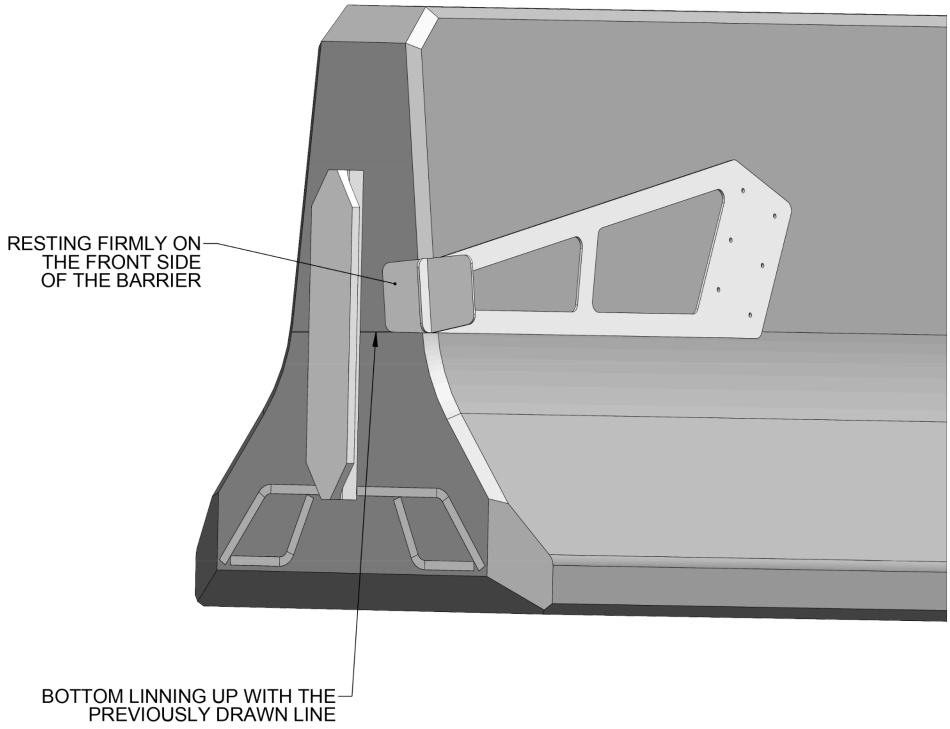


Figure 5.2.3: Quash™ Jigging Tool on Barrier

3 - Trace the holes for the anchors on the barrier using the jigging tool, then drill ⅝'' holes using the hammer drill to 4 3/4 in. (121 mm) in depth. Two anchoring patterns are acceptable (shown below); do not anchor the transition in any other way. If rebar is encountered during drilling, a rebar-drilling concrete drill bit should be used, but if not available, the second anchoring pattern can be used instead.

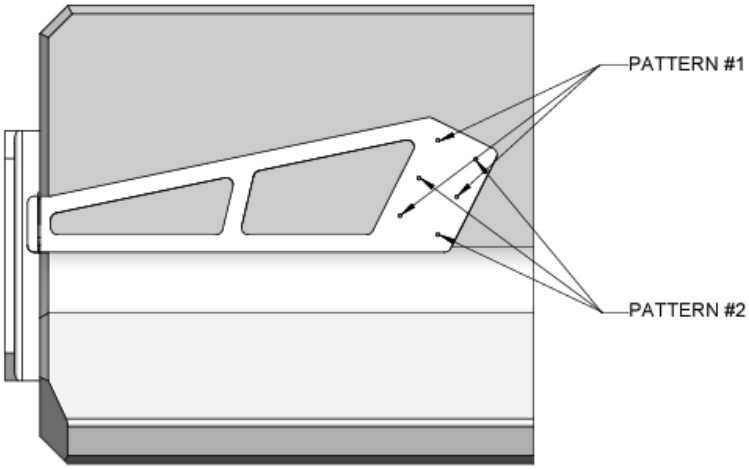


Figure 5.2.4: Quash™ Jigging tool on Barrier

4 - Install the left transition piece on the concrete barrier with the ⅝'' x 4'' KH-EZ anchors. Use the impact wrench to first snug them, then use the torque wrench to tighten the anchors to 85 ft-lbs (115 Nm).

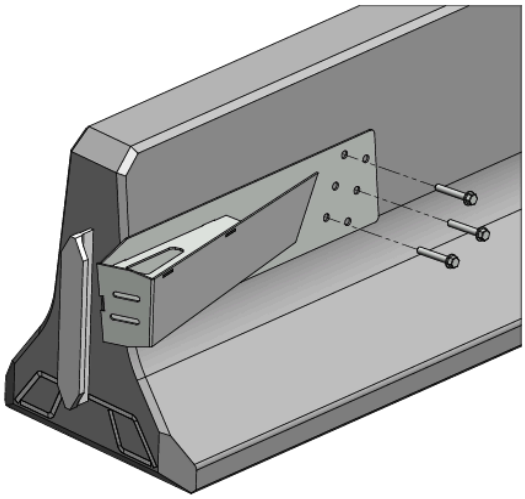


Figure 5.2.5: Quash™ Left Transition on Barrier Anchoring

5 - Repeat steps 2 to 5 on the right side of the barrier to install the right side of the transition.

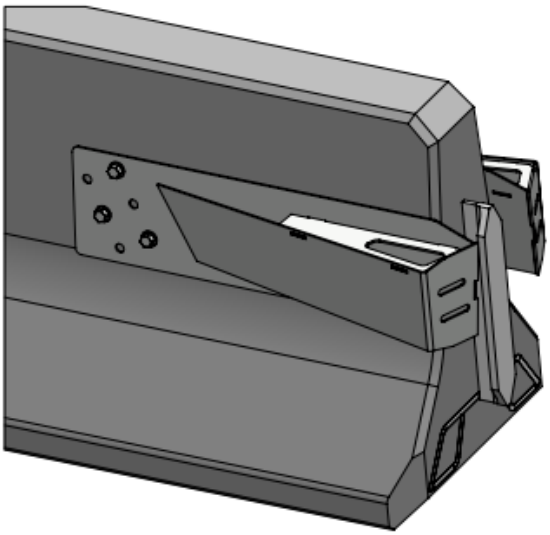


Figure 5.2.6: Quash™ Left and Right Transition on Barrier

6 - Install the front piece of the transition on both side pieces with the provided bolts, nuts and washers. The specified torque for these fasteners is 61 ft-lbs (88 Nm). When the transition installation is complete, the transition front plate stoppers should be resting on the front of the barrier.

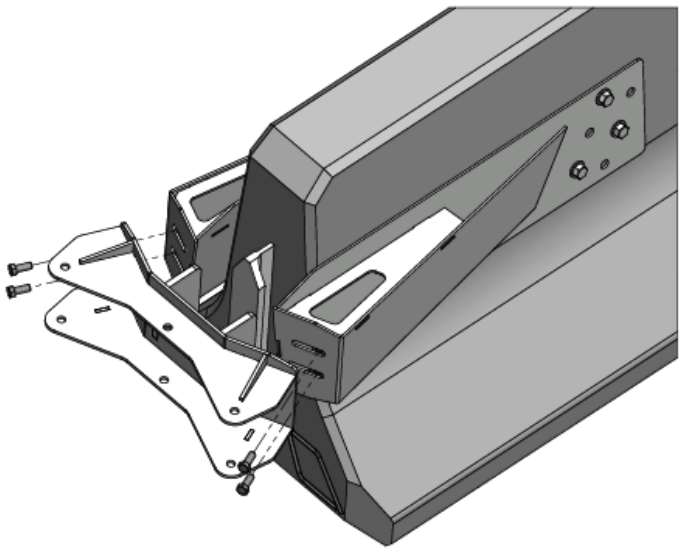


Figure 5.2.7: Quash™ Front Piece Transition on Barrier

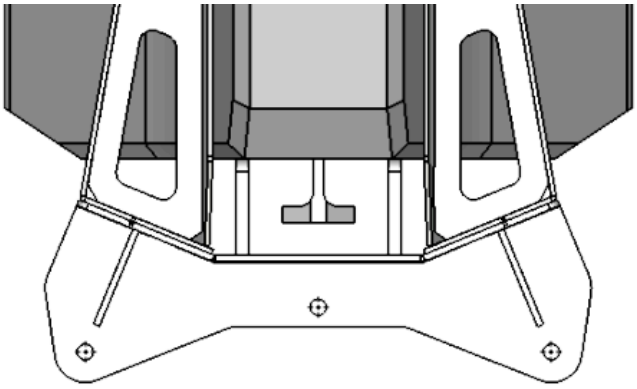


Figure 5.2.8: Quash™ Transition Front Plate Stoppers Resting on the Front of the Barrier

5.3 Absorption Cells Installation

1 - Add the absorption cells in front of the transition, with the “J” slots facing towards the transition. The system requires 6 cells for the TL-3 configuration and 4 cells for the TL-2 configuration.

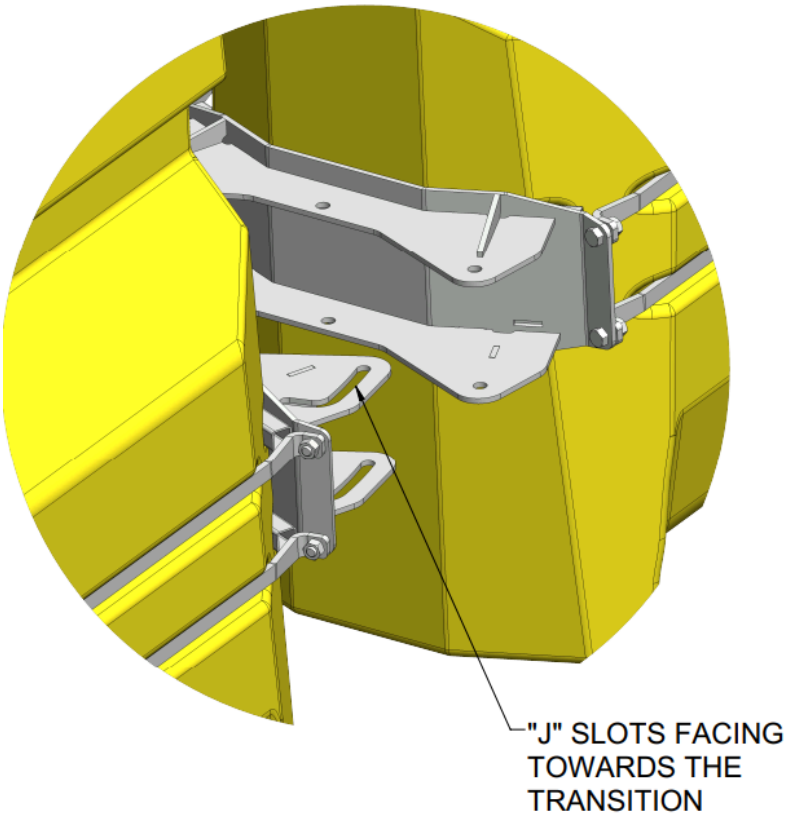


Figure 5.3.0: Quash™ Cell Orientation during Installation

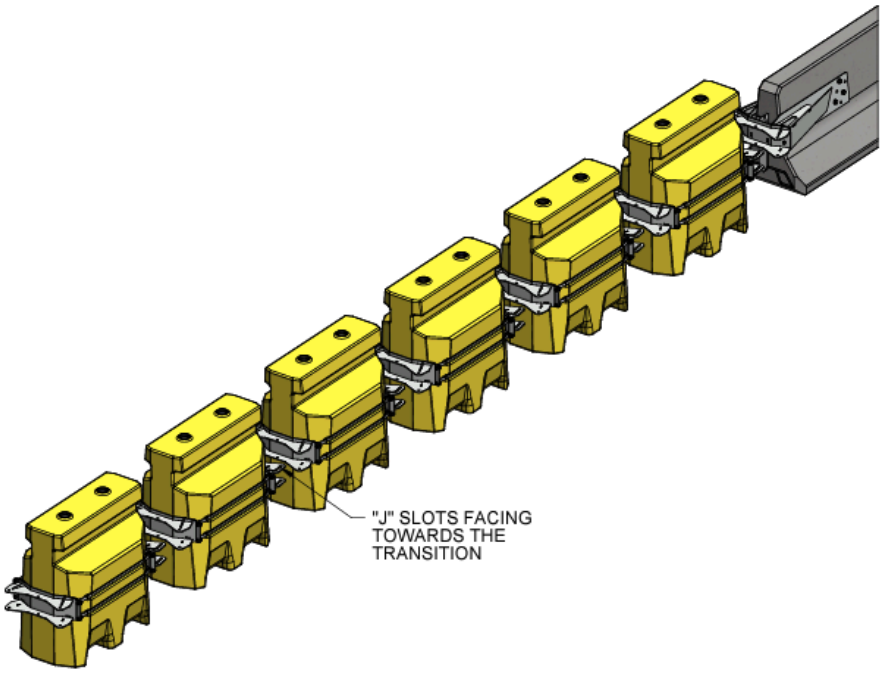


Figure 5.3.1: Installation of Quash™ Cells for TL-3 Configuration

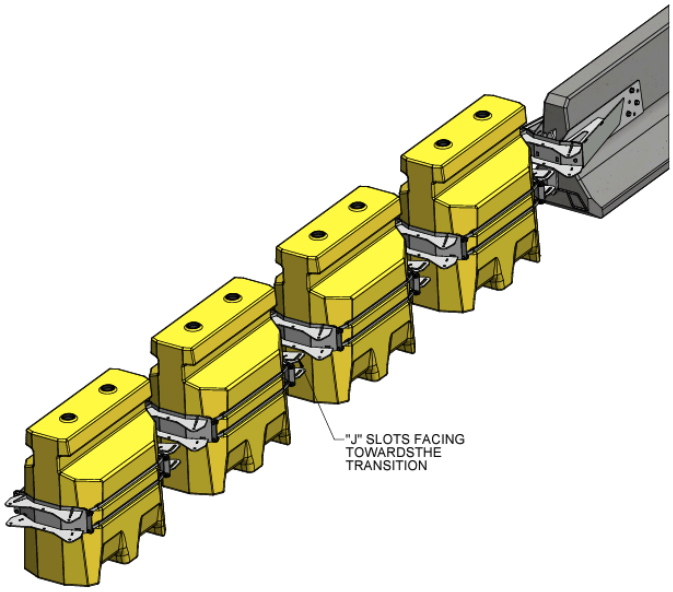


Figure 5.3.2: Installation of Quash™ Cells for TL-2 Configuration

2 - Use the pins to connect the cells to the transition and between each other (3 pins per connection for the portable and permanent barrier applications).

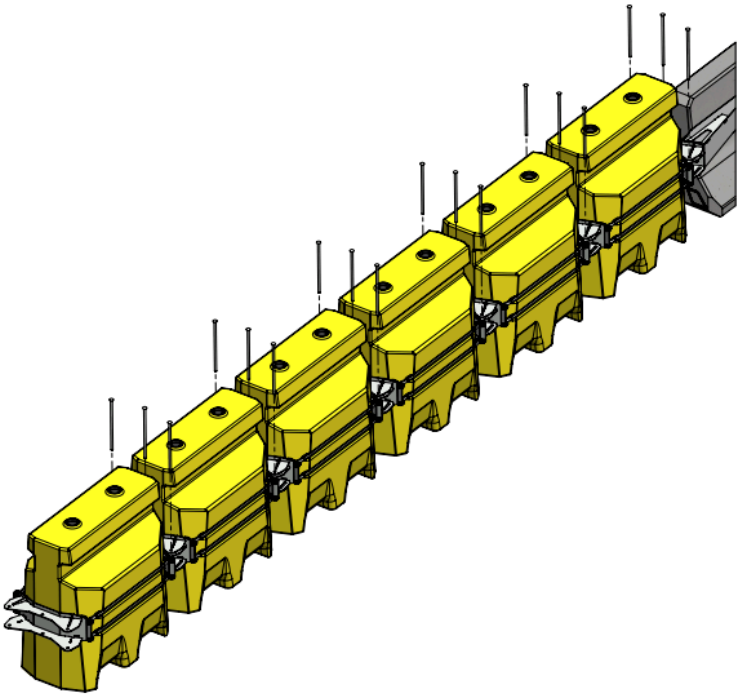


Figure 5.3.3: Installation of Quash™ Pins on Barrier for the TL-3 Configuration

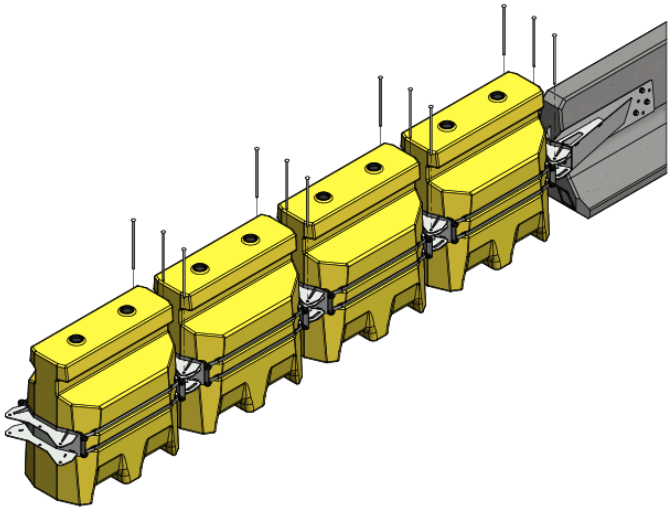


Figure 5.3.4: Installation of Quash™ Pins on Barrier for the TL-2 Configuration

3 - Make sure that all absorption cells are positioned in a straight line and aligned with the barrier.

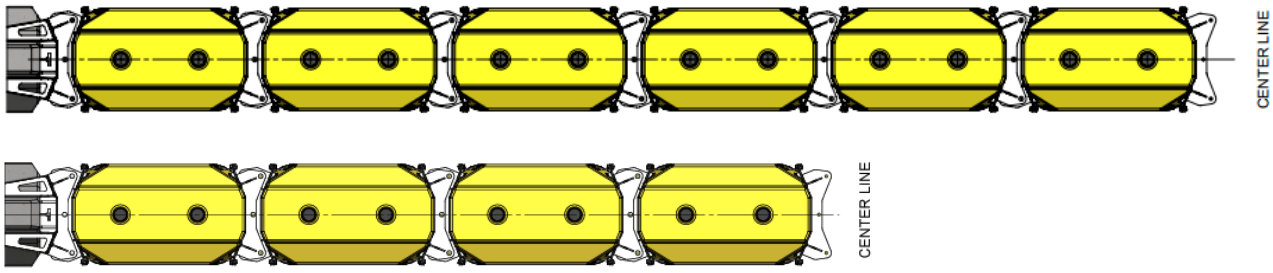


Figure 5.3.5: Center Line Position for Quash™ TL-2 and TL-3 Configurations

4 - Fill all absorption cells except for the first one (farthest away from the transition) to within 1 in. (25 mm) of the top with water or antifreeze solution (see Appendix B for more details on antifreeze solutions). For the TL-3 configuration, the first absorption cell must remain empty. For the TL-2 configuration, the first absorption cell must be filled only to a height of 15 in. (381 mm) from the ground.

TL-3 Configuration: DO NOT FILL THE FIRST ABSORPTION CELL.

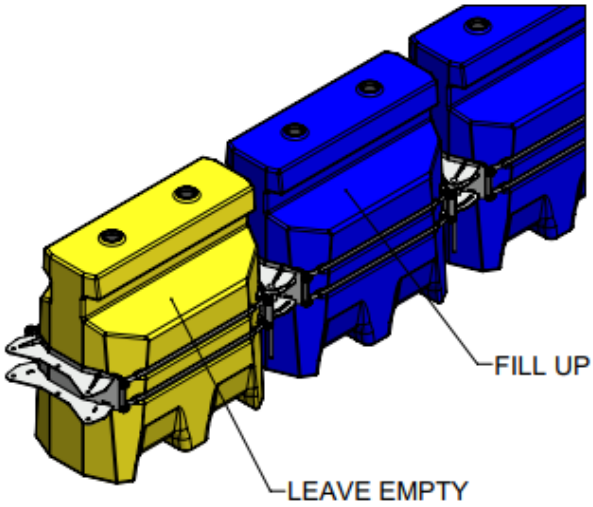


Figure 5.3.6: Quash™ TL-3 Configuration: First Cell Empty

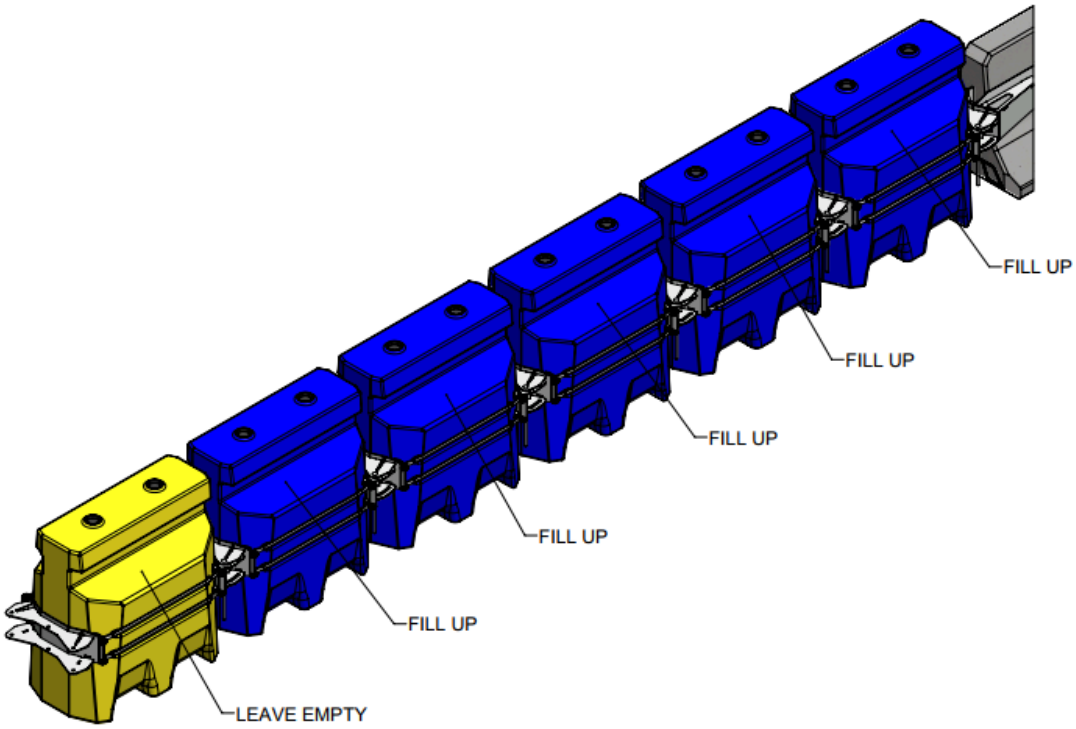


Figure 5.3.7: Filling Cells for the Quash™ TL-3 Configuration

TL-2 Configuration: DO NOT OVERFILL THE FIRST ABSORPTION CELL.

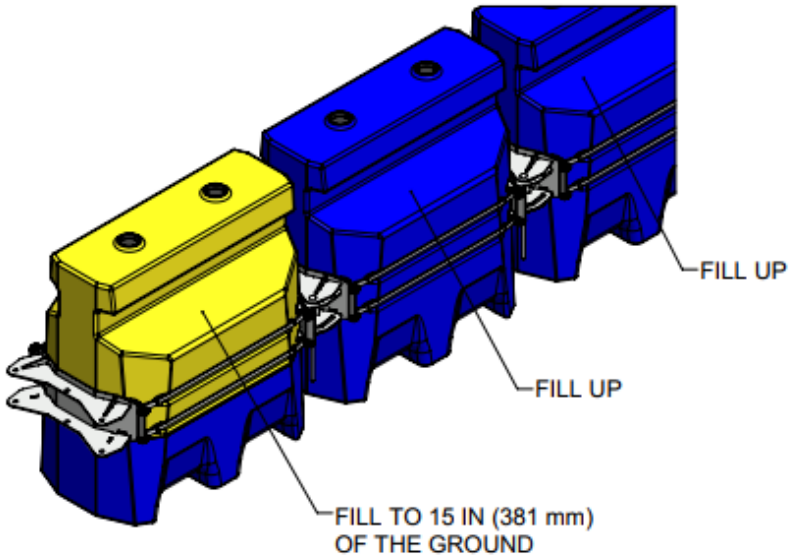


Figure 5.3.8: Quash™ TL-2 Configuration: First Cell: Fill to 15 in. from Ground Level

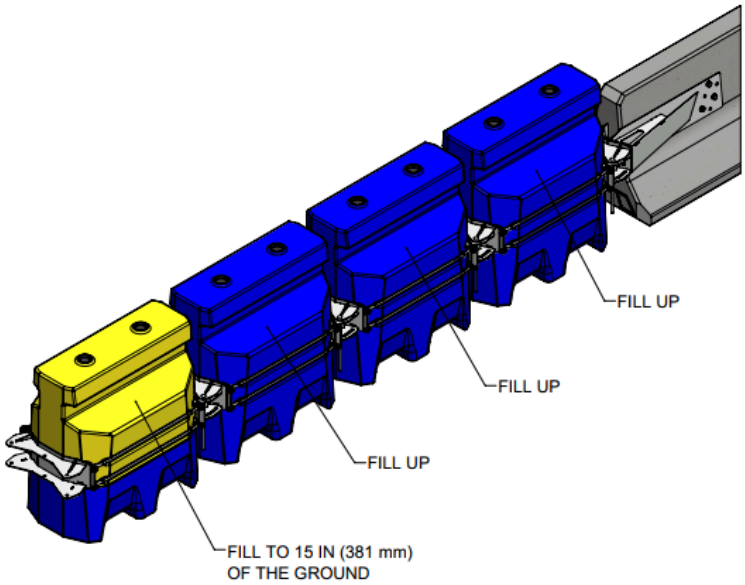


Figure 5.3.9: Filling Cells for the Quash™ TL-2 Configuration

5.4 Nose Piece Installation

1 – Using pliers, install the four snap-in nuts into the four square holes located on the front of the nose piece assembly from the rear end.

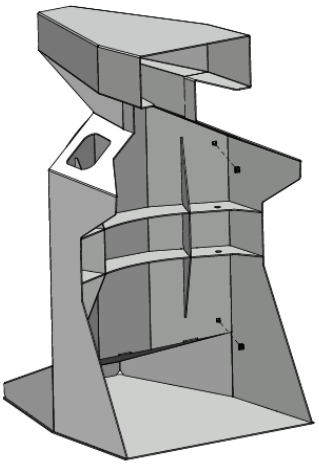


Figure 5.4.0: Quash™ Nose Piece, Inside View

2 - Install the delineation panel plate on the front of the nose piece and fasten it using the four serrated bolts and the 4 snap-in nuts with the ¼ in. torque wrench. The specified torque for these fasteners is 8 ft-lbs (11 Nm). The type of front delineation panel should be determined by the location of the system and state regulations.

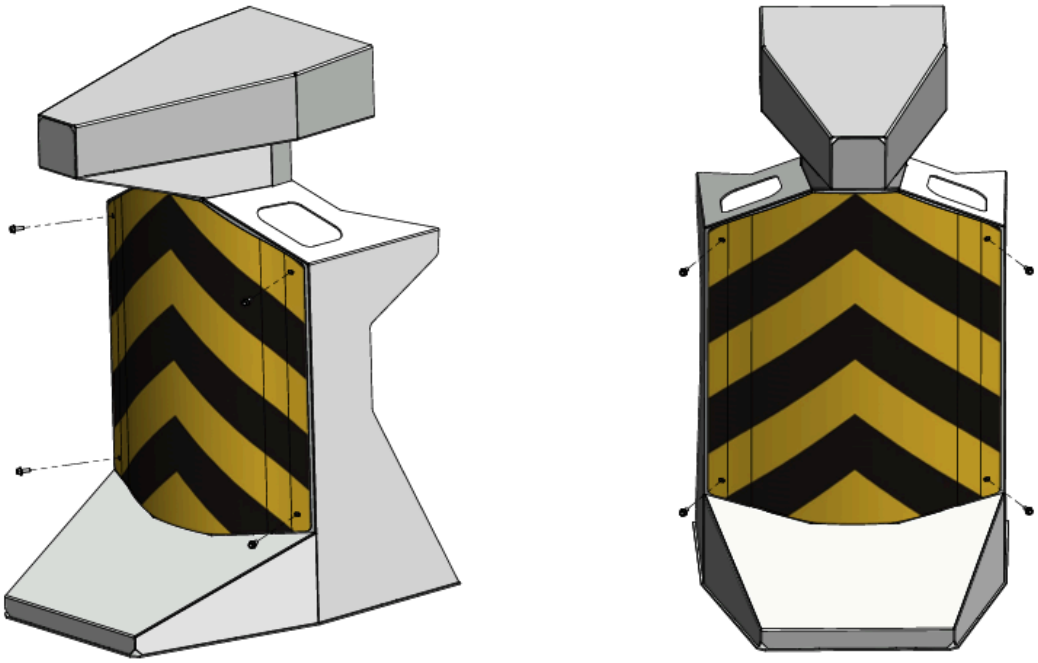


Figure 5.4.1: Quash™ Nose Piece Delineation Panel Installation

3 - Take the assembled nose piece and slide it under the frontmost absorption cell until the holes in the nose piece and the holes in the absorption cell flange align.

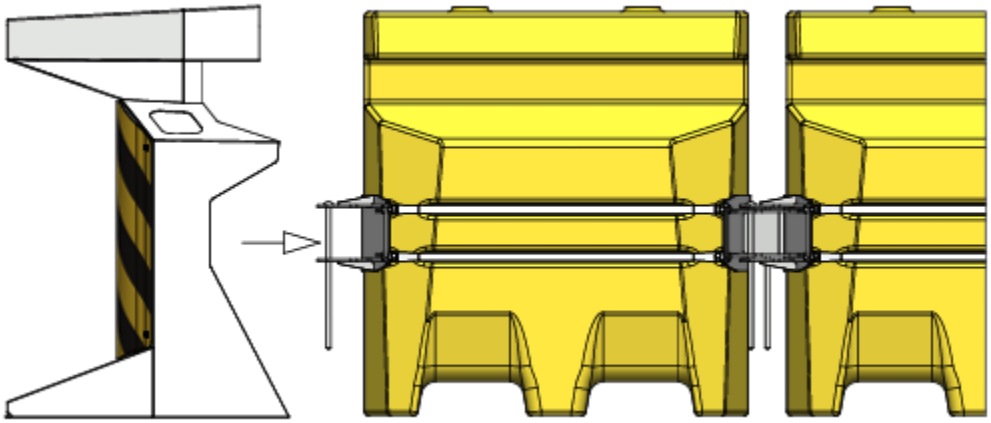


Figure 5.4.2: Quash™ Nose Piece Assembly on First Cell

4 - Use the two pins from the frontmost absorption cell to secure the nose piece to the flange.

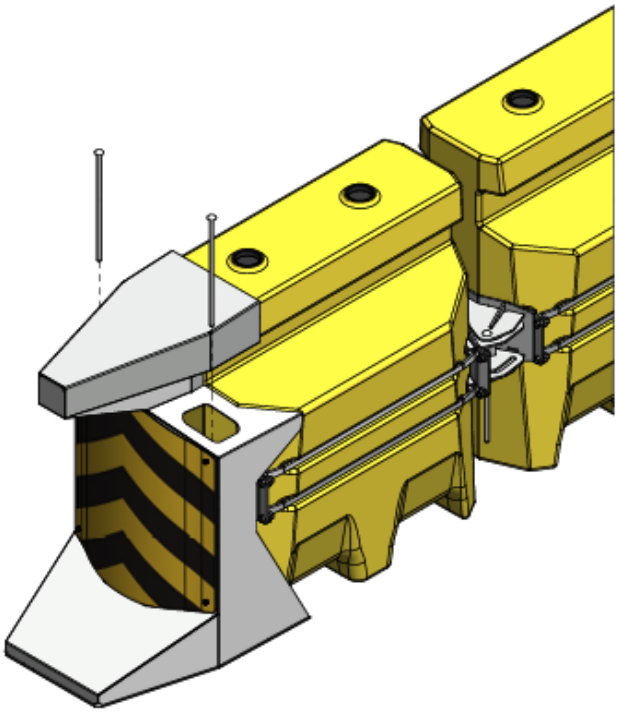


Figure 5.4.3: Quash™: Securing Nose Piece to First Cell with Pins

5.5 Final Check

A final check of the system should be performed once installation has been completed. A standard inspection form including all points to check is provided in Appendix A of this document.

5.6 Disassembly/Relocation Steps

In order to disassemble the system, the installation steps can be followed in reverse order, and the system can be reassembled at another worksite.

5.7 Maintenance and Inspection

Frequent inspections are recommended to ensure proper performance of the QUASH crash cushion. The frequency of inspections should be determined based on environmental factors, location conditions, incident history and traffic volumes. During these inspections, the following items must be verified: the liquid level in cells, the integrity of components, the alignment of the system, and the condition of the ground surface (free of debris and obstacles). Additionally, ensure that all screwed components are properly secured.

Torque Value Table:

Screws and nuts to fasten flange bar to flange assembly	61 ft-lbs (88 Nm)
Bolts to fasten transition front piece to the side pieces	61 ft-lbs (88 Nm)
Anchors to fasten the transition to the barrier	85 ft-lbs (115 Nm)
Serrated bolts and snap-in nuts to fasten plate to nose piece	8 ft-lbs (11 Nm)

6. Appendix A: Quash™ Inspection Form

Moovop Inc.
4295 Boul St-Elzear W, Laval,
QC, Canada, H7P 4J3
450-978-1818
www.moovop.com

DOT/Contractor	
Project	
Road #/Direction/Position	
Speed Configuration	
Date	

Transition	
Checklist	**Initials**
The transition is positioned at the correct height from the ground (15 in.).	
The transition sides are parallel to the concrete barrier/ground.	
The transition front plate stoppers are resting on the front of the barrier.	
The transition bolts (4 total) are all present and properly tightened.	
The transition anchors (3 per side, 6 total) are installed correctly and properly tightened.	

Absorption Cells	
Checklist	**Initials**
All absorption cells are present on the system. (6 cells for TL-3 and 4 cells for TL-2)	
For the TL-3 configuration, the front absorption cell is empty.	
For the TL-2 configuration, the front absorption cell is filled to a height of 15 in. from the ground.	
The rear absorption cells are full of water/antifreeze solution to within 1 in. (25 mm) of the fill holes.	
All fill hole caps are present and securely in place on the absorption cell filling holes (2 per cell).	
All absorption cells side bars are present and properly tightened to the side flanges.	
All filled absorption cells have been inspected and there are no signs of leaks	

Nose Piece	
Checklist	**Initials**
The front delineation panel complies with the location of the system and state regulations.	
All front plate panel fasteners (4 total) are present and properly tightened.	

Overall	
Checklist	**Initials**
All components are connected to each other with the proper number of pins (20 pins total for **TL-3** and 14 pins total for **TL-2**).	
The crash cushion is properly aligned with the barrier.	
No debris/obstacles are present around the crash cushion.	
The longitudinal and cross slope of the ground level is less than 10%.	

	Name	**Signature**	**Date**
Field Installer, Inspector or Engineer			

7. Appendix B: Water Freezing Prevention

Note: The following section was written based on facts either experienced by MOOVOP Inc. or taken out of scientific or promotional literature. It was written solely to be used as a general guide for Quash™ users. For official figures and instructions, see chemical manufacturer documentation.

In areas where cold weather could cause the water contained in the QUASH™ Crash Cushion cells to freeze, a 29% per volume calcium chloride solution has proven to be the best-performing and most cost-effective solution. Different concentrations of this type of solution can be used depending on minimum target temperature, and multiple options are available in order to obtain this type of antifreeze solution.

Warning: Calcium chloride solutions, which are clear, transparent and odorless, are essentially non-toxic, but will dry and irritate the skin. Wear impervious gloves and safety glasses when handling such solutions. If exposed, rinse thoroughly with clean water to prevent irritation.

B.1 - Pre-Mixed Solutions

Pre-mixed solutions are usually supplied at a precise concentration level. Transportation is an inconvenience, since most tanker transporters won't accept the corrosive liquid, but chemical suppliers will deliver the solution in their own tankers. Plastic tanks can be used to carry the liquid to the worksite, and a plastic propeller water pump can be used to empty the water out of the Quash™ absorption cells and fill them back up with the calcium chloride solution.

Two types of premixed solutions are readily available: natural solutions and lab solutions.
Natural calcium chloride solutions, often referred to as "calcium chloride based brine solutions", are extracted from underground sources and are widely used as dust control and deicing agents. They are more economical than lab solutions but their concentration can vary, depending on a multitude of factors measured during the extraction process. They also contain varying amounts of other substances such as sodium chloride, potassium chloride and magnesium chloride. These solutions can be used more freely when temperatures do not fall below -4°F (-20°C). Lab solutions are more expensive but more precise. They can also be made to bring the practical freezing point of the fluid to a much lower temperature of -58°F (-50°C).

B.2 - Pellets and Flakes

Calcium chloride pellets and flakes can be bought in bags of various sizes. This form is usually more expensive than premixed solutions because solids are derived from naturally extracted fluids, but it is easier to bring to job sites. These solids can then be dissolved in water to the desired concentration in order to obtain the required antifreeze solution. However, this procedure has to be done with great care for three main reasons:

- The freezing temperature of the solution is very sensitive to the concentration of calcium chloride, and using too much will cause the freezing point to rise significantly;
- Calcium chloride has a tendency to amalgamate at the bottom of a water container if poured in too quickly, which can lead to a lower solution concentration than expected;
- The dissolution of calcium chloride in water generates a decent amount of heat.

Due to these factors, the dissolving and mixing of calcium chloride is not easily done on the worksite and, therefore, quality can be very difficult to control. To ensure a leveled freezing point over a number of units and the safety of your personnel, please refer to supplier documentation.