



# REACT<sup>®</sup> M

## PRODUCT MANUAL



**PN 626195**  
MAY 2023

# REACT<sup>®</sup> M

The REACT<sup>®</sup> M has been tested pursuant to American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) specifications. The REACT<sup>®</sup> M has been submitted for Federal-aid reimbursement eligibility on the National Highway System to the Federal Highway Administration (FHWA).

## Product Manual



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**WARNING:** The local highway authority, distributors, owners, contractors, lessors, and lessees are **RESPONSIBLE** for the assembly, maintenance, and repair of the REACT<sup>®</sup> M. Failure to fulfill these **RESPONSIBILITIES** with respect to the assembly, maintenance, and repair of the REACT<sup>®</sup> M could result in serious injury or death.



These instructions are for standard assembly specified by the appropriate highway authority. In the event the specified system assembly, maintenance, or repair would require a deviation from standard assembly parameters, contact a Valtir representative.

**This manual must be available to the worker overseeing and/or assembling the product at all times. For additional copies, contact Valtir at (888) 323-6374 or visit [valtir.com](http://valtir.com).**

The instructions contained in this manual supersede all previous information and manuals. All information, illustrations, and specifications in this manual are based on the latest REACT<sup>®</sup> M information available to Valtir at the time of printing. We reserve the right to make changes at any time. Please contact Valtir to confirm that you are referring to the most current instructions.

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## Customer Service Contacts

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Valtir is committed to the highest level of customer service. Feedback regarding the REACT® M assembly procedures, supporting documentation, and performance is always welcome. Additional information can be obtained from the contact information below:

### Valtir

#### Telephone:

(888) 323-6374 (USA)

+1 214 589 8140 (International)

#### Internet:

[valtir.com/contact](http://valtir.com/contact)

## Abbreviations

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AASHTO	American Association of State Highway and Transportation Officials
FHWA	Federal Highway Administration
MASH	Manual for Assessing Safety Hardware
MUTCD	Manual on Uniform Traffic Control Devices
PPE	Personal Protective Equipment

## Important Introductory Notes

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Proper assembly of the REACT® M is critical to achieve performance. The REACT® M has been submitted for eligibility to the FHWA per AASHTO MASH criteria. These instructions should be read in their entirety and understood before assembling the REACT® M. These instructions are to be used only in conjunction with the assembly of the REACT® M and are for standard assemblies only as specified by the applicable highway authority. If you need additional information, or have questions about the REACT® M, please contact the highway authority that has planned and specified this assembly and, if needed, contact Valtir's Customer Service Department. This product must be assembled in the location specified by the appropriate highway authority. If there are deviations, alterations, or departures from the assembly protocol specified in this manual, the device may not perform as tested.



DO NOT use any component part that has not been specified and/or approved for this system during assembly or repair.

This product has been specified for use by the appropriate highway authority and has been provided to that user who has unique knowledge of how this system is to be assembled. No person should be permitted to assist in the assembly, maintenance, or repair of this system that does not possess the unique knowledge described herein. These instructions are intended for an individual qualified to both read and accurately interpret them as written. These instructions are intended only for an individual experienced and skilled in the assembly of highway products that are specified and selected by the highway authority. A manufacturer's drawing package will be supplied by Valtir upon request. Each system will be supplied with a specific drawing package unique to that system. Such drawings take precedence over information in this manual and shall be studied thoroughly by a qualified individual who is skilled in interpreting them before the start of any product assembly.

## Safety Symbols

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This section describes safety symbols that may appear in the REACT® M manual. Read the manual for complete safety, assembly, operating, maintenance, repair, and service information.



Indicates Danger or Warning. Failure to read and follow this warning could result in serious injury or death to the workers and/or bystanders.



Indicates Caution or High Importance. Failure to follow this warning can result in improper performance, failure of operation, or serious injury or death in the event of a vehicle impact with the system.



Indicates Notifications or Reference. These denote important items but will not cause system damage or serious injury.

## Safety Rules for Assembly

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This manual must be kept in a location where it is readily available to persons who are skilled and experienced in the assembly, maintenance, or repair of the REACT® M. Additional copies of this manual are available from Valtir by calling (888) 323-6374 or visiting [valtir.com/contact](http://valtir.com/contact). Please contact Valtir if you have any questions concerning the information in this manual or about the REACT® M.



It is the responsibility of the installer to use proper safety precautions when operating power equipment and when moving heavy equipment or REACT® M components. Hand, eye, foot, and back protection is recommended.



Ensure that all of the Danger, Warning, Caution, and Important statements within the REACT® M manual are completely followed. Failure to follow this warning could result in serious injury or death in the event of a collision.

## Limitations and Warnings

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Valtir contracts with FHWA approved testing facilities to perform crash tests, evaluation of tests, and submit the results to the FHWA for review.

The REACT® M was tested to meet the impact criteria, requirements and guidelines of MASH. These tests, specifically set forth by the FHWA, evaluate product performance defined by AASHTO involving lightweight cars (approx. 2420 lb. [1100 kg]) and full size pickup trucks (approx. 5000 lb. [2270 kg]). A product can be certified for multiple Test Levels. The REACT® M is certified to the Test Level(s) as shown below:

### Test Level 3: 62 mph [100 km/h]

**These FHWA directed tests are not intended to represent the performance of systems when impacted by every vehicle type or every impact condition existing on the roadway. This system is tested to the test matrix criteria of MASH as approved by FHWA.**

Valtir expressly disclaims any warranty or liability for injury or damage to persons or property resulting from any impact, collision or harmful contact with products, other vehicles, or nearby hazards or objects by any vehicle, object or person, whether or not the products were assembled in consultation with Valtir or by third parties.

The REACT® M is intended to be assembled and maintained in accordance with specific state and federal guidelines. Valtir offers a reflective delineator panel and has reflective tape for the REACT® M. However, the material is only intended to supplement delineation required by the US Department of Transportation's MUTCD or local jurisdiction. The appropriate highway authority approved engineer should be careful to properly select, assemble, and maintain the product. Careful evaluation of site layout, traffic speed/type, direction, and visibility are some of the elements that require evaluation by the highway authority in the selection of a highway product. For example, curbs could cause an untested effect on an impacting vehicle.

After an impact occurs, the debris from the impact should be removed from the area immediately and the specified highway product should be evaluated and restored to its original specified condition or replaced as the highway authority determines as soon as possible.



Do not assemble, maintain, or repair the REACT® M until you have read this manual thoroughly and completely understand it. Ensure that all Danger, Warning, Caution, and Important statements within the manual are completely followed. Please call Valtir at (888) 323-6374 if you do not understand these instructions.



Do not modify the REACT® M in any way.



It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that the REACT® M and delineation used meet all federal, state, specifying agency, and local specifications.



It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that your assembly meets all appropriate Manual on Uniform Traffic Control Devices (MUTCD) and local standards.

## System Overview

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Crash testing results have shown that the REACT® M is a potentially reusable, re-directive, non-gating crash cushion for roadside obstacles up to 30” [762 mm] wide when impacted within MASH 16 TL-3 crash test standards. After those impacts observed within MASH criteria, it has been observed that the bulk of the system can be potentially reused.

When impacted under MASH criteria, this system is capable of shielding specified roadside obstacles up to 30” [762 mm] wide. It consists of a series of “smart plastic” cylinders attached to a steel base track. The term “smart plastic” refers to the memory characteristics of the cylinders. After a head-on impact as described in MASH 16 TL-3, the REACT® M has the potential to regain a major portion of its shape, position, and energy absorbing capability.

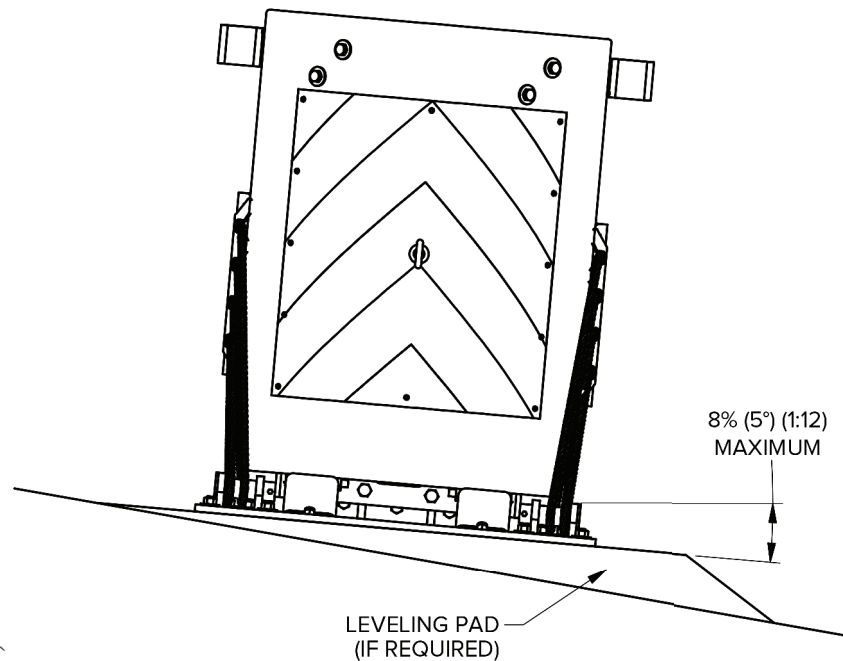
The REACT® M utilizes various cylinder wall thicknesses that have been shown to help withstand impacts by light cars or heavier, high-center-of-gravity vehicles.

The REACT® M is intended to minimize assembly time and arrives at the site fully assembled. The assembly crew needs only to lift and place the system in front of the barrier or roadside obstacle, drill boreholes, set anchors, and attach transition(s) where applicable.

## Site Preparation

The REACT® M must be assembled on an existing or freshly placed and cured concrete foundation (4000 psi [28 MPa] minimum). Location and orientation of the concrete foundation and attenuator must comply with project plans or as otherwise determined by the local highway authority.

Recommended dimension and reinforcement specifications for new concrete foundations are in the site-specific drawing package provided with each REACT® M. The system may be assembled on a reinforced or non-reinforced concrete roadway (minimum 8" [200 mm] thick). Deployment cross-slope shall not exceed 8% and shall not twist more than 2% over the length of the system. The foundation surface shall have a light broom finish.



## Foundation/Anchoring



It is the responsibility of the installer to ensure the foundation conforms to the AASHTO Roadside Design Guide.

The REACT® M may be installed on any of the following foundations using the specified anchorage:

### Foundation A: Reinforced Concrete Pad

Foundation: 8" [203 mm] minimum depth portland cement concrete

Anchorage: Approved adhesive with 7" [180 mm] studs (5 1/2" [140 mm] embedment)

### Foundation B: Asphalt over Subbase

Foundation: 6" [152 mm] minimum A.C. over 6" [152 mm] minimum compacted subbase

Anchorage: Approved adhesive with 18" [460 mm] studs 16 1/2" [420 mm] embedment

### Valtir Approved Adhesive Anchoring System

A Valtir approved adhesive anchoring system is required to securely anchor crash cushions. Each approved adhesive kit contains adhesive, studs, nuts and washers. Both vertical and horizontal assemblies are possible using an approved adhesive anchoring system.

## Vertical Anchors



Follow adhesive manufacturer's requirements for safety, storage, handling, working time, cure time, and torque specifications.

1. The anchors used to secure the REACT® M backup and base track to the concrete foundation must be those shipped in the kit. These studs must be set in minimum 4000 psi [28 MPa] concrete. Allow the concrete to cure a minimum of seven days before applying anchoring adhesive.
2. Use the part that is to be anchored as a drilling template. Drill the boreholes 7/8" [22 mm] diameter to the recommended depth. See the approved adhesive instructions provided with your kit. Check to ensure each borehole is drilled to the proper depth as shown below and aligned with the part to be anchored.

Anchoring Information			
Stud Size	Concrete Bit Size	Minimum Depth	Recommended Torque
3/4" X 7"	7/8" [22 mm]	5 1/2" [140 mm]	see adhesive specification.

3. Blow the concrete dust from the borehole using oil-free compressed air. Thoroughly brush it with a 7/8" [22 mm] diameter steel bristle tube brush and then blow it out again. If the borehole is wet, completely flush it with water while brushing and then blow it clean to remove all water. Alternatively, a hollow concrete drill bit with an approved vacuum system may be used to prepare and clean the boreholes.
4. Fill the borehole to the top of the pavement surface. Fill from the bottom-up to prevent air pockets.
5. Place a flat washer and nut onto the stud until the top end of the stud is flush with the top of the nut.
6. Insert the stud through the part to be anchored and into the borehole.
7. Once the adhesive has fully cured, torque the nut to the adhesive manufacturer's specification.

## Rebar

Per the project engineer's recommendation, if rebar is encountered while drilling a borehole, the rebar may be drilled through or the borehole may be drilled at an angle. If drilled at an angle, both holes are to be filled with anchor adhesive.

## Transitions

The REACT® M can be used in unidirectional and bidirectional applications. Transition panels must be added to any side exposed to traffic if there is potential of vehicle interaction on the impacting face or end of roadside obstacle. The proper transition panel to use will depend on the direction of traffic and what type of barrier or roadside obstacle the REACT® M is shielding. Contact the Customer Service Department for additional information.

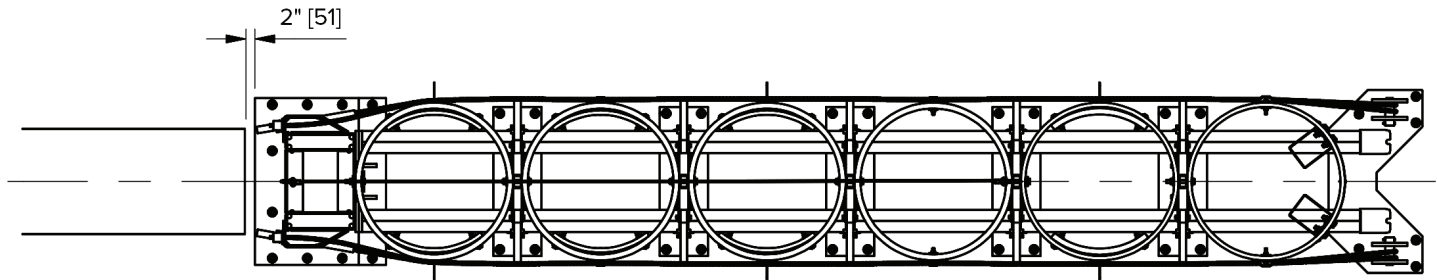


The system backup must not become a roadside obstacle to reverse direction traffic. A system placed with traffic approaching from the rear may require transition hardware.

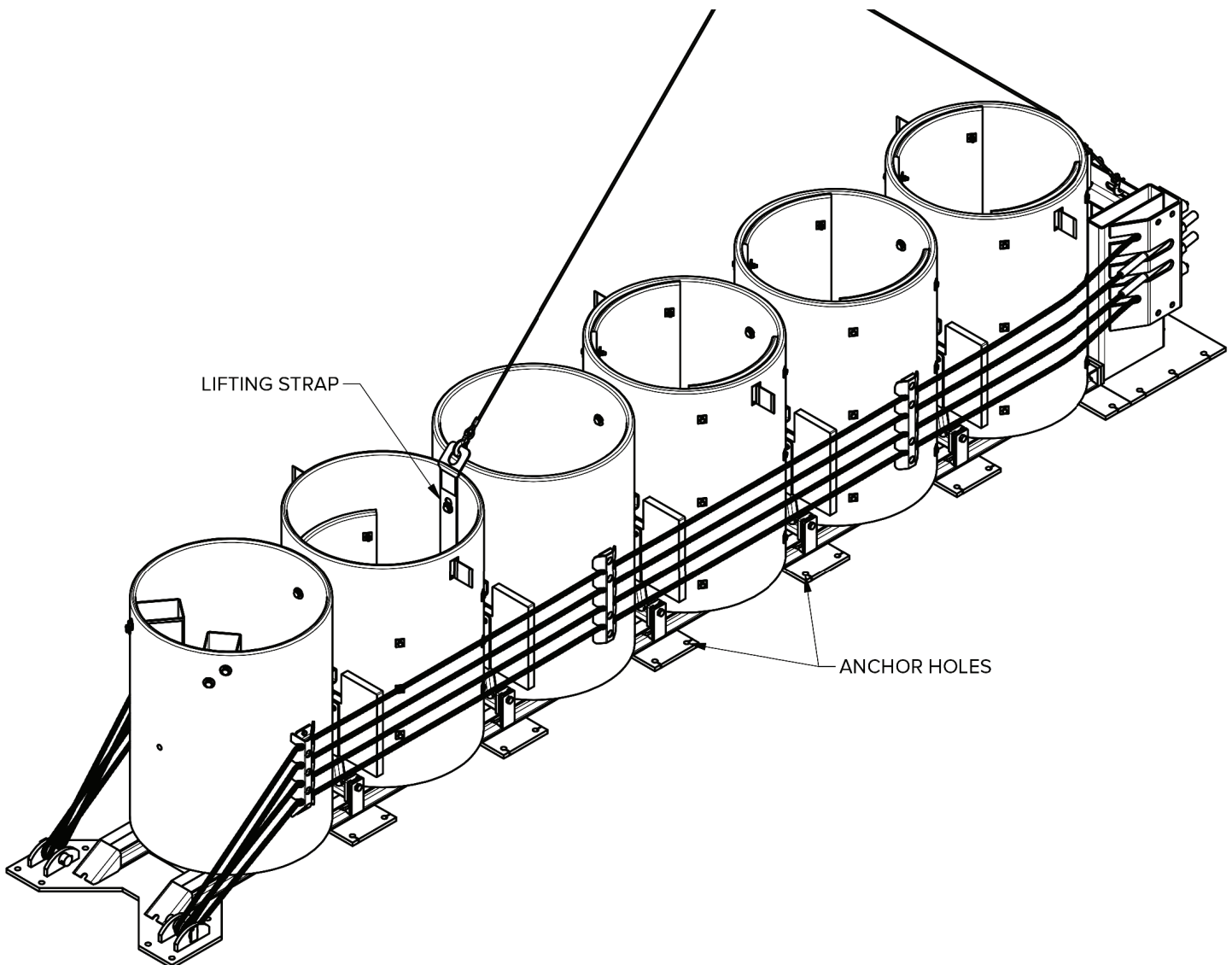


## System Installation

1. Typically the base point of the REACT® M will be the midpoint of the roadside obstacle at its front face. This may change depending on obstacle width or if bidirectional traffic is present (refer to the provided drawing package for details). Mark a centerline from the base point, perpendicular to the roadside obstacle face, or as determined by project engineer, to a distance greater than the maximum length of the REACT® M.



2. Use fixed-length slings with a 6,000 lb. [2722 kg] minimum capacity. Fixed slings will prevent the system from tipping. Connect slings to the the lifting strap in cylinder #2 and to the rear of the backup. Once the system is in place, remove the slings and the lifting strap in cylinder #2 and re-tighten hardware. This strap is for shipping/installing purposes only. Do not lift overhead. Measure from the centerline to ensure that the REACT® M is centered and positioned at the proper angle. The steel backup base plate should be 2" [50 mm] forward of the roadside obstacle face.



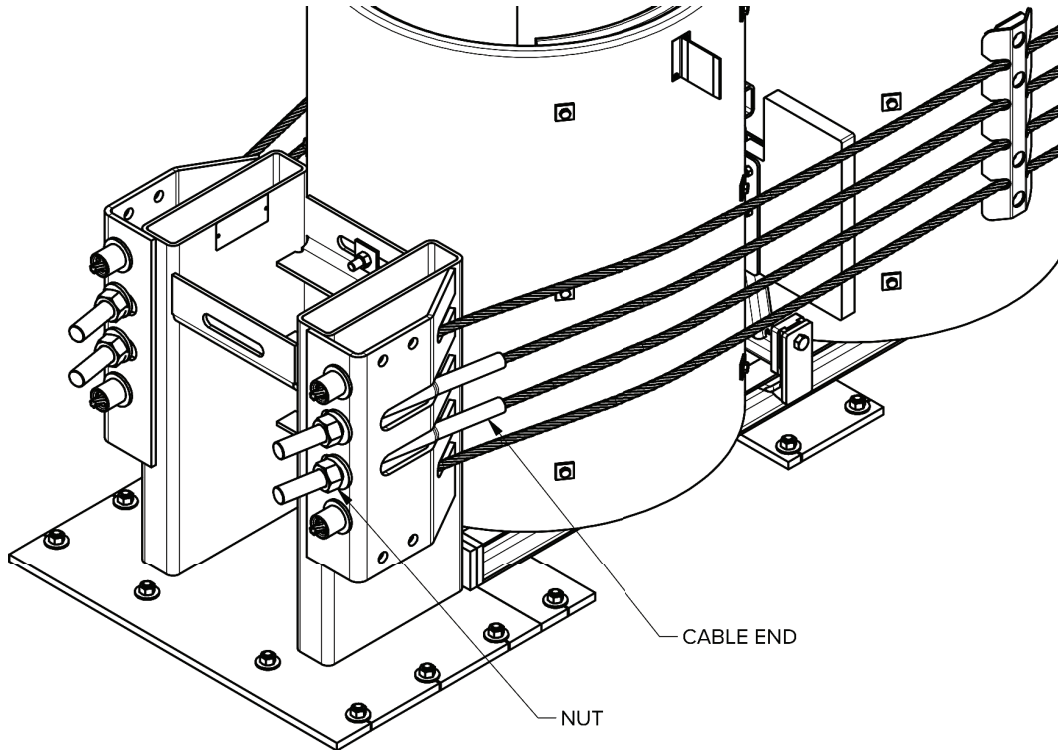


Lifting strap must be removed and cylinder fasteners tightened after system installation.

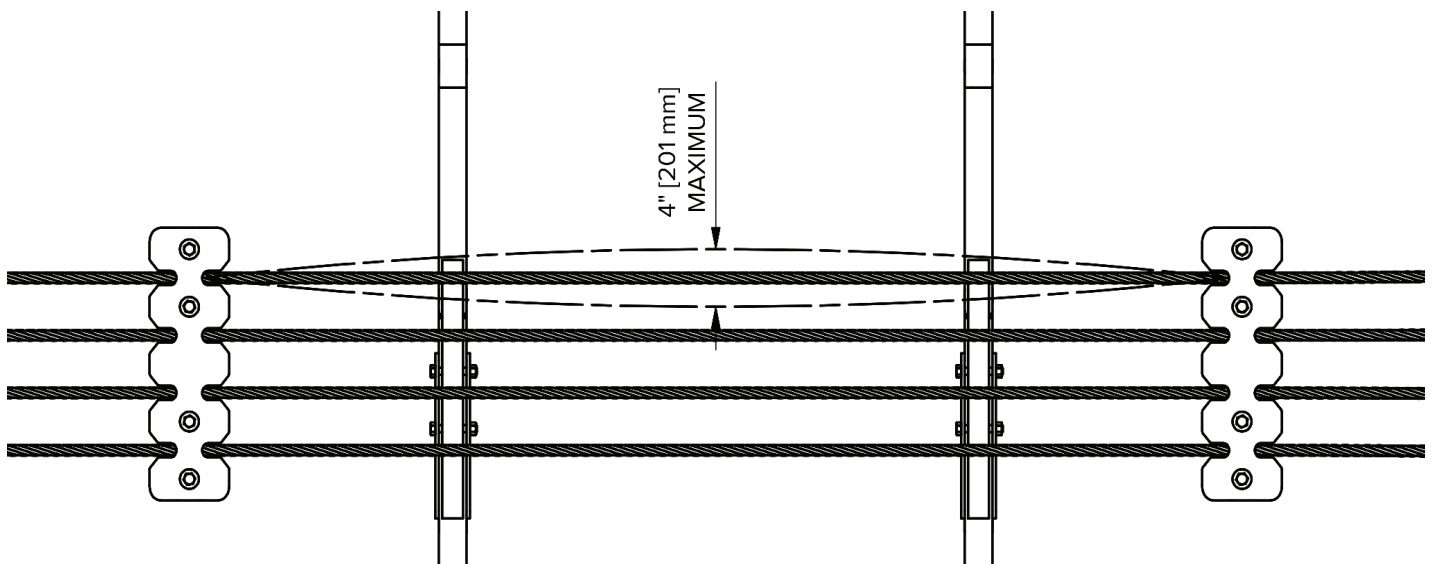
3. Use the holes in the backup and base track as a template to locate and drill boreholes. See “Vertical Anchors” for details. All anchor holes in the backup and base track must be used to anchor the REACT® M to the foundation.
4. Tighten the nuts on the threaded end of the cables to tension the cables. A pipe wrench may be used on the cable ends to prevent the cable from spinning.



Do not tension cables until the anchor adhesive has fully cured.



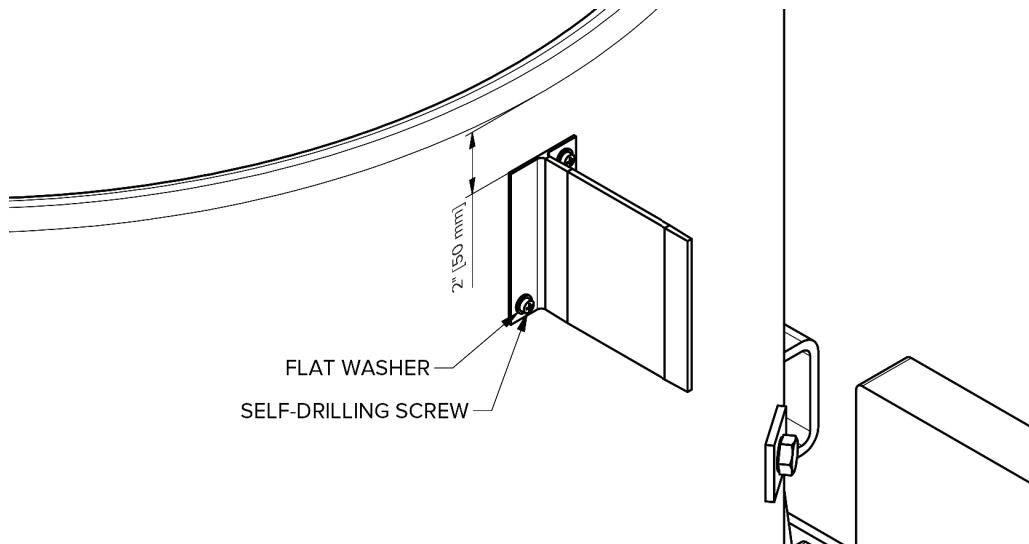
When properly tensioned, the cables should not deflect more than 4" [102 mm] with approximately 100 lb. [45 kg] force applied midway between cable guides.



## Side Reflectors

Side reflectors are typically attached to cylinders 2, 4, and 6 with the silver side facing traffic. Refer to local standards and MUTCD requirements.

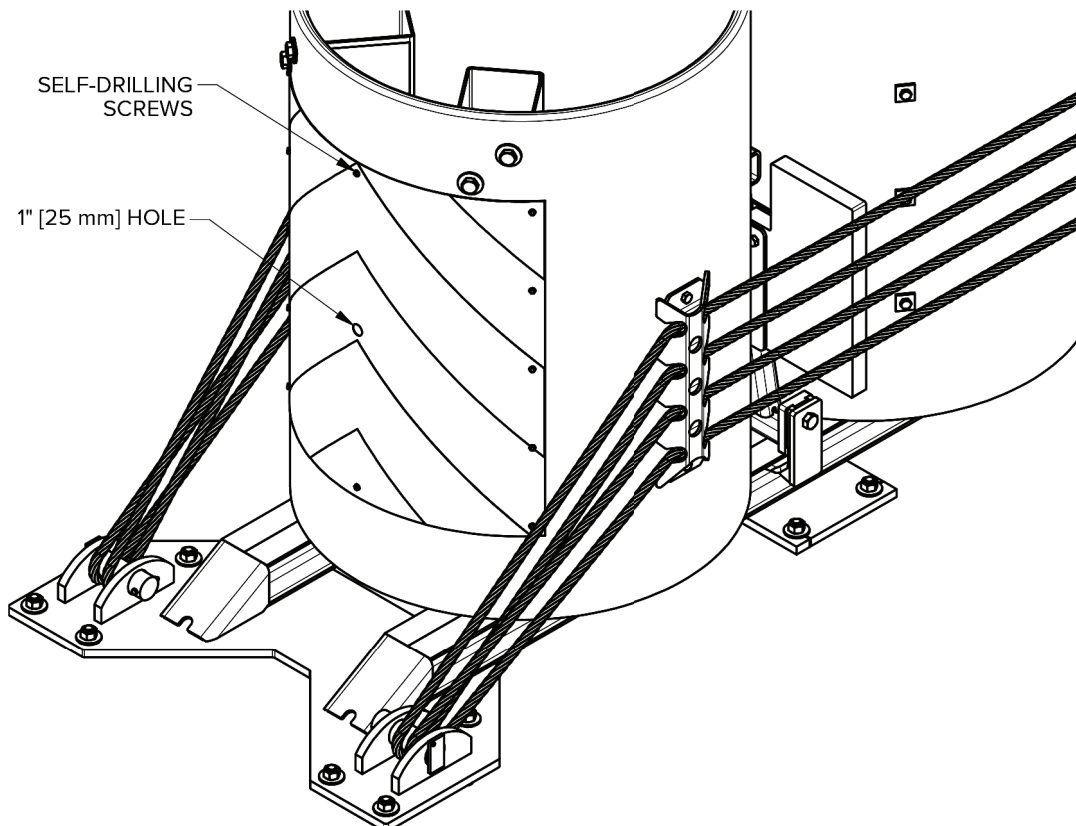
1. Fasten the reflectors with #8 self-drilling screws and washers.



## Nose Cover

Nose covers vary and are sold separately. Refer to local standards and MUTCD requirements.

1. Align 1" [25 mm] holes in the nose cover and cylinder 1.
2. Fasten the nose cover with 1/4" self-drilling screws.



## Assembly Checklist

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Performed by: \_\_\_\_\_

Date: \_\_\_\_\_

Location: \_\_\_\_\_

- Transitions, if required, are in place and properly fitted.
- Every anchor hole on the backup and base track is fastened to the foundation by an anchor.
- Each anchor is torqued to the adhesive manufacturer's specifications.
- All cables are attached and properly tensioned.
- Sling and sling strap are removed from the system.
- All fasteners are properly tightened.
- Each cylinder is properly positioned on base track.
- Appropriate nose cover is attached.
- Side reflectors, if required, are attached.
- Remove all construction debris in and around the system.

## Maintenance and Repair

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The REACT® M, through crash testing, has been shown to be a potentially reusable crash cushion. After impacts within MASH 16 TL-3 criteria, it has been observed that, potentially, the bulk of the system can be reused. However, whether or not a system is reusable is the responsibility of the highway authority specifying their use.

The REACT® M must be inspected after each impact. Depending on the impact, components may get damaged and need replacement. It is critical that all cables and anchoring be checked and returned to original assembly conditions.



Use only Valtir parts that are specified herein for assembling, maintaining, or repairing the REACT® M. Do not utilize or otherwise commingle parts from other systems even if those systems are other Valtir systems. Such configurations have not been tested, nor have they been deemed eligible for use. Assembly, maintenance, or repairs using unspecified parts or accessories is strictly prohibited.



Valtir makes no recommendation whether use or reuse of any part of the system is appropriate or acceptable following an impact. It is the sole responsibility of the project engineer and/or the local highway authority and its engineers to make that determination. It is critical that you inspect this product after assembly is complete to make certain that the instructions provided in this manual have been strictly followed.

## Inspection

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Inspections by the appropriate highway authority are recommended as determined by that authority based upon volume of traffic and impact history. Visual drive-by inspections are recommended at least once every three months. Walk-up inspections are recommended at least twice a year.

### Visual Drive-By Inspection

1. If the REACT® M is not fully extended, a walk-up inspection will be required to determine the cause or identify damage.



It is important to inspect a system after an impact even if it appears to be self-restored and fully maintained. An unrestored system may retain stored energy.

2. Determine the condition of the nose cover and the side reflectors are in place.
3. Record the date, location, and system location.



Debris, snow, or ice inside the cylinders may prevent the REACT<sup>®</sup> M from absorbing the impact of a crash as observed in MASH compliant crash testing. Perform a walk-up inspection as needed to check for and remove any debris inside or around the cylinders. Failing to remove this debris or other material infringes upon the performance of the system as tested.

### Walk-Up Inspection

- Remove debris found inside the REACT<sup>®</sup> M cylinders.
- Remove debris found under and around the REACT<sup>®</sup> M.
- All fasteners are tight and rust free.
- Anchor studs are securely anchored.
- Inspect all diaphragm outer rail guides.
- Replace any cylinder that is cracked, damaged, or when the minor axis measures 18" [460 mm] or less.
- All cables are attached and properly tensioned.
- Transitions are properly attached (if applicable).
- Nose cover and side reflectors are intact and undamaged.
- Note the location and condition of the REACT<sup>®</sup> M and any work done for the date of this inspection. If further repair is necessary, note the repair requested.
- Replace all damaged parts as soon as possible.

### Post-Impact

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- Remove debris inside the cylinders.
- Remove debris found under and around the system.
- The REACT<sup>®</sup> M must be pulled out to its original length after each impact.
- Replace any cylinder that is cracked, damaged, or when the minor axis measures 18" [460 mm] or less.
- All fasteners are tight and rust free.
- Replace any anchors that are loose, broken, or pulled out.
- Replace diaphragm outer rail guides if damaged.
- Replace diaphragm inner rail guides if damaged.
- Replace diaphragms if damaged.
- Cables are properly attached and tensioned.
- Base track is undamaged.
- Backup is undamaged.
- Transitions are properly attached and undamaged (if applicable).
- Nose cover and side reflectors are intact and undamaged.
- Note the location and condition of the REACT<sup>®</sup> M and any work done for the date of this inspection. If further repair is necessary, note the repair required.
- Replace damaged parts as soon as possible.

## Restoring a Collapsed System



Self-restoring systems have the ability to store energy that could cause sudden system movement and injury to maintenance workers. This condition would be visually evident by a system staying collapsed after an impact. Extreme compression of REACT® M cylinders after an impact is an indication that the system is storing large amounts of energy. Every compressed REACT® M repair must be performed with caution.



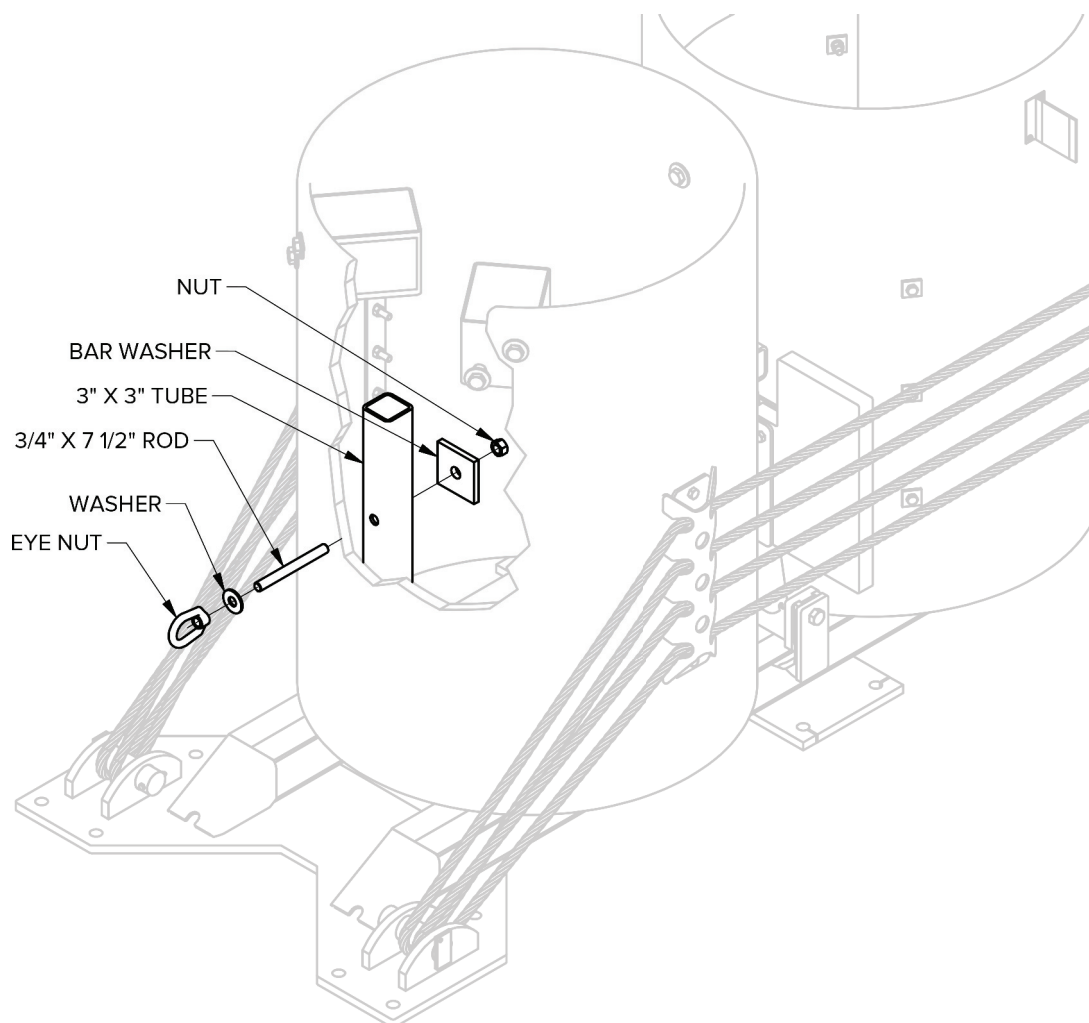
Do not stand in front, on top, or put any portion of your body on or inside any part of a collapsed system. Instead, use a chain and truck to pull from the front of the system as explained below and on the following pages.

### System Reset



The REACT® M must be pulled out to its original length after each impact.

1. Attach the Pullout Assembly to cylinder 1.



2. Pull the system to over-extension by using a work vehicle or other means.
3. Hold system in the extended position for at least 15 minutes.
4. Release the system slowly.
5. Remove and store the Pullout Assembly for future use.

Cylinders will need to be replaced if the system does not retain an effective length of at least 17' [5.18 m].

## Releasing a Collapsed System

1. Position a truck of not less than 13,250 lb. [6000 kg] centered on the system just in front of cylinder 1. The truck should be presenting its strongest bumper to the system. The bumper's height should be such that the center of the bumper rests on the middle of cylinder 1 (approximately 24" [610 mm] in height).
2. Slowly drive the truck so that the bumper displaces cylinder 1 approximately 6" [150 mm]. The driver should remain in the vehicle depressing the brake pedal after the vehicle has been placed in position.



Once the leading bumper is over the base track assembly, the vehicle may be subject to forces by the system due to an unexpected restoration. The driver should be wearing a seat belt and have the vehicle in the lowest possible gear when approaching the system. In the event that the system unexpectedly expands before the system is compressed in Step 2, the driver should apply the brakes immediately, bringing the vehicle to a controlled stop. The driver should then put the vehicle in neutral while still applying the brakes. Gradually release the brakes, allowing the system to push the vehicle back in a safe and controlled manner.

3. It should now be safe for a maintenance worker to inspect the system to determine where mechanical binding is present. Remove all debris from the system prior to checking for binding. The binding will probably be located at a diaphragm and the rail guides. Cautiously using a pry bar or jostling the system with a vehicle may aid in releasing any binding components. Once released, the driver should allow the system to extend in a safe and controlled manner.



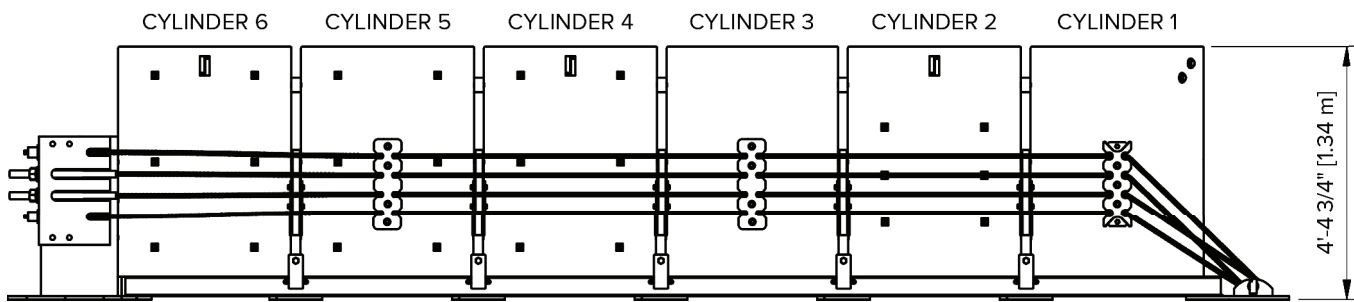
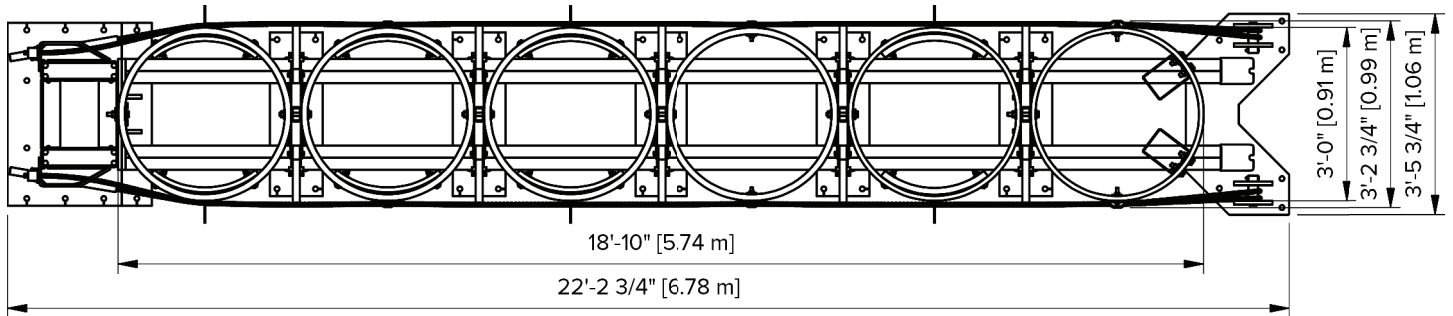
Keep hands and other body parts clear of possible system interaction. Be aware of tools (pry bar, etc.) that could move unexpectedly if a bind is suddenly released.

4. Replace all damaged system components and reassemble the system.

## Technical Specifications

### Dimensions (nominal)

Length	22'-2 3/4" [6.78 m]
Effective Length	18'-10" [5.74 m]
Cylinder Width	3'-0" [0.91 m]
Cylinder Width w/Cable Guides	3'-2 3/4" [0.99 m]
Width	3'-5 3/4" [1.06 m]
Height	4'-4 3/4" [1.34 m]



### Cylinder Recycling Information

The Cylinders are made of HDPE plastic and are recyclable.



# Inspection Log

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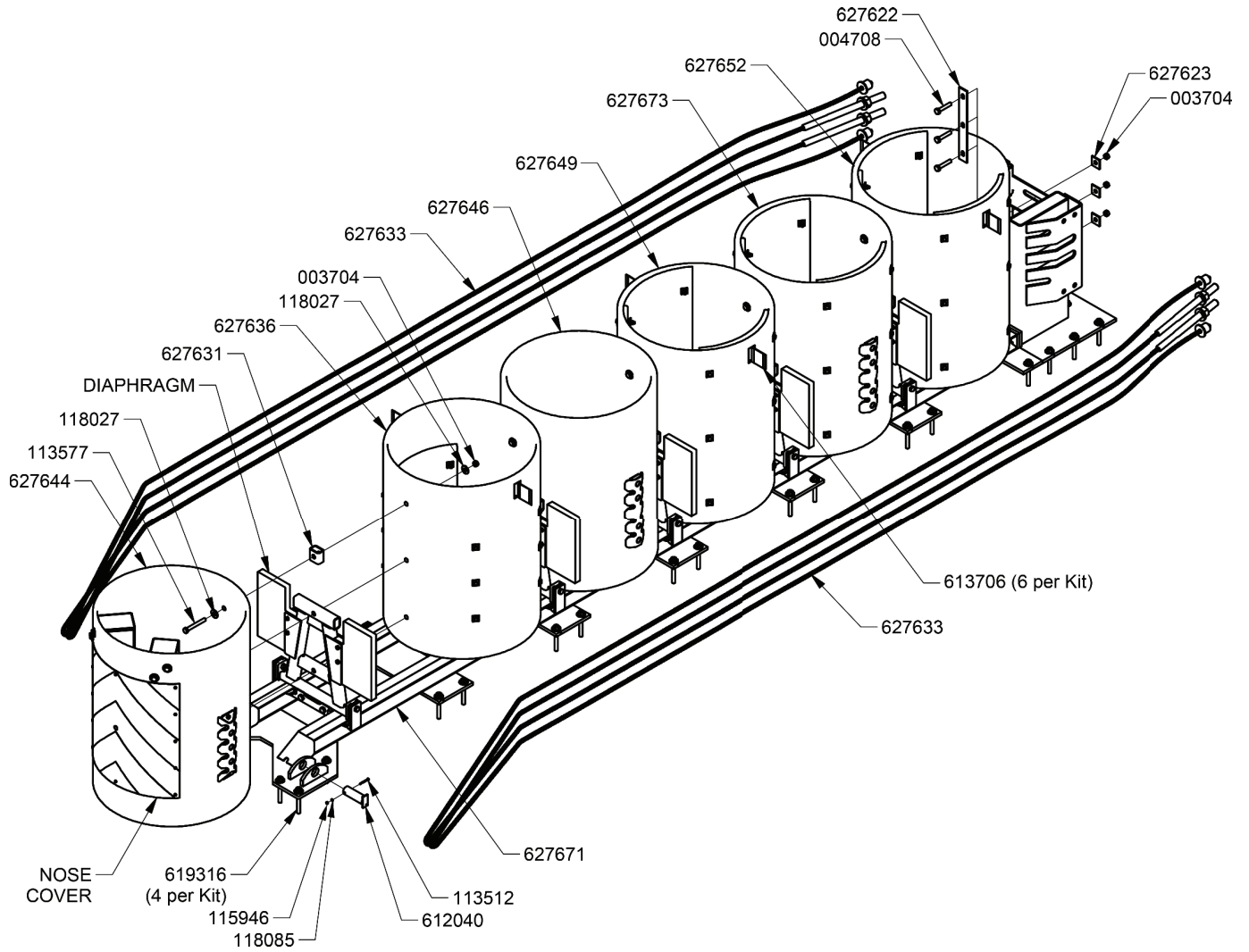
Location: \_\_\_\_\_

System Serial Number" \_\_\_\_\_

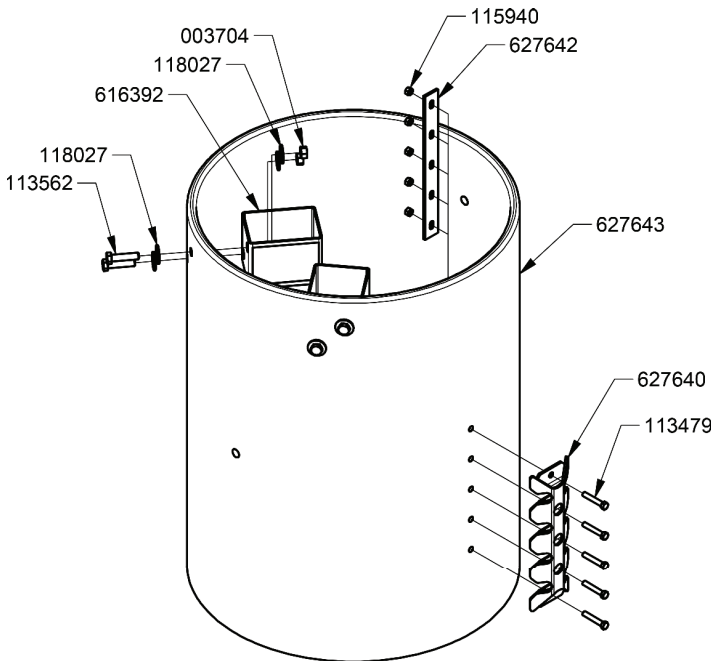
Date	Inspector	Condition	Maintenance Actions

# Parts List

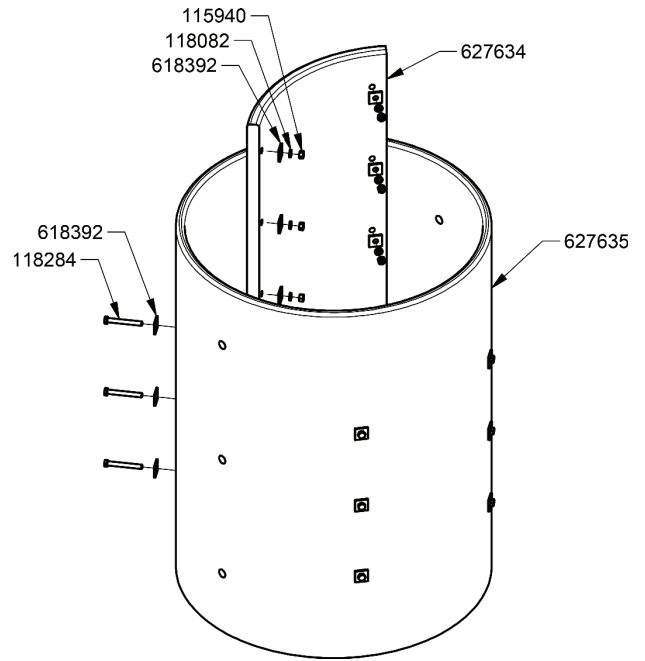
## System Components



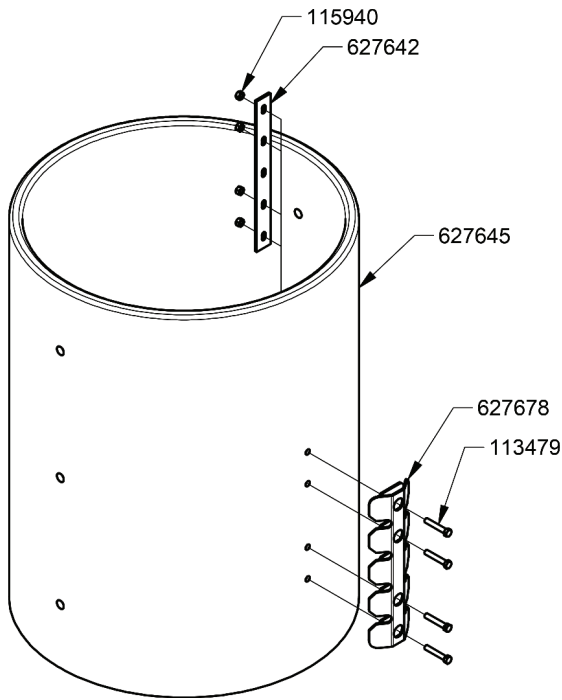
### Cylinder 1 Assembly - 627644



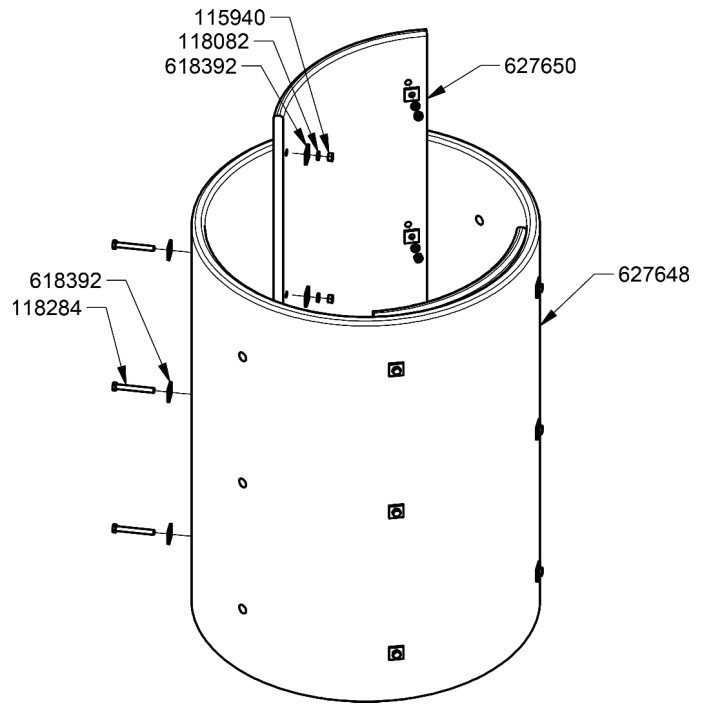
### Cylinder 2 Assembly - 627636



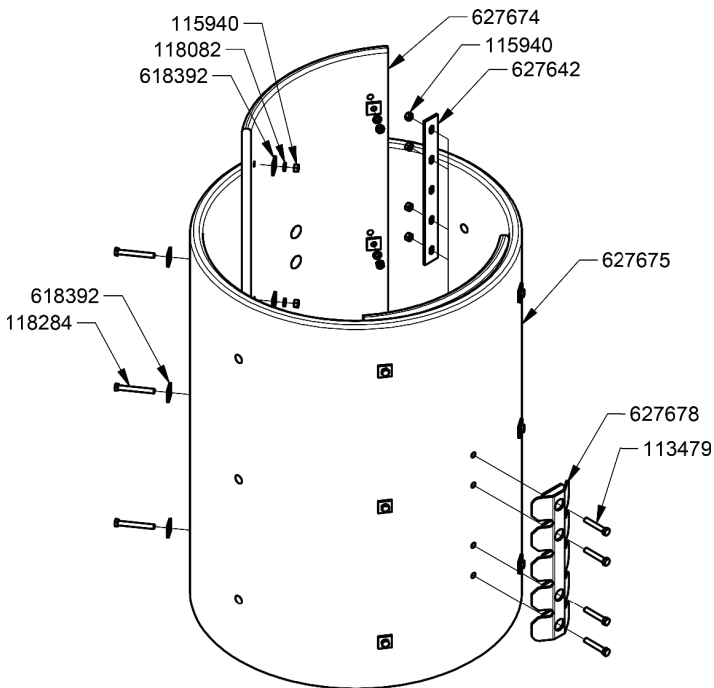
### Cylinder 3 Assembly - 627646



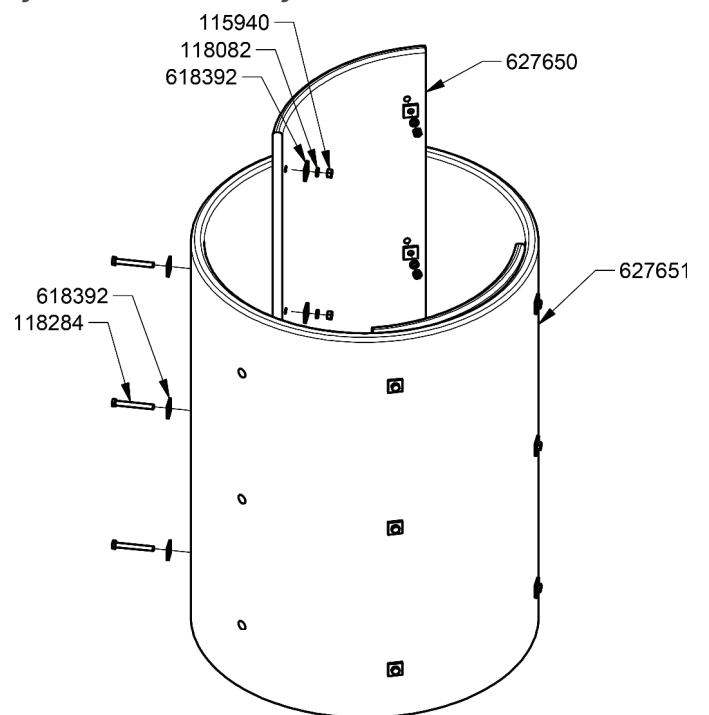
### Cylinder 4 Assembly - 627649



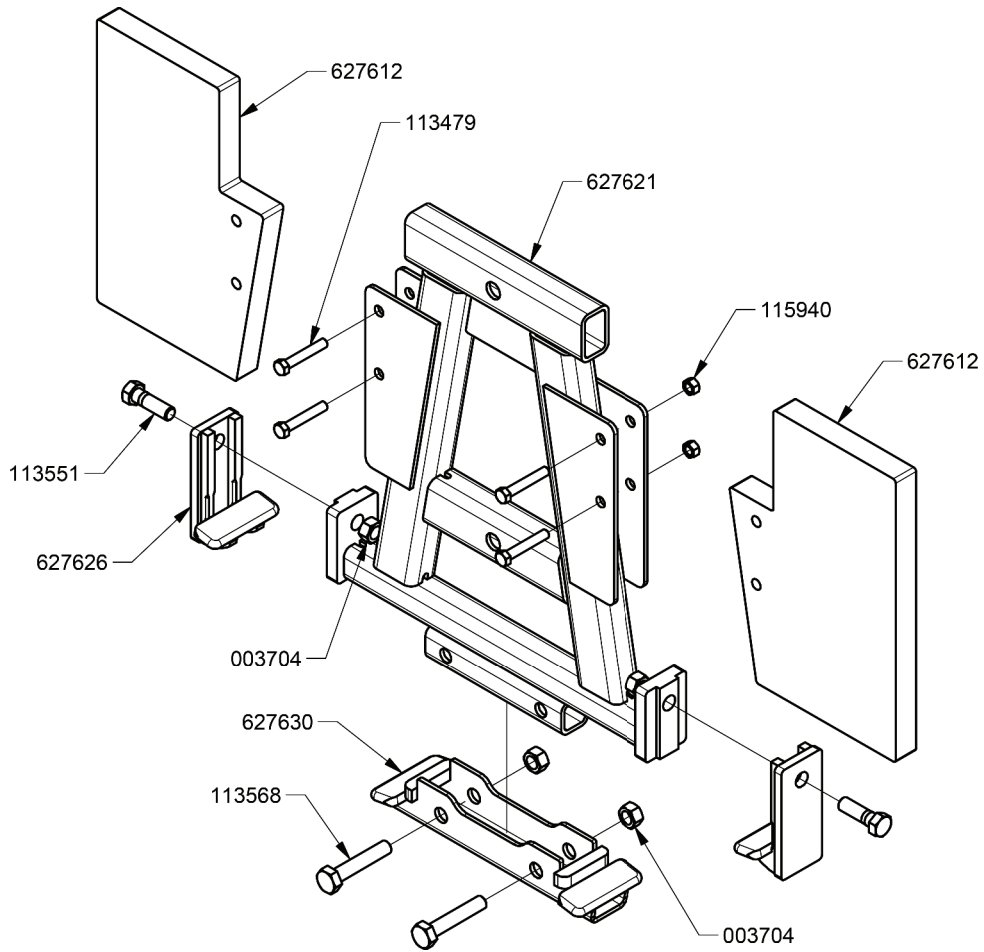
### Cylinder 5 Assembly - 627673



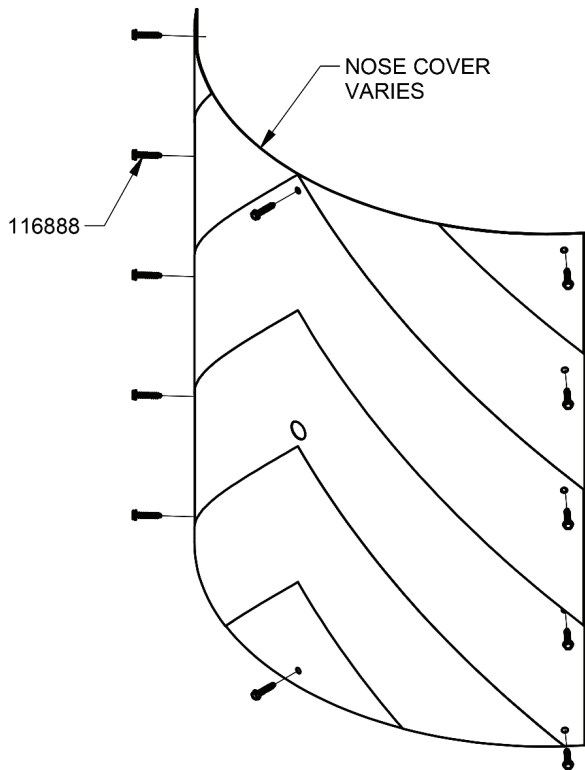
### Cylinder 6 Assembly - 627652



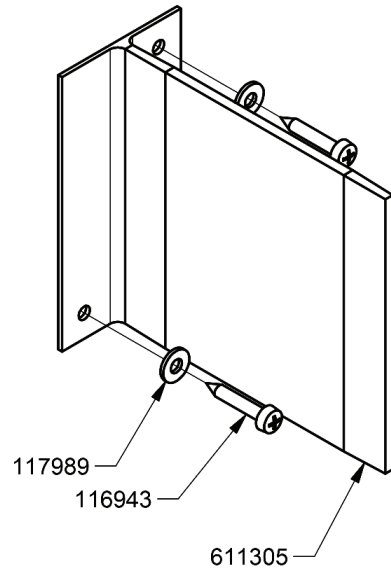
## Diaphragm Components



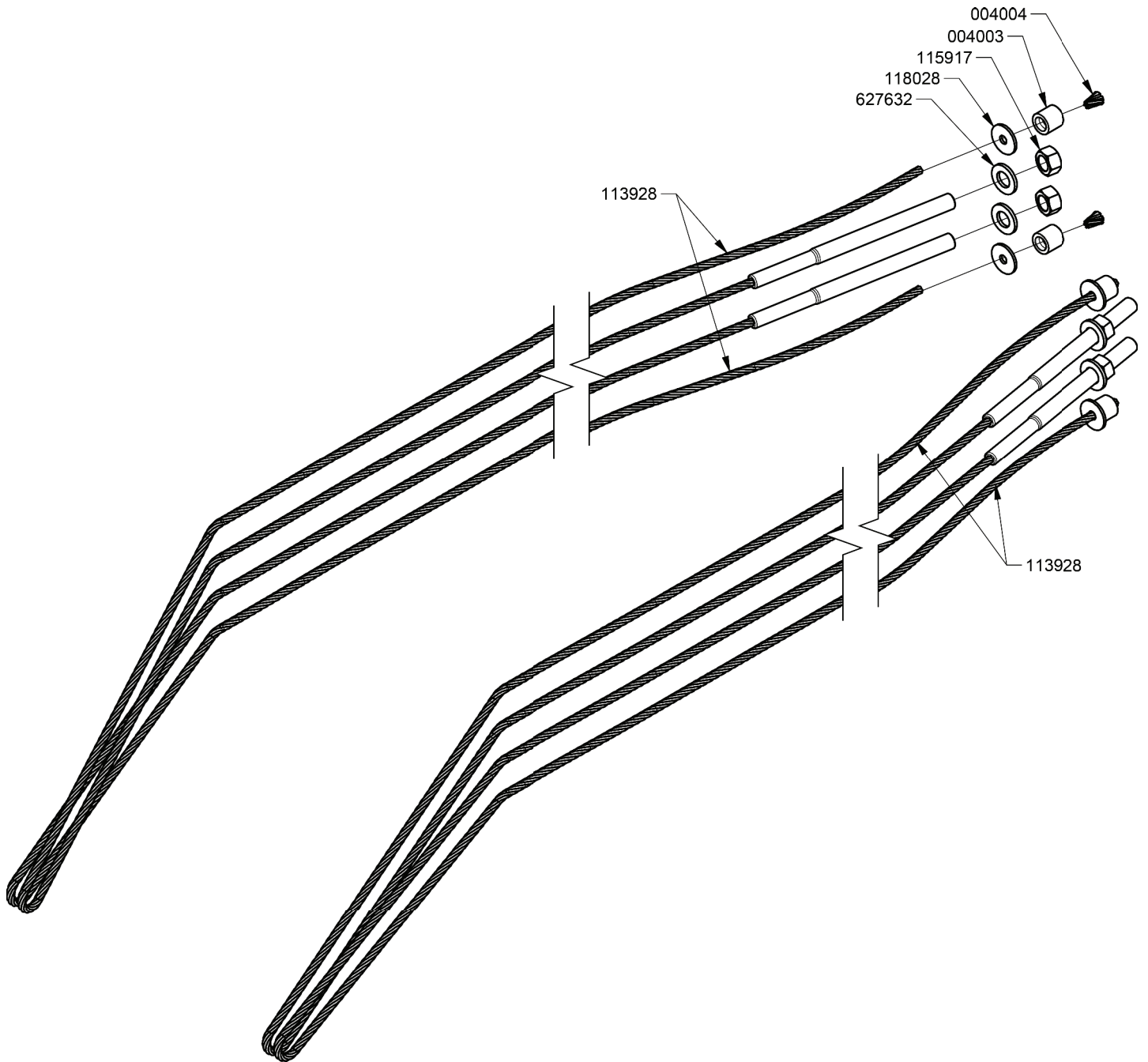
## Nose Cover



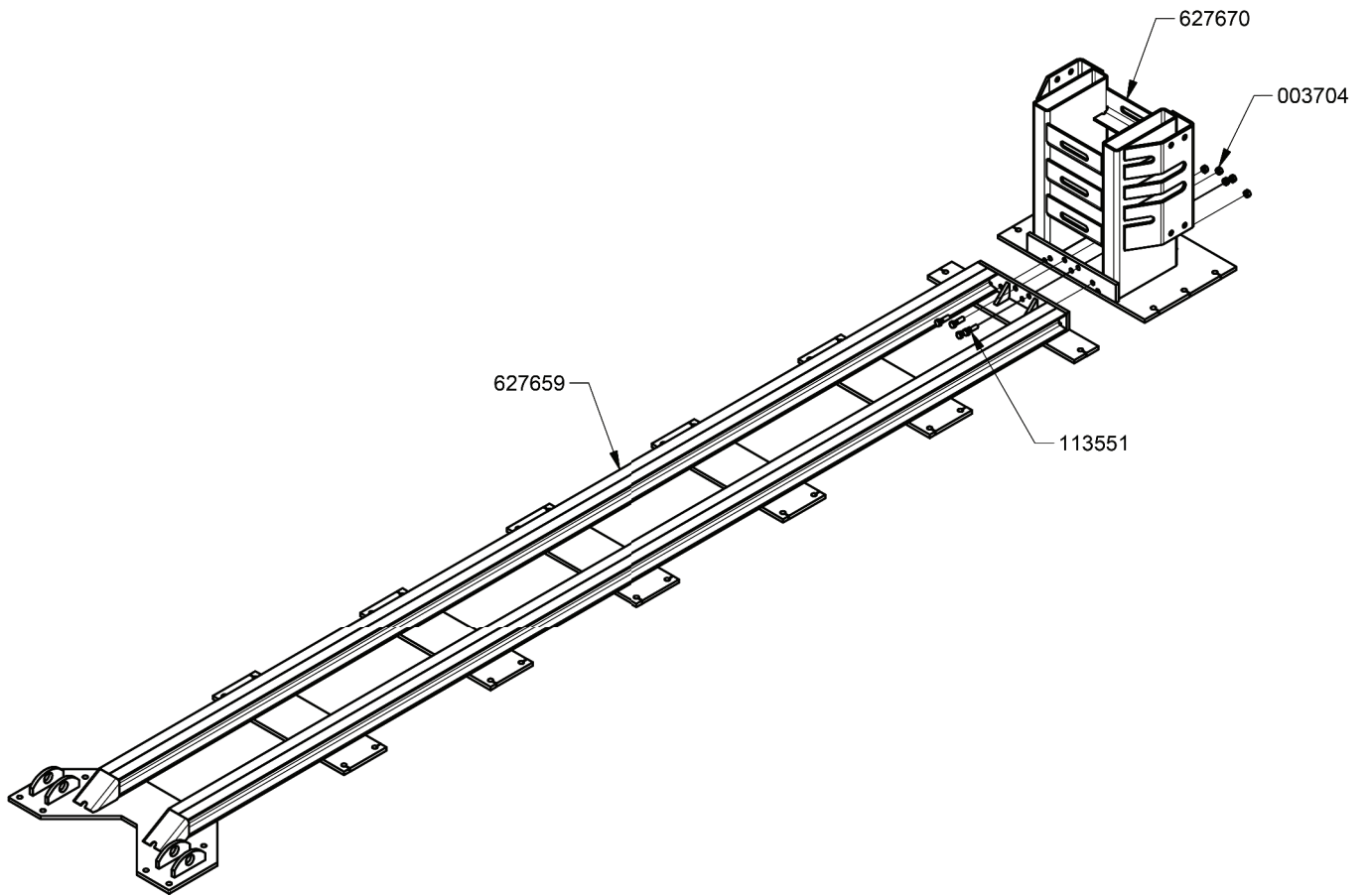
## Reflector (6 per Kit) - 613706



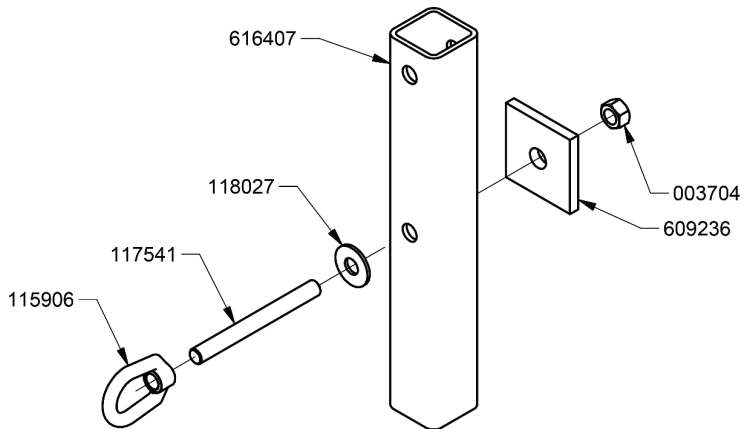
Cables - 627633 (Includes hardware for both sides of system)



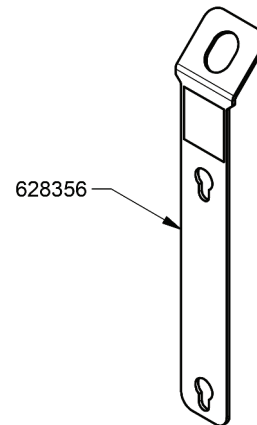
# Base Track and Backup - 627671



# Pullout Bracket - 612816



# Lifting Strap













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