PN 620076

Revision B October 2019

QuadGuard® Elite M10 [24”]

Product Description Assembly Manual

TRINITY HIGHWAY

Ahead of the Curve®

QuadGuard® Elite M10 [24”]

The QuadGuard® Elite M10 has been tested pursuant to American Association of State Highway and Transportation Officials (“AASHTO”) Manual for Assessing Safety Hardware (“MASH”) specifications. The QuadGuard® Elite M10 has been deemed eligible for Federal-aid reimbursement on the National Highway System by the Federal Highway Administration (“FHWA”).

Product Description
Assembly Manual

2525 N. Stemmons Freeway
Dallas, Texas 75207

Warning: The local highway authority, distributors, owners, contractors, lessors, and lessees are RESPONSIBLE for the assembly, maintenance, and repair of the QuadGuard® Elite M10. Failure to fulfill these RESPONSIBILITIES with respect to the assembly, maintenance, and repair of the QuadGuard® Elite M10 could result in serious injury or death.

Important: 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 Trinity Highway representative. This system has been deemed eligible by the FHWA for use on the national highway system under strict criteria utilized by that agency.

This manual must be available to the worker overseeing and/or assembling the product at all times. For additional copies, contact Trinity Highway directly at (888) 323-6374 or visit TrinityHighway.com.

The instructions contained in this manual supersede all previous information and manuals. The information, illustrations, and specifications in this manual are based on the latest QuadGuard® Elite M10 system information available to Trinity Highway at the time of printing. We reserve the right to make changes at any time. Please contact Trinity Highway to confirm that you are referring to the most current instructions.

Part No. 620076

Table of Contents

Customer Service Contacts

Trinity Highway is committed to the highest level of customer service. Feedback regarding the QuadGuard® Elite M10 system, its assembly procedures, supporting documentation, and performance is always welcome. Additional information can be obtained from the contact information below:

Trinity Highway:

Telephone	(888) 323-6374 (USA) +1 312 467 6750 (International)
E-mail	TrinityHighway.com/Contact
Online	TrinityHighway.com

Important Introductory Notes

The performance of the QuadGuard® Elite M10 as designed, and approved for reimbursement by the FHWA pursuant to its MASH standard, is dependent upon the proper assembly, deployment and future maintenance of the system. These instructions should be read in their entirety and understood before assembling the QuadGuard® Elite M10. These instructions are to be used in conjunction with the assembly of QuadGuard® Elite M10 system and are for standard assemblies only as specified by the applicable highway authority. If you need additional information, or have questions about the QuadGuard® Elite M10, please contact the highway authority that has planned and specified this assembly and, if needed, contact Trinity Highway Customer Service. 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.

Important: **DO NOT** use any component part that has not been specifically approved for this system during the assembly or repair of this system.

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 Trinity Highway 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

This section describes the safety symbols that appear in this QuadGuard® Elite M10 manual. Read the manual for complete safety and assembly information.

Symbol	Meaning
	**Safety Alert Symbol:** Indicates Important, Caution, Warning, or Danger. Failure to read and follow the Important, Caution, Warning, or Danger indicators could result in serious injury or death to workers and/or bystanders.
	**Warning:** Read safety instructions thoroughly and follow the assembly directions and suggested safe practices before assembling, maintaining, or repairing the QuadGuard® Elite M10. It is the responsibility of the installer to follow the instructions contained in this manual. Failure to comply with these warnings could result in increased risk of serious injury of death in the event of a vehicle impact.
	**Important:** Please keep up-to-date instructions for later use and reference by anyone involved in the assembly of the product.

Safety Rules for Assembly

*** Important Safety Instructions ***

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 QuadGuard® Elite M10. Additional copies of this manual are available from Trinity Highway by calling (888) 323-6374 or at TrinityHighway.com/Contact. Please contact Trinity Highway if you have any questions concerning the information in this manual or about the QuadGuard® Elite M10.

It is the responsibility of the installer to use appropriate safety precautions when operating power equipment, mixing chemicals, and when moving heavy equipment or QuadGuard® Elite M10 components. Safety articles including but not necessarily limited to work gloves, eye protection, safety-toe shoes, and back protection should be used.

Warning: It is the responsibility of the installer to use all safety measures incorporating appropriate traffic control devices specified by the highway authority. These measures must be used to protect all personnel while at the assembly, maintenance, or repair site.

Warning: Failure to comply with these warnings could result in increased risk of serious injury or death in the event of a vehicle impact with a system that has not been accepted by the FHWA.

Warning: Use only Trinity Highway parts on the QuadGuard® Elite M10 for assembly, maintenance, or repair. The use of component parts not specified herein is **strictly prohibited**. The QuadGuard® Elite M10 assembled with Trinity Highway Parts has been tested, approved, and accepted for state use by the FHWA. A QuadGuard® Elite M10 Assembly using parts other than those specified herein has not been tested, approved, or accepted for state use by the FHWA. Failure to follow this warning could result in increased risk of serious injury or death in the event of a vehicle impact.

Limitations and Warnings

Pursuant to MASH "Recommended Procedures for the Safety Performance of Highway Safety Features", Trinity Highway contracts with FHWA approved testing facilities to perform and evaluate crash tests to prepare a crash test results report. Trinity Highway is then able to submit a Request for Federal Aid Reimbursement of Safety Hardware Devices to the FHWA for review.

The QuadGuard® Elite M10 has been deemed eligible by FHWA as meeting the requirements and guidelines of MASH. These tests 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 QuadGuard® Elite M10 is certified to the Test Level(s) as shown below:

Test Level 3: 62 mph [100 kph]

These AASHTO 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 only to the test matrix criteria of MASH as approved by FHWA.

Trinity Highway 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 Trinity Highway or by third parties.

The QuadGuard® Elite M10 system is intended to be assembled, delineated, and maintained within specific state and federal guidelines. It is important for the highway authority specifying the use of a highway product to select the most appropriate product configuration for site specifications. The customer 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.

Warning: Do not assemble, maintain, or repair the QuadGuard® Elite M10 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 Trinity Highway at (888) 323-6374 if you do not understand these instructions.

Warning: Ensure that all of the QuadGuard® Elite M10 Danger, Warning, Caution, and Important statements within the QuadGuard® Elite M10 manual are completely followed. Failure to follow this warning could result in serious injury or death in the event of a collision.

System Overview

The QuadGuard® Elite M10 is a potentially reusable, re-directive, non-gating crash cushion for roadside features of 24" [610 mm]. It consists of energy-absorbing high density polyethylene cylinders surrounded by a framework of Quad-Beam Panels.

Important: Trinity Highway 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.

The QuadGuard® Elite M10 system utilizes two types of Cylinders in a "staged" configuration that are designed and tested to address vehicles as defined by MASH for both lighter cars and heavier, high center-of-gravity vehicles.

Impact Performance

The **8 Bay** QuadGuard® Elite M10 systems have successfully passed the requirements stipulated in MASH, Test Level 3 tests with both the light car and pickup trucks at speeds of up to **62 mph [100 kph]** at angles up to 25 degrees.

During head-on impact testing, within MASH criteria, the QuadGuard® Elite M10 has been shown to telescope rearward to absorb the energy of impact. When impacted from the side, within the applicable MASH criteria, it has been shown to redirect the vehicle back toward its original travel path and away from the highway feature.

Warning: It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that the QuadGuard® Elite M10 and delineation used meet all federal, state, specifying agency, and local specifications.

Warning: It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that the QuadGuard® Elite M10 meets all appropriate Manual on Uniform Traffic Control Devices ("MUTCD") and local standards.

Inspect Shipping

Check the received parts against the shipping list supplied with the system before deploying the QuadGuard® Elite M10. Make sure all parts have been received (pp. 7 - 11).

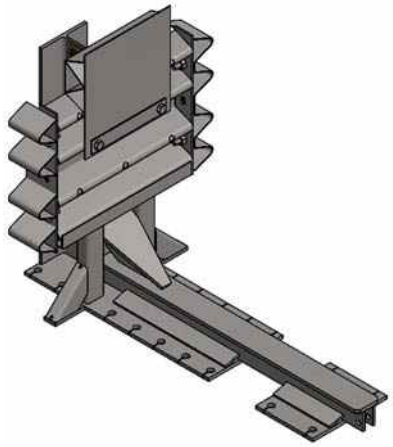
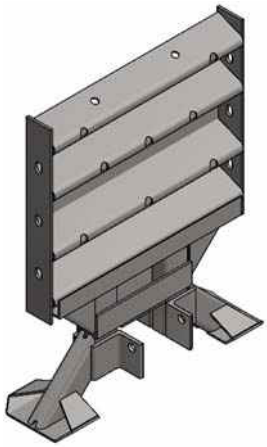
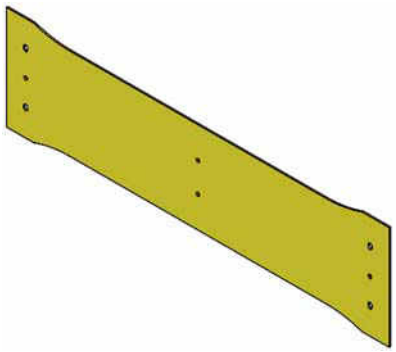
Important: The Manufacturer's Drawing Package supplied with the QuadGuard® Elite M10 must be used with these instructions for proper assembly and should take precedence over these general instructions.

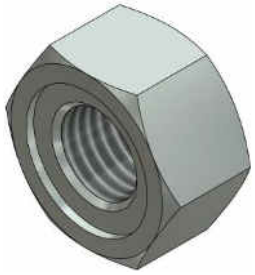
Warning: Do NOT modify the QuadGuard® Elite M10 in any way.

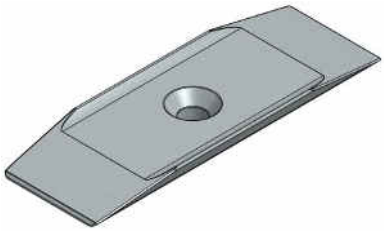
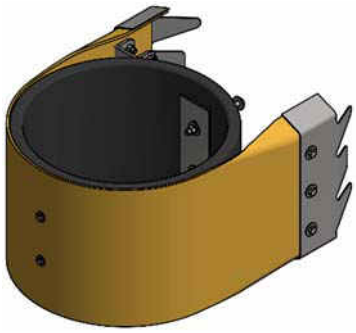
System Components

Below is a list of system components that may be used in your particular QuadGuard® Elite M10 configuration. Verify parts delivered and system details with the BOM (Bill of Materials) and system drawings shipped with your system. Please call Trinity Highway if you have any system questions (p. 3).

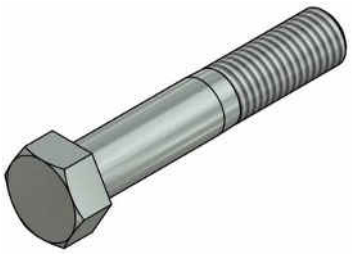
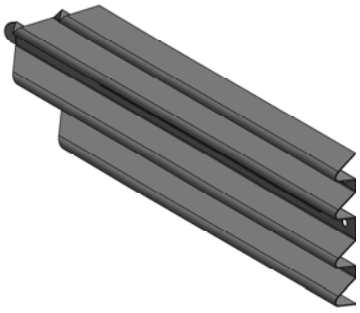
Note: Components are not shown to scale.

Tension Strut Backup 24”	Diaphragm 24”	Belt Nose, Y
		
618857	625647	605100

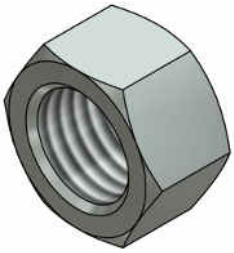
Flat Screw 5/8X5,G8	Die Spring, 5/8 X 1 1/2	Rail Nut, Hex, 5/8
		
116878	117459	003340

Mushroom Washer	Rail Bolt, 5/8”X2”, G5	Nose Assy 24, M10, QGE, Y
		
617045	118614	618843

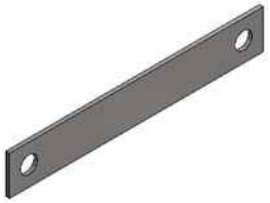
Cylinder Nose, HDPE, 28X20	Extension, Backup, M10, QGE	Bolt, Hex,3/4X5,G5,G
		
606689	618536	113573

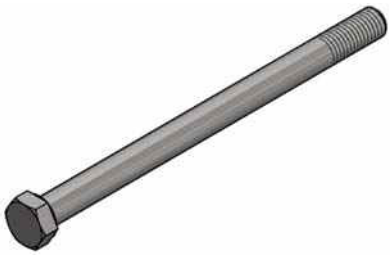
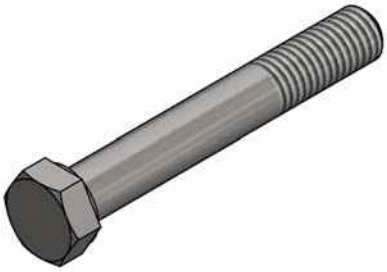
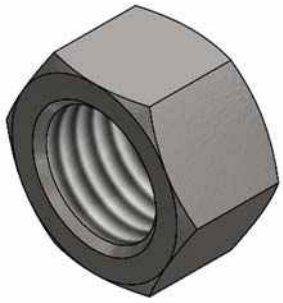
Plate, Nose Cylinder, G	Bolt, Hex, 5/8X3 1/2, G5	Panel, Fender, QG
		
612253	113660	611832

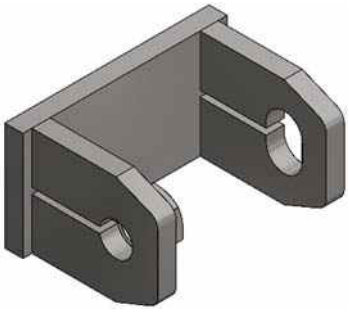
Bolt, Hex, 5/8X2, G5	Washer, Flat, 5/8X1 3/4	Washer, Lock, 5/8
		
118570	003300	118100

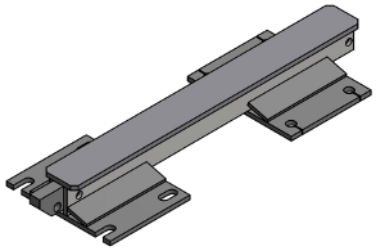
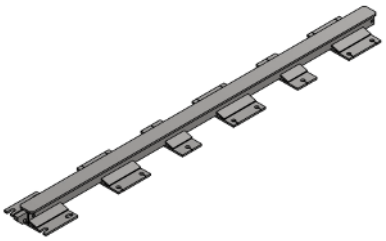
Bolt, Hex, 3/4X9,G5,G	Washer, Lock, 3/4	Nut, Hex, 5/8
		
118563	118089	115970

Bolt, Hex, 3/4X2, G8	Monorail Guide	Nut, Heavy Hex, 3/4
		
113555	611368	003704

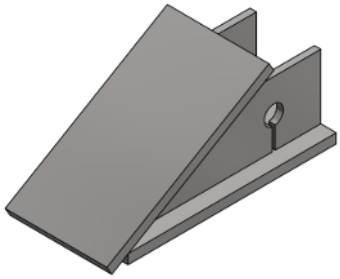
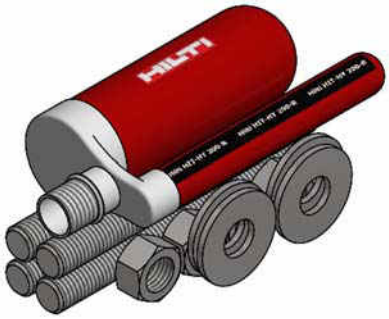
Panel, Side, QG	Extension, Diaphragm, Flat	Flt St 3/16X2X13, W/Holes
		
611898	618525	618652

Bolt, Hex 5/8”X9” A325	Bolt, Hex 1/2”X3 1/2”, G5	Nut, Hex 1/2”
		
004489	113474	115939

Washer, Flat 1/2”X1 3/8”	Washer, Lock 1/2”	Stop, Tab, Weldment, G
		
118009	118082	614666

Monorail, One Bay, QG, G	Monorail, Three Bays, QG, G	Clamp, Nose Belt, QG, G
		
611370	611379	606330

Stud, 3/4X6 1/2, G5	Stud, 3/4X7, G5	Bolt, Hex, 3/4X9,G5,G
		
117540	117542	118563

Washer, Flat, 3/4X2	End Cap, Monorail, QG, G	Approved Adhesive
		
118027	608136	619316

Cylinder ME1 MASH	Cylinder ME2 MASH	Cylinder Assy ME3 MASH
		
618538	618649	618702

Spring Torsion .078 LH ST	Spring torsion .078 RH ST	Bracket Hit Indicator LMC
		
117466	117467	605464

Recommend Tools

Documentation

- Manufacturer's Assembly Manual
- Manufacturer's Drawing Package

Personal Protective equipment

- Eye Protection
- Gloves
- Safety Toe Shoes

Cutting equipment

- Rotary Hammer Drill
- Rebar cutting bit
- Concrete drill (Double Fluted*) bits – 22 mm [7/8"]
- Grinder, Hacksaw or Torch (optional)
- Drill motor
- Drill bits 1/16" through 7/8"

Important: Trinity Highway recommends using Double Fluted drills to achieve required tensile strength when assembling the approved anchoring system.

Hammers

- Sledgehammer
- Standard hammer

Wrenches

- Heavy duty impact wrench
- Standard adjustable wrench
- 1/2" drive Sockets: 9/16", 11/16", 3/4", 15/16", 1 1/8", 1 1/4"
- 1/2" drive Deep Sockets: 15/16", 1 1/4"
- 1/2" drive Ratchet and attachments
- 1/2" drive Breaker Bar - 24" long
- 1/2" drive Torque Wrench: 200 ft.-lbs.
- Crescent Wrench: 12” [300 mm]
- Allen Wrench: 3/8”
- Impact Wrench: 1/2"

Important: Because every impact is different, Trinity Highway 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.

Miscellaneous

- Traffic control equipment
- Lifting and moving equipment - Minimum 5,000 lb. capacity required
- Air Compressor (100 psi) and Generator (5 kW)
- Pry bar
- Drift pin 300 mm [12”]
- Center punch
- Tape measure 25’ [7.5 m]
- Chalk line
- Concrete marking pencil
- Nylon bottle brush for cleaning 7/8” drilled holes
- Rags, water, and solvent for touch-up
- Chain, 3/8” grade 40, 20’ [6 m] with 1/2” [13 mm] hooks
- Acetylene torch

Note: The above list of tools is a general recommendation and should not be considered an extensive list. Depending on specific site conditions and the complexity of the assembly specified by the appropriate highway authority, the required tools may vary. Decisions as to what tools are needed to perform the job are entirely within the discretion of the specifying highway authority and the authority’s selected contractor performing the assembly of the system at the authority’s specified assembly site.

Site Preparation/Foundation

A QuadGuard® Elite M10 should be assembled only on an existing or freshly placed and cured concrete foundation (4000 psi [28 MPa] minimum). Location and orientation of the concrete base and attenuator must comply with project plans or as otherwise determined by the resident project engineer.

Recommended dimension and reinforcement specifications for new concrete foundations are provided in Trinity Highway Concrete Foundation drawing, supplied with the system. The system may only be assembled on reinforced concrete roadway (minimum 6” [150 mm] thick). Assembly cross-slope shall not exceed 8% and should not twist more than 2% over the length of the system; the foundation surface shall have a light broom finish.

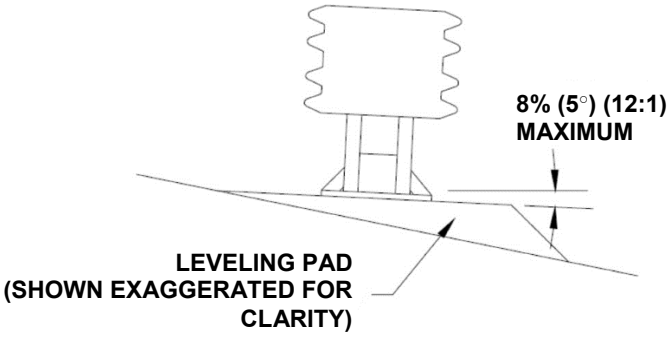


Figure 1
Cross-Slope

Caution: Accurate placement of all steel rebar is critical to avoid interference with the concrete anchor bolts.

Warning: Location of the Backup in relation to nearby objects will affect the operation of the attenuator. Upon impact, the Fender Panels telescope rearward and extend beyond the rigid Backup as much as 25” [635 mm]. Position the Backup so that the rear ends of the last Fender Panels are a minimum of 25” [635 mm] forward of objects that would otherwise interfere with movement of the rearmost Fender Panels. Failure to comply with this requirement is likely to result in system performance which has not been crash tested pursuant to MASH criteria and may also cause component damage which will necessitate maintenance or replacement of the system.

Warning: Ensure that there is proper site grading for the QuadGuard® Elite M10 placement as dictated by the state or specifying agency pursuant to the AASHTO Roadside Design Guide.

Foundation/Anchoring

Warning: It is the responsibility of the local DOT or appropriate highway authority to ensure that this assembly conforms to the AASHTO Roadside Design Guide.

Warning: It is the responsibility of the installer to ensure that your assembly procedure meets all appropriate Occupational Safety and Health Administration ("OSHA") and local standards.

Asphalt Installations

Warning: QuadGuard® Elite M10 systems have not been tested on asphalt.

Concrete Installations

For concrete installations, the QuadGuard® Elite M10 system should be installed only on an existing or freshly placed and cured concrete base (4000 psi [28 MPa] minimum). Orientation of the concrete base and the attenuator must comply with the project plans or as otherwise determined by the resident project engineer or appropriate highway authority.

Recommended dimension and reinforcement specifications for new concrete pads can be found on the standard drawings.

Concrete Pad or Roadway

Foundation: 150 mm [6"] minimum depth P.C.C.

Anchorage: Approved adhesive with 180 mm [7"] studs 140 mm [5 3/4"] embedment

Determine Transition Type

Note: A proper Transition Panel or Side Panel must be used on each side of the Backup. A Side Panel is not needed when a Transition Panel is used.

Note: The proper Transition Panel or Side Panel must be used for proper Transition Panel impact performance of the system. The correct panel to use will depend on the direction of traffic and what type of highway feature the QuadGuard® Elite M10 is shielding. Contact the Customer Service Department prior to assembly if you have any questions (p. 3).

Figure 2
Side Panel

Trinity Highway Approved Adhesive Anchoring System

A Trinity Highway 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

Note: Read all Trinity Highway approved adhesive instructions before starting.

1) **Prepare the Concrete Foundation**

Warning: Do not allow anchoring adhesive to contact skin or eyes. See material safety data sheet supplied with adhesive kit for first-aid procedures. Use only in well-ventilated area. Do not use near open flame.

Warning: It is the responsibility of the installer to maintain a safe work area including the use of standard work zone safety equipment & PPE: gloves, safety-toe shoes, and eye / ear protection.

The anchor bolts (studs) that anchor the QuadGuard® Elite M10 Backup and/or Monorail sections to the concrete foundation must be those shipped in the kit or of high strength steel (120,000 psi [830 MPa] minimum tensile strength or equal). 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) **Drill Boreholes**

Caution: It is the responsibility of the installer to consult OSHA silica respiratory standard 29 CFR 1910.134 for debris removal from borehole(s) and use Trinity Highway approved adhesive to achieve optimum tensile strength. Do not use diamond drill bits for drilling boreholes.

Use the Monorail(s) and Tension Strut Backup as drilling templates. Use a rotary hammer drill to drill the boreholes 7/8" [22 mm] diameter to the recommended depth. See the approved adhesive instructions provided with adhesive kit. Check to ensure each borehole is drilled to the proper depth and aligned with the part to be anchored per Anchoring Information table.

Anchor Information					
Stud Size:	**Orientation**	**Bit Size**	**Minimum Depth**	**Torque**	**Medium**
3/4" X 6 1/2"	Horizontal	22 mm [7/8"]	125 mm [5"]	Manufacturer Spec	Concrete
3/4" X 7"	Vertical	22 mm [7/8"]	146 mm [5 3/4"]	Manufacturer Spec	Concrete

3) **Clean the Boreholes**

Blow the concrete dust from the borehole using (90 psi) oil-free compressed air. Thoroughly brush the borehole with a 7/8" 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 using oil-free compressed air.

Note: Use of the Trinity Highway approved vacuum drilling equipment is authorized to replace the blowing and brushing requirement of Step 3.

4) Apply Approved Adhesive

Fill the borehole 100% full.

Caution: Fill borehole 100% full so it is even with the pavement surface per the adhesive manufacturer's instructions.

5) Add the Washers and Nuts

Place a flat washer onto the stud then thread a nut on until the end of the stud is flush with the nut (Figure 3).

6) Insert Studs in Boreholes and Wait for Adhesive to Cure

Push the stud down through the part to be anchored and into the borehole.

Warning: Do not disturb or load the stud until the approved adhesive material has fully cured (reference instructions supplied with the approved adhesive kit).

Figure 3
Anchor Application
(Before Applied Torque)

7) Torque the Nuts

Once the adhesive has fully cured, torque the nut to the adhesive manufacturer's recommended values.

Anchor Assembly Cautions

1) Steel rebar

If steel rebar is encountered while drilling an anchor bolt borehole, apply one of the following solutions:

A) Use a rebar drill bit for the **rebar only** and then switch back to the concrete bit to finish drilling into the underlying concrete until the proper borehole depth is reached.

Caution: Do not drill through rebar without first obtaining permission to do so from the project engineer.

B) Drill a new borehole down at an angle past the rebar to the proper depth. Anchor the stud by completely filling both boreholes with an approved adhesive.

Horizontal Anchors

The horizontal approved adhesive kit is the same as the vertical kit.

Caution: Fill borehole 100% full so it is even with the vertical concrete surface per manufacturer's instructions.

1) **Follow the instructions supplied with your approved adhesive kit**

   Apply approved adhesive to each anchor per instructions.

2) **Add the Washers and Nuts**

   Put washer and nut on stud so the **nut is flush with end of stud**.

3) **Insert each Stud with Washer and Nut into Borehole**

   Push stud with washer and nut into borehole.

Important: The stud should be flush with the top of the nut in both **vertical** and **horizontal** applications prior to tightening (Figure 4).

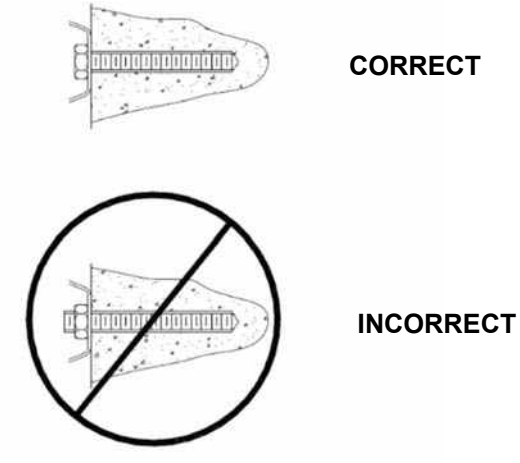


Figure 4
Horizontal Application
(Before Applied Torque)

Caution: Do not disturb or load the stud until the approved adhesive material has hardened (reference approved adhesive kit instructions for hardening times).

4) **Torque the nuts**

   Once the adhesive has fully cured, torque nut(s) to the approved adhesive manufacturers specification.

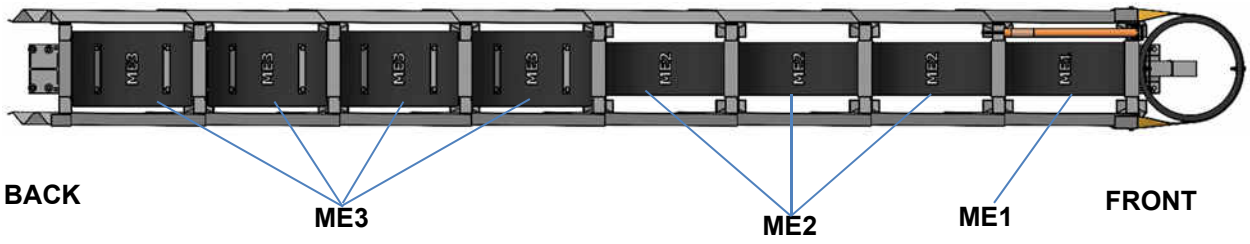


Figure 5 Plan View

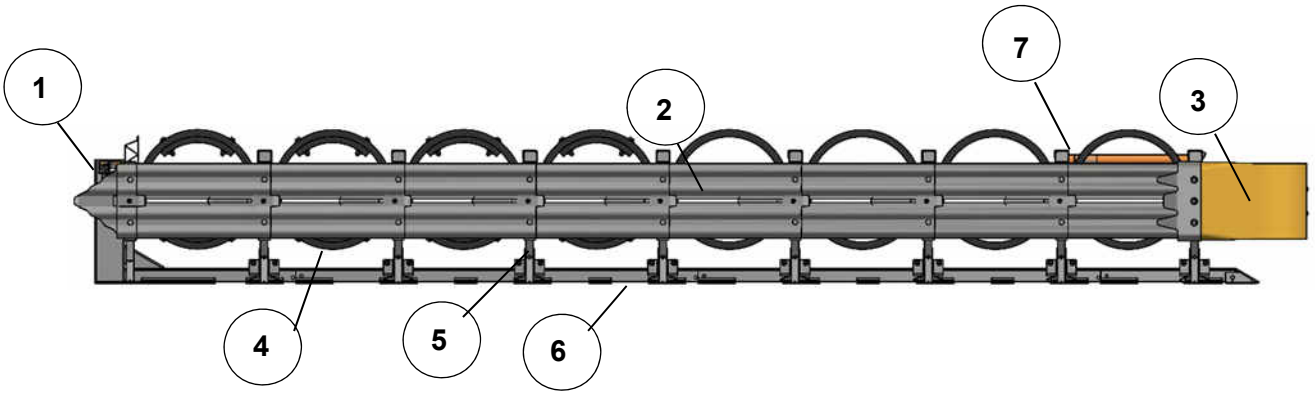


Figure 6 Elevation View

KEY

1) **Backup**
2) **Quad-Beam Fender Panel**
3) **Belt Nose**
4) **Cylinder**
5) **Diaphragm**
6) **Monorail**
7) **Hit Indicator**

How to Determine Left/Right

To determine left from right when ordering parts, stand in front of the system facing the road feature. Your left is the system's left and your right is the system's right.

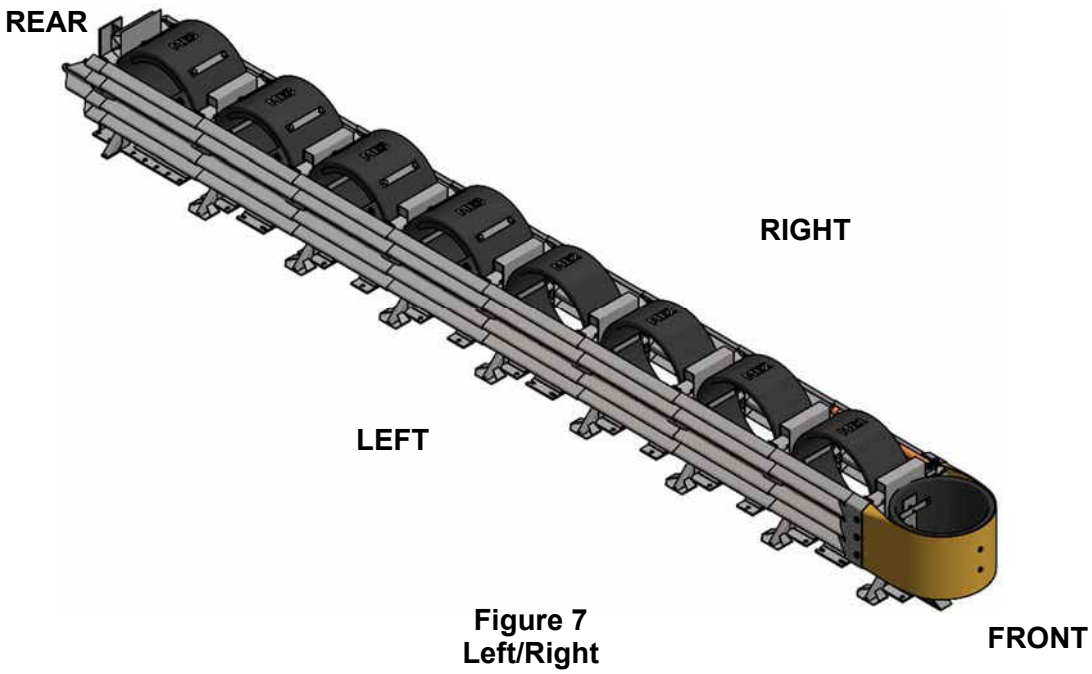


Figure 7
Left/Right

Counting the Number of Bays

One Bay consists of one Diaphragm, two Fender Panels, etc. The Nose Assembly is not considered a Bay (Figure 8).

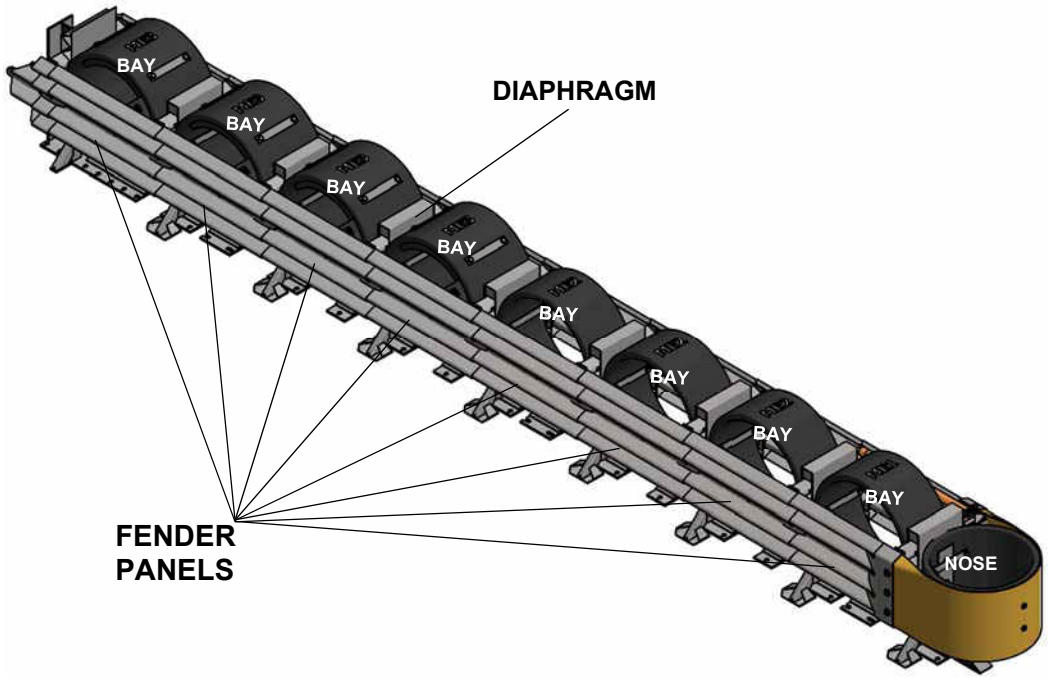


Figure 8
8 - Bay System

Measuring the Width

The nominal width of the **24" parallel system is the width of the Backup** (Figure 9). The outside width of the system is approximately 6" [152 mm] wider than the nominal width. The outside width of the system is not the same as the width of the Backup.

Figure 9
Width of a Parallel System

QuadGuard® Elite M10 System Chart	
Width	**8 Bay - 62 mph [100 kph]**
24" [610mm]	QM10024E

QuadGuard® Elite M10

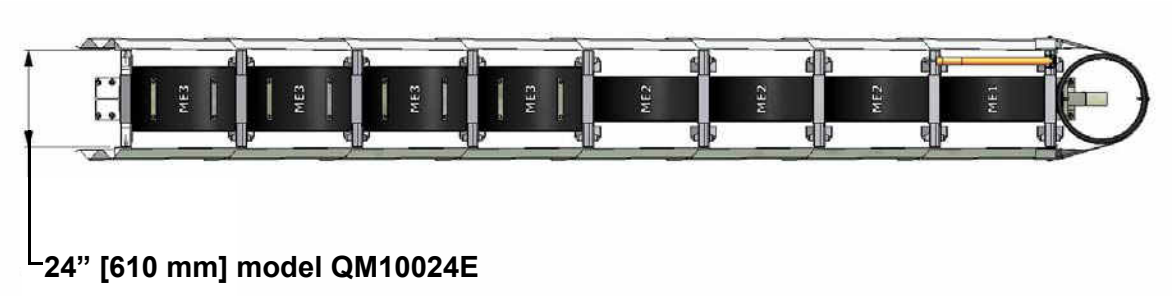


Figure 10
8 - Bay System

Assembly Procedures

Note: The Drawing Package supplied with the QuadGuard® Elite M10 must be used with these instructions for proper assembly and should take precedence over these general instructions.

1) Determine Backup & Transition Type

The QuadGuard® Elite M10 uses a Tension Strut Backup.

A Transition Panel or Side Panel must be used on each side of the Backup (Figure 11). A Side Panel is not needed when a Transition Panel is used. Several types of transitions are available for use with the QuadGuard® Elite M10.

Tension Strut Backup

The QuadGuard® Elite M10 uses a Tension Strut Backup.

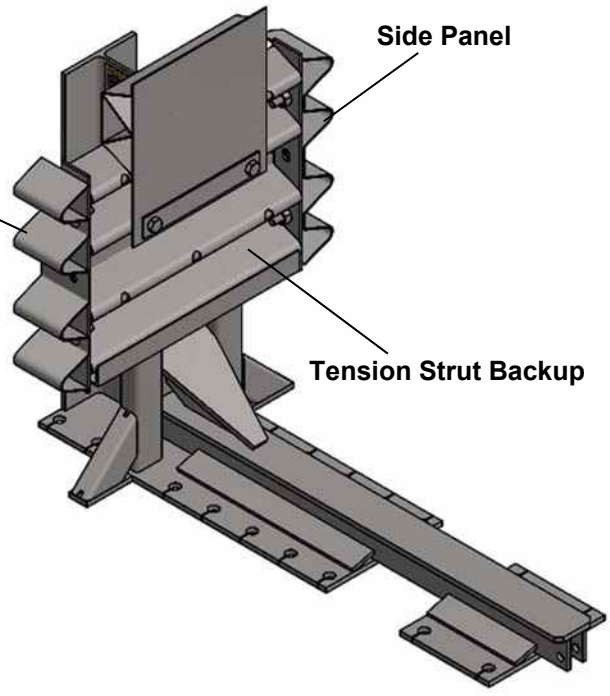


Figure 11
Narrow Tension Strut Backup

2) Mark System Location

A. Locate the centerline of the system by measuring the proper offset from the hazard. See the drawing package supplied with the system.

B. Mark the centerline of the system with a chalk line.

C. Mark a construction line parallel to the center line and offset 6.5” [165 mm] to one side as shown in Figure 12.

D. The edge of the Monorail will be placed on this line.

Note: The concrete pad must comply with the Manufacturer’s Drawing Package supplied with the system.

Warning: Only Strong Soil, AASHTO M147 with static performance >90% is to be used with the assembly of a transition in soil.

Warning: Location of system with respect to the hazard is critical and dependent on the type of Transition Panel used. See the project plans supplied with the system for details.

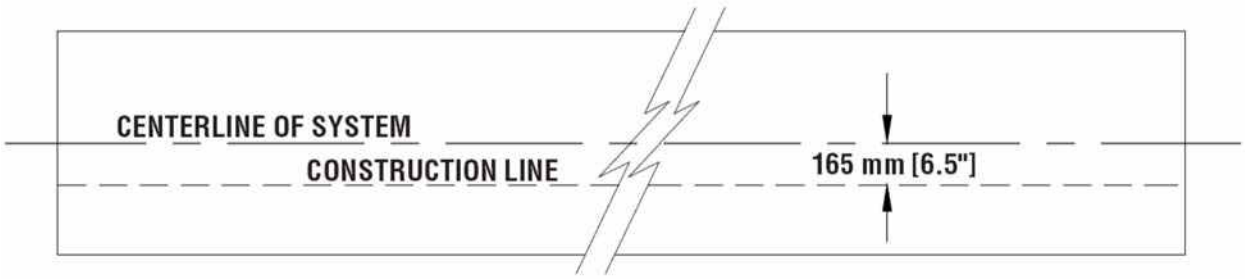


Figure 12
(Top view of concrete pad)
Locating Construction Line

3) Anchor the Backup and Monorail

See Figure 13 (showing Backup Assembly) and Figure 15 (showing Monorail deployment). Also refer to the drawing package and the approved anchoring instructions (p. 15).

Warning: Location of the system as determined by the proper highway authority is critical and dependent on the type of Transition Panel used. Consult project plans supplied by the applicable highway authority with the system for details.

Step 1. Tension Strut Backup Assembly (Figure 13)

Locate the Backup and Monorail on the pad with the side of the Monorail on the construction line (Figure 12). Verify that applicable Transition Panels fit properly before anchoring the Backup. Drill 5 3/4" [146 mm] deep anchor holes in the pad using the Backup as a template. Do not drill through pad. Anchor the Backup to the concrete pad using approved adhesive kits (p. 15).

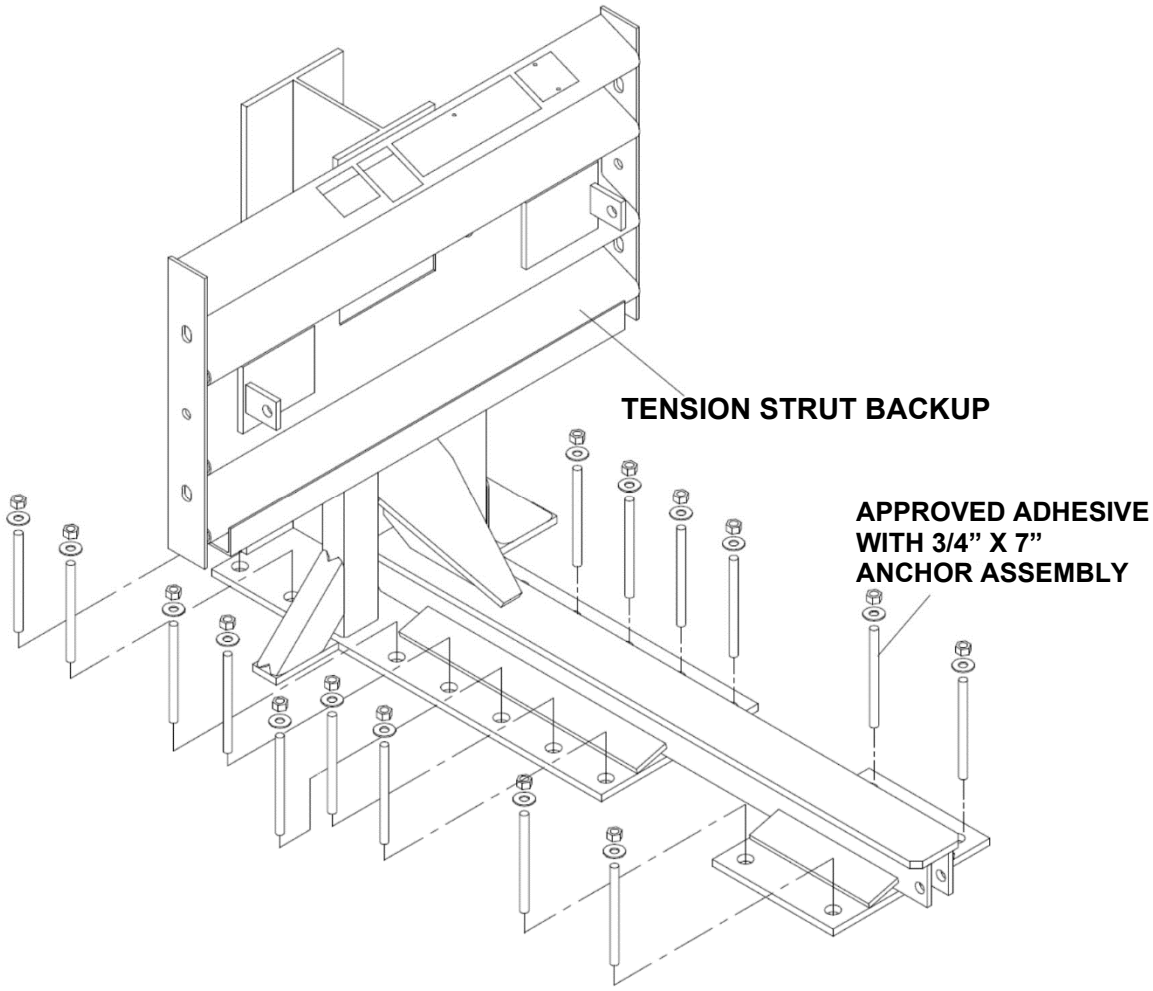


Figure 13
Anchoring Tension Strut Backup to Foundation

Step 2. Monorail Assembly

Locate the Monorail on the construction line as shown in the Monorail Assembly drawings. Drill 5 3/4" [146 mm] deep anchor holes using the Monorail as a template (Figure 15). Do not drill through the pad. Anchor each Monorail section using the provided approved adhesive kits.

Warning: Improper alignment at the Monorail Splice Joints will prevent proper system collapse during an impact.

Warning: Every hole and slot in Backup and Monorail must have an approved adhesive stud anchoring it.

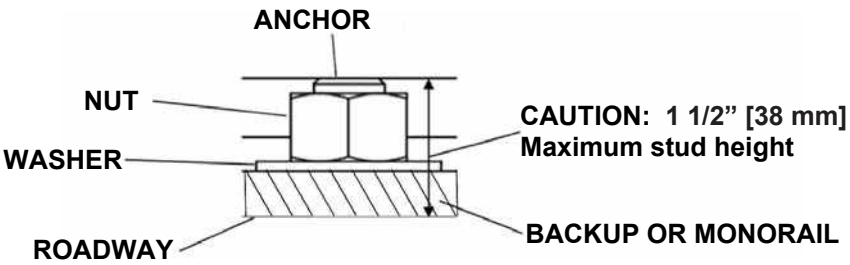


Figure 14
Proper Stud Height

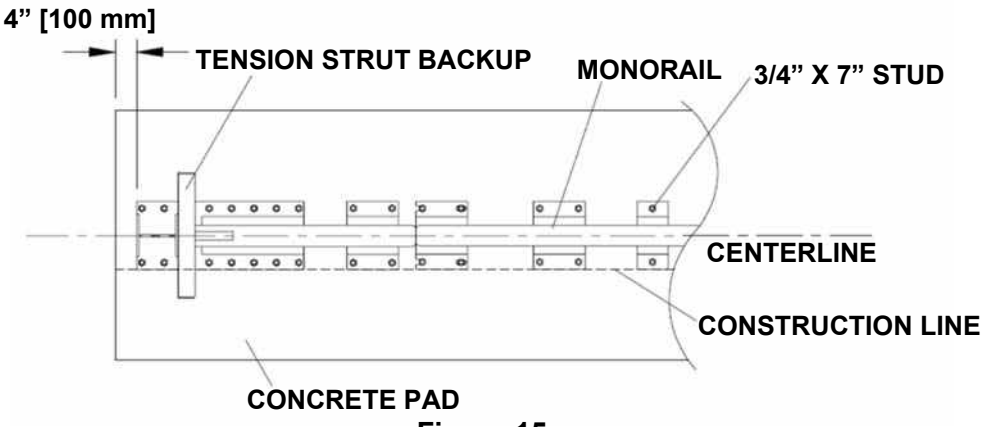


Figure 15
Backup and Monorail Location for Tension Strut Backup

It is important to align each Monorail segment vertically to (±1/16" [2 mm]) (Detail 16a). Anchor each Monorail section using the provided Trinity Highway approved adhesive kit. Do not drill though foundation.

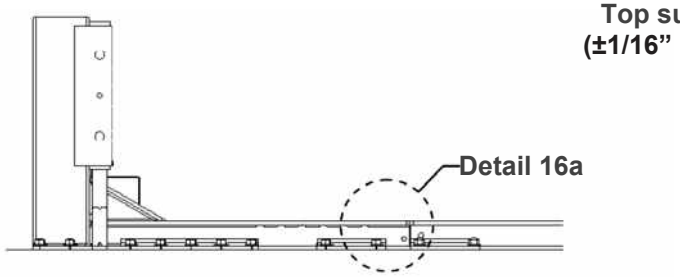
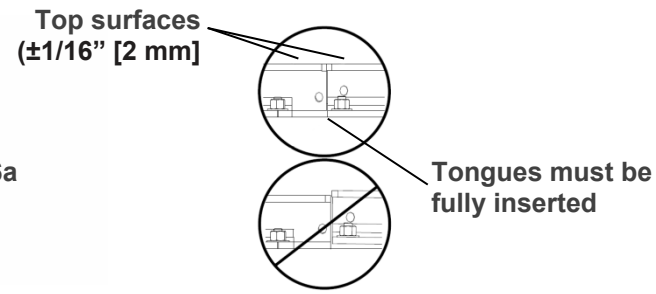


Figure 16
Rail Height and Alignment



Detail 16a

4) Attach Side Panels / Transition Panels to Backup Assembly

Attach the Transition Panel or Side Panel as appropriate to each side of the Backup. Refer to Figure 16 and the drawing package for more information.

Note: A Side Panel is not needed when a Transition Panel is used.

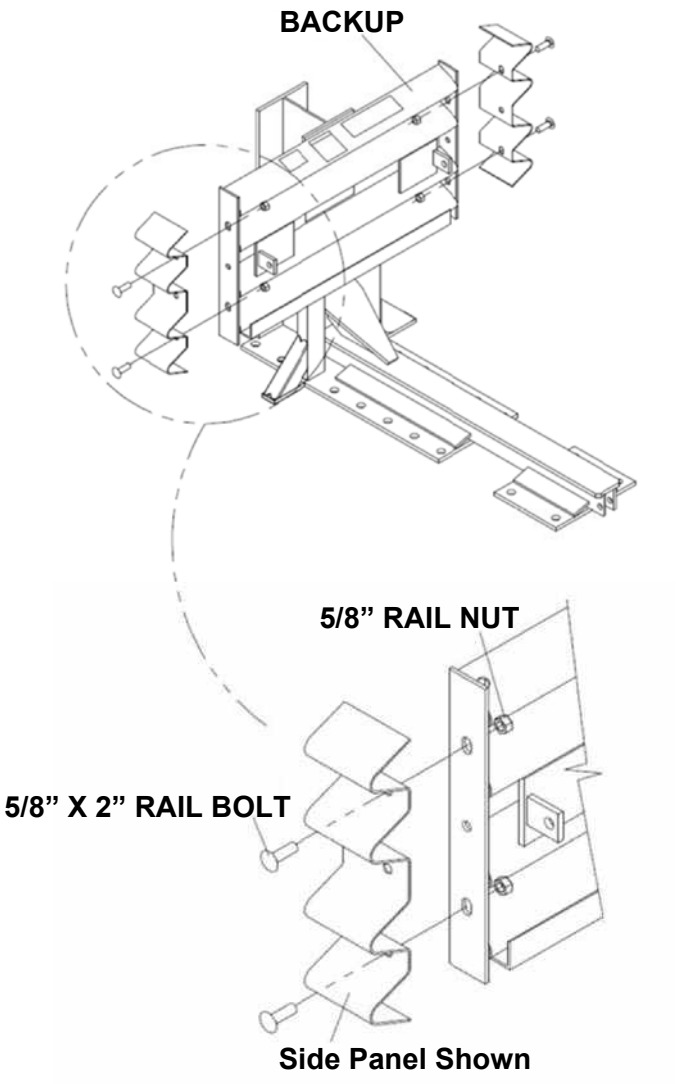


Figure 16
Side Panel/Transition Panel Attachment

5) Attach Monorail Guides

Attach Monorail Guides to Diaphragms as shown in Figure 17, and the Diaphragm Assembly drawing.

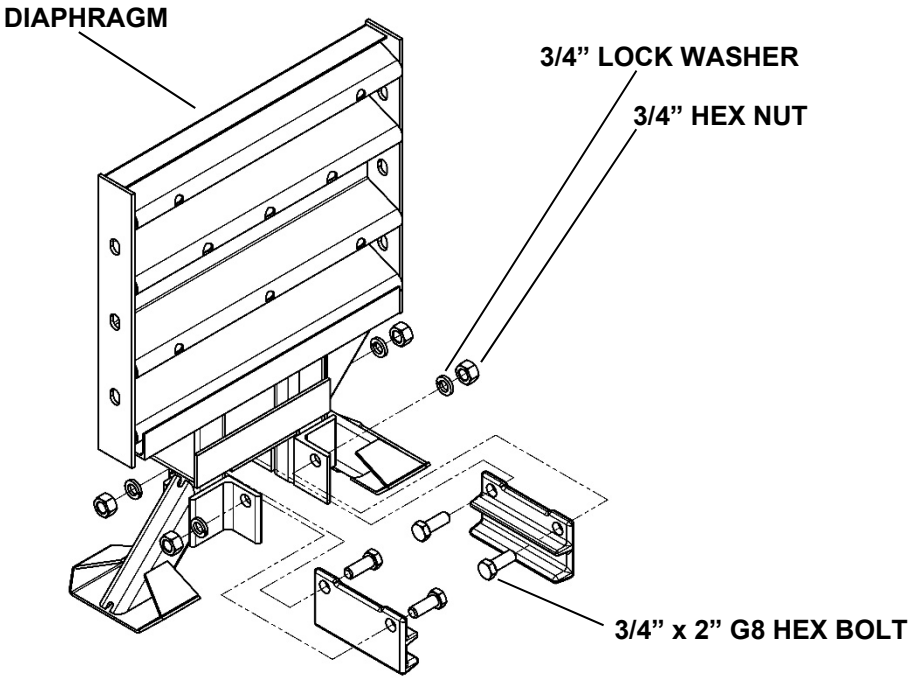


Figure 17
Monorail Guide Attachment

6) Deploy Diaphragms

Orient a Diaphragm so that the front face of the Quad-Beam shape faces toward the Nose of the system as shown in Figure 18. Slide one Diaphragm all the way to the Backup to ensure the system is able to collapse properly during impact. Once this has been verified, slide the Diaphragm forward to approximately 32” [813 mm] in front of the Backup. Orient and slide all Diaphragms onto Monorail and position each approximately as shown below (Figure 19).

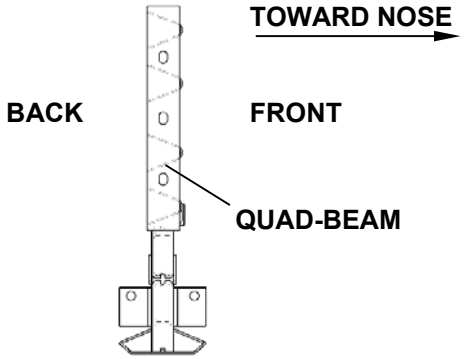


Figure 18
Diaphragm Orientation

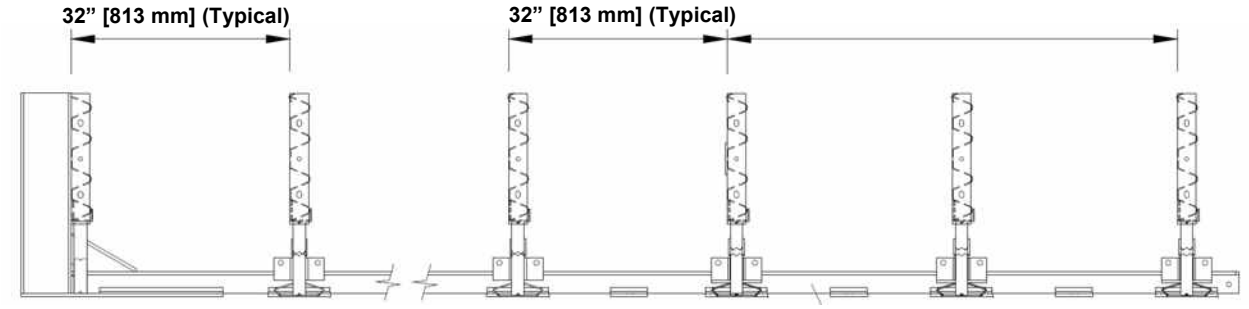


Figure 19
Diaphragm spacing

7) Attach End Cap

Attach End Cap to the Monorail as shown in Figure 20 and the Monorail Assembly drawing.

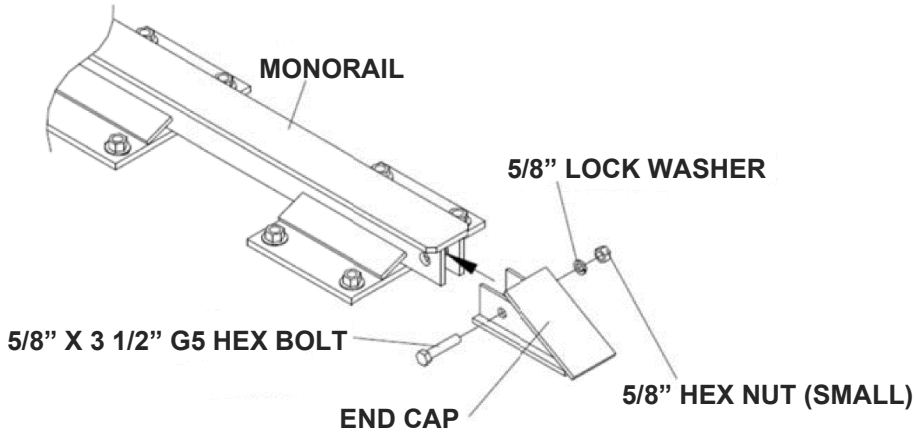


Figure 20
End Cap Attachment

8) Fender Panel Attachment

Starting at the Backup and working forward, assemble Left and Right Fender Panels as shown in Figure 22.

Step 1. Place the Fender Panel so that the center hole of the rearward Diaphragm is lined up with the approximate center of the slot in the Fender Panel.

Attach the Mushroom Washer Assembly as shown in Figure 23 but do not torque at this time. (This helps to balance the Fender Panel.)

Step 2. Slide the Fender Panel forward until the holes in the Fender Panel line up with the holes in the forward Diaphragm.

Step 3. Use a drift pin to align the center hole of the Fender Panel with the center hole of the Diaphragm.

Step 4. Attach the front of the Fender Panels to the next Diaphragm using two rail bolts and large hex nuts per side. Use only the top and bottom holes; leave the center hole open until the next Fender Panel is attached.

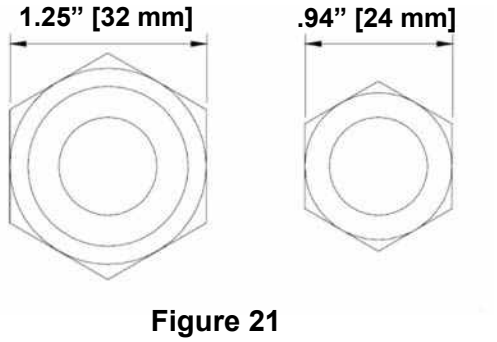


Figure 21
Rail Nuts are Oversize

Note: Do not mix the 5/8” rail nuts (large) with the 5/8” hex nuts (small) (Figure 21).

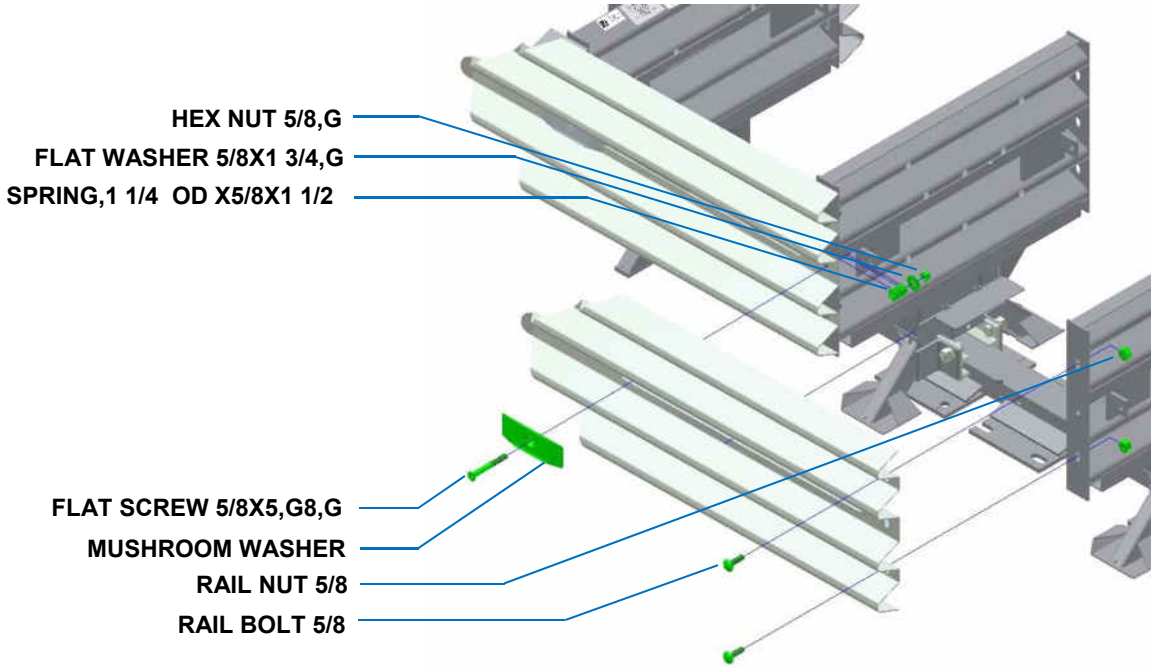


Figure 22
Fender Panel Assembly

Be sure Mushroom Washers lay flat against the Fender Panel as shown below. Stand-off on Mushroom Washer must be seated completely through slot (Figure 23).

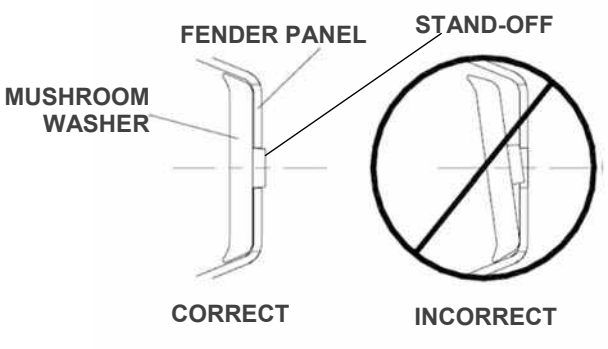


Figure 23

Continue attaching Fender Panels until you reach Diaphragm No. 2. Figure 24 shows the location of Diaphragm No. 2.

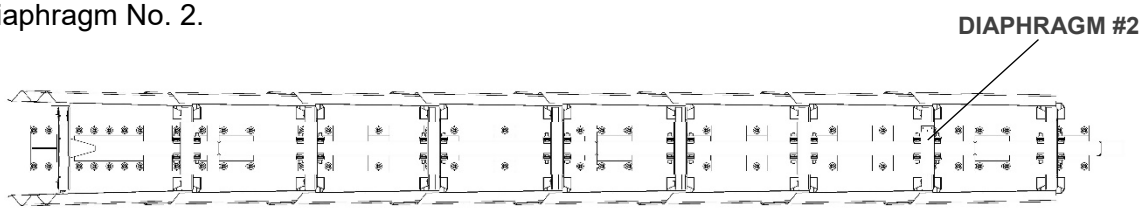


Figure 24
Locate Diaphragm No. 2

9) Cylinder Assembly

All QuadGuard® Elite M10 systems utilize three Cylinder types. Bay 1 contains a Cylinder with ME1 stenciled on the outer surface. The remaining Bays will contain Cylinders with ME2 or ME3 stenciled on the outer surface. The Nose Assembly contains a single walled 28” outside diameter Cylinder with QEN stenciled on the surface. For specific Cylinder quantities and placement, see reference drawings in back.

Warning: Placing the wrong type Cylinder in the nose or any Bay may result in impact standards outside of MASH criteria.

10) Attach Rear Most ME3 Cylinder

Beginning at the Backup, place Backup Extension in place, locate and position a ME3 Cylinder such that it is centered to the mounting holes. Fasten to Backup using 3/4" x 5” hex bolts, hex nuts, and bar washers. Slide the rear most Diaphragm towards the Cylinder such that no gaps exist between the Backup, Cylinder, and Diaphragm.

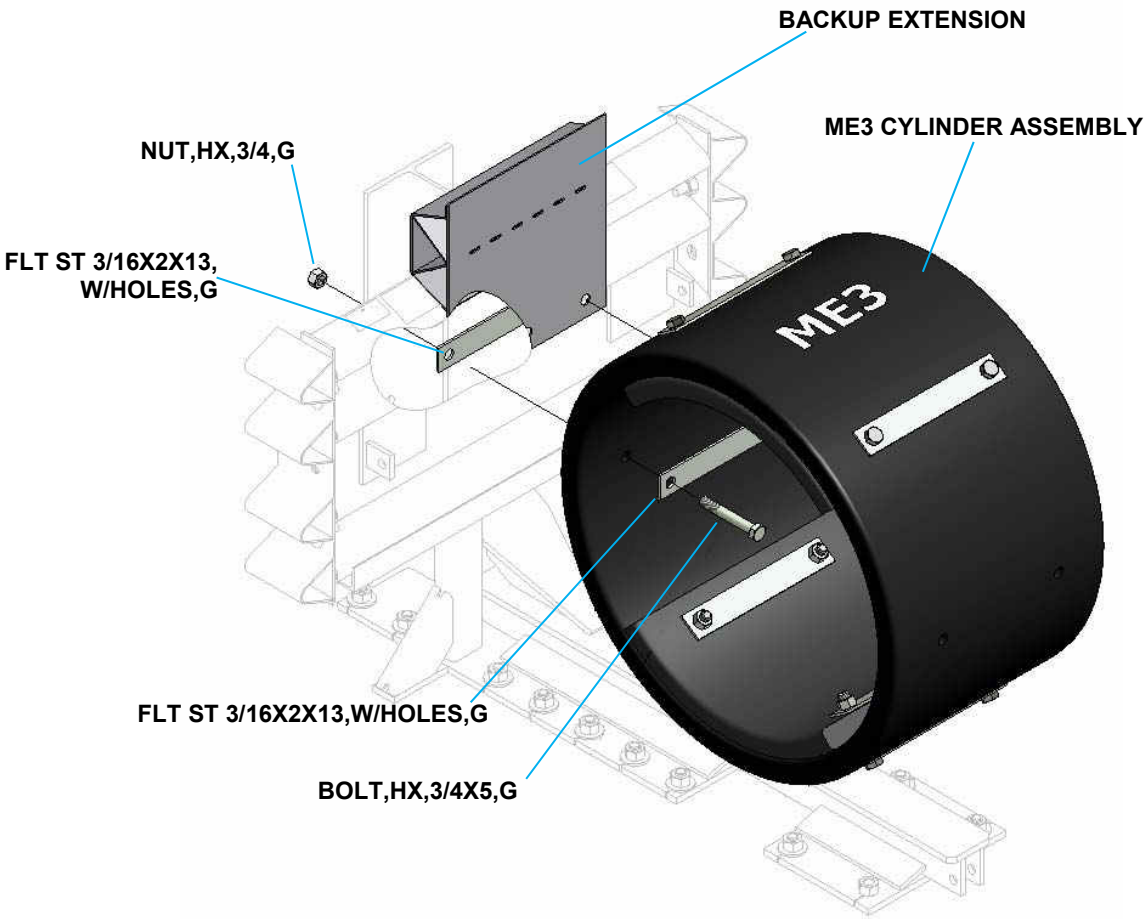


Figure 25
Typical Backup ME3 Cylinder Assembly

11) Attach Remaining ME3 Cylinders

Continue attaching the ME3 Cylinders to their common diaphragms using 3/4" x 9” hex bolts. Work forward from the Backup and attach ME3 Cylinders as you proceed forward. Be sure to remove any clearance between the ME3 Cylinders and their adjacent Diaphragms.

12) Attach the ME2 Cylinders

Attach ME2 Cylinders with Diaphragm Extensions to the appropriate Bays in the same manner used to attach the ME3 Cylinders (See reference drawings in back).

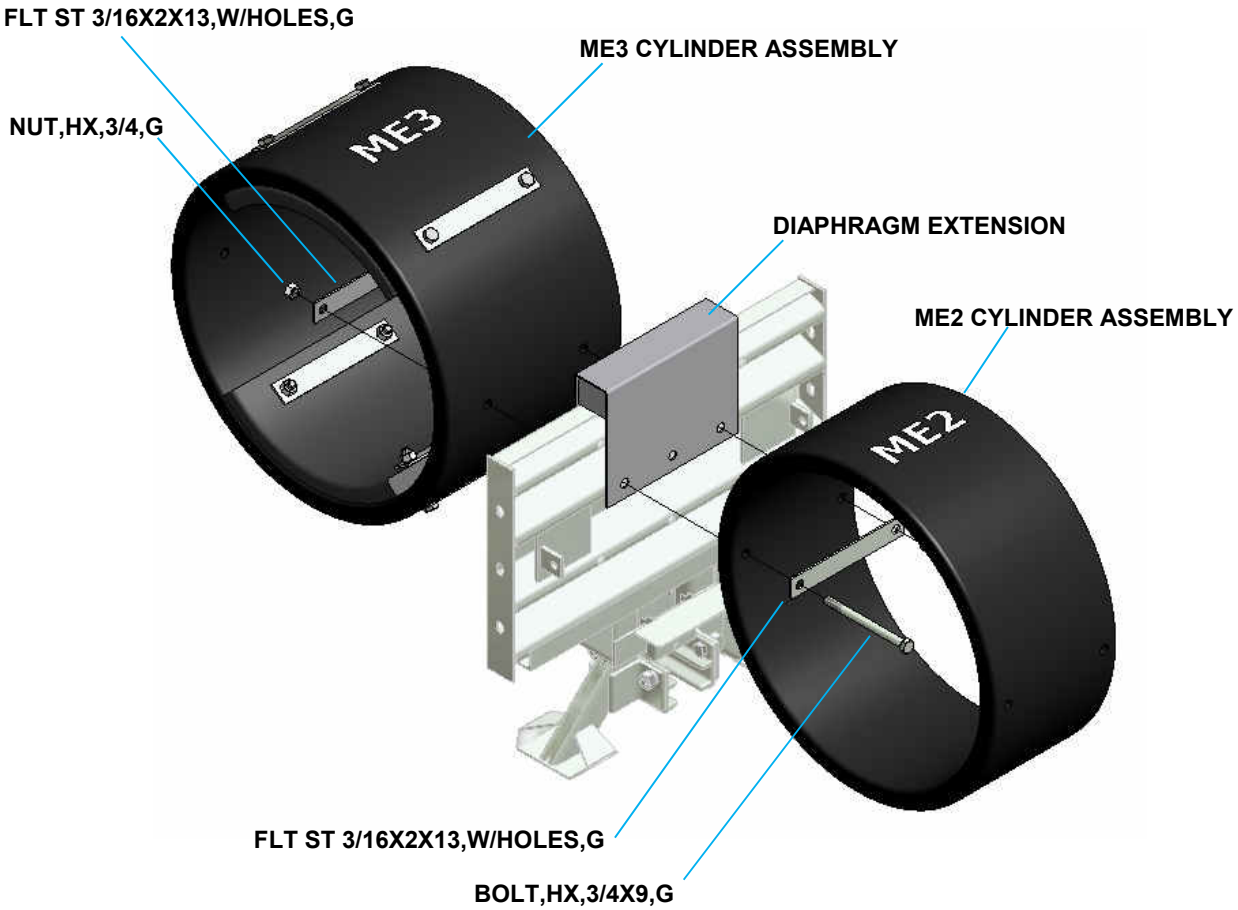


Figure 26
Typical ME3 Cylinder Mounting

13) Attach the ME1 Cylinder in Bay 1

Attach ME1 Cylinder with Diaphragm Extension to Bay 1 in the same manner used to attach the ME2 & ME3 Cylinders.

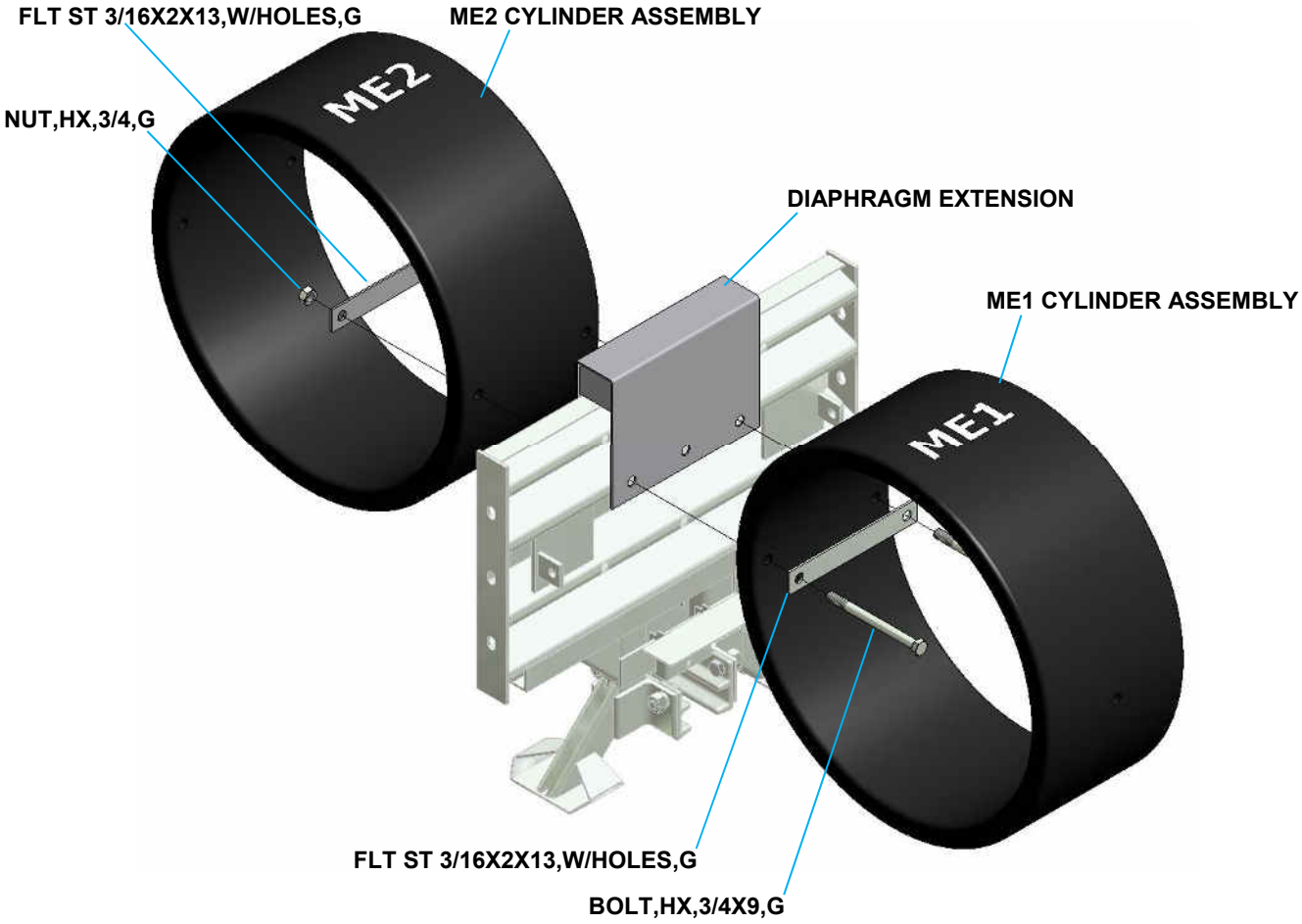


Figure 27
Typical ME1 to ME2 Mounting

14) Attach Nose Cylinder

Attach the Nose Cylinder using two 5/8” bolts through the Nose Cylinder Plate, Nose Cylinder, and Diaphragm (Figure 28). Secure each 5/8” hex bolt with flat washers, lock washers, and hex nuts. Torque bolts to 20 ft-lbf [27 N-m] minimum, 25 ft-lbf [34 N-m] maximum.

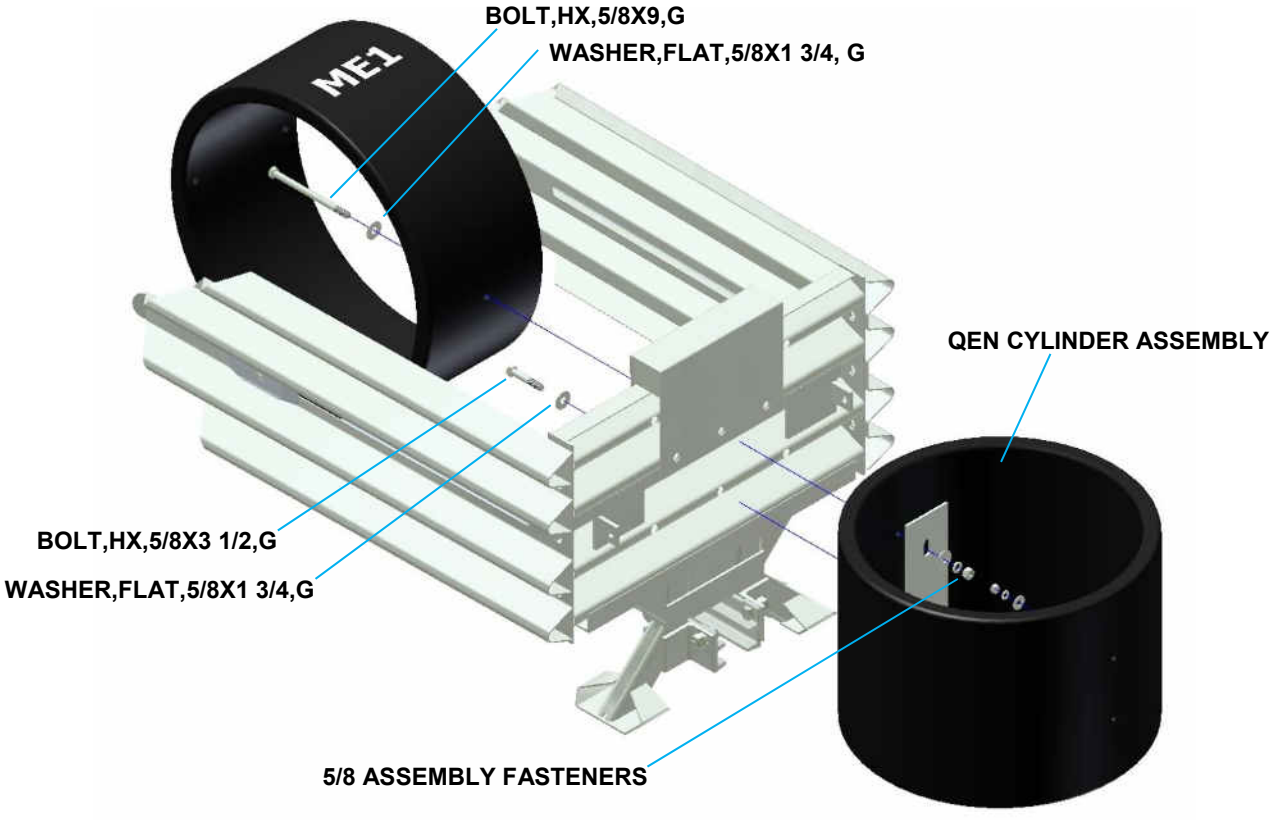


Figure 28
Attach Nose Cylinder to First Diaphragm

15) Attach Nose Belt

Finally attach the Nose Belt to the Fender Panels using 5/8” x 2” long hex bolts (6), 5/8” flat washers (24) and 5/8” hex nuts (18), through the Belt Clamps (Figure 29).

The Nose of the system may be delineated to comply with local codes (chevron, reflectorized sign, etc.).

Warning: Placing the wrong type Cylinder in the Nose or any Bay may result in impact standards outside of MASH criteria.

Adjust the hex nuts so that the faces of the flat washers are flush with the outside humps of the Fender Panels (Figure 30).

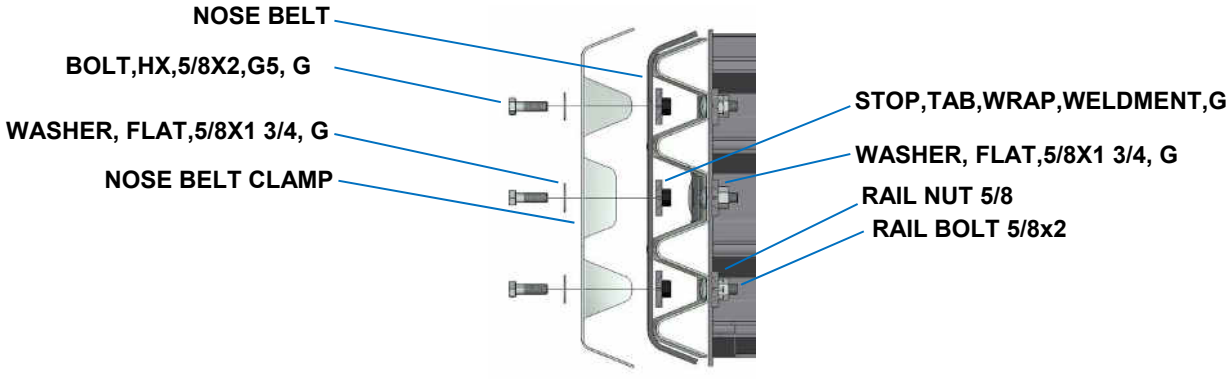


Figure 29

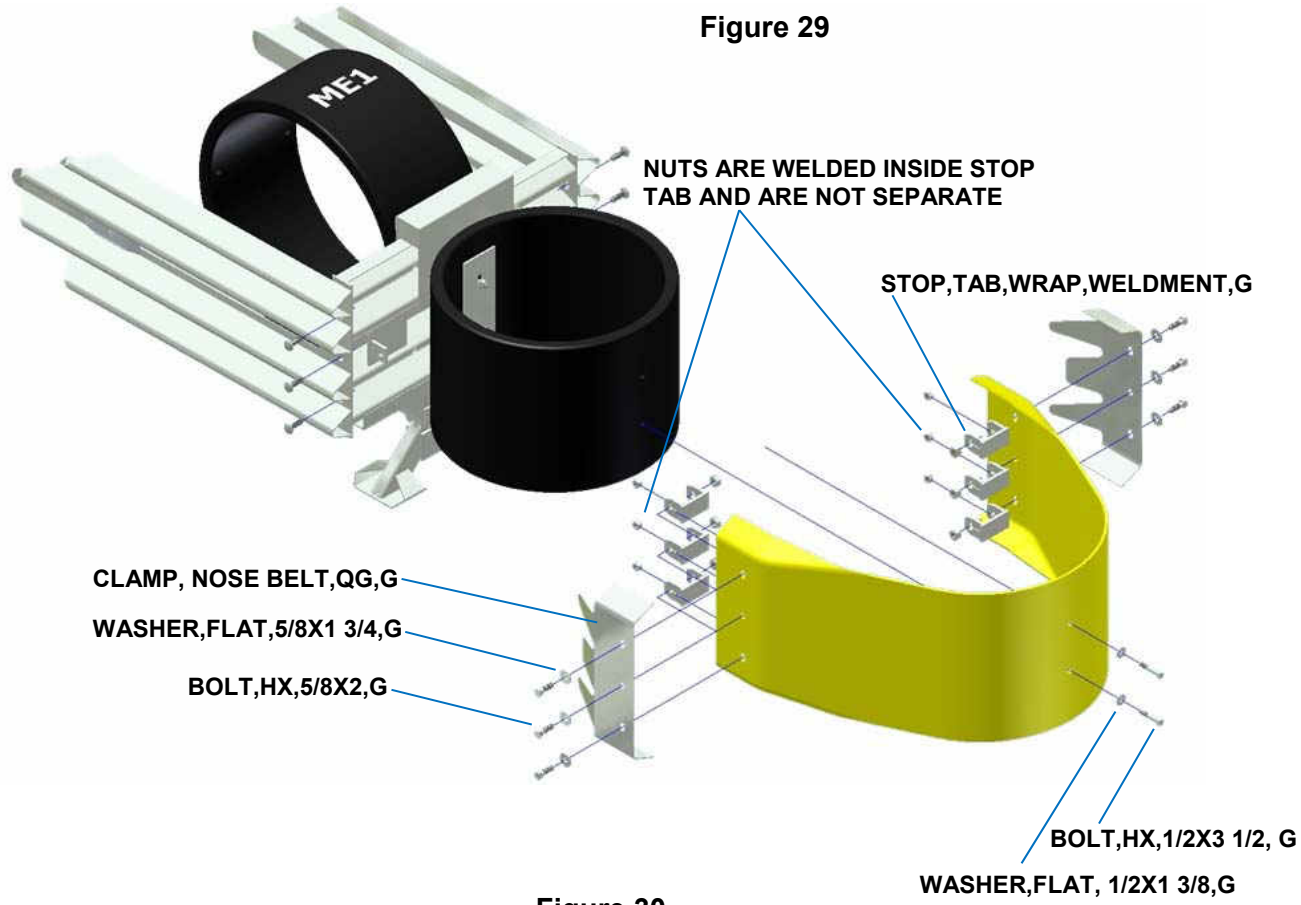


Figure 30
Attach Nose Belt to Fender Panels

16) Attach Hit Indicator to Diaphragm No. 1

The Hit Indicator should be the last component attached to the system. Fasten the Hit Indicator to the first Diaphragm with the hardware provided as shown in Figure 31. Offset component to right side of Diaphragm.

Step 1. Position Hit Indicator on 1st Diaphragm. Center Hit Indicator 2 1/2" from edge of Diaphragm for 24" systems. Drill one 1/4" hole as needed to set bracket tab in Diaphragm.

Step 2. Attach hit indicator to 1st Diaphragm.

Option 1. Match drill two 9/16" holes as needed in Diaphragm. Use 1/2" hex bolts, 1/2" lock washers, and 1/2" hex nuts to attach bracket (p. 50).

Option 2. Use 1/4" self-drilling + tap screws along with flat washer to attach bracket.

Step 3. Rotate Hit indicator to horizontal position and bend trigger clip around top of 2nd diaphragm (Figure 32).

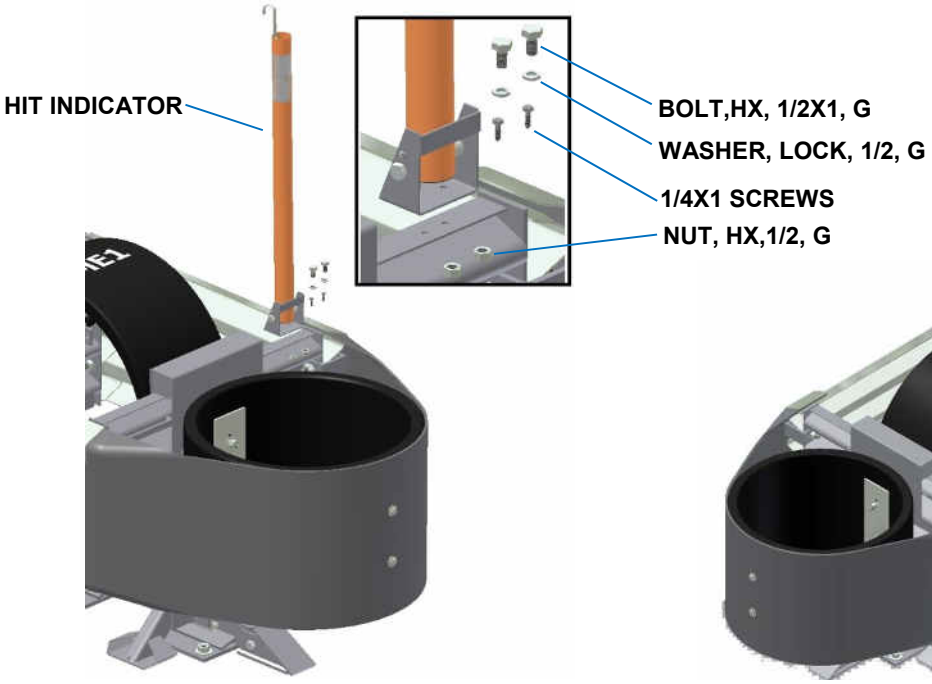


Figure 31
Attach Hit Indicator

Figure 32
Rotate Hit Indicator/Bend Trigger Clip

17) Checking The System Assembly

At this point tighten all Mushroom Bolts and recheck to ensure that all fasteners are properly tightened throughout the system (anchor bolts, etc.). Check all Fender Panels. If they do not fit tightly against the underlying panel, system realignment may be necessary (Figure 33).

Bolt Torque Specifications	
Warning:	
Anchor Studs	Torqued to adhesive manufacturer's recommended values (p. 15) Shall Not protrude above nuts (p. 24, Figure 14)
All Other Bolts	Tightened
Fender Panel	Maximum gap allowed: Narrow Systems – 0.78" [20 mm]

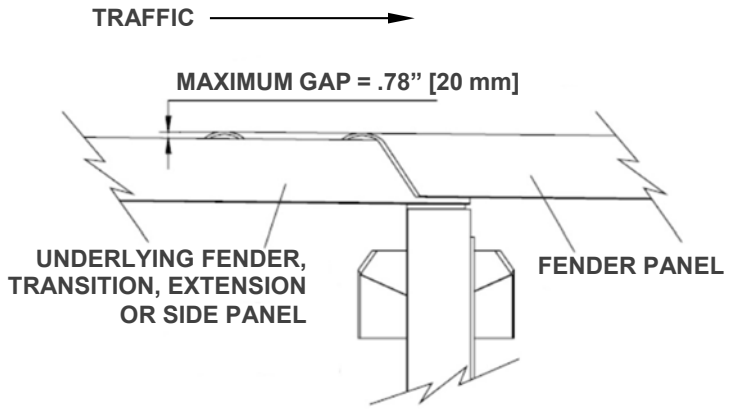


Figure 33
Fender Panel Gap

18) Inspect System

Inspect the system in accordance with Maintenance Flow Chart (p. 43).

QuadGuard® Elite M10 Final Inspection Checklist

Site Location: _____

Date: _____

Inspector: _____

Refer to the QuadGuard® Elite M10 Assembly manual and/or drawing package.

- ☐ Minimum clearance of 25” behind rear Fender Panels for movement (p. 13)
- ☐ Anchor nuts are torqued to adhesive manufacturer specification (p. 15)
- ☐ Proper Transition Panel is used for the type of barrier (p. 14)
- ☐ If no transition is used, narrow side panels are used with Backup (p. 14)
- ☐ Cylinder types are properly placed (p. 18)
- ☐ Every borehole and slot in Backup and Monorail is utilized (p. 24)
- ☐ Anchor stud(s) height is 1 1/2” [38 mm]or less above the pad (p. 24)
- ☐ Monorail guides are attached to the Diaphragms (p. 26)
- ☐ Monorail End Cap Assembly in place (p. 27)
- ☐ Mushroom Washers tabs lay flat within Fender Panel slots (pp. 28, 29)
- ☐ Fender Panel nuts are bottomed out on Mushroom Washer bolt (p. 29)
- ☐ Bolts and nuts are properly tightened throughout the system (p. 36)
- ☐ Fender Panel gap is 0.78” or less for Narrow systems (p. 41)
- ☐ Each Diaphragm and Backup Extension is attached (pp. 30, 31)
- ☐ Cylinders are bolted together and tight (pp. 30-33)
- ☐ Nose Cylinder is level (p. 33)
- ☐ System is clear of debris

Maintenance and Repair

Important: Inspections are recommended, as needed, based upon volume of traffic and impact history. Visual Drive-By Inspections are recommended at least once a month. Walk-Up Inspections are recommended at least once a year.

Visual Drive-By Inspection

1) Encountering a system with the Hit Indicator in the vertical position mandates inspection of the system. A walk-up inspection will be necessary.
2) Inspect the system in accordance with the QuadGuard® Elite M10 Maintenance Flow Chart (p. 43).

Caution: It is important to inspect a system after it has been impacted even if it appears to be self-restored and fully maintained. In particular, check the Fender Panels/Diaphragm attachment bolts to be sure none have failed.

3) Be sure the Nose assembly is in place and in good condition.
4) Note the location and condition of the QuadGuard® Elite M10 and the date of visual drive-by inspection.

Walk-Up Inspection

Warning: A system that has been impacted can store energy in collapsed Cylinders and may spring back unexpectedly causing possible serious injury. Use caution when inspecting, disassembling or restoring systems that are collapsed or compressed by any amount.

Maintenance Checklist

1) Clear and dispose of any debris on the site. Check along length of Monorail and remove any debris.
2) All bolts are tight and rust free.
3) Monorail Anchor Nuts are securely anchored.
4) Diaphragm Legs are straight.
5) All Mushroom Washer Assemblies are properly aligned and positioned (Figure 35).
6) Fender Panels and Transition Panels should nest tightly against the system. For wrong way traffic, the maximum gap allowed is .78” [20 mm].
7) All Cylinders are in good condition and are properly positioned within each Bay.
8) Always inspect system if the Hit Indicator is in the UP position even if the system appears normal.
9) Reset Hit Indicator after inspection and restoration of the QuadGuard® Elite M10.

Note: The energy absorbing HDPE Cylinders lose their ability to absorb energy with increasing number of system impacts. After multiple full capacity design impacts, the system will no longer be able to meet the requirements as specified in MASH. To ensure that Cylinder replacement is accomplished before this condition occurs, it is essential that this part of the inspection be conducted every time the Hit Indicator indicates the system has been impacted.

The rear-most Cylinder must measure at least 26” [660 mm] for proper impact performance (Figure 34). If distance is less than 26” [660 mm], replace all ME1 and ME2 Cylinders. If distance is greater than 26” [660 mm], inspect all Cylinders for major cracks, tears or cuts. Replace any damaged Cylinders. Please call the Trinity Highway Customer Service Department if you have any questions (p.3).

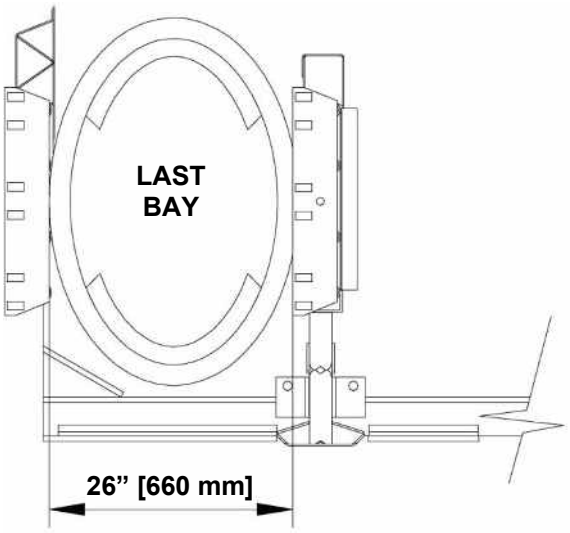


Figure 34
Distance Across
Minor Axis of ME2 Cylinder

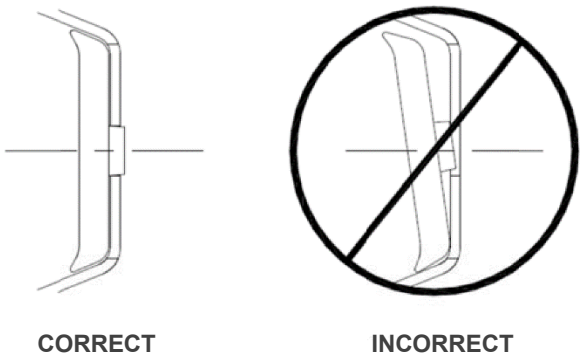


Figure 35
Mushroom Washer Orientation

10) Ensure the system is deployed to its full length.

Caution: Systems that are not restored to their full length may not perform to impact performance standards of MASH.

11) Make all necessary repairs as described above and see the following page for Post-Impact Instructions.

12) Reset Hit Indicator if necessary.

13) Note the location and condition of the QuadGuard® Elite M10, and any work done, in your **Impact Attenuator Inspection Logbook** under the date of this inspection. If further repair is required, note repair request date in logbook. Walk-up inspections are recommended as needed based upon volume of traffic and impact history. Refer to Post-Impact Instructions on the next page for more information.

Post-Impact Instructions

1) Deploy the appropriate traffic-control devices to protect your crew.
2) Check to see that all Anchor Bolts have remained firmly anchored to the roadway surface. Replace any that are loose, broken, or pulled out. Proper performance of the system depends on the Monorail Anchors being properly deployed.
3) Clear and dispose of any debris on the site.
4) Check the system to be certain that the Mushroom Washer Assemblies holding the Fender Panels together are still intact and that the system has not been deformed in a way that would prevent pulling it back to its original position.
5) Be sure that the Diaphragm Support Legs are all properly attached to the Monorail.
6) Attach a 3/8" [10 mm] Grade 40 x 20' [6 m] chain around the bottom of the first diaphragm. Attach both ends of the chain to the back of a heavy vehicle (1 ton pickup).

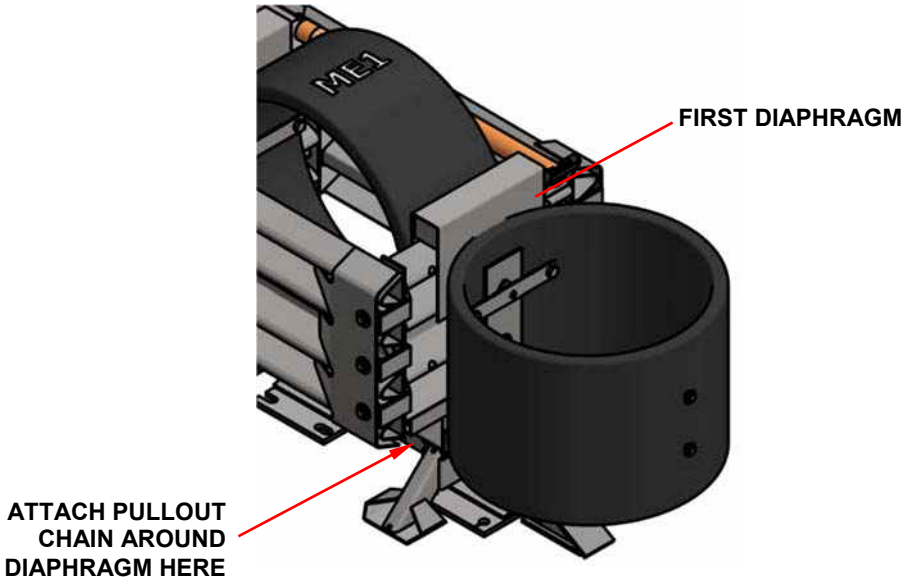


Figure 36
Attach Chain Around First Diaphragm

Warning: A system that has been impacted can store energy in collapsed Cylinders and may spring back unexpectedly causing possible serious injury. Use caution when inspecting, disassembling or restoring systems that are collapsed or compressed by any amount.

Important: Slowly pull the QuadGuard® Elite M10 forward until the system reaches its original length. Have someone watch the system during repositioning to be certain previously undetected damage does not cause the Diaphragms to bind or pull out improperly.

7) Inspect the system in accordance with the QuadGuard® Elite M10 Maintenance Flow chart (p. 43). After typical design speed impacts, the Cylinders are potentially reusable (p. 5).

8) Ensure each system Diaphragm is in usable condition. Diaphragms that are bowed or have bent legs must be replaced.

9) Check that the Fender Panels are properly attached with the Mushroom Washer Assemblies. Check all bolt connections of Fender Panels to Diaphragms. Damaged bolts, Fender Panels and Transition Panels must be replaced.

10) Check all Fender Panel gaps (Figure 37). The maximum gap allowed for these overlapping parts on the side of the system with traffic approaching from the rear (including Fender Panels overlapping components behind the system) is .78" [20 mm] for narrow systems and 1.0" [25 mm] for wide systems. Be sure the Mushroom Washer Assemblies are torqued to 60 ft-lbf [80 N-m]. If the gaps between the Fender Panels are still too large, then it may be necessary to replace bent parts.

11) Replace all damaged Cylinders. If a Cylinder's condition is questionable, a photo of the Cylinder may be forwarded to Trinity Highway for evaluation.

12) Check the torque of all fasteners on the system (p. 42).

13) Check that the site is free from any debris.

14) The QuadGuard® Elite M10 is ready for use.

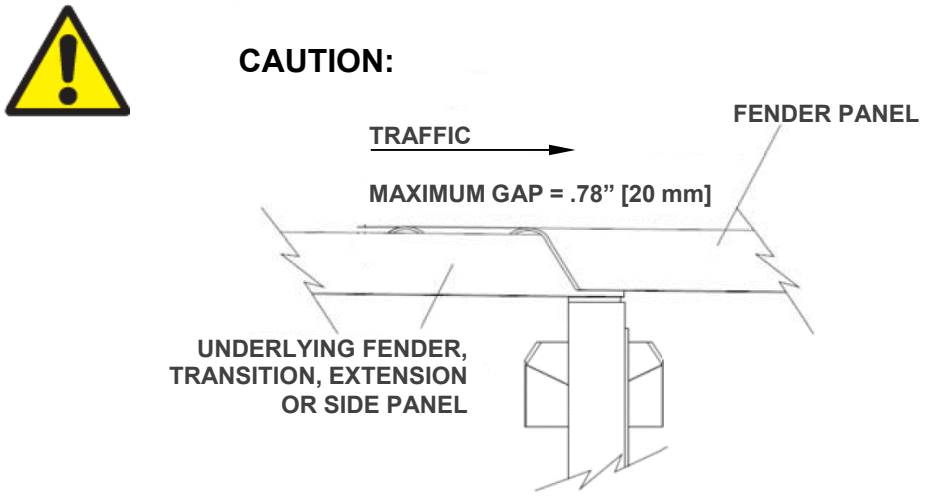


Figure 37
Fender Panel Gap

Torque Specifications	
Warning:	
Mushroom Bolt Assemblies	Tighten to end of bolt threads
Anchor Studs	Torqued to adhesive manufacturer spec shall NOT protrude 1 1/2" above nuts (Figure 14 on p. 24)
All Other Bolts	Tightened
Fender Panel	Maximum Gap Allowed
24" System	**.78" [20 mm]**

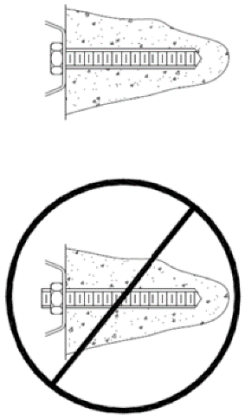


Figure 38
Horizontal Assembly

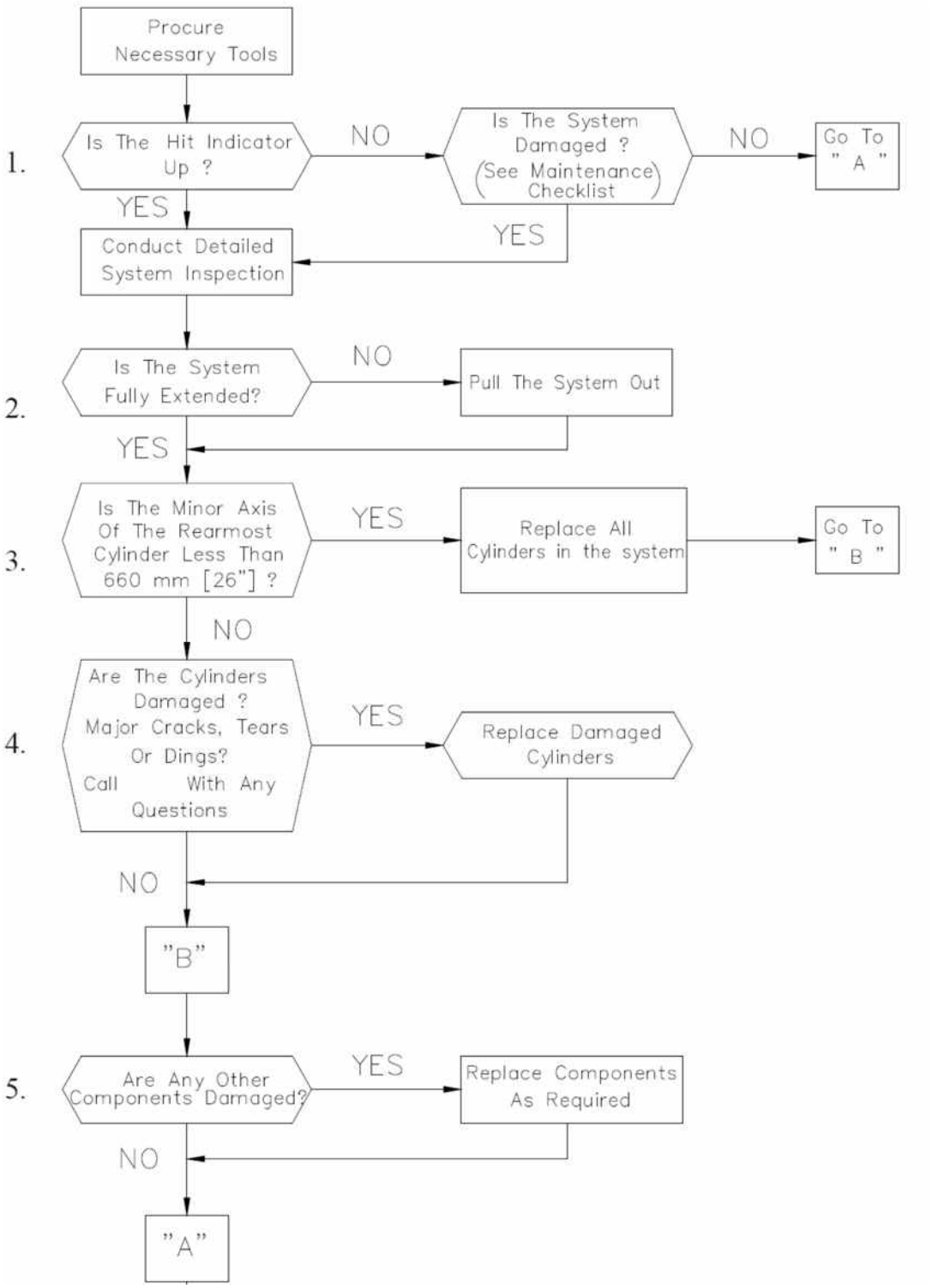
Parts Ordering Procedure

Make a list of all damaged parts using part descriptions illustrated on drawings in the back. Answer the following questions in the spaces provided. This information is necessary to receive the proper parts.

QuadGuard® Elite M10 Ordering Information Chart		
Description:	**Choices**	**Fill in this section**
Transition Panel Type Right side, left side, or no Transition (p. 25)	Quad to Thrie Beam Quad to End Shoe Quad to 4" Offset to PCMB	
Width of Backup	24" [610 mm]	

Maintenance Flow Chart and System Drawings

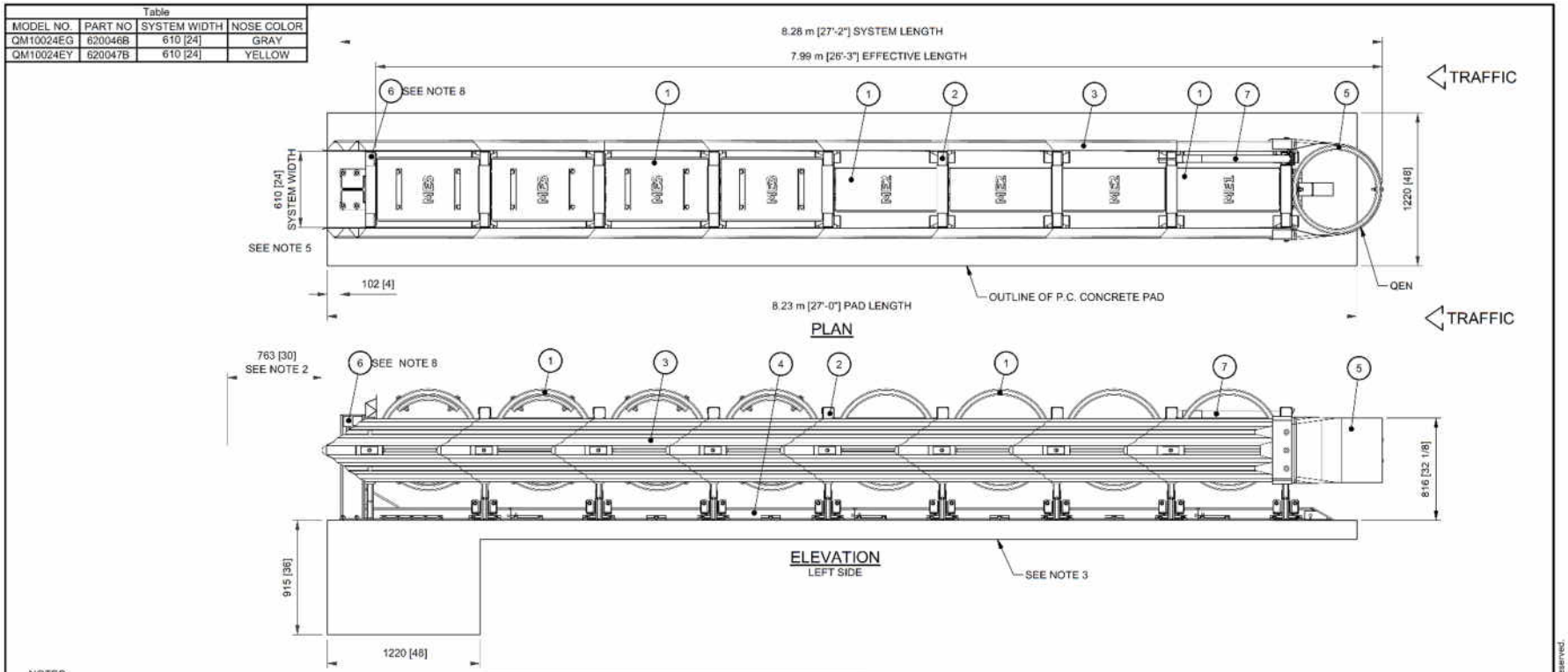
This flow chart is provided only to clarify the sequence of steps. Refer to the appropriate sections of this manual for specific procedures. Step 5 represents final inspection of system components and QuadGuard® Elite M10 restoration (pp. 38-41).



QuadGuard® Elite M10 Maintenance Flow Chart

QGEMTSCVR8-U

Table			
MODEL NO.	PART NO	SYSTEM WIDTH	NOSE COLOR
QM10024EG	620046B	610 [24]	GRAY
QM10024EY	620047B	610 [24]	YELLOW



NOTES:
1. IN COMPLIANCE WITH THE AASHTO 2011 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
2. PROVISION SHALL BE MADE FOR REAR FENDER PANELS TO SLIDE REARWARD UPON IMPACT 762 [30] MIN.
3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY (MEASURING AT LEAST 3.7m [12'] WIDE AND 15.2m [50'] LONG).
4. **SEE THE "QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 323-6374.**
5. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY A TRANSITION FROM THE QUADGUARD SYSTEM TO THE OBJECT BEING SHIELDED.
6. FOR PROPER IMPACT PERFORMANCE, THE UNIT MUST BE RESTORED TO ITS ORIGINAL LENGTH AFTER EACH IMPACT.
7. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
8. BACKUP ASSEMBLY NOT INCLUDED IN MODEL NUMBER.

UNIDIRECTIONAL

KEY

1. QG M10 ELITE CYLINDER
2. DIAPHRAGM
3. FENDER PANEL
4. MONORAIL
5. NOSE ASSEMBLY
6. BACKUP
7. HIT INDICATOR

REFERENCES

SERIAL NO. _____
SALES ORDER _____
EH PROJECT _____
DESIGN SPEED 100 km/h [62 MPH]
NOSE TYPE _____
NO. OF UNITS _____

DIAPHRAGM ASSY.	619133
NOSE ASSY.	618842
FENDER PANEL ASSY.	608235
BACKUP ASSY.	618857
MONORAIL ASSY.	618839
CONCRETE PAD	618686
BAY ASSY.	618880
HIT INDICATOR ASSY.	610237
TRANSITION ASSY.	N/A
WHEEL DEFLECTOR ASSY.	N/A

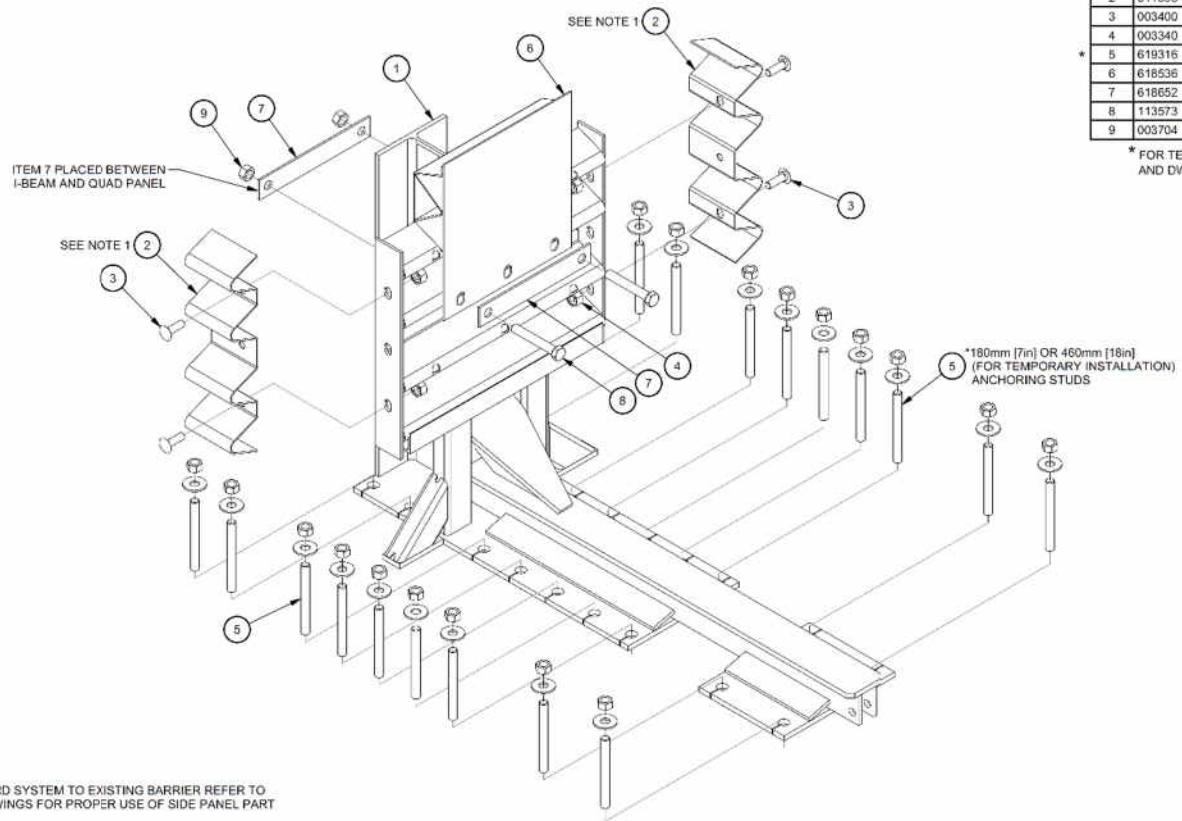
DRAWN	D. Hayes Jr.	DATE	3/21/2012
CHECKED	M. BUEHLER	DATE	7/9/2010
DO NOT SCALE DRAWING			

SEE TABLE
QGEMTSCVR8-U.idw

QUADGUARD® ELITE™ M10 SYSTEM
24" SYSTEM W/ TENSION STRUT BACKUP

QGEMTSCVR8-U | C | 1 of 1

QuadGuard® Elite M10 w/Tension Strut Backup



PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY
1	618844	BACKUP,TS,24,M10,QGE,G,W/DECA	1
2	611898	PANEL,SIDE,QG	2
3	003400	BOLT,RAIL,5/8X2,G	4
4	003340	NUT,HX,5/8,G,RAIL	4
* 5	619316	ANCHOR KIT,HILTI,330ml,3/4X7,(4)	5
6	618536	EXTENSION,BACKUP,M10,QGE	1
7	618652	FLT ST 3/16X2X13,W/HOLES	2
8	113573	BOLT,HX,3/4X5,G5,G	2
9	003704	3/4" HVY HEX NUT A563 DH	2

* FOR TEMPORARY INSTALLATION, SEE NOTE BELOW AND DWG 354024L (604379)

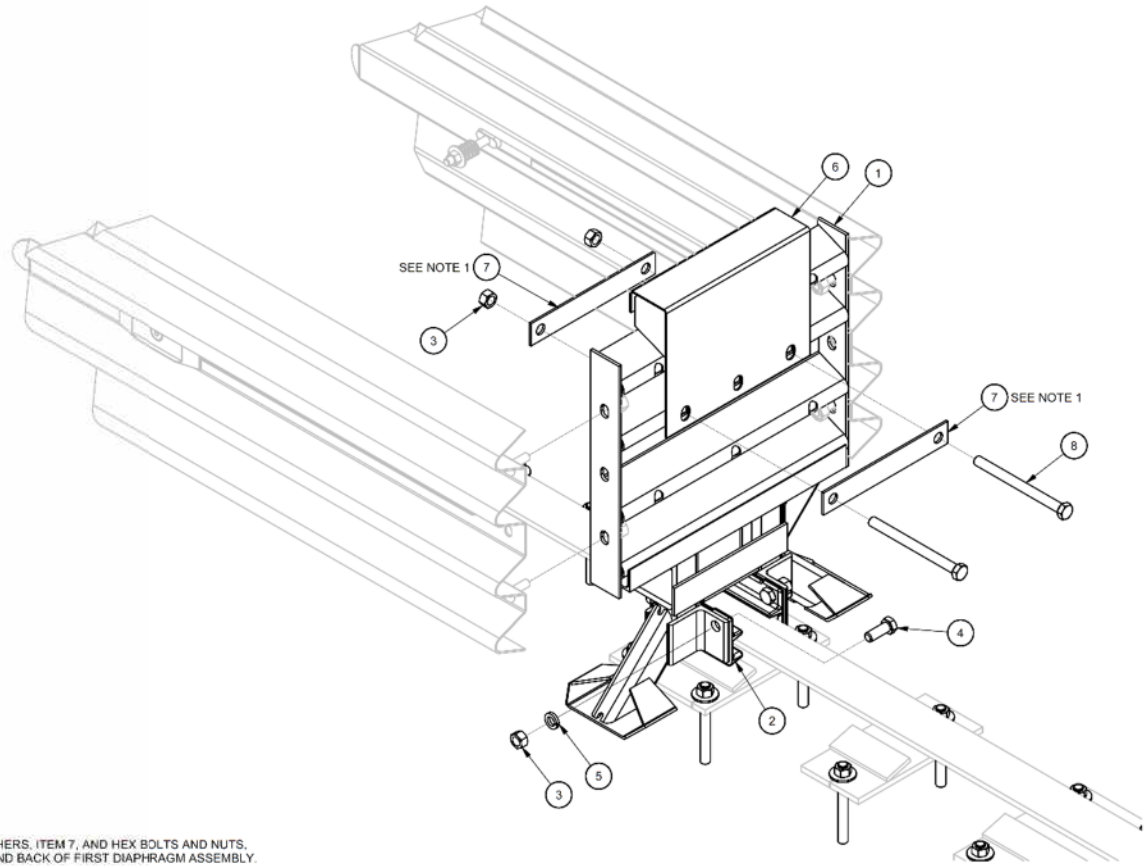
NOTE:
1. WHEN TRANSITIONING QUADGUARD SYSTEM TO EXISTING BARRIER REFER TO THE TRANSITION ASSEMBLY DRAWINGS FOR PROPER USE OF SIDE PANEL PART NO. 611898.

D. Hayes Jr.	2/27/2012		QUADGUARD® ELITE™ M10 SYSTEM
M. Buehler	4/25/2012	618857.idw	BACKUP ASSY,TS,24,M10,QGE
		DO NOT SCALE DRAWING	
			618857 E 1 of 1

Tension Strut Backup Assembly

619133

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	625647	DIAPHRAGM,QB,24,QG	1
2	611368	MONORAIL GUIDE,QG,G	2
3	003704	3/4" HVY HEX NUT A563 DH	6
4	113555	BOLT,HX,3/4X2,G8,G	4
5	118089	WASHER,LOCK,3/4,G	4
6	618526	EXTENSION,DIAPHRAGM,ANGLE	1
7	618652	FLT ST 3/16X2X13,W/HOLES	2
8	118563	BOLT,HX,3/4X9,G5,G	2

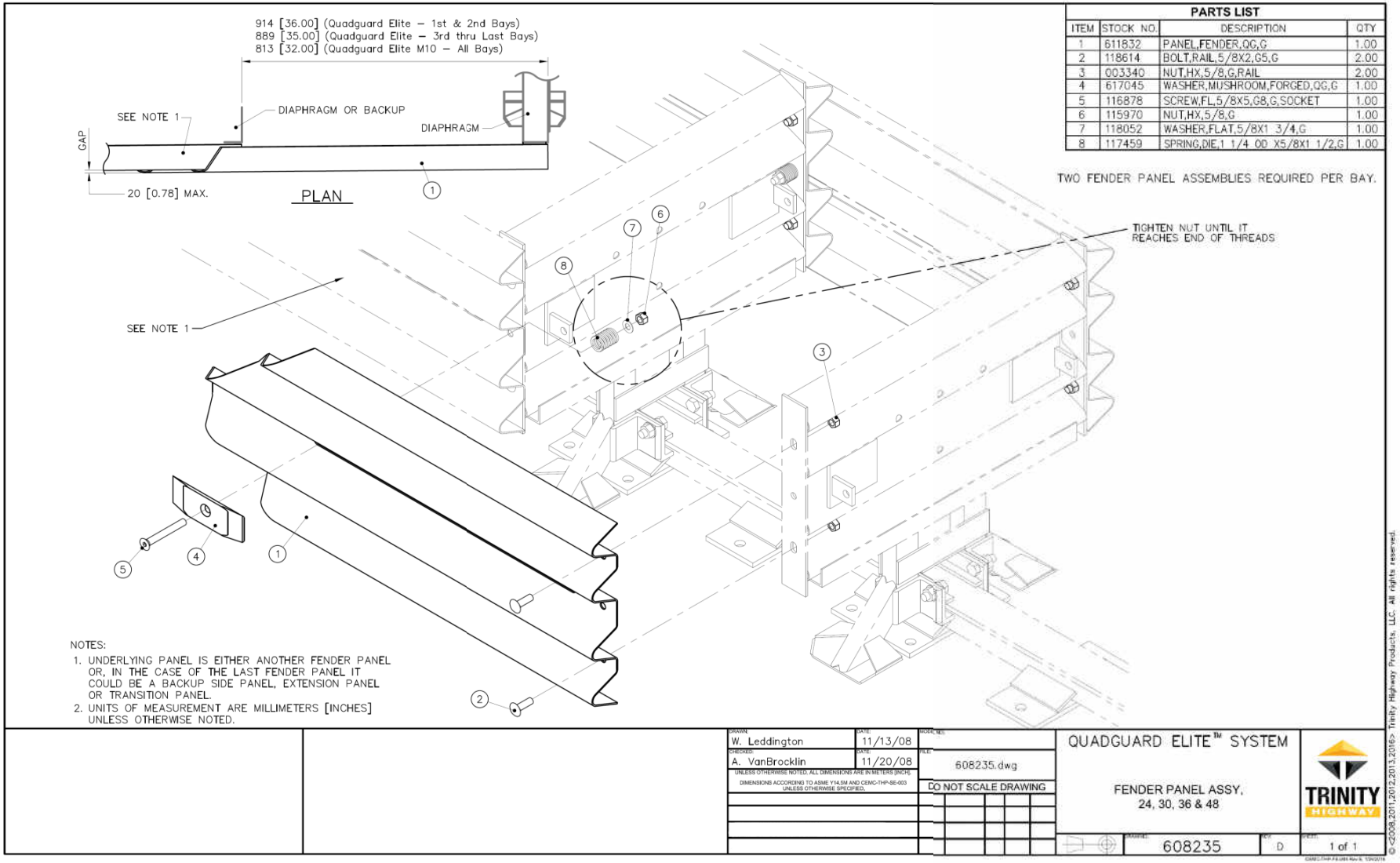


NOTE:
1. OMIT PLACING BAR WASHERS, ITEM 7, AND HEX BOLTS AND NUTS, ITEMS 8 & 3 ON FRONT AND BACK OF FIRST DIAPHRAGM ASSEMBLY.

D. Wren	2/26/2013		QUADGUARD® ELITE™ M10 SYSTEM
A. Van Brocklin	4/4/2013	619133.idw	DIAPHRAGM ASSY, 24
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN MILLIMETERS. INCH DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TMP-SE-008 UNLESS OTHERWISE SPECIFIED		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		619133	E 1 of 1

Diaphragm Assembly

608235



PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	QTY
1	611832	PANEL,FENDER,QG,G	1.00
2	118614	BOLT,RAIL,5/8X2,G5,G	2.00
3	003340	NUT,HX,5/8,G,RAIL	2.00
4	617045	WASHER,MUSHROOM,FORGED,QG,G	1.00
5	116878	SCREW,FL,5/8X5,G8,G,SOCKET	1.00
6	115970	NUT,HX,5/8,G	1.00
7	118052	WASHER,FLAT,5/8X1 3/4,G	1.00
8	117459	SPRING,DIE,1 1/4 OD X5/8X1 1/2,G	1.00

TWO FENDER PANEL ASSEMBLIES REQUIRED PER BAY.

DRAWN: W. Leddington	DATE: 11/13/08
CHECKED: A. VanBrocklin	DATE: 11/20/08
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M AND CEMC-THP-SE-003 UNLESS OTHERWISE SPECIFIED.	
MODEL NO.	
FILE: 608235.dwg	
DO NOT SCALE DRAWING	

QUADGUARD ELITE™ SYSTEM

FENDER PANEL ASSY, 24, 30, 36 & 48

TRINITY HIGHWAY

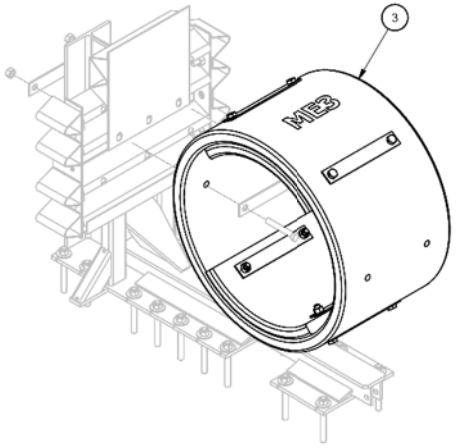
DRAWING: 608235 REV: D SHEET: 1 of 1

Fender Panel Assembly

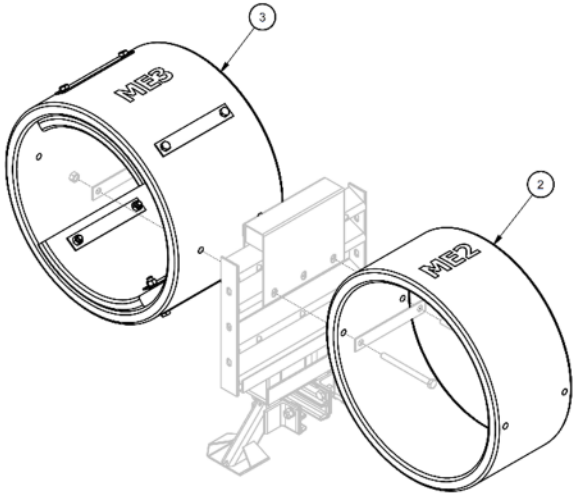
618879

Table				
ASSY NO.	ITEM 2 QTY	ITEM 3 QTY	SYTEM LENGTH	SYSTEM WIDTH
618879	2	1	4 BAY	24
620060	2	1	4 BAY	69

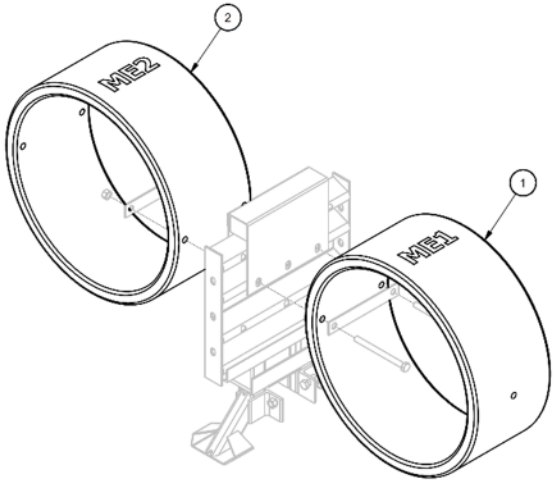
PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	618538	CYLINDER,ME1,MASH,QGE	1
2	618649	CYLINDER,ME2,MASH,QGE	2
3	618702	CYLINDER ASSY,ME3,MASH,QGE	1



ME3 TO BACKUP



ME2 TO ME3



ME1 TO ME2

DRAWN: D. Hayes Jr.	DATE: 3/14/2012	PRODUCT NO:	QUADGUARD® ELITE™ M10 SYSTEM
CHECKED: M. Buehler	DATE: 5/29/2012	FILE: 618879.idw	BAY ASSY,4 BAY,M10,QGE
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN INCHES [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TRINITY-003 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	DRAWING NO: 618879 REV: B SHEET: 1 of 1

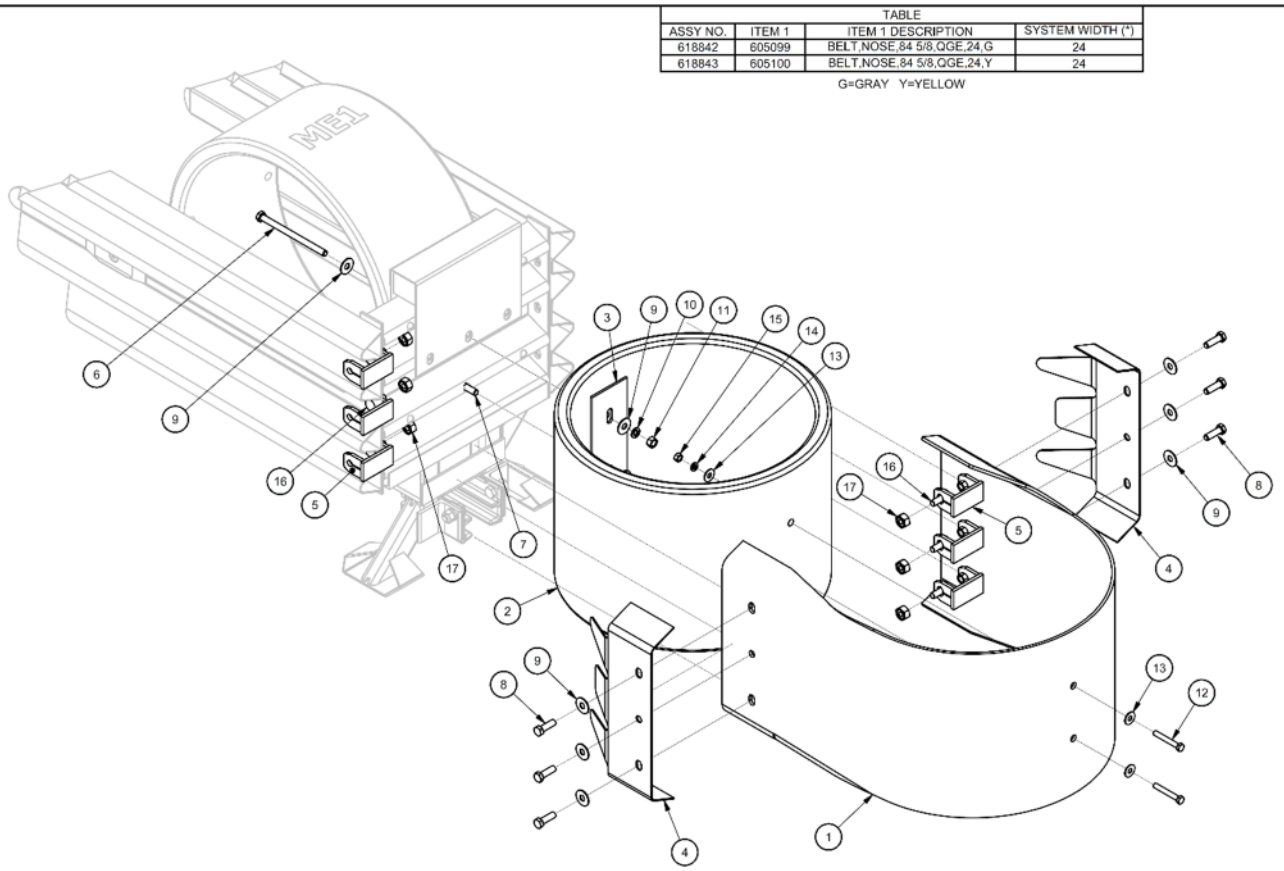
Bay Assembly

618842

TABLE			
ASSY NO.	ITEM 1	ITEM 1 DESCRIPTION	SYSTEM WIDTH (*)
618842	605099	BELT,NOSE,84 5/8,QGE,24,G	24
618843	605100	BELT,NOSE,84 5/8,QGE,24,Y	24

G=GRAY Y=YELLOW

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	BELT,NOSE,84 5/8,QGE,24,G or Y	1
2	606689	CYLINDER,NOSE,HDPE,28X20	1
3	612253	PLATE,NOSE CYLINDER	1
4	606330	CLAMP,NOSE BELT,QG,G	2
5	614666	STOP,TAB,WRAP,WELDMENT	6
6	004489	5/8"X9" HEX BOLT A325	1
7	113660	BOLT,HX,5/8X3 1/2,G5,G	1
8	118570	BOLT,HX,5/8X2,G5,G	6
9	003300	WASHER,FLAT,5/8 X 1 3/4, G	9
10	118100	WASHER,LOCK,5/8,G	2
11	003354	5/8" HVY HEX NUT A563A	2
12	113474	BOLT,HX,1/2X3 1/2,G5,G	2
13	118009	WASHER,FLAT,1/2X1 3/8,G	4
14	118082	WASHER,LOCK,1/2,G	2
15	115939	NUT,HX,1/2,G	2
16	118614	BOLT,RAIL,5/8X2,G5,G	6
17	003340	NUT,HX,5/8,G,RAIL	6



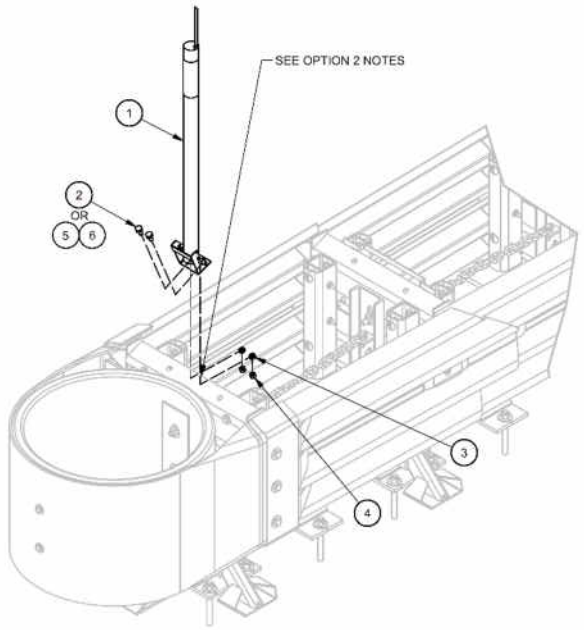
DRAWN: D. Hayes Jr.	DATE: 3/16/2012	MODEL NO: ASSY NO. - SEE TABLE	NOSE ASSY,24,M10,QGE,G or Y
CHECKED: M. Buehler	DATE: 4/25/2012	FILE: 618842.idw	
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS. INCH DIMENSIONS ACCORDING TO ASME Y14.5M-1994 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	DRAWING NO: 618842 REV: F SHEET: 1 of 1

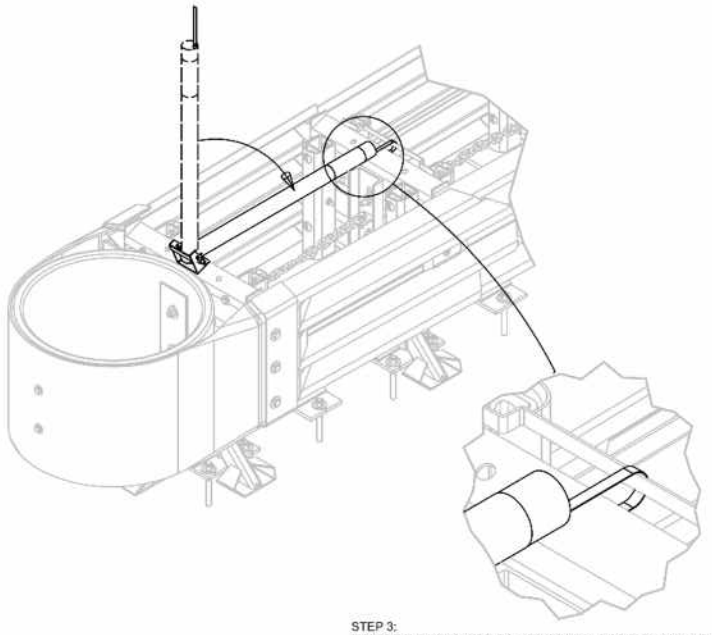
TRINITY HIGHWAY

Nose Assembly

610237

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	610238	HIT INDICATOR,LMC/ELITE	1.00
2	113467	BOLT,HX,1/2X1,G5,G	2.00
3	118082	WASHER,LOCK,1/2,G	2.00
4	115939	NUT,HX,1/2,G	2.00
5	116891	SCREW,HWH,1/4X1,SELF DRILL/TAPPING,G	2.00
6	118013	WASHER,FLAT,1/4 X 1,G	2.00





STEP 1:
POSITION HIT INDICATOR ON 1ST DIAPHRAGM. DRILL ONE ø1/4" HOLE AS NEEDED TO SET BRACKET TAB IN DIAPHRAGM. BRACKET SHOULD BE CENTERED ON TOP SURFACE OF DIAPHRAGM.

STEP 2:
ATTACH HIT INDICATOR TO 1ST DIAPHRAGM.
OPTION 1: MATCH DRILL TWO ø9/16" HOLES AS NEEDED IN DIAPHRAGM. USE ITEM 2,3 & 4 TO ATTACH BRACKET.
OPTION 2: USE SELF DRILLING + TAP SCREWS (ITEM 5) ALONG WITH FLAT WASHER (ITEM 6) TO ATTCH BRACKET.

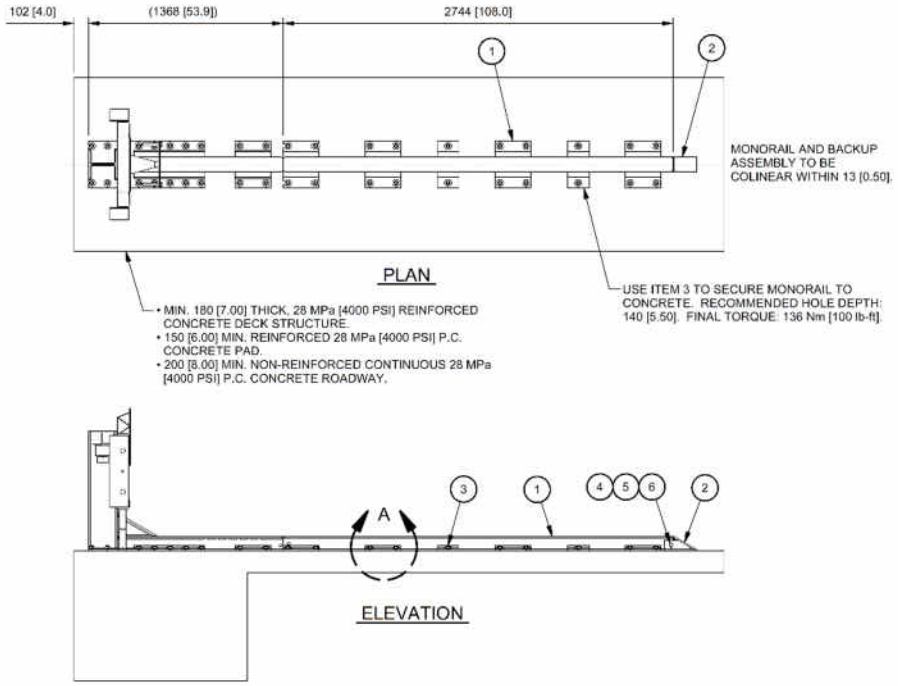
STEP 3:
ROTATE HIT INDICATOR TO HORIZONTAL POSITION AND BEND TRIGGER CLIP AROUND BRACKET OF 2ND DIAPHRAGM AS SHOWN.

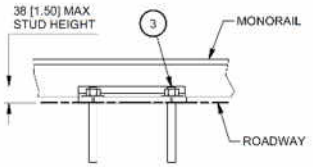
DRAWN: T. Busse	DATE: 8/19/1998	WORK NO.	QUADGUARD® SYSTEM ELITE / ELITE M10
CHECKED: RBB	DATE: 9/10/1998	610237.idw	HIT INDICATOR W/ HARDWARE
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TUP-EC-003 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	DRAWING NO. 610237 REV. F SHEET 1 of 2

Hit Indicator with Hardware

618838

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611379	MONORAIL,3 BAYS,QG	1
2	608136	ENDCAP,MONORAIL,QG	1
3	619316	ANCHOR KIT,HILTI,330ml,3/4X7,(4)	6
4	113660	BOLT,HX,5/8X3 1/2,G5,G	1
5	118100	WASHER,LOCK,5/8,G	1
6	003354	5/8" HVY HEX NUT A563A	1





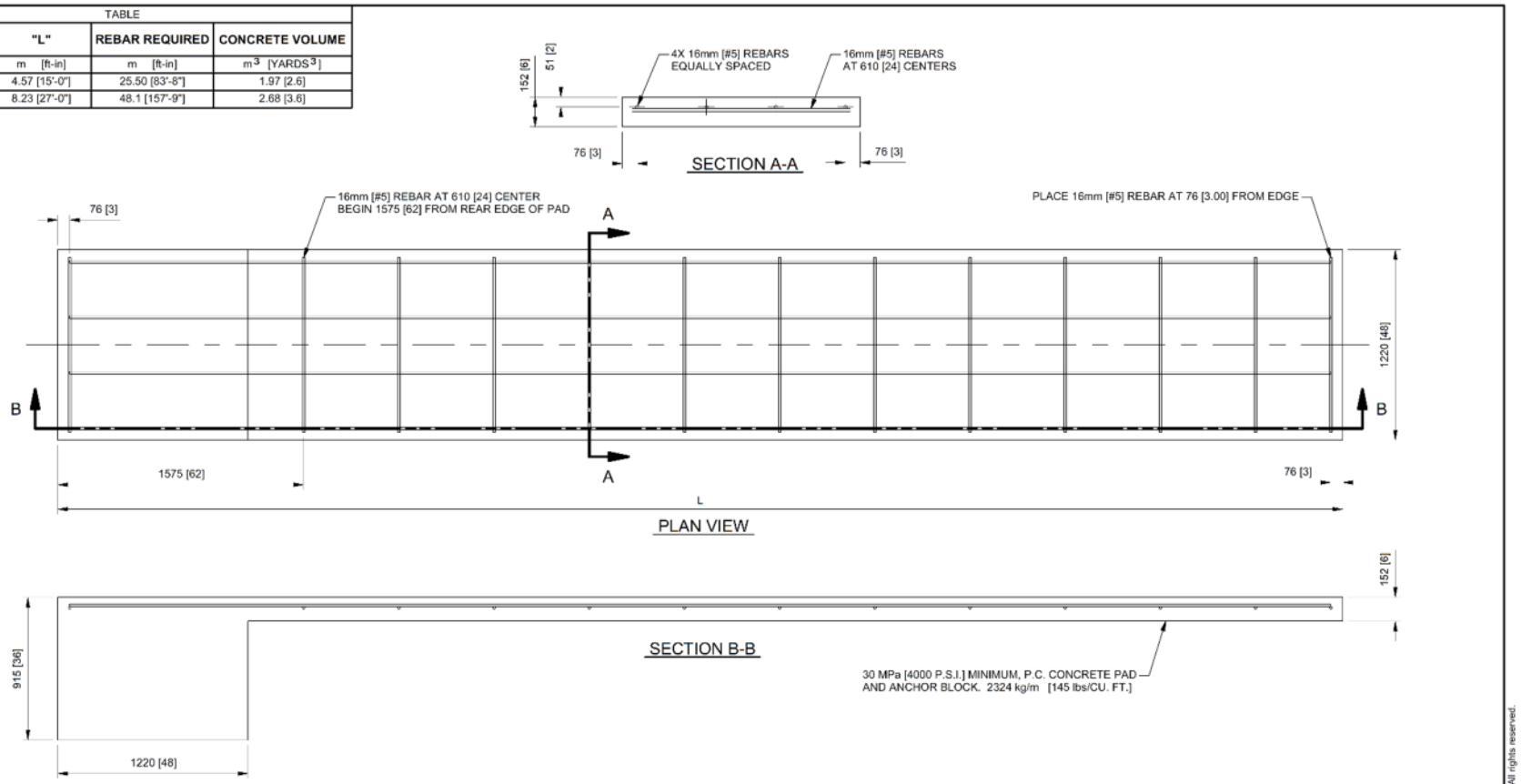
NOTES:
1. USE BACKUP AND MONORAIL (ITEM 1) AS TEMPLATES TO LOCATE ANCHOR BOLTS (ITEM 3).
2. CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
3. EVERY STUD MUST BE EMBEDDED TO A DEPTH OF 140 [5.50]. IF REBAR IS ENCOUNTERED IN A P.C. CONCRETE PAD, DRILL THROUGH IT. IF REBAR IS ENCOUNTERED ON A DECK STRUCTURE, ASK PROJECT ENGINEER FOR DIRECTION.

DRAWN: D. Hayes Jr.	DATE: 2/28/2012	MODEL NO.	QUADGUARD® ELITE™ M10 SYSTEM
CHANGE: M. Buehler	DATE: 4/25/2012	FILE: 618838.idw	MONORAIL ASSY,4 BAY,M10,QGE
UNLESS OTHERWISE NOTED: DIMENSIONS ARE IN IN. [MM] DIMENSIONS ACCURATE TO ±0.06 [1.5] FOR ASSY AND ±0.12 [3.0] UNLESS OTHERWISE SPECIFIED		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		DRAWING: 618838	REV: B
			SHEET: 1 of 1

Monorail Assembly

618686

TABLE			
UNIT SIZE	"L"	REBAR REQUIRED	CONCRETE VOLUME
	m [ft-in]	m [ft-in]	m^3 [YARDS^3]
4 BAY	4.57 [15'-0"]	25.50 [83'-8"]	1.97 [2.6]
8 BAY	8.23 [27'-0"]	48.1 [157'-9"]	2.68 [3.6]



NOTES:
1. CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
2. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.

DRAWN: D. Hayes Jr	DATE: 12/20/2011	MODEL NO:	QUADGUARD® ELITE™ M10 SYSTEM
CHECKED: M. Buehler	DATE: 4/25/2012	FILE: 618686.idw	CONCRETE PAD,QG,ELITE M10
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN MILLIMETERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TRP-SS-003 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	DRAWING: 618686 REV: A SHEET: 1 of 1

Concrete Pad

Notes:

Notes:

TRINITY
HIGHWAY

Ahead of the Curve®

For more complete information on Trinity Highway products and services, visit us on the web at www.trinityhighway.com. Materials and specifications are subject to change without notice. Please contact Trinity Highway to confirm that you are referring to the most current instructions.