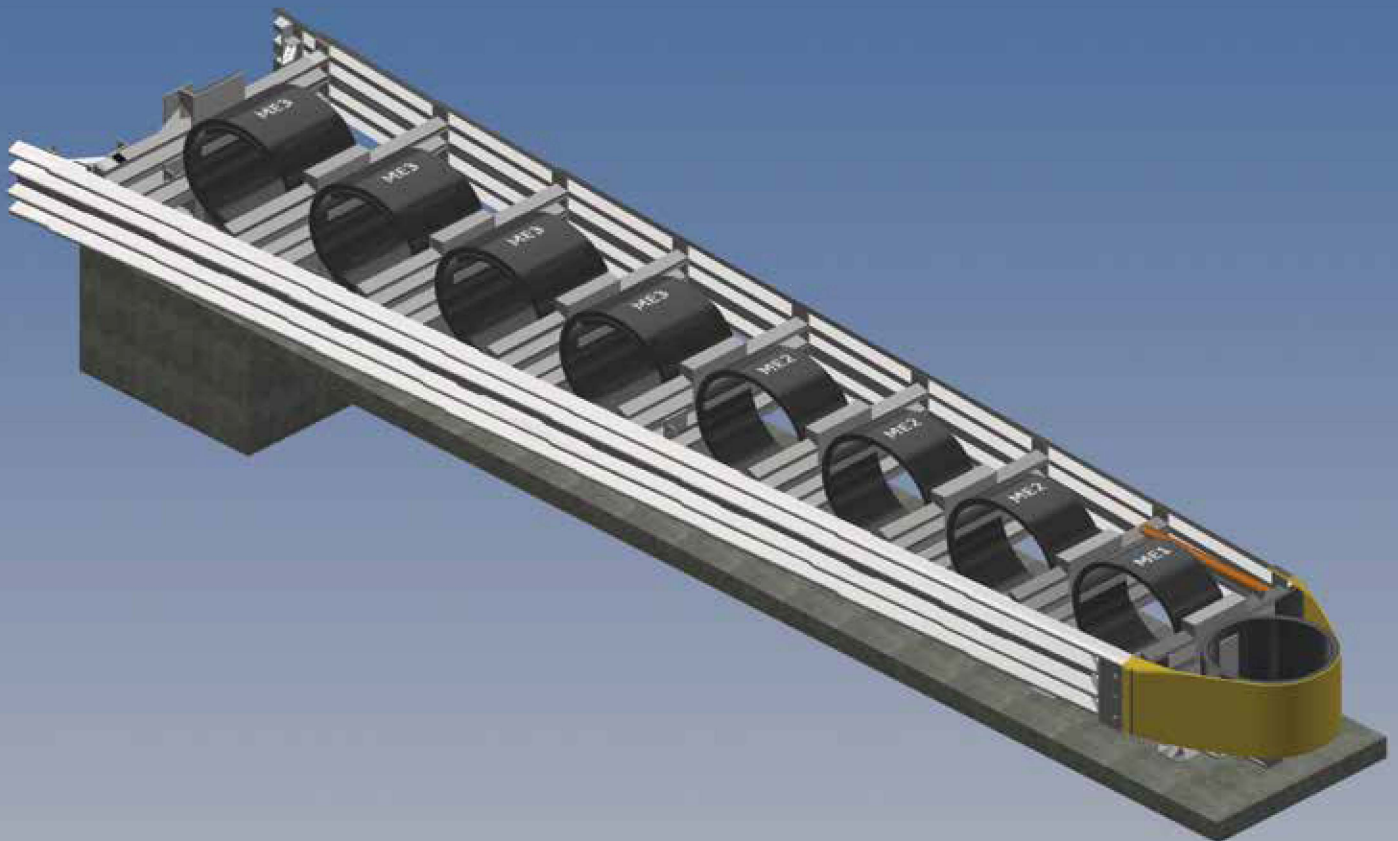


QuadGuard® Elite M10 Wide [69"]

Product Description Assembly Manual



TRINITY
HIGHWAY

Ahead of the Curve®



INGAL
CIVIL PRODUCTS

A valmont COMPANY

QuadGuard® Elite M10 Wide [69”]

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



Important: These instructions are for standard assembly. 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 Ingal Civil Products on 1300 446 425 or visit IngalCivil.com.au

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 Wide 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.

Table of Contents

Customer Service Contacts	3
Important Introductory Notes	3
Safety Symbols	4
Safety Rules for Assembly	4
Limitations and Warnings	5
System Overview	6
Inspect Shipping	6
System Components	7
Select Transition	11
Recommend Tools	12
Site Preparation/Foundation	14
Foundation/Anchoring	15
Trinity Highway Approved Adhesive Anchoring System	16
Vertical Anchors	16
Steel Rebar Anchor Assembly Cautions	17
Horizontal Anchors	18
System Assembly	21
QuadGuard® Elite M10 Wide Final Inspection Checklist	37
Maintenance and Repair	38
Visual Drive-By Inspection	38
Walk-Up Inspection	38
Maintenance Flow Chart	40
Post-Impact Instructions	41
Parts Ordering Procedure and Drawings	44
QuadGuard® Elite M10 Wide QGEMTSCVR8-U69	46
Backup Assembly, Tension Strut 627528	47
Bay 1 Diaphragm Assembly 627506	48
Standard Diaphragm Assembly 627506	49
Fender Panel Assembly 608240	50
Cylinder Attachment 618879	51
Nose Assembly 627505	52
Hit Indicator 610237	53
Monorail Assembly 625637	54
TS Concrete Pad 618686	55
TS Concrete Pad 8" 618686	56
31" W-Beam Transition QFEMTSCVR-TWLR	57
Thrie-Beam Transition QFEMTSCVR-TTLR	58
4" Safety Shape Transition QFEMTSCVR-T4LR	59
4" Safety Shape Flared Transition QFEMTSCVR-T4LRF	60
6" Single Slope Transition QFEMTSCVR-T6LR	61
6" Single Slope Flared Transition QFEMTSCVR-T6LRF	62
End Shoe Transition QFEMTSCVR-ESLR	63

Customer Service Contacts

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

Ingal Civil Products:

Telephone:	1300 446 425 (AU) 021 2464 997 (NZ)
Contact Link	Ingalcivil.com.au/contact-us

Important Introductory Notes

Proper assembly of the QuadGuard® Elite M10 Wide system is critical to achieve performance that has been evaluated and deemed eligible by the FHWA per AASHTO MASH criteria. These instructions should be read in their entirety and understood before assembling the QuadGuard® Elite M10 Wide. These instructions are to be used in conjunction with the assembly of QuadGuard® Elite M10 Wide 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 Wide, 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 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 above. 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.

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 Wide manual. Read the manual for complete safety and assembly information.

<u>Symbol</u>	<u>Meaning</u>
	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 Wide. 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 or 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 Wide. Additional copies of this manual are available from Ingal Civil Products by calling 1300 446 425, by email at products@ingalcivil.com.au, or at IngalCivil.com.au. Please contact Trinity Highway if you have any questions concerning the information in this manual or about the QuadGuard® Elite M10 Wide.



Warning: 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® M10 Wide 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: Use only Trinity Highway parts on the QuadGuard® Elite M10 Wide for assembly, maintenance, or repair. The use of component parts not specified herein is **strictly prohibited**. The QuadGuard® Elite M10 Wide assembled with Trinity Highway parts has been tested, approved, and accepted for state use by the FHWA. A QuadGuard® Elite M10 Wide 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® M10 Wide 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® M10 Wide 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 Wide 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 Wide until you have read this manual thoroughly and completely understand it. Please contact Trinity Highway if you do not understand these instructions (p. 3).



Warning: It is the responsibility of the installer to ensure that all Danger, Warning, Caution, and Important statements within the QuadGuard® Elite M10 Wide 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 Wide is a potentially reusable, re-directive, non-gating crash cushion for roadside features of 69" [1,755 mm]. It consists of energy-absorbing high density polyethylene cylinders surrounded by a framework of Quad-Beam Panels.



Important: Recommendation of use or reuse of any part of the system following an impact is the responsibility of the project engineer. 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 Wide utilizes three types of Cylinders in a 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 Wide has successfully passed MASH requirements stipulated for 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 Wide 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 responsibility of the project engineer to ensure that the delineation used for the QuadGuard® Elite M10 Wide meet all federal, state, specifying agency, and local specifications.



Warning: It is the responsibility of the project engineer to ensure that the QuadGuard® Elite M10 Wide 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 Wide. Make sure all parts have been received (pp. 7 - 11).



Important: The manufacturer's drawing package supplied with the QuadGuard® Elite M10 Wide must be used with these instructions for proper assembly and should take precedence over these general instructions.

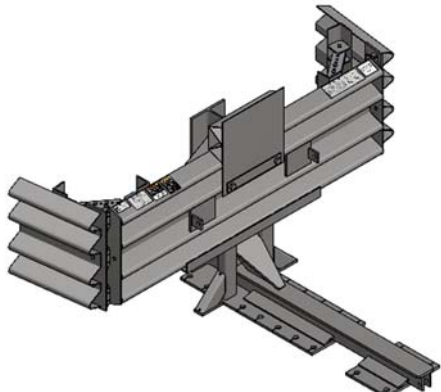
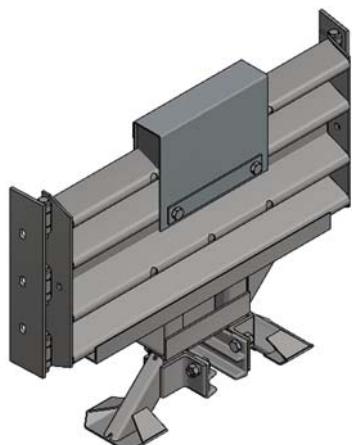

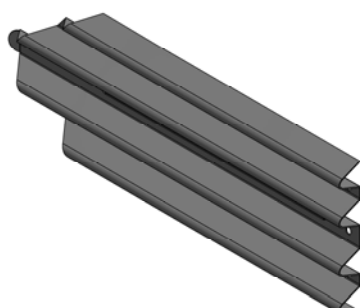
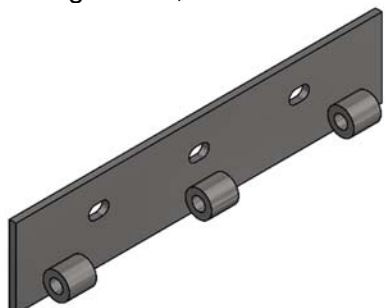

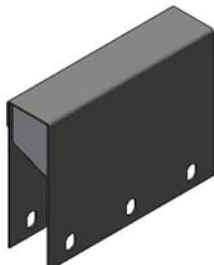



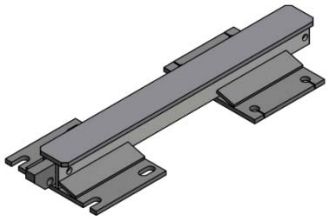
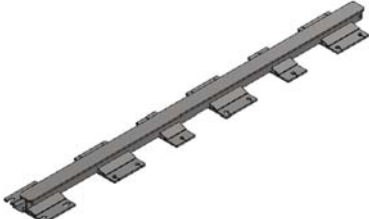
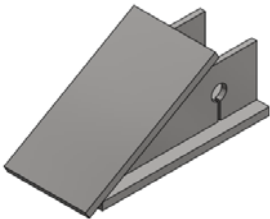
Warning: Do NOT modify the QuadGuard® Elite M10 Wide in any way.

System Components



Below is a list of system components that may be used in your particular QuadGuard® Elite M10 Wide 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).

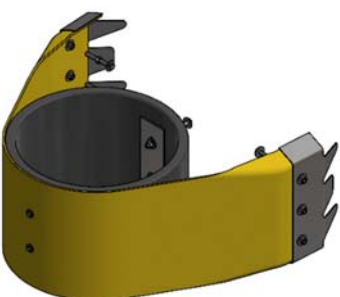
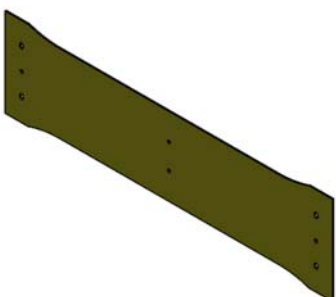

Note: Components are not shown to scale.

<p>Tension Strut Backup 69"</p>  <p>627531</p>	<p>Diaphragm Assembly, QG Elite M10</p>  <p>619120 - Varies</p>	
<p>Panel, Side, QG, Wide</p>  <p>611900</p>	<p>Panel, Fender, QG</p>  <p>10102002</p>	<p>Hinge Plate, Fender Panel</p>  <p>10102417</p>
<p>Extension, Backup, M10, QGE</p>  <p>618536</p>	<p>Extension, Diaphragm, Angle</p>  <p>618526</p>	<p>Monorail Guide</p>  <p>10102534</p>

Monorail, One Bay, QG 	Monorail, Three Bays, QG 	End Cap, Monorail, QG 
10102310	10102312	10102313

Flt St 3/16X2X13, W/ Holes 	Die Spring, 1 1/2 ODX3/4X6 	Mushroom Washer 
618652	10102522	10102536

Clamp, Nose Belt 	Nose Cylinder Plate 
10102200	10102807

Belt Nose Assy QGE, 69 	Nose Belt 	Hit Indicator Assembly 
618870	605108	10102815

Washer, 1/4X1 	Washer, Flat 1/2X1 3/8 	Washer, Flat, 5/8X1 3/4 
118013	118009	10102500

Washer, Flat, 3/4X2 	Washer, Lock, 3/8 	Washer, Lock 1/2 
10102548	10102529	10103460
Washer, Lock, 5/8 	Washer, Lock, 3/4 	Nut, Hex 3/8, G2 
10102530	10102528	10102516
Nut, Hex 1/2 	Rail Nut, Hex, 5/8 	Nut, Hex, 5/8, A563A 
10102514	10102501	10102517
Nut, Heavy Hex, 3/4 	Screw, HWH, 1/4X1, Tap 	Bolt, Hex, 3/8X3 1/2, AT, G5 
10102504	10103448	10102510
Bolt, Hex, 1/2X1, G5 	Bolt, Hex 1/2X3, G2 	Rail Bolt, 5/8X2, A307 
113467	10102505	10102503

<p>Bolt, Hex, 5/8X3 1/2, G5</p>  <p>10102552</p>	<p>Bolt, Hex, 5/8X4, G5</p>  <p>10102512</p>	<p>Bolt, Hex, 5/8X5", G5</p>  <p>10103429</p>
<p>Flat Screw 5/8X8 1/2,G8</p>  <p>10102521</p>	<p>Bolt, Hex 5/8X9 A325</p>  <p>004489</p>	<p>Bolt, Hex, 3/4X2, G8</p>  <p>10102509</p>
<p>Bolt, Hex,3/4X5,G5,G</p>  <p>113573</p>	<p>Stud, 3/4X6 1/2, G5</p>  <p>10102549</p>	<p>Stud, 3/4X7, G5</p>  <p>10102547</p>
<p>Cylinder Nose, HDPE, 28X20</p>  <p>10102813</p>	<p>Cylinder ME1 MASH</p>  <p>618538</p>	<p>Cylinder ME2 MASH</p>  <p>618649</p>
<p>Cylinder Assy ME3 MASH</p>  <p>618702</p>	<p>Cylinder Segment, 18X9 1/2</p>  <p>627504</p>	<p>Tel 1 3/4X1 3/4X12GA, G, 10"</p>  <p>10102907</p>

Adhesive, HY200, Hilti	Anchor Kit, Hilti 3/4X7	Tel 2X2X12GA, H2S, G, 10"
		
10102902	619316	10102908

Select Transition



Important: 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. Several types of transitions are available for use with the QuadGuard® Elite M10 Wide (Figures 1 – 6). The correct Panel(s) to use will depend on the direction of traffic and what type of barrier or road feature the QuadGuard® Elite M10 Wide is shielding. Contact Customer Service for any transition questions (p. 3).

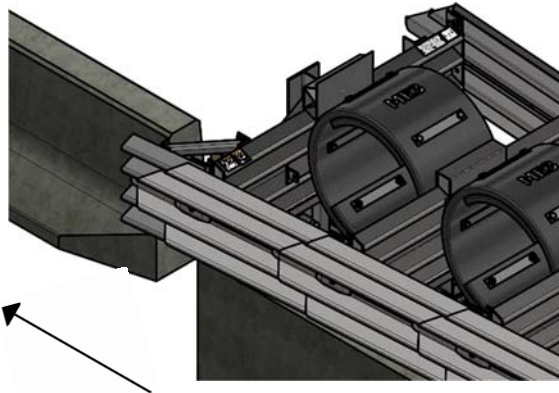


Figure 1
No Transition
(Unidirectional only)

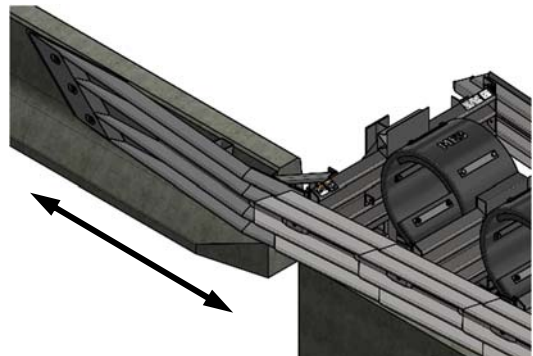


Figure 2
Safety Shape Barrier

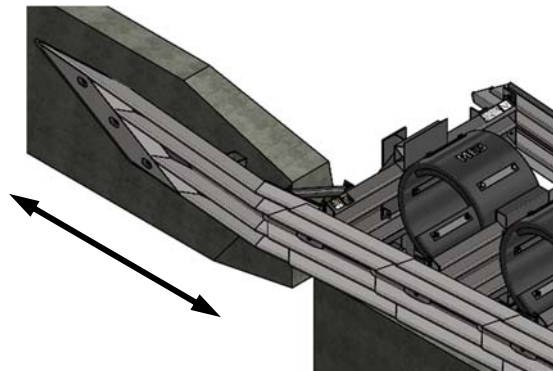


Figure 3
Single Slope Offset

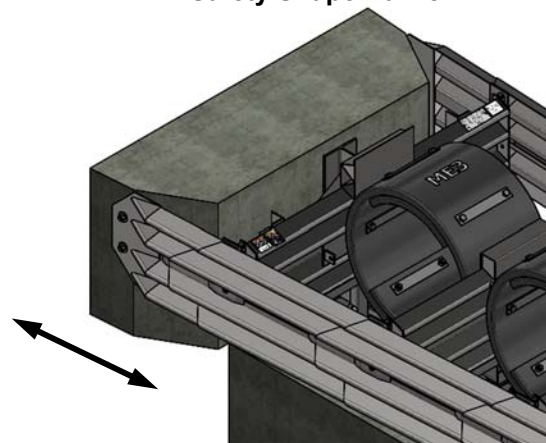


Figure 4
Vertical Barrier

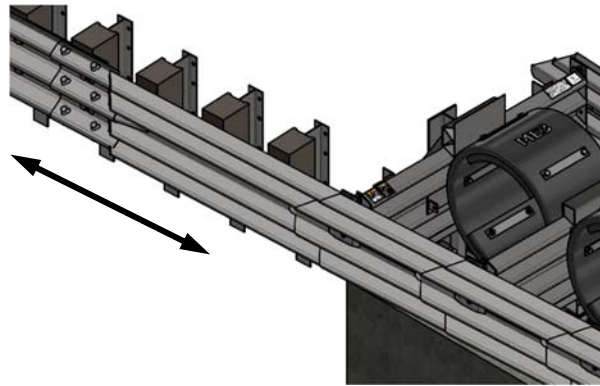


Figure 5
Quad to Thrie-Beam

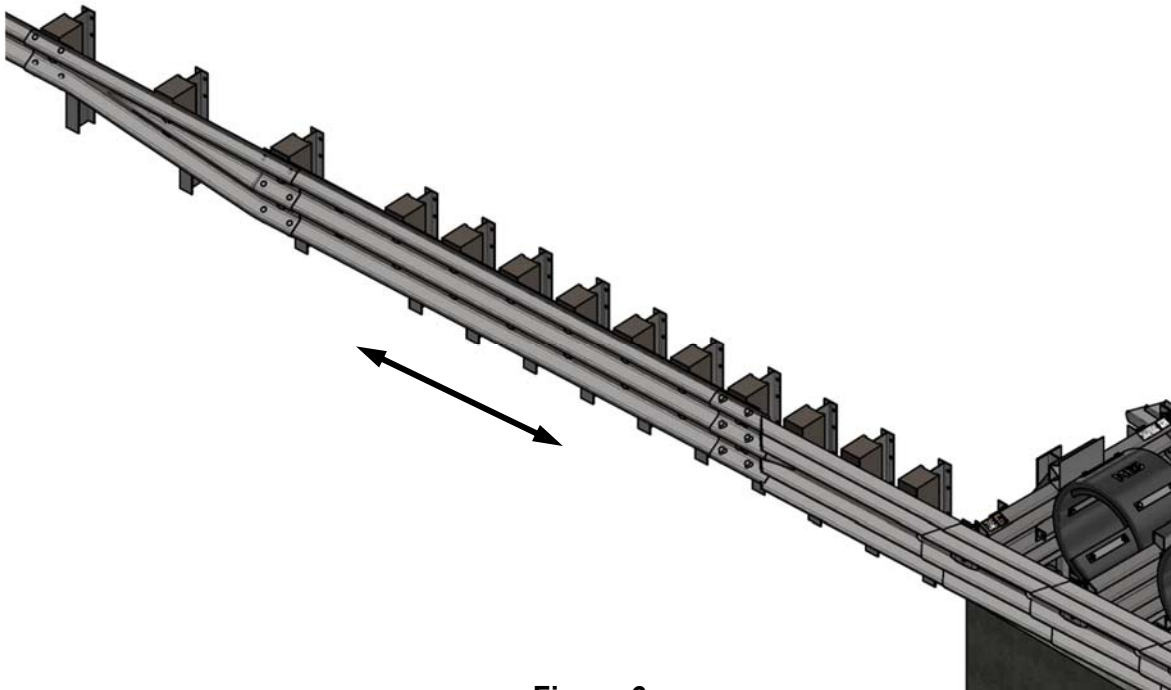


Figure 6
Quad to W-Beam Guardrail

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 –7/8" [22 mm]
- 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.-lbf.
- Crescent Wrench: 12" [300 mm]
- Allen Wrench: 3/8"
- Impact Wrench: 1/2"

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 a complete list. Depending on specific site conditions and the complexity of the assembly specified, the required tools may vary. Decisions as to what tools are needed to perform the job are entirely within the discretion of the contractor performing the assembly of the system at the specified assembly site.

Site Preparation/Foundation

A QuadGuard® Elite M10 Wide 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 be assembled on a non-reinforced concrete roadway (minimum 8" [203 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.

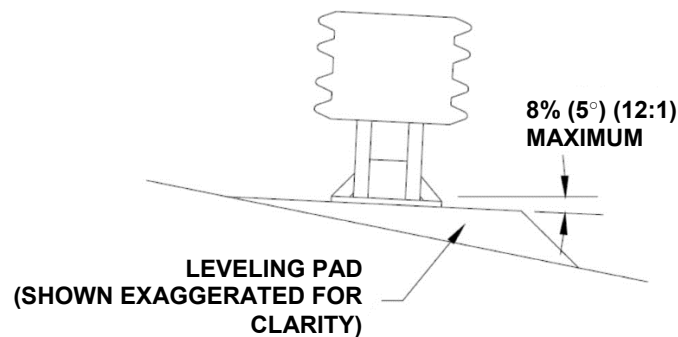


Figure 7
Cross-Slope



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: It is the responsibility of the installer to ensure proper site grading for the QuadGuard® Elite M10 Wide as directed 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 Wide has not been tested on asphalt.

Concrete Installations

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

The QuadGuard® Elite M10 69” may be installed on any of the following foundations using the specified anchorage:

Foundation A: Reinforced Concrete Pad or Roadway

Foundation: 6” [152 mm] (reinforced) **with Anchor Block** minimum thickness P.C.C.

Anchorage: Approved adhesive with 180mm studs at 140 mm embedment

Foundation B: Reinforced Concrete Pad or Reinforced / Non-Reinforced Roadway

Foundation: 8” [203 mm] minimum thickness P.C.C.



Important: To prevent sliding during impact, the pad must be placed against or tied to an existing structure. Additional below grade supports may also be necessary as the project engineer directs.)

Anchorage: Approved adhesive with 180 mm studs at 140mm embedment

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 Wide 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 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
M20 x 165mm	Horizontal	22 mm	135 mm	Adhesive Manufacturer's Spec	Concrete
M20 x 180mm	Vertical	22 mm	146 mm	Adhesive Manufacturer's 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 22mm 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 8).

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).

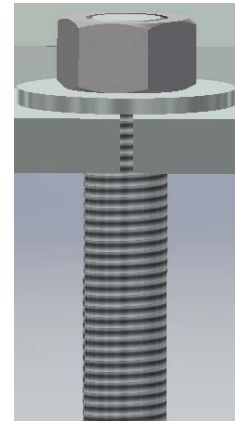


Figure 8
Anchor Application
(Before Applied Torque)

7) Torque the Nuts

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

Steel Rebar Anchor Assembly Cautions

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 9).

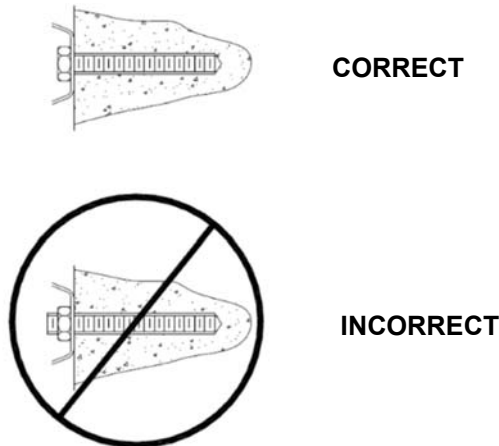


Figure 9
Horizontal Application
(Before Applied Torque)



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 manufacturer's specification.

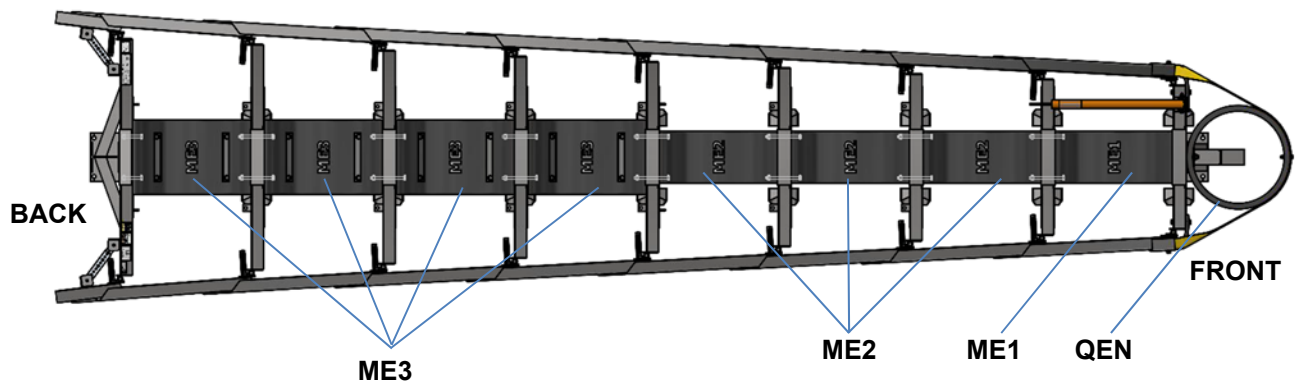


Figure 10 Plan View

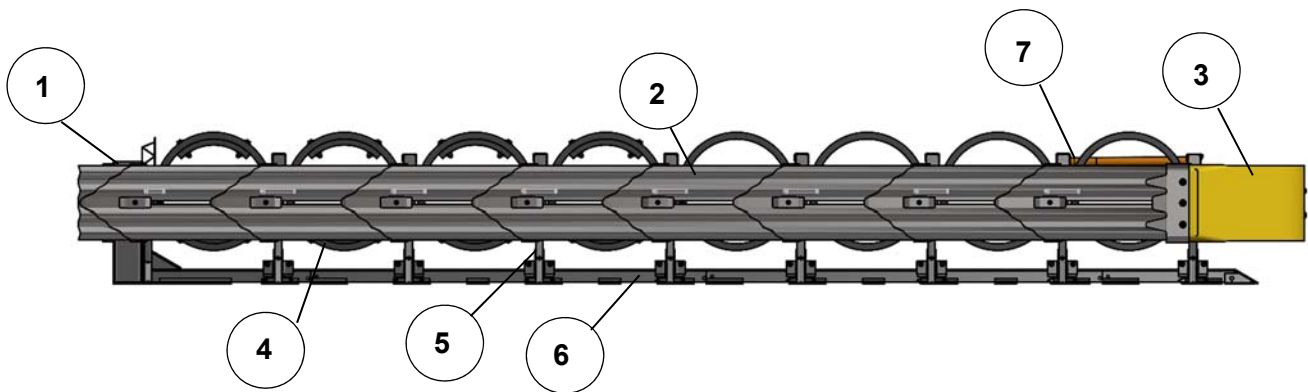


Figure 11 Elevation View

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 hazard. Your left is the system's left and your right is the system's right.

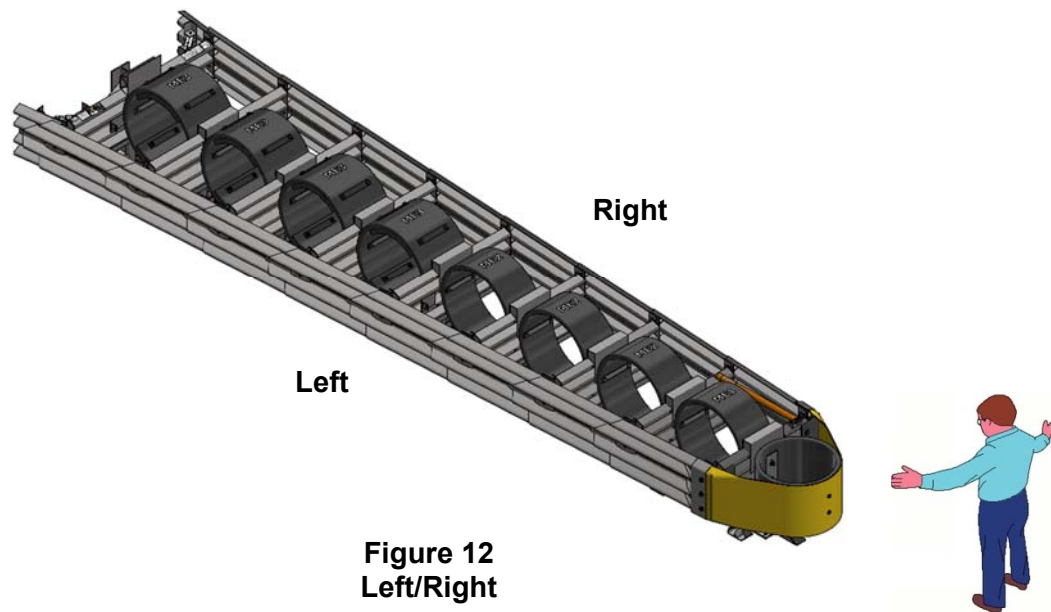


Figure 12
Left/Right

Counting the Number of Bays

One Bay consists of one Diaphragm, two Fender Panels, etc. The Nose Assembly is not considered a Bay (Figure 13).

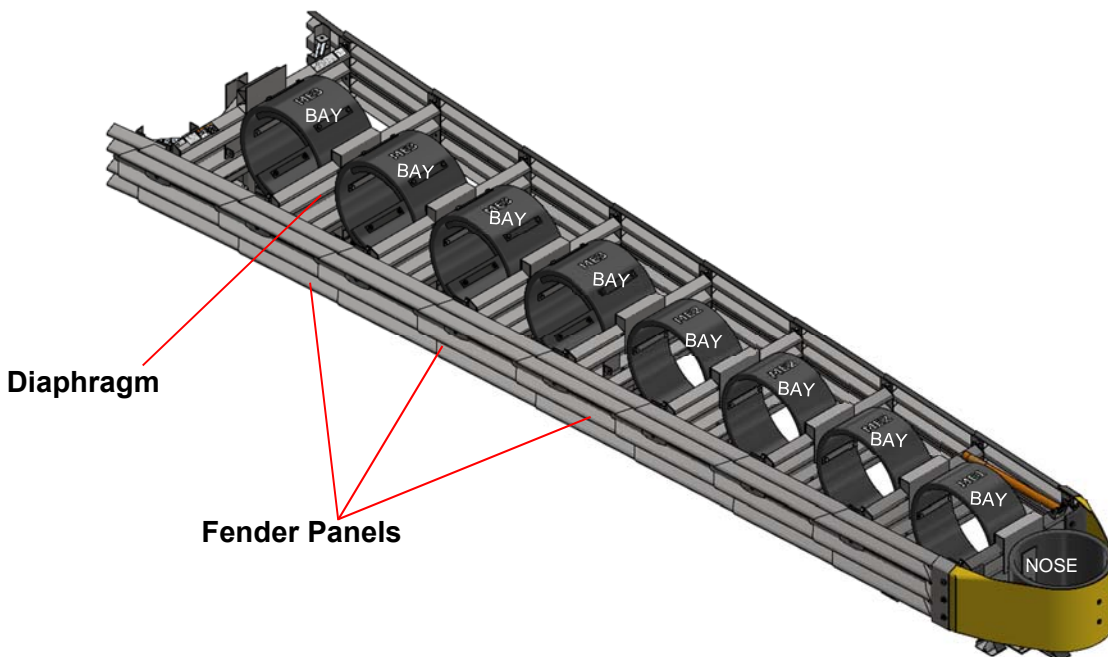


Figure 13
Number of Bays (8 Bay System Shown)

QuadGuard® Elite M10 System Chart	
Width	8 Bay - 62 mph [100 kph]
1755mm	QM10069E

The nominal width of the **Tension Strut Backup** is the width between Side panels behind the Backup (Figure 14). The outside width of the system is approximately 6" [152 mm] to 9" [229 mm] wider than this measurement. The width of the system is not the same as the width of the Backup.



Figure 14
Width of System with Tension Strut Backup

System Assembly

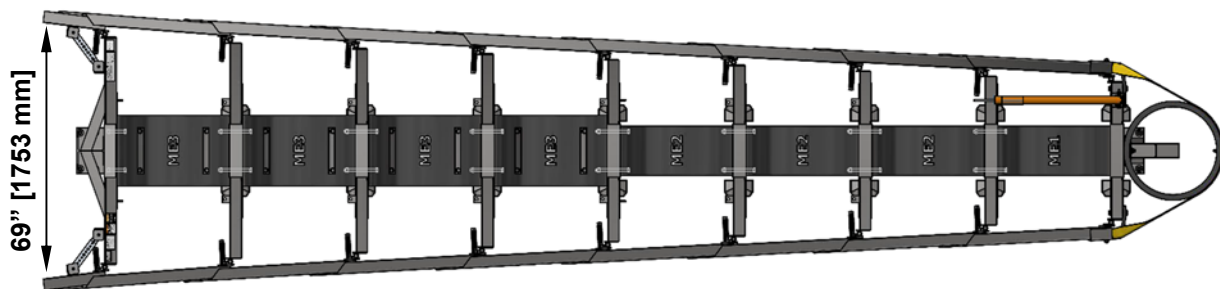


Figure 15

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

1) Determine Transition Type with Tension Strut Backup

The QuadGuard® Elite M10 Wide uses a Tension Strut Backup.

A 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. Several types of transitions are available for use with the QuadGuard® Elite M10 Wide.

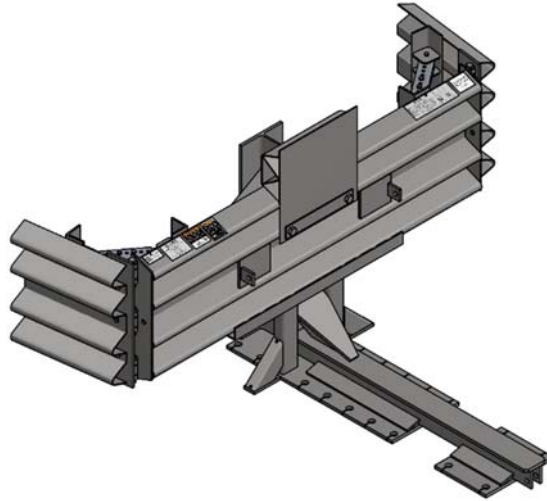


Figure 16
Tension Strut Backup

- 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 17.
- 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.

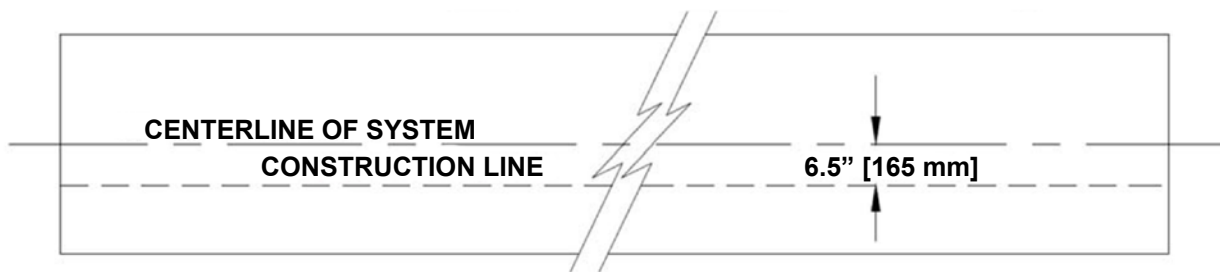


Figure 17
(Top view of concrete pad)
Locating Construction Line

2) Anchor the Backup and Monorail

See Figure 18 (showing Backup Assembly) and Figure 20 (showing Monorail deployment). Also refer to the drawing package and the approved anchoring instructions (p. 16).



Warning: Location of the system 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 18)

Locate the Backup and Monorail on the pad with the side of the Monorail on the construction line (Figure 20). Verify that applicable Transition Panels fit properly before anchoring the Backup. Drill 22mm diameter by 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. 16).

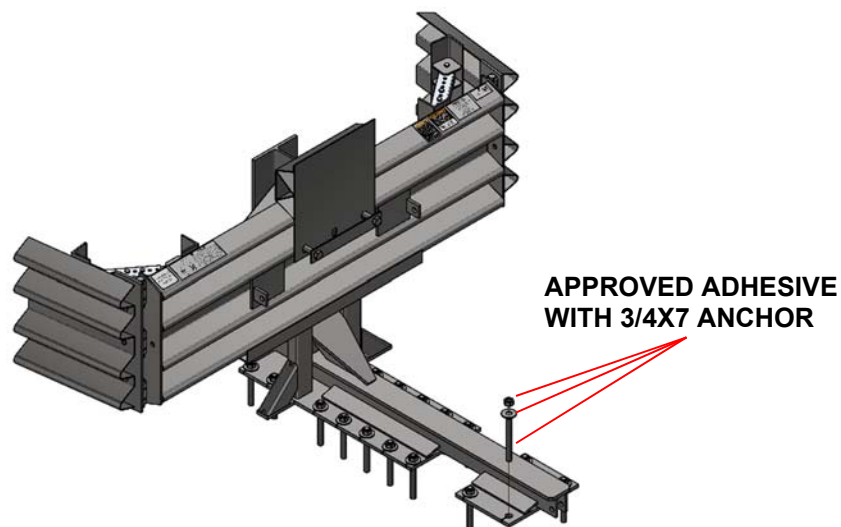


Figure 18
Anchoring Tension Strut Backup to Foundation

Step 2. Monorail Assembly

Locate the Monorail on the construction line as shown in the Monorail Assembly drawings. Drill 22mm diameter by 146 mm deep anchor holes using the Monorail as a template (Figure 20). Do not drill through the pad. Anchor each Monorail section using the provided approved adhesive kits (p. 16). It is important to attach each segment of Monorail in alignment from the back to the front of the system ($\pm 1/4"$ [6 mm]).



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.

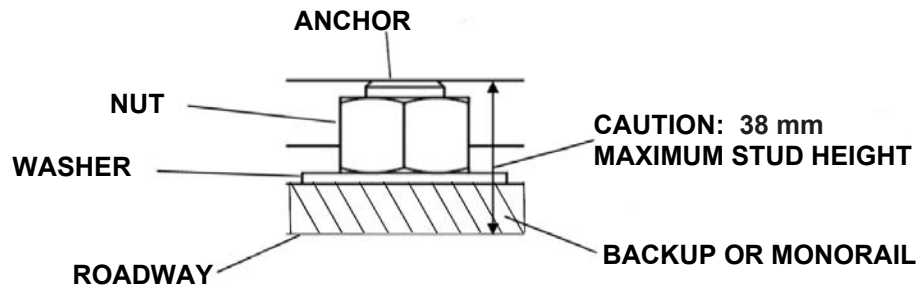


Figure 19
Proper Stud Height

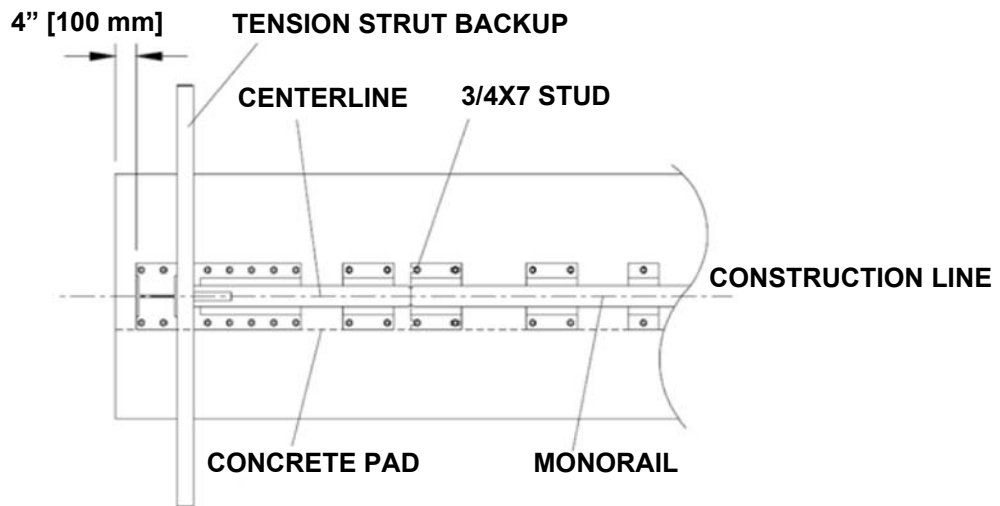


Figure 20
Backup and Monorail Placement for Tension Strut Backup

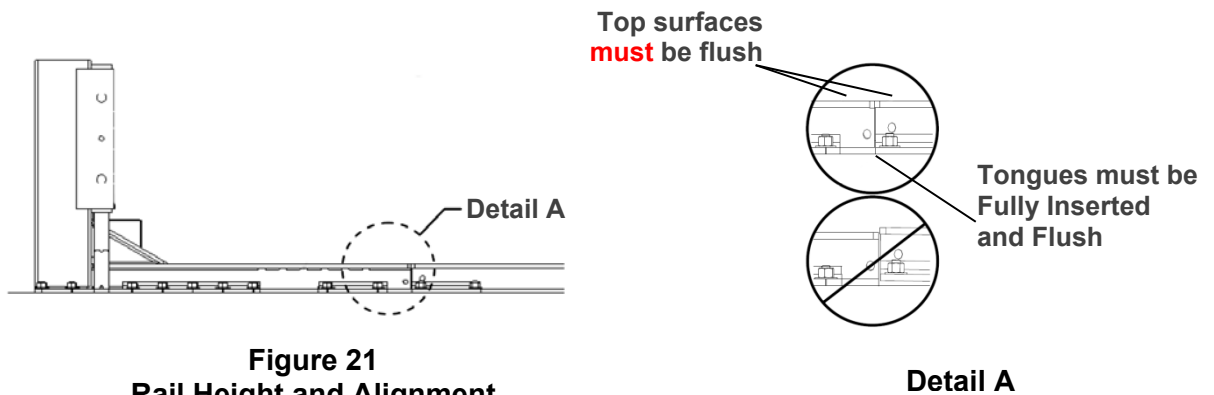


Figure 21
Rail Height and Alignment

3) 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 22 and the drawing package for more information.

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

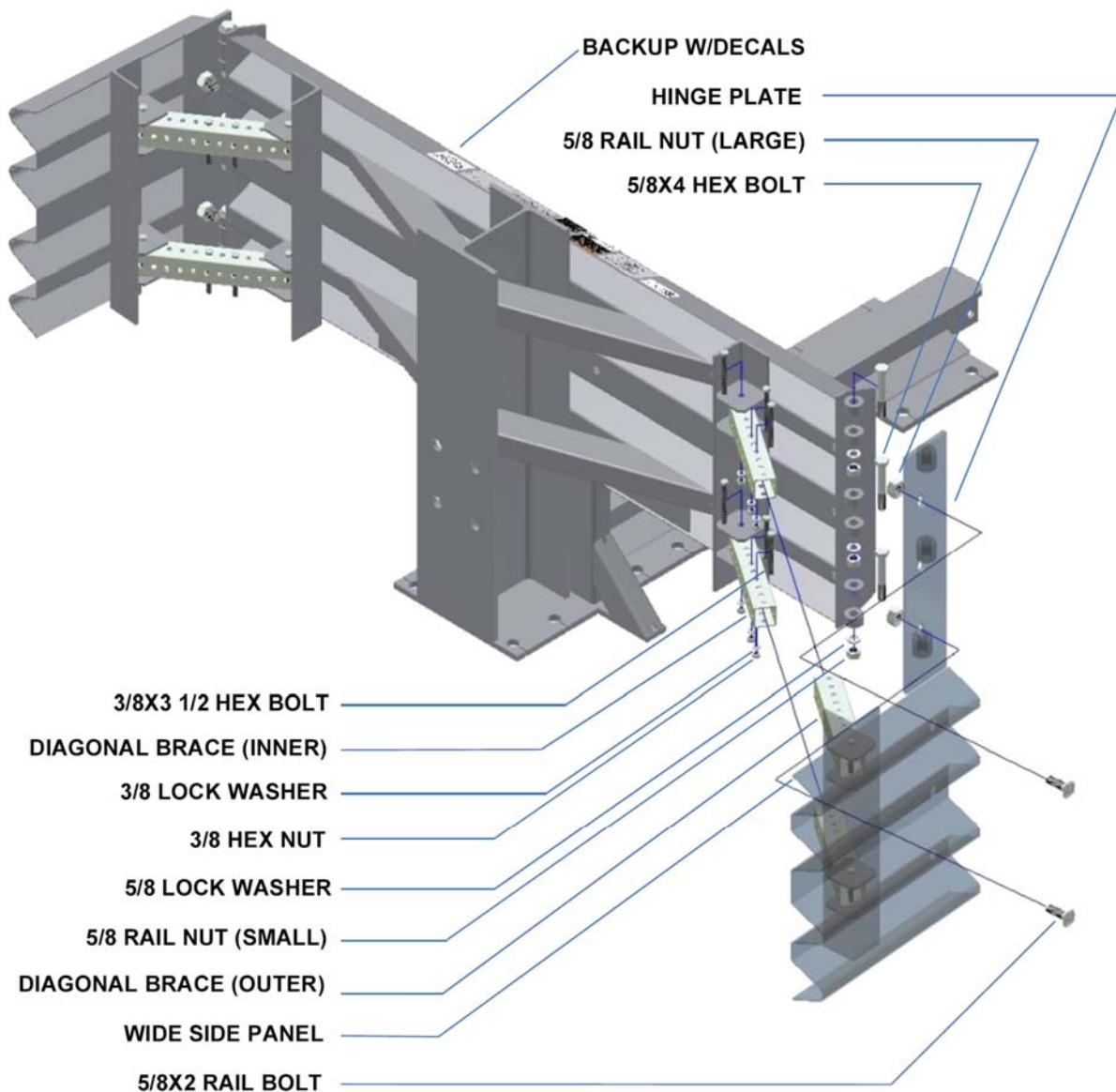


Figure 22
Side Panel/Transition Panel Attachment

4) Attach Monorail Guides

Attach Monorail Guides to Diaphragms as shown in Figure 23, and the Diaphragm Assembly drawing (p. 49).

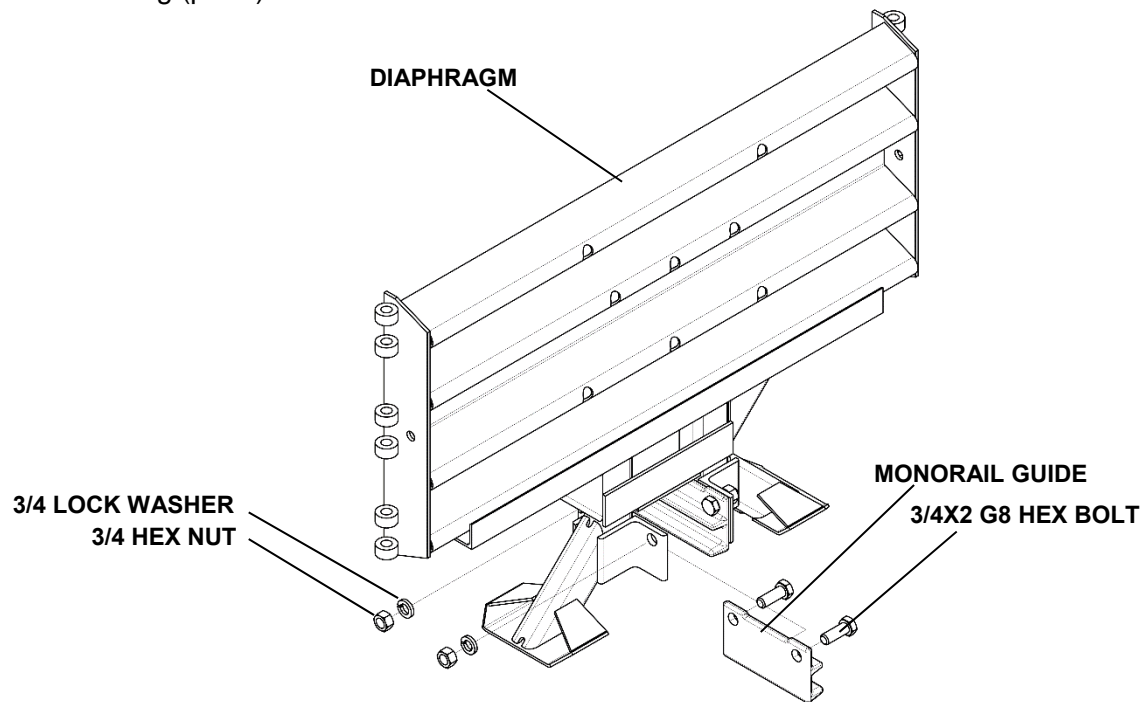


Figure 23
Monorail Guide Attachment One Side

5) 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 24. 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 25).

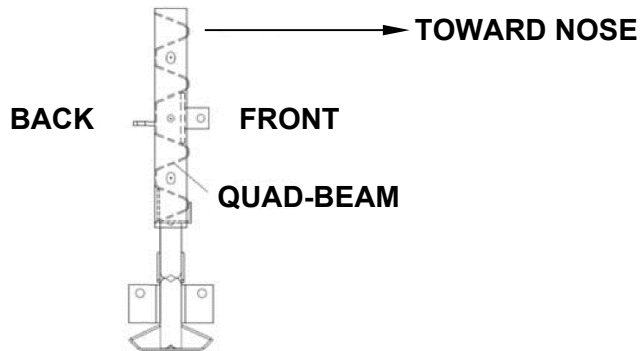


Figure 24
Diaphragm Orientation

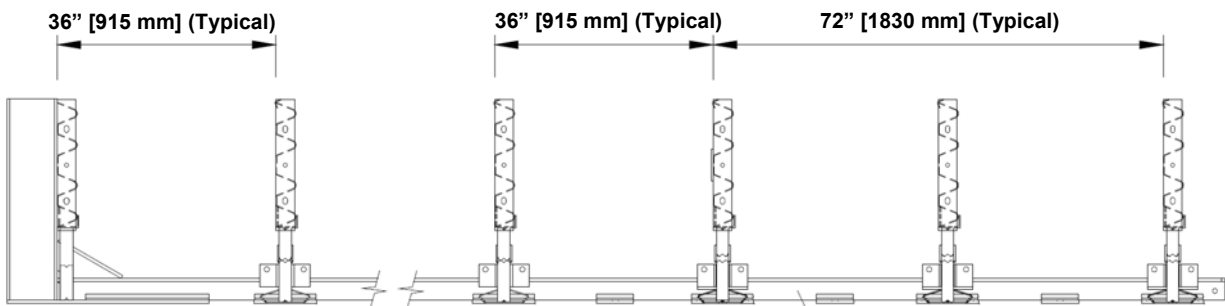


Figure 25
Diaphragm spacing

6) Attach End Cap

Attach End Cap to the Monorail as shown in Figure 26 and the Monorail Assembly drawing.

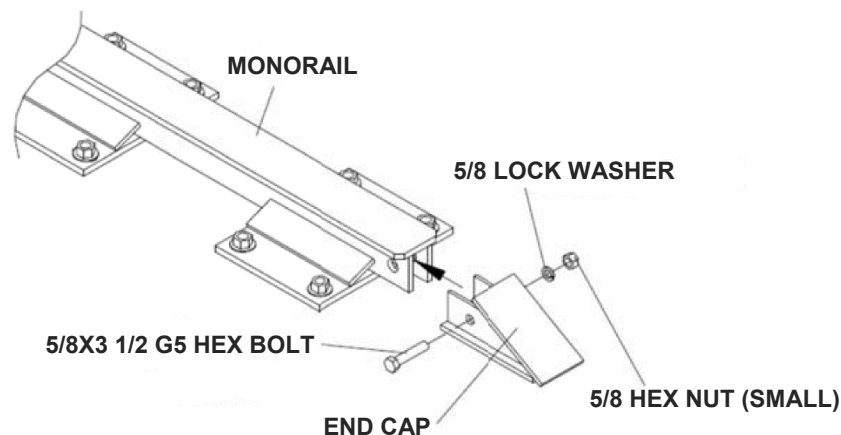


Figure 26
End Cap Attachment

7) Cylinder Attachment

All QuadGuard® Elite M10 Wide systems utilize three Cylinder types. Bay 1 contains a Cylinder with ME1 stenciled on the outer surface. The Nose Assembly contains a single walled 710mm outside diameter Cylinder with QEN stenciled on the surface. All remaining Bays have Cylinders with ME2 or ME3 stenciled on the outer surface.



Warning: Placing the wrong Cylinder in the nose or any Bay may result in unaccepted crash performance as described in MASH.

8) Attach Rear Most ME3 Cylinder

With Backup Extension in place, position a ME3 Cylinder so it is centered on the mounting holes. Fasten Cylinder to Backup using 3/4X5" hex bolts, hex nuts, and bar washers. Tighten ME3 Cylinder to Backup. Slide the next Diaphragm against the Cylinder so no gaps exist between the Backup, Cylinder, and Diaphragm. Tighten all fasteners.

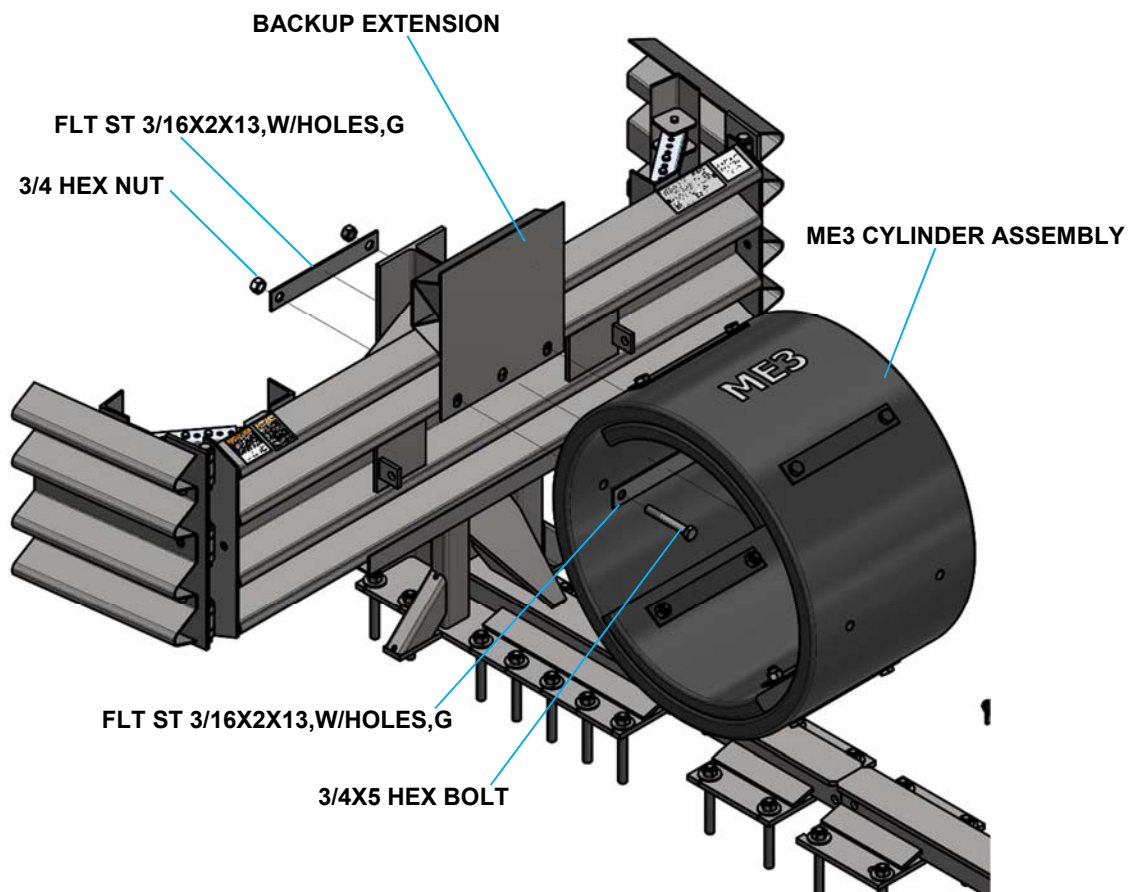


Figure 27
Typical Backup ME3 Cylinder Assembly

9) Attach Remaining ME3 Cylinders

Continue attaching the ME3 Cylinders to Diaphragms using 3/4X9" hex bolts, hex nuts and bar washers. Remove any clearance between the ME3 Cylinders and Diaphragms as you work forward from the Backup. Tighten all fasteners.



Important: Diaphragm Extensions must be in place before Cylinder attachment.

10) Attach the ME2 Cylinders

Attach ME2 Cylinders in the same way as ME3 Cylinders. Tighten all fasteners.



Important: Diaphragm Extensions must be in place before Cylinder attachment.

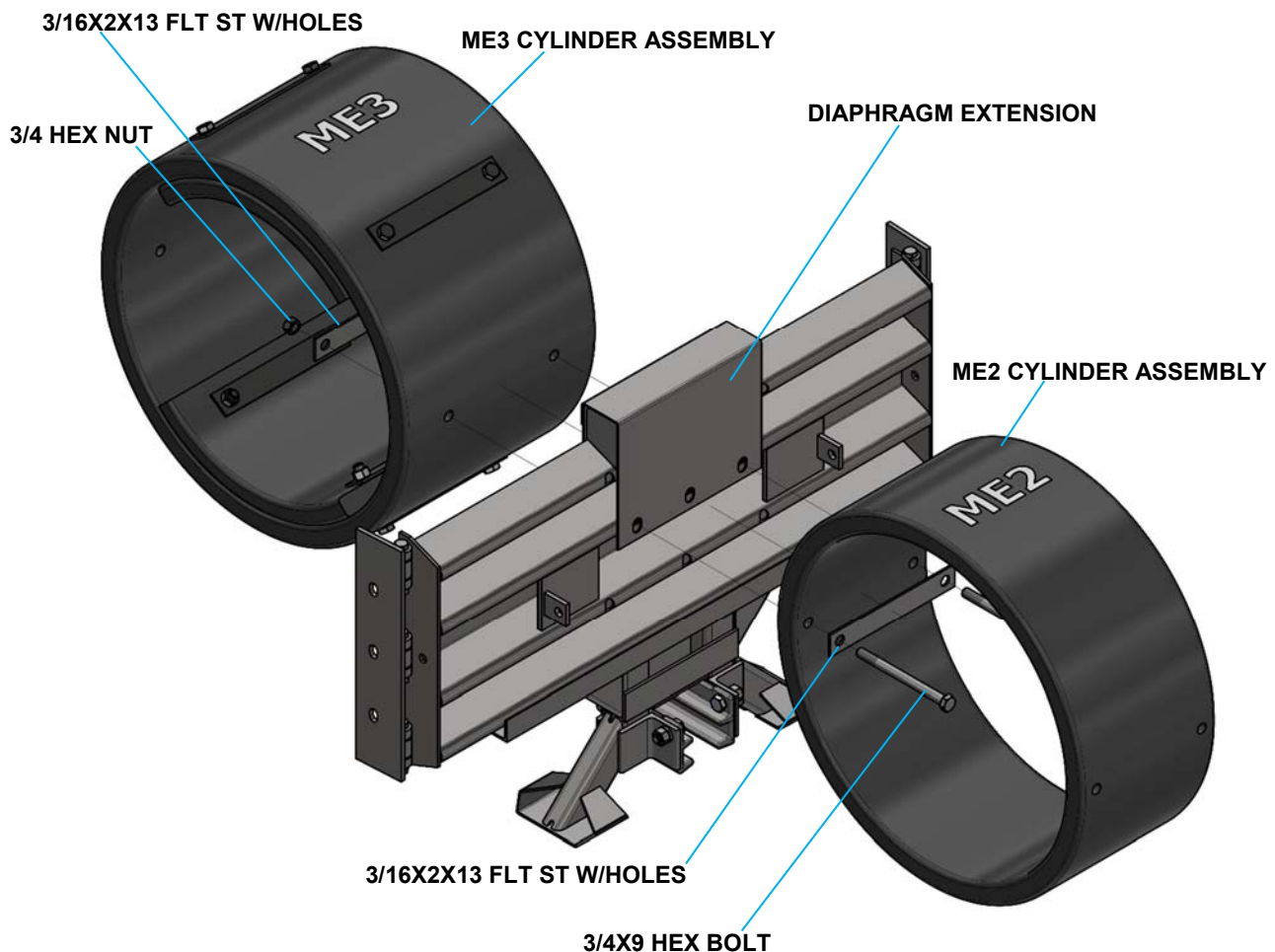


Figure 28
Typical ME3 Cylinder Mounting

11) Attach the ME1 Cylinder in Bay 1

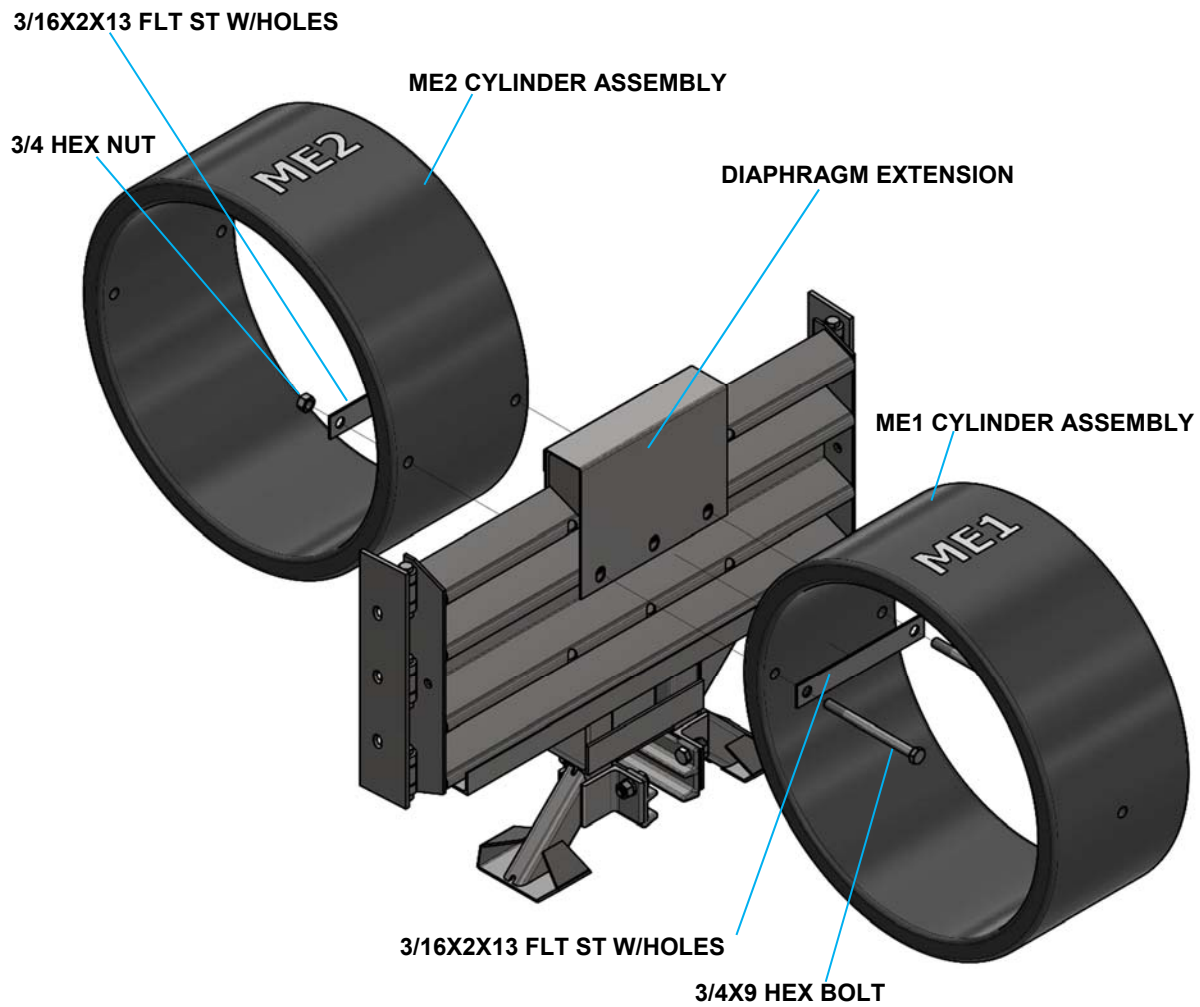


Figure 29
Typical ME1 to ME2 Mounting

12) Attach Nose Cylinder

Attach the Nose Cylinder using two 5/8" bolts rods through the Nose Cylinder Plate, Nose Cylinder, and Diaphragm (Figure 30). Secure each 5/8" hex bolt with flat washers, lock washers, and hex nuts. Tighten all fasteners.

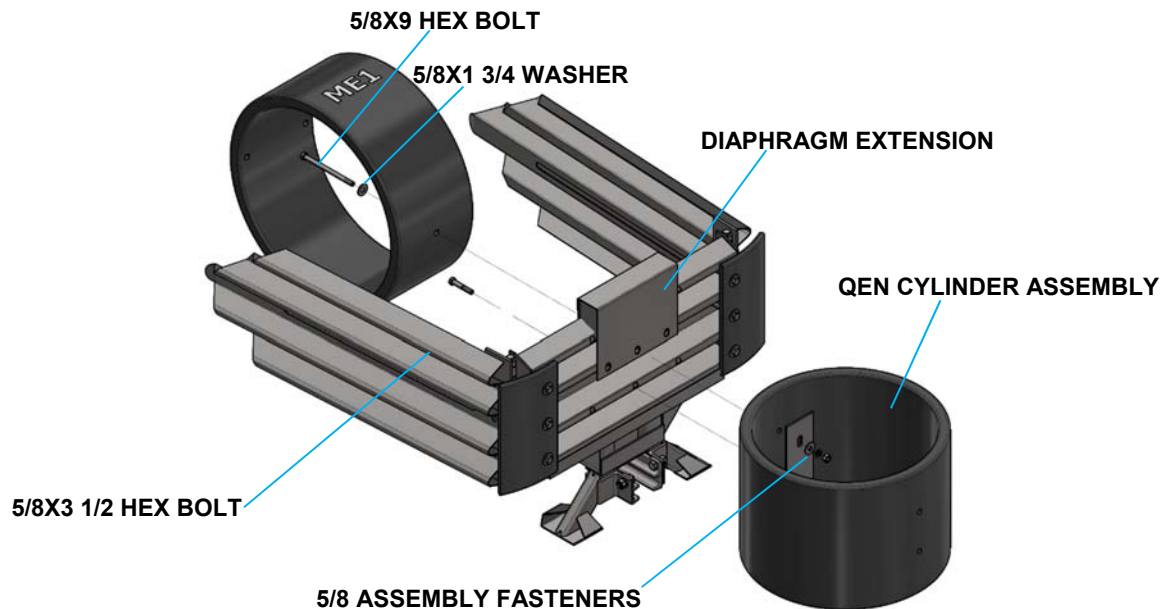


Figure 30
Attach Nose Cylinder to First Diaphragm

13) Attach Hinge Plates to Diaphragm

Orient Hinge Plate with holes rearward and hinges toward the front. Insert 5/8x4" hex bolts through all hinges. Secure each bolt with 5/8" lock washer and hex nut (Figure 31). (Typical three places per side on all Diaphragms) The First Diaphragm has additional Cylinder Segments fastened with 5/8" heavy hex nuts, flat washers and 5/8x5" hex bolts (Figure 32). See pages 48 and 49 for additional information.

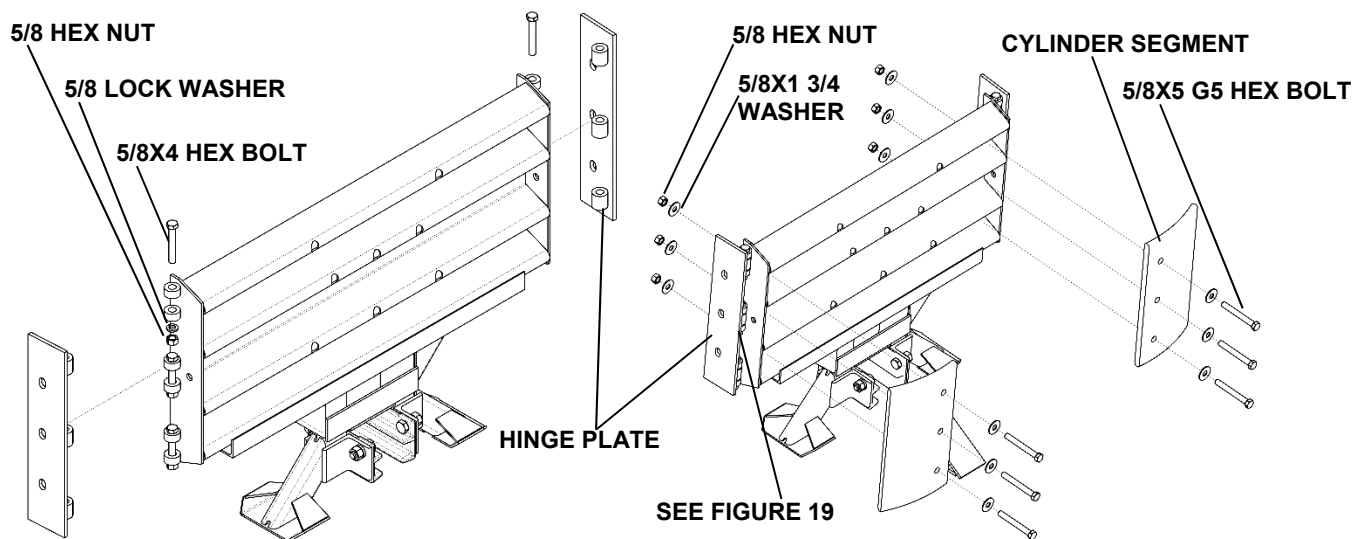


Figure 31 - Hinge Plate Diaphragms 2-6

Figure 32 - Hinge Plate 1st Diaphragm

14) Fender Panel Attachment

Starting at the Backup and working forward, assemble Left and Right Fender Panels as shown in Figure 34.

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 35 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 rail nuts per side. Use only the top and bottom holes; leave the center hole open until the next Fender Panel is attached.

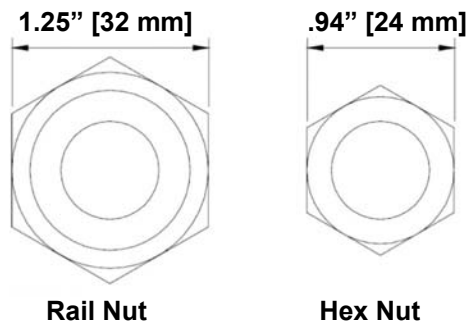


Figure 33
Rail Nuts are Oversize

Note: Do not mix the 5/8" rail nuts (large) with the 5/8" hex nuts (small) (Figure 33).

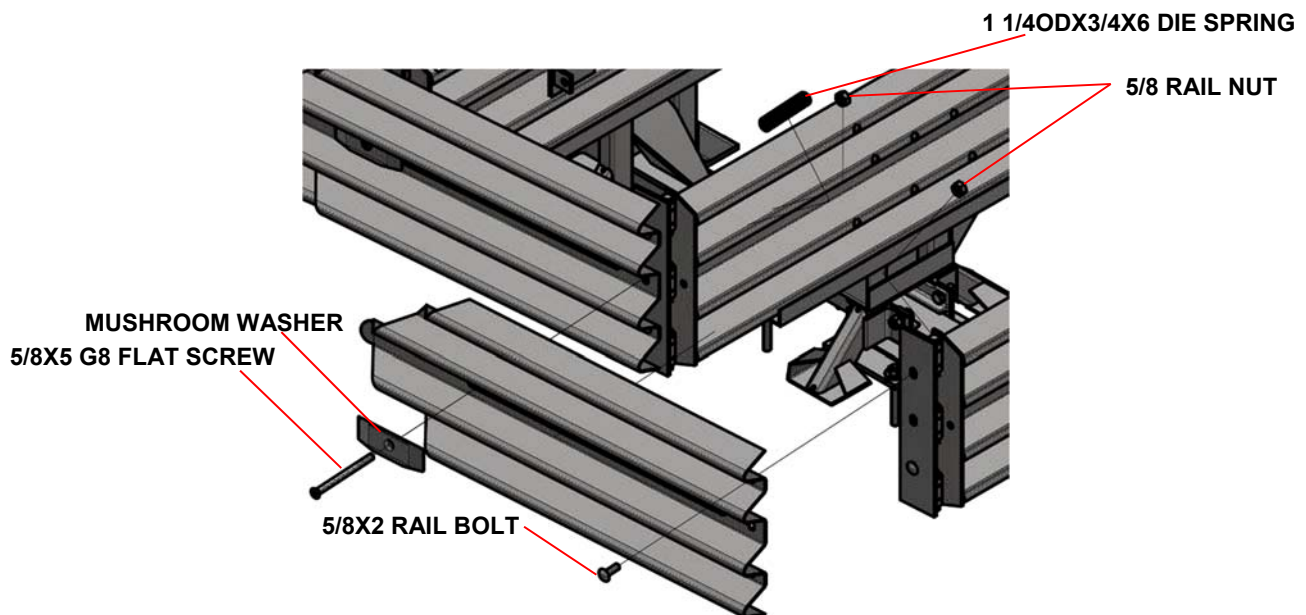


Figure 34
Fender Panel Assembly

Note: Mushroom Washers lay flat against the Fender Panel as shown below. Mushroom Washer Stand-off must be seated completely through slot (Figure 35).

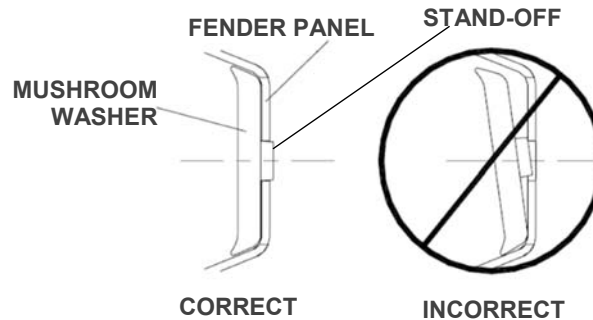


Figure 35

Continue attaching Fender Panels until you reach Diaphragm No. 1 (Figure 36).

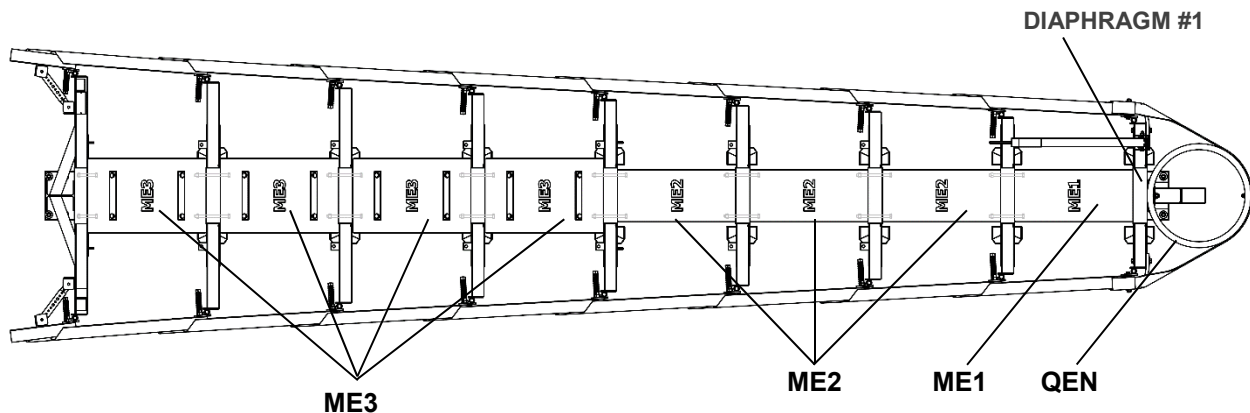


Figure 36
Diaphragm No. 1 & Cartridge Placement

15) Belt Nose Assembly

- Using 5/8X5" hex bolts, 5/8X1 3/4" flat washers, and 5/8" hex nuts, attach Fender Panels to Diaphragm Hinge Plates on three places per side (Figure 37 and 38). Tighten all fasteners.
- Thread additional 5/8" nuts onto the 5/8X5" hex bolts. Slide 5/8X1 3/4" flat washers onto bolts (three places per side). Adjust the nuts so the outside of the washers are even with the Fender Panel humps (Figure 37).
- Place Belt Nose over Diaphragm/Fender Panel attachment bolts.
- Align holes in Belt Clamps with bolts and place onto bolts against belt.
- Secure with 5/8X1 3/4" washers and 5/8" hex nuts in three places per side. Adjust Belt Nose Assembly so belt height is 32.0" above grade. Tighten all fasteners.
- Complete Belt Nose Assembly by attaching Belt to Nose Cylinder with 1/2X3" hex bolt, 1/2" washer, lock washer, and hex nut.

The Nose can be delineated to comply with local codes (chevron, reflectorized sign, etc.).



Warning: Placing the wrong type Cylinder in the Nose or any Bay will result in unacceptable crash performance as described in MASH.

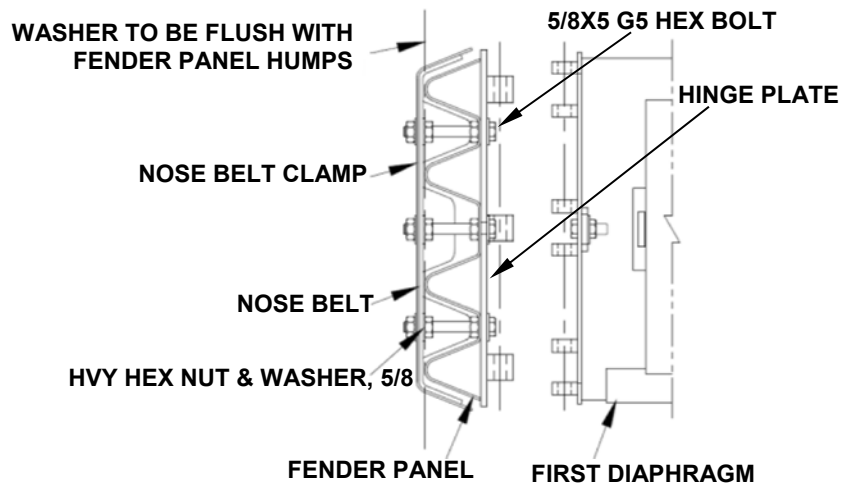
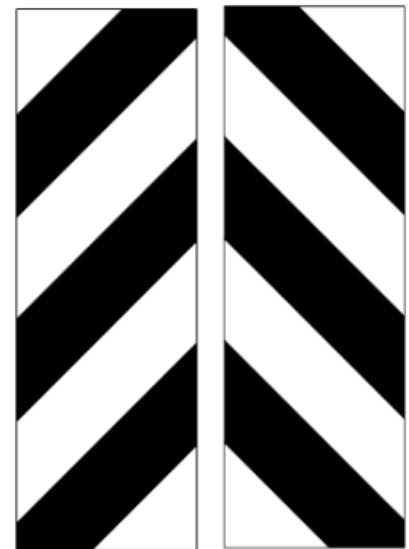


Figure 37



Nose Cover LHS	Nose Cover RHS
Part No.	Part No.
B/W - 10009233	B/W - 10009234
B/Y - 10009235	B/Y - 10009236

Figure 37a

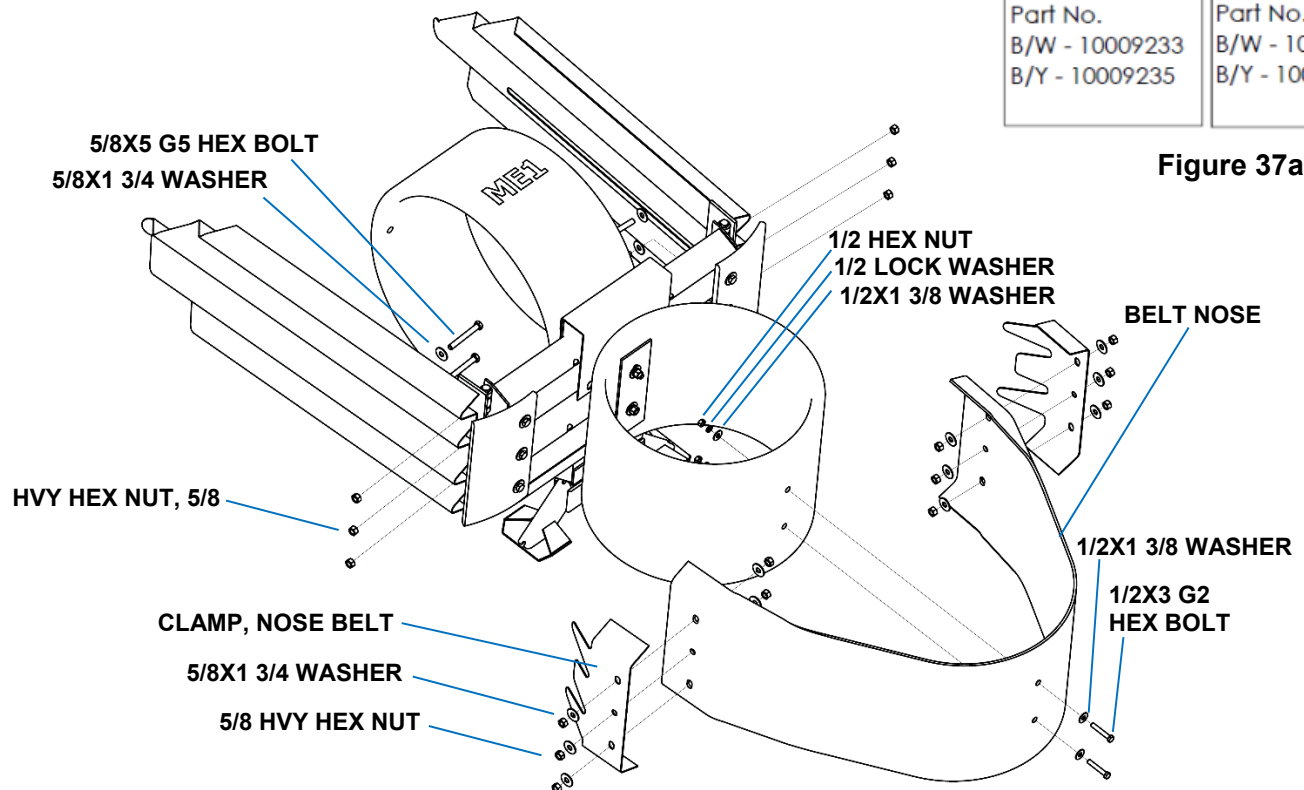


Figure 38
Attach Nose Belt to Fender Panels

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 as shown in Figure 39. Offset component to right side of Diaphragm.

Step 1. Position Hit Indicator on 1st Diaphragm. Center Hit Indicator between Diaphragm Extension and edge of Diaphragm. 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. 53).

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 40).

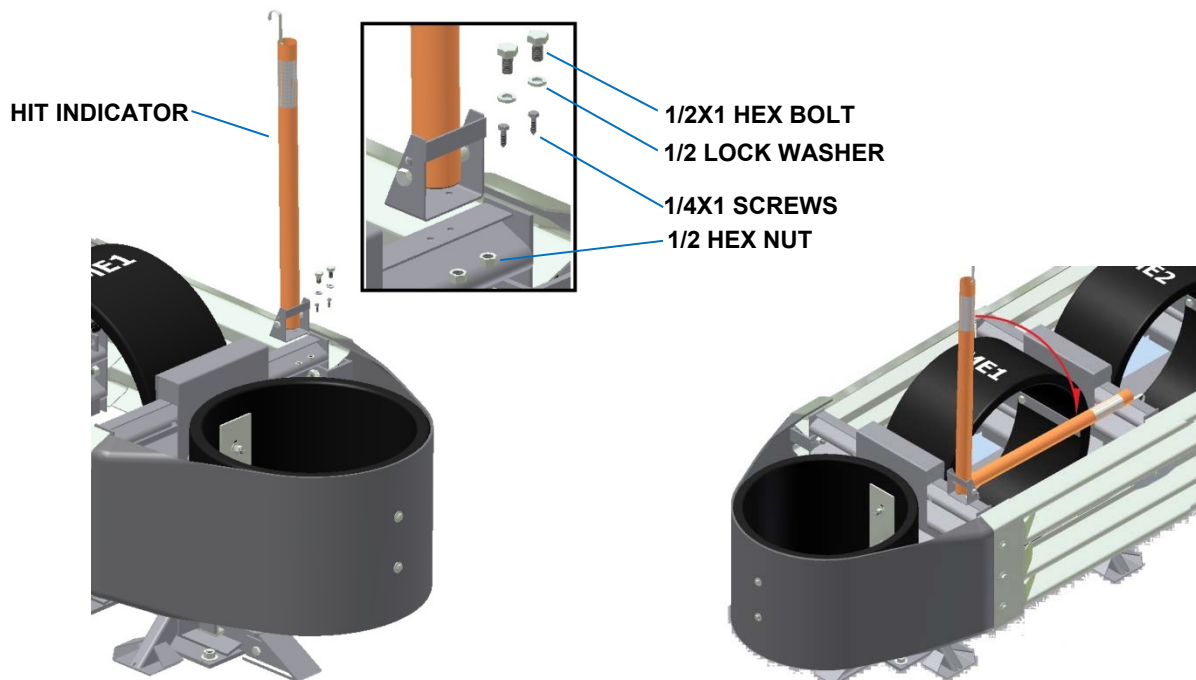


Figure 39
Attach Hit Indicator

Figure 40
Rotate Hit Indicator/Bend Trigger Clip

17) Checking The System Assembly

At this point tighten all Mushroom Washer Assembly nuts until they bottom out on the threads of screws 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 41).



Bolt Torque Specifications	
Warning:	
Anchor Studs	Torqued to Adhesive Manufacturer's Specification Shall Not Extend Above Concrete Pad More than 30mm (p. 24)
All Other Bolts	Tightened
Fender Panel	Maximum gap allowed: WIDE Systems – 25 mm

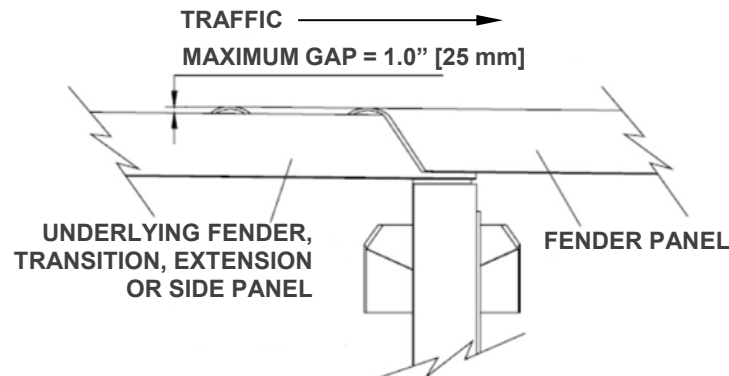


Figure 41
Fender Panel Gap

18) Inspect System

Inspect the system in accordance with Maintenance Flow Chart (p. 40).

QuadGuard® Elite M10 Wide Final Inspection Checklist

Site Location: _____

Date: _____

Inspector: _____

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

- ☐ Proper Transition Panel is used for barrier type (p. 11)
- ☐ If no transition is used, side panels are used with backup (p. 11)
- ☐ Minimum clearance of 25" behind rear Fender Panels for movement (p. 14)
- ☐ Anchor nuts are torqued to adhesive manufacturer's specification (p. 16)
- ☐ Cylinder types are properly placed (p. 19)
- ☐ Every borehole and slot in Backup and Monorail is utilized (pp. 23, 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)
- ☐ Cylinder Segments are fastened on each side of the 1st Diaphragm (p. 27)
- ☐ Monorail End Cap Assembly in place (p. 27)
- ☐ Mushroom Washer Assembly nuts must be tightened to the bolt shank. (p. 32)
- ☐ Mushroom Washers tabs lay flat within Fender Panel slots (pp. 33, 39)
- ☐ Belt Nose Assembly and is 32" above grade (p. 33)
- ☐ Fender Panel gap is 1.0" [25 mm] or less for Wide systems (p. 43)
- ☐ Bolts and nuts are properly tightened throughout the system (p. 43)
- ☐ 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 Wide Maintenance Flow Chart (p. 40).



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 Wide 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 (p. 43).
- 6) Fender Panels and Transition Panels should nest tightly against the system. For wrong way traffic, the maximum gap allowed is 1.0" [25 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 it appears normal.

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 660 mm for proper impact performance (Figure 42). If distance is less than 660 mm, replace all ME1 and ME2 Cylinders. If distance is greater than 660 mm, inspect all Cylinders for major cracks, tears or cuts. Replace any damaged Cylinders. Please call Customer Service if you have any questions (p. 3).

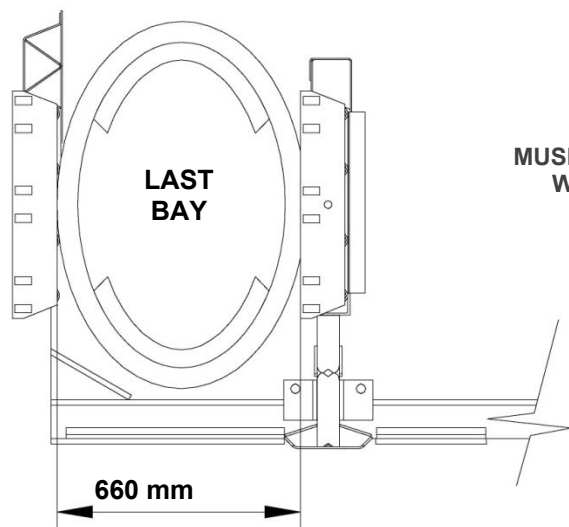


Figure 42
Distance Across
Minor Axis of ME2 Cylinder

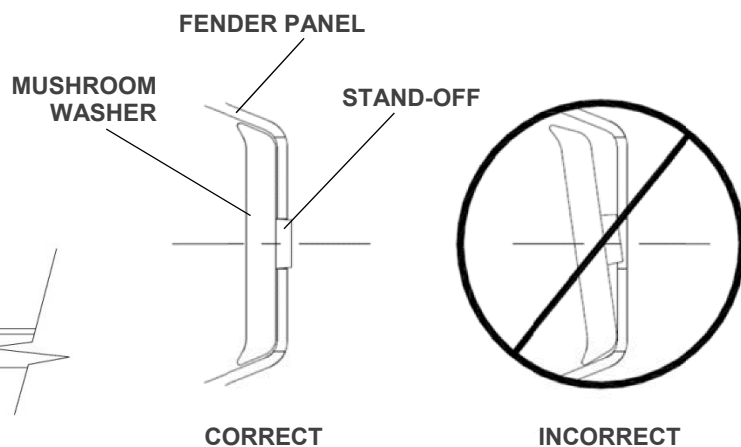


Figure 43
Mushroom Washer Orientation

- 9) Ensure the system is deployed to its full length.

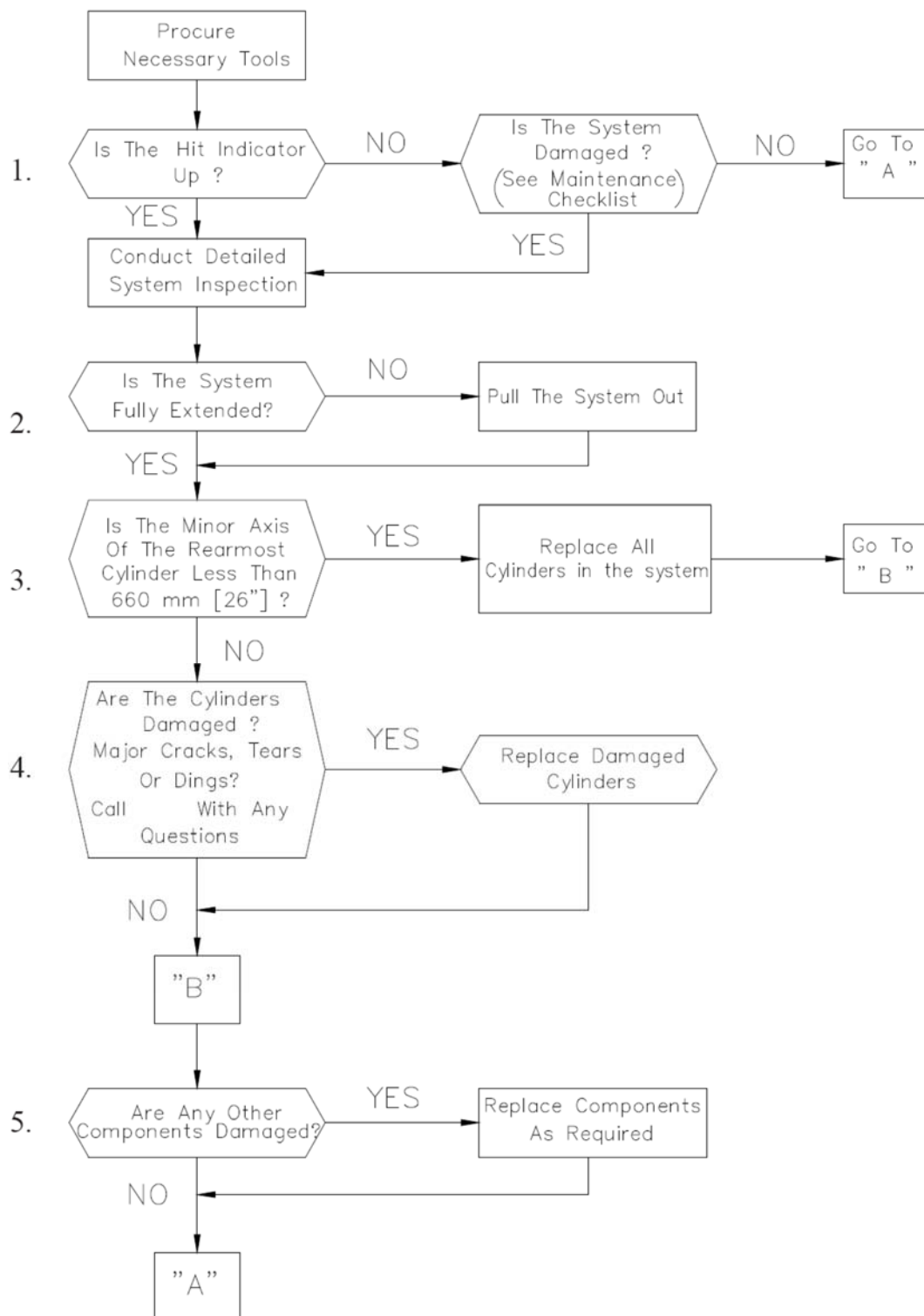


Caution: Systems that are not restored to their full length may not perform to impact performance standards of MASH.

- 10) Make all necessary repairs as described above and see the following page for Post-Impact Instructions.
- 11) Reset Hit Indicator if necessary.
- 12) Note the location and condition of the QuadGuard® Elite M10 Wide, 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 for more information (p. 41).

Maintenance Flow Chart

Refer to the appropriate sections of this manual for specific procedures.



Post-Impact Instructions

- 1) Deploy the appropriate traffic-control devices to protect your crew.



Warning: An impacted system can store energy in collapsed Cylinders and **may spring back unexpectedly** causing serious injury. Use caution during post-impact inspections for repair or refurbishment.



Warning: It is the responsibility of the worker to keep hands and other body parts clear of system interaction. Be aware of tools (pry bar, etc.) that could move unexpectedly if a bind is suddenly released.

- 2) Position a minimum 1 ton pickup truck on the system just in front of the Nose Assembly. Place the truck bumper against the system. The truck bumper height, approximately 24" [610 mm], should rest against the middle center of the Nose Assembly.



Warning: Once the bumper is over the system's Monorail, the vehicle may be subject to pushing force due to 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 deploys before Step 2 is complete, the driver should apply the brakes immediately to bring the vehicle to a controlled stop. The vehicle must be in neutral while still applying the brakes and then gradually release the brakes to allow the system to restore against the truck bumper in a safe and controlled way.

- 3) Once in place, carefully move the truck so the bumper displaces the Nose Cylinder 6". In the absence of the Nose assembly, place protective material between the bumper and the first Diaphragm leaving a 25mm gap between the protective material and the truck bumper. It is the responsibility of the driver to remain in the vehicle to apply the brake during initial system displacement.



Caution: Use a pry bar with a 1 ton truck to release additional mechanical binds in a safe and controlled manner.

- 4) Wrap a chain, 3/8"X20' Grade 40 minimum, around the first Diaphragm (Figure 44). Attach both ends of chain to truck bumper anchor points.



Important: Wrap chain around the first Diaphragm so the pull force is aligned with the long slots in the Fender Panels to ensure a smoother extension.



Warning: Stand clear in case chain breaks or becomes disconnected.



Important: Have someone watch during repositioning to ensure undetected damage does not cause the Diaphragms to bind or pull out improperly. Wait ten minutes after full extension for Cylinders to regain their former shape.

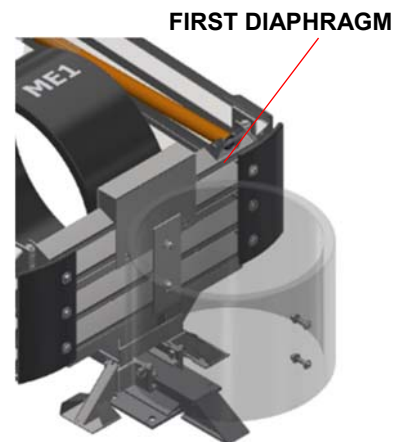


Figure 44
Attach Chain to First Diaphragm

- 5) Ensure the Mushroom Washer Assemblies holding the Fender Panels together are still intact and the system has not been deformed to prevent it from pulling back fully to its original position.



Caution: Use eye protection and gloves when repairing any Mushroom Washer Die Spring Assembly. Do not place fingers underneath an assembled Mushroom Washer. Parts may suddenly shift and fingers may be pinched. If the Die Spring is still under compression, then secure it with a clamp to ensure safe action and release when the nut is removed.

- 6) The system should now be safe to approach for debris removal and further mechanical binding inspection. Binding is typically located at the Monorail Guides near the front Diaphragms or Fender Panels.
- 7) Verify all Anchor Bolts are firmly anchored to the roadway surface. Replace any loose, broken, or pulled out Anchors. Proper performance of the system depends on the Monorail Anchors being properly deployed.
- 8) All Diaphragm Support Legs must be properly attached to the Monorail.
- 9) Inspect the system in accordance with the QuadGuard® Elite M10 Wide Maintenance Flow chart (p. 40). The Cylinders are potentially reusable after typical design speed impacts. See the Limitations and Warnings section on page 5.
- 10) Diaphragms that are bowed or have bent legs must be replaced.
- 11) Each Fender Panel must be properly attached with a Mushroom Washer Assembly. Check all Fender Panel to Diaphragm bolt connections. All damaged bolts, Fender Panels and Transition Panels must be replaced.
- 12) The maximum gap allowed for overlapping Fender Panels on the side of the system with traffic approaching from the rear (including Fender Panels overlapping components behind the system) is 25 mm. Mushroom Washer Assembly nuts must be tightened to the bolt shank. Replace damaged parts if a gap between any Fender Panel exceeds 25 mm (p. 43).
- 13) Replace all damaged Cylinders. If a Cylinder's condition is questionable, a photo of the Cylinder may be forwarded to Trinity Highway for evaluation (p. 3).
- 14) Tighten and torque all fasteners on the system (p. 36).
- 15) Clear site debris.
- 16) The QuadGuard® Elite M10 Wide is ready for use.



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 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.



CAUTION:

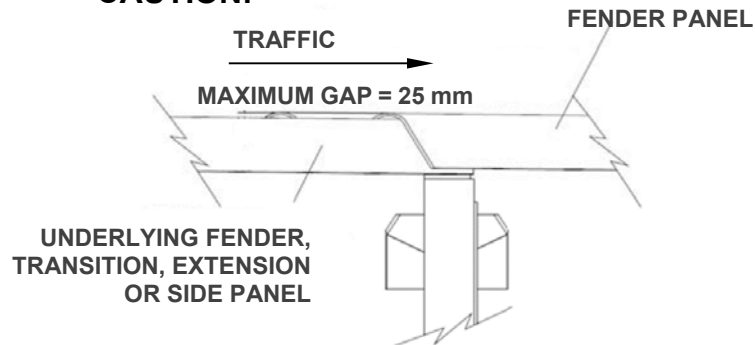


Figure 45
Fender Panel Gap



Torque Specifications

Warning:

Mushroom Bolt Assemblies	Tighten nut to bolt shank
Anchor Studs	Torqued to adhesive manufacturer's specification. Shall Not Extend Above Concrete Pad More than 38mm (p. 24)
All Other Bolts	Tightened
Fender Panel	Maximum Gap Allowed
WIDE System	25 mm

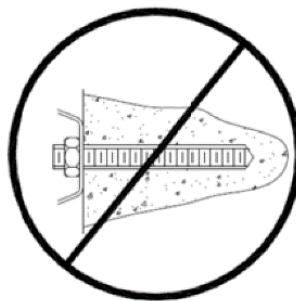
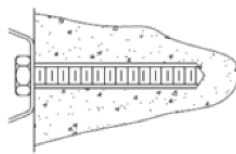


Figure 46
Horizontal Anchor

Parts Ordering Procedure and Drawings

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 Wide Ordering Information Chart		
Description:	Choices	Fill in this section
Transition Panel Type Right side, left side, or no Transition (p. 11)	W-Beam Thrie Beam Guardrail Safety Shape Barrier Single Slope Barrier Verticle Concrete	
Width of Backup	4" [100 mm] Offset Panel	

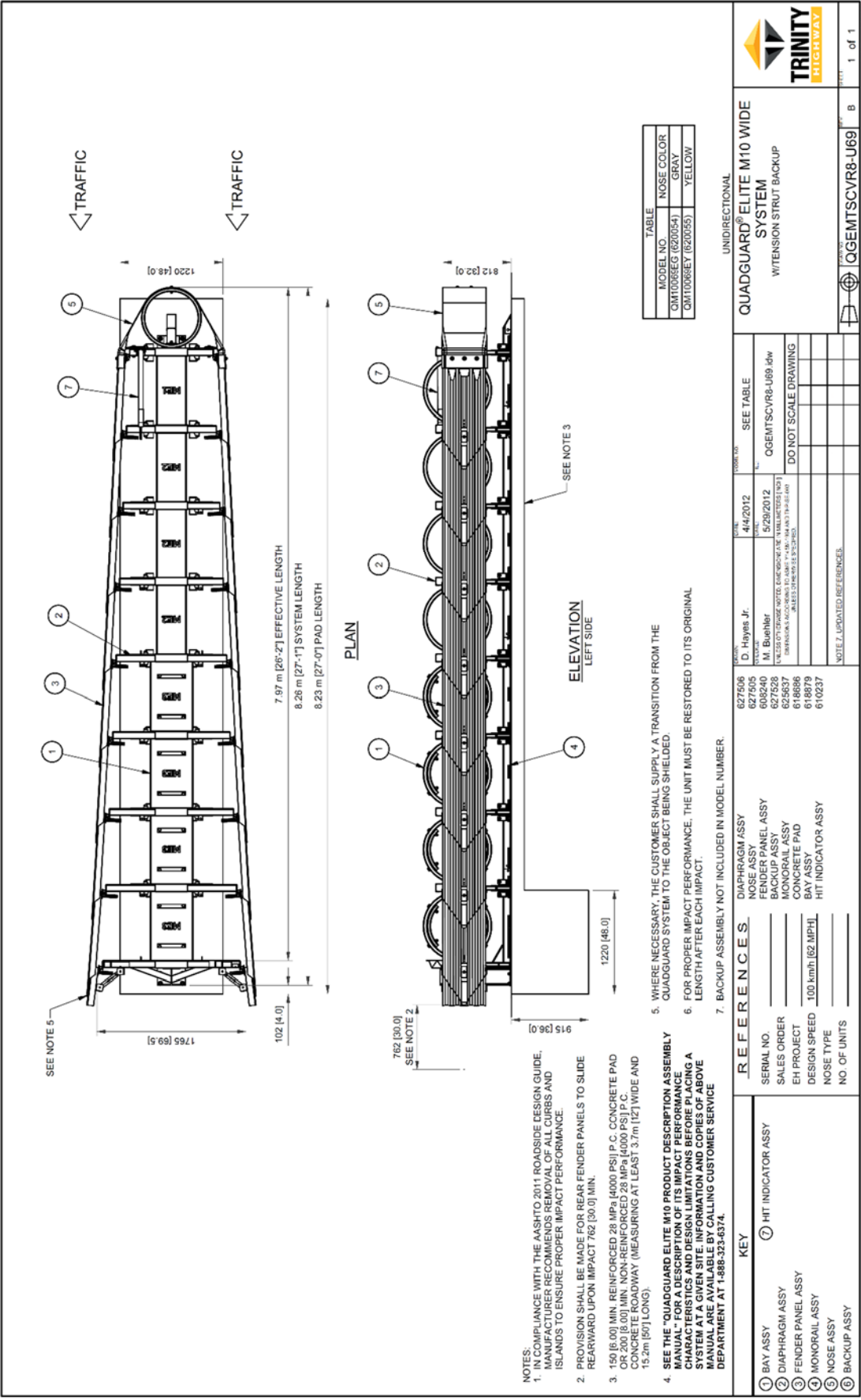
Parts List(s) & Quantities

PN	Description	Count
10102902	Adhesive, HY200, 500, Hilti	12
618847	Backup, TS, 64, QGE, G, W/Decals	1
605108	Belt, Nose, 96, QGE, 90, 7 Bay, Y	1
113467	Bolt, Hex, 1/2x1, G5, G	2
10102505	Bolt, Hex, 1/2x3, G2, G	2
113555	Bolt, Hex, 3/4x2, G8, G	32
113573	Bolt, Hex, 3/4x5, G5, G	2
10102510	Bolt, Hex, 3/8x3 1/2, All Thread, G5, G	16
10102552	Bolt, Hex, 5/8x3 1/2, G5, G	1
10102512	Bolt, Hex, 5/8x4, G5, G	54
10103429	Bolt, Hex, 5/8x5, G5, G, All Thread	12
004489	Bolt, Hex, 5/8x9, A325	15
10102503	Bolt, Rail, 5/8x2, G	6
10102200	Clamp, Nose Belt, QG, G	2
618702	Cylinder Assy, ME3, MASH, QGE	4
627504	Cylinder Seg, 18x9 1/2x0.8	2
618538	Cylinder, ME1, MASH, QGE	1
618649	Cylinder, ME2, MASH, QGE	3
606689	Cylinder, Nose, HDPE, 28x20	1
627503	Diaphragm, QG, 0993, QGE	1
619120	Diaphragm, QG, 1073, QGE	1
619121	Diaphragm, QG, 1153, QGE	1
619122	Diaphragm, QG, 1233, QGE	1
619124	Diaphragm, QG, 1313, QGE	1

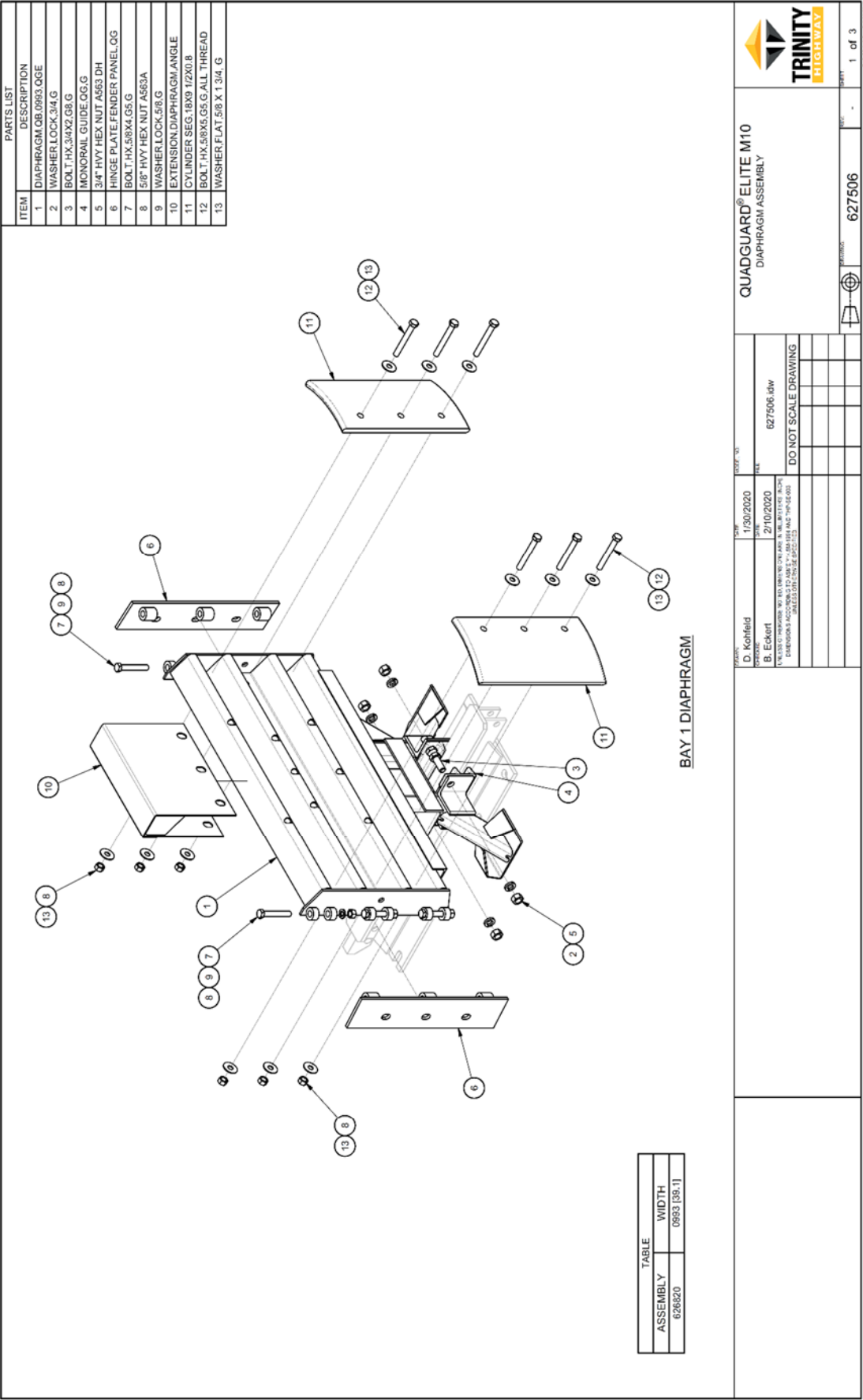
PN	Description	Count
619125	Diaphragm,QG,1393,QGE	1
619126	Diaphragm,QG,1473,QGE	1
619128	Diaphragm,QG,1553,QGE	1
10102313	Endcap,Monorail,QG	1
618526	Extension,Diaphragm,Angle	8
618536	Extension,Backup,M10,QGE	1
618652	Flt St 3/16x2x13,W/Holes	16
10102417	Hinge Plate,Fender Panel,QG	18
10102815	Hit Indicator,LMC/Elite	1
10102534	Monorail Guide,QG,G	16
10102310	Monorail,1 Bay,QG	1
10102312	Monorail,3 Bay,QG	2
10102504	Nut,Heavy Hex,3/4,A563DH	116
10102517	Nut,Heavy Hex,5/8,A563A	81
10102514	Nut,Hex,1/2,G	4
10102516	Nut,Hex,3/8,G	16
10102501	Nut,Hex,5/8,G,Rail	52
10102002	Panel,Fender,QG	16
10102005	Panel,Side,QG,Wide,G	2
10102807	Plate,Nose Cylinder	1
10102521	Screw,FL,5/8x8 1/2,G8,G,Socket	16
10103448	Screw,HWH,1/4x1,Self Drill/Tapping,G	2
10102522	Spring,Die,1 1/2ODx3/4x6,G	16
10102547	Stud, M20 x 120mm, 8.8	68
10102907	Tel St,1 3/4x1 3/4x12 GAx10,H4S,G	4
10102908	Tel St,2x2x12 GAx10,H4S,G	4
118009	Washer,Flat,1/2x1 3/8,G	4
118013	Washer,Flat,1/4x1,G	2
10102500	Washer,Flat,5/8x1 3/4,G	33
10102548	Washer,Flat,Hvy,3/4x2,G	68
118082	Washer,Lock,1/2,G	4
10102528	Washer,Lock,3/4,G	32
118092	Washer,Lock,3/8,G	16
10102530	Washer,Lock,5/8,G	57
10102536	Washer,Mushroom,Forged,QG,G	16



Warning: Use only Trinity Highway parts that are specified herein for assembling, maintaining, or repairing the QuadGuard® Elite M10 Wide. **Do not utilize or otherwise comingle parts from other systems even if those systems are other Trinity Highway 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.

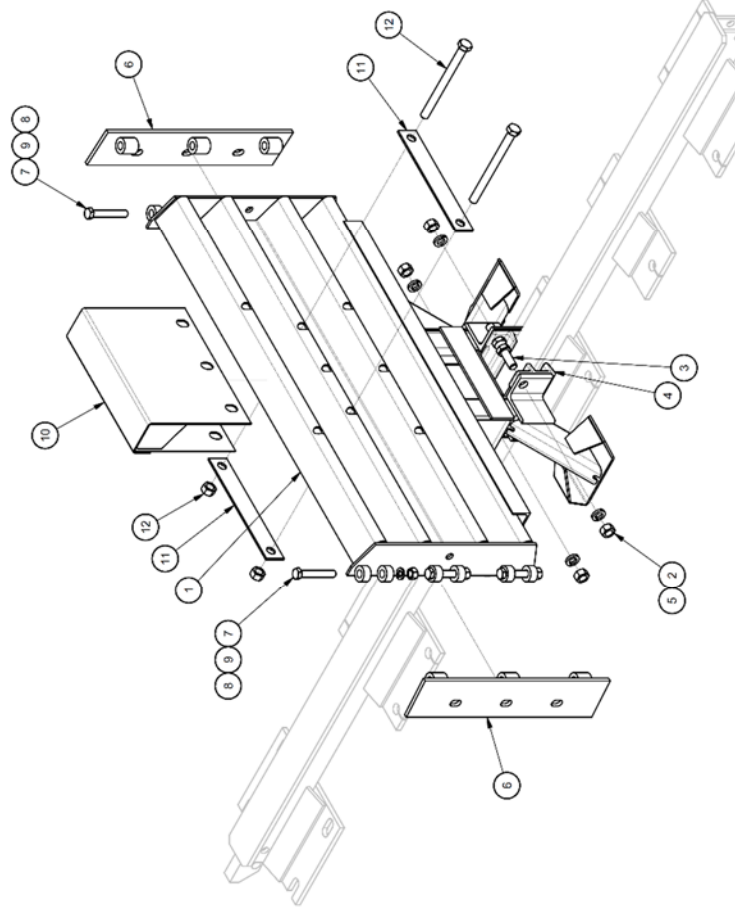


QuadGuard® Elite M10 Wide QGEMTSCVR8-U69



Bay 1 Diaphragm Assembly 627506

ITEM	PARTS LIST
1	DIAPHRAGM Q8 1073 QG6
2	WASHER LOCK 3/4 G
3	BOLT HX 3/4X2 G8 G
4	MONORAIL GUIDE QG G
5	3/4" HX HEX NUT A563 DH
6	HINGE PLATE FENDER PANEL QG
7	BOLT HX 5/8X4 G5 G
8	5/8" HX HEX NUT A563A
9	WASHER LOCK 5/8 G
10	EXTENSION DIAPHRAGM ANGLE
11	FLT ST 3/16X2X13 WH/CLS
12	BOLT HX 3/4X9 G5 G



ASSEMBLY	WIDTH
619120	1073 [42.2]
619121	1153 [45.4]
619122	1233 [48.5]
619124	1313 [51.7]
619125	1393 [54.8]
619126	1473 [58.0]
619128	1553 [61.1]

STANDARD DIAPHRAGMS

DATE	BY	DATE	BY
1/30/2020	D. Kohfeld	2/10/2020	B. Eckert

DATE: 2/10/2020
DRAWN BY: B. Eckert
CHECKED BY: D. Kohfeld
SCALE: 1:1
DO NOT SCALE DRAWING

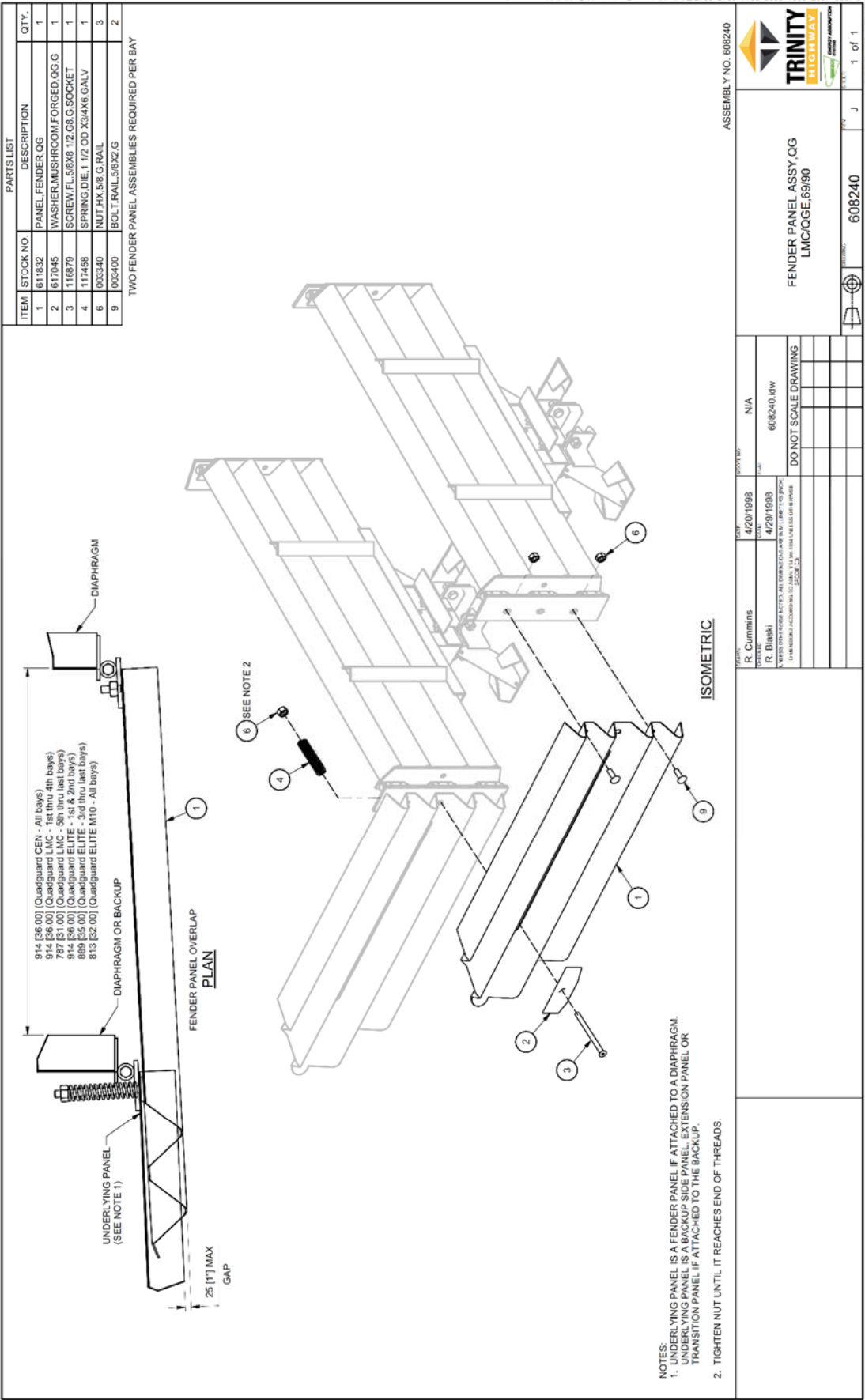
QUADGUARD® ELITE M10
DIAPHRAGM ASSEMBLY

627506

2 of 3

Standard Diaphragm Assembly 627506





ITEM

DESCRIPTION

1

CYLINDER ME1 MASH QGE

2

CYLINDER ME2 MASH QGE

3

CYLINDER ASSY ME3 MASH QGE

ME1 TO ME2

ME1

ME2

ME2 TO ME3

ME2

ME3

ME3 TO BACKUP

ME3

ME4

ME5

ME6

ME7

ME8

ME9

ME10

ME11

ME12

ME13

ME14

ME15

ME16

ME17

ME18

ME19

ME20

ME21

ME22

ME23

ME24

ME25

ME26

ME27

ME28

ME29

ME30

ME31

ME32

ME33

ME34

ME35

ME36

ME37

ME38

ME39

ME40

ME41

ME42

ME43

ME44

ME45

ME46

ME47

ME48

ME49

ME50

ME51

ME52

ME53

ME54

ME55

ME56

ME57

ME58

ME59

ME60

ME61

ME62

ME63

ME64

ME65

ME66

ME67

ME68

ME69

ME70

ME71

ME72

ME73

ME74

ME75

ME76

ME77

ME78

ME79

ME80

ME81

ME82

ME83

ME84

ME85

ME86

ME87

ME88

ME89

ME90

ME91

ME92

ME93

ME94

ME95

ME96

ME97

ME98

ME99

ME100

ME101

ME102

ME103

ME104

ME105

ME106

ME107

ME108

ME109

ME110

ME111

ME112

ME113

ME114

ME115

ME116

ME117

ME118

ME119

ME120

ME121

ME122

ME123

ME124

ME125

ME126

ME127

ME128

ME129

ME130

ME131

ME132

ME133

ME134

ME135

ME136

ME137

ME138

ME139

ME140

ME141

ME142

ME143

ME144

ME145

ME146

ME147

ME148

ME149

ME150

ME151

ME152

ME153

ME154

ME155

ME156

ME157

ME158

ME159

ME160

ME161

ME162

ME163

ME164

ME165

ME166

ME167

ME168

ME169

ME170

ME171

ME172

ME173

ME174

ME175

ME176

ME177

ME178

ME179

ME180

ME181

ME182

ME183

ME184

ME185

ME186

ME187

ME188

ME189

ME190

ME191

ME192

ME193

ME194

ME195

ME196

ME197

ME198

ME199

ME200

ME201

ME202

ME203

ME204

ME205

ME206

ME207

ME208

ME209

ME210

ME211

ME212

ME213

ME214

ME215

ME216

ME217

ME218

ME219

ME220

ME221

ME222

ME223

ME224

ME225

ME226

ME227

ME228

ME229

ME230

ME231

ME232

ME233

ME234

ME235

ME236

ME237

ME238

ME239

ME240

ME241

ME242

ME243

ME244

ME245

ME246

ME247

ME248

ME249

ME250

ME251

ME252

ME253

ME254

ME255

ME256

ME257

ME258

ME259

ME260

ME261

ME262

ME263

ME264

ME265

ME266

ME267

ME268

ME269

ME270

ME271

ME272

ME273

ME274

ME275

ME276

ME277

ME278

ME279

ME280

ME281

ME282

ME283

ME284

ME285

ME286

ME287

ME288

ME289

ME290

ME291

ME292

ME293

ME294

ME295

ME296

ME297

ME298

ME299

ME300

ME301

ME302

ME303

ME304

ME305

ME306

ME307

ME308

ME309

ME310

ME311

ME312

ME313

ME314

ME315

ME316

ME317

ME318

ME319

ME320

ME321

ME322

ME323

ME324

ME325

ME326

ME327

ME328

ME329

ME330

ME331

ME332

ME333

ME334

ME335

ME336

ME337

ME338

ME339

ME340

ME341

ME342

ME343

ME344

ME345

ME346

ME347

ME348

ME349

ME350

ME351

ME352

ME353

ME354

ME355

ME356

ME357

ME358

ME359

ME360

ME361

ME362

ME363

ME364

<

PARTS LIST	
ITEM	DESCRIPTION
1	BELT NOSE OGE
2	CYLINDER NOSE HDPE 28X20
3	NUT HX 1/2 G
4	WASHER FLAT 1/2X1 3/8 G
5	BOLT HX 5/8X5.65 G ALL THREAD
6	WASHER FLAT 5/8 X 1 3/4 G
7	BOLT HX 1/2X3 G2 G
8	BOLT HX 5/8X3 1/2 G5 G
9	CLAMP NOSE BELT OG G
10	PLATE NOSE CYLINDER
11	5/8"X5" HEX BOLT A325
12	5/8" HVY HEX NUT A463A
13	WASHER LOCK 1/2 G
14	WASHER LOCK 5/8 G

TABLE		
ASSEMBLY	COLOR	MODELS
620028	GRAY	8 BAY / 60"
618870	YELLOW	8 BAY / 60"

QUADGUARD® ELITE M10 NOSE ASSY M10 OGE		627505.dwg	DO NOT SCALE DRAWING
D. Kohfeld	1/30/2020	2/10/2020	
B. Eckert			
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED.			
DO NOT SCALE DRAWING			
1 of 1			

SEE OPTION 2 NOTES

STEP 1:
POSITION HIT INDICATOR ON 1ST DIAPHRAGM. CENTER HIT INDICATOR (ITEM 1) 2 1/2" FROM EDGE OF DIAPHRAGM FOR 24" SYSTEMS. DRILL ONE #1/4" 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 #9/16" 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 ATTACH BRACKET.

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

QUADGUARD® SYSTEM
ELITE / ELITE M10

HIT INDICATOR W/ HARDWARE

DESIGN	DATE	BY	CHECKED	DATE
T. Bussie	8/19/1998			
RBB	9/10/1998			
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN INCHES (RND TO 1/16" UNLESS OTHERWISE NOTED). DIMENSIONS IN PARENTHESIS ARE ALTERNATE DIMENSIONS TO FIT.				
DO NOT SCALE DRAWING				

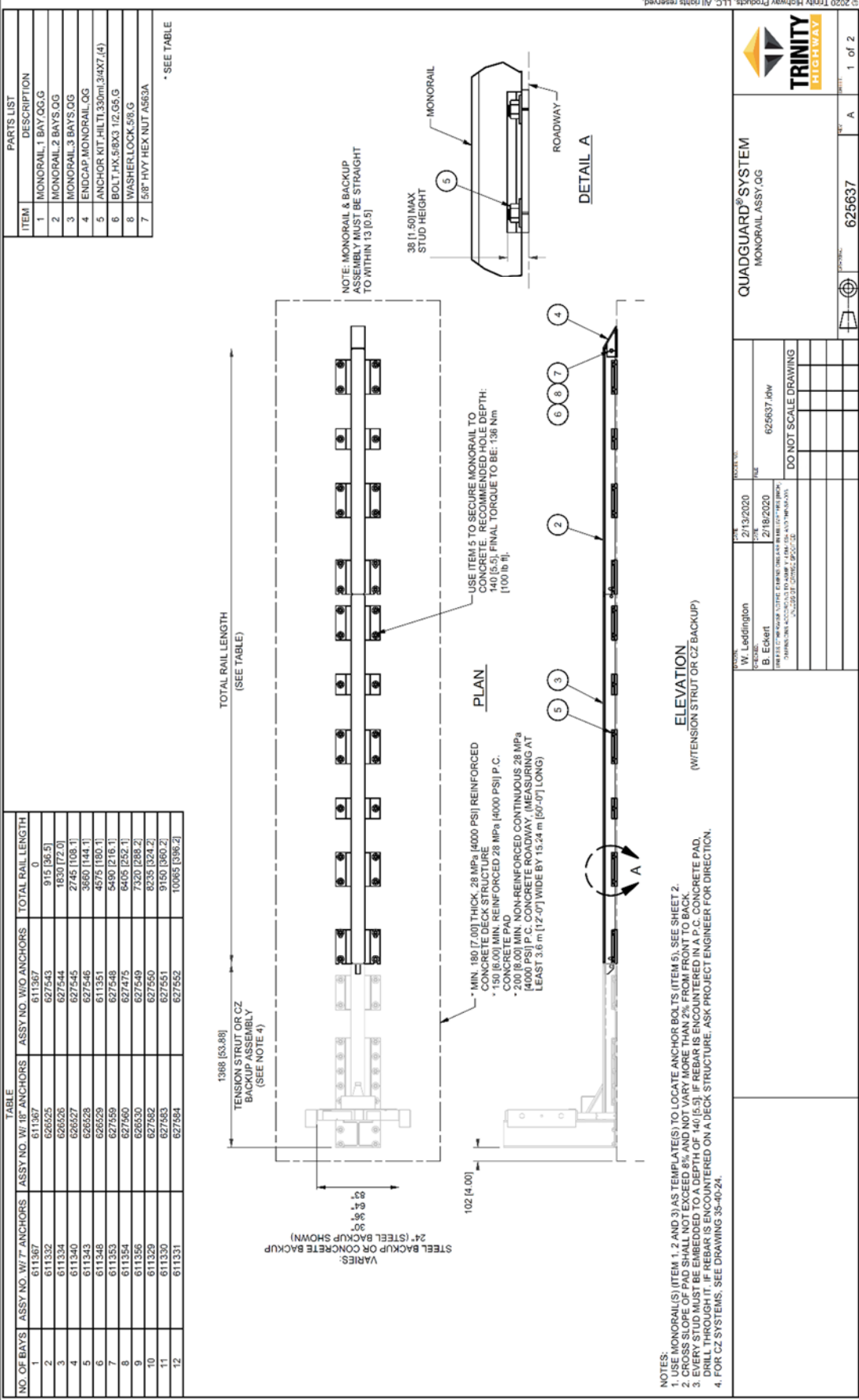
610237.dwg

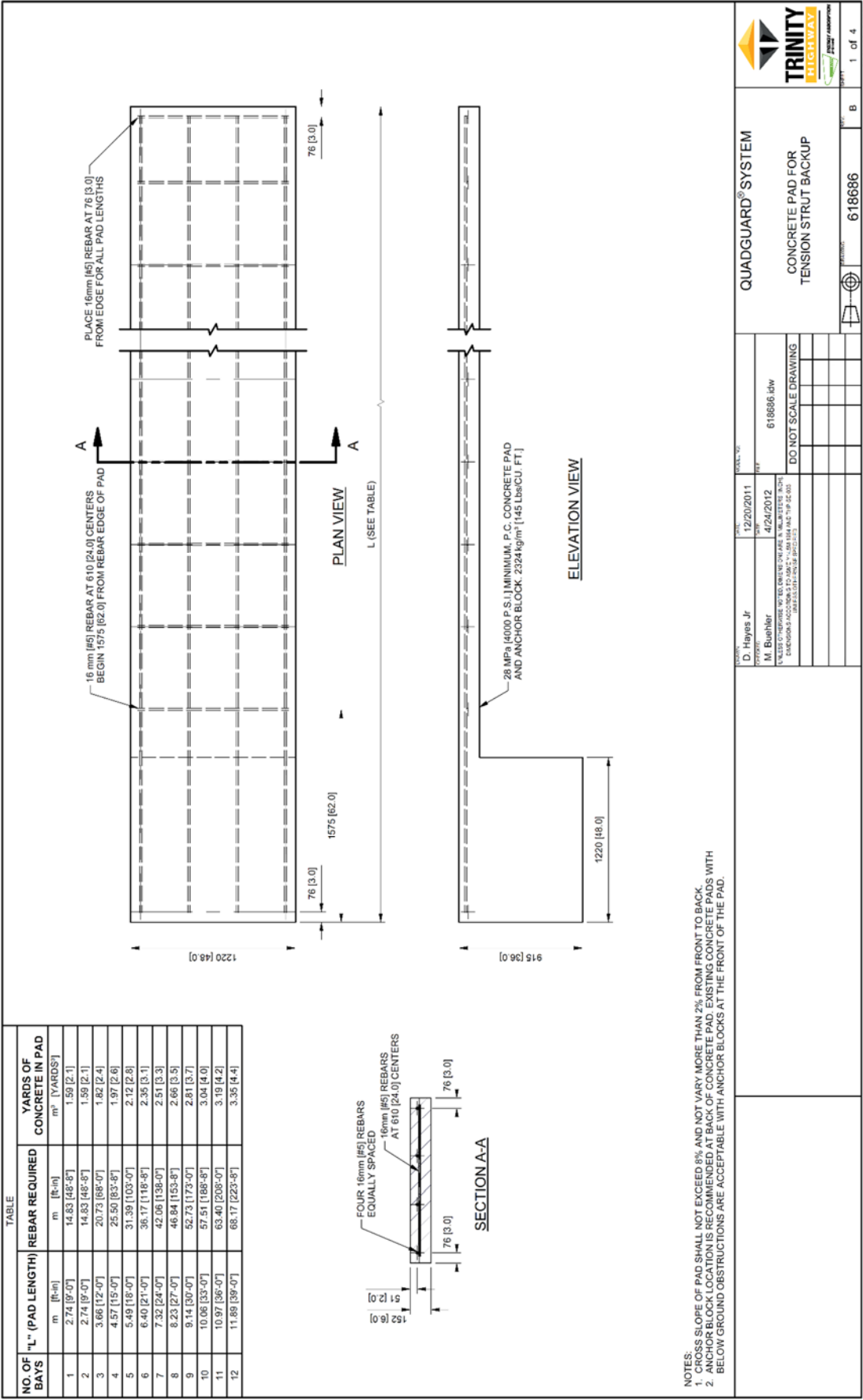
610237

2 of 2

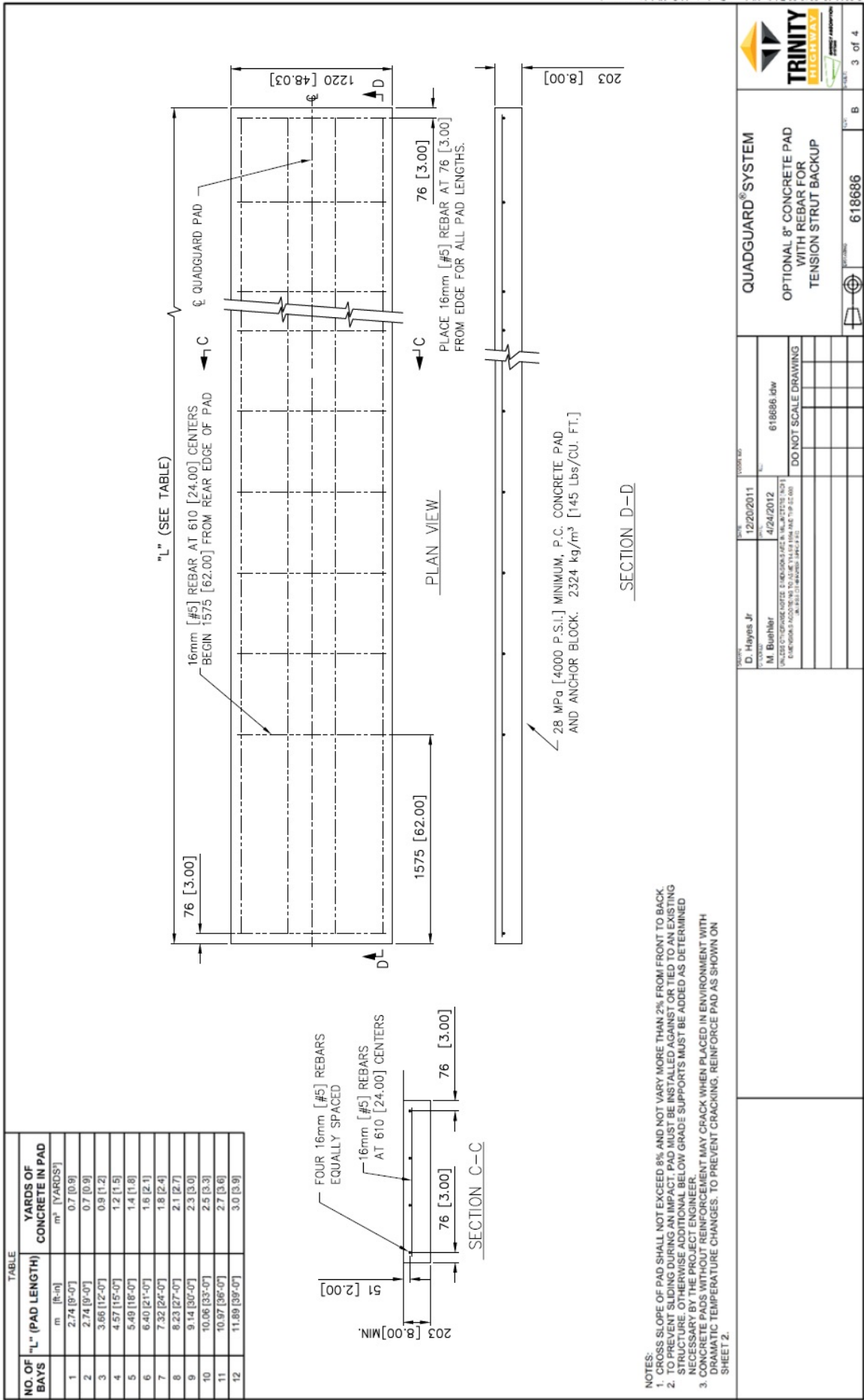
F

Hit Indicator 610237





TS Concrete Pad 618686



TS Concrete Pad 8" 618686

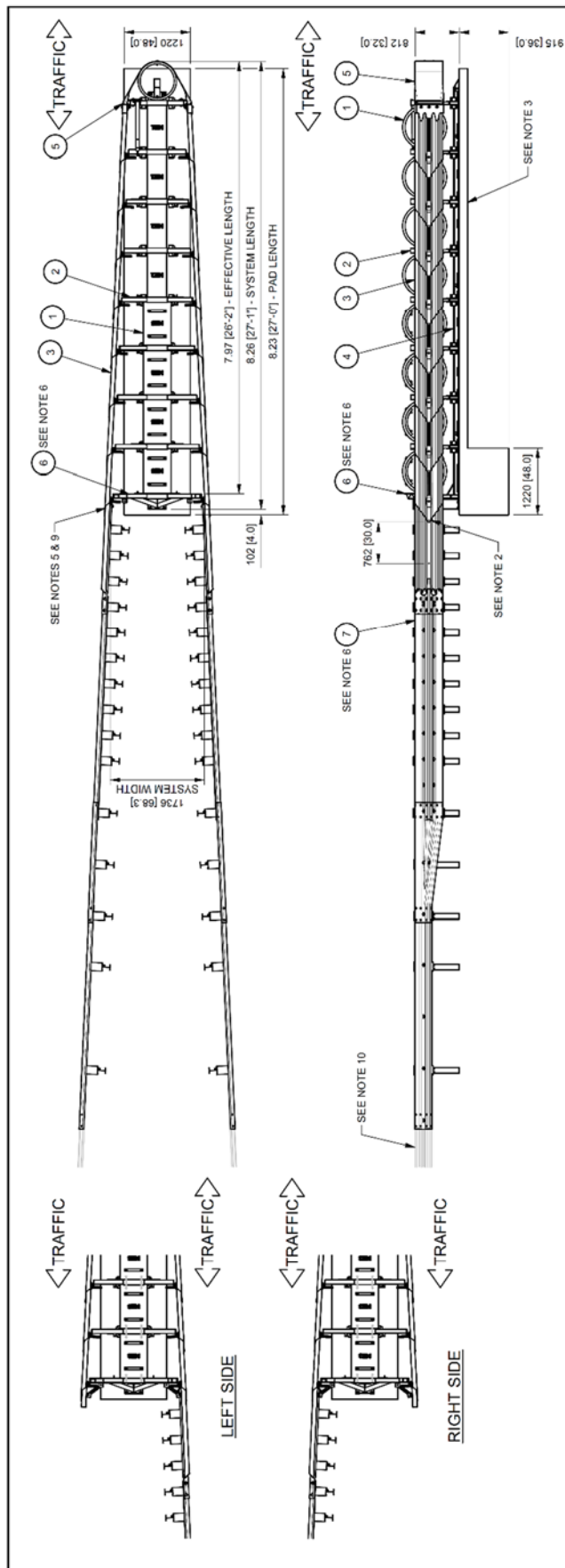
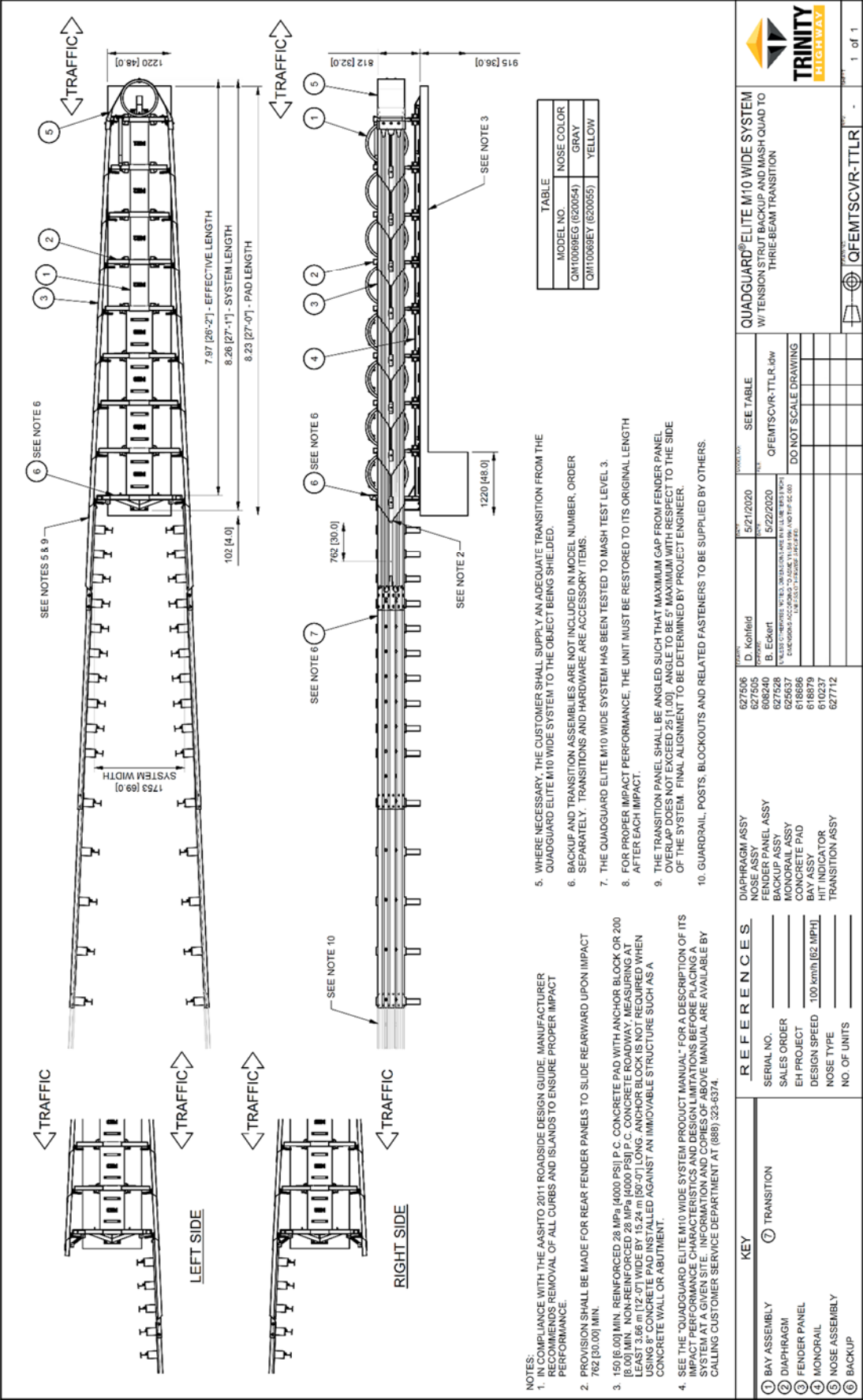


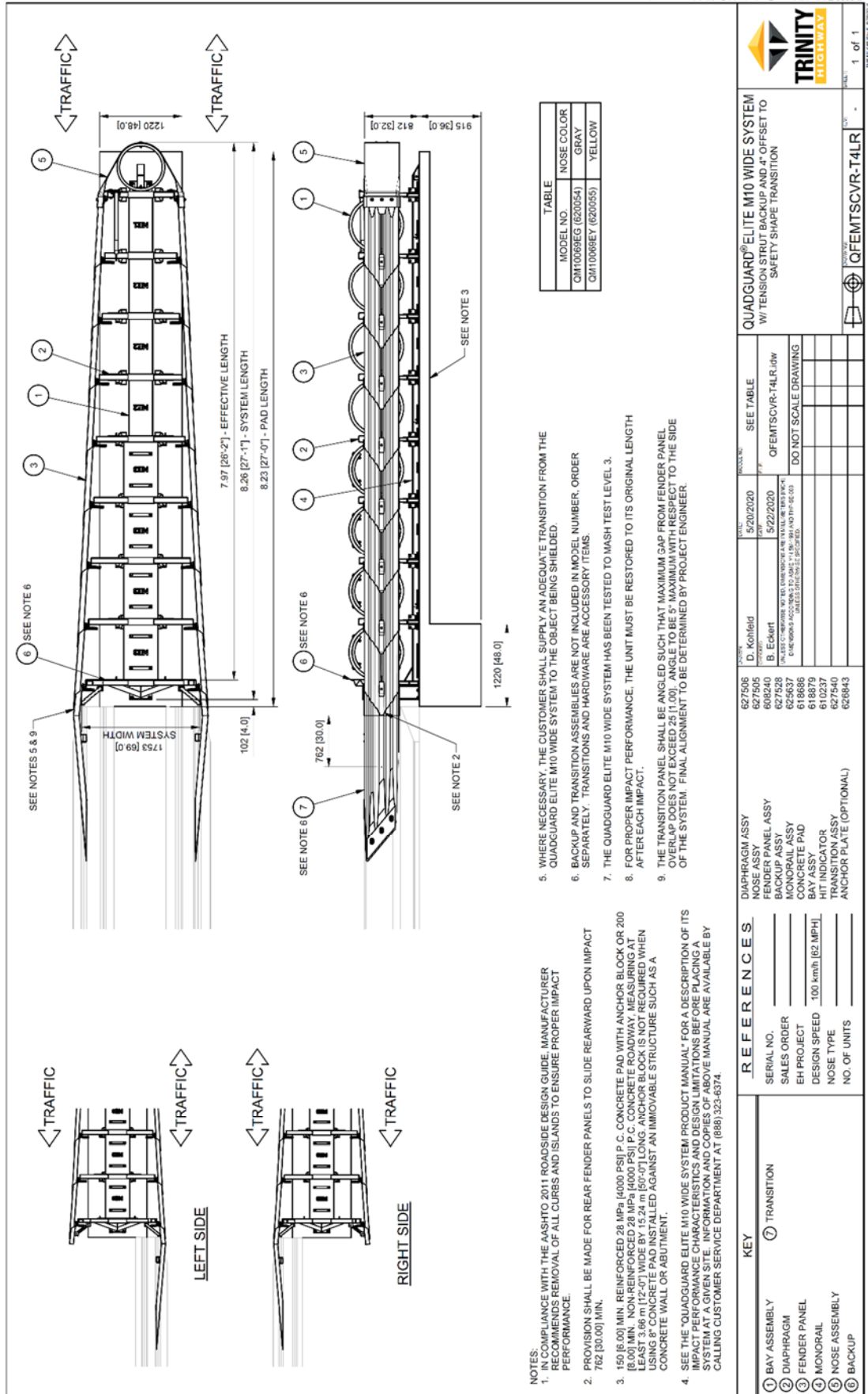
TABLE	
MODEL NO.	NOSE COLOR
QM10089EG (620054)	GRAY
QM10069EY (620055)	YELLOW

[illegible]

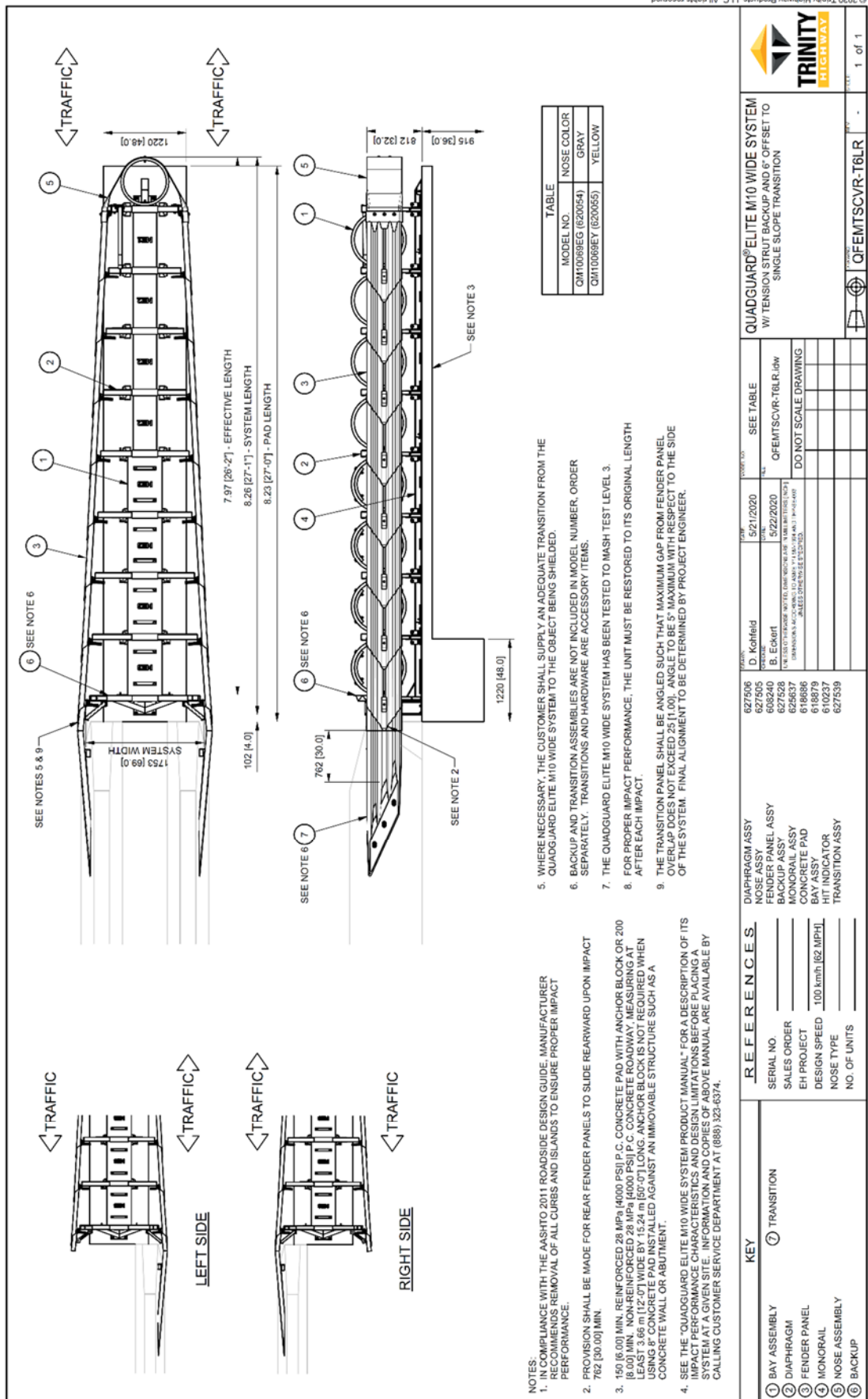
31" W-Beam Transition

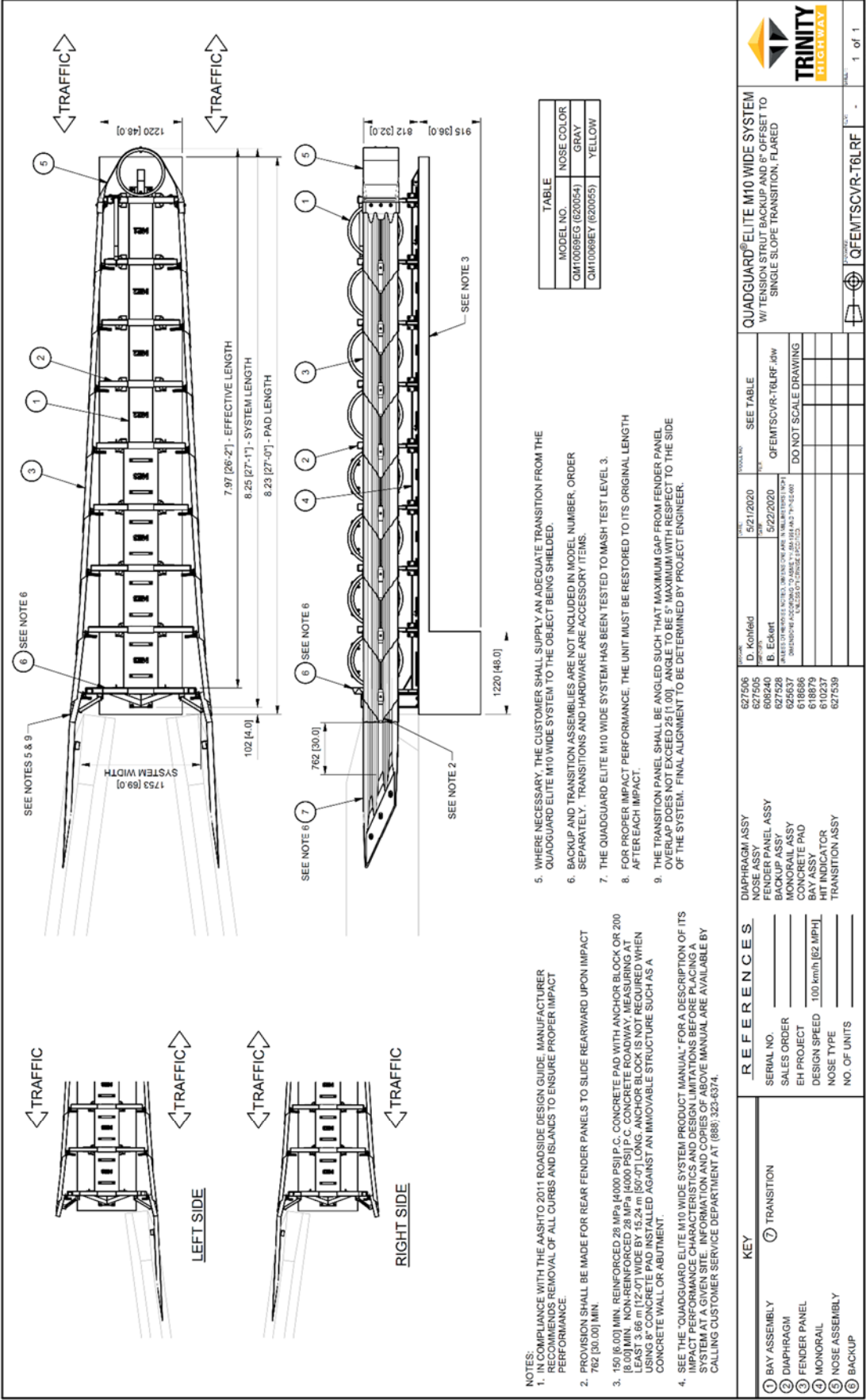


Thrie-Beam Transition QFEMTSCVR-TTLR

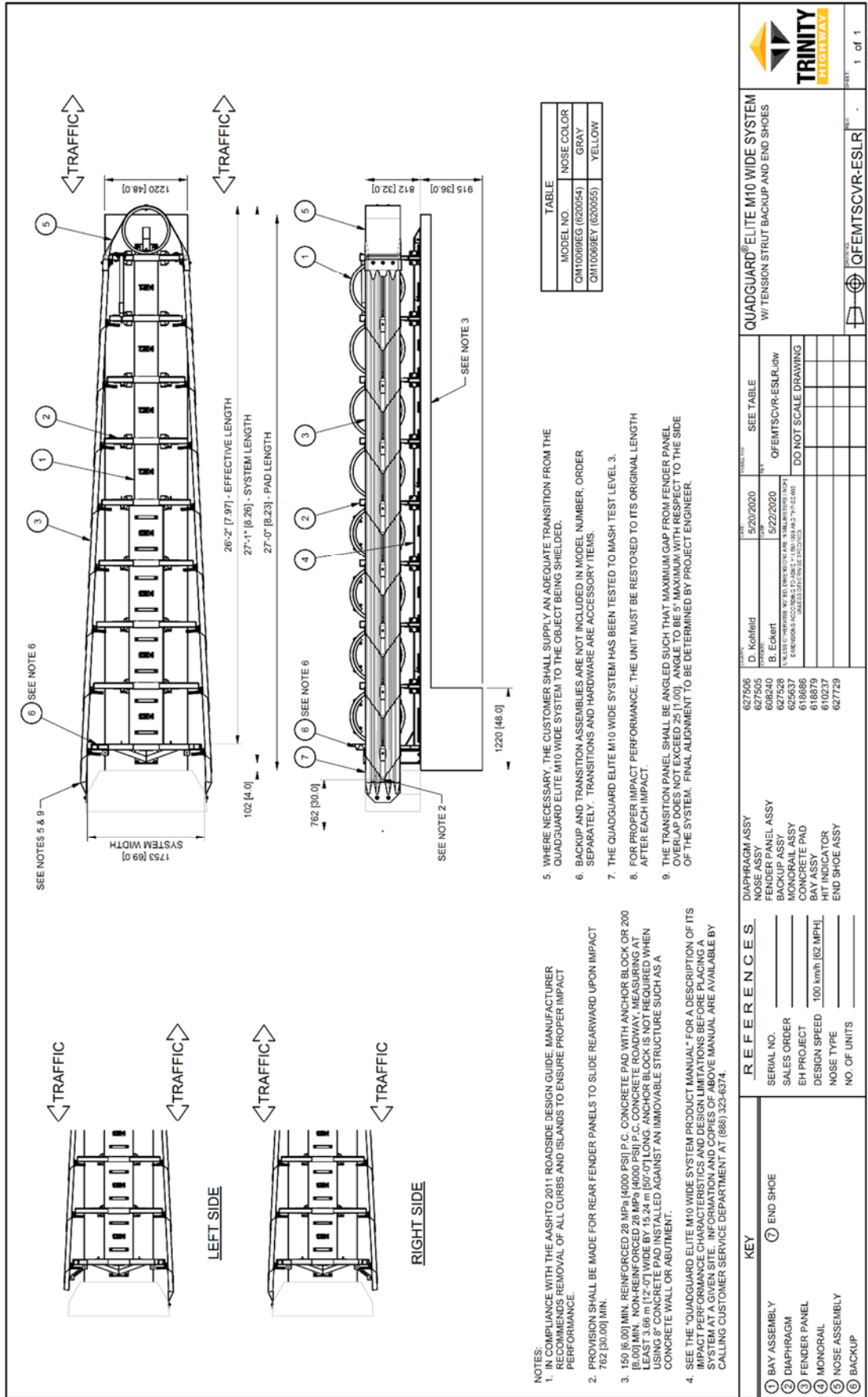








6" Single Slope Flared Transition QFEMTSCVR-T6LRF



End Shoe Transition QFEMTSCVR-ESLR



Notes:

Notes:

Notes:



INGAL

CIVIL PRODUCTS

A **valmont**  COMPANY



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.

www.trinityhighway.com

888.323.6374 (USA) +1 214.589.8140 (International)