PN 625877

QuadGuard® M10 24"

Product Description Assembly Manual

INGAL CIVIL PRODUCTS
A valmont COMPANY

TRINITY HIGHWAY
Ahead of the Curve®

QuadGuard® M10 610mm 24”

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

Product Description
Assembly Manual

15601 Dallas Parkway
Suite 525
Addison, Texas 75001

Warning: The distributors, owners, contractors, lessors, and lessees are RESPONSIBLE for the assembly, maintenance, and repair of the QuadGuard® M10. Failure to fulfill these RESPONSIBILITIES 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 Ingal Civil Products 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

The information contained in this manual supersede all previous versions. The instructions, illustrations, and specifications are based on the latest QuadGuard® M10 information available to Trinity Highway at publication. We reserve the right to make changes at any time. Please visit ingalcivil.com.au/products/road-safety-barriers/crash-cushions/quadguard-m10-mash to confirm the latest revision.

Part No. 625877

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Customer Service Contacts

Ingal Civil Products is committed to the highest level of customer service. Feedback regarding the QuadGuard® M10, 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
Contact Link	ingalcivil.com.au/contact-us

Important Introductory Notes

Proper assembly of the QuadGuard® M10 is critical to achieve tested performance that has been evaluated and deemed eligible by the FHWA per AASHTO MASH criteria. These instructions should be read and understood in their entirety before assembly. These instructions are for standard assemblies and used in conjunction with the assembly of the QuadGuard® M10 as specified by the applicable highway authority. If you needed additional information, or have questions about the QuadGuard® M10, please contact the highway authority that has planned and specified this assembly and, if needed, contact Ingal Civil Products. This product must be assembled in the location specified by the appropriate project engineers. 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 specified herein for the QuadGuard® M10 during the assembly or repair of this system (p. 7 – 10 / 38 - 39).

This product has been specified for use 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.

A manufacturer's drawing package will be supplied by Ingal Civil Products 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 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® 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® M10. Additional copies of this manual are available from Ingal Civil Products on 1300 446 425 or by visiting ingalcivil.com.au/products/road-safety-barriers/crash-cushions/quadguard-m10-mash. Please contact Ingal Civil Products if you have any questions concerning the information in this manual or about the QuadGuard® 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 Quad Guard® 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® M10 for assembly, maintenance, or repair. The use of component parts not specified herein is **strictly prohibited**. The QuadGuard® M10 assembled with Trinity Highway parts has been tested, approved, and accepted for use by the FHWA. A QuadGuard® M10 using parts other than those specified herein has not been tested, approved, or accepted for 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 system 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. 1100 kg [2420 lb.]) and full size pickup trucks (approx. 2270 kg [5000 lb.]). A product can be certified for multiple Test Levels. The QuadGuard® M10 is certified to the Test Level(s) as shown below:

Test Level 3: 100 kph
Test Level 2: 70 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® M10 is intended to be assembled, delineated, and maintained within specific state and federal guidelines. It is important for the project engineer 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 project engineer 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 project engineer determines as soon as possible.

Warning: Do not assemble, maintain, or repair the QuadGuard ® M10 until you have read this manual thoroughly and completely understand it.

Warning: Ensure that all Danger, Warning, Caution, and Important statements within this 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® M10 is a re-dire ctive, non-gating crash cushion fo r roadside f eatures of 24” [610 mm] or greater in width with use of approved transitions. It consists of energy-absorbing cartridges surrounded by a framework of Quad-Beam Fender 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 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® M10 utilizes two types of cartridges 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 six (6) Bay QuadGuard® M10 has successfully passed the requirements stipulated in MASH with both the light car and pickup trucks at speeds of up to 100 kph [62 mph] at redirection angles up to 25 degrees.

The three (3) Bay QuadGuard® M10 has successfully passed the re quirements stipulated in MASH with both the light car and pickup trucks at speeds of up to 70 kph [44 mph] at redirection angles up to 25 degrees.

During head-on impact t esting, within MASH criteria, the QuadGuard® M10 has been shown to telescope rearward to absorb the energy of impact. When impacted from the side, within th e 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 to ensure that the QuadGuard® M10 and delineation used meet all federal, state, specifying agency, and local specifications.

Warning: It is the sole responsibility of the project engineer to ensure that the QuadGuard® M10 meets all appropriate Manual on Uniform Traffic Control Devices (“MUTCD”) a nd local standards.

Inspect Shipping

Check the received parts against the shipping list supplied with the system before deploying the QuadGuard® M10. Make sure all parts have been received (p. 38 - 39).

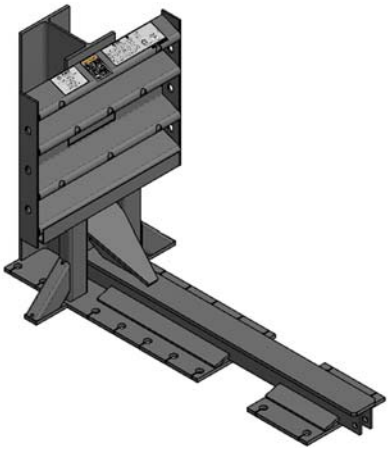
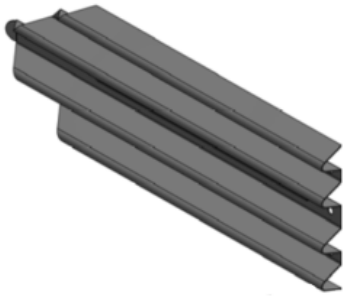
Important: The Manufacturer’s Drawing Package supplied with the QuadGuard® M10 must be used with these instr uctions for proper assembly and should take precedence over these general instructions.

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

System Components

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

Note: Components are not shown to scale.

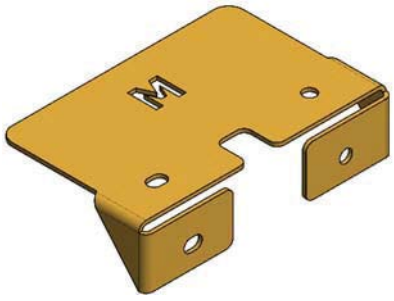
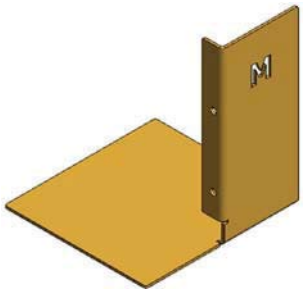
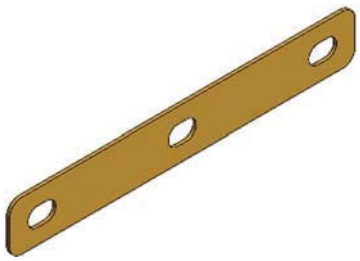
Tension Strut Backup 24”	Diaphragm 24”	Panel, Fender, QG
		
10102304	10102113	10102002

Panel, Side, QG	Bracket, Cartridge Support	End Cap, Monorail, QG, G
		
10102004	10102400	10102313

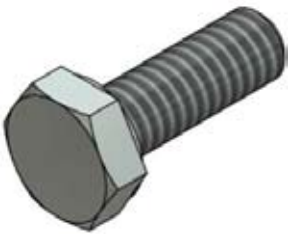
Bracket, Cartridge Support TS B/U	Locking Bar, Cartridge Support	Pipe, 3/4” Sch 80X3
		
10102406	10102419	627537

Monorail Guide	Monorail, Two Bays, QG, G	Monorail, Three Bays, QG, G
		
10102534	10102311	10102312

Shim, 12GAX3 5/8X8	Bracket, Angle, 2X1, W/Holes	Bracket, Pull-Out
		
10102906	10102213	10102411

Bracket, Cart, Hold Down	Bracket, Cart Support, Nose	WASHER,10GA X2X14,SLOT
		
10102211	10102212	10102210

Nose, L, W/Logo	Nose, R, W/Logo	
		
10102202	10102204	

Bolt, Hex, 1/4X3/4, G5	Bolt, Hex,3/8X1,G5	Bolt, Hex, 5/8X3 1/2, G5
		
10102508	10103162	10102552

Rail Bolt, 5/8X2	Bolt, Rail 5/8-11X5	Bolt, Hex, 3/4X2, G8
		
10102503	004441	10102462

Anchor, M20 x 165mm Gr 8.8	Anchor, M20 x 180mm, Gr 8.8	Anchor, M20 x 460mm Gr 8.8
		
10102549	10102547	10102911

Nut, Hex, 1/4	Nut, Hex, 3/8	Rail Nut, Hex, 5/8
		
10102515	10102516	10102501

Nut, Hex, 5/8	Nut, Heavy Hex, 3/4	M20 Structual Nut Hex Galv
		
10102502	10102504	10102539

Washer, Lock, 5/8	Washer, Lock, 3/4	Washer, Flat 3/8X1
		
10102530	10102528	10102526

Washer, Flat, 5/8X1 3/4	Washer, Fender, 3/8X2	Washer, Flat, 3/4X2
		
10102500	118038	10102547

Mushroom Washer	Flat Screw 5/8X5,G8	Die Spring, 5/8 X 1 1/2
		
10102536	10102520	10102523

Cartridge Assy, Type I	Cartridge Assy, Type II	Approved Adhesive
		
10102903	10102904	10102902

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. The correct Panel(s) to use will depend on the direction of traffic and what type of barrier or road feature the QuadGuard® M10 is shielding. Contact the Customer Service Department prior to deployment if you have any questions (p. 3).

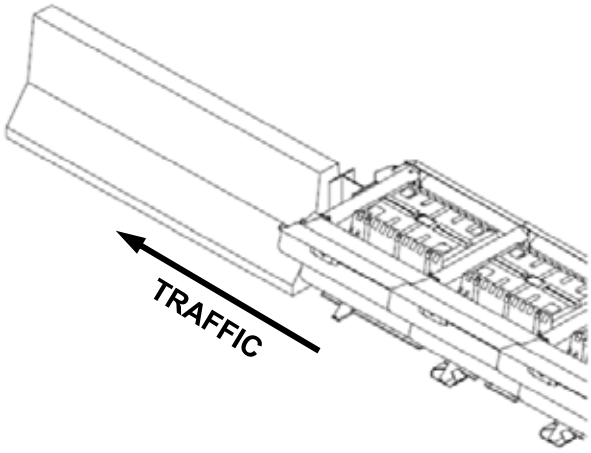


Figure 1
No Transition
(Unidirectional only)

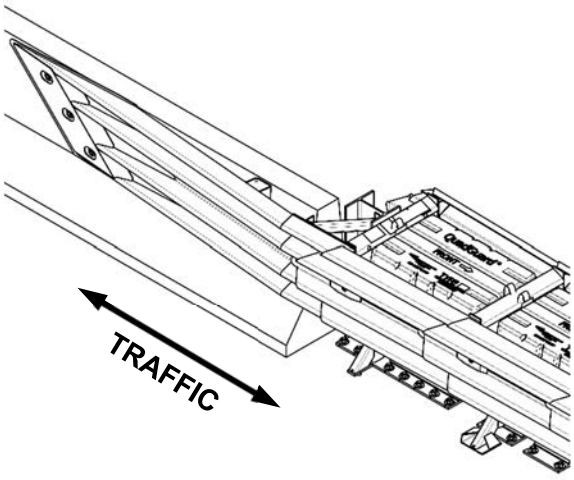


Figure 2
Safety Shape 4" Offset

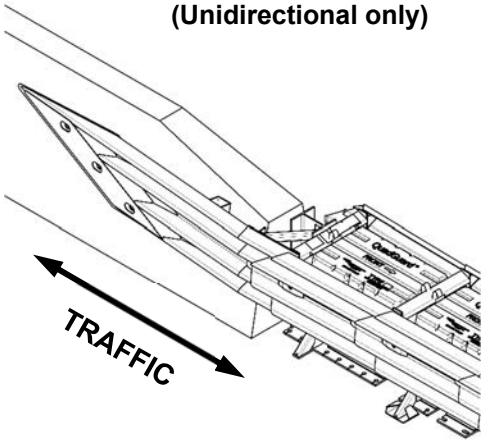


Figure 3
Single Slope 6" Offset

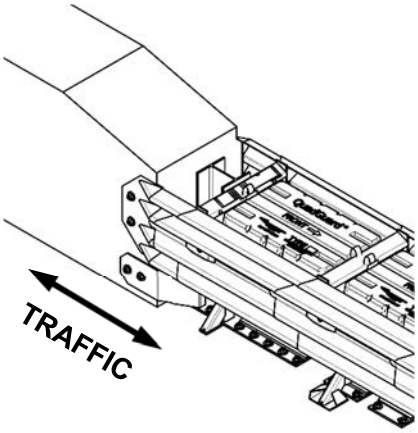


Figure 4
End Shoe

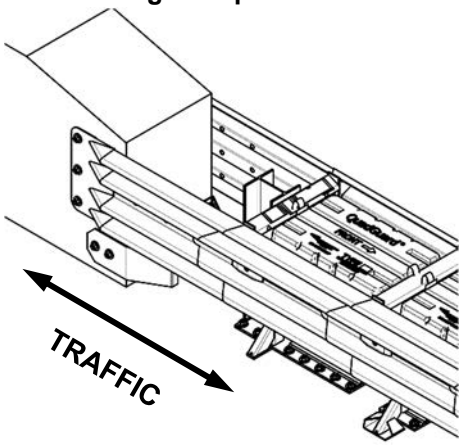


Figure 5
Extended End Shoe

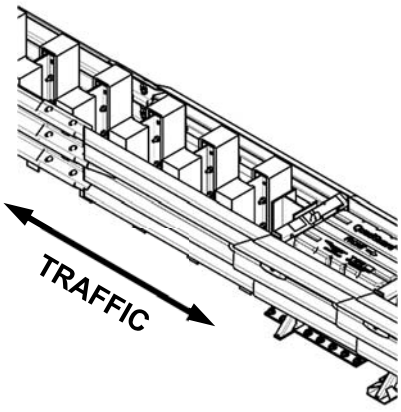


Figure 6
Quad to Thrie-Beam

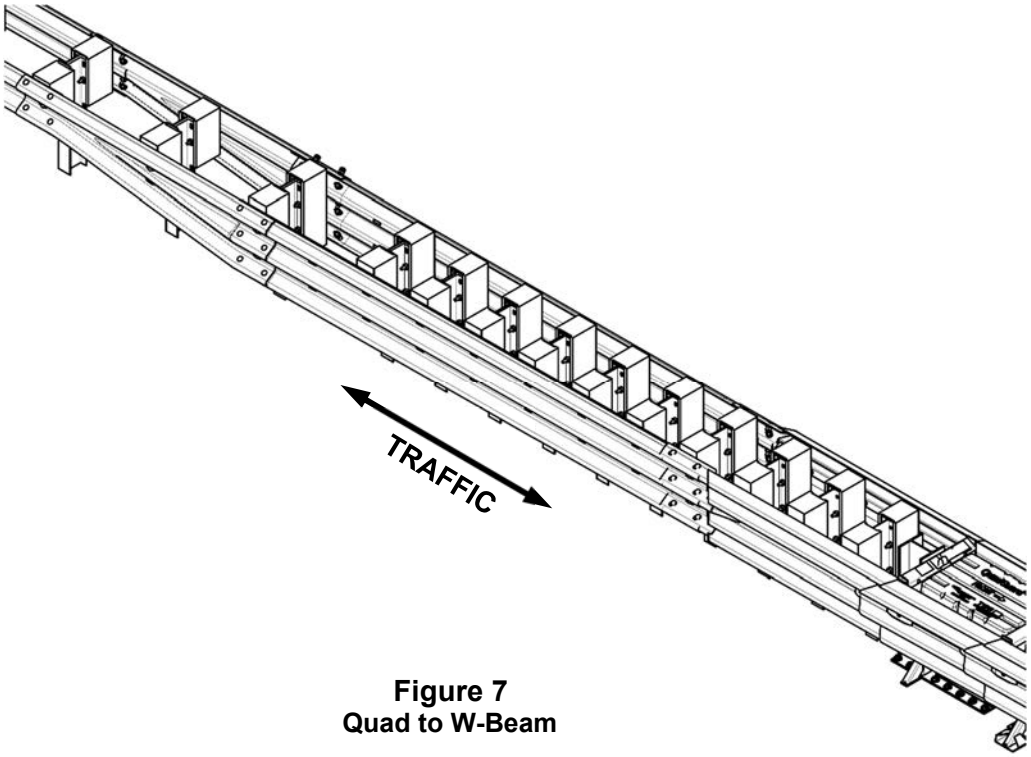


Figure 7
Quad to W-Beam

Recommended Tools

Documentation

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

Personal Protective equipment

- Eye Protection
- Gloves
- Safety-toe Shoes
- Protective Clothing
- Reflective Vest

Cutting equipment

- Rotary Hammer Drill
- Rebar cutting bit
- Concrete drill bits – 22 mm] **(Double-Fluted)**
- Grinder, Hacksaw or Torch (optional)

Important: Trinity Highway recommends using **double-fluted** drill bits to achieve optimum tensile strength when applying an approved adhesive anchoring system (p. 15).

Hammers

- Sledgehammer
- Standard hammer

Wrenches

- Heavy duty 1/2” drive impact wrench
- 1/2" drive sockets: 7/16”, 9/16", 15/16", 1 1/16”, 1 1/8", 1 1/4"
- 1/2" drive Deep well 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-lb
- Combination wrench(s): 7/16”,9/16”, 15/16”, 1 1/8”
- Hex Key (Allen) wrench: 3/8”

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 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 (A lifting device is preferred although a forklift can be used.) Minimum 5,000 lb. capacity required.
- Air Compressor (100 psi minimum) and Generator (5 kW)
- Long pry bar
- Drift pin 300 mm
- Center punch
- Tape measure 7.5m [25’]
- Chalkline
- Concrete marking pencil
- Steel bristled tube brush for cleaning 22mm drilled boreholes
- Rags, water, and solvent for touch-up

Note: The provided 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 , the required tools may vary. Decisions as to what tools are needed to perform the job are entirely the responsibility of the selected contractor performing the assembly of the system at the specified assembly site.

Site Preparation/Foundation

A QuadGuard® M10, for permanent applications, should be assembled on an existing or freshly placed and cured concrete base (28 MPa [4000 psi] minimum). Location and orientation of the concrete base and attenuator must comply with project plans or as otherwise determined by the local highway authority.

Recommended dimension and reinforcement specifications for new concrete foundations are provided in Trinity Highway concrete foundation drawings, supplied with the system. The system may be assembled on a non-reinforced concrete roadway (minimum 200 mm [8"] thick). Deployment 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.

Warning: It is the responsibility of the installer to ensure proper site grading for the QuadGuard® M10 placement as dictated by the state or specifying agency pursuant to the AASHTO Roadside Design Guide.

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

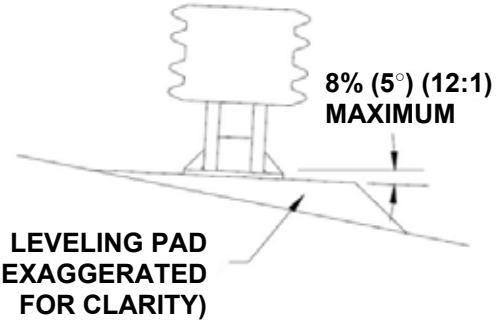


Figure 8
Cross-Slope

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 Backupas much as 765 mm [30"]. Position the Backup so that the rear ends of the last Fender Panels are a minimum of 765 mm [30"] 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.

Important: Systems mounted on asphalt must be replaced and mounted on fresh, undisturbed asphalt if more than 10% of anchors are found to be loose, broken, or show signs of pull out. If 10% or fewer anchors are damaged, replace the damaged anchors in the existing asphalt. Anchor bolts used on systems mounted on asphalt must be inspected every 6 months. Review Maintenance and Repair Instructions and Post-Impact Instructions (pp. 35-38).

Foundation/Anchoring

Important: It is the r esponsibility of the local DOT to ensure that this assembly conforms to the AASHTO Roadside Design Guide.

Warning: It is the re sponsibility of the in staller to ensure that your assembly procedure meets all appropriate Safe Work Australia, WorkSafe NZ, or state & territory authorities standards.

Asphalt Installations

Systems with a Tension -Strut Backup may be tem porarily installed in construction zones on asphalt. Assemblies on **Asphalt Concrete ("A.C.")** must provide a minimum of 76 mm [3"] [76 mm] layer of asphalt over a minimum o f 76 mm [3"] layer of **Portland Cement Concrete ("P.C.C.")**, 152 mm [6"] layer of asphalt over 152 mm [6"] layer of subbase, or 200 mm [8"] layer of asphalt with no subbase.

Important: Only 460 mm [18"] threaded rods, utilizing Trinity Highway approved adhesive, can be used with **asphalt** foundations (p. 15). Contact Trinit y Highway for a complete list of approved adhesives (p. 3).

Concrete Installations

For concrete installations, the QuadGuard® M10 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.

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

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

Foundation A: Reinforced Concrete Pad or Roadway

Foundation: 152 mm [6"] minimum depth P.C.C.

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

Foundation B: Asphalt over P.C.C.

Foundation: 76 mm [3"] minimum asphalt concrete (A.C.) over 76 mm [3"] minimum P.C.C.

Anchorage: Length of anchor required is 460 mm [18"] and embedment of 420 mm [16 1/2"]

Foundation C: Asphalt over Subbase

Foundation: 152 mm [6"] minimum A.C. over 152 mm [6"] minimum Compacted Subbase (C.S.)

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

Foundation D: Asphalt Only

Foundation: 200 mm [8"] minimum A.C.

Anchorage: Approved adhesive with 460 mm [18"] studs 420 mm [16 1/2"] 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® 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 Safe Work Australia,WorkSafe NZ, or state & territory authorities 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 22 mm [7/8”] 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.

Anchoring Information					
Stud Size:	**Orientation**	**Bit Size**	**Minimum Depth**	**Torque**	**Medium**
M20 x 180mm	Vertical	22 mm [7/8”]	145 mm	Manufacturer Spec	Concrete
M20 x 460mm	Vertical	22 mm [7/8”]	425 mm	10 ft-lb [15 N-m]	Asphalt

Important: When mounting on asphalt, initial torque shall be as shown above. Due to the properties of asphalt, anchors may loosen over time. For this reason Trinity Highway recommends anchoring to asphalt only at temporary locations. It is recommended to re-torque anchors in asphalt every six (6) months to the proper initial torque specified.

3) Clean the Boreholes

Blow the concrete dust from the borehole using oil-free compressed air. Thoroughly brush it with a 22mm [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 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 9).

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.

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

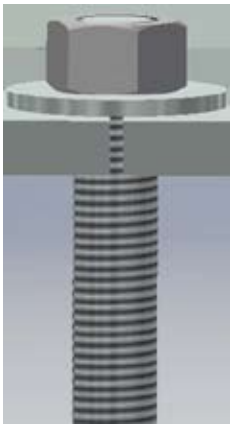


Figure 9
Vertical Application
(Before Applied Torque)

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 10).

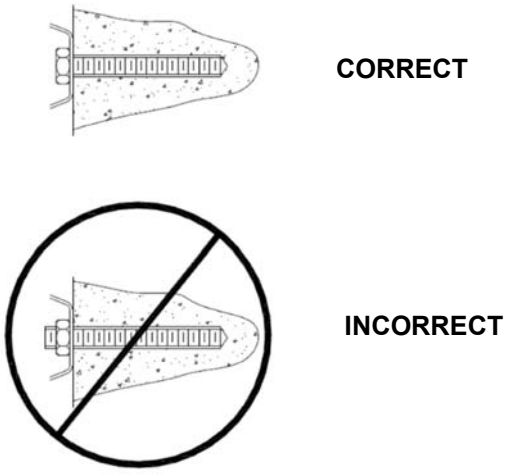


Figure 10
Horizontal Application
(Before Applied Torque)

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 manufacturing specification.

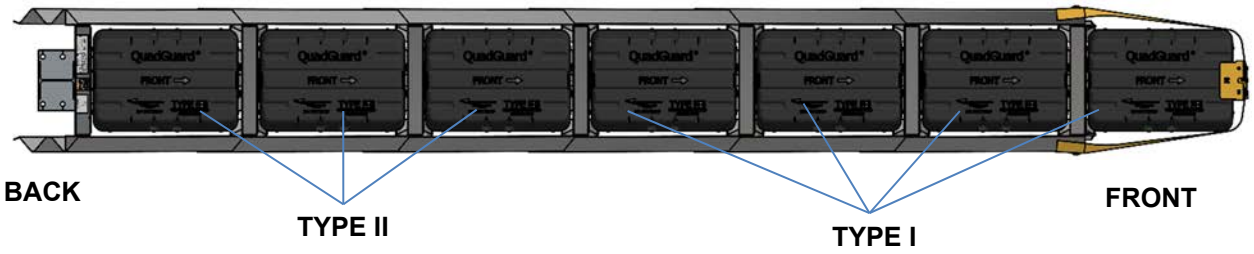


Figure 11 Plan View

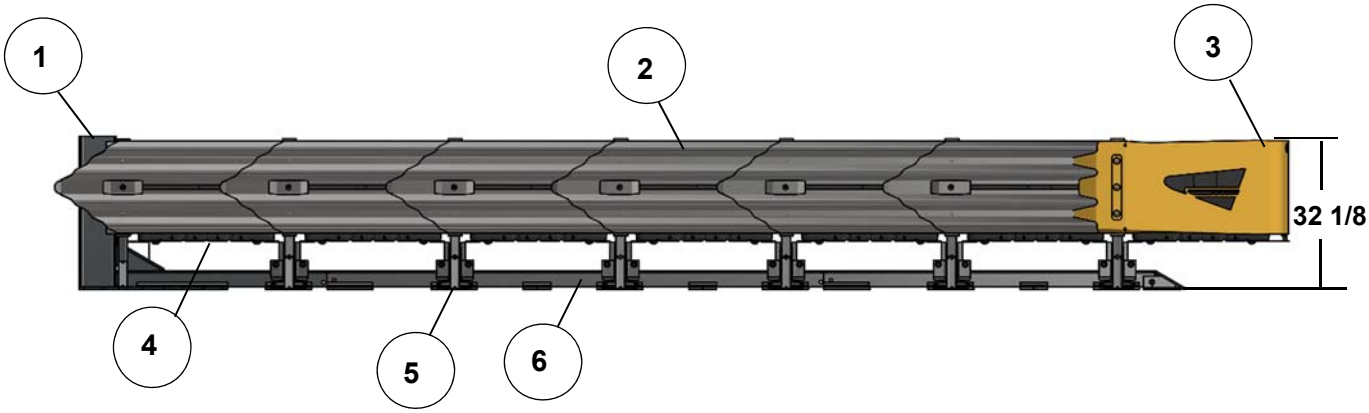


Figure 12 Elevation View
6 Bay TL-3

KEY

1) Backup
2) Quad-Beam Fender Panel
3) Nose Cover
4) Cartridge
5) Diaphragm
6) Monorail

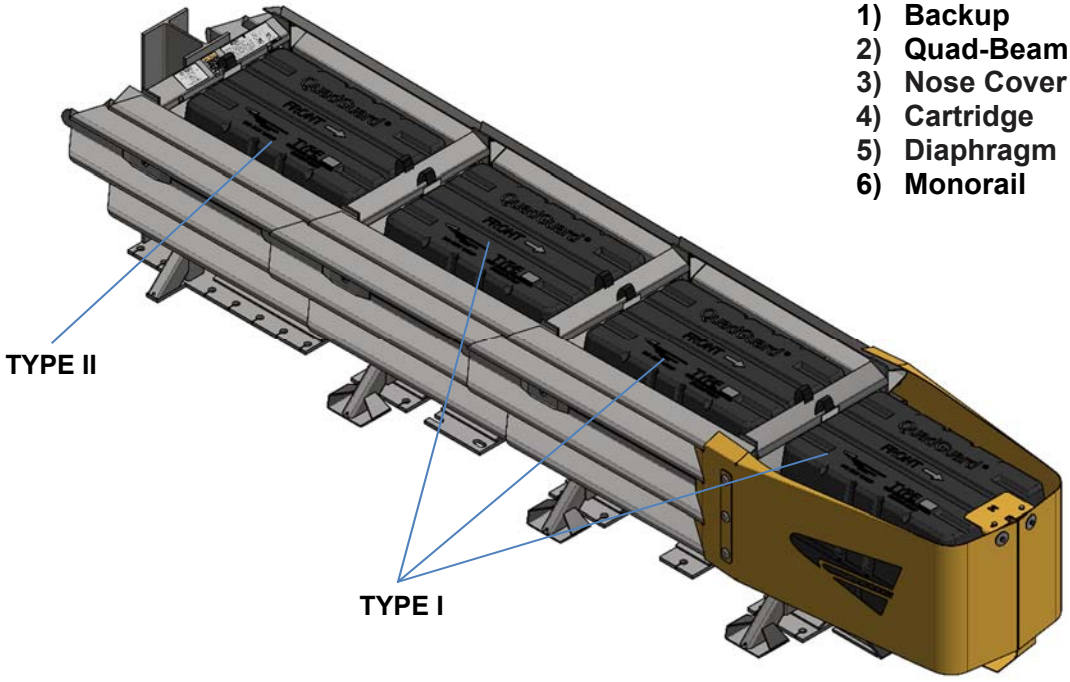


Figure 13
3 Bay TL-2

How to Determine Left/Right

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

Counting the Number of Bays

One Bay consists of one Cartridge, one Diaphragm, and two Fender Panels. The Nose section is not considered a Bay, though there is a Cartridge in the Nose of each system.

Note: There will always be one more Cartridge in the syst em than the number of Bays in the system. To determine number of Bays, count Fender Panels on one side (Figure 14).

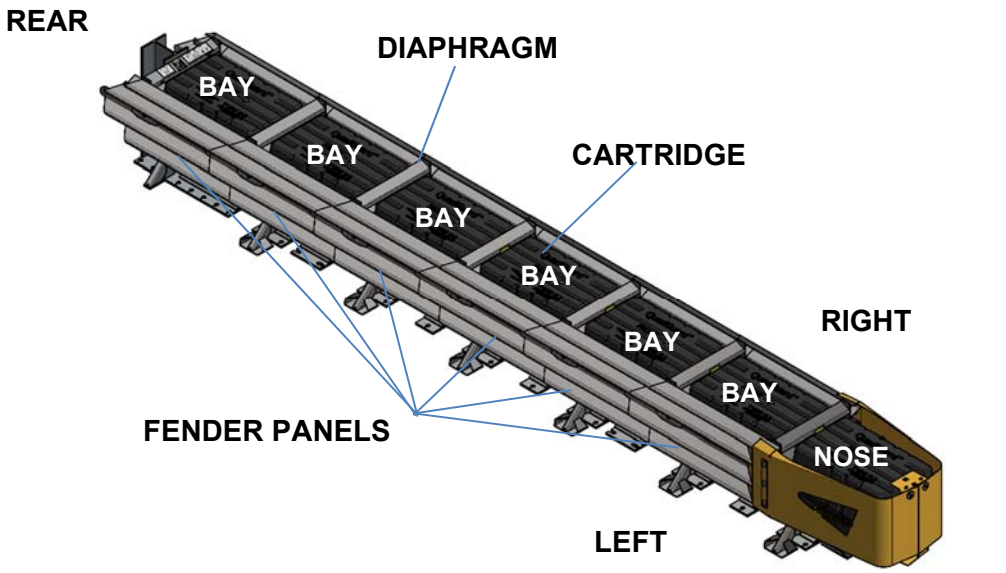


Figure 14
System Orientation

Measuring the Width

The nominal width of the 610 mm [24"] **parallel** system is the width of the diaphragm (Figure 15).

The outside width of the system is approximately 152 mm [6"] wider than the nominal width.

Note: The outside width of the system is not the same as the width of the Backup.

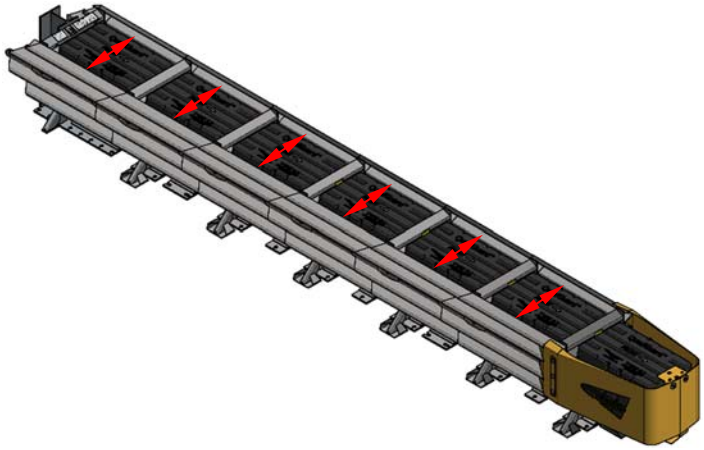


Figure 15
Width of Parallel system

System Assembly

Warning: If the QuadGuard system has been supplied pre-assembled, it will have transport bolts with warning tags installed in the monorail. These monorail bolts are used to hold the system together while in transit and therefore are for transportation purposes only. They MUST be removed during installation of the QuadGuard system. It is solely the responsibility of the installer to ensure any transport bolts are completely removed. Failure to remove can affect the systems performance and may result in personal injury or death.

Warning: It is the responsibility of the installer to ensure the assembly procedure meets all appropriate Safe Work Australia, WorkSafe NZ, or state & territory authorities standards.

1) Mark System Location

Locate the centerline of the system by measuring the proper offset from the fixed object. Refer to the Drawing Package supplied with the system. Place chalk line to mark the centerline of the system. Mark a construction line parallel to the center line and offset 165 mm [6.5”] to one side as shown in Figure 16. The edge of the Monorail will be positioned on this line.

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

Warning: Location of system with respect to the roadside obstacle is critical and dependent on the type of Transition Panel used. Please refer to the Drawing Package supplied with the system for details.

Figure 16
(Top view of concrete foundation)

2) Anchor the Tension Strut Backup (Figure 17)

Locate Tension Strut Backup and Monorail on foundation with side of Monorail on the construction line (p. 24). **Verify that any applicable Transition Panels fit properly before anchoring Backup.** Drill 22 mm [7/8”] diameter by 145 mm [5 3/4”] anchor boreholes in foundation using the Backup as template. Anchor the Backup to the concrete foundation using an approved adhesive supplied with the QuadGuard® M10 (p. 16).

Note: Verify that any applicable Transition Panels fit properly before anchoring Backup.

Caution: Every hole in the Backup and Monorail must be anchored by a stud using an approved adhesive (p. 16).

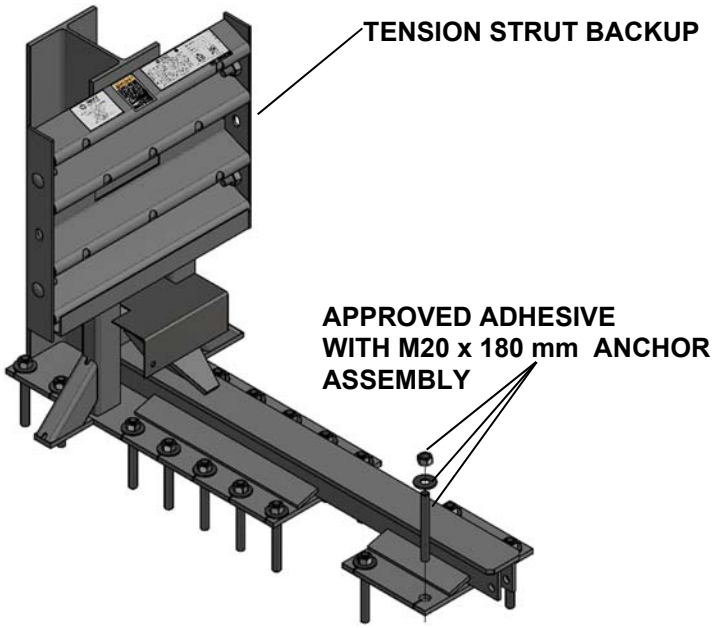


Figure 17
Anchoring Tension Strut
Backup to Foundation

3) Anchor the Monorail

Monorail Placement for Tension Strut Backup (Figure 21)

Locate Monorail on foundation with side of Monorail on the construction line and rear edge of Backup foot 100 mm [4”] forward of edge of foundation.

Orient the Monorail so that the Monorail tongues face the Backup.

Warning: Improper alignment at the Monorail splice joints may prevent proper system collapse during an impact (p. 24, Detail 19a).

It is important to align each segment of Monorail from the back to the front of the system (±6 mm[1/4”]). Anchor each Monorail section using the Trinity Highway approved adhesive kits provided (p. 16).

4) Attach Side Panels and/or Transition Panels to Backup Assembly

Attach Transition Panel or Side Panel to side of Backup using 5/8" rail bolt and 5/8" rail nut (two places - top and bottom holes only*). See Backup Assembly drawing(s) **below.**

Note: Do not use a Side Panel when a Transition Panel is used.

Assembly Tip:

Use drift pin to align the center hole of the Side Panel with the center hole of the Backup before inserting the Rail Bolts.

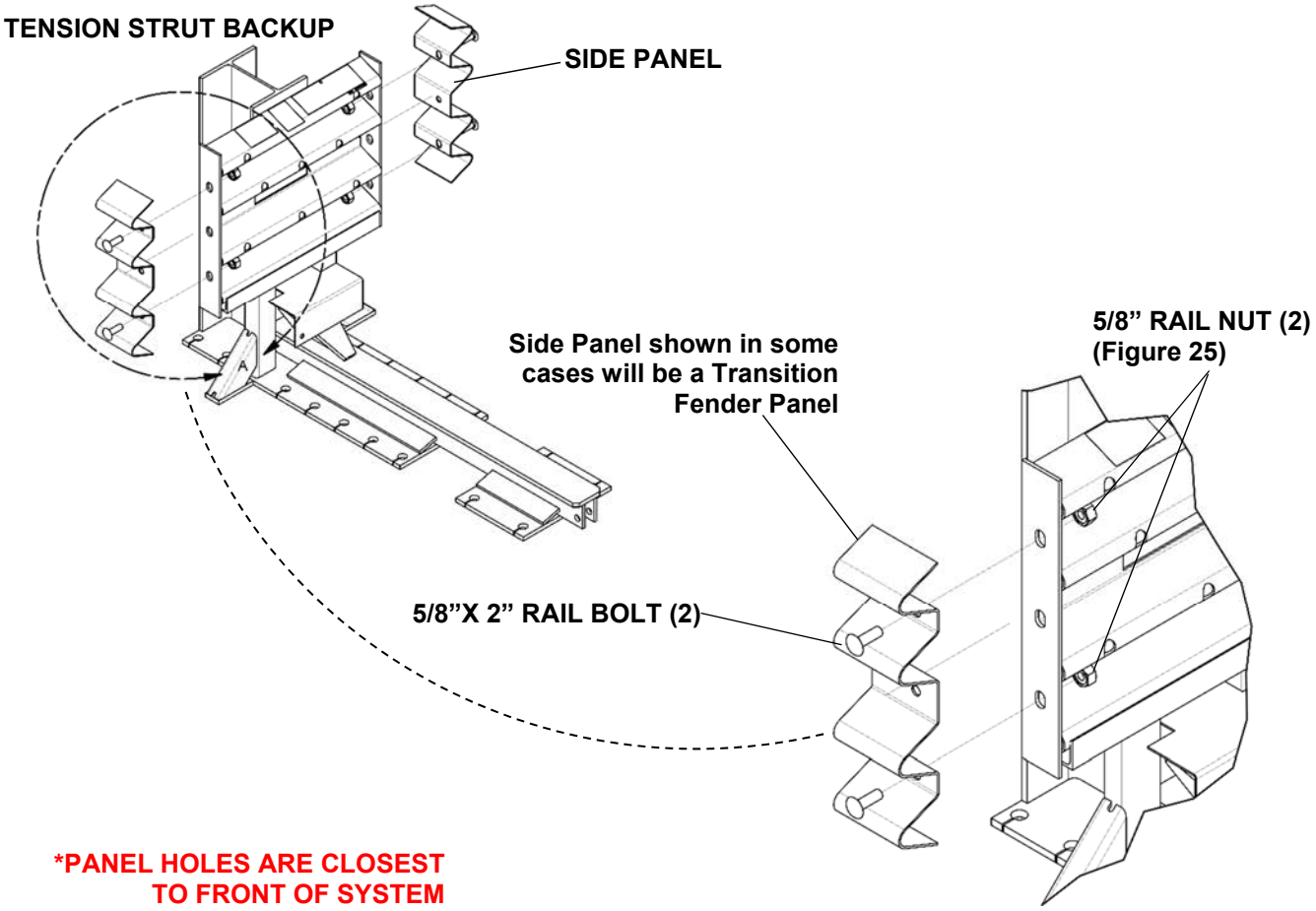


Figure 18
Side Panel/Transition Panel Attachment

Warning: Every hole in the Backup and Monorail must be anchored by a stud using an approved adhesive (p. 16).

Drill 22 mm [7/8”] diameter by 145 mm [5 3/4”] boreholes using the Monorail as a template. Do not drill through foundation.

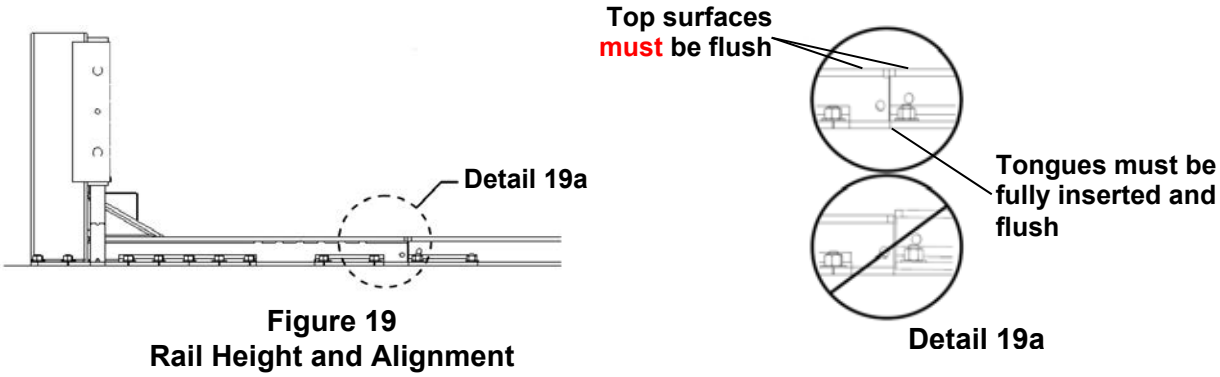


Figure 19
Rail Height and Alignment

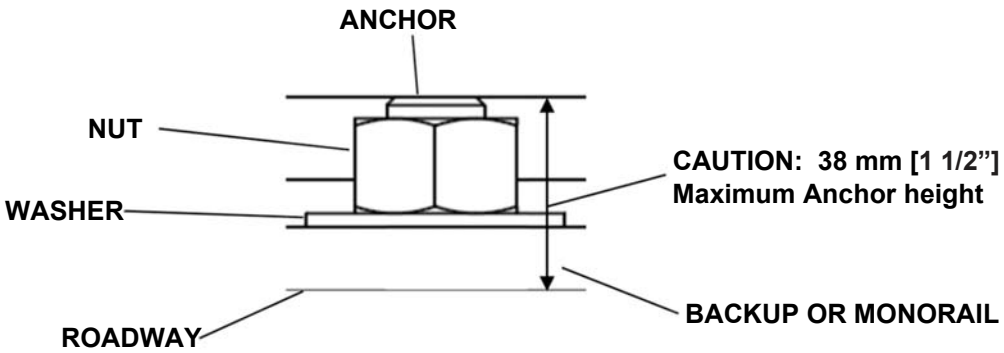


Figure 20
Final Anchor Height
(After Applied Torque)

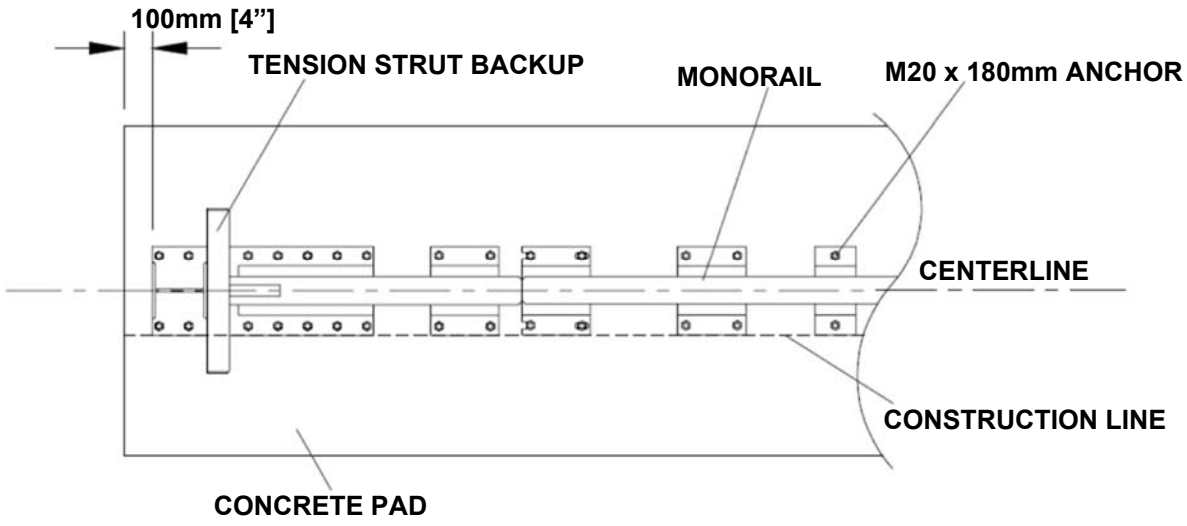


Figure 21
Backup and Monorail Location for Tension Strut Backup

5) Attach Monorail Guides

Attach Monorail guides to Diaphragm as follows:

Insert 3/4" x 2" G8 hex bolt through Monorail guide and Di aphragm with a shim pl aced between them and oriented as shown in Figure 22. Secure with 3/4" lock washer and 3/4" hex nut (typical 4 places). See the Diaphragm Assembly drawing supplied with the system.

Repeat process for each Diaphragm.

6) Attach Diaphragms

Orient a Diaphragm so that the front face of the Diaphragm shape faces toward the Nose of the system as shown in Figure 23.

Important: Slide one Diaphragm all the way to the Backup to ensure the system is able to collapse properly during impact.

Orient and slide all other Diaphragms onto M onorail and p osition each approximately as shown in Figure 24.

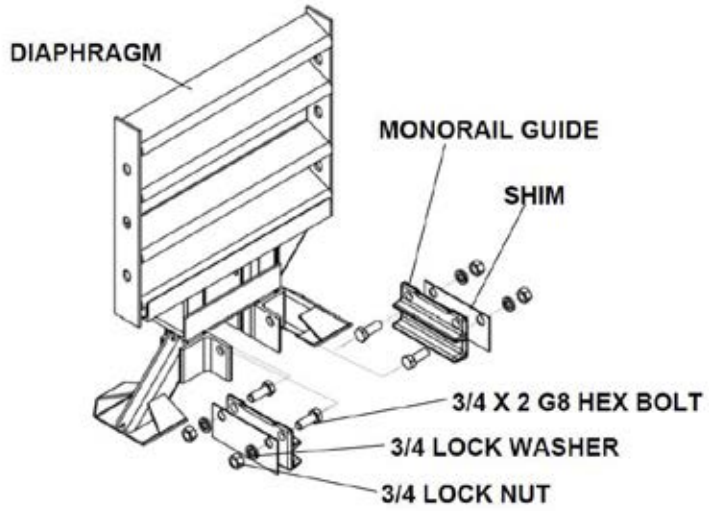


Figure 22
Monorail Guide Attachment

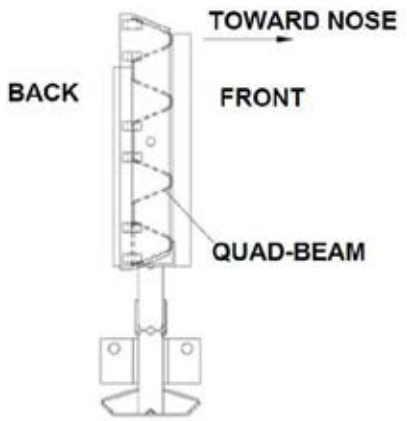


Figure 23
Diaphragm Orientation

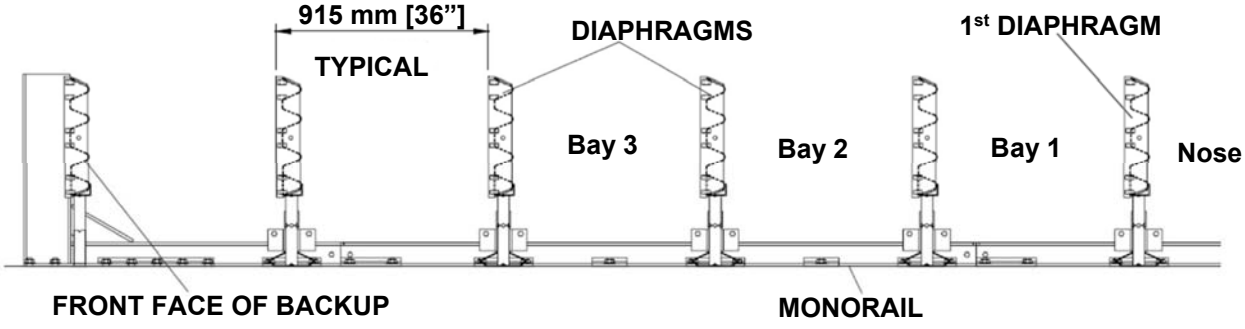


Figure 24
Diaphragm Spacing

7) Attach Fender Panels

Note: Do not mix the 5/8” rail nuts (large) with the 5/8” hex nuts (small) (Figure 25).

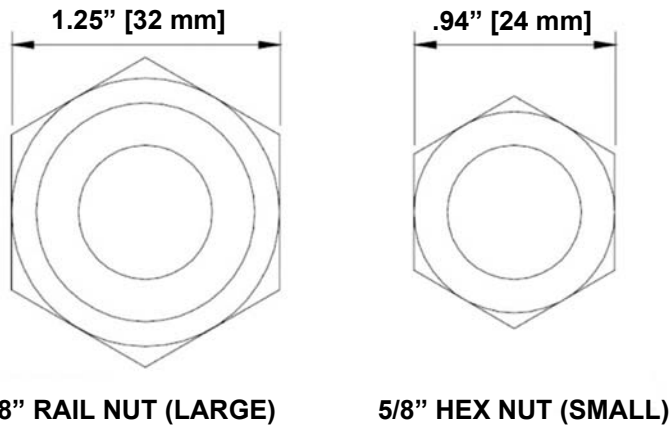


Figure 25
Rail Nuts are Oversize

Note: Starting at the Backup, attach left and right Fender Panels shown below in Step(s) 4 & 5 **with each tapered end pointing toward the rear of the system (p. 27).**

Step 1

Place the Fender Panel so that the center of the slot of the rearward Di aphragm is lined up with the approximate center of the slot in the Fender Panel.

Attach Mushroom Washer Assembly as shown in Figure 26, Detail 26a, and 26b. Do not torque fasteners at this time. This (Step 1) 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.

Note: Working from the Backup, assemble and tighten each Bay section one at a time toward the Nose of the system.

Step 4

Attach the front of the Fender Panels to the next Diaphragm using two (2) rail bolts and large hex nuts per side. Use only the top and bottom holes and leave the center hole open until the next Fender Panel is attached.

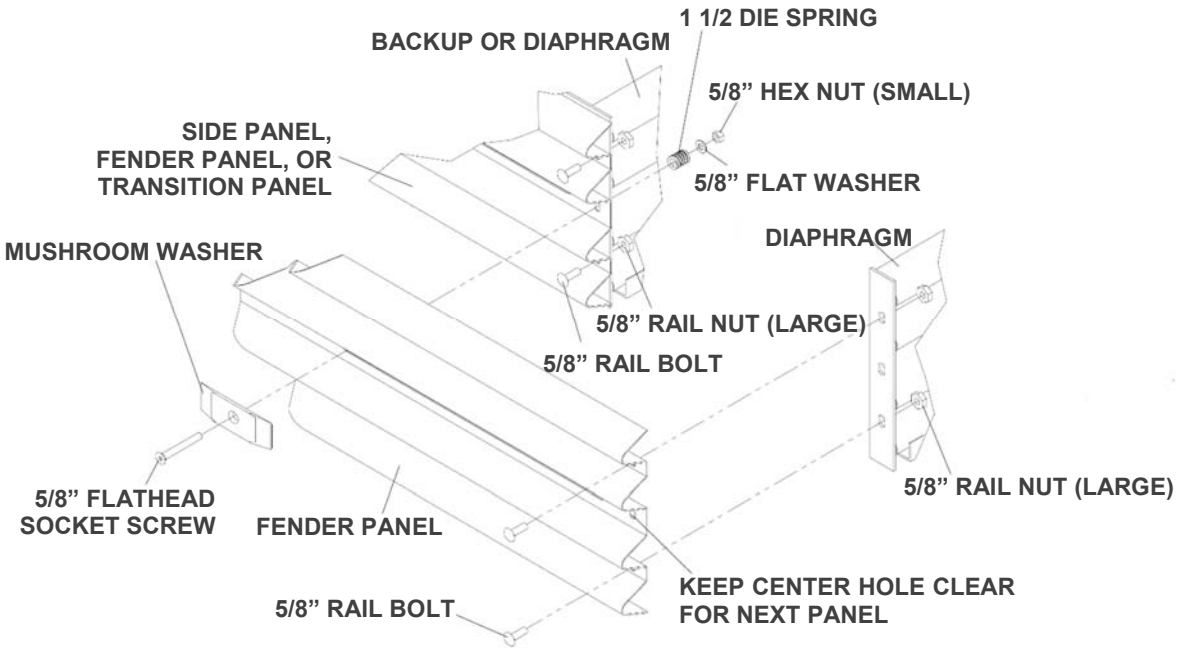
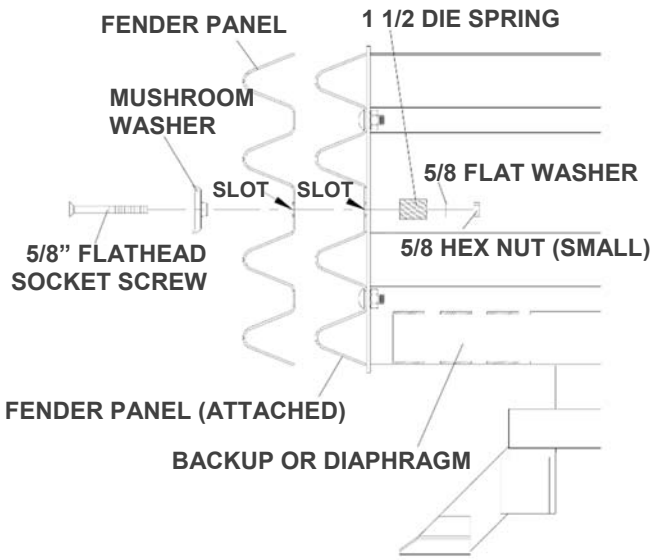


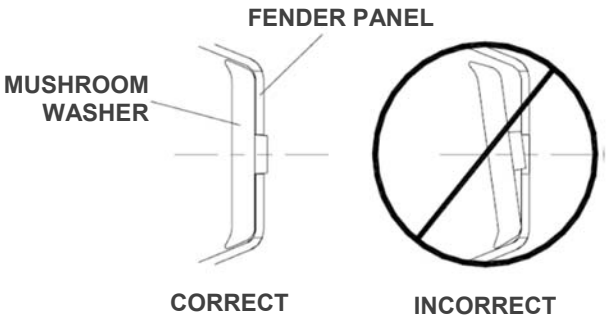
Figure 26
Fender Panel Assembly

Step 5

Be sure Mushroom Washer lays flat against the Fender Panel as shown in Detail 26b. Standoff on Mushroom Washer must be seated completely through slot.



Detail 26a
Mushroom Washer Attachment



Detail 26b
Mushroom Washer Orientation

Important: Starting from the Backup, attach and tighten each Bay section one at a time.

Step 6

Check Diaphragm spacing to ensure 915 mm [36”] between rear faces of consecutive Diaphragms as shown in Fender Panel assembly drawing (Figure 27).

Step 7

Once proper spacing has been achieved, tighten the Mushroom Washer Assembly (small hex) nut until it reaches the end of the threads.

Assemble the remaining Diaphragms and Fender Panels following the same procedures.

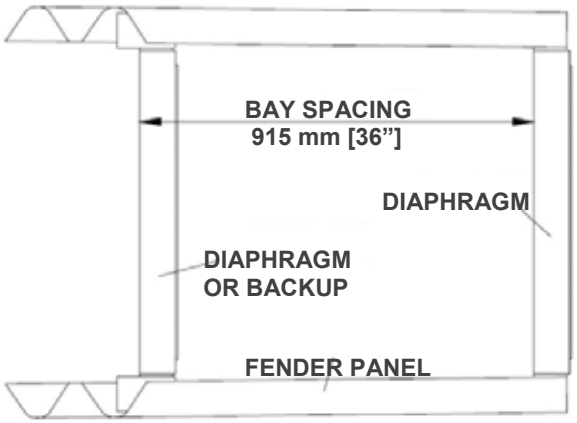


Figure 27
Proper Diaphragm Spacing

8) Attach End Cap

Attach the End Cap to the front of the first Monorail segment, as shown below and the Monorail Assembly drawing.

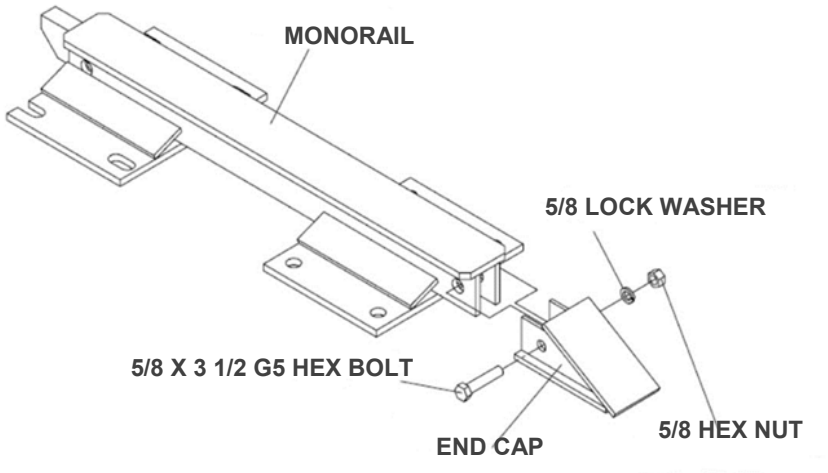


Figure 28
Monorail End Cap Attachment

9) Attach Lower Cartridge Support Brackets

Attach lower Cartridge Support Bracket to the front and back of all Diaphragms and also to the front of the Backup as shown below.

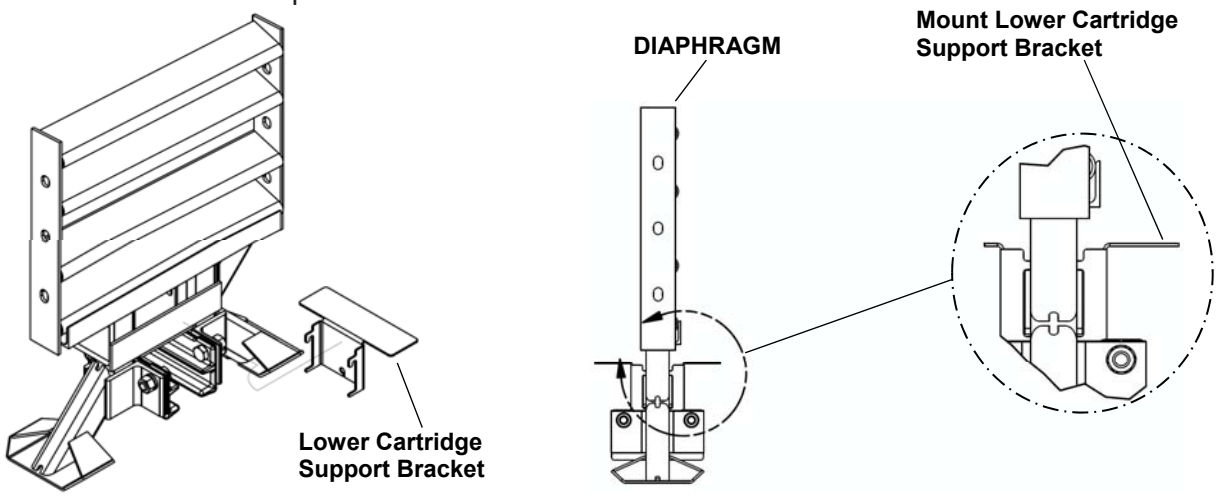


Figure 29
Lower Cartridge Support Bracket Assembly

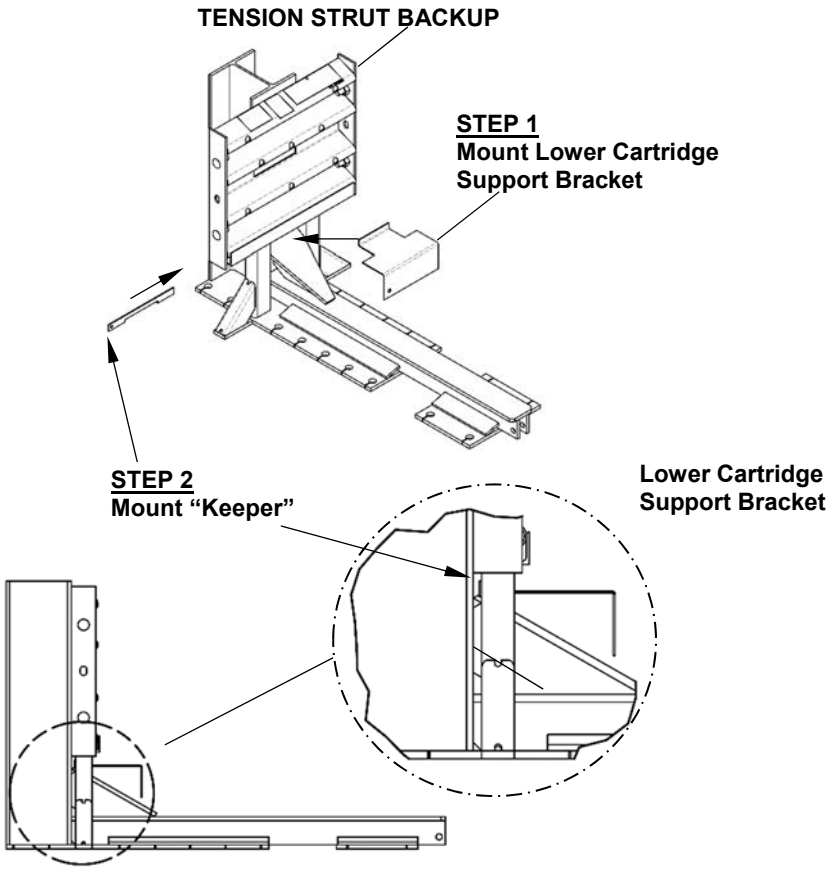


Figure 30
Lower Cartridge Support Bracket Assembly
(Tension Strut Backup)

10) Nose Assembly

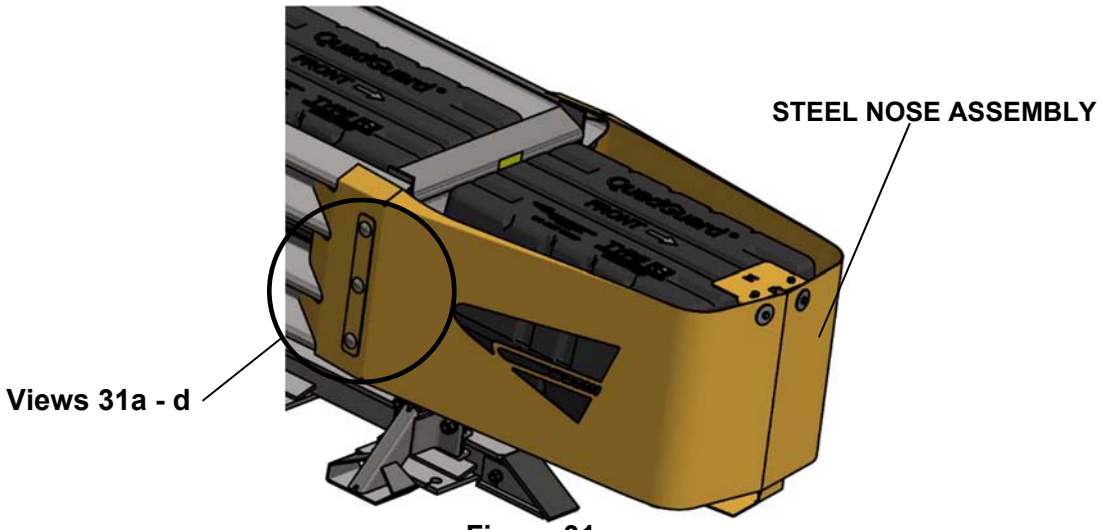


Figure 31
NOSE ASSEMBLY (p. 47)

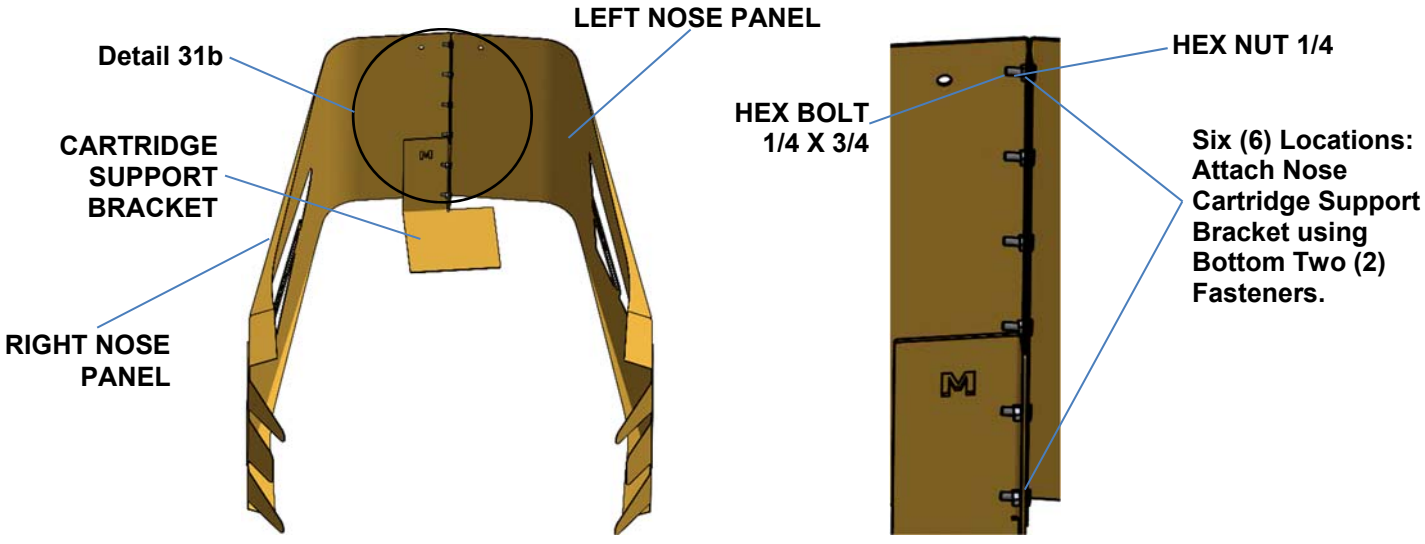
A. Preassemble Left and Right Nose Panels and Cartridge Nose Support Bracket using 1/4X3/4 hex bolt and hex nuts (Detail 31a & 31b).

B. Attach preassembled Nose Assembly to front Diaphragm with 5/8X5 rail bolts, bar washers, 3/4 sch 80X3" pipe, pullout brackets and 5/8 hex nuts. Do not tighten at this time (Details 31c, 31d, 31e).

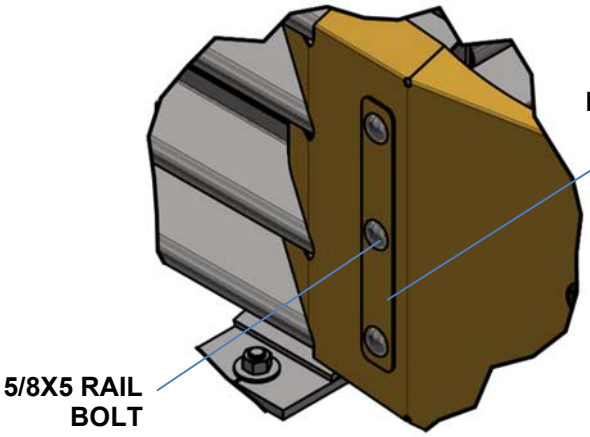
C. Adjust Nose assembly height so top front Nose is 815 mm above concrete pad. Tighten all six (6) rail bolts and nuts.

D. Install Type 1 Cartridge insuring directional arrow is pointing to front of system.

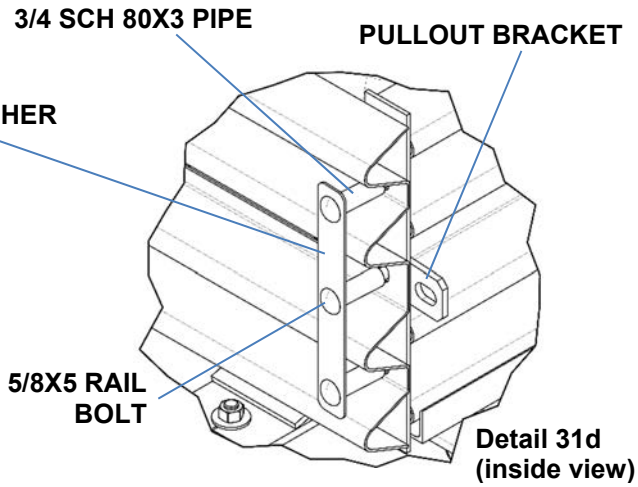
E. Assemble QuadGuard® M Cartridge Hold Down Bracket with 3/8X 1 hex bolts, washers and nuts (Figure 32).



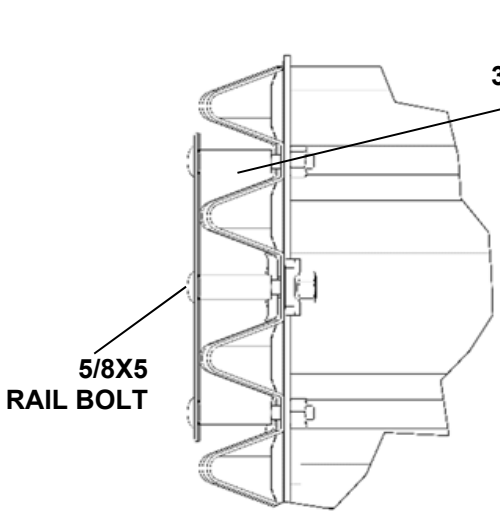
Detail 31a **Detail 31b**



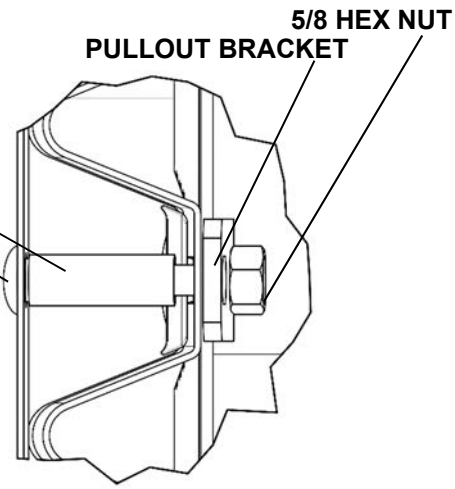
Detail 31c
Fastener Assembly



Detail 31d
Steel Nose not shown for clarity



Detail 31e
End View: Nose Cover Removed



Detail 31f
Inside View: Nose Cover Cut Away

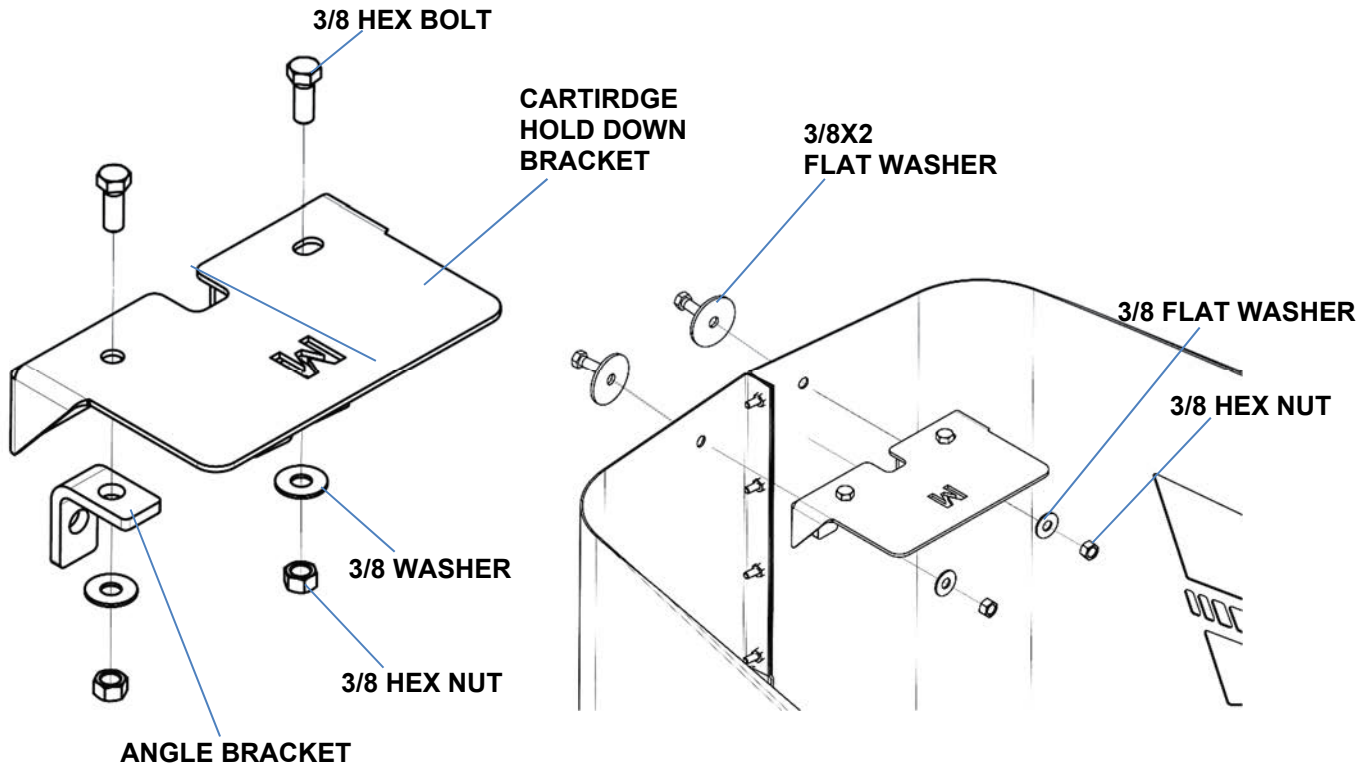


Figure 32
Hold Down Bracket Assembly

Note: Figure 33 shows proper placement of Cartridge Nose Support Bracket.

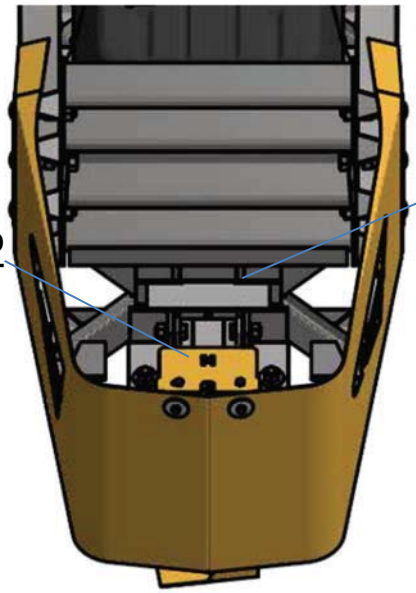


Figure 33

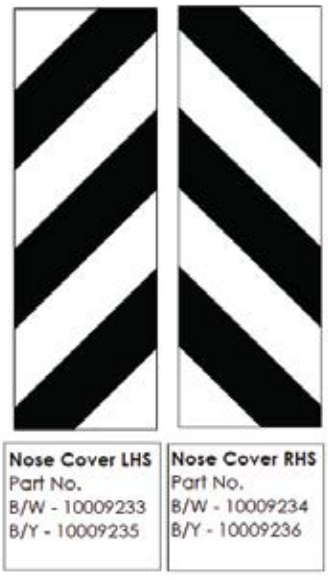


Figure 33a

11) Checking the System Assembly

At this point recheck to ensure that all fasteners are properly tightened throughout the system (anchor bolts, etc.). See torque requirements below. Check all Fender Panels. If they do not fit tightly against the underlying Panel, system realignment may be necessary (Figure 34).

Warning
Bolt Torque Requirements
Anchor Studs – p. 16
Critical Clearances
Anchor Studs above nuts – p. 24, Figure 20 Fender Panel Gap – 20mm [.78”] Figure 34

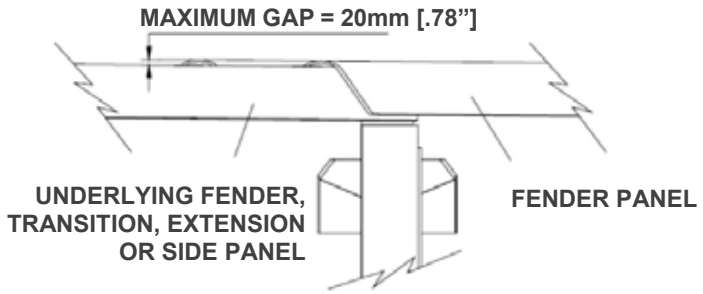


Figure 34
Fender Panel Gap

12) Cartridge Placement

The top surface of the Nose Cartridge should be horizontal. To complete the assembly of a QuadGuard® M10, place the appropriate Cartridge in each Bay and Nose section of the system. Type I Cartridges are placed toward the front (Nose) of the system; Type II Cartridges are placed toward the rear (Backup) of the system (p. 19).

Warning: Placing the wrong Cartridge in the Nose or Bay(s) could result in unacceptable crash performance per MASH criteria and cause serious injury or death to occupants and/or bystanders in the event of a vehicle impact.

Important: The QuadGuard® M10 is a six (6) Bay configuration.

QuadGuard® M10 610mm [24"] Final Inspection Checklist

Site Location: _____

Date: _____

Inspector: _____

Refer to the QuadGuard® M10 61mm [24]" manual and / or drawing package.

- ☐ Transition Panel fits for the offset (p. 11)
- ☐ Clearance of 765 mm behind rear Fender Panels for slide back (p. 14)
- ☐ Anchor nuts are torqued to manufacturer specification (p. 16)
- ☐ Top of Nose panels are 815 mm above concrete pad (p. 19)
- ☐ Cartridges are level and the same height in each Bay (p. 19)
- ☐ Correct Cartridge is placed in each Bay and pointing to front of system (p. 19)
- ☐ Cartridge Hold Down Bracket is secure and engaged with Nose Cartridge (p. 19)
- ☐ Every hole and slot in Backup and Monorail is anchored (pp. 22, 24)
- ☐ If no transition, check for narrow side panels at backup (p. 23)
- ☐ Anchor stud(s) are 38 mm maximum above the pad) (p. 24)
- ☐ Diaphragms attached to the Monorail guides (p. 25)
- ☐ Diaphragm Shims installed between Diaphragm & Monorail guides (p. 25)
- ☐ Each Fender Panel has a tension Die Spring (p. 27)
- ☐ Mushroom Washers lay flat in slots (p. 27)
- ☐ Monorail has End Cap attached (p. 28)
- ☐ Nose Cartridge is at the same height as Bay Cartridges (p. 30)
- ☐ Fender Panel gap is 20 mm for Narrow systems (p. 33)
- ☐ Bolts and nuts are properly tightened (p. 33)
- ☐ System is clear of debris with any monorail transport bolts (if fitted) removed (p. 21)

Maintenance and Repair

Inspection Frequency

Inspections for QuadGuard® M10 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) Check to see if there is evidence of an impact. If so, perform a walk-up inspection.
2) Check to see if the Cartridges are properly seated on the Support Brackets. Any damaged Cartridges must be replaced.

Warning: See Cartridge placement instructions on page 19.

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

Walk-Up Inspection Checklist

- ☐ Clear and dispose of on-site debris.
- ☐ Clear and remove excessive dirt from around the Monorail and Diaphragm feet.
- ☐ Bolts are tight and rust free.
- ☐ Anchor bolts are securely anchored.
- ☐ Diaphragm Legs are straight.
- ☐ All Mushroom Washer Assemblies are properly seated.
- ☐ Fender Panels and Transition Panels should nest tightly against the system.
- ☐ Cartridges have not been damaged and are properly seated on their Support Brackets. To ensure intended speed characteristics, partially crushed Cartridges (due to low speed impacts) must be replaced.
- ☐ Make all necessary repairs as described above. See Post-Impact Instructions for more information on next page.
- ☐ To determine if a product should be replaced or is potentially reusable, a trained engineer experienced in highway products and directed by the DOT must be consulted.

Post-Impact Instructions

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 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.

1) Deploy appropriate traffic-control devices.
2) Ensure all anchor bolts have remained firmly anchored in the roadway surface. Replace any loose, broken, or pulled out anchors.

   The performance of the system during an angle impact depends on a properly anchored Monorail.
3) Clear and dispose of any debris on site.
4) Ensure the Mushroom Washer Assemblies are intact so the system can be restored to its original position.

Caution: Use eye protection and gloves when refurbishing the 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 as the nut is nearing the end of the bolt, to prevent injury make sure that the Die Spring is restrained with a clamp so it does not suddenly release when the nut is removed from the Mushroom Washer Bolt.

5) The Diaphragm Support Legs are all properly attached to the Monorail.
6) Remove the Nose Assembly and attach a chain to the Pullout Brackets on the first Diaphragm (Figure 35). Attach both ends of chain to a heavy vehicle (such as a 1 ton pickup).

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

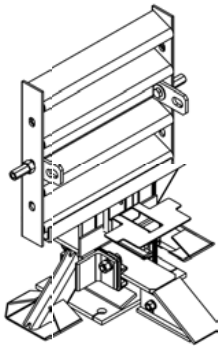


Figure 35
Pullout Brackets

Important: Slowly pull the system forward to its original length. Have someone watch the repositioning to ensure undetected damage does not cause the Diaphragms to bind or pull out improperly.

7) Remove all crushed Cartridges.

8) All Diaphragms are in usable condition. Diaphragms which are bowed or have bent legs must be replaced.

9) Each Fender Panel is properly attached with Mushroom Washer Assemblies. Damaged Fender and Transition Panels must be replaced.

Warning
Anchor Torque and Clearance Requirements
Torque Requirements – Adhesive Manufacturer Spec Anchor clearance above nuts – Figure 20, p. 24
Fender Panel Critical Clearances
Fender Panel Gap – 20mm

.

10) Check the **gaps between Fender Panels**. The maximum gap allowed for these overlapping parts (including Fender Panels overlapping Panels behind the system) is 20 mm.

Important: Ensure the Mushroom Washer Assemblies are torqued to the end of the threads. If the gaps between the Fender Panels are still too large, it may be necessary to replace bent parts.

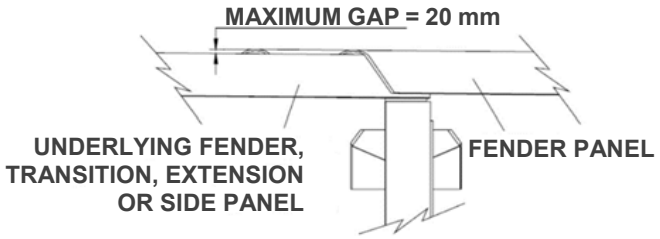


Figure 36
Fender Panel Gap

11) Replace all crushed Cartridges and damaged Cartridge Support Brackets. See Cartridge Placement on page 19.

12) Remove damaged Nose Assembly. Attach the new Nose to the first Diaphragm. See pages 30 - 32 and 48 for Nose attachment instructions.

13) All bolts on the system are adequately tight.

14) Site is free from debris.

15) The QuadGuard® M10 is now ready for use.

Parts Ordering Procedure & Drawings

Make a list of all damaged parts from the System Components section in this manual (p. 7 – 10). Answer the following questions in the spaces provided. This information is necessary to receive the proper parts.

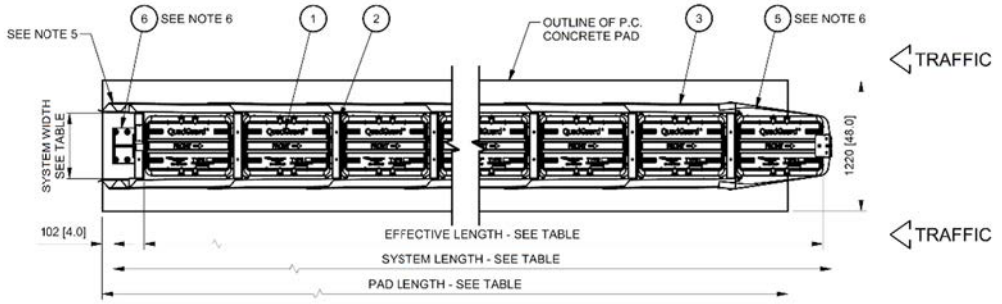
QuadGuard® M10 Ordering Information Chart		
Description:	**Choices**	**Fill in this section**
Transition Panel Type? Side Panel and Transition Panel Types are on page 11. Include Transition options for both sides if necessary. How to Determine Left/Right is on page 20.	• Quad to W-Beam Guardrail • Quad to Thrie Beam Guardrail • Quad to Safety Shape Barrier • Quad to Single Slope Barrier • Quad to Vertical Concrete End Shoe • None	

Parts List(s) & Quantities

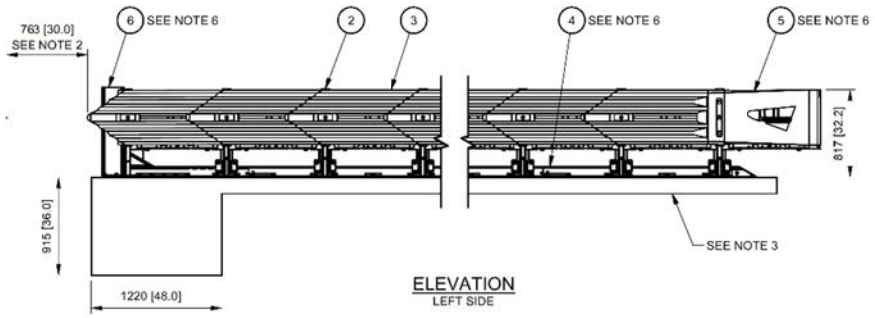
		Tension Strut Backup	
PN	**Description**	**6 Bay**	**3 Bay**
10102902	Injection Mortar 500/2/EE	3	2
10102304	Backup, TS, 24, QG, M10, W/Decals	1	1
004441	Bolt, GR, 5/8X5, A307	6	6
10102508	Bolt, Hex, 1/4X3/4, G5	6	6
10103462	Bolt, Hex, 3/4X2, G8	24	12
10103162	Bolt, Hex, 3/8X1, G5	4	4
10102552	Bolt, Hex, 5/8X3 1/2, G5	1	1
10102503	Bolt, Rail, 5/8X2	24	12
10102213	Bracket, Angle, 2X1, W/Holes	2	2
10102211	Bracket, Cart Hold Down, QG M	1	1
10102212	Bracket, Cart Support, Nose, QG M	1	1
10102400	Bracket, Cartridge Supt, Dia, Folded, QG	12	6
10102419	Bracket, Cartridge, Supt, TS B/U, QG	1	1
10102411	Bracket, Pull-Out, QG	2	2
10102113	Diaphragm, QG, 24 QG	6	3
10102313	Endcap, Monorail	1	1
10102419	Locking Bar, Cartridge Supt, QG	1	1
10102534	Monorail Guide, QG	12	6
10102311	Monorail, 2 Bays	1	1

		Tension Strut Backup	
PN	Description	6 Bay	3 Bay
10102312	Monorail, 3 Bays	1	0
10102202	Nose, L, Narrow, QGII, W/Logo	1	1
10102204	Nose, R, Narrow, QGII, W/Logo	1	1
10102504	Nut, Hex Heavy, 3/4	24	12
10102502	Nut, Hex Heavy, 5/8	13	7
10102515	Nut, Hex, 1/4	6	6
10102516	Nut, Hex, 3/8	4	4
10102501	Nut, Hex, Rail, 5/8	34	22
10102002	Panel, Fender, QG	12	6
10102004	Panel, Side, QG	2	2
627537	Pipe, 3/4 Schedule 80X3	6	6
10102520	Screw, FL Hex Socket, 5/8X5	12	6
10102906	Shim, 12GA X 3 5/8X8	12	6
10102523	Spring, Die, 1 1/4 OD X 1 1/2	12	6
10102547	Stud, M20 x 180mm, G	52	32
10102210	WASHER,10GA X2X14,SLOTS,Y	2	2
10102526	Washer, Flat, 3/8X1, G	4	4
10102568	Washer, Flat, 3/8X2	2	2
10102500	Washer, Flat, 5/8X1 3/4	12	6
10102538	M20 Structual Flat Washer	52	32
10102528	Washer, Lock, 3/4	24	12
10102530	Washer, Lock, 5/8	1	1
10102536	Washer, Mushroom Forged, QG	12	6
10102539	M20 Structual Nut Hex Nut Galv	52	32

Warning: Use only Trinity Highway parts that are specified herein for assembling, maintaining, or repairing the QuadGuard ® M10. **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.



PLAN



ELEVATION
LEFT SIDE

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 [30.00] MIN.
3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 200 [8.00] MIN. NON-REINFORCED 28MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE SUCH AS A CONCRETE WALL OR ABUTMENT.
4. SEE THE "QUADGUARD M10 SYSTEM PRODUCT 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 AN ADEQUATE TRANSITION FROM THE QUADGUARD M10 SYSTEM TO THE OBJECT BEING SHIELDED.
6. BACKUP, MONORAIL, AND NOSE ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY.
7. THE QUADGUARD M10 3-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 2.
8. THE QUADGUARD M10 6-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

BAYS	610 [24"] WIDTH	SYSTEM LENGTH		EFFECTIVE LENGTH		PAD LENGTH		MAX DESIGN SPEED		NO. OF CARTRIDGES	
**	MODEL NO (PART NO)	m	ft-in	m	ft-in	m	ft-in	Km/h	[MPH]	TYPE I	TYPE II
3	QM7024 (618693)	3.94	[12'-11"]	3.56	[11'-8"]	3.66	[12'-0"]	70	[43]	3	1
6	QM10024 (617607)	6.68	[21'-11"]	6.30	[20'-8"]	6.40	[21'-0"]	100	[62]	4	3

KEY

1. CARTRIDGE
2. DIAPHRAGM
3. FENDER PANEL
4. MONORAIL
5. NOSE
6. BACKUP

REFERENCES

SERIAL NO. _____
SALES ORDER _____
EH PROJECT _____
DESIGN SPEED SEE TABLE
NOSE TYPE _____
NO. OF UNITS _____

DIAPHRAGM ASSY	625650
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	626814
FENDER PANEL ASSY	608236
BACKUP ASSY M10	627448
MONORAIL ASSY	625637
CONCRETE PAD	618686

DRAWN: D. Standridge 4/21/2010
CHECKED: ST 6/27/2010
DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND THEY ARE IN MILLIMETERS [INCH] UNLESS OTHERWISE SPECIFIED.
QUADS: SEE TABLE
FILE: QGMTSCVR-U.idw
DO NOT SCALE DRAWING

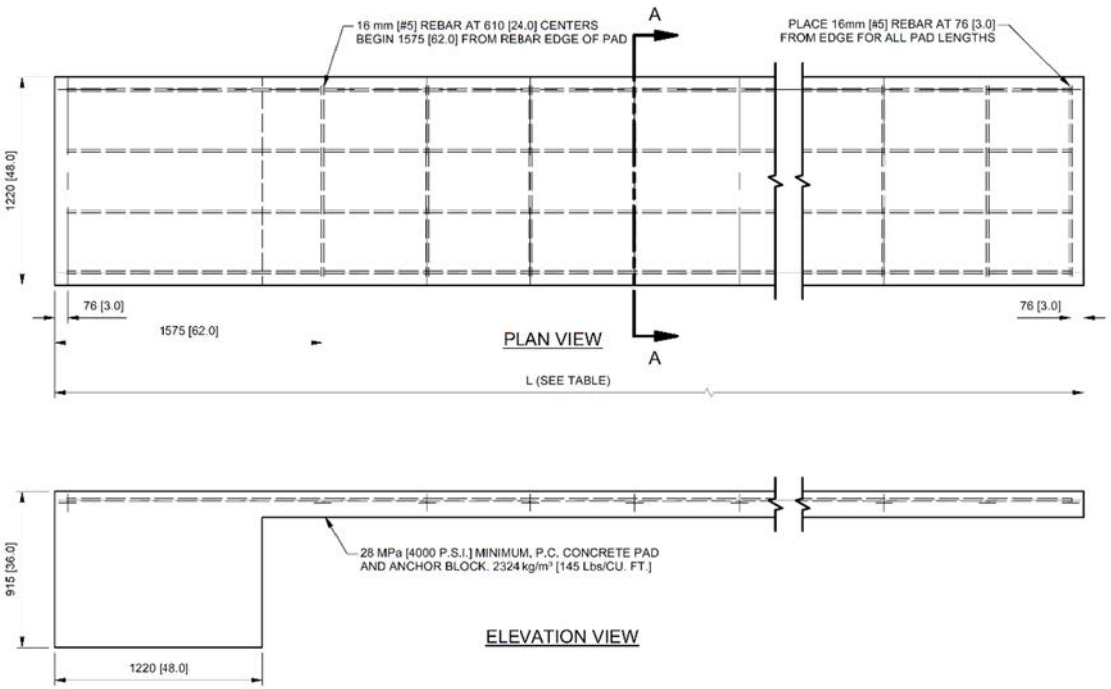
QUADGUARD® QGM10 SYSTEM
NARROW SYSTEM WITH TENSION STRUT BACKUP

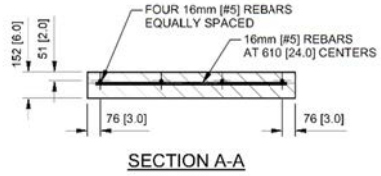
TRINITY HIGHWAY

DRAWING: QGMTSCVR-U REV: J SHEET: 1 of 1

QuadGuard® M10 w/ Tension Strut Backup QGMTSCVR-U

TABLE			
NO. OF BAYS	"L" (PAD LENGTH)	REBAR REQUIRED	YARDS OF CONCRETE IN PAD
	m [ft-in]	m [ft-in]	m^3 [$YARDS^3$]
1	2.74 [9'-0"]	14.83 [48'-8"]	1.59 [2.1]
2	2.74 [9'-0"]	14.83 [48'-8"]	1.59 [2.1]
3	3.66 [12'-0"]	20.73 [68'-0"]	1.82 [2.4]
4	4.57 [15'-0"]	25.50 [83'-8"]	1.97 [2.6]
5	5.49 [18'-0"]	31.39 [103'-0"]	2.12 [2.8]
6	6.40 [21'-0"]	36.17 [118'-8"]	2.35 [3.1]
7	7.32 [24'-0"]	42.06 [138-0"]	2.51 [3.3]
8	8.23 [27'-0"]	46.84 [153-8"]	2.66 [3.5]
9	9.14 [30'-0"]	52.73 [173'-0"]	2.81 [3.7]
10	10.06 [33'-0"]	57.51 [188'-8"]	3.04 [4.0]
11	10.97 [36'-0"]	63.40 [208'-0"]	3.19 [4.2]
12	11.89 [39'-0"]	68.17 [223'-8"]	3.35 [4.4]





SECTION A-A

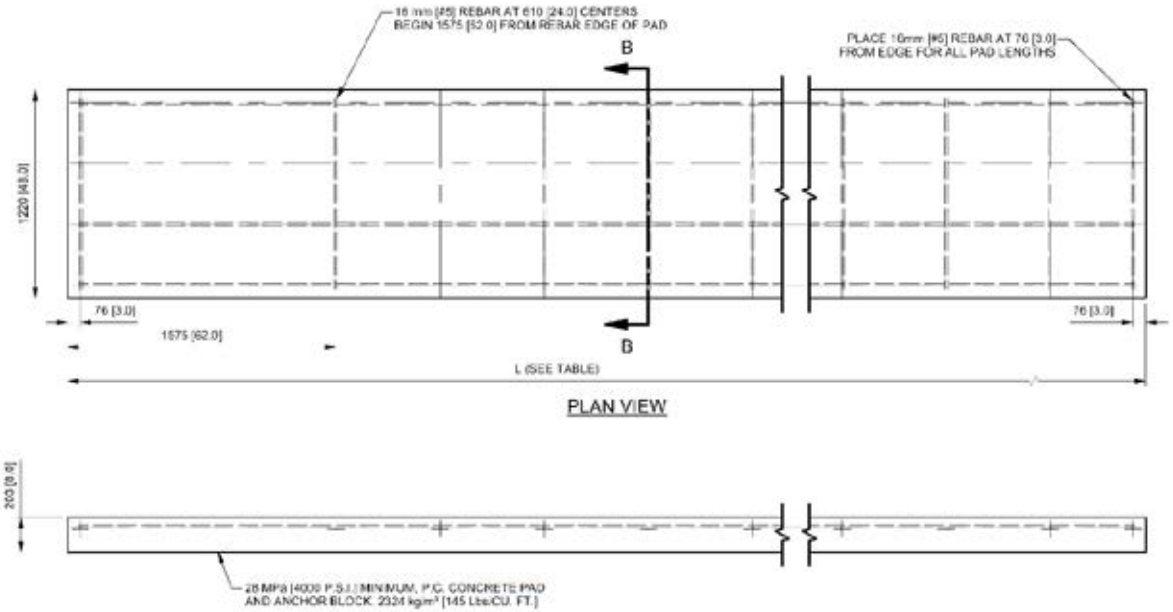
NOTES:
1. CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
2. ANCHOR BLOCK LOCATION IS RECOMMENDED AT BACK OF CONCRETE PAD. EXISTING CONCRETE PADS WITH BELOW GROUND OBSTRUCTIONS ARE ACCEPTABLE WITH ANCHOR BLOCKS AT THE FRONT OF THE PAD.

D. Hayes Jr	12/20/2011		QUADGUARD® SYSTEM
M. Buehler	4/24/2012	618686.idw	CONCRETE PAD FOR TENSION STRUT BACKUP
UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN MILLIMETERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND IMPERIAL UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	DRAWING 618686 REV B SHEET 1 of 4

TRINITY HIGHWAY

TS Concrete Pad 618686

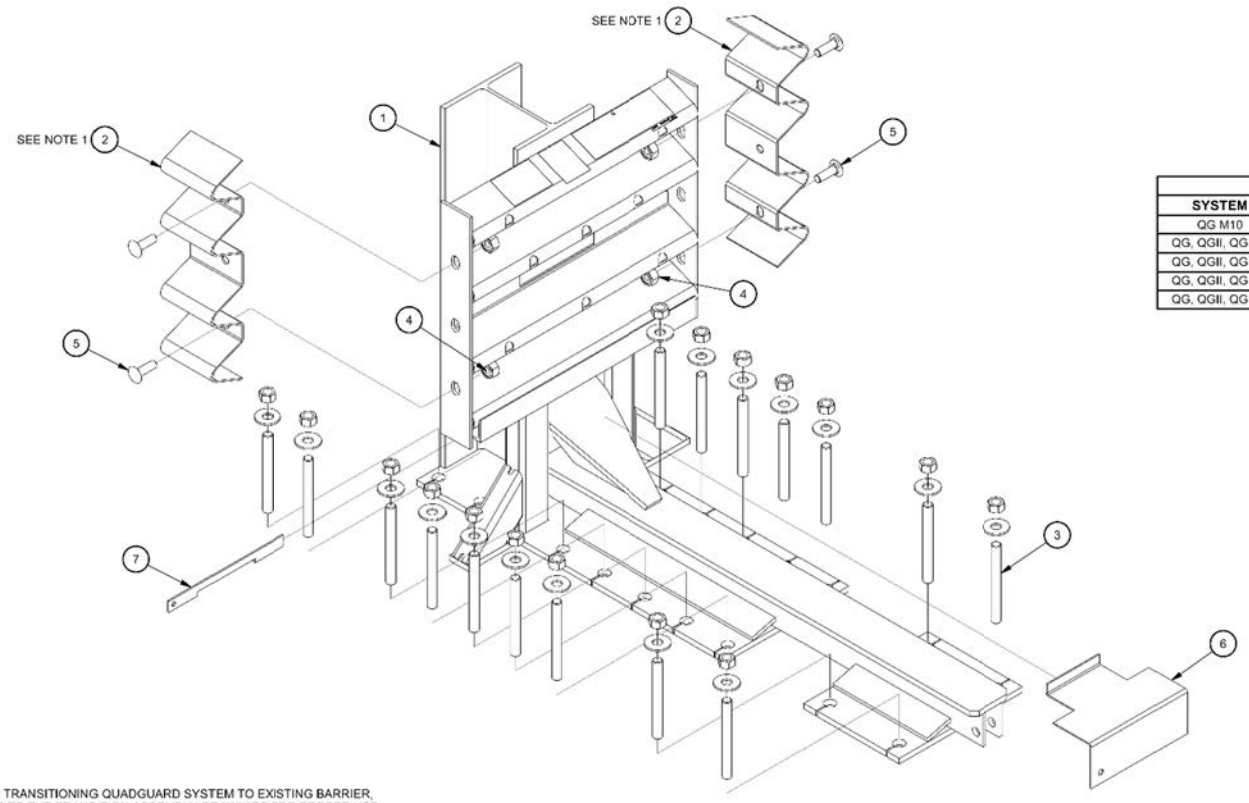
TABLE			
NO. OF BAYS	"L" (PAD LENGTH)	REBAR REQUIRED	YARDS OF CONCRETE IN PAD
	m [ft-in]	m [ft-in]	m³ [YARDS³]
1	2.74 [9'-0"]	14.83 [48'-8"]	0.7 [0.9]
2	2.74 [9'-0"]	14.83 [48'-8"]	0.7 [0.9]
3	3.66 [12'-0"]	20.73 [68'-0"]	0.9 [1.2]
4	4.57 [15'-0"]	25.90 [85'-0"]	1.2 [1.5]
5	5.49 [18'-0"]	31.39 [103'-0"]	1.4 [1.8]
6	6.40 [21'-0"]	36.17 [118'-8"]	1.6 [2.1]
7	7.32 [24'-0"]	42.06 [138'-0"]	1.9 [2.4]
8	8.23 [27'-0"]	46.84 [153'-8"]	2.1 [2.7]
9	9.14 [30'-0"]	52.73 [173'-0"]	2.3 [3.0]
10	10.06 [33'-0"]	57.51 [188'-8"]	2.5 [3.3]
11	10.97 [36'-0"]	63.40 [208'-0"]	2.7 [3.6]
12	11.89 [39'-0"]	68.17 [223'-8"]	3.0 [3.9]



NOTES:
1. CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
2. TO PREVENT SLIDING DURING AN IMPACT, PAD MUST BE INSTALLED AGAINST OR TIED TO AN EXISTING STRUCTURE. OTHERWISE ADDITIONAL BELOW GRADE SUPPORTS MUST BE ADDED AS DETERMINED NECESSARY BY THE PROJECT ENGINEER.

D. Hayes Jr	12/20/2011		QUADGUARD® SYSTEM
M. Buehler	4/24/2012	618686.idw	OPTIONAL 8" CONCRETE PAD WITH REBAR FOR TENSION STRUT BACKUP
		DO NOT SCALE DRAWING	618686 B 2 of 4

TS Concrete Pad 8" w/Rebar 618686



PARTS LIST	
ITEM	DESCRIPTION
1	BACKUP,TS,QG W/DECALS
2	PANEL,SIDE,QG
3	ANCHOR KIT,HILTI
4	NUT,HX,5/8,G,RAIL
5	BOLT,RAIL,5/8X2,G
6	BRACKET,CARTRIDGE SUPT,TS B/U,QG
7	LOCKING BAR,CARTRIDGE SUPT,QG

TABLE				
SYSTEM	WIDTH	7" ANCHORS	18" ANCHORS	NO ANCHORS
QG M10	24"	626059	627447	627449
QG, QGII, QG HS	24"	604570	626516	627450
QG, QGII, QG HS	30"	604574	626517	627451
QG, QGII, QG HS	36"	604584	626518	627452
QG, QGII, QG HS	48"	604590	626519	627453

NOTE:
1. WHEN TRANSITIONING QUADGUARD SYSTEM TO EXISTING BARRIER, REFER TO THE TRANSITION ASSEMBLY DRAWINGS FOR PROPER USE OF SIDE PANEL, PART NO. 611898 (ITEM 2).

R. VENZON	2/12/2020	SEE TABLE	QUADGUARD® SYSTEM
B. ECKERT	2/14/2020	627448.idw	BACKUP ASSY, TS, QG
		DO NOT SCALE DRAWING	627448 - 1 of 1

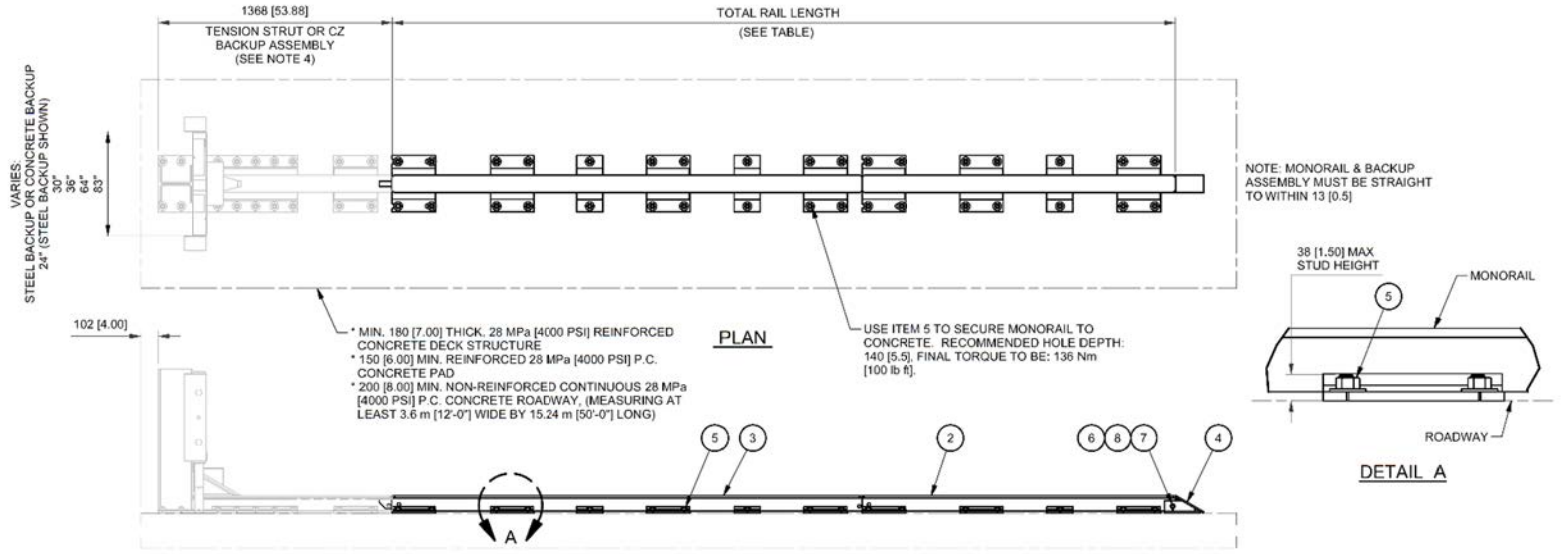
TRINITY HIGHWAY

Tension Strut Backup 627448

TABLE				
NO. OF BAYS	ASSY NO. W/ 7" ANCHORS	ASSY NO. W/ 18" ANCHORS	ASSY NO. W/O ANCHORS	TOTAL RAIL LENGTH
1	611367	611367	611367	0
2	611332	626525	627543	915 [36.5]
3	611334	626526	627544	1830 [72.0]
4	611340	626527	627545	2745 [108.1]
5	611343	626528	627546	3660 [144.1]
6	611348	626529	611351	4575 [180.1]
7	611353	627559	627548	5490 [216.1]
8	611354	627560	627475	6405 [252.1]
9	611356	626530	627549	7320 [288.2]
10	611329	627582	627550	8235 [324.2]
11	611330	627583	627551	9150 [360.2]
12	611331	627584	627552	10065 [396.2]

PARTS LIST	
ITEM	DESCRIPTION
1	MONORAIL,1 BAY,QG,G
2	MONORAIL,2 BAYS,QG
3	MONORAIL,3 BAYS,QG
4	ENDCAP,MONORAIL,QG
5	ANCHOR KIT,HILTI,330ml,3/4X7,(4)
6	BOLT,HX,5/8X3 1/2,G5,G
8	WASHER,LOCK,5/8,G
7	5/8" HVY HEX NUT A563A

* SEE TABLE



ELEVATION
(W/TENSION STRUT OR CZ BACKUP)

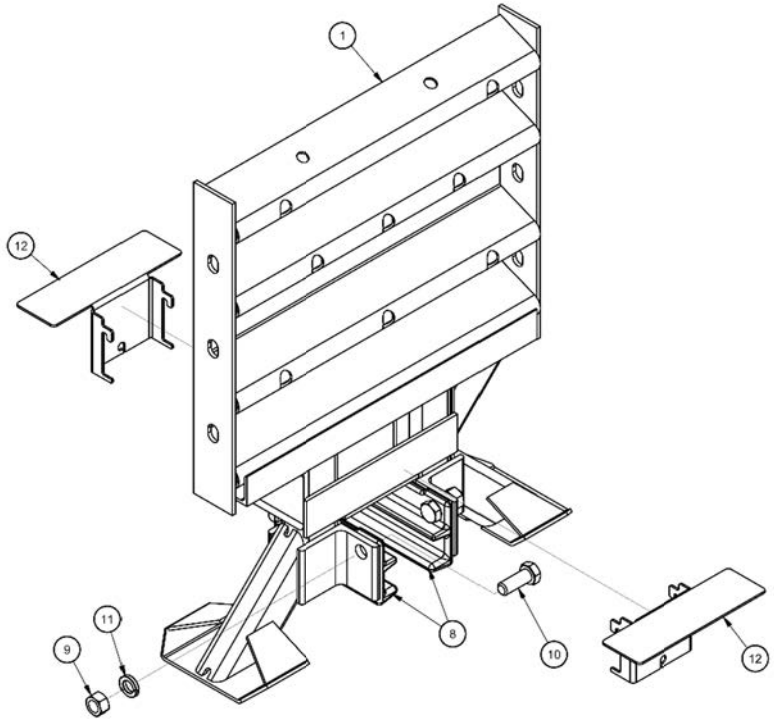
NOTES:
1. USE MONORAIL(S) (ITEM 1, 2 AND 3) AS TEMPLATE(S) TO LOCATE ANCHOR BOLTS (ITEM 5), SEE SHEET 2.
2. CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
3. EVERY STUD MUST BE EMBEDDED TO A DEPTH OF 140 [5.5]. IF REBAR IS ENCOUNTERED IN A P.C. CONCRETE PAD, DRILL THROUGH IT. IF REBAR IS ENCOUNTERED ON A DECK STRUCTURE, ASK PROJECT ENGINEER FOR DIRECTION.
4. FOR CZ SYSTEMS, SEE DRAWING 35-40-24.

DRAWN: W. Leddington	DATE: 2/13/2020	MODEL NO:	QUADGUARD® SYSTEM MONORAIL ASSY,QG
CHECKED: B. Eckert	DATE: 2/18/2020	FILE: 625637.idw	
UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN MILLIMETERS [INCH] DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TOLERANCES UNLESS OTHERWISE SPECIFIED		DO NOT SCALE DRAWING	DRAWING: 625637 REV: A SHEET: 1 of 2

Monorail Assembly 625637

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	SEE TABLE	1
8	611368	MONORAIL GUIDE,QG,G	2
9	003704	3/4" HVY HEX NUT A563 DH	4
10	113555	BOLT,HX,3/4X2,G8,G	4
11	118089	WASHER,LOCK,3/4,G	4
12	605446	BRACKET,CARTRIDGE SUPT,DIA,FOLDED,QG,G	2

ASSY. NO.	ITEM 1	DESCRIPTION	WIDTH
625650	625647	DIAPHRAGM,QB,24,QG,G	610 [24.00]
625651	625648	DIAPHRAGM,QB,30,QG,G	760 [30.00]
625652	625649	DIAPHRAGM,QB,36,QG,G	915 [36.00]
606810	607838	DIAPHRAGM,QB,48,QG,G	1219 [48.00]



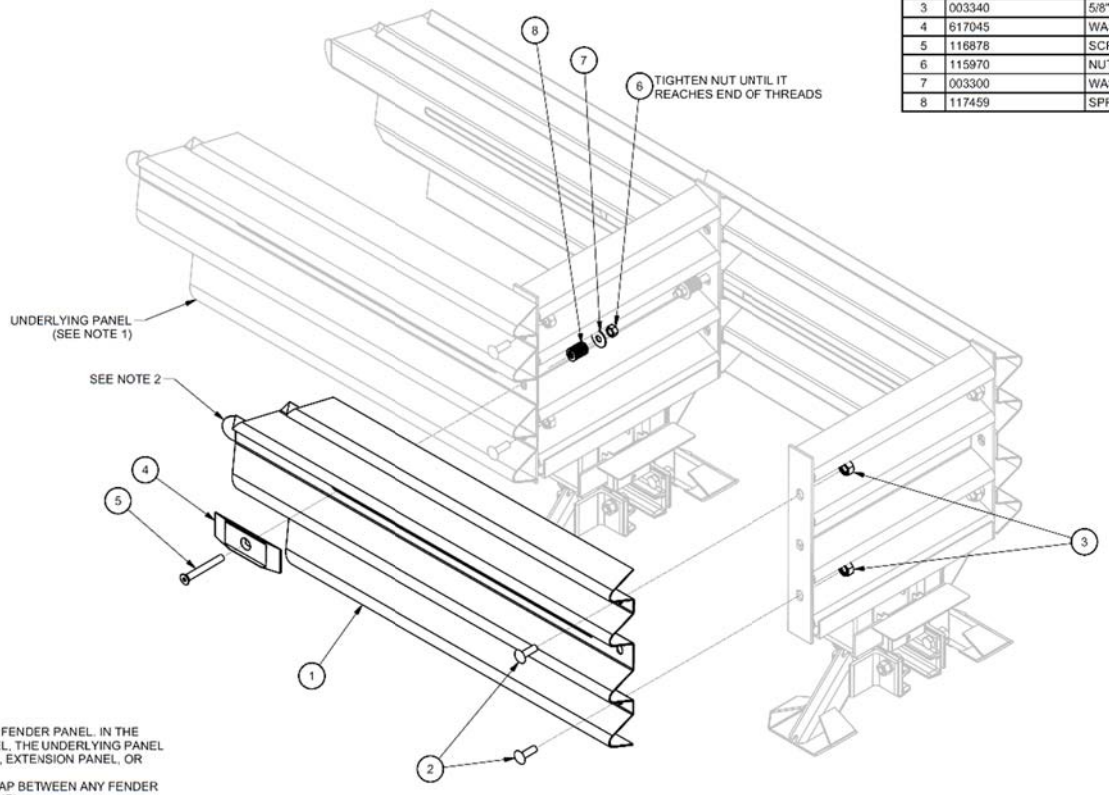
NOTE:
1. QUADGUARD II REQUIRES THE SHIM KIT, SEE 614050.

DRAWN: W. Leddington	DATE: 4/13/2016	CODE NO.: SEE TABLE	
CHECKED: A. Van Brocklin	DATE: 4/28/2016	FILE: 625650.idw	DIAPHRAGM ASSY, QB, 24"
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M 1994 ARE DIRECT-HR-SE-DIS UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		DRAWING NO.: 625650	REV.: B
			SHEET: 1 of 3

Diaphragm Assembly 625650

Shim Kit 627518

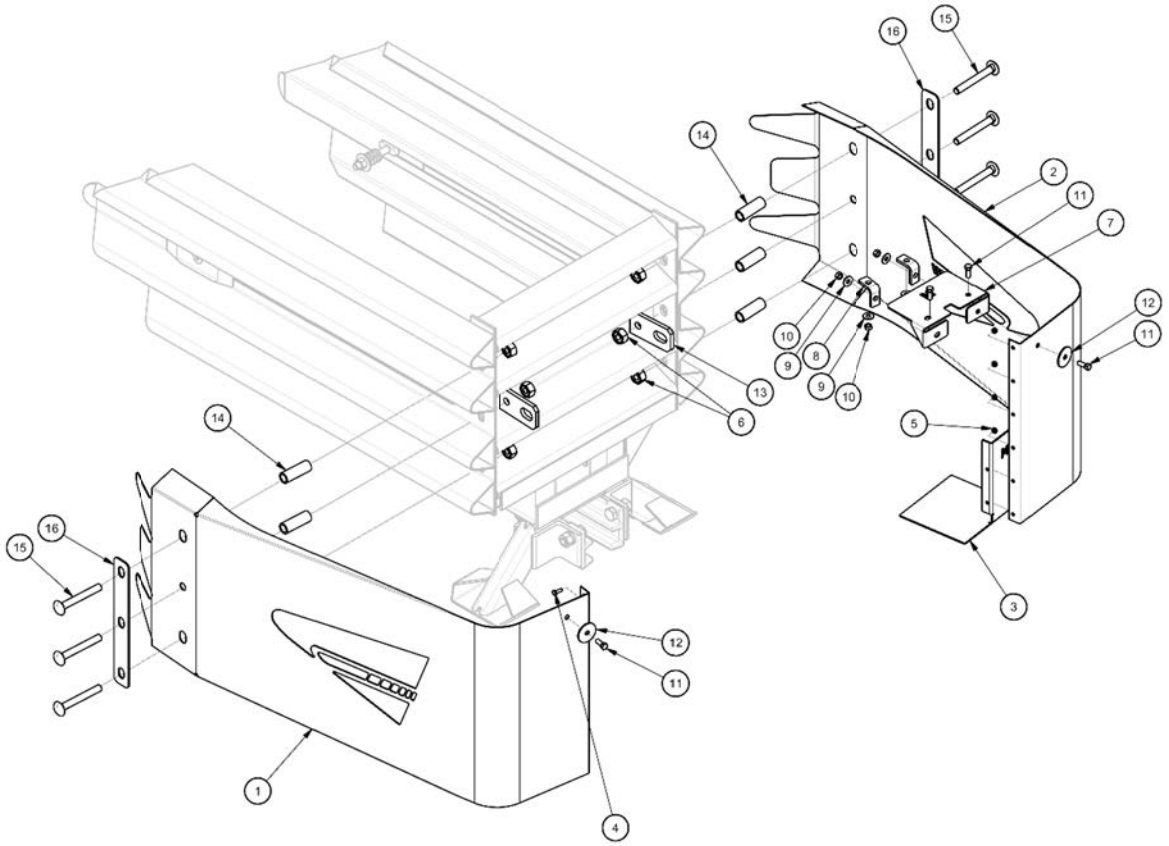
PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611832	PANEL,FENDER,QG	1
2	003400	BOLT,RAIL,5/8X2,G	2
3	003340	5/8" GR HEX NUT	2
4	617045	WASHER,MUSHROOM,FORGED,QG,G	1
5	116878	SCREW,FL,5/8X5,G8,G,HEX SOCKET	1
6	115970	NUT,HX,5/8,G	1
7	003300	WASHER,FLAT,5/8 X 1 3/4, G	1
8	117459	SPRING,DIE,1 1/4 ODX9/16X1 1/2,G	1



NOTES:
1. UNDERLYING PANEL IS ANOTHER FENDER PANEL. IN THE CASE OF THE LAST FENDER PANEL, THE UNDERLYING PANEL COULD BE A BACKUP SIDE PANEL, EXTENSION PANEL, OR TRANSITION PANEL.
2. THERE IS TO BE A 20 [.78"] MAX. GAP BETWEEN ANY FENDER PANEL AND THE UNDERLYING PANEL.

DRAWN: J. Espinoza	DATE: 5/21/1996	MODEL NO.	QUADGUARD®
APPROVED: J. Machado	DATE: 5/21/1996	608236.idw	FENDER PANEL, ASSY, QG
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS [INCHES] UNLESS OTHERWISE NOTED.		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		DRAWING NO. 608236	REV K
			SHEET 1 of 1

Fender Panel Assembly 608236

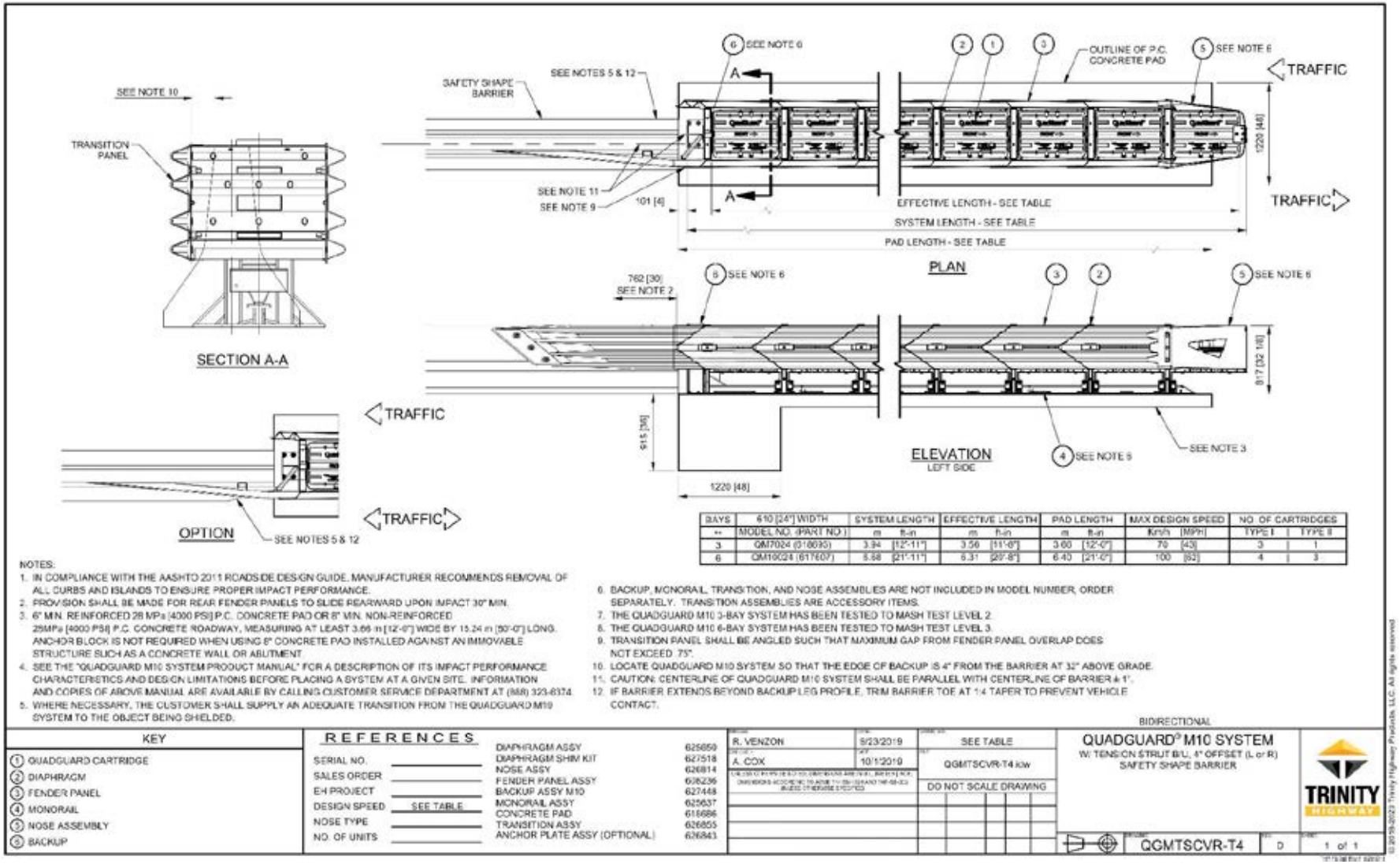


PARTS LIST	
ITEM	DESCRIPTION
1	NOSE,L,NARROW,QGII,W/LOGO
2	NOSE,R,NARROW,QGII,W/LOGO
3	BRACKET,CART SUPPORT,NOSE,QG M
4	BOLT,HX,1/4X3/4,G5,G
5	NUT,HX,1/4,G
6	NUT,HX,5/8,G,RAIL
7	BRACKET,CART HOLD DOWN,QG M
8	BRACKET,ANGLE,2X1,W/HOLES
9	WASHER,FLAT,3/8X1,G
10	NUT,HX,3/8,G
11	BOLT,HX,3/8X1,G5,G
12	WASHER,FLAT,3/8X2,G
13	BRACKET,PULL-OUT,QG
14	PIPE 3/4 SCH 80X3
15	5/8"X5" GR BOLT A307
16	WASHER,BAR,10GAX2X14,SLOTS

TABLE	
ASSEMBLY	**FINISH**
617385	GALVANIZED
617424	YELLOW
617425	BLACK

DRAWN: D. Kohfeld	DATE: 11/19/2019		QUADGUARD® M10 SYSTEM NOSE ASSY,NARROW,QGM
CHECKED: B. Eckert	DATE: 1/7/2020	626814.idw	
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN METERS [INCH]. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND ISO 129 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	TRINITY HIGHWAY
			DRAWING: 626814 REV: - SHEET: 1 of 1

Nose Assembly 626814



BAYS	610 [24"] WIDTH	SYSTEM LENGTH		EFFECTIVE LENGTH		PAD LENGTH		MAX DESIGN SPEED		NO. OF CARTRIDGES	
↔	MODEL NO. (PART NO.)	m	ft-in	m	ft-in	m	ft-in	Km/h	[MPH]	TYPE I	TYPE II
3	QM7024 (618693)	3.94	[12'-11"]	3.56	[11'-8"]	3.66	[12'-0"]	70	[43]	3	1
6	QM10024 (617607)	6.88	[21'-11"]	6.31	[20'-8"]	6.40	[21'-0"]	100	[62]	4	3

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 30" MIN.
3. 6" MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 8" MIN. NON-REINFORCED 25MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE SUCH AS A CONCRETE WALL OR ABUTMENT.
4. SEE THE "QUADGUARD M10 SYSTEM PRODUCT 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 (866) 323-6374.
5. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY AN ADEQUATE TRANSITION FROM THE QUADGUARD M10 SYSTEM TO THE OBJECT BEING SHIELDED.
6. BACKUP, MONORAIL, TRANSITION, AND NOSE ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. TRANSITION ASSEMBLIES ARE ACCESSORY ITEMS.
7. THE QUADGUARD M10 3-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 2.
8. THE QUADGUARD M10 6-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.
9. TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED .75".
10. LOCATE QUADGUARD M10 SYSTEM SO THAT THE EDGE OF BACKUP IS 4" FROM THE BARRIER AT 32" ABOVE GRADE.
11. CAUTION: CENTERLINE OF QUADGUARD M10 SYSTEM SHALL BE PARALLEL WITH CENTERLINE OF BARRIER ± 1°.
12. IF BARRIER EXTENDS BEYOND BACKUP LEG PROFILE, TRIM BARRIER TOE AT 1:4 TAPER TO PREVENT VEHICLE CONTACT.

BIDIRECTIONAL

KEY

1. QUADGUARD CARTRIDGE
2. DIAPHRAGM
3. FENDER PANEL
4. MONORAIL
5. NOSE ASSEMBLY
6. BACKUP

REFERENCES

SERIAL NO. _____
SALES ORDER _____
E-H PROJECT _____
DESIGN SPEED SEE TABLE
NOSE TYPE _____
NO. OF UNITS _____

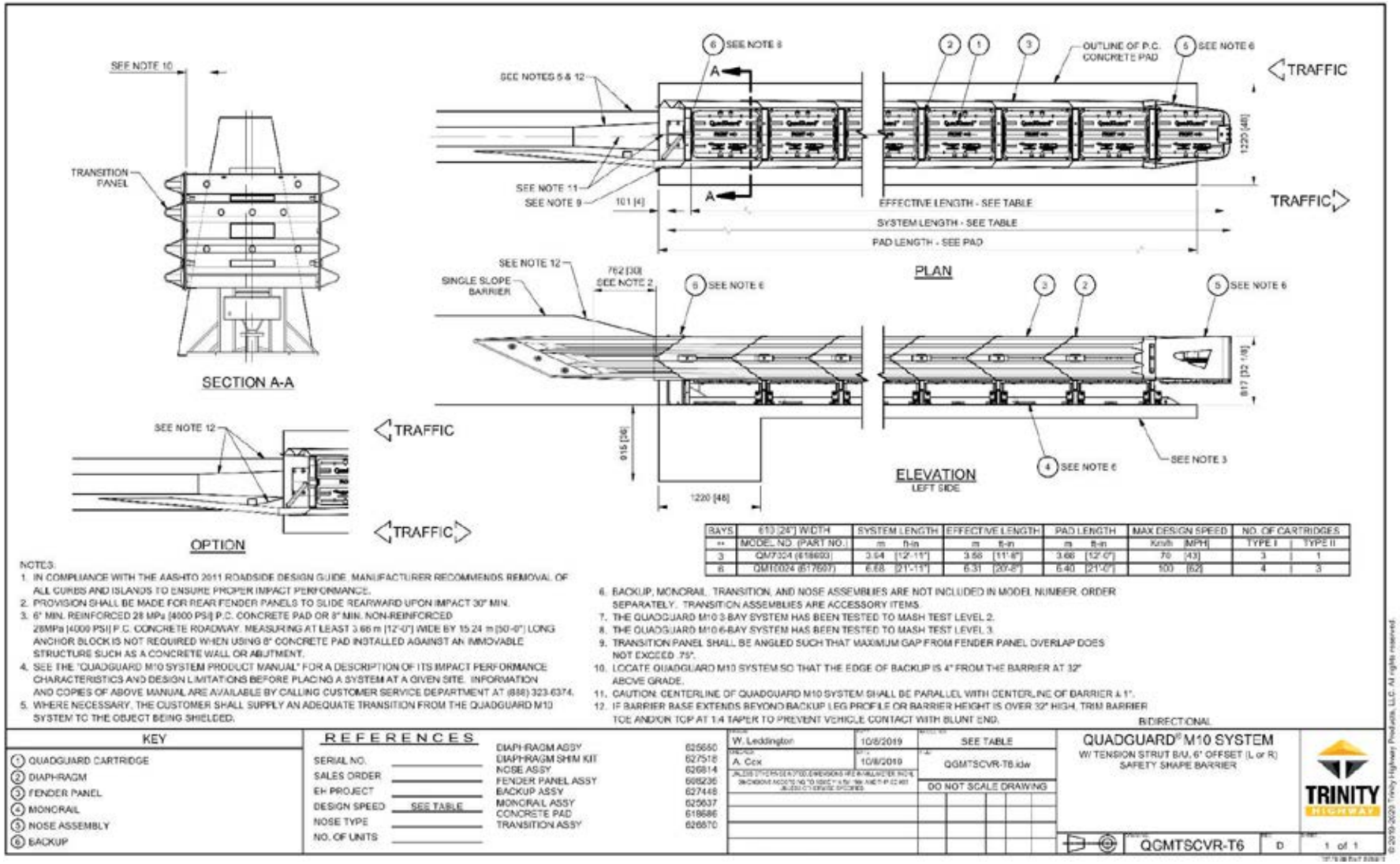
DIAPHRAGM ASSY	625859
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	626814
FENDER PANEL ASSY	626236
BACKUP ASSY M10	627448
MONORAIL ASSY	625637
CONCRETE PAD	616686
TRANSITION ASSY	626855
ANCHOR PLATE ASSY (OPTIONAL)	626843

R. VENZON	5/23/2019	SEE TABLE	QUADGUARD® M10 SYSTEM
A. COX	10/1/2019	QGMTSCVR-T4.idw	W/ TENSION STRUT B/U, 4° OFFSET (L or R) SAFETY SHAPE BARRIER
		DO NOT SCALE DRAWING	

TRINITY HIGHWAY

QGMTSCVR-T4 | D | 1 of 1

Safety Shape Barrier Transition QGMTSCVR-T4



BAYS	610 [24"] WIDTH	SYSTEM LENGTH		EFFECTIVE LENGTH		PAD LENGTH		MAX DESIGN SPEED		NO. OF CARTRIDGES	
**	MODEL NO. (PART NO.)	m	ft-in	m	ft-in	m	ft-in	Km/h	[MPH]	TYPE I	TYPE II
3	QM7324 (618603)	3.64	[12'-11"]	3.58	[11'-8"]	3.66	[12'-0"]	70	[43]	3	1
6	QM10024 (617697)	6.68	[21'-11"]	6.31	[20'-8"]	6.40	[21'-0"]	100	[62]	4	3

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 30" MIN.
3. 6" MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 8" MIN. NON-REINFORCED 28MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE SUCH AS A CONCRETE WALL OR ABUTMENT.
4. SEE THE "QUADGUARD M10 SYSTEM PRODUCT 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 AN ADEQUATE TRANSITION FROM THE QUADGUARD M10 SYSTEM TO THE OBJECT BEING SHIELDED.
6. BACKUP, MONORAIL, TRANSITION, AND NOSE ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER. ORDER SEPARATELY. TRANSITION ASSEMBLIES ARE ACCESSORY ITEMS.
7. THE QUADGUARD M10 3-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 2.
8. THE QUADGUARD M10 6-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.
9. TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED .75".
10. LOCATE QUADGUARD M10 SYSTEM SO THAT THE EDGE OF BACKUP IS 4" FROM THE BARRIER AT 32" ABOVE GRADE.
11. CAUTION: CENTERLINE OF QUADGUARD M10 SYSTEM SHALL BE PARALLEL WITH CENTERLINE OF BARRIER ± 1".
12. IF BARRIER BASE EXTENDS BEYOND BACKUP LEG PROFILE OR BARRIER HEIGHT IS OVER 32" HIGH, TRIM BARRIER TOE AND/OR TOP AT 1:4 TAPER TO PREVENT VEHICLE CONTACT WITH BLUNT END.

BIDIRECTIONAL

KEY
1 QUADGUARD CARTRIDGE
2 DIAPHRAGM
3 FENDER PANEL
4 MONORAIL
5 NOSE ASSEMBLY
6 BACKUP

REFERENCES

SERIAL NO.	
SALES ORDER	
EH PROJECT	
DESIGN SPEED	SEE TABLE
NOSE TYPE	
NO. OF UNITS	

DIAPHRAGM ASSY	625650
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	626814
FENDER PANEL ASSY	626236
BACKUP ASSY	627448
MONORAIL ASSY	625637
CONCRETE PAD	619686
TRANSITION ASSY	626870

DESIGNED	W. Leddington	DATE	10/8/2019
DRAWN	A. Cox	DATE	10/8/2019
CHECKED			
DO NOT SCALE DRAWING			

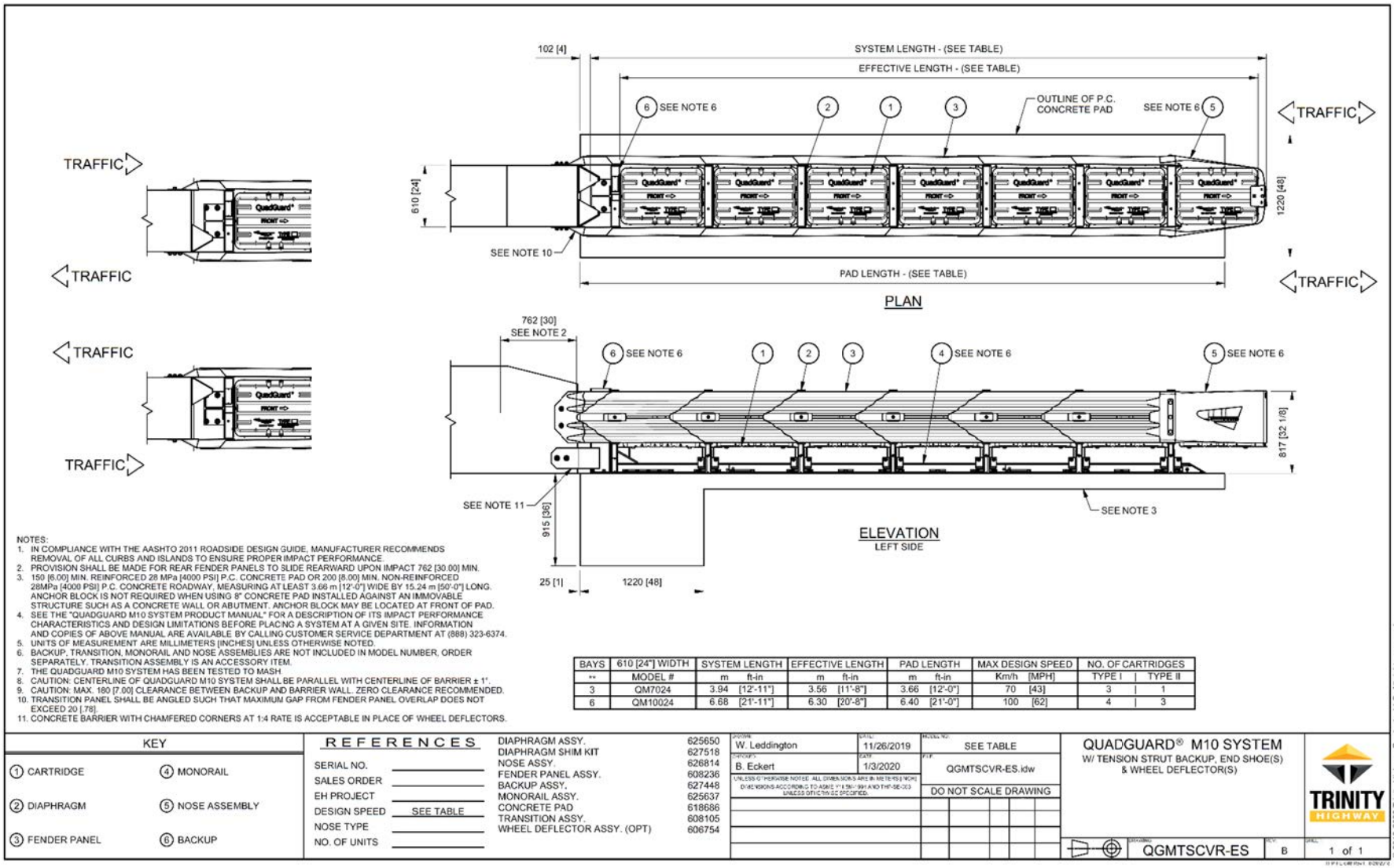
SEE TABLE
QGMTSCVR-T6.idw

QUADGUARD® M10 SYSTEM
W TENSION STRUT B/U, 6" OFFSET (L or R)
SAFETY SHAPE BARRIER

TRINITY HIGHWAY

QGMTSCVR-T6 | D | 1 of 1

Single Slope Transition QGMTSCVR-T6



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 [30.00] MIN.
3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 200 [8.00] MIN. NON-REINFORCED 28MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE SUCH AS A CONCRETE WALL OR ABUTMENT. ANCHOR BLOCK MAY BE LOCATED AT FRONT OF PAD.
4. SEE THE "QUADGUARD M10 SYSTEM PRODUCT 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. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
6. BACKUP, TRANSITION, MONORAIL AND NOSE ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. TRANSITION ASSEMBLY IS AN ACCESSORY ITEM.
7. THE QUADGUARD M10 SYSTEM HAS BEEN TESTED TO MASH.
8. CAUTION: CENTERLINE OF QUADGUARD M10 SYSTEM SHALL BE PARALLEL WITH CENTERLINE OF BARRIER ± 1°.
9. CAUTION: MAX. 180 [7.00] CLEARANCE BETWEEN BACKUP AND BARRIER WALL. ZERO CLEARANCE RECOMMENDED.
10. TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED 20 [.78].
11. CONCRETE BARRIER WITH CHAMFERED CORNERS AT 1:4 RATE IS ACCEPTABLE IN PLACE OF WHEEL DEFLECTORS.

BAYS	610 [24"] WIDTH	SYSTEM LENGTH		EFFECTIVE LENGTH		PAD LENGTH		MAX DESIGN SPEED		NO. OF CARTRIDGES	
**	MODEL #	m	ft-in	m	ft-in	m	ft-in	Km/h	[MPH]	TYPE I	TYPE II
3	QM7024	3.94	[12'-11"]	3.56	[11'-8"]	3.66	[12'-0"]	70	[43]	3	1
6	QM10024	6.68	[21'-11"]	6.30	[20'-8"]	6.40	[21'-0"]	100	[62]	4	3

KEY

① CARTRIDGE	④ MONORAIL
② DIAPHRAGM	⑤ NOSE ASSEMBLY
③ FENDER PANEL	⑥ BACKUP

REFERENCES

SERIAL NO.	
SALES ORDER	
EH PROJECT	
DESIGN SPEED	SEE TABLE
NOSE TYPE	
NO. OF UNITS	

DIAPHRAGM ASSY.	625650
DIAPHRAGM SHIM KIT	627518
NOSE ASSY.	626814
FENDER PANEL ASSY.	608236
BACKUP ASSY.	627448
MONORAIL ASSY.	625637
CONCRETE PAD	618686
TRANSITION ASSY.	608105
WHEEL DEFLECTOR ASSY. (OPT)	606754

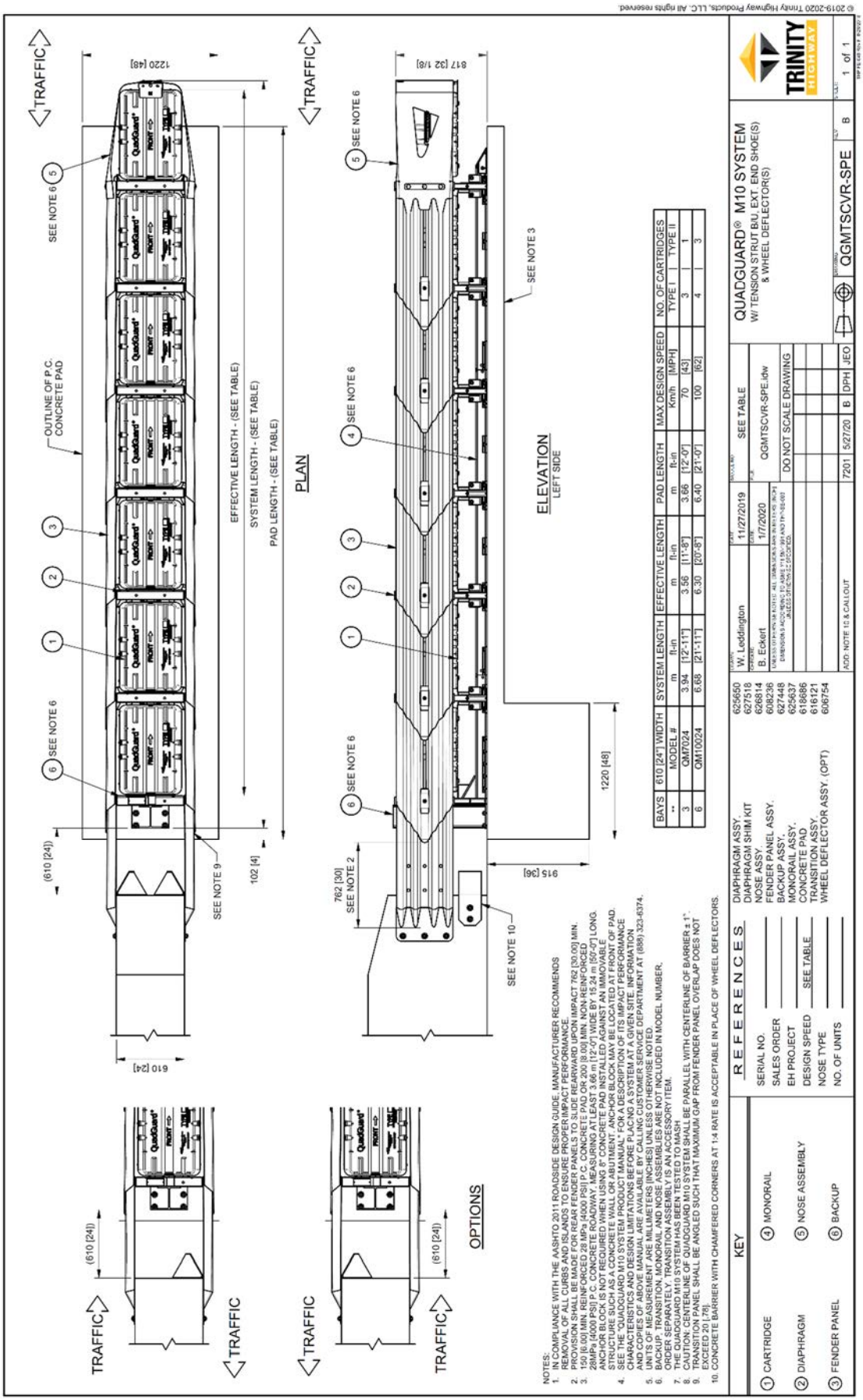
DRAWN: W. Leddington — DATE: 11/26/2019
CHANGED: B. Eckert — DATE: 1/3/2020
UNLESS OTHERWISE NOTED: ALL DIMENSIONS ARE IN METERS [INCH] DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND THP-SE-003 UNLESS OTHERWISE SPECIFIED.
MODEL NO.: SEE TABLE
FILE: QGMTSCVR-ES.idw
DO NOT SCALE DRAWING

QUADGUARD® M10 SYSTEM
W/ TENSION STRUT BACKUP, END SHOE(S) & WHEEL DEFLECTOR(S)

TRINITY HIGHWAY

DRAWING: QGMTSCVR-ES — REV: B — SHEET: 1 of 1

Vertical Barrier Transition QGMTSCVR-ES



Vertical Barrier Transition, Extended **QGMTSCVR-SPE**

NOTES:

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