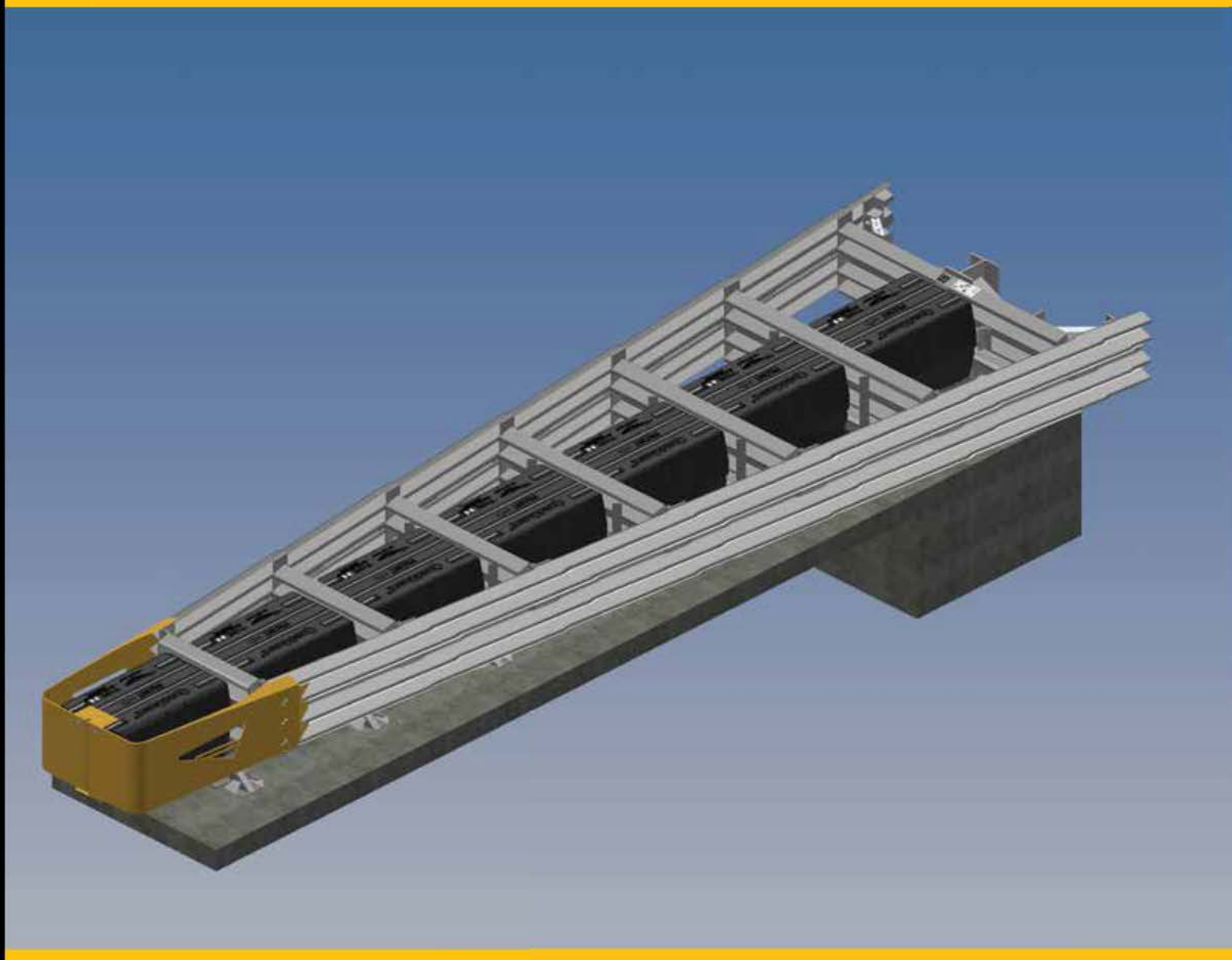
PN 626824

Revision B April 2021

QuadGuard® M Wide

Product Description Assembly Manual



INGAL CIVIL PRODUCTS
A valmont COMPANY

TRINITY HIGHWAY
Ahead of the Curve®

QuadGuard® M Wide

The QuadGuard® M Wide has been tested pursuant to American Association of State Highway and Transportation Officials ("AASHTO") Manual for Assessing Safety Hardware ("MASH") specifications. The QuadGuard® M 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 local distributors, owners, contractors, lessors, and lessees are RESPONSIBLE for the assembly, maintenance, and repair of the QuadGuard® M Wide. Failure to fulfill these RESPONSIBILITIES with respect to the assembly, maintenance, and repair of the QuadGuard® M Wide 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 directly at 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® M Wide information available to Ingal Civil Products at the time of printing. We reserve the right to make changes at any time. Please contact Ingal Civil Products to confirm that you are referring to the most current instructions.

Part No. 626824 ©

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
Determine Transition Type 12
Recommended Tools 13
Site Preparation/Foundation 15
Foundation/Anchoring 16
Trinity Highway Approved Adhesive Anchoring System 17
Vertical Anchors 17
Anchor Assembly Cautions 18
Horizontal Anchors 19
System Assembly 22
QuadGuard® M Wide Final Inspection Checklist 36
Maintenance and Repair 37
Inspection Frequency 37
Visual Drive-By Inspection 37
Walk-Up Inspection Checklist 37
Post-Impact Instructions 38
Parts Ordering Procedure & Drawings 40
..... 42
44
45
46
49
50
..... 52
..... 54

Customer Service Contacts

Trinit□ High□a□ is committ□d to th□ high□st l□v□l o□custom□r s□rvic□. □□□dback r□garding th□ □uadGuard□ M □ id□, its ass□mbl□ proc□dur□s, supporting docum□ntation, and p□r□ormanc□ is al□a□s □□lcom□. Additional in□ormation can b□ obtain□d □rom th□ contact in□ormation b□lo□□

Ingal Civil Products

T□l□phon□	1300 446 425
Contact Link	ingalcivil.com.au□contact-us

Important Introductory Notes

Prop□r ass□mbl□ o□th□ □uadGuard□ M □ id□ is critical to achi□v□ p□r□ormanc□ that has b□□n □valuat□d and d□□m□d □ligibl□ b□ th□ □H□ A p□r AASHTO MASH crit□ria. Th□s□ instructions should b□ r□ad in th□ir □ntir□t□ and und□rstood b□□or□ ass□mbling th□ □uadGuard□ M □ id□. Th□s□ instructions ar□ to b□ us□d in con□unction □ith th□ ass□mbl□ o□□uadGuard□ M □ id□ and ar□ □or standard ass□mbli□s onl□ as sp□ci□i□d b□ th□ applicabl□ high□a□ authorit□. I□□ou n□□d additional in□ormation, or hav□ □u□stions about th□ □uadGuard□ M □ id□, pl□as□ contact th□ high□a□ authorit□ that has plann□d and sp□ci□i□d this ass□mbl□ and, i□n□□d□d, contact Trinit□ High□a□s Custom□r S□rvic□ D□partm□nt. This product must b□ ass□mbl□d in th□ location sp□ci□i□d b□ th□ appropriat□ high□a□ authorit□. I□ th□r□ ar□ d□viations, alt□rations, or d□partur□s □rom th□ ass□mbl□ protocol sp□ci□i□d in this manual, th□ d□vic□ ma□ not p□r□orm as t□st□d.

Important: **DO NOT** us□ an□ compon□nt part that has not b□□n sp□ci□icall□ sp□ci□i□d h□r□in □or th□ □uadGuard□ M □ id□ during th□ ass□mbl□ or r□pair o□ this s□st□m □pp. 7 □11 □40 - 41□

This product has b□□n sp□ci□i□d □or us□ and has b□□n provid□d to that us□r □ho has uni□u□ kno□l□dg□ o□ho□ this s□st□m is to b□ ass□mbl□d. □o p□rson should b□ p□rmitt□d to assist in th□ ass□mbl□, maint□nanc□, or r□pair o□ this s□st□m that do□s not poss□ss th□ uni□u□ kno□l□dg□ d□scrib□d h□r□in. Th□s□ instructions ar□ int□nd□d □or an individual □uali□i□d to both r□ad and accurat□l□ int□rpr□t th□m as □ritt□n. Th□s□ instructions ar□ int□nd□d onl□ □or an individual □□p□ri□nc□d and skill□d in th□ ass□mbl□ o□ high□a□ products.

A Manu□actur□r□s Dra□ing Packag□ □ill b□ suppli□d b□ Ingal Civil Products upon r□□u□st. □ach s□st□m □ill b□ suppli□d □ith a sp□ci□ic dra□ing packag□ uni□u□ to that s□st□m. Such dra□ings tak□ pr□c□d□nc□ ov□r in□ormation in this manual and shall b□ studi□d thoroughl□ b□ a □uali□i□d individual □ho is skill□d in int□rpr□ting th□m b□□or□ th□ start o□ an□ product ass□mbl□.

Safety Symbols

This section describes the safety symbols that appear in this QuadGuard® M Wide 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® M 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 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® M Wide. Additional copies of this manual are available from Ingal Civil Products on 1300 446 425 or by visiting https://www.ingalcivil.com.au/products/road-safety-barriers/crash-cushions/quadguard-m-wide. Please contact Ingal Civil Products if you have any questions concerning the information in this manual or about the QuadGuard® M Wide.

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® M 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:** 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® M Wide for assembly, maintenance, or repair. The use of component parts not specified herein is **strictly prohibited**. The QuadGuard® M Wide assembled with Trinity Highway Parts has been tested, approved, and accepted for state use by the FHWA. A QuadGuard® M 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® M Mid has been deemed eligible by FHWA as meeting the requirements and guidelines of MASH. These tests evaluate product performance defined by AASHTO involving light-weight cars (approx. 1100kg [2420 lb.]) and full size pickup trucks (approx. 2270kg [5000 lb.]). A product can be certified for multiple Test Levels. The QuadGuard® M Mid is certified to the Test Levels as shown below:

Test Level 3: 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® M Mid 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 unstated 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® M Mid 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® M Mid manual are completely followed. Failure to follow this warning could result in serious injury or death in the event of a collision.

System Overview

Th□ □uadGuard□ M □ id□ is a r□-dir□ctiv□, non-gating crash cushion □or roadsid□ □□atur□s o□ 1753 mm [69”□or l□ss in □idth □ith us□ o□approv□d transitions. It consists o□□n□rg□-absorbing cartridg□s surround□d b□a □ram□□ork o□□uad-B□am □□nd□r Pan□ls.

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.

Th□ □uadGuard□ M □ id□ utili□□s t□o t□p□s o□cartridg□s in a □stag□d” con□iguration that ar□ d□sign□d and t□st□d to addr□ss v□hicl□s as d□□in□d b□ MASH □or both light□r cars and h□avi□r, high c□nt□r-o□gravit□ v□hicl□s.

Impact Performance

Th□ si□ □6□Ba□ □uadGuard□ M □ id□ has succ□ss□ull□ pass□d th□ r□□uir□m□nts stipulat□d in MASH □ith both th□ light car and pickup trucks at sp□□ds o□ up to 100kph [62 mph□at r□dir□ction angl□s up to 25 d□gr□□s.

During h□ad-on impact t□sting, □ithin MASH crit□ria, th□ □uadGuard□ M □ id□ has b□□n sho□n to t□l□scop□ r□ar□ard to absorb th□ □n□rg□ o□impact. □ h□n impact□d □rom th□ sid□, □ithin th□ applicabl□ MASH crit□ria, it has b□□n sho□n to r□dir□ct th□ v□hicl□ back to□ard its original trav□l path and a□a□ □rom th□ high□a□ □atur□.

Warning: It is th□ sol□ r□sponsibilit□ o□ th□ pro□□ct □ngin□□r to □nsur□ that th□ □uadGuard□ M □ id□ and d□lin□ation us□d m□□t all □□d□ral, stat□, sp□ci□ing ag□nc□, and local sp□ci□ications.

Warning: It is th□ sol□ r□sponsibilit□ o□ th□ pro□□ct □ngin□□r to □nsur□ that th□ □uadGuard□ M □ id□ m□□ts all appropriat□ Manual on □ni□orm Tra□ic Control D□vic□s □M□TCD”□ and local standards.

Inspect Shipping

Ch□ck th□ r□c□iv□d parts against th□ shipping list suppli□d □ith th□ s□st□m b□□or□ d□plo□ing th□ □uadGuard□ M □ id□. Mak□ sur□ all parts hav□ b□□n r□c□iv□d □pp. 40 - 41□.

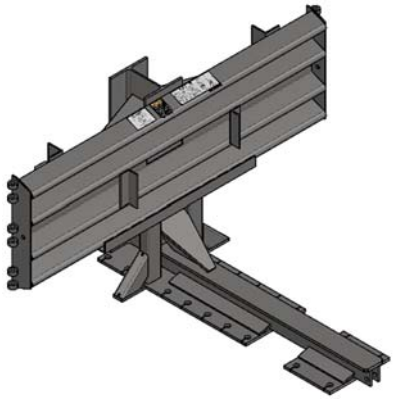
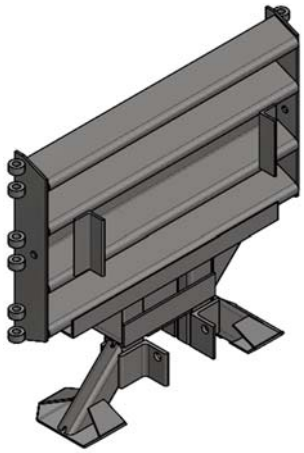
Important: Th□ Manu□actur□r□s Dra□ing Packag□ suppli□d □ith th□ □uadGuard□ M □ id□ must b□ us□d □ith th□s□ instructions □or prop□r ass□mbl□ and should tak□ pr□c□d□nc□ ov□r th□s□ g□n□ral instructions.

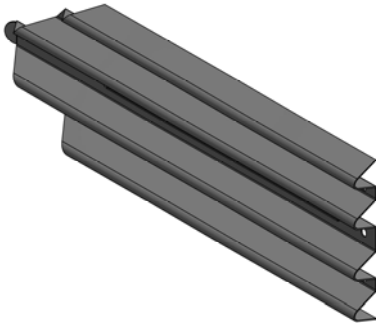
Warning: Do □OT modi□□ th□ □uadGuard□ M □ id□ in an□ □a□.

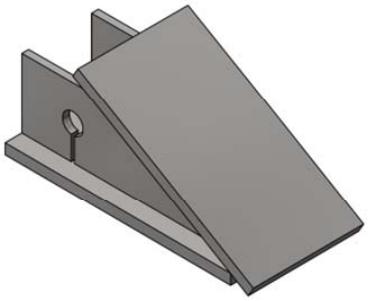
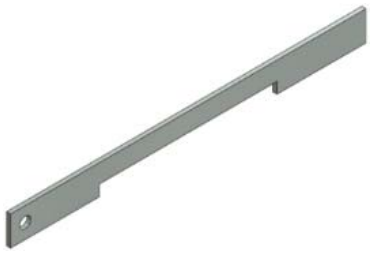
System Components

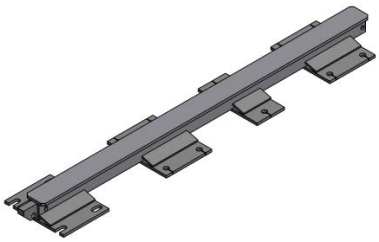
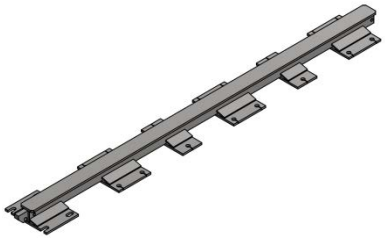
B□lo□ is a list o□s□st□m compon□nts that ma□ b□ us□d in □our particular □uadGuard□ M □ id□ con□iguration. V□ri□ parts d□liv□r□d and s□st□m d□tails □ith th□ BOM □Bill o□Mat□rials□and s□st□m dra□ings shipp□d □ith □our s□st□m. Pl□as□ call Ingal Civil Products i□□ou hav□ an□ s□st□m □u□stions □p. 3□

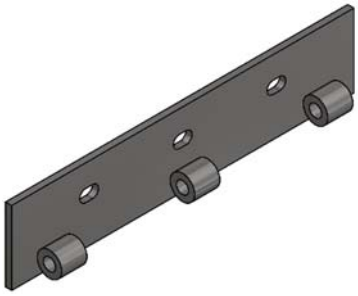
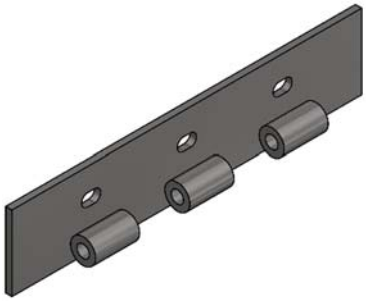
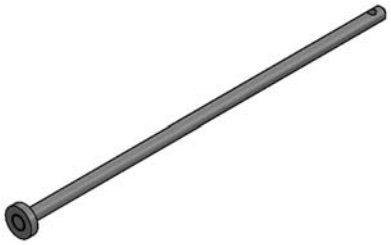
Note: Compon□nts ar□ not sho□n to scal□.

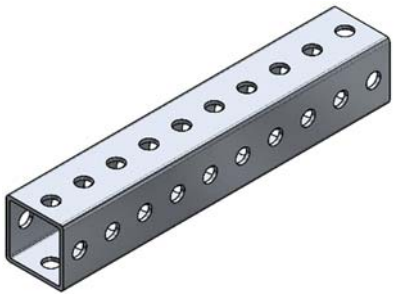
T□nsion Strut Backup 69”	Diaphragms 2 - 6	Diaphragm □1
		
10102307	Vari□s	10102128

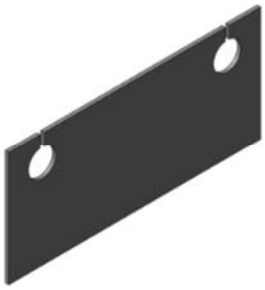
□□nd□r Pan□l	Sid□ Pan□l, □ id□	Brack□t, Cartridg□ Support TS B□□
		
10102002	10102005	10102406

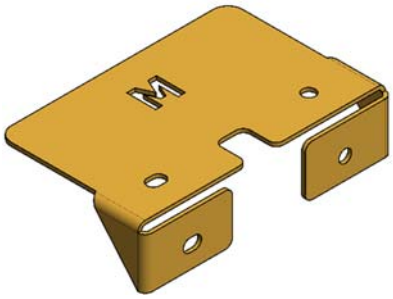
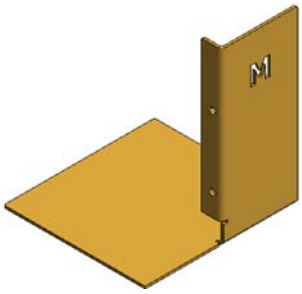
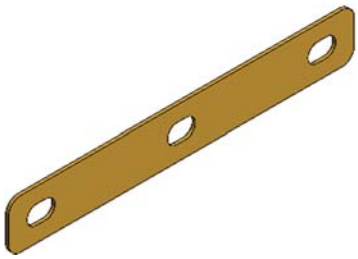
□nd Cap, Monorail	Brack□t, Cartridg□ Support	Locking Bar, Cartridg□ Support
		
10102313	10102400	10102419

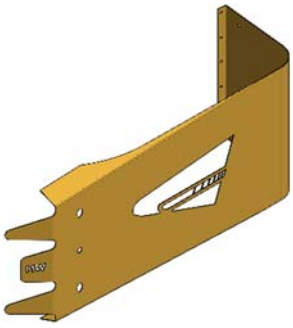
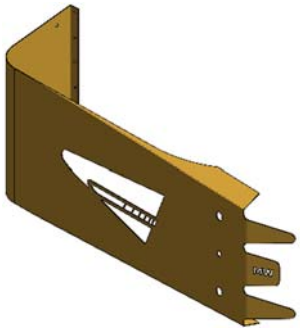
Monorail Guid□	Monorail, 2 Ba□s, □G, G	Monorail, 3 Ba□s, □G, G
		
10102534	10102311	10102312

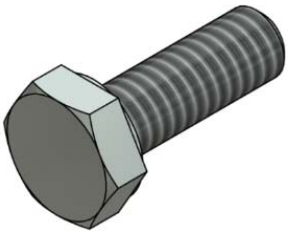
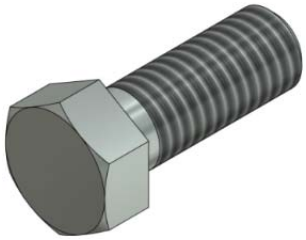
Hing□ Plat□, □□nd□r Pan□	Hing□ Plat□, □ull L□ngth	Hing□ Pin, Dia, □ull L□ngth
		
10102417	10102443	10102557

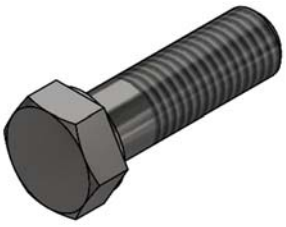
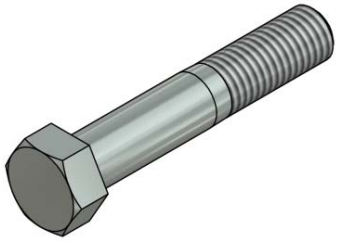
T□ ST 1 3⁄4□1 3⁄4□12 GA□10	T□ ST 2□2□12 GA□10	Pip□, 3⁄4 Sch□dul□ 80□2 5⁄16
		
10102907	10102908	626819

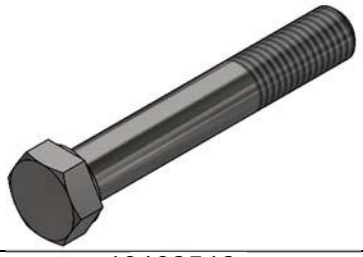
Shim, 12GA□3 5⁄8□8	Brack□t, Angl□, 2□1, □ □Hol□s	Brack□t, Pull-Out
		
10102906	10102209	10102411

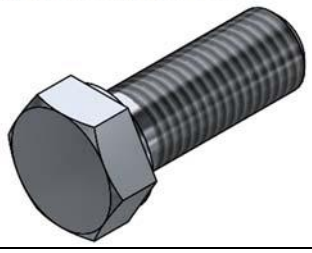
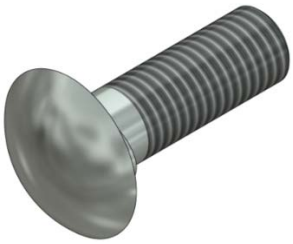
Brack□t,Cart,Hold Do□n,MASH	Brack□t,Cart Supt,□os□,MASH	□ ash□r, Bar, 10GA□2□14
		
10102211	10102212	10102210

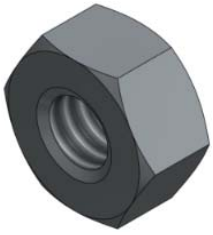
□os□, L, □G M □ id□	□os□, R, □G M □ id□
	
10102214	10102215

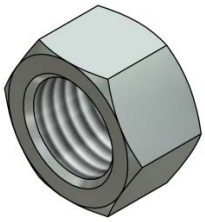
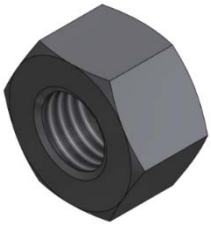
Bolt, H□□, 1□4□3□4, G5	Bolt, H□□, 1□4□1, G5	Bolt, H□□,3□8□1,G5
		
10102508	10102556	10103162

Bolt, H□□, 3□8□3 1□2, G5	Bolt, H□□, 5□8□2, G5	Bolt, H□□, 5□8□3 1□2, G5
		
10102510	10102531	10103420

Bolt, H□□, 5□8□4, G5	Bolt, H□□, 5□8□5, G8, P, □T	□lat Scr□□ 5□8□8 1□2,G8
		
10102512	119163	10102521

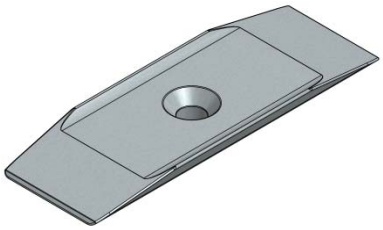
Bolt, Hex, 3/4X2, G8	Rail Bolt, 5□8□2	Stud, M20 x 180mm, GR8.8
		
10102509	10102503	10102547

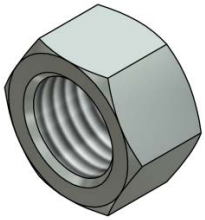
□ut, H□□, 1□4	□ut, H□□, 3□8	Rail □ut, H□□, 5□8
		
10102515	10102516	10102501

□ut, H□□, 5□8	□ut, H□av□H□□, 3□4	□ ash□r, Lock 3□8 G
		
10102517	10102504	10102529

□ ash□r, Lock, 5□8	□ ash□r, Lock, 3□4	□ ash□r, □lat 3□8□1
		
10102530	10102528	10102526

□ ash□r, □□nd□r, 3⁄8□2	□ ash□r, □lat, 5⁄8□1 3⁄4	□ ash□r, □lat, 3⁄4□2,Hv□
		
118038	10102500	10102548

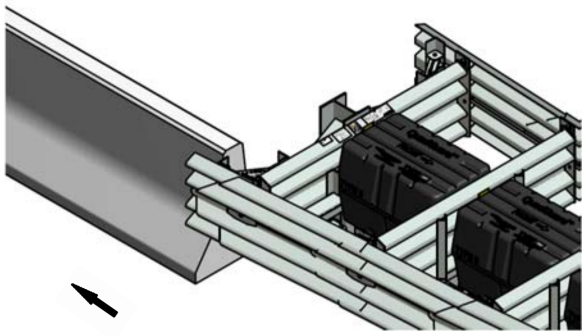
Di□ Spring, 1 1□2 OD□3⁄4□6	Mushroom □ ash□r	Approv□d Adh□siv□
		
10102522	10102536	10102902

M20 Structual □ut H□□Galv	Cartridg□ Ass□, T□p□ I	Cartridg□ Ass□, T□p□ II
		
10102539	10102903	10102904

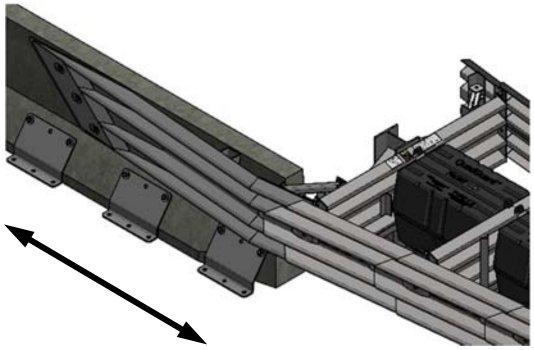
D□t□rmin□ Transition T ype

□ot□: A prop□r Transition Pan□l or Sid□ Pan□l must b□ us□d on □ach sid□ o□ th□ Backup. A Sid□ Pan□l is not n□□d□d □h□n a Transition Pan□l is us□d. S□v□ral t□p□s o□ transitions ar□ availabl□ □or us□ □ith th□ □uadGuard M □ id□ (□igur□s 1 - 6) Th□ corr□ct Pan□l(s) to us□ □ill d□p□nd on th□ dir□ction o□ tra□ic and □hat t□p□ o□ barri□r or road □□atur□ th□ □uadGuard® M □ id□ is shi□lding. Contact Custom□r S□rvic□ prior to d□plo□m□nt i□□ou hav□ an□ □u□stions (p. 3)

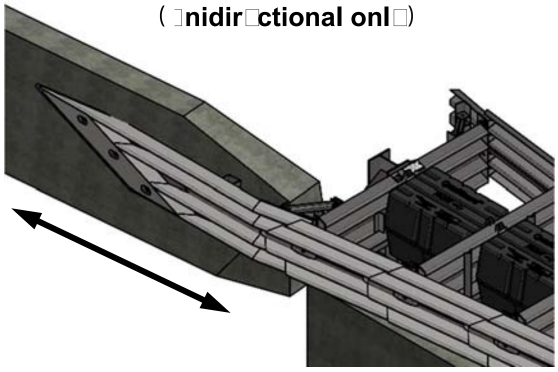
Im□ortant: Th□ □uadGuard M □ id□ is availabl□ □ith transitions to concr□t□ barri□r, guardrail, and oth□r roadsid□ □□atur□s. Contact Custom□r S□rvic□ □or an□ transition □u□stions (p. 3)



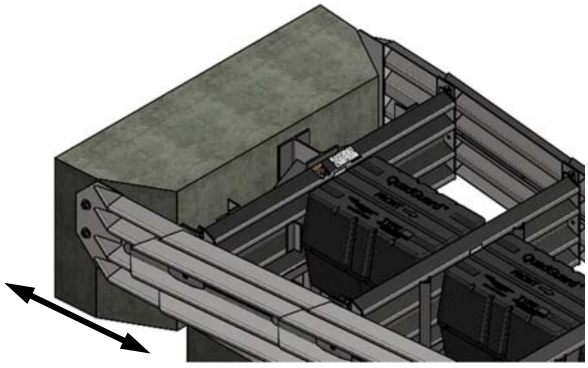
□igur□ 1
□o Transition
(□nidir□ctional onl□)



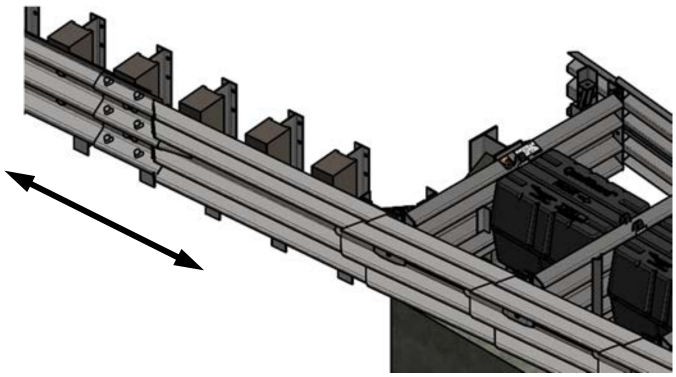
□igur□ 2
Sa□□t□ Sha□e □arri□r



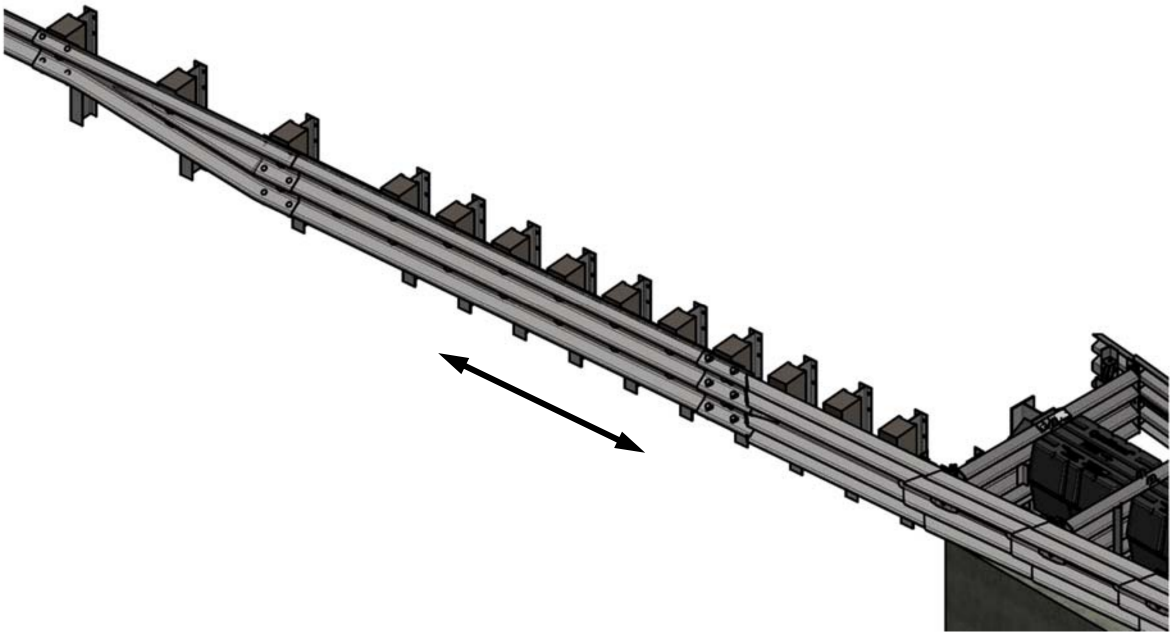
□igur□ 3
Singl□ Slo□□ O□s□t



□igur□ 4
V□rtical □arri□r



□igur□ 5
□uad to Thrie-Beam



□igur□ 6
□uad to W-Beam

R□comm□nd□d Tools

Docum□ntation

- Manu□actur□r's Ass□mbl□ Manual
- Manu□actur□r's Dra□ing Packag□

P□rsonal Prot□ctiv□ □□ui□m□nt

- Eye Prot□ction
- Glov□s
- Sa□□t□-to□ Sho□s
- Prot□ctiv□ Clothing
- R□□l□ctiv□ V□st

Cutting □□ui□m□nt

- Rotar□ Hamm□r Drill
- R□bar cutting bit
- Concr□t□ drill bits - 22 mm □**Dou□l□- □lut□d**)
- Grind□r, Hacksa□ or Torch □optional)

Im□ortant: Trinit□ High□a□r□comm□nds using **dou□l□- lut□d** drill bits to achi□v□ optimum t□nsil□ str□ngth □h□n appl□ing an approv□d adh□siv□ anchoring s□st□m □p. 17)

Hammers

- Sledge hammer
- 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 wrenches 7/16”,9/16”, 15/16”, 1 1/8”
- Hex Key Set 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 required although a forklift can be used. Minimum 2,500 kg. capacity required.
- Air Compressor 100 psi minimum and Generator 5 kW
- Long prybar
- Drift pin 300 mm
- Center punch
- Tape measure 8 m
- Chalk line
- Concrete marking pencil
- Steel bristled tube brush for cleaning 22mm drilled borehole
- 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 specified, 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 □uadGuard□ M □ id□, □or p□rman□nt applications, should b□ ass□mbl□d on an □□isting or □r□shl□ plac□d and cur□d concr□t□ bas□ □28 MPa [4000 psi□minimum□. Location and ori□ntation o□th□ concr□t□ bas□ and att□nuator must compl□ □ith pro□□ct plans or as oth□r□is□ d□t□rmin□d b□th□ local high□a□authorit□.

R□comm□nd□d dim□nsion and r□in□orc□m□nt sp□ci□ications □or n□□ concr□t□ □oundations ar□ provid□d in Trinit□ High□a□concr□t□ □oundation dra□ings, suppli□d □ith th□ s□st□m. Th□ s□st□m ma□ also b□ ass□mbl□d on r□in□orc□d or non-r□in□orc□d concr□t□ road□a□ □minimum 200 mm thick□ D□plo□m□nt cross-slop□ shall not □□c□□d 8□ and should not t□ist mor□ than 2□ ov□r th□ l□ngth o□th□ s□st□m□th□ □oundation sur□ac□ shall hav□ a light broom □inish.

Warning: It is th□ r□sponsibilit□ o□th□ install□r to □nsur□ prop□r sit□ grading □or th□ □uadGuard□ M □ id□ plac□m□nt as dictat□d b□th□ stat□ or sp□ci□□ing ag□nc□ pursuant to th□ AASHTO Roadsid□ D□sign Guid□.

Caution: Accurat□ plac□m□nt o□all st□□l r□bar is critical to avoid int□r□□r□nc□ □ith th□ concr□t□ anchor bolts.

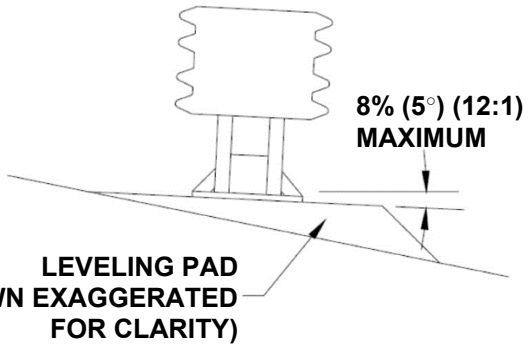


Figure 7
Cross-Slope

Warning: Location o□th□ Backup in r□lation to n□arb□ ob□□cts □ill a□□ct th□ op□ration o□ th□ att□nuator. □pon impact, th□ □□nd□r Pan□ls t□l□scop□ r□ar□ard and □□t□nd b□□ond th□ rigid Backup as much as 762 mm. Position th□ Backup so that th□ r□ar □nds o□th□ last □□nd□r Pan□ls ar□ a minimum o□762 mm □or□ard o□ ob□□cts that □ould oth□r□is□ int□r□□r□ □ith mov□m□nt o□th□ r□armost □□nd□r Pan□ls. □ailur□ to compl□ □ith this r□□uir□m□nt is lik□l□ to r□sult in s□st□m p□r□ormanc□ □hich has not b□□n crash t□st□d pursuant to MASH crit□ria and ma□ also caus□ compon□nt damag□ □hich □ill n□c□ssitat□ maint□nanc□ or r□plac□m□nt o□th□ s□st□m.

Important: □uadGuard□ M □ id□ cannot b□ mount□d on asphalt.

Foundation/Anchoring

Important: It is th□ r□sponsibilit□ o□th□ local DOT to □nsur□ that this ass□mbl□ con□orms to th□ AASHTO Roadsid□ D□sign Guid□.

Warning: It is th□ r□sponsibilit□ o□th□ install□r to □nsur□ that □our ass□mbl□ proc□dur□ m□□ts all appropriat□ Safe Work Australia, WorkSafe NZ, or state & territory authorities.

Concrete Installations

□or concr□t□ installations, th□ □uadGuard□ M □ id□ should b□ install□d onl□ on an □□isting or r□shl□plac□d and cur□d concr□t□ bas□ □4000 psi [28 MPa□minimum□. Ori□ntation o□th□ concr□t□ bas□ and th□ att□nuator must compl□ □ith th□ pro□□ct plans or as oth□r□is□ d□t□rmin□d b□ th□ r□sid□nt pro□□ct □ngin□□r.

R□comm□nd□d dim□nsion and r□in□orc□m□nt sp□ci□ications □or n□□ concr□t□ pads can b□ □ound on th□ standard dra□ings.

Th□ □uadGuard□ M □ id□ ma□b□ install□d on an□o□th□ □ollo□ing □oundations using th□ sp□ci□i□d anchorag□□

Foundation A: Reinforced Concrete Pad or Roadway

□oundation□ 152 mm r□in□orc□d□**with Anchor Block** minimum thickn□ss P.C.C.

Anchorag□□ Approv□d adh□siv□ □ith 180 mm studs with 140 mm □mb□dm□nt

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

□oundation□ 203 mm minimum thickn□ss P.C.C.

Important: To pr□v□nt sliding during impact, th□ pad must b□ plac□d against or ti□d to an □□isting structur□. Additional b□lo□ grad□ supports ma□ also b□ n□c□ssar□ as th□ pro□□ct □ngin□□r dir□cts.

Anchorag□□ Approv□d adh□siv□ □ith 180 mm studs with 140 mm □mb□dm□nt

Trinity Highway Approved Adhesive Anchoring System

A Trinity Highway approved adhesive anchoring system is required to secure 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 eyewear, safety-toe shoes, and hearing protection.

The anchor bolts (studs) that anchor the QuadGuard® M Grid 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 & territories 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 slot and Tension Strut Backup as drilling templates. Use a rotary hammer drill to drill the borehole 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.

Anchoring Information					
Stud Size:	**Orientation**	**Bit Size**	**Minimum Depth**	**Torque**	**Medium**
M20 x 180mm	Vertical	22 mm	180mm	Adhesive Manufacturer Spec	Concrete

3) Clean the Boreholes

Blow the concrete dust from the borehole using oil-free compressed air. Thoroughly brush it 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

□ill th□ bor□hol□ 100□ □ull.

Caution: □ill bor□hol□ 100□ □ull so it is □v□n □ith th□ pav□m□nt sur□ac□ p□r manu□actur□r□s instructions.

5) Add the Washers and Nuts

Plac□ a □at □ash□r onto th□ stud th□n thr□ad a nut on until th□ □nd o□ th□ stud is □ush □ith th□ nut □□igur□ 8□

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

Push th□ stud do□n through th□ part to b□ anchor□d and into th□ bor□hol□.

Caution: Do not disturb or load th□ stud until th□ approv□d adh□siv□ mat□rial has □ull□ cur□d □r□□r□nc□ instructions suppli□d □ith th□ approv□d adh□siv□ kit□

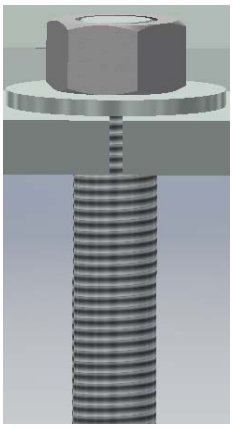


Figure 8
Vertical Application
(Before Applied Torque)

7) Torque the Nuts

Onc□ th□ adh□siv□ has □ull□ cur□d, tor□u□ th□ nut to th□ adh□siv□ manu□actur□r□s r□comm□nd□d valu□s.

Anchor Assembly Cautions

1) Steel rebar

I□st□□l r□bar is □ncount□r□d □hil□ drilling an anchor bolt bor□hol□, appl□on□ o□th□ □ollo□ing solutions□

A□ □s□ a r□bar drill bit □or th□ **rebar only** and th□n s□itch back to th□ concr□t□ bit to □inish drilling into th□ und□rl□ing concr□t□ until th□ prop□r bor□hol□ d□pth is r□ach□d.

Caution: Do not drill through r□bar □ithout □irst obtaining p□rmission to do so □rom th□ pro□□ct □ngin□□r.

B□ Drill a n□□ bor□hol□ do□n at an angl□ past th□ r□bar to th□ prop□r d□pth. Anchor th□ stud b□ compl□t□l□ □illing both bor□hol□s □ith an approv□d adh□siv□.

Horizontal Anchors

Th□ hori□ontal approv□d adh□siv□ kit is th□ sam□ as th□ v□rtical kit.

Caution: □ill bor□hol□ 100□ □ull so it is □v□n □ith th□ v□rtical concr□t□ sur□ac□ p□r manu□actur□r□s instructions.

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

   Appl□ approv□d adh□siv□ to □ach anchor p□r instructions.

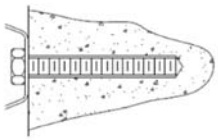
2) **Add the Washers and Nuts**

   Put □ash□r and nut on stud so th□ **nut is flush with end of stud**.

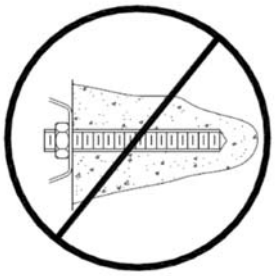
3) **Insert each Stud with Washer and Nut into Borehole**

   Push stud □ith □ash□r and nut into bor□hol□.

Important: Th□ stud should b□ □lush □ith th□ top o□th□ nut in both **vertical** and **horizontal** applications prior to tight□ning □□igur□ 9□



CORRECT



INCORRECT

Figure 9
Horizontal Application
(Before Applied Torque)

Caution: Do not disturb or load th□ stud until th□ approv□d adh□siv□ mat□rial has hard□n□d □r□□r□nc□ approv□d adh□siv□ kit instructions □or hard□ning tim□s□

4) **Torque the nuts**

   Onc□ th□ adh□siv□ has □ull□ cur□d, tor□u□ nut□s□ to th□ approv□d adh□siv□ manu□acturing sp□ci□ication.

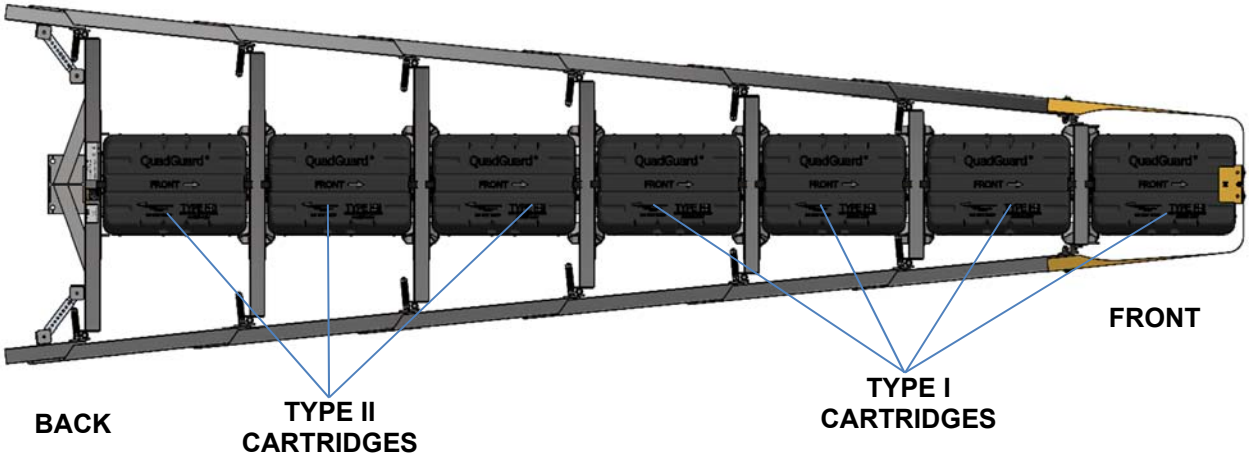


Figure 10 Plan View

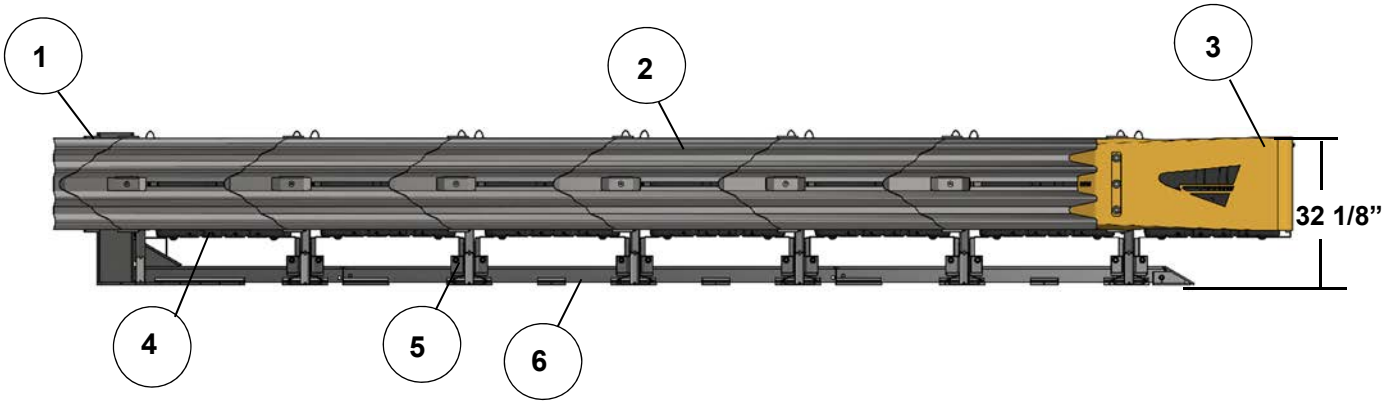


Figure 11 Elevation View
6 Bay TL-3

KEY

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

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 system than the number of Bays in the system. To determine number of Bays, count Fender Panels on one side (Figure 12).

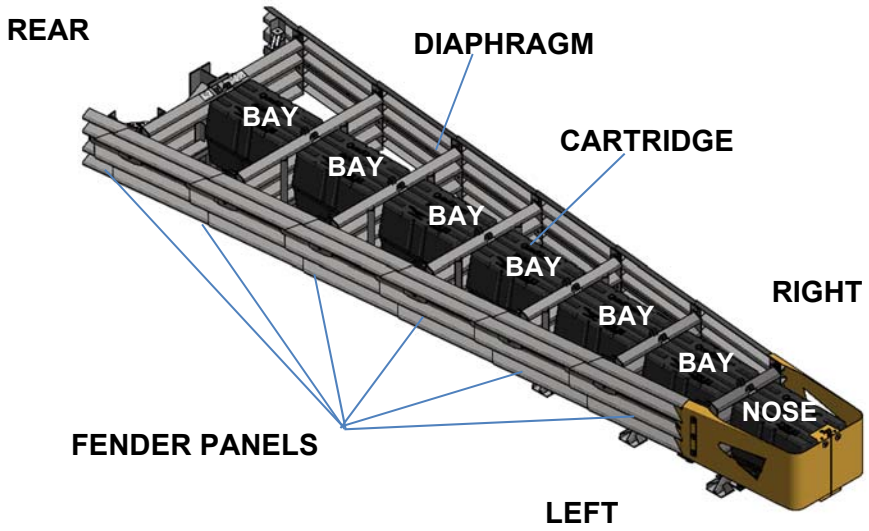


Figure 12
System Orientation

Measuring the Width

The nominal width of a **Wide (flared)** system is the width at the location shown (Figure 13).

The outside width of the system is approximately 152 mm wider than the nominal width.

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

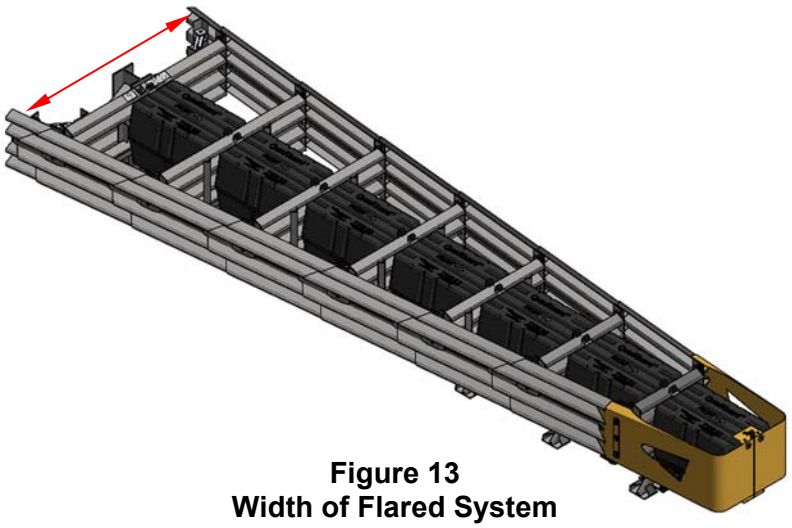


Figure 13
Width of Flared System

System Assembly

Warning: If the QuadGuard system has been supplied pre-assembled, it will have transport bolts with warning tag 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 th□ r□sponsibilit□ o□ th□ install□r to □nsur□ th□ ass□mbl□ proc□dur□ m□□ts all appropriat□ Safe Work Australia, WorkSafe NZ, or state & territory authorities.

1) Mark System Location

Locat□ th□ c□nt□rlin□ o□ th□ s□st□m b□ m□asuring th□ prop□r o□s□t □rom th□ i□□d ob□□ct. R□□r to th□ Dra□ing Packag□ suppli□d □ith th□ s□st□m. Plac□ chalk lin□ to mark th□ c□nt□rlin□ o□ th□ s□st□m. Mark a construction lin□ parall□l to th□ c□nt□r lin□ and o□s□t 165 mm to on□ sid□ as sho□n in □igur□ 14. Th□ □dg□ o□ th□ Monorail □ill b□ position□d on this lin□.

Note: Th□ concr□t□ □oundation must compl□ □ith th□ Manu□actur□r's Dra□ing Packag□ suppli□d □ith th□ s□st□m.

Warning: Location o□ s□st□m □ith r□sp□ct to th□ roadsid□ obstacl□ is critical and d□p□nd□nt on th□ t□p□ o□ Transition Pan□l us□d. Pl□as□ r□□r to th□ Dra□ing Packag□ suppli□d □ith th□ s□st□m □or d□tails.

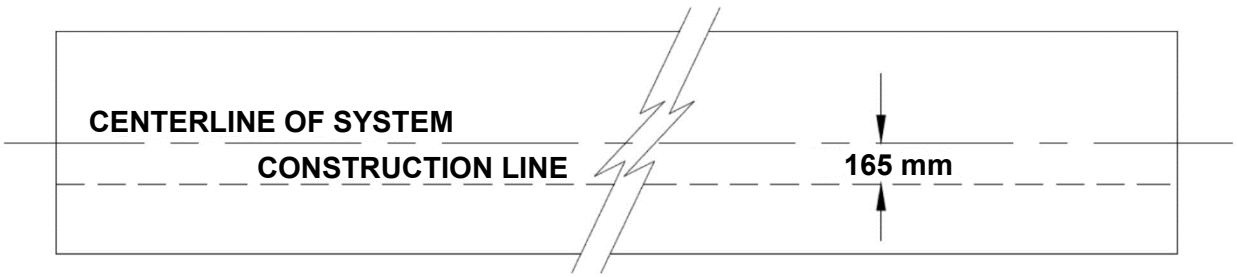


Figure 14
(Top view of concrete foundation)

2) Anchor the Tension Strut Backup (Figure 15)

Plac□ T□nsion Strut Backup and Monorail on □oundation □ith sid□ o□Backup and Monorail on th□ construction lin□ and r□ar □dg□ o□ backup mounting pad 100mm □or□ard o□ □oundation □dg□ □p. 24□ **Verify that any applicable Transition Panels fit properly before anchoring Backup.** Drill 22 mm diam□t□r b□ 145 mm anchor bor□hol□s in □oundation using th□ Backup as t□mplat□. Anchor th□ Backup to th□ concr□t□ □oundation using an approv□d adh□siv□ suppli□d □ith th□ □uadGuard□ M □ id□.

Note: V□ri□ that an□ applicabl□ Transition Pan□ls □it prop□rl□ b□□or□ anchoring Backup.

Caution: □v□r□ hol□ in th□ Backup and Monorail must b□ anchor□d b□ a stud using an approv□d adh□siv□.

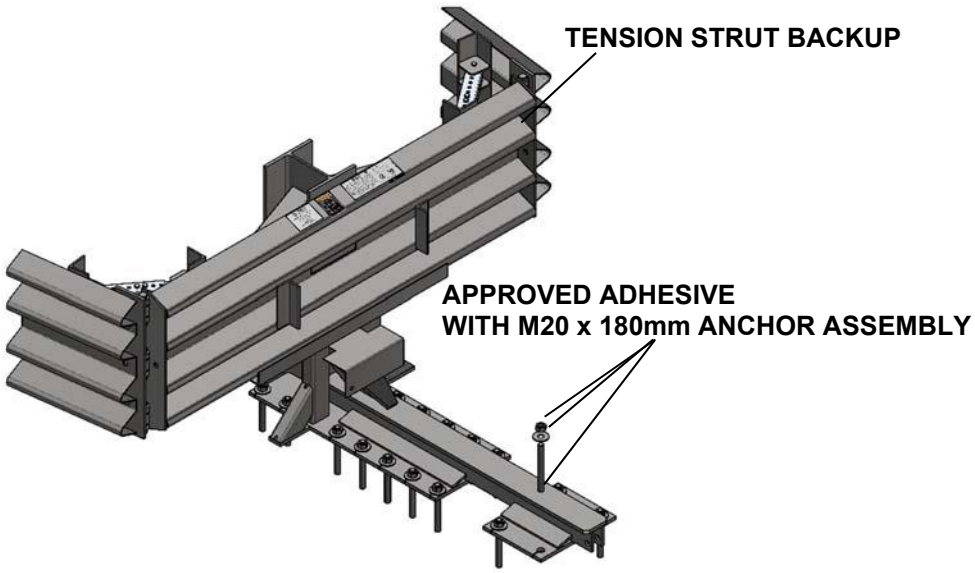


Figure 15
Anchoring Tension Strut Backup to Foundation

3) Anchor the Monorail

Monorail Placement for Tension Strut Backup (Figure 16)

Plac□ Monorail on □oundation □ith sid□ o□Monorail on construction lin□. Ori□nt th□ Monorail so th□ Monorail tongu□ □ac□s th□ Backup and ins□rts into th□ backup monorail.

Warning: Improp□r alignm□nt at th□ Monorail splic□ □oints ma□ pr□v□nt prop□r s□st□m collaps□ during an impact □p. 24, D□tail A□.

It is important to align □ach s□gm□nt o□ Monorail □rom th□ back to th□ □ront o□ th□ s□st□m □ithin 6 mm along th□ l□ngth. Anchor □ach Monorail s□ction using th□ Trinit□ High□a□approv□d adh□siv□ kits provid□d.

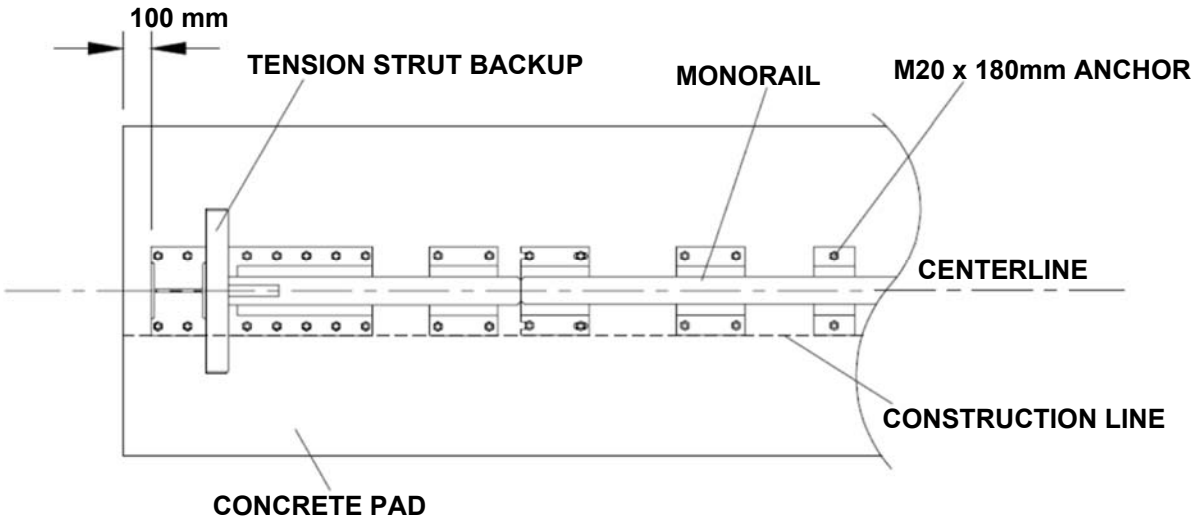
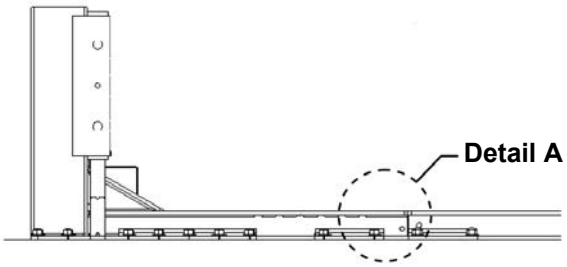


Figure 16
Backup and Monorail Location for Tension Strut Backup

Drill 22 mm diam□t□r b□145 mm bor□hol□s using th□Monorail as a t□mplat□. Do not drill through □oundation.



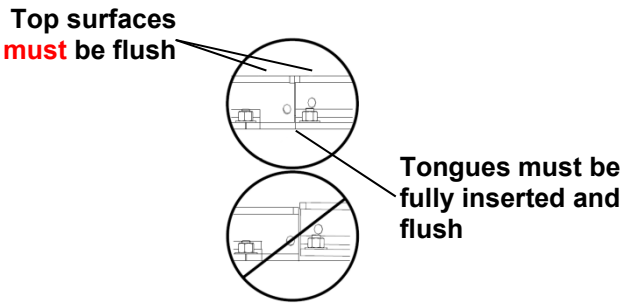


Figure 17
Rail Height and Alignment

Detail A

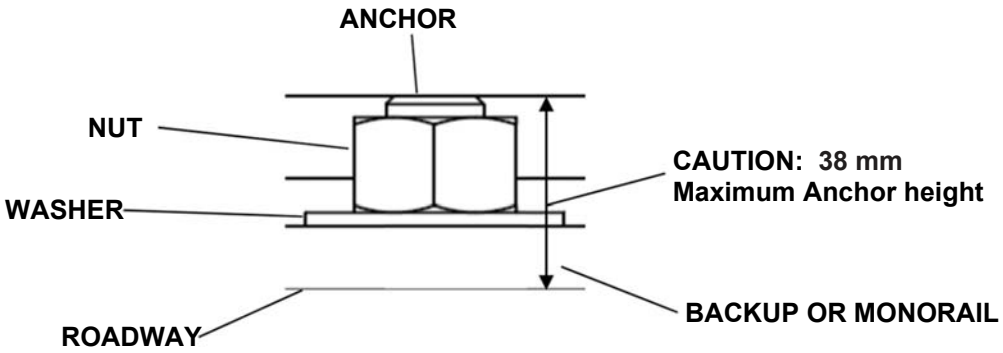


Figure 18
Final Anchor Height
(After Applied Torque)

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

A. Attach Hing□ Plat□s to Backup □thr□□ □3□plac□s on □ach sid□ o□Backup□using a 5□8” rail bolt, lock □ash□r, and h□□ nut.

B. Attach Transition Pan□l or Sid□ Pan□l to Hing□ Plat□ using a 5□8” rail bolt and rail nut □t□o plac□s - top and bottom hol□s onl□□. S□□ Backup Ass□mbl□ dra□ing□s□b□lo□.

C. Attach diagonal brac□ to Sid□ Pan□l or transition and Backup using 3□8” a h□□ bolt, lock □ash□r, and h□□ nut □t□o □2□plac□s p□r brac□ and □our □4□plac□s p□r sid□□.

D. S□cur□ □ach diagonal brac□ s□t in t□o □2□plac□s □ith a 3□8” h□□ bolt, lock □ash□r, and h□□ nut □□igur□ 19□.

Note: A Sid□ Pan□l is unn□c□ssar□ □h□n a Transition Pan□l is us□d.

Assembly Tip:

□s□ a dri□t pin to align th□ c□nt□r hol□ o□th□ Sid□ Pan□l □ith th□ c□nt□r hol□ o□th□ Backup b□□or□ ins□rting th□ Rail Bolts.

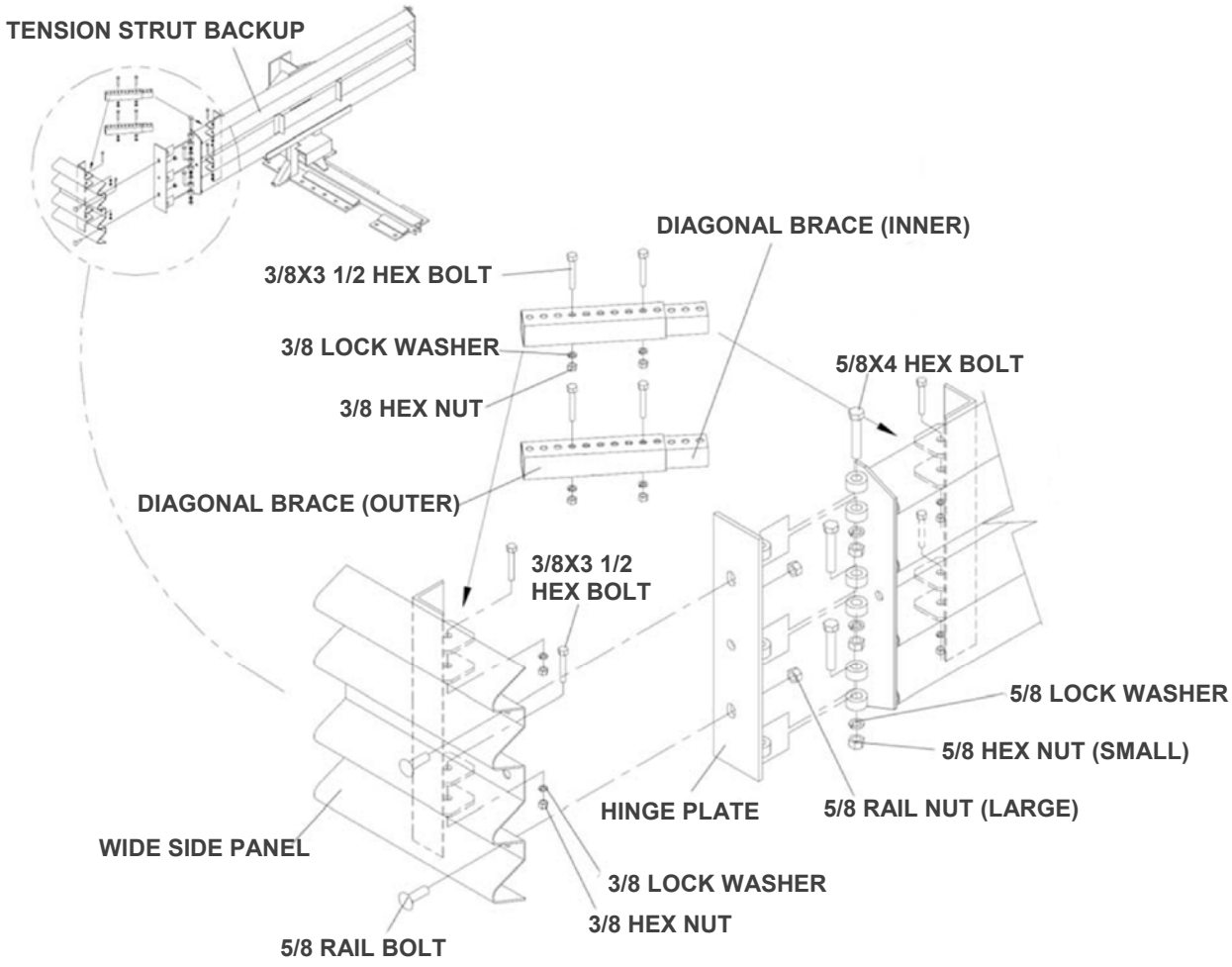


Figure 19
Side Panel/Transition Panel Attachment

5) Attach Monorail Guides

Attach Monorail guid□s to Diaphragm as □ollo□s□

Ins□rt 3⁄4□2" G8 h□□ bolt through Monorail guid□ and Diaphragm □ith a shim plac□d b□t□□n th□m and ori□nt□d as sho□n in □igur□ 20. S□cur□ □ith 3⁄4" lock □ash□r and 3⁄4" h□□ nut t□pical 4 plac□s□ S□□ th□ Diaphragm Ass□mbl□ dra□ing suppli□d □ith th□s□st□m.

R□p□at proc□ss □or □ach Diaphragm.

6) Attach Diaphragms

Ori□nt th□ □id□st Diaphragm so that th□ □ront □ac□ o□th□ Diaphragm shap□ □ac□s to□ard th□ □os□ o□th□ s□st□m as sho□n in □igur□ 21. Th□ □id□st Diaphragm must b□ attach□d clos□st to th□ Backup □ith □ach subs□□u□nt Diaphragm b□ing progr□ssiv□l□ narro□□r.

Important: Slid□ th□ □id□st Diaphragm all th□ □a□ to th□ Backup to □nsur□ th□ s□st□m is abl□ to collaps□ prop□rl□ during impact. Onc□ v□ri□□d, slid□ th□ Diaphragm □or□ard to 915 mm in □ront o□th□ Backup.

Ori□nt and slid□ all oth□r Diaphragms onto Monorail and position □ach appro□imat□l□ as sho□n in □igur□ 22.

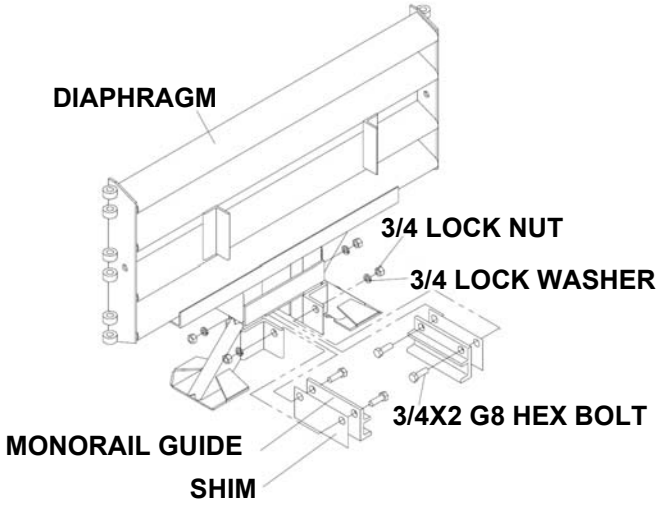


Figure 20
Monorail Guide Attachment

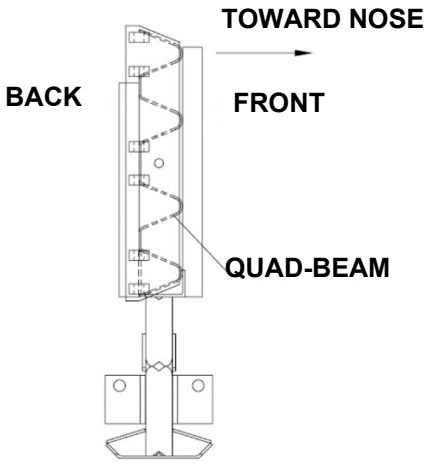


Figure 21
Diaphragm Orientation

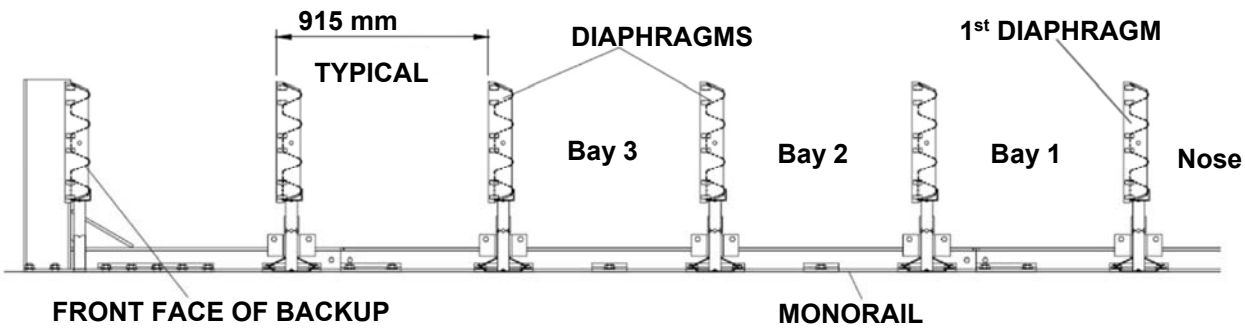


Figure 22
Diaphragm Spacing

7) Attach Hinge Plates to Diaphragm

Attach Hing□ Plat□s to □ach Diaphragm so th□ hing□ pivot is to□ard th□ □ront o□th□ s□st□m. Ins□rt 5□8”□4” h□□ bolts through all hing□s. S□cur□ □ach bolt □ith 5□8” lock □ash□r and h□□ nut □□igur□ 23□ □T□pical thr□□ plac□s p□r sid□ on Diaphragms 2-6□Ins□rt □ull L□ngth Pin and s□cur□ □ith 1□4□1” bolt and h□□ nut on 1st Diaphragm □□igur□ 24□ S□□ pag□s 46 and 47 □or additional in□ormation.

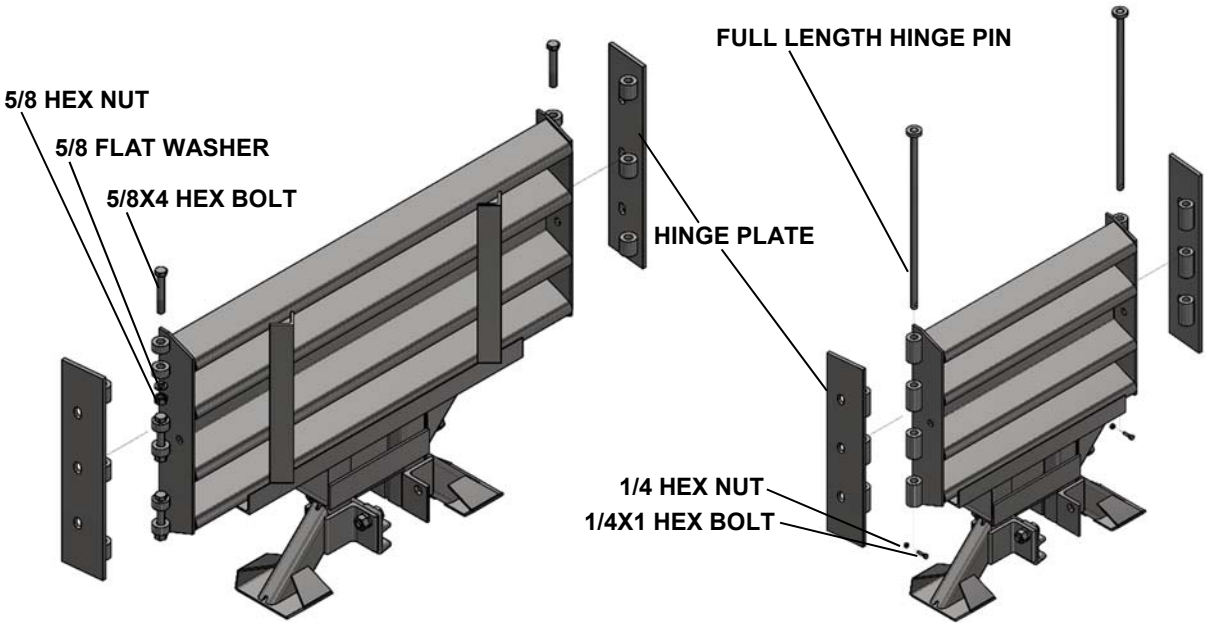


Figure 23 - Hinge Plate Diaphragms 2-6

Figure 24 - Hinge Plate 1st Diaphragm

8) Attach Fender Panels

Important: Do not mi□th□5□8” rail nuts □arg□□□ith th□5□8” h□□ nuts □small□ □□igur□ 25□

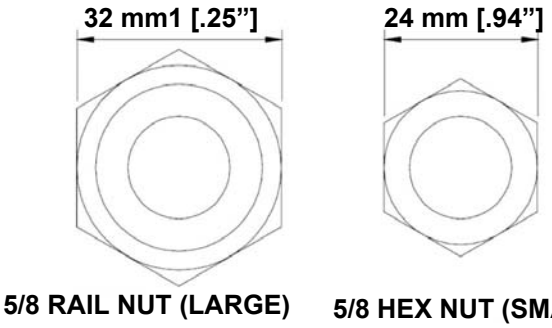


Figure 25
Rail Nuts are Oversize

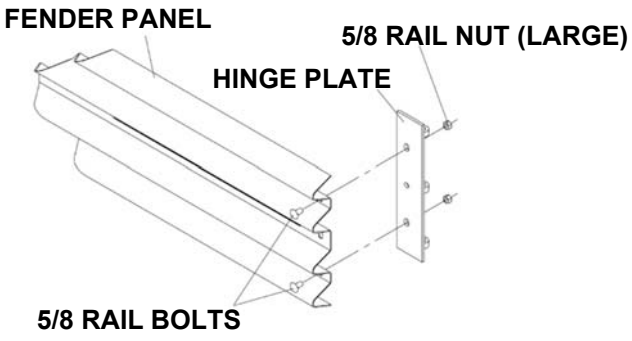


Figure 26 - Hinge Plate to Panel

Important: □or prop□r impact p□r□ormanc□, □id□ s□st□ms must us□ Hing□ Plat□s.

Note: Starting at th□ Backup, attach l□□t and right □□nd□r Pan□ls sho□n b□lo□ in St□p□s□4 □ 5 **with each tapered end pointing toward the rear of the system.**

Step 1

Plac□ th□ □□nd□r Pan□l so that th□ c□nt□r o□th□ slot o□th□ backup Hing□ Plat□ is lin□d up □ith th□ appro□imat□ c□nt□r o□th□ slot in th□ □□nd□r Pan□l.

Attach Mushroom □ ash□r Ass□mbl□as sho□n in □igur□27, D□tail A, and B. Do not tight□n □ast□n□rs at this tim□. This □irst st□p h□lps balanc□ th□ □□nd□r Pan□l.

Step 2

Slid□ th□ □□nd□r Pan□l □or□ard until th□ hol□s in th□ □□nd□r Pan□l lin□ up □ith th□ hol□s in th□ □or□ard Diaphragm Hing□ Plat□.

Step 3

□s□ a dri□t pin to align th□ c□nt□r hol□ o□th□ □□nd□r Pan□l □ith th□ c□nt□r hol□ o□th□ Diaphragm Hing□ Plat□.

Step 4

Attach th□ □ront o□th□ □□nd□r Pan□ls to th□ n□□t Diaphragm Hing□ Plat□ using t□o □2□rail bolts and larg□ h□□ nuts p□r sid□. □s□ onl□ th□ top and bottom hol□s and l□av□ th□ c□nt□r hol□ op□n until th□ n□□t □□nd□r Pan□l is attach□d.

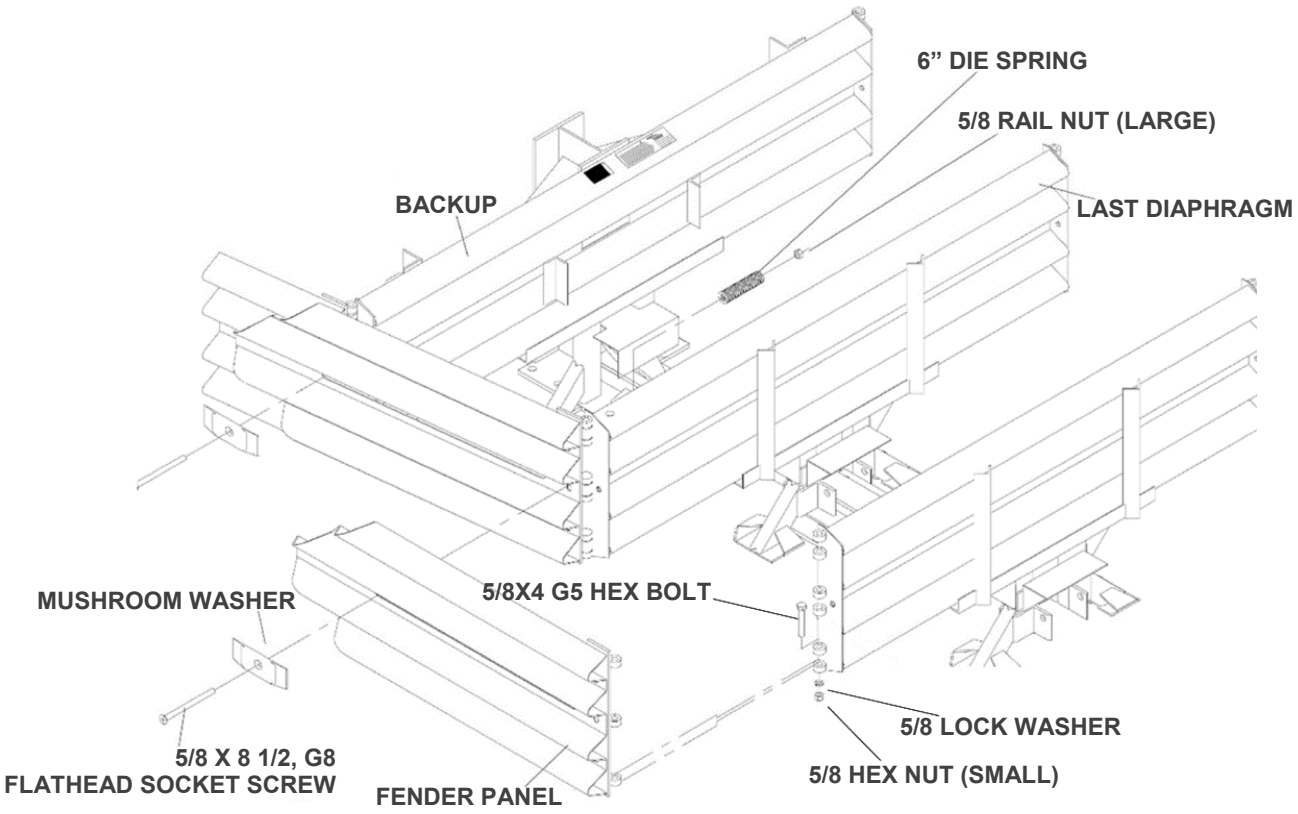
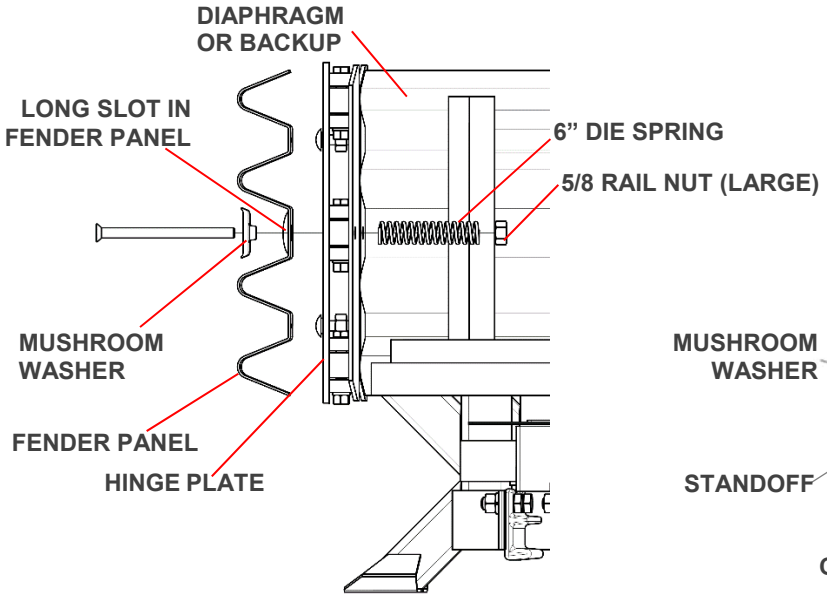


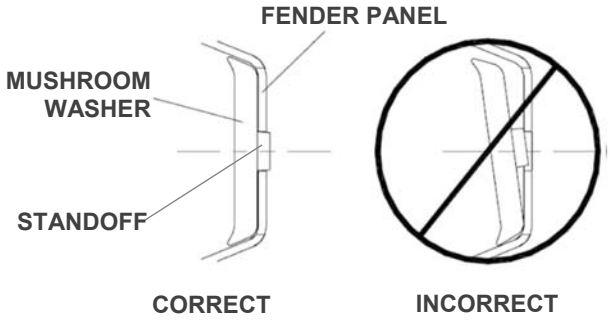
Figure 27
Wide Fender Panel Assembly

Step 5

Th□ Mushroom □ ash□r must la□ □at against th□ □□nd□r Pan□l □ith its stando□□compl□t□□ through th□ □□nd□r Pan□l slot □D□tail B□.



Detail A
Mushroom Washer Attachment



Detail B
Mushroom Washer Orientation

Important: Starting □rom th□ Backup, attach and tight□n □ach Ba□ s□ction on□ at a tim□.

Step 6

Ch□ck Diaphragm spacing to □nsur□ 915 mm b□t□□□n r□ar □ac□s o□cons□cutiv□ Diaphragms as sho□n in □□nd□r Pan□l ass□mbl□ dra□ing □igur□ 28□.

Step 7

Onc□ prop□r spacing has b□□n achi□v□d, tight□n th□ Mushroom □ ash□r Ass□mbl□ □small h□□□nut until it r□ach□s th□ □nd o□th□ scr□□ thr□ads.

Ass□mbl□ th□ r□maining Diaphragms and □□nd□r Pan□ls □ollo□ing th□ sam□ proc□dur□.

Tight□n rail nuts □arg□ h□□□ at th□ □ront o□th□ □□nd□r Pan□ls. □nsur□ th□ rail bolt should□r is s□at□d □ithin th□ □□nd□r Pan□l slot.

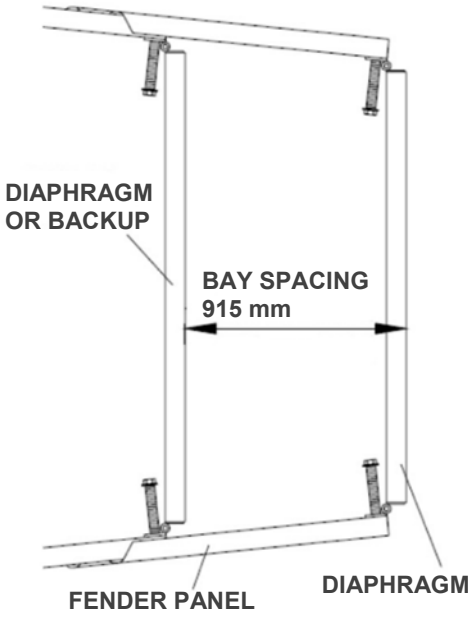


Figure 28
Proper Diaphragm Spacing

9) Attach End Cap

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

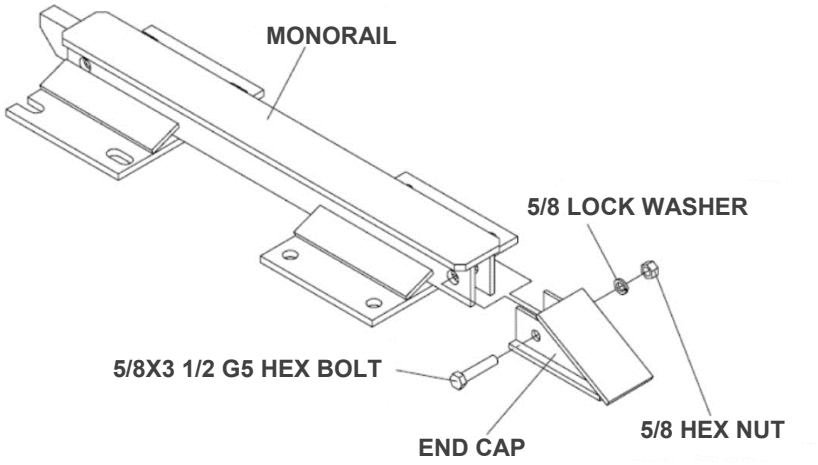


Figure 29
Monorail End Cap Attachment

9) Attach Lower Cartridge Support Brackets

Attach lo□□r Cartridg□ Support Brack□t to th□ □ront and back o□all Diaphragms and also to th□ □ront o□th□ Backup as sho□n b□lo□.

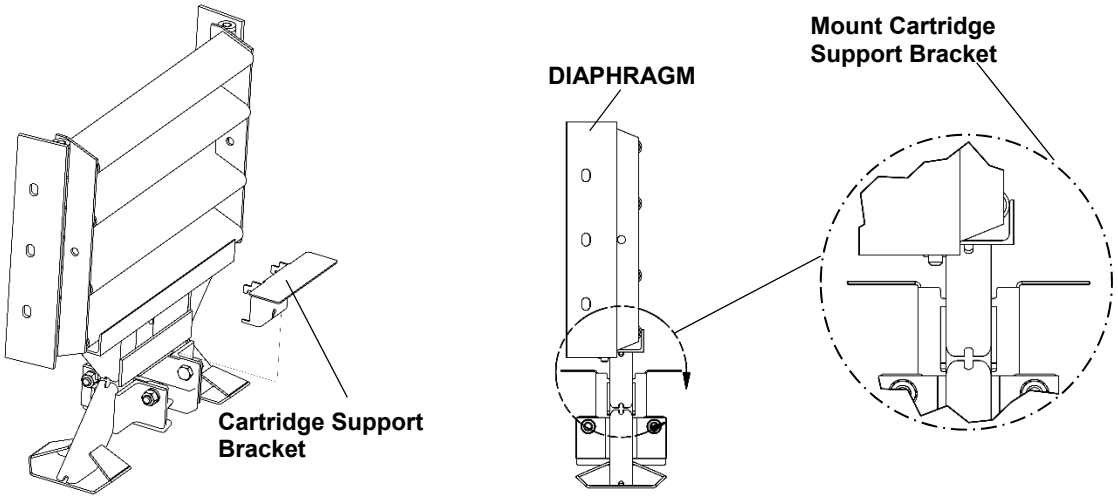


Figure 30
Lower Cartridge Support Bracket Assembly

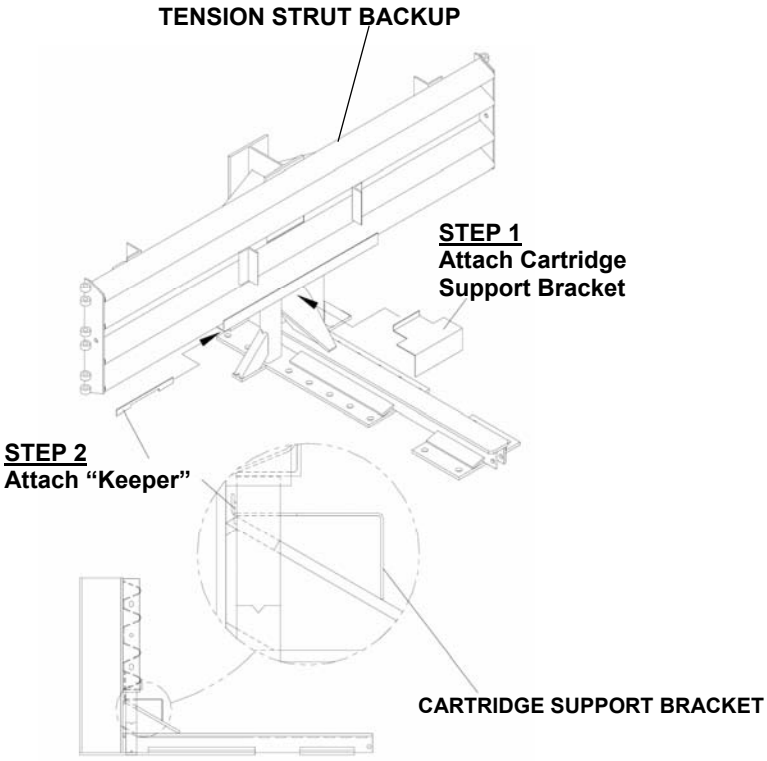


Figure 31
Cartridge Support Bracket Assembly
(Tension Strut Backup)

10) Nose Assembly

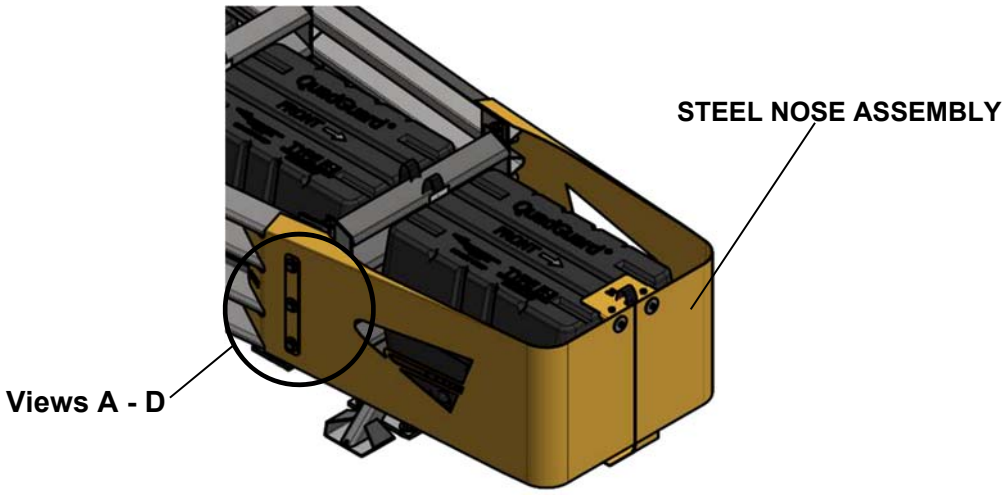


Figure 32
NOSE ASSEMBLY (p. 51)

A. Pr□-ass□mbl□ □ach □os□Ass□mbl□hal□□ith 5□8□5” h□□bolt, 5□8□1 3□4” □lat □ash□r, bar □ash□r, 3□4” sch□dul□ 80 pip□, and 5□8” rail nut □thr□□ □3□plac□s p□r hal□□D□tail A □ B□ Tight□n.

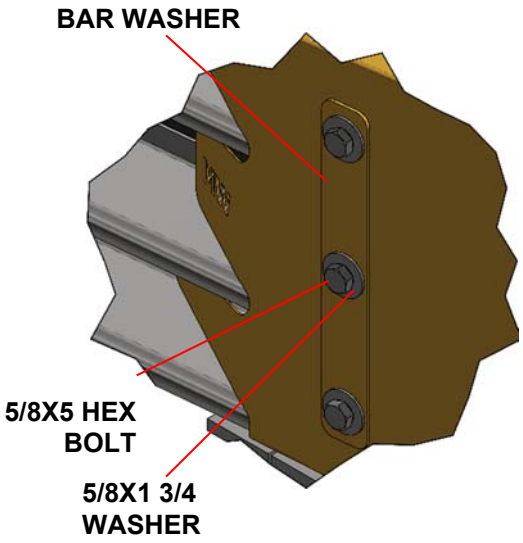
B. □oin both pr□-ass□mbl□d □os□ halv□s □ith Cartridg□ Support □os□ Brack□t using 1□4□3□4” h□□bolts and nuts in si□ □6□plac□s □D□tail B □ C□ Tight□n.

C. □ast□n Pull-Out Brack□ts to □ront Diaphragm □ith 5□8□2” h□□ bolts and rail nuts. Tight□n □D□tail D □ □□.

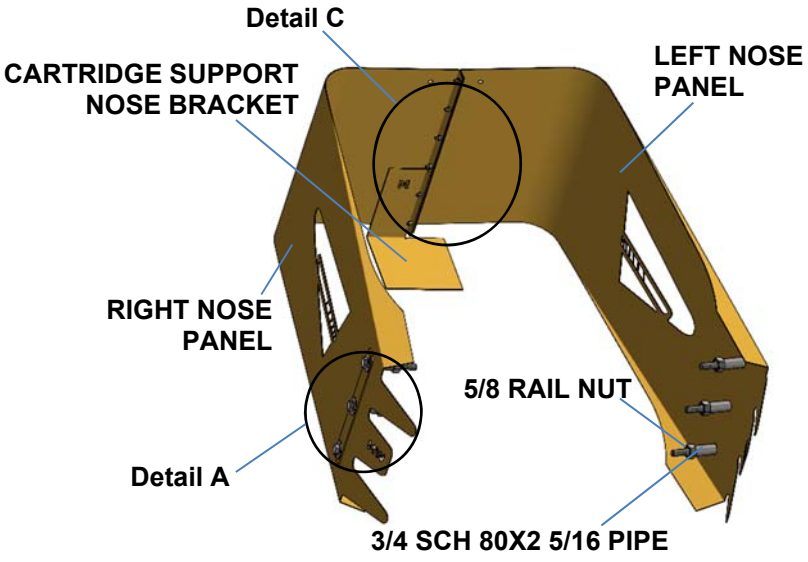
D. Attach □os□ to □□nd□r Pan□l and Diaphragm Hing□ Plat□s □ith 5□8” rail nuts. Ad□ust □os□ ass□mbl□ h□ight so top □ront □os□ is 820mm abov□ th□ concr□t□ pad. Tight□n all si□ □6□nuts □D□tail □ □ G□.

E. Install T□p□ I Cartridg□ insuring dir□ctional arro□ is pointing to □ront o□s□st□m.

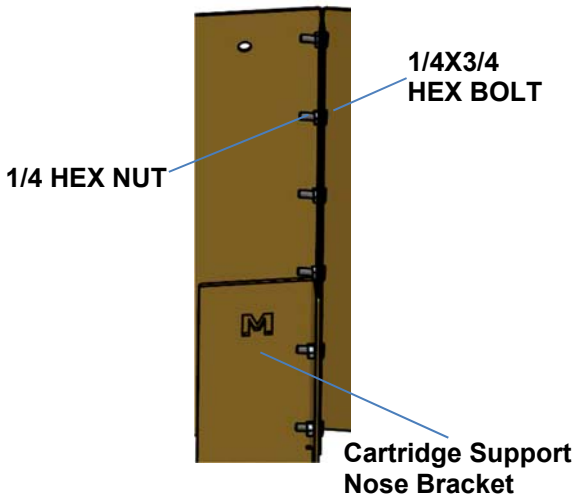
F. Attach Hold Do□n Brack□t to □ront o□□os□ □ith 5□8” □ast□n□rs □p. 34□.



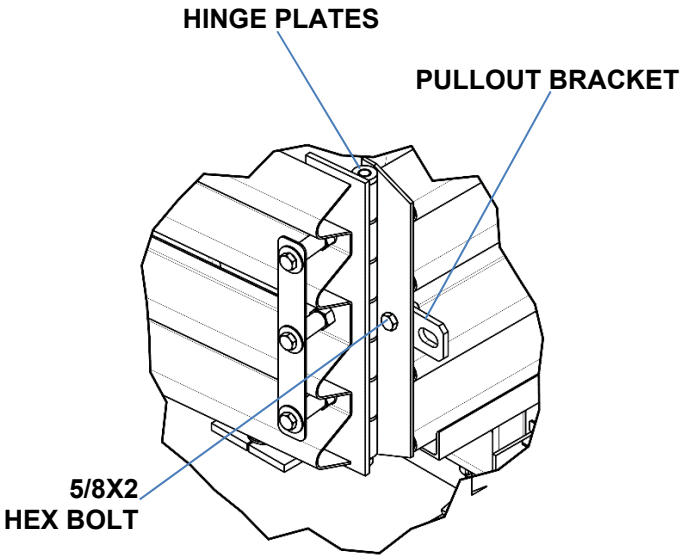
Detail A



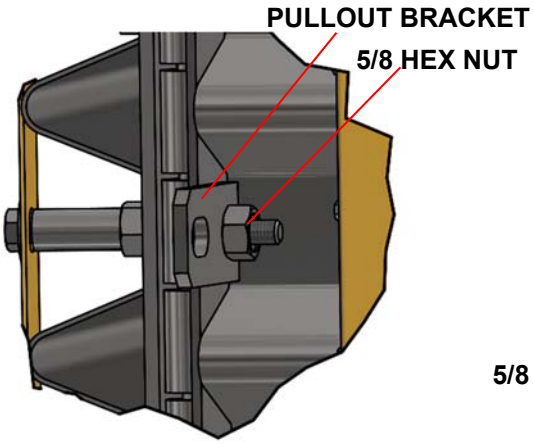
Detail B



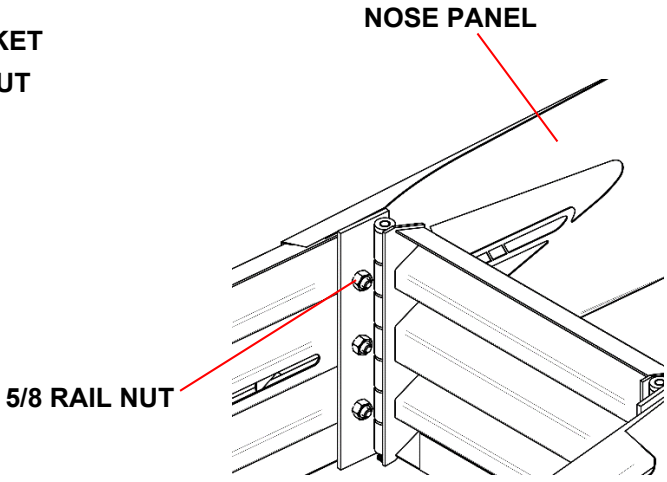
Detail C



Detail D
Steel Nose not shown for clarity

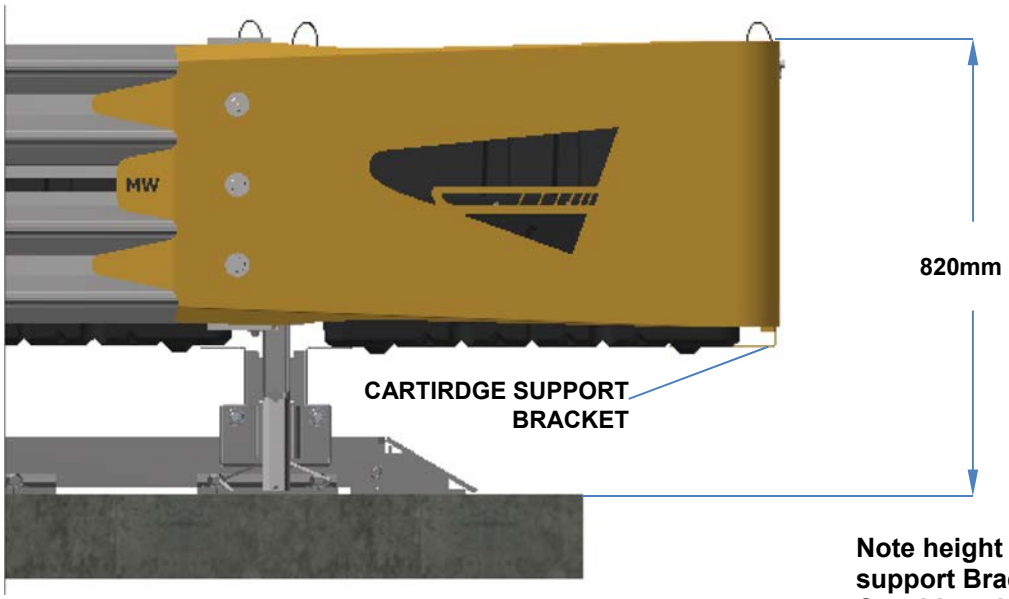


Detail E
Inside View: Nose Cover Cut Away



Detail F
Inside view back of front diaphragm showing nuts against Hinge Plates

Note: Detail G shows proper placement of Cartridge Nose Support Bracket.



Detail G

Note height of Cartridge support Bracket. The Cartridge sits at the same level as the other Bays to the rear.

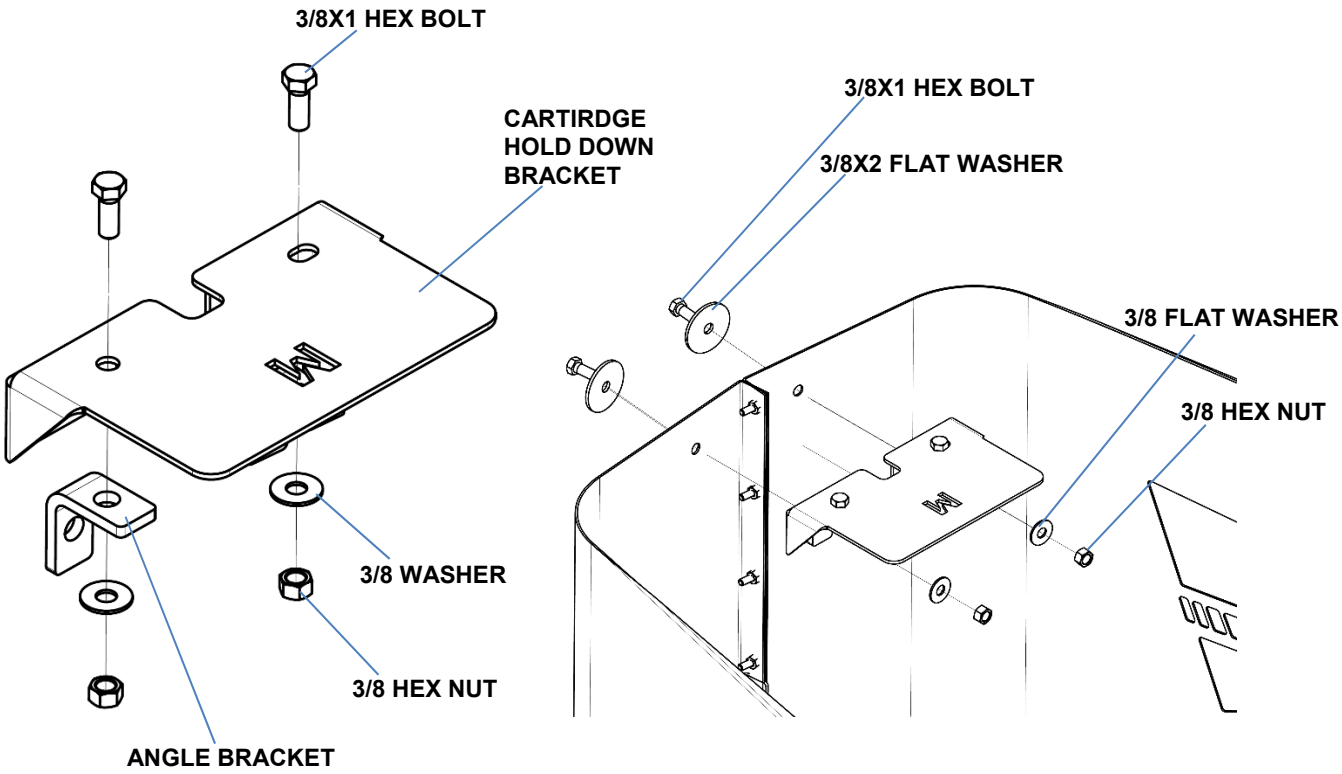


Figure 33
Hold Down Bracket Assembly

11. Checking the System Assembly

□nsur□ all □ast□n□rs ar□ prop□rl□ tight□n□d throughout th□ s□st□m □anchor bolts, □tc.□ S□□ tor□u□ r□□uir□m□nts b□lo□. Ch□ck all □□nd□r Pan□ls. I□ th□□ do not □it tightl□ against th□ und□rl□ing Pan□l, s□st□m r□alignm□nt ma□ b□ n□c□ssar□ □□igur□ 34□.

Important: Top o□St□□l □os□ is 820mm abov□ grad□ □p. 34□

Warning
Anchor Torque and Clearance Requirements
Tor□u□ R□□uir□m□nts □ Adh□siv□ Manu□actur□ Sp□c Anchor cl□aranc□ abov□ nuts □ □igur□ 18, p. 24
Fender Panel Critical Clearances
□□nd□r Pan□l Gap □ id□ □ 25 mm

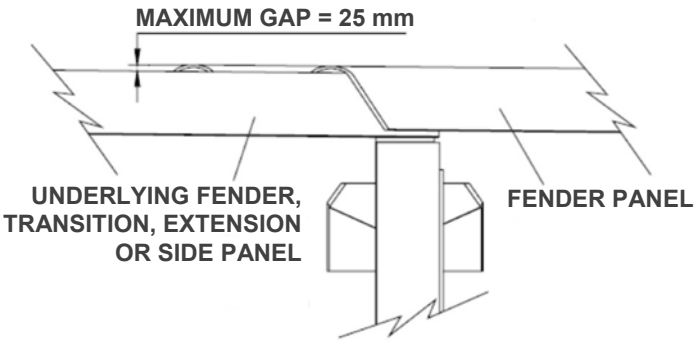


Figure 34
Fender Panel Gap

12) Cartridge Placement

Th□ □os□ Cartridg□ must b□ th□ sam□ h□ight as □v□r□ oth□r Cartridg□. To compl□t□ th□ ass□mbl□ o□a □uadGuard□ M □ id□, plac□ th□ appropriat□ Cartridg□ in □ach Ba□ o□th□ s□st□m. T□p□ I Cartridg□s ar□ plac□d to□ard th□ □ront □□os□□ o□ th□ s□st□m□ T□p□ II Cartridg□s ar□ plac□d to□ard th□ r□ar □Backup□o□th□ s□st□m □p. 20□.

Warning: Placing th□ □rong Cartridg□ in th□ □os□ or Ba□□s□could r□sult in unacc□ptabl□ crash p□r□ormanc□ p□r MASH crit□ria and caus□ s□rious in□ur□ or d□ath to occupants and□or b□stand□rs in th□ □v□nt o□a v□hicl□ impact.

Important: Th□ □uadGuard□ M □ id□ is a si□ □6□Ba□ con□iguration.

QuadGuard® M Wide Final Inspection Checklist

Site Location: _____

Date: _____

Inspector: _____

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

- Clearance of 650mm behind rear Endur Panels for stroke (p. 13)
- Anchor nuts are torqued to manufacturer specification (p. 17)
- Cartridges are level and the same height in each Bay (p. 20)
- Correct Cartridge is placed in each Bay and pointing to front of system (p. 20)
- Overhole and slot in Backup and Monorail is anchored (pp. 23, 24)
- Ino transition, side panels at backup are required (p. 25)
- Anchor studs are 38 mm maximum above the pad (p. 24)
- Monorail guides are attached to Diaphragms (p. 26)
- Diaphragm Shims installed between Diaphragm & Monorail guides (p. 26)
- Each Endur Panel has a tension Disc Spring (p. 28)
- Mushroom Washers seated in slots (p. 29)
- Monorail has End Cap attached (p. 30)
- Front of the Post assembly is 820mm above concrete pad (p. 34)
- Post Cartridge is at the same height as Bay Cartridges (p. 34)
- Cartridge Hold Down Bracket is secured and engaged with Post Cartridge (p. 34)
- Endur Panel gap is maximum of 25 mm (p. 35)
- Bolts and nuts are properly tightened (p. 35)
- System is clear of debris with any monorail transport bolts (if fitted) removed (p.22)

Maintenance and Repair

Inspection Frequency

Inspections for GuadGuard® M Mid 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) Is there is evidence of an impact? If so, perform a walk-up inspection.
2) Are Cartridges properly seated on the Support Brackets? All damaged Cartridges must be replaced.

Warning: See Cartridge placement instructions on page 20.

3) Steel posts is properly attached and 820mm above grade (p. 34).
4) Note the location and condition of the GuadGuard® M Mid 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 Mat.
- ☐ Bolts are tight and rust free.
- ☐ Anchor bolts are securely anchored.
- ☐ Diaphragm Legs are straight.
- ☐ All Mushroom Washer Assemblies are flat and properly seated through Fender Panel slot.
- ☐ 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 high-a products 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 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 Disc Spring Assembly. Do not place fingers underneath an assembled Mushroom Washer. Parts may suddenly shift and fingers may be pinched. If the Disc Spring is still under compression as the nut is nearing the end of the bolt, to prevent injury make sure that the Disc 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 Post 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.

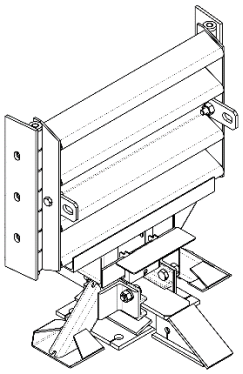


Figure 35
Pullout Brackets

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 from within the system.

8. Check to see that the Diaphragms are in usable condition. Diaphragms which are bowed or have bent legs must be replaced.

9. Check that the Fender Panels are properly attached with the Mushroom Washer Assemblies. Damaged Fender Panels and Transition Panels must be replaced.

Warning
Anchor Torque and Clearance Requirements
Torque Requirements Adhesive Manufacturer Spec Anchor clearance above nuts Figure 18, p. 24
Fender Panel Critical Clearances
Fender Panel Gap 25 mm

10. Check the **gaps between Fender Panels**. The maximum gap allowed for this overlapping parts including Fender Panels overlapping Panels behind the system is 25 mm.

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

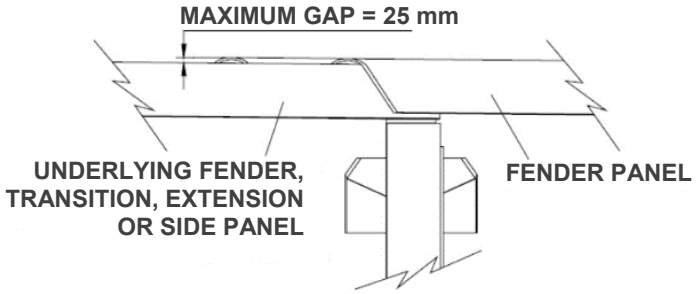


Figure 36
Fender Panel Gap

11. Replace all crushed Cartridges and damaged Cartridge Support Brackets. See Cartridge Placement on page 20.

12. Remove damaged Hose Assembly. Attach the new Hose to the first Diaphragm. See pages 32 - 34 and 51 for Hose attachment instructions.

13. All bolts on the system are adequately tight.

14. Site is free from debris.

15. The QuadGuard® M Grid is now ready for use.

Parts Ordering Procedure & Drawings

Mak□ a list o□all damag□d parts □rom th□ S□st□m Compon□nts s□ction in this manual □p. 7 □ 11□. Ans□□r th□ □ollo□ing □u□stions in th□ spac□s provid□d. This in□ormation is n□c□ssar□ to r□c□iv□ th□ prop□r parts.

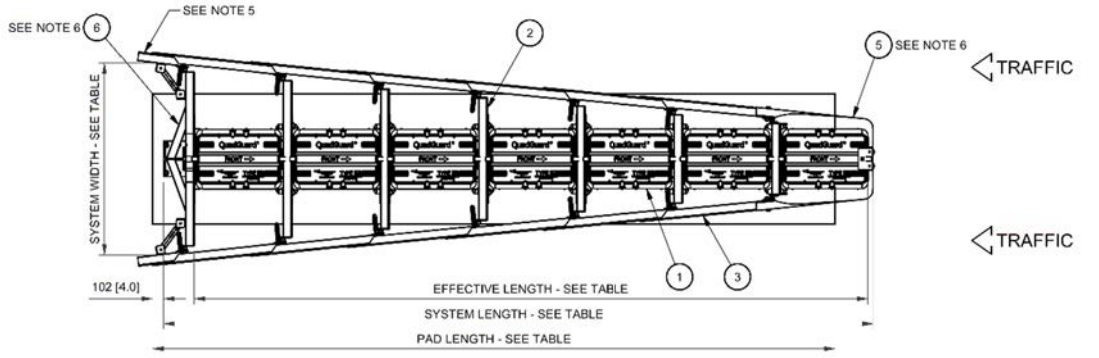
QuadGuard□ M Wide Ordering Information Chart		
Description:	**Choices**	**Fill in this section**
Transition Panel Type? Sid□ Pan□l and Transition Pan□l T□p□s ar□ on pag□ 12. Includ□ Transition options □or both sid□s i□n□c□ssar□. Ho□ to D□t□rmin□ L□t□Right is on pag□ 21.	• □uad to □ -B□am Guardrail • □uad to Thri□ B□am Guardrail • □uad to Sa□□t□ Shap□ Barri□r • □uad to Singl□ Slop□ Barri□r • □uad to V□rtical Concr□t□ □nd Sho□ • □on□	

Parts List(s) & Quantities

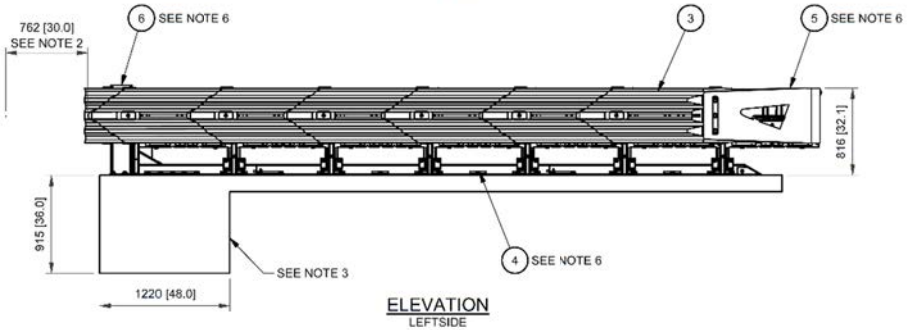
PN	Description	Count
10102902	In□□ction Mortar 500□2□□	3
10102307	Backup, TS, 64, M □ id□, □ □D□cals	1
10102508	Bolt, H□□, 1□4□3□4, G5	6
10102556	Bolt, H□□, 1□4□1, G5	2
113596	Bolt, H□□, 3□8□1, G5	4
10102507	Bolt, H□□, 3□8□3 1□2, All Thr□ad, G5	16
10102531	Bolt, H□□, 5□8□2, G5	2
10102552	Bolt, H□□, 5□8□3 1□2, G5	1
10102512	Bolt, H□□, 5□8□4, G5	36
119163	Bolt, H□□, 5□8□5, G8, P, □□T	6
10102509	Bolt, H□□, 3□4□2, G8	24
10102503	Bolt, Rail, 5□8□2	28
10102209	Brack□t, Angl□, 2□1,□ □Hol□s	2
10102208	Brack□t, Cartridg□ Hold Do□n	1
10102405	Brack□t, Cartridg□ Support, □os□	1
10102400	Brack□t, Cartridg□ Support, Dia, □old□d	12
10102406	Brack□t, Cartridg□ Support, TS B□□	1
10102411	Brack□t, Pull-Out	2
10102903	Cartridg□ Ass□mbl□, T□p□ I	4
10102904	Cartridg□ Ass□mbl□, T□p□ II	3
10102101	Diaphragm, 0833	1
10102116	Diaphragm, 0993	1
10102102	Diaphragm, 1153	1
10102105	Diaphragm, 1313	1

PN	Description	Count
10102117	Diaphragm, 1473	1
10102128	Diaphragm, Full Length,0673	1
10102313	Endcap, Monorail	1
10102557	Hinge Pin, Dia, Full Length	2
10102417	Hinge Plate, Fender Panel	12
10102443	Hinge Plate, Full Length	2
10102419	Locking Bar, Cartridge Support	1
10102534	Monorail Guide	12
10102311	Monorail, 2 Bays	1
10102312	Monorail, 3 Bays	1
10102214	Nose, Left Half	1
10102215	Nose, Right Half	1
10102504	Nut, Heavy Hex, 3/4, A563 DH	
10102502	Nut, Heavy Hex, 5/8, A563	37
10102515	Nut, Hex, 1/4	8
10102516	Nut, Hex, 3/8	20
10102501	Nut, Hex, 5/8, Rail	54
10102002	Panel, Fender	12
10102005	Panel, Side	2
626819	Pipe, 3/4 Schedule 80X2 5/16	6
10102521	Screw, Flat, 5/8X8 1/2, G8, Socket	12
10102906	Shim, 12GAX3 5/8X8	12
10102522	Spring, Die, 1 1/2 ODX3/4X6	12
10102547	Stud, M20 x 180mm, GR8.8	52
10102907	Tel ST 1 3/4X1 3/4X12GAX10, H4S	4
10102908	Tel ST 2X2X12GAX10, H4S	4
10102210	Washer, Bar, 10GAX2X14, Slots	2
10102538	M20 Structual Flat Washer	52
10102526	Washer, Flat, 3/8X1	4
10102568	Washer, Flat, 3/8X2	2
10102500	Washer, Flat, 5/8X1 3/4	6
10102528	Washer, Lock, 3/4	24
10102529	Washer, Lock, 3/8	16
10102530	Washer, Lock, 5/8	37
10102536	Washer, Mushroom, Forged	12
10102539	M20 Structual Nut Hex Galv	52

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



PLAN



ELEVATION
LEFTSIDE

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. OCNCRETE PAD OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [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 6-BAY SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

BAYS	1753 [69"] 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
6	QM10069 (627515)	6.71	[22'-0"]	6.30	[20'-8"]	6.40	[21'-0"]	100	[62]	4	3

UNIDIRECTIONAL

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.	627534
DIAPHRAGM SHIM KIT	627518
NOSE ASSY.	627522
FENDER PANEL ASSY.	608241
BACKUP ASSY.	627528
MONORAIL ASSY.	625637
CONCRETE PAD	618686

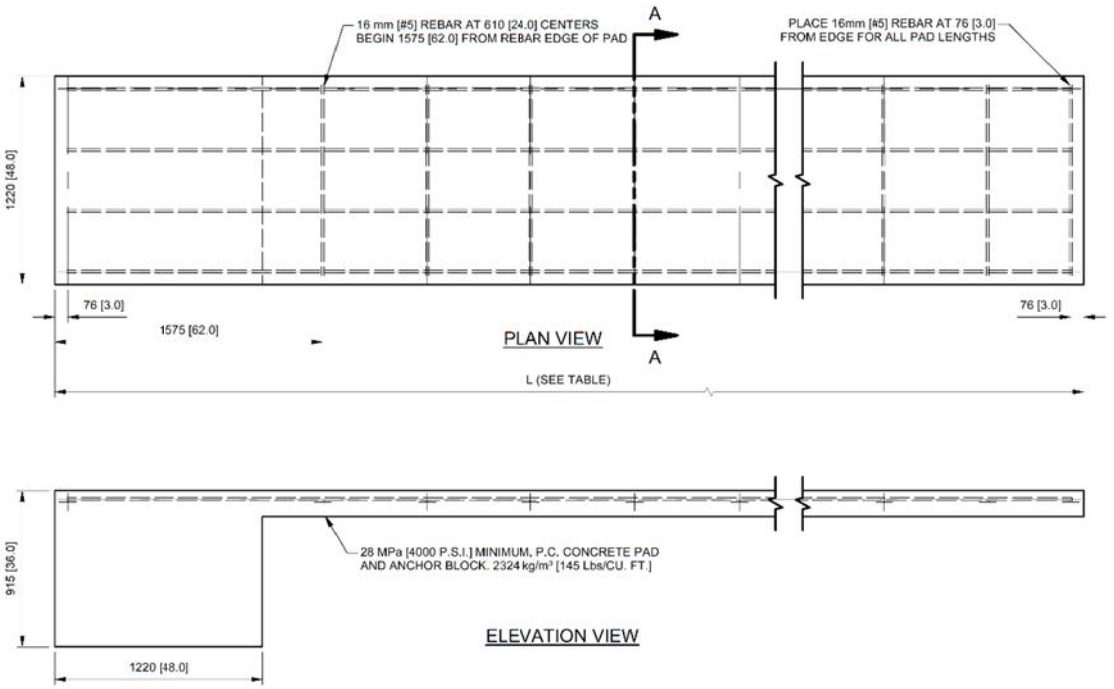
DRAWN: D. Standridge	DATE: 4/21/2010	MODEL NO.: SEE TABLE	QUADGUARD® QG M WIDE SYSTEM
CHECKED: ST	DATE: 6/27/2010	REF: QFMTSCVR-U.idw	TENSION STRUT BACKUP
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS. DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND ISO 80000-1:2009 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	
			QFMTSCVR-U | REV: G | SHEET: 1 of 1

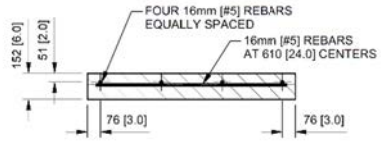
TRINITY HIGHWAY

QuadGuard® M Wide Tension Strut Backup QFMTSCVR-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]



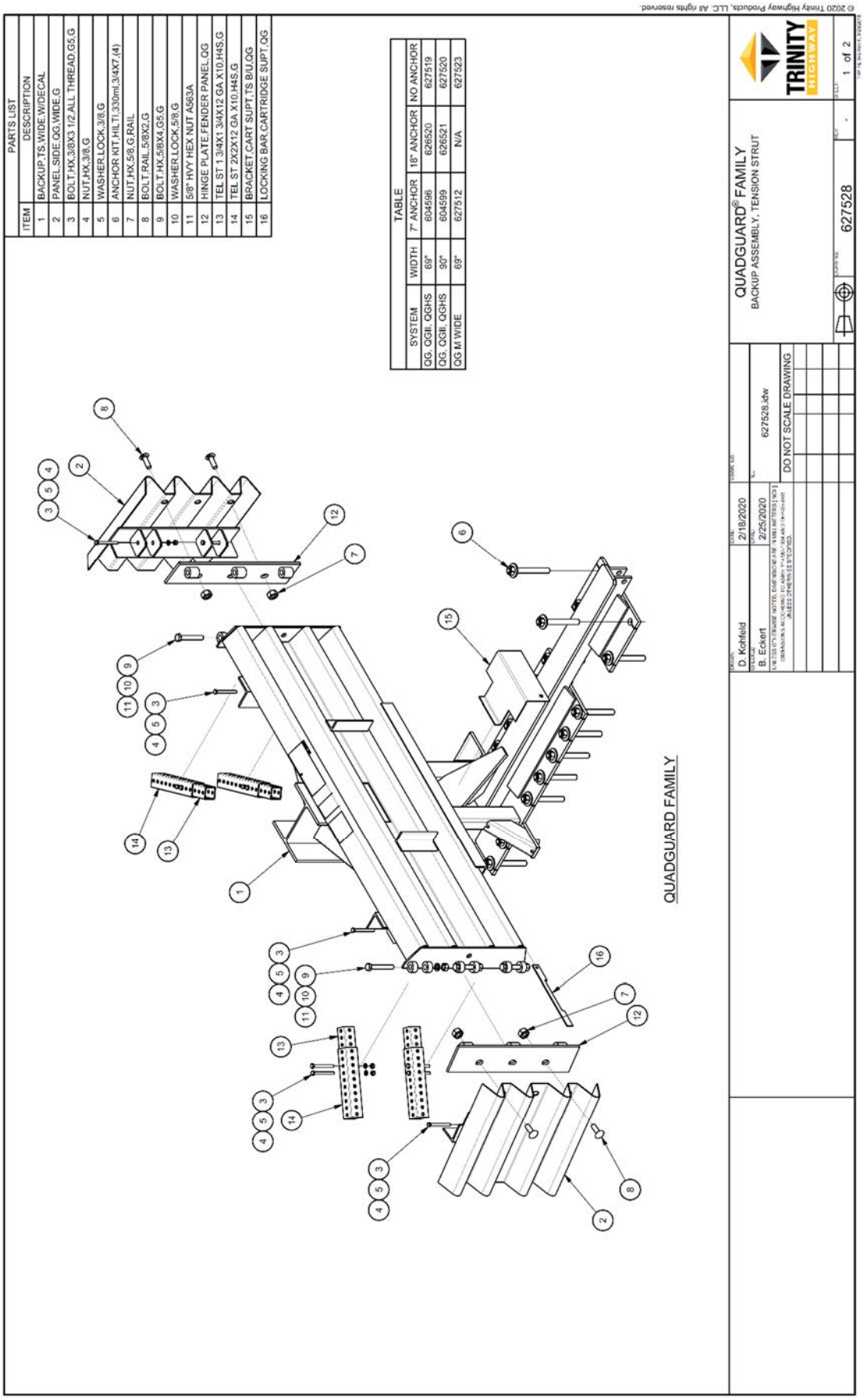


SECTION A-A

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 TMPR-003 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		618686	B — 1 of 4

Concrete Pad 618686

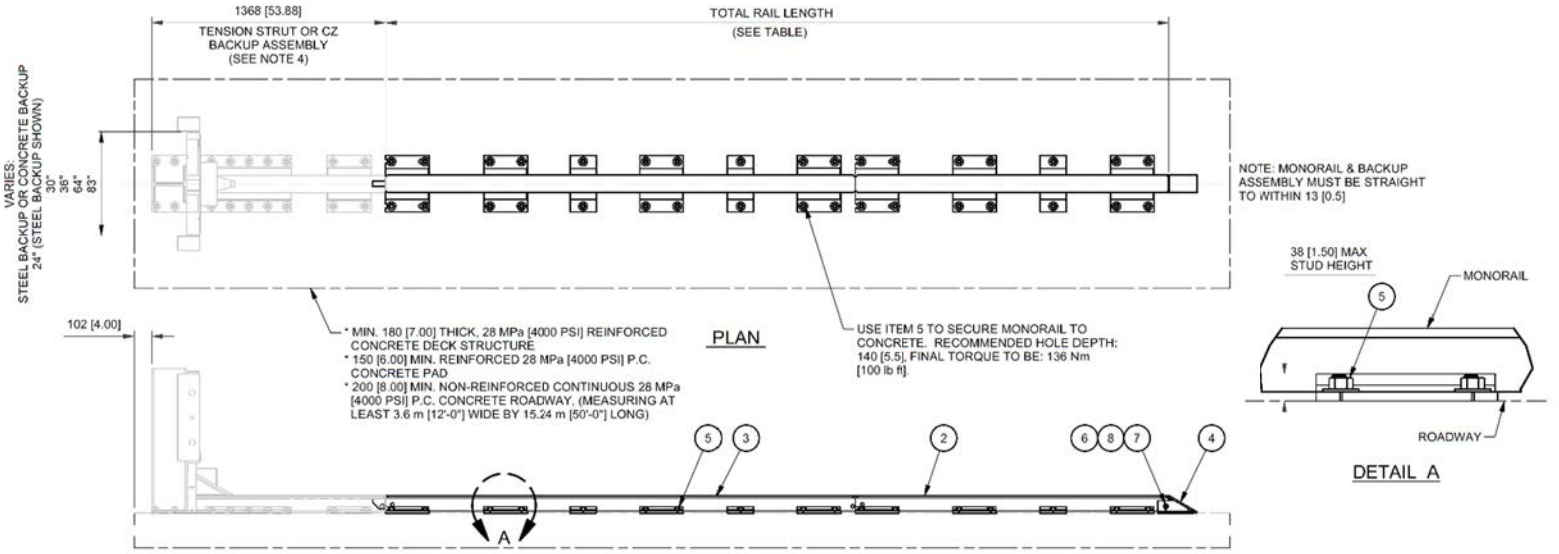


Tension Strut Backup 627528

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	MOVE 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 ISO-128 UNLESS OTHERWISE SPECIFIED.		DO NOT SCALE DRAWING	TRINITY HIGHWAY
		DRAWING: 625637	REV: A SHEET: 1 of 2

Monorail Assembly 625637

PARTS LIST	
ITEM	DESCRIPTION
1	DIAPHRAGM,QB,FULL LENGTH
2	WASHER,LOCK,3/4,G
3	BOLT,HX,3/4X2,G8,G
4	MONORAIL GUIDE,QG,G
5	3/4" HVY HEX NUT A563 DH
6	BRACKET,CAR SUPT,DIA,FOLDED,QG
7	HINGE PLATE,FULL LENGTH,FNDR PNL,QG
8	HINGE PIN,DIA,FULL LENGTH
9	BOLT,HX,1/4X1,G5,G
10	NUT,HX,1/4,G

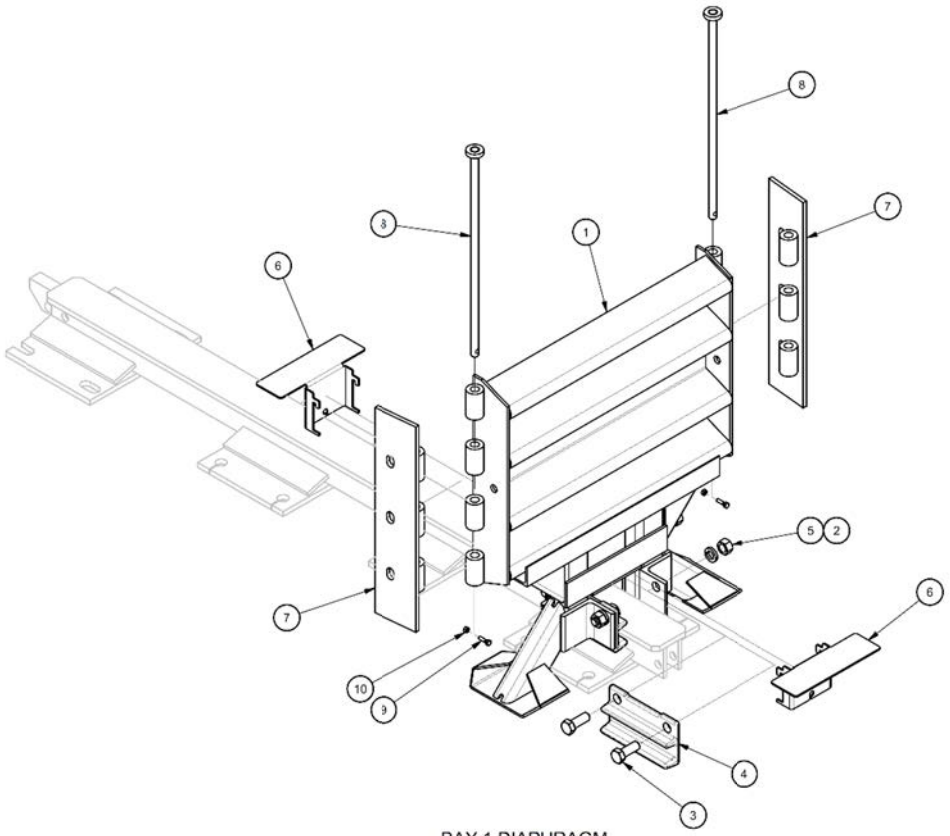


TABLE	
ASSEMBLY	WIDTH
627526	673 [26.5]

BAY 1 DIAPHRAGM

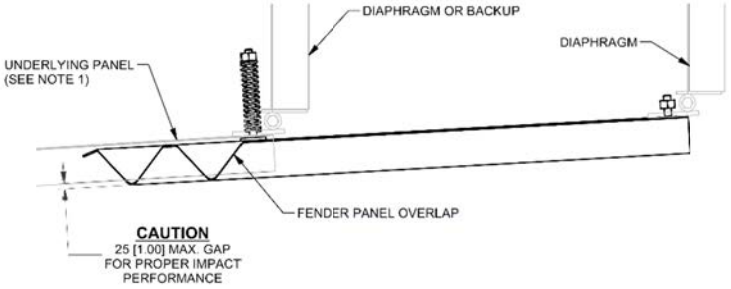
D. Kohfeld	2/20/2020		QUADGUARD® QG M WIDE DIAPHRAGM ASSEMBLY
B. Eckert	2/25/2020	627534.idw	
UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN MILLIMETERS [INCH] DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND TYP-SC-002 UNLESS OTHERWISE SPECIFIED		DO NOT SCALE DRAWING	TRINITY HIGHWAY 627534 - 1 of 3

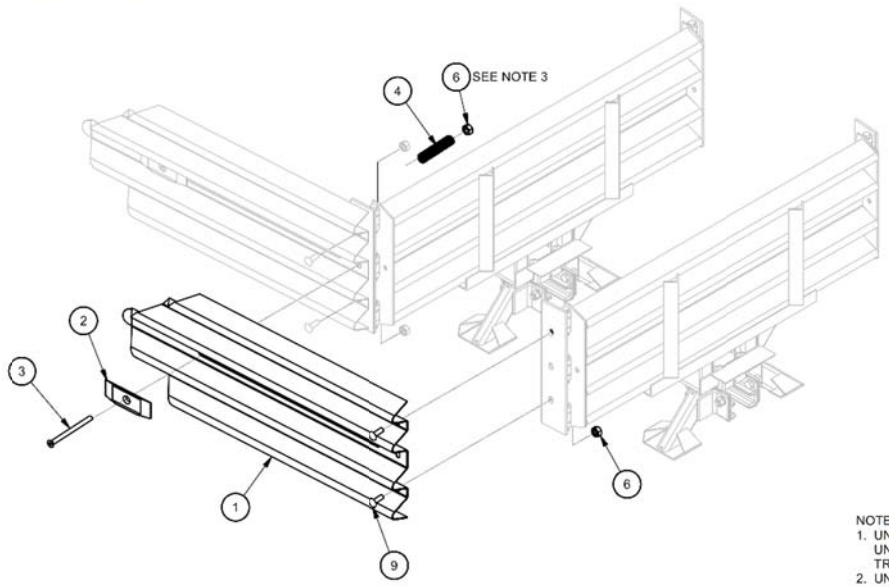
Diaphragm Assembly 627534

PARTS LIST
ITEM
DESCRIPTION
1 DIAPHRAGM.QB
2 WASHER,LOCK,3/4,G
3 BOLT,HX,3/4X2,G8,G
4 MONORAIL GUIDE,QG,G
5 3/4" HVY HEX NUT A563 DH
6 BRACKET,CART SUPT,DIA,FOLDED,QG
7 HINGE PLATE,FENDER PANEL,QG
8 BOLT,HX,5/8X4,G5,G
9 5/8" HVY HEX NUT A563A
10 WASHER,LOCK,5/8,G
TABLE
ASSEMBLY
WIDTH
607175 833 [32.8]
607177 993 [39.1]
607146 1153 [45.4]
607150 1313 [51.7]
607152 1473 [60.0]
STANDARD DIAPHRAGMS
QUADGUARD® QG M WIDE
DIAPHRAGM ASSEMBLY
TRINITY HIGHWAY
D. Kohfeld 2/20/2020
B. Eckert 2/25/2020
627534.idw
DO NOT SCALE DRAWING
627534
2 of 3
© 2020 Trinity Highway Products, LLC. All rights reserved.

673 [26.5]
BAY 1
DIAPHRAGM
833 [32.8]
993 [39.1]
1153 [45.4]
1313 [51.7]
1473 [58.0]
(1620 [63.8])
6 BAY
QG M WIDE SYSTEMS - 1755 [69]
QUADGUARD QG M WIDE
DIAPHRAGM ASSEMBLY
TRINITY HIGHWAY
627534
3 of 3
627534.idw
DO NOT SCALE DRAWING
D. Kohfeld
B. Eckert
2/20/2020
2/25/2020
Revision
INITIAL RELEASE
ECO
Date
Rev
By
Chk.
6821
2/26/20
-
DK
/
© 2020 Trinity Highway Products, LLC. All rights reserved.

Shim Kit 627518





PARTS LIST

ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611832	PANEL,FENDER,QG	1
2	617045	WASHER,MUSHROOM,FORGED,QG,G	1
3	116879	SCREW,FL,5/8X8 1/2,G8,G,SOCKET	1
4	117458	SPRING,DIE,1 1/2 OD X3/4X6,GALV	1
6	003340	NUT,HX,5/8,G,RAIL	3
9	003400	BOLT,RAIL,5/8X2,G	2

TWO FENDER PANEL ASSEMBLIES REQUIRED PER BAY.

NOTES:
1. UNDERLYING PANEL IS A FENDER PANEL IF ATTACHED TO A DIAPHRAGM. UNDERLYING PANEL IS A BACKUP SIDE PANEL, EXTENSION PANEL OR TRANSITION PANEL IF ATTACHED TO THE BACKUP.
2. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
3. TIGHTEN NUT UNTIL IT REACHES END OF THREADS.

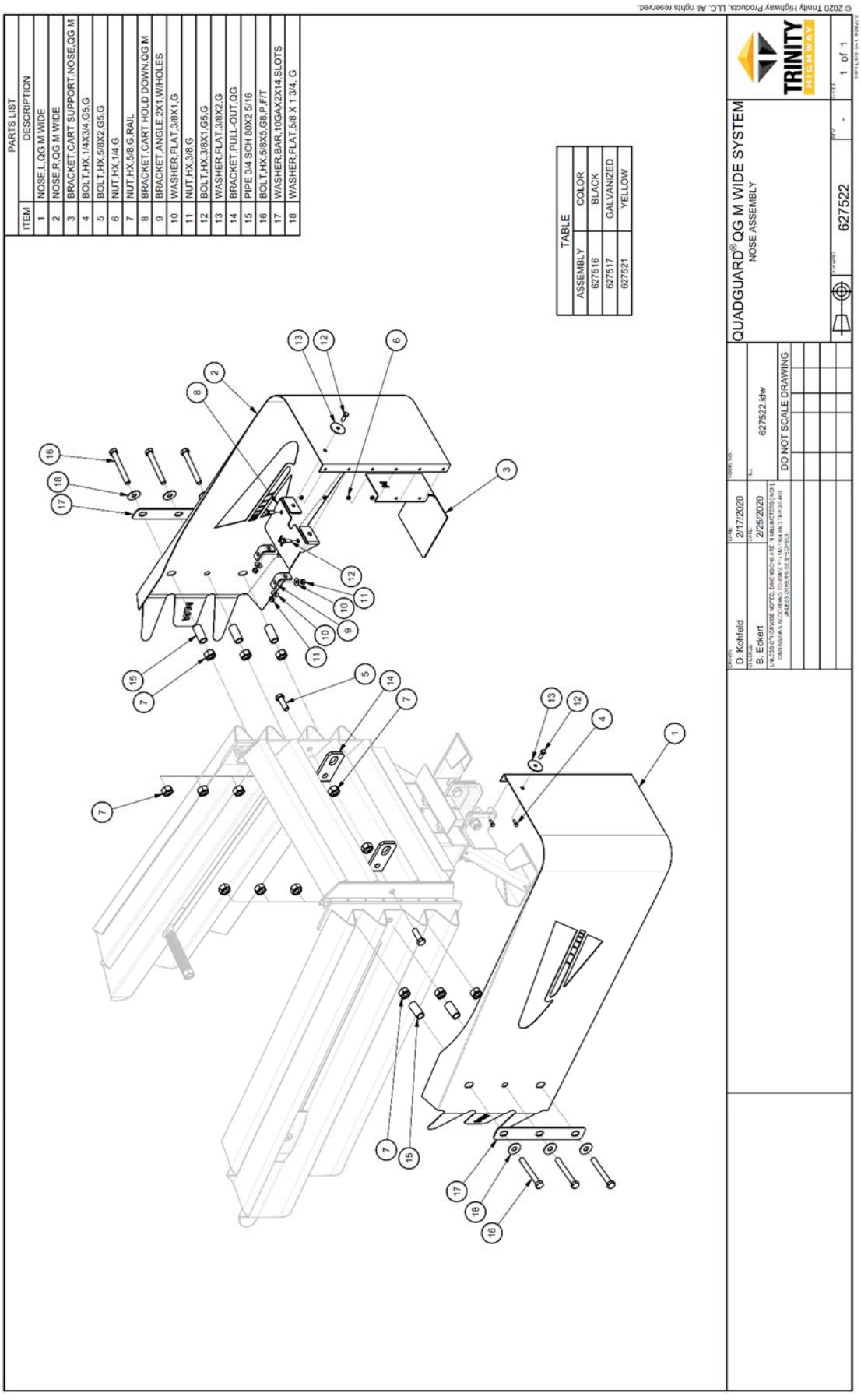
ASSEMBLY NO. 608241

D. Staus	6/12/1997
J. Machado	4/10/1997
KRM	7/7/1997
J. Machado	7/7/1997
608241.idw	

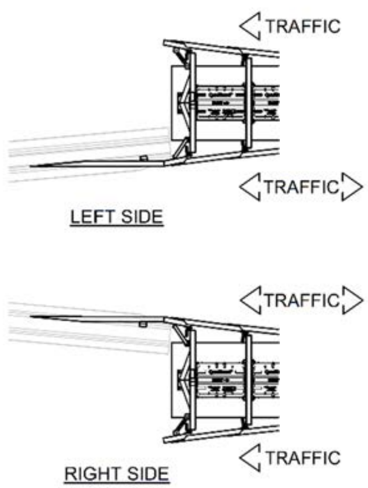
QuadGuard - Wide System
FENDER PANEL ASSEMBLY

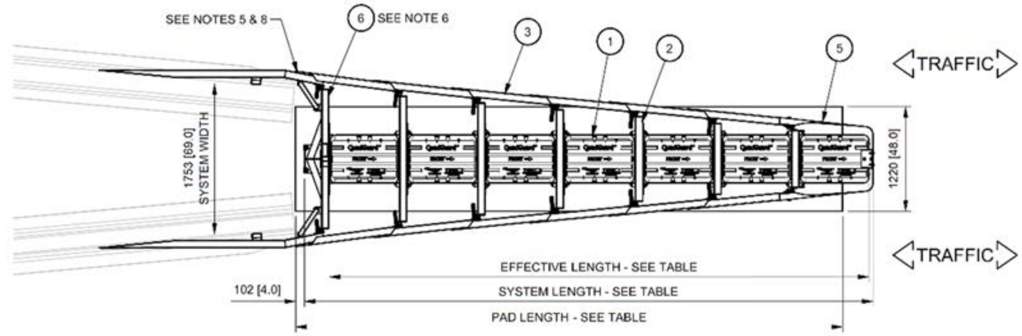
SCALE	DRAWING	SHEET	REV
1 : 16	608241	1 of 1	J

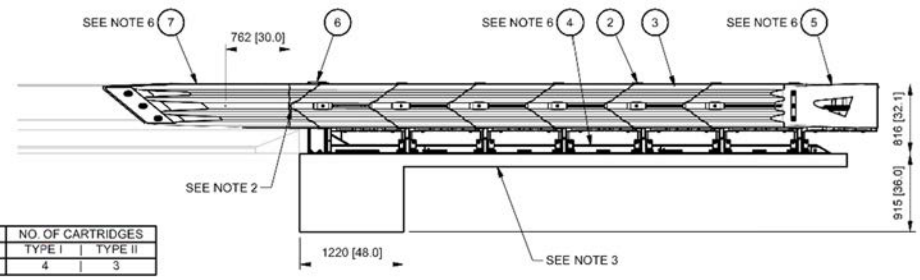
Fender Panel Assembly 608241



Nose Assembly 627522







BAYS	1753 [69"] 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
6	QM10069 (627515)	6.71	[22'-0"]	6.30	[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 762 [30.00] MIN.

3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD WITH ANCHOR BLOCK OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [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 M WIDE 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 M WIDE SYSTEM TO THE OBJECT BEING SHIELDED.

6. BACKUP, MONORAIL, NOSE, AND TRANSITION ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. TRANSITIONS AND HARDWARE ARE ACCESSORY ITEMS.

7. THE QUADGUARD M WIDE SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.

8. THE TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED 25 [1.00]. ANGLE TO BE 5° MAXIMUM WITH RESPECT TO THE SIDE OF THE SYSTEM. FINAL ALIGNMENT TO BE DETERMINED BY PROJECT ENGINEER.

KEY

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

REFERENCES

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

DIAPHRAGM ASSY	627534
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	627522
FENDER PANEL ASSY	608241
BACKUP ASSY	627528
MONORAIL ASSY	625637
CONCRETE PAD	618686
TRANSITION ASSY	627540
ANCHOR PLATE ASSY (OPTIONAL)	626843

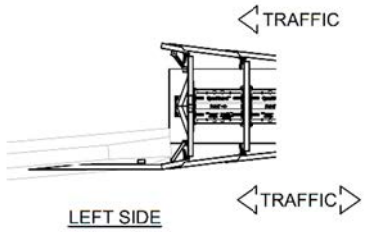
D. Kohfeld 4/29/2020
B. Eckert 5/14/2020
SEE TABLE
QFMTSCVR-T4LRF.idw
DO NOT SCALE DRAWING

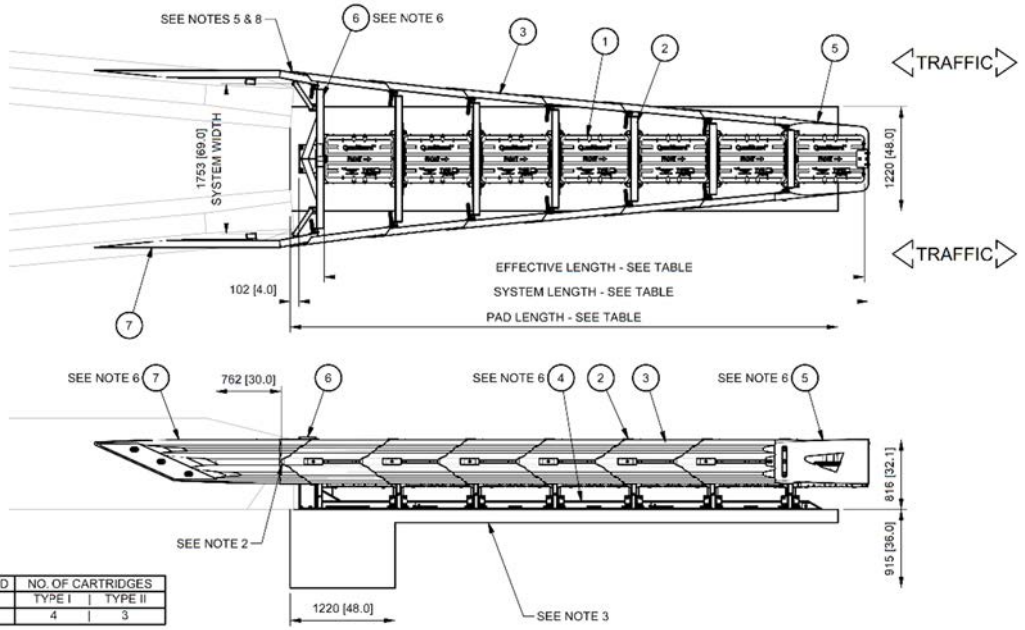
QUADGUARD® M WIDE SYSTEM
W/ TENSION STRUT BACKUP AND 4" OFFSET TO SAFETY SHAPE TRANSITION, FLARED

TRINITY HIGHWAY

QFMTSCVR-T4LRF - 1 of 1

Transition to Safety Shape Barrier QFMTSCVR-T4





BAYS	1753 [69"] 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
6	QM10069 (627515)	6.71 [22'-0"]	6.30 [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 762 [30.00] MIN.
3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD WITH ANCHOR BLOCK OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [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 M WIDE 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 M WIDE SYSTEM TO THE OBJECT BEING SHIELDED.
6. BACKUP, MONORAIL, NOSE, AND TRANSITION ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. TRANSITIONS AND HARDWARE ARE ACCESSORY ITEMS.
7. THE QUADGUARD M WIDE SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.
8. THE TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED 25 [1.00]. ANGLE TO BE 5° MAXIMUM WITH RESPECT TO THE SIDE OF THE SYSTEM. FINAL ALIGNMENT TO BE DETERMINED BY PROJECT ENGINEER.

KEY
1. CARTRIDGE
2. DIAPHRAGM
3. FENDER PANEL
4. MONORAIL
5. NOSE ASSEMBLY
6. BACKUP
7. TRANSITION

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

DIAPHRAGM ASSY	627534
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	627522
FENDER PANEL ASSY	608241
BACKUP ASSY	627528
MONORAIL ASSY	625637
CONCRETE PAD	618686
TRANSITION ASSY	627539
ANCHOR PLATE ASSY (OPTIONAL)	626843

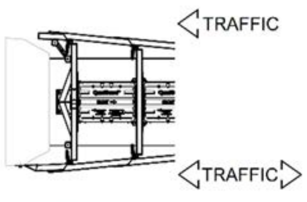
DESIGN	D. Kohfeld	DATE 4/29/2020	SEE TABLE
CHECKED	B. Eckert	DATE 5/14/2020	QFMTSCVR-T6LRF.idw
UNLESS OTHERWISE NOTED, DIMENSIONS ARE IN MILLIMETERS [INCH] DIMENSIONS ACCORDING TO ASME Y14.5M-1994 AND THP-SE-003 UNLESS OTHERWISE SPECIFIED			DO NOT SCALE DRAWING

QUADGUARD® M WIDE SYSTEM
W/ TENSION STRUT BACKUP AND 6" OFFSET TO SINGLE SLOPE TRANSITION, FLARED

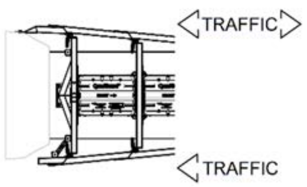
TRINITY HIGHWAY

QFMTSCVR-T6LRF | REV - | 1 of 1

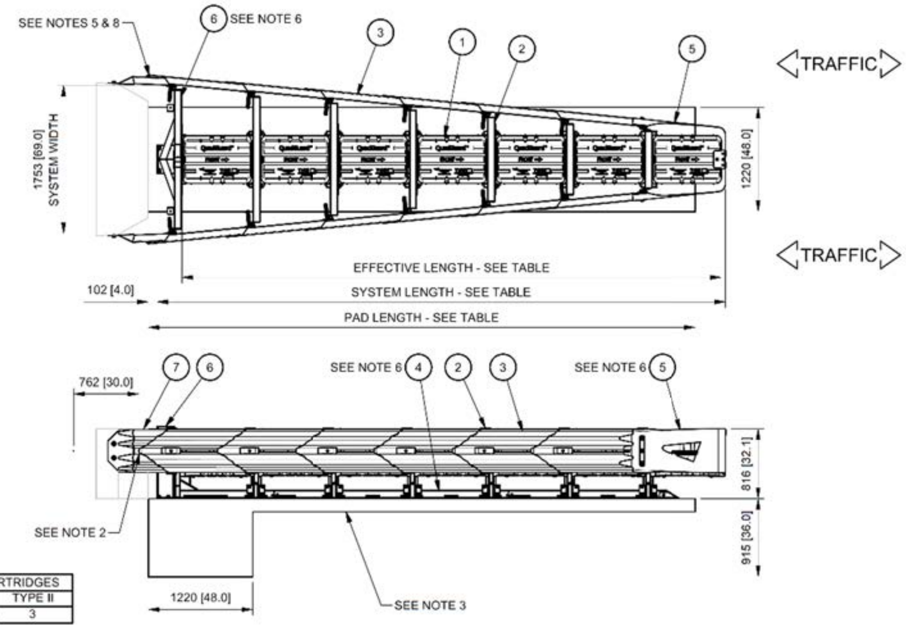
Transition to Single Slope QFMTSCVR-T6



LEFT SIDE



RIGHT SIDE



BAYS	1753 [69"] 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
6	QM10069 (627515)	6.71	[22'-0"]	6.30	[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 762 [30.00] MIN.
3. 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD WITH ANCHOR BLOCK OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [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 M WIDE 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 M WIDE SYSTEM TO THE OBJECT BEING SHIELDED.
6. BACKUP, MONORAIL, NOSE, AND TRANSITION ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. TRANSITIONS AND HARDWARE ARE ACCESSORY ITEMS.
7. THE QUADGUARD M WIDE SYSTEM HAS BEEN TESTED TO MASH TEST LEVEL 3.
8. THE TRANSITION PANEL SHALL BE ANGLED SUCH THAT MAXIMUM GAP FROM FENDER PANEL OVERLAP DOES NOT EXCEED 25 [1.00]. ANGLE TO BE 5° MAXIMUM WITH RESPECT TO THE SIDE OF THE SYSTEM. FINAL ALIGNMENT TO BE DETERMINED BY PROJECT ENGINEER.

KEY

① CARTRIDGE
② DIAPHRAGM
③ FENDER PANEL
④ MONORAIL
⑤ NOSE ASSEMBLY
⑥ BACKUP
⑦ END SHOE

REFERENCES

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

DIAPHRAGM ASSY	627534
DIAPHRAGM SHIM KIT	627518
NOSE ASSY	627522
FENDER PANEL ASSY	608241
BACKUP ASSY	627528
MONORAIL ASSY	625637
CONCRETE PAD	618686
END SHOE ASSY	627729

D. Kohfeld 4/29/2020
B. Eckert 5/14/2020
SEE TABLE
QFMTSCVR-ESLR.idw
DO NOT SCALE DRAWING

QUADGUARD® M WIDE SYSTEM
W/ TENSION STRUT BACKUP AND END SHOES

QFMTSCVR-ESLR - 1 of 1

TRINITY HIGHWAY

Transition to Vertical Barrier QFMTSCVR-ESLR

NOTES:

NOTES:

INGAL CIVIL PRODUCTS
A valmont COMPANY

www.ingalcivil.com.au
sales@ingalcivil.com.au
1300 446 425

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.