

# QuadGuard<sup>®</sup> II

## Product Description Manual



**TRINITY**  
**HIGHWAY**

*Ahead of the Curve<sup>®</sup>*

# QuadGuard® II

The QuadGuard® II has been tested pursuant to National Cooperative Highway Research Program (“NCHRP Report 350”) specifications. The QuadGuard® II has been deemed eligible for federal-aid reimbursement on the National Highway System by the Federal Highway Administration (“FHWA”).

## Product Description Manual



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

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

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## **Customer Service Contacts**

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

### **Trinity Highway**

Telephone	(888) 323-6374 (USA) +1 312 467 6750 (International)
E-mail	<a href="http://TrinityHighway.com/Contact">TrinityHighway.com/Contact</a>
Website	<a href="http://TrinityHighway.com">TrinityHighway.com</a>

## **Limitations and Warnings**

Trinity Highway contracts with FHWA approved testing facilities to perform crash tests, evaluate test results, and submit results to the FHWA for review.

The QuadGuard® II has been deemed eligible for reimbursement by FHWA as meeting the requirements and guidelines of NCHRP Report 350. NCHRP Report 350 tests are designed to evaluate product performance involving a range of vehicles on roadways, from lightweight cars (approx. 1800 lb. [820 kg]) to full size pickup trucks (approx. 4400 lb. [2000 kg]). A product can be certified for multiple Test Levels. The QuadGuard® II is certified to the Test Level(s) as shown below:

**Test Level 2: 43 mph [70 km/h]**

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

**These FHWA directed tests are not intended to represent the performance of systems when impacted by every vehicle type or every impact condition existing on the roadway. This system is tested only to the test matrix criteria of NCHRP Report 350 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® II 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 its site specifications. The customer should be careful to properly select, assemble, and maintain the product. Site lay out, vehicle population type; speed, traffic direction, and visibility are important elements that require evaluation in the selection of a highway product. For example, curbs could cause an untested effect on an impacting vehicle.

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

## System Overview

The QuadGuard® II is a potentially reusable, re-directive, non-gating crash cushion for roadside obstacles ranging in width from 24" to 126" [610 mm to 3200 mm]. It consists of energy-absorbing cartridges surrounded by a framework of Quad-Beam™ Panels. The decision as to whether this product is reusable after impact rests solely within the sound discretion of the trained engineer, experienced in highway products, who is working at the direction of the local DOT, or appropriate highway authority, which specified and now owns the product.

The QuadGuard® II utilizes two types of cartridges in a staged configuration designed to address both lighter cars and heavier, high center-of-gravity vehicles. Its modular design allows the system length to be tailored to the design speed and appropriate number of Bays for a site (p. 10).

### **Impact Performance**

The 5 Bay QuadGuard® II has successfully passed the requirements outlined in NCHRP Report 350, Test Level 3 tests with both the light car and pickup at speeds of up to 62 mph [100 km/h] at angles up to 20 degrees.

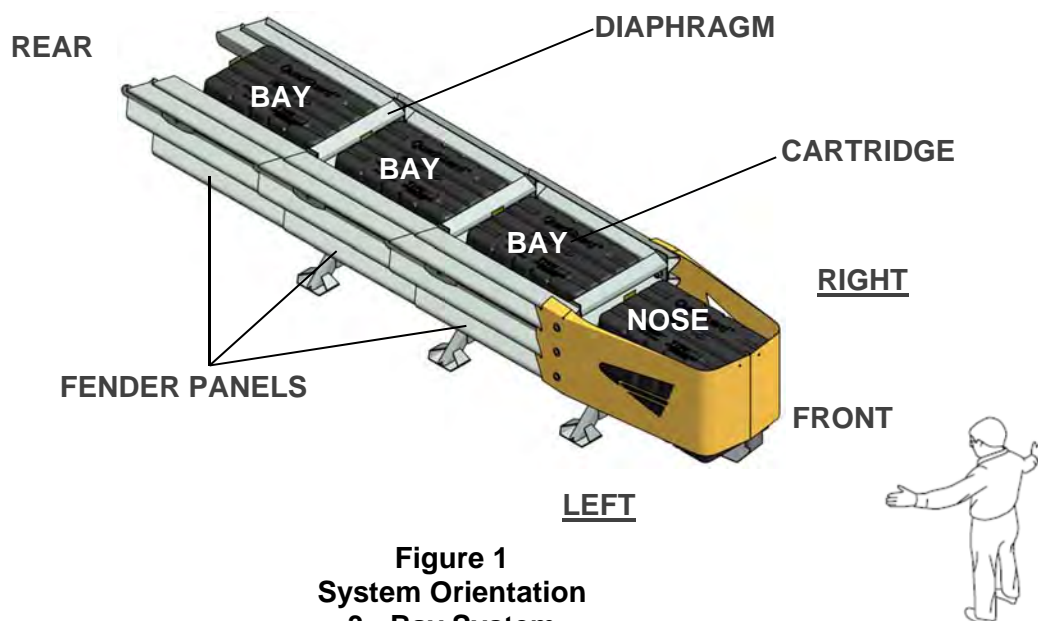
During head-on impact testing, within NCHRP Report 350 criteria, the QuadGuard® II is designed to telescope rearward to absorb the energy of impact. When impacted from the side, within the applicable NCHRP Report 350 criteria, it is designed to redirect the vehicle back toward its original travel path and away from the roadside obstacle.

### **How to Determine Left/Right**

To determine left from right when ordering parts, stand in front of the system facing the roadside feature. 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, two Fender Panels, etc. The Nose section is not considered a Bay, though there is a Cartridge in the Nose of each system. Note that this means 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 1).





## Measuring the Width

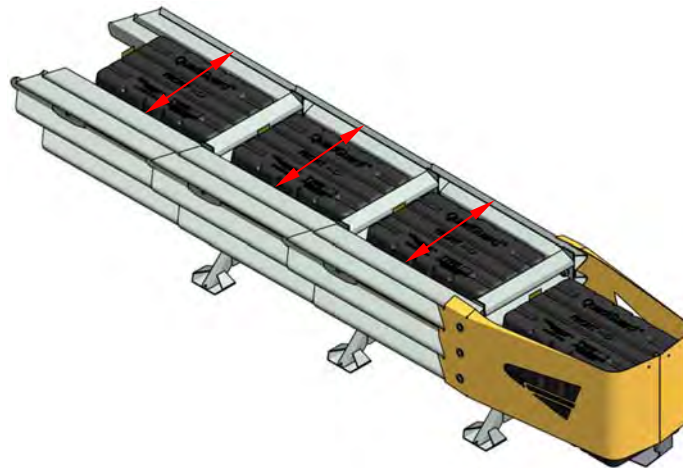
The QuadGuard® II is available in seven (7) nominal widths:

- 24" [610 mm]
- 30" [760 mm]
- 36" [915 mm]
- 48" [1219 mm]
- 69" [1755 mm] - (Minimum 3 Bays Required)
- 90" [2285 mm] - (Minimum 3 Bays Required)
- 126" [3200 mm] - (Minimum 6 Bays Required)

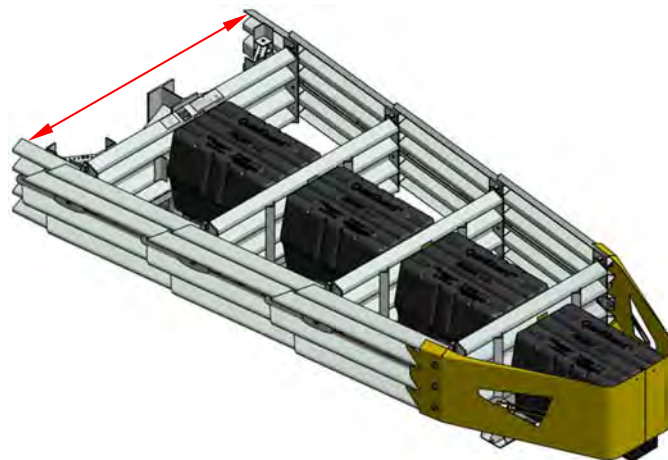
The nominal width of a parallel system is the width of the diaphragm (Figure 2).

The nominal width of a wide system is the width at the location shown in Figure 3.

The outside width of the system is approximately 6" [150 mm] to 9" [230 mm] wider than the nominal width. The width of the system is not the same as the width of the Backup.



**Figure 2**  
**Width of Narrow system**



**Figure 3**  
**Width of Wide system**

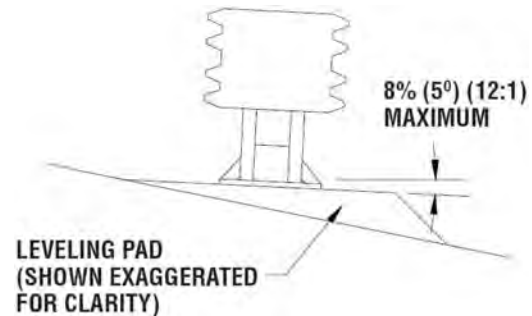
## **Trinity Highway Approved Adhesive Anchoring System**

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

### **Site Conditions**

**Cross-slope exists** – If there is a cross-slope of more than 8% (5 degrees), or if the cross-slope varies (twists) more than 2% (1 degree) over the length of the system, a concrete leveling pad may be required (Figure 4).

**No cross-slope** – No additional action is required.



**Figure 4  
Cross-Slope**

#### **1) Specify Backup Structure**

The two Backup designs available are the Tension Strut Backup and the Concrete Backup. Both types are appropriate for use on grade or deck.

#### **2) Special Conditions**

Contact Trinity Highway Customer Service Department if you would like input with your application. You will need to answer the following questions:

- 1. Are curbs, islands or elevated objects (delineators or signs) present at the site? What height and width are they?** All curbs and elevated objects over 4" [100 mm] high should be removed. If possible, curbs taller than 4" [100 mm] high should be removed approximately 50' [15 m] in front of the QuadGuard® II and as far back as the system's Backup. Any curbs that must remain should be 4" [100 mm] maximum and be mountable.
- 2. What is the angle of divergence** if the construction site is a gore area?

**What is the general geometry of the site**, including the roadway for at least 500' [150 m] in front, so traffic patterns can be visualized?

- 3. Is there an existing barrier?** Where there is an existing guardrail or median barrier at the site, the Backup of the QuadGuard® II should tie into it when possible.
- 4. Will there be traffic approaching from the rear of the system?** Is the system in a two-way traffic situation, with traffic going in opposite directions on either side of the system? Or, is the system on the side of the road in a location where crossover traffic is a concern? If so, a Transition from the back of the system to the hazard is necessary to prevent vehicle interaction (pp. 12 & 13).
- 5. Are there any other unique features at the site that may affect positioning or performance of the QuadGuard® II?**

### 3) Other Factors that May Affect Your Deployment:

1. The existence of drain inlets.
2. Junction boxes or other appurtenances located near the hazard.
3. Insufficient space for the length preferred.
4. The location and movement of expansion joints.

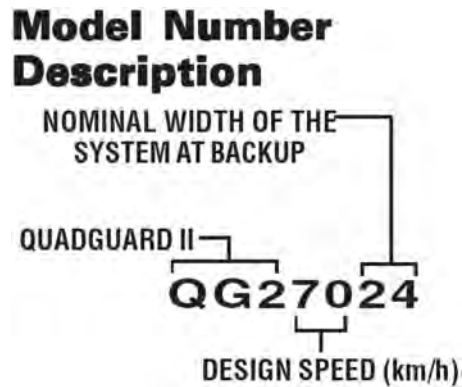
If these or any other special site conditions exist, please contact Trinity Highway Customer Service Department before proceeding with your design (p. 3).



**Important:** It is the responsibility of the appropriate highway authority to select the location for the QuadGuard II in accordance with the Roadside Design Guide. Trinity Highway is not responsible for choosing the location where a system will be placed.

Impact conditions which differ from those described in the NCHRP Report 350 test matrix for non-gating, redirecting crash cushions may result in different crash results than those encountered in testing.

Furthermore, impacts in excess of TL-3 impact severity, or the existence (at the site of assembly) of curbs or cross-slopes in excess of 8%, may yield performance which does not meet NCHRP Report 350 evaluation criteria relative to structural adequacy, occupant risk and vehicle trajectory factors.



**Figure 5  
Model Number Key**

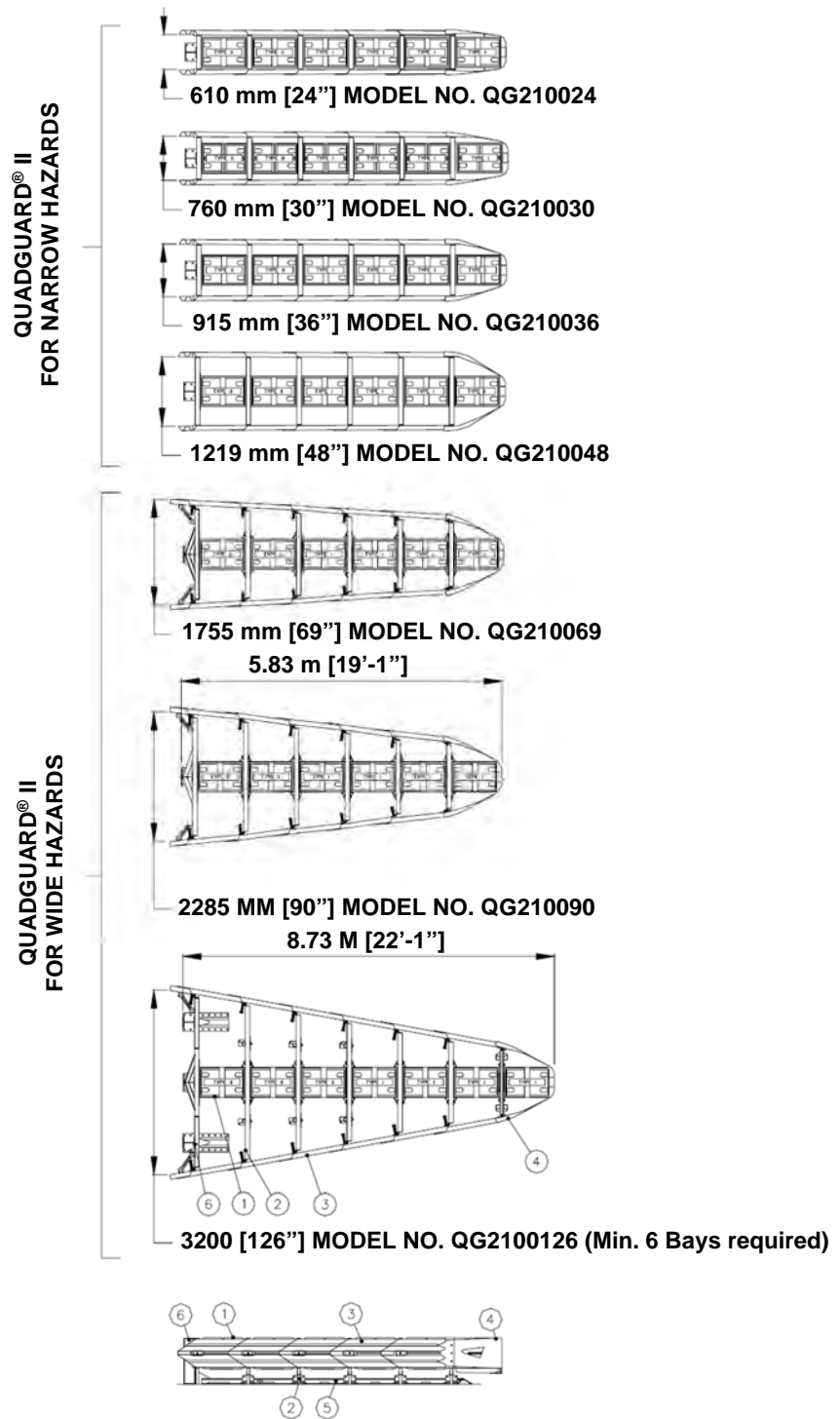


These following charts represent the modified versions of the QG II length relative to impact speed, which is based on the capacity of the system using a 2000 kg [4400 lb.] pickup truck.

<b>Speed &amp; Cartridge Placement Chart For Narrow Systems</b>				
<b># of Bays</b>	<b>Model #</b>	<b>kph [mph]</b>	<b>Type I</b>	<b>Type II</b>
1*	QG 240__	40 [25]	2	0
2	QG 270__	70 [44]	2	1
3*	QG 280__	80 [50]	2	2
4*	QG 290__	90 [56]	3	2
5	QG 2100__	100 [62]	3	3
6*	QG 2105__	105 [65]	4	3
7*	QG 2110__	110 [68]	4	4
8*	QG 2115__	115 [71]	4	5
9*	QG 2120__	120 [75]	4	6

<b>Speed &amp; Cartridge Placement Chart For Wide Systems</b>				
<b># of Bays</b>	<b>Model #</b>	<b>kph [mph]</b>	<b>Type I</b>	<b>Type II</b>
3*	QG 270__	70 [44]	2	2
4*	QG 280__	80 [50]	3	2
5*	QG 2100__	100 [62]	3	3
6*	QG 2105__	105 [65]	4	3
7*	QG 2110__	110 [68]	4	4
8*	QG 2115__	115 [71]	4	5
9*	QG 2120__	120 [75]	4	6

\*System capacity estimated through calculation.



**Figure 6  
Plan & Elevation  
5 - Bay system with Tension Strut Backup**

# **Transitioning**

## **Quad-Beam™ End Shoe Transition Panel**

The Quad-Beam™ End Shoe Panel transitions the QuadGuard® II system to vertical faced concrete structures whether it is a concrete Backup or concrete barrier wall (p. 13). An Extended End Shoe is also available. In cases where the corners of the hazard are not chamfered, it may be necessary to add wheel deflectors to the structure in order to prevent wheel interaction.

## **Quad-Beam™ to Guardrail Transition Panel (W-Beam and Thrie-Beam)**

The Quad-Beam™ to W-Beam and Quad-Beam™ to Thrie-Beam Transition Panels transition the QuadGuard® II system to new and existing runs of standard guardrail (p. 13).

## **Quad-Beam™ to Safety Barrier Transition Panel**

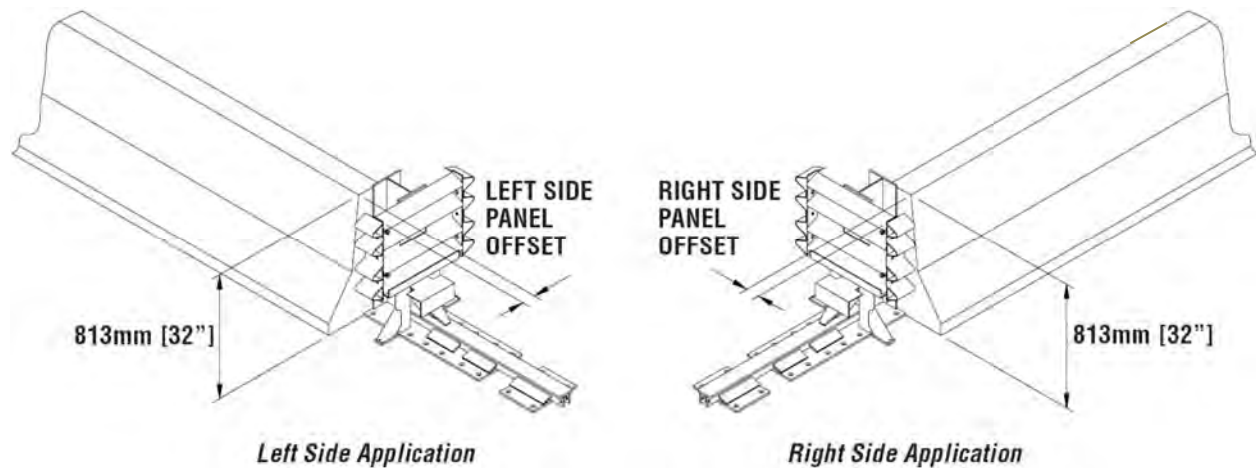
There are several options available when transitioning the QuadGuard® II system to safety shape barrier depending on the shape and position of the barrier.

When transitioning to barriers with a “New Jersey” style profile, the 4” offset Transition Panel is most commonly used (p. 13). For transitioning to barriers that are in line with the side of the system, use transition assembly 616041B or 616044B. For transitioning a wide system to barrier that runs parallel to the centerline of the system, transition assembly 616048B or 616049B is used. A 9” offset Transition Panel is also available for transitioning to barriers that are in line with the side of the system.

When transitioning the Single Slope style barriers and parapets, 6” and 8” offset Transition Panels are available. For transitioning a wide system to barrier that runs parallel to the centerline of the system, a 6” offset panel is available.

### **How do you determine the Transition Panel offset?**

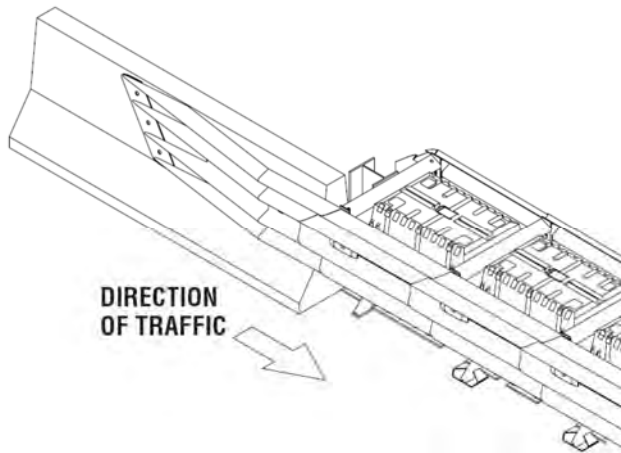
Transition Panel offset is determined by measuring the distance between the face of the barrier and the top edge of the Backup Diaphragm at 32” above ground level (Figure 7). Remember, when assembling the QuadGuard® II that the correct Transition Panel offset must be achieved in order for the offset bracket to nest between the barrier and Transition Panel ensuring proper performance of the transition.



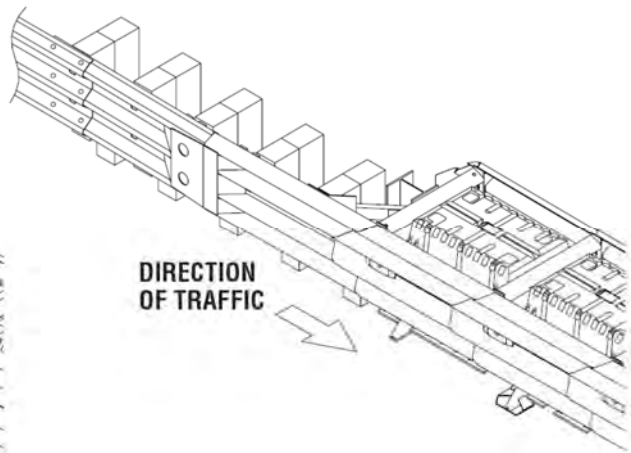
**Figure 7  
Transition Panel Offset**

## Transition Panel Types

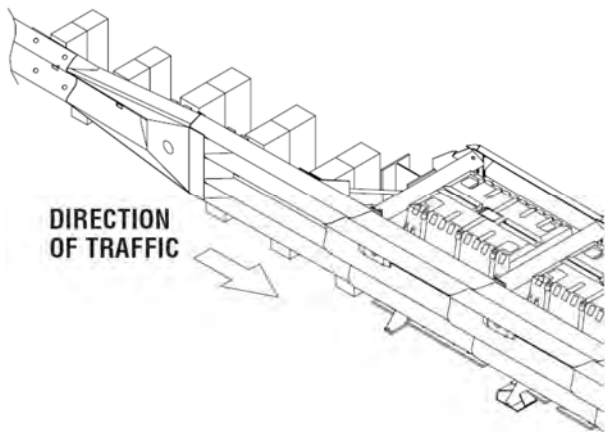
If a system is placed in a location where traffic will be approaching from the rear, a Transition Panel is necessary. Standard panel types are illustrated below and there are variations for each panel type. The specific panel applied will depend on system and site conditions. Therefore, it is important to send site specific data to the Trinity Highway Customer Service Department for exact panel requirements of your application.



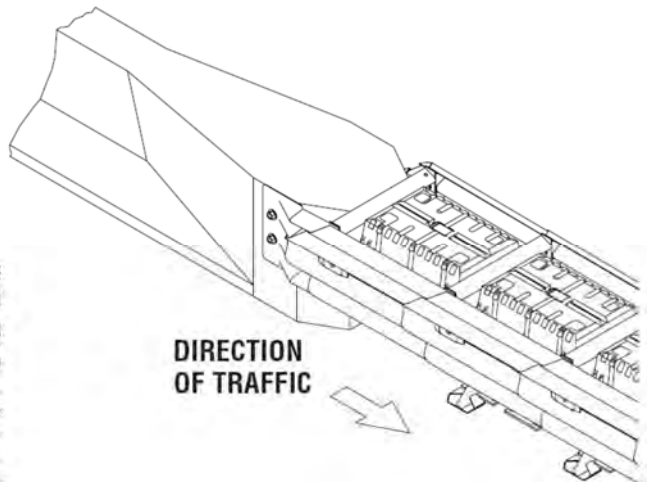
**Figure 8**  
**Quad-Beam™ to Safety Barrier**  
**(NJ shape) Transition Panel**



**Figure 9**  
**Quad-Beam™ to Thrie-Beam**  
**Transition Panel**



**Figure 10**  
**Quad-Beam™ to W-Beam**  
**Transition Panel**



**Figure 11**  
**Quad-Beam™ End Shoe**  
**Transition Panel**

## QuadGuard® II CZ Deployment Criteria

This portable compact crash cushion is for **construction zones**. The QuadGuard® II CZ is available in the same narrow sizes as permanent systems.

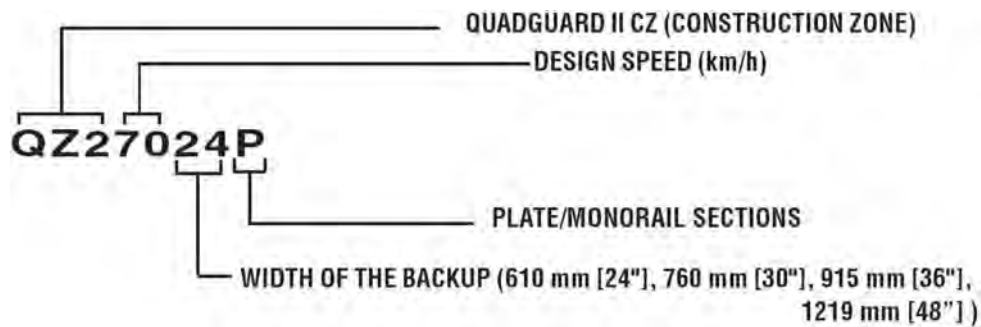
The QuadGuard® II CZ must be properly anchored.



**Important:** QuadGuard® II wide systems should not be anchored to asphalt.

QuadGuard® II CZ Plate Model Numbers and Widths			
Number of Bays	610 mm [24"]	760 mm [30"]	915 mm [36"]
2	QZ27024P	QZ27030P	QZ27036P
5	QZ210024P	QZ210030P	QZ210036P

### Model Number Description



**Figure 12**  
**Model Number Key**

## **Foundation/Anchoring**



**Warning:** It is the responsibility of the installer that this assembly conforms with the guidance provided by the AASHTO Roadside Design Guide, including, but not limited to, those regarding placement on or adjacent to curbs.

### **Asphalt Installations**

Systems with a Tension-Strut Backup may be temporarily installed in construction zones on asphalt. Assemblies on **Asphalt Concrete (“A.C.”)** must provide a minimum of 76 mm [3”] layer of asphalt over a minimum of 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 203 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. Contact Trinity Highway for a complete list of approved adhesives (p. 3).

### **Concrete Installations**

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

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

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

#### **Foundation A: Reinforced Concrete Pad or Roadway**

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

Anchorage: Approved adhesive with 180 mm [7”] studs 140 mm [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”] 420 mm [16 1/2”] embedment

#### **Foundation C: Asphalt over Subbase**

Foundation: 150 mm [6”] minimum A.C. over 150 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.

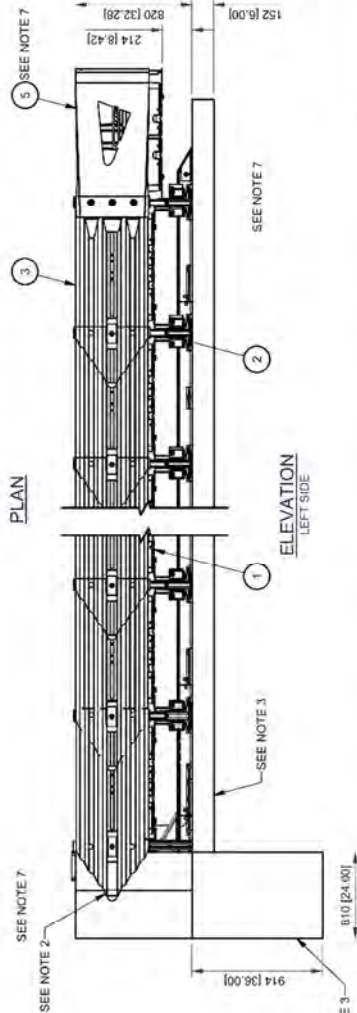
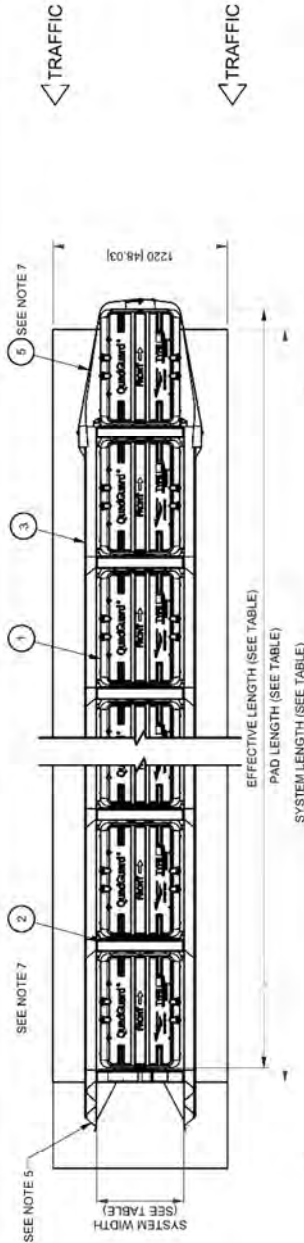
Anchorage: Approved adhesive with 460 mm [18”] studs - 420 mm [16 1/2”] embedment







# QG2CBCVR-U



- NOTES:
1. IN COMPLIANCE WITH THE AASHTO 2011 ROADSIDE DESIGN GUIDE, THIS SYSTEM IS DESIGNED TO PROVIDE IMPACT RESISTANCE 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. 15016.00) MIN. REINFORCED MPa (6000 PSI) P.C. CONCRETE SHALL BE USED FOR THE CONCRETE BACKUP. THE REAR FENDER PANEL SHALL BE P.C. CONCRETE ROADWAY MEASURING AT LEAST (3.66 TO (12.07) 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 II 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) 352-6374.
  5. WHERE NECESSARY, THE CUSTOMER SHALL SUPPLY AN ADEQUATE TRANSITION FROM THE QUADGUARD II SYSTEM TO THE OBJECT BEING SHIELDED.
  6. UNITS OF MEASUREMENT ARE MILLIMETERS (INCHES) UNLESS OTHERWISE NOTED.
  7. BACKUP, MONORAIL, AND NOSE ASSEMBLIES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY.
  8. THE QUADGUARD II HAS BEEN FULLY TESTED TO NCHRP 350.

\* SYSTEM CAPACITY ESTIMATED THROUGH CALCULATION

BAYS	610 (24') WIDTH	762 (30') WIDTH	914 (36') WIDTH	1220 (48') WIDTH	EFFECTIVE LENGTH	PAD LENGTH	MAX DESIGN SPEED	NO. OF CARTRIDGES	
	MODEL NO.	MODEL NO.	MODEL NO.	MODEL NO.	m	ft/in	km/h	TYPE I	TYPE II
1*	QG24024	QG24030	QG24036	QG24043	1.73 [5'-5"]	1.68 [5'-5"]	40 [25]	2	0
2	QG27024	QG27030	QG27036	QG27043	2.52 [8'-3"]	2.59 [8'-5"]	70 [43]	2	1
3*	QG28024	QG28030	QG28036	QG28043	3.43 [11'-3"]	3.51 [11'-5"]	80 [50]	2	2
4*	QG29024	QG29030	QG29036	QG29043	4.34 [14'-3"]	4.42 [14'-5"]	90 [60]	3	2
5	QG21024	QG21030	QG21036	QG21043	5.26 [17'-3"]	5.33 [17'-5"]	100 [62]	3	3

### REFERENCES

SERIAL NO.	DIAPHRAGM ASSY.	625850
SALES ORDER	DIAPHRAGM SHIM KIT	61065
EH PROJECT	NOSE ASSY	611540
DESIGN SPEED	FENDER PANEL ASSY.	609236
NOSE TYPE	MONORAIL ASSY.	35-40-08 604507
NO. OF UNITS	CONCRETE PAD	611367
		35-40-09

### KEY

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

DATE	3/31/2009	BY	D. Kohfeld
DATE	4/21/2006	BY	R. Broughtner
DATE	3/25/2002	BY	TRINITY HIGHWAY
DATE	3/25/2002	BY	TRINITY HIGHWAY

UNIDIRECTIONAL

**QUADGUARD® II SYSTEM**  
WITH CONCRETE BACKUP

MODEL NO. QG2CBCVR-U

DATE 3/31/2009

BY D. Kohfeld

DATE 4/21/2006

BY R. Broughtner

DATE 3/25/2002

BY TRINITY HIGHWAY

DATE 3/25/2002

BY TRINITY HIGHWAY

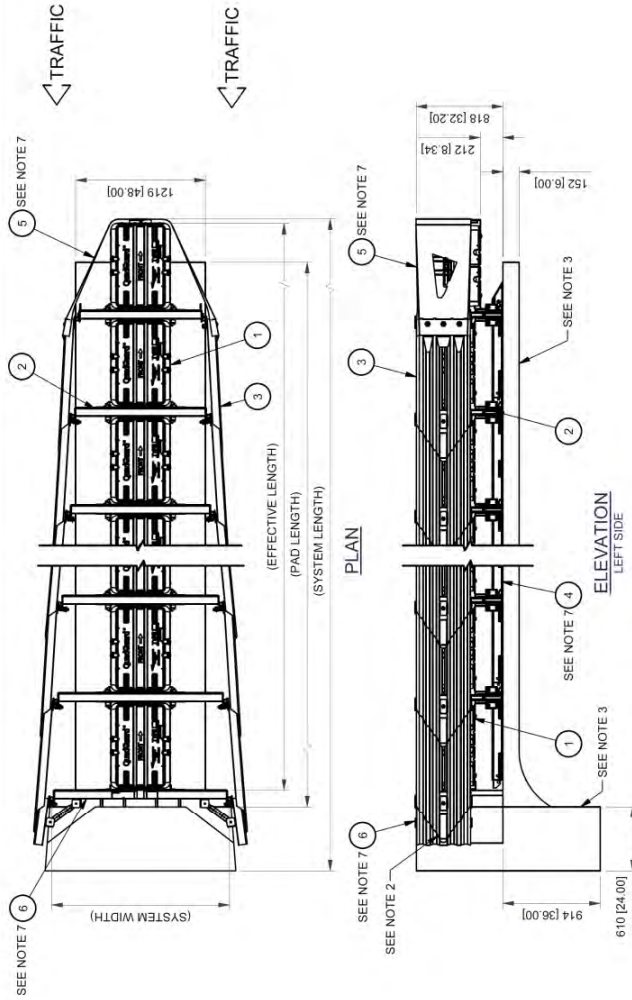
DO NOT SCALE DRAWING

1 of 1

## QuadGuard® II w/Concrete Backup



**QF2CBCVR-U**



- 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. MONORAIL SHALL BE 28MPa (4000 PSI) P.C. CONCRETE PAD OR 200 (8.00) MIN. NON-REINFORCED.
  3. 50 (6.00) MIN. REINFORCED 28 MPa (4000 PSI) P.C. CONCRETE PAD OR 200 (8.00) MIN. NON-REINFORCED.
  4. 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.
  5. SEE THE QUADGUARD II SYSTEM PRODUCT MANUAL FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION IS PROVIDED FOR YOUR INFORMATION ONLY. THE CUSTOMER SHALL SUPPLY AN ADEQUATE TRANSITION FROM THE QUADGUARD II SYSTEM TO THE OBJECT BEING SHIELDED.
  6. UNITS OF MEASUREMENT ARE MILLIMETERS (INCHES) UNLESS OTHERWISE NOTED.
  7. BACKUP, MONORAIL AND NOSE ASSEMBLES ARE NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY.
  8. THE QUADGUARD II FAMILY HAS BEEN FULLY TESTED TO NCHRP 350.

**\* SYSTEM CAPACITY ESTIMATED THROUGH CALCULATION**

BAYS	1753 (69") WIDTH	2285 (90") WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	PAD LENGTH	MAX DESIGN SPEED	NO. OF CARTRIDGES
	MODEL #	MODEL #	m / ft	m / ft	m / ft	Kmph / MPH	TYPE I / TYPE II
3	CG27069	4.54 [14'-3"]	3.56 [11'-8"]	4.42 [14'-5"]	70 [43]	2	2
4*	CG28069	5.26 [17'-3"]	4.42 [14'-5"]	5.33 [17'-6"]	80 [50]	3	2
5	CG21069	6.17 [20'-3"]	5.33 [17'-6"]	5.33 [17'-6"]	100 [62]	3	3

**REFERENCES**

SERIAL NO.	DESCRIPTION
607173	DIAPHRAGM ASSY.
614050	DIAPHRAGM SHIM KIT
611583	NOSE ASSY.
609241	FENDER PANEL ASSY.
604513	BACKUP ASSY.
35-40-06	MONORAIL ASSY.
35-40-11	CONCRETE PAD

**KEY**

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

**SEE TABLE**

DATE	DESCRIPTION
4/6/2009 <td>QF2CBCVR-U.dwg</td>	QF2CBCVR-U.dwg
4/15/2009 <td>DO NOT SCALE DRAWING</td>	DO NOT SCALE DRAWING

**UNIDIRECTIONAL**



PROJECT	NO.	REV.
QUADGUARD® II SYSTEM WITH CONCRETE BACKUP	QF2CBCVR-U	F

DATE	DESCRIPTION
4/6/2009 <td>QF2CBCVR-U.dwg</td>	QF2CBCVR-U.dwg
4/15/2009 <td>DO NOT SCALE DRAWING</td>	DO NOT SCALE DRAWING

NO.	REV.	DESCRIPTION
1		

NO.	REV.	DESCRIPTION
1		

NO.	REV.	DESCRIPTION
1		

NO.	REV.	DESCRIPTION
1		

NO.	REV.	DESCRIPTION
1		

NO.	REV.	DESCRIPTION
1		

**QuadGuard® II w/Concrete Backup Wide**



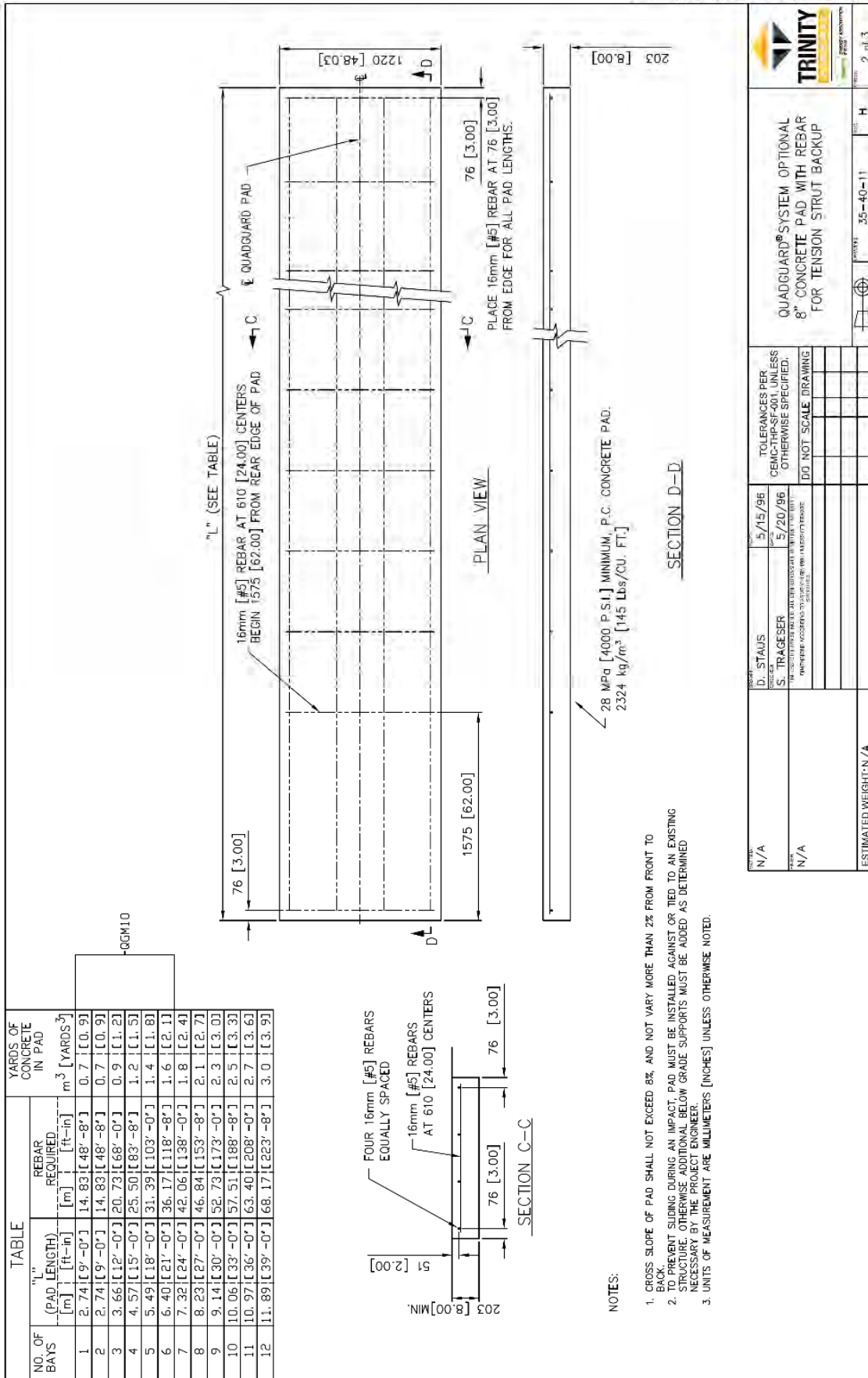
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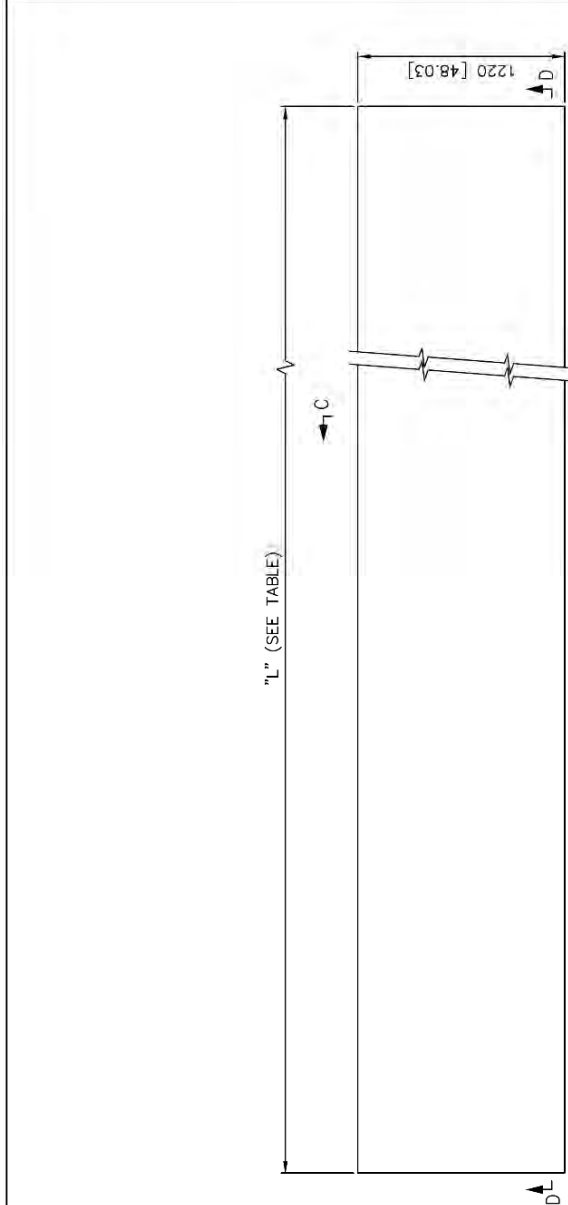


35-40-11 - 2 of 3

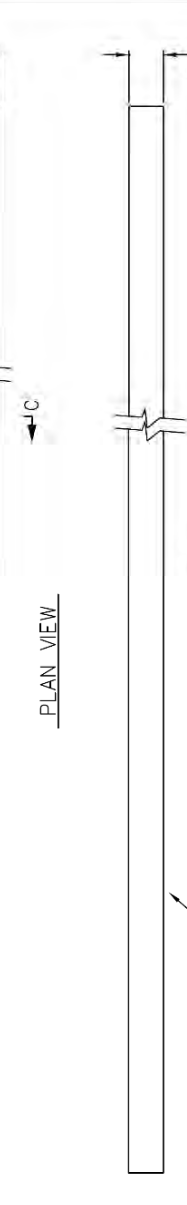


35-40-11 – 3 of 3

NO. OF BAYS	"L" (PAD LENGTH)		YARDS OF CONCRETE IN PAD m <sup>3</sup> [YARDS <sup>3</sup> ]
	[ft-in]	[m]	
1	2.74 [9'-0"]	0.7 [0.9]	-QGM10
2	2.74 [9'-0"]	0.7 [0.9]	
3	3.66 [12'-0"]	0.9 [1.2]	
4	4.57 [15'-0"]	1.2 [1.5]	
5	5.49 [18'-0"]	1.4 [1.8]	
6	6.40 [21'-0"]	1.6 [2.1]	
7	7.32 [24'-0"]	1.8 [2.4]	
8	8.23 [27'-0"]	2.1 [2.7]	
9	9.14 [30'-0"]	2.3 [3.0]	
10	10.06 [33'-0"]	2.5 [3.3]	
11	10.97 [36'-0"]	2.7 [3.6]	
12	11.89 [39'-0"]	3.0 [3.9]	



SECTION C-C



← 28 MPa [4000 P.S.I.] MINIMUM, P.C. CONCRETE PAD.  
2324 kg/m<sup>3</sup> [145 Lbs/CU. FT.]

NOTES:

1. GROSS 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.
3. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
4. IMPROPER CONSTRUCTION PRACTICES, SUCH AS OVERCURE, OVERWATERING, OR EXPOSURE TO DRAMATIC TEMPERATURE CHANGES, TO PREVENT CRACKING, REINFORCE PAD AS NECESSARY.

SECTION D-D

DESIGNER: J. SIMMONS	DATE: 1/12/16	TOLERANCES PER CEMC-THP-SF-001, UNLESS OTHERWISE SPECIFIED.	QUADGUARD® SYSTEM OPTIONAL 8" CONCRETE PAD WITHOUT REBAR FOR TENSION STRUT BACKUP	SCALE: 3 of 3
DRAWN BY: R. BROUGHER	DATE: 1/12/16	DO NOT SCALE DRAWING		
REVISIONS ACCORDING TO AASHTO AND AISC CONFORMANCE SPECIFICATIONS				
ESTIMATED WEIGHT: N/A				

Optional 8" Concrete Pad Without Rebar for Tension Strut Backup



604570

**TABLE A**

ASSY. NO.	STOCK NO.	DESCRIPTION	WIDTH
604570	604741	BACKUP.TS.24.OG.WITH DECALS.G	610 (24.00)
604574	604748	BACKUP.TS.30.OG.WITH DECALS.G	760 (30.00)
604584	604762	BACKUP.TS.38.OG.WITH DECALS.G	915 (36.00)
604590	604770	BACKUP.TS.46.OG.WIDEDECALS	1219 (48.00)

**NOTE**

1. WHEN TRANSITIONING QUADGUARD SYSTEM TO EXISTING BARRIER, SEE THE QUADGUARD ASSEMBLY DRAWINGS FOR PROPER USE OF SIDE PANEL. PART NO. 611868.
2. ITEM 1 SHOWN IS 604570 (24") ASSEMBLY 604574 (30") WILL NOT HAVE HOLES IN THE QUADBEAM PANEL AND HAS CARTRIDGE SUPPORT BRACKETS. ASSEMBLIES 604584 (38") AND 604590 (48") HAVE HOLES IN THE QUADBEAM PANEL, CARTRIDGE SUPPORTS, AND CHAIN-MOUNTING TABS ON THE FRONT OF THE BACKUP.

**TABLE A**

ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	BACKUP.TS.WIDTH.OG.WITH DECALS	1
2	611868	PANEL SIDE.OG	2
9	619316	ANCHOR KIT.MILT1.34X27.4)	5
10	003340	NUT.HX.5/8.G.RAIL	4
11	003400	BOLT.RAIL.5/8X2.G	4
12	605447	BRACKET.CARTRIDGE.SUPT.TS.BU.OG	1
13	611266	LOCKING BAR.CARTRIDGE.SUPT.OG	1

**TABLE A**

DATE	BY	DESCRIPTION
4/22/1998	S. LEWIS	REVISED
5/15/1996	J. Machado	REVISED

SEE TABLE  
604570 IHW

DO NOT SCALE DRAWING

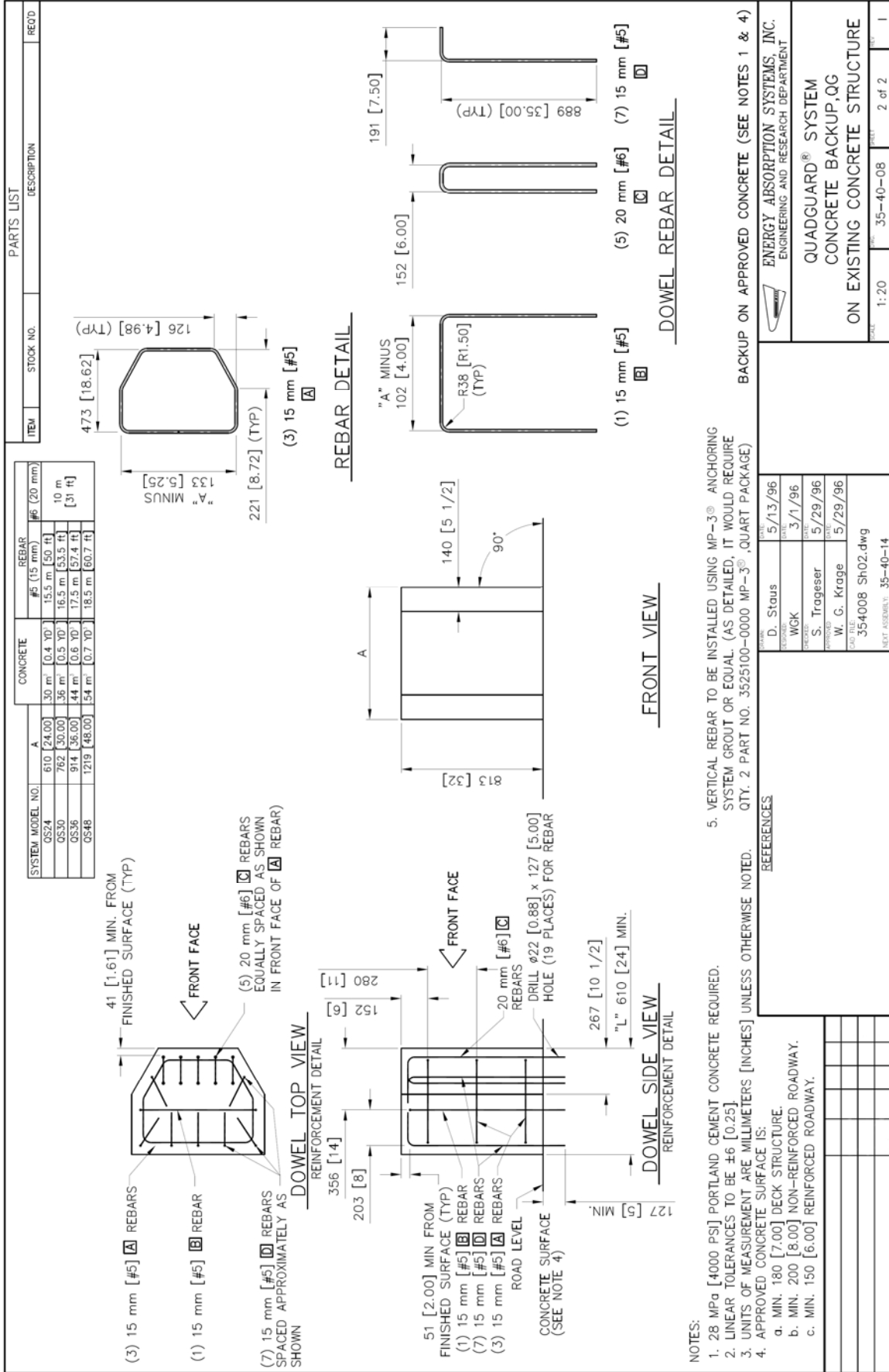
**QUADGUARD® SYSTEM**  
BACKUP ASSY. TS. QG. 24"

TRINITY HIGHWAY

1 of 1

Backup Assembly, Tension Strut, QG





NOTES:

1. 28 MPa [4000 PSI] PORTLAND CEMENT CONCRETE REQUIRED.
2. LINEAR TOLERANCES TO BE ±6 [0.25]
3. UNITS OF MEASUREMENT ARE MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.
4. APPROVED CONCRETE SURFACE IS:
  - a. MIN. 180 [7.00] DECK STRUCTURE.
  - b. MIN. 200 [8.00] NON-REINFORCED ROADWAY.
  - c. MIN. 150 [6.00] REINFORCED ROADWAY.

5. VERTICAL REBAR TO BE INSTALLED USING MP-3® ANCHORING SYSTEM GROUT OR EQUAL. (AS DETAILED, IT WOULD REQUIRE QTY. 2 PART NO. 3525100-0000 MP-3® ,QUART PACKAGE)

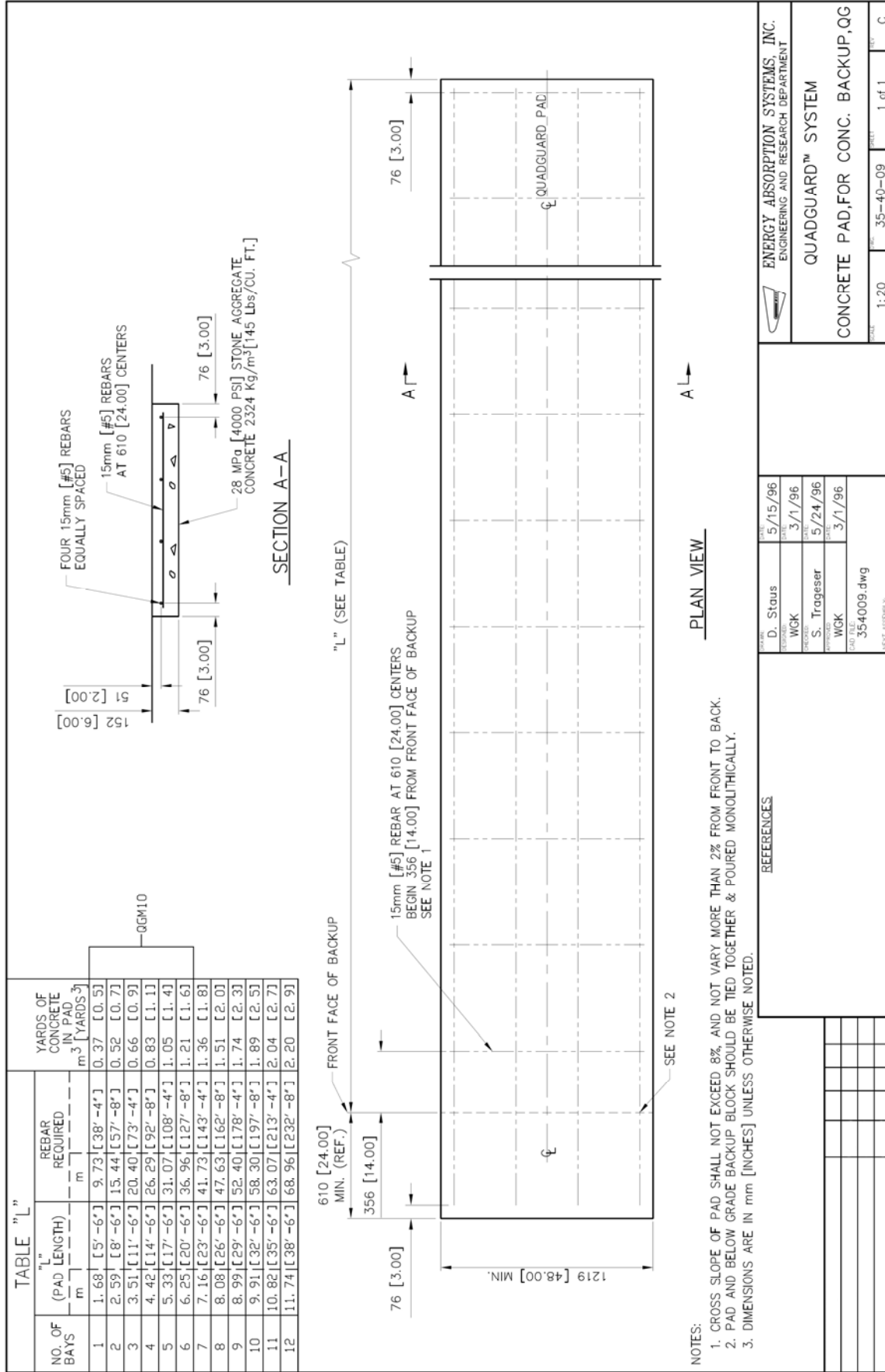
REFERENCES

NO.	DATE	BY	CHKD.	APP'D.
1	5/13/96	D. Staus		
2	3/1/96	WCK		
3	5/29/96	S. Trageser		
4	5/29/96	W. G. Krage		

APP. FILE: 354008 SH02.dwg  
NEXT ASSEMBLY: 35-40-14

ITEM	STOCK NO.	DESCRIPTION	RECD
PARTS LIST			
ENERGY ABSORPTION SYSTEMS, INC. ENGINEERING AND RESEARCH DEPARTMENT			
QUADGUARD® SYSTEM CONCRETE BACKUP, QG ON EXISTING CONCRETE STRUCTURE			
SCALE: 1:20		DATE: 35-40-08	2 of 2

Concrete B-up, QG on Existing Concrete Structure



Concrete Pad, for Concrete Backup, QG

ENERGY ABSORPTION SYSTEMS, INC.  
ENGINEERING AND RESEARCH DEPARTMENT

QUADGUARD™ SYSTEM

CONCRETE PAD, FOR CONC. BACKUP, QG

SCALE: 1:20

PROJECT: 35-40-09

SHEET: 1 of 1

REV: C



604507

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	BACKUP CONCRETE FRONT FACE QG	1
2	619315	ANCH KIT HLT 3/4X6 1/2(4)	1
3	611988	PANEL SIDE QG	2
10	003340	NUT HX.5/8 G.NAIL	4
11	003410	BOLT RAIL 5/8X2 G	4
15	619316	ANCHOR KIT HLT 1.3/4X7 (4)	2
16	611370	MONORAIL 1 BAY QG	1

TABLE		
ASSY NO.	ITEM 1 DESCRIPTION	WIDTH
604507	BACKUP ASSY CONCRETE 24 QG	610 (24.0)
604508	BACKUP ASSY CONCRETE 30 QG	762 (30.0)
604509	BACKUP ASSY CONCRETE 36 QG	914 (36.0)
604511	BACKUP ASSY CONCRETE 48 QG	1219 (48.0)

**NOTES:**

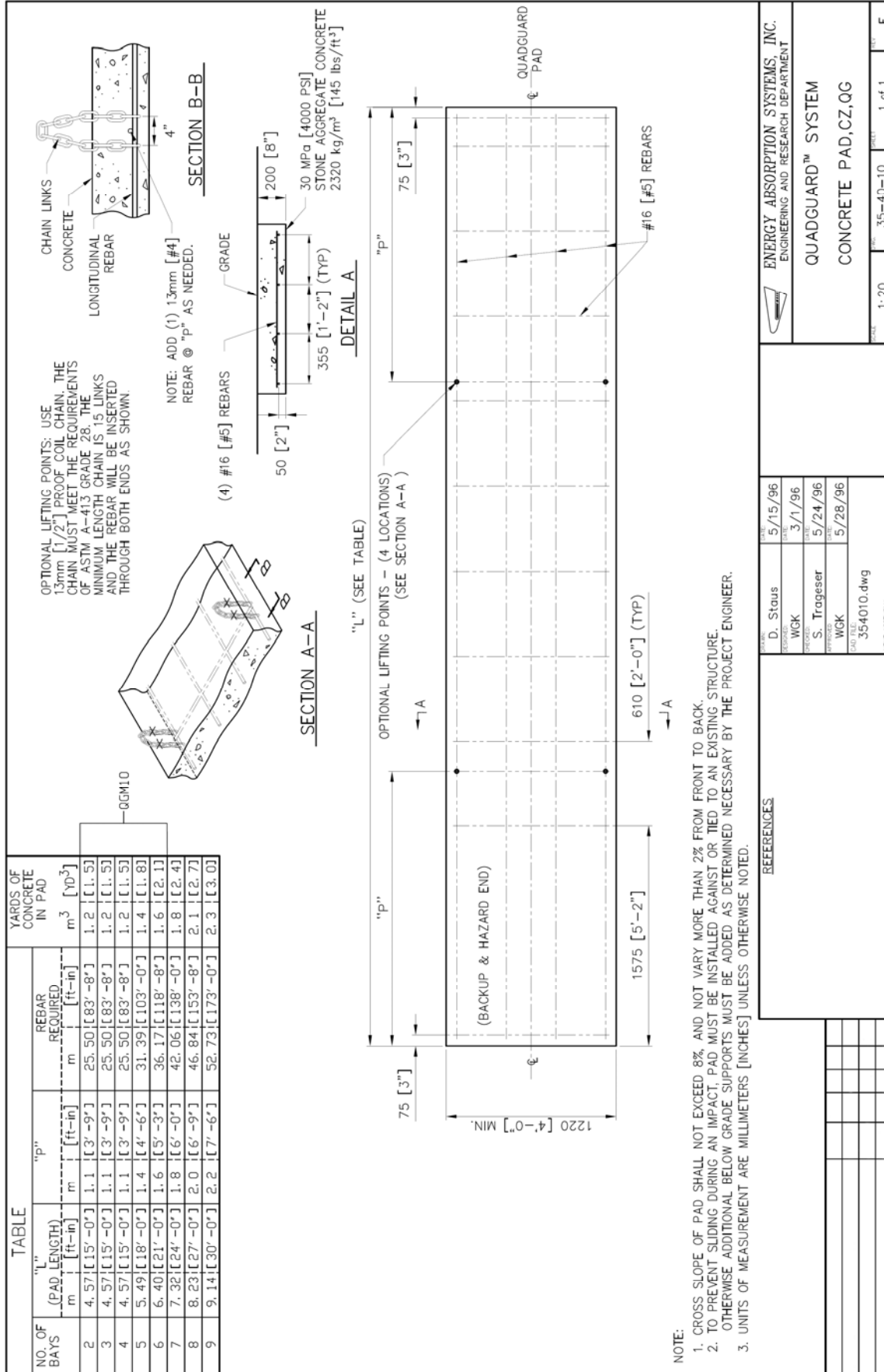
- USE ITEMS 1 AND 16 TO LOCATE HOLES IN CONCRETE.
- ITEMS 1 AND 16 TO BE CENTERED WITH CONCRETE BACKUP FACE
- ANCHORING BIT BAY BE REQUIRED TO ACHIEVE PROPER ANCHOR INSTALLATION.
- ANCHOR STUDS LOCATED IN UPPER VALLEY MUST EXTEND APPROXIMATELY 57 (2.25) FROM FACE OF CONCRETE TO FASTEN NUTS. WASHERS MAY BE OMITTED.

## Backup Assembly, Concrete, QG

REFERENCES		CONCRETE BACKUP QG WIDE		35-40-08	REV	DATE	BY	CHKD
SERIAL NO.	_____	D. Sibus	5/24/1996					
SALES ORDER	_____	W. Krage	6/5/1996					
EH PROJECT	_____	QUADGUARD SYSTEM BACKUP ASSY CONCRETE QG ALL DIMENSIONS ARE PARTS DIMENSIONS UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED						
DESIGN SPEED	_____	DO NOT SCALE DRAWING						
NOSE TYPE	_____							
NO. OF UNITS	_____							

<b>QUADGUARD<sup>®</sup> SYSTEM</b> BACKUP ASSY CONCRETE QG	
	604507 K
1 of 1	REFLECTED DRAWING



Concrete Pad, CZ, QG

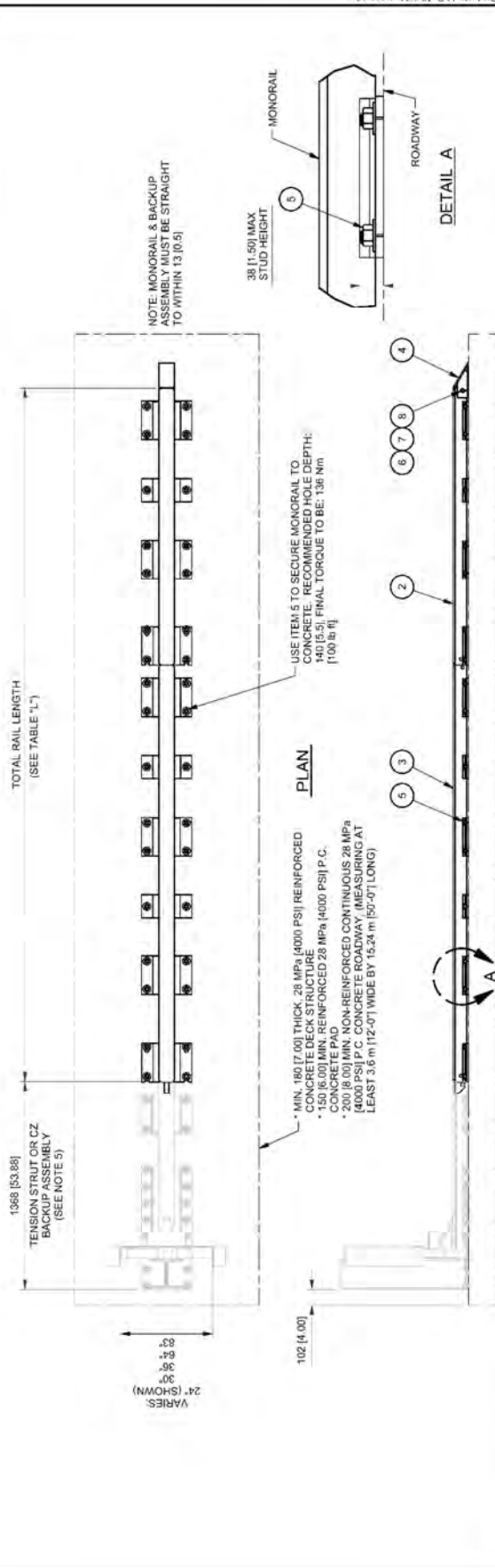




611367 - 1 of 3

ASSEMBLY NO.	TOTAL RAIL LENGTH	TABLE "L"				NO. OF BAYS	NOT APPLICABLE FOR 1/2 OR CZ CG SYSTEMS
		ITEM 1	ITEM 2	ITEM 3	ITEM 5		
611367	0	0	0	0	1		
611332	915 (96.5)	1	0	2	2		
611334	1830 (172.0)	0	1	0	4		
611340	2745 (108.1)	0	0	1	5		
611343	3660 (144.1)	1	0	1	7		GG1
611349	4575 (180.1)	0	1	1	9		OGM10
611356	7320 (288.2)	0	1	2	14		

\* SEE TABLE L



NOTES:

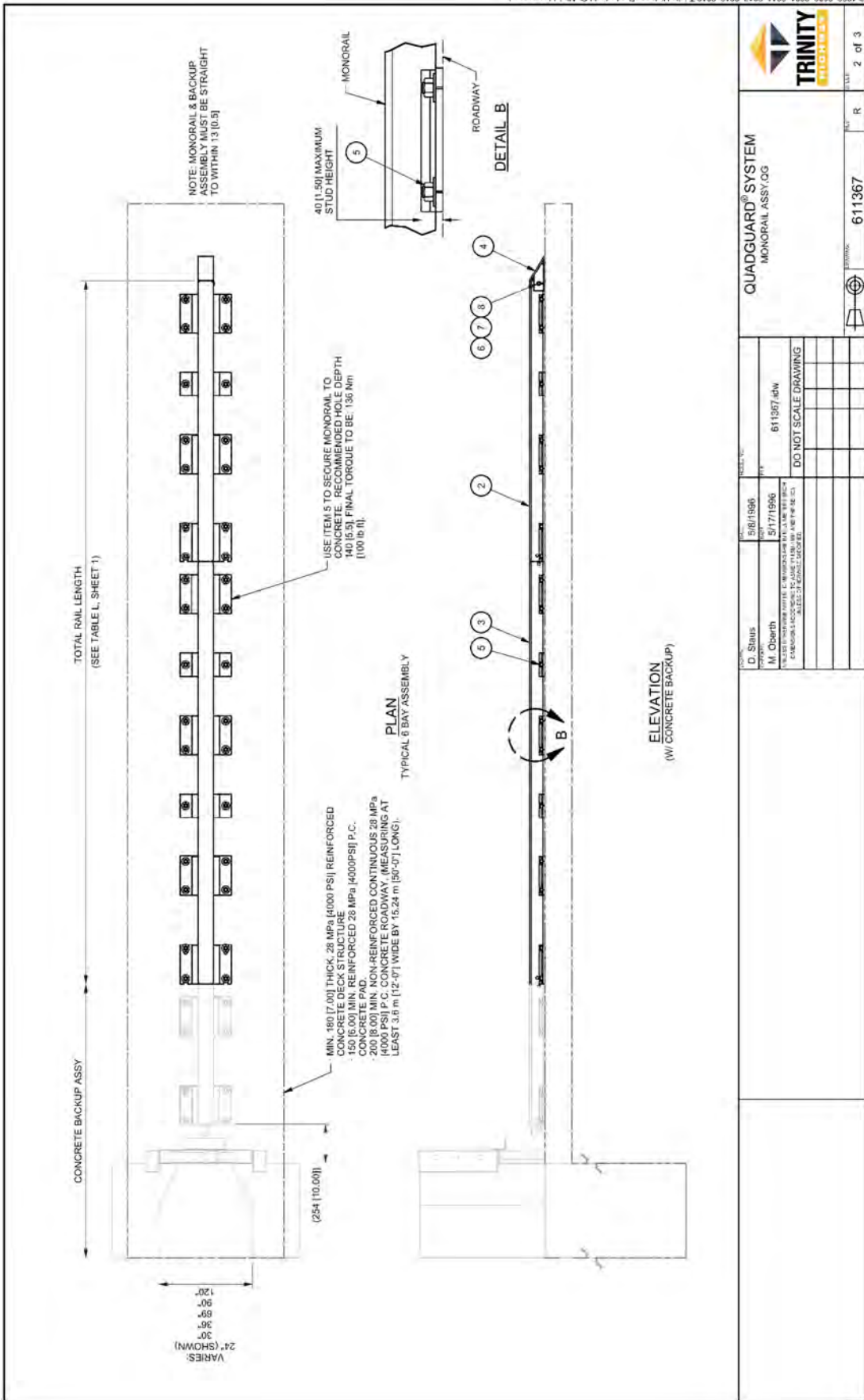
1. USE MONORAILS (ITEM 1, 2 AND 3) AS TEMPLATE(S) TO LOCATE ANCHOR BOLTS (ITEM 5). SEE SHEET 2.
2. CROSS SLOPE OF PAD SHALL NOT EXCEED 8%, AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.
3. EVERY STUD MUST BE EMBEDDED TO A DEPTH OF 140 (5.5) IF REBAR IS ENCOUNTERED IN A P.C. CONCRETE PAD.
4. FOR CZ SYSTEMS, SEE DRAWING 35-40-24.

QUADGUARD SYSTEM		MONORAIL ASSY. OG	
DESIGNED BY	D. Staus	DATE	5/8/1986
CHECKED BY	M. Oberth	DATE	5/17/1986
DESIGNED BY (OR OTHER AVAILABLE FOR REVIEW)		DATE	
CHECKED BY (OR OTHER AVAILABLE FOR REVIEW)		DATE	
DO NOT SCALE DRAWING			
PROJECT NO.		611367.dwg	
DRAWING NO.		611367	
REV.		R	
SHEET		1 of 3	

# Monorail Assembly



611367 - 2 of 3

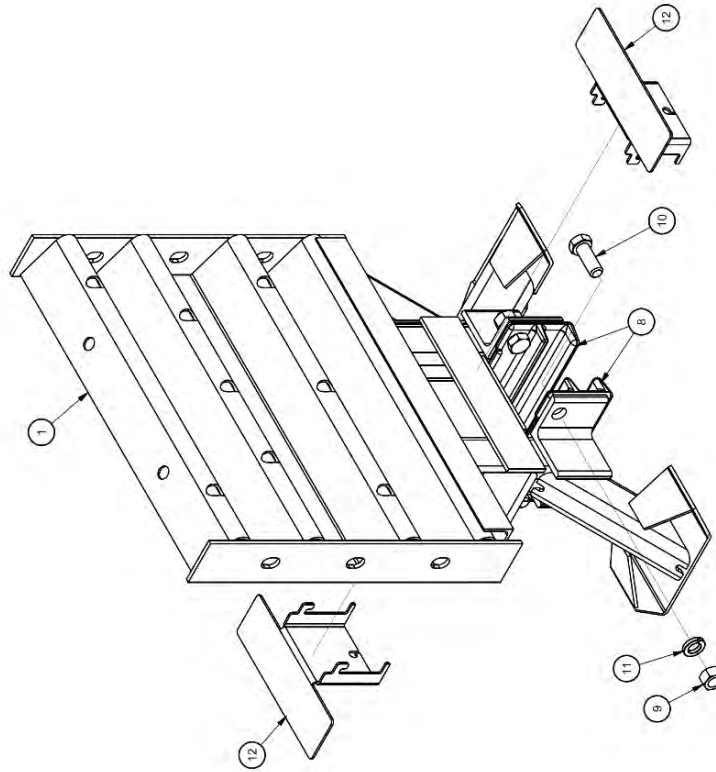


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625650



PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	SEE TABLE	1
8	811368	MONORAIL GUIDE QG.G	2
9	003704	3/4" HVY HEX NUT A-683 DH	4
10	119555	BOLT HK-3/4X2.38 G	4
11	118089	WASHER LOCK-3/4 G	4
12	805446	BRACKET CARTRIDGE SUPT DIA FOLDED QG.G	2

ASSY. NO.	ITEM I.	DESCRIPTION	WIDTH
625650	625647	DIAPHRAGM QB-24 QG.G	810 [24.00]
625651	625648	DIAPHRAGM QB-30 QG.G	760 [30.00]
625652	625649	DIAPHRAGM QB-36 QG.G	815 [36.00]
606810	607838	DIAPHRAGM QB-48 QG.G	1219 [48.00]

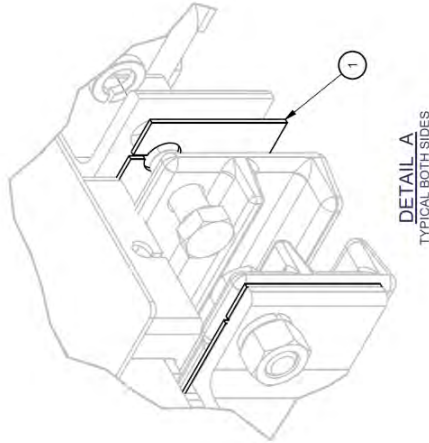
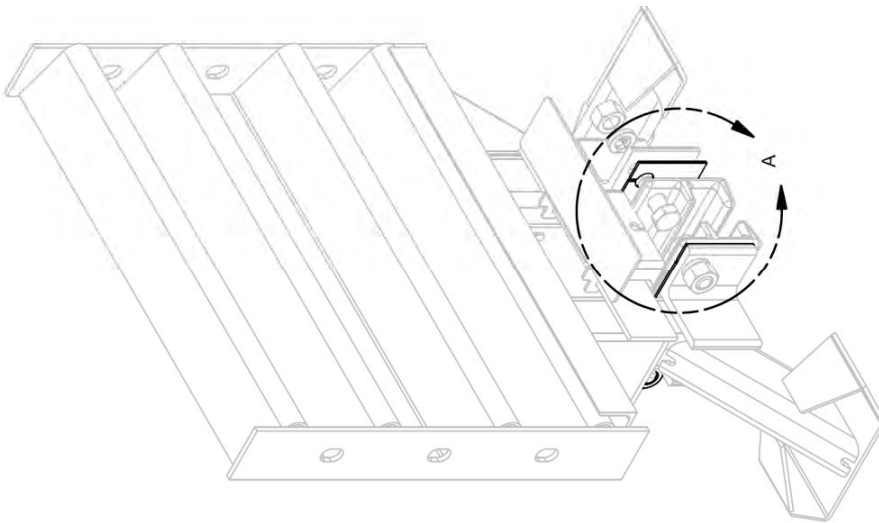
NOTE:  
1. QUADGUARD II REQUIRES THE SHIM KIT, SEE 614050.

		DIAPHRAGM ASSY., QB, 24"	
W. Leddington A. Van Brocklin		SEE TABLE 625650.idw	
DATE: 4/13/2016 DATE: 4/28/2016		DO NOT SCALE DRAWING	
REVISION: 4016 4/13/16 / WWIL AVB		ECO: 4847 DATE: 5/31/17 BY: DDIS ARV	
INITIAL RELEASE: 4781 5/31/17 / WWIL AVB		SHEET: 1 of 3	
UPDATED NOTE: 2 HANDSDI LEASER TEXT SHEET TYPES: 625650-01 RELEASED FOR SET-UP SHEETS: 2 & 3 FOR 30" & 48" DIAPHRAGMS		PART: 625650	

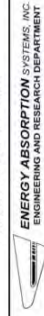
# Diaphragm Assembly, QB

614050

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	614052G	SHIM,1/8X3 5/8X8,G	2



ASSEMBLY NO. 614050B



SHIM KIT, DIAPHRAGM, RAIL GUIDE, QG II

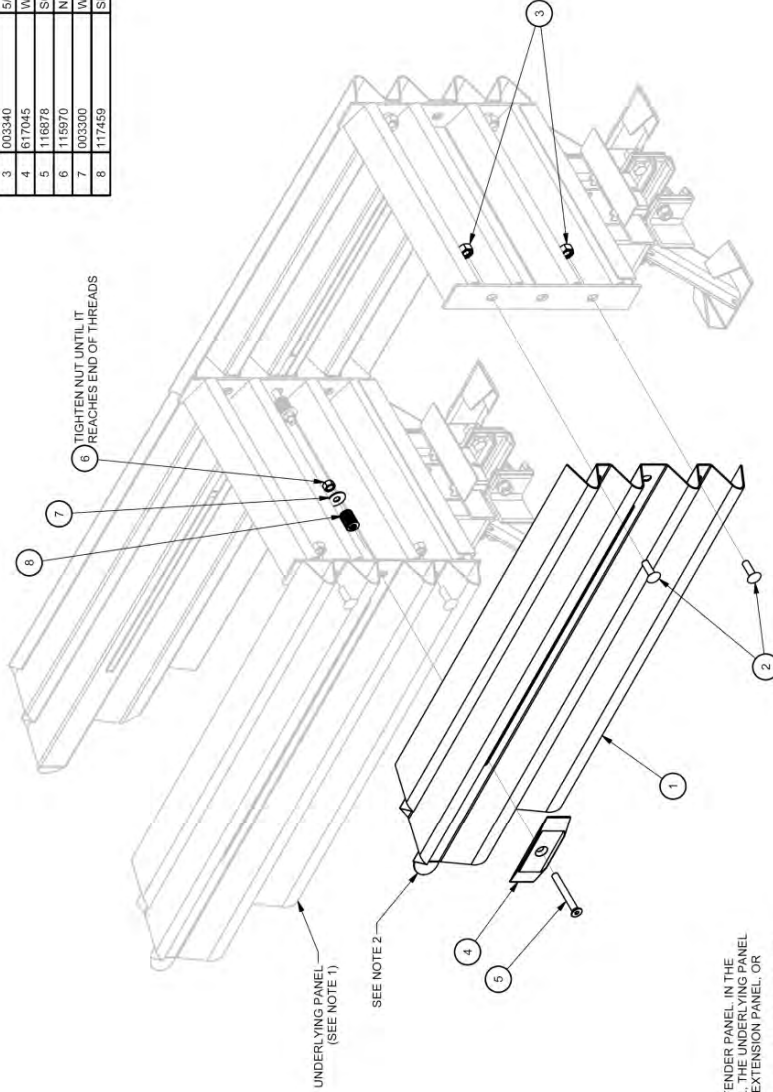
DESIGNED BY	D. Kohfeld	DATE	2/27/2009
REVIEWED BY	M. Buehler	DATE	12/02/2008
DESIGNED BY	JME	DATE	3/4/2008
APPROVED BY	MJB	DATE	3/19/2009
FILE	614050.idw		
WORK ASSEMBLY			

SCALE	DRAWING	614050	SHEET	1	of	1	REV	C
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## Shim Kit, Diaphragm, Rail Guide, QG II

608236

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY
1	611832	PANEL FENDER, QG	1
2	003400	BOLT, TRAIL, 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, GR, G, HEX SOCKET	1
6	116970	NUT, HX, 5/8, G	1
7	003300	WASHER, FLAT, 5/8 X 1.34, G	1
8	117459	SPRING, DIE, 1/4 ODD, 9/16X1 1/2, G	1



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

		<b>QUADGUARD®</b> FENDER PANEL, ASSY, QG	
DRAWN J. Espinoza	DATE 5/21/1996	REV K	QTY 1 of 1
CHECKED J. Machado	DATE 5/21/1996	PART NO. 608236	
DO NOT SCALE DRAWING			
DIMENSIONS ACCORDING TO ASME Y14.5M AND ASME Y14.5-2009 UNLESS OTHERWISE SPECIFIED			

# Fender Panel Assembly, QG

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611689*	NOSE L NARROW QG II W/LOGO *	1
2	611680*	NOSE R NARROW QG II W/LOGO *	1
3	605430*	BRACKET CART SUPPORT NOSE QG II *	1
4	605420	BRACKET CART SUPPORT NOSE BAY QG II	1
5	113518	BOLT HK 1/4X3/4 G5.G	6
6	113404	BOLT BT 5/8X1 1/4 HK SOC.M GALV	6
7	118570	BOLT HK 5/8X2 G5.G	4
8	115846	NUT HK 1/4.G	6
9	000340	NUT HK 5/8.G RAIL	6
10	115966	NUT HEX COUPLING 5/8-11X2 1/8.G	6
11	118095	WASHER LOCK 1/4.G	6
12	000300	WASHER FLAT 5/8 X 1 3/4.G	12
13	806535	BRACKET PULL-OUT QG	2
14	118232	BOLT HK 5/8X2 1/2 G5.G	2

TABLE	
ASSEMBLY NO.	FINISH
611580	GALVANIZED
611581	YELLOW
611579	BLACK
621867	GALV/YELLOW

		TRINITY HIGHWAY <small>CONSTRUCTION PRODUCTS</small>	
NOSE ASSY, QG II, NARROW		611580	
D: 10/16/16	DATE: 2/26/2009	REV: 611580.dwg	1 of 2
MJB	DATE: 3/19/2009	DO NOT SCALE DRAWING	
<small>THIS DRAWING IS THE PROPERTY OF TRINITY HIGHWAY CONSTRUCTION PRODUCTS. IT IS TO BE USED ONLY FOR THE PROJECT AND AT THE LOCATION SPECIFIED THEREON.</small>			

Nose Assembly, QG II, Narrow



PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611680*	NOSE L,NARROW,QGII,W/LOGO,*	1
2	611680*	NOSE R,NARROW,QGII,W/LOGO,*	1
3	614487*	SPACER 12,NOSE ASSY,QGII,*	1
4	605420	BRACKET,CART SUPPORT,NOSE BAY,QGII	1
5	113518	BOLT,HX,1/4X3/4,GS,G	12
6	113404	BOLT,BT,5/8X1 1/4,HX,SOC,M,GALV	6
7	118570	BOLT,HX,5/8X2,GS,G	4
8	115946	NUT,HX,1/4,G	12
9	003340	NUT,HX,5/8,G,RAIL	6
10	115986	NUT,HEX,COUPLING,5/8-11X2 1/8,G	6
11	118065	WASHER,LOCK,1/4,G	12
12	003300	WASHER,FLAT,5/8 X 1 3/4, G	12
13	605535	BRACKET,PULL-OUT,OG,G	2
14	118232	BOLT,HX,5/8X2 1/2,GS,G	2

TABLE	
ASSEMBLY NO.	FINISH
611577	GALVANIZED
611578	YELLOW
611576	BLACK
62225	GALV/YELLOW

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		NOSE ASSY,QGII,48	
D. Kofield MJB		611580.dwg	
2/26/2009 3/19/2009		DO NOT SCALE DRAWING	
TRINITY HIGHWAY PRODUCTS, LLC 10000 W. 100th Street, Suite 100 Overland Park, KS 66212		611580	
2 of 2		J	

Nose Assembly, QG II, 48

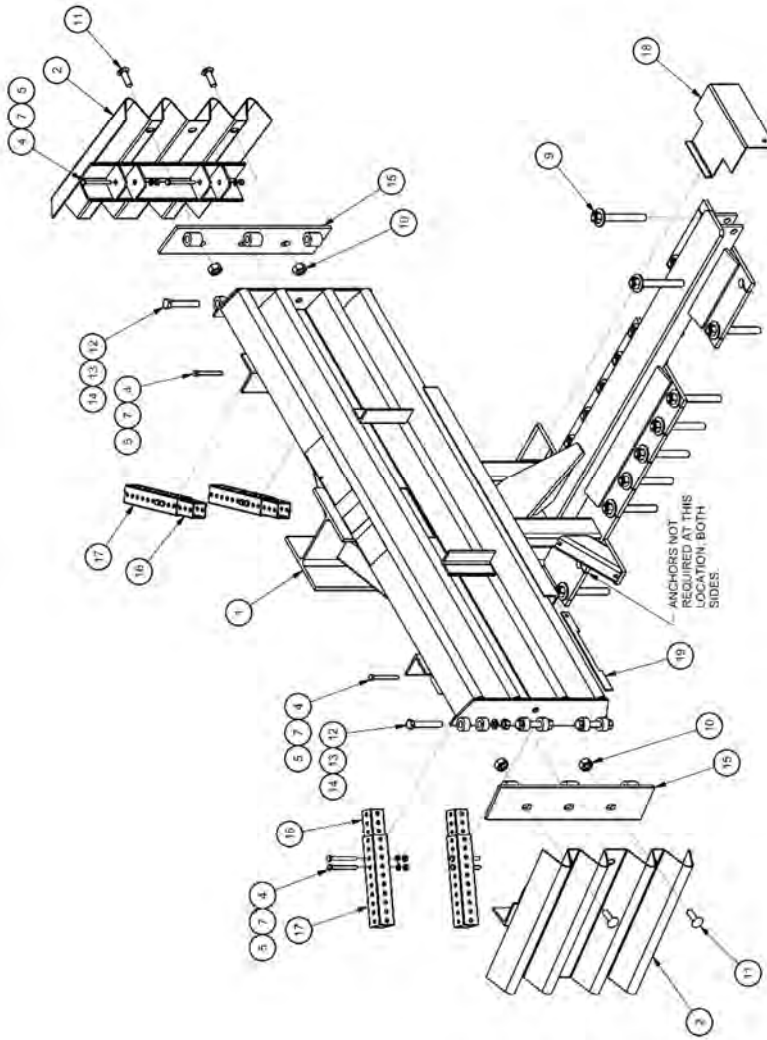


604596

PARTS LIST			
ITEM	STOCK NO	DESCRIPTION	QTY.
1	SEE TABLE	BACKUP, TS, XX WIDE, WIDECAL	1
2	611900	PANEL, SIDE, QG, WIDE	2
4	113612	BOLT, HK, 3/8X3 1/2 ALL THREAD, G5, G	16
5	115960	NUT, HK, 3/8, G	16
7	118092	WASHER, LOCK, 3/8, G	16
9	619116	ANCHOR KIT, HILT, 3/4X7, (4)	5
10	1003440	NUT, HK, 5/8, G, RAIL	4
11	1003400	BOLT, TRAIL, 5/8X22, G	4
12	113668	BOLT, HK, 5/8X4, G5, G	6
13	118100	WASHER, LOCK, 5/8, G	6
14	1003354	5/8" HVT HEX NUT A563A	6
15	610172	HINGE PLATE, FENDER PANEL, QG	2
16	615156	TEL ST 1, 3/4X1, 3/4X1/2 GA X10, HHS, G	4
17	615165	TEL ST 2, 2X2X1/2 GA X10, HHS, G	4
18	605447	BRACKET, CARTRIDGE, SUPT, TS, B/U, QG	1
19	611266	LOCKING BAR, CARTRIDGE, SUPT, QG	1

TABLE		
ASSY NO.	DESCRIPTION	WIDTH
604596	BACKUP, TS, 64 WIDE, WIDECALS	1620 [64']
604599	BACKUP, TS, 83 QG, WIDE, WIDECALS	2100 [83']

NOTES:  
 1. WHEN TRANSITIONING QUADGUARD SYSTEM TO EXISTING BARRIER, REFER TO THE TRANSITION ASSEMBLY DRAWINGS FOR PROPER USE OF SIDE PANEL, NO. 611888.



QUADGUARD® SYSTEM BACKUP ASSY, TS, QG WIDE	
D. Scahis DATE: 7/11/1987	604596 idw
DO NOT SCALE DRAWING	
604596	
1 of 1	

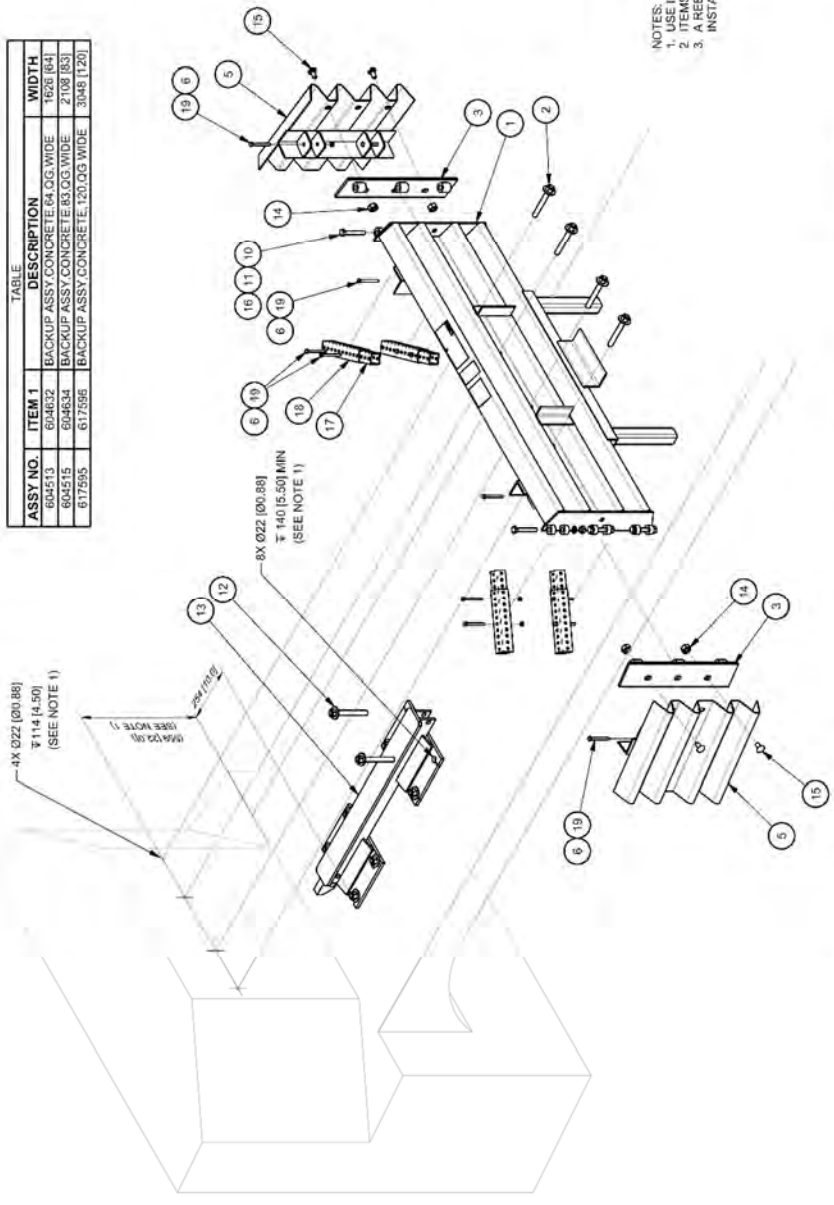
Backup Assembly, TS, QG Wide

604513

ASSY NO.	ITEM 1	DESCRIPTION	WIDTH
604513	604513	BACKUP ASSY CONCRETE 64.0G WIDE	1626 (84)
604515	604515	BACKUP ASSY CONCRETE 63.0G WIDE	2108 (83)
617595	617595	BACKUP ASSY CONCRETE 120.0G WIDE	3048 (120)

4x Ø22 (Ø0.88)  
 ±114 (±5.0)  
 (SEE NOTE 1)

8x Ø22 (Ø0.88)  
 ±140 (±5.50) MIN  
 (SEE NOTE 1)

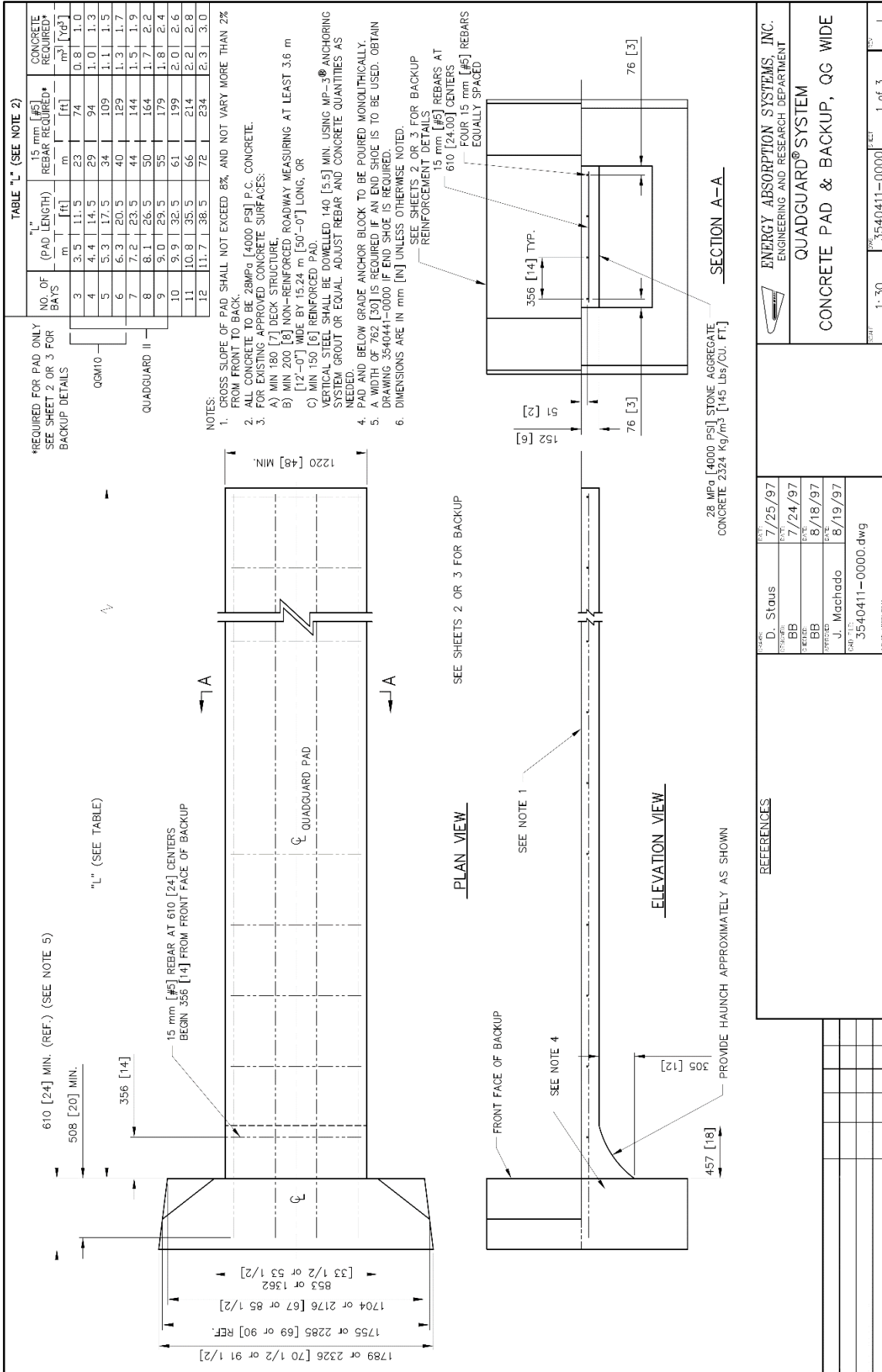


NOTES:  
 1. USE ITEMS 1 AND 13 TO LOCATE HOLES IN CONCRETE.  
 2. ITEMS 1 AND 13 TO BE CENTERED WITH CONCRETE BACKUP FACE.  
 3. A REBAR CUTTING BIT MAY BE REQUIRED TO ACHIEVE PROPER ANCHOR INSTALLATION.

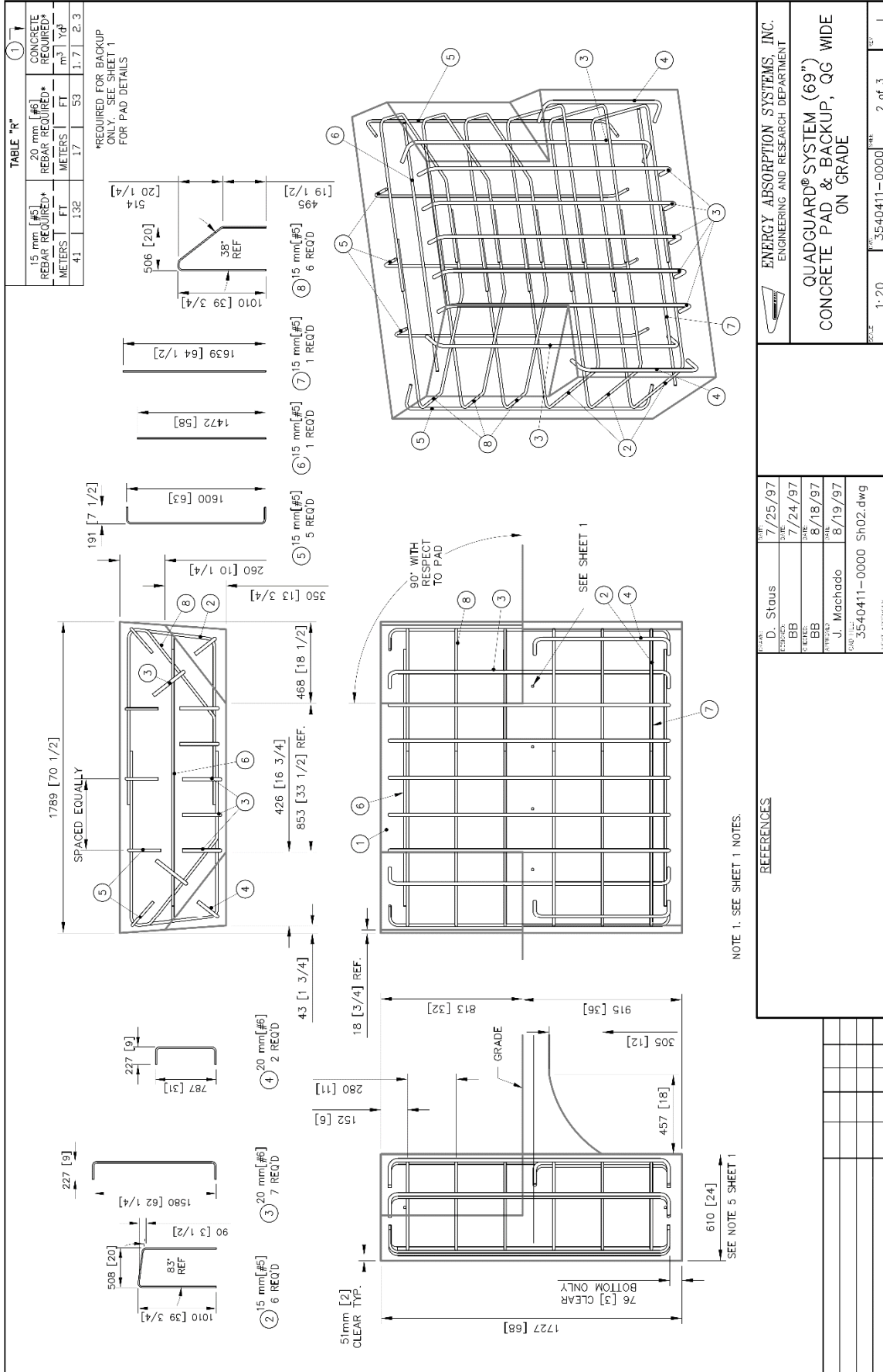
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	SEE TABLE	BACKUP FACE CONC. QG WIDE G	1
2	618315	ANCH MIT. HIL. 3/4X6 1/2(4)	1
3	610772	HINGE PLATE FENDER PANEL. OG	2
5	611900	PANEL SIDE OG. WIDE	2
6	115960	NUT HX. 3/8 G	16
10	115666	BOLT HX. 5/8X4 G5.G	6
11	118100	WASHER LOCK. 5/8 G	6
12	618216	ANCHOR KIT. HLT. 3/4X7 (4)	2
13	611970	MONORAIL, 1 BAY. OG	1
14	003340	NUT HX. 5/8 G. RAIL	4
15	003360	5/8" X1.25" GR BOLT	4
16	003354	5/8" Hvy HEX NUT A463A	6
17	615756	TEL ST 1 3/4X1 3/4X12 GA X10 HAS.G	4
18	615756	TEL ST 2KX12 GA X10 HAS.G	4
19	113512	BOLT HX. 3/8X3 1/2 ALL THREAD G5.G	16

<p>TRINITY HIGHWAY</p>		<p>BACKUP ASSY, CONCRETE, XX, OG, WIDE</p>	
<p>ISSUED: 7/6/1987</p> <p>BY: S. Tragus</p> <p>DATE: 7/17/1987</p> <p>PROJECT: 604513 kW</p>	<p>REV: 01</p> <p>DATE: 7/17/1987</p> <p>BY: S. Tragus</p> <p>DATE: 7/17/1987</p>	<p>604513</p>	<p>G</p>
<p>DO NOT SCALE DRAWING</p>			
<p>REFERENCES: CONCRETE BACKUP, OG WIDE 35-40-41</p>			
<p>SERIAL NO. _____</p> <p>SALES ORDER _____</p> <p>EH PROJECT _____</p> <p>DESIGN SPEED _____</p> <p>NOSE TYPE _____</p> <p>NO OF UNITS _____</p>			

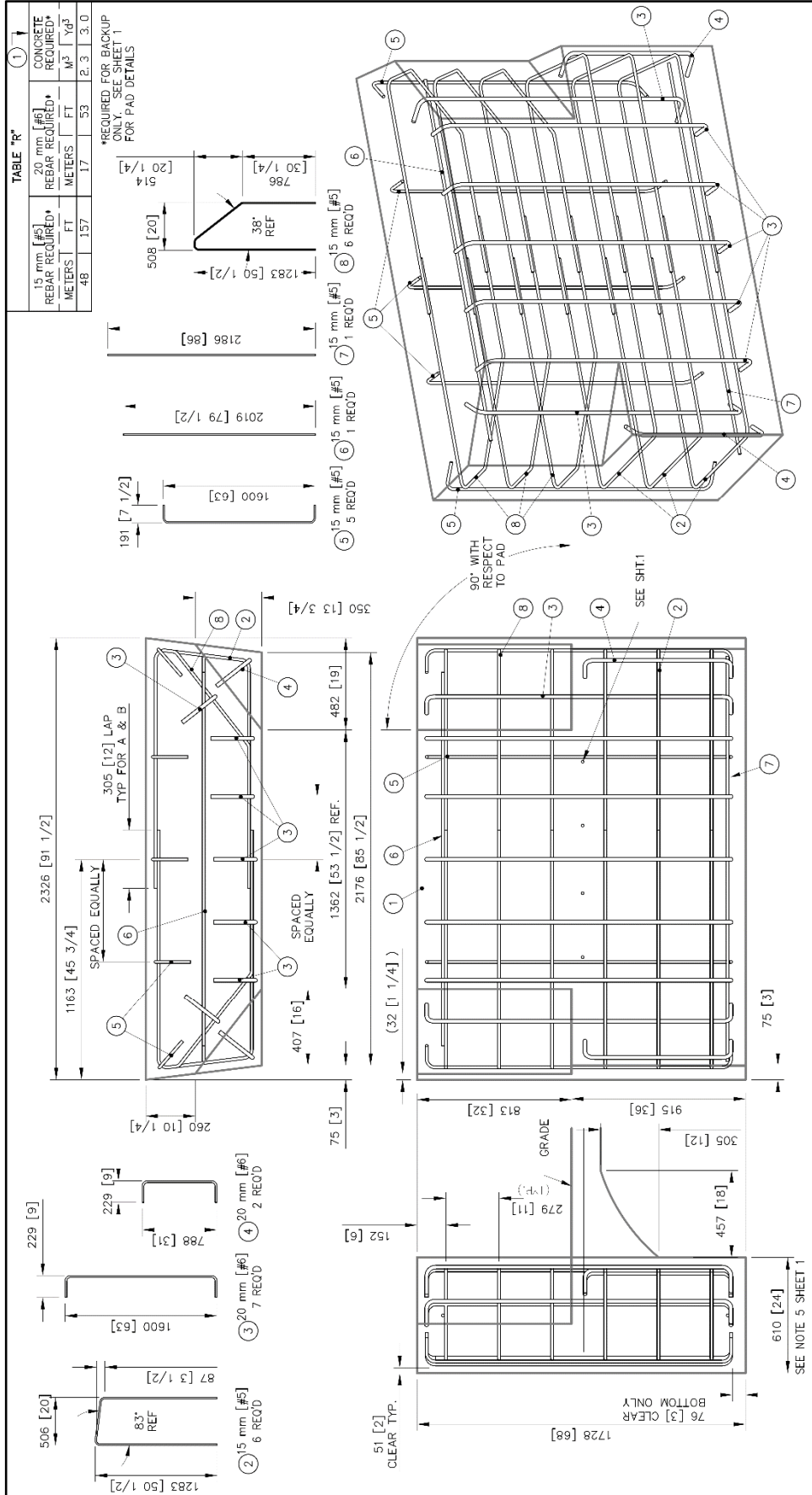
Backup Assembly, Concrete, QG Wide



Concrete Pad & Backup, QG Wide



(69") Concrete Pad & Backup, QG Wide on Grade



**ENERGY ABSORPTION SYSTEMS, INC.**  
ENGINEERING AND RESEARCH DEPARTMENT

**QUADGUARD® SYSTEM (90")**  
CONCRETE PAD & BACKUP, QG WIDE  
ON GRADE

DATE: 7/25/97  
DESIGNED BY: D. Staus  
CHECKED BY: BB  
FIELD BY: BB  
APPROVED BY: J. Machado  
DRAWN FILE: 3540411-0000  
LEFT ASSYMETRY: Sh03.dwg

SCALE: 1:20

NO. 3540411-0000

SHEET 3 of 3

REV. 1

**(90") Concrete Pad & Backup, QG Wide on Grade**

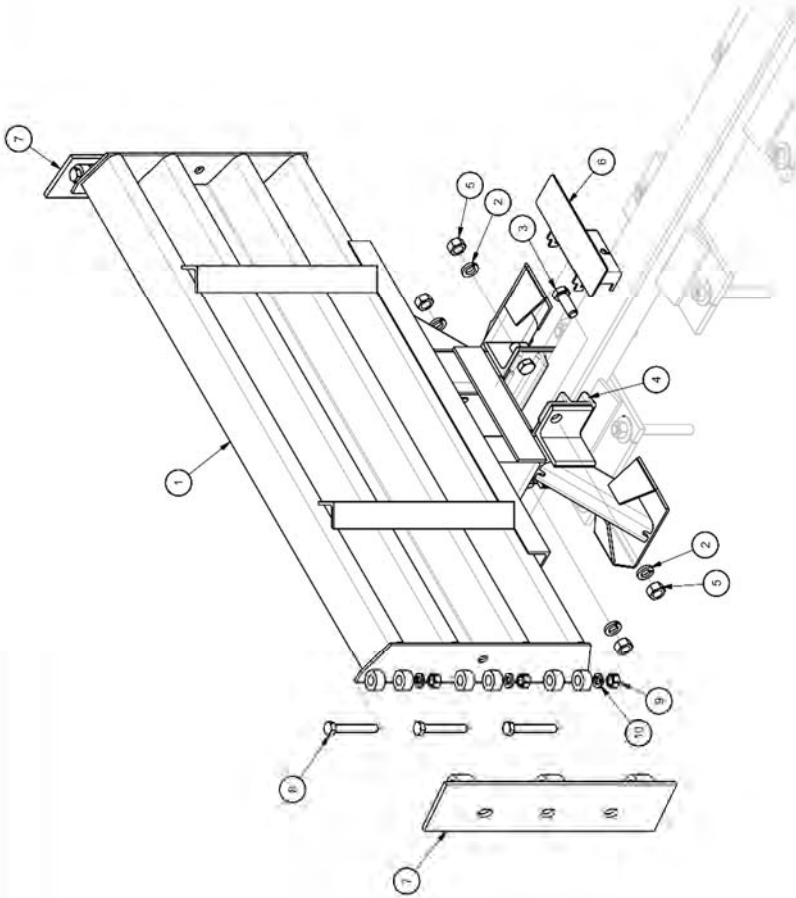


PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
11	SEE TABLE	DIAPHRAGM LOG G	1
2	118089	WASHER LOCK 3/4 G	4
3	113555	BOLT HK 3/4 X 2.58 G	4
4	611368	MONORAIL GUIDE CG G	2
5	003704	3/4" HXV HEX NUT A563 DH	4
6	605446	BRACKET CARTRIDGE SUPT DIA FOLDED QG	2
7	610172	HINGE PLATE FENDER PANEL QG	2
8	113666	BOLT HK 5/8 X 4 G5 G	6
9	003354	5/8" HXV HEX NUT A563A	6
10	118100	WASHER LOCK 5/8 G	6

Table		
ASSEMBLY NO.	DESCRIPTION	ITEM 1 PART NO.
*607173	DIAPHRAGM ASSY QG 0673	607766
*607174	DIAPHRAGM ASSY QG 0753	607700
*607175	DIAPHRAGM ASSY QG 0833	607771
*607176	DIAPHRAGM ASSY QG 0913	607773
*607177	DIAPHRAGM ASSY QG 0993	607775
*607145	DIAPHRAGM ASSY QG 1073	607777
607146	DIAPHRAGM ASSY QG 1153	607780
607148	DIAPHRAGM ASSY QG 1233	607783
607149	DIAPHRAGM ASSY QG 1273	607787
607150	DIAPHRAGM ASSY QG 1313	607788
607151	DIAPHRAGM ASSY QG 1393	607792
607152	DIAPHRAGM ASSY QG 1473	607796
607156	DIAPHRAGM ASSY QG 1513	607800
607157	DIAPHRAGM ASSY QG 1553	607801
607158	DIAPHRAGM ASSY QG 1633	607804
607160	DIAPHRAGM ASSY QG 1729	607806
607162	DIAPHRAGM ASSY QG 1783	607808
607163	DIAPHRAGM ASSY QG 1853	607811
*607164	DIAPHRAGM ASSY QG 2033	607815

\* NO LONGER AVAILABLE

NOTE:  
1. OJAGUARD IF LAND OGM10 REQUIRE SHIM KIT.  
SEE DRAWING 614050.

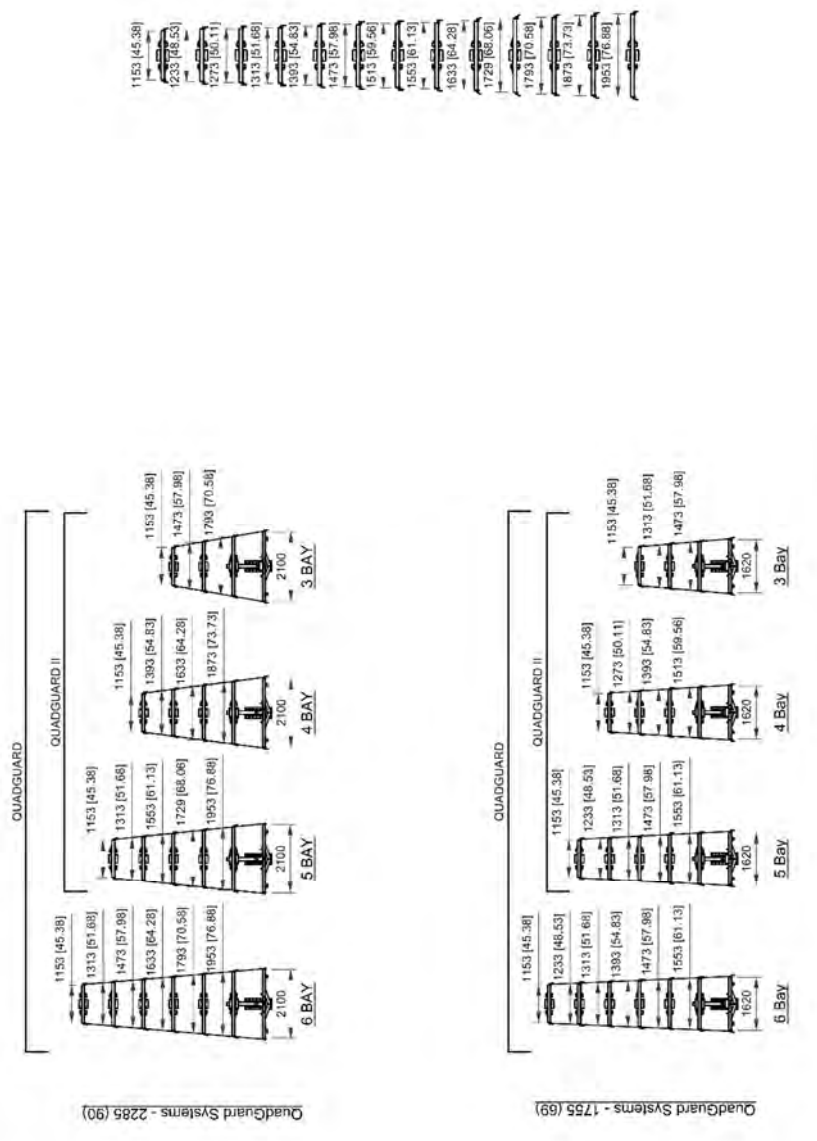


		1 of 2	
D. Shaub J. Murchio DATE: 5/12/1997 TIME: 7:77:1997		607173.dwg DO NOT SCALE DRAWING	
DIAPHRAGM ASSY, QG, WIDE		607173	
1 of 2		N	

Diaphragm Assembly, QG, Wide



607173 - 2 of 2



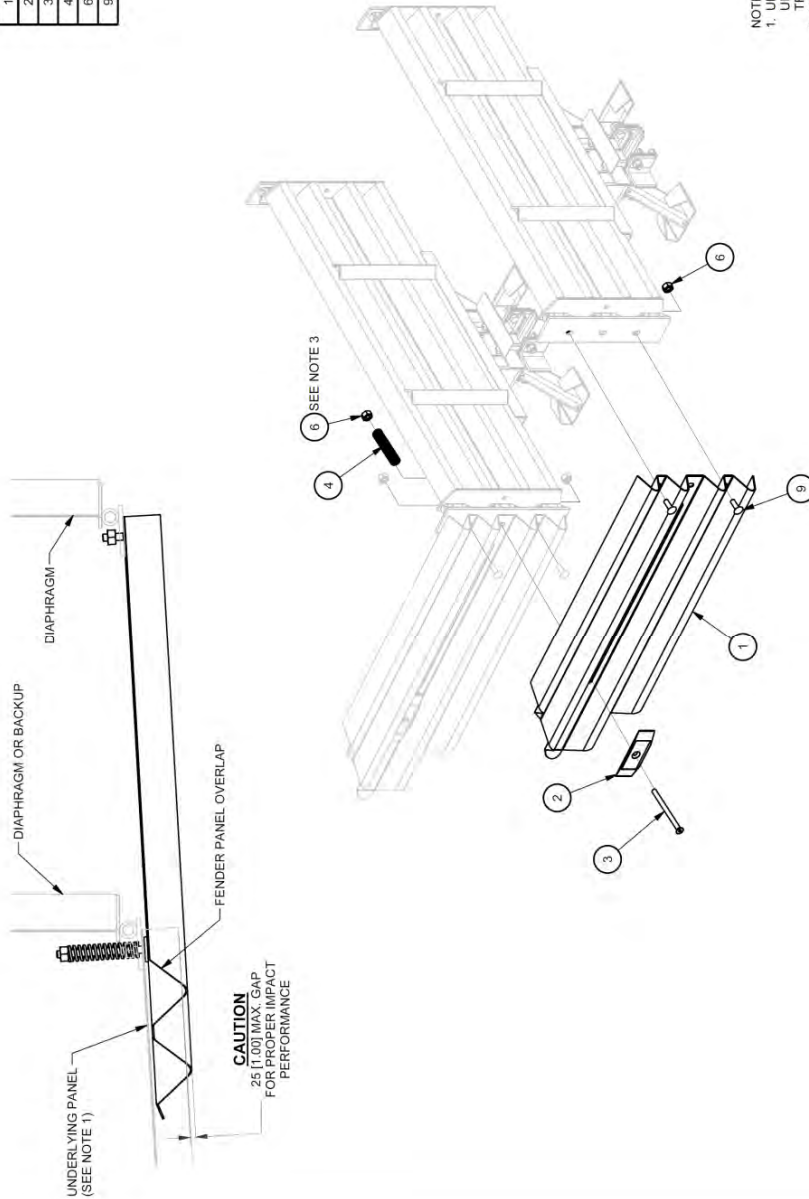
NOTE:  
1. DIMENSIONS ARE IN (mm) [IN] UNLESS OTHERWISE NOTED.

		DIAPHRAGM ASSY., QG, WIDE		607173		N		2 of 2	
D. Staus 5/12/1987	J. Machado 7/7/1997	607173-0W		DO NOT SCALE DRAWING					
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608241

PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	QTY.
1	611832	PANEL,FENDER,OG	1
2	617045	WASHER,MUSHROOM,FORGED,OG,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

DESIGNED BY	D. Staus	DATE	6/12/1987
DRAWN BY	J. Machado	DATE	4/10/1987
CHECKED BY	KRM	DATE	7/7/1997
APPROVED BY	J. Machado	DATE	7/7/1997
FILE	608241.dwg		

QuadGuard - Wide System  
FENDER PANEL ASSEMBLY

SCALE	1 : 16	DRAWING NO.	608241	SHEET	1	OF	1	REV.	J
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# Wide System Fender Panel Assembly

611583

PARTS LIST			
ITEM	STOCK NO	DESCRIPTION	QTY
1	611672*	NOSE L WIDE QGII W/LOGO*	1
2	611683*	NOSE R WIDE QGII W/LOGO*	1
3	605430*	BRACKET CART SUPPORT NOSE QGII*	1
4	605420	BRACKET CART SUPPORT NOSE BAY QGII	1
5	113518	BOLT HX 1/4X3/4 G5.G	6
6	113404	BOLT HT 5/8X1 1/4 HX SOC M GALV	6
7	118570	BOLT HX 5/8X2 G5.G	6
8	115946	NUT HX 1/4 G	6
9	103340	NUT HX 5/8 G RAIL	8
10	115986	NUT HEX COUPLING 5/8-11X2 1/8.G	6
11	118085	WASHER LOCK 1/4 G	6
12	003300	WASHER FLAT 5/8 X 1 3/4 G	12
13	113654	BOLT HX 5/8X1 1/2 G5.G	2
14	605535	BRACKET PULL-OUT QG	2

TABLE	
ASSEMBLY NO.	FINISH
611583	GALVANIZED
611584	YELLOW
611582	BLACK
621868	GALV/YELLOW

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NOSE ASSY QGII WIDE

611583

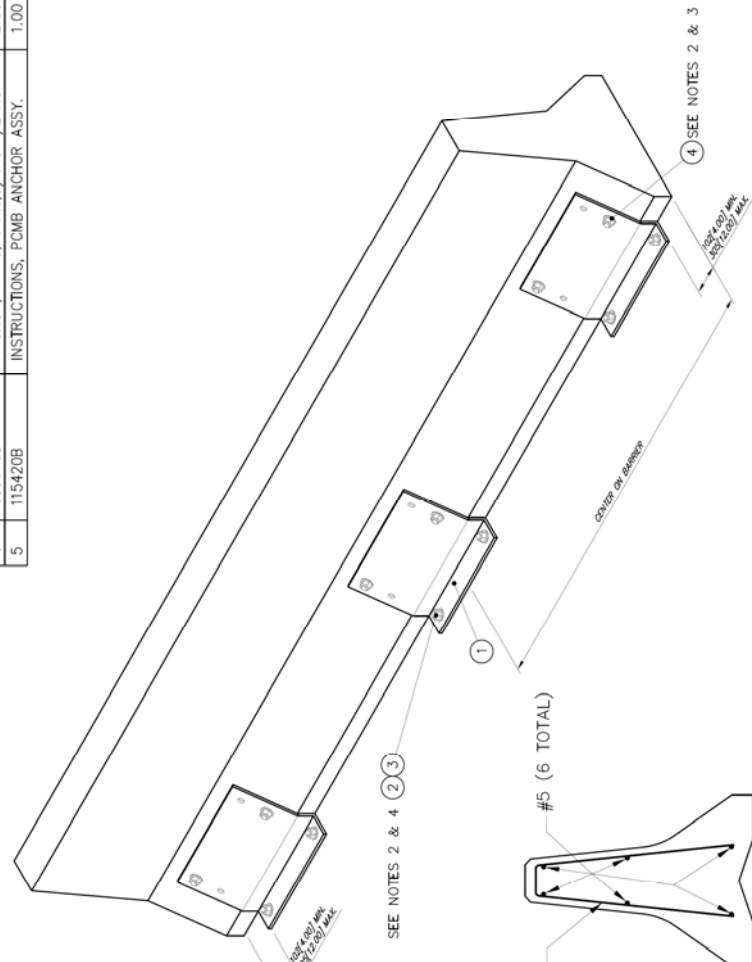
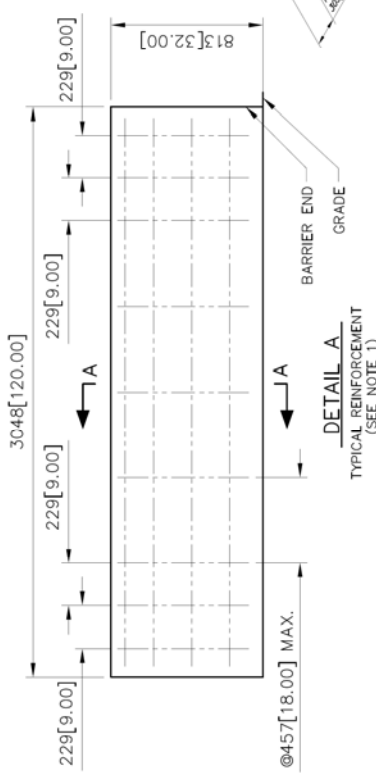
1 of 1

D. Koehfeld	4/3/2009	611583.dwg	
H. Broughtner	3/6/2009		
DO NOT SCALE DRAWING			

Nose Assembly, QG II, Wide

612006

ASSEMBLY NO.		ITEM 1		ITEM 1 DESCRIPTION		ITEM		STOCK NO.		DESCRIPTION		REQ'D
612006B		612006G		ANCHOR,PCMB,OG,G		1		SEE TABLE		SEE TABLE		6.00
603648B		603653G		ANCHOR,BARRIER,F-SHAPE,G		2		603676B		ANCHOR,MP-3,QUART KIT,CZ		3.00
						3		116799G		ROD,THREADED 3/4X18,G5,G		12.00
						4		603670B		ANCHOR,MP-3,PT KIT,3/4X6 1/2 HOR		2.00
						5		115420B		INSTRUCTIONS,PCMB ANCHOR ASSY.		1.00



- NOTE:**
- THE REINFORCEMENT SHOWN IN DETAIL "A", IS RECOMMENDED FOR PORTABLE CONCRETE BARRIER TO ENSURE ADEQUATE BARRIER INTEGRITY WHEN USED IN COMBINATION WITH THE QUADGUARD SYSTEM. THE DETAIL SHOWN IS BASED ON STATE OF CALIFORNIA STANDARD PLANS FOR TEMPORARY RAILING (TYPE K). VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO REASONABLE EQUIVALENCE BY PROJECT ENGINEER.
  - USE ANCHOR PLATE AS TEMPLATE FOR DRILLING.
  - RECOMMENDED HOLE DEPTH INTO PCMB IS 127[5.00]. DRILL 4 HOLES IF NECESSARY TO INSTALL A MINIMUM OF 2 ANCHOR BOLTS PER BRACKET. FINAL TORQUE TO BE 163 kN[120 ft-lbs] (TYP).
  - IMPACT FORCES CAN BE TRANSFERRED INTO TERMINAL END OF THE BARRIER. ADEQUATE ANCHORAGE IS REQUIRED TO ENSURE PROPER IMPACT PERFORMANCE. PCMB MUST BE ANCHORED TO A RIGID SURFACE (NOT DIRT) WITH A MINIMUM OF 12 THREADED RODS (ITEM 3) AS SHOWN. ANCHOR BOTH SIDES OF BARRIER USING ITEM 1 (6 REQUIRED). ATTACH PCMB USING ONE OF THE FOLLOWING:
    - 1/2" STUDS MAY BE USED TO ANCHOR PCMB TO 28 MPa [4000 PSI] MIN. P.C. CONCRETE PER THE FOLLOWING MINIMUM CONCRETE DEPTHS:\*\*
      - 150 [6.00] NON-REINFORCED ROADWAY.
      - 180 [7.00] DECK STRUCTURE.
      - 18" THREADED RODS MAY BE USED TO ANCHOR PCMB TO ASPHALT (6" MIN. THICKNESS)\*\*.
    - MIN. 28 MPa [4,000 PSI] P.C. CONCRETE MEDIAN BARRIER.
  - DIMENSIONS ARE IN MILLIMETERS [INCHES] UNLESS OTHERWISE NOTED.

**ASSEMBLY NO. 603648B**  
**ASSEMBLY NO. 612006B**

**ENERGY ABSORPTION SYSTEMS, INC.**  
ENGINEERING AND RESEARCH DEPARTMENT

**QUADGUARD™ SYSTEM**  
**PCMB ANCHOR ASSEMBLY**

INSTRUCTION NUMBER 115420B

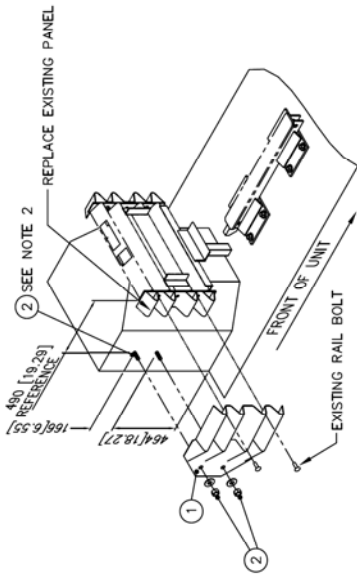
N.T.S. 612006 1 of 1

DATE: 7/31/97  
DESIGNED BY: J. Espinoza  
CHECKED BY: S. Turner  
DATE: 11/07/96  
DRAWN BY: KRM  
DATE: 9/12/97  
SCALE: SPT  
DATE: 9/17/97  
CADD FILE: 612006.dwg  
NEXT ASSEMBLY:

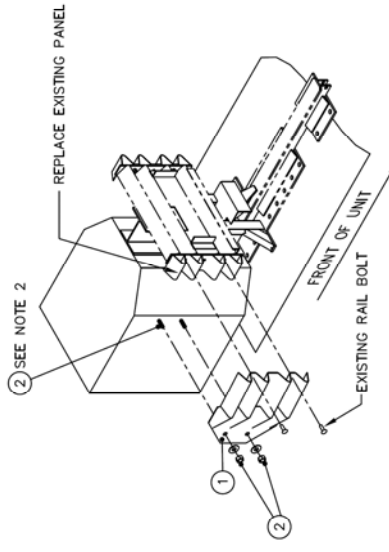
PCMB Anchor Assembly

608105

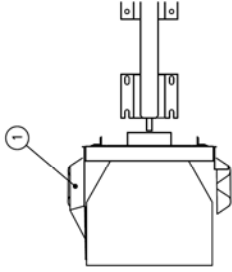
PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	RECD
1	608122G	SIDE PANEL/END SHOE, QG, G	1.00
2	603670B	ANCHOR, MP-3, PT KIT, 3/4X6 1/2 HOR	1.00



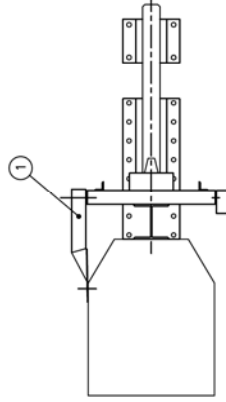
CONCRETE BACKUP



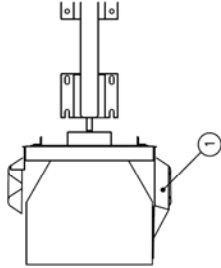
TENSION STRUT BACKUP



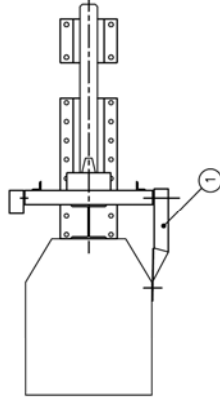
RIGHT SIDE APPLICATION



RIGHT SIDE APPLICATION



LEFT SIDE APPLICATION



LEFT SIDE APPLICATION

NOTES:  
 1. DIMENSIONS ARE IN MILLIMETERS [INCHES]  
 2. USE END SHOE AS TEMPLATE FOR DRILLING.  
 RECOMMENDED HOLE DEPTH 127 [5.00]  
 FINAL TORQUE TO BE 163Nm [120 FT-LBS] (TYP).  
 ANCHOR STUD END SHOULD BE FLUSH WITH  
 OUTSIDE SURFACE OF ANCHOR NUT.

REFERENCES

DATE	BY	DATE	BY
5/24/96	D. Staus	5/24/96	
5/1/96	WCK	5/1/96	
6/5/96	S. Trageser	6/5/96	
6/5/96	W. Krage	6/5/96	

APP. FILE: 608105.dwg  
 NEXT ASSEMBLY:

ASSEMBLY NO. 608105B

ENERGY ABSORPTION SYSTEMS, INC.  
 ENGINEERING AND RESEARCH DEPARTMENT

QUADGUARD® SYSTEM  
 END SHOE ASSY, QG

SCALE	N.T.S.	DATE	608105	SHEET	1 of 1	REV	1
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End Shoe Assembly







616108

ITEM	STOCK NO.	DESCRIPTION	PARTS LIST			REOD
			N	M	W	
1	611953	PANEL TRANS QUAD-W-BEAM.O.G.G	1	1	1	1
2	605338	BRACE DIAGONAL TRANSITION.O.G.G	1	1	1	1
3	003400	BOLT RAIL 5/8X2 LG	4	6	6	6
4	003340	5/8 RECESSED HEX NUT	4	6	6	6
5	117976	WASHER BAR 1/8X1 1/4X2 W/HOLE	2	2	2	2
6	605334	BRACE BLOCKOUT 3.O.G.G	0	1	0	0
7	605335	BRACE BLOCKOUT 6.O.G.G	0	0	1	0
8	605333	BRACE BLOCKOUT 12.O.G.G	0	0	0	1

SYSTEM WIDTH	ASSEMBLY NO.	BLOCKOUT
610 [24.00]	N	616108
762 [30.00]	M	NOT REOD
914 [36.00]	W	ITEM #6*
1219 [48.00]	48	ITEM #7*
		ITEM #8*

\*SEE PARTS LIST ABOVE FOR CITY REOD

**NOTES:**

- PANEL OVERLAP SHOWN IS FOR TRAFFIC DIRECTION SHOWN. ACTUAL OVERLAP SHALL BE DETERMINED BY THE SITE CONDITIONS AND PROJECT ENGINEER PER TRAFFIC DIRECTION. USE STANDARD GUARDRAIL CONNECTION.
- RIGHT SIDE OF ROAD APPLICATION SHOWN. ASSEMBLY MAY BE USED ON EITHER OR BOTH SIDES FOR LEFT, RIGHT, MEDIUM OR GORE APPLICATIONS. SEE NOTE 1. THIS ASSEMBLY IS NOT INCLUDED IN THE MODEL NUMBER AND MUST BE ORDERED SEPARATELY.
- FOR DOWNSTREAM GUARDRAIL APPLICATIONS, THE DOWNSTREAM GUARDRAIL SHALL BE ORDERED SEPARATELY.
- OF THE DOWNSTREAM GUARDRAIL ARE STANDARD HIGHWAY MATERIALS AND MAY BE OBTAINED FROM YOUR LOCAL HIGHWAY SUPPLY VENDORS.
- TRANSITION AND GUARDRAIL PANEL CONNECTIONS MAY BE SLOTTED IN ORDER TO ACCOMMODATE THERMAL EXPANSION AND CONTRACTION.

**DIAGONAL BRACE ASSEMBLY**

TRAFFIC

SEE NOTE 1

POST #1 IS NOT BOLTED DIRECTLY TO TRANSITION PANEL COUNTERSINK HOLES AS NEEDED

POST #1

POST #2

POST #3

POST #4

POST #5

AASHTO SPEC #RVC16B 5/8\"/>

REPLACE SIDE PANEL TRANSITION PANEL (ITEM 1)

SEE DETAIL BRACE ASSEMBLY AND DETAIL A

ALL OTHERS TO BE STANDARD AASHTO SEE NOTE 3

5

2

1

TRANSITION ASSEMBLY, QUAD-BEAM TO W-BEAM

616108

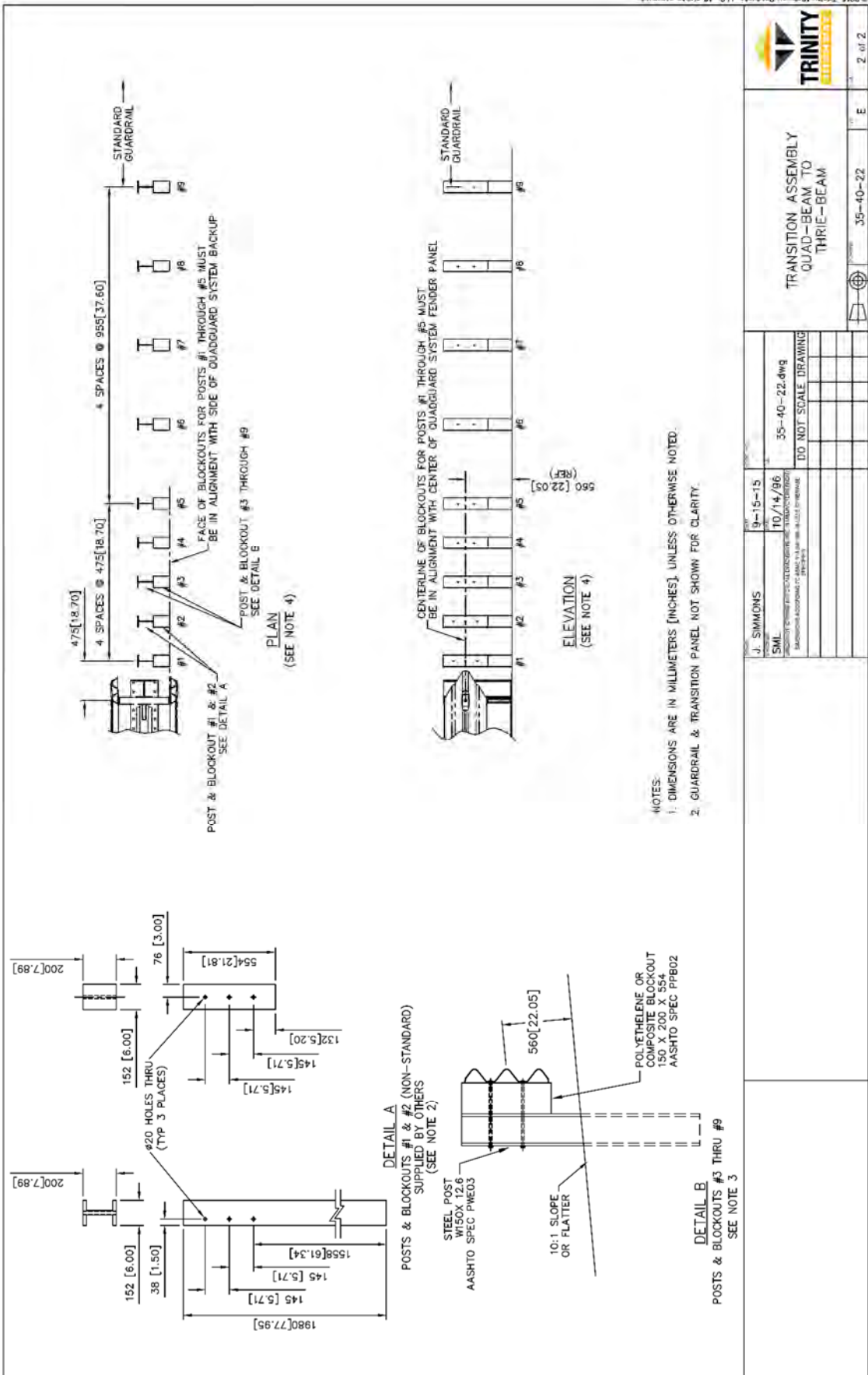
REV G

1 of 2

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Quad-Beam to W-Beam Transition Assembly





NOTES:  
1. DIMENSIONS ARE IN MILLIMETERS [INCHES], UNLESS OTHERWISE NOTED.  
2. GUARDRAIL & TRANSITION PANEL NOT SHOWN FOR CLARITY.

J. SIMMONS		9-15-15	35-40-22.dwg	2 of 2
SMI	10/14/06	35-40-22.dwg	DO NOT SCALE DRAWING	E
<p>TRANSITION ASSEMBLY QUAD-BEAM TO THREE-BEAM</p>				
<p>35-40-22</p>				



**Notes:**

**Notes:**





# TRINITY

## HIGHWAY

*Ahead of the Curve*<sup>®</sup>

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+1 214.589.8140 (International)