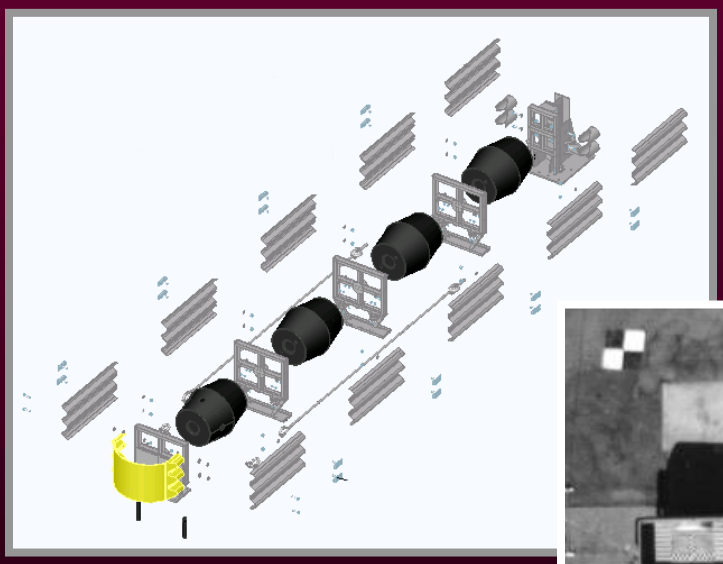
TAU-II®
Crash Cushion System

DESIGN GUIDE



"Advancing Safety Through Innovation"

Patents Pending

BARRIER SYSTEMS INC
180 River Road • Rio Vista, CA 94571

Table of Contents

PREFACE

The Barrier Systems, Inc. (BSI), TAU-II crash cushion system incorporates the newest roadside safety materials and engineering processes.

As with any roadside safety device, the TAU-II system must be installed properly to insure proper performance. Thoroughly review and fully understand the installation instructions and product limitations before starting the installation. An instructional video is available from BSI to help explain the general installation requirements. Watch and fully understand the TAU-II *Installation and Assembly Video* before attempting to install this crash cushion. Do not start the installation without the proper plans and tools required for installation.

If you need additional information, or have questions about the TAU-II Crash Cushion, please call the BSI Customer Service Department at 888-800-3691 (U.S. toll free) or 707-374-6800.

INTRODUCTION

The TAU-II system has been tested to meet the rigorous requirements of NCHRP Report 350, Test Levels 2 and 3. The systems will be provided in lengths and capacities for both low speed and high speed applications.

The TAU-II system is fully redirective and non-gating, and is ideally suited for narrow hazards such as the ends of rigid barriers, tollbooths, utility poles and more. Ease of installation, numerous transition options, low maintenance requirements, and reusability of system components make the TAU-II system ideal for treating many roadside hazards.

Redirective, non-gating crash cushions are highway safety devices whose primary function is to improve the safety for occupants of errant vehicles that impact the end of rigid or semi-rigid barriers or fixed roadside hazards by absorbing the kinetic energy of impact or by allowing controlled redirection of the vehicle. These devices are designed to safely decelerate an errant vehicle to a safe stop or redirect an errant vehicle away from roadside or median hazards. These types of systems are typically applied to locations where head-on and angled impacts are likely to occur and it is desirable to have the majority of post impact trajectories on the impact side of the system.

Placement and use of the TAU-II system should be accomplished in accordance with the guidelines and recommendations set forth in the “AASHTO Roadside Design Guide,” FHWA memoranda and other state and local standards.

IMPORTANT INFORMATION

The TAU-II crash cushion must be installed properly to maximize the systems ability to protect errant motorists that impact the system. Designers, installers and people that maintain the system should thoroughly understand the manufacturer's instructions prior to performing the necessary work. Key information is provided in this Design Manual and important additional information is in the Installation Manual and Maintenance Instructions. If these documents are not available or if there are any questions regarding the proper placement, installation or maintenance of the TAU-II crash cushion, contact Barrier Systems, Inc., Customer Service toll free at 888-800-3691 (in the U.S.) or 707-374-6800.

SYSTEM OVERVIEW

The TAU-II system is designed and constructed to provide acceptable structural adequacy, minimal occupant risk and safe vehicle trajectory as set forth in NCHRP 350 for redirective, non-gating, crash cushions. The TAU-II system is designed to shield the ends of median barriers and other narrow fixed objects likely to be struck head-on, by absorbing and dissipating the kinetic energy of impacting vehicles. TAU-II utilizes disposable Energy Absorbing Cartridges (EACs) to absorb the kinetic energy of the impacting vehicle. The EACs are separated by diaphragms and held in place with a framework of thrie-beam corrugated steel rail panels that "telescope" rearward during head-on impacts. As the vehicle compresses the cushion, it exerts a force on the first bay containing an EAC. The diaphragms distribute the impact forces uniformly to all the remaining cartridges in each bay until the vehicle eventually stops. The depth of penetration is dependent upon both the original impact speed and the mass of the impacting vehicle. Only the Energy Absorbing Cartridges are expended after most head-on impacts. When hit at an angle along the side, the system is restrained laterally by guidance cables that run the length of the system, attaching to the bottoms of the diaphragms, and terminate at the anchors at each end of the system. The front and rear cable anchors are bolted to a foundation.

TAU-II CRASH CUSHION SYSTEM

ISOMETRIC DRAWING (TL-2)

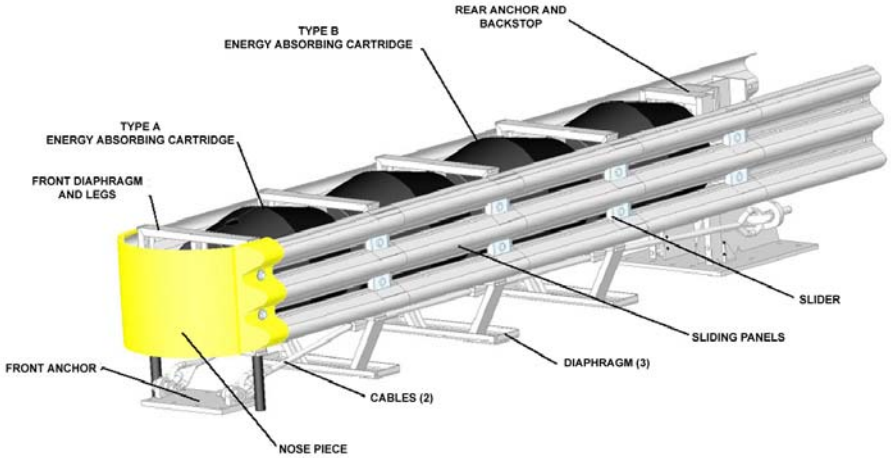
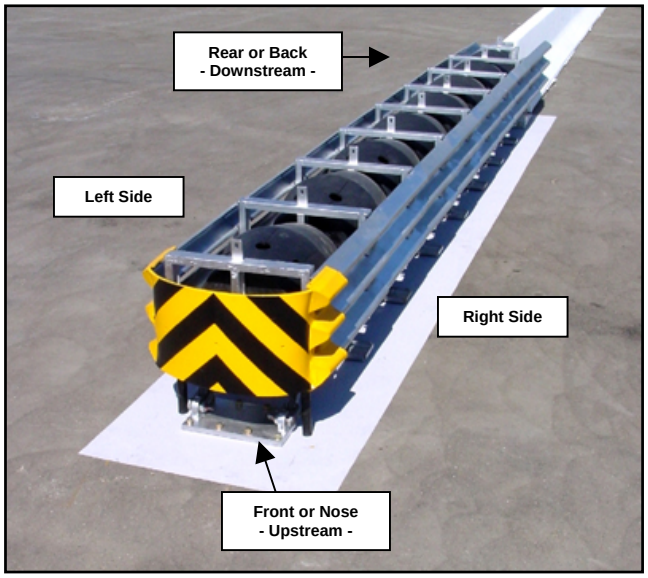
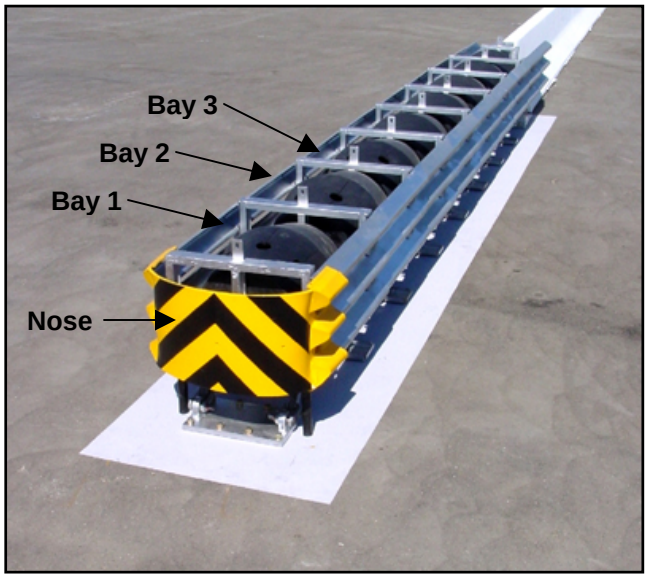


Figure 1. Illustrated parts list



Sign Conventions

The picture of the TAU-II system above is labeled to show the descriptive terms that will be used throughout this manual.



Bay Counting Convention

The picture of the TAU-II system above is labeled to show how the bays are numbered throughout this manual. Note that the nose does not have an Energy Absorbing Cartridge and is not counted as a bay.

Design Considerations

The TAU-II system is a redirective, non-gating system that has been fully tested in conformance with NCHRP Report 350 and approved by the U. S. DOT Federal Highway Administration as well as several countries outside of the U.S. Redirective, non-gating crash cushions are frequently used at locations where if is desirable to have the majority of post impact vehicle trajectories on the impact side of the system. If it is desirable to maximize the post impact trajectories to the back side of the system, non-redirective crash cushions should be considered.

This section will address several of the other key issues that should be considered in deciding where and how to use the TAU-II crash cushion.

System Length and Width

The length and width of the TAU-II crash cushion is shown on the drawings in the Appendix.

System Capacity

The TAU-II crash cushion is available in several lengths to accommodate frontal impact velocities higher and lower than required in NCHRP Report 350. Appendix B (Page 15) contains a chart that shows the number of options available, the frontal impact speed capacity and the Type “A” and Type “B” EAC configurations.

Types of Backstop Structures

The TAU-II crash cushion can be installed with either a freestanding “Compact Backstop” or a “P.C.B. Backstop” that can be attached to properly reinforced concrete barrier. These two options are shown in Appendix A.

Foundation Options and Considerations

There are three foundation options that are described in Appendix A. The TAU-II system must be securely attached to the appropriate foundation in accordance with the Installation Manual and the drawings in Appendix A and E. Anchoring material options are listed in Appendix C.

The concrete foundation shown on the drawings must be a minimum of 6 inches (150 mm) thick, reinforced 28 Mpa (4000 psi) Portland Cement Concrete (PCC) or 8 inches (200 mm) non-reinforced 28 Mpa (4000

psi) PCC. Asphalt foundations must be a minimum of 8 inches (200 mm) thick, AR-4000 Asphalt Concrete as described in Appendix A (Page 8). The foundation should be free of major cracks and other structures (expansion joints, drainage structures, etc.) that could interfere with the operation of the TAU-II system.

Cross slopes of up to 8% (5 degrees or 1:12 slope) can be accommodated with the standard hardware and with the instructions provided with the system. If there are cross slopes in excess of 8%, contact Barrier Systems, Inc., Customer Service to obtain engineering advice and assistance.

Transition Options

The TAU-II crash cushion was designed to be able to use standard AASHTO type transitions. Departments of transportation can apply their standard transition designs between the TAU-II system and adjacent longitudinal barrier systems. Several typical transition options are provided in Appendix D.

Special care should be taken to ensure that the type of transition system chosen properly addresses the direction of all vehicles that will be exposed to the system. If there is bi-directional traffic around the system, ensure that the transition properly shields the vehicles from the backstop structure of the TAU-II system.

Other Site Conditions and Considerations

There are numerous other conditions that should be taken into consideration when selecting and locating crash cushions. The majority of these are addressed in the "AASHTO Roadside Design Guide" and in memoranda from the Federal Highway Administration and state Departments of Transportation. These should always be taken into consideration when selecting and locating crash cushions.

A few of the typical considerations are as follows:

- All curbs, islands and elevated objects greater than 4 inches (100 mm) high that would be beneath, beside or less than 50 feet (15 m) in front of a TAU-II crash cushion should be removed prior to installation.
- Ensure that all drainage inlets or structures, junction boxes, expansion joints, sign supports, delineators or any other element that is close to the installation site of the TAU-II system, cannot interfere with the proper operation of the system.

Limitations and Warnings

The TAU-II system has been rigorously tested and evaluated per the recommendations in the NCHRP Report 350 Guidelines for Test Level 2 (TL-2) and Test Level 3 (TL-3) terminals and crash cushions. The impact conditions recommended in NCHRP 350 are intended to address typical in-service collisions.

When the TAU-II system is properly installed and maintained, the system is capable of stopping or containing and redirecting impacting vehicles in a predictable and safe manner under the NCHRP 350 impact conditions of:

Vehicles: Pickup (2000P) and small car (820C)

Mass: 4409 lbs. (2000 kg) and 1808 lbs. (820 kg)

Speed: 62 mph (100 km/hr)

Angle: 20 degrees for pickup and 15 for small car

Vehicle impacts that vary from the NCHRP 350 impact conditions described for redirective non-gating, crash cushions may result in significantly different results than those experienced in testing. Vehicle impact characteristics different than or in excess of those encountered in NCHRP 350 testing (speed and angle) may result in system performance that may not meet the NCHRP 350 evaluation criteria.

APPENDIX A

Anchoring Foundation Options

There are three approved anchoring foundation configurations for the TAU-II system. The first method utilizes a solid concrete pad over the length of the system. The second utilizes concrete blocks at the Backstop and Front Cable Anchor locations. The third is asphalt (as specified in Appendix A, Page 8).

(Variations of these foundations may be reviewed and determinations made as to equivalence by the Project engineer.)

There are different foundation configurations depending on which backstop you are using (Compact or P.C.B.). Foundation options for both of the Backstop systems are shown in the following drawings.

For additional information regarding this product, please contact:

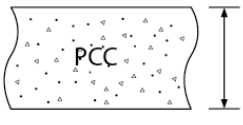
Barrier Systems, Inc.
Customer Support
180 River Road
Rio Vista, CA 94571

Toll Free (US) 888 800 3691
Phone 707 374 6800
Fax 707 374 6801

APPENDIX A: Foundation Specifications

The TAU-II Crash Cushion system has been designed to attach to concrete or asphalt foundations. Use the anchorage specified below depending on the foundation at the job site. Please see Appendix C for chemical anchoring specifications.

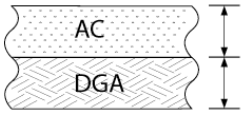
1. Concrete Pad



Foundation: Minimum 6 in. (150 mm) Reinforced PCC Pad or 8 in. (200 mm) Nonreinforced PCC Pad

Anchorage: 3/4 in. (20 mm) x 8 1/4 in. (210 mm) bolts 6 in. (150 mm) embedment

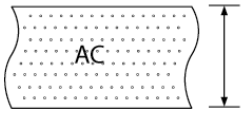
2. Asphalt over Subbase



Foundation: Minimum 6 in. (150 mm) AC over 6 in. (150 mm) Compacted DGA Subbase

Anchorage: 3/4 in. (20 mm) x 18 in. (460 mm) bolts 15 to 16 1/2 in. (380 to 420 mm) embedment

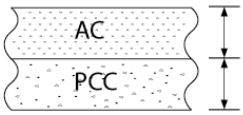
3. Asphalt Only



Foundation: Minimum 8 in. (200 mm) AC

Anchorage: 3/4 in. (20 mm) x 18 in. (460 mm) bolts 15 to 16 1/2 in. (380 to 420 mm) embedment

4. Asphalt over P.C. Concrete

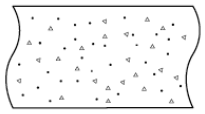


Foundation: Minimum 3 in. (75 mm) AC over minimum 3 in. (75 mm) PCC

Anchorage: 3/4 in. (20 mm) x 18 in. (460 mm) bolts 15 to 16 1/2 in. (380 to 420 mm) embedment

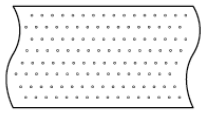
SPECIFICATION SUMMARY

Portland Cement Concrete (PCC)



Stone aggregate concrete mix, 4,000 psi (28 MPa) minimum compressive strength (sampling per ASTM C31-84 or ASTM C42-84a, testing per ASTM C39-84)

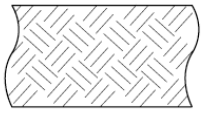
Asphalt Concrete (AC)



AR-4000 A.C. (per ASTM D3381 '83) .75" Maximum, medium (Type A or B) aggregate

Sieve Size	% Passing
1"	100
3/4"	95 - 100
3/8"	65 - 80
No. 4	49 - 54
No. 8	36 - 40
No. 30	18 - 21
No. 200	3 - 8

Compacted Subbase (DGA)



6 in. (150 mm) minimum depth, 95% compaction, class 2 aggregate

Sieve Size	% Passing
3"	100
2 1/2"	90 - 100
No. 4	40 - 90
No. 200	0 - 25

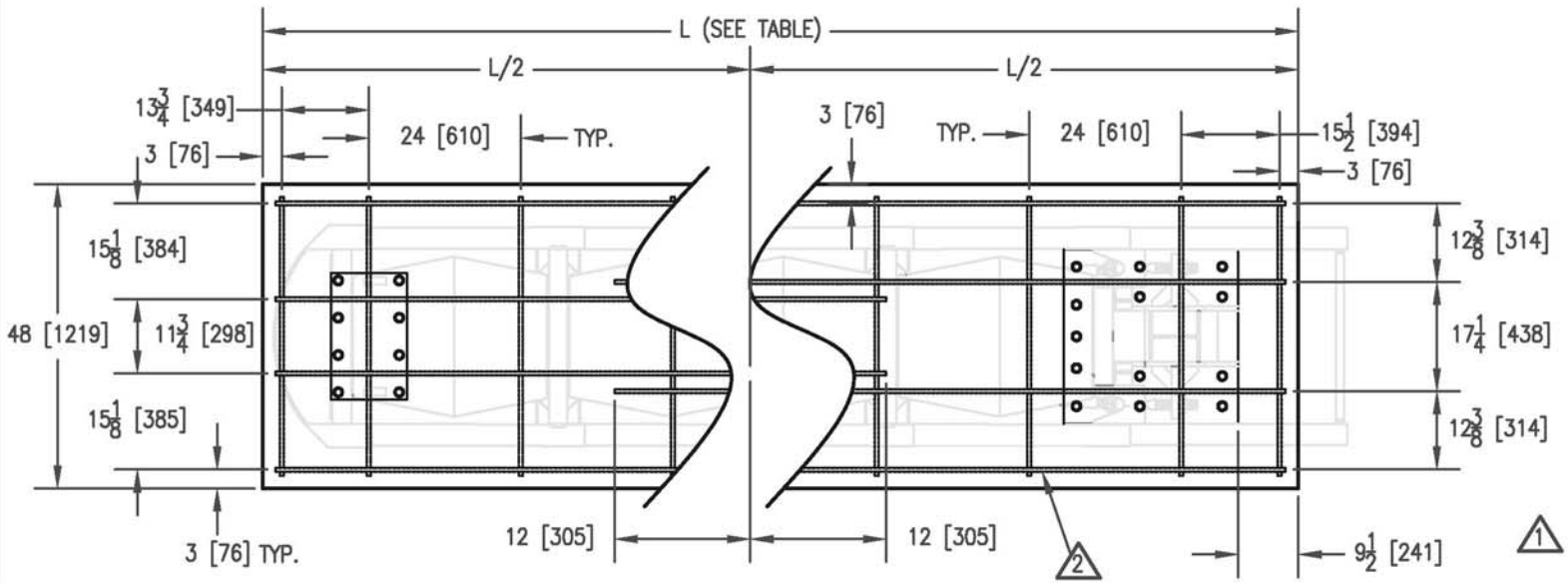
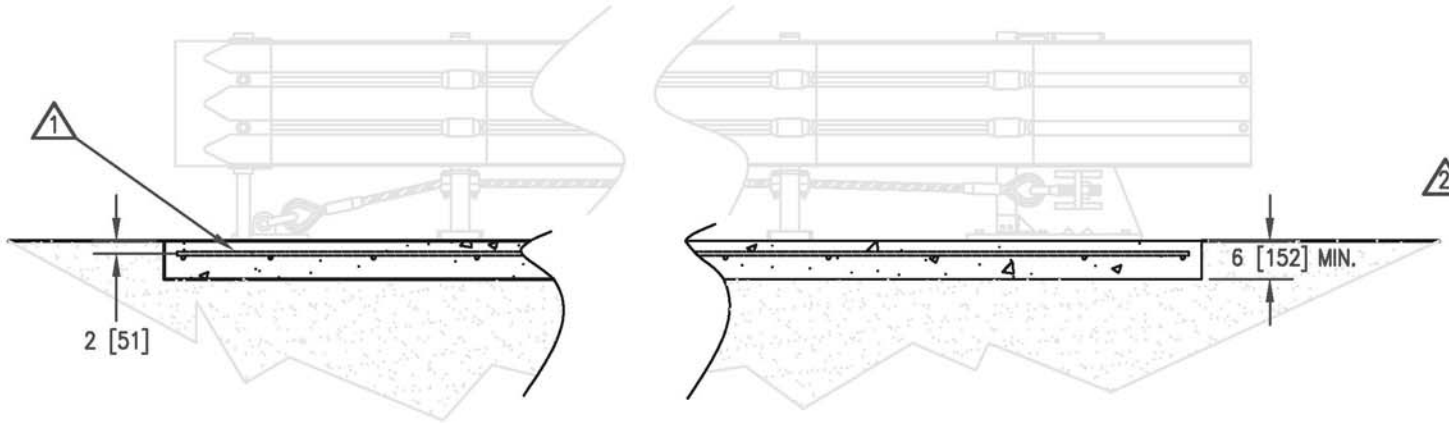


TABLE "L"			
No. OF BAYS	PART No.	L (IN)	L(MM)
2	B011027	115 1/2	2934
3	B011029	149 1/2	3797
4	B010529	183 1/2	4661
5	B011031	217 1/2	5525
6	B011033	252	6401
7	B011035	286	7264
8	B010708	320	8128
9	B011037	354	8992
10	B011039	388 1/2	9868



1 6 IN [150 MM] MIN. REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE PAD
OR
8 IN [200 MM] MIN NON-REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE ROADWAY.

4000 PSI [28 MPa] STONE AGGREGATE CONCRETE 145 LBS/CU.FT [2324 KG/CU.M].

2 #5 [15MM] REBAR

NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
A	SEE ECN 00331	2/25/02	GAD			

SCALE: 1=20

	DATE	INIT.
DRAWN BY	08/13/01	GAD
APPR'D BY	11/09/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, PC CONCRETE PAD OR ROADWAY, TAU-II WITH COMPACT BACKSTOP

APPENDIX A - Anchoring Pad Options
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
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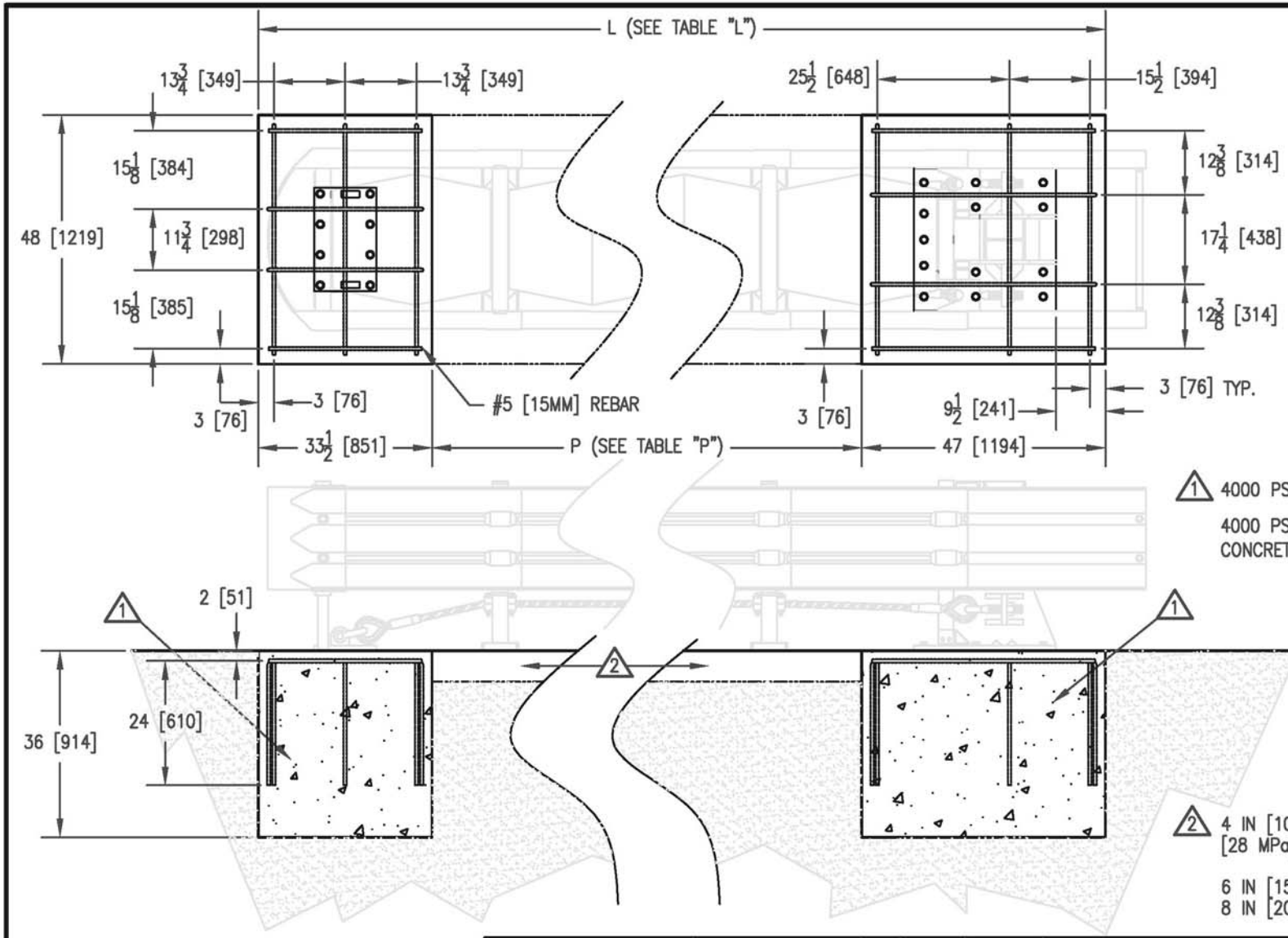

TABLE "L"			
No. OF BAYS	PART No.	L (IN)	L(MM)
2	B011027	115 1/2	2934
3	B011029	149 1/2	3797
4	B010529	183 1/2	4661
5	B011031	217 1/2	5525
6	B011033	252	6401
7	B011035	286	7264
8	B010708	320	8128
9	B011037	354	8992
10	B011039	388 1/2	9868

TABLE "P"			
No. OF BAYS	PART No.	P (IN)	P (MM)
2	B011027	35	889
3	B011029	69	1752
4	B010529	103	2616
5	B011031	137	3480
6	B011033	171 1/2	4356
7	B011035	205 1/2	5219
8	B010708	239 1/2	6083
9	B011037	273 1/2	6947
10	B011039	308	7823

1 4000 PSI [28 MPa] REINFORCED P.C. CONCRETE

4000 PSI [28 MPa] STONE AGGREGATE CONCRETE 145 LBS/CU.FT [2324 KG/CU.M].

2 4 IN [100 MM] MIN. NON-REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE
OR
6 IN [150 MM] ASPHALTIC CONCRETE ABOVE
8 IN [200 MM] D.G.A. BASE.

NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
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SCALE: 1=20

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APPR'D BY	11/09/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, PC CONCRETE ANCHOR BLOCKS, TAU-II WITH COMPACT BACKSTOP

APPENDIX A - Anchoring Pad Options
TAU-II Design Guide

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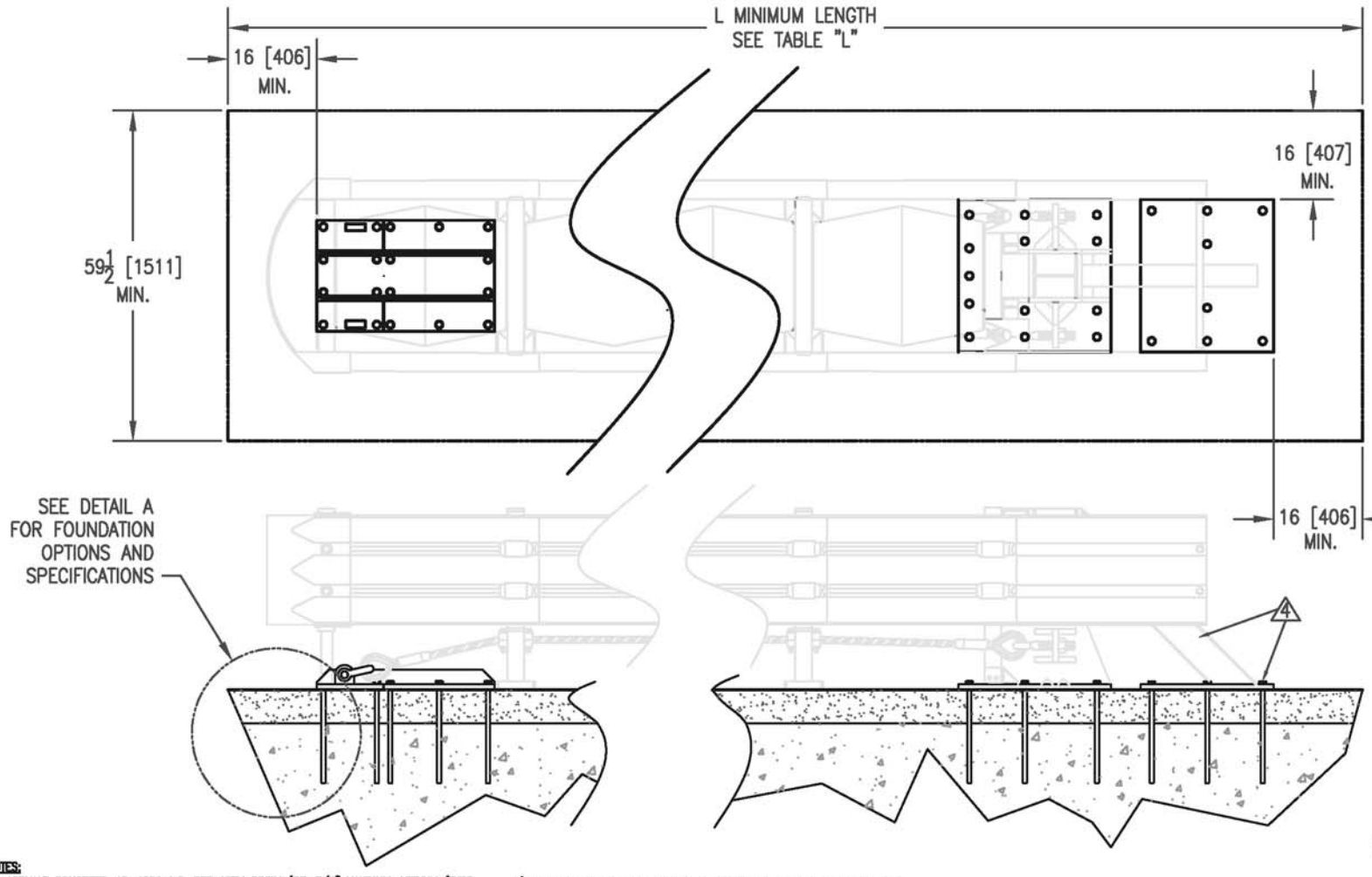

TABLE "L" MIN.			
No. OF BAYS	PART No.	L (IN)	L(MM)
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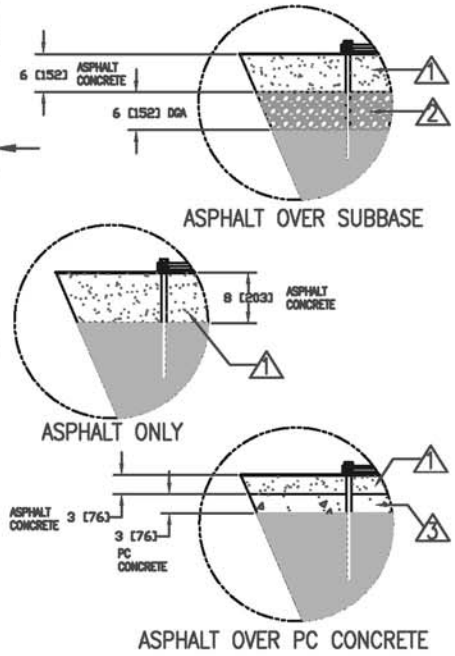
3	B011029	190 1/2	4842
4	B010529	224 1/2	5706
5	B011031	258 1/2	6570
6	B011033	293	7446
7	B011035	327	8309
8	B010708	361	9173
9	B011037	395	10037
10	B011039	429 1/2	10913

DETAIL A



NOTES:

1.) ASPHALT CONCRETE: AR–4000 A.C. PER ASTM D3381 '83. 3/4" MAXIMUM, MEDIUM (TYPE A OR B) AGGREGATE.

SIEVE SIZE	% PASSING
1"	100
3/4"	95-100
3/8"	65-80
No. 4	49-54
No. 8	36-40
No. 30	16-21
No. 200	3-8

2.) COMPACTED SUBBASE (DGA): 6 [150] MINIMUM, 95% COMPACTION, CLASS 2 AGGREGATE.

SIEVE SIZE	% PASSING
3"	100
2 1/2	90-100
No. 4	40-90
No. 200	0-25

3.) PORTLAND CEMENT CONCRETE (PCC): STONE AGGREGATE CONCRETE MIX, 4000 PSI (28 MPa) MINIMUM COMPRESSIVE STRENGTH (SAMPLING PER ASTM C31–84 OR ASTM C42–84A, TESTING PER ASTM C39–84).

4.) FOUNDATION OPTIONS TO BE USED WITH ASPHALT COMPACT BACKSTOP ANCHORING KIT, B020414.

5.) THE FOUNDATION OPTIONS SHOWN ARE RECOMMENDED TO ENSURE PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM

SCALE: 1=20

	DATE	INIT.
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APPR'D BY	04/19/02	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, ASPHALTIC CONCRETE PAD OR ROADWAY, TAU–II WITH COMPACT BACKSTOP

APPENDIX A - Anchoring Pad Options

TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
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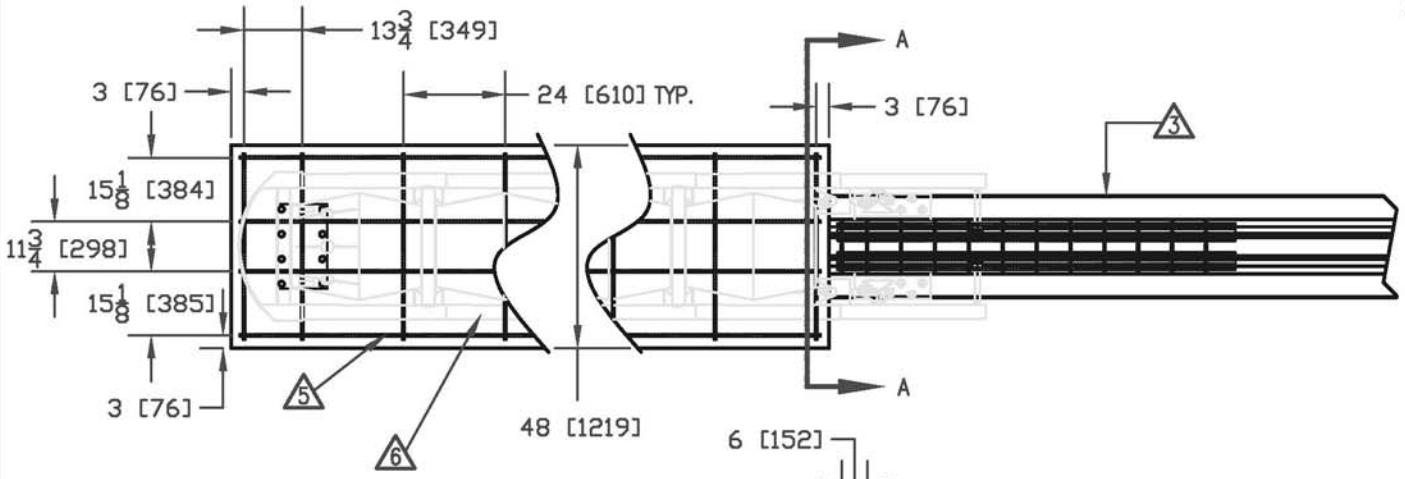

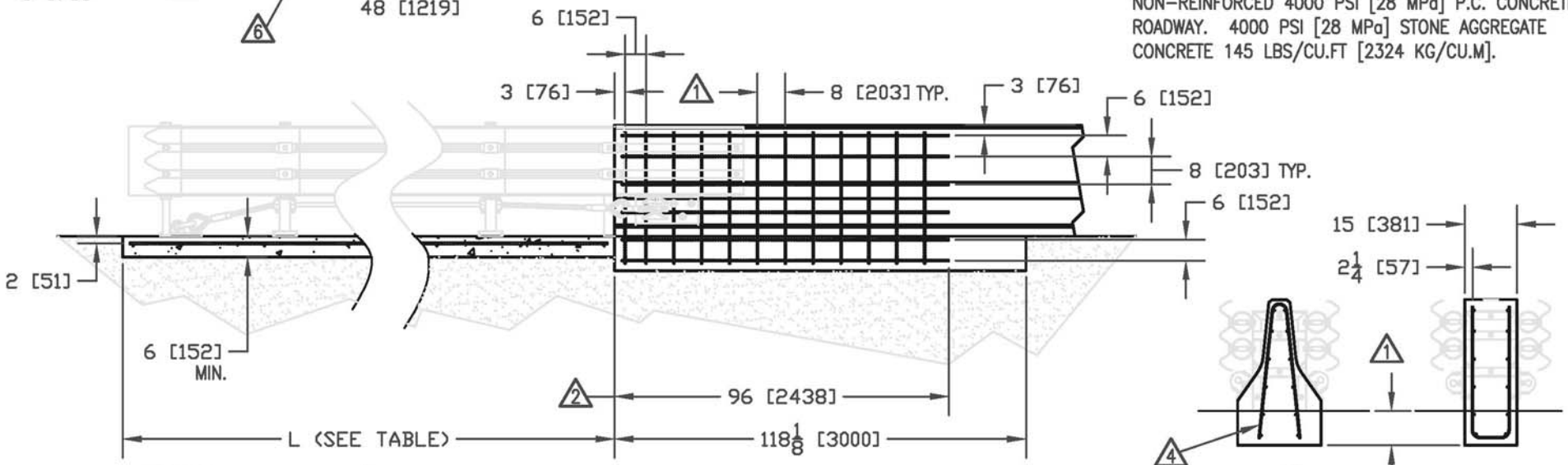

SECTION A–A

NOTES:

1.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE BARRIER INTEGRITY FOR PROPER IMPACT PERFORMANCE. IT IS APPROPRIATE FOR SAFETY SHAPED BARRIER AND VERTICAL CONCRETE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.

2.) MANUFACTURER RECOMMENDS TO REINFORCE A MINIMUM OF 96 IN [2438 MM] OF BARRIER.

3.) MINIMUM 4000 PSI [28 MPa] P.C. CONCRETE MEDIAN BARRIER.

4.) #4 [13MM] REBAR.

5.) #5 [15MM] REBAR.

6.) 6 IN [150 MM] MIN. REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE PAD OR 8 IN [200 MM] MIN. NON–REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE ROADWAY. 4000 PSI [28 MPa] STONE AGGREGATE CONCRETE 145 LBS/CU.FT [2324 KG/CU.M].

TABLE "L"			
No. OF BAYS	PART No.	L (IN)	L(MM)
2	B011026	85 1/2	2172
3	B011028	119 1/2	3035
4	B010922	154	3912
5	B011030	188	4775
6	B011032	222	5639
7	B011034	256	6502
8	B010923	290 1/2	7379
9	B011036	324 1/2	8242
10	B011038	358 1/2	9106

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
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APPR'D BY	11/09/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, PC CONCRETE PAD OR ROADWAY, TAU–II WITH P.C.B. BACKSTOP

APPENDIX A - Anchoring Pad Options

TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
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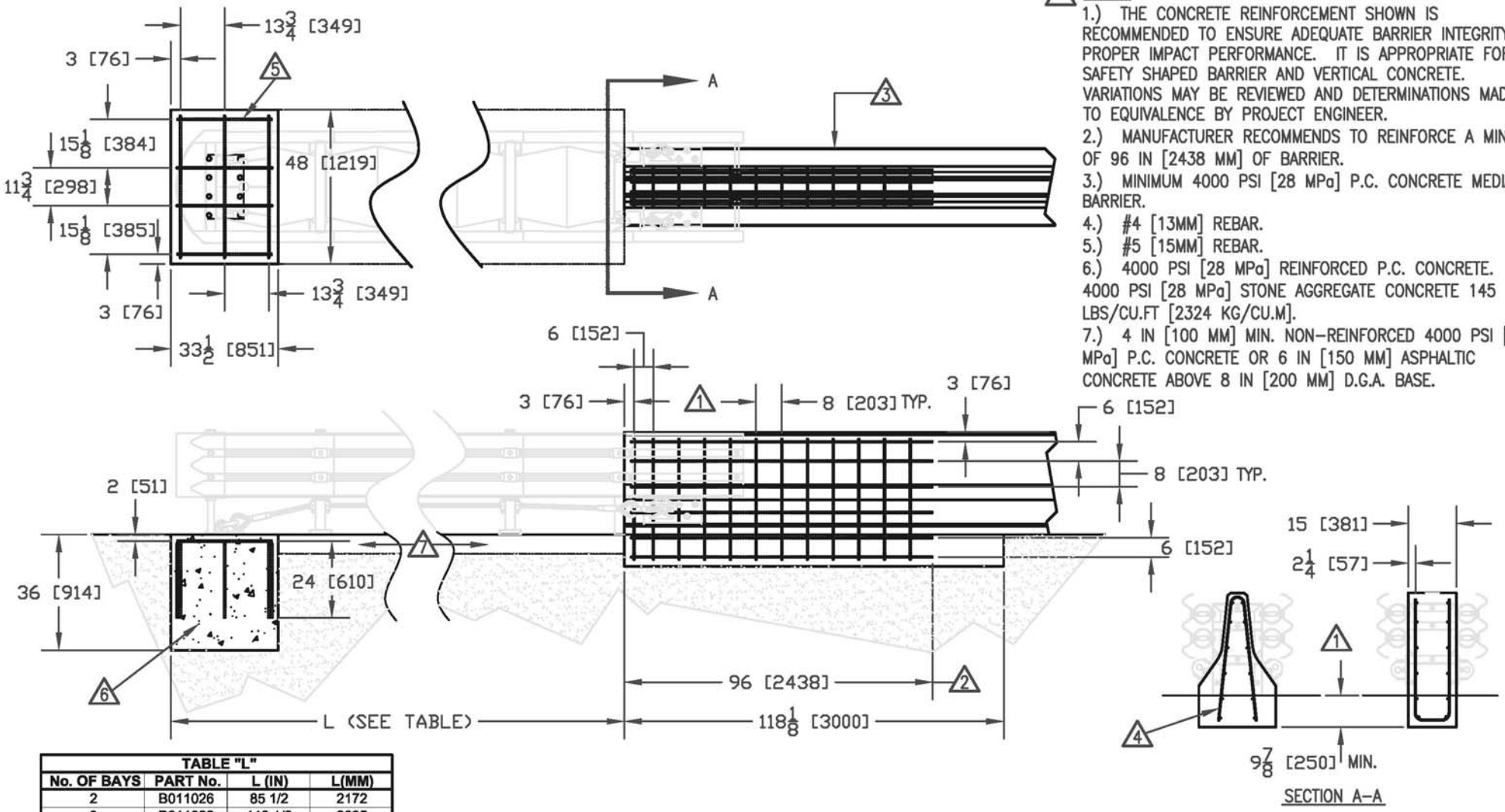


SECTION A–A

NOTES:

1.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE BARRIER INTEGRITY FOR PROPER IMPACT PERFORMANCE. IT IS APPROPRIATE FOR SAFETY SHAPED BARRIER AND VERTICAL CONCRETE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.

2.) MANUFACTURER RECOMMENDS TO REINFORCE A MINIMUM OF 96 IN [2438 MM] OF BARRIER.

3.) MINIMUM 4000 PSI [28 MPa] P.C. CONCRETE MEDIAN BARRIER.

4.) #4 [13MM] REBAR.

5.) #5 [15MM] REBAR.

6.) 4000 PSI [28 MPa] REINFORCED P.C. CONCRETE. 4000 PSI [28 MPa] STONE AGGREGATE CONCRETE 145 LBS/CU.FT [2324 KG/CU.M].

7.) 4 IN [100 MM] MIN. NON–REINFORCED 4000 PSI [28 MPa] P.C. CONCRETE OR 6 IN [150 MM] ASPHALTIC CONCRETE ABOVE 8 IN [200 MM] D.G.A. BASE.

TABLE "L"

No. OF BAYS	PART No.	L (IN)	L(MM)
2	B011026	85 1/2	2172
3	B011028	119 1/2	3035
4	B010922	154	3912
5	B011030	188	4775
6	B011032	222	5639
7	B011034	256	6502
8	B010923	290 1/2	7379
9	B011036	324 1/2	8242
10	B011038	358 1/2	9106

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
A	SEE ECN 00331	2/25/02	GAD			

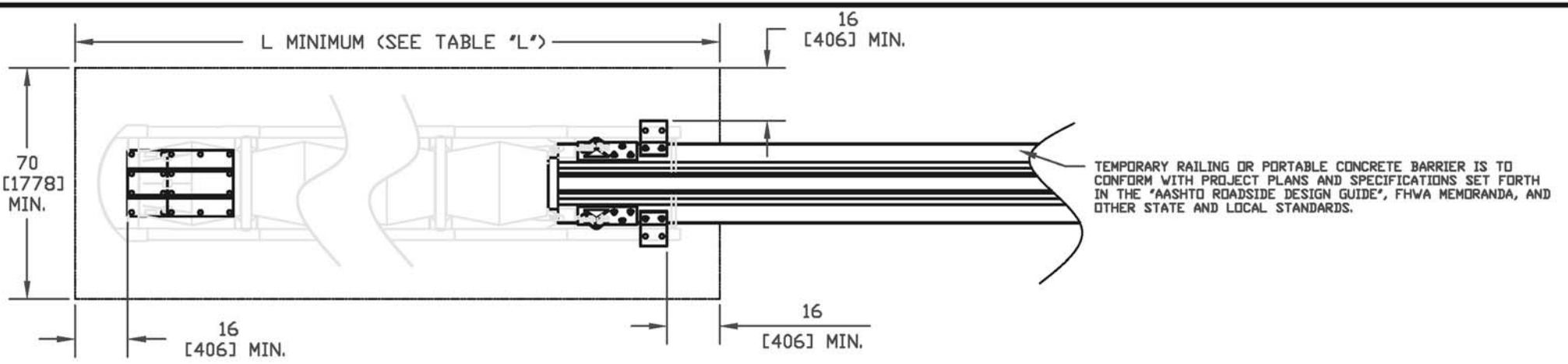
SCALE: 1:30

	DATE	INIT.
DRAWN BY	11/07/01	GAD
APPR'D BY	11/09/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, PC CONCRETE ANCHOR BLOCK, TAU–II WITH P.C.B. BACKSTOP

MODEL	DRAWING NUMBER	REV.
	B011045	A



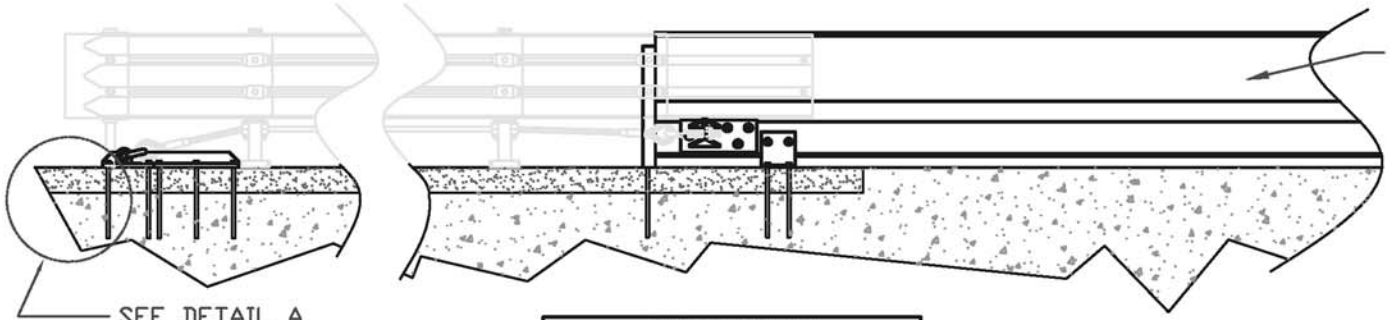
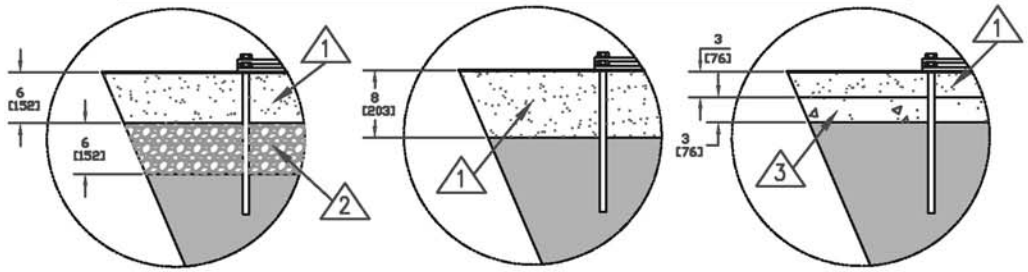


TABLE "L" MIN.			
No. OF BAYS	PART No.	L (IN)	L(MM)
2	B011026	139 3/4	3550
3	B011028	173 3/4	4413
4	B010922	208 1/4	5290
5	B011030	242 1/4	6153
6	B011032	276 1/4	7017
7	B011034	310 1/4	7880
8	B010923	344 3/4	8757
9	B011036	378 3/4	9620
10	B011038	412 3/4	10484

DETAIL A



NOTES:

1.) ASPHALT CONCRETE: AR-4000 A.C. PER ASTM D3381 '83. 3/4" MAXIMUM, MEDIUM (TYPE A OR B) AGGREGATE.

SIEVE SIZE	% PASSING
1"	100
3/4"	95-100
3/8"	65-80
No. 4	48-54
No. 8	38-40
No. 30	15-21
No. 200	3-8

2.) COMPACTED SUBBASE (DGA): 6 [150] MINIMUM, 95% COMPACTION, CLASS 2 AGGREGATE.

SIEVE SIZE	% PASSING
3"	100
2 1/2	90-100
No. 4	40-90
No. 200	0-25

3.) PORTLAND CEMENT CONCRETE (PCC): STONE AGGREGATE CONCRETE MIX, 4000 PSI (28 MPa) MINIMUM COMPRESSIVE STRENGTH (SAMPLING PER ASTM C31-84 OR ASTM C42-84A, TESTING PER ASTM C39-84).

4.) FOUNDATION OPTIONS TO BE USED WITH ASPHALT P.C.B. BACKSTOP ANCHORING KIT, B020415.

5.) THE FOUNDATION OPTIONS SHOWN ARE RECOMMENDED TO ENSURE PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM

SCALE: 1:30

	DATE	INIT.
DRAWN BY	11/07/01	GAD
APPR'D BY	11/09/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION, ASPHALTIC CONCRETE PAD OR ROADWAY, TAU-II WITH P.C.B. BACKSTOP

APPENDIX A - Anchoring Pad Options

TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B020411	

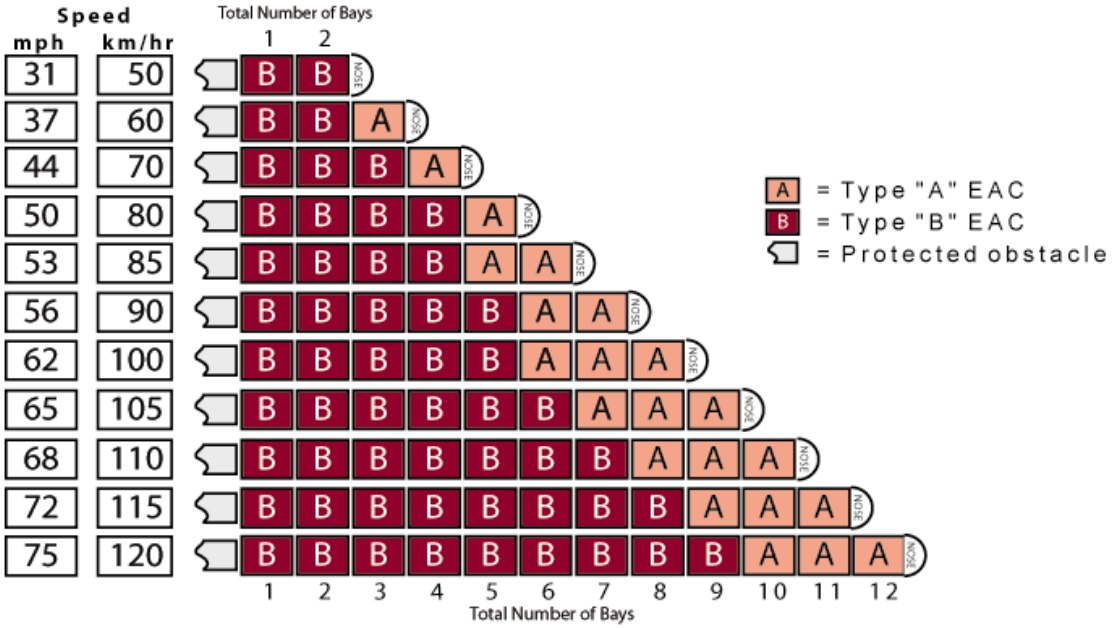
APPENDIX B System Configurations

The TAU-II Crash Cushion System has been fully designed and tested to comply with the evaluation requirements of the National Cooperative Highway Research Program Report 350 (NCHRP 350) for Test Levels 2 (70 km/h) and 3 (100 km/h). The Test Level 2 system contains four energy absorbing bays and the Test Level 3 system contains eight energy absorbing bays.

It is sometimes desirable to have a crash cushion that has an energy absorbing capacity that is less than Test Level 2, between Test Level 2 and Test Level 3 or greater than Test Level 3. Therefore, the following table indicates the number of bays, and the energy absorbing cartridge configuration, that would be required to absorb the kinetic energy of a 2000 kg (4400 lb.) vehicle impacting the front of the TAU-II system, head-on and at the velocity indicated.

Roadside safety features, such as crash cushions, must be installed in accordance with the AASHTO Roadside Design Guide, state and local standards and in conformance with the manufacturer's instructions. Instructions from the manufacturer are available by contacting Barrier Systems, Inc., Customer Service Department at 1-888-800-3691.

TAU-II System Configuration Chart



There are two types of Energy Absorbing Cartridges (EAC). Each EAC has a forward and rearward end. Type "B" EAC's have a solid cylinder wall with (3) vent holes on the rearward end. Type "A" EAC's have (8) 3" diameter holes around the circumference of the front half of the cylinder. When installing the EAC's in a system it is important to ensure that they are placed according to manufacturer specification and in the configurations illustrated above.

APPENDIX C

Anchoring Material Options

The anchoring package supplied with the TAU-II system contains the necessary threaded rods and epoxy needed to install the system. (Fosroc Anchortite Polyester Epoxy and galvanized or stainless steel threaded rods ¾" (20 mm) cut to length.) The epoxy has the following physical properties:

Compressive Strength, ASTM C-109 (7 days):
14,000 psi (97 MPa)

Tensile Strength, ASTM C-307 (7days):
2,000 psi (14 MPa)

Heat Distortion, Temperature, ASTM D-648:
233°F (112°C)

Coefficient of Linear Expansion:
2.55×10^{5}/°C

The proper ratio of filler/hardener to **resin** is two parts of filler/hardener to one part resin by volume.

Anchor bolt holes should be drilled using air-flushed or water-flushed rotary percussive drilling equipment. If diamond core or non-percussive drills are used, the hole must be thoroughly scoured using a coarse wire flue brush.

Other anchoring materials can be used if they comply with the following specifications: epoxy should meet the ASTM C307 tensile strength of 2,000 psi (14 MPa) and compressive strength of 10,000 psi (70 MPa) per ASTM C109 or C579. The anchoring compound (epoxy) should provide a pull out strength of 20,000 lb. (9070 kg) minimum in 4,000 psi (28 MPa) concrete. Products such as HILTI HIT HY150 injection Adhesive Anchor or HVA Adhesive Anchoring System fit this criteria.

The mechanical expansion anchors provided with the P.C.B. anchoring package can be replaced with any corrosion resistant mechanical or chemical anchor that provides a shear capacity of at least 30,000 lb. (13607 KG) and a tensile capacity of at least 20,000 lb. (9070 KG), in 4,000 psi (28MPa) concrete. Appropriate sized threaded rod and specified epoxy can also be substituted.

For additional information regarding this product, please contact:

Barrier Systems, Inc.
Customer Service
180 River Road
Rio Vista, CA 94571

U.S. Toll Free (888) 800-3691
Phone: (707) 374-6800
Fax: (707) 374-6801

APPENDIX D Transitions

There are a variety of transition options available for the TAU-II system. The system was designed to be compatible with a variety of generic transitions already available to the industry.

Placement and installation of the TAU-II system and transitions must be accomplished in accordance with the guidelines and recommendations set forth in the "AASHTO Roadside Design Guide," FHWA memoranda and other state and local standards.

There are different transition configurations depending on which backstop you are using (Compact or P.C.B.). Transition options for either of the Backstop systems are shown in the following drawings.

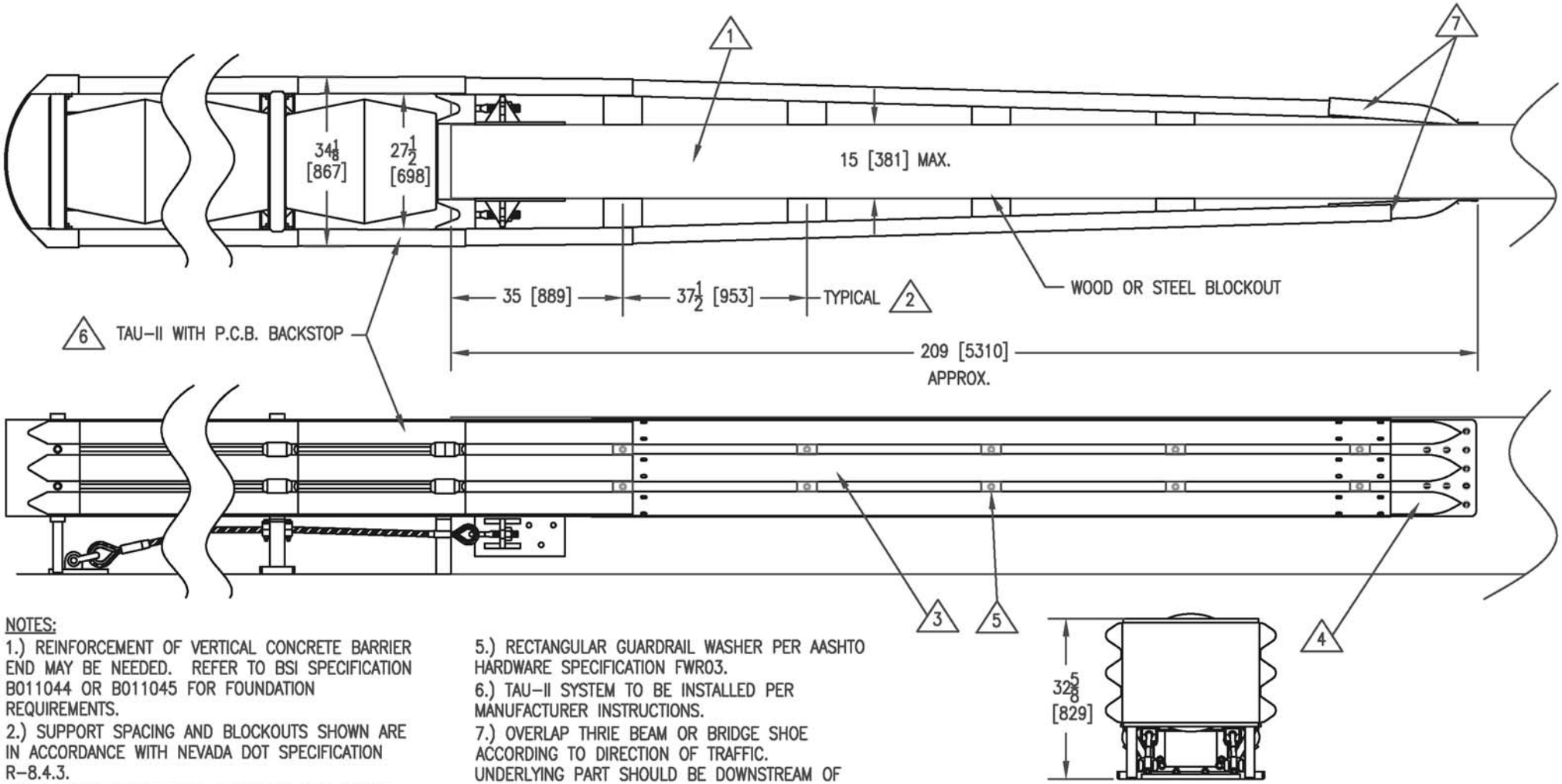
With P.C.B. Backstop:

With Compact Backstop:

For additional information regarding this product, please contact:

Barrier Systems, Inc.
Customer Support
180 River Road
Rio Vista, CA 94571

Toll Free (US) 888 800 3691
Phone 707 374 6800
Fax 707 374 6801



NOTES:

1.) REINFORCEMENT OF VERTICAL CONCRETE BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B011044 OR B011045 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND BLOCKOUTS SHOWN ARE IN ACCORDANCE WITH NEVADA DOT SPECIFICATION R–8.4.3.

3.) 4–SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b.

4.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

5.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

6.) TAU–II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

7.) OVERLAP THRIE BEAM OR BRIDGE SHOE ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/25/02	GAD			
A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

SCALE: 1=20

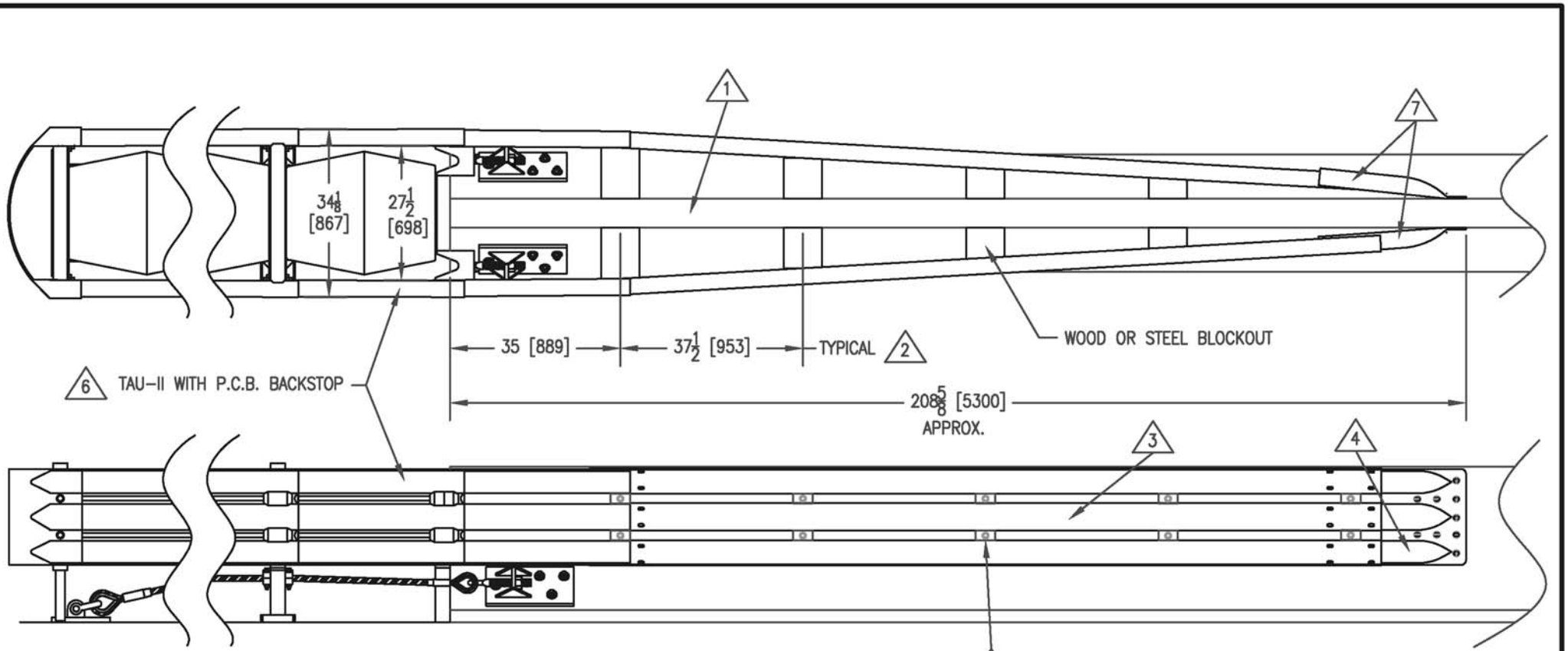
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/19/01	JSM

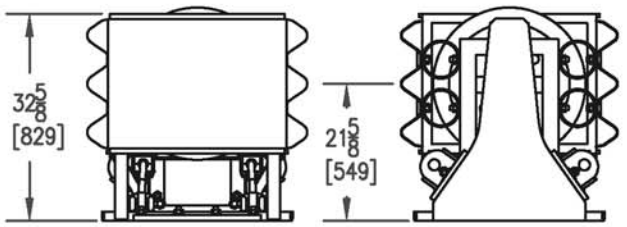
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU–II WITH PCB BACKSTOP TRANSITION TO VERTICAL CONCRETE

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010727	B





NOTES:

1.) REINFORCEMENT OF SAFETY SHAPED BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B011044 OR B011045 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND BLOCKOUTS SHOWN ARE IN ACCORDANCE WITH NEVADA DOT SPECIFICATION R-8.4.3.

3.) 4-SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b.

4.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

5.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

6.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

7.) OVERLAP THRIE BEAM OR BRIDGE SHOE ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/25/02	GAD			
A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

SCALE: 1=20

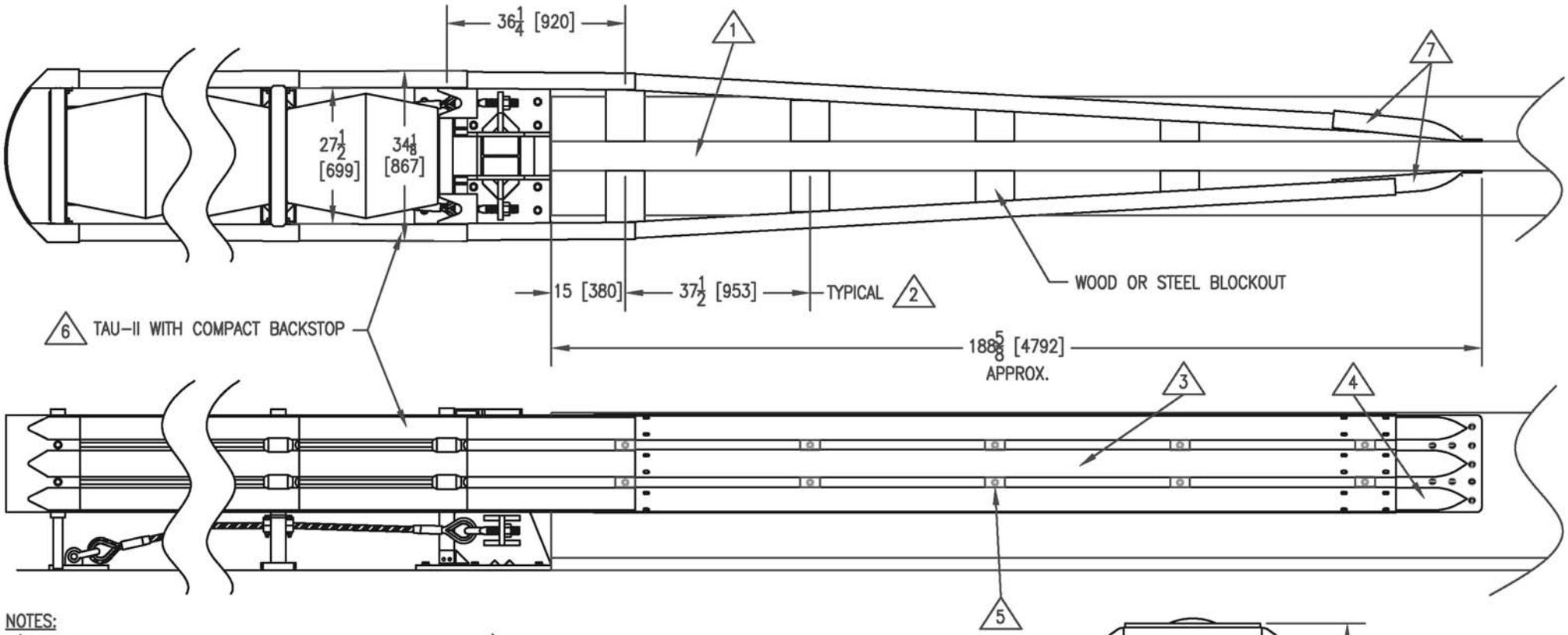
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/19/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH PCB BACKSTOP TRANSITION TO SAFETY SHAPE P.C.B

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010809	B



NOTES:

1.) REINFORCEMENT OF SAFETY SHAPED BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND BLOCKOUTS SHOWN ARE IN ACCORDANCE WITH NEVADA DOT SPECIFICATION R-8.4.3.

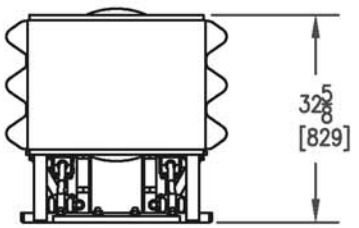
3.) 4-SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b.

4.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

5.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

6.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

7.) OVERLAP THRIE BEAM OR BRIDGE SHOE ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.



REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
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A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

SCALE: 1=20

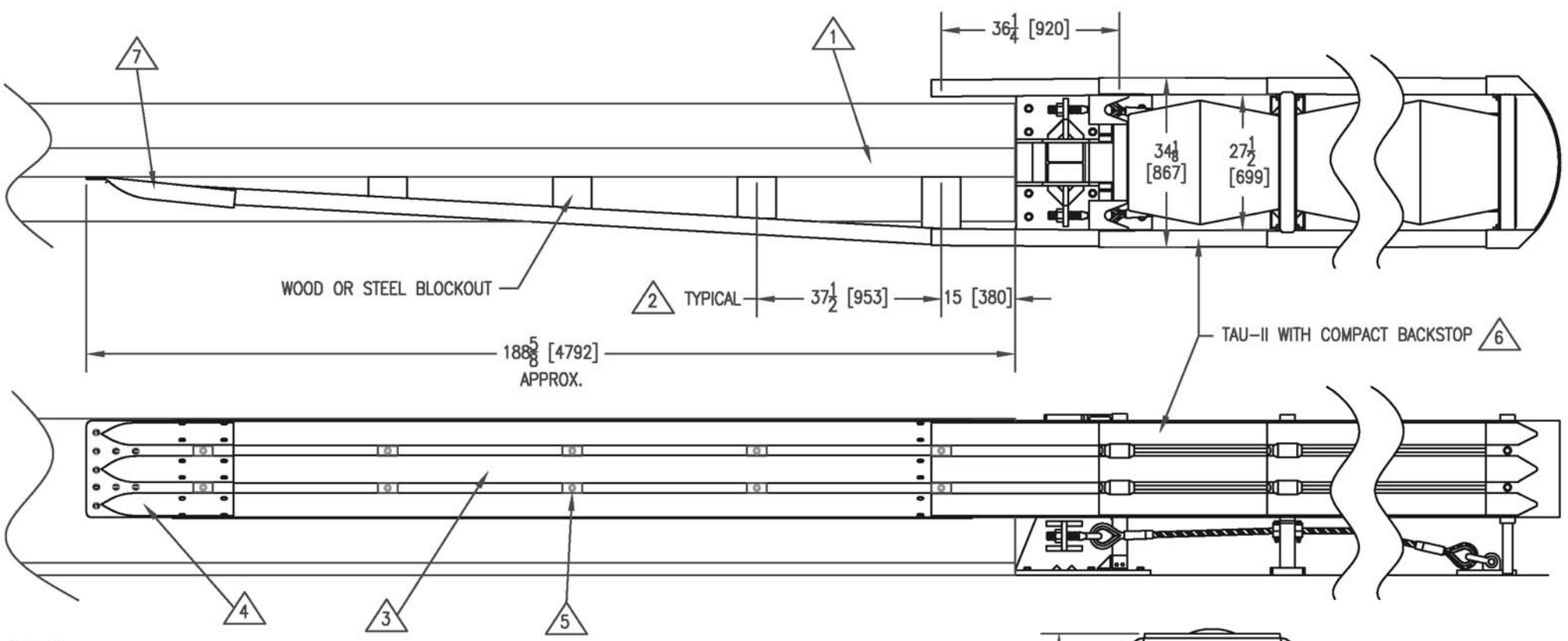
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/19/01	JSM

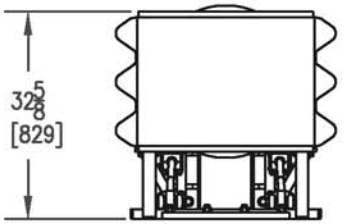
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010725	B





NOTES:

1.) REINFORCEMENT OF SAFETY SHAPED BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND BLOCKOUTS SHOWN ARE IN ACCORDANCE WITH NEVADA DOT SPECIFICATION R-8.4.3.

3.) 4-SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b.

4.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

5.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

6.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

7.) OVERLAP THRIE BEAM OR BRIDGE SHOE ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC AS SHOWN.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/25/02	GAD			
A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

SCALE: 1=20

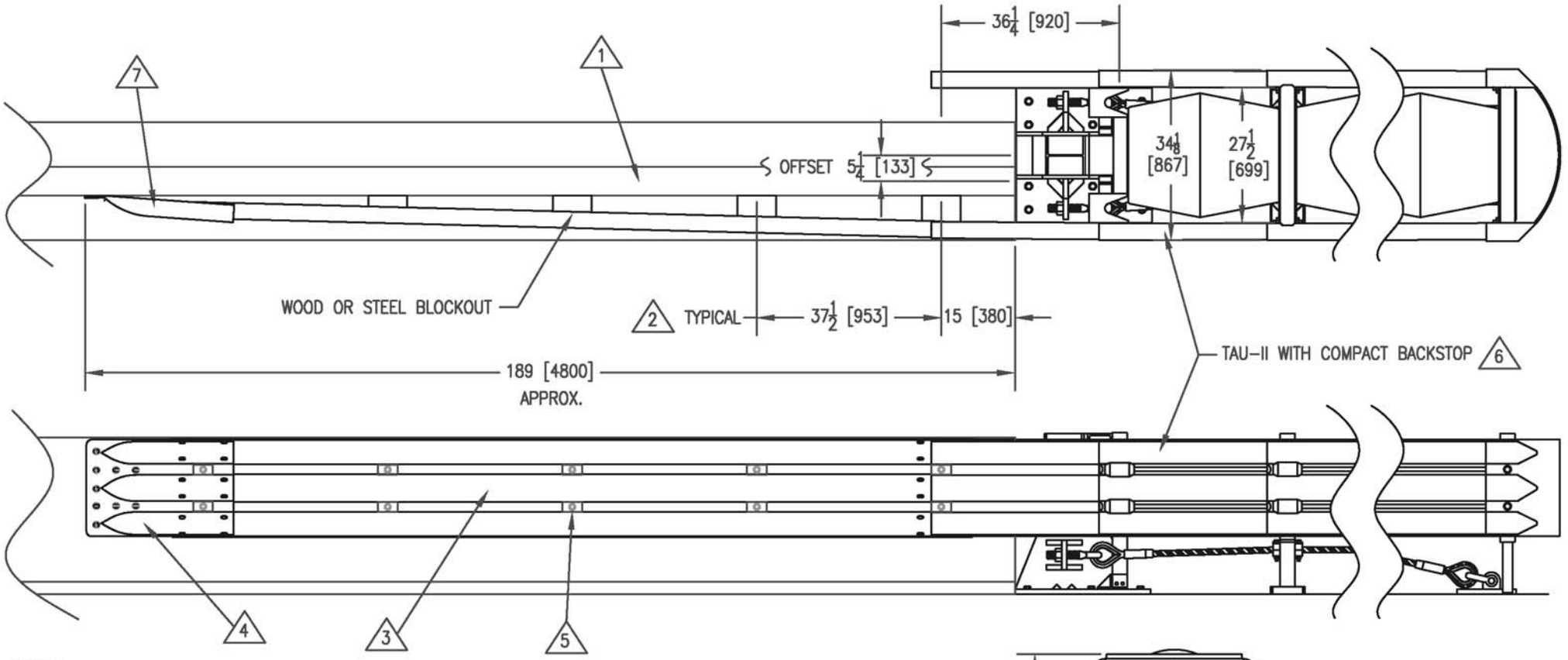
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/20/01	JSM

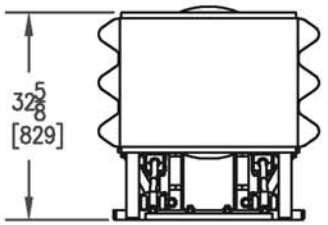
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B, ONE SIDE

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010811	B





NOTES:

1.) REINFORCEMENT OF SAFETY SHAPED BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND BLOCKOUTS SHOWN ARE IN ACCORDANCE WITH NEVADA DOT SPECIFICATION R-8.4.3.

3.) 4-SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b.

4.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

5.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

6.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

7.) OVERLAP THRIE BEAM OR BRIDGE SHOE ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC AS SHOWN.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/26/02	GAD			
A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

SCALE: 1=20

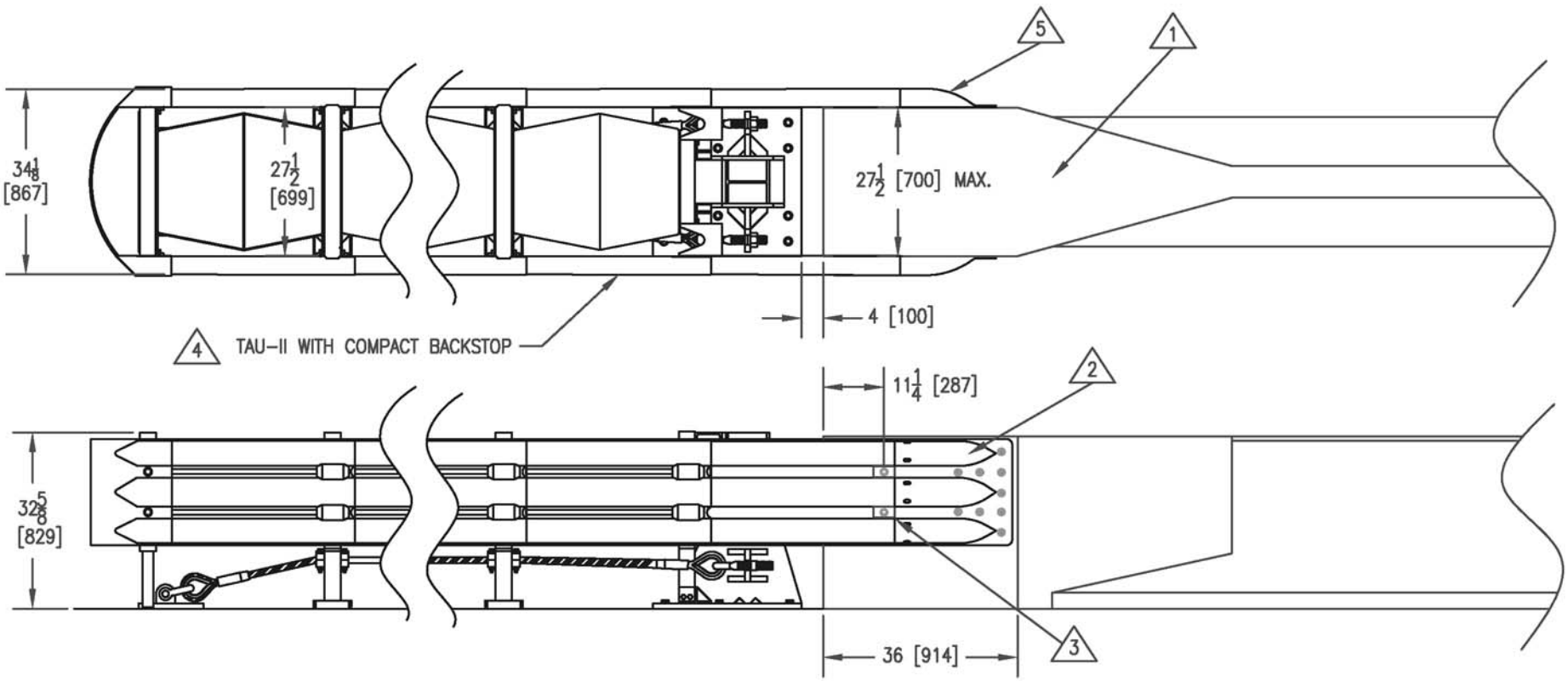
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/20/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B, OFFSET

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010726	B



NOTES:

1.) REINFORCEMENT OF VERTICAL CONCRETE END SHOE MAY BE NEEDED. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) THRIE BEAM BRIDGE SHOE PER AASHTO HARDWARE SPECIFICATION RTE01b.

3.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

4.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

5.) END PANEL MUST OVERLAP BRIDGE SHOE TO INSURE PROPER FUNCTION OF TAU-II SYSTEM.

NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/26/02	GAD			
A	RELEASE PREP.	11/19/01	GAD	NA	NA	NA

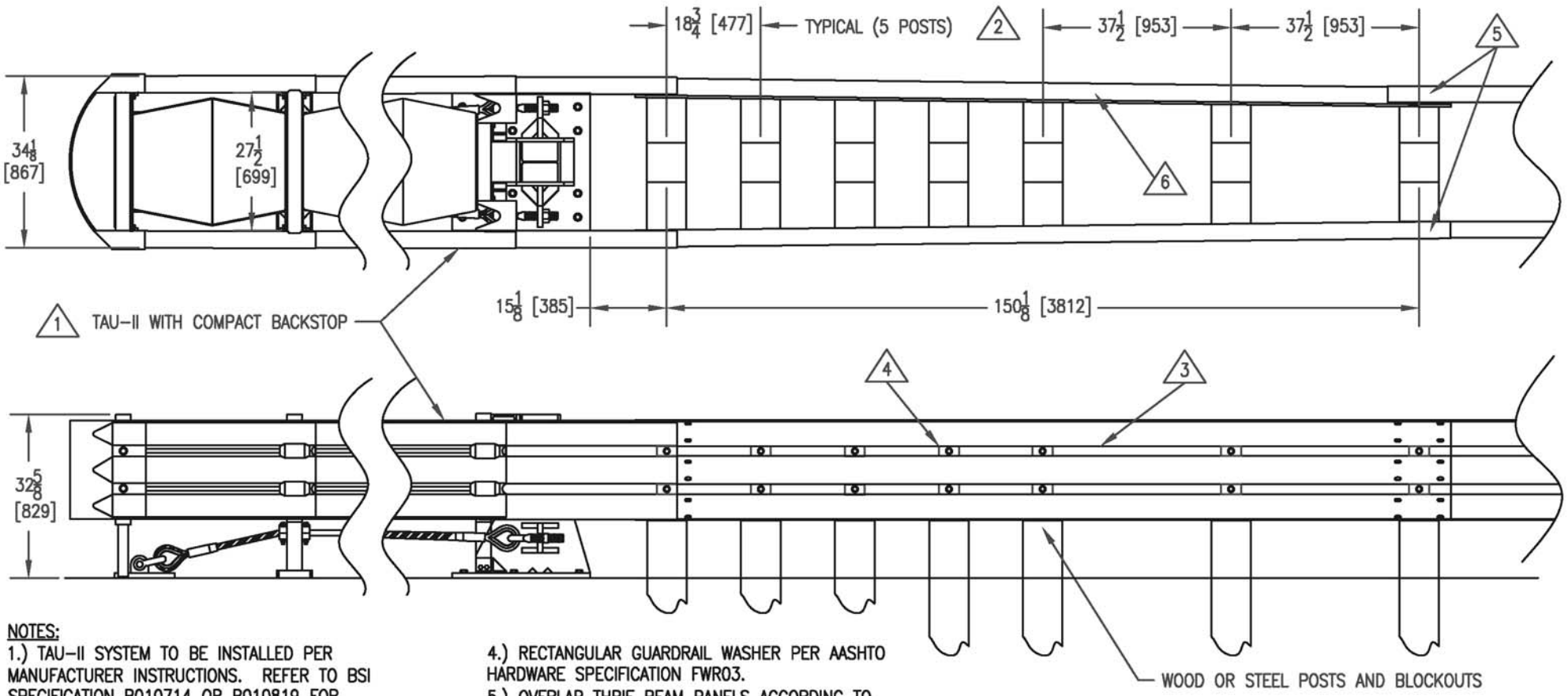
SCALE: 1=20

	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY	11/20/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO CONCRETE END SHOE

MODEL	DRAWING NUMBER	REV.
	B010806	B



NOTES:

1.) TAU–II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND POSTS SHOWN ARE IN ACCORDANCE WITH AASHTO SPECIFICATION STB06 AND NEVADA DOT SPECIFICATION R–8.4.3.

3.) 4–SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b. ADDITIONAL HOLES ARE REQUIRED AT 18¾ [476] SPACING.

4.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

5.) OVERLAP THRIE BEAM PANELS ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.

6.) TWO (2) 4–SPACED THRIE BEAM GUARDRAIL (RTM04b) PANELS–ONE SET INSIDE THE OTHER FOR BI–DIRECTIONAL TRAFFIC CONDITIONS. ONLY NEEDED ON SIDE WHERE TAU–II SYSTEM IS DOWNSTREAM OF TRANSITION.

NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN 00368	4/26/02	GAD			
A	RELEASE PREP.	11/19/01	GAD			

SCALE: 1=20

	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPR'D BY		

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX=± .010
Dec .XX=± .030

TITLE: TAU–II WITH COMPACT BACKSTOP, TRANSITION TO THRIE BEAM GUARDRAIL

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
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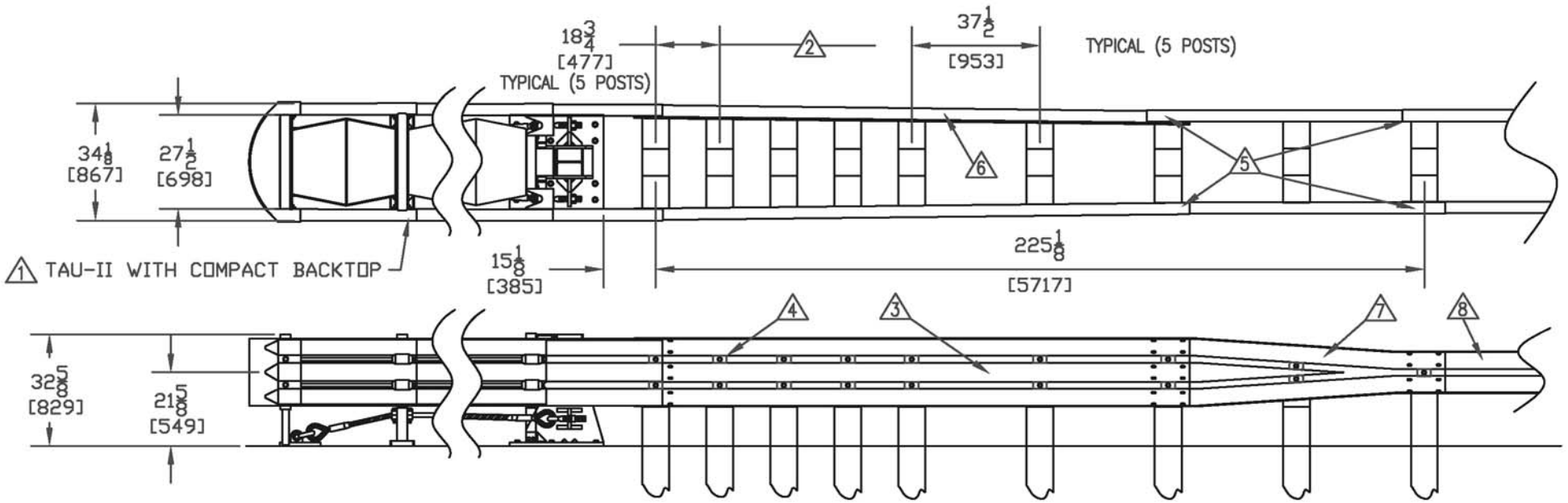


NOTES:

1.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS. REFER TO BSI SPECIFICATION B010714 OR B010819 FOR FOUNDATION REQUIREMENTS.

2.) SUPPORT SPACING AND POSTS SHOWN ARE IN ACCORDANCE WITH AASHTO SPECIFICATION STB06 AND NEVADA DOT SPECIFICATION R-8.4.3.

3.) 4-SPACE THRIE BEAM GUARDRAIL PER AASHTO HARDWARE SPECIFICATION RTM01b. ADDITIONAL HOLES ARE REQUIRED AT 18 3/4 [476] SPACING.

4.) RECTANGULAR GUARDRAIL WASHER PER AASHTO HARDWARE SPECIFICATION FWR03.

5.) OVERLAP PANELS ACCORDING TO DIRECTION OF TRAFFIC. UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.

6.) TWO (2) 4-SPACED THRIE BEAM GUARDRAIL (RTM04b) PANELS-ONE SET INSIDE THE OTHER FOR BI-DIRECTIONAL TRAFFIC CONDITIONS. ONLY NEEDED ON SIDE WHERE TAU-II SYSTEM IS DOWNSTREAM OF TRANSITION.

7.) W-THRIE BEAM TRANSITION SECTION PER AASHTO HARDWARE SPECIFICATION RWT01b.

8.) 4-SPACE W-BEAM PER AASHTO HARDWARE SPECIFICATION RWM04a OR RWM04b.

NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.

REV.	CHANGES	DATE	BY
B	SEE ECN 00368	4/24/02	GAD
A	RELEASE PREP.	11/20/01	GAD

REQ'D	NEXT ASSY.	ITEM

SCALE: 1:30

	DATE	INIT.
DRAWN BY	09/05/01	RGC
APPR'D BY	11/20/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO W-BEAM

APPENDIX D - Transitions
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B010728	B

APPENDIX E Installation Drawings

There are a variety of system configurations available for the TAU-II system.

Placement and installation of the TAU-II system and transitions must be accomplished in accordance with the guidelines and recommendations set forth in the "AASHTO Roadside Design Guide," FHWA memoranda and other state and local standards.

The following drawings show the TAU-II system installation specifications

With P.C.B. Backstop:

With Compact Backstop:

Design Dimensions:

For additional information regarding this product, please contact:

Barrier Systems, Inc.
Customer Support
180 River Road
Rio Vista, CA 94571

Toll Free (US) 888 800 3691
Phone 707 374 6800
Fax 707 374 6801

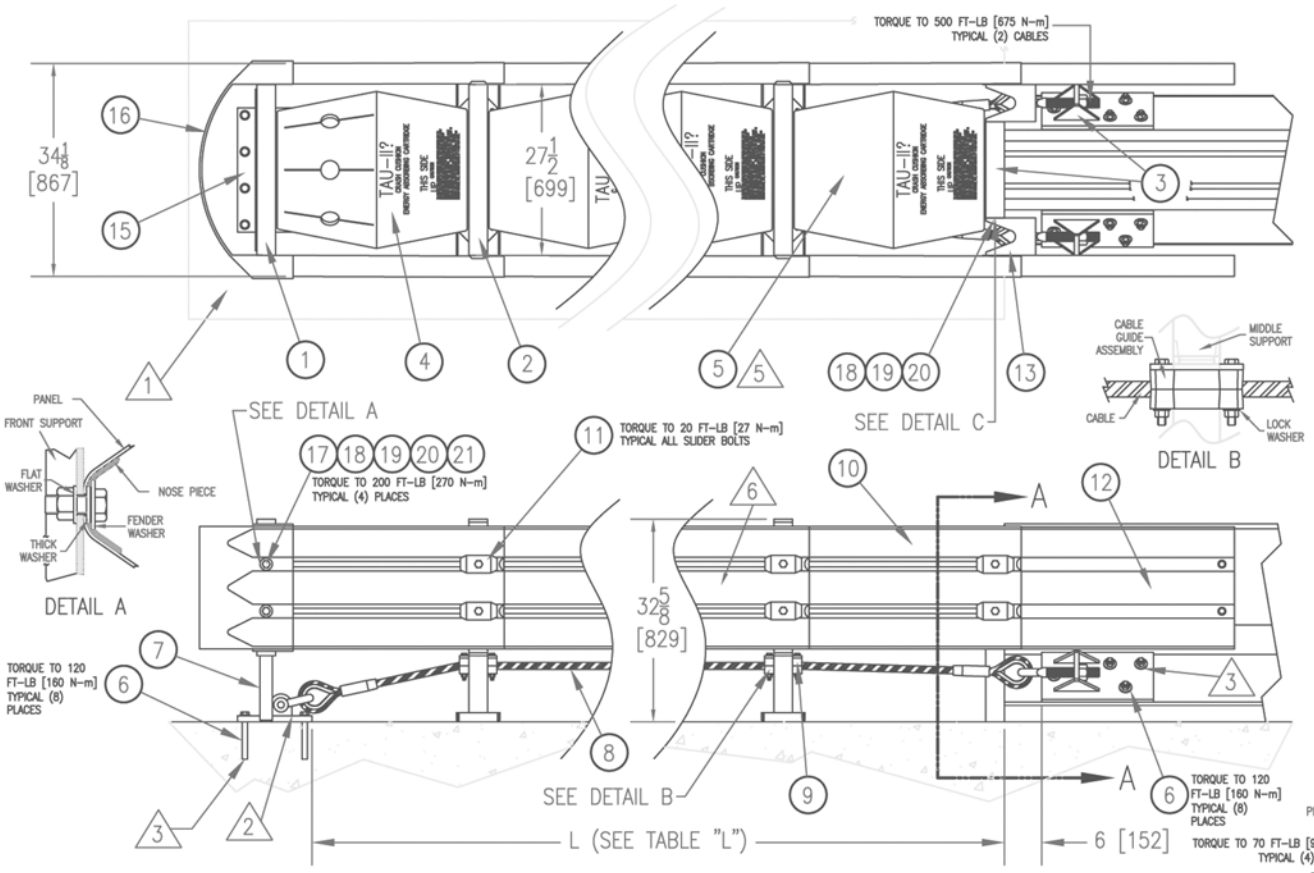
NOTES:

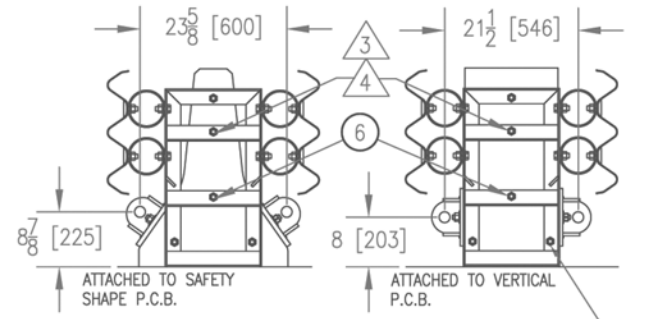
1. FOUNDATION PER BSI SPECIFICATION B011044 OR B011045 OR EQUIVALENT.
2. POSITION FRONT CABLE ANCHOR'S OFFSET LUGS TOWARD BACKSTOP. REVERSE IF MORE THREAD IS NEEDED TO REACH SPECIFIED CABLE TENSIONING TORQUE.
5. ENERGY ABSORBING CARTRIDGES MUST BE INSTALLED AS ILLUSTRATED. TEXT FACES UP AND IS READ FACING THE FRONT OF THE SYSTEM.
6. FORWARD PANEL ALWAYS OVERLAPS REARWARD PANEL AT DIAPHRAGMS.

ITEM	PART DESCRIPTION	PART #	ITEM	PART DESCRIPTION	PART #
1	FRONT SUPPORT	B010528	12	END PANEL	B010659
2	MIDDLE SUPPORT DIAPHRAGM	B010530	13	PIPE PANEL MOUNT	B010651
3	P.C.B. BACKSTOP	B011008	14	N/A	N/A
4	ENERGY ABSORBING CARTRIDGE, TYPE A	B010802	15	FRONT CABLE ANCHOR	B010248
5	ENERGY ABSORBING CARTRIDGE, TYPE B	B010722	16	NOSE PIECE	B010711
6	ANCHORING PACKAGE, PCB BACKSTOP	B011017	17	EXTRA THICK FLAT WASHER, SS	2001009
7	FRONT SUPPORT LEG	B010712	18	HEX BOLT, SS-20MM X 50MM	2001005
8	COMPACT CABLE	TBD	19	WASHER, SS	2001006
9	CABLE GUIDE ASSEMBLY	B010721	20	HEX NUT, SS-20MM	2001007
10	SLIDING PANEL	B010202	21	FENDER WASHER, SS-20MM X 50MM	2001009
11	SLIDING BOLT	B010842			

TABLE "L"

SYSTEM	PART No.	L (IN)	L (MM)
TAU-II TL-1 [2 BAY] WITH P.C.B. BACKSTOP	B011026	62 3/4	1594
TAU-II [3 BAY] WITH P.C.B. BACKSTOP	B011028	96 7/8	2461
TAU-II TL-2 [4 BAY] WITH P.C.B. BACKSTOP	B010922	131	3327
TAU-II [5 BAY] WITH P.C.B. BACKSTOP	B011030	165 1/8	4194
TAU-II [6 BAY] WITH P.C.B. BACKSTOP	B011032	199 1/4	5061
TAU-II [7 BAY] WITH P.C.B. BACKSTOP	B011034	233 3/8	5928
TAU-II TL-3 [8 BAY] WITH P.C.B. BACKSTOP	B010923	267 1/2	6795
TAU-II [9 BAY] WITH P.C.B. BACKSTOP	B011036	301 5/8	7661
TAU-II [10 BAY] WITH P.C.B. BACKSTOP	B011038	335 3/4	8528
TAU-II [11 BAY] WITH P.C.B. BACKSTOP	B020836	369 7/8	9395
TAU-II [12 BAY] WITH P.C.B. BACKSTOP	B020838	404	10262





TORQUE TO 120 FT-LB [160 N-m] TYPICAL (5) PLACES

NOTES:

3. 7/8 [22] HOLE DRILLED 6 [150] DEEP FOR 3/4 [20] X 8 1/4 [210] GALVANIZED ANCHOR.
4. USE CAULKING GUN TO FILL HORIZONTAL HOLES.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
D	SEE ECN 00391	8/29/02	GAD			
C	SEE ECN 00368	4/26/02	GAD			
B	SEE ECN 00365	4/24/02	GAD			
A	SEE ECN 00331	2/25/02	GAD	1		1

SCALE: 1=20

	DATE	INIT.
DRAWN BY	11/28/01	GAD
APPR'D BY	12/03/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX=± .010
Dec .XX=± .030

TITLE : INSTALLATION, TAU-II WITH P.C.B. BACKSTOP

APPENDIX E: Installation Drawings
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B011132	D

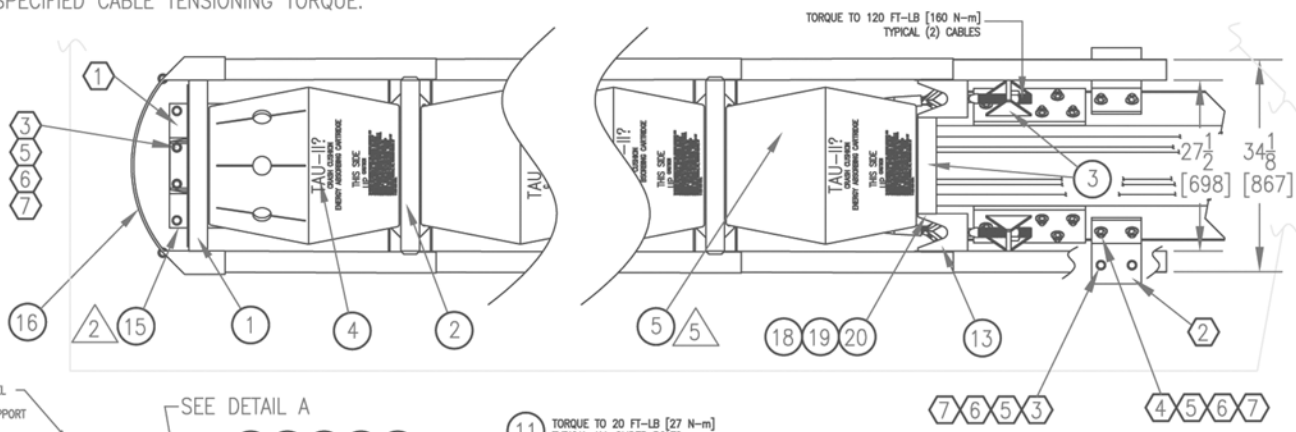
NOTES:

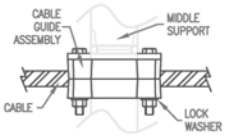
1. FOUNDATION PER BSI SPECIFICATION B020411 OR EQUIVALENT.
2. POSITION FRONT CABLE ANCHOR'S OFFSET LUGS TOWARD BACKSTOP. REVERSE IF MORE THREAD IS NEEDED TO REACH SPECIFIED CABLE TENSIONING TORQUE.
5. ENERGY ABSORBING CARTRIDGES MUST BE INSTALLED AS ILLUSTRATED. TEXT FACES UP AND IS READ FACING THE FRONT OF THE SYSTEM.
6. FORWARD PANEL ALWAYS OVERLAPS REARWARD PANEL AT DIAPHRAGMS.

ITEM	PART DESCRIPTION	PART #	ITEM	PART DESCRIPTION	PART #
1	FRONT SUPPORT	B010528	12	END PANEL	B010659
2	MIDDLE SUPPORT DIAPHRAGM	B010530	13	PIPE PANEL MOUNT	B010651
3	P.C.B. BACKSTOP	B011008	14	N/A	N/A
4	ENERGY ABSORBING CARTRIDGE, TYPE A	B010802	15	FRONT CABLE ANCHOR	B010248
5	ENERGY ABSORBING CARTRIDGE, TYPE B	B010722	16	NOSE PIECE	B010711
6	ANCHORING PACKAGE, PCB BACKSTOP	B011017	17	EXTRA THICK FLAT WASHER, SS	2001009
7	FRONT SUPPORT LEG	B010712	18	HEX BOLT, SS-20MM X 50MM	2001005
8	COMPACT CABLE	TBD	19	WASHER, SS	2001006
9	CABLE GUIDE ASSEMBLY	B010721	20	HEX NUT, SS-20MM	2001007
10	SLIDING PANEL	B010202	21	FENDER WASHER, SS-20MM X 50MM	2001009
11	SLIDING BOLT	B010842			

TABLE "L"

SYSTEM	PART No.	L (IN)	L (MM)
TAU-II TL-1 [2 BAY] WITH P.C.B. BACKSTOP	B011026	62 3/4	1594
TAU-II [3 BAY] WITH P.C.B. BACKSTOP	B011028	96 7/8	2461
TAU-II TL-2 [4 BAY] WITH P.C.B. BACKSTOP	B010922	131	3327
TAU-II [5 BAY] WITH P.C.B. BACKSTOP	B011030	165 1/8	4194
TAU-II [6 BAY] WITH P.C.B. BACKSTOP	B011032	199 1/4	5061
TAU-II [7 BAY] WITH P.C.B. BACKSTOP	B011034	233 3/8	5928
TAU-II TL-3 [8 BAY] WITH P.C.B. BACKSTOP	B010923	267 1/2	6795
TAU-II [9 BAY] WITH P.C.B. BACKSTOP	B011036	301 5/8	7661
TAU-II [10 BAY] WITH P.C.B. BACKSTOP	B011038	335 3/4	8528
TAU-II [11 BAY] WITH P.C.B. BACKSTOP	B020836	369 7/8	9395
TAU-II [12 BAY] WITH P.C.B. BACKSTOP	B020838	404	10262

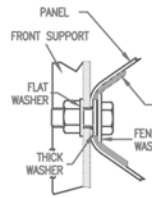




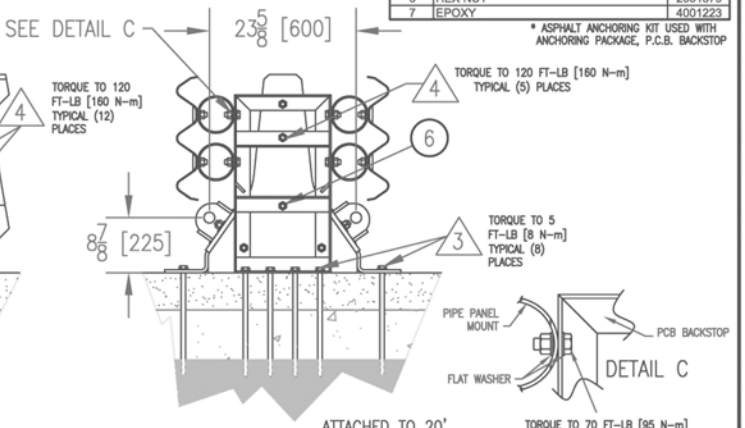
DETAIL B

ASPHALT P.C.B. BACKSTOP ANCHORING KIT		B020415
ITEM	DESCRIPTION	PART No.
1	ASPHALT FRONT ANCHOR ASSEMBLY	B020401
2	CONCRETE BARRIER ANCHOR, NEW JERSEY SAFETY SHAPE	B020409
3	18" THREADED ANCHOR	B020353
4	8 1/4" THREADED ANCHOR	B011001
5	FLAT WASHER	2001380
6	HEX NUT	2001379
7	EPOXY	4001223

* ASPHALT ANCHORING KIT USED WITH ANCHORING PACKAGE, P.C.B. BACKSTOP



DETAIL A



SECTION A-A

ATTACHED TO 20' SECTION OF SAFETY SHAPE PORTABLE CONCRETE BARRIER

NOTES:

3. 7/8 [22] HOLE DRILLED 16 [410] DEEP FOR 3/4 [20] X 18 [457] GALVANIZED ANCHOR.
4. 7/8 [22] HOLE DRILLED 6 [150] DEEP FOR 3/4 [20] X 8 1/4 [210] GALVANIZED ANCHOR.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
A	SEE ECN 00391	8/30/02	GAD	1		1

SCALE: 1=20

	DATE	INIT.
DRAWN BY	04/12/02	GAD
APPR'D BY	04/19/02	JSM

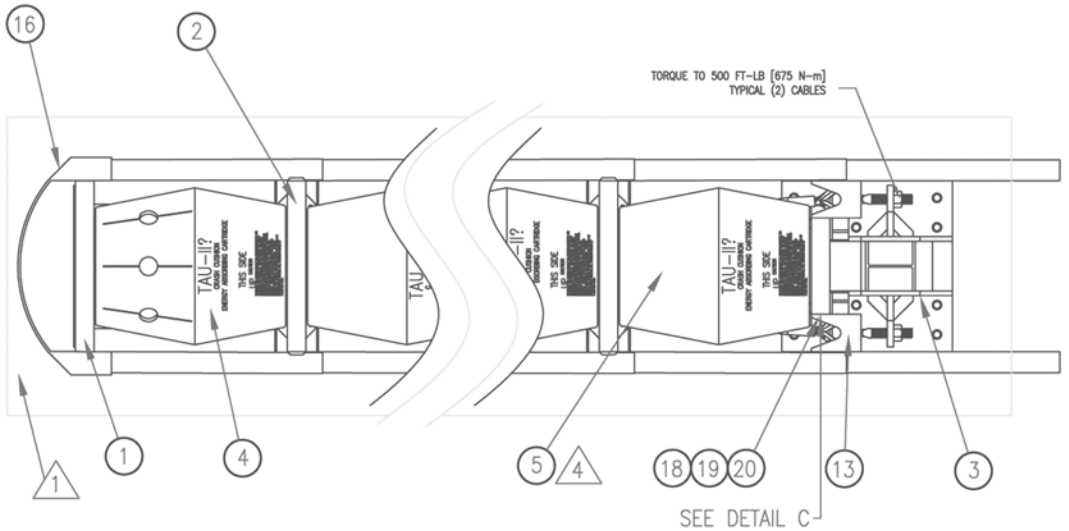
Standard Tolerance
Angular ± 1/2"
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

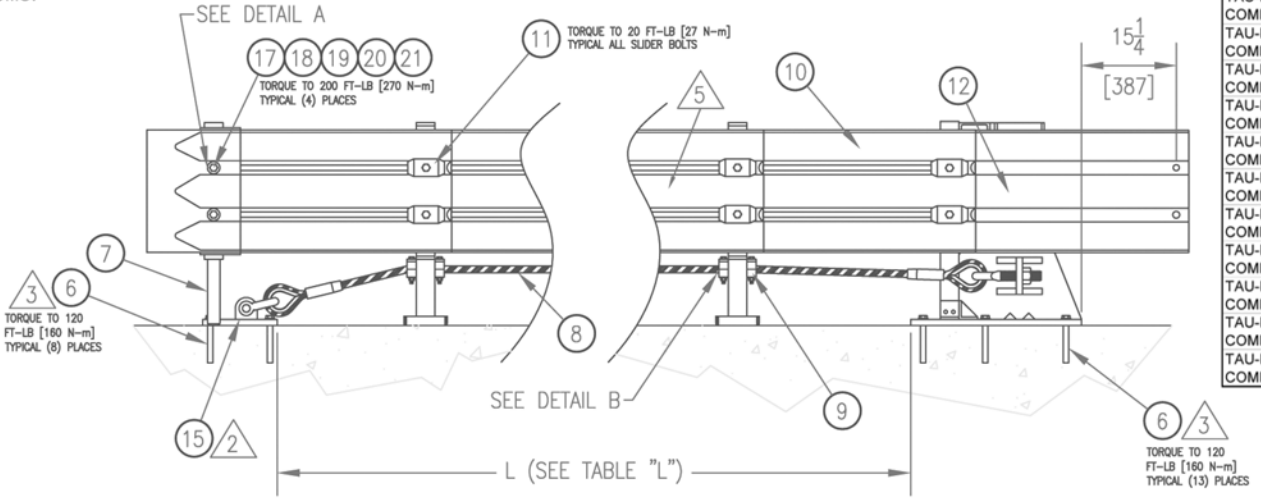
TITLE: INSTALLATION, TAU-II WITH P.C.B. BACKSTOP, ASPHALT FOUNDATION

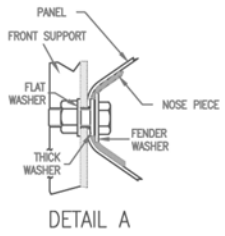
APPENDIX E: Installation Drawings
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B020413	A

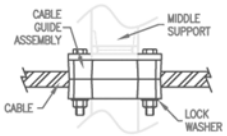
NOTES:
1. FOUNDATION PER BSI SPECIFICATION B010819 OR B010714 OR EQUIVALENT.
2. POSITION FRONT CABLE ANCHOR'S OFFSET LUGS TOWARD BACKSTOP. REVERSE IF MORE THREAD IS NEEDED TO REACH SPECIFIED CABLE TENSIONING TORQUE.
3. 7/8 [22] HOLE DRILLED 6 [150] DEEP FOR 3/4 [20] X 8 1/4 [210] GALVANIZED ANCHOR.
4. ENERGY ABSORBING CARTRIDGES MUST BE INSTALLED AS ILLUSTRATED. TEXT FACES UP AND IS READ FACING THE FRONT OF THE SYSTEM.
5. FORWARD PANEL ALWAYS OVERLAPS REARWARD PANEL AT DIAPHRAGMS.



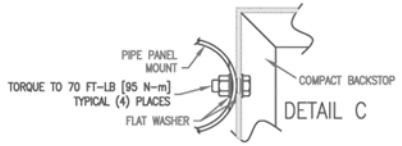




DETAIL A



DETAIL B



DETAIL C

ITEM	PART DESCRIPTION	PART #
1	FRONT SUPPORT	B010528
2	MIDDLE SUPPORT DIAPHRAGM	B010530
3	COMPACT BACKSTOP	B010537
4	ENERGY ABSORBING CARTRIDGE, TYPE A	B010802
5	ENERGY ABSORBING CARTRIDGE, TYPE B	B010722
6	ANCHORING PACKAGE, COMPACT BACKSTOP	B010713
7	FRONT SUPPORT LEG	B010712
8	COMPACT CABLE	TBD
9	CABLE GUIDE ASSEMBLY	B010721
10	SLIDING PANEL	B010202
11	SLIDING BOLT	B010842
12	END PANEL	B010659
13	PIPE PANEL MOUNT	B010651
14	NA	NA
15	FRONT CABLE ANCHOR	B010248
16	NOSE PIECE	B010711
17	EXTRA THICK FLAT WASHER, SS	2001009
18	HEX BOLT, SS-20MM X 50MM	2001005
19	WASHER, SS	2001006
20	HEX NUT, SS-20MM	2001007
21	FENDER WASHER, SS-20MM X 50MM	2001009

TABLE "L"			
SYSTEM	PART No.	L (IN)	L (MM)
TAU-II TL-1 [2 BAY] WITH COMPACT BACKSTOP	B011027	55 1/2	1410
TAU-II [3 BAY] WITH COMPACT BACKSTOP	B011029	89 5/8	2276
TAU-II TL-2 [4 BAY] WITH COMPACT BACKSTOP	B010529	123 3/4	3143
TAU-II [5 BAY] WITH COMPACT BACKSTOP	B011031	157 7/8	4010
TAU-II [6 BAY] WITH COMPACT BACKSTOP	B011033	192	4877
TAU-II [7 BAY] WITH COMPACT BACKSTOP	B011035	226 1/8	5744
TAU-II TL-3 [8 BAY] WITH COMPACT BACKSTOP	B010708	260 1/4	6610
TAU-II [9 BAY] WITH COMPACT BACKSTOP	B011037	294 3/8	7477
TAU-II [10 BAY] WITH COMPACT BACKSTOP	B011039	328 1/2	8344
TAU-II [11 BAY] WITH COMPACT BACKSTOP	B020835	362 5/8	9211
TAU-II [12 BAY] WITH COMPACT BACKSTOP	B020837	396 3/4	10077

REV.	CHANGES	DATE	BY
B	SEE ECN 00391	8/29/02	GAD
A	SEE ECN 00331	2/25/02	GAD

REQ'D	NEXT ASSY.	ITEM

SCALE: 1=20

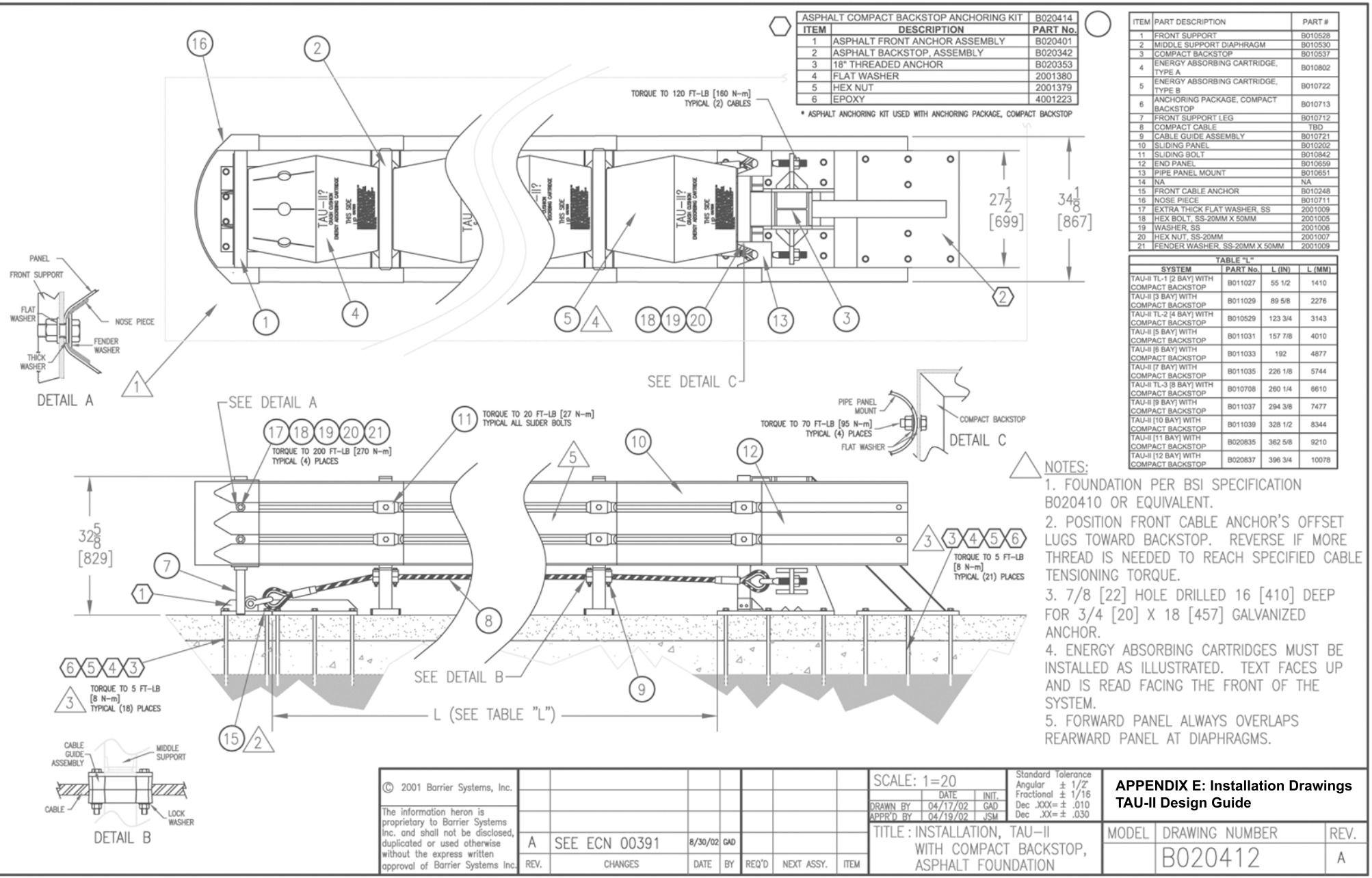
	DATE	INIT.
DRAWN BY	11/28/01	GAD
APPR'D BY	12/03/01	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE : INSTALLATION, TAU-II WITH COMPACT BACKSTOP

MODEL	DRAWING NUMBER	REV.
	B011131	B

APPENDIX E: Installation Drawings
TAU-II Design Guide



ASPHALT COMPACT BACKSTOP ANCHORING KIT		B020414
ITEM	DESCRIPTION	PART No.
1	ASPHALT FRONT ANCHOR ASSEMBLY	B020401
2	ASPHALT BACKSTOP, ASSEMBLY	B020342
3	18" THREADED ANCHOR	B020353
4	FLAT WASHER	2001380
5	HEX NUT	2001379
6	EPOXY	4001223

ITEM	PART DESCRIPTION	PART #
1	FRONT SUPPORT	B010528
2	MIDDLE SUPPORT DIAPHRAGM	B010530
3	COMPACT BACKSTOP	B010537
4	ENERGY ABSORBING CARTRIDGE, TYPE A	B010802
5	ENERGY ABSORBING CARTRIDGE, TYPE B	B010722
6	ANCHORING PACKAGE, COMPACT BACKSTOP	B010713
7	FRONT SUPPORT LEG	B010712
8	COMPACT CABLE	TBD
9	CABLE GUIDE ASSEMBLY	B010721
10	SLIDING PANEL	B010202
11	SLIDING BOLT	B010842
12	END PANEL	B010659
13	PIPE PANEL MOUNT	B010651
14	NA	NA
15	FRONT CABLE ANCHOR	B010248
16	NOSE PIECE	B010711
17	EXTRA THICK FLAT WASHER, SS	2001009
18	HEX BOLT, SS-20MM X 50MM	2001005
19	WASHER, SS	2001006
20	HEX NUT, SS-20MM	2001007
21	FENDER WASHER, SS-20MM X 50MM	2001009

TABLE "L"			
SYSTEM	PART No.	L (IN)	L (MM)
TAU-II TL-1 [2 BAY] WITH COMPACT BACKSTOP	B011027	55 1/2	1410
TAU-II [3 BAY] WITH COMPACT BACKSTOP	B011029	89 5/8	2276
TAU-II TL-2 [4 BAY] WITH COMPACT BACKSTOP	B010529	123 3/4	3143
TAU-II [5 BAY] WITH COMPACT BACKSTOP	B011031	157 7/8	4010
TAU-II [6 BAY] WITH COMPACT BACKSTOP	B011033	192	4877
TAU-II [7 BAY] WITH COMPACT BACKSTOP	B011035	226 1/8	5744
TAU-II TL-3 [8 BAY] WITH COMPACT BACKSTOP	B010708	260 1/4	6610
TAU-II [9 BAY] WITH COMPACT BACKSTOP	B011037	294 3/8	7477
TAU-II [10 BAY] WITH COMPACT BACKSTOP	B011039	328 1/2	8344
TAU-II [11 BAY] WITH COMPACT BACKSTOP	B020835	362 5/8	9210
TAU-II [12 BAY] WITH COMPACT BACKSTOP	B020837	396 3/4	10078

NOTES:
1. FOUNDATION PER BSI SPECIFICATION B020410 OR EQUIVALENT.
2. POSITION FRONT CABLE ANCHOR'S OFFSET LUGS TOWARD BACKSTOP. REVERSE IF MORE THREAD IS NEEDED TO REACH SPECIFIED CABLE TENSIONING TORQUE.
3. 7/8 [22] HOLE DRILLED 16 [410] DEEP FOR 3/4 [20] X 18 [457] GALVANIZED ANCHOR.
4. ENERGY ABSORBING CARTRIDGES MUST BE INSTALLED AS ILLUSTRATED. TEXT FACES UP AND IS READ FACING THE FRONT OF THE SYSTEM.
5. FORWARD PANEL ALWAYS OVERLAPS REARWARD PANEL AT DIAPHRAGMS.

REV.	CHANGES	DATE	BY
A	SEE ECN 00391	8/30/02	GAD

REQ'D	NEXT ASSY.	ITEM

SCALE: 1=20

	DATE	INIT.
DRAWN BY	04/17/02	GAD
APPR'D BY	04/19/02	JSM

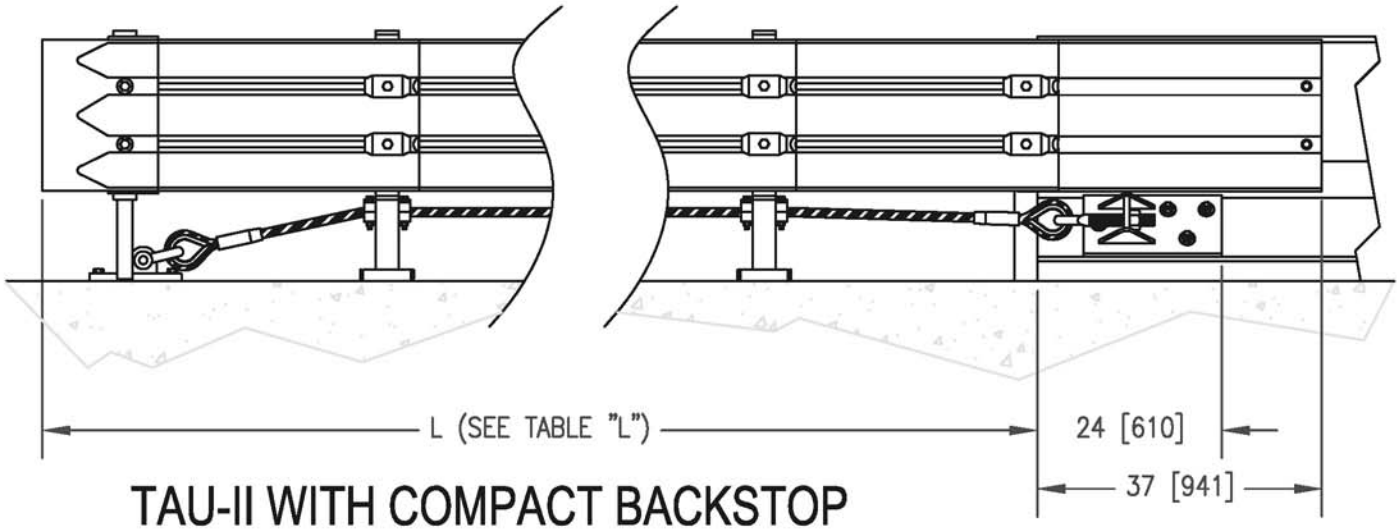
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE : INSTALLATION, TAU-II WITH COMPACT BACKSTOP, ASPHALT FOUNDATION

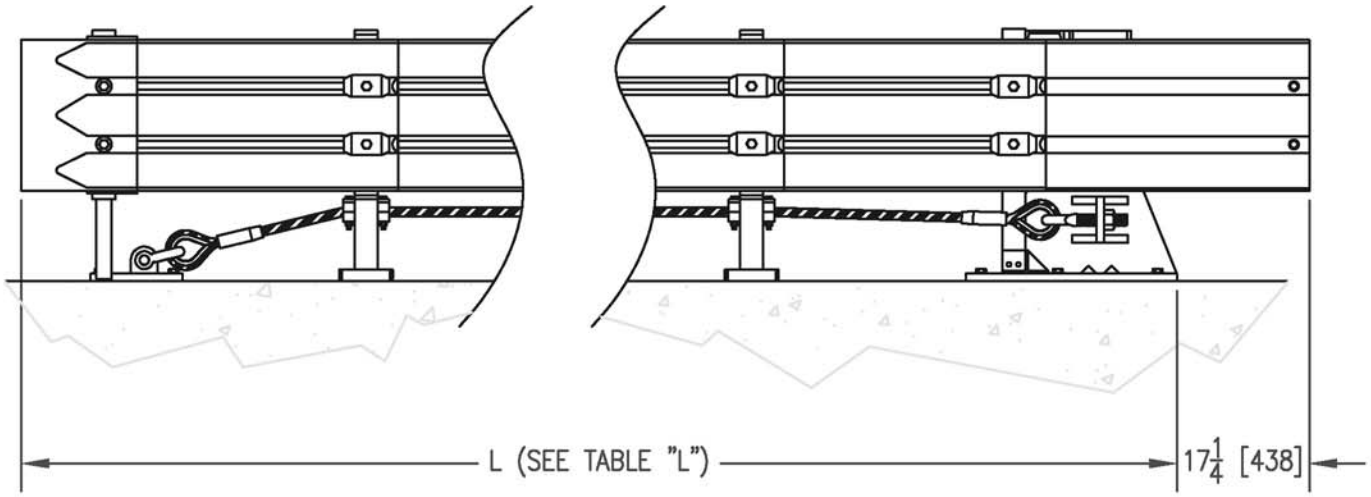
APPENDIX E: Installation Drawings
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	B020412	A

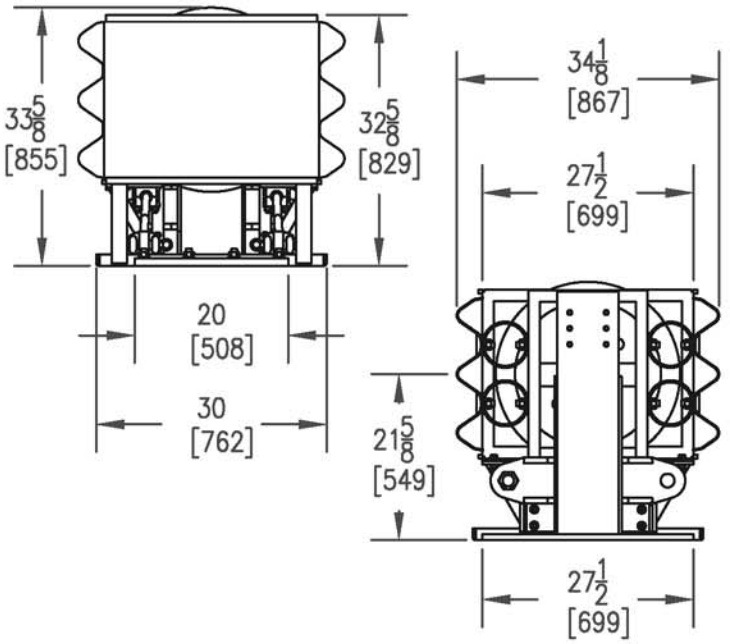
TAU-II WITH P.C.B. BACKSTOP



TAU-II WITH COMPACT BACKSTOP



NUMBER OF BAYS	LENGTH "L"			
	P.C.B. BACKSTOP		COMPACT BACKSTOP	
	FEET	METERS	FEET	METERS
2	6' 8 1/2"	2.04	8' 4 1/4"	2.55
3	9' 6 5/8"	2.91	11' 2 3/8"	3.41
4	12' 4 3/4"	3.78	14' 1/2"	4.28
5	15' 2 7/8"	4.65	16' 10 5/8"	5.15
6	18' 1"	5.51	19' 8 3/4"	6.01
7	20' 11 1/8"	6.38	22' 6 7/8"	6.88
8	23' 9 1/4"	7.25	25' 5"	7.75
9	26' 7 3/8"	8.11	28' 3 1/8"	8.61
10	29' 5 1/2"	8.98	31' 1 1/4"	9.48
11	32' 3 5/8"	9.85	33' 11 3/8"	10.35
12	35' 1 3/4"	10.71	36' 9 1/2"	11.21



REV.	CHANGES	DATE	BY
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SCALE: 1=20

	DATE	INIT.
DRAWN BY	03/04/02	GAD
APPR'D BY	03/04/02	JSM

Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX=± .010
Dec .XX=± .030

TITLE: TAU-II, DESIGN DIMENSIONS
APPENDIX E - Installation
TAU-II Design Guide

MODEL	DRAWING NUMBER	REV.
	A020305	A