FOR CONTRACT No.: 10-0M7804

INFORMATION HANDOUT

MATERIALS INFORMATION

1. Geotechnical Design Report
Dated May 25, 2010

2. Alternative Crash Cushion Systems
* Crash Cushion - Type QuadGuard II
* Crash Cushion - Type TAU-II
* Crash Cushion - Type REACT 350 Wide

Dist-Co-Rte-PM: 10-SJ-5-25.1/28.6

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: MR. DAVID SANGHA
Design Manager, Branch X
Project Development Division

Attention: Mr. Harjinder Dhillon

Date: May 25, 2010

File: 10-SJ-5
PM 25.3/28.53
EA 10-0M7801
I-5 Roadway Rehab

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Geotechnical Design Report

1. Introduction

This report has been prepared to provide geotechnical recommendations for the I-5 Roadway Rehab project, located on Interstate 5 through the city of Stockton in San Joaquin County. The project proposes to replace the existing PCC (Portland Cement Concrete) pavement with new CRCP (Continually Reinforced Concrete Pavement) and to widen the shoulders to 10 feet (within the existing fill embankments). A Location Map is presented on Plate No. 1.

2. Existing Facilities

Interstate 5 within the project limits is an 8 to 10 lane divided highway constructed on embankment fill. Fill heights range from 20 to 50 feet. The roadway is constructed on PCC pavement slabs, which have experienced heavy cracking and deterioration, especially in the outside (truck) lanes. Design has indicated that the pavement failure may be due to water retention beneath the concrete slabs. Water pumping between the cracked slabs has been seen by Maintenance personnel even during summer months. Additionally, broken irrigation pipes have been recently found within the project limits.

3. Pertinent Reports and Investigations

The following publications were reviewed to assist in the assessment of site conditions:

- California Seismic Hazard Map, 2007.
- Geologic map of the San Francisco-San Jose quadrangle, California, 1:250,000: California Division of Mines and Geology, 1991.

- Geologic map of the Sacramento quadrangle, California, 1:250,000: California Division of Mines and Geology, 1981.
- Stockton, CA 7.5-Minute Quadrangle, 1989.
- Stockton WSO / Stockton Fire Station # 4, CA, Period of Record Monthly Climate Summary, Western Regional Climate Center.
- Caltrans Continuously Reinforced Concrete Pavement (CRCP) Design and Construction Guide, June 5, 2007.

Additionally, a subsurface investigation of the project site was conducted in April 2010 for the purpose of determining subsurface conditions.

4. Physical Setting

Climate

According to the Western Regional Climate Center, the average annual precipitation in Stockton is about 15 in. The majority of this precipitation (over 90 percent) falls between October and April. The average annual air temperature is around 61°F with the highest average daily maximum of around 93°F in July and the lowest average daily minimum of around 59°F in December.

Topography

The Stockton, Ca. 7.5-Minute Quadrangle, dated 1989, was reviewed to determine the topographic features of the project region. The general terrain is relatively level with ground elevations in the project area varying from approximately 0 feet to 14 feet. The highway is constructed on fill embankments, with elevations ranging from 22 feet to 65 feet. A Topographic Map is presented on Plate No. 2.

Regional Geology

The Geologic Map of the San Francisco-San Jose quadrangle and the Geologic Map of the Sacramento quadrangle were reviewed to determine the geologic features within the project limits. The map indicates the geology within the project limits consists of the Modesto Formation (Qm) and Artificial Fill (af).

The Modesto Formation consists of moderately consolidated silty clay, silt, sand and gravel deposits of alluvial origins. The Artificial Fill consists of engineered and/or non-engineered material and locally includes artificial dam fill and tailings associated with dredge mining. A Geologic Map is presented on Plate No. 3.

Seismicity

In accordance with Caltrans 2009 Seismic Design Procedure (SPD), the nearest active fault to the site is the Great Valley fault (Fault ID No. 25) with an Mmax of 6.7. This fault is about 30 km from the project location and is identified as a reverse fault. The spectral acceleration (SA) generated from this fault is less than the SA generated from the probabilistic method. Therefore, based on the 5% probability of exceedance in 50 years (corresponding to a 975 year return period), and a shear wave velocity of 240 m/s, the estimated peak ground acceleration is 0.32g.

The potential for surface rupture at the project site due to fault movement is considered low, as there are no known faults projecting toward or passing through the project site.

As the subsurface material is a granular engineered fill and the soil densities for the granular material is predominantly medium dense to dense, the potential for liquefaction to occur during a seismic event is considered to be minimal.

5. Exploration

The Office of Geotechnical Design North conducted a geotechnical field investigation in April 2010 to evaluate subsurface soil conditions and to provide recommendations for the proposed project.

The subsurface investigation consisted of 13 borings using a hollow stem auger drilling method. The equipment used to drill the borings consisted of a Mobile B-47 drill rig equipped with a safety hammer.

Penetration resistance tests were conducted as the borings were advanced. The sampler driving hammer consisted of a 140 pound, 30-inch drop, safety hammer, which delivers an average efficiency of 57%. The type of sampler used was a 1.4-inch Standard Penetration Test (SPT) sampler, without liners.

Sampling was performed at intervals of 2.5 to 5 feet. Selected samples of the native subsoil were collected from the borings, and laboratory tests were performed in order to evaluate the characteristics of the material encountered.

The boring locations are presented on Plate No 4. The soils encountered within the borings were logged in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual, 2010. Detailed descriptions of the soils encountered are presented on the boring logs in the Appendix.

6. Geotechnical Testing

Selected soil samples collected during the subsurface investigation were submitted for lab testing, and included sieve analysis, in-place moisture content, and Atterberg limits (plasticity). Due to time constraints, only the results for in-place moisture content were available to be included in this report. Results of the other tests, when received, will be used to verify the recommendations provided in this report, and will only be forwarded if changes in the recommendations are necessary. The moisture content test results are presented on the boring logs in the Appendix.

7. Geotechnical Conditions

Subsurface Soil Conditions

The subsurface investigation revealed the subsurface material is engineered fill (believed to be originally constructed from dredging of the Stockton Channel), which consists predominantly of a fine to medium sand to silty fine to medium sand. The sand becomes clayey between depths of 5 to 10 feet. The borings at the north end of the project indicated more clay. The density ranges from medium dense to very dense, with a general trend of increasing density with depth. The soil is generally moist, with an increase in moisture seen within the upper 5 feet.

Ground Water

As the borings were performed within the fill embankments and did not extend below the bottom of the fills, groundwater was not encountered in the borings.

Department of Water Resource well data indicates that ground water in the vicinity of the project is at an average elevation of –8.2 feet, which corresponds to an average depth of 11.2 feet below the ground surface (bottom of fill embankments).

8. Geotechnical Recommendations

The following recommendations are based on communication with District 10 personnel (Design, Materials, and Maintenance), field reconnaissance, and the subsurface investigation conducted within the project limits.

The subsurface investigation indicates that, in general, the soils beneath the pavement are of adequate strength to support the new pavement. The soil beneath the pavement consists predominantly of silty fine sand. This type of soil has adequate load bearing capacity when not wet or saturated. However, when this type of soil becomes wet or saturated, it has a tendency to lose strength, especially when subjected to vibration. It is believed that water is entering the soil through cracks in the concrete slabs or from recently discovered broken irrigation pipes, and in combination with vibration from the large volume of heavy trucks, the soil is losing strength and causing excessive cracking and failure of the concrete slabs.

Therefore, this Office recommends that the proposed CRCP be used with a good drainage system to keep water from saturating the soil beneath the pavement. It is anticipated that the use of CRCP will greatly reduce the amount of cracking in the pavement, and therefore reduce the amount of water entering the subgrade soil. In conjunction with a good drainage system, the new pavement should perform favorably.

If additional support for the pavement is desired, the following options may be used, if deemed necessary by District Materials:

1. Stabilization: The addition of a binding material may increase the subgrade load-bearing capacity.
2. Over-excavation: 1 to 2 feet of the in-situ subgrade may be replaced with better load-bearing fill such as gravel.
3. Increase Base / Add Subbase: Increasing the thickness of the base course or adding a subbase may offer additional load-bearing capacity.

9. Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:

A. None

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. Geotechnical Design Report for EA 10-0M7801, dated 5/25/2010.

Data and Information available for inspection at the District Office:

A. None

Data and Information available for inspection at the Transportation Laboratory are:

A. None

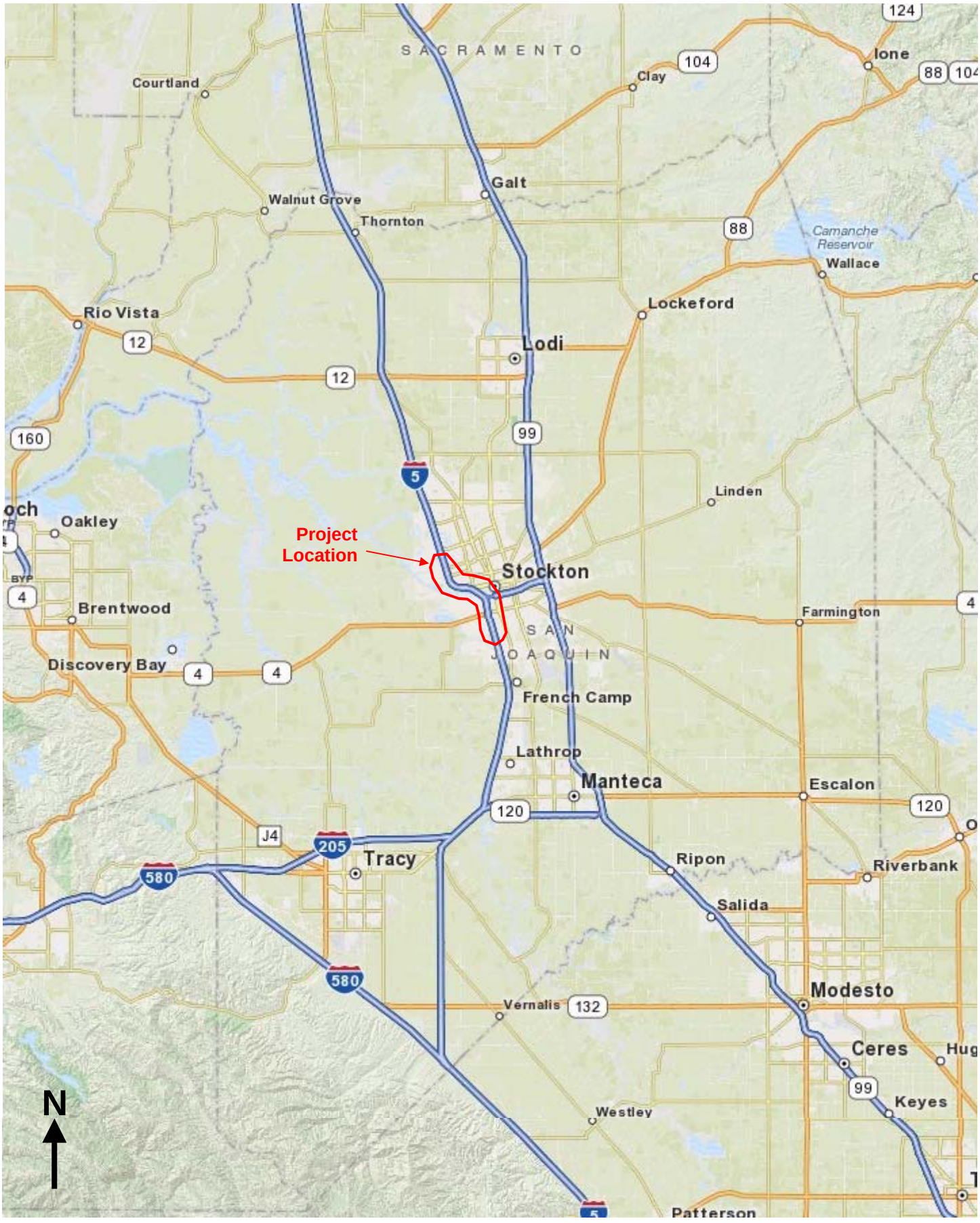
The recommendations contained in this report are based upon site conditions that we observed at the time of our investigation, data from our subsurface explorations and laboratory tests, and our current understanding of proposed project. If the scope of the proposed project changes from that described in this report, our recommendations should be reviewed to determine if revisions are needed.

If there are any questions or comments in regards to this report, please contact Ben Barnes at 916-227-1039.

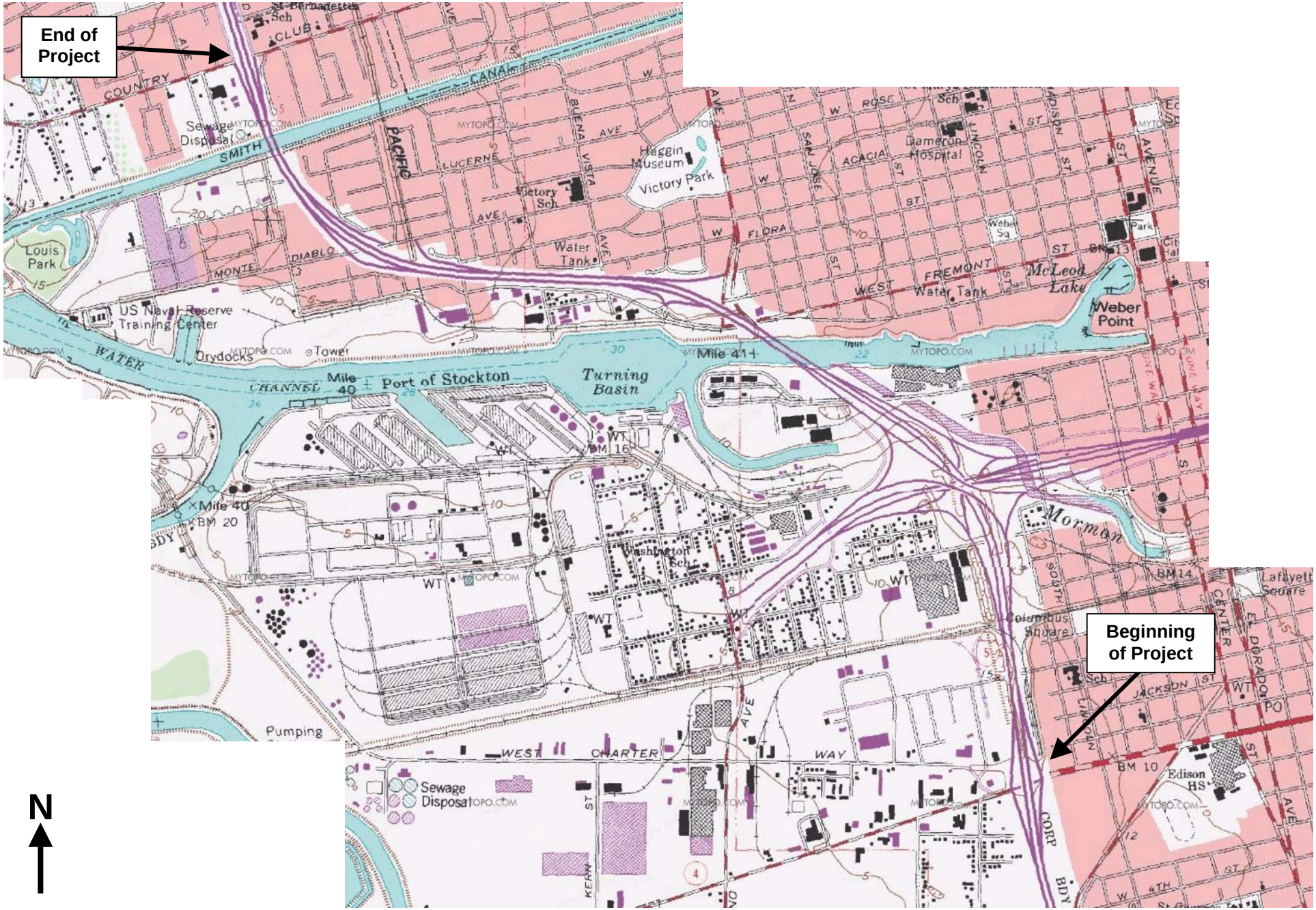
BENJAMIN M. BARNES, PE
Transportation Engineer
Office of Geotechnical Design – North
Branch E

Attachments:
Plate No. 1: Location Map
Plate No. 2: Topographic Map
Plate No. 3: Geologic Map
Plate No. 4: Boring Location Map
Appendix: Boring Logs

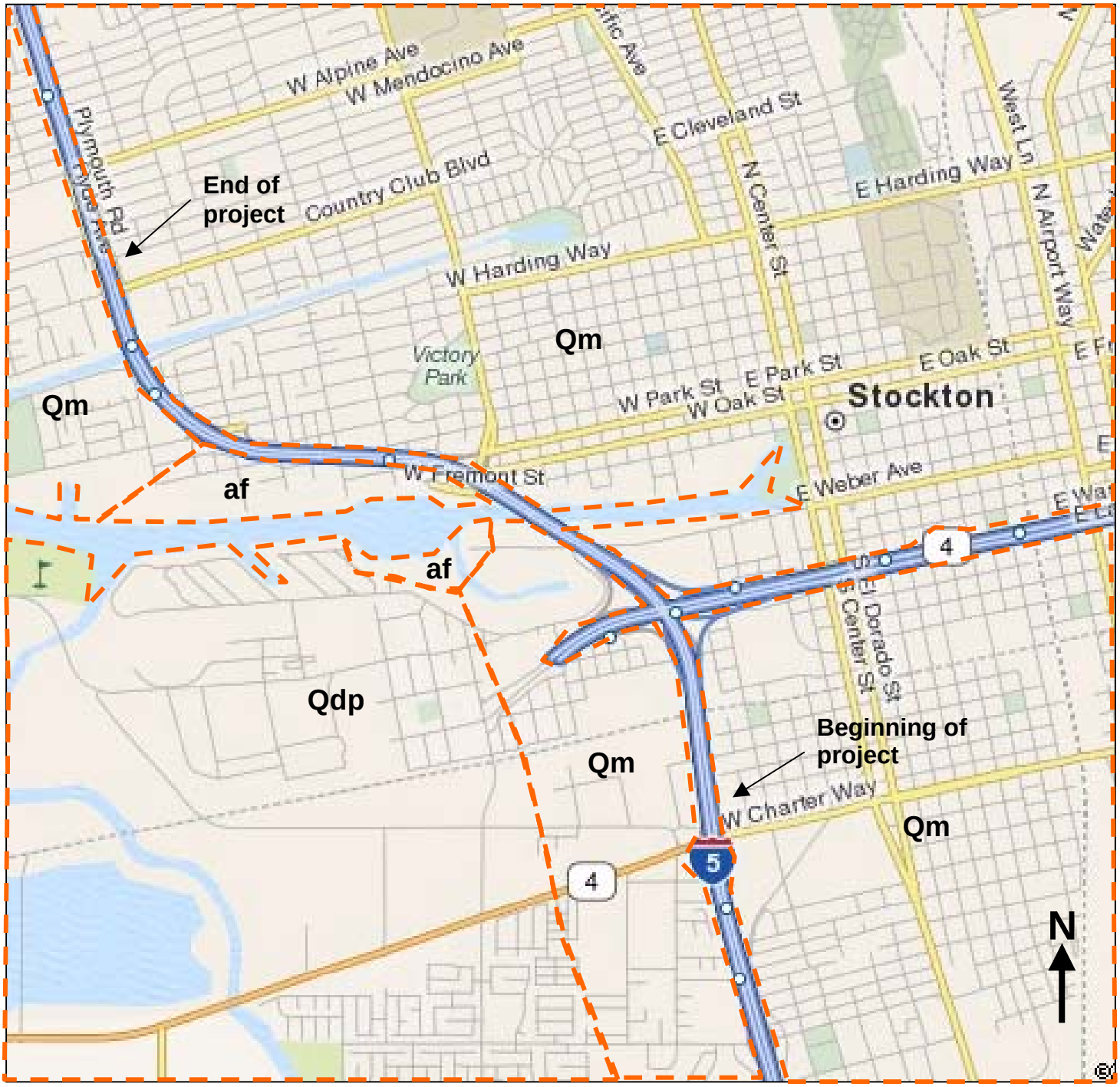
c: Qiang Huang
Iorzua Akuva (District Project Manager)
Mark Willian (GS Corporate)
Dave Dhillon (District Materials Engineer)
District Construction R.E. Pending File



Caltrans	Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 10-0M7801	LOCATION MAP	Plate No. 1
		May 2010	10-SJ-5 PM 25.3 / 28.5 GDR	



Caltrans Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 10-0M7801	TOPOGRAPHIC MAP	Plate No. 2
	May 2010	10-SJ-5 PM 25.3 / 28.5 GDR	



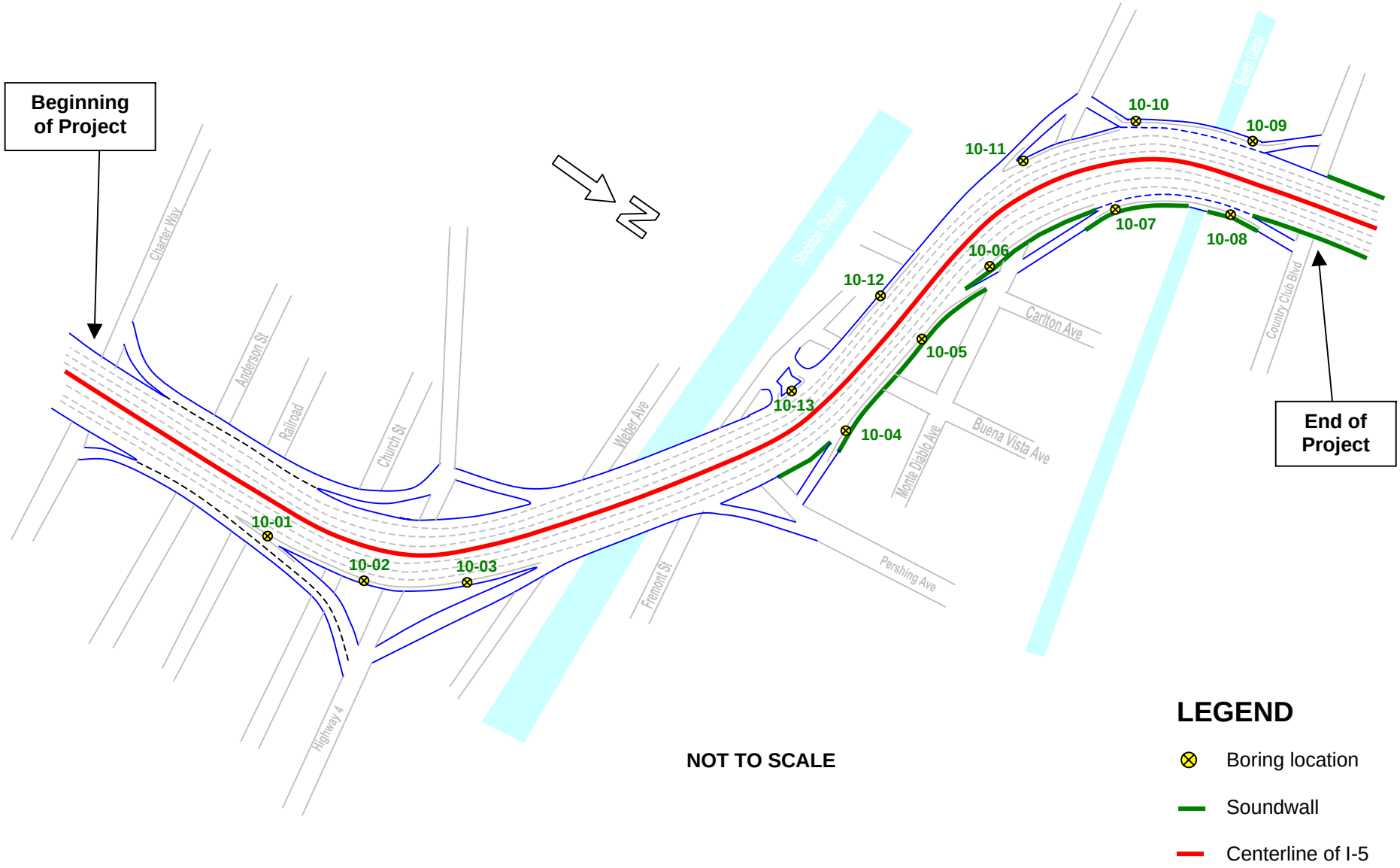
Qm	Modesto Formation: Moderately consolidated silty clay, silt, sand and gravel deposits of alluvial origins.
af	Artificial Fill: Engineered and/or non-engineered. Locally includes artificial dam fill and tailings associated with dredge mining.
Qdp	Dos Palos Alluvium: flood plain deposits from Holocene age.

SOURCES:

Wagner, D.L., Bortugno, E.J. and McJunkin, R.D., 1991, Geologic map of the San Francisco-San Jose quadrangle, California, 1:250,000: California Division of Mines and Geology, Regional Geologic Map 5A, scale 1:250000.

Wagner, D.L., Jennings, C.W., Bedrossian, T.L. and Bortugno, E.J., 1981, Geologic map of the Sacramento quadrangle, California, 1:250,000: California Division of Mines and Geology, Regional Geologic Map 1A, scale 1:250000.

Caltrans	**Division of Engineering Services** **Geotechnical Services** **Office of Geotechnical Design - North**	**EA: 10-0M7801**	**GEOLOGIC MAP**	**Plate No. 3**
		May 2010	**10-SJ-5 PM 25.3 / 28.5 GDR**	



Caltrans Division of Engineering Services Geotechnical Services Office of Geotechnical Design - North	EA: 10-0M7801 May 2010	BORING LOCATION MAP 10-SJ-5 PM 25.3 / 28.5 GDR	Plate No. 4

APPENDIX

Boring Logs

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
10	SJ	5	25.3 / 28.53	10-0M7801

PROJECT OR BRIDGE NAME
I-5 Roadway Rehab

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
			1 of 15

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (July 2007), Section 2, for tables of additional soil description components and discussion of soil description and identification.

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-6-10**	**4-6-10**		**10-01**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**7' Rt Sta 1438+00 ETW (shoulder)**	**52 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
50.00	2				1	50/3"		0							SPT sampler hung up on tip of auger, blow count inaccurate
48.00	4														
	5		Medium dense, some clay.		2	10 11 10	21	100							
46.00	6														
	7				3	7 14 14	28	100							
44.00	8														
	9														
42.00	10		5Becomes dense.		4	10 18 19	37	100							
40.00	12														
	13														
38.00	14														
	15				5	14 22 15	37	100							
36.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
34.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-01**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**3 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-6-10**	**4-6-10**		**10-02**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**5' Rt Sta 1446+00 ETW (shoulder)**	**55 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; trace gravel.												Entire boring within embankment fill
53.00	2				1	7 8 10	18	100		10					
51.00	4														
	5		Some clay.		2	11 11 12	23	100							
49.00	6														
	7														
47.00	8				3	9 13 12	25	100							
	9		No clay.												
45.00	10				4	8 16 15	31	100							
43.00	12														
41.00	14														
	15				5	9 13 14	27	100							
39.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
37.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-02**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**4 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-6-10**	**4-6-10**		**10-03**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**5.5' Rt Sta 1471+00 ETW (shoulder)**	**51 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; trace gravel.												Entire boring within embankment fill
49.00	2				1	4 15 17	32	100							
47.00	4														
	5		Some clay.		2	8 15 19	34	100							
45.00	6														
	7														
43.00	8		No clay.		3	18 18 21	39	100							
	9														
41.00	10				4	10 20 20	40	100							
39.00	12														
	13														
37.00	14														
	15				5	12 16 20	36	100							
35.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
33.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-03**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**5 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-7-10**	**4-7-10**		**10-04**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**8.5' Rt Sta 1511+00 ETW (shoulder)**	**37 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist to wet; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
35.00	2				1	7 9 12	21	100							
33.00	4														
	5		CLAYEY SAND (SC); dense; brown; moist to wet; fine SAND; nonplastic to low plasticity fines; weak cementation.		2	11 16 29	45	100		12					
31.00	6														
	7		SILTY SAND (SM); dense; gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												
29.00	8				3	10 20 17	37	100							
	9														
27.00	10		Becomes medium dense.		4	9 11 10	21	100							
25.00	12		Some clay.												
	13														
23.00	14														
	15		Becomes dense.		5	11 19 26	45	100							
21.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
19.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-04**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**6 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-7-10**	**4-7-10**		**10-05**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**5' Rt Sta 1528+00 ETW (shoulder)**	**28 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
26.00	2														
	3		Some clay.		1	6 9 9	18	100		13					
24.00	4														
	5		Becomes very dense, moist to wet.		2	8 20 50/5"		100		12					
22.00	6														
	7														
20.00	8		Becomes dense, moist.		3	14 19 20	39	100							
	9														
18.00	10		CLAYEY SAND (SC); medium dense; brown; moist; fine SAND; low plasticity fines; weak cementation.		4	11 11 10	21	100							
	11														
16.00	12														
	13														
14.00	14		SILTY SAND (SM); dense; gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												
	15				5	13 13 19	32	100							
12.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
10.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-05**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**7 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-7-10**	**4-7-10**		**10-06**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**5.5' Rt Sta 1534+00 ETW (shoulder)**	**32 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; some clay, trace gravel.												Entire boring within embankment fill
30.00	2				1	9 11 10	21	100							
28.00	4		Becomes moist to wet.												
	5				2	4 7 8	15	100		16					
26.00	6														
	7		Becomes dense, moist, more clay.												
24.00	8				3	12 19 16	35	100							
	9														
22.00	10		No clay, becomes gray.		4	14 18 21	39	100							
20.00	12														
	13		CLAYEY SAND (SC); medium dense; grayish brown; moist; fine SAND; low plasticity fines; weak cementation.												
18.00	14														
	15				5	7 12 13	25	100							
16.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
14.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-06**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**8 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-8-10**	**4-8-10**		**10-07**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**18' Rt Sta 1549+00 ETW (shoulder)**	**24 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
22.00	2				1	7 11 11	22	100		12					
20.00	4														
	5		Some clay.		2	6 6 8	14	100							
18.00	6		Becomes gray.												
	7		CLAYEY SAND (SC); medium dense; dark gray; moist; fine SAND; low plasticity fines; weak cementation.		3	6 7 9	16	100		15					
16.00	8														
14.00	10		SILTY SAND (SM); dense; dark gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.		4	14 17 23	40	100							
12.00	12														
10.00	14														
	15		Becomes medium dense.		5	14 16 14	30	100							
8.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
6.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-07**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**9 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-8-10**	**4-8-10**		**10-08**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**21' Rt Sta 1571+00 ETW (shoulder)**	**22 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
20.00	2				1	14 16 20	36	100							
18.00	4														
	5		Becomes gray, medium dense, moist to wet, some clay.		2	15 14 14	28	100		12					
16.00	6														
	7		CLAYEY SAND (SC); medium dense; brown; moist; fine SAND; low plasticity fines; weak cementation.												
14.00	8				3	4 11 11	22	100		16					
	9														
12.00	10		Becomes dark gray.		4	10 10 9	19	100							
10.00	12														
	13														
8.00	14		SANDY lean CLAY (CL); very stiff; dark gray; moist; fine SAND; low to medium plasticity fines; PP = 2.5 tsf.												
	15				5	4 6 7	13	100							
6.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
4.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-08**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**10 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-13-10**	**4-13-10**		**10-09**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**22' Rt Sta 1568+00 ETW (shoulder)**	**23 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; some clay.												Entire boring within embankment fill
21.00	2				1	7 13 15	28	100		11					
	3		Becomes moist to wet.												
19.00	4														
	5		Becomes dense.		2	11 17 25	42	100							
17.00	6		Becomes gray, moist, fine to medium sand.												
	7														
15.00	8		Becomes very dense, dark gray.		3	40 44 39	83	100							
	9														
13.00	10				4	18 32 39	71	100							
	11														
11.00	12														
	13														
9.00	14														
	15		SANDY lean CLAY (CL); very stiff; dark gray; moist; medium plasticity fines; PP = 2.5 tsf.		5	4 7 9	16	100							
7.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
5.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-09**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**11 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-13-10**	**4-13-10**		**10-10**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**9' Rt Sta 1559+00 ETW (shoulder)**	**25 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
23.00	2				1	11 9 13	22	100							
21.00	4				2	7 12 15	27	100							
19.00	6														
	7		Becomes dark gray, dense.		3	11 18 38	56	100							
17.00	8														
15.00	10				4	20 26 18	44	100							
13.00	12														
11.00	14														
9.00	16				5	6 15 18	33	100							
	17		Bottom of borehole at 16.5 ft bgs												
7.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-10**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**12 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-13-10**	**4-13-10**		**10-11**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**8' Rt Sta 1542+00 ETW (shoulder)**	**30 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												Entire boring within embankment fill
28.00	2		Becomes moist to wet.		1	4 7 10	17	100		14					
26.00	4		CLAYEY SAND (SC); medium dense; gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.		2	4 7 8	15	100							
24.00	6														
22.00	8		SILTY SAND (SM); dense; dark gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; some clay.		3	13 20 24	44	100							
20.00	10		Becomes dark gray.		4	7 13 23	36	100							
18.00	12														
16.00	14														
14.00	15		Becomes medium dense.		5	8 8 8	16	100							
	16														
	17		Bottom of borehole at 16.5 ft bgs												
12.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-11**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**13 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-20-10**	**4-20-10**		**10-12**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**6' Rt Sta 1531+00 ETW (shoulder)**	**26 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; some clay.												Entire boring within embankment fill
24.00	2				1	10 13 14	27	100		14					
22.00	4														
	5		Becomes moist to wet.		2	2 4 14	18	100							
20.00	6														
	7														
18.00	8		Becomes dense, moist.		3	12 24 25	49	100							
	9		CLAYEY SAND (SC); dense; gray; moist; fine SAND; low plasticity fines; weak cementation.												
16.00	10				4	11 18 19	37	100							
	11														
14.00	12														
	13														
12.00	14		SILTY SAND (SM); very dense; dark gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												
	15				5	17 17 39	56	100							
10.00	16														
	17		Bottom of borehole at 16.5 ft bgs												
8.00	18														
	19														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-12**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**14 of 15**

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or North/East and Datum)	HOLE ID
B. Barnes	**4-20-10**	**4-20-10**		**10-13**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Offset, Station, Line)	SURFACE ELEVATION
Caltrans			**5.5' Rt Sta 1502+00 ETW (shoulder)**	**46 ft MSL**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow-Stem Auger			**Mobile B47 (3174786)**	**6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT			**Safety Hammer, 30 in drop**	**57%**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READINGS DURING DRILLING AFTER DRILLING (DATE)	TOTAL DEPTH OF BORING
Backfill with cuttings, quickpatch seal			**Not Encountered**	**16.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SILTY SAND (SM); medium dense; brown; moist; fine SAND; nonplastic to low plasticity fines; weak cementation; some clay.												Entire boring within embankment fill
44.00	2				1	10 13 14	27	100		9					
42.00	4		CLAYEY SAND (SC); dense; brown; moist to wet; fine SAND; low plasticity fines; weak cementation.												
	5				2	12 15 19	34	100							
40.00	6		SILTY SAND (SM); very dense; gray; moist; fine SAND; nonplastic to low plasticity fines; weak cementation.												
38.00	8				3	22 30 26	56	100							
36.00	10		Becomes dense.		4	13 16 21	37	100							
34.00	12		Some clay.												
32.00	14				5	8 16 17	33	100							
30.00	16		Bottom of borehole at 16.5 ft bgs												
28.00	18														
	20														

CALTRANS BORING RECORD MET+ENG FIXED I5_REHAB.GPJ CALTRANS LIBRARY 040808.GLB 5/12/10

Department of Transportation
Division of Engineering Services
Geotechnical Services
Office of Geotechnical Design - North

REPORT TITLE				HOLE ID
BORING RECORD				**10-13**
DIST.	COUNTY	ROUTE	POSTMILE	EA
10	**SJ**	**5**	**25.3 / 28.53**	**10-0M7801**
PROJECT OR BRIDGE NAME				
I-5 Roadway Rehab				
BRIDGE NUMBER	PREPARED BY		DATE	SHEET
	B. Barnes		**4-26-10**	**15 of 15**

ENERGY ABSORPTION SYSTEMS, INC.
A TRINITY INDUSTRIES,INC. COMPANY

HOME
WHAT'S NEW
PRODUCTS
LINKS
ABOUT US
CONTACT US

Product Sheet
Product Specifications
FHWA Acceptance

QuadGuard®II CRASH CUSHION SYSTEM

QUADGUARD®II CRASH CUSHION

QUADGUARD®II CRASH CUSHION family has evolved again! Using the existing framework of the QuadGuard, the QuadGuard II provides TL-2 and TL-3 protection using less length.

The TL-2 QuadGuard II is 25% shorter than the original QuadGuard measuring less than 3m (10'). The TL-3 model is also nearly a meter, 3 feet, shorter than its predecessor.

The only modifications are the addition of the revolutionary Steel Nose, and the monorail Guide Stabilizers. The remaining components are identical to the existing NCHRP 350 systems that have been installed globally since the mid 1990's.

The QuadGuard II will telescope rearward on head-on impacts by both the light car and the high center-of-gravity pickup truck at speeds up to 100 km/h (62 mph) and safely redirect errant vehicles on impact up to 20 angles into the side of the unit without gating.

FEATURES AND BENEFITS

- LESS is MORE!
- QuadGuard II has up to 25% less footprint reducing installation cost
- Steel Nose provides excellent visibly
- Majority of system is identical to QuadGuard reduced inventory requirements
- Shorter Systems are less likely to be impacted
- Offers hazard protection from 40 km/h (25mph)to 115 km/h to (70mph)

Post Impact Debris

The design of the QuadGuard II does an excellent job of minimizing debris affecting other vehicles in the roadway.

European Standard EN-1317-3

The QuadGuard® Family also includes systems to meet Europe's EN-1317-3 Criteria
- QuadGuard CEN Crash Cushion Family

Head-On Impacts

During head-on impacts, the QuadGuard® System telescopes rearward and crushes the cartridges to absorb the energy of impact.

Redirective Capability

When impacted from the side, the QuadGuard® System redirects the errant vehicle back toward its original travel path without allowing gating.

Quad-Beam™ Panels

Quad-Beam panels provide 30% higher beam strength than thrie beam panels.

Monorail Base

Monorail base eliminates the need for chains and cables providing excellent redirective capability.

Self-Supporting Nosee

Self-supporting nose means no legs to complicate installation and maintenance. Optional Flex-Belt Nose available.

Easy Refurbishment of Crash Cushions

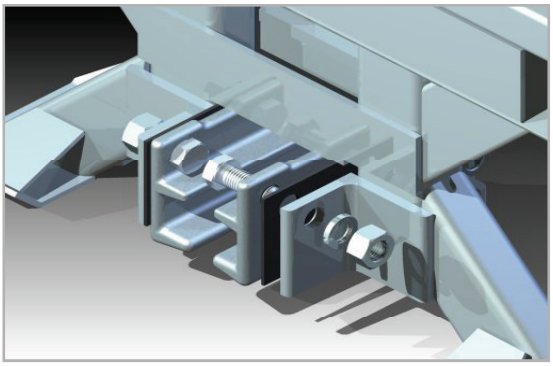
Self-supporting nose means no legs to complicate installation and maintenance. Optional Flex-Belt Nose available.

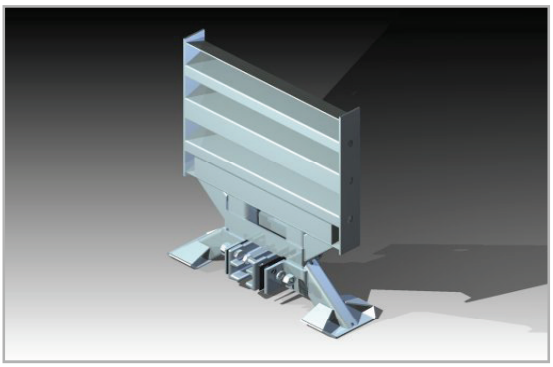
Replaceable Cartridge

Replaceable cartridge contains impact debris, avoiding loose parts that may cause secondary accidents.

QuadGuard® II

The New Standard in Crash Cushions





OVERVIEW

The QuadGuard family has evolved again! Using the existing framework of the QuadGuard, the QuadGuard II provides TL-2 and TL-3 protection using less length. The TL-2 QuadGuard II is 25% shorter than the original QuadGuard measuring less than 3m (10'). The TL-3 model is also nearly a meter, 3 feet, shorter than its predecessor.

The only modifications are the addition of the revolutionary Steel Nose, and the monorail Guide Stabilizers. The remaining components are identical to the existing NCHRP 350 systems that have been installed globally since the mid 1990's.

The QuadGuard II will telescope rearward on head-on impacts by both the light car and the high center-of-gravity pickup truck at speeds up to 100 km/h (62 mph) and safely redirect errant vehicles on impact up to 20 angles into the side of the unit without gating.

POST IMPACT DEBRIS

The design of the QuadGuard II does an excellent job of minimizing debris affecting other vehicles in the roadway.

FEATURES AND BENEFITS

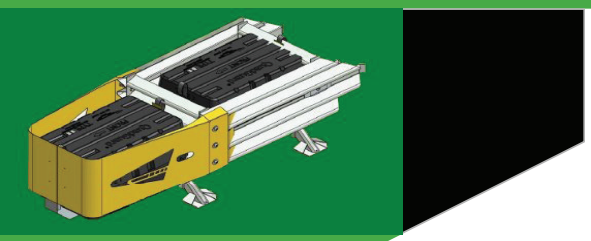
- More is LESS!
- QuadGuard II has up to 25% less footprint reducing installation cost
- Steel Nose provides excellent visibly
- Majority of system is identical to QuadGuard- reduced inventory requirements
- Shorter Systems are less likely to be impacted
- Offers hazard protection from 40 km/h (25mph) to 115 km/h to (70mph)

ENERGY ABSORPTION SYSTEMS, INC.

SAVING LIVES BY DESIGN®

www.energyabsorption.com

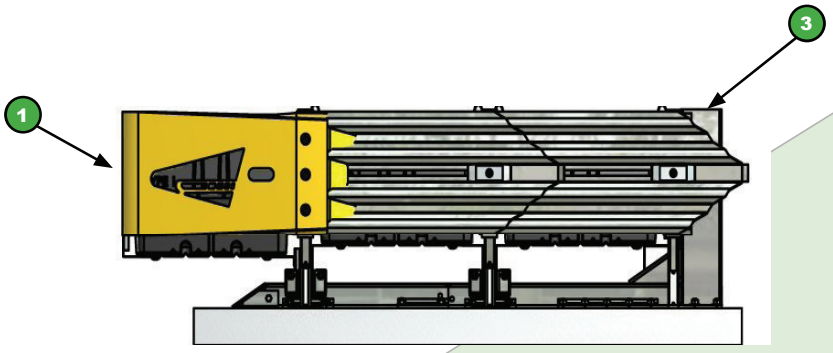
QuadGuard® II



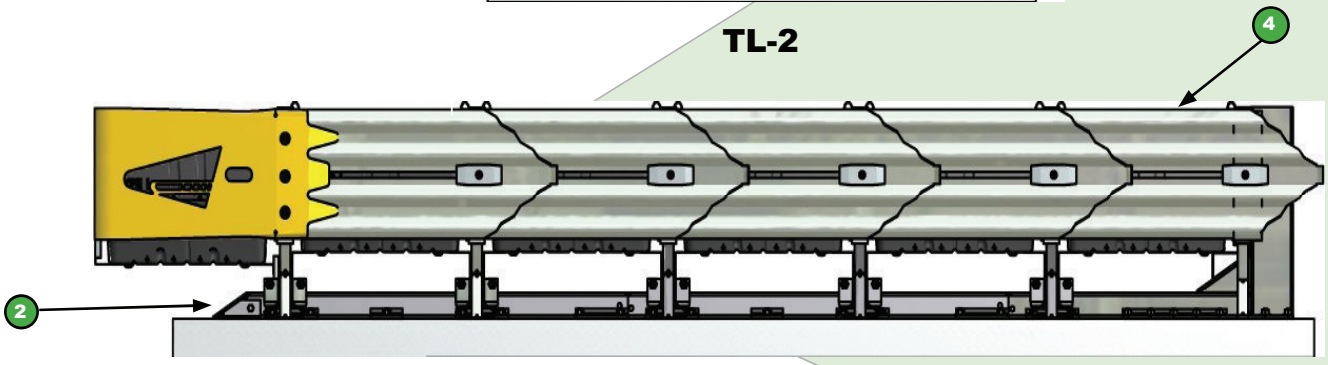
SPECIFICATIONS

Minimum Width at Backup	610 mm	(2')
Maximum Width at Backup	2.3 m	(8')
TL-2 Effective Length	2.6 m	(8'8")
TL-3 Effective Length	5.4 m	(8'8")

1. ENGINEERED STEEL NOSE
2. MONORAIL
3. STEEL BACKUP
4. FENDER PANEL



TL-2



TL-3

DISTRIBUTED BY:

Quixote Transportation Safety
www.quixtrans.com

35 E. Wacker Drive • Chicago, IL 60601
Tel: (312) 467-6750 • Fax: (312) 467-9625

Crown House, Crown Street • Ipswich, IP1 3HS
Tel: 44-1473-221-105 • Fax: 44-1473-221-106

www.energyabsorption.com

ENERGY ABSORPTION SYSTEMS, INC.

BARRIER SYSTEMS

A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

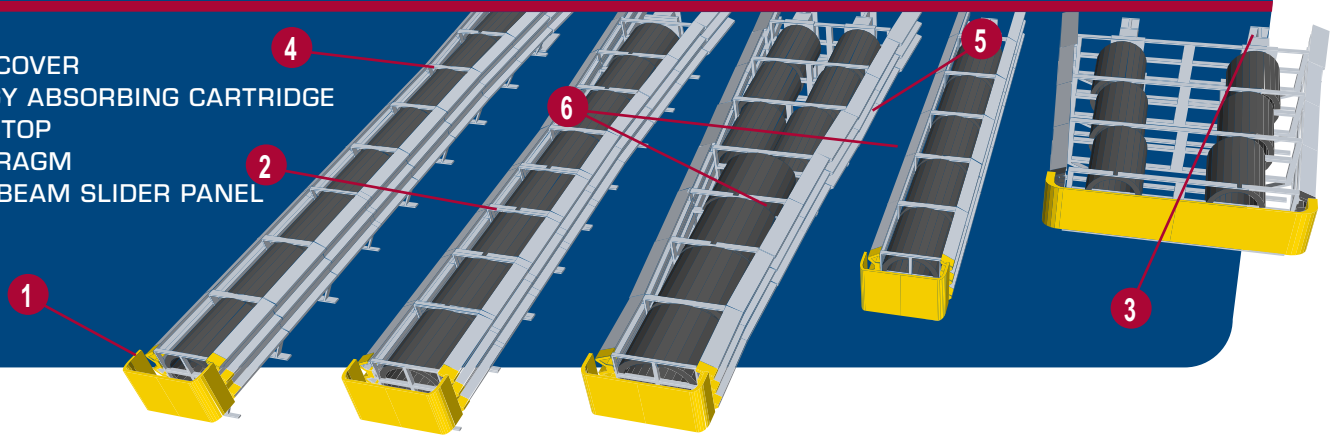
TAU-II®

Redirective Non-Gating Crash Cushion System

- Shields Multiple Width Hazards
- Partially Reusable Design
- Quick and Easy to Install
- NCHRP 350 TL-3 Accepted

TAU-II® System

1 NOSE COVER
2 ENERGY ABSORBING CARTRIDGE
3 BACKSTOP
4. DIAPHRAGM
5. THRIE-BEAM SLIDER PANEL



TAU-II® FAMILY OF CRASH CUSHIONS

The Redirective, Non-Gating TAU-II Crash Cushion Family consists of a full line of Systems designed to meet the requirements of NCHRP Report 350, TL-2 & TL-3. The system is available in lengths and capacities for both low and high speed applications (30-70 mph, 50-113 km/h). The TAU-II System can shield hazards with widths up to 102" [2.6 m]. The TAU-II System is ideally suited for roadway hazards such as the ends of rigid concrete barriers, steel barrier, bridge piers, signs, etc. Ease of installation, low profile foundation, numerous transition options, low priced replacement components, after an impact make the TAU-II System ideal to shield most roadside hazards.

FEATURES

- Inexpensive replacement parts
- Low profile 6" [152 mm] reinforced foundation ideal for bridge decks
- Universal parts kit available to repair or build any size unit
- Minimum number of anchors
- Reusable nose standard
- Standard transitions

WHERE TO USE

- Medians
- Gore Areas
- Construction Zones
- Toll Plazas
- Side of Road

PHYSICAL SPECIFICATIONS

TL-3 Length	7 m [23' 1"]
Width	0.7 - 3m [27 - 102""]
Height	800 mm [31 1/2"]
TL-3 Weight	1129 kg [2489 lb.]
Test Performance Level	NCHRP 350 TL-1/2/3

The TAU-II System uses disposable, inexpensive cartridges and telescoping panels making the System easy to reset after a design impact.

FREQUENTLY ASKED QUESTIONS

WHAT NEEDS TO BE REPLACED AFTER A DESIGN IMPACT?
Typically only the damaged cartridges will need to be replaced. The Nose and slider panels will withstand multiple design impacts.

WHAT TYPE OF FOUNDATION IS NEEDED FOR THE UNIVERSAL TAU-II SYSTEM?
Typically a 6" [152 mm] reinforced concrete pad is required. However for temporary applications, the unit can be installed on asphalt using the Universal TAU-II CZ System.

WHAT TRANSITIONS ARE AVAILABLE?
Since TAU-II transitions are non-proprietary, any approved thrie beam barrier transition will fit..

CAN THE TAU-II SYSTEM BE USED FOR LOW AND HIGH SPEEDS?
The TAU-II System is designed for speeds from 31 to 70 mph (50 to 113 km/h).

DISTRIBUTED BY:

General details for the TAU-II System are subject to change without notice to reflect improvements and upgrades. Additional information is available from Barrier Systems, Inc.

BARRIER SYSTEMS

A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

3333 VACAVALLEY PKWY, VACAVILLE, CA 95688 TEL. +1 707.374.6800 U.S. TOLL FREE 888.800.3691 WWW.BARRIERSYSTEMSINC.COM

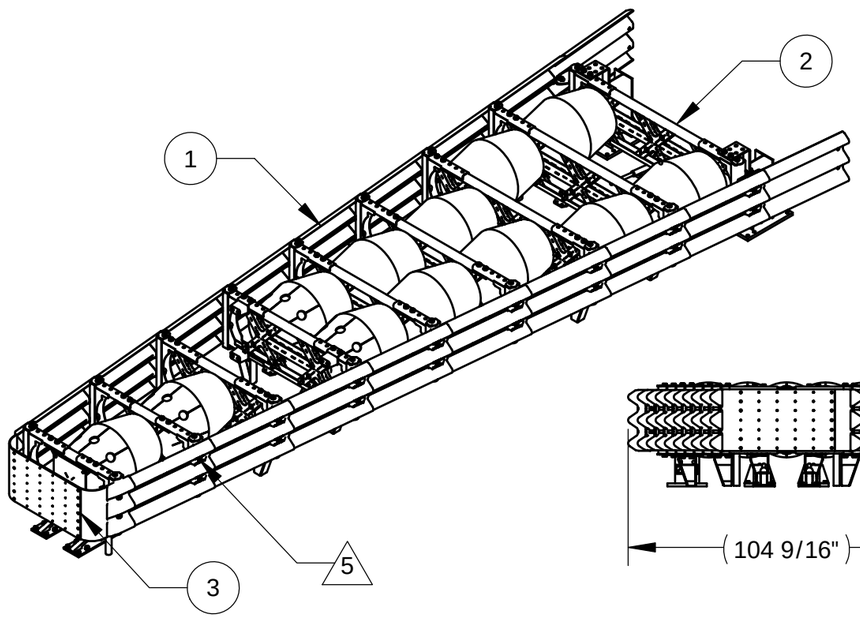
ITEM	PART NO	DESCRIPTION	QTY	UOM
1	90T105	90" Universal TAU-II 105kph	1	EACH
2	W90IL	90" Backstop Assembly Ind Mount	1	EACH
3	K001029	Tau-II Wide Nose Piece Kit, BL	1	EACH
4	CWIM	Concrete Anc Pkg, WFI	1	EACH

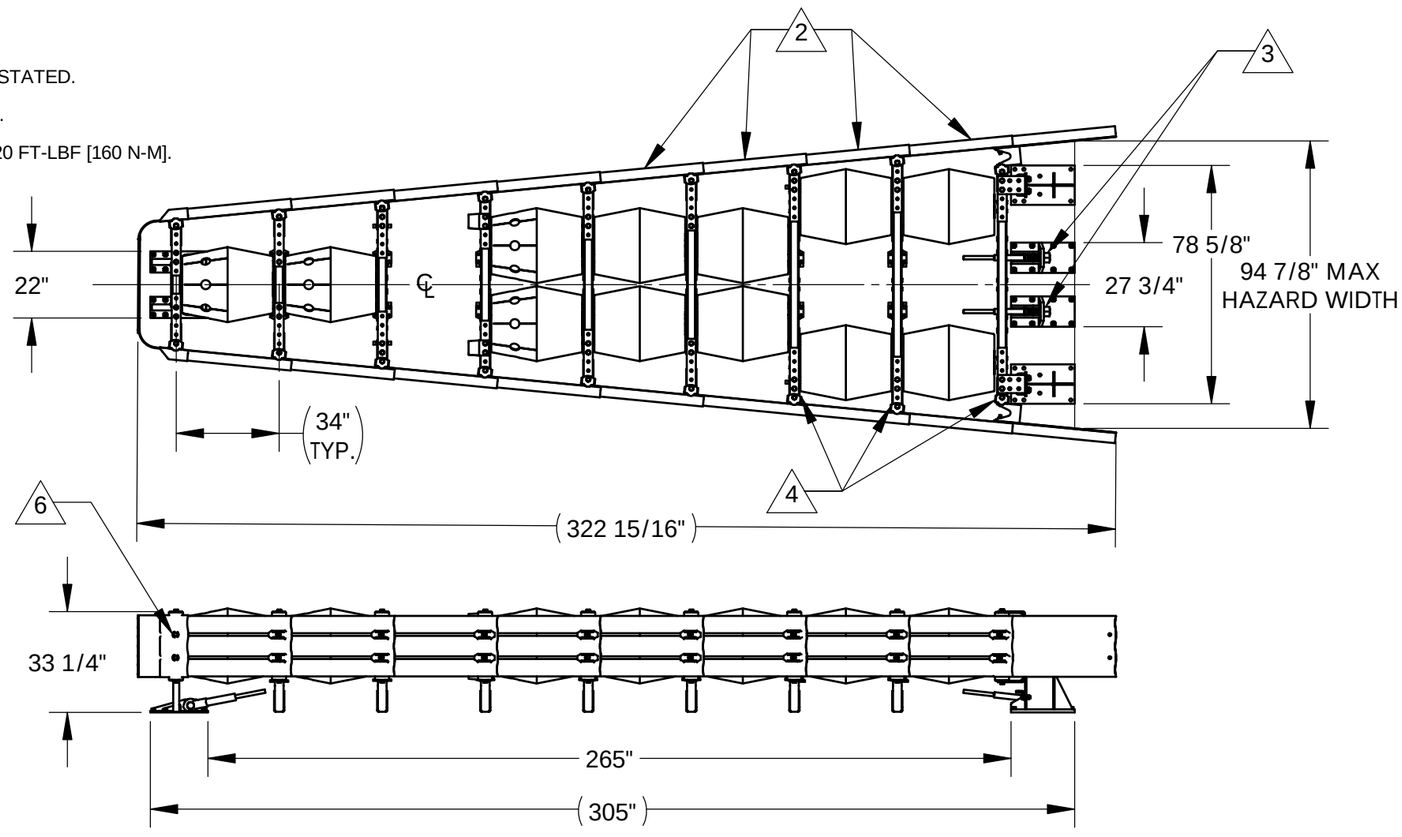
NOTES: UNLESS OTHERWISE SPECIFIED

1. ITEM #4 NOT SHOWN.
2. NEST (2) PANELS ON LAST (4) BAYS.
3. TENSION CABLE TO APPROXIMATELY 20,000 LBF [89 KN]. FOR 2.0" - 6.0 THREAD, TORQUE NUT TO 500 FT-LBF [680 N-m].
4. LATERAL RESTRAINT CABLES (NOT SHOWN) CONNECT THE BACKSTOPS TO THE OPPOSITE ENDS OF THE LAST (2) BULKHEADS.
5. TORQUE SLIDER BOLTS TO 20 FT-LBF [27 N-m].
6. TORQUE NOSE PIECE ATTACHMENT HARDWARE TO 200 FT-LBF [270 N-m].
7. TRANSITIONS MUST NOT CREATE AN EDGE CAPABLE OF SNAGGING A VEHICLE AND SHOULD REMAIN PARALLEL TO THE END PANELS AT THE CONNECTIONS. FOR BI-DIRECTIONAL TRAFFIC A STANDARD AASHTO THRIE BEAM TRANSITION SHOULD BE USED TO PREVENT SNAGGING OF THE END PANELS. THE LATERAL STIFFNESS OF THE TRANSITION SHOULD BE EQUAL TO OR STRONGER THAN THAT OF THE TAU-II SYSTEM.

SPECIFICATIONS:

1. ALL STEEL COMPONENTS ARE ASTM A36 OR EQUIVALENT UNLESS OTHERWISE STATED.
2. ALL STEEL COMPONENTS ARE HOT DIPPED GALVANIZED PER ASTM A-123 UNLESS OTHERWISE STATED.
3. ALL FASTENERS ARE GRADE 2 OR EQUIVALENT AND GALVANIZED UNLESS OTHERWISE STATED.
4. THE STANDARD TORQUE SPECIFICATION FOR 20MM-2.5 FASTENERS WHEN NOT SPECIFIED IS 120 FT-LBF [160 N-M].
5. ALL FASTENERS WILL INCORPORATE A POSITIVE THREAD LOCKING DEVICE.





APPROVALS

DRAWN BY:	JMT
DRAWN DATE:	10/19/11
APPR'D BY:	GAD
APPR'D DATE:	10/19/11

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS ±1/16 DECIMAL .XX = ±.03 .XXX = ±.010 ANGLES ±1/2°

INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5-1994

THIRD ANGLE PROJECTION

DO NOT SCALE DRAWING

REV	ECN#	DATE
0	NEW DWG	10/19/11

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY
3333 Vaca Valley Parkway Ste 800
Vacaville, CA 95688
Tel: 888-800-3691
www.barriersystemsinc.com

TITLE

TAU-II 90in 105kph, WIDE FLAGE BACKSTOP BLACK NOSE, CONCRETE ANCHORING

SIZE	DWG NO.	REV.
B	90T105WBC	0

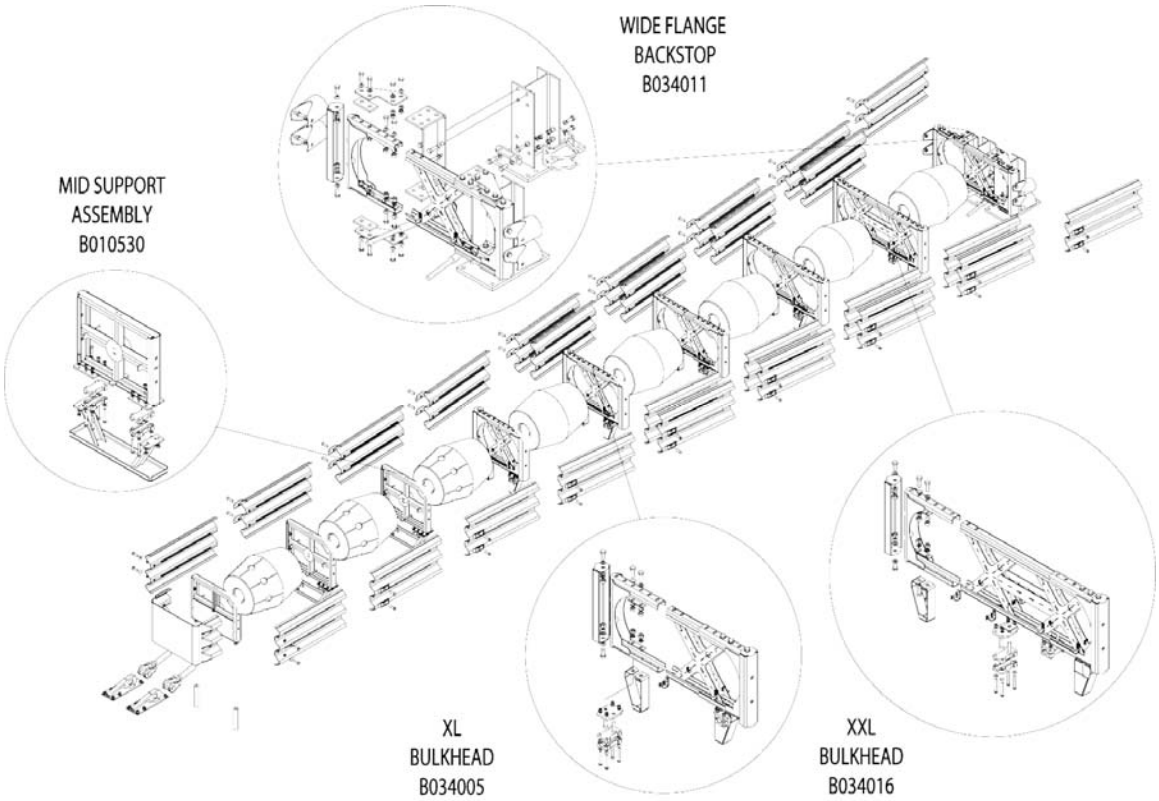
SCALE 1:50 SHEET 1 OF 1

Doc. B100108

Installation and Assembly Manual

UNIVERSAL TAU-II® Crash Cushion

Step By Step Instructions For Parallel & Tapered Systems



"Advancing Safety Through Innovation"

This page left blank

TABLE OF CONTENTS

PREFACE

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

As with any roadside safety device, the Universal 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. Do not start the installation without the proper plans and tools required for installation.

If you need additional information, or have questions about the Universal 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 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.

SYSTEM OVERVIEW

The Universal 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. Refer to Figure 1 to familiarize yourself with the basic parts and part names of the system.

The Universal TAU-II system is designed to shield the ends of median barriers and other fixed objects likely to be struck head-on, by absorbing and dissipating the kinetic energy of impacting vehicles. Universal TAU-II systems utilize 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 and attach to the bottoms of the diaphragms and terminate at the anchors at each end of the system. The front and rear cable anchors are attached to the foundation as described in Appendix A Foundation Requirements.

BEFORE TAU-II INSTALLATION

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.

Depending on the application and circumstances at the job site, installation and assembly of a Test Level 3 system should take a two-person crew less than 3 hours.

The TAU-II is a highly engineered safety device made up of a relatively small amount of parts. Before

starting the assembly, become familiar with the basic elements that make up the TAU-II system. The TAU-II system components are illustrated separately in Figure 1 (Pages 6-7).

Limitations and Warnings

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

When 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.

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.

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

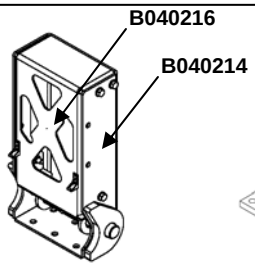
PROVIDED TOOLS

- Long bolt for nested slider panel installation
- Allen socket for the slider bolt assembly
- Cable socket

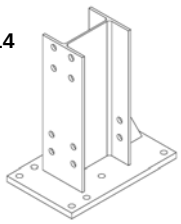
REQUIRED TOOLS

- ½" [12 mm] drive deep sockets:
  3/4" [19 mm], 13/16", [20 mm],
  15/16", [24 mm], 1 1/8" [30 mm]
  3/4" [20 mm] deep socket
- 3/4" [19mm] combination end wrench
- ½" (12 mm) drive ratchet with extensions
- Rotohammer for drilling holes in concrete:
- 7/8" [22 mm] X 10" [250 mm] bit for chemical anchors
- ½" Torque wrenchs:
- 20 ft-lbs [27 N-m] and 500 ft-lbs [680 N-m] capacity
- Measuring tape
- Safety Equipment: Glasses, Gloves
- ½" (12 mm) Air impact wrench (Optional)

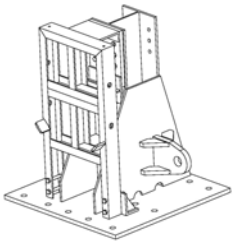
Note: The tools list is a general recommendation. Depending on the specific characteristics of the job site, more or less tools may be necessary.



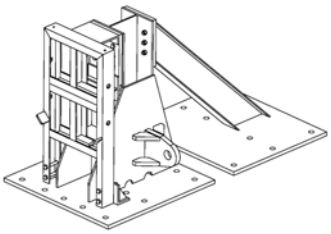
Flush Mount Backstop



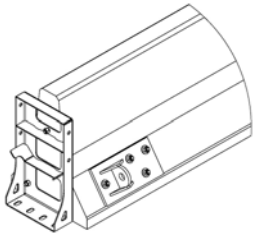
Wide Flange Backstop
Pt# B030668



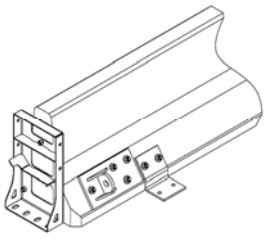
Compact Backstop
Pt# B040430



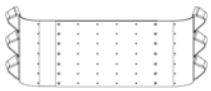
Compact Backstop with Asphalt Support



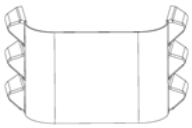
PCB Backstop
Pt# B040425



PCB Backstop with Cable Anchor and Barrier Support

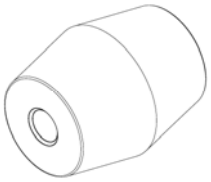


Nose Piece – (wide)
Pt# K001034 Y (Black)
with rivet Kit

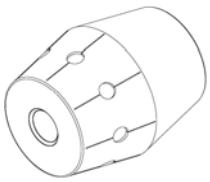


Nose Piece Only
(Parallel)
Pt# B030516 (Black)

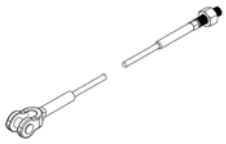
Hardware Kit
Pt# K001013



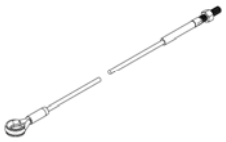
Energy Absorbing Cartridge - Type B
Pt# B010722



Energy Absorbing Cartridge - Type A
Pt# B010802

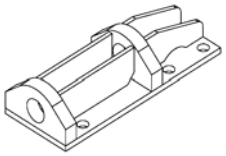


Wide Cable



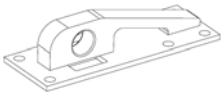
Parallel Cable

Flush Mount



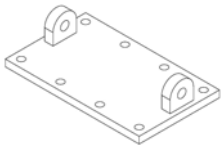
Front Cable Anchor (Reverse)
Pt# B040412

Wide Flange

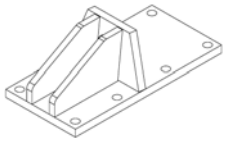


Front Cable Anchor, Universal Cable
Pt# B030935

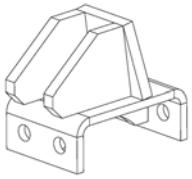
Compact or PCB



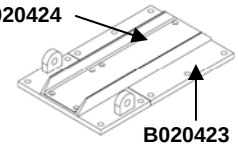
Front Cable Anchor, Compact Cable
Pt# B010248



Rear Cable Anchor, (Independent)
Pt# B030938



Rear Cable Anchor (Backstop Mount)
Pt# B031020



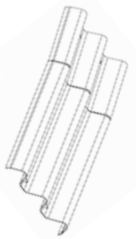
Front Cable Anchor Asphalt Anchor
Pt# B020425

Cable Key Front
Pt# B040501

Cable Key
Pt# B030942

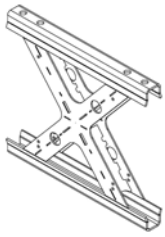
Sliding Panel
Pt# B010202

End Panel
Pt# B010659

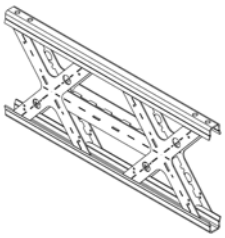


Angled End Panel
Pt# B040203

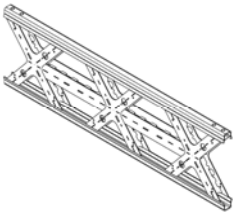
Figure 1. Illustrated parts list



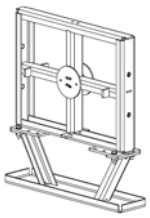
XL Bulkhead
Pt# B030521



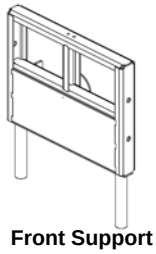
XXL Bulkhead
Pt# B030528



XXXL Bulkhead
Pt# B030529

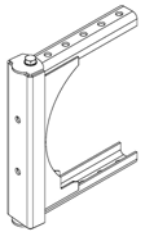


Middle Support
Pt# B030703

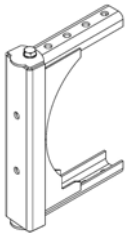


Front Support
Pt# B030704

Leg Kit Pt# K001005

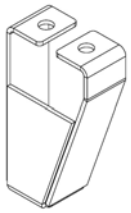


Wing Assembly
Pt# B030509

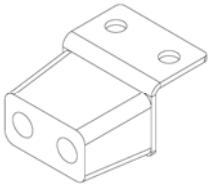


Transition Wing Assy.
Pt# B030910

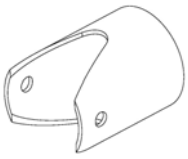
36 Inch Adapter Assy
Pt# B031201



Leg (wide)
Pt# B030425



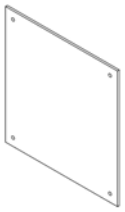
Bumper Assembly
(wide)
Pt# B031035



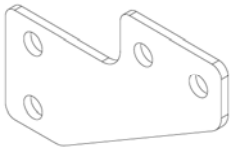
Pipe Panel Mount
Pt# B010651

Hardware Kit
Pt# K001017

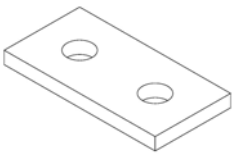
Backstop Blockout
(wide)
Pt# B030713



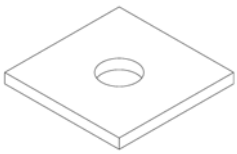
Front Collision Plate
(wide)
Pt# B030801



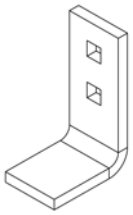
Wing Brace
(wide)
Pt# B030821



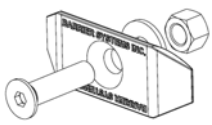
Spacer - Wing Brace
(wide)
Pt# B030823



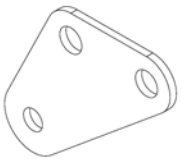
Level Spacer
Pt# B030551



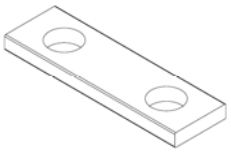
EAC Locator Kit (X4)
Pt# K001028



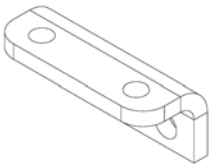
Slider Assembly Kit (x4)
Pt# K001003



Leg Adapter
(wide)
Pt# A040223

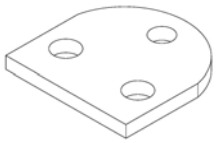


Backing Plate
(wide)
Pt# B030543

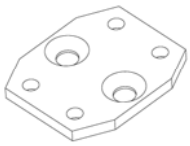


Lateral support Mount,
(Backstop Mount - wide)
Pt# B031011

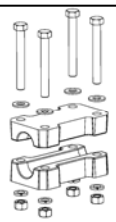
Lateral Support
Cable Assembly Kit
Pt# K001031



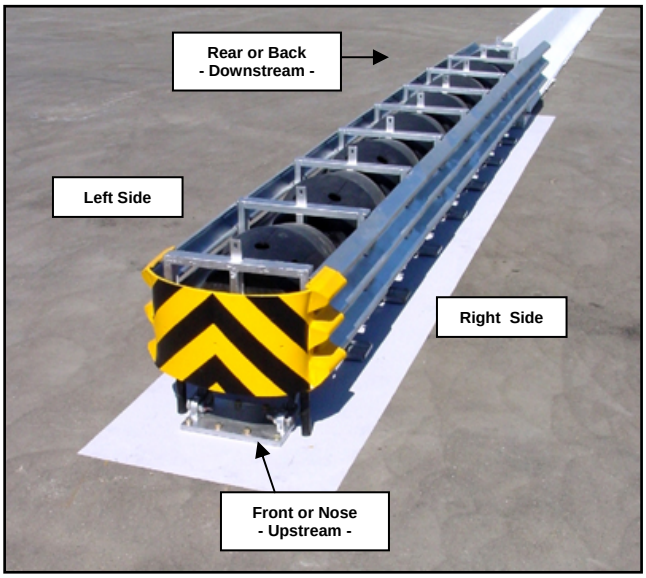
Bulkhead Mount,
Lateral Support – (wide)
Pt# B031010



Cable Guide Mounting
Plate – (wide)
Pt# B030411



Cable Guide Assembly
Kit (x4)
Pt# K001004



Sign Conventions

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

Concrete pad in front of hazard

Wide system on pallets for shipment

Preparing for installation

Depending on the size of the system ordered, the parts will be shipped on two to five pallets. Assembly of the TAU-II system is typically done at the worksite. (If preferred, the system can be assembled "off-site" and set into position as one piece, with a forklift or crane.)

Before beginning the assembly of the TAU-II system, check the packing list to be certain that all of the system components were included in the shipment.

The TAU-II Crash Cushion system has been designed to attach to concrete or asphalt foundations. BSI recommends that at a minimum, the system be anchored to standard six-inch reinforced 4,000 psi (28 MPa) Portland Cement Concrete (PCC) pad or roadway, or 8" (200 mm) AR-4000 Asphalt Concrete. When installing to concrete, care must be taken when building the concrete pad to space the rebar so as to minimize interference with the anchor bolt holes.

(See Appendix "C", Page 47, for BSI recommended foundation options and material specifications.)

NOTE:
It is important to determine the system's installation position and angle, to optimize proper function and transition.

This system is available in two configurations:

1) The system can be attached directly to the end of a concrete barrier, utilizing the "PCB Backstop" (BSI part # B040425) or the "Flush Mount Backstop" (BSI part # B040219).

2) The second configuration utilizes a "Compact Backstop" (BSI part # B010537) which is a free standing back support.

This manual describes the installation procedure for an 8 bay (Test Level 3) system.

(See the System Configuration Chart in Appendix "A", Page 44, for guidelines on choosing a system length to accommodate different traffic criteria.)

Depending on the installation design, transition hardware may be necessary. Because each transition is unique, BSI recommends that the transition hardware be properly fitted before anchoring the system. Pre-assemble the transition hardware before setting the system base plates to assure the proper spacing between the system and the object being treated.

(NOTE: See Appendix "D", Page 63, for some recommended transition types)

CONCRETE PAD INSTALLATION

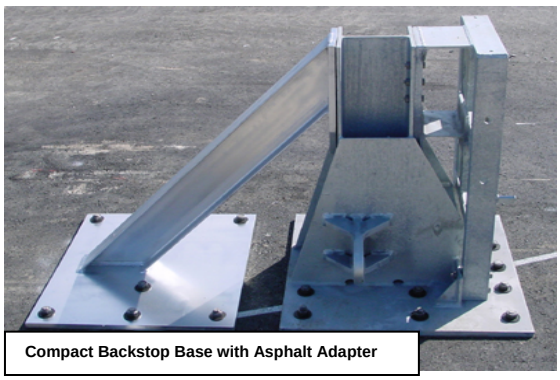
Use the Base Plate of the Compact Backstop as a template

Step 1. (Compact Backstop to Concrete Foundation)
Place the Compact Backstop in the desired final installation position. Use the holes in the base plate as a template to mark the location of the anchor points. Remove the backstop and drill the anchor bolt holes. The holes should be 6" (150 mm) deep and 7/8" (22 mm) diameter. Install the anchors into the pad following the instructions included with the anchor epoxy. When the epoxy is fully cured, install the nuts and flat washers. Tighten to 120 ft-lbs (160 N-m).

Use the P.C.B. Backstop as a template to drill the holes

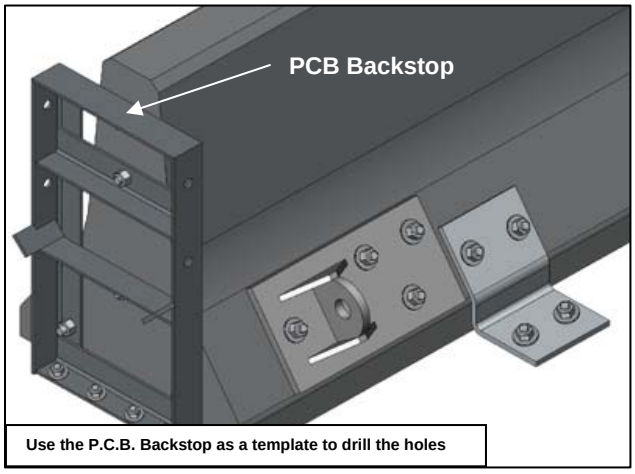
Step 1. (PCB Backstop to Concrete Foundation)
Place the PCB Backstop in the desired final installation position. Use the holes in the backstop as a template to mark the location of the anchor points. The holes should be 6" (150 mm) deep and 7/8" (22 mm) diameter. Use a caulking gun and gun insert filled with anchoring compound to secure the ¾" x 8 ¼" (20 mm x 610 mm) galvanized anchors. Torque to 120 ft-lbs (160 N-m).

ASPHALT INSTALLATION



Compact Backstop Base with Asphalt Adapter

Step 1. (Compact Backstop to Asphalt)
If the unit is being installed on asphalt, the Asphalt Adapter must be attached to the Compact Backstop. Use the base as a template to mark the anchor point locations. All holes should be 15 to 16½" (380 to 420 mm) deep. Use 18" (460 mm) anchors for the Compact Backstop and the Asphalt Adapter. Install the anchors into the foundation following the instructions included with the anchor epoxy. When the epoxy is fully cured, install the nuts and flat washers. Tighten to 120 ft-lbs (160 N-m).



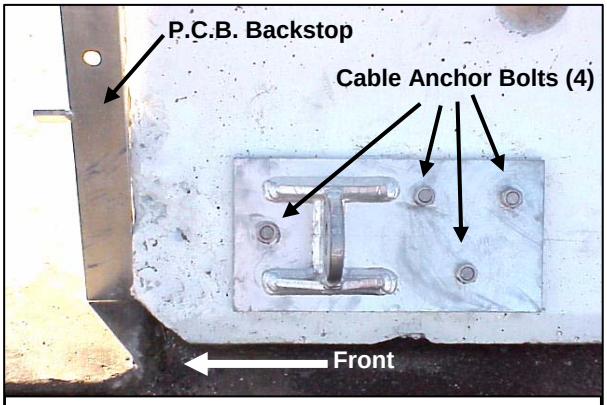
Use the P.C.B. Backstop as a template to drill the holes

Step 1. (PCB Backstop to Asphalt Foundation)
Place the PCB Backstop in the desired final installation position. Use the holes in the backstop as a template to mark the location of the anchor points. The holes should be 6" (150 mm) deep and 7/8" (22 mm) diameter. Use a caulking gun and gun insert filled with anchoring compound to secure the ¾" x 8 ¼" (20 mm x 610 mm) galvanized anchors. Torque to 120 ft-lbs. (160 N-m)

CONCRETE PAD INSTALLATION

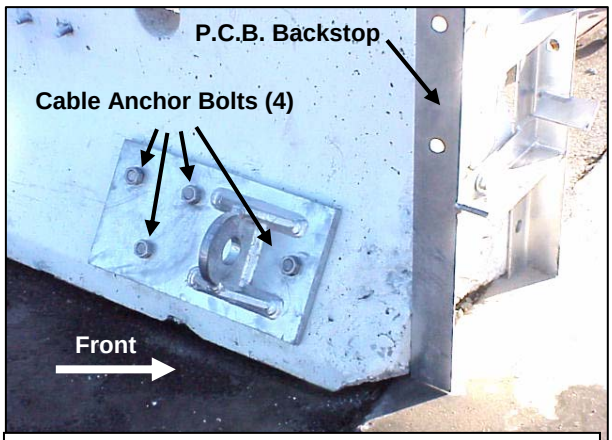
Step 2. (Concrete Rear Cable Anchors)

NOTE: IF YOU ARE USING THE COMPACT BACKSTOP, SKIP TO STEP 3.



Use the Cable Anchor Plate as a template for the bolt holes (Right Side)

Use the holes in the plate as a template to mark the location of the holes for the anchor studs. (There is one Cable Anchor for each side of the P.C.B.). The holes should be drilled 6" (150 mm) deep and 7/8" (22 mm) in diameter. Install the (all thread) studs into the PCB following the instructions included with the anchor epoxy. When the epoxy is fully cured, install the nuts and flat washers. Tighten to 120 ft-lbs (160 N-m).



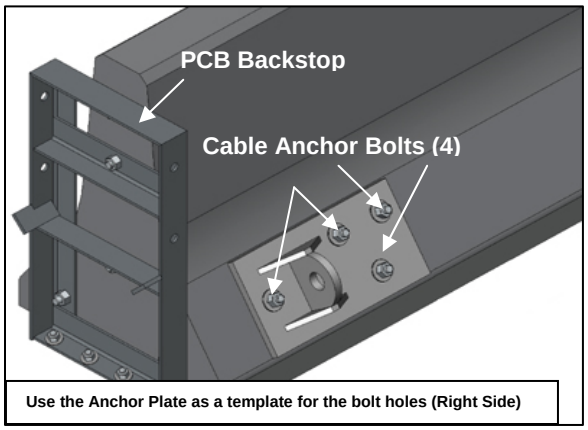
Use the Cable Anchor Plate as a template for the bolt holes (Left Side)

NOTE: For proper system performance, the concrete barrier must be rigidly attached to an adequate foundation. See Appendix "C" for Anchor Foundation Options and Page 24 for anchoring material options..

ASPHALT INSTALLATION

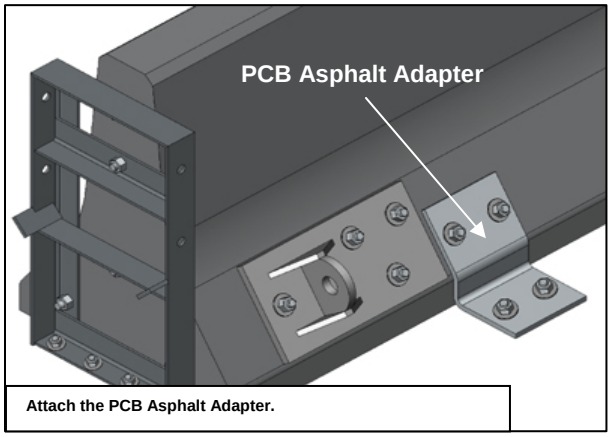
Step 2. (Asphalt Rear Cable Anchors)

NOTE: IF YOU ARE USING THE COMPACT BACKSTOP, SKIP TO STEP 3.



Use the Anchor Plate as a template for the bolt holes (Right Side)

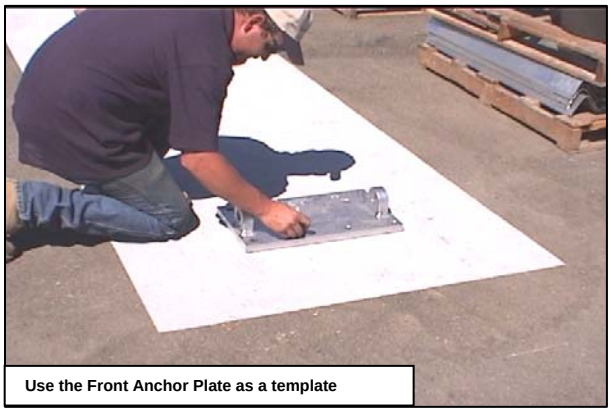
Refer to the Installation Drawings in Appendix "C" to determine the correct Cable Anchor installation position. Use the holes in the plate as a template to mark the location of the holes for the anchor studs. (There is one Cable Anchor for each side of the P.C.B.). The holes should be drilled 6" (150 mm) deep and 7/8" (22 mm) in diameter. Install the (all thread) studs into the PCB following the instructions included with the anchor epoxy. When the epoxy is fully cured, install the nuts and flat washers. Tighten to 120 ft-lbs (160 N-m)



Attach the PCB Asphalt Adapter.

Attach the PCB Asphalt Adapter. Drill holes 6" (150 mm) deep and 7/8" (22 mm) in diameter in the concrete barrier. Drill 15 to 16 ½" (380 to 420 mm) in the foundation and install 18" (460 mm) anchors following the instructions included with the anchor epoxy. When the epoxy is fully cured, install the nuts and flat washers. Tighten to 120 ft-lbs (160 N-m).

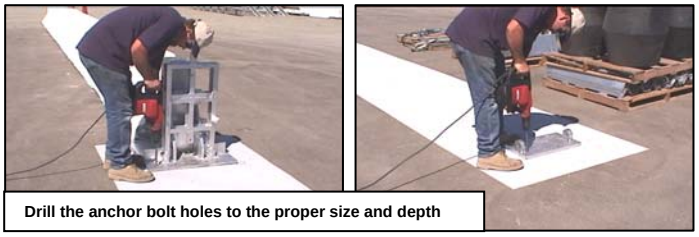
CONCRETE PAD INSTALLATION



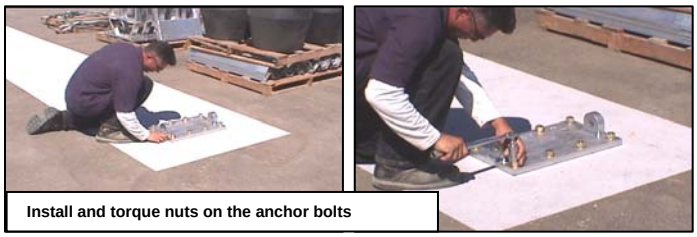
Use the Front Anchor Plate as a template

Step 3. (Concrete Front Cable Anchor)

Place the Front Cable Anchor in the desired final installation position. Use **Appendix C** for layout dimensions. Use the holes in the plate as a template to mark the location of the anchor points. Remove the plate and drill the anchor bolt holes to the desired size and depth. The holes should be 6" (150 mm) deep and 7/8" (22 mm) diameter.



Drill the anchor bolt holes to the proper size and depth

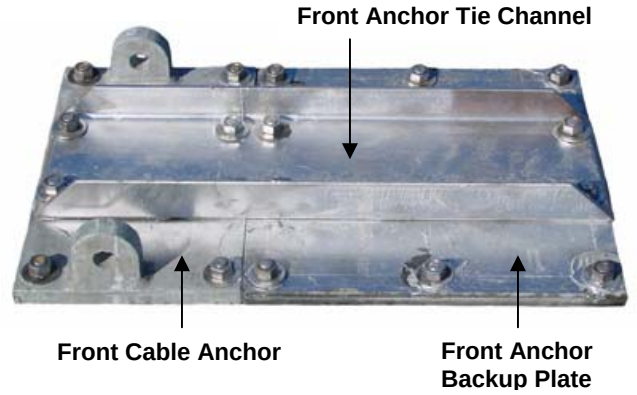


Install and torque nuts on the anchor bolts

NOTE:

It is important that the holes are drilled straight and in the correct position so that the plate will fit back over the bolts after they have been set with anchoring material. If the total hole depth cannot be reached due to rebar interference, a "diamond tip" drill or equivalent should be used to reach the total hole depth.

ASPHALT INSTALLATION



Step 3. (Asphalt Front Cable Anchor)

The Asphalt Front Cable Anchor is a three piece unit. Place the Front Cable Anchor and the Front Anchor Backup Plate in the desired final installation position. Use the holes in the plates as a template to mark the location of the anchor points. Remove the plates and drill the anchor bolt holes to the desired size and depth. The holes should be 15 to 16 ½" (380 to 420 mm) deep and 7/8" (22 mm) diameter. **Install the cable and clevis pin before installing the Front Anchor Tie Channel.** Install the Front Anchor Tie Channel on top of the Front Cable Anchor and the Front Anchor Backup Plate.

NOTE:

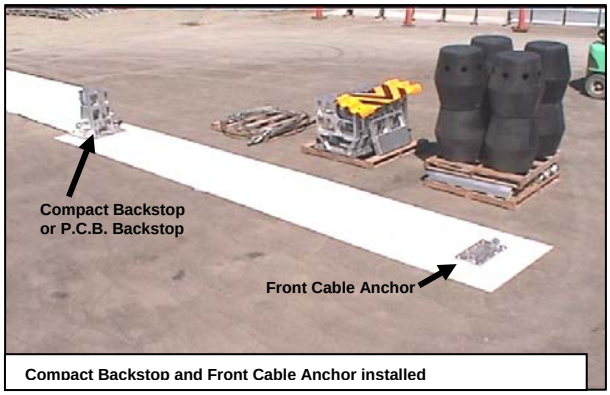
It is important that the holes are drilled straight and in the correct position so that the plate will fit back over the bolts after they have been set with anchoring material. If the total hole depth cannot be reached due to interference, a "diamond tip" drill or equivalent should be used to reach the total hole depth.

ALL FOUNDATIONS

After the anchoring epoxy is properly cured, install a nut and washer on each of the anchor bolts extending through the base plates of the Backstop and Front Cable Anchor plate.

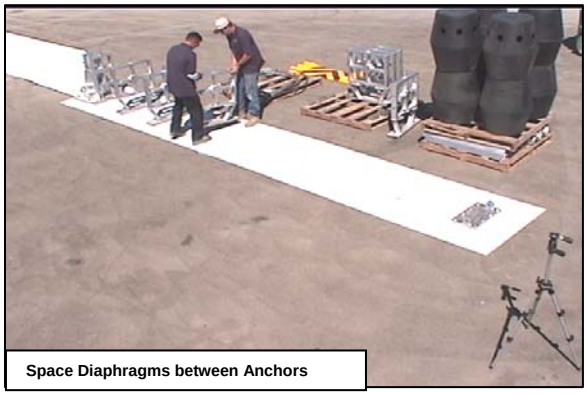
For PC Concrete foundations, torque the nuts to 120 ft-lbs (160 N-m).

For Asphaltic Concrete foundations, torque the nuts to 5 ft-lbs (8 N-m).



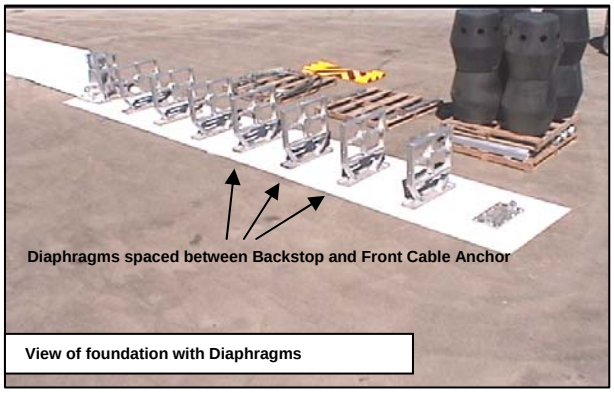
Compact Backstop and Front Cable Anchor installed

This photo shows a view of how the installation would look after the Backstop and Front Cable Anchor are securely fastened.


Space Diaphragms between Anchors

Step 4.

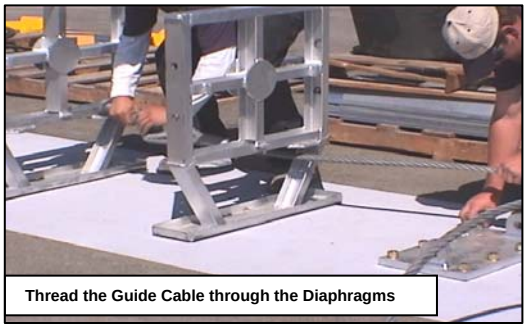
The Diaphragms should be spaced (one by one) evenly between the Front Cable Anchor and the Backstop. It is not important that they be exactly spaced at this point as they can easily be moved into the desired final assembly position when necessary.

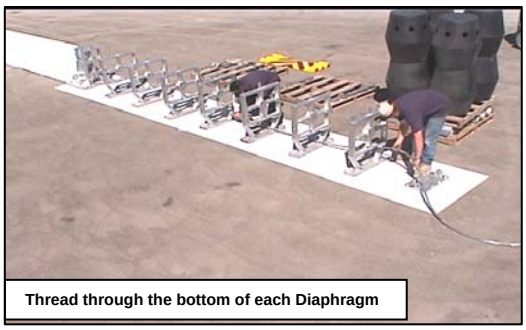


View of foundation with Diaphragms

The photo above shows what the installation would look like after the diaphragms have been placed between the Backstop and the Front Cable Anchor.

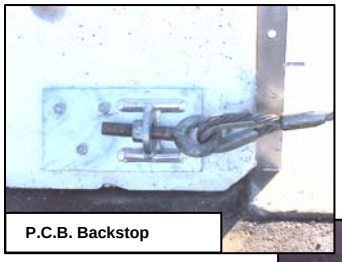
NOTE: Do not install the Front Support Assembly and nose piece at this time, it will be installed later.


Thread the Guide Cable through the Diaphragms


Thread through the bottom of each Diaphragm

Step 5.

Starting at the upstream end of the system, thread the Guide Cable through the space in the bottom of the Diaphragms. Make sure to pull the threaded cable end through first so that it will end up at the back of the unit. (Make sure that the Guide Cable is threaded through the bottom of each Diaphragm.)



P.C.B. Backstop

Compact Backstop

Push the threaded end of the cable through the hole in the anchor tab on the left side of the Compact Backstop. Install the nut on the end of the adjusting screw.

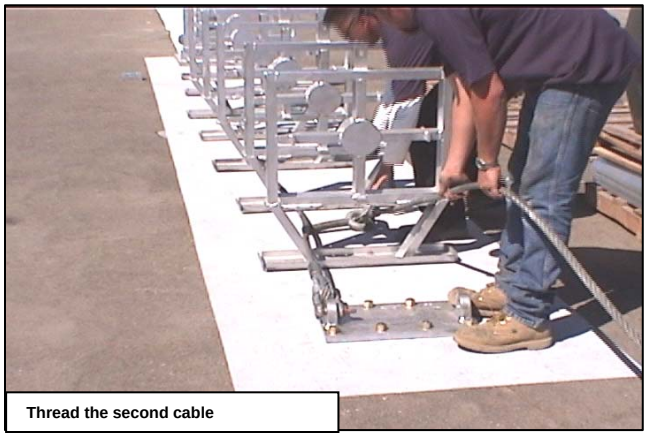
NOTE: Do not thread the nut beyond the end of the adjusting screw at this time. The nut will be tightened later.

Guide Cable to Front Cable Anchor

Pin handle of clevis is on the inside of the anchor assembly

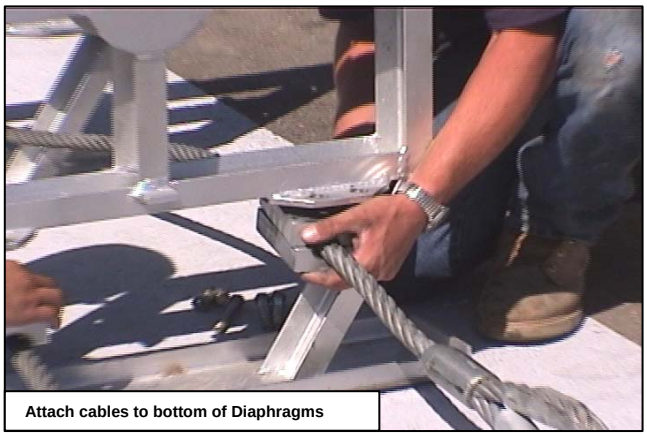
Attach the other end of the Guide Cable to the left side of the Front Cable Anchor by first removing the pin from the clevis (shackle). Place the clevis over the anchor eye and re-install the pin through the eye, making sure that the handle portion of the pin is on the inside of the anchor assembly. Firmly tighten the pin.

For asphalt installations, the cable and clevis pin have been attached in Step 3 (Page 12).



Thread the second cable

Repeat the process outlined in steps 6, 7, and 8, for the other cable. Install the second cable along the right side of the system without crossing the first cable.



Attach cables to bottom of Diaphragms

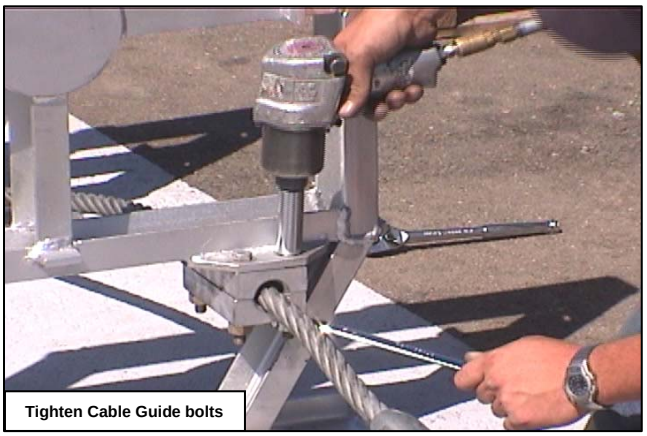
Use the Cable Guide Assembly blocks to attach the Guide Cable to the bottom cross rail of the Diaphragms. The cable blocks consist of two grooved halves that, when put together, provide a path for the Guide Cable to move through.

It is easiest to install the Cable Guides by first placing the two halves of the blocks together around the cable. Next, hold the blocks and cable up to the plate on the bottom of the Diaphragm. Push the bolt from the top down through the plate and then through the blocks.

NOTE: See Page 28, Figure 9 for cable guide positions for wide flange systems.

Install a lock washer and nut to secure the bolt. Continue the process until all four of the attachment bolts are installed on each Cable Guide Assembly.

NOTE: If properly installed, the Guide Cable should slide freely through the Cable Guide blocks and the Diaphragm should slide freely along the cable.

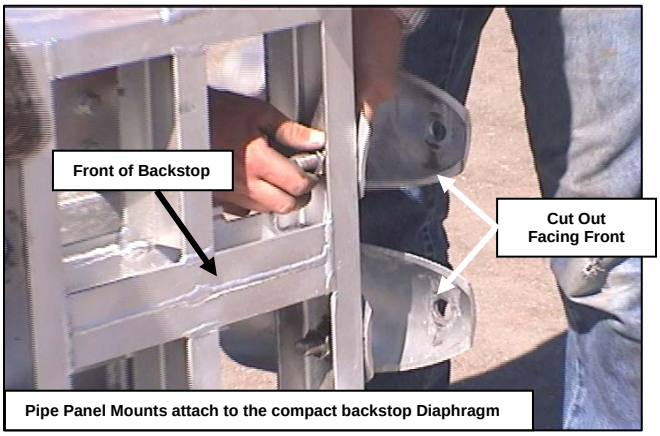


Tighten Cable Guide bolts

Use an impact wrench (or hand tools) to securely tighten the (4) bolts holding the Cable Guide blocks to the plate on the bottom of each Diaphragm. Use the Cable Guide Hardware Kit #K001004.

Compact Cables run thru the Cable Guide blocks on the Diaphragm bottoms

The photo above shows what the Diaphragms should look like after the Cable Guide blocks have been installed.



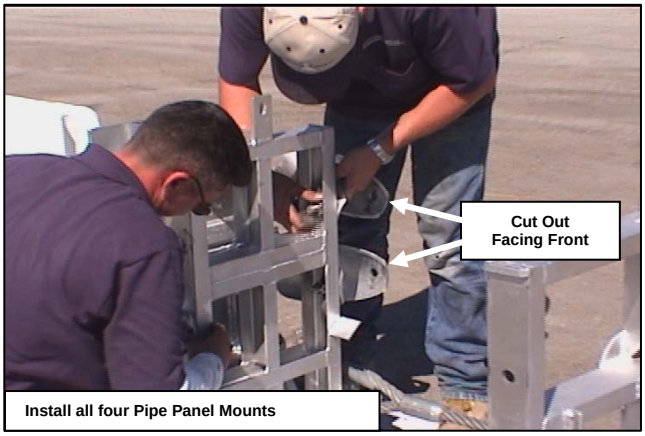
Pipe Panel Mounts attach to the compact backstop Diaphragm

Step 6.

Attach the Pipe Panel Mounts to the sides of the Backstop. (The End Panels are not attached directly to the Backstop Diaphragm.) The Pipe Panel Mount attaches between the Backstop Diaphragm and the End Panel to facilitate proper system performance during side impacts in this area.

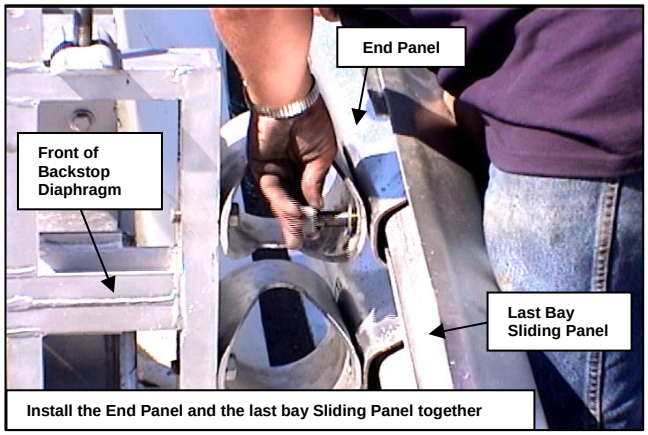
The Pipe Panel Mount is made from a piece of 6" (150 mm) diameter galvanized pipe with angles of material cut out of the top and bottom of one end.

NOTE: It is important that the end of the mount that is cut flat be facing the back (downstream) end of the system and that the cut out end of the Pipe Panel Mount be facing toward the front (upstream).



Install all four Pipe Panel Mounts

To attach the Pipe Panel Mount to the Backstop Diaphragm, place a washer on the attachment bolt and push the bolt through the inside hole on the Pipe Panel Mount and continue the bolt through the hole located on the side of the Diaphragm that is a part of the Backstop as shown in the photo above. Use the Pipe Panel Hardware Kit #K001017.



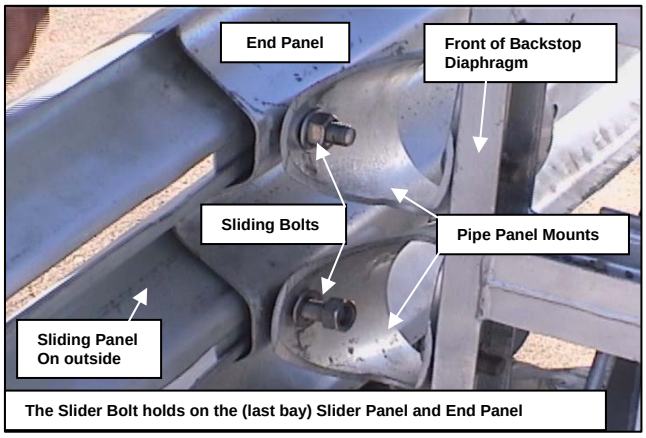
Install the End Panel and the last bay Sliding Panel together

Step 7.

At this point you will start assembling the sides of the system. The first two side panels are installed together as the Sliding Bolt attaches both of the panels to the Pipe Panel Mount located on the side of the Backstop Diaphragm. Attach the right side End Panel and right side rear-most Sliding Panel to the Pipe Panel Mount using the Sliding Bolt.

Insert the Slider Bolt through the slotted portion of the last bay Sliding Panel. Continue the bolt through the front hole of the End Panel. Continue the bolt through the bolt hole in the outside of the Pipe Panel Mount as shown in the photo above.

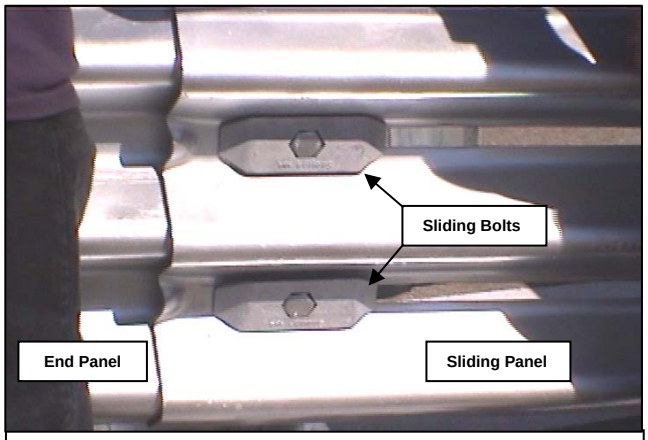
NOTE: For the system to telescope properly, the slotted Sliding Panel <u>MUST</u> be on the outside of the End Panel.



The Slider Bolt holds on the (last bay) Slider Panel and End Panel

The photo above shows the end of the Slider Bolt coming through (from the outside) the slot in the last left bay side Sliding Panel, through the front hole of the End Panel and through the outer hole of the Pipe Panel Mount.

NOTE: See configuration chart to determine if you have "stacked" or "nested" slider panels in some locations.



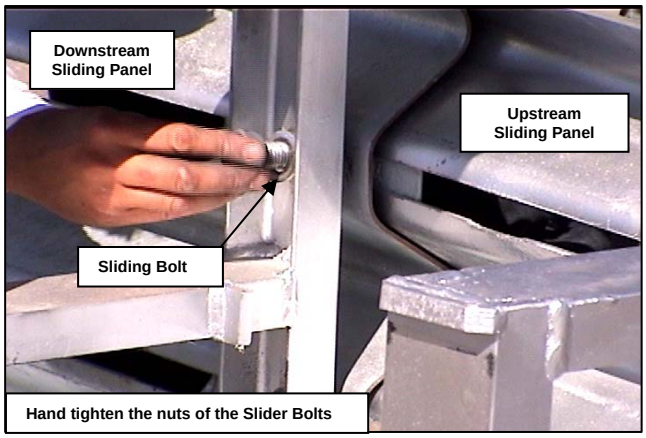
View from outside showing the End Panel and Sliding Panel attached with the Slider Bolt.

NOTE: For ease in assembly of the rest of the system, hand tighten the nut on the Slider Bolts. The bolts will be tightened in a later step. Use Slider Bolt Hardware Kit #K001003.

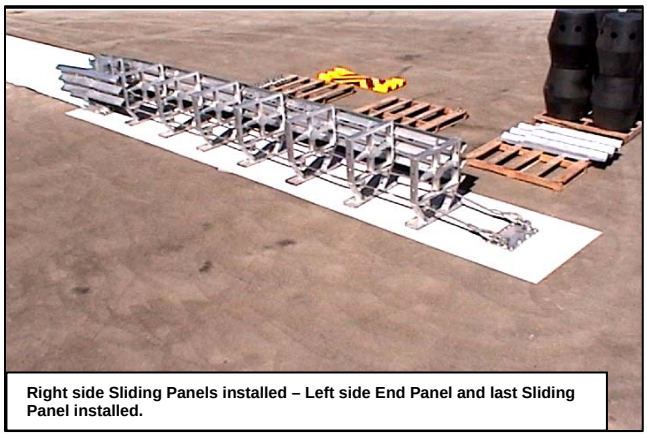

Install each of the Sliding Panels

You will now attach the right side panels one-by-one, moving towards the front of the system. Attach the rear bay and second-to-last bay Sliding Panels to the first diaphragm using Sliding Bolts. Insert the Sliding Bolt through the slot in the second-to-last bay Sliding Panel. Continue pushing the bolt through the hole in the front of the last Sliding Panel and finally push the bolt through the hole in the side of the corresponding Diaphragm.

NOTE: For the system to telescope properly, the forward most slotted Sliding Panel <u>MUST</u> be on the outside.



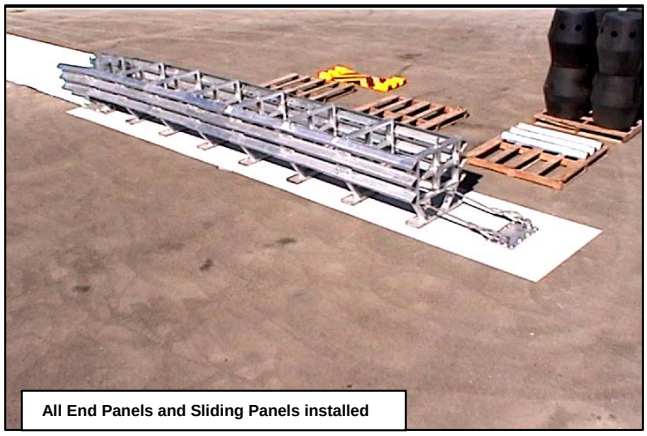
Repeat this step until all Sliding Panels have been mounted to the Diaphragms. The forward-most Sliding Panel must always be on the outside of the system (next to the mushroom head of the sliding bolt).



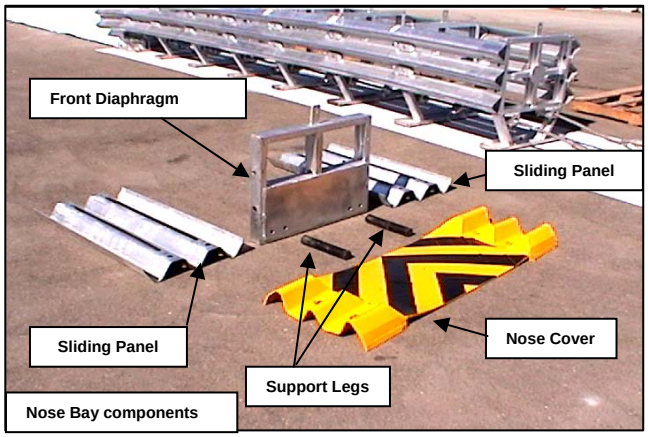
The photo above shows what the system will look like after the End Panel and all of the Sliding Panels have been installed on the right side as well as the End Panel and rear-most Sliding Panel on the left side.

Continue attaching the Sliding Panels along the left side of the system until all of the Sliding Panels are installed.

NOTE: For the system to telescope properly, the forward most slotted Sliding Panel <u>MUST</u> be on the outside.



The photo above shows what the system will look like after both of the End Panels and all of the Sliding Panels have been installed.



The final bay will be assembled separately from the rest of the system and then installed as a complete unit. The components that make up the final bay are two Sliding Panels, the Front Diaphragm, the Nose Cover and the Leg Supports.

Attach Nose Cover and Slider Panel to Front Support


Bolt the Support Legs to the bottom of the Front Support Assembly.

Step 8.

Attach the Nose Cover and left Slider Panel to the Front Support. Install the bushing in the hole of the nose piece. Install the fender washer on the machine bolt (Slider Bolt not used) and push the bolt through the bushing in the Nose Cover hole. Continue the bolt through the hole in the front edge of the last-bay Slider Panel and finally push the bolt through the hole in the Front Diaphragm. Install the washer and hand tighten the nut. (The nut will be tightened later.) Use Nose Piece Hardware Kit #K001013.

The final step in the assembly of the nose bay is to install the Support Legs. Place the nose assembly on its side. Push one of the leg support machine bolts and washer through the hole in the bottom rail of the Front Support. Screw the Leg Support onto the bolt and tighten the bolt with a wrench or socket. ***Warning: DO NOT OVER-TIGHTEN THIS BOLT.*** Use the Front Support Leg Hardware Kit #K001005.


Repeat with the right side

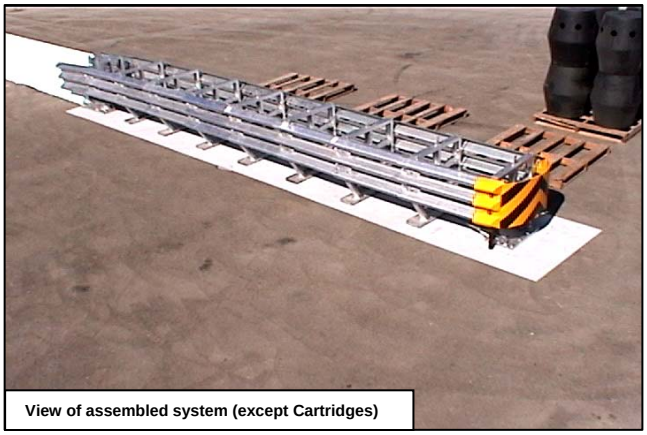

Carry the assembled Front Support Assembly into position to attach.

Repeat the process outlined in Step 8 with the right side of the assembly.


Front View of Assembled Nose Assembly Rear View

Carry the complete nose bay assembly to the front of the system. Attach the Slider Panels to the diaphragm by pushing the Slider Bolt through the slots in the final bay Slider Panels and then through the hole in the front of next bay Slider Panel. Finally, push the Slider Bolt through the hole in the side of the Diaphragm and attach the flat washer and nut.

NOTE: For the system to telescope properly, the forward most slotted Sliding Panel MUST be on the outside.

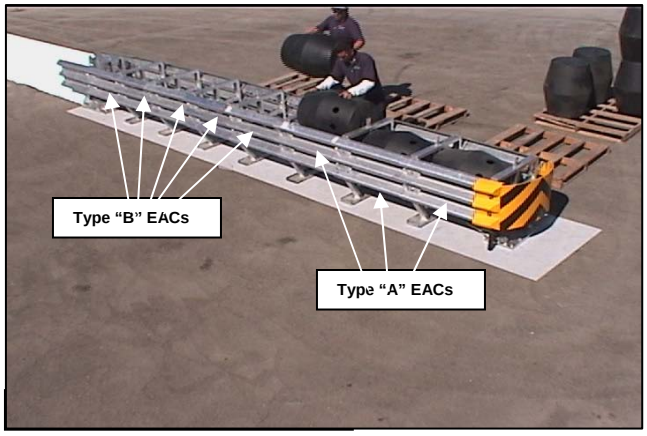


View of assembled system (except Cartridges)

It is important to make sure that the system bays are fully extended to ensure that the Energy Absorbing Cartridges will fit properly. Pull the Slider Panels of each bay until fully extended, working from the base toward the nose assembly.

Torque each of the Slider Bolts

Torque all of the Sliding Bolts to 20 ft-lbs (27 N-m). Torque the Front Panel Bolts (holding nose cover) to 200 ft-lbs (270 N-m). Do not overtighten.



Step 9.

Insert a Type "A" Energy Absorbing Cartridge into each of the first three (3) bays of the 8 bay (TL-3) system. The Type "A" cartridges have holes and slots on the sides toward the end of the cartridge. Install each cartridge on its side with the holes and slots facing the front (upstream) of the system.

Insert a Type "B" Energy Absorbing Cartridge into the remaining five (5) bays. The Type "B" Cartridges have three holes on one end of the cartridge. Install each cartridge on its side with the holes facing the back (downstream) of the system.

Refer to the matrix in Appendix "A" for proper cartridge configurations.

NOTE: For proper system performance, the Energy Absorbing Cartridges must be installed in the proper order and in the proper direction as shown in Appendix "A".

Tension the Guide Cables with a torque wrench.

Step 10.
The final step in the installation of the TAU-II system is to apply tension to the Guide Cables that run underneath the system.

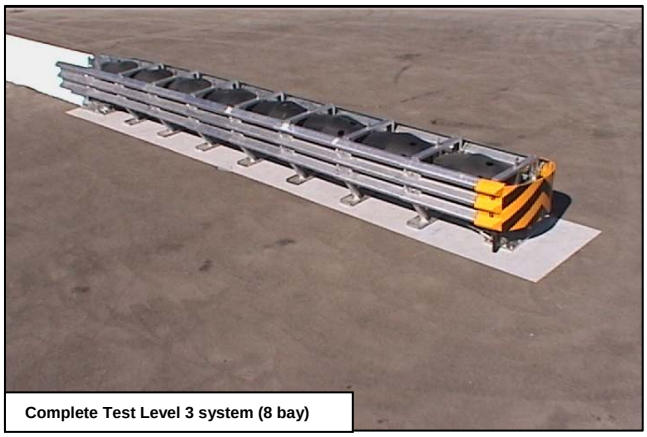
CONCRETE INSTALLATION:
Torque the nut on the end of the threaded cable end to 500 ft-lbs (680 N-m).

Torque the nut on the end of the adjustable Eye Bolt to 120 ft-lbs (160 N-m).

NOTE: For proper performance, the cables must be tensioned properly.

Step 11.
Use the check list on page 43 to confirm that all of the installation steps have been completed.

ASPHALT INSTALLATION



Complete Test Level 3 system (8 bay)

The above photo shows what a completely installed Test Level 3 TAU-II system with a compact backstop will look like.

INTRODUCTION

This manual is organized in steps that address each of the different installation options that are available. The Universal TAU-II system is very versatile and also easy to assemble and install if these basic guidelines are followed.

The Universal TAU-II system has been tested to meet the rigorous requirements of NCHRP Report 350, Test Levels 2 and 3. The systems are provided in lengths and capacities for both low speed and high speed applications and hazard widths up to 8.5 feet [2.6m].

The Universal TAU-II system is redirective, non-gating, and is ideally suited for hazards such as the ends of rigid barriers, tollbooths, utility poles, and more. Ease of installation, numerous non-proprietary transition options, low maintenance requirements, very low life cycle costs and reusability of system components make the Universal 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.

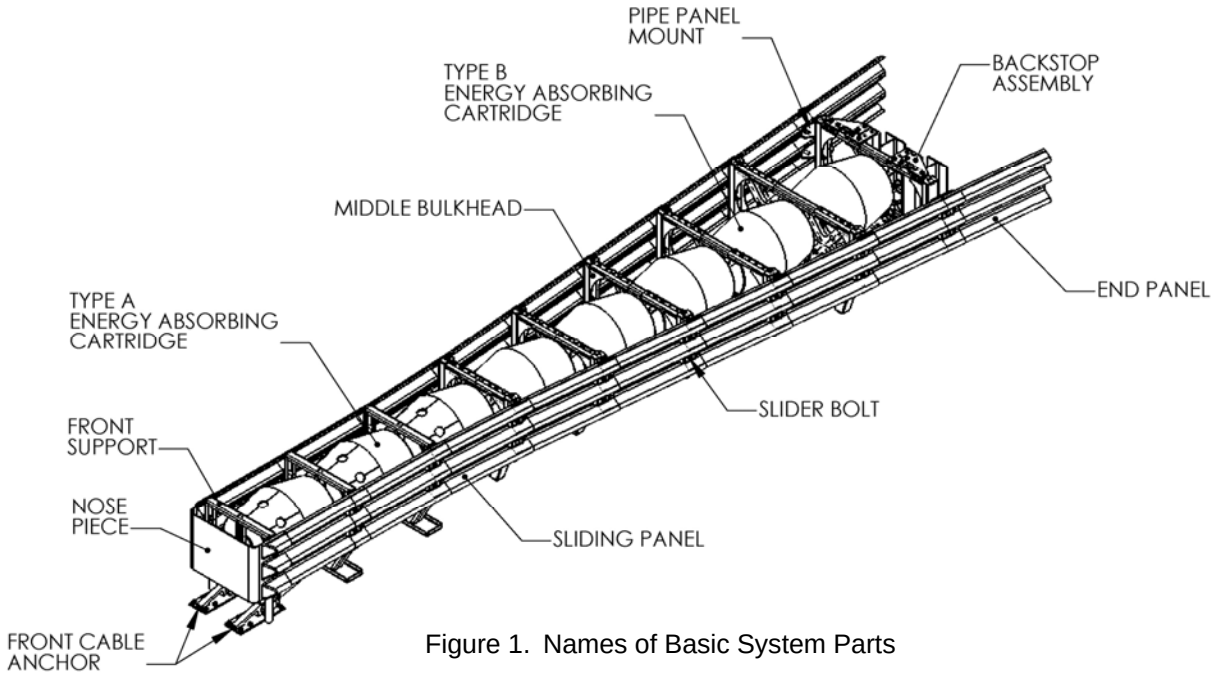


Figure 1. Names of Basic System Parts

SYSTEM OVERVIEW

The Universal 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. Refer to Figure 1 to familiarize yourself with the basic parts and part names of the system.

The Universal TAU-II system is designed to shield the ends of median barriers and other fixed objects likely to be struck head-on, by absorbing and dissipating the kinetic energy of impacting vehicles. Universal TAU-II systems utilize 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 and attach to the bottoms of the diaphragms and terminate at the anchors at each end of the system. The front and rear cable anchors are attached to the foundation as described in Appendix "C" Foundation Requirements.

STEP 1

FOUNDATION REQUIREMENTS

The Universal TAU-II crash cushion is designed to be compatible with a variety of foundations. If an existing foundation is present, verify dimensions and system layout. If modification is required, use the BSI specifications as a guideline and adapt accordingly. If no foundation is present or currently does not meet the system requirements, construct the foundation per these BSI specifications.

There are different foundation configurations depending on the system used and the type of backstop selected. Systems up to 36" [910mm] can have a P.C.B. (Portable Concrete Barrier) Backstop, Flush Mount Backstop or a stand-alone Compact Backstop. PCB and Compact Backstop systems are compatible with the optional Asphalt Anchoring Kits. Systems 42" [1070mm] and greater use a Wide Flange Backstop and require a PCC (Portland Concrete) foundation and anchoring kit.

NOTE: Recommended maximum 8% cross slope on all foundation options.

Foundation options for all configurations are specified in the following drawings contained in APPENDIX "C", Page 47:

- General Foundation and Anchorage Specs. Drawing No. A040113…….. **Page 48**
- Universal TAU-II Foundation, **PCB Backstop**-PCC Concrete Pad: Drawing No. A040105 ……. **Page 49**
- Universal TAU-II Foundation **PCB Backstop**-PCC Block: Drawing No. A040117 ……. **Page 50**
- Universal TAU-II Foundation **PCB Backstop**-Asphalt Anchoring: Drawing No. A040112 ……. **Page 51**
- Universal TAU-II Foundation **Compact Backstop**-PCC Concrete Pad: Drawing No. A040102 ……. **Page 52**
- Universal TAU-II Foundation **Flush Mount Backstop**-PCC Pad: Drawing No. A040420 ……. **Page 53**
- Universal TAU-II Foundation **Compact Backstop**-PCC Blocks: Drawing No. A040115 …… **Page 54**
- Universal TAU-II Foundation **Compact Backstop**-Asphalt Anchor: Drawing No. A040110 …… **Page 55**
- Universal TAU-II Foundation **Wide Flange Backstop**-PCC Concrete Pad: Drawing No. A040108 ……**Page 56**
- Universal TAU-II Foundation **Dimensions – US Standard Units** – Inches: Chart 1 …… **Page 57-59**
- Universal TAU-II Foundation **Dimensions – Metric Units** – Millimeters: Charts ……**Pages 60-62**

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

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

STEP 2

Anchor System to Foundation

With the proper foundation in place, anchor the Backstop, Rear Cable Anchors, and Front Cable Anchors according to the particular foundation detail (refer to Step 1).

The anchorage of the system must be in accordance with BSI foundation specifications found in Appendix "C".

To anchor the Universal TAU-II system:

1.) Determine the backstop components and Front Cable Anchor positions about the centerline of the system. The foundation drawings show positioning.

2.) Using the actual parts as templates, either mark the holes to be drilled or drill through the parts acting as guides.

3.) Hole diameter and depth depends on the foundation and the anchoring compound used. See chart below for the hole diameter as specified by the anchoring compound manufacturer. Reference BSI Foundation and Anchorage Specifications in APPENDIX "C" for specific embedment depths.

4.) Prepare the holes as specified by the anchoring compound manufacturer.

5.) With the Front Cable Anchor and backstop components in place, apply the anchoring compound to the holes as specified by the manufacturer. Insert the anchors into the holes with the nuts and washers attached.

6.) Allow anchoring compound to cure before tightening the anchors.

The anchoring package supplied with the Universal TAU-II system contains the necessary threaded rods and anchoring compound needed to install the system. Follow the instructions on the supplied package and reference the guidelines outlined below.

Anchor 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: material 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 should provide a pull out strength of 20,000 lbf (89 kN) minimum in 4,000 psi (28 Mpa) concrete. Products such as HILTI HIT HY150 injection Adhesive Anchor, RE500 injection Adhesive Anchor or HVA Adhesive Anchoring System fit these criteria. Refer to Table 1 below for required hole size for recommended anchor compounds.

Mechanical / Removable Anchors

When standard chemical anchors cannot be used to secure Barrier System products as a result of state, local, site or other requirements, mechanical anchors may be used. Various mechanical anchors are available that use wedge, self-undercutting, or expansion coils to establish the locking bond with the concrete. A minimum of 18,000 lbf [80kN] ultimate load in the tension (pull out) and a shear of 22,000 lbf [98kN] is required for use with BSI products. One product recommended is the Hilti HCA item number 00252018 HCA 3/4" x 6".

Torque anchors set in PCC concrete to 120 ft-lbf [160 N-m]. Torque anchors set in asphalt to 5 ft-lbf [8 N-m].

IMPORTANT: FOLLOW MANUFACTURER'S SPECIFICATIONS FOR HOLE SIZE AND PREPARATION

ANCHORING COMPOUND	HOLE DIAMETER
US Anchor Ultra Bond Speed Set	7/8" [22 mm]
HILTI - HIT HY 150	13/16" [20.5mm]
HILTI - HVA Adhesive Anchor System	7/8" [22 mm]
HILTI - RE 500	13/16" [20.5 mm] to 1" [25 mm]

STEP 3
Assemble Bulkheads

The Universal TAU-II is comprised of multiple bulkheads assembled to create a variety of different system lengths and widths. Systems are constructed with different bulkheads depending on the size of the system that is needed.

As illustrated in Figure 2, systems can be fully parallel, fully tapered or a combination.

Every system requires a Front Support, a series of Middle Bulkhead Assemblies and a Backstop Assembly.

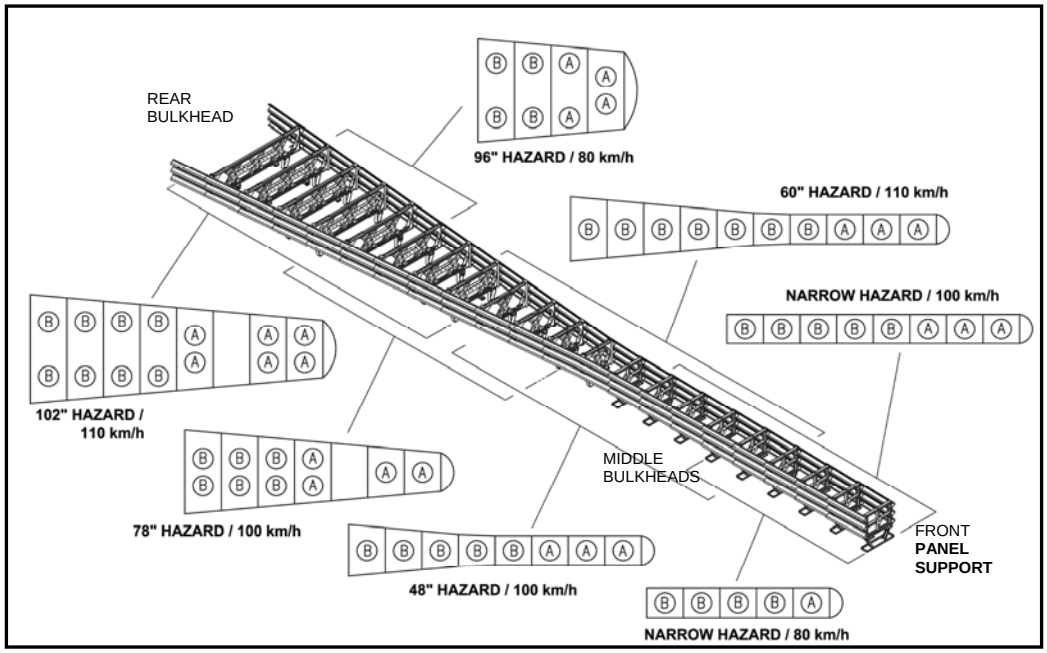
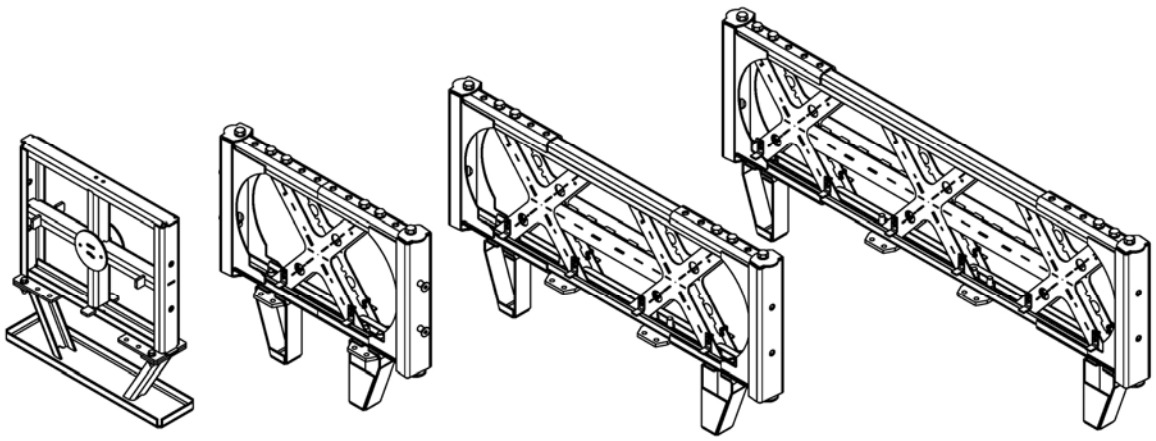


Figure 2.



Front Panel Support (1X) (2X) (3X)

Figure 3. Middle Bulkheads

The Front Support

The Front Support is different from a bulkhead in that it has polymer front support Legs and it doesn't attach to the cables underneath the system. The Front Support also has metal plates called Collision Plates, attached in the impact area on the front of the assembly. The Front Support can be built in different variations depending on the system size.

Using a Front Support:
(parallel and combination systems)

Parallel and combination systems use the Front Support (Figure 4). A tapered system designed with a large nose section may use a modified 1X, 2X or 3X bulkhead for the Front Support (Figure 5).

The polymer front support legs bolt directly to the bottom of the Front Support using the hardware provided. All fasteners use a lock washer or Locktite.

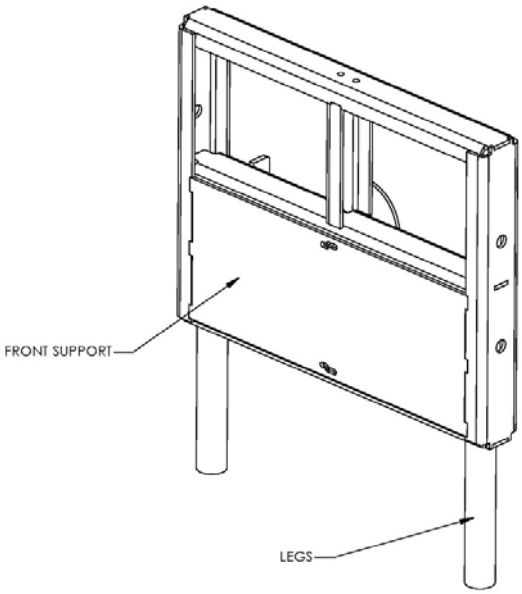


Figure 4. **Use the Front Support for a parallel or combination systems.**

Using a modified Bulkhead for Front Support
(Tapered systems)

An X style bulkhead can also be used as a Front Panel Support. The X style bulkheads are assembled according to the specific system requirements (Figure 5). Refer to the system drawing for the front bulkhead size needed. The Wing Assemblies slide over the ends of the bulkhead weldment and adjust to the width needed.

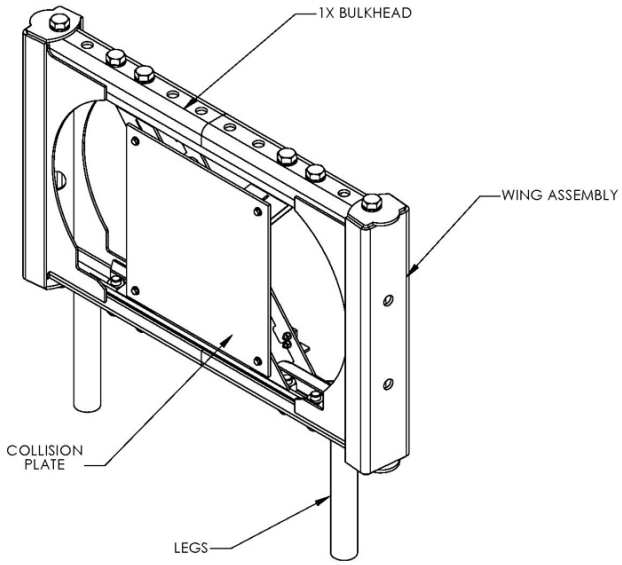


Figure 5. **A 1X Style Middle Bulkhead converted into a Front Support**

A Single X Bulkhead (1X) provides for Front Support widths of 30" [760] (using Transition Wing Assembly), 36" [910], 42" [1070], and 48" [1220].

A Double X Bulkhead (2X) provides for Front Support widths of 54" [1370], 60" [1525], 66" [1680], and 72" [1830].

A Triple X Bulkhead (3X) provides for Front Support widths of 78" [1980], 84" [2130], 90" [2290], and 96" [2440].

The Wing Assemblies are bolted in the appropriate location using Backing Plates and the hardware provided. All fasteners use a lock washer or Locktite (Figure 5).

The polymer front support legs bolt directly to the bottom of the assembly using free holes on the Wing Assemblies and the hardware provided (Figure 4,5). Some configurations require a leg adapter (Figure 6).

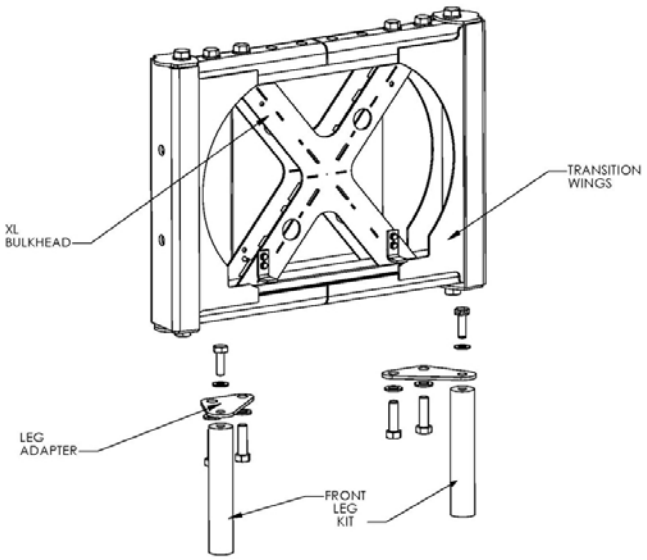


Figure 6. Leg Adapters

EAC Locating Tabs are bolted to the back of the assembly and Front Collision Plates are bolted to the front of the assembly. All fasteners use a lock washer and Locktite.

Middle Bulkhead Assemblies

The Middle Bulkheads come in two different styles: fixed and adjustable X-style. Depending on the system's cable location, the Cable Guide Mounting plates bolt to the bottom of the assembly at one of three positions.

Parallel Middle Bulkhead

The width of the Parallel Middle Bulkhead is not adjustable and is used in systems that are totally parallel or systems that start out parallel and finish with a rear taper (Figure 7).

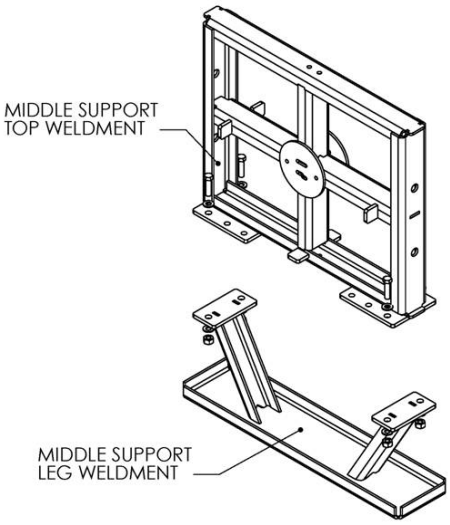


Figure 7. Parallel Middle Bulkhead

Adjustable Middle Bulkheads

The Adjustable Middle Bulkheads come in three different widths and are designated by the number of X patterns on the face of the bulkhead (Figure 3). The narrowest has a single X in its structure, the double X has two and the largest bulkhead has three X's.

All of the bulkheads have adjustable wings that are rigidly bolted on to each side (Figure 8). Using the adjustable wings, the different sized bulkheads can accommodate hazard widths up to 102" [2.6m]. The bulkheads can descend in 6" [150mm] increments until reaching the desired width.

The adjustable Middle Bulkheads are assembled according to the specific system requirements. Refer to the system drawing for the middle bulkhead sizes needed. The Wing Assemblies slide over the ends of the bulkhead and adjust to the width needed.

Single X (1) Middle Bulkheads provide for assembly widths of 30" [760] (using Transition Wing Assembly), 36" [910], 42" [1070], and 48" [1220].

Double X (2X) Middle Bulkheads provide for assembly widths of 54" [1370mm], 60" [1520mm], 66" [1680mm], and 72" [1830mm].

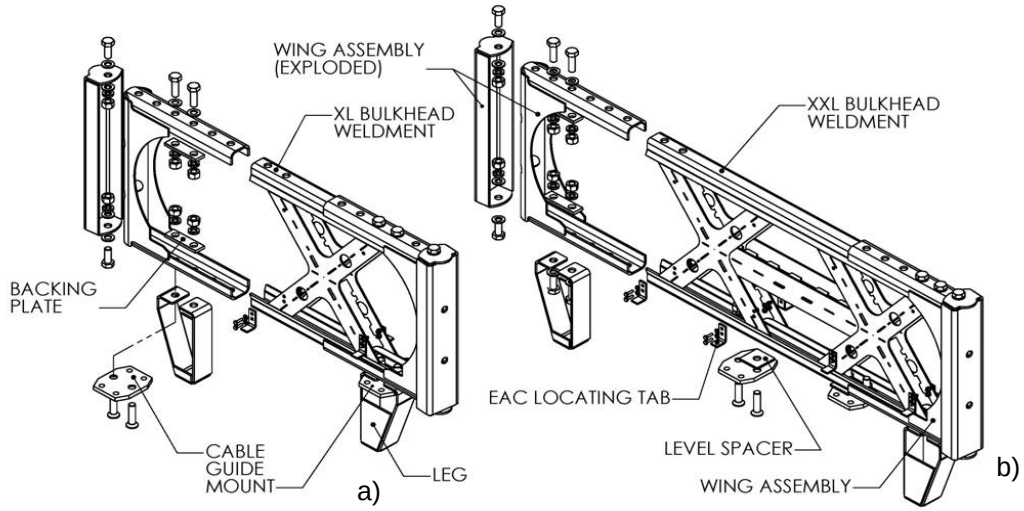


Figure 8. Adjustable Middle Bulkheads a) Single X (1X) b) Double X (2X)

Triple X (3X) Middle Bulkheads provide for assembly widths of 78" [1980mm], 84" [2130mm], 90" [2290mm], 96" [2440mm], 102" [2.6m].

The Wing Assemblies are bolted in the appropriate location using Backing Plates and the hardware provided. The Legs bolt directly to the bottom of the assembly where the Wing Assemblies attach using the same hardware. All fasteners use a lock washer or Locktite.

Cable Guide Mounts

If a parallel or 1X bulkhead is used as the Front Bulkhead Assembly, the cable is in the 1st position (Figure 9) and the Cable Guide Mounts would bolt in the corresponding location.

If a 2X or 3X bulkhead is used as the Front Bulkhead Assembly, the cable is in position 2 or 3 (Figure 9) respectively and the Cable Guide Mounts attach accordingly. If said cable position alignswith the leg mounting position the Cable Guide Mount bolts through the leg using the hardware provided for the Cable Guide Mount.

Backing Plates are used on all Leg, Wing Assembly, and Cable Guide fastenings. A Level Spacer is used when attaching components across the step between the Bulkhead

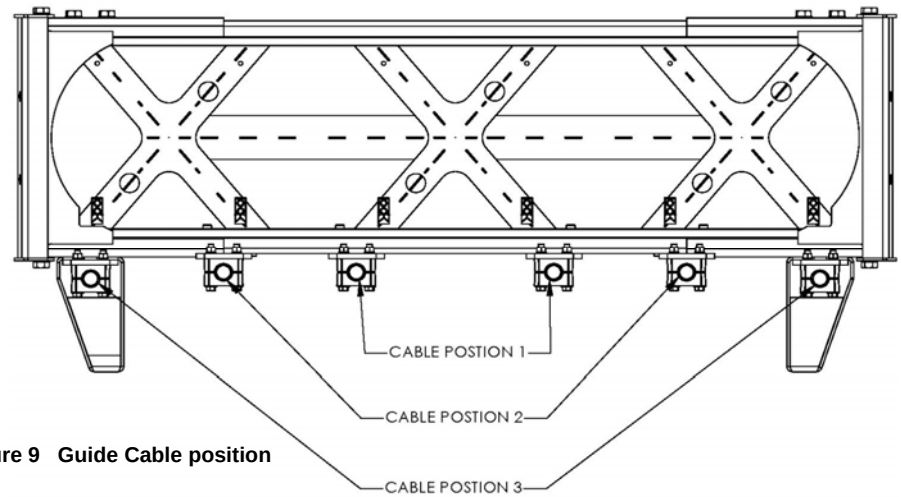


Figure 9 Guide Cable position

Weldment and the Wing Assembly.

EAC Locating Tabs

EAC Locating Tabs are bolted to the front and back of each Middle Bulkhead Assembly. All fasteners use a lock washer or Locktite (Figure 8).

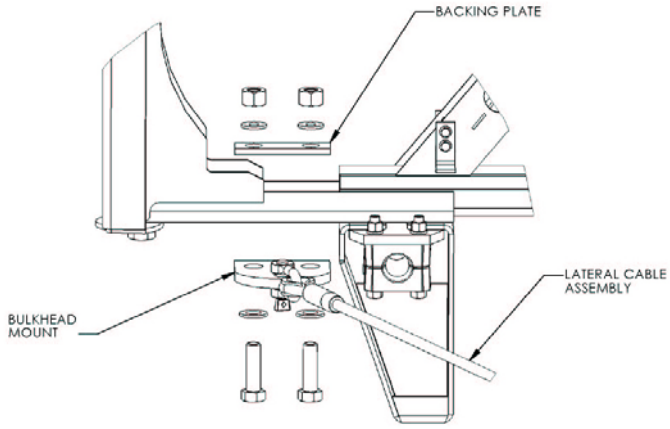


Figure 10. Lateral Cable Support

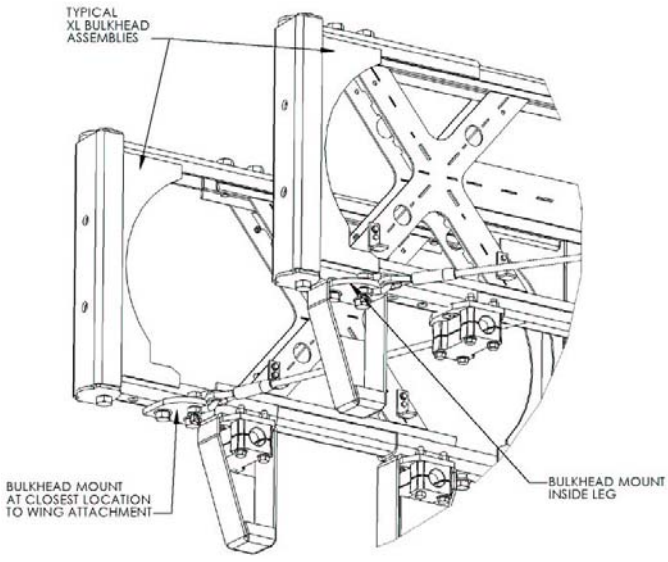


Figure 11. Lateral Cable Supports mounted inside and outside the leg

Lateral Cable Support

Some systems require a Lateral Cable Support Kit (Refer to Step 10 of this manual). The Lateral Cable Support Kit contains Bulkhead Mounts that attach to the last two bulkhead assemblies of required systems. They bolt to the outermost free holes in the Wing Assemblies (Figure 10). They do fit inside the Legs if necessary (Figure 11).

NOTE: Refer to the System Configuration chart in Appendix "A" to determine if Lateral Cable supports are required.

Empty Bay Bumpers

Some systems require an empty bay (no Energy Absorbing Cartridges). These systems utilize a Bumper Kit to minimize damage in an impact (Figure 12). The kit includes (4) Bumpers that mount to the rear bulkhead assembly of the empty bay. Two Bumpers mount to the top of the assembly at the Wing to Bulkhead joint using the same hardware. The other two Bumpers mount through the Leg to the Wing – Bulkhead joint.

NOTE: Refer to the System Configuration chart in Appendix "A" to determine if empty bays are required.

Following complete assembly of the Front, Middle, and Backstop Bulkhead assemblies, position them in order. Space them at approximately 34" [860mm] apart, center to center. Also, align them through the centerline of the system. Accuracy and care taken here will improve ease of assembly and reduce efforts to straighten the system.

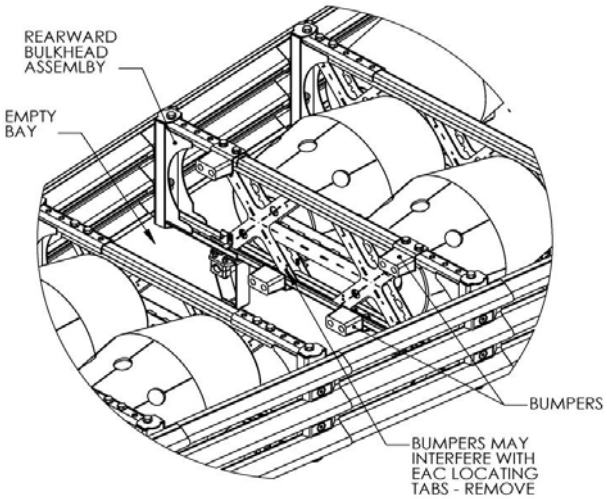


Figure 12 Empty Bay Bumpers

STEP 4

Backstop Assemblies

The Backstop Assembly is selected per application and can be configured to protect hazards up to 8.5' [2.6m] in width. Backstops can either be attached directly to a barrier wall or a suitable structure (Portable Concrete Barrier (PCB) Backstop, Flush Mount Backstop) or installed as a stand-alone system (Compact Backstop, Wide Flange Backstop). All backstops require minimum assembly if they are not pre-assembled.

PCB Backstop

The PCB Backstop (Figure 13) is configured from parts anchored directly to an existing concrete barrier wall. Refer to Step 1 and Step 2 for PCB Backstop layout and anchorage details. Pipe Panel Mounts bolt to the sides of the backstop and provide a mounting point for the Slider and End Panels.

Refer to the System Configuration Chart in Appendix "A" to determine system widths and Capacity Limitations.

If a 36" [910mm] Backstop is desired, attach the 36" [910mm] Backstop Adapters (Figure 14) to the sides of the backstops and bolt the Pipe Panel Mounts to the pivoting sections.

If the system is installed on an asphalt foundation, the portable concrete barrier must be anchored using the supplied brackets. Also, the Backstop Brace Weldment must be bolted to the Compact Backstop prior to anchoring.

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

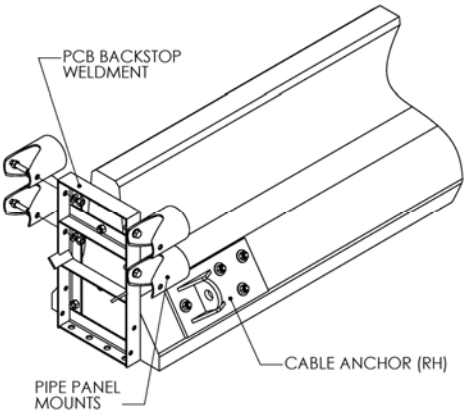


Figure 13 PCB Backstop (Parallel System)

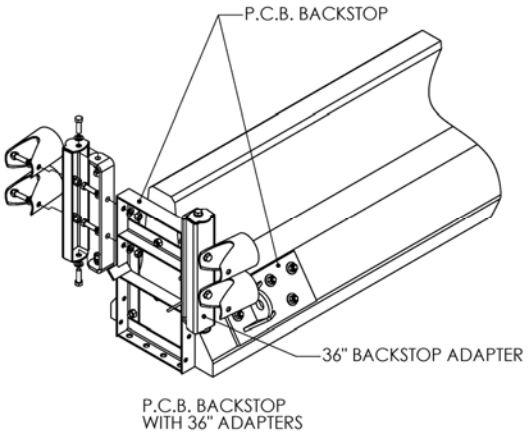


Figure 14 PCB Backstop (Tapered System)

Compact Backstop

The Compact Backstop (Figure 15) is bolted together in two halves and is usually pre-assembled. The Backstop is a stand alone design is not anchored to the hazard being protected.

Refer to Step 1 and Step 2 for Backstop layout and anchorage details.

Pipe Panel Mounts bolt to the sides of the backstop and provide a mounting point for the Slider and End Panels. Refer to the system drawing for the backstop assembly size needed.

If a 36" [910mm] Backstop is desired, attach the 36" [910mm] Backstop Adapters (Figure 16) to the sides of the backstops and bolt the Pipe Panel Mounts to the pivoting sections.

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

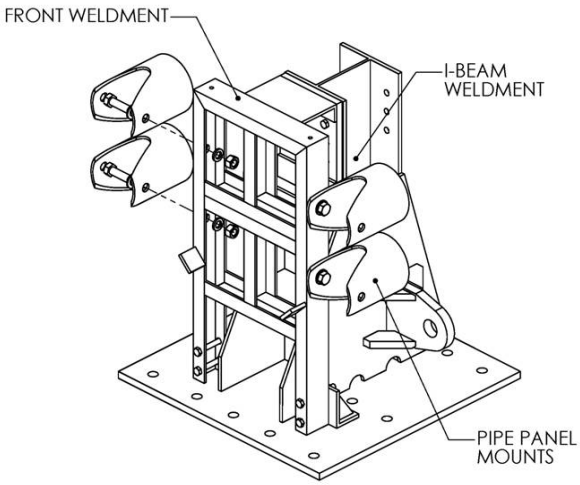


Figure 15 Compact Backstop (Parallel Systems)

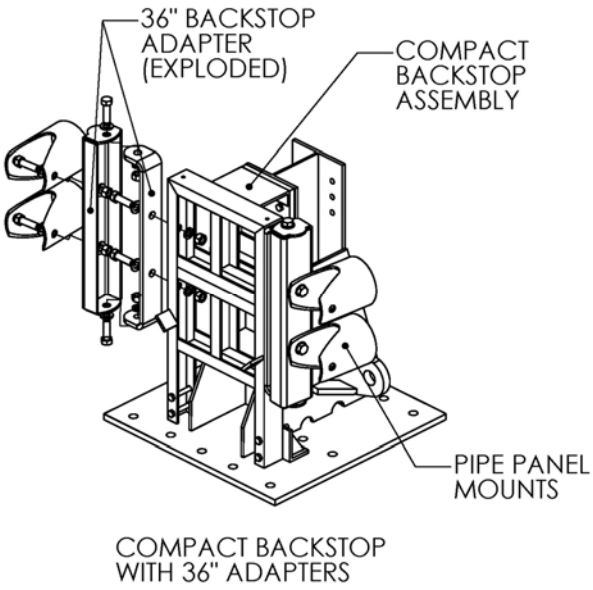


Figure 16 Compact Backstop (Tapered Systems)

Flush Mount Backstop

The Flush Mount Backstop system (Figure 17) is intended for applications where the hazard width exceeds the limitations of the PCB Backstop and are applicable in locations with limited foundation size. The Flush Mount Backstop can be attached to reinforced safety shape or vertical concrete structures up to 36" [910mm]. Systems over 24" [610mm] wide require the 36" [910mm] adapter. Edges of vertical concrete may require chamfer according to local standards.

The Cable Tensioning is moved to the front of the system so the rear cable anchors do not protrude outside of the rear extension panels.

The backstop is attached to the foundation and to the concrete backstop. Install anchors in accordance with BSI specifications. Vertical slots on the backstop allow removal replacement of the backstop. Anchors must be placed at the top of said slots to be effective. Flush Mount Backstop systems use the same cable used in all parallel systems. The cable is installed with the threaded tensioning end forward. The looped end is pinned in place at the backstop. The Front Cable Anchor uses an inserted key to keep the threaded stud from rotating during tensioning.

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

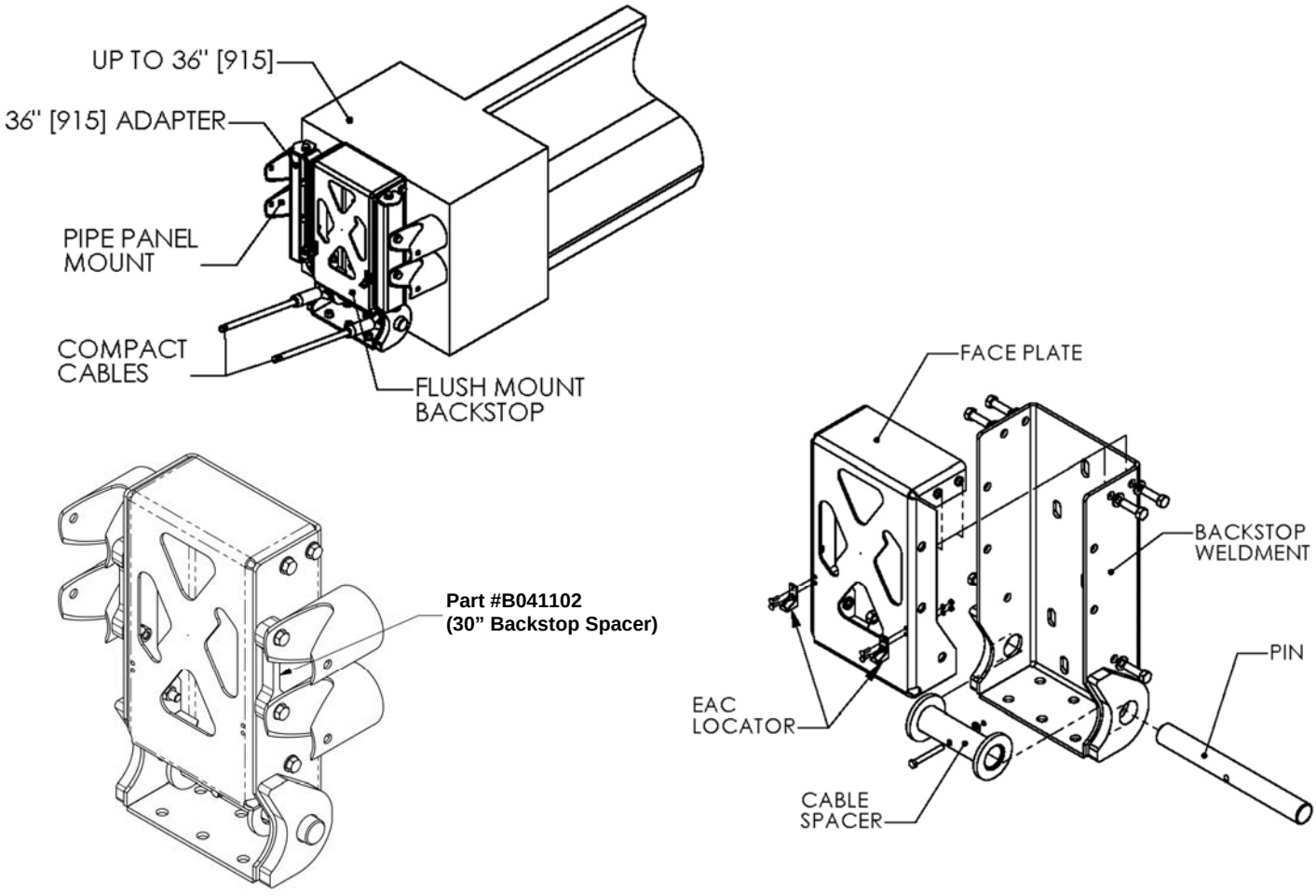


Figure 17 Flush Mount Backstop

Wide Flange Backstop

The Wide Flange Backstop (Figure 18) uses a combination of backstop elements to protect wide hazards.

The Wide Flange Backstop incorporates XL, XXL, or XXXL bulkhead assemblies attached to two Wide Flange Backstop Weldments.

The backstop bulkheads are assembled according to the specific system requirements. The Wing Assemblies slide over the ends of the bulkhead weldment and adjust to the width needed.

XL Bulkheads provide for backstop bulkhead assembly widths of 42" [1070] (using Transition Wing Assembly), 48" [1220], 54" [1370], and 60" [1525].

XXL Bulkheads provide for backstop bulkhead assembly widths of 66" [1680], 72" [1830], 78" [1980], and 84" [2130].

XXXL Bulkheads provide for backstop bulkhead assembly widths of 90" [2290], 96" [2440], and 102" [2290].

Backstop Block-outs mount to the bulkhead assemblies at the Wing Assembly to Bulkhead Weldment joint. The block-outs are bolted through the Wing Assemblies and bulkhead weldment and fastened using Backing Plates and the hardware provided. The bulkhead assembly and block-outs are then bolted to the Wide Flange Backstop Weldments. Pipe Panel Mounts are fastened to the pivoting section of the Wing Assemblies. EAC Locating Tabs bolt to the front of the bulkhead assembly. All fasteners use a lock washer or Locktite.

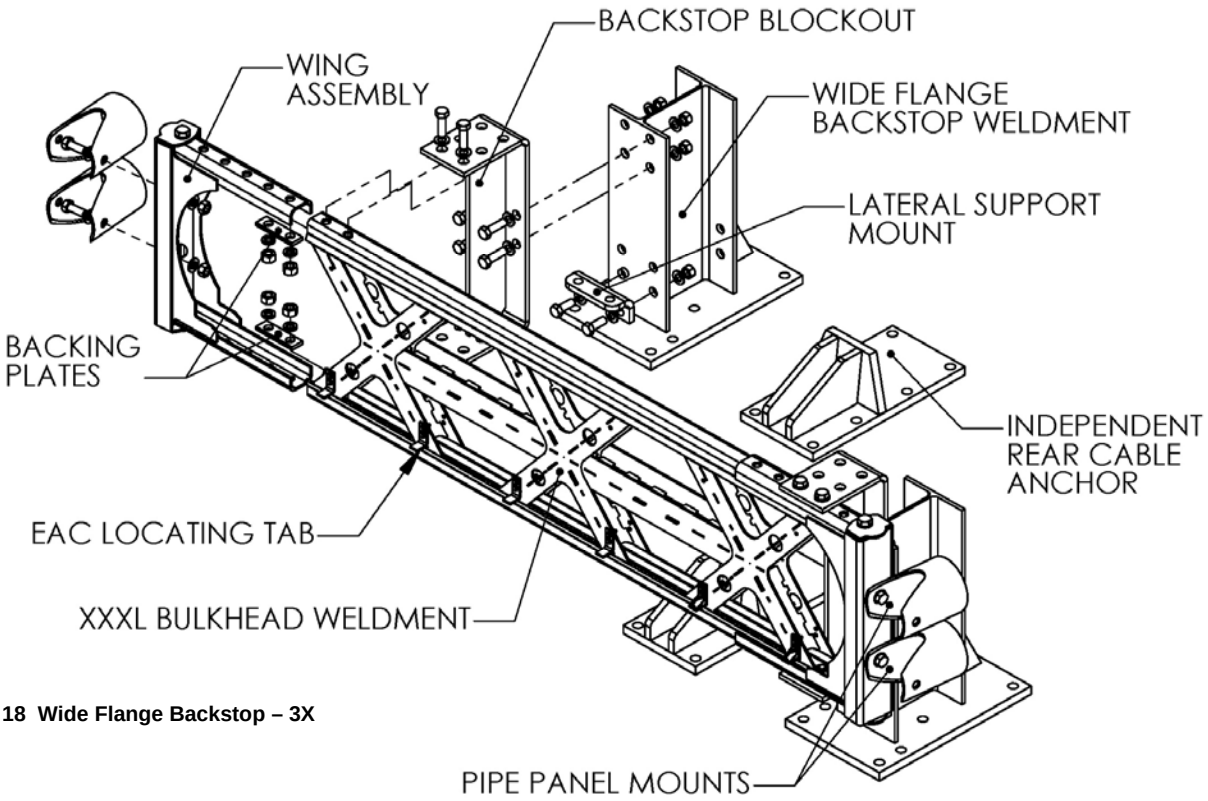


Figure 18 Wide Flange Backstop – 3X

Depending on the position of the cables in reference to the Wide Flange Backstop positioning, either an independent rear cable anchor (Figure 18) or a backstop mounted rear cable anchor (Figure 19) will be used. The independent rear cable anchor stands alone and requires no assembly. (Reference Step 1 and Step 2 for layout and anchorage specifications). The backstop mounted rear cable anchor bolts between the flanges of the Wide Flange Backstop. They are mounted to the interior of the system. All fasteners use a lock washer or Locktite. When the front support bulkhead and backstop utilize the same bulkhead, the rear cable anchors are mounted to the backstops. When the front support bulkhead and backstop bulkheads are different, the system is supplied with independent rear cable anchors mounted on the pad surface.

Some systems require a Lateral Cable Support Kit. The Lateral Cable Support Kit contains Lateral Support Mounts that attach to the backstop assembly of required systems. They bolt to the front of the Wide Flange Backstop Weldments in the lowest hole set. If backstop mounted rear cable anchors are used, one of the bolts will be shared. All fasteners use a lock washer or Locktite.

Refer to the System Configuration Chart in Appendix "A" to determine if Lateral Cable supports are required.

If the Wing Assemblies of the particular backstop are adjusted to one of their two most extended positions (54" [1370mm], 60" [1525mm], 78" [1980mm], 84" [2130mm], and 102" [2290mm] backstops), Wing Braces and Spacers are required (Figure 19). The Wing Braces attach to the Wing Assemblies and the Backstop Block-outs on the top and bottom. The Spacers level their mounting surfaces. All fasteners use a lock washer or Locktite.

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

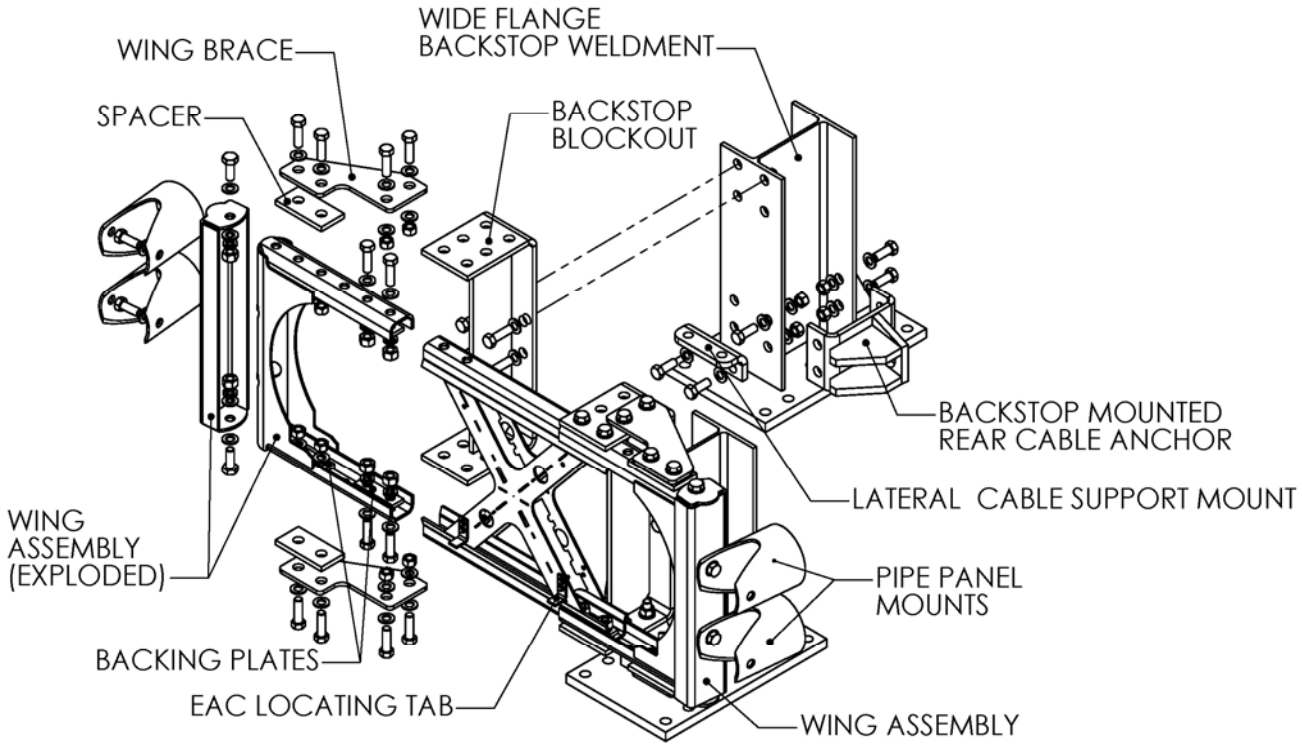


Figure 19 Backstop – 1X with Wing Braces

STEP 5

Attach Panels

The Universal TAU-II system uses two types of panels: Sliding Panels (Figure 20) and End Panels (Figure 21). Sliding Panels have a pair of holes forward and two long slots running the length of the panels. End Panels have a pair of holes at each end and do not have slots. Sliding panels are used on all collapsing bays. End panels are attached to the backstop only (Call BSI for non-proprietary transition options). Slider Bolts hold the panels to the bulkheads. Some systems require nested panels (doubled) on rearward bays.

NOTE: Refer to the System Configuration Chart in Appendix "A" to determine if/where nested panels are required. A long bolt is supplied to assist in the assembly to nest the panels.

Install the panels from back to front staggering from each side. Place the End Panels first. While holding the End Panel in place, lap the forward Sliding Panel over it and bolt through the slot, End Panel, and Pipe Panel Mount (Figure 22). Leave the nuts of the Slider Bolts loose and perform on both sides. Lap the next forward Sliding Panel and bolt through the slot, hole set in rearward Sliding Panel, and bulkhead. Leave the Slider Bolt nuts loose and progress forward alternating sides (Figure 23). If the bay requires nested panels, perform procedure with (2) panels, one nested inside the other.

The last panels to be installed will be on the first bay of the system, the Front Support. These panels lap the rearward panel and fasten to the 2nd bulkhead from the front as instructed above. The front of these panels will mount to the Front Support through the Nose Piece. Refer to Section 6 for this connection (Figure 26).

Leave the Slider Bolt nuts loose until the system is almost completely assembled and installed.

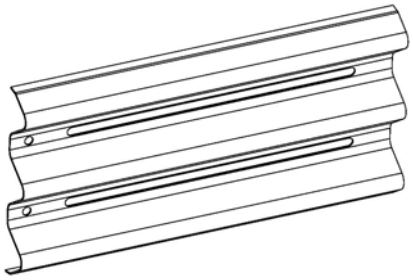


Figure 20 Slider Panel

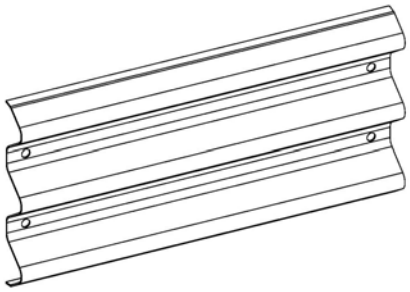


Figure 21 End Panel (no slots)

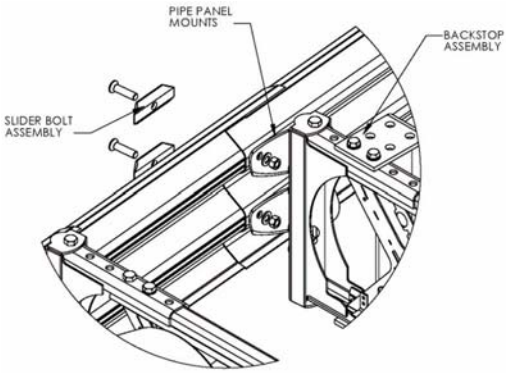


Figure 22 Attach Rear Panel

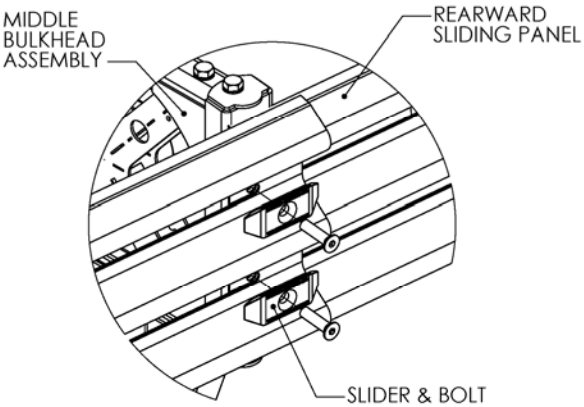


Figure 23 Attach Side Panels

STEP 6
Attach Nose Piece / Delineation Marker

Narrow systems (up to 36" [910mm] Front Support) use a one-piece polyurethane nose (Figure 24) with molded thrie beam corrugations on both ends. Wider Front Support Assemblies (42" [1070mm] and above) use two polyurethane parts (Figure 25) riveted together. The two part nose pieces have thrie beam corrugations on one side and a series of holes through the flat section. Guide Cable Torque

The Nose Piece attaches to the Front Support assembly through the Sliding Panels (Figure 26). Thick flat round washers are inserted in the mounting holes of the nose piece to limit compression of the polyurethane. Two ¾" [20mm] bolts with fender washers clamp the nose piece and Sliding Panel to the Front Support on each side. Fasteners use lock washers or Locktite.

Torque to 200 ft-lbf [270 N-m].

The two part nose pieces overlap across the width of the system. Adjust to desired profile and align holes. Using the supplied pop-rivets and washers, rivet two columns of holes. Rivets should pass through the overlapping nose pieces at the furthest possible columns apart (Figure 26).

Apply delineation markings as required (not supplied).

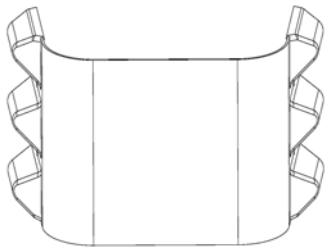


Figure 24 Nose Piece (up to 36")

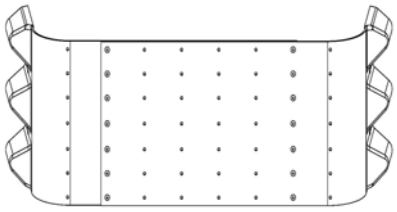


Figure 25 Nose Piece (wide)

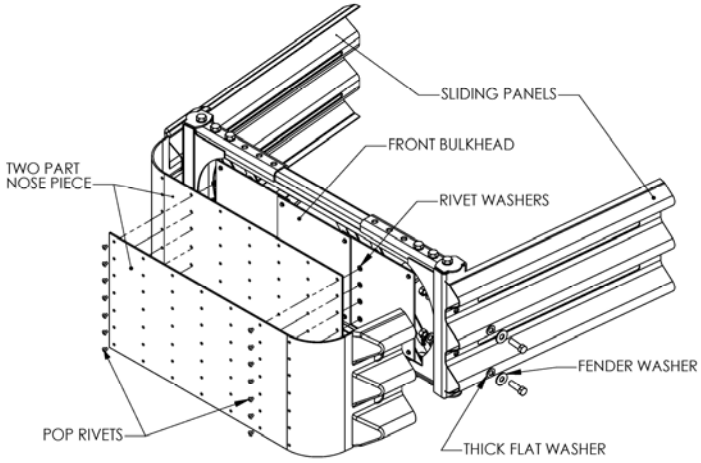


Figure 26 Wide Nose Piece Assembly

STEP 7

Install Cables and Cable Guides

Cable Location

Every system has a set of cables that run through the cable guides that attach underneath each bulkhead. The Cable Guides clamp around the cable and bolt to the bottom of the bulkheads. The Cable Guide is universal and fits all bulkhead and cable configurations. Two Cable Guide assemblies are used on every middle bulkhead assembly (Figure 27).

The cables are tentioned between the Backstop and Front Cable Anchor. The Front Cable Anchor is mounted under the first bay.

IMPORTANT NOTE: The Front Support Assembly is not attached to the cable.

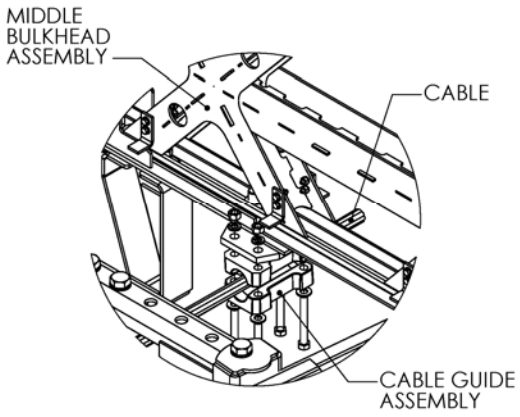


Figure 27 Cable Guide Clamp

Systems using a PCB, Compact Backstop or Flush Mount Backstop.

Systems using a PCB, Flush Mount or Compact Backstop use 1" [25mm] diameter cable (Figure 28). These Cables are identified by the loop and shackle on one end and a threaded stud swaged to the other end. (The shackle is not used on the Flush Mount Backstop).

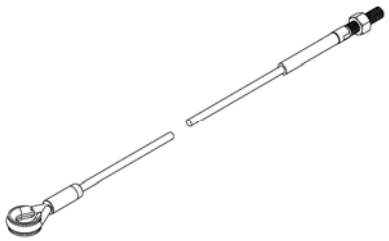


Figure 28 Compact Cable

Systems with Wide Flange Backstops

Systems with Wide Flange Backstops use a 1 1/8" [28mm] diameter cable (Figure 29). These cables have a threaded stud swaged to the rear end and a large "open swage socket" on the front end. A Key is also included which limits rotation of the cable during tensioning at the Rear Cable Anchor.

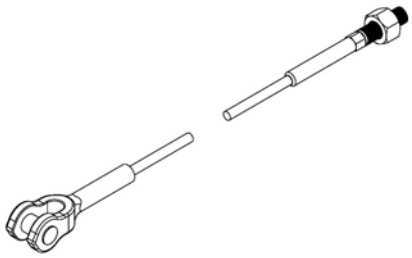


Figure 29 Universal Cable

The cables are fed through the bulkheads from the front. On parallel style bulkheads, the cables thread between the legs. On XL-XXXL bulkheads, the cables can go between the legs or through the legs, depending on the configuration. Lead with the rear of the cable. Place the rear cable end through the Rear Cable Anchor, PCB Backstop, or Compact Backstop. Start the tensioning nut with about 1" [25mm] of thread.

Without pinning the Front Cable Anchor, attach the Cable Guides to the bulkheads. Start from the last bulkhead and move forward. Cable Guides attach with ½" [12mm] hardware provided. Fasteners use lock washers or Locktite.

When all the Cable Guides are installed, pin the front cable end to the Front Cable Anchor. On Wide Flange Backstop configurations, install the Key to the Rear Cable Anchor (Figure 30).

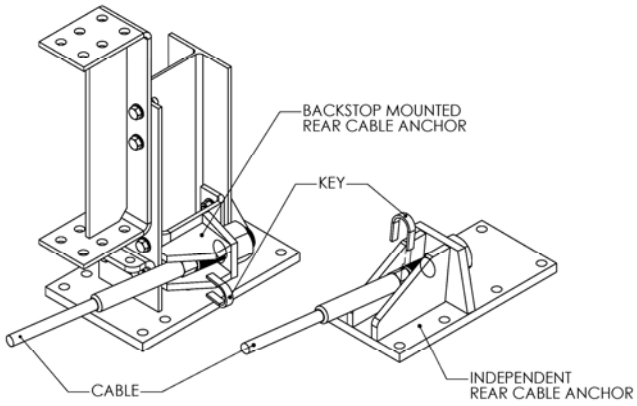


Figure 30 Backstop Cable Mount

STEP 8

Stretch and Align the System

This step can be avoided or reduced if care is taken to align and space the bulkheads properly during assembly.

Attach a pair of chains or straps to the Front Bulkhead assembly. Using a truck or other tow vehicle, pull the system forward to fully extend the bays. The bays are fully extended when the Slider Bolts are bottomed out in the slots of the Sliding Panels.

If necessary, bump or nudge the system into alignment. Each bulkhead should be aligned along the centerline of the system.

Recommended attachment points for straps or chains are at the corners of Front Support on the top and bottom horizontal channels. When attaching to XL-XXXL bulkheads, secure as close to the Wing Assembly attachment points as possible.

NOTE: Be sure not to jerk or pull on the backstop anchors before the anchoring compound has cured and the backstop is secured to the foundation.

STEP 9

Tension Cables and Torque Slider Bolts

Tension the Cables. Torque the cables in 50 ft-lbf [65 N-m] increments alternating between the two. Reference Torque Chart below (Table 2) for torque requirements. Use the deep socket provided.

Tighten Slider Bolts to approximately 100 ft-lbf [130 N-m], loosen, and then torque to 20 ft-lbf [27 N-m]. This procedure ensures proper nesting of the panels and torque accuracy.

NOTE: Care must be taken to not over tighten the sliders. Follow the procedure outlined above.

STEP 10

Install Lateral Support Cables

Skip this section if the system does not require a Lateral Cable Support Kit.

NOTE: Refer to the System Configuration chart in Appendix "A" to determine if Lateral Support Cables are required.

If the system requires a Lateral Cable Support Kit, the cable mounts should be installed on the last two bulkhead assemblies and the Wide Flange Backstops. Refer to Figure 9 and Figure 10 of Step 3.

The Lateral Support Cables are ½" [12mm] diameter and have a ½" [12mm] shackle on one end. There are eight (8) cable assemblies in the kit. The shackles pin to the cable mounts on the bulkheads and Wide Flange Backstops (Figure 31, 32, 33, 34, 35). The two cables from each backstop are routed to the opposite sides of the last two bulkheads (Figure 35).

These cables are attached to the cables pined to the bulkheads with cable clamps. Six cable clamps are used in series of three. Place the clamps at the furthest extents of the overlapping cables. The first cable clamp should be approximately 3" [75mm] from the cable end. Subsequent clamps should be spaced at 3" [75mm] (Figure 33).

Cables should be taught with minimal slack, but do not require tensioning. Routing above or below the main system cables is acceptable. Bundle access cable and use provided plastic wrap ties to secure the bundles to the suspended cables.

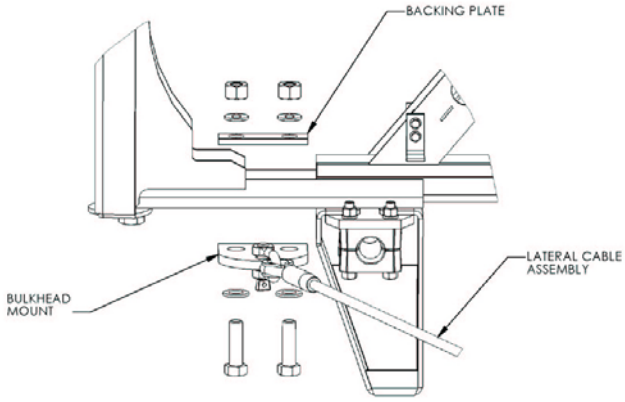


Figure 31 Lateral Support Cable

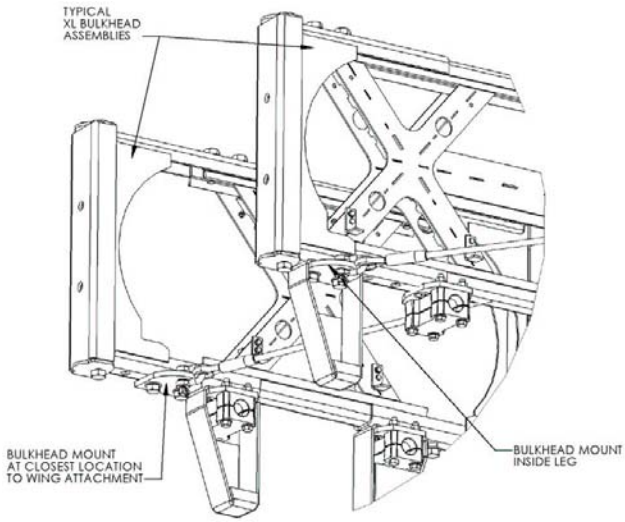


Figure 32 Lateral Support Cables

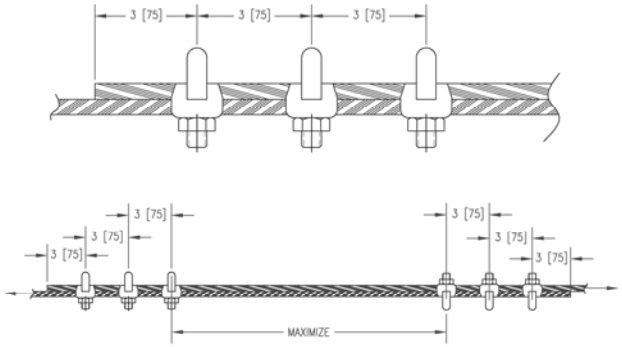


Figure 33 Install Cable Clamps

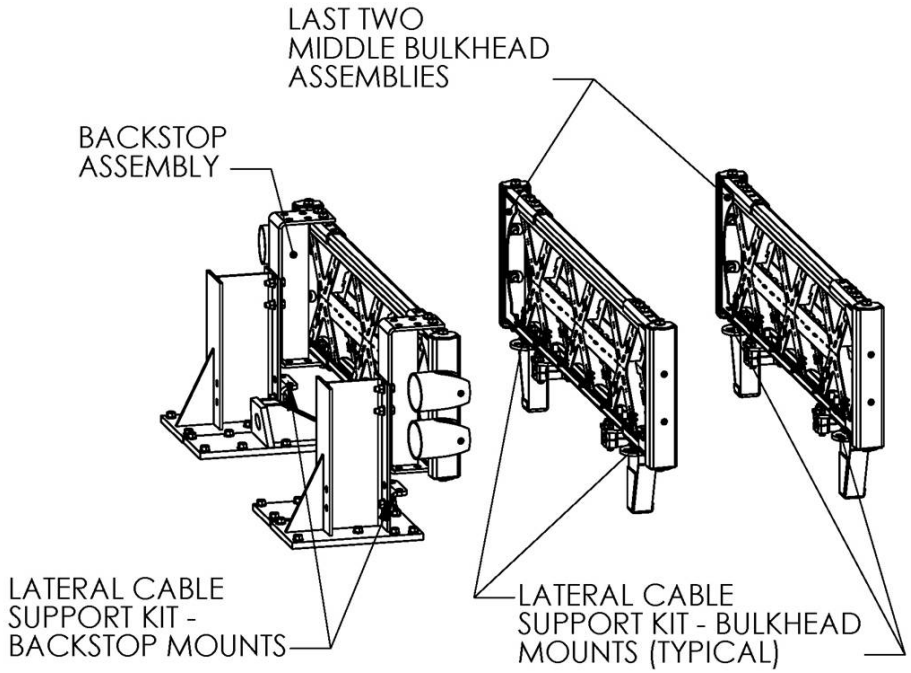


Figure 34 Cable Mounts

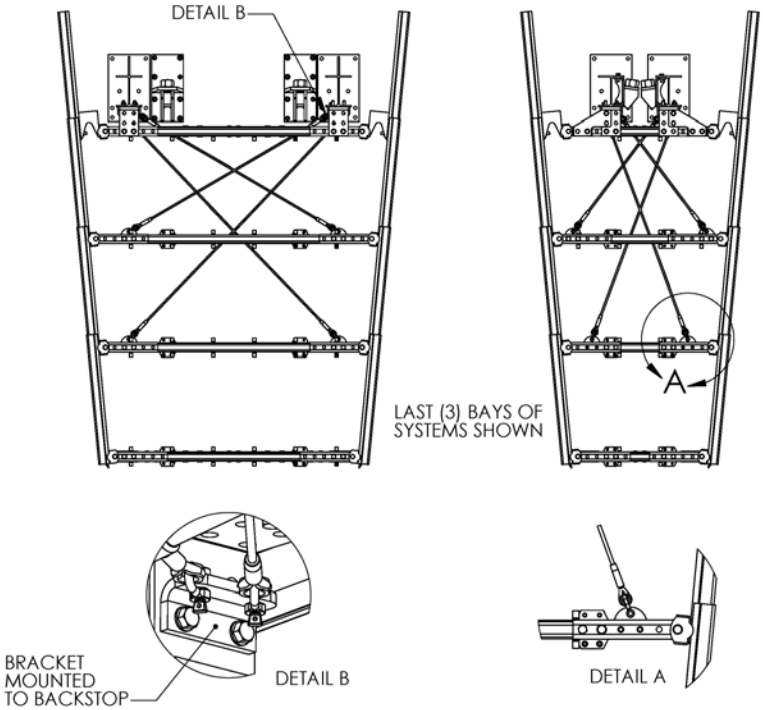


Figure 35 Install Cable Clamps

STEP 11

Insert Energy Absorbing Cartridges

There are two types of Energy Absorbing Cartridges (EAC). Each EAC has a forward and rearward end. Type "A" EAC's (Figure 36) have eight (8) 3" [75mm] diameter holes around the circumference of the front half of the cylinder. Type "B" EAC's (Figure 37) have a solid cylinder wall with three (3) vent holes on the rearward end.

When installing the EAC's in a system it is important to ensure that they are placed according to manufacturer specification.

NOTE: Refer the System Configuration Chart in Appendix "A" for proper EAC placement.

When placed in the system, the front of the EAC will face the front of the system (narrow end). Text on the EAC reading "This Side Up" should be legible and at the top of the inserted EAC. The EAC should rest on the EAC Locating Tabs.

Note that bays capable of holding (2) EAC's will always use (2) EAC's except in specified empty bays. They will also always be placed in the widest locations available.

NOTE: A single bay will never have more than (2) EAC's in it. Refer the System Configuration Chart in Appendix "A" for proper placement.

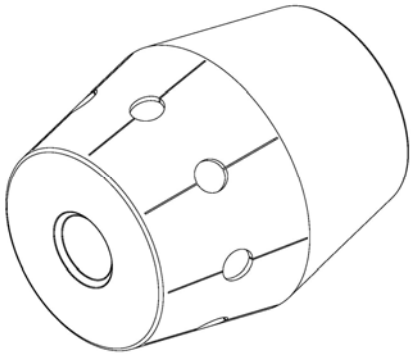


Figure 36 Energy Absorbing Cartridge – Type A

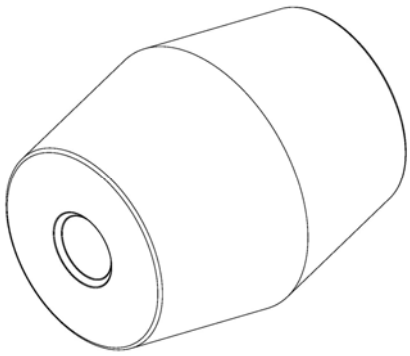


Figure 37 Energy Absorbing Cartridge – Type B

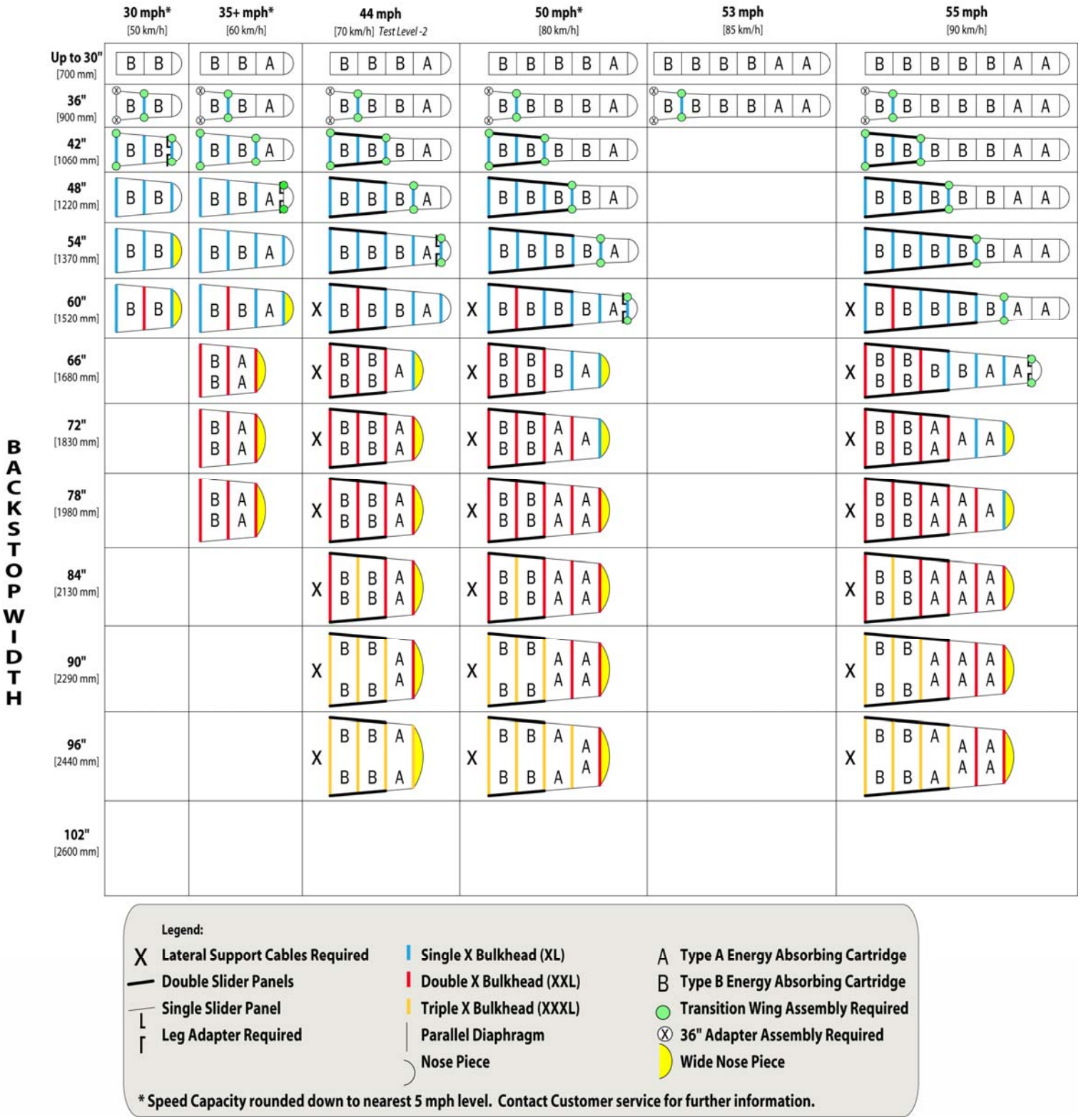
STEP 12

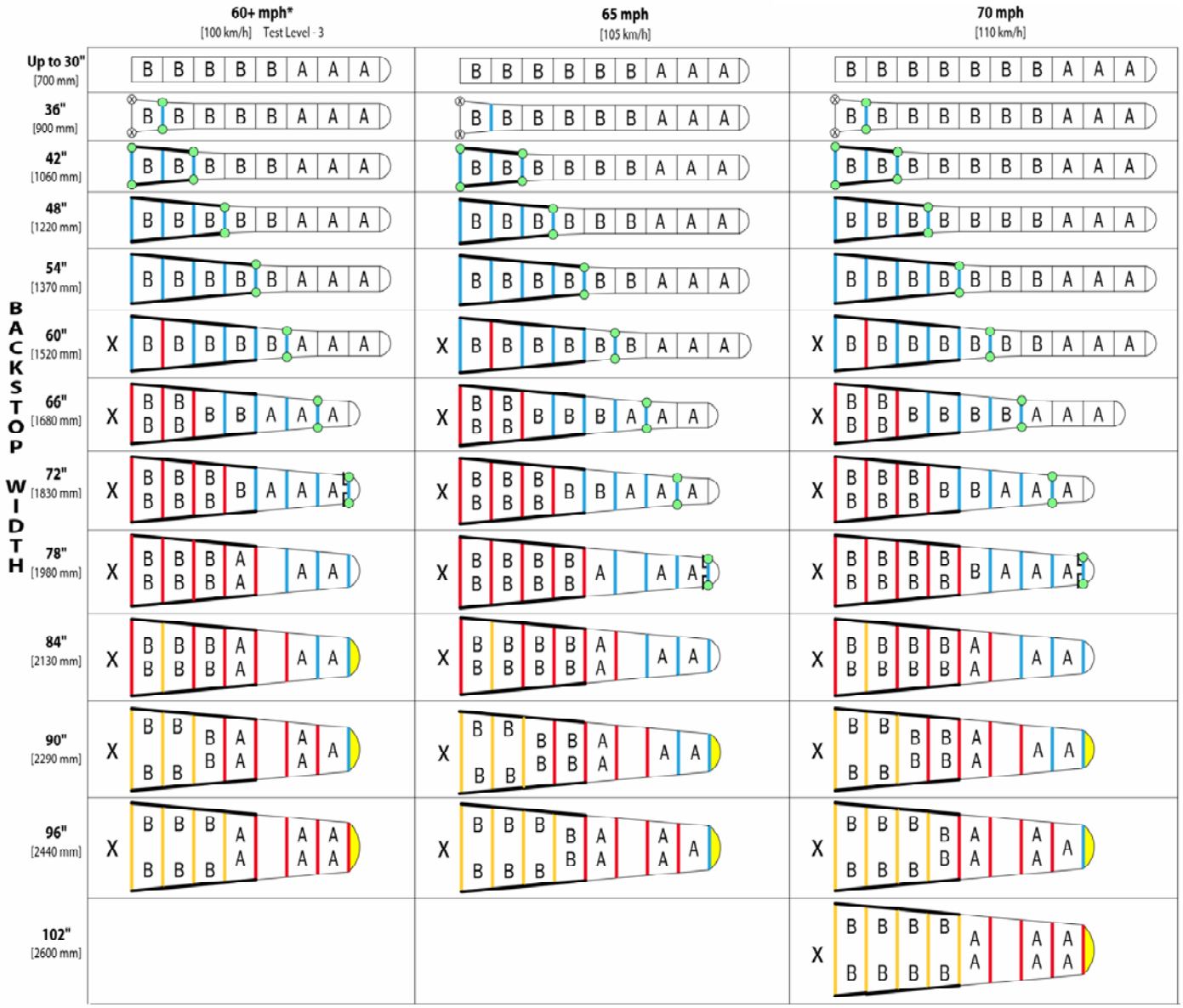
Final Inspection

Use the check list below to confirm that all of the installation steps have been completed.

Inspection Date	Inspection By:	Item
		All front cable anchor plate and backstop anchor bolts in place and epoxy cured.
		Clevis and pin, mounted to the front cable anchor, is installed with the handle portion of the pin on the inside of the anchor assembly, firmly tightened. *(This may be different depending on the type of foundation, ie, asphalt or PCC.)*
		All cable guide assemblies securely fastened.
		System cables tightened to meet torque specifications.
		Pipe panel mounts positioned properly, flat end facing back, cut out facing forward.
		Sliding panels installed properly to allow for stacking.
		Sliding panels should have no more than a ¾" (19mm) gap between stacked panels.
		Nose cover properly installed with thick spacer and tightened to specifications.
		Torque Sliding Bolt assemblies to specifications. Do NOT over tighten.
		Energy Absorbing Cartridges (EAC) installed in proper A-B position and sequence. See Configuration Chart.
		EAC air discharge holes positioned properly. Rotate cast ID to the top of the cartridge.
		Asphalt adapter installed on both sides of portable concrete barrier when applicable.
		Torque all fasteners to meet specifications.

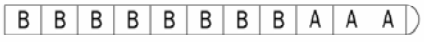
APPENDIX A - System Configuration Chart



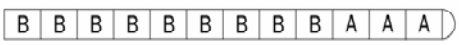


ADDITIONAL HIGHER SPEED SYSTEMS

72 mph
[115 km/h]



75 mph
[120 km/h]



Call or email BSI Customer Service:
888 800-3691 (U.S. Toll Free)
707 374-6800 (Outside U.S.)
email: rkeener@barriersystemsinc.com

Visit our website at
www.barriersystemsinc.com
An ISO 9001:2000 Company

APPENDIX B - System Torque Chart

CONCRETE INSTALLATION

Compact Backstop Anchors.....	120 ft-lbs (160 N-m)
PCB Backstop Anchors.....	120 ft-lbs (160 N-m)
Cable Anchor (Rear).....	120 ft-lbs (160 N-m)
Cable Anchor (Front).....	120 ft-lbs (160 N-m)
Cable Adj. Eye Bolt.....	500 ft-lbs (675 N-m)

ASPHALT INSTALLATION

Compact Backstop Anchors.....	5 ft-lbs (8 N-m)
PCB Backstop Anchors.....	5 ft-lbs (8 N-m)
PCB Asphalt Adapter	5 ft-lbs (8 N-m)
Cable Anchor (Front).....	5 ft-lbs (8 N-m)
Cable Adj. Eye Bolt.....	120 ft-lbs (160 N-m)

SYSTEM COMPONENT INSTALLATION

Sliding Bolt Assembly.....	20 ft-lbs (27 N-m)
Front Panel Holding Nose Cover.....	200 ft-lbs (270 N-m)
Pipe Panel Mount to Backstop.....	70 ft-lbs (95 N-m)
Cable Guide Bolts	30 ft-lbs (48 N-m)

The Universal TAU-II Crash Cushion has been successfully tested in various configurations having the cable torque ranging from 120 ft-lbs for asphalt installation, to 500 ft-lbs of torque for concrete applications. The system will function properly under this full range of torque. If a torque wrench is not available, refer to the table below for an alternate method of reaching the desired torque range.

Ways of creating approximately 500 ft-lbs of torque:

- 6 ft. [1. 8 m] wrench extension with entire weight of 100 lbs [45 kg] applied 12" from the end
- 42 in. [1.1 m] wrench extension with entire weight of 200 lbs [90 kg] applied 12" from the end
- Use free weights or human weight

These methods should ensure torque within tested range and manufacturer tolerances.

APPENDIX C

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 on Asphaltic Concrete foundation.

(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.

DRAWINGS

FOUNDATION SPECIFICATIONS:

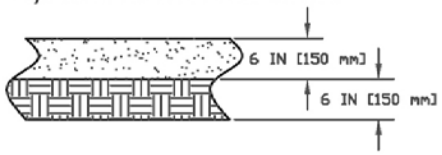
THE TAU-II CRASH CUSHION SYSTEM HAS BEEN DESIGNED TO ATTACH TO CONCRETE OR ASPHALT FOUNDATIONS. USE THE ANCHORAGE SPECIFIED BELOW DEPENDING ON THE FOUNDATION AT THE JOB SITE. REFERENCE UNIVERSAL TAU-II FOUNDATION DRAWINGS FOR FURTHER DETAIL.

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 $\frac{1}{4}$ IN. [210 mm] GALVANIZED ANCHOR WITH 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] GALVANIZED ANCHORS WITH 16 IN. [410 mm] EMBEDMENT

ASPHALT ANCHORING KIT REQUIRED

3.) ASPHALT ONLY

FOUNDATION: MINIMUM 8 IN. [200 mm] AC

ANCHORAGE: 3/4 IN. [20 mm] X 18 IN. [460 mm] GALVANIZED ANCHORS WITH 16 IN. [410 mm] EMBEDMENT

ASPHALT ANCHORING KIT REQUIRED

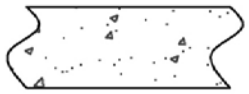
4.) ASPHALT OVER P.C. CONCRETE

FOUNDATION: AC OVER PCC.

ANCHORAGE: 3/4 IN. [20 mm] GALVANIZED ANCHORS WITH MINIMUM 6 IN. [150 mm] EMBEDMENT IN PCC - ASPHALT ANCHORING KIT NOT REQUIRED
OR
IF 6 IN. [150 mm] EMBEDMENT IN PCC IS NOT POSSIBLE USE
3/4 IN. [20 mm] X 18 IN. [460 mm] GALVANIZED ANCHORS WITH 16 IN. [410 mm] EMBEDMENT - ASPHALT ANCHORING KIT REQUIRED

MATERIAL SPECIFICATIONS

PORTLAND CEMENT CONCRETE (PCC)



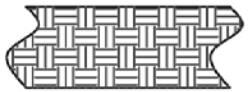
STONE AGGREGATE CONCRETE MIX, 4,000 PSI [28 MPa] MINIMUM COMPRESSIVE STRENGTH (SAMPLING PER ASTM C31-84 OR ASTM C42-84A, TESTING PER ASTM C39-84)

ASPHALTIC 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

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
A	SEE ECN 00589	03/02/04	GAD			

SCALE: FULL

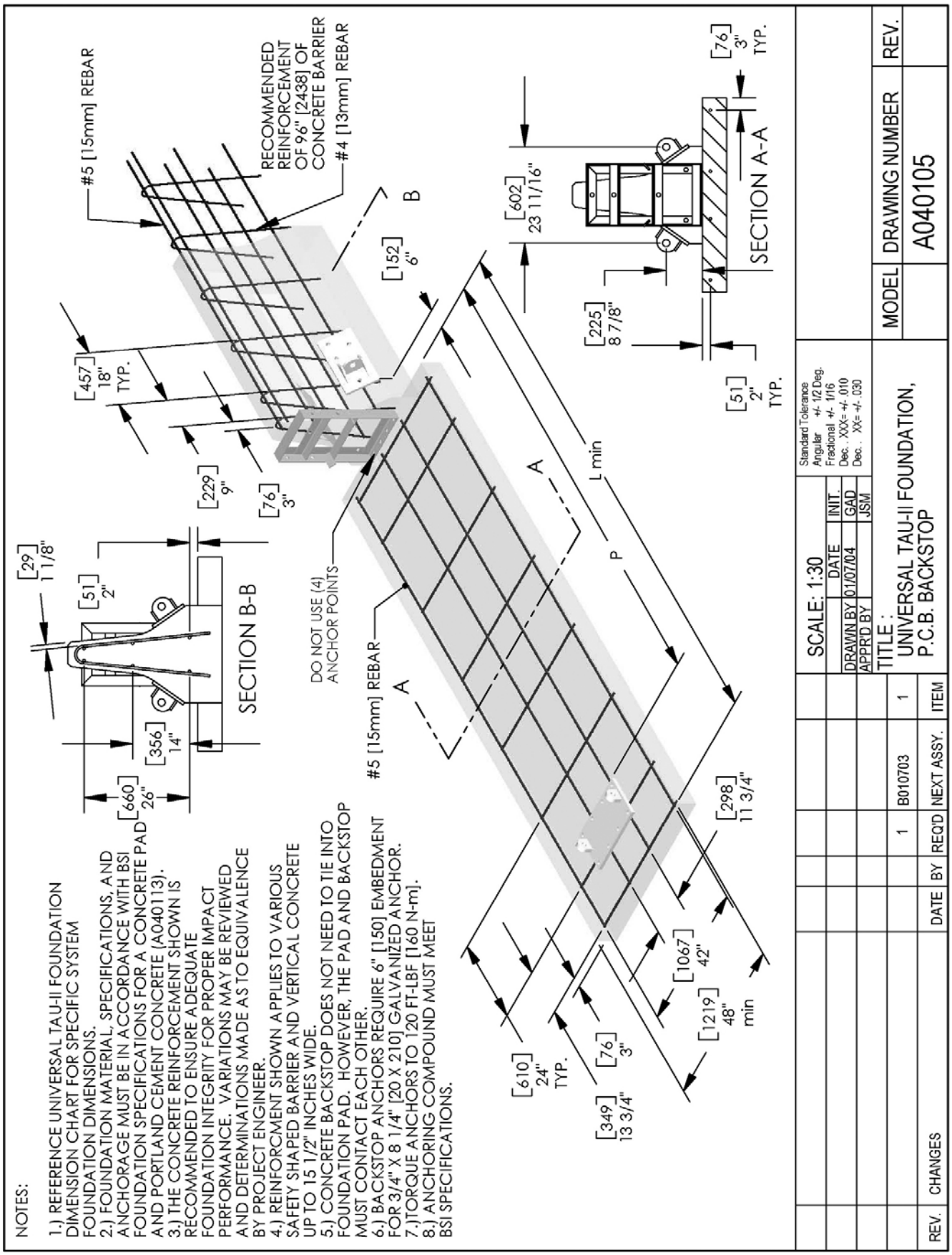
	DATE	INIT.
DRAWN BY	01/09/04	GAD
APPR'D BY		JSM

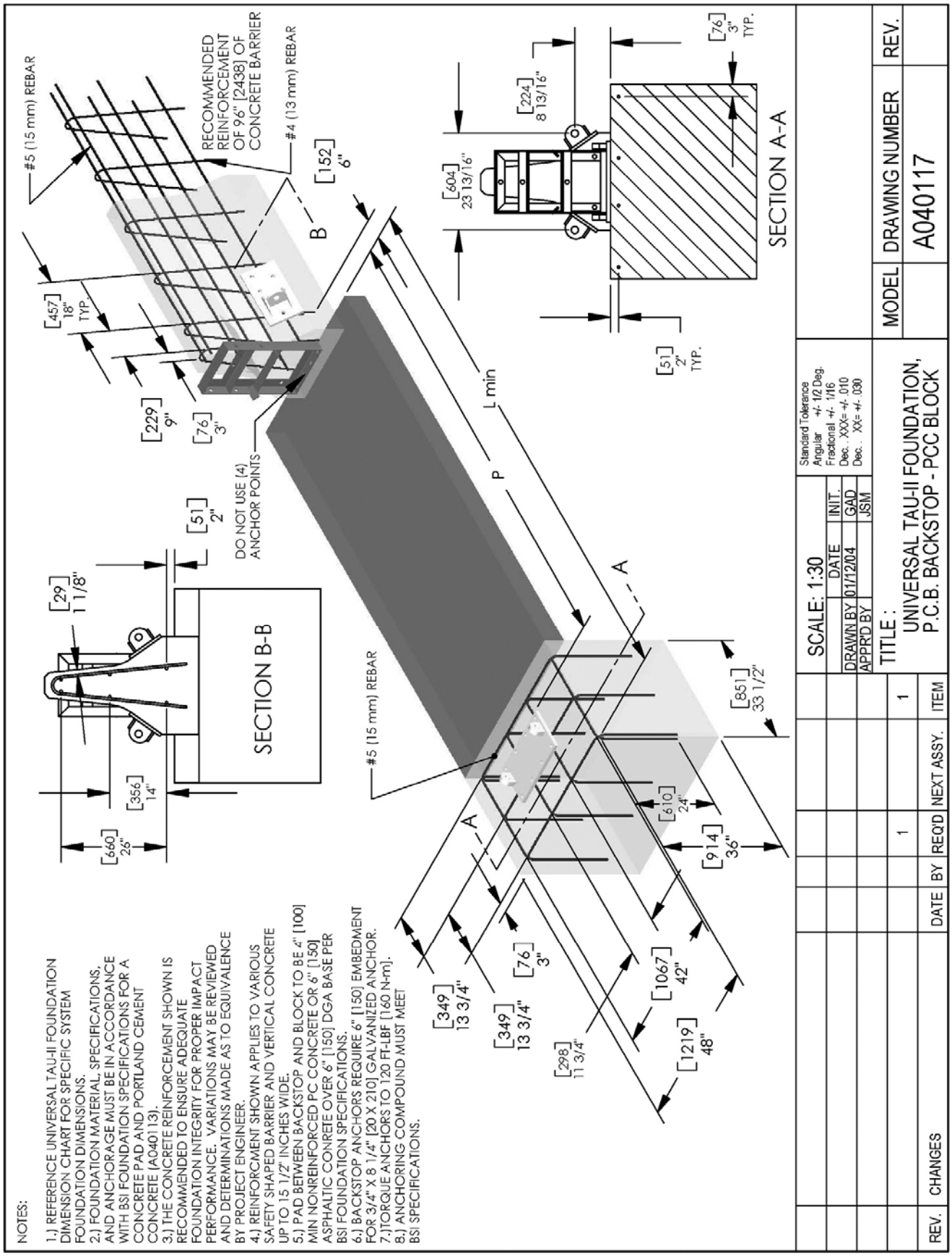
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

TITLE: FOUNDATION SPECIFICATIONS

MODEL	DRAWING NUMBER	REV.
	A040113	A

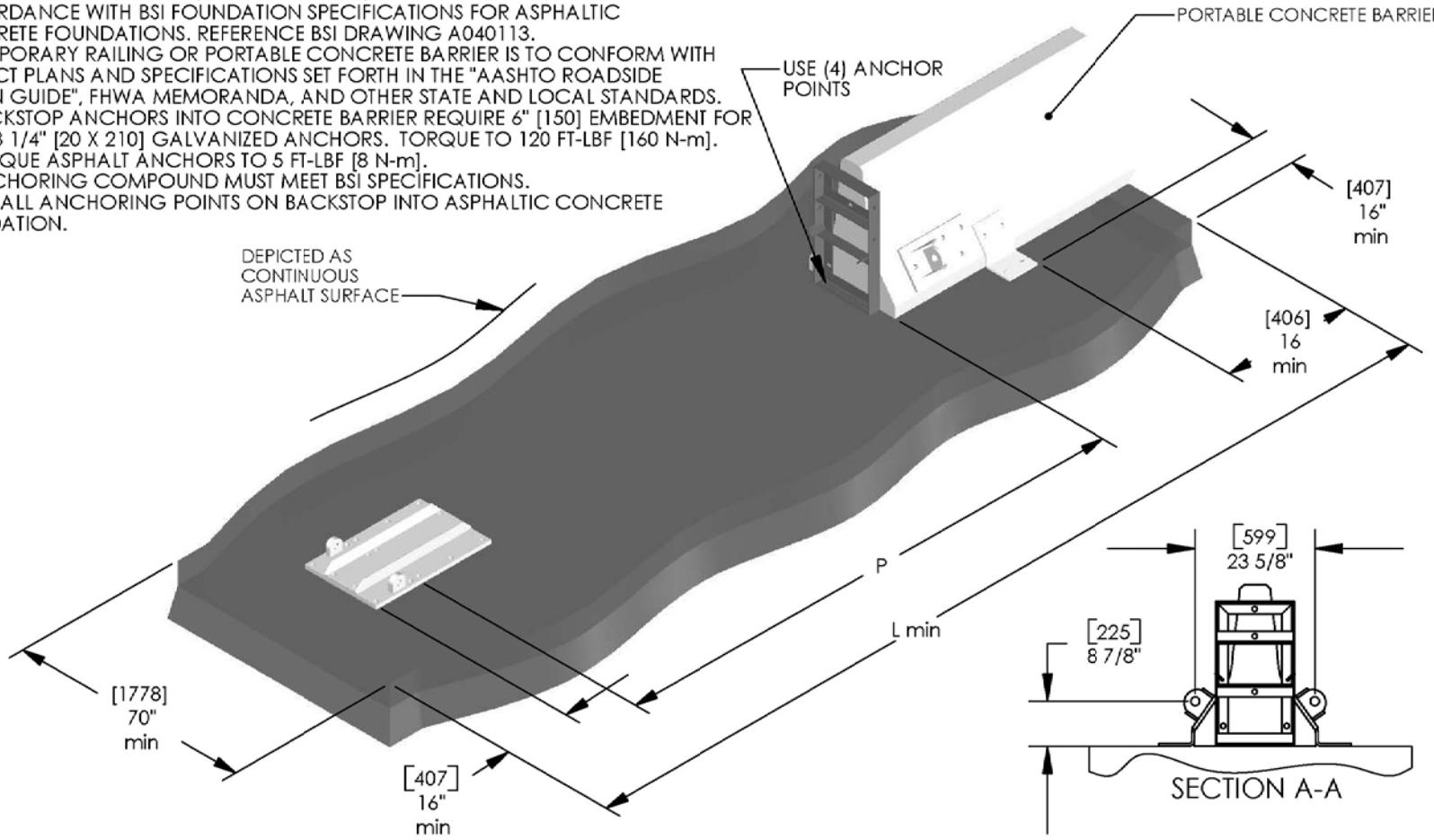
BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY


NOTES:
1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD AND PORTLAND CEMENT CONCRETE (A040113).
3.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.
4.) REINFORCMENT SHOWN APPLIES TO VARIOUS SAFETY SHAPED BARRIER AND VERTICAL CONCRETE UP TO 15 1/2" INCHES WIDE.
5.) CONCRETE BACKSTOP DOES NOT NEED TO TIE INTO FOUNDATION PAD. HOWEVER, THE PAD AND BACKSTOP MUST CONTACT EACH OTHER.
6.) BACKSTOP ANCHORS REQUIRE 6" [150] EMBEDMENT FOR 3/4" X 8 1/4" [20 X 210] GALVANIZED ANCHOR.
7.)TORQUE ANCHORS TO 120 FT-LBF [160 N-m].
8.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.
#5 [15mm] REBAR
RECOMMENDED REINFORCEMENT OF 96" [2438] OF CONCRETE BARRIER
#4 [13mm] REBAR
DO NOT USE (4) ANCHOR POINTS
#5 [15mm] REBAR
[457] 18" TYP.
[229] 9"
[76] 3"
[152] 6"
[29] 1 1/8"
[51] 2"
[660] 26"
[356] 14"
SECTION B-B
[602] 23 11/16"
[225] 8 7/8"
[51] 2" TYP.
[76] 3" TYP.
SECTION A-A
L min
P
[610] 24" TYP.
[76] 3"
[349] 13 3/4"
[1067] 42"
[1219] 48" min
[298] 11 3/4"
SCALE: 1:30
DRAWN BY 01/07/04 GAD
APPR'D BY JSM
Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. .XXX= +/- .010
Dec. .XX= +/- .030
TITLE :
UNIVERSAL TAU-II FOUNDATION, P.C.B. BACKSTOP
MODEL
DRAWING NUMBER
A040105
REV.
REV. CHANGES DATE BY
1 B010703 1
REQ'D NEXT ASSY. ITEM


NOTES:
1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD AND PORTLAND CEMENT CONCRETE (A040113).
3.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.
4.) REINFORCMENT SHOWN APPLIES TO VARIOUS SAFETY SHAPED BARRIER AND VERTICAL CONCRETE UP TO 15 1/2" INCHES WIDE.
5.) PAD BETWEEN BACKSTOP AND BLOCK TO BE 4" [100] MIN NONREINFORCED PC CONCRETE OR 6" [150] ASPHALTIC CONRETE OVER 6" [150] DGA BASE PER BSI FOUNDATION SPECIFICATIONS.
6.) BACKSTOP ANCHORS REQUIRE 6" [150] EMBEDMENT FOR 3/4" X 8 1/4" [20 X 210] GALVANIZED ANCHOR.
7.)TORQUE ANCHORS TO 120 FT-LBF [160 N-m].
8.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.
#5 (15 mm) REBAR
#4 (13 mm) REBAR
RECOMMENDED REINFORCEMENT OF 96" [2438] OF CONCRETE BARRIER
[457] 18" TYP.
[229] 9"
[76] 3"
[152] 6"
B
DO NOT USE (4) ANCHOR POINTS
[51] 2"
[29] 1 1/8"
[356] 14"
[660] 26"
SECTION B-B
L min
P
A
[604] 23 13/16"
[224] 8 13/16"
[76] 3" TYP.
[51] 2" TYP.
SECTION A-A
[851] 33 1/2"
[610] 24"
[914] 36"
[349] 13 3/4"
[76] 3"
[1067] 42"
[298] 11 3/4"
[1219] 48"
SCALE: 1:30
DRAWN BY 01/12/04 GAD
APPR'D BY JSM
Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. .XXX= +/- .010
Dec. . XX= +/- .030
TITLE :
UNIVERSAL TAU-II FOUNDATION, P.C.B. BACKSTOP - PCC BLOCK
MODEL
DRAWING NUMBER
A040117
REV.
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM
1 1

NOTES:

1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR ASPHALTIC CONCRETE FOUNDATIONS. REFERENCE BSI DRAWING A040113.
3.) TEMPORARY RAILING OR PORTABLE CONCRETE BARRIER IS TO CONFORM WITH PROJECT PLANS AND SPECIFICATIONS SET FORTH IN THE "AASHTO ROADSIDE DESIGN GUIDE", FHWA MEMORANDA, AND OTHER STATE AND LOCAL STANDARDS.
4.) BACKSTOP ANCHORS INTO CONCRETE BARRIER REQUIRE 6" [150] EMBEDMENT FOR 3/4" X 8 1/4" [20 X 210] GALVANIZED ANCHORS. TORQUE TO 120 FT-LBF [160 N-m].
5.) TORQUE ASPHALT ANCHORS TO 5 FT-LBF [8 N-m].
6.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.
7.) USE ALL ANCHORING POINTS ON BACKSTOP INTO ASPHALTIC CONCRETE FOUNDATION.



REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
				1	B010708	1

SCALE: 1:30

	DATE	INIT.
DRAWN BY	1/8/04	GAD
APPR'D BY		JSM

Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. . XXX= +/- .010
Dec. . XX= +/- .030

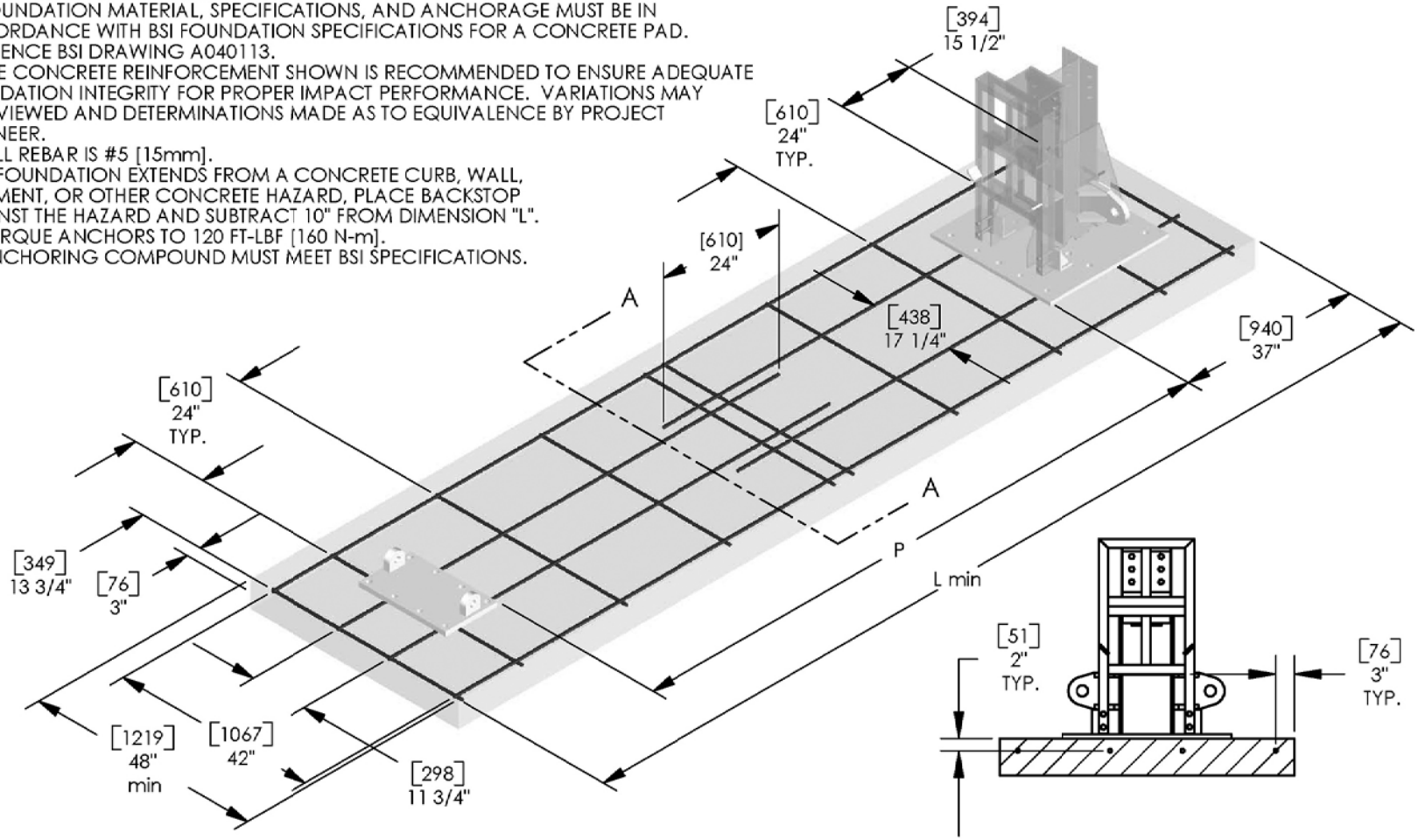
TITLE :
UNIVERSAL TAU-II FOUNDATION, ASPHALT WITH PCB BACKSTOP

MODEL	DRAWING NUMBER	REV.
	A040112	

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

NOTES:

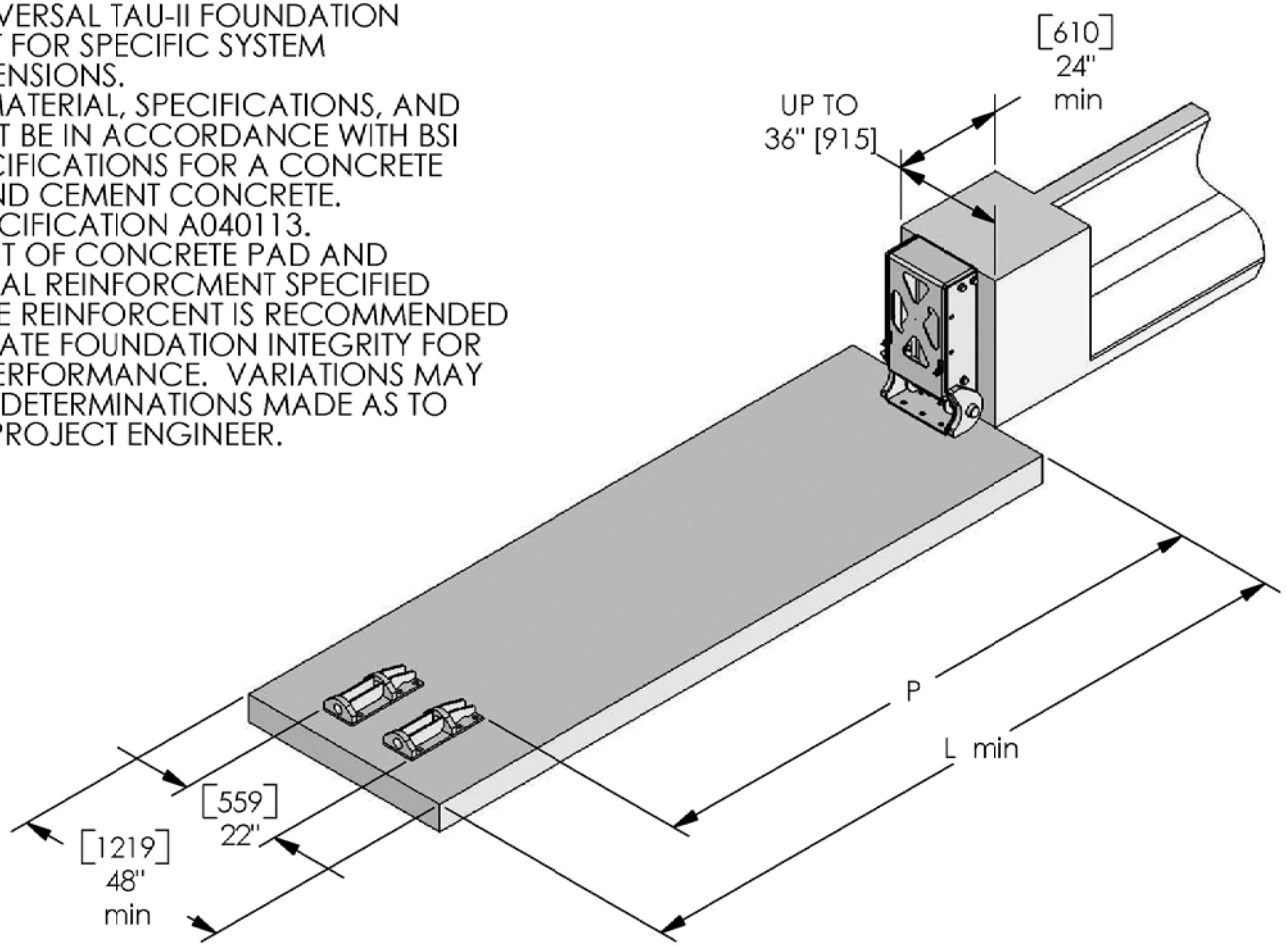
1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD. REFERENCE BSI DRAWING A040113.
3.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.
4.) ALL REBAR IS #5 [15mm].
5.) IF FOUNDATION EXTENDS FROM A CONCRETE CURB, WALL, ABUTMENT, OR OTHER CONCRETE HAZARD, PLACE BACKSTOP AGAINST THE HAZARD AND SUBTRACT 10" FROM DIMENSION "L".
6.) TORQUE ANCHORS TO 120 FT-LBF [160 N-m].
7.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.



							SCALE: 1:24	Standard Tolerance Angular +/- 1/2 Deg. Fractional +/- 1/16 Dec. . XXX= +/- .010 Dec. . XX= +/- .030
							DRAWN BY 01/08/04 GAD	SECTION A-A
							APPR'D BY JSM	
				1	B010708	1	TITLE : UNIVERSAL TAU-II FOUNDATION, COMPACT BACKSTOP	MODEL / DRAWING NUMBER A040102 / REV.
REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM		

NOTES:

1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD AND PORTLAND CEMENT CONCRETE. REFERENCE BSI SPECIFICATION A040113.
3.) REINFORCEMENT OF CONCRETE PAD AND BACKSTOP TO EQUAL REINFORCMENT SPECIFIED IN BSI A040105. THE REINFORCENT IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR 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
				1	B040239	1

SCALE: 1:30

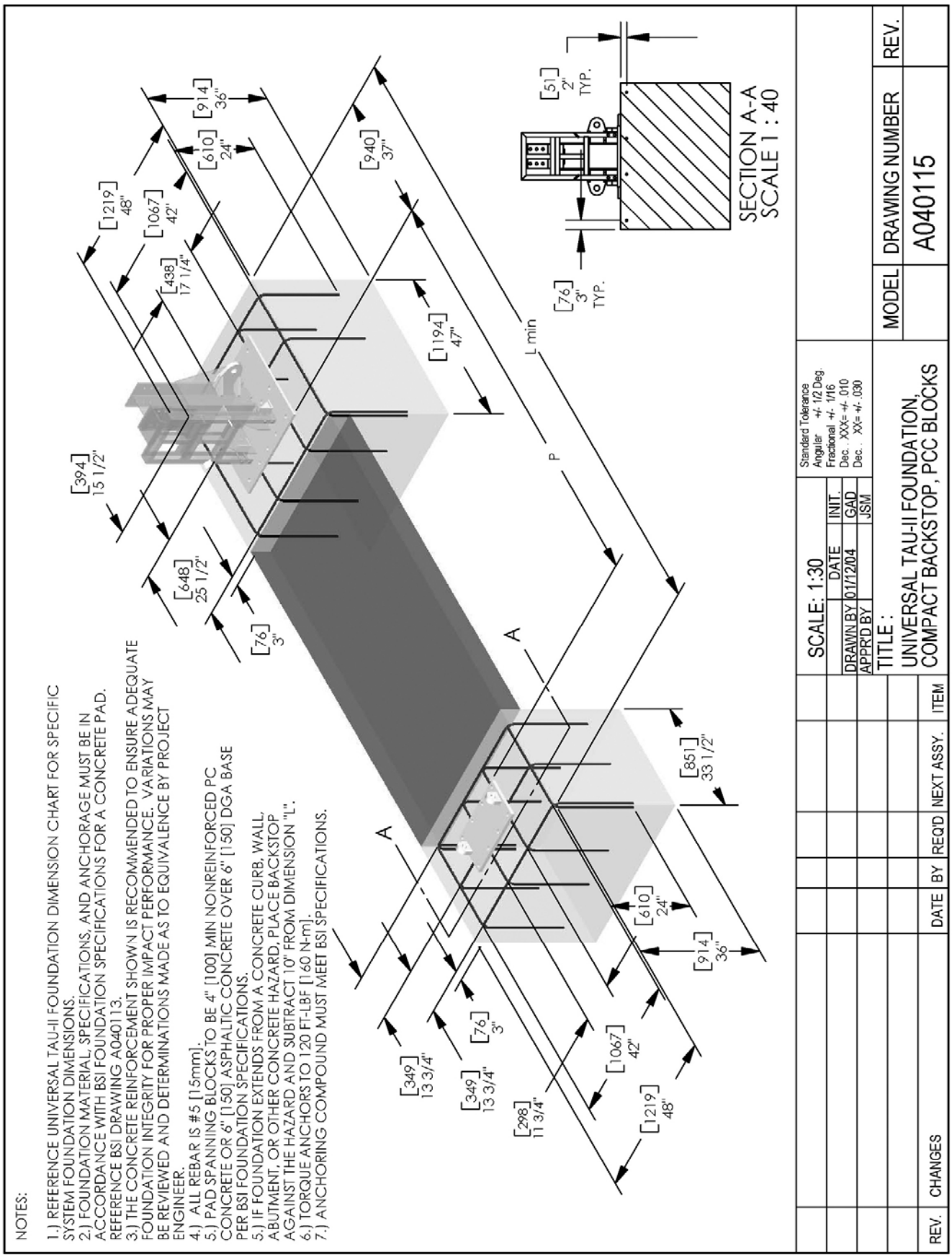
	DATE	INIT.
DRAWN BY	04/28/04	GAD
APPR'D BY		OSD

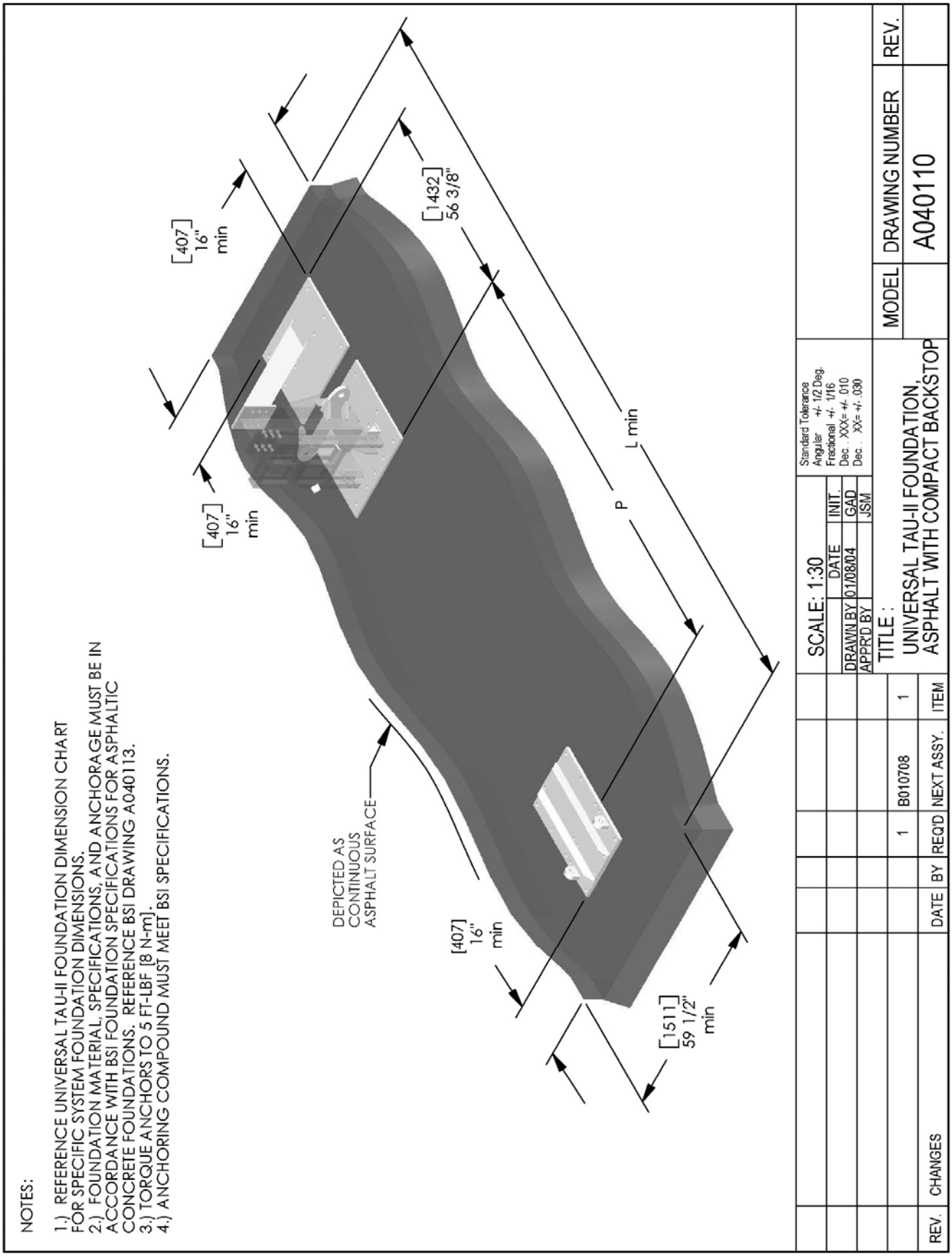
Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. . XXX= +/- .010
Dec. . XX= +/- .030

TITLE :UNIVERSAL TAU-II FOUNDATION, FLUSH MOUNT BACKSTOP - PCC PAD

MODEL	DRAWING NUMBER	REV.
	A040420	

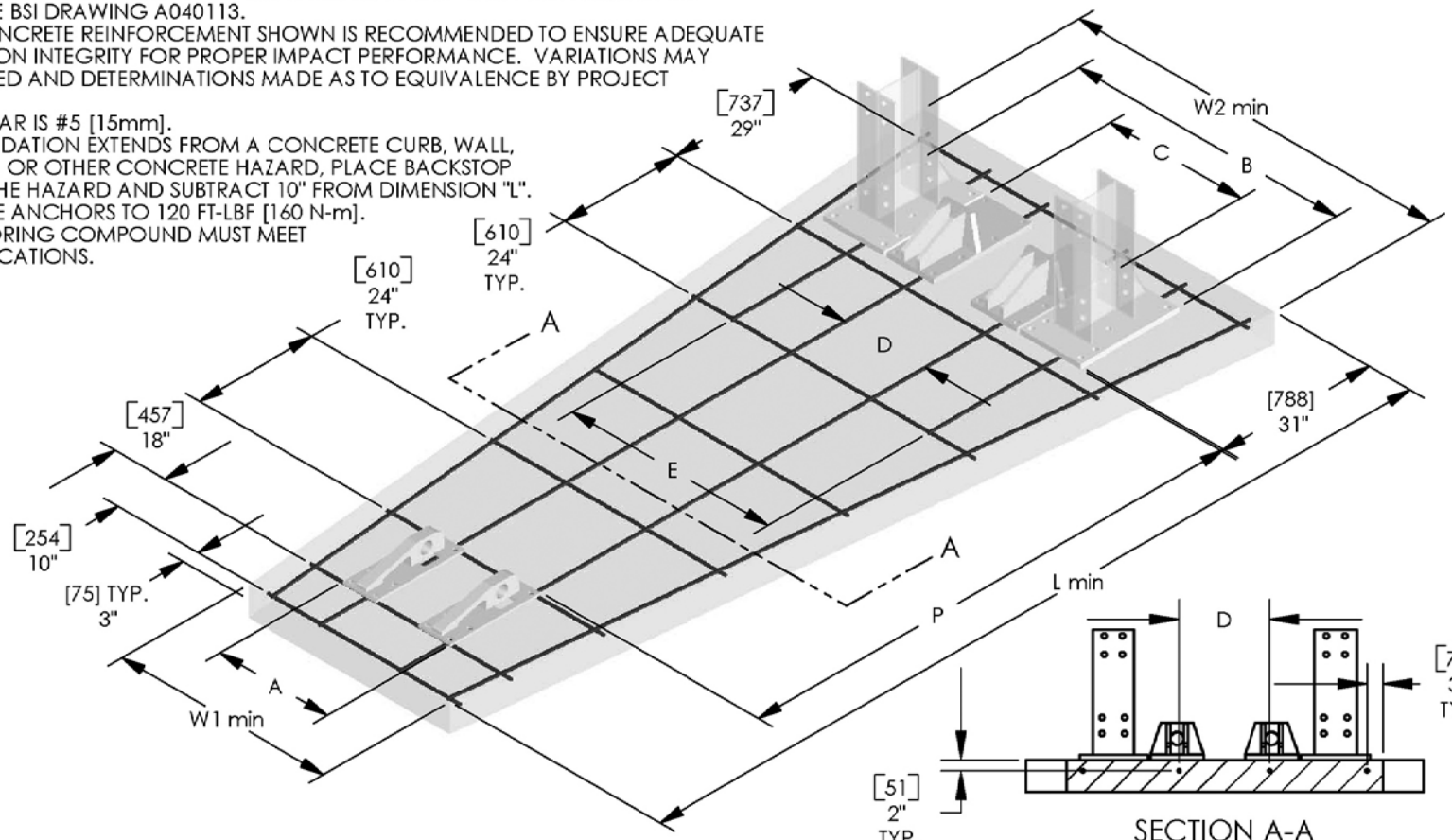
BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY


NOTES:
1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD. REFERENCE BSI DRAWING A040113.
3.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.
4.) ALL REBAR IS #5 [15mm].
5.) PAD SPANNING BLOCKS TO BE 4" [100] MIN NONREINFORCED PC CONCRETE OR 6" [150] ASPHALTIC CONCRETE OVER 6" [150] DGA BASE PER BSI FOUNDATION SPECIFICATIONS.
5.) IF FOUNDATION EXTENDS FROM A CONCRETE CURB, WALL, ABUTMENT, OR OTHER CONCRETE HAZARD, PLACE BACKSTOP AGAINST THE HAZARD AND SUBTRACT 10" FROM DIMENSION "L".
6.) TORQUE ANCHORS TO 120 FT-LBF [160 N-m].
7.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.
[394] 15 1/2"
[648] 25 1/2"
[76] 3"
[1219] 48"
[1067] 42"
[438] 17 1/4"
[610] 24"
[914] 36"
[940] 37"
[1194] 47"
L min
P
A
[51] 2" TYP.
[76] 3" TYP.
SECTION A-A
SCALE 1 : 40
[85] 33 1/2"
[610] 24"
[914] 36"
[349] 13 3/4"
[76] 3"
[298] 11 3/4"
[1067] 42"
[1219] 48"
SCALE: 1:30
DRAWN BY 01/12/04 GAD
APPRD BY JSM
Standard Tolerance
Angular +/- 1/2 Deg
Fractional +/- 1/16
Dec. .XXX= +/- .010
Dec. .XX= +/- .030
TITLE :
UNIVERSAL TAU-II FOUNDATION, COMPACT BACKSTOP, PCC BLOCKS
MODEL
DRAWING NUMBER
A040115
REV.
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM


NOTES:
1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR ASPHALTIC CONCRETE FOUNDATIONS. REFERENCE BSI DRAWING A040113.
3.) TORQUE ANCHORS TO 5 FT-LBF [8 N-m].
4.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.
[407] 16" min
[1432] 56 3/8"
[407] 16" min
P
L min
DEPICTED AS CONTINUOUS ASPHALT SURFACE
[407] 16" min
[1511] 59 1/2" min
SCALE: 1:30
DRAWN BY 01/08/04 GAD
APPR'D BY JSM
Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. XXX= +/- .010
Dec. XX= +/- .030
TITLE :
UNIVERSAL TAU-II FOUNDATION, ASPHALT WITH COMPACT BACKSTOP
MODEL
DRAWING NUMBER
A040110
REV.
1 B010708 1
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM

NOTES:

1.) REFERENCE UNIVERSAL TAU-II FOUNDATION DIMENSION CHART FOR SPECIFIC SYSTEM FOUNDATION DIMENSIONS.
2.) FOUNDATION MATERIAL, SPECIFICATIONS, AND ANCHORAGE MUST BE IN ACCORDANCE WITH BSI FOUNDATION SPECIFICATIONS FOR A CONCRETE PAD. REFERENCE BSI DRAWING A040113.
3.) THE CONCRETE REINFORCEMENT SHOWN IS RECOMMENDED TO ENSURE ADEQUATE FOUNDATION INTEGRITY FOR PROPER IMPACT PERFORMANCE. VARIATIONS MAY BE REVIEWED AND DETERMINATIONS MADE AS TO EQUIVALENCE BY PROJECT ENGINEER.
4.) ALL REBAR IS #5 [15mm].
5.) IF FOUNDATION EXTENDS FROM A CONCRETE CURB, WALL, ABUTMENT, OR OTHER CONCRETE HAZARD, PLACE BACKSTOP AGAINST THE HAZARD AND SUBTRACT 10" FROM DIMENSION "L".
6.) TORQUE ANCHORS TO 120 FT-LBF [160 N-m].
7.) ANCHORING COMPOUND MUST MEET BSI SPECIFICATIONS.



SECTION A-A
SCALE 1 : 30

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
				1	B033000	1

SCALE: 1:24

	DATE	INIT.
DRAWN BY	01/07/04	GAD
APPR'D BY		JSM

Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. . XXX= +/- .010
Dec. . XX= +/- .030

TITLE :
UNIVERSAL TAU-II FOUNDATION, WIDE FLANGE BACKSTOP

MODEL	DRAWING NUMBER	REV.
	A040108	

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

UNIVERSAL TAU-II FOUNDATION DIMENSIONS

US STANDARD UNITS - INCHES

SYSTEM WIDTH (IN)	SYSTEM SPEED CAPACITY (MPH) 30	35	40 TL-2	50	53	55	60 TL-3	65	70	72	75	DRAWING NUMBER
UP TO 30" PCB BACKSTOP	30T050PBC	30T060PBC	30T070PBC	30T080PBC	30T085PBC	30T090PBC	30T100PBC	30T105PBC	30T110PBC	30T115PBC	30T120PBC	A040105 A040117
	30T050PYC	30T060PYC	30T070PYC	30T080PYC	30T085PYC	30T090PYC	30T100PYC	30T105PYC	30T110PYC	30T115PYC	30T120PYC	
L (in)	85 1/2	119 1/2	154	188	222	256	290 1/2	324 1/2	358 1/2	392 1/2	426 1/2	
P (in)	62 3/4	96 7/8	131	165 1/8	199 1/4	233 3/8	267 1/2	301 1/2	335 3/4	369 7/8	404	
UP TO 30" COMPACT BACKSTOP	30T050CBC	30T060CBC	30T070CBC	30T080CBC	30T085CBC	30T090CBC	30T100CBC	30T105CBC	30T110CBC	30T115CBC	30T120CBC	A040102 A040115
	30T050CYC	30T060CYC	30T070CYC	30T080CYC	30T085CYC	30T090CYC	30T100CYC	30T105CYC	30T110CYC	30T115CYC	30T120PYC	
L (in)	115 1/2	149 1/2	183 1/2	217 1/2	252	286	320	354	388 1/2	422 1/2	456 1/2	
P (in)	55 1/2	89 5/8	123 3/4	157 7/8	192	226 1/8	260 1/4	294 1/4	328 1/2	362 5/8	396 3/4	
UP TO 30" ASPHALT PCB BACKSTOP	30T050PBA	30T060PBA	30T070PBA	30T080PBA	30T085PBA	30T090PBA	30T100PBA	30T105PBA	30T110PBA	30T115PBA	30T120PBA	A040112
	30T050PYA	30T060PYA	30T070PYA	30T080PYA	30T085PYA	30T090PYA	30T100PYA	30T105PYA	30T110PYA	30T115PYA	30T120PYA	
L (in)	139 3/4	173 3/4	208 1/4	242 1/4	276 1/4	310 1/4	344 3/4	378 3/4	412 3/4	446 3/4	480 3/4	
P (in)	62 3/4	96 7/8	131	165 1/8	199 1/4	233 3/8	267 1/2	301 1/2	335 3/4	369 7/8	404	
UP TO 30" ASPHALT COMPACT BACKSTOP	30T050CBA	30T060CBA	30T070CBA	30T080CBA	30T085CBA	30T090CBA	30T100CBA	30T105CBC	30T110CBA	30T115CBA	30T120CBA	A040110
	30T050CYA	30T060CYA	30T070CYA	30T080CYA	30T085CYA	30T090CYA	30T100CYA	30T105CYA	30T110CYA	30T115CYA	30T120CYA	
L (in)	156 1/2	190 1/2	224 1/2	258 1/2	293	327	361	394	429 1/2	463 1/2	497 1/2	
P (in)	55 1/2	89 5/8	123 3/4	157 7/8	192	226 1/8	260 1/4	294 1/4	328 1/2	362 5/8	396 3/4	
36" PCB BACKSTOP	36T050PBC	36T060PBC	36T070PBC	36T080PBC	30T085PBC	36T090PBC	36T100PBC	36T105PBC	36T110PBC	36T115PBC	36T120PBC	A040105 A040117
	36T050PYC	36T060PYC	36T070PYC	36T080PYC	30T085PYC	36T090PYC	36T100PYC	36T105PYC	36T110PYC	36T115PYC	36T120PYC	
L (in)	85 1/2	119 1/2	154	188	222	256	290 1/2	324 1/5	358 1/2	392 1/2	426 1/2	
P (in)	62 3/4	96 7/8	131	165 1/8	199 1/4	233 3/8	267 1/2	301 1/5	335 3/4	369 7/8	404	
36" COMPACT BACKSTOP	36T050CBC	36T060CBC	36T070CBC	36T080CBC	36T085CBC	36T090CBC	36T100CBC	36T105CBC	36T110CBC	36T115CBC	36T120CBC	A040102 A040115
	36T050CYC	36T060CYC	36T070CYC	36T080CYC	36T085CYC	36T090CYC	36T100CYC	36T105CYC	36T110CYC	36T115CYC	36T120CYC	
L (in)	115 1/2	149 1/2	183 1/2	217 1/2	252	286	320	354	388 1/2	422 1/2	456 1/2	
P (in)	55 1/2	89 5/8	123 3/4	157 7/8	192	226 1/8	260 1/4	294 1/4	328 1/2	362 5/8	396 3/4	
36" ASPHALT PCB BACKSTOP	36T050PBA	36T060PBA	36T070PBA	36T080PBA	36T085PBA	36T090PBA	36T100PBA	36T105PBA	36T110PBA	36T115PBA	36T120PBA	A040112
	36T050PYA	36T060PYA	36T070PYA	36T080PYA	36T085PYA	36T090PYA	36T100PYA	36T105PYA	36T110PYA	36T115PYA	36T120PYA	
L (in)	139 3/4	173 3/4	208 1/4	242 1/4	276 1/4	310 1/4	344 3/4	378 3/4	412 3/4	446 3/4	480 3/4	
P (in)	62 3/4	96 7/8	131	165 1/8	199 1/4	233 3/8	267 1/2	301 1/4	335 3/4	369 7/8	404	
36" ASPHALT COMPACT BACKSTOP	36T050CBA	36T060CBA	36T070CBA	36T080CBA	36T085CBA	36T090CBA	36T100CBA	36T105CBA	36T110CBA	36T115CBA	36T120CBA	A040110
	36T050CBA	36T060CYA	36T070CYA	36T080CYA	36T085CYA	36T090CYA	36T100CYA	36T105CYA	36T110CYA	36T115CYA	36T120CYA	
L (in)	156 1/2	190 1/2	224 1/2	258 1/2	293	327	361	394	429 1/2	463 1/2	497 1/2	
P (in)	55 1/2	89 5/8	123 3/4	157 7/8	192	226 1/8	260 1/4	294 1/4	328 1/2	362 5/8	396 3/4	
UP TO 36" PCC PAD FLUSH MOUNT BACKSTOP	36T050FBC	36T060FBC	36T070FBC	36T080FBC	36T085FBC	36T090FBC	36T100FBC	36T105FBC	36T110FBC	36T115FBC	36T120FBC	A040420
	36T050FYC	36T060FYC	36T070FYC	36T080FYC	36T085FYC	36T090FYC	36T100FYC	36T105CYC	36T110FYC	36T115FYC	36T120FYC	
L (in)	83 1/2	117 1/2	151 1/2	185 1/2	220	254	288	322	356 1/2	390 1/2	424 1/2	
P (in)	59 1/2	93 1/2	127 1/2	161 1/2	196	230	264	298	332 1/2	366 1/2	400 1/2	
42" WF BACKSTOP	42T050WBC	42T060WBC	42T070WBC	42T080WBC		42T090WBC	42T100WBC	42T105WBC	42T110WBC			A040108
	42T050WYC	42T060WYC	42T070WYC	42T080WYC		42T090WYC	42T100WYC	42T105WYC	42T110WYC			
L (in)	125	159	193	227		295	329	363	397			
W1 (in)	44	44	44	44		44	44	44	44			
W2 (in)	51	51	51	51		51	51	51	51			
P (in)	65	99	133	167		235	269	303	337			
A (in)	22	22	22	22		22	22	22	22			
B (in)	31	31	31	31		31	31	31	31			
C (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
D (in)	16	16	16	16		16	16	16	16			
E (in) *	NA	NA	NA	NA		NA	NA	NA	NA			

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

SYSTEM WIDTH (IN)	SYSTEM SPEED CAPACITY (MPH) 30	35	40 TL-2	50	53	55	60 TL-3	65	70	72	75	DRAWING NUMBER
48" WF BACKSTOP	**48T050WBC**	**48T060WBC**	**48T070WBC**	**48T080WBC**		**48T090WBC**	**48T100WBC**	**48T105WBC**	**48T110WBC**			A040108
	48T050WYC	**48T060WYC**	**48T070WYC**	**48T080WYC**		**48T090WYC**	**48T100WYC**	**48T105WYC**	**48T110WYC**			
L (in)	125	159	193	227		295	329	363	397			
W1 (in)	44	44	44	44		44	44	44	44			
W2 (in)	51	51	51	51		51	51	51	51			
P (in)	65	99	133	167		235	269	303	337			
A (in)	22	22	22	22		22	22	22	22			
B (in)	31	31	31	31		31	31	31	31			
C (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
D (in)	16	16	16	16		16	16	16	16			
E (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
54" WF BACKSTOP	**54T050WBC**	**54T060WBC**	**54T070WBC**	**54T080WBC**		**54T090WBC**	**54T100WBC**	**54T105WBC**	**54T110WBC**			A040108
	54T050WYC	**54T060WYC**	**54T070WYC**	**54T080WYC**		**54T090WYC**	**54T100WYC**	**54T105WYC**	**54T110WYC**			
L (in)	125	159	193	227		295	329	363	397			
W1 (in)	44	44	44	44		44	44	44	44			
W2 (in)	51	51	51	51		51	51	51	51			
P (in)	65	99	133	167		235	269	303	337			
A (in)	22	22	22	22		22	22	22	22			
B (in)	31	31	31	31		31	31	31	31			
C (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
D (in)	16	16	16	16		16	16	16	16			
E (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
60" WF BACKSTOP	**60T050WBC**	**60T060WBC**	**60T070WBC**	**60T080WBC**		**60T090WBC**	**60T100WBC**	**60T105WBC**	**60T110WBC**			A040108
	60T050WYC	**60T060WYC**	**60T070WYC**	**60T080WYC**		**60T090WYC**	**60T100WYC**	**60T105WYC**	**60T110WYC**			
L (in)	125	159	193	227		295	329	363	397			
W1 (in)	44	44	44	44		44	44	44	44			
W2 (in)	51	51	51	51		51	51	51	51			
P (in)	65	99	133	167		235	269	303	337			
A (in)	22	22	22	22		22	22	22	22			
B (in)	31	31	31	31		31	31	31	31			
C (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
D (in)	16	16	16	16		16	16	16	16			
E (in) *	NA	NA	NA	NA		NA	NA	NA	NA			
66" WF BACKSTOP		**66T060WBC**	**66T070WBC**	**66T080WBC**		**66T090WBC**	**66T100WBC**	**66T105WBC**	**66T110WBC**			A040108
		66T060WYC	**66T070WYC**	**66T080WYC**		**66T090WYC**	**66T100WYC**	**66T106WYC**	**66T110WYC**			
L (in)		125	159	193		261	295	329	363			
W1 (in)		69	44	44		44	44	44	44			
W2 (in)		75	75	75		75	75	75	75			
P (in)		65	99	133		201	235	269	303			
A (in)		48 5/8	22	22		22	22	22	22			
B (in)		54 3/4	54 3/4	54 3/4		54 3/4	54 3/4	54 3/4	54 3/4			
C (in) *		NA	27 3/4	27 3/4		27 3/4	27 3/4	27 3/4	27 3/4			
D (in)		42 5/8	16	16		16	16	16	16			
E (in) *		NA	41 3/4	41 3/4		41 3/4	41 3/4	41 3/4	41 3/4			
72" WF BACKSTOP		**72T060WBC**	**72T070WBC**	**72T080WBC**		**72T090WBC**	**72T100WBC**	**72T105WBC**	**72T110WBC**			A040108
		72T060WYC	**72T070WYC**	**72T080WYC**		**72T090WYC**	**72T100WYC**	**72T105WYC**	**72T110WYC**			
L (in)		125	159	193		227	295	329	329			
W1 (in)		69	69	44		44	44	44	44			
W2 (in)		75	75	75		75	75	75	75			
P (in)		65	99	133		167	235	269	269			
A (in)		48 5/8	48 5/8	22		22	22	22	22			
B (in)		54 3/4	54 3/4	54 3/4		54 3/4	54 3/4	54 3/4	54 3/4			
C (in) *		NA	NA	27 3/4		27 3/4	27 3/4	27 3/4	27 3/4			
D (in)		42 5/8	42 5/8	16		16	16	16	16			
E (in) *		NA	NA	41 3/4		41 3/4	41 3/4	41 3/4	41 3/4			

SYSTEM WIDTH (IN)	SYSTEM SPEED CAPACITY (MPH) 30	35	40 TL-2	50	53	55	60 TL-3	65	70	72	75	DRAWING NUMBER
78" WF BACKSTOP		78T060WBC	78T070WBC	78T080WBC		78T090WBC	78T100WBC	78T105WBC	78T110WBC			A040108
		78T060WYC	78T070WYC	78T080WYC		78T090WYC	78T100WYC	78T105WYC	78T110WYC			
L (in)		125	159	193		227	295	329	329			
W1 (in)		69	69	69		44	44	44	44			
W2 (in)		75	75	75		75	75	75	75			
P (in)		65	99	133		167	235	269	269			
A (in)		48 5/8	48 5/8	48 5/8		22	22	22	22			
B (in)		54 3/4	54 3/4	54 3/4		54 3/4	54 3/4	54 3/4	54 3/4			
C (in) *		NA	NA	NA		27 3/4	27 3/4	27 3/4	27 3/4			
D (in)		42 5/8	42 5/8	42 5/8		16	16	16	16			
E (in) *		NA	NA	NA		41 3/4	41 3/4	41 3/4	41 3/4			
84" WF BACKSTOP			84T070WBC	84T080WBC		84T090WBC	84T100WBC	84T105WBC	84T110WBC			A040108
			84T070WYC	84T080WYC		84T090WYC	84T100WYC	84T105WYC	84T110WYC			
L (in)			159	193		227	295	329	329			
W1 (in)			69	69		69	44	44	44			
W2 (in)			75	75		75	75	75	75			
P (in)			99	133		167	235	269	269			
A (in)			48 5/8	48 5/8		48 5/8	22	22	22			
B (in)			54 3/4	54 3/4		54 3/4	54 3/4	54 3/4	54 3/4			
C (in) *			NA	NA		NA	27 3/4	27 3/4	27 3/4			
D (in)			42 5/8	42 5/8		42 5/8	16	16	16			
E (in) *			NA	NA		NA	41 3/4	41 3/4	41 3/4			
90" WF BACKSTOP			90T070WBC	90T080WBC		90T090WBC	90T100WBC	90T105WBC	90T110WBC			A040108
			90T070WYC	90T080WYC		90T090WYC	90T100WYC	90T105WYC	90T110WYC			
L (in)			159	193		227	295	329	329			
W1 (in)			69	69		69	44	44	44			
W2 (in)			99	99		99	99	99	99			
P (in)			99	133		167	235	269	269			
A (in)			48 5/8	48 5/8		48 5/8	22	22	22			
B (in)			78 5/8	78 5/8		78 5/8	78 5/8	78 5/8	78 5/8			
C (in) *			51 5/8	51 5/8		51 5/8	27 3/4	27 3/4	27 3/4			
D (in)			42 5/8	42 5/8		42 5/8	16	16	16			
E (in) *			65 5/8	65 5/8		65 5/8	65 5/8	65 5/8	65 5/8			
96" WF BACKSTOP			96T070WBC	96T080WBC		96T090WBC	96T100WBC	96T105WBC	96T110WBC			A040108
			96T070WYC	96T080WYC		96T090WYC	96T100WYC	96T105WYC	96T110WYC			
L (in)			159	193		227	295	329	329			
W1 (in)			93	69		69	69	69	44			
W2 (in)			99	99		99	99	99	99			
P (in)			99	133		167	235	269	269			
A (in)			72 5/8	48 5/8		48 5/8	48 5/8	22	22			
B (in)			78 5/8	78 5/8		78 5/8	78 5/8	78 5/8	78 5/8			
C (in) *			NA	51 5/8		51 1/3	51 5/8	27 3/4	27 3/4			
D (in) *			66 5/8	42 5/8		42 5/8	42 5/8	16	16			
E (in) *			NA	65 5/8		65 5/8	65 5/8	65 5/8	65 5/8			
102" WF BACKSTOP									102T110WBC			A040108
									102T110WYC			
L (in)									329			
W1 (in)									69			
W2 (in)									99			
P (in)									269			
A (in)									48 5/8			
B (in)									78 5/8			
C (in) *									51 5/8			
D (in)									42 5/8			
E (in) *									65 5/8			

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

UNIVERSAL TAU-II FOUNDATION DIMENSIONS

METRIC UNITS - MILLIMETERS

SYSTEM WIDTH (mm)	SYSTEM SPEED CAPACITY (KPH) 50	60	70 TL-2	80	85	90	100 TL-3	105	110	115	120	DRAWING NUMBER
UP TO 760mm PCB BACKSTOP	30T050PBC	30T060PBC	30T070PBC	30T080PBC	30T085PBC	30T090PBC	30T100PBC	30T105PBC	30T110PBC	30T115PBC	30T120PBC	A040105 A040117
	30T050PYC	30T060PYC	30T070PYC	30T080PYC	30T085PYC	30T090PYC	30T100PYC	30T105PYC	30T110PYC	30T115PYC	30T120PYC	
L (mm)	2172	3035	3912	4775	5639	6502	7379	8242	9106	9970	10833	
P (mm)	1594	2461	3327	4194	5061	5928	6795	7661	8528	9395	10262	
UP TO 760mm COMPACT BACKSTOP	30T050CBC	30T060CBC	30T070CBC	30T080CBC	30T085CBC	30T090CBC	30T100CBC	30T105CBC	30T110CBC	30T115CBC	30T120CBC	A040102 A040115
	30T050CYC	30T060CYC	30T070CYC	30T080CYC	30T085CYC	30T090CYC	30T100CYC	30T105CYC	30T110CYC	30T115CYC	30T120CYC	
L (mm)	2934	3797	4661	5525	6401	7264	8128	8991	9868	10732	11595	
P (mm)	1410	2276	3143	4010	4877	5744	6610	7477	8344	9211	10077	
UP TO 760mm ASPHALT PCB BACKSTOP	30T050PBA	30T060PBA	30T070PBA	30T080PBA	30T085PBA	30T090PBA	30T100PBA	30T105PBA	30T110PBA	30T115PBA	30T120PBA	A040112
	30T050PYA	30T060PYA	30T070PYA	30T080PYA	30T085PYA	30T090PYA	30T100PYA	30T105PYA	30T110PYA	30T115PYA	30T120PYA	
L (mm)	3550	4413	5290	6153	7017	7880	8757	9620	10484	11347	12211	
P (mm)	1594	2461	3327	4194	5061	5928	6795	7661	8528	9395	10262	
UP TO 760mm ASPHALT COMPACT BACKSTOP	30T050CBA	30T060CBA	30T070CBA	30T080CBA	30T085CBA	30T090CBA	30T100CBA	30T105CBA	30T110CBA	30T115CBA	30T120CBA	A040110
	30T050CYA	30T060CYA	30T070CYA	30T080CYA	30T085CYA	30T090CYA	30T100CYA	30T105CYA	30T110CYA	30T115CYA	30T120CYA	
L (mm)	3975	4839	5702	6566	7442	8306	9169	10033	10909	11773	12637	
P (mm)	1410	2276	3143	4010	4877	5744	6610	7477	8344	9211	10077	
915mm PCB BACKSTOP	36T050PBC	36T060PBC	36T070PBC	36T080PBC	36T085PBC	36T090PBC	36T100PBC	36T105PBC	36T110PBC	36T115PBC	36T120PBC	A040105 A040117
	36T050PYC	33T060PYC	36T070PYC	36T080PYC	36T085PYC	36T090PYC	36T100PYC	36T105PYC	36T110PYC	36T115PYC	36T120PYC	
L (mm)	2172	3035	3912	4775	5639	6502	7379	8242	9106	9970	10833	
P (mm)	1594	2461	3327	4194	5061	5928	6795	7661	8528	9395	10262	
915mm COMPACT BACKSTOP	36T050CBC	36T060CBC	36T070CBC	36T080CBC	36T085CBC	36T090CBC	36T100CBC	36T105CBC	36T110CBC	36T115CBC	36T120CBC	A040102 A040115
	36T050CYC	36T060CYC	36T070CYC	36T080CYC	36T085CYC	36T090CYC	36T100CYC	36T105CYC	36T110CYC	36T115CYC	36T120CYC	
L (mm)	2934	3797	4661	5525	6401	7264	8128	8991	9868	10732	11595	
P (mm)	1410	2276	3143	4010	4877	5744	6610	7477	8344	9211	10077	
915mm ASPHALT PCB BACKSTOP	36T050PBA	36T060PBA	36T070PBA	36T080PBA	36T085PBA	36T090PBA	36T100PBA	36T105PBA	36T110PBA	36T115PBA	36T120PBA	A040112
	36T050PYA	36T060PYA	36T070PYA	36T080PYA	36T085PYA	36T090PYA	36T100PYA	36T105PYA	36T110PYA	36T115PYA	36T120PYA	
L (mm)	3550	4413	5290	6153	7017	7880	8757	9620	10484	11347	12211	
P (mm)	1594	2461	3327	4194	5061	5928	6795	7661	8528	9395	10262	
915mm ASPHALT COMPACT BACKSTOP	36T050CBA	36T060CBA	36T070CBA	36T080CBA	36T085CBA	36T090CBA	36T100CBA	36T105CBA	36T110CBA	36T115CBC	36T120CBC	A040110
	36T050CYA	36T060CYA	36T070CYA	36T080CYA	36T085CYC	36T090CYA	36T100CYA	36T105CBC	36T110CYA	36T115CYA	36T120CYA	
L (mm)	3975	4839	5702	6566	7442	8306	9169	10033	10909	11773	12637	
P (mm)	1410	2276	3143	4010	4877	5744	6610	7477	8344	9211	10077	
UP TO 915mm PCC PAD FLUSH MOUNT BACKSTOP	36T050FBC	36T060FBC	36T070FBC	36T080FBC	36T085FBC	36T090FBC	36T100FBC	36T105FBC	36T110FBC	36T115FBC	36T120FBC	A040420
	36T050FYC	36T060FYC	36T070FYC	36T080FYC	36T085FYC	36T090FYC	36T100FYC	36T105FYC	36T110FYC	36T115FYC	36T120FYC	
L (mm)	2121	2985	3848	4712	5588	6452	7315	8179	9055	9919	10782	
P (mm)	1511	2375	3239	4102	4978	5842	6706	7569	8446	9309	10173	
1070mm WF BACKSTOP	42T050WBC	42T060WBC	42T070WBC	42T080WBC		42T090WBC	42T100WBC	42T105WBC	42T110WBC			A040108
	42T050WYC	42T060WYC	42T070WYC	42T080WYC		42T090WYC	42T100WYC	42T105WYC	42T110WYC			
L (mm)	3175	4039	4902	5766		7493	8357	9220	10084			
W1 (mm)	1118	1118	1118	1118		1118	1118	1118	1118			
W2 (mm)	1295	1295	1295	1295		1295	1295	1295	1295			
P (mm)	1651	2515	3378	4242		5969	6833	7696	8560			
A (mm)	559	559	559	559		559	559	559	559			
B (mm)	787	787	787	787		787	787	787	787			
C (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
D (mm)	406	406	406	406		406	406	406	406			
E (mm)	NA	NA	NA	NA		NA	NA	NA	NA			

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

	SYSTEM SPEED CAPACITY (KPH)											
SYSTEM WIDTH (mm)	50	60	70 TL-2	80	85	90	100 TL-3	105	110	115	120	DRAWING NUMBER
1220mm WF BACKSTOP	**48T050WBC**	**48T060WBC**	**48T070WBC**	**48T080WBC**		**48T090WBC**	**48T100WBC**	**48T105WBC**	**48T110WBC**			A040108
	48T050WYC	**48T060WYC**	**48T070WYC**	**48T080WYC**		**48T090WYC**	**48T100WYC**	**48T105WYC**	**48T110WYC**			
L (mm)	3175	4039	4902	5766		7493	8357	9220	10084			
W1 (mm)	1118	1118	1118	1118		1118	1118	118	1118			
W2 (mm)	1295	1295	1295	1295		1295	1295	1295	1295			
P (mm)	1651	2515	3378	4242		5969	6833	7696	8560			
A (mm)	559	559	559	559		559	559	559	559			
B (mm)	787	787	787	787		787	787	787	787			
C (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
D (mm)	406	406	406	406		406	406	406	406			
E (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
1370mm WF BACKSTOP	**54T050WBC**	**54T060WBC**	**54T070WBC**	**54T080WBC**		**54T090WBC**	**54T100WBC**	**54T105WBC**	**54T110WBC**			A040108
	54T050WYC	**54T060WYC**	**54T070WYC**	**54T080WYC**		**54T090WYC**	**54T100WYC**	**54T105WYC**	**54T110WYC**			
L (mm)	3175	4039	4902	5766		7493	8357	9220	10084			
W1 (mm)	1118	1118	1118	1118		1118	1118	118	1118			
W2 (mm)	1295	1295	1295	1295		1295	1295	1295	1295			
P (mm)	1651	2515	3378	4242		5969	6833	7696	8560			
A (mm)	559	559	559	559		559	559	559	559			
B (mm)	787	787	787	787		787	787	785	787			
C (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
D (mm)	406	406	406	406		406	406	406	406			
E (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
1525mm WF BACKSTOP	**60T050WBC**	**60T060WBC**	**60T070WBC**	**60T080WBC**		**60T090WBC**	**60T100WBC**	**60T105WBC**	**60T110WBC**			A040108
	60T050WYC	**60T060WYC**	**60T070WYC**	**60T080WYC**		**60T090WYC**	**60T100WYC**	**60T105WYC**	**60T110WYC**			
L (mm)	3175	4039	4902	5766		7493	8357	9220	10084			
W1 (mm)	1118	1118	1118	1118		1118	1118	118	1118			
W2 (mm)	1295	1295	1295	1295		1295	1295	1295	1295			
P (mm)	1651	2515	3378	4242		5969	6833	7696	8560			
A (mm)	559	559	559	559		559	559	559	559			
B (mm)	787	787	787	787		787	787	787	787			
C (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
D (mm)	406	406	406	406		406	406	406	406			
E (mm)	NA	NA	NA	NA		NA	NA	NA	NA			
1675mm WF BACKSTOP		**66T060WBC**	**66T070WBC**	**66T080WBC**		**66T090WBC**	**66T100WBC**	**66T105WBC**	**66T110WBC**			A040108
		66T060WYC	**66T070WYC**	**66T080WYC**		**66T090WYC**	**66T100WYC**	**66T105WYC**	**66T110WYC**			
L (mm)		3175	4039	4902		6629	7493	8357	9220			
W1 (mm)		1753	1118	1118		1118	1118	1118	1118			
W2 (mm)		1905	1905	1905		1905	1905	1905	1905			
P (mm)		1651	2515	3378		5105	5969	6833	7696			
A (mm)		1235	559	559		559	559	559	559			
B (mm)		1391	1391	1391		1391	1391	1391	1391			
C (mm)		NA	705	705		705	705	705	705			
D (mm)		1083	406	406		406	406	406	406			
E (mm)		NA	1060	1060		1060	1060	1060	1060			
1830mm WF BACKSTOP		**72T060WBC**	**72T070WBC**	**72T080WBC**		**72T090WBC**	**72T100WBC**	**72T105WBC**	**72T110WBC**			A040108
		72T060WYC	**72T070WYC**	**72T080WYC**		**72T090WYC**	**72T100WYC**	**72T105WYC**	**72T110WYC**			
L (mm)		3175	4039	4902		5766	7493	8357	8357			
W1 (mm)		1753	1753	1118		1118	1118	115	1118			
W2 (mm)		1905	1905	1905		1905	1905	1905	1905			
P (mm)		1651	2515	3378		4242	5969	6833	6833			
A (mm)		1235	1235	559		559	559	556	559			
B (mm)		1391	1391	1391		1391	1391	1391	1391			
C (mm)		NA	NA	705		705	705	705	705			
D (mm)		1083	1083	406		406	406	406	406			
E (mm)		NA	NA	1060		1060	1060	1060	1060			

BARRIER SYSTEMS
A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

SYSTEM WIDTH (mm)	50	60	70 TL-2	80	85	90	100 TL-3	105	110	115	120	DRAWING NUMBER
					SYSTEM SPEED CAPACITY (KPH)							
1980mm WF BACKSTOP		**78T060WBC**	**78T070WBC**	**78T080WBC**		**78T090WBC**	**78T100WBC**	**78T105WBC**	**78T110WBC**			**A040108**
		78T060WYC	**78T070WYC**	**78T080WYC**		**78T090WYC**	**78T100WYC**	**78T105WYC**	**78T110WYC**			
L (mm)		3175	4039	4902		5766	7493	8357	8357			
W1 (mm)		1753	1753	1753		1118	1118	1118	1118			
W2 (mm)		1905	1905	1905		1905	1905	1905	1905			
P (mm)		1651	2515	3378		4242	5969	6833	6833			
A (mm)		1235	1235	1235		559	559	559	559			
B (mm)		1391	1391	1391		1391	1391	1391	1391			
C (mm)		NA	NA	NA		705	705	705	705			
D (mm)		1083	1083	1083		406	406	406	406			
E (mm)		NA	NA	NA		1060	1060	1060	1060			
2135mm WF BACKSTOP			**84T070WBC**	**84T080WBC**		**84T090WBC**	**84T100WBC**	**84T105WBC**	**84T110WBC**			**A040108**
			84T070WYC	**84T080WYC**		**84T090WYC**	**84T100WYC**	**84T105WYC**	**84T110WYC**			
L (mm)			4039	4902		5766	7493	8357	8357			
W1 (mm)			1753	1753		1753	1118	118	1118			
W2 (mm)			1905	1905		1905	1905	1905	1905			
P (mm)			2515	3378		4242	5969	6833	6833			
A (mm)			1235	1235		1235	559	559	559			
B (mm)			1391	1391		1391	1391	1391	1391			
C (mm)			NA	NA		NA	705	705	705			
D (mm)			1083	1083		1083	406	406	406			
E (mm)			NA	NA		NA	1060	1060	1060			
2285mm WF BACKSTOP			**90T070WBC**	**90T080WBC**		**90T090WBC**	**90T100WBC**	**90T105WBC**	**90T110WBC**			**A040108**
			90T070WYC	**90T080WYC**		**90T090WYC**	**90T100WYC**	**90T105WYC**	**90T110WYC**			
L (mm)			4039	4902		5766	7493	8357	8357			
W1 (mm)			1753	1753		1753	1118	1118	1118			
W2 (mm)			2515	2515		2515	2515	2515	2515			
P (mm)			2515	3378		4242	5969	6633	6833			
A (mm)			1235	1235		1235	559	559	559			
B (mm)			1997	1997		1997	1997	1997	1997			
C (mm)			1311	1311		1311	705	705	705			
D (mm)			1083	1083		1083	406	406	406			
E (mm)			1667	1667		1667	1667	1667	1667			
2440mm WF BACKSTOP			**96T070WBC**	**96T080WBC**		**96T090WBC**	**96T100WBC**	**96T105WBC**	**96T110WBC**			**A040108**
			96T070WYC	**96T080WYC**		**96T090WYC**	**96T100WYC**	**96T105WYC**	**96T110WYC**			
L (mm)			4039	4902		5766	7493	8357	8357			
W1 (mm)			2362	1753		1753	1753	118	1118			
W2 (mm)			2515	2515		2515	2515	2515	2515			
P (mm)			2515	3378		4242	5969	6833	6833			
A (mm)			1845	1235		1235	1235	559	559			
B (mm)			1997	1997		1997	1997	1997	1997			
C (mm)			NA	1311		1305	1311	705	705			
D (mm)			1692	1083		1083	1083	406	406			
E (mm)			NA	1667		1667	1667	1667	1667			
2590mm WF BACKSTOP									**102T110WBC**			**A040108**
									102T110WYC			
L (mm)									8357			
W1 (mm)									1753			
W2 (mm)									2515			
P (mm)									6833			
A (mm)									1235			
B (mm)									1997			
C (mm)									1311			
D (mm)									1083			
E (mm)									1667			

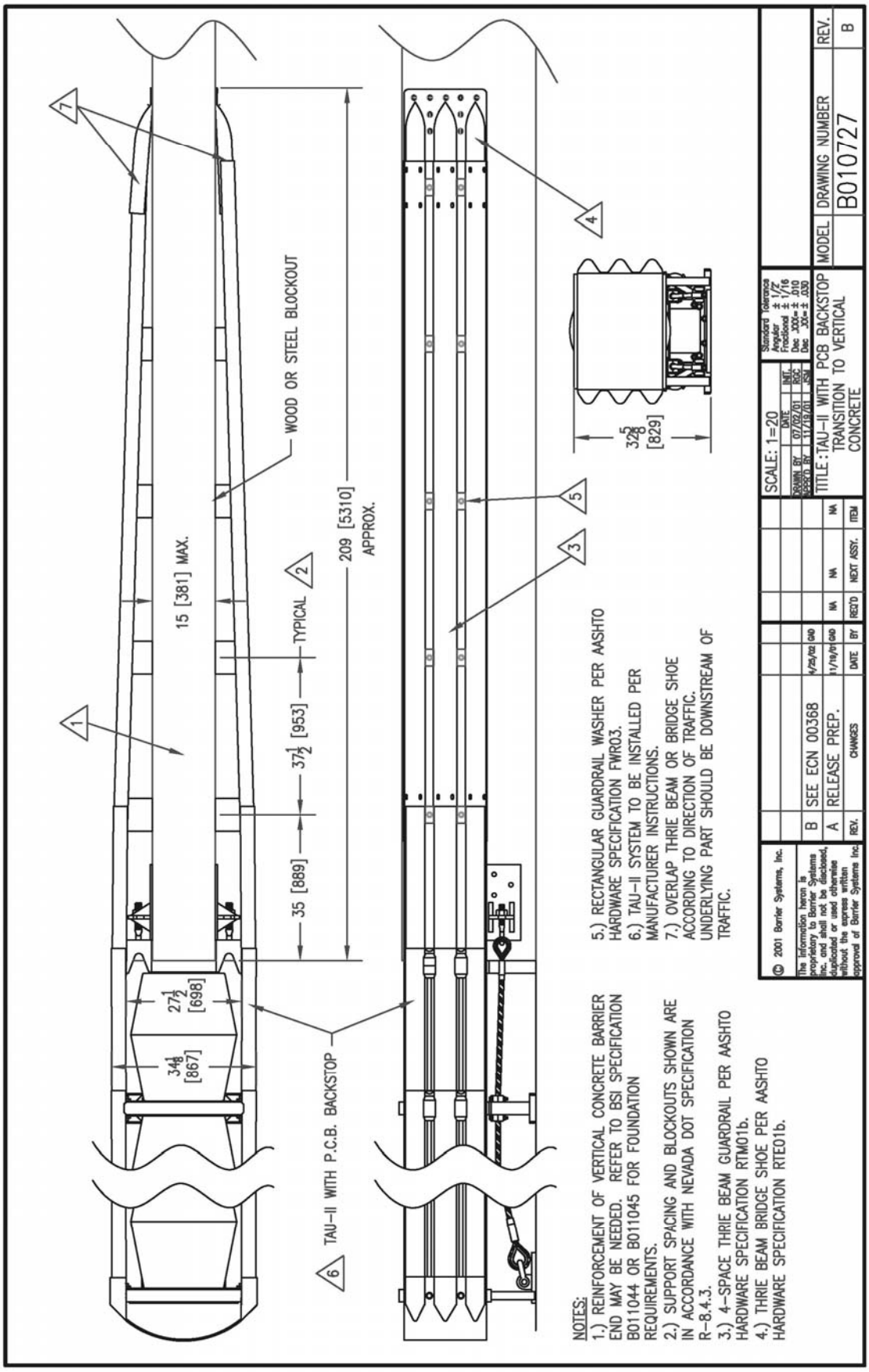
APPENDIX D
TRANSITIONS

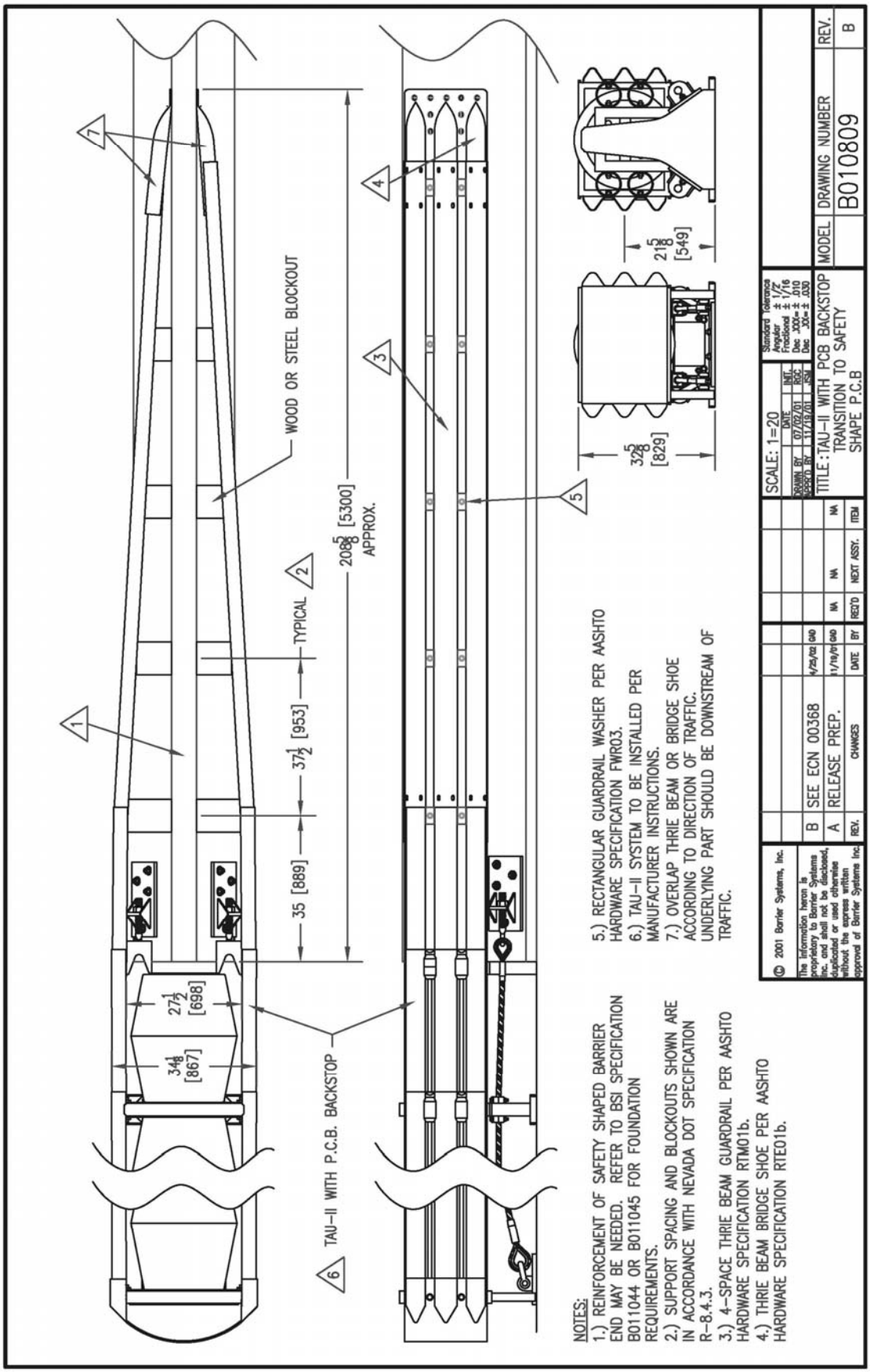
There are a variety of transition options available for the TAU-II system. The system was designed to be compatible with a variety of generic transitions already available to the industry.

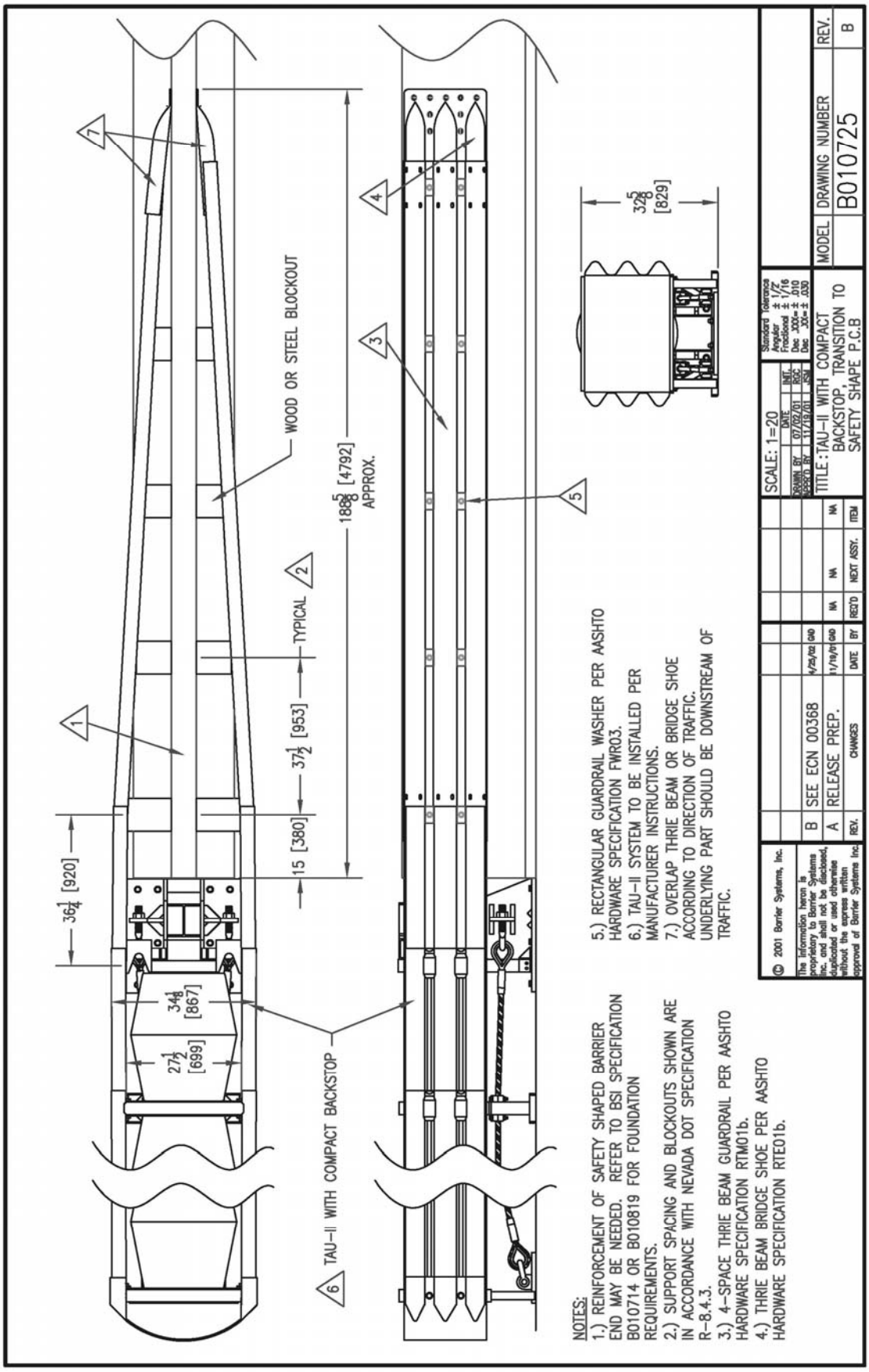
Placement and installation of the TAU-II system and transitions must be accomplished in accordance with the guidelines and recommendations set forth in the "AASHTO Roadside Design Guide," FHWA memoranda and other state and local standards.

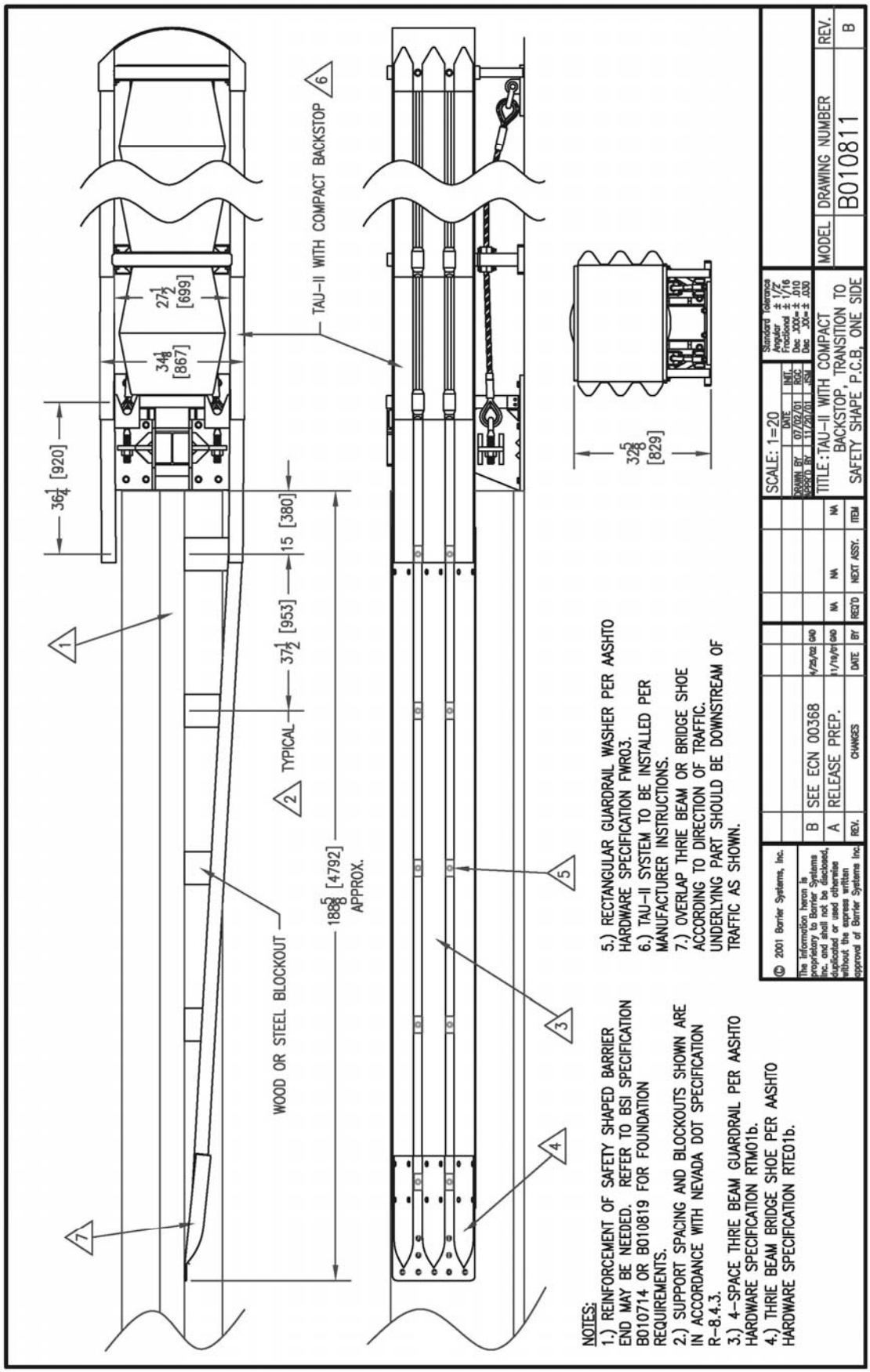
There are different transition configurations depending on which backstop you are using (Compact or P.C.B.). Transition options for either of the backstop systems are shown in the following drawings.

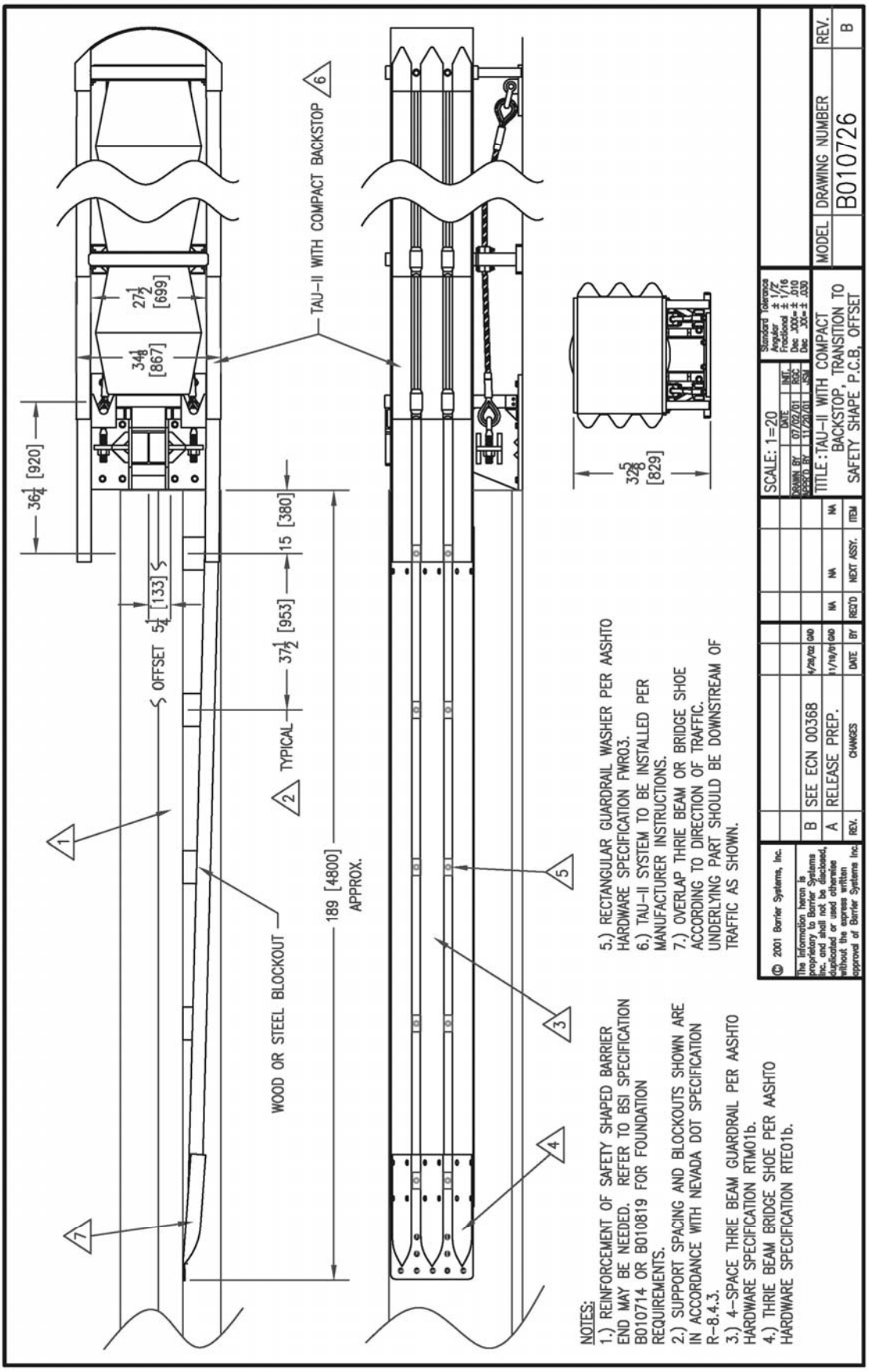
DRAWINGS

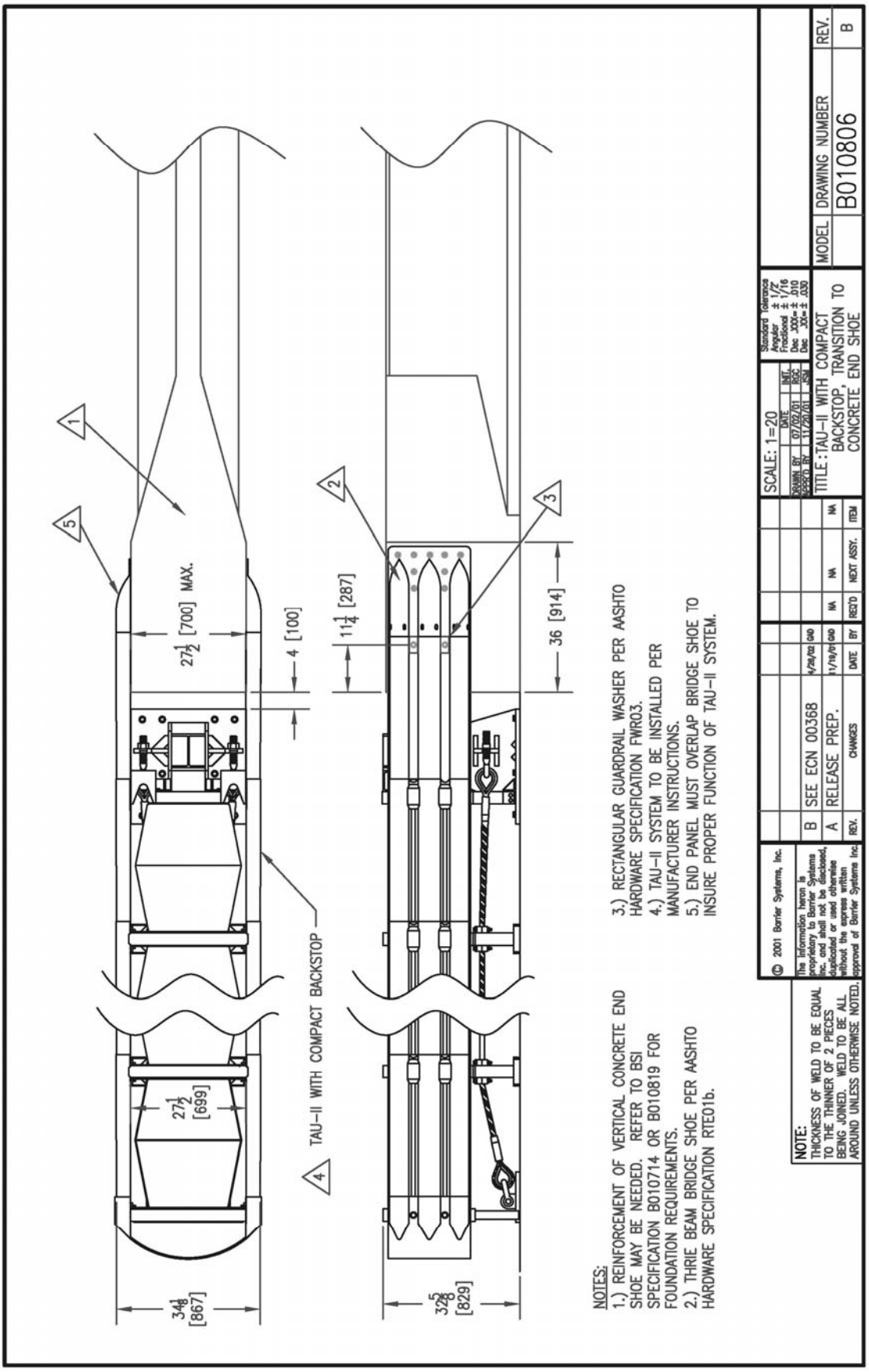

15 [381] MAX.
WOOD OR STEEL BLOCKOUT
TYPICAL
209 [5310] APPROX.
35 [889]
37½ [953]
27½ [698]
34⅛ [867]
32⅝ [829]
TAU-II WITH P.C.B. BACKSTOP
1
2
3
4
5
6
7
NOTES:
1.) REINFORCEMENT OF VERTICAL CONCRETE BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B011044 OR B011045 FOR FOUNDATION REQUIREMENTS.
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.
© 2001 Barrier Systems, Inc.
The information hereon is proprietary to Barrier Systems Inc. and shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY
B SEE ECN 00368 4/25/02 GAD
A RELEASE PREP. 11/14/01 GAD
REQ'D NEXT ASSY. ITEM
NA NA NA
SCALE: 1=20
DRAWN BY DATE
GAD 07/02/01
CHKD BY
GAD 11/19/01
INIT.
RGC
JSM
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030
TITLE: TAU-II WITH PCB BACKSTOP TRANSITION TO VERTICAL CONCRETE
MODEL
DRAWING NUMBER
B010727
REV.
B

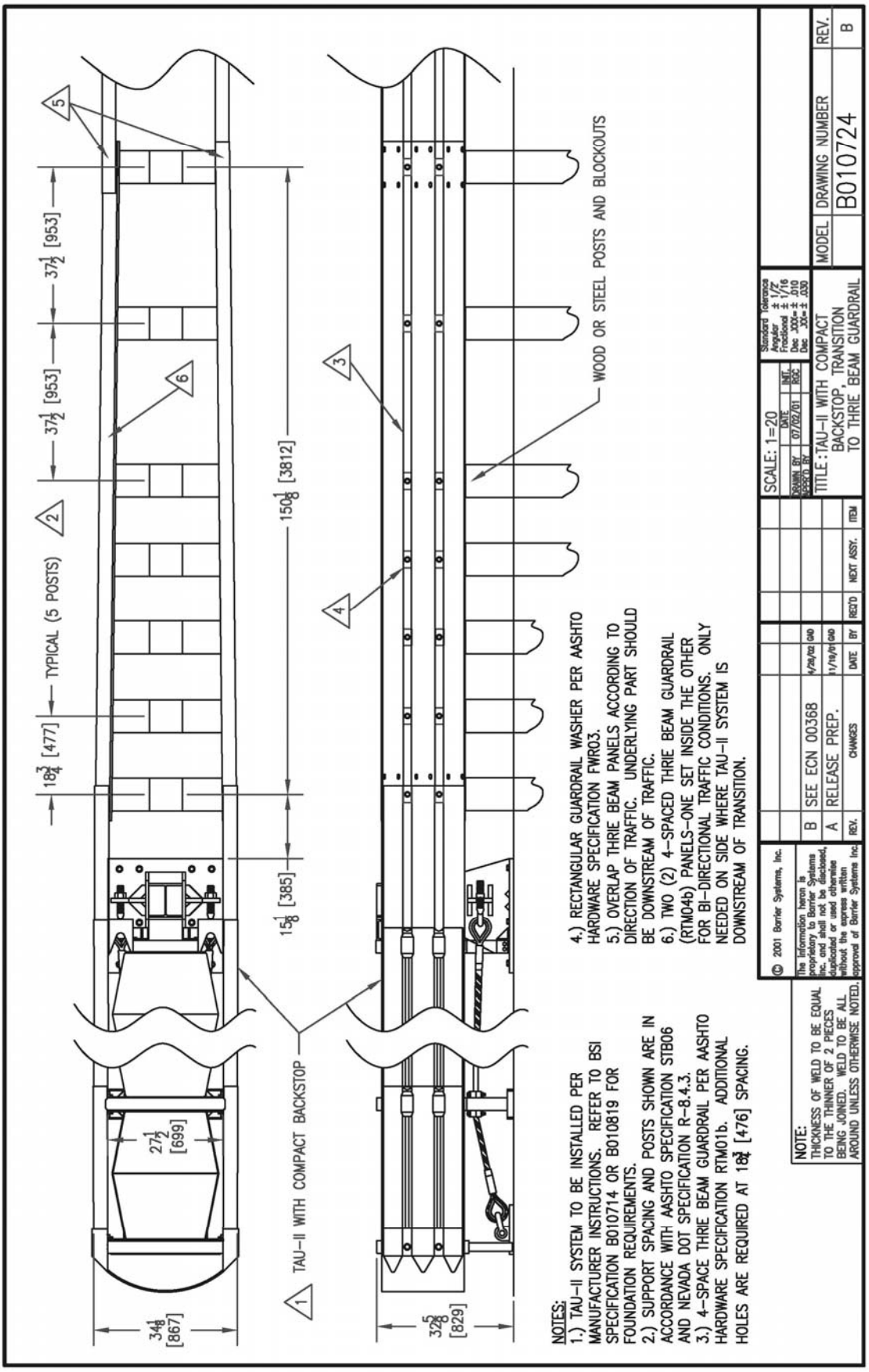

WOOD OR STEEL BLOCKOUT
TYPICAL
APPROX.
35 [889]
37½ [953]
208⅝ [5300]
34⅛ [867]
27½ [698]
TAU-II WITH P.C.B. BACKSTOP
32⅝ [829]
21⅝ [549]
NOTES:
1.) REINFORCEMENT OF SAFETY SHAPED BARRIER END MAY BE NEEDED. REFER TO BSI SPECIFICATION B011044 OR B011045 FOR FOUNDATION REQUIREMENTS.
2.) SUPPORT SPACING 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.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems Inc. and shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY
B SEE ECN 00368 4/25/02 GMD
A RELEASE PREP. 11/19/01 GMD
REQ'D NEXT ASSY. ITEM
SCALE: 1=20
DRAWN BY 07/02/01
CHECK BY 11/19/01
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX=± .010
Dec .XXX=± .030
TITLE: TAU-II WITH PCB BACKSTOP TRANSITION TO SAFETY SHAPE P.C.B
MODEL
DRAWING NUMBER B010809
REV. B


WOOD OR STEEL BLOCKOUT
TYPICAL
188⅝ [4792] APPROX.
36¼ [920]
34⅛ [867]
27½ [699]
37½ [953]
15 [380]
32⅝ [829]
TAU-II WITH COMPACT BACKSTOP
1
2
3
4
5
6
7
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.
© 2001 Barrier Systems, Inc.
The information heron is proprietary to Barrier Systems Inc. and shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY
B SEE ECN 00368 4/25/02 GAD
A RELEASE PREP. 11/14/01 GAD
REQ'D NEXT ASSY. ITEM
NA NA NA
SCALE: 1=20
DRAWN BY DATE
GAD 07/02/01
CHKD BY 11/19/01
INIT. RGC JSM
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030
TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B
MODEL DRAWING NUMBER REV.
B010725 B


TAU-II WITH COMPACT BACKSTOP
WOOD OR STEEL BLOCKOUT
TYPICAL
APPROX.
15 [380]
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.
SCALE: 1=20
TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B, ONE SIDE
MODEL
DRAWING NUMBER
B010811
REV.
B
SEE ECN 00368
RELEASE PREP.
CHANGES
© 2001 Barrier Systems, Inc.


TAU-II WITH COMPACT BACKSTOP
WOOD OR STEEL BLOCKOUT
OFFSET 5¼ [133]
TYPICAL 37½ [953]
15 [380]
189 [4800] APPROX.
36¼ [920]
27½ [699]
34⅛ [867]
32⅝ [829]
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.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems and may not be reproduced, disclosed or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM
B SEE ECN 00368 4/29/02 GAD NA NA NA
A RELEASE PREP. 11/19/01 GAD NA NA NA
SCALE: 1=20
DRAWN BY DATE INIT.
APPRD. BY 07/02/01 RGC
11/20/01 KSN
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX=± .010
Dec .XX=± .030
TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO SAFETY SHAPE P.C.B. OFFSET
MODEL DRAWING NUMBER REV.
B010726 B


1
2
3
4 TAU-II WITH COMPACT BACKSTOP
5
27½ [700] MAX.
4 [100]
11¼ [287]
36 [914]
34⅛ [867]
27½ [699]
32⅝ [829]
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.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems and may not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM
B SEE ECN 00368 4/29/02 GAD NA NA NA
A RELEASE PREP. 11/19/01 GAD NA NA NA
SCALE: 1=20
DRAWN BY DATE
CHKD. BY 07/02/01 INT.
11/20/01 ROC
ASH
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .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	4/29/02	GAD			
A	RELEASE PREP.	11/19/01	GAD			

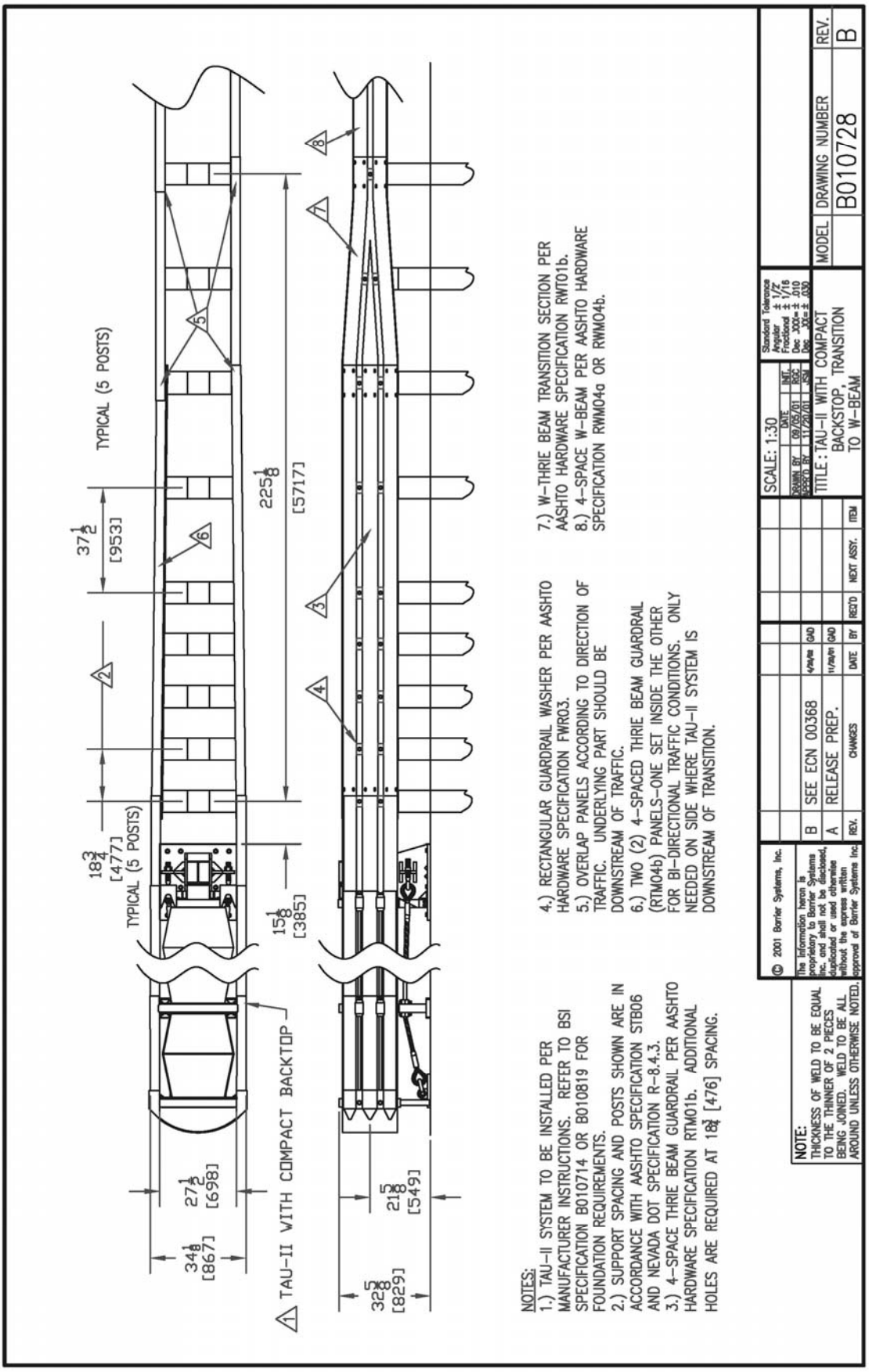
SCALE: 1=20

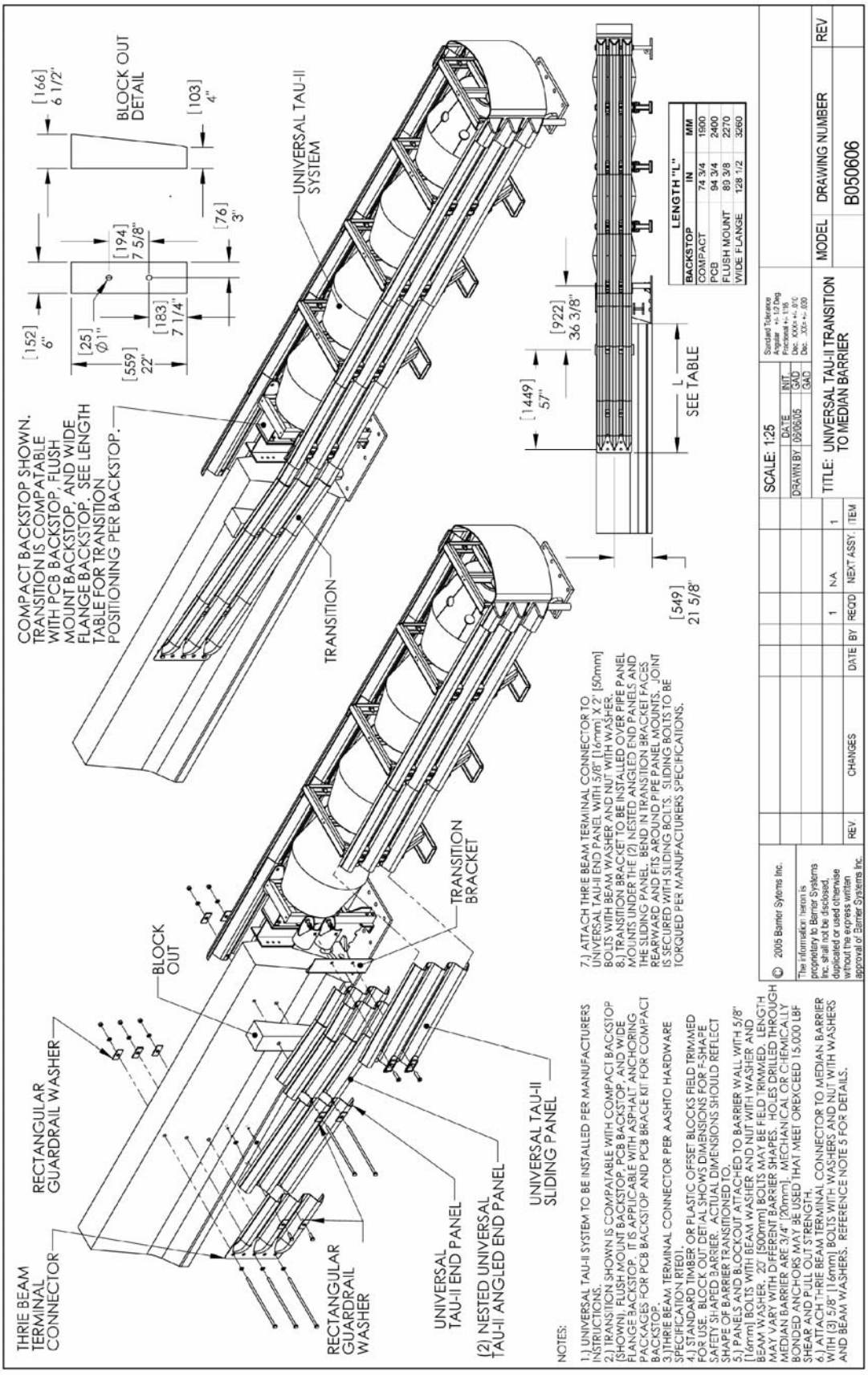
	DATE	INIT.
DRAWN BY	07/02/01	RGC
APPRD. BY		

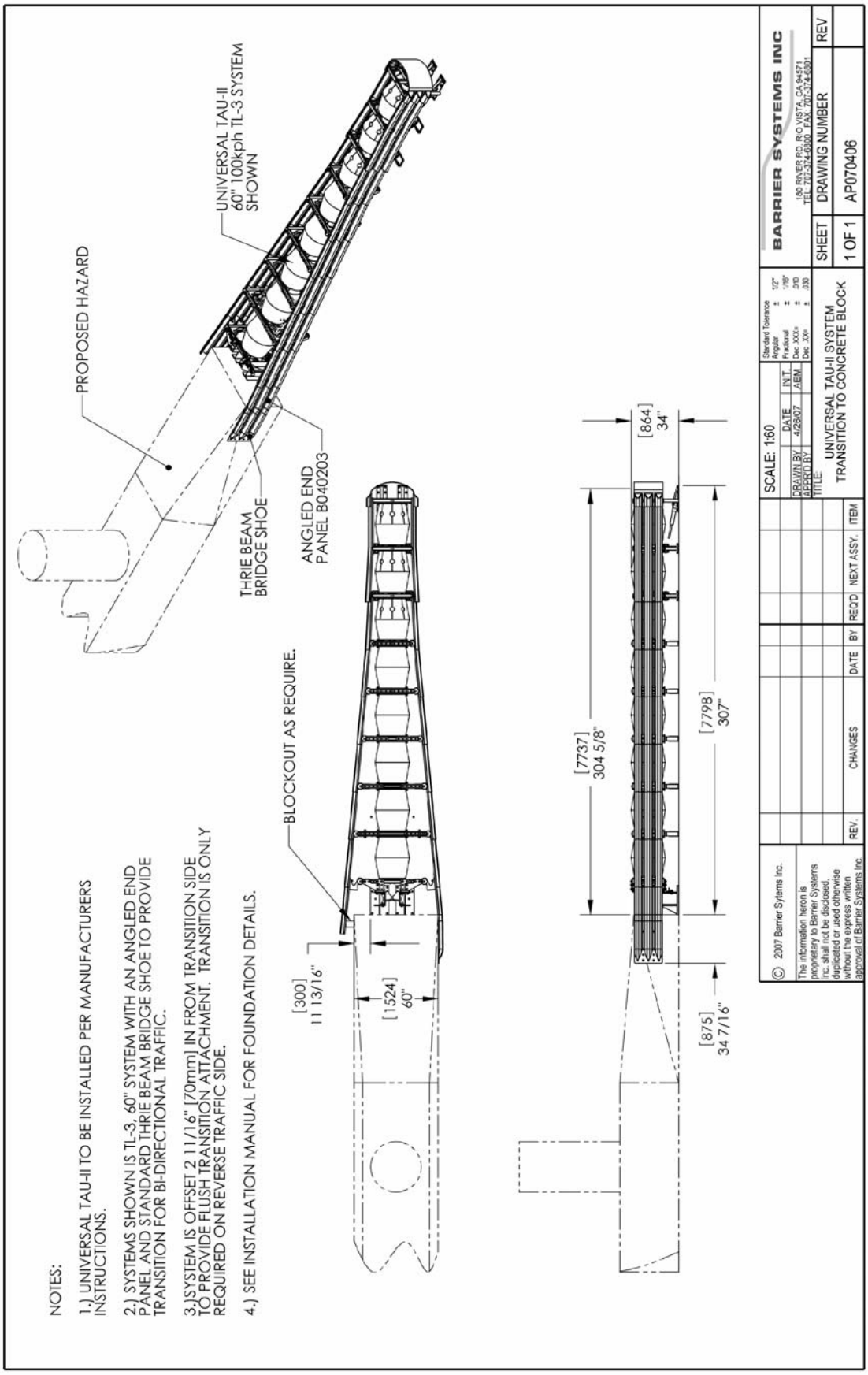
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XXX= ± .010
Dec .XX= ± .030

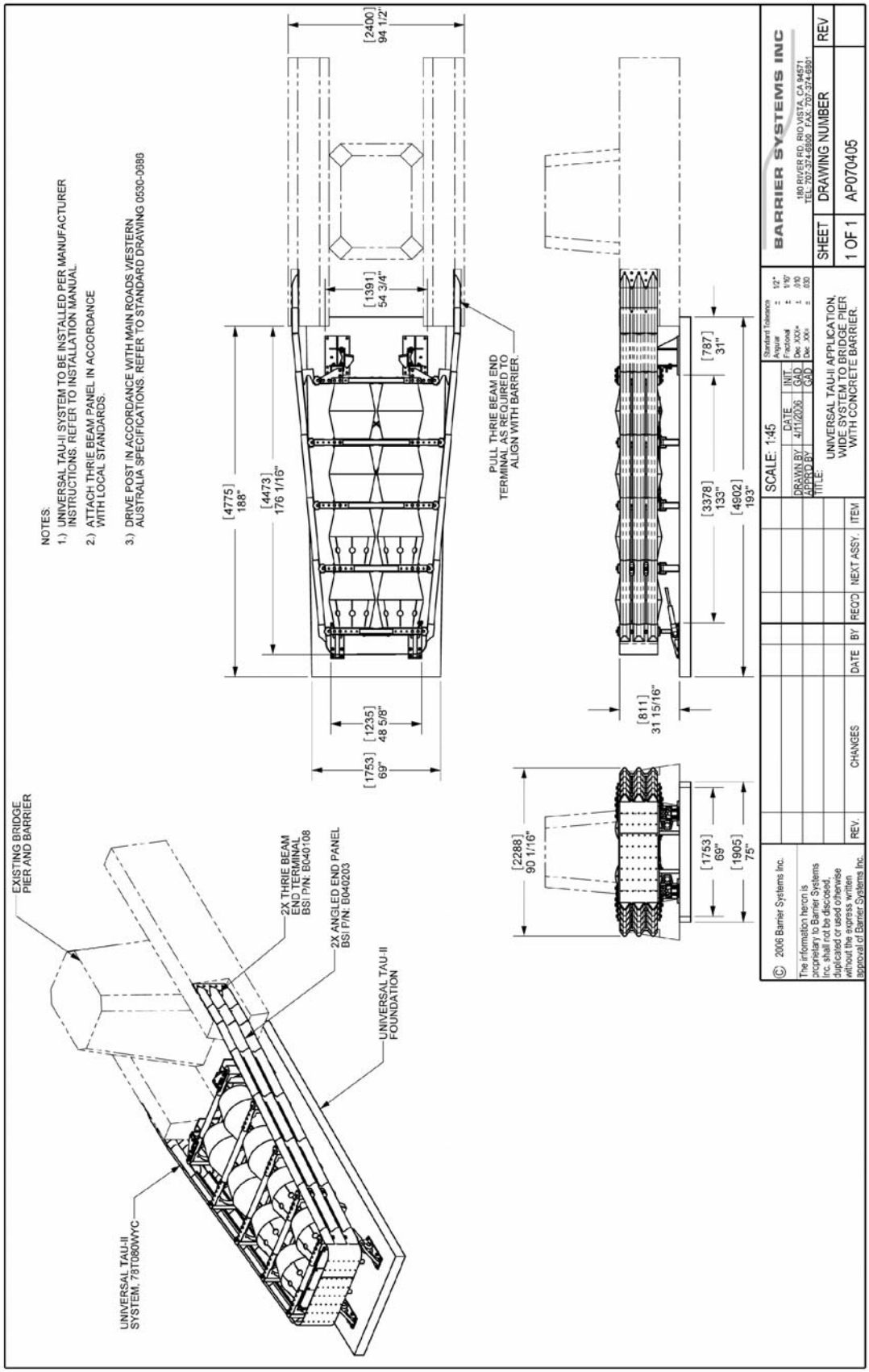
TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO THRIE BEAM GUARDRAIL

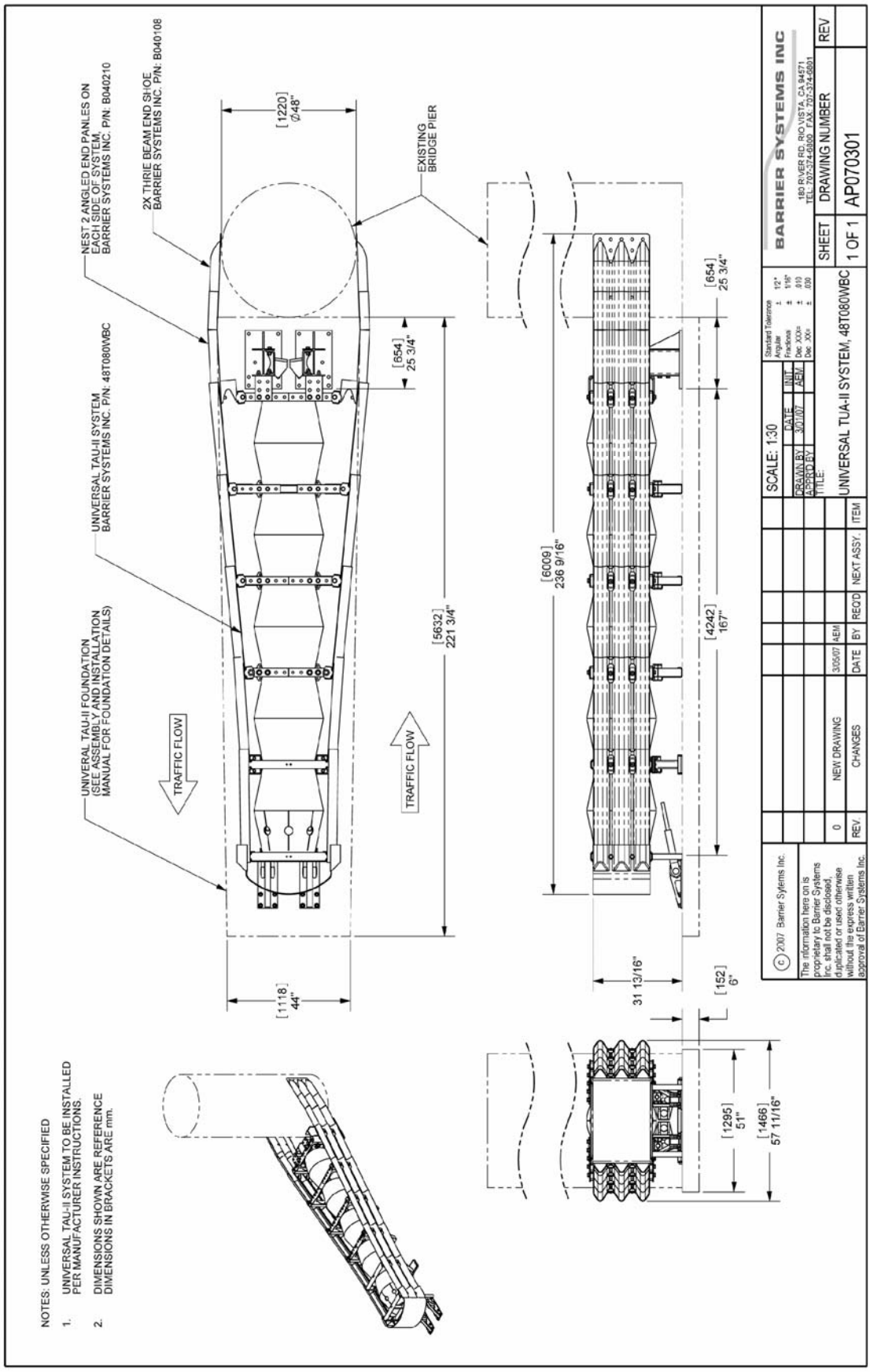
MODEL DRAWING NUMBER B010724 REV. B


TYPICAL (5 POSTS)
37½ [953]
225⅛ [5717]
18¾ [477]
TYPICAL (5 POSTS)
15⅛ [385]
TAU-II WITH COMPACT BACKTOP
34⅛ [867]
27½ [698]
32⅝ [829]
21⅝ [549]
NOTES:
1.) TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS. REFER TO 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 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.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems and may not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
B SEE ECN 00368 KPM/MH GAD
A RELEASE PREP. 11/28/01 GAD
REV. CHANGES DATE BY
NOTE: THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.
REQ'D NEXT ASSY. ITEM
SCALE: 1:30
DRAWN BY DATE
APPRO. BY 11/28/01
09/05/01 INIT. RGC KSN
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec .XX= ± .010
Dec .XXX= ± .030
TITLE: TAU-II WITH COMPACT BACKSTOP, TRANSITION TO W-BEAM
MODEL DRAWING NUMBER REV.
B010728 B


COMPACT BACKSTOP SHOWN. TRANSITION IS COMPATABLE WITH PCB BACKSTOP, FLUSH MOUNT BACKSTOP, AND WIDE FLANGE BACKSTOP. SEE LENGTH TABLE FOR TRANSITION POSITIONING PER BACKSTOP.
UNIVERSAL TAU-II SYSTEM
TRANSITION
BLOCK OUT DETAIL
[166] 6 1/2"
[103] 4"
[76] 3"
[194] 7 5/8"
[183] 7 1/4"
[152] 6"
[25] Ø1"
[559] 22"
[1449] 57"
[922] 36 3/8"
[549] 21 5/8"
L SEE TABLE
LENGTH "L"
BACKSTOP | IN | MM
COMPACT | 74 3/4 | 1900
PCB | 94 3/4 | 2400
FLUSH MOUNT | 89 3/8 | 2270
WIDE FLANGE | 128 1/2 | 3260
THRIE BEAM TERMINAL CONNECTOR
RECTANGULAR GUARDRAIL WASHER
BLOCK OUT
TRANSITION BRACKET
RECTANGULAR GUARDRAIL WASHER
UNIVERSAL TAU-II END PANEL
(2) NESTED UNIVERSAL TAU-II ANGLED END PANEL
UNIVERSAL TAU-II SLIDING PANEL
NOTES:
1.) UNIVERSAL TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURERS INSTRUCTIONS.
2.) TRANSITION SHOWN IS COMPATABLE WITH COMPACT BACKSTOP (SHOWN), FLUSH MOUNT BACKSTOP, PCB BACKSTOP, AND WIDE FLANGE BACKSTOP. IT IS APPLICABLE WITH ASPHALT ANCHORING PACKAGES FOR PCB BACKSTOP AND PCB BRACE KIT FOR COMPACT BACKSTOP.
3.) THRIE BEAM TERMINAL CONNECTOR PER AASHTO HARDWARE SPECIFICATION RTE01.
4.) STANDARD TIMBER OR PLASTIC OFFSET BLOCKS FIELD TRIMMED FOR USE. BLOCK OUT DETAIL SHOWS DIMENSIONS FOR P-SHAPE SAFETY SHAPED BARRIER. ACTUAL DIMENSIONS SHOULD REFLECT SHAPE OF BARRIER TRANSITIONED TO.
5.) PANELS AND BLOCKOUT ATTACHED TO BARRIER WALL WITH 5/8" [16mm] BOLTS WITH BEAM WASHER AND NUT WITH WASHER AND BEAM WASHER. 20' [500mm] BOLTS MAY BE FIELD TRIMMED. LENGTH MAY VARY WITH DIFFERENT BARRIER SHAPES. HOLES DRILLED THROUGH MEDIAN BARRIER ARE 3/4" [20mm]. MECHANICAL OR CHEMICALLY BONDED ANCHORS MAY BE USED THAT MEET OR EXCEED 15,000 LBF SHEAR AND PULL OUT STRENGTH.
6.) ATTACH THRIE BEAM TERMINAL CONNECTOR TO MEDIAN BARRIER WITH (3) 5/8" [16mm] BOLTS WITH WASHERS AND NUT WITH WASHERS AND BEAM WASHERS. REFERENCE NOTE 5 FOR DETAILS.
7.) ATTACH THRIE BEAM TERMINAL CONNECTOR TO UNIVERSAL TAU-II END PANEL WITH 5/8" [16mm] X 2' [50mm] BOLTS WITH BEAM WASHER AND NUT WITH WASHER.
8.) TRANSITION BRACKET TO BE INSTALLED OVER PIPE PANEL MOUNTS UNDER THE (2) NESTED ANGLED END PANELS AND THE SLIDING PANEL. BEND IN TRANSITION BRACKET FACES REARWARD AND FITS AROUND PIPE PANEL MOUNTS. JOINT IS SECURED WITH SLIDING BOLTS. SLIDING BOLTS TO BE TORQUED PER MANUFACTURERS SPECIFICATIONS.
© 2005 Barrier Systems Inc.
The information herein is proprietary to Barrier Systems Inc. shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV | CHANGES | DATE | BY | REQ'D | NEXT ASSY. | ITEM
1 | N.A. | 1
SCALE: 1:25
DRAWN BY | DATE | INIT.
09/06/05 | GAD
GAD
Standard Tolerance Assembly: +-1/2 Deg Fractional +-1/16 Dec .XXX +-.010 Dec .XX +-.020
TITLE: UNIVERSAL TAU-II TRANSITION TO MEDIAN BARRIER
MODEL DRAWING NUMBER REV
B050606


NOTES:
1.) UNIVERSAL TAU-II TO BE INSTALLED PER MANUFACTURERS INSTRUCTIONS.
2.) SYSTEMS SHOWN IS TL-3, 60" SYSTEM WITH AN ANGLED END PANEL AND STANDARD THRIE BEAM BRIDGE SHOE TO PROVIDE TRANSITION FOR BI-DIRECTIONAL TRAFFIC.
3.)SYSTEM IS OFFSET 2 11/16" [70mm] IN FROM TRANSITION SIDE TO PROVIDE FLUSH TRANSITION ATTACHMENT. TRANSITION IS ONLY REQUIRED ON REVERSE TRAFFIC SIDE.
4.) SEE INSTALLATION MANUAL FOR FOUNDATION DETAILS.
PROPOSED HAZARD
UNIVERSAL TAU-II 60" 100kph TL-3 SYSTEM SHOWN
THRIE BEAM BRIDGE SHOE
ANGLED END PANEL B040203
BLOCKOUT AS REQUIRE.
[300] 11 13/16"
[1524] 60"
[7737] 304 5/8"
[7798] 307"
[864] 34"
[875] 34 7/16"
© 2007 Barrier Sytems Inc.
The information herein is proprietary to Barrier Systems Inc. shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY REQD NEXT ASSY. ITEM
SCALE: 1:60
DRAWN BY 4/26/07 N.T.
APPRD BY AEM
TITLE
UNIVERSAL TAU-II SYSTEM TRANSITION TO CONCRETE BLOCK
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16"
Dec .XXX± ± .010
Dec .XX± ± .030
BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL 707-374-6800 FAX 707-374-6801
SHEET 1 OF 1
DRAWING NUMBER AP070406
REV


NOTES:
1.) UNIVERSAL TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS. REFER TO INSTALLATION MANUAL.
2.) ATTACH THRIE BEAM PANEL IN ACCORDANCE WITH LOCAL STANDARDS.
3.) DRIVE POST IN ACCORDANCE WITH MAIN ROADS WESTERN AUSTRALIA SPECIFICATIONS. REFER TO STANDARD DRAWING 0530-0986
[2400] 94 1/2"
[1391] 54 3/4"
[4775] 188"
[4473] 176 1/16"
[1235] 48 5/8"
[1753] 69"
PULL THRIE BEAM END TERMINAL AS REQUIRED TO ALIGN WITH BARRIER.
[787] 31"
[3378] 133"
[4902] 193"
[811] 31 15/16"
[2288] 90 1/16"
[1753] 69"
[1905] 75"
EXISTING BRIDGE PIER AND BARRIER
2X THRIE BEAM END TERMINAL BSI P/N: B040108
2X ANGLED END PANEL BSI P/N: B040203
UNIVERSAL TAU-II FOUNDATION
UNIVERSAL TAU-II SYSTEM, 78T060WYC
BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6991
SCALE: 1:45
DRAWN BY: 4/11/2006
APPRD BY:
TITLE:
UNIVERSAL TAU-II APPLICATION, WIDE SYSTEM TO BRIDGE PIER WITH CONCRETE BARRIER.
SHEET 1 OF 1
DRAWING NUMBER AP070405
REV
© 2006 Barrier Systems Inc.
The information herein is proprietary to Barrier Systems Inc. shall not be discussed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV. CHANGES DATE BY REQ'D NEXT ASSY. ITEM


NEST 2 ANGLED END PANLES ON EACH SIDE OF SYSTEM. BARRIER SYSTEMS INC. P/N: B040210
2X THRIE BEAM END SHOE. BARRIER SYSTEMS INC. P/N: B040108
[1220] Ø48"
EXISTING BRIDGE PIER
UNIVERSAL TAU-II SYSTEM BARRIER SYSTEMS INC. P/N: 48T080WBC
UNIVERAL TAU-II FOUNDATION (SEE ASSEMBLY AND INSTALLATION MANUAL FOR FOUNDATION DETAILS)
TRAFFIC FLOW
TRAFFIC FLOW
[654] 25 3/4"
[5632] 221 3/4"
[1118] 44"
[6009] 236 9/16"
[4242] 167"
[654] 25 3/4"
31 13/16"
[152] 6"
[1295] 51"
[1466] 57 11/16"
NOTES: UNLESS OTHERWISE SPECIFIED
1. UNIVERSAL TAU-II SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.
2. DIMENSIONS SHOWN ARE REFERENCE DIMENSIONS IN BRACKETS ARE mm.
REV | CHANGES | DATE | BY | REQ'D | NEXT ASSY. | ITEM
0 | NEW DRAWING | 3/05/07 | AEM
© 2007 Barrier Sytems Inc.
The information here on is proprietary to Barrier Systems Inc. shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
SCALE: 1:30
DRAWN BY AEM DATE 3/01/07
APPR'D BY
TITLE:
UNIVERSAL TUA-II SYSTEM, 48T080WBC
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16"
Dec .XXX± ± .010
Dec .XX± ± .030
BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6801
SHEET 1 OF 1
DRAWING NUMBER AP070301
REV

Universal TAU-II®
Attachment to BarrierGuard 800™
Installation Guide

Refer to the Universal TAU-II Installation and Maintenance Manual for more information, introduction, system overview, required tools, and other considerations for the Universal TAU-II systems.

The Universal TAU-II system is installed after the BarrierGuard 800 is fully deployed, installed, and anchored. Reference the BarrierGuard 800 Design, Installation, and Maintenance Manual for complete information on the BarrierGuard 800 barrier system implementation and installation.

The Universal TAU-II system utilizes a monolithic backstop that bolts directly in place of the terminal cover of the BarrierGuard 800. The front cable anchor remains as the only foundation anchorage required for the Universal TAU-II system. The front cable anchor is to be anchored to the same foundation type as the end of the BarrierGuard 800 that it is attached to (PC Concrete or Asphaltic Concrete). Anchorage shall be in accordance with BSI specifications A040113.

Installation Procedure: *Each Procedure references a page number from the Universal TAU-II Installation Manual for further information –*

1.) Remove terminal cover from BarrierGuard 800 end section (if in place).

2.) Install and fasten Universal TAU-II BarrierGuard 800 Backstop in place. **(See diagram on next page).**

3.) Locate and position Front Cable anchor (see below). Drill and secure the appropriate anchors for the foundation used per BSI specification A040113. Use the Front Cable anchor as the drilling template. Use a BSI approved anchoring compound. See pages 12 &13.

4.) Place the Middle Bulkheads along the centerline of the system spaced approximately 34” [865mm] apart. See page 13.

5.) Thread the guide Cables through the legs of the Middle Bulkheads, threaded end first, starting from the front of the system. Loosely place the threaded end into the backstop lugs and spin the nut on to hold it in place. See pages 13 & 14.

6.) Pin the guide Cables to the Front Cable Anchor with the shackles. See page 14.

7.) Install Cable Guides. See pages 14 & 15.

8.) Attach Pipe Panel Mounts. See page 15.

9.) Install the End Panels and first Slider Panels starting at the Pipe Panel Mounts. If a transition is to be installed the End Panel will be replaced by the Angled End Panel. See page 16 & 72.

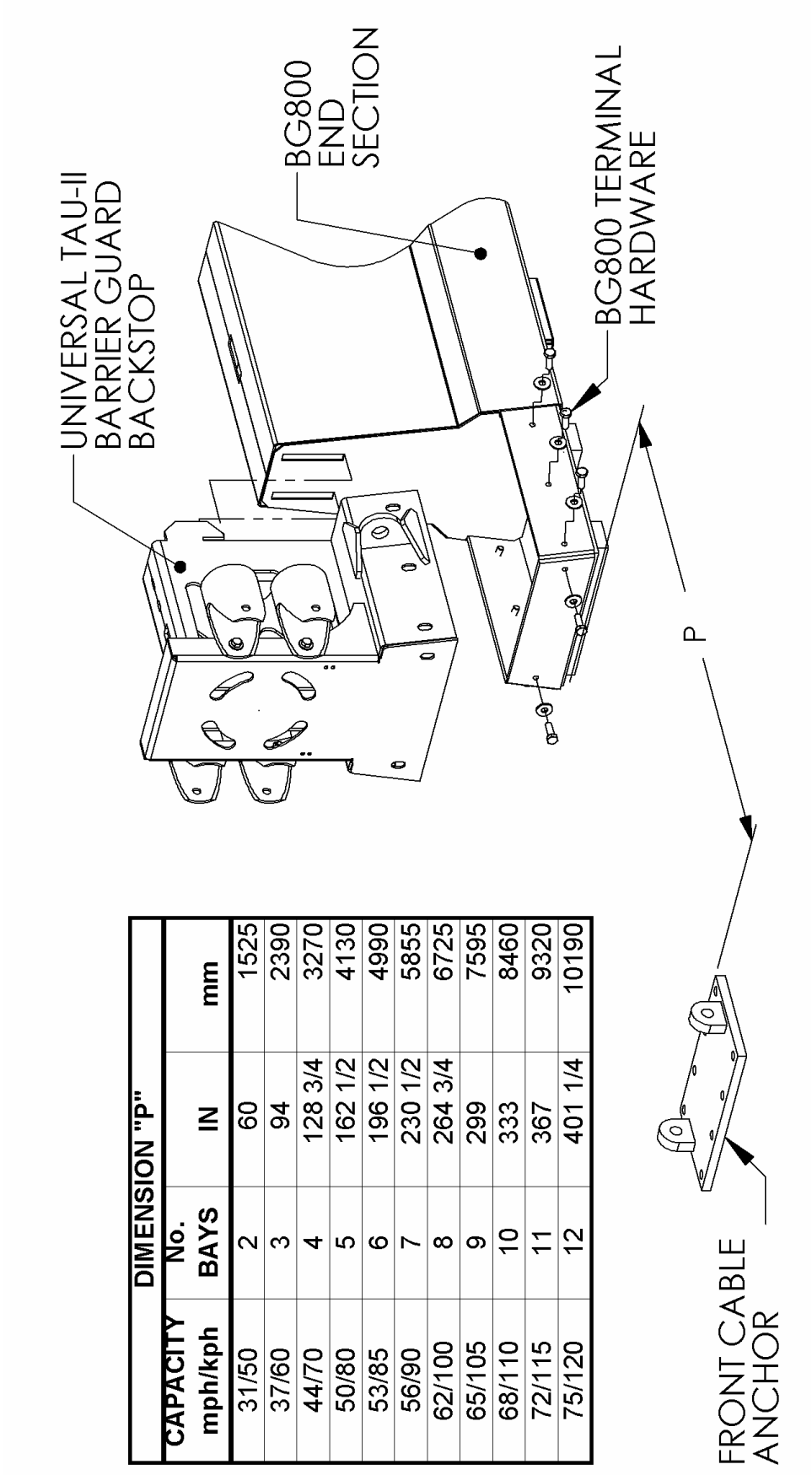
10.) Install Slider Panels. Start from the back of the system and move forward, overlapping the rearward panel. Secure the panels in place with the Slider Bolts. See pages 16 & 17.

11.) Install the Front Support, attach the Slider Panels, Nose Cover, and Leg Supports and connect to the first Middle Support with Slider Bolts. See page 18.

12.) Torque Slider Bolts and Front Panel Bolts and install Energy Absorbing Cartridges. See page 19.

13.) Apply tension to cables – Torque to specification. Ensure foundation anchors are properly cured. See page 20.

(See Installation Diagram on Next Page)

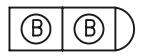
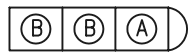
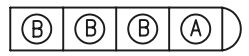
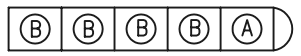
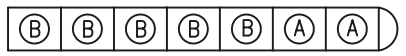
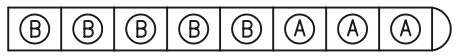
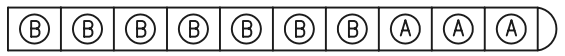
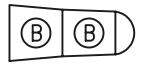
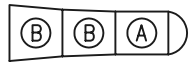
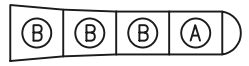
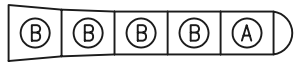
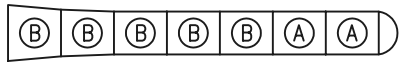
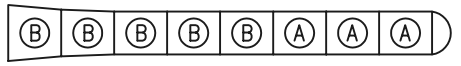
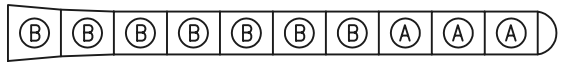
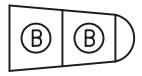
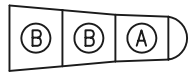
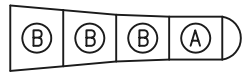
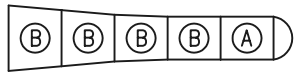
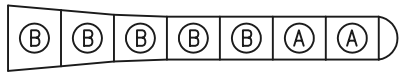
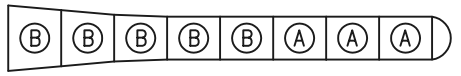
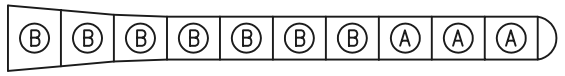
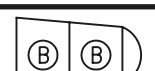
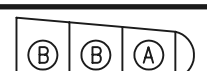
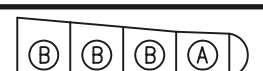
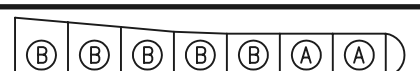
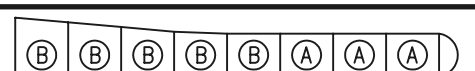
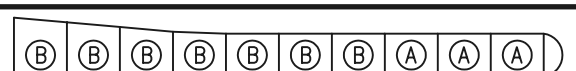
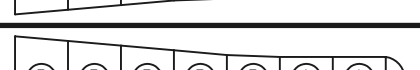
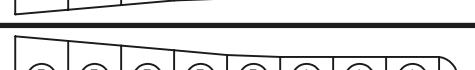
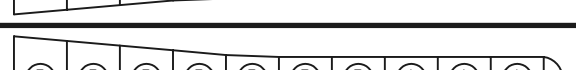


DIMENSION "P"			
CAPACITY mph/kph	No. BAYS	IN	mm
31/50	2	60	1525
37/60	3	94	2390
44/70	4	128 3/4	3270
50/80	5	162 1/2	4130
53/85	6	196 1/2	4990
56/90	7	230 1/2	5855
62/100	8	264 3/4	6725
65/105	9	299	7595
68/110	10	333	8460
72/115	11	367	9320
75/120	12	401 1/4	10190

Notes

Notes

Barrier Systems Sales and Service
3333 Vaca Valley Pkwy, Ste 800 Vacaville, CA 95688
Tel: (707) 374-6800 Fax: (707) 374-6801
www.barriersystemsinc.com • info@barriersystemsinc.com

BACKSTOP WIDTH	SYSTEM CAPACITY						
	50 KPH	60 KPH	70 KPH	80 KPH	90 KPH	100 KPH	110 KPH
PARALLEL UP TO 30"							
36" BACKSTOP							
42" BACKSTOP							
48" BACKSTOP							
54" BACKSTOP							
60" BACKSTOP							
66" BACKSTOP							
72" BACKSTOP							
78" BACKSTOP							
84" BACKSTOP							
90" BACKSTOP							
96" BACKSTOP							
102" BACKSTOP							

REV.	CHANGES	DATE	BY
B	ADD 36" BACKSTOP	12/9/03	GAD
A	50 KPH CORRECT	12/1/03	GAD

REQ'D	NEXT ASSY.	ITEM
1	NA	1

SCALE: 1=80

	DATE	INIT.
DRAWN BY	10/31/03	GAD
APPR'D BY		

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

TITLE : TAU-II SYSTEM CONFIGURATION MATRIX

MODEL	DRAWING NUMBER	REV.
	D031101	A

BARRIER SYSTEMS INC

TECHNICAL BRIEF

180 River Road • Rio Vista, CA 94571 • Tel 707-374-6800 • Fax 707-374-6801
Email: info@barriersystemsinc.com • Website: barriersystemsinc.com

Product Specification

Universal TAU-II®
Redirective, Non-Gating, Crash Cushion

I. General

The Universal TAU-II® system is a Redirective, Non-Gating Crash Cushion in accordance with the definitions in the National Cooperative Highway Research Program Report 350 (NCHRP 350). The system configurations that have been evaluated for various impact velocities and hazard widths are shown in the Universal TAU-II System Configuration Chart (Figure 1).

II. Performance

The Universal TAU-II® system is designed to absorb the impact energy of an errant vehicle in accordance with NCHRP 350 guidelines for Redirective, Non-Gating Crash Cushions. The system is designed for locations where both head-on and angled impacts are likely to occur and where it is desirable to have the majority of post impact trajectories on the impact side of the system. The design provides for a high degree of flexibility in applying the system to a wide range of hazard widths (up to 2.6 meters (8.5 feet)) in 150mm (6 inch) increments and a large variety of non-proprietary transitions to other highway barriers. The systems also provide a very low life-cycle cost by demonstrating an average repair cost of less than 20% for the whole NCHRP 350, Test Level 3 test matrix. When installed in accordance with the manufacturer's instructions, any of the configurations shown in the Configuration Chart (Figure 1) under the 100 km/h (62.1 mph) column is capable of safely redirecting or stopping a 2000 kg (4400 lb) pick-up truck and an 820 kg (1800 lb) car impacting the system at 100 km/hr (62.1 mph).

A. When properly installed according to the manufacturer's recommendations, the systems shall be able to meet the recommended structural adequacy, occupant risk, and vehicle trajectory criteria set forth in the in NCHRP 350 for Test Level 3 (100 km/hr) Redirective, Non-Gating Crash Cushions with an average material cost for refurbishment of less than 20% of the installed cost. The NCHRP 350, Test Level 3 Test Matrix includes the following conditions:

    1. A 2000 kg vehicle at -20 degrees (reverse direction) impact to the midpoint of the system (Test 3-39).

2. A 2000 kg vehicle at 20 degrees impacting at the Critical Impact Point of the system. The critical impact point was determined to be the front of the backstop along the centerline of the system (Test 3-38).

3. A 2000 kg vehicle at 20 degrees impacting the side, near the front of the system (Test 3-37).

4. An 820 kg vehicle at 20 degrees impacting the side, near the front of the system (Test 3-36).

5. A 2000 kg vehicle at 15 degrees impacting the front of the system (Test 3-33).

6. An 820 kg vehicle at 15 degrees impacting the front of the system (Test 3-32).

7. A 2000 kg vehicle at 0 degrees and centered on the front of the system (Test 3-31).

8. An 820 kg vehicle at 0 degrees and an offset of ¼ the width of the vehicle from the centerline of the system (Test 3-30).

B. The impact velocity of a hypothetical front seat passenger against the vehicle interior as calculated from the longitudinal vehicle acceleration and 600 mm [23 5/8 in] forward displacement, and the lateral vehicle acceleration and 300 mm [12 in] lateral vehicle displacement, shall be less than 12 m/s (39.3 ft/s). The highest 10 ms average vehicle acceleration in the longitudinal and lateral directions subsequent to the instant of hypothetical occupant impact shall be less than 20 g's in the NCHRP 350 testing matrix of the Universal TAU-II system.

Detached debris shall not show potential for penetrating the vehicle occupant compartment or present a hazard to other traffic, pedestrians, or workers in a work zone. The vehicle shall remain upright during and after the collision, although moderate roll, pitch, and yaw may occur. Vehicle deformations shall not cause intrusion into the occupant compartment in excess of 150 mm (6 inches).

III. Description of System

A. The Universal TAU-II crash cushion is made up of independent collapsible bays that are guided and supported by high strength galvanized steel cables. The system's energy capacity is provided by an array of Energy Absorbing Cartridges. The Universal TAU-II systems are available in various length and width configurations and with capacities as shown in the Universal TAU-II System Configuration Chart (Figure 1). All of these configurations can be assembled from the basic parts as shown in the Universal TAU-II Parts List (Figure 2). The systems shall be made up of the following components and shall be fabricated from materials conforming to the following specifications:

1. The foundation system for the Universal TAU-II consists of two cables, a Back Support and Front Cable Anchors as shown in Figure 2 or Figure 3. The Front Cable Anchor weighs approximately 35 kg (75 lb). The types of Cable Anchors and Back Supports can be selected from those shown in Figures 2 and 3 based on the requirements of the specific site.

    a. All steel structural components of these assemblies shall be fabricated from mild steel in conformance with ASTM A-36 specifications. These components are hot dipped galvanized per ASTM A-123.

    b. Fasteners shall be Class 5.8 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

    c. The steel cables shall be at least 25 mm (1 in) diameter and galvanized in accordance with ASTM A-603.

2. Front and Middle Supports and the various sizes of Bulkheads (XL, XXL and XXXL) (Figure 2) separate each independent collapsible bay. Cable Guides bolt to the Middle Supports and Bulkheads, capturing the cables and connecting the bays to the foundation system.

    a. All Front and Middle Supports, Bulkheads and cable guides shall be fabricated from mild steel in conformance with ASTM A-36 specifications. These components are hot dipped galvanized per ASTM A-123.

    b. All fasteners shall be Class 5.8 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

3. Each Bay is enclosed on the sides with Sliding Panels. Sliding Bolts fasten the panels to the Front and Middle Supports and Bulkheads. End Panels are attached to the Back Support and the last bays's Sliding Panels through Pipe Panel Mounts and provide transition mounting points. The Pipe Panel Mounts are bolted to the back support.

    a. Steel panels are to be fabricated from steel that conforms to the requirements of AASHTO M180 Class B.

    b. Sliding Bolts are to be cast from ASTM 1045 HT steel and galvanized per ASTM A-123.

c. Steel Pipe Panel Mounts shall be fabricated from mild steel in conformance to ASTM A513, Type 5 specifications.

d. Fasteners shall be Class 5.8 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

4. Flexible Front Support Legs and a Nose Piece mount to the Front Support. The Front Support Legs and Nose Piece are bolted in place. The Nose Piece provides a location to attach suitable delineation in conformance with local specifications (to be supplied by others).

a. The front support legs shall be fabricated from either synthetic or natural rubber or polyurethane.

b. The Nose Piece shall be fabricated from polyurethane.

c. All fasteners shall be Class 5.8 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

5. Two types of Energy Absorbing Cartridges (Figures 4 and 5) provide the primary energy absorbing capacity for the system. The cartridges appear as cylindrical plastic containers measuring approximately 775 mm (30 ½ in) in length and approximately 635 mm (25 in) in diameter. Each cartridge weighs approximately 16 kg (35 lb).

a. All plastic parts shall be molded from specially formulated High Density Cross-linked Polyethylene.

B. The Universal TAU-II systems are available in various capacities, each requiring a specific configuration of Energy Absorbing Cartridges (Types A and B). The capacities and configurations are shown in the Universal TAU-II System Configuration Chart (Figure 1).

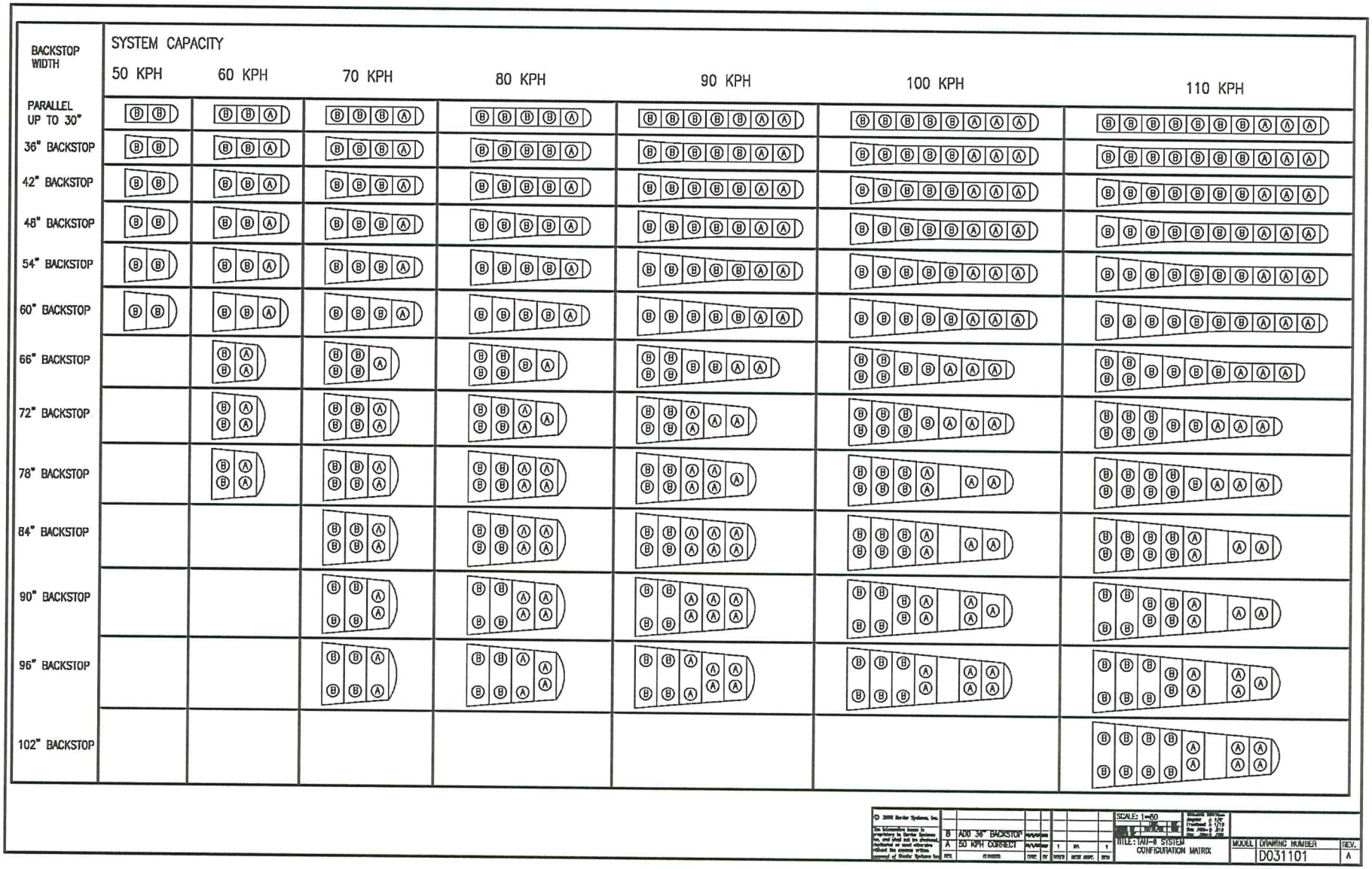
C. The Universal TAU-II system shall require attachment to a foundation. Anchoring of the system will require attachment in accordance with the manufacturer's drawings and instructions. Anchor capacity will require 12000 kg (25000 lb) pull out and 8500 kg (19000 lb) shear strength.

D. The TAU-II system shall be assembled, installed, and refurbished in accordance with the manufacturer's instructions.

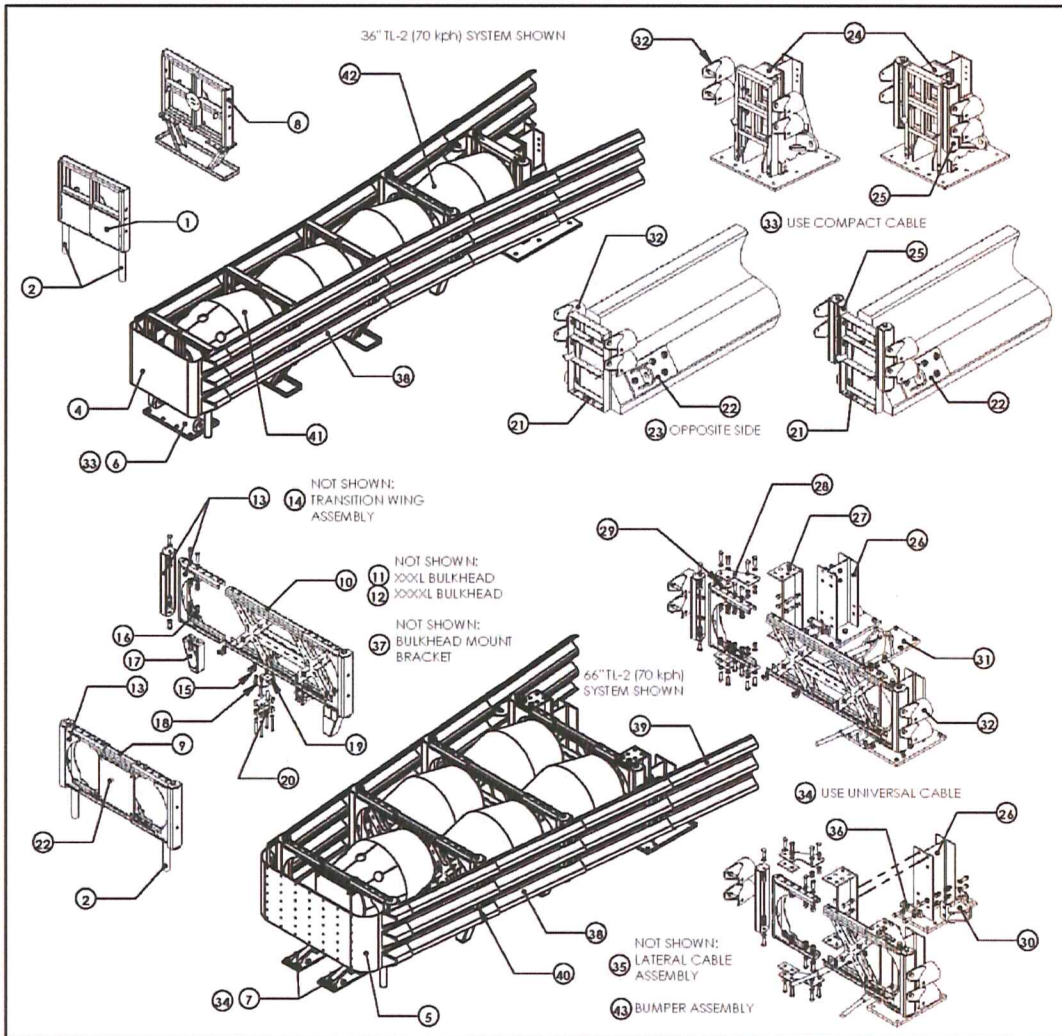
IV. Application of Safety Appurtenances

Highway safety appurtenances should be applied to hazardous sites in accordance with the guidelines and recommendations in the American Association of State Highway

Transportation Officials (AASHTO), "Roadside Design Guide", and other Federal Highway Administration and State Department of Transportation requirements. Placement of the TAU-II system must comply with these specifications and guidelines as well as those of the manufacturer.


BACKSTOP WIDTH
SYSTEM CAPACITY
50 KPH
60 KPH
70 KPH
80 KPH
90 KPH
100 KPH
110 KPH
PARALLEL UP TO 30"
36" BACKSTOP
42" BACKSTOP
48" BACKSTOP
54" BACKSTOP
60" BACKSTOP
66" BACKSTOP
72" BACKSTOP
78" BACKSTOP
84" BACKSTOP
90" BACKSTOP
96" BACKSTOP
102" BACKSTOP
B ADD 36" BACKSTOP
A 50 KPH CORRECT
SCALE: 1=60
TITLE: TAT-II SYSTEM CONFIGURATION MATRIX
MODEL
DRAWING NUMBER
D031101
REV.
A

Fiaure 1



ITEM	PART DESCRIPTION	PART #
1	FRONT SUPPORT	B010528
2	FRONT SUPPORT LEG KIT	K001005
3	FRONT COLLISION PLATE	B030801
4	NOSE PIECE, NARROW	B010711
5	NOSE PIECE WIDE	B030902
6	FRONT CABLE ANCHOR, COMPACT	B010248
7	FRONT CABLE ANCHOR, UNIVERSAL	B010935
8	MIDDLE SUPPORT ASSEMBLY	B010530
9	XL BULKHEAD	B030521
10	XXL BULKHEAD	B030528
11	XXXL BULKHEAD	B030529
12	XXXXL BULKHEAD	B030532
13	WING ASSEMBLY	B030509
14	TRANSITION WING ASSEMBLY	B030910
15	EAC LOCATING TAB	B031112
16	BACKING PLATE	B030543
17	LEG	B030425
18	CABLE GUIDE MOUNT	B030411
19	LEVEL SPACER	B030551
20	CABLE GUIDE ASSEMBLY KIT	K001004
21	PCB BACKSTOP	B011007
22	REAR CABLE ANCHOR "R" (PCB)	B010929
23	REAR CABLE ANCHOR "L" (PCB)	B011041
24	COMPACT BACKSTOP	B010537
25	36" ADAPTER (PCB & COMPACT)	B031201
26	WIDE FLANGE BACKSTOP	B030668
27	BACKSTOP BLOCKOUT (WF)	B030713
28	WING BRACE (WF)	B030821
29	WING BRACE SPACER (WF)	B030823
30	REAR CABLE ANCHOR, WF	B031020
31	REAR CABLE ANCHOR, IND (WF)	B030938
32	PIPE PANEL MOUNT	B010651
33	CABLE, COMPACT	TBD
34	CABLE, UNIVERSAL	TBD
35	LATERAL CABLE ASSEMBLY	B031034
36	LATERAL SUPPORT MOUNT (WF)	B031011
37	BULKHEAD MOUNT BRACKET	B031010
38	SLIDING PANEL	B010202
39	END PANEL	B010659
40	SLIDING BOLT ASSEMBLY	K001003
41	ENERGY ABSORBING CARTRIDE, TYPE	B010802
42	ENERGY ABSORBING CARTRIDE, TYPE	B010722
43	BUMPER ASSEMBLY	B031035

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
				1	NA	1

SCALE: 1:1

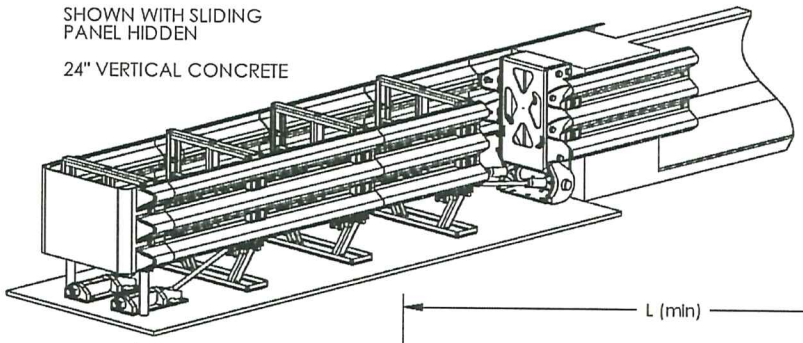
	DATE	INIT.
DRAWN BY	04/22/04	GAD
APPR'D BY		JSM

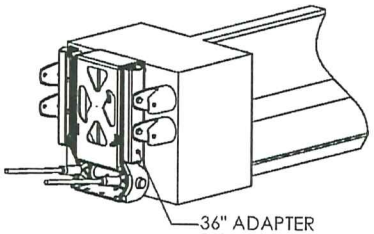
Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. . XXX= +/- .010
Dec. . XX= +/- .030

TITLE : UNIVERSAL TAU-II PARTS LIST

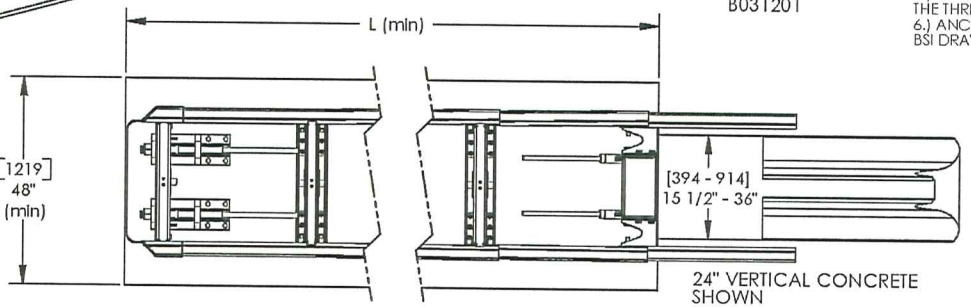
MODEL	DRAWING NUMBER	REV.
	A040416	

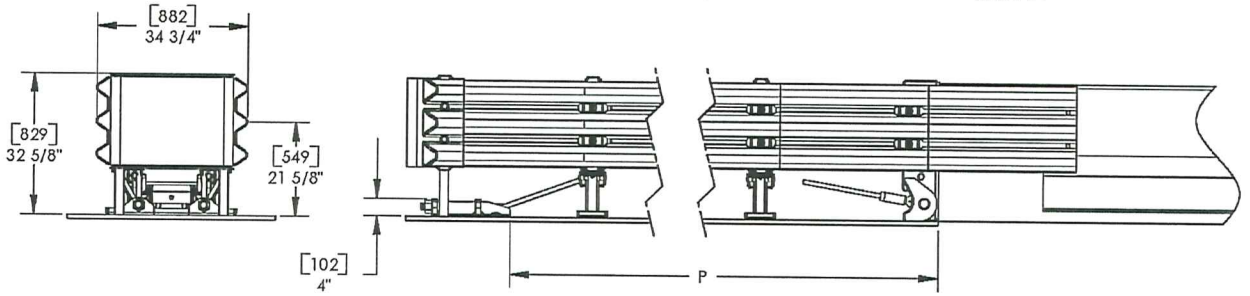
Figure 2





NOTES:
1.) FLUSH MOUNT BACKSTOP SYSTEMS ARE INTENDED FOR APPLICATIONS WHERE THE HAZARD WIDTH EXCEEDS THE LIMITATIONS OF THE PCB BACKSTOP. FLUSH MOUNT SYSTEMS ARE ALSO APPLICABLE IN LOCATIONS WITH LIMITED FOUNDATION SIZE.
2.) THE FLUSH MOUNT BACKSTOP MAY BE ATTACHED TO REINFORCED SAFETY SHAPE OR VERTICAL CONCRETE STRUCTURES UP TO 36" [914] WIDE. STRUCTURES OVER 24"[610] WIDE REQUIRE 36" ADAPTER B031201. EDGES OF VERTICLE CONCRETE MAY REQUIRE CHAMFER ACCORDING TO LOCAL STANDARDS.
3.) VERTICAL SLOTS ON THE BACKSTOP ALLOW REMOVAL/ REPLACEMENT OF THE BACKSTOP. ANCHORS MUST BE PLACED AT THE TOP OF SAID SLOTS TO BE EFFECTIVE.
4.) FLUSH MOUNT BACKSTOP SYSTEMS USE THE SAME CABLE USED IN ALL PARALLEL SYSTEMS. THE CABLE IS INSTALLED WITH THE THREADED TENSIONING END FORWARD. THE LOOPED END IS PINNED IN PLACE AT THE BACKSTOP.
5.) THE FRONT CABLE ANCHOR USES AN INSERTED KEY TO KEEP THE THREADED STUD FROM ROTATING DURING TENSIONING.
6.) ANCHOR ACCORDING TO BSI SPECIFICATIONS. REFERENCE BSI DRAWING A040113.





FOUNDATION PAD LENGTH
DIMENSION "L" (MINIMUM)

BAY No.	CAPACITY (kph)	L (ft-in)	L (mm)
2	50	6' - 11 1/2"	2121
3	60	9' - 9 1/2"	2985
4	70	12' - 7 1/2"	3848
5	80	15' - 5 1/2"	4712
6	85	18' - 4"	5598
7	90	21' - 2"	6452
8	100	24' - 0"	7315
9	105	26' - 10"	8179
10	110	29' - 8 1/2"	9055
11	115	32' - 6 1/2"	9919
12	120	35' - 4 1/2"	10782

FRONT ANCHOR PLACEMENT
DIMENSION "P"

BAY No.	CAPACITY (kph)	P (ft-in)	P (mm)
2	50	4' - 11 1/2"	1511
3	60	7' - 9 1/2"	2375
4	70	10' - 7 1/2"	3239
5	80	13' - 5 1/2"	4102
6	85	16' - 4"	4978
7	90	19' - 2"	5842
8	100	22' - 0"	6706
9	105	24' - 10"	7569
10	110	27' - 8 1/2"	8446
11	115	30' - 6 1/2"	9309
12	120	33' - 4 1/2"	10173

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

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
				1	TBD	1

SCALE: 1:24

	DATE	INT.
DRAWN BY	4/21/04	GAD
		GAD

Standard Tolerance
Angular +/- 1/2 Deg.
Fractional +/- 1/16
Dec. .XXX= +/- .010
Dec. .XX= +/- .030

TITLE: APPLICATION, FLUSH MOUNT BACKSTOP

MODEL	DRAWING NUMBER	REV
	B040239	

Figure 3

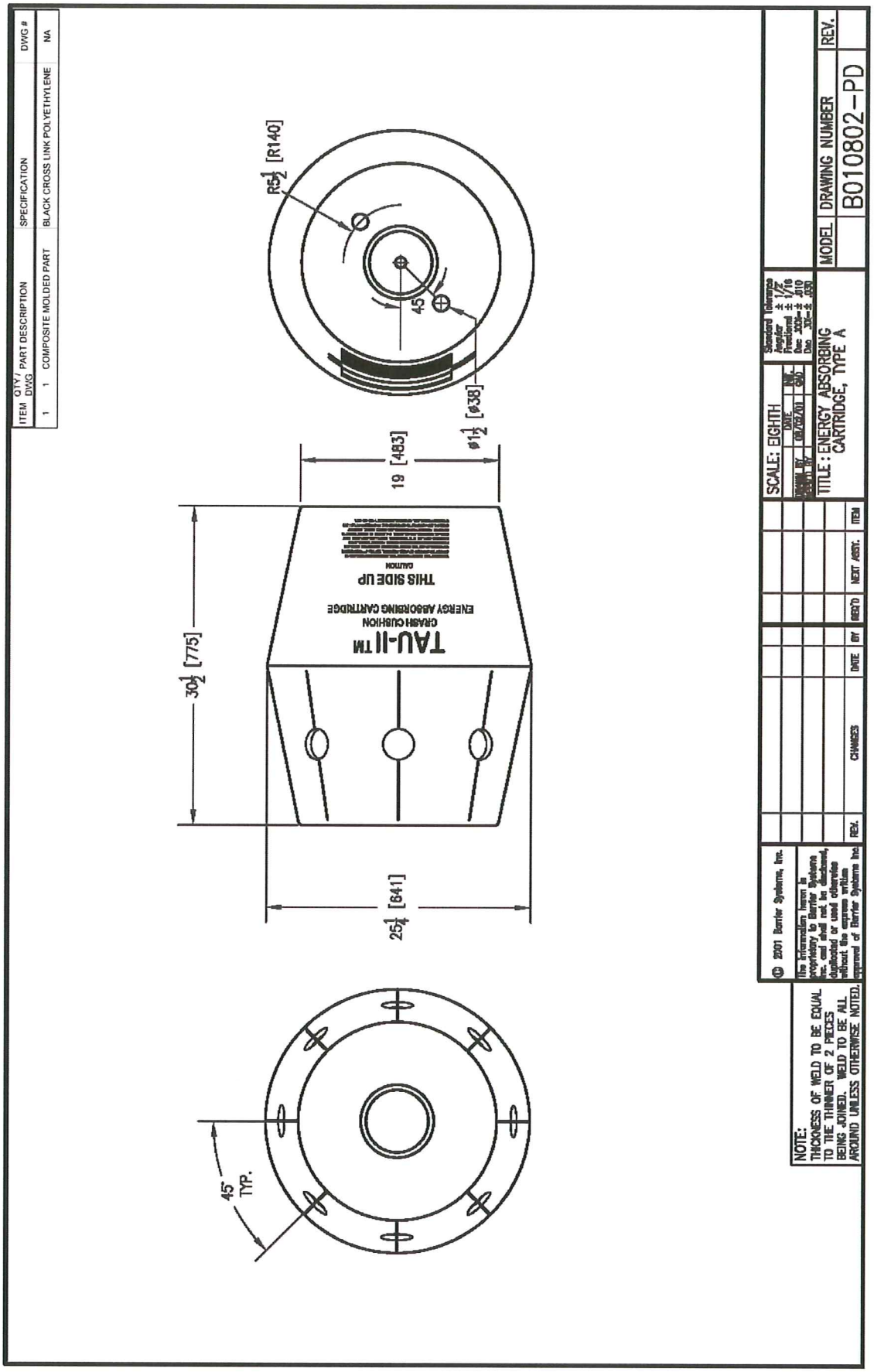

ITEM QTY./ DWG
PART DESCRIPTION
SPECIFICATION
DWG #
1 1 COMPOSITE MOLDED PART
BLACK CROSS LINK POLYETHYLENE
NA
R5½ [R140]
45°
ø1½ [ø38]
19 [483]
30½ [775]
25¼ [641]
TAU-II™
CRASH CUSHION
ENERGY ABSORBING CARTRIDGE
THIS SIDE UP
CAUTION
45° TYP.
NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems Inc. and shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV.
CHANGES
DATE
BY
CHK'D
NEXT ASSY.
ITEM
SCALE: EIGHTH
DRAWN BY
CHECKED BY
DATE
08/29/01
MFG
QUAL
Standard Tolerances
Angular ± 1°
Fractional ± 1/16
Dec .XX=± .010
Dec .XXX=± .030
TITLE: ENERGY ABSORBING CARTRIDGE, TYPE A
MODEL
DRAWING NUMBER
REV.
B010802-PD

Figure 4

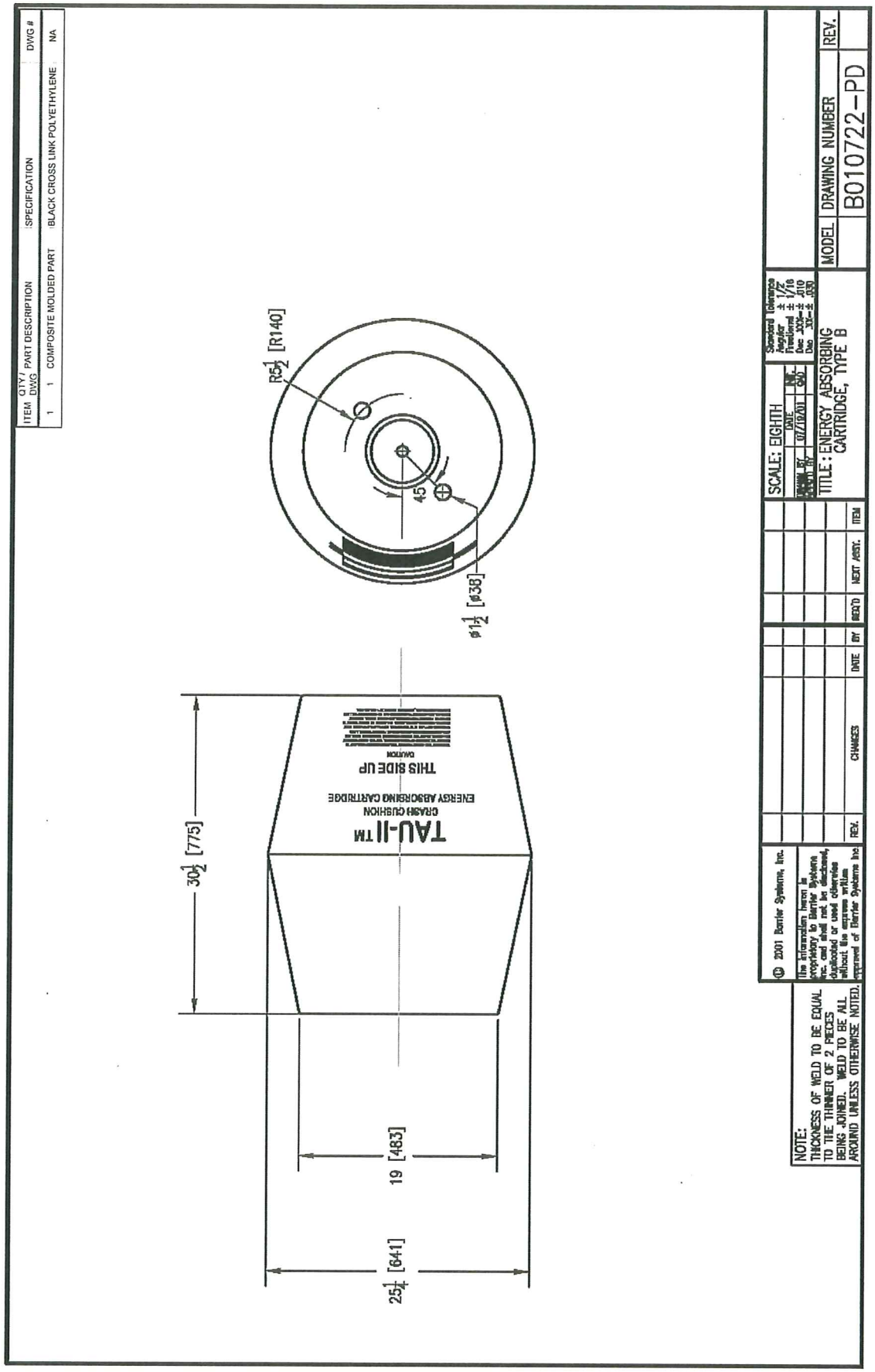

ITEM QTY./ DWG
PART DESCRIPTION
SPECIFICATION
DWG #
1 1 COMPOSITE MOLDED PART BLACK CROSS LINK POLYETHYLENE NA
R5½ [R140]
45
ø1½ [ø38]
30½ [775]
TAU-II™
CRASH CUSHION
ENERGY ABSORBING CARTRIDGE
THIS SIDE UP
DAMTRON
19 [483]
25¼ [641]
NOTE:
THICKNESS OF WELD TO BE EQUAL TO THE THINNER OF 2 PIECES BEING JOINED. WELD TO BE ALL AROUND UNLESS OTHERWISE NOTED.
© 2001 Barrier Systems, Inc.
The information herein is proprietary to Barrier Systems Inc. and shall not be disclosed, duplicated or used otherwise without the express written approval of Barrier Systems Inc.
REV.
CHANGES
DATE
BY
APVD
NEXT ASSY.
ITEM
SCALE: EIGHTH
DRAWN BY
DATE
07/19/01
CHK'D BY
ENG. APP.
Standard Tolerances
Angular ± 1/2°
Fractional ± 1/16
Dec .XX=± .010
Dec .XXX=± .030
TITLE: ENERGY ABSORBING CARTRIDGE, TYPE B
MODEL
DRAWING NUMBER
B010722-PD
REV.

Figure 5

ENERGY ABSORPTION SYSTEMS, INC.
A TRINITY INDUSTRIES,INC. COMPANY
HOME
WHAT'S NEW
PRODUCTS
LINKS
ABOUT US
CONTACT US

Product Sheet
Product Specifications
FHWA Acceptance

React 350® Wide Crash Cushion System

View ISO Drawing

REACT 350® WIDE CRASH CUSHION SYSTEM

The REACT 350 Wide Systems are redirective, non-gating crash cushion that meets NCHRP 350, Test Level 3. They features “smart plastic” cylinders made of high molecular weight, high-density polyethylene (HMW/HDPE) plastic that are arranged to shield rigid hazards with three system widths of 1.525 m (60”), 2.440 m (96”) and 2.050 m (120”). When impacted within the design capacity specified in NCHRP 350, the cylinders typically regain up to 90% of their original shape and capacity without maintenance or repair of major components.

Smart Plastic Cylinders

The React 350® Wide 60/90/120 in. Crash Cushion System features "smart plastic" cylinders made of high-molecular weight, high-density polyethylene (HMW/HDPE) plastic that is arranged to shield rigid roadway hazards with widths up to 3050 mm (120 in).

NCHRP 350

- Non-gating, redirective crash cushion system
- Performs effectively with design speeds up to 100 km/h (62 mph)
- Meets TL-3 (100 km/h / 62 mph)

Redirective Capability

During side angle impacts up to 20°, an errant vehicle weighing between 820 kg

(1800 lbs) and 2000 kg (4400 lbs) is redirected back into the original traffic flow as a result of energy-absorbing cylinders with internal struts, combined with rail guides.

Crashworthy

Crashworthy at speeds up to 100 km/h (62 mph) and at angles as high as 20°, when impacted by vehicles weighing up to 2000 kg (4400 lbs).

Easy Maintenance

Design impacts would require no major component replacement. Reusability is up to 99% after most design impacts.

Extreme Efficiency

The REACT 350® crash cushion system will continue to perform after multiple design impacts, typically regaining up to 90% of its original shape and capacity without maintenance or repair of major components after most design impacts.

REACT 350® WIDE

A REUSABLE CRASH CUSHION FOR WIDE ROADWAY HAZARDS

OVERVIEW

The REACT 350 Wide Systems are redirective, non-gating crash cushion that meets NCHRP 350, Test Level 3. They features "smart plastic" cylinders made of high molecular weight, high-density polyethylene (HMW/HDPE) plastic that are arranged to shield rigid hazards with three system widths of 1.525 m (60"), 2.440 m (96") and 2.050 m (120"). When impacted within the design capacity specified in NCHRP 350, the cylinders typically regain up to 90% of their original shape and capacity without maintenance or repair of major components.

MEETS NCHRP 350, TEST LEVEL 3

The REACT 350 Wide Systems meet NCHRP 350, Test Level 3 criteria as a redirective, non-gating crash cushion. During a head-on impact, at speeds up to 62 mph, the cylinders compress to absorb the energy of impact and bring the vehicle to a controlled stop. During side angle impacts up to 20 degrees, the REACT 350 Wide Systems redirect the errant vehicle back onto the roadway at a shallow angle. This redirection is the result of internal struts within the cylinders (except the nose).

FEATURES AND BENEFITS

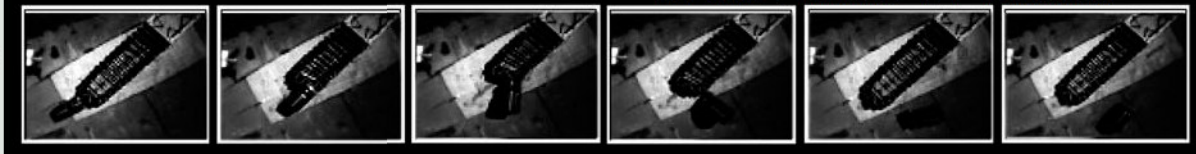
- Self-restoring and reusable after most impacts
- Able to withstand a number of impacts without the need for major repairs or parts
- Minimal maintenance and refurbishment – spare parts typically not required
- Low lifecycle cost in comparison to disposable systems

The REACT 350 Wide System uses a monorail to provide lateral strength

ENERGY ABSORPTION SYSTEMS, INC.

WWW.ENERGYABSORPTION.COM

SAVING LIVES BY DESIGN



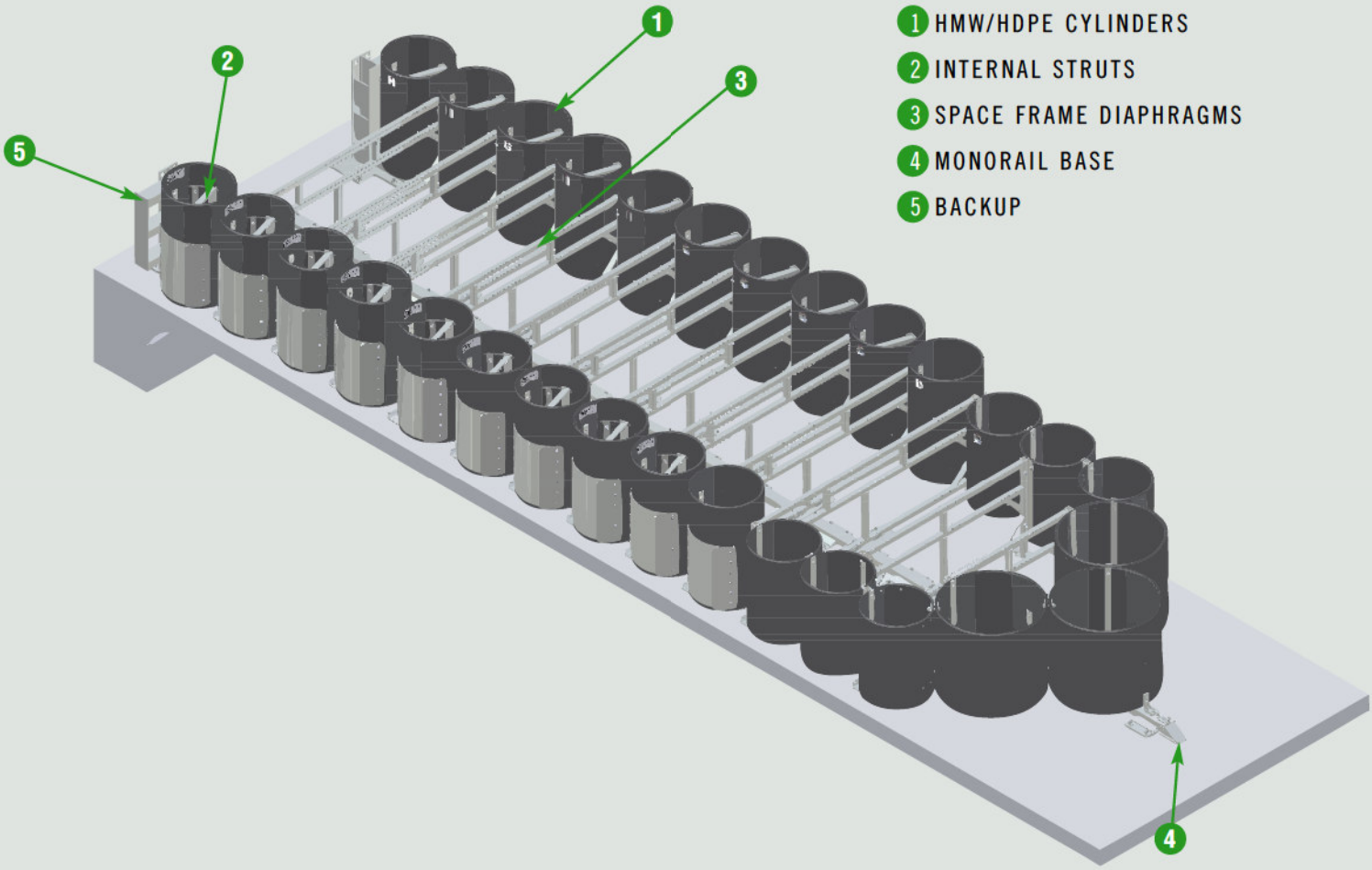
MINIMAL MAINTENANCE AND REFURBISHMENT

After a typical design impact, the REACT 350 Wide System can be quickly restored by simply over pulling the system out and replacing the shear bolt. Spare parts are typically not required. Limited exposure to traffic provides for optimum safety for maintenance workers. Very high reusability allows for exceptional life cycle savings.

The REACT 350 Wide System is available with a steel backup or a concrete-mounted backup. The concrete-mounted backup allows the unit to be attached directly to an existing or new concrete backup at the site. The steel backup allows the system to be placed at sites where a stand alone system is required. The REACT 350 Wide system of a width of 1.525/2.440/3.050 m (60/96/120") width consists of 27/29/29 cylinders arranged in 14/15/15 Rows for Test Level 3 conditions.

SPECIFICATIONS

	SELF-CONTAINED BACKUP	CONCRETE-MOUNTED BACKUP
60 INCH TL-3		
Width at Backup	1.5 m (60")	1.5 m (60")
Length	9.4 m (30'10")	9.2 m (30'7")
96 INCH TL-3		
Width at Backup	2.4 m (96")	2.4 m (96")
Length	10.6 m (34'9")	10.6 m (34'9")
120 INCH TL-3		
Width at Backup	3.1 m (120")	3.1 m (120")
Length	10.3 m (33'10")	10.3 m (33'10")



1. HMW/HDPE CYLINDERS
2. INTERNAL STRUTS
3. SPACE FRAME DIAPHRAGMS
4. MONORAIL BASE
5. BACKUP

Quixote Transportation Safety

SAVING LIVES BY DESIGN

WWW.QUIXTRANS.COM

ENERGY ABSORPTION SYSTEMS, INC.

Distributed By:

35 East Wacker Drive • Chicago, IL 60601
Tel: (312) 467-6750 • Fax: (312) 467-9625
www.energyabsorption.com

General specifications for the REACT 350 Wide System are subject to change without notice to reflect improvements and upgrades. Additional information is available in the Product Manual for this system. Contact Energy Absorption Systems for details.

REACT 350® (60"/96"/120")
GENERAL SPECIFICATIONS

I. GENERAL

All REACT 350® (60"/96"/120")[1] (Reusable Energy Absorbing Crash Terminal 350) shall be produced by Energy Absorption Systems, Inc., of Chicago, Illinois.

II. DESCRIPTION OF SYSTEM

A. General

REACT 350 refers to a family of reusable crash cushions made up from arrays of cylinders that have the ability to recover a major portion of their shape, position, and capabilities after being impacted. Transitions are available and may be required depending on the site conditions.

The REACT 350 (60"/96"/120") for Test Level 3 (TL-3) conditions, as specified in NCHRP 350, is a 27/29/29[2] cylinder, 14/15/15[3] row, redirective non-gating crash terminal. The system incorporates HMW/HDPE or "smart plastic" cylinders as the main energy absorbers, internal struts for lateral redirective performance, space frame diaphragms, and a single monorail.

B. Component Description

1. The cylinders shall be made of high molecular weight, high-density polyethylene (HMW/HDPE). Cylinders shall be nominally 610 mm [24"] in outside diameter except at the nose of the system. The nose cylinders shall be nominally 610 mm [24"] or 914 mm [36"] in outside diameter depending on the width of the system. Two distinct cylinder heights (813 mm [32"] and 1016 mm [40"]) are used. The wall thickness of the cylinders may vary from 19 mm [.738"] to 29 mm [1.14"]. Cylinder color shall be black.

2. The system is comprised of 27/29/29 cylinders. The cylinders are arranged in rows in which each row contains a single pair of cylinders. The exception is the nose cylinder, which is placed centrally at the front of the unit.

---

[1] The terminology 60"/96"/120" refers to nominal system widths of REACT systems contained within this specification.

[2] Referencing the total number of cylinders per system with respect to the specified system widths.
[3] Referencing the total number of rows per system with respect to the specified system widths.

3. Cylinders may include "wheel deflectors" attached to the outboard sides. The wheel deflectors each include a flexible metallic sheet with a stiff plate attached on one side. The wheel deflectors are attached directly to the cylinders.

4. Cylinders may contain internal struts. The struts are a vertical steel framework and are fastened to the cylinder by means of a self-restoring HDPE hinge.

5. Space-frame diaphragms support the pairs of cylinders in each row.

6. A single monorail captures the diaphragms, provides lateral strength, and guides the system longitudinally during system stroke.

7. A mechanical "*trigger mechanism*" at the front of the system provides a predetermined positive fastening location for resetting the system after an impact.

8. The backup shall be a single concrete block or a steel back up as specified for use with this system.

C. Material Specifications

1. Metal work shall be fabricated from either M1020 Merchant Quality or ASTM A-36 steel. After fabrication, metal work shall be galvanized in accordance with ASTM A-123. All welding shall be done by or under the direction of a certified welder.

2. The system shall be assembled with galvanized fasteners. All bolts, nuts, and washers shall be Commercial Quality "American National Standard" unless otherwise specified.

III. TEST CRITERIA

A. The REACT 350 (60"/96"/120") with 27/29/29 cylinders and 14/15/15 rows are capable of passing the NCHRP 350 TL-3 tests with both the light car and pickup truck at speeds up to 100 km/h (62 mph) at angles up to 20 degrees. NCHRP 350 TL-3 specifies the following evaluation criteria:

NCHRP 350 Evaluation Criteria

1. For head-on impacts into the nose, a crash cushion should be capable of meeting the Occupant Risk Criteria as recommended in NCHRP 350. For vehicles weighing between 820 and 2000 kg [1810 and 4410 lbs.], the theoretical impact velocity of a hypothetical front seat passenger against the vehicle's interior (calculated from vehicle acceleration and 610mm [24"]

forward displacement) should be less than 12 m/s [39.4 ft/sec]. The vehicle's highest 10-millisecond average acceleration subsequent to the instant of the hypothetical passenger impact should be less than 20 G's.

2. At angles up to 20 degrees, a crash cushion should be capable of redirecting 2000 kg [4,410 lb.] vehicles that impact the sides of the system at speeds up to 100 km/h [62 mph]. This criteria is for both right–way and wrong-way impacts (angles measured from system's longitudinal centerline) assuming appropriate transition hardware is properly installed. At angles up to 15 degrees, a crash cushion should be capable of redirecting 820 kg [1,810 lb.] vehicles that impact the sides of the system at speeds up to 100 km/h [62 mph].

3. A crash cushion should be designed and constructed so no solid debris is present from the system that can create a hazard on the roadway after either head-on or side angle design impacts.

B. Impact conditions that differ from those described in the NCHRP 350 test matrix for non-gating, redirective 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 of unusual impact conditions such as vehicle instability resulting from traversing curbs of excessive cross slopes prior to impact may compromise crash performance. Under these conditions, performance criteria relative to structural adequacy, occupant risk and vehicle trajectory may not meet NCHRP 350 evaluation criteria.

V. DESIGN AND SELECTION CRITERIA

A. Design, selection and placement of crash cushions shall conform to The American Association of State and Highway and Transportation Officials (AASHTO) Publication, "Roadside Design Guide" 1996.

B. Installation of the REACT 350 shall be accomplished in accordance with the recommendations of Energy Absorption Systems, Inc.