

September 14, 2001

Refer to: HSA-10/CC75

**Mr. James R. Keaton
Vice President of Sales and Marketing
Barrier Systems, Inc.
180 River Road
Rio Vista, CA 94571-1208**

Dear Mr. Keaton:

In your August 31 letter, you provided design and test information on two versions of a new redirective crash cushion called the TAU-II, and requested the Federal Highway Administration's (FHWA) approval of these units as NCHRP Report 350 test level 2 (TL-2) and test level 3 (TL-3) devices, respectively. The design and test information was contained in three reports prepared by Safe Technologies, Inc.: "NCHRP Report 350 Crash Test Results TAU-II Redirective, Non-Gating Crash Cushion," dated August 15, 2001, "NCHRP Report 350 Crash Test Results TAU-II Redirective, Non-Gating Crash Cushion – Addendum 1," dated August 31, 2001, and "NCHRP Report 350 Crash Test Results TAU-II Redirective, Non-Gating Crash Cushion – Test Level 2," also dated August 31, 2001. Test data, including videos, were submitted on CD-ROMs and the crash tests themselves were also submitted in VHS format.

The TAU-II is a redirective crash cushion designed to shield the ends of median barriers and similar narrow fixed objects. It consists of Type A and Type B expendable Energy Absorbing Cartridges (EACs) separated by steel diaphragms within a framework of Thrie-beam rail panels. The EACs are made from black cross link polyethylene. To accommodate side impacts, two steel cables are attached to the bottom of the diaphragms and anchored at the front and rear of the unit. The effective length of the TL-3 system is 8.2 m with a height of 929 mm and a width of 889 mm. Type A cartridges are used in the first three bays and Type B cartridges are used in the remaining five bays. The TL-2 unit is similar in height and width, but is only 4.7 m long and uses one Type A EAC in the first (nose) bay and Type B EACs in the remaining 3 bays. Both units are bolted to inserts epoxied in holes drilled into 254-mm thick reinforced concrete pads. Enclosure 1 consists of drawings that show the layouts and selected components of both the TL-2 and TL-3 designs.

For the 8-bay TL-3 unit, the full compliment of tests recommended in NCHRP Report 350 was successfully conducted. Enclosure 2 includes the test summary sheets for these tests (Tests 3-30, 3-31, 3-32, 3-33, 3-36, 3-37, 3-38, and 3-39). Since the shorter TL-2 unit is comprised of the same components, only those tests directly affected by the length of the TAU-II were deemed necessary, i.e., the head-on and

angled tests into the nose of the unit (Tests 2-30, 2-31, 2-32, and 2-33). Because test 2-33 repeats test 2-32 (with the 2000-kg pickup truck in lieu of the 820-kg car) it was also considered unnecessary since the small car test is more critical for a device like the TAU-II. The summary sheets for tests 2-30, 2-31, and 2-32 are shown in Enclosure 3.

You also provided drawings of transition designs to use when the TAU-II is installed in a narrow median or other locations where reverse direction impacts are a possibility. The drawings for the transitions from a median barrier to the TAU-II shown in Enclosure 4 are acceptable. The connection to a rigid concrete median barrier is a standard design and the transitions from metal beam median barriers are similar to guardrail to bridge rail transitions that have been successfully tested in the past. Therefore, none of these designs require additional testing.

Based on staff review of the information you provided, I agree that that the 4-bay TAU-II and the 8-bay TAU-II, as tested, meet the appropriate NCHRP Report 350 evaluation criteria for TL-2 and TL-3 redirective crash cushions, respectively, and may be used on the National Highway System when such use is acceptable to the contracting agency. Since the TAU-II is a proprietary crash cushion, its use on Federal-aid projects, except exempt, non-NHS projects, is subject to the conditions listed in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

(original signed by Frederick G. Wright, Jr.)

Frederick G. Wright, Jr.
Program Manager, Safety

4 Enclosures

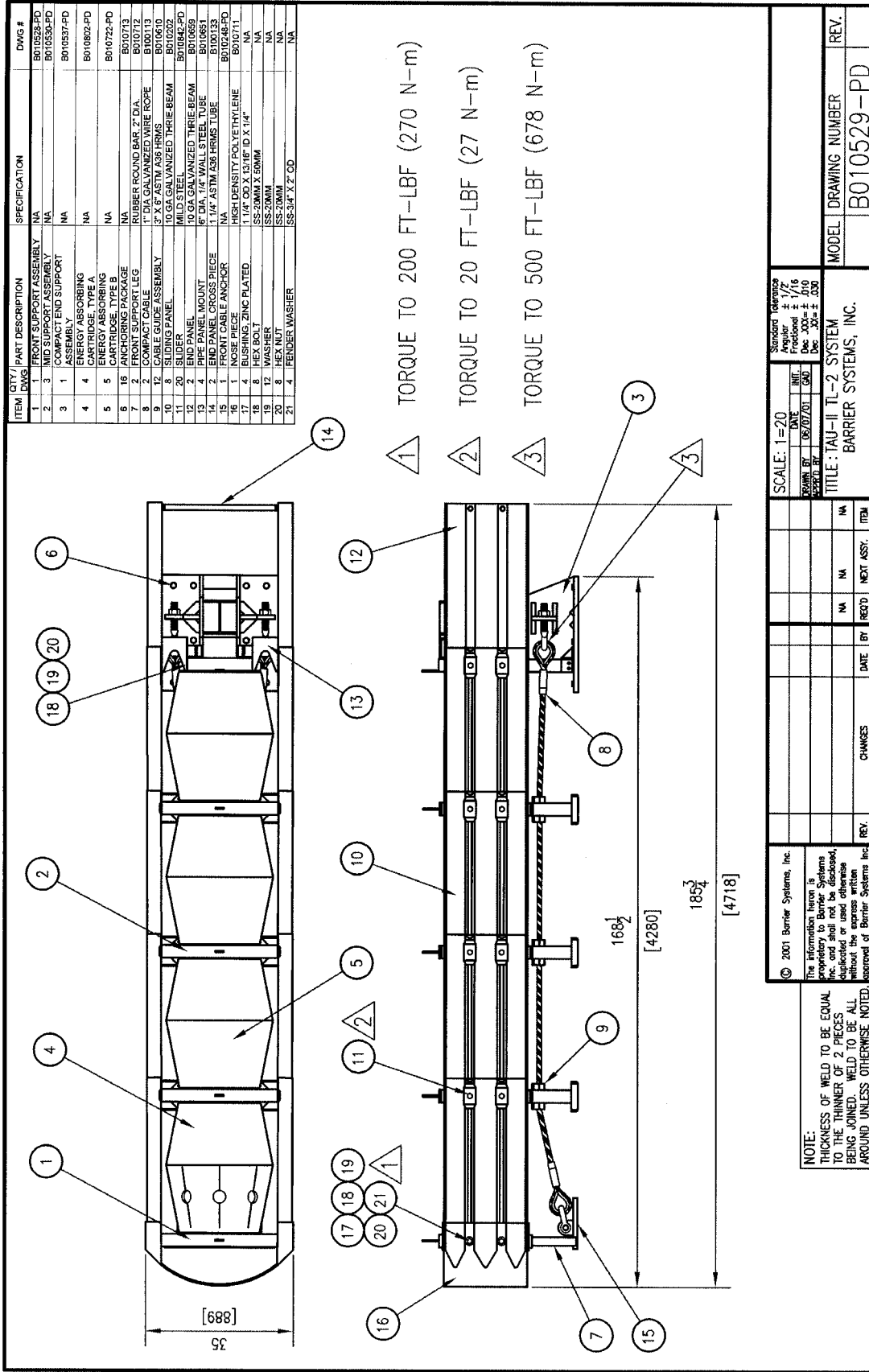
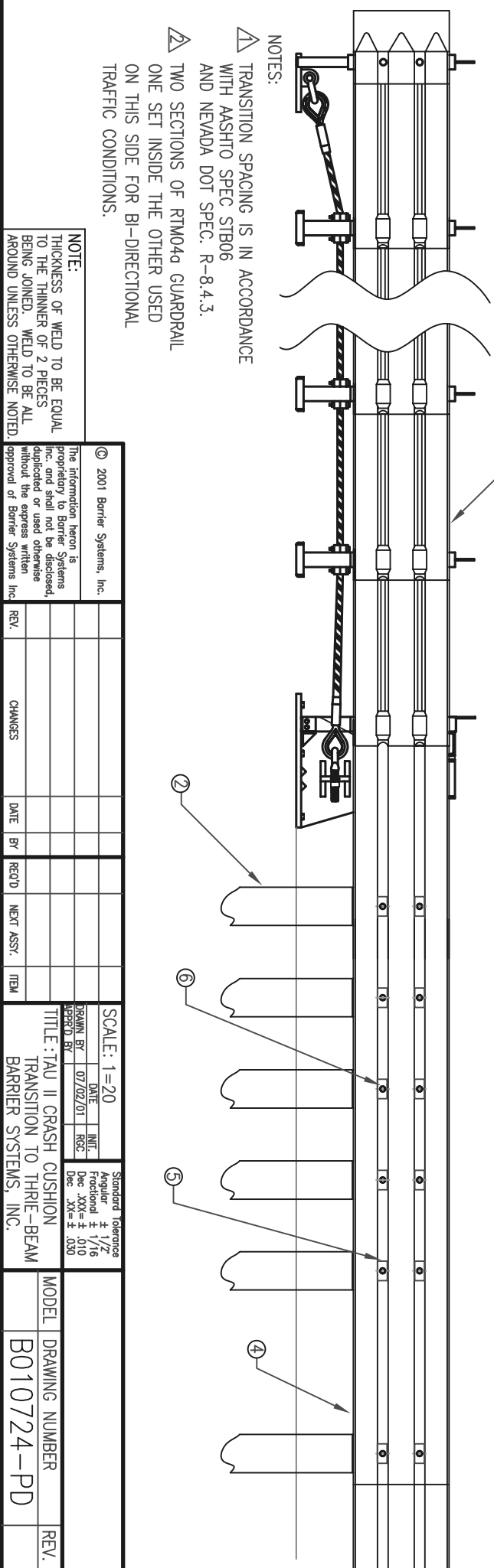
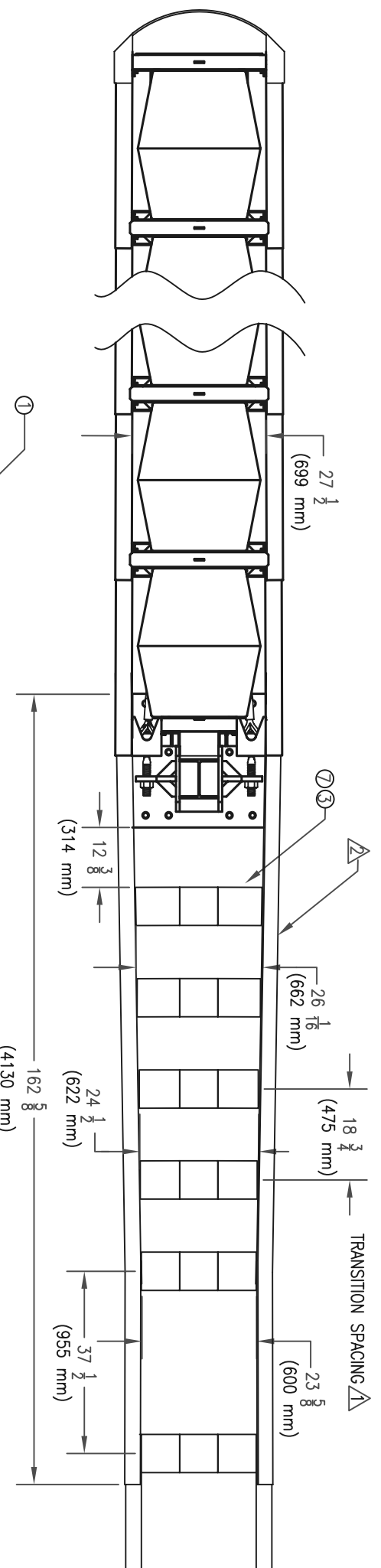


Figure D-1

ITEM	DWG	PART DESCRIPTION	SPECIFICATION	LENGTH AS REQUIRED	DWG #
1		TAU™ BARRIER SYSTEM			N/A
2		STRONG POST BLOCKOUT	STANDARD WOOD OR STEEL STRONG POST		N/A
3		4-SPACE THINE BEAM	STANDARD WOOD OR STEEL THINE BEAM BLOCKOUT		N/A
4		RECTANGULAR GUARDRAIL WASHER	ASHTO HARDWARE SPEC. (R1M4a)		N/A
5		GALVANIZED HEX BOLT AND NUT	ASHTO HARDWARE SPEC. (FMR03)		N/A
6		SPACER BLOCKOUT	ASHTO HARDWARE SPEC. (FBX16a)		N/A
7			STANDARD WOOD OR STEEL TRANSITION SPACER		N/A



NOTES:

△ TRANSITION SPACING IS IN ACCORDANCE WITH ASHTO SPEC. STB06 AND NEVADA DOT SPEC. R-8.4.3.

△ TWO SECTIONS OF RTM04g GUARDRAIL ONE SET INSIDE THE OTHER USED ON THIS SIDE FOR BI-DIRECTIONAL TRAFFIC CONDITIONS.

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

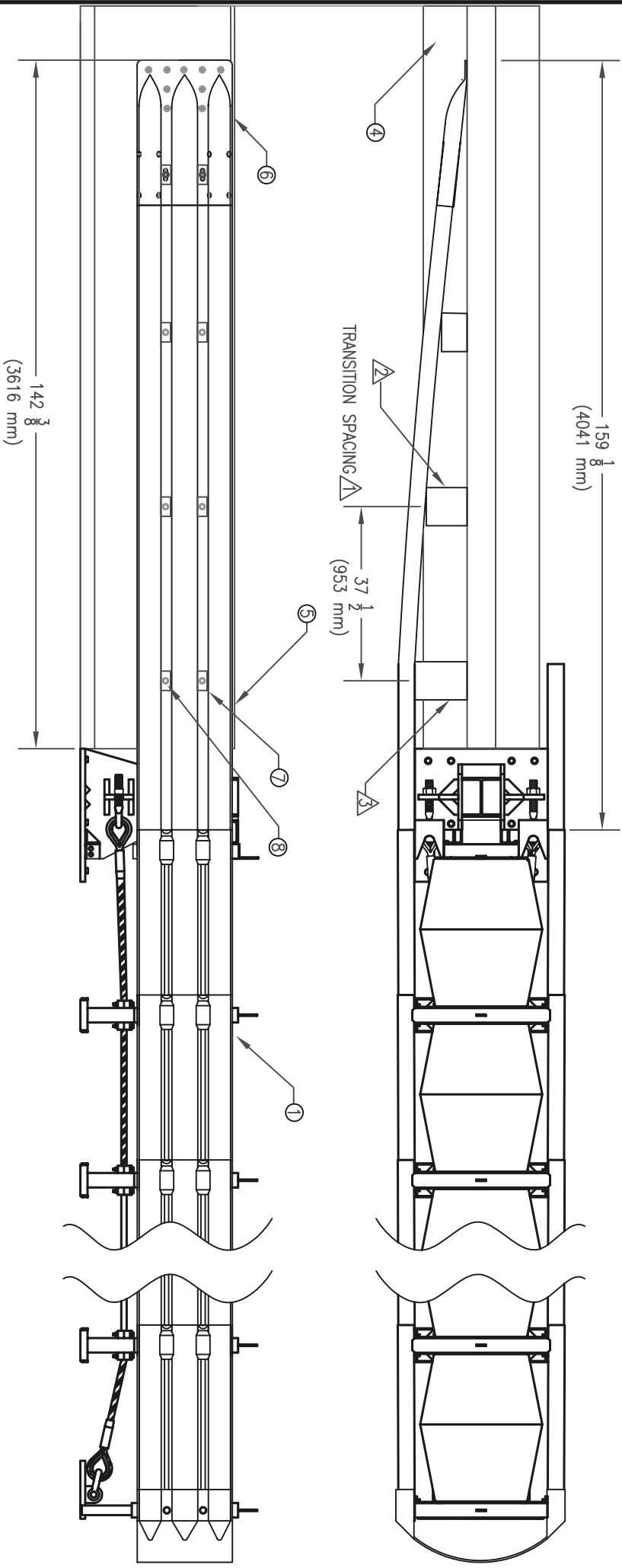
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REV.	CHANGES	DATE	BY	REQD.	NEXT ASSY.	ITEM

SCALE: 1=20
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec. .XXX ± .010
Dec. .XX ± .030

MODEL	DRAWING NUMBER	REV.
B010724-PD		

ITEM	QTY / PART DESCRIPTION	SPECIFICATION	DWG #
1	TAU II CRASH CUSHION	LENGTH AS REQUIRED	N/A
4	PERMANENT CONCRETE BARRIER	N/A	N/A
6	ASHTO HARDWARE SPEC. (F1953)	N/A	N/A
8	ASHTO HARDWARE SPEC. (F1953)	N/A	N/A
7	ASHTO HARDWARE SPEC. (F1953)	N/A	N/A
9	ASHTO HARDWARE SPEC. (F1953)	N/A	N/A
17	ASHTO HARDWARE SPEC. (F1953)	N/A	N/A

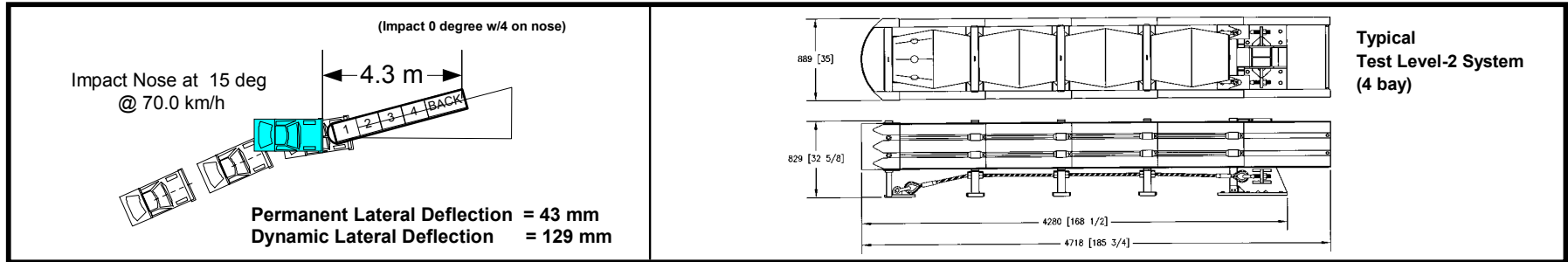
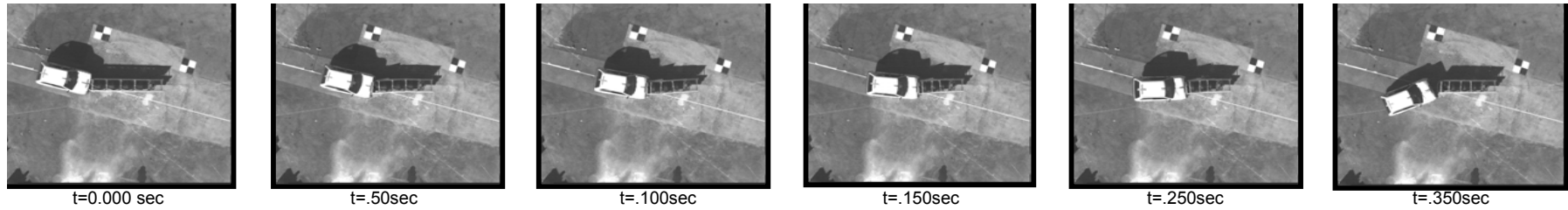


- NOTES:
- △ TRANSITION SPACING IS IN ACCORDANCE WITH CAL-TRANS SPEC. A781 AND NEVADA DOT SPEC. R-8.4.3.
 - △ TRANSITION BLOCKOUTS AND SPACERS IN ACCORDANCE WITH NEVADA DOT SPEC. R-8.4.3.
 - △ WOOD SPACER BLOCKS (OF THE PROPER DIMENSIONS) MAY BE SUBSTITUTED FOR THE DETAILED STEEL BLOCKS.

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

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SCALE: 1=20	Standard Tolerance	Angular ± 1/2°	Model
DRAWN BY: []	DATE: 07/02/01	Fractional ± 1/16	DRAWING NUMBER
APPROVED BY: []	RCG	Dec. XXX ± .010	B010811-PD
	Dec. XX ± .030		REV.
REV.	CHANGES	DATE	BY
			REQD.
			NEXT ASSY.
			ITEM

TITLE: TAU II CRASH CUSHION
TRANSITION TO SAFETY
SHAPE P.C.B ONE-SIDE.



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 2-32 (Head On Angled)**
 Test No..... **STI Test #TAD32**
 Date..... 8/27/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length

..... 4.3 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 913 kg / 4 bay system

Test Vehicle

Type..... Production Model
 Designation..... 820C
 Model..... 1989, Ford Festiva

Mass (kg)

Curb..... 785.5
 Test Inertial..... 824
 Dummy(s)..... 75
 Gross Static..... 900

Impact Conditions

Speed (km/h)..... 70
 Angle (deg)..... 15
 Impact Severity (kJ)..... 155.9

Exit Conditions

Speed (km/h)..... 10.8 km/h (6.7 mph)
 Angle (deg)..... Recoil

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 11.2
 y-direction..... 0.6
 Ridedown Acceleration (g's)
 x-direction..... -11.1
 y-direction..... 6.5
 THIV (m/s)..... 11.2
 PHD (g's)..... 11.2
 ASI..... 1.07

Test Article Deflection (mm)

Dynamic..... 129
 Permanent..... 43

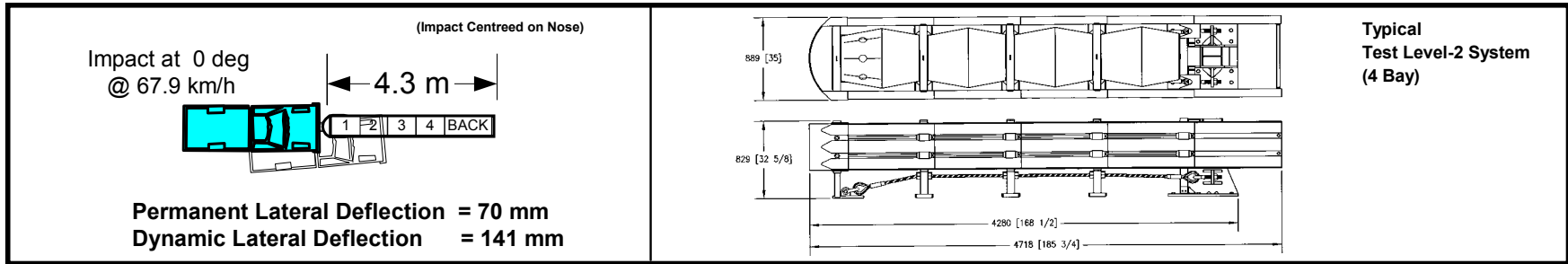
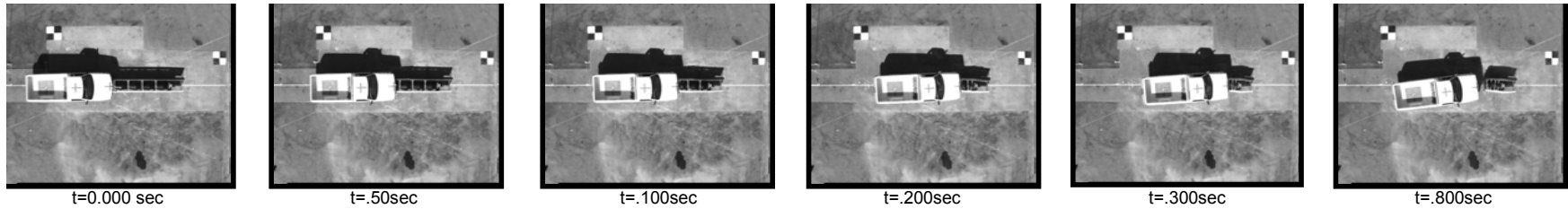
Vehicle Damage

Exterior
 VDS..... FC-1
 CDC..... 12FYEW1
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 2.6
 Maximum Pitch Angle..... -6.8
 Maximum Yaw Angle..... -37.3

Figure 11. Summary of Results Test #TAD32



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 2-31 (Head On)**
 Test No..... **STI Test #TAD31**
 Date..... 8/15/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion
Installation Length..... 4.3 meters (8 bay system)
 Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 913 kg / 4 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1989, Chevrolet Scottsdale 2500
 3/4 Ton Pickup
 Mass (kg)
 Curb..... 1854
 Test Inertial..... 1980
 Dummy(s)..... n/a
 Gross Static..... 1980

Impact Conditions

Speed (km/h)..... 67.9
 Angle (deg)..... 0
 Impact Severity (kJ)..... 351.7

Exit Conditions

Speed (km/h)..... n/a
 Angle (deg)..... n/a

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 8.6
 y-direction..... 0.1
 Ridedown Acceleration (g's)
 x-direction..... -11.2
 y-direction..... 1.8
 THIV (m/s)..... 8.6
 PHD (g's)..... 11.2
 ASI..... 0.8

Test Article Deflection (mm)

Dynamic..... 141
 Permanent..... 70

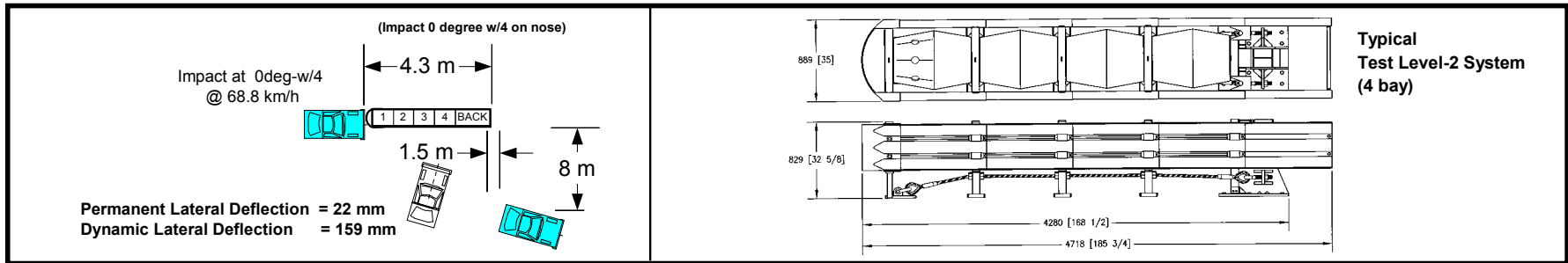
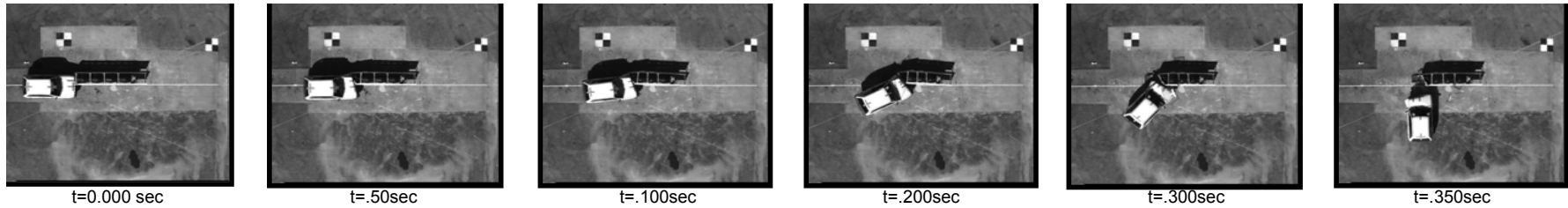
Vehicle Damage

Exterior
 VDS..... FC-2
 CDC..... 12FDEW2
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 2.8
 Maximum Pitch Angle..... -2.4
 Maximum Yaw Angle..... -7.3

Figure 6. Summary of Results Test #TAD31



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 2-30 (Head On)**
 Test No..... **STI Test #TAD30**
 Date..... 8/14/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length..... 4.3 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 913 kg / 4 bay system

Test Vehicle

Type..... Production Model
 Designation..... 820C
 Model..... 1988, Ford Festiva

Mass (kg)

Curb..... 755
 Test Inertial..... 839.5
 Dummy(s)..... 75
 Gross Static..... 915

Impact Conditions

Speed (km/h)..... 68.8
 Angle (deg)..... 0
 Impact Severity (kJ)..... 153.4

Exit Conditions

Speed (km/h)..... n/a
 Angle (deg)..... n/a

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 10.9
 y-direction..... -1.2
 Ridedown Acceleration (g's)
 x-direction..... -11.6
 y-direction..... 5.8
 THIV (m/s)..... 11.4
 PHD (g's)..... 12.9
 ASI..... 1.04

Test Article Deflection (mm)

Dynamic..... 159
 Permanent..... 23

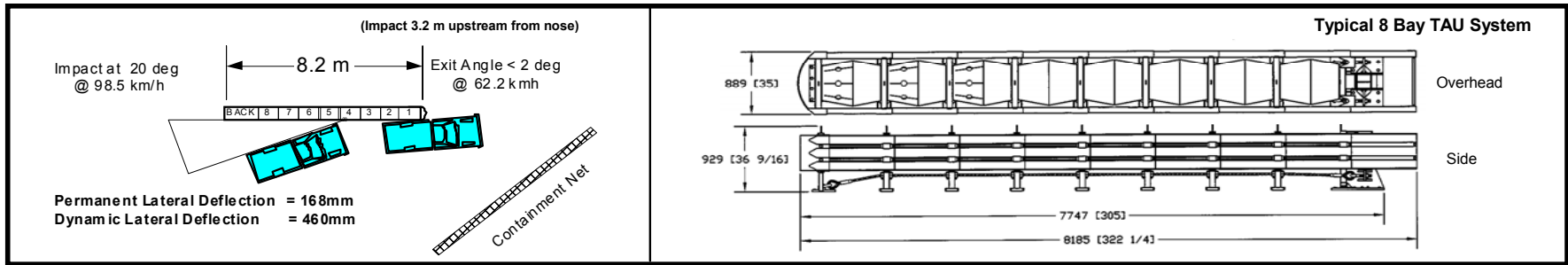
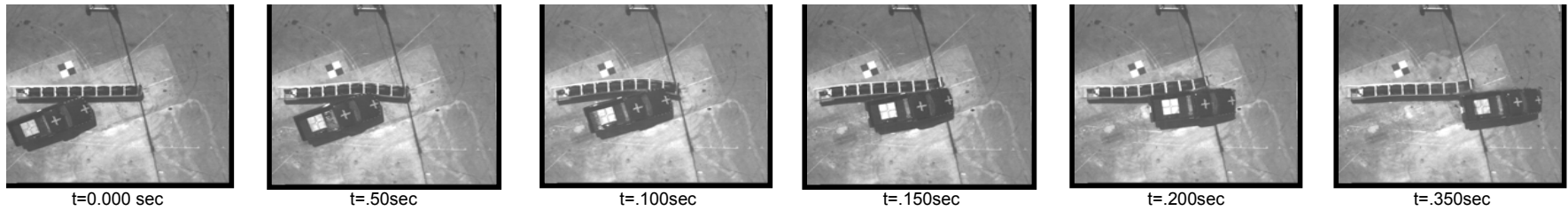
Vehicle Damage

Exterior
 VDS..... FC-2
 CDC..... 12FYEW2
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... -7.5
 Maximum Pitch Angle..... -6.8
 Maximum Yaw Angle..... -212.5

Figure 1. Summary of Results Test #TAD30



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-39 (Reverse Hit)**
 Test No..... **STI Test #TAD14**
 Date..... 7/3/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion
 Installation Length..... 8.2 meters (8 bay system)

Installation Length

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1988, Chevrolet Scottsdale 2500
 3/4 Ton Pickup
 Mass (kg)
 Curb..... 1857
 Test Inertial..... 1974
 Dummy(s)..... n/a
 Gross Static..... 1974

Impact Conditions

Speed (km/h)..... 98.5
 Angle (deg)..... 20
 Impact Severity (kJ)..... 86.3

Exit Conditions

Speed (km/h)..... 62.2 (38.6 mph)
 Angle (deg)..... 1.3

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 4.4
 y-direction..... -6.2
 Ridedown Acceleration (g's)
 x-direction..... -9.8
 y-direction..... 13.9
 THIV (m/s)..... 6.9
 PHD (g's)..... 16.8
 ASI..... 1.08

Test Article Deflection (mm)

Dynamic..... 460
 Permanent..... 168

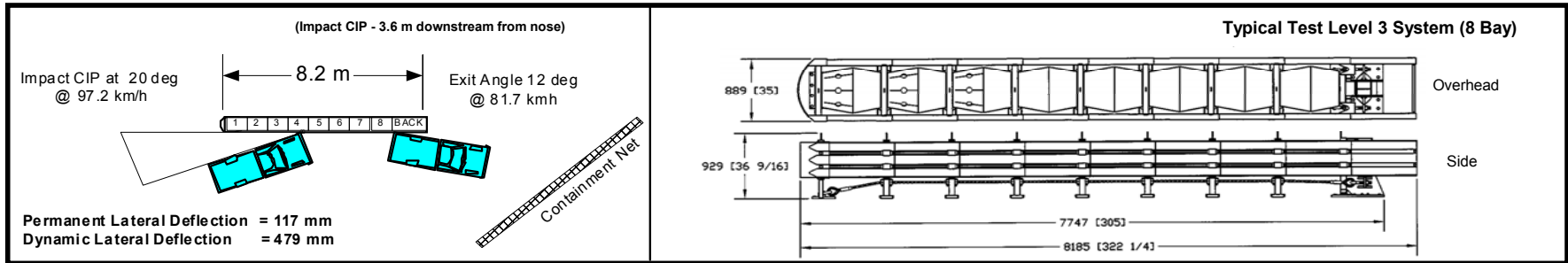
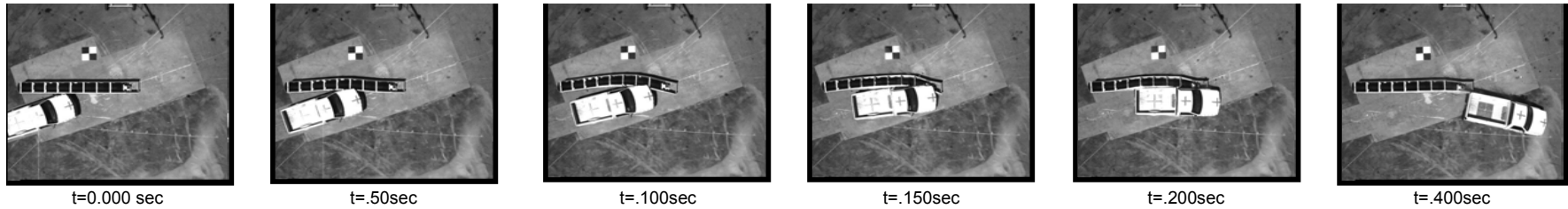
Vehicle Damage

Exterior
 VDS..... LD-4
 CDC..... 11LDES2
 Interior
 OCDI..... AS0103100

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... -11.3
 Maximum Pitch Angle..... -6.2
 Maximum Yaw Angle..... 16.3

Figure 1. Summary of Results Test TAD14



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-38 (CIP)**
 Test No..... **STI Test #TAD15**
 Date..... 7/6/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length..... 8.2 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1990, Chevrolet Cheyenne 2500
 3/4 Ton Pickup

Mass (kg)
 Curb..... 2003
 Test Inertial..... 1965
 Dummy(s)..... n/a
 Gross Static..... 1965

Impact Conditions

Speed (km/h)..... 97.2
 Angle (deg)..... 20
 Impact Severity (kJ)..... 83.9

Exit Conditions

Speed (km/h)..... 81.7 (50.8 mph)
 Angle (deg)..... 12

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 3.7
 y-direction..... -5.5

Ridedown Acceleration (g's)
 x-direction..... -10.8
 y-direction..... 17.6

THIV (m/s)..... 5.9
 PHD (g's)..... 18.5
 ASI..... 1.07

Test Article Deflection (mm)

Dynamic..... 479
 Permanent..... 117

Vehicle Damage

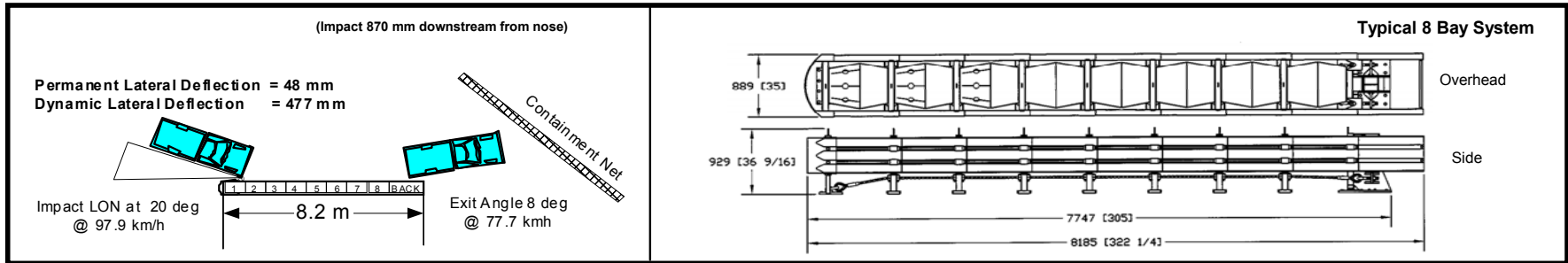
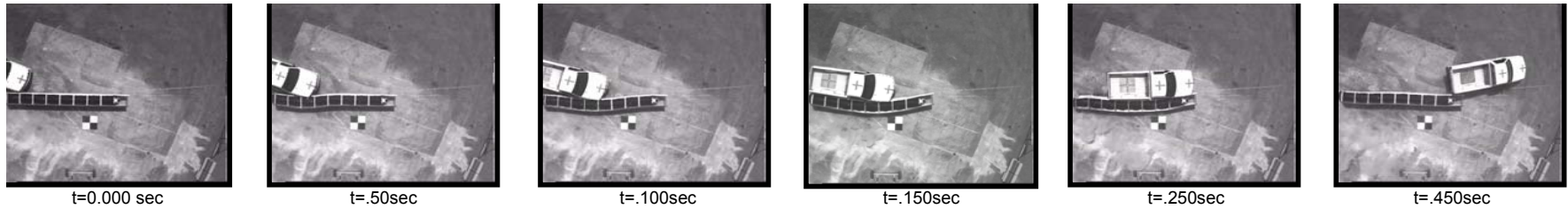
Exterior
 VDS..... LFQ-3
 CDC..... 11FLEE3

Interior
 OCDI..... AS1113100

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... -13.8
 Maximum Pitch Angle..... -5.3
 Maximum Yaw Angle..... 48

Figure 6. Summary of Results Test #TAD15



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-37 (LON)**
 Test No..... **STI Test #TAD16**
 Date..... 7/9/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length..... 8.2 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1989, GMC Sierra
 3/4 Ton Pickup

Mass (kg)
 Curb..... 1864
 Test Inertial..... 1973
 Dummy(s)..... n/a
 Gross Static..... 1973

Impact Conditions

Speed (km/h)..... 97.9
 Angle (deg)..... 20
 Impact Severity (kJ)..... 85.3

Exit Conditions

Speed (km/h)..... 77.7 (48.2 mph)
 Angle (deg)..... 8

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 2.2
 y-direction..... 4.8

Ridedown Acceleration (g's)
 x-direction..... -11.5
 y-direction..... -13.8

THIV (m/s)..... 4.9
 PHD (g's)..... 14.4
 ASI..... 1.09

Test Article Deflection (mm)

Dynamic..... 477
 Permanent..... 48

Vehicle Damage

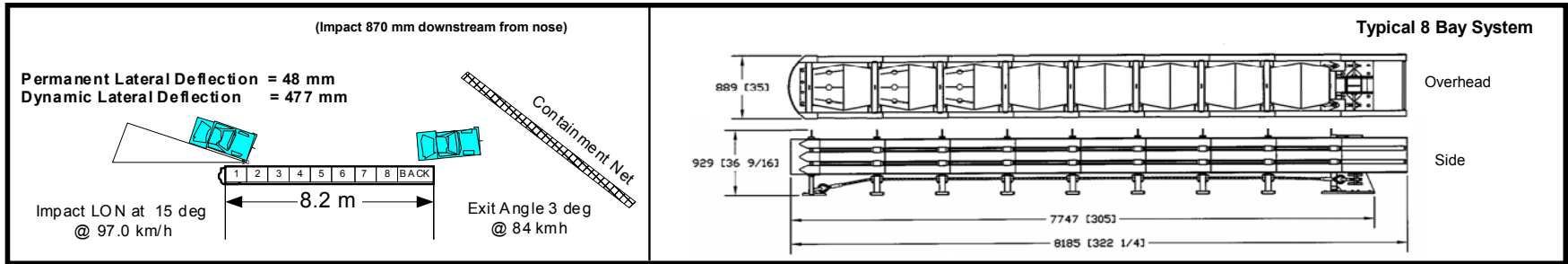
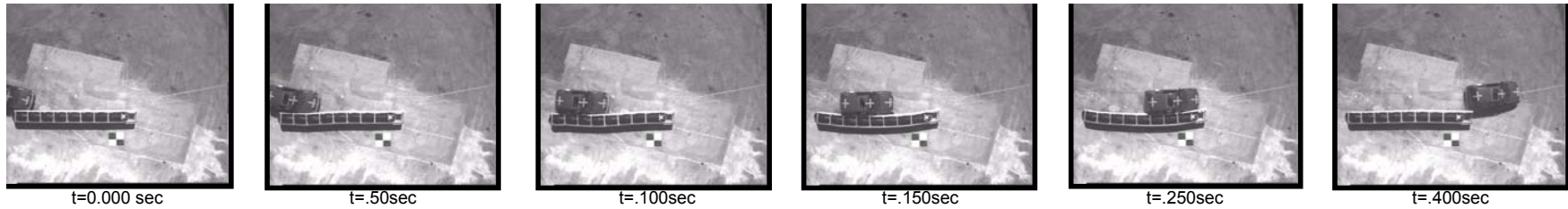
Exterior
 VDS..... RFQ-3
 CDC..... 01RFEW2

Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 13.1
 Maximum Pitch Angle..... 6.2
 Maximum Yaw Angle..... 150.7

Figure 11. Summary of Results Test #TAD16



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-36 (LON)**
 Test No..... **STI Test #TAD17**
 Date..... 7/10/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length

..... 8.2 meters (8 bay system)
 Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 820C
 Model..... 1989, Ford Festiva

Mass (kg)

Curb..... 747
 Test Inertial..... 808
 Dummy(s)..... 75
 Gross Static..... 883

Impact Conditions

Speed (km/h)..... 97
 Angle (deg)..... 15
 Impact Severity (kJ)..... 19.7

Exit Conditions

Speed (km/h)..... 84 (52.2 mph)
 Angle (deg)..... 3

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 1.9
 y-direction..... 4.6
 Ridedown Acceleration (g's)
 x-direction..... -2.2
 y-direction..... -13.2
 THIV (m/s)..... 4.7
 PHD (g's)..... 13.2
 ASI..... 0.77

Test Article Deflection (mm)

Dynamic..... 348
 Permanent..... 46

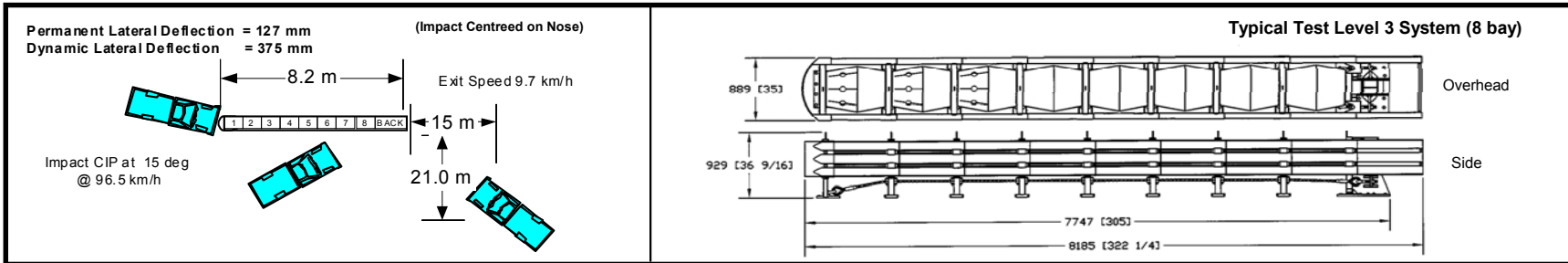
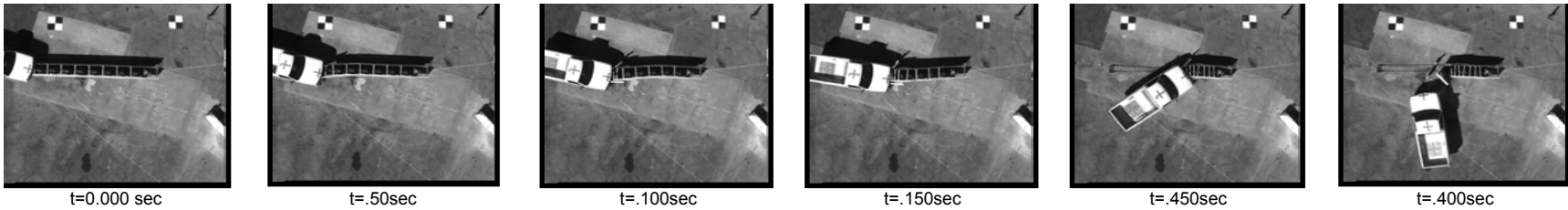
Vehicle Damage

Exterior
 VDS..... RFQ-2
 CDC..... 01RFEW1
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 7
 Maximum Pitch Angle..... 1.3
 Maximum Yaw Angle..... -24.9

Figure 16. Summary of Results Test #TAD17



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-33 (Head On)**
 Test No..... **STI Test #TAD29**
 Date..... 8/10/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU-II Redirective, Non-Gating, Crash Cushion

Installation Length..... 8.2 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1989, GMC Sierra
 3/4 Ton Pickup

Mass (kg)

Curb..... 1908
 Test Inertial..... 1982
 Dummy(s)..... n/a
 Gross Static..... 1982

Impact Conditions

Speed (km/h)..... 96.5
 Angle (deg)..... 15
 Impact Severity (kJ)..... 712.4

Exit Conditions

Speed (km/h)..... 9.72 (6.0 mph)
 Angle (deg)..... 70

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 8.6
 y-direction..... 0.4
 Ridedown Acceleration (g's)
 x-direction..... -8.6
 y-direction..... 3.4
 THIV (m/s)..... 8.7
 PHD (g's)..... 8.7
 ASI..... 0.63

Test Article Deflection (mm)

Dynamic..... 375
 Permanent..... 127

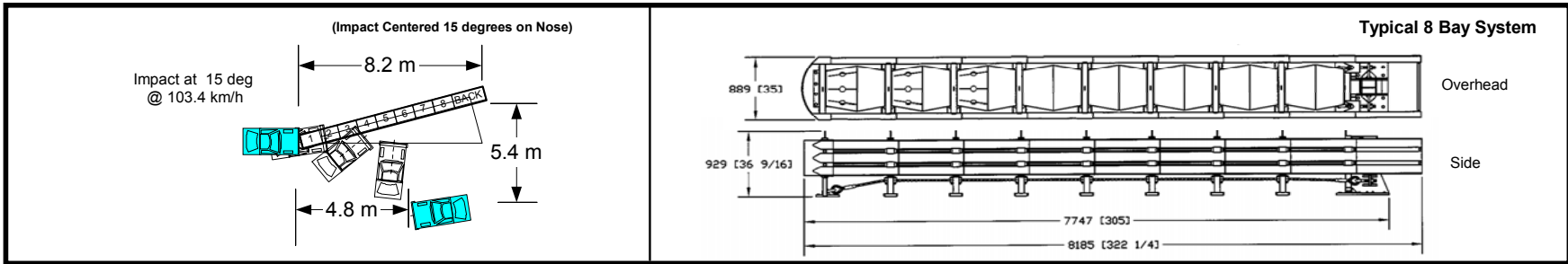
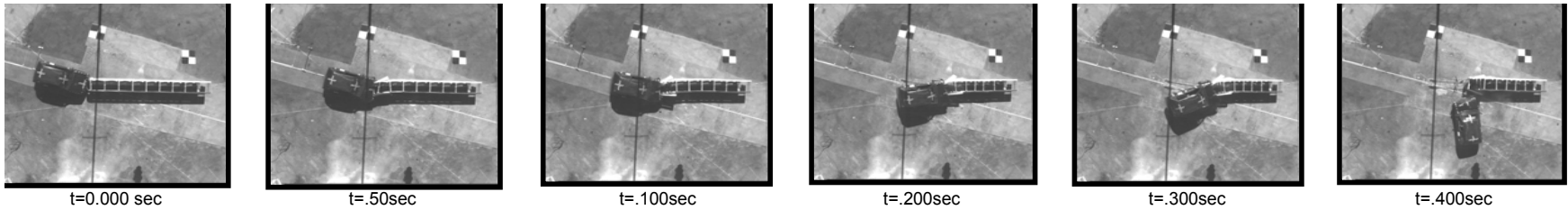
Vehicle Damage

Exterior
 VDS..... FC-1
 CDC..... 12FDEW1
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 7.1
 Maximum Pitch Angle..... -5.4
 Maximum Yaw Angle..... -168.7

Figure 31. Summary of Results Test #TAD29



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-32 (Head On Angled)**
 Test No..... **STI Test #TAD34**
 Date..... 8/28/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 820C
 Model..... 1990, Ford Festiva

Mass (kg)

Curb..... 770.5
 Test Inertial..... 831
 Dummy(s)..... 75
 Gross Static..... 907.5

Impact Conditions

Speed (km/h)..... 103.4
 Angle (deg)..... 15
 Impact Severity (kJ)..... 343

Exit Conditions

Speed (km/h)..... n/a
 Angle (deg)..... n/a

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 11.6
 y-direction..... 0.3
 Ridedown Acceleration (g's)
 x-direction..... -14.7
 y-direction..... -10.2
 THIV (m/s)..... 11.7
 PHD (g's)..... 17.8
 ASI..... 1.1

Test Article Deflection (mm)

Dynamic..... n/a
 Permanent..... n/a

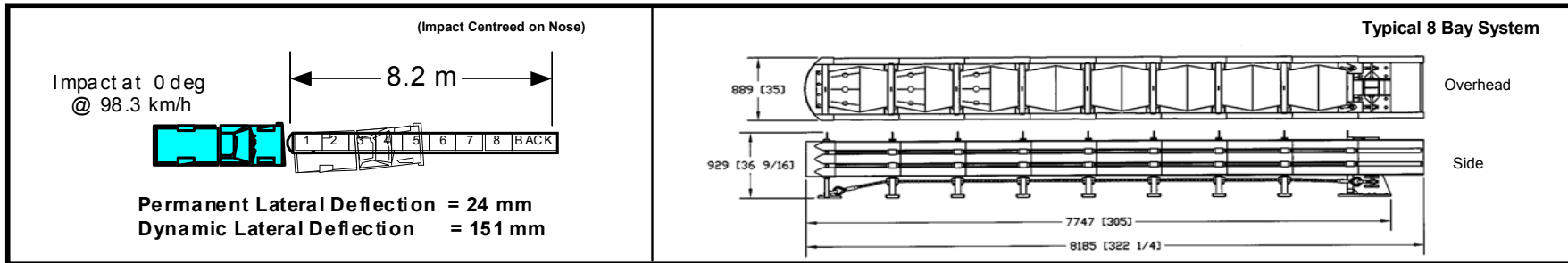
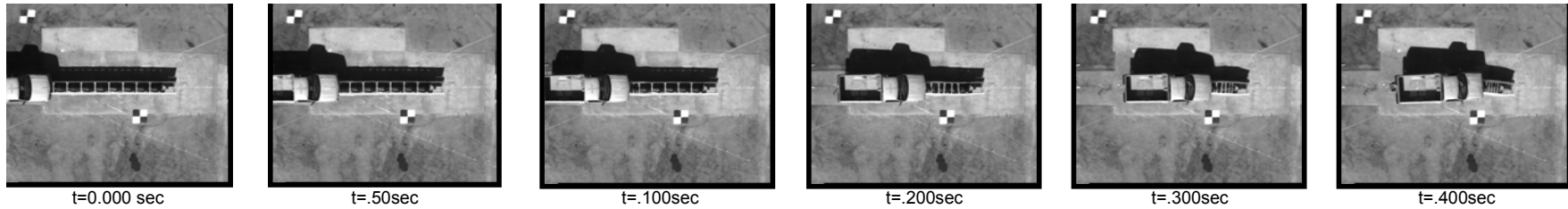
Vehicle Damage

Exterior
 VDS..... FL-4
 CDC..... 11FDEW4
 Interior
 OCDI..... AS0122000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 18.3
 Maximum Pitch Angle..... -12.6
 Maximum Yaw Angle..... -220.4

Figure 1. Summary of Results Test #TAD34



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-31 (Head On)**
 Test No..... **STI Test #TAD28**
 Date..... 8/8/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion

Installation Length..... 8.2 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 2000P
 Model..... 1989, Chevrolet Scottsdale 2500
 3/4 Ton Pickup

Mass (kg)
 Curb..... 1915
 Test Inertial..... 1970
 Dummy(s)..... n/a
 Gross Static..... 1970

Impact Conditions

Speed (km/h)..... 98.3
 Angle (deg)..... 0
 Impact Severity (kJ)..... 734.6

Exit Conditions

Speed (km/h)..... n/a
 Angle (deg)..... n/a

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 8.2
 y-direction..... 0.1
 Ridedown Acceleration (g's)
 x-direction..... -18
 y-direction..... -3
 THIV (m/s)..... 8.2
 PHD (g's)..... 18.2
 ASI..... 1.21

Test Article Deflection (mm)

Dynamic..... 151
 Permanent..... 24

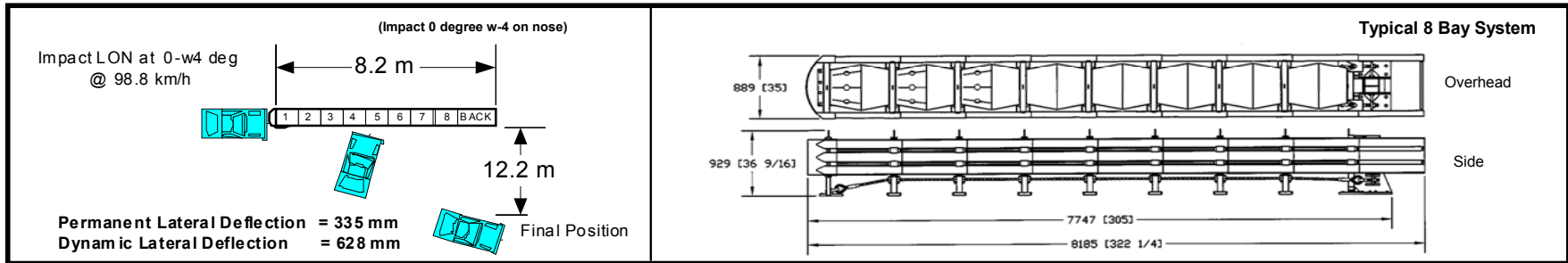
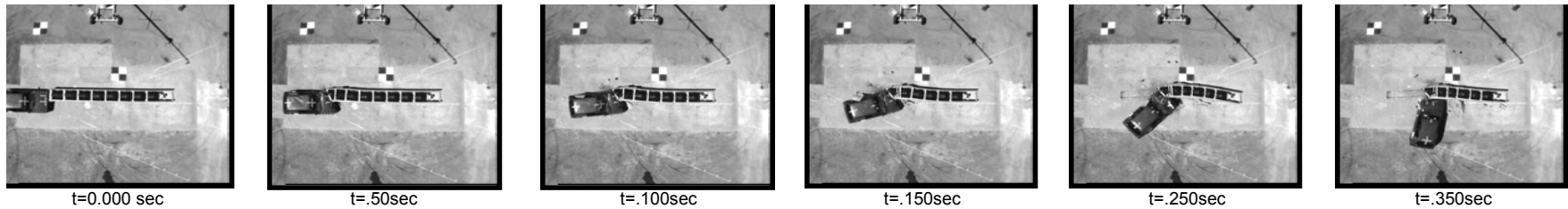
Vehicle Damage

Exterior
 VDS..... FC-3
 CDC..... 12FDEW3
 Interior
 OCDI..... AS000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... -5.7
 Maximum Pitch Angle..... -3.2
 Maximum Yaw Angle..... -12.9

Figure 26. Summary of Results Test #TAD28



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-30 (Head On)**
 Test No..... **STI Test #TAD26**
 Date..... 8/3/2001

Test Article

Type..... Barrier Systems, Inc.
 TAU Redirective, Non-Gating, Crash Cushion
 Installation Length..... 8.2 meters (8 bay system)

Size and/or dimension and material
 of key elements..... Height 929 mm, Width 889 mm,
 Mass 1383 kg / 8 bay system

Test Vehicle

Type..... Production Model
 Designation..... 820C
 Model..... 1988, Ford Festiva

Mass (kg)
 Curb..... 775.5
 Test Inertial..... 840
 Dummy(s)..... 75
 Gross Static..... 916

Impact Conditions

Speed (km/h)..... 98.8
 Angle (deg)..... 0
 Impact Severity (kJ)..... 316.4

Exit Conditions

Speed (km/h)..... 23.7 (14.7 mph)
 Angle (deg)..... n/a

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 10.6
 y-direction..... -0.9
 Ridedown Acceleration (g's)
 x-direction..... -13.4
 y-direction..... -7.9
 THIV (m/s)..... 11.1
 PHD (g's)..... 13.4
 ASI..... 1.13

Test Article Deflection (mm)

Dynamic..... 628
 Permanent..... 335

Vehicle Damage

Exterior
 VDS..... RFQ-2FC-4
 CDC..... 12FYEW3
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... 14.9
 Maximum Pitch Angle..... -8.1
 Maximum Yaw Angle..... -328.9

Figure 21. Summary of Results Test #TAD26

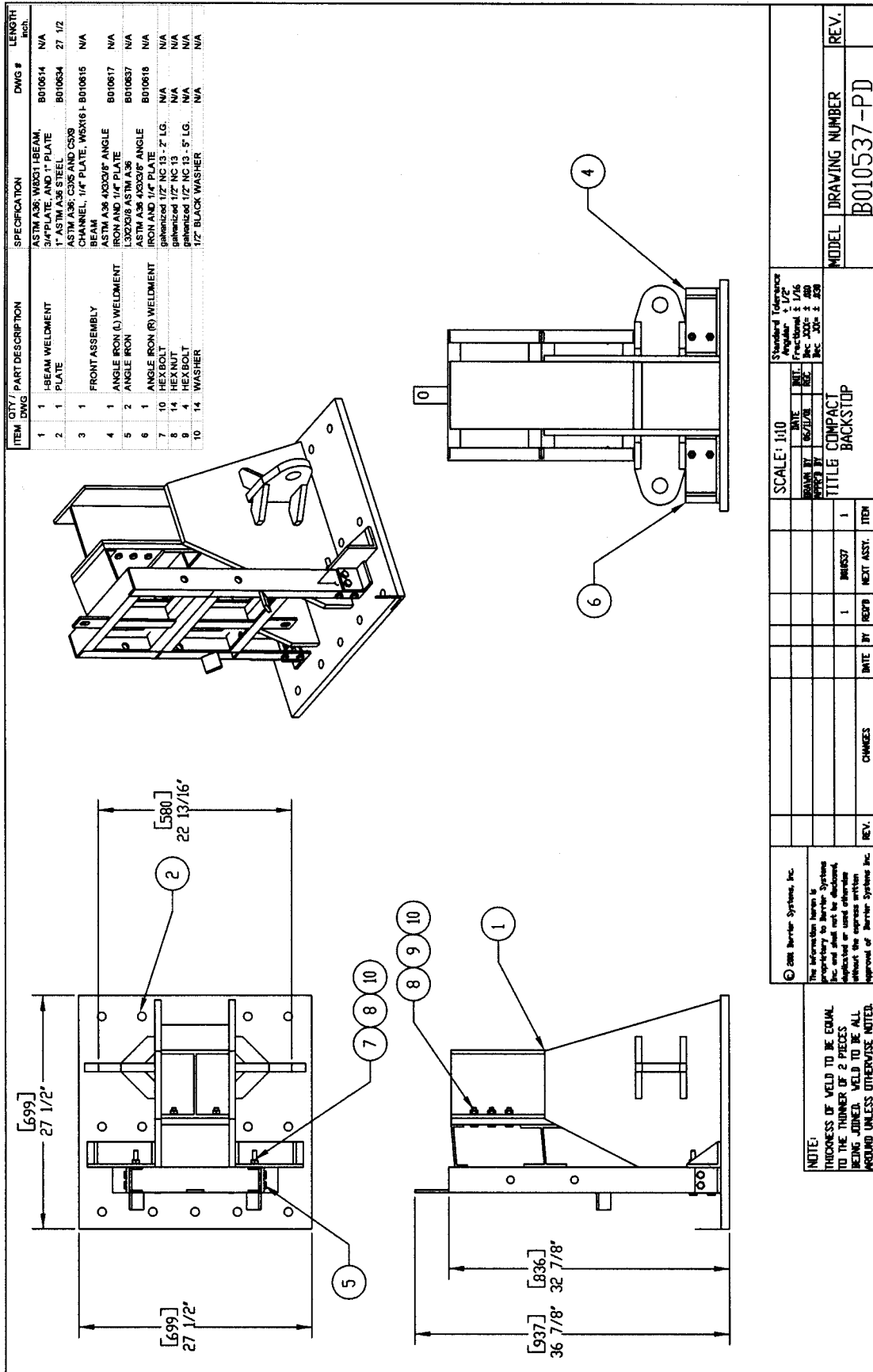


Figure D-4

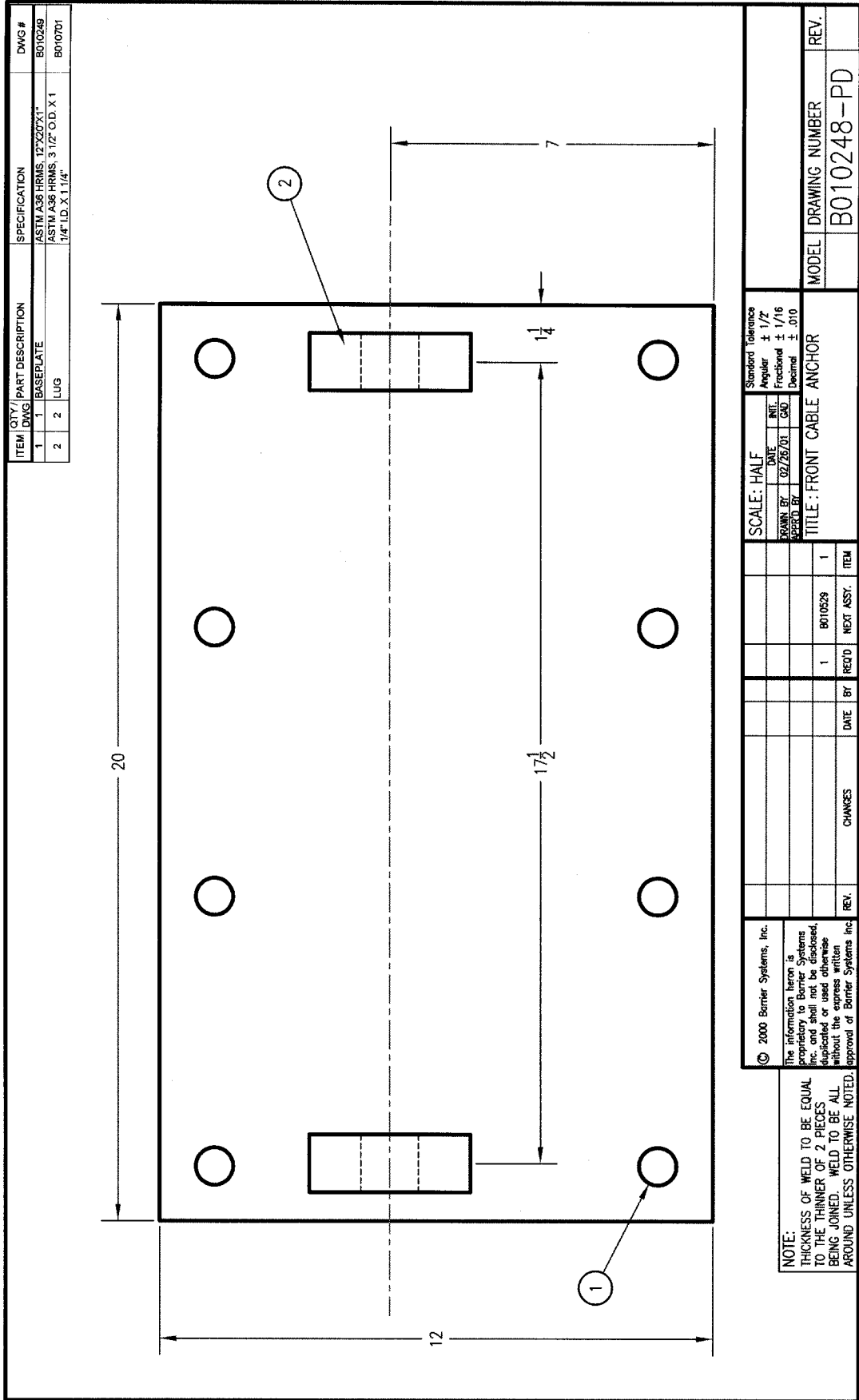


Figure D-8

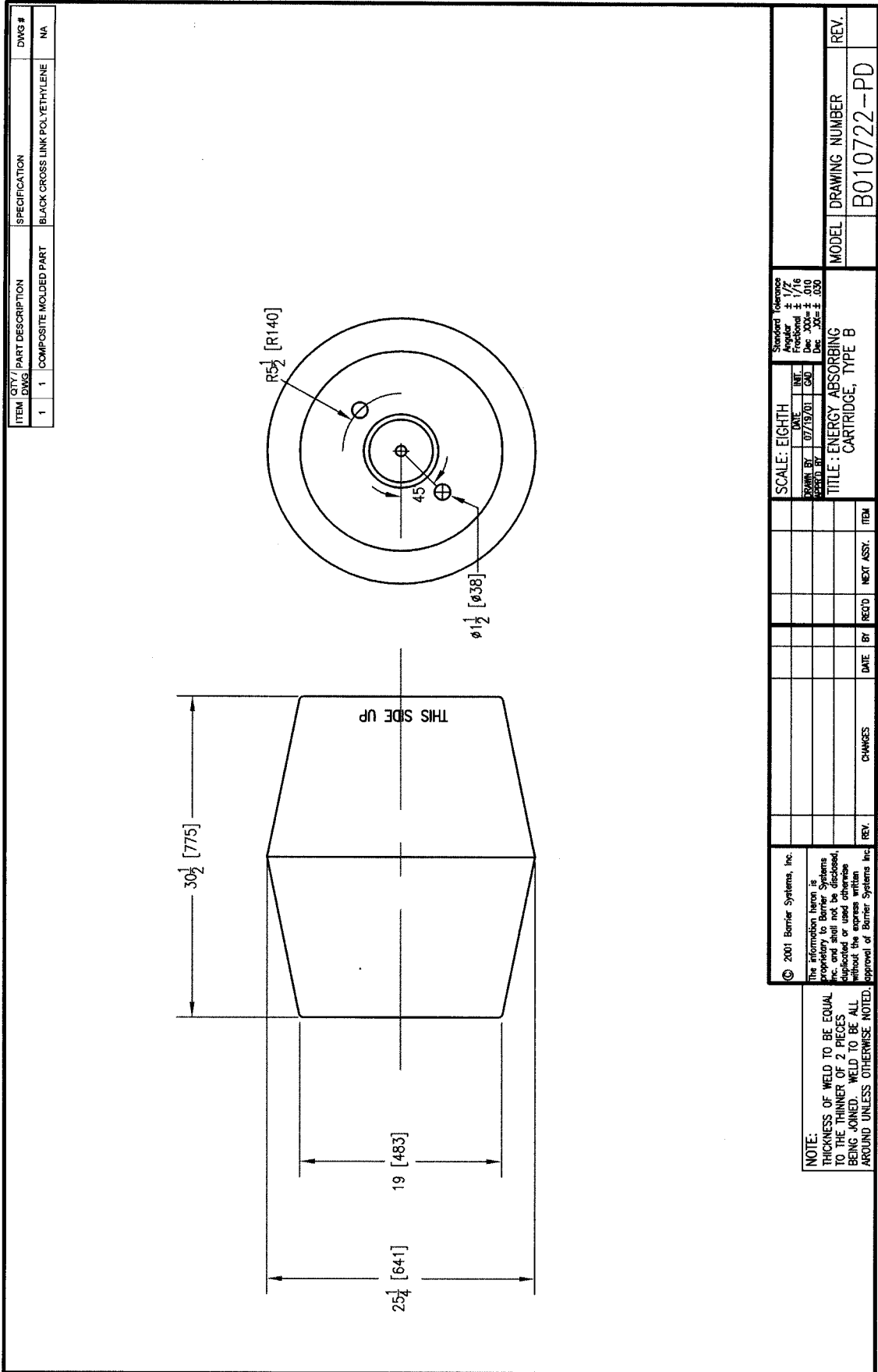


Figure D-5

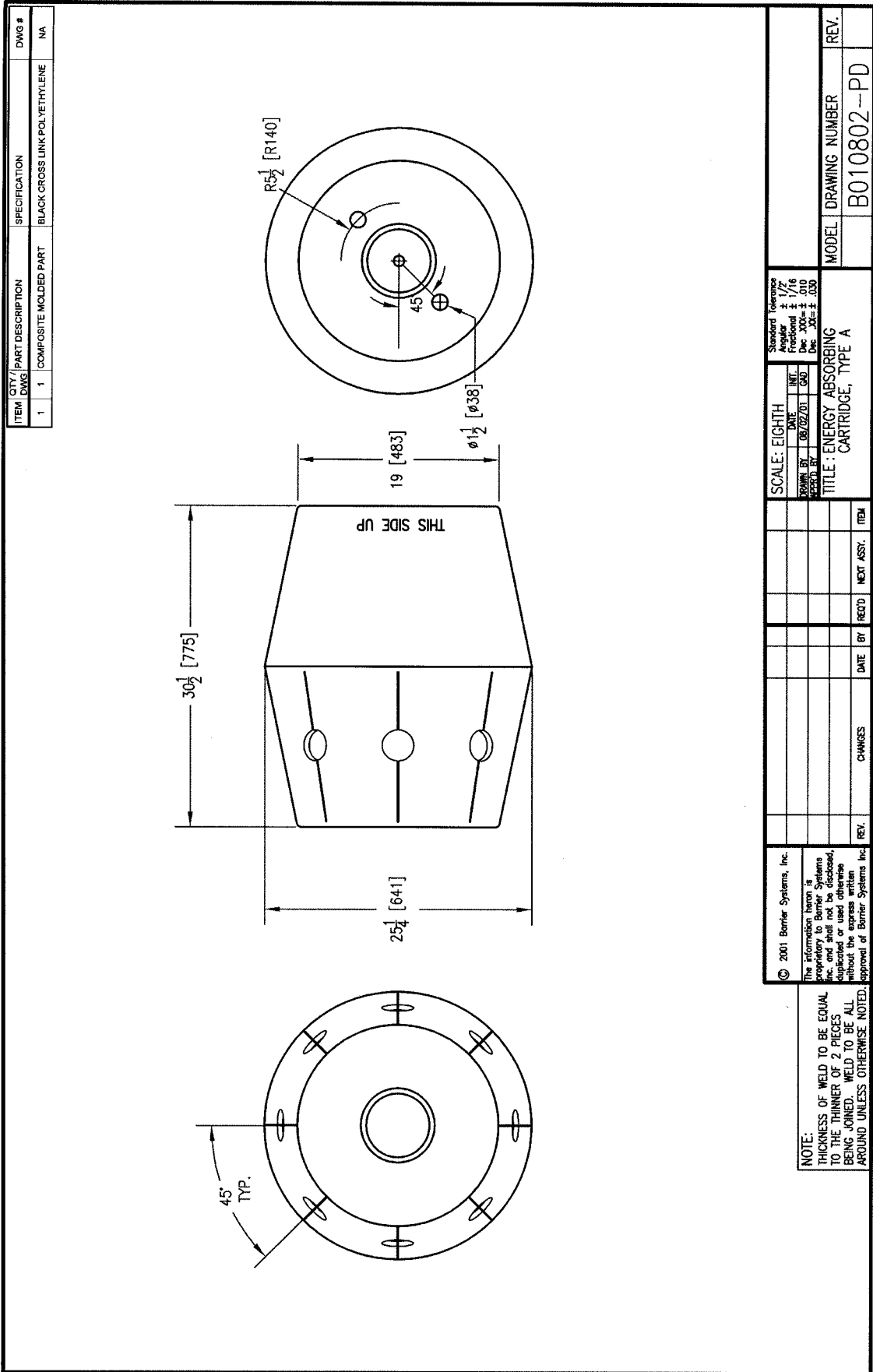


Figure D-6

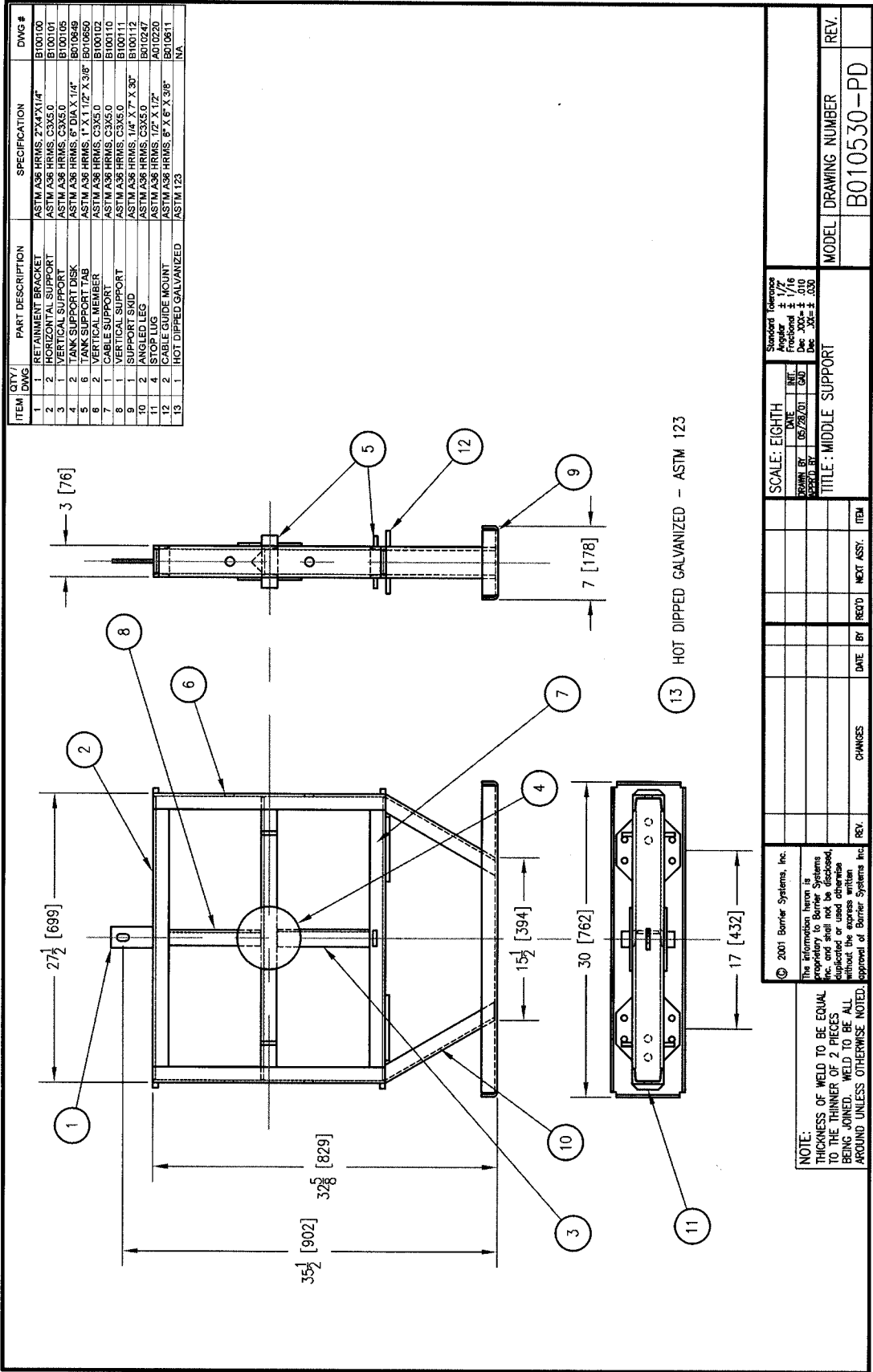
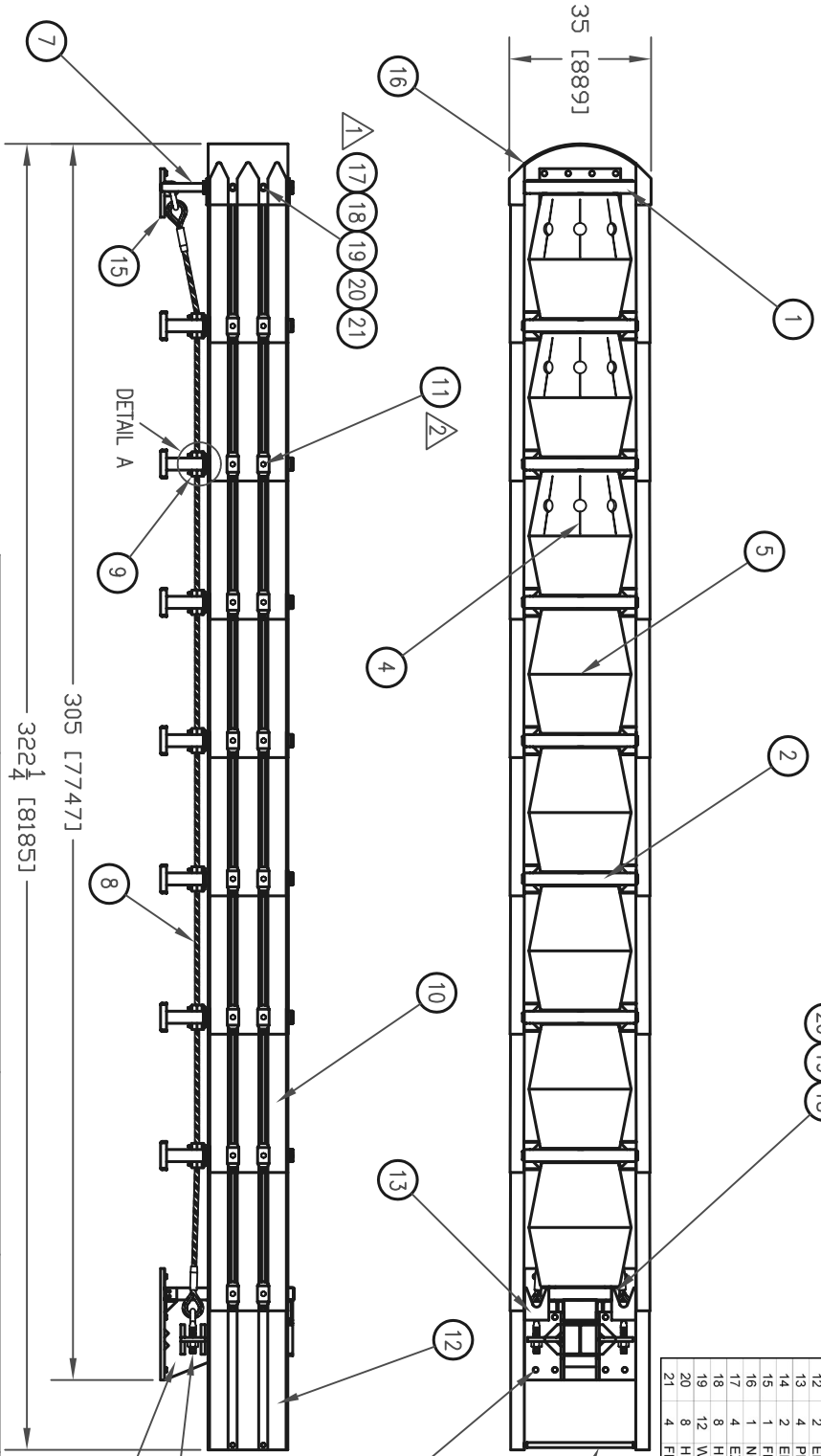
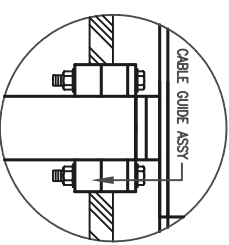


Figure D-3

- 1 TORQUE TO 200 FT-LBF
- 2 TORQUE TO 20 FT-LBF
- 3 TORQUE TO 500 FT-LBF



ITEM	QTY / DWG	PART DESCRIPTION	SPECIFICATION	PART #
1	1	FRONT SUPPORT ASSEMBLY	NA	B010528
2	7	MID SUPPORT ASSEMBLY	NA	B010530
3	1	COMPACT END SUPPORT ASSEMBLY	NA	B010537
4	3	ENERGY ABSORBING CARTRIDGE, TYPE A	NA	B010802
5	5	ENERGY ABSORBING CARTRIDGE, TYPE B	NA	B010722
6	1	ANCHORING PACKAGE	NA	B010713
7	2	FRONT SUPPORT LEG	NA	B010712
8	2	COMPACT CABLE	NA	B100113
9	14	CABLE GUIDE ASSEMBLY	NA	B010721
10	16	SLIDING PANEL	NA	B010202
11	32	END PANEL	NA	B100130
12	2	END PANEL MOUNT	NA	B010659
13	4	END PANEL CROSS PIECE	NA	B100133
14	2	FRONT CABLE ANCHOR	NA	B010248
15	1	NOSE PIECE	NA	B010711
16	4	EXTRA THICK FLAT WASHER	SS - 1 1/2" OD X 13/16" ID X 7/32"	2001009
17	4	HEX BOLT	SS-20MM-2.5 X 50MM	2001005
18	8	WASHER	SS-20MM	2001006
19	12	HEX NUT	SS-20MM-2.5	2001007
20	8	FENDER WASHER	SS-13/16" ID X 1 7/8" OD	2001009
21	4	FENDER WASHER	SS-13/16" ID X 1 7/8" OD	2001009



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

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

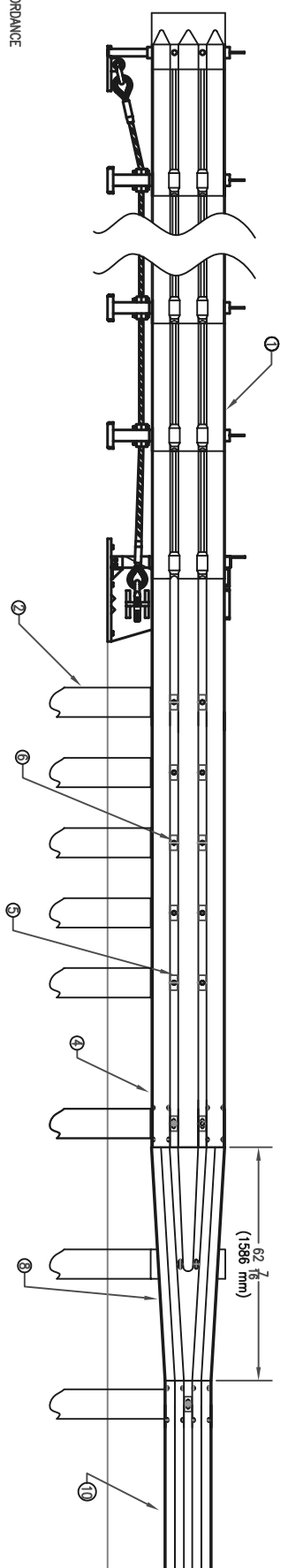
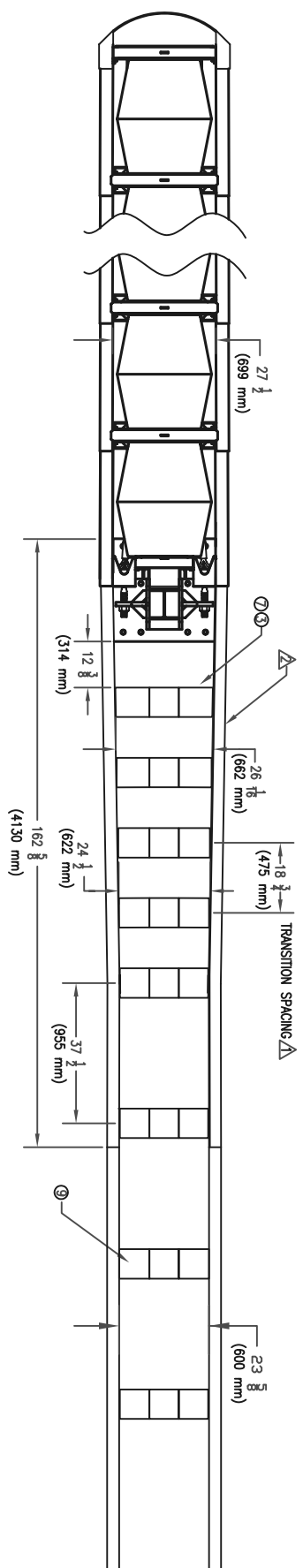
SCALE: 1:30
Standard Tolerance
Angular ± 1/2°
Fractional ± 1/16
Dec. XXX ± .010
Dec. .XXX ± .030

DATE: 07/09/07
INFL: GAO
DRAWN BY: [Signature]
APPROV BY: [Signature]

TITLE: TAU-II TL-3 SYSTEM
BARRIER SYSTEMS, INC

MODEL	DRAWING NUMBER	REV.
B010708		1

ITEM	QTY	PART DESCRIPTION	SPECIFICATION	DWG #
1	1	TAU II CRASH CUSHION	LENGTH AS REQUIRED	N/A
2	8	STROG POST	STANDARD WOOD OR STEEL STROG POST	N/A
3	4	BLOCKOUT	STANDARD WOOD OR STEEL W-BEAM BLOCKOUT	N/A
4	5	SPACE W-BEAM	ASHTO HARDWARE SPEC. (RW105B)	N/A
5	26	RECTANGULAR GUARDRAIL WASHER HARDWARE SPEC. (RW103)	ASHTO HARDWARE SPEC. (RW103)	N/A
6	30	GALVANIZED HEX BOLT AND NUT	ASHTO HARDWARE SPEC. (FBX16)	N/A
7	8	SPACER BLOCKOUT	STANDARD WOOD OR STEEL TRANSITION SPACER	N/A
8	2	W-THREE BEAM TRANSITION SECTION	ASHTO HARDWARE SPEC. (RW101)	N/A
9	2	BLOCKOUT	STANDARD WOOD OR STEEL W-BEAM BLOCKOUT	N/A
10	2	4-SPACE W-BEAM	ASHTO HARDWARE SPEC. (RW104B)	N/A



- NOTES:
- △ TRANSITION SPACING IS IN ACCORDANCE WITH ASHTO SPEC STR06 AND NEVADA DOT SPEC. R-8.4.3.
 - △ TWO SECTIONS OF RIMWOOD GUARDRAIL ONE SET INSIDE THE OTHER USED ON THIS SIDE FOR BI-DIRECTIONAL TRAFFIC CONDITIONS.

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

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

SCALE: 1:30
 DRAWN BY: [] DATE: []
 INTR: []
 CHECKED BY: [] DATE: 09/05/01
 RGC: []
 APPR'D BY: [] DATE: Dec. XXX ± 1/16
 Dec. XXX ± 1/16
 Dec. XXX ± .030

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

TITLE: TAU II CRASH CUSHION
 TRANSITION TO W-BEAM
 BARRIER SYSTEMS, INC.

MODEL: DRAWING NUMBER
 B010728-PD

REV.