BARRIER SYSTEMS

A LINDSAY TRANSPORTATION SOLUTIONS COMPANY

X-MAS™

X-Tension™ Median Attenuator System

- Low Initial Price
- Redirective, Non-Gating
- Contractor Friendly
- Simple installation

X-MAS™ X-Tension™ Median Attenuator System

1 IMPACT HEAD
2 SOIL ANCHOR
3 CABLES
4. X-TENSION POSTS
5. STANDARD POSTS
6. STANDARD GUARDRAIL

NCHRP 350 TL-3 REDIRECTIVE, NON-GATING IMPACT ATTENUATOR DESIGNED FOR MEDIAN APPLICATIONS

The Redirective, Non-Gating, NCHRP 350 TL-3 X-MAS features excellent impact performance and easy installation at an affordable price, with no foundation required. By using standard guardrail parts and superior engineering, this low cost median terminal offers the same life saving performance expected from NCHRP 350 Redirective, Non-Gating Impact Attenuators at a fraction of the high initial price.

FEATURES

- The lowest initial price NCHRP 350 TL-3 Redirective Non-Gating crash cushion available
- Attaches directly to double faced guardrail
- Can be attached to concrete barrier with standard transitions
- Contractor friendly
- Easy to install
- No foundation required
- No backup required

WHERE TO USE

- Narrow medians
- Wide medians
- Gore areas

The X-MAS is available with an optional high visibility nose.

PHYSICAL SPECIFICATIONS

Length	12 m [40’]
Width	572 mm [22.5”]
Height	813 mm [32”]
Weight	594 kg [1310 lb]
Test Performance Level	NCHRP 350 TL-3

Frequently Asked Questions

DOES THE X-MAS USE STANDARD GUARDRAIL POSTS?
All the posts are steel. The first two posts are special, all other posts are standard steel guardrail posts.

CAN THE X-MAS BE INSTALLED WITHOUT A FOUNDATION?
The X-MAS is designed to be installed in-ground using standard guard-rail installation equipment..

CAN THE X-MAS BE ATTACHED TO CONCRETE BARRIER?
The X-MAS can be attached to concrete barrier with the addition of standard transitions..

IS A TRANSITION NEEDED TO ATTACH TO STANDARD DOUBLE SIDED GUARDRAIL?
The X-MAS is designed to attach directly to standard double faced guardrail with no transition required.

CAN THE X-MAS BE INSTALLED USING COMPOSITE BLOCKOUTS?
The X-MAS can be ordered with either wood or composite blockouts.

IS THE X-MAS REUSABLE AFTER A DESIGN IMPACT?
The X-MAS is designed to be a sacrificial crash cushion, making it ideal for low impact locations.

DISTRIBUTED BY:

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

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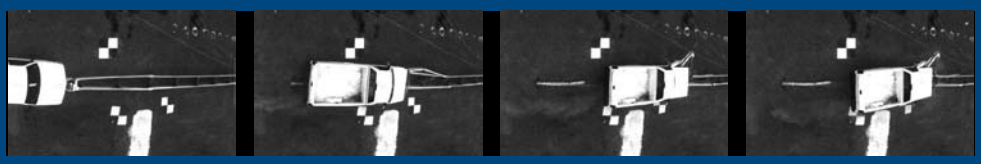

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U.S. Department
of Transportation
Federal Highway Administration

1200 New Jersey Avenue, SE.
Washington, DC 20590

In Reply Refer To: HSSD-1/CC-102

Mr. Owen Denman, PE
President, Barrier Systems Inc.
180 River Road
Rio Vista, CA 94571-1208

Dear Mr. Denman:

Thank you for your letter of August 2, 2007, requesting the Federal Highway Administration (FHWA) acceptance of tangent, flared, and median versions of the X-Tension™ Technology End Terminals for use on the National Highway System (NHS). The original system, the X-350™ Guardrail Terminal was developed by Armorflex, Ltd., and accepted by FHWA in our July 9, 2005, letter CC-91. Barrier Systems, Inc. has since acquired the rights to use the X-350™ Guardrail technology and has developed it further. Accompanying your letter were reports of crash testing conducted by Holmes Solutions, an approved test laboratory which was formerly a facility of the University of Canterbury in Christchurch, New Zealand, and DVD video of the tests. You requested that we find the terminals acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Introduction

The FHWA guidance on crash testing of roadside safety hardware is contained in a memorandum dated July 25, 1997, titled "INFORMATION: Identifying Acceptable Highway Safety Features." The original Armorflex X350 tangent terminal for use with strong-post W-beam guardrail includes an impact head through which two anchor cables are threaded, breakaway line posts, a slider/slider bracket assembly, a cable anchor bracket, and a foundation anchor. For side impacts to the rail, tension is transferred via the cables to the foundation anchor to provide containment and redirection. For head-on and angled impacts directly at the end, friction between the cables and a convolution in the impact head dissipates crash energy. The slider/slider bracket assembly allows the first W-beam rail segment to slide back along the second segment and away from the impacting vehicle.

Your present request is for: 1) modifications to the original tangent version, 2) a flared version, and 3) a median version, using the name X-Tension™ Technology Guardrail End Terminals. The enclosed chart "National Cooperative Highway Research Program Report 350 Test Matrix – X-Tension Testing Program" details the original matrix of tests used to validate the Armorflex X350 design, a Test Requirement Analysis of the needed impacts to validate the Flared Offset Configuration and the Median Terminal, and a Component Modification Analysis.

Testing
You discussed the proposed test matrix with Mr. Nicholas Artimovich of my staff and reached agreement on the tests detailed in the enclosed testing program chart mentioned above. The following tests were conducted and the test data summary sheets are enclosed for reference:

NCHRP Report 350 test 3-30 for the flared configuration.
NCHRP Report 350 tests 3-31 and 3-32 for the median configuration.

We concur that these tests are satisfactory to show NCHRP Report 350 compliance with the following:

- The modified tangent, flared, and median configurations using either wood (CRT) or steel line posts (first two posts crimped near the ground line) as shown in the enclosed drawings.
- The tangent, flared and median configurations use a small "kit" of key components that are used in conjunction with standard W-beam guardrail, wood or composite block-outs, steel line posts or CRT wood posts and standard guardrail component hardware to make up any of the noted configurations noted in the enclosed drawings.
- The amount of offset for flared applications can be between the tangent position (no offset) and the fully flared (1.2 m offset) as tested.
- Recognition of the redirective capability of the system from the first post. Therefore, the system qualifies as a "Redirective, Non-Gating" Terminal under the definitions in NCHRP Report 350.

Findings
The results of the testing met the FHWA requirements and, therefore, the devices described in the various requests above and detailed in the enclosed drawings are acceptable for use on the NHS under the range of conditions tested, when proposed by a highway agency.

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.

- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-102 shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- The X-Tension™ products are patented devices and considered "proprietary." The use of proprietary devices *specified by a highway agency* for use on Federal-aid projects must meet one of the following criteria: (a) it must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that it is essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) it must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

George E. Rice, Jr.
Acting Director, Office of Safety Design
Office of Safety

Enclosures

National Cooperative Highway Research Program Report 350 Test Matrix

X-Tension Testing Program

X-Tension Guardrail Terminal - Tangent Configuration (FHWA Approval Letter HAS-10/CC-91)

Test	Vehicle	Speed	Angle	Results	Test Requirement Analysis
3-30	816.5	99.7	0	Pass	Required
3-31	2025	99.5	0	Pass	Required
3-32	817.5	101.3	14.6	Pass	Required
3-33	1975	101.5	14.4	Pass	Required
3-34	N/A	N/A	N/A	N/A	Test 3-37 proved CIP and LON are at the same location, slightly after post 1, making 3-34 & 3-35 redundant (Ref FHWA Letter HAS-10/CC-91)
3-35	N/A	N/A	N/A	N/A	
3-37	1988.5	98.9	20.2	Pass	Required
3-39	1988	98.3	19.8	Pass	Required

X-Tension Guardrail Terminal - Flared Offset Configuration

Test	Vehicle	Speed	Angle	Results	Test Requirement Analysis
3-30*	837	98.7	0	Pass	Required - This test was modified in accordance with FHWA discussions to create the most severe impact condition. The vehicle was offset toward the traffic lane and the occupant mass was moved to the inside to maximize the yaw rate and see potential for intrusion into the side of the vehicle.
3-31				N/A	Test 3-31 on this system in the flared configuration is less severe than the impacting characteristics of tests 3-32 & 3-33 on the system in the tangent configuration.
3-32				N/A	Test 3-32 & 33 were not required because they were run on the system in the tangent configuration. The performance of the system under test 3-32 & 33 conditions while the system is in the flared configuration is not significantly different than what was tested in the tangent configuration. The modified test 3-30 accurately demonstrates the impacting characteristics of frontal impacts with the greatest potential for failure.
3-33				N/A	
3-34				N/A	Because the analysis of 3-37 below holds true, and the analysis of 3-34 & 35 hold true for the system in the tangent configuration, tests 3-34 & 35 in the flared configuration are redundant.
3-35				N/A	
3-37				N/A	Test 3-37 was performed in the tangent configuration. Discussions with FHWA determined this test was unnecessary.
3-39				N/A	The severity of test 3-39 in the flared configuration is less than that of the system in the tangent configuration because the angle of impact is lower.

X-Tension Median Terminal

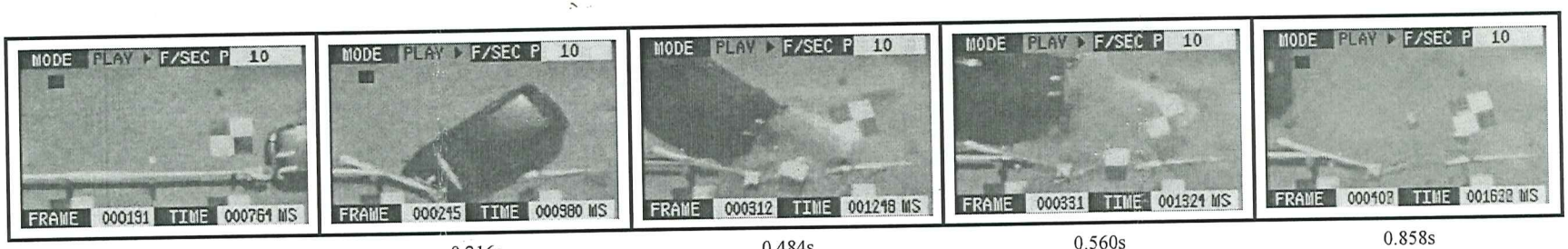
Test	Vehicle	Speed	Angle	Results	Test Requirement Analysis
3-30				N/A	Test 3-32 demonstrates the performance of the system during frontal impacts with the greatest potential for binding the system and causing failure. Because the design does not introduce any additional energy absorbing components to the standard X-Tension (tangent or flared) system and the additional mass is minimal, Test 3-30 was determined to be unnecessary.
3-31	2005	99.3	0	Pass	Because the design does not introduce any additional energy absorbing components to the standard X-Tension (tangent or flared) system and the additional mass is minimal, Test 3-31 was determined to be unnecessary. However, this test was run to verify crimped posts 1 & 2 and unweakened posts 3-6 does not effect ride down acceleration.
3-32	843	103.6	15	Pass	Required
3-33				N/A	Because the design does not introduce any additional energy absorbing components to the standard X-Tension (tangent or flared) system and the additional mass is minimal, Test 3-33 was determined to be unnecessary.
3-34				N/A	Because the analysis of 3-37 below holds true, and the analysis of 3-34 & 35 hold true for the system in the tangent configuration, tests 3-34 & 35 on the X-Tension Median terminal are redundant.
3-35				N/A	
3-37				N/A	The X-Tension Median Terminal is stronger than the X-Tension tangent system as the additional rail components on the back of the system add to the section rigidity and do not reduce the structural capacity of the tangent system tested. The redirective capacity of the system is equal to or greater than the tangent system that was successfully tested under 3-37 conditions. This test was determined to be unnecessary.
3-39				N/A	Because this test was successfully tested on the X-Tension tangent system, it is redundant. The X-Tension median terminal does not introduce any changes to the components interfacing with the vehicle in this test. Also, the structural components are not reduced in capacity. This test was determined to be unnecessary.

* = Modified Test

Component Modification Analysis

Analysis of changes made to components of the X-Tension system following original NCHRP 350 testing of Tangent System

Test	System	Part No.	Description	Component Modification Analysis
3-30, 31, 32, 33, 34, 35, 37, 39	Tangent		Posts	All X-Tension testing on the Tangent configured system used steel wide flange posts notched at ground level. The system is approved to use timber CRT posts as well. Reference FHWA letter HAS 10/CC-91 for system details.
3-30*	Offset	B061099, B061100	Post 1 (top), Post 2, Post 3	The flanges of Post 1, 2, and 3 were "crimped" at ground level to weaken the post for head on impacts with light vehicles. The weakened posts perform similar to those tested during the original X-Tension Tangent testing (notched steel posts or timber crt posts). The lateral strength of the post is equal to or stronger than what was tested in the X-Tension tangent matrix. All other posts on the system were standard wide flange steel posts, unweakened.
3-32	Median	B061099, B061100	Post 1 (top), Post 2	The flanges of Post 1, 2, and 3 were "crimped" near ground level as in test 3-30*. The crimps on Post 1 were lowered to allow the post to fold closer to the ground. Post 2 was also notched on the reverse side at the blockout/panel attachment hole. This was only on the reverse side and does not effect the system as previously tested in tangent or offset configurations.
3-32	Median	B061098	Post 1 (bottom)	The bottom reciever channel for Post 1 was modified to allow Post 1 to fold lower to the ground and reduce the possibility of interaction with the floor pan of light vehicles. The modification removed a portion of the back side of the receiving channel. The channel was made thicker and reinforced to facilitate driving the post. The modification does not effect the lateral strength of the post and only benefits the longitudinal break-away function of Post 1.
3-31	Median		Posts	In this test, only Posts 1 and 2 were crimped and all other posts were standard wide flange steel posts unweakened. Posts used are Wide Flange Guardrail posts in accordance with Roadside Hardware Specification PWE01. The crimps were removed from Post 3 because the light car was proven to not significantly interact with post 3.



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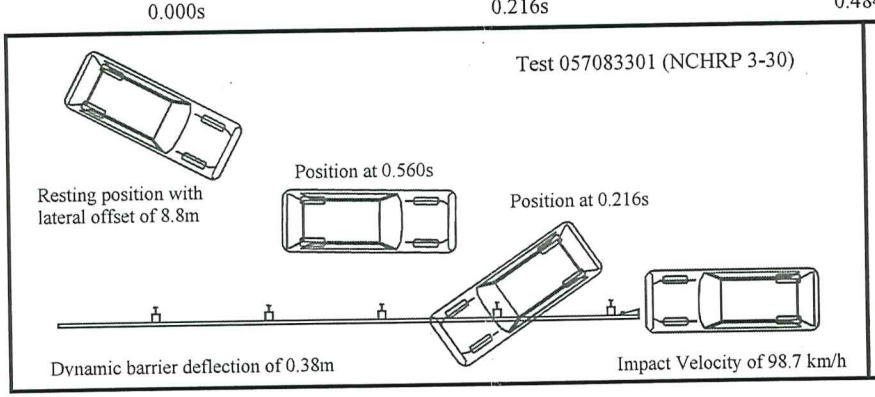
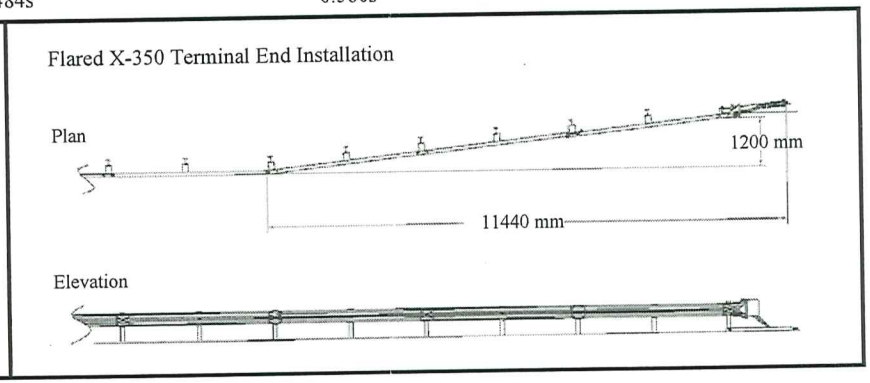




General Information

Test Agency	Holmes Solutions Limited
Test Designation	NCHRP 350 Test 3-30
Test No.	057083301
Date	13th December 2006
Test Article	
Type	Flared Guardrail Terminal End
Name or Manufacturer	Armorflex Ltd
Installation Length	38 m
Material or Key Elements	AASHTO SGR04a-b Guardrail with Armorflex X350 Terminal End
Soil Type and Condition	AASHTO 'standard' soil M147-64 (1990)
Test Vehicle	
Type	Production Model
Designation	820C
Model	1997 Toyota Starlet
Mass (kg)	
Curb	873.0
Test Inertial	837.0
Dummy	75.0
Gross Static	912.0

Impact Conditions

Speed (km/h)	98.7
Angle (deg)	0
Exit Conditions	
Speed (km/h)	27.5
Angle (deg)	n/a
Occupant Risk Values	
Impact Velocity (m/s)	
x-direction	9.4
y-direction	-0.8
THIV (km/h)	34.9
Ridedown Accelerations (g's)	
x-direction	-18.8
y-direction	7.0
PHD (g's)	19.5
ASI	1.09
Max. 0.050-s Average (g's)	
x-direction	-13.0
y-direction	-4.0
z-direction	7.3

Test Article Deflections

Dynamic (m)	0.38
Permanent (m)	0.34
Vehicle Damage	
Exterior	
VDS	12-FC-5
CDC	12FLEN2
Maximum Exterior Vehicle Crush (mm)	300
Interior	
OCDI	AS0000000
Max. Occ. Compartment. Deformation (mm)	30
Post-Impact Behaviour	
Max. Yaw Angle (deg)	497.1
Max. Pitch Angle (deg)	47.0
Max Roll Angle (deg)	27.7

General Information

Test Agency	Holmes Solutions, New Zealand
Test Designation	NCHRP 350 Test 3-32
Test No.	057083325
Date	22 March 2007

Test Article

Type	Median X Tension terminal end
Name or Manufacturer	Barrier Systems Incorporated
Installation Length	38 m
Material or Key Elements	AASHTO SGR04a-b guardrail with X Tension terminal end in median configuration
Soil Type and Condition	AASHTO 'standard' soil M147-64 (1990)

Test Vehicle

Type	Production Model
Designation	820C
Model	1997 Toyota Starlet
Mass (kg)	
Curb	873
Test Inertial	841
Dummy	73
Gross Static	914

Impact Conditions

Speed (km/h)	101.2
Angle (deg)	14.8

Exit Conditions

Speed (km/h)	2.9
Angle (deg)	n/a

Occupant Risk Values

Impact Velocity (m/s)	
x-direction	10
y-direction	0.3
THIV (km/h)	36.1
Ridedown Accelerations	
x-direction (g's)	-18.4
y-direction (g's)	-5.3
PHD (g's)	18.7
ASI	1.4
Max. 0.050-s Average	
x-direction (g's)	-16.7
y-direction (g's)	1.6
z-direction (g's)	5.3

Test Article Deflections

Dynamic (m)	0.63*
Permanent (m)	0.54*

Vehicle Damage

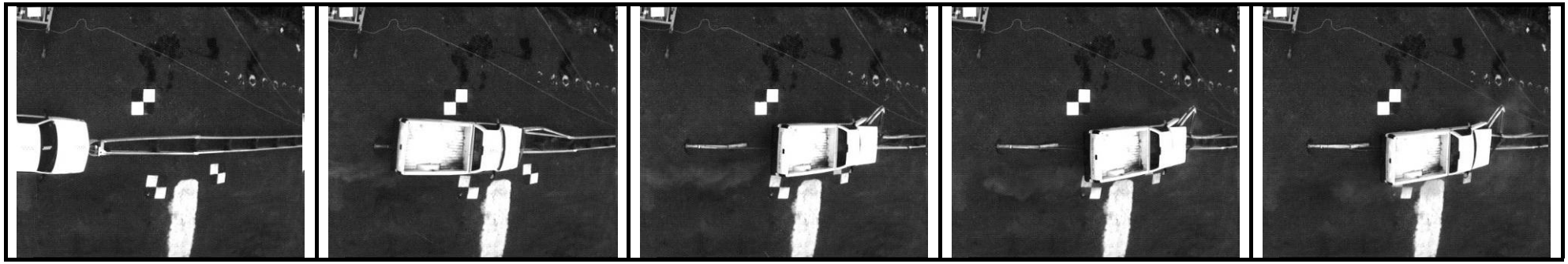
Exterior	
VDS	12FC-5
CDC	12FCEN2
Maximum Exterior	
Vehicle Crush (mm)	320
Interior	
OCDI	AS0000000
Max. Occ. Compart.	
Deformation (mm)	50

Post-Impact Behaviour

Max. Yaw Angle (deg)	-182.2
Max. Pitch Angle (deg)	-33.9
Max Roll Angle (deg)	16.6

* Deflections measured as lateral deflection of the guardrail

Figure 3.5 *Summary of results for test 057083325 (NCHRP 350 Test 3-32)*



General Information

Test Agency	Holmes Solutions, New Zealand
Test Designation	NCHRP 350 Test 3-31
Test No.	057083311
Date	10 May 2007

Test Article

Type	Median X Tension terminal end
Name or Manufacturer	Barrier Systems Incorporated
Installation Length	38 m
Material or Key Elements	AASHTO SGR04a-b guardrail with X Tension terminal end in median configuration

Soil Type and Condition AASHTO 'standard' soil M147-64 (1990)

Test Vehicle

Type	Production Model
Designation	2000P
Model	1996 Chevrolet Silverado
Mass (kg)	
Curb	
Test Inertial	2004.5
Dummy	0.0
Gross Static	2004.5

Impact Conditions

Speed (km/h)	99.3
Angle (deg)	0.0

Exit Conditions

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

Occupant Risk Values

Impact Velocity (m/s)	
x-direction	6.4
y-direction	-0.2
THIV (km/h)	22.9
Ridedown Accelerations	
x-direction (g's)	-14.7
y-direction (g's)	5.8
PHD (g's)	14.7
ASI	0.72
Max. 0.050-s Average	
x-direction (g's)	-8.4
y-direction (g's)	-1.6
z-direction (g's)	-4.8

Test Article Deflections

Dynamic (m)	1.80*
Permanent (m)	1.78*

Vehicle Damage

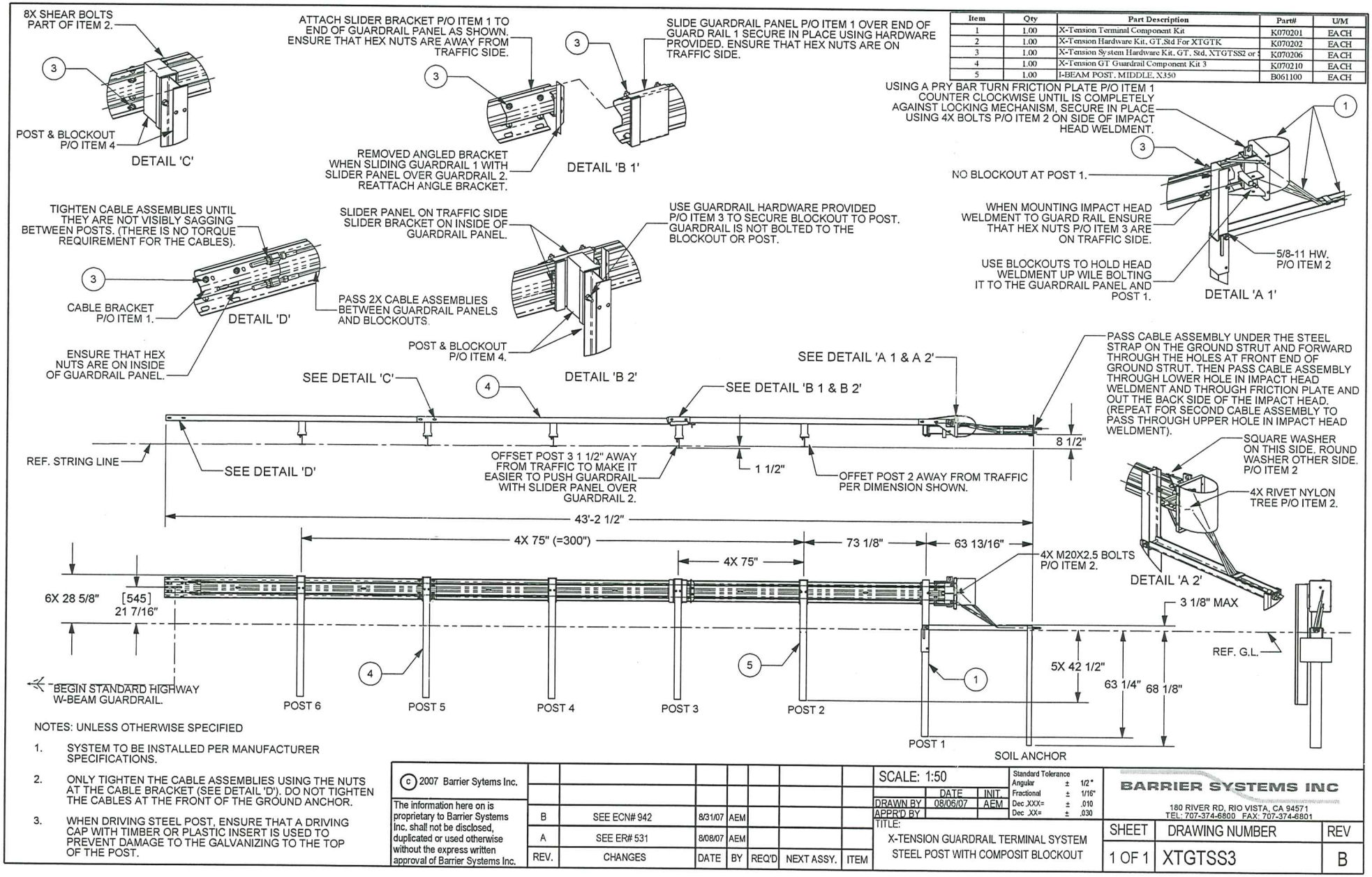
Exterior	
VDS	12FC-5
CDC	12FCEN2
Maximum Exterior	
Vehicle Crush (mm)	400
Interior	
OCDI	AS0000000
Max. Occ. Compart.	
Deformation (mm)	0.0

Post-Impact Behaviour

Max. Yaw Angle (deg)	5.3
Max. Pitch Angle (deg)	-7.8
Max Roll Angle (deg)	-7.1

* Deflections measured as lateral deflection of the guardrail

Figure 3.10 *Summary of results for test 057083311 (NCHRP 350 Test 3-31).*



Item	Qty	Part Description	Part#	U/M
1	1.00	X-Tension Terminal Component Kit	K070201	EACH
2	1.00	X-Tension Hardware Kit, GT,Std For XTGTK	K070202	EACH
3	1.00	X-Tension System Hardware Kit, GT, Std, XTGTSS2 or 3	K070206	EACH
4	1.00	X-Tension GT Guardrail Component Kit 3	K070210	EACH
5	1.00	I-BEAM POST, MIDDLE, X350	B061100	EACH

NOTES: UNLESS OTHERWISE SPECIFIED

1. SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
2. ONLY TIGHTEN THE CABLE ASSEMBLIES USING THE NUTS AT THE CABLE BRACKET (SEE DETAIL 'D'). DO NOT TIGHTEN THE CABLES AT THE FRONT OF THE GROUND ANCHOR.
3. WHEN DRIVING STEEL POST, ENSURE THAT A DRIVING CAP WITH TIMBER OR PLASTIC INSERT IS USED TO PREVENT DAMAGE TO THE GALVANIZING TO THE TOP OF THE POST.

REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
B	SEE ECN# 942	8/31/07	AEM			
A	SEE ER# 531	8/08/07	AEM			

SCALE: 1:50

	DATE	INIT.
DRAWN BY	08/06/07	AEM
APPR'D BY		

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

TITLE:
X-TENSION GUARDRAIL TERMINAL SYSTEM
STEEL POST WITH COMPOSIT BLOCKOUT

BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6801

SHEET	DRAWING NUMBER	REV
1 OF 1	XTGTSS3	B

NOTES: UNLESS OTHERWISE SPECIFIED

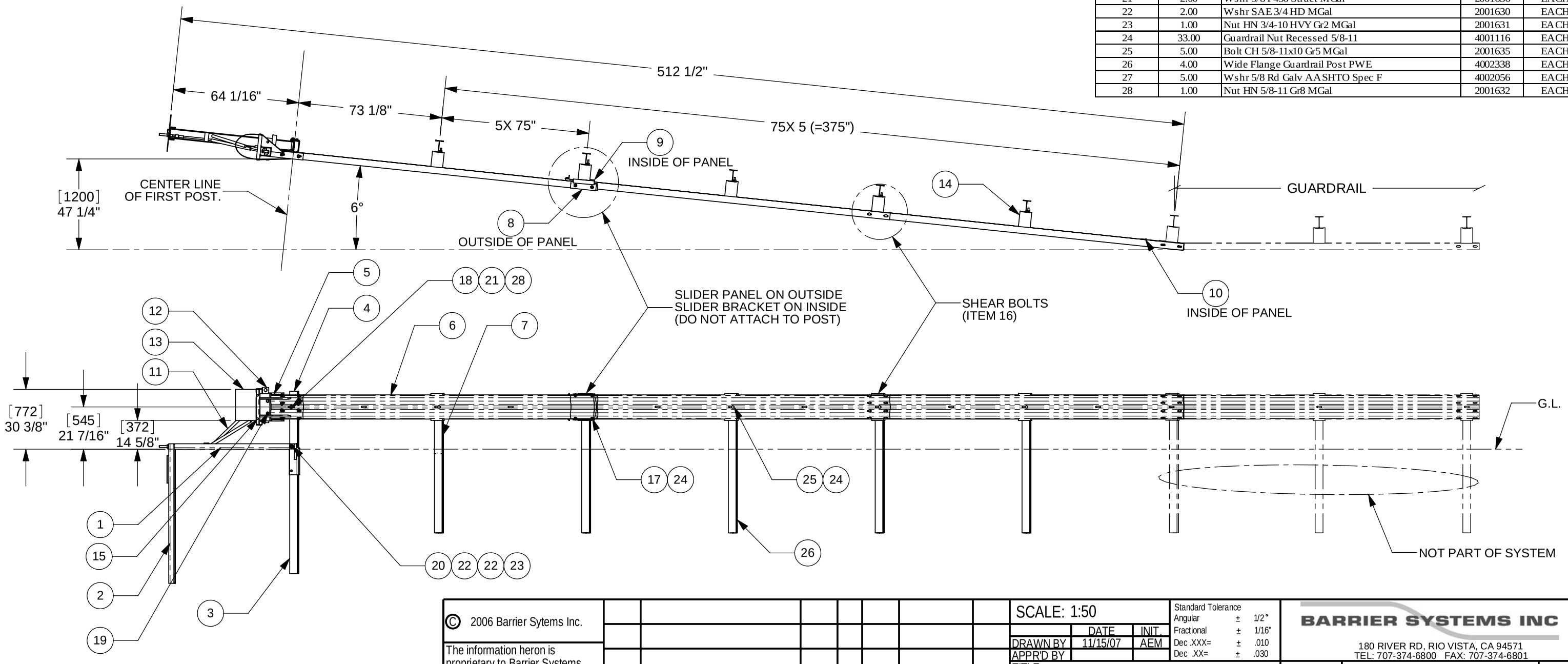
1. X-TENSION SYSTEM TO BE INSTALLED PER MANUFACTURER INSTRUCTIONS.

2. SYSTEM SHOWN USING STEEL WIDE FLANGE POST (PWE01) WITH TIMBER BLOCKOUTS (ROUTED, PDB01B), POST 2 MUST BE A BREAKAWAY STYLE POST CRIMPED (AS SHOWN) TIMBER CRT POST, OR EQUIVALENT.

3. SYSTEM MAY ALSO USE TIMBER CRT POSTS (PDE09) WITH TIMBER BLOCKOUTS (PDB01A).

4. SYSTEM MAY ALSO USE COMPOSITE OR PLASTIC BLOCKOUTS.

Item	Qty	Part Description	Part#	U/M
1	1.00	GROUND STRUT WELDMENT, X350	B061094	EACH
2	1.00	SOIL ANCHOR WELDMENT, X350	B061104	EACH
3	1.00	BOTTOM POST WELDMENT, X350	B061098	EACH
4	1.00	I-BAEM POST, TOP, X350	B061099	EACH
5	1.00	HEAD UNIT WELDMENT, X350	B061072	EACH
6	3.00	W-Beam Guardrail RWMO4b	4002018	EACH
7	1.00	I-BEAM POST, MIDDLE, X350	B061100	EACH
8	1.00	SLIDER PANEL WELDMENT, W-BEAM, X350	B061088	EACH
9	1.00	SLIDER BRACKET WELDMENT, X350	B061079	EACH
10	1.00	CABLE BRACKET WELDMENT, X350	B061083	EACH
11	2.00	CABLE ASSEMBLY, X350	B061109	EACH
12	1.00	CABLE FRICTION PLATE, HEAD UNI	B061058	EACH
13	1.00	NOSE PIECE, X350	B061105	EACH
14	5.00	W-Beam Timber Blockout PDB1b 8	4002337	EACH
15	4.00	Rivet Nylon Tree Push-In	4002305	EACH
16	8.00	SHEAR BOLT, US, X-TENSION	A070426	EACH
17	20.00	Guardrail Bolt 5/8-11x1 1/4 MG	2001642	EACH
18	1.00	C-Scr HH 5/8-11x1 1/2 Gr5 MGal	2001626	EACH
19	4.00	C-Scr HH M20-2.5x75mm Gr 5.8 M	2001615	EACH
20	1.00	C-Scr HH 3/4-10x8 Gr5 MGal	2001653	EACH
21	2.00	Wshr 5/8 F436 Struct MGal	2001636	EACH
22	2.00	Wshr SAE 3/4 HD MGal	2001630	EACH
23	1.00	Nut HN 3/4-10 HVY Gr2 MGal	2001631	EACH
24	33.00	Guardrail Nut Recessed 5/8-11	4001116	EACH
25	5.00	Bolt CH 5/8-11x10 Gr5 MGal	2001635	EACH
26	4.00	Wide Flange Guardrail Post PWE	4002338	EACH
27	5.00	Wshr 5/8 Rd Galv AASHTO Spec F	4002056	EACH
28	1.00	Nut HN 5/8-11 Gr8 MGal	2001632	EACH



REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
0	NEW DRAWING	11/15/07	AEM			

SCALE: 1:50

	DATE	INIT.
DRAWN BY	11/15/07	AEM
APPR'D BY		

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

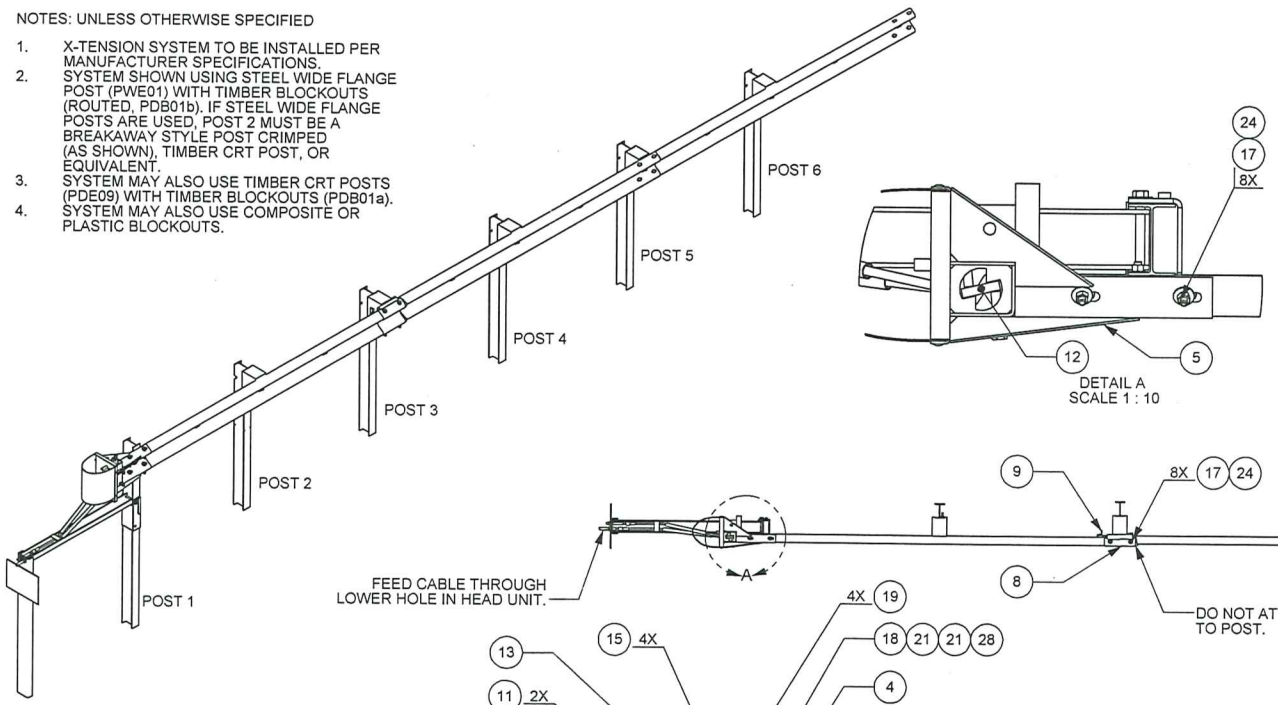
TITLE:
SYSTEM, X-TENSION GUARDRAIL TERMINAL
1.2M OFFSET

BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6801

SHEET	DRAWING NUMBER	REV
1 OF 1	B071109	0

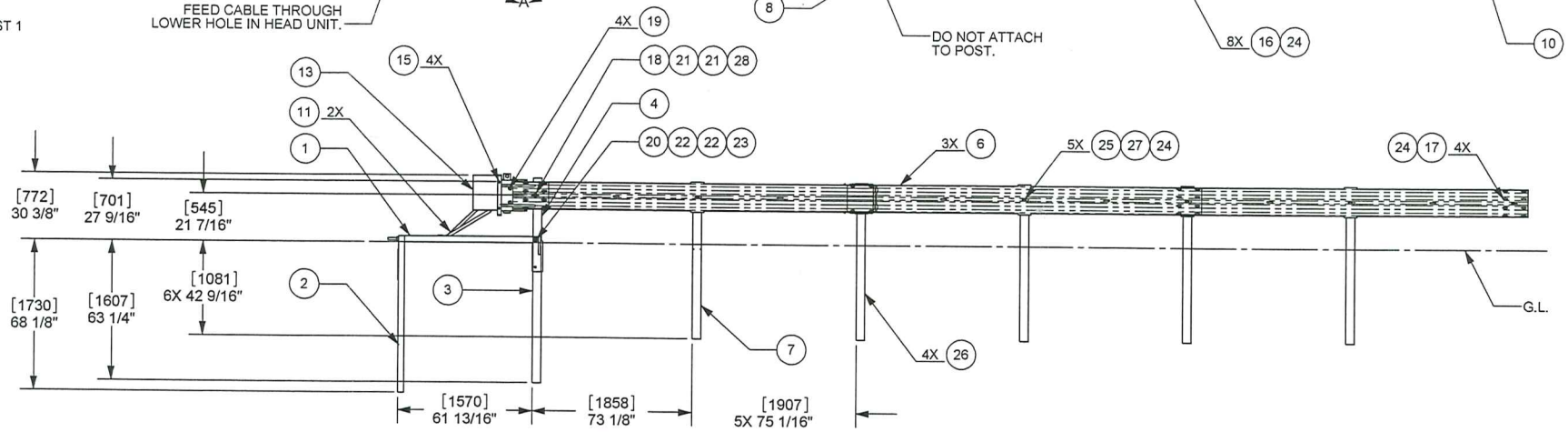
NOTES: UNLESS OTHERWISE SPECIFIED

1. X-TENSION SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
2. SYSTEM SHOWN USING STEEL WIDE FLANGE POST (PWE01) WITH TIMBER BLOCKOUTS (ROUTED, PDB01b). IF STEEL WIDE FLANGE POSTS ARE USED, POST 2 MUST BE A BREAKAWAY STYLE POST CRIMPED (AS SHOWN), TIMBER CRT POST, OR EQUIVALENT.
3. SYSTEM MAY ALSO USE TIMBER CRT POSTS (PDE09) WITH TIMBER BLOCKOUTS (PDB01a).
4. SYSTEM MAY ALSO USE COMPOSITE OR PLASTIC BLOCKOUTS.



DETAIL A
SCALE 1 : 10

Item	Qty	Part Description	Part#	U/M
1	1.00	GROUND STRUT WELDMENT, X350	B061094	EACH
2	1.00	SOIL ANCHOR WELDMENT, X350	B061104	EACH
3	1.00	BOTTOM POST WELDMENT, X350	B061098	EACH
4	1.00	I-BEAM POST, TOP, X350	B061099	EACH
5	1.00	HEAD UNIT WELDMENT, X350	B061072	EACH
6	3.00	W-Beam Guardrail RWMO2b	4002018	EACH
7	1.00	I-BEAM POST, MIDDLE, X350	B061100	EACH
8	1.00	SLIDER PANEL WELDMENT, W-BEAM, X350	B061088	EACH
9	1.00	SLIDER BRACKET WELDMENT, X350	B061079	EACH
10	1.00	CABLE BRACKET WELDMENT, X350	B061083	EACH
11	2.00	CABLE ASSEMBLY, X350	B061109	EACH
12	1.00	CABLE FRICTION PLATE, HEAD UNIT	B061058	EACH
13	1.00	NOSE PIECE, X350	B061105	EACH
14	5.00	W-Beam Timber Blockout PDB1b 8	4002337	EACH
15	4.00	Rivet Nylon Tree Push-In 25/64	4002305	EACH
16	8.00	SHEAR BOLT, US, X-TENSION	A070426	EACH
17	20.00	Guardrail Bolt 5/8-11xl 1/4 MG	2001642	EACH
18	1.00	C-Scr HH 5/8-11xl 1/2 Gr5 MGal	2001626	EACH
19	4.00	C-Scr HH M20-2.5x75mm Gr 5.8 M	2001615	EACH
20	1.00	C-Scr HH 3/4-10x8 Gr5 MGal	2001653	EACH
21	2.00	Wshr 5/8 F436 Struct MGal	2001636	EACH
22	2.00	Wshr SAE 3/4 HD MGal	2001630	EACH
23	1.00	Nut HN 3/4-10 HVY Gr2 MGal	2001631	EACH
24	33.00	Guardrail Nut Recessed 5/8-11	4001116	EACH
25	5.00	Bolt CH 5/8-11x10 Gr5 MGal	2001635	EACH
26	4.00	Wide Flange Guardrail Post PWE	4002338	EACH
27	5.00	Wshr 5/8 Rd Galv AASHTO Spec F	4002056	EACH
28	1.00	Nut HN 5/8-11 Gr8 MGal	2001632	EACH



REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
C	SEE ECN# 871	1/25/07	AEM			
B	SEE ECN# 840	2/21/07	AEM			
A	SEE ECN# 821	1/25/07	AEM			

SCALE: 1:50

	DATE	INIT.
DRAWN BY	10/26/06	AEM
APPR'D BY		

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

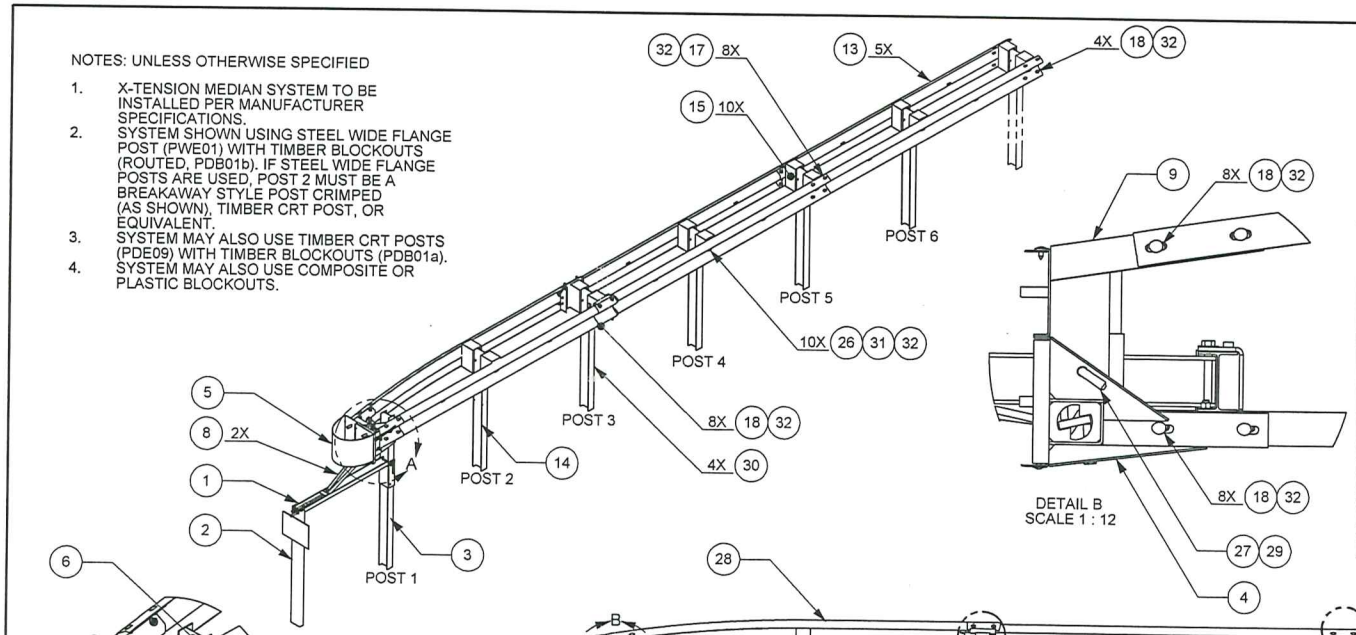
TITLE:
SYSTEM, X-TENSION GUARDRAIL TERMINAL

BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6801

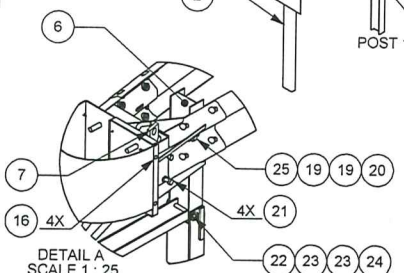
SHEET	DRAWING NUMBER	REV
1 OF 1	B061113	C

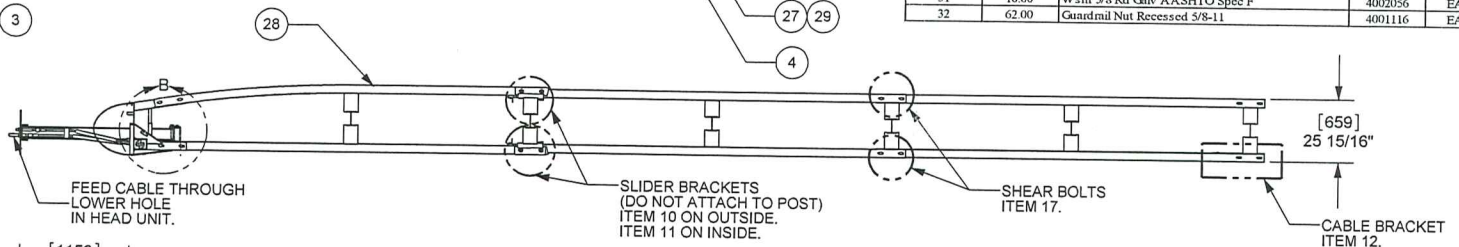
NOTES: UNLESS OTHERWISE SPECIFIED

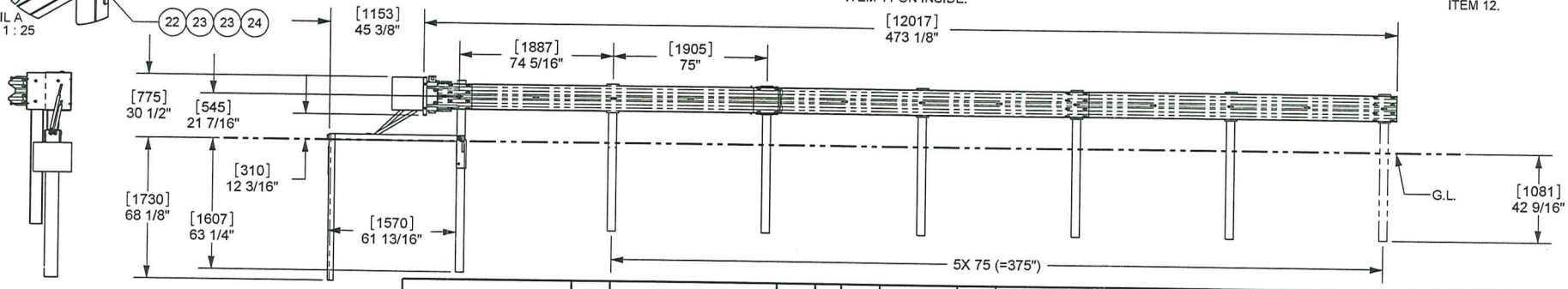
1. X-TENSION MEDIAN SYSTEM TO BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
2. SYSTEM SHOWN USING STEEL WIDE FLANGE POST (PWE01) WITH TIMBER BLOCKOUTS (ROUTED, PDB01b). IF STEEL WIDE FLANGE POSTS ARE USED, POST 2 MUST BE A BREAKAWAY STYLE POST CRIMPED (AS SHOWN), TIMBER CRT POST, OR EQUIVALENT.
3. SYSTEM MAY ALSO USE TIMBER CRT POSTS (PDE09) WITH TIMBER BLOCKOUTS (PDB01a).
4. SYSTEM MAY ALSO USE COMPOSITE OR PLASTIC BLOCKOUTS.



Item	Qty	Part Description	Part#	U/M
1	1.00	GROUND STRUT WELDMENT, X350	B061094	EACH
2	1.00	SOIL ANCHOR WELDMENT, X350	B061104	EACH
3	1.00	BOTTOM POST WELDMENT, X350	B061098	EACH
4	1.00	HEAD UNIT WELDMENT, X350	B061072	EACH
5	1.00	NOSE PIECE, X-TENSION MEDIAN GUARDRAIL TI	B070234	EACH
6	1.00	I-BAEM POST, TOP, X350	B061099	EACH
7	1.00	CABLE FRICTION PLATE, HEAD UNI	B061058	EACH
8	2.00	CABLE ASSEMBLY, X350	B061109	EACH
9	1.00	IMPACT HEAD WELDMENT, MEDIAN TERMINAL	B070219	EACH
10	2.00	SLIDER PANEL WELDMENT, W-BEAM, X350	B061088	EACH
11	2.00	SLIDER BRACKET WELDMENT, X350	B061079	EACH
12	1.00	CABLE BRACKET WELDMENT, X350	B061083	EACH
13	5.00	W-Beam Guardrail RWMO2b	4002018	EACH
14	1.00	I-BEAM POST, MIDDLE, X350	B061100	EACH
15	10.00	W-Beam Timber Blockout PDB1b 8	4002337	EACH
16	4.00	Rivet Nylon Tree Push-In 25/64	4002305	EACH
17	16.00	SHEAR BOLT, US, X-TENSION	A070426	EACH
18	36.00	Guardrail Bolt 5/8-11x1 1/4 MG	2001642	EACH
19	2.00	Wshr 5/8 F436 Struct MGal	2001636	EACH
20	1.00	Nut HN 5/8-11 Gr8 MGal	2001632	EACH
21	4.00	C-Scr HH M20-2.5x75mm Gr 5.8 M	2001615	EACH
22	1.00	C-Scr HH 3/4-10x8 Gr5 MGal	2001653	EACH
23	2.00	Wshr SAE 3/4 HD MGal	2001630	EACH
24	1.00	Nut HN 3/4-10 HVY Gr2 MGal	2001631	EACH
25	1.00	C-Scr HH 5/8-11x1 1/2 Gr5 MGal	2001626	EACH
26	10.00	Bolt CH 5/8-11x10 Gr5 MGal	2001635	EACH
27	1.00	BAR, MEDIAN GUARDRAIL TERMINAL	B061236	EACH
28	1.00	PANEL, RADIUS GUARDRAIL, W-BEAM, X-TENSION TERMINAL	B070233	EACH
29	1.00	Pin Lynch 1/4	2000090	EACH
30	4.00	Wide Flange Guardrail Post PWE	4002338	EACH
31	10.00	Wshr 5/8 Rd Galv AASHTO Spec F	4002056	EACH
32	62.00	Guardrail Nut Recessed 5/8-11	4001116	EACH







REV.	CHANGES	DATE	BY	REQ'D	NEXT ASSY.	ITEM
D	SEE ECN# 871	4/23/07	AEM			
C	SEE ECN# 840	2/21/07	AEM			
B	SEE ECN# 830	2/9/07	AEM			
A	SEE ECN# 821	1/25/07	AEM			

SCALE: 1:50

	DATE	INIT.
DRAWN BY	12/06/06	AEM
APPR'D BY		

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

TITLE: SYSTEM, X-TENSION MEDIAN GUARDRAIL TERMINAL

BARRIER SYSTEMS INC
180 RIVER RD, RIO VISTA, CA 94571
TEL: 707-374-6800 FAX: 707-374-6801

SHEET	DRAWING NUMBER	REV
1 OF 1	B061228	D