



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

May 8, 2007

400 Seventh St., S.W.  
Washington, DC 20590

In Reply Refer To:  
HSSD/B-160

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

Dear Mr. Denman:

Thank you for your letter of December 18, 2006, requesting the Federal Highway Administration (FHWA) acceptance of your company's **BarrierGuard™ 800 (BG 800) – Variable Length Barrier (BGVLB)** for use on the National Highway System (NHS) under the provisions of the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features". Accompanying your letter were crash test reports on testing of your company's BarrierGuard™ 800 system in regular and minimum deflection applications and test reports on the Reactive Tension System (RTS) and Quickchange Moveable Barrier (QMB) systems of April 2000, including results of the NCHRP 350 test 3-11 conducted to evaluate the performance of a concrete RTS Variable Length Barrier section under direct impact conditions.

### **Requirements**

Longitudinal barrier systems should meet the guidelines contained in the NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features". FHWA Memorandum "**ACTION**: Identifying Acceptable Highway Safety Features" of July 25, 1997 provides further guidance on crash testing of longitudinal barriers.

### **Product description**

The previously approved BarrierGuard™ 800 systems (FHWA acceptance letters B-131 and B-158) are high containment and low deflection steel barriers designed for both permanent applications and temporary use in roadwork situations, preventing penetration of errant vehicles into working areas. The modifications of the system (the use of intermediate anchoring along with T-tops) allow lowering the deflection from maximum 1000 mm in regular BarrierGuard™ 800 system to approximately 300 mm in BarrierGuard™ 800 Minimum Deflection applications. BarrierGuard™ 800 Variable Length Barrier is designed to provide clearance and flexibility for expansion joints on bridges, overpasses, and roadways. The BGVLB is designed to be used with



regular and minimum deflection applications of BarrierGuard™ 800 system when it is anchored to a bridge deck (or other highway feature) on both sides of a structural expansion joint. The BGVLB allows slow relative movement for conditions such as thermal expansion/contraction, bridge joint movement, etc., but hydraulically locks when the movement is fast, such as during a vehicle impact with the barrier. Each BGVLB provides 355 mm (14") of travel. The units are deployed with a nominal length of 1.6 m (63") and are capable of extending or retracting 178 mm (7"). Multiple BGVLB units can be attached to each other in order to obtain greater movement across a highway expansion joint. The BGVLB is always used with the T-Top used to aid in the redirection and stability of the vehicle after impact. If used with BarrierGuard™ 800 Minimum Deflection system, BGVLB can be located between either 6-meter or 12-meter sections but there should be no foundation anchors within 6 meters of either end of the BGVLB attachment. If used with regular BarrierGuard™ 800, the T-top attachment should be used for 12 meters on either side of the BGVLB and terminate with a transition section.

Drawings of the BarrierGuard™ 800 – Variable Length Barrier and of the T-top transition are provided in Enclosure 1.

### **Testing**

The NCHRP Report 350 requires that in order for the length-of-need of longitudinal barriers to meet the NCHRP Report 350 test level 3 criteria they must successfully pass tests 3-10 and 3-11 while test S3-10 is optional. However, since your company's RTS VLB was successfully tested in April 2000, including testing of CRTS VLB under direct impact conditions (FHWA acceptance letter HSA/B-69), you requested to waive a full crash testing of the BGVLB. The assumption was that BGVLB uses the same telescoping mechanisms and will perform similarly to RTS VLB.

We noted the RTS VLB was tested in a concrete moveable barrier system which is more massive than the steel systems in your present request. However, we eventually concluded that the difference in lateral stiffness between the systems in which the VLB will be used would not significantly affect the performance and, most importantly, it is unlikely that its lap will cause snagging of the impacting vehicles under direct impact conditions.

Therefore, I concur that BarrierGuard™ 800 – Variable Length Barrier, as described above, meets the appropriate evaluation criteria for the NCHRP 350 test level 3 longitudinal barriers and may be used at all appropriate locations on the NHS when selected by the contracting authority, subject to the provisions of Title 23, Code of Federal Regulations, Section 635.411 as they pertain to proprietary products. Since no testing was conducted on the BGVLB, I encourage you to monitor its in-service performance and report to me any issues found.

The BGVLB is accepted to be used with different applications of BarrierGuard™ 800, including regular BarrierGuard™ 800, BarrierGuard™ 800 - Minimum Deflection and BarrierGuard™ 800 Gate applications. This acceptance is based on the reported crash performance of the BarrierGuard™ 800 – Variable Length Barrier system and is not intended to address the long-term durability of the unit. Further, I am assuming that production models will be identical to the prototype test units.

**Standard provisions**

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

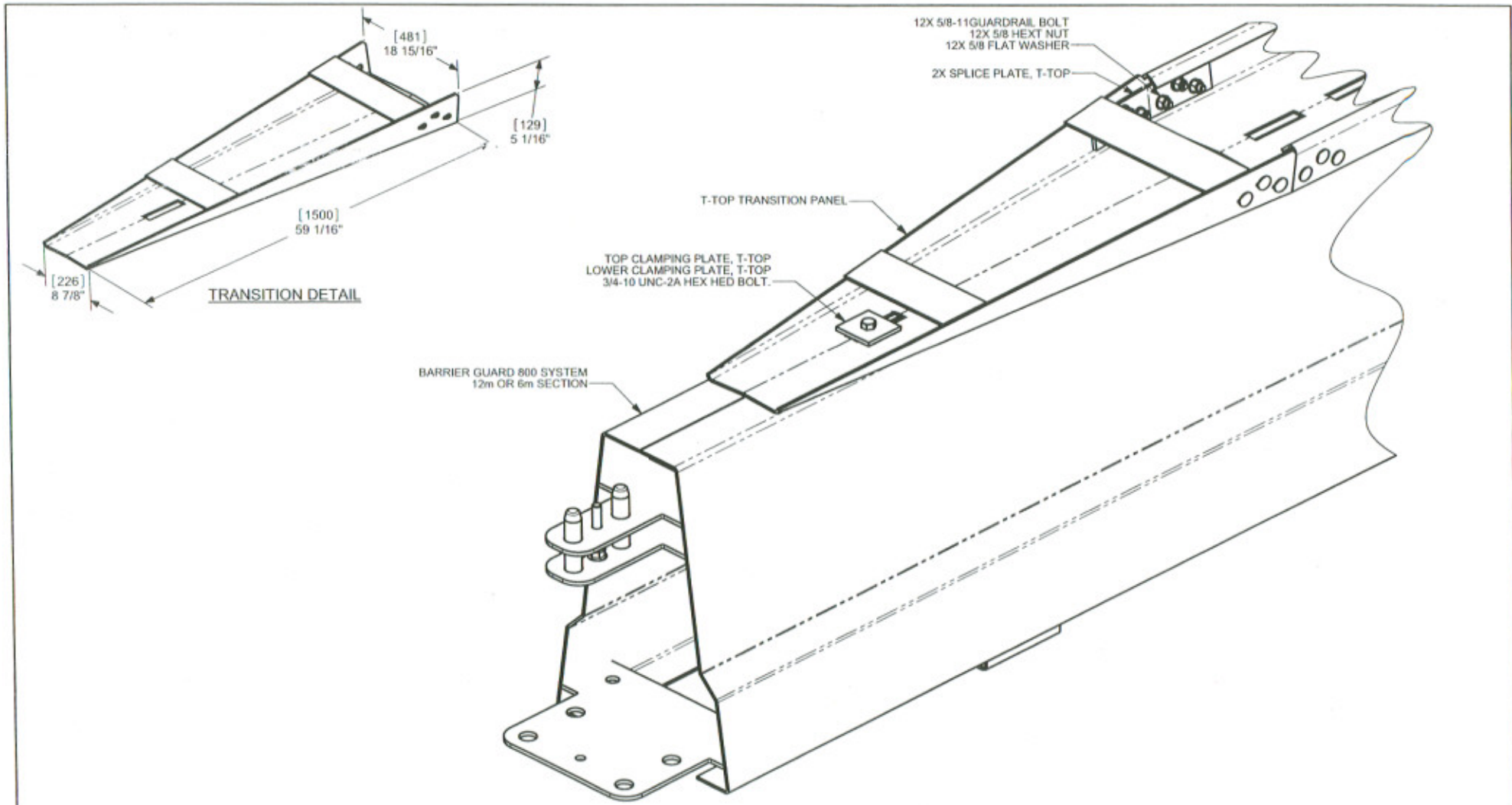
- This acceptance is limited to the crashworthiness characteristics of the devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals 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 the FHWA and the NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number B-160 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 BarrierGuard™ 800 - Variable Length Barrier (BGVLB) is a patented product and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they 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.
- Since BarrierGuard™ 800 - Variable Length Barrier is a steel product, the provisions of Title 23, Code of Federal Regulations Section 635.410 (a copy of which is enclosed) are applicable. Note that the “Buy America” provisions apply only to steel products that are permanently incorporated into highway projects, not to temporary barriers used only during construction or maintenance operations
- 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



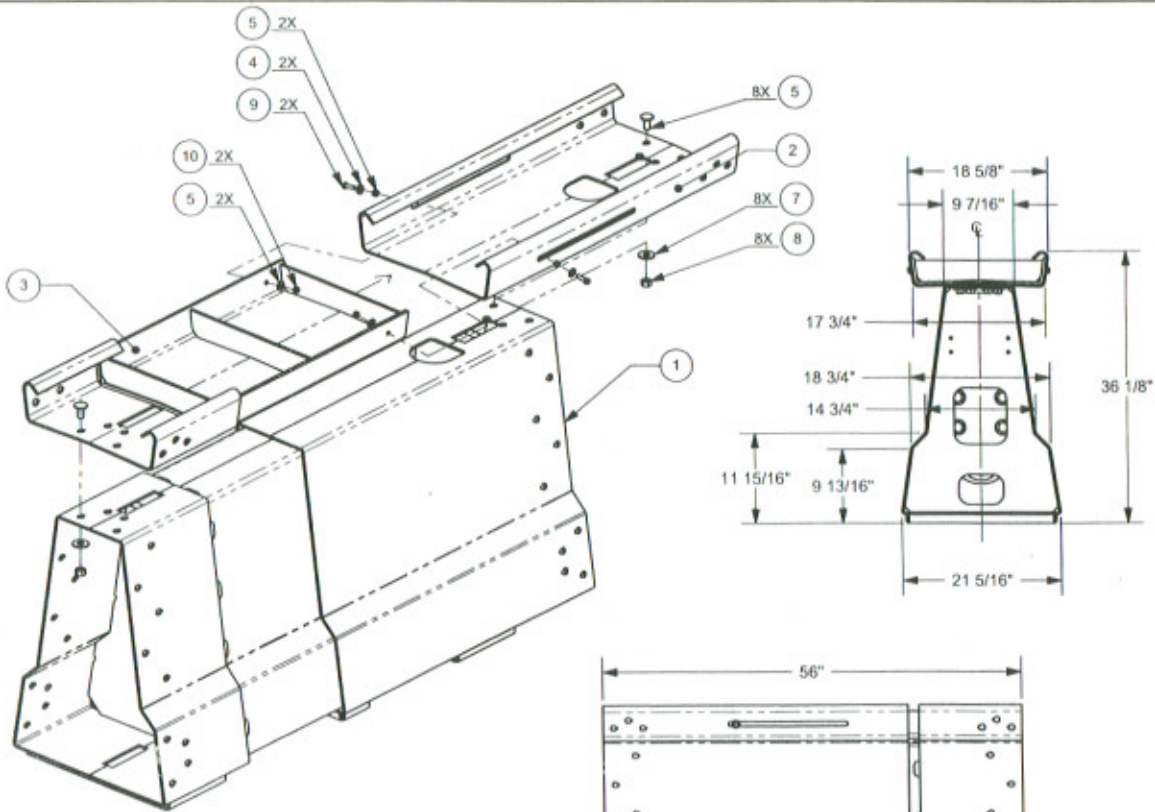
**NOTE:**  
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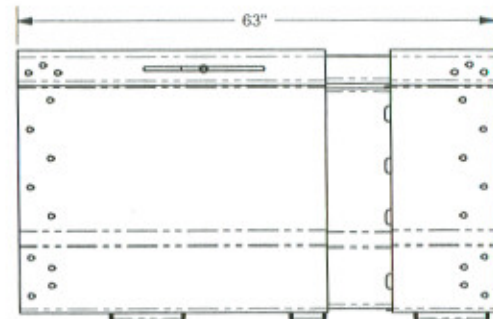
REV.	CHANGES	DATE	BY	REQD.	NEXT ASSY.	ITEM
0	NEW DRAWING	1/16/07	AEM			

SCALE: 1:8		
DRAWN BY	DATE	INT.
AEM	1/16/07	AEM
APPROD BY		
TITLE:		
T-TOP TRANSITION DETAIL ASSEMBLY		

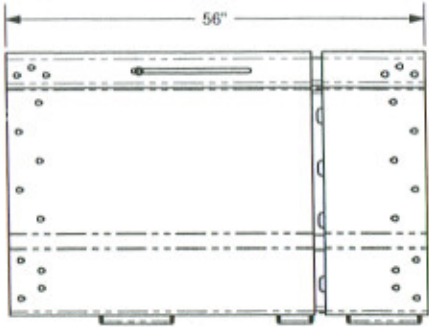
Standard Tolerance Angular ± 1/2° Fractional ± 1/16" Dec. XXX ± .010 Dec. XXX ± .030			<b>BARRIER SYSTEMS INC</b> 180 RIVER RD, RIO VISTA, CA 94571 TEL: 707-374-6800 FAX: 707-374-6801		
SHEET	DRAWING NUMBER	REV			
1 OF 1	B070139				



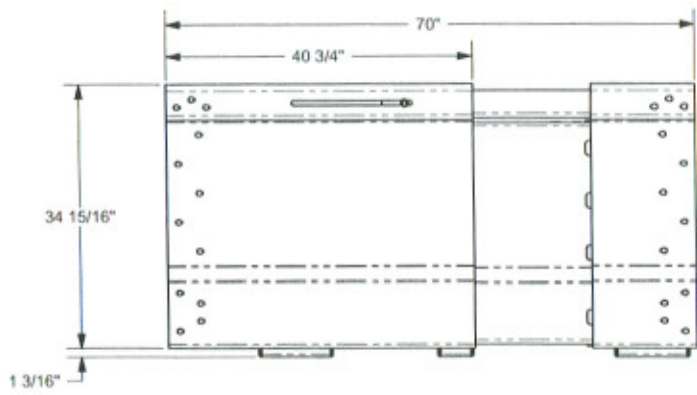
Item	Qty	Part Description	Part#	UM
1	1.00	Barrier Guard Variable Length Barrier	BGVLBT	EACH
2	1.00	T-TOP, LARGE, BGVLBT	E1061187	EACH
3	1.00	T-TOP SLIDER WELDMENT, BGVLBT	E1061189	EACH
4	2.00	BEARING SLERVE, T-TOP BGVLBT	E1061191	EACH
5	4.00	Wahr 3/8 Flat Rd SAE Galv	2001409	EACH
6	8.00	Guardrail Bolt 5/8-11x 1 1/4 G	4001115	EACH
7	8.00	Wahr 5/8 USS Flat Galv F179	4001120	EACH
8	8.00	Guardrail Nut Recessed 5/8-11	4001116	EACH
9	2.00	C SCR BH 3/8-16x1 1/8 Gr5 Pd	2000349	EACH
10	2.00	Nut HN 3/8-16 Gr5 Gal	2000405	EACH



BGVLBT SHOWN IN NEUTRAL POSITION



BGVLBT SHOWN COMPRESSED



BGVLBT SHOWN EXTENDED

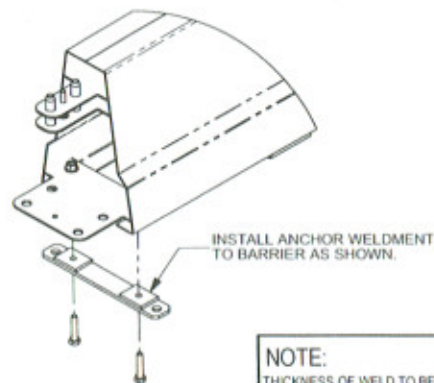
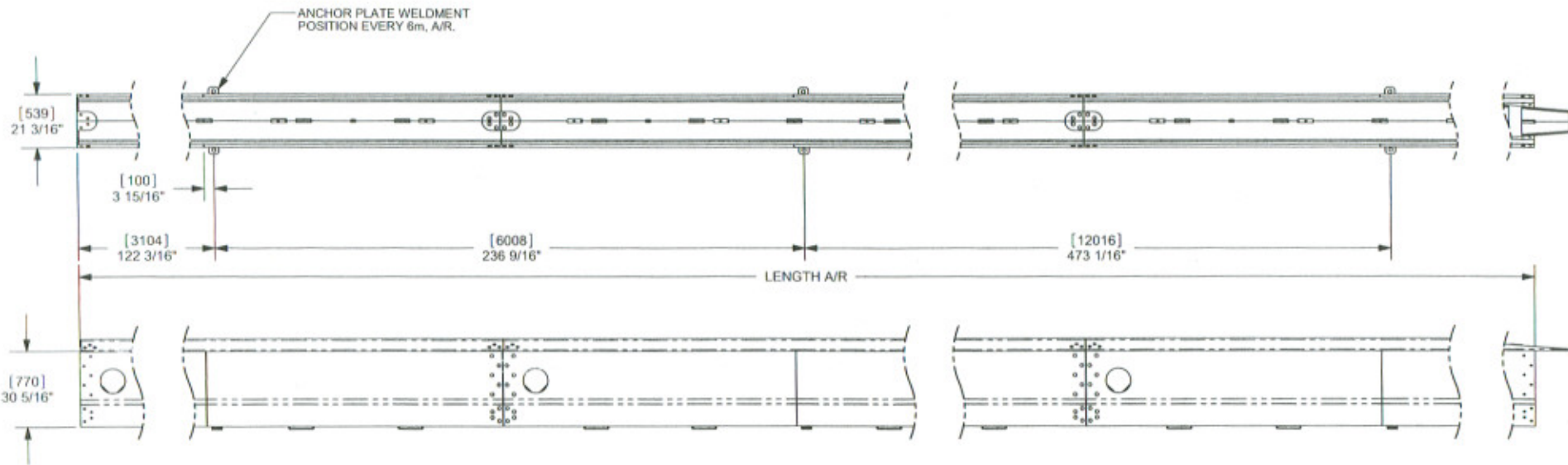
- NOTES: UNLESS OTHERWISE SPECIFIED
- BGVLBT SHOULD BE USED WHEN THE BG800 SYSTEM IS ANCHORED ACROSS AN EXPANSION JOINT TO ALLOW CLEAR MOVEMENT ACROSS THE JOINT. THE T-TOP SECTION SHOULD BE USED FOR 12m ON EITHER SIDE TO THE VLB AND TERMINATED WITH A TRANSITION SECTION.

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

© 2006 Barrier Systems Inc.										SCALE: 1:16		Standard Tolerance Angular ± 1/2° Fractional ± 1/16" Dec XXX ± .010 Dec XXX ± .008	
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.										DRAWN BY 11/21/06 AEM		DATE INT AEM	
										APPROD BY GAD		DATE INT GAD	
										TITLE BARRIER GUARD VARIABLE LENGTH BARRIER, T-TOP		SHEET DRAWING NUMBER REV	
										0 NEW DRAWING 11/21/06 AEM		1 1 1 BGVLBT	
										REV. CHANGES DATE BY REQD NEXT ASSY. ITEM			

**BARRIER SYSTEMS INC**  
180 RIVER RD, RIO VISTA, CA 94571  
TEL: 707-374-6850 FAX: 707-374-6801

SHEET	DRAWING NUMBER	REV
1 OF 1	BGVLBT	



DETAIL A  
SCALE 1 : 20

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

**NOTES: UNLESS OTHERWISE SPECIFIED**

1. DIMENSIONS SHOWN ARE REFERENCE DIMENSIONS IN BRACKETS ARE mm.
2. BARRIER GUARD SYSTEM SHOWN WITH 6 METER SEGMENTS ANCHORED EVERY 6m.
3. BARRIER GUARD MAY BE DEPLOYED IN 6m OR 12m [20, OR 40] SECTIONS ANCHORED WITH INTERMEDIATE ANCHORS INSTALLED TO MINIMIZE DEFLECTION.
4. T-TOP IS TO BEGIN A MINIMUM OF 12m PRIOR TO ANY ANCHOR, GATE OR VLB, AND RUN A MINIMUM OF 12m PAST ANCHORS. TRANSITION SHALL EXTEND AN ADDITIONAL 1.5m.

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0	NEW DRAWING	11/17/06	AEM					
REV.	CHANGES	DATE	BY	REQD	NEXT ASSY.	ITEM		

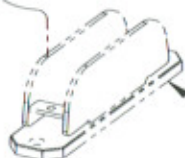
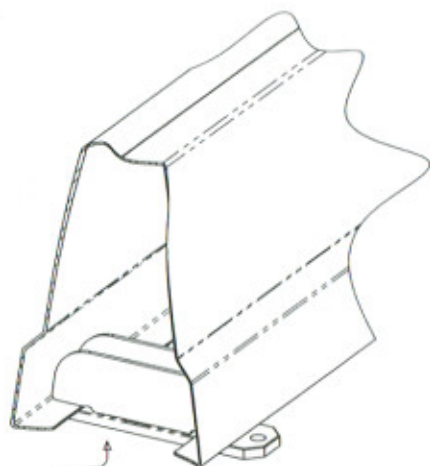
SCALE: 1:1		
DRAWN BY	DATE	INT
APP'D BY	11/17/06	AEM
TITLE		
T-TOP TRANSITION DETAIL ASSEMBLY ANCHORED		

Standard Tolerances	
Angular	± 12°
Fractional	± 1/16"
Dec. XXX	± 0.10
Dec. XXX	± 0.08

<b>BARRIER SYSTEMS INC</b>		
180 RIVER RD. RIO VISTA, CA 94571 TEL: 707-374-6800 FAX: 707-374-6801		
SHEET	DRAWING NUMBER	REV
1 OF 1	B061183	

DYNAMIC DEFLECTION TL-3				
ANCHORAGE	in		mm	
STANDARD	59		1,500	
12m [40 ft]	35		890	
6m [20 ft]	TOP	BASE	TOP	BASE
	12	8	305	200

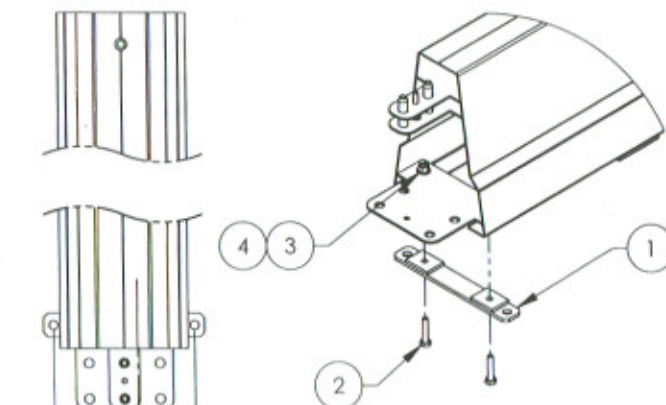
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1	1.00	ANCHOR PLATE WELDMENT, BU100	B060982	EACH
2	2.00	C-SCR HB M24-3.0x120 CLR F GAL	2001562	EACH
3	2.00	Wshr M24 Gal	2001563	EACH
4	2.00	Nut HN M24-3.0 Gal	2001565	EACH



BSI P/N: B060224

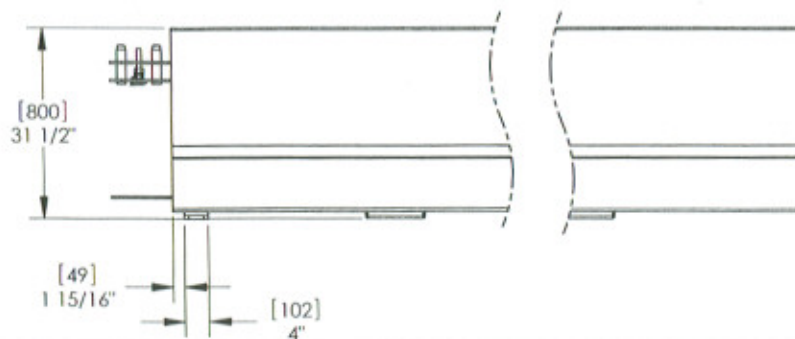
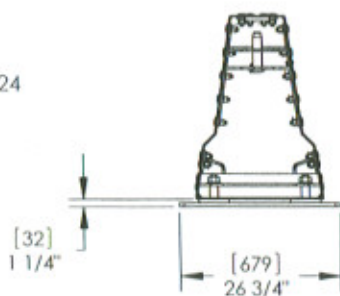
DETAIL B  
SCALE 1 : 12

(INTERMEDIATE ANCHOR,  
INSTALL BETWEEN  
QUICK-CONNECT POINTS)



(INSTALLATION AT QUICK-CONNECT)

[595]  
23 7/16"



NOTES: UNLESS OTHERWISE SPECIFIED

1. INTERMEDIATE ANCHORS MAY BE INSTALLED TO REDUCED DEFLECTION.
2. T-TOP SHALL BE INSTALLED ON BARRIER GUARD SECTIONS WHEN INTERMEDIATE ANCHORS ARE USED. T-TOP IS TO BEGIN A MIN OF 12m PRIOR TO ANY ANCHOR AND RUN A MINIMUM 12m PAST ANCHORS. TRANSITION SHALL EXTEND AND ADDITIONAL 1.5m.

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

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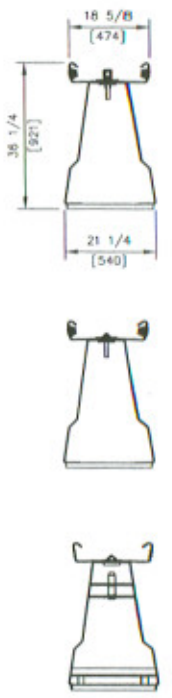
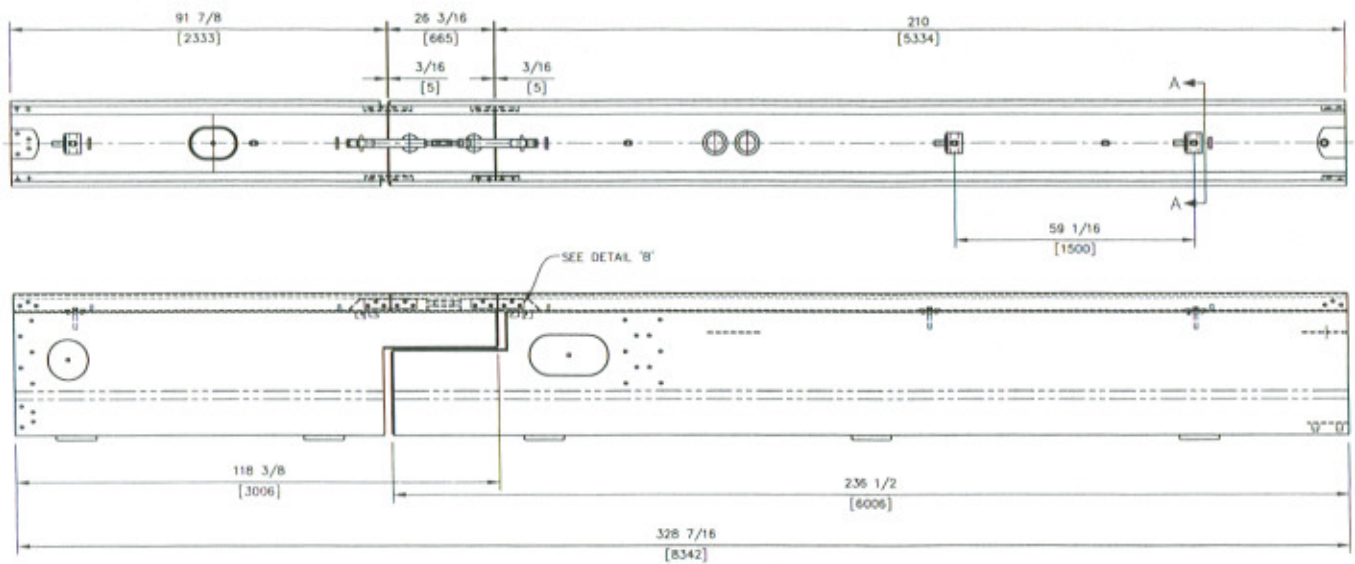
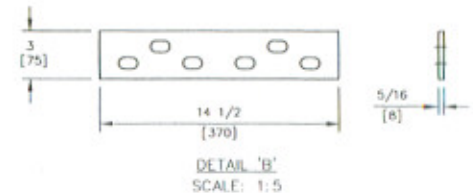
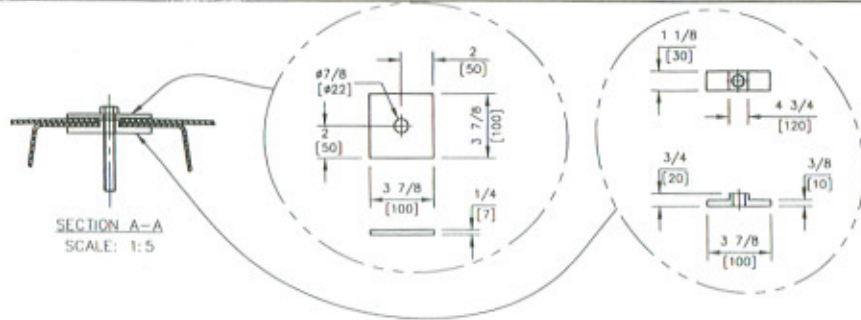
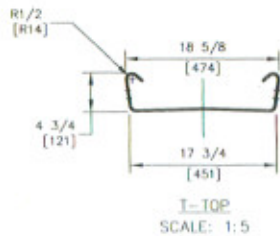
REV.	CHANGES	DATE	BY	REQD	NEXT ASSY.	ITEM
1	ADDED TABLE 'DYNAMIC DEFLECTION' ADDED DETAIL 'B'	12/05/06	AEM			

SCALE: 1:20  
DATE: 11/7/05  
INIT: CMB  
GAD

Standard Tolerance  
Angular +/- .02 Deg  
Fractional +/- .016  
Dec. XXXX +/- .010  
Dec. XXX +/- .030

TITLE: INTERMEDIATE ANCHOR  
INSTALLATION

MODEL	DRAWING NUMBER	REV
	B051103	1



- NOTES: UNLESS OTHERWISE SPECIFIED
- BARRIER GUARD GATE SHOWN WITH ATTACHEMENT SECTIONS.
  - GATE IS AVAILABLE IN 6m [20'] INCREMENTS AND ATTACHES WITH HARDWARE SHOWN EVERY 1.5m [59"] T-TOPS ARE SPliced TOGETHER WITH BRACKETS SHOWN.
  - T-TOP IS REQUIRED WHEN A GATE IS USED. T-TOP SHALL BEGIN MIN. 12m PRIOR TO GATE AND EXTEND PAST THE GATE A MINIMUM OF 12m. T-TOP TRANSITION SECTION SHALL EXTEND AN ADDITIONAL 1.5m.

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REV.	CHANGES	DATE	BY	REQ'D	NEXT ASS'Y	ITEM

SCALE: 1:30

DRAWN BY	DATE	INIT.
APPR'D BY	11/15/06	AEM
		GAD

TITLE:  
T-TOP, GATE LOCKING BG800

Standard Tolerance  
Angular ± 1/2°  
Fractional ± 1/16"  
Decimal ± .010

**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	B061177	