



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

400 Seventh St., S.W.
Washington, D.C. 20590

November 30, 2004

In Reply Refer To: HSA-10/B-131

Mr. Owen S. Denman, P.E.
President
Barrier Systems, Incorporated
180 River Road
Rio Vista, California 94571-1208

Dear Mr. Denman:

In your November 9 letter, you requested formal Federal Highway Administration review and acceptance of a proprietary temporary steel barrier named the BarrierGuard 800. To support this request, you also sent copies of an October test report entitled "NCHRP Report 350 Crash Test Report: Highway Care Ltd. and Laura Metaal Eyselshoven, BV BarrierGuard 800", compiled and prepared by Safe Technologies, Inc. and videotapes of the crash tests that were conducted on the barrier.

The BarrierGuard 800 is a longitudinal barrier constructed from 5-mm thick A36 galvanized steel panels assembled in 12-meter segments. Each segment is 800-mm high with a base width of 540 mm and a top width of 230 mm. As shown in Enclosure 1, the BarrierGuard 800 has a sloped face with a "step" 255 mm above the ground. Each segment weighs approximately 1080 kg. The system is anchored at each end and at a point approximately 6 m in from each end with a total of 16 24-mm diameter by 460-mm long threaded steel rods (4 rods at each anchor location) in a minimum of 75-mm of asphaltic concrete over at least 200-mm of compacted dense graded aggregate. Alternative designs certified by the manufacturer to provide anchorage equal to or better than the tested design may also be used.

The BarrierGuard 800 has been tested and approved under the European EN 1317 testing and evaluation criteria up to test level H2. Tests were successfully conducted at the BASt facility in Germany and the LIER facility in France with cars weighing 900 kg and 1500 kg. These tests may be considered equivalent to National Cooperative Highway Research Program (NCHRP) Report 350 test 3-10. Safe Technologies, Inc. constructed a 72-m long test installation that was impacted by a 2000-kg pickup truck at 25 degrees and 100.5 km/h. The impact point was approximately 15 m upstream from the anchored end section, thus effectively replicating a transition test (NCHRP Report 350 test 3-21). The vehicle was contained and redirected. Dynamic deflection was reported to be 1 m. Test results met all appropriate evaluation criteria as noted in Enclosure 2.



In addition to the passenger vehicle tests noted above, the BarrierGuard 800 was tested with a 13000-kg intercity bus impacting at 70 km/h and 20 degrees and a 7500-kg single unit truck at 50 km/h and at a 45 degree angle. You noted that the impact severity in the two latter crashes exceeded that required by the NCHRP Report 350 TL-4 single unit truck by factors of nearly 2 and 3, respectively. Staff members have reviewed the crash videos and test data for these tests and recommended that together, they be considered equivalent to the current TL-4 test with the 8000-kg single unit truck impacting at 80 km/h and 15 degrees. However, it is not my intention to set any precedent by accepting the European tests in lieu of Report 350 tests and any future requests for “equivalent” tests will be reviewed on a case-by-case basis.

Based on the information you submitted, I agree the BarrierGuard 800, as tested, meets NCHRP Report 350 evaluation criteria and may be used on the National Highway System (NHS) as a test level 4 temporary barrier. Because NCHRP Report 350 test 3-11 was not conducted, the design deflection for the BarrierGuard anchored only at the ends will exceed the 1-m distance seen in test 3-21. Based on a review of the deflections noted in BAST test 2001 7S 08/JF, a design deflection of approximately 1.5 m appears reasonable. The approach ends of the system will, of course, need to be shielded if located within the design clear zone on projects on the NHS.

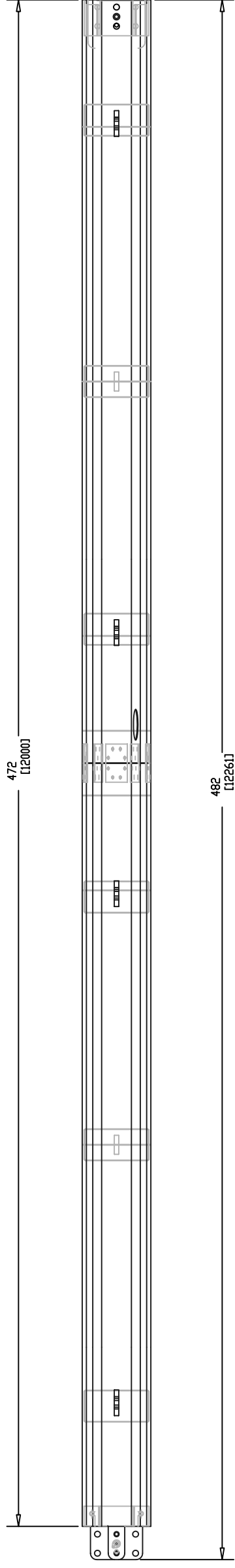
Since the BarrierGuard 800 is a steel product and is proprietary, the provisions of Title 23, Code of Federal Regulations Sections 635.410 and 635.411 are applicable. Note that the “Buy America” provisions apply only to steel products that are permanently incorporated into highway projects, not to temporary barriers used only during construction or maintenance operations.

Sincerely yours,

/Original Signed by/

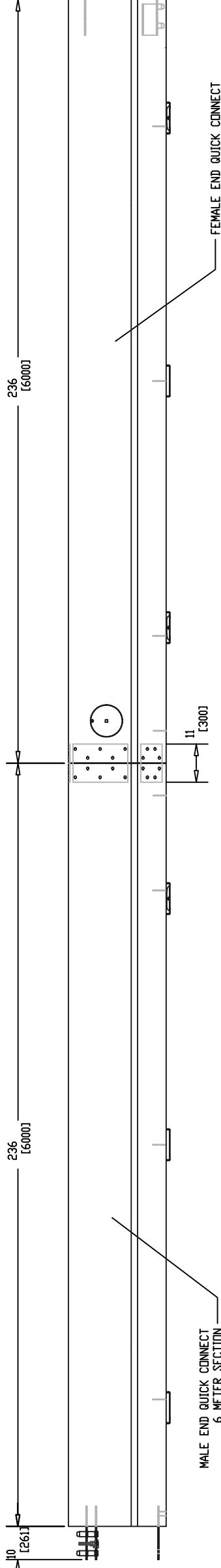
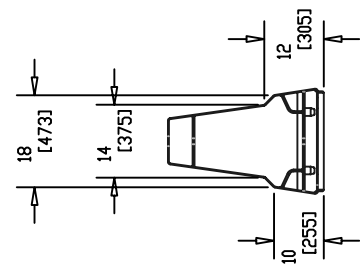
John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures

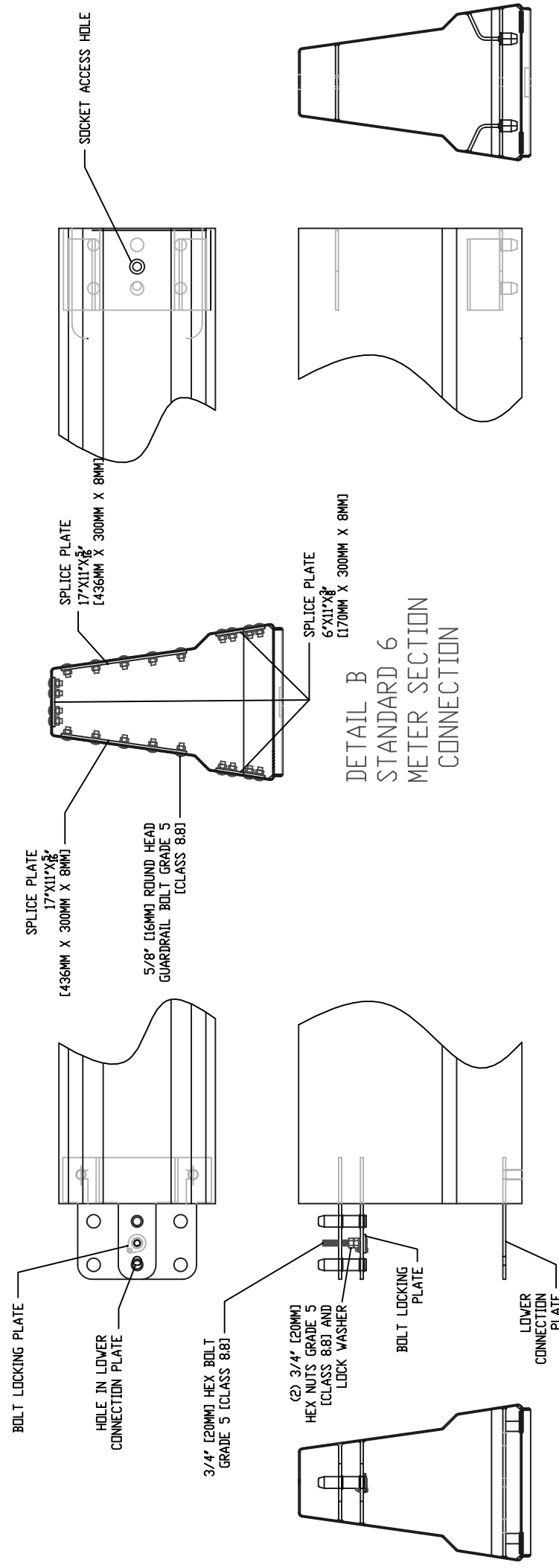


SEE DETAIL C FOR
TYPICAL FEMALE QUICK
CONNECT

SEE DETAIL A FOR
TYPICAL MALE QUICK
CONNECT



SEE DETAIL B FOR STANDARD
6 METER SECTION CONNECTION



DETAIL
C
TYPICAL
FEMALE
QUICK CONNECT

DETAIL A
TYPICAL MALE
QUICK CONNECT

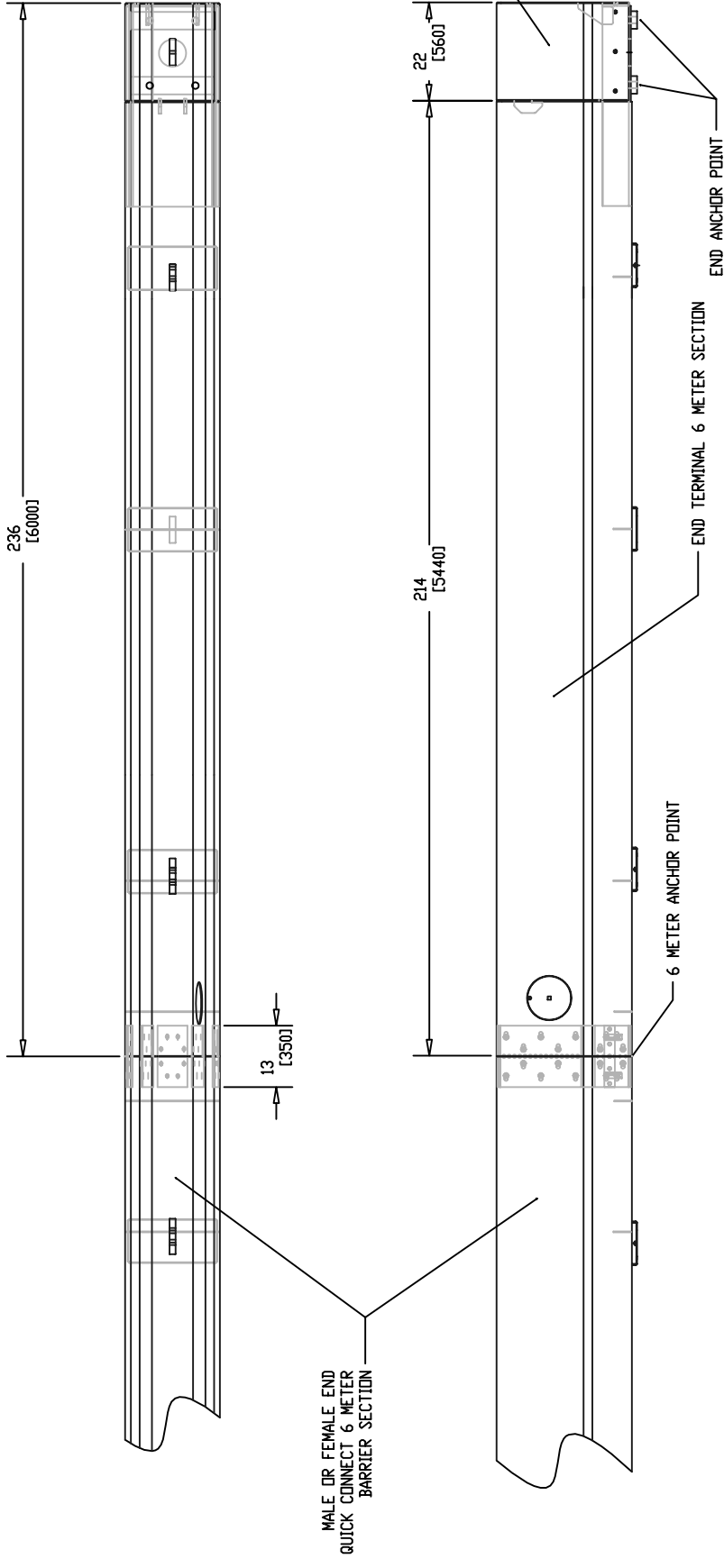
NOTES:

- 1.) ALL STEEL COMPONENTS ARE ASTM A36 OR EQUIVALENT UNLESS OTHERWISE STATED.
- 2.) ALL STEEL COMPONENTS ARE HOT DIPPED GALVANIZED PER ASTM A-123.
- 3.) ALL FASTENERS ARE GRADE 2 OR STRONGER, UNLESS OTHERWISE STATED. ALL FASTENERS ARE GALVANIZED UNLESS OTHERWISE STATED.
- 4.) WHEN CONNECTING 12 METER SECTIONS, THE TOP JOINT IS SECURED WITH A GRADE 5 (CLASS 8.8) NUT THREADED ONTO THE 3/4" (20MM) FASTENER IN DETAIL A. ACCESS THROUGH THE FEMALE END IS SHOWN IN DETAIL C. THIS HARDWARE MAY BE ZINC PLATED.
- 5.) WHEN CONNECTING A 12 METER SECTION TO AN ANCHORED 12 METER SECTION, BOTH THE TOP AND BOTTOM JOINTS OF THE QUICK CONNECTS ARE SECURED. THE TOP IS SECURED AS STATED IN NOTE 4. THE BOTTOM WITH 3/4" (20MM) GRADE 5 (CLASS 8.8) BOLTING HARDWARE. THIS HARDWARE MAY BE ZINC PLATED.

PROJECTIE DIN 6930	Pos No.	Aantal Stuks	Benaming	Materiaal	Opmerking
	Maatvoering	DIN 8570-C	BIJ beh. tek:		Schaal
	Lassen	EN 25718-D			
	Branden	DIN 2310-IIB			
	Getek.	J.Mertens	Benaming		
	Datum:				
	Gezelen:				
DIN 6930-A					

12 METER SECTION ASSEMBLY		Tek. No.	A04-19026
LAURA METAAL EYGELSHOVEN BV		CAD-CAM	Vervangen door:
Wijziging/A	Wijziging/B	Datum:	Datum:
Paraaf:	Paraaf:	Paraaf:	Paraaf:

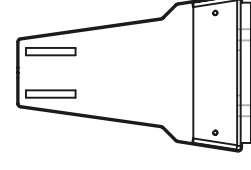
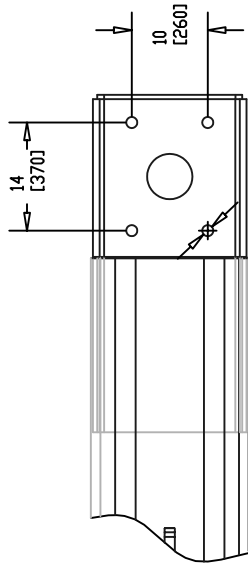
Het auteursrecht van deze tekening blijft voor ons voorbehouden. Het is niet toegestaan deze tekening of de afgeleide daarvan te kopiëren, verspreiden of anderszins openbaar te maken. Het is niet toegestaan deze tekening of de afgeleide daarvan te kopiëren, verspreiden of anderszins openbaar te maken.



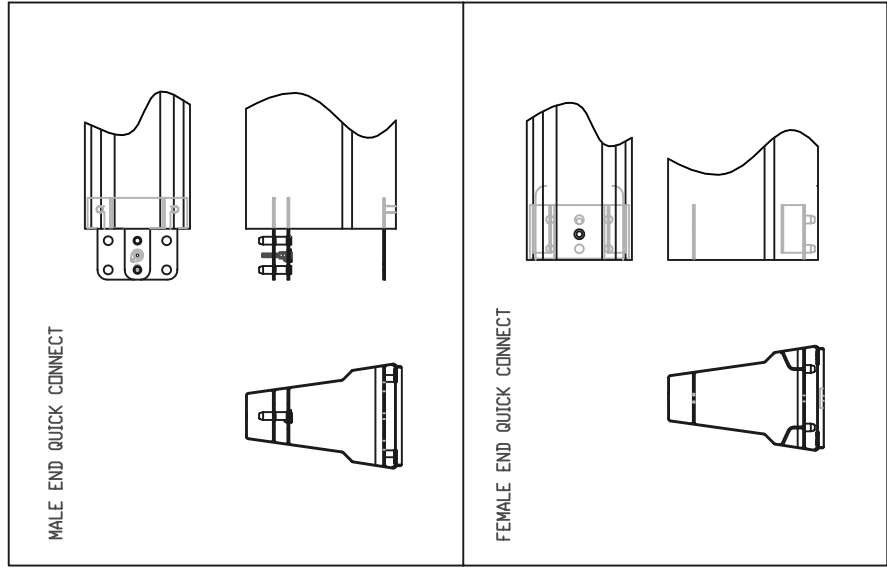
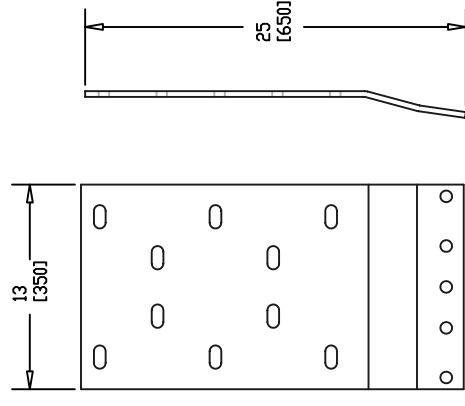
SEE DETAIL A FOR SHEAR STRIP 6 METER SECTION CONNECTION

NOTES:

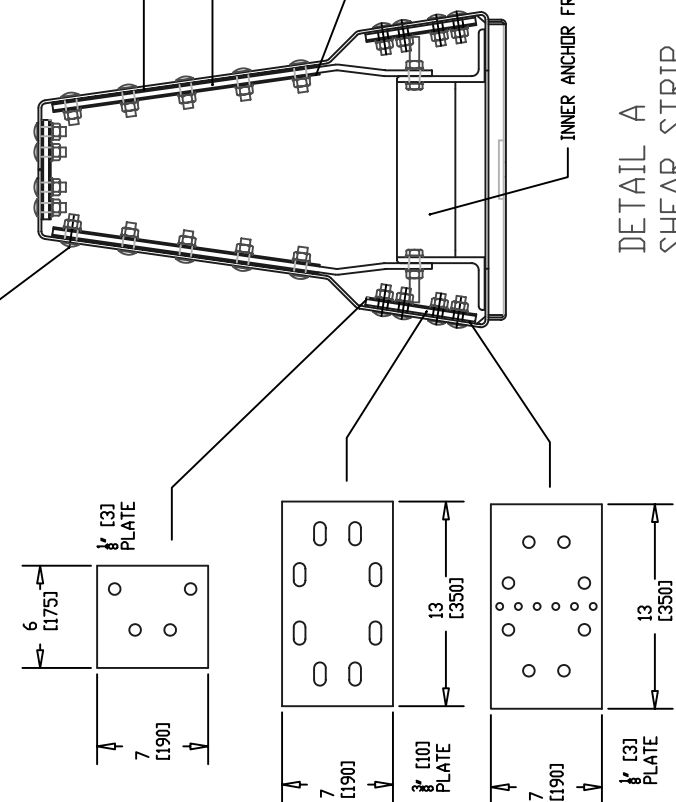
- 1.) ALL STEEL COMPONENTS ARE ASTM A36 OR EQUIVALENT UNLESS OTHERWISE STATED.
- 2.) ALL STEEL COMPONENTS ARE HOT DIPPED GALVANIZED PER ASTM A-123.
- 3.) ALL FASTENERS ARE GRADE 2 OR STRONGER, UNLESS OTHERWISE STATED. ALL FASTENERS ARE GALVANIZED UNLESS OTHERWISE STATED.
- 4.) WHEN CONNECTING A 12 METER SECTION TO AN ANCHORED 12 METER SECTION, BOTH THE TOP AND BOTTOM JOINTS OF THE QUICK CONNECTS ARE SECURED WITH FASTENERS. THE TOP IS SECURED WITH THE BOLT ON THE MALE QUICK CONNECT, THE BOTTOM WITH 3/4" (20MM) GRADE 5 (CLASS 8.8) BOLTING HARDWARE. THIS HARDWARE MAY BE ZINC PLATED.
- 5.) THE END TERMINAL SHOWN PROVIDES AN MOUNTING LOCATION AND SUPPORT FOR INSTALLATION OF A CRASH CUSHION.



DETAIL B
END TERMINAL
WITH
COVER REMOVED



5/8" [16MM] ROUND HEAD GUARDRAIL BOLT GRADE 5 [CLASS 8.8]



DETAIL A
SHEAR STRIP
6 METER SECTION
CONNECTION

PROJECTIE	Pos No.	Aantal Stuks	Benaming	Materiaal	Opmerking
DIN 6930	Maatvoering	DIN 8570-C	BIJ beh. tek:		Schaal
		EN 25718-D			
DIN 6930-A	Branden	DIN 2310-IIIB	Benaming:		
		Getek. : J.Mertens			
	Datum:				
	Gezelen:				

Wijziging/A	Wijziging/B	Wijziging/C
Datum:	Datum:	Datum:
Paraaf:	Paraaf:	Paraaf:

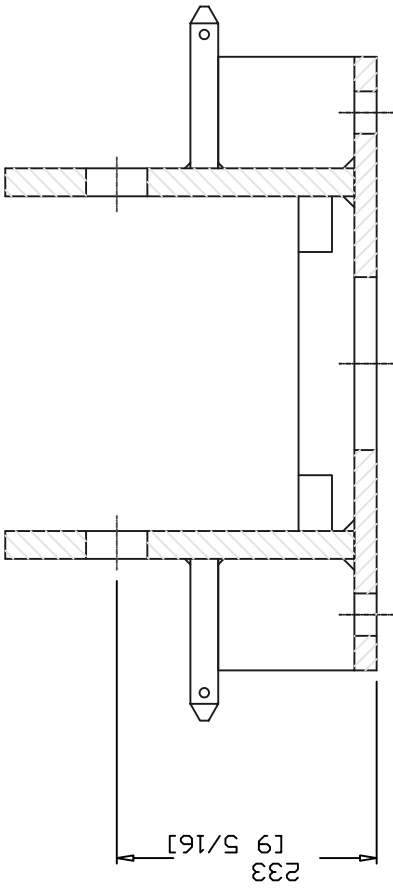
12 METER END SECTION ASSEMBLY

Tek. No. A04-19027

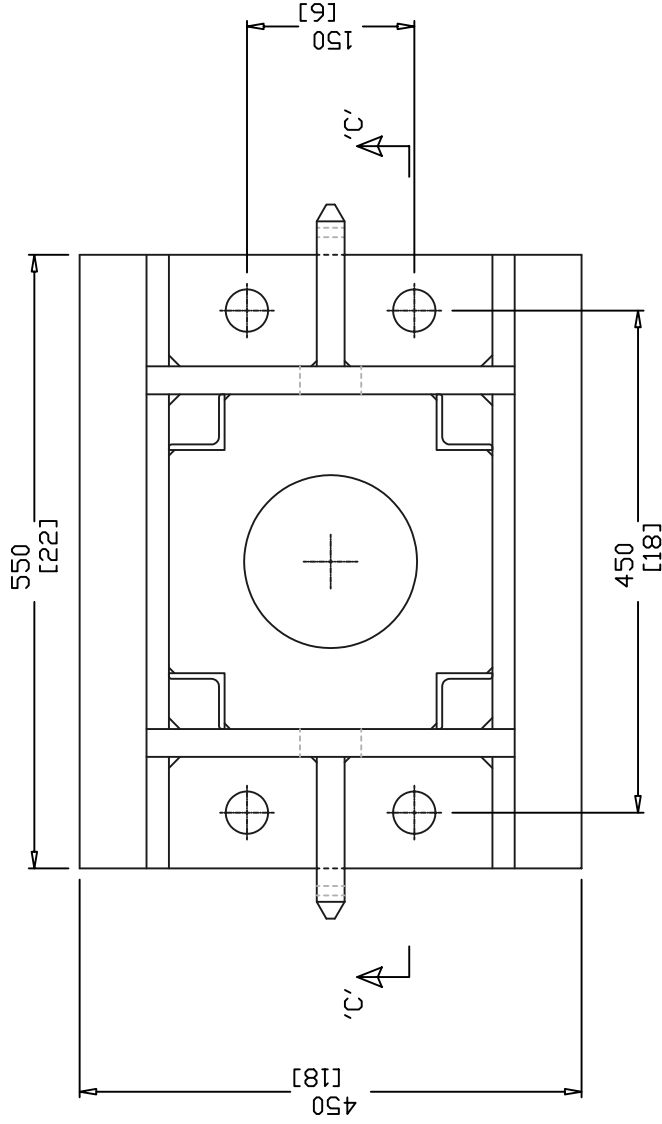
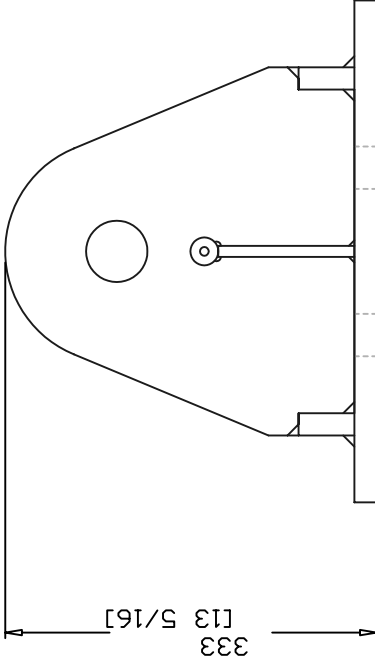
LAURA METAAL EYGELSHOVEN BV

CAD-CAM Vervangen door:

Het auteursrecht van deze tekening wordt voor alle rechten behouden. Het is niet toegestaan deze tekening of de inhoud daarvan te kopiëren, te verspreiden of anderszins openbaar te maken. Het is niet toegestaan deze tekening of de inhoud daarvan te kopiëren, te verspreiden of anderszins openbaar te maken.



SECTION 'C-C'



NOTES:

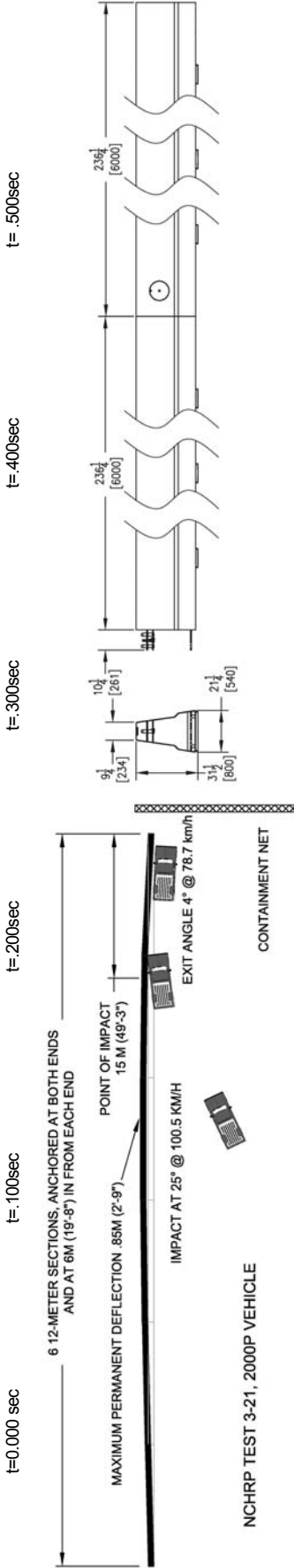
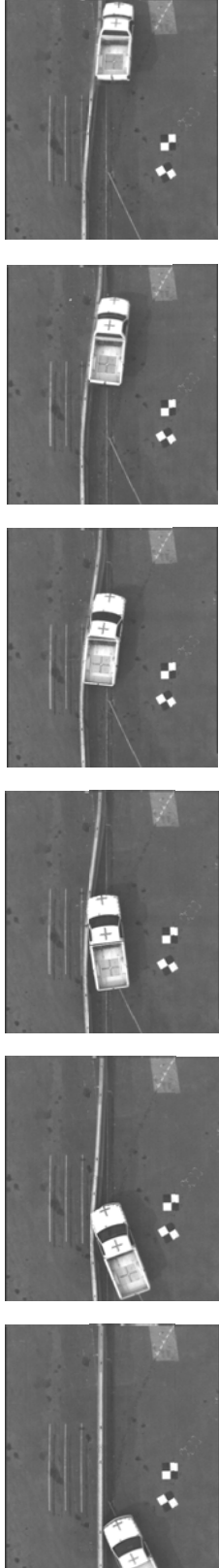
- 1.) ALL STEEL COMPONENTS ARE ASTM A36.
- 2.) HOT DIPPED GALVANIZED PER ASTM A-123.
- 3.) ENGLISH STANDARD UNITS (INCHES) IN BRACKETS.

PROJECTE No.	Aantal Stuks	Benoeming	Material	Opmerking
1	1	Bij beh. tek-BGE 05		Schaal
2	1	Benoeming		
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100	1	Benoeming		

LAURA METAAL EYGELSHOVEN BV

BARRIER GUARD 800 ANCHOR ASSEMBLY

Tek. No. D03-18738/1
 Verw. No. CAD-CAM
 Datum: 10-01-2018
 Paraaf: []



NCHRP TEST 3-21, 2000P VEHICLE

General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 Test 3-21**
 Test No..... **BG801**
 Date..... 10/14/2004

Test Article

Type..... Highway Care Ltd and Laura Metaal Eygelshoven, BV
 BarrierGuard 800
 Installation Length..... 72 meters overall

Size and/or dimension and material

of key elements..... Section length 12000mm, height 800mm,
 width 544mm, mass 90kg per meter.

Test Vehicle

Type..... Production Model
 Designation..... 2000 kg
 Model..... 1992 GMC 3/4 Ton Pick-up
 Mass (kg)
 Curb..... 1810.5
 Test Inertial..... 2004
 Dummy(s)..... n/a
 Gross Static..... 2004

Impact Conditions

Speed (km/h)..... 100.5
 Angle (deg)..... 25
 Impact Severity (ku)..... 139.5

Exit Conditions

Speed (km/h)..... 78.7
 Angle (deg)..... 4

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... 3.6
 y-direction..... -4.8
 Ridedown Acceleration (g/s)
 x-direction..... -5.7
 y-direction..... 13.3

THIV (km/h)..... 20.2
 PHD (g/s)..... 13.5
 ASI..... 0.9

Test Article Deflection (mm)

Dynamic..... 1000
 Permanent..... 850

Vehicle Damage

Exterior
 VDS..... LFQ-3
 CDC..... 11FLEE3
 Interior
 OCCDI..... LF0000000

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

Maximum Roll Angle..... -12.6
 Maximum Pitch Angle..... -19.8
 Maximum Yaw Angle..... -68.3

Figure 1. Summary of Results-Test #BG801