

March 27, 2002

HSA-10/B97

Mr. Leo J. Yodock, III  
Yodock Wall Company, Inc.  
623 N.E. 5th Terrace  
Ft. Lauderdale, FL 33304

Dear Mr. Yodock:

In your March 8 letter to Mr. Frederick Wright, former Program Manager for the Safety Core Business Unit, you requested the Federal Highway Administration's acceptance of two traffic barrier designs as National Cooperative Highway Research Program (NCHRP) Report 350 test level 2 (TL-2) and test level 3 (TL-3) barriers, respectively. To support this request, you also provided copies of three test reports prepared by the Texas Transportation Institute and videotapes of the tests that were conducted.

The first report, dated October 2001, is entitled "NCHRP Report 350 Test 2-11 of the 813 mm Tall Yodock Barrier Model 2001M, Energy Dispersement Cell with Steel Tubing Side Rails Longitudinal Barrier." The test installation consisted of 25 low-density polyethylene water-filled barriers, each 1830-mm long, 813-mm tall, 457-mm wide at the base and 203-mm wide at the top. The individual units are connected at the ends with polyethylene couplers and along the sides by 89 mm x 89 mm x 6.4 mm structural steel tubes supported by steel brackets which extend through two forklift holes in each unit. The steel side tubes are 1830-mm long and spliced with 280-mm long 64 mm x 64 mm x 6.4 mm steel tubes using two 19-mm diameter x 114-mm long Grade 8 hex head bolts. The centerline height of the side rails was 596 mm. These design details are shown on Enclosure 1. The results of test 2-11, a pickup truck impacting at 68.5 km/h and 24.0 degrees approximately 14 m from the upstream end of the test installation, are summarized in Enclosure 2. All NCHRP Report 350 evaluation criteria were met. Barrier deflection under the stated impact conditions was reported to be 3.68 m and the truck stopped in contact with the barrier.

The second report, also dated October 2001, is entitled "NCHRP Report 350 Test 3-11 of the Yodock Barrier Model 2001, Energy Dispersement Cell with Steel Tubing Side Rails for Longitudinal Barrier." The Model 2001 is similar in design to the 2001M model, but is larger, being 1170-mm tall, 610-mm wide at the base, and 280-mm wide at the top. These units were connected along each side by the same size steel tubes as described above, but the centerline height of these rails was increased to 706 mm. Enclosure 3 shows these and other design details. The results of test 3-11 are summarized in Enclosure 4. All appropriate evaluation criteria were met, although the occupant impact velocity was near the upper limit. Again, the truck was stopped in contact with the barrier. Dynamic deflection was reported to be 4.28 meters, with the impact point approximately 14 m from the upstream end of the 45 m-long test installation.

**The third report, dated February 2002, is entitled “NCHRP Report 350 Test 3-10 of the Yodock Barrier Model 2001, Energy Dispersement Cell with Steel Tubing Side Rails for Longitudinal Barrier,” and describes the test with the 820-kg car into the taller Model 2001 design. Enclosure 5 summarizes the results of this 97.7 km/h test.**

**Based on staff review of the information you provided, I agree that the Model 2001M Longitudinal Barrier meets Report 350 evaluation criteria at test level 2 (TL-2), and that the Model 2001 Longitudinal Barrier meets test level 3 (TL-3) criteria. Either design may be used as a temporary barrier on the National Highway System (NHS) when deemed appropriate by the contracting authority. This acceptance is based on the crash performance of your barriers and is not meant to address installation, maintenance or repair of the barriers. It also assumes that any barrier supplied for use on the NHS is identical in dimensions and material specifications to the tested barrier. Since this product is proprietary, the provisions of Section 635.411 of Title 23, Code of Federal Regulations, are applicable.**

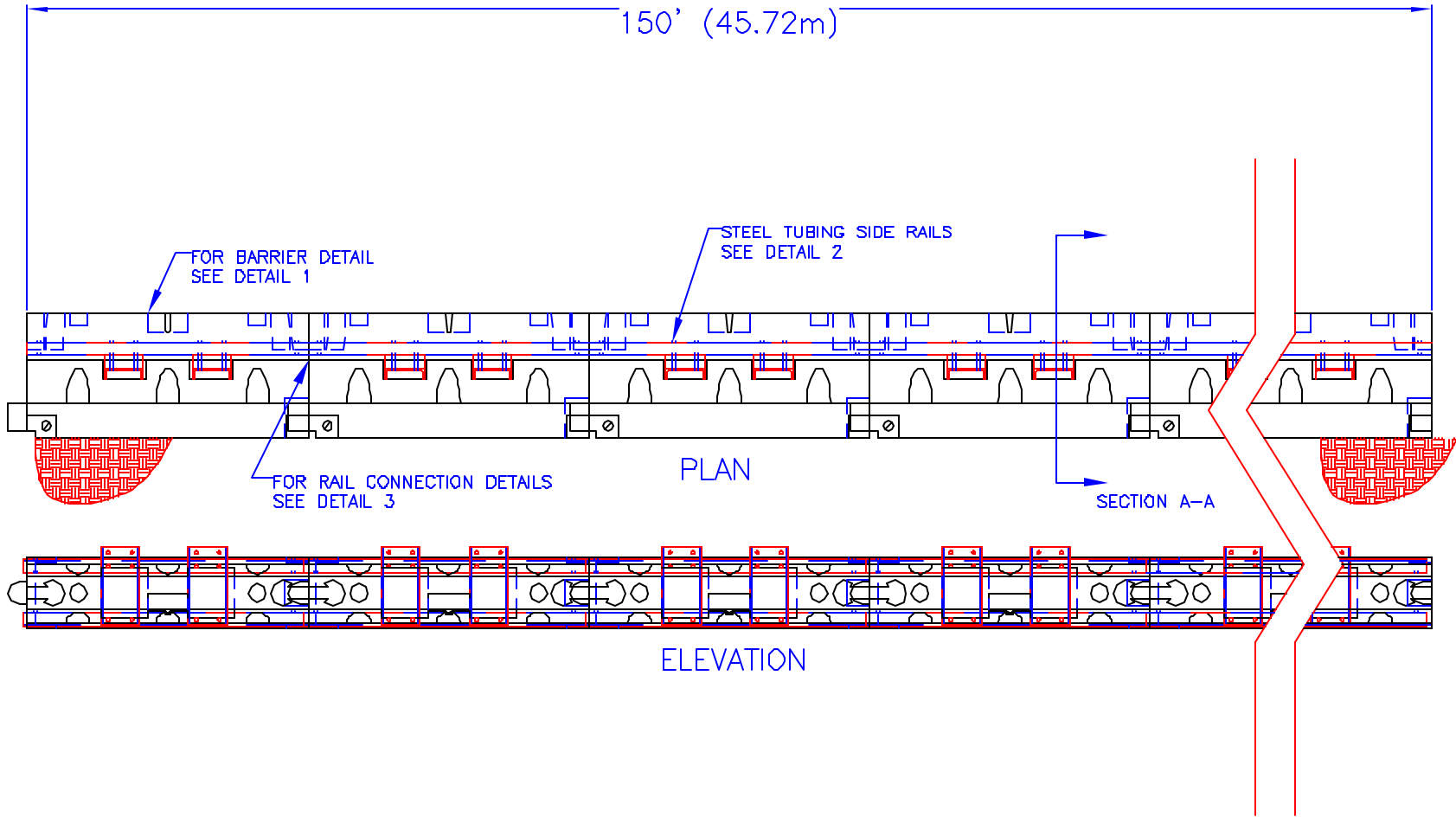
**Sincerely yours,**

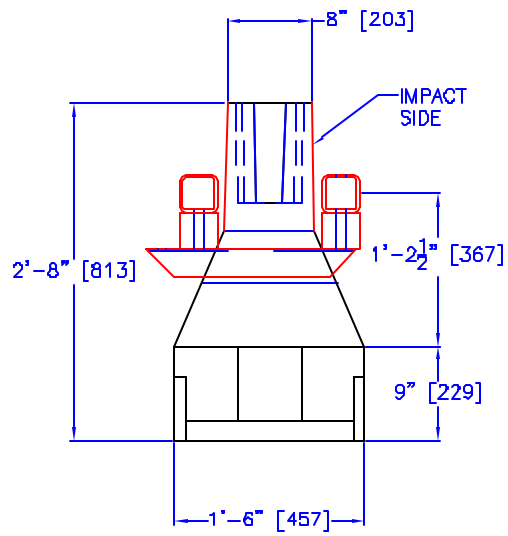
**(original signed by David M. Smith)**

***for* A . George Ostensen  
Program Manager, Safety**

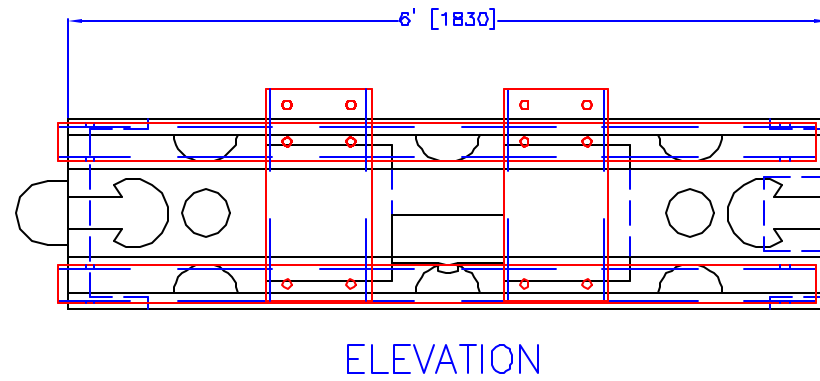
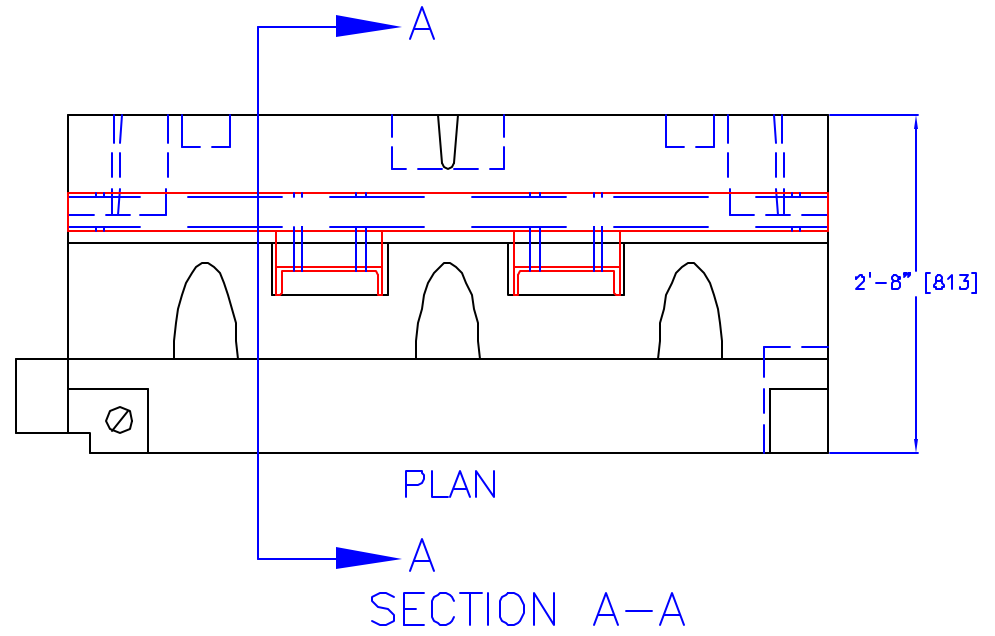
**5 Enclosures**

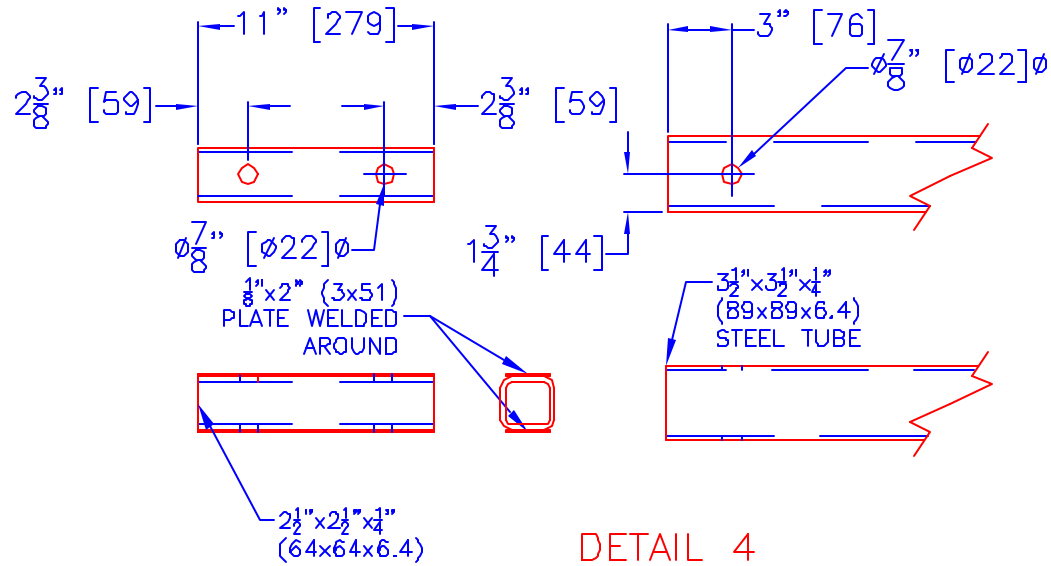
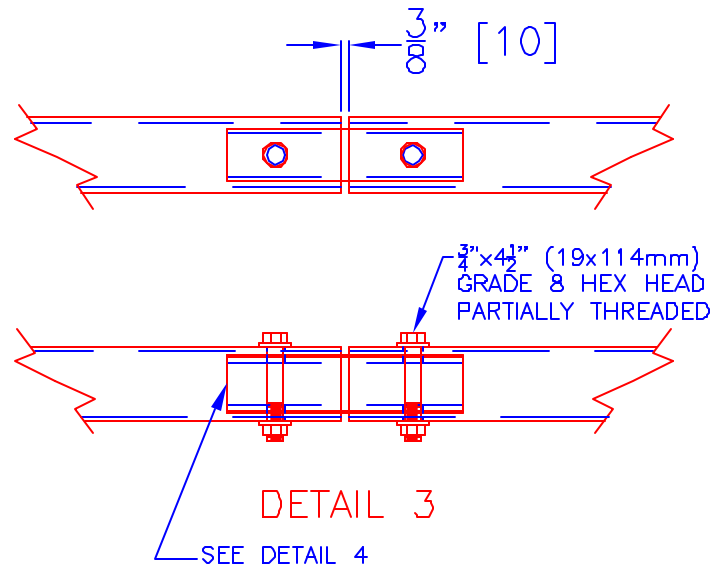
25 BARRIERS  
150' (45.72m)

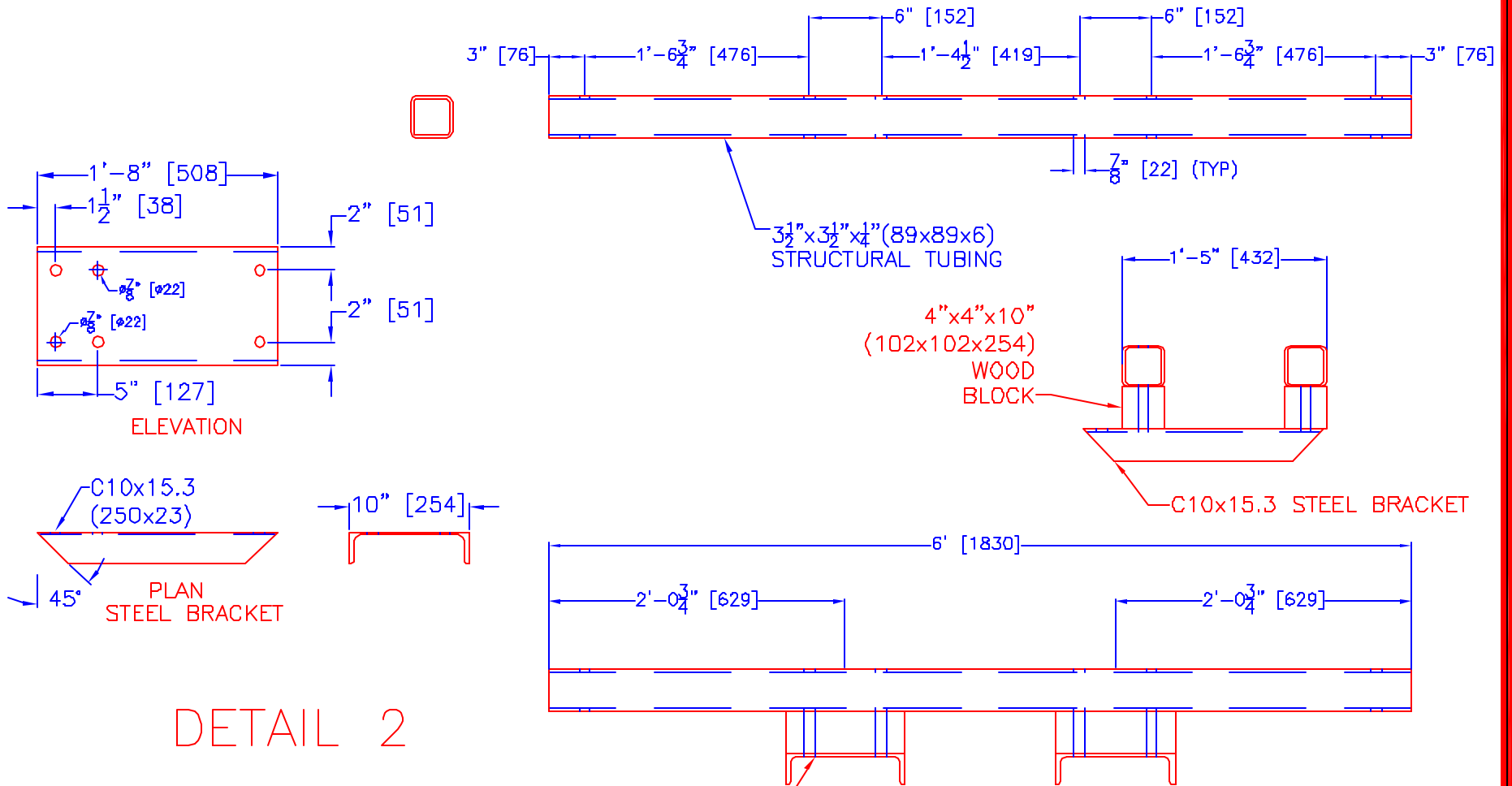




SECTION A-A

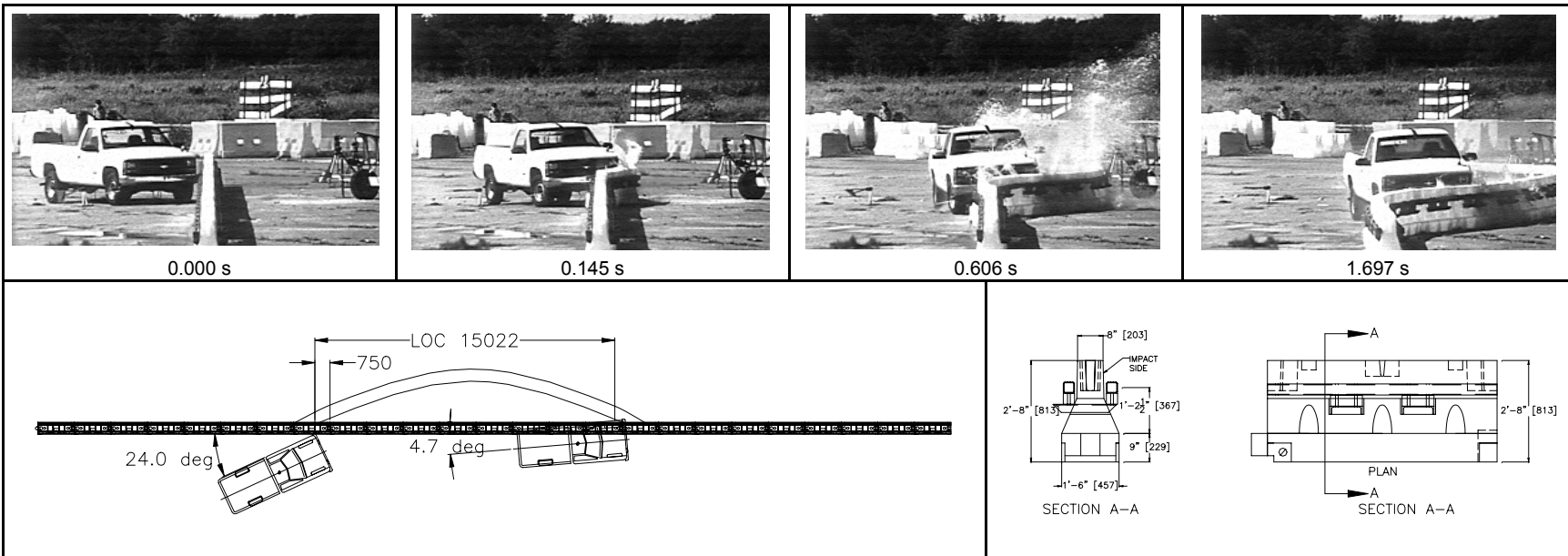






DETAIL 2

HOLES FOR  $\phi 3/4 \times 9$ " [ $\phi 19 \times 230$ ]  
 GRADE 5 CARRIAGE BOLT (TYP)



**General Information**

Test Agency ..... Texas Transportation Institute  
 Test No. .... 400001-YWC5  
 Date ..... 09/13/01

**Test Article**

Type ..... Median Barrier  
 Name ..... Energy Dispersement Cell  
 Installation Length (m) ..... 45.75  
 Material or Key Elements ... 813 mm tall Yodock Energy  
 Dispersement Cells

**Soil Type and Condition**

Concrete Pavement, Dry

**Test Vehicle**

Type ..... Production  
 Designation ..... 2000P  
 Model ..... 1996 Chevrolet 2500 Pickup Truck  
 Mass (kg)  
 Curb ..... 2136  
 Test Inertial ..... 2042  
 Dummy ..... No Dummy  
 Gross Static ..... 2042

**Impact Conditions**

Speed (km/h) ..... 68.5  
 Angle (deg) ..... 24.0

**Exit Conditions**

Speed (km/h) ..... 30.0  
 Angle (deg) ..... 4.7

**Occupant Risk Values**

Impact Velocity (m/s)  
 x-direction ..... 3.7  
 y-direction ..... 3.2  
 THIV (km/h) ..... 15.4  
 Ridedown Accelerations (g's)  
 x-direction ..... -5.4  
 y-direction ..... 8.2  
 PHD (g's) ..... 8.2  
 ASI ..... 0.37  
 Max. 0.050-s Average (g's)  
 x-direction ..... -3.4  
 y-direction ..... 2.9  
 z-direction ..... 1.7

**Test Article Deflections (m)**

Dynamic ..... 3.68  
 Permanent ..... 3.68  
 Working Width ..... 4.11

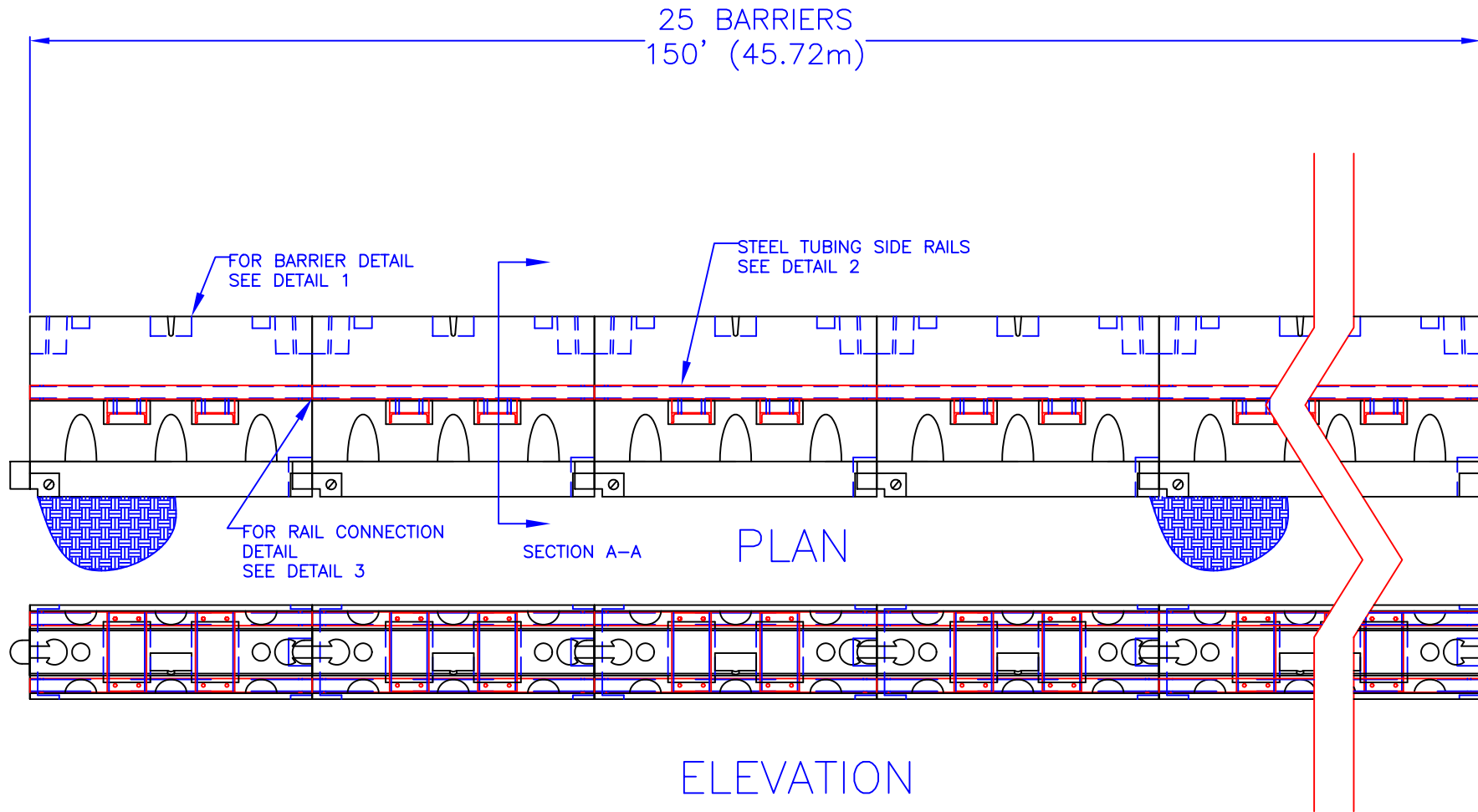
**Vehicle Damage**

Exterior  
 VDS ..... 11LFQ2  
 CDC ..... 11LFEW2  
 Maximum Exterior  
 Vehicle Crush (mm) ..... 300  
 Interior  
 OCDI ..... LF0000000  
 Max. Occ. Compart.  
 Deformation (mm) ..... 0

**Post-Impact Behavior**

(during 1.0 s after impact)  
 Max. Yaw Angle (deg) ..... 18  
 Max. Pitch Angle (deg) ..... -1  
 Max. Roll Angle (deg) ..... 3

Summary of results for test 400001-YWC5, NCHRP Report 350 test 2-11.

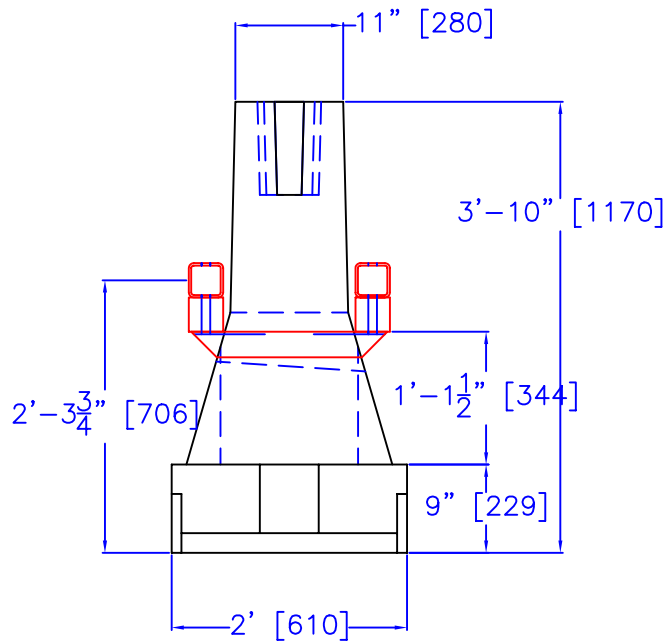


The Texas A&M University System

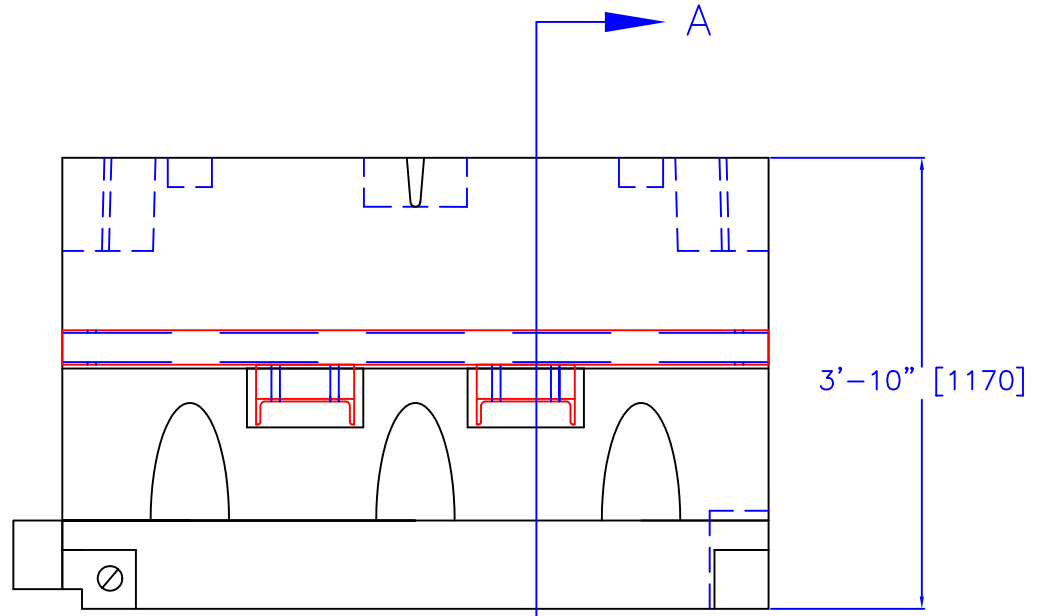
Revisions			TEXAS TRANSPORTATION INSTITUTE COLLEGE STATION, TEXAS 77843			
No.	Date	By	Project No.	Date	Drawn By	Scale
1.			400001-YWC	8/01	BAS	
2.						
3.						
4.						
5.						
YODOCK BRARRIER MODEL 2001 SYSTEM					Sheet No. 1 of 5	

T:\2001-2002\400001\YWC6\AutoCad Drawings\400001-YWC6.dwg



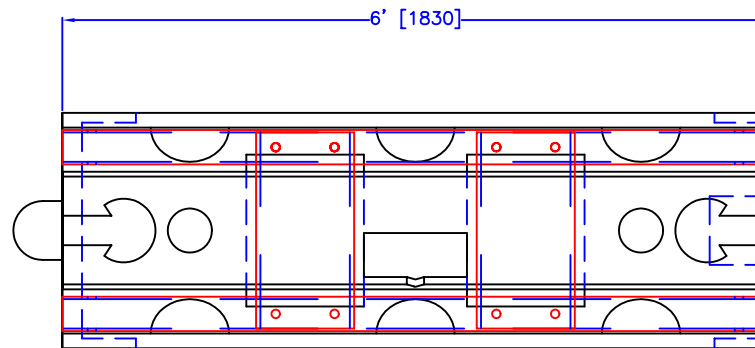


SECTION A-A



PLAN

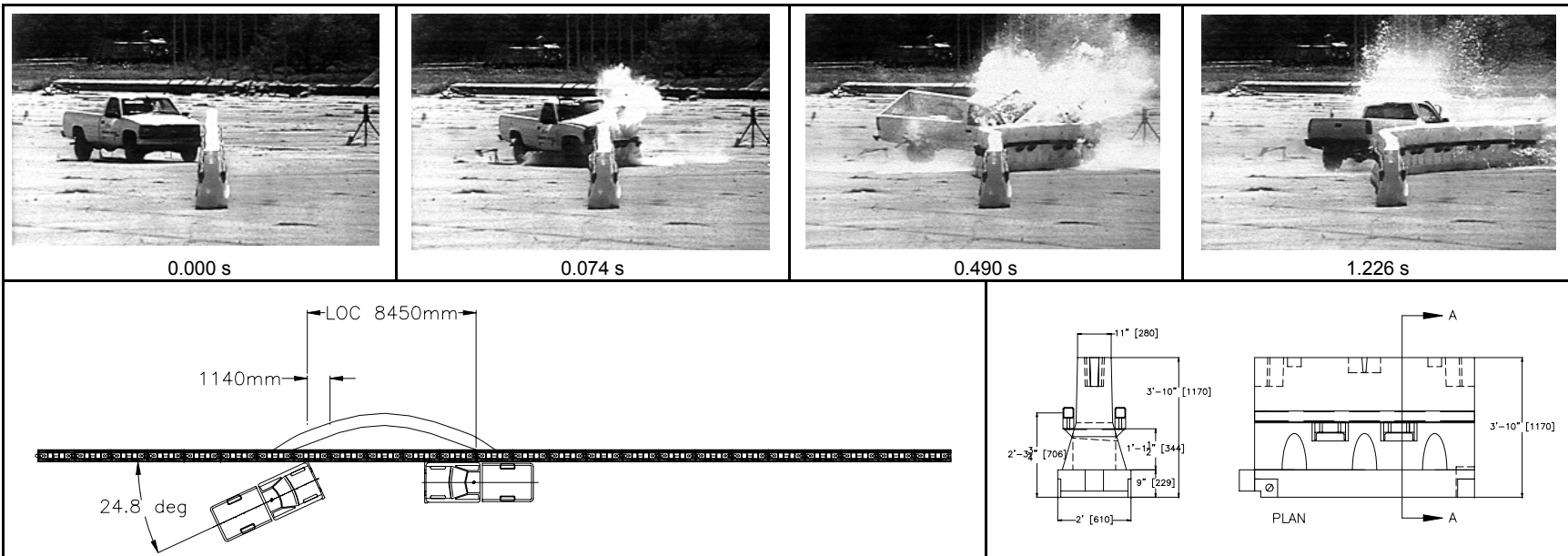
SECTION A-A



ELEVATION

The Texas A&M University System

Revisions			TEXAS TRANSPORTATION INSTITUTE COLLEGE STATION, TEXAS 77843			
No.	Date	By	Project No.	Date	Drawn By	Scale
1.			400001-YWC	8/01	BAS	
2.						
3.						
4.						
5.						
YODOCK BRARRIER MODEL 2001 SYSTEM					Sheet No. 3 of 5	



**General Information**

Test Agency ..... Texas Transportation Institute  
 Test No. .... 400001-YWC6  
 Date ..... 09/14/01

**Test Article**

Type ..... Median Barrier  
 Name ..... Energy Dispersement Cell  
 Installation Length (m) ..... 45.75  
 Material or Key Elements ... 1160 mm tall Energy Dispersement Cells  
 with Tubular Steel Rail Elements  
**Soil Type and Condition** .... Concrete Pavement, Dry

**Test Vehicle**

Type ..... Production  
 Designation ..... 2000P  
 Model ..... 1996 Chevrolet 2500 Pickup Truck  
 Mass (kg)  
 Curb ..... 2137  
 Test Inertial ..... 2041  
 Dummy ..... No Dummy  
 Gross Static ..... 2041

**Impact Conditions**

Speed (km/h) ..... 98.4  
 Angle (deg) ..... 24.8

**Exit Conditions**

Speed (km/h) ..... 11.6  
 Exit Trajectory Angle (deg) ..... 27.5  
 Vehicle Heading Angle (deg) .... 80.5

**Occupant Risk Values**

Impact Velocity (m/s)  
 x-direction ..... 11.6  
 y-direction ..... 2.3  
 THIV (km/h) ..... 42.6  
 Ridedown Accelerations (g's)  
 x-direction ..... -10.0  
 y-direction ..... -6.1  
 PHD (g's) ..... 10.5  
 ASI ..... 1.11  
 Max. 0.050-s Average (g's)  
 x-direction ..... -13.3  
 y-direction ..... 4.2  
 z-direction ..... -4.7

**Test Article Deflections (m)**

Dynamic ..... 4.28  
 Permanent ..... 4.02  
 Working Width ..... 4.62

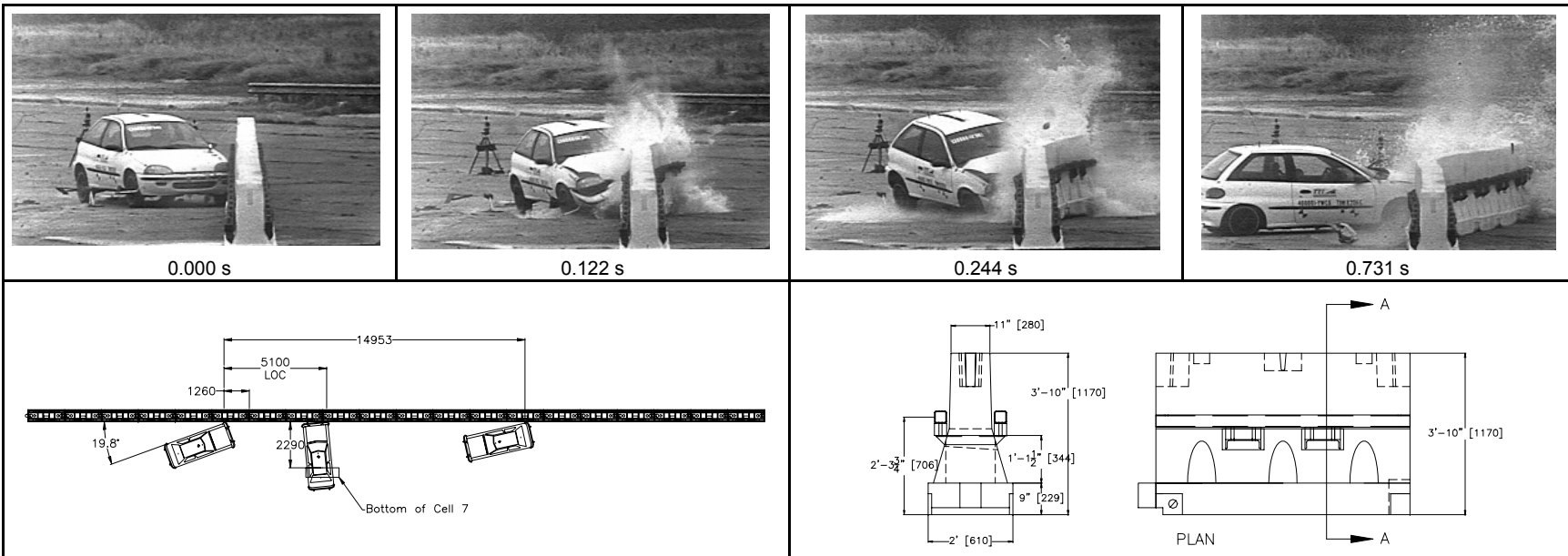
**Vehicle Damage**

Exterior  
 VDS ..... 11LFQ5  
 CDC ..... 11FLEK3  
 & 11LYEW4  
 Maximum Exterior  
 Vehicle Crush (mm) ..... 840  
 Interior  
 OCDI ..... LF0010000  
 Max. Occ. Compart.  
 Deformation (mm) ..... 72

**Post-Impact Behavior**

(during 1.6 s after impact)  
 Max. Yaw Angle (deg) ..... -147  
 Max. Pitch Angle (deg) ..... -4  
 Max. Roll Angle (deg) ..... 21

Summary of results for test 400001-YWC6, *NCHRP Report 350* test 3-11.



**General Information**

Test Agency ..... Texas Transportation Institute  
 Test No. .... 400001-YWC8  
 Date ..... 01/28/02

**Test Article**

Type ..... Median Barrier  
 Name ..... Yodock Model 2001 Energy Dispersement Cell  
 Installation Length (m) ..... 36.58  
 Material or Key Elements ..... 1170 mm Tall Energy Dispersement Cells With Tubular Steel Rail Elements  
 Soil Type and Condition .... Concrete Pavement, Dry

**Test Vehicle**

Type ..... Production  
 Designation ..... 820C  
 Model ..... 1996 Geo Metro  
 Mass (kg)  
 Curb ..... 820  
 Test Inertial ..... 820  
 Dummy ..... 76  
 Gross Static ..... 896

**Impact Conditions**

Speed (km/h) ..... 97.7  
 Angle (deg) ..... 19.8

**Exit Conditions**

Speed (km/h) ..... 26.2  
 Angle (deg) ..... 95.9

**Occupant Risk Values**

Impact Velocity (m/s)  
 x-direction ..... 11.0  
 y-direction ..... 3.7  
 THIV (km/h) ..... 41.4  
 Ridedown Accelerations (g's)  
 x-direction ..... -10.4  
 y-direction ..... 2.7  
 PHD (g's) ..... 10.7  
 ASI ..... 1.03  
 Max. 0.050-s Average (g's)  
 x-direction ..... -11.0  
 y-direction ..... 5.3  
 z-direction ..... -2.1

**Test Article Deflections (m)**

Dynamic ..... 1.230  
 Permanent ..... 1.195  
 Working Width ..... 1.845

**Vehicle Damage**

Exterior  
 VDS ..... 11FL3  
 CDC ..... 11FLEW3  
 Maximum Exterior  
 Vehicle Crush (mm) .... 390  
 Interior  
 OCDI ..... LF0011000  
 Max. Occ. Compart.  
 Deformation (mm) ..... 46

**Post-Impact Behavior**

(during 1.0 s after impact)  
 Max. Yaw Angle (deg) ..... -174  
 Max. Pitch Angle (deg) .... -4  
 Max. Roll Angle (deg) ..... -14

Summary of results for test 400001-YWC8, *NCHRP Report 350* test 3-10.