



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

May 19, 2006

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

In Reply Refer To:
HSA-10/B149

Chuck Plaxico, Ph.D.
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201-2693

Dear Dr. Plaxico:

In Mr. Michael Halladay's January 8, 2002, letter to the Ohio Department of Transportation's Mr. Larry Sutherland, the Federal Highway Administration (FHWA) agreed that the Ohio Department of Transportation 32-inch high precast New Jersey shape concrete barrier with a standard pin and loop connection met the evaluation criteria for an National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) temporary traffic barrier. In your May 1, 2006, letter to Mr. Richard Powers of my staff, you requested the FHWA's concurrence that a new barrier, a 50-inch high precast safety shape with a unique pin and loop connection, also be accepted as a TL-3 design.

Prior to conducting a full-scale crash test, Battelle developed a new design for the pin and loop connection through a series of finite element analyses that predicted the design would meet all Report 350 evaluation criteria for a TL-3 temporary barrier. The Ohio Department of Transportation's tall barrier is a 50-inch high, modified New Jersey shape concrete barrier with each segment being 12-feet long. Since the base width remained a standard 24 inches and the top width remained 6 inches, the extended upper sloped face was about 3 degrees steeper than the upper slope of a 32-inch tall New Jersey shape. Reinforcement consisted of five #5 steel bars and two sections of 6 x 6 x W2.9 welded wire fabric. Segments were connected by 1.25-inch diameter x 43-inch long galvanized Grade 5 (high strength) steel bolts passing through 8 loops (4 loops at the ends of each segment). These loops are made from 0.75-inch diameter A36 steel bars bent to an inside radius of 2.25 inches. There are two loops at the top of each segment at one end and a single upper loop at the opposite end. The bottom loops are reversed, with a single loop beneath the upper double loops and vice versa. Each segment also has a single loop, approximately centered between the upper and lower sets of loops. This design, shown as Enclosure 1, was successfully tested at the Transportation Research Center in East Liberty, Ohio on April 12, 2006. Total installation length was about 200 feet and the impact point was approximately 80 feet from the upstream end, resulting in a dynamic



deflection of 1.9 meters. Equally severe impacts closer to either unanchored end would be expected to result in greater deflections. Enclosure 2 is the test summary sheet. Vehicular pitch and roll were significantly less than typically noted in concrete barrier tests, probably due to the increase in height and the steeper upper slope that minimizes vehicular climb and roll upon contact.

Based on the crash test results, I agree that this 50-inch high New Jersey portable concrete barrier may be considered an NCHRP Report 350 TL-3 design and used on the National Highway System at the State's discretion. The same barrier design in a 20-foot length may also be considered a TL-3 barrier, provided the longitudinal reinforcement is equivalent to that contained in any other 20-ft segment that has been crash tested successfully. California, New York, and Virginia each have such designs. Please note also that the Oregon Department of Transportation successfully tested a 42-inch tall F-shape concrete barrier with a similar double-shear pin connection to NCHRP Report 350 TL-4. It is very likely that the Ohio Department of Transportation 50-inch tall barrier would have similar capacity.

Sincerely yours,

/original signed by/

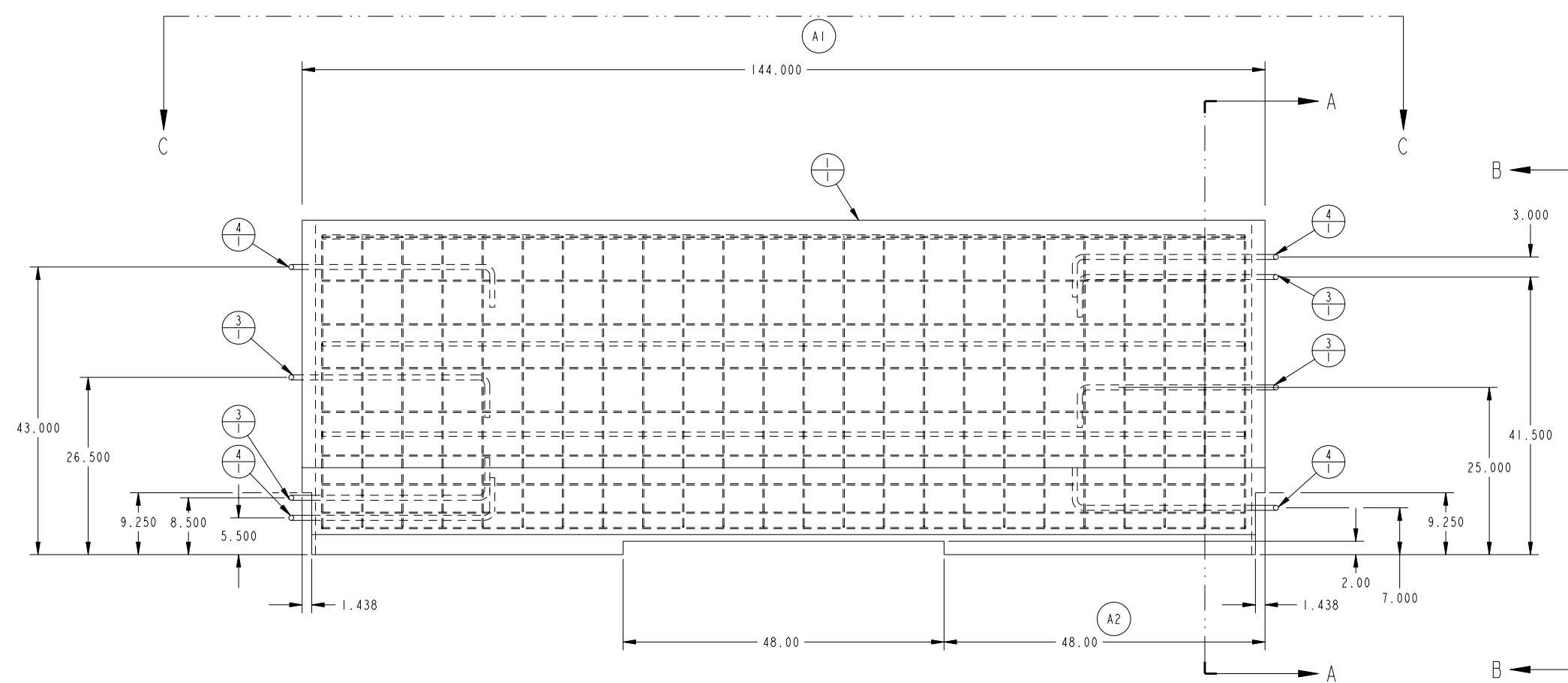
John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures

NAME:HARRISS OBJECT:G005063-30_1 DATE:01-Sep-05 09:14:20

DWG NO		G005063-30		SH	I	REV	A
REVISION HISTORY							
ZONE	REV	DESCRIPTION	DATE	APPROVED			
1	D3	(1) 144.000 WAS 120.00.	2005-08-25				
1	B2	(2) 48.00 WAS 36.00.					
1	A3	(3) ITEM #5 LENGTH 138.00 WAS 114.00.					
1	A3	(4) HINGE BAR DIAMETER IS: .75. WAS #6					
1	D8	(5) ADDED MATERIAL SPECIFICATIONS TO CONNECTING HARDWARE, HINGE AND REINFORCING BARS.					
2	B5	(6) (144.000) WAS 120.000.					
2	D3	(7) 3X 47.50 WAS 47.50.					
3	B4	(8) 138.000 WAS 114.000.					
3	B7	(9) G005063-21-10 WAS SPLIT IN HALF ALONG THE VERTICAL PLANE AND WAS CONNECTED AT THE TOP BY A RADIAL BEND.					

- NOTES:
- APPLICABLE STANDARDS/SPECIFICATIONS:
ASME Y14.5M-1994, DIMENSIONS AND TOLERANCES
ASME Y14.38, ABBREVIATIONS
 - BARRIER SPECIFICATIONS, INCLUDING BARS AND CONCRETE, SHALL BE PER CMS 622.
 - HINGE AND REINFORCING BARS:
THE .75 HINGE MAY BE ASTM A-36. REBARS SHALL MEET THE REQUIREMENTS OF CMS 509. BLACK STEEL IS PERMITTED.
 - CONNECTING HARDWARE:
BOLTS, WASHERS AND HEX NUTS SHALL BE GALVANIZED AFTER FABRICATION PER CMS 711.02 AND SHALL MEET THE REQUIREMENTS OF CMS 711.09 EXCEPT THAT THE ROTATIONAL CAPACITY TEST SPECIFIED IN ASTM A-325 SHALL BE WAIVED.
 - MARKING:
MARK WITH DAY, MONTH, YEAR OF CAST AND UNIQUE IDENTIFICATION NUMBER IN THE LOCATION SHOWN. MARKINGS SHALL BE PERMANENTLY IMPRESSED IN THE BARRIER USING A MINIMUM OF 2 IN HIGH LETTERING.
 - REFLECTORIZATION:
BARRIER REFLECTORS SHALL BE INSTALLED IN ACCORDANCE WITH TRAFFIC ENGINEERING'S STANDARD DRAWING MT-95.82, WHEN SPECIFIED IN THE PLANS.



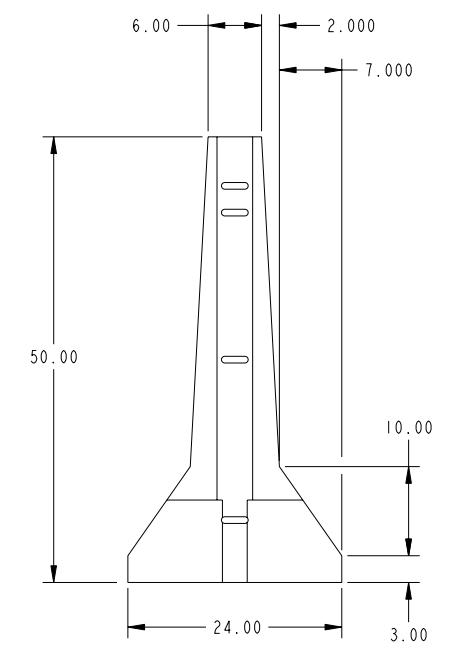
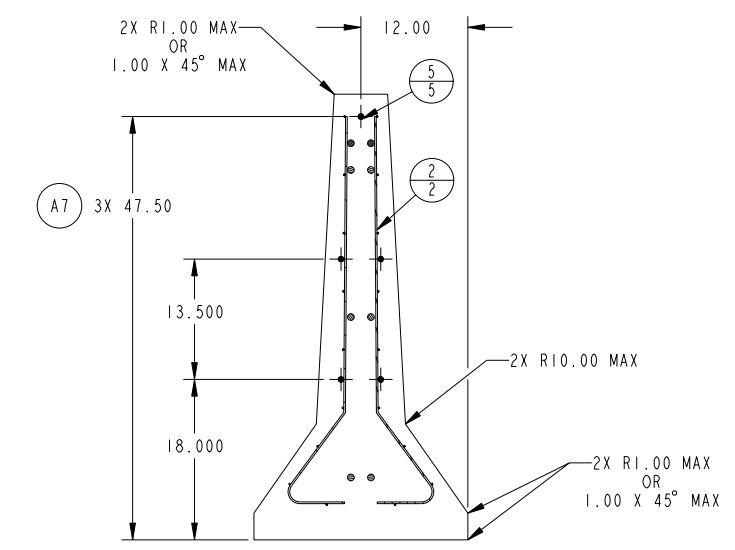
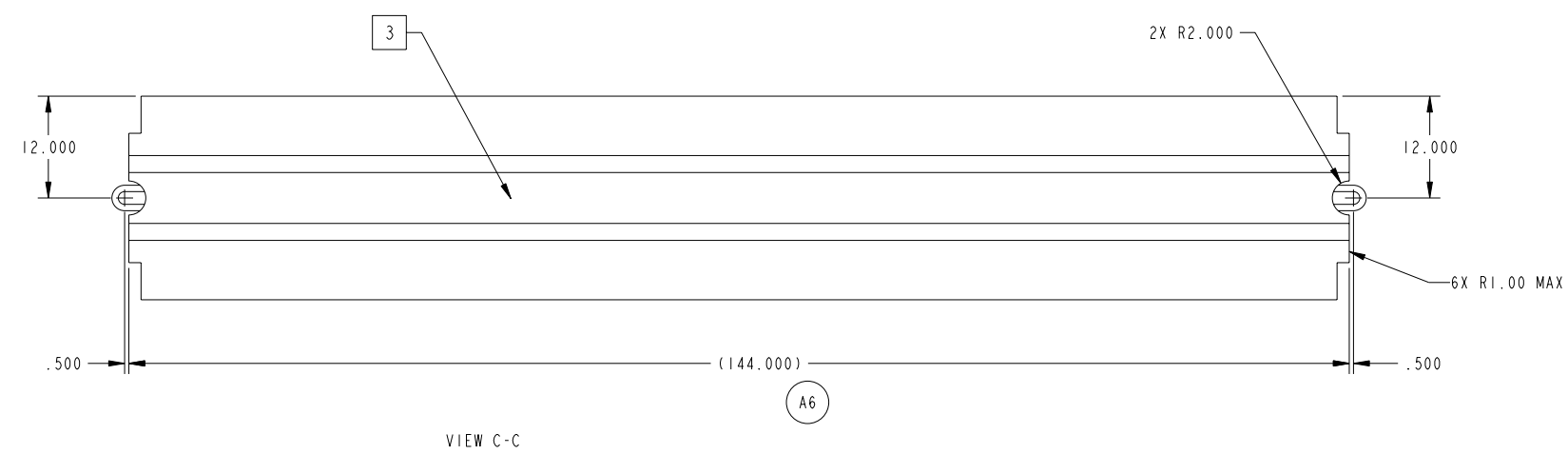
QTY	FIND REOD	PART OR IDENTIFYING NO	CAGE CODE	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
5	5	G005063-19-01		BAR, REINF, STR, #5 X 138.00	2
4	4	G005063-14-01		BAR, HINGE, .75 X 87.87	2
4	3	G005063-13-01		BAR, HINGE, .75 X 86.37	2
2	2	G005063-21-10		WWF, 6 X 6 X W2.9 X W2.9	2
1	1	G005063-11-01		BARRIER, CONCRETE	2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMAL: .XX ±0.25 .XXX ±0.125 FRACTIONAL: ±1/32 ANGULAR: ±0.5°		CONTRACT NO			
THIRD ANGLE PROJECTION		APPROVAL	DATE	TITLE	
		J. V.	2005-05-25	BARRIER, ASSEMBLY	
G005063-40		CHECKED		SIZE CAGE CODE DWG NO	
NEXT ASSY USED ON APPLICATION		ENGINEER		D 79986 G005063-30	
				SCALE 1/10 DO NOT SCALE DRAWING SHEET 1 OF 3	

COMPUTER FILE NAME
G005063-30
DRAWING
MODEL ASSEM G005063-30

NAME:HARRISS OBJECT:G005063-30_2 DATE:01-Sep-05 09:14:20

DWG NO	G005063-30	SH	2	REV	A
REVISION HISTORY					
ZONE	REV	DESCRIPTION	DATE	APPROVED	

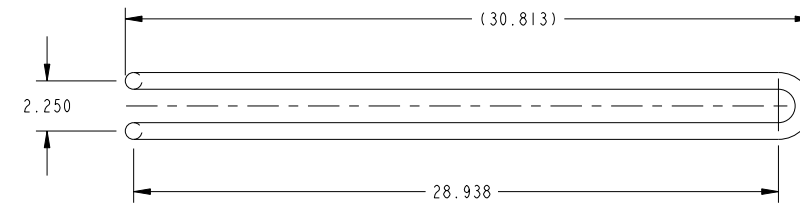
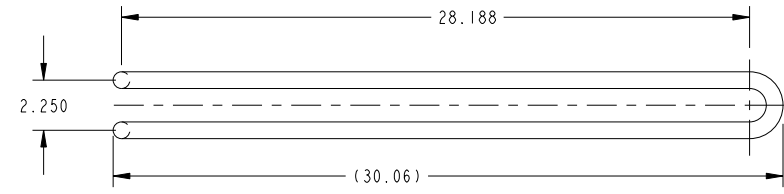


SIZE	CAGE CODE	DWG NO	REV
D	79986	G005063-30	A
SCALE	1/10 DO NOT SCALE DRAWING		SHEET 2 OF 3

NAME:HARRISS OBJECT:G005063-30_3 DATE:01-Sep-05 09:14:21

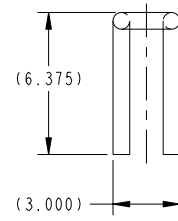
DWG NO	G005063-30	SH	3	REV	A
REVISION HISTORY					
ZONE	REV	DESCRIPTION	DATE	APPROVED	

D

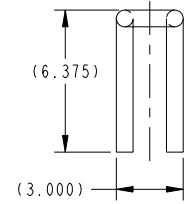


D

C



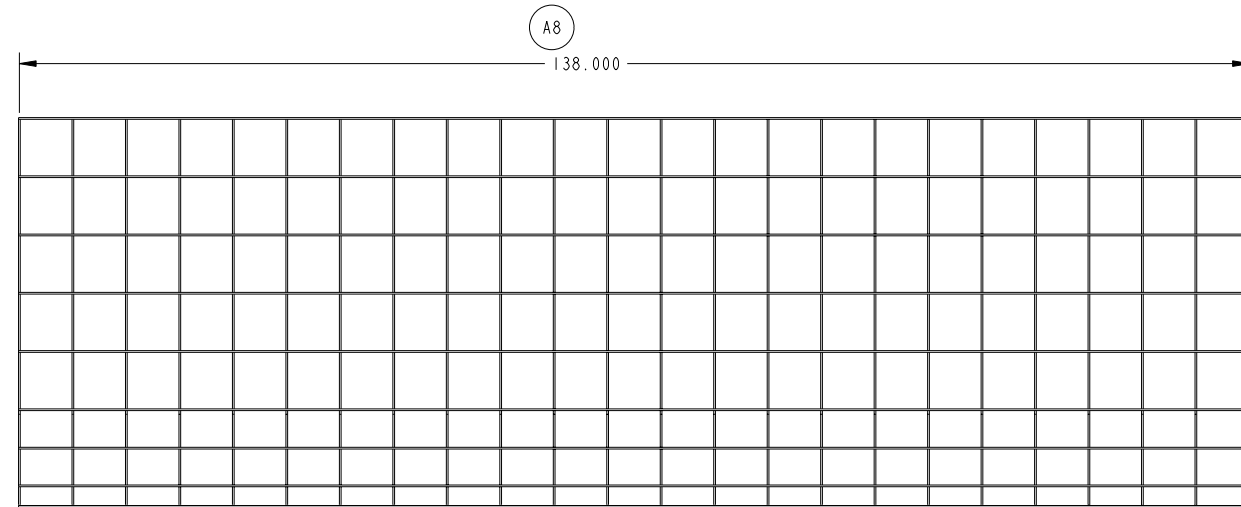
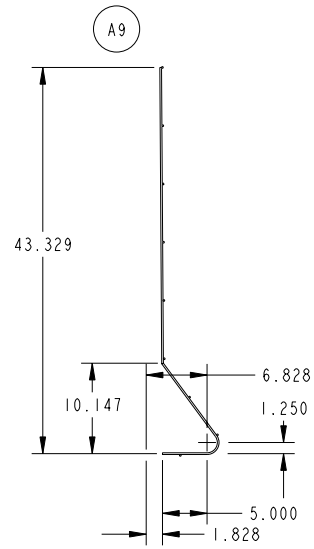
P/N: G005063-13
SCALE: 1/4



P/N: G005063-14
SCALE: 1/4

C

B



B

A

SIZE	CAGE CODE	DWG NO	REV
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SCALE		DO NOT SCALE DRAWING	SHEET 3 OF 3

8

7

6

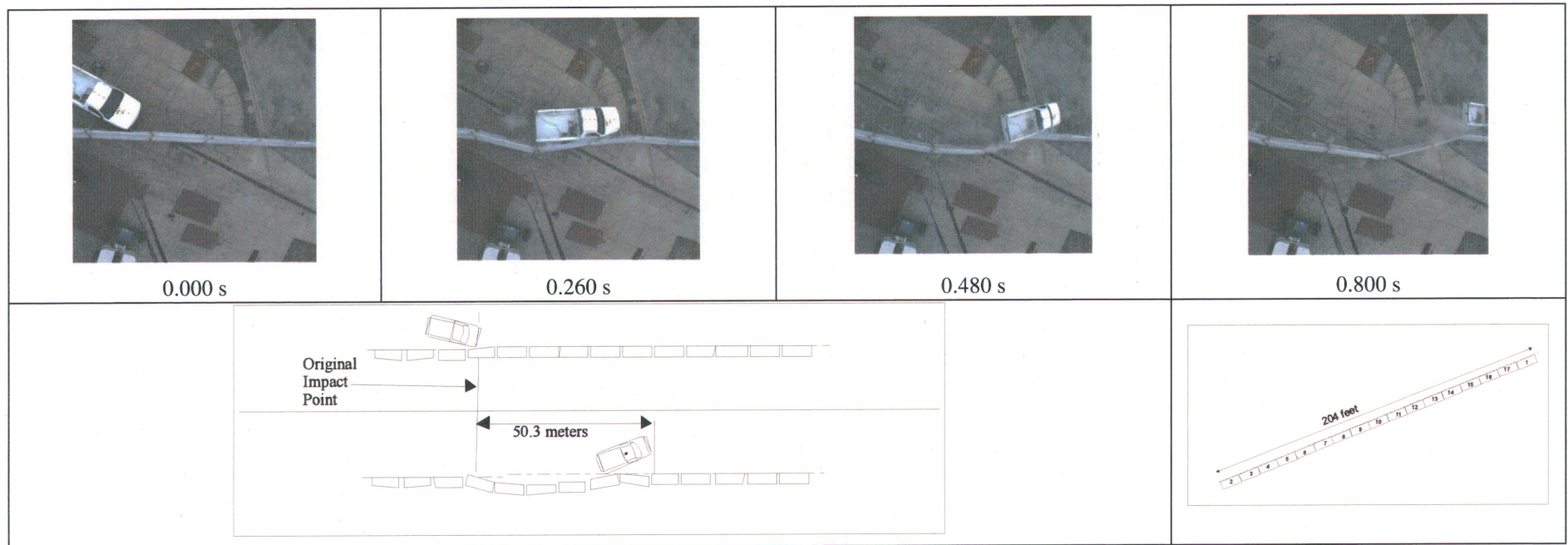
5

4

3

2

1



General Information		Impact Conditions		Test Article Deflections (m)		Vehicle Trajectory Post Test	The impacting vehicle was redirected by the test article 50.3 meters downstream and 2.1 meters left of the barrier.
Test Agency	Transportation Research Center Inc. (TRC Inc.)	Speed (km/h)	100.5	Dynamic	~1.6		
Test No.	060412	Angle (deg)	25.0	Permanent	~1.6		
Date	April 12, 2006	Exit Conditions		Vehicle Damage			
Test Article	Longitudinal median barrier system	Speed (km/h)	N/A	Exterior	N/A		
Type	Battelle Memorial Institute	Angle (deg)	N/A	VDS	N/A		
Name or Manufacturer	17-50" x 12' steel reinforced portable concrete barriers	Occupant Risk Values		CDC	02FZEW3		
Size and/or dimension and material of key elements		Impact Velocity (m/s)		Interior	FS0000000		
		x-direction	4.5	OCDI			
		y-direction	6.1	Maximum Exterior			
		THIV (optional)	N/A	Vehicle Crush (mm)	N/A		
		Ridedown Acceleration (g's)		Max. Occ. Compart.			
Soil Type and Condition	N/A	x-direction	5.4	Deformation (mm)	25		
Test Vehicle		y-direction	8.6				
Type	Production Model	PHD (optional)	N/A	Post-Impact Vehicular Behavior			
Designation	2000P	ASI (optional)	N/A	Maximum Roll Angle (deg)	16.2		
Model	2003 Chevrolet 2500 Pickup truck	Max. 0.050 -s Average (g's)		Maximum Pitch Angle (deg)	-10.2		
Mass (kg)		x-direction	N/A	Maximum Yaw Angle (deg)	-45.1		
Curb	2254.3	y-direction	N/A				
Test Inertial Dummy(s)	2040.6	z-direction	N/A				
Gross Static	2040.6						

Figure 9. Summary of results for test 060412