

NCHRP Report 350 Test 3-71
Of the Multi-Barrier Model MB-42x72 JSS LCB
Longitudinal Channelizing Barricade System
TRC Inc. Test Number: 061221

Prepared by:
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Final Report
December 2006 - January 2007

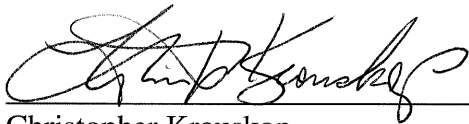
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Notice

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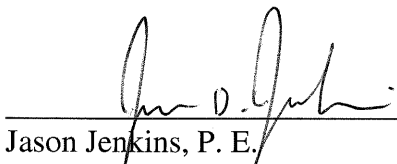


Date

1-10-07

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Date

1/13/07

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Technical Report Documentation Page

1. Report No. 061221	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle NCHRP Report 350 Test 3-71		5. Report Date January 11, 2007	
		6. Performing Organization Code TRC	
7. Author(s) Christopher Krouskop, Project Manager Transportation Research Center Inc.		8. Performing Organization Report No. Test Report 061221	
9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Off the Wall Products, LLC 180 South 300 West, Suite 314 Salt Lake City, UT 48101		13. Type of Report and Period Covered Final Report January 2007	
		14. Sponsoring Agency Code	
15. Supplemental Notes			
16. Abstract Reported herein are the details and results of a full-scale crash test performed on the Multi-Barrier Safety Barricade Model MB-42x72 JSS LCB longitudinal channelizing barricade system. The crash test performed was NCHRP Report 350 test designation 3-71 involving a 2001 Suzuki Swift at a nominal speed of 100 km/h.			
17. Key Words Longitudinal barricade, work zones, traffic control devices, roadside safety		18. Distribution Statement No restrictions, This document, if published, is available to the public through National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. Number of Pages 117	22. Price

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yards	0.836	square meters	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.765	cubic meters	m ³
NOTE: Volumes greater than 1000l shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000lb)	0.907	Megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact)				
°F	Fahrenheit	5(F-32)/9	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm ²	square millimeters	0.0016	square inches	in ²
m ²	square meters	10.764	square feet	ft ²
m ²	square meters	1.195	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	square kilometers	0.386	square miles	mi ²
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	cubic meters	35.71	cubic feet	ft ³
m ³	cubic meters	1.307	cubic yards	yd ³
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000lb)	T
TEMPERATURE (exact)				
°C	Celsius	1.8C + 32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised September 1995)

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Section 1.0

INTRODUCTION

PURPOSE

This test was conducted to obtain vehicle crashworthiness data to evaluate the performance of the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system relative to the work zone traffic control device requirements of the Federal Highway Administration's National Cooperative Highway Research Program Report 350 (NCHRP 350) "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Section 2.0

STUDY APPROACH

TEST ARTICLE

The Multi-Barrier Model MB-42x72 JSS LCB longitudinal channelizing barricade system consisted of ten (10) water-filled UV-resistant polyethylene barricades is to be tested to the NCHRP 350 test level 3-71 guidelines.

Each polyethylene barricade consists of two equal chambers that are manufactured from High Density Polyethylene (HDPE) plastic. Each barricade weighs approximately 19.3 kg (42.5 lbs) empty and can be filled with up to 90 gallons (701.0 kg) of water in each of the two chambers.

Customer Test Set-up Requirements

The Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system consisting of 10 interlocking barricades, is to be positioned in a longitudinal line such that the right front corner of the impacting 820C vehicle will strike the center of the fifth barricade of the system at a 20° angle. Each chamber of each individual barricade is to be filled with approximately 5.38 gallons (20.4 kg) of water.

The overall length of the ten (10) interlocking barricade system is to be approximately 18.3 meters (see Figure 1).

Actual Test Set-up

The Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system, that was tested to the NCHRP Report 350 test level 3-71 guidelines, was positioned in a longitudinal line such that the right front corner of the impacting 820C vehicle struck the center of the fifth barricade of the system.

Each chamber of each individual barricade was filled with approximately 5.38 gallons (20.4 kg) of water. The overall length of the ten (10) interlocking barricade system was approximately 18.3 meters (see Figure 1).

Details of the Multi-Barrier Model MB-42x72 JSS channelizing barricade system are shown in Figure 1, Figure 2, and Appendix D.



Type: Multi-Barrier Channelizing Barricade Model MB-42x72 JSS LCB

Colors: Orange or White

Composition: High Impact UV Resistant High Density Polyethylene

Size:

Height:	42" / 107 cm
Length:	72" / 183 cm
Width:	24" / 61 cm
Wall:	0.22" / 5.6 mm
Mass:	42.5 lb. / 19.3 kg (empty)
Mass:	1545.5 lb. / 701.0 kg (full)

Scope of service: Rapidly deployable traffic / security barricade. Enhances security and safety in less time than constructing sandbag structures or moving concrete road barriers. Weighing only 42.5 pounds, the barricade can be installed manually and once positioned each of the two compartments can be filled with up to 90 gallons of water. Compatible with lights, signage, and stanchions and fencing. Stackable and easy to ship and store. Made from High Density Polyethylene Plastic. Can form a tamper proof inseparable wall in any configuration.

Figure 1. Details of the Multi-Barrier Model MB-42x72 JSS LCB

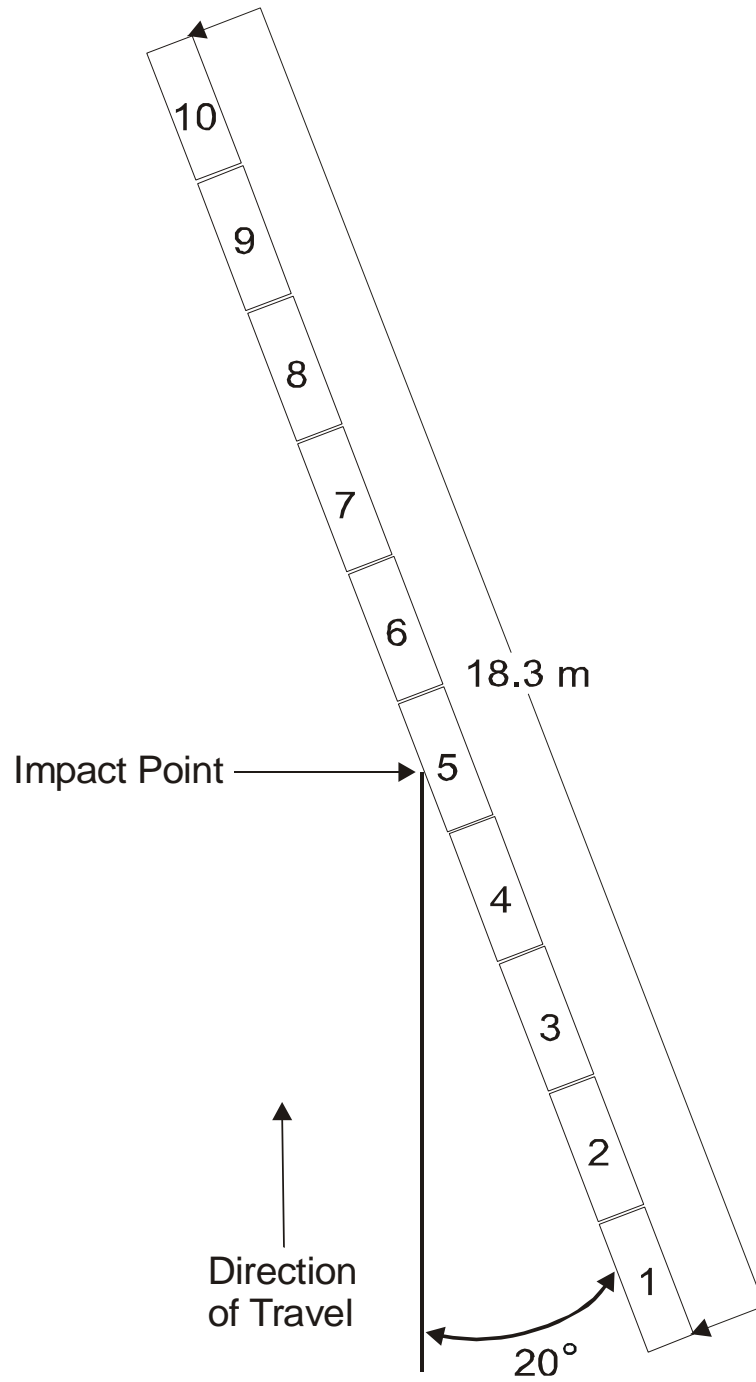


Figure 1. Details of the Multi-Barrier Model MB-42x72 JSS LCB (continued)

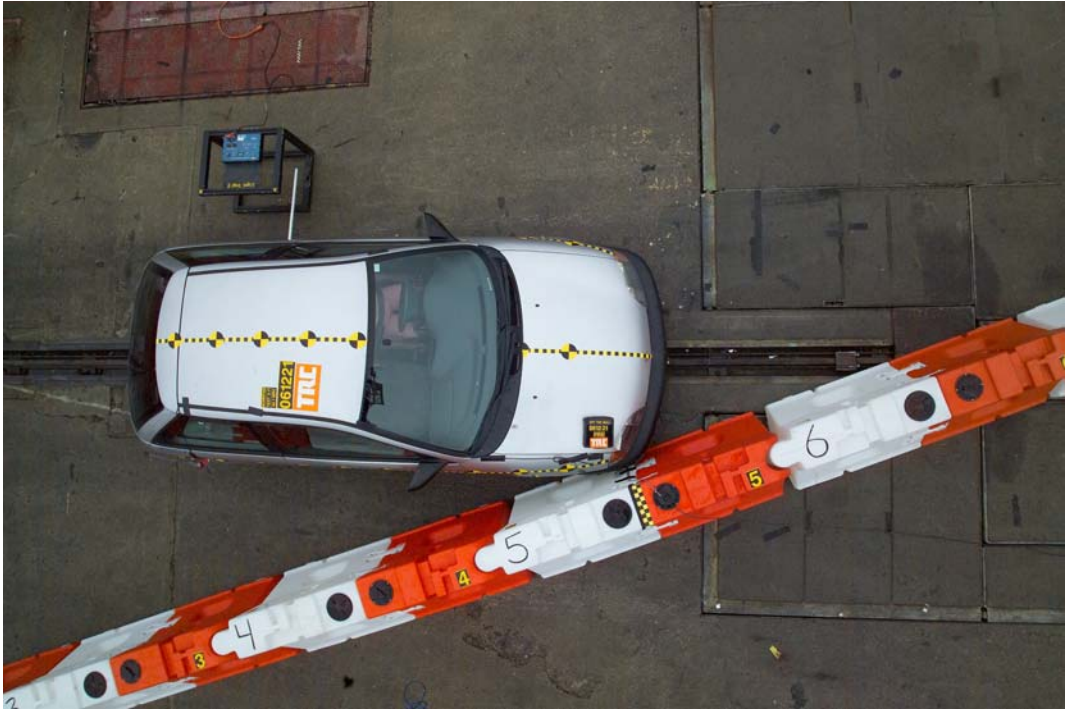


Figure 2. Multi-Barrier Model MB-42x72 JSS LCB Barricade System before test 061221.

CRASH TEST CONDITIONS

NCHRP Report 350 Test Designation

According to NCHRP Report 350, there are two tests that are required to evaluate longitudinal barriers, such as the Multi-Barrier Model MB-42x72 JSS LCB portable water-filled barricade, to test level two (TL-3) as described below.

NCHRP Report 350 test designation 3-70¹: This test involves a 700-kg passenger car impacting the critical impact point (CIP) of the length of need (LON) of the work-zone traffic control device at a nominal speed of 35 km/h and angle and 20 degrees. The critical impact point (CIP) and length of need (LON) of the test article are determined through discussion between the manufacturer and FHWA. The purpose of this test is to evaluate the performance of the test article, at the pre-approved LON, based upon the breakaway, fracture or yielding mechanism of the device through the evaluation criteria (including occupant risk) for test level 3-70.

NCHRP Report 350 test designation 3-71: This test involves an 820-kg passenger car impacting the critical impact point (CIP) of the length of need (LON) of the work-zone traffic control device, such as plastic drums used as channelizing devices, at a nominal speed of 100 km/h and angle and 20 degrees. The critical impact point (CIP) and length of need (LON) of the test article are determined through discussion between the manufacturer and FHWA. The purpose of this test is to evaluate the performance of the test article, at the pre-approved LON, based upon the evaluation criteria (including occupant risk) for test level 3-71; with the exception of occupant impact velocities, which will be based upon the evaluation criteria for test level 3-10 (longitudinal barriers).

FHWA Safety Questions and Answers about Crash Testing of Work Zone Safety Appurtenances: Work zone traffic control devices individually weighing 45 kg (empty) have no pretext of being a barrier that can redirect an errant vehicle; therefore, the evaluation criteria sub-part H and I, found in Table 5.1 of the NCHRP Report 350 is optional.

¹ NCHRP Report 350 TL 3-70 can be omitted when it is clearly determined that test level 3-71 is more critical.

NCHRP Report 350 test designation 3-71 was performed on the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system and the details and results are reported herein. Off the Wall Products, LLC specified the Critical Impact Point (CIP) chosen for this test. The CIP was requested to be the center of barricade 5.

The crash test and data analysis procedures were in accordance with the guidelines presented in NCHRP Report 350. Brief descriptions of these procedures are presented below:

Evaluation Criteria

The crash test performed was evaluated in accordance with the criteria presented in NCHRP Report 350, with special emphasis on longitudinal channelizing devices. As stated in NCHRP Report 350, “Safety performance of a highway appurtenance cannot be measured directly but can be judged on the basis of three factors: structural adequacy, occupant risk, and vehicle trajectory after collision.” Accordingly, the following safety evaluation criteria from table 5.1 of NCHRP Report 350 were used to evaluate the crash test reported herein.

- **Structural Adequacy**

- B. The test article should readily activate in a predictable manner by breaking away, fracturing, or yielding.

- **Occupant Risk**

- D. Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetration of the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformation of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.

- E. Detached elements, fragments or other debris from the test article, or vehicular damage should not block the driver's vision or otherwise cause the driver to lose control of the vehicle.
- F. The vehicle should remain upright during and after collision although moderate roll, pitching and yawing are acceptable.
- H. Occupant impact velocities should satisfy the following¹:

Occupant Impact Velocity Limits (m/s)		
Component	Preferred	Maximum
Longitudinal and Lateral	9	12

- I. Occupant ride down accelerations should satisfy the following:

Occupant Ridedown Acceleration Limits (G's)		
Component	Preferred	Maximum
Longitudinal and Lateral	15	20

- J. (Optional) Hybrid III dummy. Response should conform to evaluation criteria of Part 571.208, Title 49 of Code of Federal Regulation, Chapter V (10-1-88 Edition).

- **Vehicle Trajectory**

- K. After collision it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.
- N. Vehicle trajectory behind the test article is acceptable.

¹ FHWA requested the testing facility (TRC Inc.) to use the longitudinal barrier criteria for this portion of the evaluation criteria for longitudinal channelizing barricades.

CRASH TEST AND DATA ANALYSIS PROCEDURES

The crash test and data analysis procedures were in accordance with guidelines presented in NCHRP Report 350. Brief descriptions of these procedures are presented as follows.

Electronic Instrumentation and Data Processing

The impacting vehicle was instrumented with three angular rate transducers to measure roll, pitch and yaw; a primary and redundant set of triaxial accelerometers near the vehicle center-of-gravity to measure longitudinal, lateral, and vertical acceleration levels.

The electronic signals from the accelerometers and transducers were collected by means of a self-contained onboard digital data acquisition system at a rate of 10,000 samples per second. The onboard digital data acquisition system was connected by an umbilical cable to the data acquisition room only for pre-test setup and checkout and post-test data downloading.

Each data channel was filtered to SAE J211 OCT88 Channel Class 1000. Immediately preceding each test, all data channels were checked and balanced by the data acquisition system software. The data was downloaded from the onboard digital storage to the data acquisition room by an umbilical cable, which is connected from the test vehicle to the personal computer in the data acquisition room. Following initial verification of the data signals, fiber optic cable transferred the data to the digital computer for all subsequent digital data processing.

Subsequent digital filtering of the data was performed. As specified in NCHRP 350, the filters conform to the Society of Automotive Engineers Recommended Practice SAE J211 OCT88.

Anthropomorphic Dummy Instrumentation

An uninstrumented anthropomorphic dummy was used for test 3-71, performed on December 21, 2006.

Photographic Instrumentation and Data Processing

Photographic coverage of the test included eight (8) high-speed digital cameras: two (2) overhead with a field of view perpendicular to the ground and directly over the impact point; a third placed to have a field of view perpendicular to the impact point; a fourth placed to have a field of view perpendicular to and upstream of the impact point; a fifth placed to have a narrow field of view perpendicular to the impact point; a sixth placed to have a field of view upstream to the impact point on the non-impact side; and a seventh placed to have a field of view upstream to the impact point on the impact side. A pressure sensitive tape switch was positioned on the impacting vehicle to indicate the instant of contact with the MB-42x72 JSS LCB channelizing barricade system. The views from these high-speed cameras were analyzed on a digital motion picture image analyzer to observe phenomena occurring during the collision and to obtain time-event, displacement and angular data. One (1) Canon real-time motion picture camera was used to record and document the conditions of the test vehicle and installation before and after the test and to record and document the impact event. A still camera was used to record and document conditions of the test vehicle and installation before and after the test.

Description of Timing Marks on TRC Inc. Digital High-Speed Cameras

All TRC Inc. high-speed cameras are equipped with timing displays. When converted to AVI files, this information is displayed in the upper left corner of the picture.

Test Vehicle Propulsion and Guidance

The test vehicle was towed into the test article by towing cables attached to each side of the vehicle's front suspension and connected to the drive cable by a frangible skate assembly. The frangible skate assembly was attached to a monorail providing lateral guidance while towing the

vehicle. The test vehicle's steering wheel was unlocked to allow proper tracking of vehicle while attached to the monorail. At a predetermined point prior to impact, the frangible skate assembly struck a block of steel driving the wedge portion of the assembly through the assembly's channels. This action simultaneously released the tension to the drive cable, the vehicle towing cables, and the attachment to the monorail. This method allowed the vehicle to free-roll to the impact point without influence from the propulsion system.

Section 3.0

Crash Test Results

NCHRP Report 350 Test Designation 3-71

Test Vehicle

A 2001 Suzuki Swift passenger car was used for this crash test. The test inertial weight was 844.8 kg and the gross static weight of the vehicle was 919.6 kg. The height to the lower edge of the vehicle bumper was 393 mm and it was 508 mm to the upper edge of the bumper. Additional dimensions and information on the vehicle are given on page 3-8. The vehicle was directed into the installation using the tow system, and was released to be freewheeling and unrestrained just prior to impact.

Weather Conditions

The crash test was performed the morning of December 21, 2006. The pavement was wet and the weather conditions at the time of testing were as follows:

Wind speed:	3.2 km/h
Wind direction:	76° NE
Temperature:	5.6° C
Relative humidity:	89 percent
Barometric pressure:	200.1 kPa

Test Description

The vehicle, traveling at 100.5 km/h, impacted the center of barricade 5 of the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system at 20° with the vehicle's right front fender (see Figure 3). The vehicle continued in a forward direction and remained in momentary contact with barricade 5. At approximately 40 milliseconds after time zero barricade 6 was pushed to the right and backwards slightly, as the vehicle, remaining in contact with barricade 5, continued in a forward direction. At approximately 54 milliseconds after time zero, barricade 5 started to become disconnected from barricades 4 and 6. At approximately 68 milliseconds after time zero the vehicle's right front fender impacted the center of barricade 6, while barricade 5 was pushed slightly to the right and parallel to the vehicle's forward direction. At approximately 90 milliseconds after time zero the vehicle

continued in a forward direction pushing barricade 6 such that barricade 6 was bent into an approximate 30 degree shape while being disengaged from barricade 5. At approximately 100 milliseconds the vehicle's left front bumper area impacted the end of barricade 7; while the vehicle's right front bumper remained in contact with barricade 6, pushing it forward and slightly to the right. At approximately 110 milliseconds after time zero the vehicle's right front wheel started to ride up barricade 6 as the vehicle moved forward. The vehicle's right side wheels remained airborne from approximately 110 to 860 milliseconds. At approximately 140 milliseconds after time zero, barricade 6 became disengaged from barricade 7 as the vehicle continued forward. From approximately 144 to 230 milliseconds, the vehicle continued forward, pushing barricade 7 into barricade 8 thus causing barricade 8 to move sideways and into barricade 9 in a jagged saw-tooth fashion. At approximately 260 milliseconds after time zero, barricades 8 and 9 separated from each other as the vehicle continued to move forward. At approximately 320 milliseconds after time zero, barricade 9 separated from barricade 10, as the vehicle continued forward. At approximately 400 milliseconds after time zero, barricade 8 was pushed into barricade 10 by the momentum of the vehicle's forward motion. As the vehicle continued in a forward direction, barricade 7 remained in contact with the vehicle's front bumper area. From approximately 450 to 900 milliseconds after time zero, the vehicle continued to displace barricades 6 and 7 to the right and barricades 8, 9 and 10 to the left as the vehicle continued forward. At approximately 1100 milliseconds after time zero all of the vehicle's wheels came back to the ground, while barricade 7 was propelled away from and to the right of the vehicle. From approximately 1160 to 4800 milliseconds after time zero, the vehicle continued forward, prior to being stopped by TRC Inc.'s secondary back-up breaking system. The vehicle came to rest at approximately 4800 milliseconds in a straight line from the initial impact direction. The vehicle remained upright throughout the test event. Maximum displacement of the vehicle into the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system was approximately 88.4 meters longitudinally and 1.2 meters laterally to the right from the original impact point. Maximum roll was -23.2 degrees. Maximum pitch was 6.2 degrees. Maximum yaw was -22.1 degrees.

Damage to Test Installation

One of the ten individual barricade sections that made up the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system, barricade 5, was displaced in the immediate impact zone as shown in Appendix A, Figures A-37, A-39, A-41, A-43, A-45, A-47 and A-50.

Five of the ten individual barricade sections that made up the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system, barricades 6, 7, 8, 9 and 10, were displaced outside of the immediate impact zone as shown in Appendix A, A-37, A-39, A-41, A-43, A-45, A-47, A-50, A-56, A-57, A-58, A-59, A-60, A-67, A-68, A-69, A-70 and A-71.

Individual barricade sections 5, 6, 7, and 8 incurred damage to their overall outer shell sidewalls, being scored or ruptured, as shown in Appendix A, Figures A-57, A-58, A-61, A-62, A-63, A-64, and A-65.

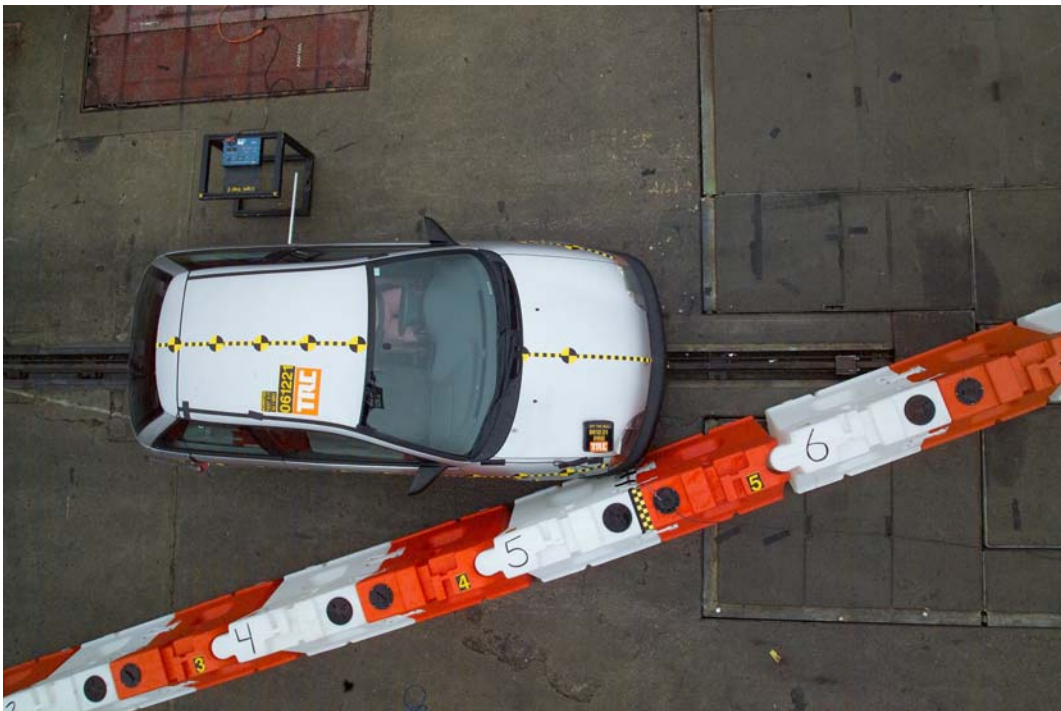


Figure 3. Impacting vehicle/ MB-42x72 JSS LCB channelizing barricade system geometrics for test 061221.



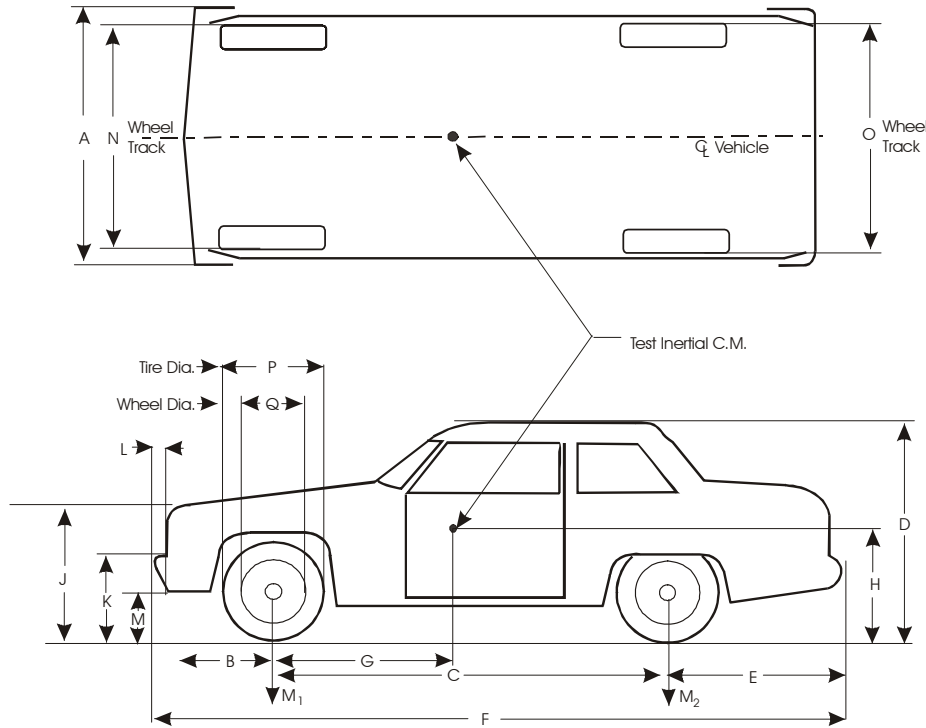
Figure 4. Impacting vehicle before test 061221.



Figure 4. Impacting vehicle before test 061221. (continued)

Date: 12/21/06 Test No: 061221 Vin No: 2S2AB21H016602815 Make: Suzuki
 Model: Swift Year: 2001 Odometer: 103,220 miles GVW: 1190 kg
 Tire Size: P155/80R13 Tire Inflation Pressure: Front 32 psi / Rear 32 psi Tread Type: N/A
 Mass Distribution (kg) LF 301.2 RF 265.6 LR 181.4 RR 171.4

Describe any damage to vehicle prior to test:



Engine Type:
Transverse
 Engine Size: 1.3 L
 Transmission Type:
 Auto
 Manual
 Optional Equipment:
N/A
 Dummy Data:
 Type: Hybrid II 50th
 Mass: 74.8 kg
 Seat Position: Left front

Geometry - (mm)

A	<u>1585</u>	D	<u>1405</u>	G	<u>905</u>	K	<u>508</u>	N	<u>1400</u>	Q	<u>370</u>
B	<u>820</u>	E	<u>605</u>	H	<u>N/A</u>	L	<u>98</u>	O	<u>1360</u>		
C	<u>2360</u>	F	<u>3785</u>	J	<u>550</u>	M	<u>393</u>	P	<u>555</u>		

<u>Mass - (kg)</u>	<u>Curb</u>	<u>Test Inertial¹</u>	<u>Gross Static</u>
M ₁	<u>554.4</u>	<u>528.2</u>	<u>566.8</u>
M ₂	<u>306.2</u>	<u>316.6</u>	<u>352.8</u>
M _T	<u>860.6</u>	<u>844.8</u>	<u>919.6</u>

Figure 5. Vehicle properties for test 061221

¹ The following components were removed to achieve test inertial weight: tail lights, hubcaps, hatch seal, rear seat belt assemblies, and rear fascia.



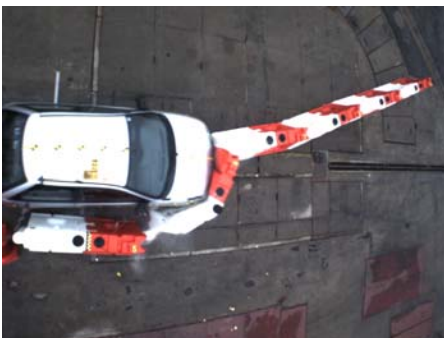
0.000 s



0.030 s



0.060 s



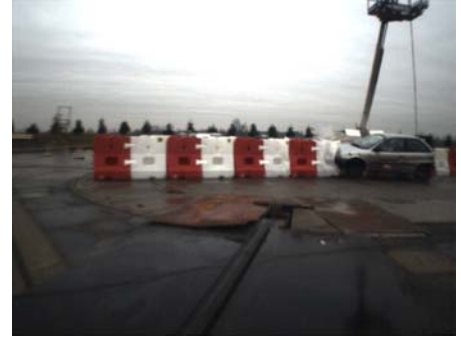
0.090 s



Figure 6. Sequential photographs for test 061221 (overhead and perpendicular views).



0.120 s



0.180 s



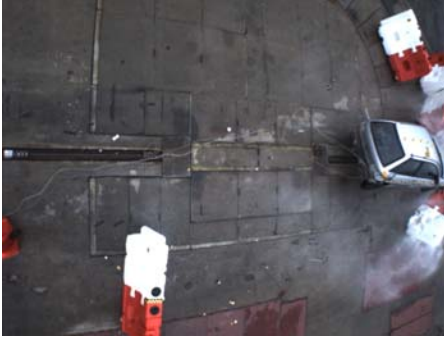
0.240 s



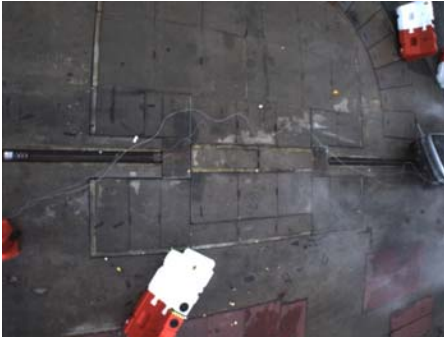
0.300 s



Figure 6. Sequential photographs for test 061221 (overhead and perpendicular views) (continued).



0.450 s



0.600 s



0.800 s



3Figure 6. Sequential photographs for test 061221 (overhead and perpendicular views) (continued).



Figure 7. MB-42x72 JSS LCB channelizing barricade system after test 061221

Damage to Test Vehicle

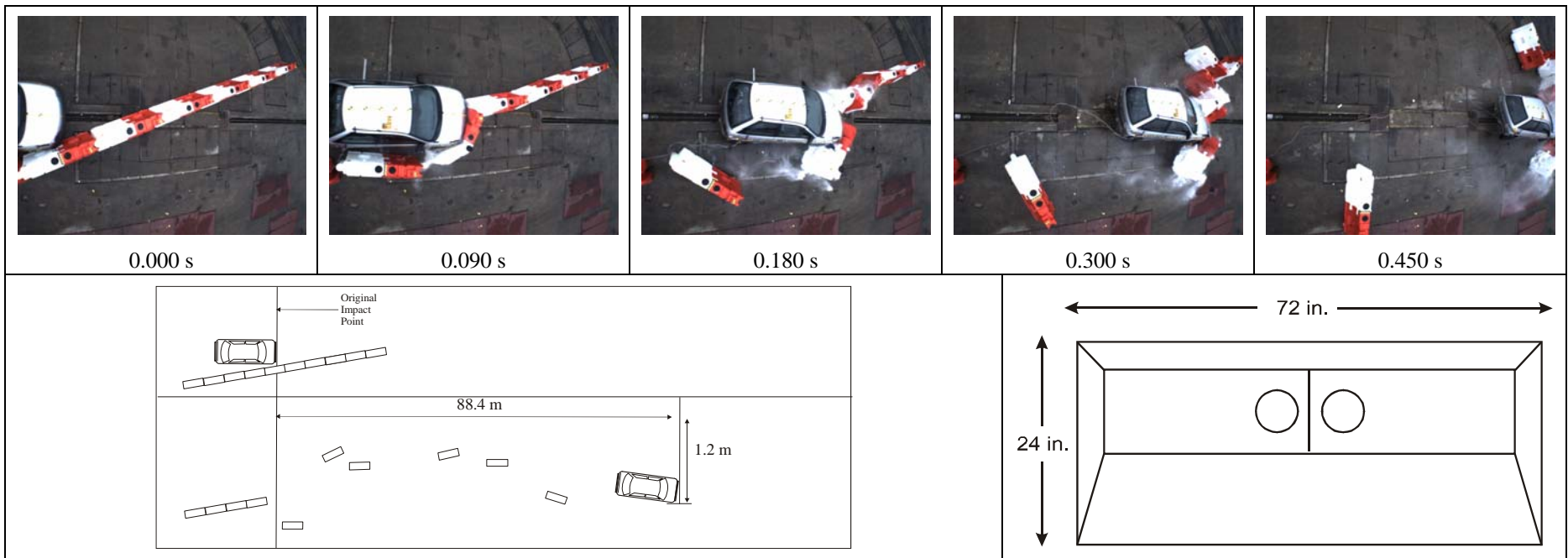
Most of the damage to the vehicle was to the front and right front sides as shown in Appendix A, Figures A-2, A-14, A-16, A-17 and A-18. The bumper, hood and right fender were moderately damaged. Maximum crush to the exterior of the vehicle was 280 mm. No measurable crush was evident to the occupant compartment of the vehicle.

Occupant Risk Values

Data from the accelerometers located at the vehicle center-of-gravity was integrated for evaluation of occupant risk and were computed as follows. The occupant impact velocity at 0.194 s was 6.7 m/s in the longitudinal direction, and 0.4 m/s in the lateral direction. The highest occupant ridedown acceleration was 5.6 g in the longitudinal direction and 3.0 g in the lateral direction. The data plots are in Appendix B.



Figure 8. Impacting vehicle after test 061221.



General Information

Test Agency	Transportation Research Center Inc. (TRC Inc.)
Test No.	061221
Date	December 21, 2006
Test Article	Longitudinal Channelizing Barricade
Type	MB-42x72 JSS LCB
Name or Manufacturer	by Off the Wall Products, LLC
Size and/or dimension and material of key elements	10 individual portable polyethylene water filled barricades, each being 107 cm (H) 182.9 cm (L) x 61 cm (W)
Soil Type and Condition	N/A
Test Vehicle	
Type	Production Model
Designation	820C
Model	2001 Suzuki Swift
Mass (kg)	
Curb	860.6
Test Inertial	844.8
Dummy(s)	74.8
Gross Static	919.6

Impact Conditions

Speed (km/h)	100.5
Angle (deg)	20
Exit Conditions	
Speed (km/h)	N/A
Angle (deg)	N/A
Occupant Risk Values	
Impact Velocity (m/s)	
x-direction	6.7
y-direction	0.4
THIV (optional)	24.38
Ridedown Acceleration (g's)	
x-direction	5.6
y-direction	3.0
PHD (optional)	5.59 g
ASI (optional)	0.48
Max. 0.050 -s Average (g's)	
x-direction	-5.7 g
y-direction	1.4 g
z-direction	-2.4 g

Test Article Deflections (m)

Dynamic	13.3
Permanent	13.3
Vehicle Damage	
Exterior	
VDS	N/A
CDC	01FZEW1
Interior	
OCDI	FS0000000
Maximum Exterior	
Vehicle Crush (mm)	280
Max. Occ. Compart.	
Deformation (mm)	0
Post-Impact Vehicular Behavior	
Maximum Roll Angle (deg)	-23.2
Maximum Pitch Angle (deg)	6.2
Maximum Yaw Angle (deg)	-22.1

Vehicle Trajectory Post Test

The impacting vehicle's final most outer left trajectory stayed within twelve feet of the barrier. Assuming that the barrier was at the edge of the lane, the vehicle would have stayed within a 12-foot lane width.

Figure 9. Summary of results for test 061221



NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

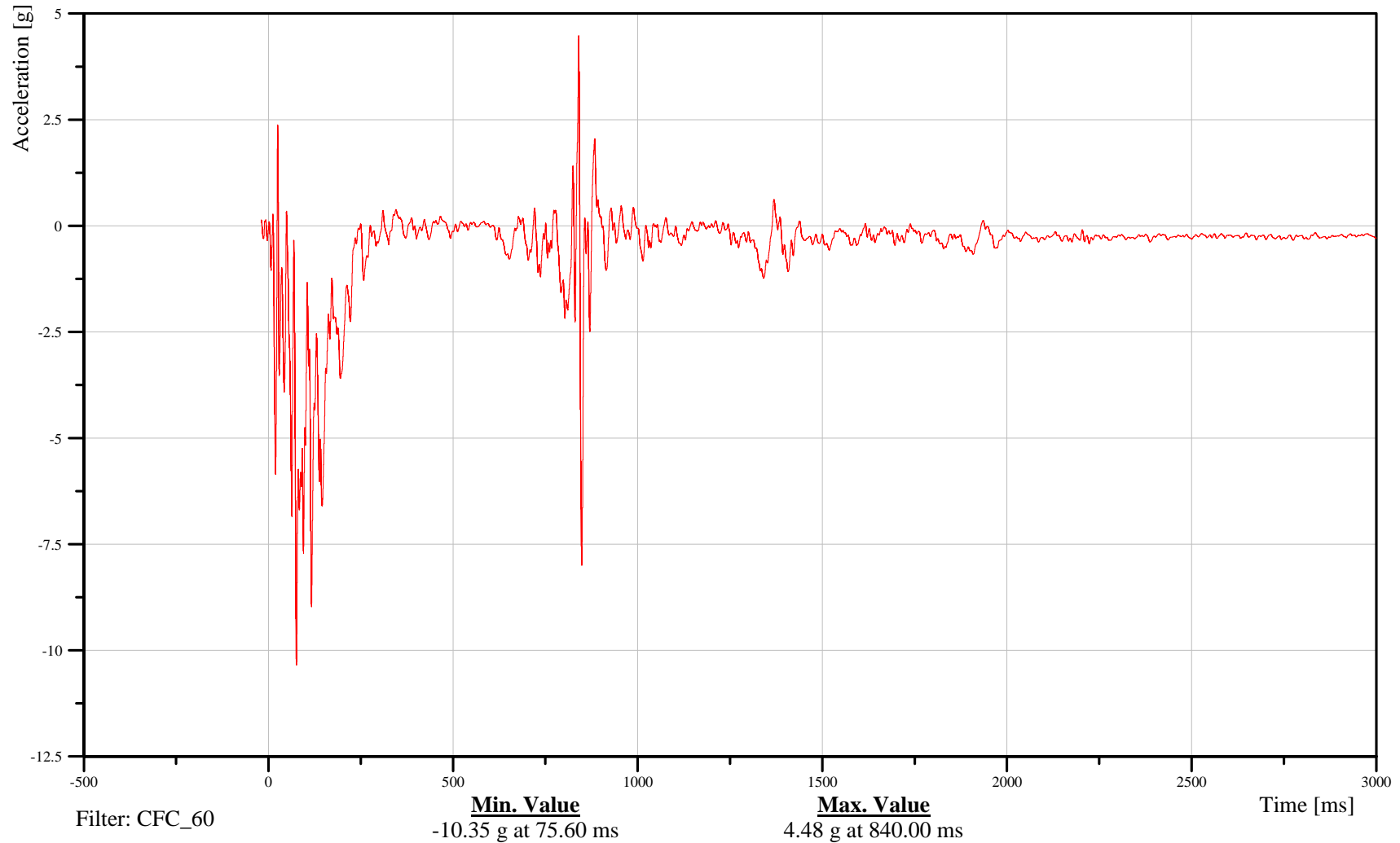
Vehicle CG X-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACXD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

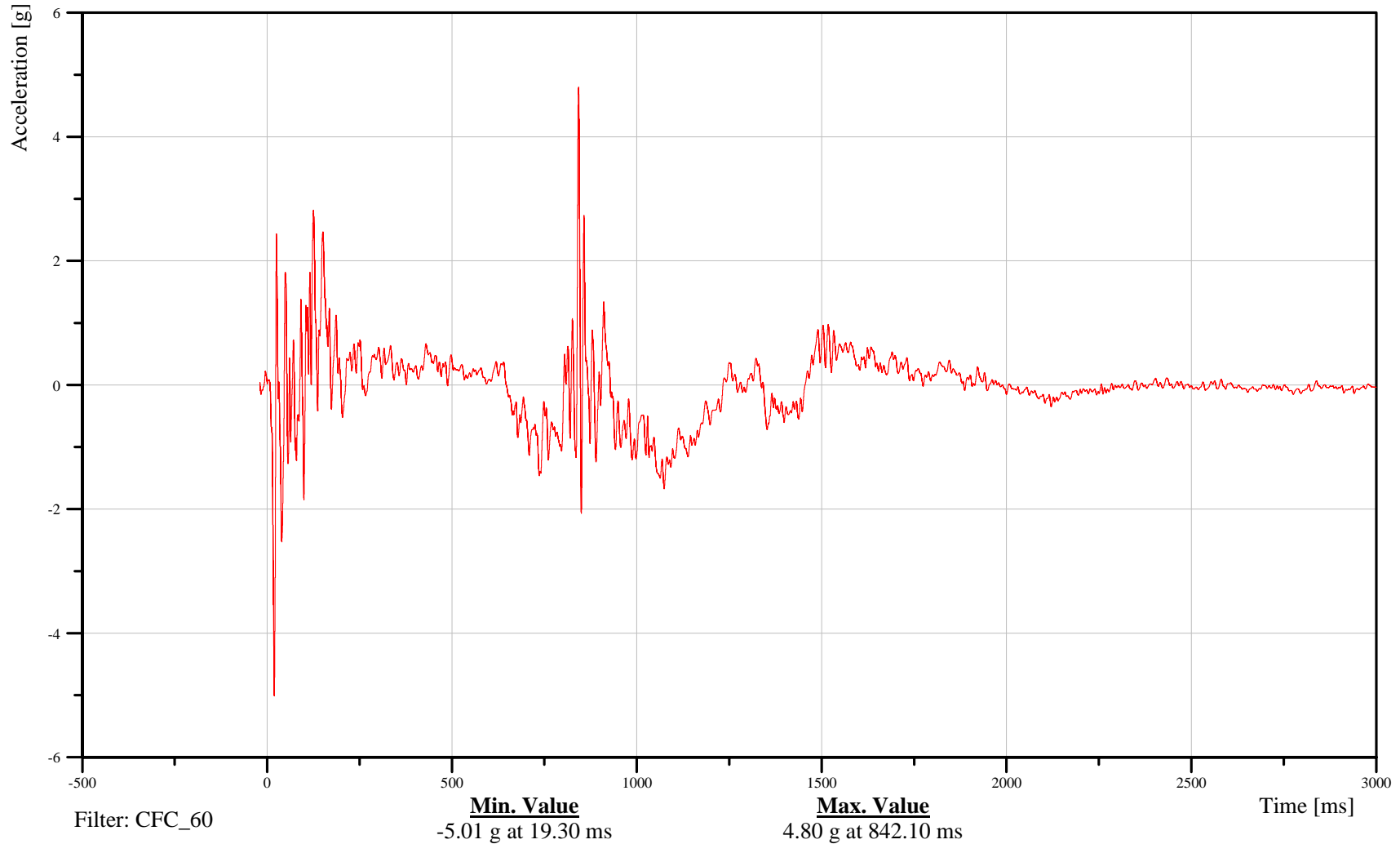
Vehicle CG Y-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACYD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
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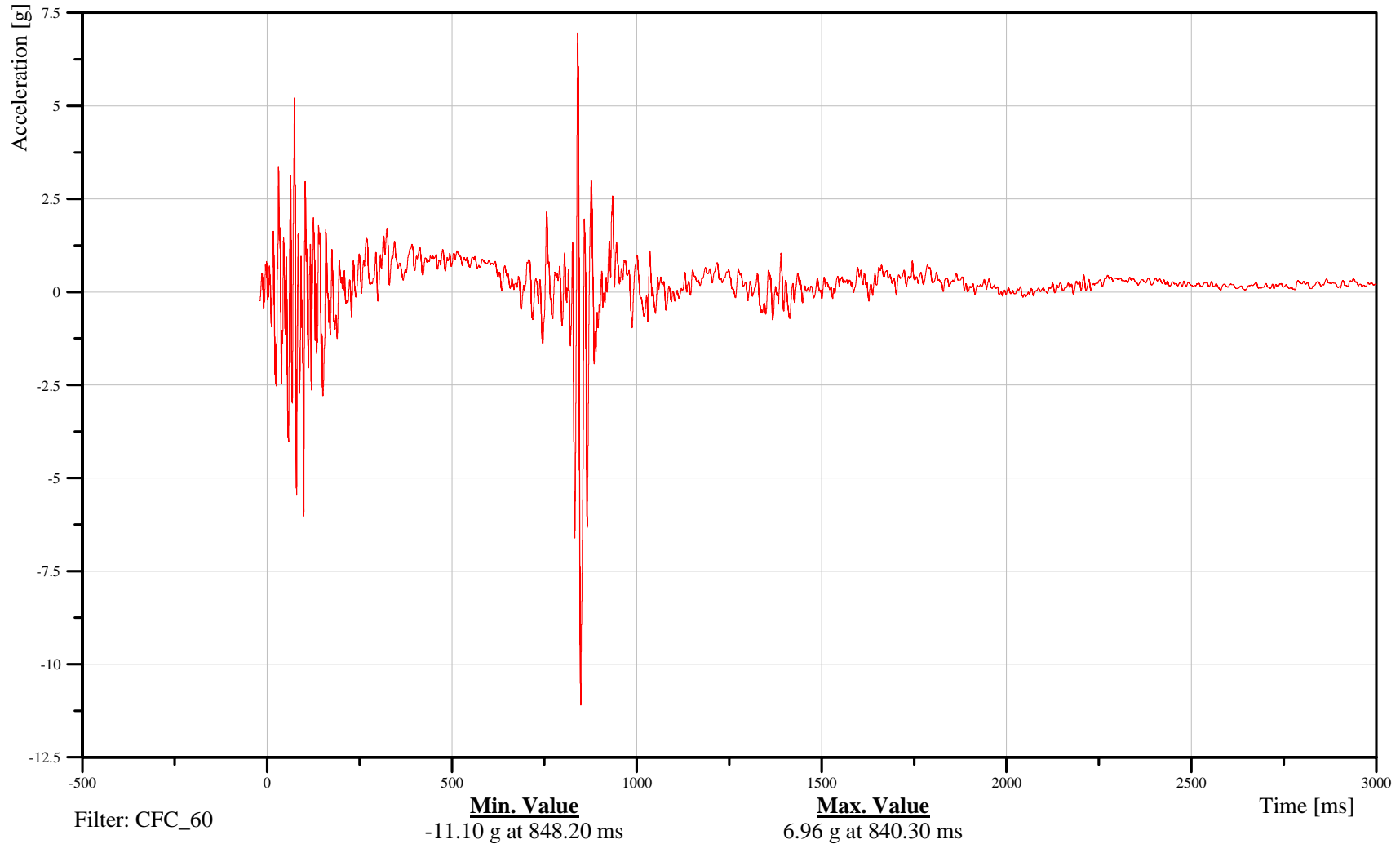
Vehicle CG Z-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACZD

TRC Inc. Test Lab: CTF

Test Number: 061221



Section 4.0

Summary of Findings and Conclusions

Summary of Findings

During test 061221 (NCHRP Report 350 TL 3-71), there were six detached individual barricades, and four individual barricades that exhibited damage from the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system, with each individual barricade weighing less than 45 kg empty. There were no detached elements from the impacting vehicle or barricade system to penetrate the occupant compartment of the impacting vehicle or to present hazards to others in the area. There was no measurable deformation into the occupant compartment. The ridedown accelerations were within the recommended limits for the impacting vehicle. The occupant impact velocity was within the stated limits when evaluating the Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system to the longitudinal barrier criteria for velocity. The Multi-Barrier Model MB-42x72 JSS LCB channelizing barricade system performed acceptably per current NCHRP Report 350 TL 3-71 test standards, which require the test article to activate in a predictable manner by breaking away, fracturing, or yielding in response to the test vehicle. The channelizing barricade system, used as a work zone traffic control device, allowed the test vehicle to penetrate the barrier system. The impacting vehicle's final resting place intruded into the adjacent pedestrian area to the right of the barricade's initial pre-test placement location.

Conclusions

Test 061221, with the 820C vehicle, appeared to meet all NCHRP Report 350 evaluation criteria for test designation 3-71¹. The impacting vehicle remained upright during and after the impact. The impacting vehicle was not contained by the barricade system, which was tested as a work zone traffic control device. The impacting vehicle remained within 12 feet laterally of the barricade. There were multiple detached barricade elements however none penetrated the vehicle's occupant area. All occupant risk factors were within the limits specified in NCHRP Report 350.

¹ As referenced in the American Association of State Highway and Transportation Officials (AASHTO) publication "A Policy on the Geometric Design of Highways and Streets, 2001", Chapter 4, Page 315.

Performance Evaluation Summary for Impacting Vehicle

Test Agency: Transportation Research Center Inc.

Test No.: 061221, NCHRP Report 350 Test 3-71 Test Date: 12/21/06

NCHRP Report 350 Evaluation Criteria	Test Results	Assessment									
<p><u>Structural Adequacy</u> B. The test article should readily activate in a predictable manner by breaking away, fracturing, or yielding.</p>	The MB-42x72 JSS LCB channelizing barricade system broke away in a predictable manner.	Pass									
<p><u>Occupant Risk</u> D. Detached elements, fragments or other debris from the test article should not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformations of, or intrusions into, the occupant compartment that could cause serious injuries should not be permitted.</p>	The MB-42x72 JSS LCB channelizing barricade system remained contained in the immediate impact location, did not allow debris to penetrate the occupant compartment, or present hazard to the immediate area. There was no deformation into the occupant compartment.	Pass									
E. Detached elements, fragments or other debris from the test article, or vehicular damage should not block the driver's vision or otherwise cause the driver to lose control of the vehicle.	The MB-42x72 JSS LCB channelizing barricade system did not appear to block the driver's vision.	Pass									
F. The vehicle should remain upright during and after collision although moderate roll, pitching and yawing are acceptable.	The impacting vehicle remained upright during and after the collision.	Pass									
<p>H. Occupant impact velocities should satisfy the following¹:</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="3">Occupant Impact Velocity Limits (ms)</th> </tr> <tr> <th>Component</th> <th>Preferred</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>Longitudinal and Lateral</td> <td align="center">9</td> <td align="center">12</td> </tr> </tbody> </table>	Occupant Impact Velocity Limits (ms)			Component	Preferred	Maximum	Longitudinal and Lateral	9	12	Longitudinal Velocity 6.7 m/s Lateral Velocity 0.4 m/s	Met Criteria ¹
Occupant Impact Velocity Limits (ms)											
Component	Preferred	Maximum									
Longitudinal and Lateral	9	12									
<p>I. Occupant ridedown accelerations should satisfy the following:</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="3">Occupant Ridedown Acceleration Limits (G's)</th> </tr> <tr> <th>Component</th> <th>Preferred</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>Longitudinal And Lateral</td> <td align="center">15</td> <td align="center">20</td> </tr> </tbody> </table>	Occupant Ridedown Acceleration Limits (G's)			Component	Preferred	Maximum	Longitudinal And Lateral	15	20	Longitudinal Ridedown Acceleration: 5.6 g's Lateral Ridedown Acceleration: 3.0 g's	Pass
Occupant Ridedown Acceleration Limits (G's)											
Component	Preferred	Maximum									
Longitudinal And Lateral	15	20									
J. (Optional) Hybrid III dummy. Response should conform to evaluation criteria of Part 571.208, Title 49 of Code of Federal Regulation, Chapter V (10-1-88 Edition)	Dummy was not instrumented	Not Applicable									

¹ FHWA requested the testing facility (TRC Inc.) to use the longitudinal barrier criteria for this portion of the evaluation criteria for longitudinal channelizing barricades.

Performance Evaluation Summary for Impacting Vehicle, Continued

Test Agency: Transportation Research Center Inc.

Test No.: 061221, NCHRP Report 350 Test 3-71 Test Date: 12/21/06

Vehicle Trajectory K. After collision, it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.	The impacting vehicle's final most outer right trajectory stayed within twelve feet of the barricade. Assuming that the barricade was at the edge of the lane, the vehicle would have stayed within a 12-foot lane width. ¹	Pass
N. Vehicle trajectory behind the test article is acceptable.	The impacting vehicle's final trajectory extended behind the test article.	Pass

¹ As referenced in the American Association of State Highway and Transportation Officials (AASHTO) publication "A Policy on the Geometric Design of Highways and Streets, 2001", Chapter 4, Page 315.

References

1. H.E. Ross, Jr., D.L. Sicking, R.A. Zimmer, and J.D. Michie, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," NCHRP Report 350, Transportation Research Board, Washington, D.C., 1995.

Appendix A

NCHRP 350 3-71 Test Photographs

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Pre-Test Rear Underbody View	A-27
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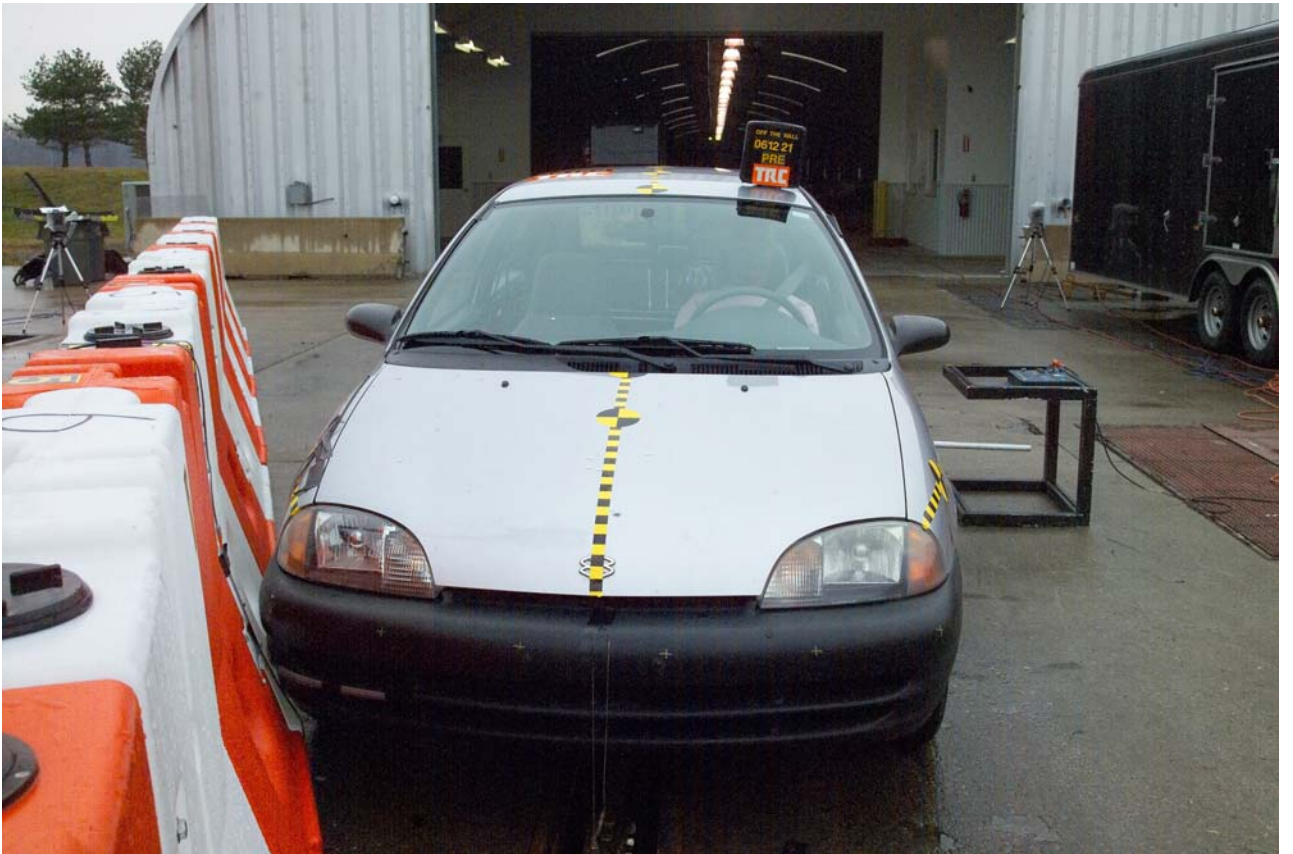


Figure A-1 Pre-Test Vehicle Front with Channelizing Barricade View



Figure A-2 Post-Test Vehicle Front - Final Resting Position View



Figure A-3 Pre-Test Vehicle Left Front with Channelizing Barricade View



Figure A-4 Post-Test Vehicle Left Front - Final Resting Position View



Figure A-5 Pre-Test Vehicle Left Side with Channelizing Barricade View



Figure A-6 Post-Test Vehicle Left Side - Final Resting Position View



Figure A-7 Pre-Test Vehicle Left Rear with Channelizing Barricade View



Figure A-8 Post-Test Vehicle Left Rear - Final Resting Position View



Figure A-9 Pre-Test Vehicle Rear with Channelizing Barricade View



Figure A-10 Post-Test Vehicle Rear - Final Resting Position View



Figure A-11 Pre-Test Vehicle Right Rear with Channelizing Barricade View



Figure A-12 Post-Test Vehicle Right Rear - Final Resting Position View



Figure A-13 Pre-Test Vehicle Right Side View



Figure A-14 Post-Test Vehicle Right Side - Final Resting Position View



Figure A-15 Pre-Test Vehicle Right Front View



Figure A-16 Post-Test Vehicle Right Front - Final Resting Position View



Figure A-17 Post-Test Vehicle Damage - View 1



Figure A-18 Post-Test Vehicle Damage - View 2

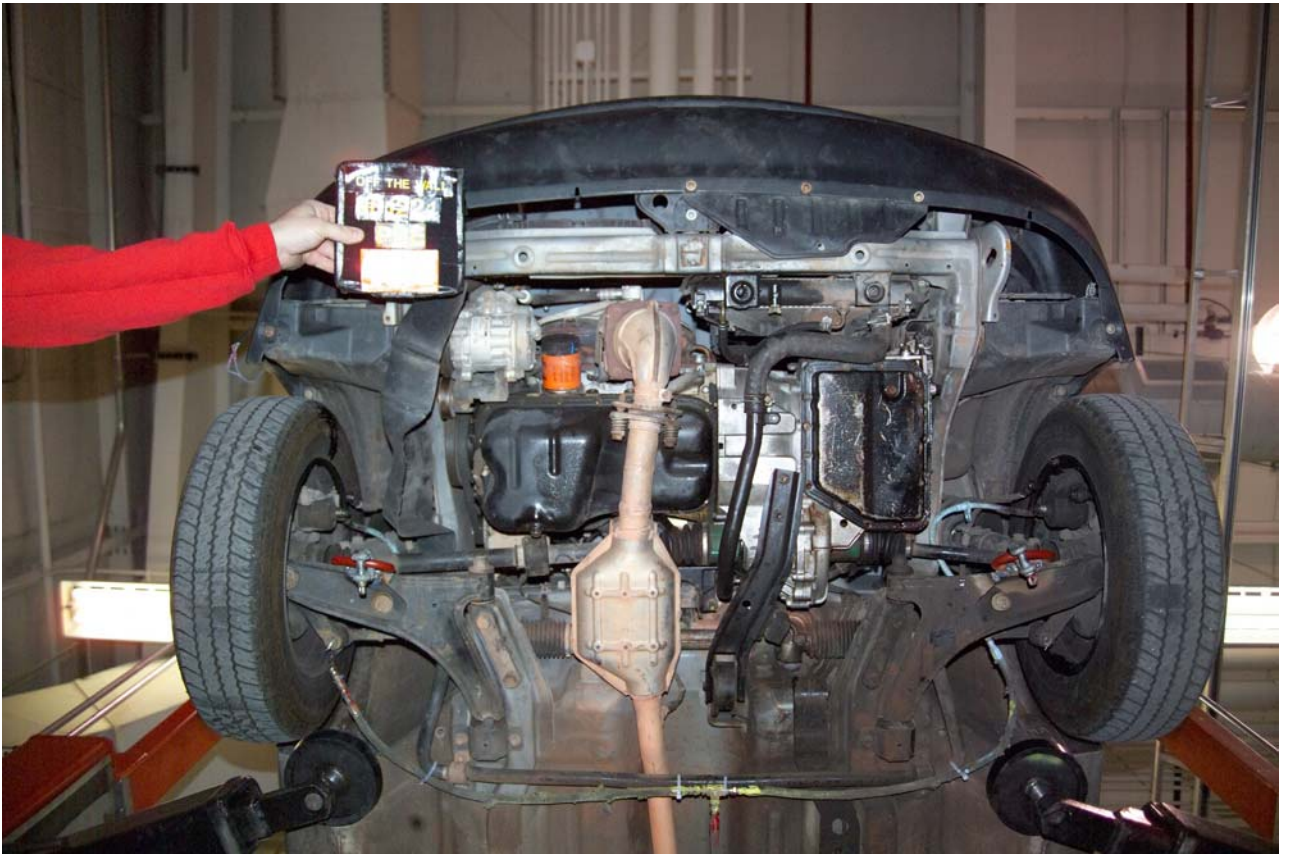


Figure A-19 Pre-Test Front Underbody View



Figure A-20 Post-Test Front Underbody View

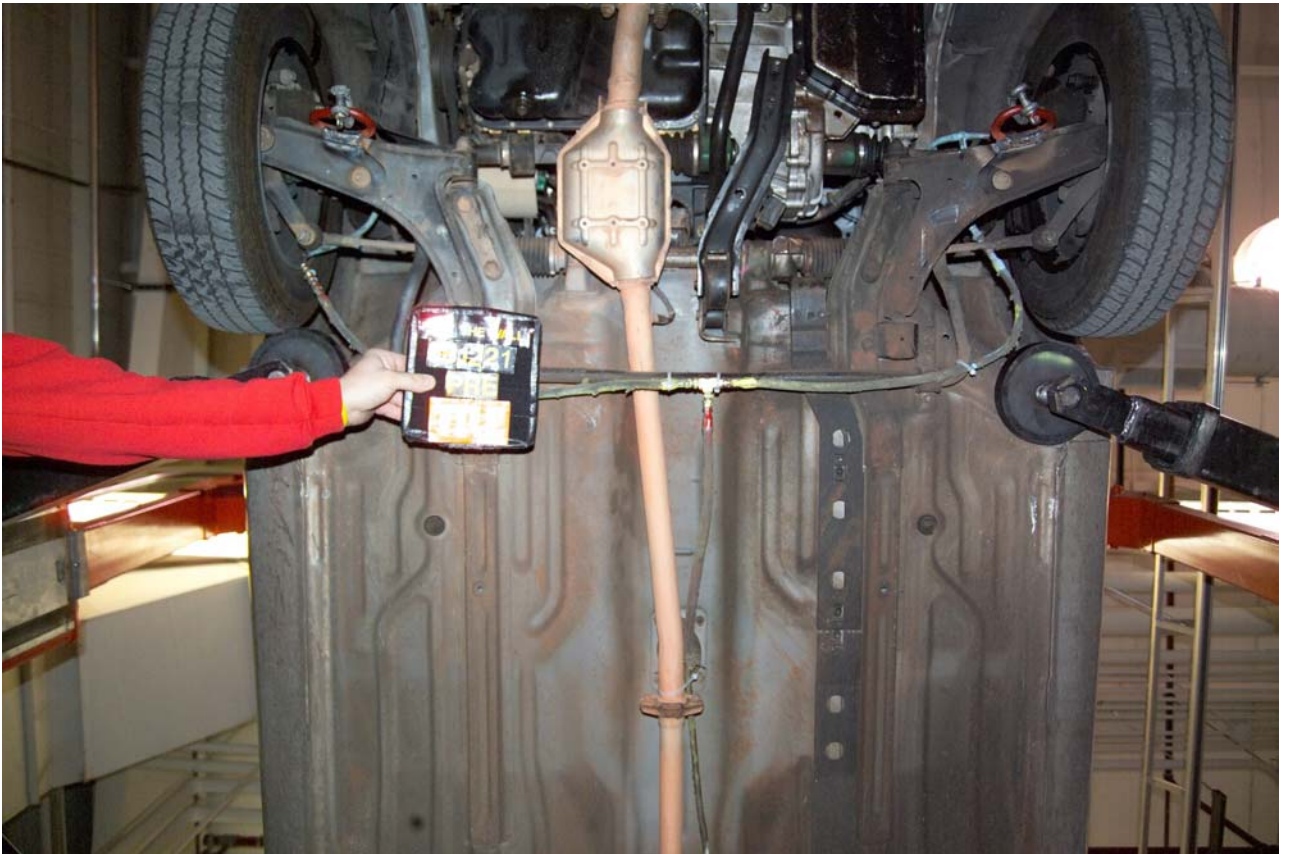


Figure A-21 Pre-Test Mid Front Underbody View



Figure A-22 Post-Test Mid Front Underbody View



Figure A-23 Pre-Test Mid Underbody View



Figure A-24 Post-Test Mid Underbody View



Figure A-25 Pre-Test Mid Rear Underbody View



Figure A-26 Post-Test Mid Rear Underbody View



Figure A-27 Pre-Test Rear Underbody View



Figure A-28 Post-Test Rear Underbody View



Figure A-29 Pre-Test Engine Compartment View



Figure A-30 Post-Test Engine Compartment View

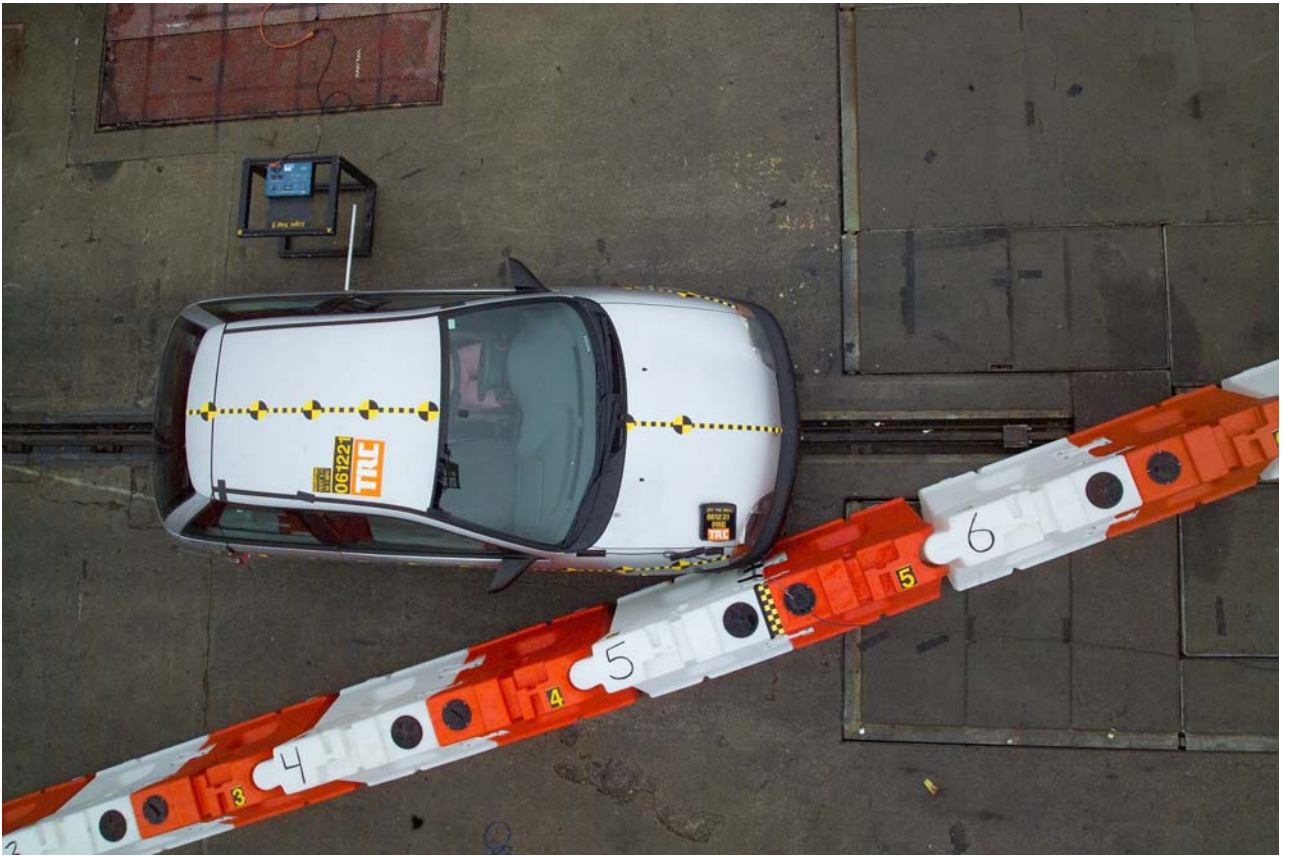


Figure A-31 Pre-Test Overhead Impact Alignment View



Figure A-32 Pre-Test Front Impact Alignment View



Figure A-33 Pre-Test Left Front Impact Alignment - View 1



Figure A-34 Pre-Test Left Front Impact Alignment - View 2



Figure A-35 Pre-Test Channelizing Barricade Upstream Overall View

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Figure A-36 Pre-Test Channelizing Barricade Impact Side Upstream Overall View



Figure A-37 Post-Test Channelizing Barricade Impact Side Upstream Overall View



Figure A-38 Pre-Test Channelizing Barricade Impact Side Overall View



Figure A-39 Post-Test Channelizing Barricade Impact Side Overall View



Figure A-40 Pre-Test Channelizing Barricade Impact Side Downstream Overall - View 1



Figure A-41 Post-Test Channelizing Barricade Impact Side Downstream Overall - View 1



Figure A-42 Pre-Test Channelizing Barricade Impact Side Downstream Overall - View 2



Figure A-43 Post-Test Channelizing Barricade Impact Side Downstream Overall - View 2



Figure A-44 Pre-Test Channelizing Barricade Downstream Overall View



Figure A-45 Post-Test Channelizing Barricade Downstream Overall View



Figure A-46 Pre-Test Channelizing Barricade Non-Impact Side Downstream Overall View



Figure A-47 Post-Test Channelizing Barricade Non-Impact Side Downstream Overall View



Figure A-48 Pre-Test Channelizing Barricade Non-Impact Side Overall View

Intentionally Left Blank



Figure A-49 Pre-Test Channelizing Barricade Non-Impact Side Upstream Overall View



Figure A-50 Post-Test Channelizing Barricade Non-Impact Side Upstream Overall View



Figure A-51 Post-Test Barricade 1 View



Figure A-52 Post-Test Barricade 2 View



Figure A-53 Post-Test Barricade 3 View



Figure A-54 Post-Test Barricade 4 View



Figure A-55 Post-Test Barricade 5 View



Figure A-56 Post-Test Barricade 6 View



Figure A-57 Post-Test Barricade 7 View



Figure A-58 Post-Test Barricade 8 View



Figure A-59 Post-Test Barricade 9 View



Figure A-60 Post-Test Barricade 10 View



Figure A-61 Post-Test Damage to Barricade 5 - View 1



Figure A-62 Post-Test Damage to Barricade 5 - View 2



Figure A-63 Post-Test Damage to Barricade 6 - View 1



Figure A-64 Post-Test Damage to Barricade 6 - View 2



Figure A-65 Post-Test Damage to Barricade 8 View

Intentionally Left Blank



Figure A-66 Post-Test Channelizing Barricade Resting Position - View 1



Figure A-67 Post-Test Channelizing Barricade Resting Position - View 2



Figure A-68 Post-Test Channelizing Barricade Resting Position - View 3



Figure A-69 Post-Test Channelizing Barricade Resting Position - View 4



Figure A-70 Post-Test Channelizing Barricade Resting Position - View 5



Figure A-71 Post-Test Channelizing Barricade and Vehicle Resting Positions View

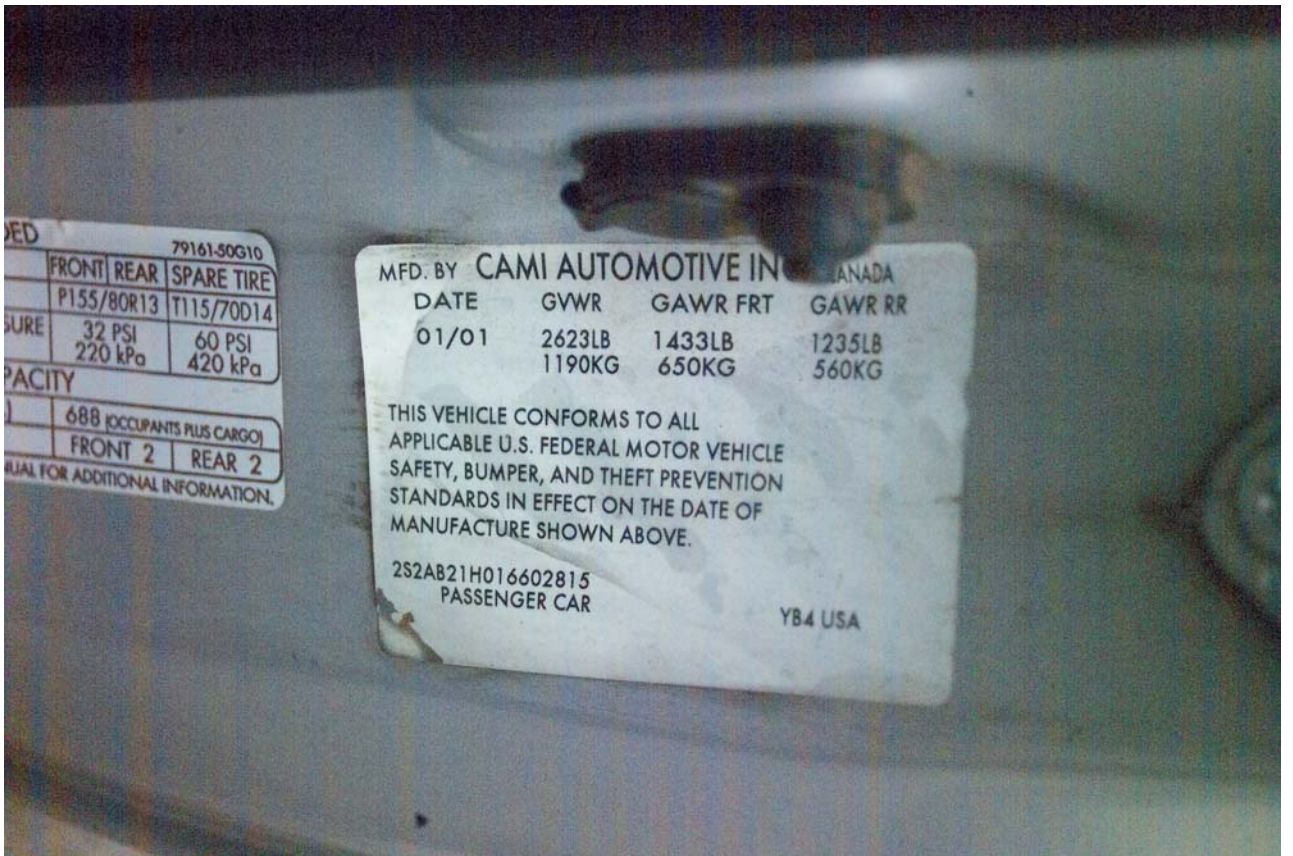


Figure A-72 Vehicle Certification Label View

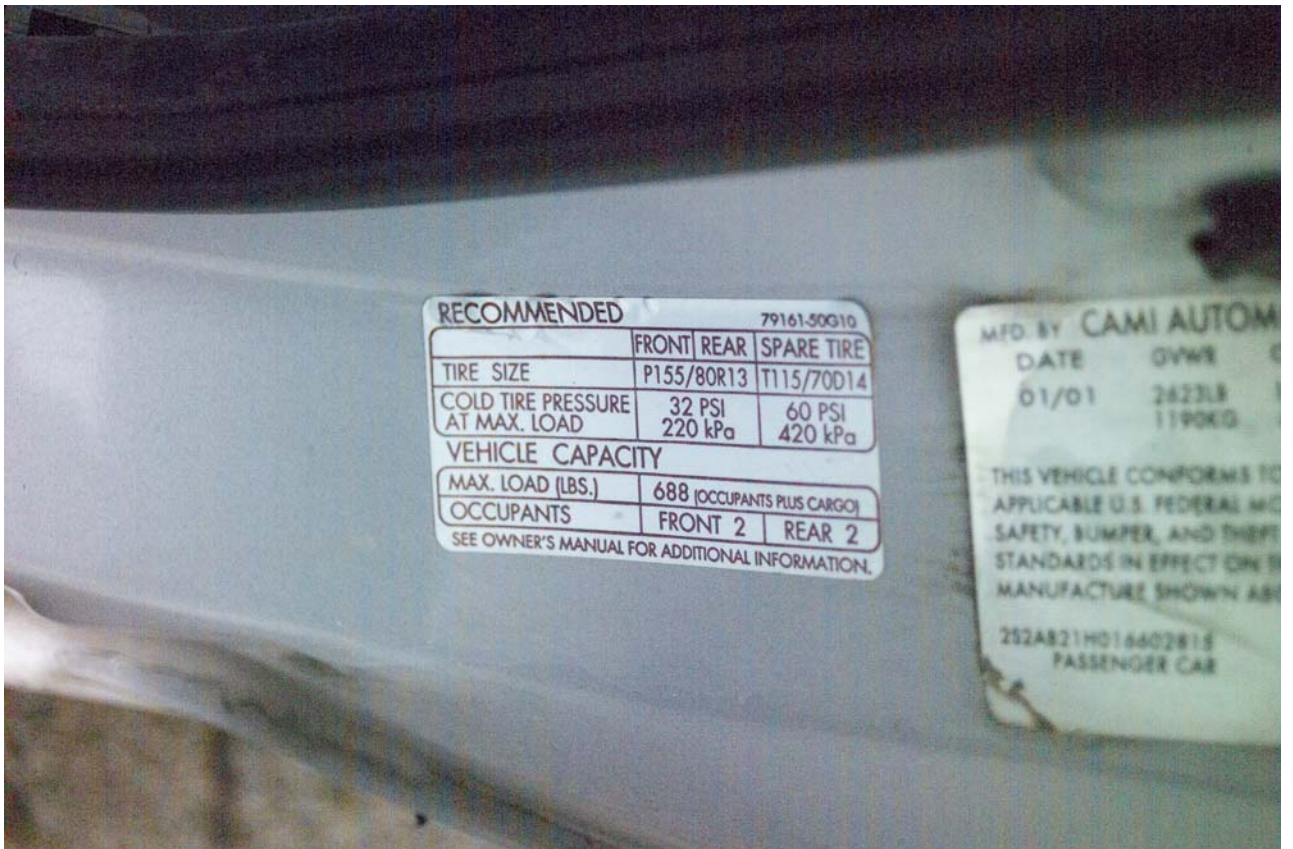


Figure A-73 Vehicle Tire Information Label

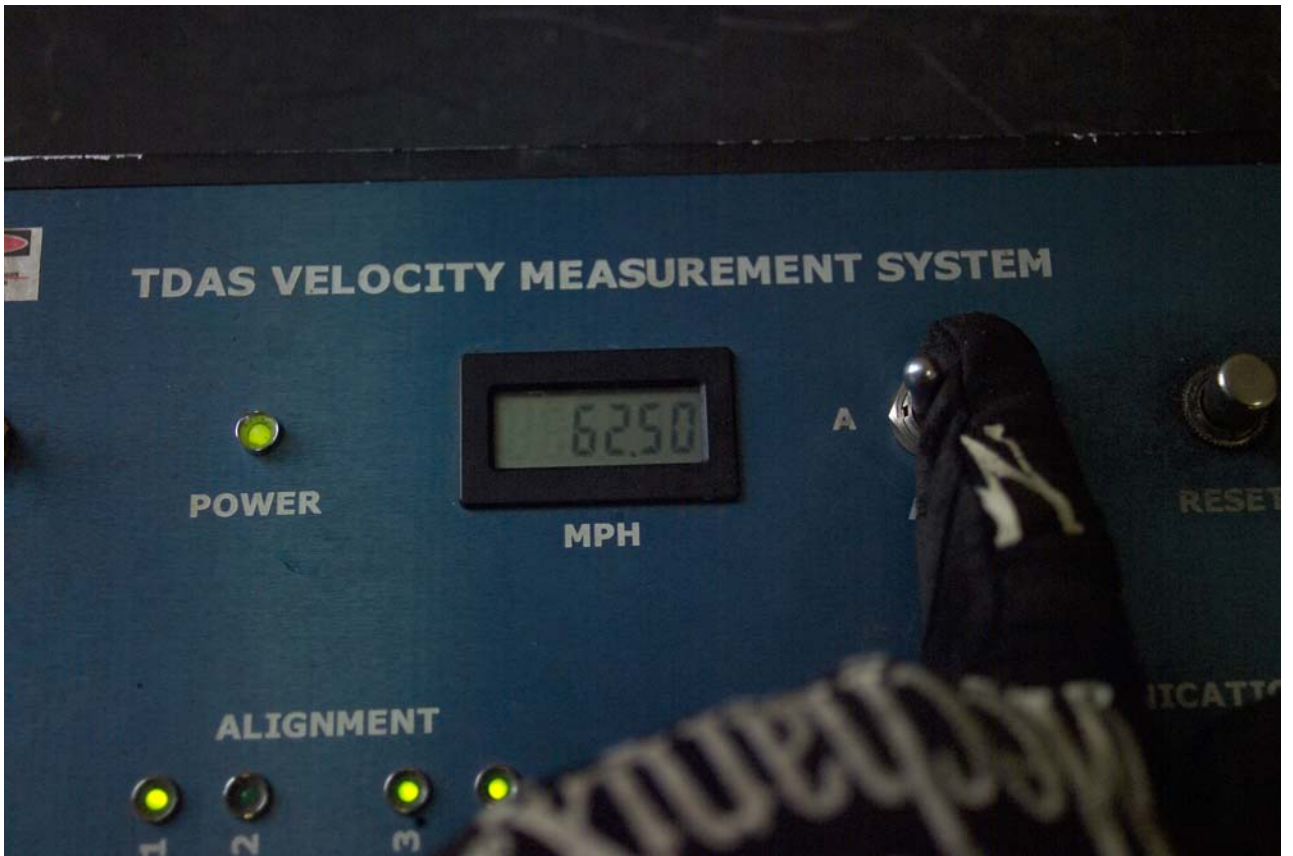


Figure A-74 Post-Test Primary Digital Light Trap Readout View

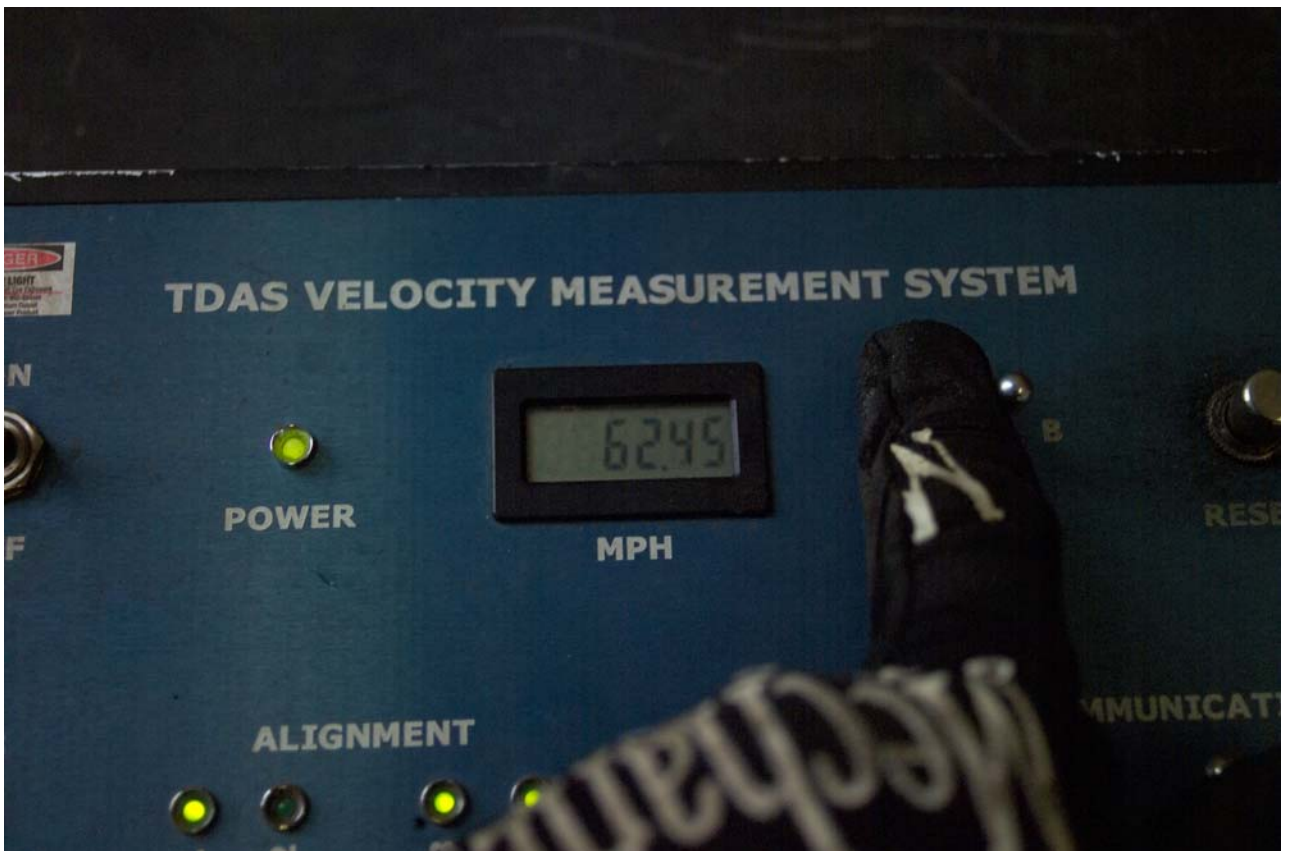


Figure A-75 Post-Test Secondary Digital Light Trap Readout View

Appendix B

NCHRP 350 3-71 Test Data Plots



NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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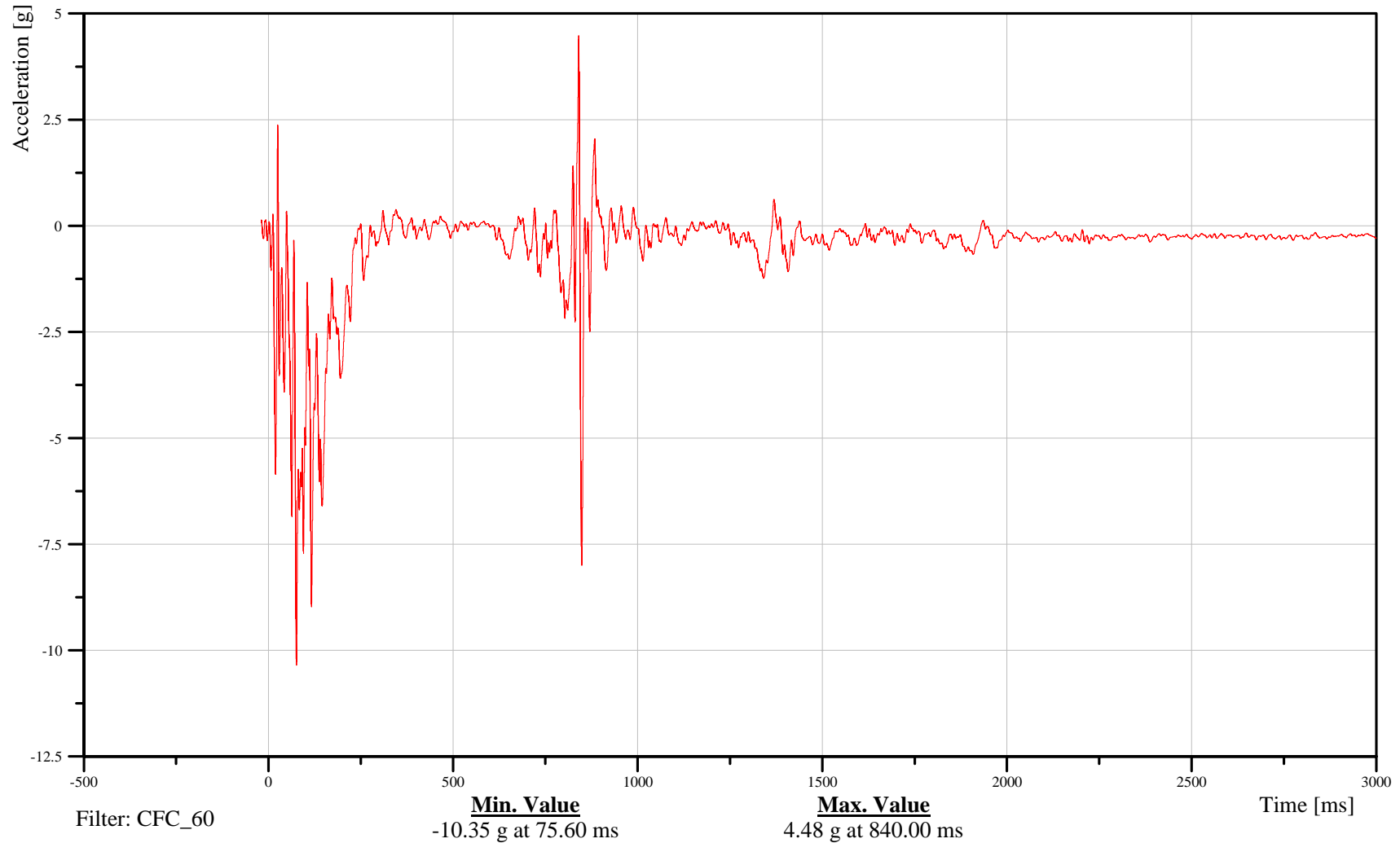
Vehicle CG X-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACXD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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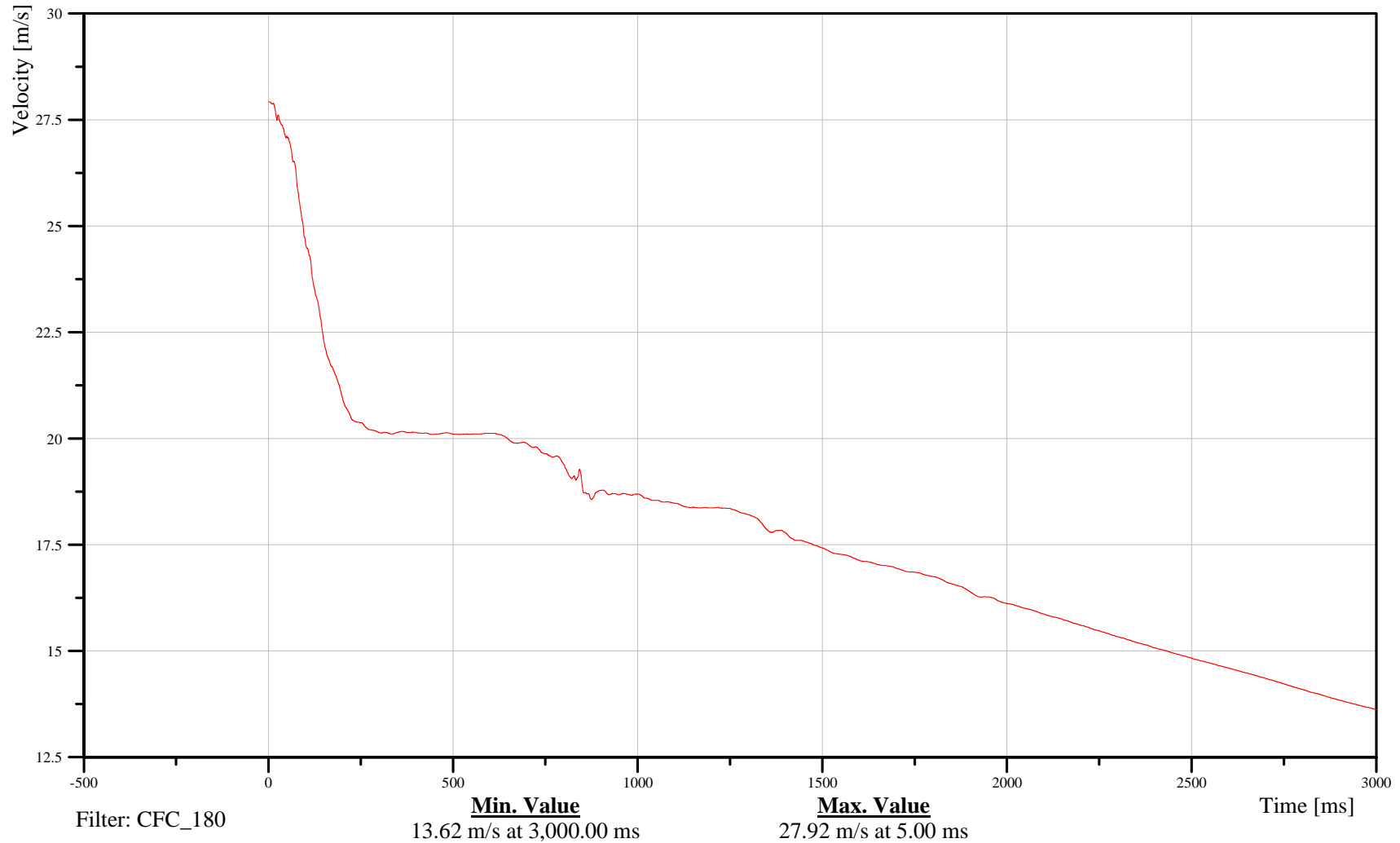
Vehicle CG X-Axis Velocity

Customer: Off the Wall Products, LLC

10VEHCCG0000VEXC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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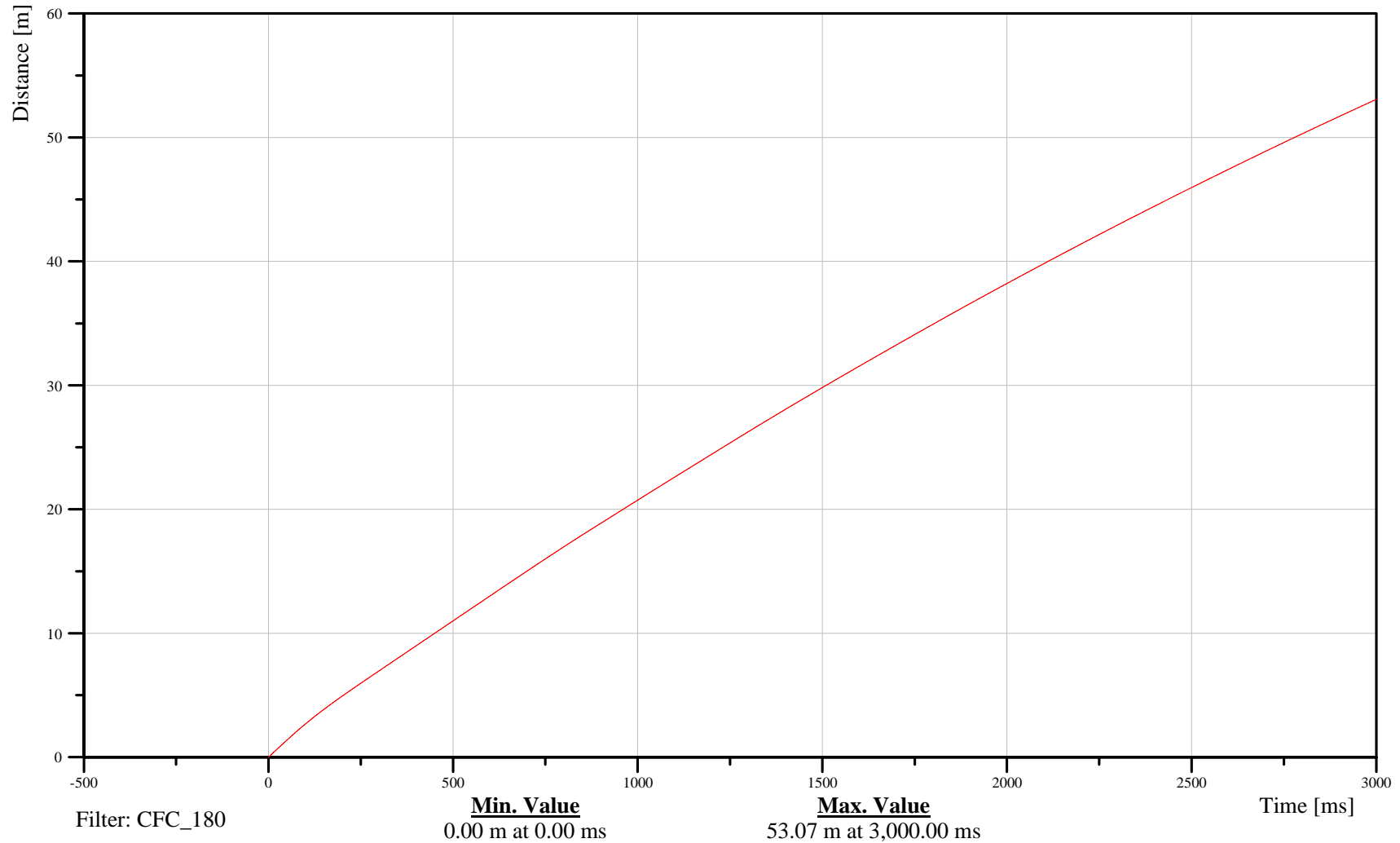
Vehicle CG X-Axis Displacement

Customer: Off the Wall Products, LLC

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TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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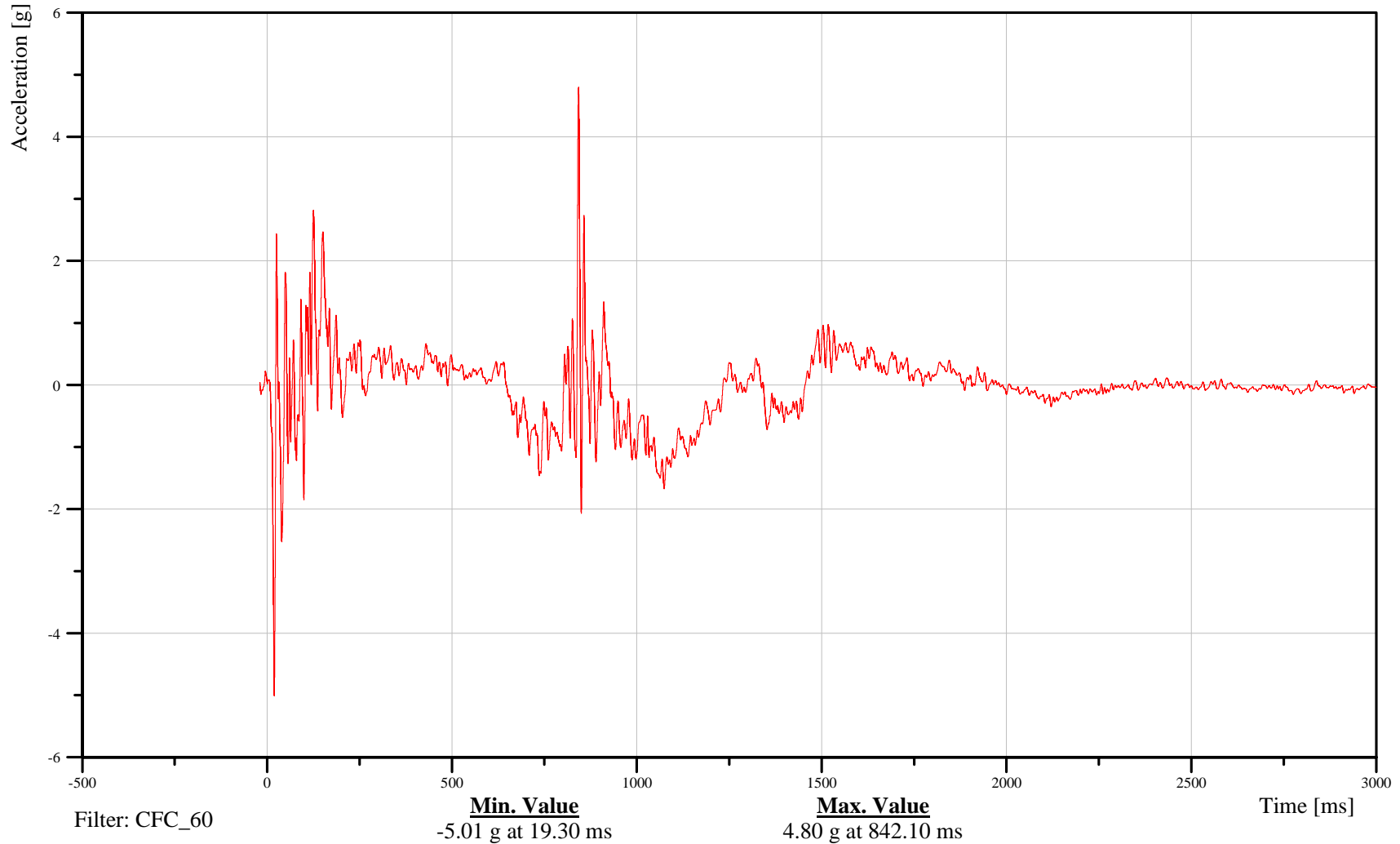
Vehicle CG Y-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACYD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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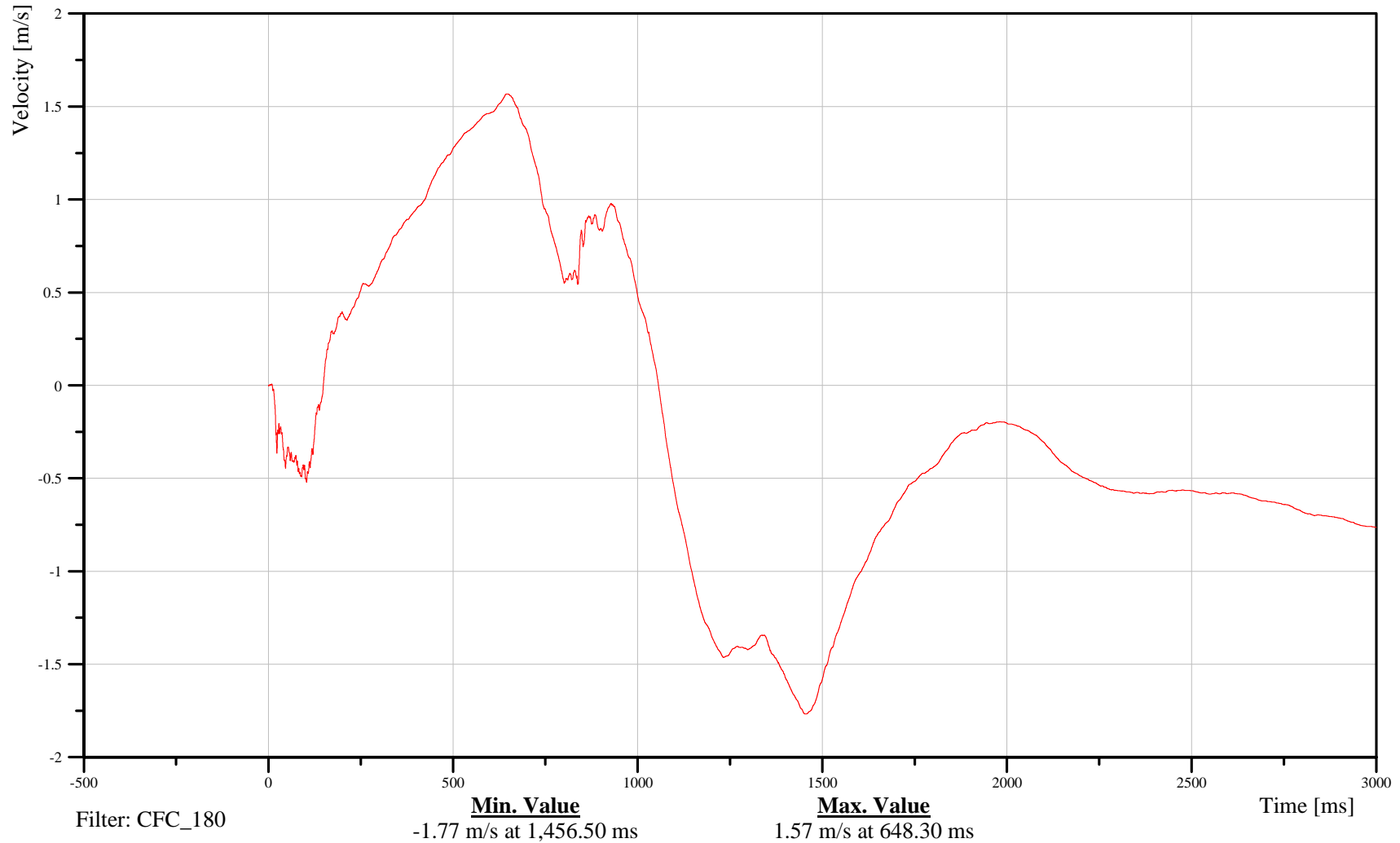
Vehicle CG Y-Axis Velocity

Customer: Off the Wall Products, LLC

10VEHCCG0000VEYC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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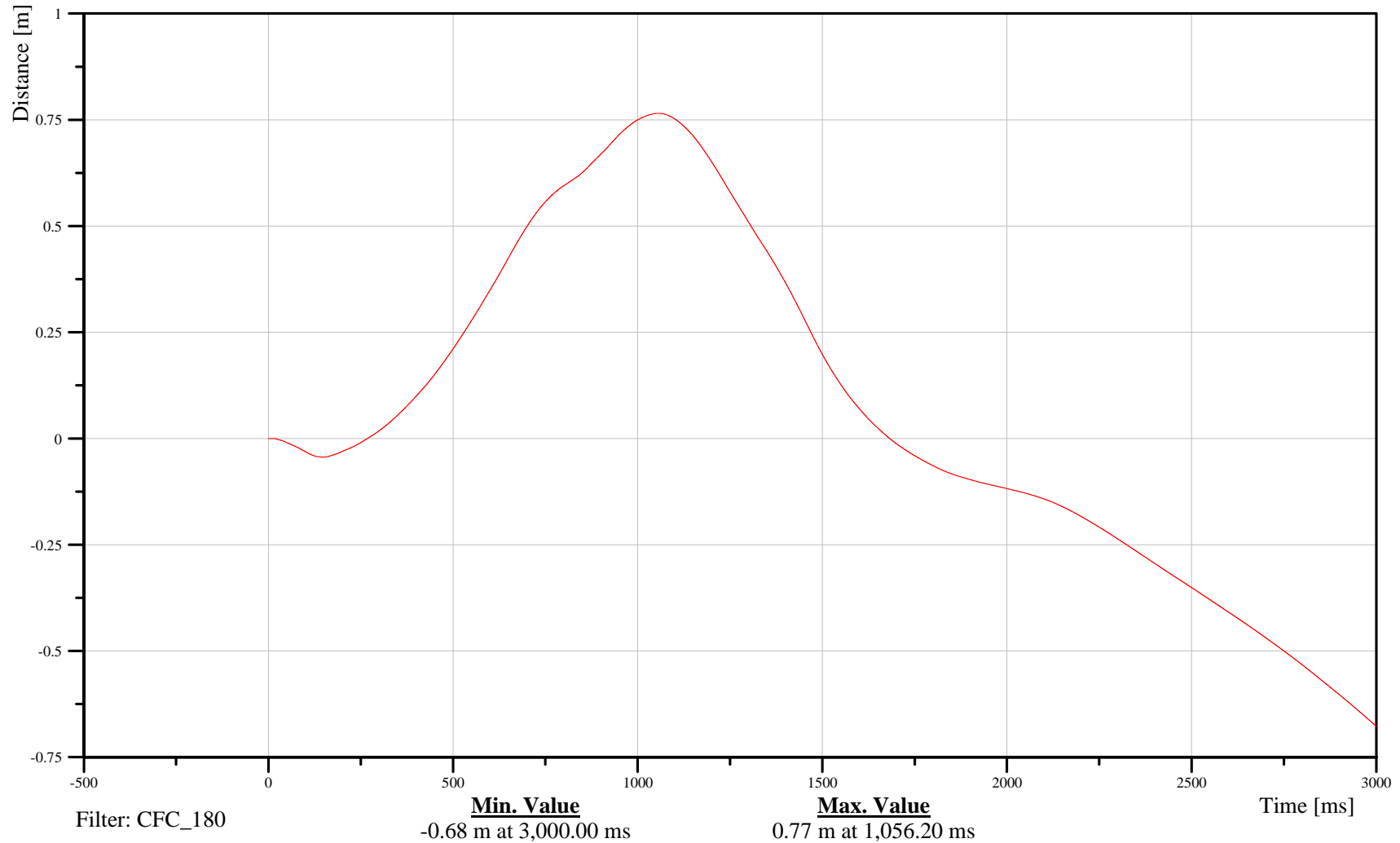
Vehicle CG Y-Axis Displacement

Customer: Off the Wall Products, LLC

10VEHCCG0000DCYC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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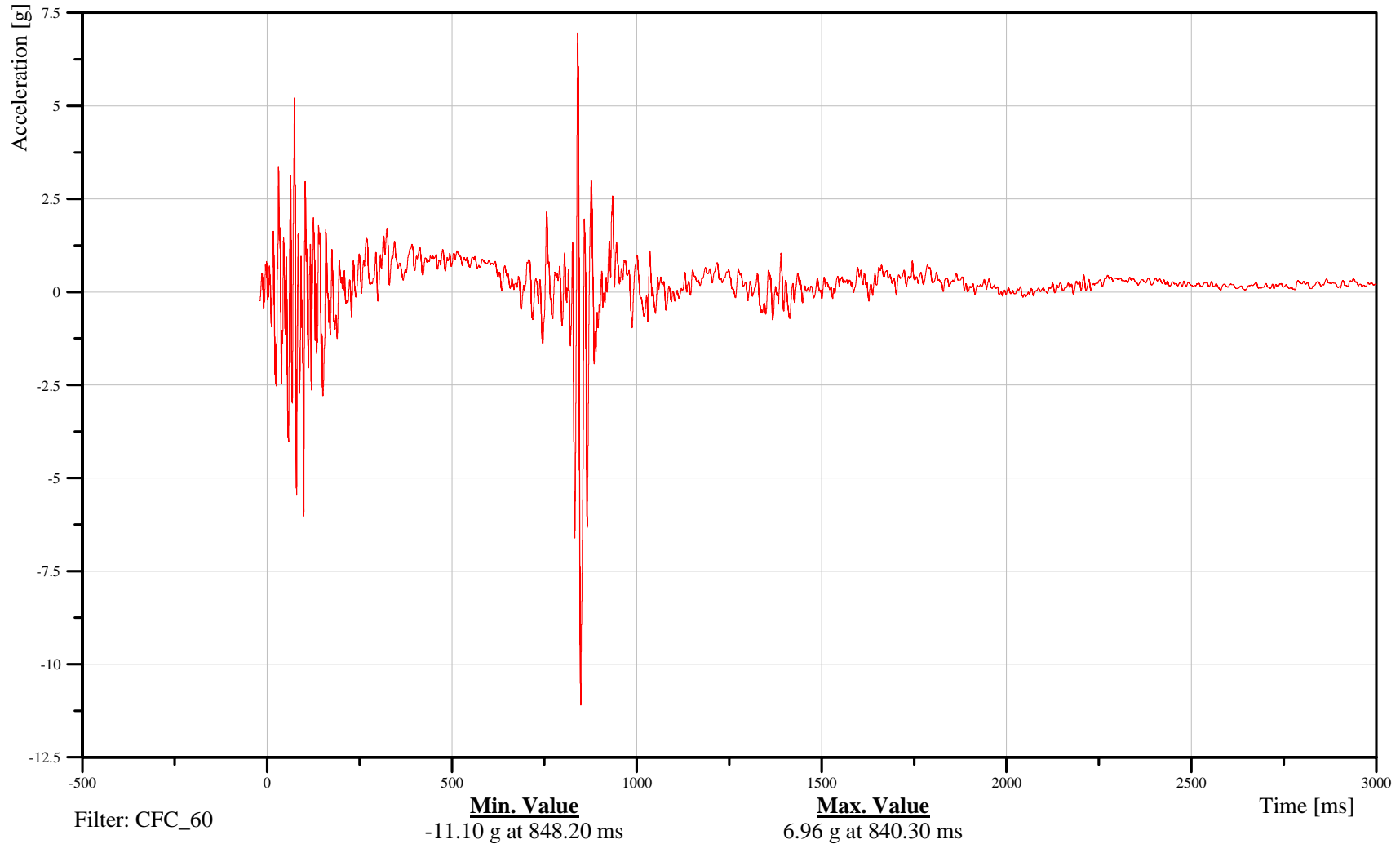
Vehicle CG Z-Axis Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACZD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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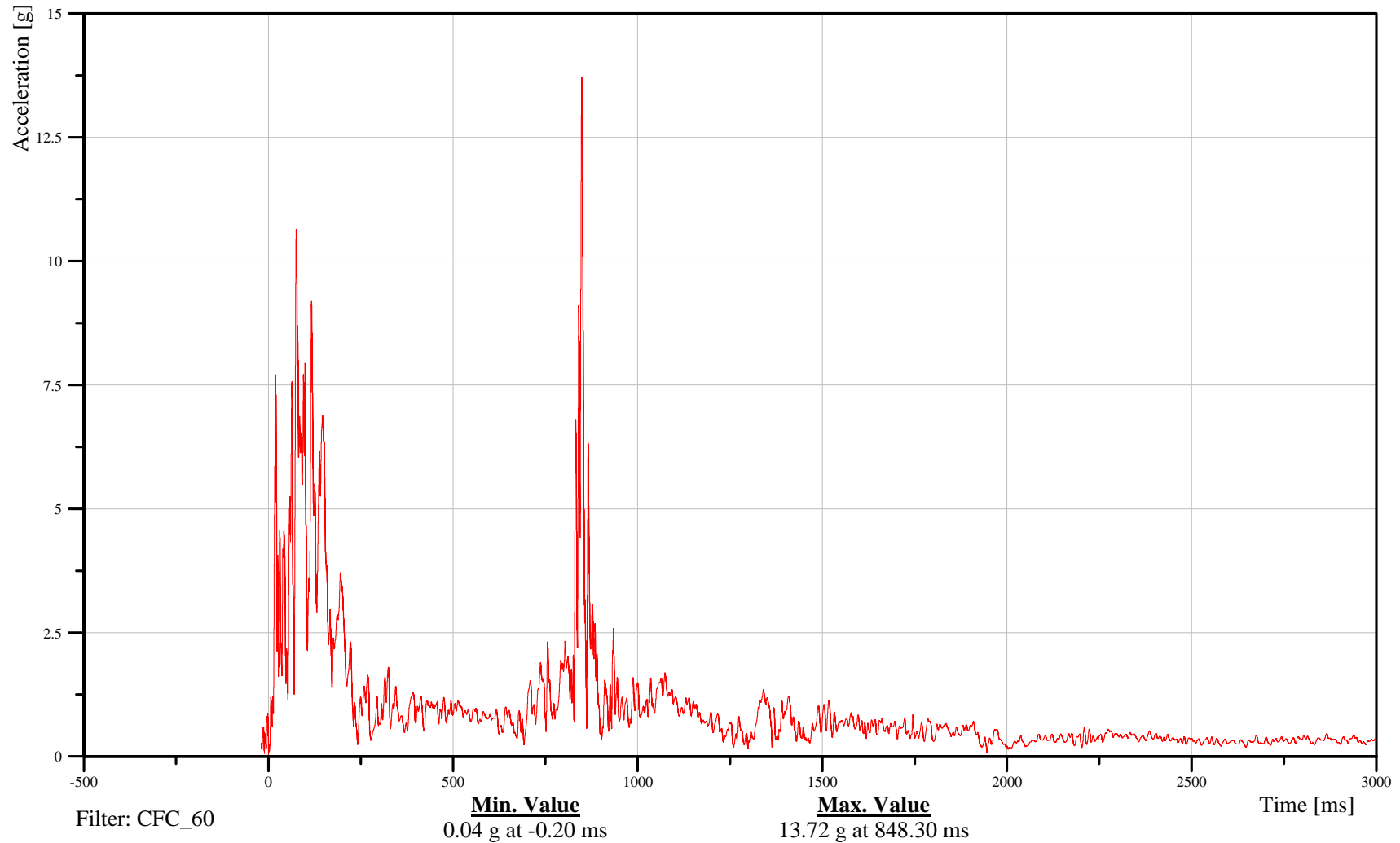
Vehicle CG Resultant Acceleration

Customer: Off the Wall Products, LLC

10VEHCCG0000ACRD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

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Time: 11:11

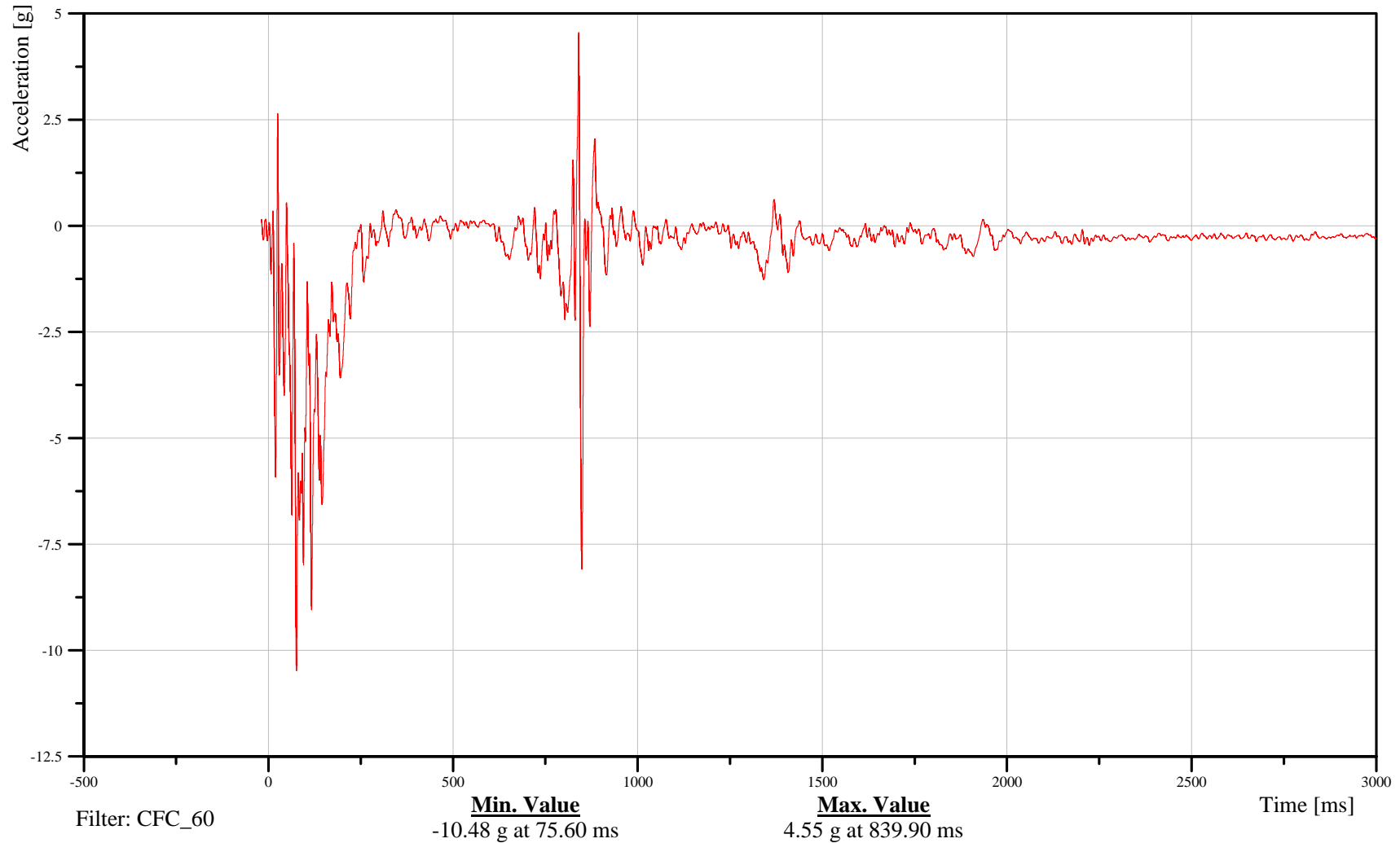
Vehicle CG X-Axis Acceleration - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00ACXD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
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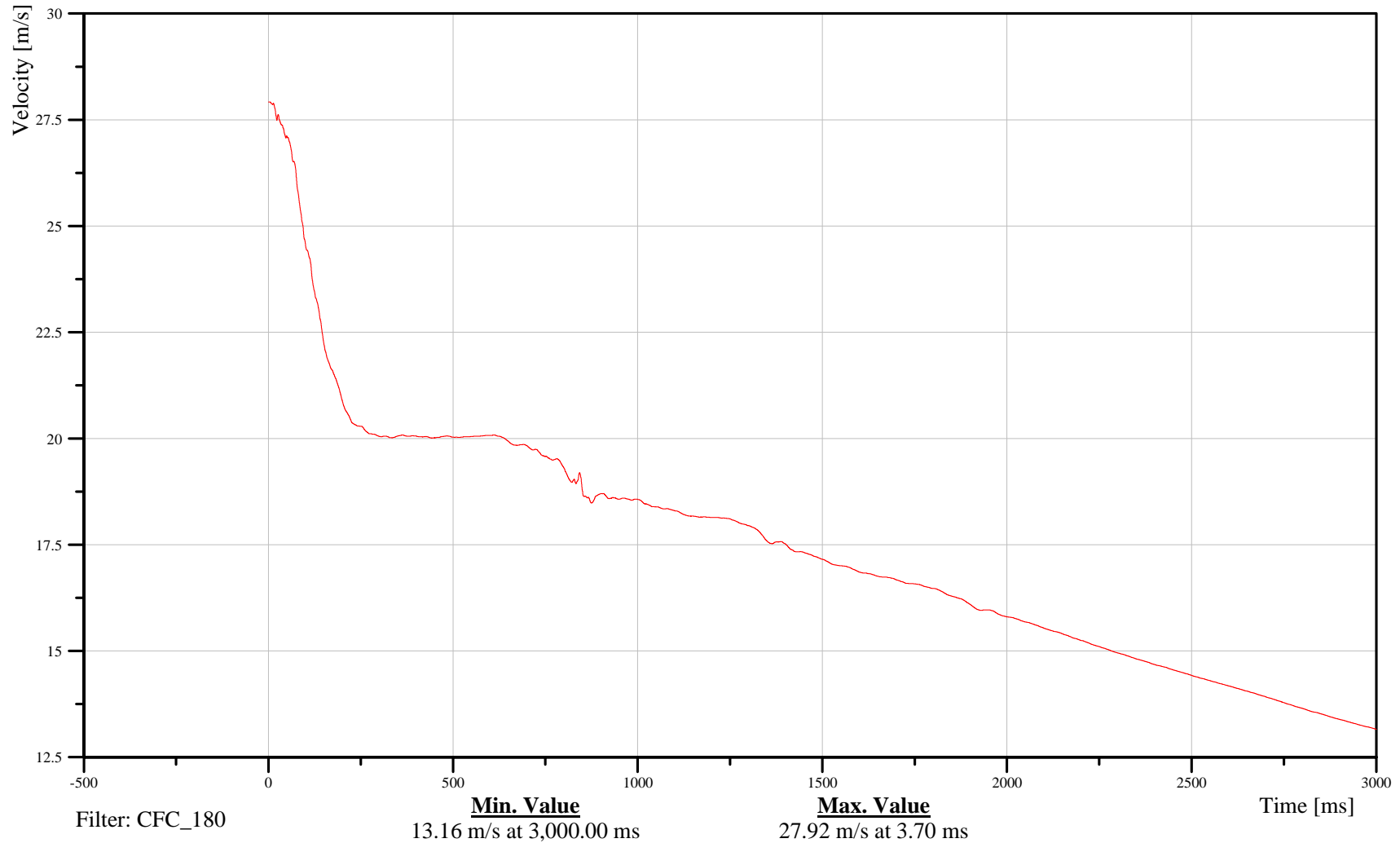
Vehicle CG X-Axis Velocity - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00VEXC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
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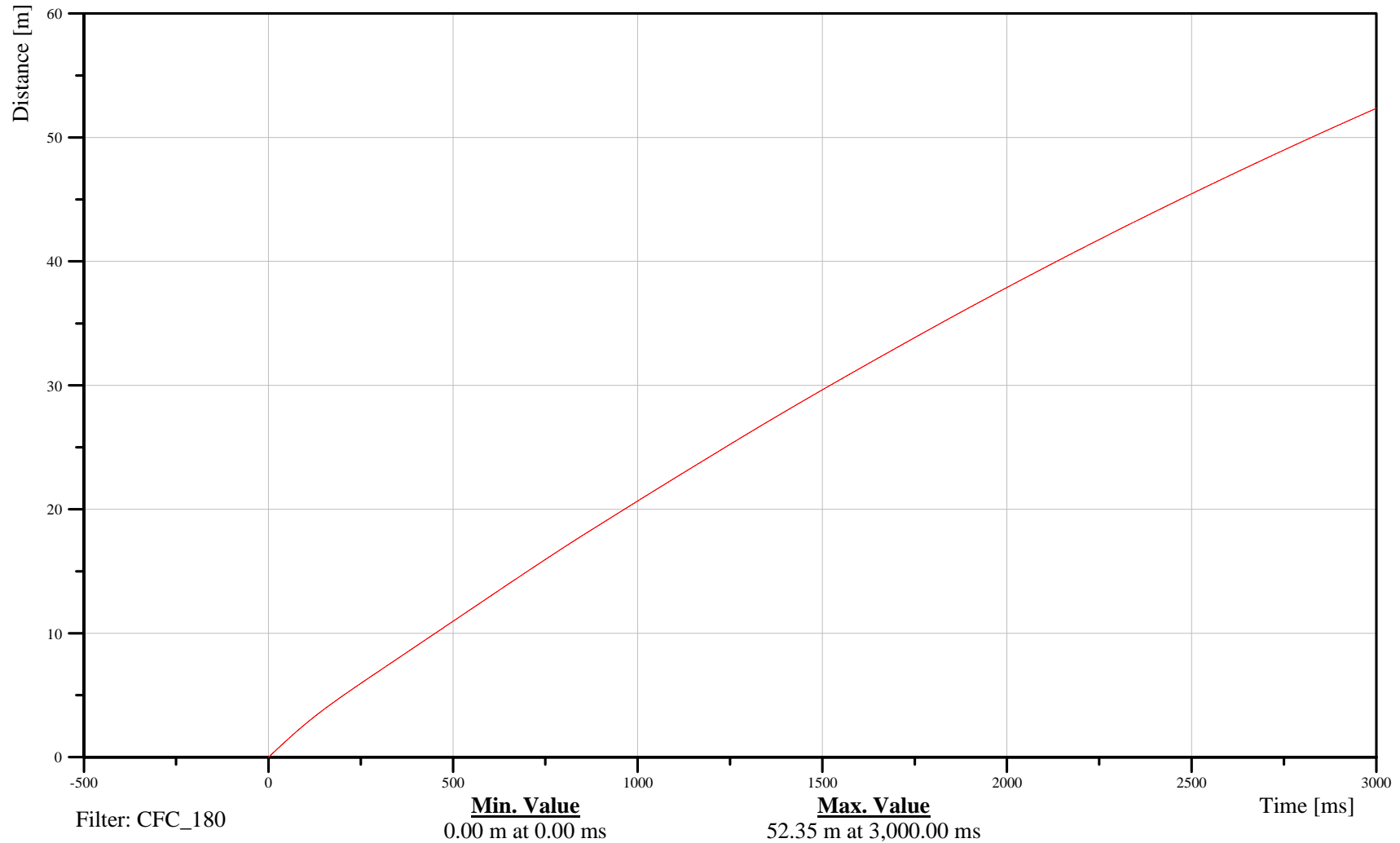
Vehicle CG X-Axis Displacement - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00DCXC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

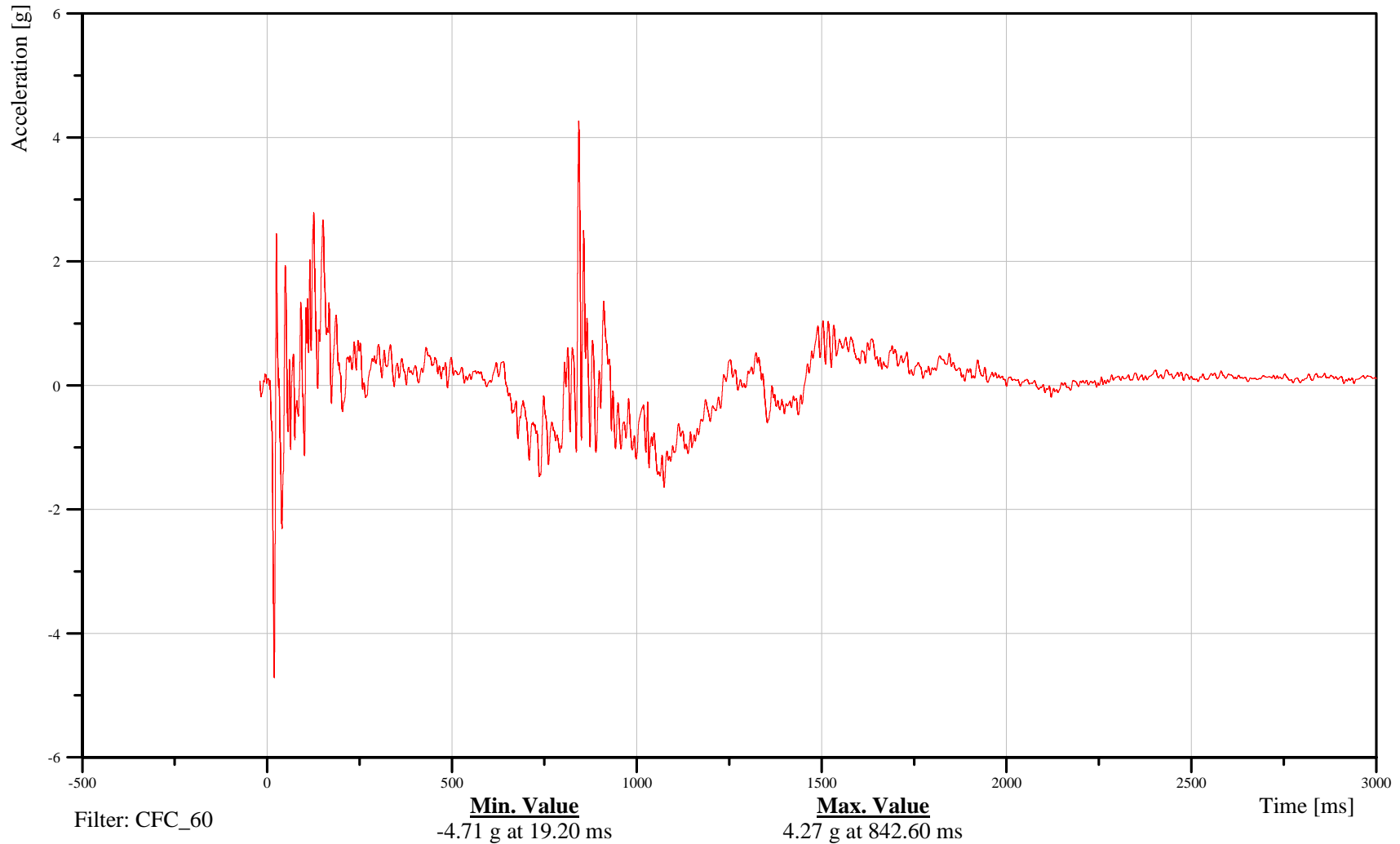
Vehicle CG Y-Axis Acceleration - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00ACYD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

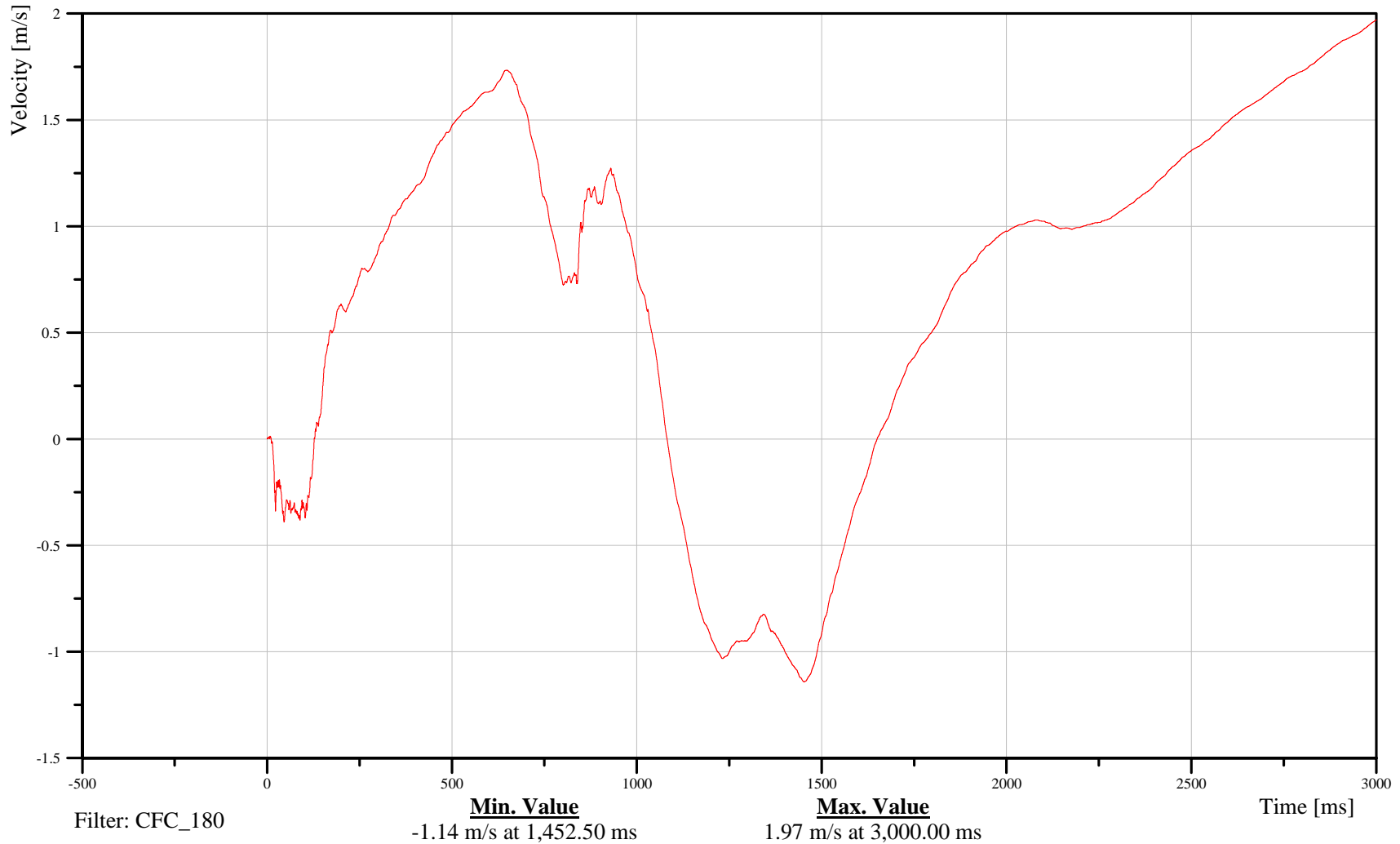
Vehicle CG Y-Axis Velocity - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00VEYC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

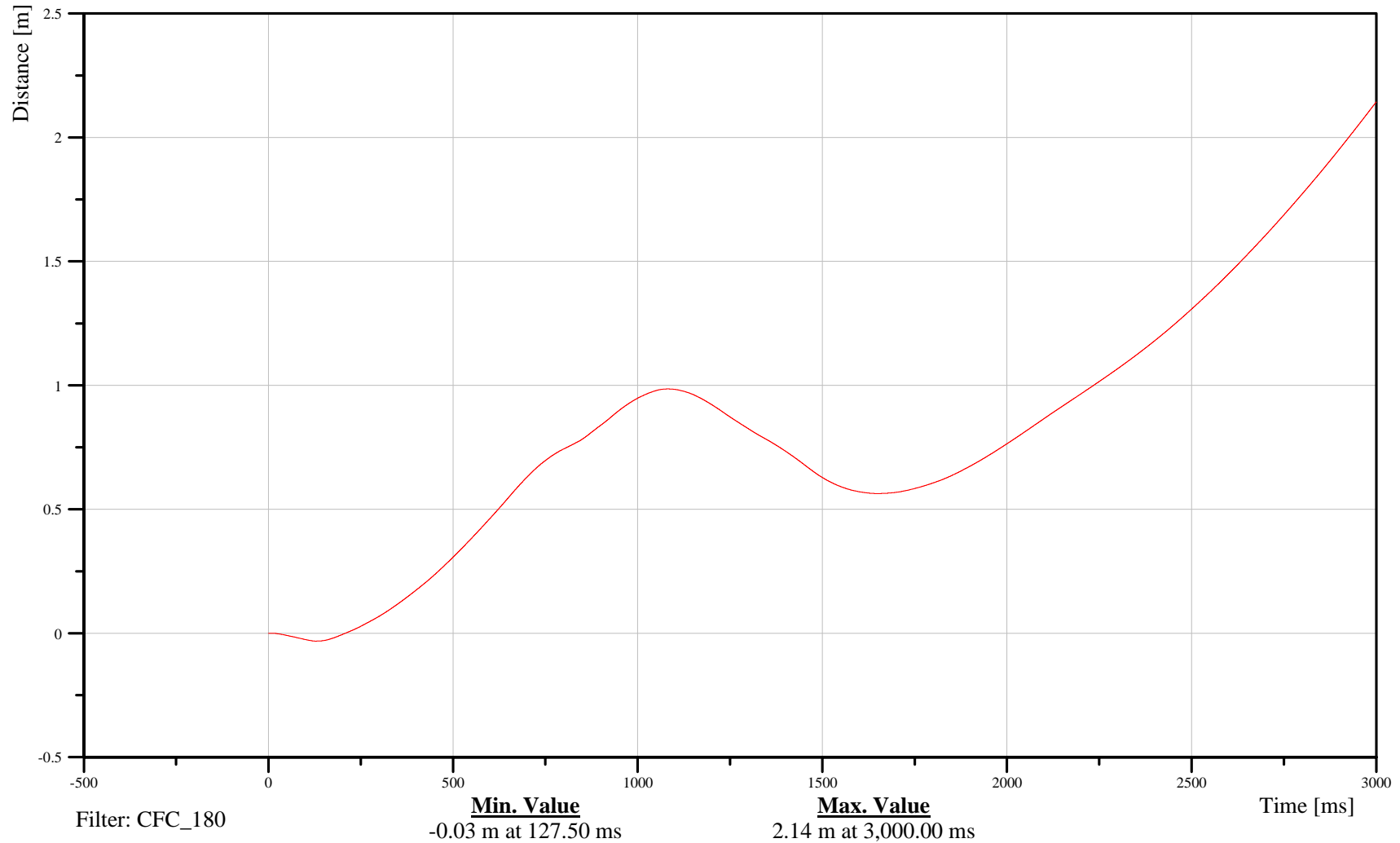
Vehicle CG Y-Axis Displacement - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00DCYC

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

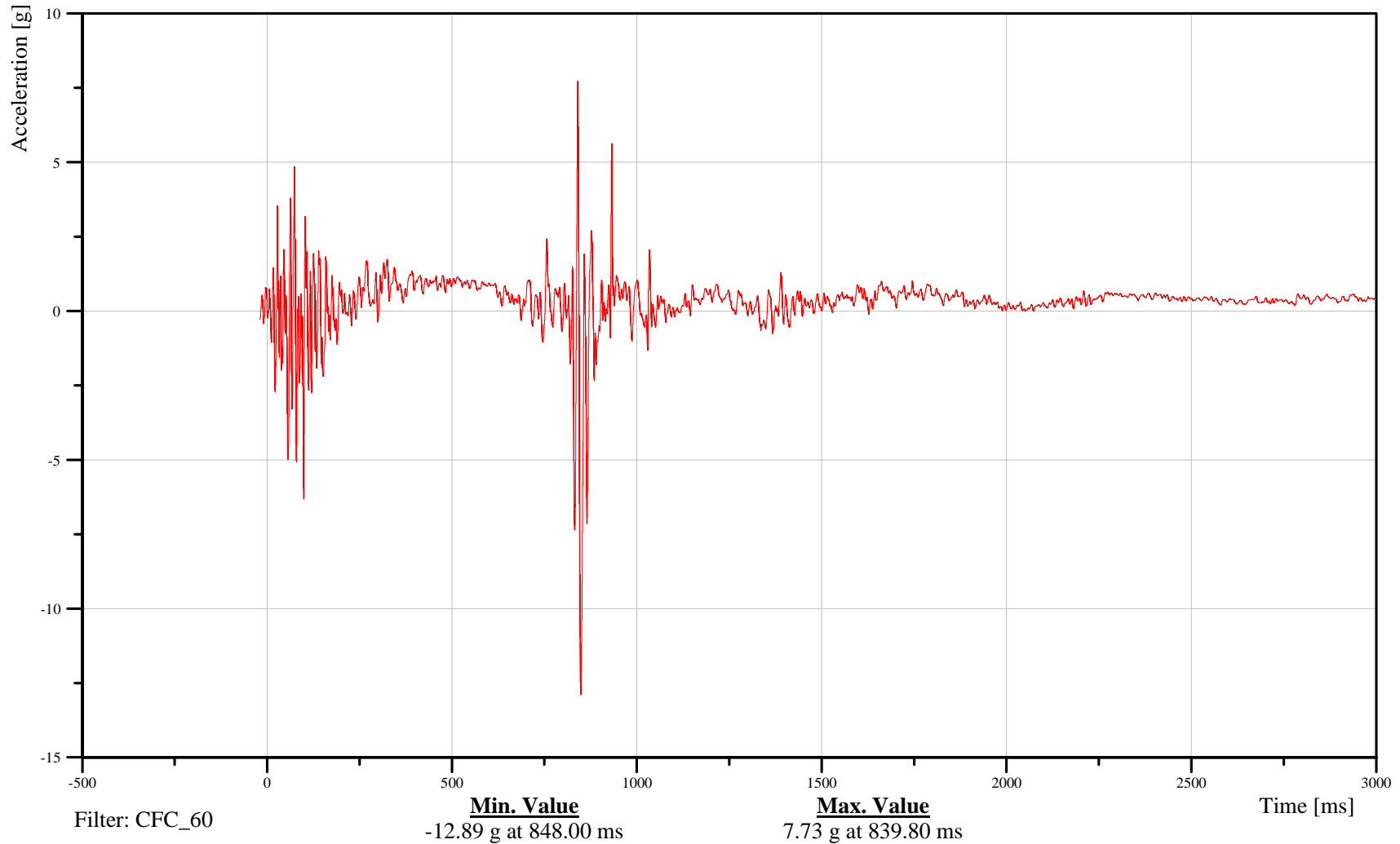
Vehicle CG Z-Axis Acceleration - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00ACZD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

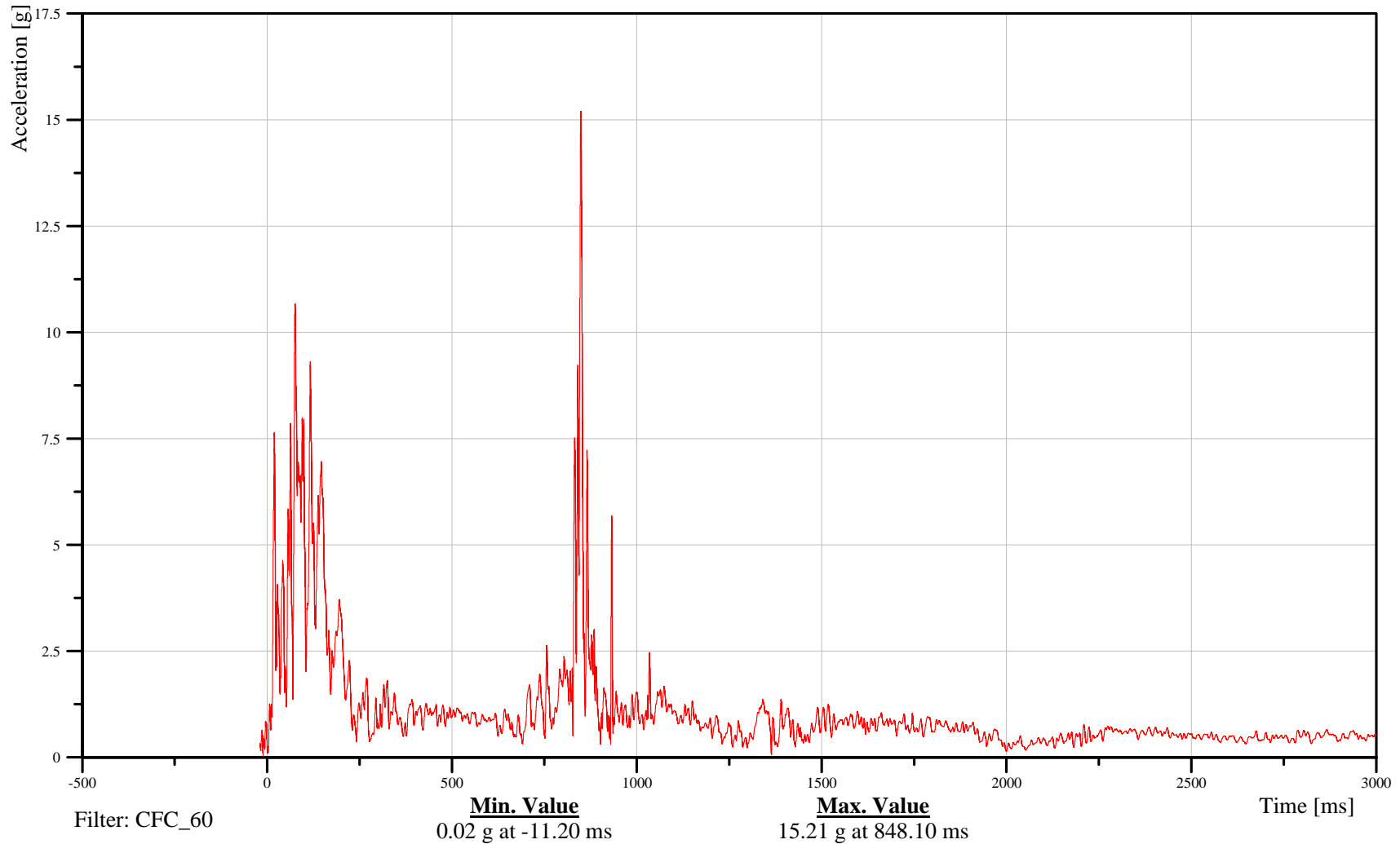
Vehicle CG Resultant Acceleration - Redundant

Customer: Off the Wall Products, LLC

10VEHCCGRD00ACRD

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

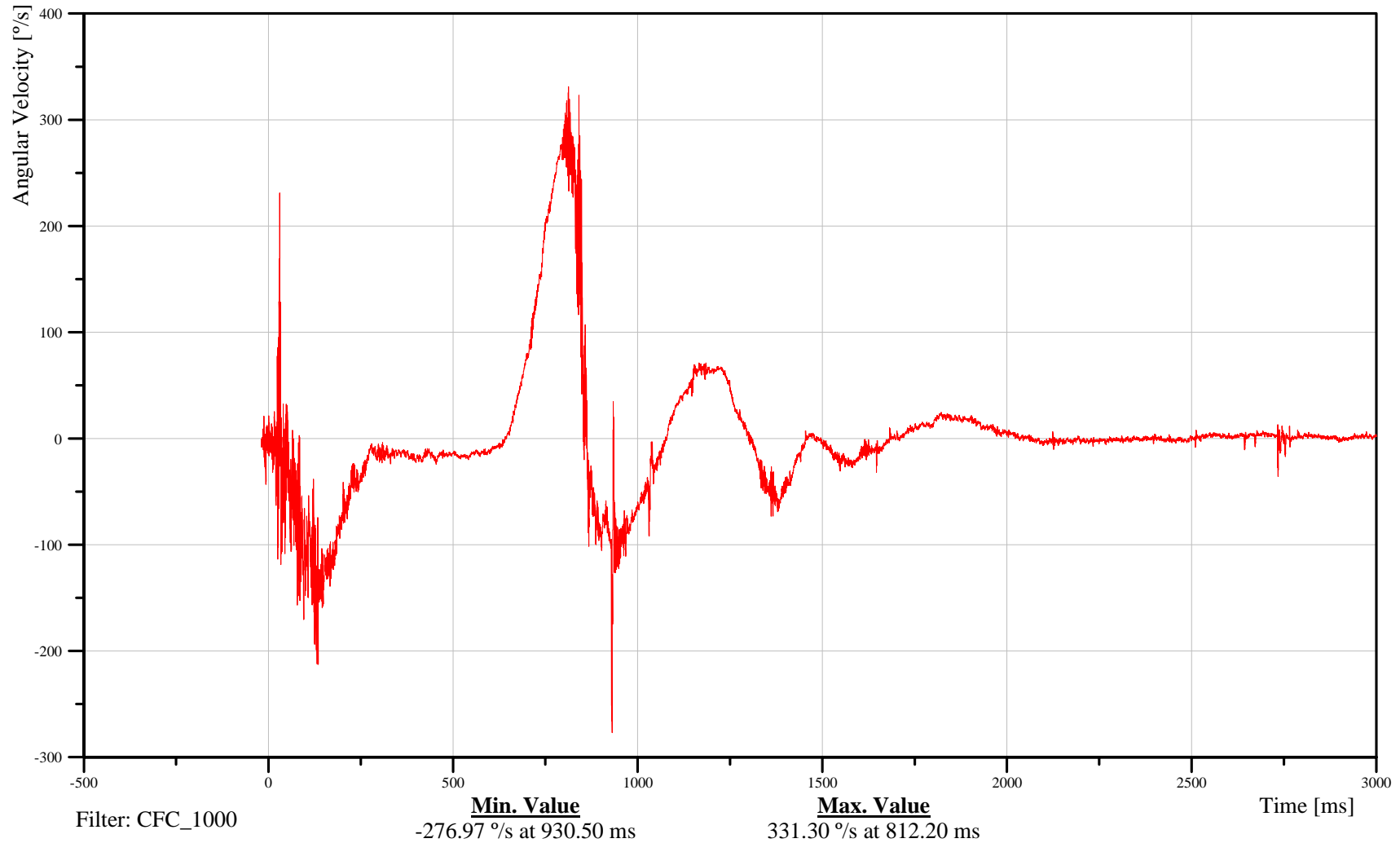
GYRO at CG X

Customer: Off the Wall Products, LLC

10VEHCCG0000AVXA

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

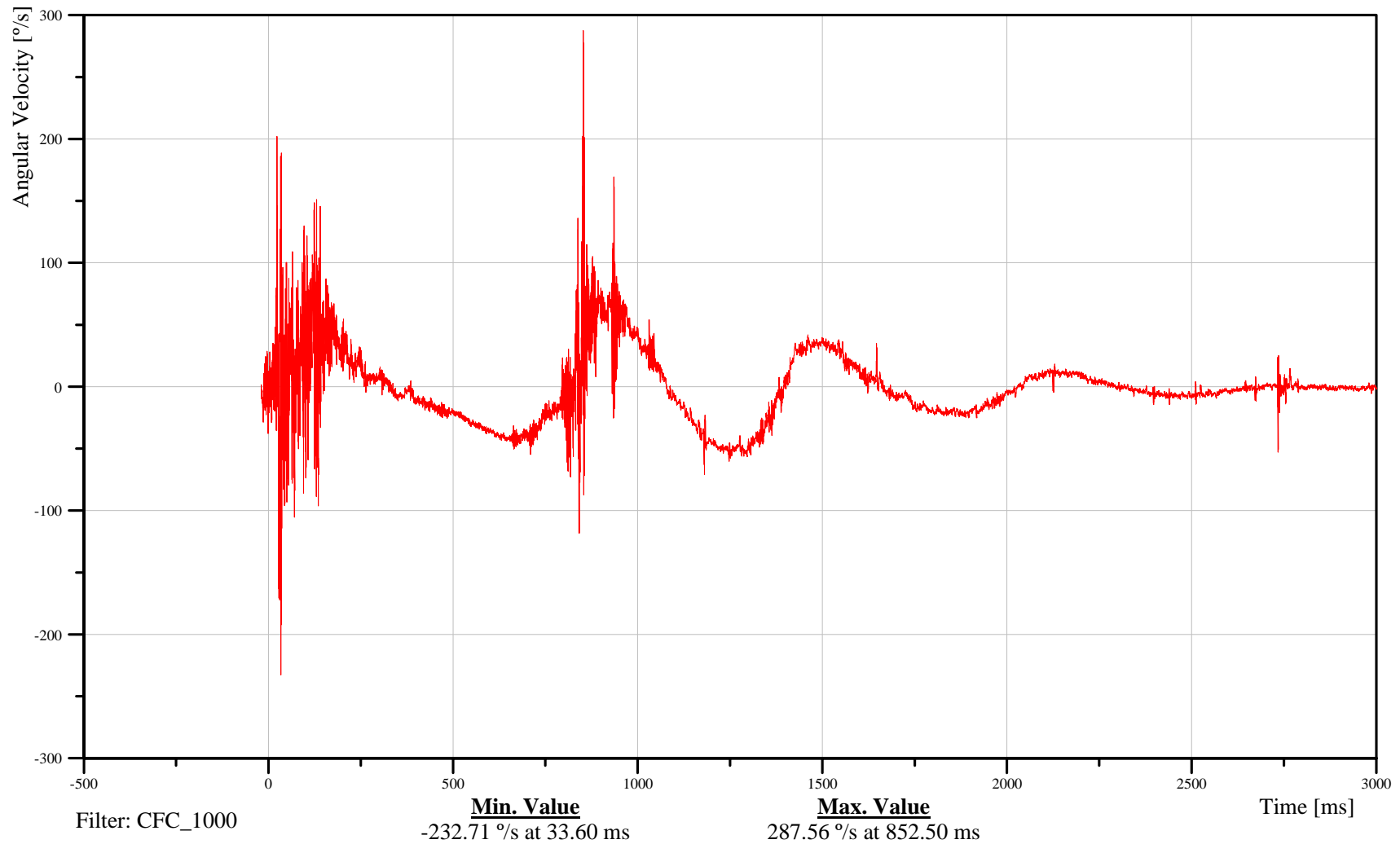
GYRO at CG Y

Customer: Off the Wall Products, LLC

10VEHCCG0000AVYA

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

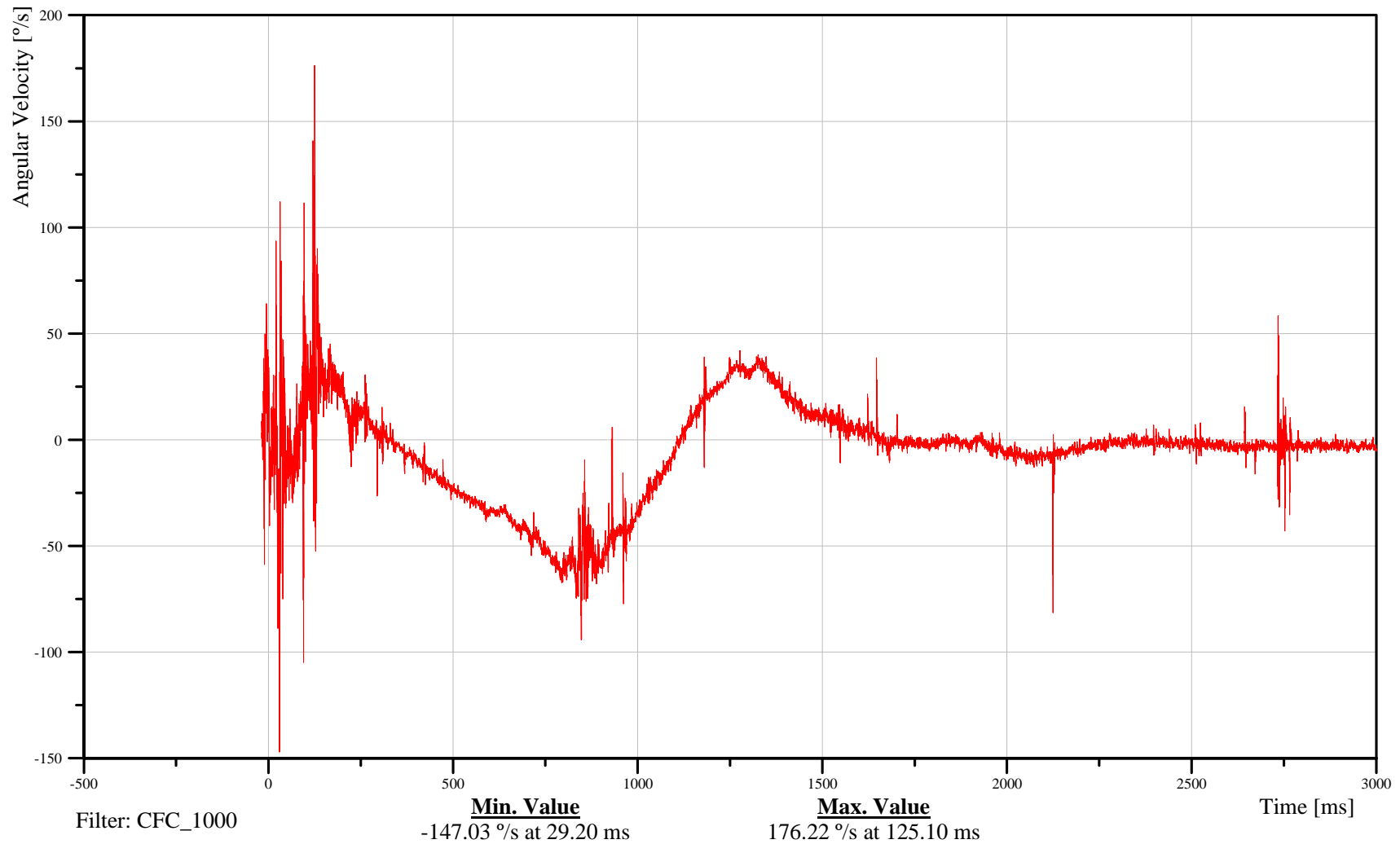
GYRO at CG Z

Customer: Off the Wall Products, LLC

10VEHCCG0000AVZA

TRC Inc. Test Lab: CTF

Test Number: 061221





NCHRP350 Test 3-71 on Multi-Barrier Model MB-42x72 JSS LCB

Date: 12/21/2006
Time: 11:11

NCHRP350 Analysis

Customer: Off the Wall Products, LLC

TRC Inc. Test Lab: CTF

Test Number: 061221

Acceleration Severity Index



Theoretical Head Impact Velocity

<u>Channels</u> 10VEHCCG0000AVZC 10VEHCCG0000ACXC 10VEHCCG0000ACYC	Initial Yaw Angle: 0 radians Distance of Head CG to Vehc. CG: 0 m Distance of Head to Impact Surface (X): 0.6 m Distance of Head to Impact Surface (Y): 0.3 m	Time of Flight: 193.90 ms Head Impact Velocity: 24.38 km/h
---	--	---

Post-Impact Head Deceleration

<u>Channels</u> 10VEHCCG0000ACXC 10VEHCCG0000ACYC Time of Collision: 0.1939 s	Time of Maximum Head Delay: 842.70 ms Maximum Head Deceleration After Impact: 5.59 g
--	---

Occupant Impact Velocity

<u>Channels</u> 10VEHCCG0000ACXC 10VEHCCG0000ACYC	Distance of Head CG to Vehc. CG: 0 m Distance of Head to Impact Surface (X): 0.6 m Distance of Head to Impact Surface (Y): 0.3 m	Time of Flight: 193.70 ms Occupant Impact Velocity: 24.25 km/h (X) Occupant Impact Velocity: -1.33 km/h (Y)
---	--	---

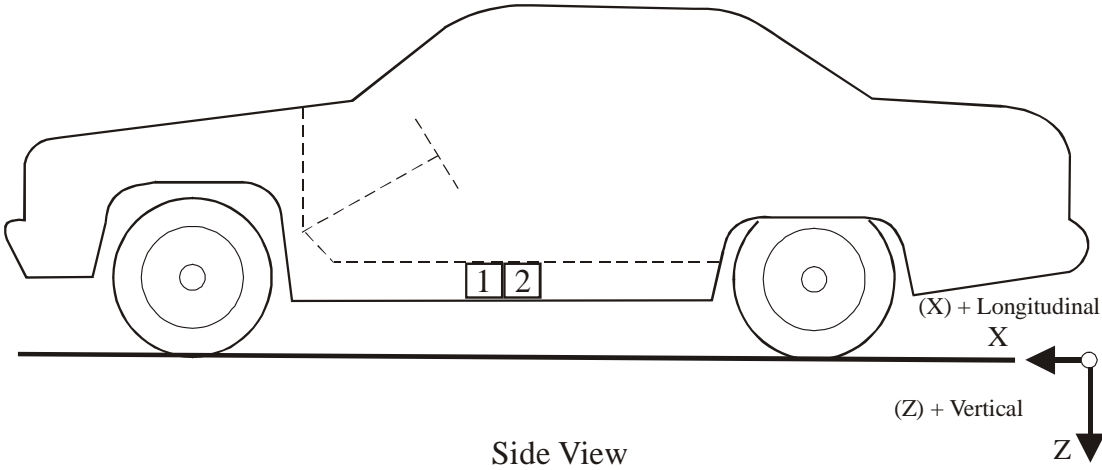
Occupant Ridedown Acceleration

<u>Channels</u> 10VEHCCG0000ACXC 10VEHCCG0000ACYC Time of Collision: 0.1937 s	Time of the Stoppage Deceleration (X): 842.70 ms Stoppage Deceleration After the Impact (X): 5.57 g Time of the Stoppage Deceleration (Y): 837.30 ms Stoppage Deceleration After the Impact (Y): 2.97 g
--	--

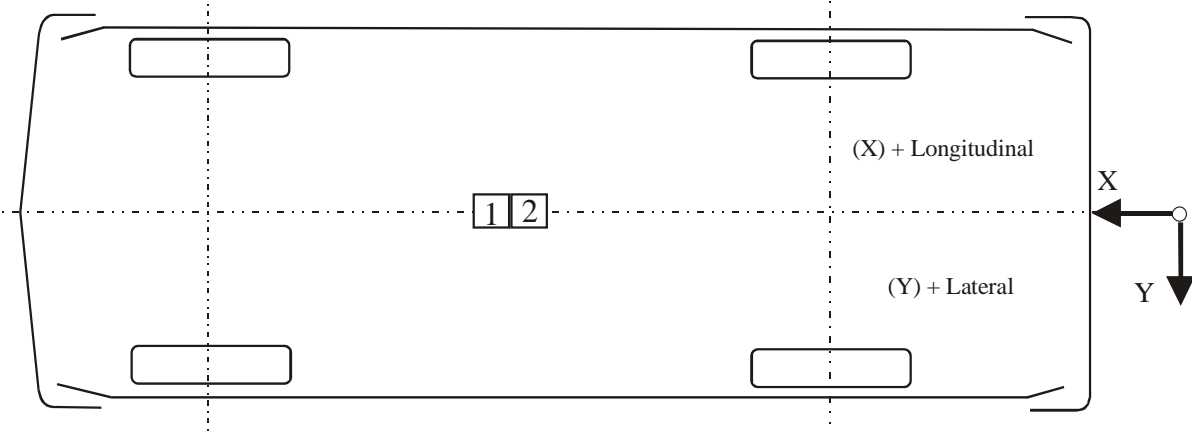
Appendix C

Miscellaneous Test Data

820C Passenger Vehicle Accelerometer Placement



Side View

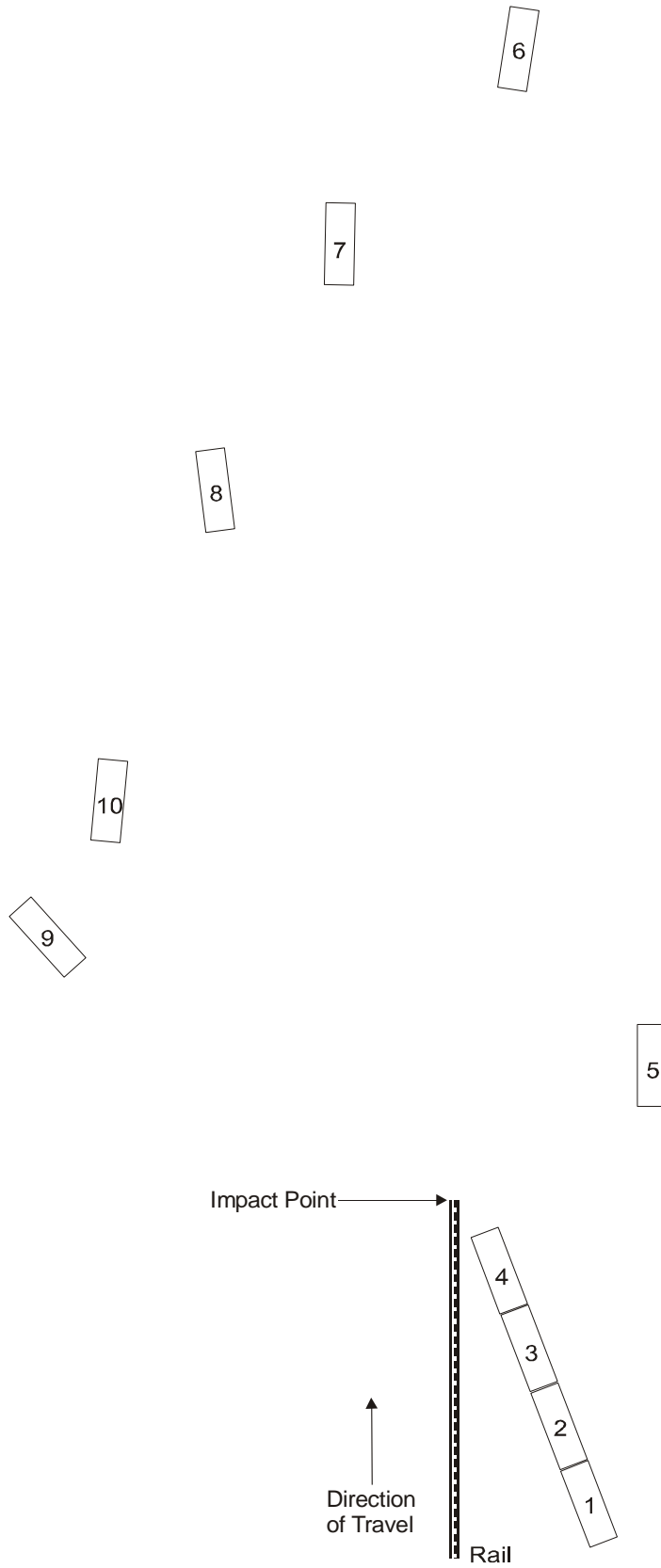


Bottom View

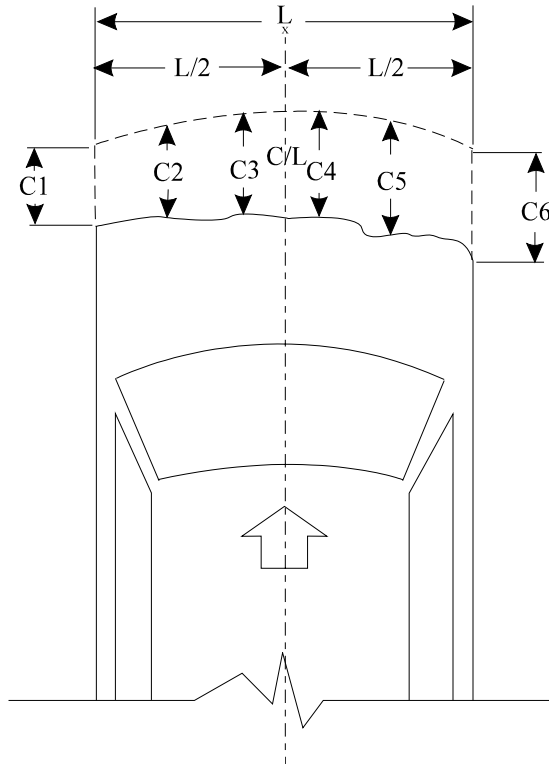
820C Passenger Vehicle Accelerometer Locations and Data Summary

Accel. No.	Location	Positive Direction		Negative Direction	
		Max. (g)	Time (ms)	Max. (g)	Time (ms)
1	Vehicle Center of Gravity				
	Longitudinal X	4.5	840.0	10.35	75.6
	Lateral Y	4.8	842.1	5.01	19.3
	Vertical Z	7.0	840.3	11.10	848.2
	Resultant R	13.7	848.3		
2	Vehicle Center of Gravity				
	Redundant				
	Longitudinal X	4.6	839.9	10.48	75.6
	Lateral Y	4.3	842.6	4.72	19.2
	Vertical Z	7.7	839.8	12.89	848.0
Resultant R	15.2	848.1			

Post-Test Barrier Diagram



Impacting Vehicle Crush Data



NOTES: L is pre-test length of contact surface.
 $C1$ through $C6$ are spaced equally apart.
 CL is vehicle centerline.

Vehicle: 2001 Suzuki Swift 2-door

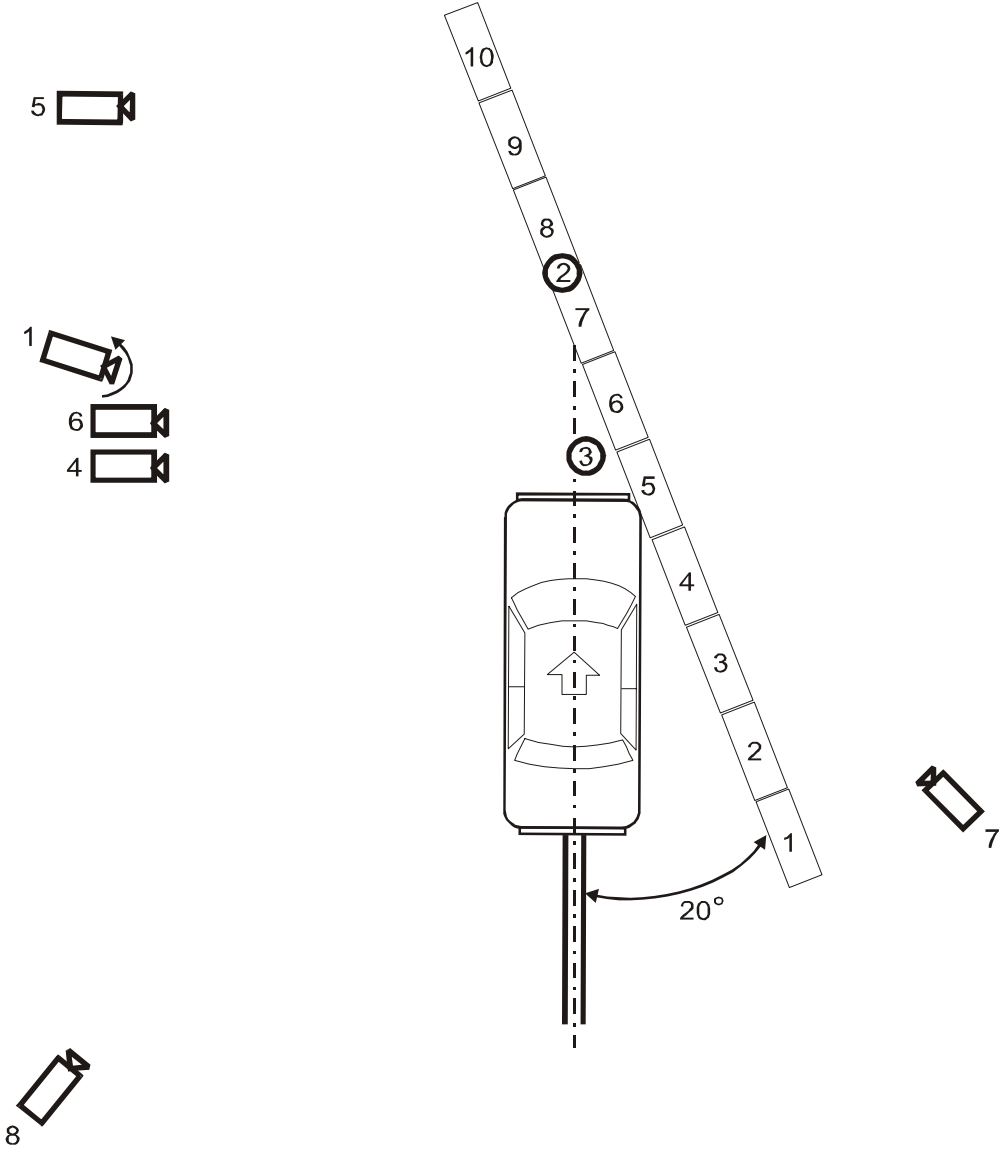
	Pre-test	Post-test	Crush
L	1423 mm	N/A	N/A
$C1$	3875 mm	3624 mm	251 mm
$C2$	3990 mm	3731 mm	259 mm
$C3$	4045 mm	3777 mm	268 mm
$C4$	4045 mm	3765 mm	280 mm
$C5$	3994 mm	3725 mm	269 mm
$C6$	3878 mm	3610 mm	268 mm
CL	4050 mm	3780 mm	270 mm

Impacting Vehicle Occupant Compartment Deformation

Test No. 061221

Measurement	Pre-Test	Post-Test	Difference	Percent Reduction
AL: Left Dash to Rear	1755 mm	1755 mm	0 mm	0.0%
AR: Right Dash to Rear	1718 mm	1718 mm	0 mm	0.0%
BL: Left Roof to Floor	1030 mm	1030 mm	0 mm	0.0%
BR: Right Roof to Floor	1030 mm	1030 mm	0 mm	0.0%
CL: Left Toeboard to Rear	2095 mm	2095 mm	0 mm	0.0%
CR: Right Toeboard to Rear	2073 mm	2073 mm	0 mm	0.0%
DL: Left Lower Dash to Floor	345 mm	345 mm	0 mm	0.0%
DR: Right Lower Dash to Floor	310 mm	310 mm	0 mm	0.0%
E: Interior Width	1250 mm	1250 mm	0 mm	0.0%
F: Right Window Lower Edge to Left Window Upper Edge	1250 mm	1250 mm	0 mm	0.0%
G: Left Window Lower Edge to Right Window Upper Edge	1270 mm	1270 mm	0 mm	0.0%

Camera Positions



Camera Information

<u>Camera Number</u>	<u>Location</u>	<u>Type</u>	<u>Lens (mm)</u>	<u>Speed (fps)</u>	<u>Purpose of Camera Data</u>
1	Real-time panning	Canon	Zoom	30	Documentation
2	Overhead wide	Redlake-LE	12.5	500	Vehicle dynamics
3	Overhead tight	Redlake-LE	25	500	Impact alignment
4	Left wide	Redlake-LE	12.5	500	Vehicle dynamics
5	Left wide upstream	Redlake-LE	6.5	500	Vehicle dynamics
6	Left tight	Redlake-LE	25	500	Impact alignment
7	Right oblique	Redlake-LE	12.5	500	Vehicle dynamics
8	Left oblique	Redlake-LE	12.5	500	Vehicle dynamics

Channel Report Test Number 061221

Ref	Transducer ID	ISO Signal Identifier	Description	FScale	Units	DAS	
						Flip	Positive Polarity
1	Trig D1	10ZERO00000VO0A	EVENT		1 Logic	+	Bipolar
2	P54220	10VEHCCG0000ACXA	Vehicle CG X-Axis Acceleration	2000	g	+	Forward
3	P54192	10VEHCCG0000ACYA	Vehicle CG Y-Axis Acceleration	2000	g	+	Rightward
4	P46610	10VEHCCG0000ACZA	Vehicle CG Z-Axis Acceleration	2000	g	-	Upward
5	P54224	10VEHCCGRD00ACXA	Vehicle CG X-Axis Acceleration - Redundant	2000	g	+	Forward
6	P49772	10VEHCCGRD00ACYA	Vehicle CG Y-Axis Acceleration - Redundant	2000	g	-	Leftward
7	P50431	10VEHCCGRD00ACZA	Vehicle CG Z-Axis Acceleration - Redundant	2000	g	-	Upward
8	DT-225-X	10VEHCCG0000AVXA	GYRO at CG X	400	%s	+	Right side down
9	DT-225-Y	10VEHCCG0000AVYA	GYRO at CG Y	400	%s	-	Nose down
10	DT-225-Z	10VEHCCG0000AVZA	GYRO at CG Z	400	%s	+	Front turned right

Command File Test Number 061221

Channel	ISO Mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
1	10VEHCCG0000ACXA	Vehicle CG X-Axis Acceleration	60	+	yes	2000
1A	10VEHCCG0000VEXA	Vehicle CG X-Axis Velocity	180			
1B	10VEHCCG0000DCXA	Vehicle CG X-Axis Displacement	180			
2	10VEHCCG0000ACYA	Vehicle CG Y-Axis Acceleration	60	+	yes	2000
2A	10VEHCCG0000VEYA	Vehicle CG Y-Axis Velocity	180			
2B	10VEHCCG0000DCYA	Vehicle CG Y-Axis Displacement	180			
3	10VEHCCG0000ACZA	Vehicle CG Z-Axis Acceleration	60	+	yes	2000
3A	10VEHCCG0000ACRA	Vehicle CG Resultant Acceleration	60			
4	10VEHCCGRD00ACXA	Vehicle CG X-Axis Acceleration - Redundant	60	+	yes	2000
4A	10VEHCCGRD00VEXA	Vehicle CG X-Axis Velocity - Redundant	180			
4B	10VEHCCGRD00DCXA	Vehicle CG X-Axis Displacement - Redundant	180			
5	10VEHCCGRD00ACYA	Vehicle CG Y-Axis Acceleration - Redundant	60	+	yes	2000
5A	10VEHCCGRD00VEYA	Vehicle CG Y-Axis Velocity - Redundant	180			
5B	10VEHCCGRD00DCYA	Vehicle CG Y-Axis Displacement - Redundant	180			
6	10VEHCCGRD00ACZA	Vehicle CG Z-Axis Acceleration - Redundant	60	+	yes	2000
6A	10VEHCCGRD00ACRA	Vehicle CG Resultant Acceleration - Redundant	60			
7	10VEHCCG0000AVXA	GYRO at CG X	1000	+	yes	400
8	10VEHCCG0000AVYA	GYRO at CG Y	1000	+	yes	400
9	10VEHCCG0000AVZA	GYRO at CG Z	1000	+	yes	400

Appendix D

Multi-Barrier Model MB-42x72 JSS LCB Channelizing Barricade System Specifications

Additional test article information to be supplied by Off The Wall Products, LLC