REPORT NUMBER: 301R-CAL-12-012

SAFETY COMPLIANCE TESTING FOR FMVSS 301R
FUEL SYSTEM INTEGRITY – REAR IMPACT

Chrysler Group LLC
2012 Fiat 500
Pop Hatchback

NHTSA NUMBER: CC0524

PREPARED BY:
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October 8, 2012

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration Enforcement
Office of Vehicle Safety Compliance
Mail Code: NVS-220
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9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225		***10. Work Unit No.*** ***11. Contract or Grant No.*** DTNH22-11-D-00243
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16. Abstract Compliance tests were conducted on the subject of a 2012 Fiat 500 Pop Hatchback in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301R compliance. Test failures identified were as follows: **None - The test vehicle appeared to comply with all requirements of FMVSS 301R "Fuel System Integrity – Rear Impact."**		
17. Key Words Compliance Testing Safety Engineering FMVSS 301R	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Reference Division (TIS) (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Telephone No. (202) 366-4946	

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SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301R Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-11-D-00243. The purpose of this test was to determine if the subject vehicle, a 2012 Fiat 500 Pop Hatchback, meets the performance requirements of FMVSS No. 301R “Fuel System Integrity – Rear Impact.” The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1281.5 kg 2012 Fiat 500 Pop Hatchback was impacted from the rear by a 1357.0 kg moving barrier at a velocity of 79.41 kph (49.34 mph). The test was performed by Calspan Corporation on September 14, 2012.

The test vehicle was equipped with a 40.1 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (68.0kg) was secured in the vehicle cargo area. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information are found on page 3-7 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact and including all portions of the static rollover test. The maximum vehicle longitudinal crush was 250 millimeters of which the average was 155 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

SECTION 3

SUMMARY OF TEST RESULTS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – Test Vehicle Specifications

Data Sheet No. 2 – Pre-Test Data

Data Sheet No. 3 – Moving Deformable Barrier (MDB) Data

Data Sheet No. 4 – High Speed Camera Locations and Data Summary

Data Sheet No. 5 – Post-Test Data

Data Sheet No. 6 – FMVSS No. 301 Static Rollover Test Data

DATA SHEET NO. 1
TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2012 Fiat 500 Pop Hatchback
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: CC0524
Test Date: 9/14/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	CC0524
Model Year	2012
Make	Fiat
Model	500
Body Style	Pop Hatchback
Body Color	Orange
Odometer Reading (km/mi)	35 / 22
Engine Displacement (L)	1.4
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Manual
Transmission Speeds	5-Speed
Final Drive	Front Wheel Drive

Overdrive	Yes
Air Conditioning (AC)	Yes
All-Wheel Drive (AWD)	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADL)	No
Power Brakes	Yes
Power Seats	No
Power Steering	Yes
Power Windows	Yes
Stability Control (Auto-Leveling)	Yes
Sunroof/T-Top	No
Tilt Steering Wheel	Yes
Traction Control System (TCS)	Yes

DEALER AND DELIVERY INFORMATION FROM CERTIFICATION LABEL

Manufactured By	Chrysler Group LLC
Date of Manufacture	5/12
VIN	3C3CFFARXCT348119

GVWR (kg)	1497
GAWR Front (kg)	850
GAWR Rear (kg)	810

TIRE PLACARD & SIDEWALL INFORMATION

Tire Placard Location: Driver's Door Sill
Spare Tire Type: Inflatable Spare Tire Kit

Measured Parameter	Front	Rear
Tire Manufacturer	Firestone	Firestone
Tire Name	Firehawk GT	Firehawk GT
Tire Type	All season	All season
Max. Tire Pressure (kPa)	300	300
Recommended Tire Size	185/55R15	185/55R15
Load Index/Speed Symbol	82H	82H
Recommended Cold Tire Pressure (kPa)	230	210
Tire Size on Vehicle	185/55R15	185/55R15
Treadwear/ Traction Grade/ Temperature Grade	460/B/A	460/B/A

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	2	0	4
Seat Type (Bench, Bucket, or Split Bench)	Bucket	Bench	--	
Capacity Weight (VCW) (kg)				340.00
DSC X 68.04 (kg)				272.16
Cargo Weight (RCLW) (kg)				67.84

DATA SHEET NO. 2
PRE-TEST DATA

Test Vehicle: 2012 Fiat 500 Pop Hatchback
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: CC0524
Test Date: 9/14/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	341.0	198.0		396.0	254.0	
Right	kg	334.0	190.0		382.0	249.5	
Ratio	%	63.5	36.5		60.7	39.3	
Totals	kg	675.0	388.0	1,063.0	778.0	503.5	1,281.5

TARGET TEST WEIGHT CALCULATION (TTW)

Measured Parameter	Units	Value	
Total Unloaded Vehicle Weight (UVW)	kg	1,063.0	(A)
Rated Cargo/Luggage Weight (RCLW)	kg	67.8	(B)
Weight of two P572E ATDS @ 78kg each	kg	156.0	(C)
Target Vehicle Test Weight (TVTW)	kg	1,286.8	(A+B+C)

*As tested Weight = (TTW -10kg) <=ATW < (TTW -5kg); TTW = Weight of Test Vehicle with 2 dummies and 67.8kg of Cargo Weight

GENERAL TEST VEHICLE DATA

Measured Parameter	Units	Value
Vehicle Wheelbase	mm	2298
Vehicle Length (at Centerline)	mm	3544
Vehicle Width (at B-pillar)	mm	1598
Weight of Ballast Secured in Cargo Area[1]	kg	68.0
Type of Ballast		Lead Shot
Method of Securing Ballast		Rear Passenger Foot Well
Components Removed for Weight Reduction		None
Vehicle Width at Widest Point	mm	1632
Vehicle Width at Widest Point Location		A-Pillar
Centerline offset for impact line	mm	326
Filler neck side (left/right)		Right

[1] Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

TEST VEHICLE ATTITUDE AND CG

	Units	Left		Right		CG (aft of front axle)
		Front	Rear	Front	Rear	
As Delivered (UVW)	mm	634	672	639	672	839
As Tested (ATW)	mm	618	632	616	641	903

DATA SHEET NO. 2 (Continued)
PRE-TEST DATA

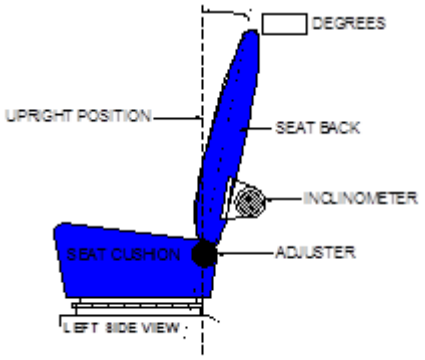
Test Vehicle: 2012 Fiat 500 Pop Hatchback
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: CC0524
Test Date: 9/14/2012

SEATING

Nominal Design Riding Position (for adjustable driver and passenger seat backs). *Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.*

Driver Seat Instructions: The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1.

Passenger Seat Instructions: The passenger seat back was positioned to allow for a zero head angle of the passenger dummy.



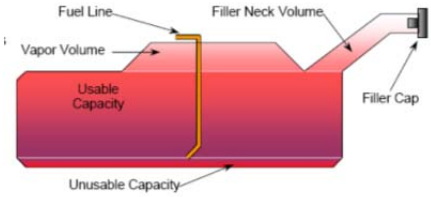
FRONT SEAT ASSEMBLY

Measured Parameter	Deg.
Driver Seat Back Angle	0.9
Passenger Seat Back Angle	0.8

SEAT FORE/AFT POSITIONING

Driver Seat: Set to mid-point of fore/aft at lowest height
Passenger Seat: Set to mid-point of fore/aft

	Total # of Positions	Placed in Position #
Driver Seat	22	11
Passenger Seat	22	11



VEHICLE FUEL TANK ASSEMBLY

FUEL TANK CAPACITY DATA

Measured Parameter	Reference	Liters
Fuel System Capacity (Standard Tank)	Owner's Manual	40.1
COTR Usable Capacity (Standard Tank)	Form No. 1	40.1
Test Volume Range	91-94% of Usable Capacity	36.5 – 37.7
Actual Test Volume (Solvent Used)	93% of Usable Capacity	37.3

FUEL SYSTEM DATA

Measured Parameter	Value
Test Fluid Type	Stoddard Solvent
Test Fluid Specific Gravity	0.764
Test Fluid Kinematic Viscosity (centistokes)	0.96
Test Fluid Color	Red
Electric Fuel Pump?	Yes
Can Activate Electric Fuel Pump with Ignition Switch On but Engine Off?	No

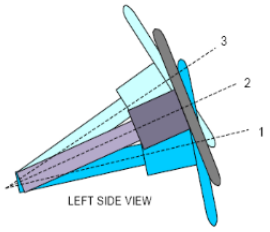
Fuel Pump Comments : None

DATA SHEET NO. 2 (Continued)
PRE-TEST DATA

Test Vehicle: 2012 Fiat 500 Pop Hatchback NHTSA No.: CC0524
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 9/14/2012

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



STEERING COLUMN ASSEMBLY

Operational Instructions: was set to mid position at 26.8 degrees.

SEAT BELT UPPER ANCHORAGE

Nominal design riding position

Operational Instructions: There were no adjustable upper anchorages

COMMENTS: None

DATA SHEET NO. 3
MOVING DEFORMABLE BARRIER (MDB) DATA

Test Vehicle: 2012 Fiat 500 Pop Hatchback
NHTSA No.: CC0524
Test Program: FMVSS 301R Compliance Rear Impact Test
Test Date: 9/14/2012

MDB Face Manufacturer: Plascore
MDB Face Serial No. A0110001

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length of MDB (incl. honeycomb impactor face)	4120
Wheelbase of Framework Carriage	2591
Tread of Framework Carriage (Front & Rear)	1875
CG Location of Front Axle	1139

MDB WEIGHTS

	Units	Front	Rear	Total
Left	kg	358.0	322.0	680.0
Right	kg	404.0	273.0	677.0
Ratio	%	56.2%	43.8%	100.0%
Totals	kg	762.0	595.0	1357.0

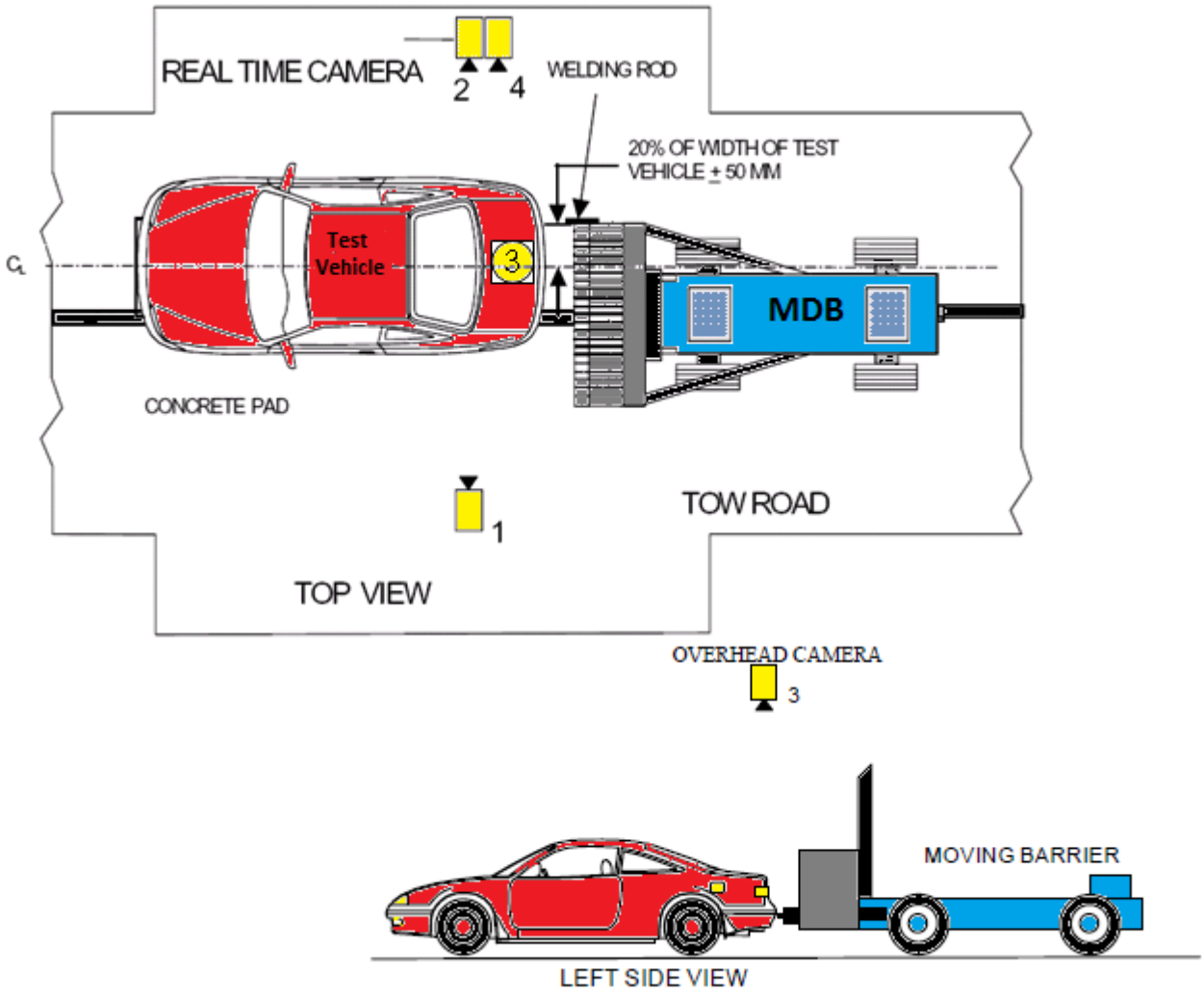
MDB TIRE SIZE & PRESSURES

	Units	Requirement	Left Front	Right Front	Left Rear	Right Rear
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

Brake Abort System? (Yes/No): Yes
Date of Last MDB Calibration: May 15th, 2010

DATA SHEET NO. 4
HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Test Vehicle: 2012 Fiat 500 Pop Hatchback
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: CC0524
Test Date: 9/14/2012



No.	Camera View	Coordinates (mm)			Angle (Deg)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	2083	9203	939	0.0	24	1000
2	Real-Time Camera						30
3	Overhead View	273	454	5305	0.0	20	1000
4	Right Side View	1597	8675	949	0.0	24	1000

* Reference (from point of impact); all measurements accurate to within ±6 mm.
X = (Impact Point) + Forward
Y = (Impact Point) + To Right
Z = (Ground Level) + Down

DATA SHEET NO. 5
POST-TEST DATA

Test Vehicle: 2012 Fiat 500 Pop Hatchback NHTSA No.: CC0524
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 9/14/2012

VIN: 3C3CFFARXCT348119

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)

Measurement Description	Units	Speed
Trap No. 1	km/h	79.41
Trap No. 2	km/h	79.33
Average Impact Speed	km/h	79.37

WELDING ROD IMPACT POINT

Measurement Description	Tolerance	Units	Value
Vertical distance from target center (+ is above)	±40 mm	mm	-24
Horizontal distance from target center (+ is right)	±50 mm	mm	5

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases:
(Maximum allowable is 28 grams) 0 grams

B. For the 5-minute period after motion ceases:
(Maximum allowable is 28 grams) 0 grams

C. For the next 25 minutes:
(Maximum allowable is 28 grams/minute) 0 grams

D. Spillage Details: No Spillage Occurred

DATA SHEET NO. 5
POST-TEST DATA (Continued)

Test Vehicle: 2012 Fiat 500 Pop Hatchback NHTSA No.: CC0524
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 9/14/2012

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	15	54
Seat Back Failure	Yes	Yes
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	Rear Windshield Shattered on Impact

VEHICLE CRUSH MEASUREMENTS: LENGTH

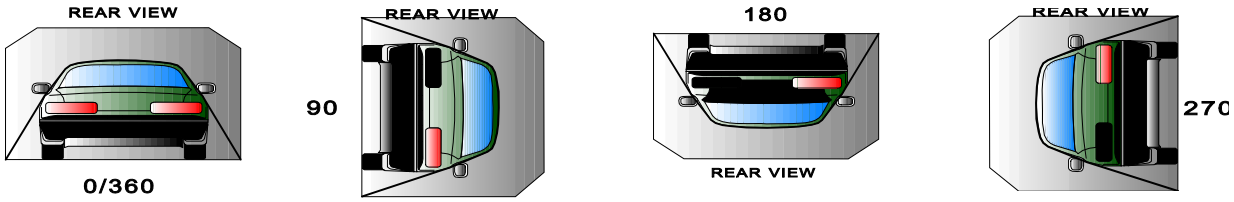
Measurement	Left Side	Centerline	Right Side
Pre-Test	3448	3544	3450
Post-Test	3409	3294	3274
Crush	39	250	176

VEHICLE CRUSH MEASUREMENTS: WHEELBASE

Measurement	Left Side	Centerline	Right Side
Pre-Test	2298		2298
Post-Test	2301		2245
Crush	-3		53

DATA SHEET NO. 6
FMVSS NO. 301 STATIC ROLLOVER TEST DATA

Test Vehicle:	2012 Fiat 500 Pop Hatchback	NHTSA No.:	CC0524
Test Program:	FMVSS 301R Compliance Rear Impact Test	Test Date:	9/14/2012



Rear View

ROLLOVER SOLVENT COLLECTION TIME TABLE

Test Phase	Rotation Time (spec. 1 -3 min)		Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	15	5	6	15	7
90° to 180°	1	2	5	6	2	7
180° to 270°	1	2	5	6	2	7
270° to 360°	1	9	5	6	9	7

FMVSS 301 REQUIREMENTS TABLE (Maximum allowable solvent spillage)

First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
142	28	28	28

ACTUAL TEST VEHICLE STODDARD SOLVENT SPILLAGE TABLE

Test Phase	First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER STODDARD SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure A-1: As Delivered Left Front ¾ View

Figure A-2: Vehicle Certification Placard

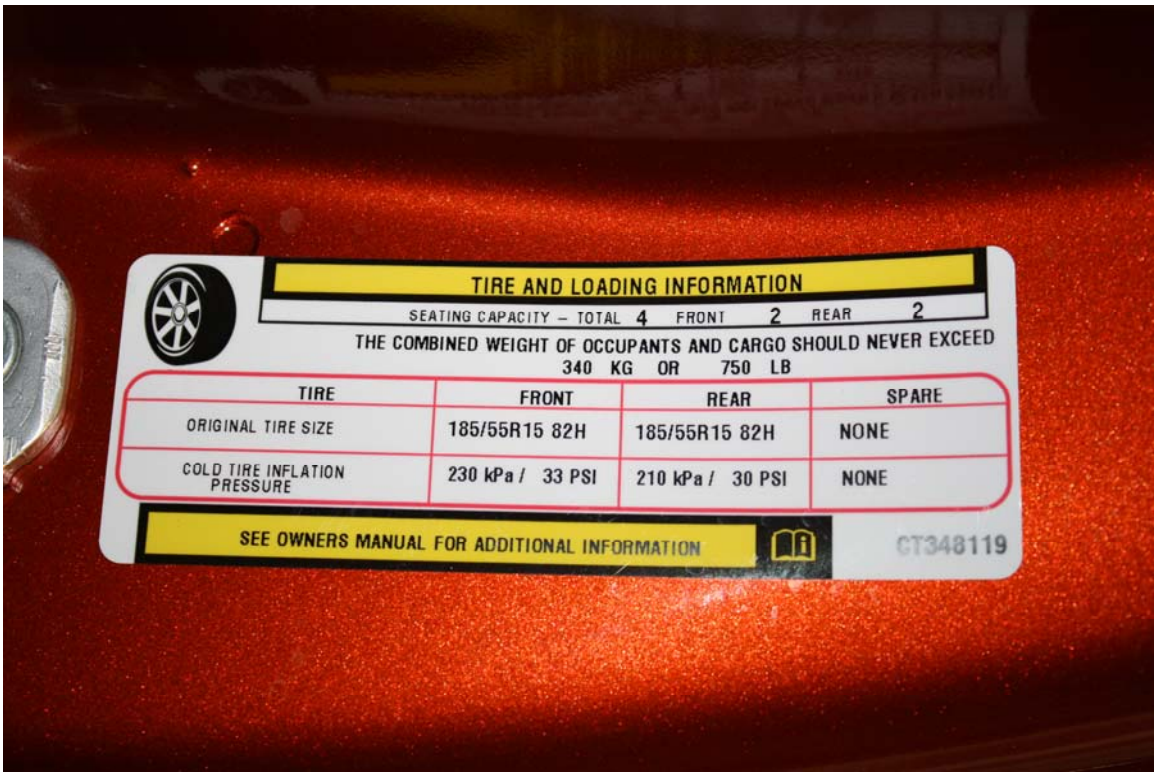


Figure A-3: Vehicle Tire Placard

Figure A-4: Pre-Test Front View

Figure A-5: Post-Test Front View

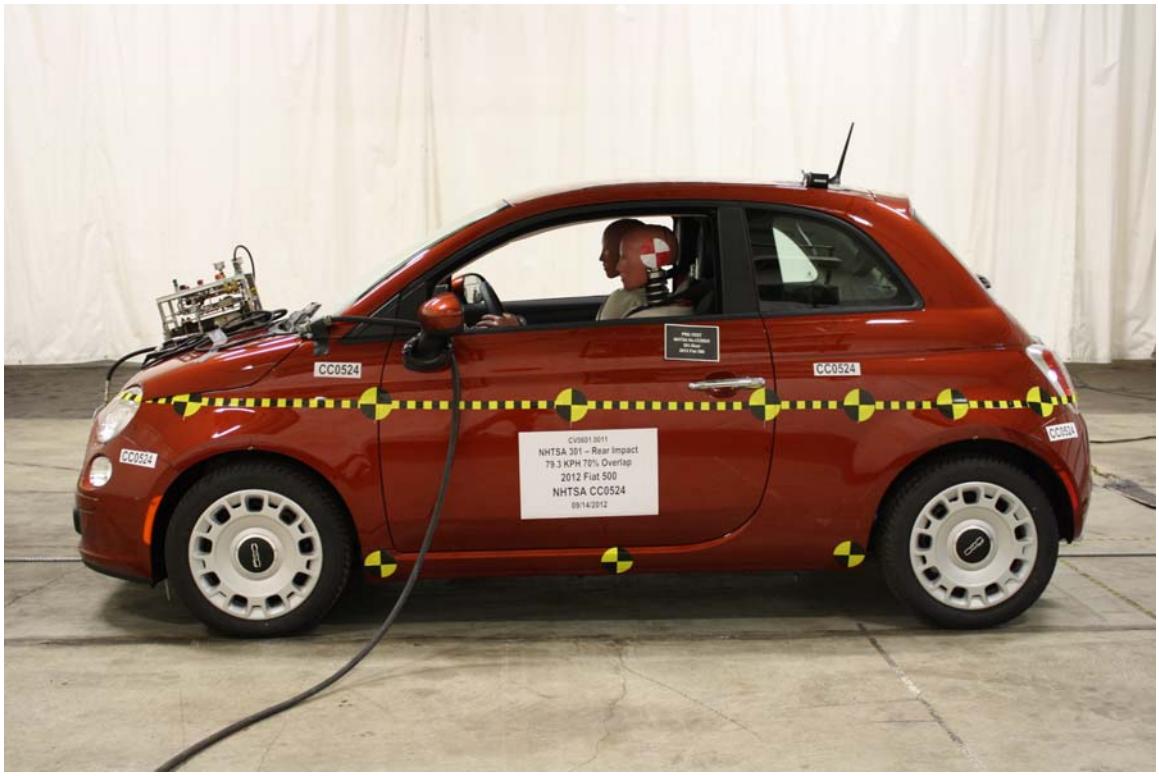


Figure A-6: Pre-Test Left Side View

Figure A-7: Post-Test Left Side View

Figure A-8: Pre-Test Right Side View

Figure A-9: Post-Test Right Side View

Figure A-10: Pre-Test Left Front 3/4 View

Figure A-11: Post-Test Left Front 3/4 View

Figure A-12: Pre-Test Right Front 3/4 View

Figure A-13: Post-Test Right Front 3/4 View

Figure A-14: Pre-Test Left Rear 3/4 View

Figure A-15: Post-Test Left Rear 3/4 View

Figure A-16: Pre-Test Right Rear 3/4 View

Figure A-17: Post-Test Right Rear 3/4 View

Figure A-18: Pre-Test Rear View

Figure A-19: Post-Test Rear View

Figure A-20: Pre-Test MDB Front View

Figure A-21: Post-Test MDB Front View

Figure A-22: Pre-Test MDB Left Side View

Figure A-23: Post-Test MDB Left Side View

Figure A-24: Pre-Test MDB Right Side View

Figure A-25: Post-Test MDB Right Side View

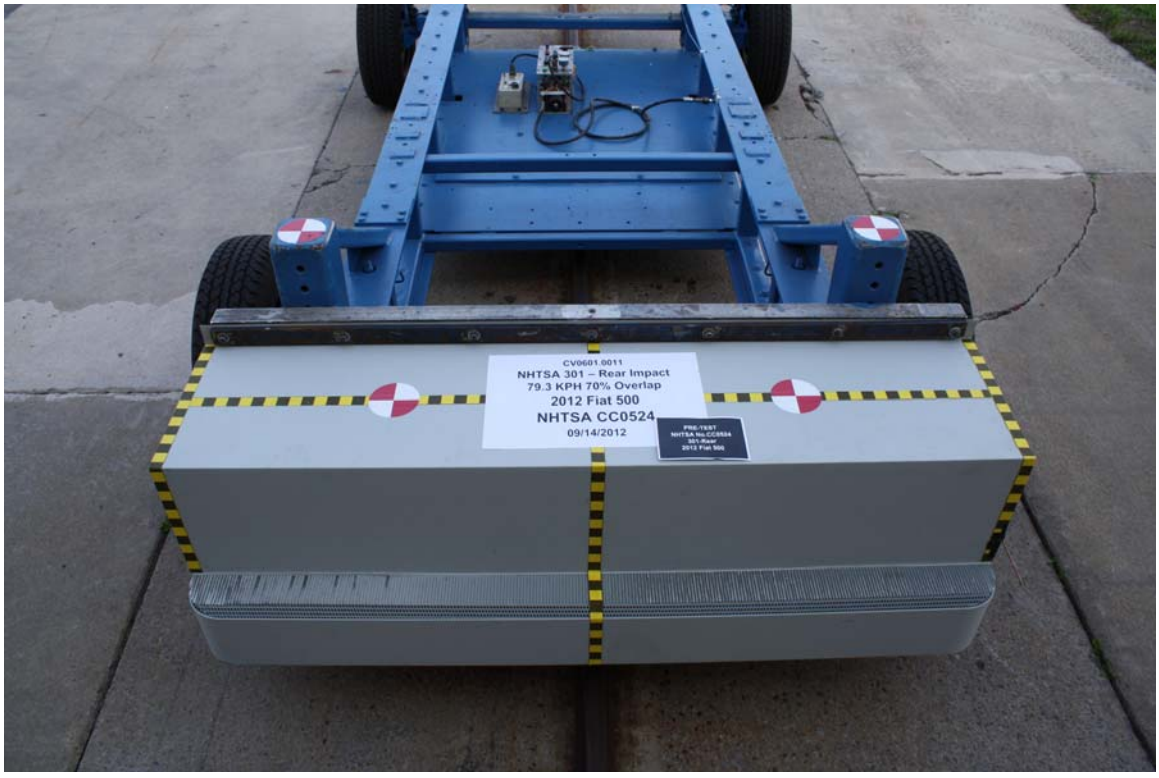


Figure A-26: Pre-Test MDB Top View

Figure A-27: Post-Test MDB Top View

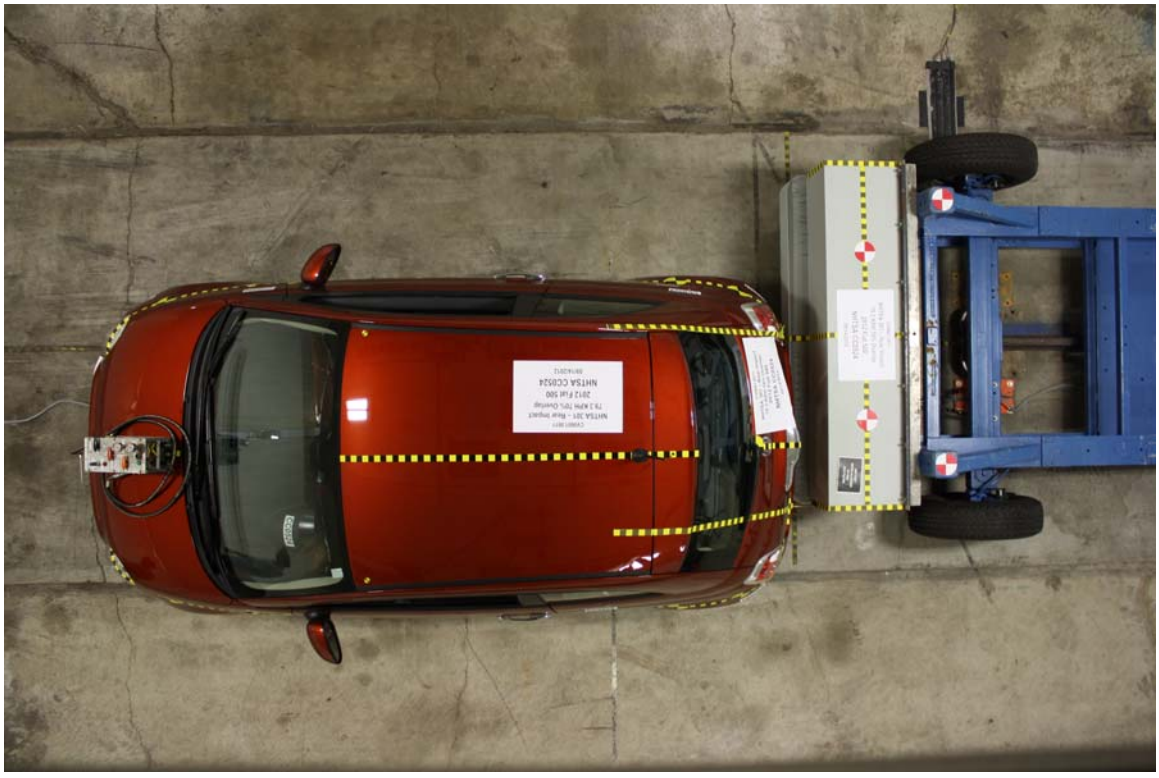


Figure A-28: Pre-Test Overhead Vehicle and MDB View

Figure A-29: Post-Test Impact Target View

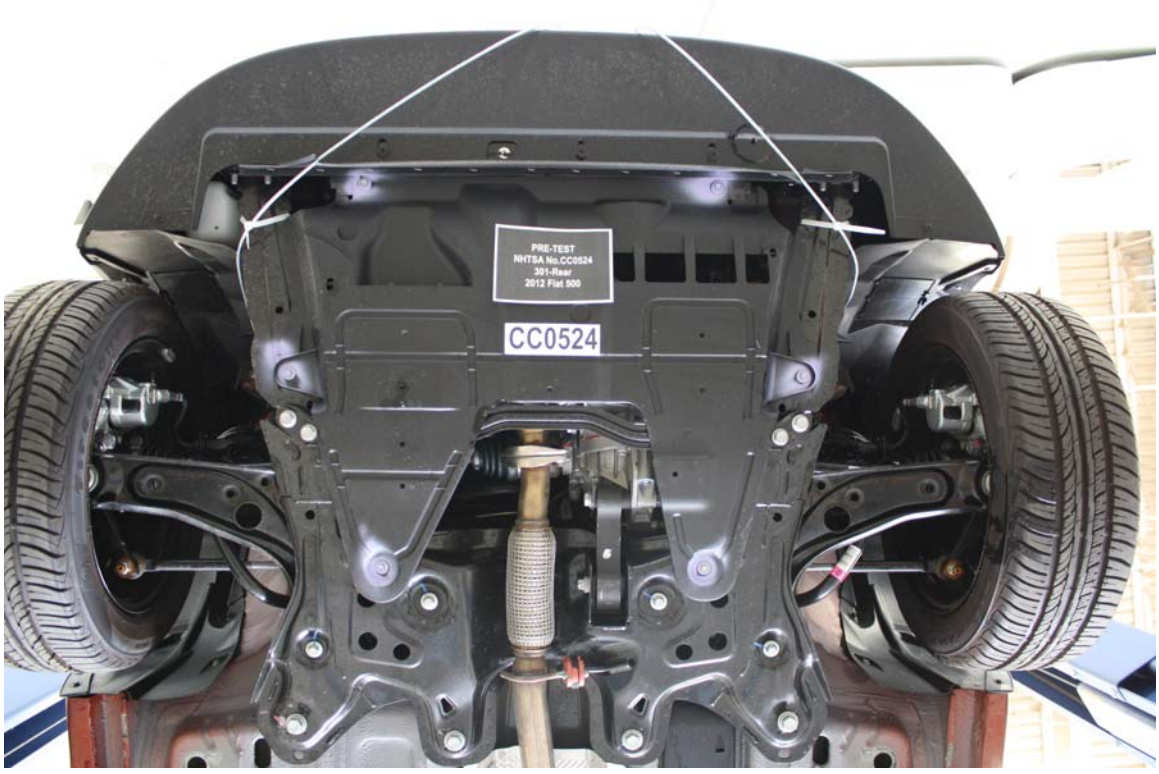


Figure A-30: Pre-Test Front Underbody View

Figure A-31: Post-Test Front Underbody View

Figure A-32: Pre-Test Mid Underbody View

Figure A-33: Post-Test Mid Underbody View

Figure A-34:Pre-Test Rear Underbody View

Figure A-35: Post-Test Rear Underbody View

Figure A-36: Pre-Test Fuel Filler Cap View

Figure A-37: Post-Test Fuel Filler Cap View

Figure A-38: Impact View

Figure A-39: Speed Trap View

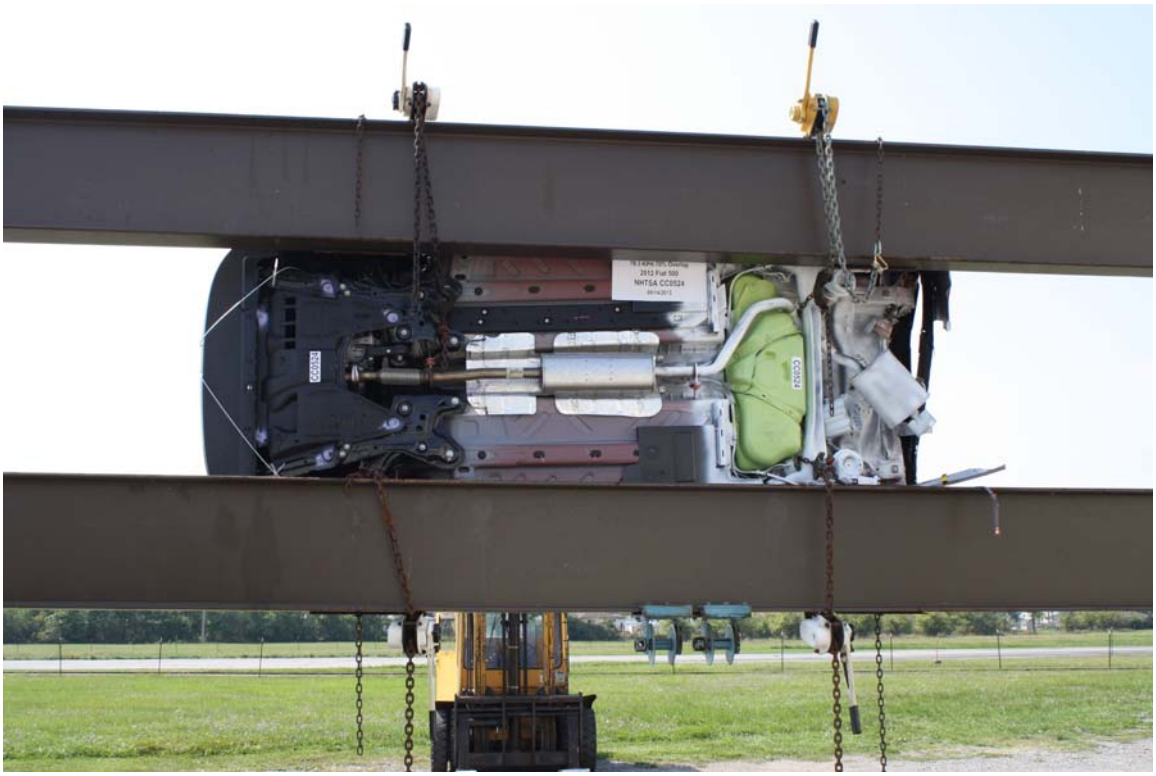


Figure A-40: Rollover 90° View

Figure A-41: Rollover 180° View

Figure A-42: Rollover 270° View

Figure A-43: Rollover 360° View