

REPORT NUMBER: TR-P32096-01-NC

**RESEARCH AND DEVELOPMENT
80 KM/H 70% OFFSET REAR IMPACT**

**VOLKSWAGEN DE MEXICO S.A. DE C.V.
1998 VOLKSWAGEN BEETLE 3-DOOR HATCHBACK**

NHTSA NUMBER: PW5800

**PREPARED BY:
KARCO ENGINEERING, LLC.
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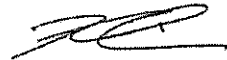
**TEST DATE:
JUNE 27, 2012**

**REPORT DATE:
JULY 6, 2012
FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
NATIONAL CENTER FOR STATISTICS AND ANALYSIS
OFFICE OF REGULATORY ANALYSIS AND EVALUATION
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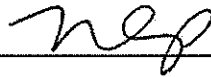
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July 6, 2012

FINAL REPORT ACCEPTANCE BY NHTSA COTR



7/18/12

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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				6. Performing Organization Code KAR	
7. Authors Mr. Kelsey A. Chiu, Engineering Department Supervisor, KARCO Mr. Frank Richardson, Program Manager, KARCO				8. Performing Organization Report No. TR-P32096-01-NC	
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12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration National Center for Statistics and Analysis Office of Regulatory Analysis and Evaluation 1200 New Jersey Ave., SE, Room W53-469 Washington, D.C. 20590				13. Type of Report and Period Covered Final Test Report, June 27, 2012 - July 7, 2012	
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15. Supplementary Notes					
16. Abstract A 80 km/h 70% offset rear impact test was conducted on the subject 1998 Volkswagen Beetle 3-door hatchback in accordance with the specifications of the Office of Vehicle Compliance Laboratory Test Procedure Laboratory Test Procedure for FMVSS 301R. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on June 27, 2012. The impact velocity was 79.58 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 35.6 deg. C. The vehicle's doors remained closed and operational throughout the event. The rear hatch opened as a result of the impact. Stoddard solvent leaked from the fuel filler neck area on the right rear fender fo the vehicle during portions of the static rollover. Leaks were visible whild holding at the 90° position, while moving from 90° to 180°, and while holding at 180°.					
17. Key Words FMVSS 301R Offset Rear Impact MDB 1998 Volkswagen Beetle				18. Distribution Statement	
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SECTION 1

SUMMARY OF TEST

SUMMARY

The purpose of this rear impact test series is to measure the performance of the subject vehicle, a 1998 Volkswagen Beetle, for FMVSS 301R *'Fuel System Integrity – Rear Impact'*.

This 80 km/h 70% Offset Rear Impact is sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-11-D-00245. It was conducted in accordance with the Office of Vehicle Compliance Laboratory Test Procedure for FMVSS 301R *'Fuel System Integrity – Rear Impact'*, dated January, 2007.

A 1998 Volkswagen Beetle 3-door hatchback was impacted by a moving deformable barrier at a velocity of 79.58 km/h. The test was performed at KARCO Engineering, LLC. on June 27, 2012. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

Two (2) real-time cameras and three (3) high-speed cameras were used to document the rear impact event.

Two Part 572E 50th percentile male anthropomorphic test devices (ATD) were placed in the driver and right front passenger seating positions. Both ATD's were un-instrumented for this test.

Both the driver and passenger side doors remained closed during the impact event and were operable after the impact. The rear hatch unlatched and opened after impact.

There was no Stoddard solvent leakage immediately after the event. During the static rollover there was solvent leakage while rotating from 0° to 90°, while holding at 90°, while rotating from 90° to 180°, and while holding at 180°. All solvent leakage appeared to come from the fuel filler neck portion that is contained within the right rear fender. The leak appeared to come from several different tubes connected to the fuel tank and filler port. Some tubes were pinched while others appeared to be cut. Solvent leakage is summarized in Data Sheets 5 and 6. Photographs of the damaged area are presented in Appendix A.

SECTION 2
DATA SHEETS

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback

NHTSA No.: PW5800

Test Program: 70% Overlap Rear Impact

Test Date: 06/27/12

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

TEST VEHICLE SPECIFICATIONS

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback NHTSA No.: PW5800
 Test Program: 70% Overlap Rear Impact Test Date: 06/27/12

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	PW5800
Model Year	1998
Make	Volkswagen
Model	Beetle
Body Style	3-Door Hatchback
VIN	3VWBB61C0WM0
Date Received	6/12/2012
Body Color	Red
Odometer Reading (km / mi)	72622
Engine Displacement (L)	2.0
Engine Placement	Transverse
Transmission Type	Standard
Transmission Speeds	6
Overdrive	Yes
Final Drive	Front
Roof Rack	No
Sunroof / T-Top	No
Tinted Glass	Yes
Traction Control	Yes
Power Brakes	Yes
Front Disc Brakes	Yes
Rear Disc Brakes	Yes
Anti-Lock Brakes (ABS)	Yes

All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Airbag	Yes
Driver Head Airbag	No
Driver Curtain Airbag	No
Driver Combo Airbag	No
Driver Knee Airbag	No
Passenger Front Airbag	Yes
Passenger Side Airbag	Yes
Passenger Head Airbag	No
Passenger Curtain Airbag	No
Passenger Combo Airbag	No
Passenger Knee Airbag	No
Seat Belt Pre-Tensioners	Yes
Load Limiters	Yes
Bucket Seats	No
Air Conditioning	Yes
AM/FM CD	Yes
Tilt Steering	Yes
Automatic Door Locks	Yes
Power Windows	Yes
Power Seats	No

Does Owner's Manual provide instructions to turn off automatic door locks?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Volkswagen De Mexico S.A. De C.V.
Date of Manufacture	Jan-98

GVWR (kg)	1780
GAWR Front (kg)	930
GAWR Rear (kg)	850

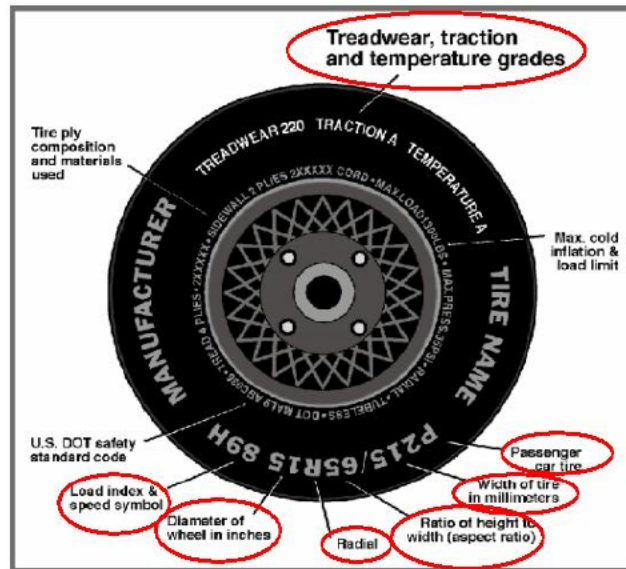
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	2		4	
Capacity Weight (VCW) (kg)				417.0	A
DSC x 68.04 (kg)				272.2	B
Cargo Weight (RCLW) (kg)				145.0	A-B

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	1998 Volkswagen Beetle 3-Door Hatchback	NHTSA No.:	PW5800
Test Program:	70% Overlap Rear Impact	Test Date:	06/27/12



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max Tire Pressure (kPa)	300	300
Cold Tire Pressure (kPa)	175	175
Max Load Tire Pressure (kPa)	200	200
Recommended Tire Size	P205/60R15	P205/60R15
Tire Size on Vehicle	P205/55R16	P205/55R16
Tire Manufacturer	BF Goodrich	BF Goodrich
Tire Model	Traction T/A	Traction T/A
Load Range	89T	89T
Treadwear Rating	620	620
Traction Rating	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	89T	89T
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	N4T2 TJ11 0708	N4T2 TJ11 0708
DOT Safety Code Right	N4T2 TJ11 0708	N4T2 TJ11 0708
Type of Spare Tire	195/65R15	
Location of Tire Placard on Vehicle	Fuel Filler Cover	

DATA SHEET NO. 2
PRE-TEST INSPECTION

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback

NHTSA No.: PW5800

Test Program: 70% Overlap Rear Impact

Test Date: 06/27/12

Feature	Yes	No	Comments
Is the vehicle totally complete?	X		None
Does the vehicle run and drive?	X		None
Is there any sign that the vehicle has ever been in a crash?		X	None
Are the bumpers damaged?		X	None
Do the doors open and close properly?	X		None
Are the doors properly aligned so that there are no gaps when closed?	X		None
Does the battery hold a charge so that electrical accessories in the vehicle may be operated without starting the engine?	X		None
Does the vehicle sag or have a raised or lowered suspension?		X	None
Are any of the control arms or other suspension components damaged or distorted?		X	None
Do the tires have some usable tread remaining and hold pressure?	X		None
Are the radiator and/or its supporting cross members damaged?		X	None
Is the cooling system able to retain its coolant and are the proper fluid levels maintained?	X		None
Does the fuel tank leak?		X	None
Does the fuel tank have any damages or dents that would reduce its internal capacity?		X	None
Is the fuel tank located behind the rear axle?		X	None
Is the fuel tank located between the front and rear axle?	X		None
Is the vehicle attitude "as tested" between "as delivered" and "fully loaded" before running the test?	X		None

Equipment	Present		Proper Place		Operate Properly	
	Yes	No	Yes	No	Yes	No
Engine	X		X		X	
Transmission	X		X		X	
Drive Axles	X		X		X	
Battery	X		X		X	
Alternator	X		X		X	
Radiator	X		X		X	

DATA SHEET NO. 3**PRE-TEST DATA**Test Vehicle: 1998 Volkswagen Beetle 3-Door HatchbackNHTSA No.: PW5800Test Program: 70% Overlap Rear ImpactTest Date: 06/27/12**TEST VEHICLE AXLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	406.5	234.5		450.0	319.0		444.5	331.5	
Right	kg	391.0	232.0		457.0	326.0		449.5	332.5	
Ratio	%	63.1%	36.9%	100.0%	58.4%	41.6%	100.0%	57.4%	42.6%	100.0%
Total	kg	797.5	466.5	1264.0	907.0	645.0	1552.0	894.0	664.0	1558.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1264.0	A
Actual Weight of 2 P572 ATDs Used	kg	148.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	145.0	C
Calculated Vehicle Target Wt (TVTW)	kg	1557.0	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	675	680	682	690	929
As Tested	mm	654	661	645	658	1046
Fully Loaded	mm	652	660	639	650	1073
Post-Test	mm	649	661	625	708	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2518
Total Vehicle Length	mm	4075
Amount of Stoddard Solvent in Fuel Tank	L	51.04

DATA SHEET NO. 3 ... (CONTINUED)**PRE-TEST DATA**

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback NHTSA No.: PW5800
Test Program: 70% Overlap Rear Impact Test Date: 06/27/12

BALLAST DATA

Description	Value
Type of Ballast	Ballast Dummy
Method of Securing Ballast	Seat Belt
Weight of Ballast in Cargo Area	140.5 kg
Weight of Vehicle Components Removed	0 kg

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

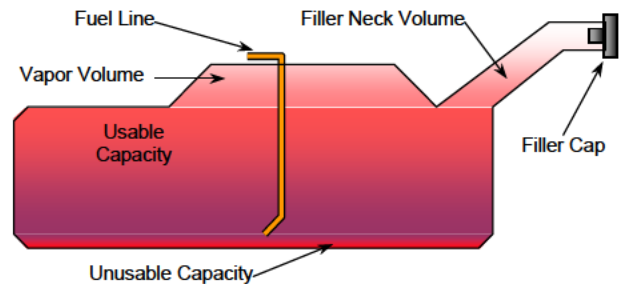
No vehicle components were removed

FUEL TANK CAPACITY

Description	Liters
Fuel System Capacity Listed in Owners Manual	54.89
Usable Capacity of "Standard Tank"	54.89
91 - 94% of Usable Capacity	49.95 - 51.60
Actual Amount of Stoddard Solvent Used	51.04

FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned on.



VEHICLE FUEL TANK ASSEMBLY

TEST FLUID

Description	Value
Test Fluid Type	Stoddard Solvent
Test Fluid Specific Gravity	0.97
Test Fluid Kinematic Viscosity	
Test Fluid Color	Purple

DATA SHEET NO. 3 ... (CONTINUED)

PRE-TEST DATA

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback

NHTSA No.: PW5800

Test Program: 70% Overlap Rear Impact

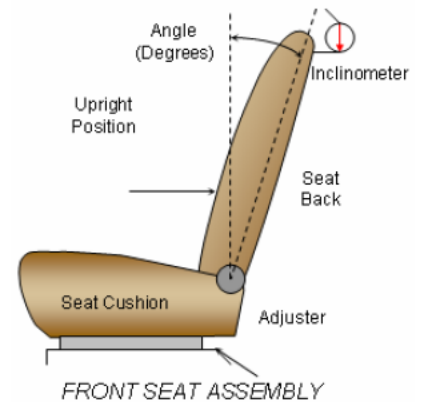
Test Date: 06/27/12

NOMINAL DESIGN RIDING POSITION

Seat back angle is measured at the headrest post using a digital inclinometer.

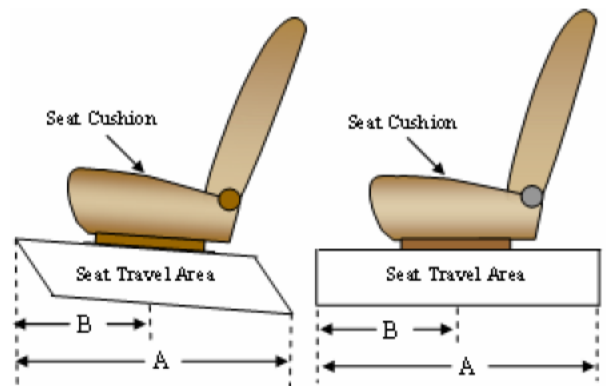
SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	17.1
Passenger Seat Back Angle	17.1



SEAT FORE / AFT POSITIONING

The total seat travel is measured from the forward most possible position to the rear most possible position. The driver's seat is set to the middle of the fore-aft travel. The passenger's seat is set to the middle of the fore-aft travel.



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	268 mm	143 mm
Passenger Seat	268 mm	143 mm

DATA SHEET NO. 3 ... (CONTINUED)

PRE-TEST DATA

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback

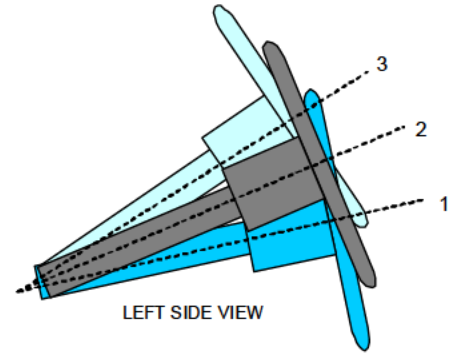
NHTSA No.: PW5800

Test Program: 70% Overlap Rear Impact

Test Date: 06/27/12

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements. A tape measure is used to measure telescoping steering wheel travel.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	21.4	110
Geometric Center Position, No. 2	23.6	126.5
Uppermost Position, No. 3	25.8	143
Telescoping Steering Wheel Travel	4.4	33
Test Position	23.6	126.5

DATA SHEET NO. 4**MOVING BARRIER DATA**Test Vehicle: 1998 Volkswagen Beetle 3-Door HatchbackNHTSA No.: PW5800Test Program: 70% Overlap Rear ImpactTest Date: 06/27/12**MOVING BARRIER TEST WEIGHT**

	Units	As Delivered Weights (UVW)		
		Front Axle	Rear Axle	Total
Left	kg	402	298	700
Right	kg	377	292	669
Ratio	%	56.9%	43.1%	100.0%
Total	kg	779	590	1368

MOVING BARRIER TIRE INFORMATION

Measured Parameter	Front	Rear
Recommended Tire Size	205/75R15	205/75R15
Tire Size on Vehicle	205/75R15	205/75R15
Tire Manufacturer	Pacemark	Pacemark
Tire Model	All Weather	All Weather
Treadwear	420	420
Traction	A	A
Temperature Grades	B	B
Tire Pressure - Front	220	220
Tire Pressure - Rear	220	220

MOVING BARRIER DIMENSIONS

Measurement Description	Length (mm)
Overall Width	1676
Overall Height	559
Honeycomb Depth	381
Overall Depth	483
Bottom Honeycomb to Bottom Bumper	51
Bumper Height	203
Ground to Top of MDB	788
Ground to Bottom of MDB	229
Ground to Bottom of Bumper	280
Ground to Top of Bumper	483

DATA SHEET NO. 5**POST TEST DATA**Test Vehicle: 1998 Volkswagen Beetle 3-Door HatchbackNHTSA No.: PW5800Test Program: 70% Overlap Rear ImpactTest Date: 06/27/12Temperature at Time of Impact: 35.6° CTest Time: 2:51 PMVIN: 3VWBB61C0WM0**IMPACT VELOCITY DATA**

Measured Parameter	Units	Value
Trap No. 1 Velocity (Primary)	km/h	79.58
Trap No. 2 Velocity (Redundant)	km/h	79.94
Average Impact Speed	km/h	79.76

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Width	mm		1730
Vertical Impact Reference Line (Left of Vehicle Center Line)	mm		346
Actual Impact Point (Left of Vehicle Center Line)	mm		339
Horizontal Offset (+ right / - left)	mm	± 50 of Intended Impact Point	-7
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	2

TARGET VEHICLE PRE- AND POST- TEST STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length at Centerline	4075	3735	-340
2	Total Length	4075	3890	-185
3	Total Width	1730	1720	-10
4	Left Side Wheelbase	2518	2530	12
5	Right Side Wheelbase	2518	2442	-76

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	382
B	Top of Bumper	533	800	Left	212
C	Mid Level	686	100	Right	132
D	Top of Stack	813	100	Right	145

DATA SHEET NO. 5 ... (CONTINUED)**POST-TEST DATA**

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback NHTSA No.: PW5800
Test Program: 70% Overlap Rear Impact Test Date: 06/27/12

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Rear Door Opening		
Hatch and Other Doors	Rear hatch unlatched and opened during impact.	

DATA SHEET NO. 6

FMVSS 301 DATA

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback NHTSA No.: PW5800
Test Program: 70% Overlap Rear Impact Test Date: 06/27/12

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Stoddard Solvent Spillage Measurements

- A. From impact until vehicle motion ceases: 0 g
(Maximum allowable = 28 g)
- B. For the 5 minute period after motion ceases: 0 g
(Maximum allowable = 28 g)
- C. For the following 25 minutes: 0 g
(Maximum allowable = 28 g/minute)
- D. Spillage: There was no Stoddard solvent spillage.

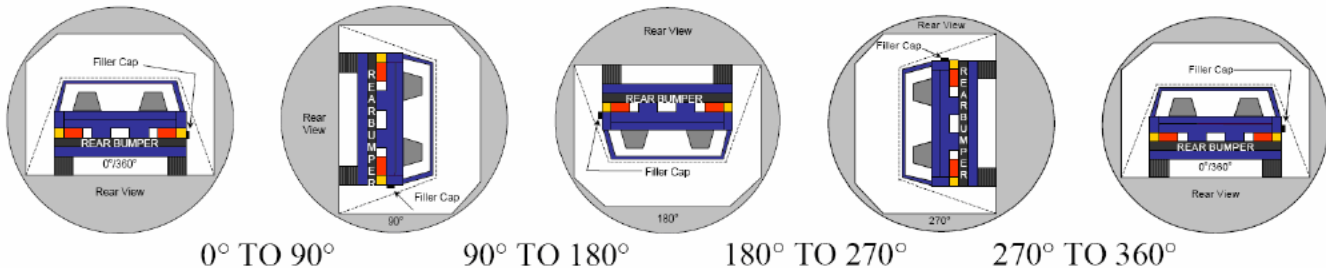
DATA SHEET NO. 7
STATIC ROLLOVER TEST DATA

Test Vehicle: 1998 Volkswagen Beetle 3-Door Hatchback

NHTSA No.: PW5800

Test Program: 70% Overlap Rear Impact

Test Date: 06/27/12



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: Stoddard solvent leaked from the fuel filler neck area on the right rear of the vehicle.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	85	310	395
90° To 180°	80	300	380
180° To 270°	78	300	378
270° To 360°	80	300	380

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° To 90°	0 g			
90°	231 g	Included in 1st 5		
90° To 180°	142 g			
180°	249 g			
180° To 270°	0 g			
270°	0 g			
270° To 360°	0 g			
360°	0 g			

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	Fuel Filler Neck
90° To 180°	Fuel Filler Neck
180° To 270°	Fuel Filler Neck
270° To 360°	

LABORATORY NOTICE OF APPARENT TEST FAILURE

TEST INFORMATION:

Test Date	6/27/2012
Laboratory	KARCO Engineering, LLC.
Contract No.	DTNH22-11-D-00245
Delivery Order No.	
Lab Project Engineer's Name	Kelsey Chiu
NHTSA No.	PW5800
Test Vehicle	
Year	1998
Make	Volkswagen
Model	Beetle
Body Style	3-Door Hatchback
VIN	3VWBB61C0WM0
Manufacturer	Volkswagen De Mexico S.A. De C.V.

TEST FAILURE DESCRIPTION:

Stoddard solvent leaked from the fuel filler neck area on the right rear fender of the vehicle during portions of the static rollover. Leaks were visible while holding at the 90° position, while moving from 90° to 180°, and while holding at 180°.

FMVSS REQUIREMENT, PARAGRAPHS:

5.3 Static Rollover

NOTIFICATION TO NHTSA

Date: 7/17/12 By: Kelsey Chiu

REMARKS:

None.

APPENDIX A
PHOTOGRAPHS

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FIGURE 1. Vehicle Certification Label

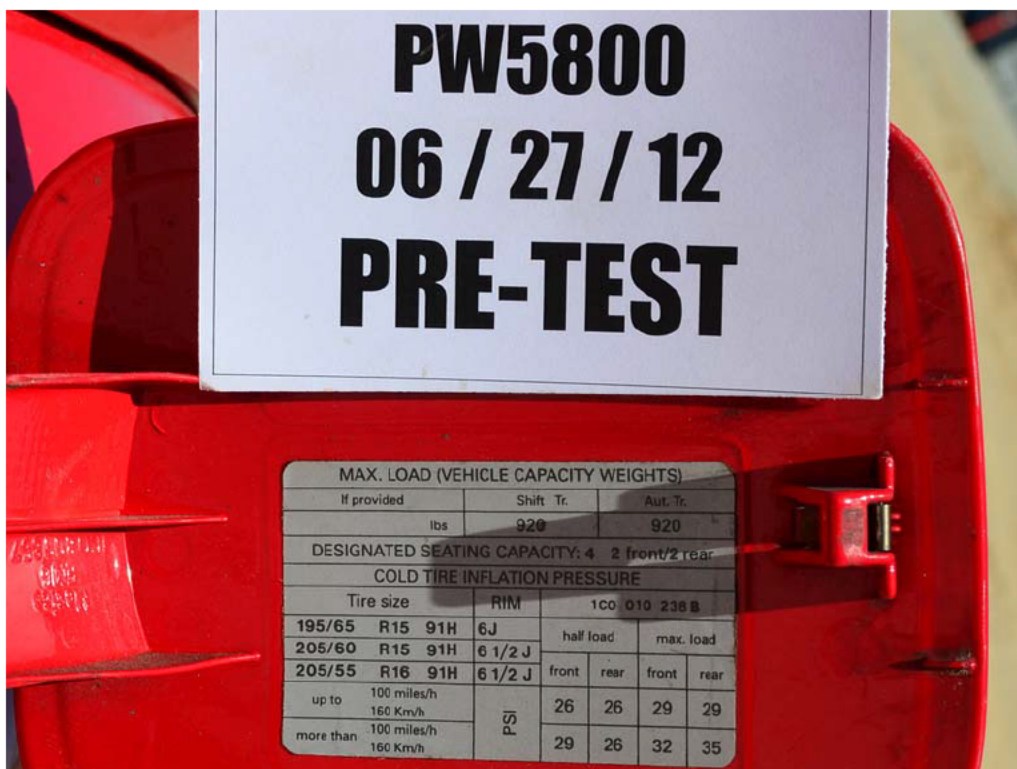


FIGURE 2. Vehicle Tire Placard



FIGURE 3. Pre-Test Front of Test Vehicle



FIGURE 4. Post-Test Front of Test Vehicle



FIGURE 5. Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 6. Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 7. Pre-Test Left View of Test Vehicle



FIGURE 8. Post-Test Left View of Test Vehicle



FIGURE 9. Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 10. Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 11. Pre-Test Rear View of Test Vehicle

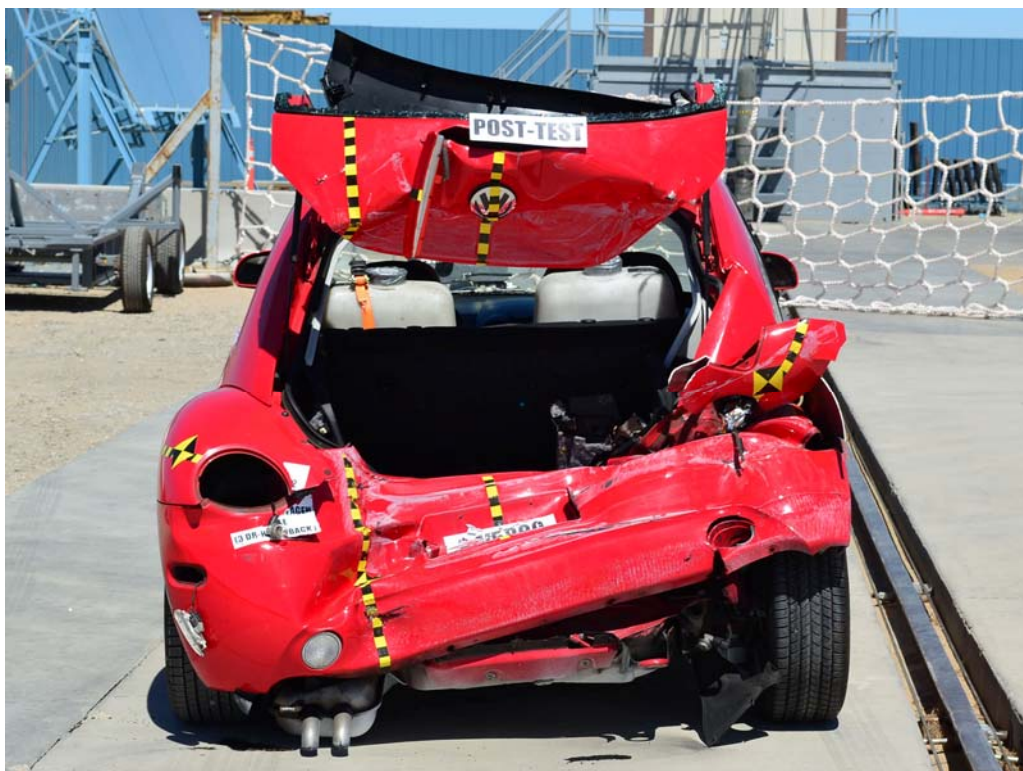


FIGURE 12. Post-Test Rear View of Test Vehicle



FIGURE 13. Pre-Test Right Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 14. Post-Test Right Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 15. Pre-Test Right View of Test Vehicle



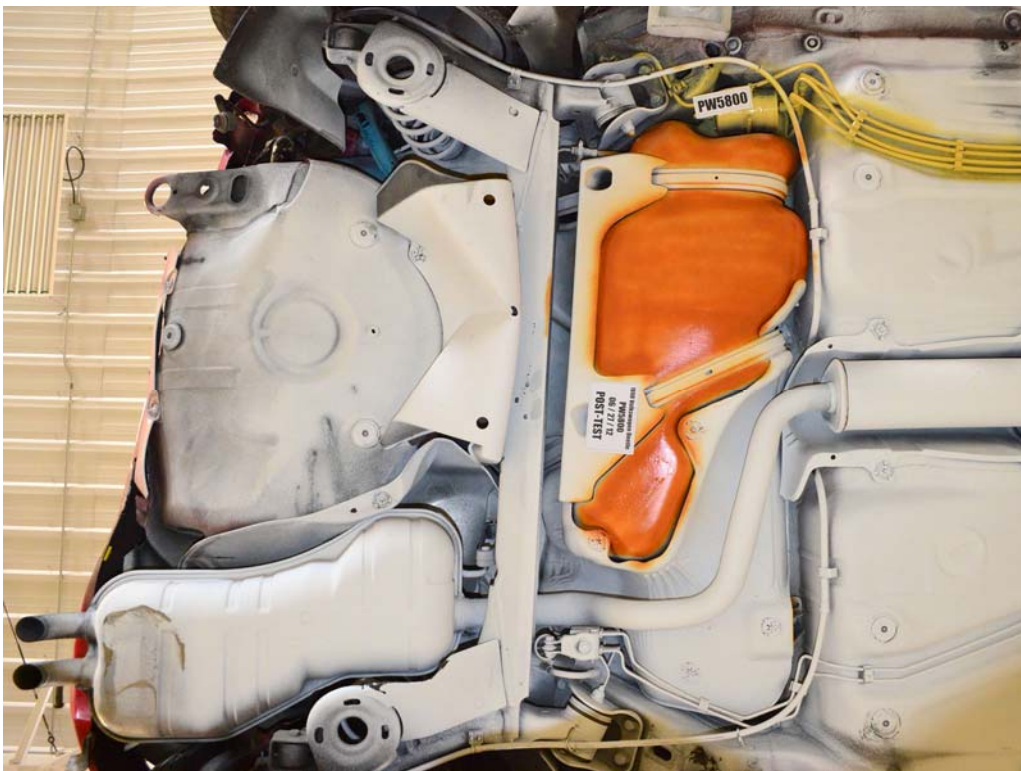
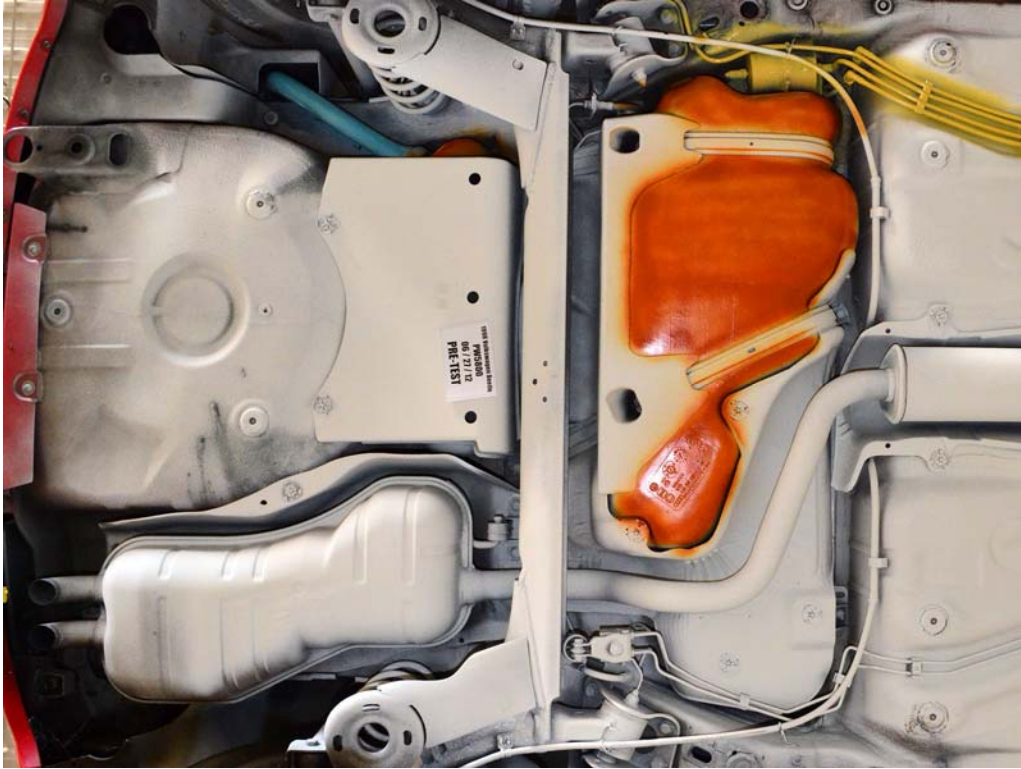
FIGURE 16. Post-Test Right View of Test Vehicle



FIGURE 17. Pre-Test Right Front ¾ View of Test Vehicle



FIGURE 18. Post-Test Right Front ¾ View of Test Vehicle



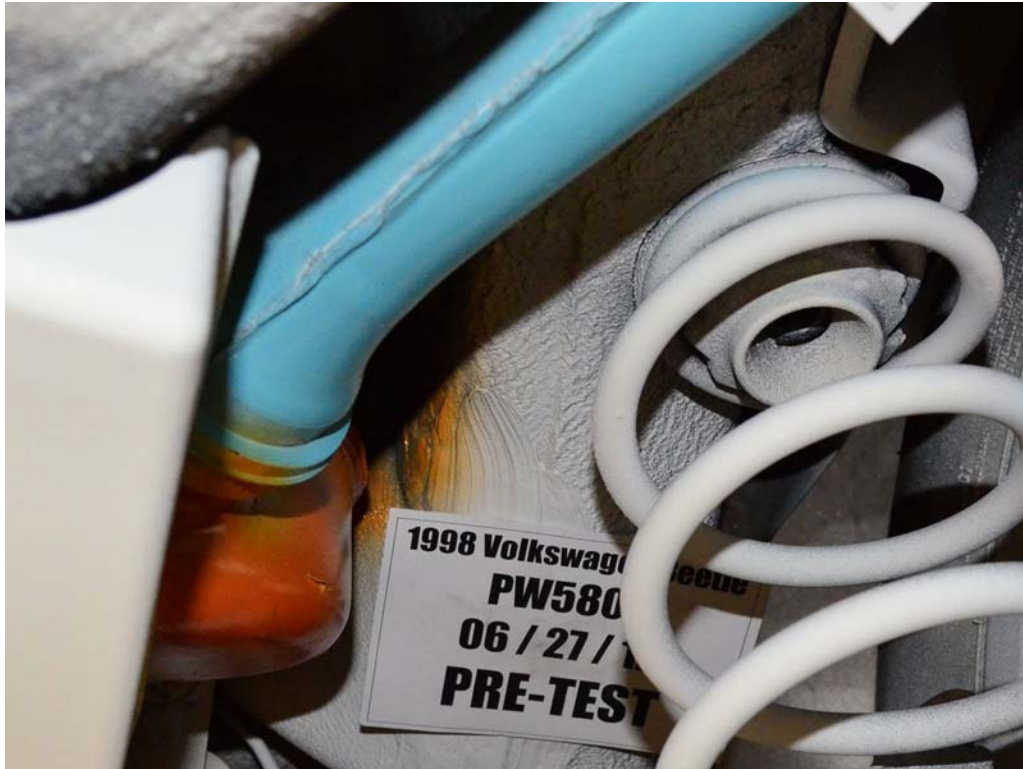


FIGURE 21. Pre-Test Underbody, Fuel Filler Neck Location



FIGURE 22. Post-Test Underbody, Fuel Filler Neck Location

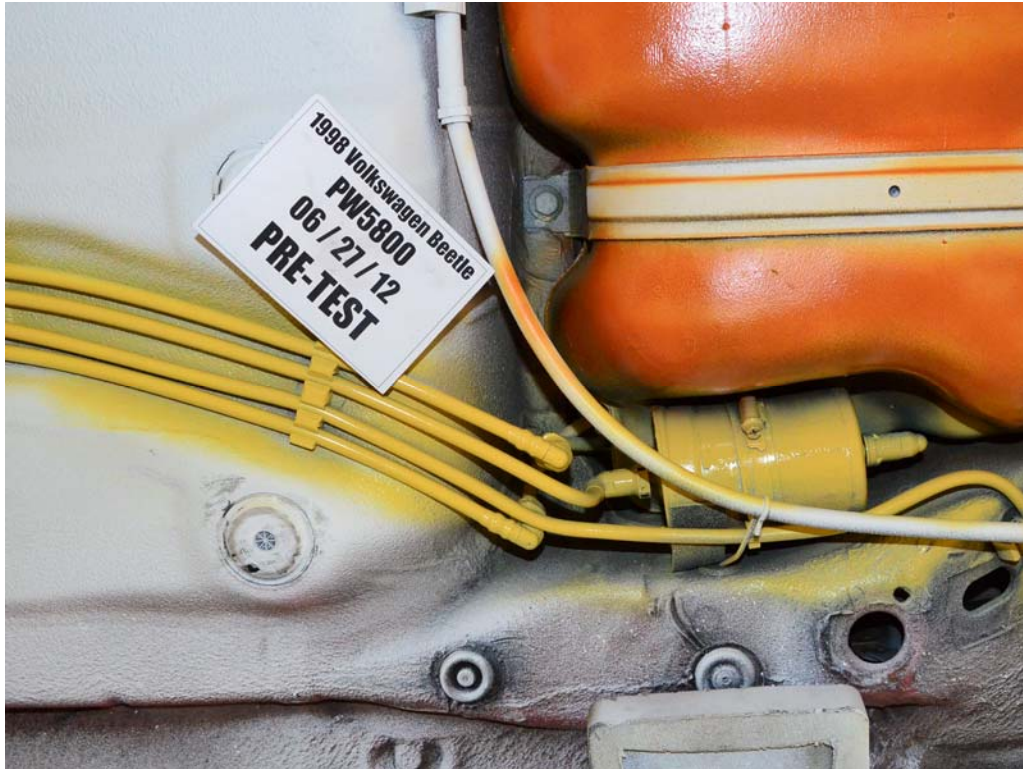


FIGURE 23. Pre-Test Underbody, Fuel Line Location



FIGURE 24. Post-Test Underbody, Fuel Line Location



FIGURE 25. Vehicle at 0° on Static Rollover Device

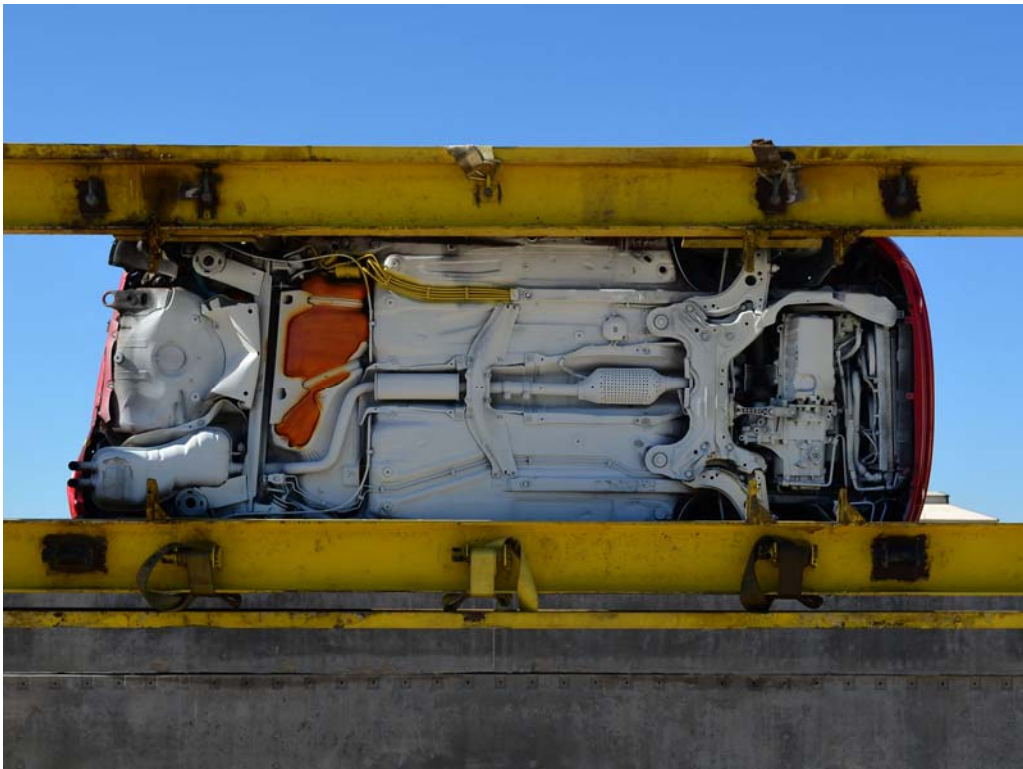


FIGURE 26. Vehicle at 90° on Static Rollover Device



FIGURE 27. Vehicle at 180° on Static Rollover Device



FIGURE 28. Vehicle at 270° on Static Rollover Device



FIGURE 29. Vehicle at 360° on Static Rollover Device



FIGURE 30. Post-Test Stoddard Solvent Spillage Location View



FIGURE 31. Post-Test Stoddard Solvent Spillage Location View



FIGURE 32. Post-Test Stoddard Solvent Spillage Location View



FIGURE 33. Post-Test Stoddard Solvent Spillage Location View



FIGURE 34. Post-Test Stoddard Solvent Spillage Location View



FIGURE 35. Post-Test Stoddard Solvent Spillage Location View



FIGURE 36. Post-Test Stoddard Solvent Spillage Location View



FIGURE 37. Post-Test Stoddard Solvent Spillage Location View



FIGURE 38. Post-Test Stoddard Solvent Spillage Location View



FIGURE 39. Post-Test Stoddard Solvent Spillage Location View