REPORT NUMBER: TR-P35090-01-NC

SAFETY COMPLIANCE TESTING FOR FMVSS 301R

FUEL SYSTEM INTEGRITY – REAR IMPACT

79.3 KM/H 70% OVERLAP REAR IMPACT

VOLKSWAGEN AG GERMANY

2015 VOLKSWAGEN TIGUAN S 5-DOOR MPV

NHTSA NUMBER: C20155800

PREPARED BY:

KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

TEST DATE:

JANUARY 11, 2016

REPORT DATE:

JANUARY 25, 2016

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

ENFORCEMENT

OFFICE OF VEHICLE SAFETY COMPLIANCE

ROOM 6111, NVS-220

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WASHINGTON, DC 20590

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7. Authors Mr. Javier J. Martinez, Project Engineer, KARCO Mr. Frank Richardson, Program Manager, KARCO		**8. Performing Organization Report No.** TR-P35090-01-NC	
9. Performing Organization Name and Address KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301		**10. Work Unit No.** **11. Contract or Grant No.** DTNH22-11-D-00245	
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15. Supplementary Notes			
16. Abstract A 79.3 km/h 70% overlap rear impact test was conducted on the subject 2015 Volkswagen Tiguan S 5-door MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Laboratory Test Procedure for FMVSS 301R. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on January 11, 2016. The impact velocity was 80.03 km/h and the outside ambient temperature was 11.1 deg. C. There was no Stoddard solvent leakage immediately after the test or during any portion of the static rollover. The test vehicle appeared to comply with all requirements of FMVSS 301R "Fuel System Integrity - Rear Impact".			
17. Key Words FMVSS 301R 70% Overlap Rear Impact MDB 2015 Volkswagen Tiguan S 5-Door MPV		**18. Distribution Statement**	
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SECTION 1
SUMMARY OF TEST

SUMMARY

The purpose of this rear impact test is to measure the performance of the subject vehicle, a 2015 Volkswagen Tiguan S 5-door MPV, for FMVSS 301R “Fuel System Integrity – Rear Impact”.

This 79.3 km/h 70% Overlap 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 Safety Compliance Laboratory Test Procedure TP-301R-02 for FMVSS 301R “Fuel System Integrity – Rear Impact”, dated January, 2007.

The test was performed at KARCO Engineering, LLC. on January 11, 2016. Pre- and post- test photographs of the vehicle and ATD’s 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 not instrumented for this test.

There was no Stoddard solvent leakage after the impact or during any portion of the static rollover. The test vehicle appeared to comply with all requirements of FMVSS 301R “Fuel System Integrity – Rear Impact”. FMVSS 301 data is summarized in Data Sheets 4 and 5.

SECTION 2

DATA SHEETS

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

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	^oF	^oC	=(Tf -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: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	C20155800
Model Year	2015
Make	Volkswagen
Model	Tiguan
Body Style	5-Door MPV
VIN	WVGAV7AX6FW558463
Body Color	Night Blue Metallic
Odometer Reading (km / mi)	922 / 573
Engine Displacement (L)	2.0
Type / No. of Cylinders	Inline 4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	Front
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Seat Belt Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other	No

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Volkswagen AG Germany
Date of Manufacture	Nov-14

GVWR (lbs)	4806
GAWR Front (lbs)	2425
GAWR Rear (lbs)	2491

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				520.0	*A*
DSC x 68 (kg)				340.0	*B*
Cargo Weight (RCLW) (kg)				136.0	*A-B* [1]

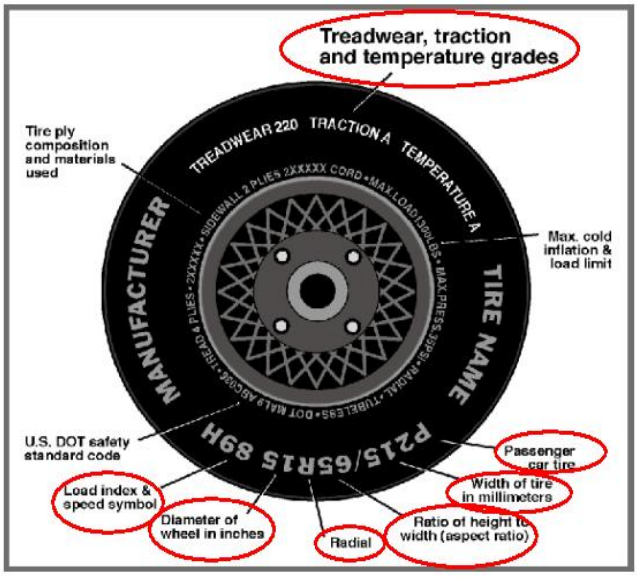
[1] - for trucks and MPV's maximum RCLW is 136.0 kg

DATA SHEET NO. 1 … (CONTINUED)

TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max Tire Pressure (kPa)	300	300
Cold Tire Pressure (kPa)	240	240
Max Load Tire Pressure (kPa)		
Recommended Tire Size	P215/65R16	P215/65R16
Tire Size on Vehicle	P215/65R16	P215/65R16
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion	Scorpion
Load Range	750	750
Treadwear Rating	520	520
Traction Rating	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Nylon	1 Nylon
Tire Plies Body	1 Rayon, 2 Steel, 1 Nylon	1 Rayon, 2 Steel, 1 Nylon
Load Index/Speed Symbol	98H	98H
Tire Material	Rayon, Steel, Nylon	Rayon, Steel, Nylon
DOT Safety Code Left	XNLK D943 4414	XNLK D943 4414
DOT Safety Code Right	XNLK D943 4414	XNLK D943 4414
Type of Spare Tire	Compact Size Spare Tire T145/80R18	
Location of Tire Placard on Vehicle	Driver Side 'B' Pillar Panel	

DATA SHEET NO. 2

PRE-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	458.0	325.0	783.0	537.5	405.0	942.5	485.5	430.5	916.0
Right	kg	447.0	325.0	772.0	497.5	391.0	888.5	481.5	443.0	924.5
Ratio	%	58.2%	41.8%	100.0%	56.5%	43.5%	100.0%	52.5%	47.5%	100.0%
Total	kg	905.0	650.0	1555.0	1035.0	796.0	1831.0	967.0	873.5	1840.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1555.0	A
Actual Weight of 2 P572 ATDs Used	kg	148.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	136.0	C
Calculated Vehicle Target Wt (TVTW)	kg	1839.0	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	797	792	803	795	1087
As Tested	mm	771	782	777	787	1130
Fully Loaded	mm	787	783	764	754	1234
Post-Test	mm	784	759	729	706	

GENERAL TEST VEHICLE DATA

Measured Parameter	Units	Value
Total Vehicle Wheel Base	mm	2600
Total Vehicle Length	mm	4401
Total Vehicle Width	mm	1800
Amount of Stoddard Solvent in Fuel Tank	L	59.50

DATA SHEET NO. 2… (CONTINUED)

PRE-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

BALLAST DATA

Description	Value
Type of Ballast	Sand Bottle Dummies
Method of Securing Ballast	Belted into the rear seat
Weight of Ballast	80.5 kg
Weight of Vehicle Components Removed	0.0 kg

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

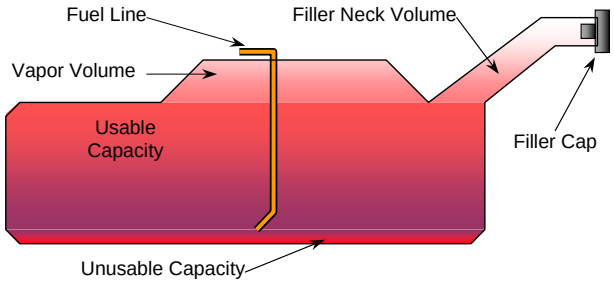
No vehicle components were removed

FUEL TANK CAPACITY

Description	Liters
Fuel System Capacity Listed in Owners Manual	63.97
Usable Capacity of "Standard Tank"	63.97
91 - 94% of Usable Capacity	58.21 - 60.13
Actual Amount of Stoddard Solvent Used	59.50

FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel pump operates when the vehicle is running. The fuel pump runs for 2 seconds after ignition is switched on.



VEHICLE FUEL TANK ASSEMBLY

TEST FLUID

Description	Value
Test Fluid Type	Stoddard Solvent
Test Fluid Specific Gravity	0.76
Test Fluid Kinematic Viscosity	
Test Fluid Color	Purple

DATA SHEET NO. 2… (CONTINUED)

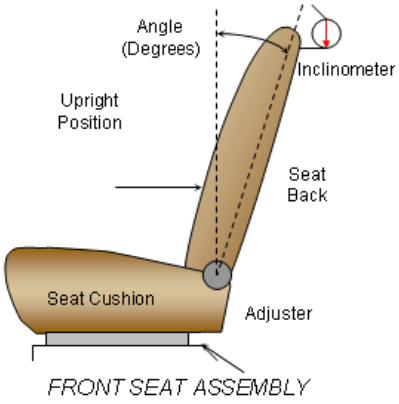
PRE-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

NOMINAL DESIGN RIDING POSITION

Seat back angle is measured using a 600 mm long ruler against the rearmost points of the seat back with a digital inclinometer.

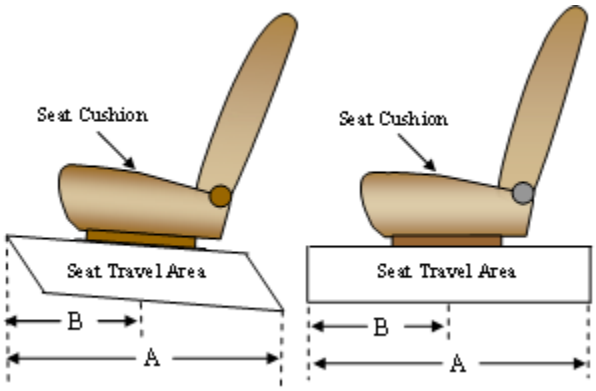


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	18.0
Passenger Seat Back Angle	18.1

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	298 mm	149 mm
Passenger Seat	271 mm	136 mm

DATA SHEET NO. 2… (CONTINUED)

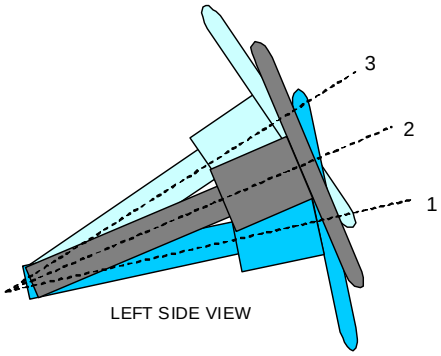
PRE-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

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	26.0	73
Geometric Center Position, No. 2	28.4	95
Uppermost Position, No. 3	30.7	117
Telescoping Steering Wheel Travel	4.7	44
Test Position	28.4	95

DATA SHEET NO. 3

MOVING BARRIER DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

MOVING BARRIER TEST WEIGHT

	Units	As Delivered Weights (UVW)		
		Front Axle	Rear Axle	Total
Left	kg	377.0	292.5	669.5
Right	kg	389.5	301.5	691.0
Ratio	%	56.3%	43.7%	100.0%
Total	kg	766.5	594.0	1360.5

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	560
Honeycomb Depth	382
Overall Depth	483
Bottom Honeycomb to Bottom Bumper	50
Bumper Height	203
Ground to Top of MDB	788
Ground to Bottom of MDB	229
Ground to Bottom of Bumper	281
Ground to Top of Bumper	484

DATA SHEET NO. 4

POST-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

Temperature at Time of Impact: 11.1°C Test Time: 11:32 AM

VIN: VWGAV7AX6FW558463

IMPACT VELOCITY DATA

Measured Parameter	Units	Value
Trap No. 1 Velocity (Primary)	km/h	80.03
Trap No. 2 Velocity (Redundant)	km/h	79.97

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Width	mm		1800
Vertical Impact Reference Line (Left of Vehicle Center Line)	mm		360
Actual Impact Point (Left of Vehicle Center Line)	mm		378
Horizontal Offset (+ right / - left)	mm	± 50 of Intended Impact Point	-18
Vertical Offset (+ down / - up)	mm	± 40 of Intended Impact Point	-18

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length at Centerline	4401	4254	147
2	Total Length	4401	4322	79
3	Total Width	1800	1869	69
4	Left Side Wheelbase	2600	2618	18
5	Right Side Wheelbase	2602	2505	97

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	382	800	Right	192
B	Top of Bumper	483	800	Right	199
C	Mid Level	636	500	Right	249
D	Top of Stack	763	800	Right	285

DATA SHEET NO. 4… (CONTINUED)

POST-TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Remained closed and latched	Remained closed and latched
Rear Door Opening	Remained closed and latched	Jammed Shut
Hatch and other doors	Rear Hatch Jammed Shut	

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Stoddard Solvent Spillage Measurements

From impact until vehicle motion ceases: 0 g

(Maximum allowable = 28 g)

For the 5 minute period after motion ceases: 0 g

(Maximum allowable = 28 g)

For the following 25 minutes: 0 g

(Maximum allowable = 28 g/minute)

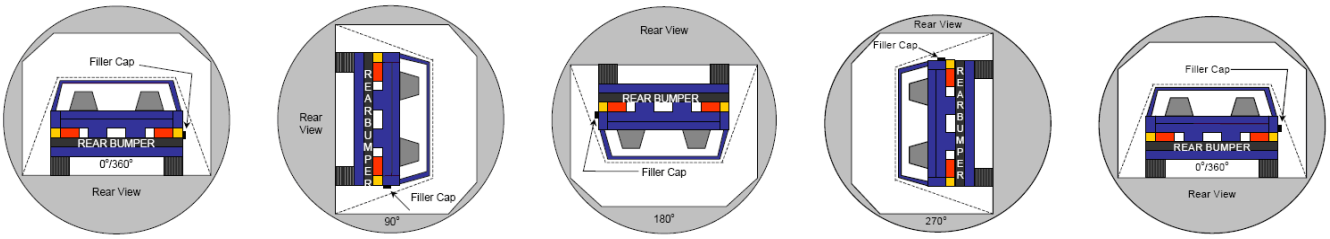
Spillage: None

DATA SHEET NO. 5

STATIC ROLLOVER TEST DATA

Test Vehicle: 2015 Volkswagen Tiguan S 5-Door MPV NHTSA No.: C20155800

Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 1/11/16



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

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).

Details of Stoddard solvent spillage: No Stoddard solvent spillage

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	77	300	377
90° To 180°	89	300	389
180° To 270°	79	300	379
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° To 180°	0 g			
180° To 270°	0 g			
270° To 360°	0 g			

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	No Spillage
90° To 180°	No Spillage
180° To 270°	No Spillage
270° To 360°	No Spillage

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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FIGURE 2. As Received Left Rear ¾ View of Test Vehicle

FIGURE 3. Test Vehicle Manufacturer's Label

FIGURE 4. Test Vehicle Tire Information Placard

FIGURE 5. Pre-Test Front View of Test Vehicle

FIGURE 6. Post-Test Front View of Test Vehicle

FIGURE 7. Pre-Test Left Front ¾ View of Test Vehicle

FIGURE 8. Post-Test Left Front ¾ View of Test Vehicle

FIGURE 9. Pre-Test Left Side View of Test Vehicle

FIGURE 10. Post-Test Left Side View of Test Vehicle

FIGURE 11. Pre-Test Left Rear ¾ View of Test Vehicle

FIGURE 12. Post-Test Left Rear ¾ View of Test Vehicle

FIGURE 13. Pre-Test Rear View of Test Vehicle

FIGURE 14. Post-Test Rear View of Test Vehicle

FIGURE 15. Pre-Test Right Rear ¾ View of Test Vehicle

FIGURE 16. Post-Test Right Rear ¾ View of Test Vehicle

FIGURE 17. Pre-Test Right Side View of Test Vehicle

FIGURE 18. Post-Test Right Side View of Test Vehicle

FIGURE 19. Pre-Test Right Front ¾ View of Test Vehicle

FIGURE 20. Post-Test Right Front ¾ View of Test Vehicle

FIGURE 21. Pre-Test Close-Up View of Impact Point Target

FIGURE 22. Post-Test Close-Up View of Impact Point Target

FIGURE 23. Pre-Test View of Fuel Filler Cap

FIGURE 24. Post-Test View of Fuel Filler Cap

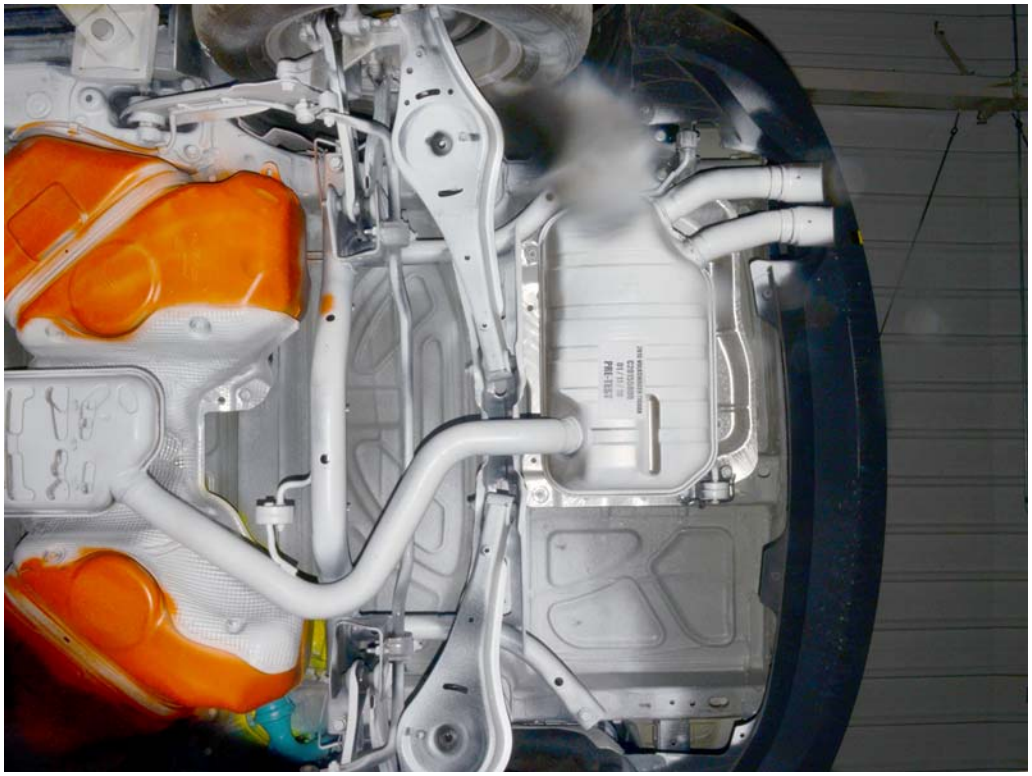

FIGURE 25. Pre-Test Rear Underbody View of Test Vehicle

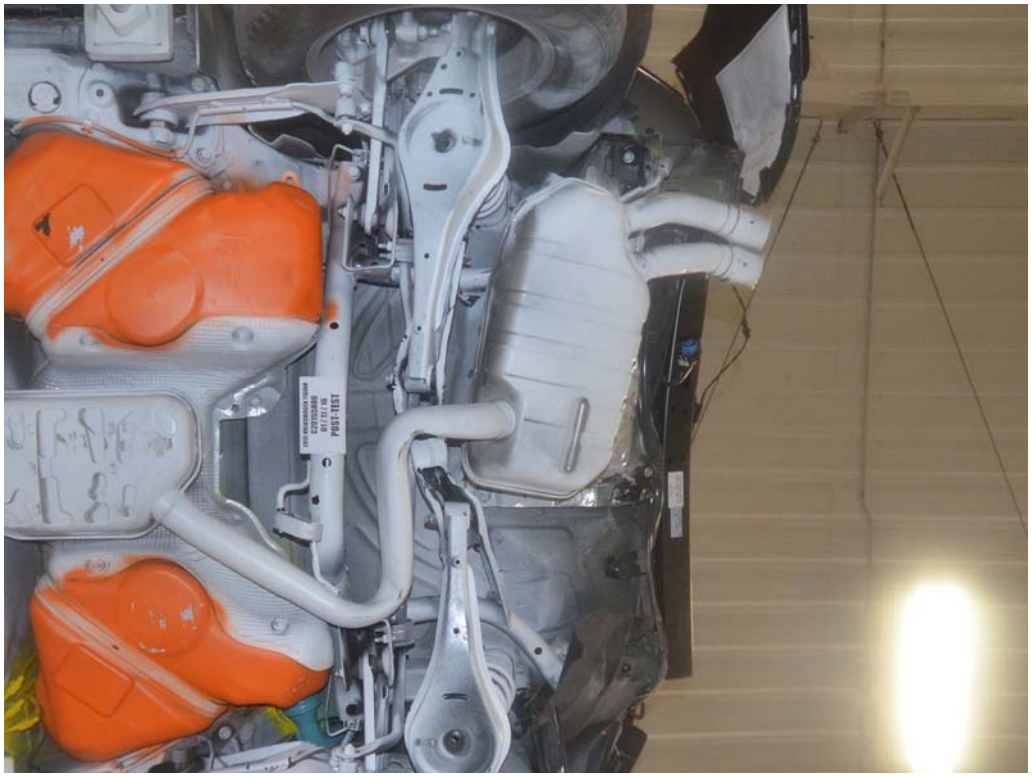

FIGURE 26. Post-Test Rear Underbody View of Test Vehicle

FIGURE 27. Pre-Test Underbody View of Fuel Tank

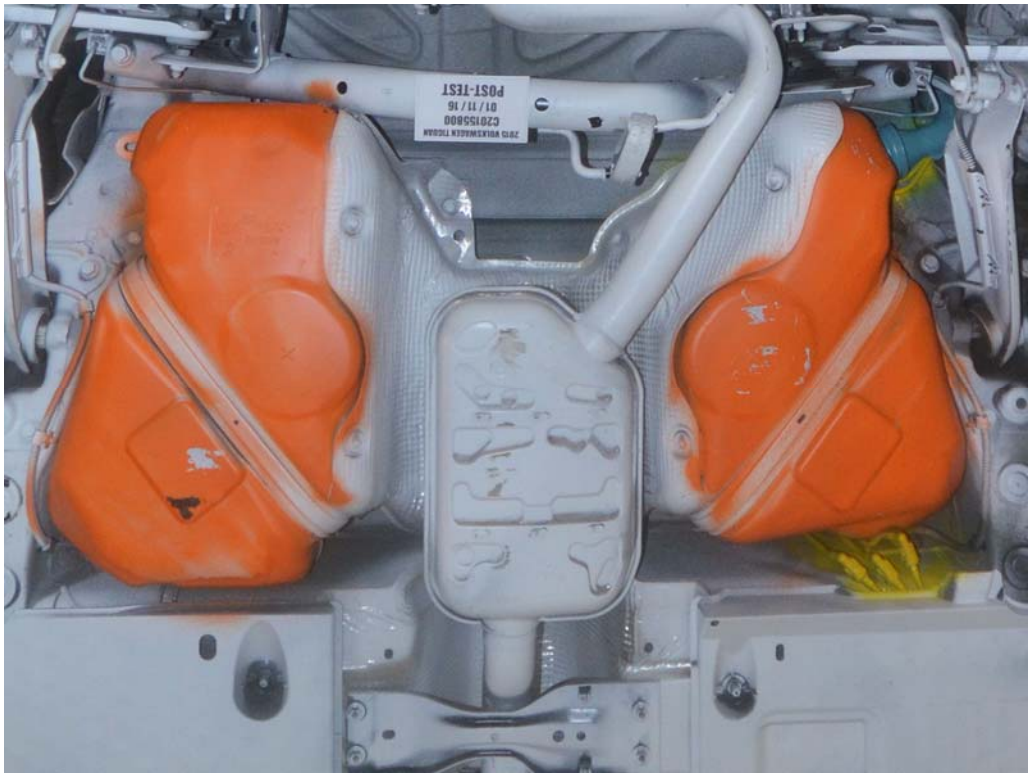

FIGURE 28. Post-Test Underbody View of Fuel Tank

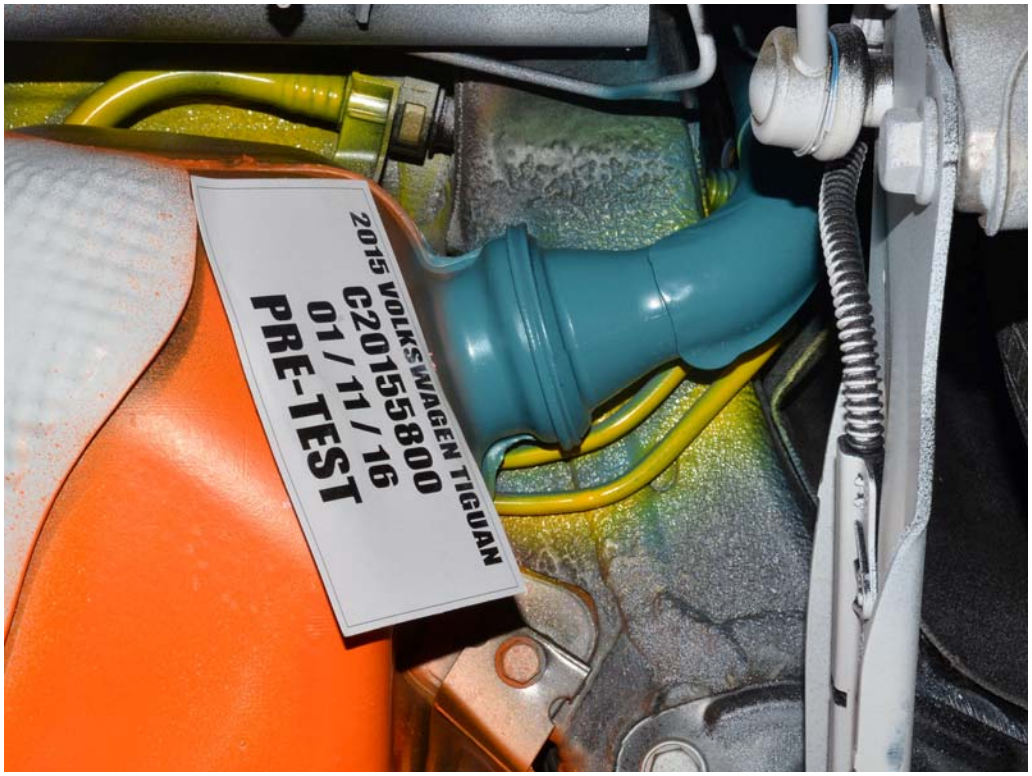

FIGURE 29. Pre-Test Underbody View of Fuel Lines

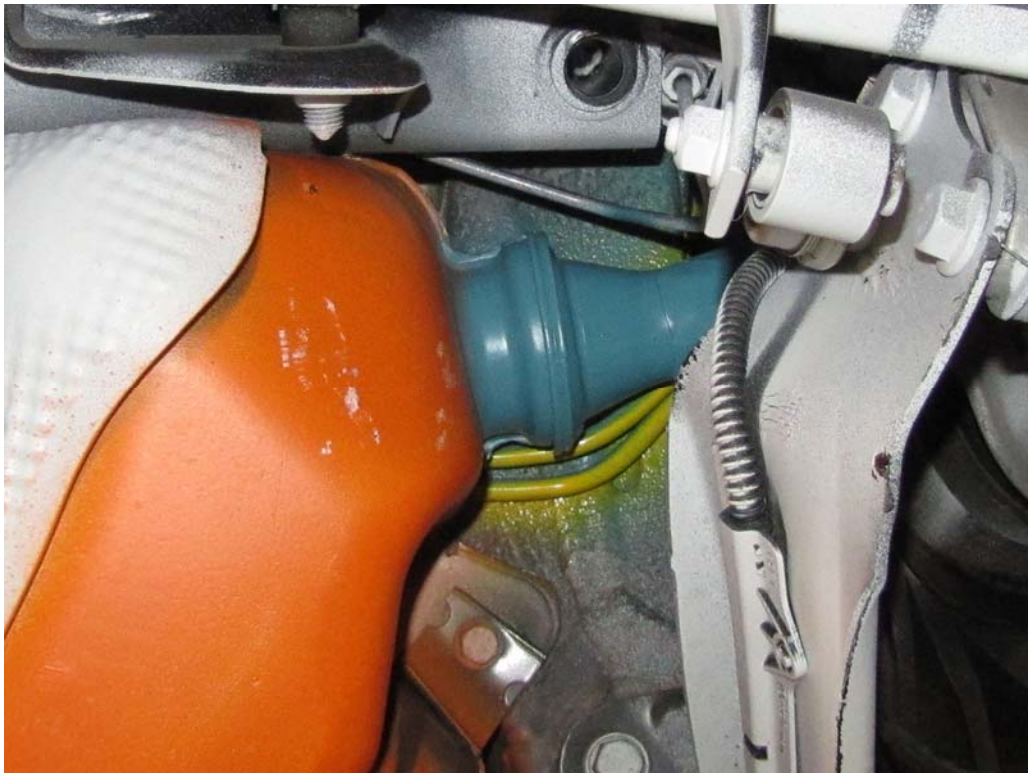

FIGURE 30. Post-Test Underbody View of Fuel Lines

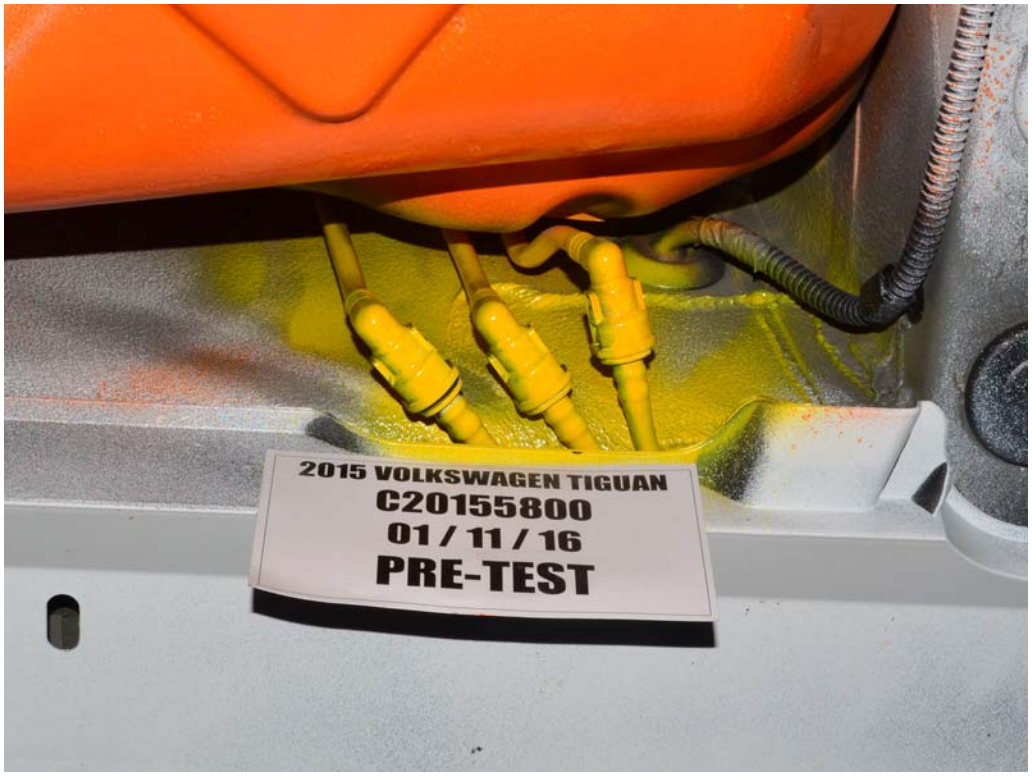

FIGURE 31. Pre-Test Underbody View of Fuel Lines

FIGURE 32. Post-Test Underbody View of Fuel Lines

FIGURE 33. Test Vehicle at 0° on FMVSS 301 Static Rollover Device

FIGURE 34. Test Vehicle at 90° on FMVSS 301 Static Rollover Device

FIGURE 35. Test Vehicle at 180° on FMVSS 301 Static Rollover Device

FIGURE 36. Test Vehicle at 270° on FMVSS 301 Static Rollover Device

FIGURE 37. Test Vehicle at 360° on FMVSS 301 Static Rollover Device

FIGURE 38. Impact Event