

**REPORT NUMBER: 301-KAR-20-002**  
**SAFETY COMPLIANCE TESTING FOR FMVSS 301R**  
**FUEL SYSTEM INTEGRITY – REAR IMPACT**  
**79.3 KM/H 70% OVERLAP REAR IMPACT**

**SUBARU CORPORATION**  
**2020 SUBARU OUTBACK 5-DOOR MPV**

**NHTSA NUMBER: C20205500**

**PREPARED BY:**  
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**9270 HOLLY ROAD**  
**ADELANTO, CA 92301**





**TEST DATE:**  
**MAY 8, 2020**

**REPORT DATE:**  
**MAY 22, 2020**  
**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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<b>16. Abstract</b>  A 79.3 km/h 70% overlap rear impact test was conducted on the subject 2020 Subaru Outback 5-door MPV in accordance with the Office of Vehicle Safety Compliance Laboratory Test Procedure No. TP-301R-02 for the determination of FMVSS 301 compliance. The test was conducted at the Applus+ IDIADA KARCO Engineering, LLC. facility in Adelanto, California on May 8, 2020.  The impact velocity was 79.15 km/h and the outside ambient temperature was 32.2° C. There was no Stoddard solvent leakage immediately after the test nor during any portion of the static rollover. The test vehicle appeared to comply with all requirements of FMVSS 301R.			
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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 2020 Subaru Outback 5-door MPV, for FMVSS 301 compliance.

This 79.3 km/h 70% Overlap Rear Impact is sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-16-D-00029. 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 Applus+ IDIADA KARCO Engineering, LLC. on May 8, 2020. 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 50<sup>th</sup> percentile male anthropomorphic test devices (ATD) were placed in the driver and right front passenger seating positions. Neither of the ATD's were 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-02 "Fuel System Integrity – Rear Impact". FMVSS 301 data is summarized in Data Sheets 4 and 5.

**SECTION 2**  
**DATA SHEETS**

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No.: C20205500  
 Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 05/08/20

**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 <sup>2</sup>	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: 2020 Subaru Outback 5-Door MPV

NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

Test Date: 05/08/20

NHTSA Number	C20205500
Model Year	2020
Make	Subaru
Model	Outback
Body Style	5-Door MPV
VIN	4S4BTACC6L3102400
Body Color	Magnetite Gray Metallic
Odometer Reading (km / mi)	66 / 41
Engine Displacement (L)	2.5
Type / No. of Cylinders	BOXER 4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
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	Yes
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
Front Pass. Seat Cushion Airbag	Yes

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

**Yes**

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Subaru Corporation
Date of Manufacture	08/19

GVWR (kg)	2200
GAWR Front (kg)	1250
GAWR Rear (kg)	1220

**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)				408.0	A
DSC x 68 (kg)				340.0	B
Cargo Weight (RCLW) (kg)				68.0	A-B



**DATA SHEET NO. 2**

**PRE-TEST DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No.: C20205500  
 Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 05/08/20

**TEST VEHICLE AXLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	471.0	374.5	845.5	508.0	450.0	958.0
Right	kg	462.0	350.0	812.0	488.5	419.5	908.0
Ratio	%	56.3%	43.7%	100.0%	53.4%	46.6%	100.0%
Total	kg	933.0	724.5	1657.5	996.5	869.5	1866.0

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1657.5	A
Actual Weight of 2 P572 ATDs Used	kg	148.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	68.0	C
Calculated Vehicle Target Wt (TVTW)	kg	1873.5	A+B+C

**TEST VEHICLE ATTITUDES**

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	891	896	891	900	1202
As Tested	mm	852	858	860	875	1281

**GENERAL TEST VEHICLE DATA**

Measured Parameter	Units	Value
Total Vehicle Wheel Base	mm	2750
Total Vehicle Length	mm	4855
Total Vehicle Width	mm	1865
Amount of Stoddard Solvent in Fuel Tank	L	65.12

**DATA SHEET NO. 2... (CONTINUED)**

**PRE-TEST DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

Test Date: 05/08/20

**BALLAST DATA**

Description	Value
Type of Ballast	None
Method of Securing Ballast	N/A
Total Weight of Ballast	0.0 kg
Weight of Vehicle Components Removed	0.0 kg

**VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:**

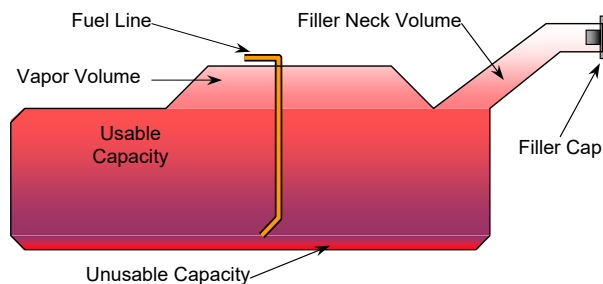
None

**FUEL TANK CAPACITY**

Description	Liters
Fuel System Capacity Listed in Owners Manual	70.02
Usable Capacity of "Standard Tank"	70.02
91 - 94% of Usable Capacity	63.72 - 65.82
Actual Amount of Stoddard Solvent Used	65.12

**FUEL PUMP**

The vehicle is equipped with an electric fuel pump. The fuel pump operates for a few seconds after the ignition switch is turned "ON" and then operates only while the engine is running.



VEHICLE FUEL TANK ASSEMBLY

**TEST FLUID**

Description	Value
Test Fluid Type	Stoddard Solvent
Test Fluid Specific Gravity	0.758
Test Fluid Kinematic Viscosity	0.96
Test Fluid Color	Purple

**DATA SHEET NO. 2... (CONTINUED)**

**PRE-TEST DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

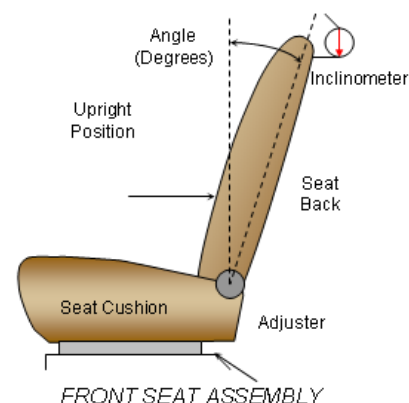
Test Date: 05/08/20

**NOMINAL DESIGN RIDING POSITION**

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

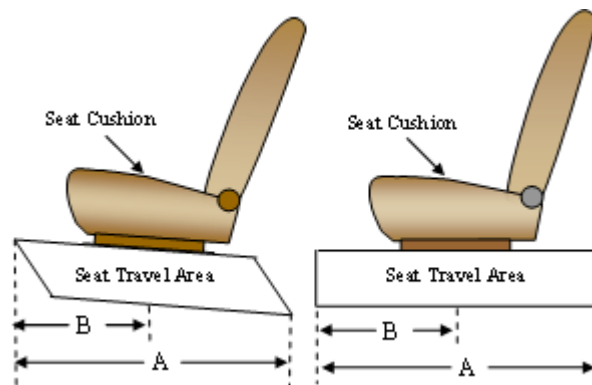
**SEAT BACK ANGLE**

Seating Position	Degrees
Driver Seat Back Angle	9.1
Passenger Seat Back Angle	1.2



**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 and passenger's seats are set to the middle of the fore-aft travel.



**SEAT FORE/AFT POSITIONS**

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	295 mm	148 mm
Passenger Seat	250 mm (26 detents)	130 mm (13th detent)

## DATA SHEET NO. 2... (CONTINUED)

### PRE-TEST DATA

Test Vehicle: 2020 Subaru Outback 5-Door MPV

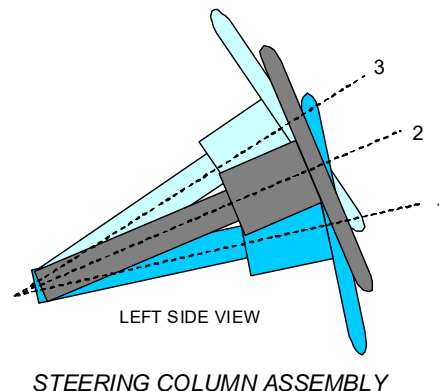
NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

Test Date: 05/08/20

### 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 POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	21.7	110
Geometric Center Position, No. 2	23.7	138
Uppermost Position, No. 3	25.7	165
Telescoping Steering Wheel Travel		55
Test Position	23.7	138

**DATA SHEET NO. 3**  
**MOVING BARRIER DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

Test Date: 05/08/20

**MOVING BARRIER TEST WEIGHT**

	Units	As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total
Left	kg	386.5	316.5	703.0
Right	kg	385.5	271.5	657.0
Ratio	%	56.8%	43.2%	100.0%
Total	kg	772.0	588.0	1360.0

**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	380
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	280
Ground to Top of Bumper	483

**DATA SHEET NO. 4****POST-TEST DATA**Test Vehicle: 2020 Subaru Outback 5-Door MPVNHTSA No.: C20205500Test Program: 79.3 km/h 70% Overlap Rear ImpactTest Date: 05/08/20Temperature at Time of Impact: 32.2°CTest Time: 4:51 PMVIN: 4S4BTACC6L3102400**IMPACT VELOCITY DATA**

Measured Parameter	Units	Value
Trap No. 1 Velocity (Primary)	km/h	79.15
Trap No. 2 Velocity (Redundant)	km/h	79.09

**IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Vehicle Width	mm		1865
Vertical Impact Reference Line (Left of Vehicle Center Line)	mm		373
Actual Impact Point (Left of Vehicle Center Line)	mm		385
Horizontal Offset (+ right / - left)	mm	± 50 of Intended Impact Point	-12
Vertical Offset (- down / + up)	mm	± 40 of Intended Impact Point	-1

**TARGET VEHICLE STRUCTURAL MEASUREMENTS**

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length at Centerline	4855	4255	600
2	Total Length	4855	4727	128
3	Total Width	1865	1940	-75
4	Left Side Wheelbase	2750	2755	-5
5	Right Side Wheelbase	2750	2640	110

**MAXIMUM STATIC CRUSH OF HONEYCOMB FACE**

Row	Vertical Location		From Centerline		Max. Crush (mm)
	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	785	800	Left	132
B	Top of Bumper	846	800	Left	185
C	Mid Level	919	100	Left	360
D	Top of Stack	664	800	Left	355

**DATA SHEET NO. 4... (CONTINUED)**

**POST-TEST DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV NHTSA No.: C20205500  
Test Program: 79.3 km/h 70% Overlap Rear Impact Test Date: 05/08/20

**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	Remained closed and latched
Hatch and other doors	Rear Hatch Jammed Shut	

**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 = 142 g)
- C. For the following 25 minutes: 0 g  
(Maximum allowable = 28 g/minute)
- D. Spillage: None  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

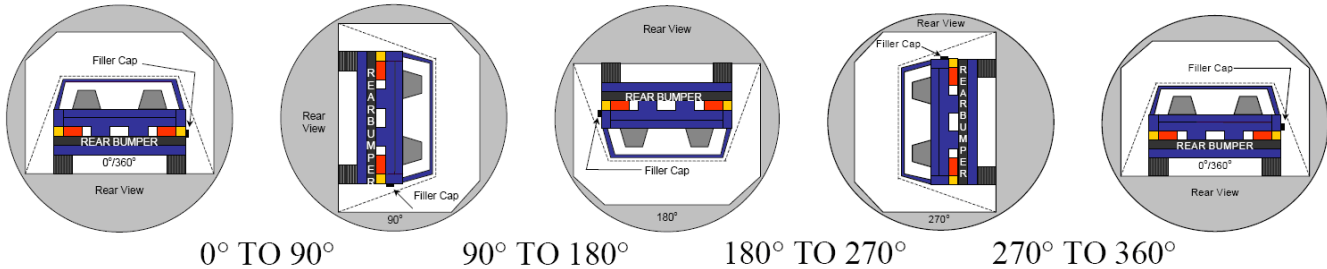
**DATA SHEET NO. 5**  
**STATIC ROLLOVER TEST DATA**

Test Vehicle: 2020 Subaru Outback 5-Door MPV

NHTSA No.: C20205500

Test Program: 79.3 km/h 70% Overlap Rear Impact

Test Date: 05/08/20



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: None

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	81	300	381
90° To 180°	81	300	381
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	0 g	0 g	
90° To 180°	0 g	0 g	0 g	
180° To 270°	0 g	0 g	0 g	
270° To 360°	0 g	0 g	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**

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FIGURE 1. Pre-Test Front View of Test Vehicle



FIGURE 2. Post-Test Front View of Test Vehicle



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



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



FIGURE 5. Pre-Test Left View of Test Vehicle



FIGURE 6. Post-Test Left View of Test Vehicle



FIGURE 7. Pre-Test Left Rear  $\frac{3}{4}$  View of Test Vehicle

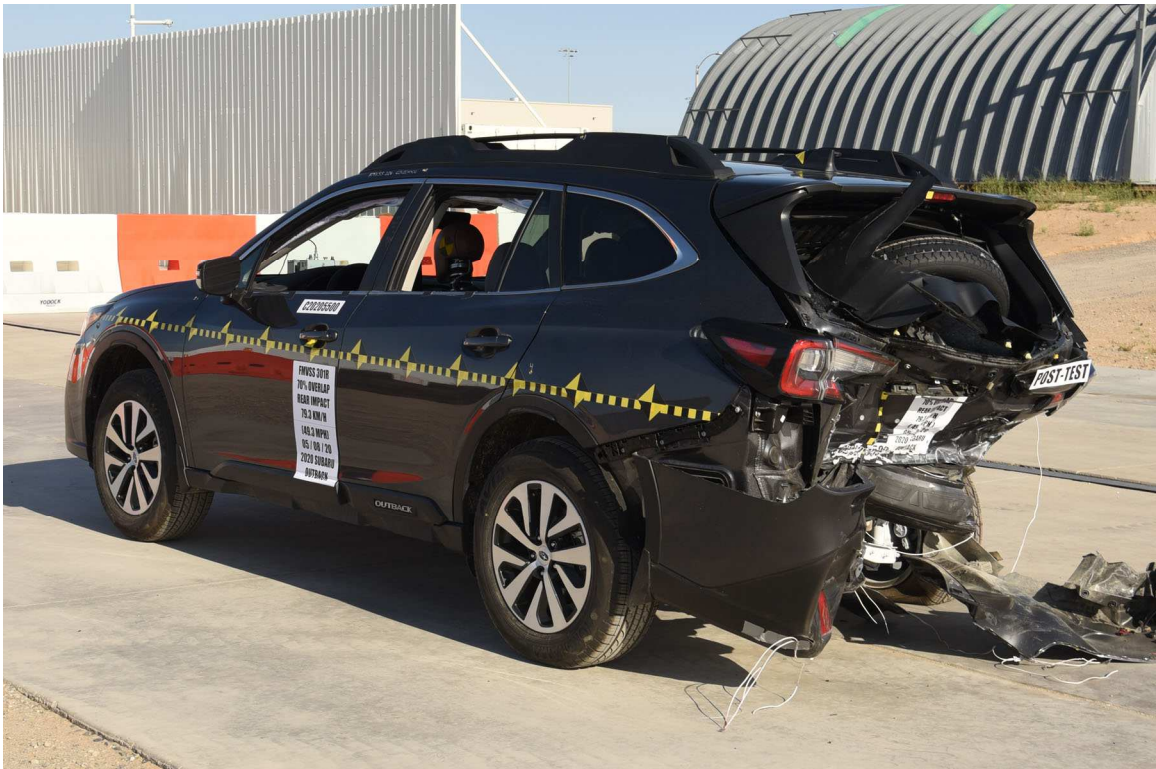


FIGURE 8. Post-Test Left Rear  $\frac{3}{4}$  View of Test Vehicle



FIGURE 9. Pre-Test Rear View of Test Vehicle

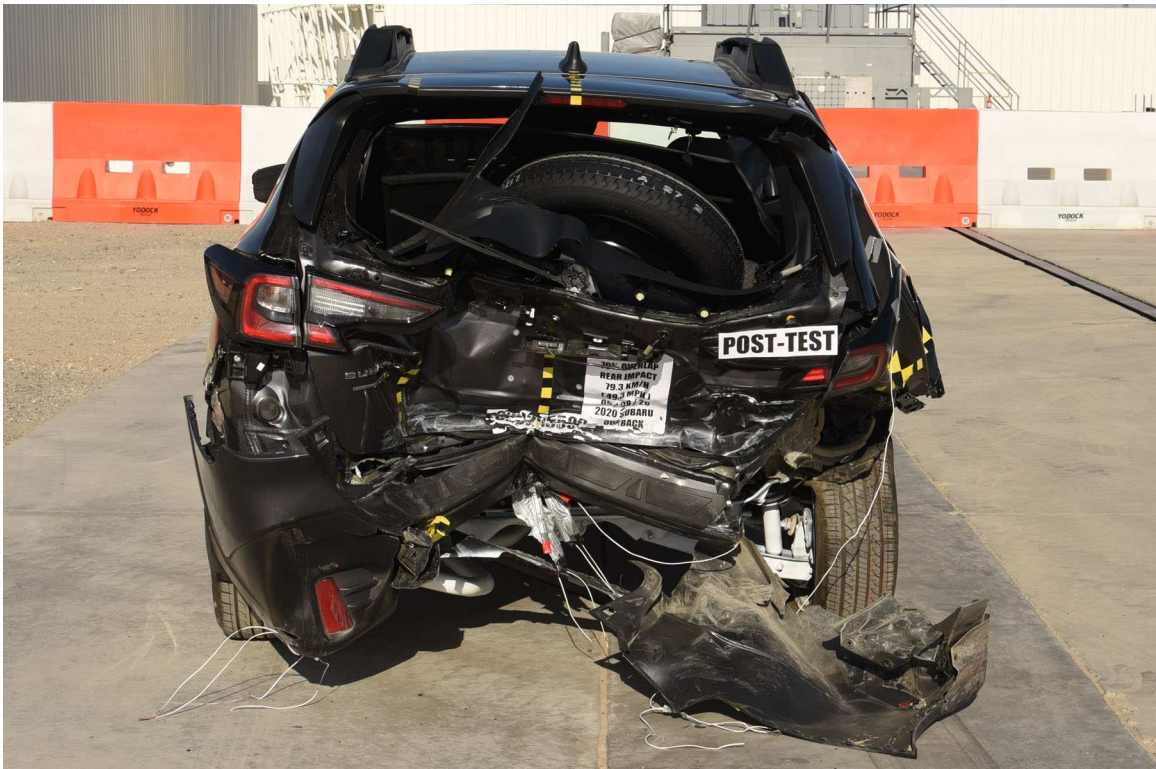


FIGURE 10. Post-Test Rear View of Test Vehicle



FIGURE 11. Pre-Test Right Rear  $\frac{3}{4}$  View of Test Vehicle



FIGURE 12. Post-Test Right Rear  $\frac{3}{4}$  View of Test Vehicle



FIGURE 13. Pre-Test Right View of Test Vehicle

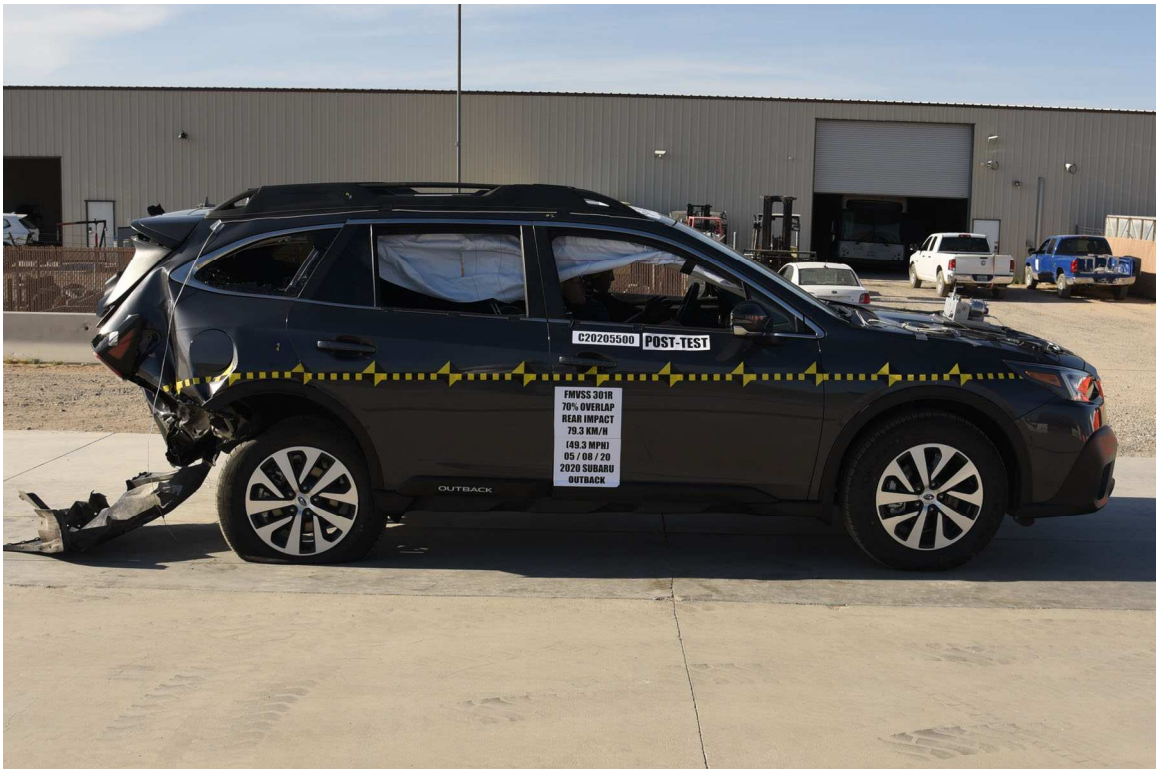


FIGURE 14. Post-Test Right View of Test Vehicle



FIGURE 15. Pre-Test Right Front  $\frac{3}{4}$  View of Test Vehicle



FIGURE 16. Post-Test Right Front  $\frac{3}{4}$  View of Test Vehicle



FIGURE 17. Pre-Test View of Fuel Filler Cap



FIGURE 18. Post-Test View of Fuel Filler Cap

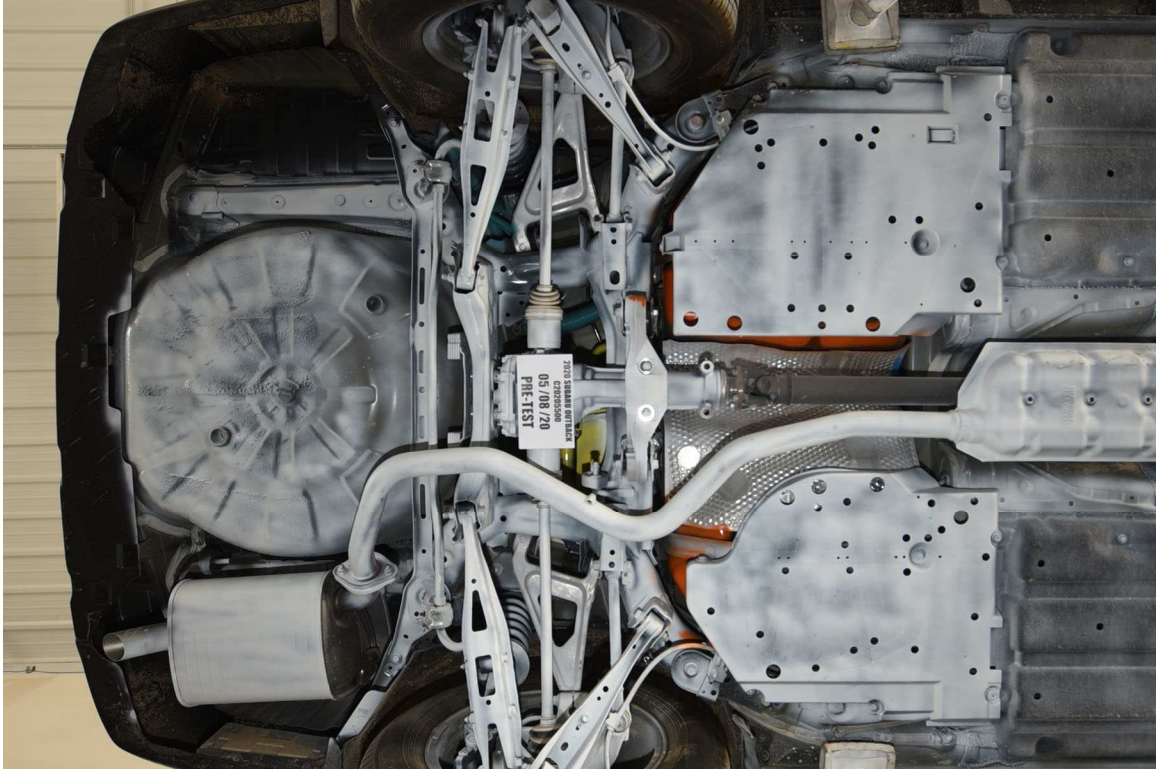


FIGURE 19. Pre-Test Rear Underbody View of Test Vehicle



FIGURE 20. Post-Test Rear Underbody View of Test Vehicle

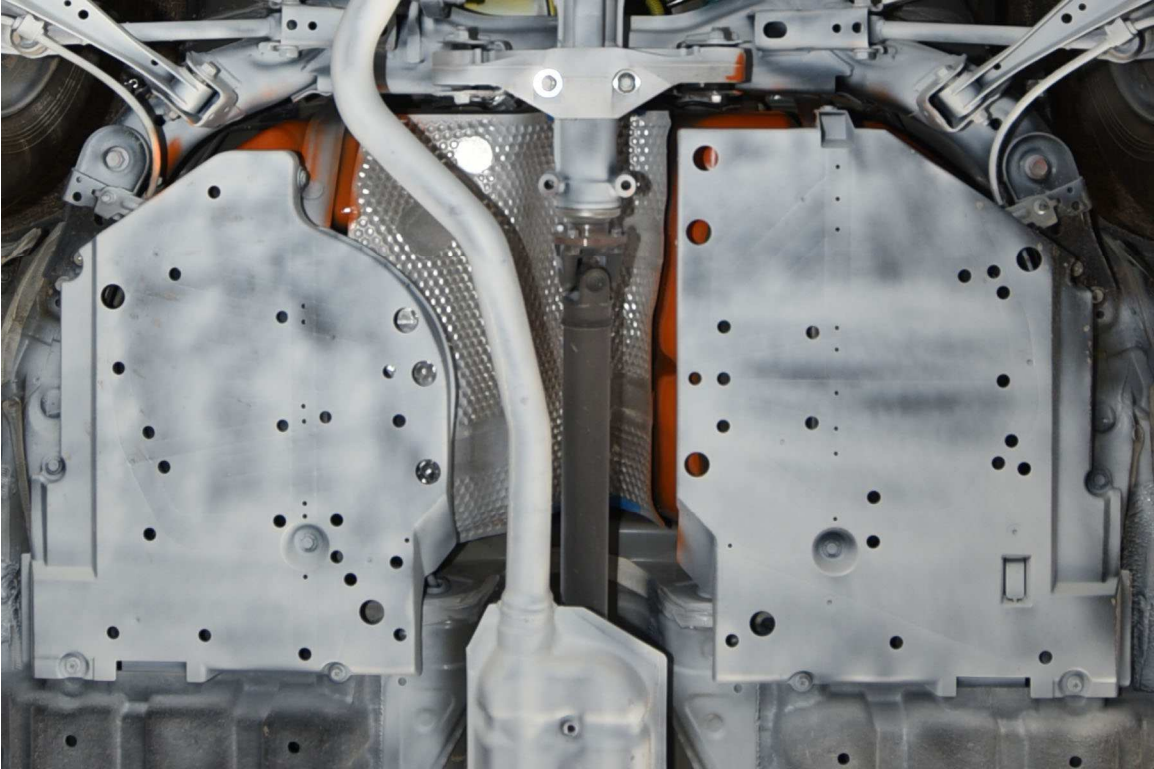


FIGURE 21. Pre-Test Underbody View of Fuel Tank

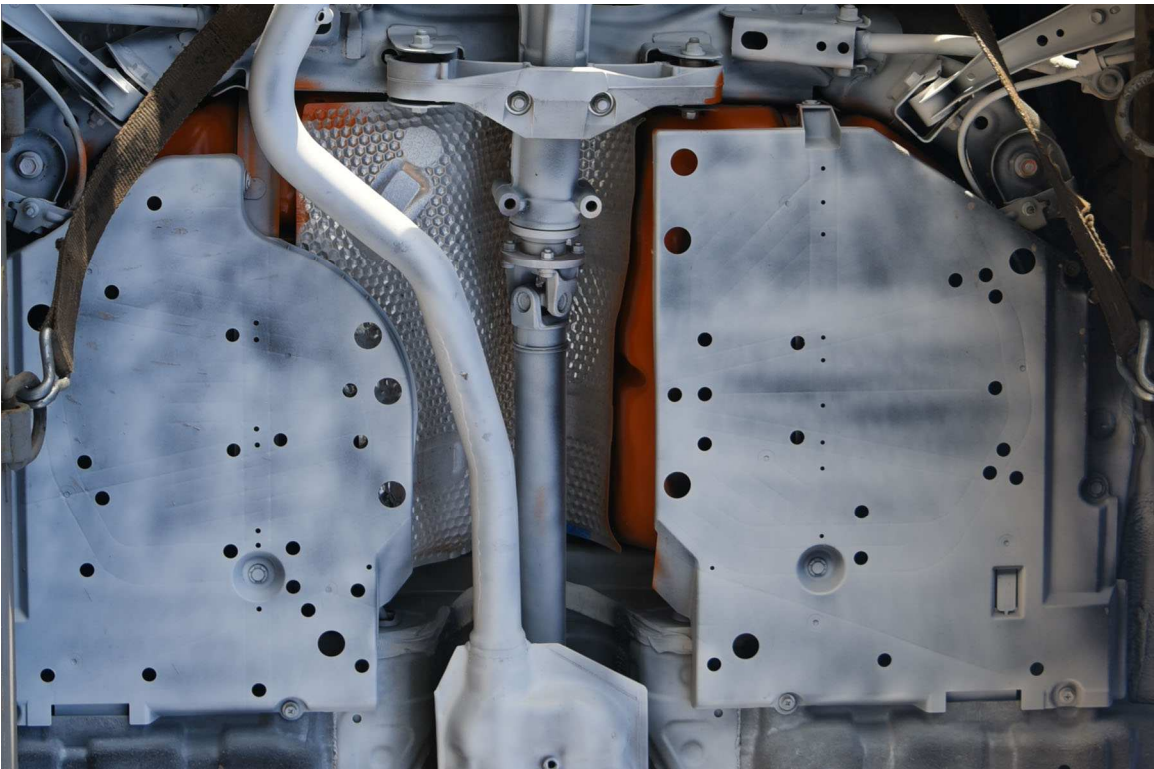


FIGURE 22. Post-Test Underbody View of Fuel Tank



FIGURE 23. Test Vehicle at 0° on FMVSS 301 Static Rollover Device



FIGURE 24. Test Vehicle at 90° on FMVSS 301 Static Rollover Device





FIGURE 27. Test Vehicle at 360° on FMVSS 301 Static Rollover Device



FIGURE 28. Test Vehicle Manufacturer's Label

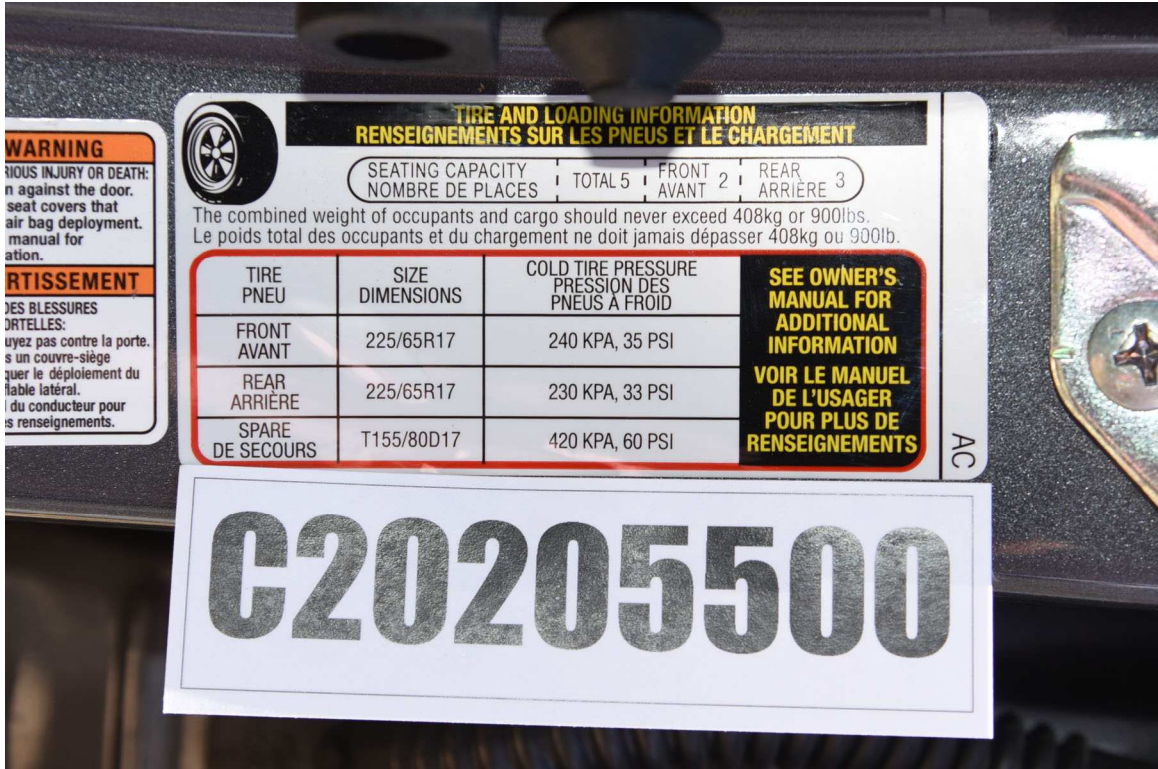


FIGURE 29. Test Vehicle Tire Information Placard



FIGURE 30. Impact Event