

REPORT NUMBER: TR-P32096-05-NC

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

**GENERAL MOTORS CORPORATION
1999 BUICK LESABRE 4-DOOR SEDAN**

NHTSA NUMBER: PX0100

**PREPARED BY:
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**TEST DATE:
AUGUST 17, 2012**

**REPORT DATE:
AUGUST 31, 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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16. Abstract A 80 km/h 70% overlap rear impact test was conducted on the subject 1999 Buick LeSabre 4-door sedan in accordance with the specifications of the Office of Vehicle Compliance Laboratory Test Procedure for FMVSS 301R. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on August 17, 2012. The impact velocity was 78.69 km/h and the outside ambient temperature at the struck side of the vehicle was 35.0 deg. C. Both the driver and passenger side doors remained closed during the impact event. The left front and right front doors remained operational after the event. The left rear and right rear doors and hatch were jammed shut. Stoddard solvent leaked from the fuel tank of the vehicle immediately after the test. Solvent was observed leaking from the bottom of the fuel tank. Solvent continued to leak until the tank was drained. Due to the nature of the test failure, the static rollover was not required.					
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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 1999 Buick LeSabre 4-door sedan, for FMVSS 301R *'Fuel System Integrity – Rear Impact'*.

This 80 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 Compliance Laboratory Test Procedure for FMVSS 301R *'Fuel System Integrity – Rear Impact'*, dated January, 2007.

A 1999 Buick LeSabre 4-door sedan was impacted by a moving deformable barrier at a velocity of 78.69 km/h. The test was performed at KARCO Engineering, LLC. on August 17, 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. The left front and right front doors remained operational after the event. The left rear and right rear doors and hatch were jammed shut.

Stoddard solvent leaked from the fuel tank of the vehicle immediately after the test. Solvent was observed leaking from the bottom of the fuel tank. Solvent continued to leak until the tank was drained. Due to the nature of the test failure, the static rollover was not required. 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: 1999 Buick LeSabre 4-Door Sedan

NHTSA No.: PX0100

Test Program: 70% Overlap Rear Impact

Test Date: 08/17/12

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	lb/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: 1999 Buick LeSabre 4-Door Sedan NHTSA No.: PX0100
 Test Program: 70% Overlap Rear Impact Test Date: 08/17/12

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	PX0100
Model Year	1999
Make	Buick
Model	LeSabre
Body Style	4-Door Sedan
VIN	1G4HR52K2XH4
Date Received	8/3/2012
Body Color	Blue
Odometer Reading (km / mi)	256521 / 159395
Engine Displacement (L)	3.8
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	4
Overdrive	Yes
Final Drive	Front
Roof Rack	No
Sunroof / T-Top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc Brakes	Yes
Rear Disc Brakes	No
Anti-Lock Brakes (ABS)	Yes

All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Airbag	No
Driver Head Airbag	No
Driver Curtain Airbag	No
Driver Combo Airbag	No
Driver Knee Airbag	No
Passenger Front Airbag	Yes
Passenger Side Airbag	No
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	Yes

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

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors Corporation
Date of Manufacture	

GVWR (kg)	
GAWR Front (kg)	
GAWR Rear (kg)	

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Split Bench	Bench			
Designated Seating Capacity	3	3		6	
Capacity Weight (VCW) (kg)				488.0	A
DSC x 68.04 (kg)				408.0	B
Cargo Weight (RCLW) (kg)				80.0	A-B

DATA SHEET NO. 1 ... (CONTINUED)

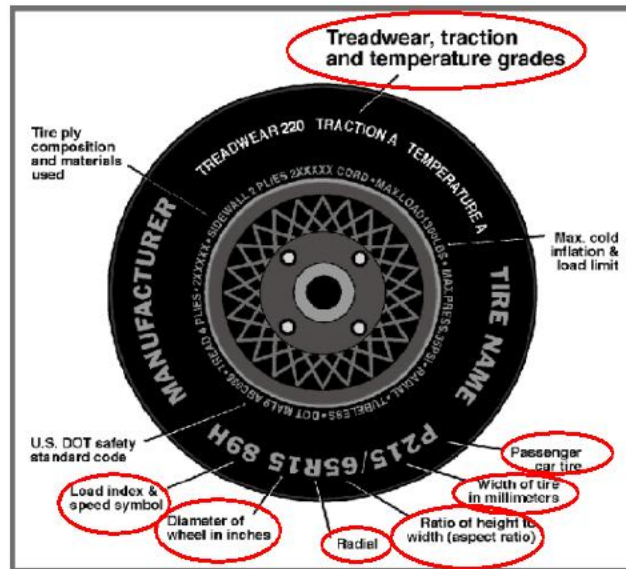
TEST VEHICLE SPECIFICATIONS

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan

NHTSA No.: PX0100

Test Program: 70% Overlap Rear Impact

Test Date: 08/17/12



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max Tire Pressure (kPa)	300	300
Cold Tire Pressure (kPa)	210	210
Max Load Tire Pressure (kPa)	210	210
Recommended Tire Size	P205/70R15	P205/70R15
Tire Size on Vehicle	215/70R15	215/70R15
Tire Manufacturer	Cooper	Cooper
Tire Model	CS4 Touring	CS4 Touring
Load Range	750	750
Treadwear Rating	780	780
Traction Rating	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Nylon, 2 Steel, 2 Polyester	1 Nylon, 2 Steel, 2 Polyester
Load Index/Speed Symbol	98T	98T
Tire Material	Nylon, Steel, Polyester	Nylon, Steel, Polyester
DOT Safety Code Left	U934 CL1 2810	U934 CL1 2810
DOT Safety Code Right	U934 CL1 2810	U934 CL1 2810
Type of Spare Tire	T125/70D15	
Location of Tire Placard on Vehicle	Trunk	

DATA SHEET NO. 2
PRE-TEST INSPECTION

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan

NHTSA No.: PX0100

Test Program: 70% Overlap Rear Impact

Test Date: 08/17/12

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: 1999 Buick LeSabre 4-Door SedanNHTSA No.: PX0100Test Program: 70% Overlap Rear ImpactTest Date: 08/17/12**TEST VEHICLE AXLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	504.0	286.0		558.5	341.0		537.5	366.0	
Right	kg	513.5	287.0		567.0	343.5		549.5	365.0	
Ratio	%	64.0%	36.0%	100.0%	62.2%	37.8%	100.0%	59.8%	40.2%	100.0%
Total	kg	1017.5	573.0	1590.5	1125.5	684.5	1810.0	1087.0	731.0	1818.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1590.5	A
Actual Weight of 2 P572 ATDs Used	kg	148.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	80.0	C
Calculated Vehicle Target Wt (TVTW)	kg	1818.5	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	732	729	730	726	1014
As Tested	mm	716	708	694	690	1132
Fully Loaded	mm	710	707	676	671	1065
Post-Test	mm	719	776	756	669	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2815
Total Vehicle Length	mm	5080
Amount of Stoddard Solvent in Fuel Tank	L	63.36

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

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan NHTSA No.: PX0100
Test Program: 70% Overlap Rear Impact Test Date: 08/17/12

BALLAST DATA

Description	Value
Type of Ballast	Ballast Dummies
Method of Securing Ballast	Seat Belt
Weight of Ballast in Cargo Area	58.5 kg
Weight of Vehicle Components Removed	0.0 kg

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

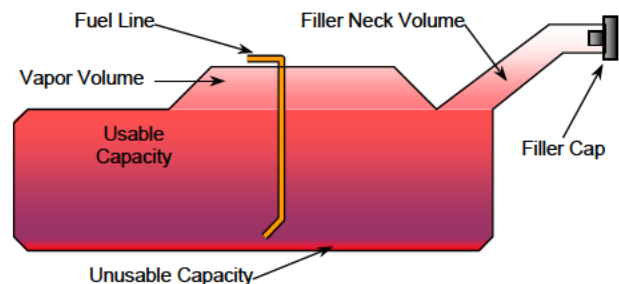
No vehicle components were removed

FUEL TANK CAPACITY

Description	Liters
Fuel System Capacity Listed in Owners Manual	68.13
Usable Capacity of "Standard Tank"	68.13
91 - 94% of Usable Capacity	62.00 - 64.04
Actual Amount of Stoddard Solvent Used	63.36

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: 1999 Buick LeSabre 4-Door Sedan

NHTSA No.: PX0100

Test Program: 70% Overlap Rear Impact

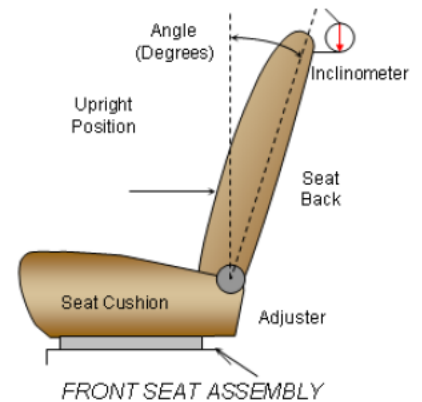
Test Date: 08/17/12

NOMINAL DESIGN RIDING POSITION

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

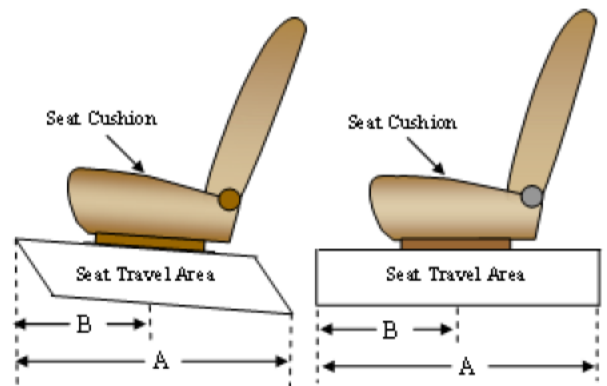
SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	7.8
Passenger Seat Back Angle	7.8



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	232 mm	116 mm
Passenger Seat	232 mm	116 mm

DATA SHEET NO. 3 ... (CONTINUED)

PRE-TEST DATA

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan

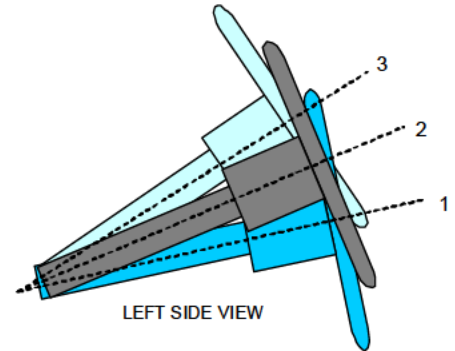
NHTSA No.: PX0100

Test Program: 70% Overlap Rear Impact

Test Date: 08/17/12

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	12.8	
Geometric Center Position, No. 2	25.2	
Uppermost Position, No. 3	37.5	
Telescoping Steering Wheel Travel		
Test Position	22.7	

DATA SHEET NO. 4**MOVING BARRIER DATA**Test Vehicle: 1999 Buick LeSabre 4-Door SedanNHTSA No.: PX0100Test Program: 70% Overlap Rear ImpactTest Date: 08/17/12**MOVING BARRIER TEST WEIGHT**

	Units	As Tested Weights		
		Front Axle	Rear Axle	Total
Left	kg	401.8	298.0	699.8
Right	kg	376.9	291.6	668.5
Ratio	%	56.9%	43.1%	100.0%
Total	kg	778.7	589.6	1368.3

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: 1999 Buick LeSabre 4-Door Sedan NHTSA No.: PX0100
 Test Program: 70% Overlap Rear Impact Test Date: 08/17/12

Temperature at Time of Impact: 35°C Test Time: 3:25 PM
 VIN: 1G4HR52K2XH4

IMPACT VELOCITY DATA

Measured Parameter	Units	Value
Trap No. 1 Velocity (Primary)	km/h	78.69
Trap No. 2 Velocity (Redundant)	km/h	78.68

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Width	mm		1838
Vertical Impact Reference Line (Left of Vehicle Center Line)	mm		368
Actual Impact Point (Left of Vehicle Center Line)	mm		390
Horizontal Offset (+ right / - left)	mm	± 50 of Intended Impact Point	22
Vertical Offset (+ down / - up)	mm	± 40 of Intended Impact Point	35

TARGET VEHICLE PRE- AND POST- TEST STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length at Centerline	5080	4542	-538
2	Total Length	5080	4685	-395
3	Total Width	1838	2060	222
4	Left Side Wheelbase	2815	2475	-340
5	Right Side Wheelbase	2815	2720	-95

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	Right	239
B	Top of Bumper	533	800	Right	222
C	Mid Level	686	800	Right	84
D	Top of Stack	813	800	Right	57

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

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan NHTSA No.: PX0100
Test Program: 70% Overlap Rear Impact Test Date: 08/17/12

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Remained closed and latched	Remained closed and latched
Rear Door Opening	Jammed Shut	Jammed Shut
Hatch and Other Doors	Jammed Shut	

DATA SHEET NO. 6

FMVSS 301 DATA

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan NHTSA No.: PX0100
Test Program: 70% Overlap Rear Impact Test Date: 08/17/12

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

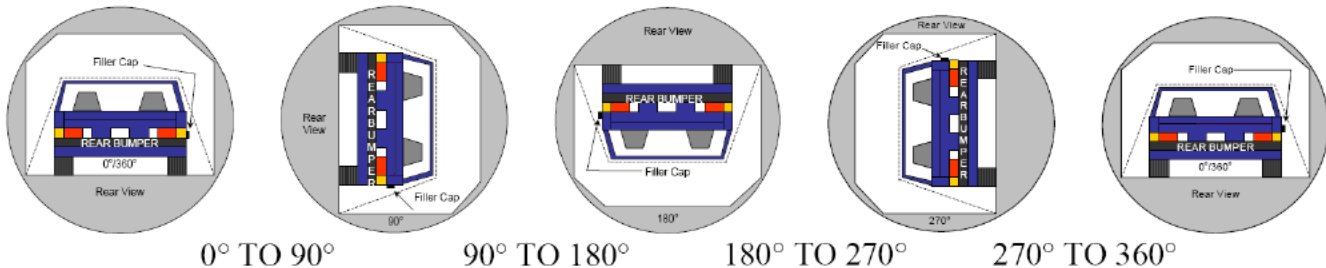
Stoddard Solvent Spillage Measurements

- A. From impact until vehicle motion ceases: 0 g
(Maximum allowable = 28 g)
- B. For the 5 minute period after motion ceases: 516.3 g
(Maximum allowable = 28 g)
- C. For the following 25 minutes: 1663.6 g
(Maximum allowable = 28 g/minute)
- D. Spillage: Solvent was observed leaking from the bottom of the fuel tank.

DATA SHEET NO. 7
STATIC ROLLOVER TEST DATA

Test Vehicle: 1999 Buick LeSabre 4-Door Sedan
 Test Program: 70% Overlap Rear Impact

NHTSA No.: PX0100
 Test Date: 08/17/12



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).

Details of Stoddard solvent spillage: Test was not conducted due to the test failure

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°			
90° To 180°			
180° To 270°			
270° To 360°			

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° To 90°				
90° To 180°				
180° To 270°				
270° To 360°				

SOLVENT SPILLAGE LOCATION TABLE

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

SECTION 3
LABORATORY NOTICE OF APPARENT TEST FAILURE

TEST INFORMATION:

Test Date	8/17/2012
Laboratory	KARCO Engineering, LLC.
Contract No.	DTNH22-11-D-00245
Delivery Order No.	
Lab Project Engineer's Name	Steven Matsusaka
NHTSA No.	PX0100
Test Vehicle	
Year	1999
Make	Buick
Model	LeSabre
Body Style	4-Door Sedan
VIN	1G4HR52K2XH4
Manufacturer	Unknown

TEST FAILURE DESCRIPTION:

Stoddard solvent leaked from the fuel tank of the vehicle immediately after the test. Solvent was observed leaking from the bottom of the fuel tank. Due to the test failure after the impact, the static rollover test was not conducted.

FMVSS REQUIREMENT, PARAGRAPHS:

5.2 Collection of Stoddard Spillage

NOTIFICATION TO NHTSA

Date: 8/24/12 By: Kelsey Chiu

REMARKS:

None.

APPENDIX A
PHOTOGRAPHS

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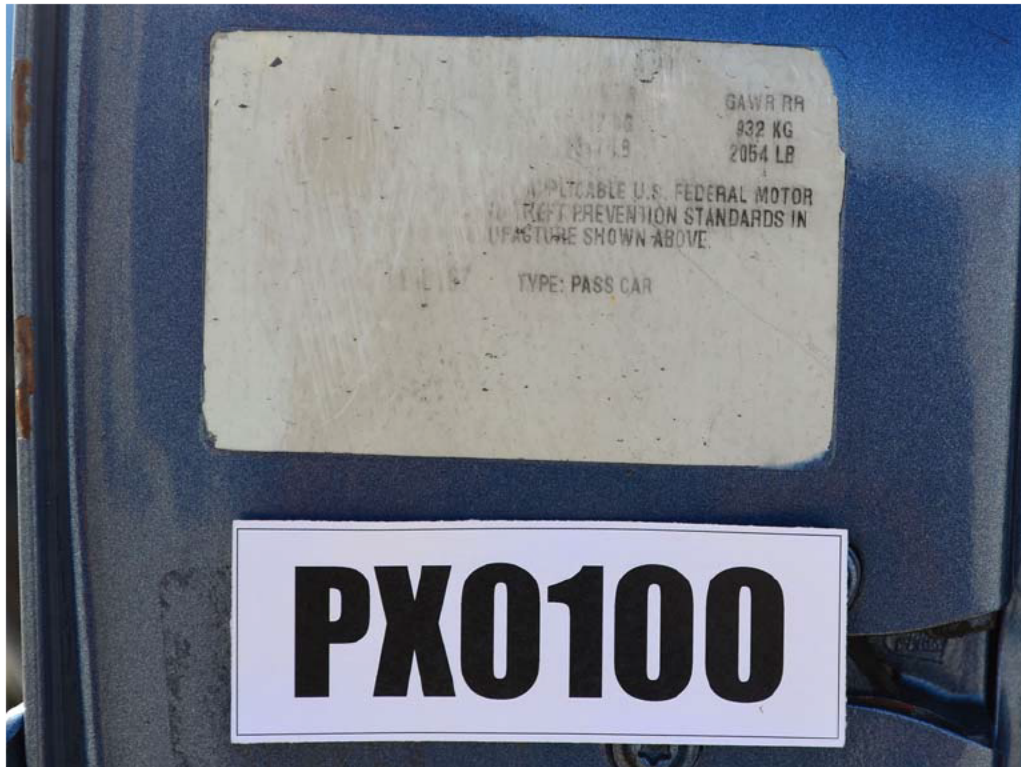


FIGURE 1. Vehicle Certification Label

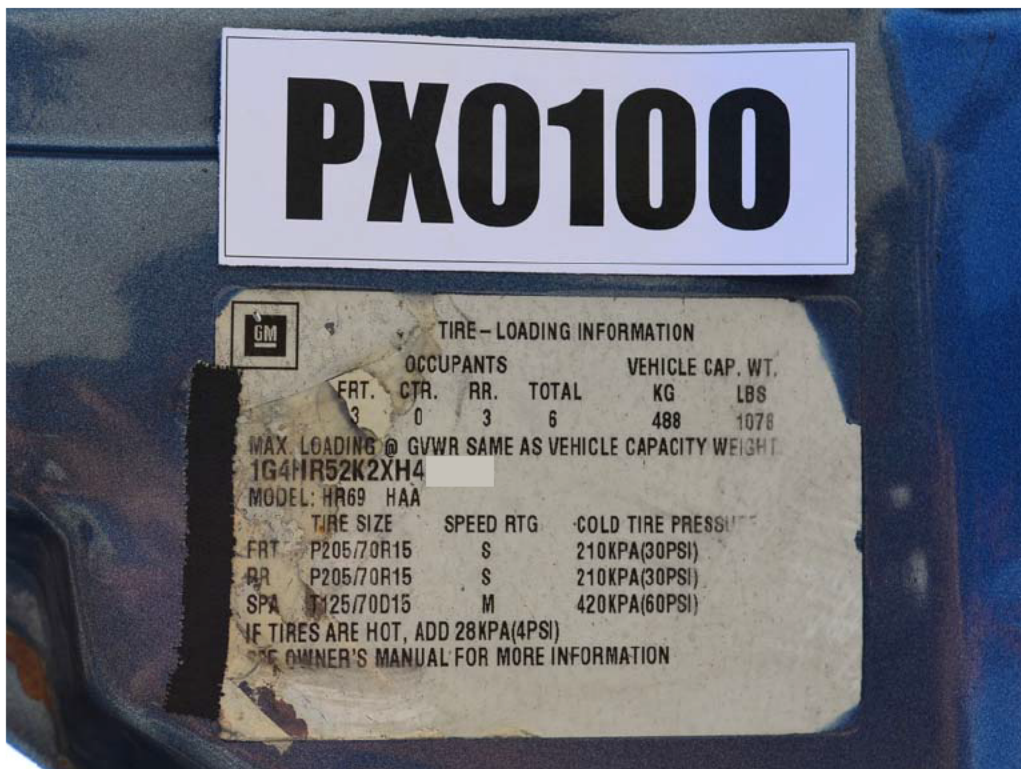


FIGURE 2. Vehicle Tire Placard



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 ¾ View of Test Vehicle



FIGURE 10. Post-Test Left Rear ¾ 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 $\frac{3}{4}$ View of Test Vehicle



FIGURE 18. Post-Test Right Front $\frac{3}{4}$ View of Test Vehicle

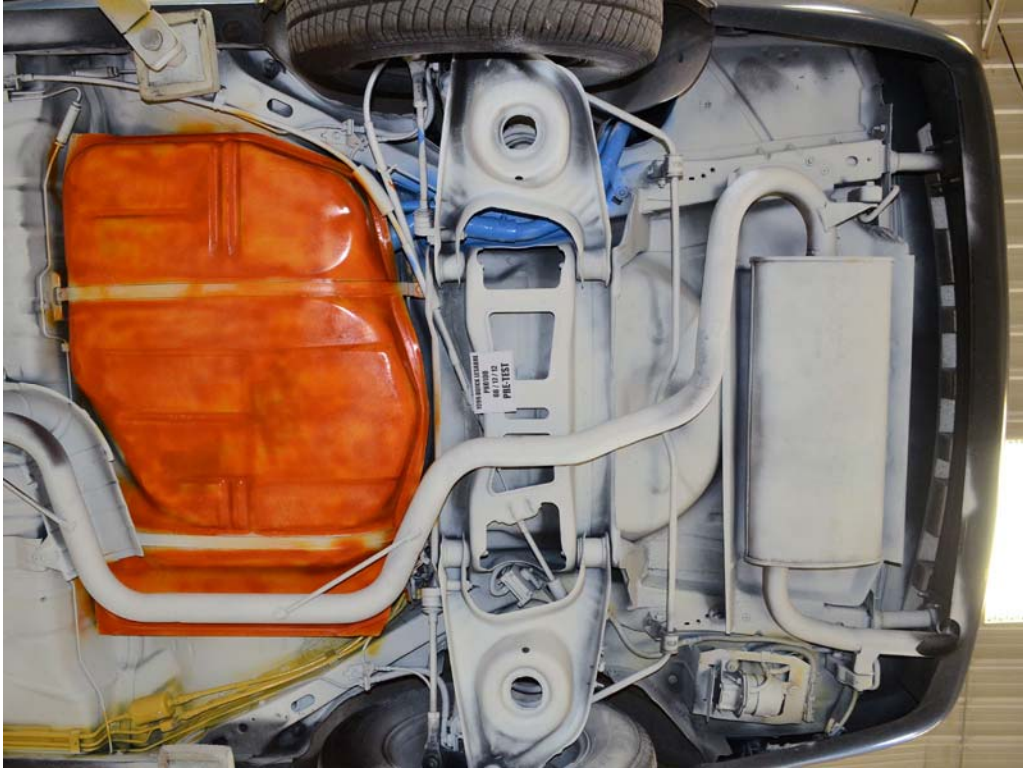


FIGURE 19. Pre-Test Underbody, Fuel Tank Location



FIGURE 20. Post-Test Underbody, Fuel Tank Location



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

Photograph Not Applicable

Rollover Not Required

FIGURE 25. Vehicle at 0° on Static Rollover Device

Photograph Not Applicable

Rollover Not Required

FIGURE 26. Vehicle at 90° on Static Rollover Device

Photograph Not Applicable

Rollover Not Required

FIGURE 27. Vehicle at 180° on Static Rollover Device

Photograph Not Applicable

Rollover Not Required

FIGURE 28. Vehicle at 270° on Static Rollover Device

Photograph Not Applicable

Rollover Not Required

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