SAFETY COMPLIANCE TESTING FOR FMVSS NO. 214S SIDE IMPACT PROTECTION (STATIC)

GENERAL MOTORS OF CANADA LTD. 2009 CHEVROLET IMPALA LS, PASSENGER CAR NHTSA NO. C90100

GENERAL TESTING LABORATORIES, INC. 1623 LEEDSTOWN ROAD COLONIAL BEACH, VIRGINIA 22443



August 12, 2009

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION ENFORCEMENT OFFICE OF VEHICLE SAFETY COMPLIANCE 1200 NEW JERSEY AVE., SE WASHINGTON, D.C. 20590 This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

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SECTION 1 INTRODUCTION

1.0 PURPOSE OF COMPLIANCE TEST

A 2009 Chevrolet Impala LS passenger car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 214 testing to determine if the vehicle was in compliance with the requirements of the standard. FMVSS No. 214 establishes requirements for the side doors of a Motor Vehicle to minimize the safety hazard caused by intrusion into the passenger compartment as a result of a side impact accident.

1.1 TEST VEHICLE

The test vehicle was a 2009 Chevrolet Impala LS Passenger Car. Nomenclature applicable to the test vehicle are:

- A. Vehicle Identification Number: 2G1WB57K991103176
- B. <u>NHTSA No.</u>: C90100
- C. <u>Manufacturer</u>: GENERAL MOTORS OF CANADA LTD.
- D. Manufacture Date: 07/08

The vehicle's front and rear seating systems were removed for this test. All vehicle windows were closed and all doors were locked for this test.

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 214 testing on July 29, 2009.

SECTION 2 TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 TEST PROCEDURE

All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-214S-05 dated 14 September 1993 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-214S-05, "Static – Side Impact Protection".

Each vehicle shall be able to meet the requirements of either, at the manufacturer's option, 2.1 or 2.2 when any of its side doors that can be used for occupant egress are tested.

2.1 OPTION ONE

With any seats that may affect load upon or deflection of the side of the vehicle removed from the vehicle, each vehicle must be able to meet the requirements of 2.1.1 through 2.1.3.

2.1.1 INITIAL CRUSH RESISTANCE

The initial crush resistance shall not be less than 2,250 pounds.

2.1.2 INTERMEDIATE CRUSH RESISTANCE

The intermediate crush resistance shall not be less than 3,500 pounds.

2.1.3 PEAK CRUSH RESISTANCE

The peak crush resistance shall not be less than two times the curb weight of the vehicle or 7,000 pounds, whichever is less.

2.2 OPTION TWO

With seats installed in the vehicle, and located in any horizontal or vertical position to which they can be adjusted and at any seat back angle to which they can be adjusted, each vehicle must be able to meet the requirements of 2.2.1 through 2.2.3.

2.2.1 INITIAL CRUSH RESISTANCE

The initial crush resistance shall not be less than 2,250 pounds.

2.2.2 INTERMEDIATE CRUSH RESISTANCE

The intermediate crush resistance shall not be less than 4,375 pounds.

2.2.3 PEAK CRUSH RESISTANCE

The peak crush resistance shall not be less than three and one half times the curb weight of the vehicle or 12,000 pounds, whichever is less.

SECTION 3 COMPLIANCE TEST DATA

DATA SHEET 1 TEST VEHICLE RECEIVING-INSPECTION

VEH. MOD YR/MAKE/MODEL/BODY: <u>2009 CHEVROLET IMPALA LS PASSENGER CAR</u> VEH. NHTSA NO.: <u>C90100</u>; VIN: <u>2G1WB57K991103176</u> VEH. BUILD DATE: <u>07/08</u>; TEST DATE: <u>JULY 29, 2009</u> TEST LABORATORY: <u>GENERAL TESTING LABS</u> OBSERVERS: <u>G. FARRAND, J. LATANE</u>

- A. First compliance test by laboratory for this vehicle is the static FMVSS 214 test.
 - ____ Yes <u>X</u> No (Go to item 2)
 - X (1) Label test vehicle with NHTSA Number
 - X (2) Verify all options on the "window sticker" are present on the vehicle
 - X (3) Verify tires and wheel rims are new and the same as listed
 - X (4) Verify there are no dents or other interior or exterior flaws
 - X (5) Verify the glove box contains an owner's manual, warranty document, consumer information, and extra keys
 - X (6) Verify the vehicle is equipped with the proper fuel filler cap
 - X (7) If the vehicle has been delivered from the dealer, verify the vehicle has been properly prepared and is in running condition
- B. Verify seat adjusters are working <u>X</u> Yes <u>No</u>
- C. Verify there is a seat belt at each seating position <u>X</u> Yes <u>No</u>
- D. Without disturbing the integrity of each seat belt and anchorage, verify that each seat belt is attached to the anchorage. For seat belts that are attached to the seat, also verify the seats are attached to the seat anchors and the seat anchors are attached to the vehicle.
 - <u>X</u> Yes ____ No
- E. Curb Weight of Vehicle: <u>3532</u> LBS. (1602 KG)
- F. COMMENTS: (Explain any problems here)

RECORDED BY: <u>G. FARRAND</u>

DATE: 07/29/09

APPROVED BY: <u>D. MESSICK</u>

DATA SHEET 2 PRETEST PREPARATION

VEH. VEH. TEST	MOD YR/MAKE/MODEL/BODY: <u>2009 CHEVROLET IMPALA LS PASSEN</u> NHTSA NO.: <u>C90100</u> ; VIN: <u>2G1WB57K991103176</u> BUILD DATE: <u>07/08</u> ; TEST DATE: <u>JULY 29, 2009</u> LABORATORY: <u>GENERAL TESTING LABS</u> RVERS: <u>G. FARRAND, J. LATANE</u>	<u> GER C</u> - - -	<u>AR</u>
Prior t	o testing the following will be accomplished:	1 1	<u>87</u> 2
A.	Check the manufacturers certification statement to determine if the vehicle should be tested with or without seats installed.	<u>X</u>	<u>_X</u>
В.	Remove all seats unless the vehicle has been certified with the seats installed. If the seats remain in the vehicle, they are to be adjusted per the COTR's instructions.	<u>X</u>	<u>X</u>
C.	Close all windows	<u>X</u>	<u>X</u>
D.	Lock All doors	<u>X</u>	<u>X</u>
E.	State door tested	<u>LF</u>	RR
F.	State the length of a horizontal line drawn on door through a point 5 inches vertically above lowest point of test door	42.7	<u>29.7</u>
G.	State vertical distance from the lowest part of test door to bottom of loading device	_5"	<u>5"</u>
H.	State position of vertical centerline of loading device on the midpoint of line determined step F	<u>21.3</u>	<u>14.8</u>
I.	Determine that the vertical axis of the loading device is perpendicular to the longitudinal and lateral axis of the test vehicle	<u>X</u>	<u>_X</u>
J.	Determine that the top of the loading device is above the door window opening but not touching any structure above the window opening	<u>X</u>	<u>X</u>
RECC	ORDED BY: <u>G. FARRAND</u> DATE: <u>07/29/</u>	<u>′09</u>	

APPROVED BY: <u>D. MESSICK</u>

DATA SHEET 3 STATIC LOAD TEST - BACK-UP SYSTEM DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CHEVROLET IMPALA LS PASSENGER CAR VEH. NHTSA NO.: <u>C90100</u>; VIN: 2G1WB57K991103176 VEH. BUILD DATE: <u>07/08</u>; TEST DATE: <u>JULY 29, 2009</u> TEST LABORATORY: <u>GENERAL TESTING LABS</u> OBSERVERS: <u>G. FARRAND, J. LATANE</u>

<u>RESULTS</u>: Plots of load versus displacement and time versus displacement obtained from the back-up data (attach plots to data sheet) showed that:

TEST #1 - GTL #6269 (LEFT FRONT DOOR)

A. The initial crush resistance was <u>3692</u> lbs.

- B. The intermediate crush resistance was <u>6395</u> lbs.
- C. The peak crush resistance was <u>11,367</u> lbs at <u>12.1</u> inches
- D. The rate of loading was <u>.2"/sec</u>

The dial indicator and the inclinometer showed the following deflections.

LOADING DEVICE TRAVEL	DIAL INDICATOR	INCLINOMETER
0 inches	0.0000	0
2 inches	0.03	0
4 inches	0.10	0
6 inches	0.16	0
12 inches	0.32	0
<u>12.1</u> Inches (full travel)	0.31	0
<u>0</u> Inches (removal)	0.09	0

TEST #2 - GTL #6270 (RIGHT REAR DOOR)

A. The initial crush resistance was <u>4655</u> lbs.
B. The intermediate crush resistance was <u>7816</u> lbs.
C. The peak crush resistance was <u>13,318</u> lbs at <u>10.9</u> inches
D. The rate of loading was <u>.2"/sec</u>

DATA SHEET 3 CONTINUED STATIC LOAD TEST - BACK-UP SYSTEM DATA

The dial indicator and the inclinometer showed the following deflections.

LOADING DEVICE TRAVEL	DIAL INDICATOR	INCLINOMETER
0 inches	0.0000	0
2 inches	0.03	0
4 inches	0.10	0
6 inches	0.16	0
12 inches	0.31	0
<u>12.0</u> Inches (full travel)	0.42	0
<u>0</u> Inches (removal)	0.09	0

RECORDED BY: <u>G. FARRAND</u>

APPROVED BY: <u>D. MESSICK</u>

DATE: 07/29/09

DATA SHEET 4 DATA REDUCTION

VEH. MOD YR/MAKE/MODEL/BODY: 2009 CHEVROLET IMPALA LS PASSENGER CAR VEH. NHTSA NO.: <u>C90100</u>; VIN: <u>2G1WB57K991103176</u> VEH. BUILD DATE: <u>07/08</u>; TEST DATE: <u>JULY 29</u>, 2009 TEST LABORATORY: GENERAL TESTING LABS OBSERVERS: G. FARRAND, J. LATANE

Data from the primary data systems will be analyzed and the plots attached to the data sheet.

RESULTS - The load versus displacement plot showed that - -

TEST #1 - GTL #6269 (LEFT FRONT DOOR)

- The initial crush resistance was 3692 lbs. Α.
- The intermediate crush resistance was 6395 lbs. Β.
- C. The peak crush resistance was <u>11,367</u> lbs at <u>12.1</u> inches

The time versus displacement plot showed that - -

The rate of loading was .2"/sec

TEST #2 - GTL #6270 (RIGHT REAR DOOR)

- The initial crush resistance was <u>4655</u> lbs. The intermediate crush resistance was <u>7816</u> lbs. Α.
- Β.
- The peak crush resistance was <u>13,318</u> lbs at <u>10.9</u> inches C. The time versus displacement plot showed that - -

The rate of loading was .2"/sec

Comparison of the ABOVE DATA with the BACKUP DATA indicates the following - -

Primary and Backup data agree.

RECORDED BY: <u>G. FARRAND</u>

DATE: 07/29/09

APPROVED BY: <u>D. ME</u>SSICK

SECTION 4

TEST EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
COMPUTER	AT&T	486DX266	N/A	N/A
TEST FIXTURE	GTL 214	214	N/A	N/A
A/D INTERFACE	METRABYTE	DAS-16(F)	BEFORE USE	BEFORE USE
SCALES	INTERCOMP	199744	04/09	04/10
SIGNAL CONDITIONER	METRABYTE	EXP-RES	BEFORE USE	BEFORE USE
LOAD CELL	TRANSDUCER INC.	18550	11/08	11/09
LINEAR POT.	WALDALE WALDALE	123456A 123456B	BEFORE USE	BEFORE USE
INCLINOMETER	STARRETT	360/002	BEFORE USE	BEFORE USE
DIAL INDICATOR	ΜΙΟΤΟ	0001-2	BEFORE USE	BEFORE USE

SECTION 5

PHOTOGRAPHS



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.1 FRONT VIEW OF VEHICLE PRE-TEST



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.2 LEFT SIDE VIEW OF VEHICLE PRE-TEST



FIGURE 5.3 RIGHT SIDE VIEW OF VEHICLE PRE-TEST



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.4 REAR VIEW OF VEHICLE PRE-TEST



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.5 ¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICE PRE-TEST



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.6 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE PRE-TEST

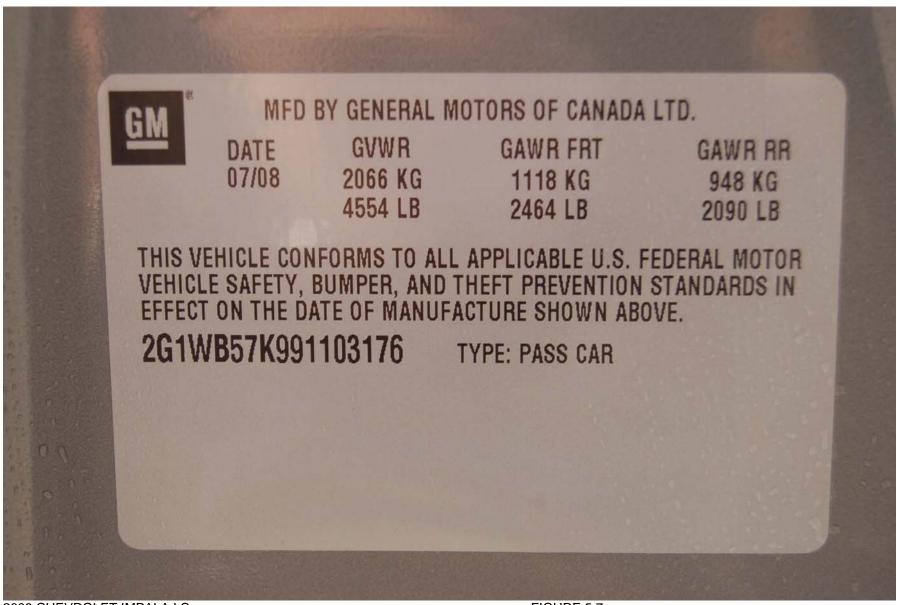


FIGURE 5.7 VEHICLE CERTIFICATION LABEL

The combined weight of occupants and cargo should never exceed 428 kg or 944 lbs.TIREORIGINAL SIZECOLD TIRE PRESSUREFRONTP225/60R16S210 kPa, 30 PSIREARP225/60R16S210 kPa, 30 PSISPARET125/70D46Manual For ADDITIONAL INFORMATIONSee Owner's ADDITIONAL INFORMATION		SEATING CAPAC	CITY	LOADING INFORM	REAR 3
TIREORIGINAL SIZECOLD TIRE PRESSUREFRONTP225/60R16S210 kPa, 30 PSIREARP225/60R16S210 kPa, 30 PSISPARET125/70D16M420 LP30 PSI	The combin	ed weight of occupar	nts and ca	argo should never exceed 428 kg	or 944 lbs.
FRONTP225/60R16S210 kPa, 30 PSISEE OWNER'S MANUAL FOR ADDITIONAL INFORMATIONREARP225/60R16S210 kPa, 30 PSIMANUAL FOR ADDITIONAL INFORMATION	TIRE				No. of Concession, Name
REAR P225/60R16 S 210 kPa, 30 PSI ADDITIONAL INFORMATION		P225/60R16	S		MANUAL FOR
SPARE T125/70D16 M 400 LD CO. TO INFORMATION			S		ADDITIONAL
1 420 KPa, 60 PSI	SPARE	T125/70D16	М	420 kPa, 60 PSI	INFORMATION

FIGURE 5.8 VEHICLE TIRE INFORMATION LABEL



FIGURE 5.9 VEHICLE VIN PLATE



FIGURE 5.10 INSTRUMENTATION SET-UP



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.11 REAR VEHICLE TIE DOWN – TEST 1



FIGURE 5.12 FRONT VEHICLE TIE DOWN – TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.13 INCLINOMETER PRE-TEST 1



FIGURE 5.14 DIAL INDICATOR PRE-TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.15 LOAD DEVICE AGAINST DOOR – PRE-TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.16 LOAD DEVICE AGAINST DOOR @ MAX LOAD – TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.17 INCLINOMETER AT MAX LOAD – TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.18 DIAL INDICATOR AT MAX LOAD – TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.19 POST TEST DOOR OUTSIDE – TEST 1



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.20 POST TEST DOOR INSIDE – TEST 1



FIGURE 5.21 REAR VEHICLE TIE DOWN – TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.22 FRONT VEHICLE TIE DOWN – TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.23 INCLINOMETER PRE-TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.24 DIAL INDICATOR – PRE-TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.25 LOAD DEVICE AGAINST DOOR – PRE-TEST 2



FIGURE 5.26 LOAD DEVICE AGAINST DOOR @ MAX LOAD – TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.27 INCLINOMETER AT MAX LOAD – TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.28 DIAL INDICATOR AT MAX LOAD – TEST 2



FIGURE 5.29 POST TEST DOOR OUTSIDE – TEST 2



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.30 POST TEST DOOR INSIDE – TEST 2



FIGURE 5.31 FRONT VIEW OF VEHICLE POST TEST



FIGURE 5.32 LEFT SIDE VIEW OF VEHICLE POST TEST



FIGURE 5.33 RIGHT SIDE VIEW OF VEHICLE POST TEST



FIGURE 5.34 REAR VIEW OF VEHICLE POST TEST



2009 CHEVROLET IMPALA LS NHTSA NO. C90100 FMVSS NO. 214

FIGURE 5.35 ¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE POST TEST



FIGURE 5.36 ¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE POST TEST

SECTION 6

TEST DATA PLOTS

