REPORT NUMBER: 220-MGA-2009-005

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 220 SCHOOL BUS ROLLOVER PROTECTION

GIRARDIN MINIBUS, INC.
2008 GIRARDIN G5 SCHOOL BUS
NHTSA NO.: C80902

PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105

TEST DATE: NOVEMBER 3, 2010

FINAL REPORT DATE: JANUARY 12, 2011

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAILCODE: NVS-220
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Prepared by: _____ Date: January 12, 2011
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Edward E. Chan
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Technical Report Documentation Page

1. Report No. 220-MGA-2009-005	*2. Government Accession No.*	*3. Recipient's Catalog No.*	
4. Title and Subtitle Final Report of FMVSS 220 Compliance Testing of 2008 Girardin G5 School Bus NHTSA No.: C80902		*5. Report Date* January 12, 2011 *6. Performing Organization Code* MGA	
7. Author(s) Eric Peschman, Project Engineer Michael Janovicz, Program Manager		*8. Performing Organization Report No.* 220-MGA-2009-005	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-08-D-00075	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance Mail Code: NVS-220 1200 New Jersey Avenue, S.E. Washington, D.C. 20590		*13. Type of Report and Period Covered* Final Report 11/03/10 *14. Sponsoring Agency Code* NVS-220	
15. Supplementary Notes			
16. Abstract Compliance tests were conducted on the subject 2008 Girardin G5 School Bus, NHTSA No.: C80902, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-220-02 for the determination of FMVSS 220 compliance. Test failures were as follows: None			
17. Key Words Compliance Testing Safety Engineering FMVSS 220		*18. Distribution Statement* Copies of this report are available from: NHTSA Technical Information Services (TIS) Mail Code: NPO-411 1200 New Jersey Avenue, S.E. Washington, D.C. 20590 Fax No.: (202) 493-2833 E-mail: tis@dot.gov	
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Form DOT F1700.7 (8-72)

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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a 2008 Girardin G5 School Bus, NHTSA No.: C80902, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedure, TP-220-02, to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 220, “School Bus Rollover Protection”.

This program is sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No.: DTNH22-08-D-00075.

SECTION 2

TEST DATA SUMMARY

Based on the tests performed, the 2008 Girardin G5 School Bus, NHTSA No.: C80902 appears to meet the requirements of FMVSS 220. The ambient temperature during testing was 23° C.

TEST RESULTS

S4.a	The downward vertical movement of any point on the application plate shall not exceed 130 mm.	**PASS**
S4.b	Each emergency exit shall be capable of:	
	Unlatching per FMVSS 217	**PASS**
	Opening per FMVSS 217	**PASS**

Comments: None

SECTION 3
COMPLIANCE TEST DATA

The following data sheets document the results of testing on the 2008 Girardin G5 School Bus, NHTSA No. C80902.

DATA SHEET 1

VEHICLE INFORMATION

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**

Contract No.:	DTNH22-08-D-00075
Laboratory Name:	MGA Research Corporation

INCOMPLETE VEHICLE

Manufacturer:	Ford Motor Company
Model:	G5
VIN:	1FD4E45PX8DB40217
Certification Date:	05/08

COMPLETED VEHICLE (SCHOOL BUS)

Manufacturer:	Girardin Minibus Inc.
Make/Model:	Girardin G5
VIN:	1FD4E45PX8DB40217
NHTSA No.:	C80902
Color:	Yellow
GVWR:	6,373 kg / 14,050 lb
Build Date:	06/08
Certification Date:	05/08

DATES

Vehicle Receipt:	02/19/09
Start of Compliance Test:	11/03/10
Completion of Compliance Test:	11/03/10

Comments: All tests were performed in accordance with the references outlined in: TP-220-02.

DATA SHEET 1 (CONTINUED)

VEHICLE INFORMATION

SCHOOL BUS UNLOADED VEHICLE WEIGHT (UVW)

	Units	As Delivered (UVW) (Axle)		
		Front	Rear	Total
Left	kg	730	1,472	
Right	kg	900	1,440	
Ratio	%	35.9	64.1	
Totals	kg	1,630	2,912	4,542

SCHOOL BUS ROOF AND APPLICATION PLATE DATA

Dimensions	School Bus Roof	Calculated Roof Plate	Actual Roof Plate
Length (mm):	5,232	4,927	4,877
Width (mm):	2,080	914	914

Note: The vehicle was centered laterally and longitudinally under the roof load application plate.

School Bus Has: X Rigid Frame; __ Unibody

Components Removed From Vehicle Before Testing : Front – Center roof air vent

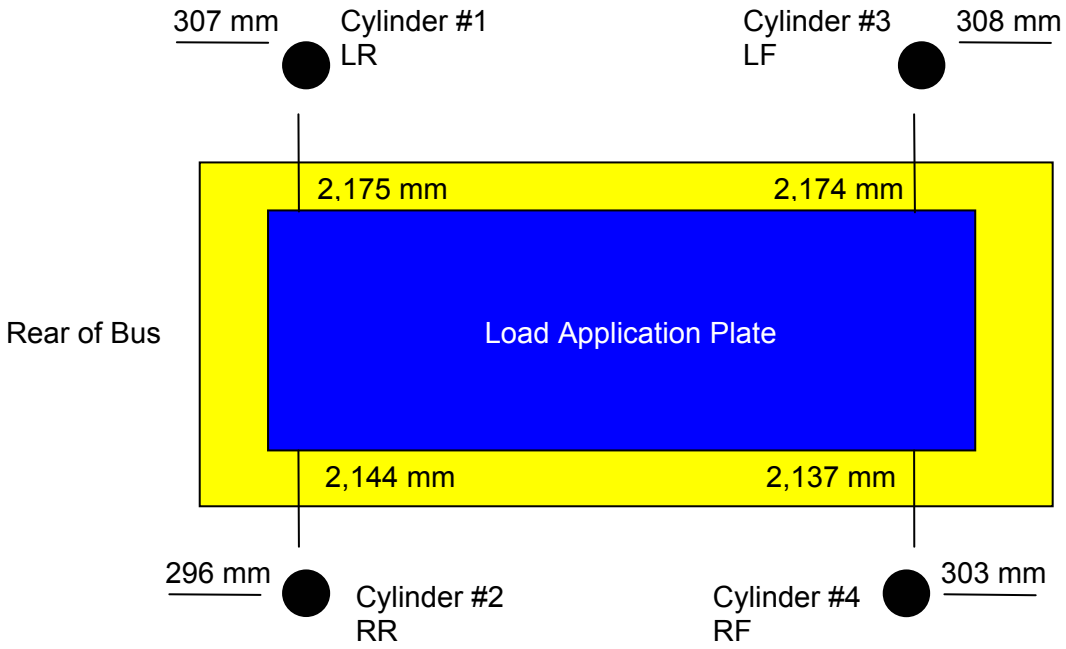
DATA SHEET 1 (CONTINUED)

VEHICLE INFORMATION

LINEAR DISPLACEMENT TRANSDUCER LOCATION

Description	LF	RF	LR	RR
Perpendicular Distance from closest corner of load application plate (mm)	308	303	307	296
From closest outside edge of load application plate (mm)	2,144	2,175	2,137	2,174

Note: LR = Left Rear, RR = Right Rear, LF = Left Front, and RF = Right Front



Comments: Bus body offset from frame 10 mm on rear.

Recorded By: _____

Approved By: _____ Date: 11/03/10

DATA SHEET 2

FORCE APPLICATION AND DEFLECTION INFORMATION

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**

FORCE APPLICATION PLATE LOAD CALCULATION

Unloaded Delivered Weight (UDW):	4,542 kg
Calculated Test Load = 1.5 * UDW:	6,813 kg (66,813 N)
Range of Test Load (-1% to -3%):	64,808 N – 66,145 N

FORCE APPLICATION PLATE LOAD

		Pre-load		Maximum Load		Deflection B-A (mm)
		Displacement A (mm)	Load (N)	Displacement B (mm)	Load (N)	
Cylinder	1 (LR)	0	500	141	16,850	141
	2 (RR)	2	304	53	16,632	51
	3 (LF)	0	520	46	16,543	46
	4 (RF)	2	422	80	16,458	78
Total Load			1,746		66,483	

FORCE APPLICATION PLATE DEFLECTION

		Pre-load	Maximum Load	Deflection B-A (mm)	Deflection ≤ 130 mm?	
		Displacement A (mm)	Displacement B (mm)		Yes - Pass	No - Fail
Corner of Force Application Plate*	1 (LR)	0	43	43	**PASS**	
	2 (RR)	2	55	53	**PASS**	
	3 (LF)	1	32	31	**PASS**	
	4 (RF)	1	52	51	**PASS**	
Average Deflection				45		

Note: LR = Left Rear, RR = Right Rear, LF = Left Front, and RF = Right Front

Comments: Deflection at each corner of the required force application plate area was measured with the use of laser indicators positioned near the four most outboard corners of the vehicle's roof.

Recorded By: _____

Approved By: _____ Date: 11/03/10

DATA SHEET 3

FORCE AND OPENING AREA TEST OF EMERGENCY EXITS

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**

		Yes - Pass	No - Fail
Can all exits be manually released and extended by a single person without tools, remote controls, and without the engine running?		**PASS**	
Is emergency exit door releasable from inside the school bus?	BEFORE LOAD:	**PASS**	
	MAXIMUM LOAD:	**PASS**	
	AFTER LOAD:	**PASS**	
Is emergency exit door releasable from outside the school bus?	BEFORE LOAD:	**PASS**	
	MAXIMUM LOAD:	**PASS**	
	AFTER LOAD:	**PASS**	

Note: BEFORE, MAXIMUM & AFTER LOAD, refer to the time when the assessment was made relative to load being applied to the school bus roof with the force application plate.

Comments: None

Recorded By: _____

Approved By: _____ Date: 11/03/10

DATA SHEET 4

FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (INTERIOR)

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**

FORCE TO RELEASE (UNLATCH) THE EMERGENCY EXITS

Exit Location	BEFORE LOAD (N)	Force ≤ 178 N?		MAXIMUM LOAD (N)	Force ≤ 178 N?		AFTER LOAD (N)	Force ≤ 178 N?		Type of Motion
		Yes - Pass	No - Fail		Yes - Pass	No - Fail		Yes - Pass	No - Fail	
Rear Emergency Exit Door	39	PASS		41	PASS		52	PASS		Rotary
	40			43			40			
	42			40			44			
	Average: 40			Average: 41			Average: 45			

FORCE TO EXTEND (OPEN) THE EMERGENCY EXITS

Exit Location	BEFORE LOAD (N)	Force ≤ 178 N?		MAXIMUM LOAD (N)	Force ≤ 178 N?		AFTER LOAD (N)	Force ≤ 178 N?		Type of Motion
		Yes - Pass	No - Fail		Yes - Pass	No - Fail		Yes - Pass	No - Fail	
Rear Emergency Exit Door	13	PASS		19	PASS		18	PASS		Push Out
	18			13			18			
	18			12			22			
	Average: 16			Average: 15			Average: 19			

Note: BEFORE, MAXIMUM & AFTER LOAD, refer to the time when the assessment was made relative to load being applied to the school bus roof with the force application plate.

Comments: None

Recorded By: _____

Approved By: _____ Date: 11/03/10

DATA SHEET 5

FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (EXTERIOR)

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**

FORCE TO RELEASE (UNLATCH) THE EMERGENCY EXITS

Exit Location	BEFORE LOAD (N)	Force ≤ 178 N?		MAXIMUM LOAD (N)	Force ≤ 178 N?		AFTER LOAD (N)	Force ≤ 178 N?		Type of Motion
		Yes - Pass	No - Fail		Yes - Pass	No - Fail		Yes - Pass	No - Fail	
Rear Emergency Exit Door	155	PASS		162	PASS		132	PASS		Rotary
	131			144			130			
	118			149			125			
	Average: 135			Average: 152			Average: 129			

FORCE TO EXTEND (OPEN) THE EMERGENCY EXITS

Exit Location	BEFORE LOAD (N)	Force ≤ 178 N?		MAXIMUM LOAD (N)	Force ≤ 178 N?		AFTER LOAD (N)	Force ≤ 178 N?		Type of Motion
		Yes - Pass	No - Fail		Yes - Pass	No - Fail		Yes - Pass	No - Fail	
Rear Emergency Exit Door	17	PASS		18	PASS		26	PASS		Pull
	15			16			19			
	14			15			20			
	Average: 15			Average: 16			Average: 22			

Note: BEFORE, MAXIMUM & AFTER LOAD, refer to the time when the assessment was made relative to load being applied to the school bus roof with the force application plate.

Comments: None

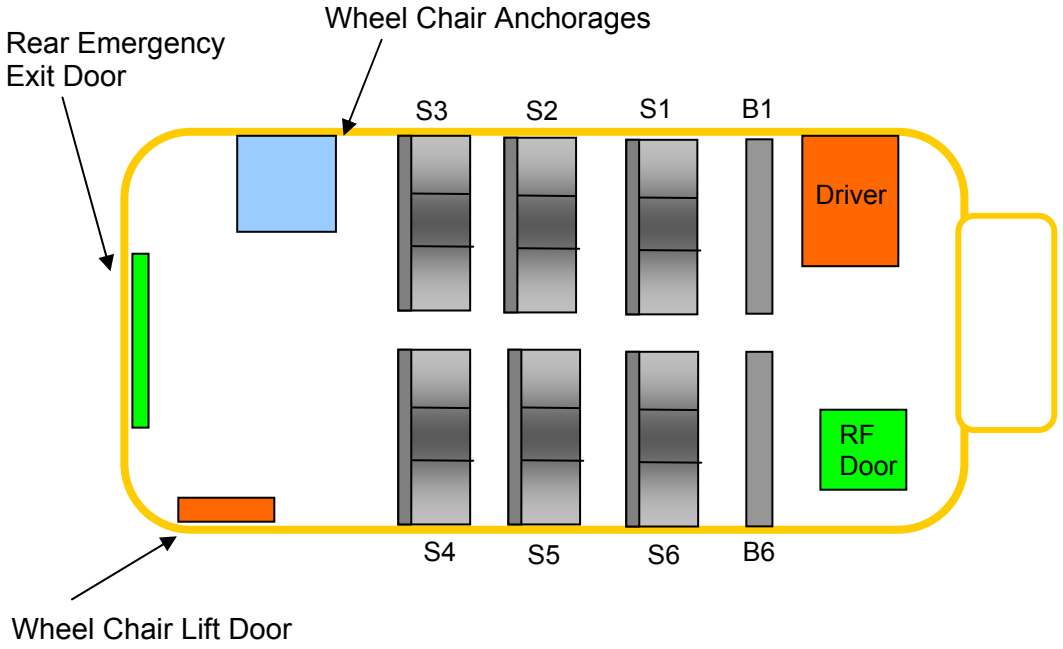
Recorded By: _____

Approved By: _____ Date: 11/03/10

DATA SHEET 6

EMERGENCY EXIT MEASUREMENTS

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Test Lab: **MGA RESEARCH CORPORATION** Test Date: **11/03/10**



		Height (mm)	Width (mm)	Required Test Form (Ellipsoid or Parallelepiped)	Opening allowed unobstructed passage of the test form?	
					Yes – Pass	No – Fail
1	Rear Emergency Exit Door	1,328	840	Parallelepiped	**PASS**	

Comments: None

Recorded By: _____

Approved By: _____ Date: 11/03/10

SECTION 4

INSTRUMENTATION AND EQUIPMENT LIST

Equipment	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
Steel Tape	Stanley	580	04/22/10	10/22/10
Cylinder #1 Load Cell	Interface	315453	09/30/10	03/30/11
Cylinder #1 Displacement Pot.	Ametek	0108-27166	10/05/10	04/05/11
Cylinder #2 Load Cell	Interface	321811	10/04/10	04/04/11
Cylinder #2 Displacement Pot.	Ametek	0304-21633	10/05/10	04/05/11
Cylinder #3 Load Cell	Interface	326710	10/01/10	04/01/11
Cylinder #3 Displacement Pot.	Ametek	0108-27168	10/05/10	04/05/11
Cylinder #4 Load Cell	Interface	321788	09/30/10	03/30/11
Cylinder #4 Displacement Pot.	Ametek	0108-27167	10/05/10	04/05/11
Force Gauge	Quantrol	DMLC1120014	10/15/10	04/15/11
Inclinometer	Pro 360	006	09/24/10	03/24/11

SECTION 5

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Frontal View of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Frontal View of School Bus After Testing

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Rear View of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Rear View of School Bus After Testing

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Full View of Left Side of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Full View of Right Side of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Full View of Right Side of School Bus After Testing

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Left Front ¾ View of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Left Front ¾ View of School Bus After Testing Right

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Front ¾ View of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Right Front ¾ View of School Bus After Testing

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Right Rear ¾ View of School Bus Before Testing (as received by MGA)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Right Rear ¾ View of School Bus After Testing

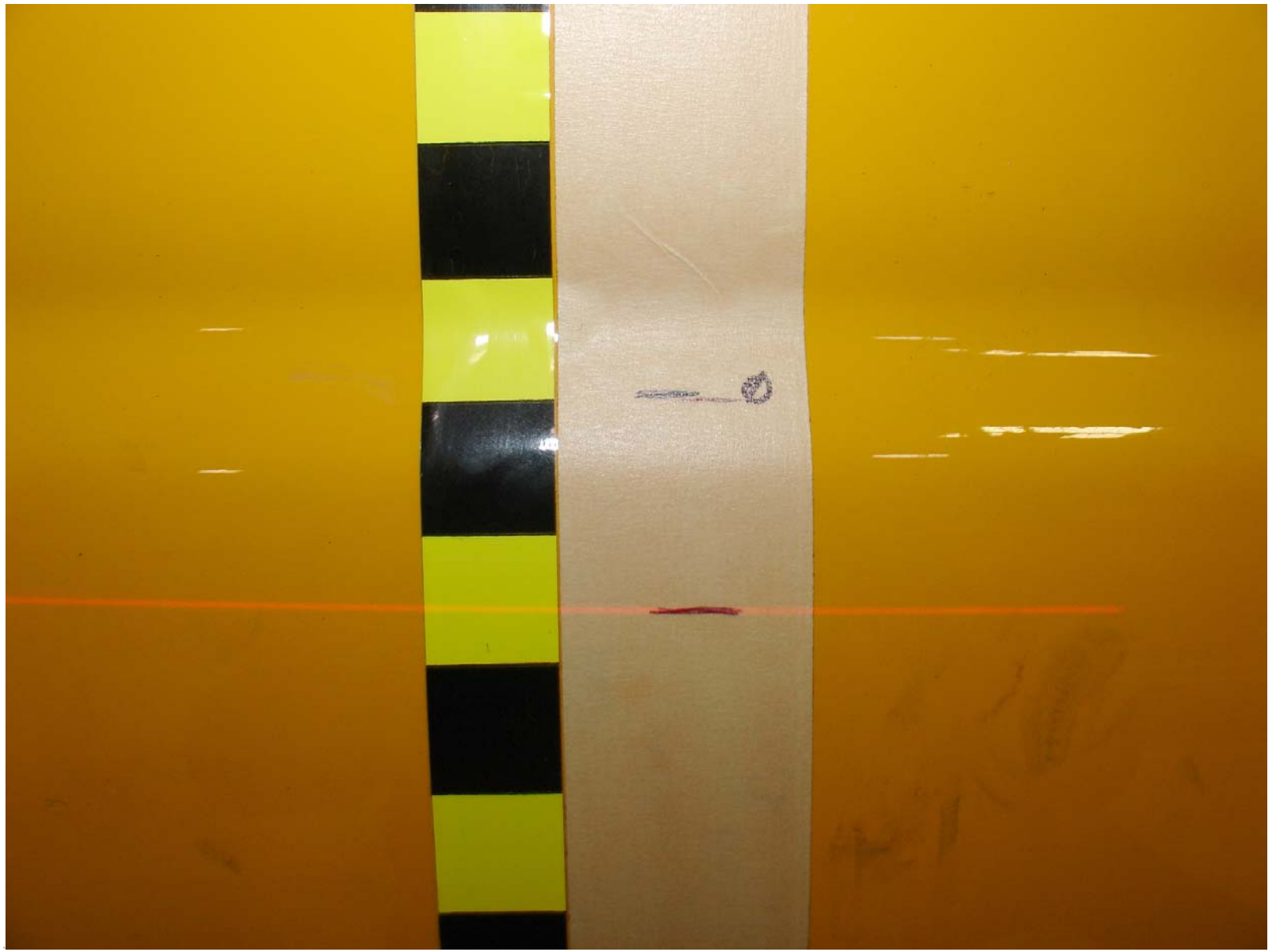
Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Loading Device Placed Against Bus's Roof at Maximum Load Condition (Front)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Loading Device Placed Against Bus's Roof at Maximum Load Condition (Rear)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**



Backup Roof Deflection Measuring Device at Maximum Load Condition (Left Front)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Backup Roof Deflection Measuring Device at Maximum Load Condition (Left Rear)

Test Vehicle: **2008 GIRARDIN G5 SCHOOL BUS** NHTSA No.: **C80902**
Procedure: **FMVSS 220** Test Date: **11/03/10**

Backup Roof Deflection Measuring Device at Maximum Load Condition (Right Front)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Backup Roof Deflection Measuring Device at Maximum Load Condition (Right Rear)

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

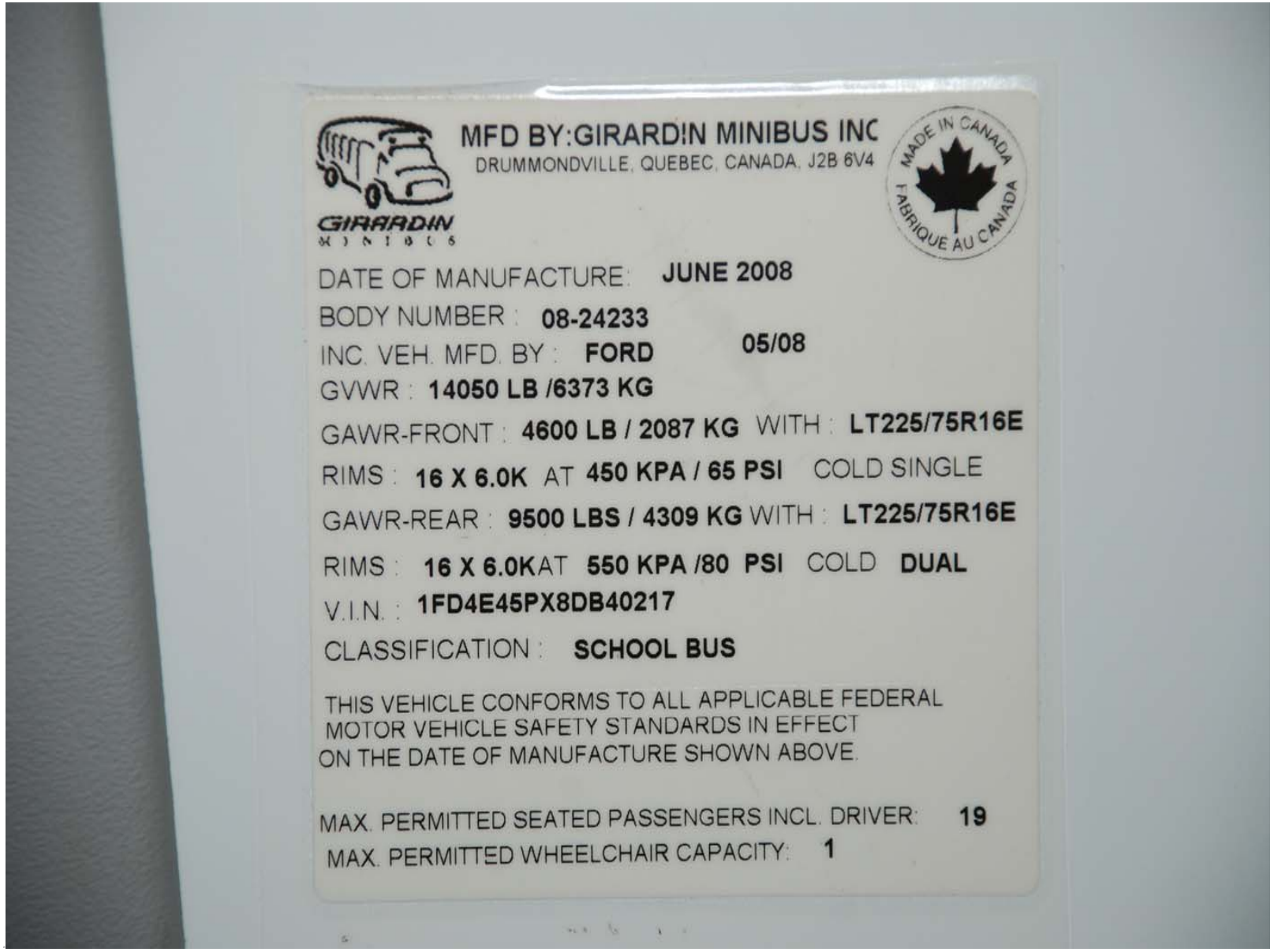
Roof, After Removal of Loading Device, Viewed From the Bus Exterior

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

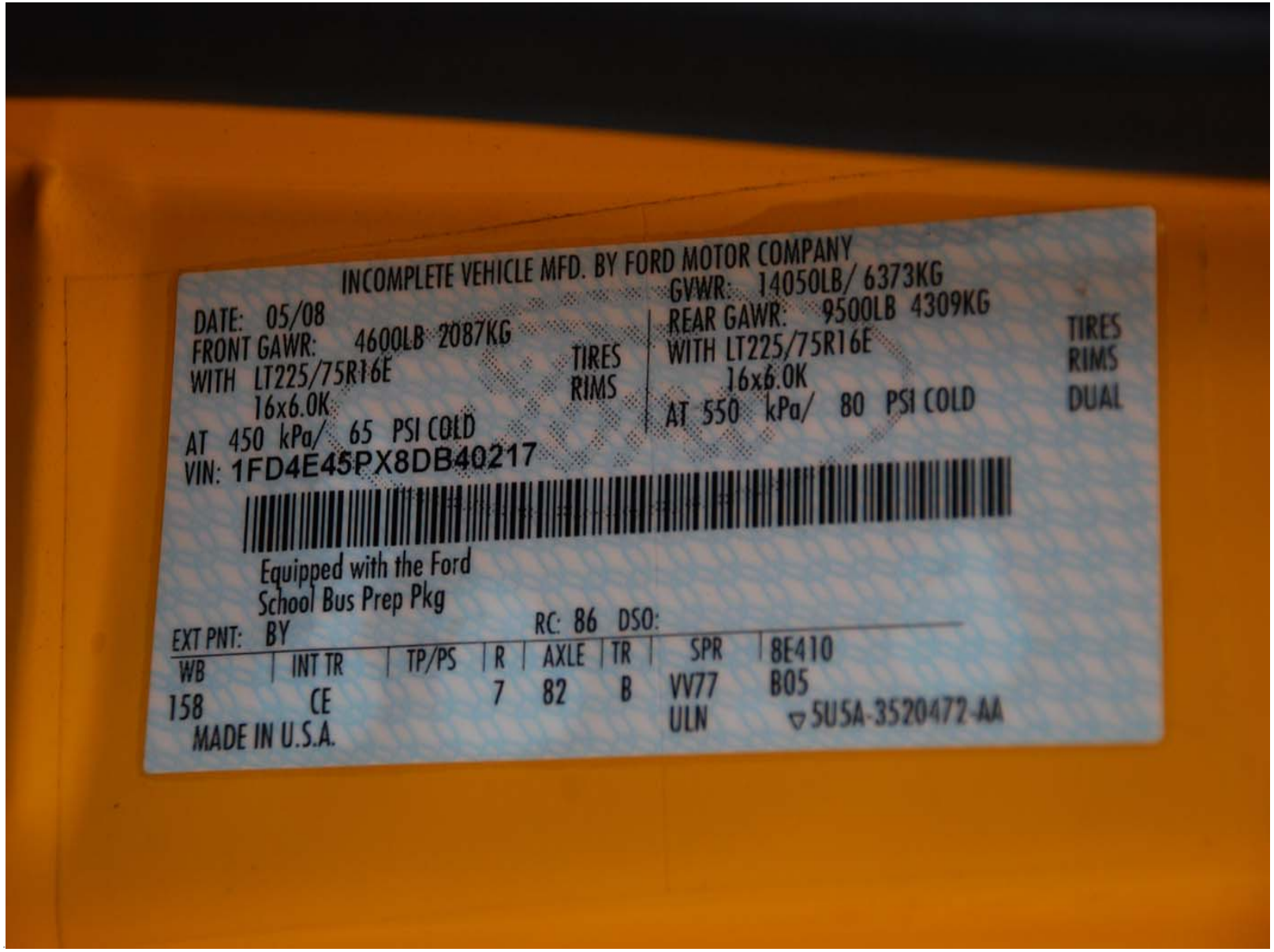
Roof, After Removal of Loading Device, Viewed From the Bus Interior

Test Vehicle:	**2008 GIRARDIN G5 SCHOOL BUS**	NHTSA No.:	**C80902**
Procedure:	**FMVSS 220**	Test Date:	**11/03/10**

Rear Exit Door Open With Parallelepiped In Place



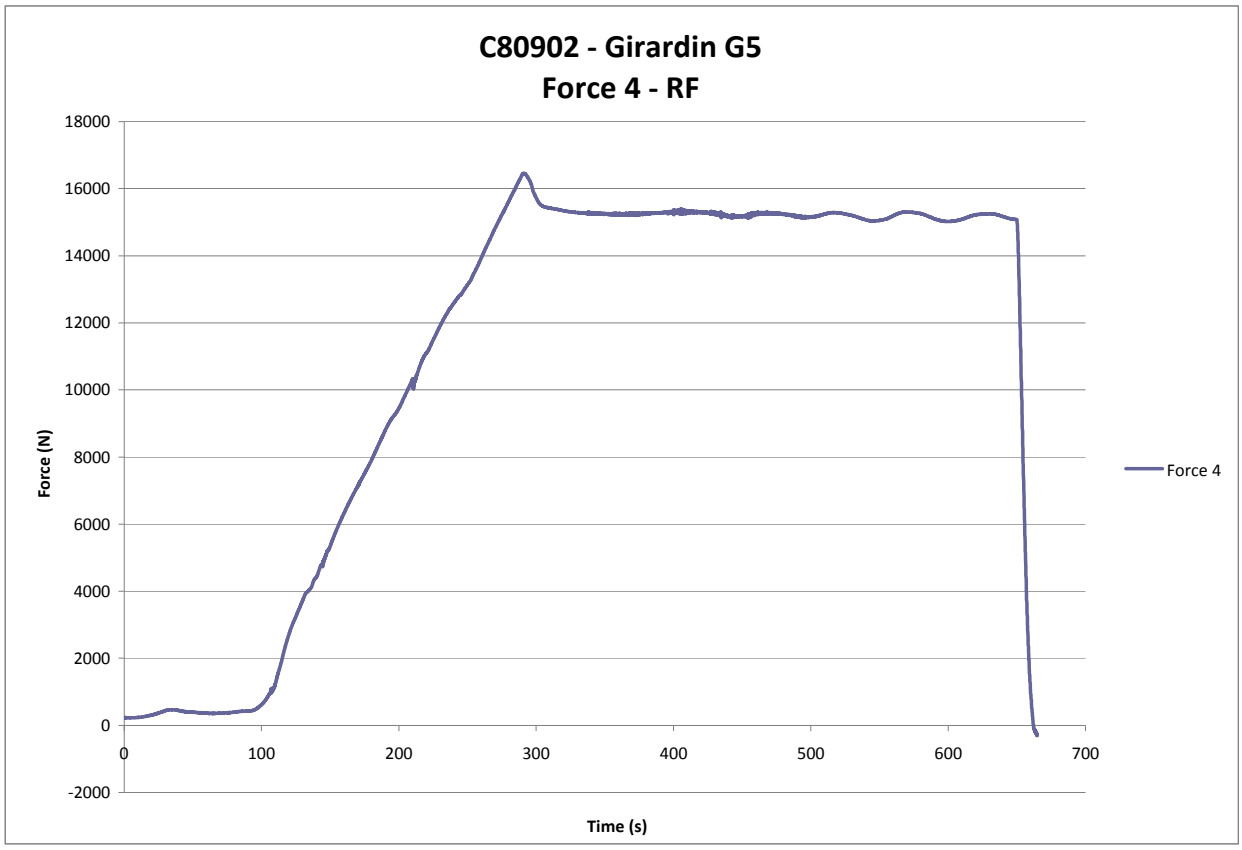
Certification Label and Tire Placard

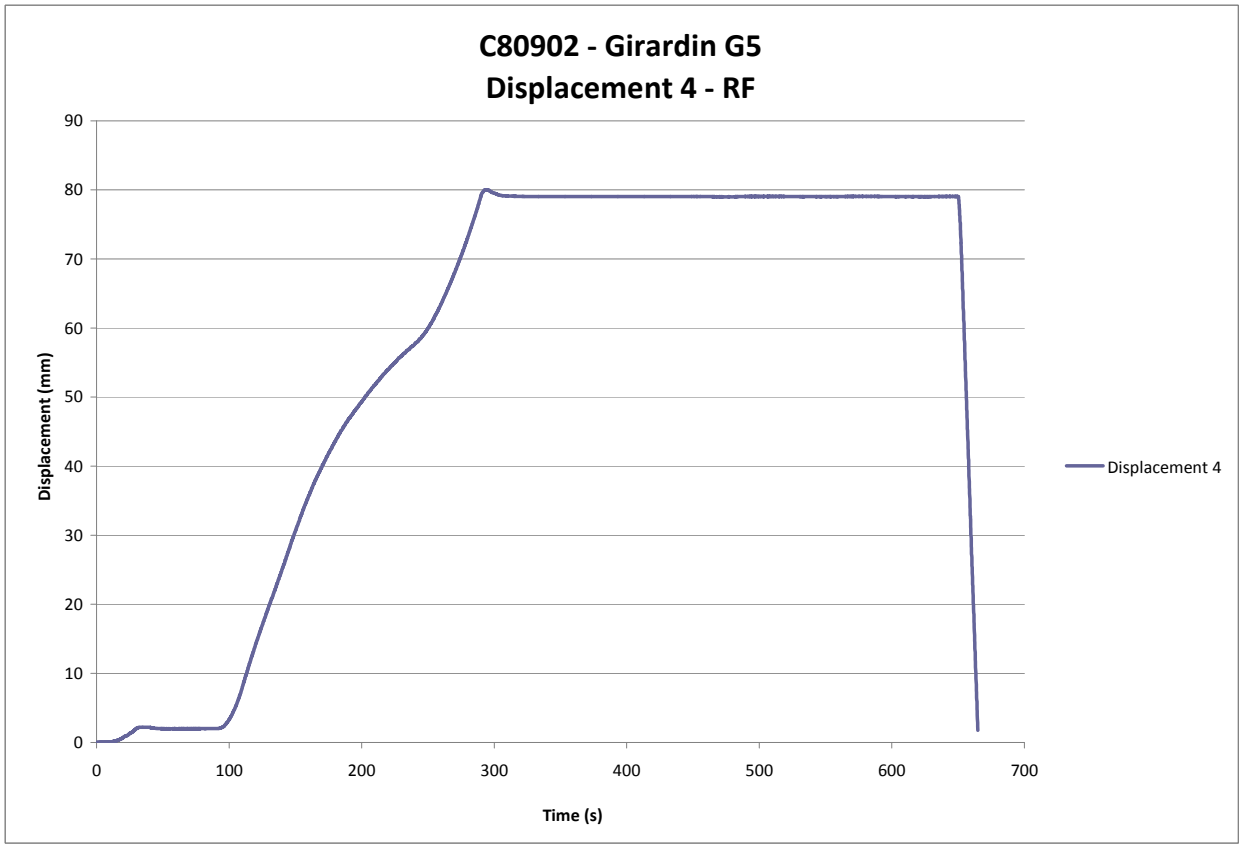


Incomplete Vehicle Label

SECTION 6

TEST PLOTS





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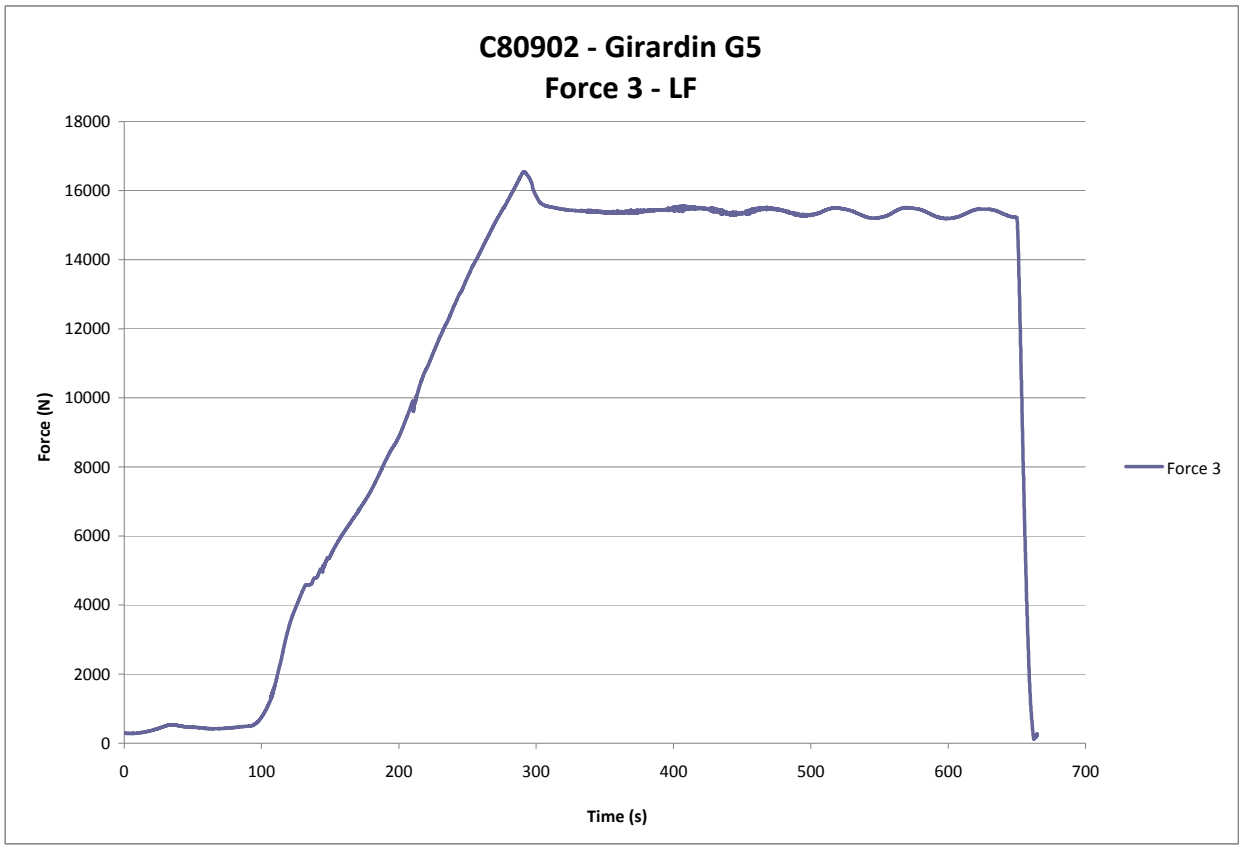
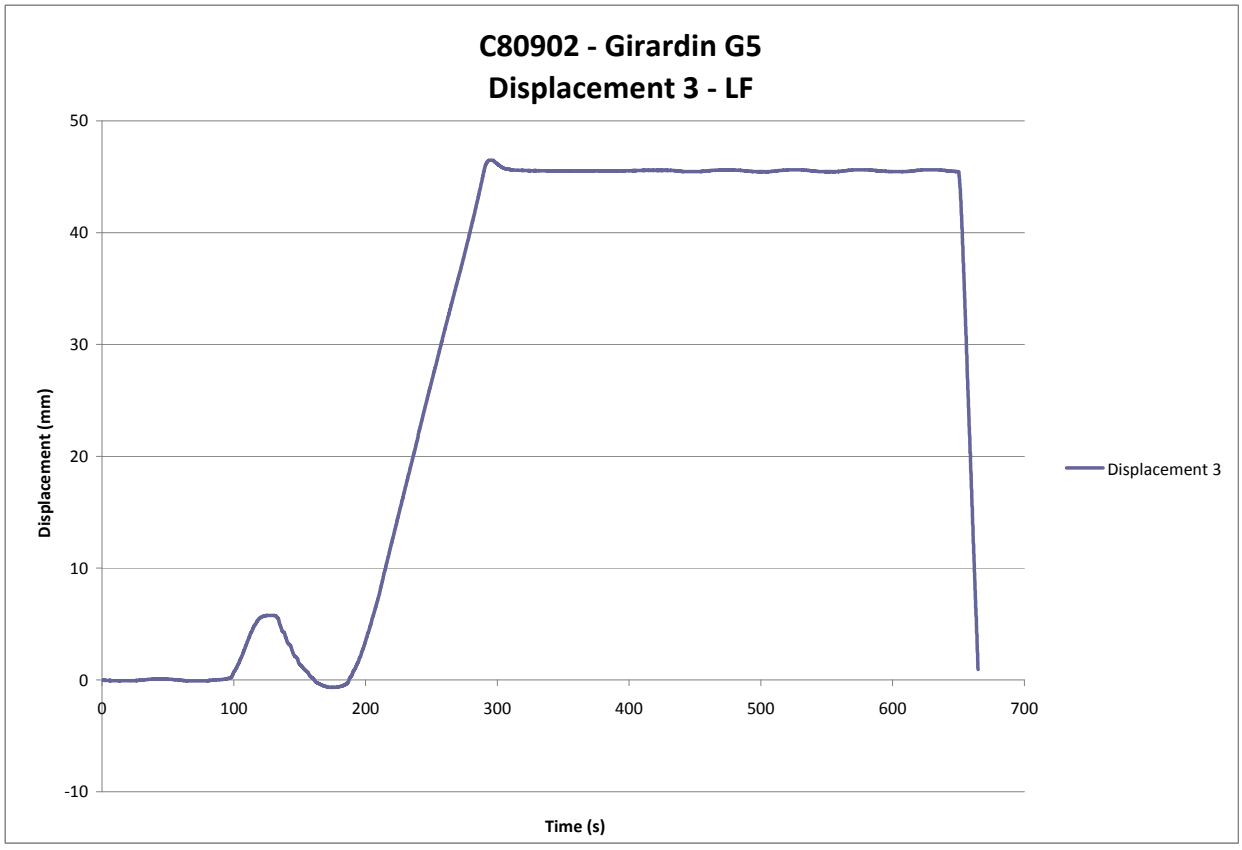
TEST PLOTS





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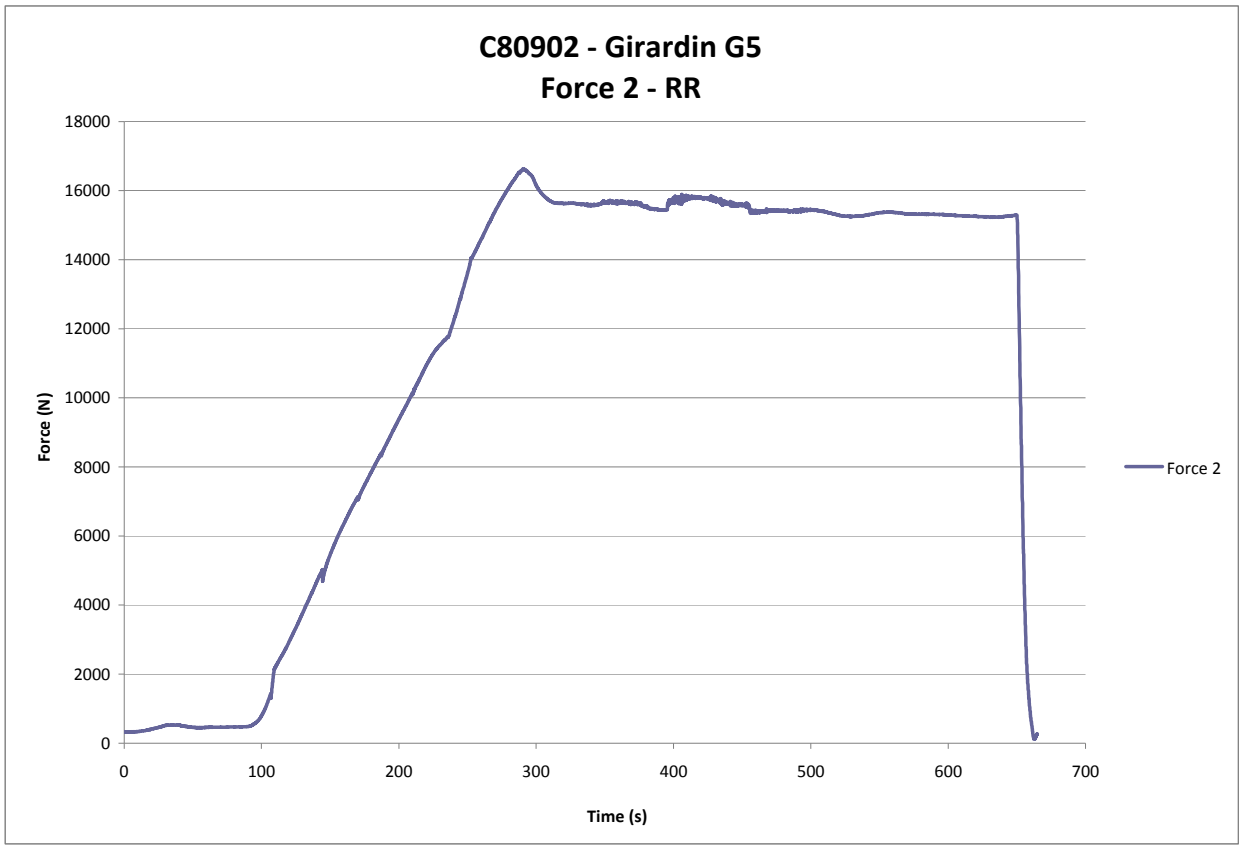
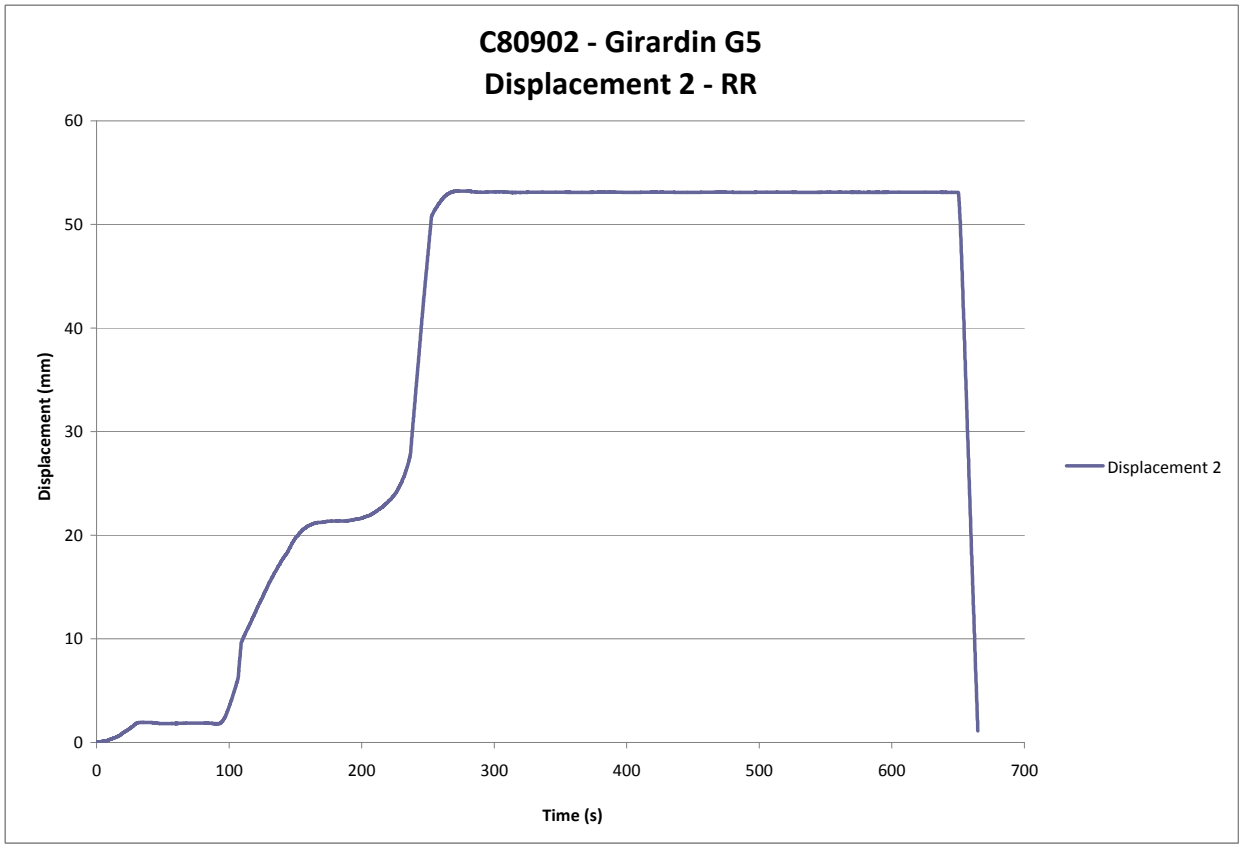
TEST PLOTS





SECTION 6

TEST PLOTS