

Final Report Number: NCAP-TRC-14-001

**New Car Assessment Program (NCAP)
Frontal Barrier Impact Test**

**General Motors LLC
2014 Chevrolet Impala 4-door Sedan
NHTSA Number: M20140100**

**PREPARED BY:
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Report Date: July 18, 2013

FINAL REPORT

**Prepared For:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
1200 New Jersey Ave, SE Room W43-410
Washington, DC 20590**

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Approved By: Jeffery W. Sankey

Approval Date: July 18, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2014 Chevrolet Impala 4-door sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and foot well intrusion performance. This test was conducted at the Transportation Research Center Inc. in East Liberty, Ohio on June 17, 2013. The impact velocity was 56.55 km/h, and the ambient temperature at the barrier face at the time of impact was 21° C. The target vehicle post-test maximum crush was 615 millimeters at vehicle centerline. The test vehicle's performance is as follows:																																																																											
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD</th> <th colspan="3">Passenger ATD</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>NA</td> <td>700</td> <td>229</td> <td>NA</td> <td>700</td> <td>412</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-16.2</td> <td>mm</td> <td>52</td> <td>-9.8</td> </tr> <tr> <td>3ms Chest Clip</td> <td>Gs</td> <td>60</td> <td>40.8</td> <td>Gs</td> <td>60</td> <td>39.1</td> </tr> <tr> <td>Nij</td> <td>NA</td> <td>1</td> <td>0.233</td> <td>NA</td> <td>1</td> <td>0.363</td> </tr> <tr> <td>Neck Tension</td> <td>Newtons</td> <td>4170</td> <td>816.6</td> <td>Newtons</td> <td>2620</td> <td>588.1</td> </tr> <tr> <td>Neck Compression</td> <td>Newtons</td> <td>4000</td> <td>-134.0</td> <td>Newtons</td> <td>2520</td> <td>-433.4</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-1200.3</td> <td>Newtons</td> <td>6805</td> <td>-253.5</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-309.1</td> <td>Newtons</td> <td>6805</td> <td>-91.2</td> </tr> </tbody> </table>							Measurement Description	Driver ATD			Passenger ATD			Units	Threshold	Result	Units	Threshold	Result	Head Injury Criteria (HIC ₁₅)	NA	700	229	NA	700	412	Maximum Chest Compression	mm	63	-16.2	mm	52	-9.8	3ms Chest Clip	Gs	60	40.8	Gs	60	39.1	Nij	NA	1	0.233	NA	1	0.363	Neck Tension	Newtons	4170	816.6	Newtons	2620	588.1	Neck Compression	Newtons	4000	-134.0	Newtons	2520	-433.4	Left Femur Force	Newtons	10008	-1200.3	Newtons	6805	-253.5	Right Femur Force	Newtons	10008	-309.1	Newtons	6805	-91.2
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1: PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00257. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

This 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Front NCAP Laboratory Test Procedure dated September 2012.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2014 Chevrolet Impala 4-door sedan at a velocity of 56.55 km/h. The test was performed at Transportation Research Center, Inc. on June 17, 2013. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 37), and the right-front passenger (position 2) ATD (Serial No. 426) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 130 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100.0 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 615 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver’s visible contact points were as follows: front airbag, headrest, and knee airbag. The passenger’s visible contact points were as follows: front airbag, headrest, and knee airbag.

The occupant data is summarized below:

ATD Position	HIC₁₅	Nij	Neck Tension (N)	Neck Compression (N)	3 ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th Male)	229	0.233	816.6	-134.0	40.8	-16.2	-1200.3	-309.1
Passenger (5 th Female)	412	0.363	588.1	-433.4	39.1	-9.8	-253.5	-91.2

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

TEST VEHICLE INFORMATION

NHTSA No.	M20140100
Model Year	2014
Make	Chevrolet
Model	Impala
Body Style	4-Door
VIN	1G11Y5SLXEU102075
Body Color	Silver
Odometer Reading (km/mi)	53 mi
Engine Displacement (L)	2.5
Type/No. Cylinders	4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

TEST VEHICLE OPTIONS

Traction Control System (TCS)	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	Yes
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other	No

Does owner's manual provide instructions to turn off automatic door locks?

No

DATA FROM CERTIFICATION LABEL

Manufactured by	General Motors LLC
Date of Manufacture	04/13

GVWR (kg)	2103
GAWR Front (kg)	1050
GAWR Rear (kg)	1053

VEHICLE SEATING AND WEIGHT CAPACITY

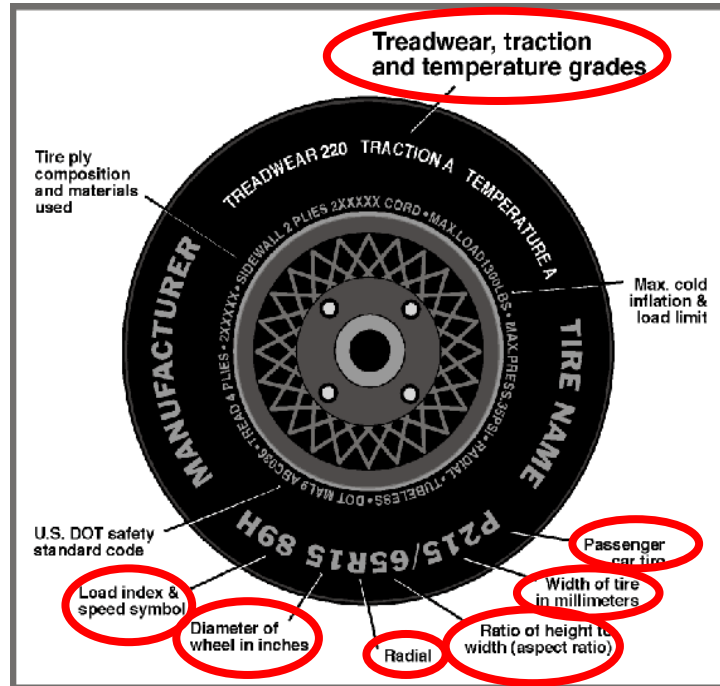
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				428.0
Cargo Wt. (RCLW) (kg)				87.8

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold / Test Pressure (kPa)	240	240
Recommended Tire Size	P235/50R18	P235/50R18
Tire Size on Vehicle	P235/50R18	P235/50R18
Tire Manufacturer	Firestone	Firestone
Tire Model	Firehawk GT	Firehawk GT
Treadwear	460	460
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	97H	97H
Tire Material	Poly, Steel, Nylon	Poly, Steel, Nylon
DOT Safety Code Right	8XPM FCH 1213	8XPM FCH 1213
DOT Safety Code Left	8XPM FCH 1213	8XPM FCH 1213

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
 Test Program: NCAP Frontal Impact Test Date: 06/17/13

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	488.8	344.8		530.0	419.4	
Right	kg	468.2	337.6		490.4	419.8	
Ratio	%	58.4	41.6		54.9	45.1	
Totals	kg	957.0	682.4	1639.4	1020.4	839.2	1859.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1639.4
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	87.8
Vehicle Target Weight (TVTW)	kg	1866.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	735	737	745	757	1179
As Tested	mm	728	729	724	728	1279
Post Test	mm	741	806	715	710	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2835
Total Vehicle Length at Left Side	mm	4861
Total Vehicle Length at Centerline	mm	5122
Total Vehicle Length at Right Side	mm	4859
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	3.8
Amount of Stoddard Solvent in Fuel Tank	liters	65.1

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk lid liner and rear taillight.

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
Test Program: NCAP Frontal Impact Test Date: 06/17/13

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	5122
2	Total Width	1860
3	Bumper Top Height	543
4	Bumper Bottom Height	466
5	Longitudinal Member Top Height	581
6	Distance Between Longitudinal Members	950
7	Longitudinal Member Width	80
8	Engine Top Height	910
9	Engine Bottom Height	295
10	Engine and Gearbox Width	740
11	Front Bumper-Engine Distance	685
12	Front Shock Absorber Fixing Height	945
13	Bonnet Leading Edge Height	832
14	Front Shock Absorber Fixing Width	1190
15	Front Bumper – Front Axle Distance	1015
16	Front Axle – A-Pillar Distance	525
17	A-Pillar – B-Pillar Distance	1080
18	B-Pillar – Rear Axle Distance	1240
19	B-Pillar – C-Pillar Distance	973
20	Roof Sill Bottom Height	1343
21	Roof Sill Top Height	1414
22	Floor Sill Bottom Height	348
23	Floor Sill Top Height	435

DATA SHEET NO. 2

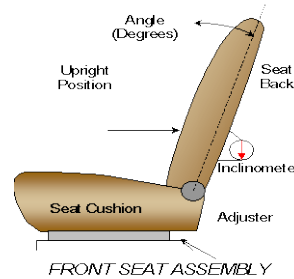
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

NORMAL DESIGN RIDING POSITION

For adjustable driver and passenger seat back. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



	Degree
Driver Seat back angle:	15.9
Passenger Seat back angle:	16.9

SEAT FORE/AFT POSITIONS

Describe the method used of determining seat for/aft positions.

Driver: Mid position, Positioned according to Form 1

Passenger: Full forward, Positioned according to Form 1

	Total Fore/Aft Travel	Placed in Position No.
Driver Seat	306	153 mm rearward
Passenger Seat	244	0 (Full Forward)

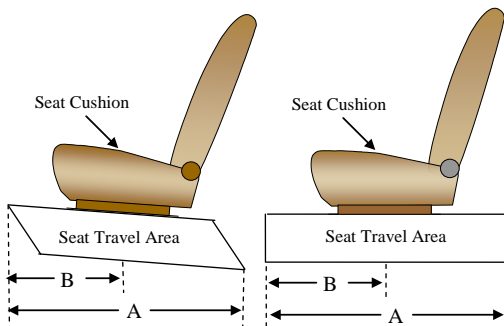
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Mid position, Positioned according to Form 1

Passenger: Full forward, Positioned according to Form 1

	Total No. of Positions	Placed in Position No.
Driver Seat	5	0 Uppermost
Passenger Seat	5	0 Uppermost



DATA SHEET NO. 2 (CONTINUED)

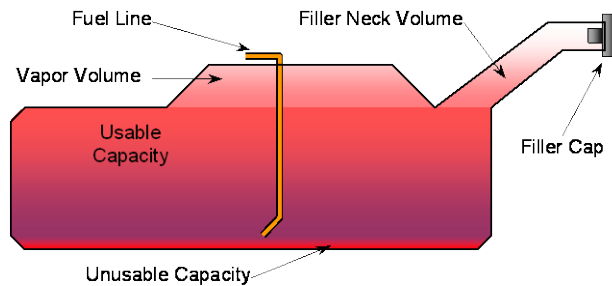
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
 Test Program: NCAP Frontal Impact Test Date: 06/17/13

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	64.4 – 65.8
Actual Amount of Solvent Used	65.1
1/3 of Usable Capacity	23.4

The vehicle is equipped with an electric fuel pump. If ignition key is at "ON" position and engine is not running, the fuel pump operates for 2 seconds. If the engine is running, then the fuel pump will run continuously.

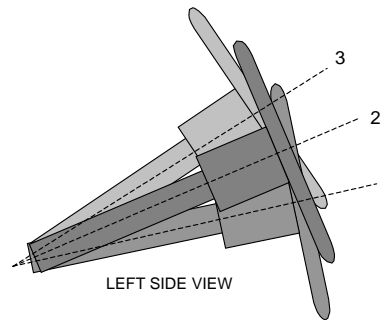


VEHICLE FUEL TANK ASSEMBLY

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. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.

STEERING COLUMN POSITIONS



STEERING COLUMN ASSEMBLY

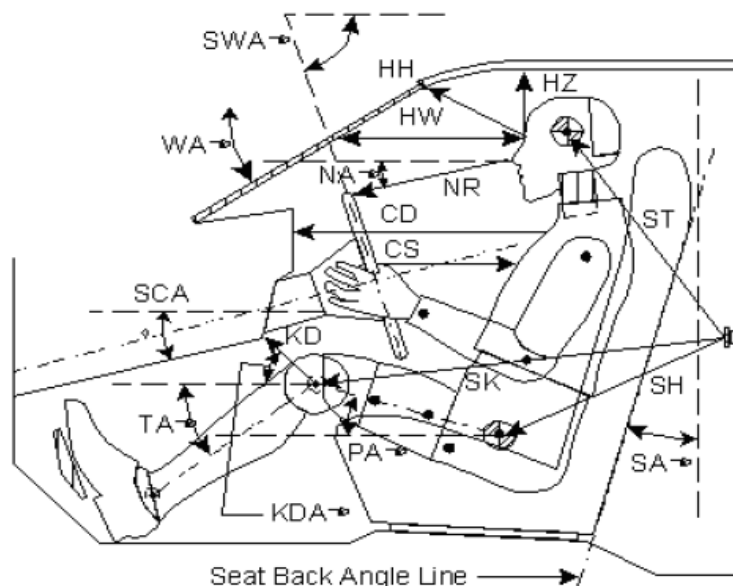
	Degrees	Fore/Aft Position (mm)
Lowermost Position No. 1	21.1	26
Geometric Center Position No. 2	23.3	26
Uppermost Position No. 3	25.6	26
Telescoping Steering Wheel Travel	N/A	52
Test Position	23.3	26

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



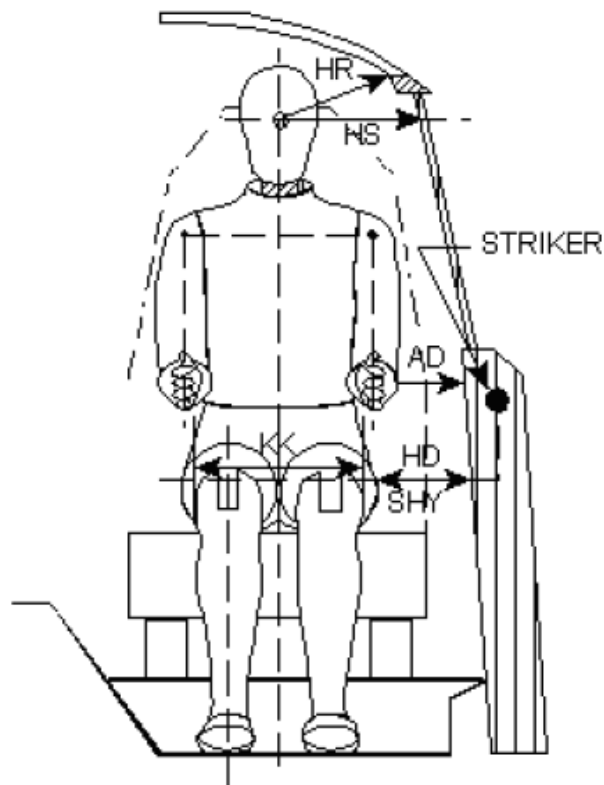
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		28.7		
SWA°	Steering Wheel Angle		66.7		
SCA°	Steering Column Angle		23.3		
SA°	Seat Back Angle (on headrest post)		15.9		16.9
HZ	Head to Roof (Z)	245	90.0	276	90.0
HH	Head to Header	323	25.4	373	40.0
HW	Head to Windshield	750	0	762	0
NR	Nose to Rim	432	1.5		
CD	Chest to Dash	568		473	
CS	Chest to Steering Hub	388	0		
RA	Rim to Abdomen	254	0		
KDL	Left Knee to Dash	232	31.0	163	33.0
KDR	Right Knee to Dash	198	33.0	171	32.6
PA°	Pelvic Angle		24.1		20.4
TA°	Tibia Angle		32.5		48.1
SK	Striker to Knee	553	8.5	629	6.6
ST	Striker to Head	438	-84.1	425	-73.2
SH	Striker to H-Point	281	56.8	339	30.4

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



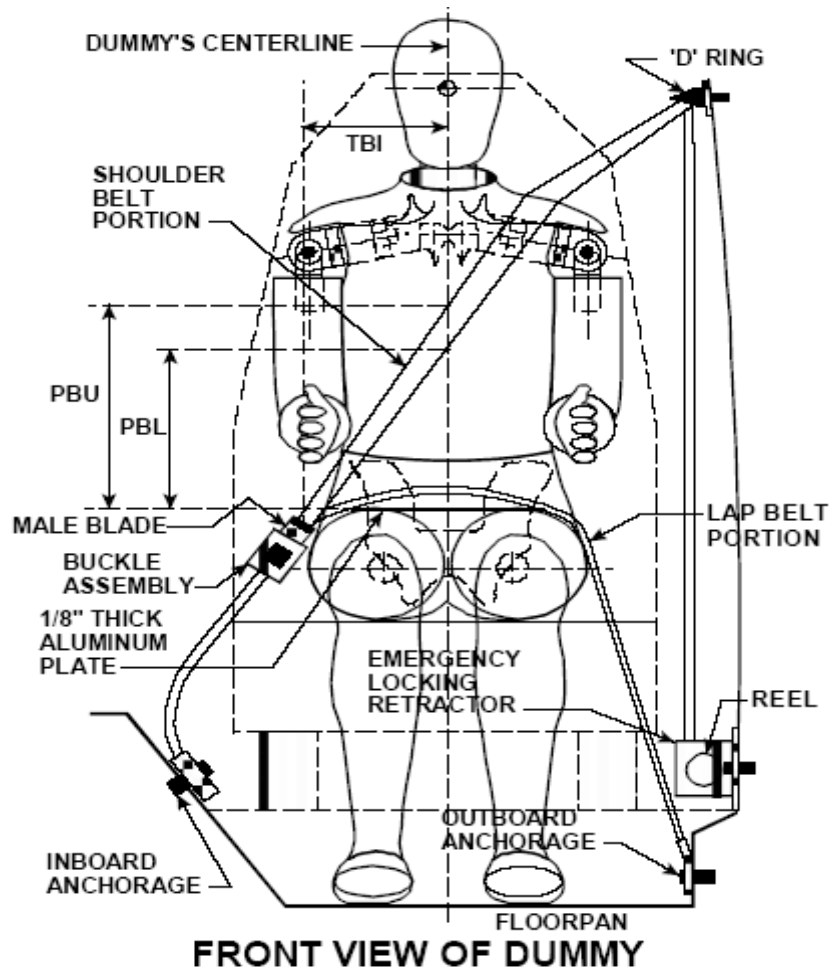
Code	Measurement Description	Driver	Passenger
AD	Arm to Door	144	104
HD	H-Point to Door	159	170
HR	Head to Side Header	244	265
HS	Head to Side Window	378	380
KK	Knee to Knee	318	170
SHY	Striker to H-Point (Y Direction)	243	268
AA	Ankle to Ankle	300	155

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	327	262
PBL – Top surface of reference to belt lower edge	mm	235	168

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	800	866
Lap belt length as measured on ATD	mm	374	403
Remainder of belt on reel	mm	1196	1176
Total belt length for continuous webbing systems	mm	2370	2445

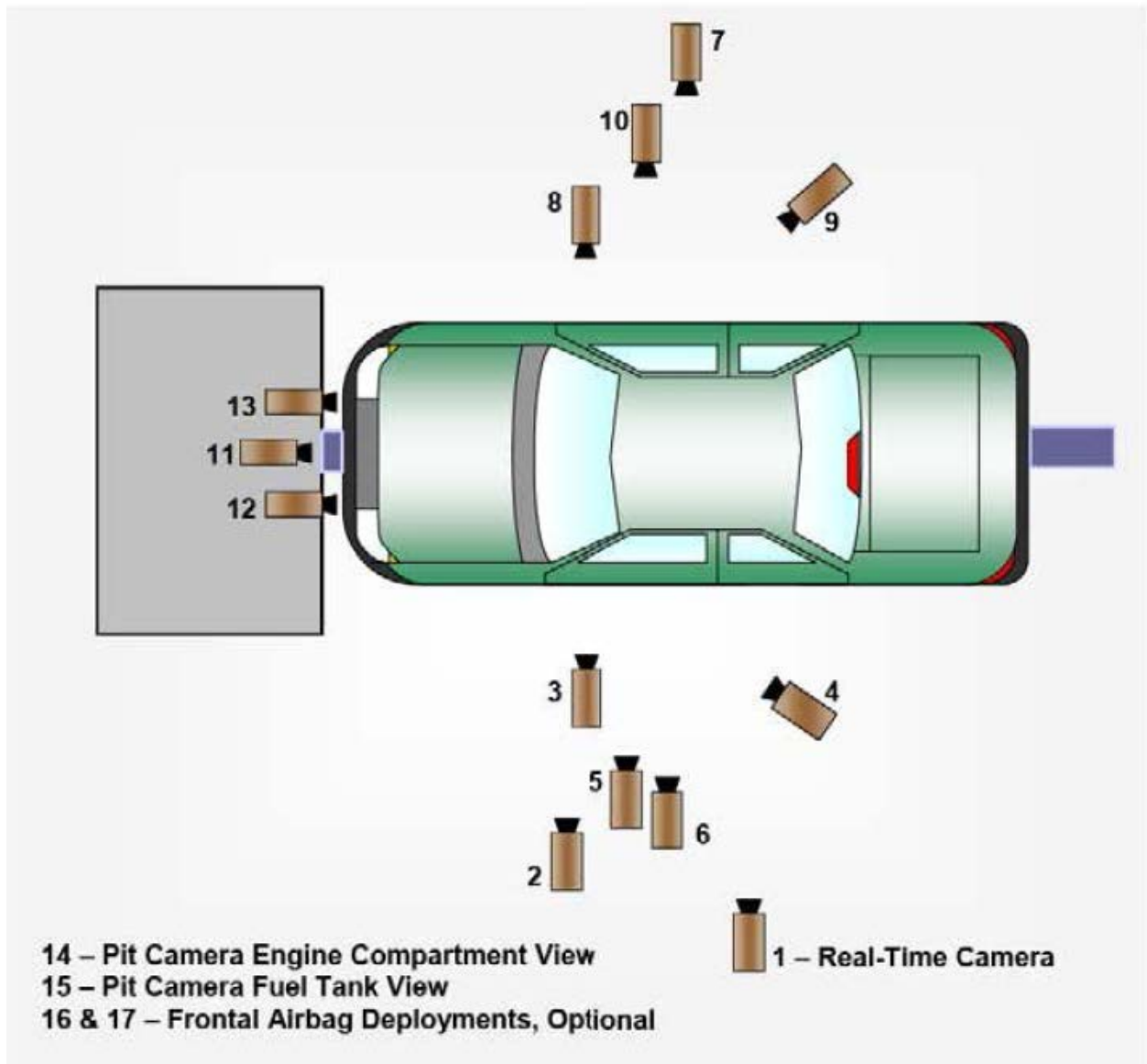
DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
Test Date: 06/17/13

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
 Test Program: NCAP Frontal Impact Test Date: 06/17/13

CAMERA LOCATIONS

No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-1358	-6260	-1092	Zoom	30
2	Driver Close-Up	-1060	-6422	-1290	50	1000
3	Left Front Half	-885	-4991	-1164	25	1000
4	Left Angle	-4069	-2781	-1682	25	1000
5	Steering Column - Top	-1951	-6101	-2091	25	1000
6	Steering Column – Bottom	-2163	-5270	-1151	25	1000
7	Right Overall	-2553	5802	-1150	16	1000
8	Passenger Close-Up	-1194	4125	-1302	50	1000
9	Right Front Half	-3961	2386	-1647	25	1000
10	Right Angle	-766	4926	-1146	25	1000
11	Windshield	-102	0	-2561	8.5	1000
12	Driver Windshield	-120	-636	-2594	16	1000
13	Passenger Windshield	-102	625	-2596	16	1000
14	Pit Front	-2069	0	2961	16	1000
15	Pit Rear	-3200	0	2932	8.5	1000
16	Onboard Driver Airbag (Optional)	N/A	N/A	N/A	8.5	1000
17	Onboard Passenger Airbag (Optional)	N/A	N/A	N/A	8.5	1000

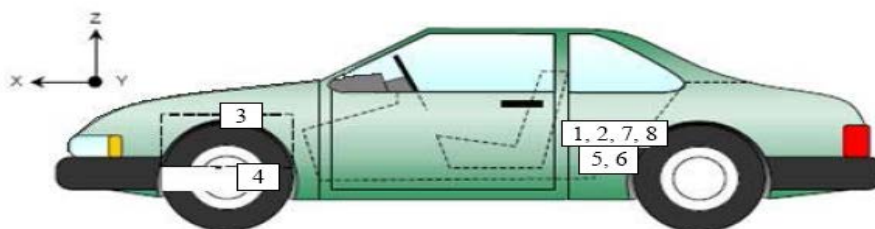
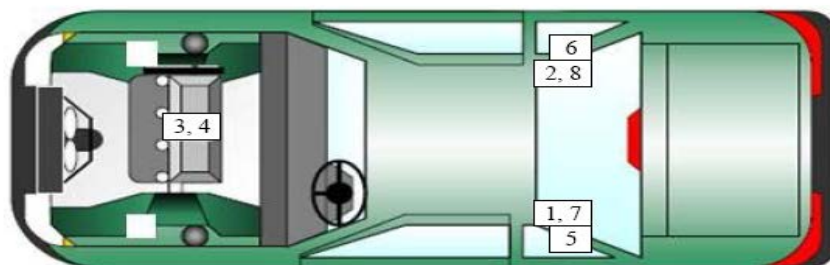
Reference Points: +X – forward of impact plane
 +Y – right of monorail center
 +Z – into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Camera View	Location (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2134	-350	-465
2	Right Rear Accelerometer – X Direction	2134	335	-460
3	Engine Top X	4085	-40	-781
4	Engine Bottom X	4267	120	-168
5	Left Rear Accelerometer – Z Direction	2134	-350	-465
6	Right Rear Accelerometer – Z Direction	2134	335	-460

Reference Points: X – Rear Surface of Vehicle (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ up)

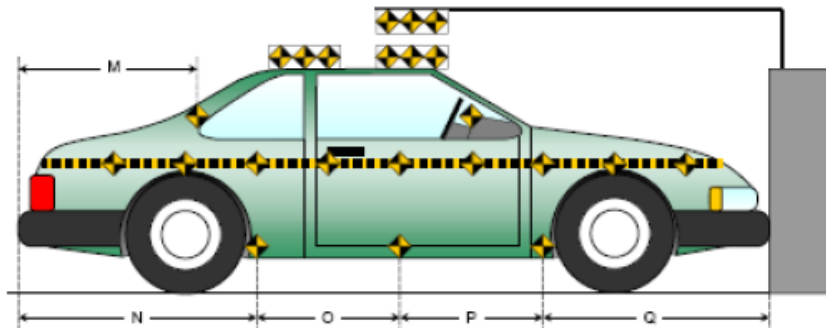
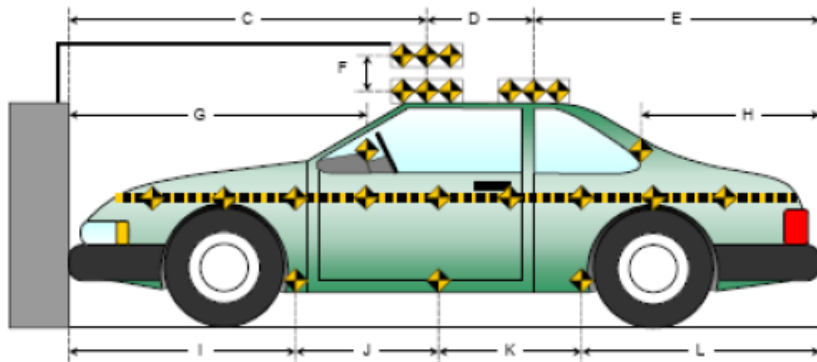
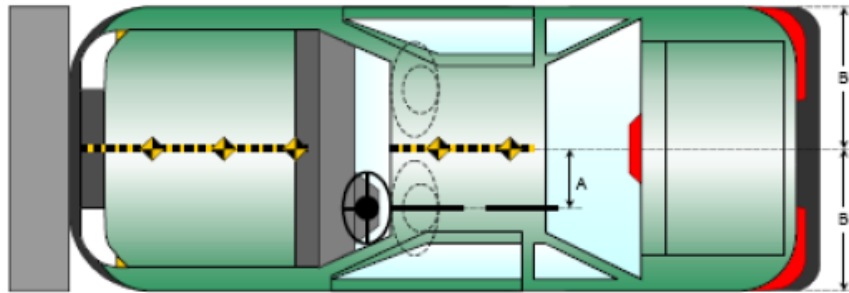
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

Item	Value
A	380
B	930
C	2771
D	610
E	2124
F	238
G	1819
H	1652
I	1468
J	960
K	972
L	1722
M	1652
N	1724
O	970
P	962
Q	1466



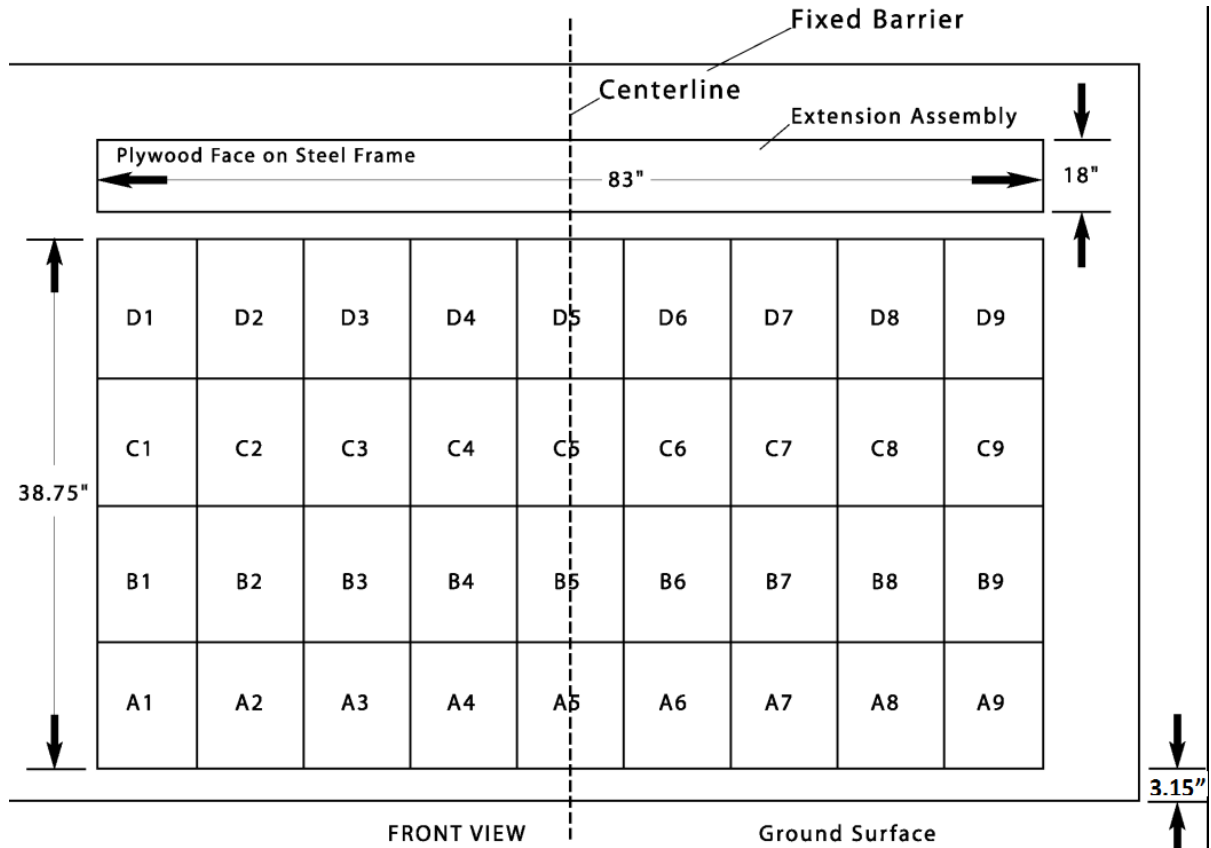
All units in millimeters

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13



DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
Test Program: NCAP Frontal Impact Test Date: 06/17/13

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	42
Passenger Dummy Accelerometers	42
Vehicle Structure Accelerometers	8
Total	92

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	2
Total	18

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
 Test Program: NCAP Frontal Impact Test Date: 06/17/13

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th/ 037	Hybrid III 5th/ 426
Head Contact	Front Airbag, headrest	Front Airbag, headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed and operational	Closed and operational
Rear Door Opening	Closed and operational	Closed and operational
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	Hood support damaged windshield

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1134
Center	mm	1021
Right Side	mm	1229
Average	mm	795

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

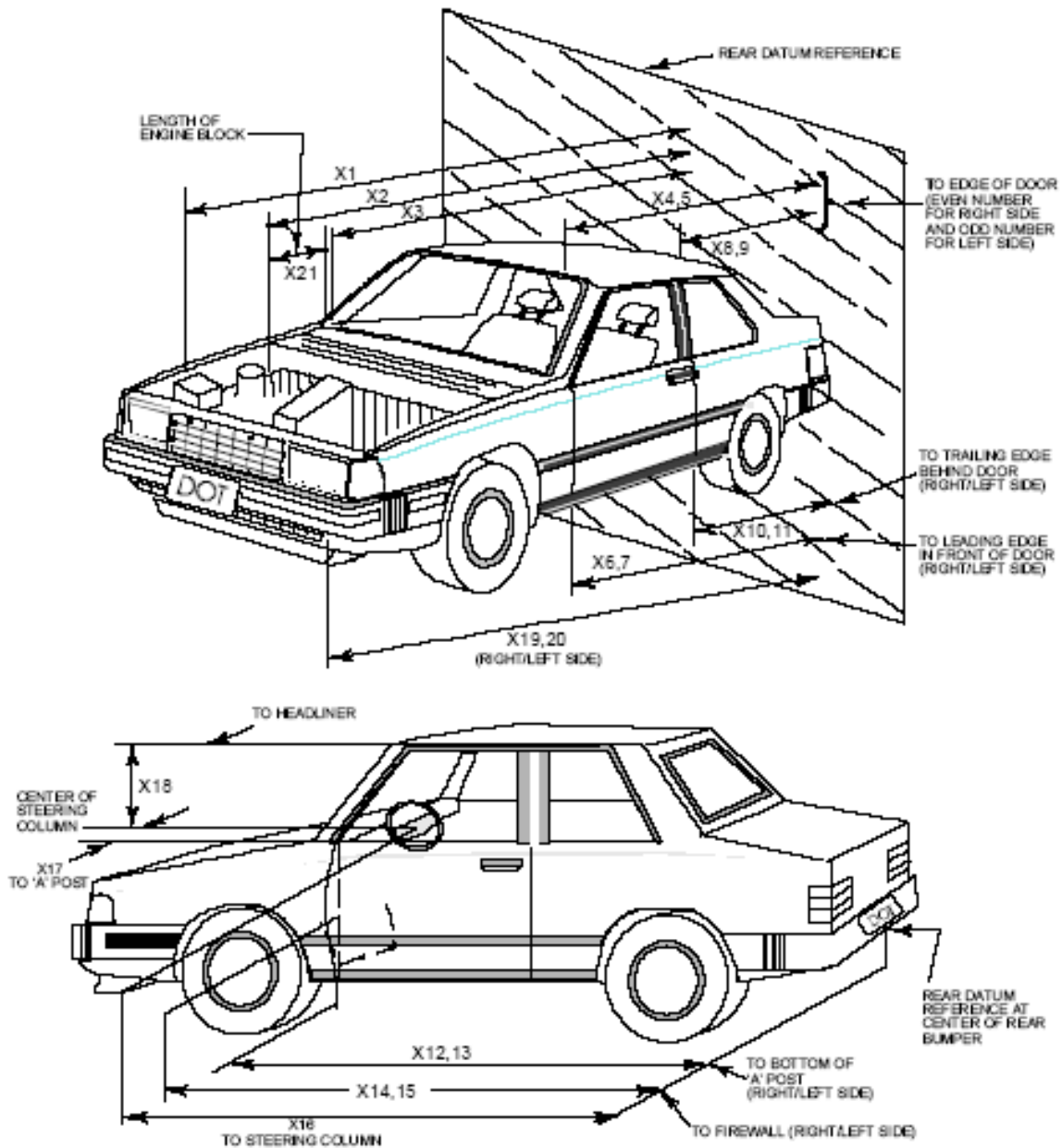
Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Curtain Airbag	Yes	No	Yes	No
Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	N/A	Yes	N/A
Other	N/A	N/A	N/A	N/A

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
Test Date: 06/17/13



DATA SHEET NO. 12 (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	5122	4507	615
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4435	4259	176
3	RSOV to Firewall	3994	3952	42
4	RSOV to Upper Leading Edge of Right Door	3589	3578	11
5	RSOV to Upper Leading Edge of Left Door	3600	3575	25
6	RSOV to Lower Leading Edge of Right Door	3550	3547	3
7	RSOV to Lower Leading Edge of Left Door	3555	3559	-4
8	RSOV to Upper Trailing Edge of Right Door	2512	2502	10
9	RSOV to Upper Trailing Edge of Left Door	2521	2497	24
10	RSOV to Lower Trailing Edge of Right Door	2529	2534	-5
11	RSOV to Lower Trailing Edge of Left Door	2535	2538	-3
12	RSOV to Bottom of "A" Post-of Right Side	3576	3553	23
13	RSOV to Bottom of "A" Post-of Left Side	3576	3552	24
14	RSOV to Firewall, Right Side	3985	3957	28
15	RSOV to Firewall, Left Side	3985	3957	28
16	RSOV to Steering Column	3134	3222	-88
17	Center of Steering Column to "A" Post	321	345	-24
18	Center of Steering Column to Headliner	402	375	27
19	RSOV to Right Side of Front Bumper	4859	4484	375
20	RSOV to Left Side of Front Bumper	4861	4482	379
21	Length of Engine Block	500	500	0
RD	RSOV to Right Side of Dash Panel	3401	3377	24
CD	RSOV to Center of Dash Panel	3370	3352	18
LD	RSOV to Left Side of Dash Panel	3414	3387	27

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

VEHICLE INFORMATION

VIN: 1G11Y5SLXEU102075
 Vehicle Size Category: Large Cars

Wheelbase: 2835
 Test Weight (kg): 1859.6

ACCELEROMETER DATA

Accelerometer Locations: As listed on Page 15 of this report.

Cal. Procedure/Interval: TRC procedure / 6 month interval

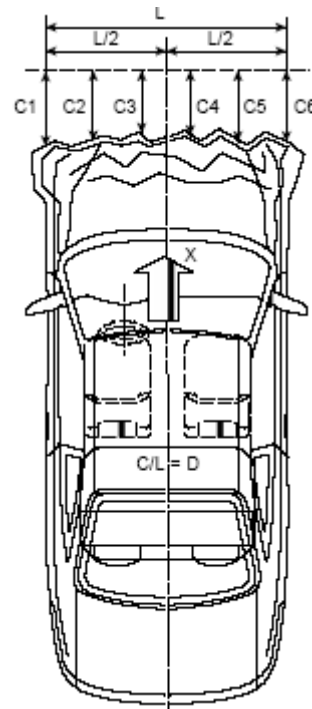
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.55

Velocity Change (km/h): 65.0

Time of Separation (ms): 127.2



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Centerline

Damage Region Length (mm): 615

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4861	4482	379
C2	Crush zone 1 at left side	mm	5022	4532	490
C3	Crush zone 1 at left side	mm	5095	4532	563
C4	Crush zone 1 at right side	mm	5095	4532	563
C5	Crush zone 1 at right side	mm	5022	4535	487
C6	Crush zone 1 at right side	mm	4859	4484	375
L	C1 to C6	mm	1524	1524	0

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

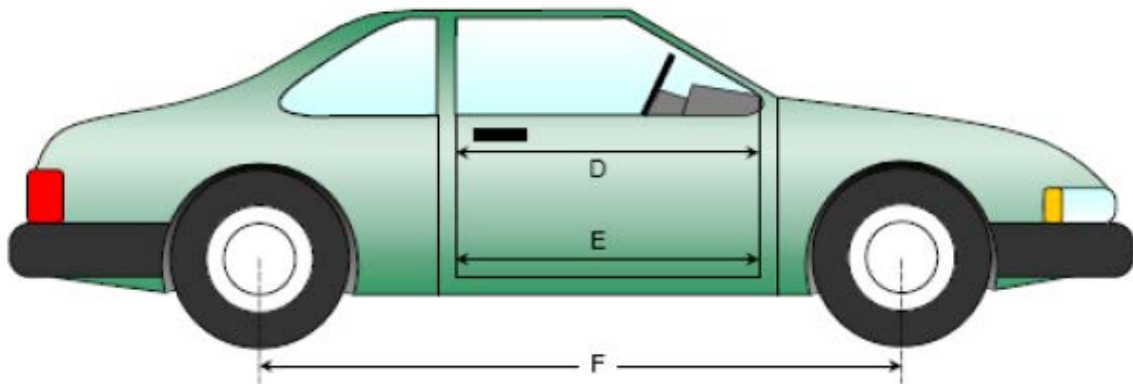
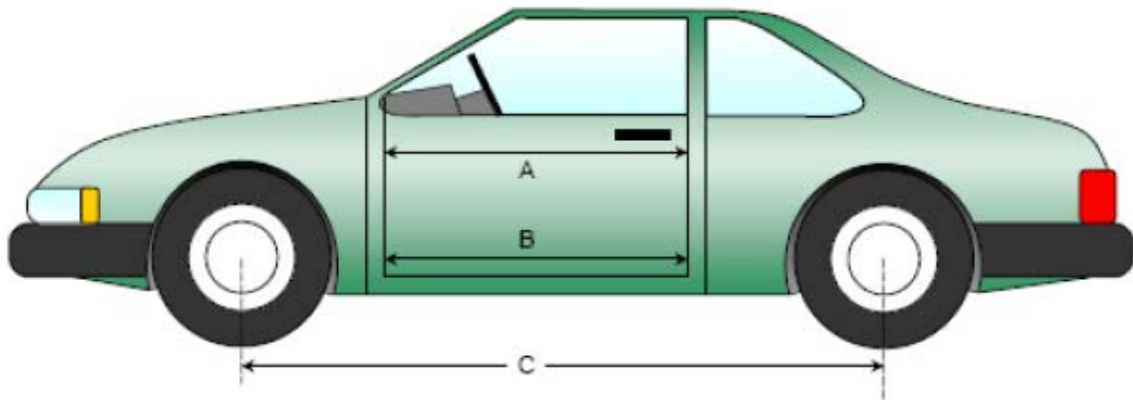
NHTSA No.: M20140100
 Test Date: 06/17/13

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1015	1015	0
B	Left Side Lower	mm	865	865	0
C	Right Side Upper	mm	1015	1015	0
D	Right Side Lower	mm	865	865	0

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2835	2780	55
F	Right Side Wheelbase	mm	2835	2775	60



DATA SHEET NO. 14 (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

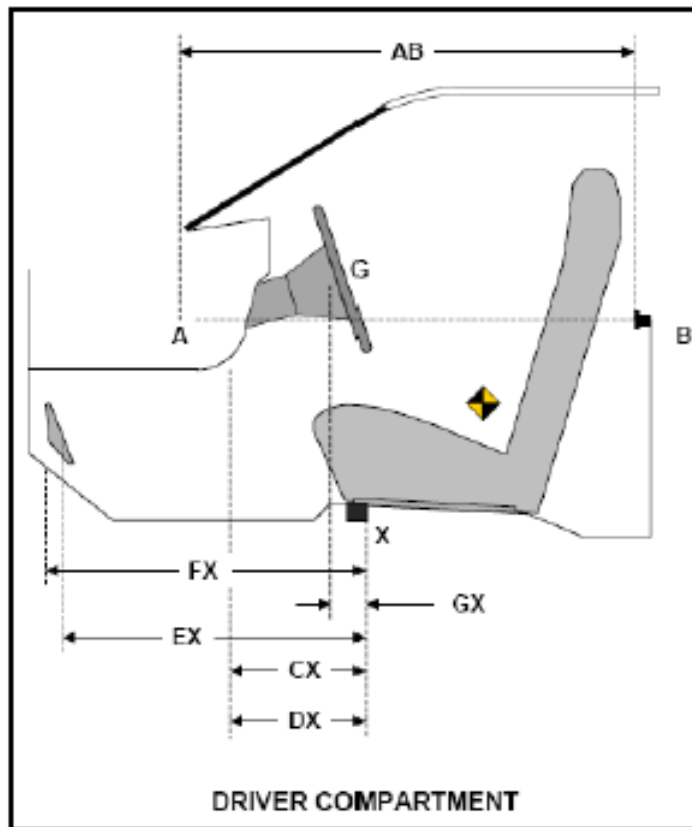
Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1005	1005	0
CX	Left Knee Bolster to X	mm	345	320	25
DX	Right Knee Bolster to X	mm	333	315	18
EX	Brake Pedal to X	mm	604	642	-38
FX	Foot Rest to X	mm	657	645	12
GX	Center of Steering Column Wheel Hub to X	mm	90	142	-52

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

Please provide windshield mounting details.

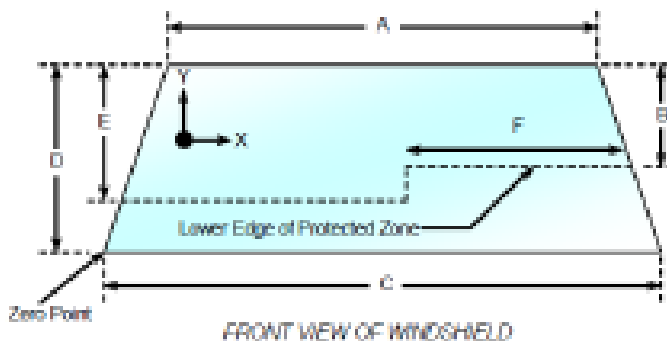
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test:

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2125	2125	100
Right Side	2140	2140	100
Total	4265	4265	100

Item	Units	Value
A	mm	1228
B	mm	477
C	mm	1540
D	mm	766
E	mm	490
F	mm	125



AREAS OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

B. The inner surface of the windshield was penetrated by the hood support beneath the protected zone.

X	Y
1185	90
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 15 (CONTINUED)

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Chevrolet Impala 4-door sedan NHTSA No.: M20140100
Test Program: NCAP Frontal Impact Test Date: 06/17/13

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: _____ Test Time: _____

Stoddard Solvent Spillage Measurements

- A From impact until vehicle motion ceases: 0 oz.
(maximum allowable – 1 oz.)
- B For the 5-minute period after motion ceases: 0 oz.
(maximum allowable – 5 oz.)
- C For the following 25 minutes: 0 oz.
(maximum allowable – 1 oz./minutes)
- D Spillage: 0

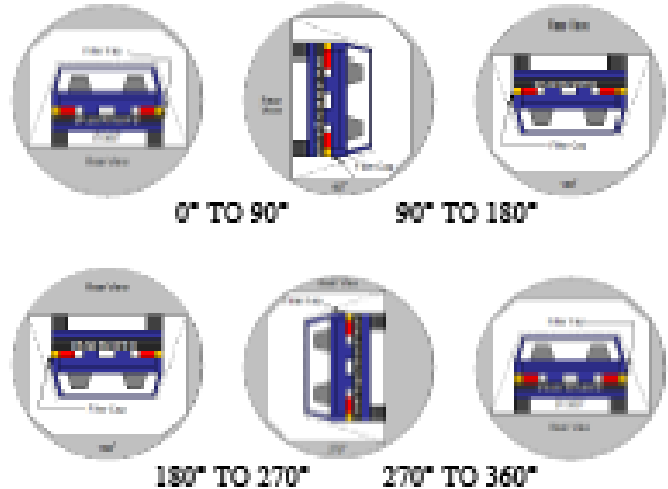
DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
 Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
 Test Date: 06/17/13

1. The specified fixture rollover rate for each 90° of rotation is 50 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage:
 None



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	90	300	390
90° to 180°	90	300	780
180° to 270°	90	300	1170
270° to 360°	90	300	1560

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

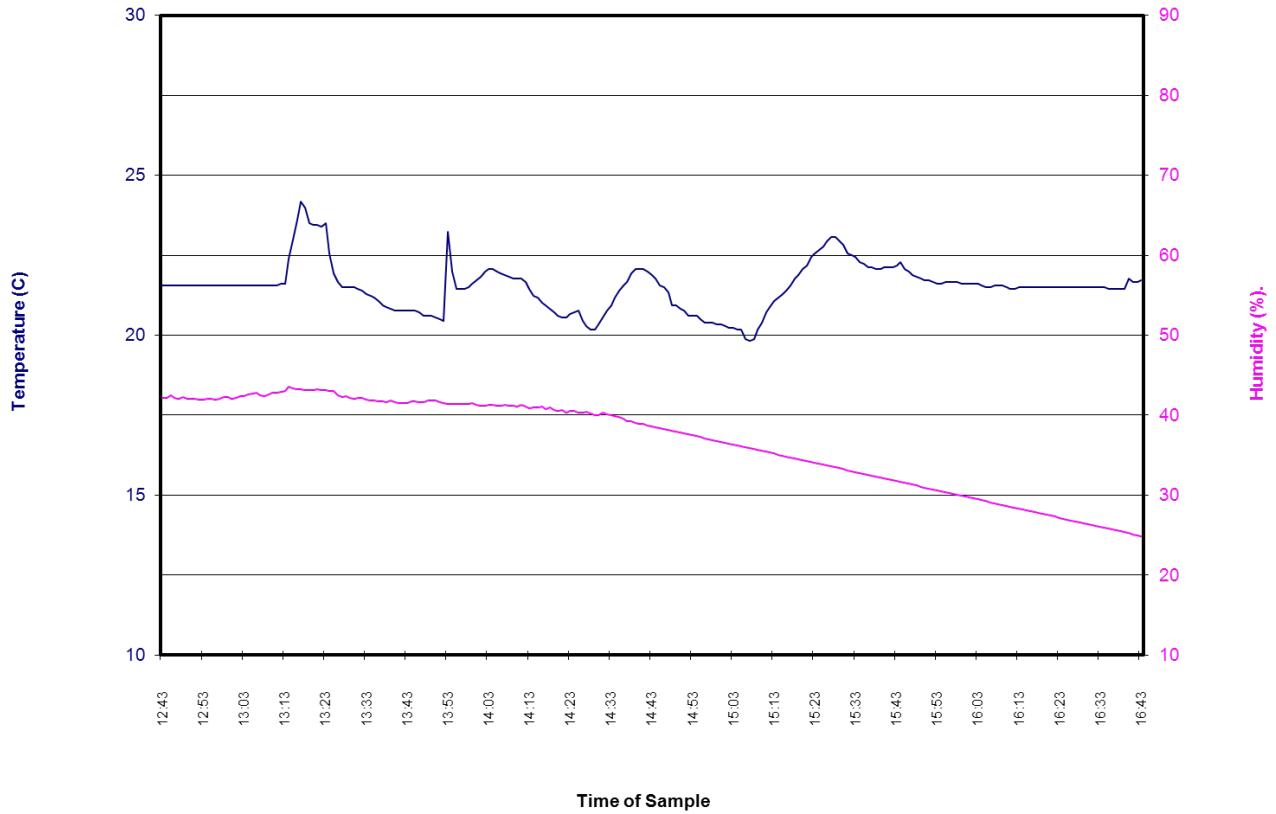
DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2014 Chevrolet Impala 4-door sedan
Test Program: NCAP Frontal Impact

NHTSA No.: M20140100
Test Date: 06/17/13

Frontal NCAP 130617: Test Time 16:43



APPENDIX A
PHOTOGRAPHS

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4	Tire Placard	A-5
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6	Left Rear 3-4 View, as Received	A-6
7	Pre-Test Front View of Test Vehicle	A-7
8	Post-Test Front View of Test Vehicle	A-7
9	Pre-Test Left View of Test Vehicle	A-8
10	Post-Test Left View of Test Vehicle	A-8
11	Pre-Test Right View of Test Vehicle	A-9
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18	Pre-Test Windshield View	A-12
19	Pre-Test Engine Compartment View	A-13
20	Post-Test Engine Compartment View	A-13
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23	Pre-Test Front Underbody View	A-15
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30	Post-Test Driver Dummy Front View	A-20
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32	Post-Test Driver Dummy Window View	A-21
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35	Pre-Test Driver's Seat Fore-Aft Markings	A-23
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TABLE OF PHOTOGRAPHS (CONTINUED)

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44	Post-Test Driver's Side Floorpan	A-27
45	Post-Test Driver Dummy Face	A-28
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47	Post-Test Driver Dummy Contact with Headrest	A-29
48	Pre-Test View of the Steering Wheel	A-29
49	Post-Test View of the Steering Wheel	A-30
50	Pre-Test Passenger Dummy Front View	A-30
51	Post-Test Passenger Dummy Front View	A-31
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54	Pre-Test Passenger Dummy and Vehicle Interior View	A-32
55	Post-Test Passenger Dummy and Vehicle Interior View	A-33
56	Pre-Test Passenger Seat Fore-Aft Markings	A-33
57	Post-Test Passenger Seat Fore-Aft Markings	A-34
58	Pre-Test View of Belt Anchorage for Passenger Dummy	A-34
59	Post-Test View of Belt Anchorage for Passenger Dummy	A-35
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61	Post-Test Passenger Dummy Feet	A-36
62	Pre-Test Passenger Side Knee Bolster	A-36
63	Post-Test Passenger Side Knee Bolster	A-37
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65	Post-Test Passenger Side Floorpan	A-38
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APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

No.	List of Data Plots Provided in the Test Report	Page
1	Driver Head X Acceleration vs. Time Primary	B-6
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5	Driver Chest X Deflection vs. Time	B-7
6	Driver Chest X Acceleration vs. Time Primary	B-8
7	Driver Chest Y Acceleration vs. Time Primary	B-8
8	Driver Chest Z Acceleration vs. Time Primary	B-8
9	Driver Chest Resultant Acceleration vs. Time Primary	B-8
10	Driver Upper Neck Force X vs. Time	B-9
11	Driver Upper Neck Force Z vs. Time	B-9
12	Driver Upper Neck Moment Y vs. Time Primary	B-9
13	Driver Nij vs. Time Primary	B-10
14	Driver Left Femur Force vs. Time	B-11
15	Driver Right Femur Force vs. Time	B-11
16	Passenger Head X Acceleration vs. Time Primary	B-12
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19	Passenger Head Resultant Acceleration vs. Time Primary	B-12
20	Passenger Chest X Deflection vs. Time	B-13
21	Passenger Chest X Acceleration vs. Time Primary	B-14
22	Passenger Chest Y Acceleration vs. Time Primary	B-14
23	Passenger Chest Z Acceleration vs. Time Primary	B-14
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-14
25	Passenger Upper Neck Force X vs. Time	B-15
26	Passenger Upper Neck Force Z vs. Time	B-15
27	Passenger Upper Neck Moment Y vs. Time Primary	B-15
28	Passenger Nij vs. Time Primary	B-16
29	Passenger Left Femur Force vs. Time	B-17
30	Passenger Right Femur Force vs. Time	B-17

The following additional dummy and vehicle response data can be found in the R & D section of the NHTSA website at: www.nhtsa.dot.gov.

Driver Head Acceleration X Redundant
 Driver Head Acceleration Y Redundant
 Driver Head Acceleration Z Redundant
 Driver Upper Neck Force Y

Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
Driver Pelvis X
Driver Pelvis Y
Driver Pelvis Z
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Shoulder Belt Force
Driver Lap Belt Force
Passenger Head Acceleration X Redundant
Passenger Head Acceleration Y Redundant
Passenger Head Acceleration Z Redundant
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
BARRIER LOAD A1
BARRIER LOAD A2
BARRIER LOAD A3
BARRIER LOAD A4
BARRIER LOAD A5
BARRIER LOAD A6
BARRIER LOAD A7
BARRIER LOAD A8
BARRIER LOAD A9
BARRIER LOAD B1
BARRIER LOAD B2
BARRIER LOAD B3
BARRIER LOAD B4
BARRIER LOAD B5

BARRIER LOAD B6
BARRIER LOAD B7
BARRIER LOAD B8
BARRIER LOAD B9
BARRIER LOAD C1
BARRIER LOAD C2
BARRIER LOAD C3
BARRIER LOAD C4
BARRIER LOAD C5
BARRIER LOAD C6
BARRIER LOAD C7
BARRIER LOAD C8
BARRIER LOAD C9
BARRIER LOAD D1
BARRIER LOAD D2
BARRIER LOAD D3
BARRIER LOAD D4
BARRIER LOAD D5
BARRIER LOAD D6
BARRIER LOAD D7
BARRIER LOAD D8
BARRIER LOAD D9

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION