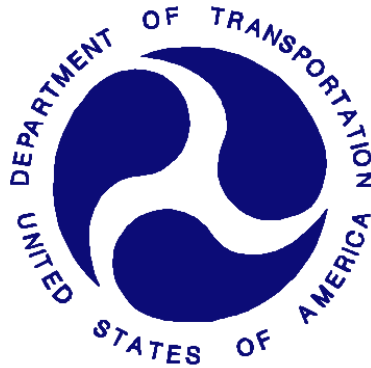


Final Report Number: NCAP-TRC-16-006

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

**General Motors LLC
2016 Chevrolet Cruze
NHTSA Number: M20160103**

**PREPARED BY:
Transportation Research Center Inc.
10820 State Route 347
P. O. Box B-67
East Liberty, OH 43319**



Report Date: September 12, 2016

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**

Notice

Transportation Research Center Inc. does not endorse or certify products of manufacturers. The manufacturer's name appears solely to identify the test article. Transportation Research Center Inc. assumes no liability for the report or use thereof. It is responsible for the facts and the accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.

Prepared By: Impact Laboratory Project Operations Group

Approved By: Melinda Lackey

Approval Date: September 12, 2016

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 56.0 km/h NCAP Frontal Impact Test was conducted on a 2016 Chevrolet Cruze, 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 15, 2016. The impact velocity was 56.50 km/h, and the ambient temperature at the barrier face at the time of impact was 21.4° C. The target vehicle post-test maximum crush was 488 millimeters at the centerline. The test vehicle's performance is as follows:																																																																											
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1: PURPOSE AND SUMMARY OF THE TEST

PURPOSE

This 56 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 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Front NCAP Laboratory Test Procedure dated October 2015.

SUMMARY

A 2016 Chevrolet Cruze impacted the barrier wall at a velocity of 56.50 km/h. The test was performed at Transportation Research Center, Inc. on June 15, 2016. 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 load cells, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and the passenger's lap belts to measure dummy pelvic section loading.

The driver (position 1) ATD (Serial No. 037), and the right-front passenger (position 2) ATD (Serial No. 070) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 100 channels of data were recorded on an on-board data acquisition system. The 288 barrier channels of data were recorded on an off-board high resolution barrier 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 488 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)	165	0.31	1,150.5	-209.7	50.2	-21.5	-960.0	-1,303.9
Passenger (5 th Female)	308	0.35	643.9	-158.3	42.2	-11.5	-982.1	-1,230.2

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

TEST VEHICLE INFORMATION

NHTSA No.	M20160103
Model Year	2016
Make	Chevrolet
Model	Cruze
Body Style	Passenger Car
VIN	1G1BE5SM4G7248091
Body Color	Silver Ice Metallic
Odometer Reading (km/mi)	10 MI.
Engine Displacement (L)	1.4
Type/No. Cylinders	Gas/4
Engine Placement	Front/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	Driver only
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	No
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:	N/A

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured by	General Motors LLC	GVWR (kg)	1744.0 (3845 lbs)
Date of Manufacture	03/16	GAWR Front (kg)	917.0 (2022 lbs)
		GAWR Rear (kg)	827.0 (1823 lbs)

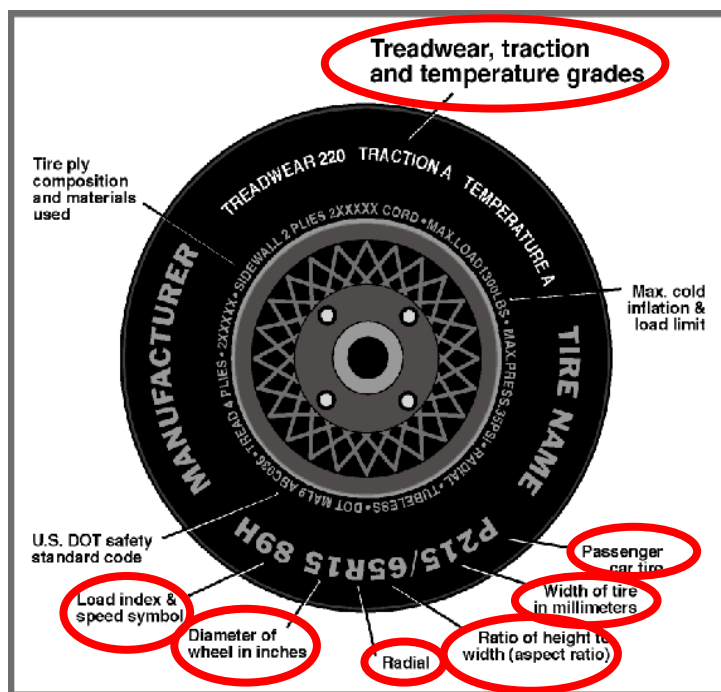
VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				395
Cargo Wt. (RCLW) (kg)				54.8

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold / Test Pressure (kPa)	240	240
Recommended Tire Size	205/55R16	205/55R16
Tire Size on Vehicle	205/55R16	205/55R16
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Assurance	Assurance
Treadwear	580	580
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index/Speed Symbol	91 H	91 H
Tire Material	Polyester, steel & polyamide	Polyester, steel & polyamide
DOT Safety Code Right	M60F VH1R 0716	M60F VH1R 0716
DOT Safety Code Left	M60F VH1R 0716	M60F VH1R 0716

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	409.2	263.2		438.0	327.0	
Right	kg	394.6	253.0		419.8	321.2	
Ratio	%	60.9	39.1		57.0	43.0	
Totals	kg	803.8	516.2	1320.0	857.8	648.2	1506.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1320.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.2
Rated Cargo/Luggage Weight (RCLW)	kg	54.8
Vehicle Target Weight (TVTW)	kg	1514.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front)
As Delivered	mm	676	670	699	699	1055
As Tested	mm	667	668	665	658	1161
Post Test	mm	704	703	698	692	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2697
Total Vehicle Length at Left Side	mm	4351
Total Vehicle Length at Centerline	mm	4658
Total Vehicle Length at Right Side	mm	4353
Weight of Ballast in Cargo Area	kg	2.4
Weight of Vehicle Components Removed	kg	43.8
Amount of Stoddard Solvent in Fuel Tank	liters	46.8

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: Rear fascia, trunk lid, tail lights, rear door panels, windows, regulator assembly, weather strips and speakers, left & right OSRV mirrors and rear package tray

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4658
2	Total Width	1782
3	Bumper Top Height	608
4	Bumper Bottom Height	235
5	Longitudinal Member Top Height	241
6	Distance Between Longitudinal Members	913
7	Longitudinal Member Width	936
8	Engine Top Height	760
9	Engine Bottom Height	187
10	Engine and Gearbox Width	785
11	Front Bumper-Engine Distance	660
12	Front Shock Absorber Fixing Height	845
13	Bonnet Leading Edge Height	703
14	Front Shock Absorber Fixing Width	1150
15	Front Bumper – Front Axle Distance	1005
16	Front Axle – A-Pillar Distance	488
17	A-Pillar – B-Pillar Distance	942
18	B-Pillar – Rear Axle Distance	1306
19	B-Pillar – C-Pillar Distance	889
20	Roof Sill Bottom Height	1377
21	Roof Sill Top Height	1475
22	Floor Sill Bottom Height	190
23	Floor Sill Top Height	285

DATA SHEET NO. 2

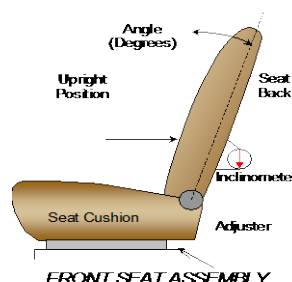
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

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. Inclinometer measurement at the top of the backrest at the seat centerline, according to Form 1 attachment.



	Degree
Driver Seat back angle:	12.9
Passenger Seat back angle:	20.1

SEAT FORE/AFT POSITIONS

Describe the method used of determining seat fore/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	304	152
Passenger Seat	240	0

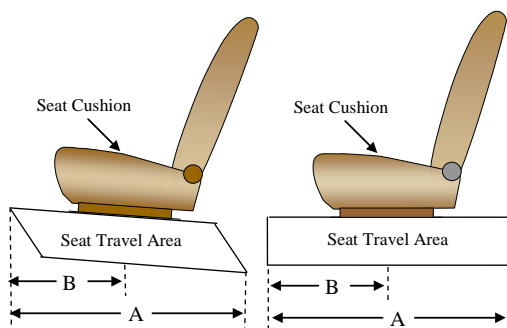
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Uppermost, Positioned according to Form 1

Passenger: Uppermost, Positioned according to Form 1.

	Total No. of Positions	Placed in Position No.
Driver Seat	1, Fixed	1, Fixed
Passenger Seat	1, Fixed	1, Fixed



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

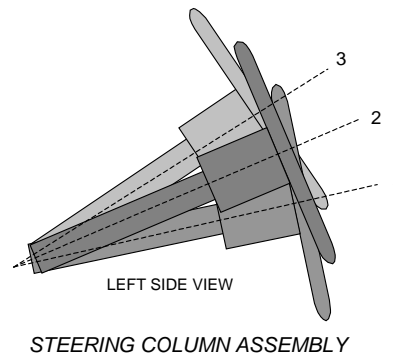
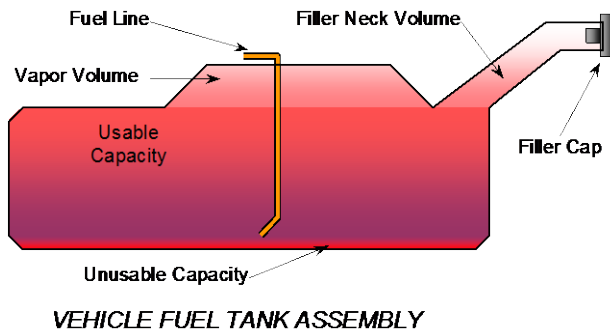
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	50.3
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	46.8
Actual Amount of Solvent Used	46.8
1/3 of Usable Capacity	16.8

The vehicle is equipped with an electric fuel pump.

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. Steel square was placed across the rim of the steering wheel, an inclinometer was placed on the plate and the angle was measured. Telescope travel was measured full in and full out and set at the midpoint.



STEERING COLUMN POSITIONS

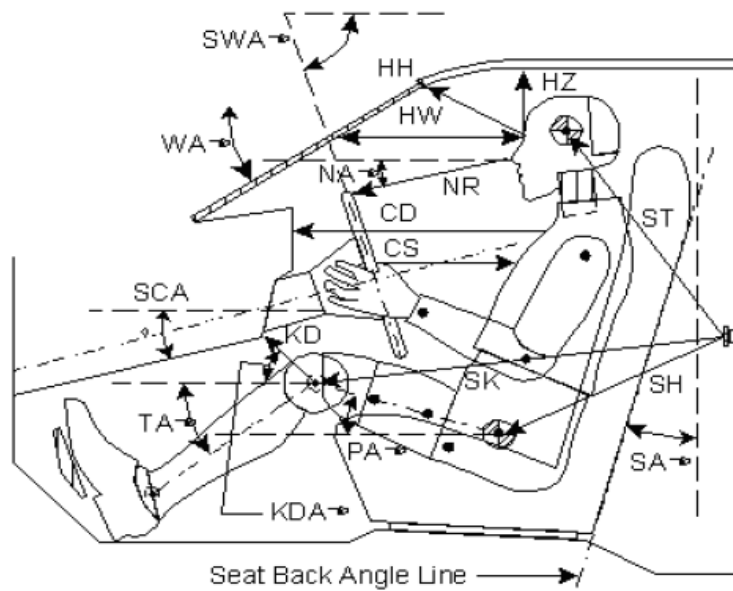
	Degrees	Fore/Aft Position (mm)
Lowermost Position No. 1	25.1	0
Geometric Center Position No. 2	23.1	30
Uppermost Position No. 3	21.1	60
Telescoping Steering Wheel Travel		60
Test Position	23.1	30

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16



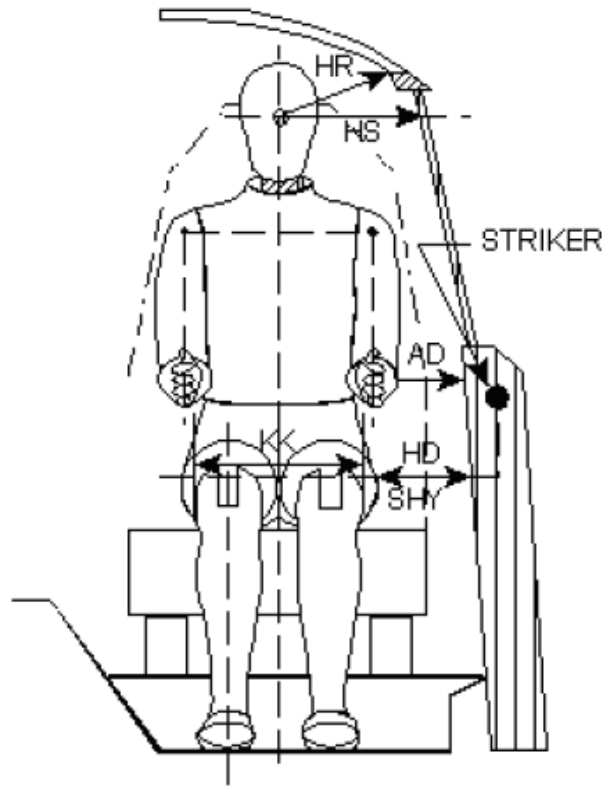
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.7		
SWA°	Steering Wheel Angle		22.0		
SCA°	Steering Column Angle		68.0		
SA°	Seat Back Angle (on headrest post)		12.9 FWD		20.1
HZ	Head to Roof (Z)	235		243	
HH	Head to Header	415		358	
HW	Head to Windshield	760		793	
NR	Nose to Rim	421	3.5		
CD	Chest to Dash	577		463	
CS	Chest to Steering Hub	342			
RA	Rim to Abdomen	241			
KDL	Left Knee to Dash	235	37.0	163	39.0
KDR	Right Knee to Dash	230	39.0	160	39.0
PA°	Pelvic Angle		22.7		21.8
TA°	Tibia Angle		35.9		39.4
SK	Striker to Knee	497	9.8	583	8.1
ST	Striker to Head	461	89.2	433	76.0
SH	Striker to H-Point	221	60.0	276	31.0

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16



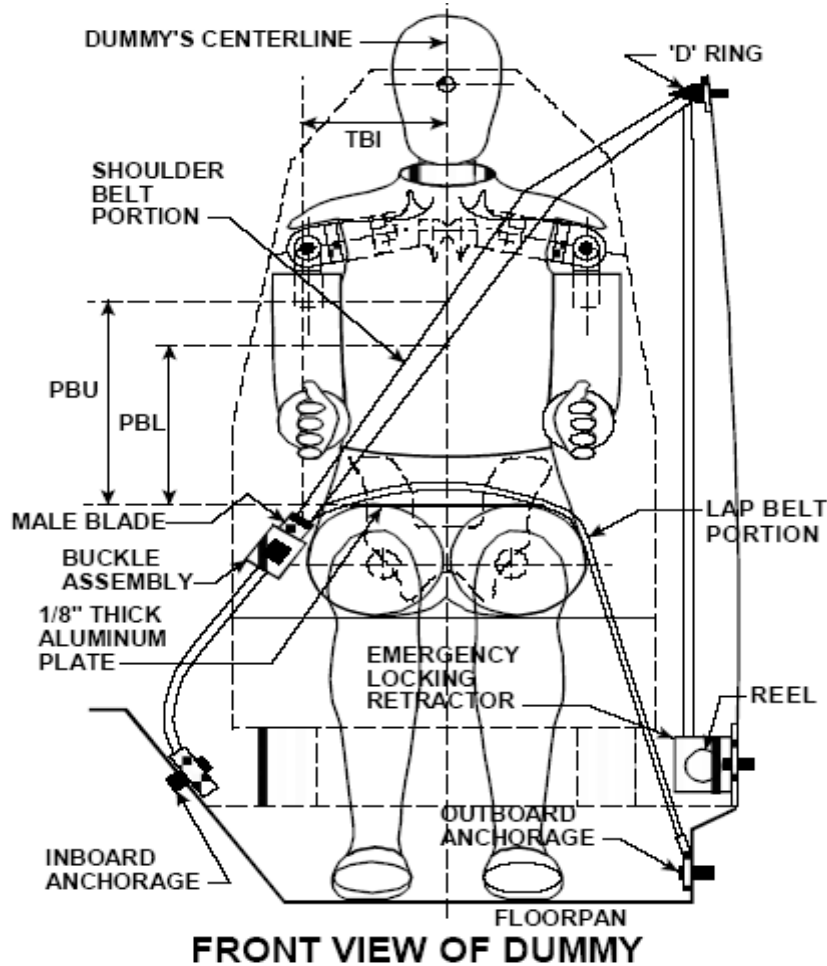
Code	Measurement Description	Driver	Passenger
AD	Arm to Door	96	113
HD	H-Point to Door	167	183
HR	Head to Side Header	209	242
HS	Head to Side Window	351	374
KK	Knee to Knee	283	165
SHY	Striker to H-Point (Y Direction)	258	165
AA	Ankle to Ankle	315	181

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	374	371
PBL – Top surface of reference to belt lower edge	mm	290	299

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	802	874
Lap belt length as measured on ATD	mm	443	516
Remainder of belt on reel	mm	1445	1260
Total belt length for continuous webbing systems	mm	2690	2650

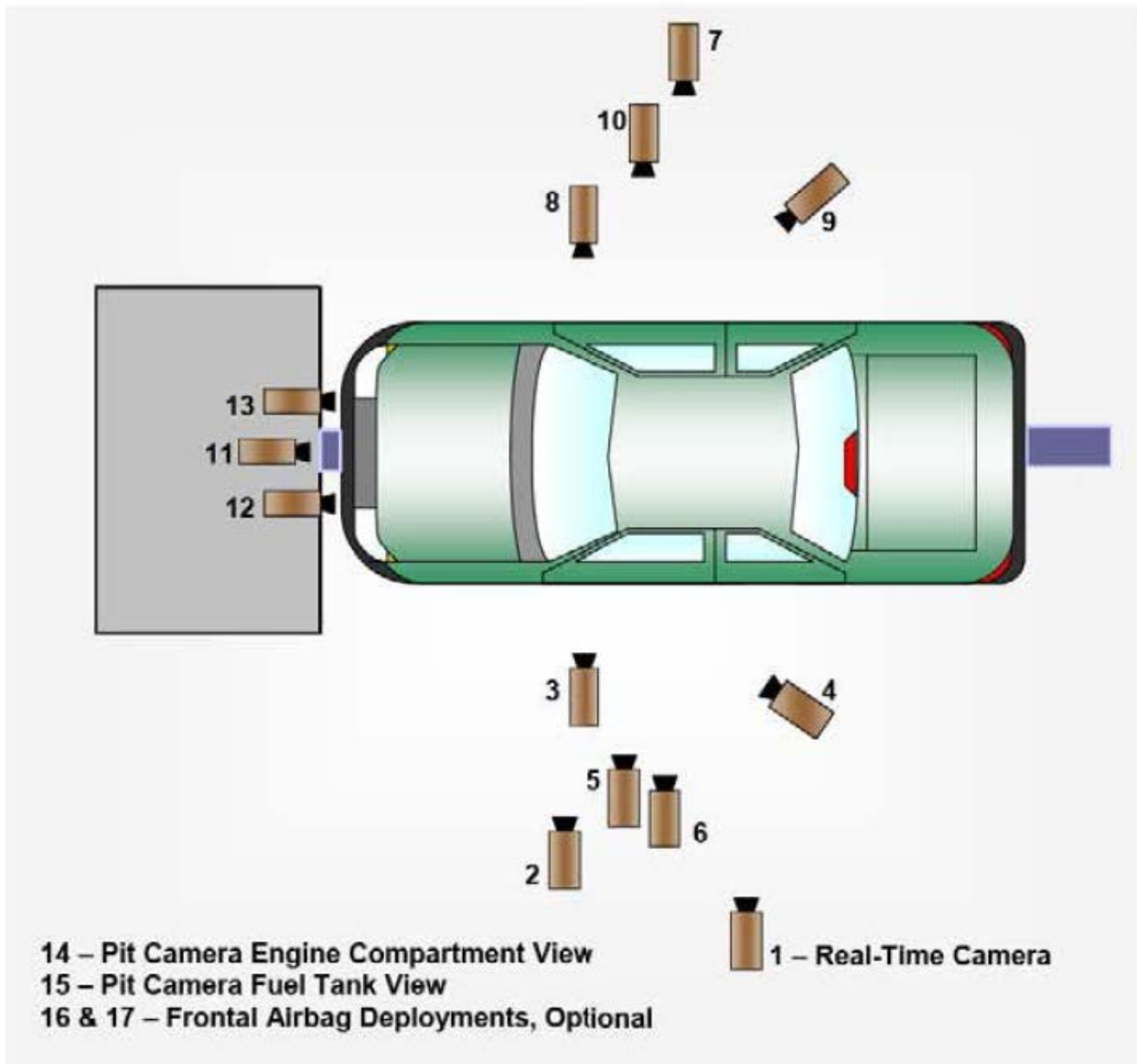
DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

CAMERA LOCATIONS

No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-732	-5812	-1339	Zoom	30
2	Driver Close-Up	-1332	-5812	-1256	50	1000
3	Left Front Half	-1023	-5702	-1284	20	1000
4	Left Angle	-4011	-2550	-1862	25	1000
5	Steering Column - Top	-1708	-5332	-2226	50	1000
6	Steering Column – Bottom	-1712	-5032	-1297	50	1000
7	Right Overall	-1766	5596	-1200	20	1000
8	Passenger Close-Up	-1332	5631	-1205	50	1000
9	Right Front Half	-4023	2765	-1857	25	1000
10	Right Angle	-1021	5706	-1171	Zoom	1000
11	Windshield	-100	0	-2658	12.5	1000
12	Driver Windshield	-110	-275	-2654	25	1000
13	Passenger Windshield	-110	396	-2654	25	1000
14	Pit Front	-709	45	3038	20	1000
15	Pit Rear	-3201	-30	3038	20	1000
16	Onboard Driver Airbag (Optional)	N/A	N/A	N/A	12.5	1000
17	Onboard Passenger Airbag (Optional)	N/A	N/A	N/A	12.5	1000

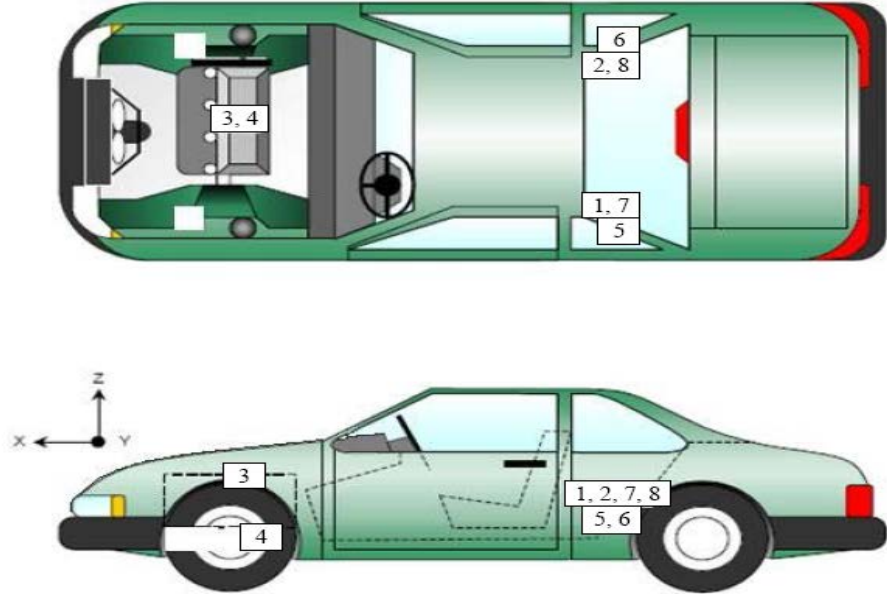
Reference Points: +X – forward of impact plane
 +Y – right of monorail center
 +Z – into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Camera View	Location (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1431	-300	-430
2	Right Rear Accelerometer – X Direction	1431	290	-430
3	Engine Top X	3585	+43	-701
4	Engine Bottom X	3420	+121	-166
5	Left Rear Accelerometer – Z Direction	1429	-300	-430
6	Right Rear Accelerometer – Z Direction	1429	+290	-430
7	Left Rear Accelerometer – X Direction Redundant	1431	-365	-430
8	Right Rear Accelerometer- X Direction Redundant	1431	+360	-430

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

¹ Measurement was not taken.

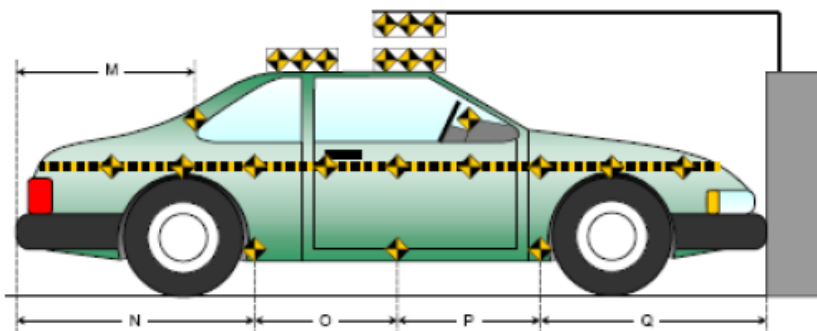
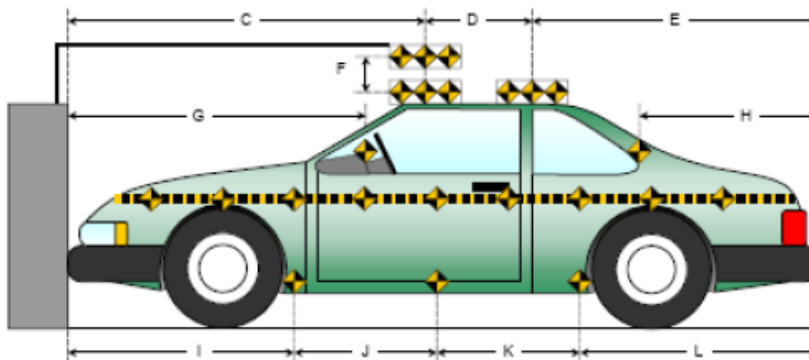
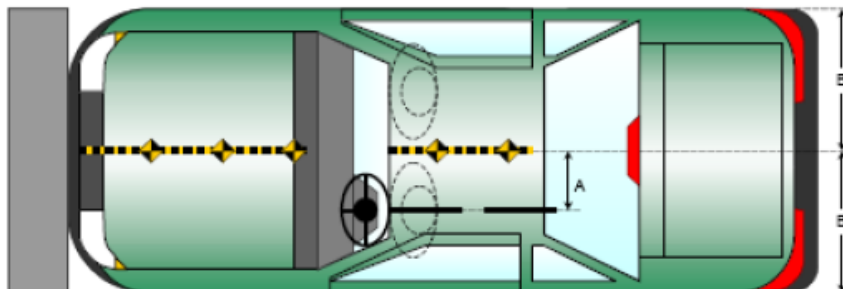
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

Item	Value
A	326
B	899
C	2361
D	603
E	1715
F	230
G	1746
H	367
I	1430
J	916
K	916
L	1426
M	867
N	1410
O	916
P	916
Q	1425



All units in millimeters

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

								Centerline								
A-16	A-15	A-14	A-13	A-12	A-11	A-10	A-09	A-08	A-07	A-06	A-05	A-04	A-03	A-02	A-01	
B-16	B-15	B-14	B-13	B-12	B-11	B-10	B-09	B-08	B-07	B-06	B-05	B-04	B-03	B-02	B-01	
C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-09	C-08	C-07	C-06	C-05	C-04	C-03	C-02	C-01	
D-16	D-15	D-14	D-13	D-12	D-11	D-10	D-09	D-08	D-07	D-06	D-05	D-04	D-03	D-02	D-01	
E-16	E-15	E-14	E-13	E-12	E-11	E-10	E-09	E-08	E-07	E-06	E-05	E-04	E-03	E-02	E-01	
F-16	F-15	F-14	F-13	F-12	F-11	F-10	F-09	F-08	F-07	F-06	F-05	F-04	F-03	F-02	F-01	
G-16	G-15	G-14	G-13	G-12	G-11	G-10	G-09	G-08	G-07	G-06	G-05	G-04	G-03	G-02	G-01	
H-16	H-15	H-14	H-13	H-12	H-11	H-10	H-09	H-08	H-07	H-06	H-05	H-04	H-03	H-02	H-01	
I-16	I-15	I-14	I-13	I-12	I-11	I-10	I-09	I-08	I-07	I-06	I-05	I-04	I-03	I-02	I-01	
J-16	J-15	J-14	J-13	J-12	J-11	J-10	J-09	J-08	J-07	J-06	J-05	J-04	J-03	J-02	J-01	
K-16	K-15	K-14	K-13	K-12	K-11	K-10	K-09	K-08	K-07	K-06	K-05	K-04	K-03	K-02	K-01	

DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	44
Passenger Dummy Accelerometers	44
Vehicle Structure Accelerometers	8
Total	100

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	1
Total	17

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2016 Chevrolet Cruze

NHTSA No.: M20160103

Test Program: NCAP Frontal Impact

Test Date: 6/15/16

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th/ 037	Hybrid III 5th/ 070
Head Contact	Frontal Airbag/Head Restraint	Frontal Airbag/Head Restraint
Upper Torso Contact	None	None
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	Front: Unlocked; Rear: Locked	Unlocked
Front Door Opening	Remained closed & latched, operational	Remained closed & latched, operational
Rear Door Opening	Remained closed & latched, operational	Remained closed & latched, 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	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1366
Center	mm	1247
Right Side	mm	1350
Average	mm	1321

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

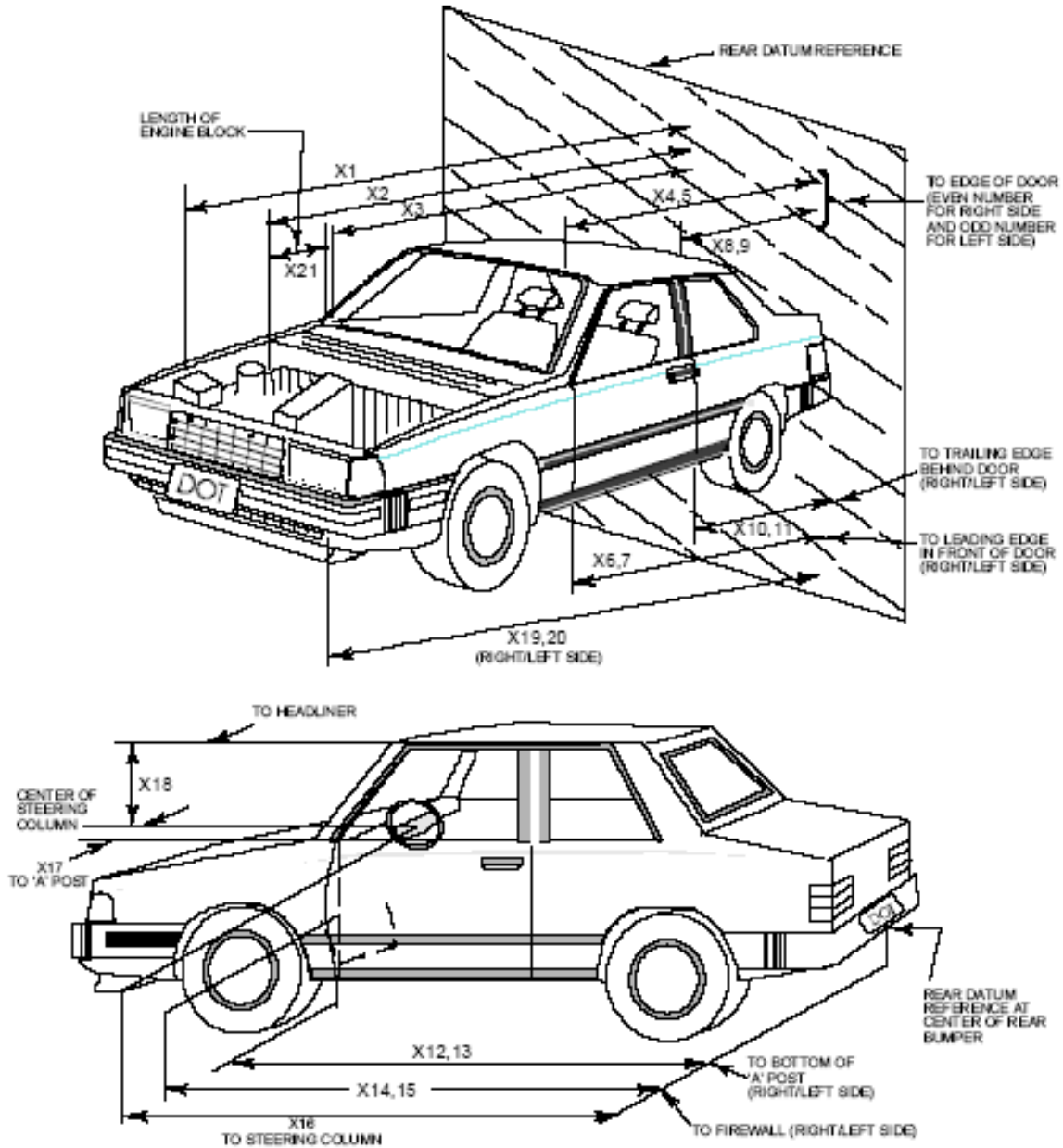
Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Curtain Airbag	Yes	Yes	Yes	Yes
Torso/Pelvis Airbag	Yes	No	Yes	No
Pelvis Airbag	No	N/A	No	N/A
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt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

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4658	4170	488
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4058	3855	203
3	RSOV to Firewall	3638	3675	-37
4	RSOV to Upper Leading Edge of Right Door	3211	3215	-4
5	RSOV to Upper Leading Edge of Left Door	3216	3218	-2
6	RSOV to Lower Leading Edge of Right Door	3171	3182	-11
7	RSOV to Lower Leading Edge of Left Door	3174	3177	-3
8	RSOV to Upper Trailing Edge of Right Door	2171	2178	-7
9	RSOV to Upper Trailing Edge of Left Door	2169	2175	-6
10	RSOV to Lower Trailing Edge of Right Door	2211	2232	-21
11	RSOV to Lower Trailing Edge of Left Door	2218	2227	-9
12	RSOV to Bottom of "A" Post-of Right Side	3211	3213	-2
13	RSOV to Bottom of "A" Post-of Left Side	3206	3210	-4
14	RSOV to Firewall, Right Side	3718	3724	-6
15	RSOV to Firewall, Left Side	3718	3711	7
16	RSOV to Steering Column	2846	2900	-54
17	Center of Steering Column to "A" Post	406	405	1
18	Center of Steering Column to Headliner	448	445	3
19	RSOV to Right Side of Front Bumper	4353	4082	271
20	RSOV to Left Side of Front Bumper	4351	4095	256
21	Length of Engine Block	749	750	-1
RD	RSOV to Right Side of Dash Panel	2986	2980	6
CD	RSOV to Center of Dash Panel	2981	3010	-29
LD	RSOV to Left Side of Dash Panel	2979	2996	-17

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

VEHICLE INFORMATION

VIN: 1G1BE5SM4G7248091
 Vehicle Size Category: Passenger Car

Wheelbase: 2697
 Test Weight (kg): 1506.0

ACCELEROMETER DATA

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

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

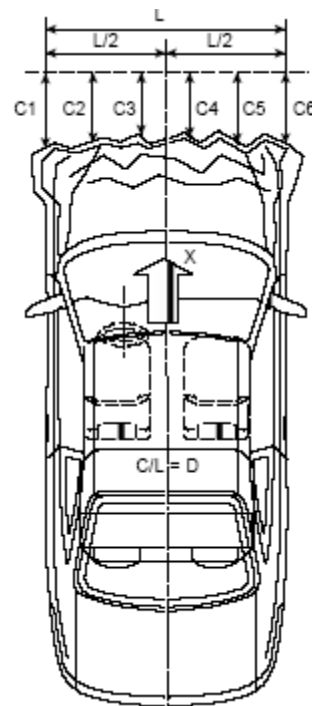
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.50

Velocity Change (km/h): 63.47

Time of Separation (ms): 110



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Centerline

Damage Region Length (mm): 1727

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4351	4095	256
C2	Crush zone 2 at left side	mm	4528	4160	368
C3	Crush zone 3 at left side	mm	4626	4167	459
C4	Crush zone 4 at right side	mm	4636	4153	483
C5	Crush zone 5 at right side	mm	4526	4120	406
C6	Crush zone 6 at right side	mm	4353	4082	271
L	C1 to C6	mm	1727	1768	-41

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

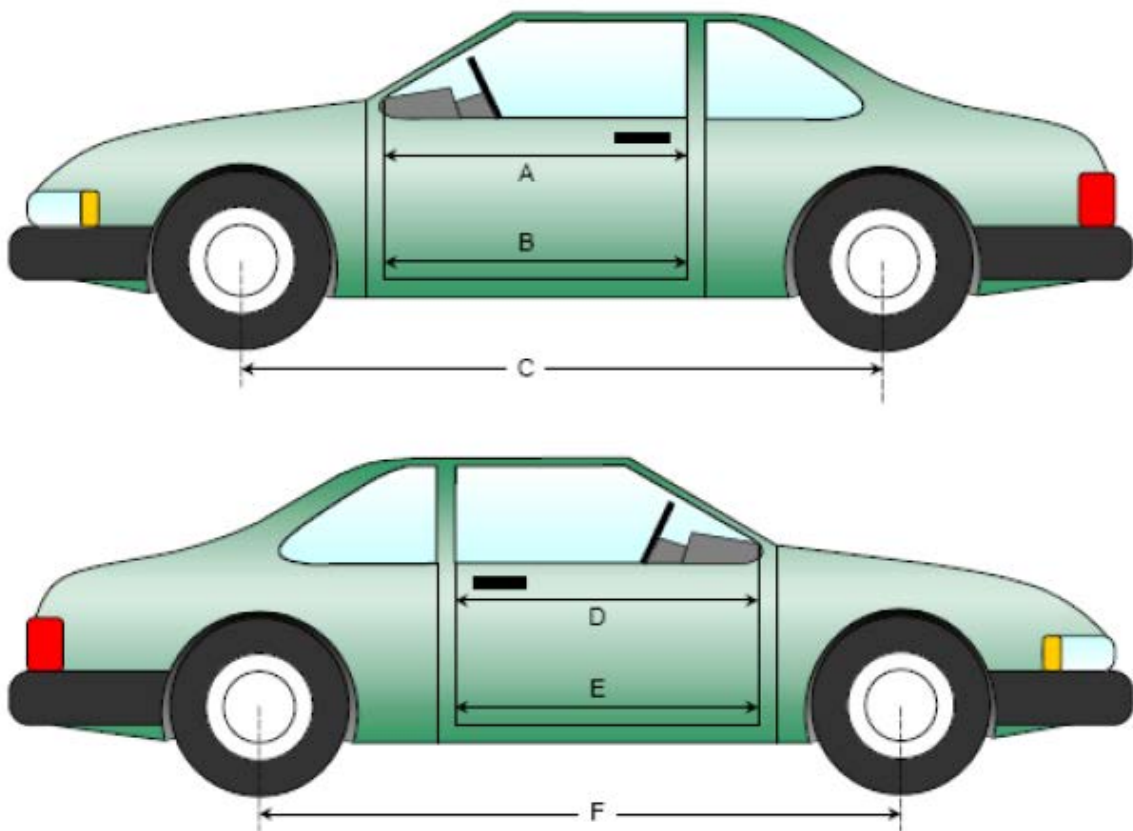
NHTSA No.: M20160103
 Test Date: 6/15/16

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	942	942	0
B	Left Side Lower	mm	762	760	2
C	Right Side Upper	mm	942	941	1
D	Right Side Lower	mm	775	773	2

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2697	2670	27
F	Right Side Wheelbase	mm	2695	2698	-3



DATA SHEET NO. 14 (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

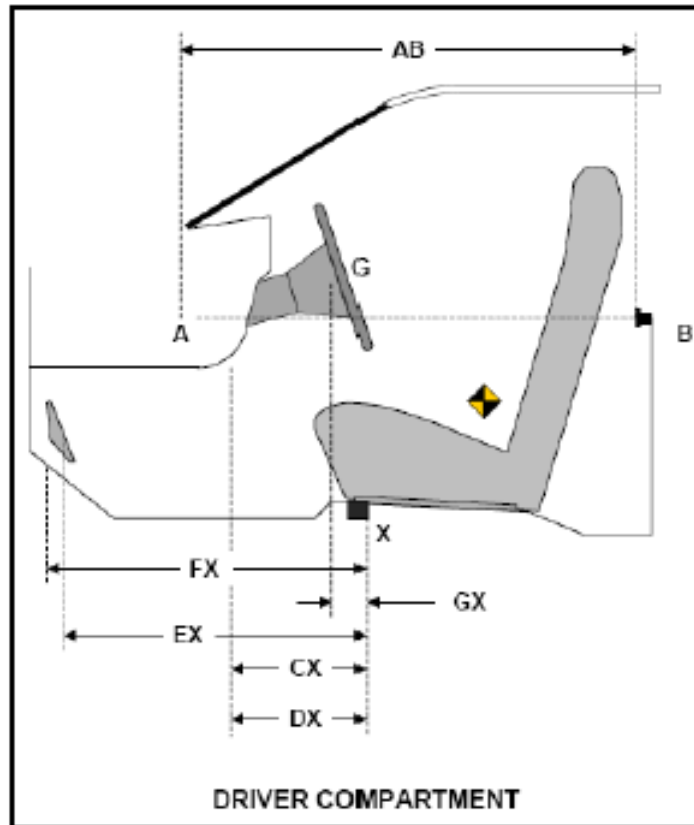
Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	940	927	13
CX	Left Knee Bolster to X	mm	290	276	14
DX	Right Knee Bolster to X	mm	372	370	2
EX	Brake Pedal to X	mm	502	496	6
FX	Foot Rest to X	mm	545	487	58
GX	Center of Steering Column Wheel Hub to X	mm	596	590	6

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

Please provide windshield mounting details.

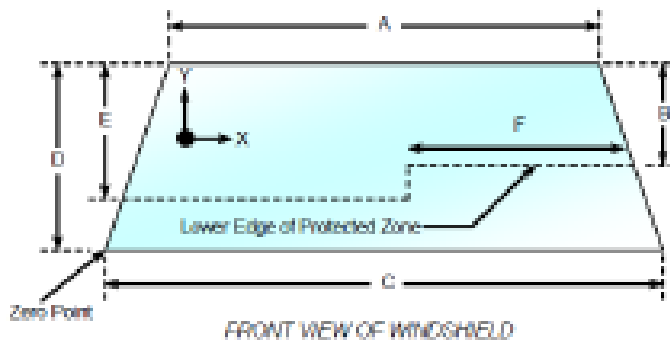
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.4° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1848	1848	100
Right Side	1848	1848	100
Total	3696	3696	100

Item	Units	Value
A	mm	1182
B	mm	570
C	mm	1374
D	mm	881
E	mm	548
F	mm	420



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
NA	NA
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 15 (CONTINUED)

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

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.4°C

Test Time: 16:50

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: None

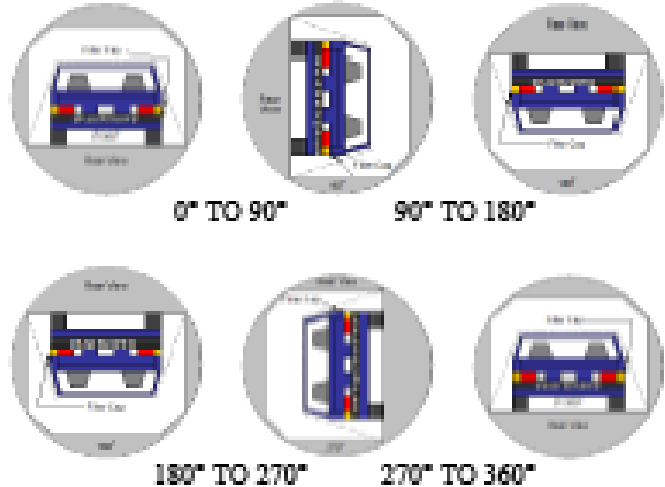
DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2016 Chevrolet Cruze
 Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
 Test Date: 6/15/16

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).
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	330	420
90° to 180°	90	330	840
180° to 270°	90	330	1260
270° to 360°	90	330	1480

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

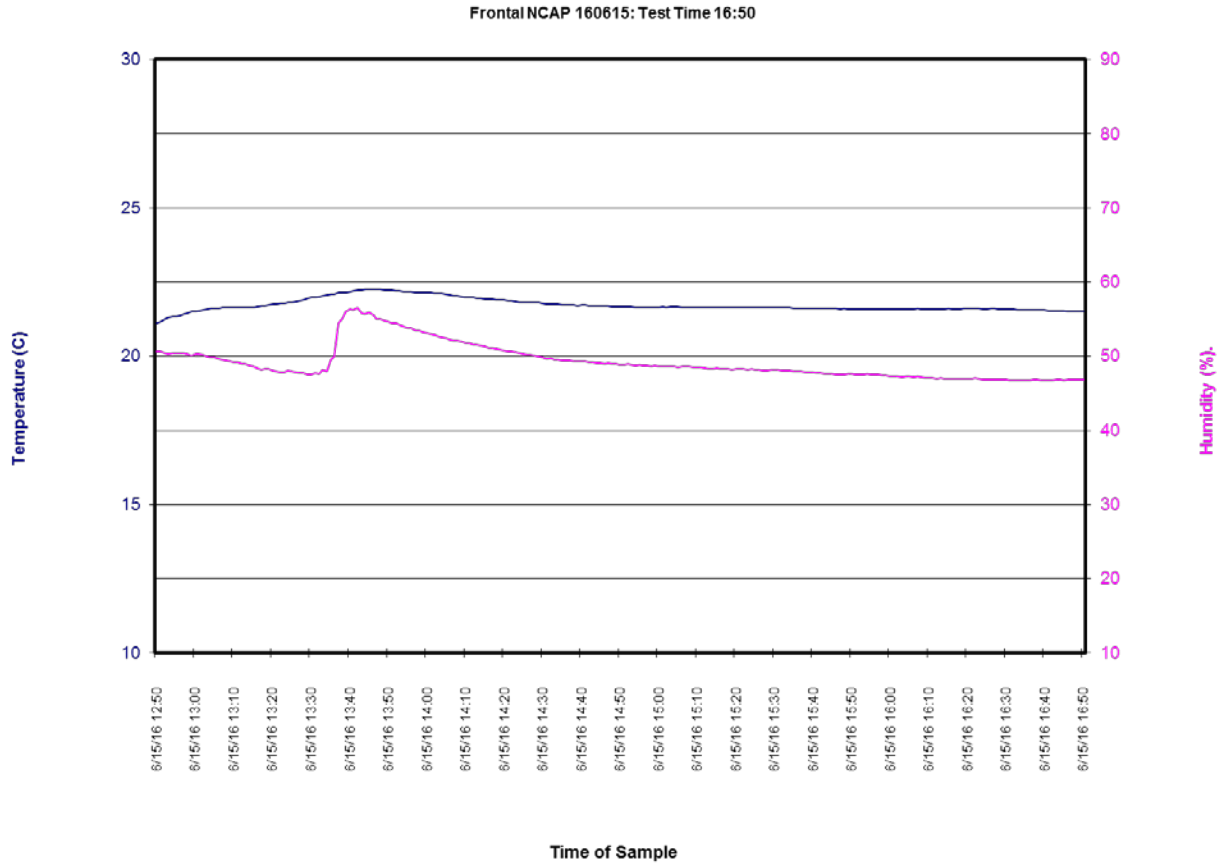
Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2016 Chevrolet Cruze
Test Program: NCAP Frontal Impact

NHTSA No.: M20160103
Test Date: 6/15/16



APPENDIX A
PHOTOGRAPHS

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8	Pre-Test Front View of Test Vehicle	A-8
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20	Pre-Test Engine Compartment View	A-14
21	Post-Test Engine Compartment View	A-15
22	Pre-Test Fuel Filler Cap View	A-15
23	Post-Test Fuel Filler Cap View	A-16
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25	Post-Test Front Underbody View	A-17
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26	Pre-Test Rear Underbody View	A-20
27	Post-Test Rear Underbody View	A-20
28	Pre-Test Dummy Cable Routing	A-21
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30	Pre-Test Driver Dummy Front View	A-22
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34	Pre-Test Driver Dummy and Vehicle Interior View	A-24
35	Post-Test Driver Dummy and Vehicle Interior View	A-24
36	Pre-Test Driver's Seat Fore-Aft Markings	A-25
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38	Pre-Test View of Belt Anchorage for Driver Dummy	A-26
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40	Pre-Test Driver Dummy Feet	A-26
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42	Pre-Test Driver's Side Knee Bolster	A-28
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44	Pre-Test Driver's Side Floorpan	A-29
45	Post-Test Driver's Side Floorpan	A-29
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48	Post-Test Driver Dummy Contact with Headrest	A-31
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54	Post-Test Passenger Dummy Window View	A-34
55	Pre-Test Passenger Dummy and Vehicle Interior View	A-35
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57	Pre-Test Passenger Seat Fore-Aft Markings	A-36
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59	Pre-Test View of Belt Anchorage for Passenger Dummy	A-37
60	Post-Test View of Belt Anchorage for Passenger Dummy	A-37
61	Pre-Test Passenger Dummy Feet	A-38
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63	Pre-Test Passenger Side Knee Bolster	A-39
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71	Post-Test Stoddard Solvent Spillage Location view, if required	A-43
72	Post-Test Speed Trap Read-out	A-44
73	Vehicle at 0° on Static Rollover Device	A-45
74	Vehicle at 90° on Static Rollover Device	A-45
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78	2016 Chevrolet Cruze Frontal Impact Event	A-47
79	Monrone Label Photograph	A-48

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

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

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 Acceleration
Driver Pelvis Y Acceleration
Driver Pelvis Z Acceleration
Driver Left Femur Force Redundant
Driver Right Femur Force Redundant
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 Femur Force Redundant
Passenger Right Femur Force Redundant
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
Load Cell Barrier Forces and Moments

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION