REPORT NUMBER: CAL-10-01

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

KIA MOTORS CORPORATION
2010 Kia Soul
5-Door MPV

NHTSA NUMBER: MA0505

CALSPAN TEST NUMBER: 8865-NCAP-04

CALSPAN CORPORATION
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225

April 22, 2009

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
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1200 New Jersey Ave SE, Room W43-410
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Prepared by: 

Vincent M. Paolini, Project Engineer

Approved by: 

David Travale, Program Manager
Transportation Science Center

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7. Author(s) David J. Travale, Program Manager Vincent M. Paolini, Project Engineer		*8. Performing Organization Report No.* 8865-NCAP-04
9. Performing Organization Name and Address Calspan Corporation 4455 Genesee Street Buffalo, New York 14225		*10. Work Unit No.*
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15. Supplementary Notes

16. Abstract

A frontal load cell barrier test of a 2010 Kia Soul 5-Door MPV was performed at Calspan Corporation's crash test facility in Buffalo, New York, on April 22, 2009.

The impact velocity was 56.6 kph and the temperature at the barrier face was 21°C. The maximum post-test vehicle crush was 464 mm. The test vehicle was equipped with 3-point restraint systems, knee bolsters, and airbags at both the driver and right outboard passenger seating positions.

With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appeared to comply with head, chest, and femur requirements. The occupant injury criteria summary is as follows:

Measurement Description	**Units**	**Threshold**	**Driver (064)**	**Passenger (061)**
Head Injury Criteria (HIC - 36 ms)	-	1000	334.8	399.0
Maximum Thorax Acceleration (3 ms Clip)	g's	60 g's	38.6	39.7
Chest Displacement	mm	-76 mm	-29.0	-24.3
Left Femur Force	Newtons	-10000 N	-3540.9	-4612.4
Right Femur Force	Newtons	-10000 N	-4460.6	-1566.4

17. Key Words 56 kph Frontal Barrier Impact test New Car Assessment Program (NCAP)	*18. Distribution Statement* Copies of this report are available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 1200 New Jersey Ave SE Washington, DC 20590

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SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.6 kph 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. DTNH22-06-D-00024. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 48.3 kph requirements.

The 56.6 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.6 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated December 1999. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion (Partial)"; and FMVSS 301 "Fuel System Integrity" performance. Procedures for receiving, inspection testing and reporting of test results are described in the test procedures and are not repeated in this report.

One real-time camera and 14 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.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis triaxial 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's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 064) and the right-front passenger (position 2) ATD (Serial No.061) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The vehicle, occupant, camera and measurement data are presented in Section 2. Appendix A contains the still photograph prints. The 128 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. Appendix C contains the dummy calibration data and Appendix D contains the transducer calibration dates.

1.3 SUMMARY OF FRONTAL BARRIER IMPACT TEST

A load cell barrier consisting of 36 load cells was impacted by a 2010 Kia Soul 5-Door MPV at a velocity of 56.6 kph. The test was performed at Calspan on April 22, 2009. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The occupant data is summarized below.

ATD	HIC	T_1	T_2	Clip (g)	T_1	T_2	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	334.8	62.7	98.7	38.6	57.8	60.8	-29.0	-3540.9	-4460.6
Passenger	399.0	69.8	105.8	39.7	70.4	73.4	-24.3	-4612.4	-1566.4

The test data can be found on the NHTSA website at www.nhtsa.dot.gov

TEST NOTES	
Data Channel	Anomalies
V1P2 Upper Neck Mx	Connector separated from transducer – Transducer data invalid
V1P2 Upper Neck My	Connector separated from transducer – Transducer data invalid
V1P2 Upper Neck Mz	Connector separated from transducer – Transducer data invalid
V1P2 Chest Red z	Questionable Data after 5 msec

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
CRASH TEST SUMMARY

Vehicle NHTSA No.: MA0505 Test Mode: 56.3 kph Frontal Barrier
Test Date: April 22, 2009 Time: 14:40 Temperature: 21 °C
Vehicle Make/Model/Body Style: 2010 Kia Soul 5-Door MPV
Vehicle Test Weight: 1389.5 kg Impact Velocity: 56.6 kph (55.5 – 57.1 kph)
Vehicle/Barrier Impact Angle: 0 ° Max Static Crush: 464 mm

ATD INFORMATION AND VISIBLE CONTACT POINTS

	DRIVER	PASSENGER
ATD Type:	Part 572E	Part 572E
Restraint System:	Seatbelt, Frontal Airbag, Knee Bolster	Seatbelt, Frontal Airbag, Knee Bolster
Head Contact:	Face – Frontal Airbag Back of head – Head restraint	Face – Frontal Airbag Back of head – Head restraint
Abdomen Contact:	None	None
Chest Contact:	Frontal Airbag	Frontal Airbag
Left Knee Contact:	Knee Bolster	Glove Box Door
Right Knee Contact:	Knee Bolster	Glove Box Door

DOOR OPENING, SEAT TRACK AND GLAZING INFORMATION

Description	Driver Side	Passenger Side
Door Lock Status	Unlocked	Unlocked
Front Door Opening	Closed / Operable without tools	Closed / Operable without tools
Rear Door Opening	Closed / Operable without tools	Closed / Operable without tools
Hatch/Other Door Opening	Closed / Operable without tools	
Front Seat Track Shift (mm)	0	0
Front Seat Back Failure	None	None
Glazing Damage	None	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Left Side (mm)	Center (mm)	Right Side (mm)	Average (mm)
Value	846	768	823	812

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	910	870
Lap belt length as measured on ATD	mm	850	905
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems	mm	Not Applicable	Not Applicable

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2010 Kia Soul 5-Door MPV

NHTSA No. : MA0505 ; VIN: KNDJT2A16A7030594 ; Color: Silver

Engine Data: 4 cylinders; - CID; 1.6 Liters; - cc

Placement: - Longitudinal or In-Line; X Transverse or Lateral

Transmission Data: 5 speeds; X Manual; - Automatic; - Overdrive

Final Drive: - Rear Wheel Drive; X Front Wheel Drive; - Four Wheel Drive

AUTOMATIC DOOR LOCKS:

Is test vehicle equipped with Automatic Door Locks (ADLs)? - Yes; X No;

Does vehicle owner's manual describe how to deactivate ADLs? - Yes; X No; - N/A

DEALER AND DELIVERY INFORMATION:

Date Received: 4/10/09 ; Odometer Reading 90 km

Selling Dealer: Northtown Kia

Dealer Address: 3900 Sheridan Drive, Amherst, NY 14226

TEST VEHICLE OPTIONS:

X AC; X Power Steering; X Power Brakes; X Power Locks; - Power Seats

X ABS; X Tilt Wheel; - Stability Control X Traction Control - Anti-Theft

SAFETY BELT FEATURES:

Driver: X Pretensioner (Shoulder); X Load Limiter; X Adjustable Anchorage

Passenger: X Pretensioner (Shoulder); X Load Limiter; X Adjustable Anchorage

AIRBAG FEATURES:

Position	Frontal	Knee Bolster	Side Torso	Side Head/Torso Combination	Side Curtain
Driver:	X	-	X	-	X
Passenger:	X	-	X	-	X
Rear Passenger:	-	-	-	-	X

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Kia Motors Corporation

Date of Manufacture 1/09

GVWR: 1665 kg; GAWR: 980 kg FRONT; 970 kg REAR

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; X Bucket; - Split Bench

Number of Occupants: 2 Front; 3 Rear; 5 Total

Vehicle Capacity Weight (VCW) = 385.0 kg

No. of Occupants x 68.04 kg = 340.2 kg

Rated Cargo/Luggage Weight (RCLW) = 44.8 kg

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	362.0	343.0	58.8	705.0
Rear =	240.5	253.5	41.2	494.0
			Total Delivered Weight (UDW) =	1199.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1199.0	kg
Rated Cargo/Luggage Weight (RCLW) =	44.8	kg
Weight of 2 p.572 Dummies @ 76 each =	152	kg
TARGET TEST WEIGHT =	1395.8	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 38.5 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	389.5	388.0	56.0	777.5
Rear =	307.5	304.5	44.0	612.0
			Total Vehicle Test Weight (ATW) =	1389.5

Weight of Ballast Secured in Vehicle Trunk Area[1] = 11 kg

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG[2]
AS DELIVERED:	698	700	717	716	1050.6
FULLY LOADED:	686	689	688	687	-
AS TESTED:	686	689	688	690	1123.1

Vehicle's Wheel Base: 2550 mm

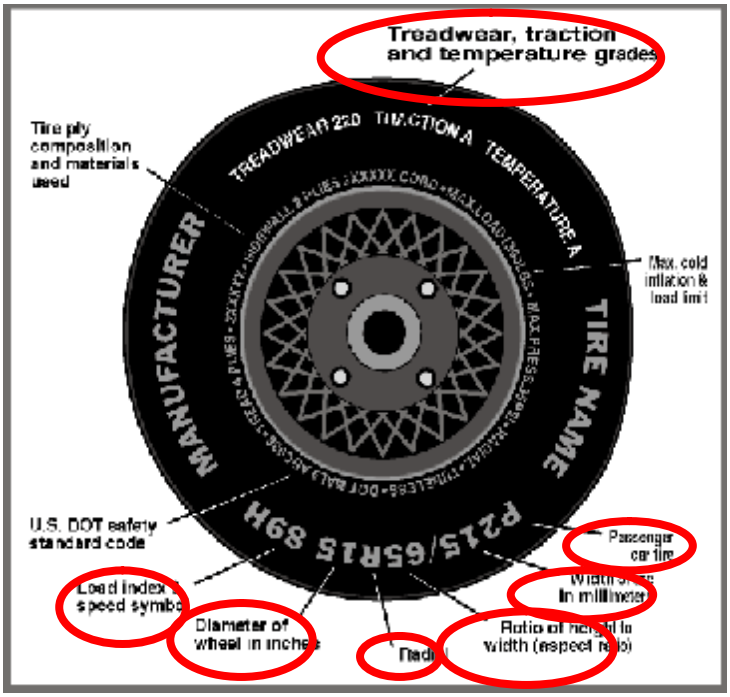
[1]Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

[2]Rearward of the front axle centerline.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Vehicle Year/Make/Model/Body Style: 2010 Kia Soul 5-Door MPV

NHTSA Test No.: MA0505 Test Date: April 22, 2009



Measured Parameter	Front	Rear
Maximum Tire Pressure (from sidewall - kPa)	300	300
Cold Pressure (from tire placard - kPa)*	230	230
Recommended Tire Size (from tire placard)	P195/65R15	P195/65R15
Tire size on Vehicle	P195/65R15	P195/65R15
Tire Manufacturer	Hankook	Hankook
Tire Name	Optimo H426	Optimo H426
Tire Type	Passenger	Passenger
Tire Width (mm)	195	195
Ratio of Height to Width (aspect ratio)	65	65
Radial	Yes	Yes
Wheel Diameter	15	15
Load Index & Speed Symbol	89S	89S
Treadwear	380	380
Traction Grade	A	A
Temperature Grade	A	A

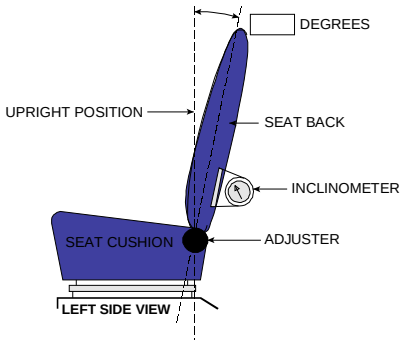
*Tire pressure used for test

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2010 Vehicle Model: Kia Soul Body Style : 5-Door MPV

1. NOMINAL DESIGN RIDING POSITION:
for adjustable driver and passenger seat backs. 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.



FRONT SEAT ASSEMBLY

Seat back angle for driver's seat: 23

Measurement instructions: Place seat in 12th detent from forward most locking position.

(Forward most locking position = 0 detent)

Seat back angle for passenger's seat: 23

Measurement instructions: Place seat in 12th detent from forward most locking position.

(Forward most locking position = 0 detent)

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Seat placed in the 11th detent from the forward most detent (forward most detent = 0)

Positioning of the passenger's seat: Seat placed in the 11th detent from the forward most detent (forward most detent = 0)

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 48.0 liters

B. "Usable Capacity" of the optional equipment fuel tank is - liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 44.2 to 45.1 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 44.5 liters

3.3 One-Third of Useable Capacity = 16.0 liters

3.4 Is vehicle equipped with electric fuel pump? Yes- X ; No- ____

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

The fuel pump will operate when the vehicle is in the 'On' position.

DATA SHEET NO. 4
TEST VEHICLE INFORMATION (cont.)

4. STEERING COLUMN ADJUSTMENTS:

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: Steering column was placed 26.8 degrees from horizontal.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: Placed in the 1st detent below the most upward locking position

(Total number of detents = 4, Test position = 1)

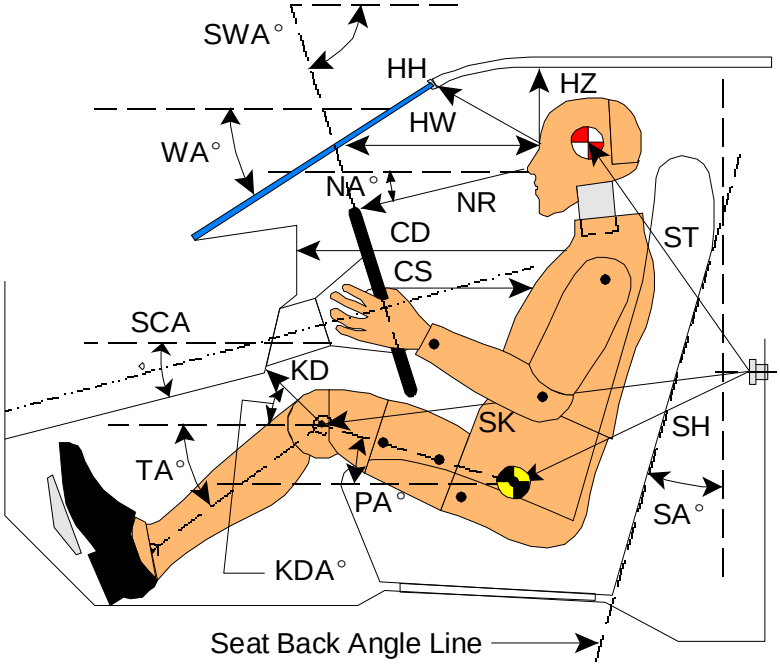
6. AUTOMATIC DOOR LOCKS: Is test vehicle equipped with ADLs? - Yes; X No; -

Does vehicle owner's manual describe how to deactivate ADLs? - Yes; X No; - N/A

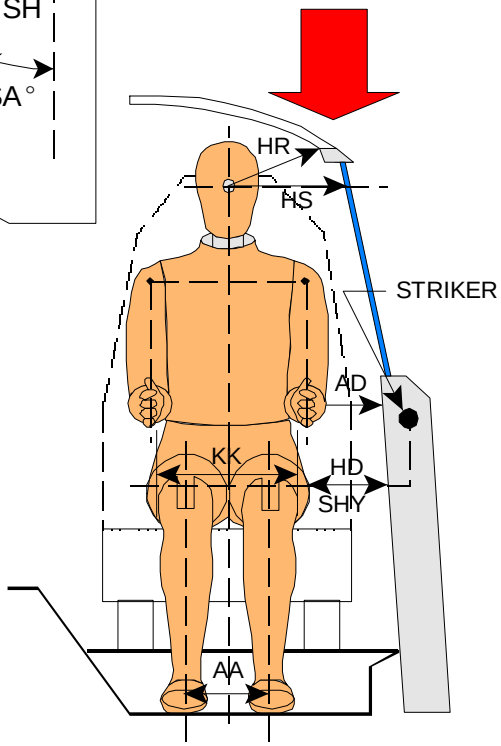
Comments: Not Applicable

DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

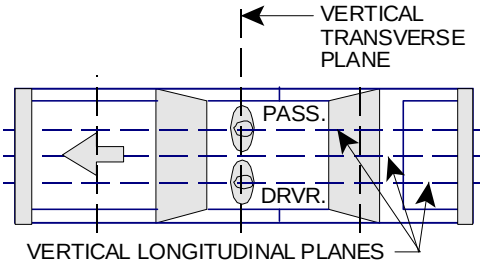
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



AD - Arm to Door
HD - H-Point to Door
HR - Head to Side Header
HS - Head to Side Window
KK - Knee to Knee
AA - Ankle to Ankle
SHY- Striker to H-Point (Y Direction)



CD - Chest to Dash
CS - Steering Wheel to Chest
HH - Head to Header
HW - Head to Windshield
HZ - Head to Roof
KDA - Knee to Dash Angle
KDL- Left Knee to Dash
KDR - Right Knee to Dash
NA - Nose to Rim Angle
NR - Nose to Rim
PA - Pelvic Angle
RA - Rim to Abdomen
SA - Seat Back Angle
SCA - Steering Column Angle
SH - Striker to H-Point
SK - Striker to Knee
ST - Striker to Head
SWA- Steering Wheel Angle
TA - Tibial Angle
WA - Windshield Angle



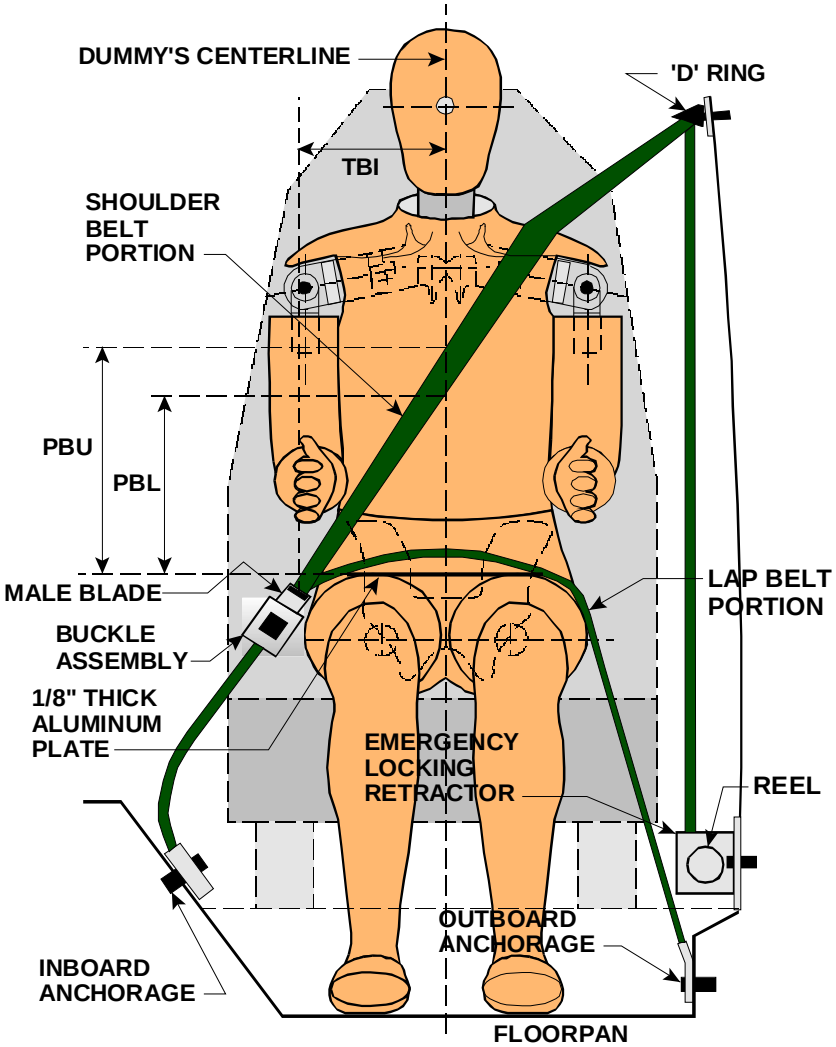
DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #064)			PASS. (Serial #061)		
WA^O	35 deg.			N/A		
SWA^O	63 deg.			N/A		
SCA^O	27 deg.			N/A		
SA^O	23 deg.			23 deg.		
HZ	238			215		
HH	422			409		
HW	661			631		
HR	245			227		
NR	407	Angle	13.5 deg.	N/A		
CD	529			524		
CS	312			N/A		
RA	208			N/A		
KDL	188	Angle (KDA)	22 deg.	150		
KDR	155			145	Angle (KDA)	30 deg.
PA^O	24.1 deg.			24.1 deg.		
TA^O	58.6 deg.			51 deg.		
KK	352			241		
AA	335			184		
ST	508	Angle	17 deg.	518	Angle	17 deg.
SK	650	Angle	98 deg.	661	Angle	98 deg.
SH	280	Angle	132 deg.	273	Angle	125 deg.
SHY	255			245		
HS	342			333		
HD	152			145		
AD	118			123		

Dimensions in millimeters

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

SEAT BELT POSITIONING DATA

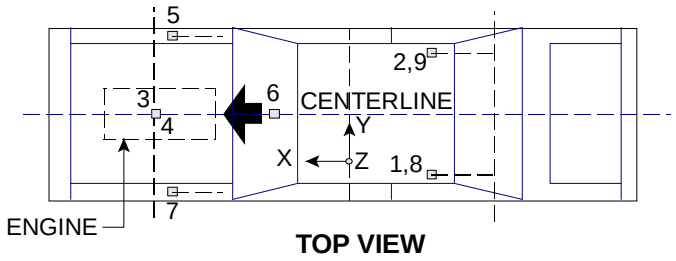


FRONT VIEW OF DUMMY

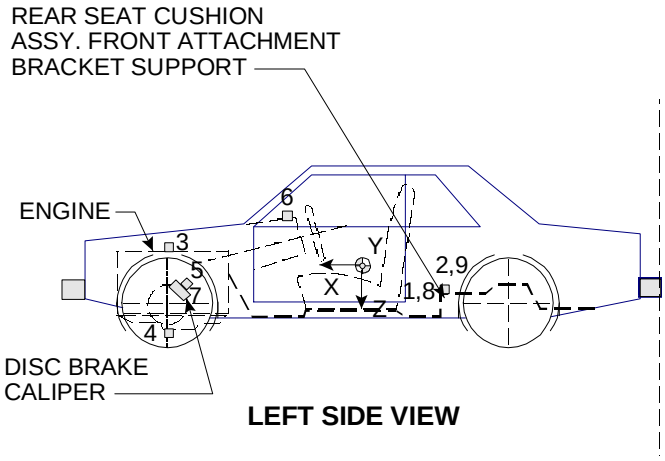
	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	350	320
PBL-- Top surface of alum. plate to belt lower edge	240	240
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

VEHICLE ACCELEROMETER LOCATIONS



TOP VIEW



LEFT SIDE VIEW

		PRE-TEST LENGTH (mm)		
No.	LOCATION	X	Y	Z
1	Left Rear Seat Cross Member X	1531	-572	359
2	Right Rear Seat Cross Member X	1528	583	351
3	Top of Engine Block	3468	82	776
4	Bottom of Engine	3116	438	173
5	Disc Brake Caliper @ Right Side	3255	627	635
6	Instrument Panel**	-	-	-
7	Disc Brake Caliper @Left Side	3232	-637	636
8	Left Rear Seat Cross Member Z	1531	-572	359
9	Right Rear Seat Cross Member Z	1528	583	351

X – From rear surface of vehicle (+ forward)
Y – From vehicle centerline (+ right)
Z – From ground plane (+ up)
** Accelerometer was not requested by the COTR

DATA SHEET NO.8
SUMMARY OF FMVSS 212 and FMVSS 219 (Partial) DATA

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

Windshield is bonded in place and covered with 20 mm molding on top, 6 mm on either side and 8 mm on bottom of windshield. In addition an 80 mm wide shroud covers the bottom of the windshield.

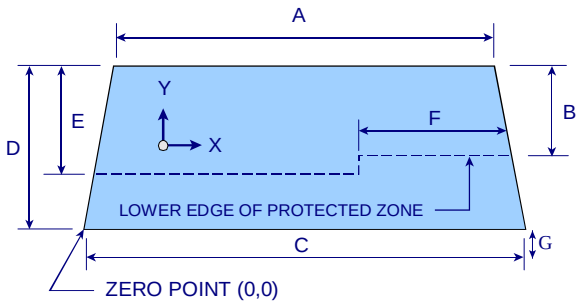
FMVSS 212 REQUIREMENTS:

The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of the windshield for vehicles equipped with automatic restraint systems for front occupants,

Temperature of windshield molding during test: 21ºC.

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2075.0	2075.0	100.0%
LEFT SIDE	2075.0	2075.0	100.0%
TOTAL	4150	4150	100.0%



FRONT VIEW OF WINDSHIELD

DIMENSIONS (mm)	
A	1228
B	570
C	1502
D	710
E	535
F	498
G	80

FAILURE DETAILS:

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

	COORDINATES	
	X	Y
1.	-	-
2.	-	-
3.	-	-
4.	-	-

DATA SHEET NO. 9
SUMMARY OF FMVSS NO. 301 DATA

NHTSA TEST No.: MA0505 TEST DATE: April 22, 2009

VEHICLE MAKE/MODEL: 2010 Kia Soul 5-Door MPV

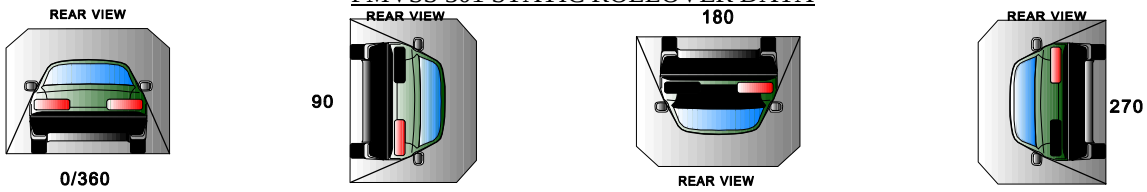
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

FUEL SPILLAGE MEASUREMENT:

Time Interval	Amount	Maximum Allowable Spillage
Impact Until Motion Ceases	0	**28 g**
First Five Minutes Following Impact	0	**142 g**
Next 25 Minutes	0	**28 g / 1 minute**

SOLVENT SPILLAGE DETAILS: None

FMVSS 301 STATIC ROLLOVER DATA



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0º - 90º	1	minutes	09	seconds	5	minutes	6	minutes	9	seconds	7	minutes
90º - 180º	1	minutes	03	seconds	5	minutes	6	minutes	3	seconds	7	minutes
180º-270º	1	minutes	01	seconds	5	minutes	6	minutes	1	seconds	7	minutes
270º-360º	1	minutes	11	seconds	5	minutes	6	minutes	11	seconds	7	minutes

II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

First 5 minutes from onset of rotation	6th min.	7th min.	8th min. (if required)
142 g	28 g	28 g	28 g

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

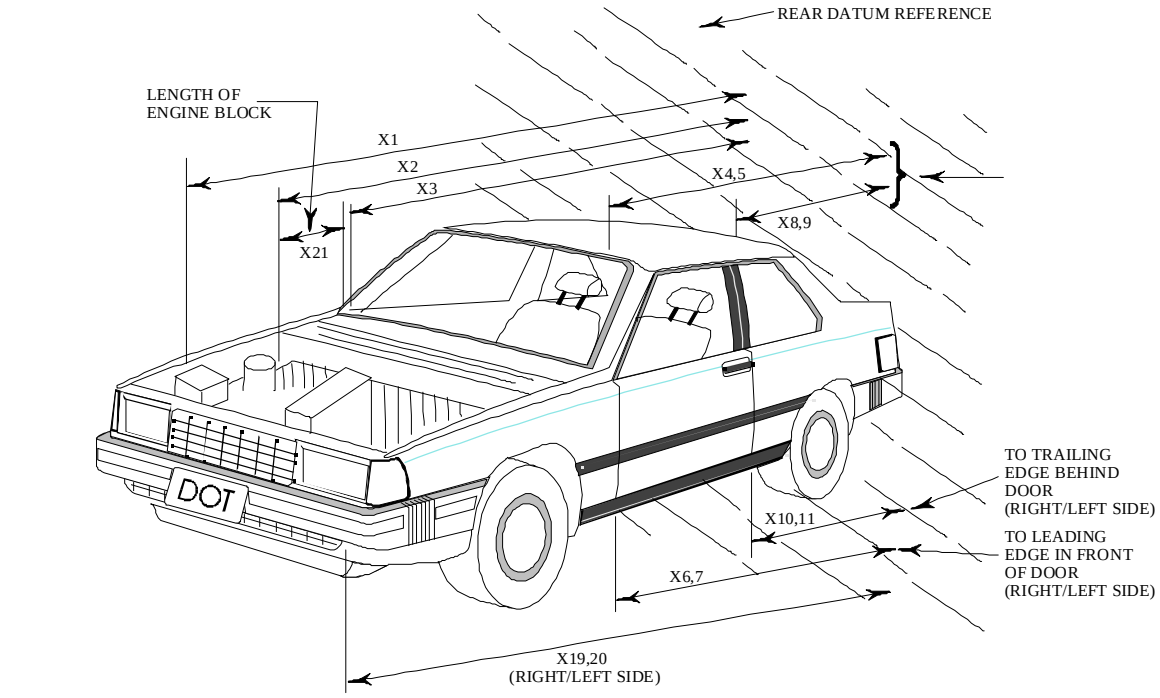
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0º - 90º	0	0	0	N/A
90º - 180º	0	0	0	N/A
180º-270º	0	0	0	N/A
270º-360º	0	0	0	N/A

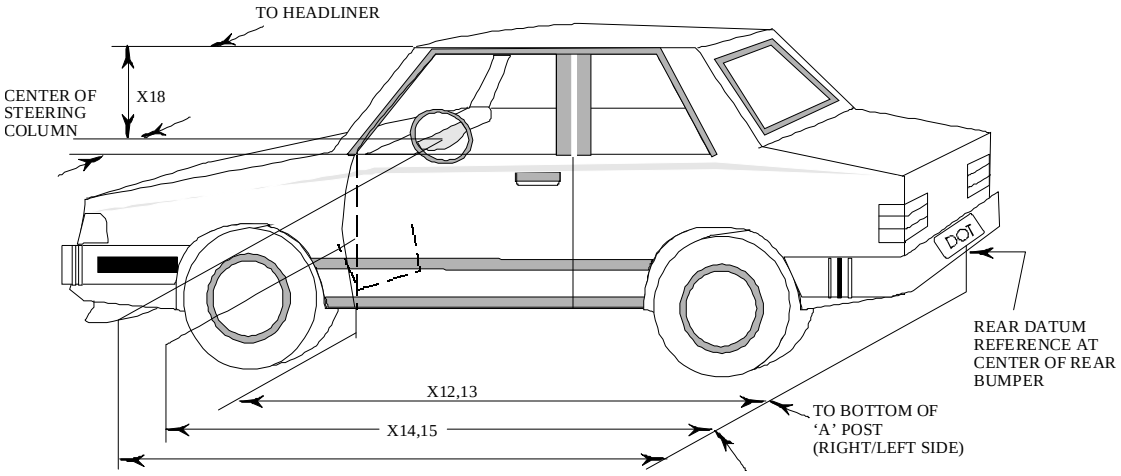
Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover Stage	Spillage Location
0º - 90º	None
90º - 180º	None
180º-270º	None
270º-360º	None

DATA SHEET NO. 10
TEST VEHICLE MEASUREMENTS





DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

NHTSA TEST No.: MA0505 TEST DATE: April 22, 2009

VEHICLE MAKE/MODEL: 2010 Kia Soul 5-Door MPV

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	4108	3677	431
X2	Rear Surface of Vehicle to Front of Engine	3685	3388	297
X3	Rear Surface of Vehicle to Firewall	3237	3196	41
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	2817	2812	5
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	2817	2816	1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	2802	2798	4
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	2798	2800	-2
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	1758	1754	4
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	1759	1758	1
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	1790	1785	5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	1790	1789	1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	2869	2864	5
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	2866	2865	1
X14	Rear Surface of Vehicle to Firewall, Right Side	3205	3105	100
X15	Rear Surface of Vehicle to Firewall, Left Side	3204	3203	1
X16	Rear Surface of Vehicle to Steering Column	2387	2434	-47
X17	Center of Steering Column to "A" Post	291	288	3
X18	Center of Steering Column to Headliner	487	483	4
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4051	3656	395
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4048	3584	464
X21	Length of Engine Block	375	375	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	2590	2579	11
CD	Rear Surface of Vehicle to Center of Dash Panel	2816	2814	2
LD	Rear Surface of Vehicle to Left Side of Dash Panel	2585	2584	1

All Dimensions in mm

DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

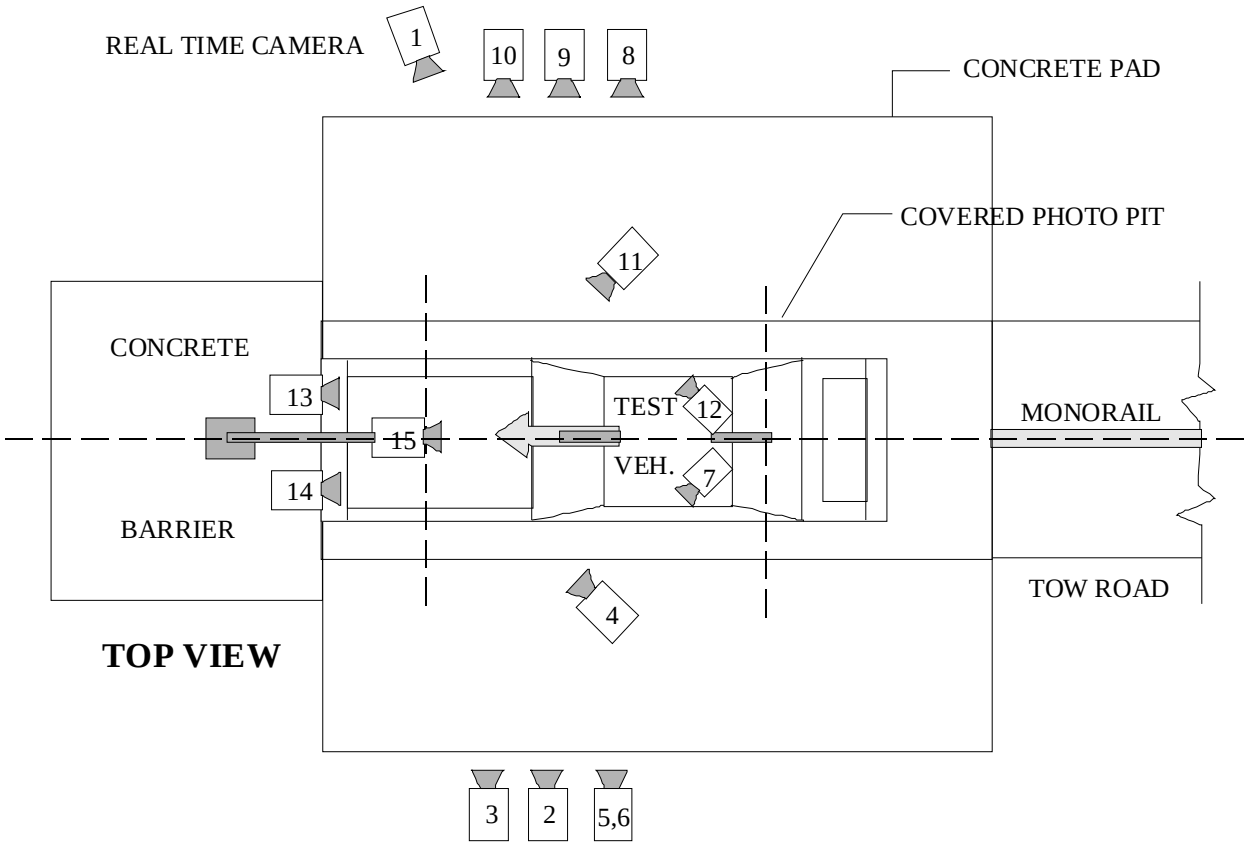
NHTSA TEST No.: MA0505 TEST DATE: April 22, 2009

VEHICLE MAKE/MODEL: 2010 Kia Soul 5-Door MPV

TARGET VEHICLE STRUCTURAL MEASUREMENTS

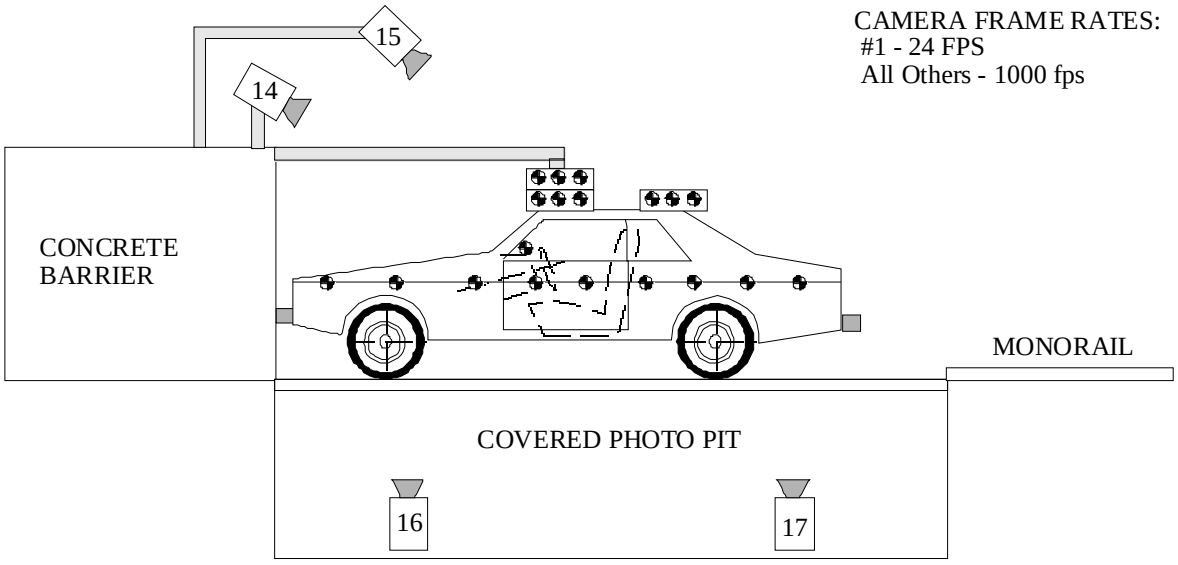
	Elements	Pre-Test (mm)
1	Total length	4108
2	Total Width	1810
3	Bumper Top Height	614
4	Bumper Bottom Height	290
5	Longitudinal Member Top Height	511
6	Distance Between Longitudinal Members	946
7	Longitudinal Member Width	65
8	Engine top height	782
9	Engine bottom height	525
10	Engine and gearbox width	406
11	Front bumper-engine distance	423
12	Front shock absorber fixing height	908
13	Bonnet leading edge height	800
14	Front shock absorber fixing width	1114
15	Front bumper – front axle distance	830
16	Front axle – A pillar distance	3278
17	A-pillar – B pillar distance	1095
18	B-pillar – rear axle distance	1026
19	B-pillar – C Pillar distance	938
20	Roof sill bottom height	1464
21	Roof sill top height	1595
22	Floor sill bottom height	324
23	Floor sill top height	423

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS



TOP VIEW

CAMERA FRAME RATES:
#1 - 24 FPS
All Others - 1000 fps



LEFT SIDE VIEW

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS (cont.)

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)* X	Y	Z	ANGLE (deg)**	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Real-Time Camera	-	-	-	-	-	-	30
2	Overall Left Side	6431	1517	964	-1.6	5968	24	1000
3	Left Side View	9020	744	909	-1.1	8557	50	1000
4	Driver and Interior View	6794	2756	2061	-10.1	-	50	1000
5	Steering Column (Bottom)	7421	1837	1215	-3.1	6958	28-70	1000
6	Steering Column (Top)	7421	1837	1804	-9.1	6958	24-70	1000
7	Left CRS Lateral View	-	-	-	-	-	-	-
8	Overall Right Side	6920	1769	931	-1.9	6457	28-70	1000
9	Right Side View	9146	1046	957	-1.4	8683	50	1000
10	Right Passenger View	8061	1526	1144	-2.0	7598	50	1000
11	Passenger and Interior View	6937	2351	2035	-7.5	-	50	1000
12	Right CRS Lateral View	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-34.6	-	24	500
14	Driver Front View	620	-92	1987	-32.6	-	24	500
15	Windshield View	0	-530	3374	-54.2	-	25	500
16	Pit View of Engine	0	615	-3048	90	-	13	500
17	Pit View of Fuel Tank	0	2450	-3048	90	-	13	500

*X = film plane to monorail centerline ** = referenced to horizontal plane

Y = film plane to impact location N.T. indicates No Timing

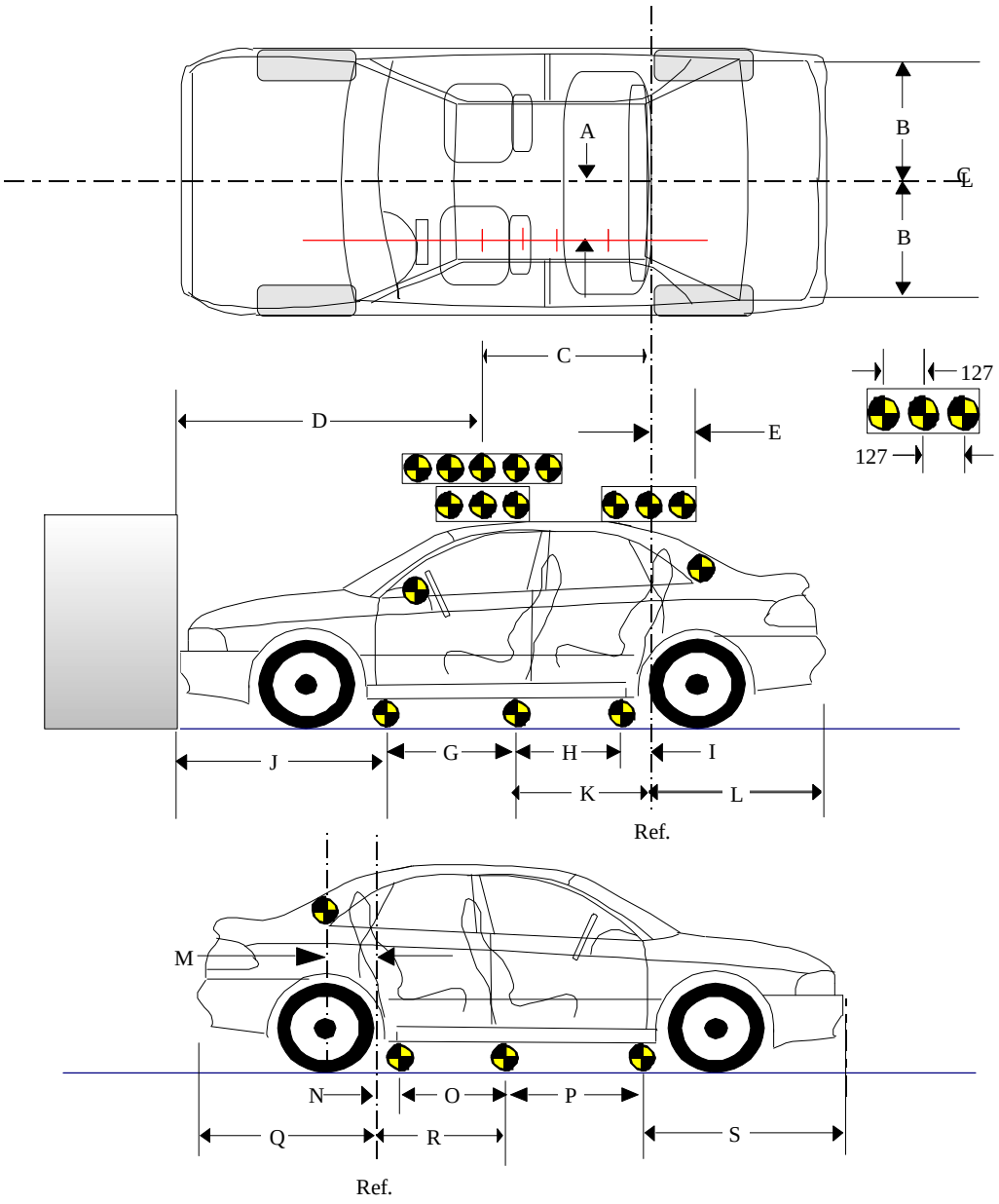
Z = film plane to ground

DATA SHEET NO. 12
VEHICLE REFERENCE PHOTO TARGET LOCATIONS

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

(Dimensions in millimeters)

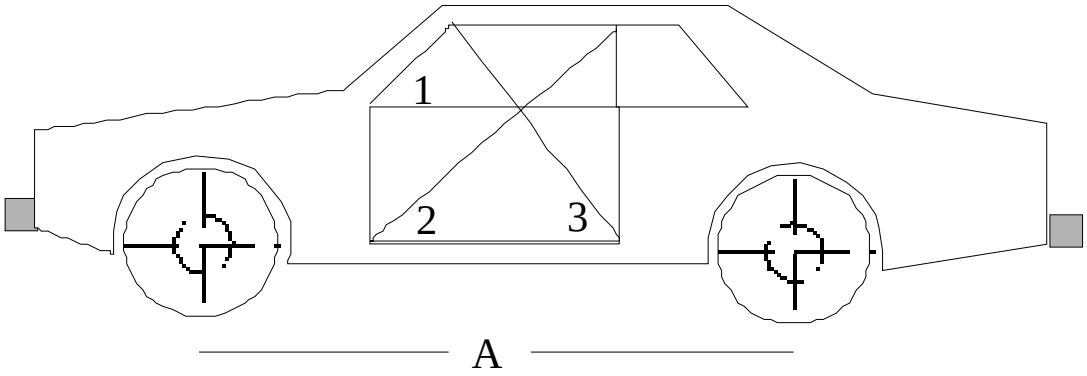
A	387
B	536
C	681
D	2371
E	431
F	1500
G	839
H	839
I	117
J	1268
K	956
L	1045
M	430
N	113
O	839
P	845
Q	1046
R	952
S	1265



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

DOOR OPENING WIDTH AND WHEELBASE MEASUREMENTS



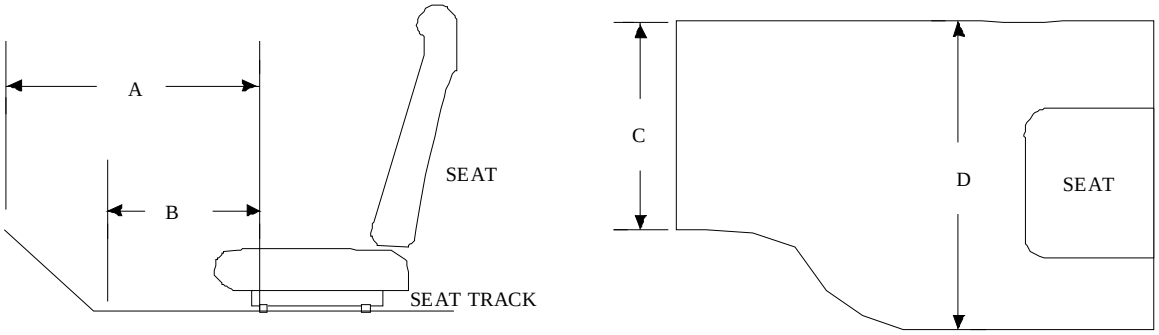
UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	938	1442	1085	939	1442	1083
AFTER TEST	937	1443	1087	936	1443	1085
DIFFERENCE	1	-1	-2	3	-1	-2

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2550	2550
AFTER TEST	2535	2499
DIFFERENCE	15	51

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont)

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

STATIC FOOTWELL DEFORMATION



DRIVER

Measurement	Pre-Test	Post-Test	Difference
A	723	691	32
B	500	493	7
C	470	463	7
D	471	466	5

PASSENGER

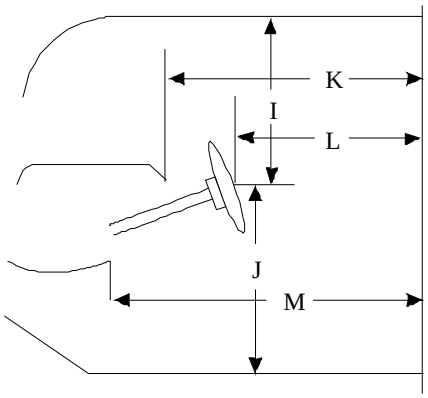
Measurement	Pre-Test	Post-Test	Difference
A	730	636	94
B	519	499	20
C	474	462	12
D	482	480	2

Units = mm

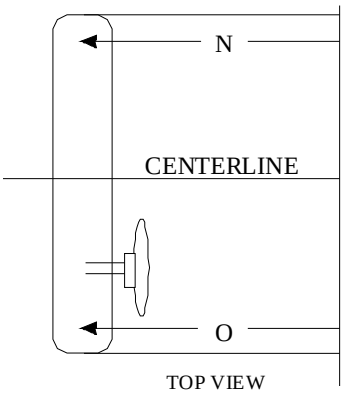
DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

STATIC PASSENGER COMPARTMENT INTRUSION

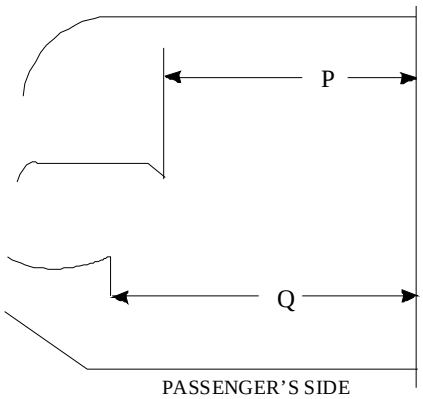


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



PASSENGER'S SIDE

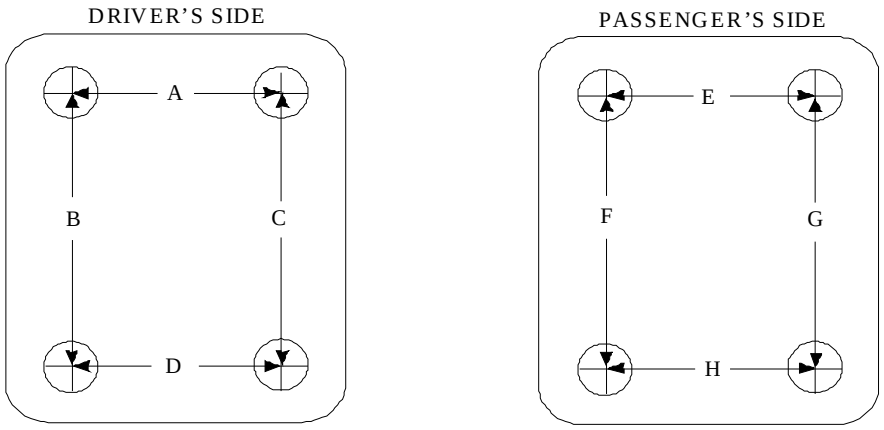
Measurement	Pre-Test	Post-Test	Difference
I	487	483	4
J	672	680	-8
K	761	762	-1
L	555	604	-49
M	796	789	7
N	760	750	10
O	754	754	0
P = K (PASS.)	872	867	5
Q = M (PASS.)	821	804	17

Units = mm

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV

FLOORBOARD DEFORMATION



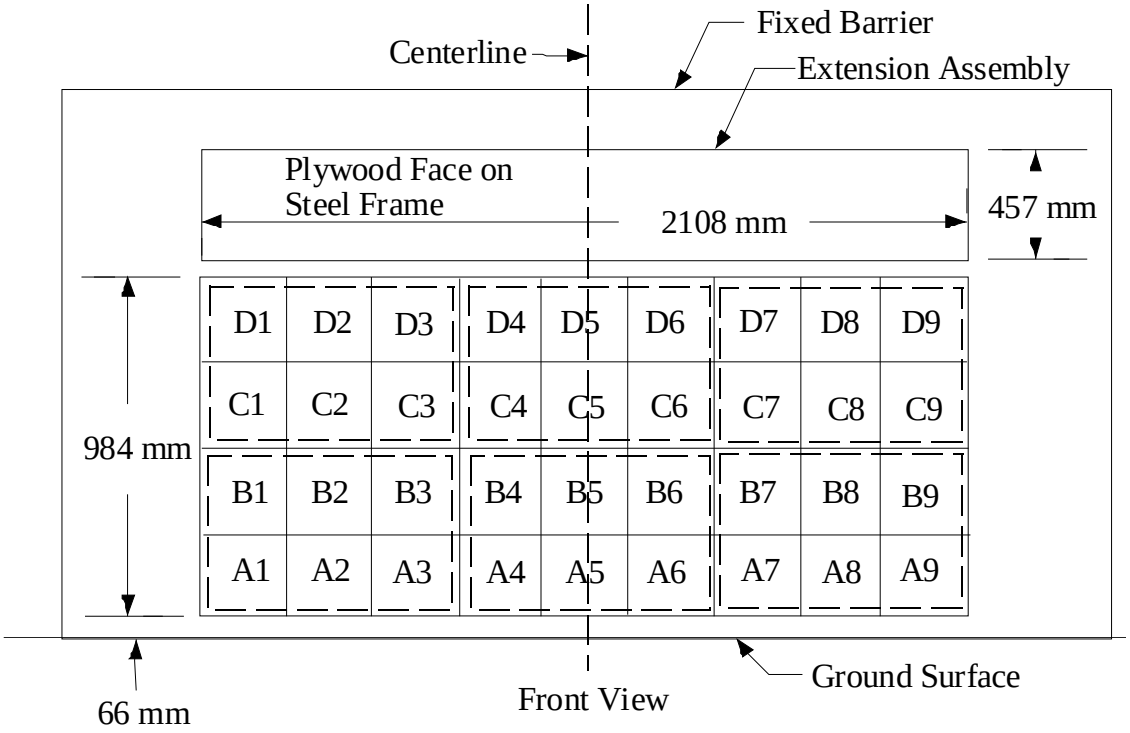
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	470	463	7
B	281	285	-4
C	308	303	5
D	471	466	5
E	474	462	12
F	342	340	2
G	321	316	5
H	482	480	2

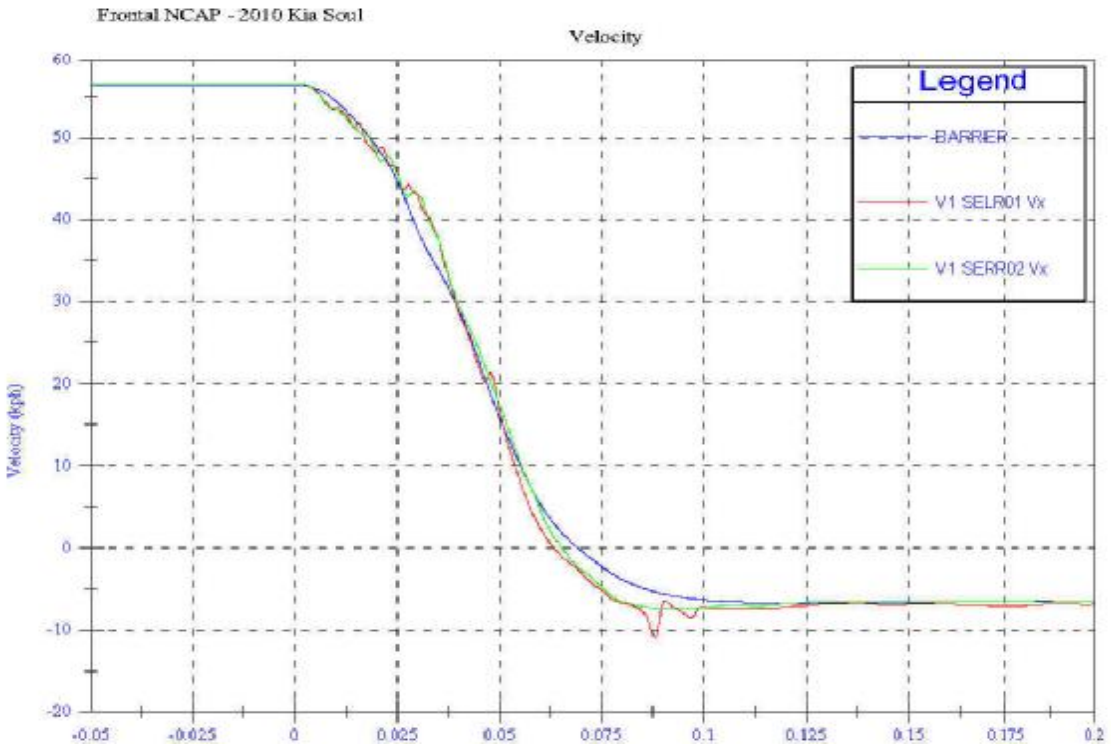
Units = mm

DATA SHEET NO.14
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells
4 Rows
9 Columns



Momentum Plot



DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Kia Soul 5-Door MPV

NHTSA Test No.: MA0505 VIN: KNDJT2A16A7030594

Model Year: 2010 Build Date: 1/09 Test Date: April 22, 2009

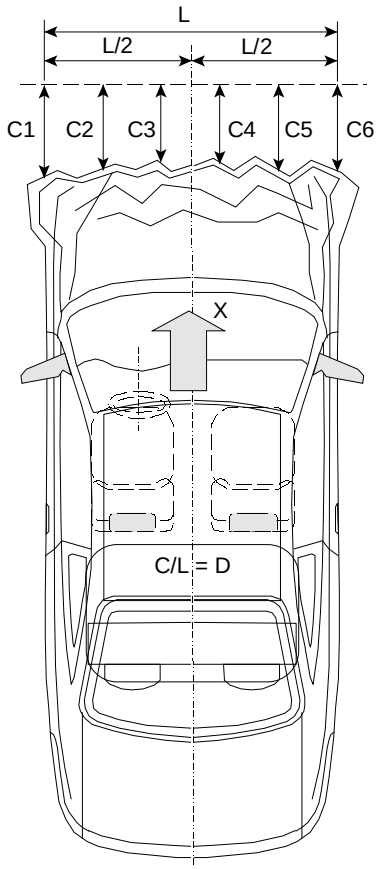
Vehicle Size Category: _____ Test Weight: 1389.5 kg

Vehicle Wheelbase: 2550 mm; Front Overhang: 830 mm; Overall Width: 1810 mm

Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	3934	3602	332
C2 =	4072	3610	462
C3 =	4105	3674	431
C4 =	4104	3681	423
C5 =	4071	3670	401
C6 =	3933	3629	304



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

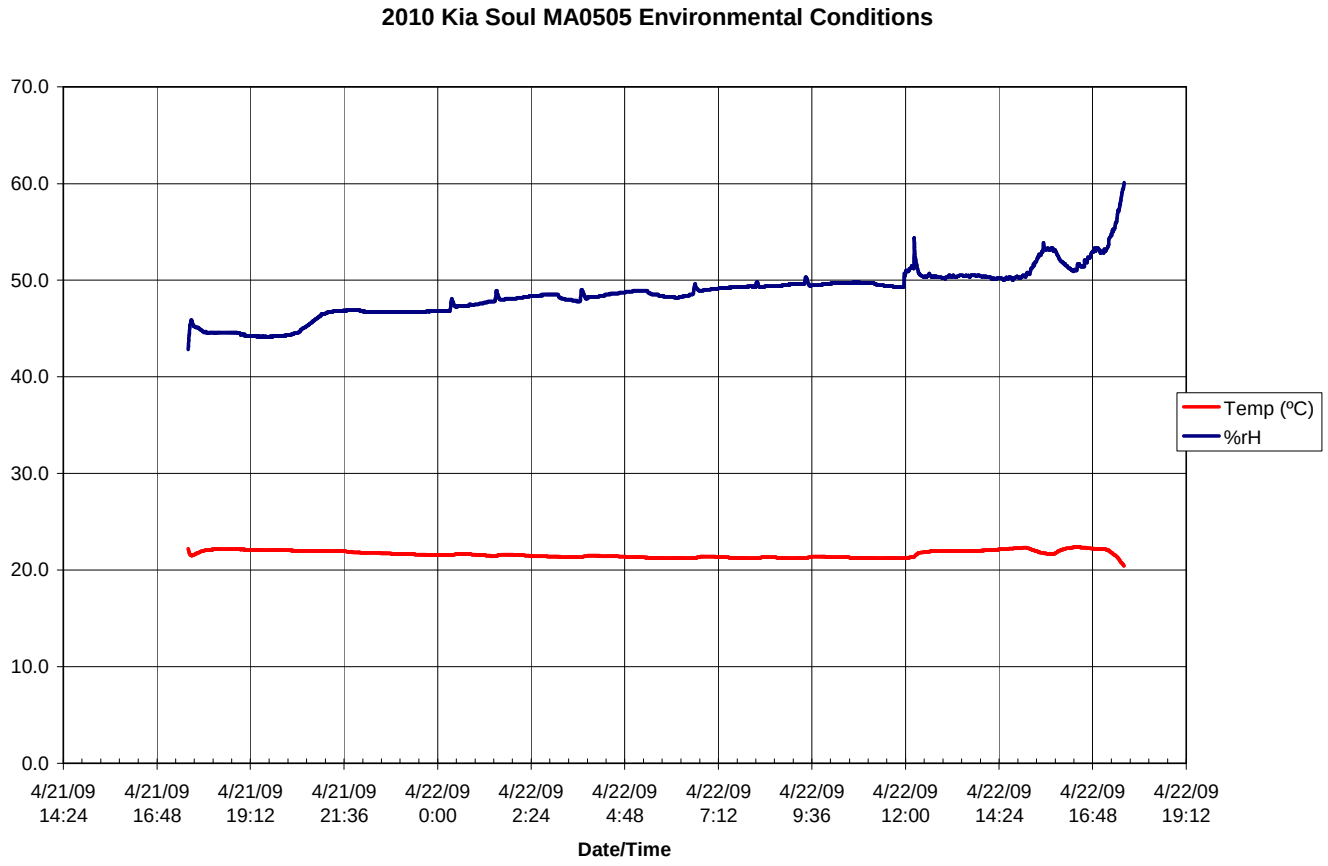
Length of Damaged Region: L1= 1163 mm

L2= 581.5 mm

L5= 232.6 mm

DATA SHEET NO.16
VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART

NHTSA Test No.: MA0505 Vehicle: 2010 Kia Soul 5-Door MPV



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

Figure A-1: Load Cell Locations

Figure A-2: Vehicle Certification Placard

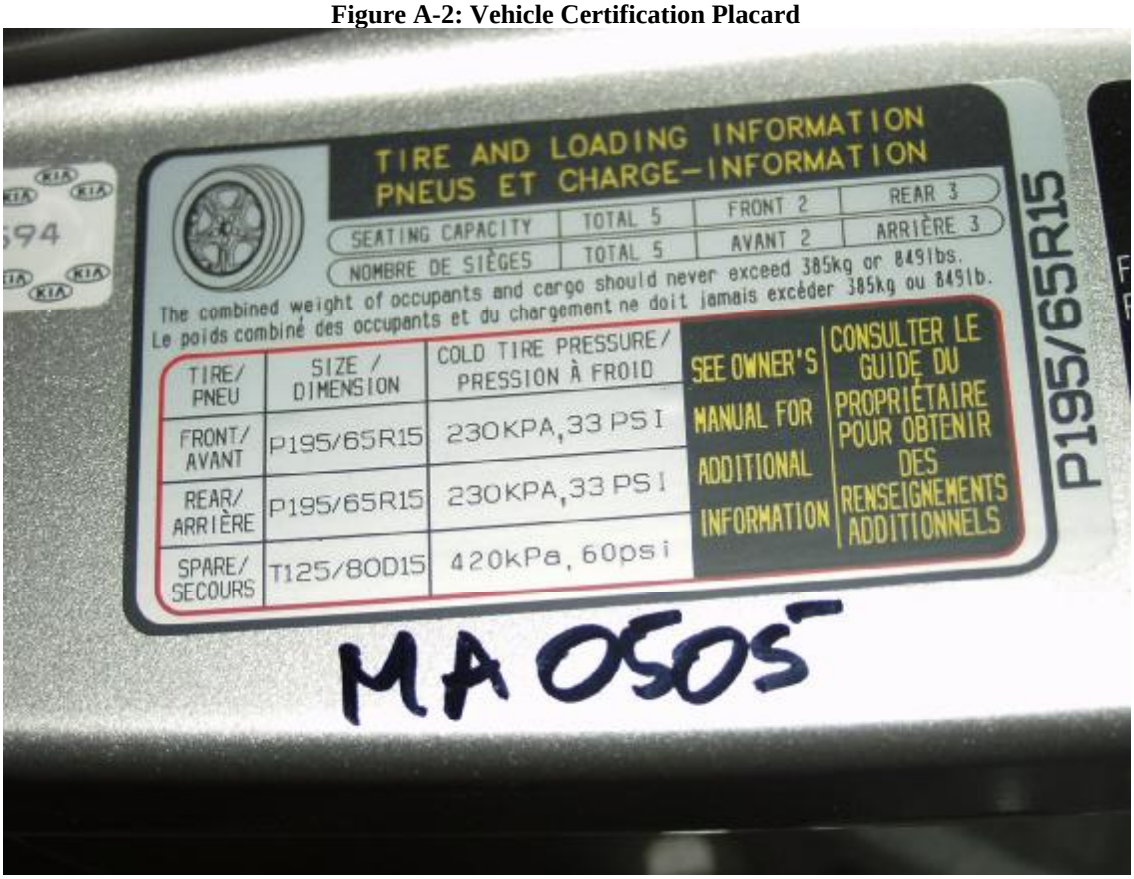


Figure A-3: Vehicle Tire Placard

Figure A-4: Right Front, As Received

Figure A-5: Left Rear, As Received

Figure A-6: Pre-Test Front View

Figure A-7: Post-Test Front View

Figure A-8: Pre-Test Left Side View

Figure A-9: Post-Test Left Side View

Figure A-10: Pre-Test Right Side View

Figure A-11: Post-Test Right Side View

Figure A-12: Pre-Test Right Front Three-Quarter View

Figure A-13: Post-Test Right Front Three-Quarter View

Figure A-14: Pre-Test Left Rear Three-Quarter View

Figure A-15: Post-Test Left Rear Three-Quarter View

Figure A-16: Left Rear Three-Quarter View of Doors After Impact

Figure A-17: Right Rear Three-Quarter View of Doors After Impact

Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

Figure A-20: Pre-Test Engine Compartment View

Figure A-21: Post-Test Engine Compartment View

Figure A-22: Pre-Test Fuel Cap View

Figure A-23: Post-Test Fuel Cap View

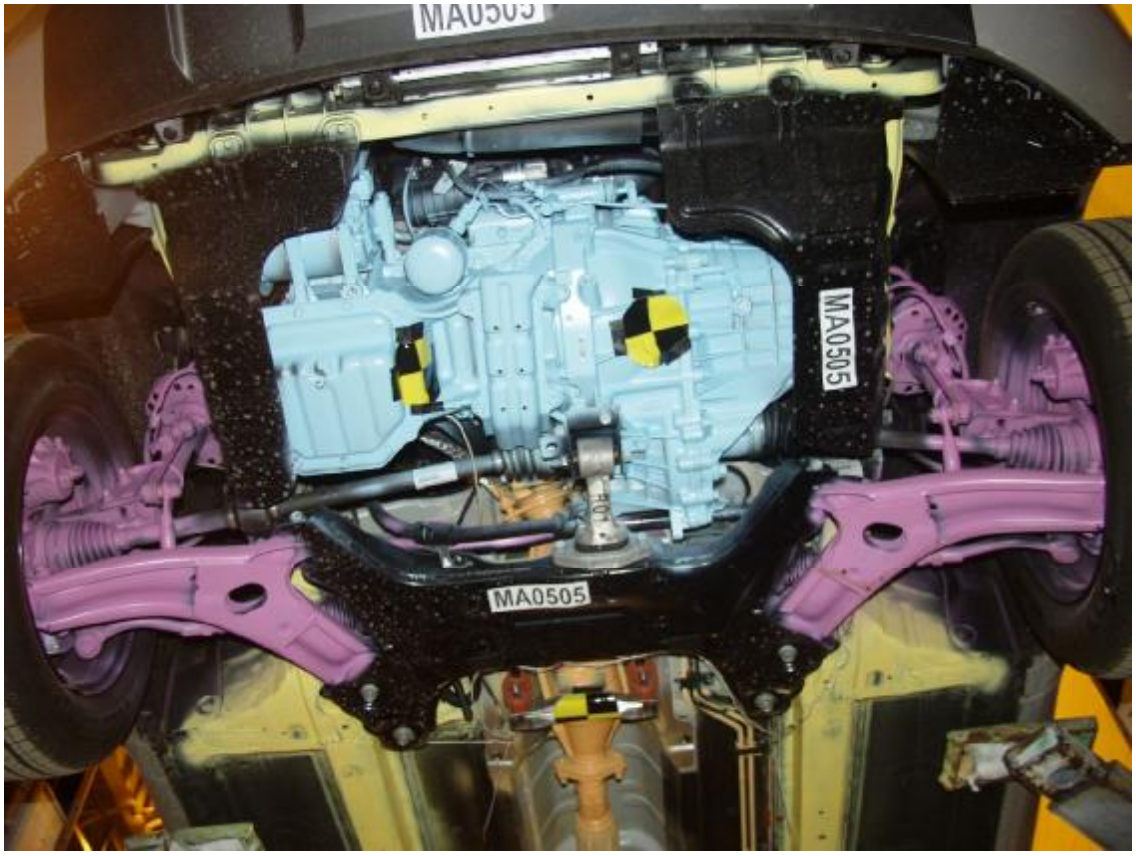


Figure A-24: Pre-Test Front Underbody View

Figure A-25: Post-Test Front Underbody View

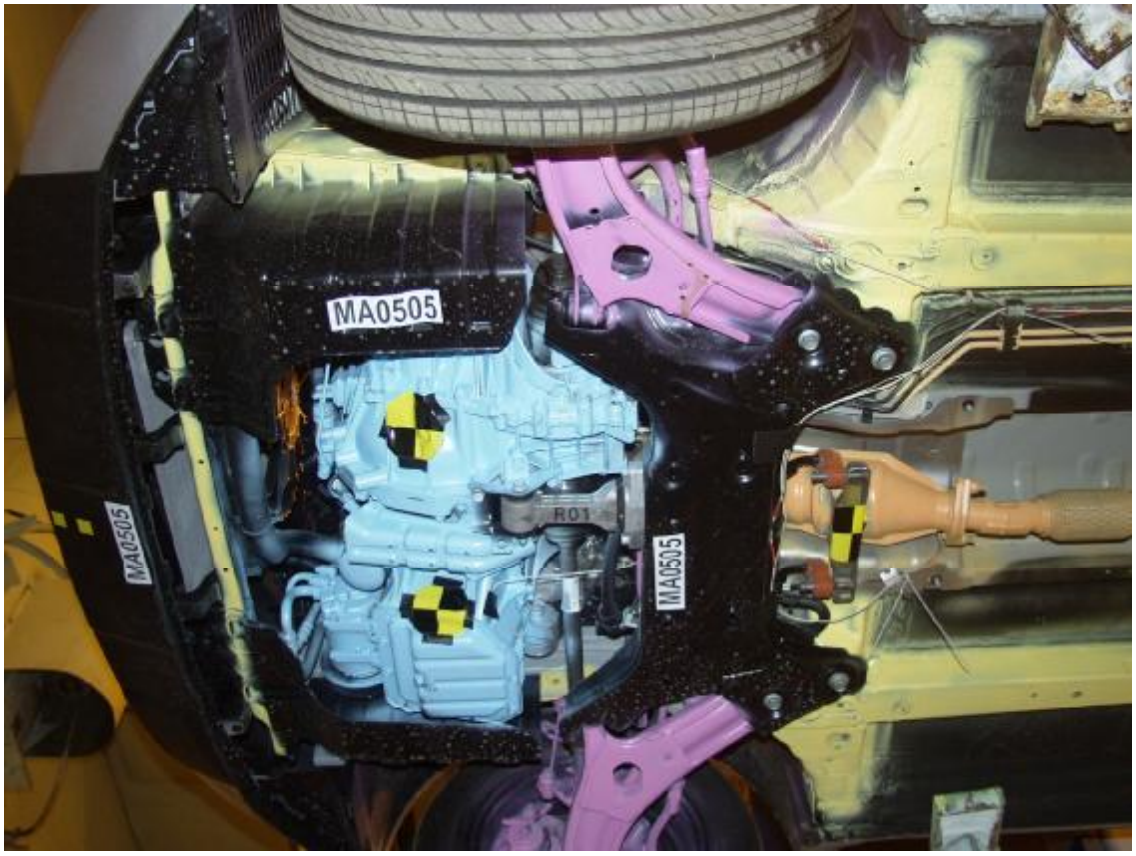


Figure A-26: Pre-Test Mid Underbody View

Figure A-27: Post-Test Mid Underbody View

Figure A-28: Pre-Test Rear Underbody View

Figure A-29: Post-Test Rear Underbody View

Figure A-30: Pre-Test Driver Head Location

Figure A-31: Post-Test Driver Head Location

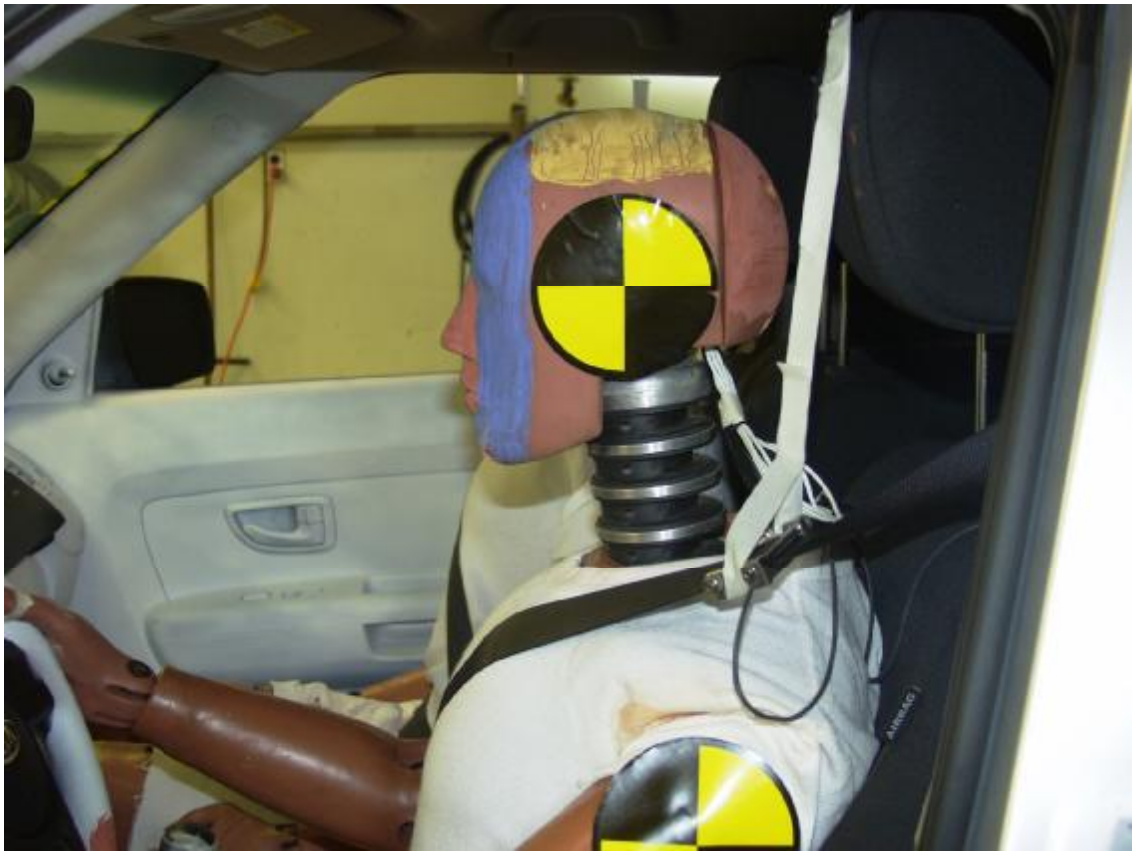


Figure A-32: Pre-Test Driver Position View

Figure A-33: Post-Test Driver Position View

Figure A-34: Pre-Test Driver and Interior View

Figure A-35: Post-Test Driver and Interior View

Figure A-36: Pre-Test Driver Feet View

Figure A-37: Post-Test Driver Feet View

Figure A-38: Pre-Test Driver Knee Bolster View

Figure A-39: Post-Test Driver Knee Bolster View

Figure A-40: Pre-Test Driver Floor Pan View

Figure A-41: Post-Test Driver Floor Pan View

Figure A-42: Post-Test Driver Head View

Figure A-43: Post-Test Driver Contact to Airbag

Figure A-44: Pre-Test Passenger Head Location

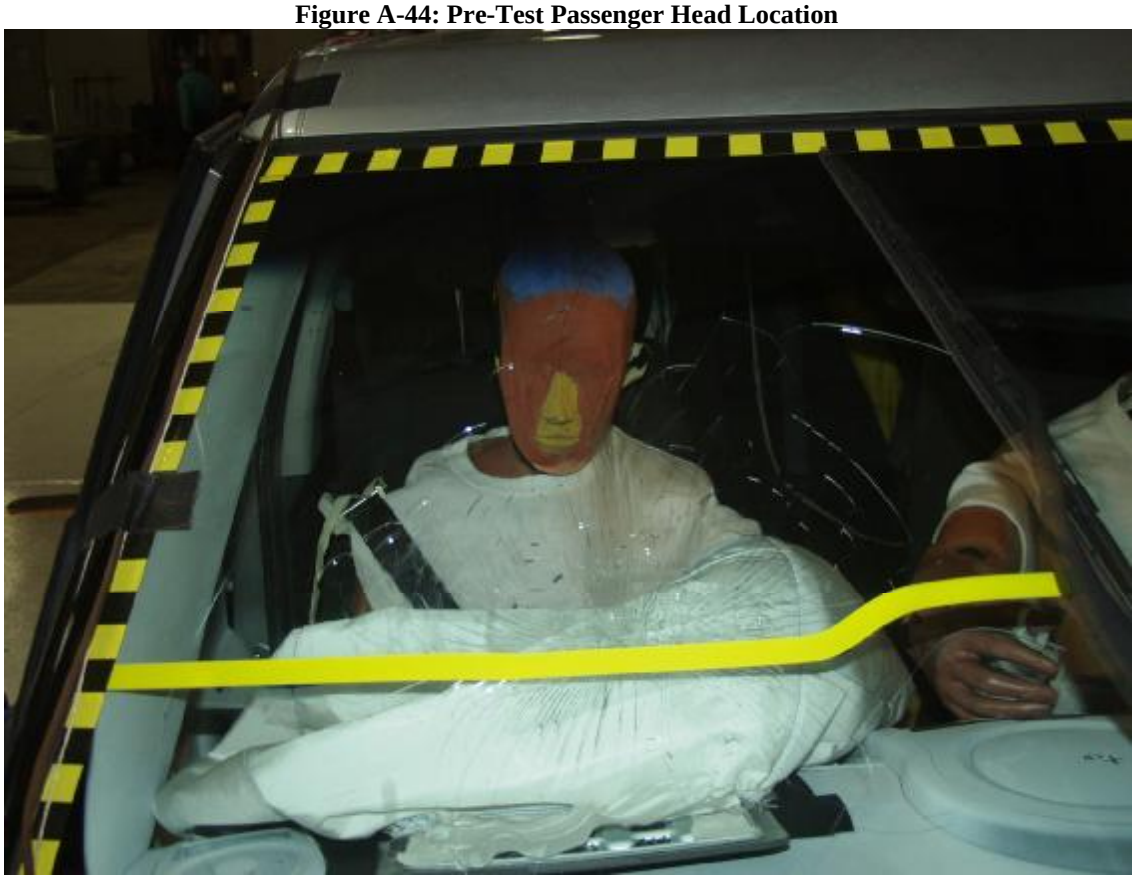


Figure A-45: Post-Test Passenger Head Location

Figure A-46: Pre-Test Passenger Position View

Figure A-47: Post-Test Passenger Position View

Figure A-48: Pre-Test Passenger and Interior View

Figure A-49: Post-Test Passenger and Interior View

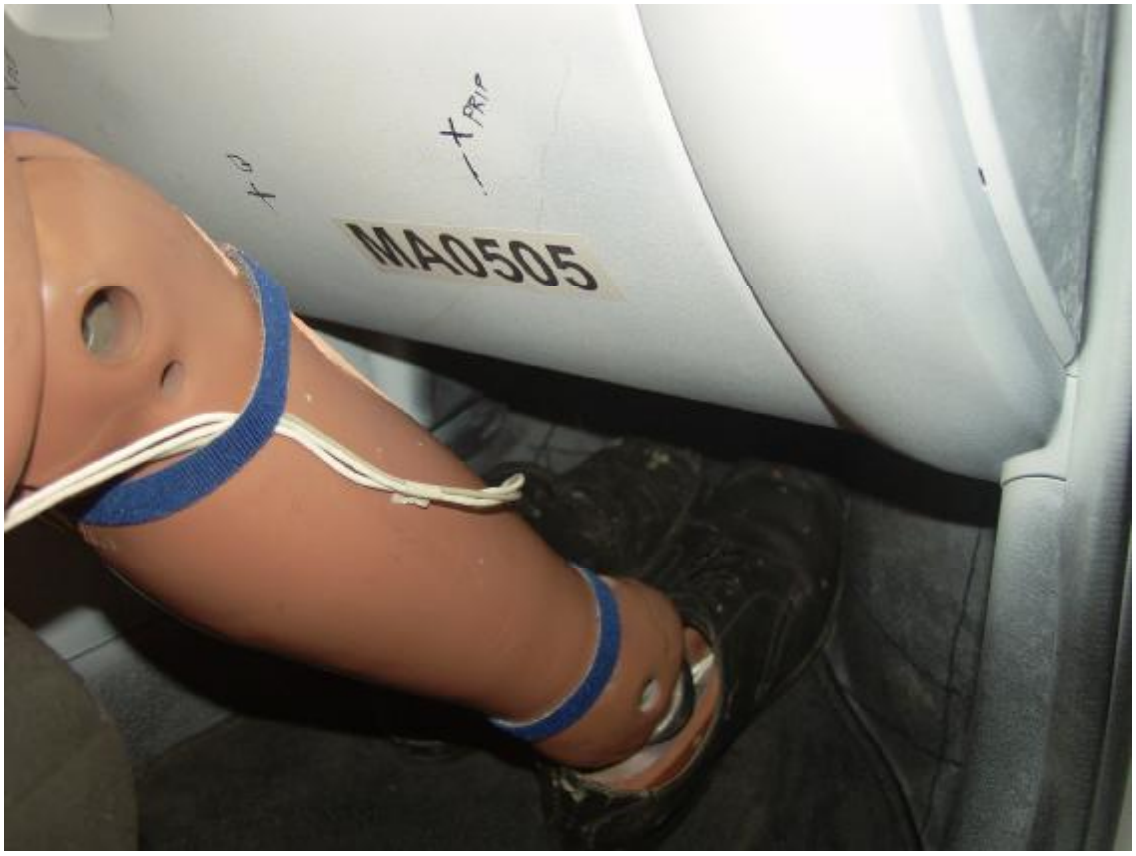


Figure A-50: Pre-Test Passenger Feet View

Figure A-51: Post-Test Passenger Feet View

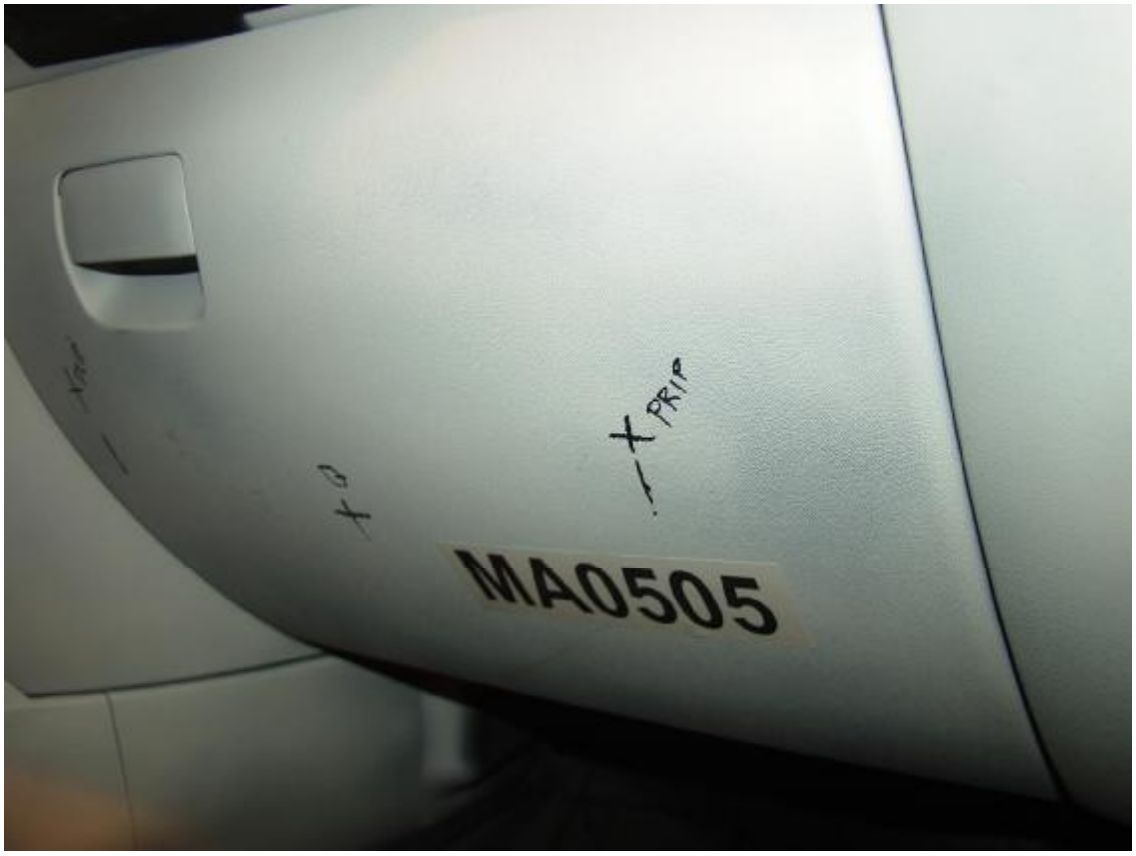


Figure A-52: Pre-Test Passenger Knee Bolster View

Figure A-53: Post-Test Passenger Knee Bolster View

Figure A-54: Pre-Test Passenger Floor Pan View

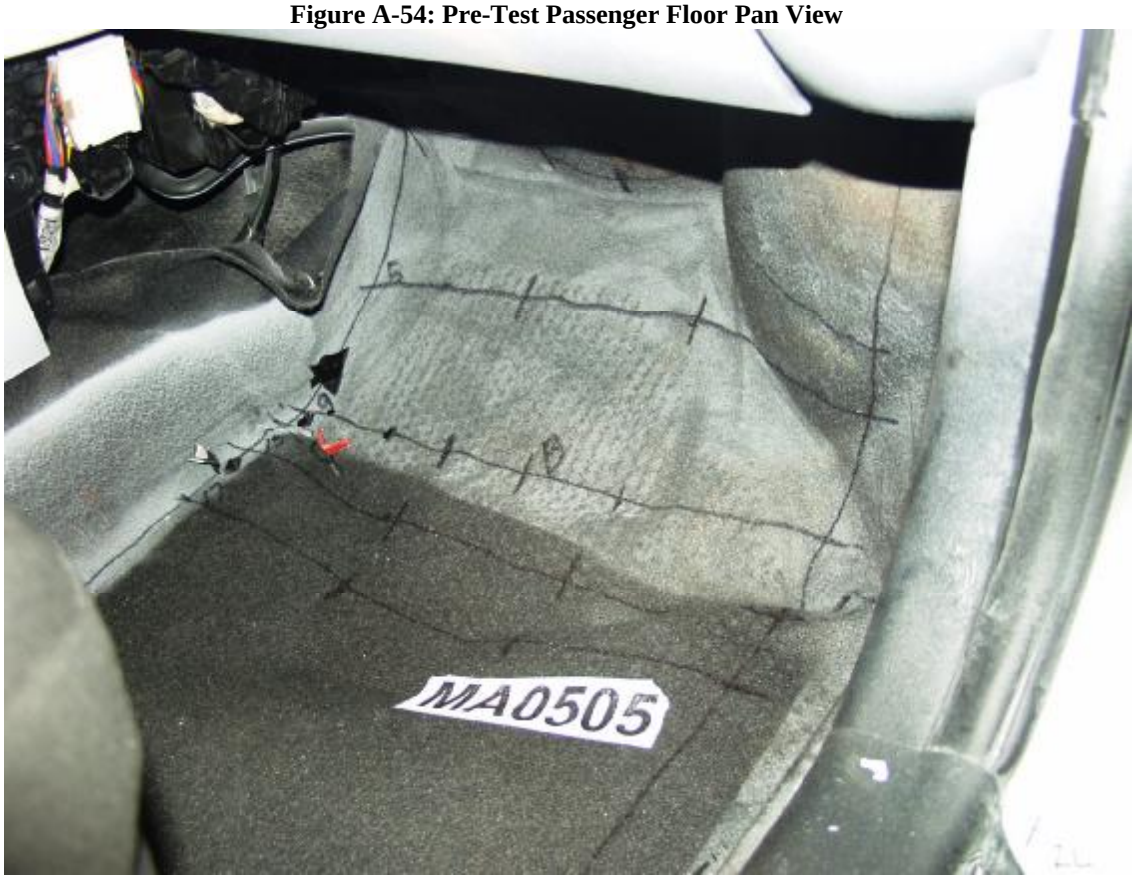


Figure A-55: Post-Test Passenger Floor Pan View

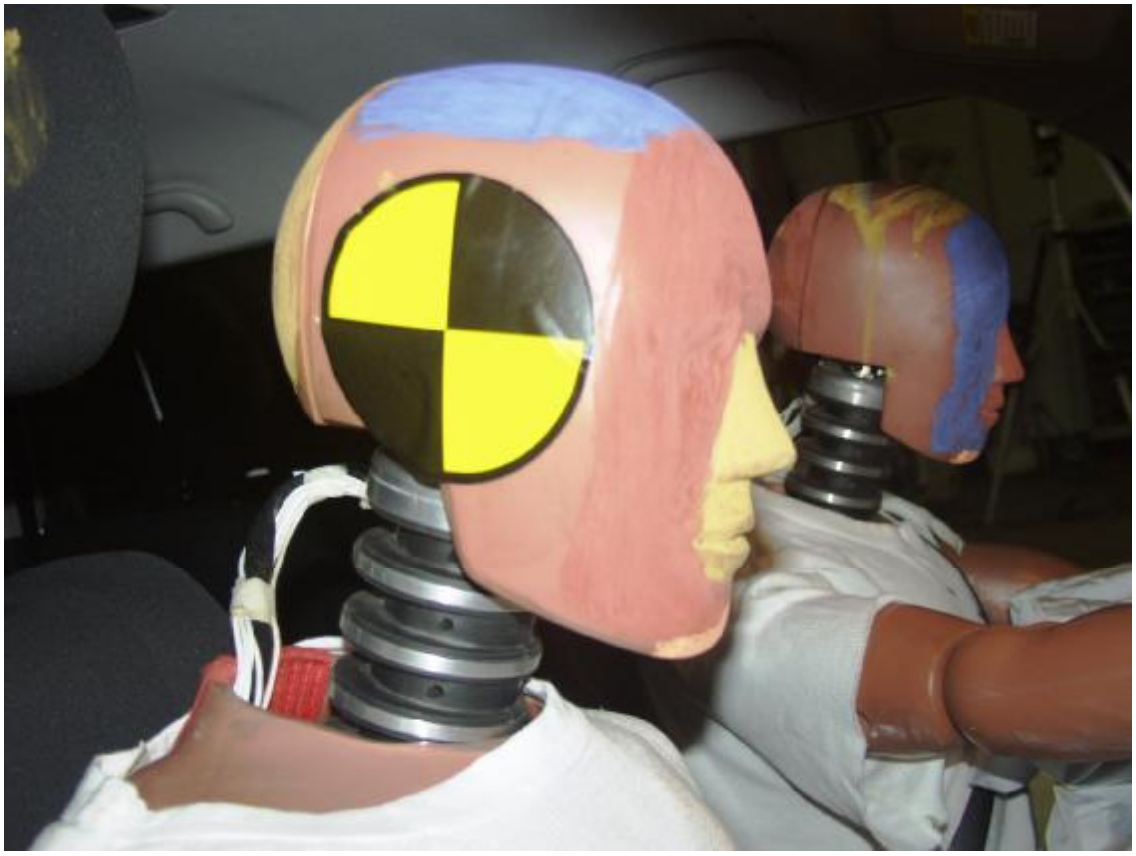


Figure A-56: Post-Test Passenger Head View

Figure A-57: Post-Test Passenger Contact to Airbag

Figure A-58: Rollover View - 90°

Figure A-59: Rollover View - 180°

Figure A-60: Rollover View - 270°

Figure A-61: Rollover View - 360°

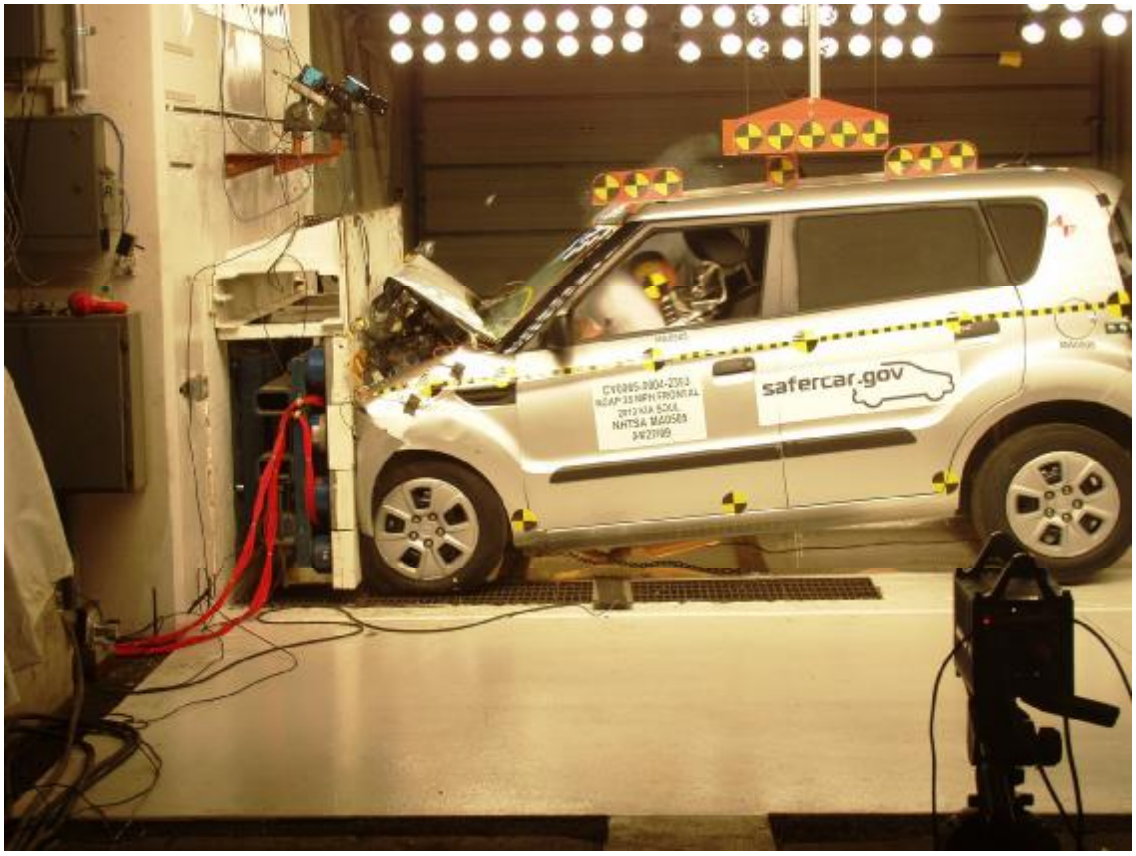


Figure A-62: Impact View

APPENDIX B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers

Transducer	**SAE Sign Convention (positive unless noted)**
Upper Neck Load Cell	Fx Head rearward Fy Head left Fz Neck in tension Mx Left ear to left shoulder My Chin to chest (flexion) Mz Chin to left shoulder (look left)
Chest Displacement Potentiometer	Compression is negative
Pelvic Load Cell (Lower Lumbar)	Fx Chest rearward Fy Chest left Fz Spine in tension
Femur Load Cell	Compression is negative
Upper Tibia Load Cell (right and left leg)	Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center
Lower Tibia Load Cell (right and left leg)	Fz Tibia in tension Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center

DATA CHANNEL FILTER CLASS SUMMARY

NHTSA TEST NO.: MA0505

DATA TYPE	**SAE FILTER CLASS (Hz)**
Dummy Head Accelerations	1000
Dummy Chest Accelerations	180
Dummy Chest Displacements	600
Dummy Femur Forces	600
Dummy Belt Loads	60
Dummy Belt Displacements	180
Dummy Neck Forces	1000
Dummy Neck Moments	600
Vehicle Accelerations	60
Vehicle Velocity Integrations	180
Vehicle Displacement Integrations	180
Load Cell Barrier Forces	60

Table of Data Plots

The following dummy, vehicle and load cell response data can be found in the research and development section of the NHTSA website at: www.nhtsa.dot.gov

V1P1 Head CG Ax	
V1P1 Head CG Ay	
V1P1 Head CG Az	
V1P1 Head CG Red Ax	
V1P1 Head CG Red Ay	
V1P1 Head CG Red Az	
V1P1 Upper Neck Fx	
V1P1 Upper Neck Fy	
V1P1 Upper Neck Fz	
V1P1 Upper Neck Mx	
V1P1 Upper Neck My	
V1P1 Upper Neck Mz	
V1P1 Chest Ax	
V1P1 Chest Ay	
V1P1 Chest Az	
V1P1 Chest Red Ax	
V1P1 Chest Red Ay	
V1P1 Chest Red Az	
V1P1 Chest Compression	
V1P1 Pelvic Ax	
V1P1 Pelvic Ay	
V1P1 Pelvic Az	
V1P1 Left Femur Fz	
V1P1 Right Femur Fz	
V1P1 Left Upper Tibia Mx	
V1P1 Left Upper Tibia My	
V1P1 Left Lower Tibia Fz	
V1P1 Left Lower Tibia Mx	
V1P1 Left Lower Tibia My	
V1P1 Right Upper Tibia Fz	
V1P1 Right Upper Tibia Mx	
V1P1 Right Upper Tibia My	
V1P1 Right Lower Tibia Mx	
V1P1 Right Lower Tibia My	
V1P1 Left Foot Aft Ax	
V1P1 Left Foot Aft Az	
V1P1 Left Foot Fore Az	
V1P1 Right Foot Aft Ax	
V1P1 Right Foot Aft Az	
V1P1 Right Foot Fore z	
V1P1 Lap Belt Load	
V1P1 Shoulder Belt Load	

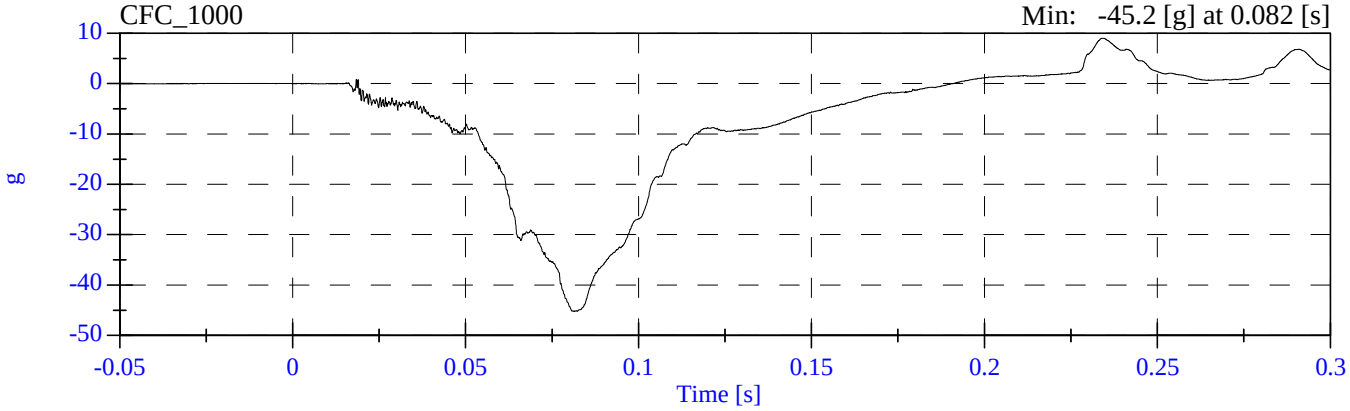
V1P2 Head CG Ax	V1 Left Rear #1x
V1P2 Head CG Ay	V1 Right Rear #2x
V1P2 Head CG Az	V1 Engine Top #3x
V1P2 Head CG Red Ax	V1 Engine Bottom #4x
V1P2 Head CG Red Ay	V1 Right Caliper #5x
V1P2 Head CG Red Az	V1 Left Caliper #7x
V1P2 Upper Neck Fx	V1 Left Rear #8z
V1P2 Upper Neck Fy	V1 Right Rear #9z
V1P2 Upper Neck Fz	
V1P2 Upper Neck Mx	
V1P2 Upper Neck My	
V1P2 Upper Neck Mz	
V1P2 Chest Ax	
V1P2 Chest Ay	
V1P2 Chest Az	
V1P2 Chest Red Ax	
V1P2 Chest Red Ay	
V1P2 Chest Red Az	
V1P2 Chest Compression	
V1P2 Pelvic Ax	
V1P2 Pelvic Ay	
V1P2 Pelvic Az	
V1P2 Left Femur Fz	
V1P2 Right Femur Fz	
V1P2 Left Upper Tibia Fz	
V1P2 Left Upper Tibia Mx	
V1P2 Left Upper Tibia My	
V1P2 Left Lower Tibia Mx	
V1P2 Left Lower Tibia My	
V1P2 Right Upper Tibia Mx	
V1P2 Right Upper Tibia My	
V1P2 Right Lower Tibia Fz	
V1P2 Right Lower Tibia Mx	
V1P2 Right Lower Tibia My	
V1P2 Left Foot Aft Ax	
V1P2 Left Foot Aft Az	
V1P2 Left Foot Fore Az	
V1P2 Right Foot Aft Ax	
V1P2 Right Foot Aft Az	
V1P2 Right Foot Fore Az	
V1P2 Lap Belt Load	
V1P2 Shoulder Belt Load	

Barrier Load Cell A1 Fx	Barrier Load Cell D6 Fx
Barrier Load Cell A2 Fx	Barrier Load Cell D7 Fx
Barrier Load Cell A3 Fx	Barrier Load Cell D8 Fx
Barrier Load Cell A4 Fx	Barrier Load Cell D9 Fx
Barrier Load Cell A5 Fx	
Barrier Load Cell A6 Fx	
Barrier Load Cell A7 Fx	
Barrier Load Cell A8 Fx	
Barrier Load Cell A9 Fx	
Barrier Load Cell B1 Fx	
Barrier Load Cell B2 Fx	
Barrier Load Cell B3 Fx	
Barrier Load Cell B4 Fx	
Barrier Load Cell B5 Fx	
Barrier Load Cell B6 Fx	
Barrier Load Cell B7 Fx	
Barrier Load Cell B8 Fx	
Barrier Load Cell B9 Fx	
Barrier Load Cell C1 Fx	
Barrier Load Cell C2 Fx	
Barrier Load Cell C3 Fx	
Barrier Load Cell C4 Fx	
Barrier Load Cell C5 Fx	
Barrier Load Cell C6 Fx	
Barrier Load Cell C7 Fx	
Barrier Load Cell C8 Fx	
Barrier Load Cell C9 Fx	
Barrier Load Cell D1 Fx	
Barrier Load Cell D2 Fx	
Barrier Load Cell D3 Fx	
Barrier Load Cell D4 Fx	
Barrier Load Cell D5 Fx	

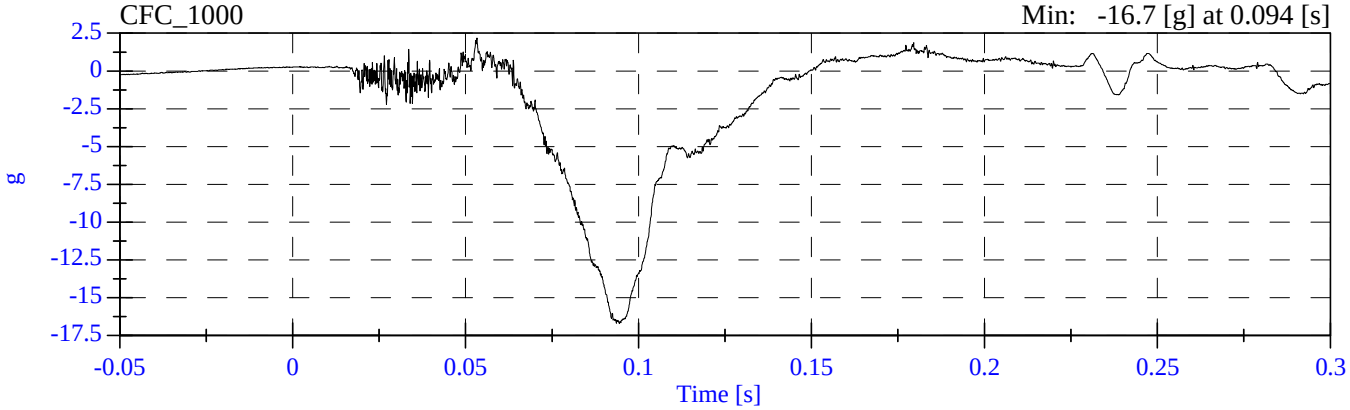
TEST NOTES	
Data Channel	Anomalies
V1P2 Upper Neck Mx	Connector separated from transducer – Transducer data invalid
V1P2 Upper Neck My	Connector separated from transducer – Transducer data invalid
V1P2 Upper Neck Mz	Connector separated from transducer – Transducer data invalid
V1P2 Chest Red z	Questionable Data after 5 msec

Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

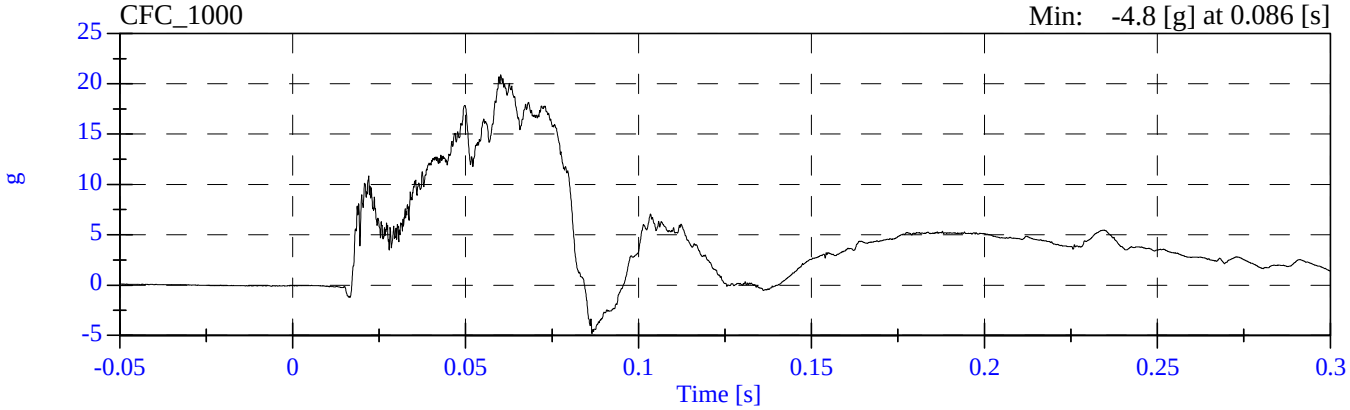
V1P1 Head CG x
CFC_1000
Max: 9.0 [g] at 0.234 [s]
Min: -45.2 [g] at 0.082 [s]



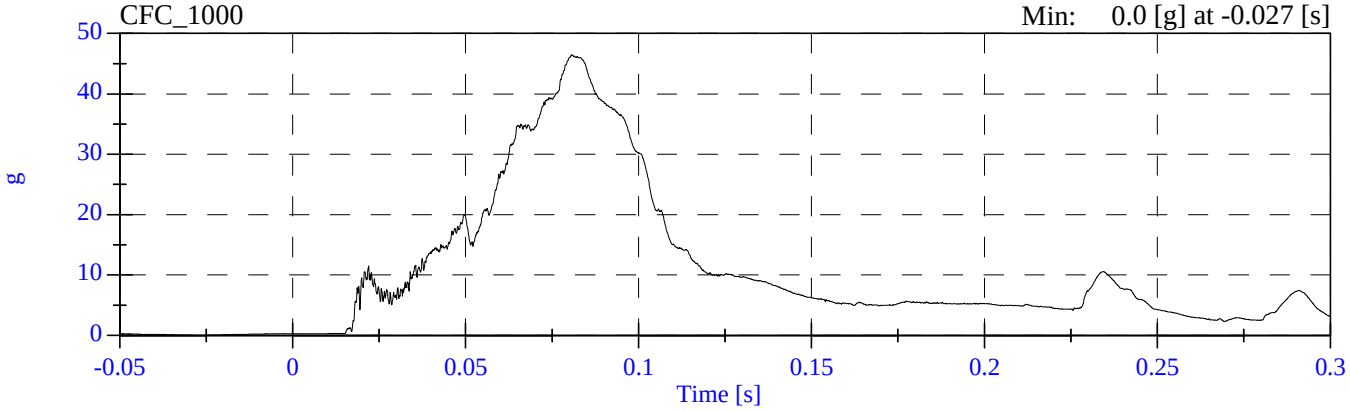
V1P1 Head CG y
CFC_1000
Max: 2.2 [g] at 0.053 [s]
Min: -16.7 [g] at 0.094 [s]



V1P1 Head CG z
CFC_1000
Max: 20.9 [g] at 0.060 [s]
Min: -4.8 [g] at 0.086 [s]

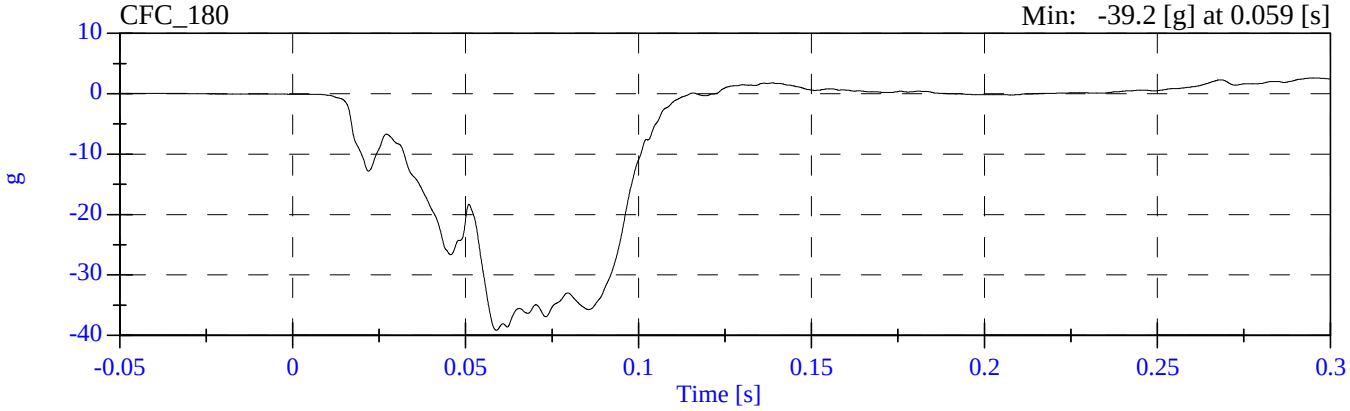


V1P1 Head CG Resultant
CFC_1000
Max: 46.5 [g] at 0.081 [s]
Min: 0.0 [g] at -0.027 [s]

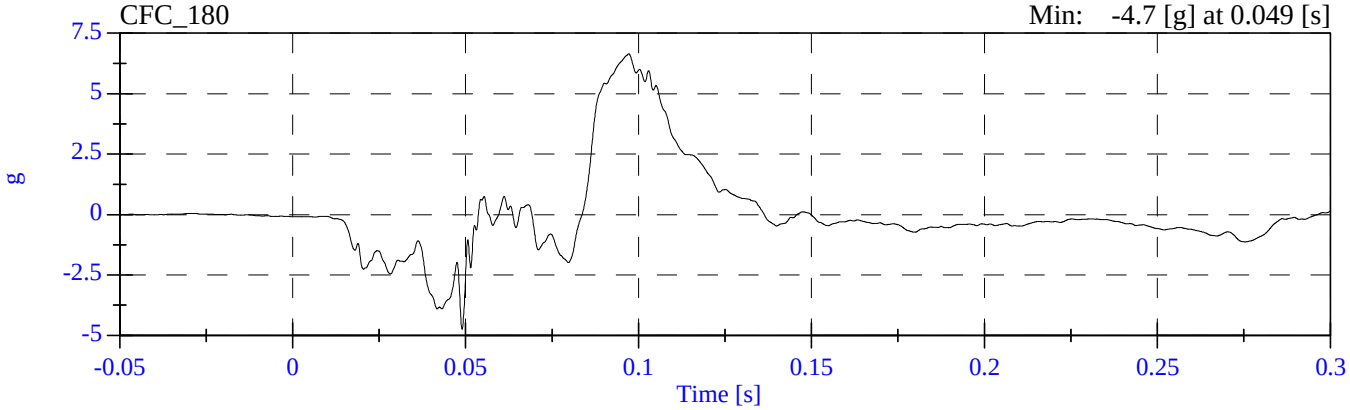


Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

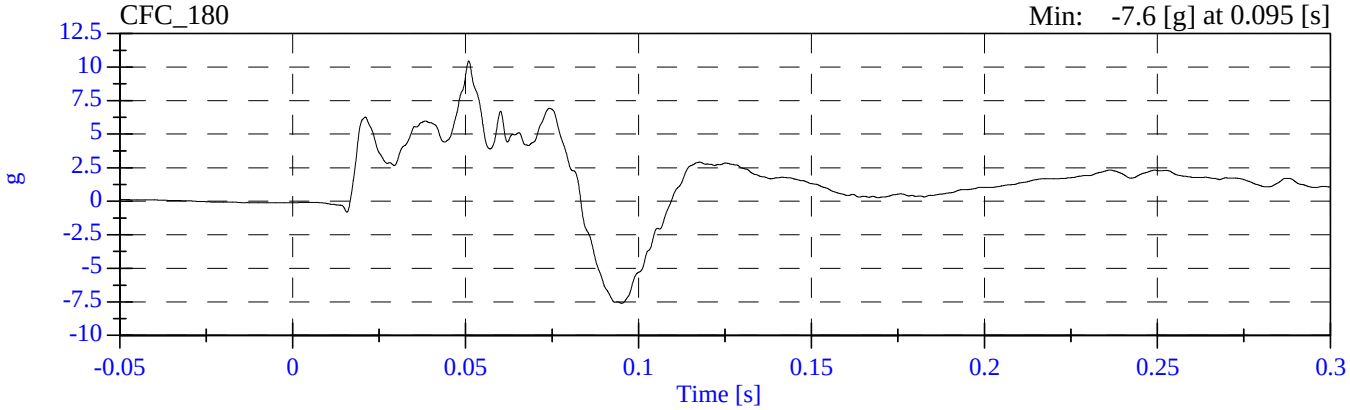
V1P1 Chest x
CFC_180
Max: 2.6 [g] at 0.296 [s]
Min: -39.2 [g] at 0.059 [s]



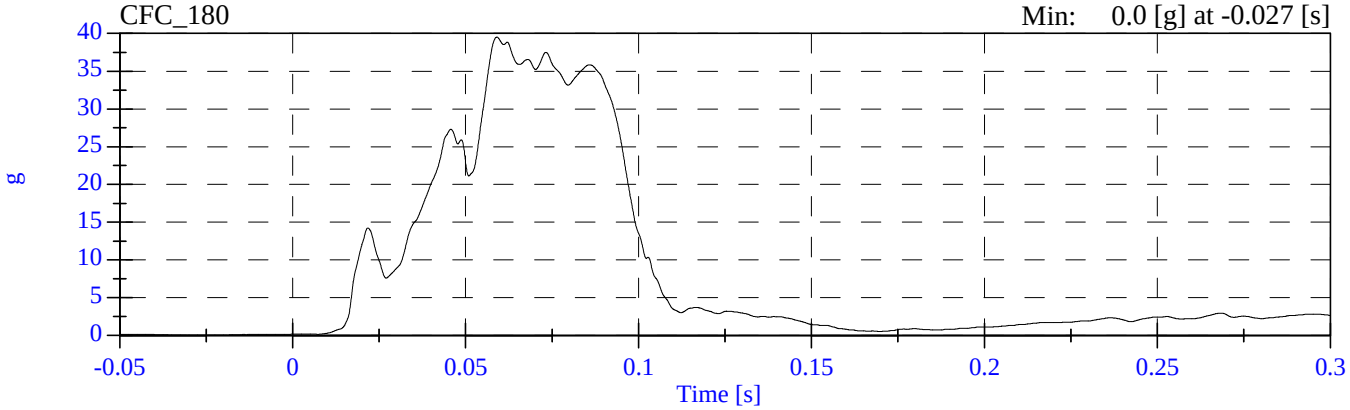
V1P1 Chest y
CFC_180
Max: 6.7 [g] at 0.097 [s]
Min: -4.7 [g] at 0.049 [s]



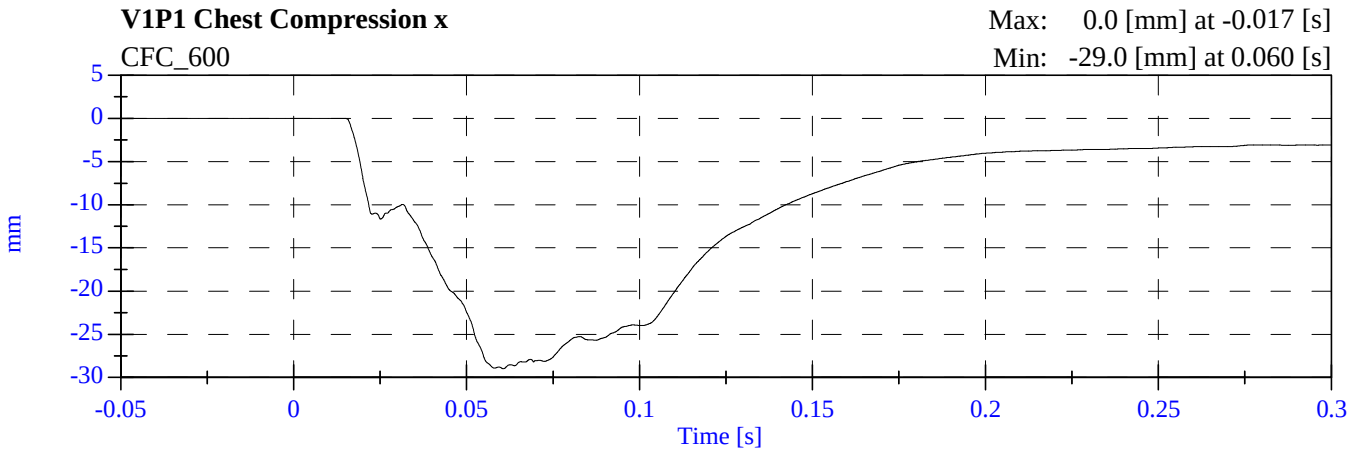
V1P1 Chest z
CFC_180
Max: 10.4 [g] at 0.051 [s]
Min: -7.6 [g] at 0.095 [s]



V1P1 Chest Resultant
CFC_180
Max: 39.5 [g] at 0.059 [s]
Min: 0.0 [g] at -0.027 [s]



Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009



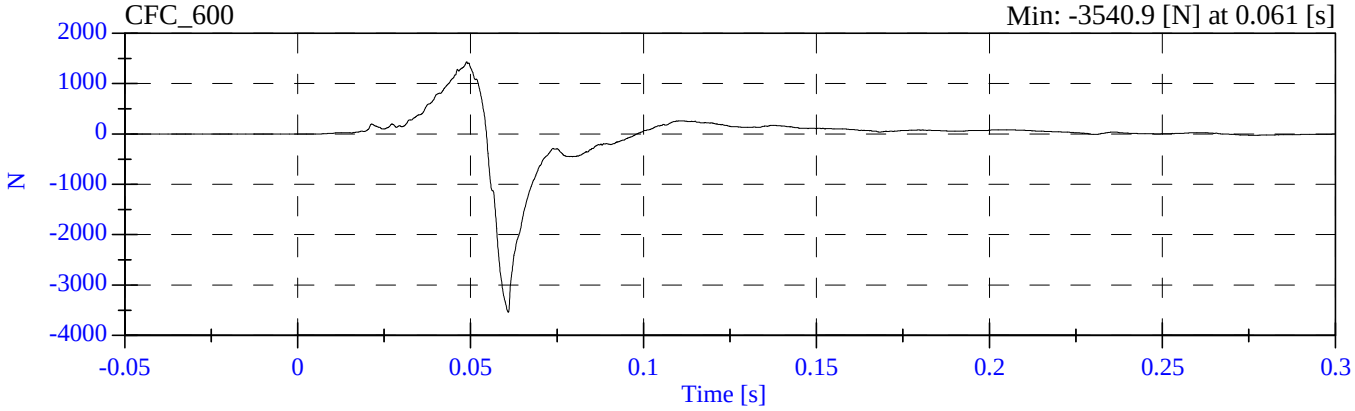
Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

V1P1 Left Femur z

CFC_600

Max: 1435.3 [N] at 0.049 [s]

Min: -3540.9 [N] at 0.061 [s]

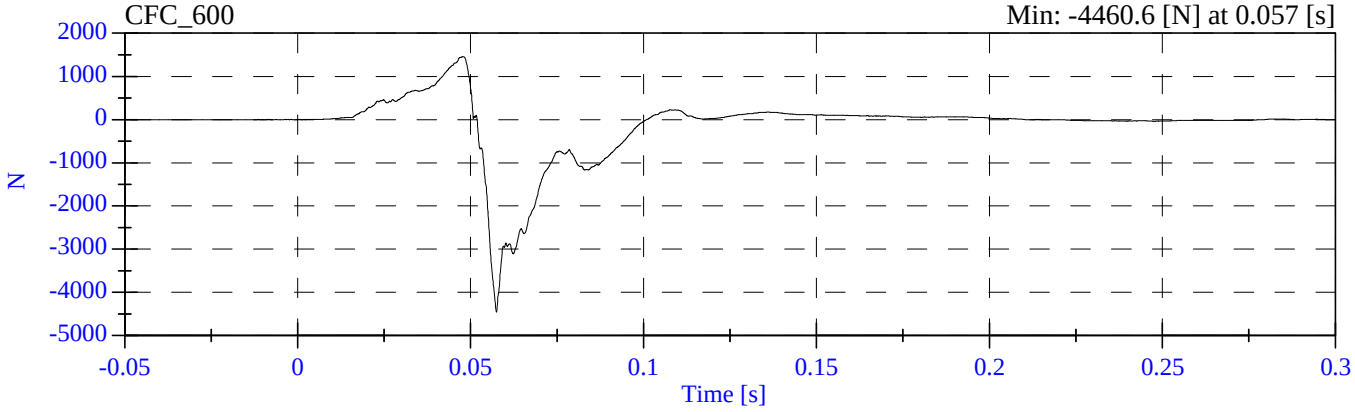


V1P1 Right Femur z

CFC_600

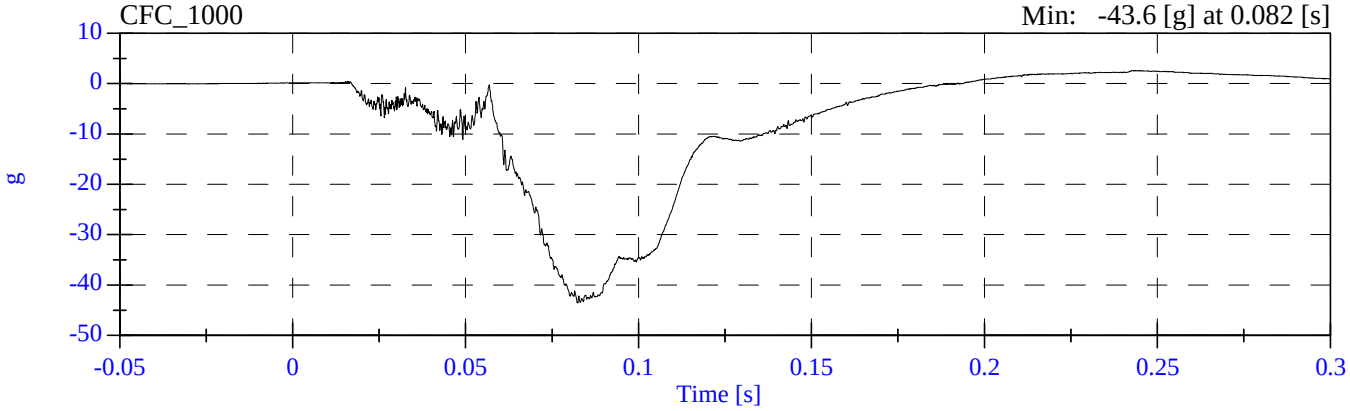
Max: 1454.3 [N] at 0.048 [s]

Min: -4460.6 [N] at 0.057 [s]

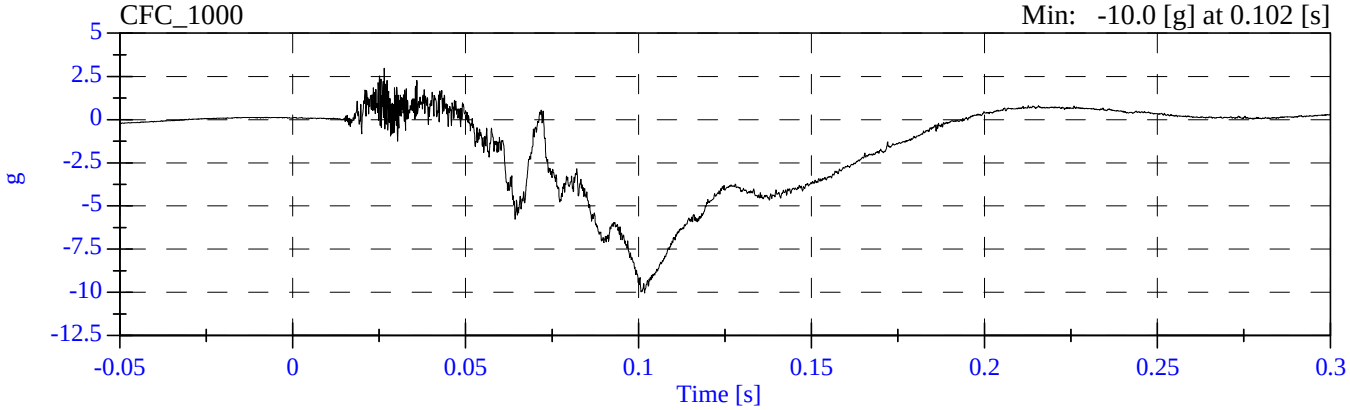


Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

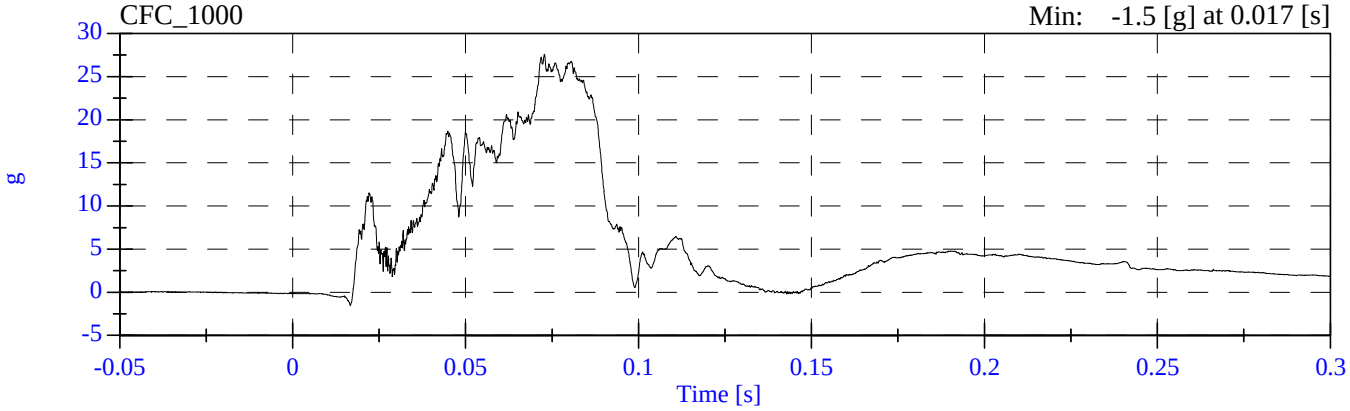
V1P2 Head CG x
CFC_1000
Max: 2.6 [g] at 0.245 [s]
Min: -43.6 [g] at 0.082 [s]



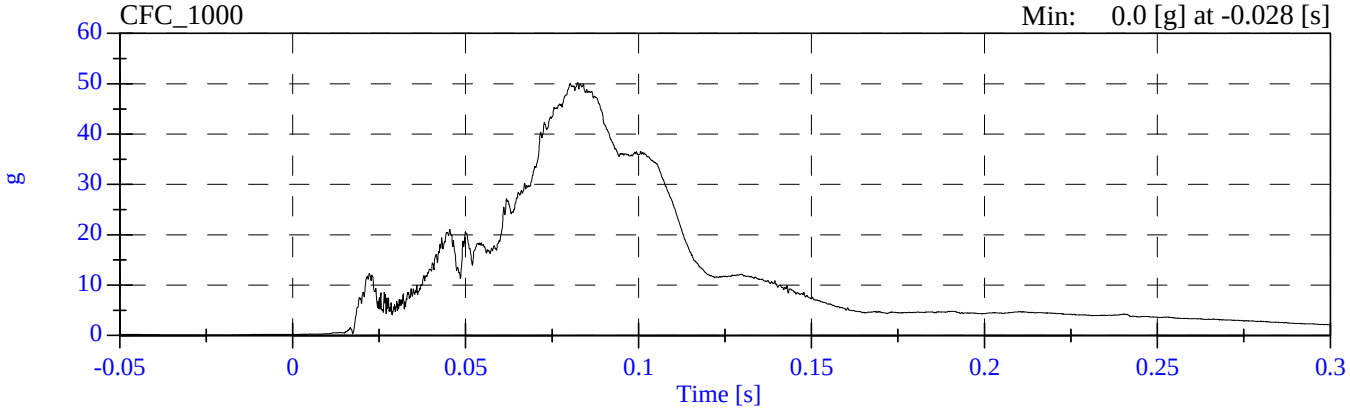
V1P2 Head CG y
CFC_1000
Max: 3.0 [g] at 0.026 [s]
Min: -10.0 [g] at 0.102 [s]



V1P2 Head CG z
CFC_1000
Max: 27.6 [g] at 0.073 [s]
Min: -1.5 [g] at 0.017 [s]

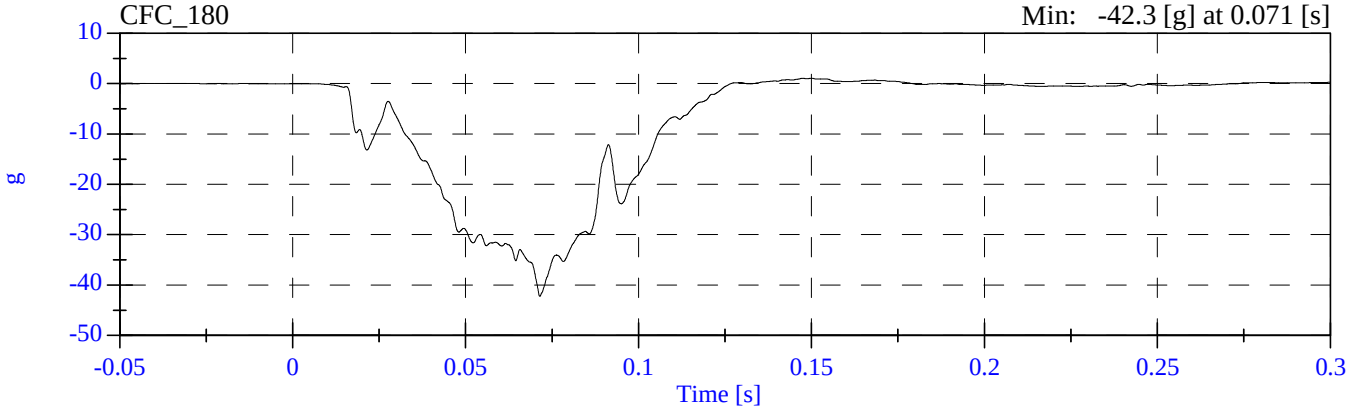


V1P2 Head CG Resultant
CFC_1000
Max: 50.3 [g] at 0.082 [s]
Min: 0.0 [g] at -0.028 [s]

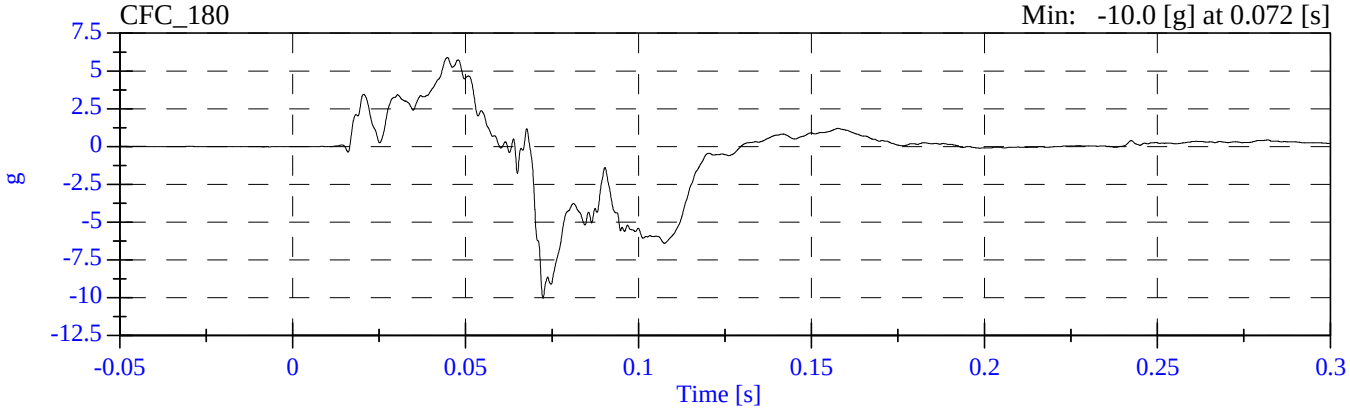


Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

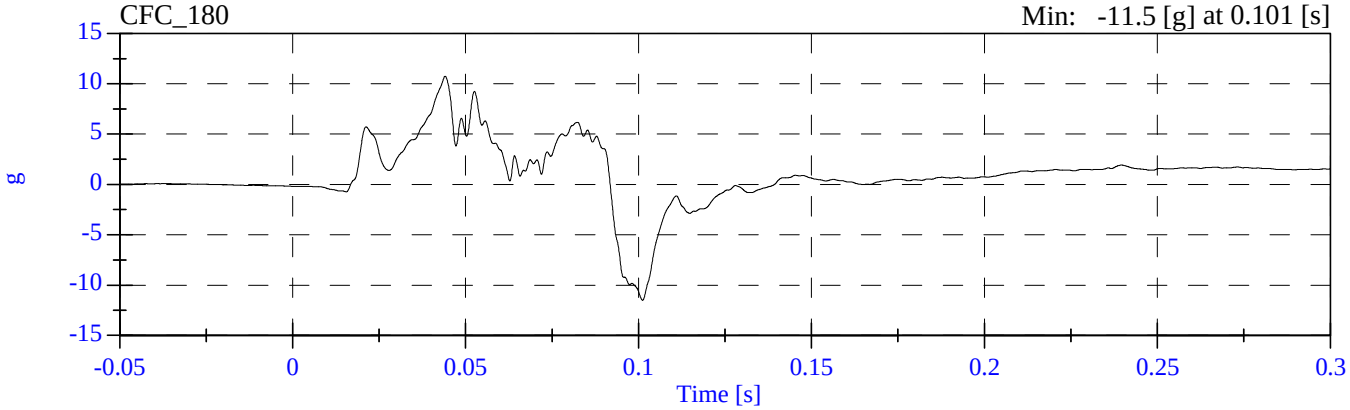
V1P2 Chest x
CFC_180
Max: 1.1 [g] at 0.150 [s]
Min: -42.3 [g] at 0.071 [s]



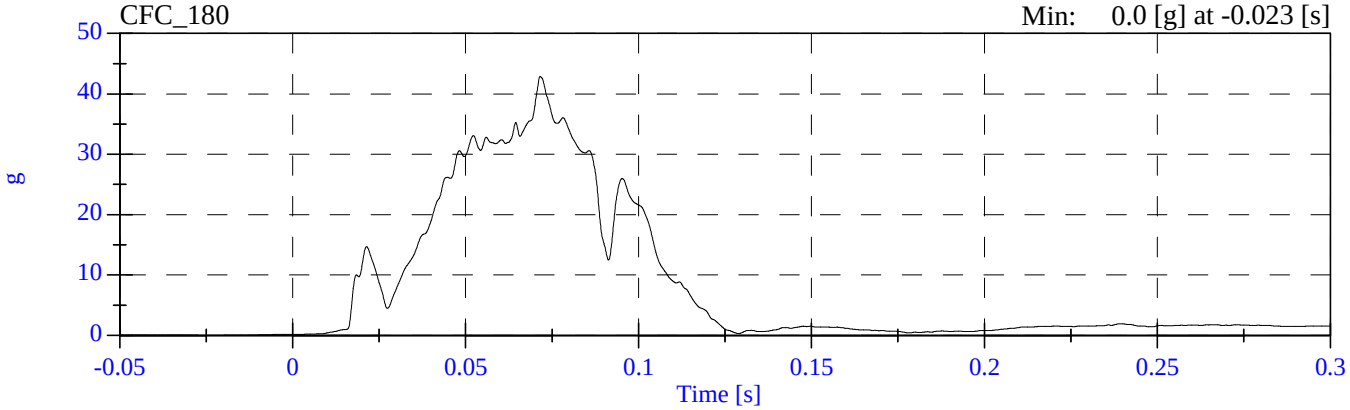
V1P2 Chest y
CFC_180
Max: 5.9 [g] at 0.045 [s]
Min: -10.0 [g] at 0.072 [s]



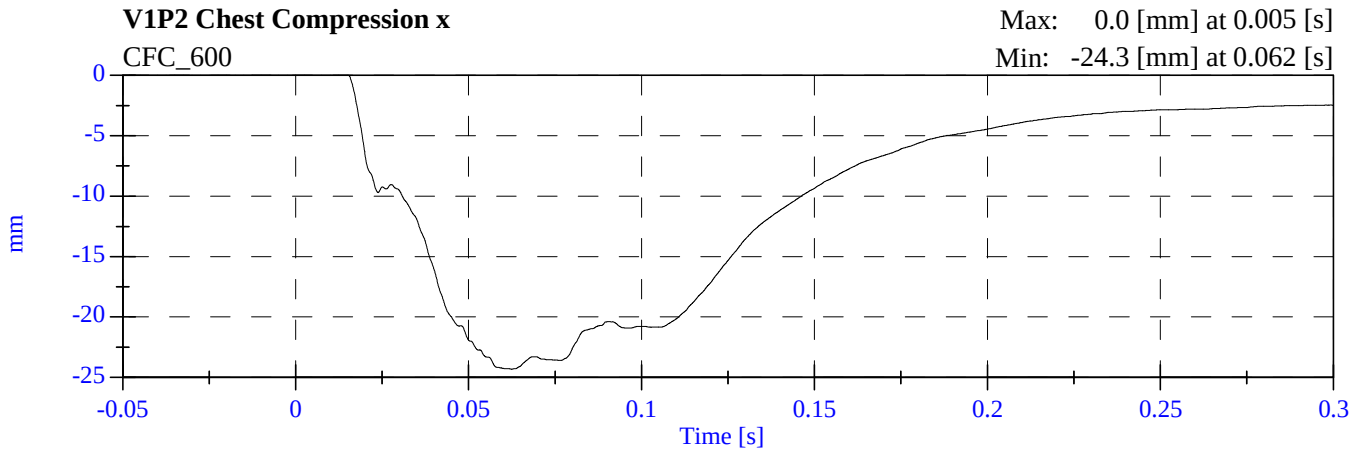
V1P2 Chest z
CFC_180
Max: 10.8 [g] at 0.044 [s]
Min: -11.5 [g] at 0.101 [s]



V1P2 Chest Resultant
CFC_180
Max: 42.9 [g] at 0.071 [s]
Min: 0.0 [g] at -0.023 [s]



Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009



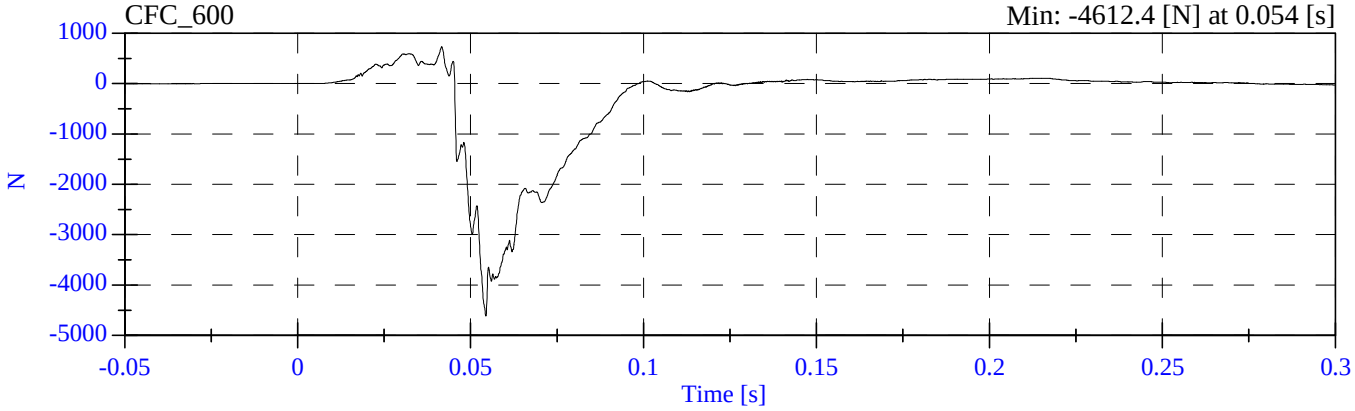
Frontal NCAP - 2010 Kia Soul
MA0505 - April 22, 2009

V1P2 Left Femur z

Max: 733.7 [N] at 0.042 [s]

CFC_600

Min: -4612.4 [N] at 0.054 [s]

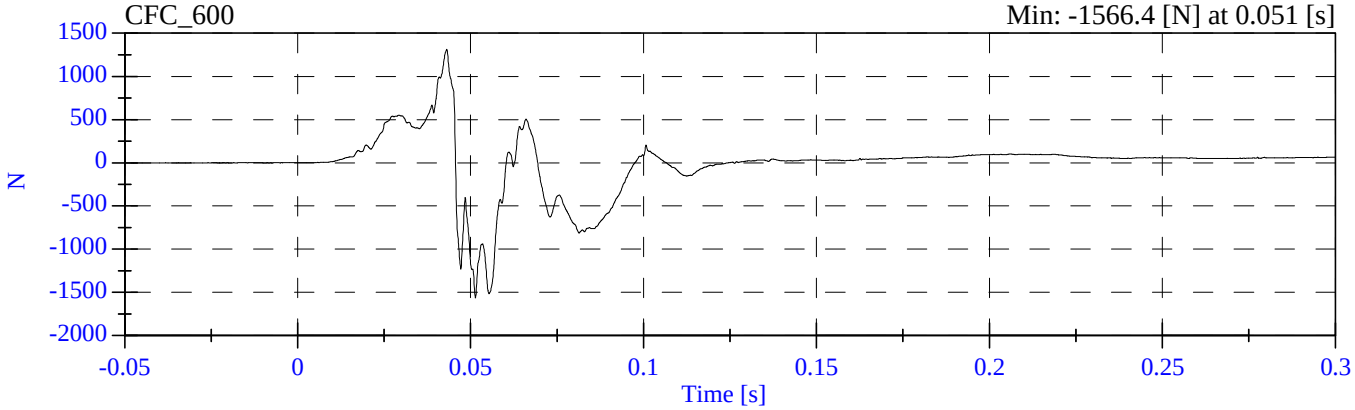


V1P2 Right Femur z

Max: 1315.6 [N] at 0.043 [s]

CFC_600

Min: -1566.4 [N] at 0.051 [s]



APPENDIX C

PART 572B/E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan. A summary of the test results, and Part 572 specifications are included in this Appendix.

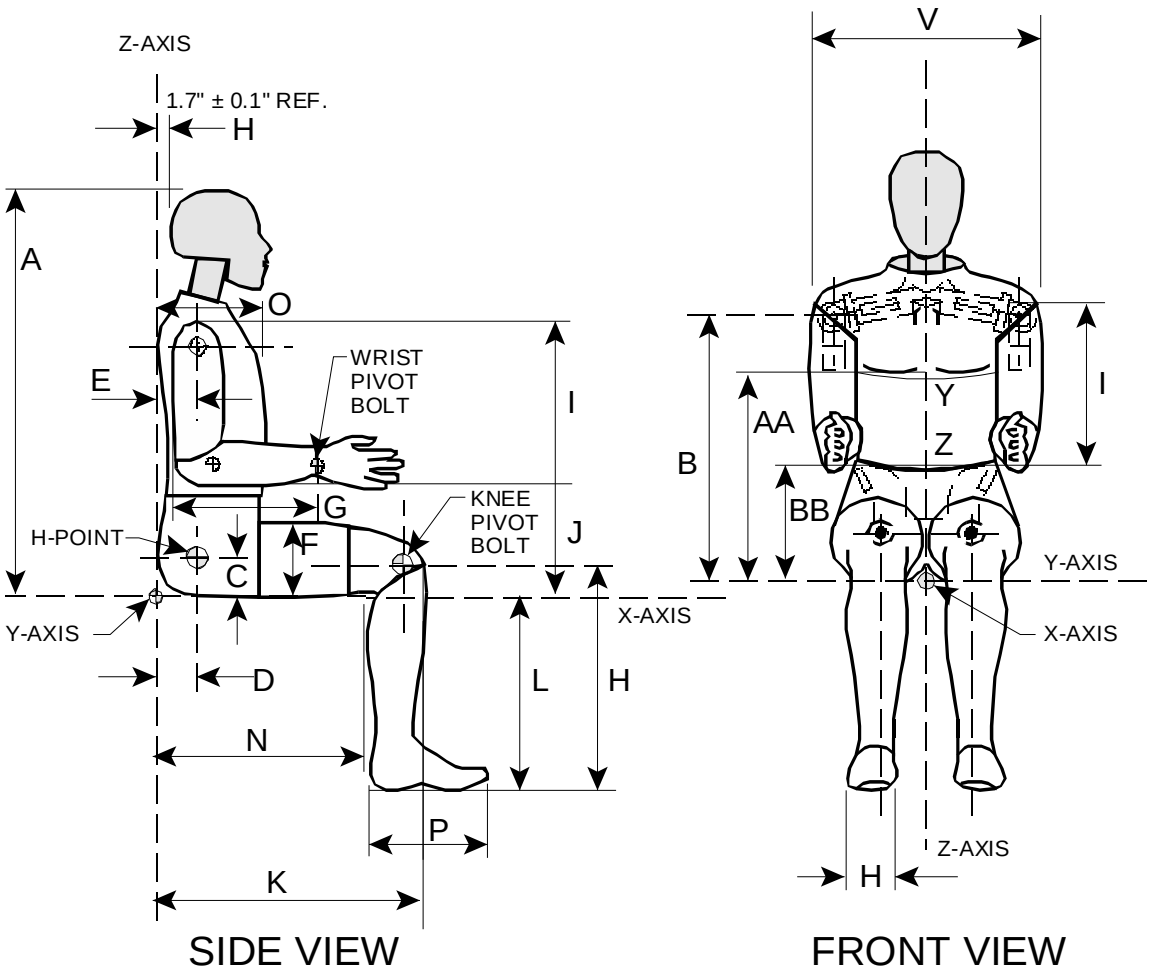
Dummy serial numbers and certification dates are:

Position No./Location	Serial No.	Completion Date
#1/Driver	064	April 21, 2009
#2/Right Front Passenger	061	April 21, 2009

Electronic Test Equipment

The complement of signal conditioning, recording and display equipment, in conjunction with dummy certification testing, can be found in New Car Assessment and Standards Indicant Testing Final Report No. 6525-V-1.

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude. (REF: S572.31(A)(6))

PART 572E
HEAD DROP TEST

Dummy Serial Number	064
Sequential Test Number	1
Date	2/10/09
Workfile	064H 2-10-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	27.00
Peak Resultant Acceleration	225-275 G's	263.90
Peak Lateral Acceleration	15 G's Max	7.33
Is Acceleration Curve Unimodal?	YES	2.54

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
NECK FLEXION TEST

Dummy Serial Number	064	
Sequential Test Number	1	
Date	2-26-09	6 Axis Neck Transducer
Workfile	064NF3 02-26-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.67
Relative Humidity		10% - 70%	23
Impact Velocity		6.89 – 7.13 m/s	7.03
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	24.59
	20 ms	17.60 - 22.60 G's	20.94
	30 ms	12.50 - 18.50 G's	16.63
Max Pendulum G's Above 30 ms		29 G's Max	16.63
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	38.40
D Plane Rotation	Max	64 - 78 Deg	70.63
	Time	57 - 64 ms	60.1
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	92.40
	Time	47 - 58 ms	50.8
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	116
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	98.6

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	064	
Sequential Test Number	1	
Date	2-26-09	6 Axis Neck Transducer
Workfile	064NE 02-26-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.67
Relative Humidity		10% - 70%	24.0
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	20.00
	20 ms	14.00 - 19.00 G's	18.32
	30 ms	11.00 - 16.00 G's	14.49
Max Pendulum G's Above 30 ms		22 G's Max	14.49
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	39.70
D Plane Rotation	Max	81 - 106 Deg	99.76
	Time	72 - 82 ms	76.10
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-70.85
	Time	65 - 79 ms	71.60
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	156.60
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	143.80

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
THORAX IMPACT TEST

Dummy Serial Number	064
Sequential Test Number	1
Date	4/21/09
Workfile	064 142ribsT12 04-21-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.7
Relative Humidity	10% - 70%	30.0
Pendulum Velocity	6.58 – 6.83 m/s	6.58
Maximum Deflection	63.50 – 72.64 mm	68.3
Maximum Resistive Force	5159.9 – 5893.9 N	5381.6
Internal Hysteresis	69 - 85 %	71.8

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
KNEE IMPACT TEST

Dummy Serial Number	064
Sequential Test Number	1
Date	2-16-09 / 2-16-09
Workfile	064LF 02-16-09; 064RF 02-16-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	18.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5163.1
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	18
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5335.7

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 064
Sequential Test Number 1
Date 3-25-09

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21
Relative Humidity			30
Location for Chest Circumference	AA	16.9 -17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Total Sitting Height	A	34.6 - 35.0 in	34.6
Shoulder Pivot Height	B	19.9 - 20.5 in	20.5
H-Point Height	C	3.3 - 3.5 in	3.5
H-Point from Backline	D	5.3 - 5.5 in	5.5
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.5
Thigh Clearance	F	5.5 - 6.1 in	6.0
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Elbow Rest Height	J	7.5 - 8.3 in	7.8
Buttock Knee Length	K	22.8 - 23.8 in	23.5
Popliteal Height	L	16.9 - 17.9 in	17.5
Knee Pivot Height	M	19.1 - 19.7 in	19.1
Buttock Popliteal Length	N	17.8 - 18.8 in	18.7
Chest Depth	O	8.4 - 9.0 in	8.5
Foot Length	P	9.9 - 10.5 in	10.2
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Foot Breadth	W	3.6 - 4.2 in	3.8
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.5
Waist Circumference	Z	32.9 - 34.1 in	33.4

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
HEAD DROP TEST

Dummy Serial Number	061
Sequential Test Number	1
Date	2-10-09
Workfile	061H 02-10-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	26
Peak Resultant Acceleration	225-275 G's	267.4
Peak Lateral Acceleration	15 G's Max	4.63
Is Acceleration Curve Unimodal?	YES	Yes

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
NECK FLEXION TEST

Dummy Serial Number	061	
Sequential Test Number	1	
Date	3-16-09	6 Axis Neck Transducer
Workfile	061NF 03-16-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.67
Relative Humidity		10% - 70%	61
Impact Velocity		6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.62
	20 ms	17.60 - 22.60 G's	21.16
	30 ms	12.50 - 18.50 G's	15.90
Max Pendulum G's Above 30 ms		29 G's Max	15.90
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	39.0
D Plane Rotation	Max	64 - 78 Deg	69.6
	Time	57 - 64 ms	60.3
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	100.0
	Time	47 - 58 ms	51.3
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	114.8
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	98.6

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	061	
Sequential Test Number	1	
Date	3-16-09	6 Axis Neck Transducer
Workfile	06NE 03-16-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	19
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	19.50
	20 ms	14.00 - 19.00 G's	18.41
	30 ms	11.00 - 16.00 G's	14.63
Max Pendulum G's Above 30 ms		22 G's Max	14.63
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	40.3
D Plane Rotation	Max	81 - 106 Deg	94.82
	Time	72 - 82 ms	76.6
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-60.25
	Time	65 - 79 ms	72.0
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	162.1
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	142.1

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
THORAX IMPACT TEST

Dummy Serial Number	061
Sequential Test Number	1
Date	4-21-09
Workfile	061NRT1 04-21-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.7
Relative Humidity	10% - 70%	34
Pendulum Velocity	6.58 – 6.83 m/s	6.59
Maximum Deflection	63.50 – 72.64 mm	64.0
Maximum Resistive Force	5159.9 – 5893.9 N	5669.3
Internal Hysteresis	69 - 85 %	73.8

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
KNEE IMPACT TEST

Dummy Serial Number	061
Sequential Test Number	1
Date	2-16-09; 2-16-09
Workfile	061LF 02-16-09; 061RF 02-16-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	18
Probe Velocity	2.07 – 2.13 m/s	2.12
Peak Knee Impact Force	4715.1 – 5782.7 N	5279.1
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	18
Probe Velocity	2.07 – 2.13 m/s	2.12
Peak Knee Impact Force	4715.1 – 5782.7 N	5288.9

Remarks: None

Laboratory Technician: A. Rudniski

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 061
Sequential Test Number 1
Date 3/25/09

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21
Relative Humidity			30
Location for Chest Circumference	AA	16.9 -17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Total Sitting Height	A	34.6 - 35.0 in	34.7
Shoulder Pivot Height	B	19.9 - 20.5 in	20.4
H-Point Height	C	3.3 - 3.5 in	3.5
H-Point from Backline	D	5.3 - 5.5 in	5.3
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.7
Thigh Clearance	F	5.5 - 6.1 in	6.1
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Elbow Rest Height	J	7.5 - 8.3 in	8.0
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Popliteal Height	L	16.9 - 17.9 in	17.5
Knee Pivot Height	M	19.1 - 19.7 in	19.2
Buttock Popliteal Length	N	17.8 - 18.8 in	18.7
Chest Depth	O	8.4 - 9.0 in	8.4
Foot Length	P	9.9 - 10.5 in	10.1
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Foot Breadth	W	3.6 - 4.2 in	3.9
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.5
Waist Circumference	Z	32.9 - 34.1 in	33.4

Remarks: None

Laboratory Technician: A. Rudniski

APPENDIX D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	AC-P52011	03-Dec-08	03-Jun-09
	Y	ENDEVCO	AC-P52128	03-Dec-08	03-Jun-09
	Z	ENDEVCO	AC-P51990	03-Dec-08	03-Jun-09
Head	X (R)	ENDEVCO	AC-P51303	03-Dec-08	03-Jun-09
	Y (R)	ENDEVCO	AC-P51985	03-Dec-08	03-Jun-09
	Z (R)	ENDEVCO	AC-P51294	03-Dec-08	03-Jun-09
Neck Load Cell	X	DENTON	LC-2019Fx	19-May-08	17-Nov-08
	Y	DENTON	LC-2019Fy	19-May-08	17-Nov-08
	Z	DENTON	LC-2019Fz	19-May-08	17-Nov-08
Neck Moment	X	DENTON	LC-2019Mx	19-May-08	17-Nov-08
	Y	DENTON	LC-2019My	19-May-08	17-Nov-08
	Z	DENTON	LC-2019Mz	19-May-08	17-Nov-08
Chest	X	ENDEVCO	AC-P52000	02-Dec-08	02-Jun-09
	Y	ENDEVCO	AC-P49163	02-Dec-08	02-Jun-09
	Z	ENDEVCO	AC-P52009	02-Dec-08	02-Jun-09
Chest	X (R)	ENDEVCO	AC-P52035	02-Dec-08	02-Jun-09
	Y (R)	ENDEVCO	AC-P52030	03-Dec-08	03-Jun-09
	Z (R)	ENDEVCO	AC-P52033	02-Dec-08	02-Jun-09
Chest Deflection	X	SERVO	DS-064	24-Jun-08	23-Dec-08
Pelvic	X	ENDEVCO	AC-P17285	03-Mar-09	01-Sep-09
	Y	ENDEVCO	AC-P17837	01-Apr-09	30-Sep-09
	Z	ENDEVCO	AC-P17553	02-Apr-09	01-Oct-09

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1525	19-May-08	17-Nov-08
Right Femur Load Cell	Fz	DENTON	LC-1533	19-May-08	17-Nov-08
Left Upper Tibia	Mx	DENTON	LC-374Mx	19-May-08	17-Nov-08
	My	DENTON	LC-374My	19-May-08	17-Nov-08
Left Lower Tibia	Fz	DENTON	LC-372Fz	19-May-08	17-Nov-08
	Mx	DENTON	LC-372Mx	19-May-08	17-Nov-08
	My	DENTON	LC-372My	19-May-08	17-Nov-08
Right Upper Tibia	Mx	DENTON	LC-404Mx	19-May-08	17-Nov-08
	My	DENTON	LC-404My	19-May-08	17-Nov-08
Right Lower Tibia	Fz	DENTON	LC-396Fz	19-May-08	17-Nov-08
	Mx	DENTON	LC-396Mx	19-May-08	17-Nov-08
	My	DENTON	LC-396My	19-May-08	17-Nov-08
Left Foot Rear	X	ENDEVCO	AC-P52152	03-Dec-08	03-Jun-09
	Z	ENDEVCO	AC-P52082	03-Dec-08	03-Jun-09
Left Foot Front	Z	ENDEVCO	AC-P16286	03-Mar-09	01-Sep-09
Right Foot Rear	X	ENDEVCO	AC-P51873	03-Dec-08	03-Jun-09
	Z	ENDEVCO	AC-P58987	03-Dec-08	03-Jun-09
Right Foot Front	Z	ENDEVCO	AC-P52025	03-Dec-08	03-Jun-09
Lap Belt Load Cell		First Technology	LC-156	02-Apr-09	01-Oct-09
Shoulder Belt Load Cell		First Technology	LC-159	02-Apr-09	01-Oct-09

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	P58871	11/24/2008	5/25/2009
	Y	ENDEVCO	P51281	11/24/2008	5/25/2009
	Z	ENDEVCO	P51209	11/24/2008	5/25/2009
Head	X (R)	ENDEVCO	P52155	11/24/2008	5/25/2009
	Y (R)	ENDEVCO	P51274	11/24/2008	5/25/2009
	Z (R)	ENDEVCO	P15526	3/25/2009	9/23/2009
Neck Load Cell	X	DENTON	1916Fx	5/19/2008	11/17/2008
	Y	DENTON	1916Fy	5/19/2008	11/17/2008
	Z	DENTON	1916Fz	5/19/2008	11/17/2008
Neck Moment	X	DENTON	1916Mx	5/19/2008	11/17/2008
	Y	DENTON	1916My	5/19/2008	11/17/2008
	Z	DENTON	1916Mz	5/19/2008	11/17/2008
Chest	X	ENDEVCO	P52157	11/24/2008	5/25/2009
	Y	ENDEVCO	P52018	11/25/2008	5/26/2009
	Z	ENDEVCO	P52133	11/25/2008	5/26/2009
Chest	X (R)	ENDEVCO	P52156	11/24/2008	5/25/2009
	Y (R)	ENDEVCO	P49179	11/25/2008	5/26/2009
	Z (R)	ENDEVCO	P51271	11/25/2008	5/26/2009
Chest Deflection	X	SERVO	DS-061	25-Jun-08	24-Dec-08
Pelvic	X	ENDEVCO	AC-P58743	02-Dec-08	02-Jun-09
	Y	ENDEVCO	AC-P58766	02-Dec-08	02-Jun-09
	Z	ENDEVCO	AC-P58767	02-Dec-08	02-Jun-09

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

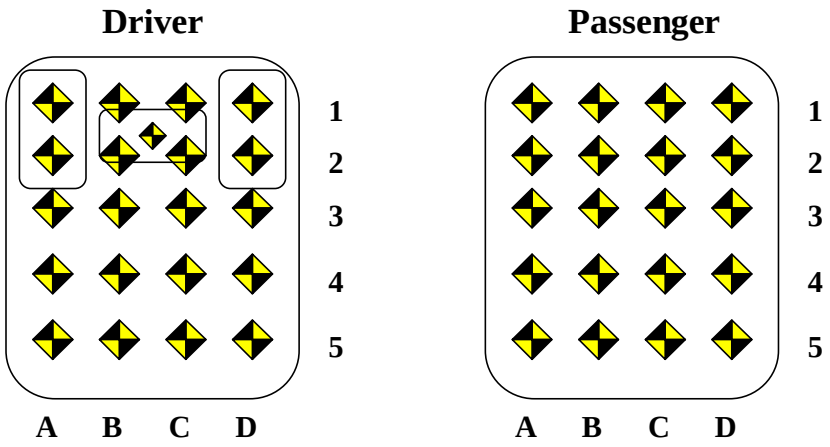
PASSENGER DUMMY (S/N)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1532	19-May-08	17-Nov-08
Right Femur Load Cell	Fz	DENTON	LC-1526	19-May-08	17-Nov-08
Left Upper Tibia	Mx	DENTON	LC-91UMx	16-Jun-08	15-Dec-08
	My	DENTON	LC-91UMy	16-Jun-08	15-Dec-08
Left Lower Tibia	Fz	DENTON	LC-91LFz	16-Jun-08	15-Dec-08
	Mx	DENTON	LC-91LMx	16-Jun-08	15-Dec-08
	My	DENTON	LC-91LMy	16-Jun-08	15-Dec-08
Right Upper Tibia	Mx	DENTON	LC-265Mx	16-Jun-08	15-Dec-08
	My	DENTON	LC-265My	16-Jun-08	15-Dec-08
Right Lower Tibia	Fz	DENTON	LC-178Fz	16-Jun-08	15-Dec-08
	Mx	DENTON	LC-178Mx	16-Jun-08	15-Dec-08
	My	DENTON	LC-178My	16-Jun-08	15-Dec-08
Left Foot Rear	X	ENTRAN	AC-00L20-A30	24-Nov-08	25-May-09
	Z	ENTRAN	AC-00L20-A22	24-Nov-08	25-May-09
Left Foot Front	Z	ENTRAN	AC-02I02I16-A05	25-Nov-08	26-May-09
Right Foot Rear	X	ENTRAN	AC-00L20-A29	24-Nov-08	25-May-09
	Z	ENTRAN	AC-03E03E20-N12	24-Nov-08	25-May-09
Right Foot Front	Z	ENDEVCO	AC-J29805	06-Dec-08	06-Jun-09
Lap Belt Load Cell		First Technology	LC-173	02-Apr-09	01-Oct-09
Shoulder Belt Load Cell		First Technology	LC-178	02-Apr-09	01-Oct-09

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ENDEVCO	P52155	11/24/2008	5/25/2009
Right Rear Seat Crossmember X	ENDEVCO	P51724	11/24/2008	5/25/2009
Top of Engine	ENDEVCO	P15526	3/25/2009	9/23/2009
Bottom of Engine	ENDEVCO	P52156	11/24/2008	5/25/2009
Right Disc Brake Caliper	ENDEVCO	P49179	11/25/2008	5/26/2009
Left Disc Brake Caliper	ENDEVCO	P51271	11/25/2008	5/26/2009
Left Seat Rear Crossmember Z	ENDEVCO	P23939	3/3/2009	9/1/2009
Right Seat Rear Crossmember Z	ENDEVCO	P35789	3/2/2009	8/31/2009

APPENDIX E

VEHICLE INTERIOR INTRUSION MEASUREMENTS

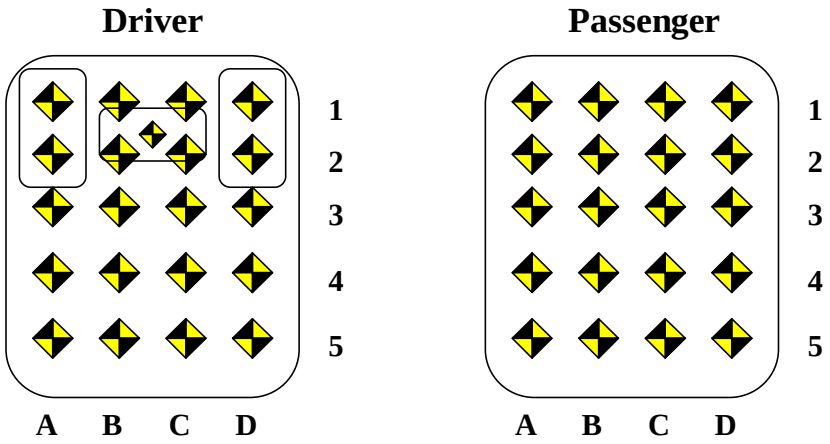


Driver Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2851	-585	420	2837	-578	423	14	-7	-3
B1	3003	-452	421	2970	-436	448	33	-16	-27
C1	3031	-313	417	2993	-301	447	38	-12	-30
D1	3011	-180	416	2981	-172	436	30	-8	-20
A2	2805	-584	367	2799	-581	369	6	-3	-2
B2	2925	-452	359	2909	-444	372	16	-8	-13
C2	2928	-313	359	2911	-306	366	17	-7	-7
D2	2866	-179	362	2845	-175	363	21	-4	-1
A3	2774	-584	330	2770	-580	327	4	-4	3
B3	2817	-450	324	2808	-449	326	9	-1	-2
C3	2809	-309	324	2796	-307	315	13	-2	9
D3	2804	-175	327	2787	-174	319	17	-1	8
A4	2730	-582	320	2725	-580	314	5	-2	6
B4	2749	-448	319	2741	-447	310	8	-1	9
C4	2742	-307	318	2731	-307	301	11	0	17
D4	2739	-178	327	2730	-186	318	9	8	9
A5	2682	-582	321	2679	-579	318	3	-3	3
B5	2680	-447	319	2675	-445	302	5	-2	17
C5	2679	-311	319	2673	-313	294	6	2	25
D5	2677	-174	327	2668	-181	316	9	7	11
BP	2853	-295	494	2800	-306	516	53	11	-22
G	2641	-495	771	2638	-498	773	3	3	-2
H	2622	-200	774	2616	-205	779	6	5	-5
L	2387	-354	995	2434	-358	998	-47	4	-3
AB	2310	-550	405	2308	-551	399	2	1	6

BP=Brake Pedal, G=Left side of bolster, H=Right side of bolster, L=Steering wheel center;
AB = Front outboard seat anchor bolt

PASSENGER SIDE INTRUSION MEASUREMENTS



Passenger Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3021	172	436	2945	174	467	76	-2	-31
B1	3039	303	432	2946	302	467	93	1	-35
C1	3026	439	435	2965	430	476	61	9	-41
D1	2898	583	429	2859	587	452	39	-4	-23
A2	2922	170	360	2888	170	361	34	0	-1
B2	2938	308	364	2908	306	377	30	2	-13
C2	2951	443	371	2915	441	393	36	2	-22
D2	2891	585	390	2855	586	408	36	-1	-18
A3	2813	171	328	2791	172	306	22	-1	22
B3	2823	307	328	2800	310	315	23	-3	13
C3	2832	445	331	2807	450	329	25	-5	2
D3	2844	589	336	2809	584	357	35	5	-21
A4	2748	172	326	2735	180	312	13	-8	14
B4	2763	310	324	2744	314	299	19	-4	25
C4	2767	449	325	2742	450	312	25	-1	13
D4	2773	587	323	2769	581	333	4	6	-10
A5	2689	174	327	2675	178	310	14	-4	17
B5	2706	312	323	2686	316	292	20	-4	31
C5	2708	451	323	2695	450	308	13	1	15
D5	2717	586	321	2712	584	334	5	2	-13
R	2614	193	777	2609	190	780	5	3	-3
S	2635	491	774	2630	485	791	5	6	-17
AB	2308	553	407	2305	557	405	3	-4	2

R=Left side of bolster, S=Right side of bolster, L=Steering wheel center;
AB = Front outboard seat anchor bolt