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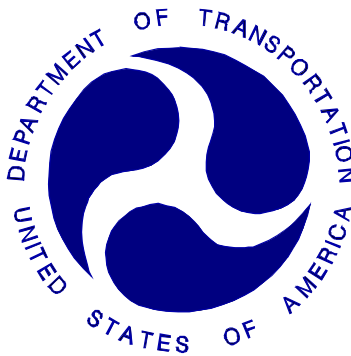
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

FORD MOTOR COMPANY
2009 LINCOLN MKS
4-DOOR SEDAN

NHTSA NUMBER: M90202

CALSPAN TEST NUMBER: 8865-NCAP-01

CALSPAN CORPORATION
TRANSPORTATION SCIENCES CENTER
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8/7/08


FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
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16. Abstract A frontal load cell barrier test of a 2009 Lincoln MKS 4-door Sedan was performed at Calspan Corporation's crash test facility in Buffalo, New York, on 8/7/08. The impact velocity was 56.3 kph and the temperature at the barrier face was 72°C. The maximum post-test vehicle crush was 499 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 (1046)	Passenger (1047)
Head Injury Criteria (HIC - 36 ms)		-	1000	377.0	496.0
Maximum Thorax Acceleration (3 ms Clip)		g's	60 g's	47.3	39.0
Chest Displacement		mm	-76 mm	35.3	32.1
Left Femur Force		Newtons	-10000 N	-1883.4	-2509.1
Right Femur Force		Newtons	-10000 N	-1839.1	-853.8
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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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND SUMMARY OF NCAP TEST	1-1
2	OCCUPANT AND VEHICLE INFORMATION	2-1
<u>Data Sheet</u>	<u>Description</u>	
1.	CRASH TEST SUMMARY	2-1
2.	GENERAL TEST AND VEHICLE PARAMETER DATA	2-2
3.	TEST VEHICLE TIRE INFORMATION	2-4
4.	TEST VEHICLE INFORMATION	2-5
5.	DUMMY POSITIONING IN VEHICLE	2-7
6.	SEAT BELT POSITIONING DATA	2-9
7.	VEHICLE ACCELEROMETER LOCATIONS	2-10
8.	SUMMARY OF FMVSS 212 and FMVSS 219 (Partial) DATA	2-11
9.	SUMMARY OF FMVSS NO. 301 DATA	2-12
10.	VEHICLE MEASUREMENTS	2-13
11.	HIGH-SPEED CAMERA LOCATIONS	2-16
12.	VEHICLE REFERENCE PHOTO TARGET LOCATIONS	2-18
13.	VEHICLE INTRUSION MEASUREMENTS	2-19
14.	LOAD CELL LOCATIONS ON FIXED BARRIER	2-23
15.	ACCIDENT INVESTIGATION DIVISION DATA	2-24
16.	VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART	2-25
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA	B-1
APPENDIX C	PART 572E DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TESTS	C-1
APPENDIX D	DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION	D-1
APPENDIX E	VEHICLE INTERIOR INTRUSION MEASUREMENTS	E-1

SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.3 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 56.3 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.3 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 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.

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. 1046) and the right-front passenger (position 2) ATD (Serial No.1047) 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 129 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 2009 Lincoln MKS 4-door Sedan at a velocity of 56.3 kph. The test was performed at Calspan on 8/7/08. 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	377.0	64.8	100.8	47.3	57.9	60.9	35.3	-1883.4	-1839.1
Passenger	496.0	68.8	101.5	39.0	83.6	86.6	32.1	-2509.1	-853.8

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

TEST NOTES	
Data Channel	Anomalies
VIP1 Right Foot Aft z	Wire cut at 68 msec
VIP2 Upper Neck Mx	Data inaccurate
VIP2 Right Lower Tibia Fz	Data Inaccurate after 72 msec
VIP1 Chest Red z	Data inaccurate after 77 msec
V1 Right Caliper #5x	Data inaccurate

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2009 Lincoln MKS 4-door Sedan

NHTSA No. : M90202 ; VIN: 1LNHM94RX9G604031 ; Color: Red

Engine Data: 6 cylinders; - CID; 3.7 Liters; - cc

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

Transmission Data: 6 speeds; - Manual; x Automatic; - Overdrive

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

AUTOMATIC DOOR LOCKS:

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

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

DEALER AND DELIVERY INFORMATION:

Date Received: 7/24 ; Odometer Reading 12 km

Selling Dealer: Riverhead Ford Lincoln Mercury

Dealer Address: 1419-23 Old Country Rd Riverhead, NY 11401

TEST VEHICLE OPTIONS:

x AC; x Power Steering; x Power Brakes; x Power Locks; x Power Seats

x ABS; x Tilt Wheel; x Stability Control x Traction Control x 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:	YES	N/A	YES	N/A	YES
Passenger:	YES	N/A	YES	N/A	YES
Rear Passenger:	NO	N/A	NO	N/A	YES

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Ford Motor Company

Date of Manufacture 06/08

GVWR: 2449 kg; GAWR: 1315 kg FRONT; 1179 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) = 430 kg

No. of Occupants x 68.04 kg = 340.2 kg

Rated Cargo/Luggage Weight (RCLW) = 89.8 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 =	575	571	59.2	1146.0
Rear =	397	392	40.8	789.0
Total Delivered Weight (UDW) =				1935.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1935.0	kg
Rated Cargo/Luggage Weight (RCLW) =	90	kg
Weight of 2 p.572 Dummies @ 76 each =	152	kg
TARGET TEST WEIGHT =	2177.0	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 82.0 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	614	605	56.2	1219.0
Rear =	477	473	43.8	950.0
Total Vehicle Test Weight (ATW) =				2169.0

Weight of Ballast Secured in Vehicle Trunk Area¹ = 49 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:	770	773	785	776	1168.6
FULLY LOADED:	760	761	758	749	-
AS TESTED:	765	764	763	751	1255.3

Vehicle's Wheel Base: 2866 mm

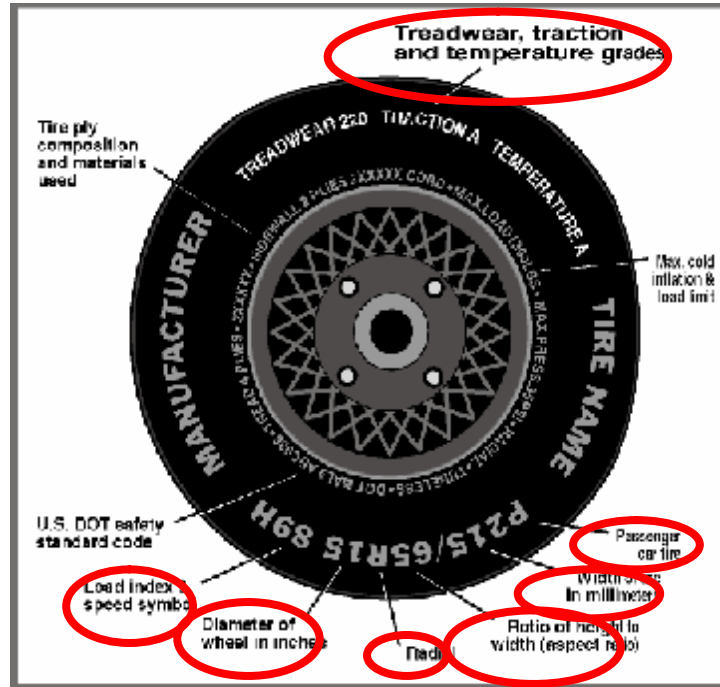
¹Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

²Rearward of the front axle centerline.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Vehicle Year/Make/Model/Body Style: 2009 Lincoln MKS 4-door Sedan

NHTSA Test No.: M90202 Test Date: 8/7/08



Measured Parameter	Front	Rear
Maximum Tire Pressure (from sidewall - kPa)	350	350
Cold Pressure (from tire placard - kPa)*	220	220
Recommended Tire Size (from tire placard)	P235/55R18	P235/55R18
Tire size on Vehicle	P235/55R18	P235/55R18
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Assurance	Assurance
Tire Type	P	P
Tire Width (mm)	235	235
Ratio of Height to Width (aspect ratio)	55	55
Radial	R	R
Wheel Diameter	18	18
Load Index & Speed Symbol	99T	99T
Treadwear	700	700
Traction Grade	A	A
Temperature Grade	B	B

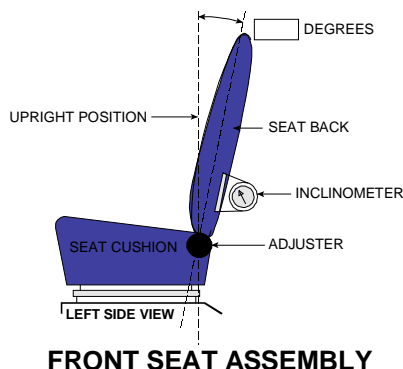
*Tire pressure used for test

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2009 Vehicle Model: Lincoln MKS Body Style : 4-door Sedan

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.



Seat back angle for driver's seat: 23

Measurement instructions: Seat back was set to 18.9° on the head restraint post with vehicle sill at 0°

Seat back angle for passenger's seat: 23

Measurement instructions: Seat back was set to 18.9° on the head restraint post with vehicle sill at 0°

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Full forward to full rear range = 326mm. Seat was set with vertical adjustment full down at 163mm.

Positioning of the passenger's seat: Full forward to full rear range = 332mm. Seat was set with vertical adjustment full down at 166mm.

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 71.9 liters

B. "Usable Capacity" of the optional equipment fuel tank is 0 liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 66.1 to 67.6 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 67.0 liters

3.3 One-Third of Useable Capacity = 24.0 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.

With ignition put 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: Wheel at center is 67° on the face of the wheel

Telescoping travel was 40mm and was centered at 20mm.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: Driver and passenger seat belt adjusters are placed in the uppermost position.

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

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

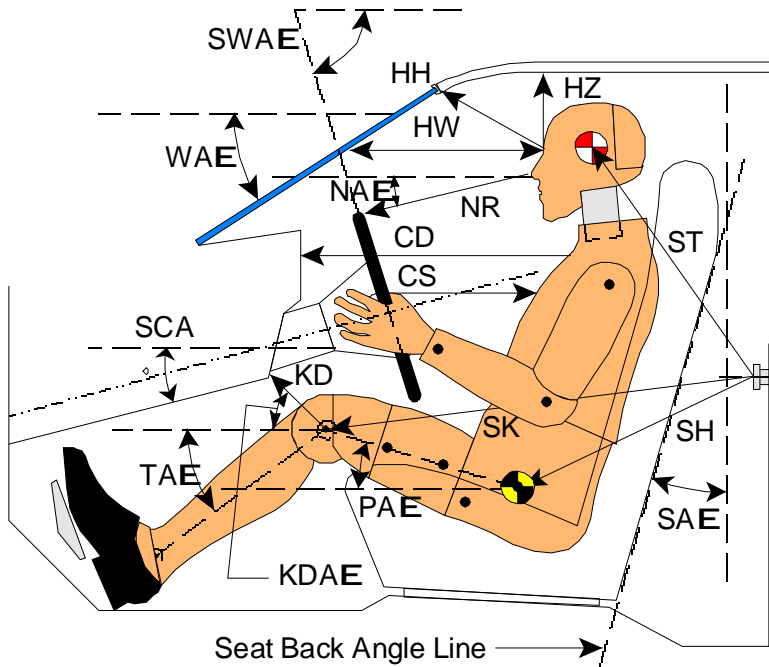
Comments: _____

None

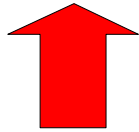
DATA SHEET NO. 5

FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

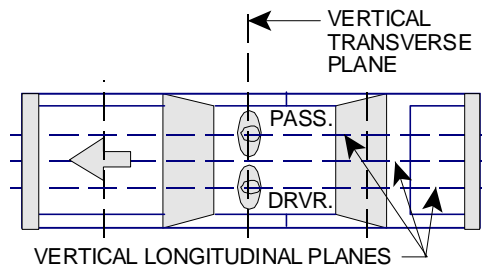
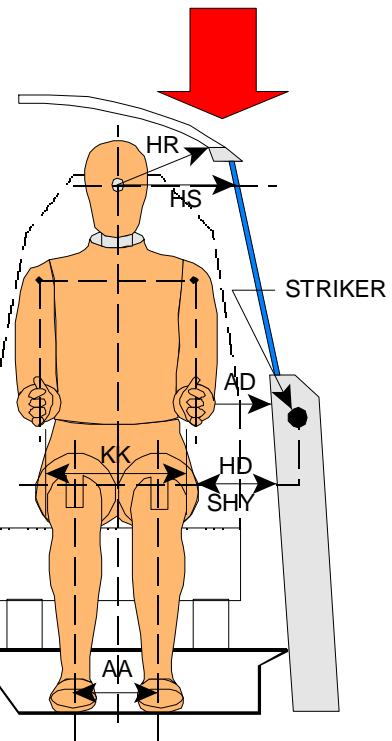
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



- 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



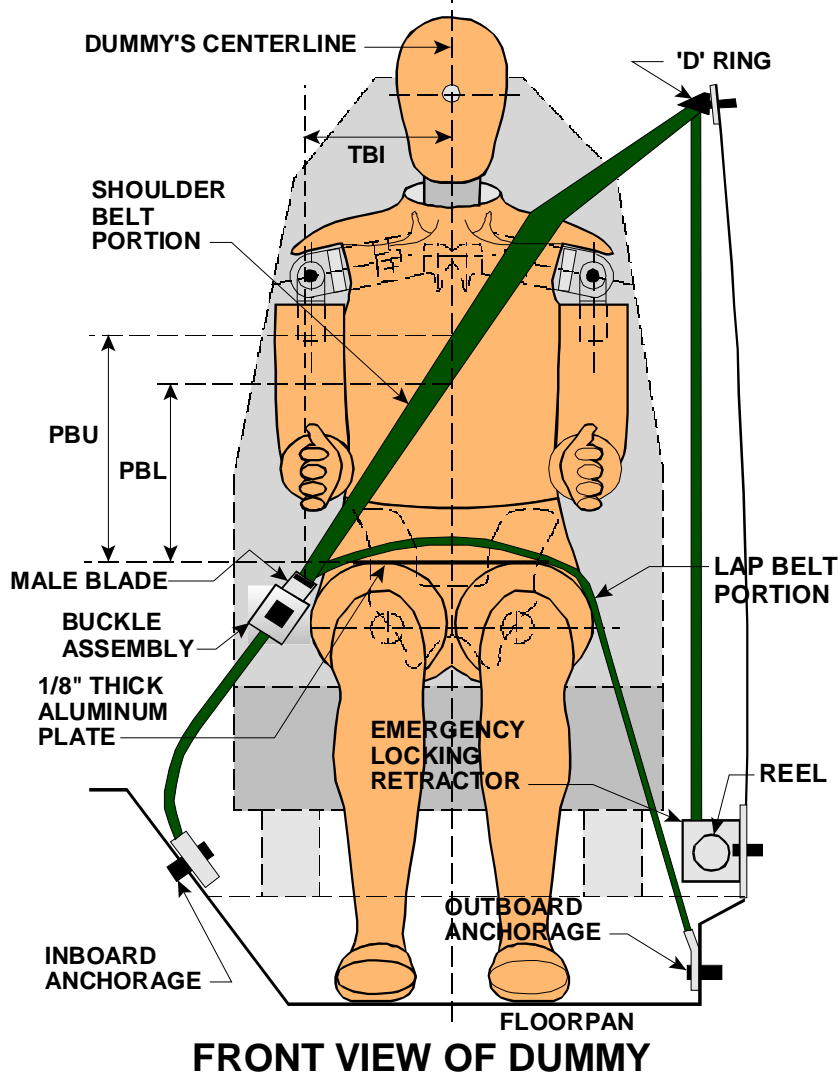
DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #1046)			PASS. (Serial #1047)		
WA ^o	26 deg.			N/A		
SWA ^o	67 deg.			N/A		
SCA ^o	23 deg.			N/A		
SA ^o	23 deg.			23 deg.		
HZ	240			215		
HH	418			412		
HW	757			774		
HR	241			234		
NR	421	Angle	10 deg.	N/A		
CD	578			509		
CS	321			N/A		
RA	219			N/A		
KDL	180	Angle (KDA)	39 deg.	147		
KDR	150			151	Angle (KDA)	27 deg.
PA ^o	22.5 deg.			23.1 deg.		
TA ^o	58.7 deg.			48.1 deg.		
KK	355			270		
AA	336			295		
ST	431	Angle	81 deg.	481	Angle	83 deg.
SK	541	Angle	5 deg.	592	Angle	12 deg.
SH	210	Angle	54 deg.	225	Angle	46 deg.
SHY	305			295		
HS	141			141		
HD	361			351		
AD	112			123		

Dimensions in millimeters

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

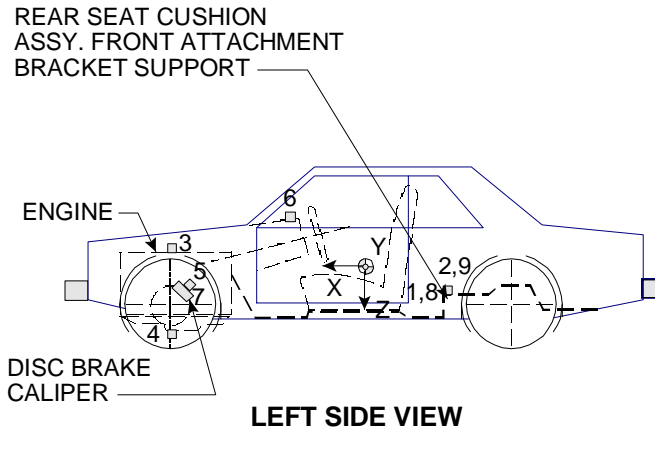
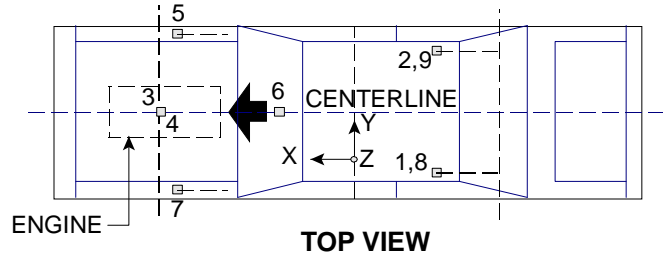
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	330	330
PBL-- Top surface of alum. plate to belt lower edge	240	250
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

VEHICLE ACCELEROMETER LOCATIONS



No.	LOCATION	PRE-TEST LENGTH (mm)		
		X	Y	Z
1	Left Rear Seat Cross Member X	2164	-618	-451
2	Right Rear Seat Cross Member X	2161	619	-450
3	Top of Engine Block	4487	-64	-803
4	Bottom of Engine	5082	1	-438
5	Disc Brake Caliper @ Right Side	4050	769	-489
6	Instrument Panel**	-	-	-
7	Disc Brake Caliper @Left Side	4041	-777	-484
8	Left Rear Seat Cross Member Z	2164	-618	-451
9	Right Rear Seat Cross Member Z	2161	619	-450

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 a 20 mm molding.

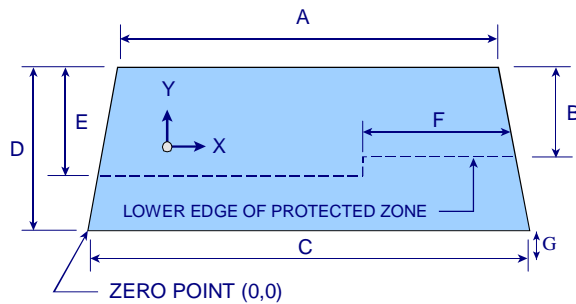
FMVSS 212 REQUIREMENTS:

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: 72°C.

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2172.5	2172.5	100.0%
LEFT SIDE	2172.5	2172.5	100.0%
TOTAL	4345	4345	100.0%



DIMENSIONS (mm)	
A	1260
B	500
C	1545
D	770
E	471
F	535
G	20

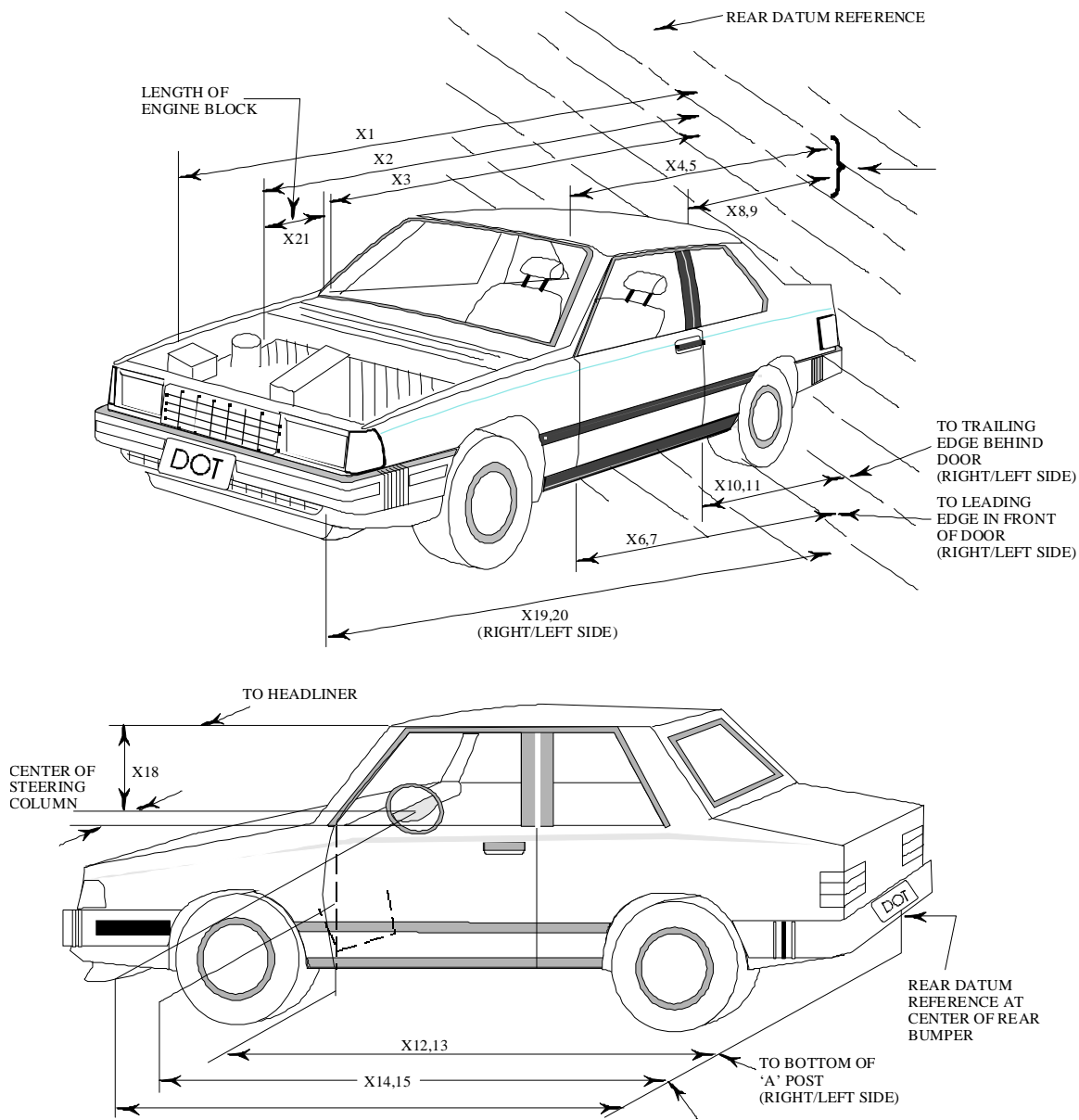
FRONT VIEW OF WINDSHIELD

FAILURE DETAILS:

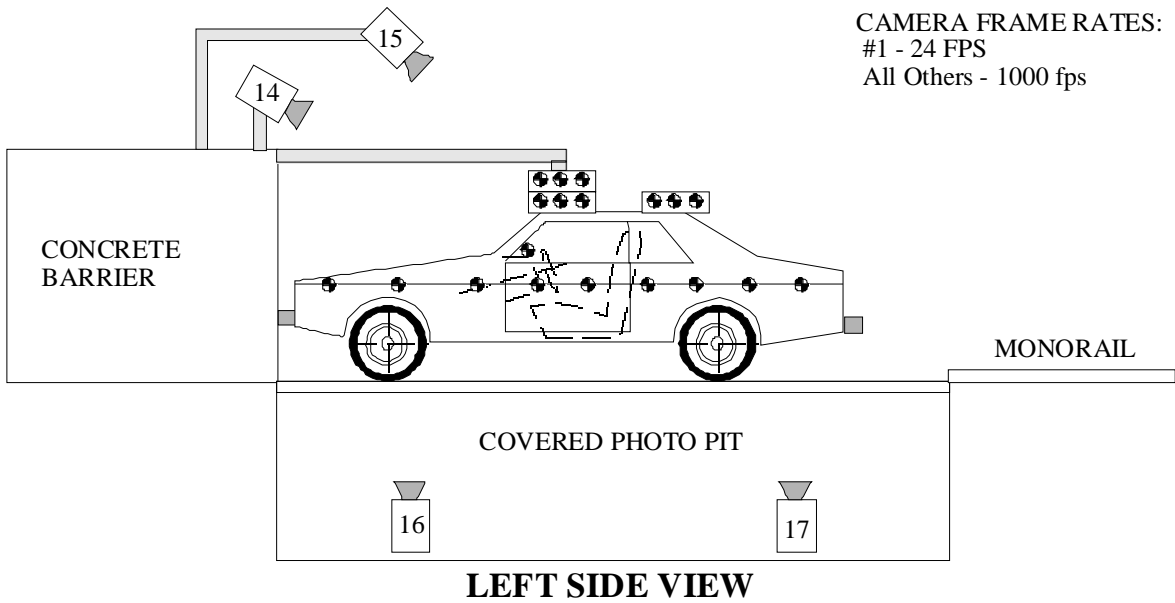
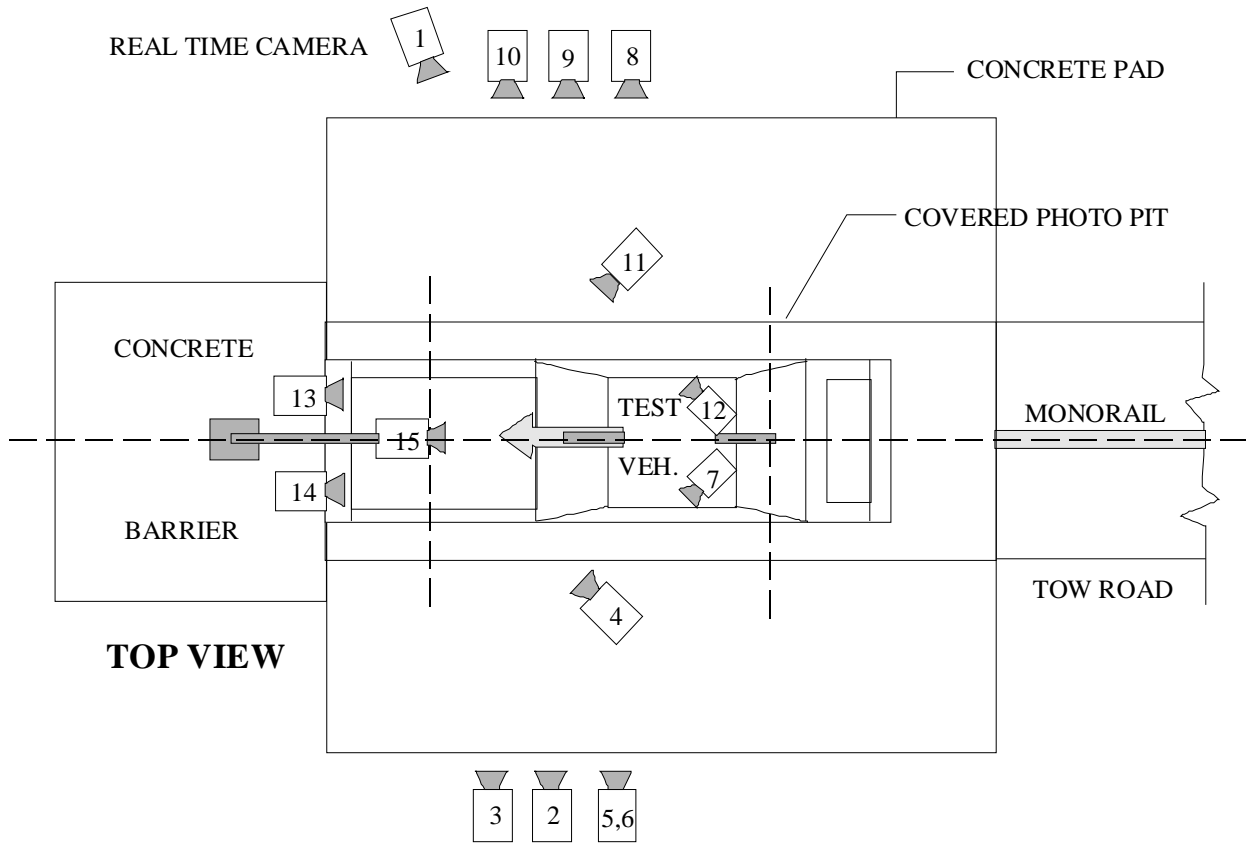
DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

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

DATA SHEET NO. 10
TEST VEHICLE MEASUREMENTS



DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS



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

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

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)*			ANGLE (deg)**	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	30
2	Overall Left Side	7375	1854	986	-2.2	6951	28	1000
3	Left Side View	9294	1062	948	0.0	8870	50	1000
4	Driver and Interior View	7950	2690	2040	-10.5	-	35	500
5	Steering Column (Bottom)	7861	1977	1205	-4.0	7437	25	1000
6	Steering Column (Top)	7861	1977	1806	-9.3	7437	28-70	1000
7	Left CRS Lateral View	-	-	-	-	-	-	-
8	Overall Right Side	7805	2010	1065	-3.8	7381	28	500
9	Right Side View	9398	1244	1052	-2.0	8974	50	1000
10	Right Passenger View	8797	1719	1159	-1.1	8373	35	1000
11	Passenger and Interior View	7621	2777	1985	-9.6	-	35	500
12	Right CRS Lateral View	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-32.8	-	13	500
14	Driver Front View	620	-92	1987	-33.1	-	13	500
15	Windshield View	0	-530	3374	-52.1	-	20	500
16	Pit View of Engine	0	615	-3048	90	-	13	500
17	Pit View of Fuel Tank	0	2745	-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

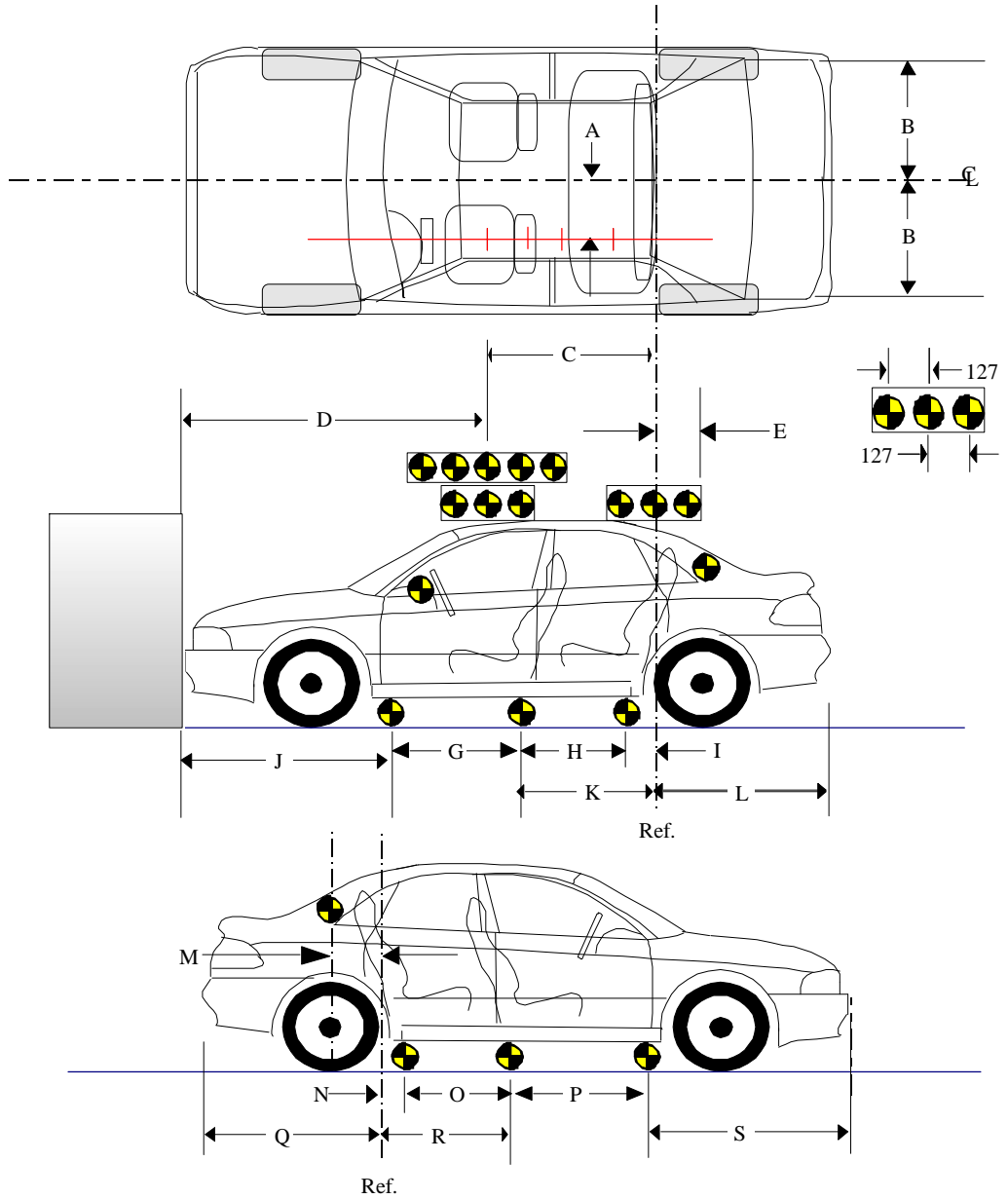
Z = film plane to ground

DATA SHEET NO. 12
VEHICLE REFERENCE PHOTO TARGET LOCATIONS

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

(Dimensions in millimeters)

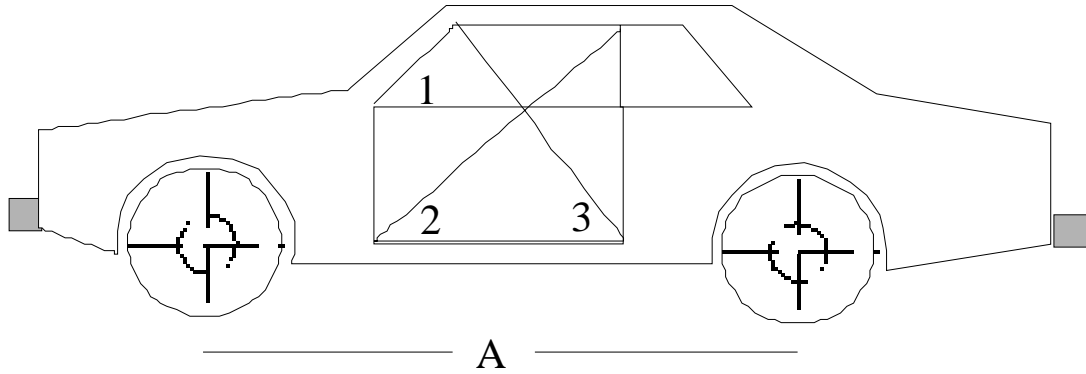
A	348
B	677
C	1222
D	2286
E	539
F	1573
G	947
H	950
I	108
J	1568
K	1058
L	1613
M	534
N	110
O	948
P	951
Q	1611
R	1058
S	1566



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

DOOR OPENING WIDTH AND WHEELBASE MEASUREMENTS



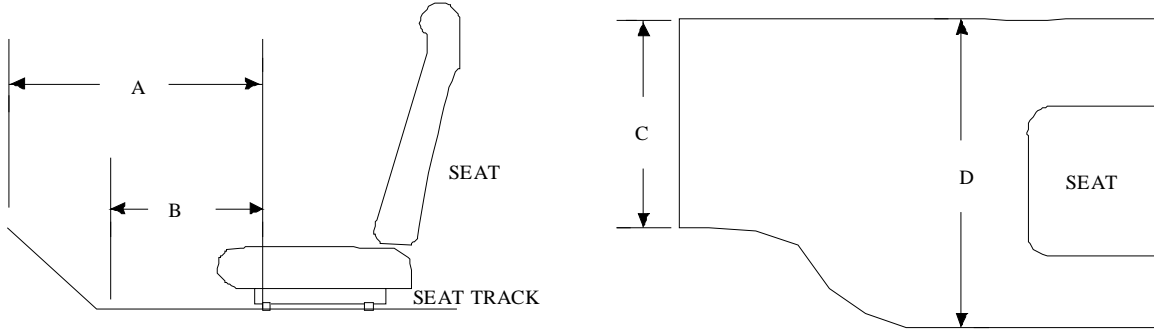
UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	946	1374	985	946	1374	984
AFTER TEST	943	1378	985	941	1381	984
DIFFERENCE	3	-4	0	5	-7	0

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2866	2865
AFTER TEST	2826	2834
DIFFERENCE	40	31

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont)

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

STATIC FOOTWELL DEFORMATION



DRIVER

Measurement	Pre-Test	Post-Test	Difference
A	684	662	22
B	508	507	1
C	424	428	-4
D	427	427	0

PASSENGER

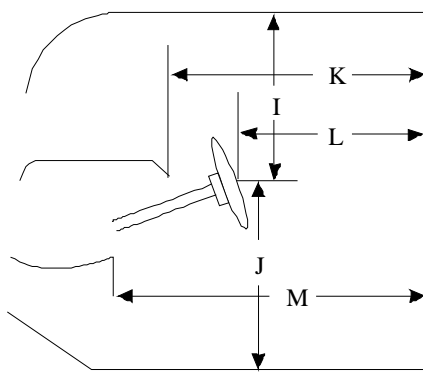
Measurement	Pre-Test	Post-Test	Difference
A	572	575	-3
B	374	383	-9
C	415	418	-3
D	420	421	-1

Units = mm

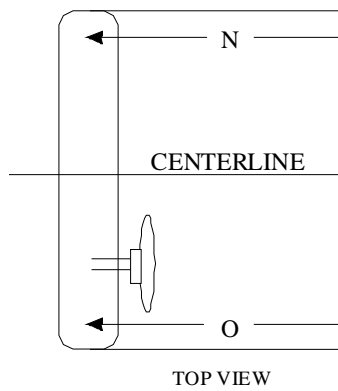
DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

STATIC PASSENGER COMPARTMENT INTRUSION

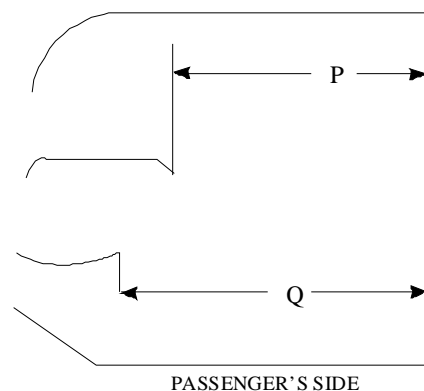


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



PASSENGER'S SIDE

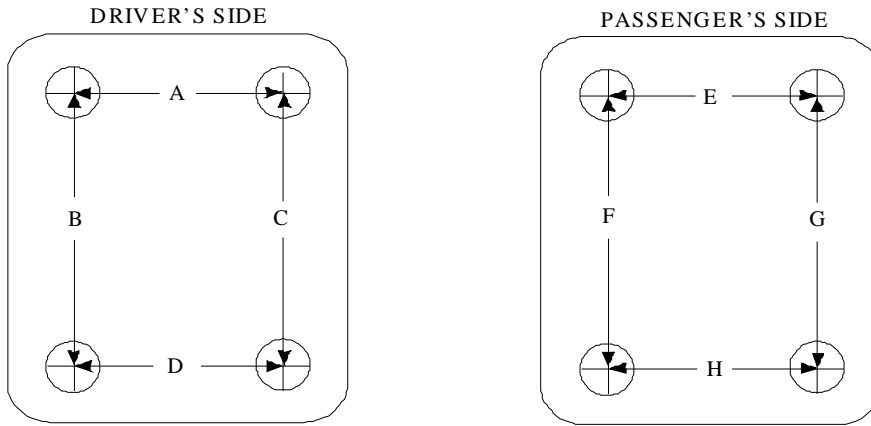
Measurement	Pre-Test	Post-Test	Difference
I	427	449	-22
J	659	639	20
K	749	750	-1
L	536	628	-92
M	796	800	-4
N	729	732	-3
O	730	729	1
P = K (PASS.)	781	781	0
Q = M (PASS.)	781	788	-7

Units = mm

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

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan

FLOORBOARD DEFORMATION



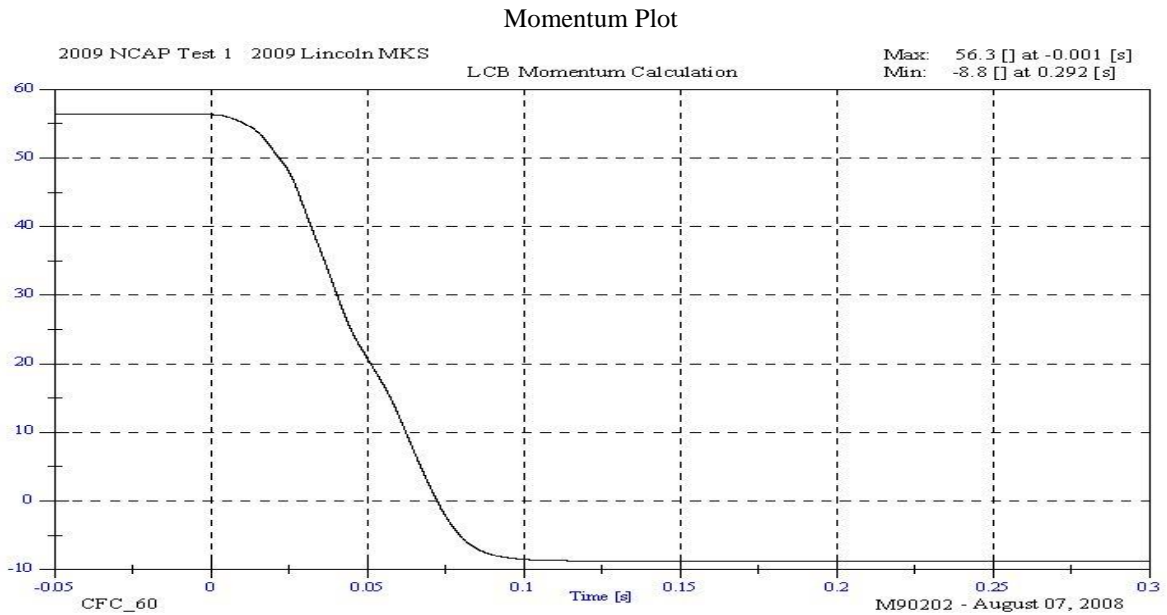
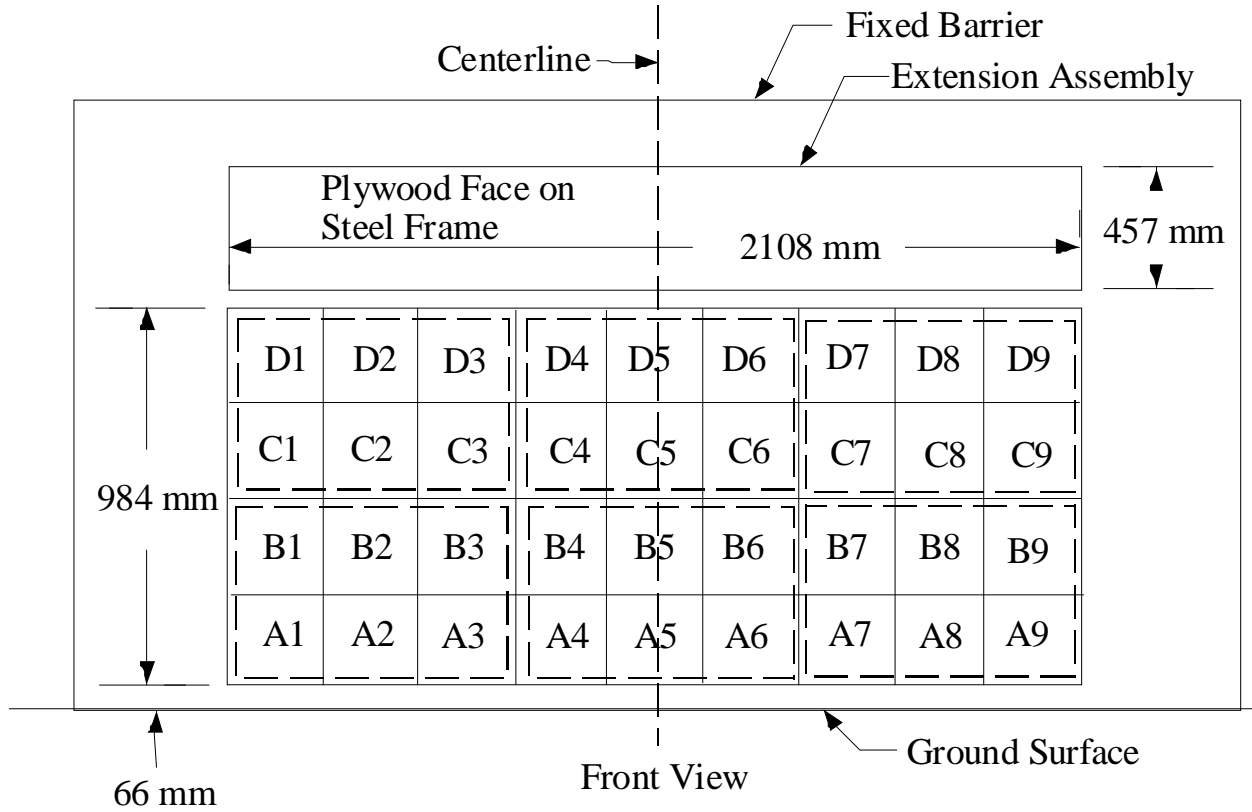
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	424	428	-4
B	288	291	-3
C	239	240	-1
D	427	427	0
E	415	418	-3
F	294	294	0
G	252	255	-3
H	420	421	-1

Units = mm

DATA SHEET NO.14
LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells
4 Rows
9 Columns



DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Lincoln MKS 4-door Sedan

NHTSA Test No.: M90202 VIN: 1LNHM94RX9G604031

Model Year: 2009 Build Date: 06/08 Test Date: 8/7/08

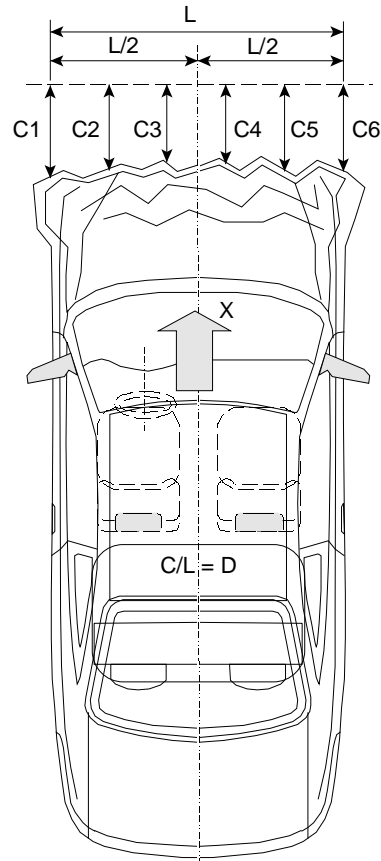
Vehicle Size Category: Sedan Test Weight: 2169 kg

Vehicle Wheelbase: 2866 mm; Front Overhang: 1071 mm; Overall Width: 1810 mm

Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	5002	4575	427
C2 =	5121	4624	497
C3 =	5172	4673	499
C4 =	5171	4687	484
C5 =	5118	4654	464
C6 =	5002	4595	407



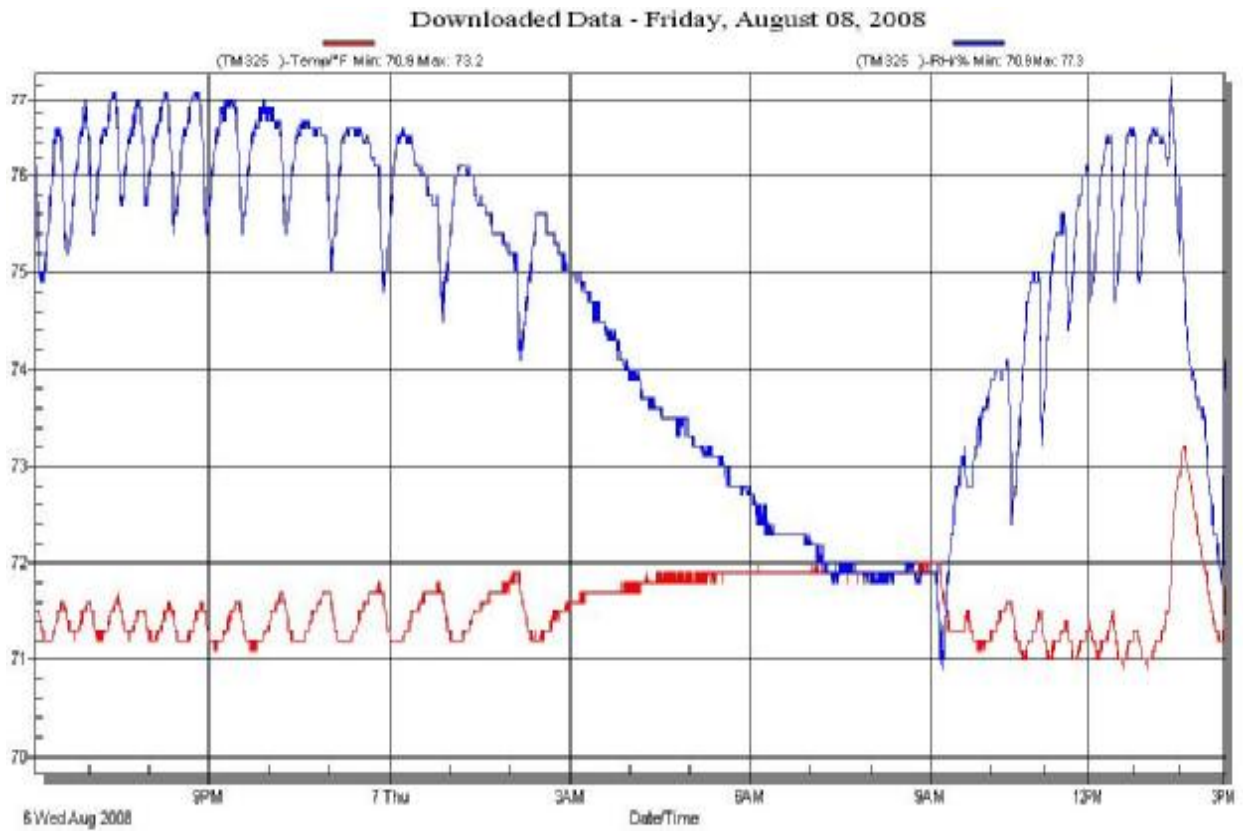
Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

Length of Damaged Region:

L1=	<u>1163</u>	mm
L2=	<u>581.5</u>	mm
L5=	<u>232.6</u>	mm

DATA SHEET NO.16
VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART

NHTSA Test No.: M90202 Vehicle: 2009 Lincoln MKS 4-door Sedan



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-1	Load Cell Locations	A-4
A-2	Vehicle Certification Placard	A-5
A-3	Tire Placard	A-5
A-4	Right Front, As Received	A-6
A-5	Left Rear, As Received	A-6
A-6	Pre-Test Front View	A-7
A-7	Post-Test Front View	A-7
A-8	Pre-Test Left Side View	A-8
A-9	Post-Test Left Side View	A-8
A-10	Pre-Test Right Side View	A-9
A-11	Post-Test Right Side View	A-9
A-12	Pre-Test Right Front Three-Quarter View	A-10
A-13	Post-Test Right Front Three-Quarter View	A-10
A-14	Pre-Test Left Rear Three-Quarter View	A-11
A-15	Post-Test Left Rear Three-Quarter View	A-11
A-16	Left Rear Three-Quarter View Of Doors After Impact	A-12
A-17	Right Rear Three-Quarter View Of Doors After Impact	A-12
A-18	Pre-Test Windshield View	A-13
A-19	Post-Test Windshield View	A-13
A-20	Pre-Test Engine Compartment View	A-14
A-21	Post-Test Engine Compartment View	A-14
A-22	Pre-Test Fuel Cap View	A-15
A-23	Post-Test Fuel Cap View	A-15
A-24	Pre-Test Front Underbody View	A-16
A-25	Post-Test Front Underbody View	A-16
A-26	Pre-Test Mid Underbody View	A-17
A-27	Post-Test Mid Underbody View	A-17
A-28	Pre-Test Rear Underbody View	A-18
A-29	Post-Test Rear Underbody View	A-18
A-30	Pre-Test Driver Head Location	A-19
A-31	Post-Test Driver Head Location	A-19
A-32	Pre-Test Driver Position View	A-20
A-33	Post-Test Driver Position View	A-20
A-34	Pre-Test Driver And Interior View	A-21
A-35	Post-Test Driver And Interior View	A-21
A-36	Pre-Test Driver Feet View	A-22
A-37	Post-Test Driver Feet View	A-22
A-38	Pre-Test Driver Knee Bolster View	A-23
A-39	Post-Test Driver Knee Bolster View	A-23
A-40	Pre-Test Driver Floor Pan View	A-24
A-41	Post-Test Driver Floor Pan View	A-24
A-42	Post-Test Driver Head View	A-25
A-43	Post-Test Driver Contact To Airbag	A-25

TABLE OF PHOTOGRAPHS (CONTINUED)

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-44	Pre-Test Passenger Head Location	A-26
A-45	Post-Test Passenger Head Location	A-26
A-46	Pre-Test Passenger Position View	A-27
A-47	Post-Test Passenger Position View	A-27
A-48	Pre-Test Passenger And Interior View	A-28
A-49	Post-Test Passenger And Interior View	A-28
A-50	Pre-Test Passenger Feet View	A-29
A-51	Post-Test Passenger Feet View	A-29
A-52	Pre-Test Passenger Knee Bolster View	A-30
A-53	Post-Test Passenger Knee Bolster View	A-30
A-54	Pre-Test Passenger Floor Pan View	A-31
A-55	Post-Test Passenger Floor Pan View	A-31
A-56	Post-Test Passenger Head View	A-32
A-57	Post-Test Passenger Contact To Airbag	A-32
A-58	Rollover View - 90°	A-33
A-59	Rollover View - 180°	A-33
A-60	Rollover View - 270°	A-34
A-61	Rollover View - 360°	A-34
A-62	Impact View	A-35



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

Photo Not Available

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.: M90202

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

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
1	V1P1 Head CG x [g, CFC_1000]	B-8
2	V1P1 Head CG y [g, CFC_1000]	B-8
3	V1P1 Head CG z [g, CFC_1000]	B-8
4	V1P1 Head CG Resultant [g, CFC_1000]	B-8
5	V1P1 Chest x [g, CFC_180]	B-9
6	V1P1 Chest y [g, CFC_180]	B-9
7	V1P1 Chest z [g, CFC_180]	B-9
8	V1P1 Chest Resultant [g, CFC_180]	B-9
9	V1P1 Chest Compression x [mm, CFC_600]	B-10
10	V1P1 Left Femur z [N, CFC_600]	B-11
11	V1P1 Right Femur z [N, CFC_600]	B-11
12	V1P2 Head CG x [g, CFC_1000]	B-12
13	V1P2 Head CG y [g, CFC_1000]	B-12
14	V1P2 Head CG z [g, CFC_1000]	B-12
15	V1P2 Head CG Resultant [g, CFC_1000]	B-12
16	V1P2 Chest x [g, CFC_180]	B-13
17	V1P2 Chest y [g, CFC_180]	B-13
18	V1P2 Chest z [g, CFC_180]	B-13
19	V1P2 Chest Resultant [g, CFC_180]	B-13
20	V1P2 Chest Compression x [mm, CFC_600]	B-14
21	V1P2 Left Femur z [N, CFC_600]	B-15
22	V1P2 Right Femur z [N, CFC_600]	B-15

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

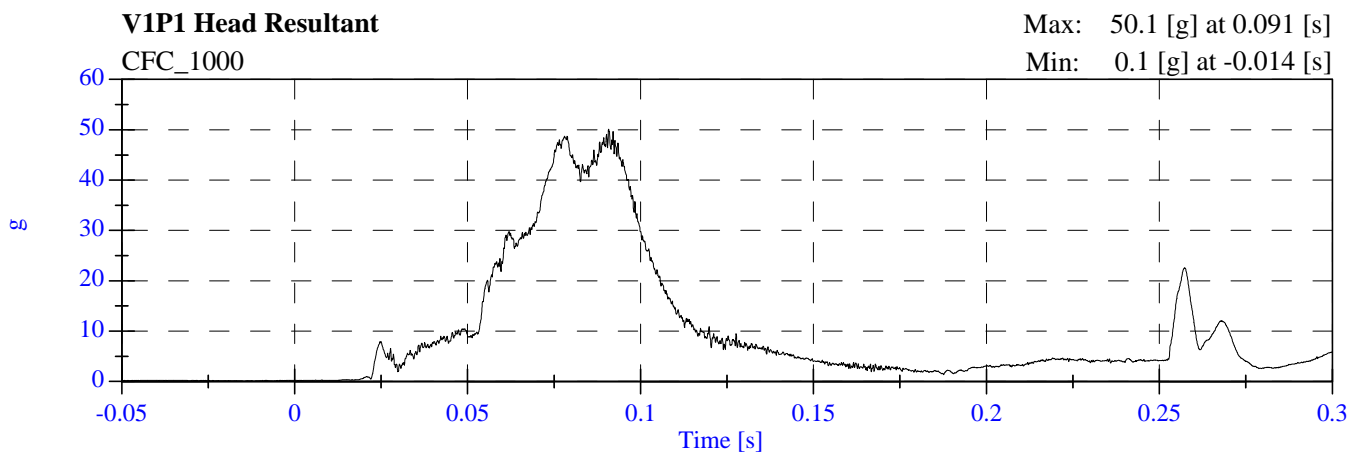
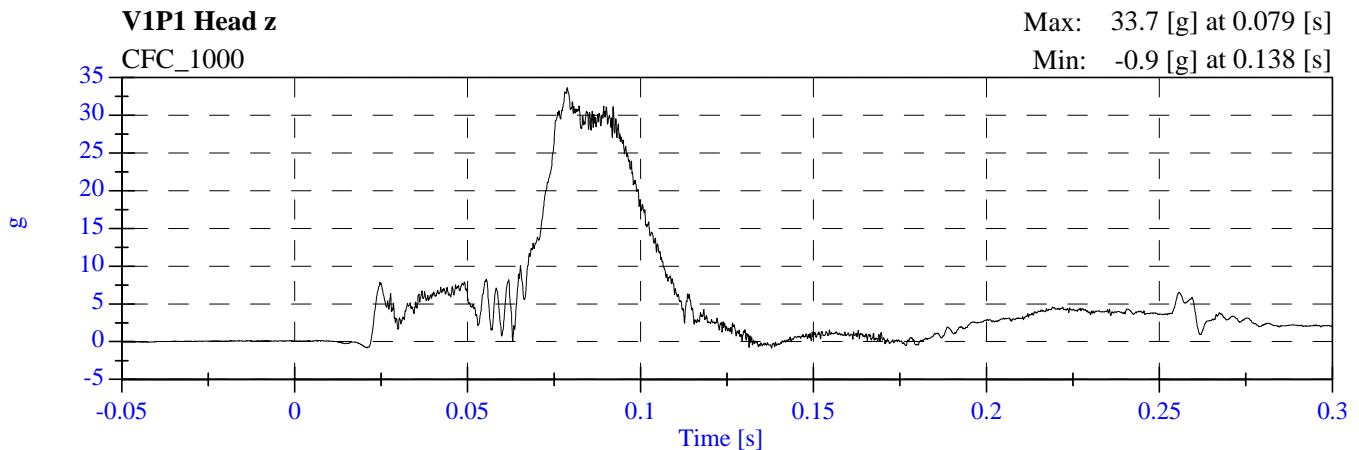
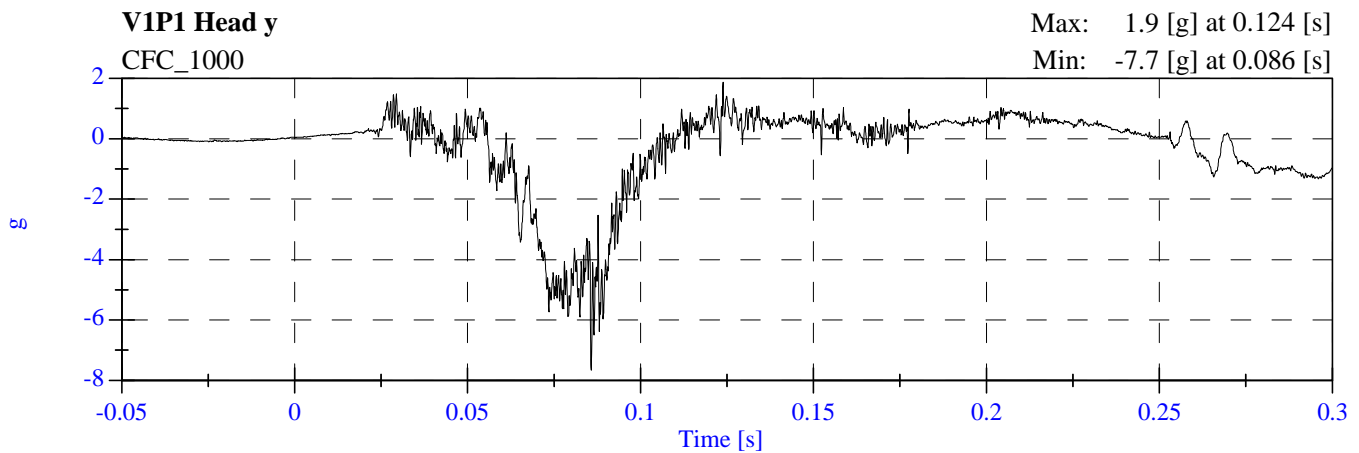
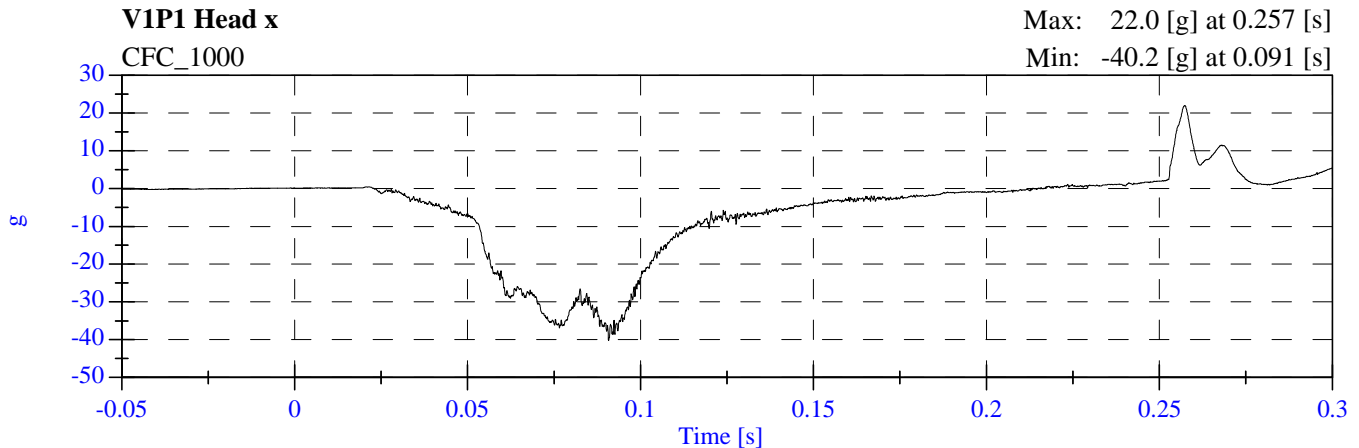
V1P1 Head 9 Array X Arm Ay	V1P1 Lap Belt Load
V1P1 Head 9 Array X Arm Az	V1P1 Shoulder Belt Load
V1P1 Head 9 Array Y Arm Ax	V1P2 Lap Belt Load
V1P1 Head 9 Array Y Arm Az	V1P2 Shoulder Belt Load
V1P1 Head 9 Array Z Arm Ax	V1 Left Rear #1x
V1P1 Head 9 Array Z Arm Ay	V1 Right Rear #2x
V1P1 Head CG Ax	V1 Engine Top #3x
V1P1 Head CG Ay	V1 Engine Bottom #4x
V1P1 Head CG Az	V1 Right Caliper #5x
V1P1 Head CG Red Ax	V1 Left Caliper #7x
V1P1 Head CG Red Ay	V1 Left Rear #8z
V1P1 Head CG Red Az	V1 Right Rear #9z
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	
V1P2 Head 9 Array X Arm Ay	

V1P2 Head 9 Array X Arm Az	
V1P2 Head 9 Array Y Arm Ax	
V1P2 Head 9 Array Y Arm Az	
V1P2 Head 9 Array Z Arm Ax	
V1P2 Head 9 Array Z Arm Ay	
V1P2 Head CG Ax	
V1P2 Head CG Ay	
V1P2 Head CG Az	
V1P2 Head CG Red Ax	
V1P2 Head CG Red Ay	
V1P2 Head CG Red Az	
V1P2 Upper Neck Fx	
V1P2 Upper Neck Fy	
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	
Barrier Load Cell A1 Fx	
Barrier Load Cell A2 Fx	
Barrier Load Cell A3 Fx	
Barrier Load Cell A4 Fx	

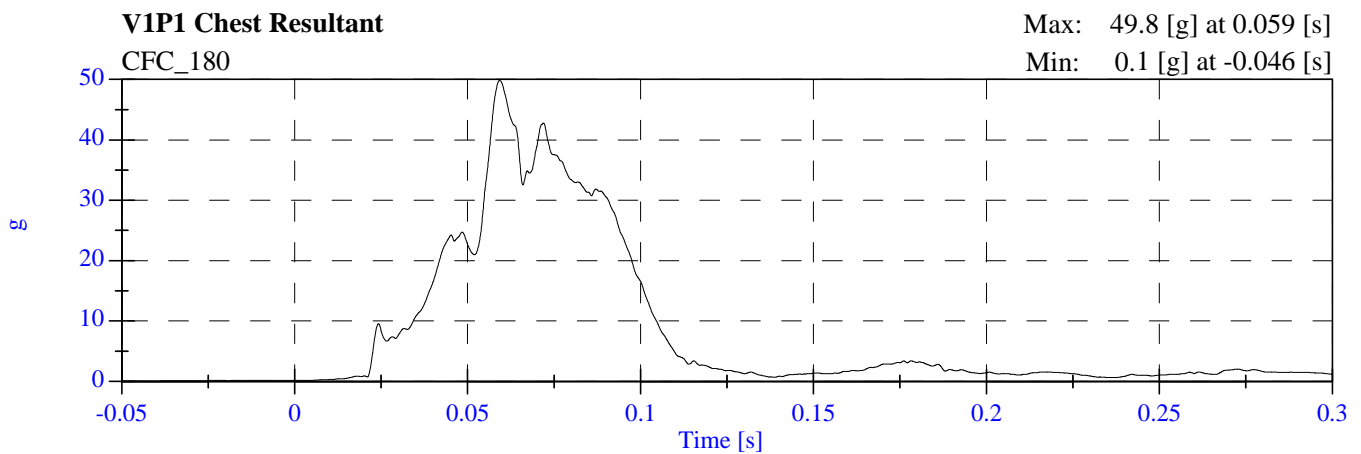
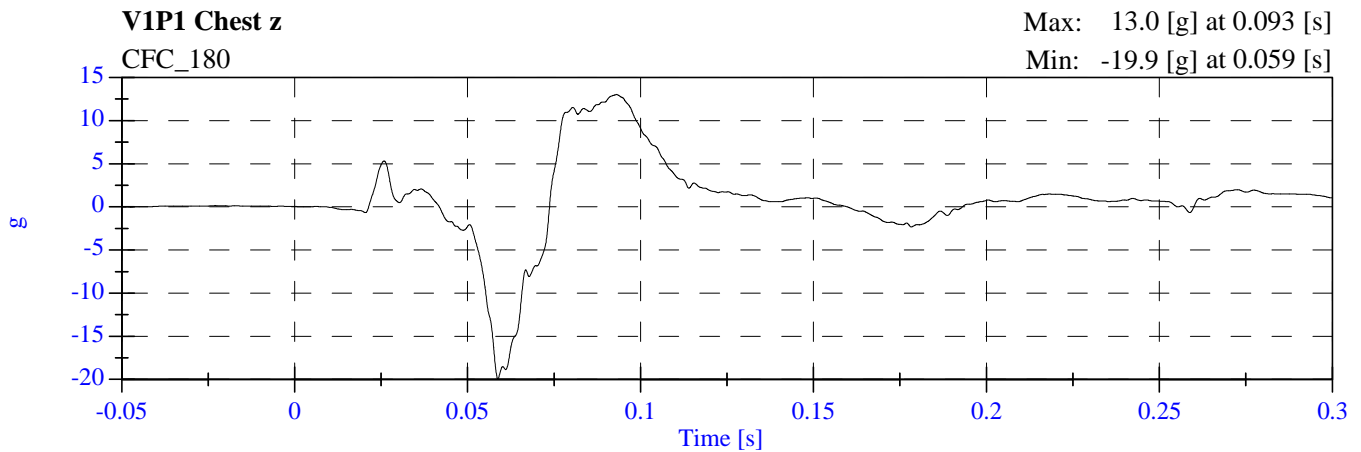
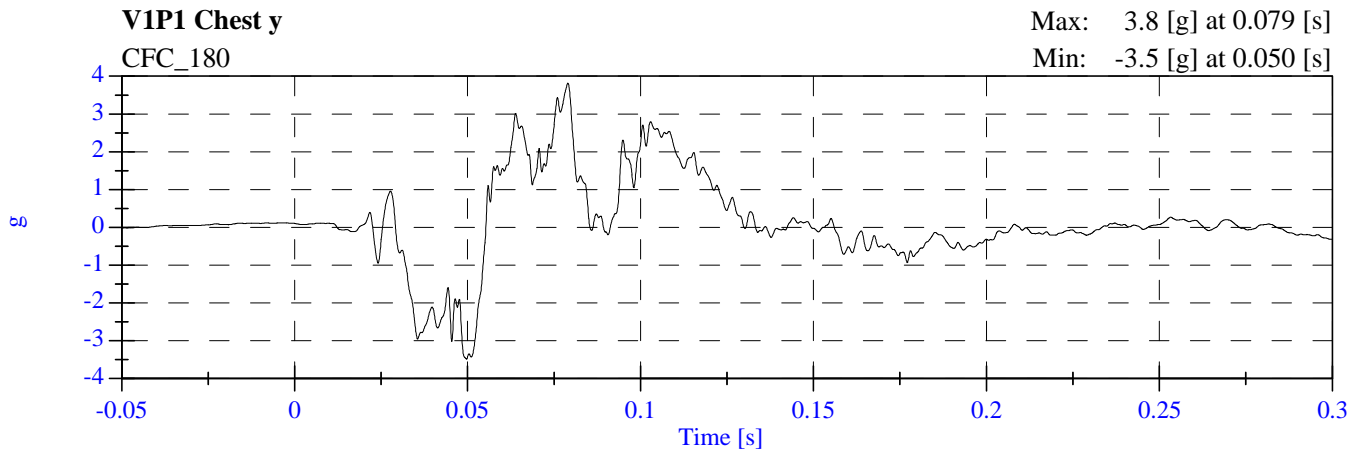
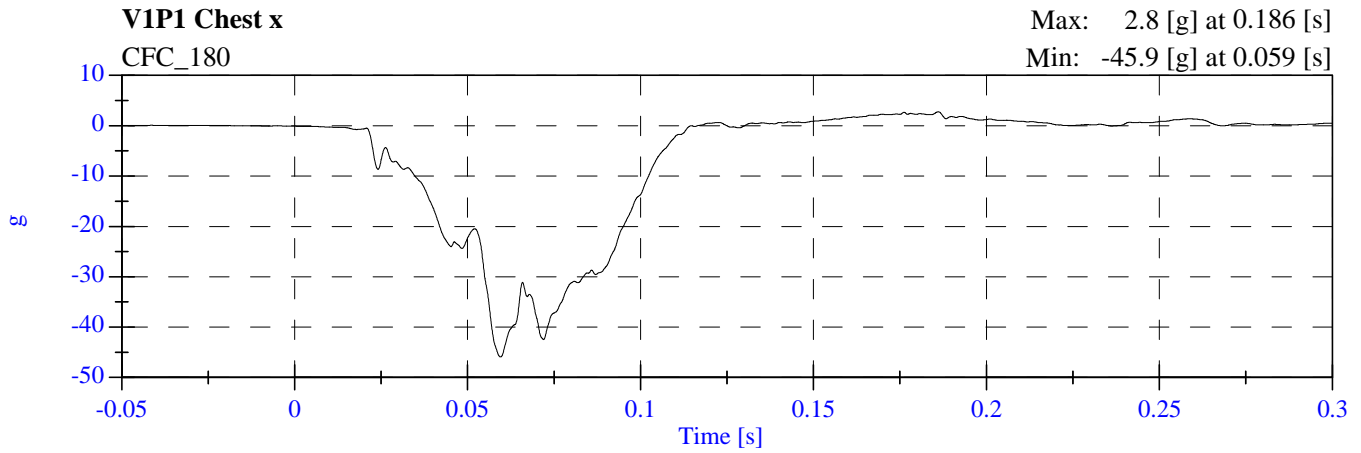
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Barrier Load Cell B2 Fx	
Barrier Load Cell B3 Fx	
Barrier Load Cell B4 Fx	
Barrier Load Cell B5 Fx	
Barrier Load Cell B6 Fx	
Barrier Load Cell B7 Fx	
Barrier Load Cell B8 Fx	
Barrier Load Cell B9 Fx	
Barrier Load Cell C1 Fx	
Barrier Load Cell C2 Fx	
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	
Barrier Load Cell D6 Fx	
Barrier Load Cell D7 Fx	
Barrier Load Cell D8 Fx	
Barrier Load Cell D9 Fx	

TEST NOTES	
Data Channel	Anomalies
V1P1 Right Foot Aft z	Wire cut at 68 msec
V1P2 Upper Neck Mx	Data inaccurate
V1P2 Right Lower Tibia Fz	Data Inaccurate after 72 msec
V1P1 Chest Red z	Data inaccurate after 77 msec
V1 Right Caliper #5x	Data inaccurate

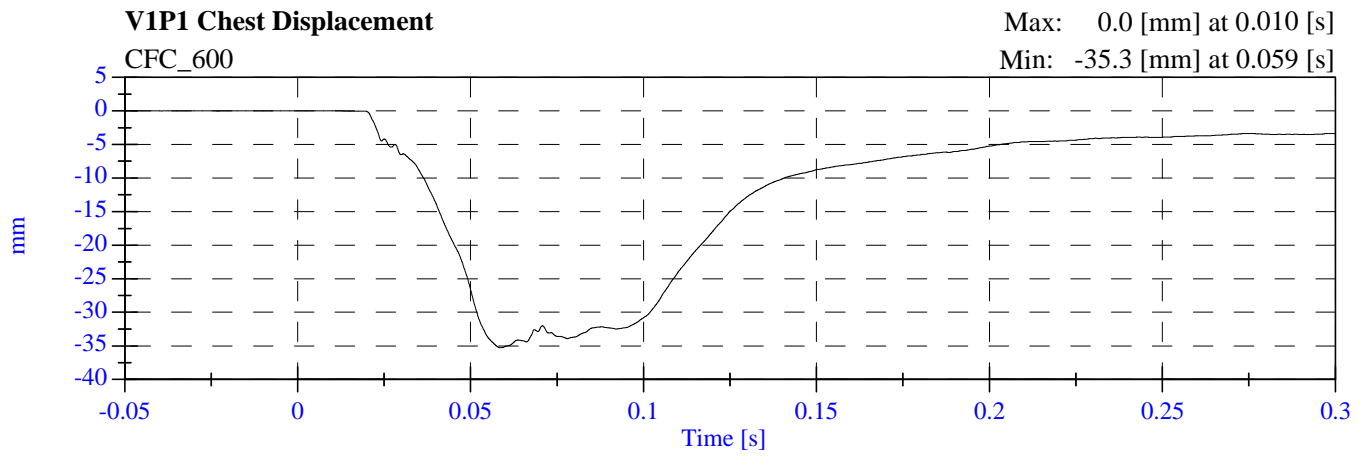
2009 NCAP Test 1 2009 Lincoln MKS M90202 - August 07, 2008



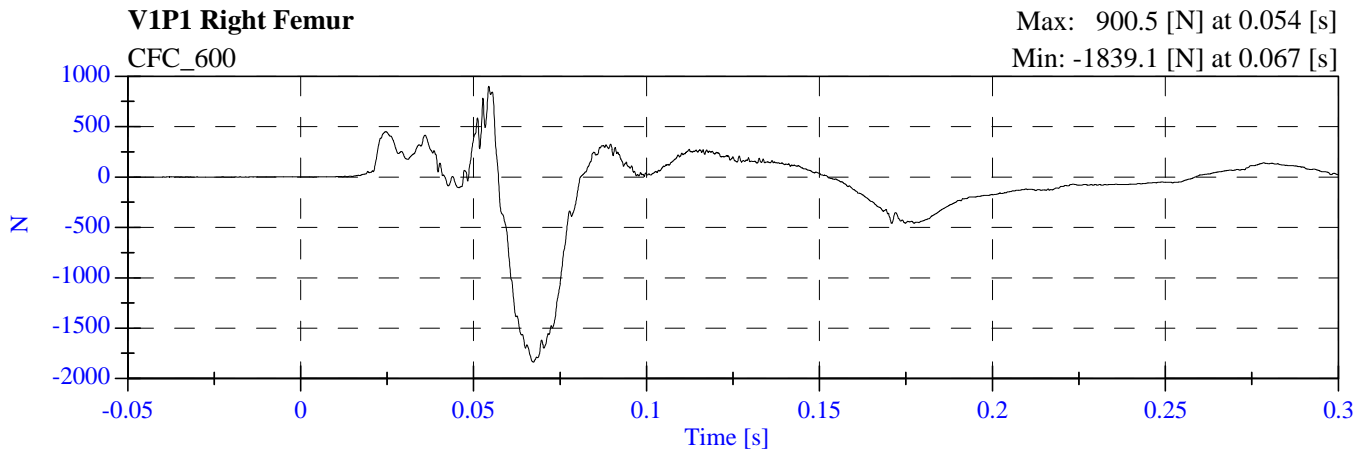
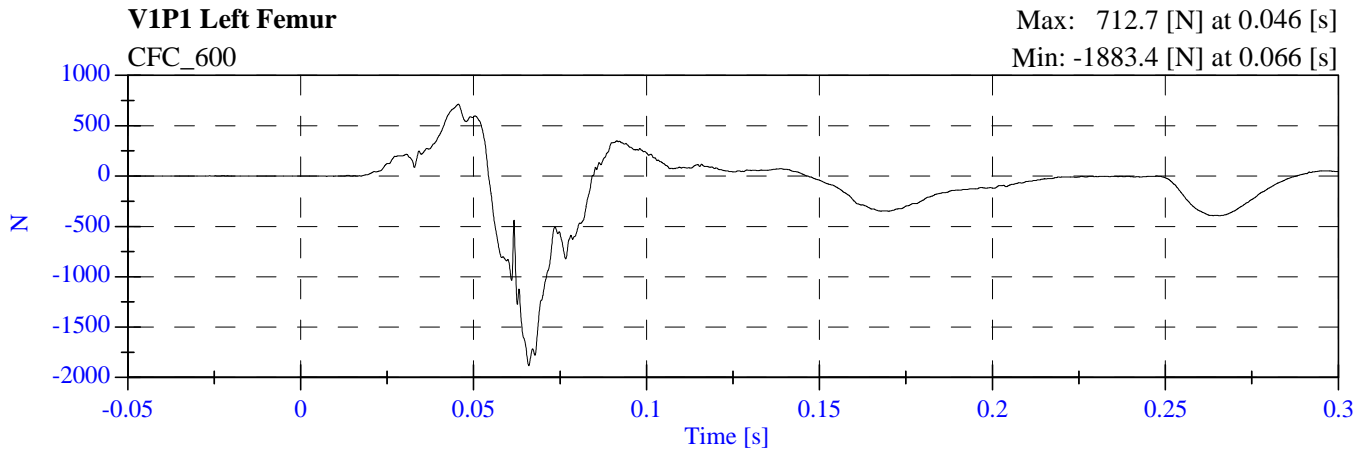
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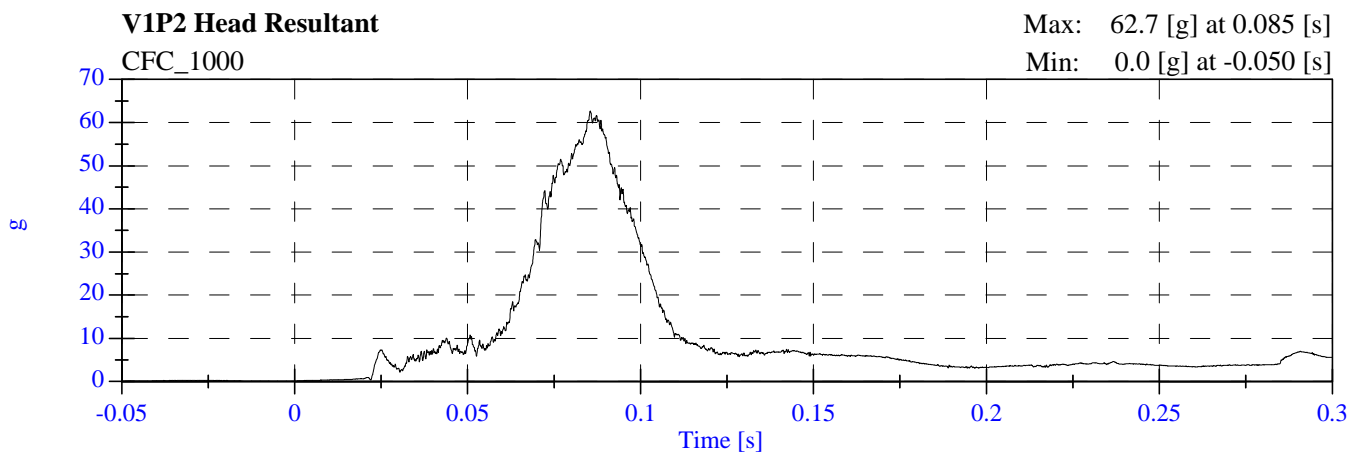
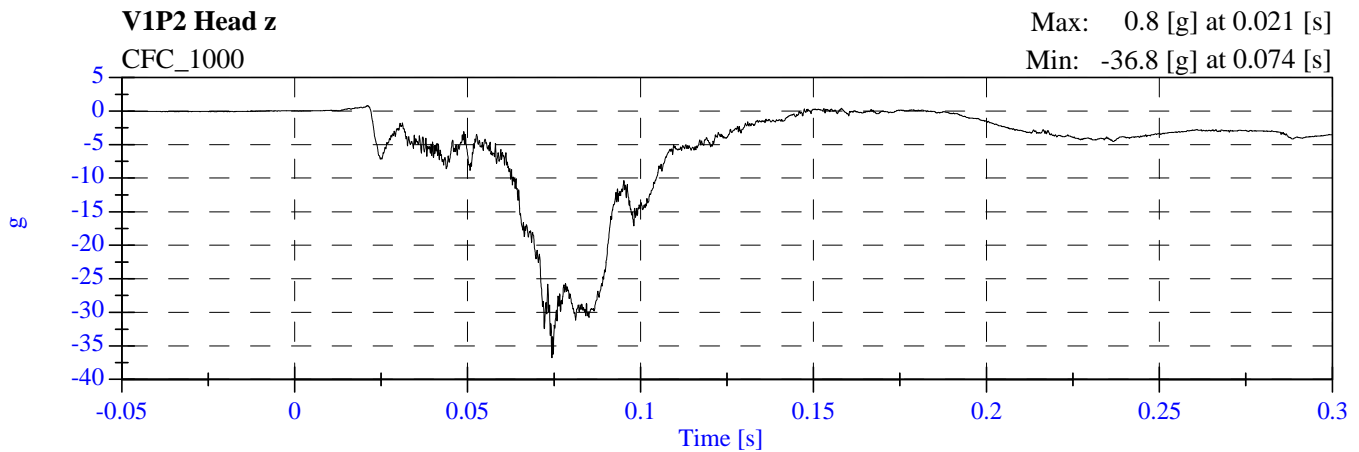
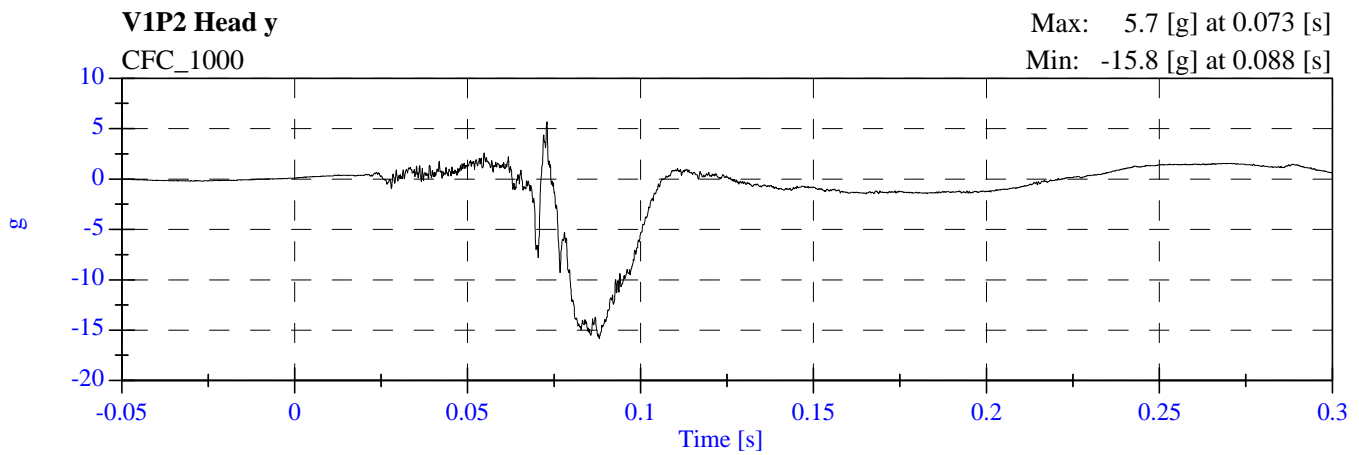
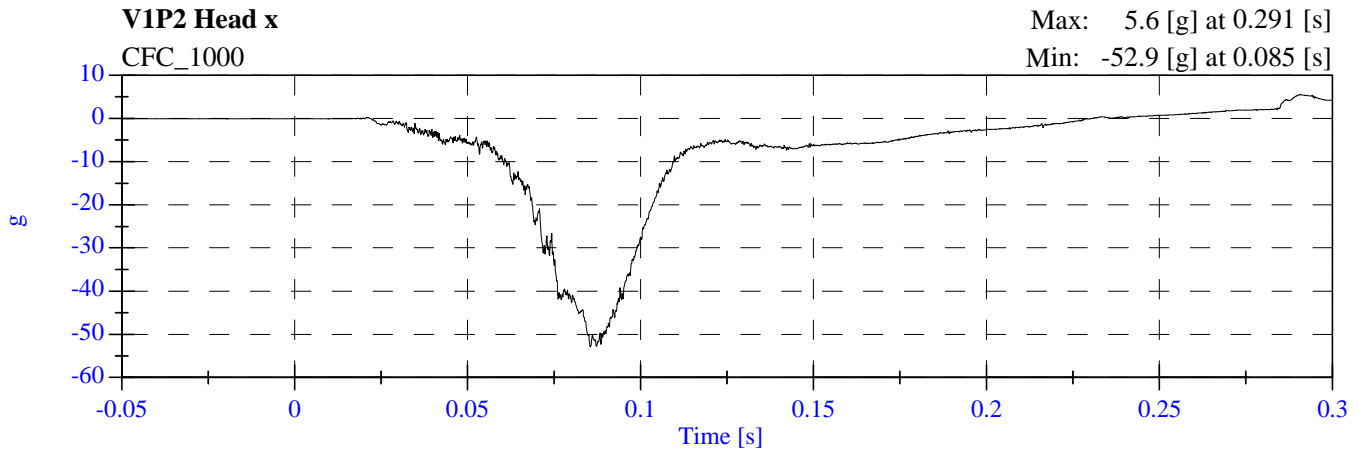
**2009 NCAP Test 1 2009 Lincoln MKS
M90202 - August 07, 2008**



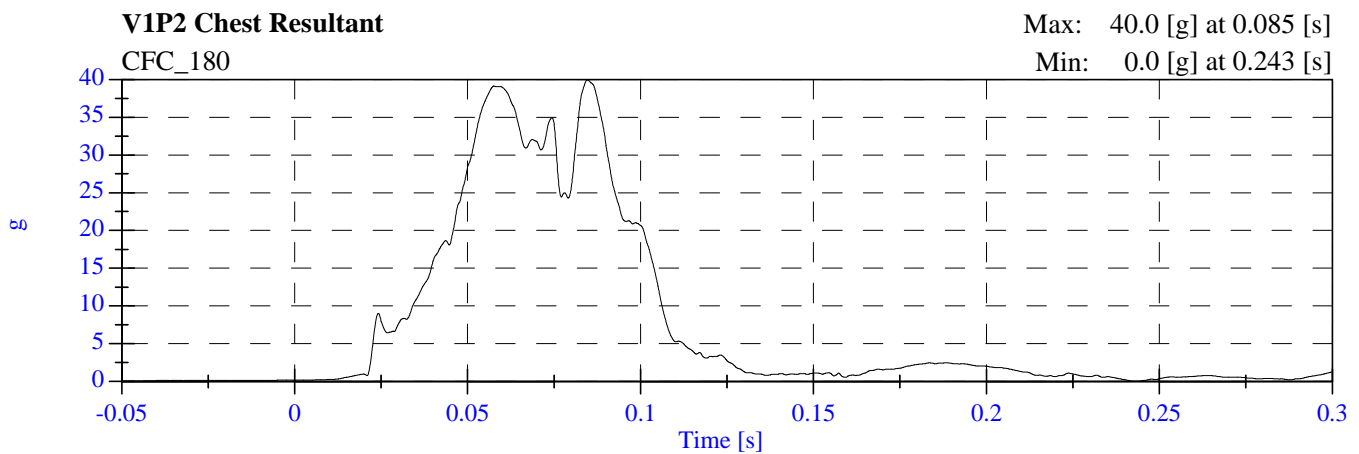
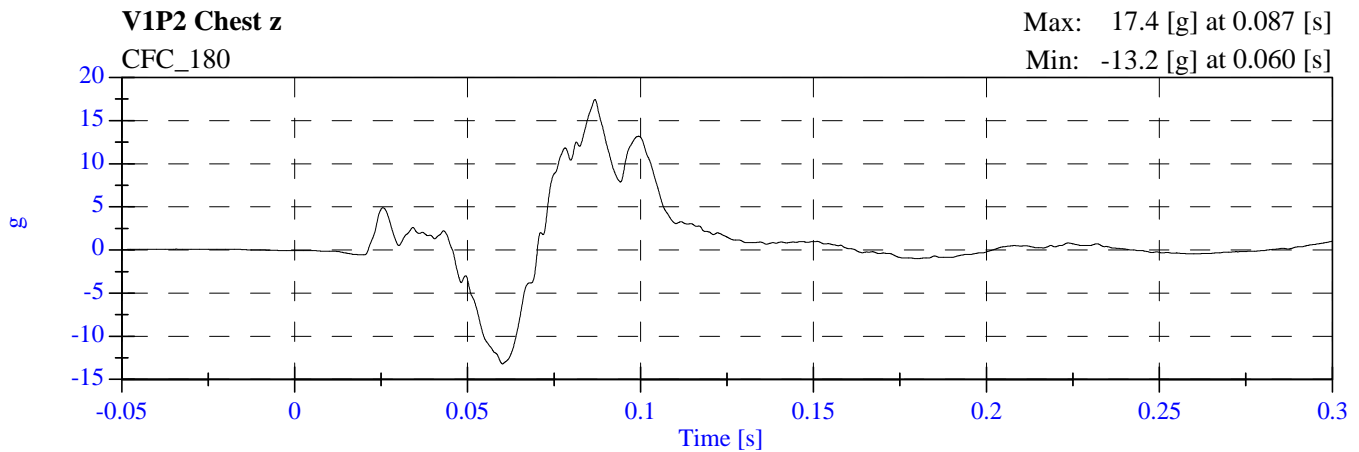
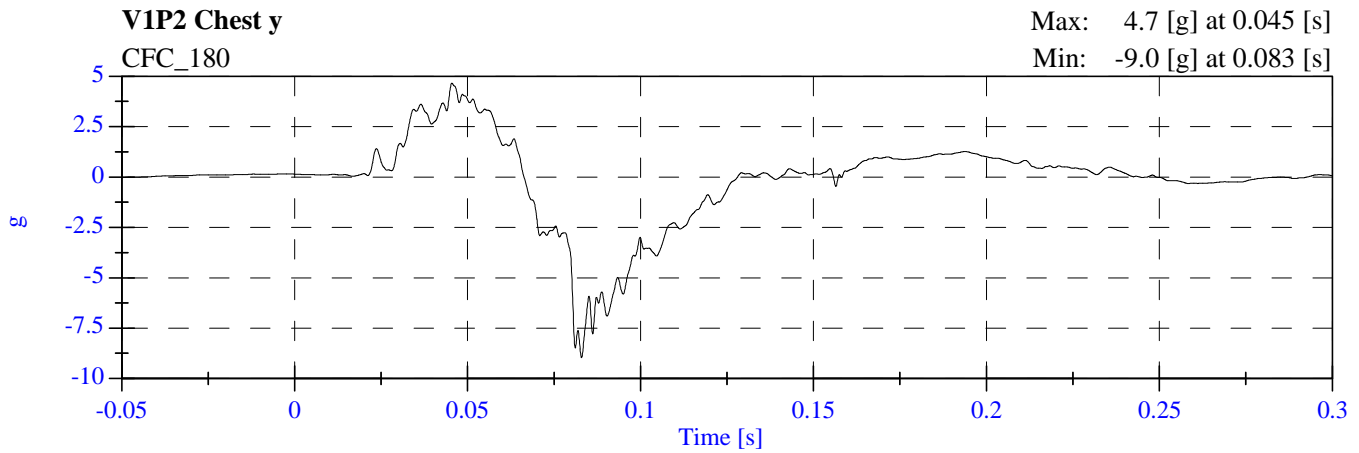
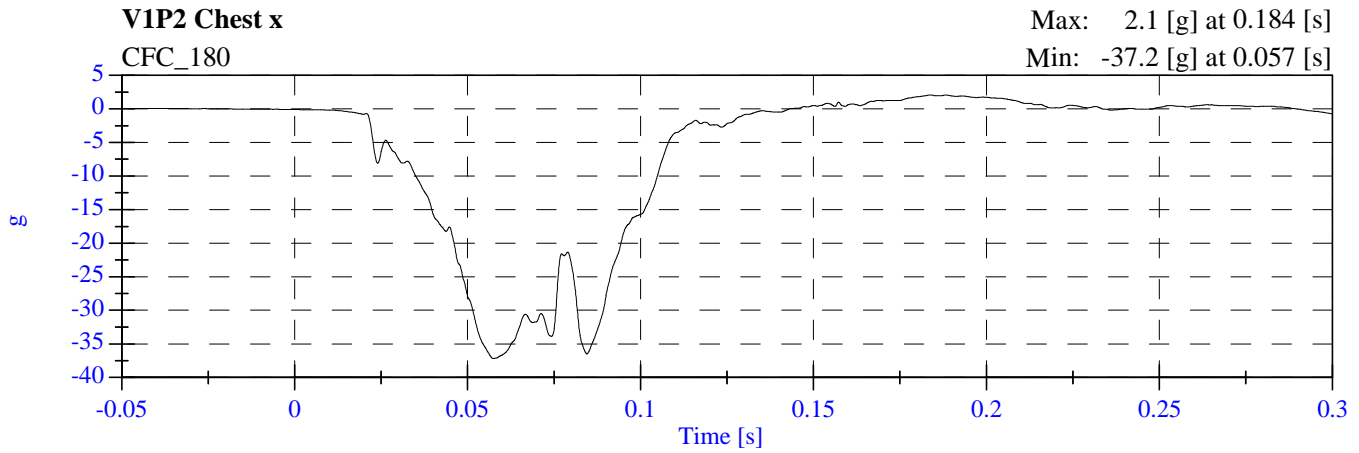
**2009 NCAP Test 1 2009 Lincoln MKS
M90202 - August 07, 2008**



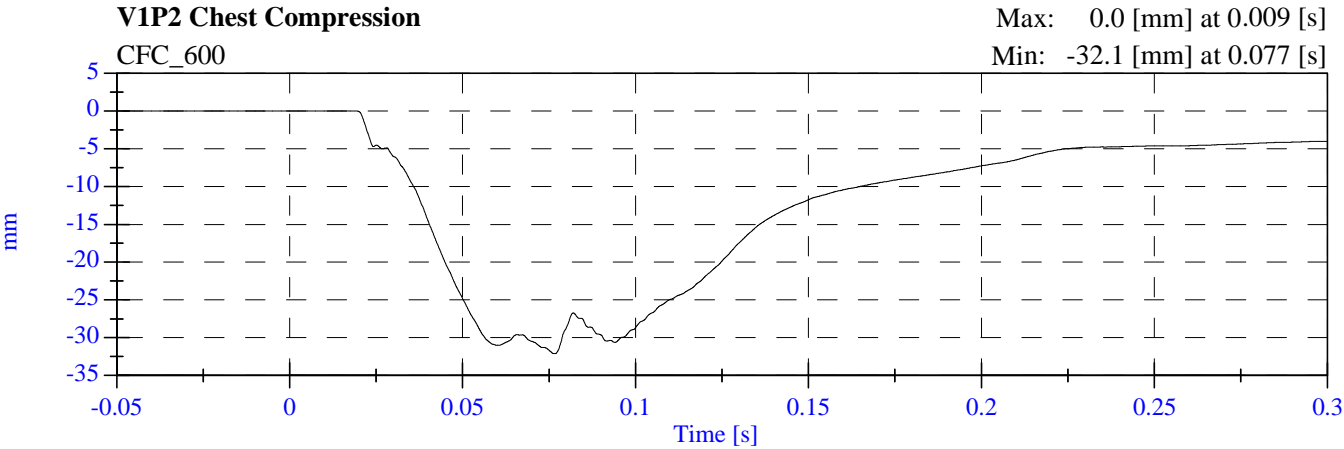
2009 NCAP Test 1 2009 Lincoln MKS M90202 - August 07, 2008



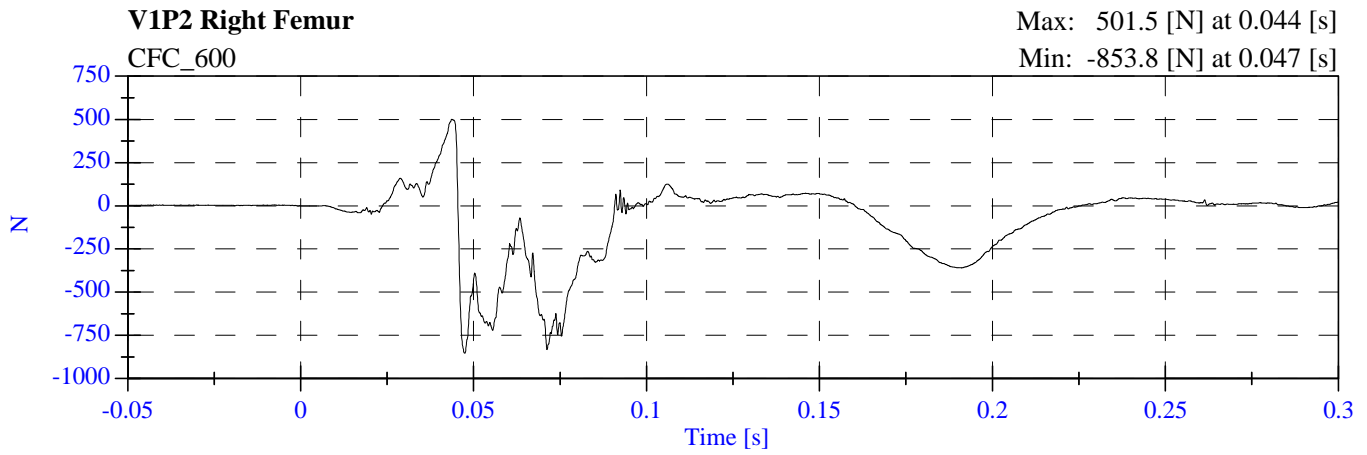
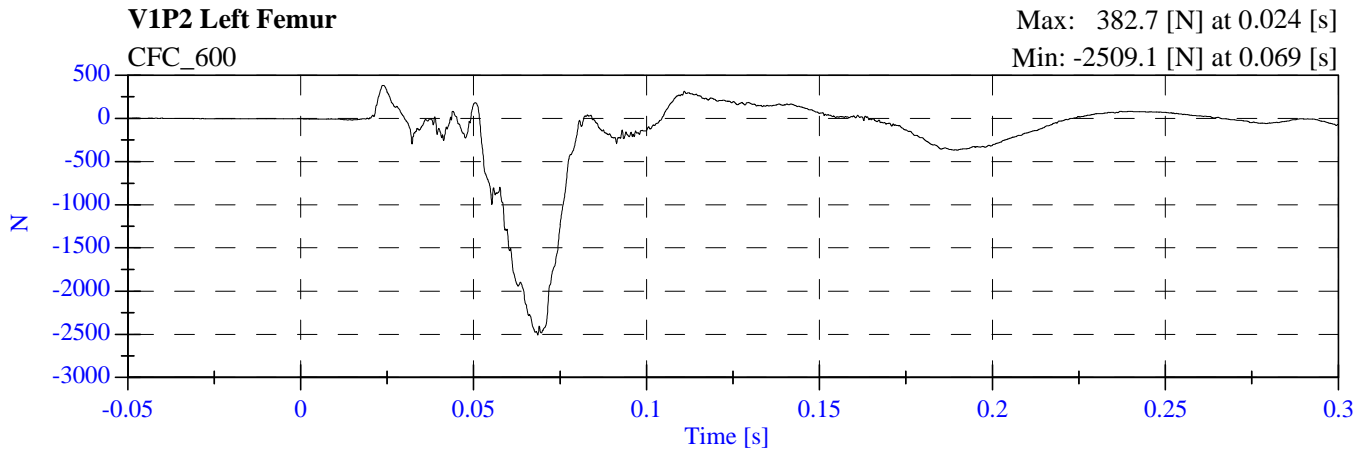
2009 NCAP Test 1 2009 Lincoln MKS M90202 - August 07, 2008



**2009 NCAP Test 1 2009 Lincoln MKS
M90202 - August 07, 2008**



**2009 NCAP Test 1 2009 Lincoln MKS
M90202 - August 07, 2008**



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.

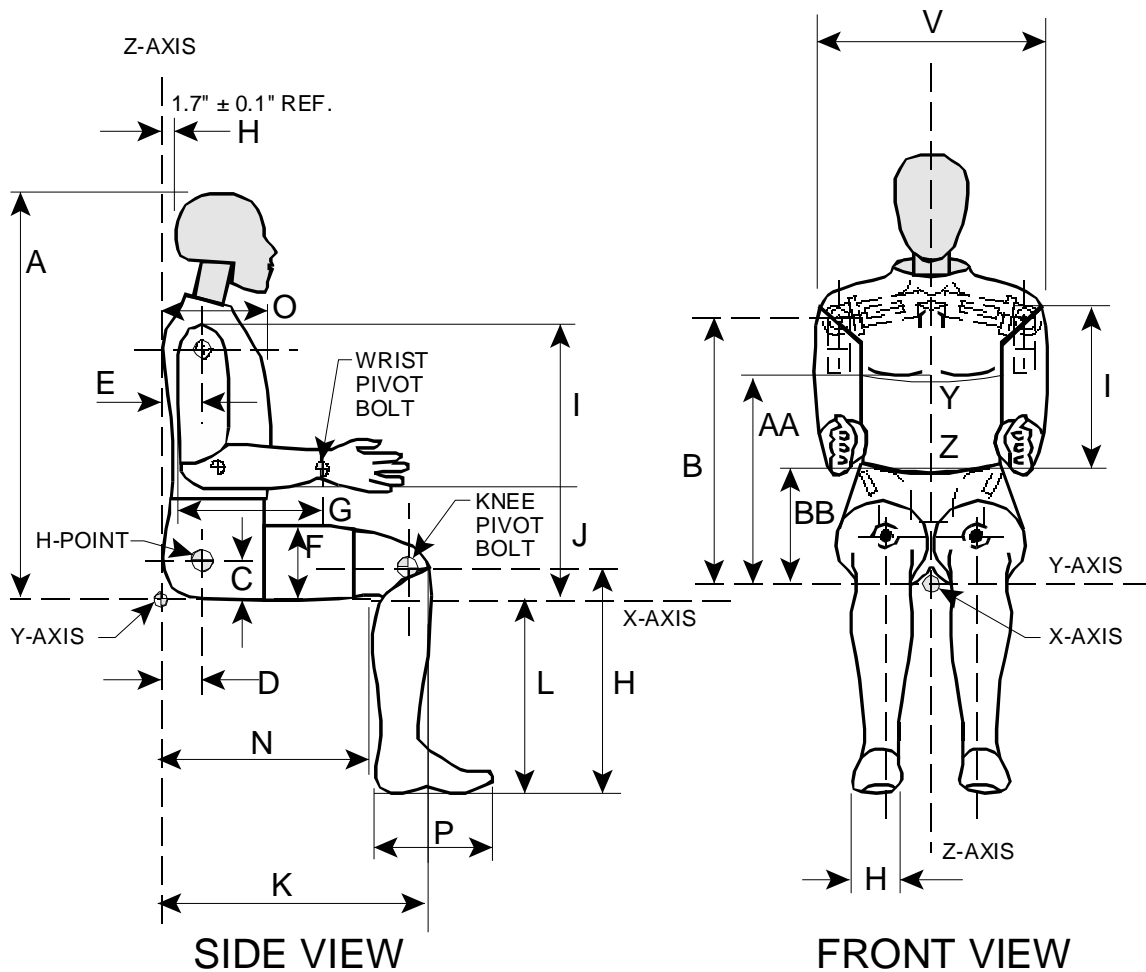
Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	1046	3/26/08
#2/Right Front Passenger	1047	3/26/08

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 1046
Sequential Test Number 1
Date 3/20/08
Workfile 1046H 3-20-08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Peak Resultant Acceleration	225-275 G's	247.79
Peak Lateral Acceleration	15 G's Max	4.65
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	1046	
Sequential Test Number	1	
Date	3/24/08	6 Axis Neck Transducer
Workfile	1046NF7 3/21/08	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	33.0
Impact Velocity		6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	22.68
	20 ms	17.60 - 22.60 G's	21.02
	30 ms	12.50 - 18.50 G's	15.79
Max Pendulum G's Above 30 ms		29 G's Max	15.79
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	40.00
D Plane Rotation	Max	64 - 78 Deg	66.17
	Time	57 - 64 ms	59.50
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	96.68
	Time	47 - 58 ms	52.50
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	116.10
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.20

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	1046	
Sequential Test Number	1	
Date	3/24/08	6 Axis Neck Transducer
Workfile	1046NE5 3/24/08	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	33.0
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	19.19
	20 ms	14.00 - 19.00 G's	17.66
	30 ms	11.00 - 16.00 G's	13.31
Max Pendulum G's Above 30 ms		22 G's Max	13.31
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	42.10
D Plane Rotation	Max	81 - 106 Deg	94.37
	Time	72 - 82 ms	75.30
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-71.76
	Time	65 - 79 ms	70.90
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	153.20
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	135.50

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 1046
Sequential Test Number 1
Date 3/25/08
Workfile 1046T 3/25/08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Pendulum Velocity	6.58 – 6.83 m/s	6.70
Maximum Deflection	63.50 – 72.64 mm	63.55
Maximum Resistive Force	5159.9 – 5893.9 N	5563
Internal Hysteresis	69 - 85 %	72.63

Remarks:

Laboratory Technician:

_____ B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 1046
 Sequential Test Number 1
 Date 3/26/08
 Workfile 1046 LF RF

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5006.63
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5416.02

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 1046
Sequential Test Number 1
Date 3/26/08

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21.1
Relative Humidity			33.0
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	34.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.0
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.3
Thigh Clearance	F	5.5 - 6.1 in	5.6
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.9
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.3
Elbow Rest Height	J	7.5 - 8.3 in	7.8
Buttock Knee Length	K	22.8 - 23.8 in	23.1
Popliteal Height	L	16.9 - 17.9 in	17.6
Knee Pivot Height	M	19.1 - 19.7 in	19.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.3
Chest Depth	O	8.4 - 9.0 in	8.7
Foot Length	P	9.9 - 10.5 in	9.9
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Foot Breadth	W	3.6 - 4.2 in	3.8
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.7
Waist Circumference	Z	32.9 - 34.1 in	33.5

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 1047
Sequential Test Number 1
Date 3/20/08
Workfile 1047H 3/20/08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Peak Resultant Acceleration	225-275 G's	261.65
Peak Lateral Acceleration	15 G's Max	7.47
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	1047	
Sequential Test Number	1	
Date	3/24/08	6 Axis Neck Transducer
Workfile	1047NF 3/24/08	

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Impact Velocity	6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's
	20 ms	17.60 - 22.60 G's
	30 ms	12.50 - 18.50 G's
Max Pendulum G's Above 30 ms	29 G's Max	16.16
Deceleration - Time Curve Decay Time to 5 G's	34 - 42 ms	38.50
D Plane Rotation	Max	64 - 78 Deg
	Time	57 - 64 ms
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m
	Time	47 - 58 ms
Rotation Angle - Time Curve Decay Time to Zero	113 - 128 ms	115.20
Positive Moment - Time Curve Decay Time to Zero	97 - 107 ms	100.40

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 1047
 Sequential Test Number 1
 Date 3/24/08 6 Axis Neck Transducer
 Workfile 1047NE 3/24/08

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	33.0
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	19.32
	20 ms	14.00 - 19.00 G's	16.79
	30 ms	11.00 - 16.00 G's	13.55
Max Pendulum G's Above 30 ms		22 G's Max	13.55
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	43.00
D Plane Rotation	Max	81 - 106 Deg	91.75
	Time	72 - 82 ms	75.40
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-68.96
	Time	65 - 79 ms	71.20
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	155.10
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	136.80

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 1047
Sequential Test Number 1
Date 3/25/08
Workfile 1047T 3/25/08

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Pendulum Velocity	6.58 – 6.83 m/s	6.73
Maximum Deflection	63.50 – 72.64 mm	66.8
Maximum Resistive Force	5159.9 – 5893.9 N	5403.9
Internal Hysteresis	69 - 85 %	71.35

Remarks:

Laboratory Technician:

_____ B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 1047
 Sequential Test Number 1
 Date 3/26/08
 Workfile 1046 LF RF

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5307.84
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	33.0
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5225.34

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 1047
 Sequential Test Number 1
 Date 3/26/08

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			21.1
Relative Humidity			33.0
Location for Chest Circumference	AA	16.9 - 17.1 in	16.9
Location for Waist Circumference	BB	8.9 - 9.1 in	8.9
Total Sitting Height	A	34.6 - 35.0 in	34.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.1
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.4
Thigh Clearance	F	5.5 - 6.1 in	5.7
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.3
Elbow Rest Height	J	7.5 - 8.3 in	7.6
Buttock Knee Length	K	22.8 - 23.8 in	22.9
Popliteal Height	L	16.9 - 17.9 in	17.3
Knee Pivot Height	M	19.1 - 19.7 in	19.4
Buttock Popliteal Length	N	17.8 - 18.8 in	17.9
Chest Depth	O	8.4 - 9.0 in	8.6
Foot Length	P	9.9 - 10.5 in	10.2
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Foot Breadth	W	3.6 - 4.2 in	3.8
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.6
Waist Circumference	Z	32.9 - 34.1 in	33.2

Remarks:

Laboratory Technician:

B. Swiecicki

APPENDIX D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 1046)	Manufacturer	Serial #	Calibration		
			Last	Next	
Head	X	ENDEVCO	P50060	3/10/2008	9/10/08
	Y	ENDEVCO	P59009	3/4/2008	9/4/08
	Z	ENDEVCO	P49239	3/10/2008	9/10/08
Head	X (R)	ENDEVCO	P50098	3/10/2008	9/10/08
	Y (R)	ENDEVCO	P58975	3/4/2008	9/4/08
	Z (R)	ENDEVCO	P58894	2/22/2008	8/22/08
Neck Load Cell	X	DENTON	1911Fx	3/13/2008	9/13/08
	Y	DENTON	1911Fy	3/13/2008	9/13/08
	Z	DENTON	1911Fz	3/19/2008	9/19/08
Neck Moment	X	DENTON	1911Mx	3/19/2008	9/19/08
	Y	DENTON	1911My	3/19/2008	9/19/08
	Z	DENTON	1911Mz	3/19/2008	9/19/08
Chest	X	ENDEVCO	P49224	3/10/2008	9/10/08
	Y	ENDEVCO	P49200	3/10/2008	9/10/08
	Z	ENDEVCO	P49231	3/10/2008	9/10/08
Chest	X (R)	ENDEVCO	P58779	2/22/2008	8/22/08
	Y (R)	ENDEVCO	P58893	2/22/2008	8/22/08
	Z (R)	ENDEVCO	P59008	3/4/2008	9/4/08
Chest Deflection	X	SERVO	1046	3/19/2008	9/19/08
Pelvic	X	ENDEVCO	P49206	3/10/2008	9/10/08
	Y	ENDEVCO	P49195	3/10/2008	9/10/08
	Z	ENDEVCO	P49185	3/10/2008	9/10/08

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 1046)	Manufacturer	Serial #	Calibration		
			Last	Next	
Left Femur Load Cell	Fz	DENTON	256	3/11/2008	9/11/08
Right Femur Load Cell	Fz	DENTON	261	3/11/2008	9/11/08
Left Upper Tibia	Mx	DENTON	114Mx	3/19/2008	9/19/08
	My	DENTON	114My	3/19/2008	9/19/08
Left Lower Tibia	Fz	DENTON	115Fz	3/18/2008	9/18/08
	Mx	DENTON	115Mx	3/18/2008	9/18/08
	My	DENTON	115My	3/18/2008	9/18/08
Right Upper Tibia	Mx	DENTON	92UMx	3/18/2008	9/18/08
	My	DENTON	92UMy	3/18/2008	9/18/08
Right Lower Tibia	Fz	DENTON	92LFz	3/18/2008	9/18/08
	Mx	DENTON	92LMx	3/18/2008	9/18/08
	My	DENTON	92LMy	3/18/2008	9/18/08
Left Foot Rear	X	ENDEVCO	P49235	3/14/2008	9/14/08
	Z	ENDEVCO	P49205	3/14/2008	9/14/08
Left Foot Front	Z	ENDEVCO	P49211	3/14/2008	9/14/08
Right Foot Rear	X	ENDEVCO	P52105	3/14/2008	9/14/08
	Z	ENDEVCO	P49222	3/14/2008	9/14/08
Right Foot Front	Z	ENDEVCO	P49440	3/14/2008	9/14/08
Lap Belt Load Cell	First Technology	156	9/7/2007	-	
Shoulder Belt Load Cell	First Technology	159	9/7/2007	-	

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 1047)	Manufacturer	Serial #	Calibration		
			Last	Next	
Head	X	ENDEVCO	P50073	3/11/2008	9/11/08
	Y	ENDEVCO	P50062	3/11/2008	9/11/08
	Z	ENDEVCO	P50097	3/11/2008	9/11/08
Head	X (R)	ENDEVCO	P58984	2/22/2008	8/22/08
	Y (R)	ENDEVCO	P58786	3/1/2008	9/14/08
	Z (R)	ENDEVCO	P58787	2/22/2008	8/22/08
Neck Load Cell	X	DENTON	441Fx	3/14/2008	9/14/08
	Y	DENTON	441Fy	3/14/2008	9/14/08
	Z	DENTON	441Fz	3/14/2008	9/14/08
Neck Moment	X	DENTON	441Mx	3/14/2008	9/14/08
	Y	DENTON	441My	3/14/2008	9/14/08
	Z	DENTON	441Mz	3/14/2008	9/14/08
Chest	X	ENDEVCO	P49459	3/11/2008	9/11/08
	Y	ENDEVCO	P52108	3/11/2008	9/11/08
	Z	ENDEVCO	P49213	3/11/2008	9/11/08
Chest	X (R)	ENDEVCO	P58892	2/22/2008	8/22/08
	Y (R)	ENDEVCO	P58885	2/22/2008	8/22/08
	Z (R)	ENDEVCO	P58899	2/22/2008	8/22/08
Chest Deflection	X	SERVO	DS-1047	3/19/2008	9/19/08
Pelvic	X	ENDEVCO	P49186	3/11/2008	9/11/08
	Y	ENDEVCO	P49164	3/11/2008	9/11/08
	Z	ENDEVCO	P52126	3/11/2008	9/11/08

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 1047)	Manufacturer	Serial #	Calibration		
			Last	Next	
Left Femur Load Cell	Fz	DENTON	255	3/11/2008	9/11/08
Right Femur Load Cell	Fz	DENTON	257	3/11/2008	9/11/08
Left Upper Tibia	Mx	DENTON	368Mx	3/19/2008	9/19/08
	My	DENTON	368My	3/19/2008	9/19/08
Left Lower Tibia	Fz	DENTON	364Fz	3/18/2008	9/18/08
	Mx	DENTON	364Mx	3/18/2008	9/18/08
	My	DENTON	364My	3/18/2008	9/18/08
Right Upper Tibia	Mx	DENTON	370Mx	3/19/2008	9/19/08
	My	DENTON	370MY	3/19/2008	9/19/08
Right Lower Tibia	Fz	DENTON	368LFz	3/18/2008	9/18/08
	Mx	DENTON	368LMx	3/18/2008	9/18/08
	My	DENTON	368LMy	3/18/2008	9/18/08
Left Foot Rear	X	ENDEVCO	P52149	3/18/2008	9/18/08
	Z	ENDEVCO	P50065	3/18/2008	9/18/08
Left Foot Front	Z	ENDEVCO	P52123	3/18/2008	9/18/08
Right Foot Rear	X	ENDEVCO	P50092	3/18/2008	9/18/08
	Z	ENDEVCO	P50089	3/18/2008	9/18/08
Right Foot Front	Z	ENDEVCO	P49463	3/18/2008	9/18/08
Lap Belt Load Cell	First Technology	173	9/7/2007	-	
Shoulder Belt Load Cell	First Technology	178	9/7/2007	-	

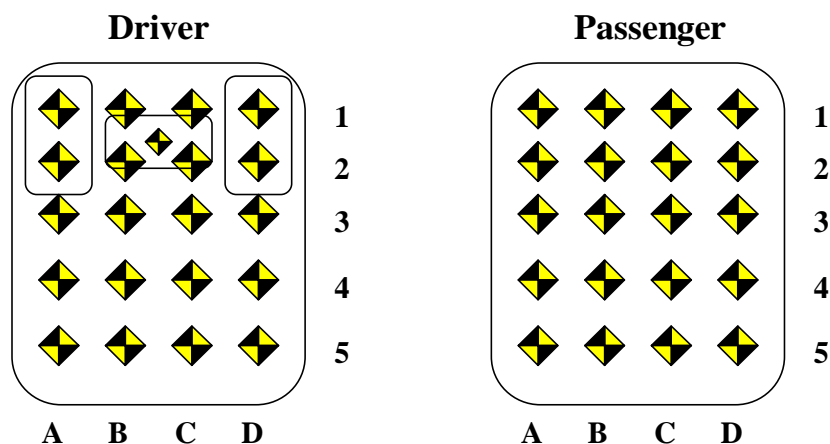
INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	MFG: ENDEVCO	S/N: P16656	7/11/2008	2/11/09
Right Rear Seat Crossmember X	MFG: ENDEVCO	S/N: P35811	7/11/2008	2/11/09
Top of Engine	MFG: ICS	S/N: FA2479	4/7/2008	10/7/08
Bottom of Engine	MFG: ICS	S/N: FA2493	3/27/2008	9/27/08
Right Disc Brake Caliper	MFG: GS SENSORS	S/N: 9440-006	6/28/2008	1/28/09
Left Disc Brake Caliper	MFG: GS SENSORS	S/N: 9440-011	4/4/2008	10/4/08
Left Seat Rear Crossmember Z	MFG: ENDEVCO	S/N: P39575	7/11/2008	2/11/09
Right Seat Rear Crossmember Z	MFG: ENDEVCO	S/N: P35789	7/11/2008	2/11/09

APPENDIX E

VEHICLE INTERIOR INTRUSION MEASUREMENTS

DRIVER SIDE INTRUSION MEASUREMENTS

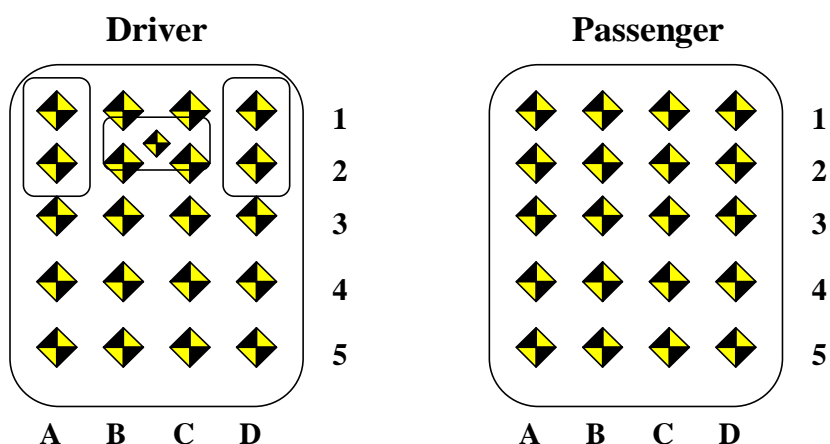


Driver Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3644	-562	-438	3643	-579	-438	1	17	0
B1	3746	-431	-439	3729	-446	-455	17	15	16
C1	3778	-313	-436	3763	-325	-445	15	12	9
D1	3750	-204	-434	3747	-212	-435	3	8	1
A2	3528	-561	-359	3529	-575	-351	-1	14	-8
B2	3702	-433	-355	3704	-446	-362	-2	13	7
C2	3696	-311	-355	3701	-323	-354	-5	12	-1
D2	3692	-192	-361	3703	-208	-351	-11	16	-10
A3	3501	-561	-335	3503	-573	-327	-2	12	-8
B3	3605	-434	-294	3614	-450	-295	-9	16	1
C3	3586	-313	-304	3597	-327	-296	-11	14	-8
D3	3556	-187	-322	3569	-202	-310	-13	15	-12
A4	3479	-560	-294	3480	-574	-285	-1	14	-9
B4	3504	-433	-284	3512	-448	-283	-8	15	-1
C4	3506	-311	-292	3517	-324	-286	-11	13	-6
D4	3501	-192	-299	3514	-206	-289	-13	14	-10
A5	3409	-560	-283	3417	-571	-278	-8	11	-5
B5	3410	-437	-280	3419	-449	-277	-9	12	-3
C5	3408	-318	-284	3417	-330	-284	-9	12	0
D5	3404	-193	-297	3415	-207	-288	-11	14	-9
BP	3568	-367	-452	3558	-347	-444	10	-20	-8
G	3324	-510	-746	3328	-509	-744	-4	-1	-2
H	3297	-201	-754	3304	-200	-747	-7	-1	-7
L	3105	-376	-954	3197	-382	-929	-92	6	-25
AB	3094	-585	-356	3103	-590	-350	-9	5	-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	3655	192	-398	3669	195	-393	-14	-3	-5
B1	3666	306	-400	3680	308	-399	-14	-2	-1
C1	3670	444	-402	3683	447	-409	-13	-3	7
D1	3619	566	-407	3635	571	-408	-16	-5	1
A2	3557	198	-346	3574	200	-339	-17	-2	-7
B2	3568	313	-347	3584	317	-340	-16	-4	-7
C2	3570	443	-349	3588	450	-347	-18	-7	-2
D2	3565	568	-352	3582	569	-349	-17	-1	-3
A3	3462	198	-298	3479	202	-287	-17	-4	-11
B3	3466	318	-301	3487	324	-292	-21	-6	-9
C3	3467	445	-296	3486	452	-288	-19	-7	-8
D3	3469	567	-293	3489	572	-287	-20	-5	-6
A4	3369	198	-292	3387	204	-284	-18	-6	-8
B4	3372	318	-287	3392	324	-282	-20	-6	-5
C4	3374	448	-287	3392	454	-281	-18	-6	-6
D4	3374	561	-290	3390	568	-285	-16	-7	-5
A5	3268	205	-293	3287	210	-286	-19	-5	-7
B5	3273	320	-288	3294	327	-282	-21	-7	-6
C5	3276	441	-289	3296	449	-283	-20	-8	-6
D5	3272	564	-293	3293	571	-287	-21	-7	-6
R	3304	198	-749	3314	198	-742	-10	0	-7
S	3328	499	-749	3332	499	-742	-4	0	-7
AB	3095	581	-356	3105	586	-346	-10	-5	-10

R=Left side of bolster, S=Right side of bolster, L=Steering wheel center;

AB = Front outboard seat anchor bolt