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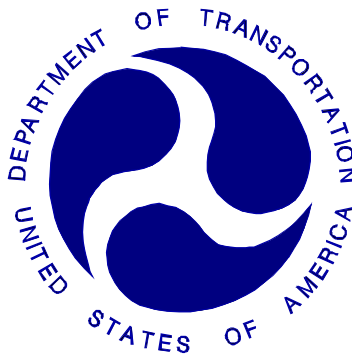
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

TOYOTA MOTOR MANUFACTURING
2010 TOYOTA TUNDRA 4x4
REGULAR CAB PICKUP

NHTSA NUMBER: MA5118

CALSPAN TEST NUMBER: tr2414

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September 15, 2009

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
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15. Supplementary Notes					
16. Abstract A frontal load cell barrier test of a 2010 Toyota Tundra 4x4 Regular Cab Pickup was performed at Calspan Corporation's crash test facility in Buffalo, New York, on September 15, 2009. The impact velocity was 56.62 kph and the temperature at the barrier face was 21.7°C. The maximum post-test vehicle crush was 470 mm. The test vehicle was equipped with 3-point restraint systems, and frontal and knee 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	533.3	512.1 §
Maximum Thorax Acceleration (3 ms Clip)		g's	60 g's	42.7	42.0
Chest Displacement		mm	-76 mm	-23.7	-30.5
Left Femur Force		Newtons	-10000 N	-2131.7	-2425.0
Right Femur Force		Newtons	-10000 N	-1983.8	-2348.2
§ The HIC was calculated using the Redundant Head X data in the Head Resultant.					
17. Key Words 56 kph Frontal Barrier Impact test New Car Assessment Program (NCAP)				18. Distribution Statement <u>Copies of this report are available from:</u> 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 56.62 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 56.62 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.62 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 Toyota Tundra 4x4 Regular Cab Pickup at a velocity of 56.62 kph. The test was performed at Calspan on September 15, 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	533.3	71.4	99.0	42.7	62.7	65.7	-23.7	-2131.7	-1983.8
Passenger	512.1§	67.0	100.8	42.0	62.7	65.7	-30.5	-2425.0	-2348.2

§ The HIC was calculated using the Redundant Head X data in the Head Resultant.

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

TEST NOTES	
Data Channel	Anomalies
V1P1 Chest Y Redundant	Questionable Data. Data spike 58.8 – 59.8 milliseconds
V1P2 Head X	Questionable Data from 54.7 – 60 milliseconds and 77.6 – 90.1 milliseconds
V1P2 Left Foot Aft x	Questionable data after 173 milliseconds
V1P2 Left Foot Aft z	Questionable data after 173 milliseconds
V1P2 Left Foot Fore z	Questionable data after 173 milliseconds
V1 Left Rear Accelerometer (z)	Questionable data 80.9 – 196.4 milliseconds

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
CRASH TEST SUMMARY

Vehicle NHTSA No.: MA5118 Test Mode: 56.3 kph Frontal Barrier
 Test Date: September 15, 2009 Time: 13:57 Temperature: 21.7 °C
 Vehicle Make/Model/Body Style: 2010 Toyota Tundra 4x4 Regular Cab Pickup
 Vehicle Test Weight: 2696.5 kg Impact Velocity: 56.62 kph (55.5 – 57.1 kph)
 Vehicle/Barrier Impact Angle: 0 ° Max Static Crush: 470 mm

ATD INFORMATION AND VISIBLE CONTACT POINTS

	DRIVER	PASSENGER
ATD Type:	Part 572E	Part 572E
Restraint System:	3-Point Seatbelt, Frontal and Knee Airbags	3-Point Seatbelt, Frontal and Knee Airbags
Head Contact:	Face – Frontal Airbag Back of Head – Head Restraint	Face – Frontal Airbag Back of Head – Head Restraint
Abdomen Contact:	Frontal Airbag	Frontal Airbag
Chest Contact:	Frontal Airbag	Frontal Airbag
Left Knee Contact:	Knee Airbag	Knee Airbag
Right Knee Contact:	Knee Airbag	Knee Airbag

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	376	247	350	324

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	1120	1120
Lap belt length as measured on ATD	mm	1100	1120
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems	mm	260	270

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2010 Toyota Tundra 4x4 Regular Cab Pickup

NHTSA No. : MA5118 ; VIN: 5TFKY5F17AX003727 ; Color: Silver

Engine Data: 8 cylinders; - CID; 5.7 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: 9/2/09 ; Odometer Reading 161 km

Selling Dealer: LUV Toyota

Dealer Address: 215 East Fairmont Avenue, Lakewood, NY 14750

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; - Adjustable Anchorage

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

AIRBAG FEATURES:

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

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Toyota Motor Manufacturing

Date of Manufacture 08/09

GVWR: 3080 kg; GAWR: 1810 kg FRONT; 1835 kg REAR

VEHICLE CAPACITY DATA:

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

Number of Occupants: 3 Front; - Rear; 3 Total

Vehicle Capacity Weight (VCW) = 685.0 kg

No. of Occupants x 68.04 kg = 204.1 kg

Rated Cargo/Luggage Weight (RCLW) = 480.9 Kg (136 kg MAX)

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 =	730.5	667.0	58.4	1397.5
Rear =	499.5	496.5	41.6	996.0
Total Delivered Weight (UDW) =				2393.5

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW)	=	2393.5	kg
Rated Cargo/Luggage Weight (RCLW)	=	136.0	kg
Weight of 2 p.572 Dummies @ 86.2 each	=	172.4	kg
TARGET TEST WEIGHT	=	2701.9	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 151.0 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	729.5	694.0	52.8	1423.5
Rear =	637.0	636.0	47.2	1273.0
Total Vehicle Test Weight (ATW) =				2696.5

Weight of Ballast Secured in Vehicle Trunk Area¹ = 122.5 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:	937	948	1035	1048	1342.4
FULLY LOADED:	929	940	1011	1024	-
AS TESTED:	936	946	1003	1012	1523.0

Vehicle's Wheel Base: 3226 mm

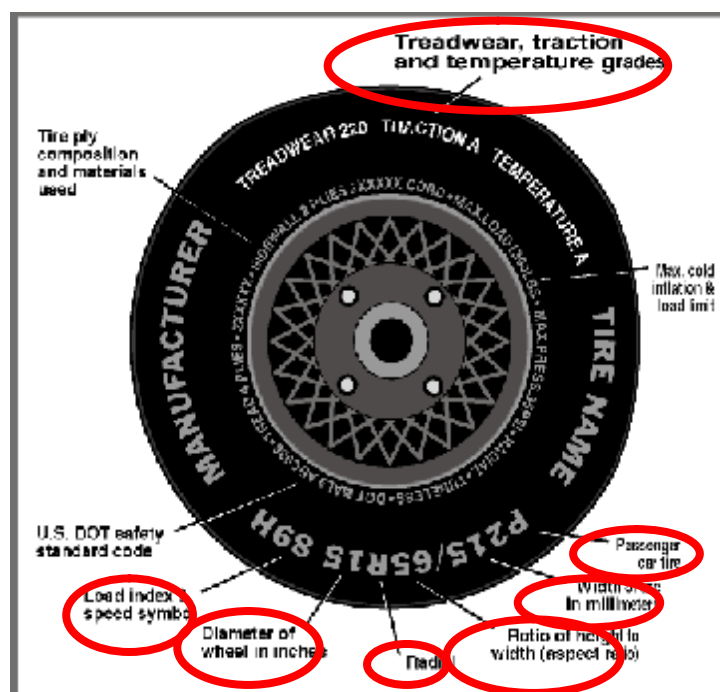
¹Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

²Rearward of the front axle centerline.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Vehicle Year/Make/Model/Body Style: 2010 Toyota Tundra 4x4 Regular Cab Pickup

NHTSA Test No.: MA5118 Test Date: September 15, 2009



Measured Parameter	Front	Rear
Maximum Tire Pressure (from sidewall - kPa)	300	300
Cold Pressure (from tire placard - kPa)*	210	210
Recommended Tire Size (from tire placard)	P255/70R18	P255/70R18
Tire size on Vehicle	P255/70R18	P255/70R18
Tire Manufacturer	Michelin	Michelin
Tire Name	LTX A/S	LTX A/S
Tire Type	Passenger	Passenger
Tire Width (mm)	255	255
Ratio of Height to Width (aspect ratio)	70	70
Radial	Yes	Yes
Wheel Diameter	18	18
Load Index & Speed Symbol	-	-
Treadwear	420	420
Traction Grade	A	A
Temperature Grade	B	B

*Tire pressure used for test

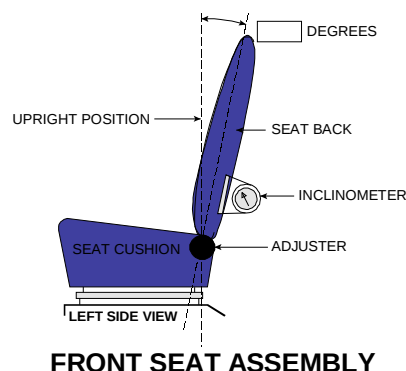
DATA SHEET NO. 4
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2010 Vehicle Model: Toyota Tundra 4x4 Body Style : Regular Cab Pickup

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: 0 deg.

Measurement instructions: Seat back was placed in 6th detent from forward most detent (forward most detent is 0). Seat back angle was measured of head restraint post (no ATD in seat)

Seat back angle for passenger's seat: 0 deg.

Measurement instructions: Seat back was placed in 6th detent from forward most detent (forward most detent is 0). Seat back angle was measured of head restraint post (no ATD in seat)

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Seat was placed in the 8th detent (mid-position) from a total of 15 detents. Total fore/aft travel of seat was 210 mm (seat placed at 105 mm)

Positioning of the passenger's seat: Seat was placed in the 8th detent (mid-position) from a total of 15 detents. Total fore/aft travel of seat was 210 mm (seat placed at 105 mm)

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 99.9 liters

B. "Usable Capacity" of the optional equipment fuel tank is Not Applicable liters

C. "Usable Capacity" of the vehicle(s) used for certification
testing to requirements of FMVSS 301 = 91.9 to 93.9 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 92.9 liters

3.3 One-Third of Useable Capacity = 33.3 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 pump fuel when the ignition is ON.

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 in mid-position (Steering column angle
was 29 degrees from horizontal).

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: Not Applicable

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

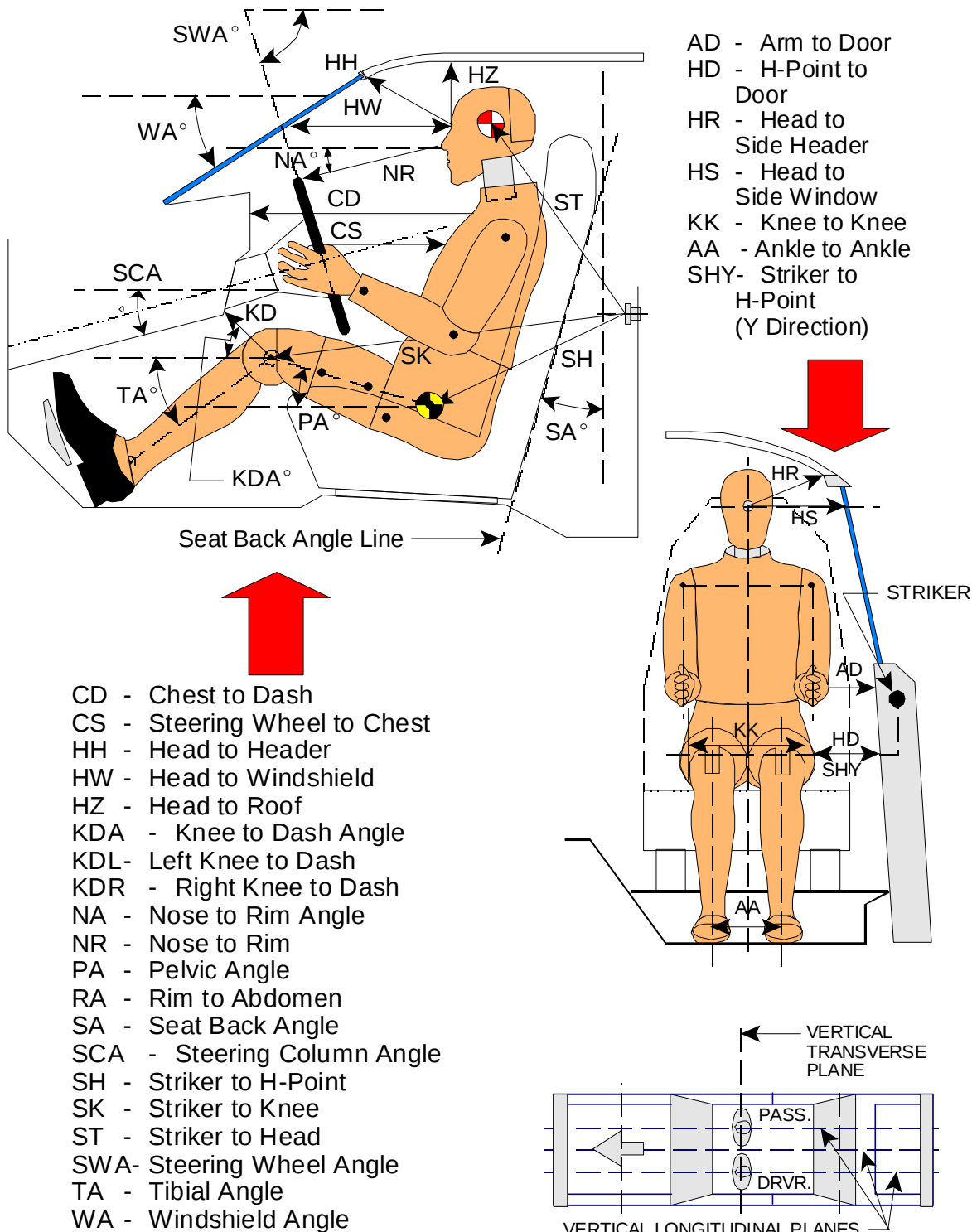
Does vehicle owner's manual describe how to deactivate ADLs? X Yes; - No; - N/A

Comments: None

DATA SHEET NO. 5

FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



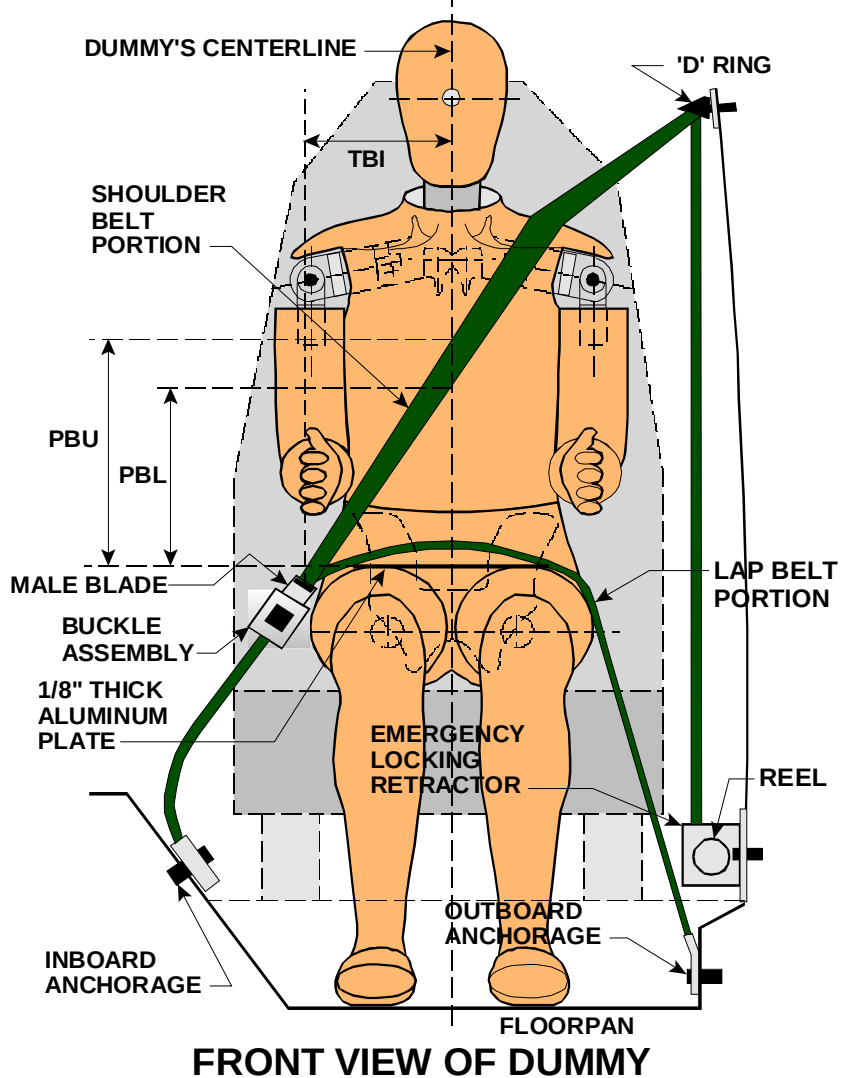
DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #064)			PASS. (Serial #061)		
WA ^o	35 deg.			N/A		
SWA ^o	61.4 deg.			N/A		
SCA ^o	28.6 deg.			N/A		
SA ^o	1 deg.			1 deg.		
HZ	225			225		
HH	415			449		
HW	697			711		
HR	228			237		
NR	429	Angle	21 deg.	N/A		
CD	558			562		
CS	315			N/A		
RA	190			N/A		
KDL	153	Angle (KDA)	21 deg.	130		
KDR	120			145	Angle (KDA)	33 deg.
PA ^o	23.2 deg.			23.5 deg.		
TA ^o	59.6 deg.			56.3 deg.		
KK	350			270		
AA	330			220		
ST	651	Angle	46 deg.	656	Angle	43 deg.
SK	985	Angle	98 deg.	990	Angle	99 deg.
SH	601	Angle	110 deg.	590	Angle	109 deg.
SHY	285			255		
HS	343			352		
HD	165			161		
AD	126			140		

Dimensions in millimeters

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

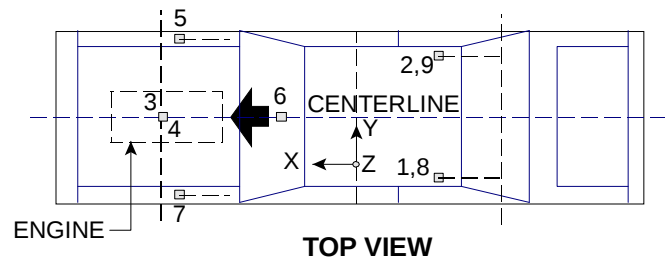
SEAT BELT POSITIONING DATA



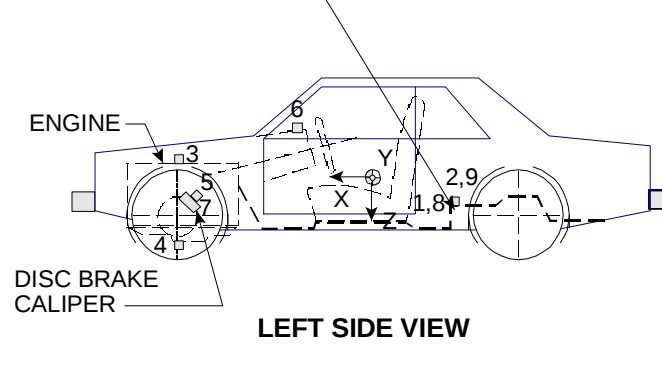
	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	355	355
PBL-- Top surface of alum. plate to belt lower edge	275	275
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

VEHICLE ACCELEROMETER LOCATIONS



REAR SEAT CUSHION
ASSY. FRONT ATTACHMENT
BRACKET SUPPORT



No.	LOCATION	PRE-TEST LENGTH (mm)		
		X	Y	Z
1	Left Rear Seat Cross Member X	2808	-683	733
2	Right Rear Seat Cross Member X	2810	695	638
3	Top of Engine Block	4617	-139	1023
4	Bottom of Engine	4903	234	249
5	Disc Brake Caliper @ Right Side	4307	923	472
6	Instrument Panel**	-	-	-
7	Disc Brake Caliper @Left Side	4308	-904	580
8	Left Rear Seat Cross Member Z	2808	-683	733
9	Right Rear Seat Cross Member Z	2810	695	638

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 10 mm molding.

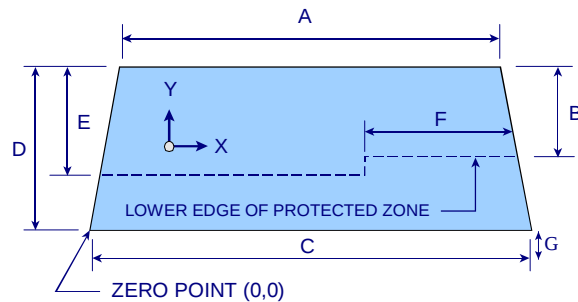
FMVSS 212 REQUIREMENTS:

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: 21.7°C.

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2332.5	2332.5	100.0%
LEFT SIDE	2332.5	2332.5	100.0%
TOTAL	4665	4665	100.0%



DIMENSIONS (mm)	
A	1415
B	429
C	1690
D	780
E	511
F	802
G	10

FRONT VIEW OF WINDSHIELD

FAILURE DETAILS:

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

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

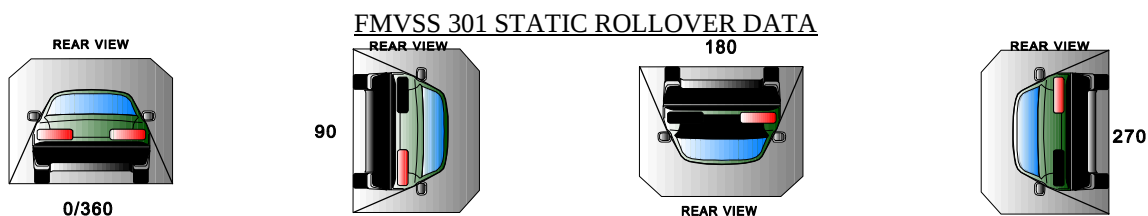
DATA SHEET NO. 9
SUMMARY OF FMVSS NO. 301 DATA

NHTSA TEST No.: _____ MA5118 TEST DATE: _____ September 15, 2009
VEHICLE MAKE/MODEL: _____ 2010 Toyota Tundra 4x4 Regular Cab Pickup
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



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	
0° - 90°	1	minutes	03	seconds	5	minutes	6	minutes	3	seconds	7	minutes
90° - 180°	1	minutes	03	seconds	5	minutes	6	minutes	3	seconds	7	minutes
180°-270°	1	minutes	08	seconds	5	minutes	6	minutes	8	seconds	7	minutes
270°-360°	1	minutes	07	seconds	5	minutes	6	minutes	7	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:

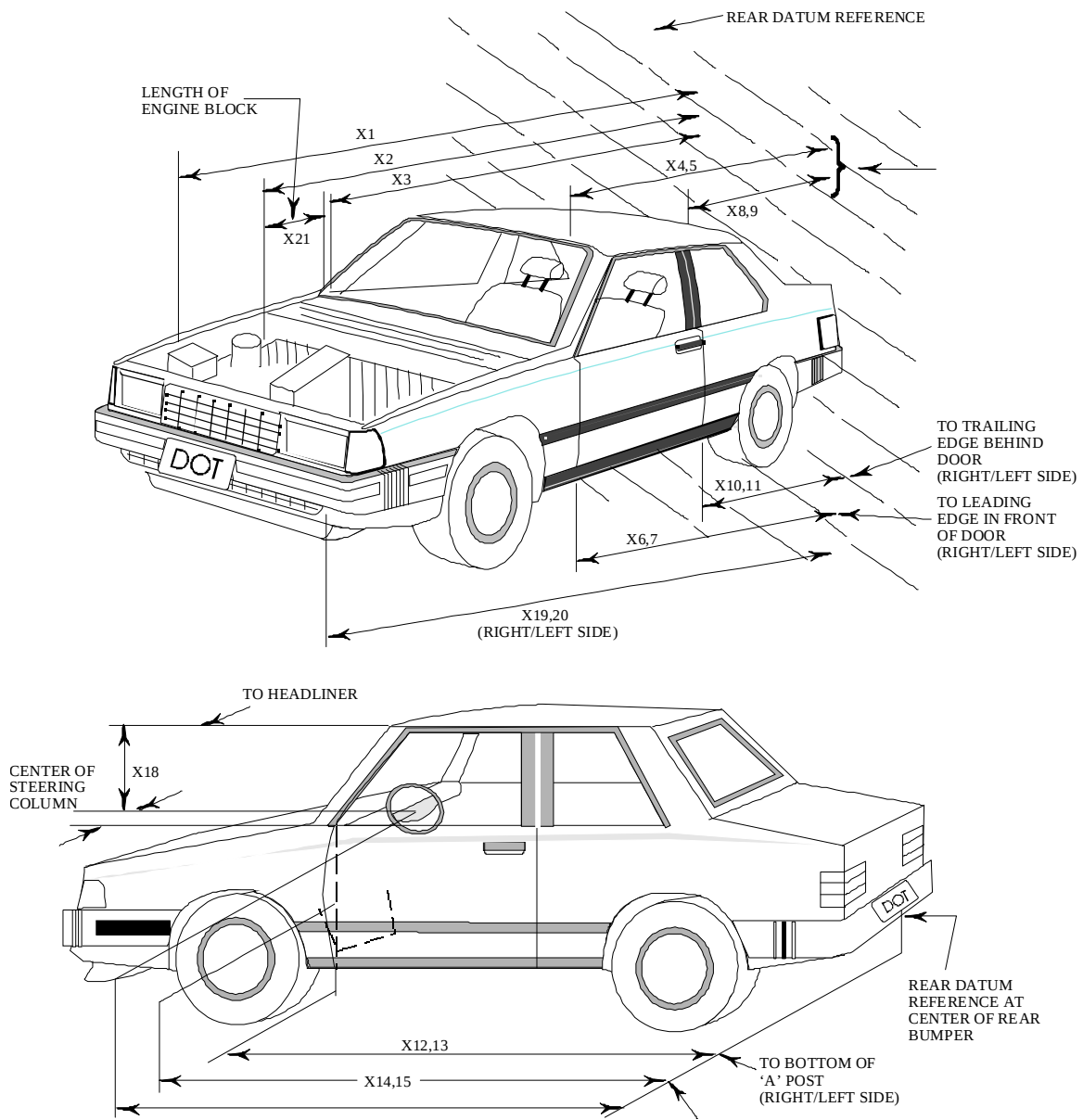
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180°-270°	0	0	0	N/A
270°-360°	0	0	0	N/A

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

IV. SOLVENT SPILLAGE LOCATION(S):

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

DATA SHEET NO. 10
TEST VEHICLE MEASUREMENTS



DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

NHTSA TEST No.: MA5118 TEST DATE: September 15, 2009
VEHICLE MAKE/MODEL: 2010 Toyota Tundra 4x4 Regular Cab Pickup

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	5354	4928	426
X2	Rear Surface of Vehicle to Front of Engine	4746	4676	70
X3	Rear Surface of Vehicle to Firewall	4125	4150	-25
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3909	3944	-35
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3908	3967	-59
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3806	3826	-20
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3807	3851	-44
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2455	2493	-38
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2452	2513	-61
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2491	2512	-21
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2487	2532	-45
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3961	4004	-43
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3958	4024	-66
X14	Rear Surface of Vehicle to Firewall, Right Side	4112	4145	-33
X15	Rear Surface of Vehicle to Firewall, Left Side	4113	4130	-17
X16	Rear Surface of Vehicle to Steering Column	3420	3474	-54
X17	Center of Steering Column to "A" Post	285	294	-9
X18	Center of Steering Column to Headliner	442	497	-55
X19	Rear Surface of Vehicle to Right Side of Front Bumper	5309	4877	432
X20	Rear Surface of Vehicle to Left Side of Front Bumper	5310	4882	428
X21	Length of Engine Block	542	542	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3627	3671	-44
CD	Rear Surface of Vehicle to Center of Dash Panel	3667	3738	-71
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3607	3662	-55

All Dimensions in mm

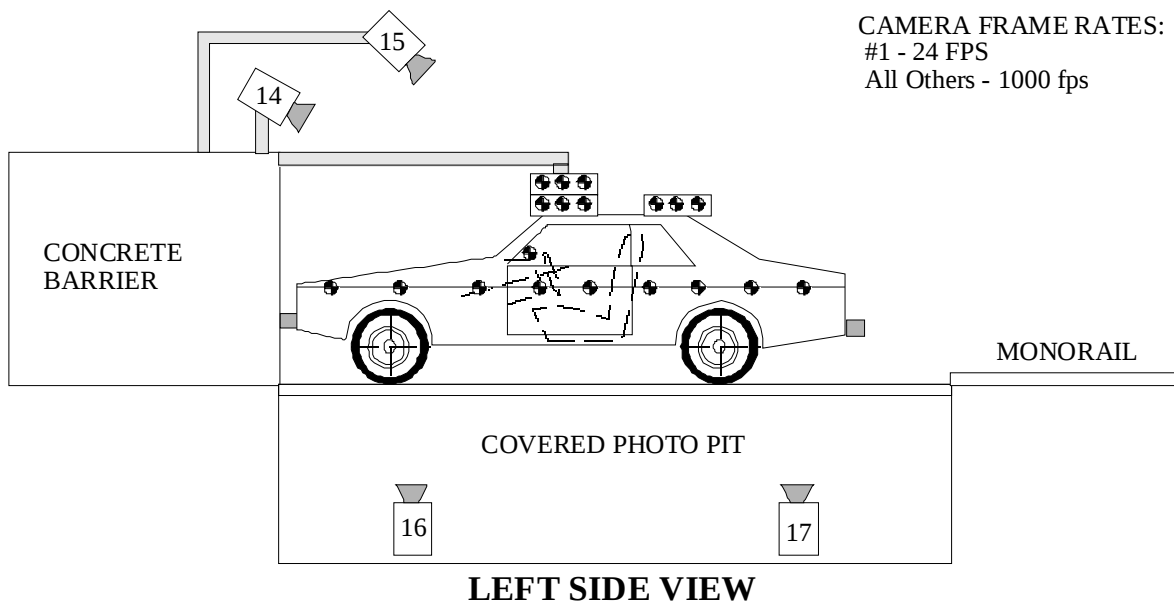
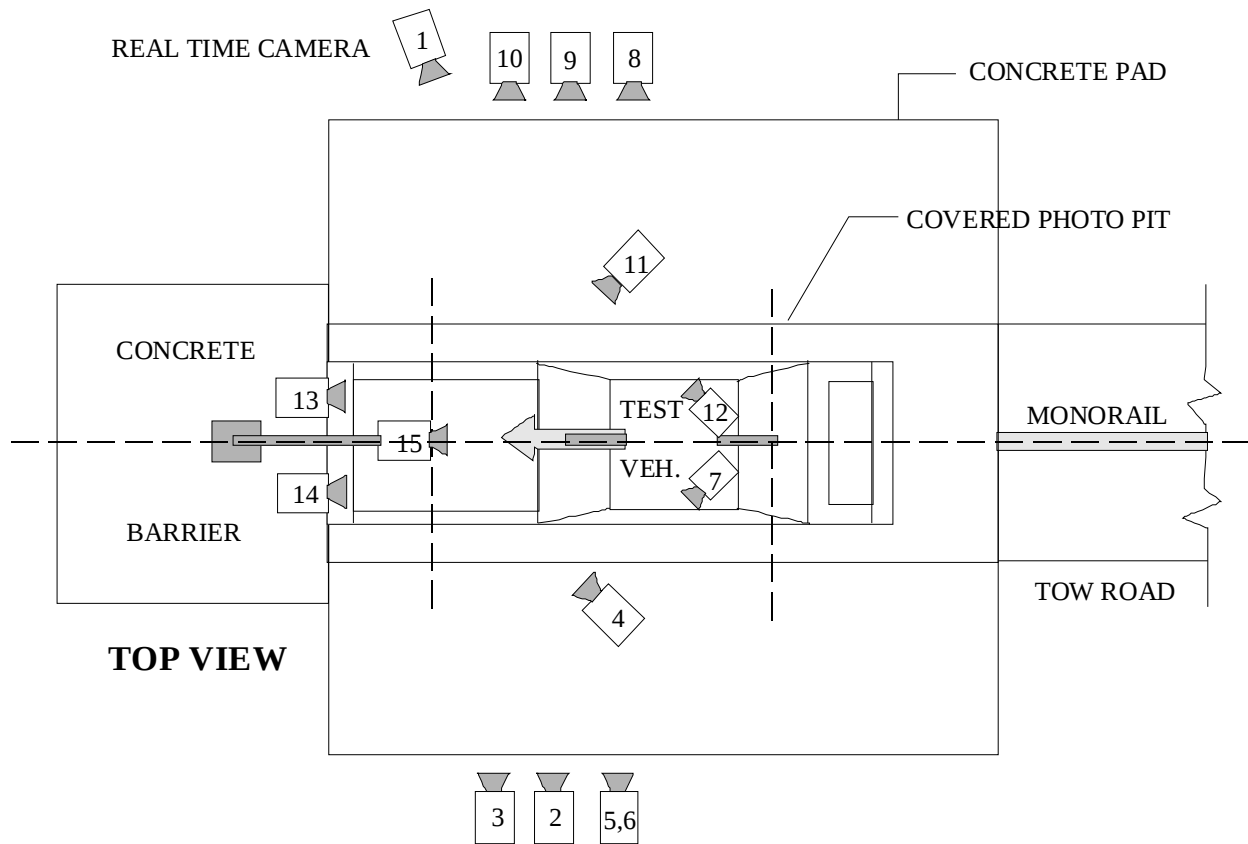
DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

NHTSA TEST No.: MA5118 TEST DATE: September 15, 2009
VEHICLE MAKE/MODEL: 2010 Toyota Tundra 4x4 Regular Cab Pickup

TARGET VEHICLE STRUCTURAL MEASUREMENTS

	Elements	Pre-Test (mm)
1	Total length	5354
2	Total Width	2042
3	Bumper Top Height	539
4	Bumper Bottom Height	411
5	Longitudinal Member Top Height	565
6	Distance Between Longitudinal Members	912
7	Longitudinal Member Width	68
8	Engine top height	1115
9	Engine bottom height	249
10	Engine and gearbox width	382
11	Front bumper-engine distance	608
12	Front shock absorber fixing height	831
13	Bonnet leading edge height	449
14	Front shock absorber fixing width	918
15	Front bumper – front axle distance	900
16	Front axle – A pillar distance	530
17	A-pillar – B pillar distance	1490
18	B-pillar – rear axle distance	1209
19	B-pillar – C Pillar distance	55
20	Roof sill bottom height	1875
21	Roof sill top height	1966
22	Floor sill bottom height	661
23	Floor sill top height	675

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS



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

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

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	8921	2107	997	-0.5	8411	28	1000
3	Left Side View	10056	1167	1058	-1.1	9546	50	1000
4	Driver and Interior View	8440	3320	2060	-5.9	-	35	500
5	Steering Column (Bottom)	7818	1721	1213	-1.9	7308	25	1000
6	Steering Column (Top)	7818	1721	1816	-6.2	7308	28-70	1000
7	Left CRS Lateral View	-	-	-	-	-	-	-
8	Overall Right Side	8360	2220	1010	-2.1	7850	28	500
9	Right Side View	9774	1380	1070	-0.8	9264	50	1000
10	Right Passenger View	9200	2080	1280	-2.8	8690	35	1000
11	Passenger and Interior View	8600	3180	2020	-5.6	-	35	500
12	Right CRS Lateral View	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-27.8	-	13	500
14	Driver Front View	620	-92	1987	-25.7	-	13	500
15	Windshield View	0	-530	3374	-56.3	-	20	500
16	Pit View of Engine	0	615	-3048	90	-	13	500
17	Pit View of Fuel Tank	0	3280	-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

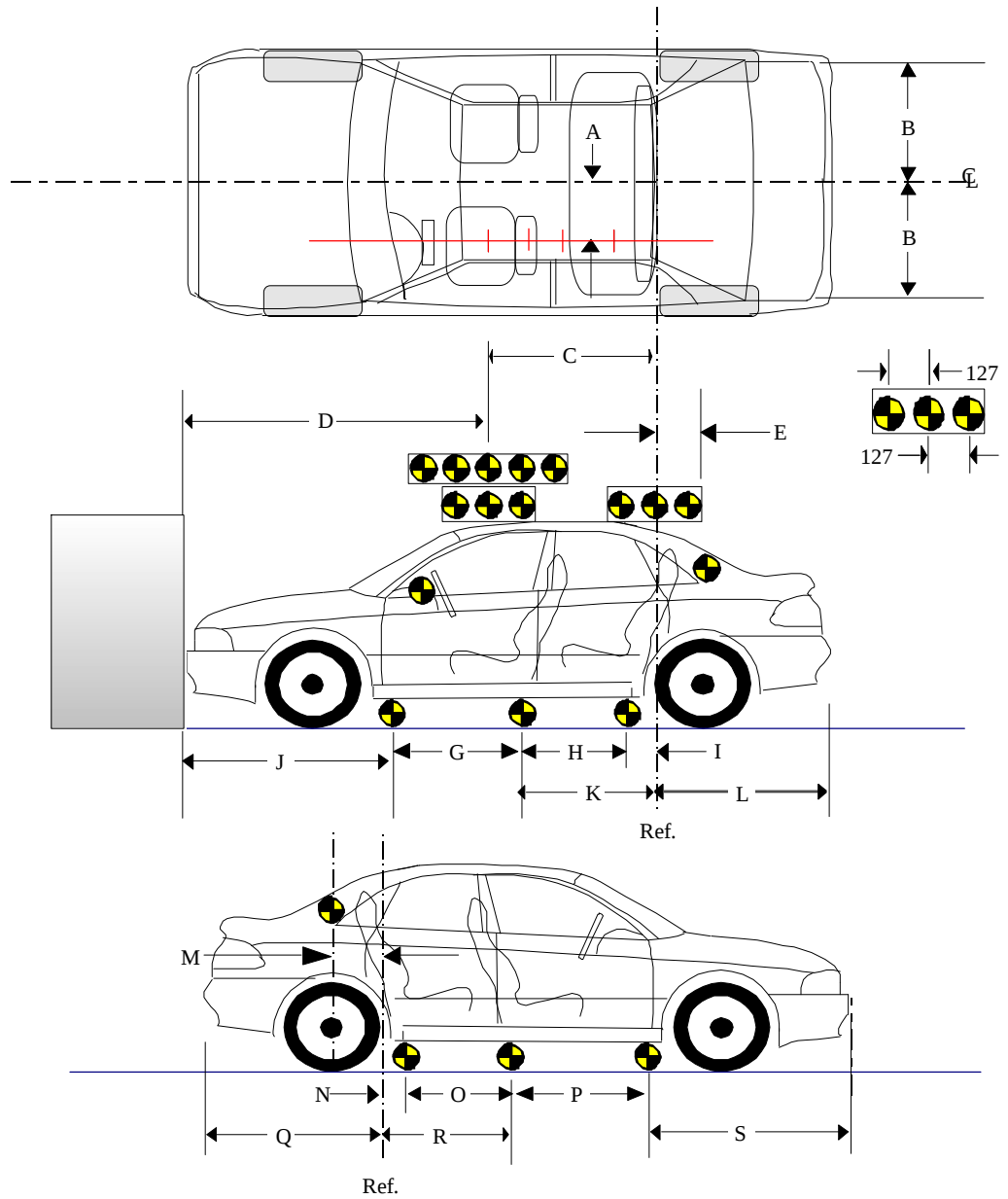
Z = film plane to ground

DATA SHEET NO. 12
VEHICLE REFERENCE PHOTO TARGET LOCATIONS

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

(Dimensions in millimeters)

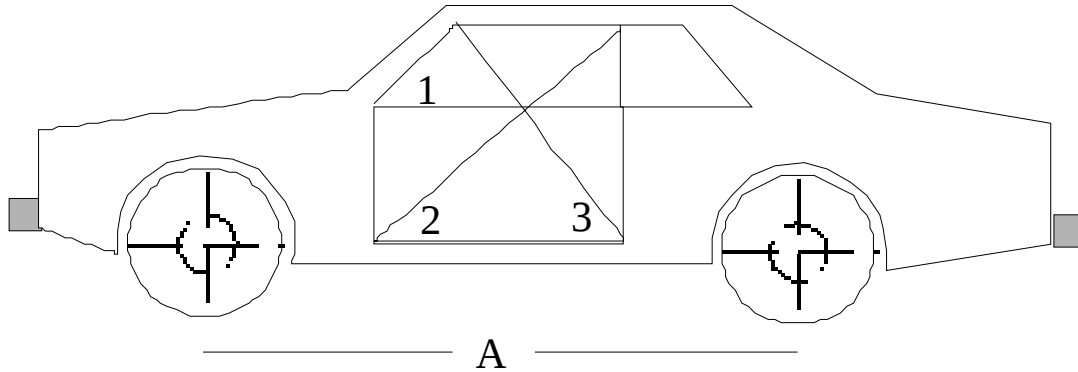
A	434
B	808
C	914
D	1901
E	164
F	1071
G	1081
H	1037
I	168
J	1434
K	1205
L	1635
M	153
N	172
O	1029
P	1036
Q	1638
R	1201
S	1479



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

DOOR OPENING WIDTH AND WHEELBASE MEASUREMENTS



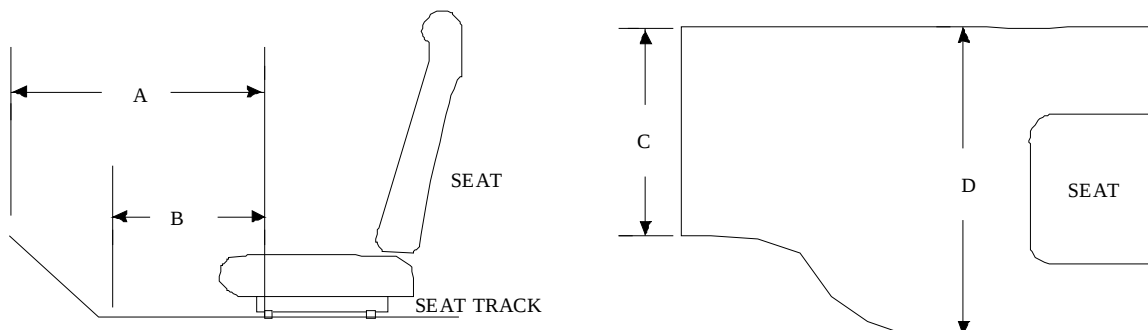
UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	1360	1752	1371	1361	1748	1371
AFTER TEST	1360	1729	1389	1361	1730	1388
DIFFERENCE	0	23	-18	0	18	-17

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	3228	3224
AFTER TEST	3161	3168
DIFFERENCE	67	56

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont)

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

STATIC FOOTWELL DEFORMATION



DRIVER

Measurement	Pre-Test	Post-Test	Difference
A	730	725	5
B	511	513	-2
C	450	451	-1
D	509	507	2

PASSENGER

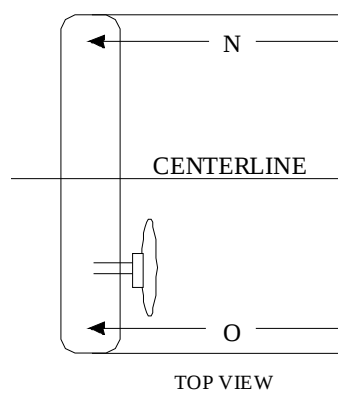
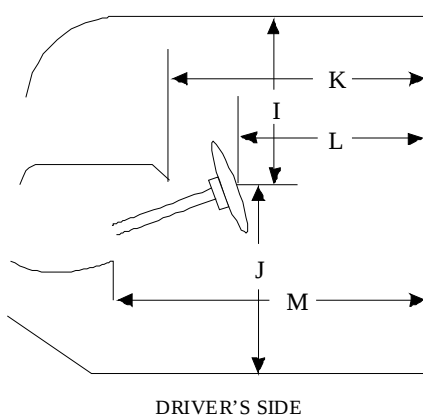
Measurement	Pre-Test	Post-Test	Difference
A	652	648	4
B	455	464	-9
C	446	445	1
D	504	505	-1

Units = mm

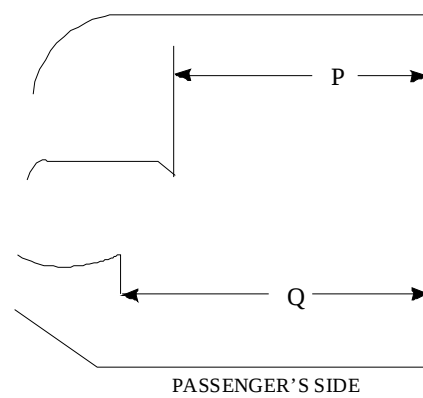
DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

STATIC PASSENGER COMPARTMENT INTRUSION



MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



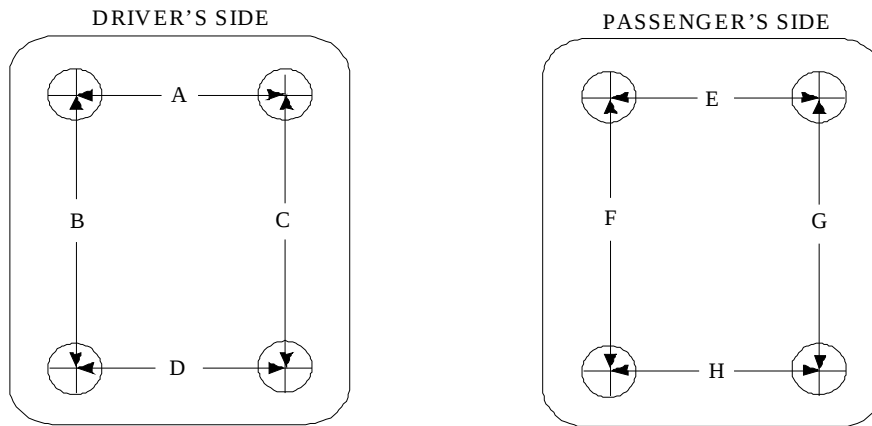
Measurement	Pre-Test	Post-Test	Difference
I	442	497	-55
J	738	686	52
K	1139	1162	-23
L	920	921	-1
M	1186	1192	-6
N	1125	1137	-12
O	1107	1108	-1
P = K (PASS.)	1348	1378	-30
Q = M (PASS.)	1162	1190	-28

Units = mm

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

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup

FLOORBOARD DEFORMATION



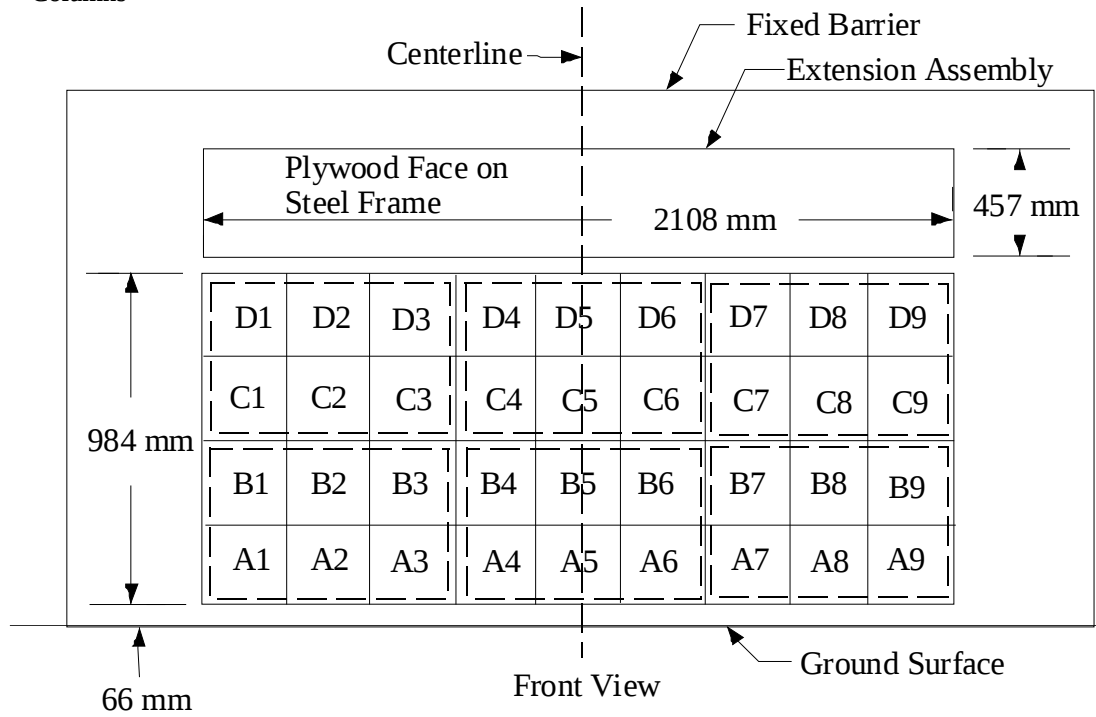
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	450	451	-1
B	408	409	-1
C	448	448	0
D	509	507	2
E	446	445	1
F	405	410	-5
G	397	395	2
H	504	505	-1

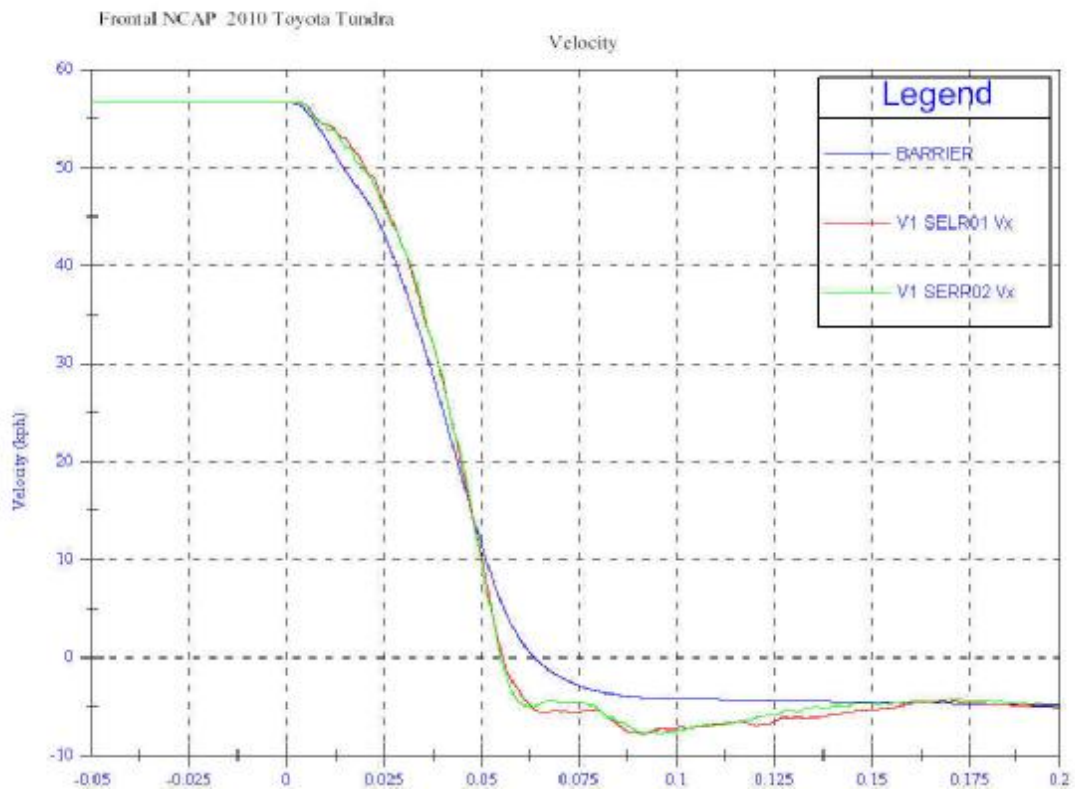
Units = mm

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: Toyota Tundra 4x4 Regular Cab Pickup

NHTSA Test No.: MA5118 VIN: 5TFKY5F17AX003727

Model Year: 2010 Build Date: 08/09 Test Date: September 15, 2009

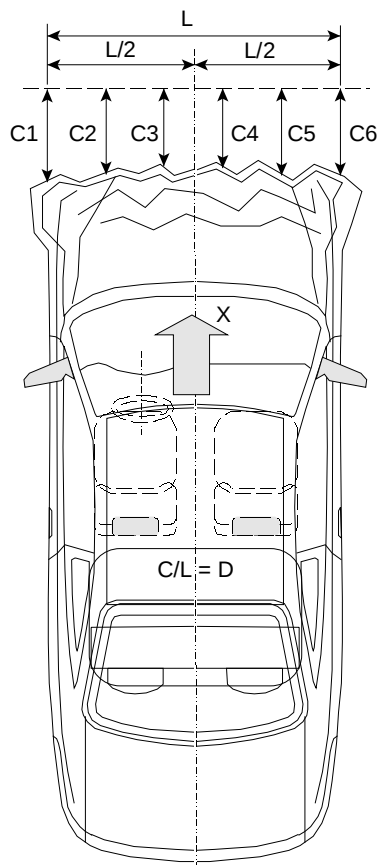
Vehicle Size Category: Pickup Truck Test Weight: 2696.5 kg

Vehicle Wheelbase: 3226 mm; Front Overhang: 902 mm; Overall Width: 2042 mm

Collision Deformation Classification (CDC) Code: 12FDEW2

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	5139	4796	343
C2 =	5308	4861	447
C3 =	5340	4870	470
C4 =	5339	4871	468
C5 =	5304	4863	441
C6 =	5133	4797	336



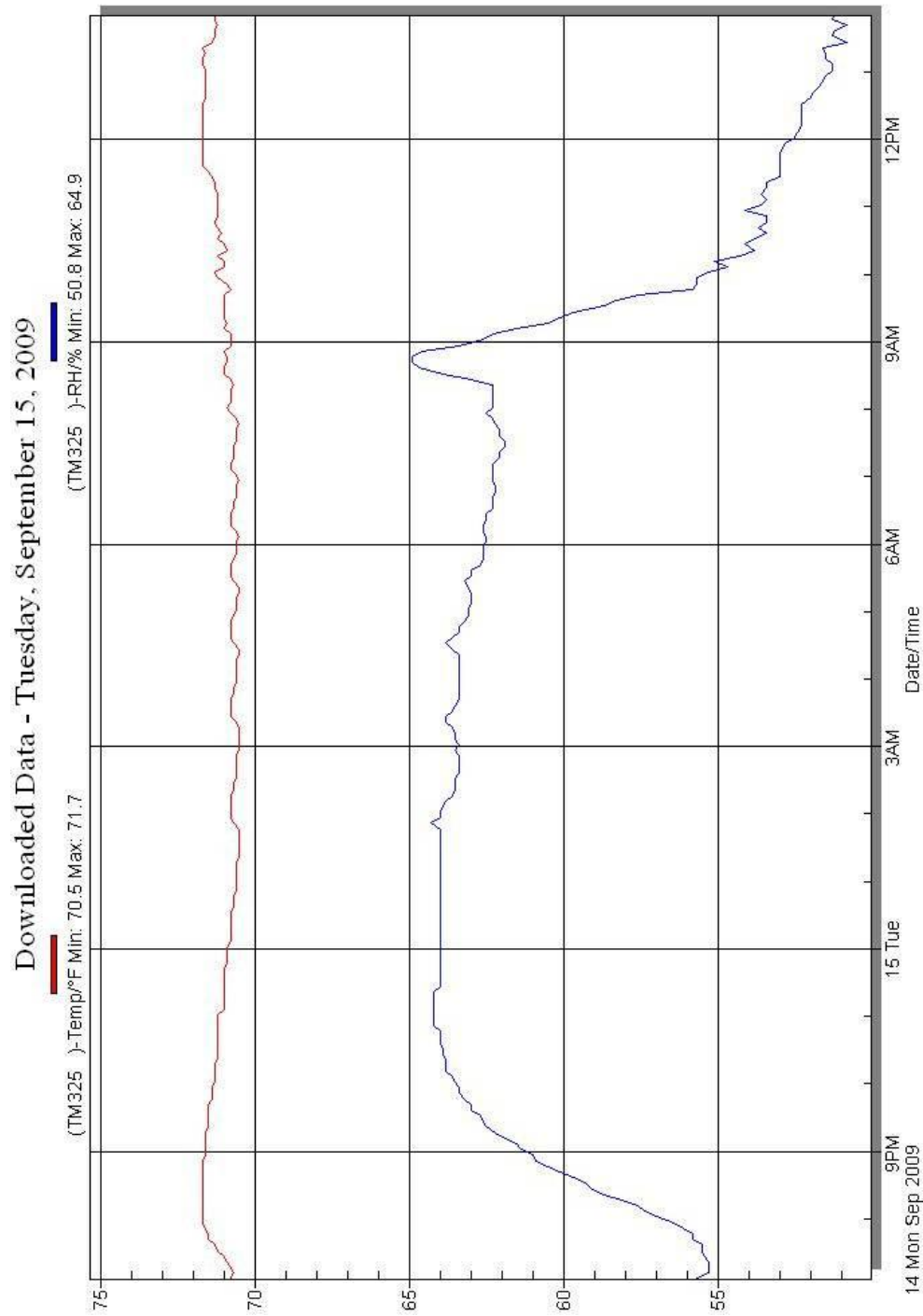
Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

Length of Damaged Region:

L1=	<u>1879</u>	mm
L2=	<u>939.5</u>	mm
L5=	<u>375.8</u>	mm

DATA SHEET NO.16
VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART

NHTSA Test No.: MA5118 Vehicle: 2010 Toyota Tundra 4x4 Regular Cab Pickup



APPENDIX A
PHOTOGRAPHS

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Figure A-1: Load Cell Locations



Figure A-2: Vehicle Certification Placard

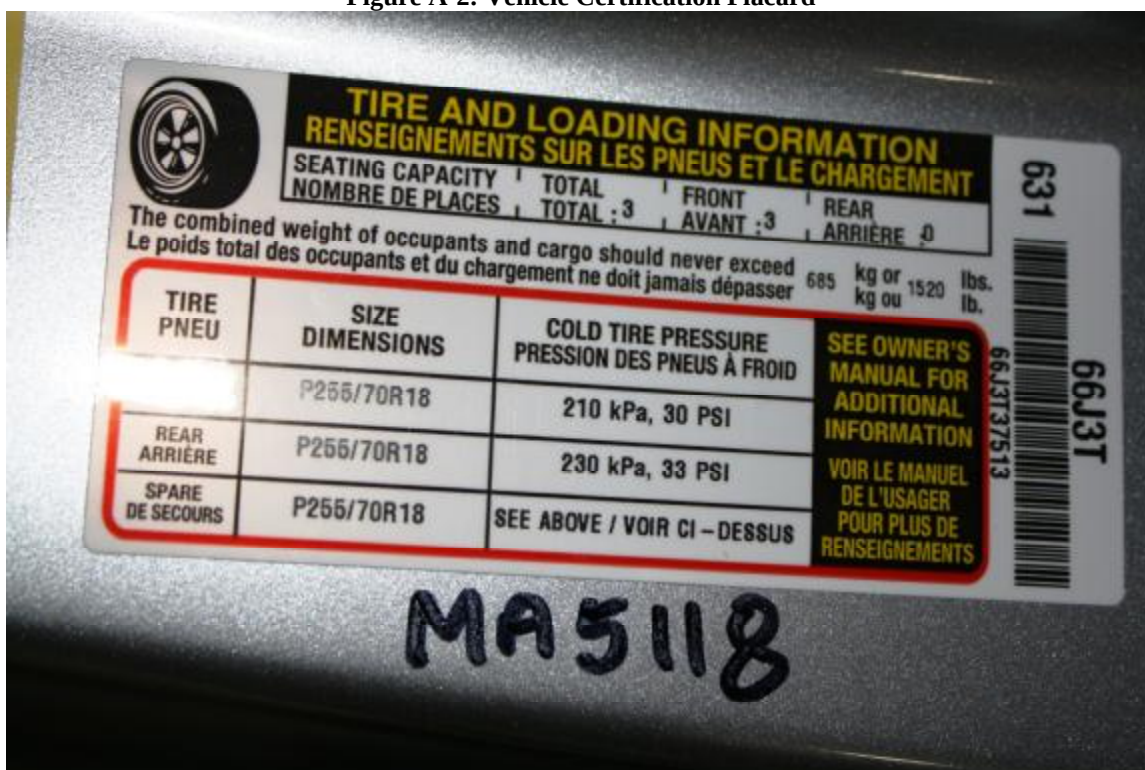


Figure A-3: Vehicle Tire Placard



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-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

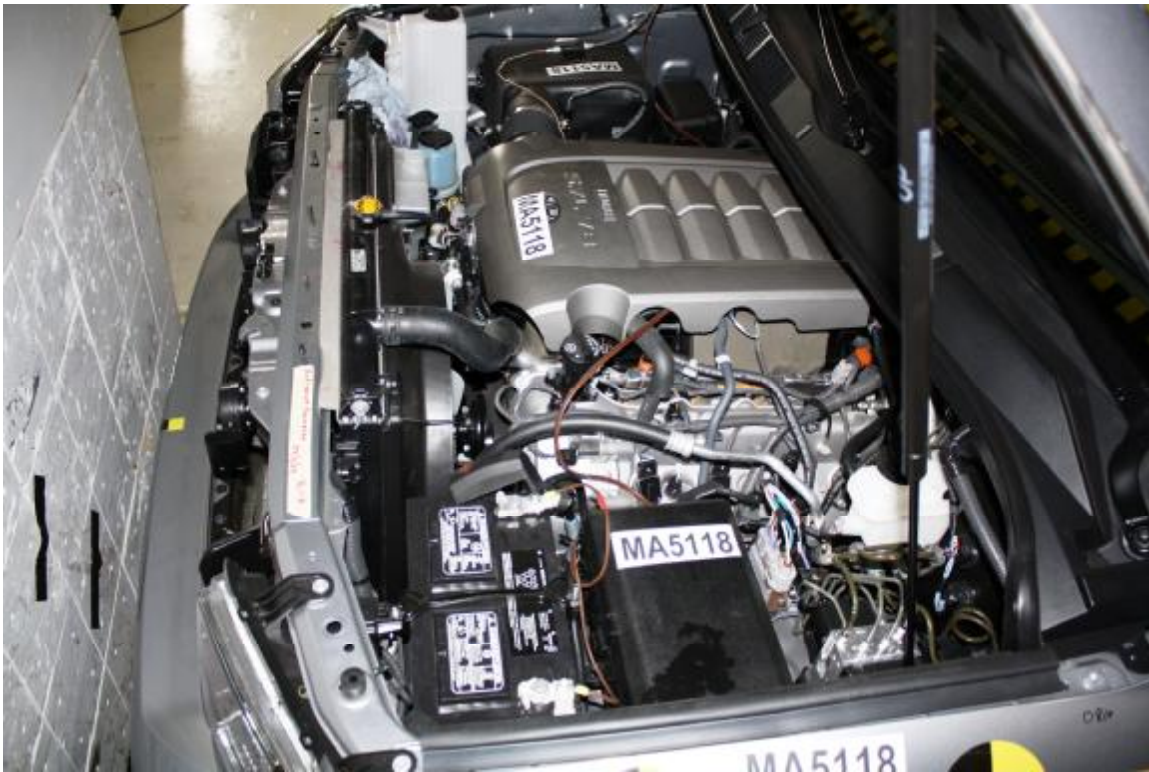


Figure A-20: Pre-Test Engine Compartment View



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

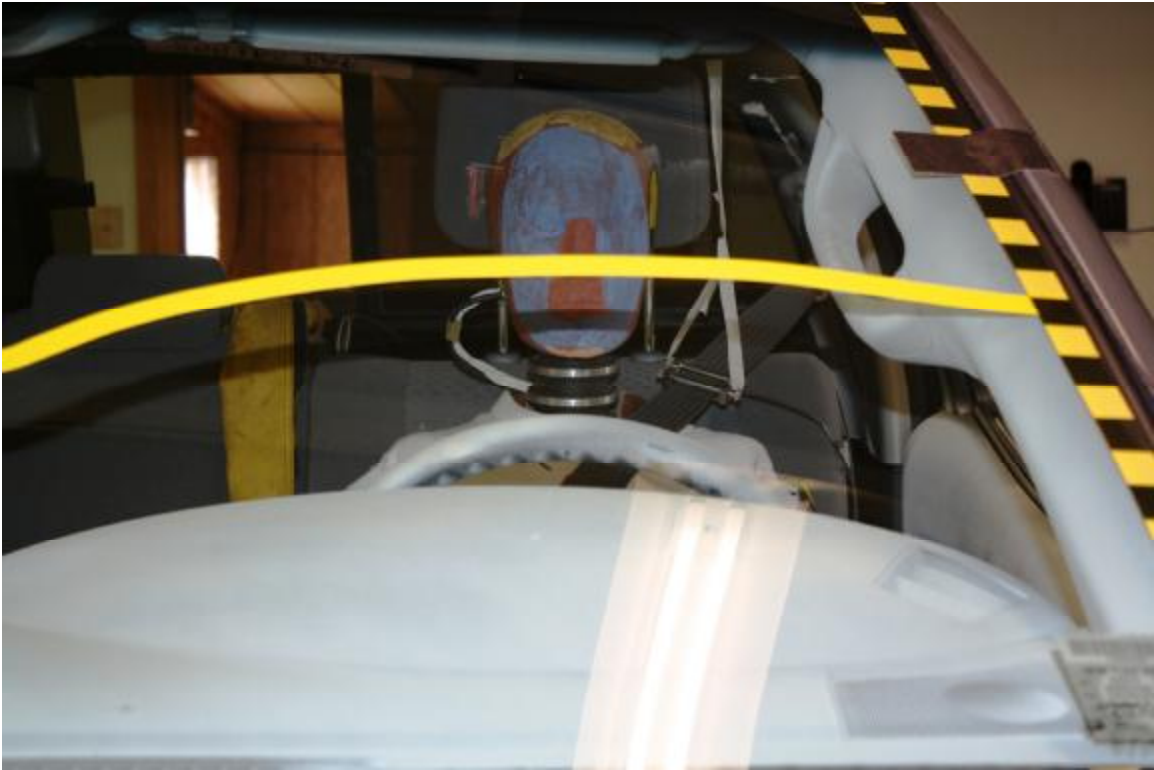


Figure A-30: Pre-Test Driver Head Location



Figure A-31: Post-Test Driver Head Location



Figure A-32: Pre-Test Driver Position View



Figure A-33: Post-Test Driver Position View

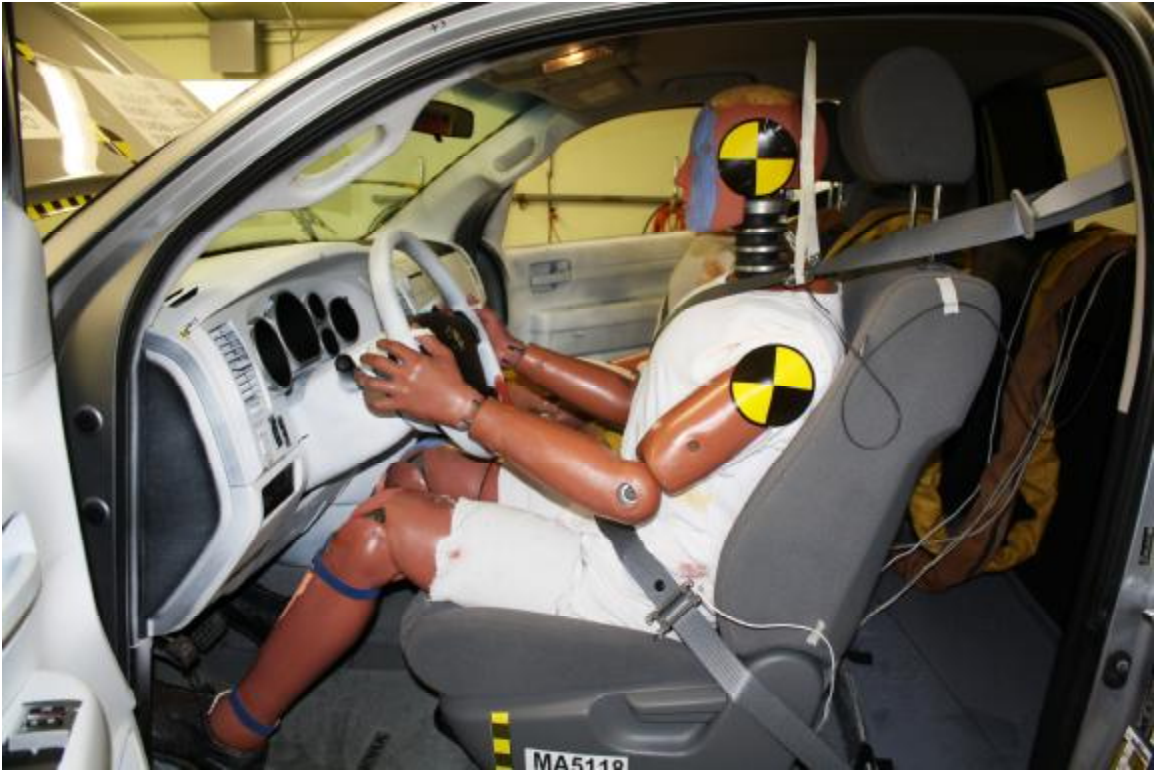


Figure A-34: Pre-Test Driver and Interior View



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

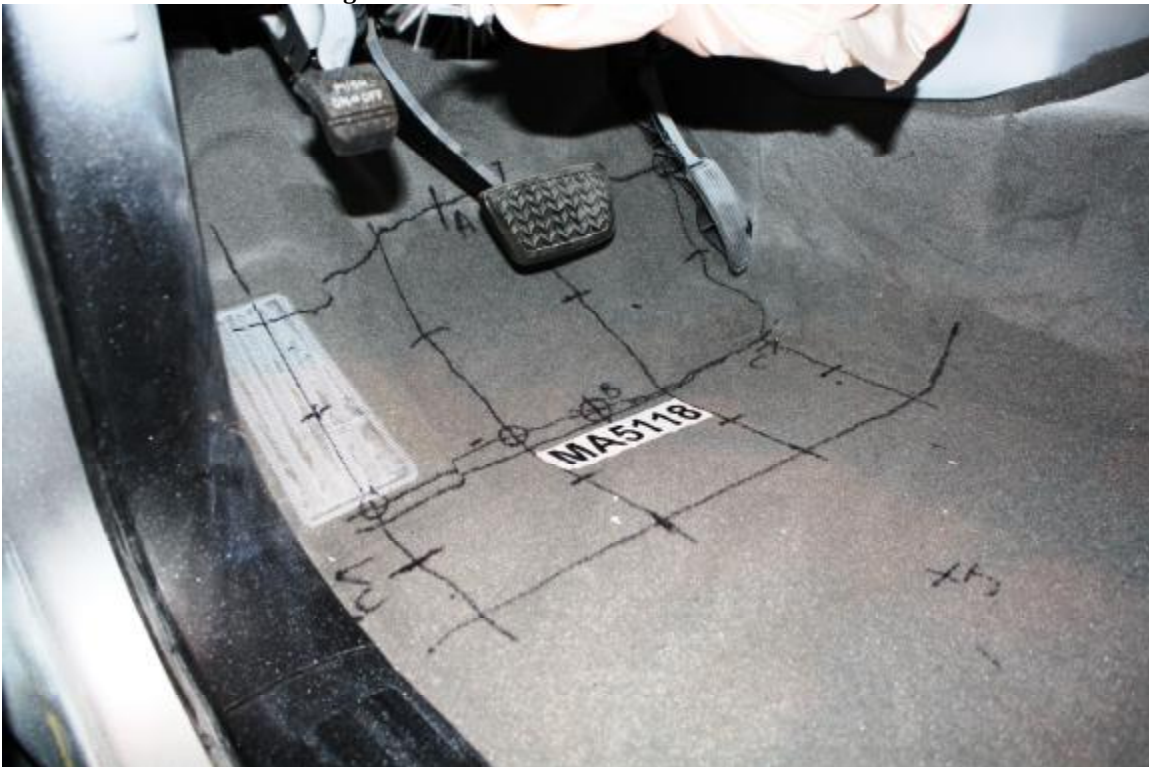


Figure A-41: Post-Test Driver Floor Pan View



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.: MA5118

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] – Redundant *	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 primary Head X data contained questionable data thus the redundant Head X data was used to generate the Head Resultant which was used for the HIC calculation.

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

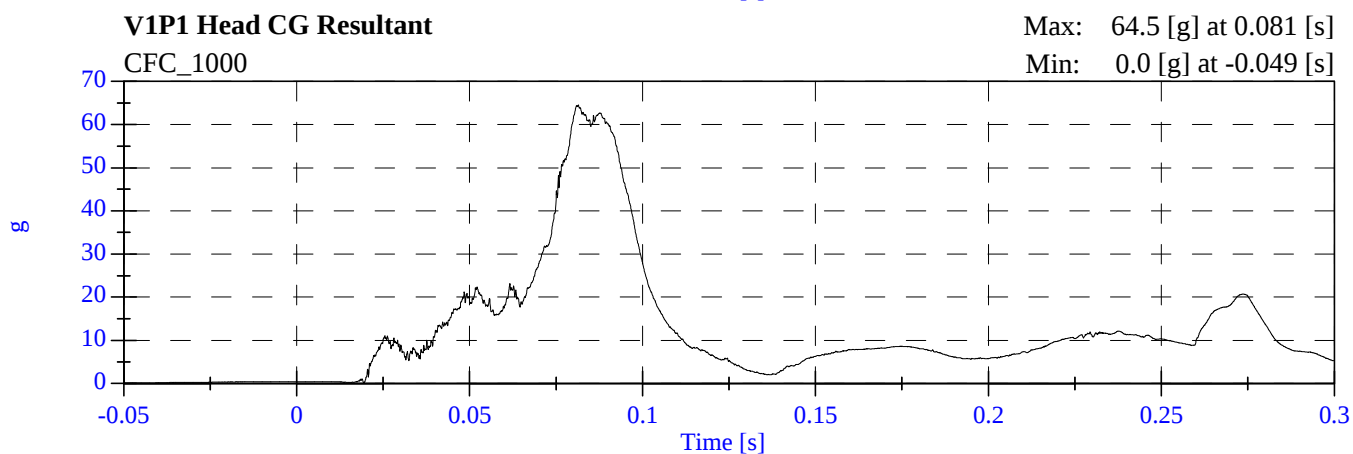
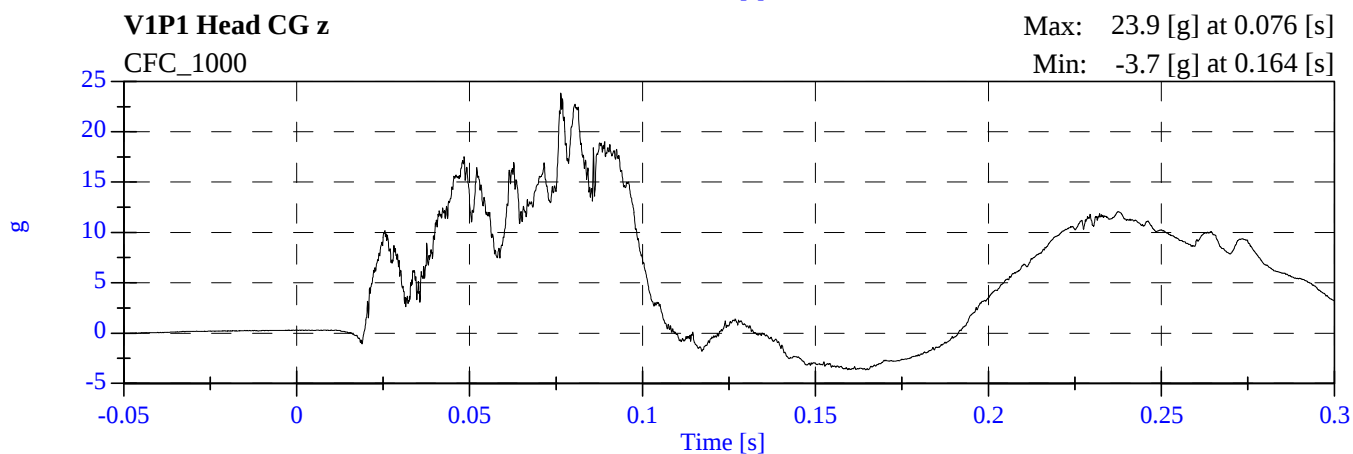
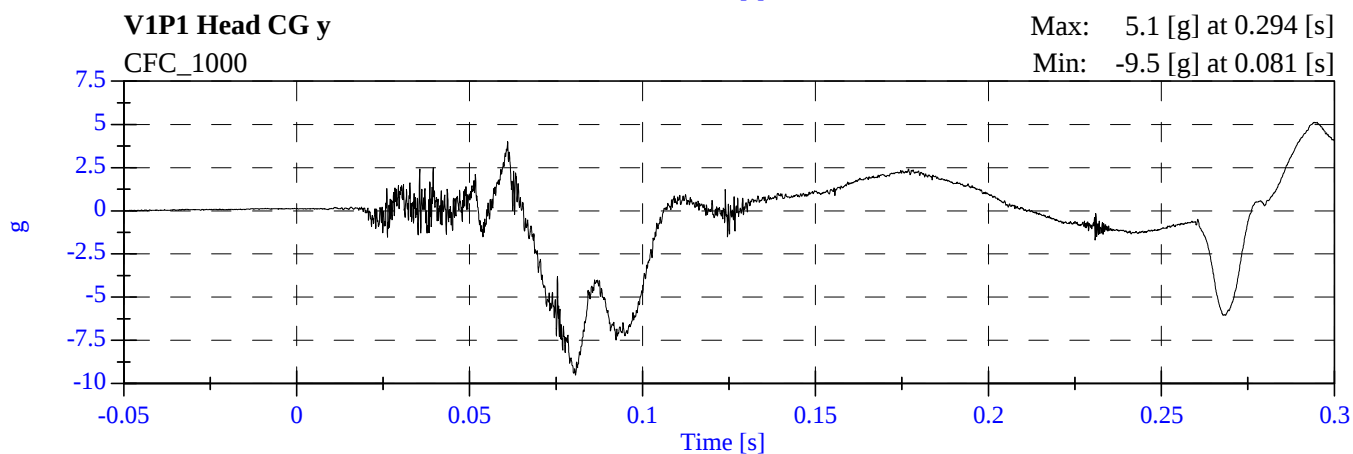
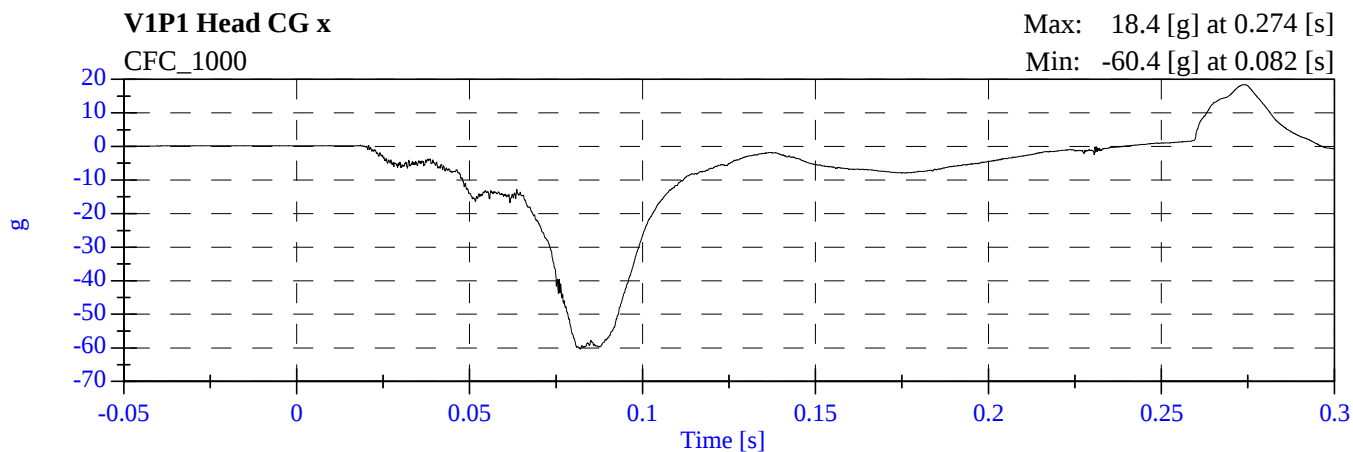
V1P1 Head CG Ax	V1P1 Lap Belt Load
V1P1 Head CG Ay	V1P1 Shoulder Belt Load
V1P1 Head CG Az	V1P2 Lap Belt Load
V1P1 Head CG Red Ax	V1P2 Shoulder Belt Load
V1P1 Head CG Red Ay	V1 Left Rear #1x
V1P1 Head CG Red Az	V1 Right Rear #2x
V1P1 Upper Neck Fx	V1 Engine Top #3x
V1P1 Upper Neck Fy	V1 Engine Bottom #4x
V1P1 Upper Neck Fz	V1 Right Caliper #5x
V1P1 Upper Neck Mx	V1 Left Caliper #7x
V1P1 Upper Neck My	V1 Left Rear #8z
V1P1 Upper Neck Mz	V1 Right Rear #9z
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 CG Ax	Barrier Load Cell A5 Fx
V1P2 Head CG Ay	Barrier Load Cell A6 Fx
V1P2 Head CG Az	Barrier Load Cell A7 Fx
V1P2 Head CG Red Ax	Barrier Load Cell A8 Fx
V1P2 Head CG Red Ay	Barrier Load Cell A9 Fx
V1P2 Head CG Red Az	Barrier Load Cell B1 Fx
V1P2 Upper Neck Fx	Barrier Load Cell B2 Fx
V1P2 Upper Neck Fy	Barrier Load Cell B3 Fx
V1P2 Upper Neck Fz	Barrier Load Cell B4 Fx
V1P2 Upper Neck Mx	Barrier Load Cell B5 Fx
V1P2 Upper Neck My	Barrier Load Cell B6 Fx
V1P2 Upper Neck Mz	Barrier Load Cell B7 Fx
V1P2 Chest Ax	Barrier Load Cell B8 Fx
V1P2 Chest Ay	Barrier Load Cell B9 Fx
V1P2 Chest Az	Barrier Load Cell C1 Fx
V1P2 Chest Red Ax	Barrier Load Cell C2 Fx
V1P2 Chest Red Ay	Barrier Load Cell C3 Fx
V1P2 Chest Red Az	Barrier Load Cell C4 Fx
V1P2 Chest Compression	Barrier Load Cell C5 Fx
V1P2 Pelvic Ax	Barrier Load Cell C6 Fx
V1P2 Pelvic Ay	Barrier Load Cell C7 Fx
V1P2 Pelvic Az	Barrier Load Cell C8 Fx
V1P2 Left Femur Fz	Barrier Load Cell C9 Fx
V1P2 Right Femur Fz	Barrier Load Cell D1 Fx
V1P2 Left Upper Tibia Fz	Barrier Load Cell D2 Fx
V1P2 Left Upper Tibia Mx	Barrier Load Cell D3 Fx
V1P2 Left Upper Tibia My	Barrier Load Cell D4 Fx
V1P2 Left Lower Tibia Mx	Barrier Load Cell D5 Fx
V1P2 Left Lower Tibia My	Barrier Load Cell D6 Fx
V1P2 Right Upper Tibia Mx	Barrier Load Cell D7 Fx
V1P2 Right Upper Tibia My	Barrier Load Cell D8 Fx
V1P2 Right Lower Tibia Fz	Barrier Load Cell D9 Fx
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	

TEST NOTES	
Data Channel	Data Channel
V1P1 Chest Y Redundant	V1P1 Chest Y Redundant
V1P2 Head X	V1P2 Head X
V1P2 Left Foot Aft x	V1P2 Left Foot Aft x
V1P2 Left Foot Aft z	V1P2 Left Foot Aft z
V1P2 Left Foot Fore z	V1P2 Left Foot Fore z
V1 Left Rear Accelerometer (z)	V1 Left Rear Accelerometer (z)

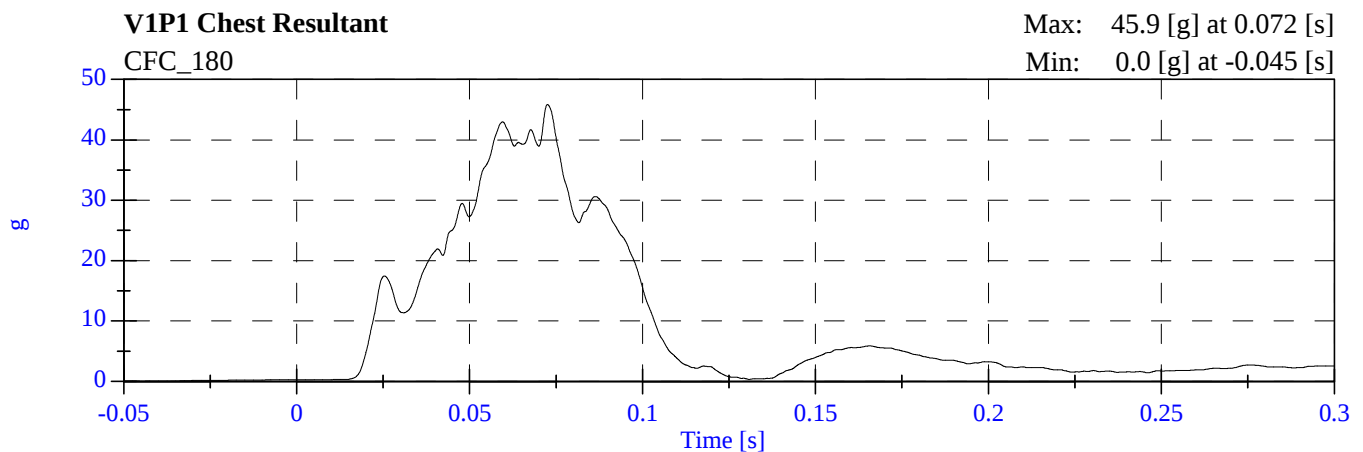
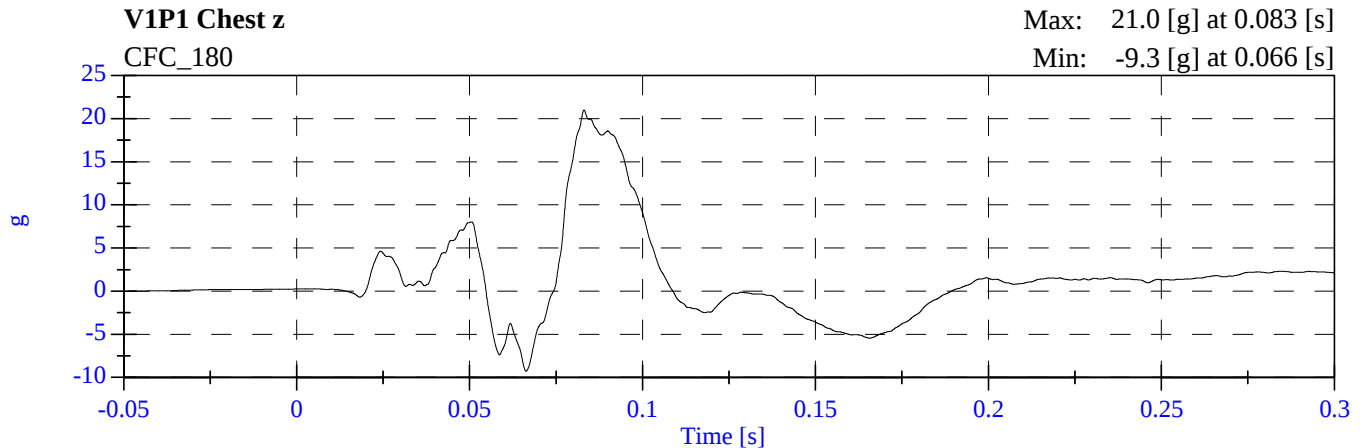
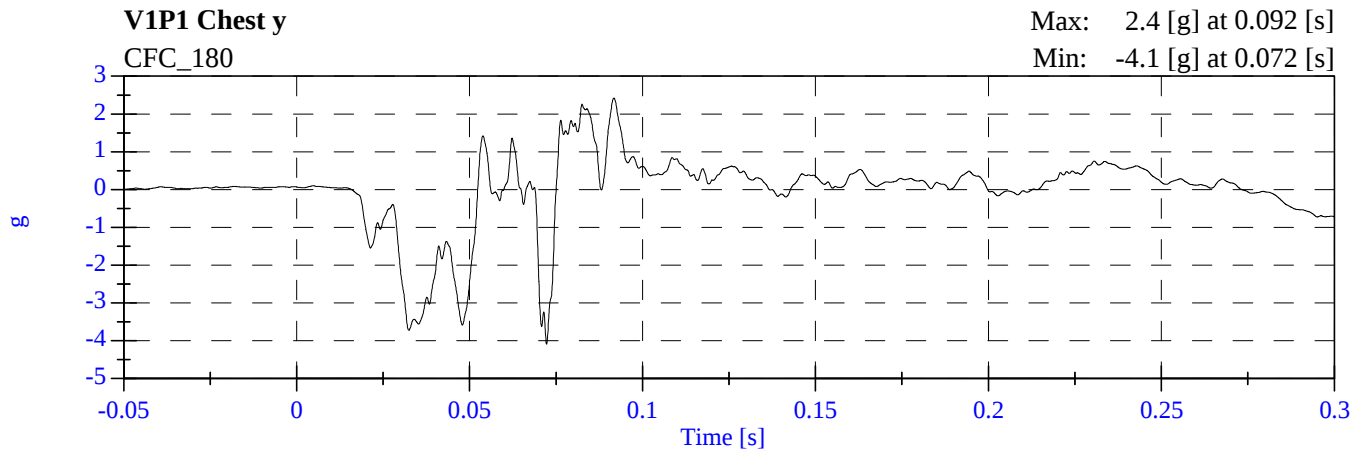
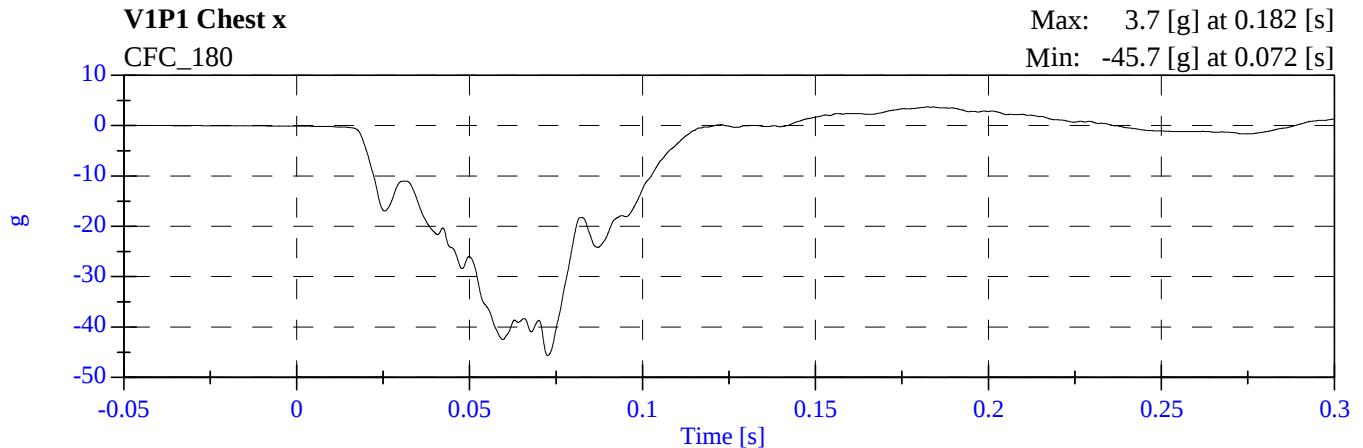
Frontal NCAP 2010 Toyota Tundra

MA5118 - September 15, 2009

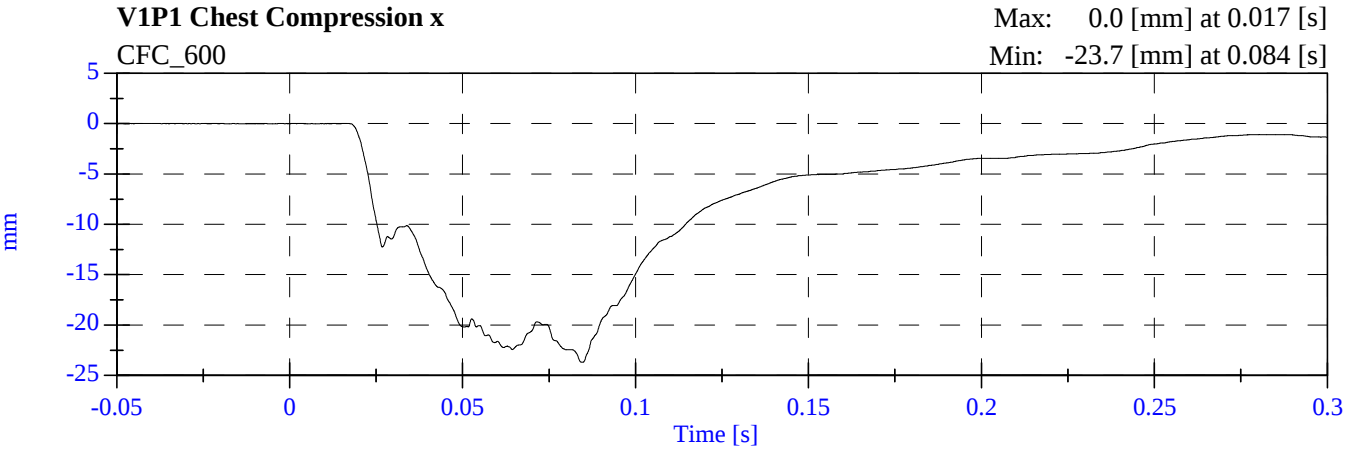


Frontal NCAP 2010 Toyota Tundra

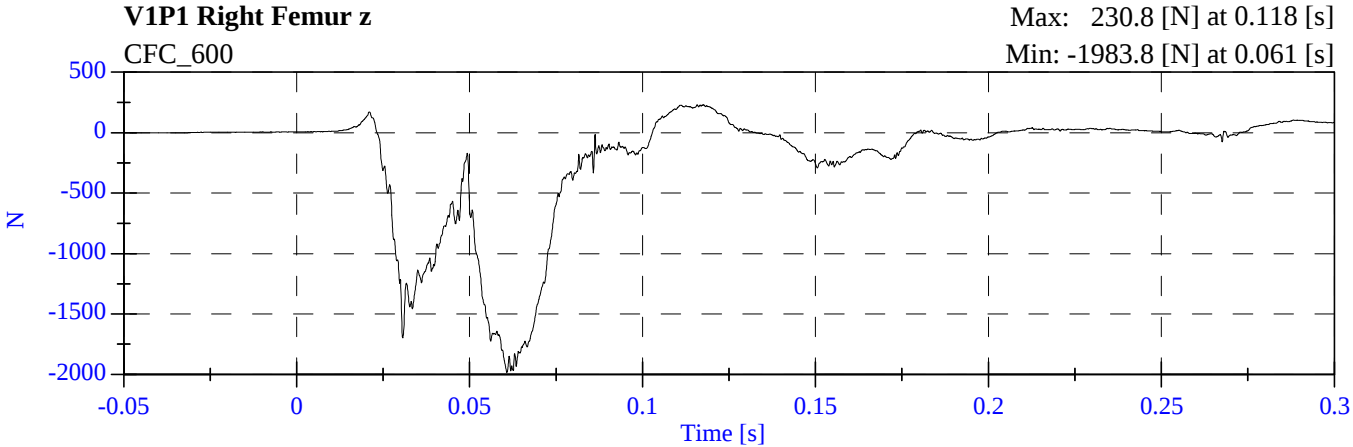
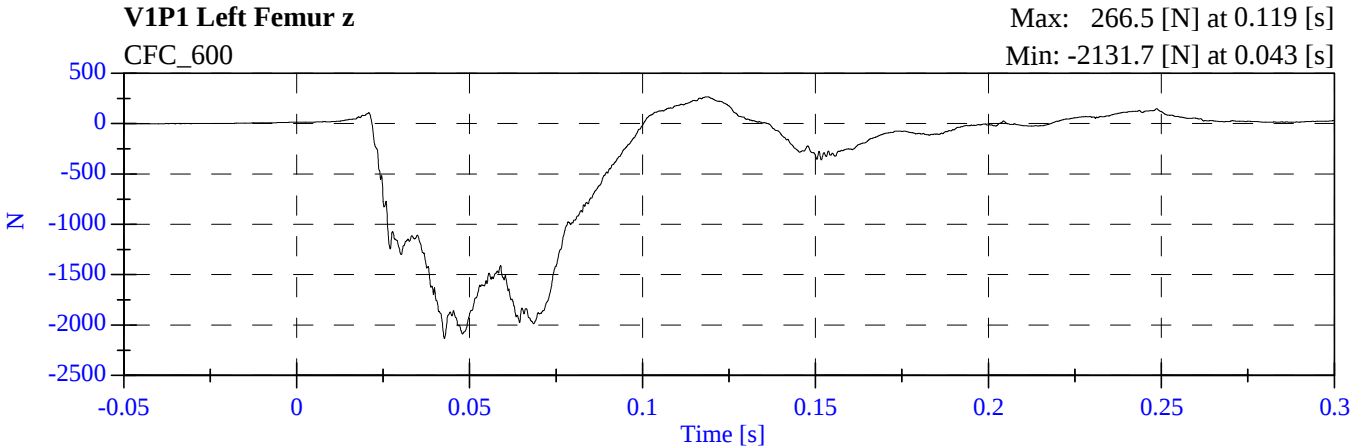
MA5118 - September 15, 2009



Frontal NCAP 2010 Toyota Tundra
MA5118 - September 15, 2009

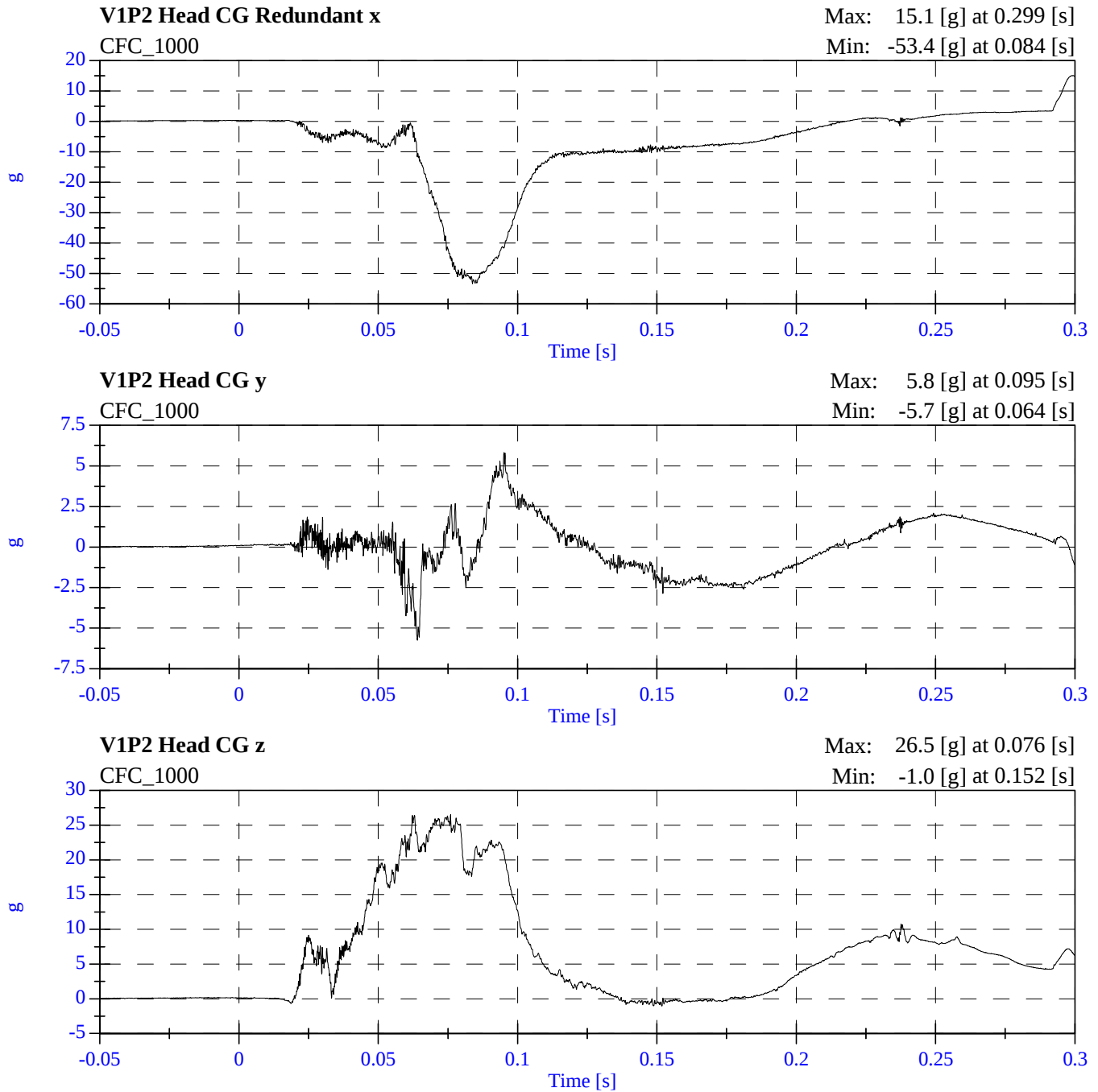


Frontal NCAP 2010 Toyota Tundra
MA5118 - September 15, 2009

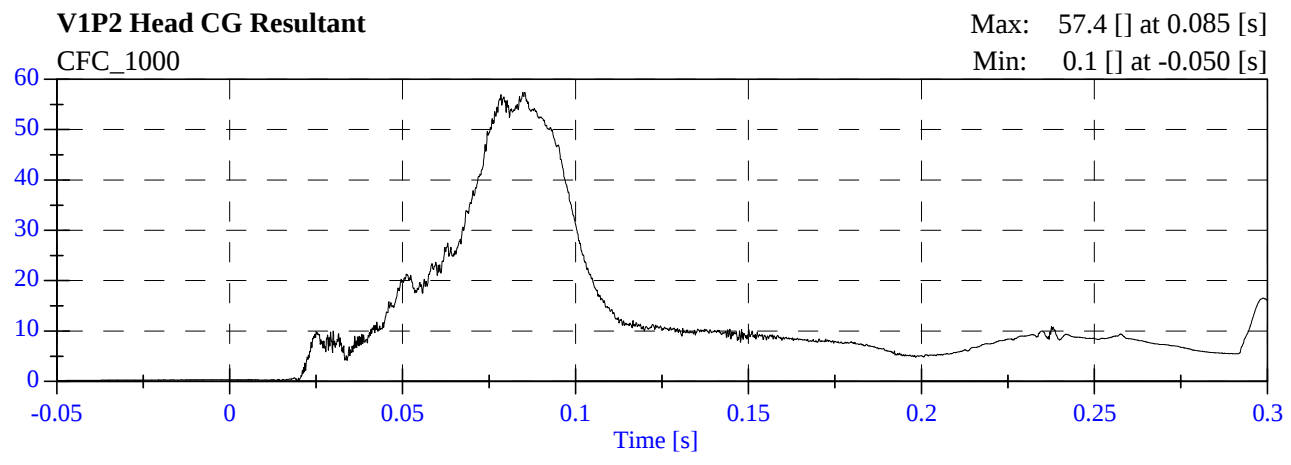


Frontal NCAP 2010 Toyota Tundra

MA5118 - September 15, 2009

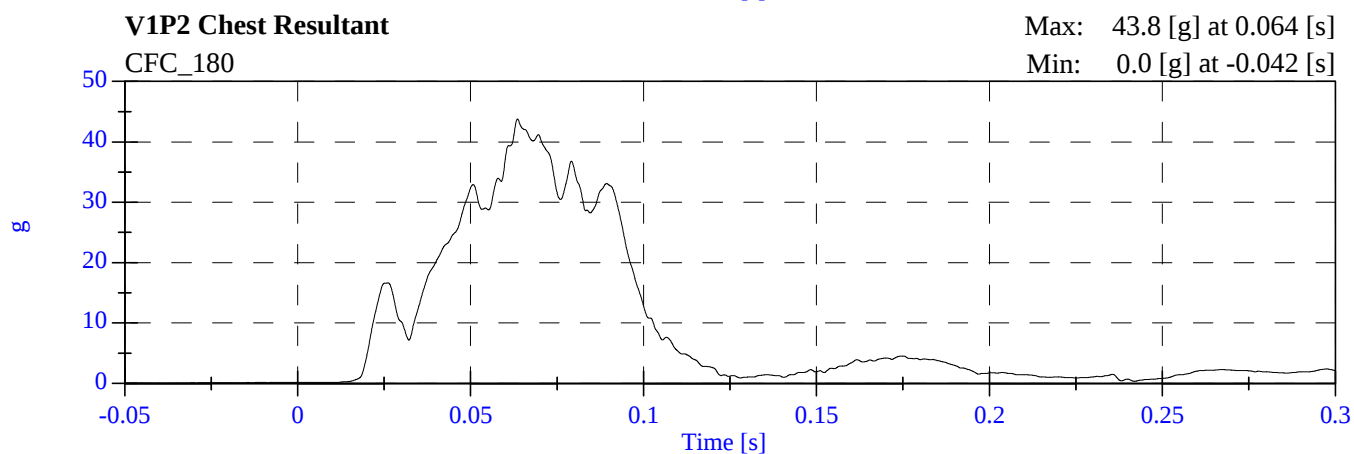
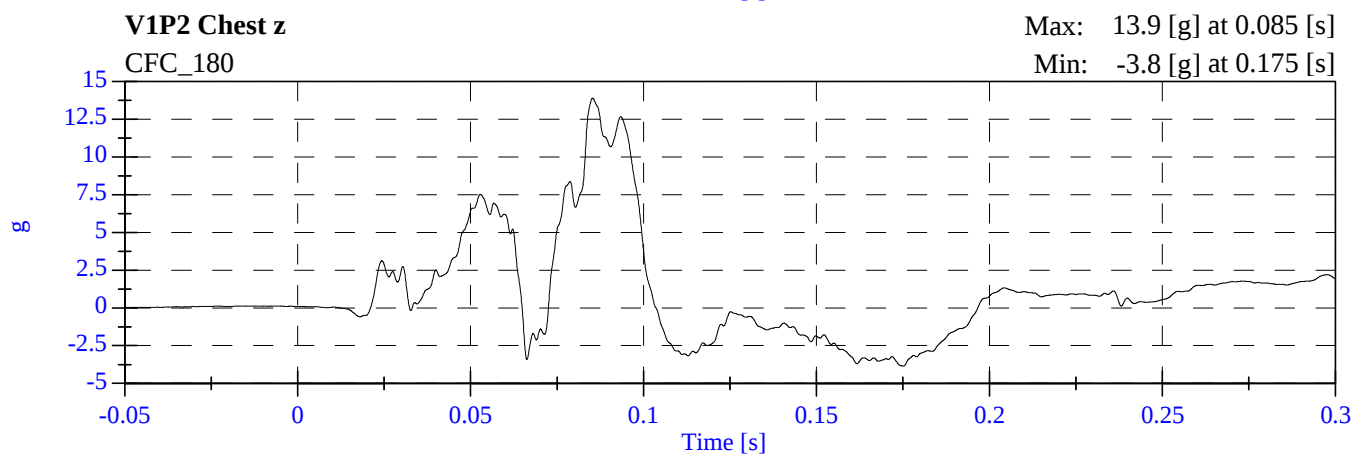
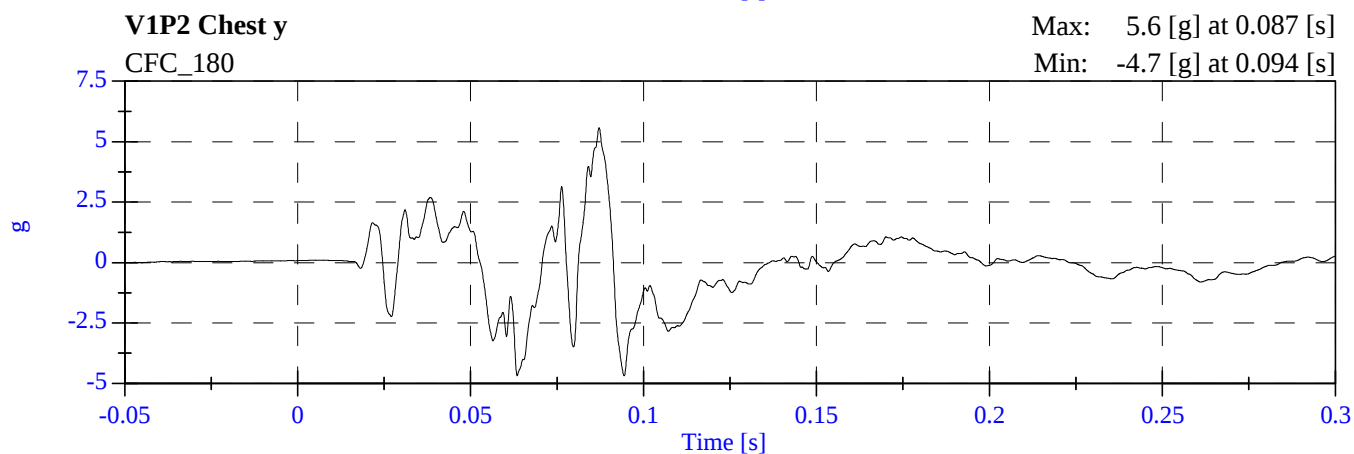
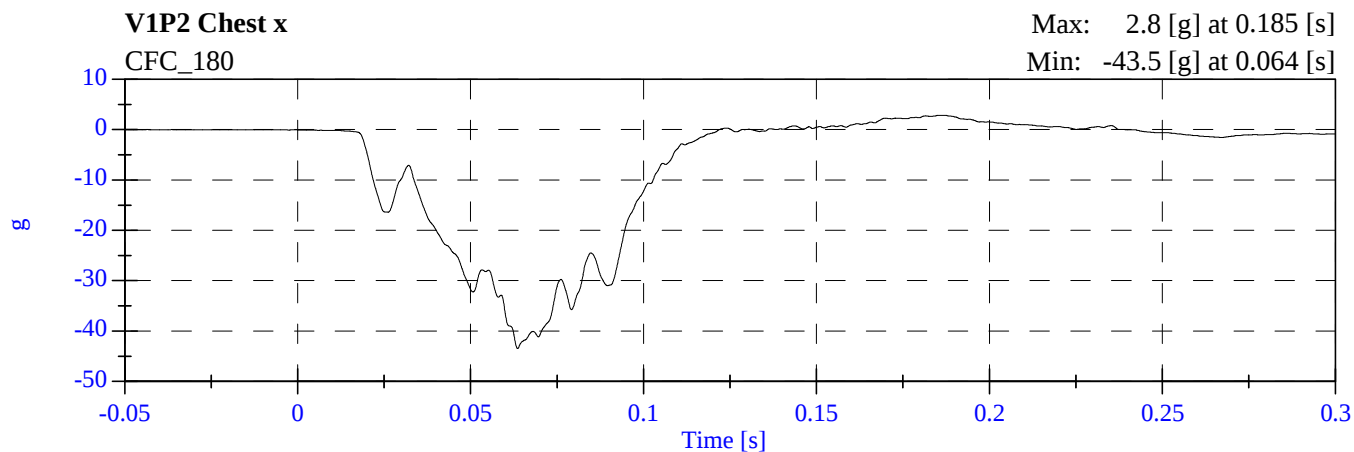


Frontal NCAP 2010 Toyota Tundra
MA5118 - September 15, 2009

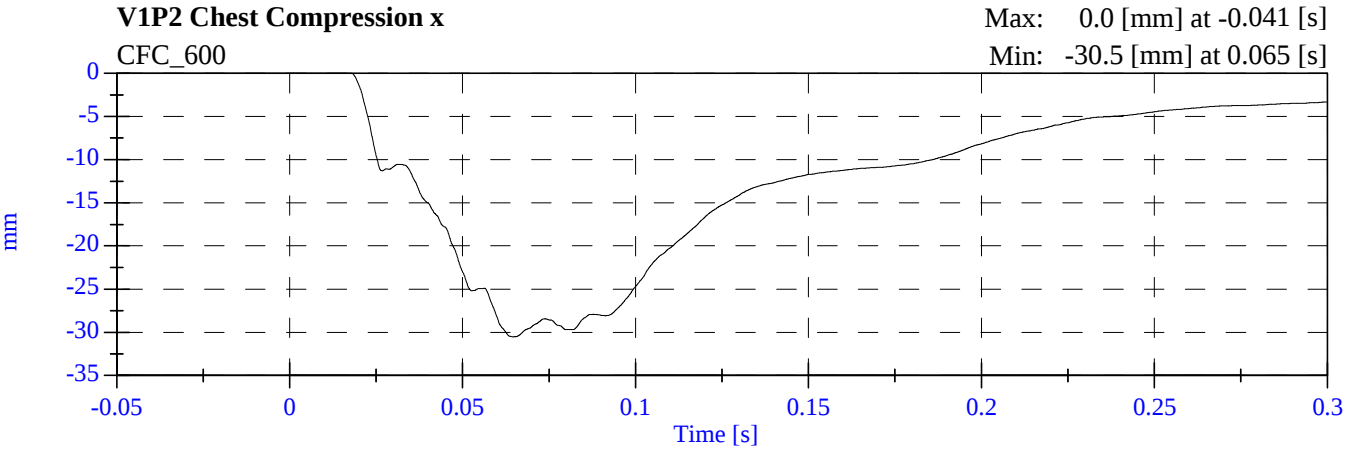


Frontal NCAP 2010 Toyota Tundra

MA5118 - September 15, 2009

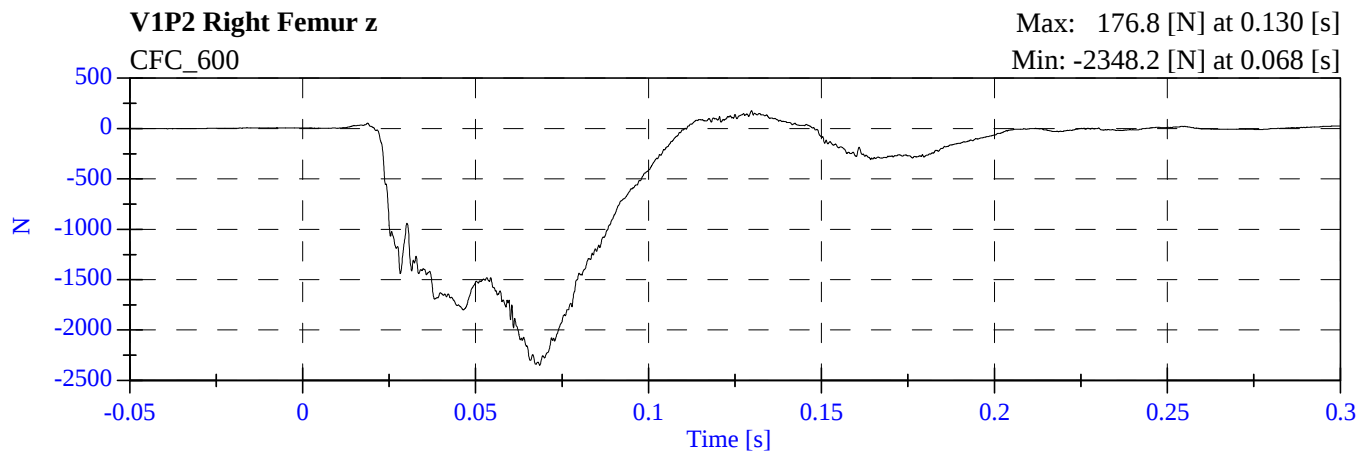
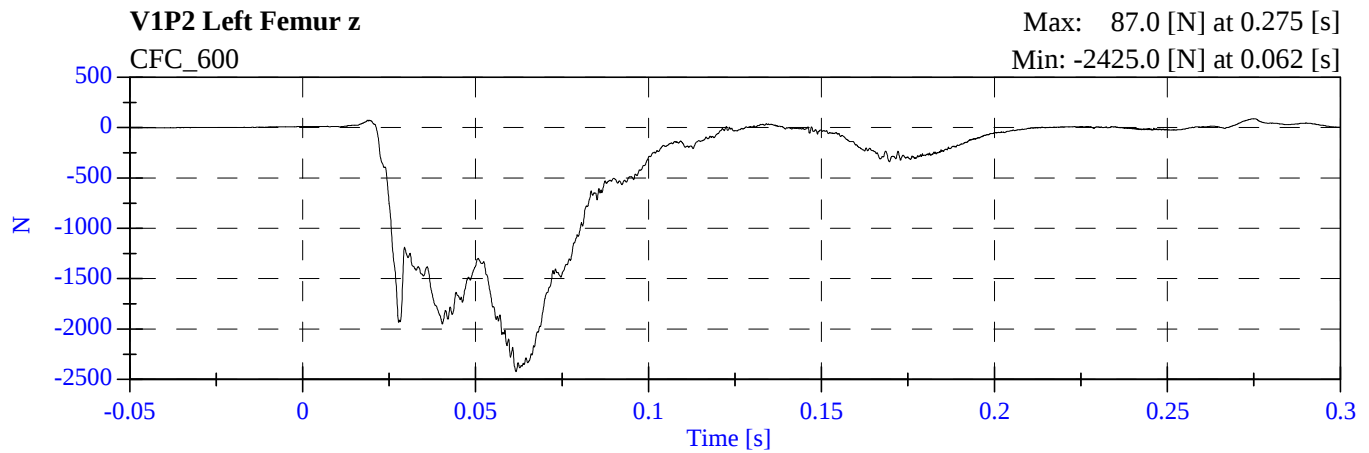


Frontal NCAP 2010 Toyota Tundra
MA5118 - September 15, 2009



Frontal NCAP 2010 Toyota Tundra

MA5118 - September 15, 2009



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.

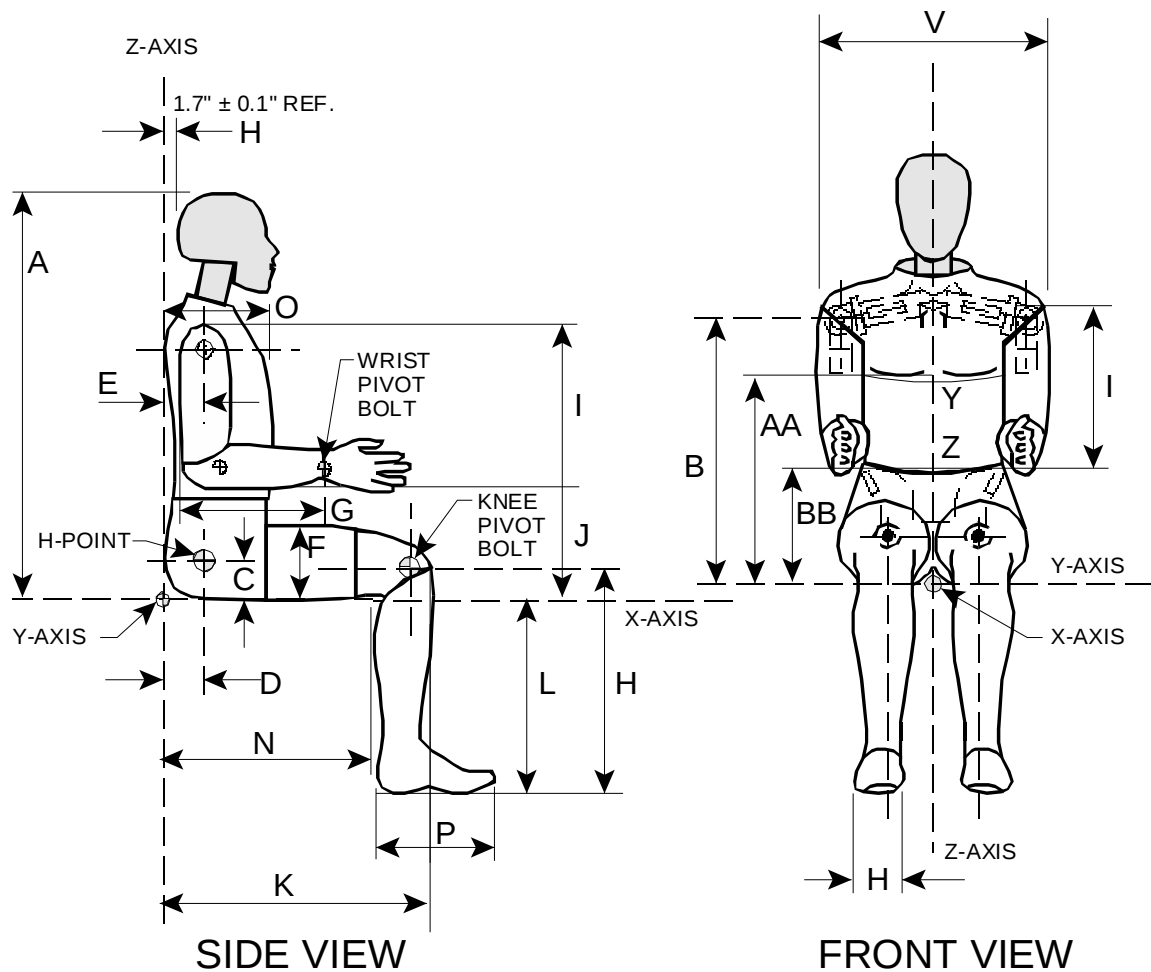
Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	064	7/30/09
#2/Right Front Passenger	061	6/5/09

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 Inducant 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 7/30/09
Workfile 064H4 07-30-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	62
Peak Resultant Acceleration	225-275 G's	263.45
Peak Lateral Acceleration	15 G's Max	3.57
Is Acceleration Curve Unimodal?	YES	Yes

Remarks: None

Laboratory Technician:

A. Rudniski

PART 572E
NECK FLEXION TEST

Dummy Serial Number	064	
Sequential Test Number	1	
Date	7-28-09	6 Axis Neck Transducer
Workfile	064NF 07-28-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	60
Impact Velocity		6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.92
	20 ms	17.60 - 22.60 G's	20.73
	30 ms	12.50 - 18.50 G's	15.86
Max Pendulum G's Above 30 ms		29 G's Max	15.86
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	39.40
D Plane Rotation	Max	64 - 78 Deg	71.13
	Time	57 - 64 ms	61.80
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	88.64
	Time	47 - 58 ms	52.80
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	116.90
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	99.50

Remarks:

Laboratory Technician: A. Rudniski

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	064	
Sequential Test Number	1	
Date	7-28-09	6 Axis Neck Transducer
Workfile	064NE 07-28-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	60
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	20.18
	20 ms	14.00 - 19.00 G's	18.42
	30 ms	11.00 - 16.00 G's	14.94
Max Pendulum G's Above 30 ms		22 G's Max	14.94
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	39.50
D Plane Rotation	Max	81 - 106 Deg	100.89
	Time	72 - 82 ms	77
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-73.09
	Time	65 - 79 ms	71.90
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	156.80
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	145.10

Remarks:

Laboratory Technician: A. Rudniski

PART 572E THORAX IMPACT TEST

Dummy Serial Number	064
Sequential Test Number	1
Date	7-28-09
Workfile	064T 07-28-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	22.2
Relative Humidity	10% - 70%	60
Pendulum Velocity	6.58 – 6.83 m/s	6.64
Maximum Deflection	63.50 – 72.64 mm	69.85
Maximum Resistive Force	5159.9 – 5893.9 N	5859.02
Internal Hysteresis	69 - 85 %	73.68

Remarks:

Laboratory Technician:

A. Rudniski

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 064
Sequential Test Number 1
Date 7-29-09
Workfile 064LK 07-29-09; 064RK 07-29-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	66
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5052.0
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.7
Relative Humidity	10% - 70%	66
Probe Velocity	2.07 – 2.13 m/s	2.09
Peak Knee Impact Force	4715.1 – 5782.7 N	5222.1

Remarks:

Laboratory Technician:

A. Rudniski

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 064
Sequential Test Number 1
Date 7/30/09

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			22
Relative Humidity			65
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:

Laboratory Technician:

A. Rudniski

PART 572E
HEAD DROP TEST

Dummy Serial Number 061
Sequential Test Number 1
Date 6-01-09
Workfile 061H2 06-01-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	22.2
Relative Humidity	10% - 70%	34
Peak Resultant Acceleration	225-275 G's	249.48
Peak Lateral Acceleration	15 G's Max	2.76
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	06-03-09	6 Axis Neck Transducer
Workfile	061NE 06-03-09	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	22.2
Relative Humidity		10% - 70%	40
Impact Velocity		6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	24.59
	20 ms	17.60 - 22.60 G's	20.85
	30 ms	12.50 - 18.50 G's	17.51
Max Pendulum G's Above 30 ms		29 G's Max	17.51
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.4
D Plane Rotation	Max	64 - 78 Deg	70.61
	Time	57 - 64 ms	59.50
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	91.00
	Time	47 - 58 ms	48.70
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	116.40
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	101.40

Remarks:

Laboratory Technician: A. Rudniski

PART 572E
NECK EXTENSION TEST

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

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	22.2
Relative Humidity		10% - 70%	40
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	20.10
	20 ms	14.00 - 19.00 G's	17.73
	30 ms	11.00 - 16.00 G's	14.28
Max Pendulum G's Above 30 ms		22 G's Max	14.28
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	40.70
D Plane Rotation	Max	81 - 106 Deg	99.29
	Time	72 - 82 ms	75.60
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-71.42
	Time	65 - 79 ms	72.20
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	157.30
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	145.20

Remarks:

Laboratory Technician: A. Rudniski

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 061
Sequential Test Number 1
Date 06-03-09
Workfile 061T 06-03-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	22.2
Relative Humidity	10% - 70%	38
Pendulum Velocity	6.58 – 6.83 m/s	6.64
Maximum Deflection	63.50 – 72.64 mm	68.77
Maximum Resistive Force	5159.9 – 5893.9 N	5579.18
Internal Hysteresis	69 - 85 %	74.41

Remarks:

Laboratory Technician: A. Rudniski

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 061
Sequential Test Number 1
Date 06-04-09
Workfile 061LF 06-04-09; 061RF 06-04-09

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	22.2
Relative Humidity	10% - 70%	30
Probe Velocity	2.07 – 2.13 m/s	2.07
Peak Knee Impact Force	4715.1 – 5782.7 N	4939.58
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	22.2
Relative Humidity	10% - 70%	30
Probe Velocity	2.07 – 2.13 m/s	2.10
Peak Knee Impact Force	4715.1 – 5782.7 N	5169.94

Remarks:

Laboratory Technician:

A. Rudniski

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 061
Sequential Test Number 1
Date 06-05-09

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			22
Relative Humidity			65
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:

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 064)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	AC-P52011	5/27/2009	11/25/2009
	Y	ENDEVCO	AC-P52128	5/27/2009	11/25/2009
	Z	ENDEVCO	AC-P51990	5/27/2009	11/25/2009
Head	X (R)	ENDEVCO	AC-P51303	5/27/2009	11/25/2009
	Y (R)	ENDEVCO	AC-P51985	5/27/2009	11/25/2009
	Z (R)	ENDEVCO	AC-P51294	5/27/2009	11/25/2009
Neck Load Cell	X	DENTON	LC-440Fx	4/7/2009	10/6/2009
	Y	DENTON	LC-440Fy	4/7/2009	10/6/2009
	Z	DENTON	LC-440Fz	4/7/2009	10/6/2009
Neck Moment	X	DENTON	LC-440Mx	4/7/2009	10/6/2009
	Y	DENTON	LC-440My	4/7/2009	10/6/2009
	Z	DENTON	LC-440Mz	4/7/2009	10/6/2009
Chest	X	ENDEVCO	AC-P52000	5/28/2009	11/26/2009
	Y	ENDEVCO	AC-P49163	5/28/2009	11/26/2009
	Z	ENDEVCO	AC-P52009	5/28/2009	11/26/2009
Chest	X (R)	ENDEVCO	AC-P52035	5/28/2009	11/26/2009
	Y (R)	ENDEVCO	AC-P52030	5/28/2009	11/26/2009
	Z (R)	ENDEVCO	AC-P52033	5/28/2009	11/26/2009
Chest Deflection	X	SERVO	DS-064	5/24/2009	11/22/2009
Pelvic	X	ENDEVCO	AC-P17285	5/28/2009	11/26/2009
	Y	ENDEVCO	AC-P17837	5/28/2009	11/26/2009
	Z	ENDEVCO	AC-P17553	5/28/2009	11/26/2009

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 064)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1525	5/29/2009	11/27/2009
Right Femur Load Cell	Fz	DENTON	LC-1533	5/29/2009	11/27/2009
Left Upper Tibia	Mx	DENTON	LC-374Mx	6/2/2009	12/1/2009
	My	DENTON	LC-374My	6/2/2009	12/1/2009
Left Lower Tibia	Fz	DENTON	LC-372Fz	6/2/2009	12/1/2009
	Mx	DENTON	LC-372Mx	6/2/2009	12/1/2009
	My	DENTON	LC-372My	6/2/2009	12/1/2009
Right Upper Tibia	Mx	DENTON	LC-404Mx	6/1/2009	11/30/2009
	My	DENTON	LC-404My	6/1/2009	11/30/2009
Right Lower Tibia	Fz	DENTON	LC-396Fz	6/1/2009	11/30/2009
	Mx	DENTON	LC-396Mx	6/1/2009	11/30/2009
	My	DENTON	LC-396My	6/1/2009	11/30/2009
Left Foot Rear	X	ENDEVCO	AC-P52152	5/28/2009	11/26/2009
	Z	ENDEVCO	AC-P52082	5/28/2009	11/26/2009
Left Foot Front	Z	ENDEVCO	AC-P52383	5/27/2009	11/25/2009
Right Foot Rear	X	ENDEVCO	AC-P51873	5/28/2009	11/26/2009
	Z	ENDEVCO	AC-P58987	5/28/2009	11/26/2009
Right Foot Front	Z	ENDEVCO	AC-P52025	5/28/2009	11/26/2009
Lap Belt Load Cell		First Technology	LC-156	4/2/2009	10/1/2009
Shoulder Belt Load Cell		First Technology	LC-159	4/2/2009	10/1/2009

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 061)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	AC-P58871	6/12/2009	12/11/2009
	Y	ENDEVCO	AC-P51281	6/12/2009	12/11/2009
	Z	ENDEVCO	AC-P51209	6/12/2009	12/11/2009
Head	X (R)	ENDEVCO	AC-P52155	6/12/2009	12/11/2009
	Y (R)	ENDEVCO	AC-P51274	6/12/2009	12/11/2009
	Z (R)	ENDEVCO	AC-P52133	6/12/2009	12/11/2009
Neck Load Cell	X	DENTON	LC-1916Fx	7/13/2009	1/11/2010
	Y	DENTON	LC-1916Fy	7/13/2009	1/11/2010
	Z	DENTON	LC-1916Fz	7/13/2009	1/11/2010
Neck Moment	X	DENTON	LC-1916Mx	7/13/2009	1/11/2010
	Y	DENTON	LC-1916My	7/13/2009	1/11/2010
	Z	DENTON	LC-1916Mz	7/13/2009	1/11/2010
Chest	X	ENDEVCO	AC-P52157	6/12/2009	12/11/2009
	Y	ENDEVCO	AC-P52018	6/12/2009	12/11/2009
	Z	ENDEVCO	AC-P52398	5/27/2009	11/25/2009
Chest	X (R)	ENDEVCO	AC-P52156	6/12/2009	12/11/2009
	Y (R)	ENDEVCO	AC-P49179	6/12/2009	12/11/2009
	Z (R)	ENDEVCO	AC-P52405	5/27/2009	11/25/2009
Chest Deflection	X	SERVO	DS-061	7/14/2009	1/12/2010
Pelvic	X	ENDEVCO	AC-P58743	6/12/2009	12/11/2009
	Y	ENDEVCO	AC-P58766	6/12/2009	12/11/2009
	Z	ENDEVCO	AC-P58767	6/12/2009	12/11/2009

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 061)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1532	6/15/2009	12/14/2009
Right Femur Load Cell	Fz	DENTON	LC-1526	6/15/2009	12/14/2009
Left Upper Tibia	Mx	DENTON	LC-91UMx	7/14/2009	1/12/2010
	My	DENTON	LC-91UMy	7/14/2009	1/12/2010
Left Lower Tibia	Fz	DENTON	LC-91LFz	7/14/2009	1/12/2010
	Mx	DENTON	LC-91LMx	7/14/2009	1/12/2010
	My	DENTON	LC-91LMy	7/14/2009	1/12/2010
Right Upper Tibia	Mx	DENTON	LC-200Mx	7/14/2009	1/12/2010
	My	DENTON	LC-200My	7/14/2009	1/12/2010
Right Lower Tibia	Fz	DENTON	LC-128Fz	7/14/2009	1/12/2010
	Mx	DENTON	LC-128Mx	7/14/2009	1/12/2010
	My	DENTON	LC-128My	7/14/2009	1/12/2010
Left Foot Rear	X	ENTRAN	AC-00L20-A30	6/12/2009	12/11/2009
	Z	ENTRAN	AC-00L20-A22	6/12/2009	12/11/2009
Left Foot Front	Z	ENTRAN	AC-02I02I16-A05	6/12/2009	12/11/2009
Right Foot Rear	X	ENTRAN	AC-00L20-A29	6/12/2009	12/11/2009
	Z	ENTRAN	AC-03E03E20-N12	6/12/2009	12/11/2009
Right Foot Front	Z	ENDEVCO	AC-J29805	6/12/2009	12/11/2009
Lap Belt Load Cell		First Technology	LC-173	4/2/2009	10/1/2009
Shoulder Belt Load Cell		First Technology	LC-178	4/2/2009	10/1/2009

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

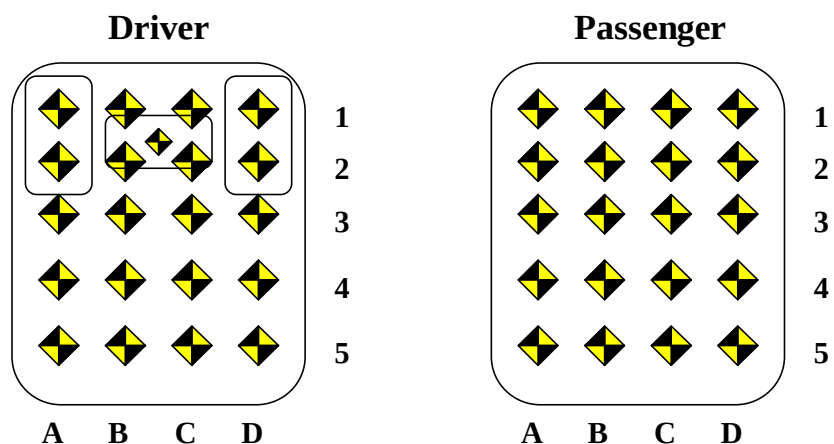
	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ENDEVCO	AC-A13829	4/3/2009	10/2/2009
Right Rear Seat Crossmember X	ENDEVCO	AC-P18531	4/3/2009	10/2/2009
Top of Engine	ICS	AC-8084-041	3/27/2009	9/25/2009
Bottom of Engine	GS SENSORS	AC-9440-039	7/23/2009	1/21/2010
Right Disc Brake Caliper	GS SENSORS	AC-9440-011	4/16/2009	10/15/2009
Left Disc Brake Caliper	ICS	AC-FA2483	4/16/2009	10/15/2009
Left Seat Rear Crossmember Z	ENDEVCO	AC-P16841	4/3/2009	10/2/2009
Right Seat Rear Crossmember Z	ENDEVCO	AC-P23128	7/23/2009	1/21/2010

TEST NOTES	
Data Channel	Anomalies
V1P1 Chest Y Redundant	Questionable Data. Data spike 58.8 – 59.8 milliseconds
V1P2 Head X	Questionable Data from 54.7 – 60 milliseconds and 77.6 – 90.1 milliseconds
V1P2 Left Foot Aft x	Questionable data after 173 milliseconds
V1P2 Left Foot Aft z	Questionable data after 173 milliseconds
V1P2 Left Foot Fore z	Questionable data after 173 milliseconds
V1 Left Rear Accelerometer (z)	Questionable data 80.9 – 196.4 milliseconds

APPENDIX E

VEHICLE INTERIOR INTRUSION MEASUREMENTS

DRIVER SIDE INTRUSION MEASUREMENTS



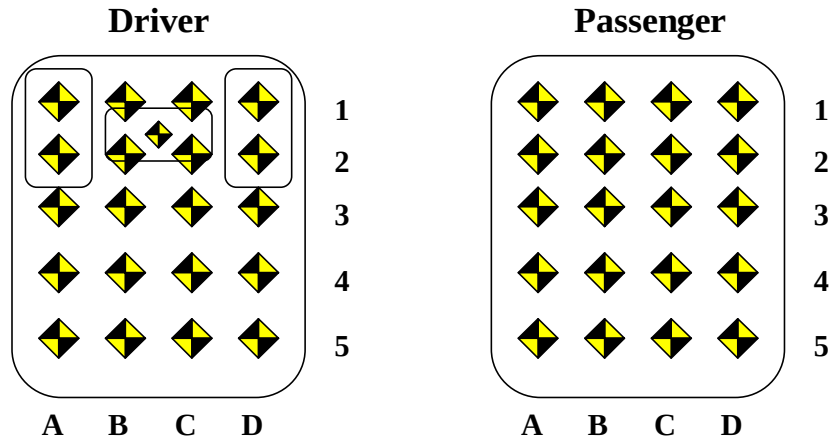
Driver Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3936	-688	782	3981	-665	807	-45	-23	-25
B1	4033	-555	781	4070	-527	813	-37	-28	-32
C1	4068	-407	781	4088	-383	824	-20	-24	-43
D1	4010	-278	782	4016	-261	835	-6	-17	-53
A2	3880	-687	732	3921	-664	758	-41	-23	-26
B2	3965	-555	721	4004	-529	749	-39	-26	-28
C2	3958	-410	716	3989	-382	748	-31	-28	-32
D2	3957	-277	714	3971	-258	762	-14	-19	-48
A3	3823	-684	681	3863	-662	712	-40	-22	-31
B3	3854	-553	674	3889	-529	703	-35	-24	-29
C3	3845	-410	673	3879	-389	696	-34	-21	-23
D3	3856	-279	669	3890	-258	700	-34	-21	-31
A4	3770	-686	665	3811	-664	697	-41	-22	-32
B4	3774	-552	667	3812	-528	701	-38	-24	-34
C4	3771	-411	667	3807	-389	696	-36	-22	-29
D4	3776	-280	666	3810	-259	698	-34	-21	-32
A5	3703	-683	664	3742	-664	696	-39	-19	-32
B5	3701	-547	667	3739	-527	698	-38	-20	-31
C5	3698	-413	668	3735	-392	699	-37	-21	-31
D5	3695	-283	667	3732	-263	699	-37	-20	-32
BP	3903	-433	840	3971	-414	831	-68	-19	9
G	3673	-595	1115	3728	-273	1159	-55	-322	-44
H	3665	-292	1114	3726	-575	1147	-61	283	-33
L	3420	-470	1408	3474	-450	1390	-54	-20	18
AB	3339	-682	724	3371	-666	752	-32	-16	-28

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	3992	285	739	3992	304	809	0	-19	-70
B1	3993	418	739	4001	438	800	-8	-20	-61
C1	3992	554	738	4018	573	781	-26	-19	-43
D1	3987	687	746	4013	707	787	-26	-20	-41
A2	3895	288	660	3906	305	721	-11	-17	-61
B2	3896	418	659	3910	438	715	-14	-20	-56
C2	3896	555	658	3921	572	702	-25	-17	-44
D2	3900	686	658	3926	704	699	-26	-18	-41
A3	3792	287	585	3822	304	625	-30	-17	-40
B3	3795	421	585	3823	438	626	-28	-17	-41
C3	3797	554	584	3823	573	629	-26	-19	-45
D3	3797	685	583	3823	702	629	-26	-17	-46
A4	3721	285	582	3753	300	621	-32	-15	-39
B4	3721	422	582	3751	436	624	-30	-14	-42
C4	3723	554	584	3750	568	630	-27	-14	-46
D4	3722	686	581	3745	703	630	-23	-17	-49
A5	3643	286	582	3674	300	623	-31	-14	-41
B5	3644	426	585	3672	438	630	-28	-12	-45
C5	3646	551	585	3673	566	633	-27	-15	-48
D5	3646	686	582	3670	700	632	-24	-14	-50
R	3650	310	1031	3716	316	1089	-66	-6	-58
S	3664	612	1034	3716	617	1090	-52	-5	-56
AB	3342	687	638	3359	694	685	-17	-7	-47

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

AB = Front outboard seat anchor bolt