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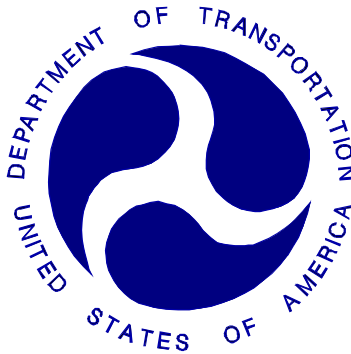
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

VOLVO CAR CORPORATION
2008 VOLVO XC90
4-DOOR SUV

NHTSA NUMBER: O85900

CALSPAN TEST NUMBER: 8842-NCAP-01

CALSPAN CORPORATION
TRANSPORTATION SCIENCES CENTER
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BUFFALO, NEW YORK 14225



October 11, 2007

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
Mail Code: NVS-111
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Approval Date:

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16. Abstract A frontal load cell barrier test of a 2008 Volvo XC90 4-Door SUV was performed at Calspan Corporation's crash test facility in Buffalo, New York, on October 11, 2007. The impact velocity was 55.84 kph and the temperature at the barrier face was 21.1°C. The maximum post-test vehicle crush was 475 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: <table border="1"> <thead> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Driver (142)</th> <th>Passenger (150)</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC - 36 ms)</td> <td>-</td> <td>1000</td> <td>248.5</td> <td>177.0</td> </tr> <tr> <td>Maximum Thorax Acceleration (3 ms Clip)</td> <td>g's</td> <td>60 g's</td> <td>41.6</td> <td>37.8</td> </tr> <tr> <td>Chest Displacement</td> <td>mm</td> <td>-76 mm</td> <td>-32.2</td> <td>-44.2</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>-10000 N</td> <td>-4499.9</td> <td>-2351.2</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>-10000 N</td> <td>-4350.7</td> <td>-4147.5</td> </tr> </tbody> </table>					Measurement Description	Units	Threshold	Driver (142)	Passenger (150)	Head Injury Criteria (HIC - 36 ms)	-	1000	248.5	177.0	Maximum Thorax Acceleration (3 ms Clip)	g's	60 g's	41.6	37.8	Chest Displacement	mm	-76 mm	-32.2	-44.2	Left Femur Force	Newtons	-10000 N	-4499.9	-2351.2	Right Femur Force	Newtons	-10000 N	-4350.7	-4147.5
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SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 55.84 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA). 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 55.84 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 55.84 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, chest and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 142) and the right-front passenger (position 2) ATD (Serial No.150) 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 157 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 2008 Volvo XC90 4-Door SUV at a velocity of 55.84 kph. The test was performed at Calspan on October 11, 2007. 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	248.5	51.1	87.2	41.6	52.0	55.0	-32.2	-4499.9	-4350.7
Passenger	177.0	48.8	84.8	37.8	65.7	68.9	-44.2	-2351.2	-4147.5

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

TEST NOTES	
Data Channel	Anomalies
V1P2 Right Upper Tibia Mx	Questionable Data 107-131 msec
V1 Right Caliper #5x	Cut wire at 39 msec
Barrier Load Cell C3 Fx	Questionable Data after 91 msec

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
CRASH TEST SUMMARY

Vehicle NHTSA No.: O85900 Test Mode: 56.3 kph Frontal Barrier
 Test Date: October 11, 2007 Time: 19:09 Temperature: 21.1 °C
 Vehicle Make/Model/Body Style: 2008 Volvo XC90 4-Door SUV
 Vehicle Test Weight: 2388.5 kg Impact Velocity: 55.84 kph (55.5 – 57.1 kph)
 Vehicle/Barrier Impact Angle: 0 ° Max Static Crush: 475 mm

ATD INFORMATION AND VISIBLE CONTACT POINTS

	DRIVER	PASSENGER
ATD Type:	Part 572E	Part 572E
Restraint System:	Seatbelt, Airbag, Knee Bolster	Seatbelt, Airbag, Knee Bolster
Head Contact:	Face – Airbag Back of Head – Head Restraint	Face – Airbag Top of Head – Sunvisor Back of Head – Head Restraint
Abdomen Contact:	Airbag	Airbag
Chest Contact:	Airbag	Airbag
Left Knee Contact:	Dashpanel	Glove Box Door
Right Knee Contact:	Dashpanel	Glove Box Door

DOOR OPENING, SEAT TRACK AND GLAZING INFORMATION

Description	Driver Side	Passenger Side
Door Lock Status	Unlocked	Unlocked
Front Door Opening	Closed/Operable – No Tools required	Closed/Operable – No Tools required
Rear Door Opening	Closed/Operable – No Tools required	Closed/Operable – No Tools required
Hatch/Other Door Opening	Closed/Operable – No Tools required	
Front Seat Track Shift (mm)	3 mm forward	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	675	650	608	644

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	900	900
Lap belt length as measured on ATD	mm	580	580
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems	mm	N/A	N/A

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2008 Volvo XC90 4-Door SUV

NHTSA No. : 085900 ; VIN: YV4CZ982081430787 ; Color: Green

Engine Data: 6 cylinders; - CID; 3.2 Liters; - cc

Placement: - Longitudinal or In-Line; X 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: 10/5/07 ; Odometer Reading km

Selling Dealer: Jim Culligan, Inc.

Dealer Address: 8129 Main Street, Williamsville, NY 14221

TEST VEHICLE OPTIONS:

X AC; X Power Steering; X Power Brakes; X Power Locks; - 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
Passenger:	X	-	X	-	X
Rear Passenger:	-	-	-	-	X

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Volvo Car Corporation

Date of Manufacture 07/07

GVWR: 2758 kg; GAWR: 1306 kg FRONT; 1551 kg REAR

VEHICLE CAPACITY DATA:

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

Number of Occupants: 2 Front; 5 Rear; 7 Total

Vehicle Capacity Weight (VCW) = 550.0 kg

No. of Occupants x 68.04 kg = 476.3 kg

Rated Cargo/Luggage Weight (RCLW) = 73.7 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 =	576.5	567.5	52.7	1144.0
Rear =	524.0	503.0	47.3	1027.0
Total Delivered Weight (UDW) =				2171.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW)	=	2171.0	kg
Rated Cargo/Luggage Weight (RCLW)	=	73.7	kg
Weight of 2 p.572 Dummies @ 76 each	=	152	kg
TARGET TEST WEIGHT	=	2396.7	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 65.5 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	612.0	604.0	50.9	1216.0
Rear =	599.5	573.0	49.1	1172.5
Total Vehicle Test Weight (ATW) =				2388.5

Weight of Ballast Secured in Vehicle Trunk Area¹ = 24.5 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:	836	837	859	855	1349.1
FULLY LOADED:	827	828	842	838	-
AS TESTED:	828	829	842	838	1400.0

Vehicle's Wheel Base: 2852 mm

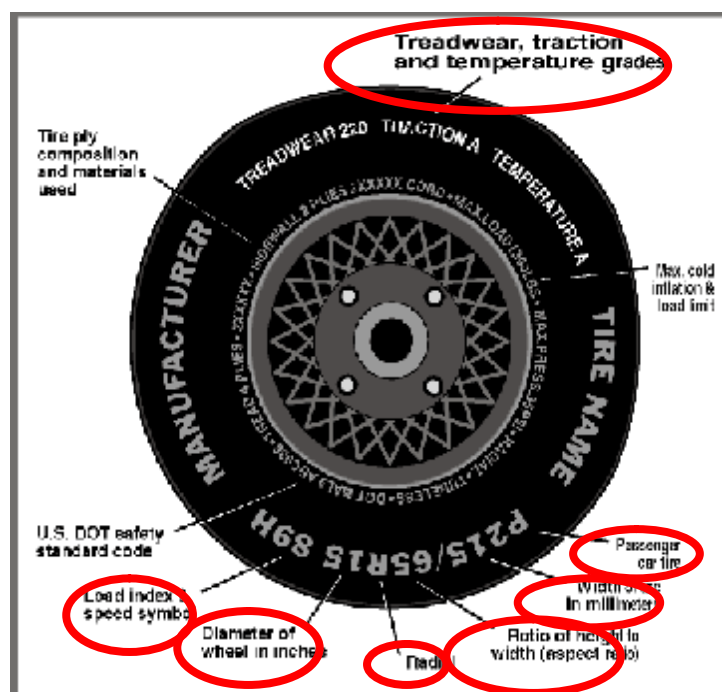
¹Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

²Rearward of the front axle centerline.

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Vehicle Year/Make/Model/Body Style: 2008 Volvo XC90 4-Door SUV

NHTSA Test No.: O85900 Test Date: October 11, 2007



Measured Parameter	Front	Rear
Maximum Tire Pressure (from sidewall - kPa)	300	300
Cold Pressure (from tire placard - kPa)*	250	250
Recommended Tire Size (from tire placard)	235/65R17	235/65R17
Tire size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	Pirelli	Pirelli
Tire Name	Scorpion Zero	Scorpion Zero
Tire Type	Passenger	Passenger
Tire Width (mm)	235	235
Ratio of Height to Width (aspect ratio)	65	65
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index & Speed Symbol	104H	104H
Treadwear	420	420
Traction Grade	A	A
Temperature Grade	A	A

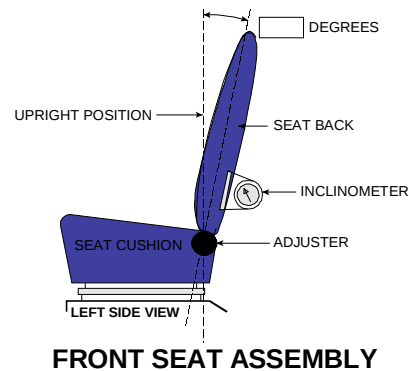
*Tire pressure used for test

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2008 Vehicle Model: Volvo XC90 Body Style : 4-Door SUV

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: 19°

Measurement instructions: Place seat at 19 degrees from vertical measured using a straight edge
along the seat back frame.

Seat back angle for passenger's seat: 19°

Measurement instructions: Place seat at 19 degrees from vertical measured using a straight edge
along the seat back frame.

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: 298 mm complete range of fore/aft travel. Seat placed at 149 mm from
most forward position.

Positioning of the passenger's seat: 296 mm complete range of fore/aft travel. Seat placed at 148 mm from
most forward position.

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 79.9 liters

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

C. "Usable Capacity" of the vehicle(s) used for certification
testing to requirements of FMVSS 301 = 73.5 to 75.1 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 73.4 liters

3.3 One-Third of Useable Capacity = 26.6 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.

Turn ignition key two 'notches' from initial position

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

4. STEERING COLUMN ADJUSTMENTS:

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

Operational Instructions: Steering wheel placed in center of travel. Total travel is 4 degrees.

Steering wheel placed at 2 degrees from full down position.

Steering column placed in center of travel. Total travel is 60 mm. Steering column placed at 30 mm from full inward position

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: Not applicable

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

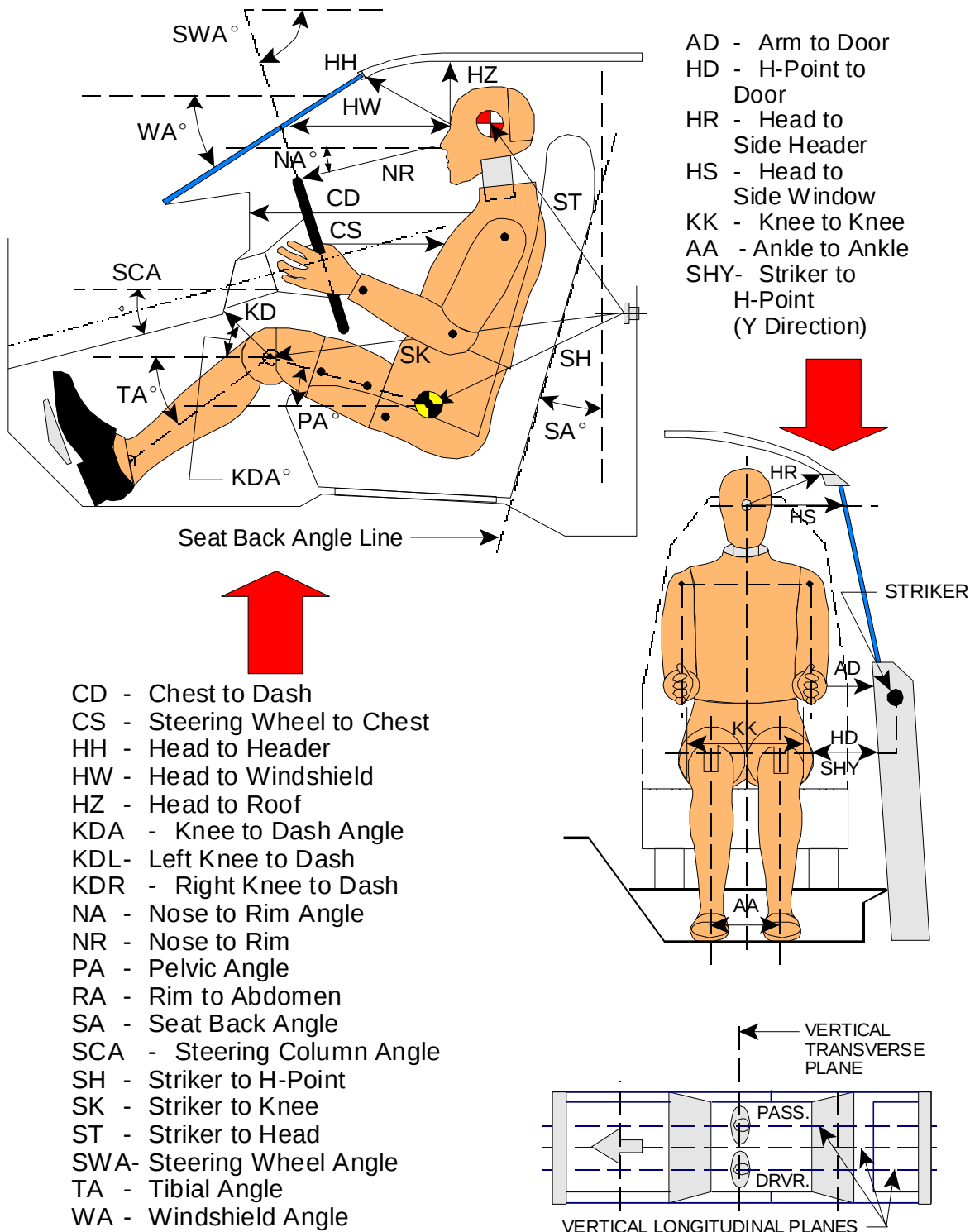
Does vehicle owner's manual describe how to deactivate ADLs? X Yes; - No; - N/A

Comments: None

DATA SHEET NO. 5

FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



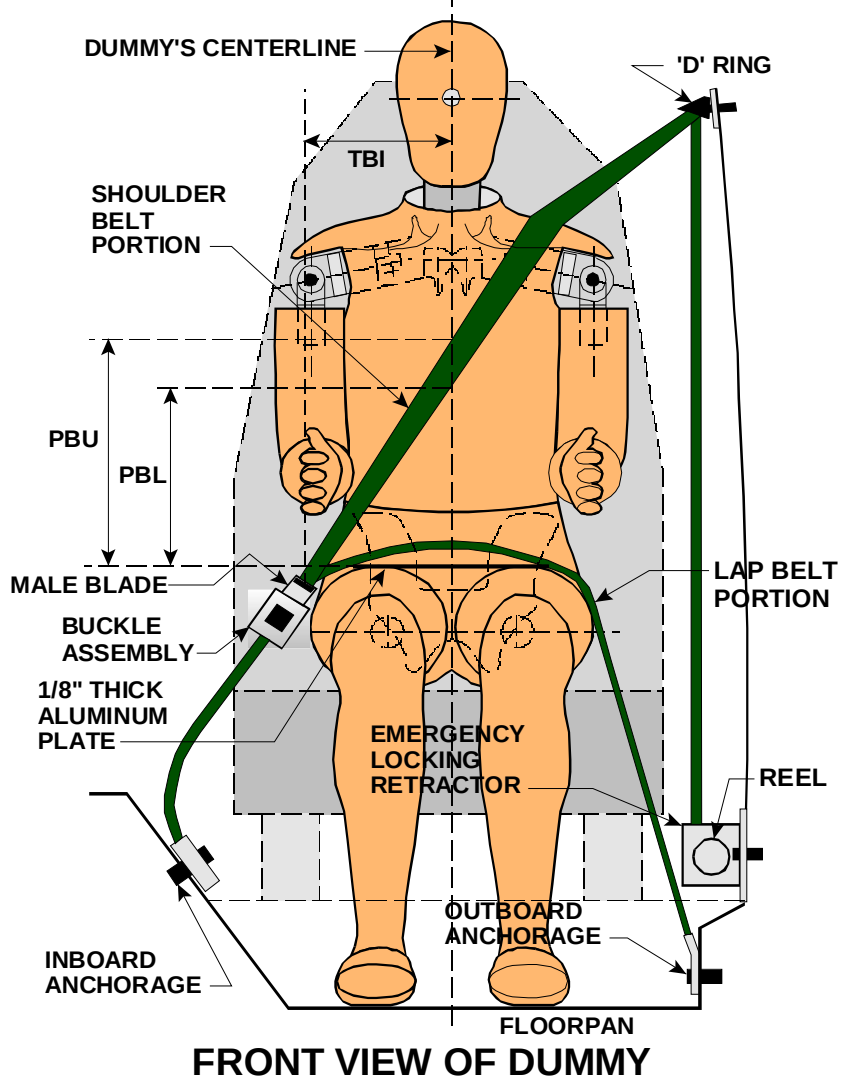
DATA SHEET NO. 5
FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #142)			PASS. (Serial #150)		
WA ^o	27.7 deg.			N/A		
SWA ^o	25.9 deg.			N/A		
SCA ^o	64.1 deg.			N/A		
SA ^o	19 deg.			19 deg.		
HZ	195			192		
HH	302			293		
HW	567			275		
HR	212			207		
NR	395	Angle	15.5 deg.	N/A		
CD	548			526		
CS	541			N/A		
RA	183			N/A		
KDL	140	Angle (KDA)	23 deg.	138		
KDR	155			165	Angle (KDA)	27 deg.
PA ^o	21.3 deg.			21.3 deg.		
TA ^o	53.6 deg.			46.9 deg.		
KK	267			265		
AA	345			200		
ST	502	Angle	14 deg.	566	Angle	14 deg.
SK	610	Angle	94 deg.	640	Angle	99 deg.
SH	250	Angle	118 deg.	260	Angle	120 deg.
SHY	275			250		
HS	333			342		
HD	144			156		
AD	105			115		

Dimensions in millimeters

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

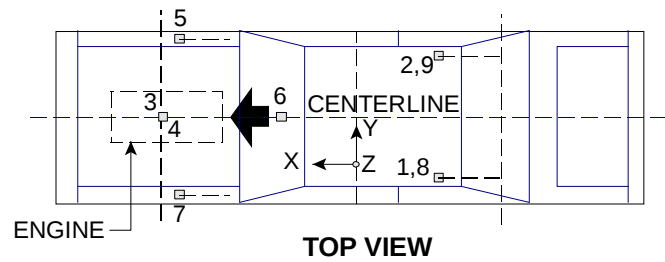
SEAT BELT POSITIONING DATA



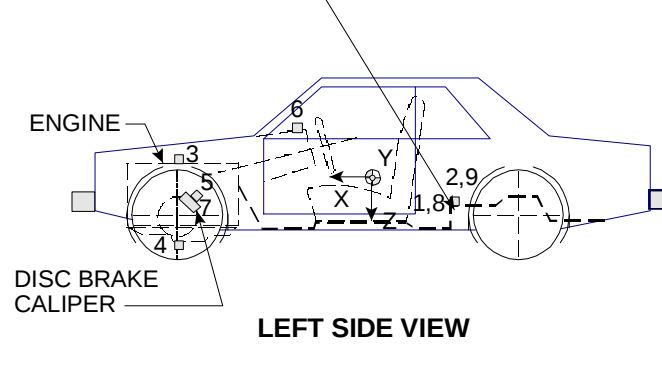
	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	340	345
PBL-- Top surface of alum. plate to belt lower edge	260	260
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

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	2064	-602	441
2	Right Rear Seat Cross Member X	2076	606	460
3	Top of Engine Block	4288	265	887
4	Bottom of Engine	3705	508	293
5	Disc Brake Caliper @ Right Side	3772	742	510
6	Instrument Panel**	-	-	-
7	Disc Brake Caliper @Left Side	3727	-718	409
8	Left Rear Seat Cross Member Z	2064	-602	441
9	Right Rear Seat Cross Member Z	2076	606	460

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.

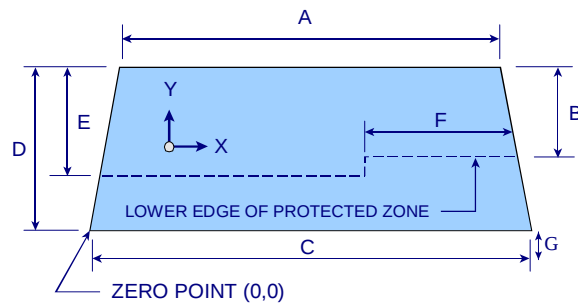
FMVSS 212 REQUIREMENTS:

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: 21.1°C.

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2214.5	2214.5	100.0%
LEFT SIDE	2214.5	2214.5	100.0%
TOTAL	4429.0	4429.0	100.0%



DIMENSIONS (mm)	
A	1215
B	647
C	1430
D	892
E	665
F	525
G	105

FRONT VIEW OF WINDSHIELD

FAILURE DETAILS: None

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

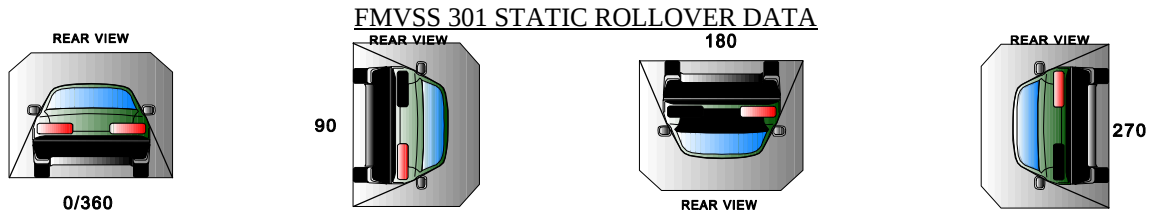
DATA SHEET NO. 9
SUMMARY OF FMVSS NO. 301 DATA

NHTSA TEST No.: _____ O85900 _____ TEST DATE: _____ October 11, 2007
VEHICLE MAKE/MODEL: _____ 2008 Volvo XC90 4-Door SUV _____
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	07	seconds	5	minutes	6	minutes	7	seconds	7	minutes
180°-270°	1	minutes	04	seconds	5	minutes	6	minutes	4	seconds	7	minutes
270°-360°	1	minutes	12	seconds	5	minutes	6	minutes	12	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:

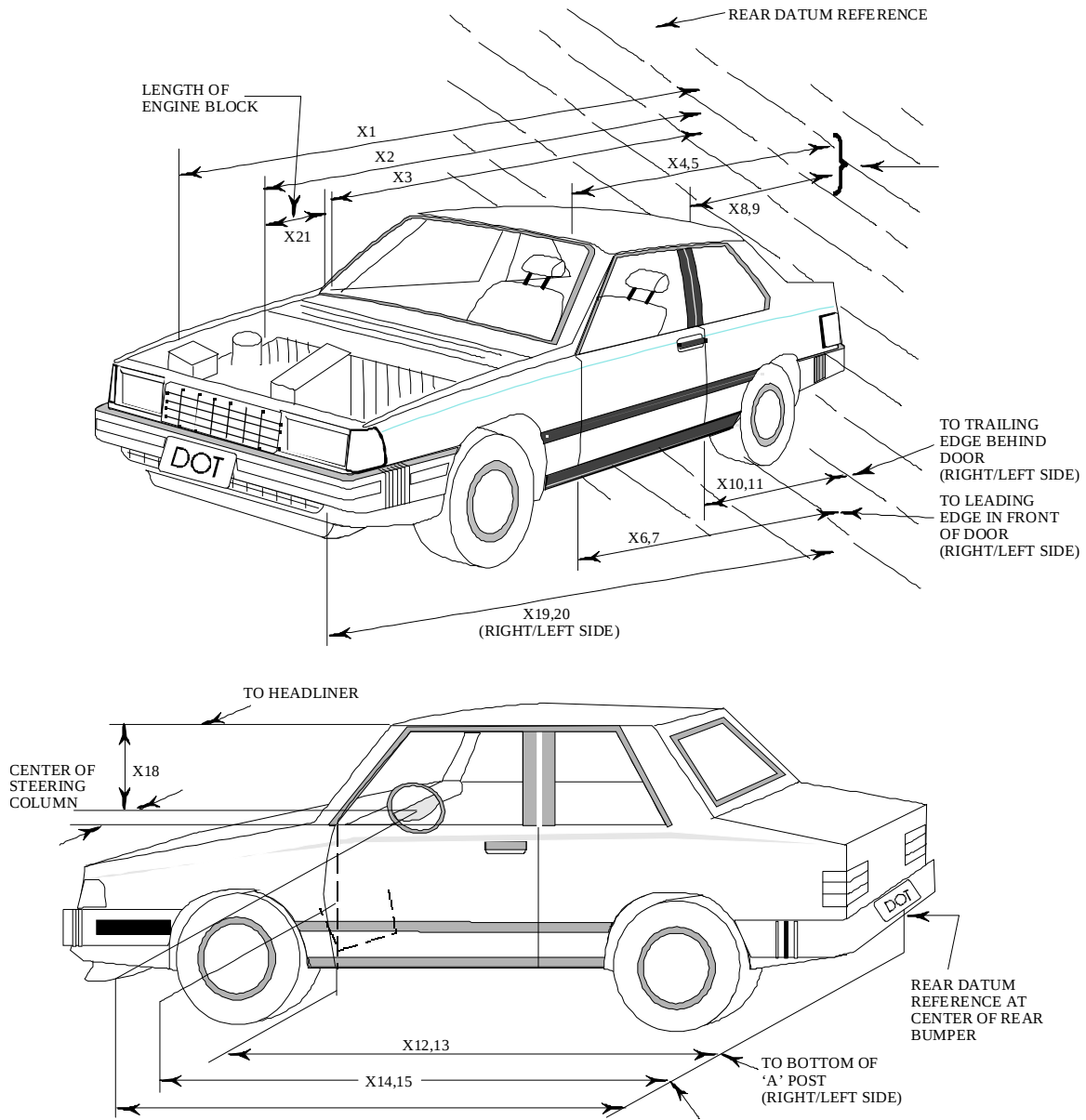
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180°-270°	0	0	0	N/A
270°-360°	0	0	0	N/A

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



NHTSA TEST No.:	O85900	TEST DATE:	October 11, 2007
VEHICLE MAKE/MODEL:	2008 Volvo XC90 4-Door SUV		

All Dimensions in mm

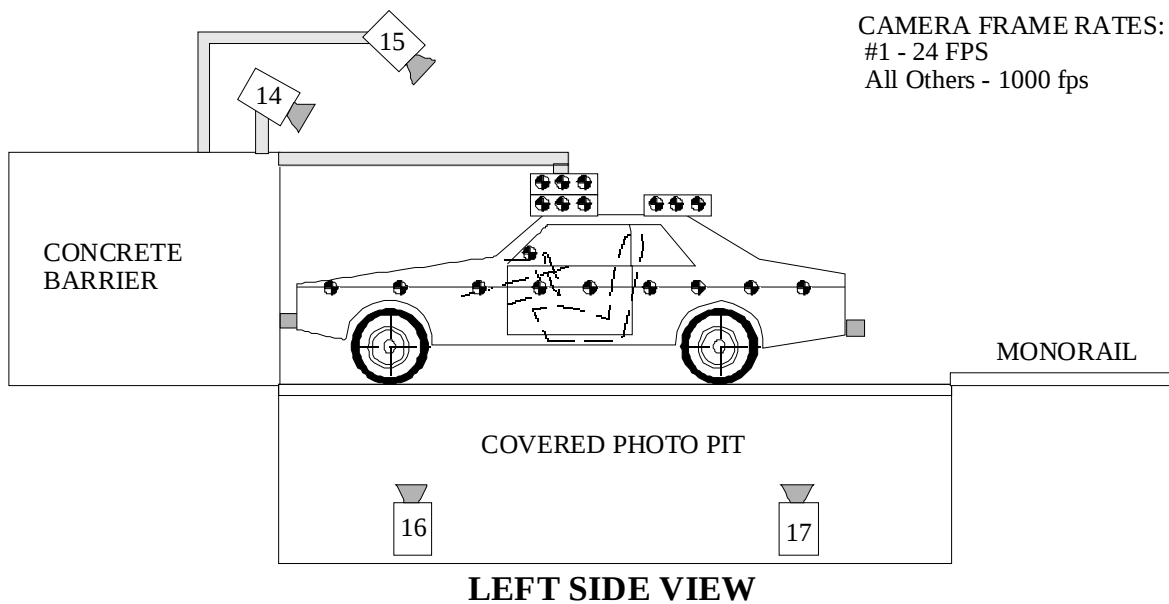
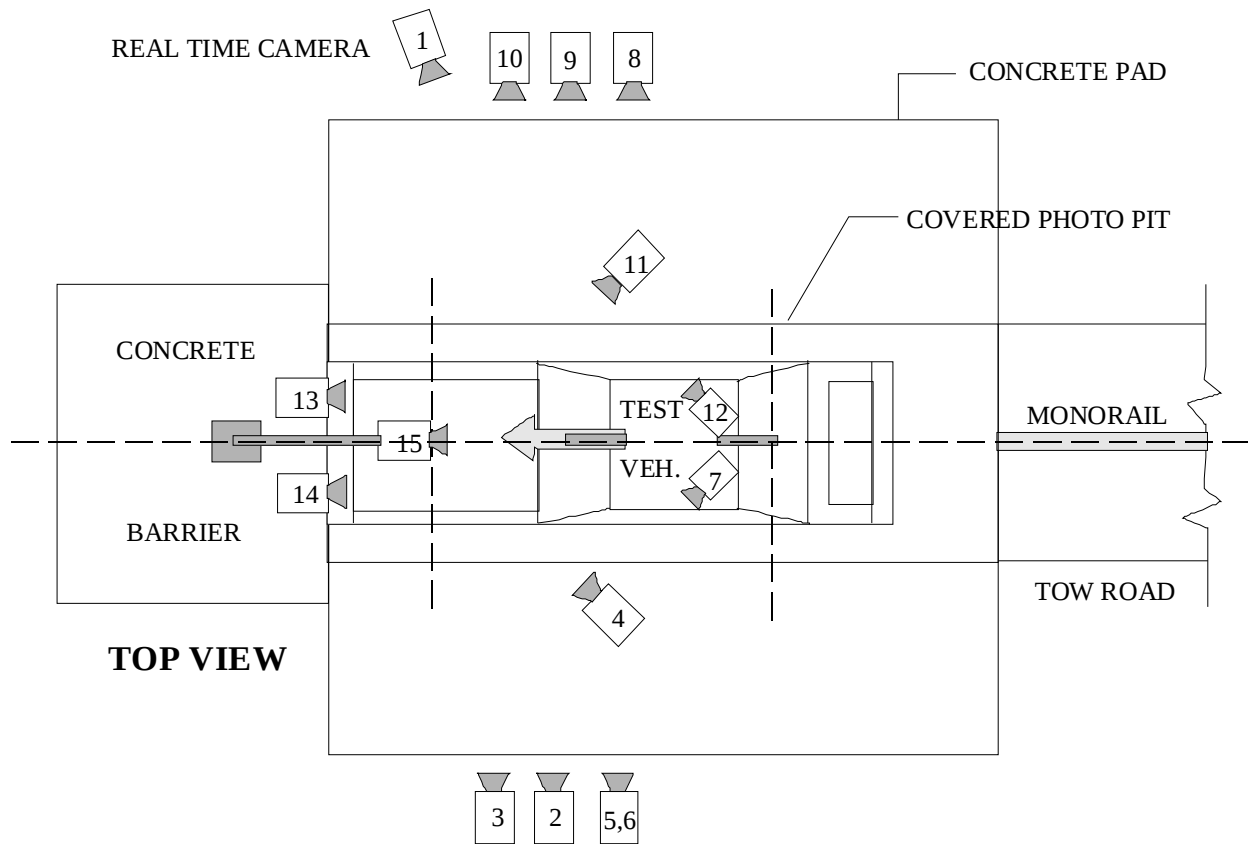
DATA SHEET NO.10
VEHICLE MEASUREMENTS (cont.)

NHTSA TEST No.: O85900 TEST DATE: October 11, 2007
VEHICLE MAKE/MODEL: 2008 Volvo XC90 4-Door SUV

TARGET VEHICLE STRUCTURAL MEASUREMENTS

	Elements	Pre-Test (mm)
1	Total length	4804
2	Total Width	1887
3	Bumper Top Height	643
4	Bumper Bottom Height	516
5	Longitudinal Member Top Height	680
6	Distance Between Longitudinal Members	1092
7	Longitudinal Member Width	43
8	Engine top height	1007
9	Engine bottom height	300
10	Engine and gearbox width	810
11	Front bumper-engine distance	411
12	Front shock absorber fixing height	646
13	Bonnet leading edge height	948
14	Front shock absorber fixing width	0
15	Front bumper – front axle distance	911
16	Front axle – A pillar distance	1200
17	A-pillar – B pillar distance	382
18	B-pillar – rear axle distance	1270
19	B-pillar – C Pillar distance	1037
20	Roof sill bottom height	1644
21	Roof sill top height	1703
22	Floor sill bottom height	338
23	Floor sill top height	431

DATA SHEET NO.11
HIGH-SPEED CAMERA LOCATIONS



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

NHTSA Test No.: 085900 Vehicle: 2008 Volvo XC90 4-Door SUV

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	7416	2335	1010	-3	-76	24	1000
3	Left Side View	9374	1625	970	-2	-76	50	1000
4	Driver and Interior View	7660	3215	2400	-9	-	50	500
5	Steering Column (Bottom)	7740	2505	1210	-2	-76	28-70	1000
6	Steering Column (Top)	7740	2505	1820	-9	-76	28-70	1000
7	Left CRS Lateral View	-	-	-	-	-	-	-
8	Overall Right Side	8140	2620	980	0	-76	28	500
9	Right Side View	9164	1910	1008	-1	-76	50	1000
10	Right Passenger View	8840	2370	1240	-2	-76	50	1000
11	Passenger and Interior View	7606	3500	2005	-7	-	50	500
12	Right CRS Lateral View	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-31	-	24	500
14	Driver Front View	620	-92	1987	-32	-	24	500
15	Windshield View	0	-530	3374	-50	-	25	500
16	Pit View of Engine	0	615	-3048	90	-	12.5	500
17	Pit View of Fuel Tank	0	2576	-3048	90	-	12.5	500

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

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

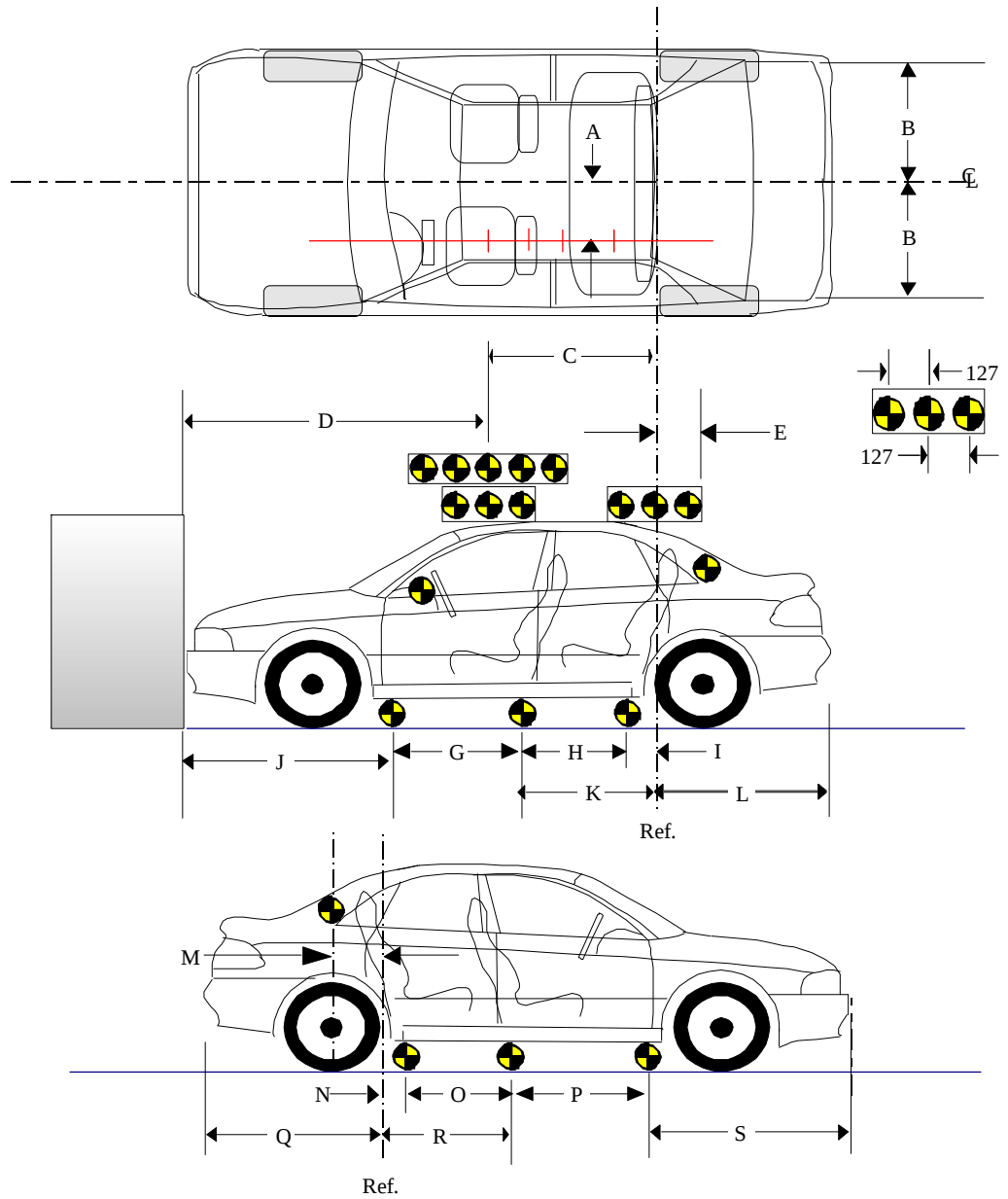
Z = film plane to ground

DATA SHEET NO. 12
VEHICLE REFERENCE PHOTO TARGET LOCATIONS

NHTSA Test No.: O85900 Vehicle: 2008 Volvo XC90 4-Door SUV

(Dimensions in millimeters)

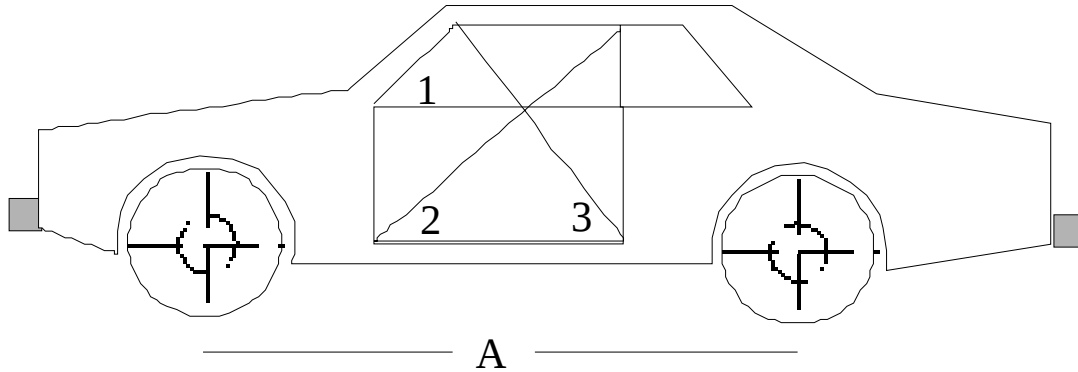
A	368
B	632
C	1220
D	2145
E	905
F	1643
G	943
H	963
I	95
J	1383
K	1058
L	1420
M	897
N	100
O	940
P	962
Q	1416
R	1040
S	1386



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

NHTSA Test No.: O85900 Vehicle: 2008 Volvo XC90 4-Door SUV

DOOR OPENING WIDTH AND WHEELBASE MEASUREMENTS



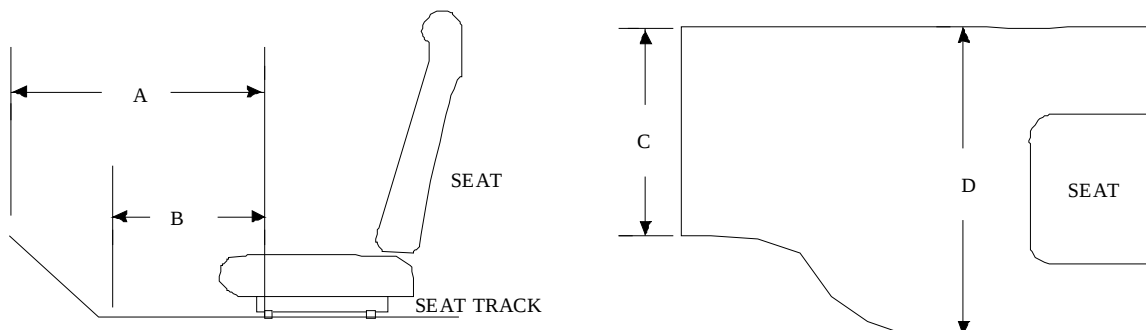
UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	951	1515	1055	951	1519	1065
AFTER TEST	947	1520	1058	947	1523	1067
DIFFERENCE	4	-5	-3	4	-4	-2

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2852	2847
AFTER TEST	2789	2781
DIFFERENCE	63	66

DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont)

NHTSA Test No.: O85900 Vehicle: 2008 Volvo XC90 4-Door SUV

STATIC FOOTWELL DEFORMATION



DRIVER

Measurement	Pre-Test	Post-Test	Difference
A	690	671	19
B	482	492	-10
C	438	682	-244
D	392	391	1

PASSENGER

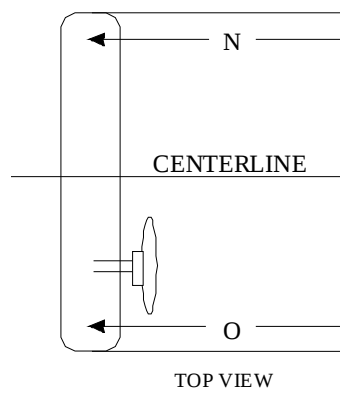
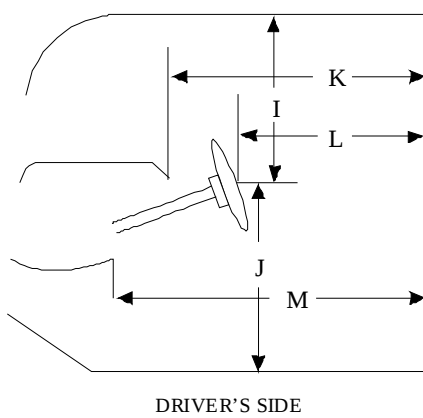
Measurement	Pre-Test	Post-Test	Difference
A	670	628	42
B	500	493	7
C	425	420	5
D	387	391	-4

Units = mm

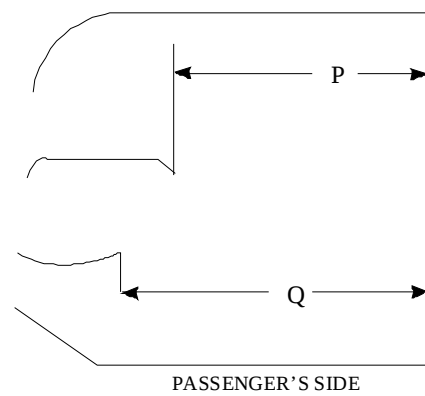
DATA SHEET NO.13
VEHICLE INTRUSION MEASUREMENTS (cont.)

NHTSA Test No.: 085900 Vehicle: 2008 Volvo XC90 4-Door SUV

STATIC PASSENGER COMPARTMENT INTRUSION



MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



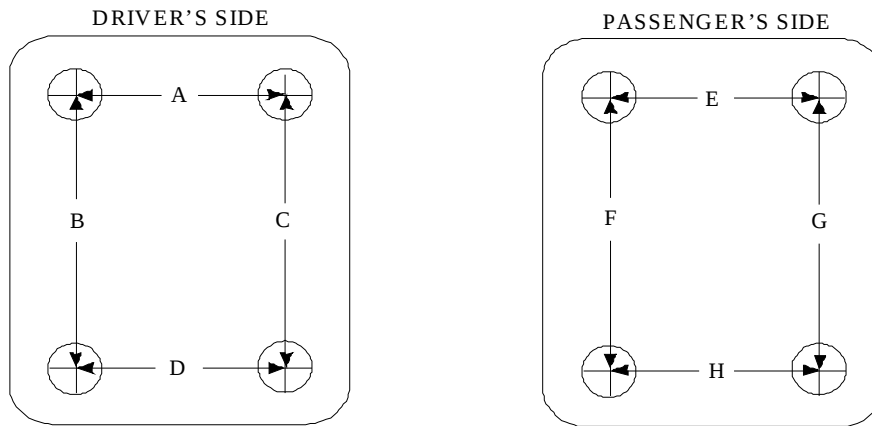
Measurement	Pre-Test	Post-Test	Difference
I	438	471	-33
J	709	689	20
K	779	780	-1
L	552	601	-49
M	818	821	-3
N	745	742	3
O	746	745	1
P = K (PASS.)	870	870	0
Q = M (PASS.)	795	804	-9

Units = mm

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

NHTSA Test No.: 085900 Vehicle: 2008 Volvo XC90 4-Door SUV

FLOORBOARD DEFORMATION



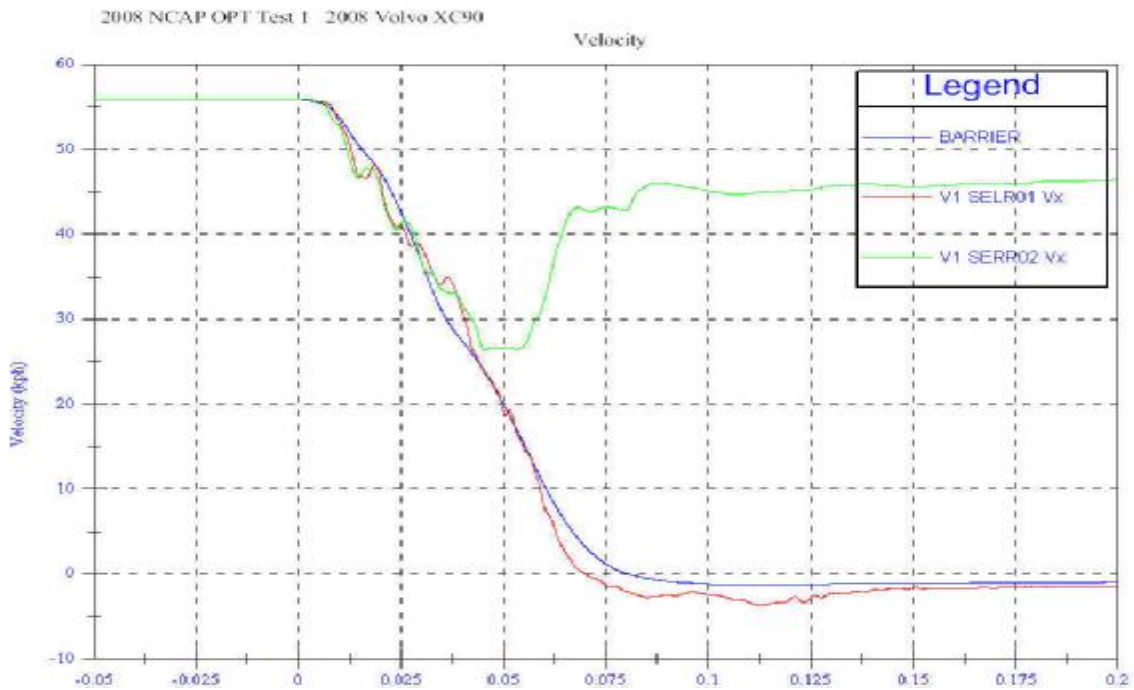
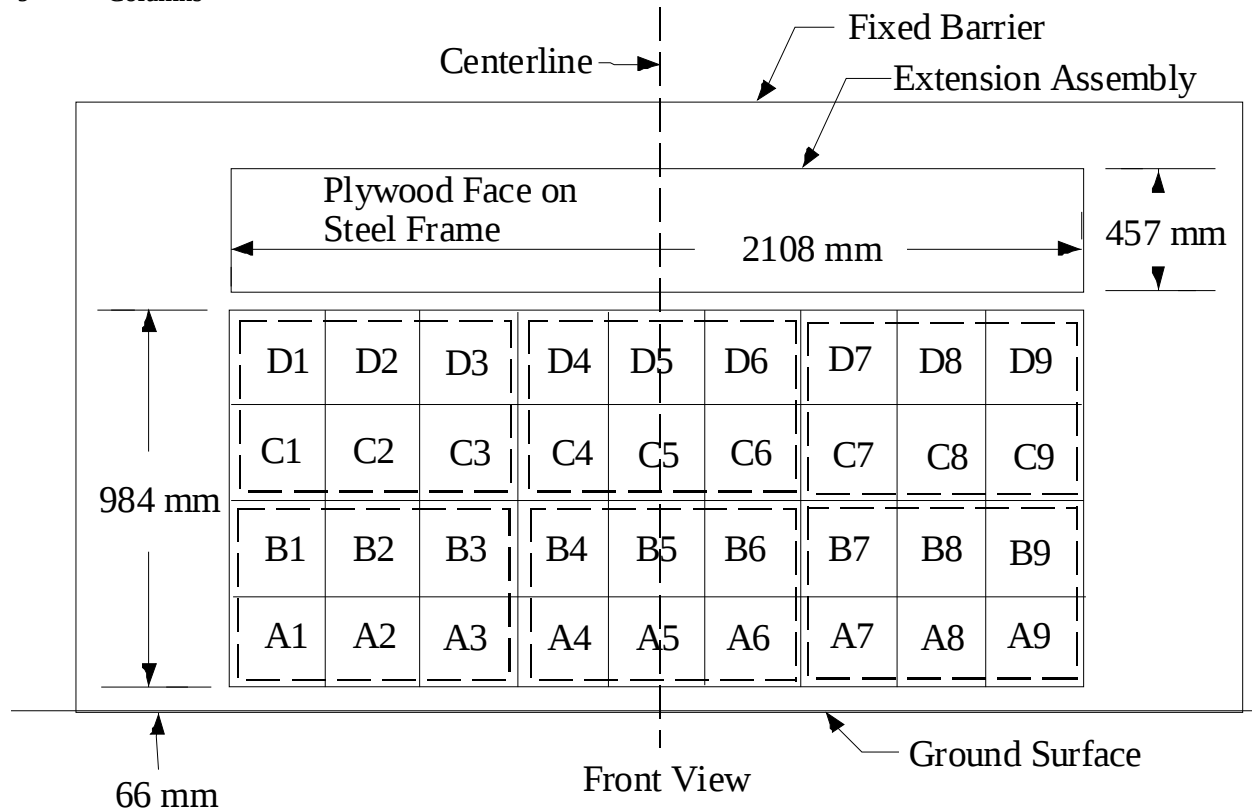
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	438	682	-244
B	340	324	16
C	339	387	-48
D	392	391	0
E	425	420	4
F	400	408	-8
G	410	399	11
H	387	391	-4

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: Volvo XC90 4-Door SUV

NHTSA Test No.: O85900 VIN: YV4CZ982081430787

Model Year: 2008 Build Date: 07/07 Test Date: October 11, 2007

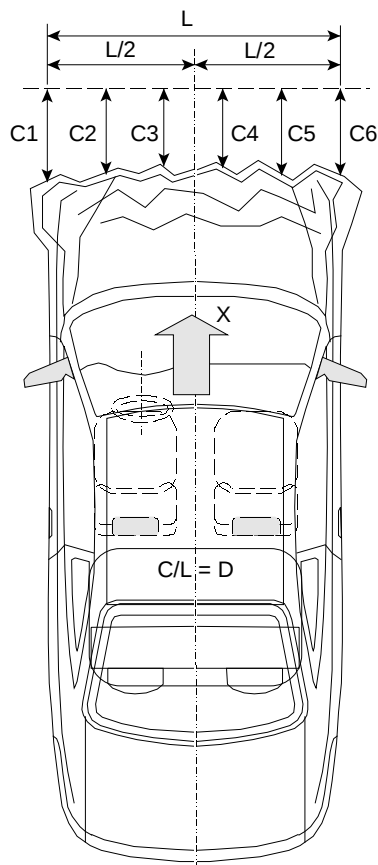
Vehicle Size Category: SUV Test Weight: 2388.5 kg

Vehicle Wheelbase: 2852 mm; Front Overhang: 908 mm; Overall Width: 1887 mm

Collision Deformation Classification (CDC) Code: 12FDEW

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	4686	4338	348
C2 =	4774	4299	475
C3 =	4801	4350	451
C4 =	4800	4398	402
C5 =	4772	4424	348
C6 =	4684	4440	244



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

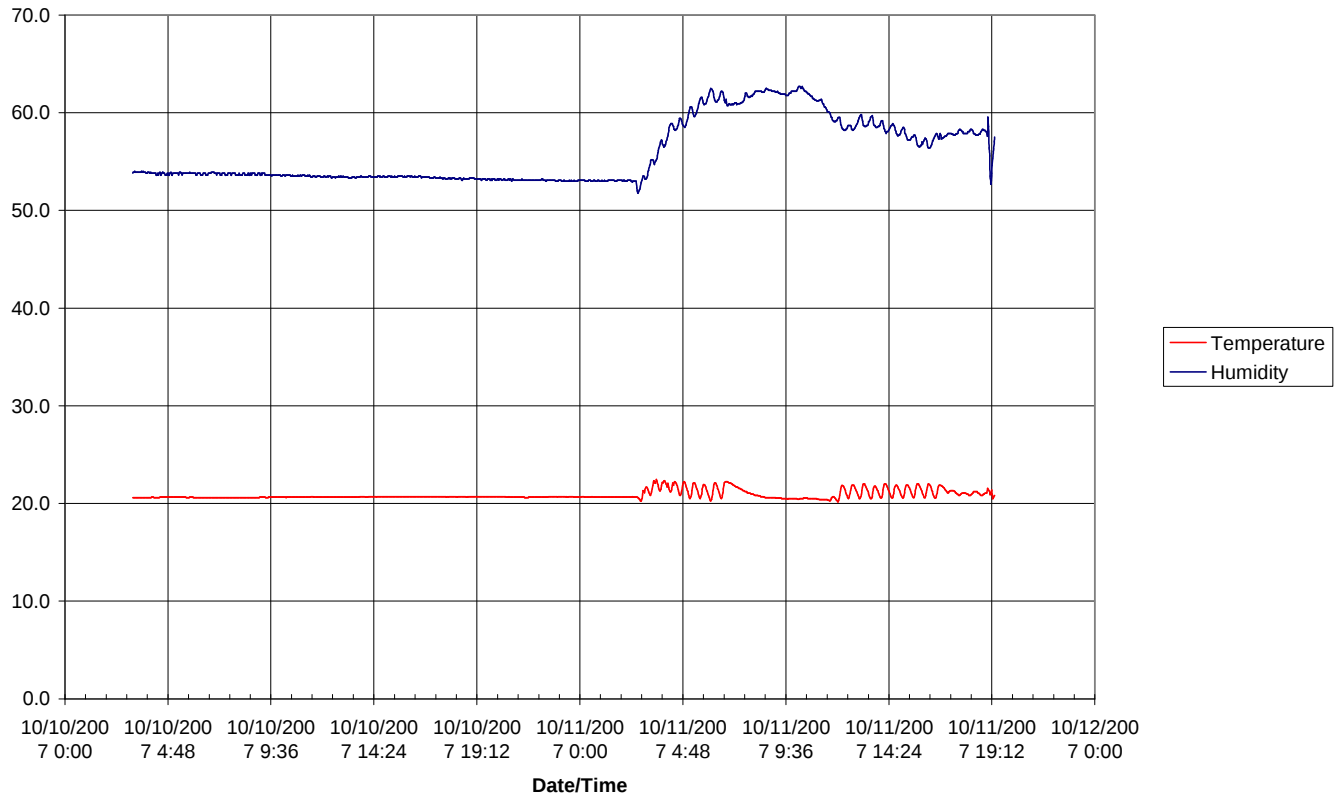
Length of Damaged Region:

L1=	<u>1371</u>	mm
L2=	<u>685.5</u>	mm
L5=	<u>274.2</u>	mm

DATA SHEET NO.16
VEHICLE AND DUMMY TEMPERATURE STABILIZATION CHART

NHTSA Test No.: O85900 Vehicle: 2008 Volvo XC90 4-Door SUV

2008 Volvo X90 O85900 Environmental Conditions



APPENDIX A
PHOTOGRAPHS

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Figure A-1: Load Cell Locations



Figure A-2: Vehicle Certification Placard

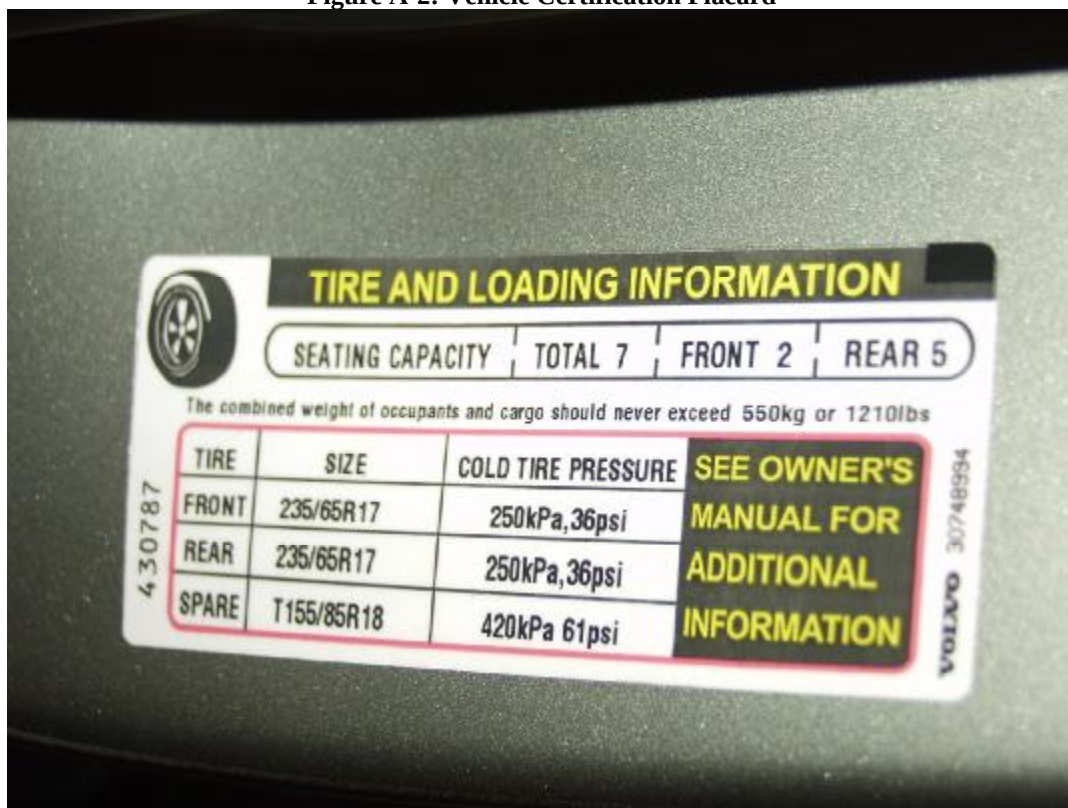


Figure A-3: Vehicle Tire Placard



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



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



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



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

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

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



Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View



Figure A-20: Pre-Test Engine Compartment View



Figure A-21: Post-Test Engine Compartment View



Figure A-22: Pre-Test Fuel Cap View



Figure A-23: Post-Test Fuel Cap View



Figure A-24: Pre-Test Front Underbody View



Figure A-25: Post-Test Front Underbody View



Figure A-26: Pre-Test Mid Underbody View



Figure A-27: Post-Test Mid Underbody View



Figure A-28: Pre-Test Rear Underbody View



Figure A-29: Post-Test Rear Underbody View



Figure A-30: Pre-Test Driver Head Location



Figure A-31: Post-Test Driver Head Location



Figure A-32: Pre-Test Driver Position View



Figure A-33: Post-Test Driver Position View



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



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

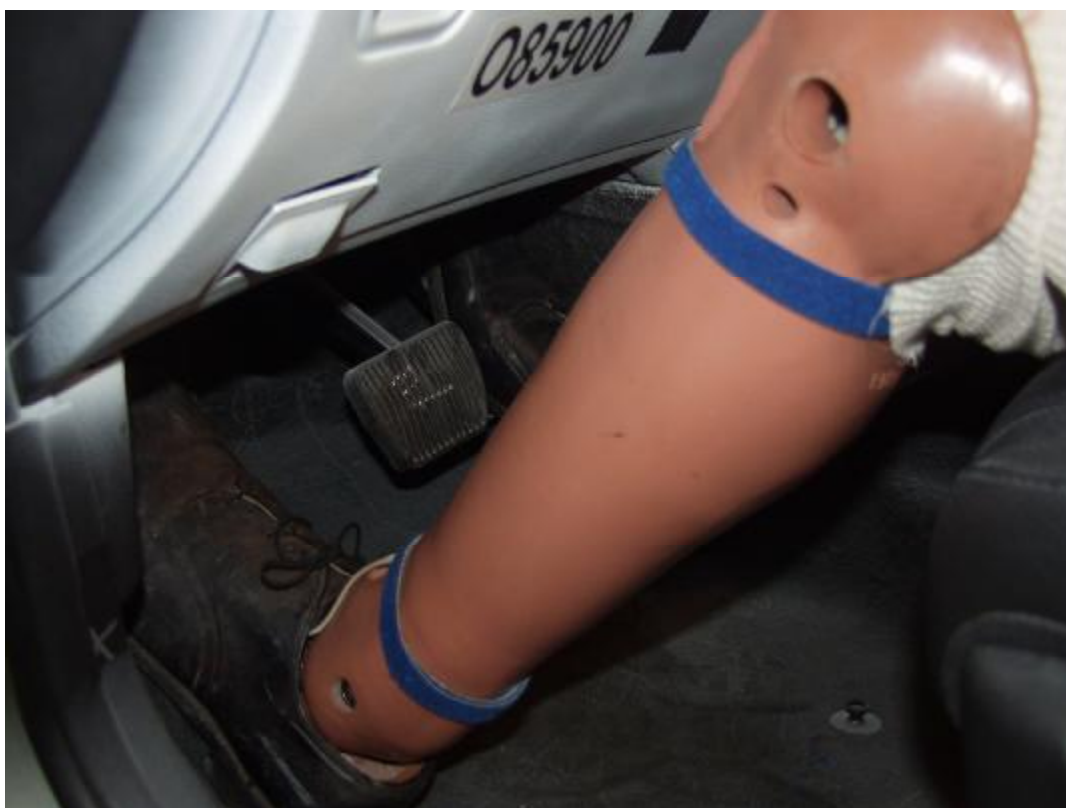


Figure A-36: Pre-Test Driver Feet View



Figure A-37: Post-Test Driver Feet View



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



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



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

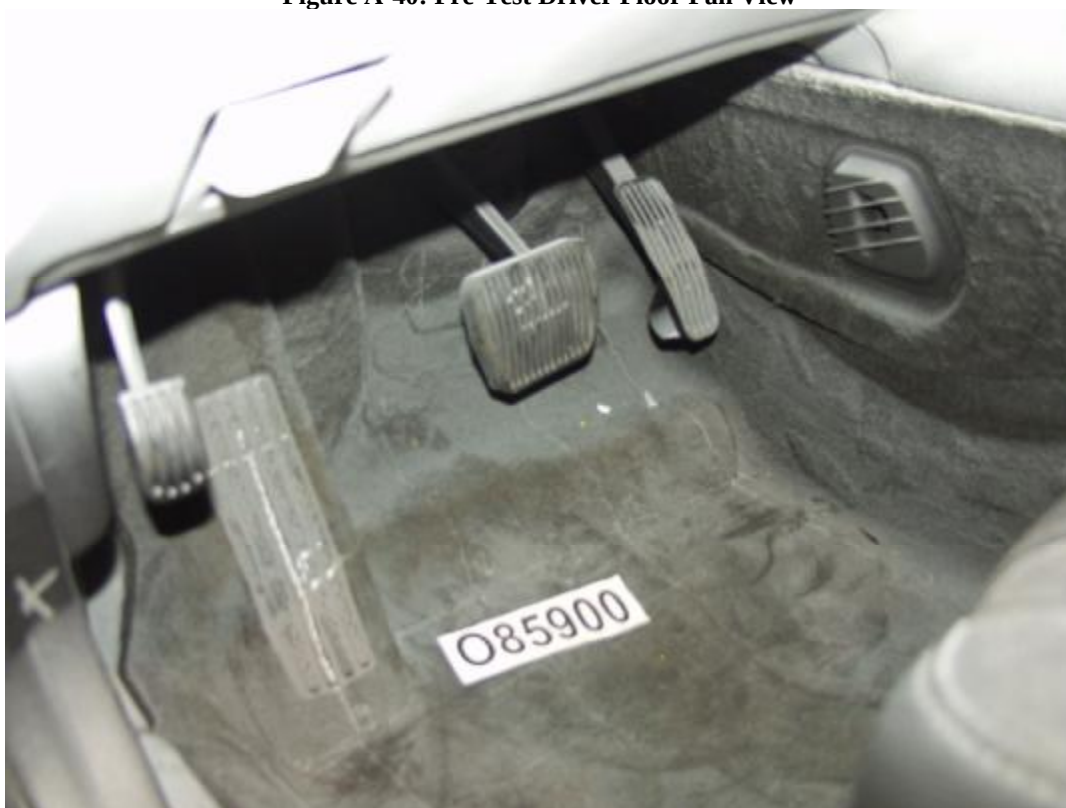


Figure A-41: Post-Test Driver Floor Pan View



Figure A-42: Post-Test Driver Head View



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



Figure A-44: Pre-Test Passenger Head Location



Figure A-45: Post-Test Passenger Head Location



Figure A-46: Pre-Test Passenger Position View



Figure A-47: Post-Test Passenger Position View



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



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



Figure A-50: Pre-Test Passenger Feet View



Figure A-51: Post-Test Passenger Feet View



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



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



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



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



Figure A-56: Post-Test Passenger Head View



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



Figure A-58: Rollover View - 90°



Figure A-59: Rollover View - 180°



Figure A-60: Rollover View - 270°



Figure A-61: Rollover View - 360°



Figure A-62: Impact View

APPENDIX B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

**Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers**

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

DATA CHANNEL FILTER CLASS SUMMARY

NHTSA TEST NO.: O85900

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 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	

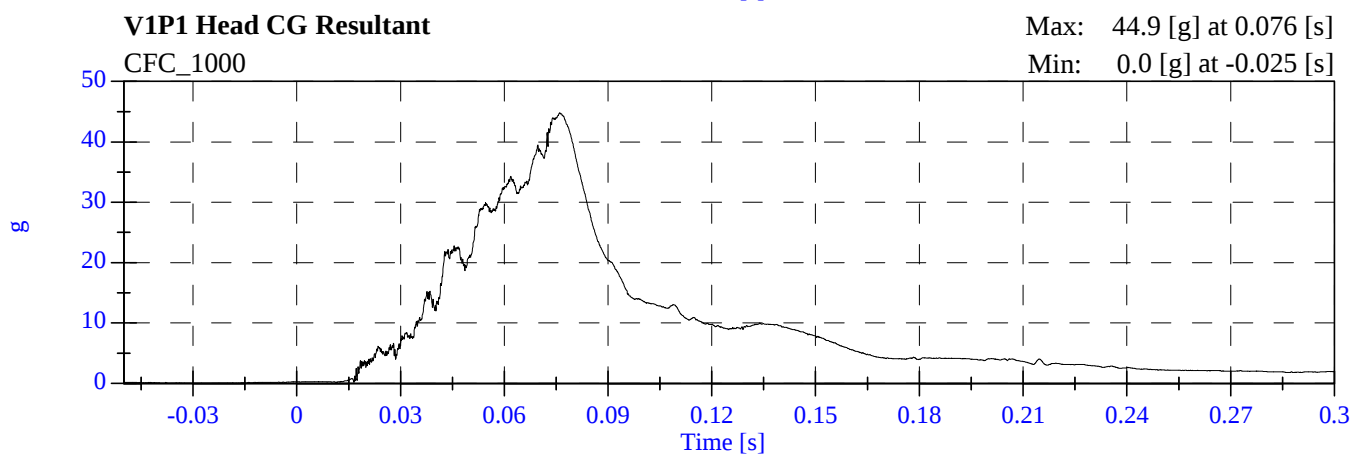
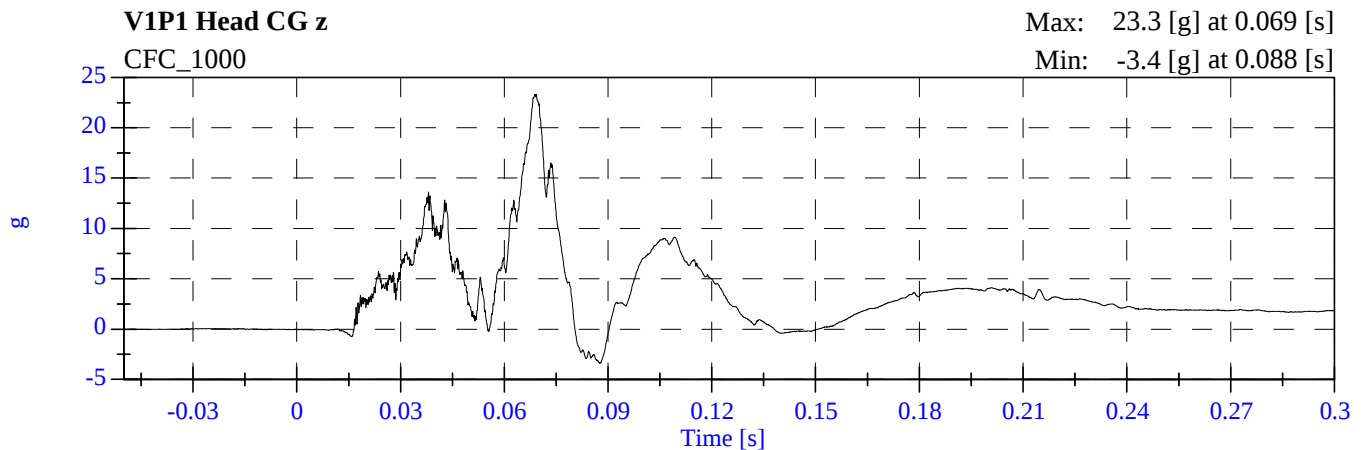
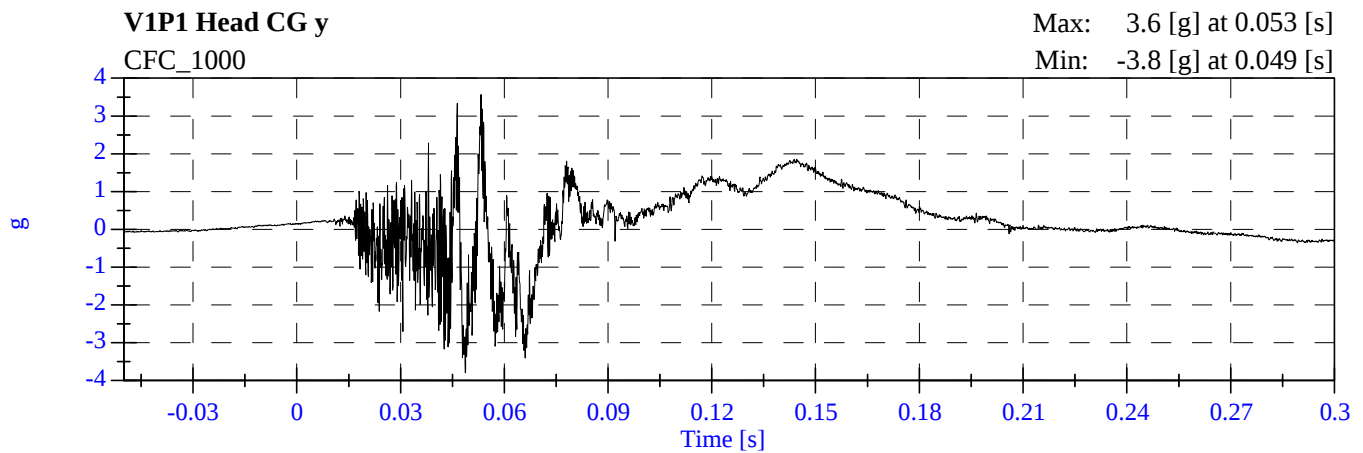
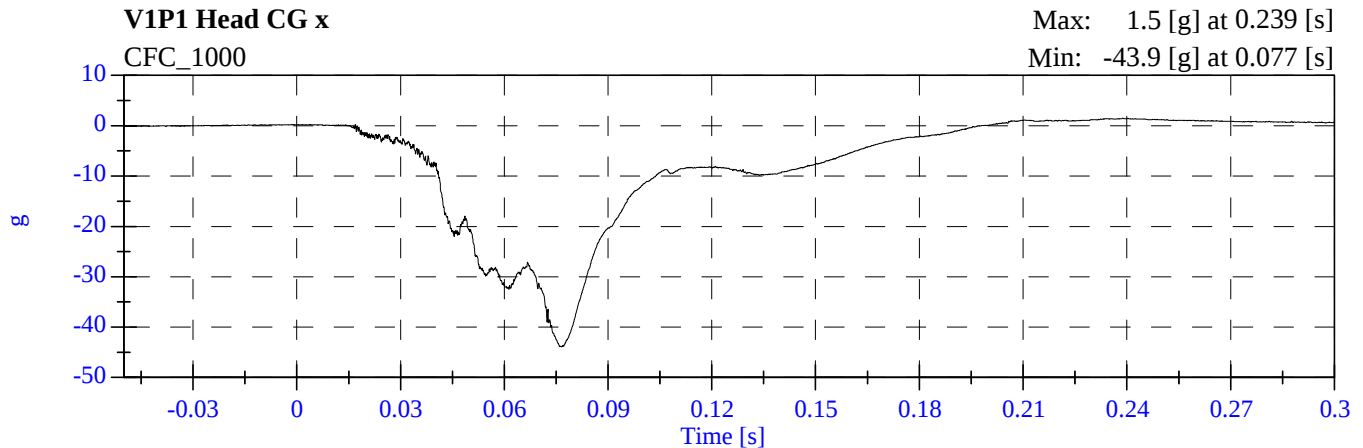
V1P2 Head CG Ax	
V1P2 Head CG Ay	
V1P2 Head CG Az	
V1P2 Head CG Red Ax	
V1P2 Head CG Red Ay	
V1P2 Head CG Red Az	
V1P2 Upper Neck Fx	
V1P2 Upper Neck Fy	
V1P2 Upper Neck Fz	
V1P2 Upper Neck Mx	
V1P2 Upper Neck My	
V1P2 Upper Neck Mz	
V1P2 Chest Ax	
V1P2 Chest Ay	
V1P2 Chest Az	
V1P2 Chest Red Ax	
V1P2 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	

Barrier Load Cell A5 Fx	
Barrier Load Cell A6 Fx	
Barrier Load Cell A7 Fx	
Barrier Load Cell A8 Fx	
Barrier Load Cell A9 Fx	
Barrier Load Cell B1 Fx	
Barrier Load Cell B2 Fx	
Barrier Load Cell B3 Fx	
Barrier Load Cell B4 Fx	
Barrier Load Cell B5 Fx	
Barrier Load Cell B6 Fx	
Barrier Load Cell B7 Fx	
Barrier Load Cell B8 Fx	
Barrier Load Cell B9 Fx	
Barrier Load Cell C1 Fx	
Barrier Load Cell C2 Fx	
Barrier Load Cell C3 Fx	
Barrier Load Cell C4 Fx	
Barrier Load Cell C5 Fx	
Barrier Load Cell C6 Fx	
Barrier Load Cell C7 Fx	
Barrier Load Cell C8 Fx	
Barrier Load Cell C9 Fx	
Barrier Load Cell D1 Fx	
Barrier Load Cell D2 Fx	
Barrier Load Cell D3 Fx	
Barrier Load Cell D4 Fx	
Barrier Load Cell D5 Fx	
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
V1P2 Right Upper Tibia Mx	Questionable Data 107-131 msec
V1 Right Caliper #5x	Cut wire at 39 msec
Barrier Load Cell C3 Fx	Questionable Data after 91 msec

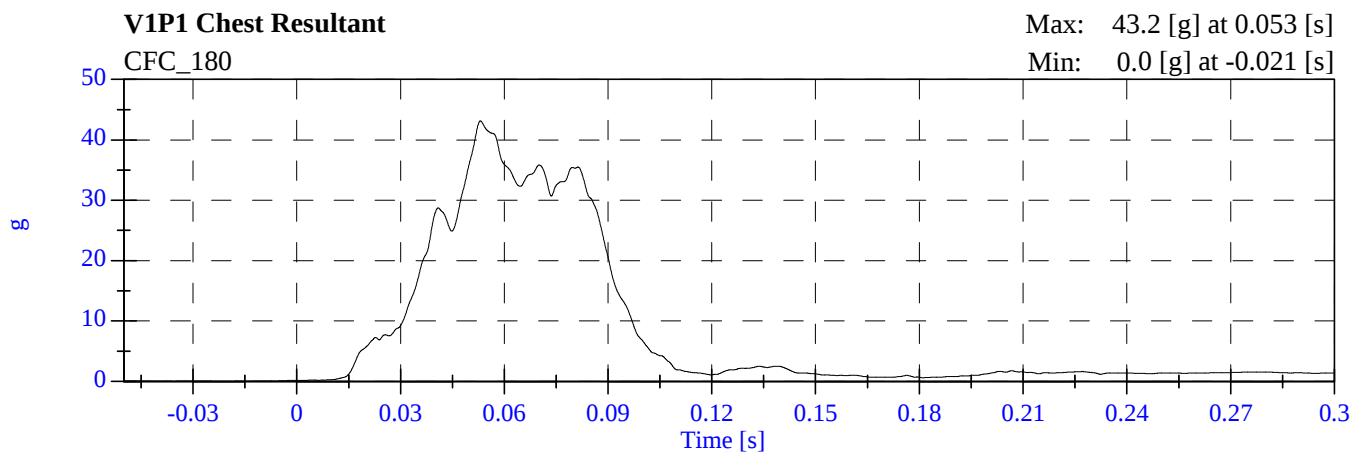
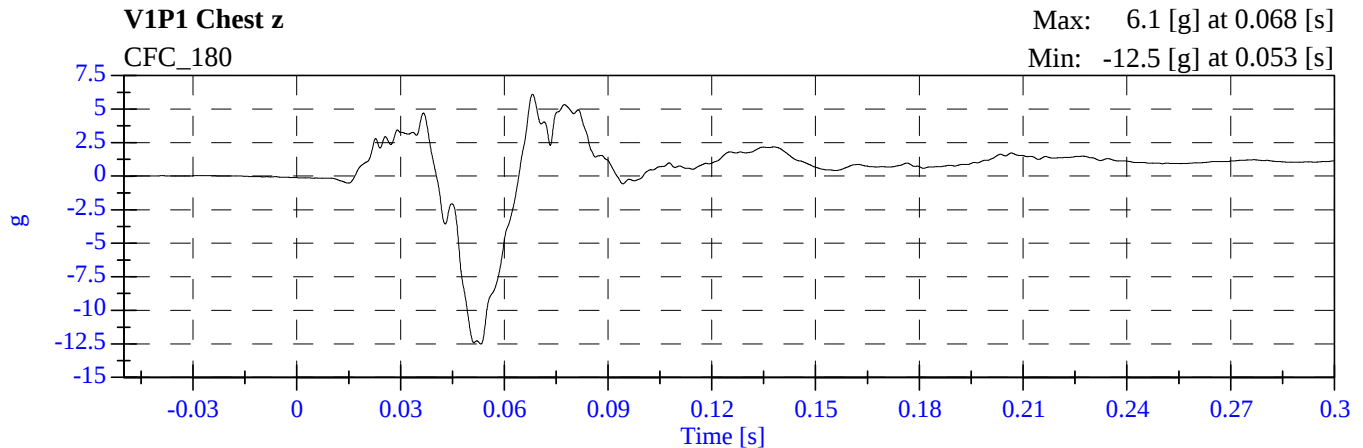
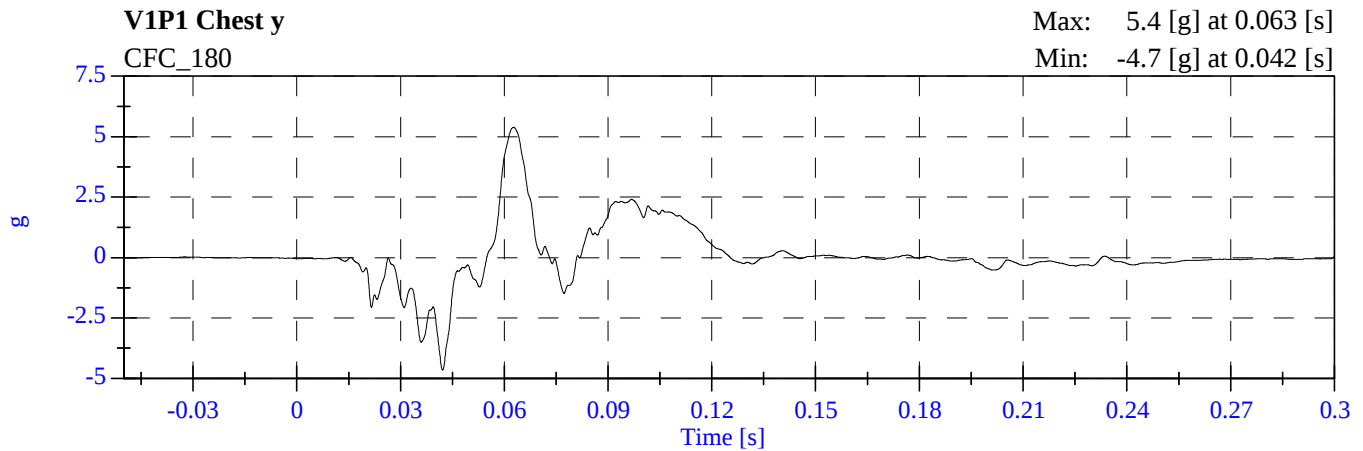
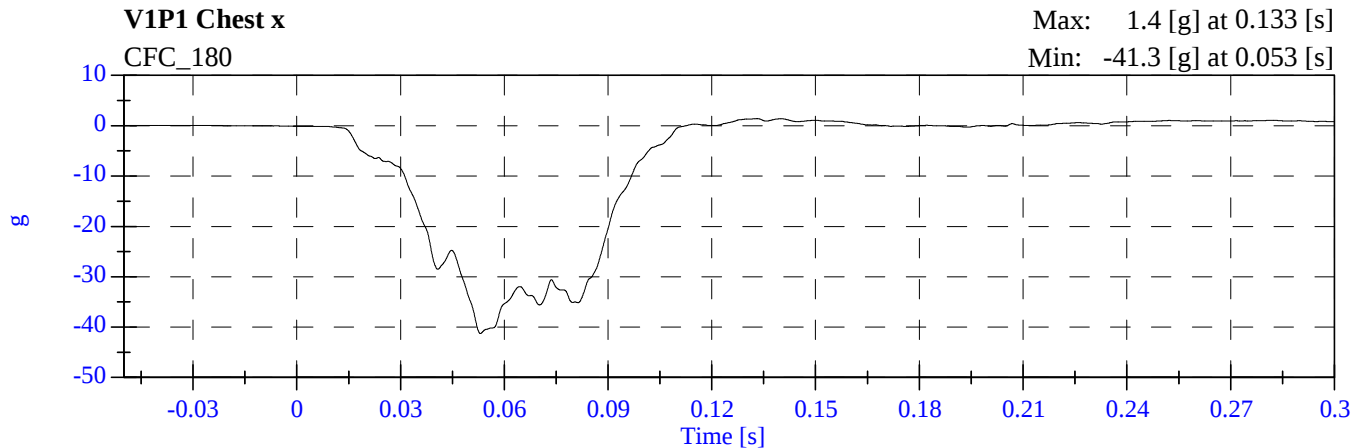
2008 NCAP OPT Test 1 2008 Volvo XC90

085900 - October 11, 2007

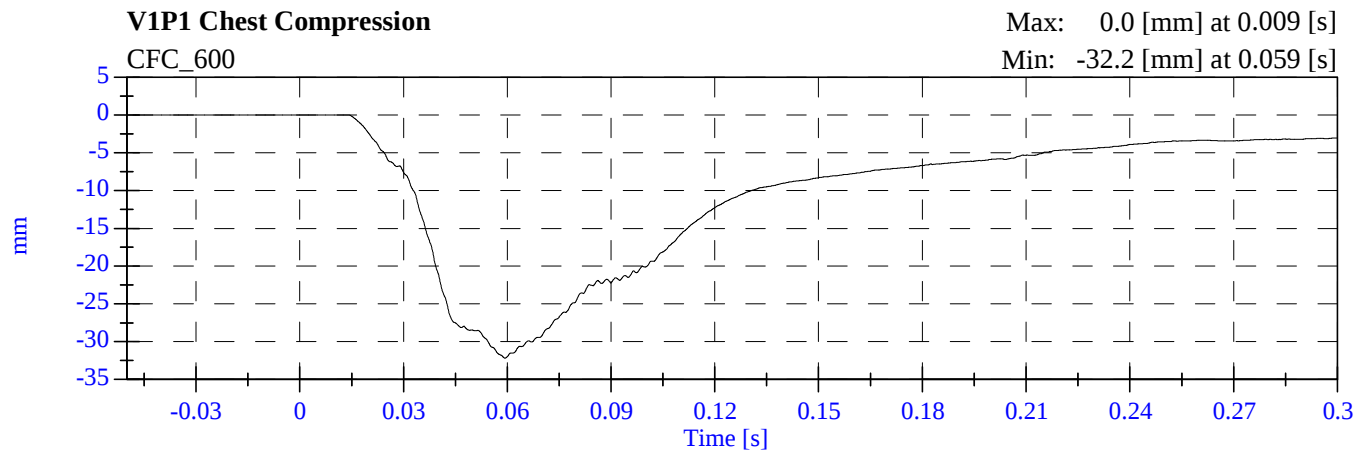


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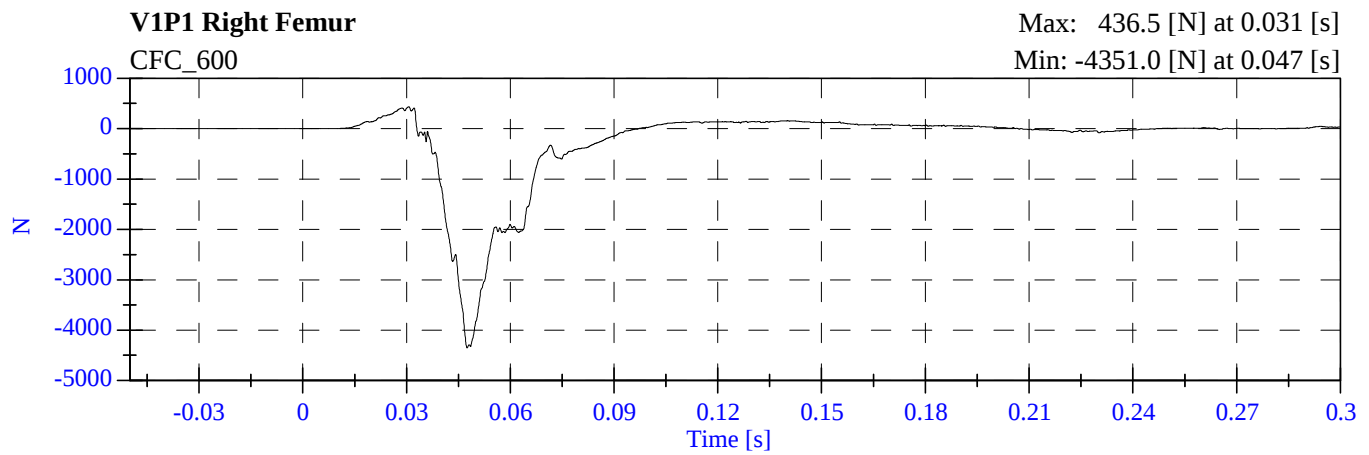
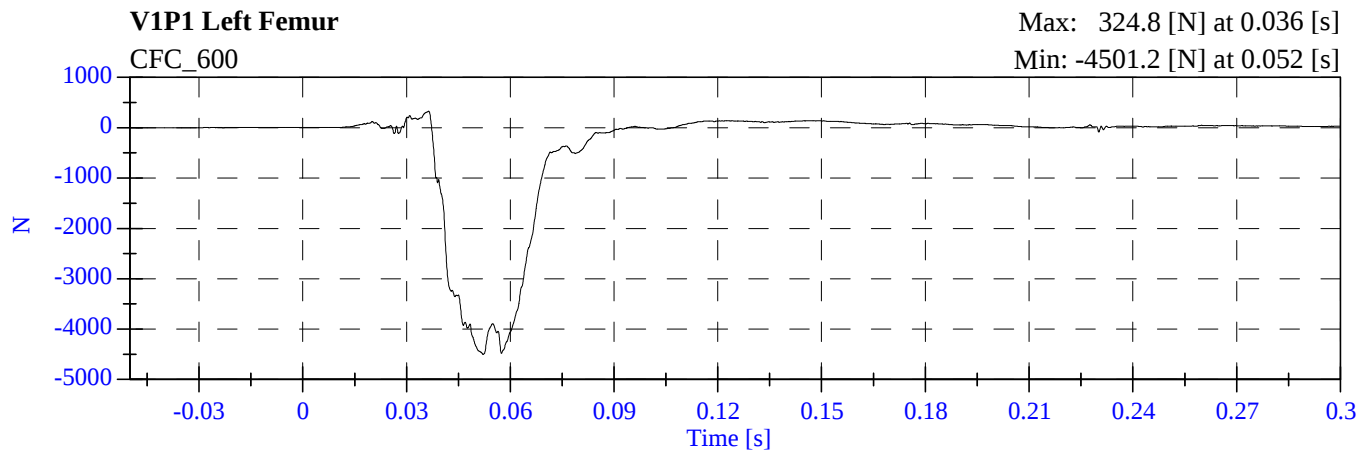
085900 - October 11, 2007



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085900 - October 11, 2007

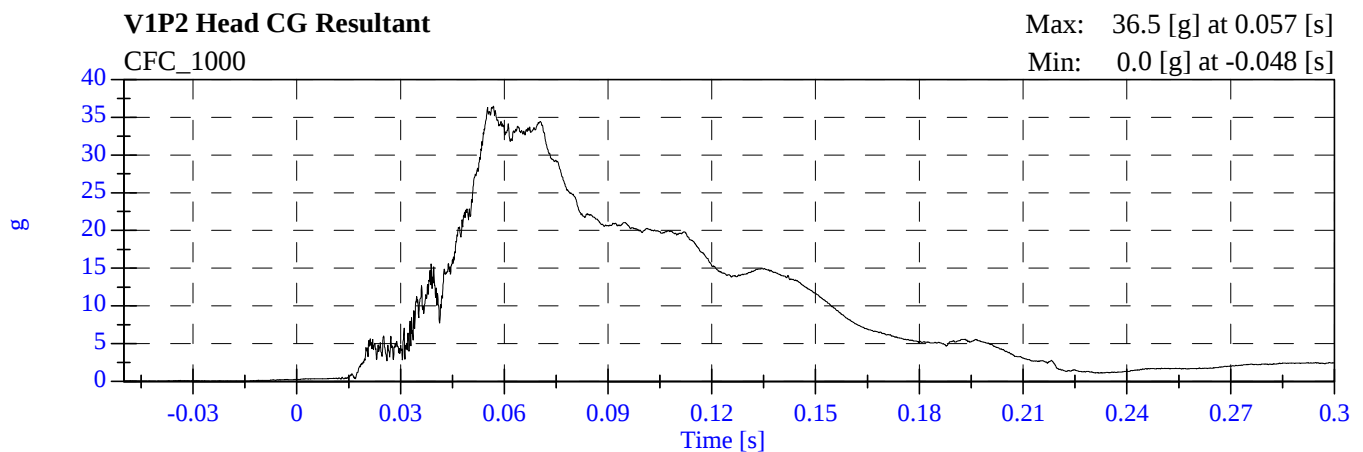
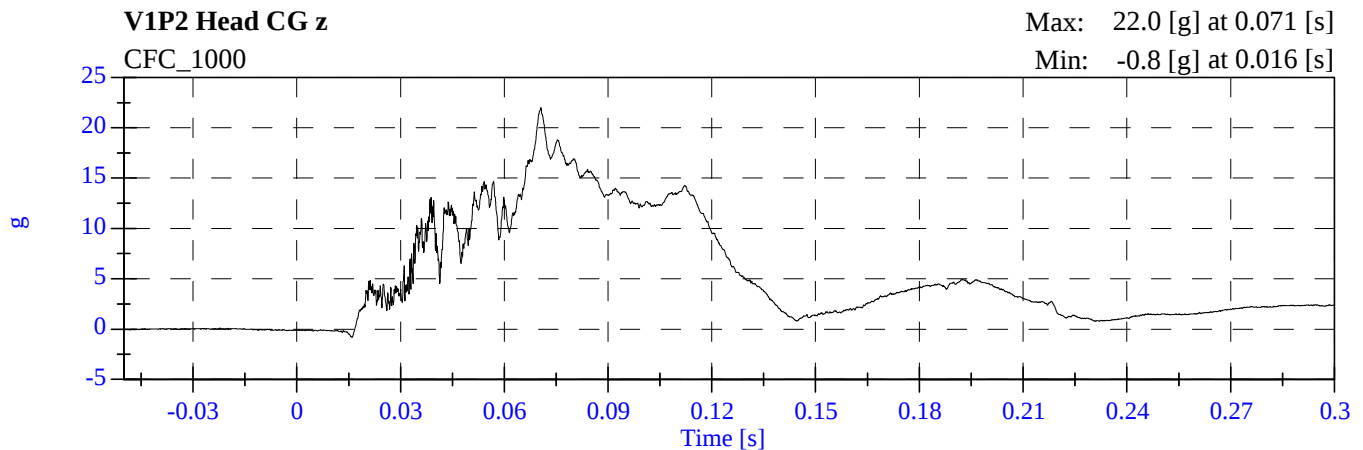
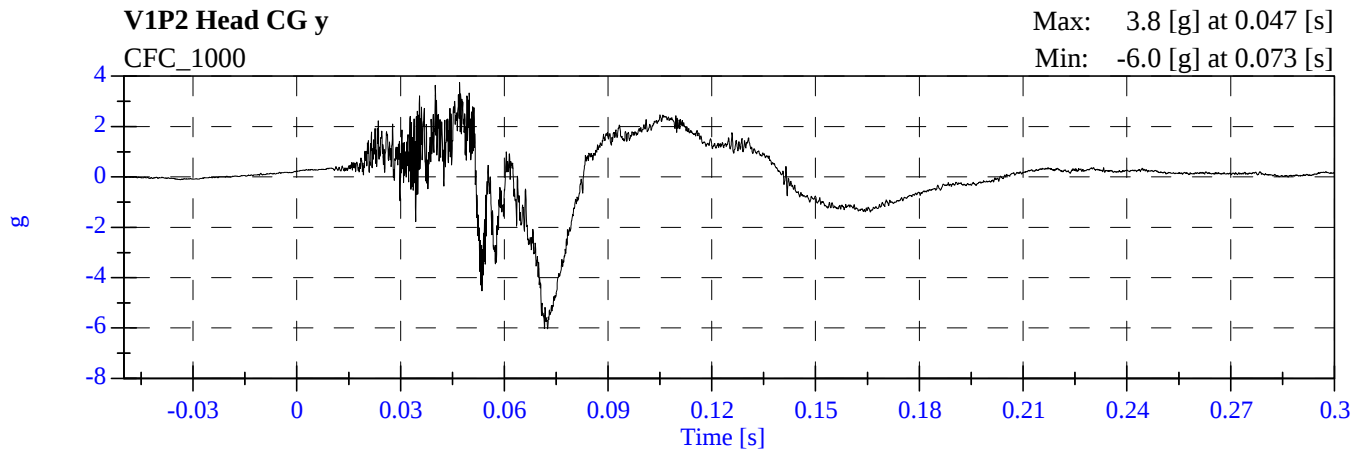
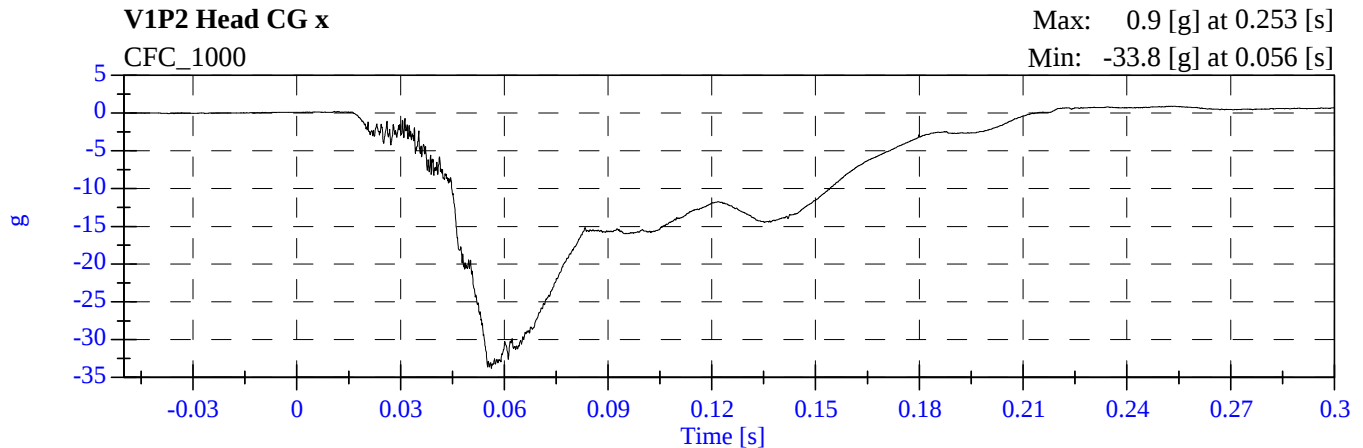


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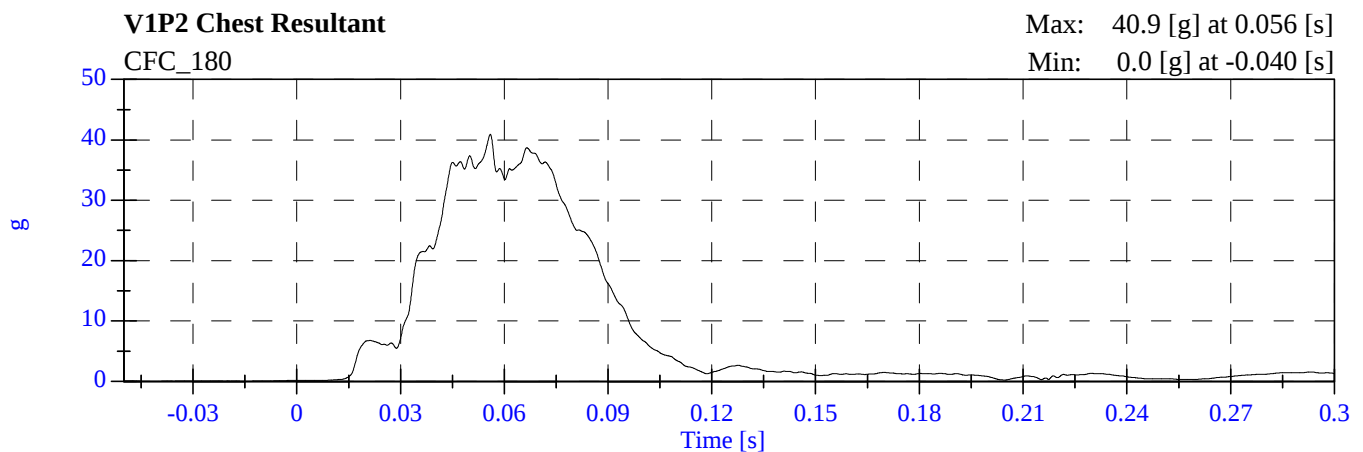
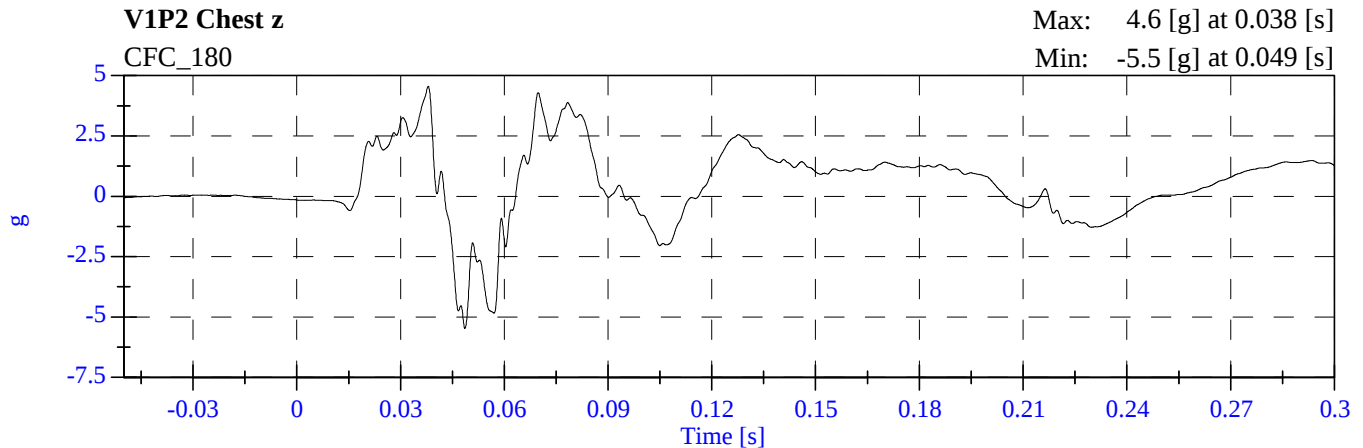
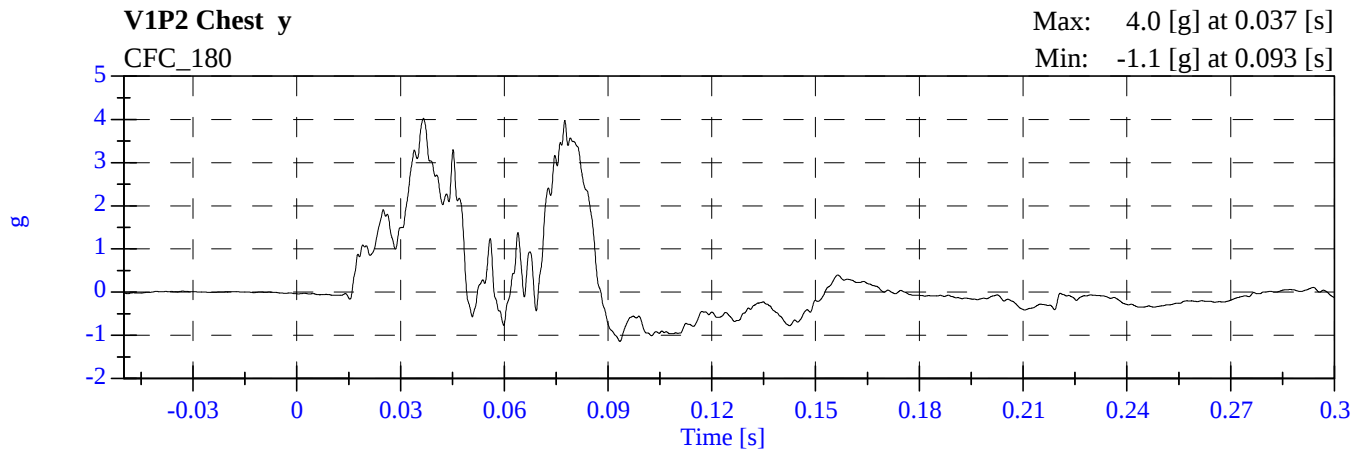
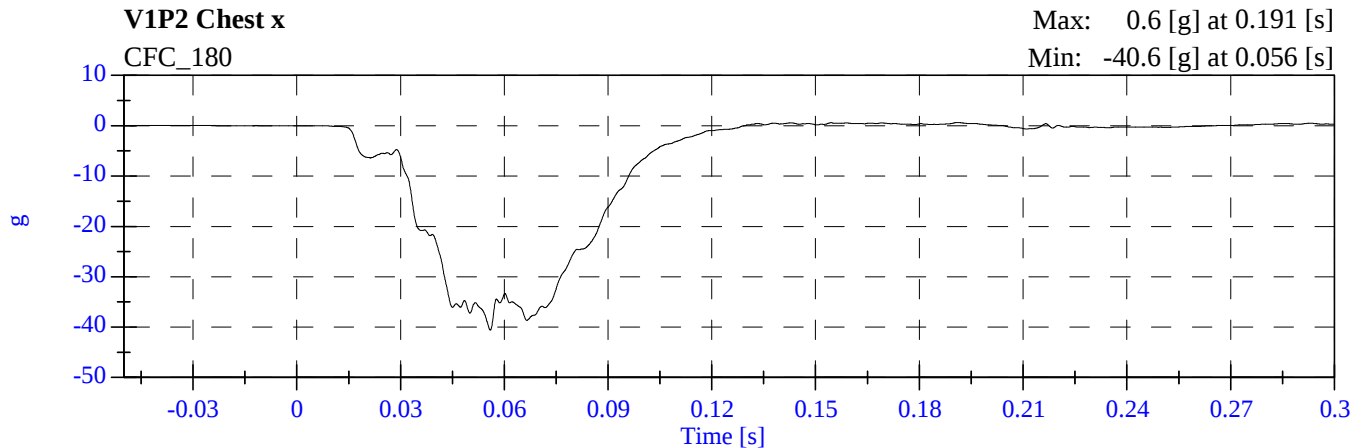
2008 NCAP OPT Test 1 2008 Volvo XC90

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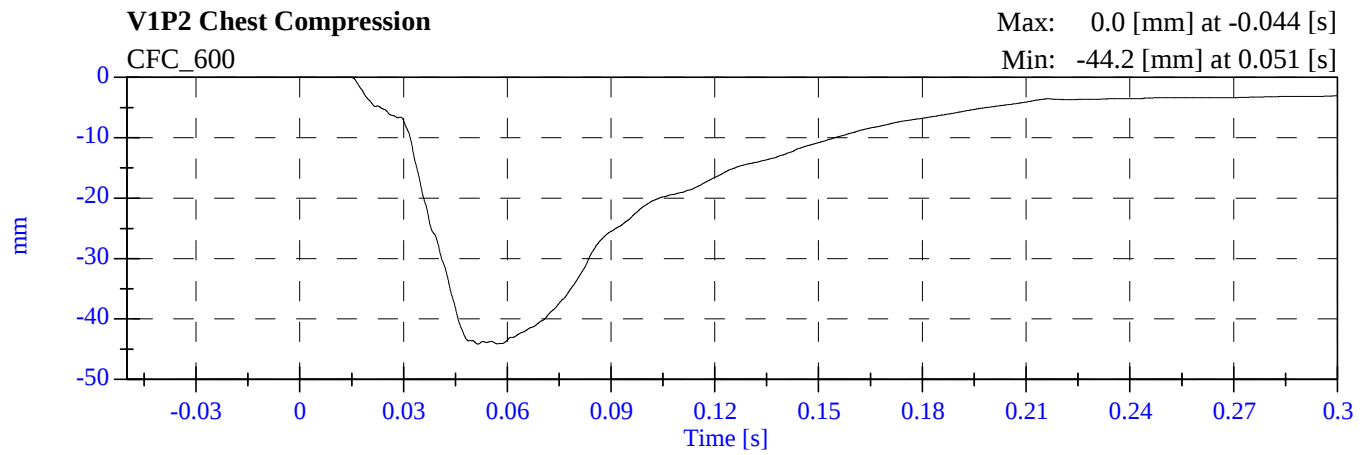


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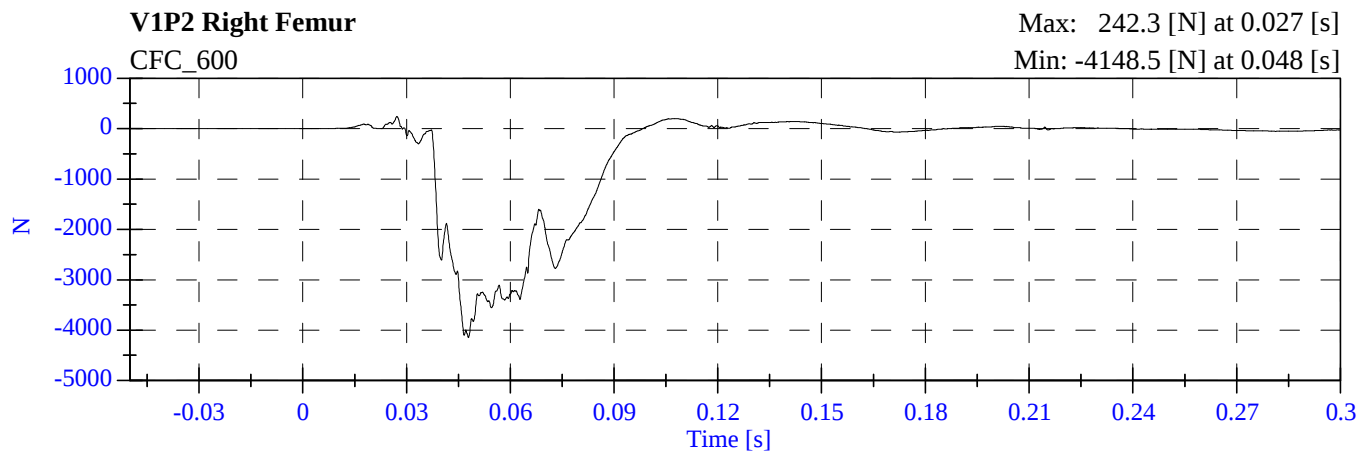
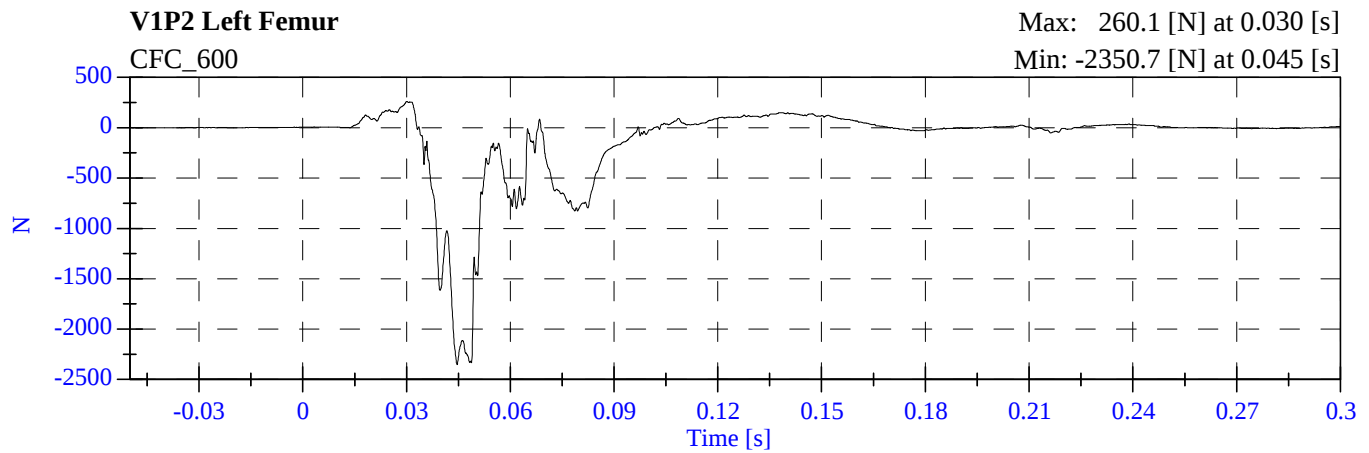
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085900 - October 11, 2007



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.

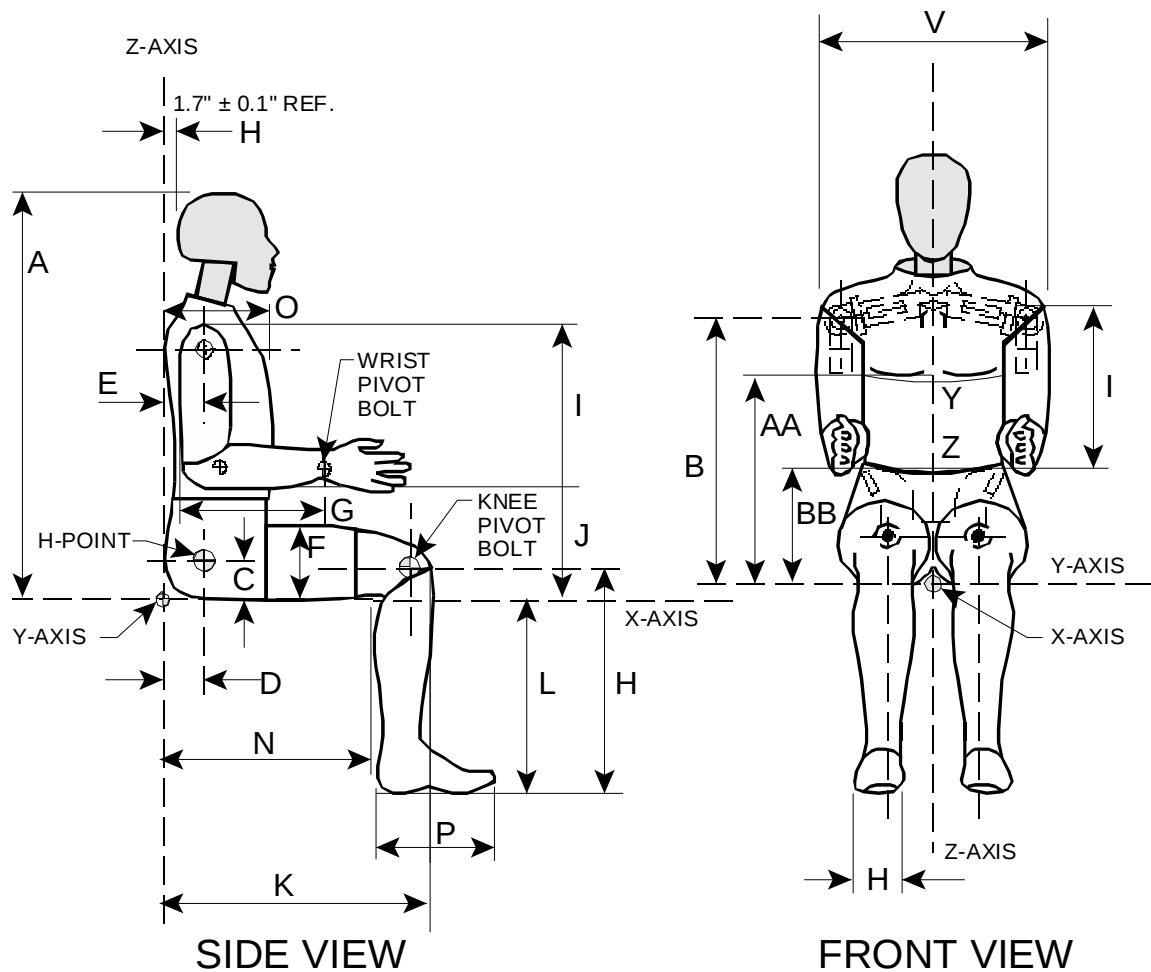
Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	142	8/23/07
#2/Right Front Passenger	150	8/23/07

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 142
Sequential Test Number 2
Date 8/17/07
Workfile 142hd 08-17-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	35.00
Peak Resultant Acceleration	225-275 G's	233.87
Peak Lateral Acceleration	15 G's Max	4.42
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	142	
Sequential Test Number	2	
Date	08/20/07	6 Axis Neck Transducer
Workfile	142NF8-20-07	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.11
Relative Humidity		10% - 70%	33.00
Impact Velocity		6.89 – 7.13 m/s	6.99
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.72
	20 ms	17.60 - 22.60 G's	22.50
	30 ms	12.50 - 18.50 G's	16.80
Max Pendulum G's Above 30 ms		29 G's Max	16.80
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.60
D Plane Rotation	Max	64 - 78 Deg	66.37
	Time	57 - 64 ms	58.00
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	105.05
	Time	47 - 58 ms	50.40
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	114.90
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.30

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	142	
Sequential Test Number	2	
Date	08/20/07	6 Axis Neck Transducer
Workfile	142NE 08-20-07	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.11
Relative Humidity		10% - 70%	33.00
Impact Velocity		5.94 – 6.19 m/s	6.07
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.60
	20 ms	14.00 - 19.00 G's	18.41
	30 ms	11.00 - 16.00 G's	14.55
Max Pendulum G's Above 30 ms		22 G's Max	14.55
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	40.40
D Plane Rotation	Max	81 - 106 Deg	94.34
	Time	72 - 82 ms	74.40
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-76.47
	Time	65 - 79 ms	70.10
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	153.0
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	136.90

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 142
Sequential Test Number 2
Date 08/22/07
Workfile 142T 08-22-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	36.00
Pendulum Velocity	6.58 – 6.83 m/s	6.68
Maximum Deflection	63.50 – 72.64 mm	65.79
Maximum Resistive Force	5159.9 – 5893.9 N	5698.17
Internal Hysteresis	69 - 85 %	75.45

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 142
Sequential Test Number 2
Date 08/23/07
Workfile 142LF 08-23-07; 142RF 08-23-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	44.00
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5572.58
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	44.00
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5390.68

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 142
Sequential Test Number 1
Date 8/17/07

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			33
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	35.0
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	6.0
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	13.5
Elbow Rest Height	J	7.5 - 8.3 in	8.2
Buttock Knee Length	K	22.8 - 23.8 in	23.5
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.2
Buttock Popliteal Length	N	17.8 - 18.8 in	18.6
Chest Depth	O	8.4 - 9.0 in	9.0
Foot Length	P	9.9 - 10.5 in	10.3
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Foot Breadth	W	3.6 - 4.2 in	4.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.1
Waist Circumference	Z	32.9 - 34.1 in	33.2

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 150
Sequential Test Number 2
Date 08-17-07
Workfile 150hd 08-17-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	35.00
Peak Resultant Acceleration	225-275 G's	25959
Peak Lateral Acceleration	15 G's Max	10.92
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	150	
Sequential Test Number	2	
Date	08-20-07	6 Axis Neck Transducer
Workfile	150NF 08-20-07	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	33.00
Impact Velocity		6.89 – 7.13 m/s	7.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.90
	20 ms	17.60 - 22.60 G's	22.12
	30 ms	12.50 - 18.50 G's	17.57
Max Pendulum G's Above 30 ms		29 G's Max	17.57
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.50
D Plane Rotation	Max	64 - 78 Deg	66.47
	Time	57 - 64 ms	57.60
Moment About Occipital Condyle	Max	88.13 – 108.47 N-m	96.77
	Time	47 - 58 ms	48.80
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	114.50
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	98.10

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	150	
Sequential Test Number	2	
Date	08-20-07	6 Axis Neck Transducer
Workfile	150NE 08-20-07	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		20.6 – 22.2 Deg C	21.1
Relative Humidity		10% - 70%	33.00
Impact Velocity		5.94 – 6.19 m/s	6.08
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.82
	20 ms	14.00 - 19.00 G's	18.32
	30 ms	11.00 - 16.00 G's	14.24
Max Pendulum G's Above 30 ms		22 G's Max	14.24
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	41.00
D Plane Rotation	Max	81 - 106 Deg	85.74
	Time	72 - 82 ms	74.70
Moment About Occipital Condyle	Max	-79.99 - -52.88 N-m	-66.76
	Time	65 - 79 ms	69.60
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	153.40
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	134.00

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 150
Sequential Test Number 2
Date 08-22-07
Workfile 150T2 08-22-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	20.6 – 22.2 Deg C	21.1
Relative Humidity	10% - 70%	37.00
Pendulum Velocity	6.58 – 6.83 m/s	6.70
Maximum Deflection	63.50 – 72.64 mm	65.8
Maximum Resistive Force	5159.9 – 5893.9 N	5635.8
Internal Hysteresis	69 - 85 %	71.70

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 150
Sequential Test Number 2
Date 08-23-07
Workfile 150LF 08-23-07; 150 RF 08-23-07

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	44.00
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5416.49
RIGHT KNEE		
Temperature	18.9 – 25.6 Deg C	21.1
Relative Humidity	10% - 70%	44.00
Probe Velocity	2.07 – 2.13 m/s	2.13
Peak Knee Impact Force	4715.1 – 5782.7 N	5167.27

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
Sequential Test Number 1
Date 8/17/07

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			33
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	34.9
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	3.7
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	8.2
Buttock Knee Length	K	22.8 - 23.8 in	23.5
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.5
Buttock Popliteal Length	N	17.8 - 18.8 in	18.5
Chest Depth	O	8.4 - 9.0 in	9.0
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	4.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.1
Waist Circumference	Z	32.9 - 34.1 in	34.0

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 142)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENTRAN	AC-02A16-A09	30-Jul-07	29-Jan-08
	Y	ENTRAN	AC-02I0210-N20	30-Jul-07	29-Jan-08
	Z	ENDEVCO	AC-J19244	30-Jul-07	29-Jan-08
Head	X (R)	ENDEVCO	AC-P16591	30-Jul-07	29-Jan-08
	Y (R)	ENDEVCO	AC-P16286	30-Jul-07	29-Jan-08
	Z (R)	ENDEVCO	AC-J23996	30-Jul-07	29-Jan-08
Neck Load Cell	X	DENTON	LC-280Fx	31-Jul-07	30-Jan-08
	Y	DENTON	LC-280Fy	31-Jul-07	30-Jan-08
	Z	DENTON	LC-280Fz	31-Jul-07	30-Jan-08
Neck Moment	X	DENTON	LC-280Mx	31-Jul-07	30-Jan-08
	Y	DENTON	LC-280My	31-Jul-07	30-Jan-08
	Z	DENTON	LC-280Mz	31-Jul-07	30-Jan-08
Chest	X	ENTRAN	AC-03E03D16-F16	30-Jul-07	29-Jan-08
	Y	ENTRAN	AC-05H31-Z04	30-Jul-07	29-Jan-08
	Z	ENTRAN	AC-04J04I20-Z04	30-Jul-07	29-Jan-08
Chest	X (R)	ENTRAN	AC-03E03E21-M02	30-Jul-07	29-Jan-08
	Y (R)	ENTRAN	AC-01G18-F08	30-Jul-07	29-Jan-08
	Z (R)	ENTRAN	AC-03F03E29-N04	30-Jul-07	29-Jan-08
Chest Deflection	X	SERVO	DS-142	22-Aug-07	21-Feb-08
Pelvic	X	ENDEVCO	AC-00L13-F10	31-Jul-07	30-Jan-08
	Y	ENTRAN	AC-03F03F09-N06	31-Jul-07	30-Jan-08
	Z	ENTRAN	AC-03E03E21-M06	31-Jul-07	30-Jan-08

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 142)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1523	02-Aug-07	01-Feb-08
Right Femur Load Cell	Fz	DENTON	LC-1524	02-Aug-07	01-Feb-08
Left Upper Tibia	Mx	DENTON	LC-265Mx	02-Aug-07	01-Feb-08
	My	DENTON	LC-265My	02-Aug-07	01-Feb-08
Left Lower Tibia	Fz	DENTON	LC-178Fz	02-Aug-07	01-Feb-08
	Mx	DENTON	LC-178Mx	02-Aug-07	01-Feb-08
	My	DENTON	LC-178My	02-Aug-07	01-Feb-08
Right Upper Tibia	Mx	DENTON	LC-200Mx	02-Aug-07	01-Feb-08
	My	DENTON	LC-200My	02-Aug-07	01-Feb-08
Right Lower Tibia	Fz	DENTON	LC-128Fz	02-Aug-07	01-Feb-08
	Mx	DENTON	LC-128Mx	02-Aug-07	01-Feb-08
	My	DENTON	LC-128My	02-Aug-07	01-Feb-08
Left Foot Rear	X	ENDEVCO	AC-AJ7G1	31-Jul-07	30-Jan-08
	Z	ENDEVCO	AC-J20084	31-Jul-07	30-Jan-08
Left Foot Front	Z	ENDEVCO	AC-J20004	31-Jul-07	30-Jan-08
Right Foot Rear	X	ENDEVCO	AC-J27079	31-Jul-07	30-Jan-08
	Z	ENDEVCO	AC-ACCE6	31-Jul-07	30-Jan-08
Right Foot Front	Z	ENDEVCO	AC-J20580	31-Jul-07	30-Jan-08
Lap Belt Load Cell *		--	--	--	--
Shoulder Belt Load Cell *		--	--	--	--

* Lap and Shoulder Belt load cells were not placed on belt for this test per approval from the NHSTA.

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 150)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	AC-J19996	16-Jul-07	15-Jan-08
	Y	ENDEVCO	AC-J14381	16-Jul-07	15-Jan-08
	Z	ENDEVCO	AC-P15856	16-Jul-07	15-Jan-08
Head	X (R)	ENDEVCO	AC-AJ4P7	16-Jul-07	15-Jan-08
	Y (R)	ENDEVCO	AC-J27366	16-Jul-07	15-Jan-08
	Z (R)	ENDEVCO	AC-P35788	09-Aug-07	08-Feb-08
Neck Load Cell	X	DENTON	LC-157Fx	17-Jul-07	16-Jan-08
	Y	DENTON	LC-157Fy	17-Jul-07	16-Jan-08
	Z	DENTON	LC-157Fz	17-Jul-07	16-Jan-08
Neck Moment	X	DENTON	LC-157Mx	17-Jul-07	16-Jan-08
	Y	DENTON	LC-157My	17-Jul-07	16-Jan-08
	Z	DENTON	LC-157Mz	17-Jul-07	16-Jan-08
Chest	X	ENDEVCO	AC-J20083	16-Jul-07	15-Jan-08
	Y	ENDEVCO	AC-P17848	16-Jul-07	15-Jan-08
	Z	ENDEVCO	AC-J19223	16-Jul-07	15-Jan-08
Chest	X (R)	ENDEVCO	AC-P35817	16-Jul-07	15-Jan-08
	Y (R)	ENDEVCO	AC-P35790	16-Jul-07	15-Jan-08
	Z (R)	ENDEVCO	AC-P39574	16-Jul-07	15-Jan-08
Chest Deflection	X	SERVO	DS-150	22-Aug-07	21-Feb-08
Pelvic	X	ENDEVCO	AC-J21985	16-Jul-07	15-Jan-08
	Y	ENDEVCO	AC-AAMW5	16-Jul-07	15-Jan-08
	Z	ENDEVCO	AC-AJ5P9	16-Jul-07	15-Jan-08

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 150)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	DENTON	LC-1528	18-Jul-07	17-Jan-08
Right Femur Load Cell	Fz	DENTON	LC-1527	18-Jul-07	17-Jan-08
Left Upper Tibia	Mx	DENTON	LC-263Mx	19-Jul-07	18-Jan-08
	My	DENTON	LC-263My	19-Jul-07	18-Jan-08
Left Lower Tibia	Fz	DENTON	LC-174Fz	19-Jul-07	18-Jan-08
	Mx	DENTON	LC-174Mx	19-Jul-07	18-Jan-08
	My	DENTON	LC-174My	19-Jul-07	18-Jan-08
Right Upper Tibia	Mx	DENTON	LC-274Mx	19-Jul-07	18-Jan-08
	My	DENTON	LC-274My	19-Jul-07	18-Jan-08
Right Lower Tibia	Fz	DENTON	LC-185Fz	19-Jul-07	18-Jan-08
	Mx	DENTON	LC-185Mx	19-Jul-07	18-Jan-08
	My	DENTON	LC-185My	19-Jul-07	18-Jan-08
Left Foot Rear	X	ENDEVCO	AC-P14914	18-Jul-07	17-Jan-08
	Z	ENDEVCO	AC-AGRP4	18-Jul-07	17-Jan-08
Left Foot Front	Z	ENDEVCO	AC-AJ4G1	18-Jul-07	17-Jan-08
Right Foot Rear	X	ENDEVCO	AC-J36723	18-Jul-07	17-Jan-08
	Z	ENDEVCO	AC-J27496	18-Jul-07	17-Jan-08
Right Foot Front	Z	ENDEVCO	AC-J35747	18-Jul-07	17-Jan-08
Lap Belt Load Cell *		--	--	--	--
Shoulder Belt Load Cell *		--	--	--	--

* Lap and Shoulder Belt load cells were not placed on belt for this test per approval from the NHSTA.

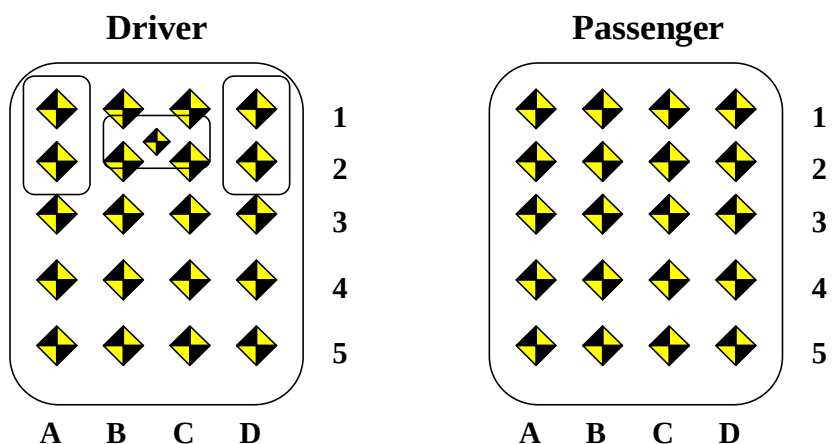
INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ICS	AC-FA2475	21-May-07	20-Nov-07
Right Rear Seat Crossmember X	ICS	AC-FA2491	21-Sep-07	22-Mar-08
Top of Engine	ICS	AC-FA2487	12-Sep-07	13-Mar-08
Bottom of Engine	ICS	AC-FA2480	12-Sep-07	13-Mar-08
Right Disc Brake Caliper	ICS	AC-FA2481	21-Apr-07	21-Oct-07
Left Disc Brake Caliper	ICS	AC-FA2477	08-Aug-07	07-Feb-08
Left Seat Rear Crossmember Z	ICS	AC-FA2489	21-Sep-07	22-Mar-08
Right Seat Rear Crossmember Z	ICS	AC-FA2490	21-Sep-07	22-Mar-08

APPENDIX E

VEHICLE INTERIOR INTRUSION MEASUREMENTS

DRIVER SIDE INTRUSION MEASUREMENTS

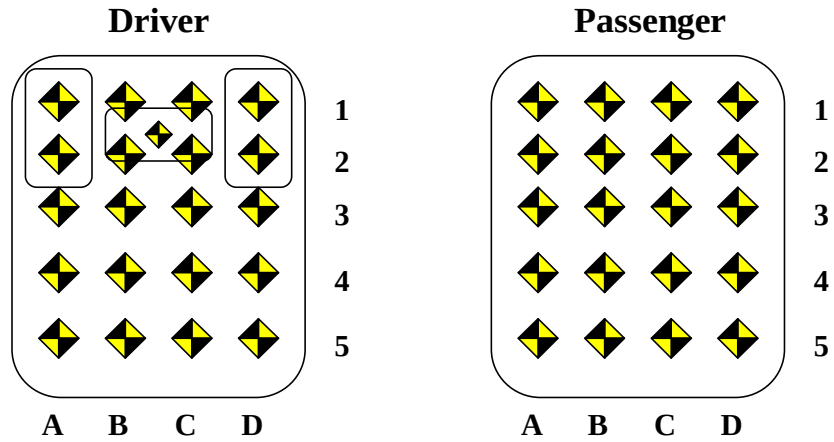


Driver Side Intrusion Measurements

Intrusion Location	PRE-TEST (mm)			POST-TEST (mm)			CHANGE (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3412	-567	528	3406	-581	525	6	14	3
B1	3541	-428	528	3520	-437	537	21	9	-9
C1	3569	-301	521	3533	-312	533	36	11	-12
D1	3565	-201	529	3528	-211	530	37	10	-1
A2	3364	-568	462	3360	-581	456	4	13	6
B2	3520	-432	462	3509	-439	463	11	7	-1
C2	3523	-302	459	3515	-311	461	8	9	-2
D2	3523	-197	461	3513	-207	453	10	10	8
A3	3307	-569	390	3311	-581	384	-4	12	6
B3	3365	-435	393	3362	-452	384	3	17	9
C3	3356	-313	397	3351	-328	382	5	15	15
D3	3345	-197	398	3343	-212	378	2	15	20
A4	3293	-568	390	3290	-582	381	3	14	9
B4	3290	-443	391	3290	-456	379	0	13	12
C4	3289	-319	393	3288	-331	377	1	12	16
D4	3291	-203	398	3280	-213	375	11	10	23
A5	3231	-564	390	3231	-580	382	0	16	8
B5	3227	-442	391	3228	-459	377	-1	17	14
C5	3224	-321	393	3222	-342	376	2	21	17
D5	3220	-203	398	3216	-218	374	4	15	24
BP	3383	-345	566	3425	-337	524	-42	-8	42
G	3144	-523	886	3139	-528	884	5	5	2
H	3147	-219	876	3150	-224	877	-3	5	-1
L	2910	-381	1105	2958	-384	1068	-48	3	37
AB	2875	-601	510	2867	-620	499	8	19	11

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	3525	205	557	3506	215	561	19	-10	-4
B1	3533	333	563	3511	338	564	22	-5	-1
C1	3534	451	563	3521	454	568	13	-3	-5
D1	3421	570	563	3415	585	557	6	-15	6
A2	3448	208	484	3436	217	469	12	-9	15
B2	3450	335	485	3439	343	477	11	-8	8
C2	3452	451	485	3442	460	482	10	-9	3
D2	3401	574	480	3400	585	481	1	-11	-1
A3	3369	209	414	3378	221	390	-9	-12	24
B3	3376	331	416	3380	344	396	-4	-13	20
C3	3374	451	414	3380	463	400	-6	-12	14
D3	3383	572	420	3384	588	410	-1	-16	10
A4	3302	214	413	3311	225	388	-9	-11	25
B4	3305	334	411	3309	347	391	-4	-13	20
C4	3308	453	409	3313	465	394	-5	-12	15
D4	3308	567	409	3315	582	400	-7	-15	9
A5	3229	214	414	3240	227	388	-11	-13	26
B5	3235	331	412	3237	344	392	-2	-13	20
C5	3237	452	411	3240	462	396	-3	-10	15
D5	3241	571	410	3242	583	400	-1	-12	10
R	3144	263	899	3155	261	896	-11	2	3
S	3143	569	901	3142	561	896	1	8	5
AB	2876	604	531	2886	614	523	-10	-10	8

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

AB = Front outboard seat anchor bolt