

REPORT NUMBER: NCAP-CAL-14-007

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

**Hyundai Motor Company
2014 Hyundai Veloster
Three door coupe**

NHTSA No: M20144203

**PREPARED BY:
CALSPAN CORPORATION
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March 27, 2014

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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Edward J. Dutton, Test Engineer Director
Transportation Test Operations

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
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16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2014 Hyundai Veloster three door coupe in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 14, 2014. The impact velocity of the vehicle was 56.44 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 458 mm at C5 to the right of the vehicle centerline. The test vehicle's occupant performance data is as follows:																																																									
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00260. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test procedure, dated August 2013.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2014 Hyundai Veloster three door coupe at a velocity of 56.44 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 14, 2014. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. 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 Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right / left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's shoulder and lap belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 142) and the right-front passenger (position 2) ATD (Serial No. 139) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 458 mm at C5 to the right of the vehicle centerline. During and after the impact event, the driver's and passenger's side doors were closed and operational.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the top headliner and head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee bolster.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the visor and head restraint. The upper torso contacted the frontal airbag. Both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	267.39	0.30	1474.87	-1144.77	41.95	-29.93	-1378.80	-2229.12
Passenger (5 th)	240.25	0.39	991.15	-495.68	51.38	-10.70	-1045.06	-616.11

GENERAL COMMENTS:

1. P1 (Driver) serial number - 142
2. P2 (Passenger) serial number - 139

Data Anomalies:

- Upper Neck Y Force, Questionable data 28 to 50 ms and after 125 ms
- Passenger Lap Seat Belt Load, Questionable data after 63 ms

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of FMVSS 212, 219 (Partial), and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20144203	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	Hyundai	Power Window Auto-Reverse	No
Model	Veloster	Driver Frontal Airbag	Yes
Body Style	Three door coupe	Driver Curtain Airbag	Yes
VIN	KMHTC6AD8EU183698	Driver Head/Torso Airbag	No
Body Color	Red	Driver Torso Airbag	No
Odometer Reading (km /mi)	156.12 km / 97 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	1.6	Driver Pelvis Airbag	No
Type / No. Cylinders	I4	Driver Knee Airbag	No
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Manual	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	Front Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	Yes	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	-

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company	GVWR (kg)	1700
Date of Manufacture	OCT/28/13	GAWR Front (kg)	940
		GAWR Rear (kg)	800

VEHICLE SEATING AND WEIGHT CAPACITY DATA

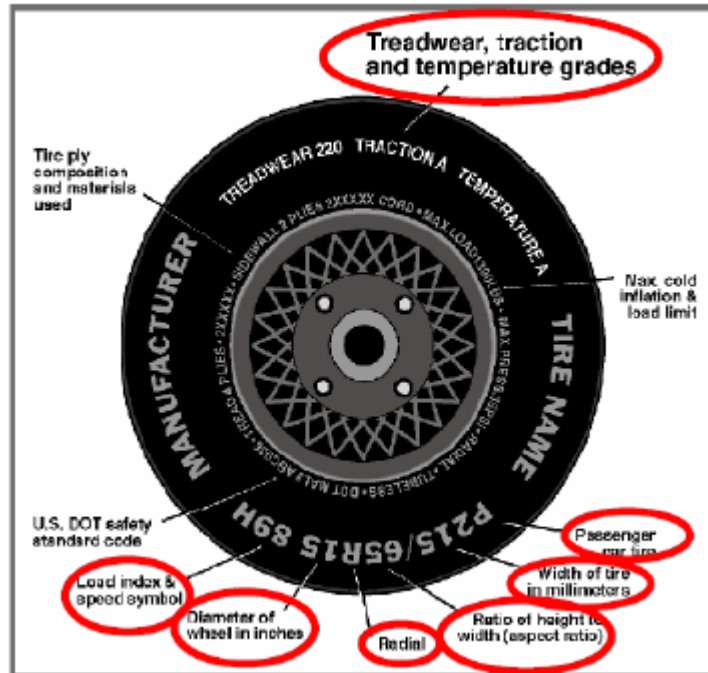
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	2	-	4
Capacity Wt. (VCW) (kg)				317
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

Collect items circled in red, tire manufacturer, and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P215/45R17	P215/45R17
Tire Size on Vehicle	P215/45R17	P215/45R17
Tire Manufacturer	NEXEN	NEXEN
Tire Model	CP671	CP671
Treadwear	400	400
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	87H	87H
Tire Material	Rubber	Rubber
DOT Safety Code Left	8EOK	8EOK
DOT Safety Code Right	8EOK	8EOKCEER2513

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

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	376	253		393	328	
Right	kg	363	246		422	273	
Ratio	%	60%	40%		58%	42%	
Totals	kg	739	499	1238	815	601	1416

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1238	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.7	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1423.5	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	693	693	680	685	1068
As Tested	mm	683	685	660	663	1125
Post-Test	mm	637	654	646	671	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2650
Total Vehicle Length at Left Side	mm	4081
Total Vehicle Length at Centerline	mm	4215
Total Vehicle Length at Right Side	mm	4083
Weight of Ballast in Cargo Area	kg	4.5
Weight of Vehicle Components Removed	kg	2
Amount of Stoddard Solvent in Fuel Tank	L	46.5

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, and tail lights.

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

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4215
2	Total Width	1772
3*	Bumper Top Height	548
4*	Bumper Bottom Height	426
5*	Longitudinal Member Top Height	522
6	Distance Between Longitudinal Members	1057
7	Longitudinal Member Width	72
8*	Engine Top Height	783
9*	Engine Bottom Height	165
10	Engine and Gearbox Width	587
11	Front Bumper-Engine Distance	412
12*	Front Shock Absorber Fixing Height	849
13*	Bonnet Leading Edge Height	721
14	Front Shock Absorber Fixing Width	1171
15	Front Bumper – Front Axle Distance	823
16	Front Axle – A Pillar Distance	547
17	A-Pillar – B-Pillar Distance	1037
18	B-Pillar – Rear Axle Distance	1066
19	B-Pillar – C-Pillar Distance	947
20*	Roof Sill Bottom Height	1253
21*	Roof Sill Top Height	1361
22*	Floor Sill Bottom Height	314
23*	Floor Sill Top Height	361

*Height Measurements are taken from the ground
 Note: All measurements are in millimeters

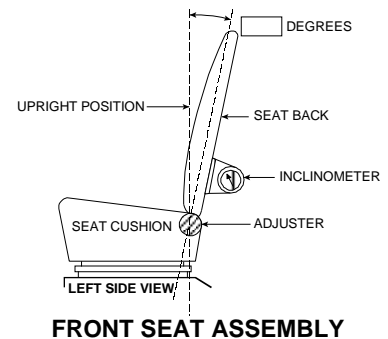
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

NOMINAL DESIGN RIDING POSITION

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	3.2
Passenger Seat Back Angle	1.3

SEAT FORE / AFT POSITIONS

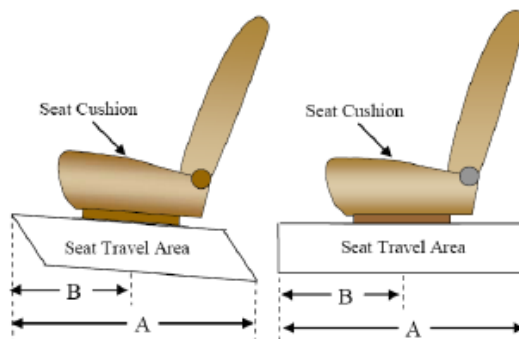
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	24	10
Passenger Seat	22	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The driver's seat belt guide was positioned to 90 degrees or highest position. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	Not Adjustable	Not Adjustable
Passenger Seat	Not Adjustable	Not Adjustable



DATA SHEET NO. 2 ... (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

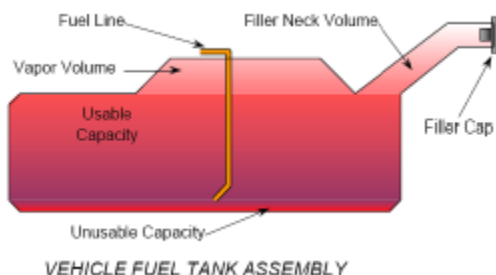
NHTSA No.: M20144203
 Test Date: 2/14/2014

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	50.0
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	46 - 47
Actual Amount of Solvent Used	46.5
1/3 of Usable Capacity	16.7

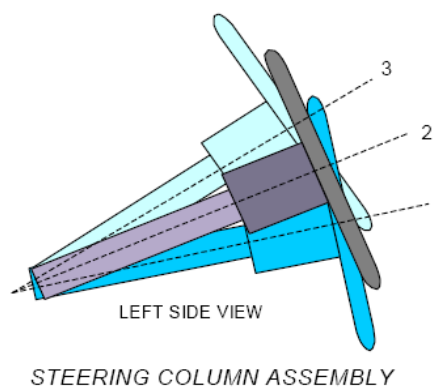
FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



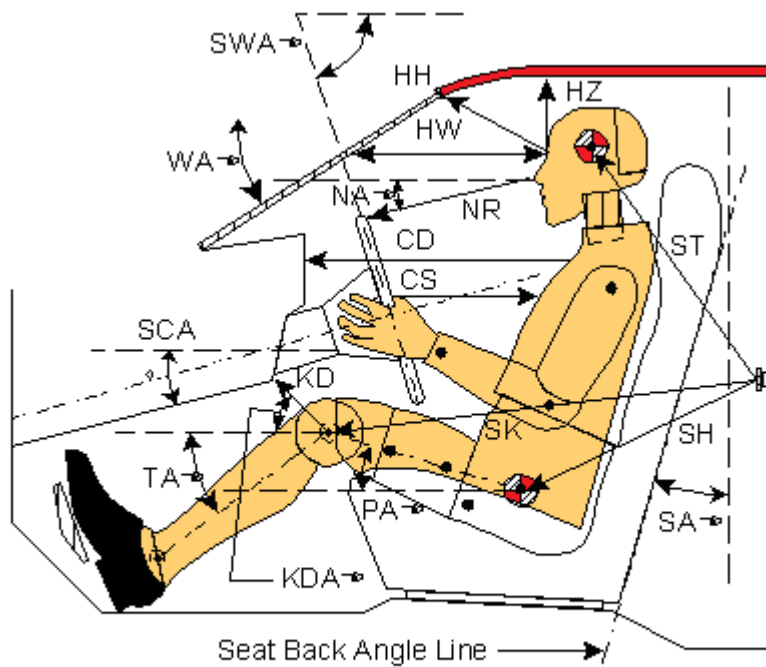
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	18.5	
Geometric center position No. 2	20.8	
Uppermost position No. 3	23	
Telescoping Steering Wheel Travel		40
Test Position	20.8	20

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014



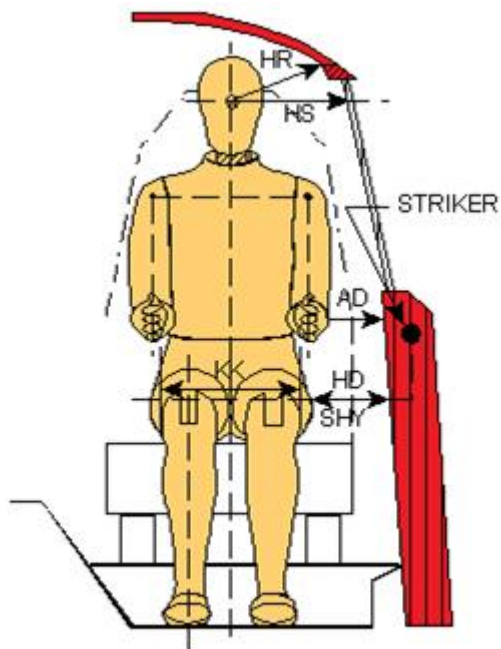
Left Side View

Code	Measurement Description	Driver (SN: 142)		Passenger (SN: 139)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-25.0		
SWA°	Steering Wheel Angle		20.8		
SCA°	Steering Column Angle		69.2		
SA°	Seat Back Angle (on headrest post)		3.4		1.4
HZ	Head to Roof (Z)	178	90	223	90
HH	Head to Header	375	21.3	342	42.1
HW	Head to Windshield	688	0	717	0
NR	Nose to Rim	401	-7.3	517	-19.8
CD	Chest to Dash	527		452	
CS	Chest to Steering Hub	328	0		
RA	Rim to Abdomen	212	0		
KDL	Left Knee to Dash	167	35.8	138	30.4
KDR	Right Knee to Dash	165	39.7	147	39.5
PA°	Pelvic Angle		21.9		20.1
TA°	Tibia Angle		24.8		35.3
SK	Striker to Knee	848	-9.5	666	-14.1
ST	Striker to Head	528	-43.8	387	-56.7
SH	Striker to H-Point	518	-31.3	421	-35.1

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014



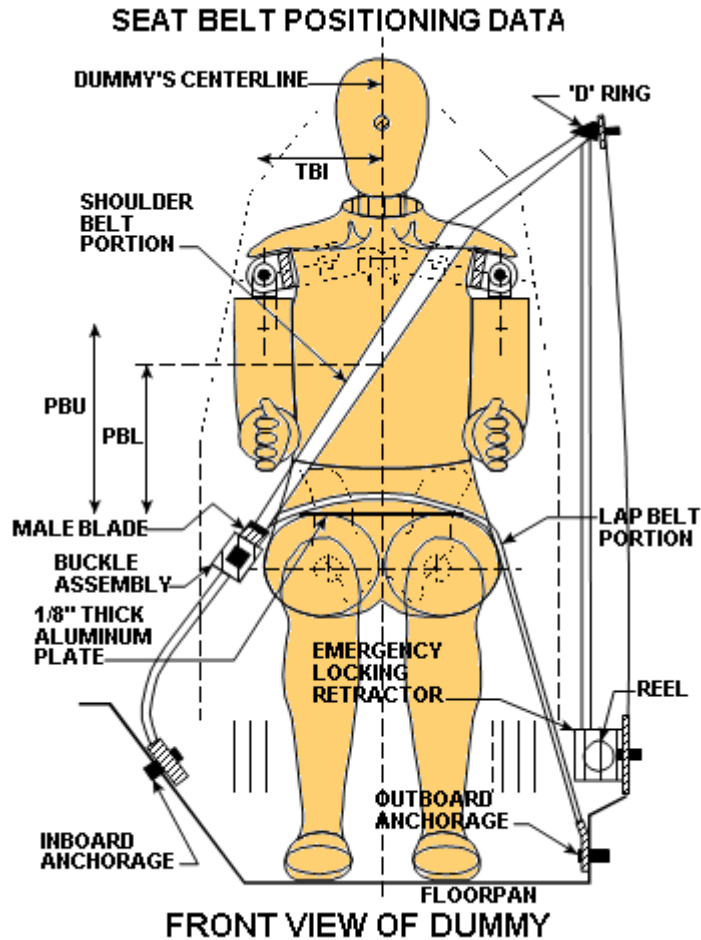
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	155	79
HD	H-Point to Door	146	174
HR	Head to Side Header	218	267
HS	Head to Side Window	355	375
KK	Knee to Knee	364	168
SHY	Striker to H-Point (Y Direction)	265	280
AA	Ankle to Ankle	395	162

**DATA SHEET NO. 5
SEAT BELT POSITIONING DATA**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	385	355
PBL — Top surface of reference to belt lower edge	mm	320	280

BELT LENGTH DATA

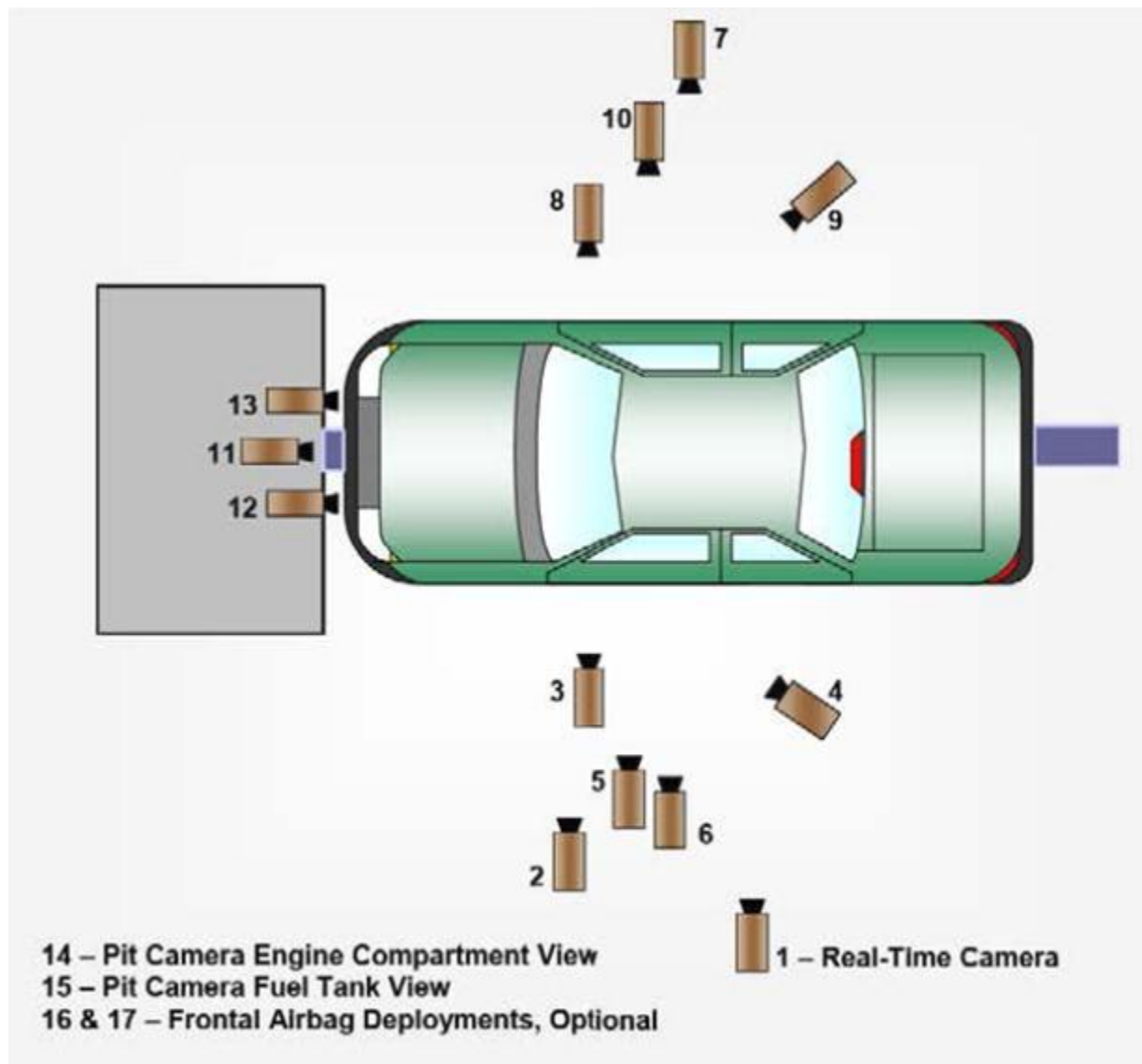
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	1005	890
Lap Belt Length as measured on ATD	mm	650	680
Remainder of belt on reel	mm	745	830
Total belt length for continuous webbing systems	mm	2400	2400

**DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

DATA SHEET NO. 6 ... (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

CAMERA LOCATIONS

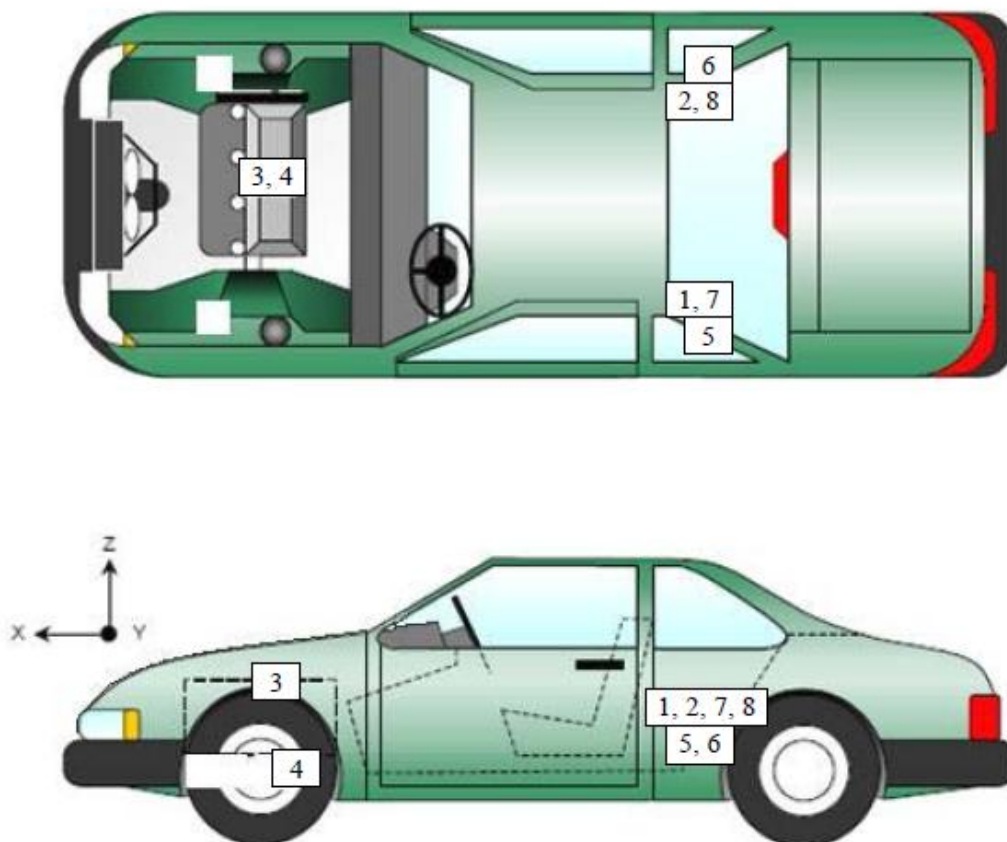
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	1327	-8370	1504	50	1000
3	Left Front Half	799	-9461	1618	50	1000
4	Left Angle	3039	-2854	2112	28	1000
5	Steering Column - Top	1741	-8257	1961	24-70	1000
6	Steering Column - Bottom	1741	-8257	1370	24-70	1000
7	Right Overall	2147	8545	1051	24	1000
8	Passenger Close-Up	1411	9246	1214	50	1000
9	Right Front Half	782	10053	1054	50	1000
10	Right Angle	2961	3101	2021	28	1000
11	Windshield	-533	0	3265	24	1000
12	Driver Windshield	-191	-638	2026	25	1000
13	Passenger Windshield	-191	621	2026	25	1000
14	Pit Front	815	0	2052	12.5	1000
15	Pit Rear	2453	0	2052	12.5	1000
16	Onboard Driver Airbag (Optional)					
17	Onboard Passenger Airbag (Optional)					

* COORDINATES: +X = forward of impact plane
 +Y = right of monorail center
 +Z = into ground

**DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1563	-601	315
2	Right Rear Accelerometer – X Direction	1562	598	358
3	Engine Top X	3722	184	-191
4	Engine Bottom X	3745	151	412
5	Left Rear Accelerometer – Z Direction	1560	-580	351
6	Right Rear Accelerometer – Z Direction	1563	617	315
7	Left Rear Accelerometer – X Direction Redundant	1563	-601	315
8	Right Rear Accelerometer – X Direction Redundant	1562	598	358

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

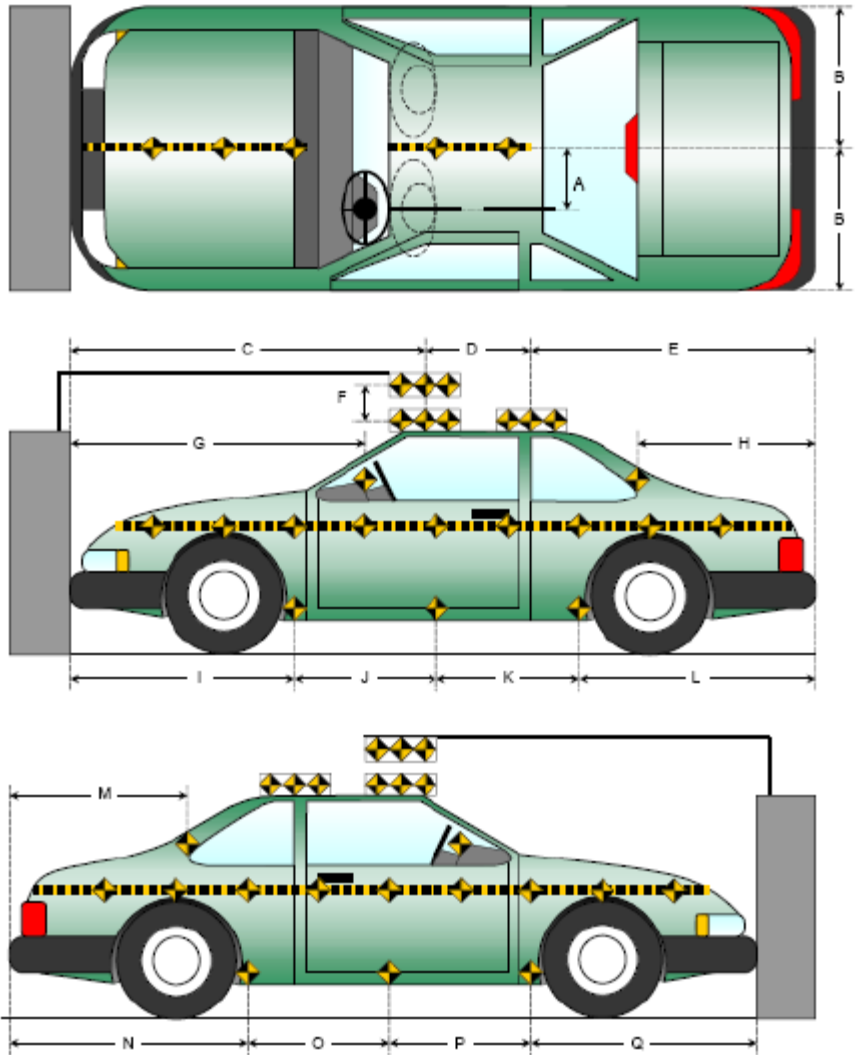
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

Item	Value
A	355
B	886
C	2052
D	253
E	1910
F	244
G	1643
H	838
I	1242
J	908
K	903
L	1162
M	763
N	1163
O	903
P	905
Q	1243

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

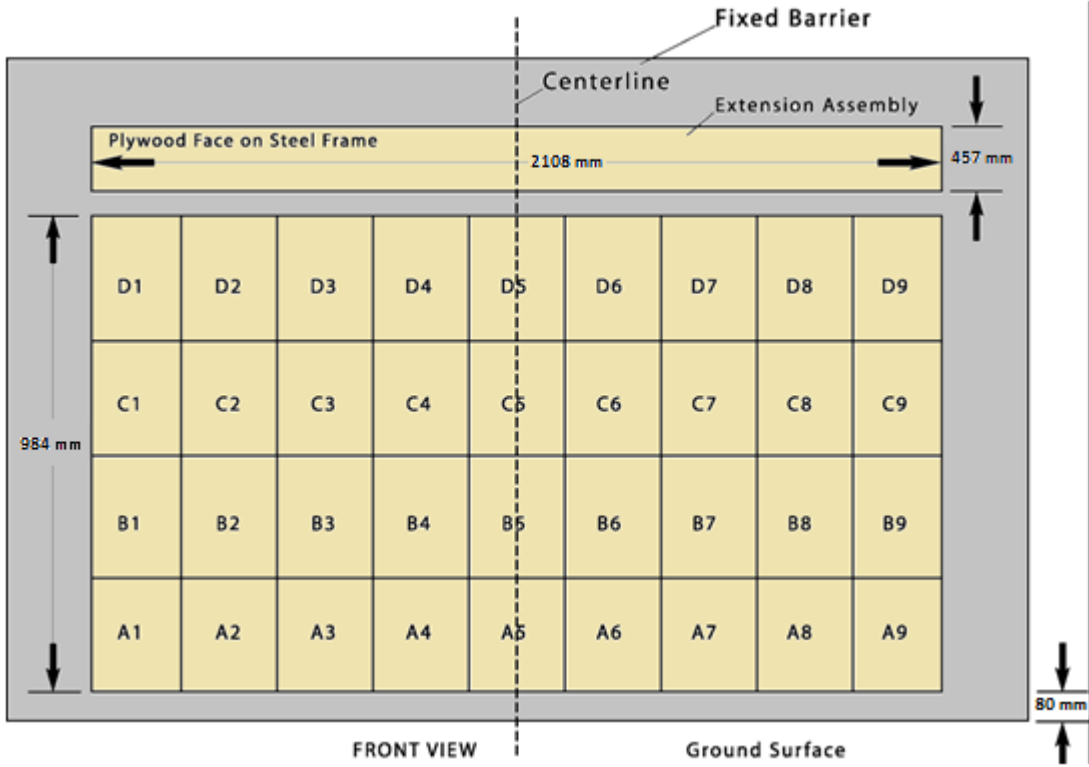


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	136

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time Panning	1
Total	15

**DATA SHEET NO. 11
POST-TEST OBSERVATIONS**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 142	P5720 5 th Female / 139
Head Contact	Front Airbag & Headrest	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Locked	Locked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	N/A	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	No	No
Glazing Damage	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracks throughout
Window Damage	None
Other Notable Effects	Front windows shifted upward during impact event

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	800
Center	mm	988
Right Side	mm	883
Average	mm	890

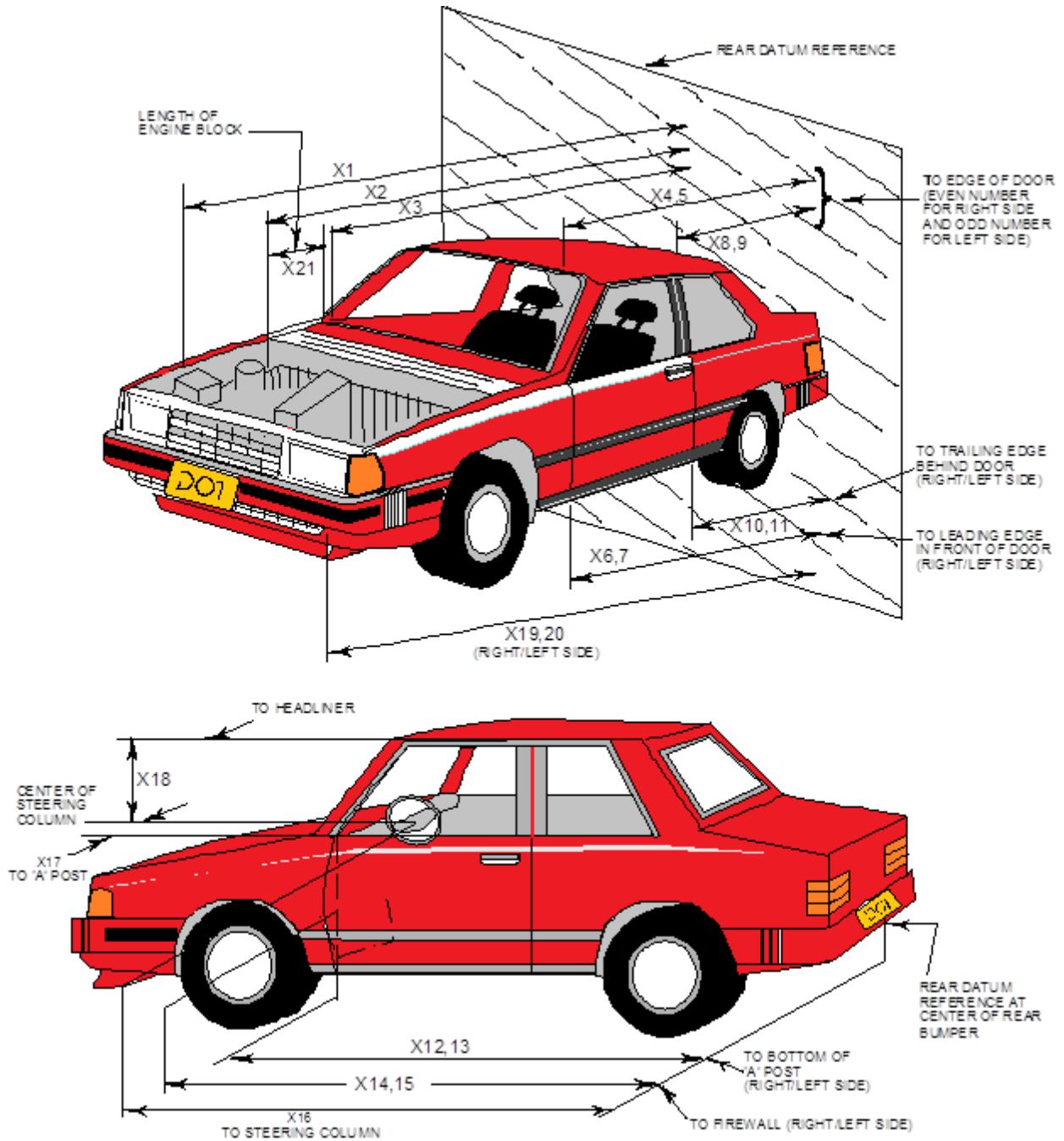
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

**DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014



**DATA SHEET NO. 12 ... (CONTINUED)
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4215	3777	-438
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3803	3551	-251
3	RSOV to Firewall	3170	3115	-54
4	RSOV to Upper Leading Edge of Right Door	2842	2841	-2
5	RSOV to Upper Leading Edge of Left Door	2842	2842	0
6	RSOV to Lower Leading Edge of Right Door	2861	2859	-3
7	RSOV to Lower Leading Edge of Left Door	2858	2857	-1
8	RSOV to Upper Trailing Edge of Right Door	1814	1813	-1
9	RSOV to Upper Trailing Edge of Left Door	1549	1550	1
10	RSOV to Lower Trailing Edge of Right Door	1831	1831	0
11	RSOV to Lower Trailing Edge of Left Door	1791	1792	1
12	RSOV to Bottom of "A" Post of Right Side	2913	2912	-1
13	RSOV to Bottom of "A" Post of Left Side	2915	2913	-2
14	RSOV to Firewall, Right Side	3221	3185	-36
15	RSOV to Firewall, Left Side	3220	3208	-12
16	RSOV to Steering Column	2432	2499	67
17	Center of Steering Column to "A" Post	292	296	4
18	Center of Steering Column to Headliner	391	430	39
19	RSOV to Right Side of Front Bumper	4131	3893	-238
20	RSOV to Left Side of Front Bumper	4131	3918	-213
21	Length of Engine Block	389	389	0
RD	RSOV to Right Side of Dash Panel	2594	2594	-1
CD	RSOV to Center of Dash Panel	2554	2556	2
LD	RSOV to Left Side of Dash Panel	2596	2595	-1

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014

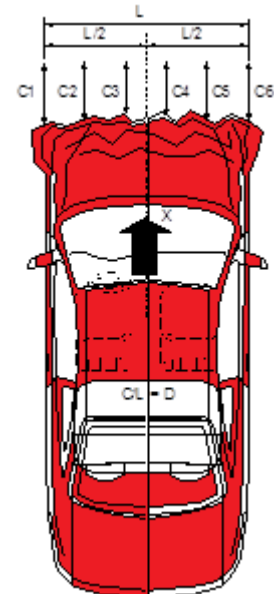
VEHICLE INFORMATION

VIN: KMHTC6AD8EU183698
Vehicle Size Category: Passenger

Wheelbase (mm): 2,650
Test Weight (kg): 1,416

ACCELEROMETER DATA

Accelerometer Locations: Please See Data Sheet No. 7
Cal. Procedure / Interval: Calspan Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.44
Velocity Change (km/h): 56.44
Time of Separation (ms): 120



CRUSH PROFILE

Collision Deformation Classification: 12FDEW3
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1057
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4115	3839	276
C2	Crush Zone 2 at Left Side	mm	4170	3751	419
C3	Crush Zone 3 at Left Side	mm	4210	3780	430
C4	Crush Zone 4 at Right Side	mm	4210	3763	447
C5	Crush Zone 5 at Right Side	mm	4173	3715	458
C6	Crush Zone 6 at Right Side	mm	4120	3818	302
L	C1 to C6	mm	1057	1050	7

**DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

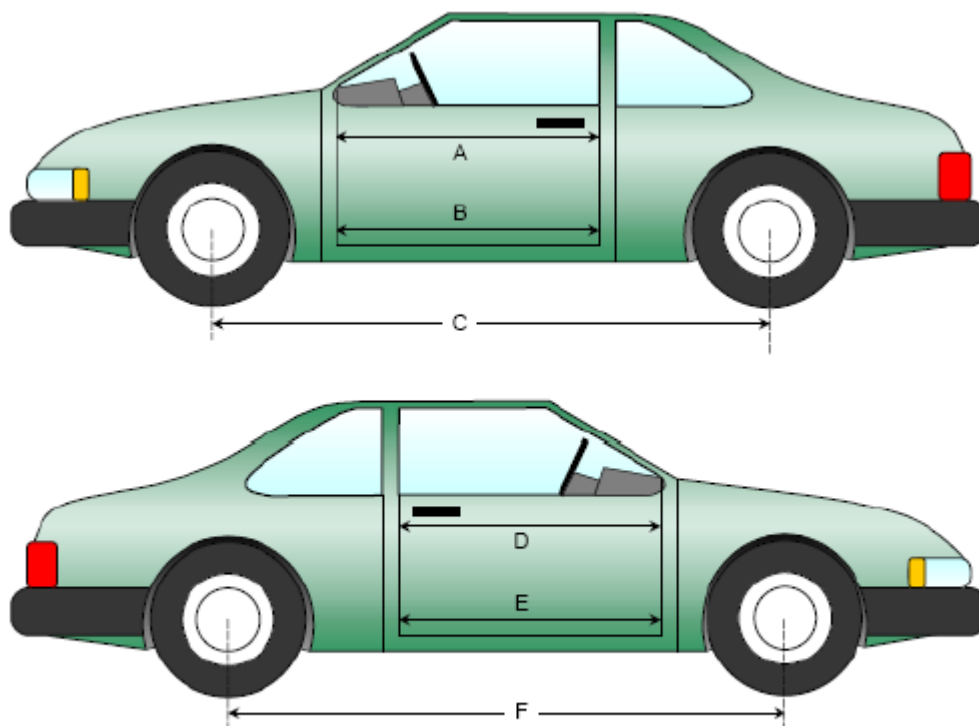
NHTSA No.: M20144203
 Test Date: 2/14/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1231	1229	-2
B	Left Side Lower	mm	1082	1082	0
D	Right Side Upper	mm	981	977	-4
E	Right Side Lower	mm	850	848	-2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2650	2635	-15
F	Right Side Wheelbase	mm	2650	2623	-27



Left & Right Side Views

**DATA SHEET NO.14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS**

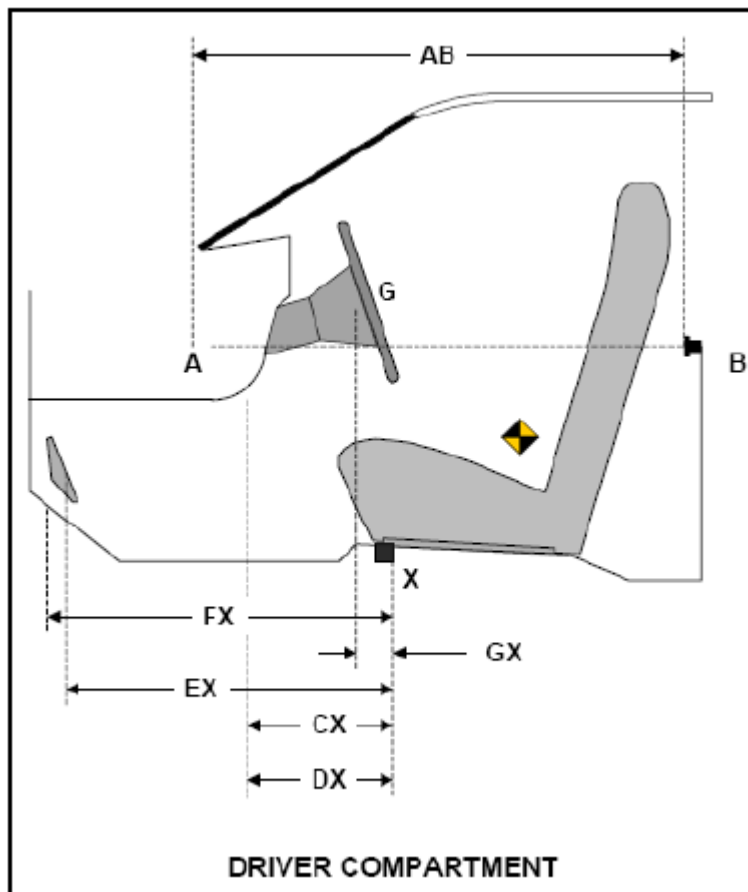
Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	950	952	2
CX	Left Knee Bolster to X	mm	248	253	5
DX	Right Knee Bolster to X	mm	250	252	2
EX	Brake Pedal to X	mm	571	510	-61
FX	Foot Rest to X	mm	627	603	-24
GX	Center of Steering Column Wheel Hub to X	mm	52	120	68

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
 Test Date: 2/14/2014

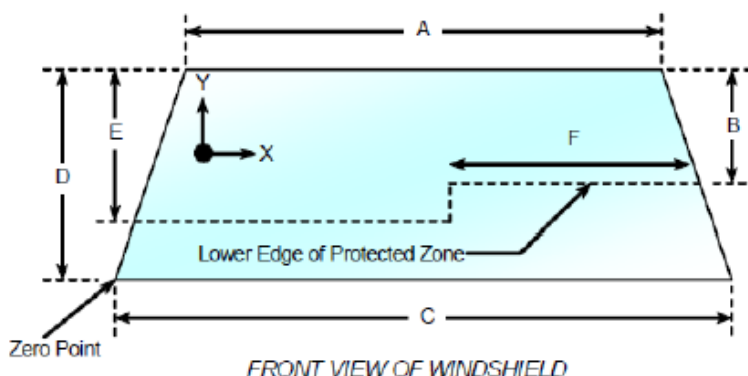
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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

Temperature of windshield molding during test: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2146	2146	100%
Right Side	2146	2146	100%
Total	4292	4292	100%



Item	Units	Value
A	mm	1210
B	mm	480
C	mm	1595
D	mm	743
E	mm	490
F	mm	475

AREAS OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

- No Penetration

X	Y

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

- No Penetration

X	Y

DATA SHEET NO. 15 ... (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 12:05 PM

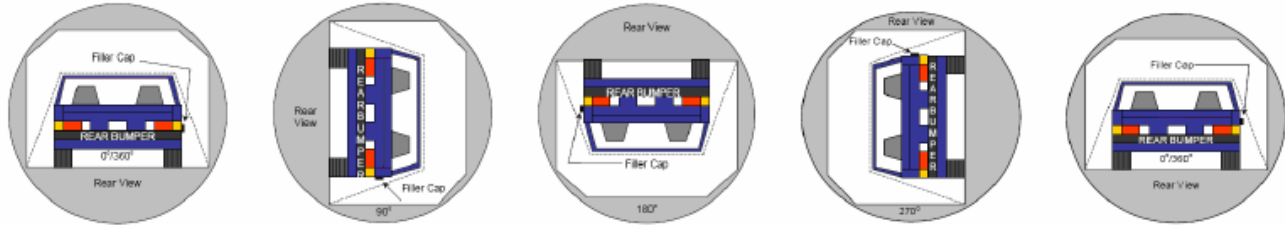
STODDARD SOLVENT SPILLAGE MEASUREMENTS

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 oz./minute)
- D. Spillage: No Spillage Occurred

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	68	300	368
90° to 180°	63	300	363
180° to 270°	61	300	361
270° to 360°	69	300	369

FMVSS 301 SPILLAGE TABLE

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

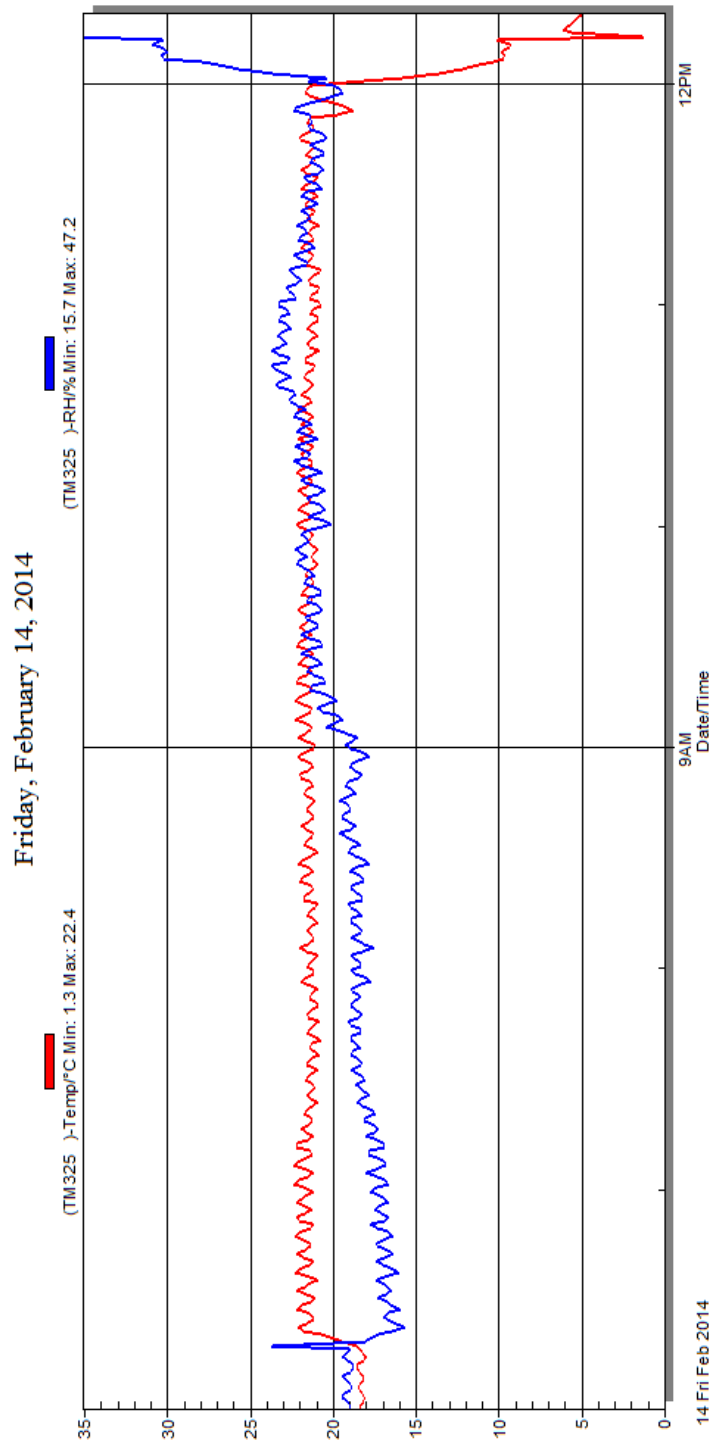
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2014 Hyundai Veloster Three door coupe
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20144203
Test Date: 2/14/2014



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

APPENDIX A
PHOTOGRAPHS

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¹**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*

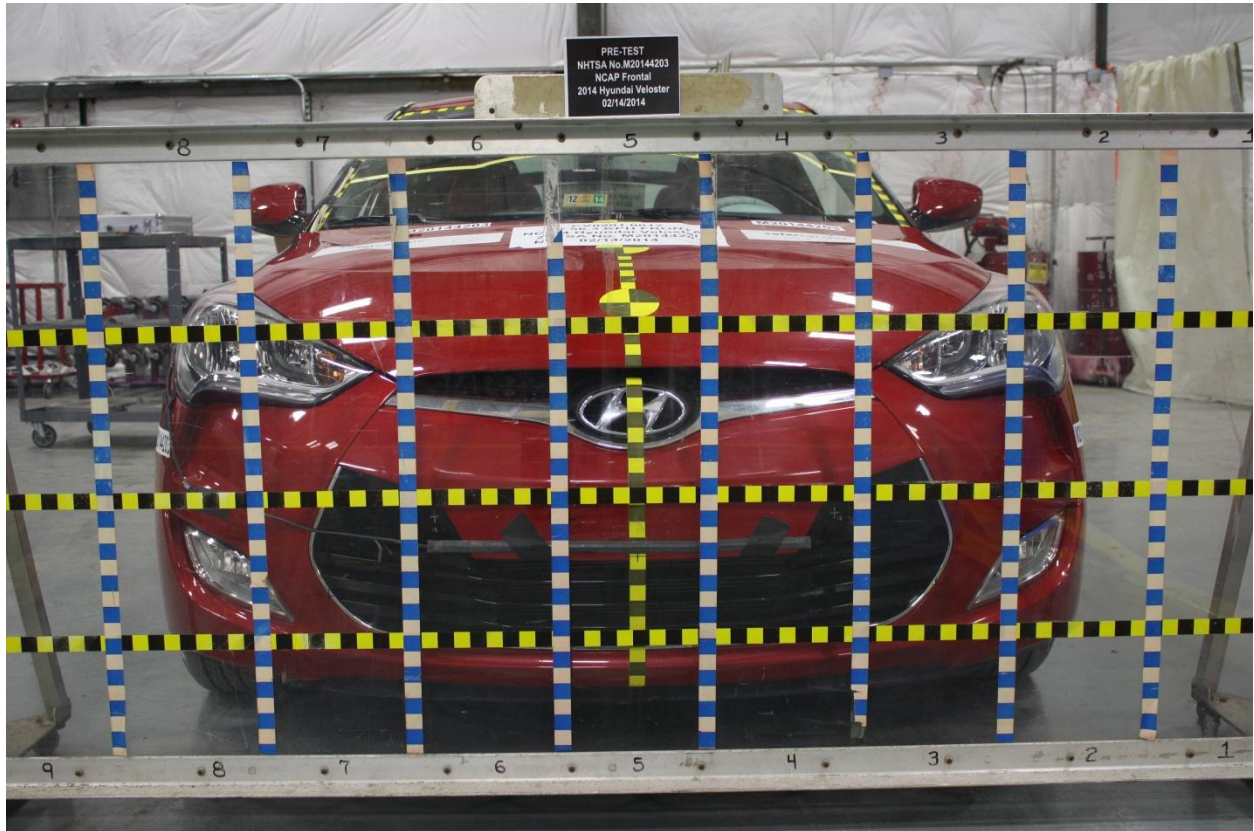


Figure A-1: Load Cell Location



Figure A-2: Load Cell Wall

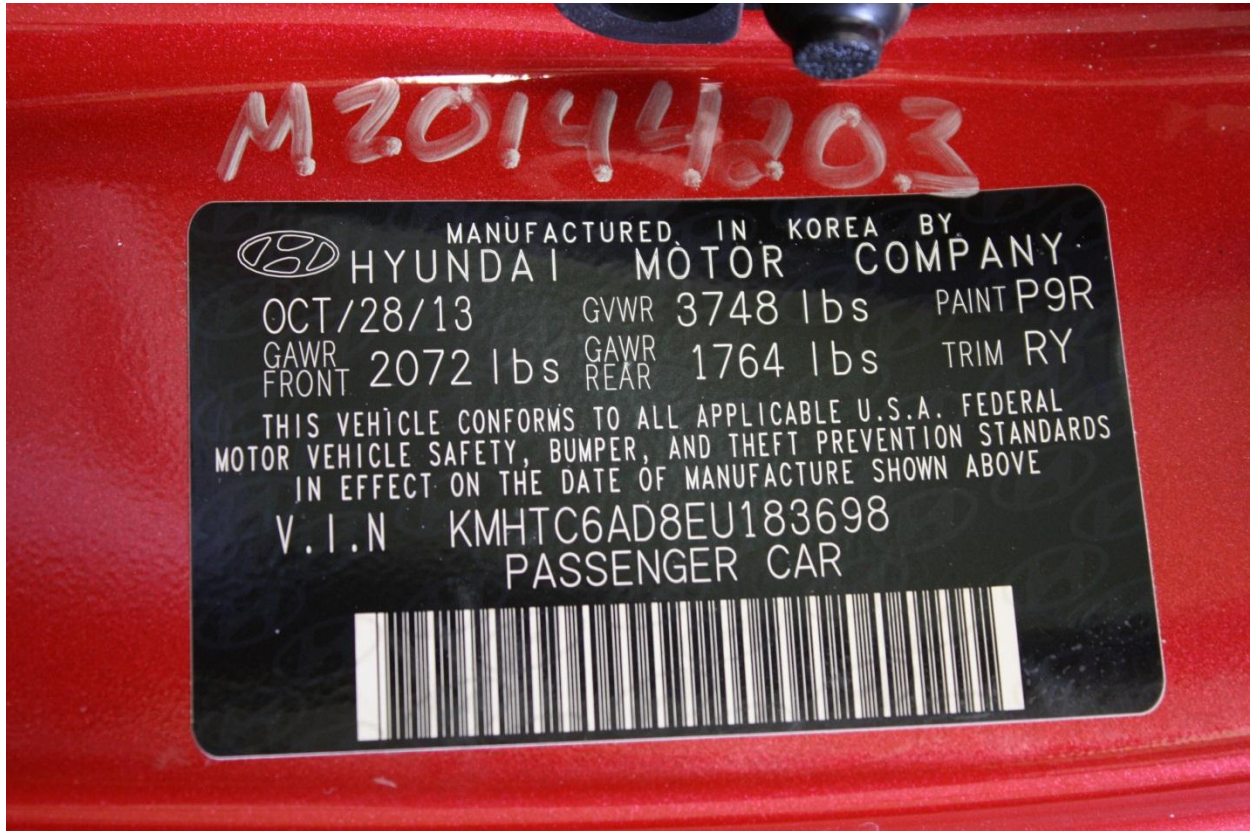


Figure A-3: Manufacturer's Label

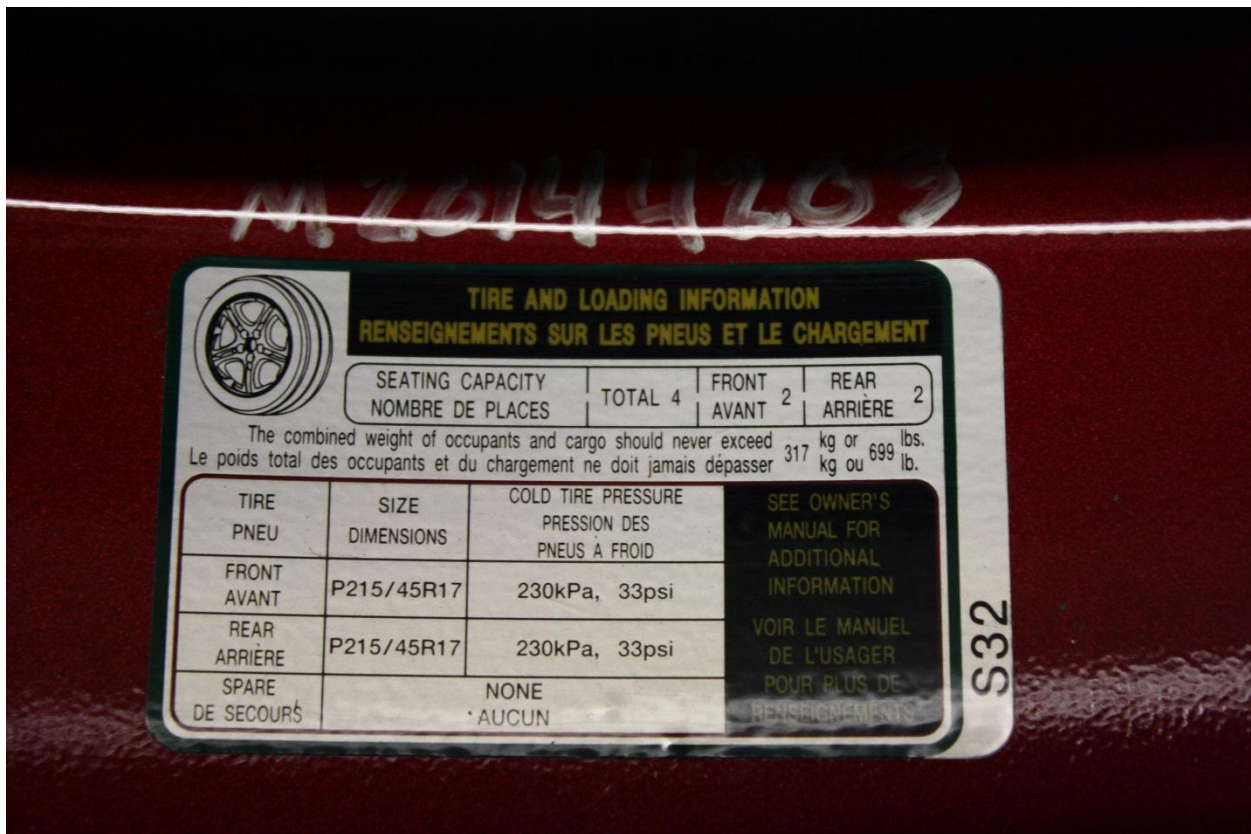


Figure A-4: Tire Placard



Figure A-5: 2014 Hyundai Veloster Frontal As Delivered



Figure A-6: Left Rear 3-4 View, As Received



Figure A-7: Pre-Test Front View of Test Vehicle

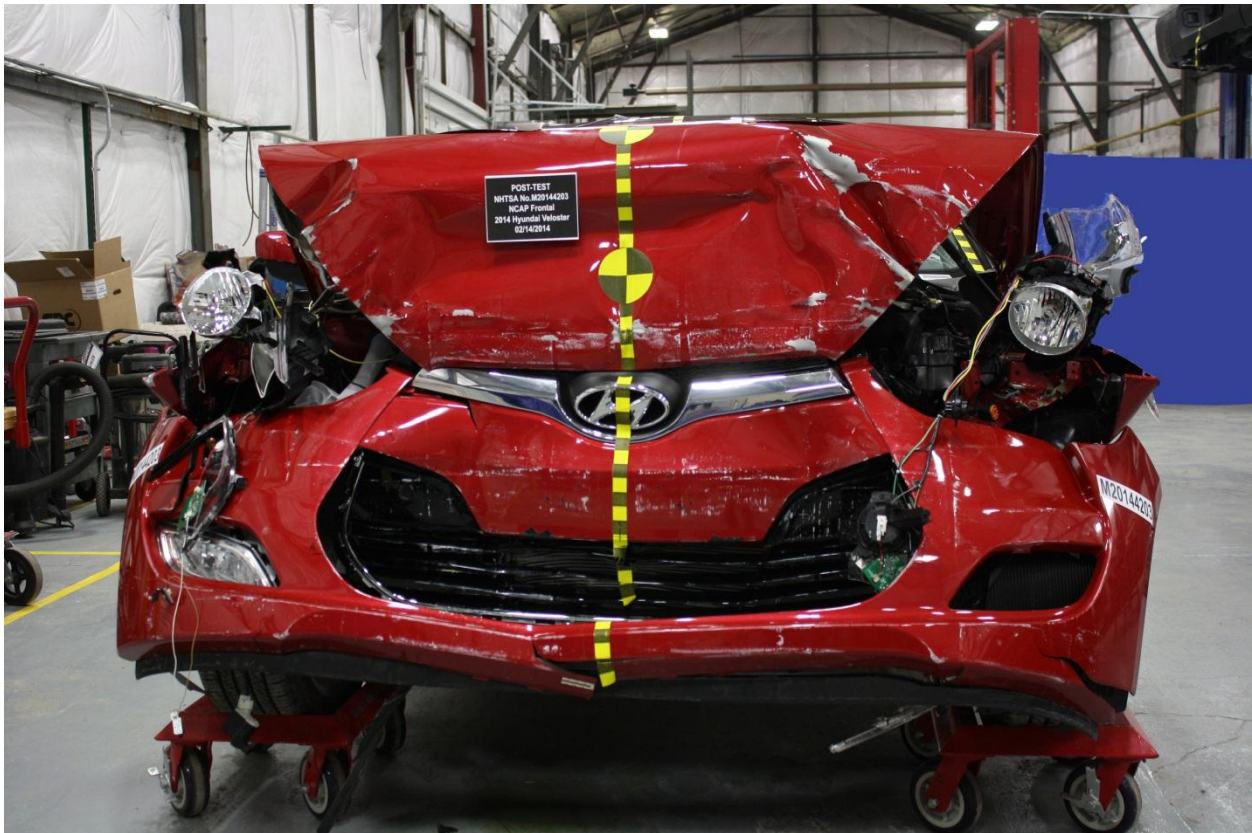


Figure A-8: Post-Test Front View of Test Vehicle



Figure A-9: Pre-Test Left View of Test Vehicle



Figure A-10: Post-Test Left View of Test Vehicle



Figure A-11: Pre-Test Right View of Test Vehicle



Figure A-12: Post-Test Right View of Test Vehicle



Figure A-13: Pre-Test Right Front 3-4 View



Figure A-14: Post-Test Right Front 3-4 View



Figure A-15: Pre-Test Left Rear 3-4 View



Figure A-16: Post-Test Left Rear 3-4 View



Figure A-17: Pre-Test Windshield View



Figure A-18: Post-Test Windshield View



Figure A-19: Pre-Test Engine Compartment View



Figure A-20: Post-Test Engine Compartment View



Figure A-21: Pre-Test Fuel Filler Cap View



Figure A-22: Post-Test Fuel Filler Cap View

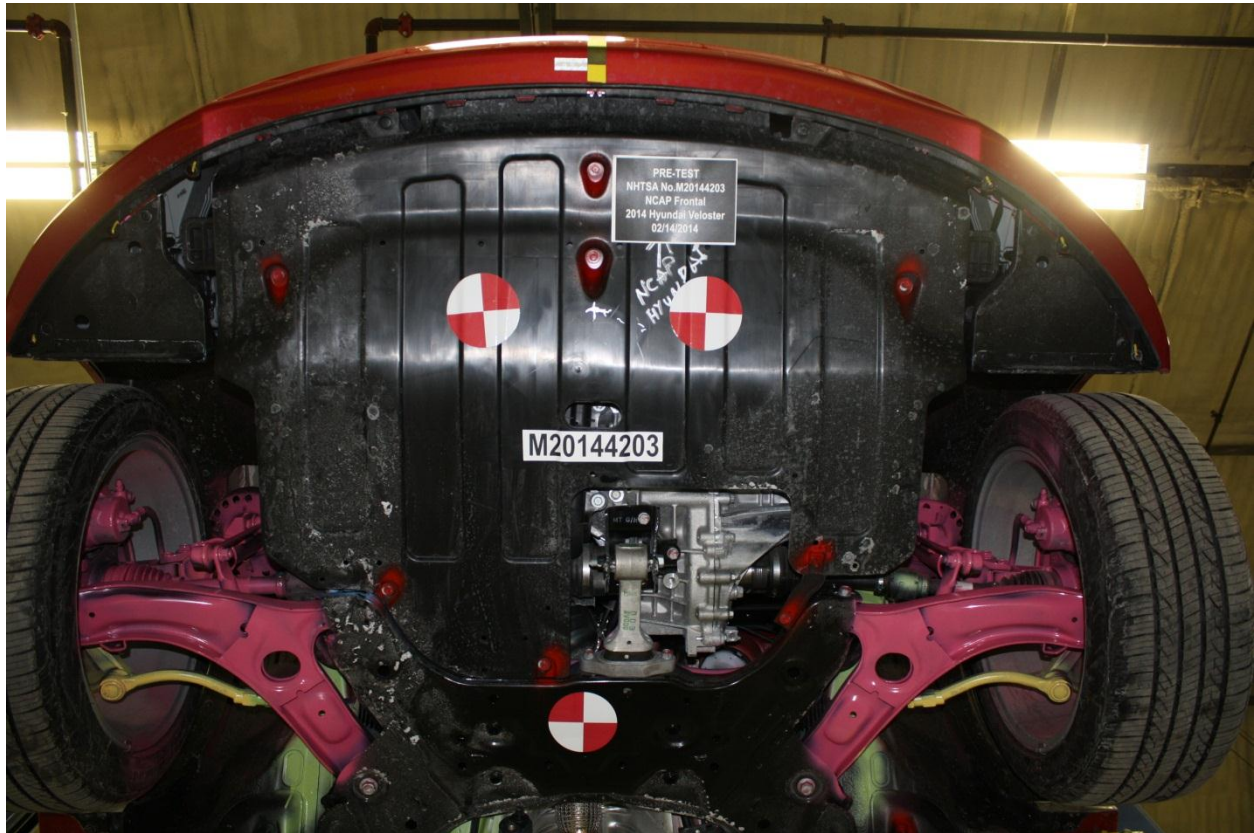


Figure A-23: Pre-Test Front Underbody View



Figure A-24: Post-Test Front Underbody View



Figure A-25: Pre-Test Rear Underbody View

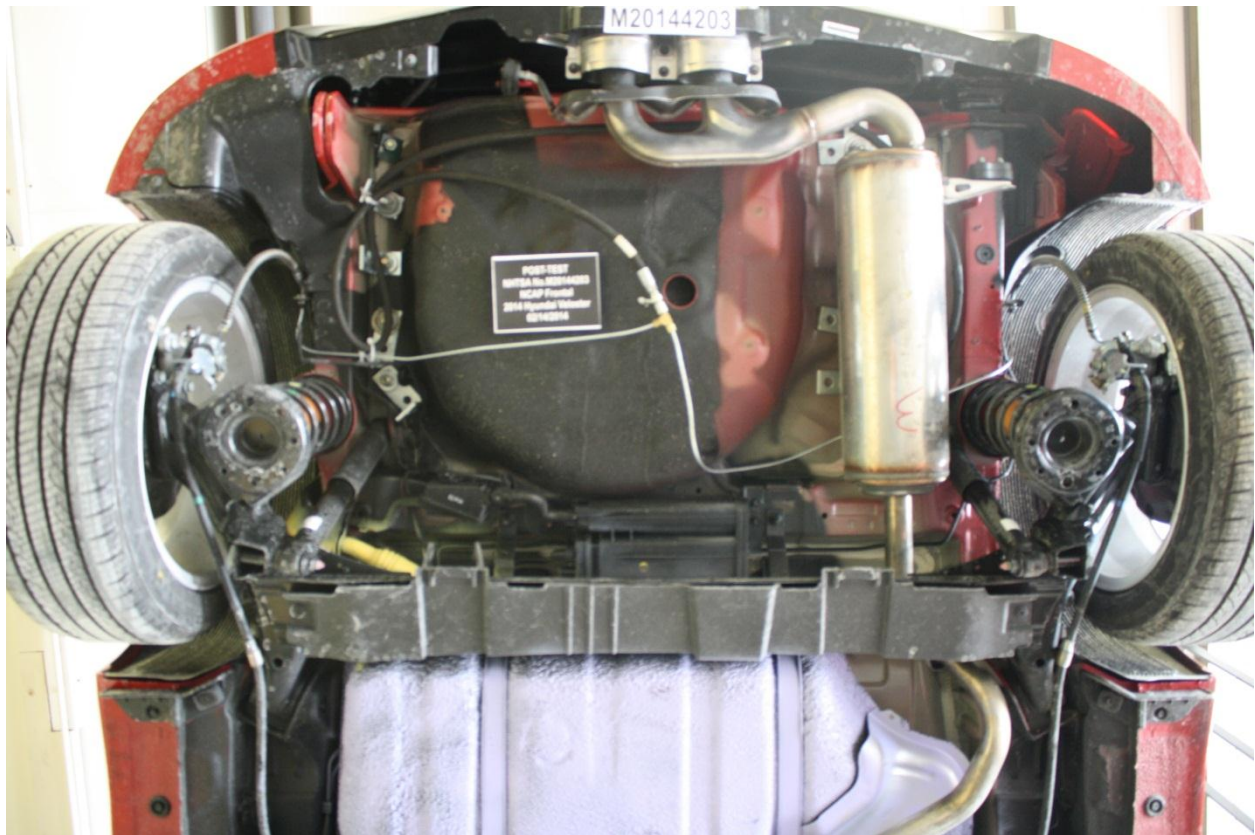


Figure A-26: Post-Test Rear Underbody View



Figure A-27: Pre-Test Dummy Cable Routing



Figure A-28: Post-Test Dummy Cable Routing



Figure A-29: Pre-Test Driver Dummy Front View



Figure A-30: Post-Test Driver Dummy Front View



Figure A-31: Pre-Test Driver Dummy Window View



Figure A-32: Post-Test Driver Dummy Window View



Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View



Figure A-34: Post-Test Driver Dummy and Vehicle Interior View



Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings



Figure A-36: Post-Test Driver's Seat Fore-Aft Markings



Figure A-37: Pre-Test View of Belt Anchorage for Driver Dummy



Figure A-38: Post-Test View of Belt Anchorage for Driver Dummy



Figure A-39: Pre-Test Driver Dummy Feet

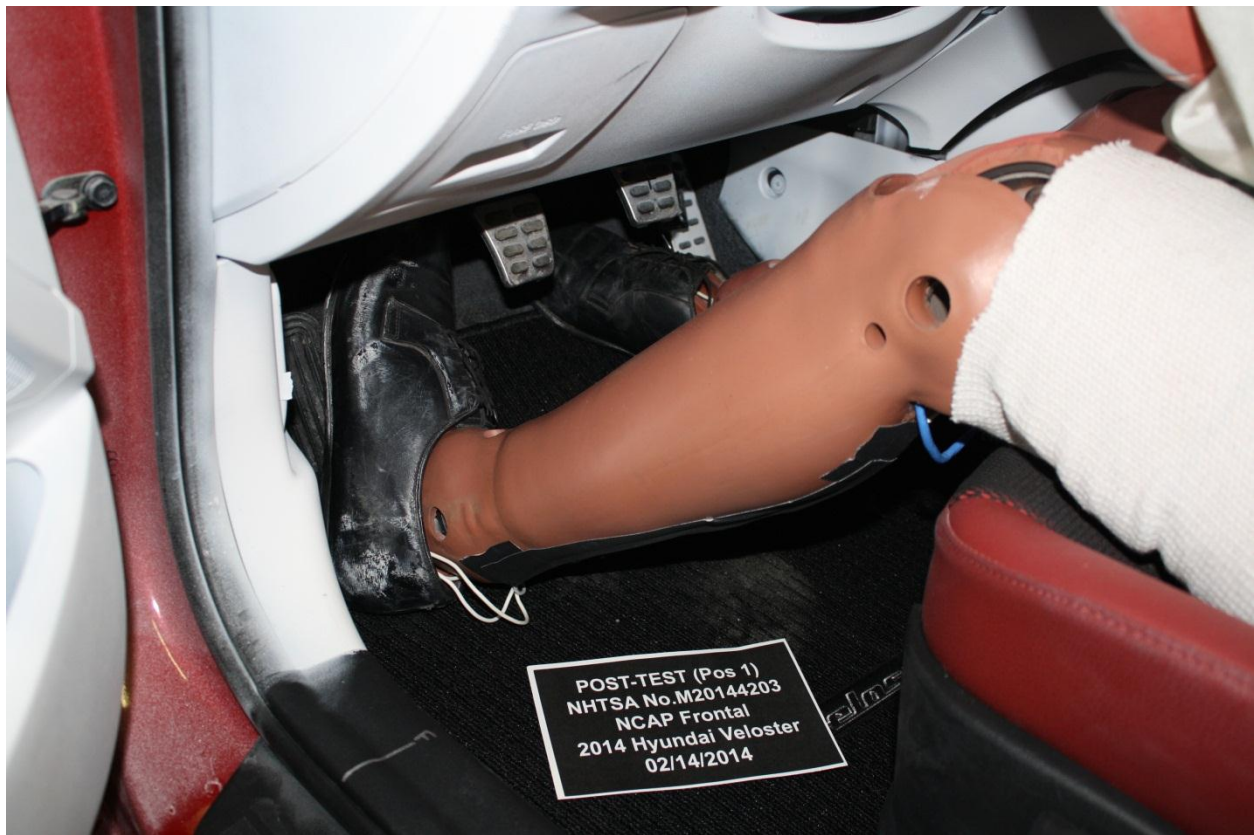


Figure A-40: Post-Test Driver Dummy Feet



Figure A-41: Pre-Test Driver's Side Knee Bolster



Figure A-42: Post-Test Driver's Side Knee Bolster



Figure A-43: Pre-Test Driver's Side Floorpan



Figure A-44: Post-Test Driver's Side Floorpan

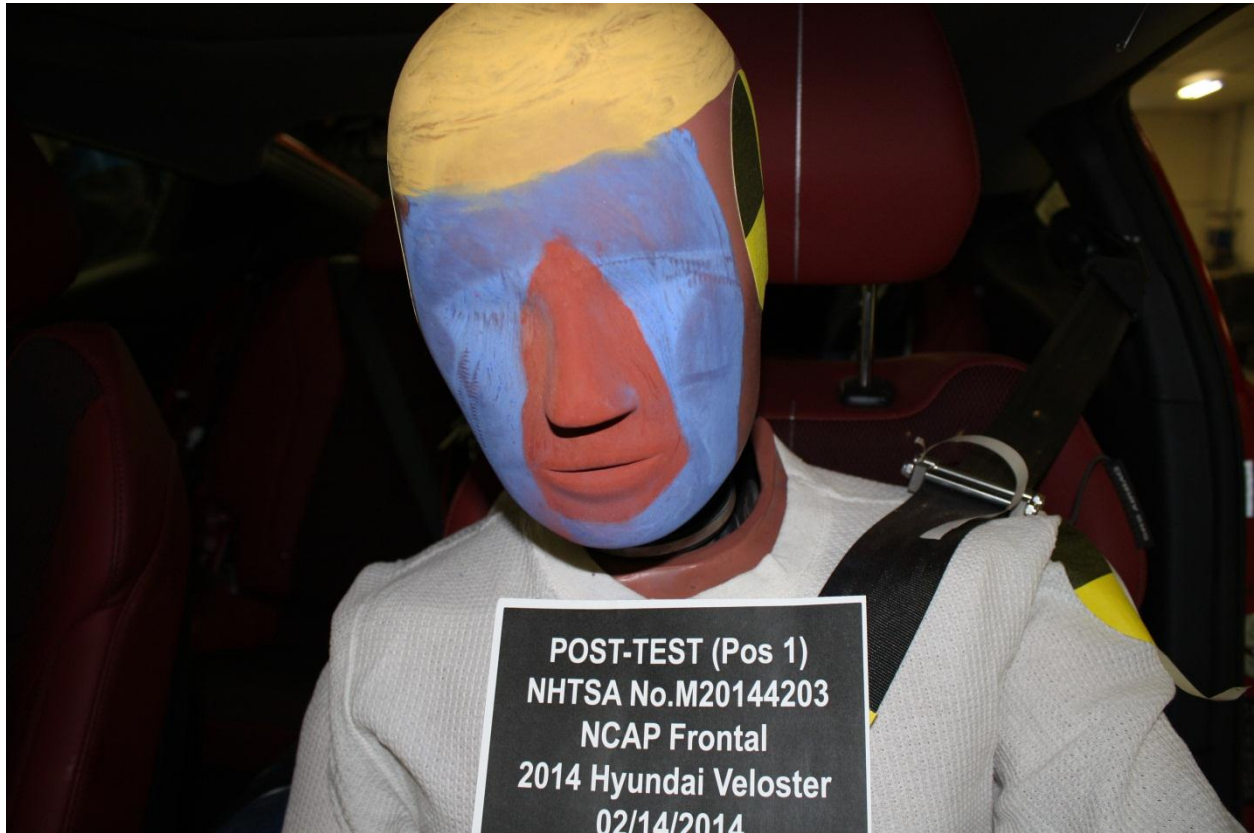


Figure A-45: Post-Test Driver Dummy Face

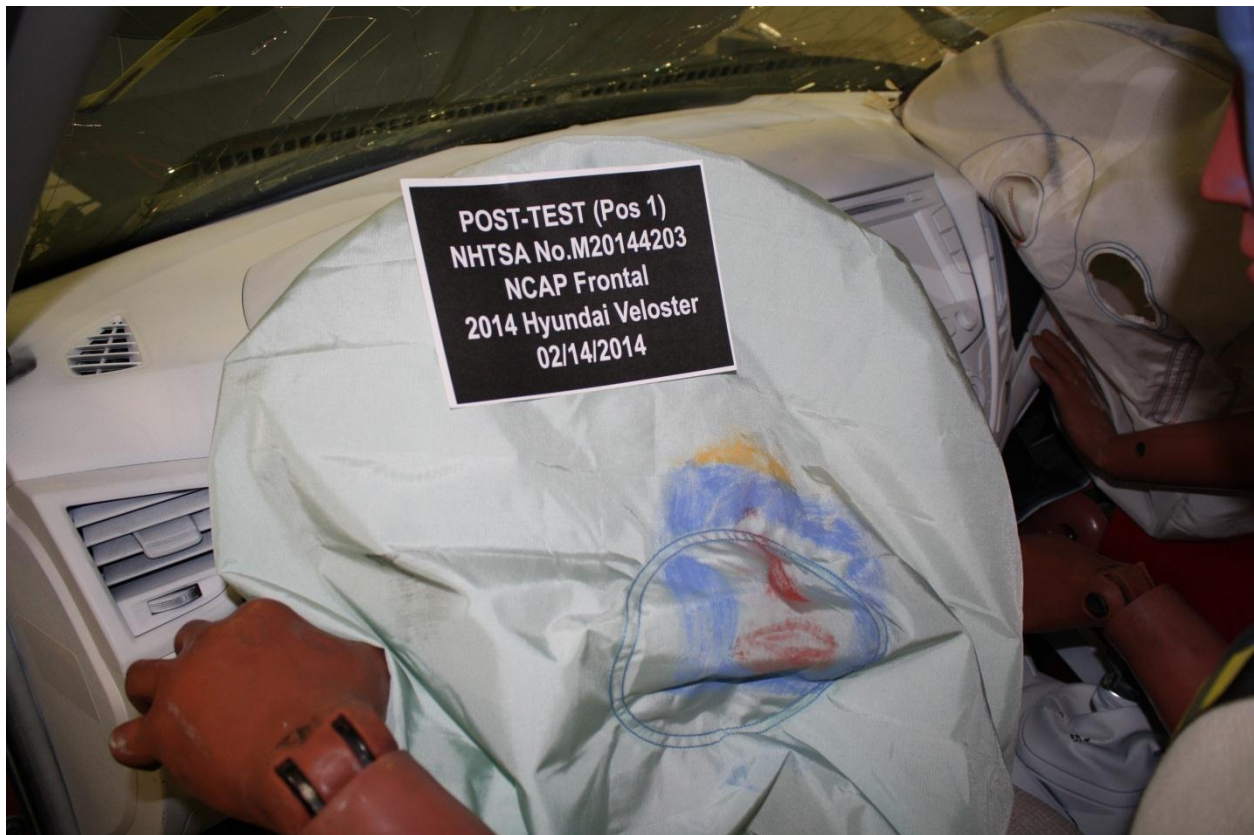


Figure A-46: Post-Test Driver Dummy Contact With Airbag

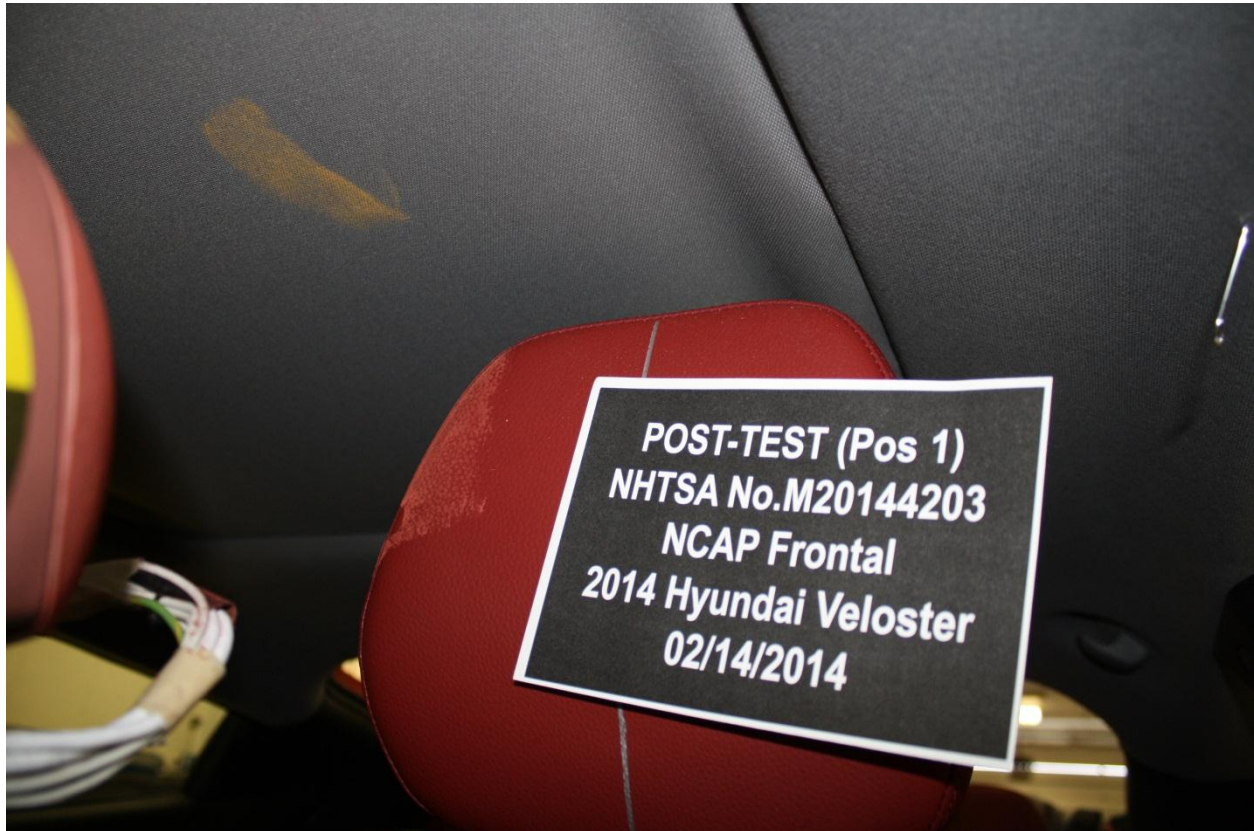


Figure A-47: Post-Test Driver Dummy Contact With Headrest



Figure A-48: Pre-Test View of the Steering Wheel



Figure A-49: Post-Test View of the Steering Wheel



Figure A-50: Pre-Test Passenger Dummy Front View



Figure A-51: Post-Test Passenger Dummy Front View



Figure A-52: Pre-Test Passenger Dummy Window View



Figure A-53: Post-Test Passenger Dummy Window View



Figure A-54: Pre-Test Passenger Dummy and Vehicle Interior View



Figure A-55: Post-Test Passenger Dummy and Vehicle Interior View



Figure A-56: Pre-Test Passenger's Seat Fore-Aft Markings



Figure A-57: Post-Test Passenger's Seat Fore-Aft Markings



Figure A-58: Pre-Test View of Belt Anchorage for Passenger Dummy



Figure A-59: Post-Test View of Belt Anchorage for Passenger Dummy



Figure A-60: Pre-Test Passenger Dummy Feet



Figure A-61: Post-Test Passenger Dummy Feet



Figure A-62: Pre-Test Passenger's Side Knee Bolster



Figure A-63: Post-Test Passenger's Side Knee Bolster



Figure A-64: Pre-Test Passenger's Side Floorpan



Figure A-65: Post-Test Passenger's Side Floorpan



Figure A-66: Post-Test Passenger Dummy Face



Figure A-67: Post-Test Passenger Dummy Contact With Airbag



Figure A-68: Post-Test Passenger Dummy Contact With Headrest



Figure A-69: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-70: Post-Test Stoddard Solvent Spillage Location View, If Required



Figure A-71: Post-Test Speed Trap Read-Out



Figure A-72: Vehicle at 0° on Static Rollover Device



Figure A-73: Vehicle at 90° on Static Rollover Device



Figure A-74: Vehicle at 180° on Static Rollover Device



Figure A-75: Vehicle at 270° on Static Rollover Device



Figure A-76: Vehicle at 360° on Static Rollover Device



Figure A-77: 2014 Hyundai Veloster Frontal Impact Event

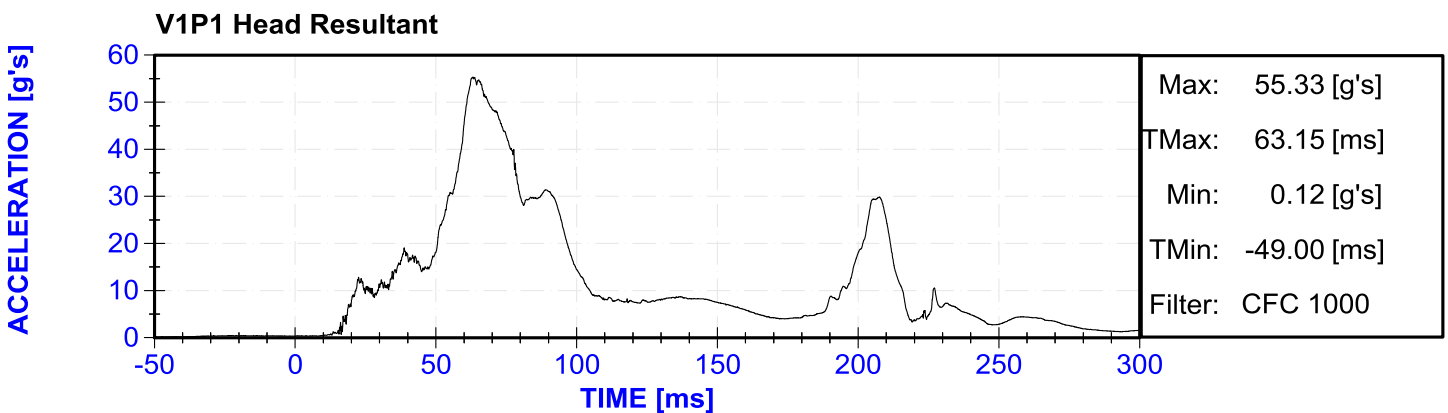
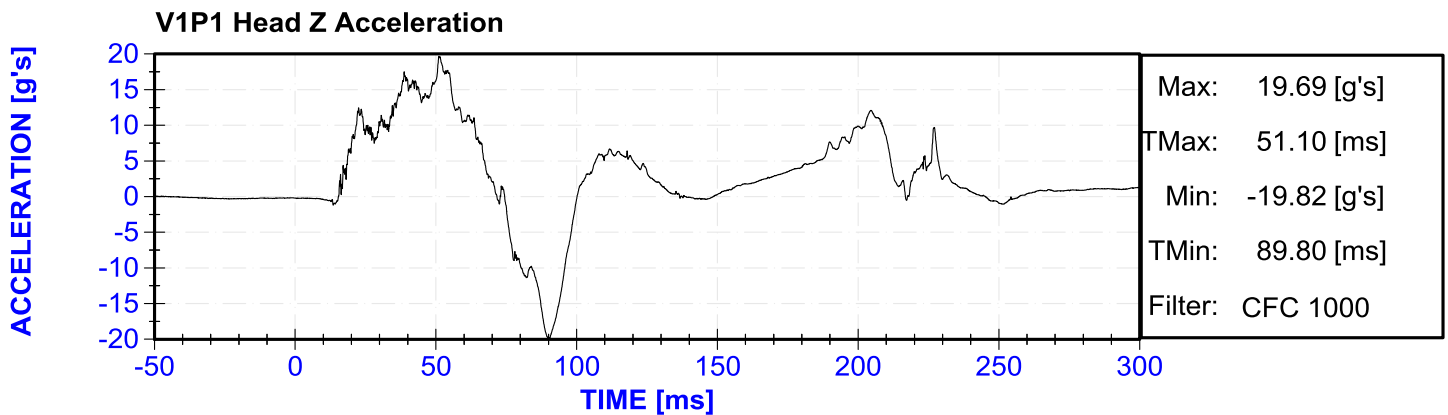
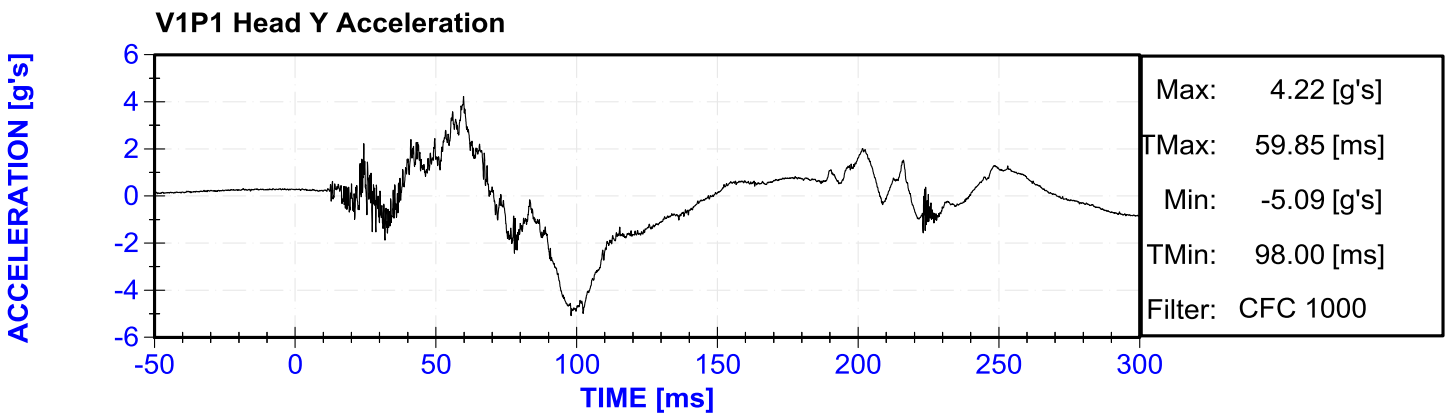
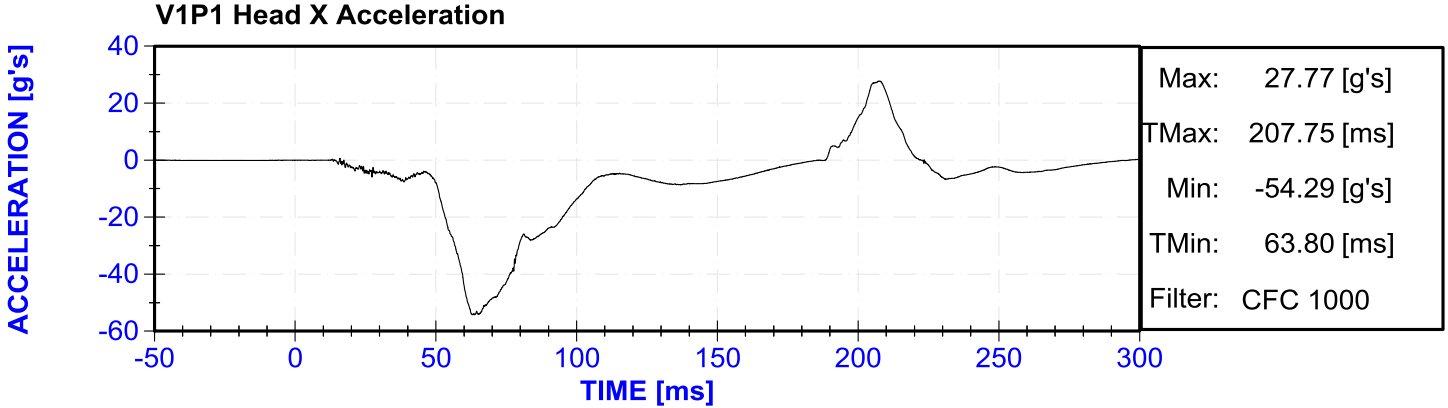
HYUNDAI		2014 VELOSTER M/T	
SOLD TO: VA024 WEST BROAD HYUNDAI 8803 WEST BROAD STREET RICHMOND VA 23294		SHIPPED TO: VA024 F032946 G4FDDU51982	
VIN: KMHTC6AD8EU183698 MODEL: F032946 ENGINE: G4FDDU51982 PORT OF ENTRY: BR EXTERIOR COLOR: BOSTON RED INTERIOR/SEAT COLOR: BLACK/RED TRANSPORT: TRUCK ACCESSORY WEIGHT: 10 lbs / 5 kgs. EMISSIONS: This vehicle is certified to meet emission requirements in all 50 states.		GOVERNMENT 5-STAR SAFETY RATINGS This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236	
STANDARD FEATURES: AMERICA'S BEST WARRANTY *5-year/60,000-mile New Vehicle Warranty* *10-year/100,000-mile Powertrain Warranty* *1-year/Unlimited-mile Anti-perforation Warranty* *5-year/Unlimited-mile Roadside Assistance* *Limited warranties, see dealer for details. ADVANCED SAFETY TECHNOLOGY *Electronic Stability Control (ESC) w/ Traction Control *ABS w/ Electronic Brake-force Distribution & Brake Assist *4 Wheel Disc Brakes *Front, Front Side Impact & Side Curtain Airbags *Front Seatbelt Pre-Tensioners *Tire Pressure Monitoring System POWERTRAIN TECHNOLOGY *1.8L GDI, 138 HP, 123 lb-ft Torque, DOHC 4-Cylinder *Dual Continuous Variable Valve Timing *5-Speed Manual Transmission COMFORT & CONVENIENCE *17-inch Alloy Wheels and P235/45R17 Tires *LED Headlight Accents *Daytime Running Lights *Rear wiper *Air Conditioning w/ Cabin Air Filter *AM/FM/SIRIUS/XM/MP3 Audio System w/ 6 Speakers *Satellite Radio w/60 Day Trial, Not Available in AK & HI *Power USB & Auxiliary Input Jacks *Hyundai Blue Link® Telematics System Technology that enables the driver to stay connected via In-Car, Web or Smartphone App; Subscription Required *7" Multimedia Touchscreen w/ rearview camera *Trip Computer *Power Windows, Locks & Heated Mirrors *Driver's Blind Spot Mirror *Remote Keyless Entry w/ Alarm *Steering Wheel Mounted Cruise, Audio & Phone Controls *Integrated Bluetooth® Hands Free Phone System *18-inch Telescopic Steering Wheel *Driver Seat Height Adjustment *Front Armrest Storage Bin *Front & Rear Cup Holders *Front Passenger Seatback Pocket *60/40 Split-Folding Rear Seat *Full Tank of Gas		Manufacturer's Suggested Retail Price: \$17,800.00 ADDED FEATURES: *Chrome Package *Chrome Grille Surround w/ Piano Black Highlights *Front Fog Lights *Panoramic Sunroof *Piano Black Interior Accents *Dimension Premium Audio w/ 8 Speakers, External Amp & Subwoofer *Leatherette Bolster Seats & Door Inserts *Leather Wrapped Steering Wheel and Shift Knob *Alloy Pedals *Driver Auto Up Window *Carpeted Floor Mats *Cargo Net \$110.00 \$50.00	
Annual fuel COST \$ 1,750		Fuel Economy and Environment 30 MPG combined city/hwy 26 MPG city 35 MPG highway 3.3 gallons per 100 miles Compact Cars range from 14 to 105 MPG. The best vehicle rates 119 MPG.	
Annual fuel COST \$ 1,750		Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only) 8 Best This vehicle emits 296 grams CO ₂ /per mile. The best emits 0 grams per mile (tailpipe only). Producing and transporting fuel also creates emissions. Learn more at fuelconomy.gov . fuelconomy.gov Calculate personalized estimates and compare vehicles.	
Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees, state and local taxes and dealer-installed options and accessories are not included in the manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq which prohibits its removal or alteration prior to delivery to the ultimate purchaser.			
PART CONTENT INFORMATION FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 1 % MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 81 % Note: Parts content does not include final assembly, distribution, or other non-parts costs. FOR THIS VEHICLE: FINAL ASSEMBLY POINT: ULSAN, KOREA COUNTRY OF ORIGIN: KOREA ENGINE: KOREA TRANSMISSION: KOREA			
338 A		S314HGRAND 186	

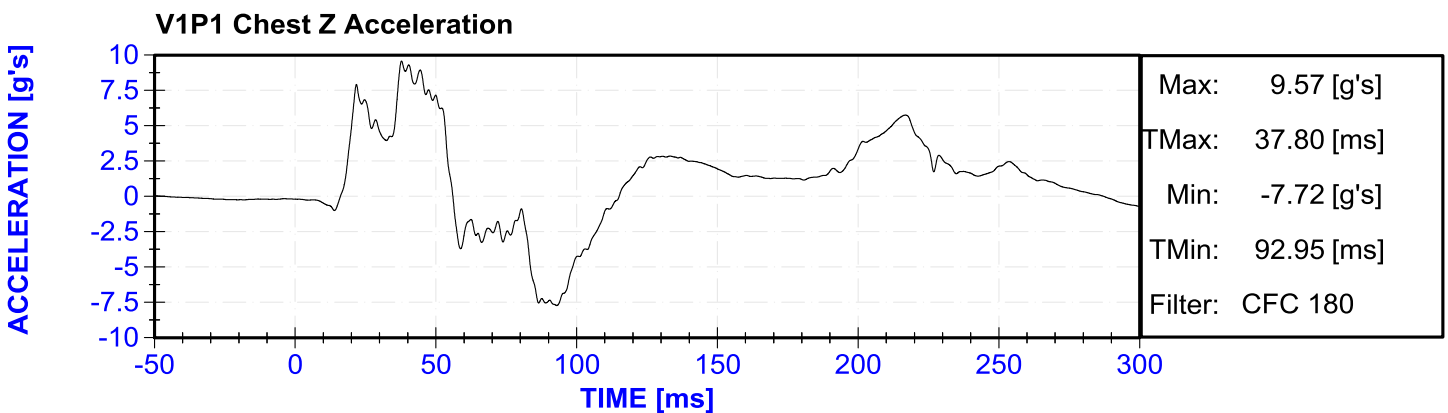
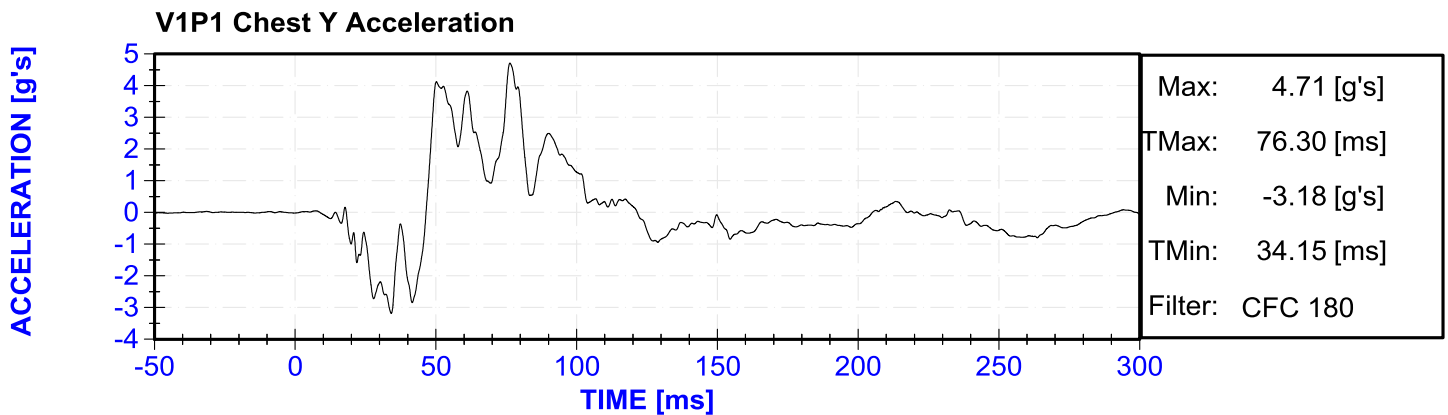
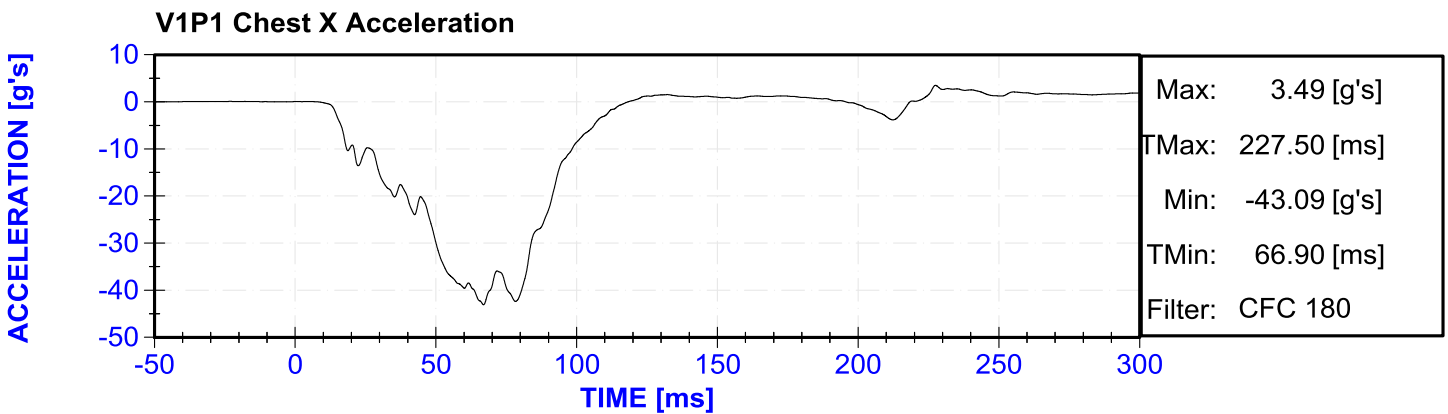
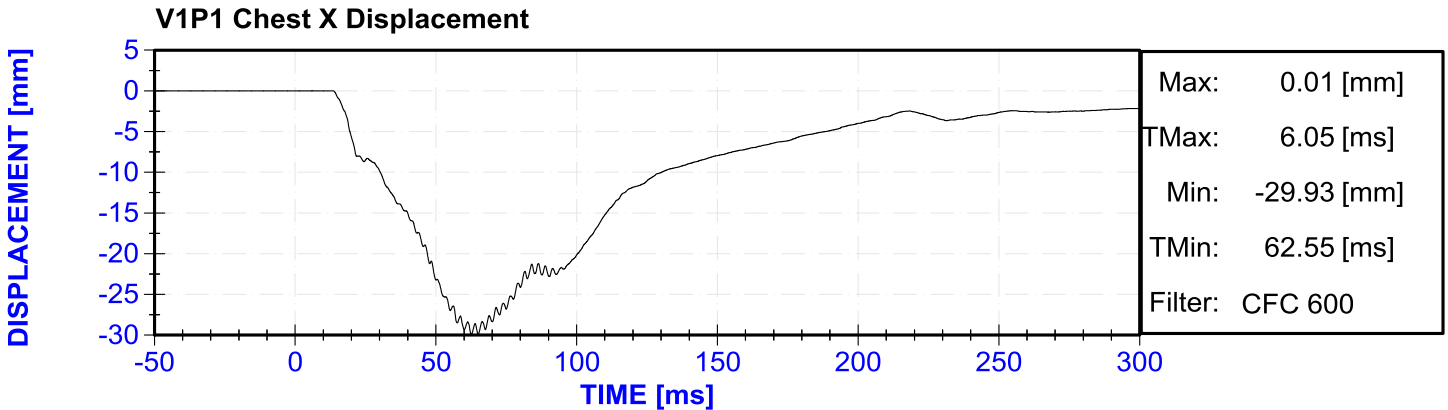
Figure A-78: Monroney Label Photograph

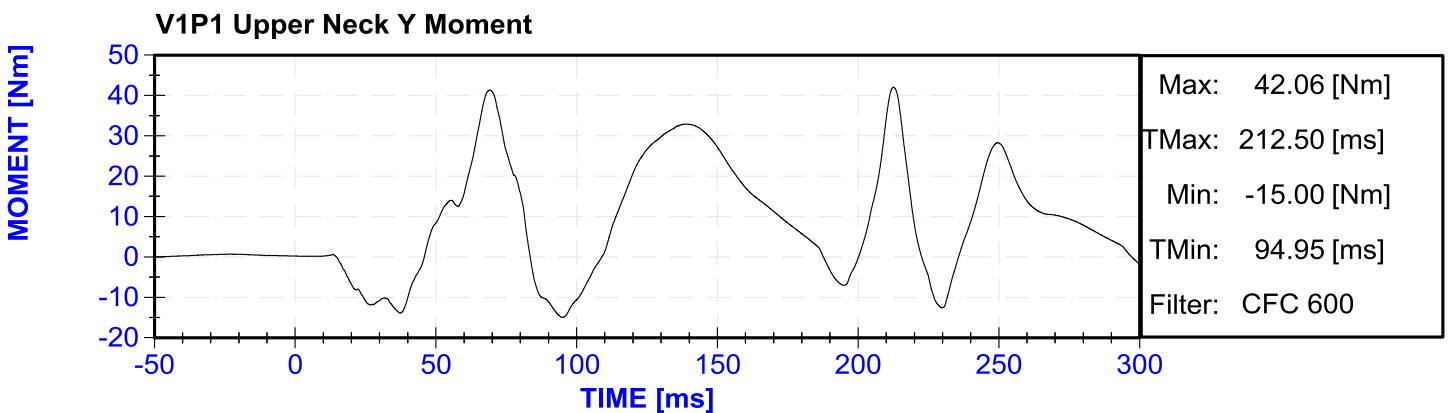
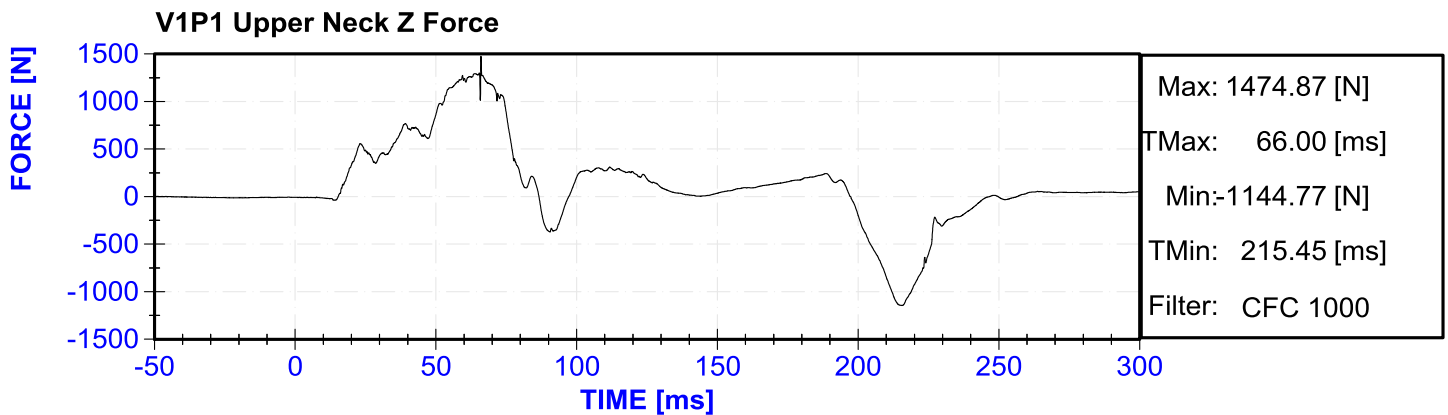
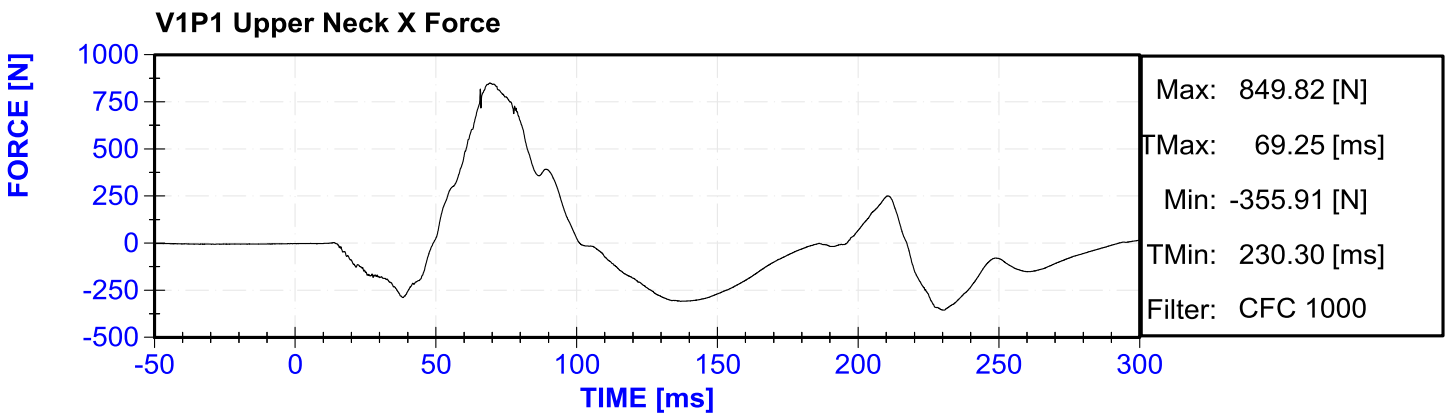
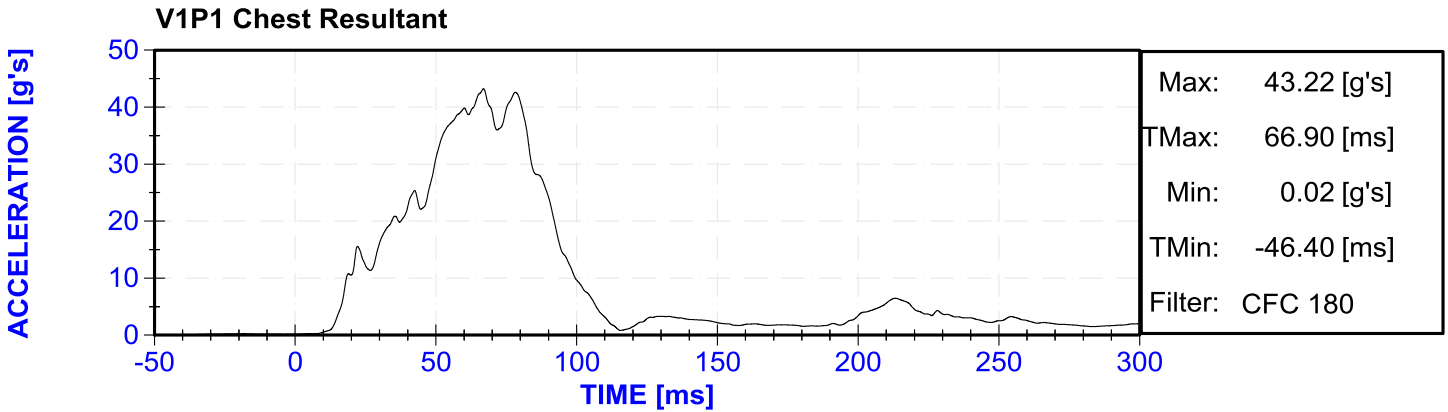
APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

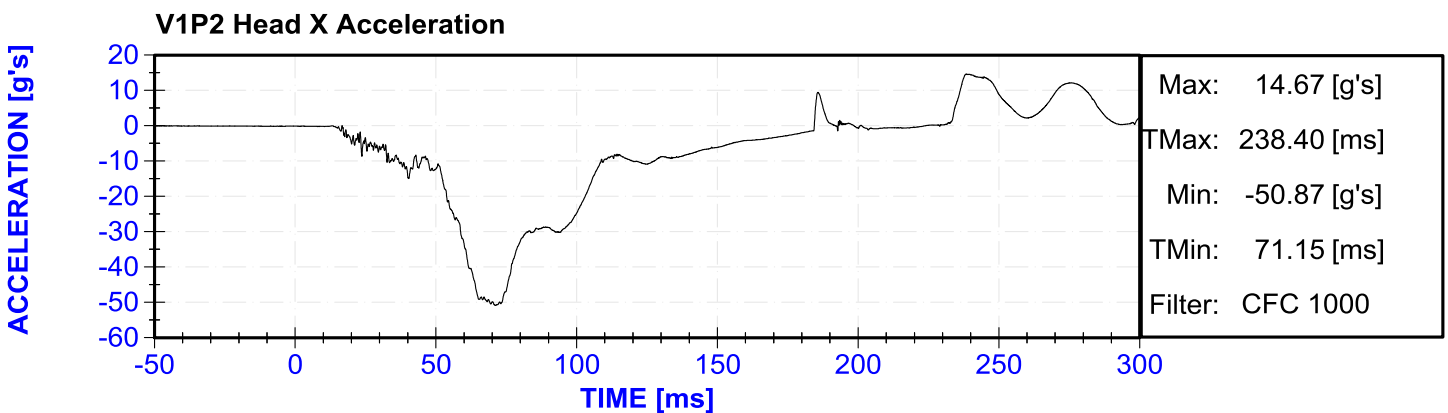
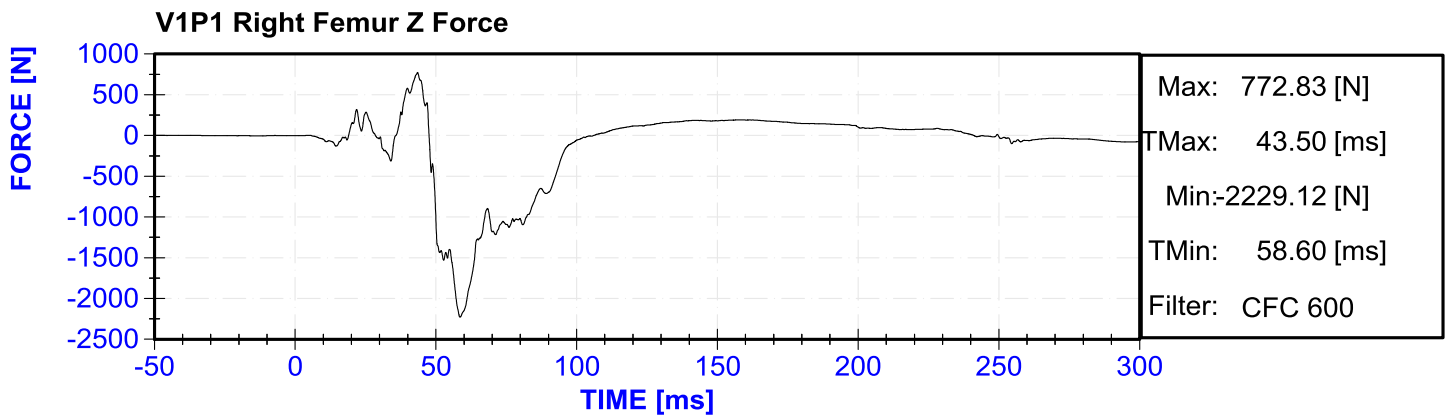
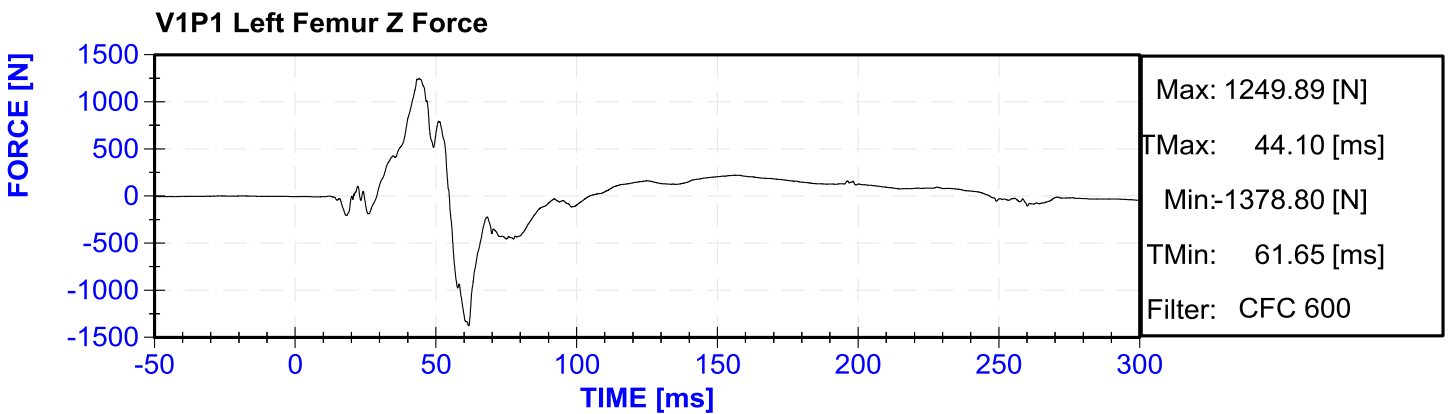
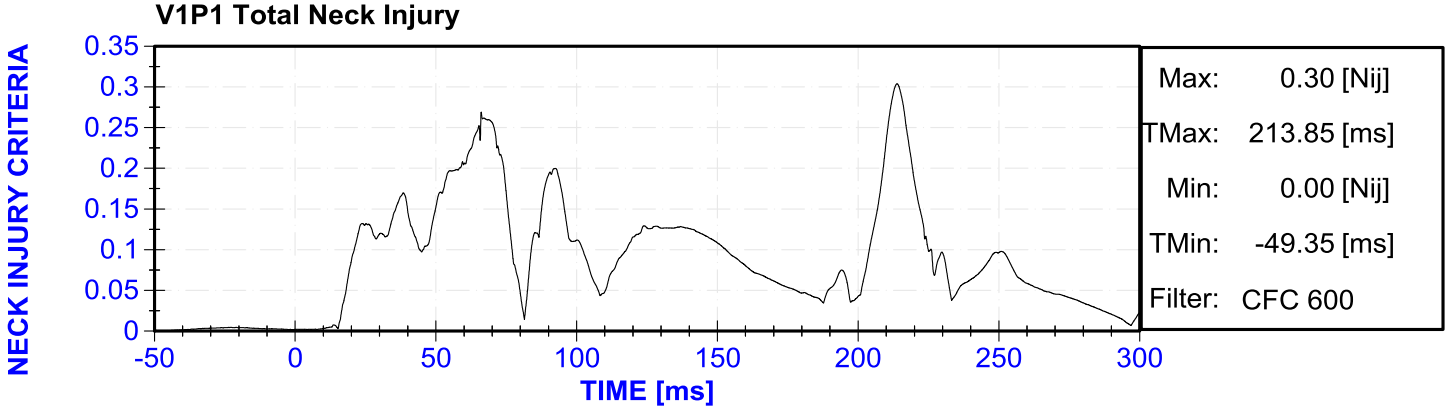
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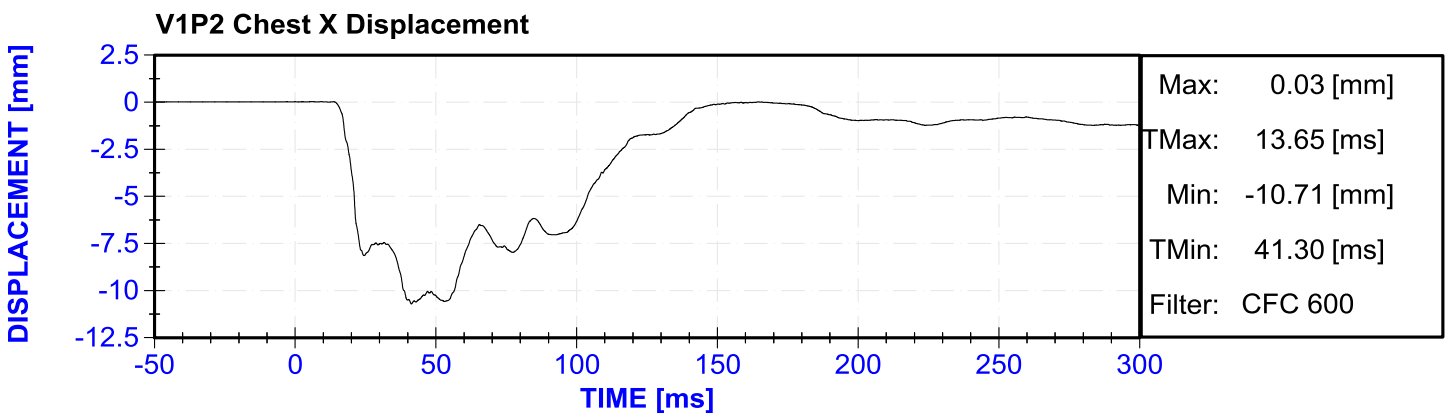
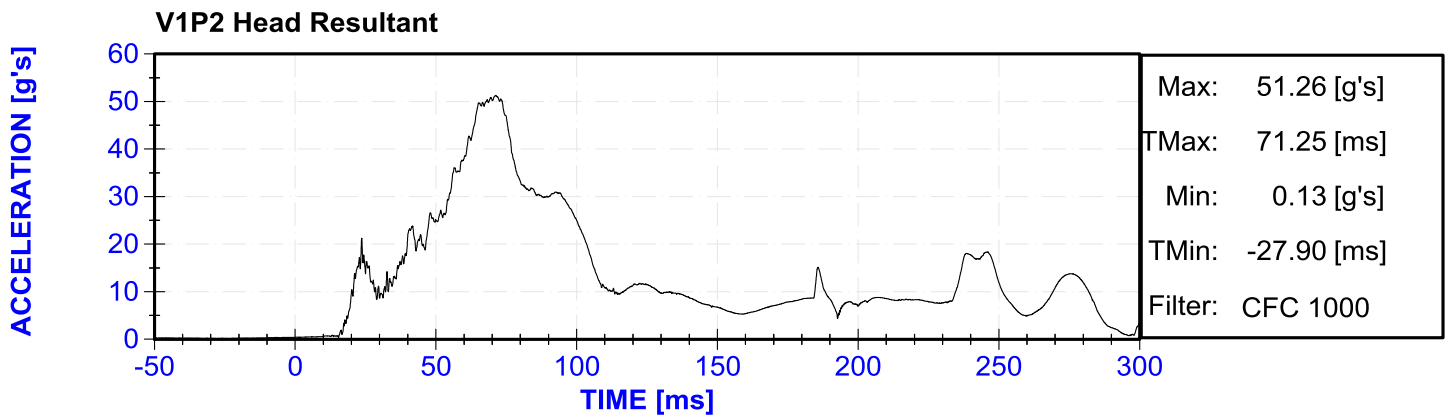
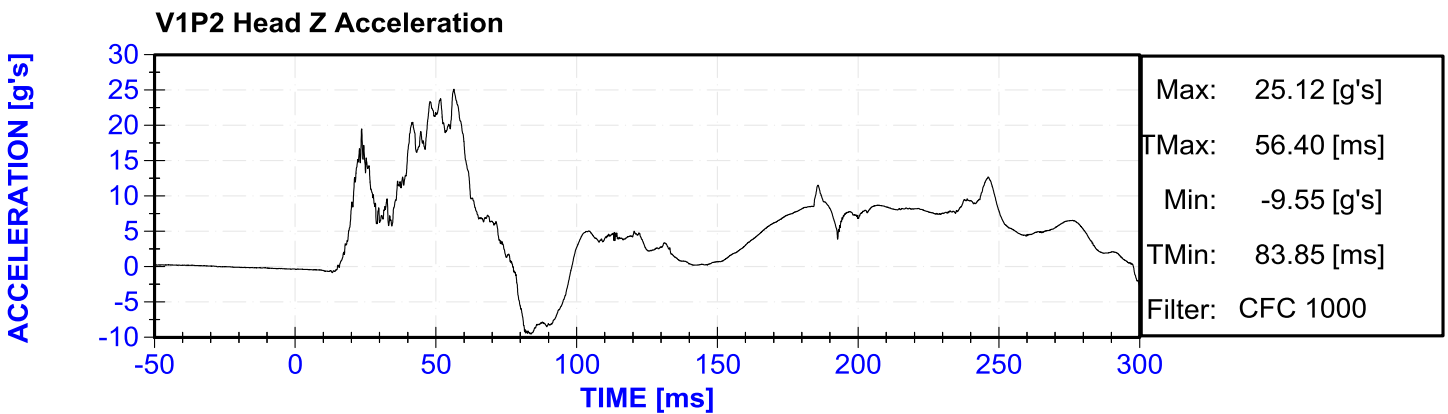
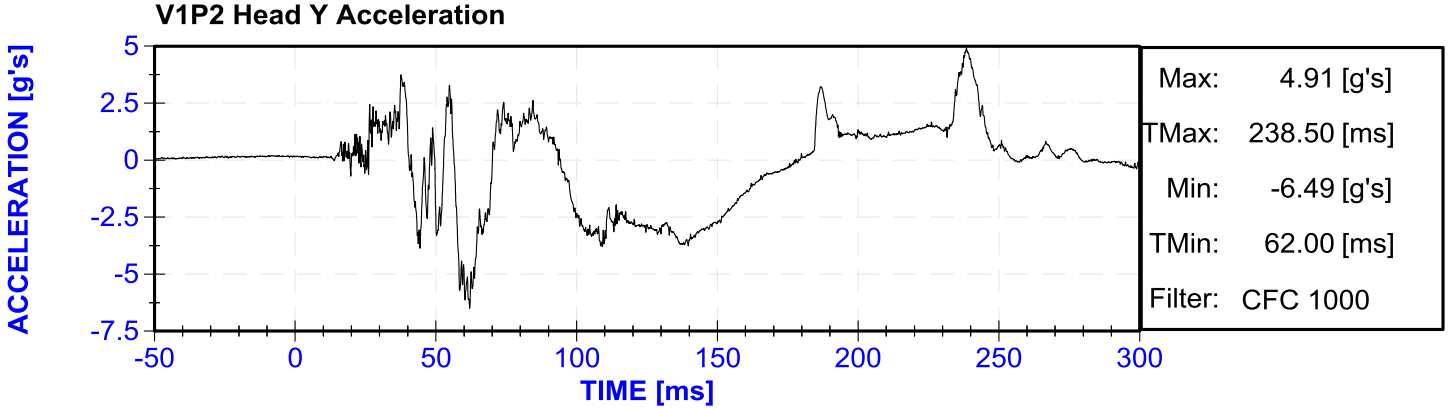
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Plot 3	V1P1 Head Z Acceleration	B-3
Plot 4	V1P1 Head Resultant	B-3
Plot 5	V1P1 Chest X Displacement	B-4
Plot 6	V1P1 Chest X Acceleration	B-4
Plot 7	V1P1 Chest Y Acceleration	B-4
Plot 8	V1P1 Chest Z Acceleration	B-4
Plot 9	V1P1 Chest Resultant	B-5
Plot 10	V1P1 Upper Neck X Force	B-5
Plot 11	V1P1 Upper Neck Z Force	B-5
Plot 12	V1P1 Upper Neck Y Moment	B-5
Plot 13	V1P1 Total Neck Injury	B-6
Plot 14	V1P1 Left Femur Z Force	B-6
Plot 15	V1P1 Right Femur Z Force	B-6
Plot 16	V1P2 Head X Acceleration	B-6
Plot 17	V1P2 Head Y Acceleration	B-7
Plot 18	V1P2 Head Z Acceleration	B-7
Plot 19	V1P2 Head Resultant	B-7
Plot 20	V1P2 Chest X Displacement	B-7
Plot 21	V1P2 Chest X Acceleration	B-8
Plot 22	V1P2 Chest Y Acceleration	B-8
Plot 23	V1P2 Chest Z Acceleration	B-8
Plot 24	V1P2 Chest Resultant	B-8
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Plot 26	V1P2 Upper Neck Z Force	B-9
Plot 27	V1P2 Upper Neck Y Moment	B-9
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Plot 30	V1P2 Right Femur Z Force	B-10

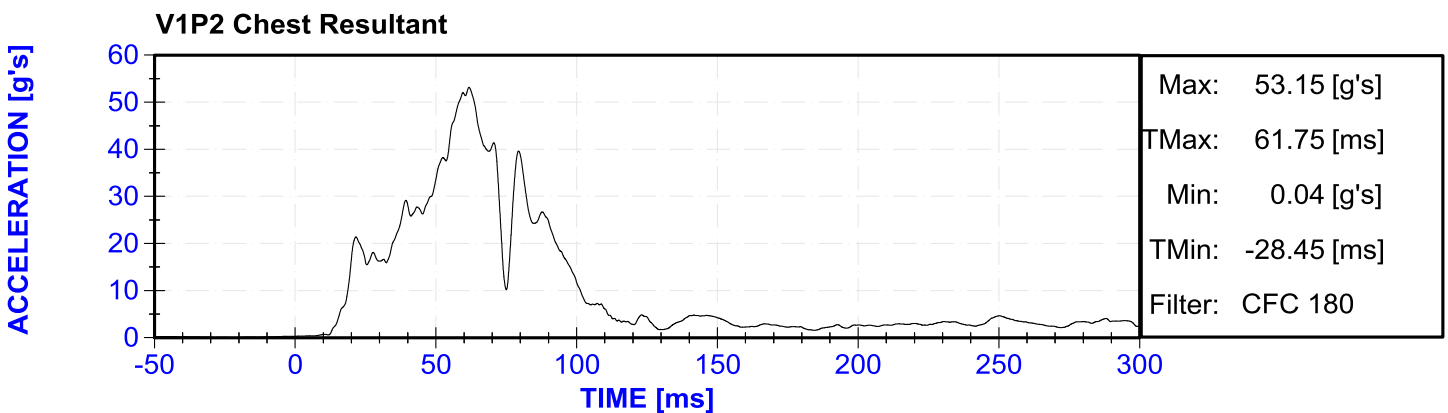
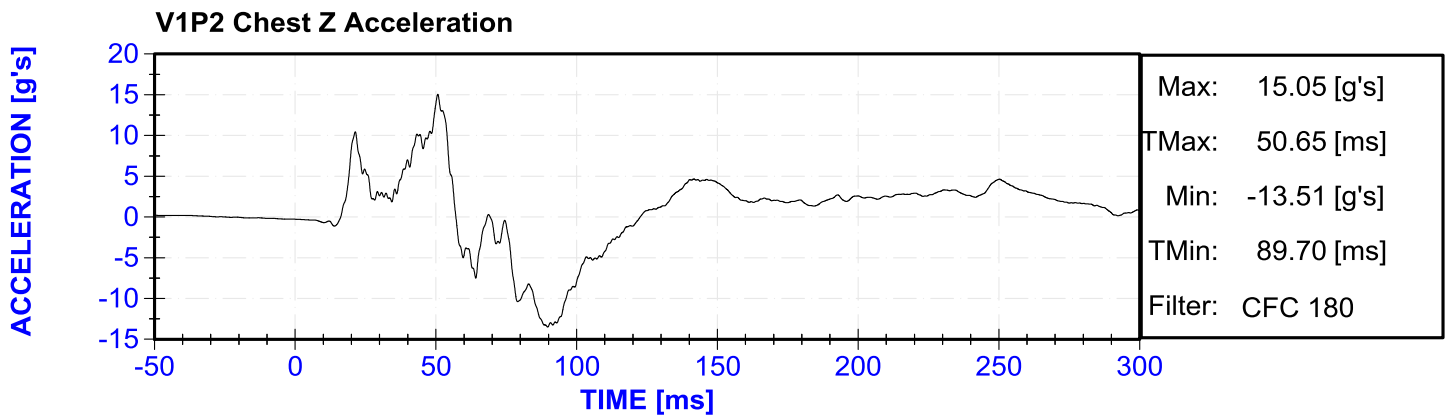
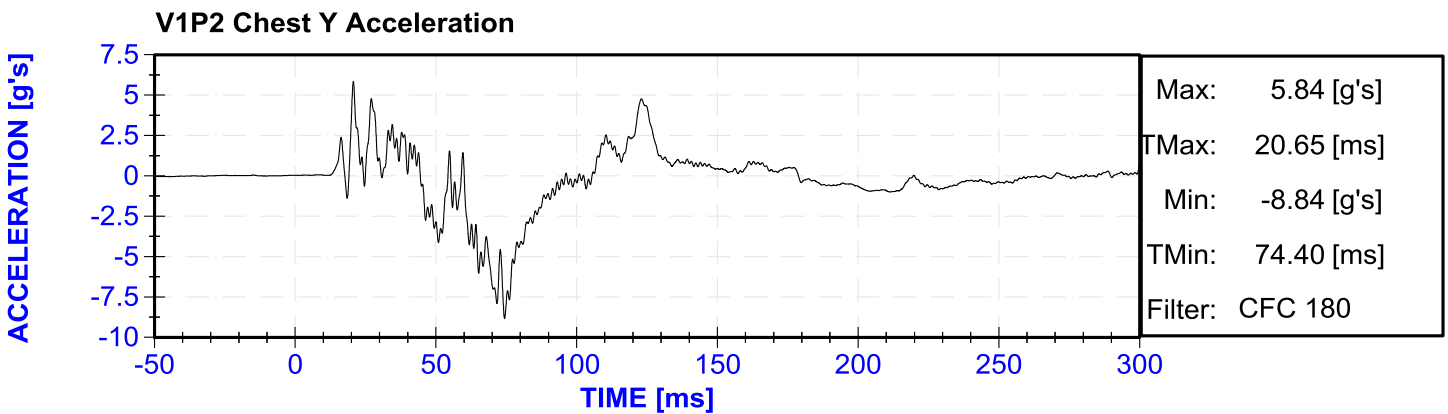
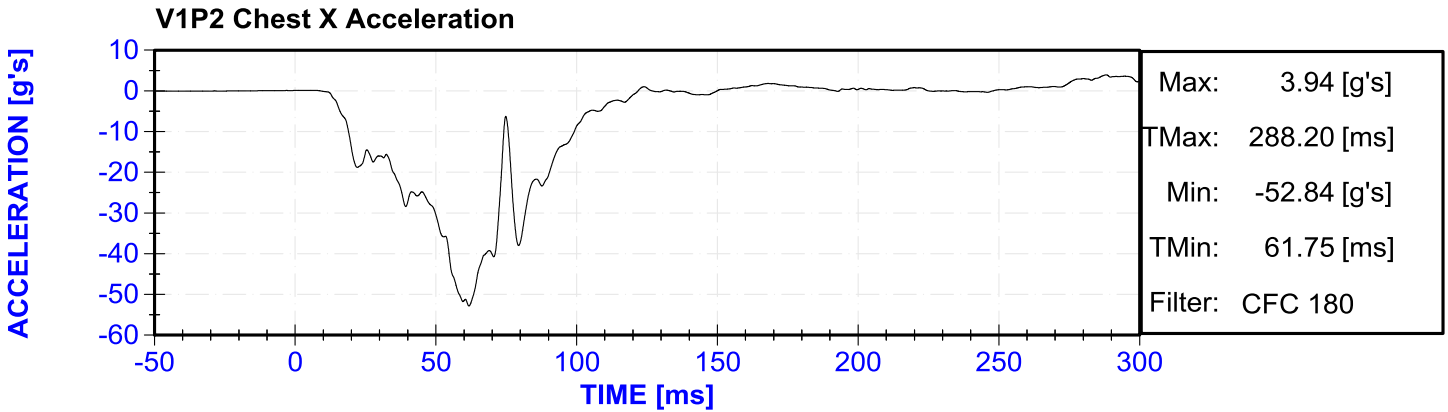


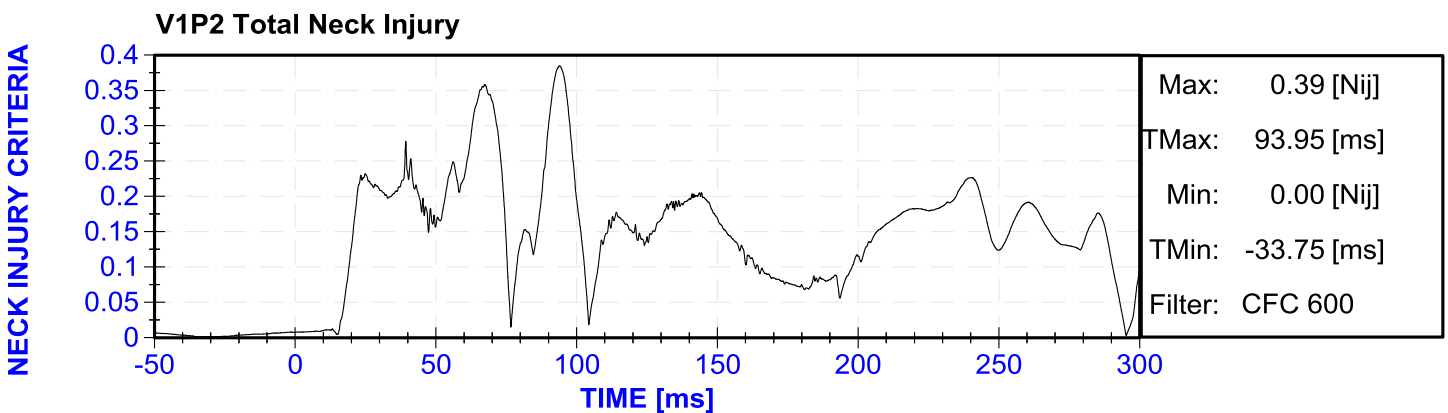
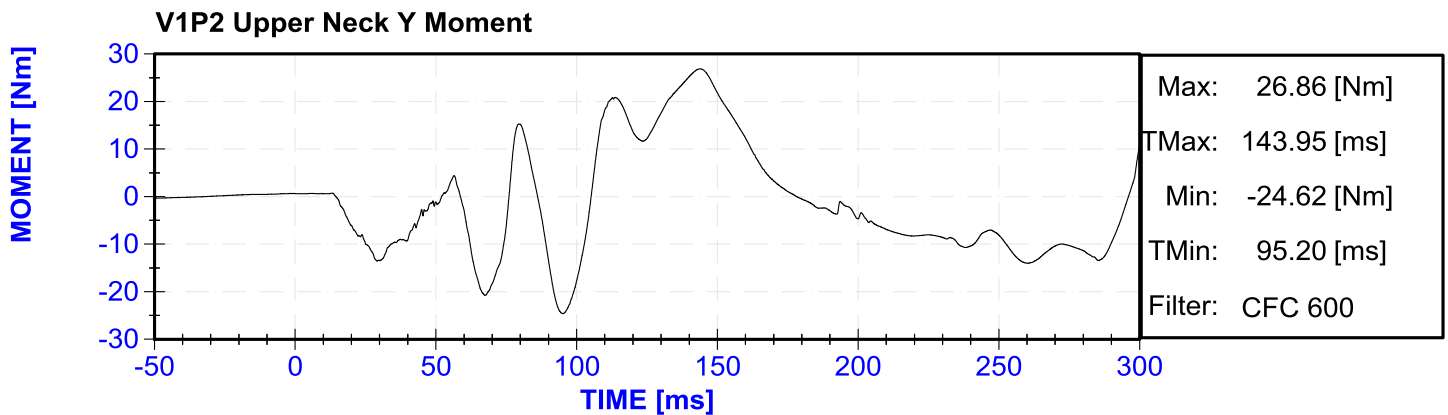
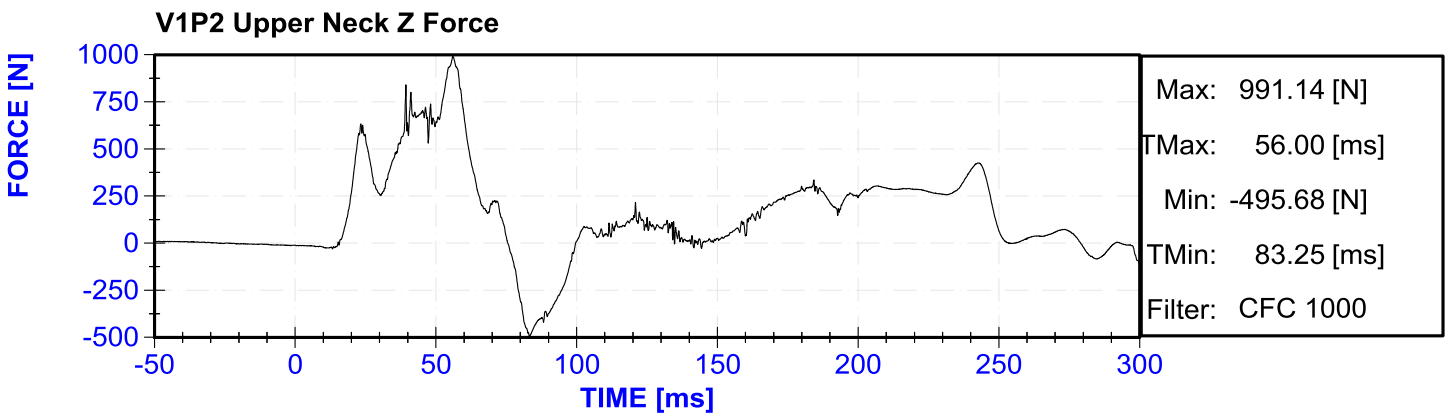
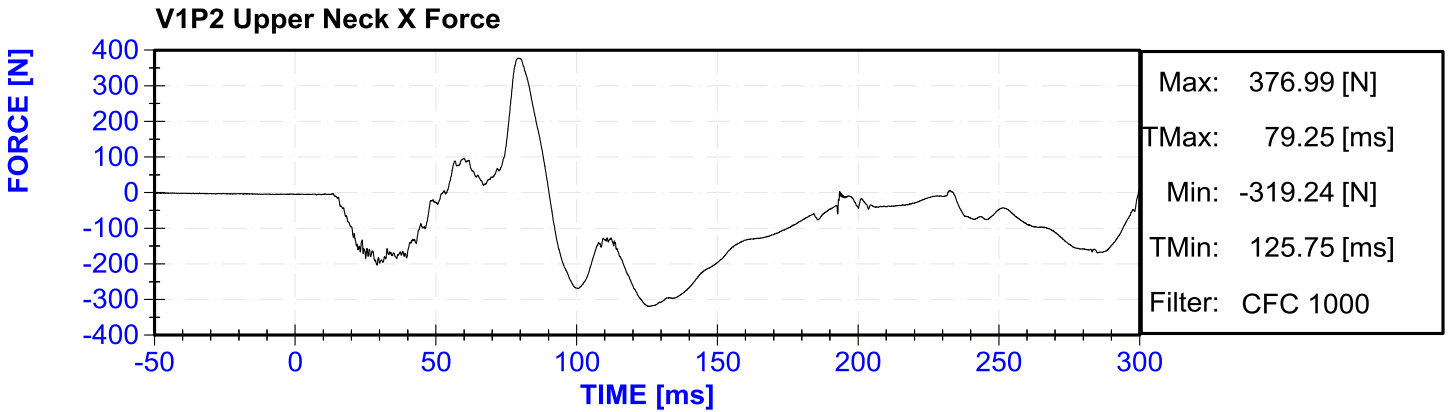


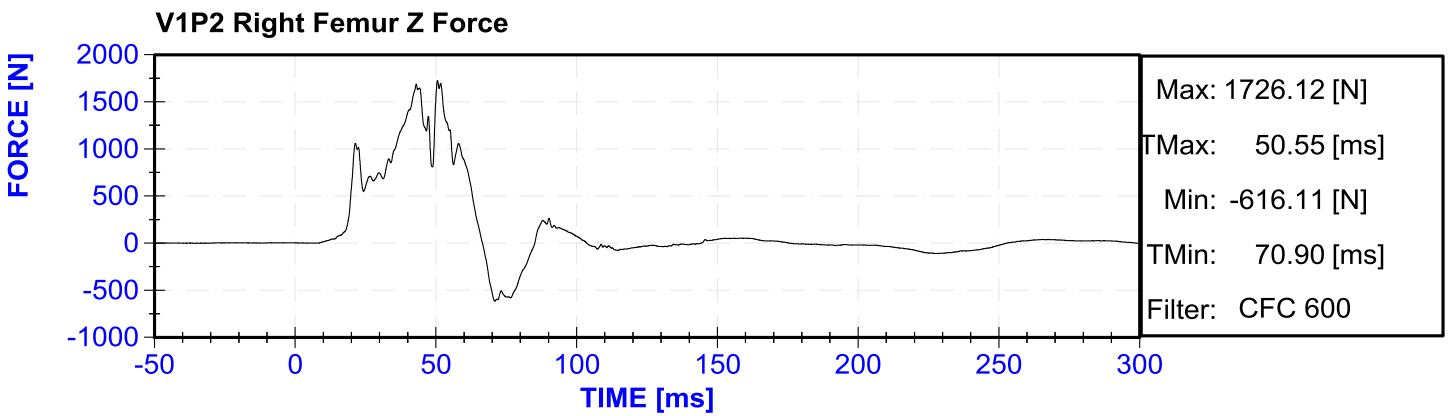
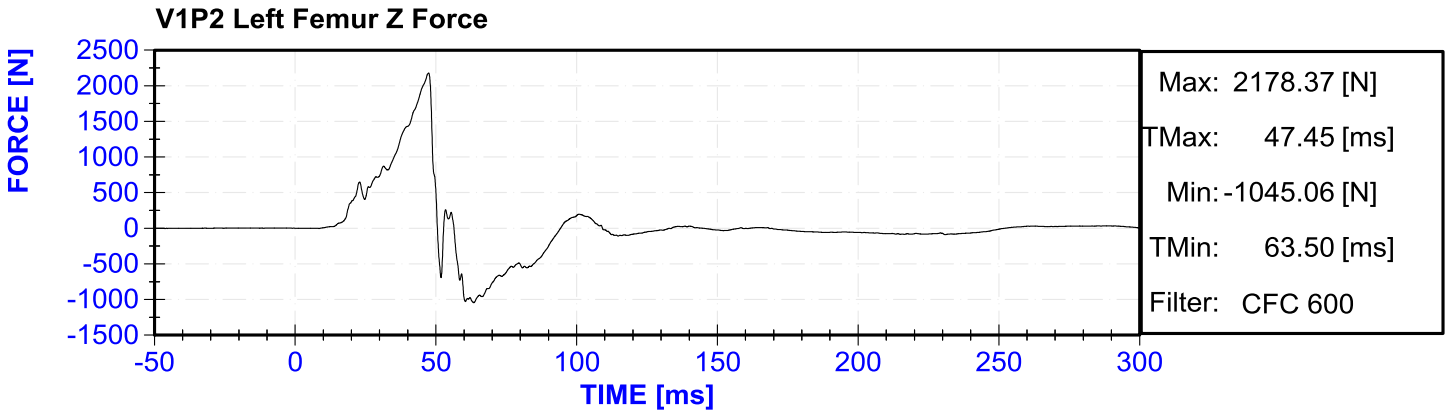












APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142



50th Male External Measurements

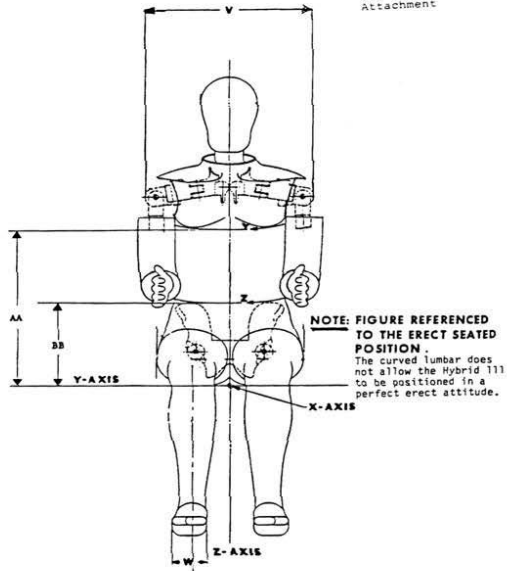
S/N 142

Symbol	Description	Specification	Results	Pass
		in	In	
A	Sitting Height	34.6 – 35.0	34.7	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.0	Yes
C	H-Point Height	3.3 – 3.5	3.4	Yes
D	H-Point from Backline	5.3 – 5.5	5.4	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.6	Yes
F	Thigh Clearance	5.5 – 6.1	6.0	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.5	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.1	Yes
J	Elbow Rest Height	7.5 – 8.3	8.1	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.0	Yes
L	Popliteal Height	16.9 – 17.9	17.1	Yes
M	Knee Pivot Height	19.1 – 19.7	19.3	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.5	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.5	Yes
P	Foot Length (right)	9.9 – 10.5	10.3	Yes
V	Shoulder Breadth	16.3 – 17.2	16.8	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	39.0	Yes
Z	Waist Circumference	32.9 – 34.1	33.6	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	17.0	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: M. Goehle

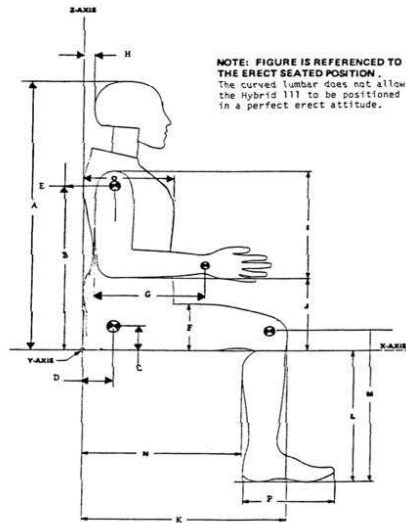
Date: 02-04-2014

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Front View

USG 2485
Attachment



HYBRID III Exterior Body Dimensions - Side View



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Head Drop	Test Date:	2/4/2014
		Test Time:	12:48:42 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	S329

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	22.80 deg C P
Humidity	10 -- 70	19.30 %RH P
Resultant Acceleration	225 -- 275	266.8 G's P
Oscillation	0 -- 10	2.1 % P
Lateral Acceleration	-15 -- 15	-9.4 G's P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



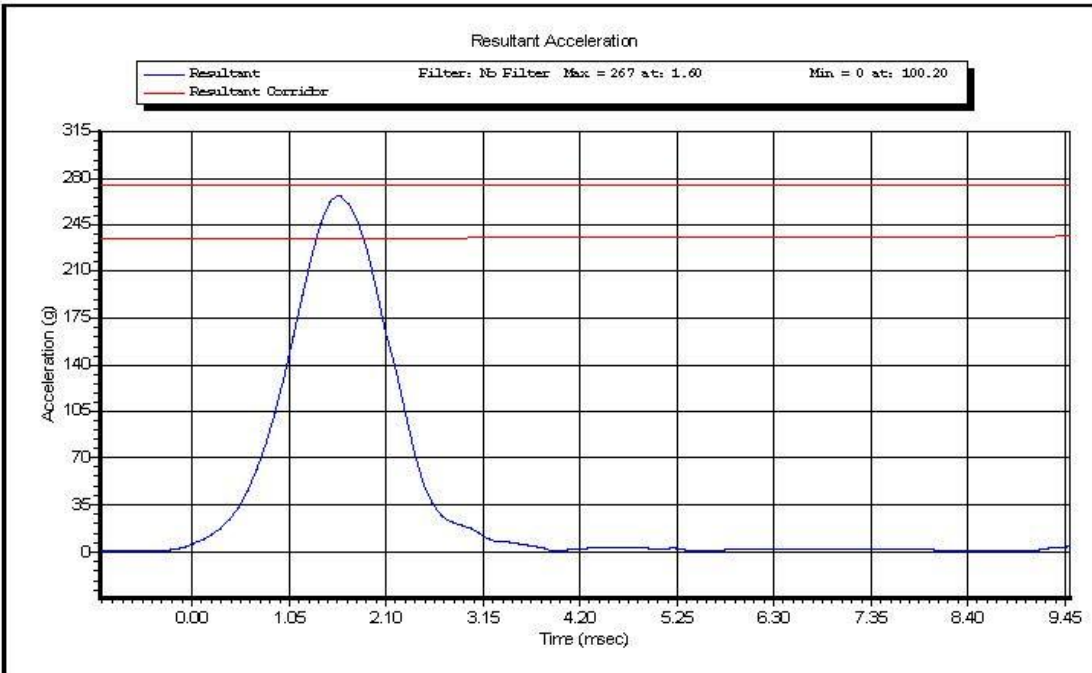
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58998	2/4/2014
Endevco	7264-2000	P58912	2/4/2014
Endevco	7264-2000	P58997	2/4/2014



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**

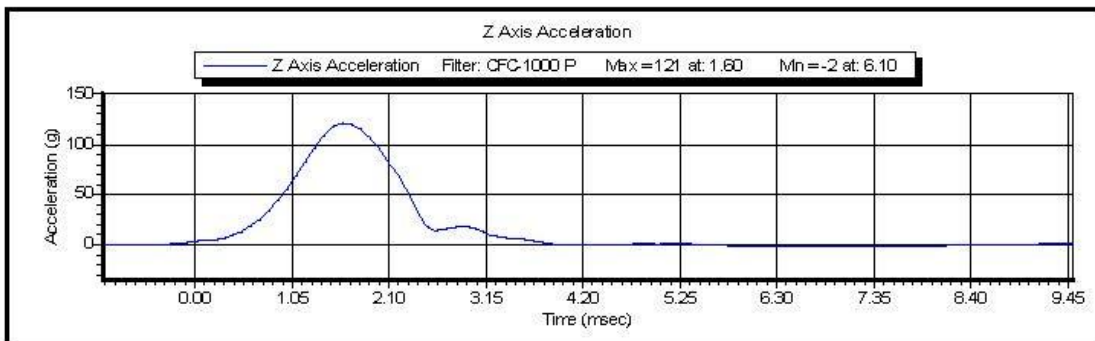
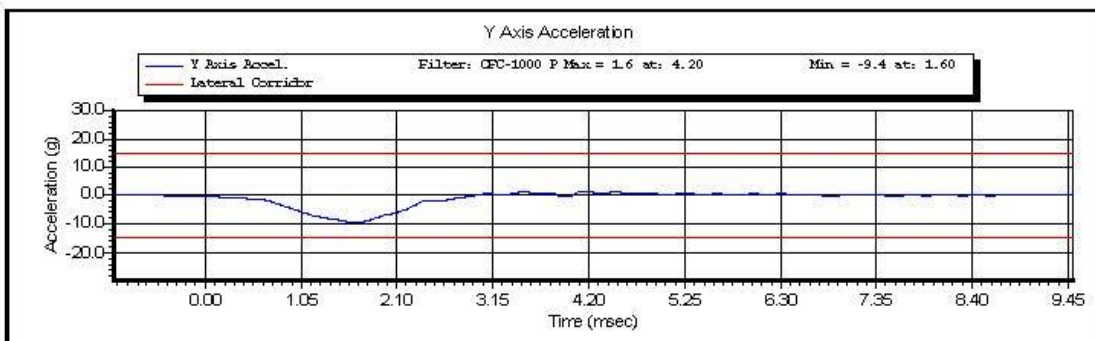
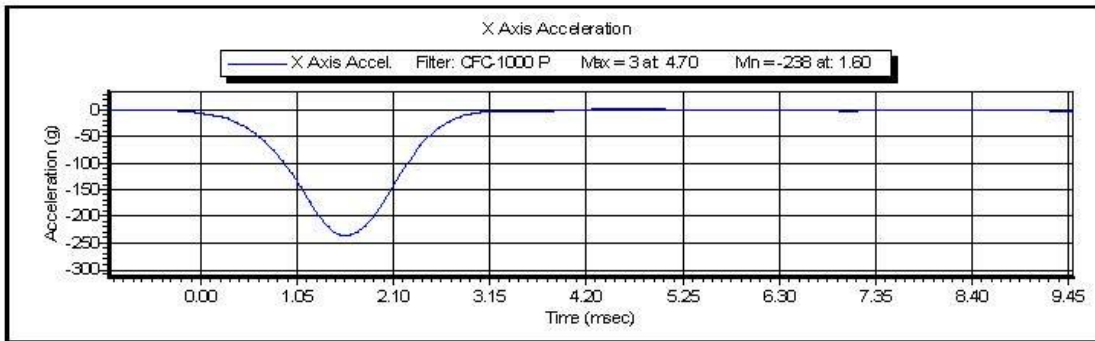


Test ID: **Head Drop**

Test Time: **12:48:42 PM**

Test Date: **2/4/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Head Drop**

Test Time: **12:48:42 PM**

Test Date: **2/4/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Neck Extension	Test Date:	2/6/2014
		Test Time:	5:00:29 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4196

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.60 deg C P
Humidity	10 -- 70	18.60 %RH P
Velocity	5.94 -- 6.19	6.032 m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	18.78 G's P
Pendulum Deceleration at 20 ms	14.0 -- 19.0	15.70 G's P
Pendulum Deceleration at 30 ms	11.0 -- 16.0	11.86 G's P
Max Pendulum Deceleration after 30 ms	0.0 -- 22.0	13.10 G's P
Deceleration Time to 5 G's	38 -- 46	43.4 ms P
D Plane Rotation	81 -- 106	96.5 degrees P
Time at Max Rotation	72 -- 82	76.5 ms P
Rotation Decay to Zero	147 -- 174	159.0 ms P
Moment About Occipital Condyle	-80.0 -- -52.9	-67.30 Nm P
Time at Maximum Moment	65 -- 79	71.5 ms P
Moment Decay to Zero	120 -- 148	142.5 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



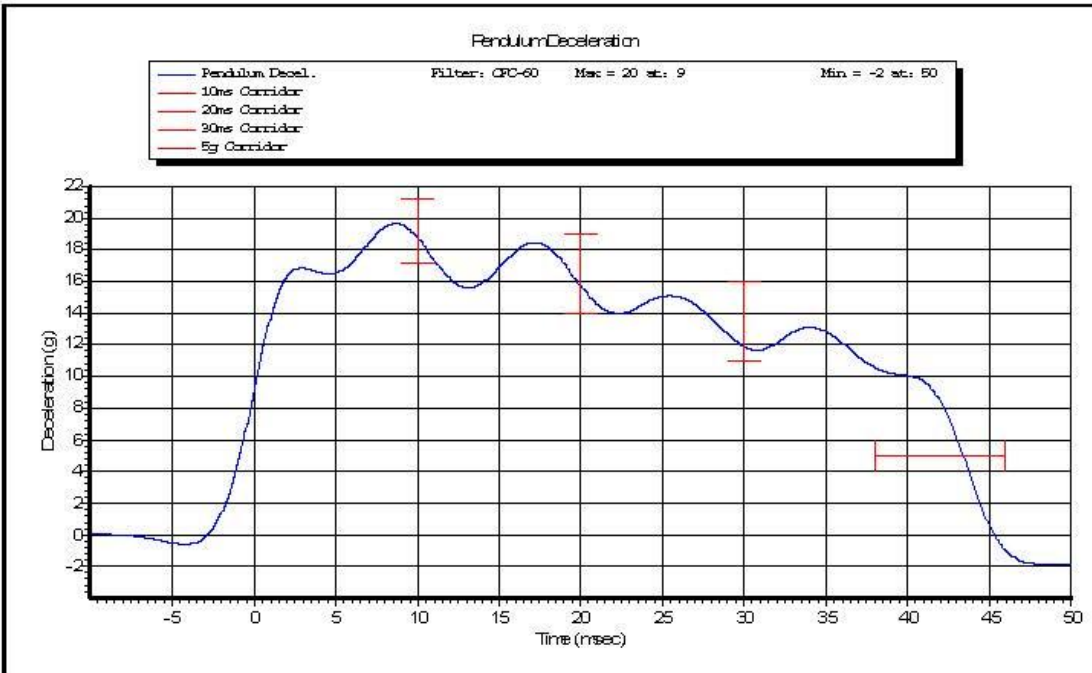
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
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Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
First Technology	IF-205	LC-161 My	4/30/2013
First Technology	IF-205	LC-161 Fx	4/30/2013



Name of Test:	Neck Extension
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	142

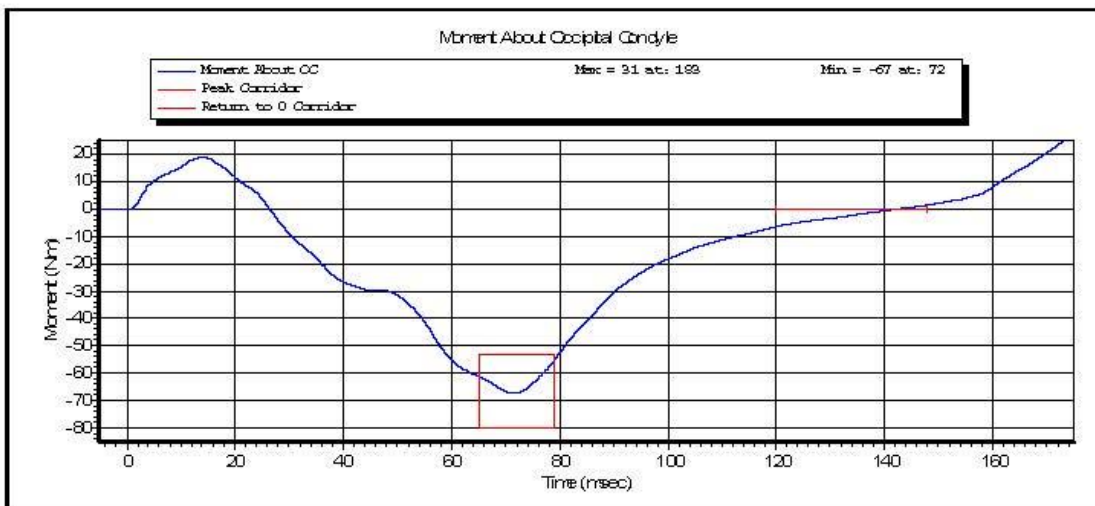
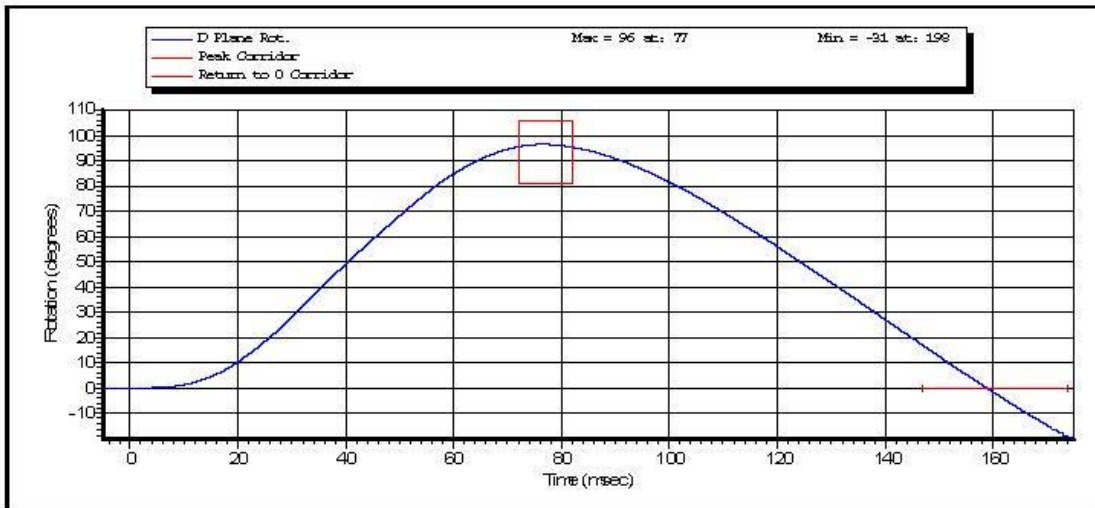


ID of Test: **Neck Extension**

Time of Test: **5:00:29 PM**

Date of Test: **2/6/2014**

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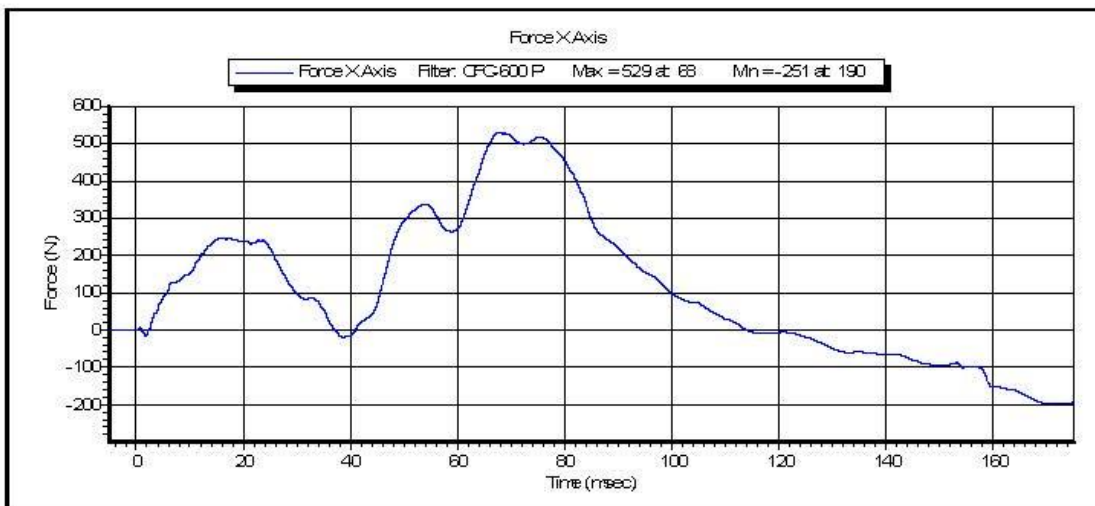
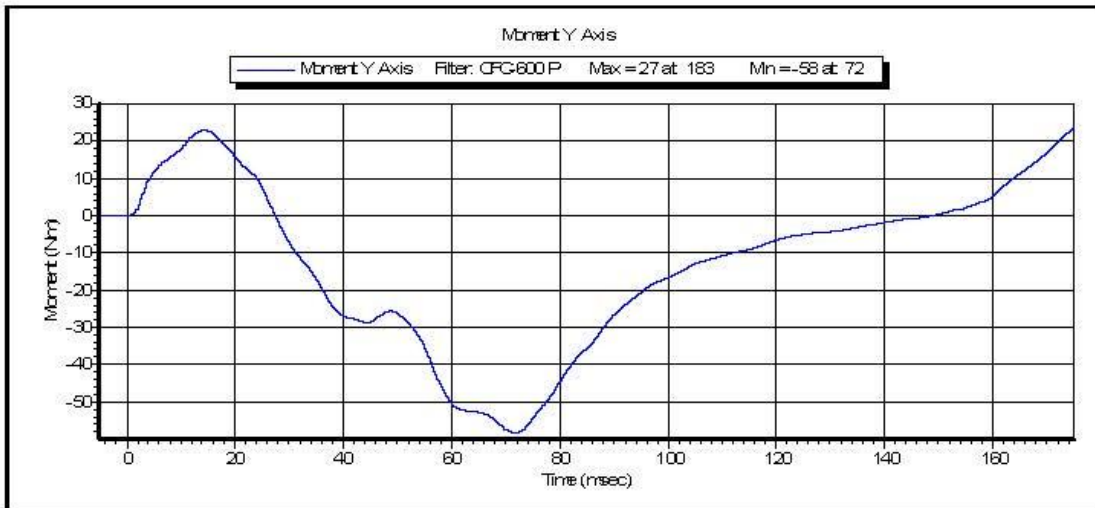


ID of Test: **Neck Extension**

Time of Test: **5:00:29 PM**

Date of Test: **2/6/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extension**

Time of Test: **5:00:29 PM**

Date of Test: **2/6/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Neck Flexion	Test Date:	2/6/2014
		Test Time:	4:23:57 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4196

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.60 deg C P
Humidity	10 -- 70	23.00 %RH P
Velocity	6.89 -- 7.13	6.958 m/s P
Pendulum Deceleration at 10 ms	22.5 -- 27.5	24.16 G's P
Pendulum Deceleration at 20 ms	17.6 -- 22.6	20.42 G's P
Pendulum Deceleration at 30 ms	12.5 -- 18.5	14.71 G's P
Maximum Pendulum Deceleration After 30 ms	0 -- 29	15.0 G's P
Deceleration Time to 5 ms	34 -- 42	39.1 ms P
D Plane Rotation	-78 -- -64	-69.4 degrees P
Time at Maximum Rotation	57 -- 64	59.1 ms P
Rotation Decay to Zero	113 -- 128	114.5 ms P
Moment About Occipital Condyle	88.1 -- 108.4	100.96 Nm P
Time at Maximum Moment	47 -- 58	52.2 ms P
Moment Decay to Zero	97.0 -- 107.0	98.3 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



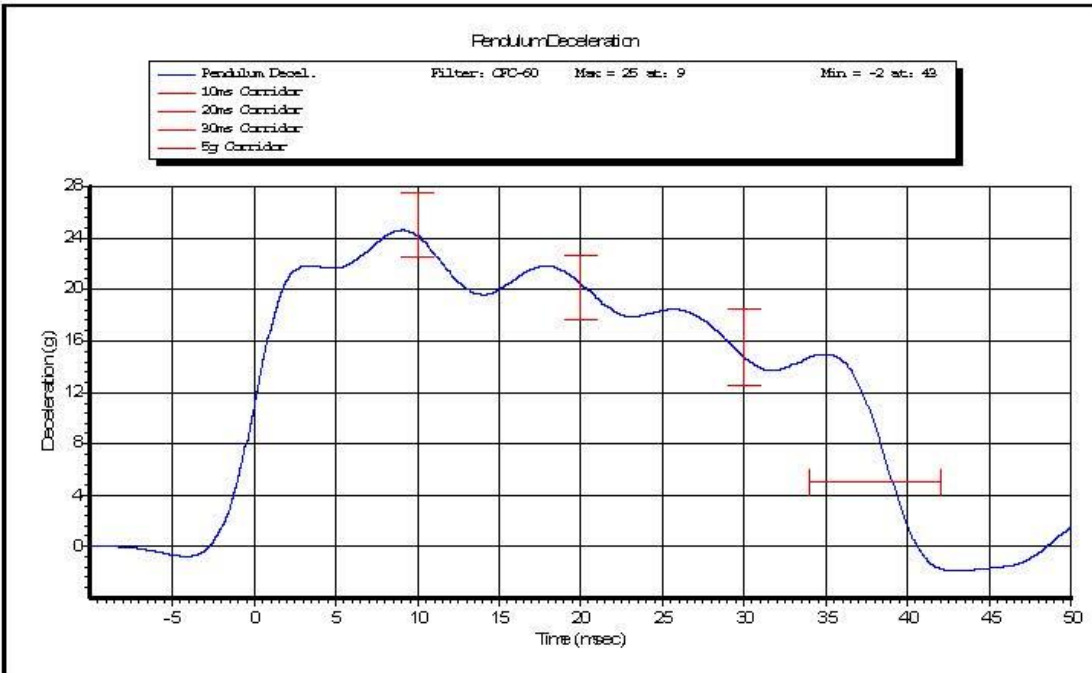
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
First Technology	IF-205	LC-161 My	4/30/2013
First Technology	IF-205	LC-161 Fx	4/30/2013



Name of Test:	Neck Flexion
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	142

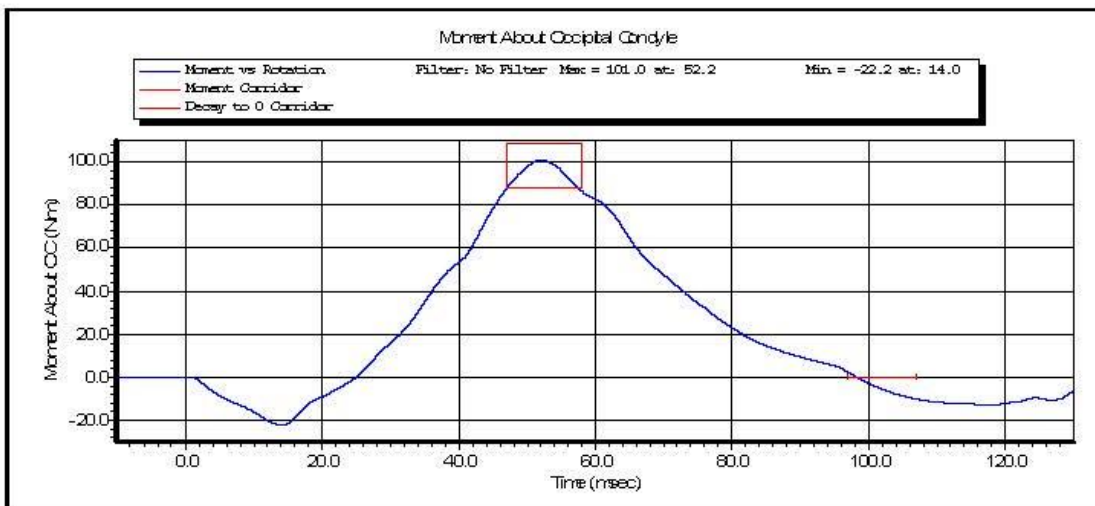
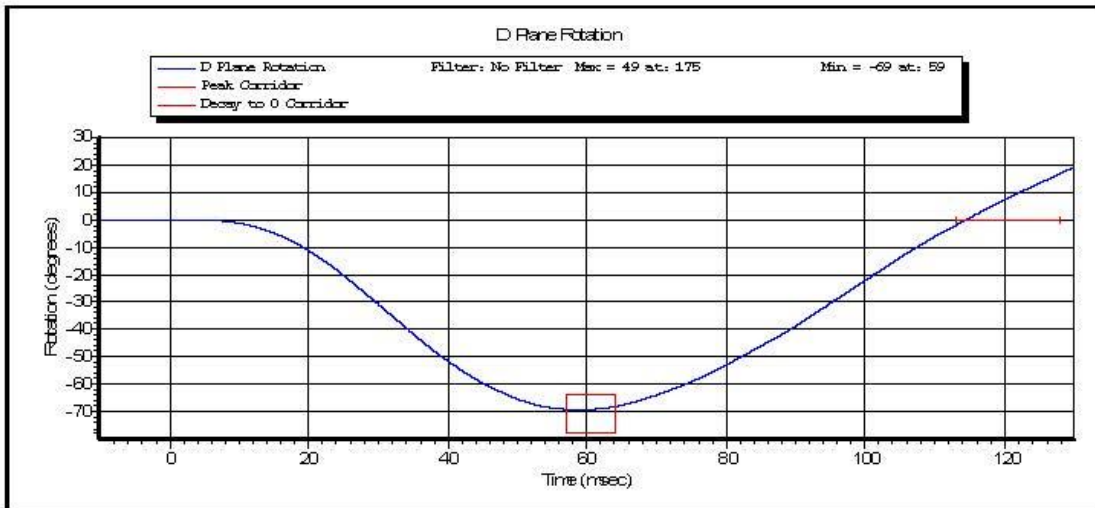


ID of Test: **Neck Flexion**

Time of Test: **4:23:57 PM**

Date of Test: **2/6/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

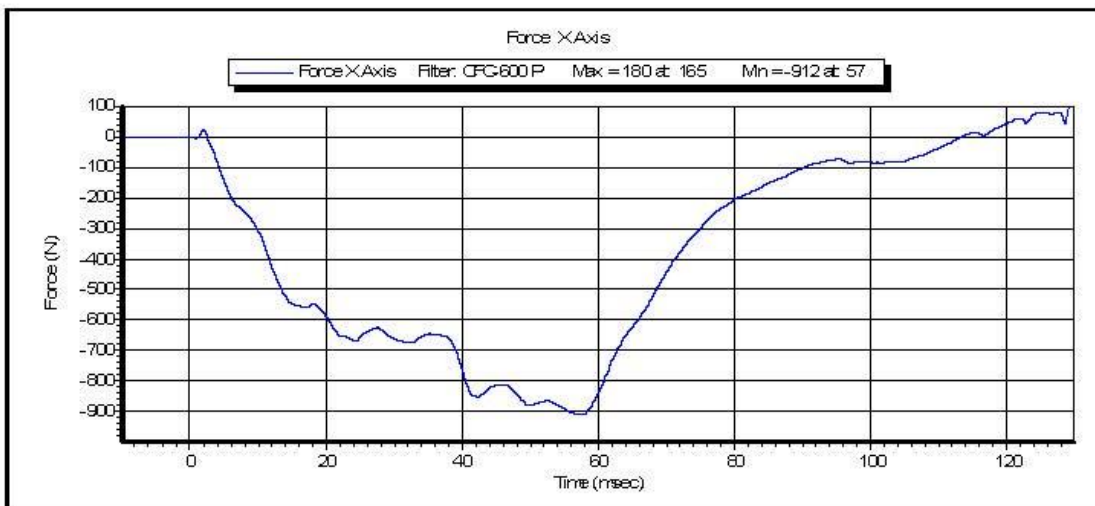
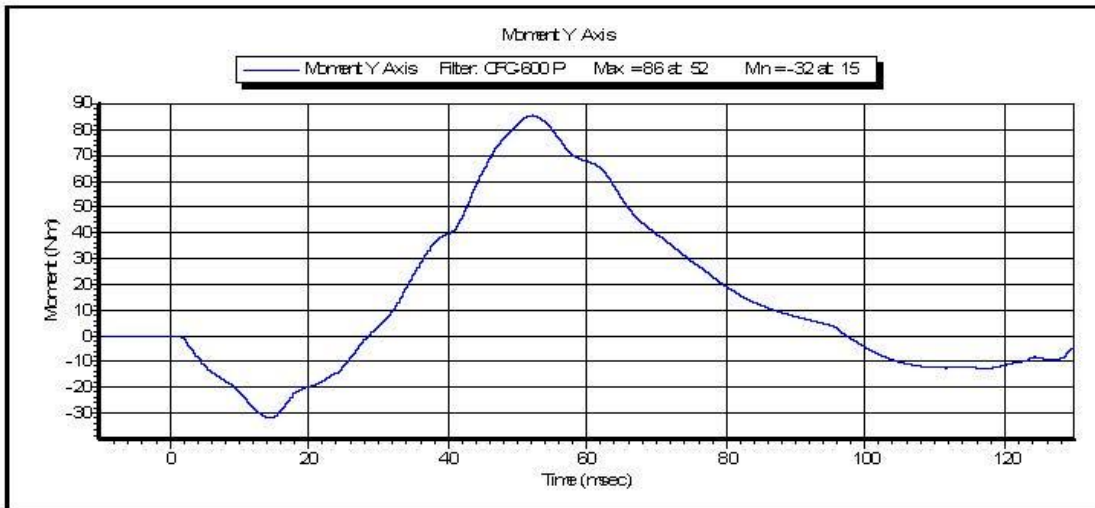


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Time of Test: **4:23:57 PM**

Date of Test: **2/6/2014**

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ID of Test: **Neck Flexion**

Time of Test: **4:23:57 PM**

Date of Test: **2/6/2014**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Thorax Impact	Test Date:	2/6/2014
		Test Time:	10:45:49 AM

Component Part Number	Component Serial Number
Chest Jacket - 78051-169	100

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.60 deg C P
Humidity	10 -- 70	12.80 %RH P
Velocity	6.59 -- 6.83	6.738 m/s P
Resistive Force	-5.894 -- -5.160	-5.7441 kN P
Sternum Displacement	-72.6 -- -63.5	-66.58 mm P
Hysteresis	69 -- 85	75.0 % P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



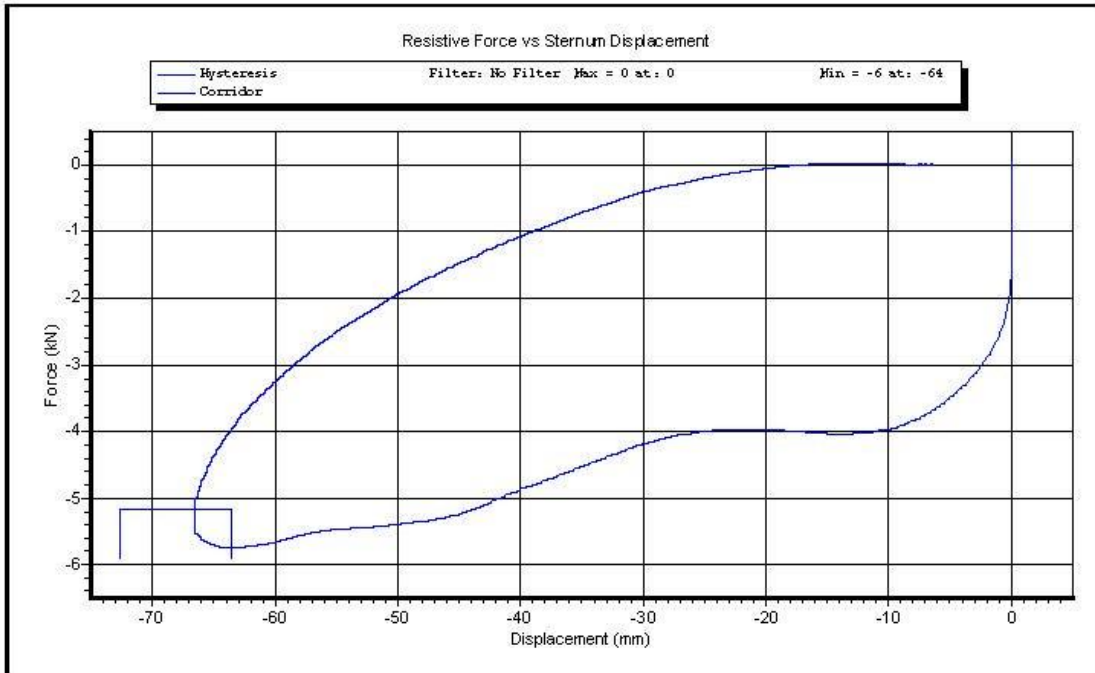
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
SERVO	78051-342	DS-142	11/18/2013



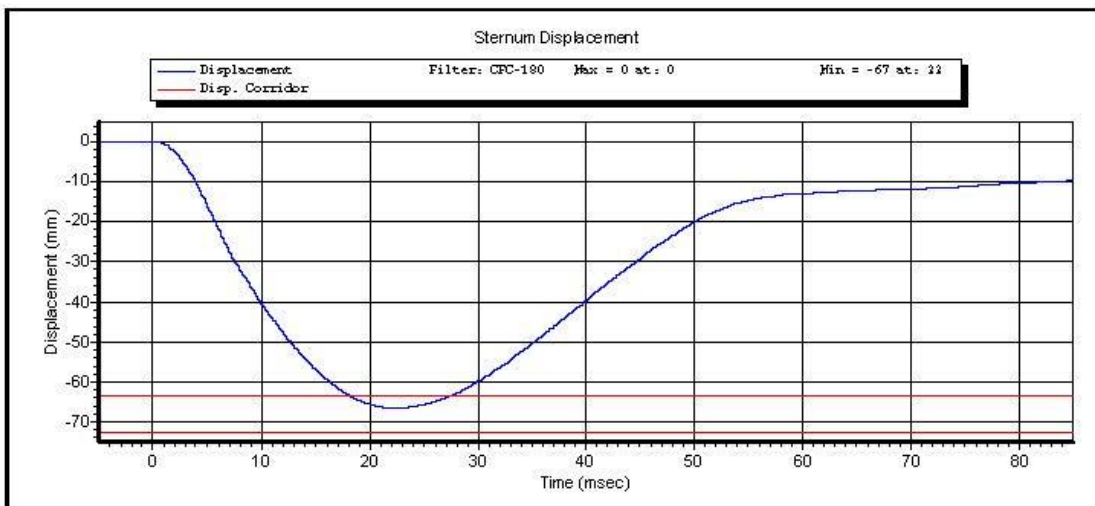
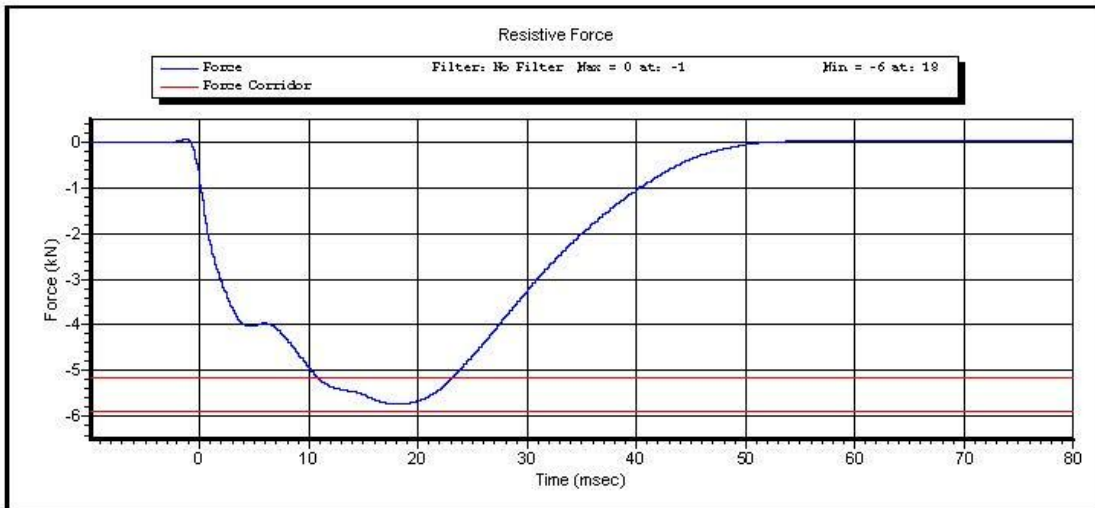
Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Thorax Impact** Test Time: **10:45:49 AM**

Test Date: **2/6/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

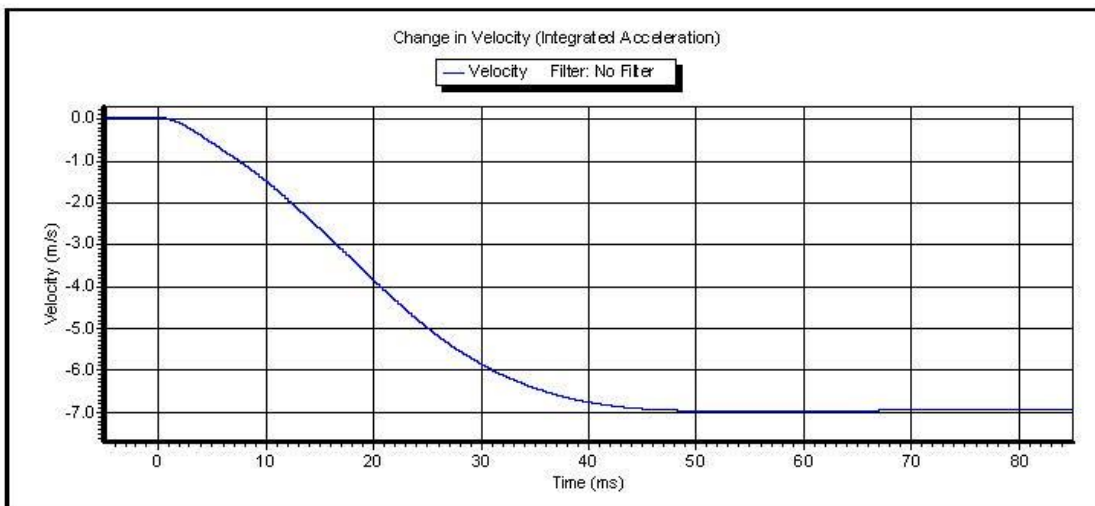
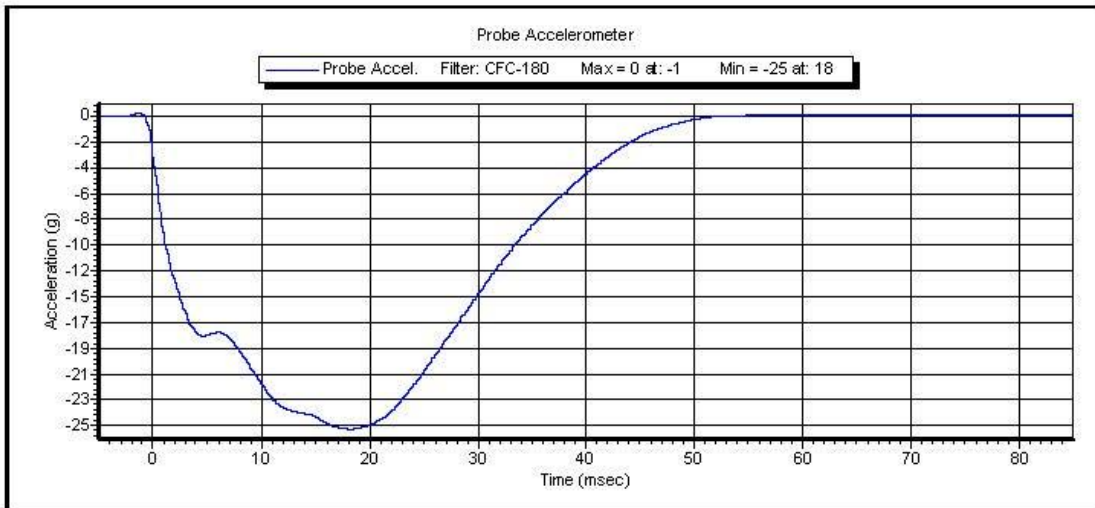


Test ID: **Thorax Impact**

Test Time: **10:45:49 AM**

Test Date: **2/6/2014**

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Test ID: **Thorax Impact**

Test Time: **10:45:49 AM**

Test Date: **2/6/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Hip ROM Left	Test Date:	2/4/2014
		Test Time:	4:34:41 PM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.20 deg C P
Humidity	10 -- 70	19.00 %RH P
Average Velocity	5 -- 10	6.1 deg/s P
Angle at 203 Nm	40 -- 50	44.2 degrees P
Moment at 30 degrees	0.0 -- 94.9	79.56 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



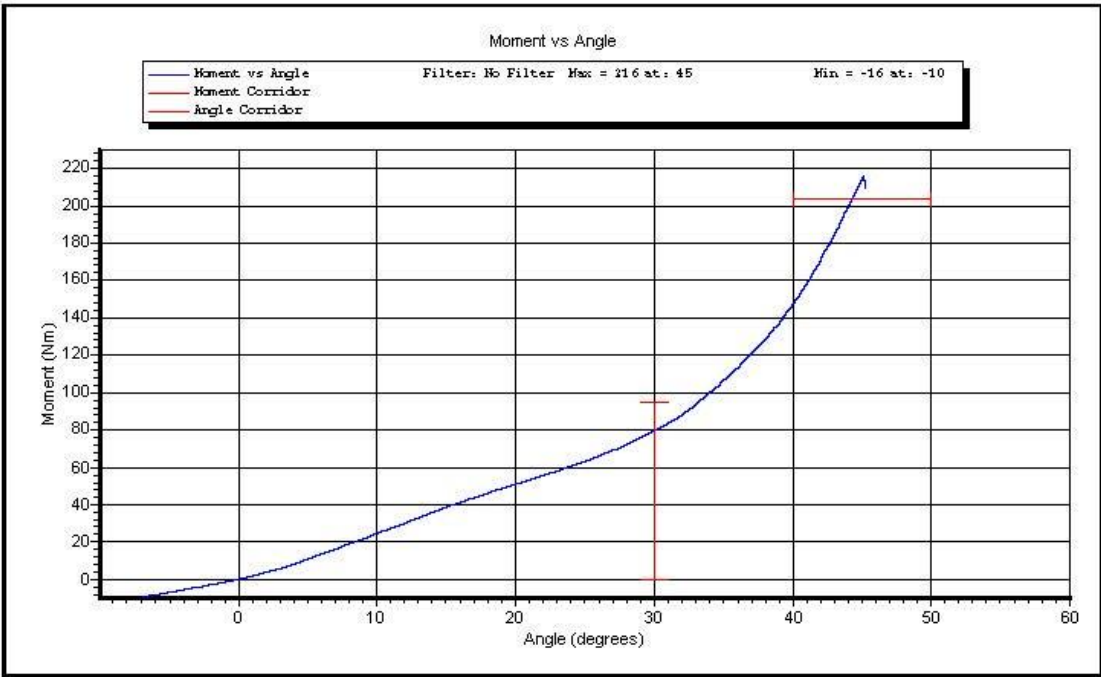
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/21/2013
DentonATD	A0 Output	1	1/11/2014



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Hip ROM Left** Test Time: **4:34:41 PM** Test Date: **2/4/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Hip ROM Right	Test Date:	2/4/2014
		Test Time:	4:45:41 PM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.20 deg C P
Humidity	10 -- 70	19.00 %RH P
Average Velocity	5 -- 10	5.9 deg/s P
Angle at 203 Nm	40 -- 50	42.0 degrees P
Moment at 30 degrees	0.0 -- 94.9	91.74 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



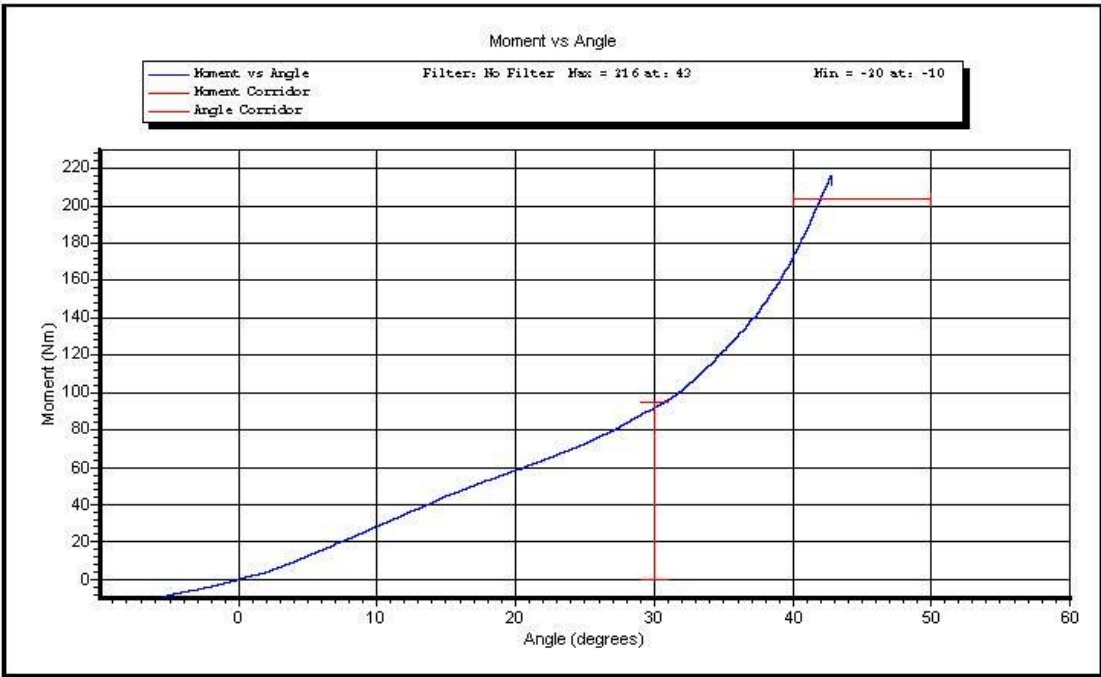
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/21/2013
DentonATD	A0 Output	1	1/11/2014



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Hip ROM Right** Test Time: **4:45:41 PM** Test Date: **2/4/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Knee Impact Left	Test Date:	2/4/2014
		Test Time:	12:51:37 PM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	078

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.60 deg C P
Humidity	10 -- 70	14.00 %RH P
Velocity	2.07 -- 2.13	2.118 m/s P
Resistive Force	-5.780 -- -4.720	-4.904 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



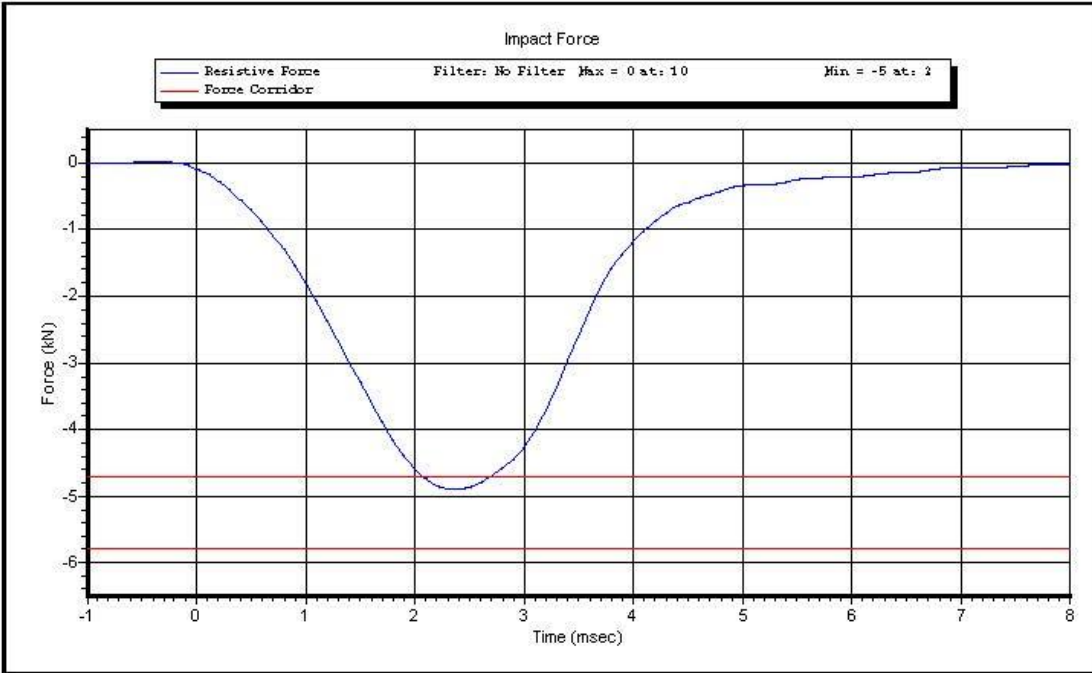
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



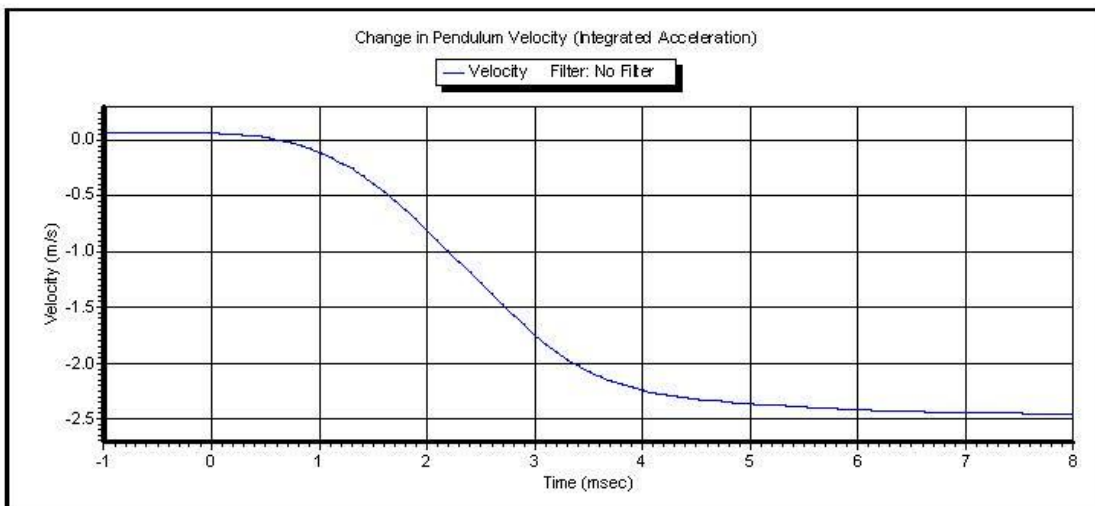
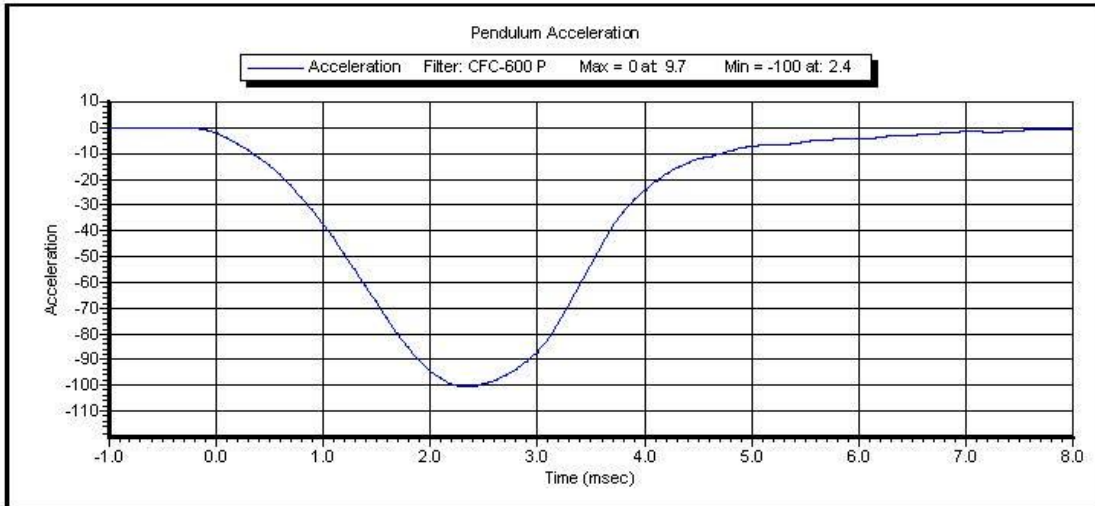
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Knee Impact Left** Test Time: **12:51:37 PM**

Test Date: **2/4/2014**

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Test ID: **Knee Impact Left** Test Time: **12:51:37 PM**

Test Date: **2/4/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Knee Impact Right	Test Date:	2/4/2014
		Test Time:	10:38:57 AM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3307

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.70 deg C P
Humidity	10 -- 70	18.80 %RH P
Velocity	2.07 -- 2.13	2.118 m/s P
Resistive Force	-5.780 -- -4.720	-5.444 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



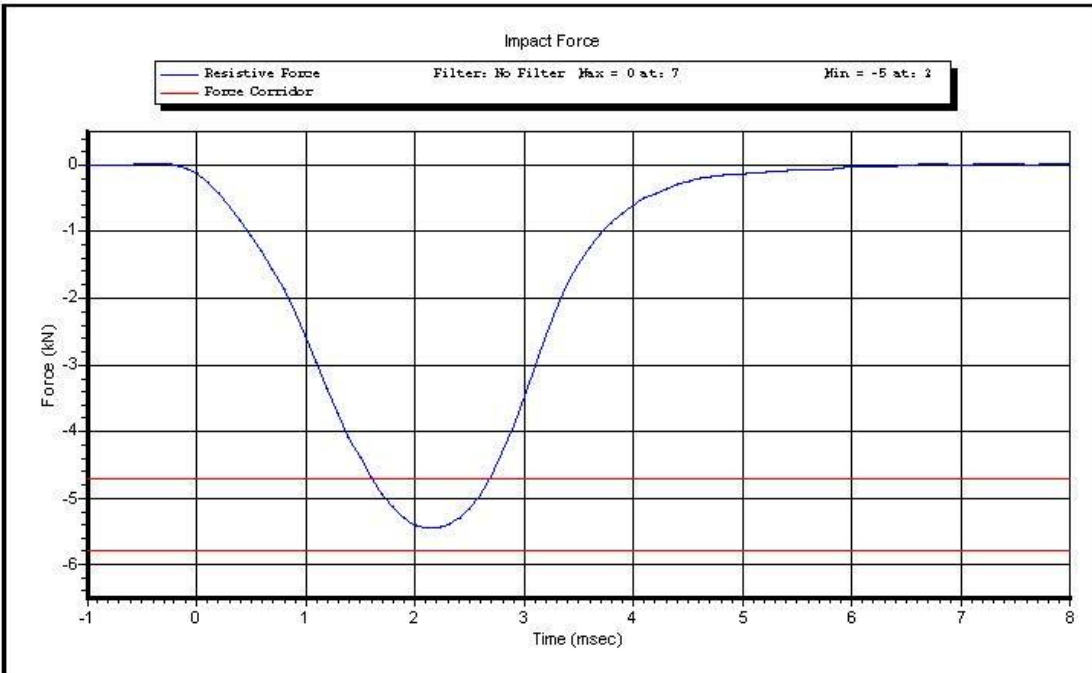
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



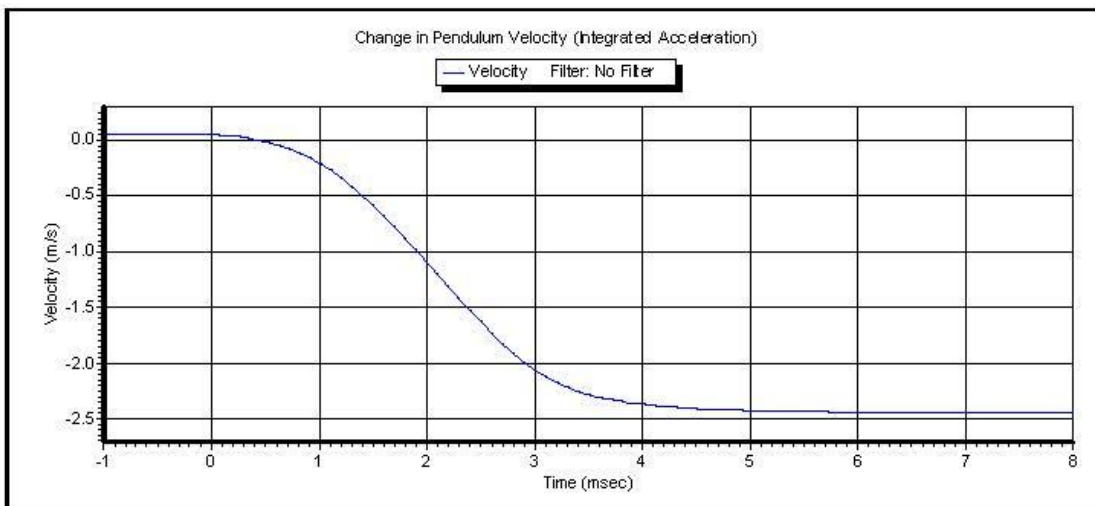
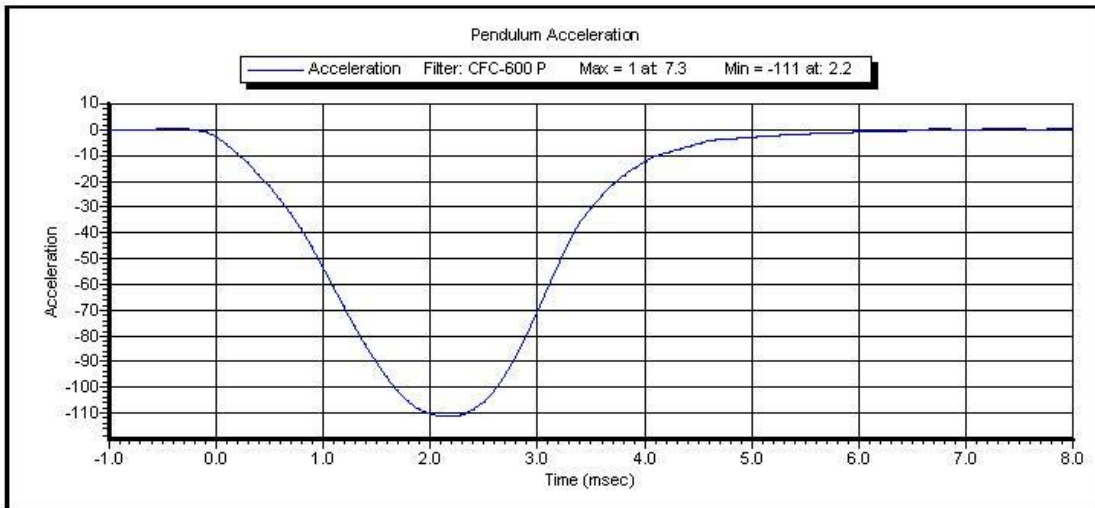
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Knee Impact Right** Test Time: **10:38:57 AM**

Test Date: **2/4/2014**

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Test ID: **Knee Impact Right** Test Time: **10:38:57 AM**

Test Date: **2/4/2014**

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CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139



External Measurements

5th Female SN 139

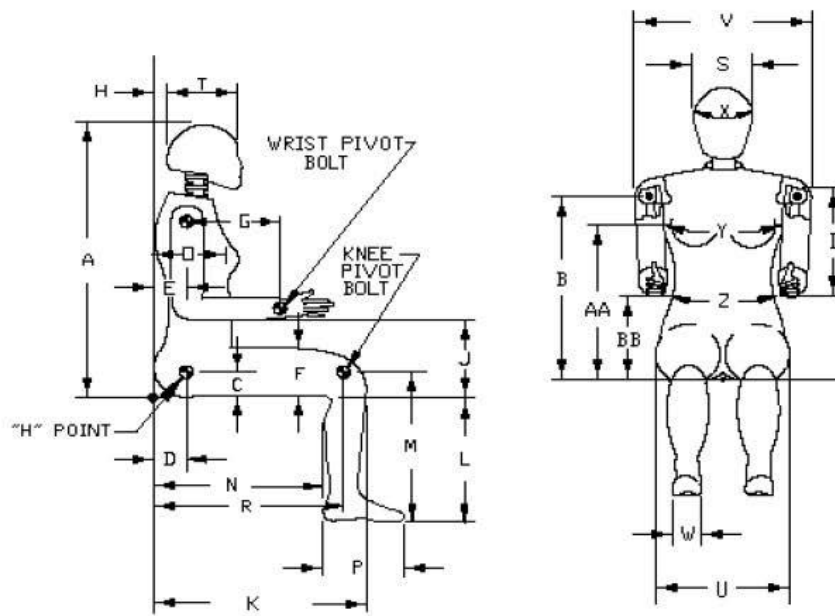
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	790	Yes
B	Shoulder Pivot Height	431.8 – 457.2	447	Yes
C	H-Point Height	81.3 – 86.3	85	Yes
D	H-Point from Backline	144.8 – 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 – 83.8	74	Yes
F	Thigh Clearance	119.4 – 134.6	124	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	248	Yes
H	Head Back to Backline	43.2 – 48.2	44	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	292	Yes
J	Elbow Rest Height	182.8 – 203.2	186	Yes
K	Buttock to Knee Length	520.7 – 546.1	542	Yes
L	Popliteal Height	355.6 – 376	361	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	421	Yes
O	Chest Depth without Jacket	175.3 – 190.5	183	Yes
P	Foot Length (right)	218.5 – 233.7	219	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	471	Yes
S	Head Breadth	137.1 – 147.3	140	Yes
T	Head Depth	177.8 – 188	181	Yes
U	Hip Breadth	299.7 – 314.9	301	Yes
V	Shoulder Breadth	350.5 – 365.7	361	Yes
W	Foot Breadth	78.8 – 94	82	Yes
X	Head Circumference	528.3 – 548.7	536	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	851	Yes
Z	Waist Circumference	759.5 – 789.9	770	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	357	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	170	Yes

Technician: M. Geesey

Date: 02/07/2014

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Head Drop	Test Date:	2/5/2014
		Test Time:	9:13:31 AM

Component Part Number	Component Serial Number
Head Skin - 78051-228	05067

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.60 deg C P
Humidity	10 -- 70	22.60 %RH P
Resultant Acceleration	250 -- 300	270.4 G's P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-3.0 G's P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



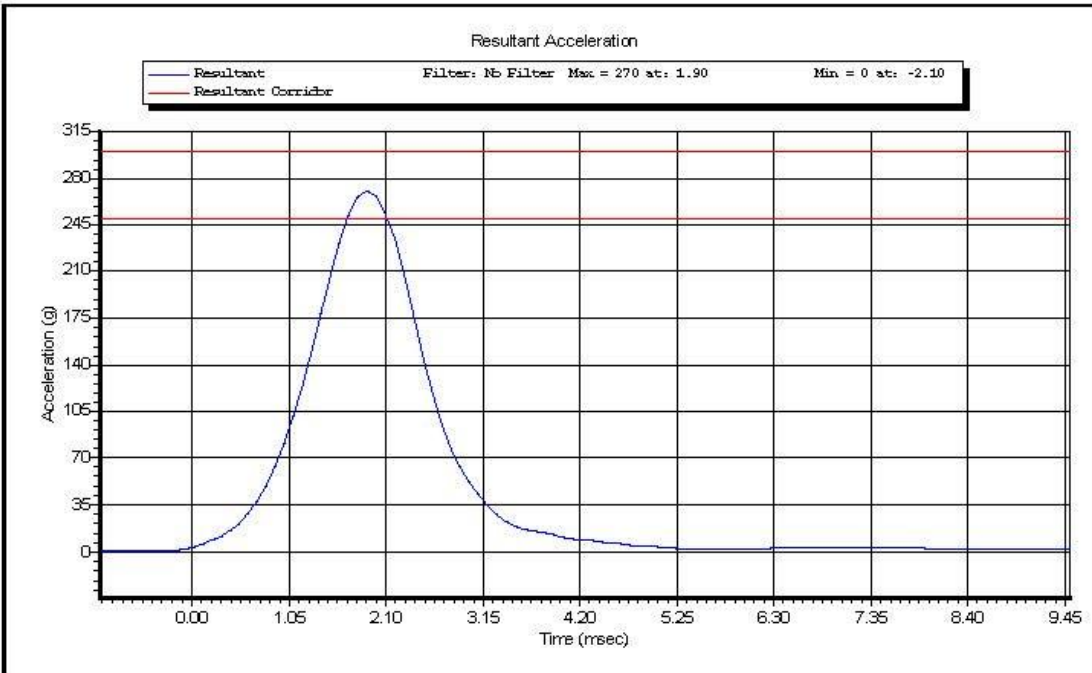
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	1/28/2014
Endevco	7264-2000	P52007	1/28/2014
Endevco	7264-2000	P51298	1/28/2014



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**

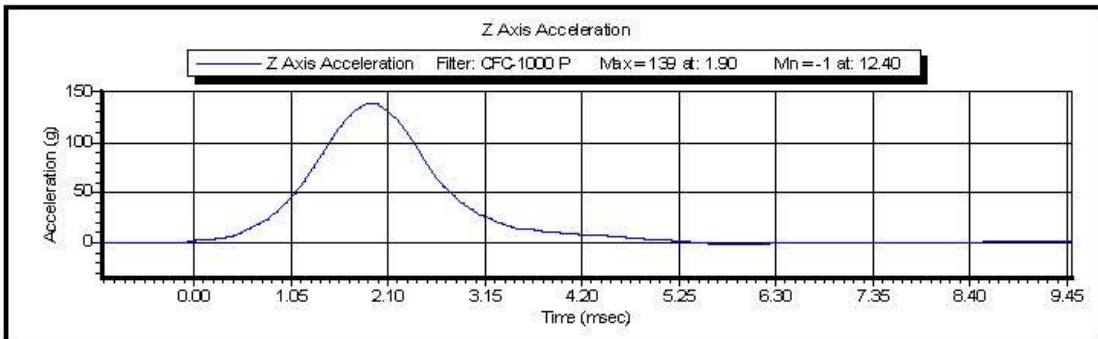
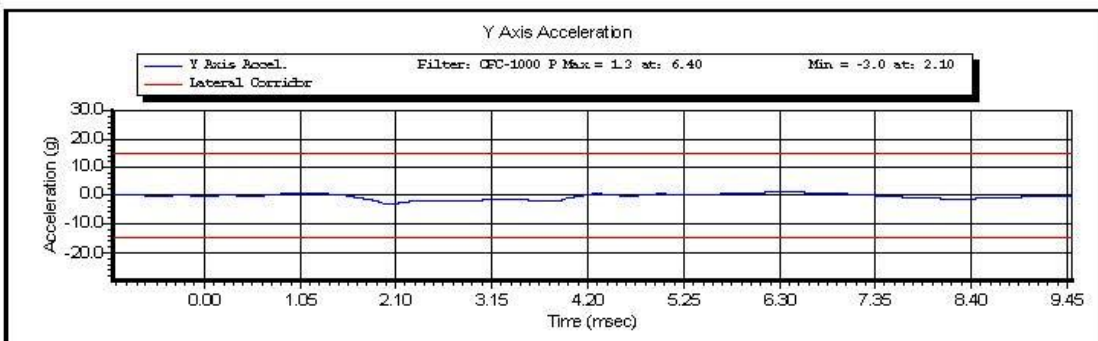
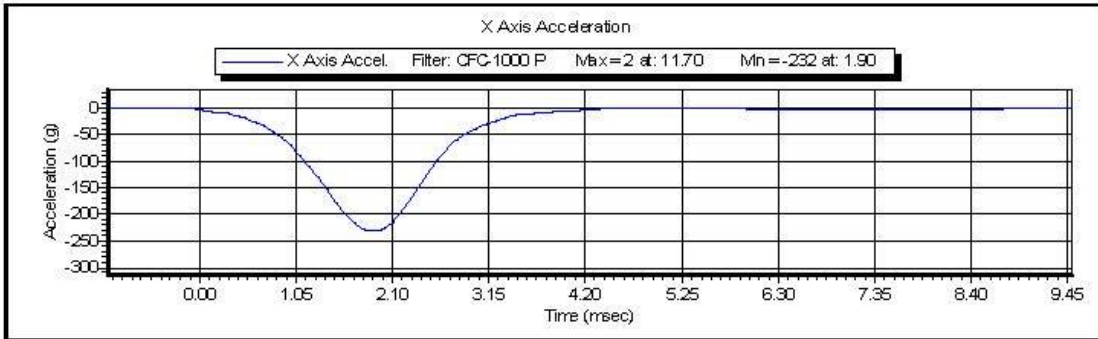


Test ID: **Head Drop**

Test Time: **9:13:31 AM**

Test Date: **2/5/2014**

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Test ID: **Head Drop**

Test Time: **9:13:31 AM**

Test Date: **2/5/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Extension	Test Date:	2/4/2014
		Test Time:	5:05:31 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.20 deg C P
Humidity	10 -- 70	19.20 %RH P
Velocity	5.95 -- 6.19	6.101 m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	1.83 m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	3.62 m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	5.30 m/s P
D Plane Rotation	99 -- 114	107.9 degrees P
Moment During Rotation Interval	-65 -- -53	-58.9 Nm P
Moment Decay to -10.0 Nm	94 -- 114	100.3 ms P

All test parameters are within specifications

Technician: **M. Goehle**
 Supervisor: **E. Dutton**



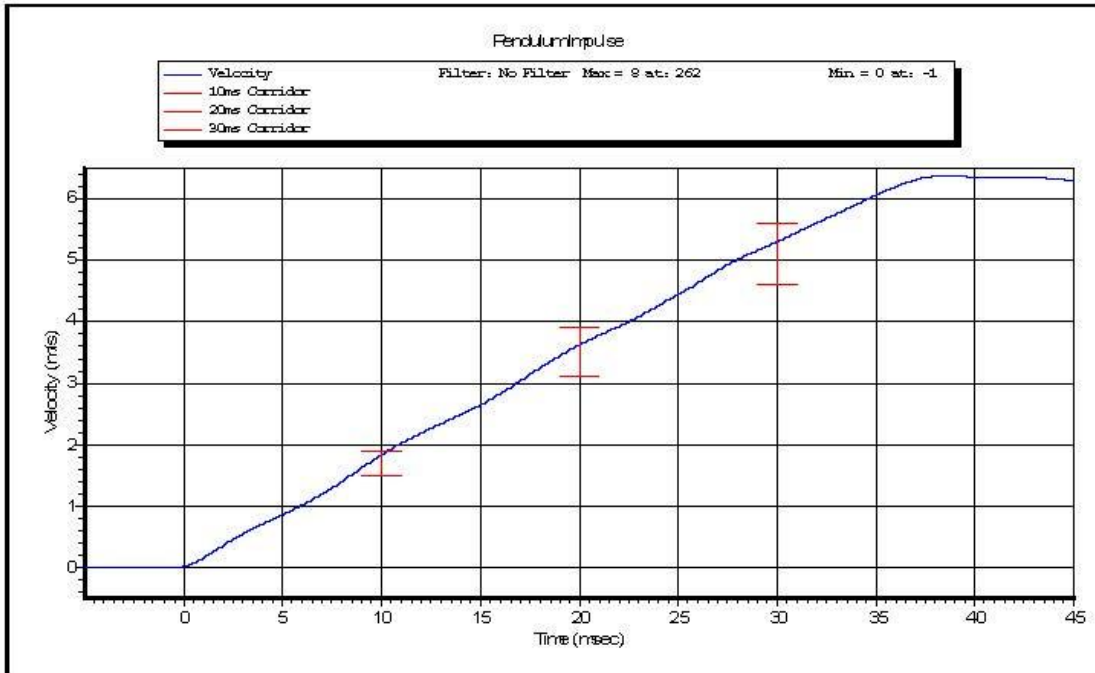
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



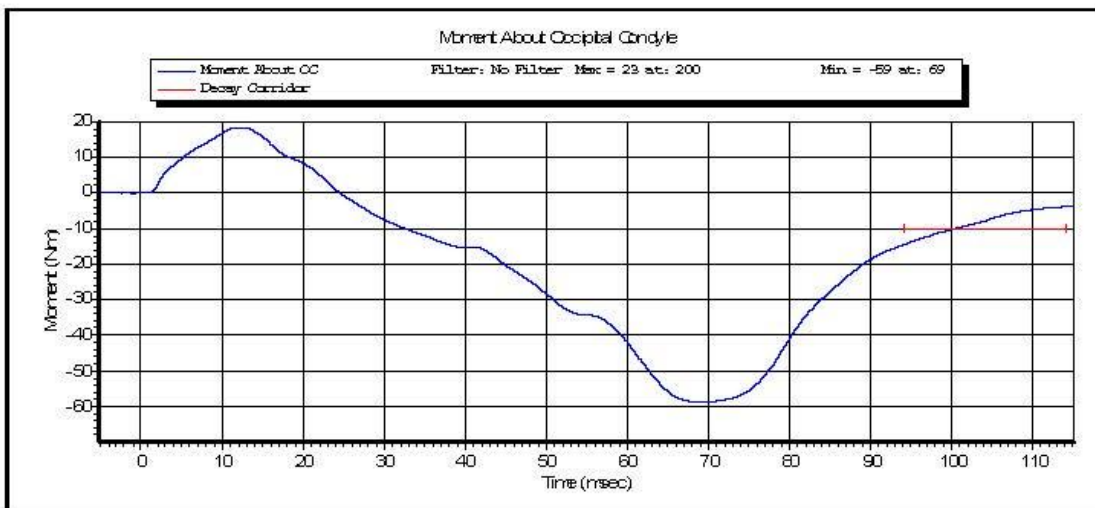
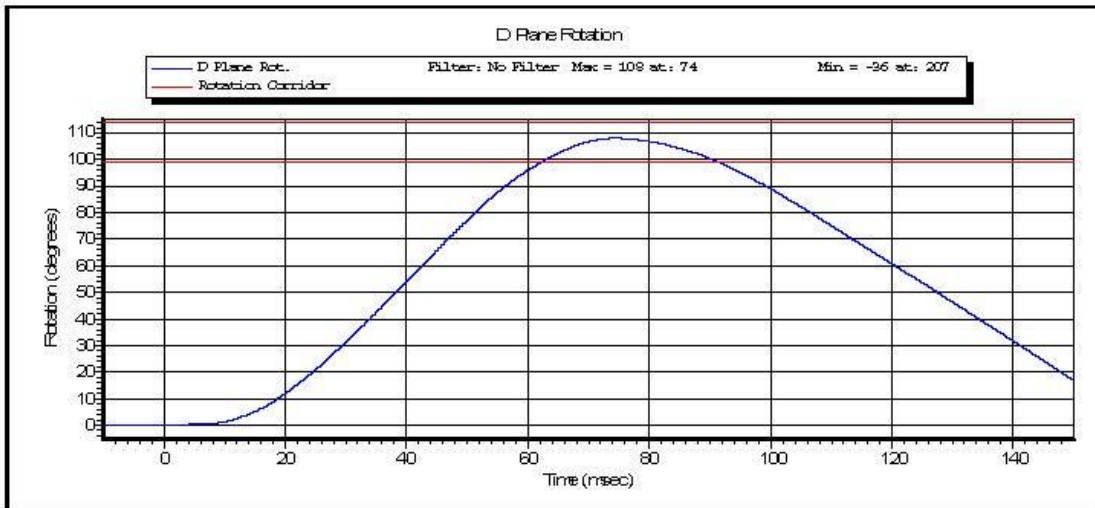
Test Name: **Neck Extension**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Neck Extension** Test Time: **5:05:31 PM**

Test Date: **2/4/2014**

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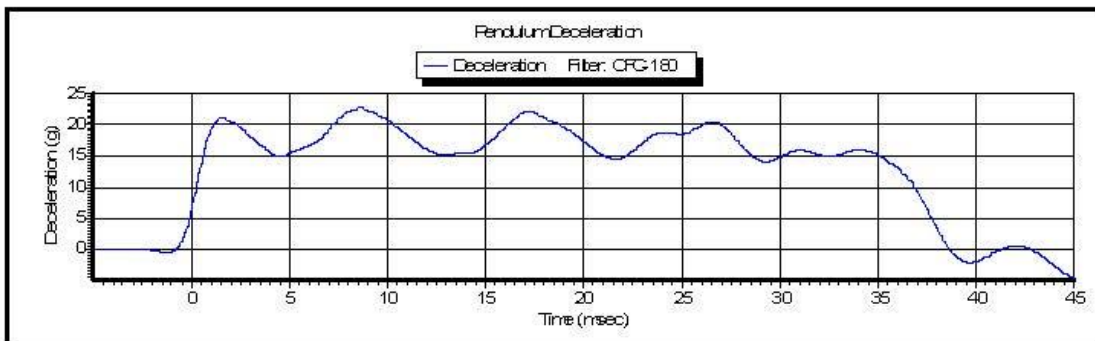
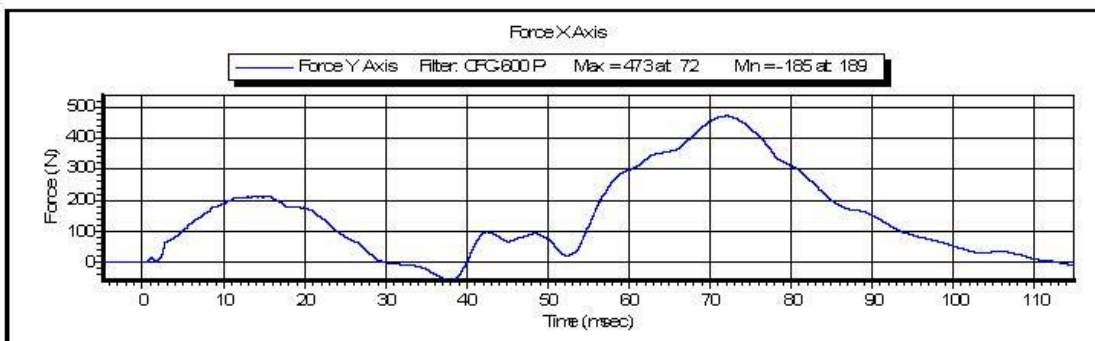
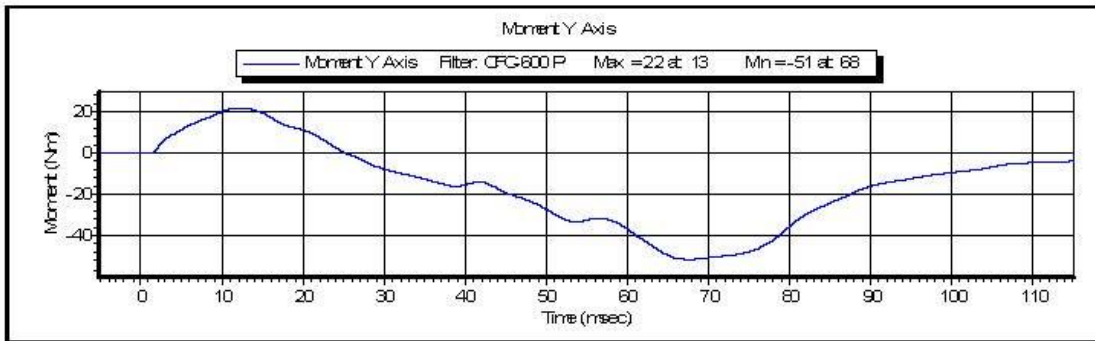


Test ID: Neck Extension

Test Time: 5:05:31 PM

Test Date: 2/4/2014

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Test ID: **Neck Extension** Test Time: **5:05:31 PM**

Test Date: **2/4/2014**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Flexion	Test Date:	2/4/2014
		Test Time:	5:20:49 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters	Test Specifications	Test Results
Temperature	21 -- 22	21.20 deg C P
Humidity	10 -- 70	19.20 %RH P
Velocity	6.89 -- 7.13	6.985 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.17 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.3 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.12 m/s P
D Plane Rotation	-91 -- -77	-78.0 degrees P
Moment During Rotation Interval	69 -- 83	72.8 Nm P
Moment Decay to 10.0 Nm	80 -- 100	87.9 ms P

All test parameters are within specifications

Technician: **M. Goehle**
 Supervisor: **E. Dutton**



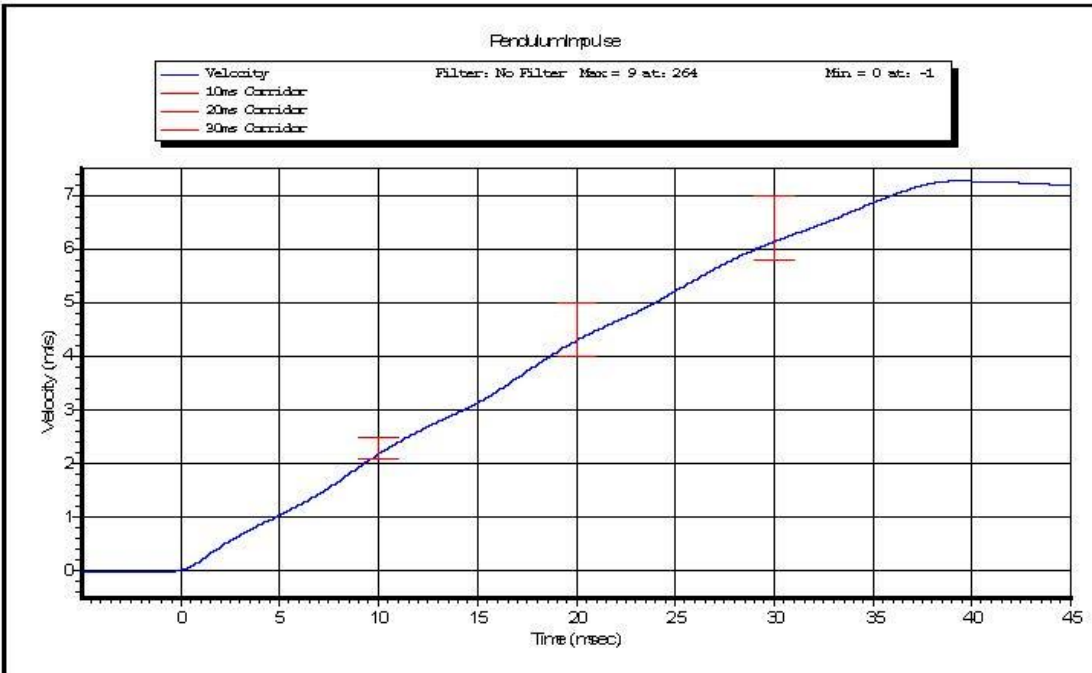
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



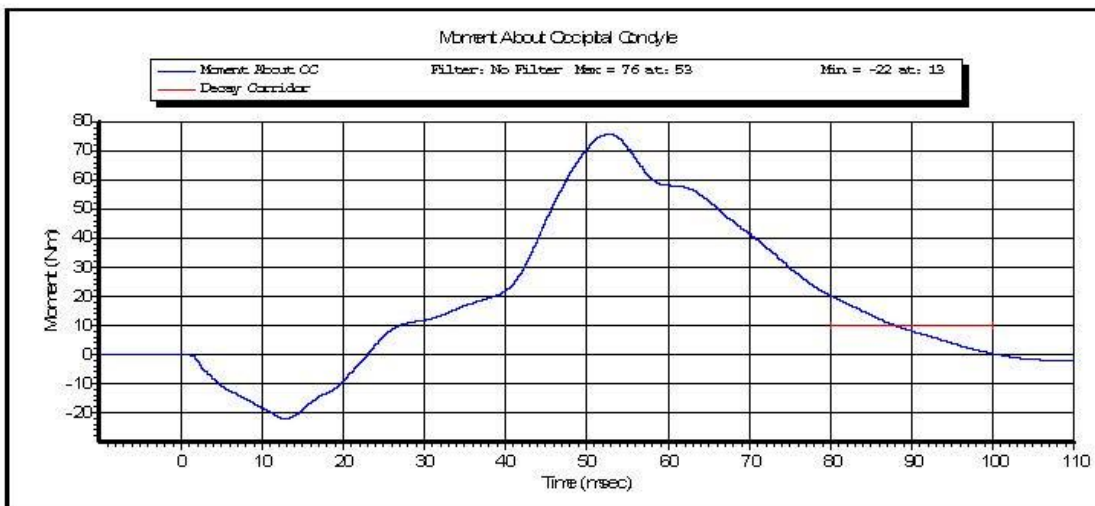
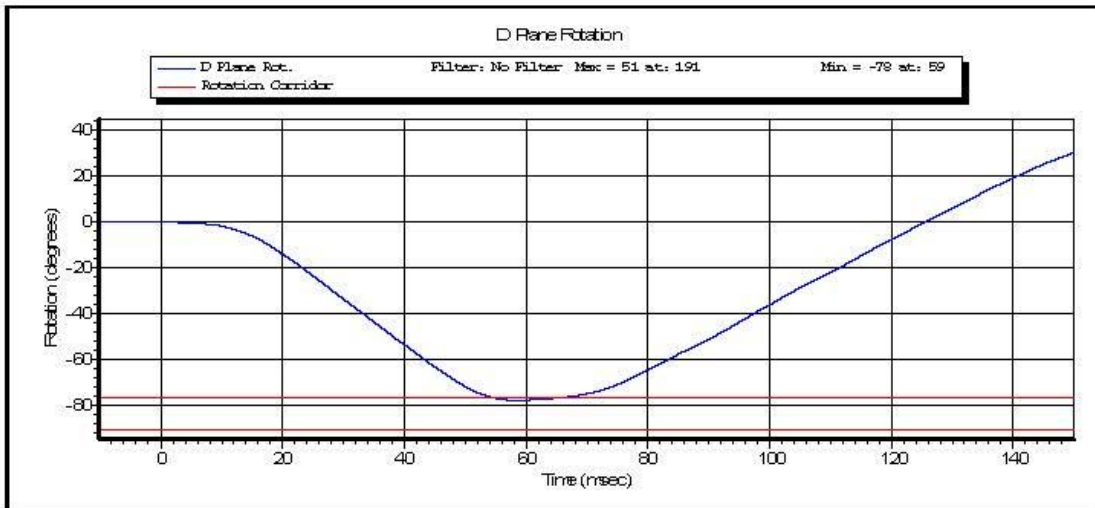
Test Name: **Neck Flexion**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Neck Flexion** Test Time: **5:20:49 PM**

Test Date: **2/4/2014**

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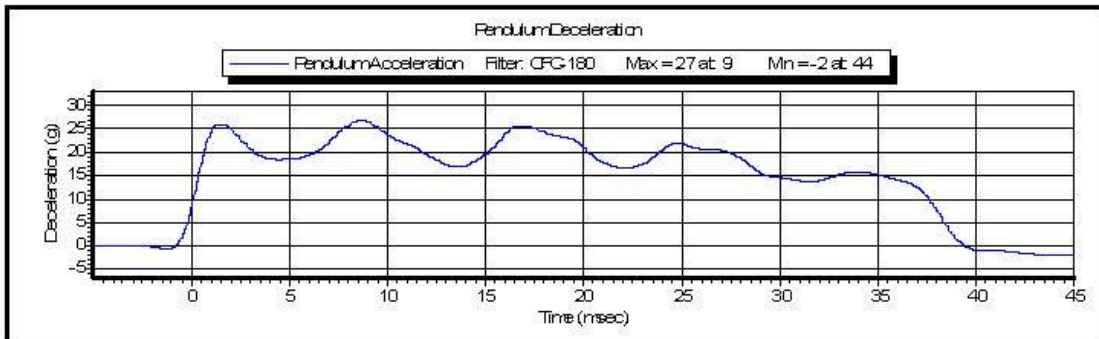
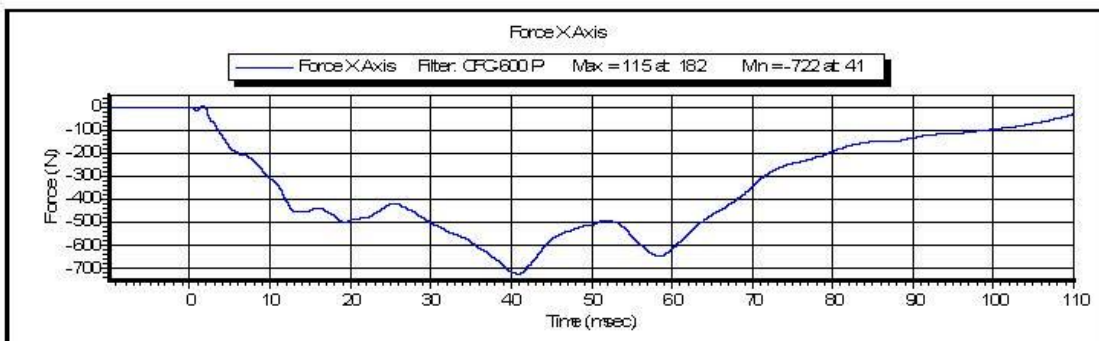
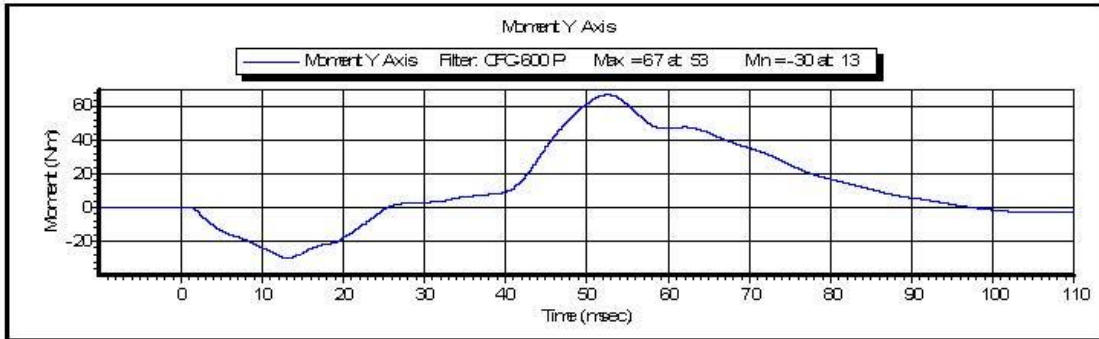


Test ID: Neck Flexion

Test Time: 5:20:49 PM

Test Date: 2/4/2014

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Test ID: **Neck Flexion**

Test Time: **5:20:49 PM**

Test Date: **2/4/2014**

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Torso Flexion
Part 5720 HIII 5% Female

ATD Serial No: 139

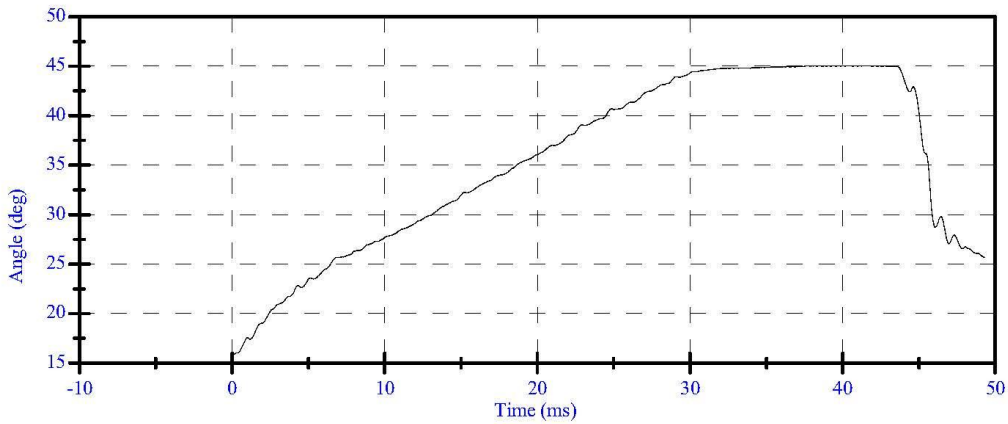
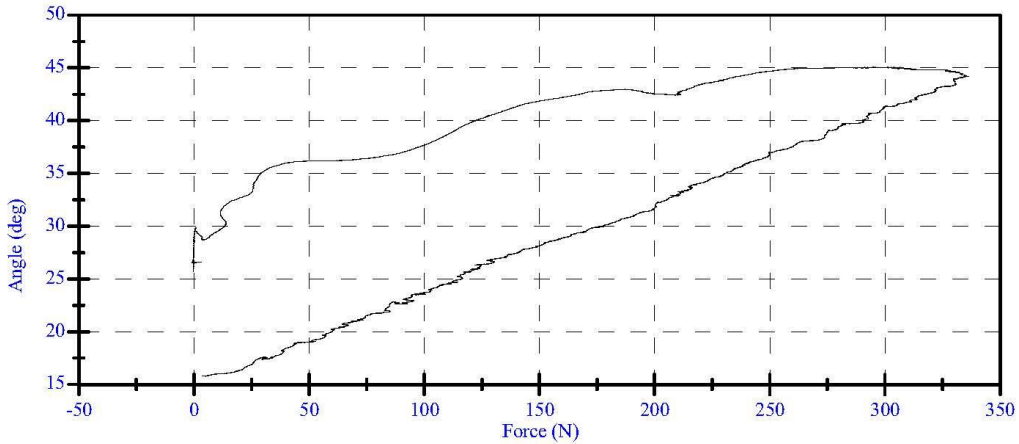
Laboratory Supervisor: E. Dutton

Date: 2/5/2014

Laboratory Technician: M. Goehle

<u>TEST PARAMETER</u>	<u>SPECIFICATION</u>	<u>TEST RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	21.7 C	Passed
Lab Humidity:	10-70 %	22.6 %	Passed
Initial Angle:	0.00-20.00 Deg	15.76 Deg	Passed
Force at 45 Deg	320.00-390.00 N	336.44 N	Passed
Return Angle	8 Deg Max from Initial	20.3 Deg	Passed

LUMBAR SPINE FLEXION TEST





VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Thorax Impact	Test Date:	2/5/2014
		Test Time:	2:24:36 PM

Component Part Number	Component Serial Number
Ribs 880105-RS	05032011A
Chest Jacket - 880105-355-E	05177
Lumbar Spine - 880105-1095	0500-0139

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.00 deg C P
Humidity	10 -- 70	18.20 %RH P
Velocity	6.59 -- 6.83	6.807 m/s P
Sternum Displacement	-58 -- -50	-53.9 mm P
Force During Displacement Interval	-4400 -- -3900	-4255.7 N P
Force During -18mm to -50mm Displacem	-4600 -- 0	-4249.4 N P
Hysteresis	69 -- 85	72.8 % P

All test parameters are within specifications

Technician: **M. Geesey**
 Supervisor: **E. Dutton**



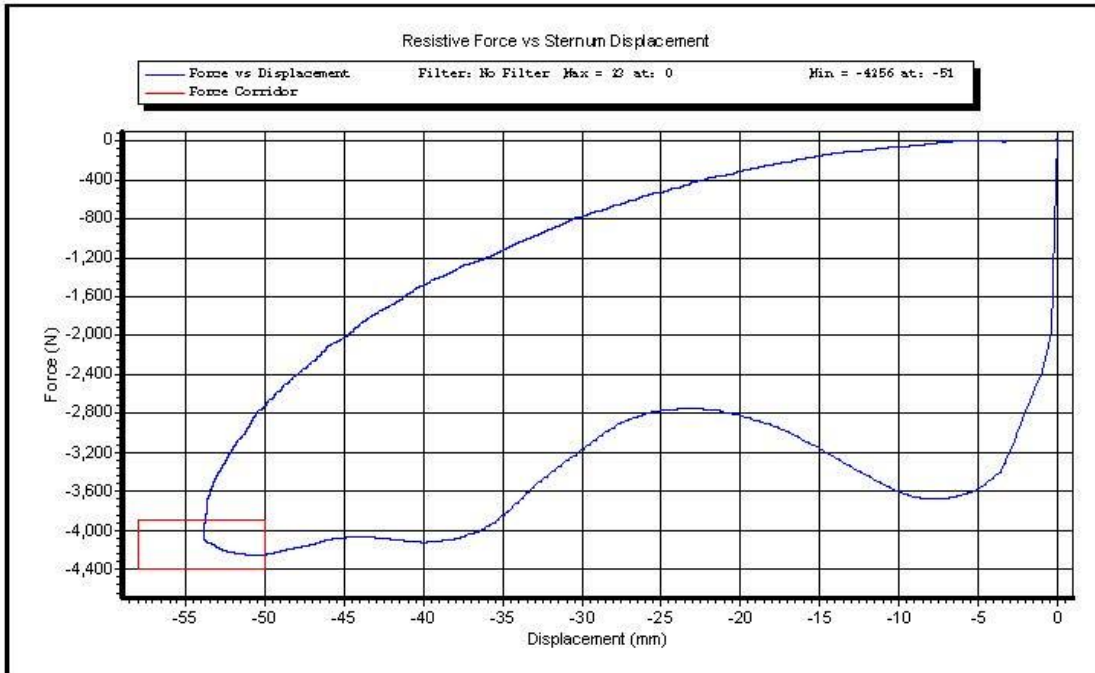
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	H3CD	DS-139	11/20/2013



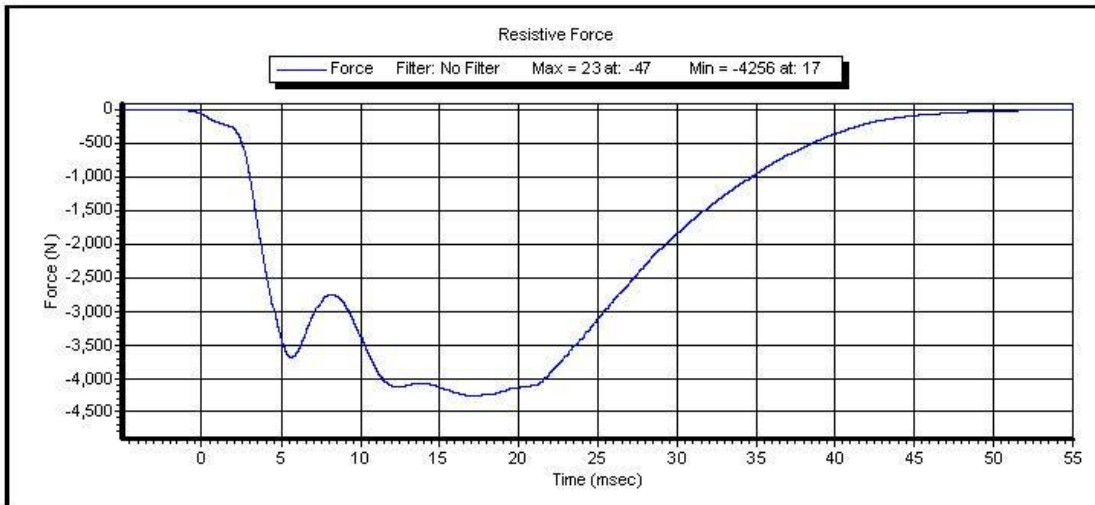
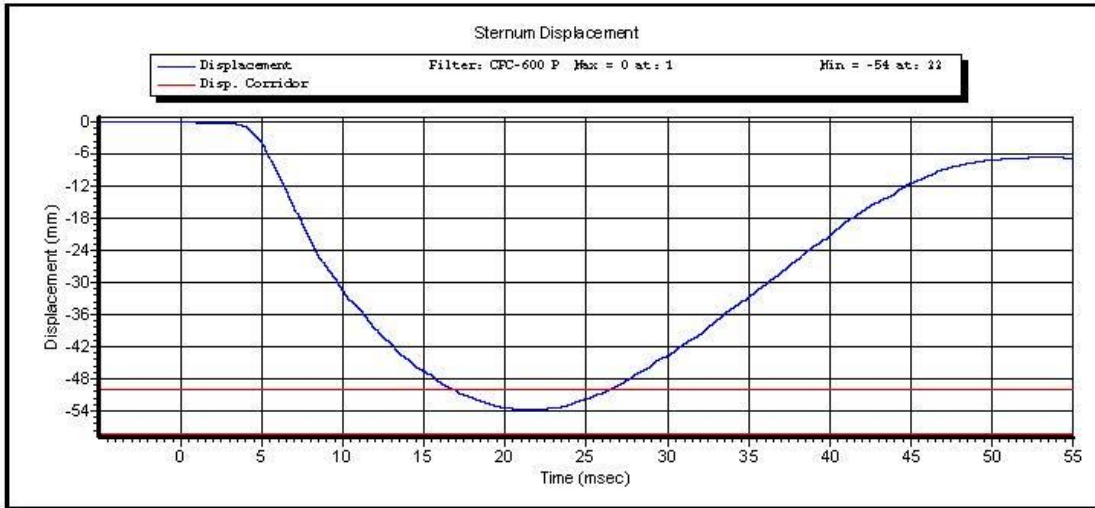
Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Thorax Impact** Test Time: **2:24:36 PM**

Test Date: **2/5/2014**

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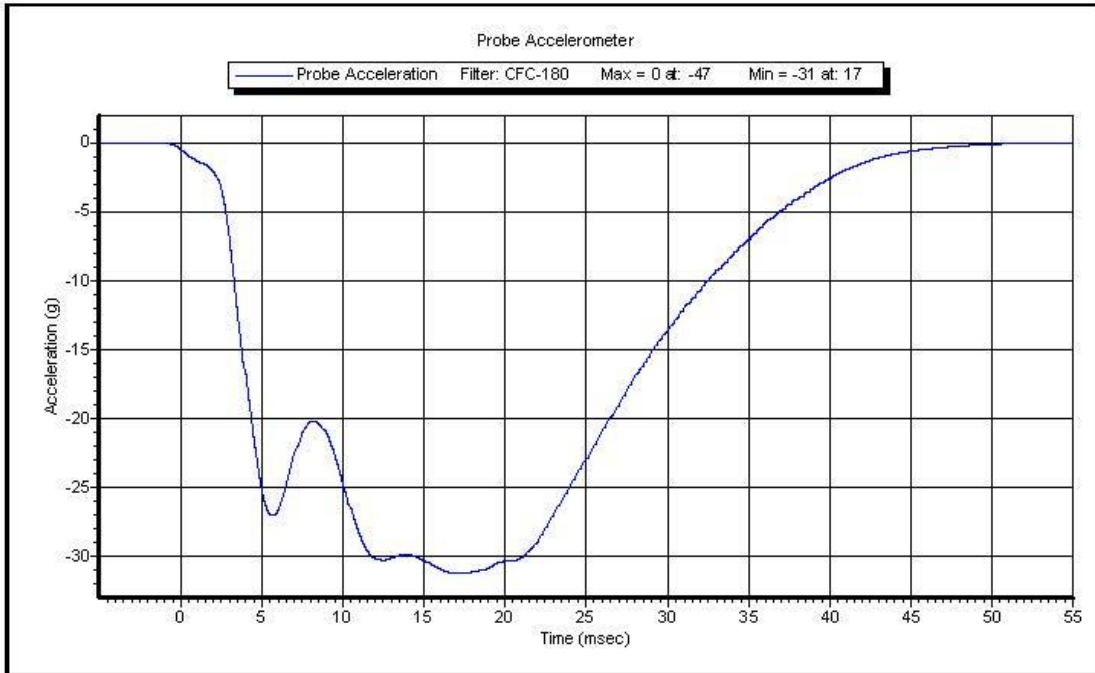


Test ID: **Thorax Impact**

Test Time: **2:24:36 PM**

Test Date: **2/5/2014**

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Test ID: **Thorax Impact**

Test Time: **2:24:36 PM**

Test Date: **2/5/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Left	Test Date:	2/3/2014
		Test Time:	1:32:15 PM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1350

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.40 deg C P
Humidity	10 -- 70	14.90 %RH P
Velocity	2.07 -- 2.13	2.116 m/s P
Resistive Force	-4060 -- -3450	-3658.1 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



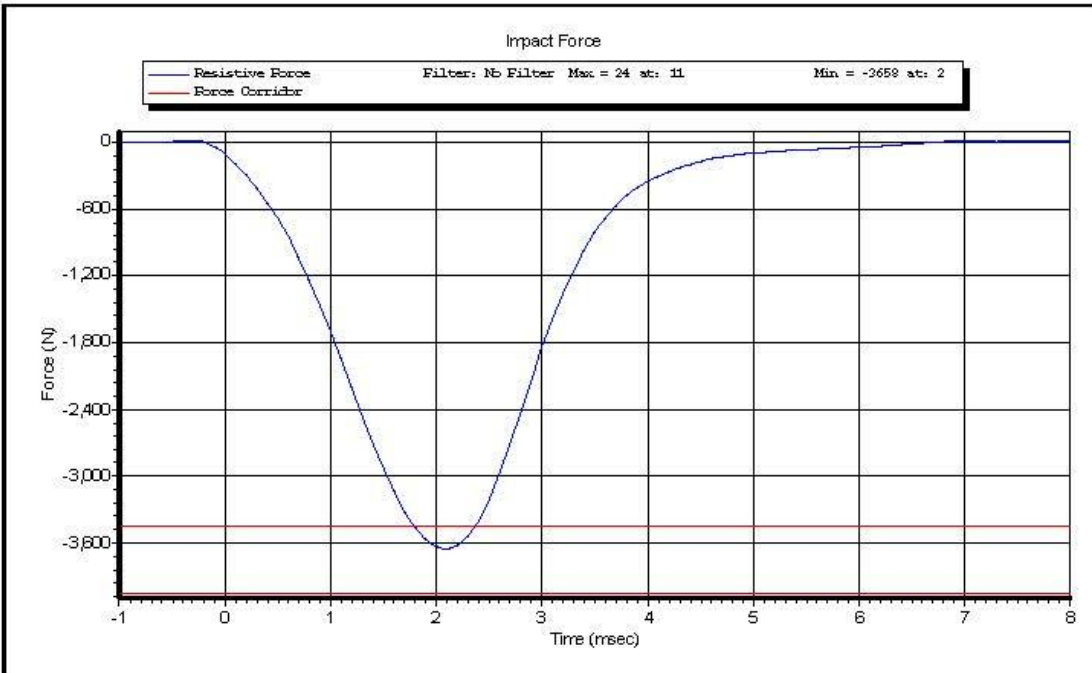
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



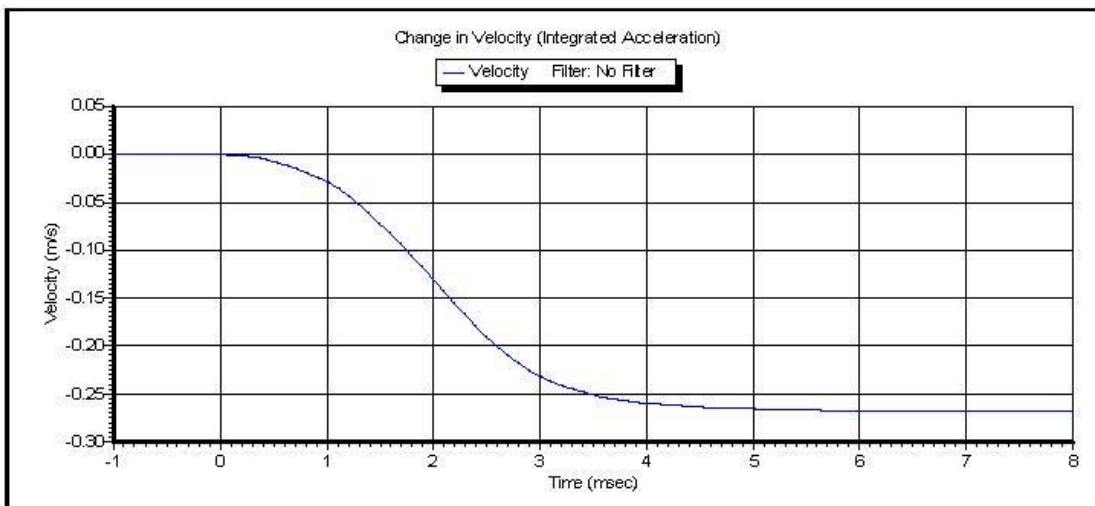
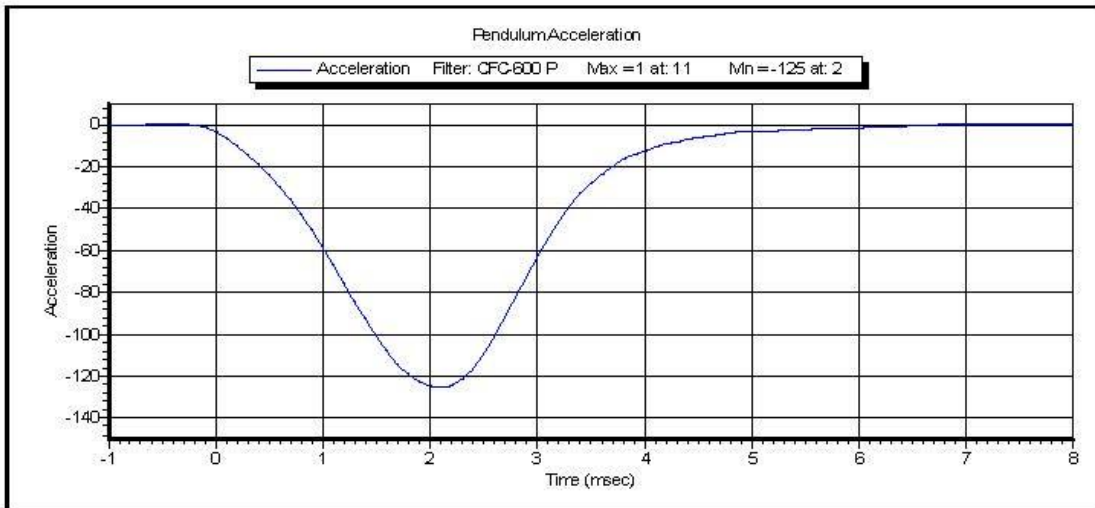
Test Name: **Knee Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Knee Impact Left** Test Time: **1:32:15 PM**

Test Date: **2/3/2014**

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Test ID: **Knee Impact Left** Test Time: **1:32:15 PM**

Test Date: **2/3/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Right	Test Date:	2/3/2014
		Test Time:	1:27:29 PM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1359

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.40 deg C P
Humidity	10 -- 70	14.90 %RH P
Velocity	2.07 -- 2.13	2.116 m/s P
Resistive Force	-4060 -- -3450	-3865.7 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



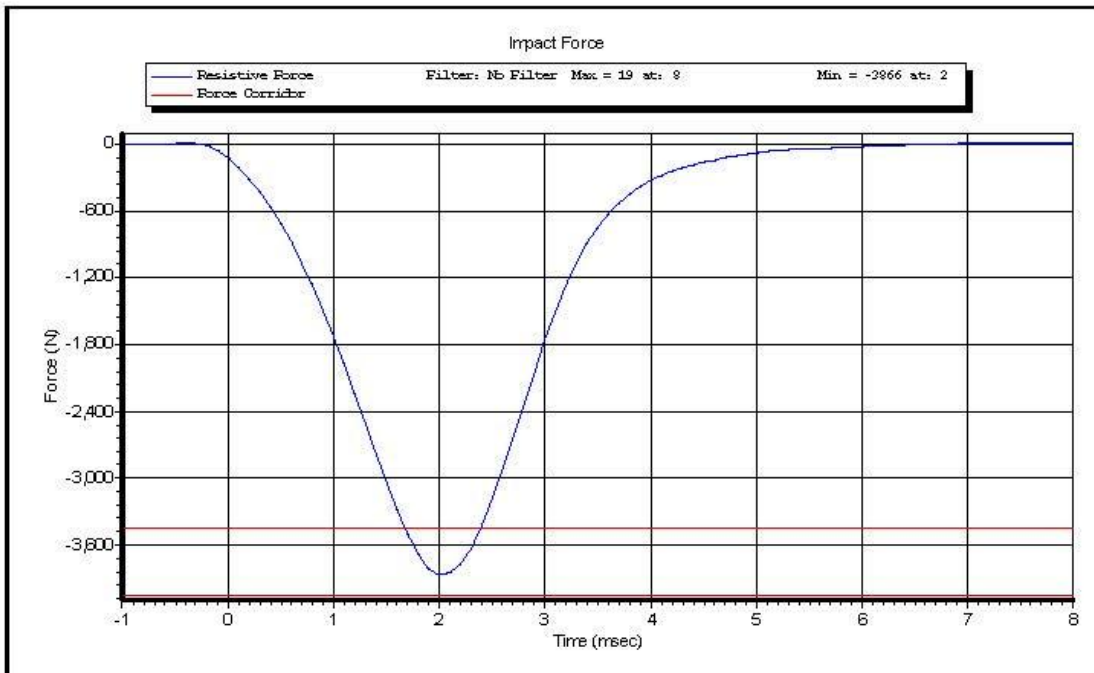
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



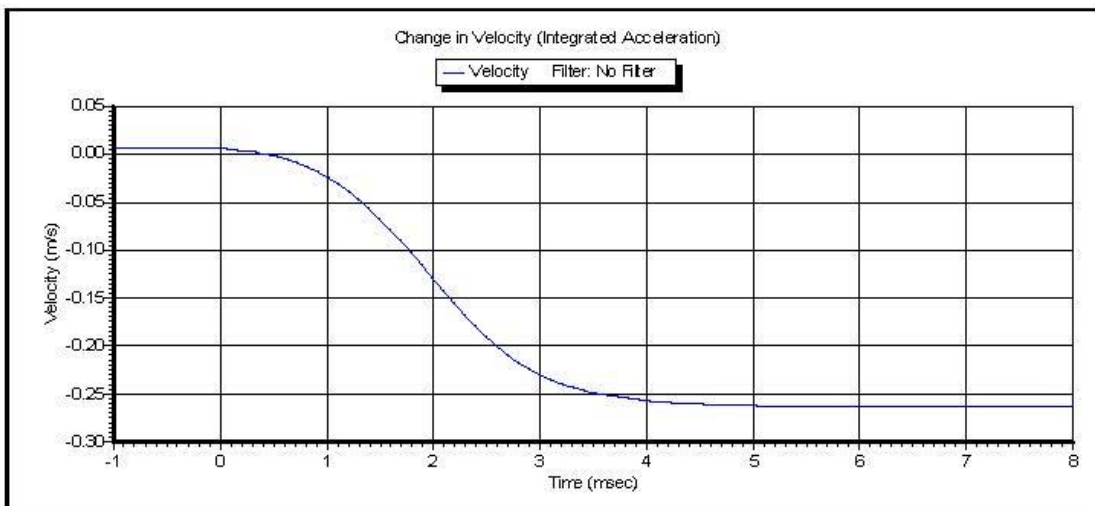
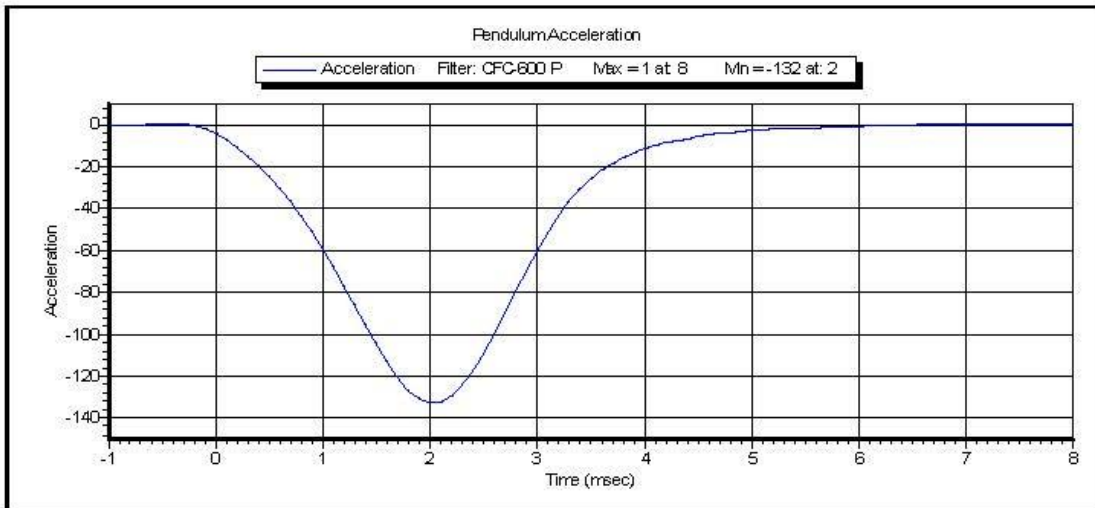
Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Right** Test Time: **1:27:29 PM**

Test Date: **2/3/2014**

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Test ID: **Knee Impact Right** Test Time: **1:27:29 PM**

Test Date: **2/3/2014**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142



50th Male External Measurements

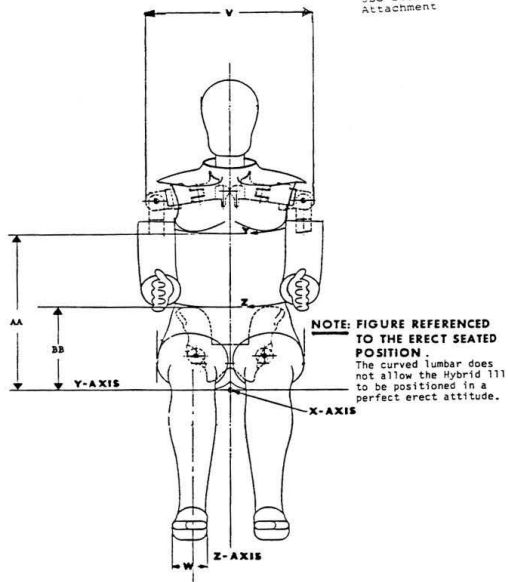
S/N 142

Symbol	Description	Specification	Results	Pass
		in	In	
A	Sitting Height	34.6 – 35.0	34.8	Yes
B	Shoulder Pivot Height	19.9 - 20.5	20.1	Yes
C	H-Point Height	3.3 – 3.5	3.4	Yes
D	H-Point from Backline	5.3 – 5.5	5.4	Yes
E	Shoulder Pivot from Backline	3.3 – 3.7	3.6	Yes
F	Thigh Clearance	5.5 – 6.1	5.8	Yes
G	Back of Elbow to Wrist Pivot	11.4 – 12.0	11.5	Yes
H	Head Back to Backline	1.6 – 1.8	1.7	Yes
I	Shoulder to Elbow Length	13.0 – 13.6	13.4	Yes
J	Elbow Rest Height	7.5 – 8.3	7.9	Yes
K	Buttock to Knee Length	22.8 – 23.8	23.0	Yes
L	Popliteal Height	16.9 – 17.9	17.1	Yes
M	Knee Pivot Height	19.1 – 19.7	19.4	Yes
N	Buttock Popliteal Length	17.8 – 18.8	18.3	Yes
O	Chest Depth without Jacket	8.4 – 9.0	8.6	Yes
P	Foot Length (right)	9.9 – 10.5	10.1	Yes
V	Shoulder Breadth	16.3 – 17.2	16.8	Yes
W	Foot Breadth	3.6 – 4.2	3.9	Yes
Y	Chest Circumference with Jacket	38.2 – 39.4	38.9	Yes
Z	Waist Circumference	32.9 – 34.1	33.4	Yes
AA	Reference Location (Chest Circumference)	16.9 – 17.1	17.0	Yes
BB	Reference Location (Waist Circumference)	8.9 – 9.1	9.0	Yes

Technician: R. Weil

Date: 02-18-14

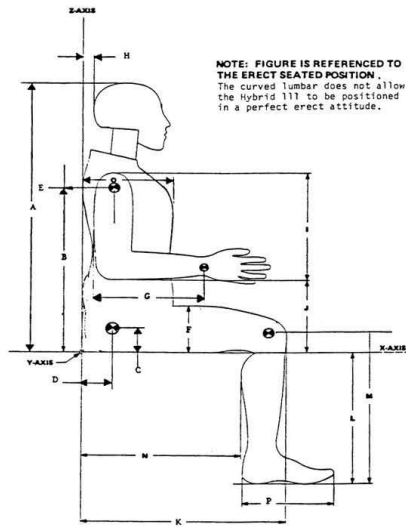
USG 2485
Attachment



NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid 111 to be positioned in a perfect erect attitude.

HYBRID 111 Exterior Body Dimensions - Front View

USG 2485
Attachment



NOTE: FIGURE IS REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid 111 to be positioned in a perfect erect attitude.

HYBRID 111 Exterior Body Dimensions - Side View



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Head Droip	Test Date:	2/18/2014
		Test Time:	10:42:22 AM

Component Part Number	Component Serial Number
Head Skin - 78051-228	S329

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.50 deg C P
Humidity	10 -- 70	22.50 %RH P
Resultant Acceleration	225 -- 275	272.5 G's P
Oscillation	0 -- 10	3.4 % P
Lateral Acceleration	-15 -- 15	-3.5 G's P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



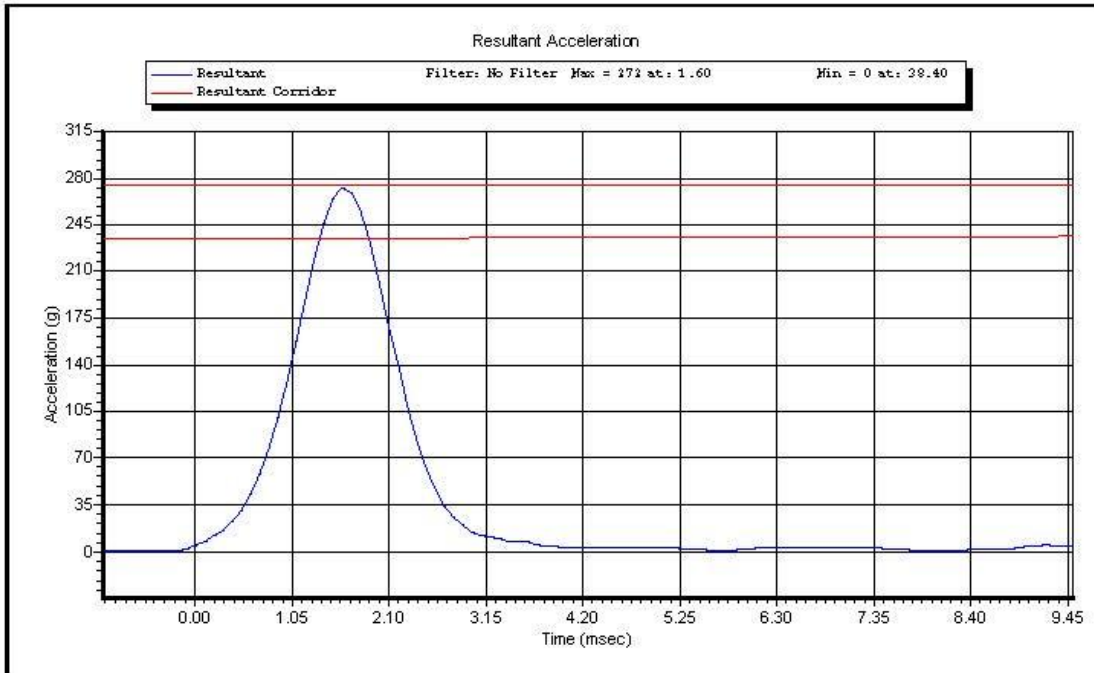
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58998	2/10/2014
Endevco	7264-2000	P58912	2/10/2014
Endevco	7264-2000	P58997	2/10/2014



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**

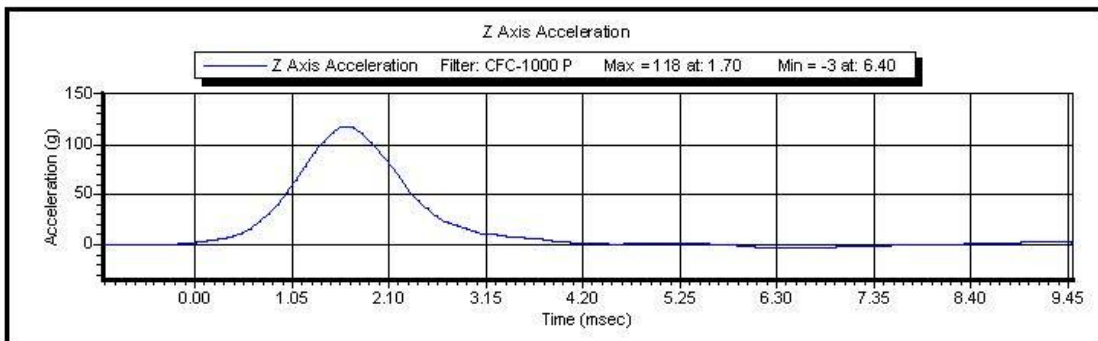
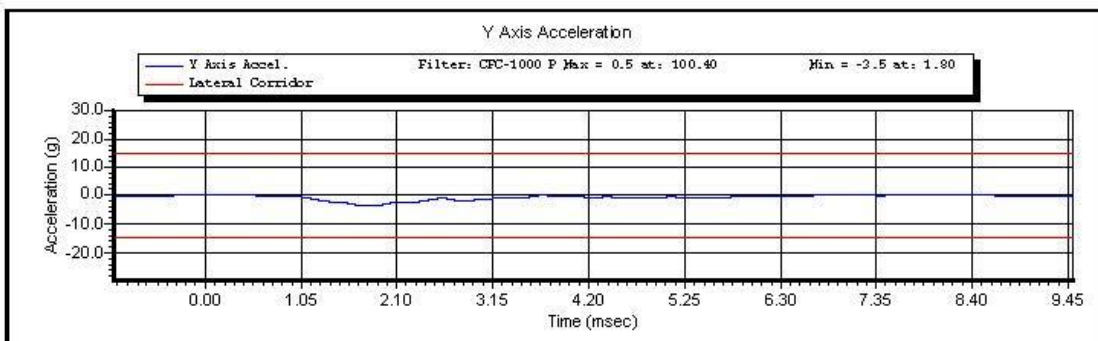
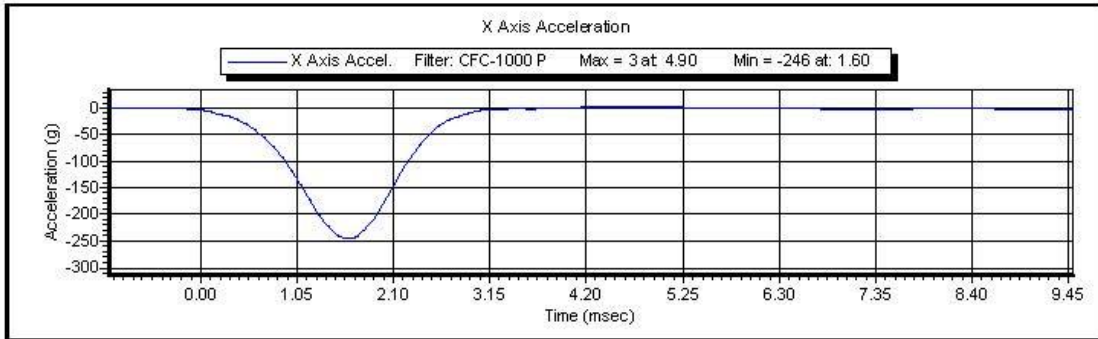


Test ID: **Head Droip**

Test Time: **10:42:22 AM**

Test Date: **2/18/2014**

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Test ID: **Head Droip**

Test Time: **10:42:22 AM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Neck Extension	Test Date:	2/18/2014
		Test Time:	1:18:06 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4196

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.20 deg C P
Humidity	10 -- 70	21.30 %RH P
Velocity	5.94 -- 6.19	6.025 m/s P
Pendulum Deceleration at 10 ms	17.2 -- 21.2	18.85 G's P
Pendulum Deceleration at 20 ms	14.0 -- 19.0	15.03 G's P
Pendulum Deceleration at 30 ms	11.0 -- 16.0	12.69 G's P
Max Pendulum Deceleration after 30 ms	0.0 -- 22.0	12.84 G's P
Deceleration Time to 5 G's	38 -- 46	43.5 ms P
D Plane Rotation	81 -- 106	94.5 degrees P
Time at Max Rotation	72 -- 82	77.1 ms P
Rotation Decay to Zero	147 -- 174	161.3 ms P
Moment About Occipital Condyle	-80.0 -- -52.9	-66.78 Nm P
Time at Maximum Moment	65 -- 79	72.6 ms P
Moment Decay to Zero	120 -- 148	142.4 ms P

All test parameters are within specifications

Technician: **R. Weil**
 Supervisor: **E. Dutton**



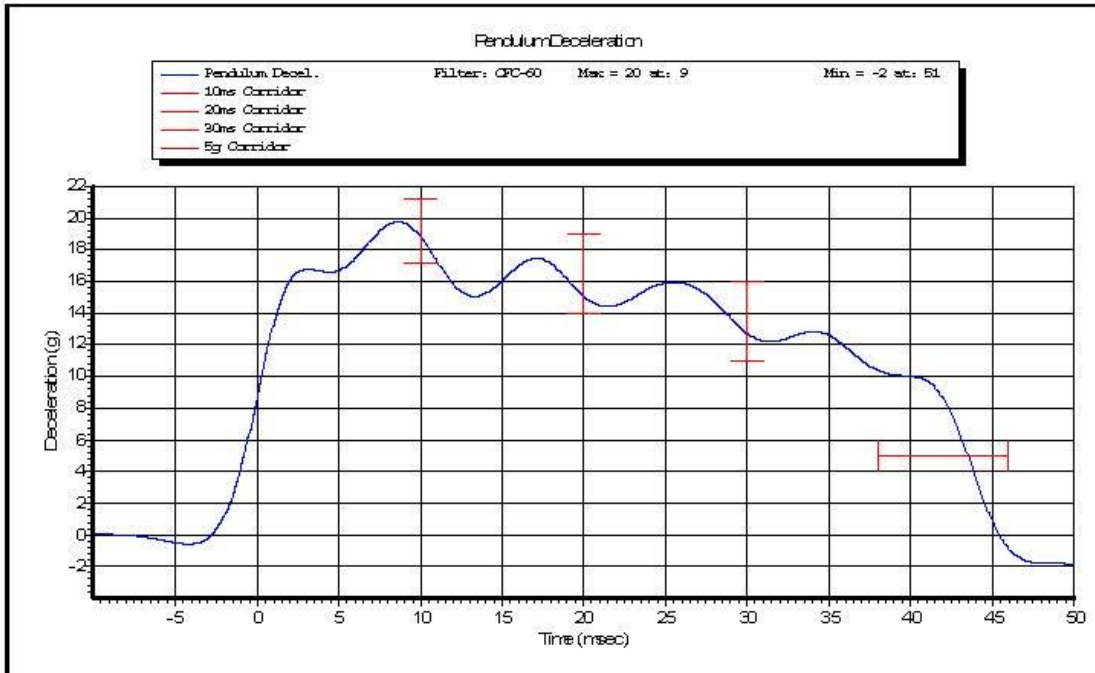
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
First Technology	IF-205	LC-161 My	4/30/2013
First Technology	IF-205	LC-161 Fx	4/30/2013



Name of Test:	Neck Extension
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	142

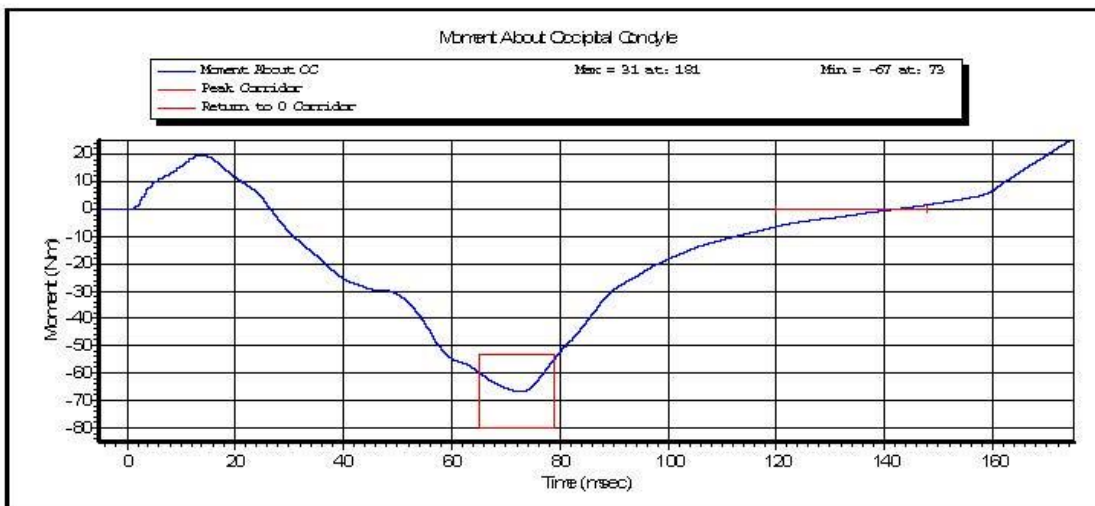
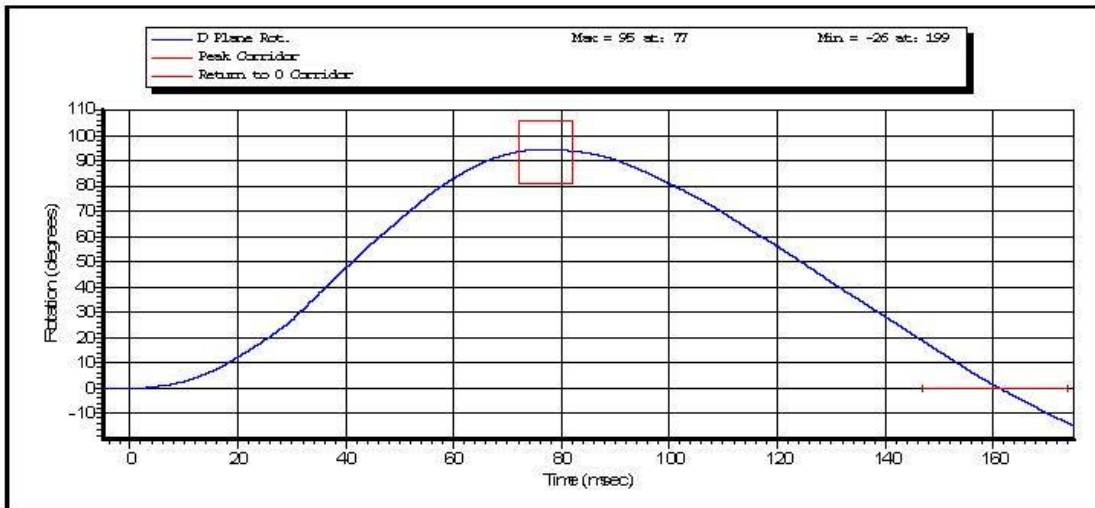


ID of Test: **Neck Extension**

Time of Test: **1:18:06 PM**

Date of Test: **2/18/2014**

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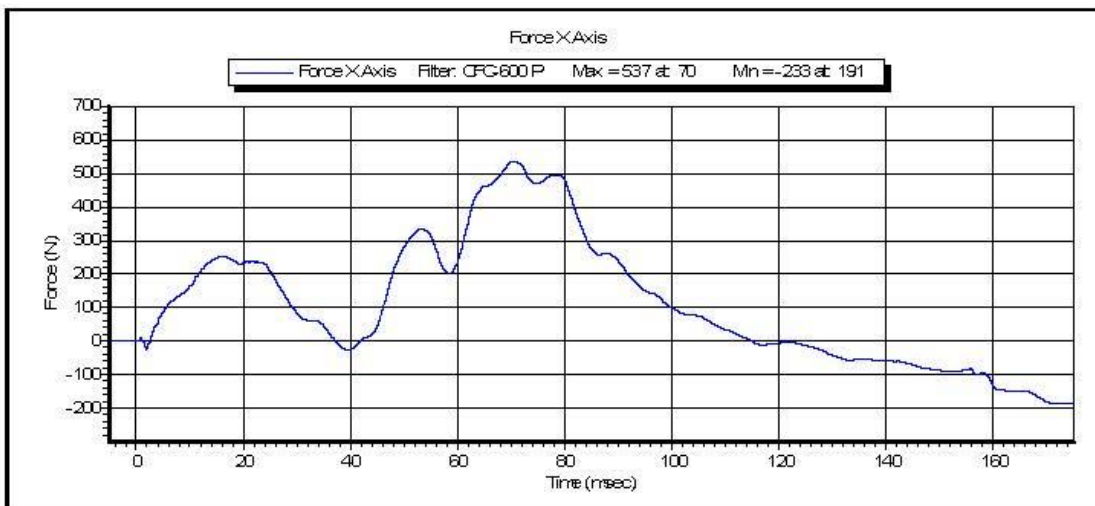
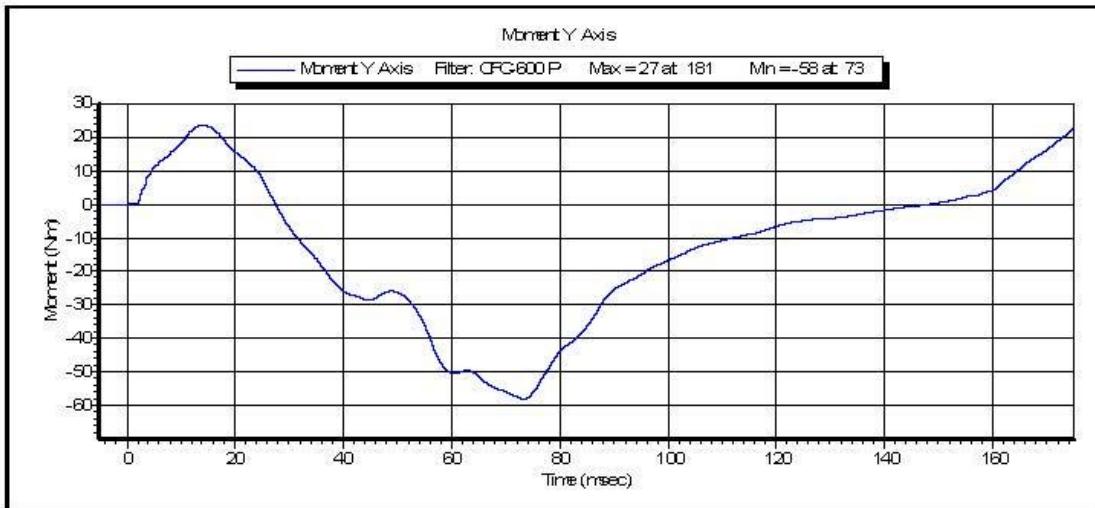


ID of Test: **Neck Extension**

Time of Test: **1:18:06 PM**

Date of Test: **2/18/2014**

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ID of Test: **Neck Extension**

Time of Test: **1:18:06 PM**

Date of Test: **2/18/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Neck Flexion	Test Date:	2/18/2014
		Test Time:	12:45:23 PM

Component Part Number	Component Serial Number
Neck - 78051-336	4196

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.50 deg C P
Humidity	10 -- 70	21.30 %RH P
Velocity	6.89 -- 7.13	6.981 m/s P
Pendulum Deceleration at 10 ms	22.5 -- 27.5	24.69 G's P
Pendulum Deceleration at 20 ms	17.6 -- 22.6	20.01 G's P
Pendulum Deceleration at 30 ms	12.5 -- 18.5	13.96 G's P
Maximum Pendulum Deceleration After 30 ms	0 -- 29	15.0 G's P
Deceleration Time to 5 ms	34 -- 42	39.0 ms P
D Plane Rotation	-78 -- -64	-68.7 degrees P
Time at Maximum Rotation	57 -- 64	58.1 ms P
Rotation Decay to Zero	113 -- 128	113.3 ms P
Moment About Occipital Condyle	88.1 -- 108.4	98.47 Nm P
Time at Maximum Moment	47 -- 58	52.4 ms P
Moment Decay to Zero	97.0 -- 107.0	98.5 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



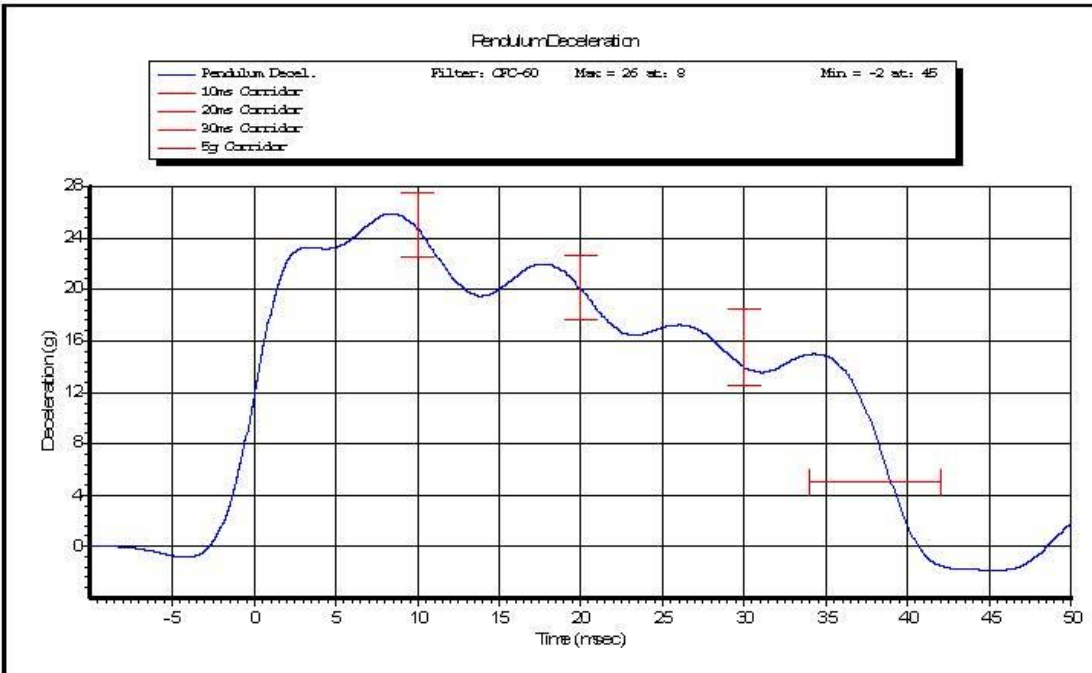
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
First Technology	IF-205	LC-161 My	4/30/2013
First Technology	IF-205	LC-161 Fx	4/30/2013



Name of Test:	Neck Flexion
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	142

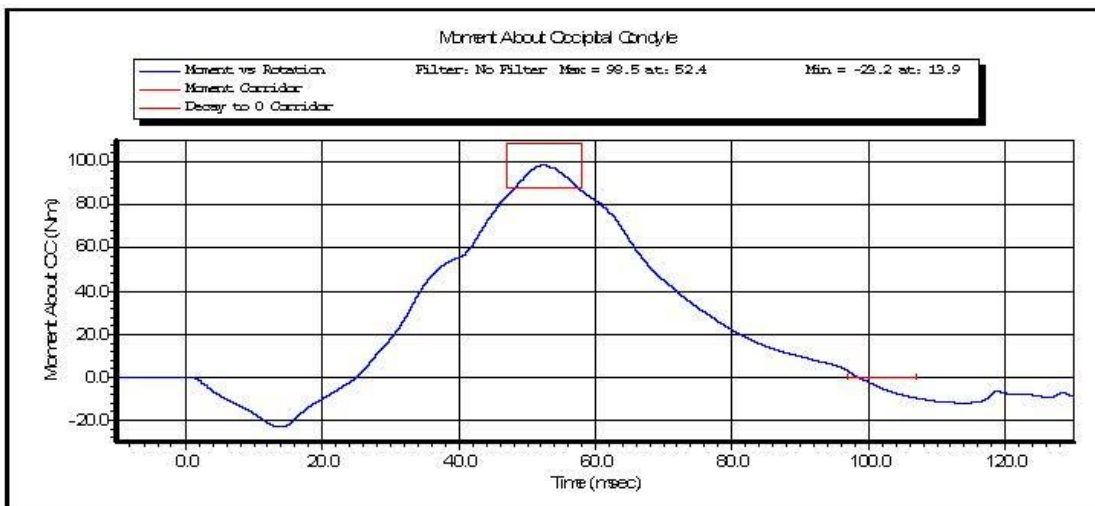
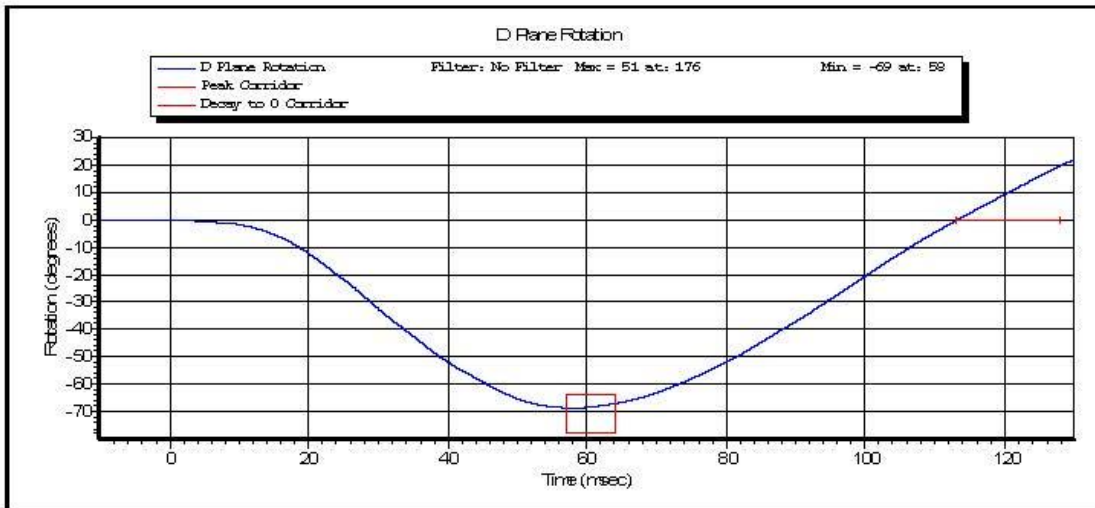


ID of Test: **Neck Flexion**

Time of Test: **12:45:23 PM**

Date of Test: **2/18/2014**

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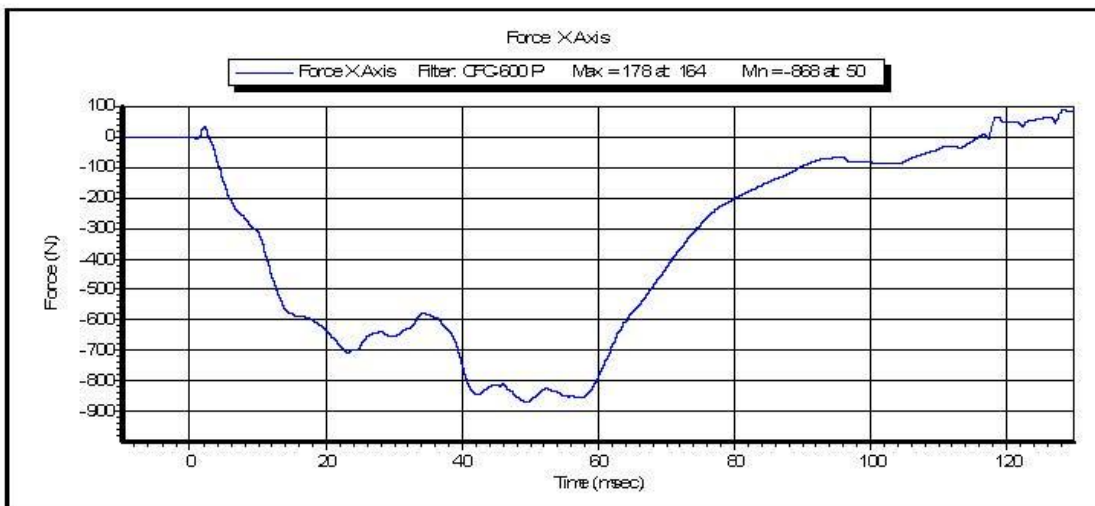
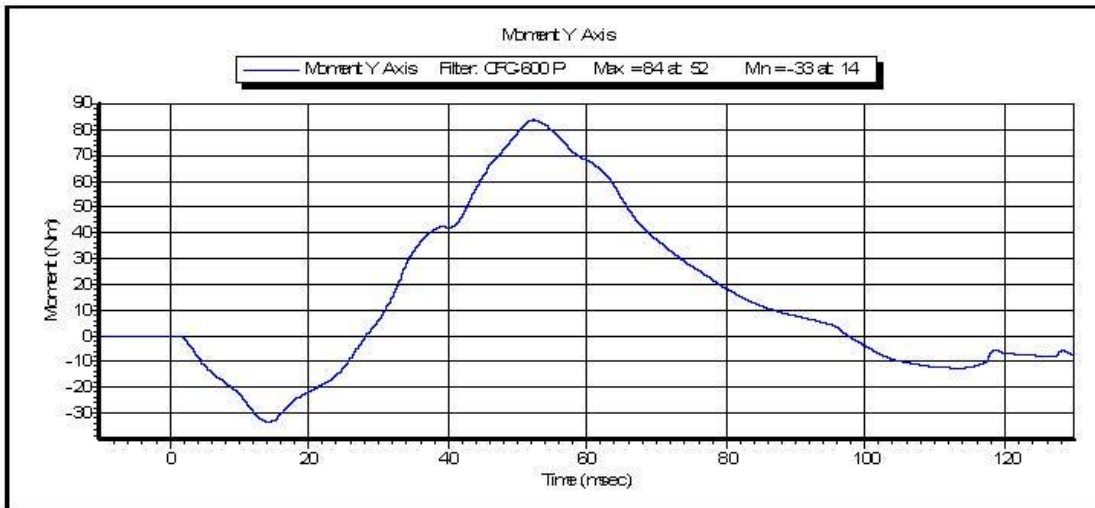


ID of Test: **Neck Flexion**

Time of Test: **12:45:23 PM**

Date of Test: **2/18/2014**

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ID of Test: **Neck Flexion**

Time of Test: **12:45:23 PM**

Date of Test: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Thorax Impact	Test Date:	2/18/2014
		Test Time:	4:36:04 PM

Component Part Number	Component Serial Number
Chest Jacket - 78051-169	100

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.90 deg C P
Humidity	10 -- 70	22.90 %RH P
Velocity	6.59 -- 6.83	6.663 m/s P
Chest Deflection	-72.6 -- -63.5	-68.17 mm P
Resistive Force	-5.894 -- -5.160	-5.8141 kN P
Hysteresis	69 -- 85	72.6 % P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



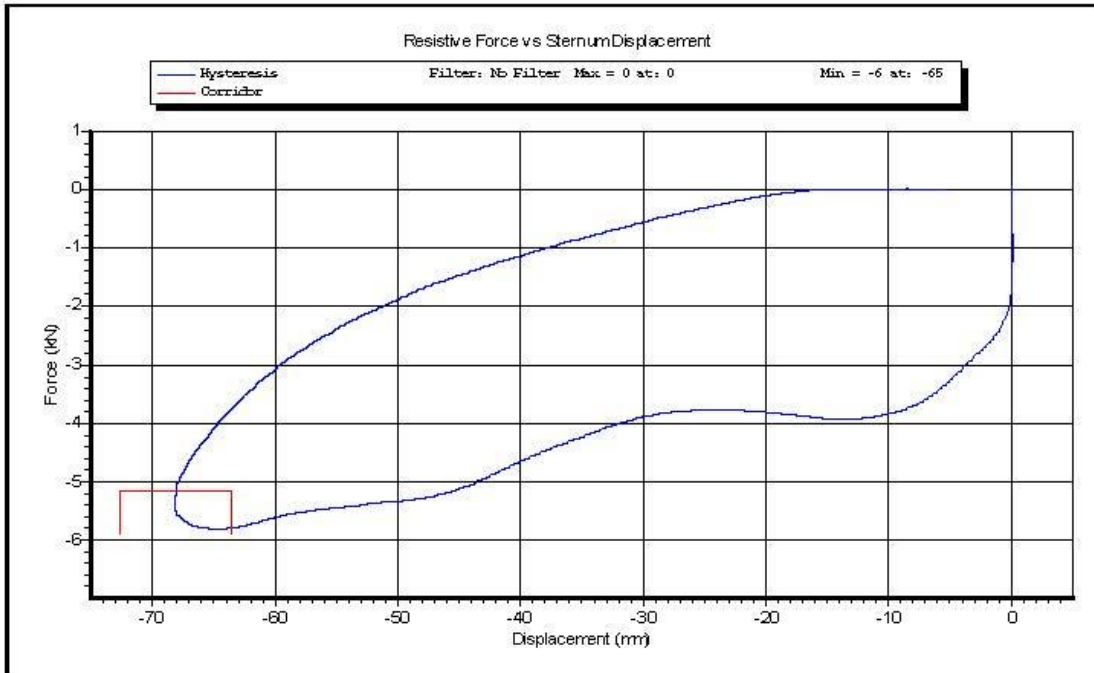
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
SERVO	78051-342	DS-142	11/18/2013



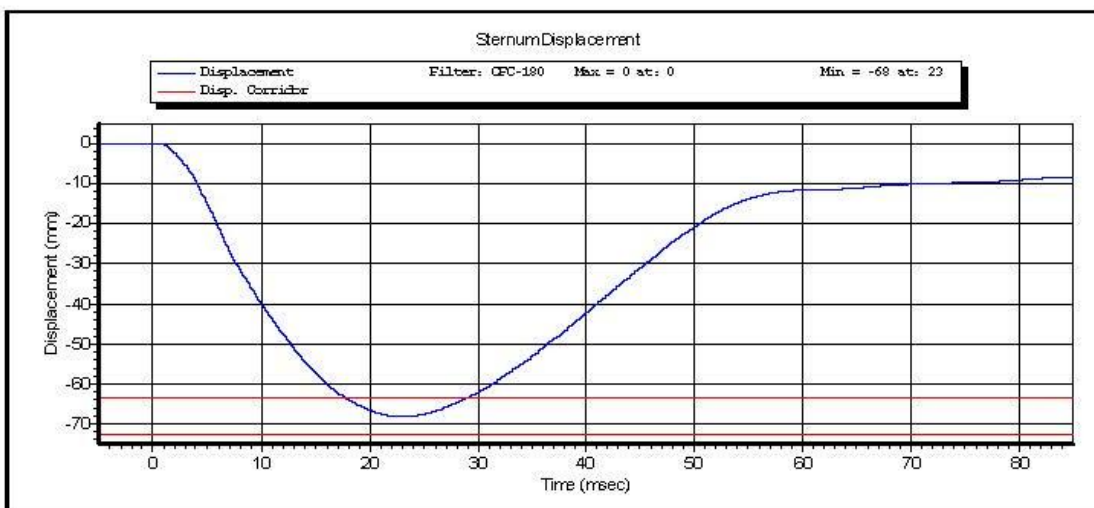
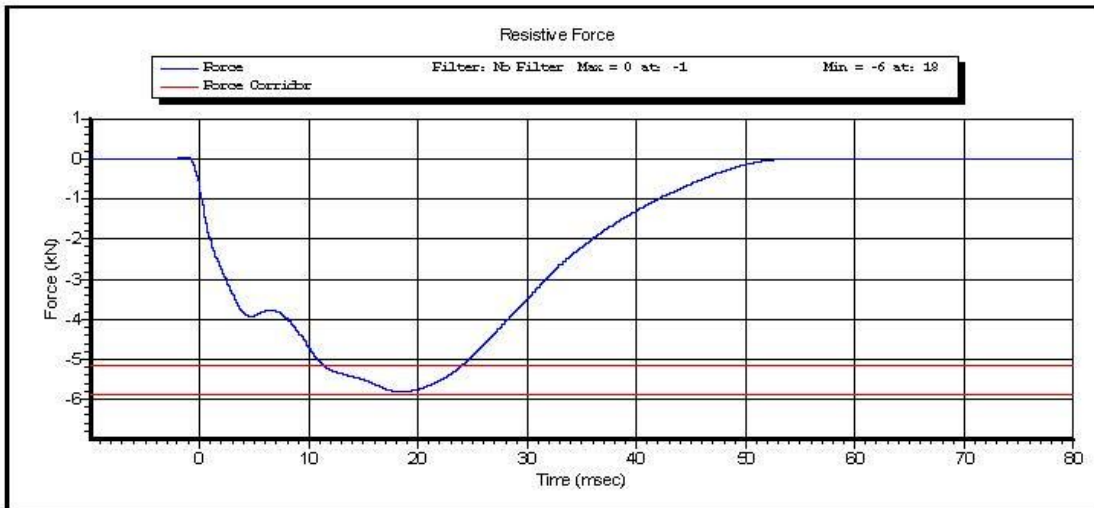
Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Thorax Impact** Test Time: **4:36:04 PM**

Test Date: **2/18/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

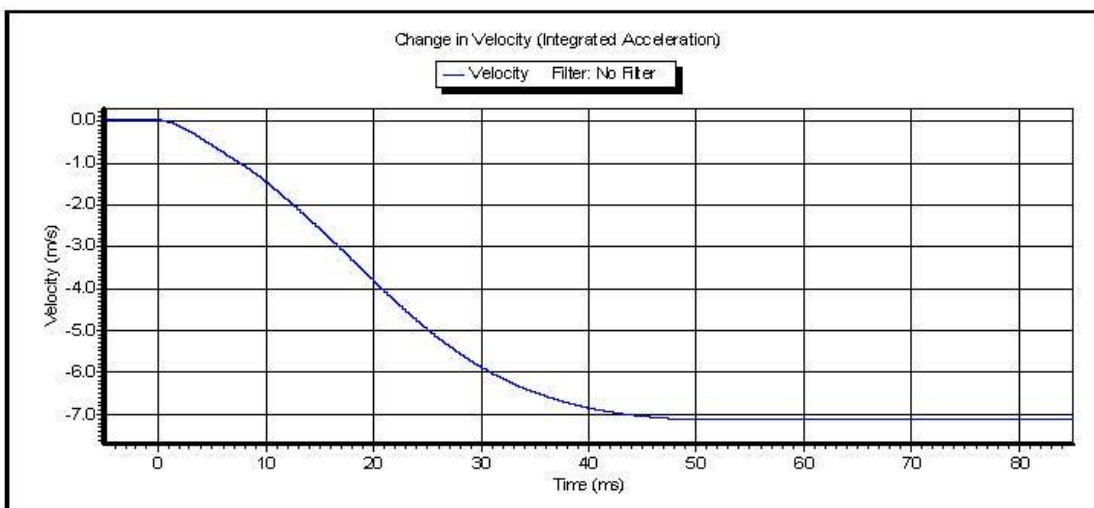


Test ID: **Thorax Impact**

Test Time: **4:36:04 PM**

Test Date: **2/18/2014**

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Test ID: **Thorax Impact**

Test Time: **4:36:04 PM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Hip ROM Left	Test Date:	2/18/2014
		Test Time:	8:25:48 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.60 deg C P
Humidity	10 -- 70	22.60 %RH P
Average Velocity	5 -- 10	6.1 deg/s P
Angle at 203 Nm	40 -- 50	44.3 degrees P
Moment at 30 degrees	0.0 -- 94.9	83.18 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



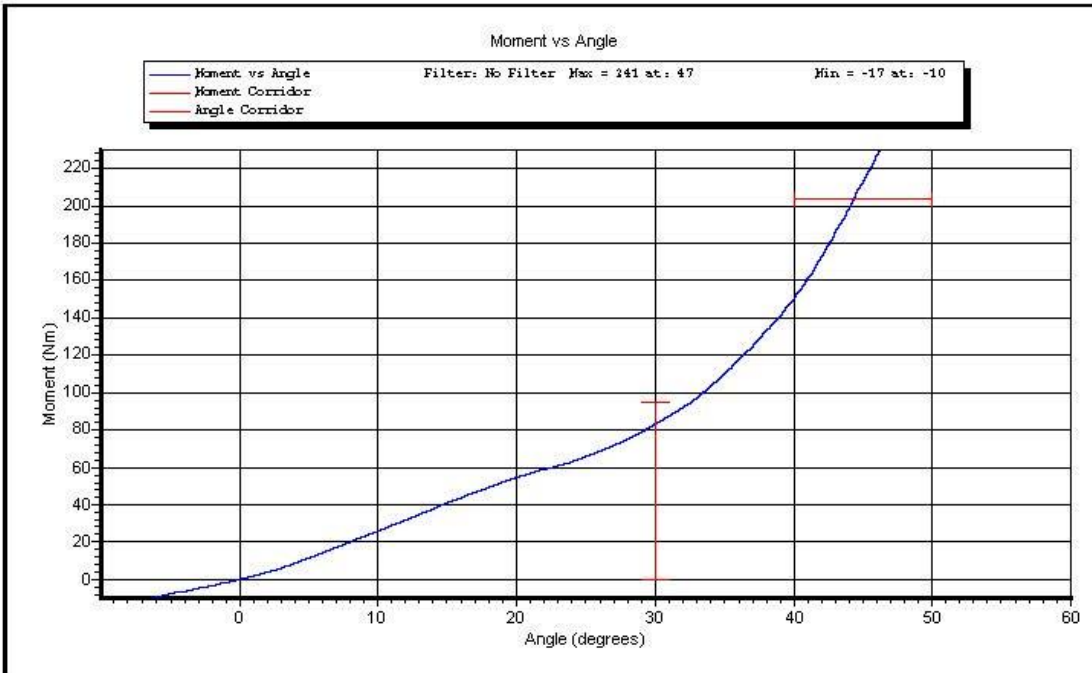
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/21/2013
DentonATD	AD Output	1	1/11/2014



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Hip ROM Left**

Test Time: **8:25:48 AM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Hip ROM Right	Test Date:	2/18/2014
		Test Time:	9:03:00 AM

Component Part Number	Component Serial Number
Pelvis Assembly 78051-60	

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.80 deg C P
Humidity	10 -- 70	21.80 %RH P
Average Velocity	5 -- 10	5.9 deg/s P
Angle at 203 Nm	40 -- 50	42.0 degrees P
Moment at 30 degrees	0.0 -- 94.9	92.31 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **E. Dutton**



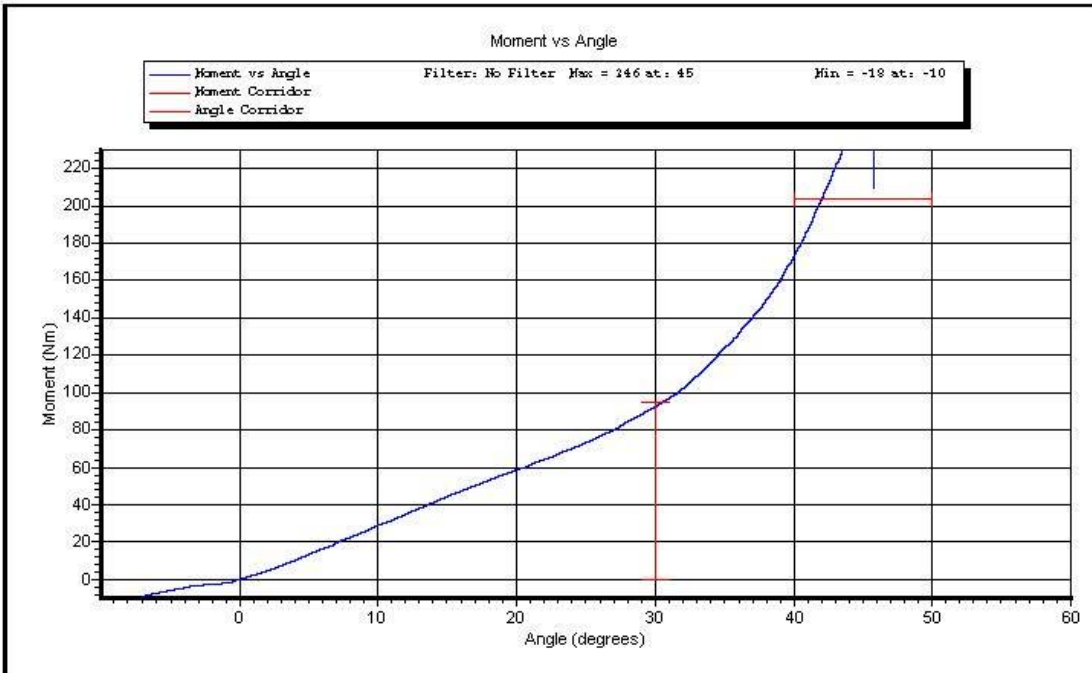
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/19/2013
DentonATD	14 CB1-3615	0008	2/21/2013
DentonATD	AD Output	1	1/11/2014



Test Name: **Hip ROM**
Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Hip ROM Right**

Test Time: **9:03:00 AM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Knee Impact LEft	Test Date:	2/17/2014
		Test Time:	7:23:48 AM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	078

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.20 deg C P
Humidity	10 -- 70	12.10 %RH P
Velocity	2.07 -- 2.13	2.118 m/s P
Resistive Force	-5.780 -- -4.720	-4.887 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



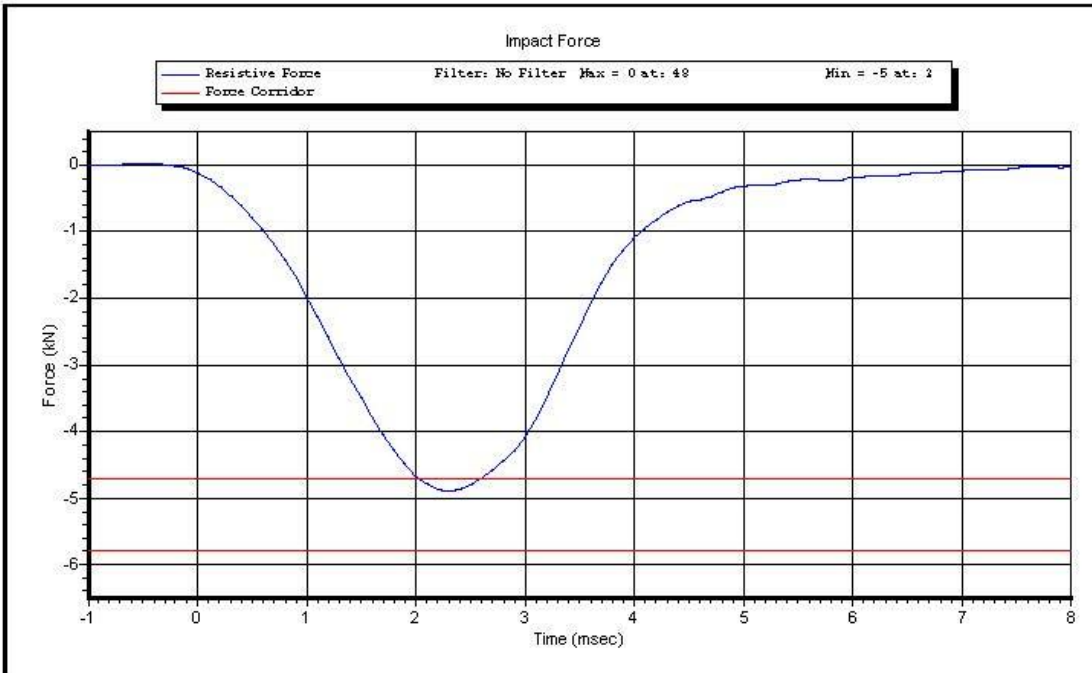
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



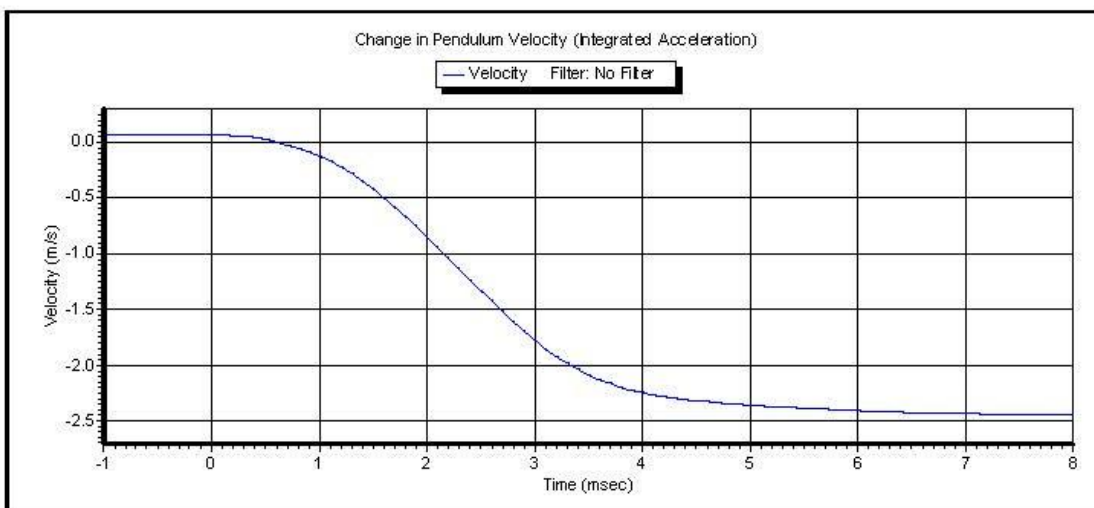
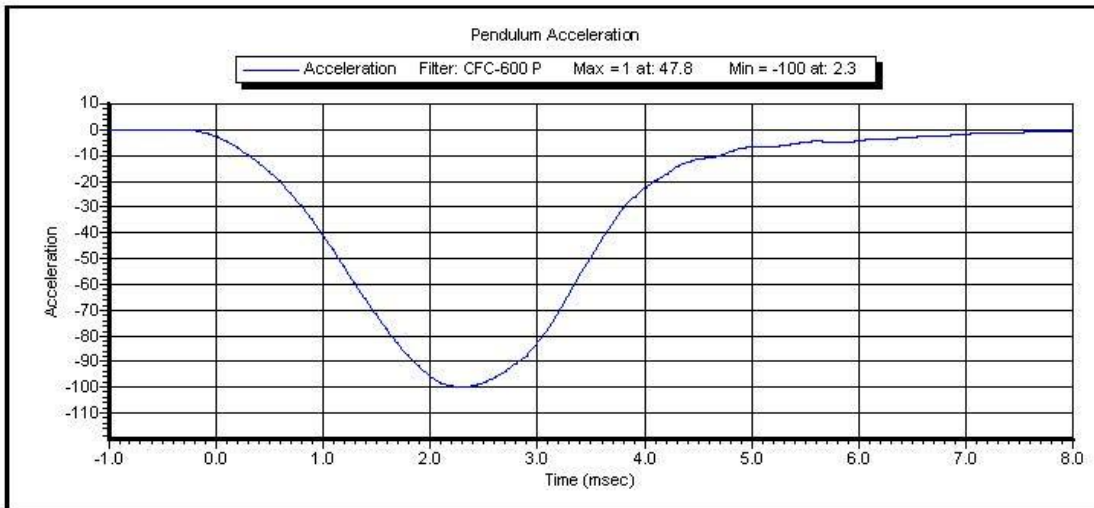
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Knee Impact Left** Test Time: **7:23:48 AM**

Test Date: **2/17/2014**

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Test ID: **Knee Impact LEft** Test Time: **7:23:48 AM**

Test Date: **2/17/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	142		
Test ID:	Knee Impact Right	Test Date:	2/17/2014
		Test Time:	7:32:08 AM

Component Part Number	Component Serial Number
Knee Skin - 78051(L) or 6(R)	3307

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.20 deg C P
Humidity	10 -- 70	12.10 %RH P
Velocity	2.07 -- 2.13	2.118 m/s P
Resistive Force	-5.780 -- -4.720	-5.563 kN P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



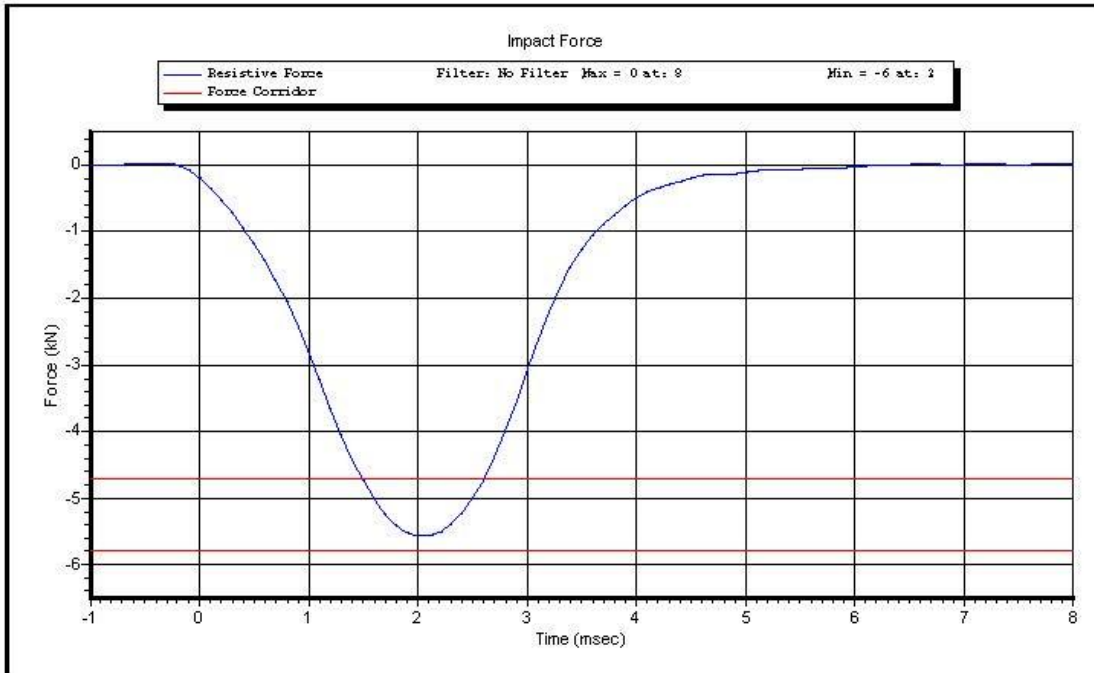
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



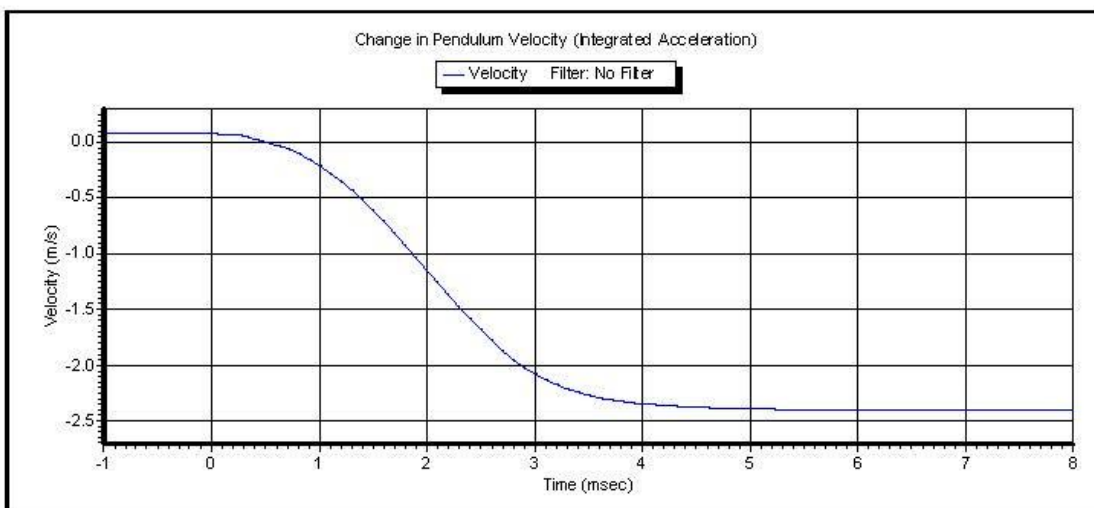
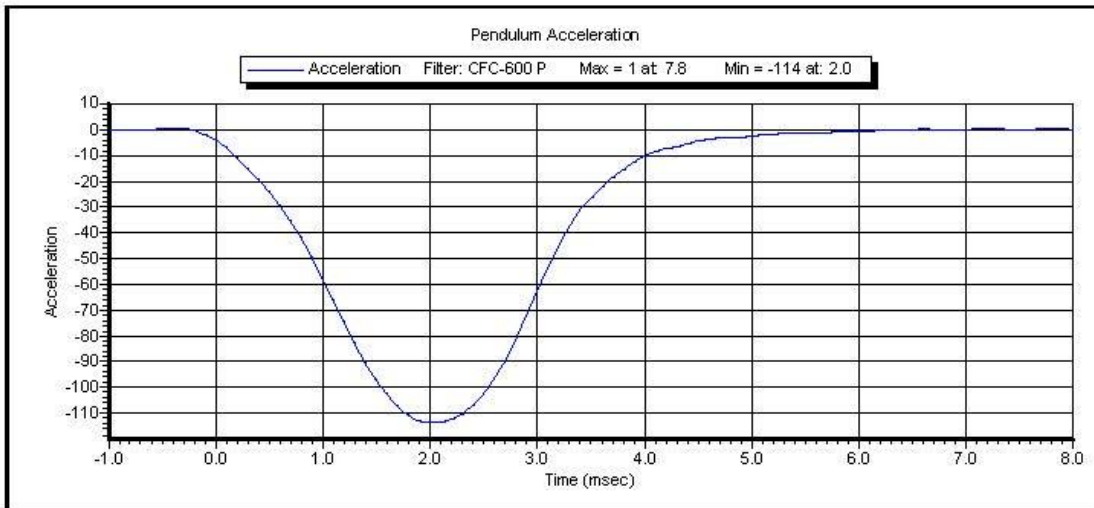
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Sub Test Name:
ATD Type: **Hybrid 3 - 50th Male**
ATD Serial Number: **142**



Test ID: **Knee Impact Right** Test Time: **7:32:08 AM**

Test Date: **2/17/2014**

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Test ID: **Knee Impact Right** Test Time: **7:32:08 AM**

Test Date: **2/17/2014**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139



External Measurements

5th Female SN 139

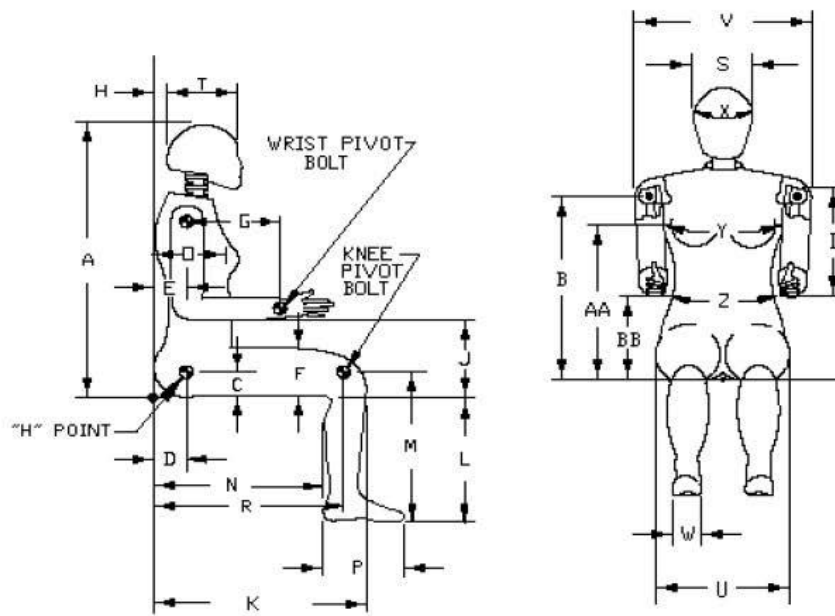
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	774.7 – 800.1	790	Yes
B	Shoulder Pivot Height	431.8 – 457.2	447	Yes
C	H-Point Height	81.3 – 86.3	85	Yes
D	H-Point from Backline	144.8 – 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	74	Yes
F	Thigh Clearance	119.4 – 134.6	125	Yes
G	Back of Elbow to Wrist Pivot	243.9 – 259.1	248	Yes
H	Head Back to Backline	43.2 – 48.2	44	Yes
I	Shoulder to Elbow Length	276.8 – 297.2	291	Yes
J	Elbow Rest Height	182.8 – 203.2	186	Yes
K	Buttock to Knee Length	520.7 – 546.1	542	Yes
L	Popliteal Height	355.6 - 376	360	Yes
M	Knee Pivot Height	393.7 – 419.1	397	Yes
N	Buttock Popliteal Length	414 – 439.4	422	Yes
O	Chest Depth without Jacket	175.3 – 190.5	183	Yes
P	Foot Length (right)	218.5 – 233.7	219	Yes
R	Buttock To Knee Pivot Length	457.2 – 482.6	471	Yes
S	Head Breadth	137.1 – 147.3	140	Yes
T	Head Depth	177.8 - 188	181	Yes
U	Hip Breadth	299.7 – 314.9	301	Yes
V	Shoulder Breadth	350.5 – 365.7	361	Yes
W	Foot Breadth	78.8 - 94	82	Yes
X	Head Circumference	528.3 – 548.7	536	Yes
Y	Chest Circumference with Jacket	850.9 – 881.3	851	Yes
Z	Waist Circumference	759.5 – 789.9	771	Yes
AA	Reference Location (Chest Circumference)	332.7 – 358.1	356	Yes
BB	Reference Location (Waist Circumference)	160.1 – 170.2	170	Yes

Technician: M. Geesey

Date: 02/18/2014

Hybrid III 5th Female External Measurements

Reference Diagram





VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Head Drop	Test Date:	2/18/2014
		Test Time:	2:31:43 PM

Component Part Number	Component Serial Number
Head Skin - 78051-228	05067
Cap Skin - 78051-229	05447

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	22.10 deg C P
Humidity	10 -- 70	21.60 %RH P
Resultant Acceleration	250 -- 300	270.0 G's P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-3.6 G's P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



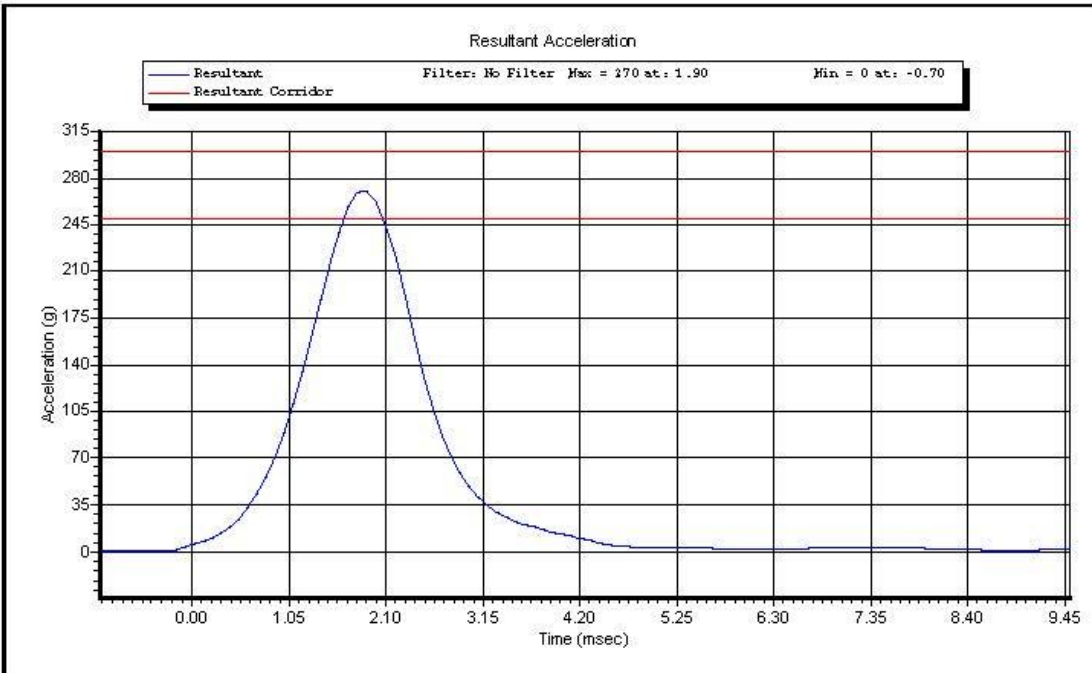
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	1/28/2014
Endevco	7264-2000	P52007	1/28/2014
Endevco	7264-2000	P51298	1/28/2014



Test Name: **Head Drop**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**

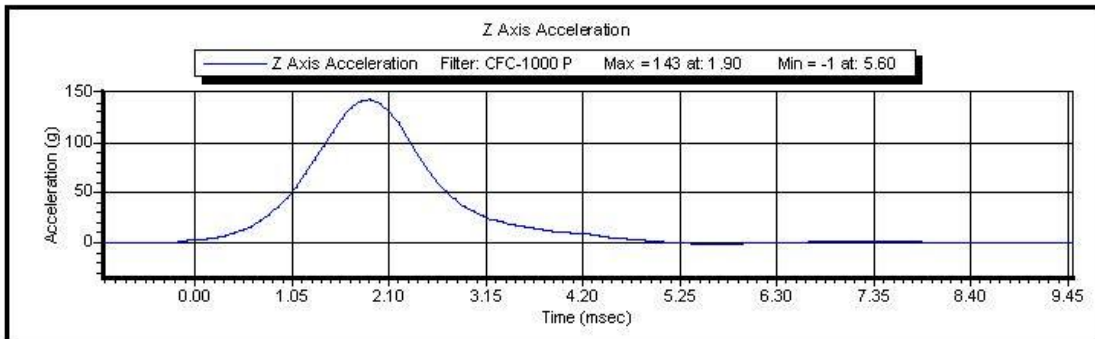
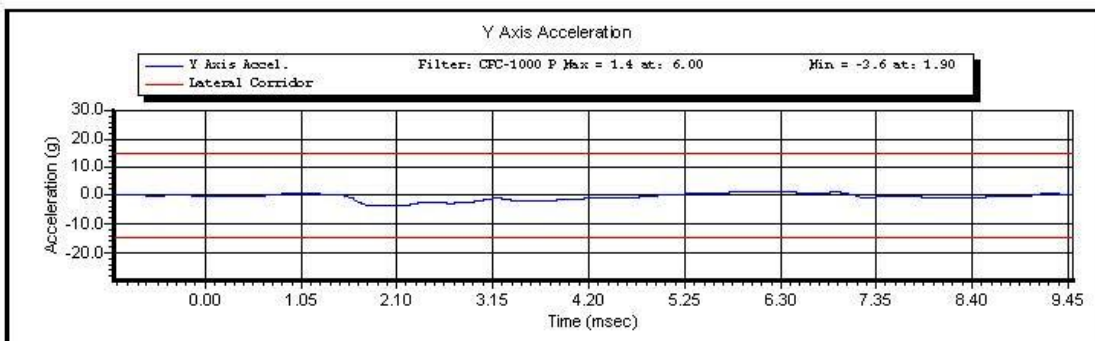
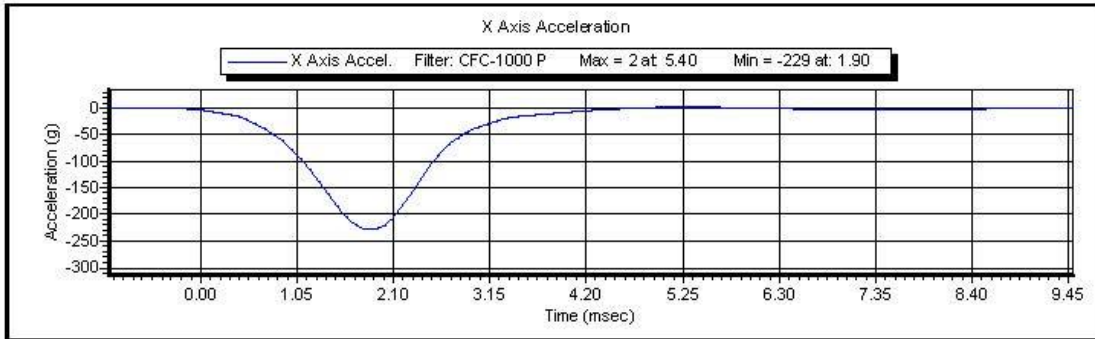


Test ID: **Head Drop**

Test Time: **2:31:43 PM**

Test Date: **2/18/2014**

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Test ID: **Head Drop**

Test Time: **2:31:43 PM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Extension	Test Date:	2/18/2014
		Test Time:	4:53:06 PM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.80 deg C P
Humidity	10 -- 70	22.90 %RH P
Velocity	5.95 -- 6.19	6.019 m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	1.84 m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	3.65 m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	5.25 m/s P
D Plane Rotation	99 -- 114	110.8 degrees P
Moment During Rotation Interval	-65 -- -53	-55.2 Nm P
Moment Decay to -10.0 Nm	94 -- 114	103.9 ms P

All test parameters are within specifications

Technician: **M. Goehle**

Supervisor: **E. Dutton**



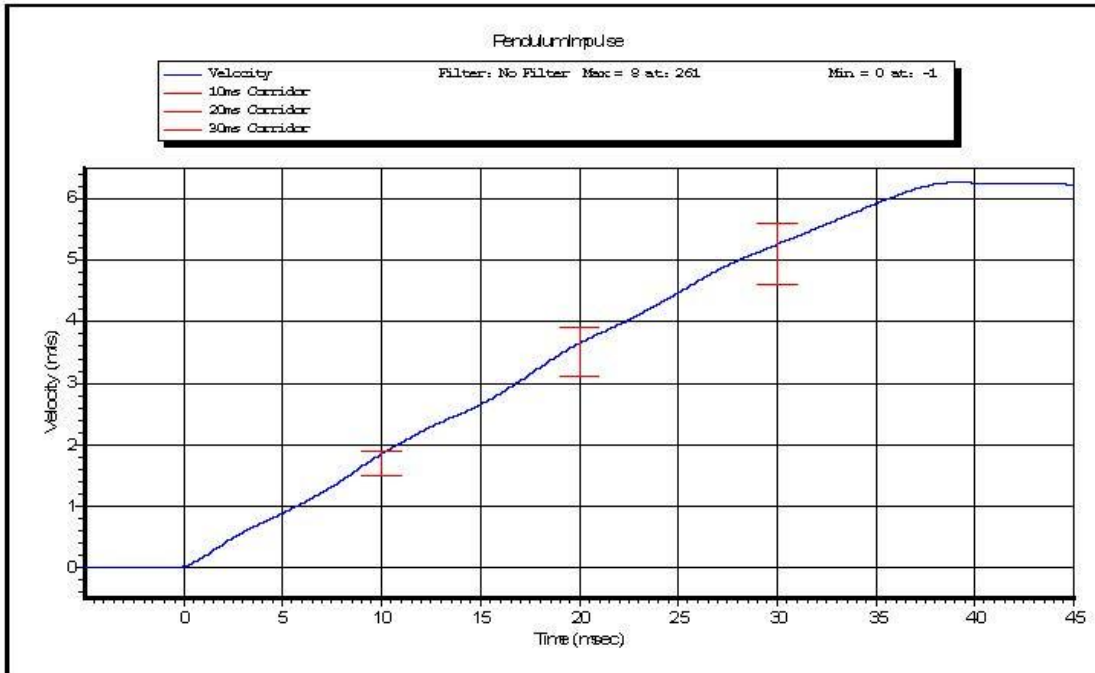
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



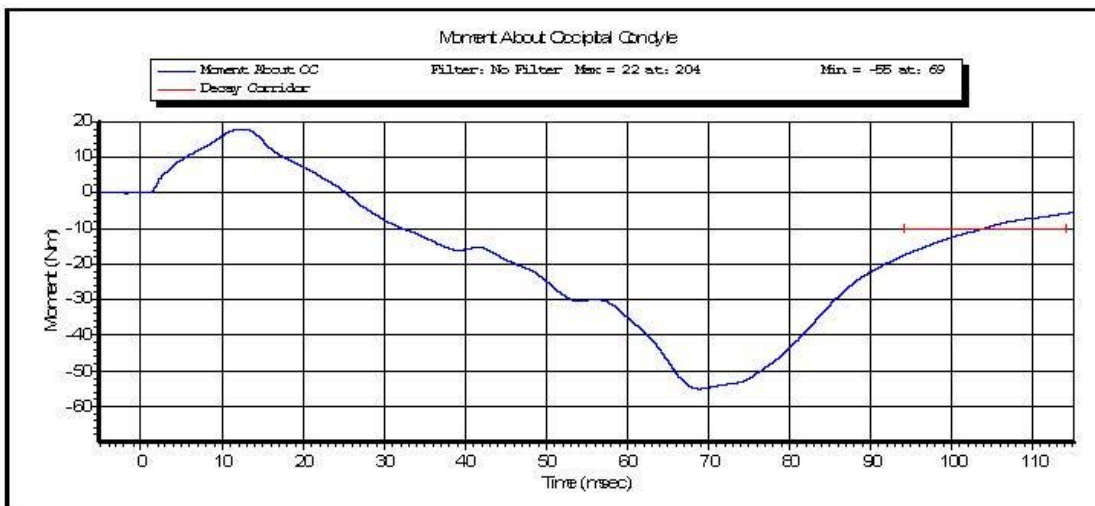
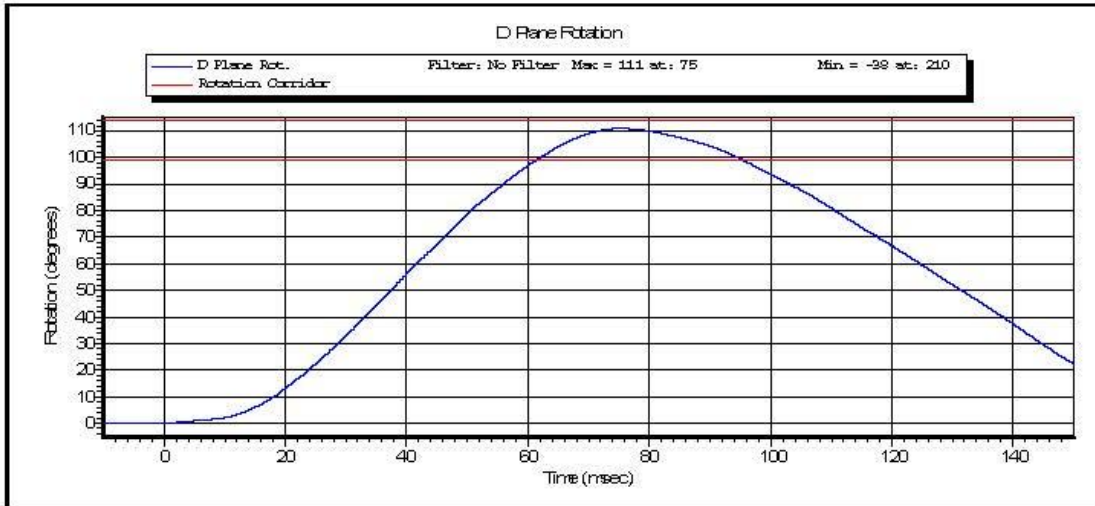
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Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Neck Extension** Test Time: **4:53:06 PM**

Test Date: **2/18/2014**

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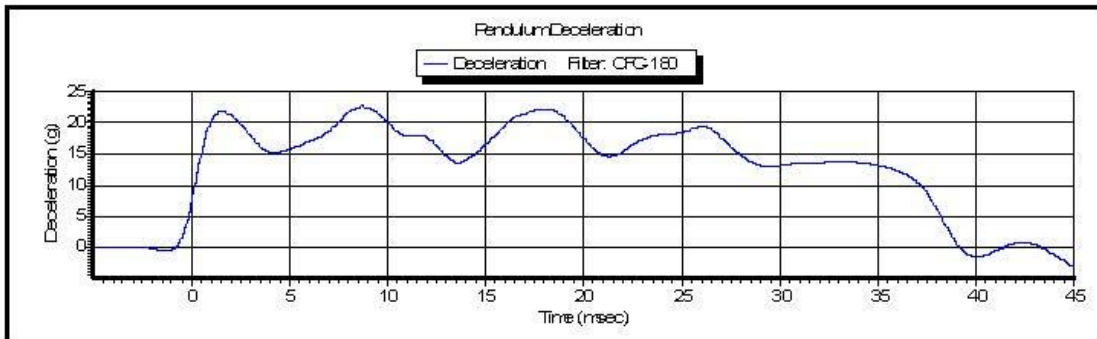
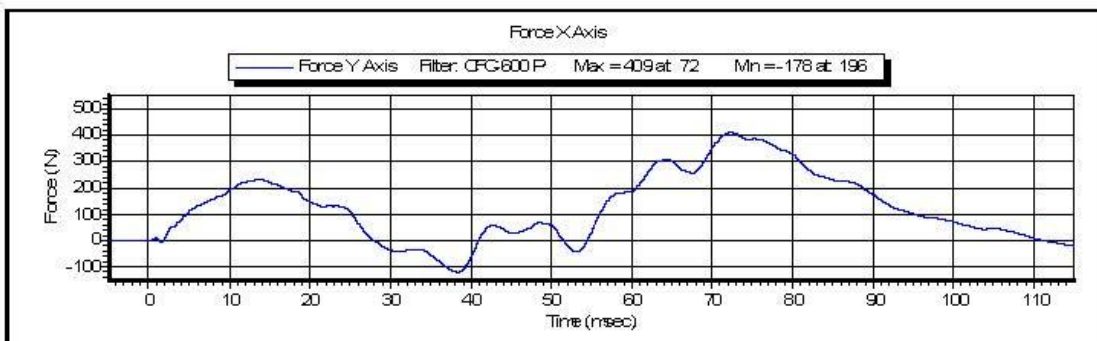
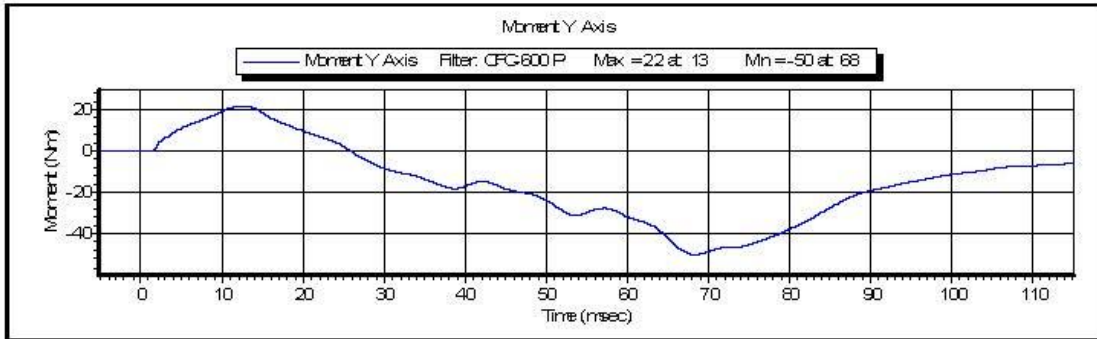


Test ID: Neck Extension

Test Time: 4:53:06 PM

Test Date: 2/18/2014

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Test ID: **Neck Extension** Test Time: **4:53:06 PM**

Test Date: **2/18/2014**

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VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Flexion	Test Date:	2/19/2014
		Test Time:	7:20:09 AM

Component Part Number	Component Serial Number
Neck - 880105-255	DJ1701

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.90 deg C P
Humidity	10.0 -- 70.0	22.90 %RH P
Velocity	6.89 -- 7.13	6.975 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.19 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.3 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.26 m/s P
D Plane Rotation	-91 -- -77	.79.5 degrees P
Moment During Rotation Interval	69 -- 83	76.2 Nm P
Moment Decay to 10.0 Nm	80 -- 100	88.3 ms P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **E. Dutton**



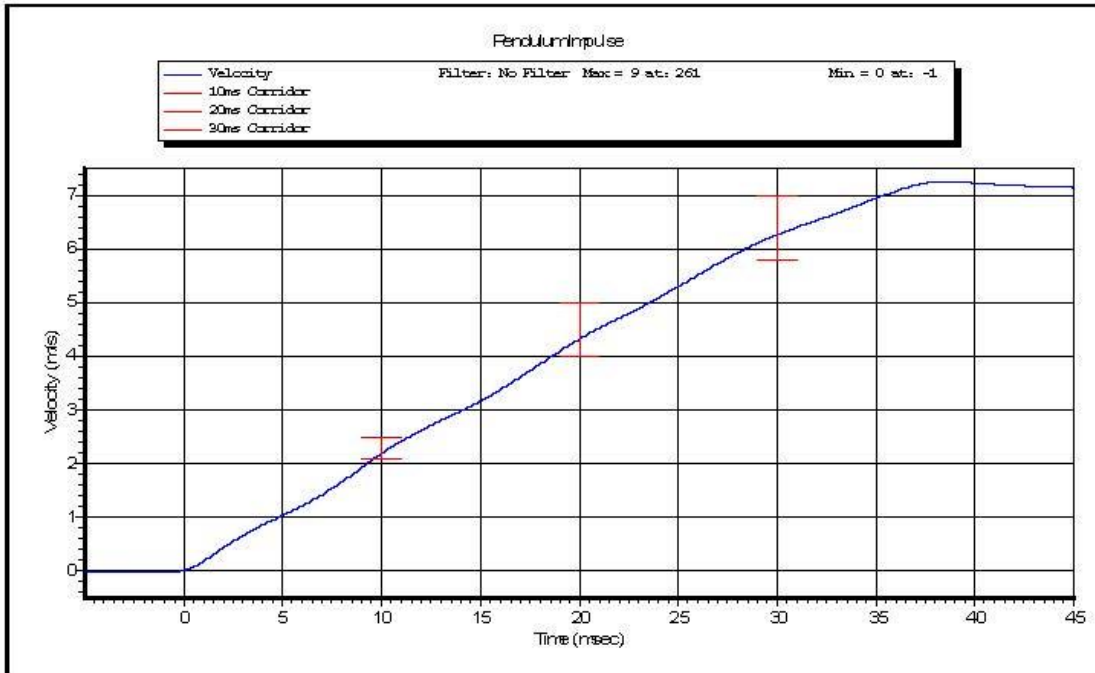
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	10/16/2013
DentonATD	78051-342	PENDULUM POT	1/31/2014
DentonATD	78051-342	CONDYLE POT	1/31/2014
Denton	1716A	LC-2018My	4/30/2013
Denton	1716A	LC-2018Fx	4/30/2013



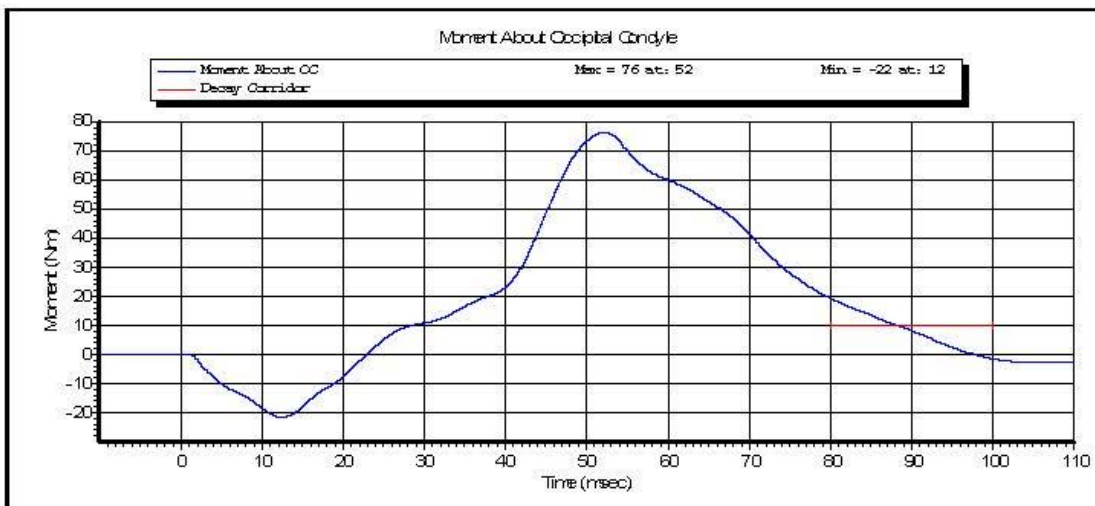
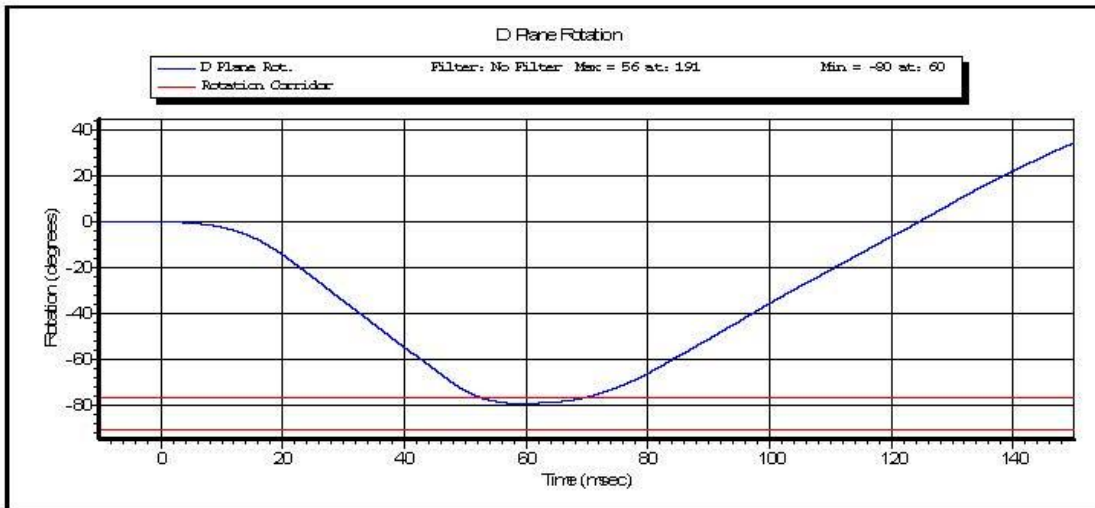
Test Name: **Neck Flexion**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Neck Flexion** Test Time: **7:20:09 AM**

Test Date: **2/19/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

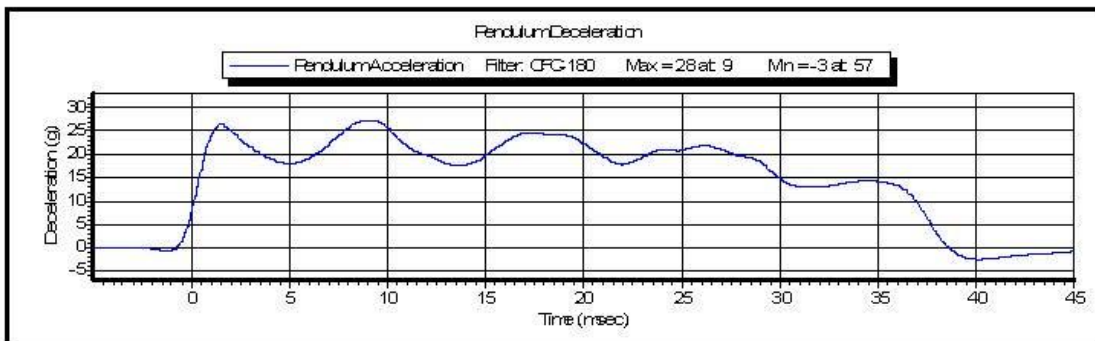
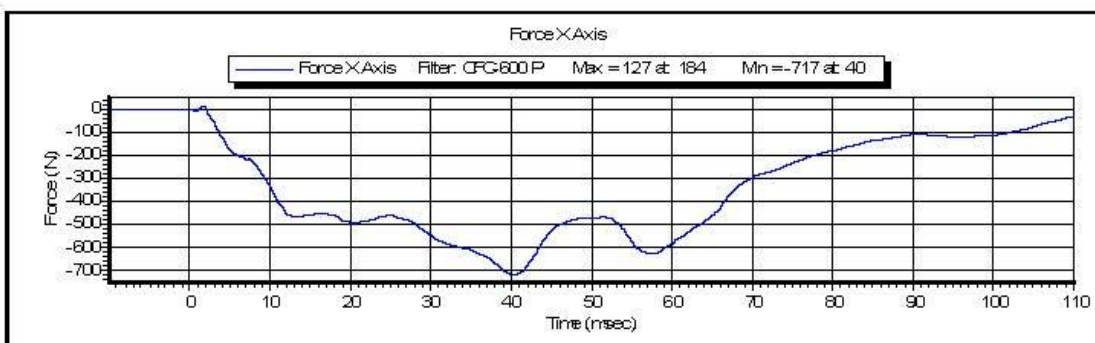
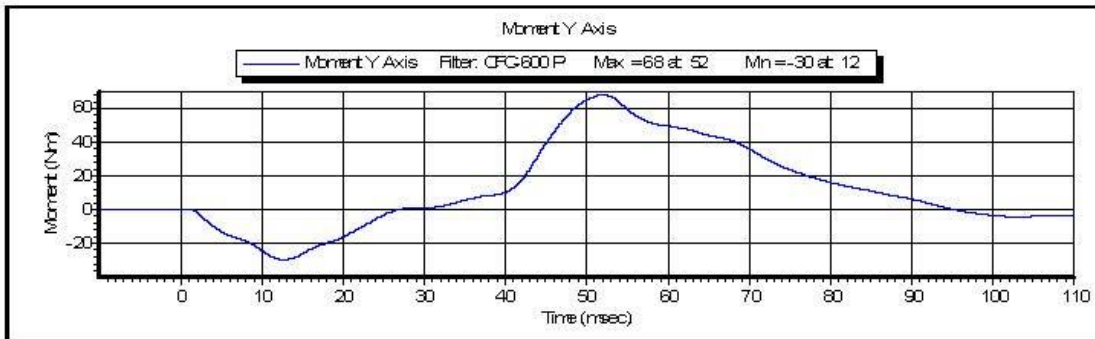


Test ID: Neck Flexion

Test Time: 7:20:09 AM

Test Date: 2/19/2014

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Test ID: **Neck Flexion**

Test Time: **7:20:09 AM**

Test Date: **2/19/2014**

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Torso Flexion
Part 5720 HIII 5% Female

ATD Serial No: 139

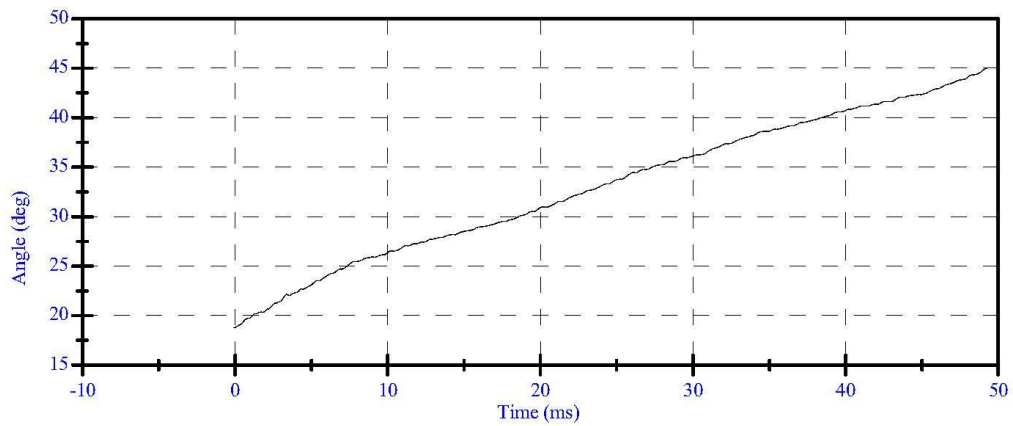
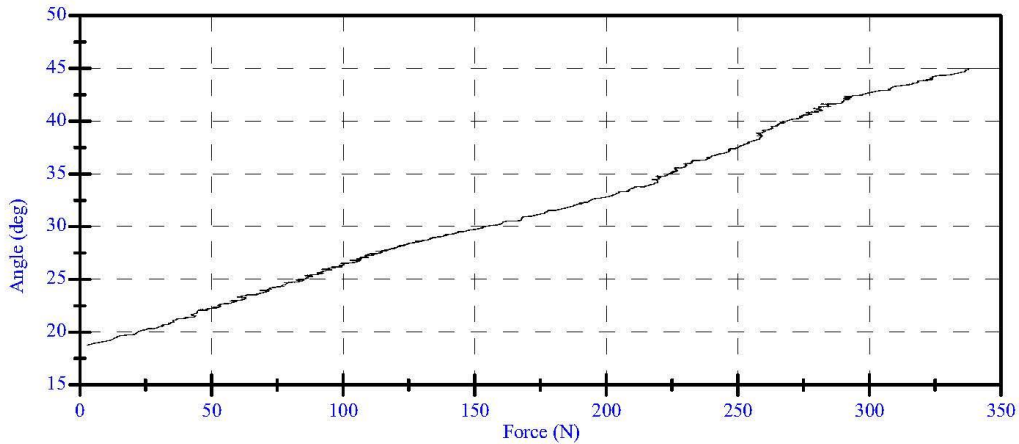
Laboratory Supervisor: E. Dutton

Date: 2/19/2014

Laboratory Technician: M. Goehle

<u>TEST PARAMETER</u>	<u>SPECIFICATION</u>	<u>TEST RESULTS</u>	<u>STATUS</u>
Lab Temperature:	18.9-25.6 C	22.1 C	Passed
Lab Humidity:	10-70 %	24.3 %	Passed
Initial Angle:	0.00-20.00 Deg	18.7 Deg	Passed
Force at 45 Deg	320.00-390.00 N	343.99 N	Passed
Return Angle	8 Deg Max from Initial	21.6 deg	Passed

TORSO FLEXION TEST





VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Thorax Impact	Test Date:	2/17/2014
		Test Time:	9:37:04 AM

Component Part Number	Component Serial Number
Ribs 880105-RS	05032011A
Chest Jacket - 880105-355-E	05177

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.30 deg C P
Humidity	10 -- 70	12.90 %RH P
Velocity	6.59 -- 6.83	6.822 m/s P
Sternum Displacement	-58 -- -50	-55.0 mm P
Force During Displacement Interval	-4400 -- -3900	-4226.4 N P
Force During -18mm to -50mm Displacem	-4600 -- 0	-4148.8 N P
Hysteresis	69 -- 85	71.7 % P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



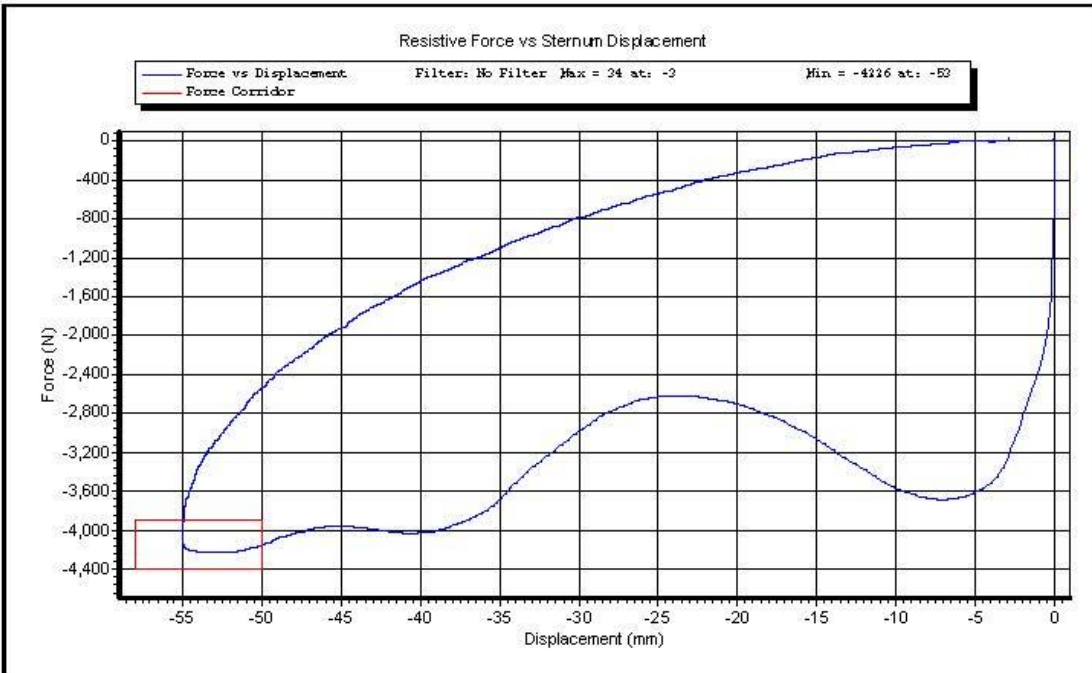
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013
DentonATD	H3CD	DS-139	11/20/2013



Test Name: **Thorax Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**

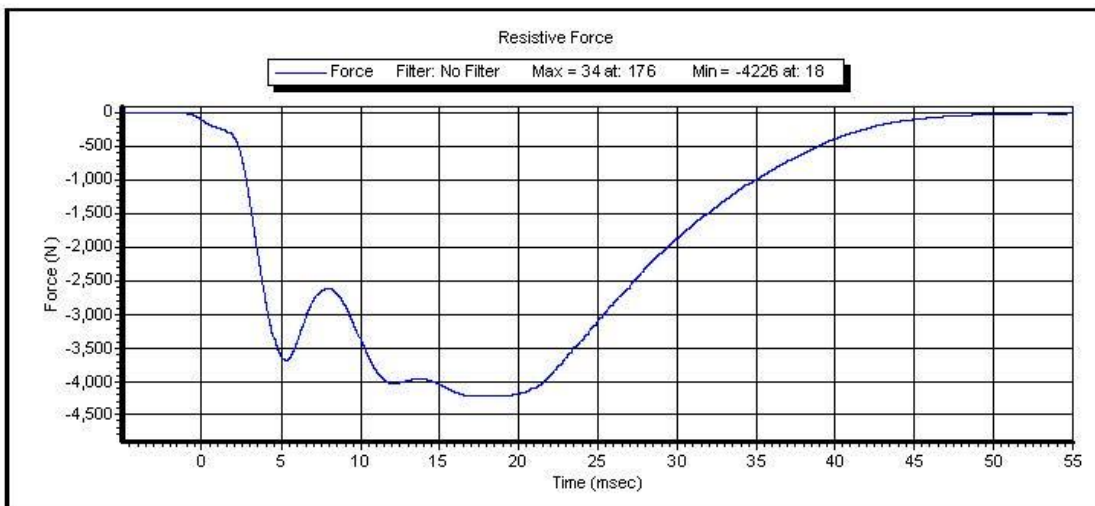
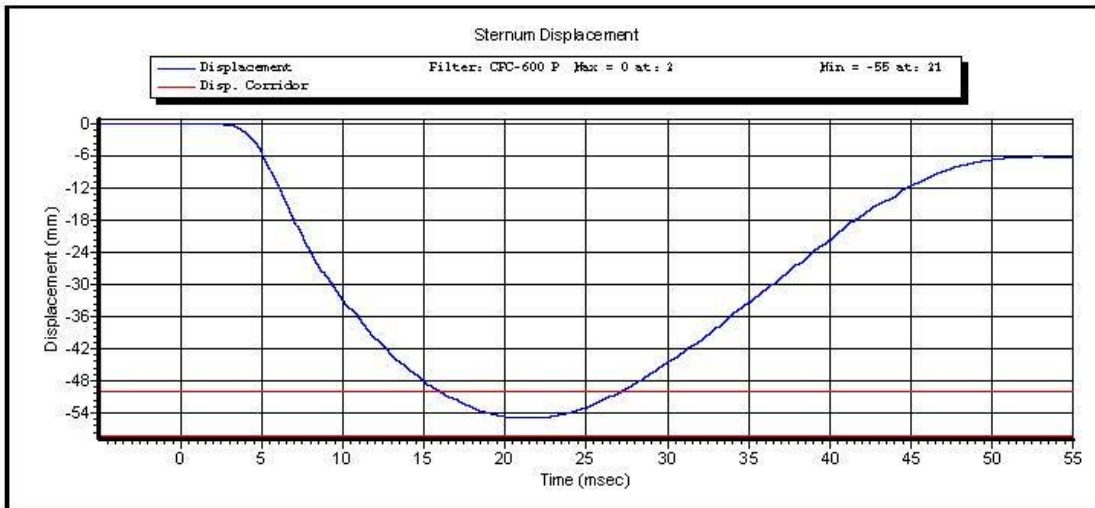


Test ID: **Thorax Impact**

Test Time: **9:37:04 AM**

Test Date: **2/17/2014**

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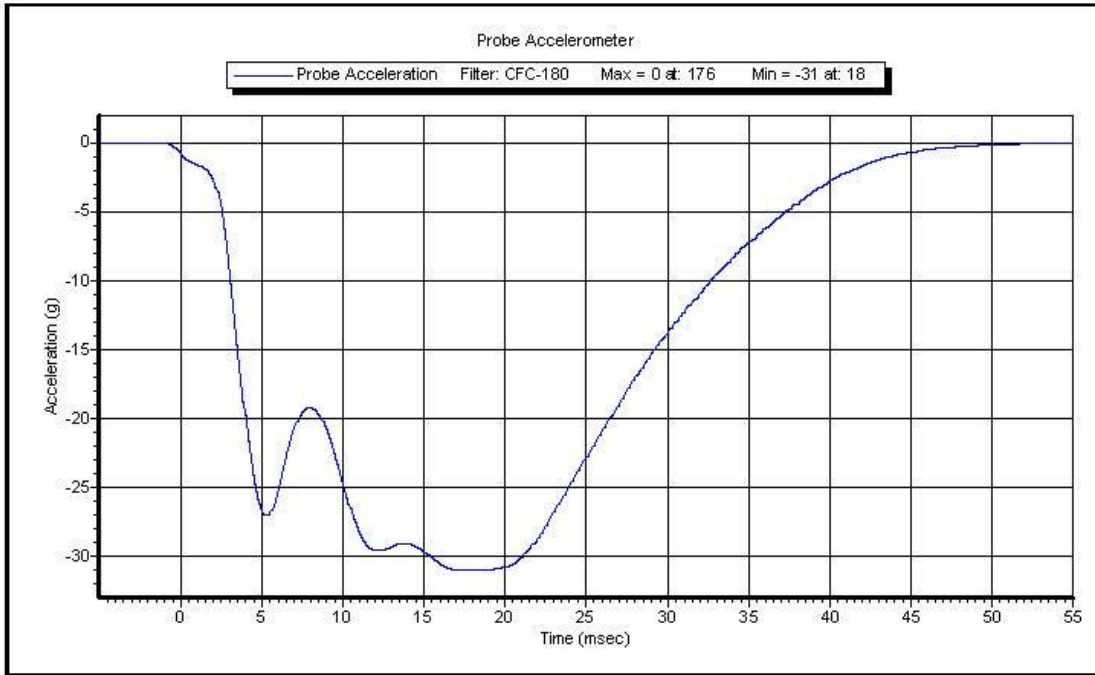


Test ID: **Thorax Impact**

Test Time: **9:37:04 AM**

Test Date: **2/17/2014**

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Test ID: **Thorax Impact**

Test Time: **9:37:04 AM**

Test Date: **2/17/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Left	Test Date:	2/17/2014
		Test Time:	6:42:27 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1350

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.10 deg C P
Humidity	10 -- 70	12.80 %RH P
Velocity	2.07 -- 2.13	2.110 m/s P
Resistive Force	-4060 -- -3450	-3646.8 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



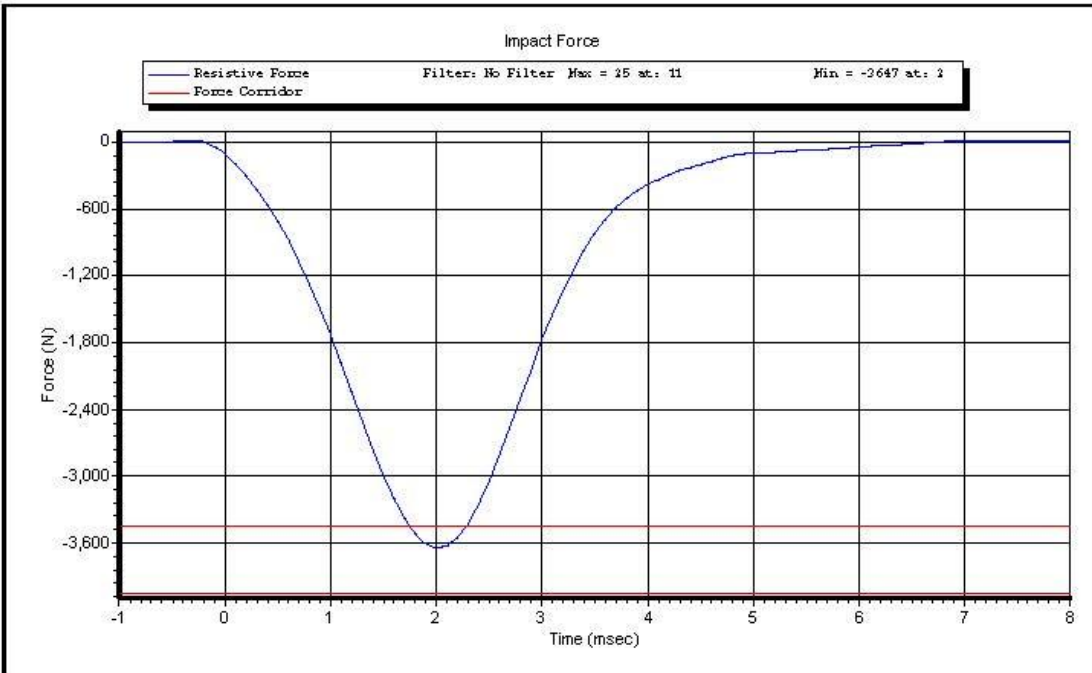
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



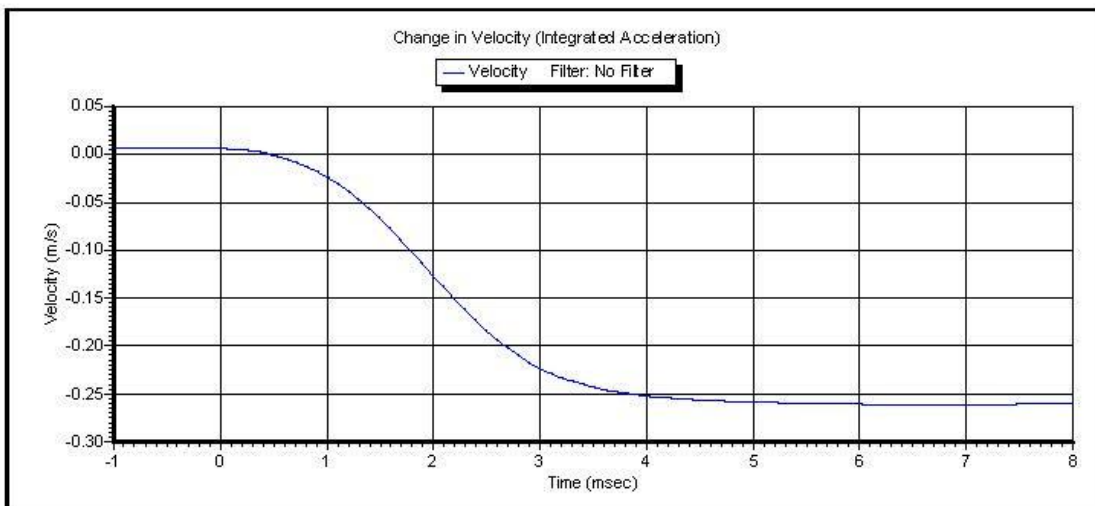
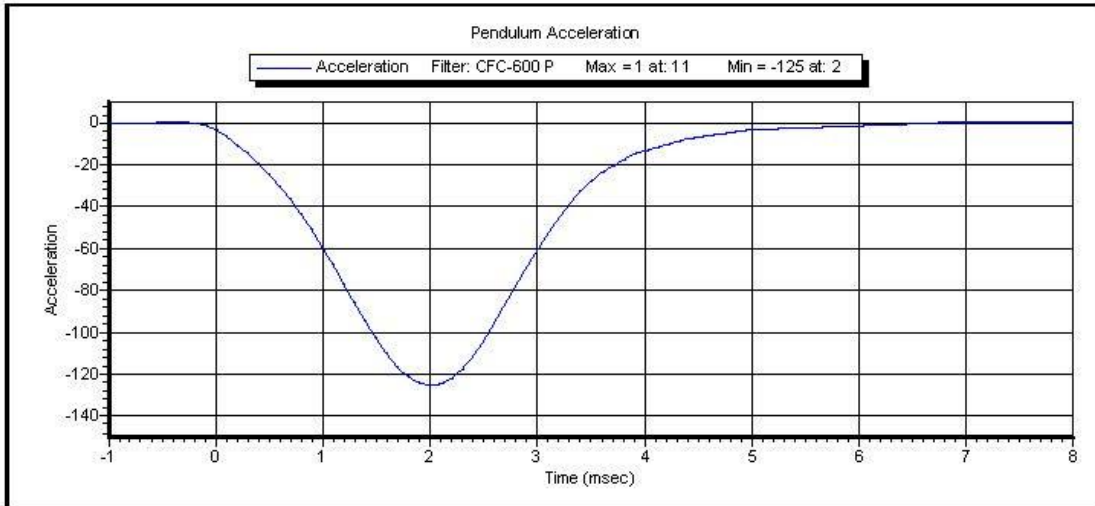
Test Name: **Knee Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Knee Impact Left** Test Time: **6:42:27 AM**

Test Date: **2/17/2014**

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Test ID: **Knee Impact Left** Test Time: **6:42:27 AM**

Test Date: **2/17/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Right	Test Date:	2/17/2014
		Test Time:	6:48:28 AM

Component Part Number	Component Serial Number
Knee Skin - 880105-508	1359

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.10 deg C P
Humidity	10 -- 70	12.10 %RH P
Velocity	2.07 -- 2.13	2.110 m/s P
Resistive Force	-4060 -- -3450	-3671.0 N P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **E. Dutton**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	12/4/2013



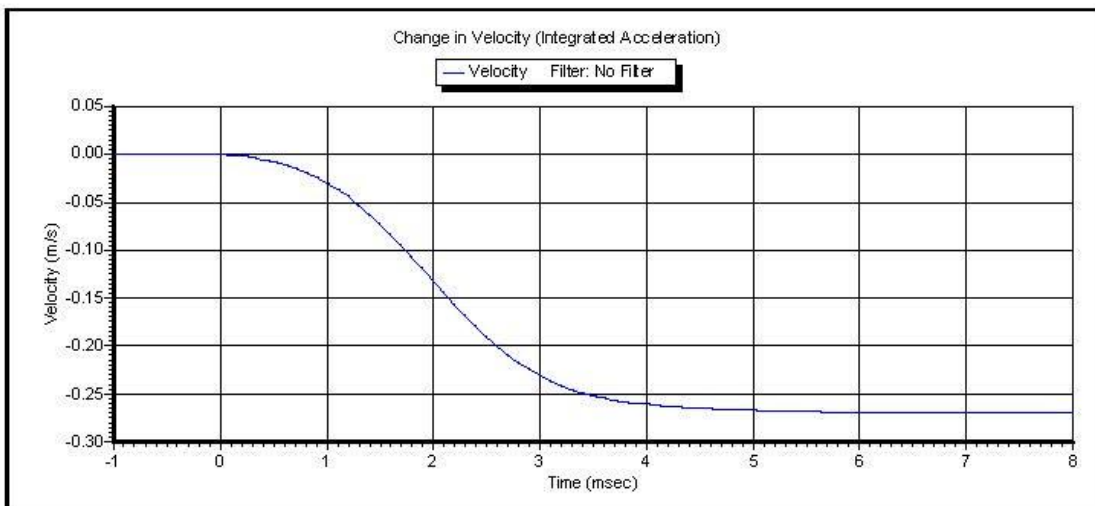
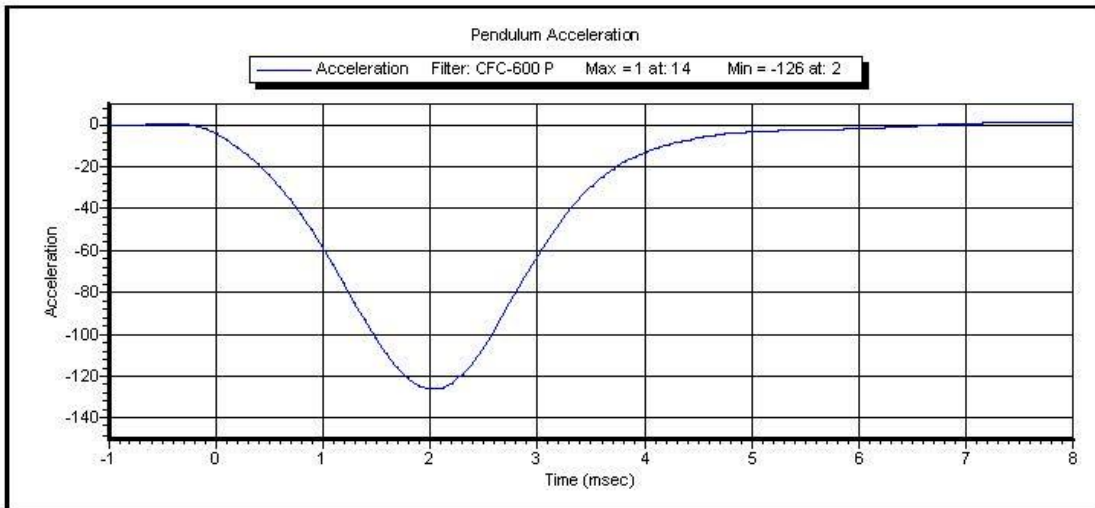
Test Name: **Knee Impact**
Sub Test Name:
ATD Type: **Hybrid 3 - 5th Female**
ATD Serial Number: **139**



Test ID: **Knee Impact Right** Test Time: **6:48:28 AM**

Test Date: **2/17/2014**

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Test ID: **Knee Impact Right** Test Time: **6:48:28 AM**

Test Date: **2/17/2014**

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