REPORT NUMBER: NCAP-MGA-2012-084

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

HONDA OF AMERICA MFG., INC.
2012 ACURA TL SH-AWD TECH 4-DR SEDAN
NHTSA No.: HC5300

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: May 30, 2012

Final Report Date: June 15, 2012

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590

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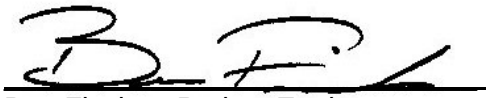
Approved by: 
Ben Fischer, Project Engineer

Approval Date: June 15, 2012

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NCAP-MGA-2012-084		

4. Title and Subtitle	5. Report Date
Final Report of New Car Assessment Program Frontal Impact Testing of 2012 Acura TL SH-AWD Tech 4-Dr Sedan, NHTSA No.: HC5300	June 15, 2012
	6. Performing Organization Code MGA
7. Author(s) Donna Janovicz, Project Manager Ben Fischer, Project Engineer	*8. Performing Organization Report No.* NCAP-MGA-2012-084
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105	*10. Work Unit No.*
	11. Contract or Grant No. DTNH22-06-D-00028
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NVS-111) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590	*13. Type of Report and Period Covered* Final Test Report May 30 to June 15, 2012
	14. Sponsoring Agency Code NVS-111

15. Supplementary Notes

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2012 Acura TL SH-AWD Tech 4-Dr Sedan 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 MGA Research Corporation in Burlington, Wisconsin, on May 30, 2012.

The impact velocity was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 21.7°C. The target vehicle post-test maximum crush was 510 mm located to the left of the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Threshold		Driver ATD	Passenger ATD
		50th	5th		
Head Injury Criteria (HIC_{15})	N/A	700	700	209	239
Maximum Chest Compression	mm	63	52	22	15
Nij	N/A	1	1	0.33	0.31
Neck Tension	N	4170	2620	959	950
Neck Compression	N	4000	2520	110	149
Left Femur Force	N	10008	6805	4624	4438
Right Femur Force	N	10008	6805	2935	3123

17. Key Words	18. Distribution Statement
35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE, Room E12-100 Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833

19. Security Classification of Report	20. Security Classification of Page	21. No. of Pages	22. Price
Unclassified	Unclassified	163	

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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 number DTNH22-06-D-00028. 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 was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure.

SUMMARY

A load cell barrier was impacted by a 2012 Acura TL SH-AWD Tech 4-Dr Sedan at a velocity of 56.4 kph. The test was performed at MGA Research Corporation on May 30, 2012. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two real-time cameras and fourteen (14) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female test device (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 installed on the driver's and passenger's lap belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 036) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 228 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest displacement, neck, and femur response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 510 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster and steering column. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's 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})	209	0.33	959	110	50	22	4624	2935
Passenger (5^{th})	239	0.31	950	149	40	15	4438	3123

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

TEST NOTES

Top of Engine has no valid data after 48 ms.
Bottom of Engine has no valid data after 23 ms.

Driver left hand outside of window post-test.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	HC5300	Traction Control System (TCS)	Yes
Model Year	2012	Auto-Leveling System	No
Make	Acura	Automatic Door Locks (ADLs)	Yes
Model	TL	Power Window Auto-Reverse	No
Body Style	4-Dr Sedan	Other Optional Feature	N/A
VIN	19UUA9F51CA010431	Driver Front Airbag	Yes
Body Color	Graphite Luster Metallic	Driver Curtain Airbag	Yes
Odometer (km/mi)	138 / 86	Driver Torso Airbag	No
Engine Displacement (L)	3.7	Driver Torso/Pelvis Airbag	Yes
Type/No. Cylinders	6	Driver Pelvis Airbag	No
Engine Placement	Longitudinal	Driver Knee Airbag	No
Transmission Type	Automatic	Pass. Front Airbag	Yes
Transmission Speeds	5	Pass. Curtain Airbag	Yes
Overdrive	Yes	Pass. Torso Airbag	No
Final Drive	AWD	Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Pass. Pelvis Airbag	No
Sunroof/T-Top	Yes	Pass. Knee Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Pass. Seat Belt Pretensioner	Yes
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Pass. Load Limiter	Yes
All-Wheel Drive (AWD)	Yes	Other Safety Restraint	N/A
Does owner's manual provide instructions to turn off automatic door locks?			Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	HONDA OF AMERICA MFG., INC.
Date of Manufacture	05/'12
Vehicle Type	Passenger Car

GVWR (kg)	2235
GAWR Front (kg)	1200
GAWR Rear (kg)	1055

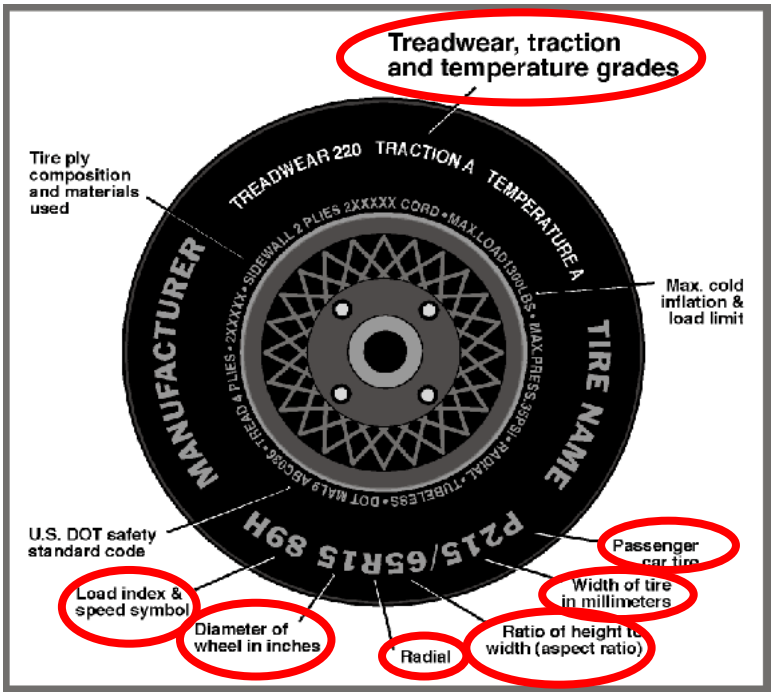
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				385
Cargo Weight (RCLW) (kg)				45

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012



TIRE PLACARD INFORMATION

Measured Parameter	Front	Rear
Recommended Cold Tire Pressure (kPa)	220	220
Recommended Tire Size	P245/45R18	P245/45R18

TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Tire Size on Vehicle	245/45R18	245/45R18
Tire Manufacturer	Michelin	Michelin
Tire Name	Pilot HXMXM4	Pilot HXMXM4
Tire Type	Passenger	Passenger
Tire Width	245	245
Aspect Ratio	45	45
Radial	Yes	Yes
Wheel Diameter	18	18
Load Index/Speed Symbol	96V	96V
Treadwear	300	300
Traction Grade	A	A
Temperature Grade	A	A
Tire Material	Rubber	Rubber

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	534.3	381.0		568.4	435.9	
Right	kg	533.9	361.6		566.0	418.7	
Ratio	%	59.0	41.0		57.0	43.0	
Totals	kg	1068.2	742.6	1810.8	1134.4	854.6	1989.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1810.8
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Vehicle Target Weight (TVTW)	kg	1996.4

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	718	719	712	722	1138
As Tested	mm	710	715	702	704	1193
Post Test	mm	785	768	706	710	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2776
Total Vehicle Length at Left Side	mm	4745
Total Vehicle Length at Centerline	mm	4930
Total Vehicle Length at Right Side	mm	4745
Weight of Ballast in Cargo Area	kg	24.9
Weight of Vehicle Components Removed	kg	23.6
Amount of Stoddard Solvent in Fuel Tank	L	65.1

List of components removed: Right taillight, trunk carpet, spare tire, and tool kit.

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4930
2	Total Width	1854
3	Bumper Top Height	536
4	Bumper Bottom Height	437
5	Longitudinal Member Top Height	571
6	Distance between Longitudinal Members	840
7	Longitudinal Member Width	70
8	Engine Top Height	876
9	Engine Bottom Height	200
10	Engine and Gearbox Width	870
11	Front Bumper-Engine Distance	500
12	Front Shock Absorber Fixing Height	854
13	Bonnet Leading Edge Height	806
14	Front Shock Absorber Fixing Width	981
15	Front Bumper – Front Axle Distance	1020
16	Front Axle – A-Pillar Distance	457
17	A-Pillar – B-Pillar Distance	1190
18	B-Pillar – Rear Axle Distance	1137
19	B-Pillar – C-Pillar Distance	711
20	Roof Sill Bottom Height	1295
21	Roof Sill Top Height	1412
22	Floor Sill Bottom Height	179
23	Floor Sill Top Height	331

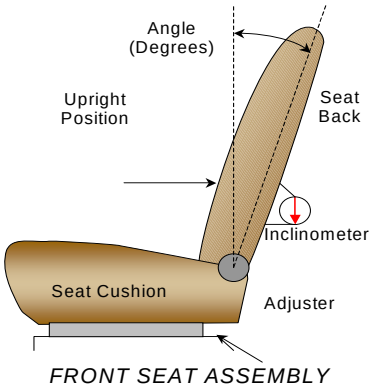
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.



SEAT BACK ANGLE	Degrees
Driver Seat Back Angle	13.6° on outboard headrest
Passenger Seat Back Angle	6.8° on outboard headrest

SEAT FORE/AFT POSITIONS

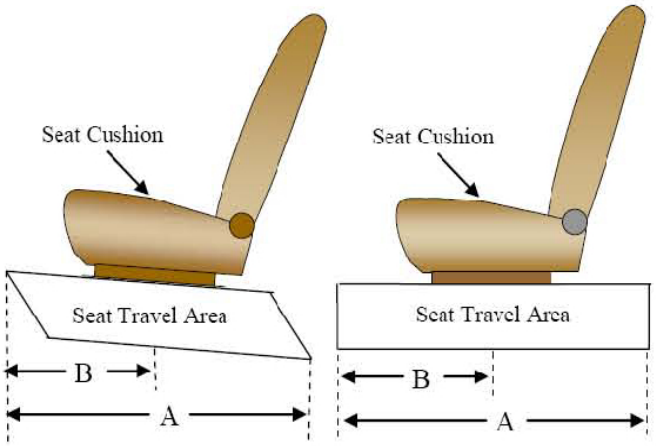
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	288 mm	144 mm (foremost as 0)
Passenger Seat	233 mm	0 (foremost as 0)

SEAT BELT UPPER ANCHORAGES

The seat belt upper anchorages are positioning following the manufacturer's specified position as listed in Form 1.

	Total # of Positions	Placed in Position #
Driver Seat	4 (1st as 1)	0 (uppermost as 0)
Passenger Seat	4 (1st as 1)	0 (uppermost as 0)



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

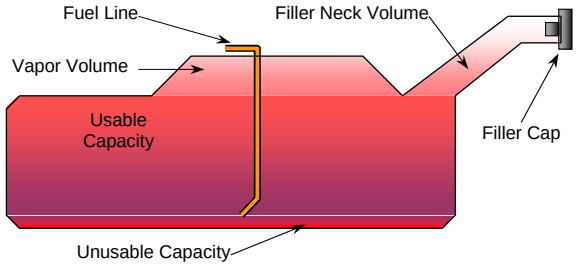
Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	64.4 – 65.8
Actual Amount of Solvent used	65.1
1/3 of Usable Capacity	23.3

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

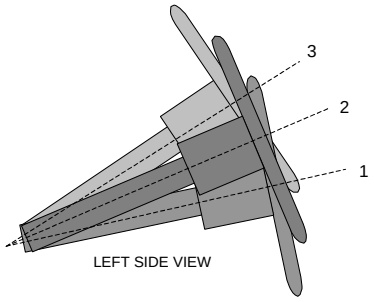
The vehicle is equipped with an electric fuel pump. After the ignition key is turned from LOCK (0) to ON (II) position, the pump will be filled up for two seconds, and then the pressure is maintained. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

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. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



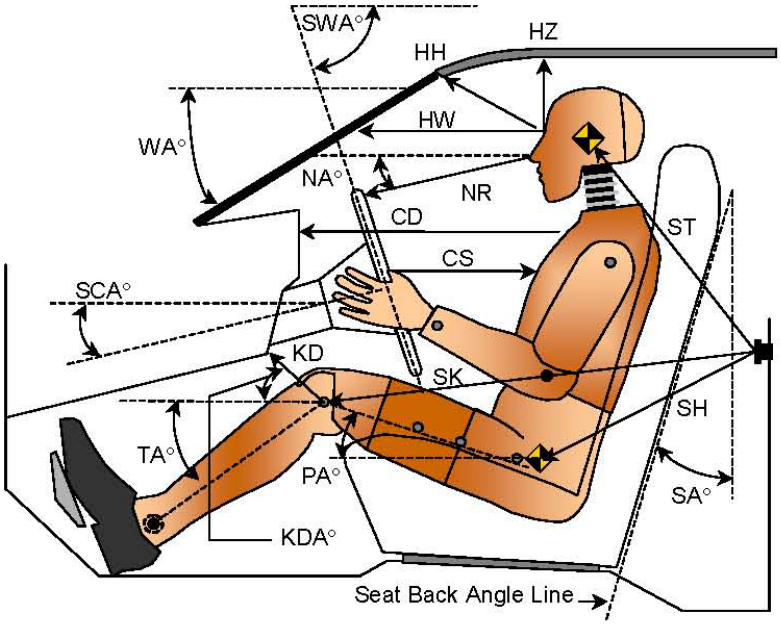
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	71.0	221
Geometric Center – Position 2	68.3	203
Uppermost – Position 3	65.6	185
Telescoping Steering Wheel Travel		36
Test Position	68.3	203

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012



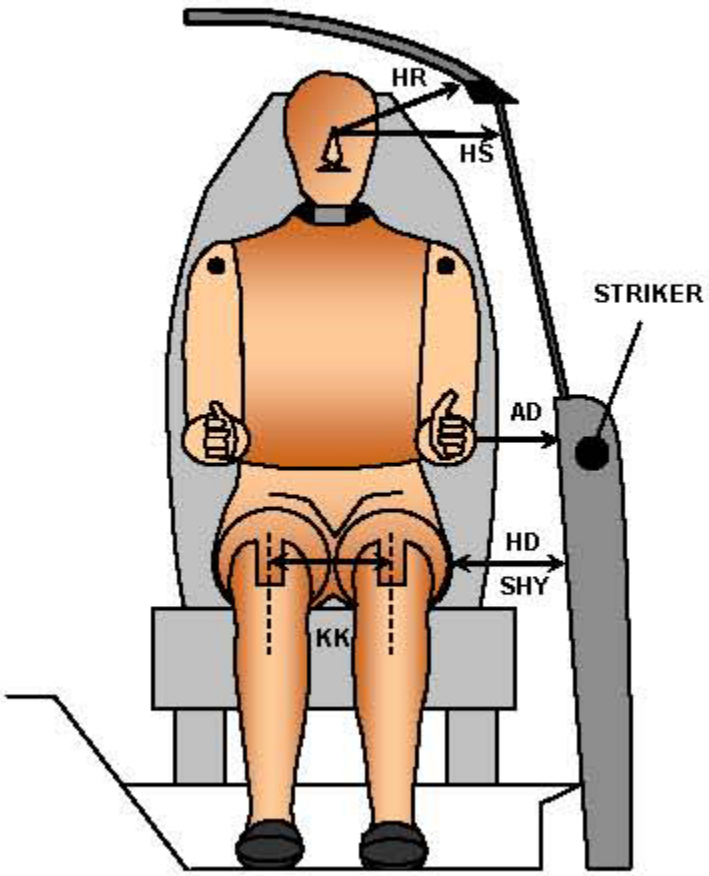
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 634	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24.8		
SWA°	Steering Wheel Angle		68.3		
SCA°	Steering Column Angle		21.7		
SA°	Seat Back Angle (on headrest post)		13.6		6.8
HZ	Head to Roof (Z)	210	90	158	90
HH	Head to Header	362	23.9	232	44.9
HW	Head to Windshield	698	0	560	0
NR	Nose to Rim	418	7.8		
CD	Chest to Dash	543		408	
CS	Chest to Steering Hub	342	1.3		
RA	Rim to Abdomen	220	0		
KDL	Left Knee to Dash	183	33.7	73	35.1
KDR	Right Knee to Dash	174	39.6	75	33.4
PA°	Pelvic Angle		24.1		21.7
TA°	Tibia Angle		39.5		54.0
SK	Striker to Knee	550	104.2	681	94.9
ST	Striker to Head	432	8.3	459	31.9
SH	Striker to H-Point	287	141.9	402	118.0

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012



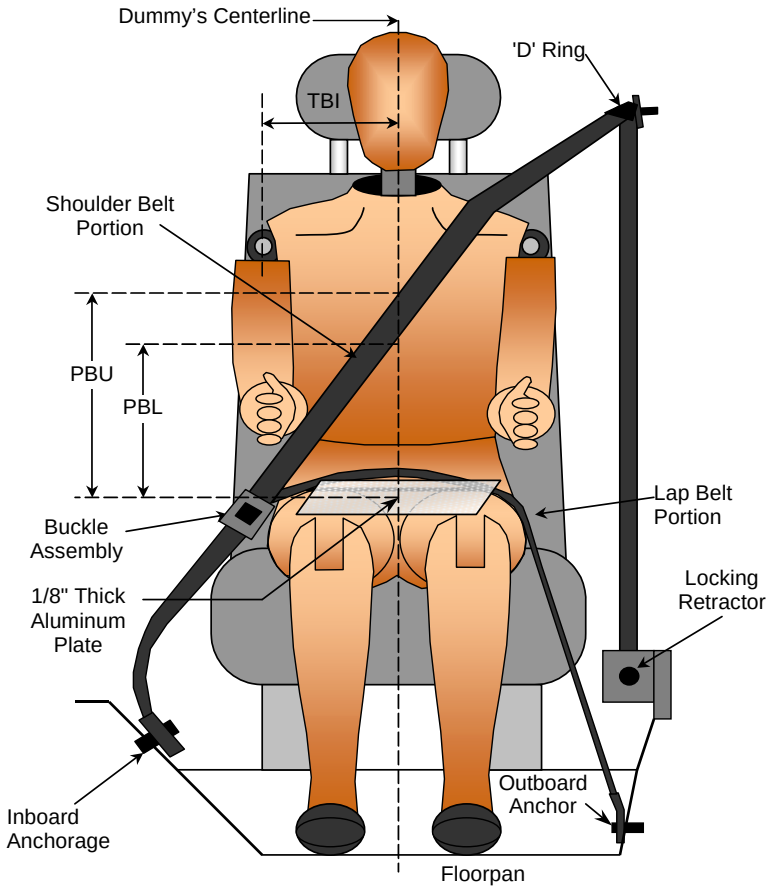
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 634
		Length (mm)	
AD	Arm to Door	140	187
HD	H-Point to Door	166	174
HR	Head to Side Header	221	218
HS	Head to Side Window	371	351
KK	Knee to Knee	352	232
SHY	Striker to H-Point (Y Direction)	303	302
AA	Ankle to Ankle	356	191

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	370	310
PBL - Top surface of reference to belt lower edge	mm	280	230

BELT LENGTH DATA

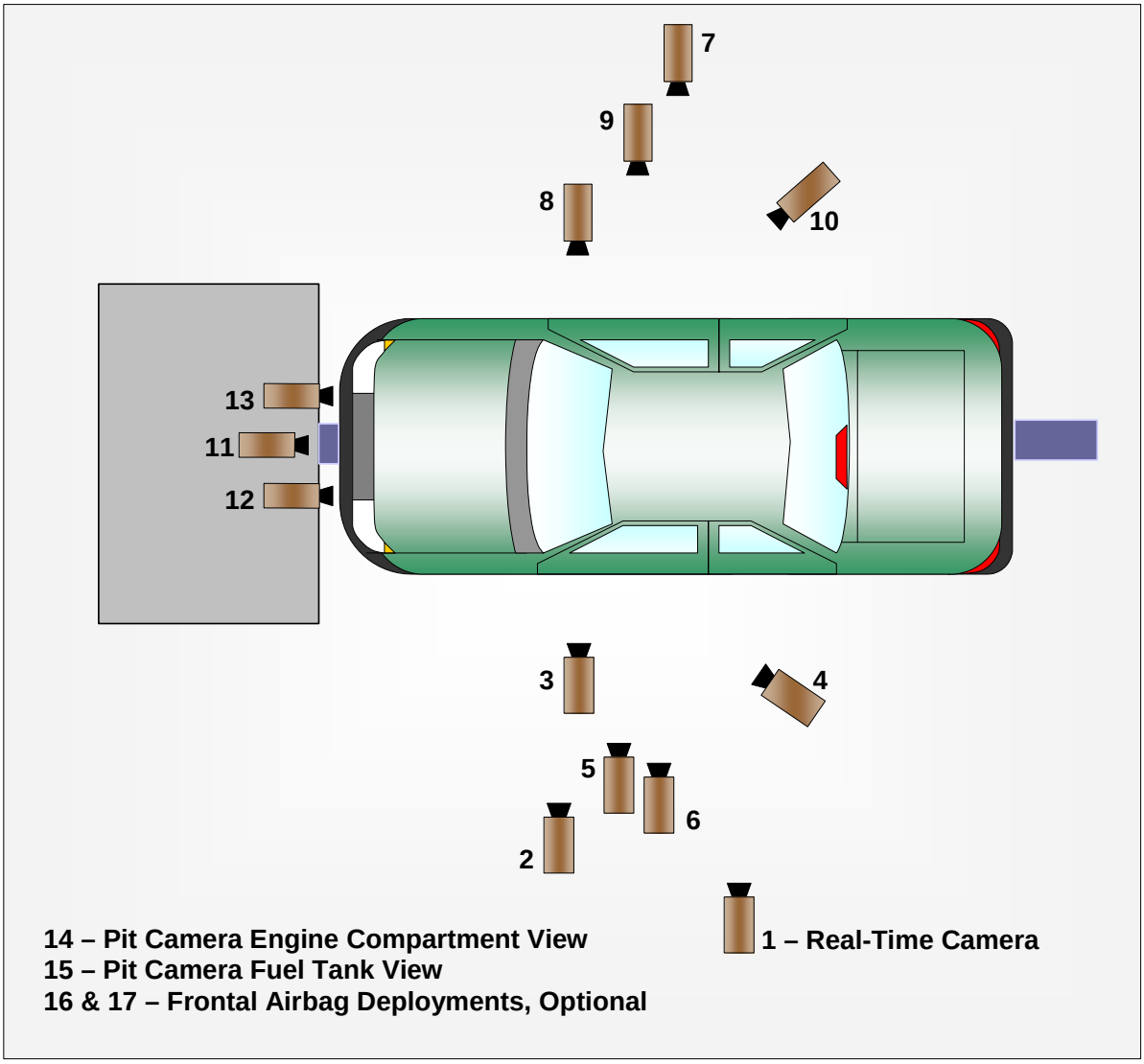
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	810	880
Lap Belt Length as measured on ATD	mm	470	500
Remainder of belt on reel	mm	1870	1770
Total Belt Length for Continuous Webbing Systems	mm	3150	3150

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012

CAMERA POSITIONS FOR FRONTAL IMPACTS



14 – Pit Camera Engine Compartment View
15 – Pit Camera Fuel Tank View
16 & 17 – Frontal Airbag Deployments, Optional

1 – Real-Time Camera

DATA SHEET NO. 6 (CONTINUED)
CAMERA LOCATIONS AND DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1580	-6870	-1780	35	1000
3	Left Front Half	1100	-5060	-1070	24	1000
4	Left Angle	5600	-5200	-2050	50	1000
5	Steering Column - Top	550	-4740	-1230	24	1000
6	Steering Column - Bottom	510	-4820	-840	24	1000
7	Right Overall	2260	6790	-1190	20	1000
8	Passenger Close-Up	1810	7000	-1820	35	1000
9	Right Front Half	1320	5260	-1070	24	1000
10	Right Angle	5720	4830	-1950	50	1000
11	Windshield	-130	0	-2810	20	1000
12	Driver Windshield	250	-450	-2030	8.5	1000
13	Passenger Windshield	250	450	-2030	8.5	1000
14	Pit Front	970	0	3150	24	1000
15	Pit Rear	3220	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

*COORDINATES:

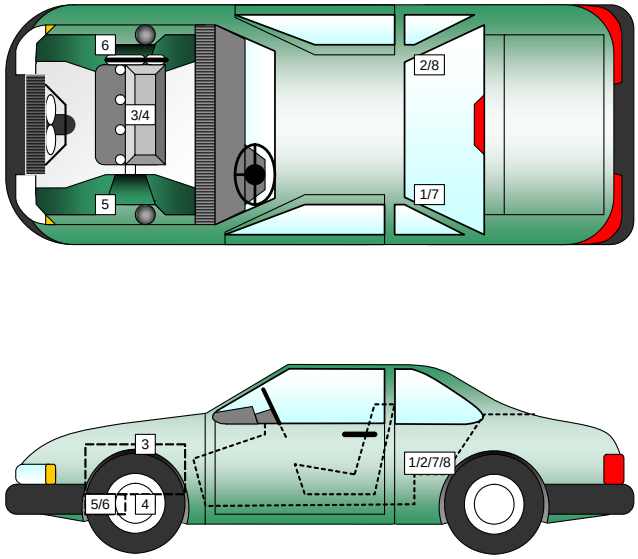
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 16 & 17 were not used for this test.

DATA SHEET NO. 7
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2011	-410	-205
2	Right Rear Accelerometer – X Direction	2011	410	-205
3	Engine Top X	3961	0	-879
4	Engine Bottom X	4123	65	-255
5	Left Brake Caliper X	4022	-710	-215
6	Right Brake Caliper X	4022	710	-215
7	Left Rear Accelerometer Redundant – X Direction			
8	Right Rear Accelerometer Redundant – X Direction			

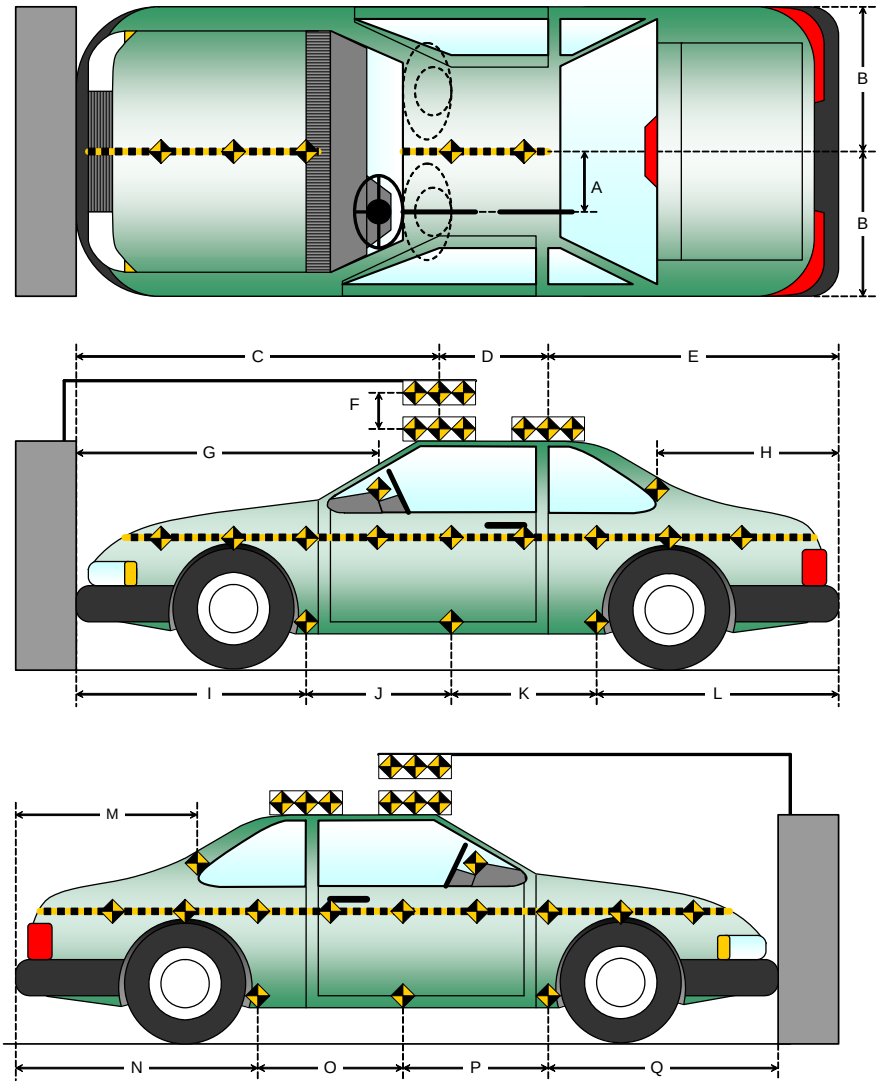
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012

Item	Value (mm)
A	375
B	927
C	2500
D	680
E	1750
F	203
G	
H	1216
I	1471
J	971
K	971
L	1517
M	1216
N	1517
O	971
P	971
Q	1471



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: HC5300
Test Date: 05/30/2012

Advanced Research Load Cell Barrier

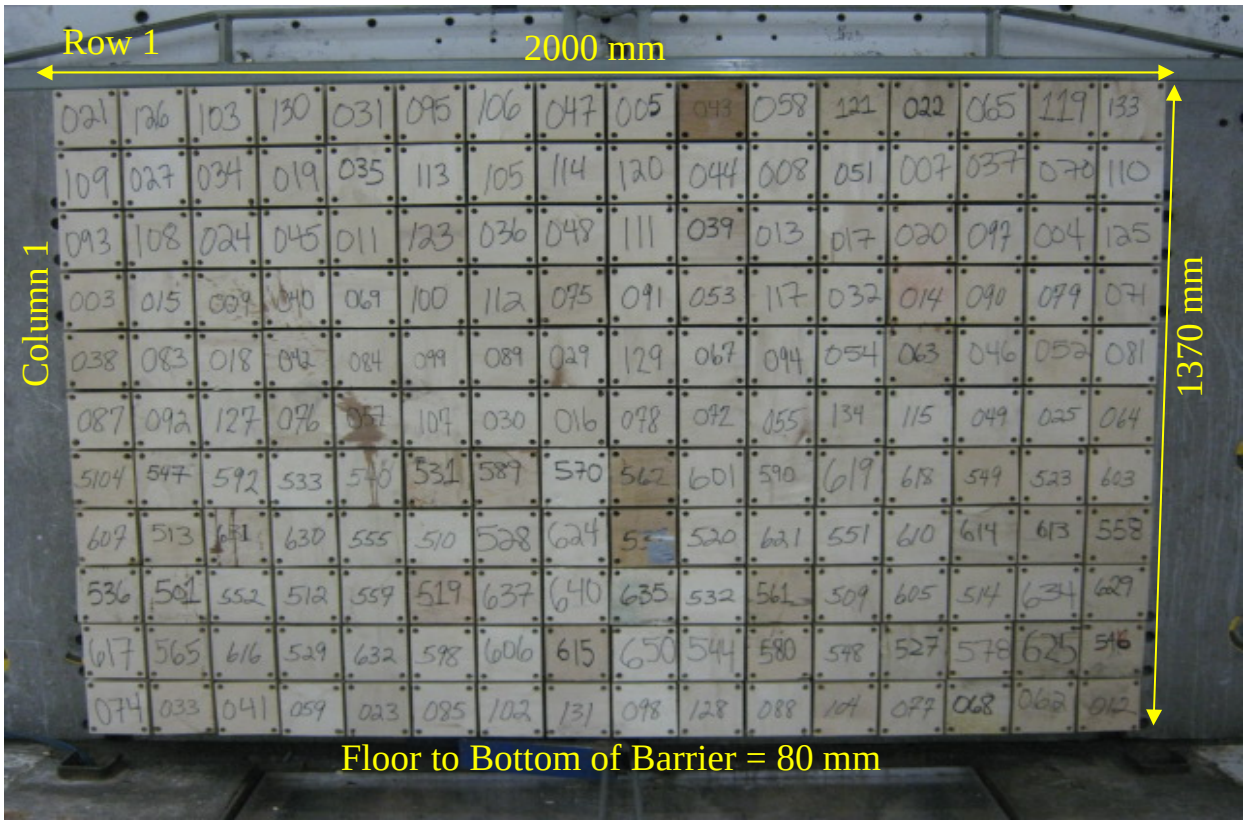


Photo for Reference Only

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15	1-16
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16
3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15	3-16
4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15	4-16
5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16
6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15	6-16
7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15	7-16
8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	8-10	8-11	8-12	8-13	8-14	8-15	8-16
9-1	9-2	9-3	9-4	9-5	9-6	9-7	9-8	9-9	9-10	9-11	9-12	9-13	9-14	9-15	9-16
10-1	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
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Load Cells are 121 mm 121 mm with a 7 mm gap in between each load cell.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	128
Total	228

CAMERA COVERAGE

High-Speed Vehicle Onboard	0
High-Speed Offboard	14
Real-Time	2
Total	16

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: HC5300
Test Date: 05/30/2012

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 036	HIII 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster, Steering Column	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

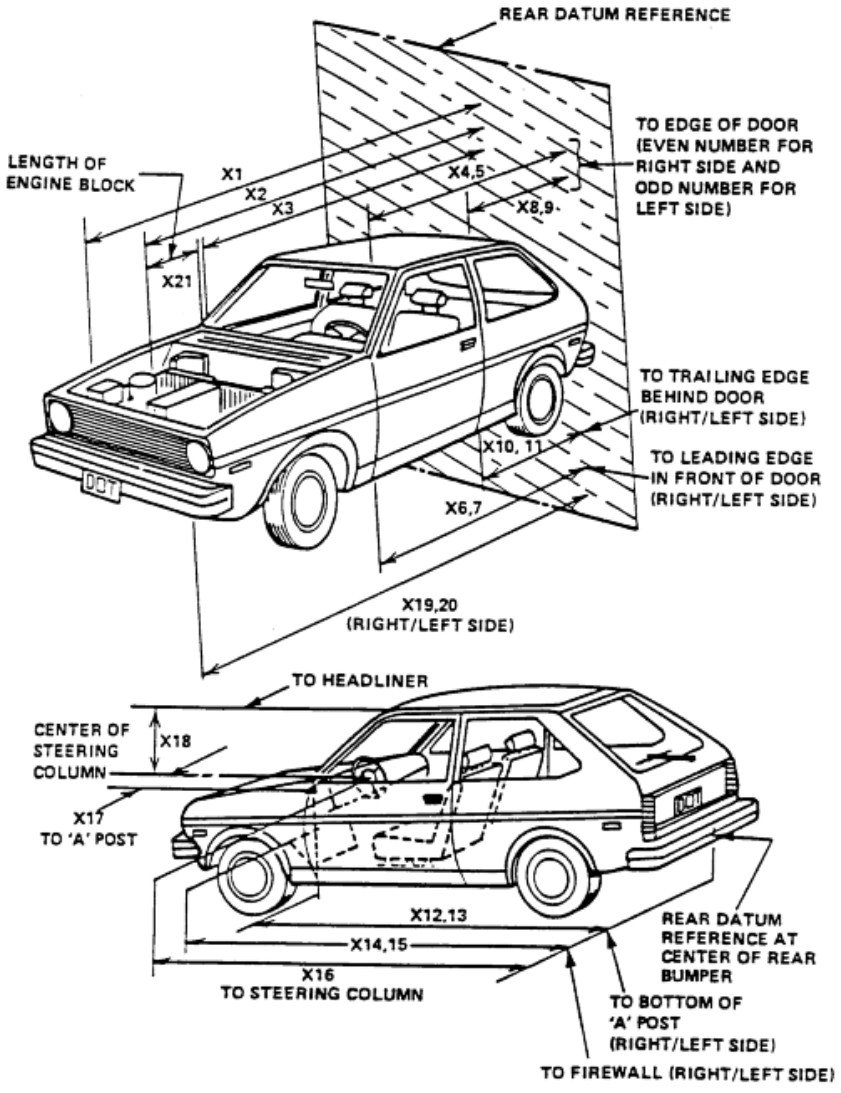
Measured Parameter	Units	Value
Left Side	mm	490
Center	mm	370
Right Side	mm	435
Average	mm	432

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Knee Airbag	No		No	
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4930	4435	495
2	RSOV to Front of Engine	mm	4366	4315	51
3	RSOV to Firewall	mm	3764	3764	0
4	RSOV to Upper Leading Edge of Right Door	mm	3340	3336	4
5	RSOV to Upper Leading Edge of Left Door	mm	3340	3340	0
6	RSOV to Lower Leading Edge of Right Door	mm	3345	3343	2
7	RSOV to Lower Leading Edge of Left Door	mm	3345	3345	0
8	RSOV to Upper Trailing Edge of Right Door	mm	2225	2225	0
9	RSOV to Upper Trailing Edge of Left Door	mm	2225	2225	0
10	RSOV to Lower Trailing Edge of Right Door	mm	2228	2228	0
11	RSOV to Lower Trailing Edge of Left Door	mm	2228	2228	0
12	RSOV to Bottom of “A” Post of Right Side	mm	3359	3359	0
13	RSOV to Bottom of “A” Post of Left Side	mm	3359	3359	0
14	RSOV to Firewall, Right Side	mm	3705	3705	0
15	RSOV to Firewall, Left Side	mm	3693	3690	3
16	RSOV to Steering Column	mm	2851	2872	-21
17	Center of Steering Column to “A” Post	mm	343	330	13
18	Center of Steering Column to Headliner	mm	405	395	10
19	RSOV to Right Side of Front Bumper	mm	4745	4402	343
20	RSOV to Left Side of Front Bumper	mm	4745	4351	394
21	Length of Engine Block	mm	374	374	0
RD	RSOV to Right Side of Dash Panel	mm	3025	3025	0
CD	RSOV to Center of Dash Panel	mm	3145	3145	0
LD	RSOV to Left Side of Dash Panel	mm	3037	3035	2

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

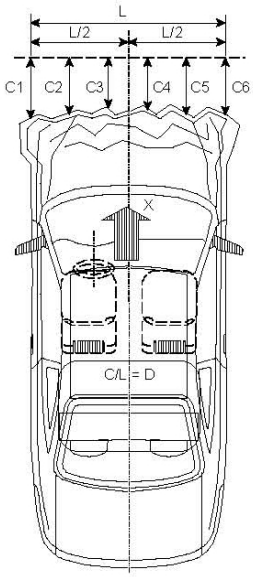
Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

VEHICLE INFORMATION

VIN: 19UUA9F51CA010431 Wheelbase (mm): 2776
Vehicle Size Category: Passenger Test Weight (kg): 1989.0

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.4
Velocity Change (km/h): 62.1
Time of Separation (msec): 114.1



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1140
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4745	4351	394
C2	Crush zone 2 at left side	mm	4814	4340	474
C3	Crush zone 3 at left side	mm	4857	4347	510
C4	Crush zone 4 at right side	mm	4857	4409	448
C5	Crush zone 5 at right side	mm	4814	4410	404
C6	Crush zone 6 at right side	mm	4745	4402	343
L	C1 TO C6	mm	1140	1120	20

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test

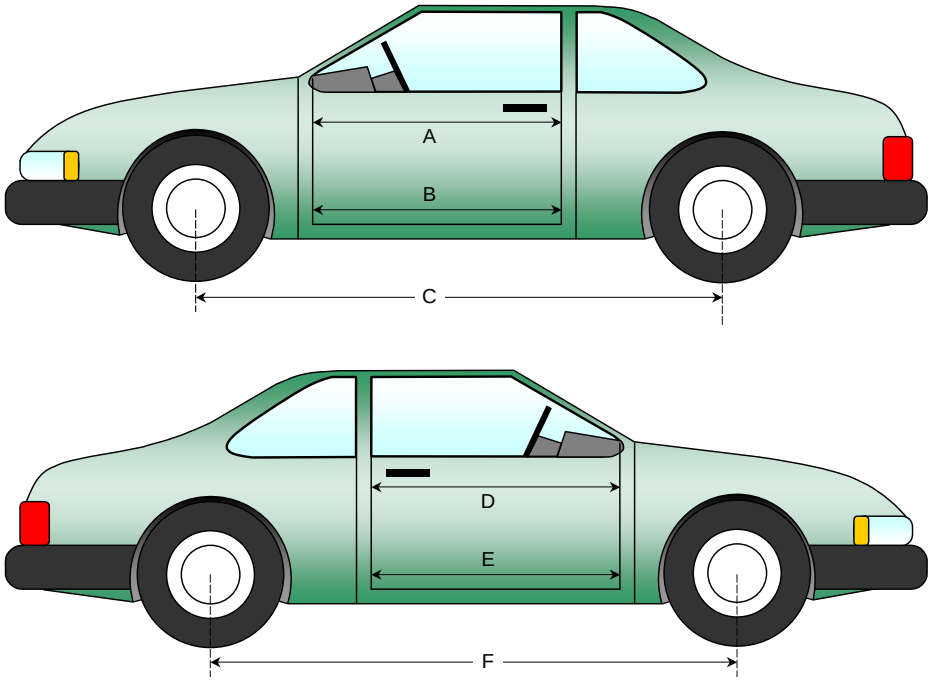
NHTSA No.: HC5300
Test Date: 05/30/2012

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1055	1055	0
B	Left Side Lower	mm	994	994	0
D	Right Side Upper	mm	1055	1055	0
E	Right Side Lower	mm	994	994	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2776	2668	108
F	Right Side Wheelbase	mm	2776	2664	112



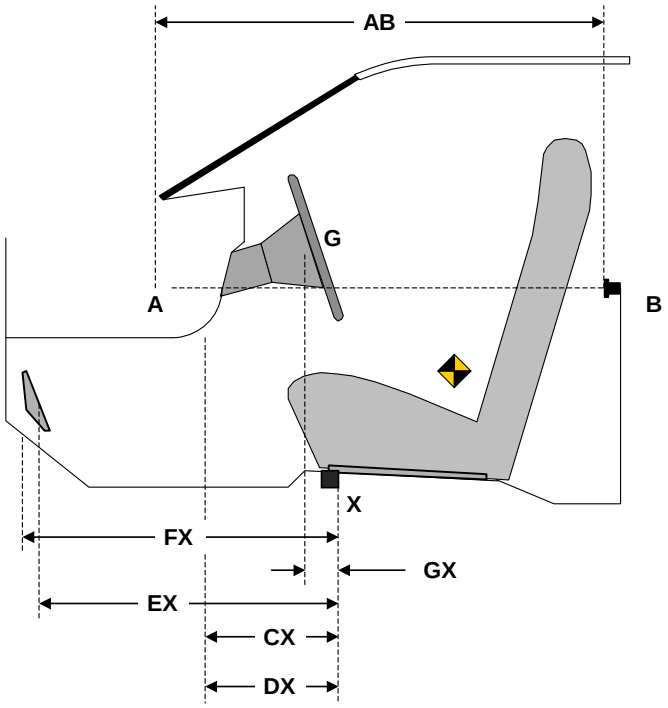
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	804	804	0
CX	Left Knee Bolster to X	mm	260	269	-9
DX	Right Knee Bolster to X	mm	265	270	-5
EX	Brake Pedal to X	mm	575	545	30
FX	Foot Rest to X	mm	587	584	3
GX	Center of Steering Column Wheel Hub to X	mm	65	135	-70

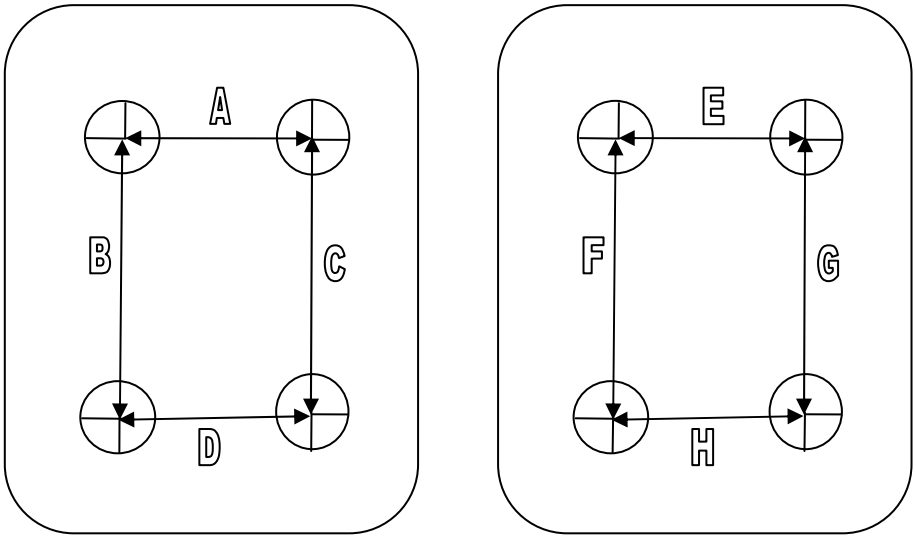
X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012



Driver Passenger

TOP VIEW THROUGH FLOOR PAN

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Units	Pre-Test	Post-Test	Difference
A	mm	339	339	0
B	mm	339	339	0
C	mm	339	339	0
D	mm	304	304	0
E	mm	339	342	-3
F	mm	339	337	2
G	mm	339	339	0
H	mm	339	339	0

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: HC5300
Test Date: 05/30/2012

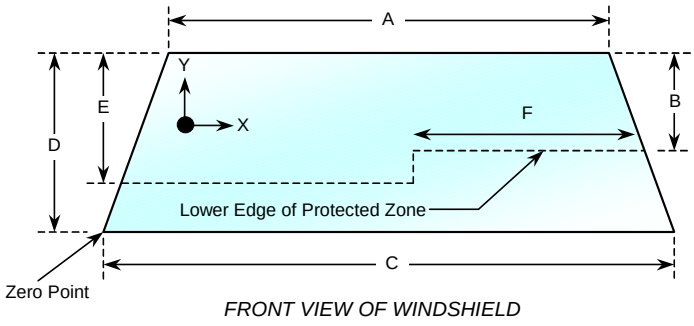
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21.7°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2154	2154	100
Right Side	2154	2154	100
Total	4308	4308	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1186
B	mm	457
C	mm	1514
D	mm	804
E	mm	552
F	mm	607

AREA OF PROTECTED ZONE FAILURES - NONE

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

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. **None**

X	Y

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

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

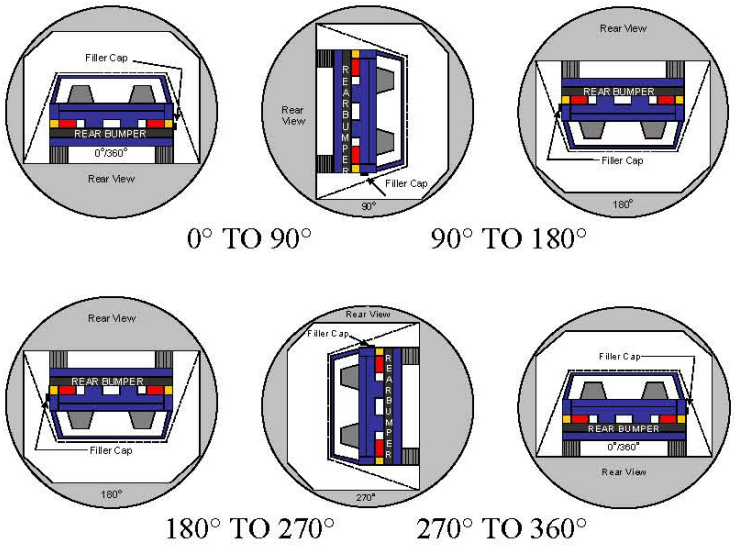
Test Time: 10:38 am Temperature: 21.7° C

A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)
B. For the 5 minute period after motion ceases: None
(Maximum allowable = 5 ounces)
C. For the following 25 minutes: None
(Maximum allowable = 1 oz./minute)
D. Spillage Details: None

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: HC5300
Test Date: 05/30/2012

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: **None**



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	111	300	411
90° to 180°	112	300	412
180° to 270°	104	300	404
270° to 360°	110	300	410

FMVSS 301 ROLLOVER SPILLAGE TABLE (units in ounces)

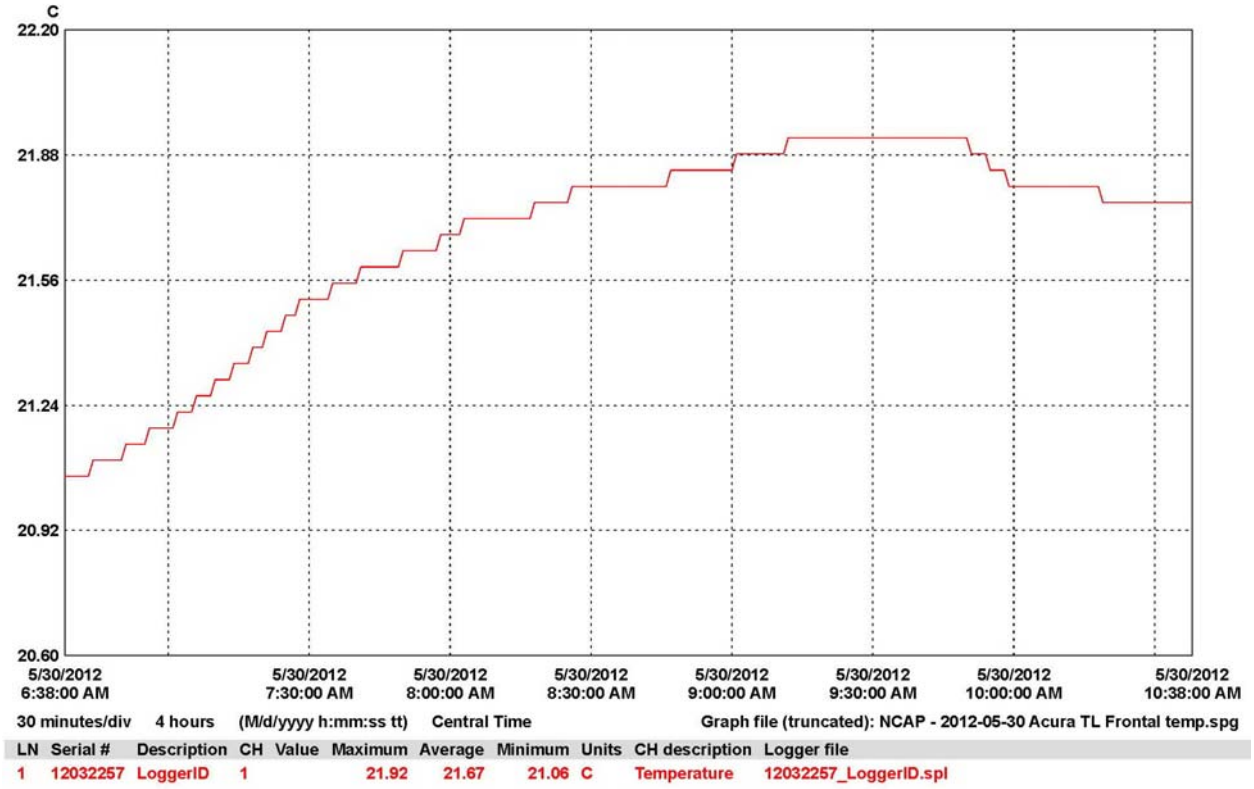
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA

Test Vehicle: 2012 Acura TL SH-AWD Tech 4-Dr Sedan NHTSA No.: HC5300
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/30/2012



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	12032257	LoggerID	1		21.92	21.67	21.06	C	Temperature	12032257_LoggerID.spl

APPENDIX A

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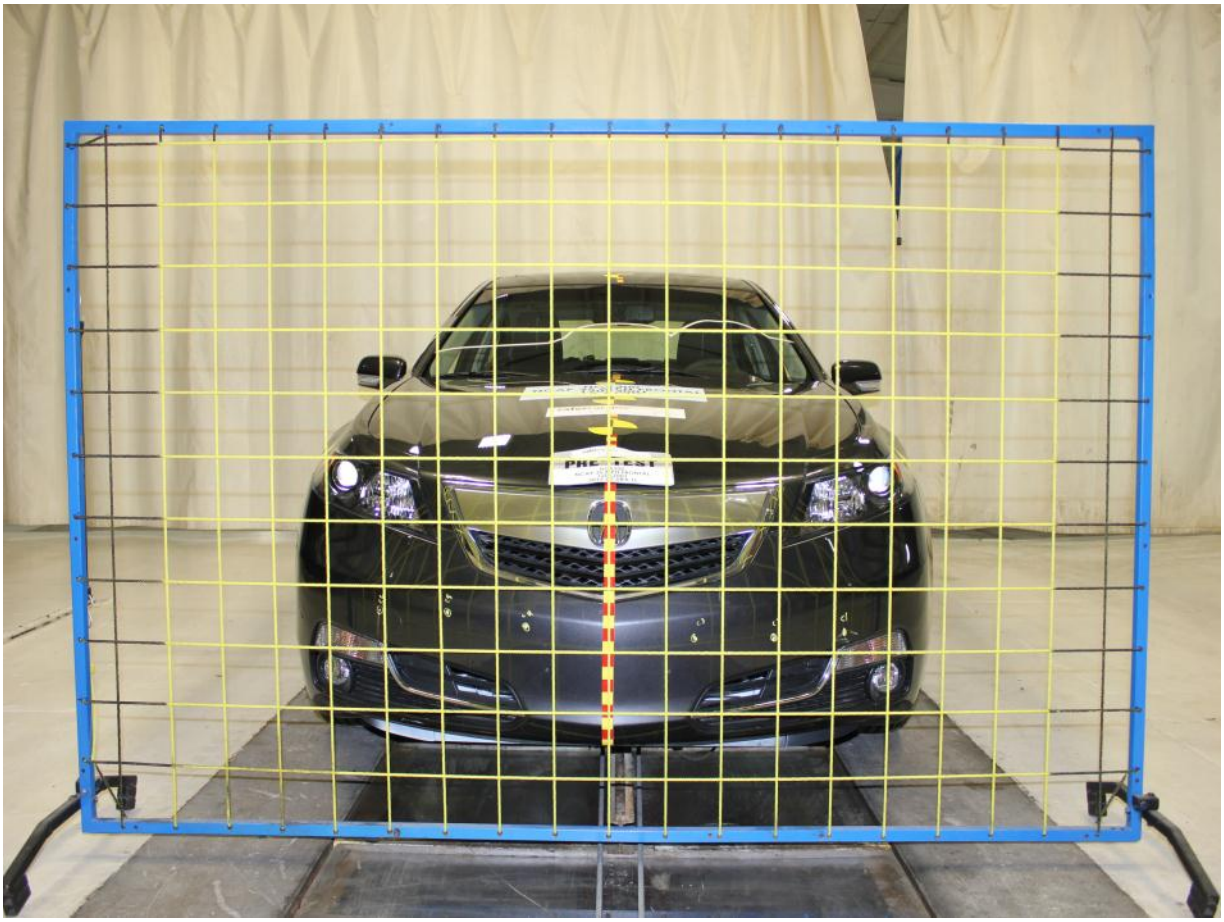


Load Cell Location

Load Cell Wall

Manufacturer's Label

Tire Placard

2012 Acura TL Frontal As Delivered

Left Rear Three-Quarter View, As Received

Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Left View of Test Vehicle

Post-Test Left View of Test Vehicle

Pre-Test Right View of Test Vehicle

Post-Test Right View of Test Vehicle

Pre-Test Right Front Three-Quarter View

Post-Test Right Front Three-Quarter View

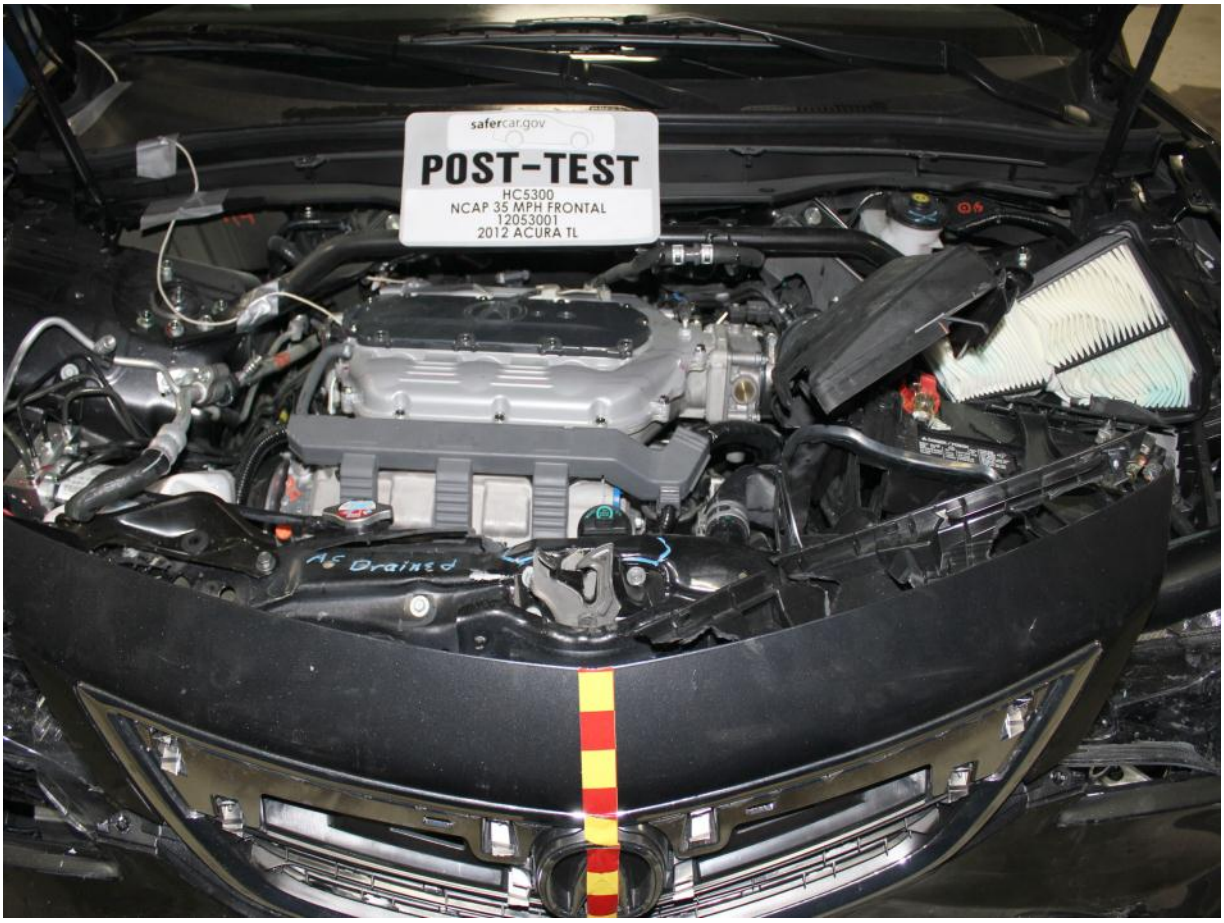
Pre-Test Left Rear Three-Quarter View

Post-Test Left Rear Three-Quarter View

Pre-Test Windshield View

Post-Test Windshield View

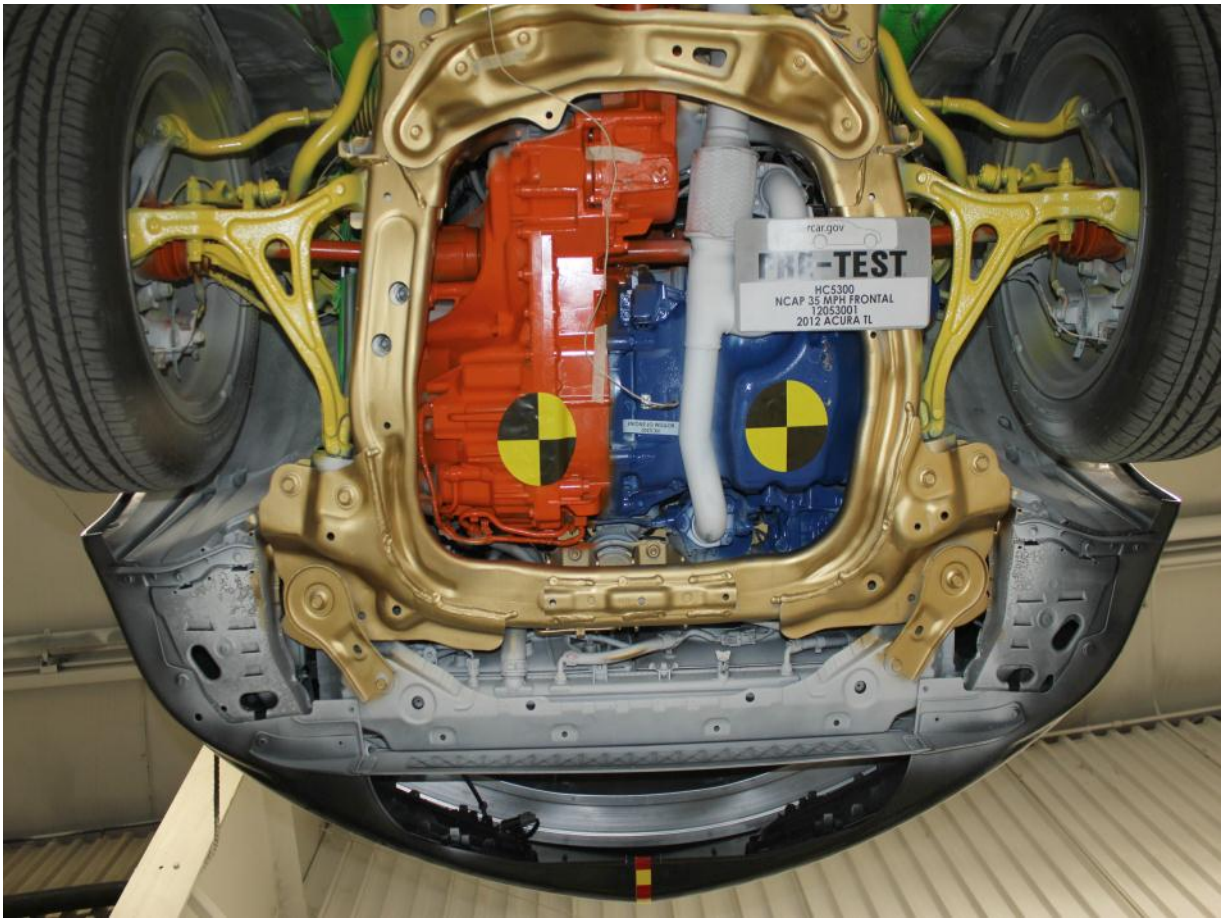
Pre-Test Engine Compartment View



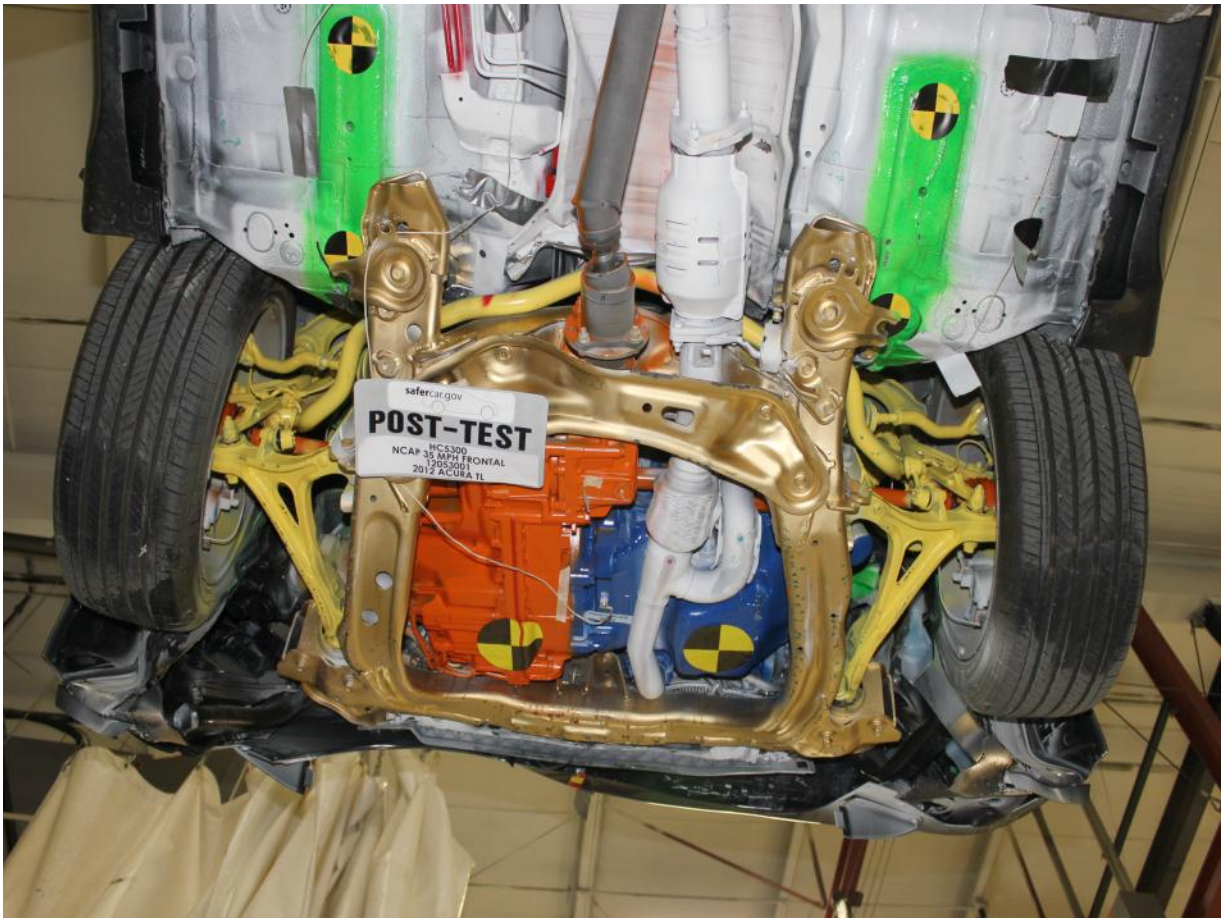
Post-Test Engine Compartment View

Pre-Test Fuel Filler Cap View

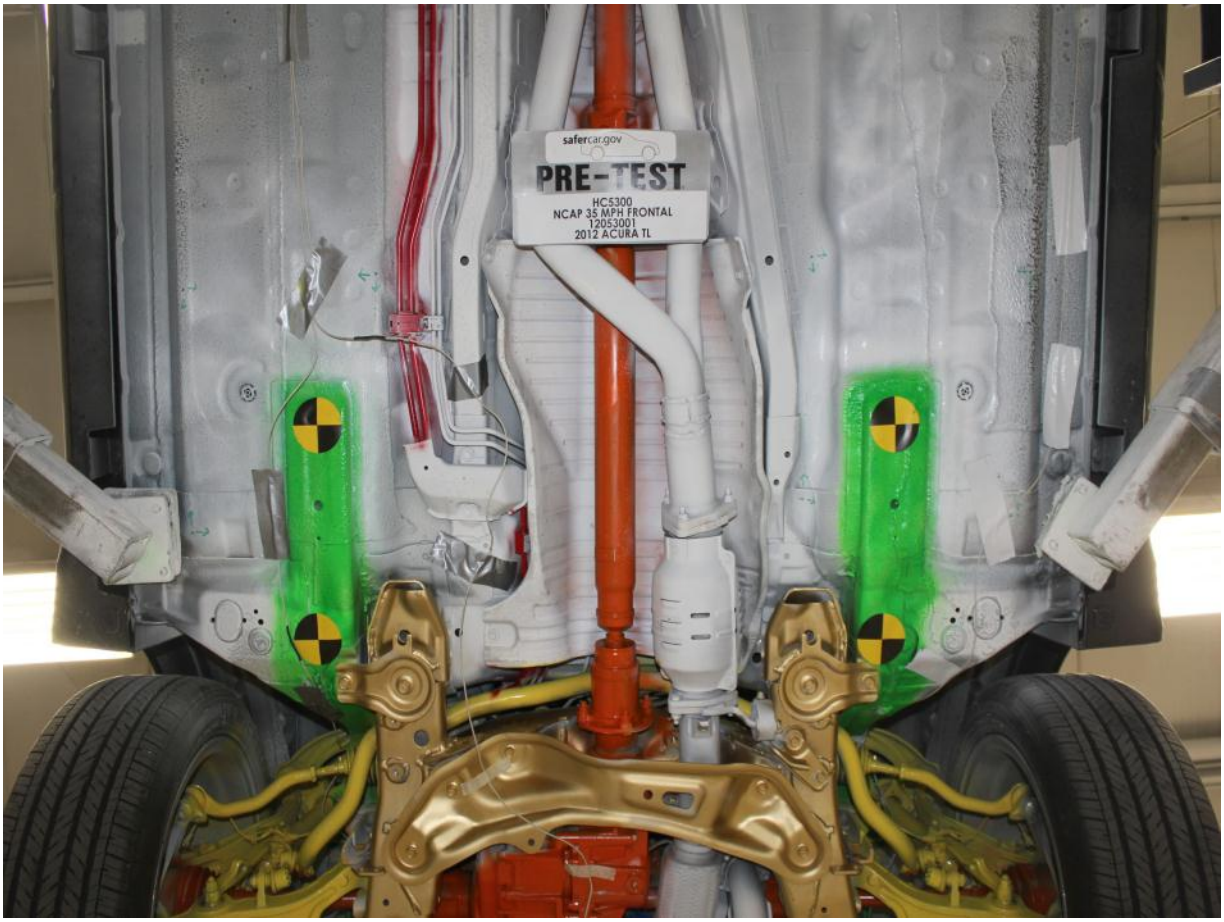
Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View

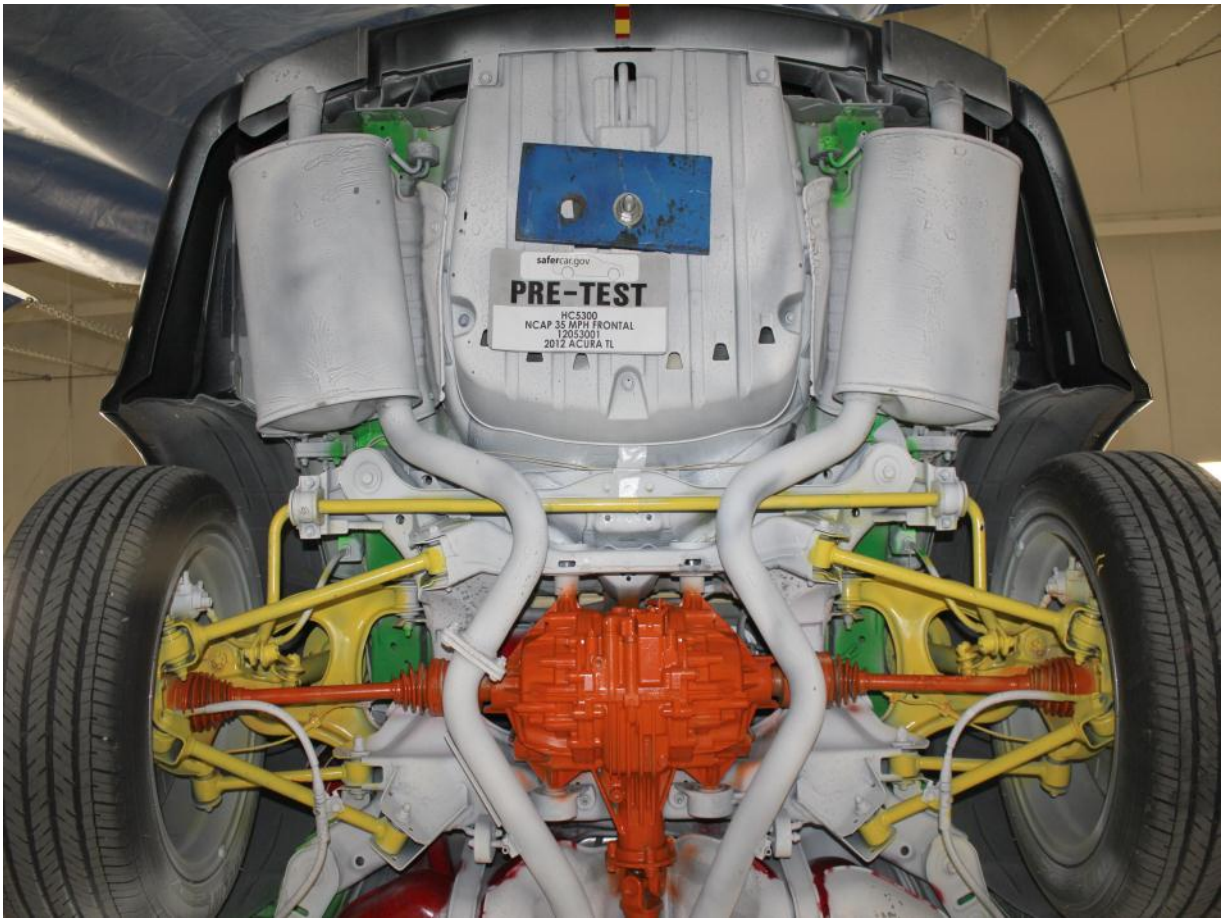


Pre-Test Mid Front Underbody View

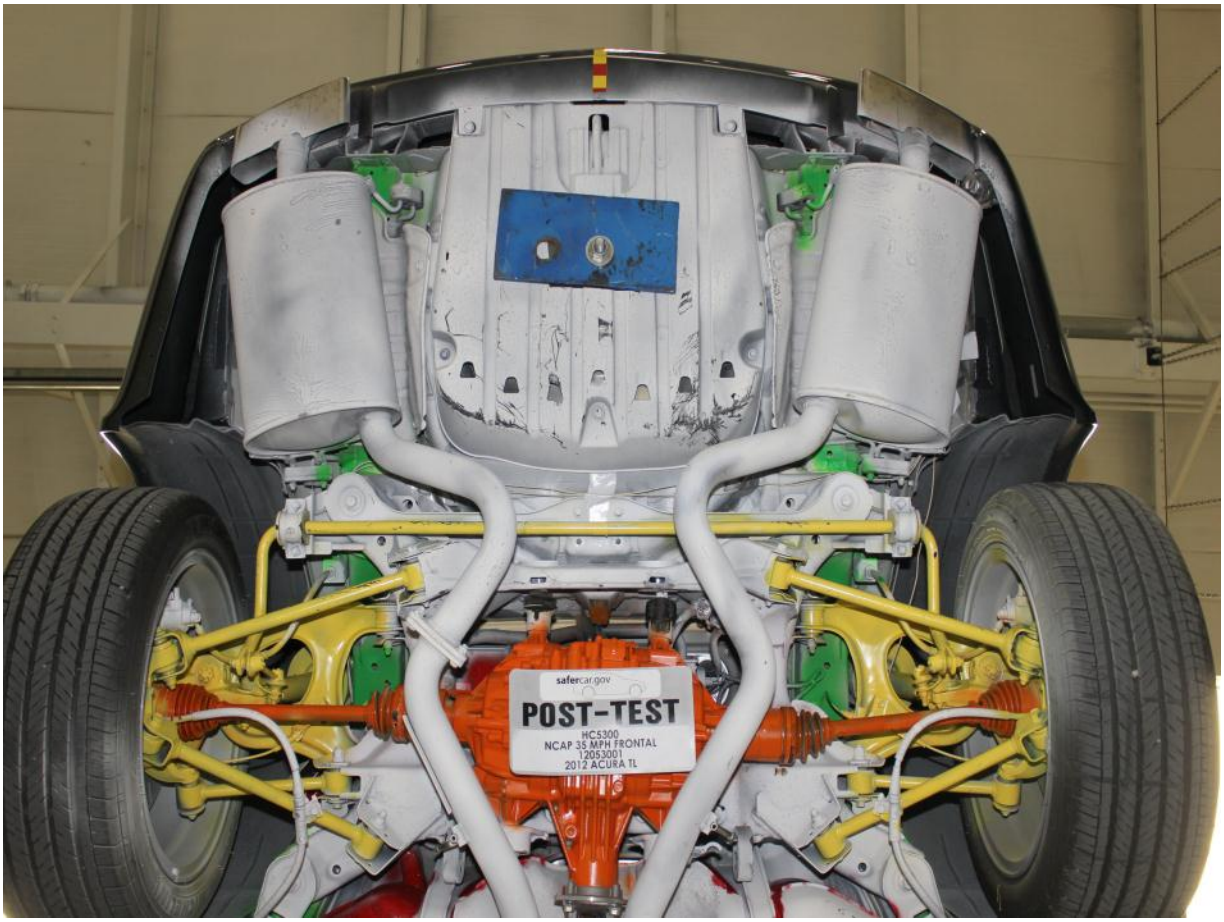
Post-Test Mid Front Underbody View

Pre-Test Mid Rear Underbody View

Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View

Pre-Test Dummy Cable Routing

Post-Test Dummy Cable Routing

Pre-Test Driver Dummy Front View

Post-Test Driver Dummy Front View

Pre-Test Driver Dummy Window View

Post-Test Driver Dummy Window View

Pre-Test Driver Dummy and Vehicle Interior (Door Open)

Post-Test Driver Dummy and Vehicle Interior (Door Open)

Pre-Test Driver's Seat Fore-Aft Markings

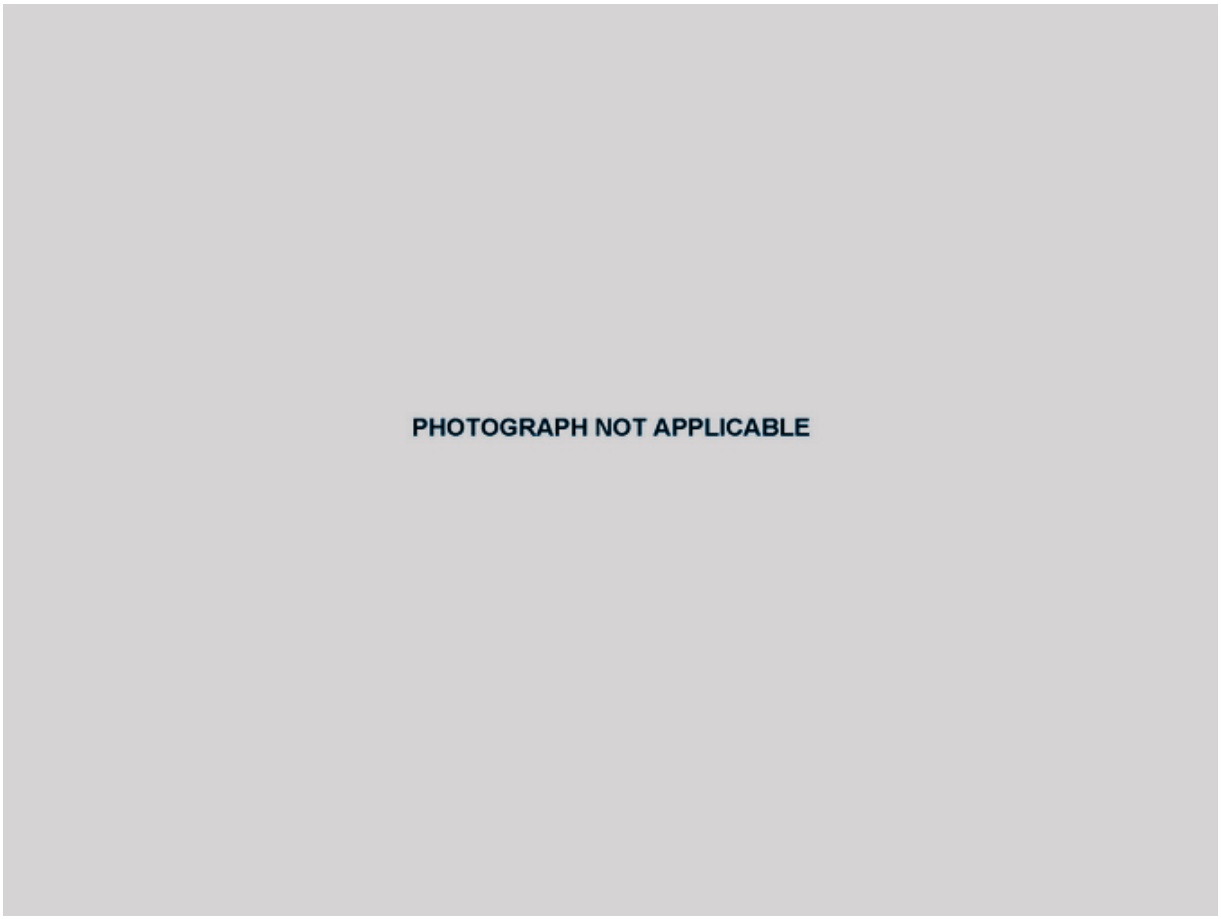
Post-Test Driver's Seat Fore-Aft Markings

Pre-Test Driver Dummy Feet

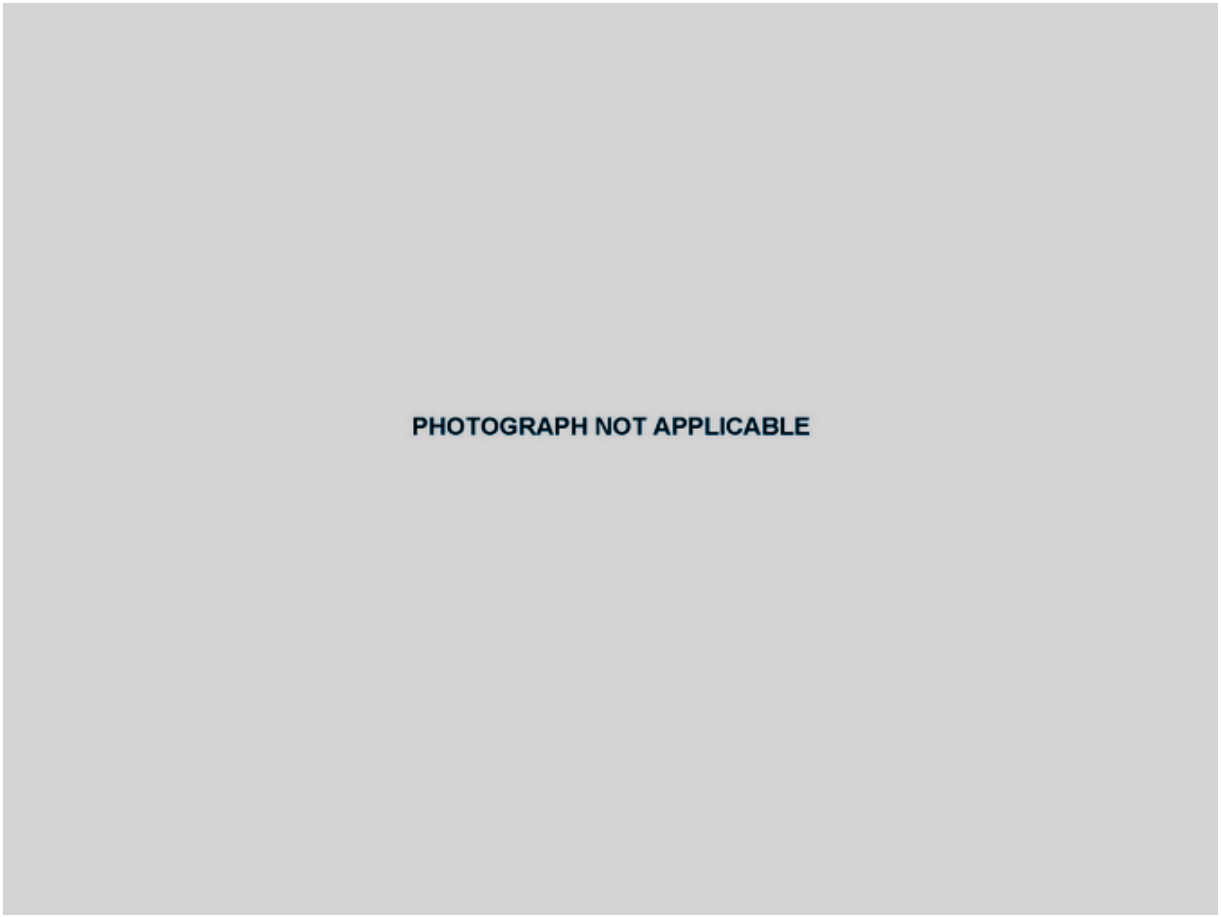
Post-Test Driver Dummy Feet

Pre-Test Driver's Side Knee Bolster (without dummy)

Post-Test Driver's Side Knee Bolster (without dummy)



Pre-Test Driver's Side Floorpan



Post-Test Driver's Side Floorpan

Post-Test Driver Dummy Face

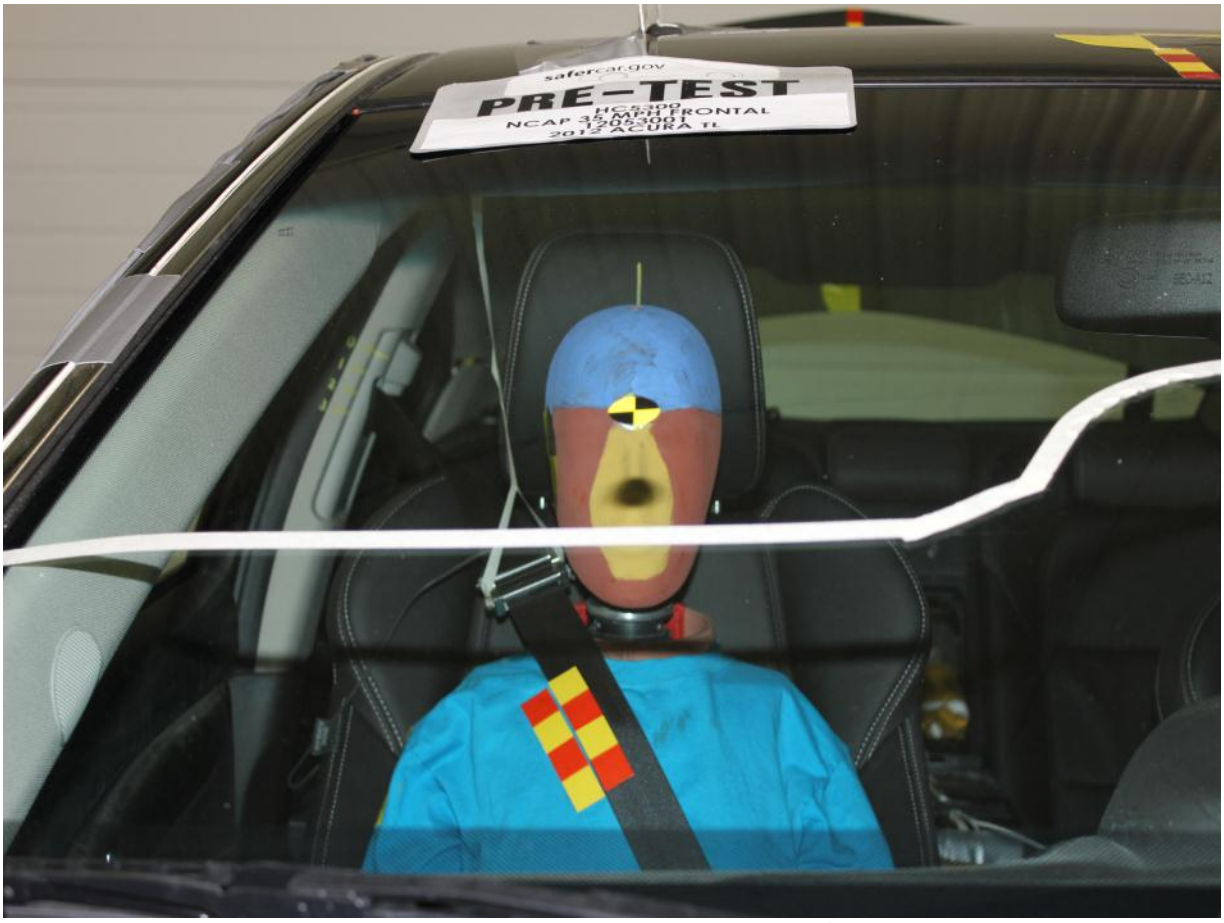
Post-Test Driver Dummy Contact with Airbag

Post-Test Driver Dummy Contact with Headrest

Post-Test Driver Dummy Contact with Knee Bolster

Pre-Test View of the Steering Wheel

Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View

Post-Test Passenger Dummy Front View

Pre-Test Passenger Dummy Window View

Post-Test Passenger Dummy Window View

Pre-Test Passenger Dummy and Vehicle Interior (Door Open)

Post-Test Passenger Dummy and Vehicle Interior (Door Open)

Pre-Test Passenger's Seat Fore-Aft Markings

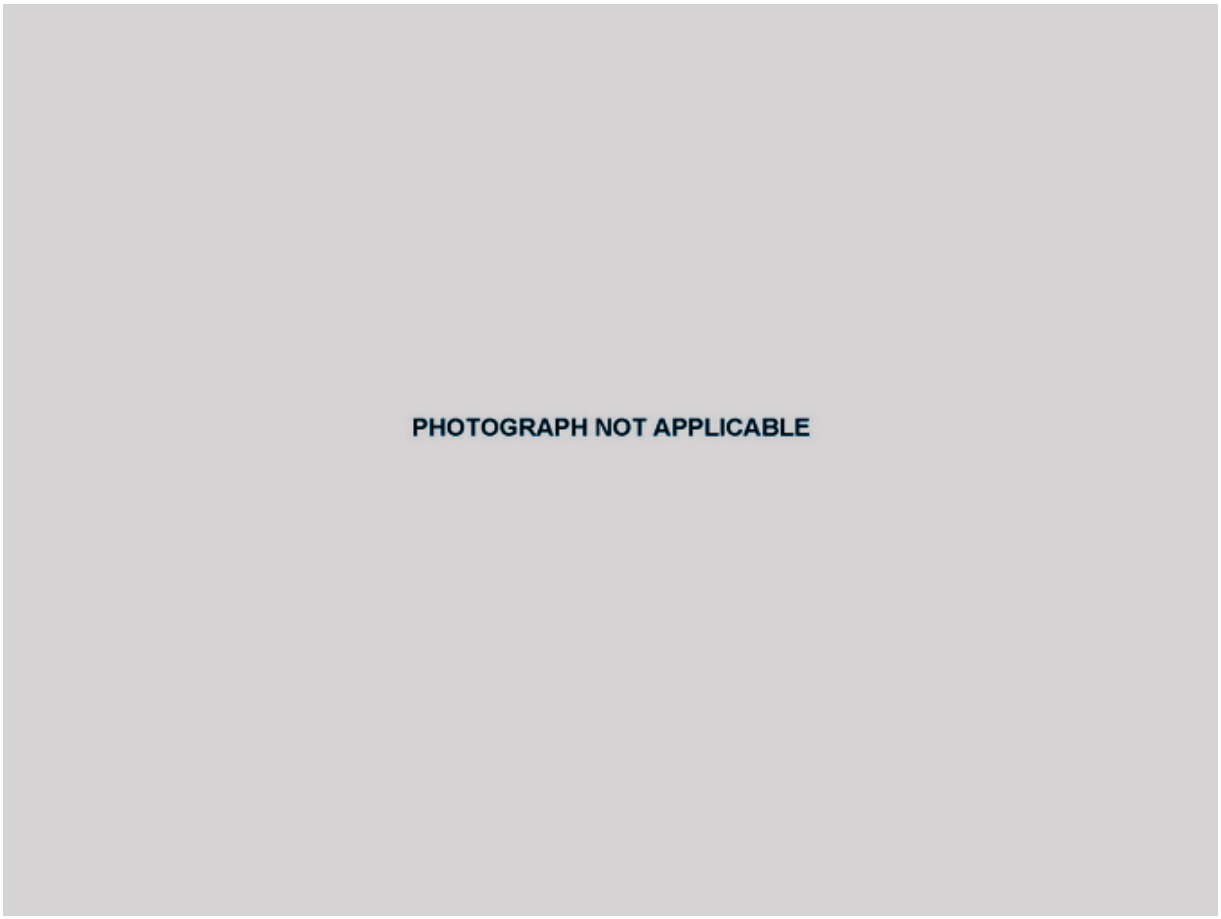
Post-Test Passenger's Seat Fore-Aft Markings

Pre-Test Passenger Dummy Feet

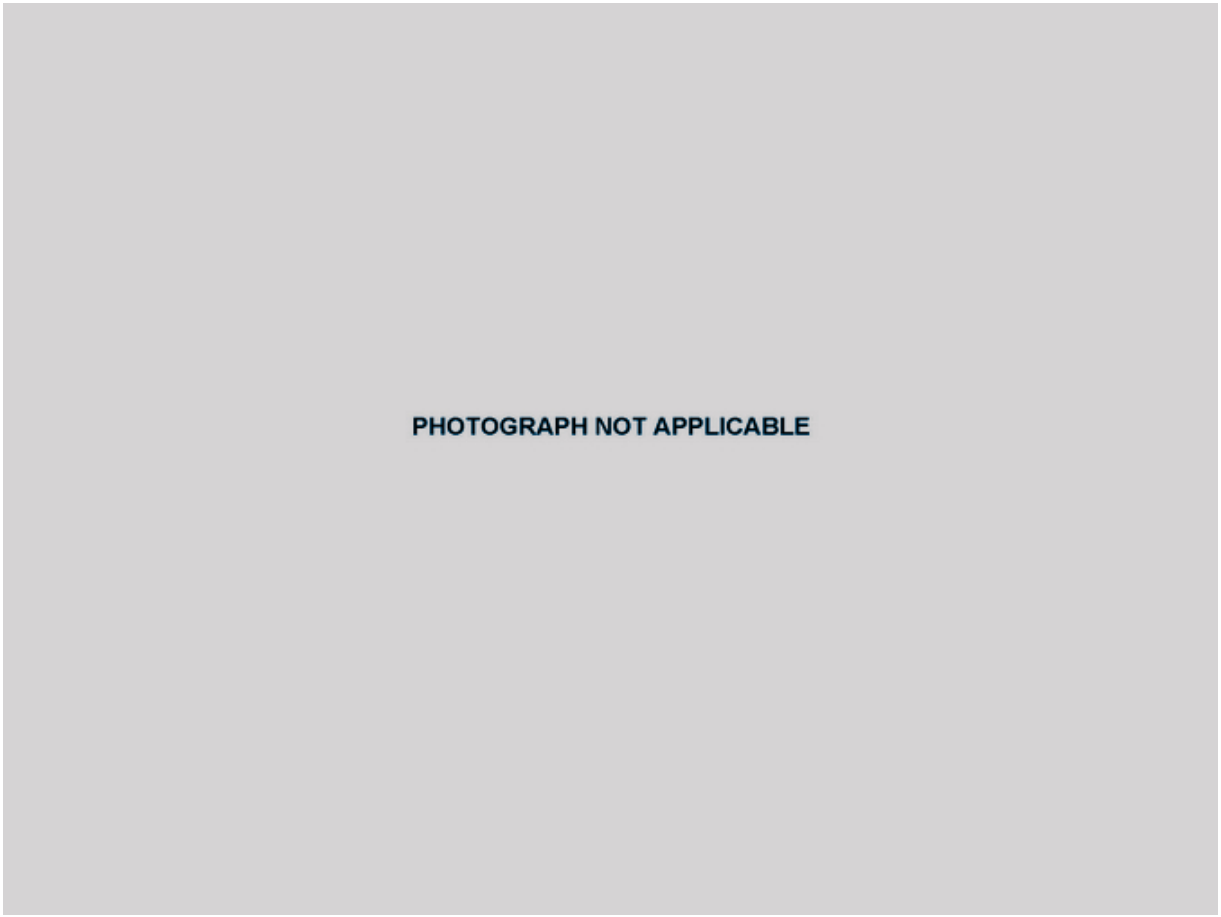
Post-Test Passenger Dummy Feet

Pre-Test Passenger's Side Knee Bolster (without dummy)

Post-Test Passenger's Side Knee Bolster (without dummy)



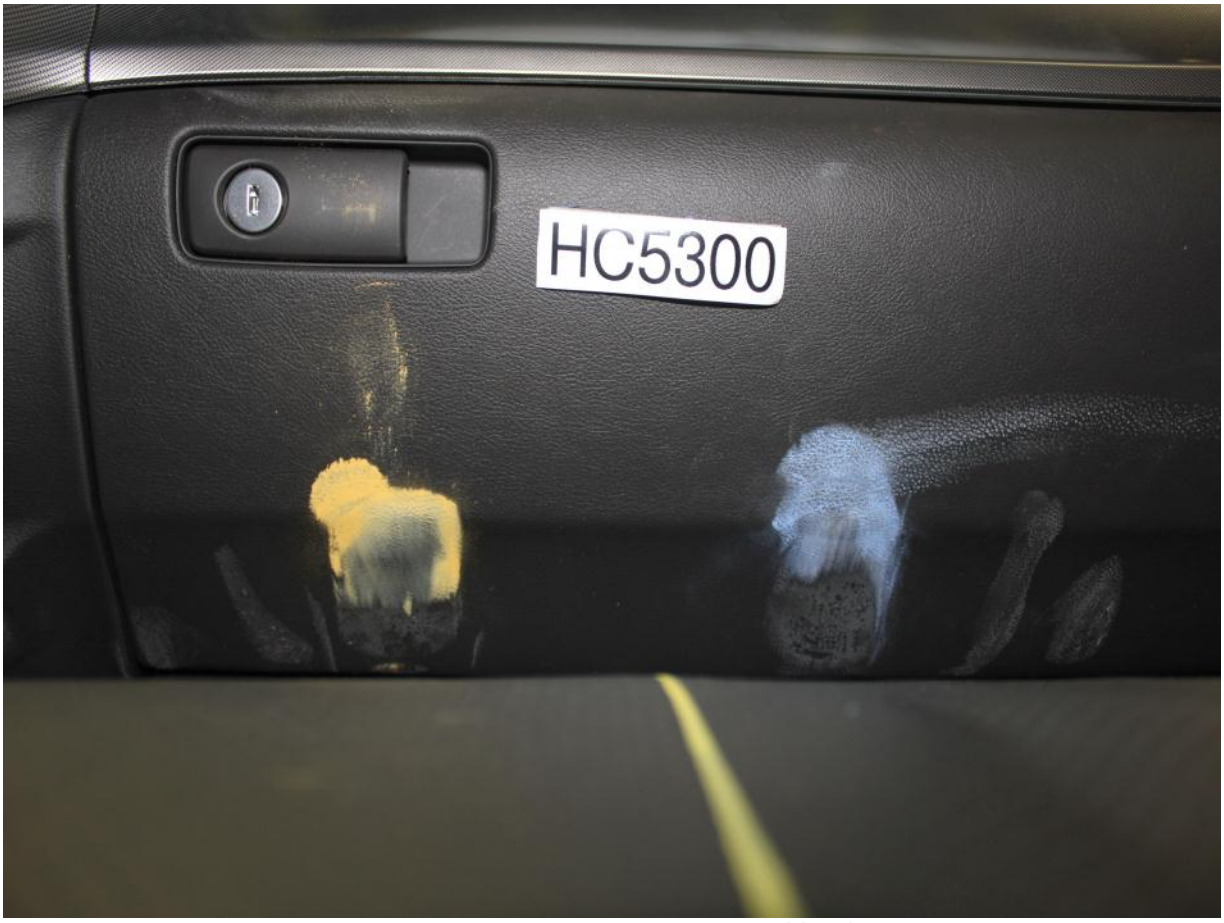
Pre-Test Passenger's Side Floorpan



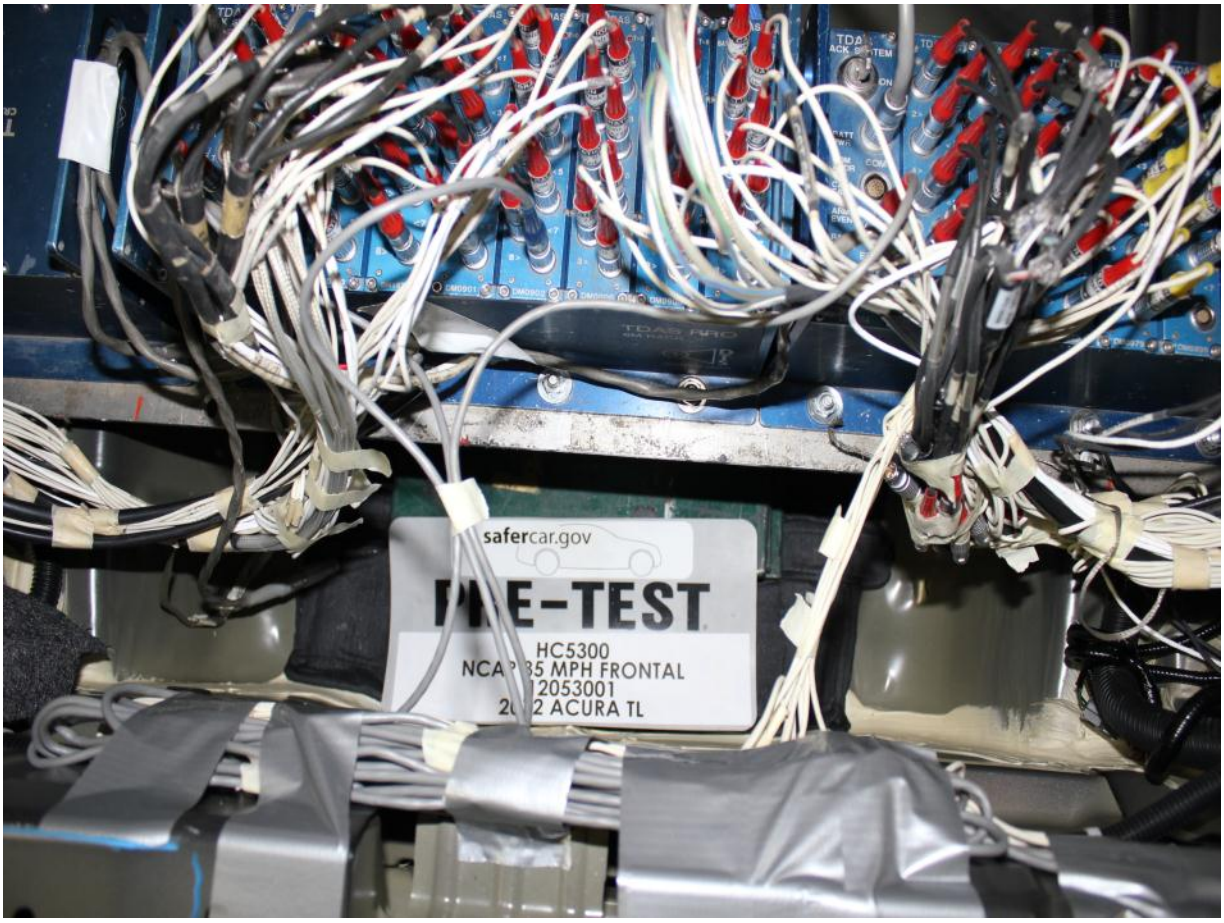
Post-Test Passenger's Side Floorpan

Post-Test Passenger Dummy Contact with Airbag

Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glove Box

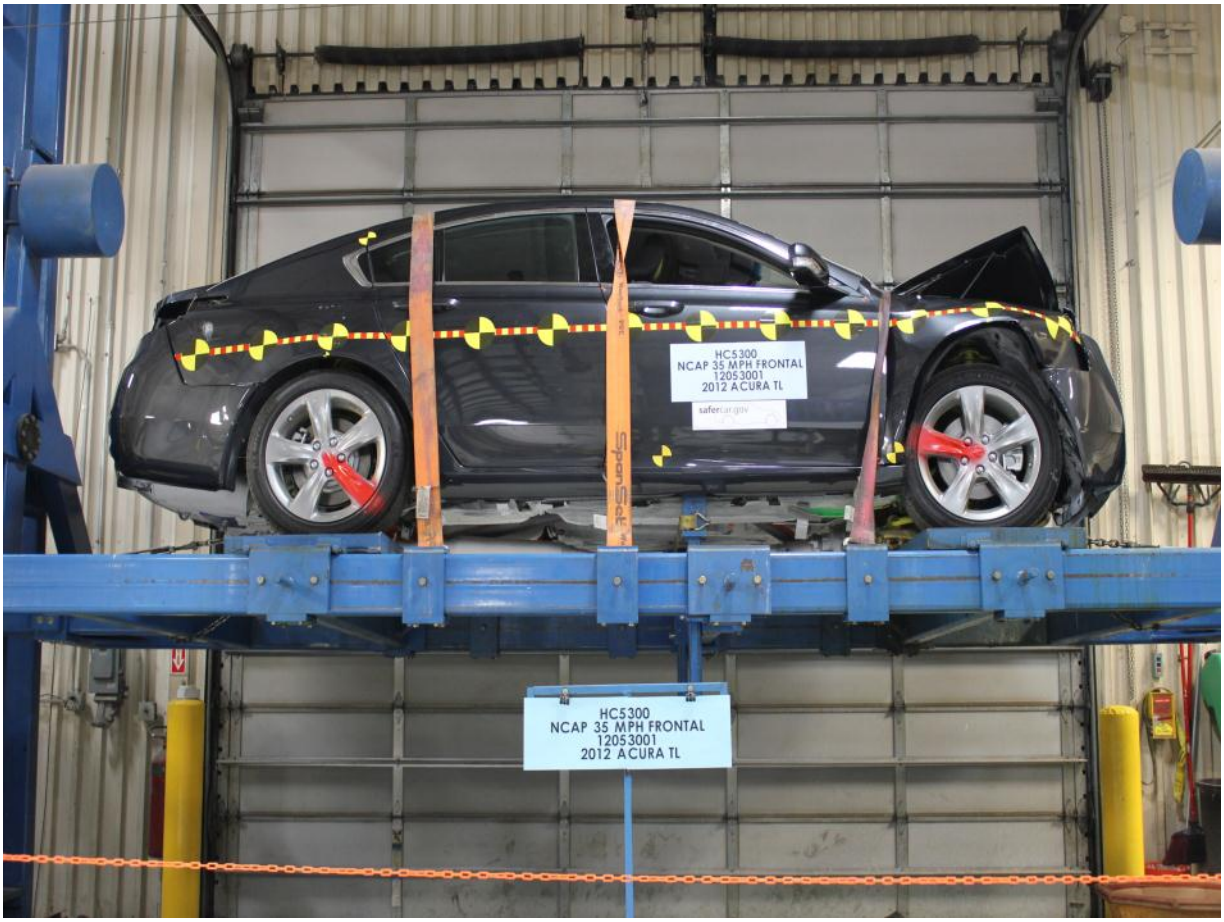


Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

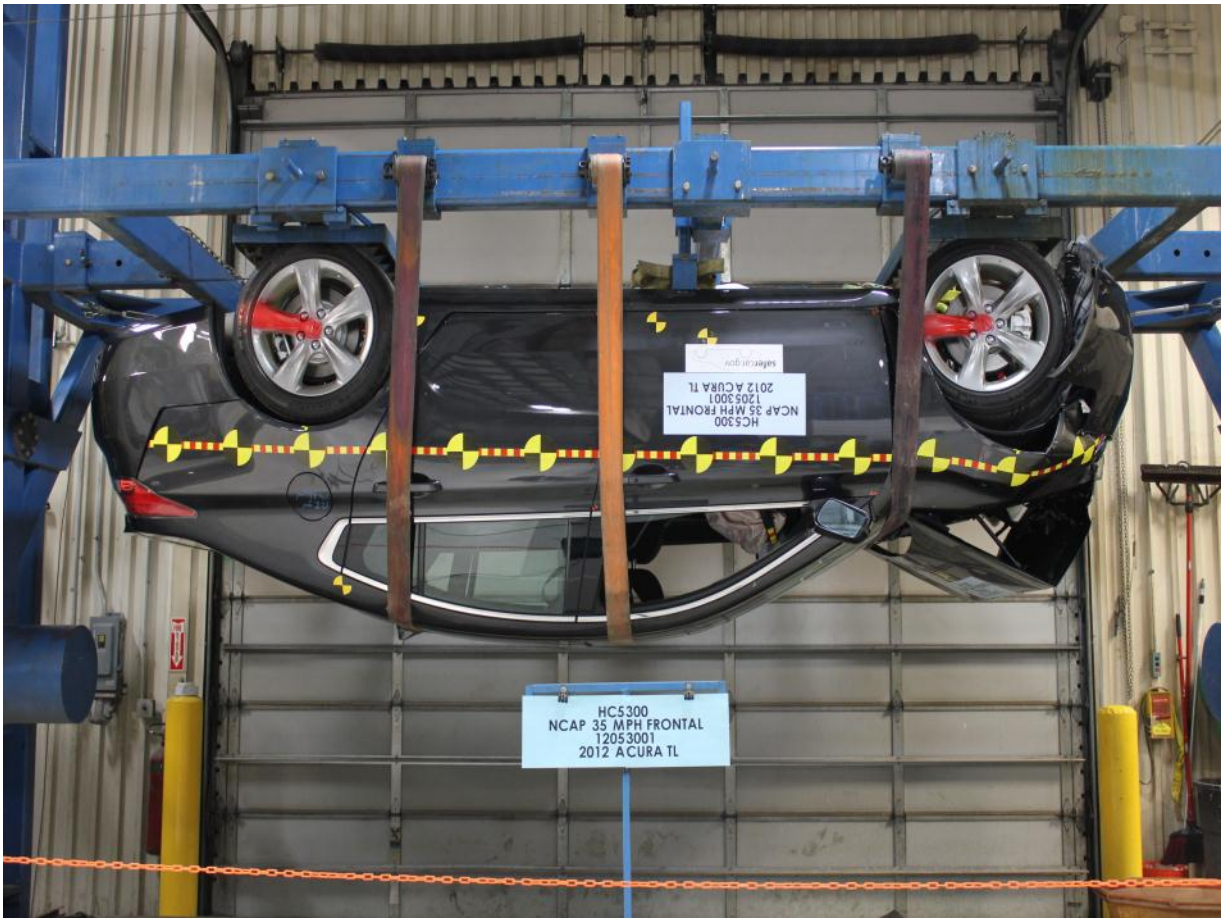
Post-Test Stoddard Solvent Spillage Location View

Post-Test Speed Trap Read-Out



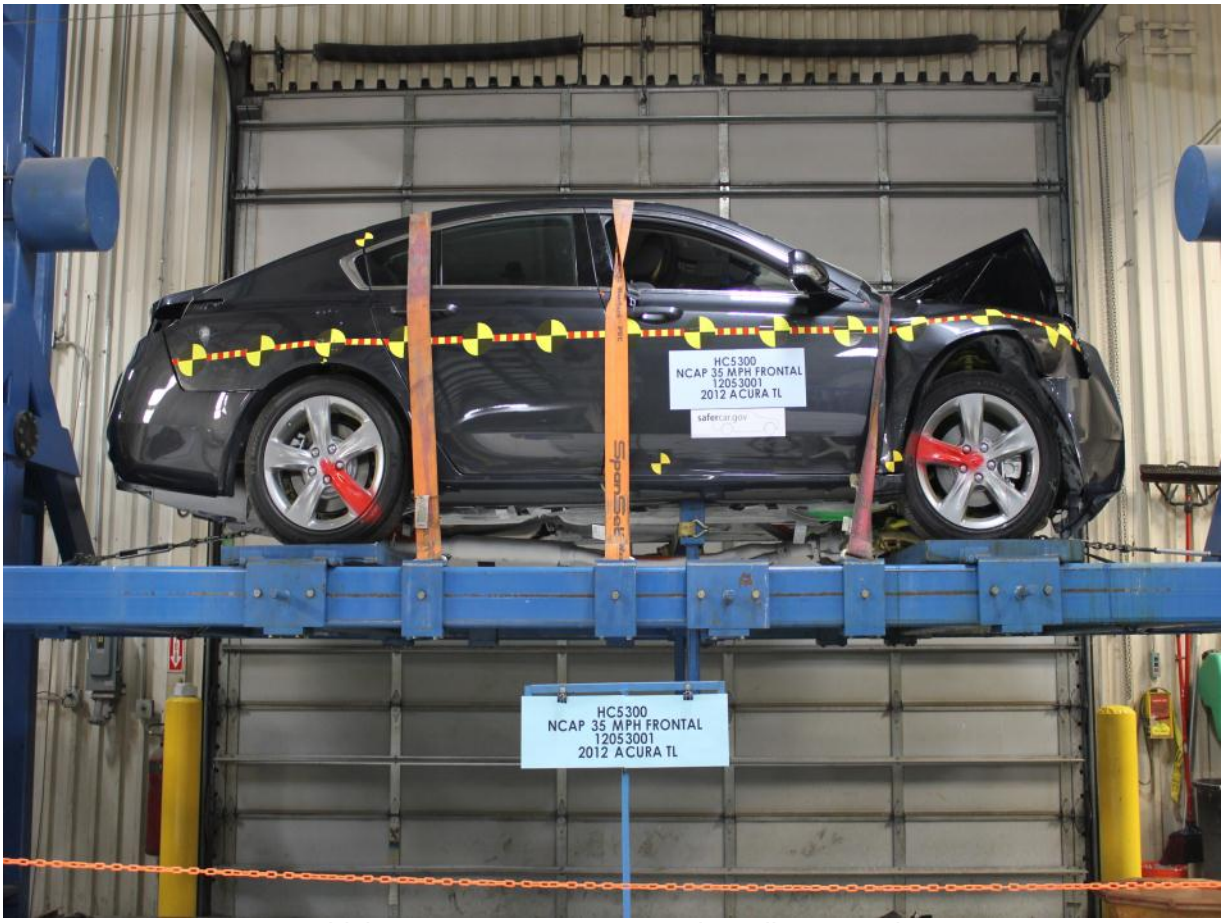
Vehicle at 0 Degrees on Static Rollover Device

Vehicle at 90 Degrees on Static Rollover Device



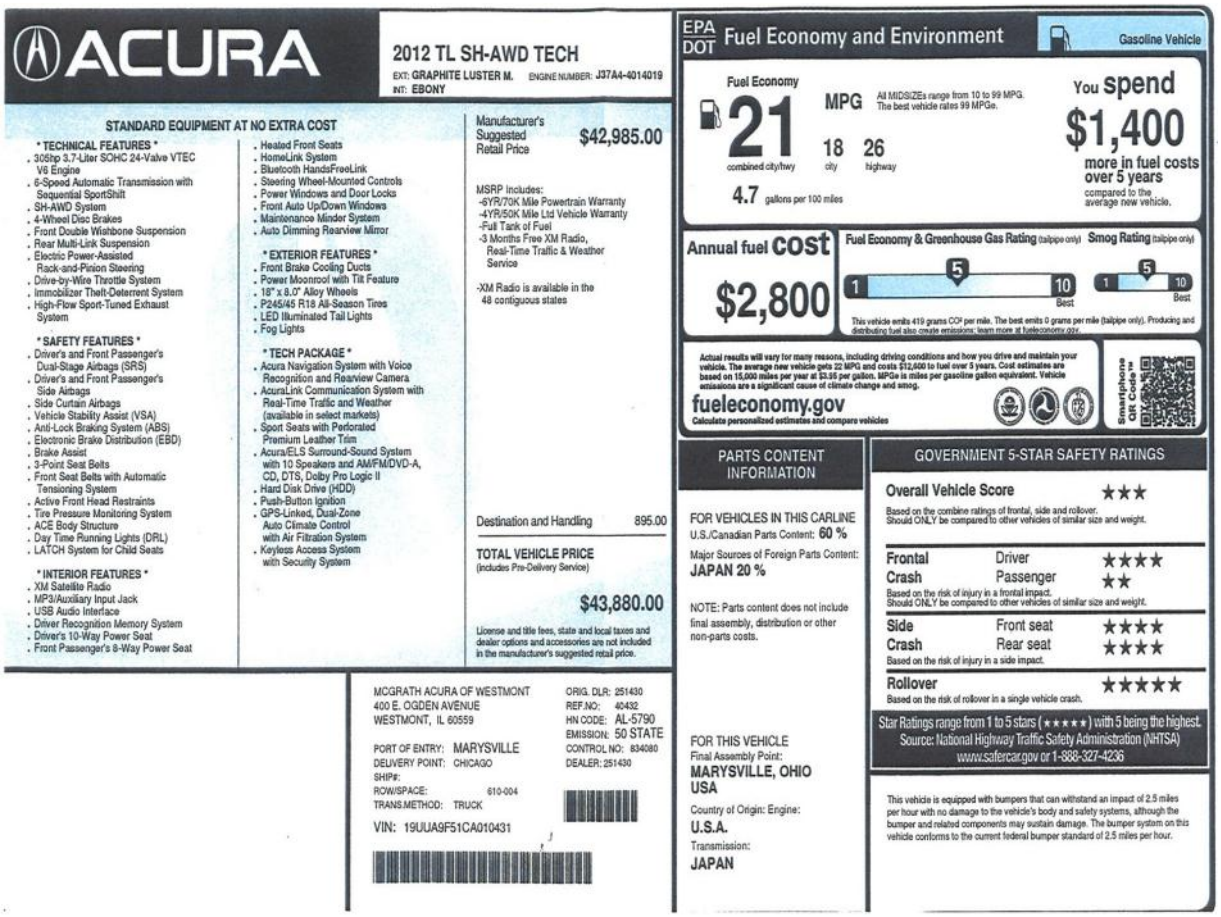
Vehicle at 180 Degrees on Static Rollover Device

Vehicle at 270 Degrees on Static Rollover Device



Vehicle at 360 Degrees on Static Rollover Device

2012 Acura TL Frontal Impact Event



ACURA

2012 TL SH-AWD TECH

EXT: GRAPHITE LUSTER M. ENGINE NUMBER: J37A4-4014019
INT: EBONY

STANDARD EQUIPMENT AT NO EXTRA COST

* TECHNICAL FEATURES *
- 305hp 3.7-Liter SOHC 24-Valve VTEC V6 Engine
- 6-Speed Automatic Transmission with Sequential SportShift
- SH-AWD System
- 4-Wheel Disc Brakes
- Front Double Wishbone Suspension
- Rear Multi-Link Suspension
- Electric Power-Assisted Rack-and-Pinion Steering
- Drive-by-Wire Throttle System
- Immobilizer Theft-Deterrent System
- High-Flow Sport-Tuned Exhaust System

* SAFETY FEATURES *
- Driver's and Front Passenger's Dual-Stage Airbags (SRS)
- Driver's and Front Passenger's Side Airbags
- Side Curtain Airbags
- Vehicle Stability Assist (VSA)
- Anti-Lock Braking System (ABS)
- Electronic Brake Distribution (EBD)
- Brake Assist
- 3-Point Seat Belts
- Front Seat Belts with Automatic Tensioning System
- Active Front Head Restraints
- Tire Pressure Monitoring System
- ACE Body Structure
- Day Time Running Lights (DRL)
- LATCH System for Child Seats

* INTERIOR FEATURES *
- XM Satellite Radio
- MP3/Auxiliary Input Jack
- USB Audio Interface
- Driver Recognition Memory System
- Driver's 10-Way Power Seat
- Front Passenger's 8-Way Power Seat
- Heated Front Seats
- HomeLink System
- Bluetooth HandsFreeLink
- Steering Wheel-Mounted Controls
- Power Windows and Door Locks
- Front Auto Up/Down Windows
- Maintenance Minder System
- Auto Dimming Rearview Mirror

* EXTERIOR FEATURES *
- Front Brake Cooling Ducts
- Power Moonroof with Tilt Feature
- 18" x 8.0" Alloy Wheels
- P245/45 R18 All-Season Tires
- LED Illuminated Tail Lights
- Fog Lights

* TECH PACKAGE *
- Acura Navigation System with Voice Recognition and Rearview Camera
- AcuraLink Communication System with Real-Time Traffic and Weather (available in select markets)
- Sport Seats with Perforated Premium Leather Trim
- Acura/ELS Surround-Sound System with 10 Speakers and AM/FM/DVD-A, CD, DTS, Dolby Pro Logic II
- Hard Disk Drive (HDD)
- Push-Button Ignition
- GPS-Linked, Dual-Zone Auto Climate Control with Air Filtration System
- Keyless Access System with Security System

Manufacturer's Suggested Retail Price $42,985.00

MSRP includes:
-6YR/70K Mile Powertrain Warranty
-4YR/50K Mile Ltd Vehicle Warranty
-Full Tank of Fuel
-3 Months Free XM Radio, Real-Time Traffic & Weather Service

-XM Radio is available in the 48 contiguous states

Destination and Handling 895.00

TOTAL VEHICLE PRICE
(Includes Pre-Delivery Service)

$43,880.00

License and title fees, state and local taxes and dealer options and accessories are not included in the manufacturer's suggested retail price.

MCGRATH ACURA OF WESTMONT
400 E. OGDEN AVENUE
WESTMONT, IL 60559

ORIG. DLR: 251430
REF.NO: 40432
HN CODE: AL-5790
EMISSION: 50 STATE
CONTROL NO: 834080
DEALER: 251430

PORT OF ENTRY: MARYSVILLE
DELIVERY POINT: CHICAGO
SHIP#:
ROW/SPACE: 610-004
TRANS.METHOD: TRUCK

VIN: 19UUA9F51CA010431

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
21 MPG
combined city/hwy
18 city 26 highway
4.7 gallons per 100 miles

All MIDSIZEs range from 10 to 99 MPG. The best vehicle rates 99 MPGe.

You spend $1,400 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost
$2,800

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 5 (1 – 10, Best)

Smog Rating (tailpipe only) 5 (1 – 10, Best)

This vehicle emits 419 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 22 MPG and costs $12,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $3.95 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE
U.S./Canadian Parts Content: 60 %
Major Sources of Foreign Parts Content:
JAPAN 20 %

NOTE: Parts content does not include final assembly, distribution or other non-parts costs.

FOR THIS VEHICLE
Final Assembly Point:
MARYSVILLE, OHIO
USA
Country of Origin: Engine:
U.S.A.
Transmission:
JAPAN

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score ★★★
Based on the combine ratings of frontal, side and rollover.
Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash — Driver ★★★★ — Passenger ★★
Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash — Front seat ★★★★ — Rear seat ★★★★
Based on the risk of injury in a side impact.

Rollover ★★★★★
Based on the risk of rollover in a single vehicle crash.

Star Ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

This vehicle is equipped with bumpers that can withstand an impact of 2.5 miles per hour with no damage to the vehicle's body and safety systems, although the bumper and related components may sustain damage. The bumper system on this vehicle conforms to the current federal bumper standard of 2.5 miles per hour.

Monroney Label

APPENDIX B

DUMMY RESPONSE DATA TRACES

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Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
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Figure No. 36.	Passenger Right Femur Force vs. Time	B-12

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force Y

Driver Upper Neck Moment X

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Left Femur Redundant

Driver Right Femur Redundant

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z

Driver Left Lower Tibia Moment X

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Driver Lap Belt Force

Driver Shoulder Belt Force

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Upper Neck Force Y

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Left Femur Redundant

Passenger Right Femur Redundant

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Passenger Lap Belt Force

Passenger Shoulder Belt Force

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

Vehicle Left Brake Caliper X

Vehicle Right Brake Caliper X

Left Rear Seat Crossmember Xr

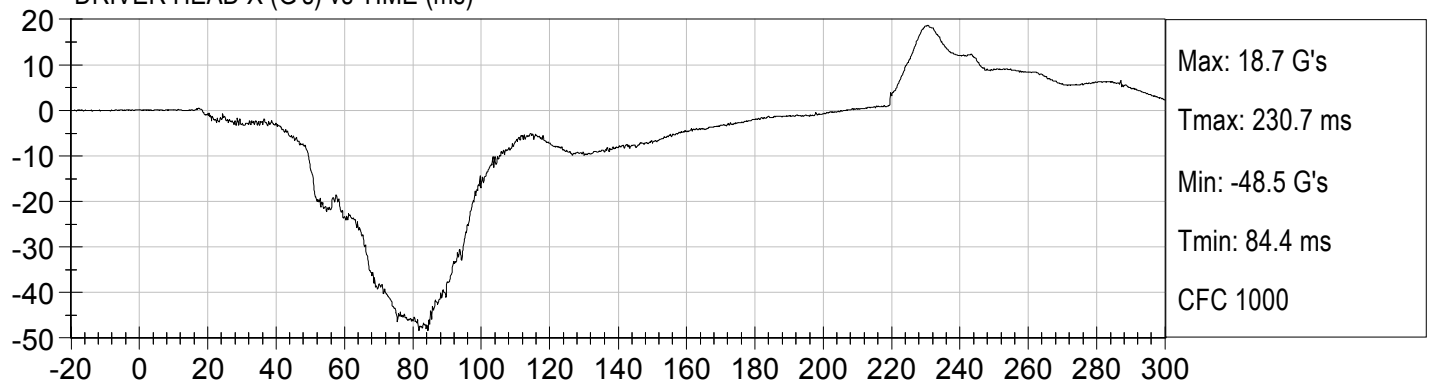
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 128 channels

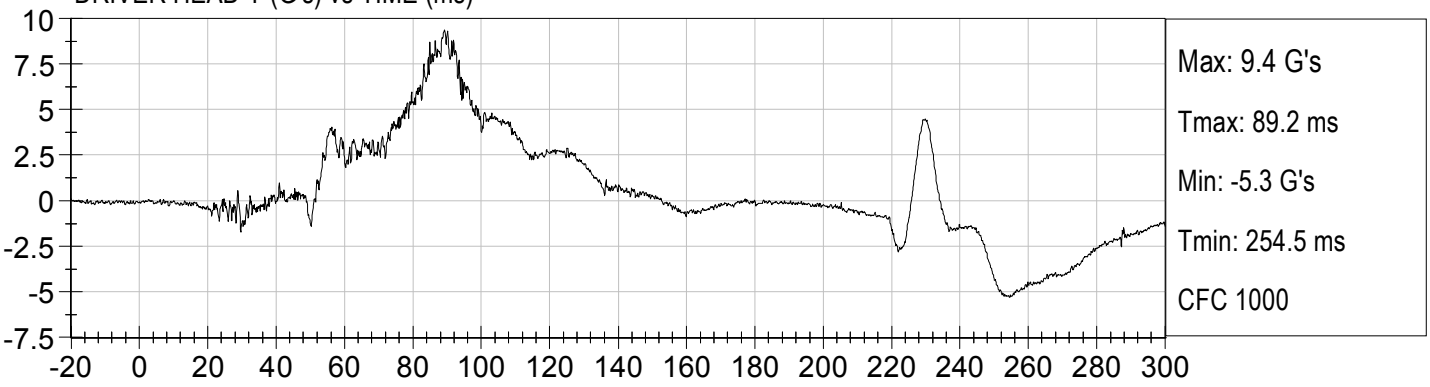
NCAP 35mph Frontal
2012 Acura TL - HC5300

Test Date: 05/30/2012
Speed: 35.0 mph (56.4 km/h)

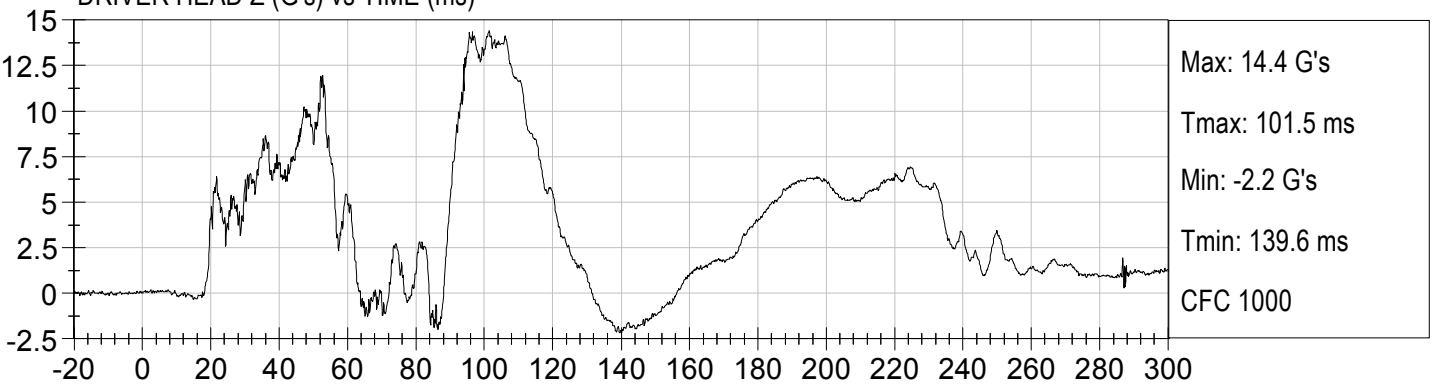
DRIVER HEAD X (G's) vs TIME (ms)



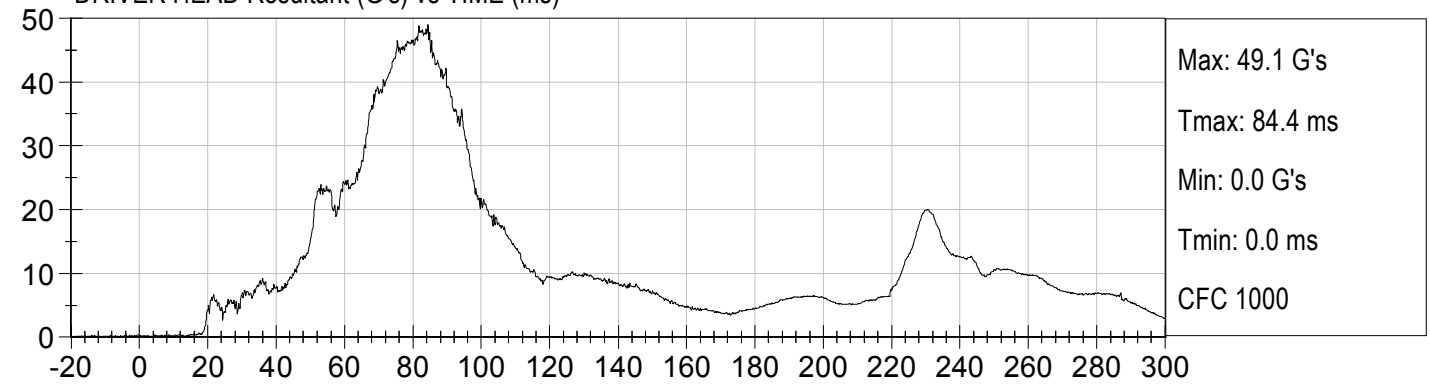
DRIVER HEAD Y (G's) vs TIME (ms)



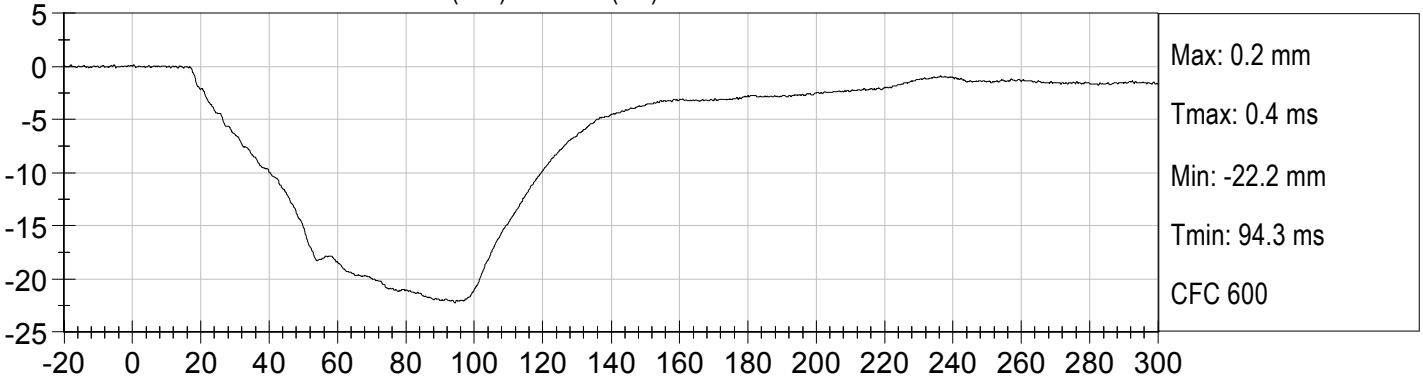
DRIVER HEAD Z (G's) vs TIME (ms)



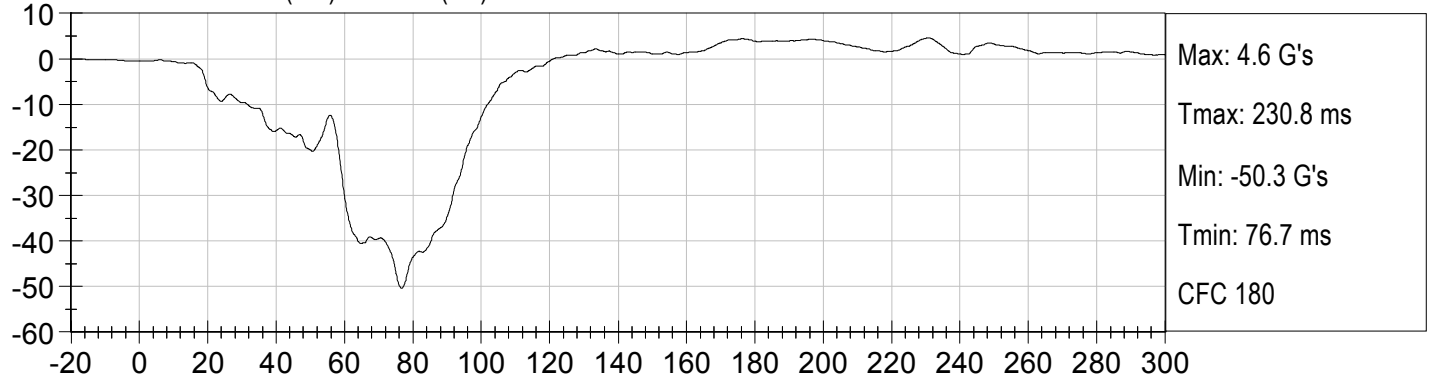
DRIVER HEAD Resultant (G's) vs TIME (ms)



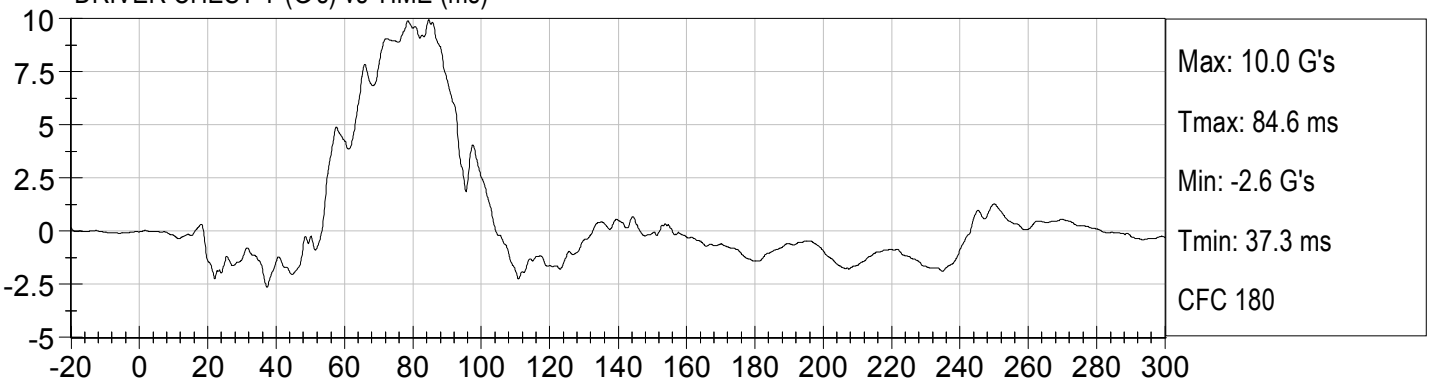
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)



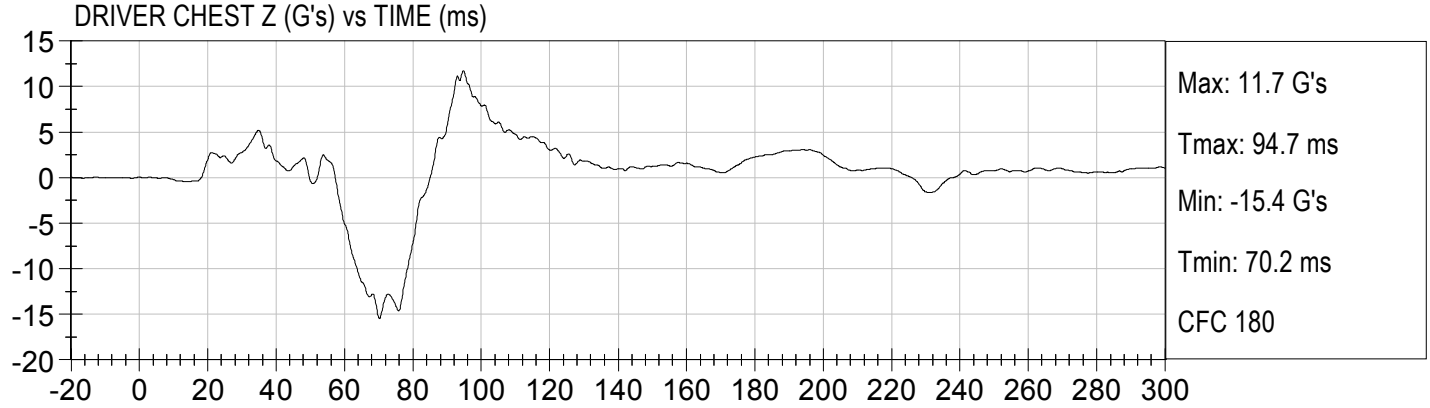
DRIVER CHEST X (G's) vs TIME (ms)



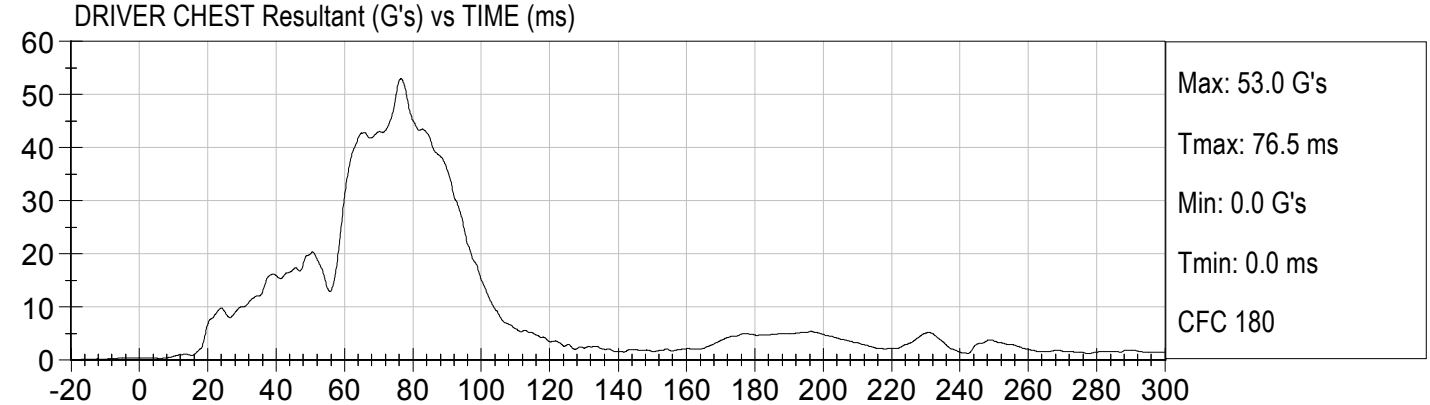
DRIVER CHEST Y (G's) vs TIME (ms)



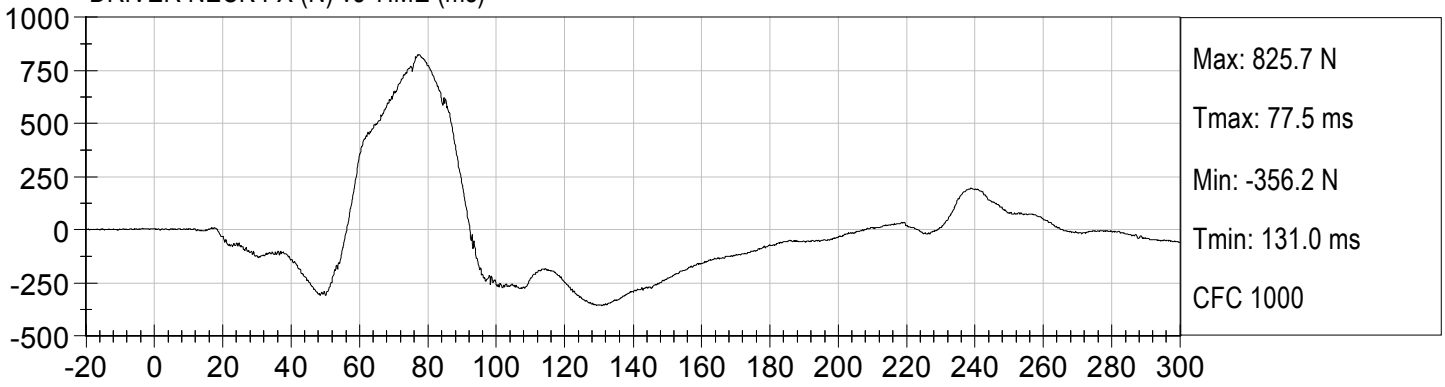
DRIVER CHEST Z (G's) vs TIME (ms)



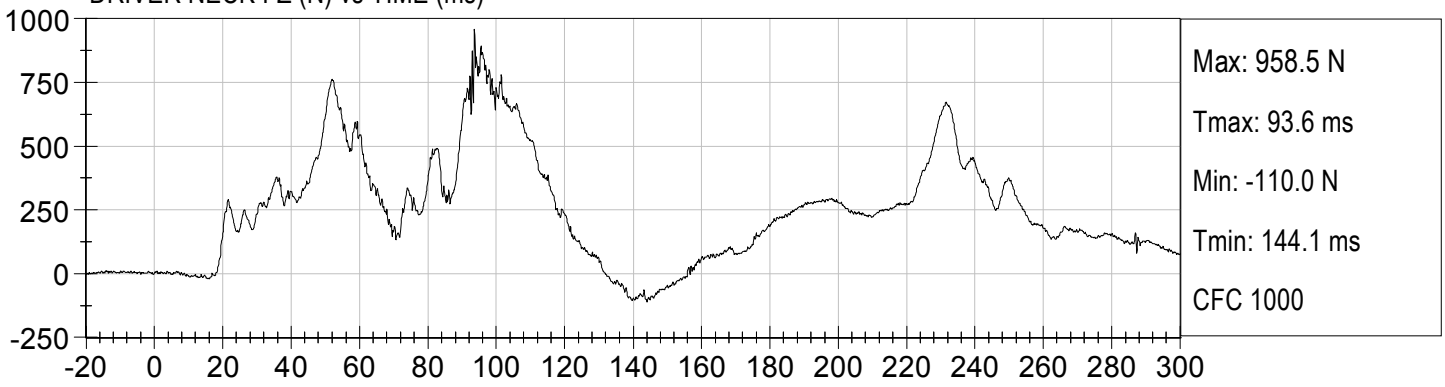
DRIVER CHEST Resultant (G's) vs TIME (ms)



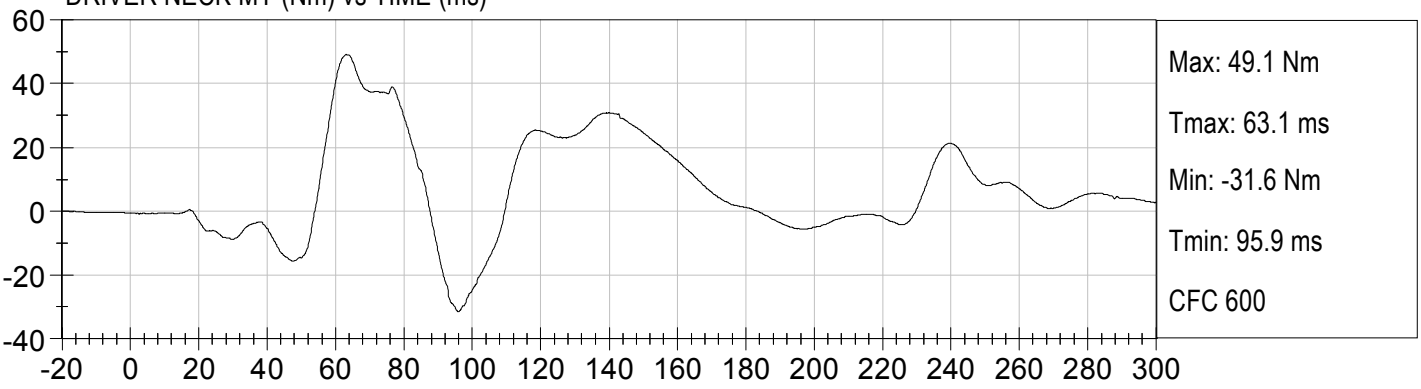
DRIVER NECK FX (N) vs TIME (ms)

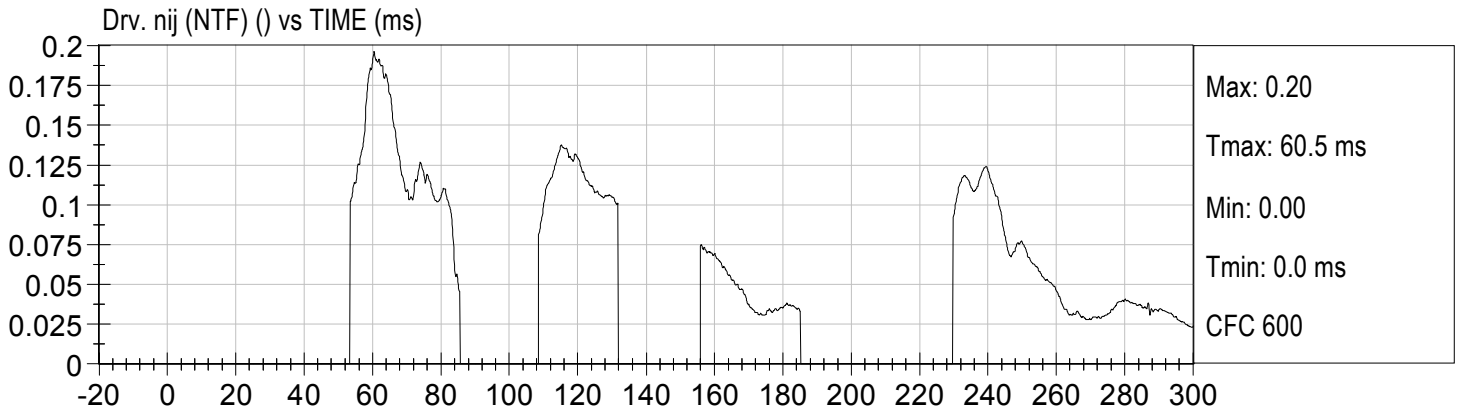


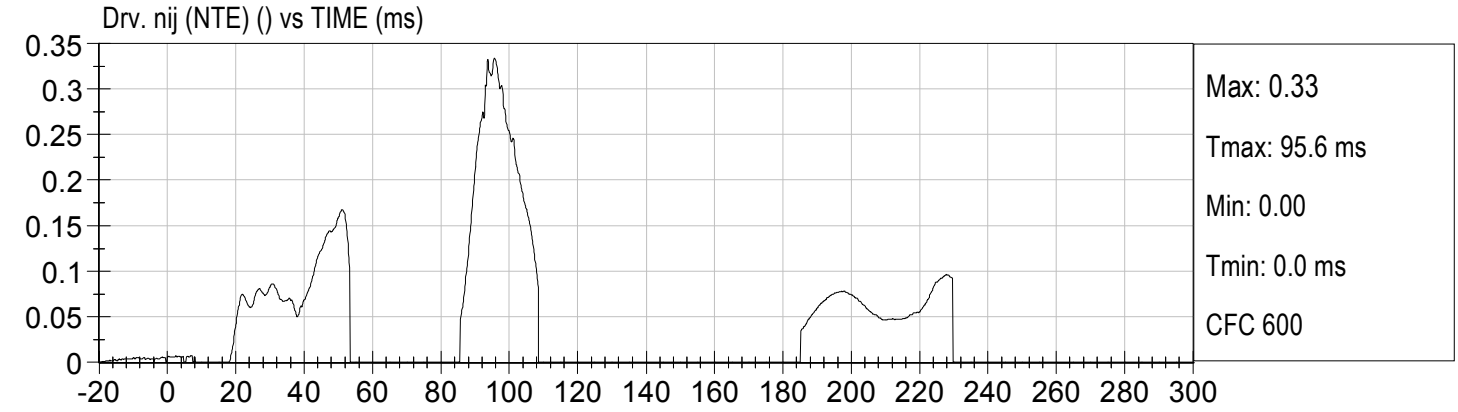
DRIVER NECK FZ (N) vs TIME (ms)

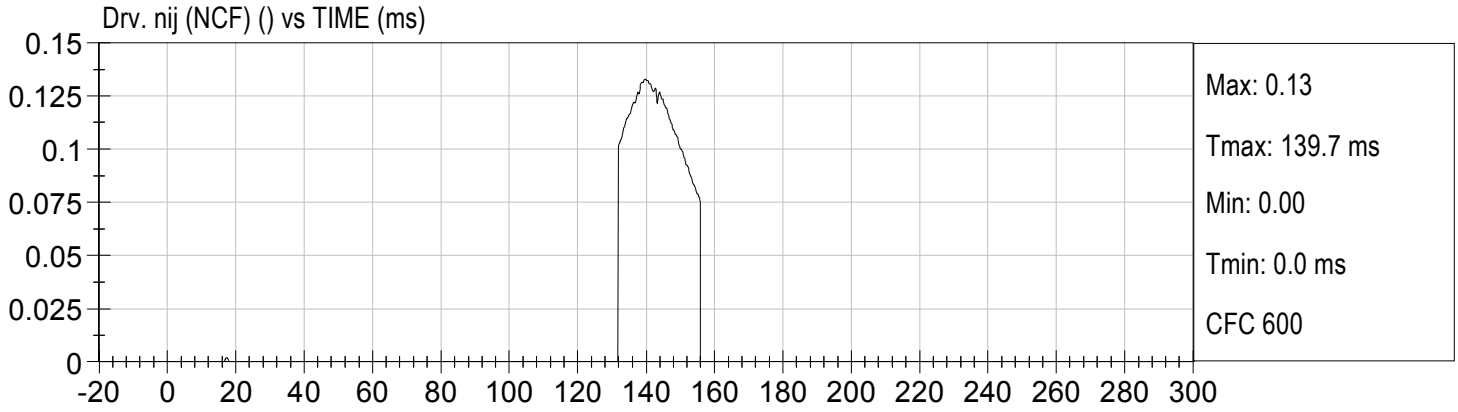


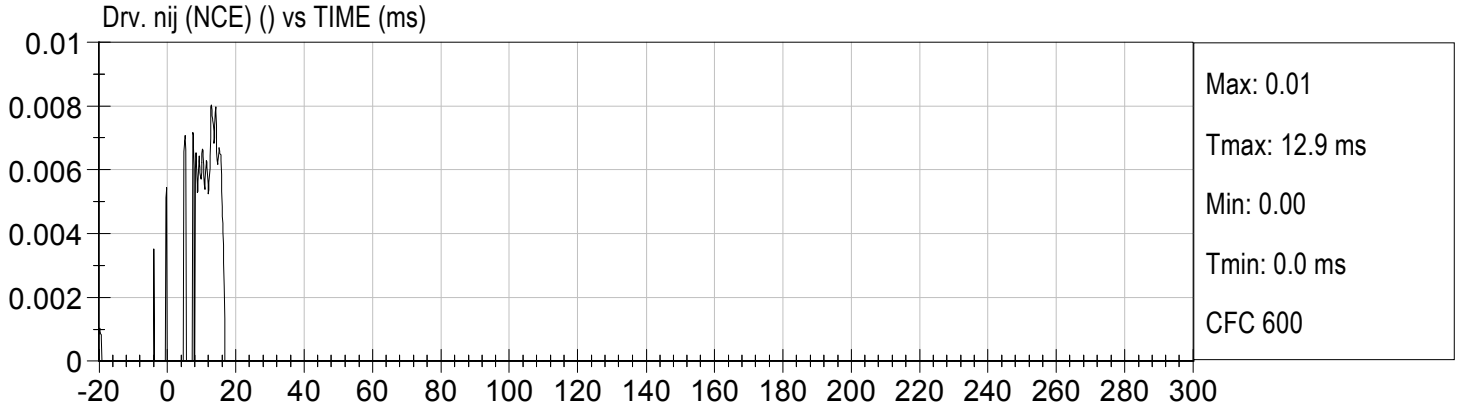
DRIVER NECK MY (Nm) vs TIME (ms)



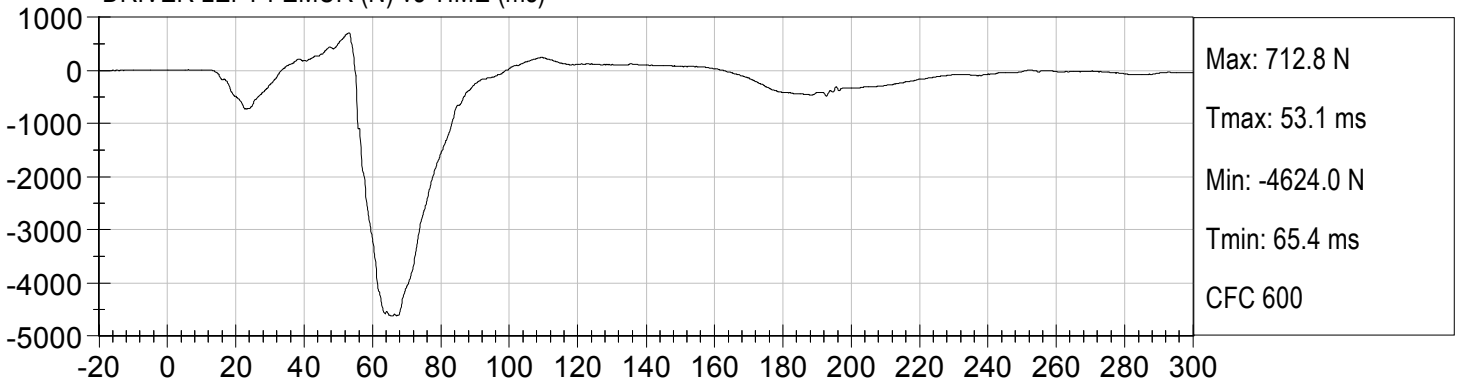

Drv. nij (NTF) () vs TIME (ms)
0.2
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.20
Tmax: 60.5 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600


Drv. nij (NTE) () vs TIME (ms)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.33
Tmax: 95.6 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600

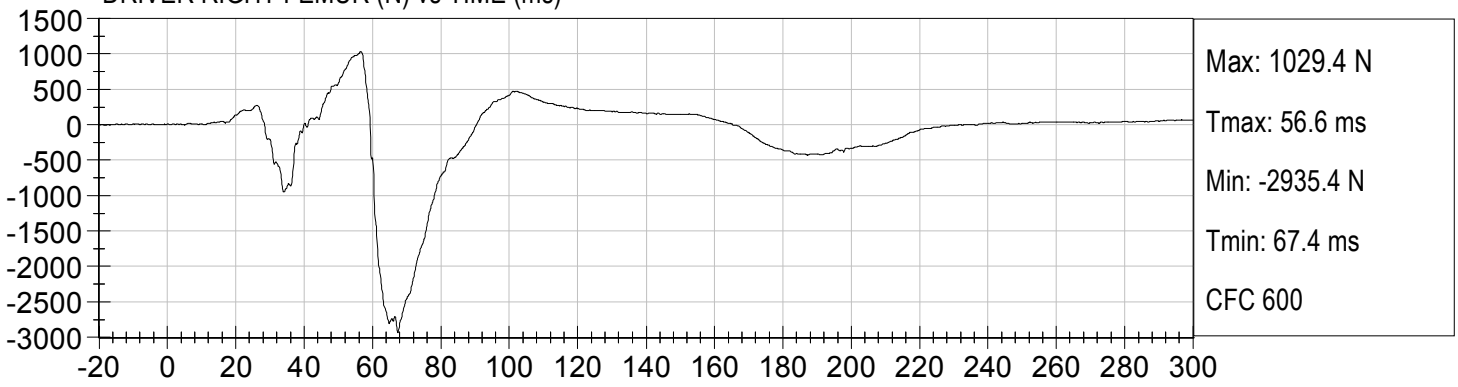

Drv. nij (NCF) () vs TIME (ms)
0.15
0.125
0.1
0.075
0.05
0.025
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.13
Tmax: 139.7 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600


Drv. nij (NCE) () vs TIME (ms)
0.01
0.008
0.006
0.004
0.002
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.01
Tmax: 12.9 ms
Min: 0.00
Tmin: 0.0 ms
CFC 600

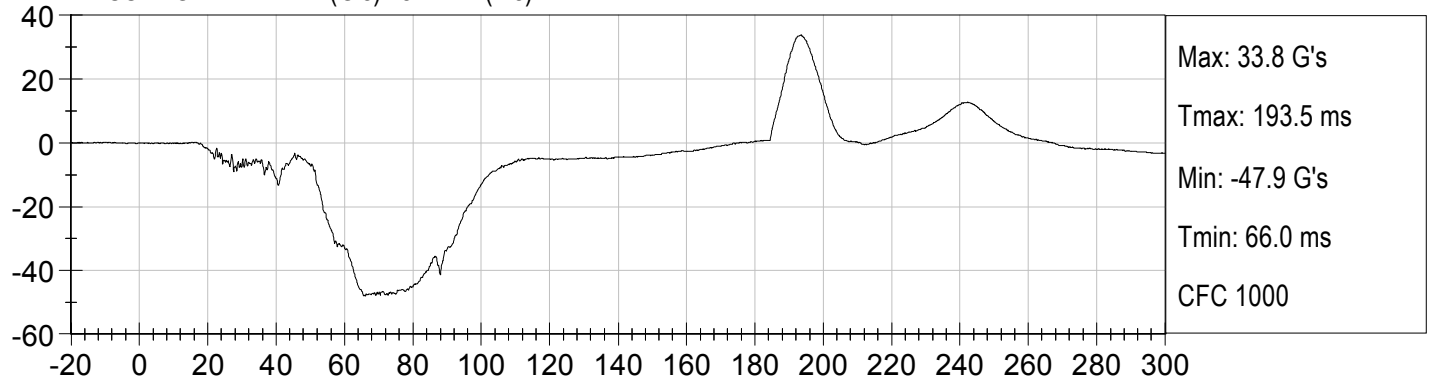
DRIVER LEFT FEMUR (N) vs TIME (ms)



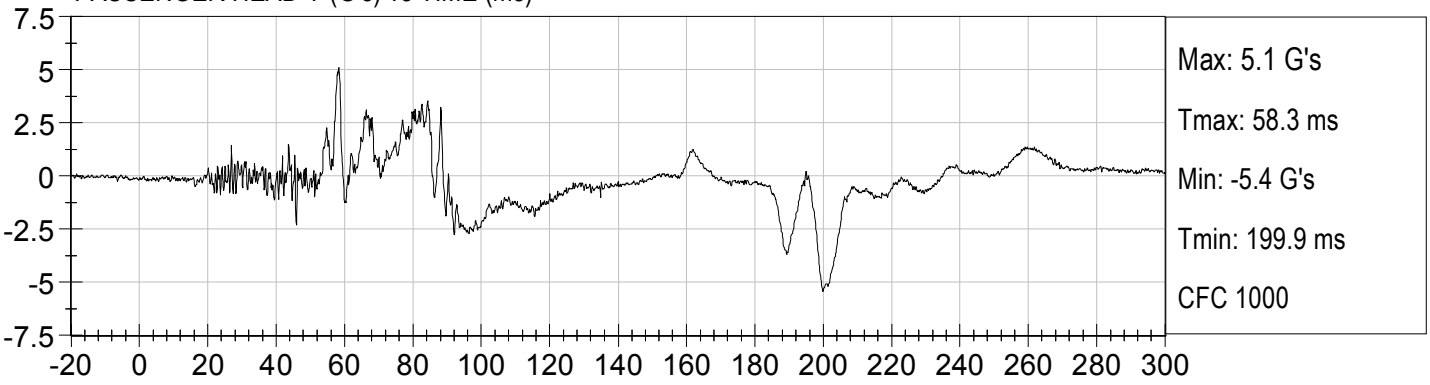
DRIVER RIGHT FEMUR (N) vs TIME (ms)



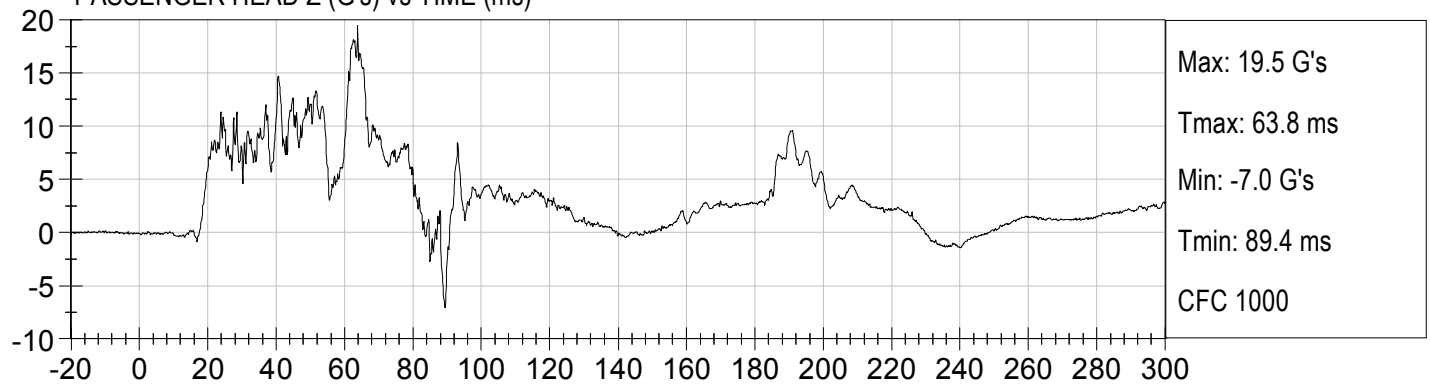
PASSENGER HEAD X (G's) vs TIME (ms)



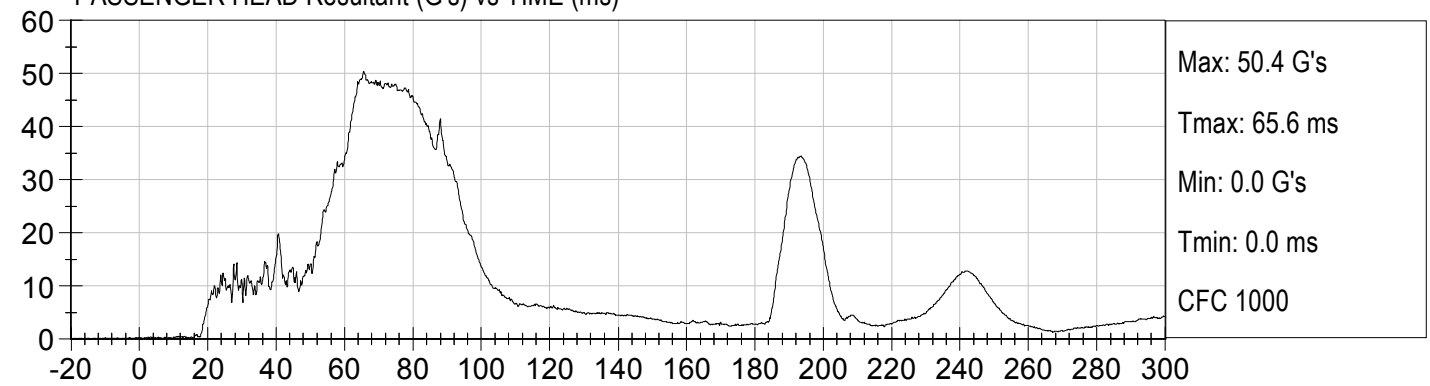
PASSENGER HEAD Y (G's) vs TIME (ms)



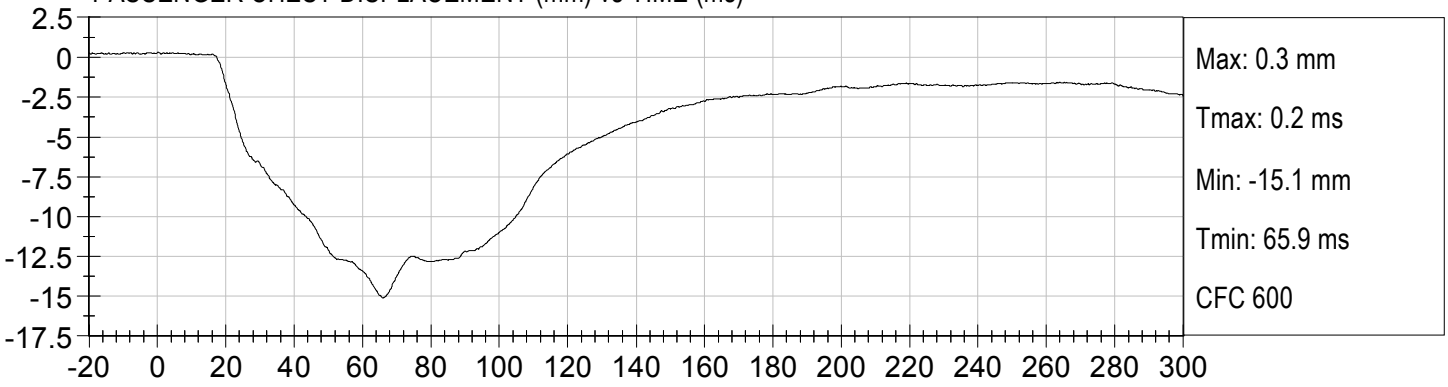
PASSENGER HEAD Z (G's) vs TIME (ms)



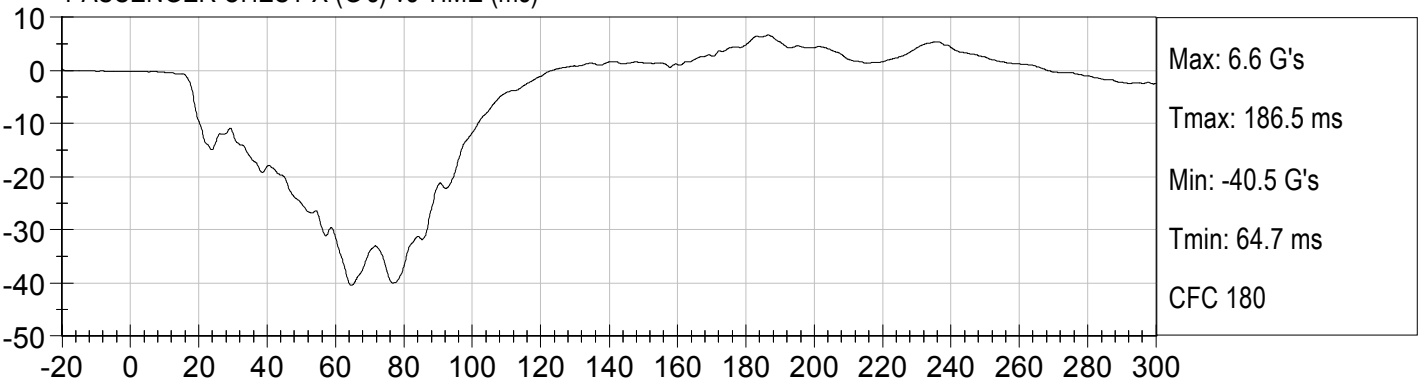
PASSENGER HEAD Resultant (G's) vs TIME (ms)



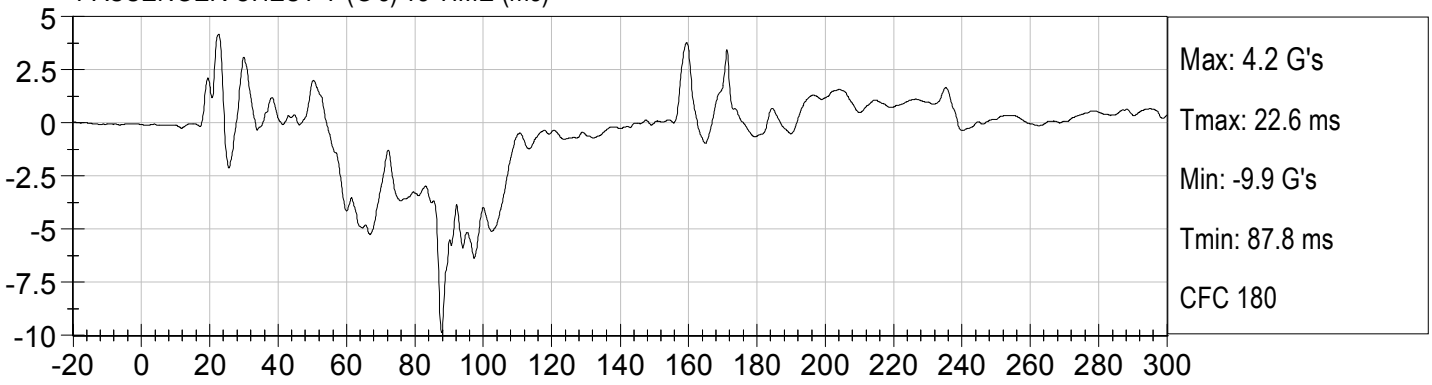
PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)



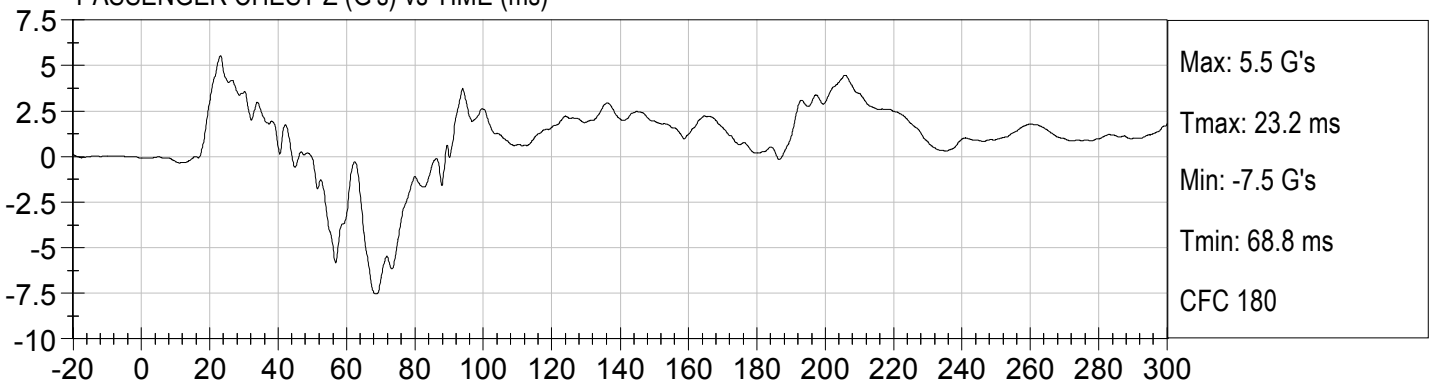
PASSENGER CHEST X (G's) vs TIME (ms)



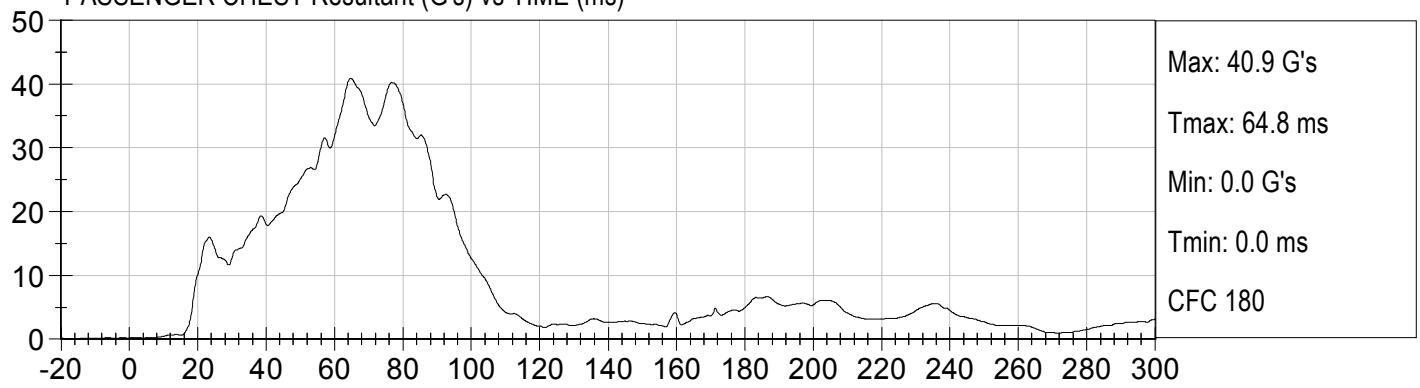
PASSENGER CHEST Y (G's) vs TIME (ms)

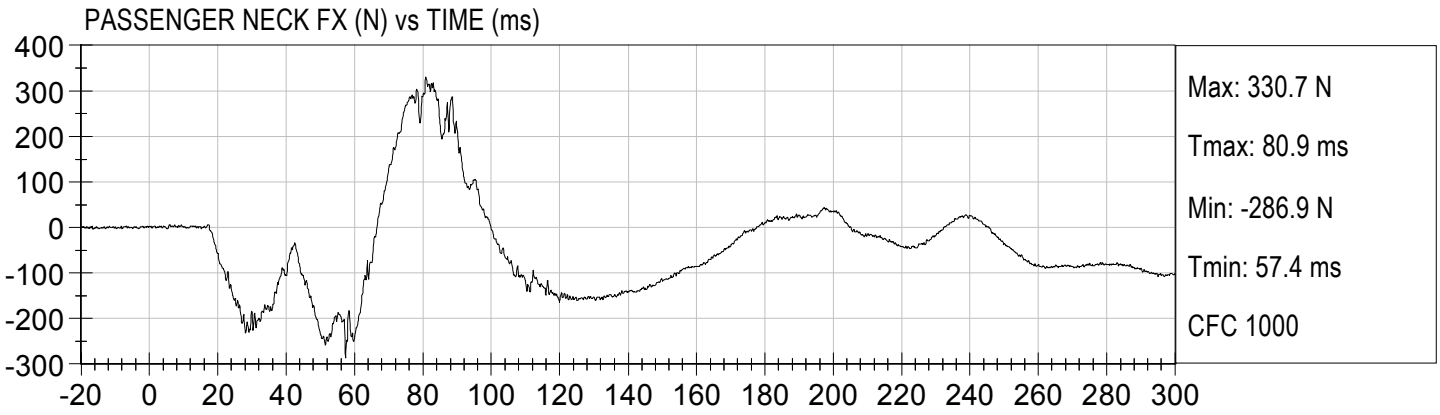


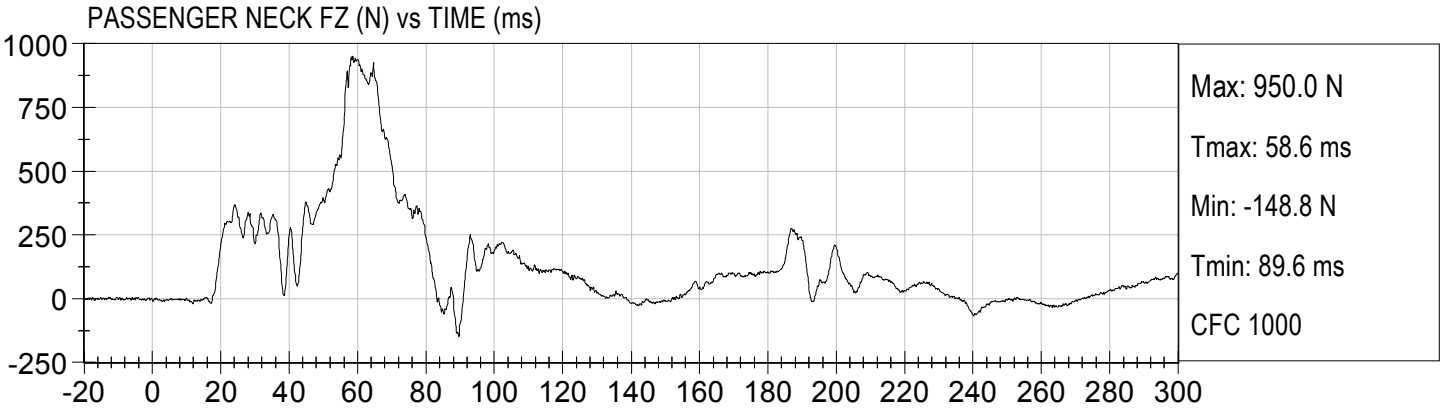
PASSENGER CHEST Z (G's) vs TIME (ms)

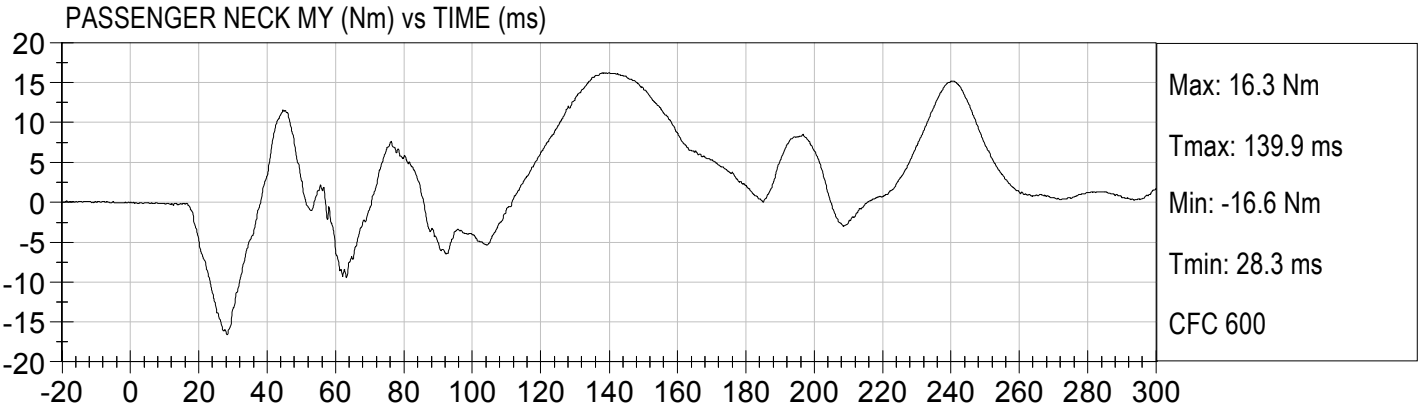


PASSENGER CHEST Resultant (G's) vs TIME (ms)

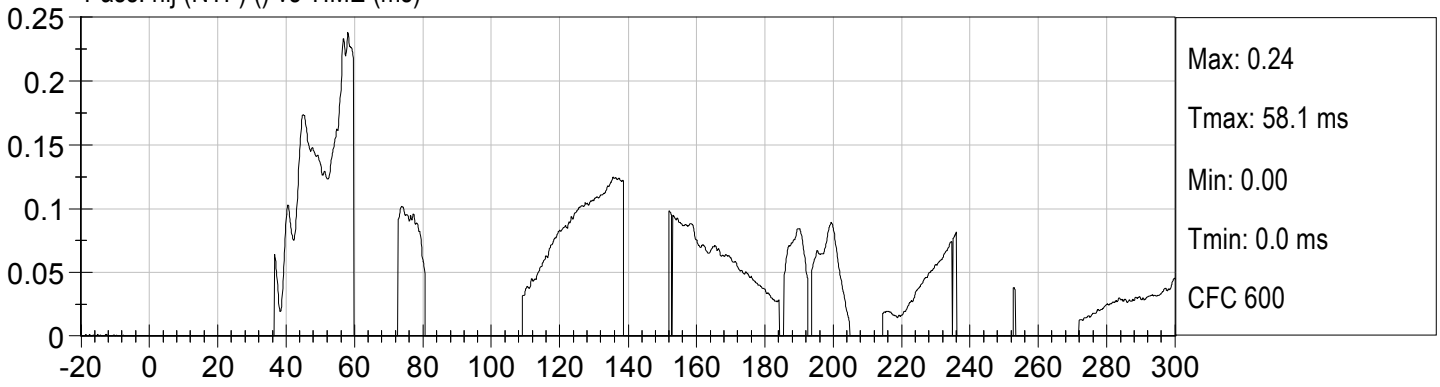



PASSENGER NECK FX (N) vs TIME (ms)
400
300
200
100
0
-100
-200
-300
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 330.7 N
Tmax: 80.9 ms
Min: -286.9 N
Tmin: 57.4 ms
CFC 1000

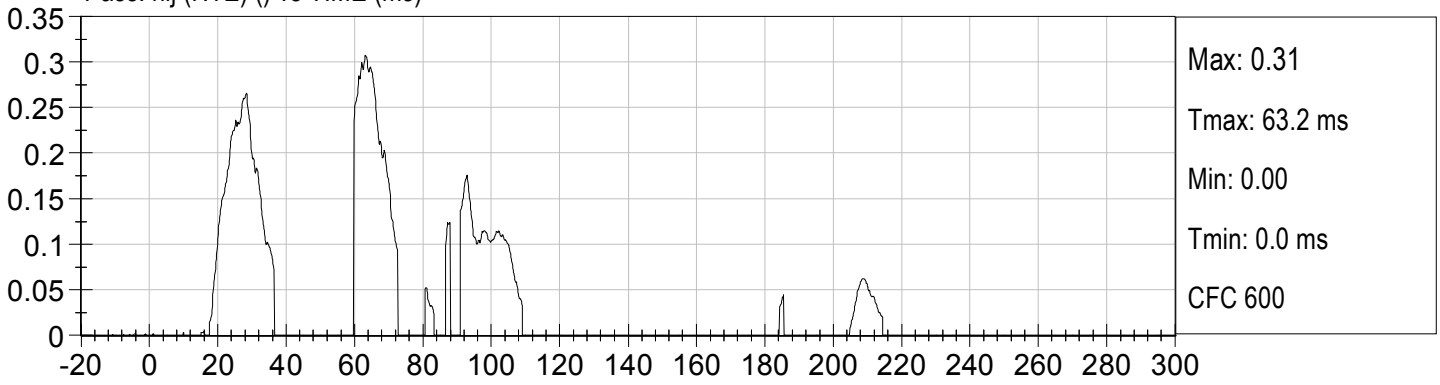

PASSENGER NECK FZ (N) vs TIME (ms)
1000
750
500
250
0
-250
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 950.0 N
Tmax: 58.6 ms
Min: -148.8 N
Tmin: 89.6 ms
CFC 1000


PASSENGER NECK MY (Nm) vs TIME (ms)
20
15
10
5
0
-5
-10
-15
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 16.3 Nm
Tmax: 139.9 ms
Min: -16.6 Nm
Tmin: 28.3 ms
CFC 600

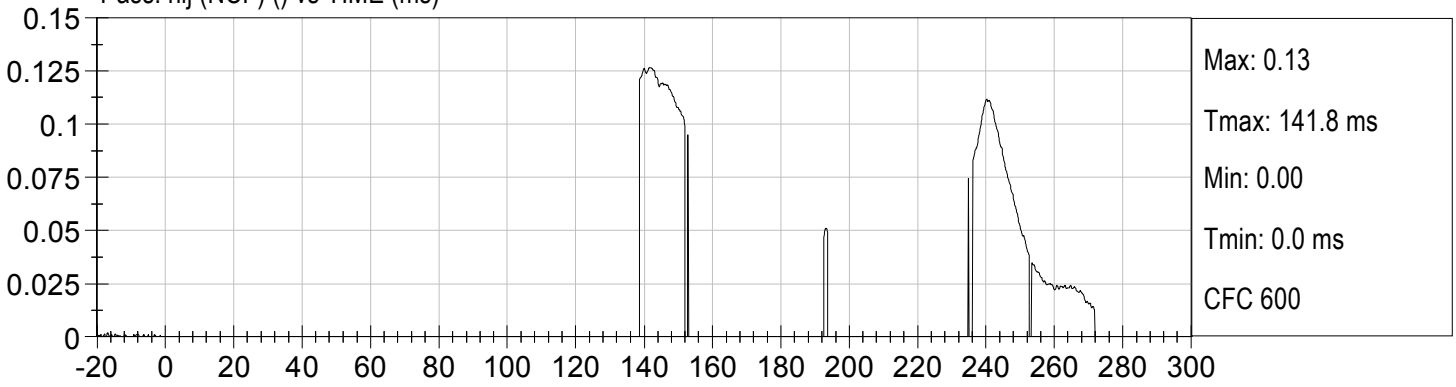
Pass. nij (NTF) () vs TIME (ms)



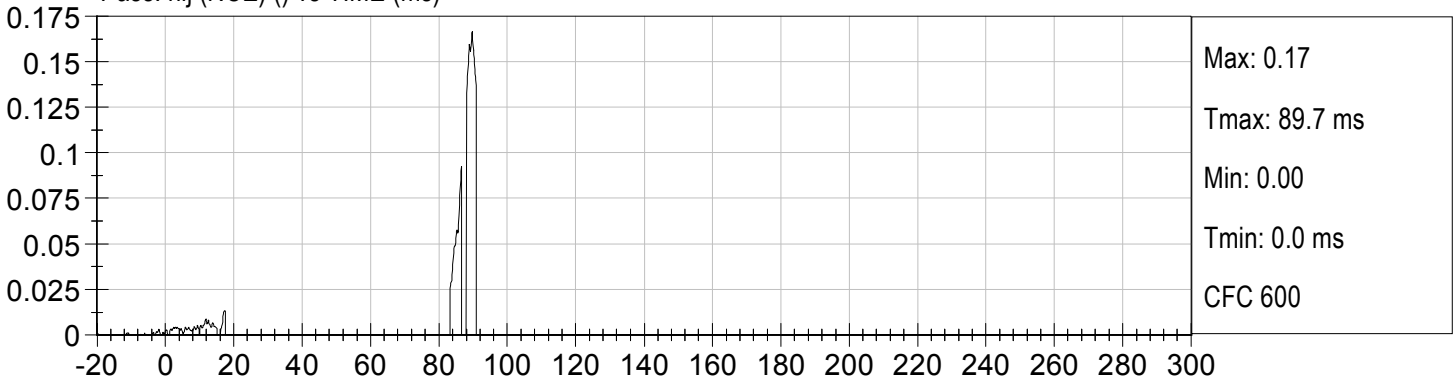
Pass. nij (NTE) () vs TIME (ms)



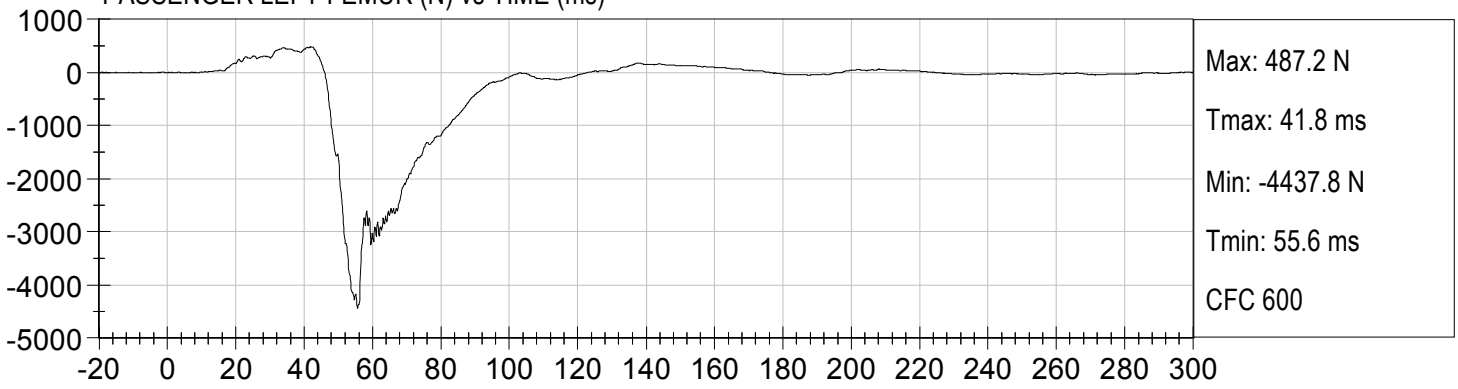
Pass. nij (NCF) () vs TIME (ms)



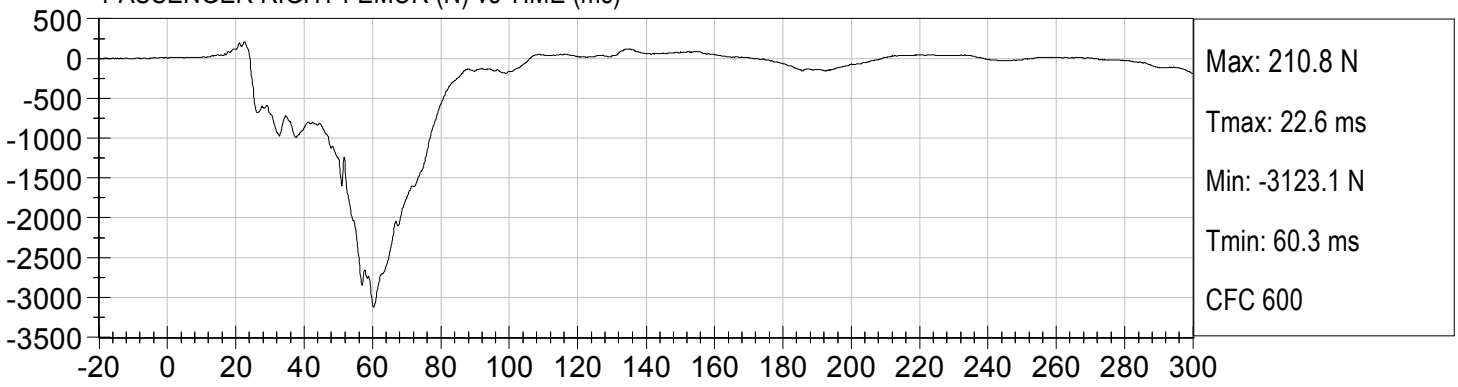
Pass. nij (NCE) () vs TIME (ms)



PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 036

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.7
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.8
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.5
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	17.8-18.8	17.9

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.8
P	FOOT LENGTH	Tip of toe to rear of heal	9.9-10.5	10.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.4
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.4
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	34.0
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test ID:** D121881

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	225 - 275	231	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-7.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

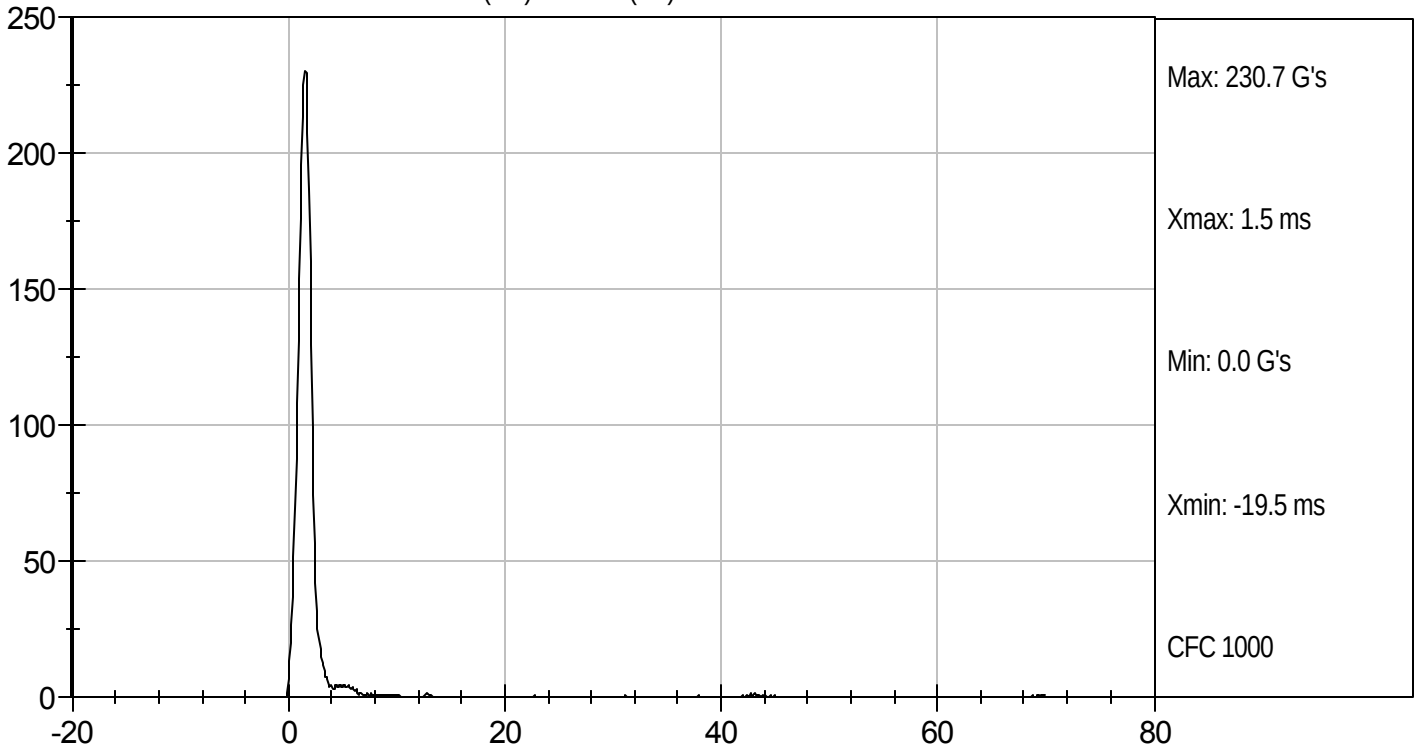
5/21/12
Test Date

David Winkelbauer
Approved By

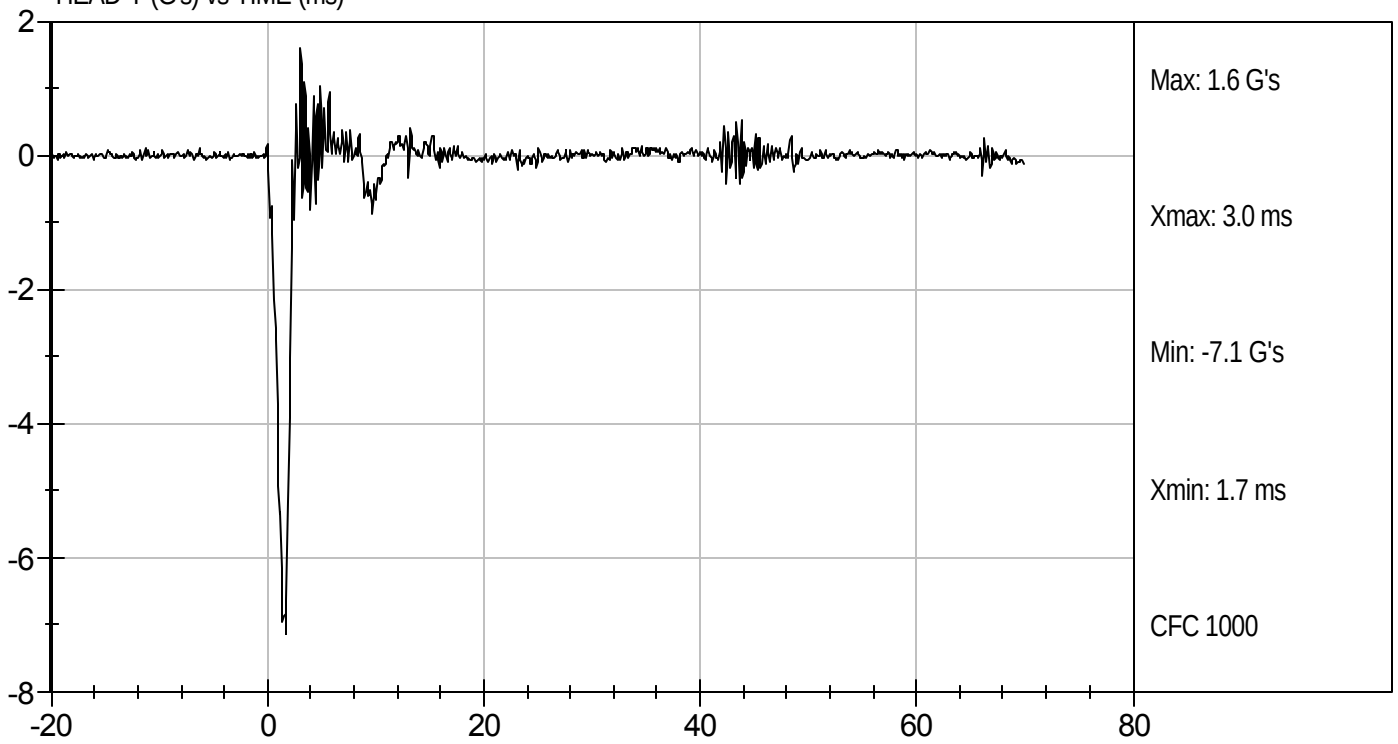
Test Desc: Head Drop
Component ID: D121881

Test Date: 5/21/12
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121882

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.55	Pass
	20 ms	G's	17.60 to 22.60	18.24	Pass
	30 ms	G's	12.50 to 18.50	12.77	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	12.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.3	Pass
	Time	ms	57.0 to 64.0	59.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	119.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.3	Pass
	Time	ms	47.0 to 58.0	52.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.9	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

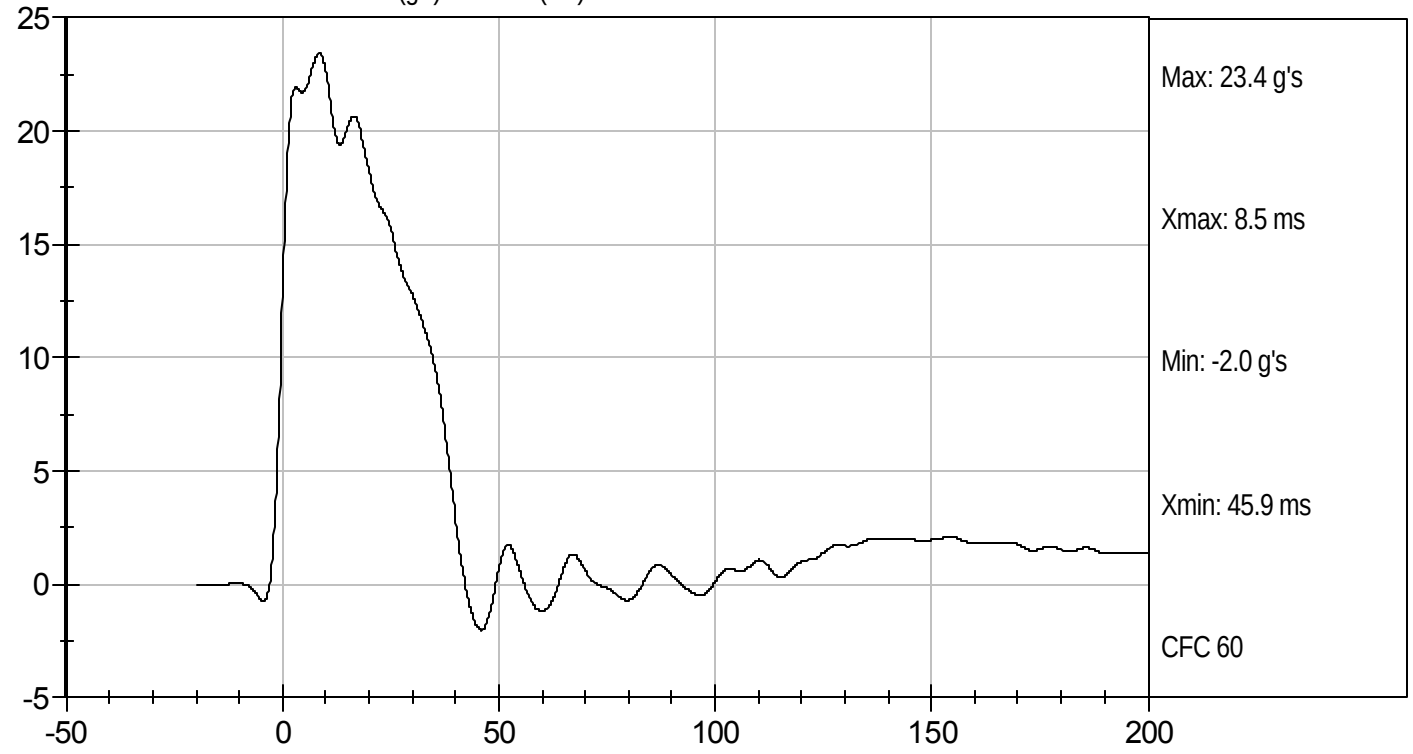
5/21/12
Test Date

David Winkelbauer
Approved By

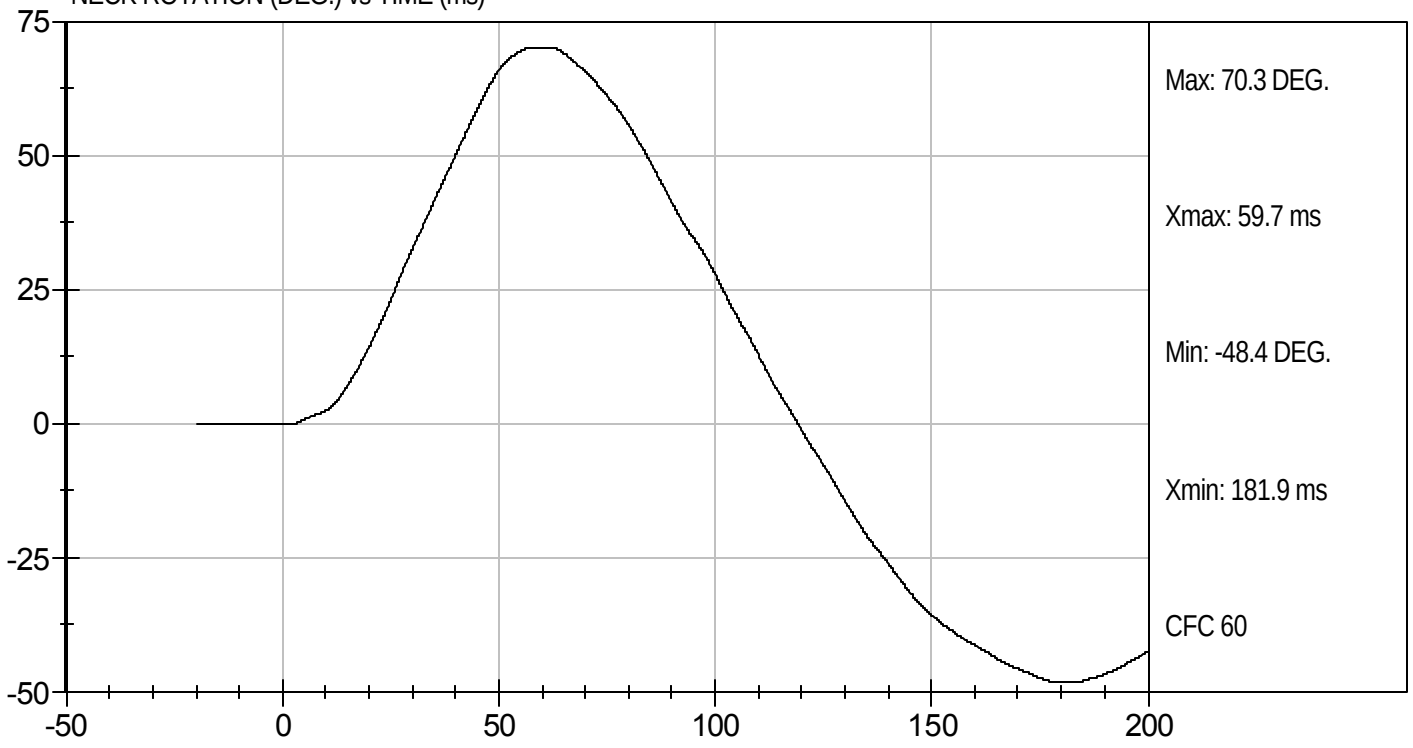
Test Desc: Neck Flexion
Component ID: D121882

Test Date: 5/21/12
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)

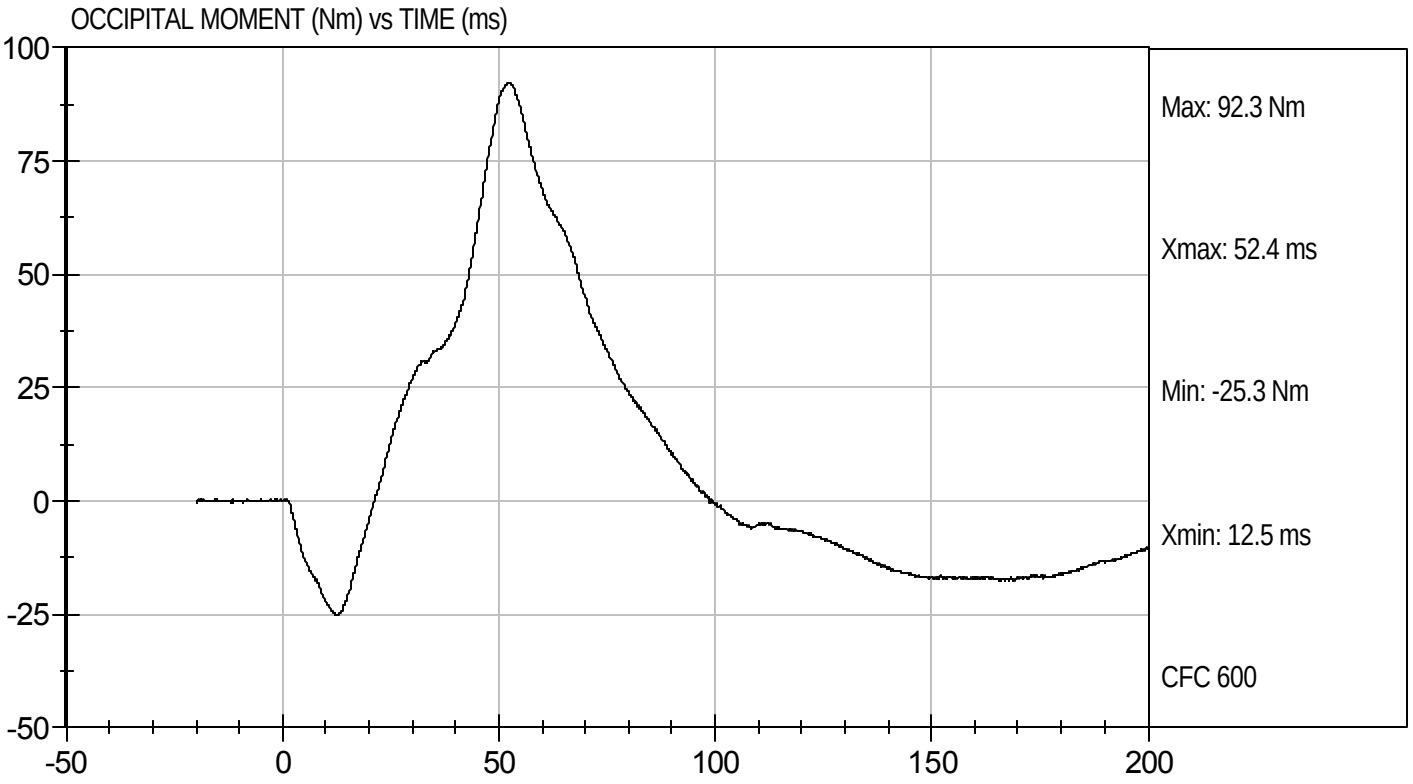


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D121882

Test Date: 5/21/12
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121883

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.78	Pass
	20 ms	G's	14.00 to 19.00	15.59	Pass
	30 ms	G's	11.00 to 16.00	11.82	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.2	Pass
	Time	ms	72.0 to 82.0	75.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	158.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.7	Pass
	Time	ms	65.0 to 79.0	70.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.0	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

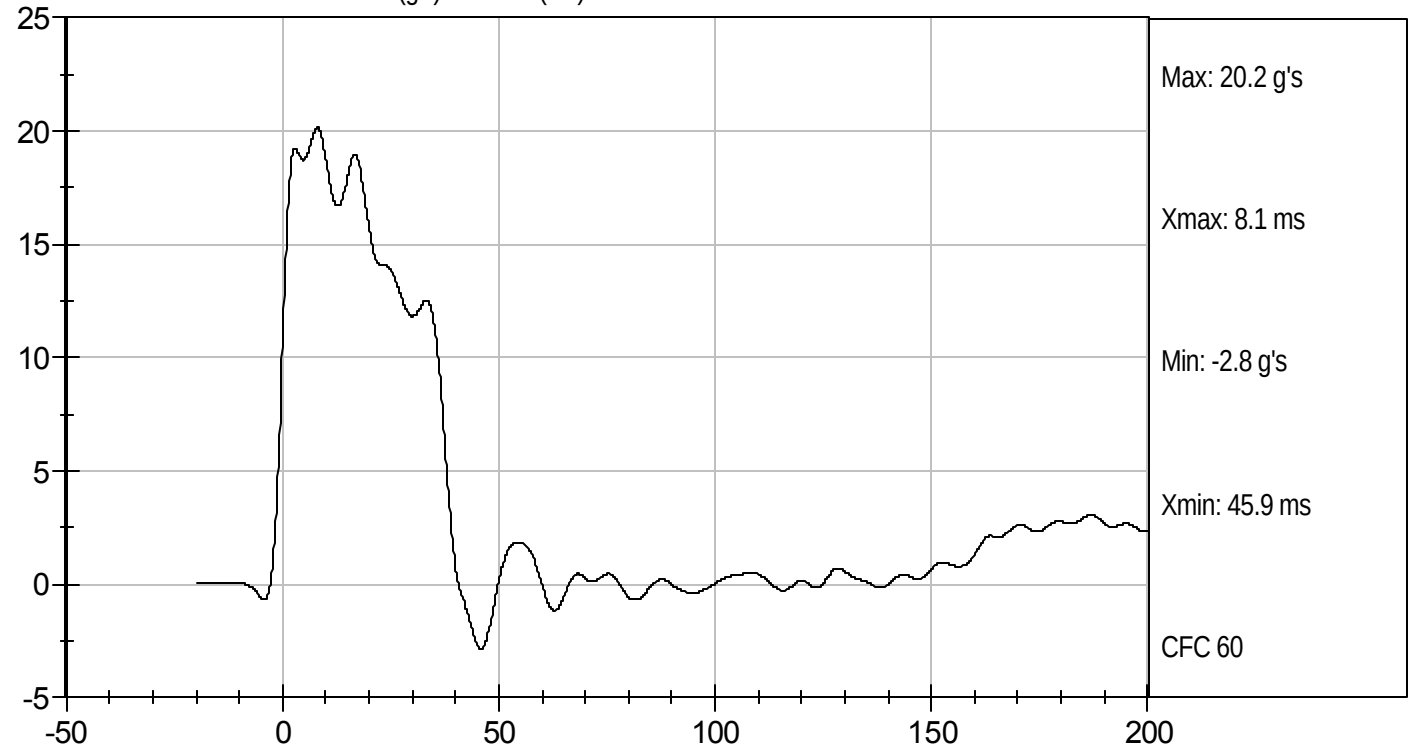
5/21/12
Test Date

David Winkelbauer
Approved By

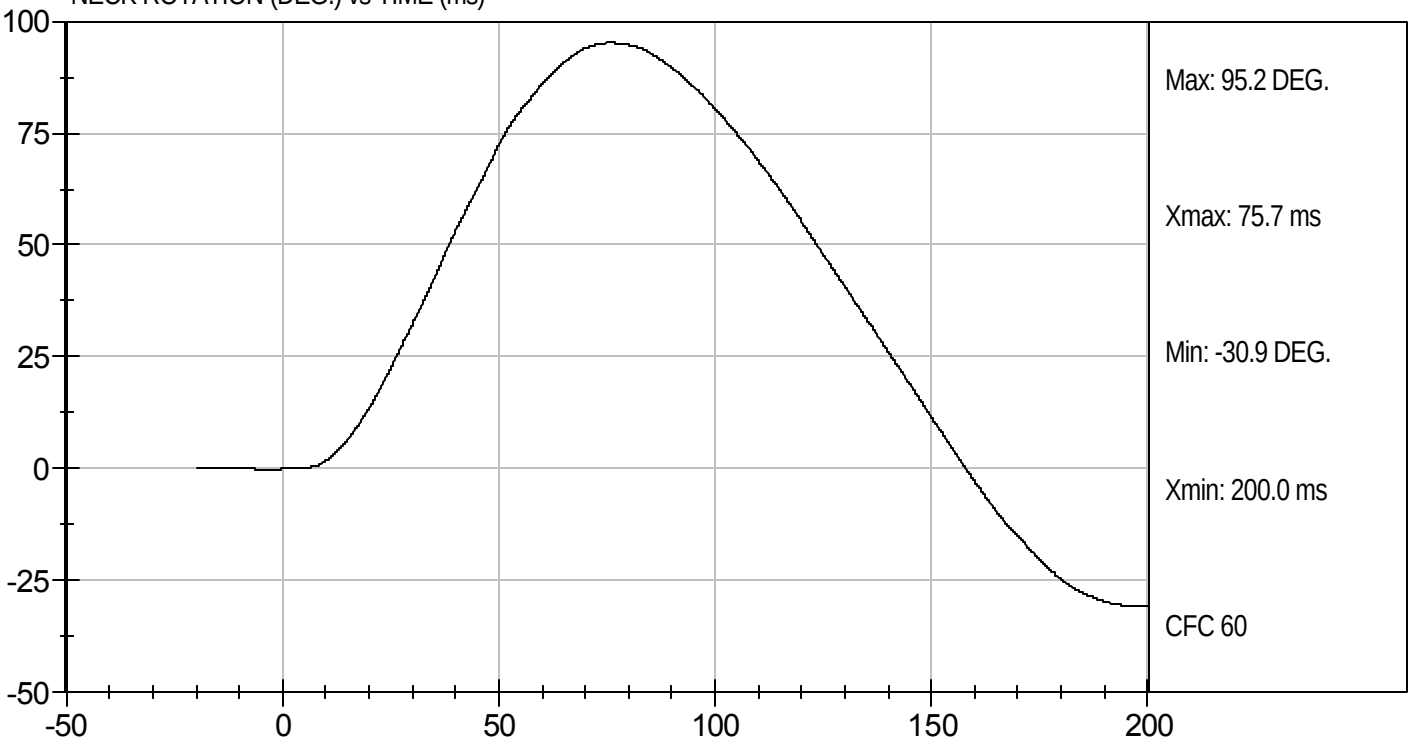
Test Desc: Neck Extension
Component ID: D121883

Test Date: 5/21/12
Velocity: 20.1 ft/s, 6.13 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)

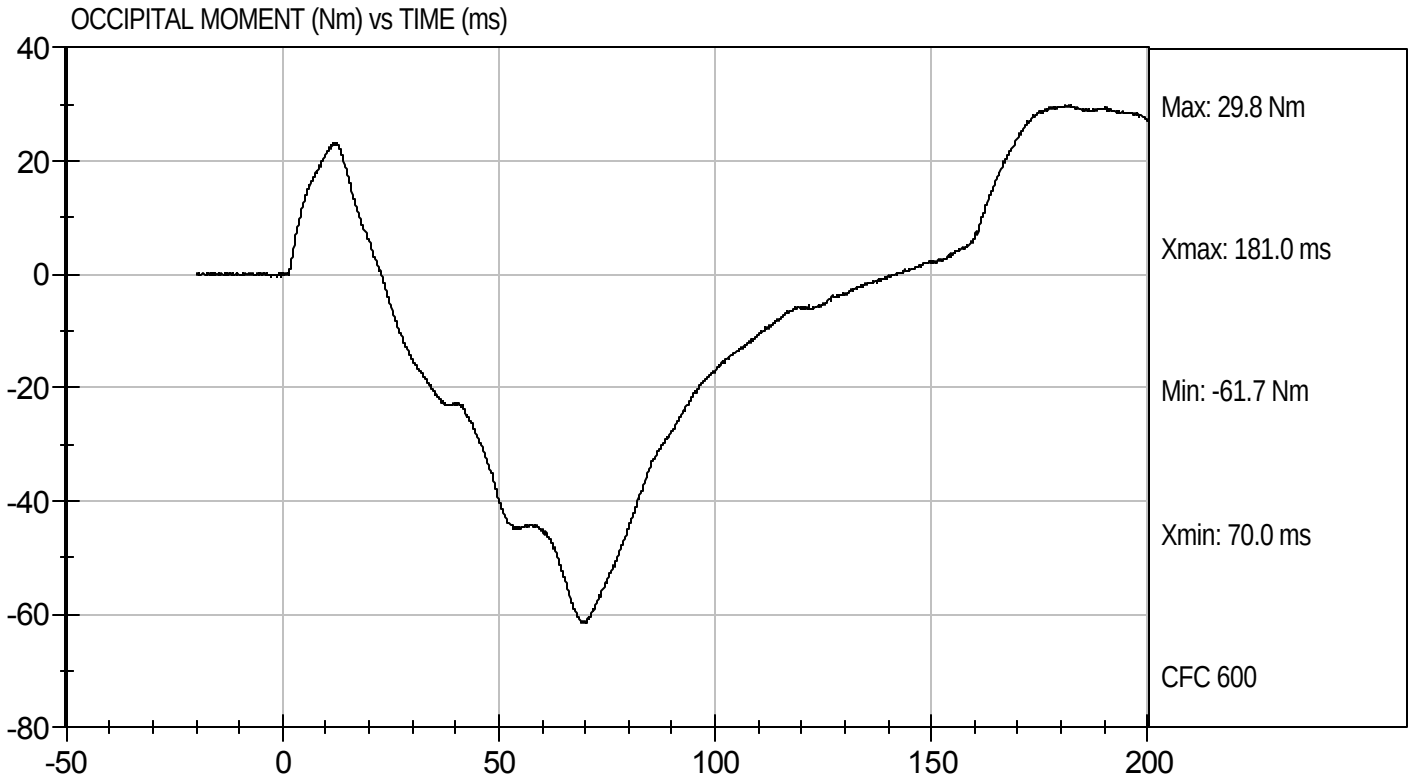


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D121883

Test Date: 5/21/12
Velocity: 20.1 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121884

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,608	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.56	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

5/22/12
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D121884

Test Date: 5/22/12
Velocity: 22.22 ft/s, 6.77 m/s

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121885

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,724	Pass
		Overall Test Results		Pass

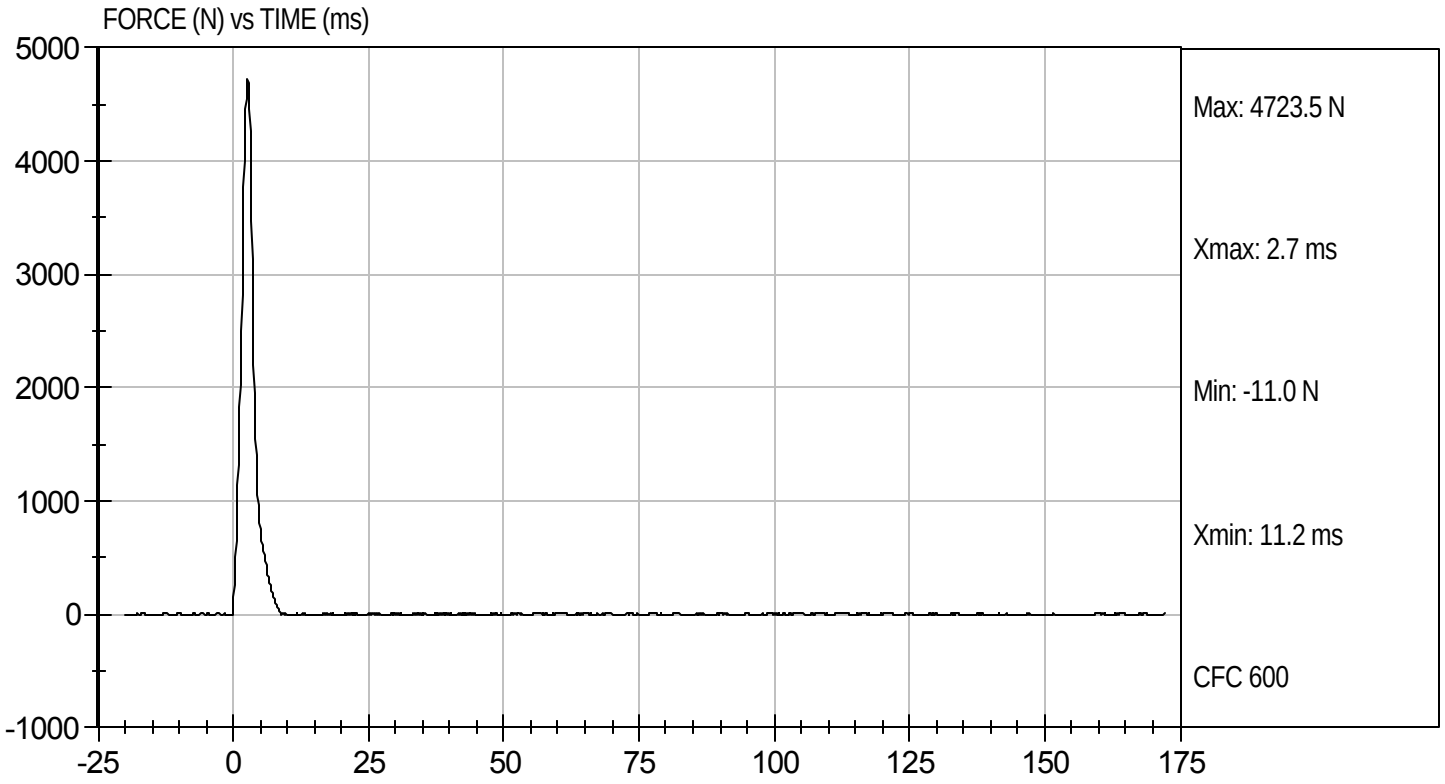
Jessica Hall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D121885

Test Date: 5/21/12
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121886

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4,848	Pass
		Overall Test Results		Pass

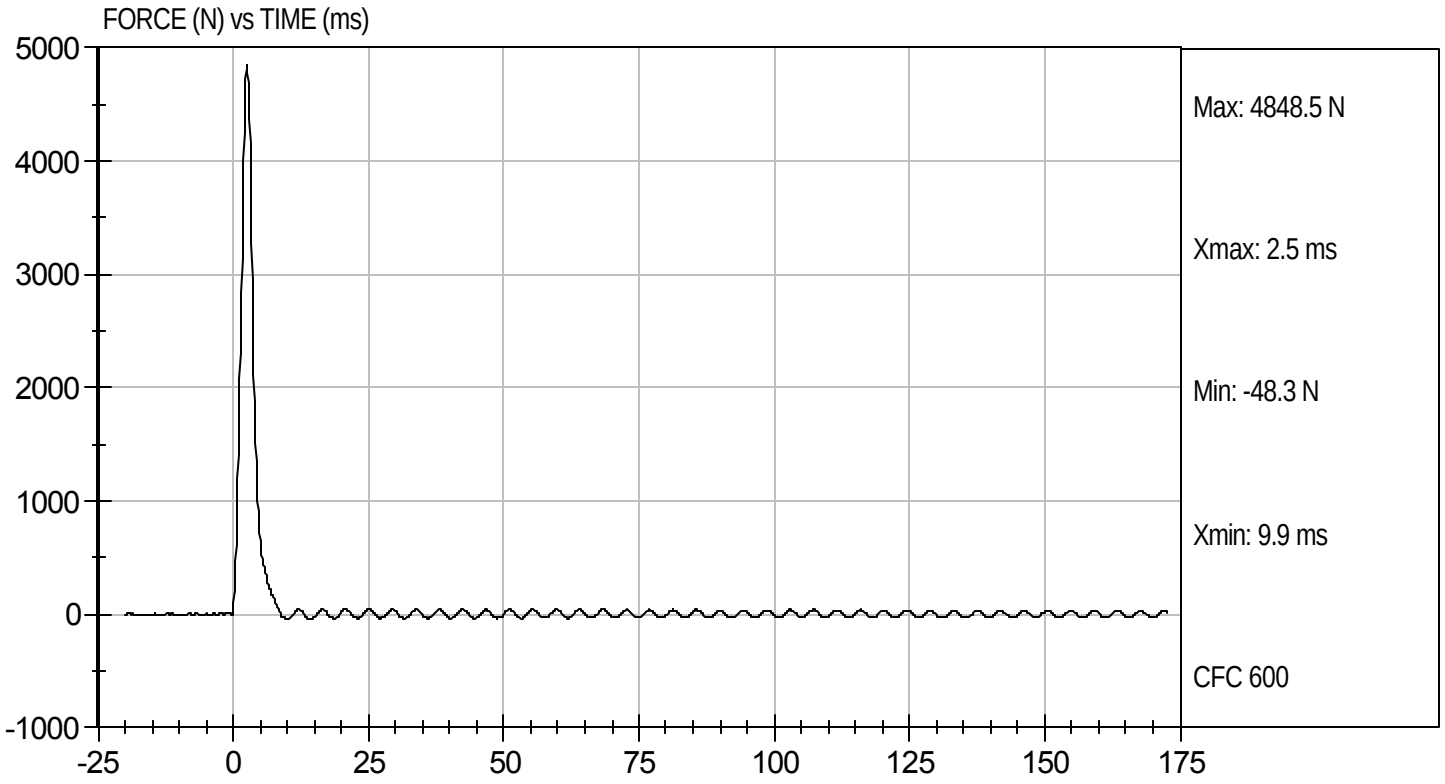
Jessica Hall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D121886

Test Date: 5/21/12
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D121880

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	39	39	Pass
Rotation Rate	deg/s	5.0 -10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	93.5	76.5	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	43.9	45.2	Pass
		Overall Test Results			Pass

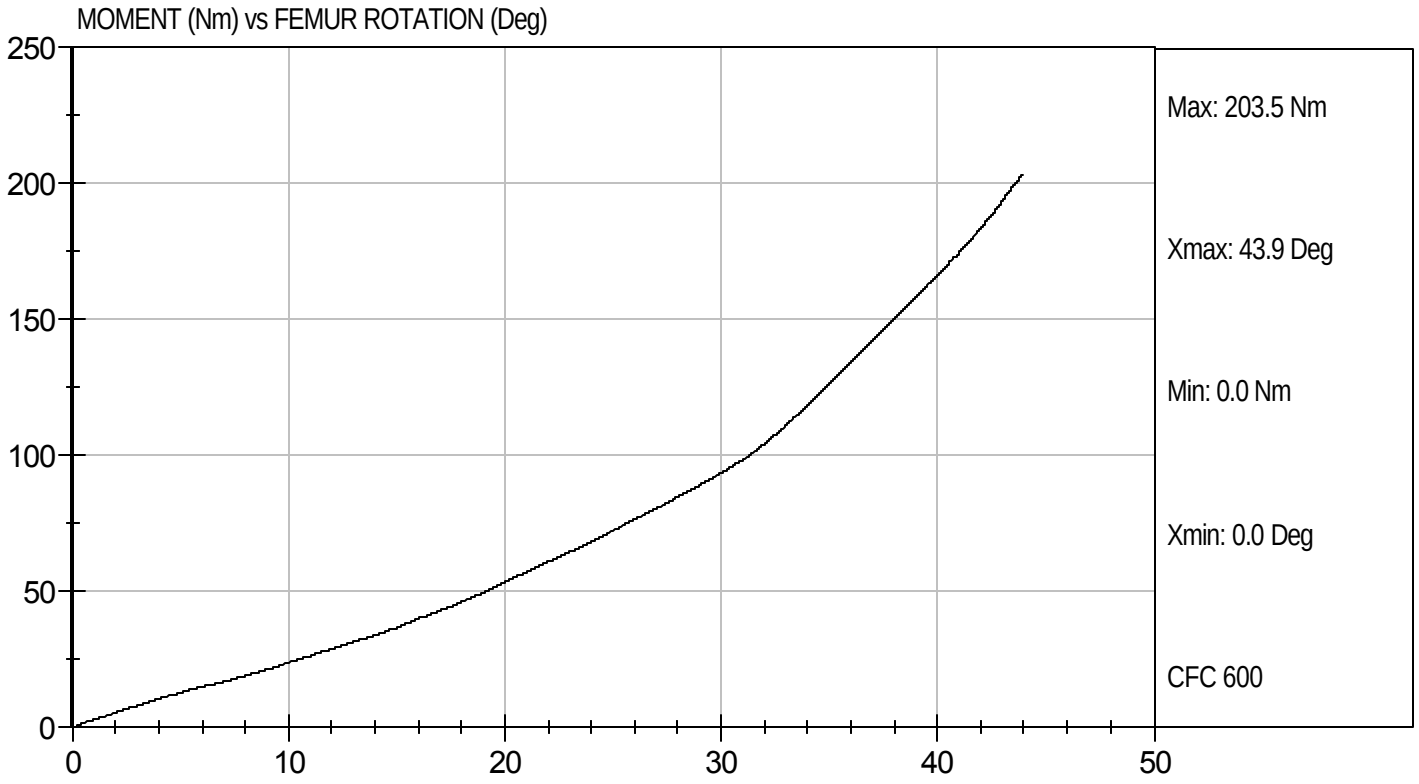
Jessica Gall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

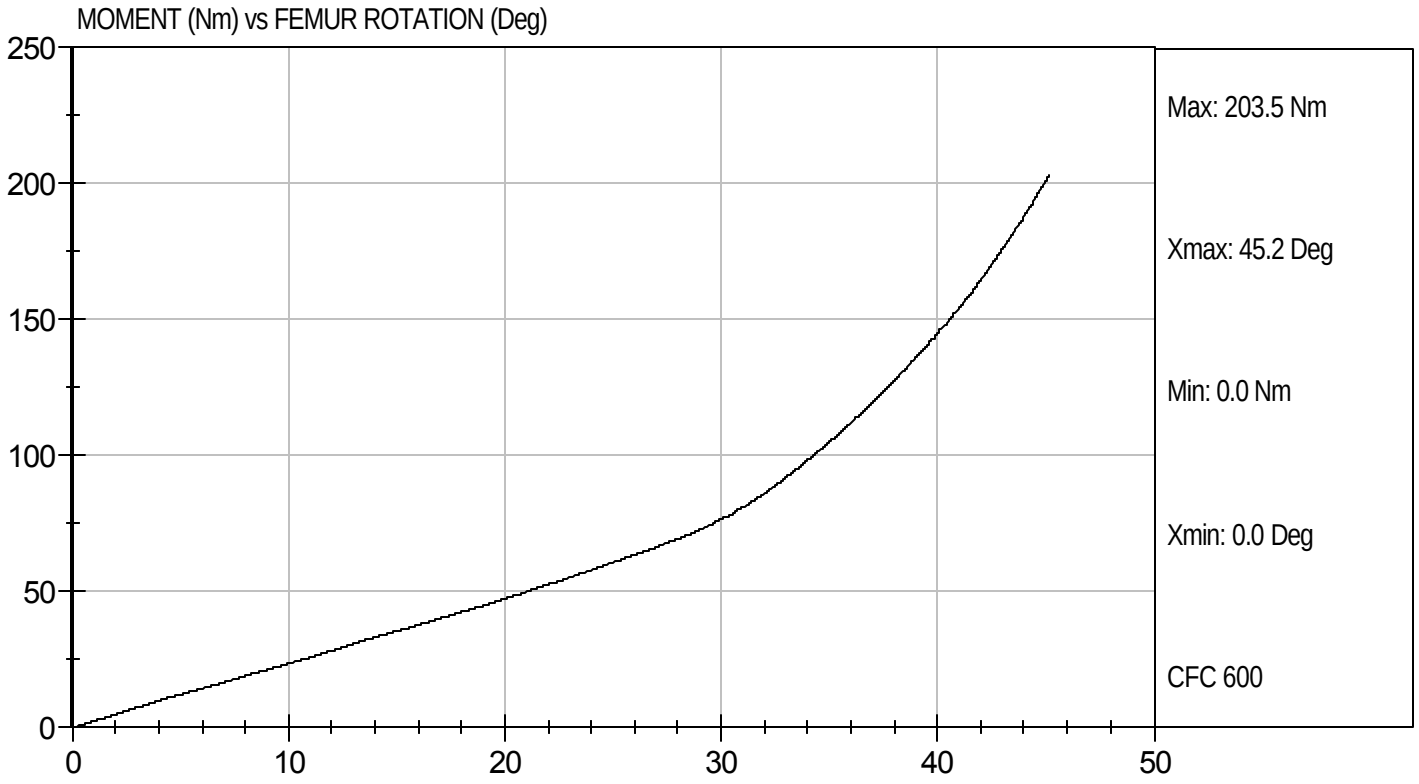
Test Desc: Hip Femur Flexion
Component ID: D121889

Test Date: 5/21/12
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D121880

Test Date: 5/21/12
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test ID:** D122021

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	225 - 275	234	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

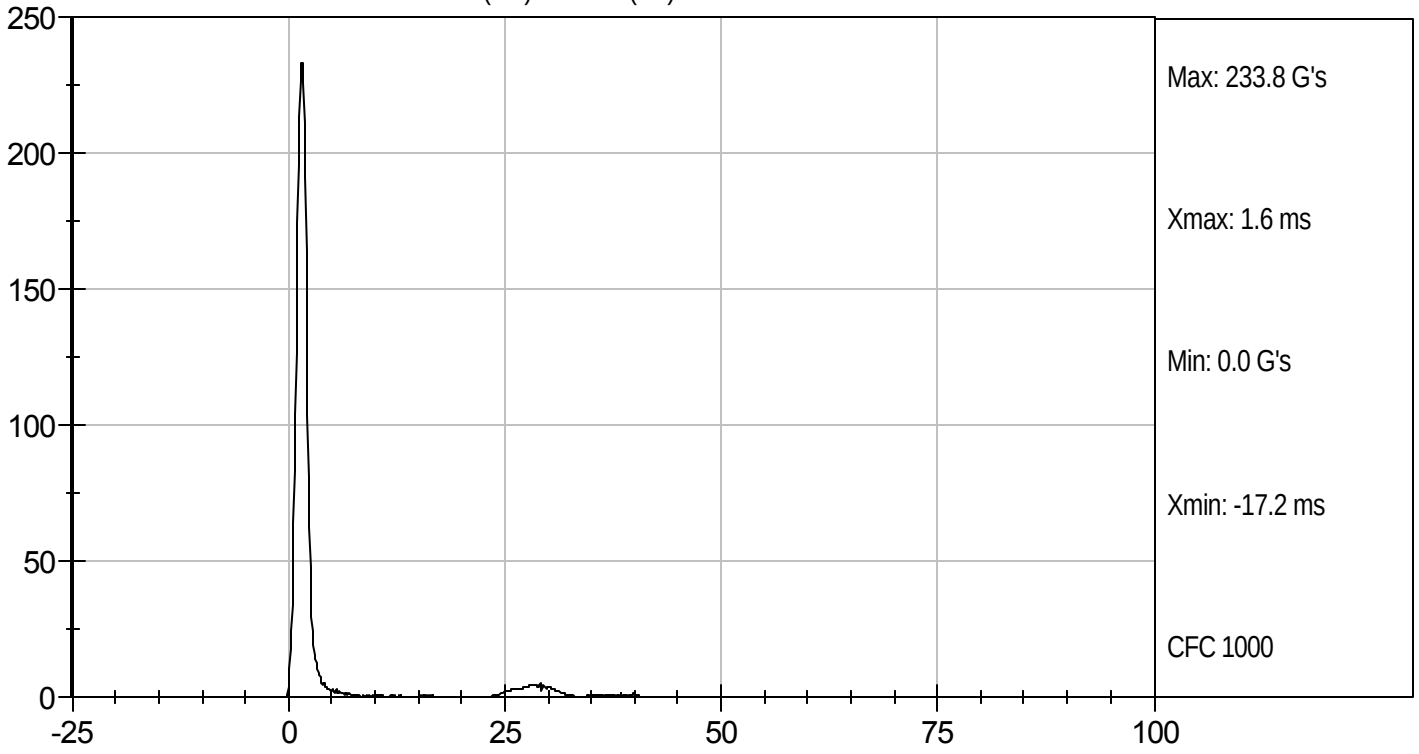
5/30/12
Test Date

David Winkelbauer
Approved By

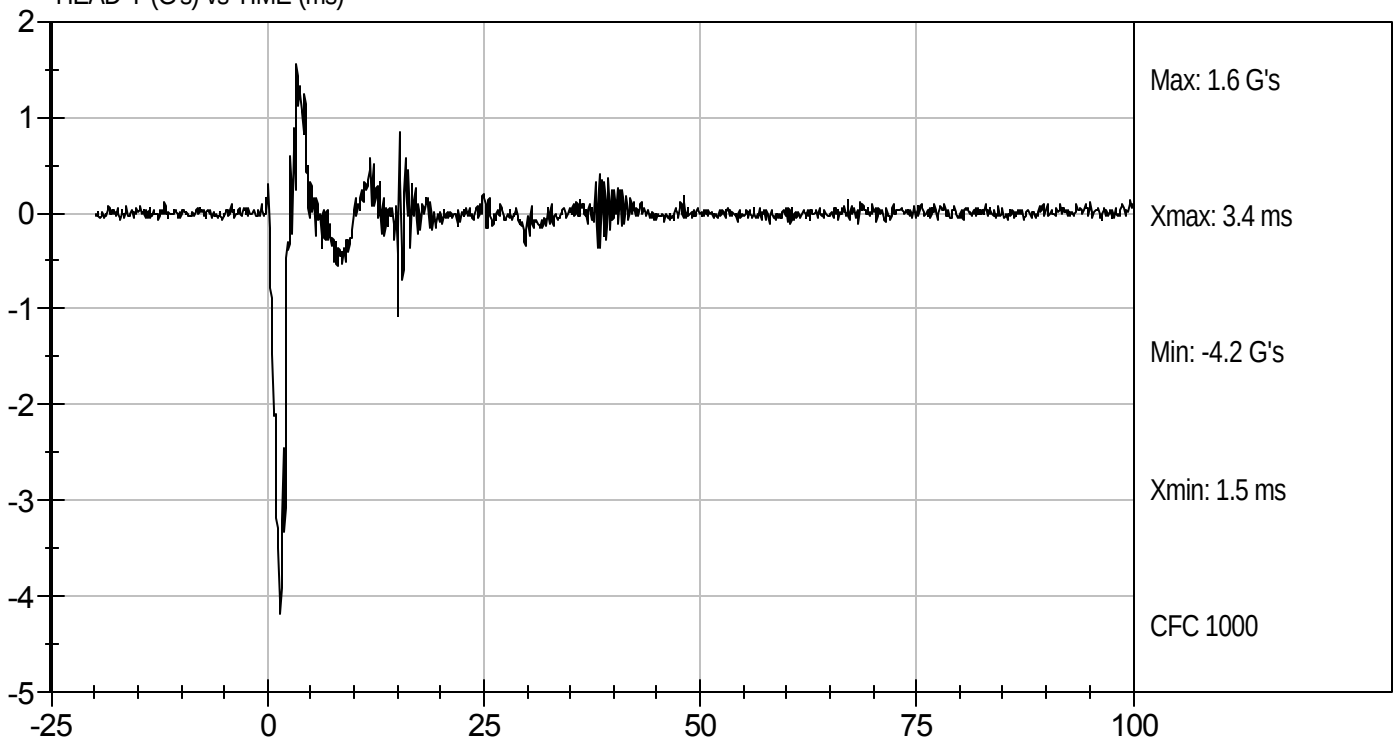
Test Desc: Head Drop
Component ID: D122021

Test Date: 5/30/12
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122022

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	22.56	Pass
	20 ms	G's	17.60 to 22.60	17.75	Pass
	30 ms	G's	12.50 to 18.50	13.41	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.1	Pass
	Time	ms	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	118.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	92.0	Pass
	Time	ms	47.0 to 58.0	50.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.0	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

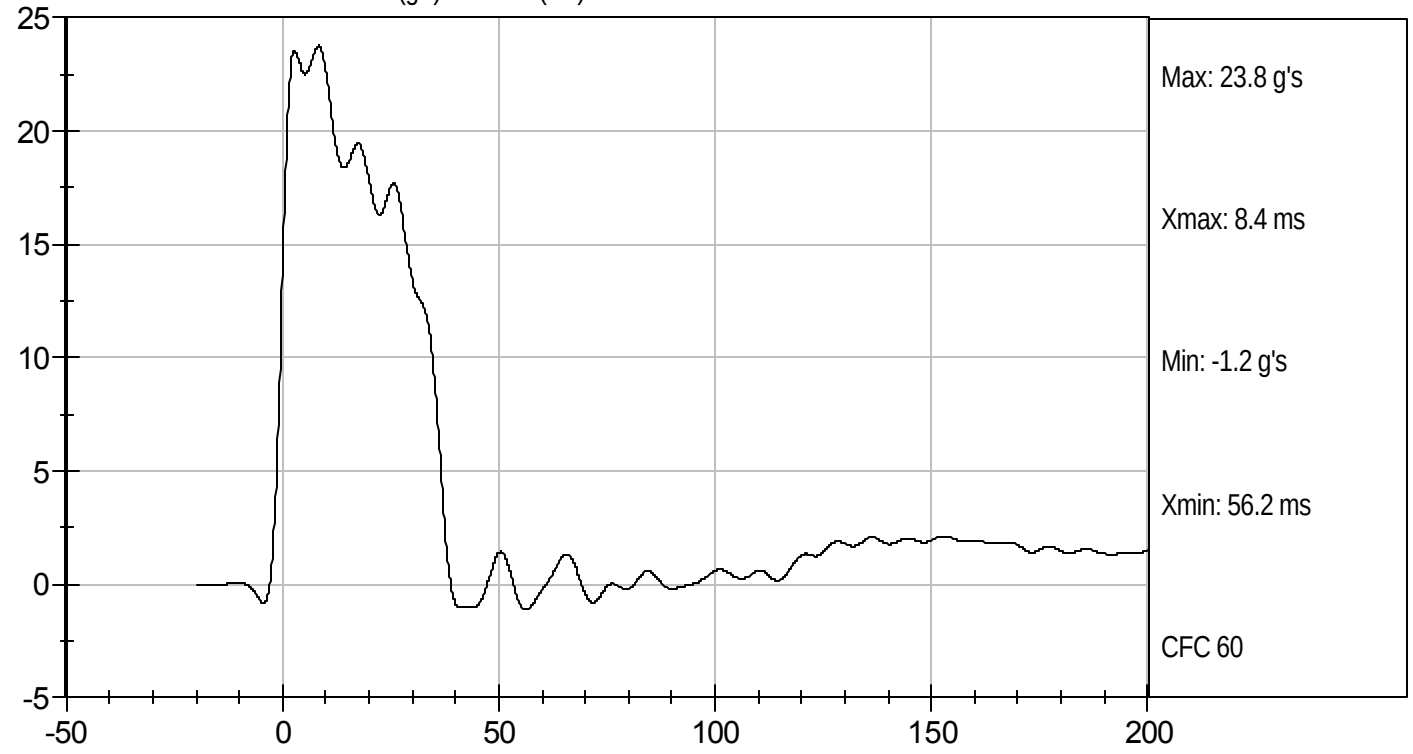
5/30/12
Test Date

David Winkelbauer
Approved By

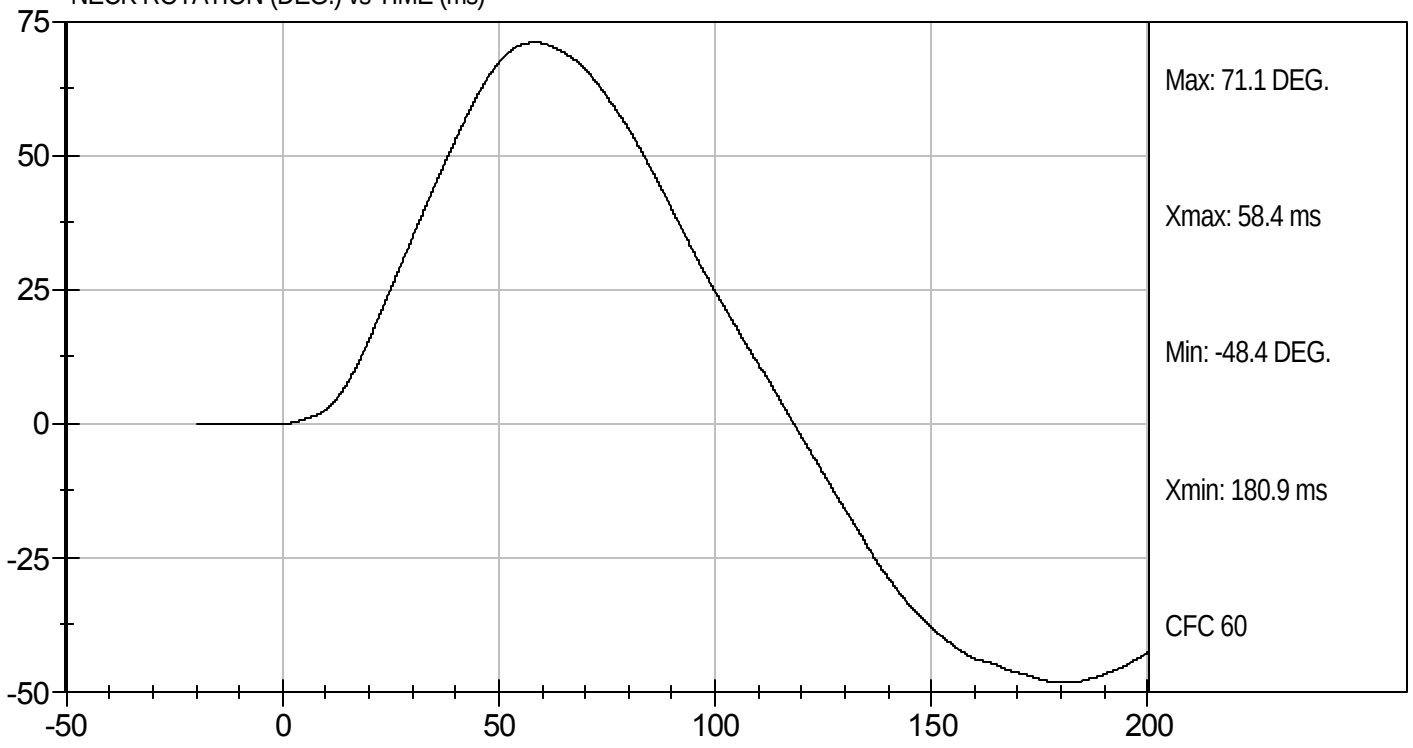
Test Desc: Neck Flexion
Component ID: D122022

Test Date: 5/30/12
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)

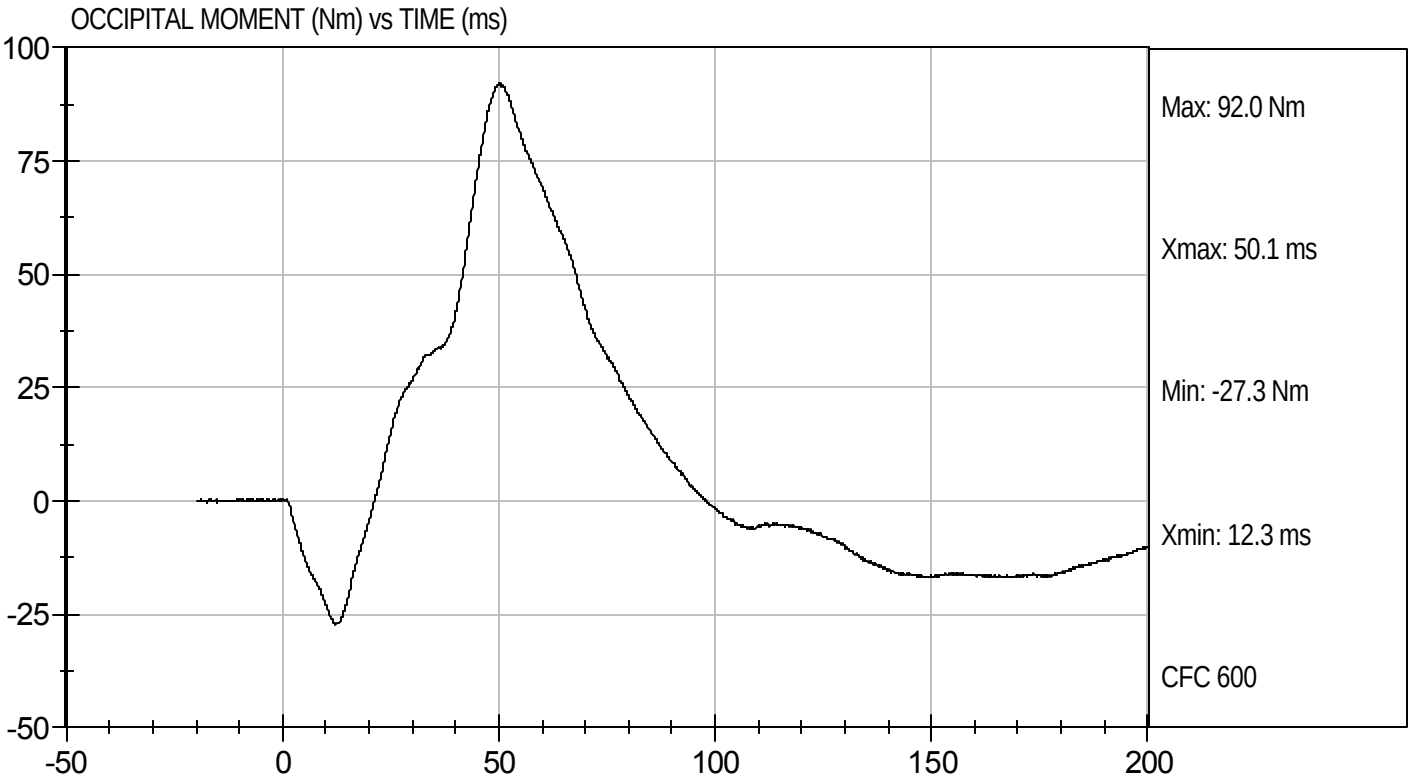


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D122022

Test Date: 5/30/12
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122023

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.83	Pass
	20 ms	G's	14.00 to 19.00	15.20	Pass
	30 ms	G's	11.00 to 16.00	11.53	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	11.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.8	Pass
	Time	ms	72.0 to 82.0	78.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.1	Pass
	Time	ms	65.0 to 79.0	73.8	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	145.5	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

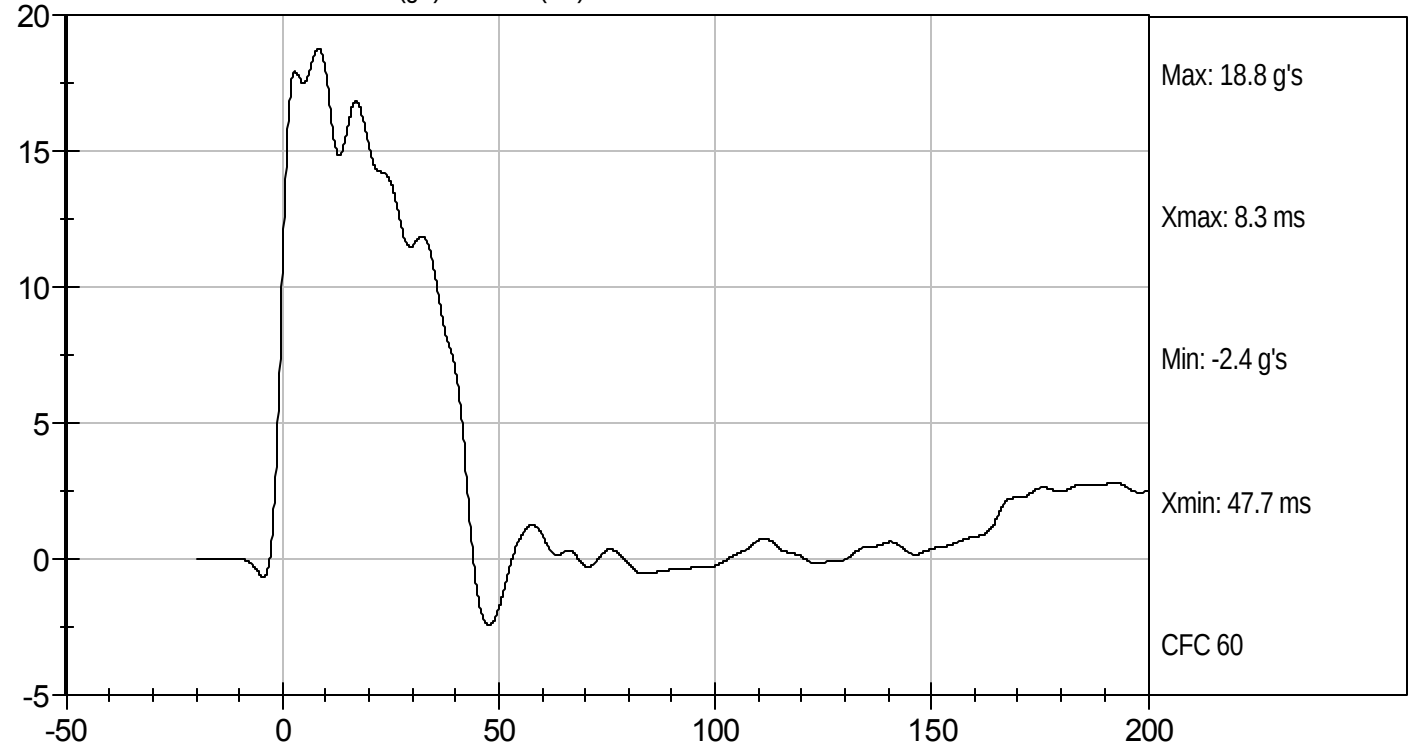
5/30/12
Test Date

David Winkelbauer
Approved By

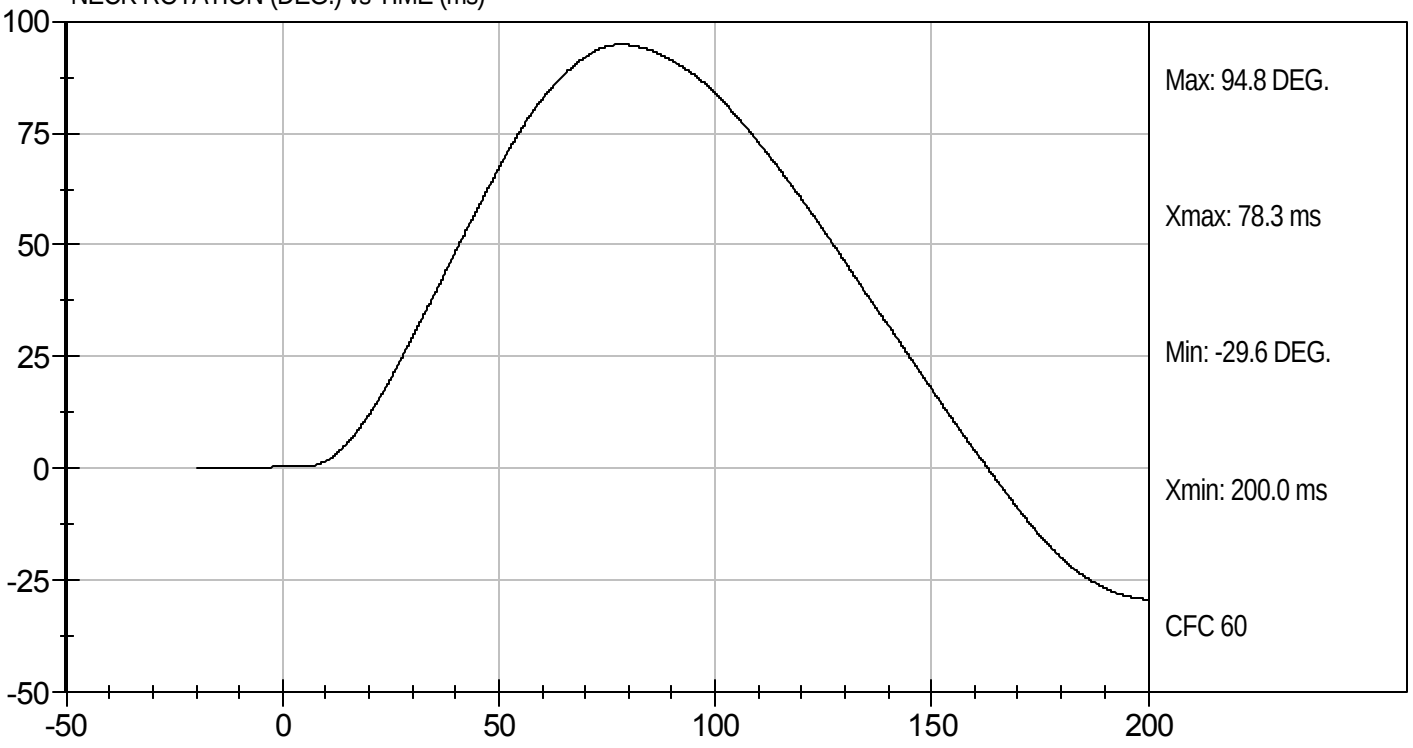
Test Desc: Neck Extension
Component ID: D122023

Test Date: 5/30/12
Velocity: 20.1 ft/s, 6.13 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)

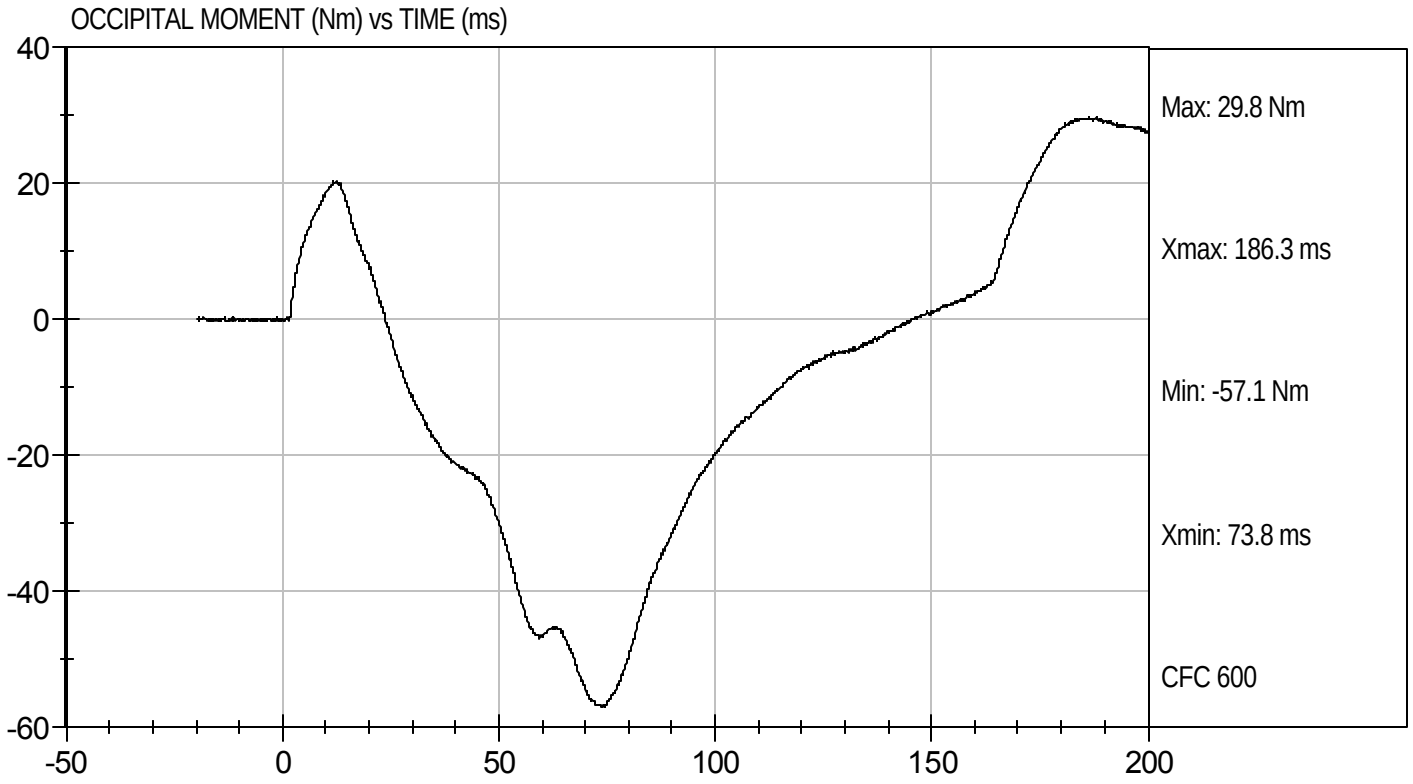


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D122023

Test Date: 5/30/12
Velocity: 20.1 ft/s, 6.13 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122024

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,361	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.81	Pass
Internal Hysteresis	%	69 to 85	71	Pass
		Overall Test Results		Pass

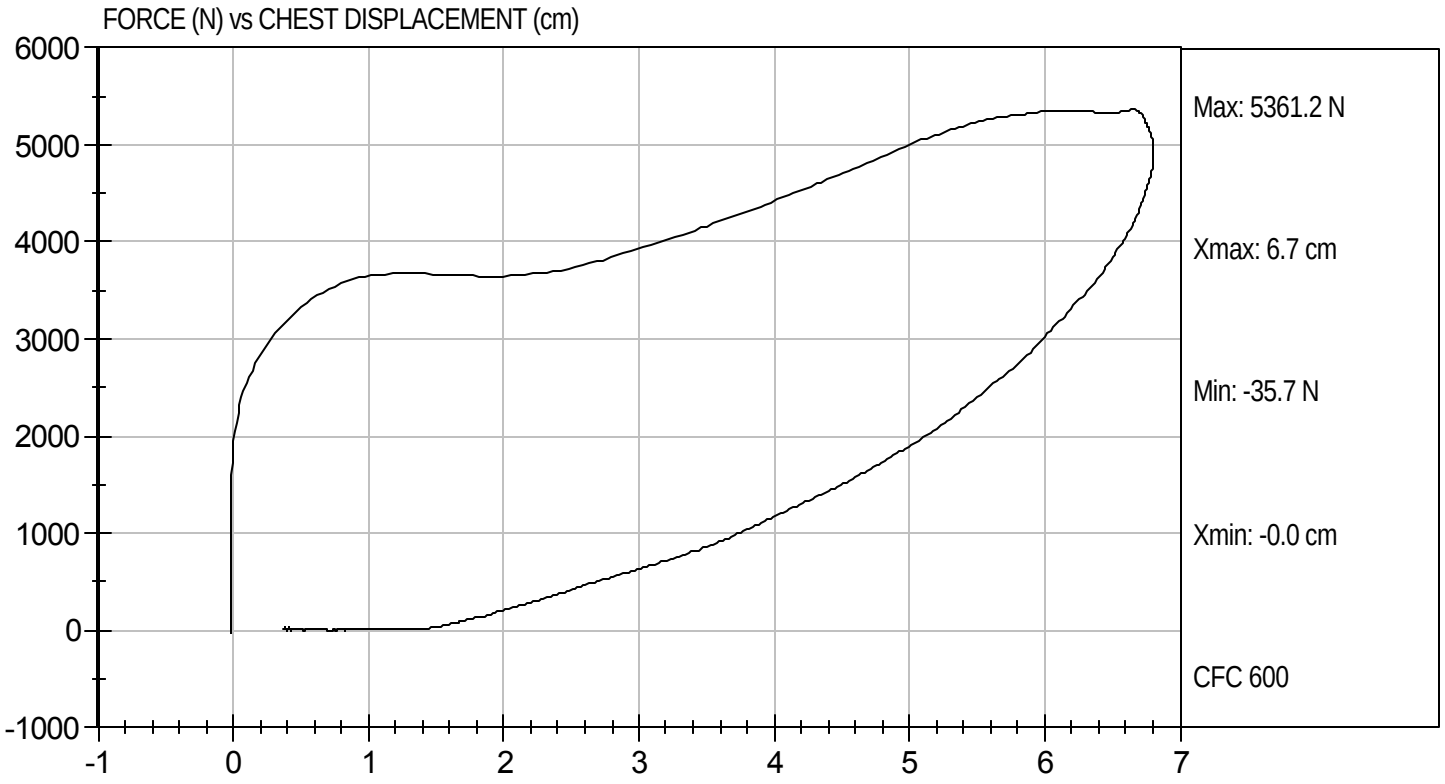
Jessica Hall
Laboratory Technician

12/31/12
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D122024

Test Date: 12/31/12
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122025

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,755	Pass
		Overall Test Results		Pass

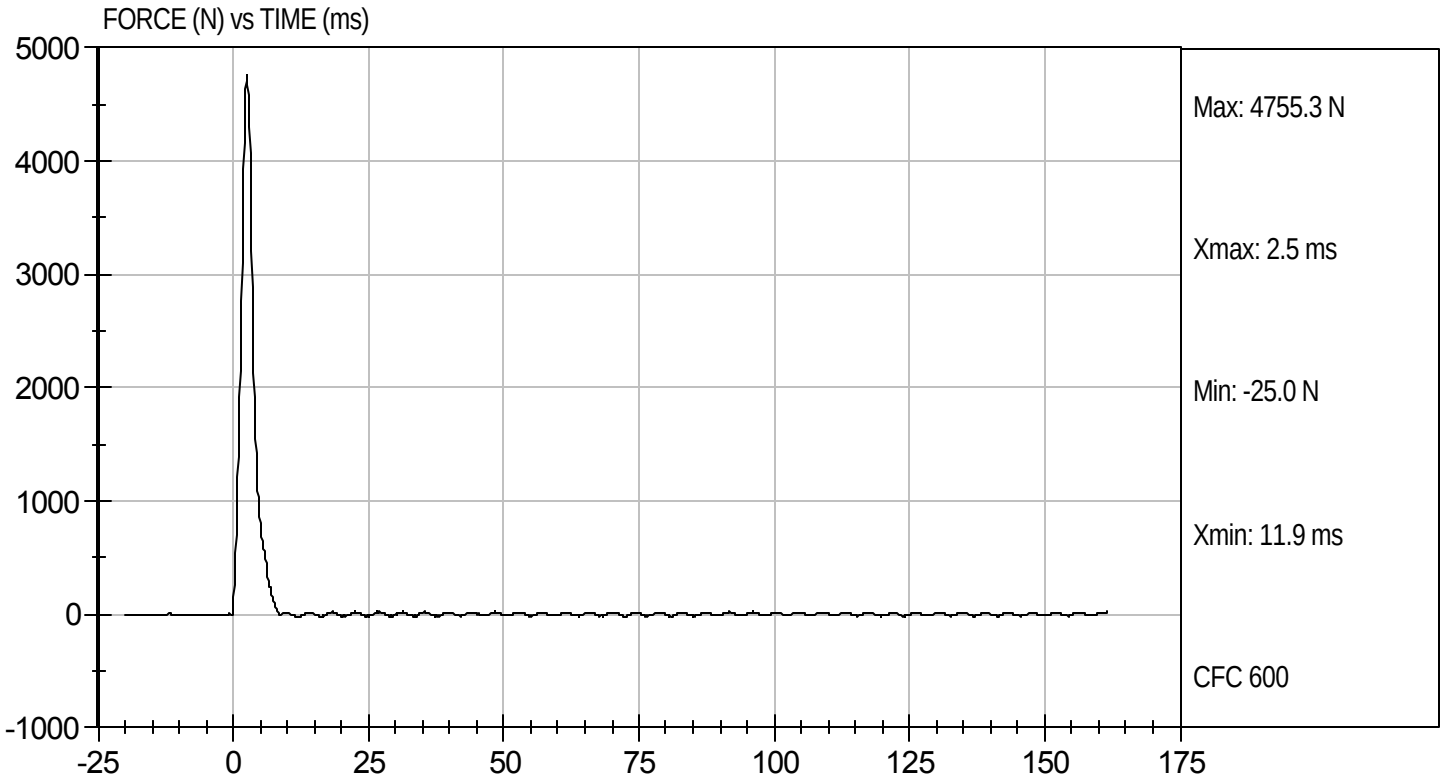
Jessica Hall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D122025

Test Date: 5/30/12
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122026

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,879	Pass
		Overall Test Results		Pass

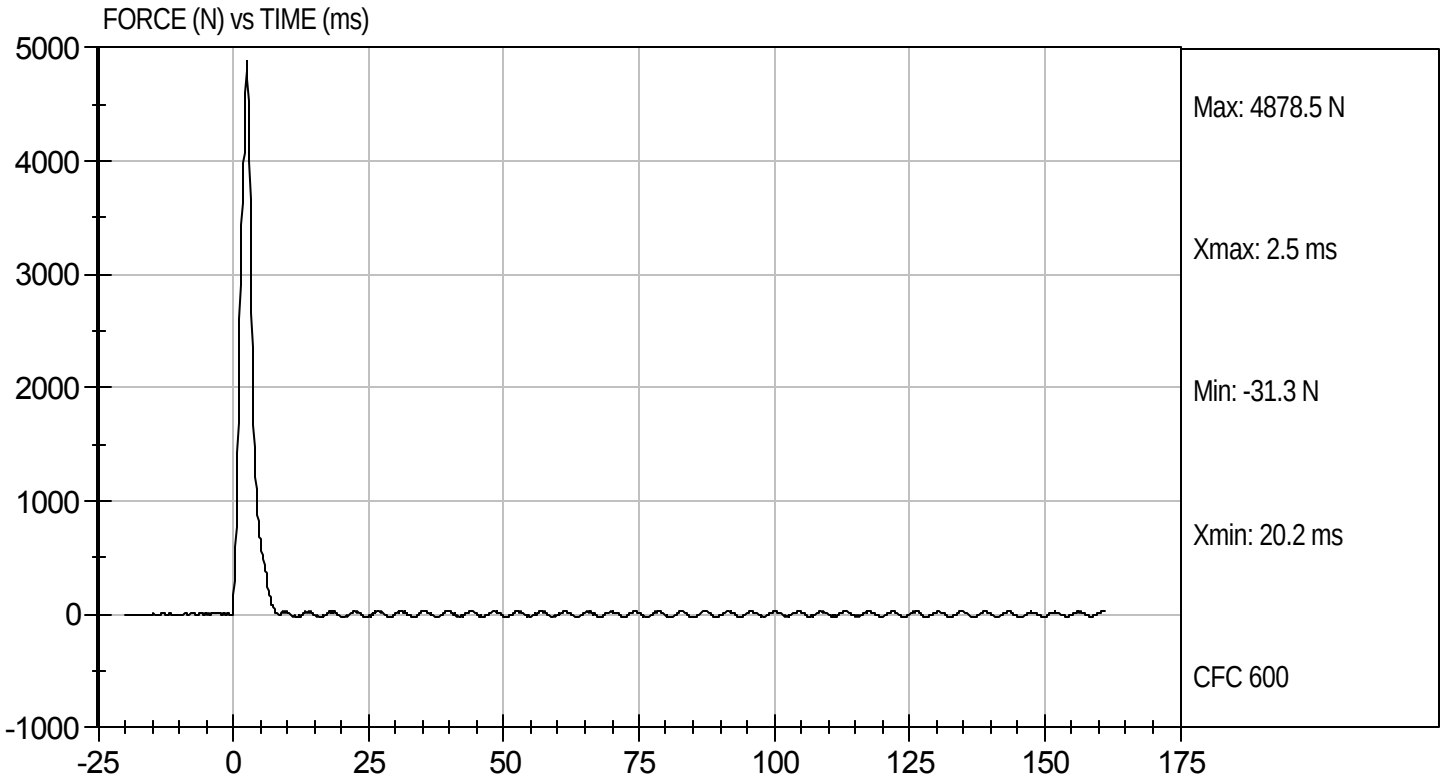
Jessica Hall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D122026

Test Date: 5/30/12
Velocity: 6.89 ft/s, 2.10 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036 **Test I.D:** D122020

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	40	40	Pass
Rotation Rate	deg/s	5.0 -10.0	6.2	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	85.6	76.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 - 50.0 Degree Max Rotation	44.6	45.2	Pass
		Overall Test Results			Pass

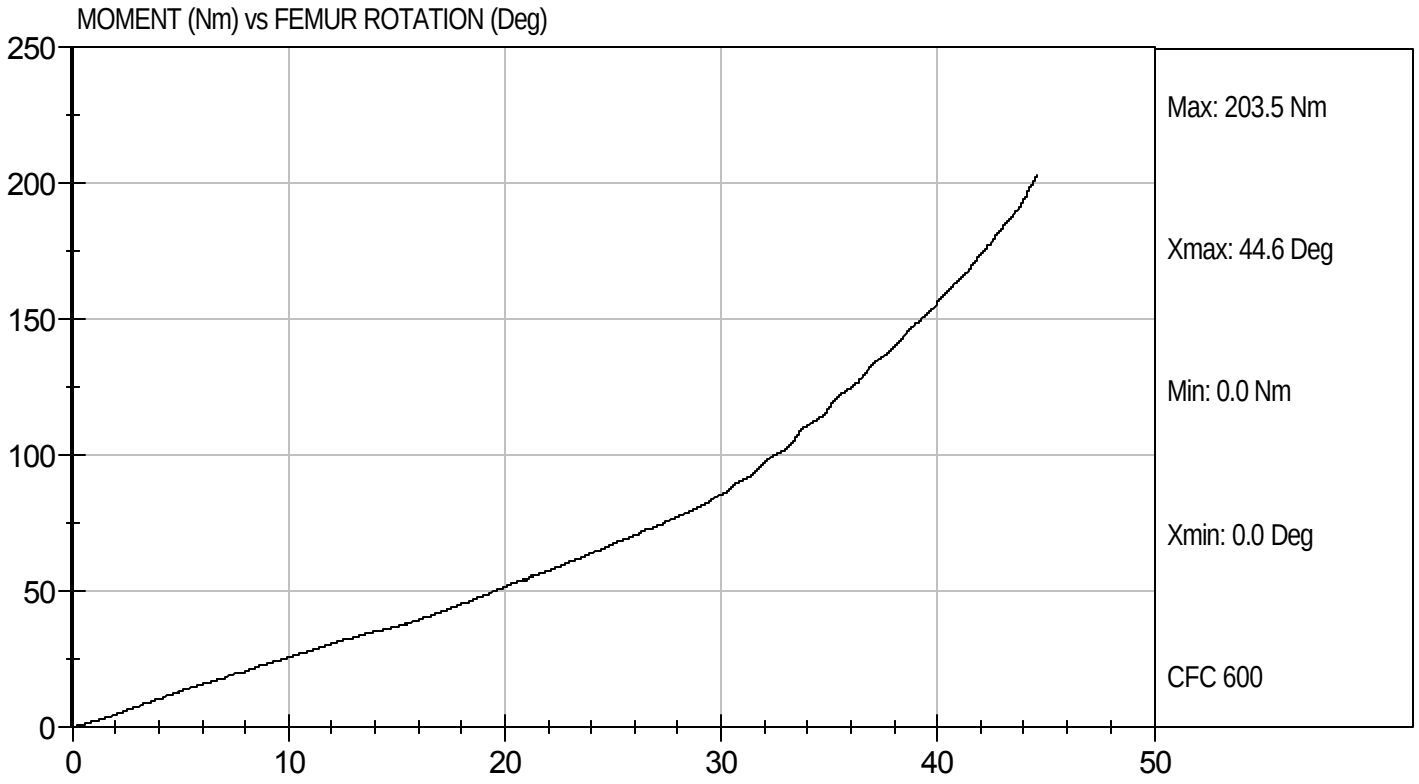
Jessica Gall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By

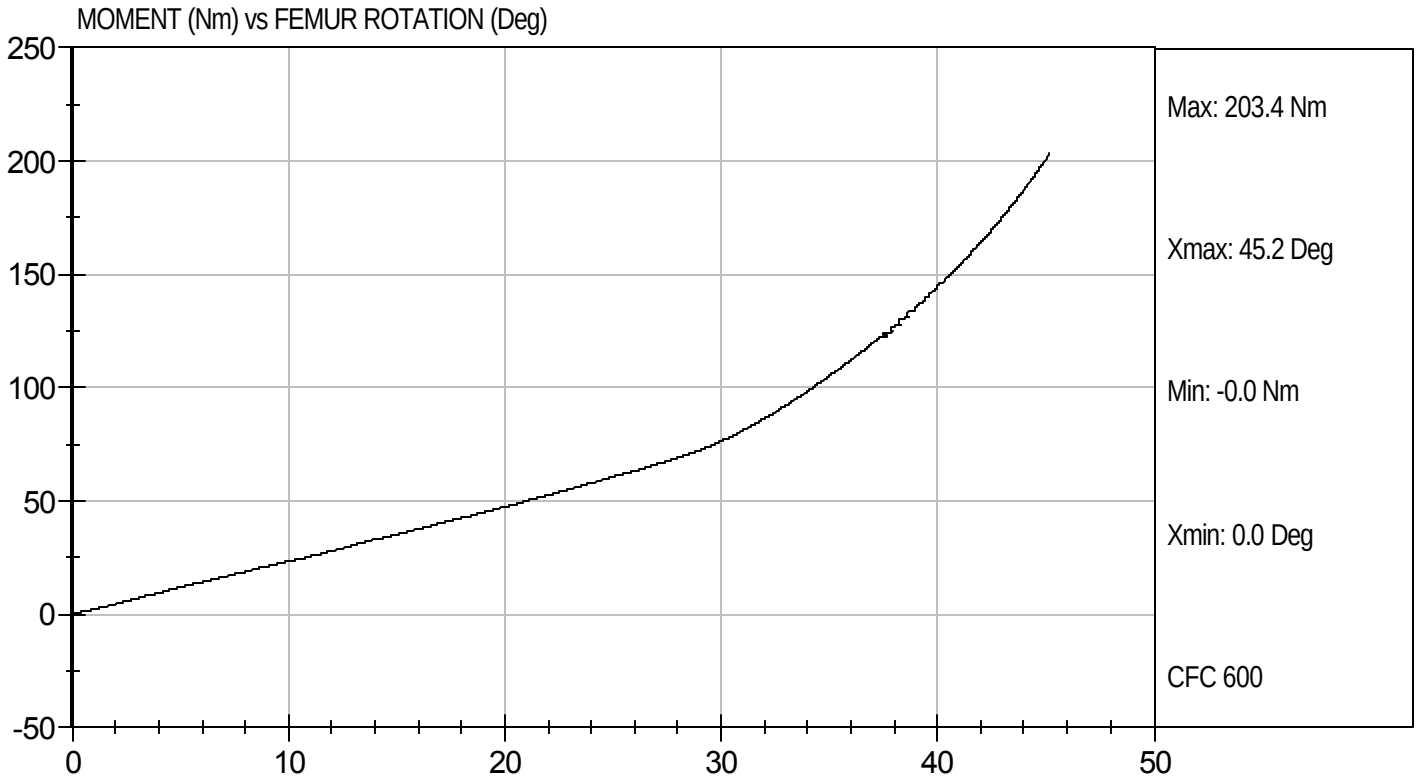
Test Desc: Hip Femur Flexion
Component ID: D122029

Test Date: 5/30/12
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D122020

Test Date: 5/30/12
Velocity: 0 ft/s, 0.00 m/s



Hybrid III, 5th External Measurements
SN: 634

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	784.6
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	253.4
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	277.8
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.5
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	541.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.4
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.	414-439.4	428.6

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	224.7
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	139.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	355.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	90.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	540.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.8
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D121891

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	250 to 300	269	Pass
Peak Lateral Acceleration	G's	+/- 15	6.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

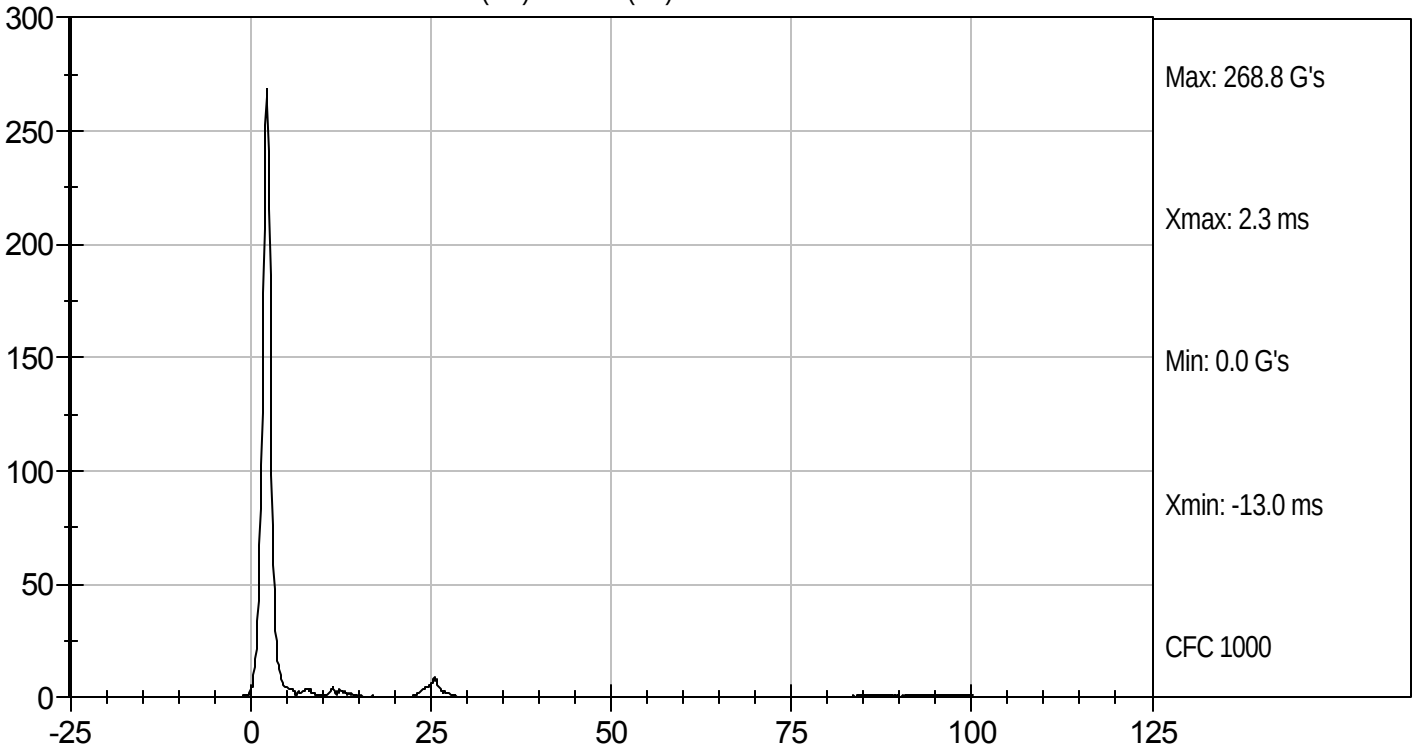
5/21/12
Test Date

David Winkelbauer
Approved By

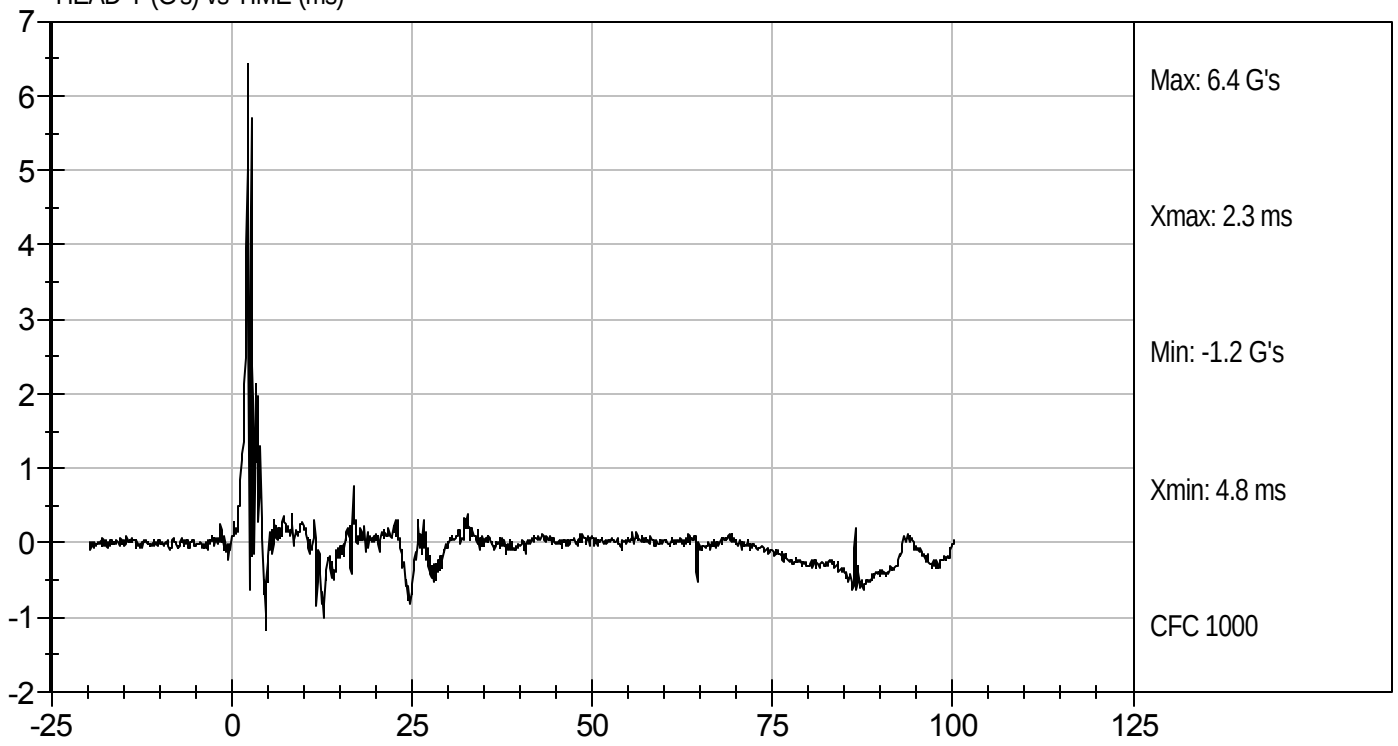
Test Desc: Head Drop
Component ID: D121891

Test Date: 5/21/12
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121892

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Pulse	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.3	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

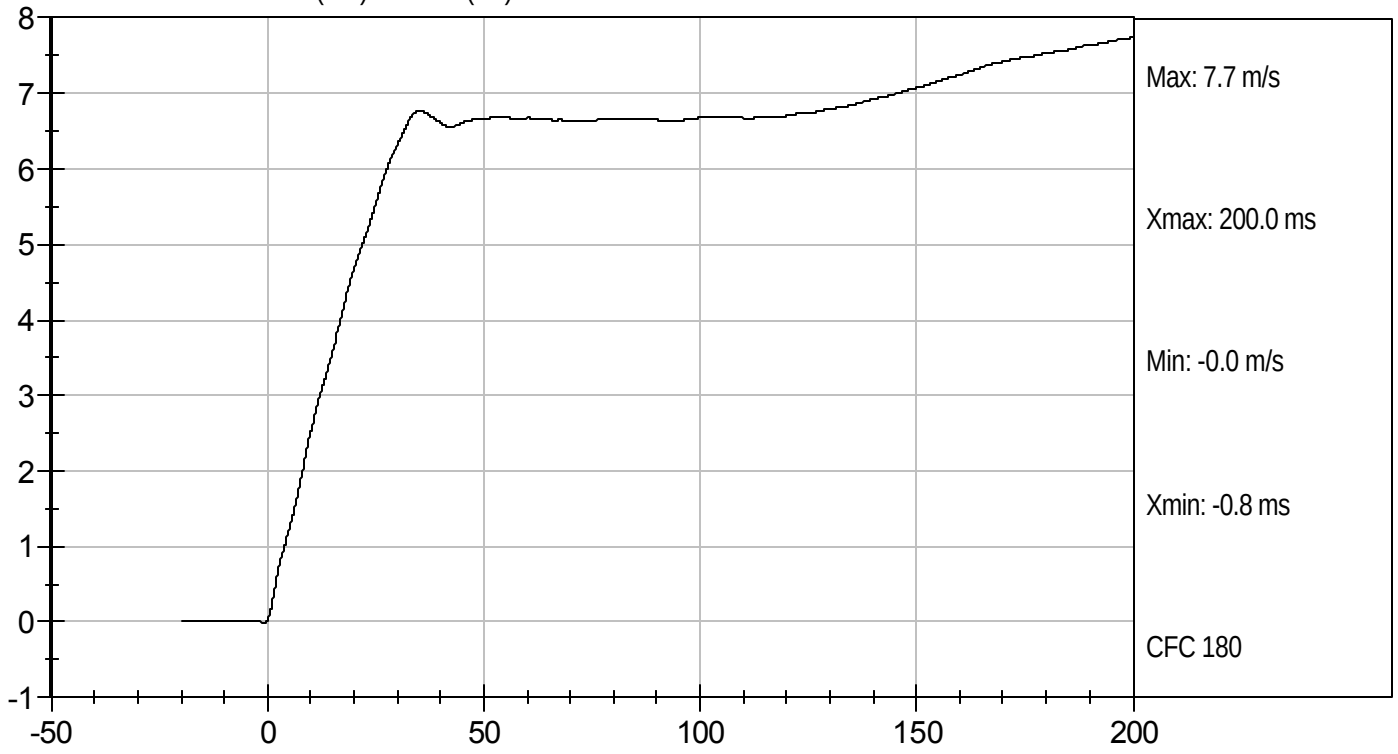
5/21/12
Test Date

David Winkelbauer
Approved By

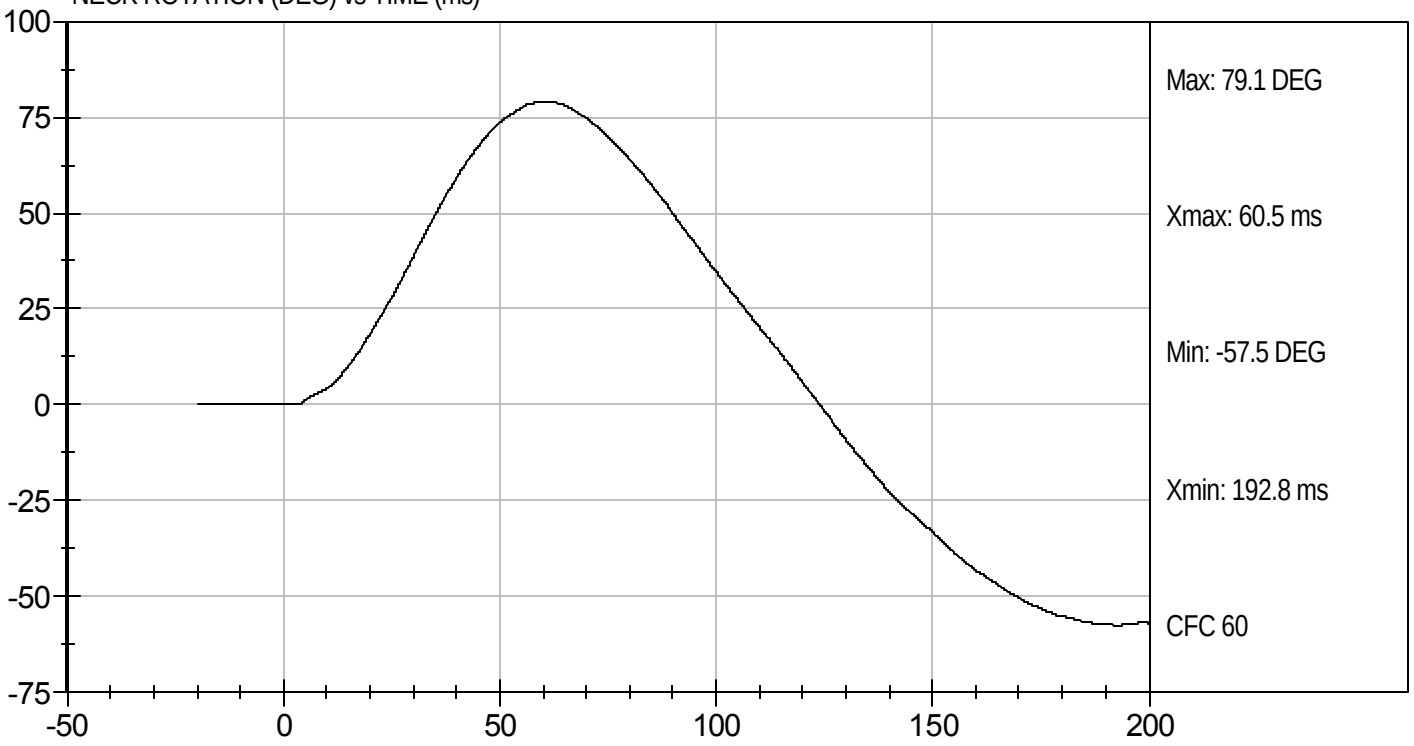
Test Desc: Neck Flexion
Component ID: D121892

Test Date: 5/21/12
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM VELOCITY (m/s) vs TIME (ms)

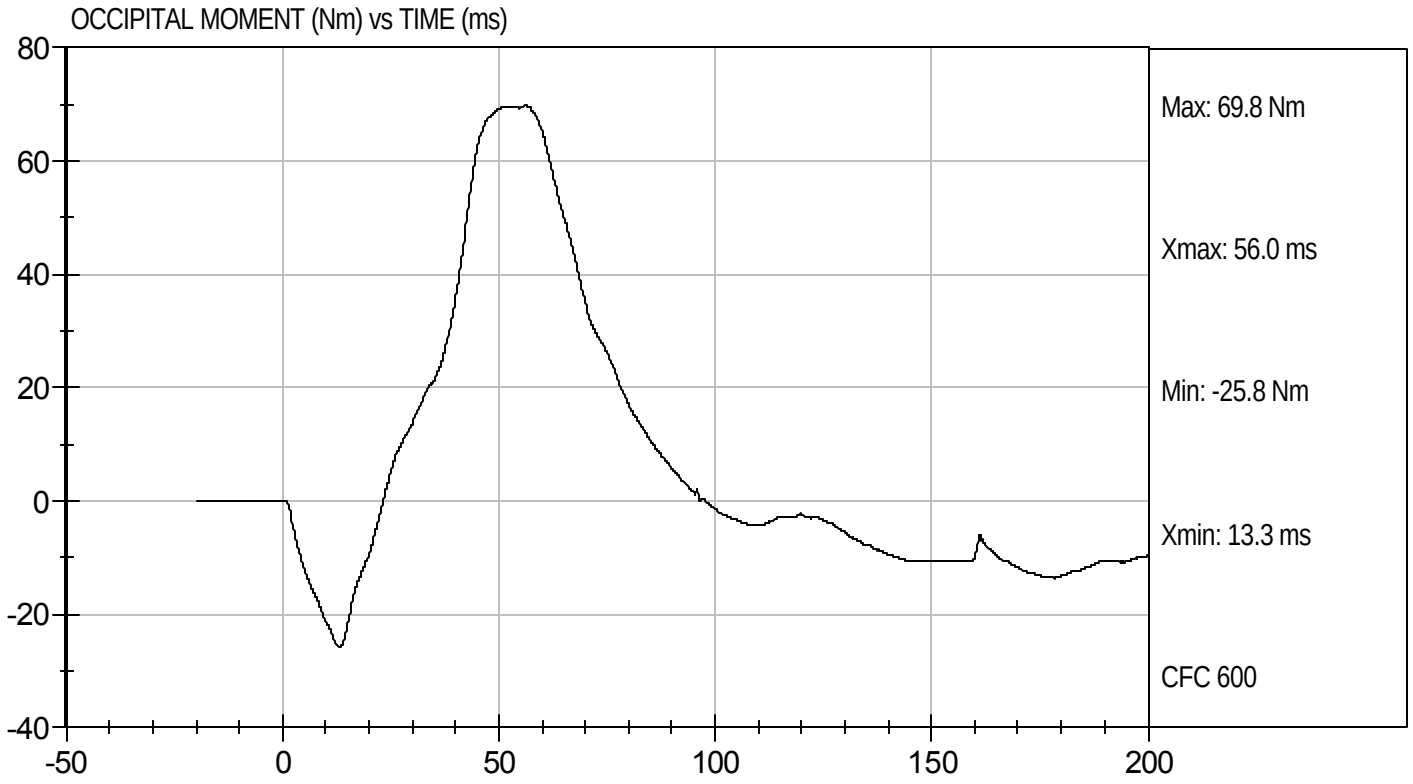


NECK ROTATION (DEG) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D121892

Test Date: 5/21/12
Velocity: 23.15 ft/s, 7.06 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121893

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.16	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.0	Pass
D Plane Rotation	Max	deg	99 to 114	100	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-64	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	95	Pass
			Overall Results		Pass

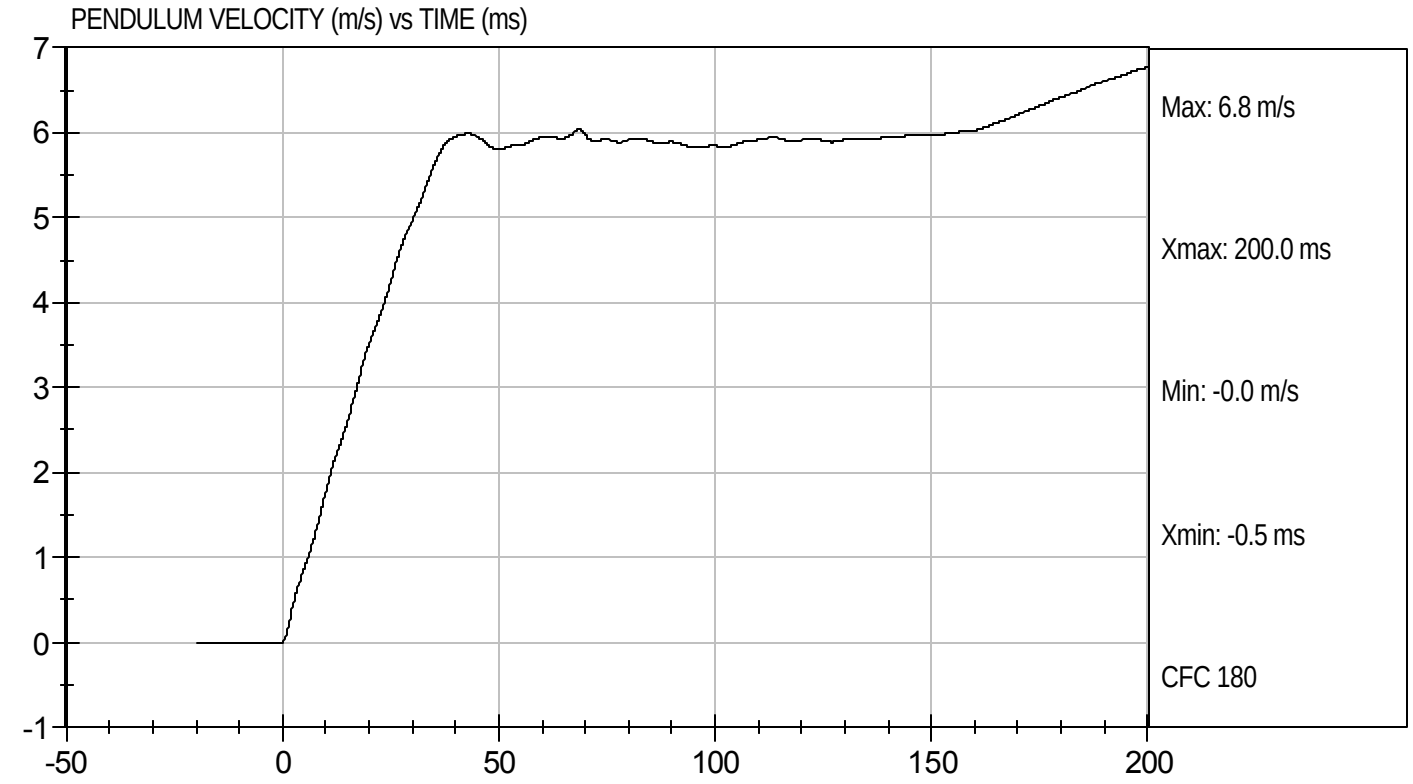
Jessica Gall
Laboratory Technician

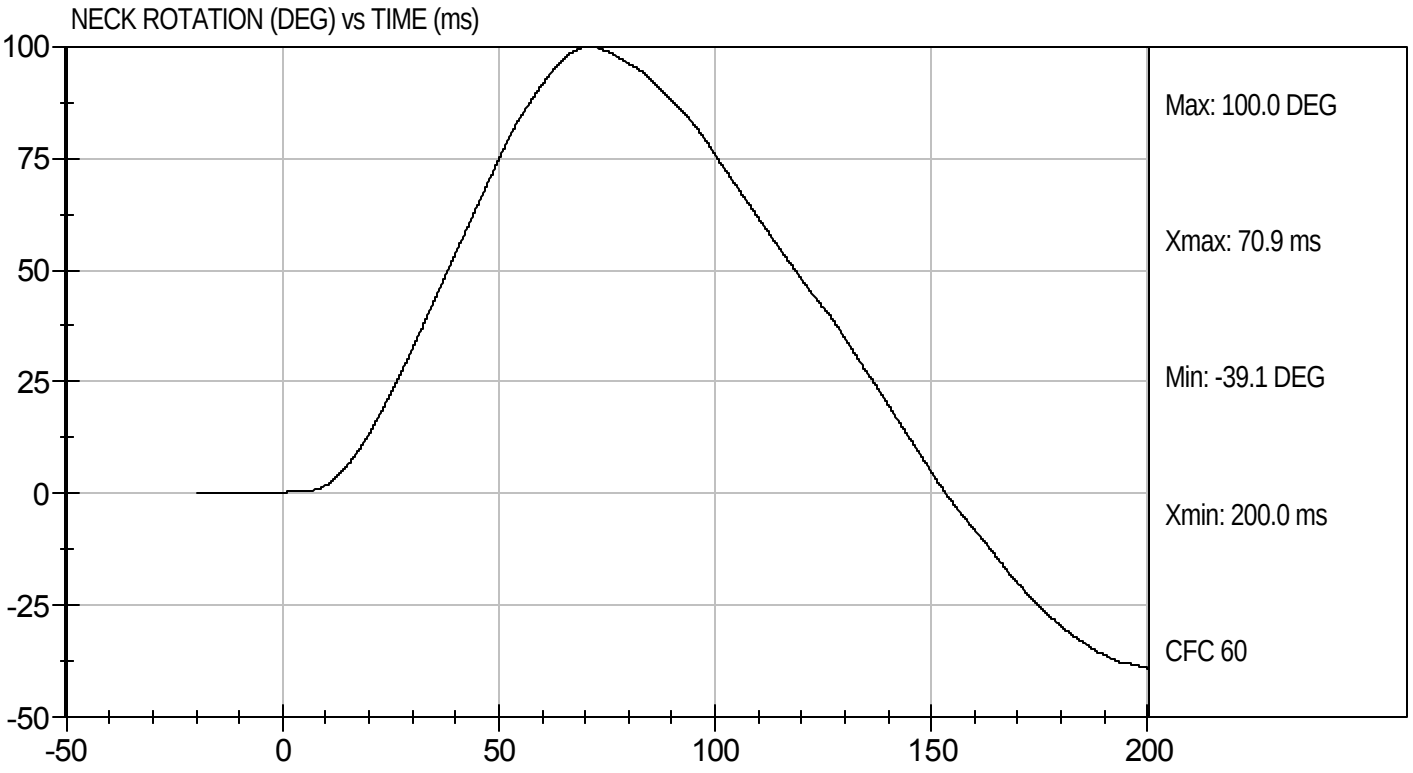
5/22/12
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Extension
Component ID: D121893

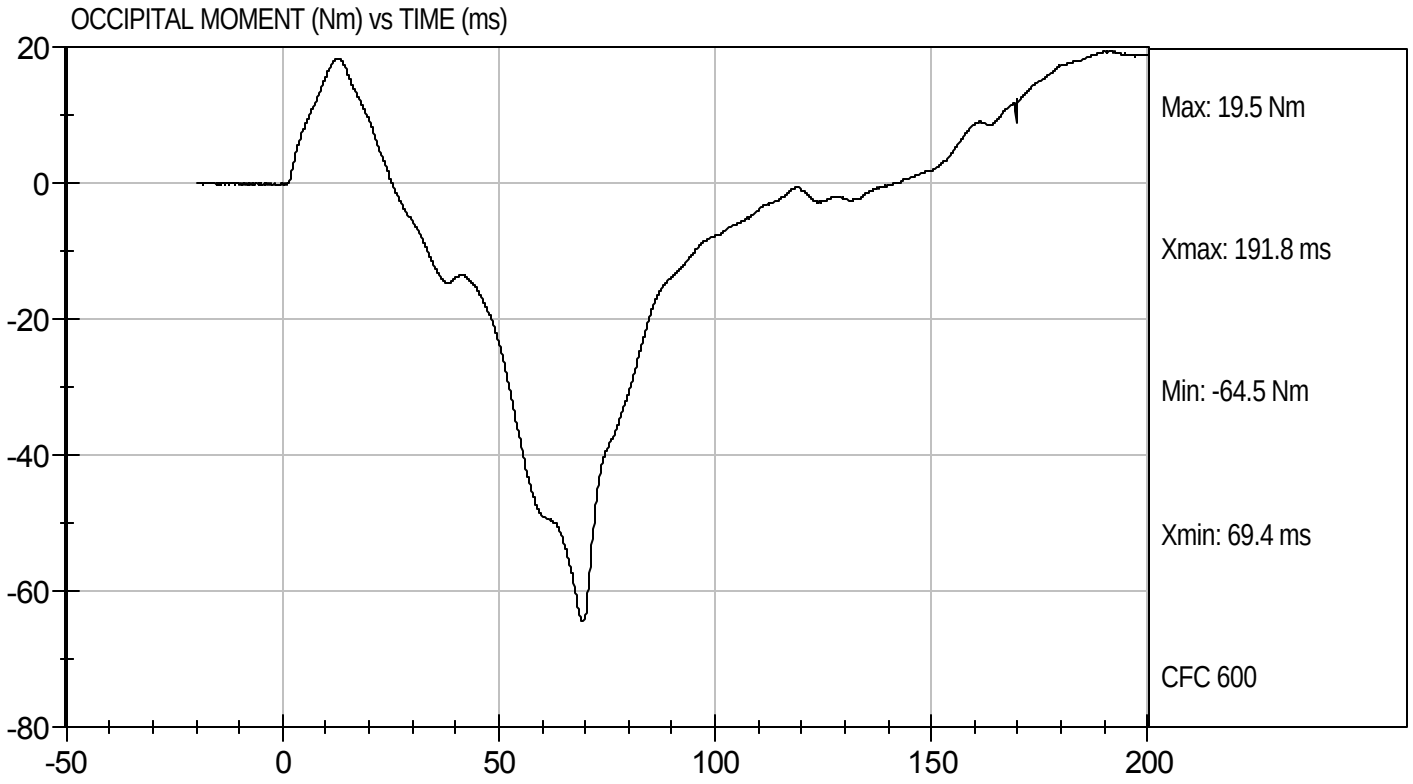
Test Date: 5/22/12
Velocity: 20.2 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D121893

Test Date: 5/22/12
Velocity: 20.2 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121894

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	4.04	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4038	Pass
		Overall Test Results		Pass

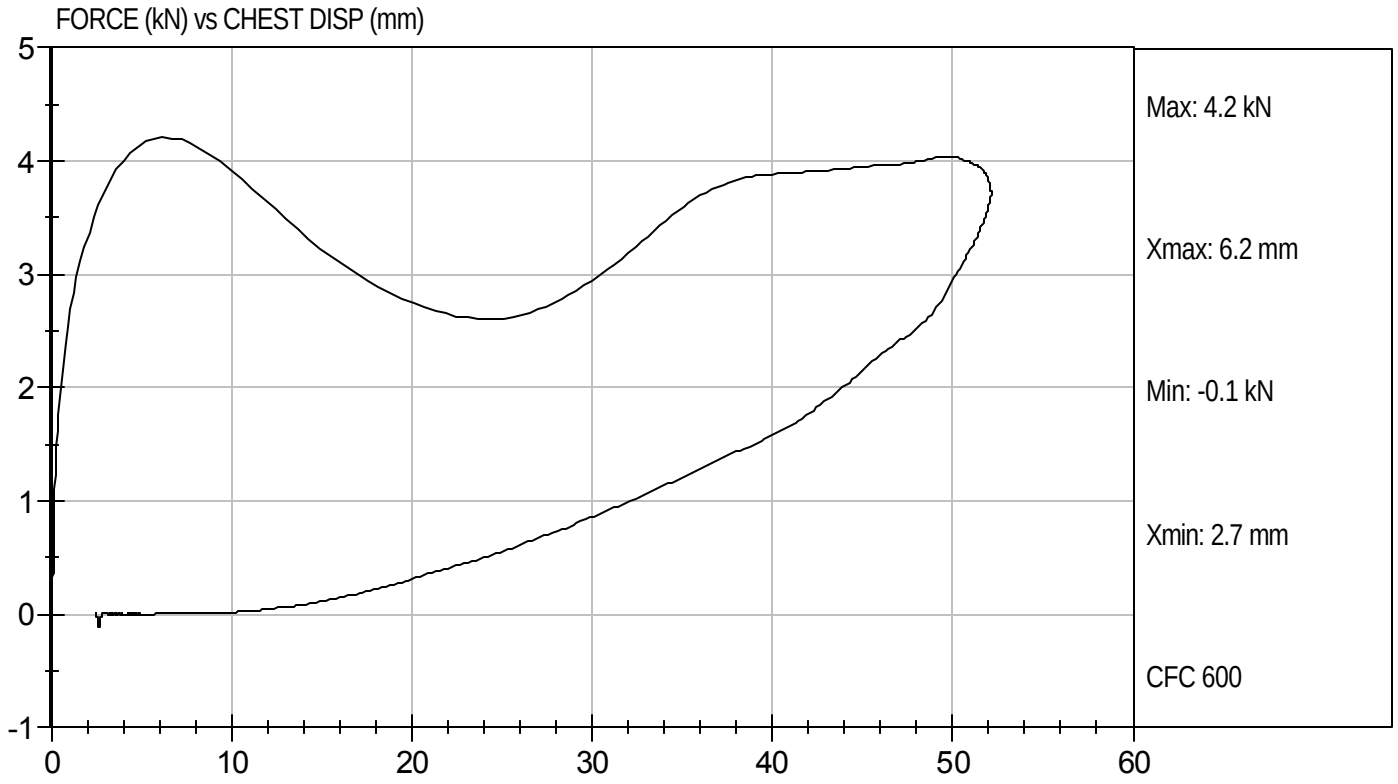
Jessica Gall
Laboratory Technician

5/22/12
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D121894

Test Date: 5/22/12
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121895

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.80	Pass
		Overall Test Results		Pass

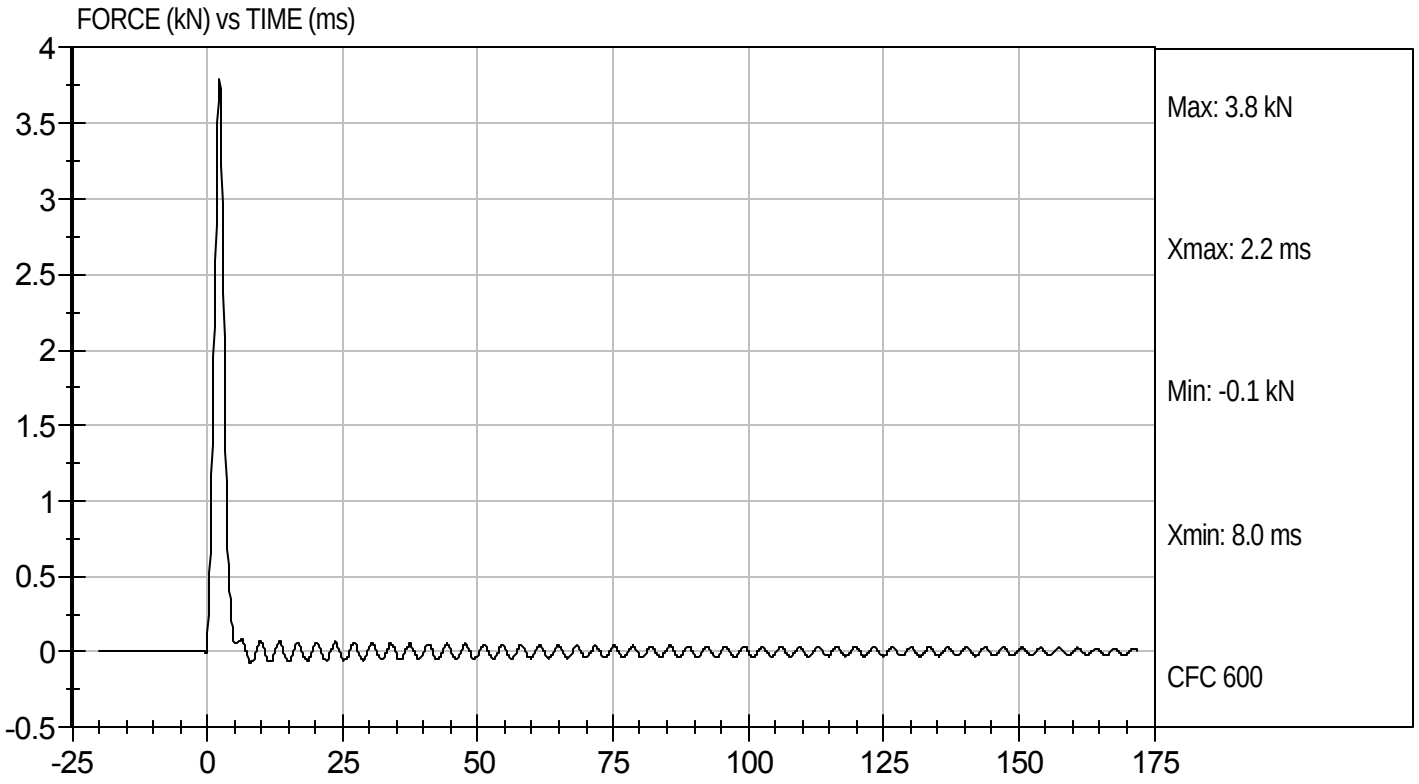
Jessica Hall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D121895

Test Date: 5/21/12
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121896

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	kN	3.45 to 4.06	3.57	Pass
		Overall Test Results		Pass

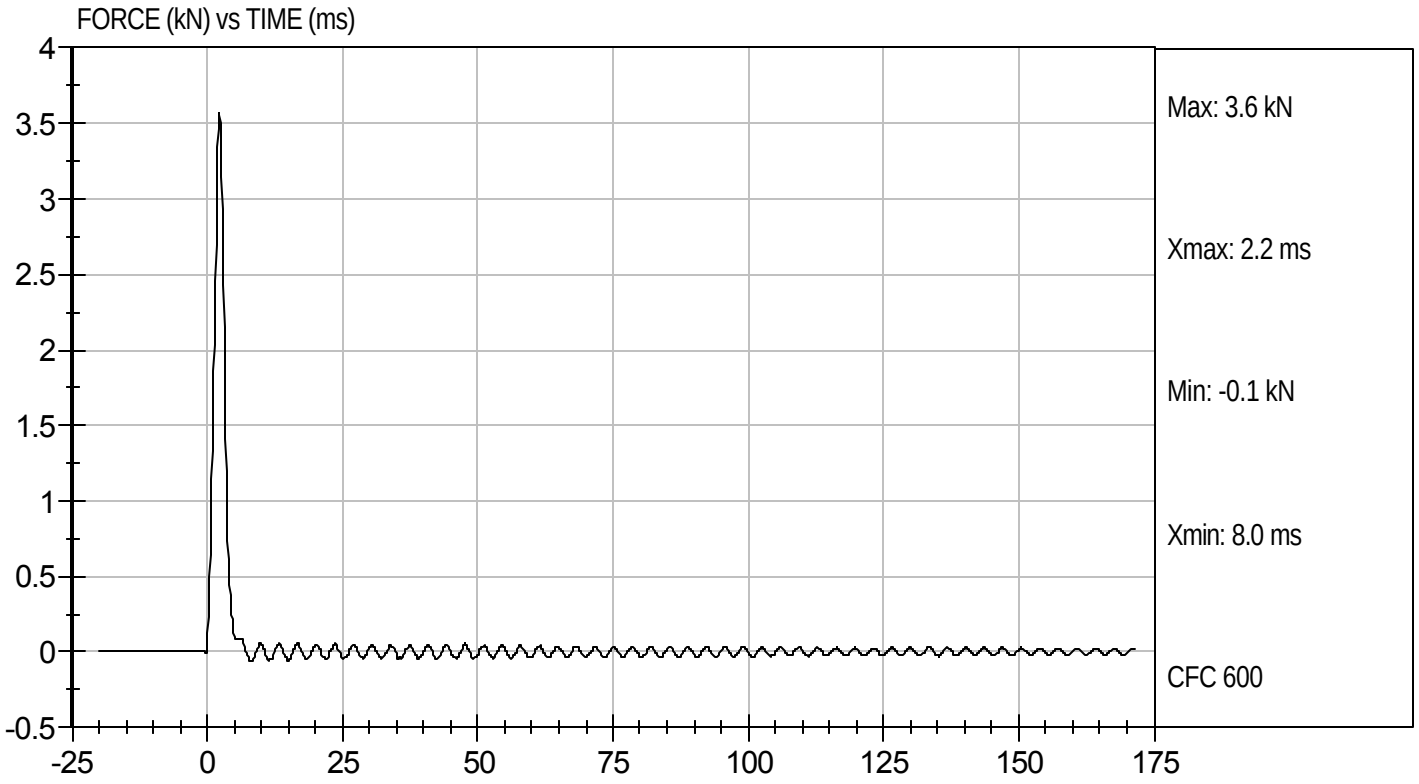
Jessica Hall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D121896

Test Date: 5/21/12
Velocity: 6.92 ft/s, 2.11 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D121897

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	363	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Hall
Laboratory Technician

5/21/12
Test Date

David Winkelbauer
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D122031

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	250 to 300	272	Pass
Peak Lateral Acceleration	G's	+/- 15	3.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

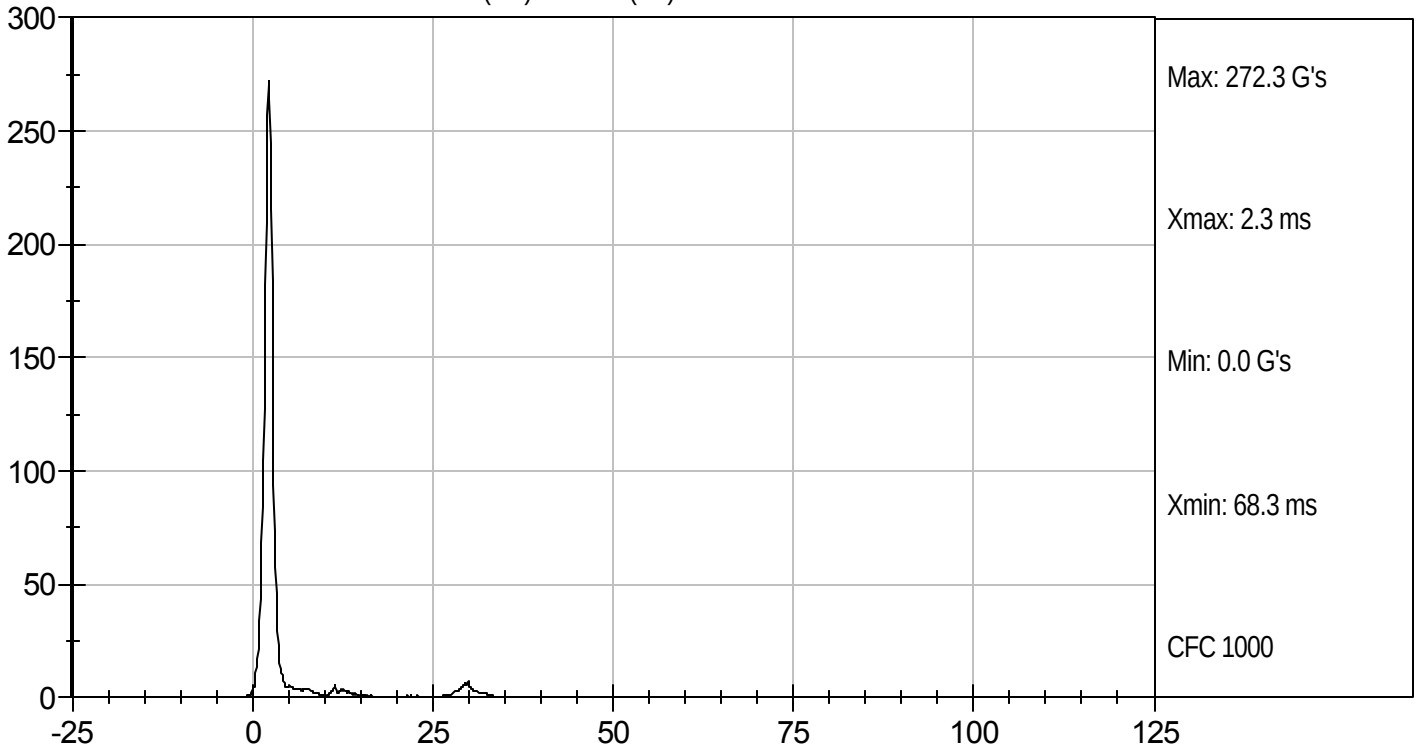
5/30/12
Test Date

David Winkelbauer
Approved By

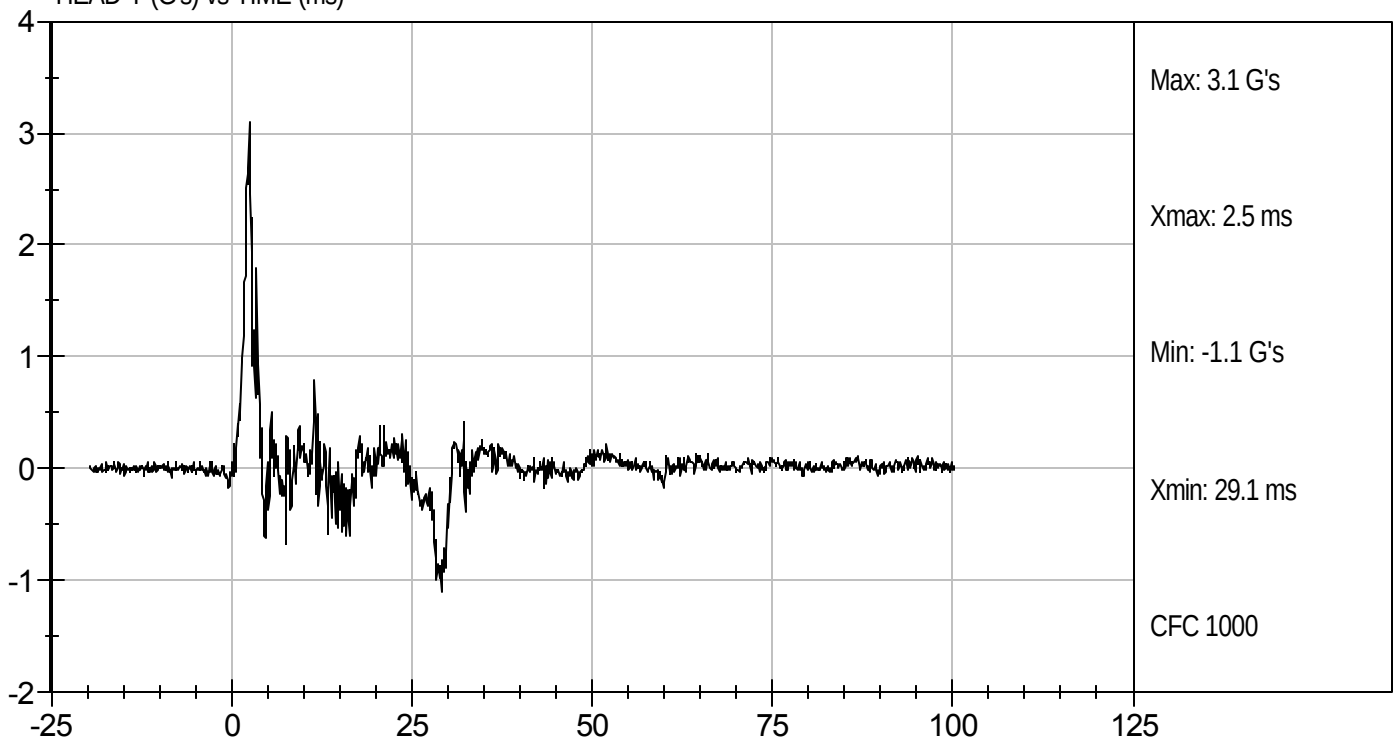
Test Desc: Head Drop
Component ID: D122031

Test Date: 5/30/12
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G's) vs TIME (ms)



HEAD Y (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122032

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	39	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Pulse	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
			Overall Results		Pass

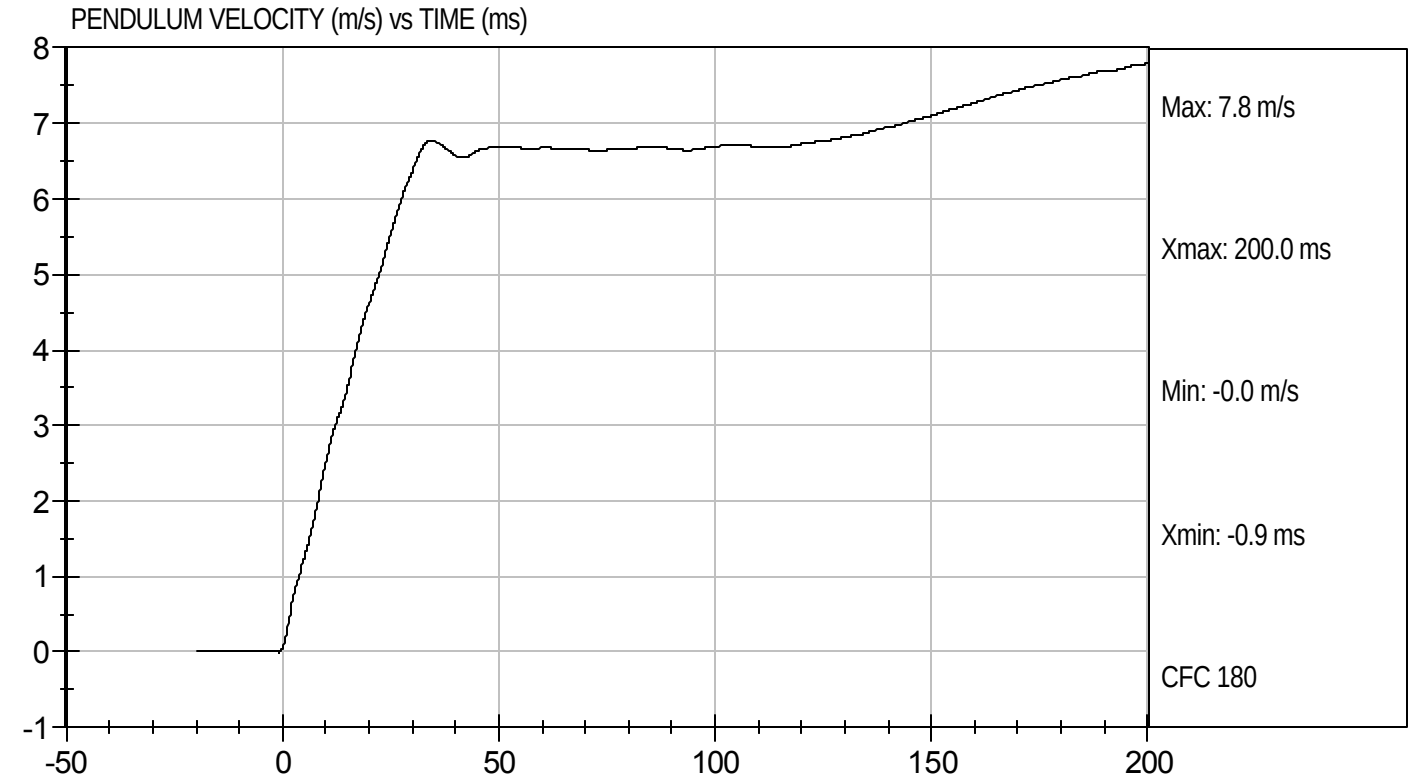
Jessica Hall
Laboratory Technician

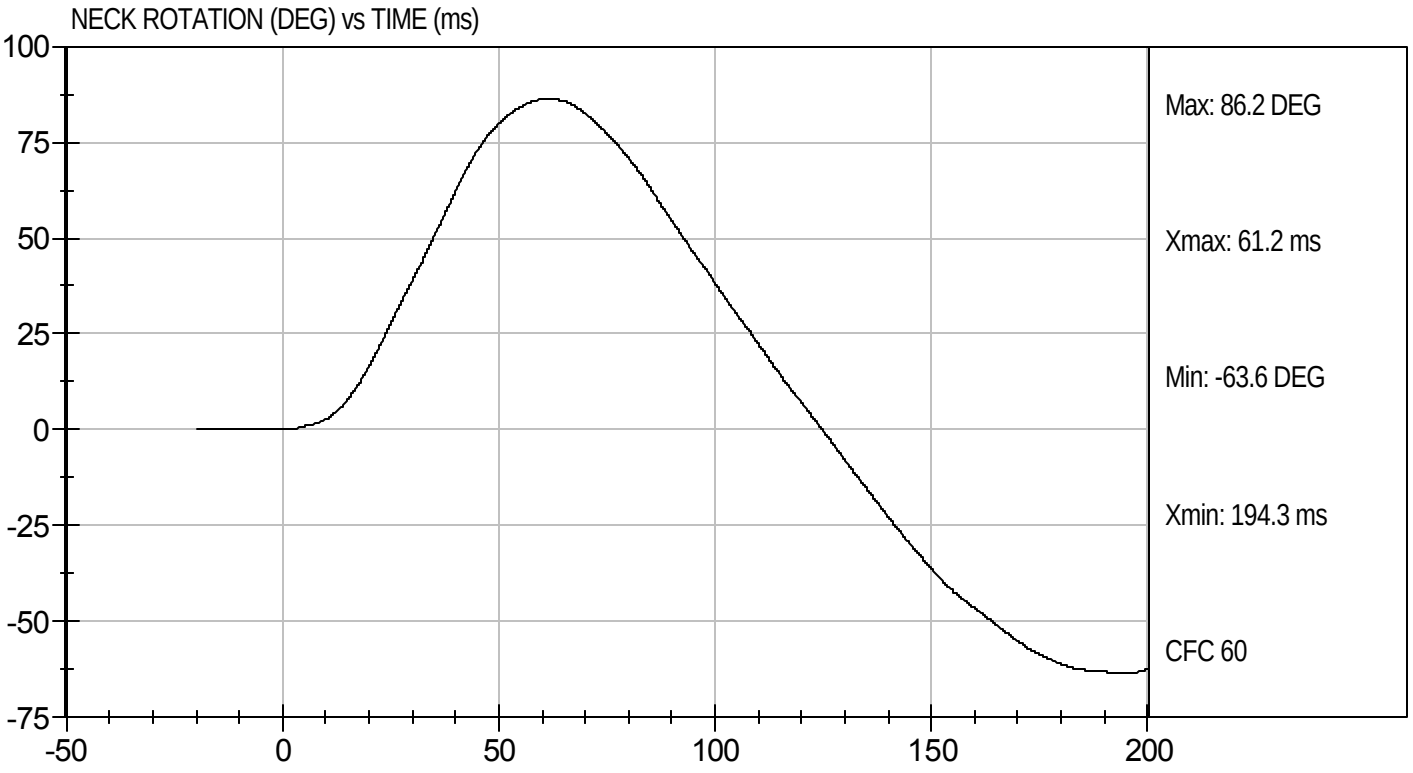
5/30/12
Test Date

David Winkelbauer
Approved By

Test Desc: Neck Flexion
Component ID: D122032

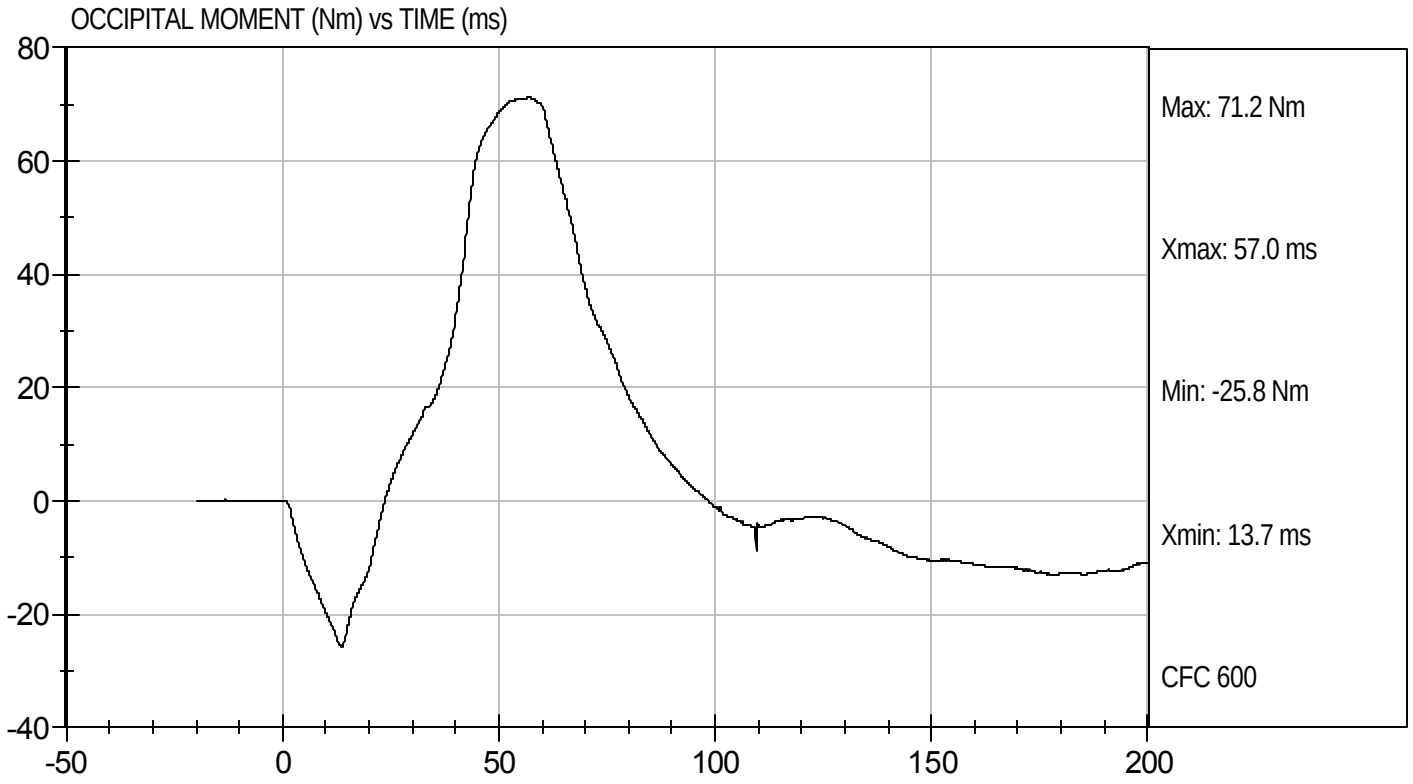
Test Date: 5/30/12
Velocity: 22.83 ft/s, 6.96 m/s





Test Desc: Neck Flexion
Component ID: D122032

Test Date: 5/30/12
Velocity: 22.83 ft/s, 6.96 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122033

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	39	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Pulse	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	4.8	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Deflection Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

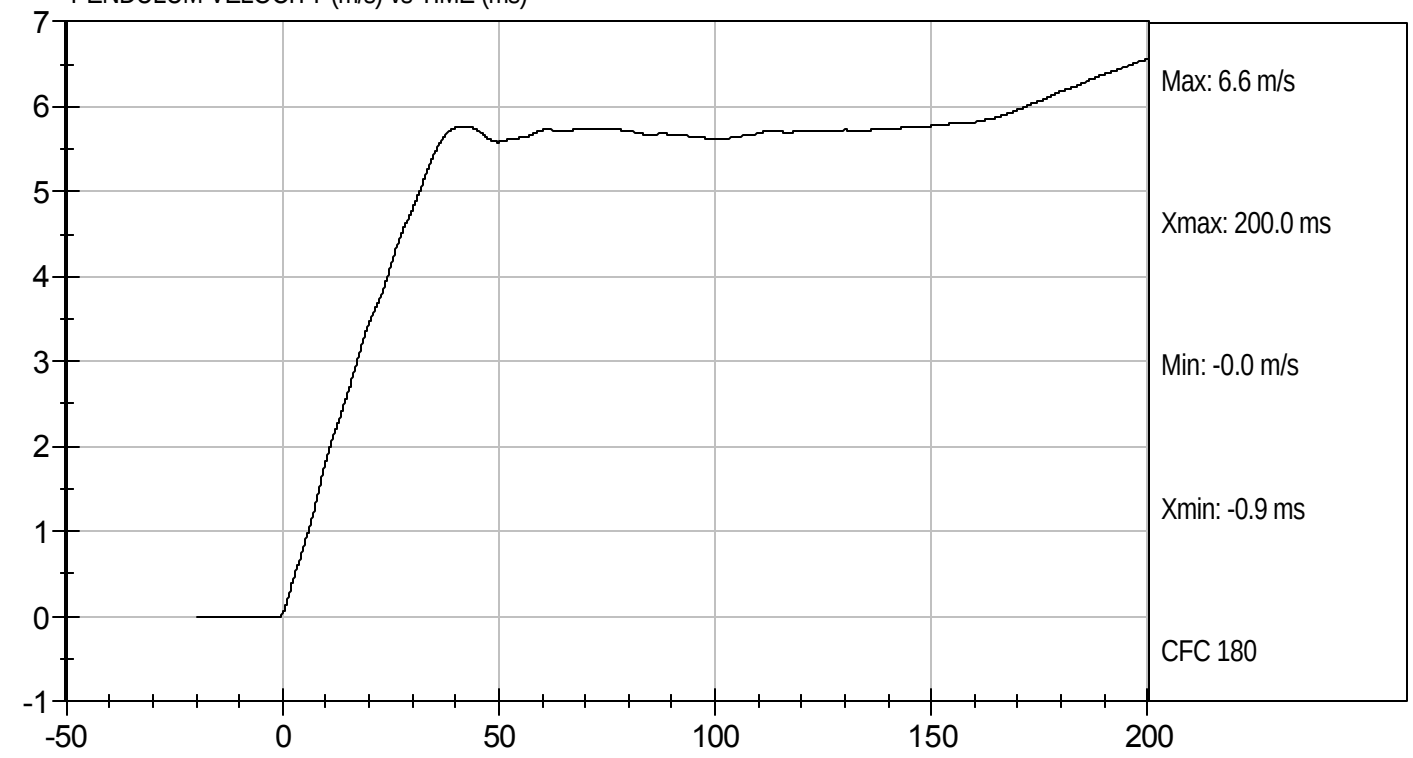
5/30/12
Test Date

David Winkelbauer
Approved By

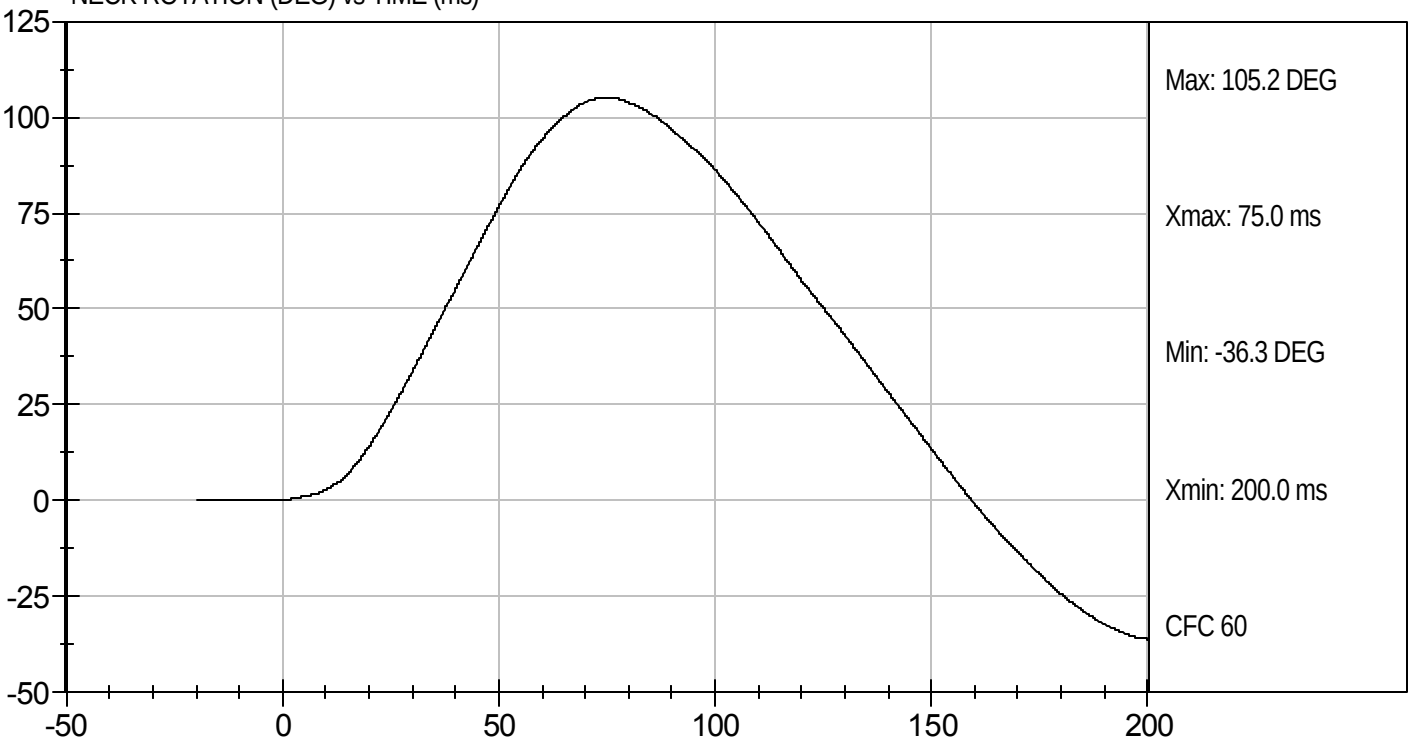
Test Desc: Neck Extension
Component ID: D122033

Test Date: 5/30/12
Velocity: 20.3 ft/s, 6.19 m/s

PENDULUM VELOCITY (m/s) vs TIME (ms)

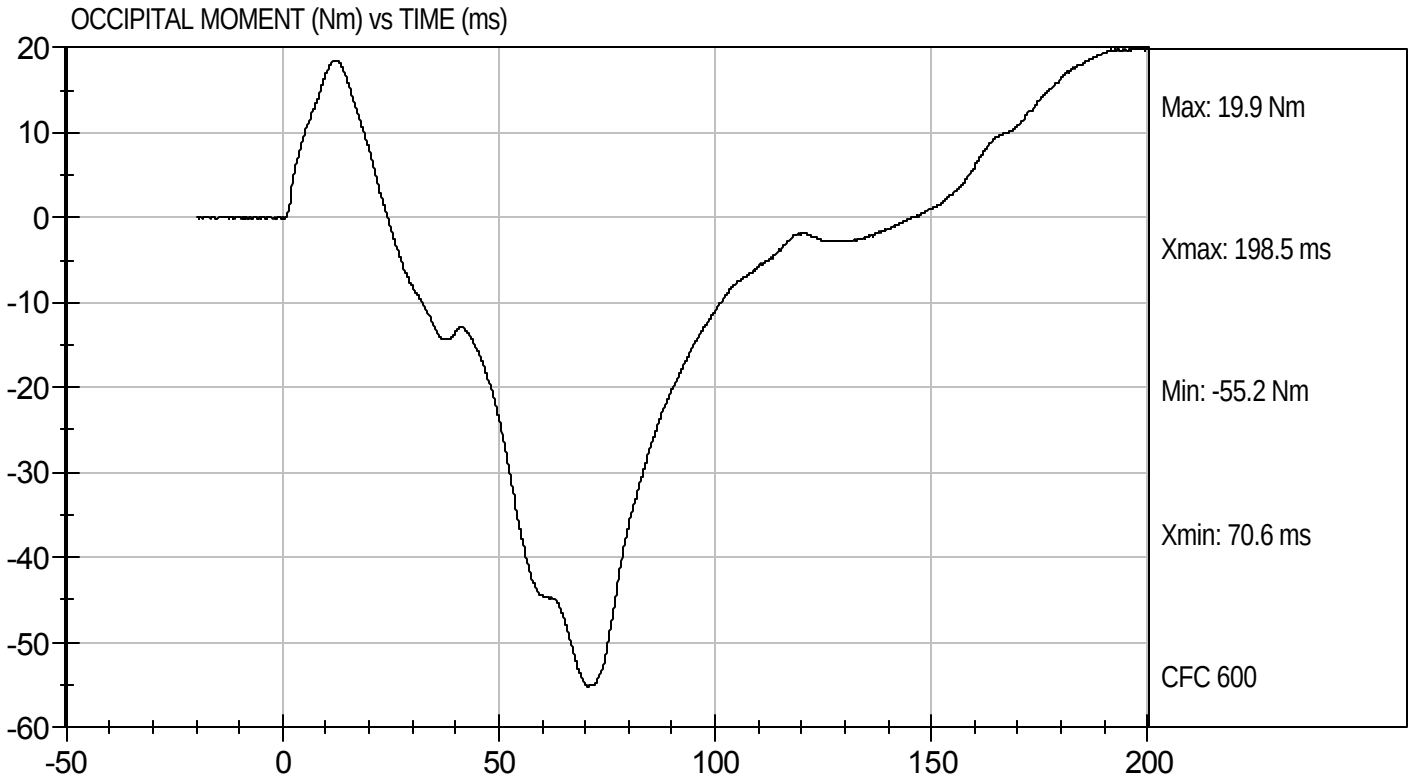


NECK ROTATION (DEG) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D122033

Test Date: 5/30/12
Velocity: 20.3 ft/s, 6.19 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122034

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	kN	3.9 to 4.4	3.90	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4,600 N	4115	Pass
		Overall Test Results		Pass

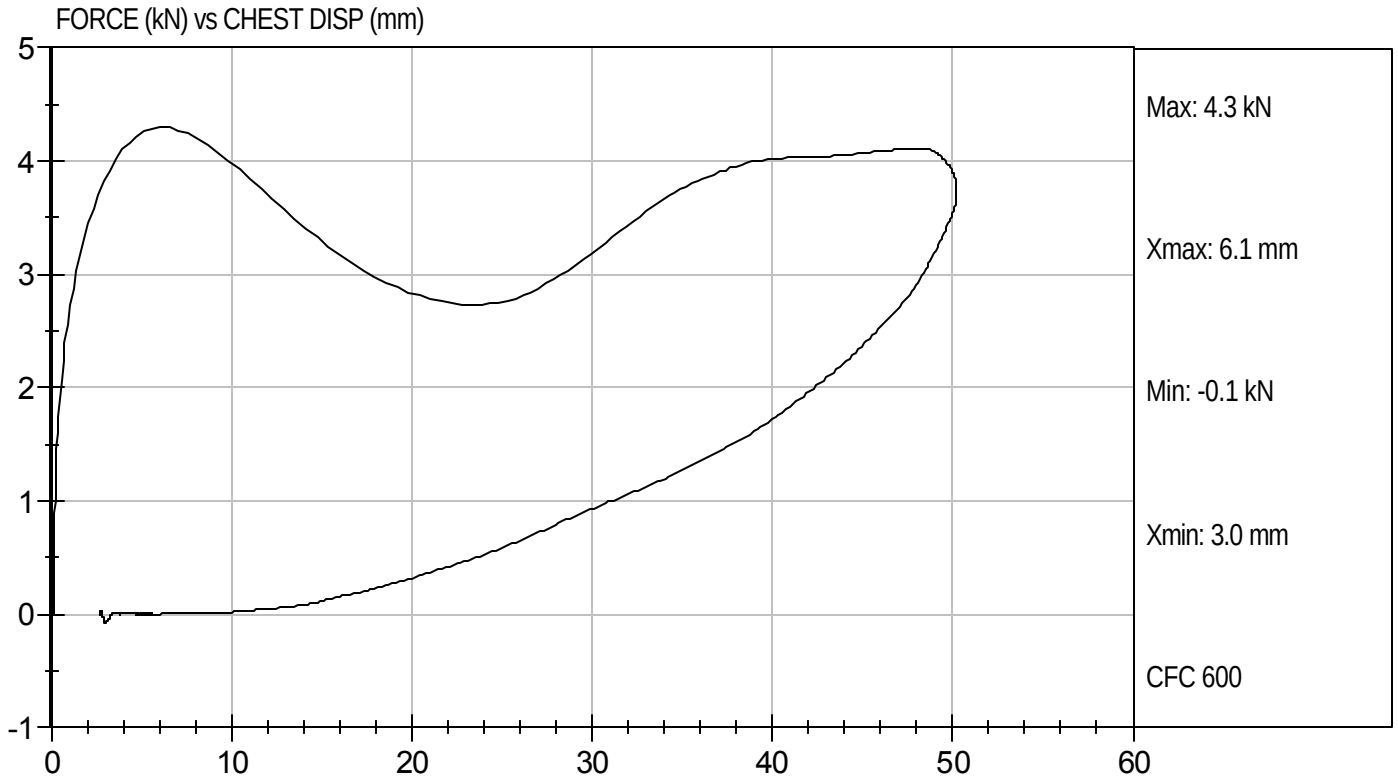
Jessica Gall
Laboratory Technician

5/31/12
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D122034

Test Date: 5/31/12
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122035

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.76	Pass
		Overall Test Results		Pass

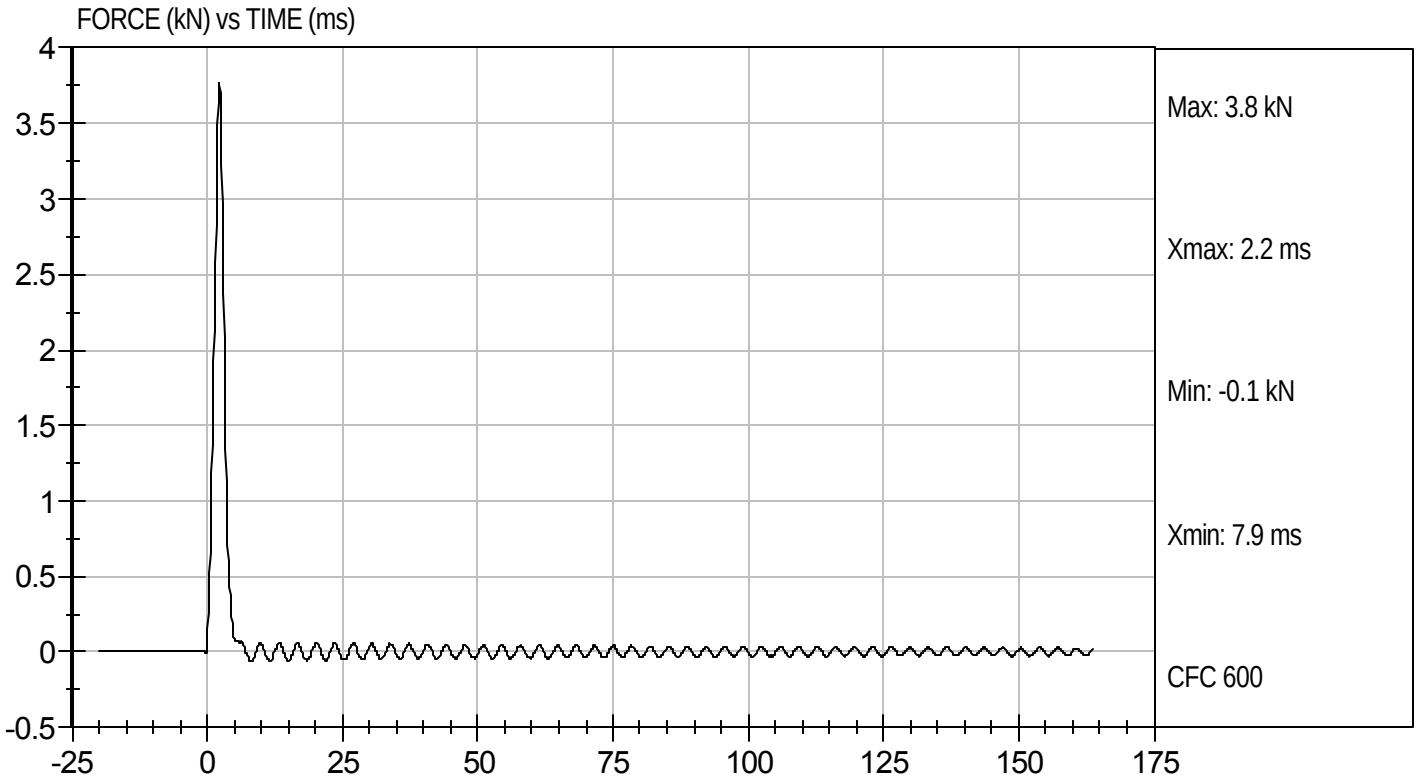
Jessica Hall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D122035

Test Date: 5/30/12
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122036

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	kN	3.45 to 4.06	3.62	Pass
		Overall Test Results		Pass

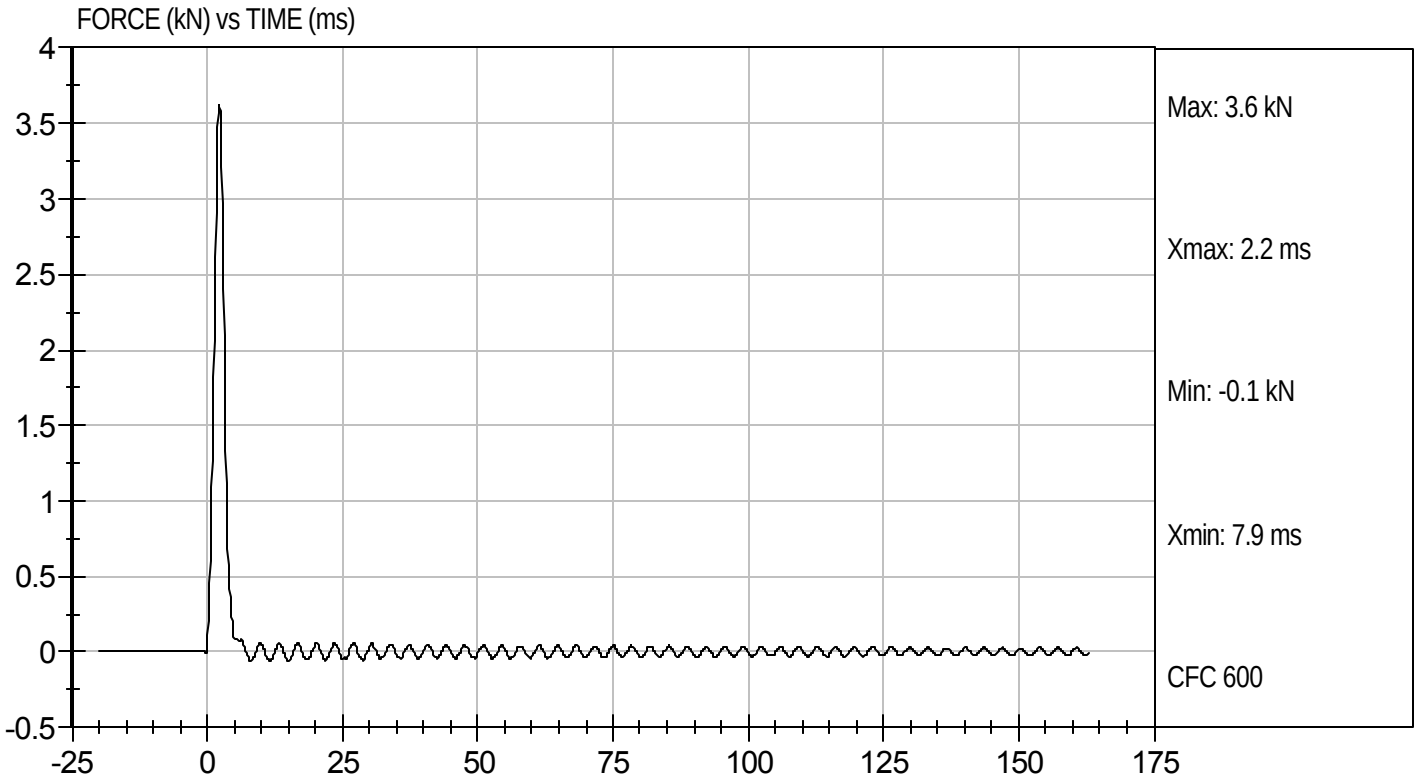
Jessica Hall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D122036

Test Date: 5/30/12
Velocity: 6.94 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D122037

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	6	Pass
Force at 45 deg	N	320 to 390	366	Pass
Upper Torso Deflection Rate	Deg/sec	0.5 to 1.5	1.0	Pass
		Overall Result		Pass

Jessica Hall
Laboratory Technician

5/30/12
Test Date

David Winkelbauer
Approved By