**REPORT NUMBER: NCAP-MGA-2011-031**

# NEW CAR ASSESSMENT PROGRAM (NCAP)
## Frontal Barrier Impact Test

**NISSAN MOTOR CO., LTD.**
**2011 Nissan Rogue S 5-Dr SUV**
**NHTSA No.: MB5211**

**MGA RESEARCH CORPORATION**
**5000 Warren Road**
**Burlington, WI 53105**


**Test Date: October 15, 2010**

**Final Report Date: March 7, 2011**

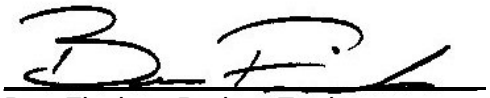
**FINAL REPORT**

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-D-00028.



Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: March 7, 2011

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**

| | | |
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| *9. Performing Organization Name and Address*<br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105 | | *10. Work Unit No.*<br>*11. Contract or Grant No.*<br>DTNH22-06-D-00028 |
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*16. Abstract*

A 56.3 km/h NCAP Frontal Impact Test was conducted on the 2011 Nissan Rogue S 5-Dr SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure for the generation of consumer information on vehicle frontal crash protection. 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 October 15, 2010.

The impact velocity was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 611 mm located at 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 | 191 | 377 |
| Maximum Chest Compression | mm | 63 | 52 | 24 | 20 |
| Nij | N/A | 1 | 1 | 0.30 | 0.53 (see test notes) |
| Neck Tension | N | 4170 | 2620 | 1381 | 837 (see test notes) |
| Neck Compression | N | 4000 | 2520 | 239 | 329 (see test notes) |
| Left Femur Force | N | 10008 | 6805 | 447 | 1399 |
| Right Femur Force | N | 10008 | 6805 | 2759 | 1811 |

| | | | |
|---|---|---|---|
| *17. Key Words*<br>35 mph Frontal Barrier Impact Test<br>New Car Assessment Program (NCAP) | | *18. Distribution Statement*<br>Copies of this report are available from:<br>National Highway Traffic Safety Adm.<br>Technical Reference Division<br>1200 New Jersey Ave, SE<br>Washington, D.C. 20590 | |
| *19. Security Classif. (of this report)* Unclassified | *20. Security Classif. (of this page)* Unclassified | *21. No. of Pages*<br>157 | 22. Price |

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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 Standard's NCAP Frontal Laboratory Test Procedure dated January 2010.

### SUMMARY

A load cell barrier was impacted by a 2011 Nissan Rogue S 5-Dr SUV at a velocity of 56.2 kph. The test was performed at MGA Research Corporation on October 15, 2010. 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, 50$^{th}$ percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5$^{th}$ 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 on the driver's lap and shoulder belts and the passenger's lap belt to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 634) were calibrated previous to this test. Certification details, along with verification data, are found in Appendix C of this report.

The 223 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 611 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted headrest. The driver's knees contacted the knee bolster. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glovebox.

The occupant data is summarized below:

| ATD position | $HIC_{15}$ | $T^1$ | $T^2$ | Chest Disp. (mm) | Nij | Neck Tension (N) | Neck Comp. (N) | Left Femur (N) | Right Femur (N) |
|---|---|---|---|---|---|---|---|---|---|
| Driver ($50^{th}$) | 191 | 67.6 | 82.6 | 24 | 0.30 | 1381 | 239 | 447 | 2759 |
| Passenger ($5^{th}$) | 377 | 62.7 | 77.7 | 20 | 0.53 * | 837 * | 329 * | 1399 | 1811 |

* See Test Notes Below

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

**TEST NOTES**

There was no valid data collected for:
Driver Chest Y after 70 msec.
Passenger Neck FX after 205 msec.
Passenger Neck FZ after 205 msec.
Bottom of Engine X after 40 msec.
Left Brake Caliper X after 40 msec.
Right Brake Caliper X after 50 msec.

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: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010

### TEST VEHICLE INFORMATION AND OPTIONS

| | |
|---|---|
| NHTSA No. | MB5211 |
| Model Year | 2011 |
| Make | Nissan |
| Model | Rogue |
| Body Style | SUV |
| VIN | JN8AS5MV4BW253585 |
| Body Color | Platinum Graphi |
| Delivery Date | 9/21/2010 |
| Odometer (mi) | 43 |
| Odometer (km) | 69 |
| Dealer | Rosen Nissan of Gurnee |
| Transmission | Automatic |
| Final Drive | AWD |
| Type/No. Cylinders | 4 |
| Engine Displacement (L) | 2.5 |
| Engine Placement | Lateral |
| Roof Rack | No |
| Sunroof/T-Top | No |
| Tinted Glass | No |
| Traction Control | Yes |
| Power Brakes | Yes |
| Front Disc | Yes |
| Rear Disc | Yes |
| Does owner's manual provide instructions to turn off automatic door locks? | No |

| | |
|---|---|
| Anti-Lock Brakes | Yes |
| All Wheel Drive | Yes |
| Power Steering | Yes |
| Driver Front Airbag | Yes |
| Driver Curtain Airbag | Yes |
| Driver Head/Torso Airbag | No |
| Driver Torso Airbag | No |
| Driver Torso/Pelvis Airbag | Yes |
| Driver Pelvis Airbag | No |
| Driver Knee Airbag | No |
| Pass. Front Airbag | Yes |
| Pass. Curtain Airbag | Yes |
| Pass. Head/Torso Airbag | No |
| Pass. Torso Airbag | No |
| Pass. Torso/Pelvis Airbag | Yes |
| Pass. Pelvis Airbag | No |
| Pass. Knee Airbag | No |
| Pretensioners | Yes |
| Load Limiters | Yes |
| Automatic Door Locks | Yes |
| Bucket Seats | Yes |
| Tilt Steering | Yes |
| Other | |

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | Nissan Motor Co., Ltd. |
| Date of Manufacture | 7/10 |

| | |
|---|---|
| GVWR (kg) | 2053 |
| GAWR Front (kg) | 1077 |
| GAWR Rear (kg) | 984 |

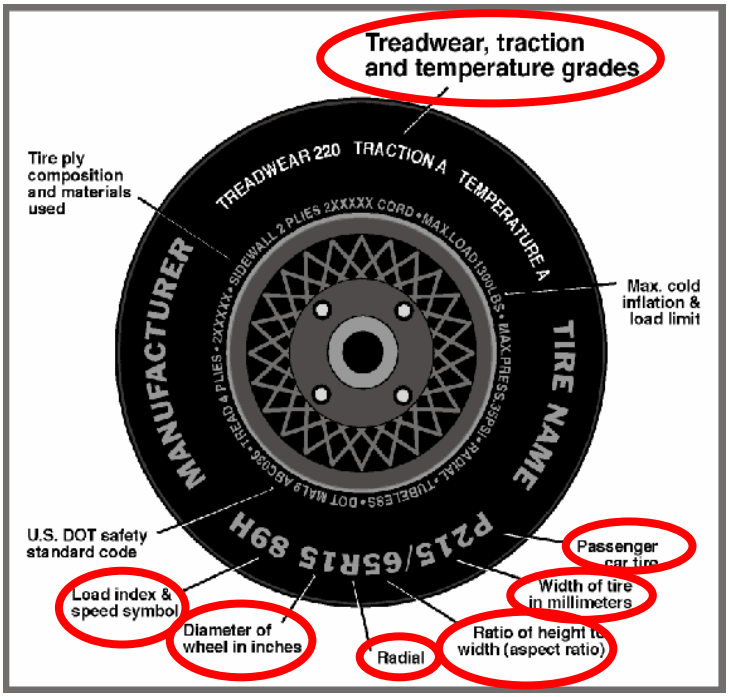
### VEHICLE SEATING AND WEIGHT CAPACITY DATA

| Measured Parameter | Front | Rear | Third | Total |
|---|---|---|---|---|
| Type of Seats | Bucket | 60/40 Split Bench | | |
| Designated Seating Capacity (DSC) | 2 | 3 | | 5 |
| Capacity Weight (VCW) (kg) | | | | 408 |
| Cargo Weight (RCLW) (kg) | | | | 68 |

**DATA SHEET NO. 1 (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010




| Measured Parameter | Front | Rear |
|---|---|---|
| Maximum Tire Pressure (kPa) | 300 | 300 |
| Cold Pressure (kPa) | 230 | 230 |
| Recommended Tire Size | P215/70R16 | P215/70R16 |
| Tire Size on Vehicle | P215/70R16 | P215/70R16 |
| Tire Manufacturer | Continental | Continental |
| Tire Model | 4X4 Contact | 4X4 Contact |
| Treadwear | 360 | 360 |
| Traction | A | A |
| Temperature Grades | A | A |
| Tire Plies Sidewall | 1 | 1 |
| Tire Plies Body | 3 | 3 |
| Load Index & Speed Symbol | 99H | 99H |
| Tire Material | Rubber | Rubber |
| DOT Safety Code Right | FDYV 3AJ2810 | FDYV 3AJ2710 |
| DOT Safety Code Left | FDYV 3AJ2810 | FDYV 3AJ2710 |

## DATA SHEET NO. 1 (CONTINUED)

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

### TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | |
|---|---|---|---|---|---|---|---|
| | | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 459.5 | 328.0 | | 508.0 | 401.4 | |
| Right | kg | 462.7 | 314.3 | | 461.3 | 396.5 | |
| Ratio | % | 58.9 | 41.1 | | 54.8 | 45.2 | |
| Totals | kg | 922.2 | 642.3 | 1564.5 | 969.3 | 797.9 | 1767.2 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value |
|---|---|---|
| Total Delivered Weight (UVW) | kg | 1564.5 |
| Weight of 1 P572E ATD & 1 P572O ATD | kg | 140.6 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 68 |
| Calculated Target Vehicle Target Weight (TVTW) | kg | 1773.1 |

### TEST VEHICLE ATTITUDES AND CG

| | Units | LF | RF | LR | RR | CG (aft of front axle) |
|---|---|---|---|---|---|---|
| As Delivered | mm | 793 | 792 | 801 | 803 | 1104 |
| As Tested | mm | 785 | 776 | 779 | 772 | 1215 |
| Post Test | mm | 838 | 796 | 775 | 751 | |

### GENERAL TEST VEHICLE DATA

| Measurement Description | Units | Value |
|---|---|---|
| Total Vehicle Wheel Base | mm | 2690 |
| Total Vehicle Length at Left Side | mm | 3432 |
| Total Vehicle Length at Centerline | mm | 4674 |
| Total Vehicle Length at Right Side | mm | 3432 |
| Weight of Ballast in Cargo Area | kg | 68.0 |
| Weight of Vehicle Components Removed | kg | 28.6 |
| Amount of Stoddard Solvent in Fuel Tank | L | 55.8 |

List of components removed to meet test weight: Spare tire & tools, trunk carpet, right tail light.

**DATA SHEET NO. 1 (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

| | Elements | Pre-Test (mm) |
|---|---|---|
| 1 | Total Length | 4674 |
| 2 | Total Width | 1793 |
| 3 | Bumper Top Height | 640 |
| 4 | Bumper Bottom Height | 540 |
| 5 | Longitudinal Member Top Height | 640 |
| 6 | Distance between Longitudinal Members | 920 |
| 7 | Longitudinal Member Width | 50 |
| 8 | Engine Top Height | 890 |
| 9 | Engine Bottom Height | 225 |
| 10 | Engine and Gearbox Width | 770 |
| 11 | Front Bumper-Engine Distance | 490 |
| 12 | Front Shock Absorber Fixing Height | 970 |
| 13 | Bonnet Leading Edge Height | 1040 |
| 14 | Front Shock Absorber Fixing Width | 1175 |
| 15 | Front Bumper – Front Axle Distance | 930 |
| 16 | Front Axle – A-Pillar Distance | 450 |
| 17 | A-Pillar – B-Pillar Distance | 1150 |
| 18 | B-Pillar – Rear Axle Distance | 1090 |
| 19 | B-Pillar – C-Pillar Distance | 980 |
| 20 | Roof Sill Bottom Height | 1480 |
| 21 | Roof Sill Top Height | 1530 |
| 22 | Floor Sill bottom Height | 300 |
| 23 | Floor Sill Top Height | 425 |

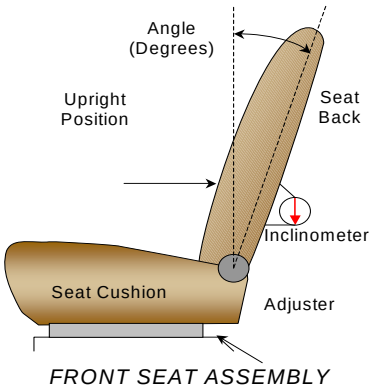
## DATA SHEET NO. 2

## SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

### 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 Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.




| SEAT BACK ANGLE | Degrees |
|---|---|
| Driver Seat Back Angle | 3.0° on headrest post |
| Passenger Seat Back Angle | -4.2° on headrest post |

### SEAT FORE/AFT POSITIONS

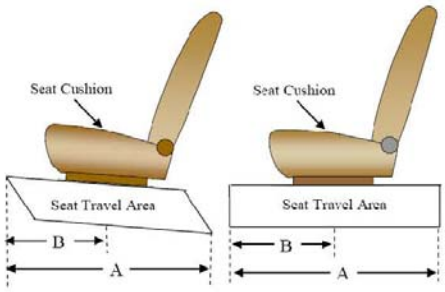
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Seating & Positioning Procedures" in the NCAP Test Procedure dated January 2010.

| SEAT FORE/AFT POSITIONS | Total Fore/Aft Travel | Placed in Position # |
|---|---|---|
| Driver Seat | 24 detents | 11th detent (forward-most as 0) |
| Passenger Seat | 24 detents | 0 detent (forward-most as 0) |

### SEAT BELT UPPER ANCHORAGES

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

| SEAT BELT UPPER ANCHORAGES | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 4 | 0 (uppermost as 0) |
| Passenger Seat | 4 | 0 (uppermost as 0) |



## DATA SHEET NO. 2 (CONTINUED)

## SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

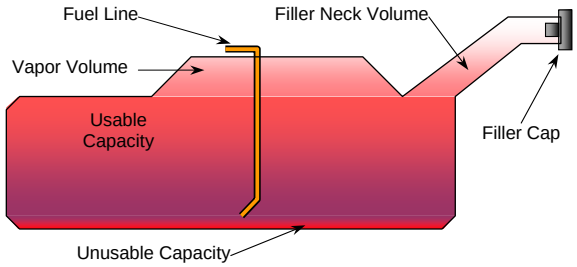
### FUEL TANK CAPACITY DATA

| | Liters |
|---|---|
| Usable Capacity of "Standard Tank" | 60.0 |
| Usable Capacity of "Optional" Tank | |
| 92-94% of Usable Capacity | 55.2 to 56.4 |
| Actual Amount of Solvent used | 55.8 |
| 1/3 of Usable Capacity | 20.0 |

### FUEL PUMP

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

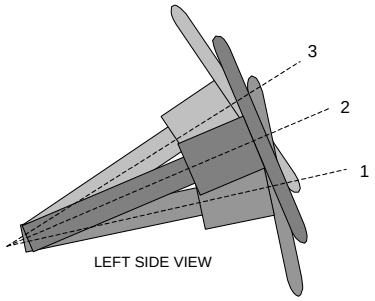
The vehicle is equipped with an electric fuel pump. The fuel pump will pump fuel when the ignition key is in the "ON" position. The fuel filler pipe is located on the right side.




*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*

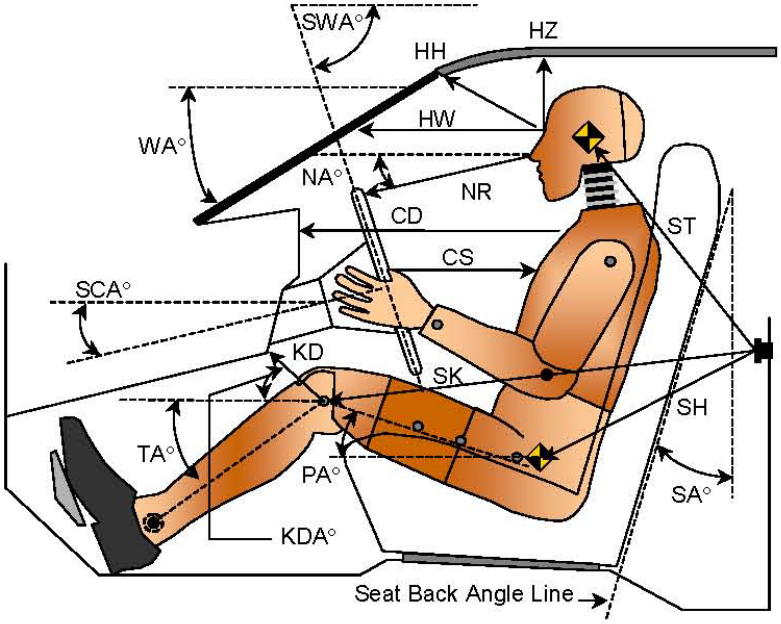
### STEERING COLUMN POSITION

| | Degrees | Fore/Aft Position (mm) |
|---|---|---|
| Lowermost – Position 1 | 65.7 | |
| Geometric Center – Position 2 | 63.4 | |
| Uppermost – Position 3 | 61.1 | |
| Telescoping Steering Wheel Travel | | |
| Test Position | 63.4 | |

**DATA SHEET NO. 3**

**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

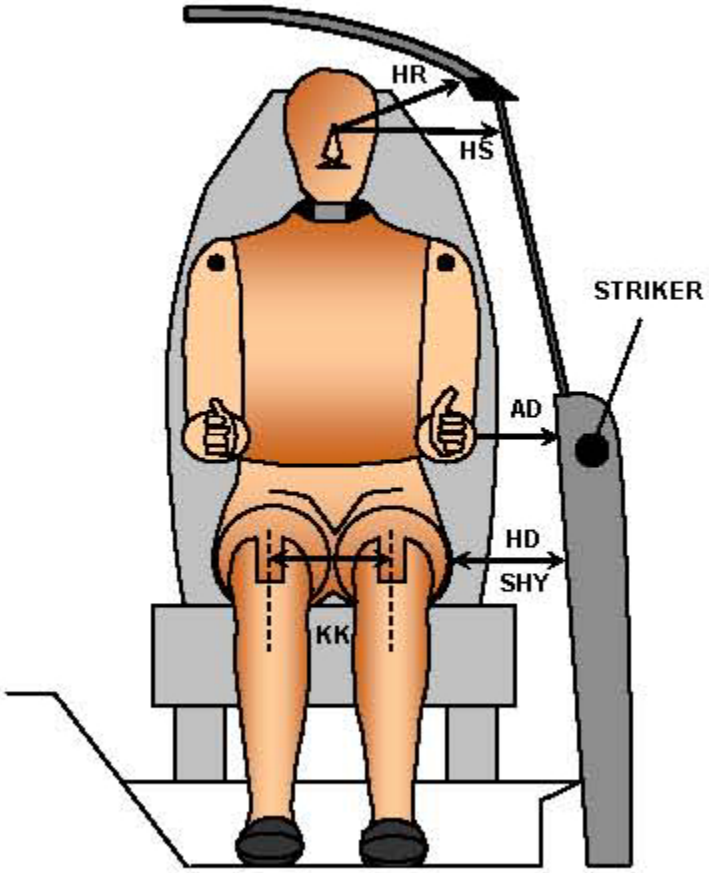



| Code | Measurement Description | Driver S/N 351 | | Passenger S/N 634 | |
|---|---|---|---|---|---|
| | | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| WA | Windshield Angle | | 25.2 | | |
| SWA | Steering Wheel Angle | | 63.4 | | |
| SCA | Steering Column Angle | | 36.6 | | |
| SA | Seat Back Angle (headrest bezel) | | 3.0 | | -4.2 |
| HZ | Head to Roof (Z) | 178 | 90 | 188 | 90 |
| HH | Head to Header | 315 | 23.7 | 231 | 48.9 |
| HW | Head to Windshield | 572 | 0 | 568 | 0 |
| NR | Nose to Rim | 405 | 18.1 | | |
| CD | Chest to Dash | 505 | | 417 | |
| CS | Chest to Steering Hub | 290 | 5.9 | | |
| RA | Rim to Abdomen | 178 | 0 | | |
| KDL | Left Knee to Dash | 165 | 10.3 | 124 | 27.7 |
| KDR | Right Knee to Dash | 163 | 14.1 | 118 | 23.8 |
| PA | Pelvic Angle | | 24.4 | | 19.7 |
| TA | Tibia Angle | | 53.8 | | 58.9 |
| SK | Striker to Knee | 536 | 87.5 | 710 | 95.2 |
| ST | Striker to Head | 627 | 15.8 | 543 | 25.5 |
| SH | Striker to H-Point | 290 | 119.9 | 402 | 103.6 |

**DATA SHEET NO. 4**

**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

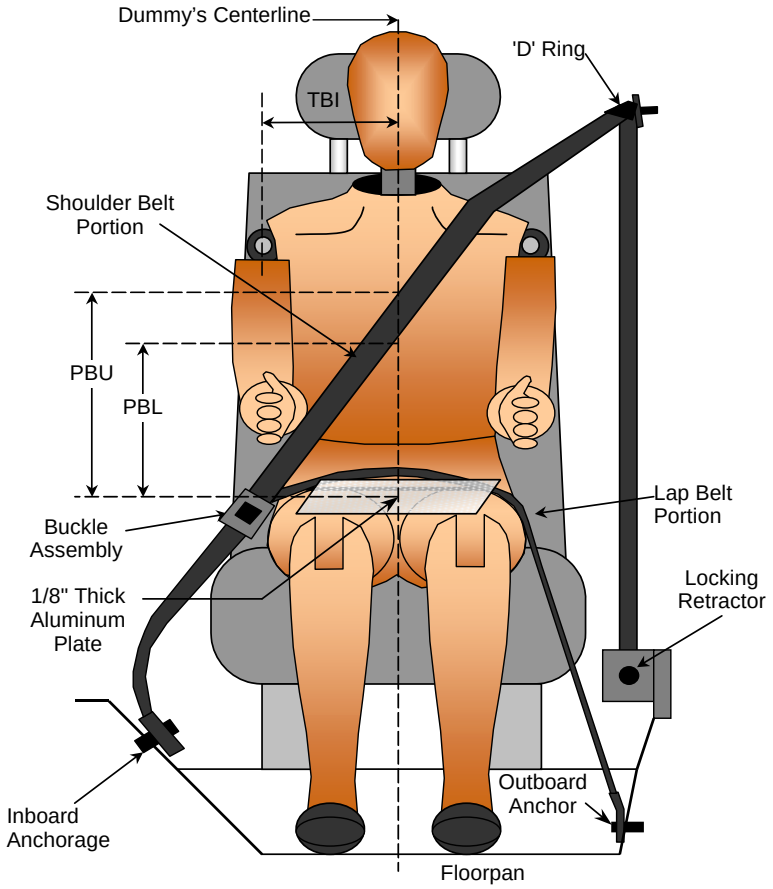



| Code | Measurement Description | Driver S/N 351 | Passenger S/N 634 |
|---|---|---|---|
| | | Length (mm) | |
| AD | Arm to Door | 95 | 74 |
| HD | H-Point to Door | 148 | 169 |
| HR | Head to Side Header | 225 | 256 |
| HS | Head to Side Window | 343 | 386 |
| KK | Knee to Knee | 339 | 223 |
| SHY | Striker to H-Point (Y Direction) | 262 | 275 |
| AA | Ankle to Ankle | 315 | 178 |

## DATA SHEET NO. 5

## SEAT BELT POSITIONING DATA

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010




**FRONT VIEW OF DUMMY**

### SEAT BELT POSITIONING MEASUREMENTS

| Measurement Description | Units | Driver | Passenger |
|---|---|---|---|
| PBU - Top surface of reference to belt upper edge | mm | 365 | 290 |
| PBL - Top surface of reference to belt lower edge | mm | 290 | 210 |

### BELT LENGTH DATA

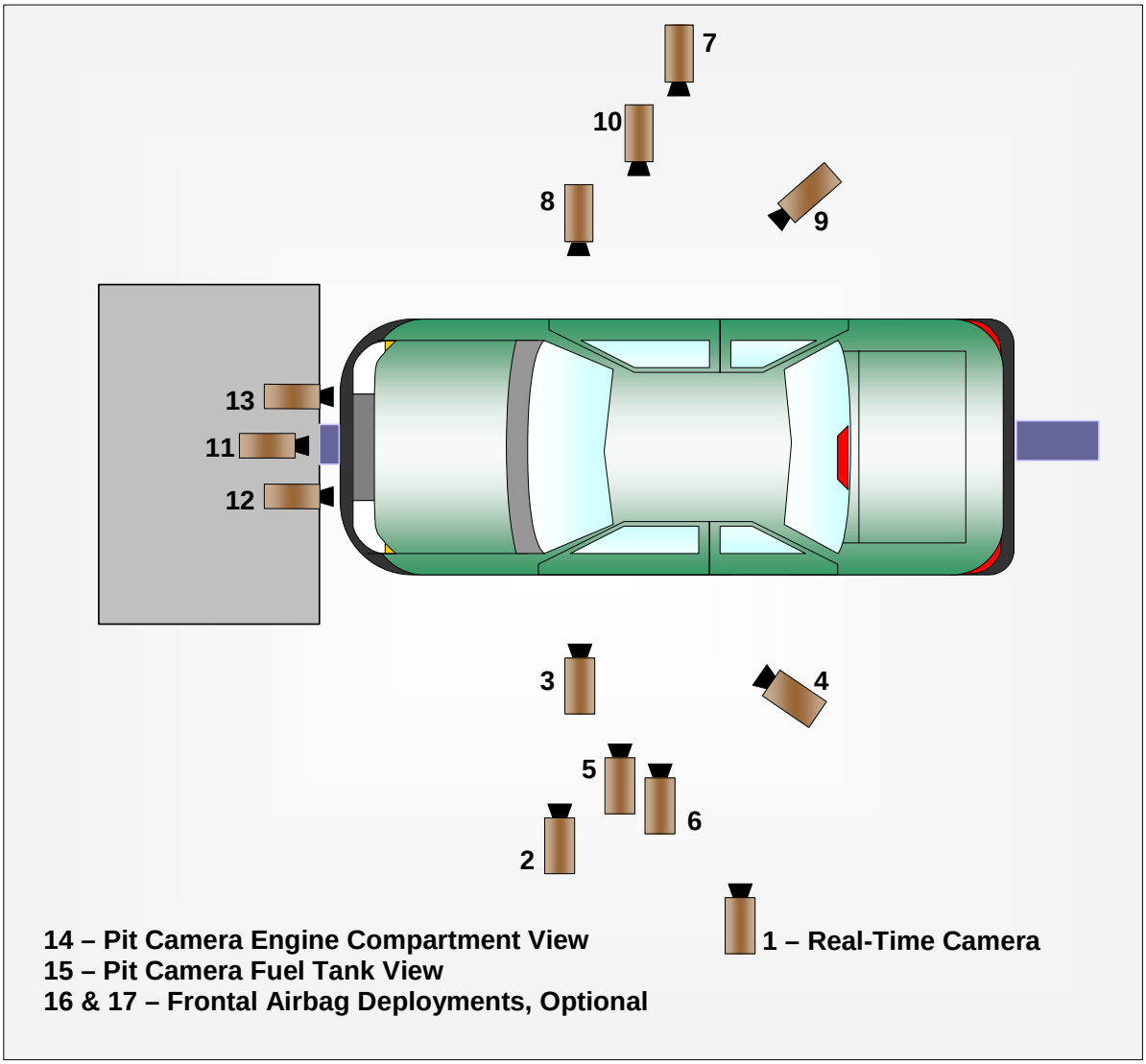
| Measurement Description | Units | Driver | Passenger |
|---|---|---|---|
| Shoulder Belt Length as measured on ATD | mm | 890 | 920 |
| Lap Belt Length as measured on ATD | mm | 900 | 810 |
| Remainder of belt on reel | mm | 1800 | 1860 |
| Total Belt Length for Continuous Webbing Systems | mm | 3590 | 3590 |

**DATA SHEET NO. 6**

**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010

**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: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

**CAMERA LOCATIONS**

| No. | Camera View | Coordinates (mm) | | | Lens (mm) | Speed (fps) |
|---|---|---|---|---|---|---|
| | | X* | Y* | Z* | | |
| 1 | Real-Time Left Side View | | | | | 30 |
| 2 | Left Front Half | 1270 | -5140 | -1270 | 24 | 1000 |
| 3 | Driver Close-Up | 1330 | -6170 | -1620 | 35 | 1000 |
| 4 | Driver Angle | 5590 | -4820 | -1860 | 50 | 1000 |
| 5 | Steering Column Top | 690 | -5420 | -1220 | 25 | 1000 |
| 6 | Steering Column Bottom | 670 | -5460 | -840 | 25 | 1000 |
| 7 | Right Overall | 2090 | 6300 | -1220 | 20 | 1000 |
| 8 | Passenger Close-Up | 1450 | 6130 | -1630 | 35 | 1000 |
| 9 | Passenger Angle | 5600 | 4750 | -1870 | 50 | 1000 |
| 10 | Right Front Half | 1240 | 5100 | -1270 | 24 | 1000 |
| 11 | Windshield | -260 | 0 | -2860 | 24 | 1000 |
| 12 | Top Driver | -30 | -360 | -2270 | 16 | 1000 |
| 13 | Top Passenger | -30 | 360 | -2270 | 16 | 1000 |
| 14 | Pit Front | 1270 | 0 | 3150 | 24 | 1000 |
| 15 | Pit Rear | 3280 | 0 | 3150 | 24 | 1000 |
| 16 | Onboard Driver Side (optional) | | | | | |
| 17 | Onboard Passenger Side (optional) | | | | | |
| 18 | Real-Time Pan View | | | | | 30 |

*COORDINATES:

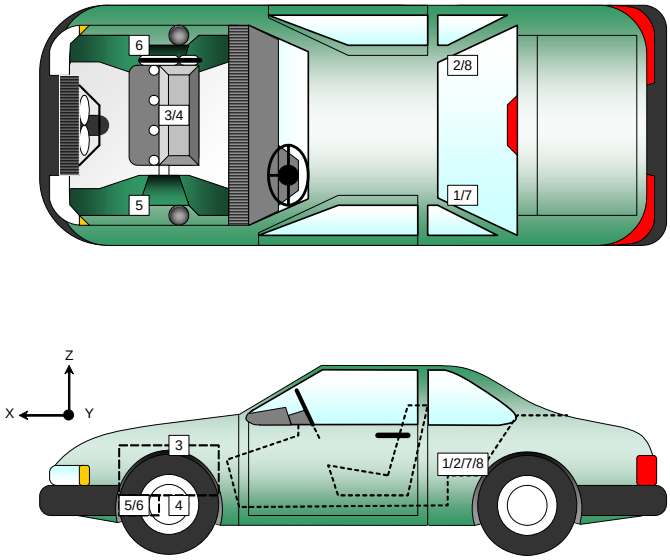
+X = forward of impact plane
+Y = right of monorail centerline
+Z = below ground level

Cameras 16 & 17 were not used for this test.

**DATA SHEET NO. 7**

**VEHICLE ACCELEROMETER DATA**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010




**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

| No. | Accelerometer Location | Measurements (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Left Rear X-Member X | 1800 | -370 | -305 |
| 2 | Right Rear X-Member X | 1800 | 400 | -305 |
| 3 | Engine Top X | 3887 | -40 | -845 |
| 4 | Engine Bottom X | 3728 | 130 | -285 |
| 5 | Left Brake Caliper X | 3760 | -650 | -248 |
| 6 | Right Brake Caliper X | 3760 | 650 | -248 |
| 7 | Left Rear X-Member Z | 1800 | -370 | -305 |
| 8 | Right Rear X-Member Z | 1800 | 400 | -305 |

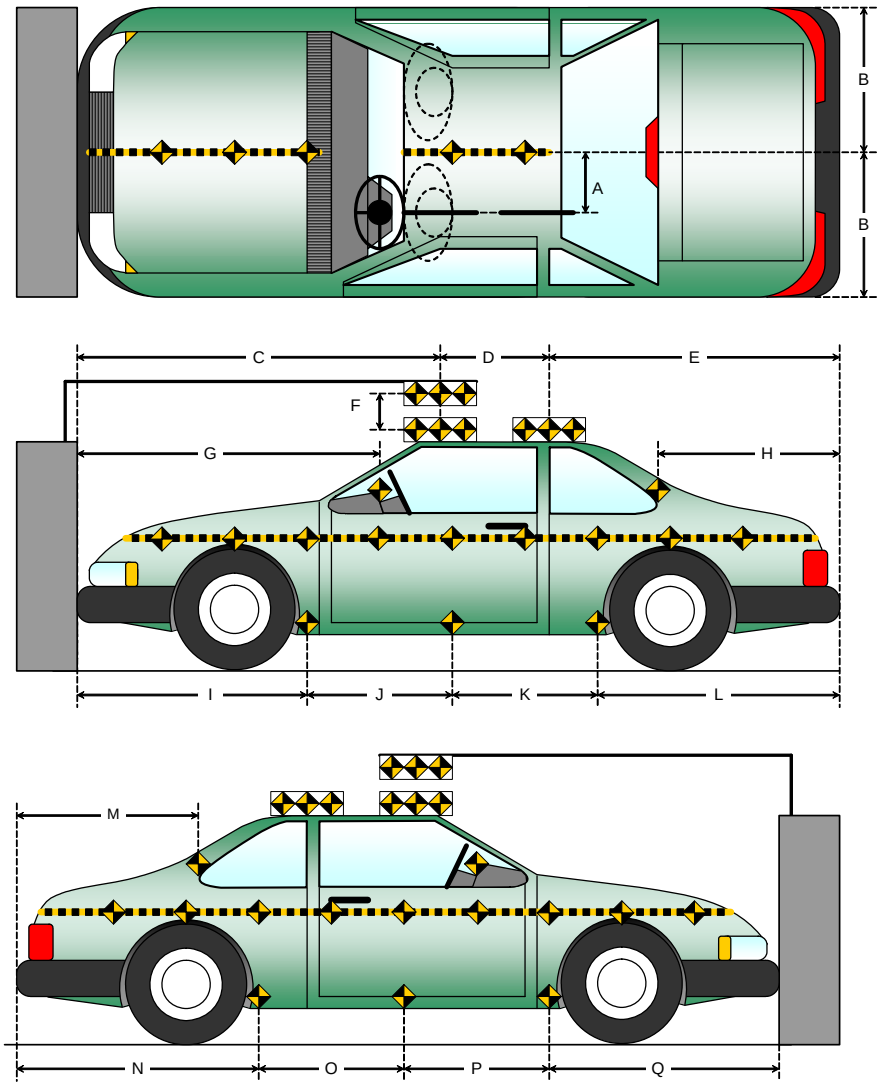
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

**DATA SHEET NO. 8**

**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010

| Item | Value (mm) |
|---|---|
| A | 360 |
| B | 896 |
| C | 2375 |
| D | 668 |
| E | 1631 |
| F | 115 |
| G | |
| H | 705 |
| I | 1515 |
| J | 837 |
| K | 843 |
| L | 1479 |
| M | 708 |
| N | 1472 |
| O | 851 |
| P | 849 |
| Q | 1502 |

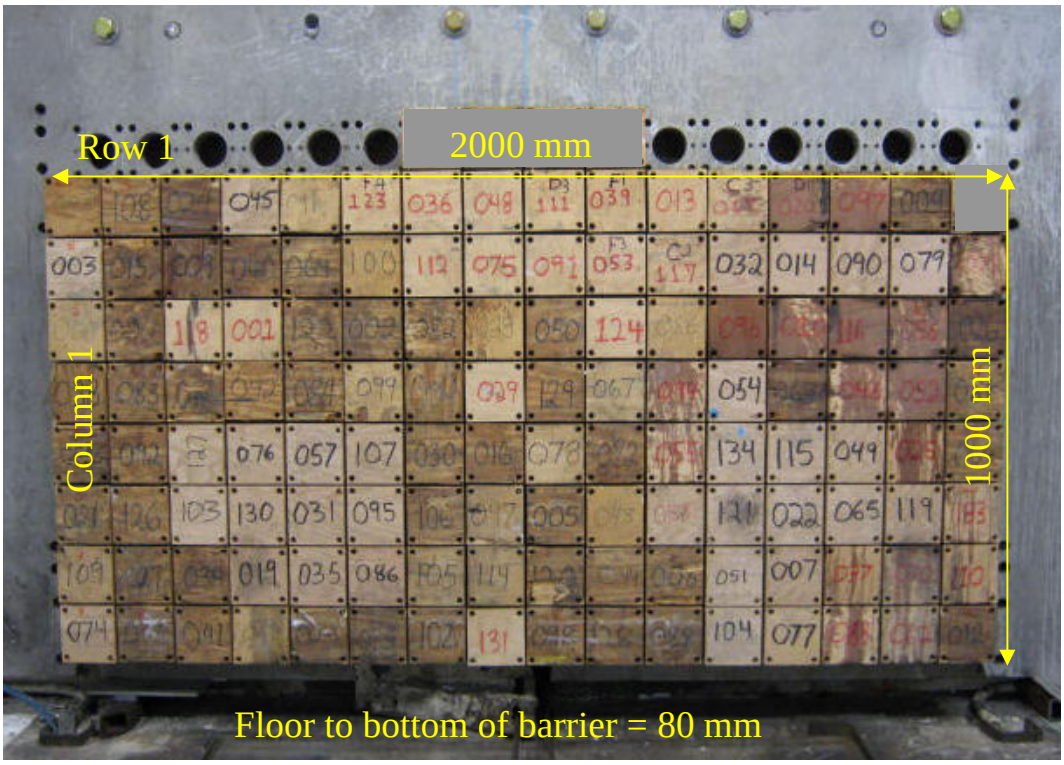


**DATA SHEET NO. 9**

**LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

**Advanced Research Load Cell Barrier**




| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

## DATA SHEET NO. 10

## TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

### INSTRUMENTATION

| | |
|---|---|
| Driver Dummy Data Channels | 44 |
| Passenger Dummy Data Channels | 44 |
| Vehicle Structure Accelerometers | 8 |
| Barrier Channels | 127 |
| Total | 223 |

### 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: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

### TEST DUMMY INFORMATION AND CONTACT

| Description | Driver | Passenger |
|---|---|---|
| Dummy Type / Serial No. | HIII 50% / 351 | HIII 5% / 634 |
| Head Contact | Airbag, Headrest | Airbag, Headrest |
| Upper Torso Contact | Airbag | Airbag |
| Lower Torso Contact | Airbag | Airbag |
| Left Knee Contact | Knee Bolster | Glovebox |
| Right Knee Contact | Knee Bolster | Glovebox |

### DOOR OPENING AND SEAT TRACK INFORMATION

| Description | Driver | Passenger |
|---|---|---|
| Locked/Unlocked Doors | Doors were locked | Doors were locked |
| 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 | 420 |
| Center | mm | 410 |
| Right Side | mm | 383 |
| Average | mm | 404 |

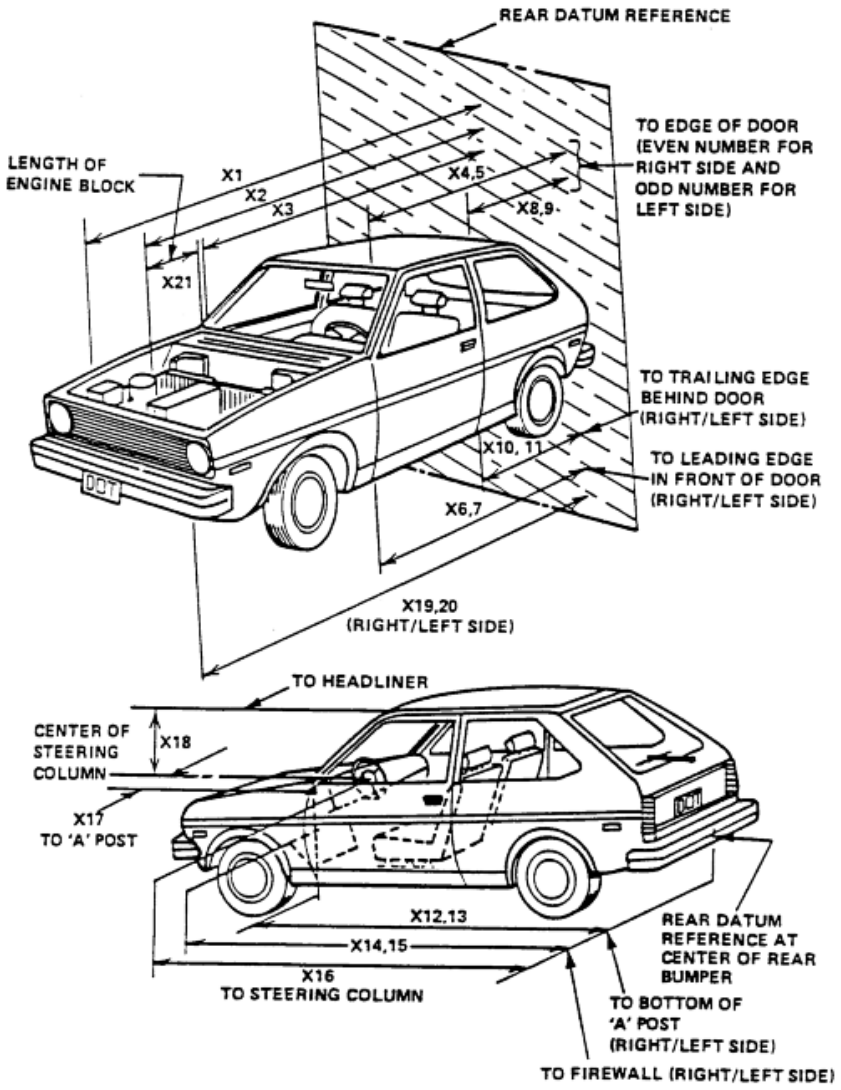
### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| 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 | No |
| Seat Belt Pretensioner | Yes | Yes | Yes | Yes |
| Seat Belt Load Limiter | Yes | | Yes | |

**DATA SHEET NO. 12**

**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010



**DATA SHEET NO. 12 (CONTINUED)**

**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

**RSOV (Rear Surface of Vehicle)**

| No. | Measurement Description | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|---|
| 1 | Total Length of Vehicle at Centerline | mm | 4674 | 4063 | 611 |
| 2 | RSOV to Front of Engine | mm | 3961 | 3704 | 257 |
| 3 | RSOV to Firewall | mm | 3630 | 3620 | 10 |
| 4 | RSOV to Upper Leading Edge of Right Door | mm | 3151 | 3151 | 0 |
| 5 | RSOV to Upper Leading Edge of Left Door | mm | 3149 | 3156 | -7 |
| 6 | RSOV to Lower Leading Edge of Right Door | mm | 3158 | 3156 | 2 |
| 7 | RSOV to Lower Leading Edge of Left Door | mm | 3157 | 3154 | 3 |
| 8 | RSOV to Upper Trailing Edge of Right Door | mm | 2044 | 2039 | 5 |
| 9 | RSOV to Upper Trailing Edge of Left Door | mm | 2039 | 2045 | -6 |
| 10 | RSOV to Lower Trailing Edge of Right Door | mm | 2054 | 2054 | 0 |
| 11 | RSOV to Lower Trailing Edge of Left Door | mm | 2052 | 2054 | -2 |
| 12 | RSOV to Bottom of “A” Post of Right Side | mm | 3140 | 3130 | 10 |
| 13 | RSOV to Bottom of “A” Post of Left Side | mm | 3135 | 3131 | 4 |
| 14 | RSOV to Firewall, Right Side | mm | 3528 | 3484 | 44 |
| 15 | RSOV to Firewall, Left Side | mm | 3534 | 3519 | 15 |
| 16 | RSOV to Steering Column | mm | 2702 | 2725 | -23 |
| 17 | Center of Steering Column to “A” Post | mm | 353 | 389 | -36 |
| 18 | Center of Steering Column to Headliner | mm | 410 | 467 | -57 |
| 19 | RSOV to Right Side of Front Bumper | mm | 3432 | 3063 | 369 |
| 20 | RSOV to Left Side of Front Bumper | mm | 3432 | 3034 | 398 |
| 21 | Length of Engine Block | mm | 460 | 460 | 0 |
| RD | RSOV to Right Side of Dash Panel | mm | 2866 | 2866 | 0 |
| CD | RSOV to Center of Dash Panel | mm | 3171 | 3171 | 0 |
| LD | RSOV to Left Side of Dash Panel | mm | 2869 | 2866 | 3 |

**DATA SHEET NO. 13**

**ACCIDENT INVESTIGATION DIVISION DATA**

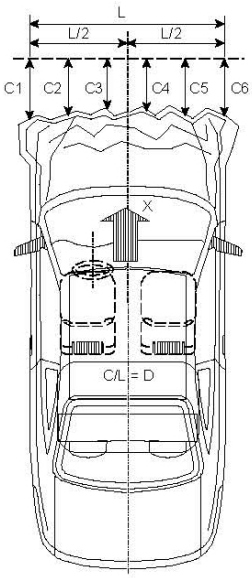
Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

**VEHICLE INFORMATION**

VIN: JN8AS5MV4BW253585 Wheelbase (mm): 2690
Vehicle Size Category: MPV Test Weight (kg): 1767.2

**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): 56.2
Velocity Change (km/h): 62.6
Time of Separation (msec): 92.7




**CRUSH PROFILE**

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1060
Impact Mode: Frontal

| No. | Measurement Description | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|---|
| C1 | Crush zone 1 at left side | mm | 4419 | 4021 | 398 |
| C2 | Crush zone 2 at left side | mm | 4551 | 4054 | 497 |
| C3 | Crush zone 3 at left side | mm | 4602 | 4042 | 560 |
| C4 | Crush zone 4 at right side | mm | 4601 | 4030 | 571 |
| C5 | Crush zone 5 at right side | mm | 4550 | 4040 | 510 |
| C6 | Crush zone 6 at right side | mm | 4420 | 4051 | 369 |
| L | C1 TO C6 | mm | 1480 | 1467 | 13 |

## DATA SHEET NO. 14

## VEHICLE INTRUSION MEASUREMENTS

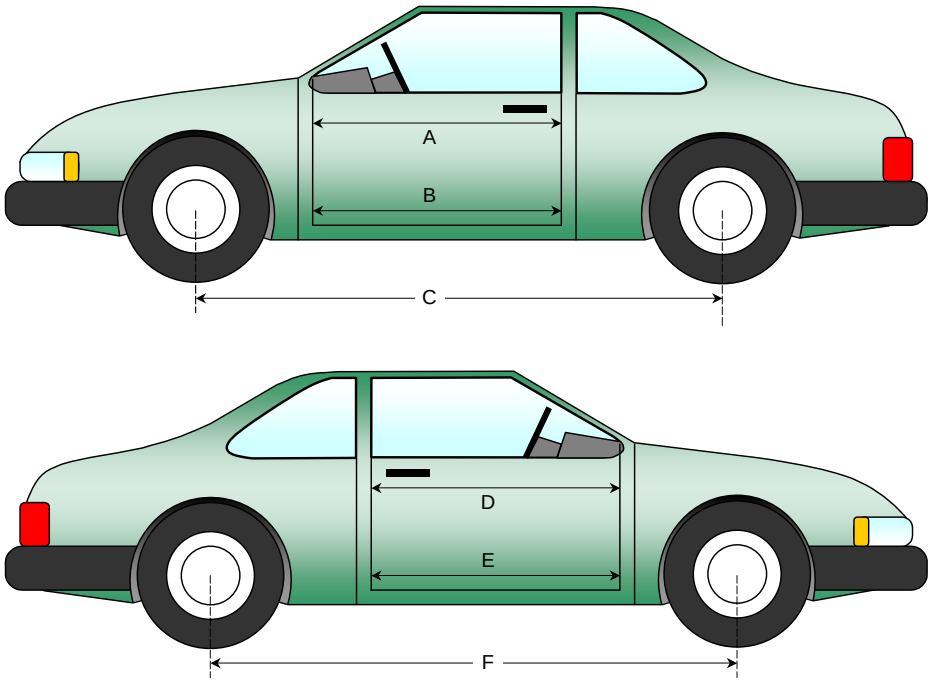
Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010

### DOOR OPENING WIDTH

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|---|
| A | Left Side Upper | mm | 1038 | 1035 | 3 |
| B | Left Side Lower | mm | 871 | 871 | 0 |
| D | Right Side Upper | mm | 1043 | 1041 | 2 |
| E | Right Side Lower | mm | 892 | 890 | 2 |

### WHEELBASE MEASUREMENTS

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|---|
| C | Left Side Wheelbase | mm | 2690 | 2647 | 43 |
| F | Right Side Wheelbase | mm | 2690 | 2646 | 44 |



## DATA SHEET NO. 14 (CONTINUED)

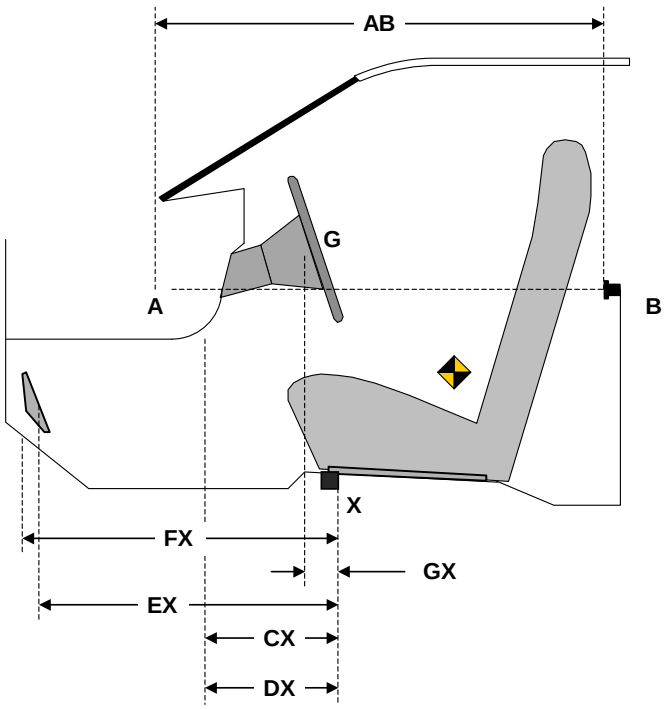
## VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: MB5211
Test Date: 10/15/2010

### DRIVER COMPARTMENT INTRUSION

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|---|
| AB | Door Opening (Inside window jam) | mm | 845 | 845 | 0 |
| CX | Left Knee Bolster to X | mm | 369 | 375 | -6 |
| DX | Right Knee Bolster to X | mm | 370 | 376 | -6 |
| EX | Brake Pedal to X | mm | 590 | 585 | 5 |
| FX | Foot Rest to X | mm | 615 | 608 | 7 |
| GX | Center of Steering Column Wheel Hub to X | mm | 105 | 116 | -11 |

X = Front of Seat Track (stationary)

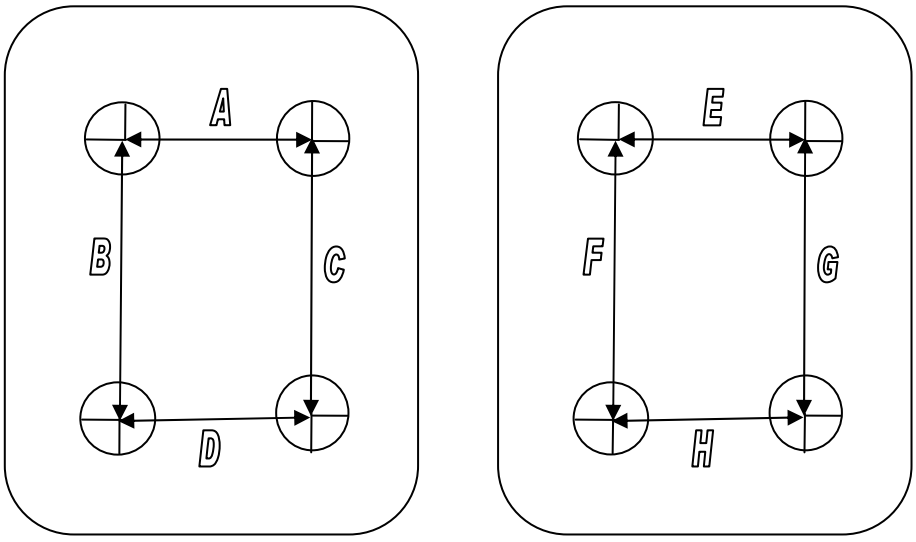



DRIVER COMPARTMENT

**DATA SHEET NO. 14 (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010




Driver Passenger

**TOP VIEW THROUGH FLOOR PAN**

**UNDERBODY FLOORBOARD DEFORMATION**

| Measurement | Units | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|
| A | mm | 150 | 150 | 0 |
| B | mm | 150 | 150 | 0 |
| C | mm | 150 | 152 | -2 |
| D | mm | 150 | 148 | 2 |
| E | mm | 150 | 150 | 0 |
| F | mm | 150 | 150 | 0 |
| G | mm | 150 | 150 | 0 |
| H | mm | 150 | 150 | 0 |

**DATA SHEET NO. 15**

**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

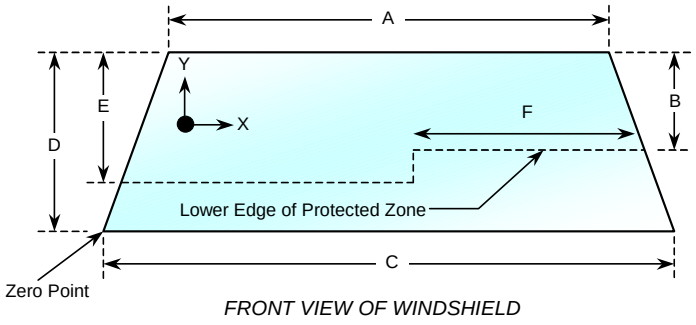
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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°C

**WINDSHIELD PERIPHERY MEASUREMENTS**

| Measurement | Pre-Test (mm) | Post-Test (mm) | % of Retention |
|---|---|---|---|
| Left Side | 2120 | 2120 | 100 |
| Right Side | 2120 | 2120 | 100 |
| Total | 4240 | 4240 | 100 |



*FRONT VIEW OF WINDSHIELD*

| Item | Units | Value |
|---|---|---|
| A | mm | 1190 |
| B | mm | 520 |
| C | mm | 1380 |
| D | mm | 835 |
| E | mm | 530 |
| F | mm | 460 |

**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: | 2011 Nissan Rogue S 5-Dr SUV | NHTSA No.: | MB5211 |
| Test Program: | NCAP Frontal Barrier Impact Test | Test Date: | 10/15/2010 |

### FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Time: 10:25 am Temperature: 21° C

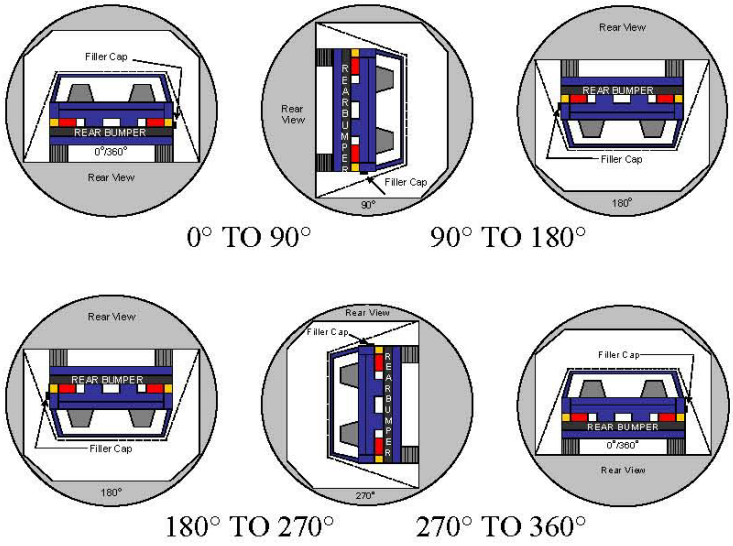
| | | |
|---|---|---|
| A. | From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) | 0 oz. |
| B. | For the 5 minute period after motion ceases: (Maximum allowable = 5 ounces) | None |
| C. | For the following 25 minutes: (Maximum allowable = 1 oz./minute) | None |
| D. | Spillage Details: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

**DATA SHEET NO. 16**

**FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010

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° | 120 | 300 | 420 |
| 90° to 180° | 115 | 300 | 415 |
| 180° to 270° | 112 | 300 | 412 |
| 270° to 360° | 119 | 300 | 419 |

**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 |

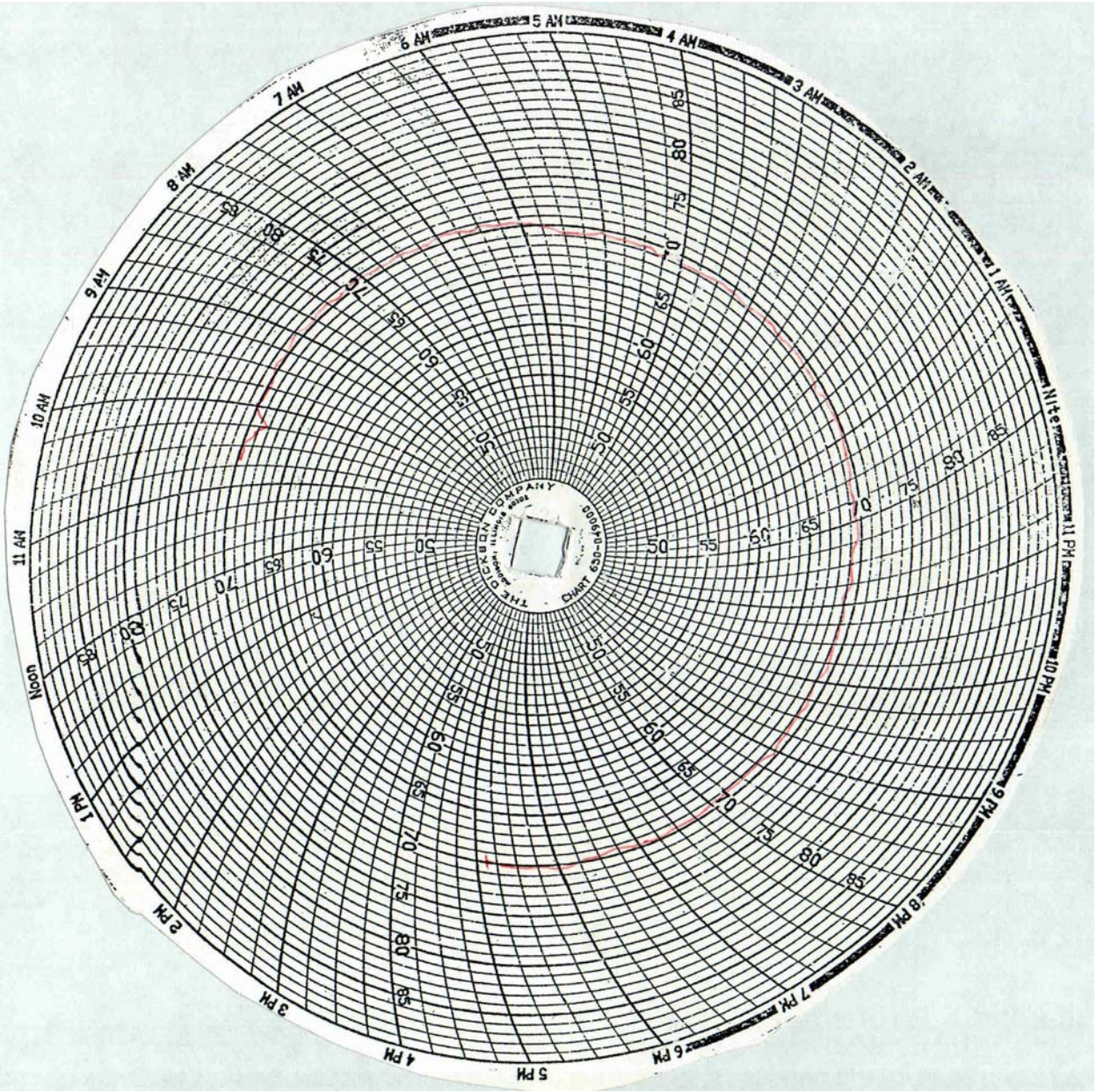
**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

| 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: 2011 Nissan Rogue S 5-Dr SUV NHTSA No.: MB5211
Test Program: NCAP Frontal Barrier Impact Test Test Date: 10/15/2010



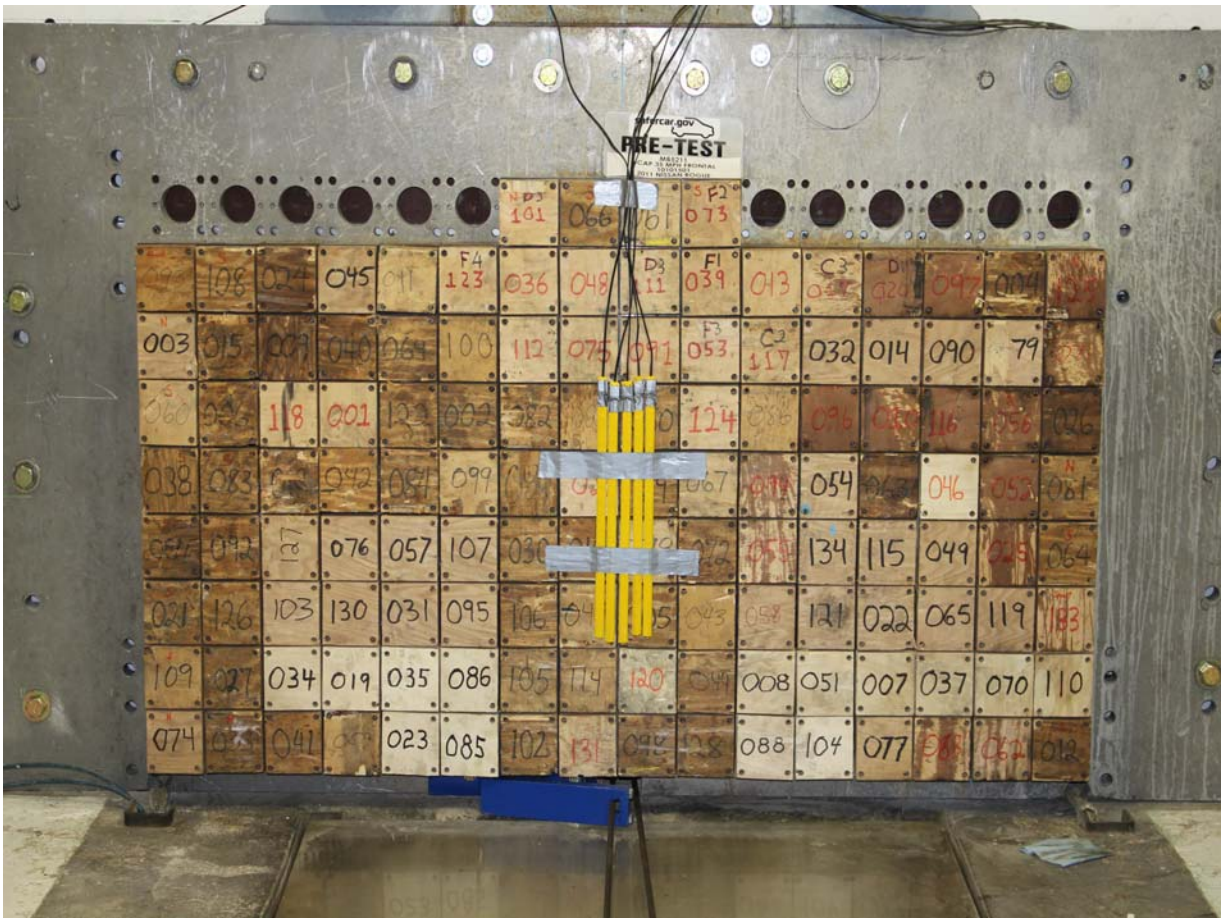
# APPENDIX A

# PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS

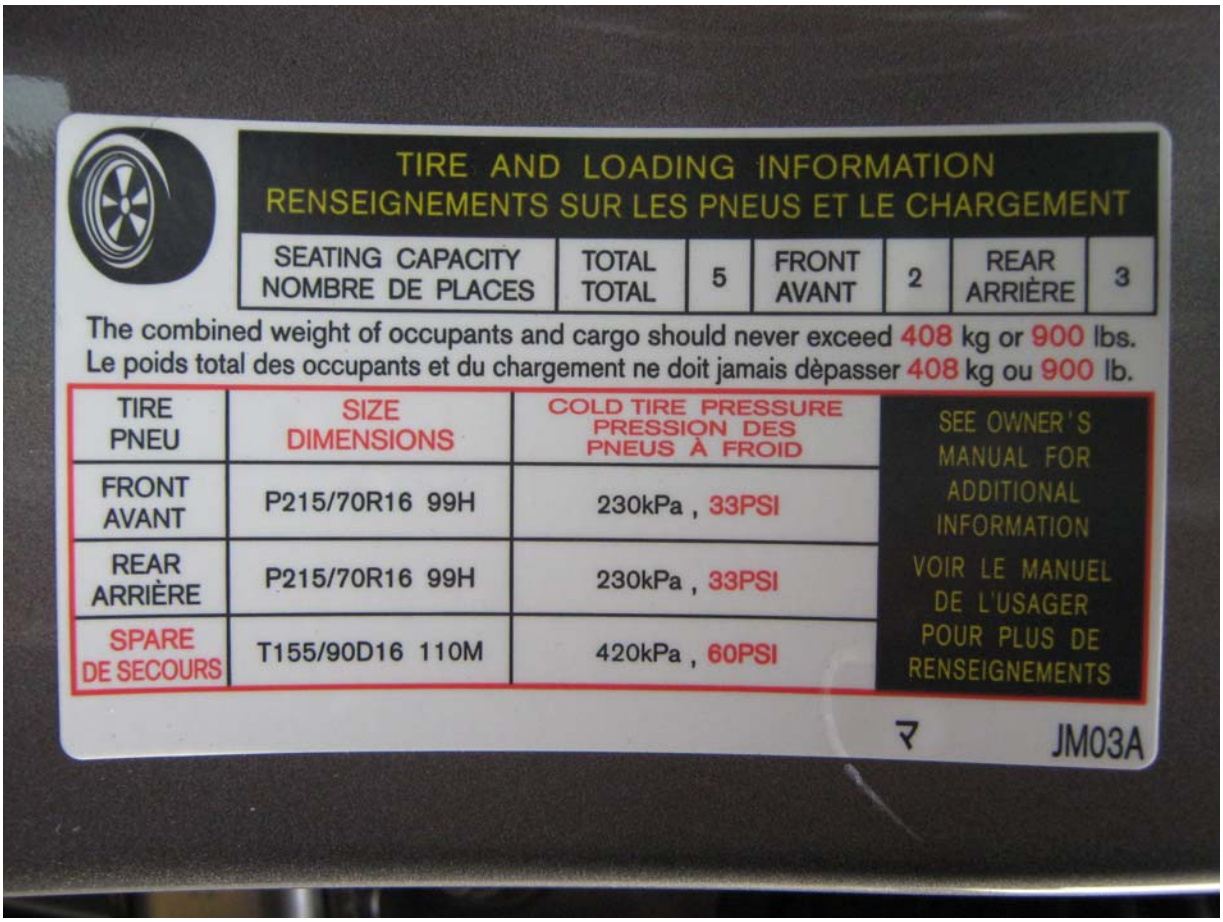
PHOTOGRAPH NOT AVAILABLE

Load Cell Location




Load Cell Wall

Manufacturer's Label

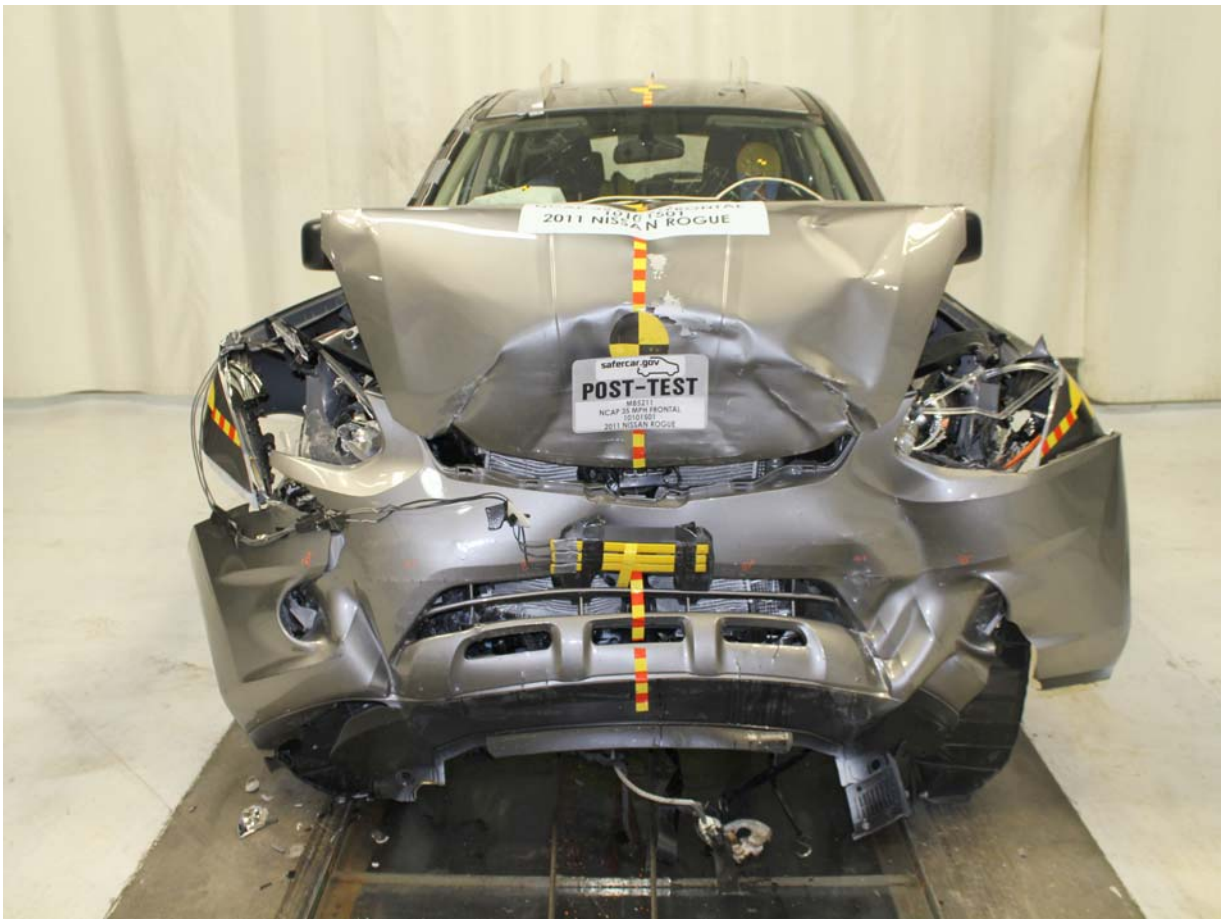


Tire Placard

Right Front Three-Quarter View, As Received


Left Rear Three-Quarter View, As Received


Pre-Test Front View




Post-Test Front View


Pre-Test Left Side View (with vehicle at barrier)


Post-Test Left Side View


Pre-Test Right Side View (with vehicle at barrier)


Post-Test Right Side View


Pre-Test Right Front Three-Quarter View


Post-Test Right Front Three-Quarter View


Pre-Test Left Rear Three-Quarter View (with vehicle at barrier)


Post-Test Left Rear Three-Quarter View


Pre-Test Windshield View

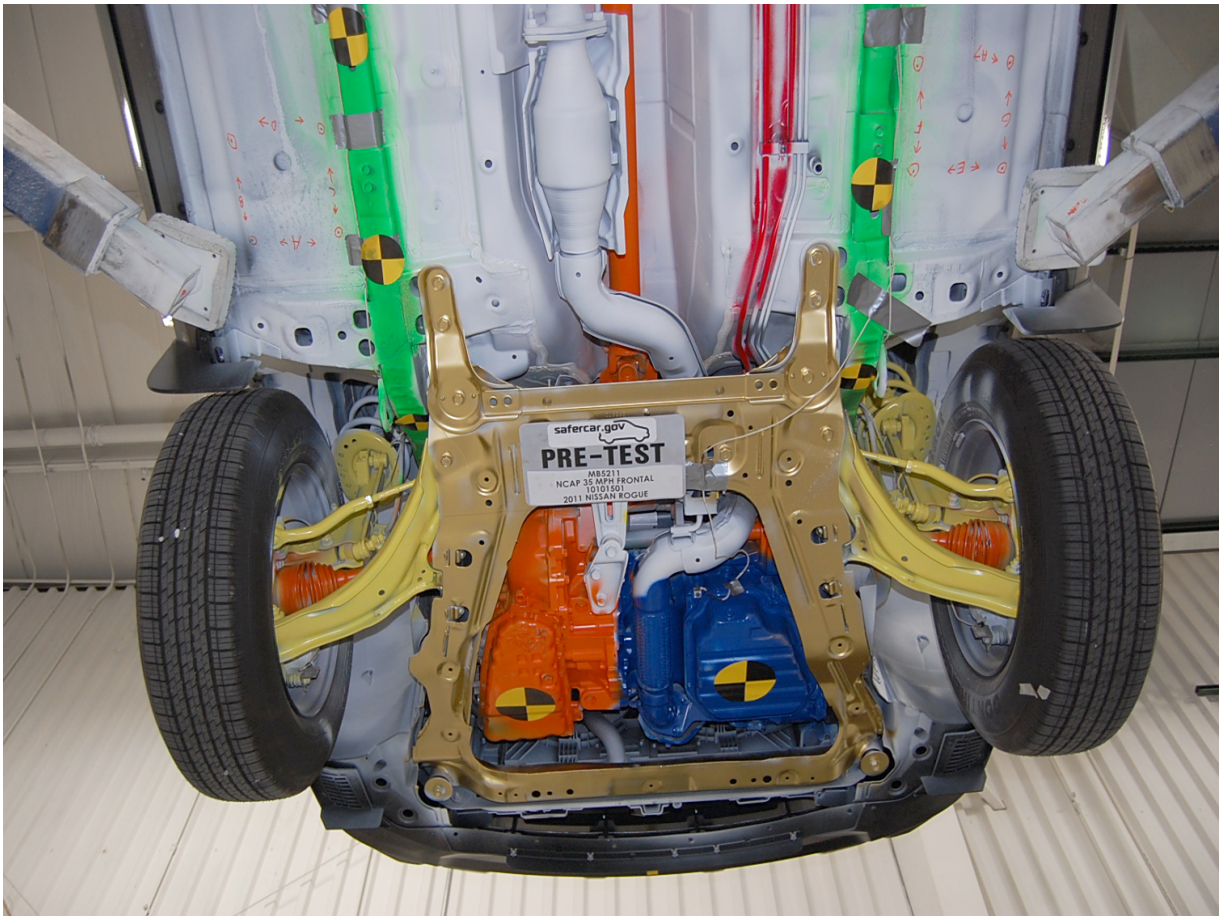

Post-Test Windshield View

Pre-Test Engine Compartment View

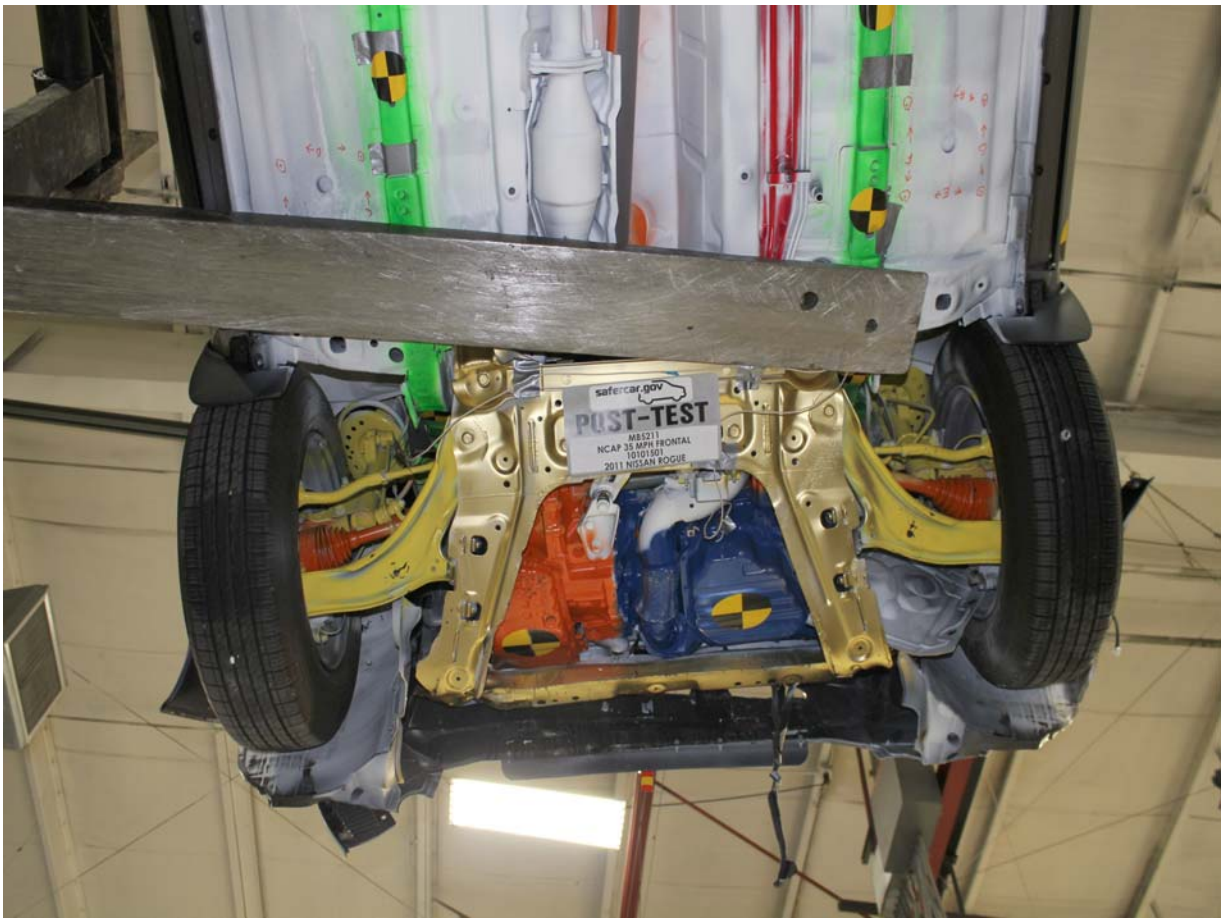
Post-Test Engine Compartment View

Pre-Test Fuel Cap View

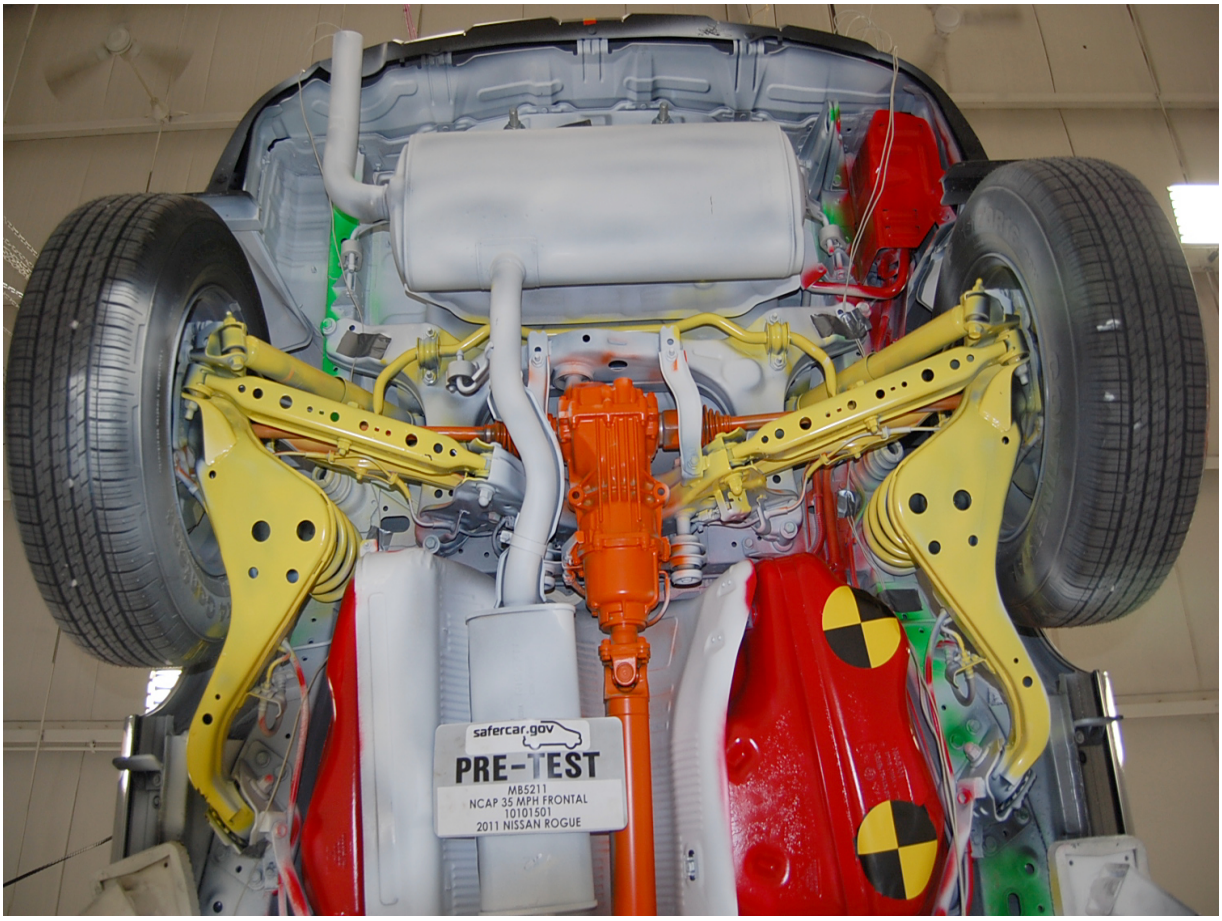
Post-Test Fuel Cap View



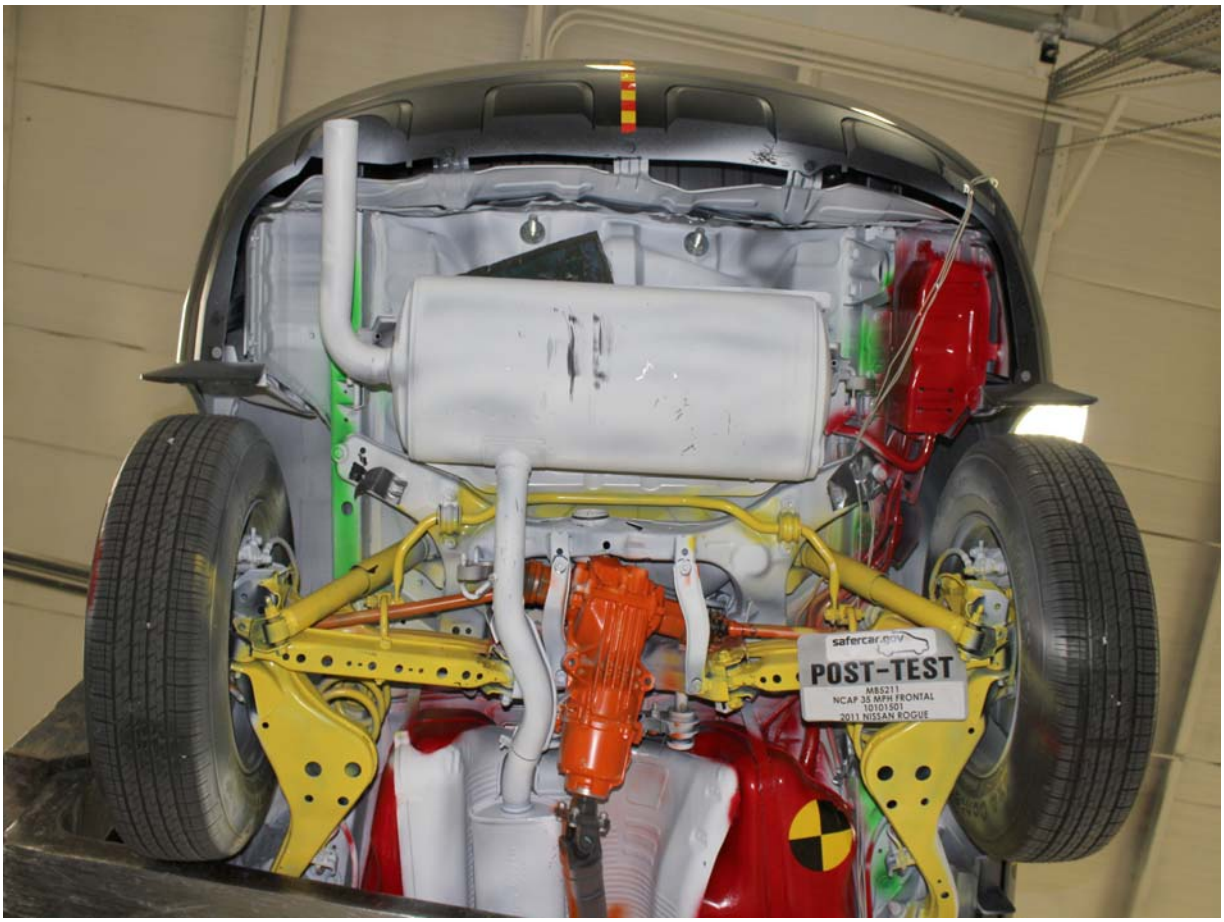

Pre-Test Front Underbody View




Post-Test Front Underbody View

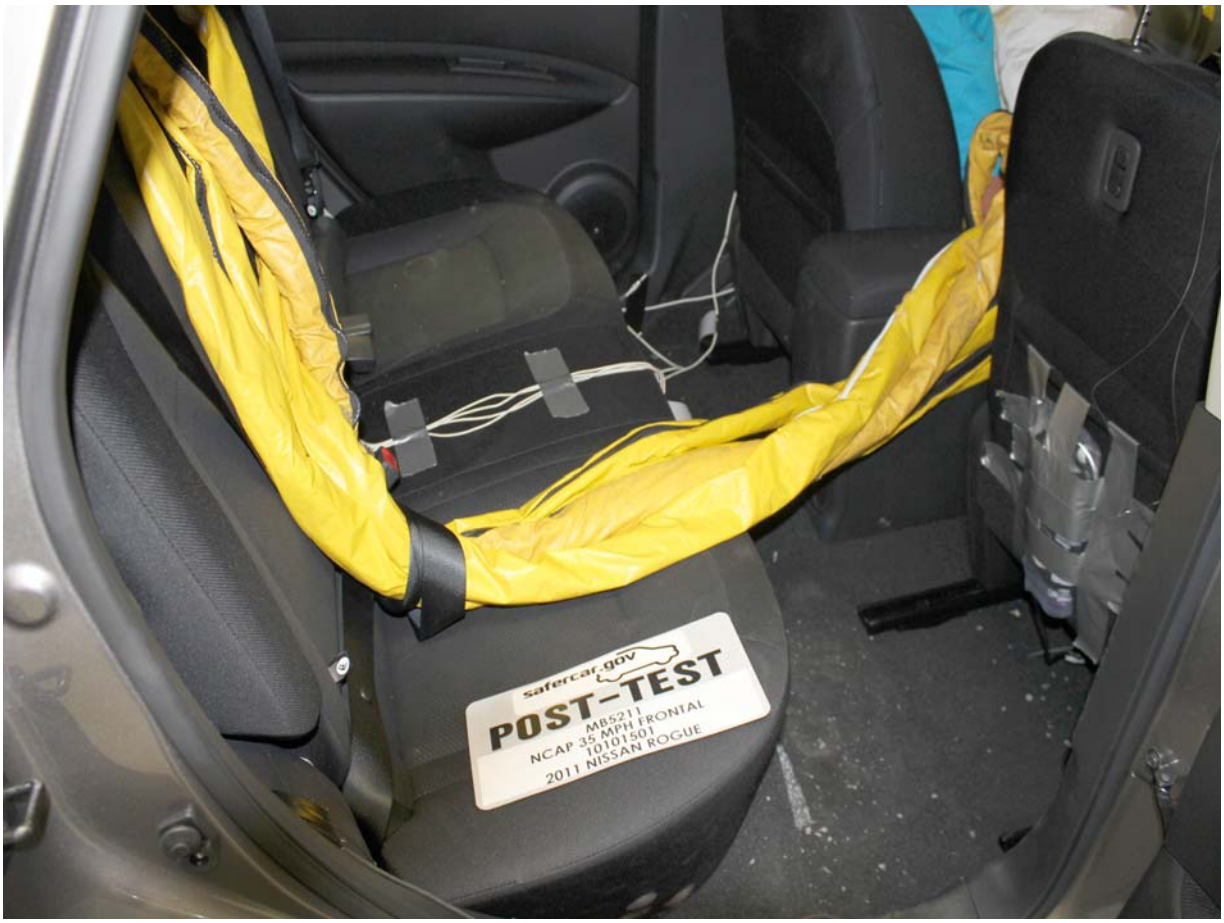


Pre-Test Rear Underbody View



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

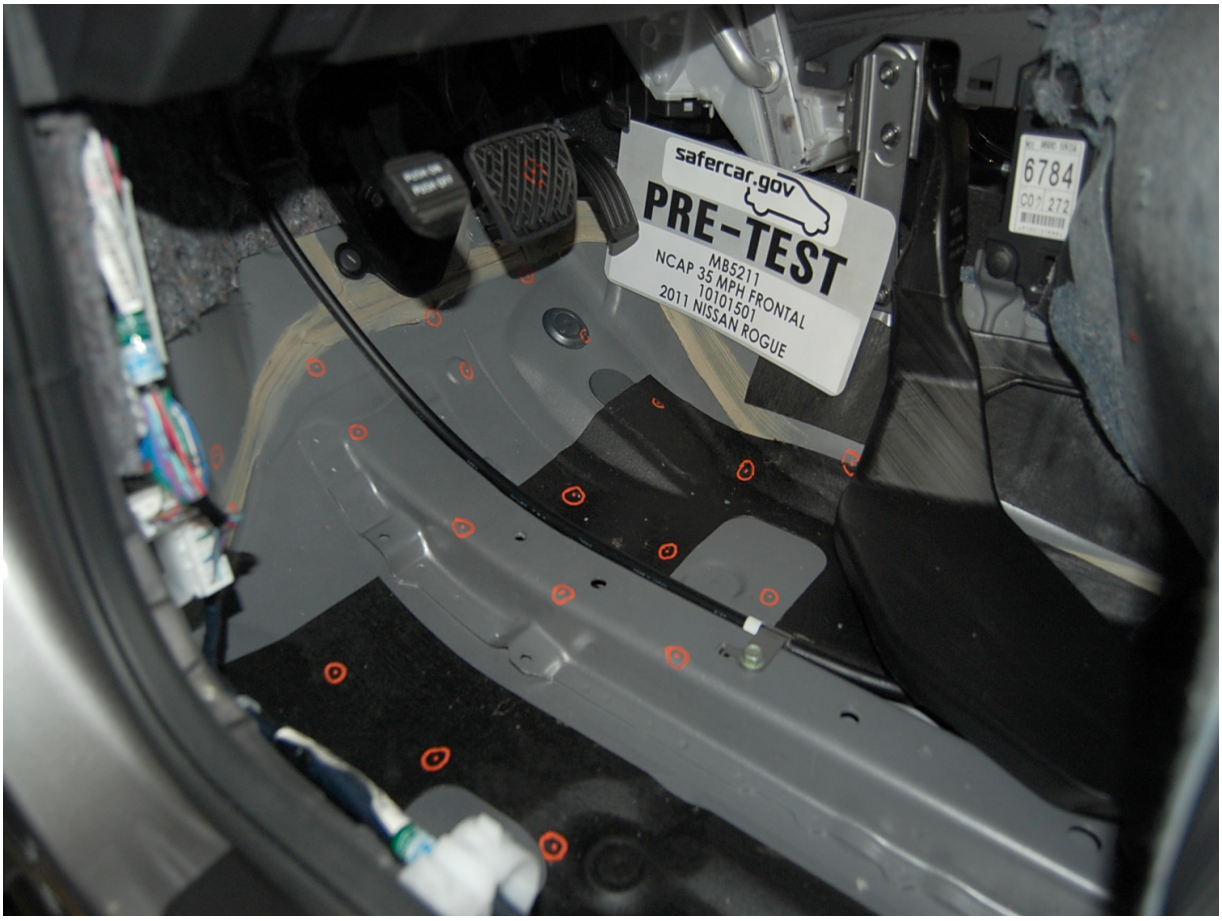
Post-Test Driver's Seat Fore-Aft Markings

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 Contact with Airbag

Post-Test Driver Dummy Contact with Headrest

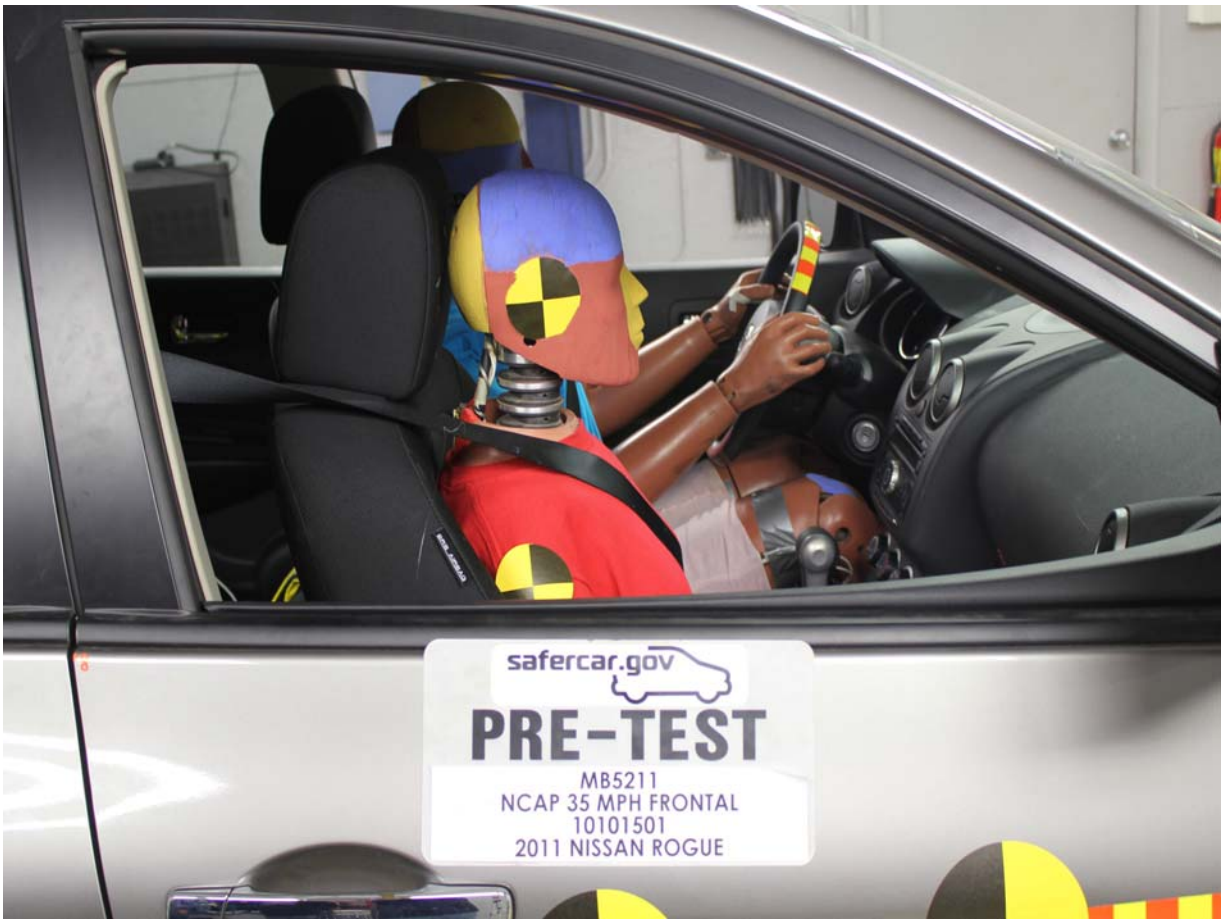
Post-Test Driver Dummy Contact with Knee Bolster

Pre-Test View of Steering Column Shear Capsule

Post-Test View of Steering Column Shear Capsule


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

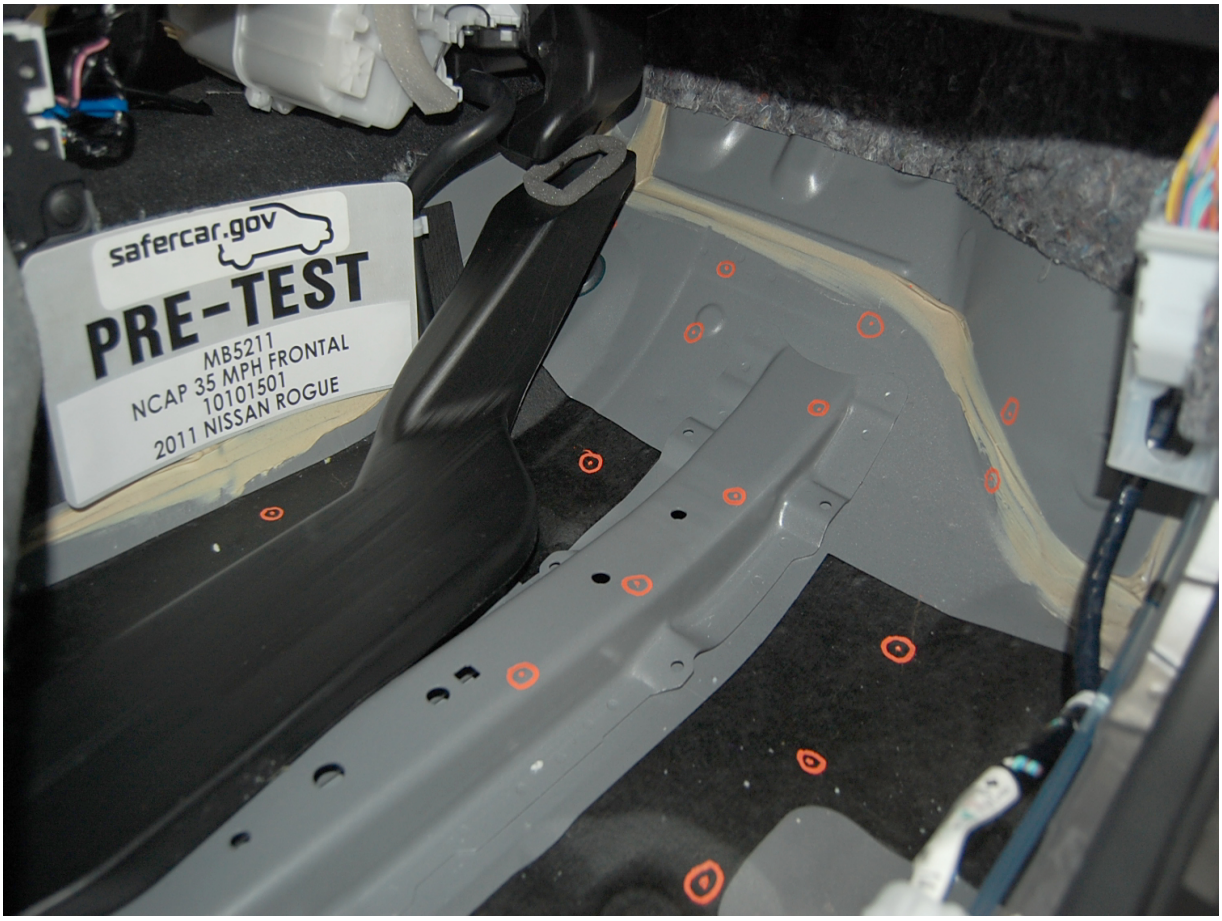
Post-Test Passenger's Seat Fore-Aft Markings

Pre-Test Passenger Dummy Feet

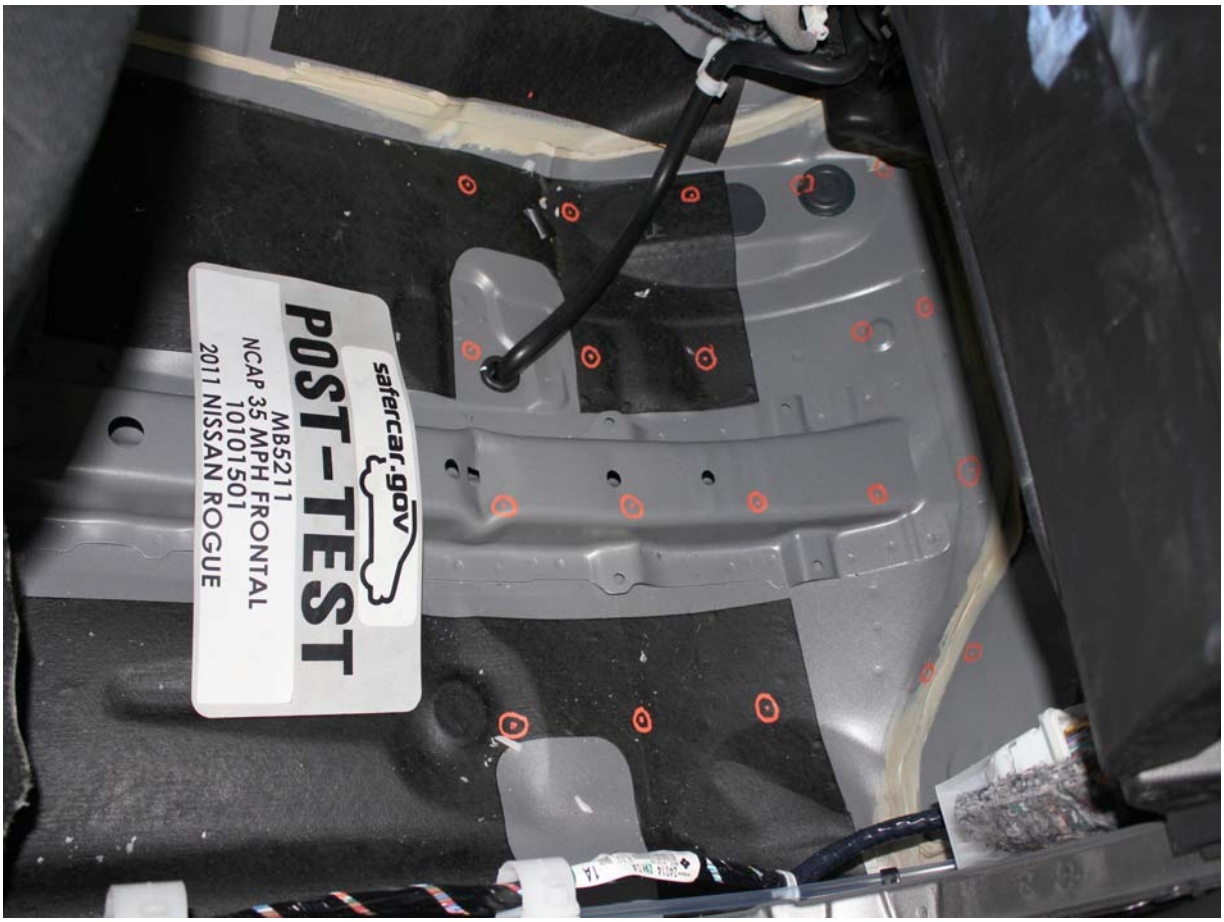
Post-Test Passenger Dummy Feet

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

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



Pre-Test Passenger's Side Floorpan

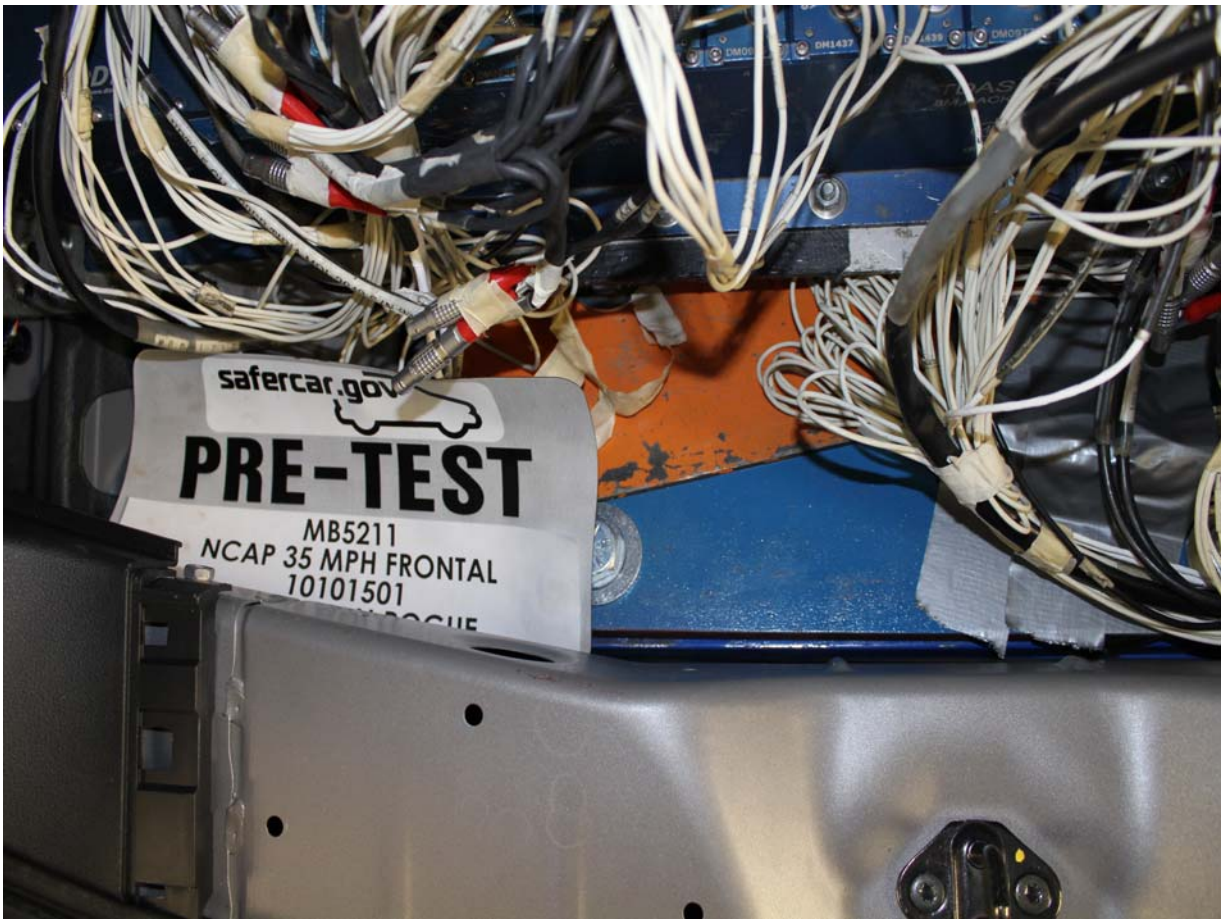


Post-Test Passenger's Side Floorpan

Post-Test Passenger Dummy Contact with Airbag

Post-Test Passenger Dummy Contact with Headrest

Post-Test Passenger Dummy Contact with Glovebox



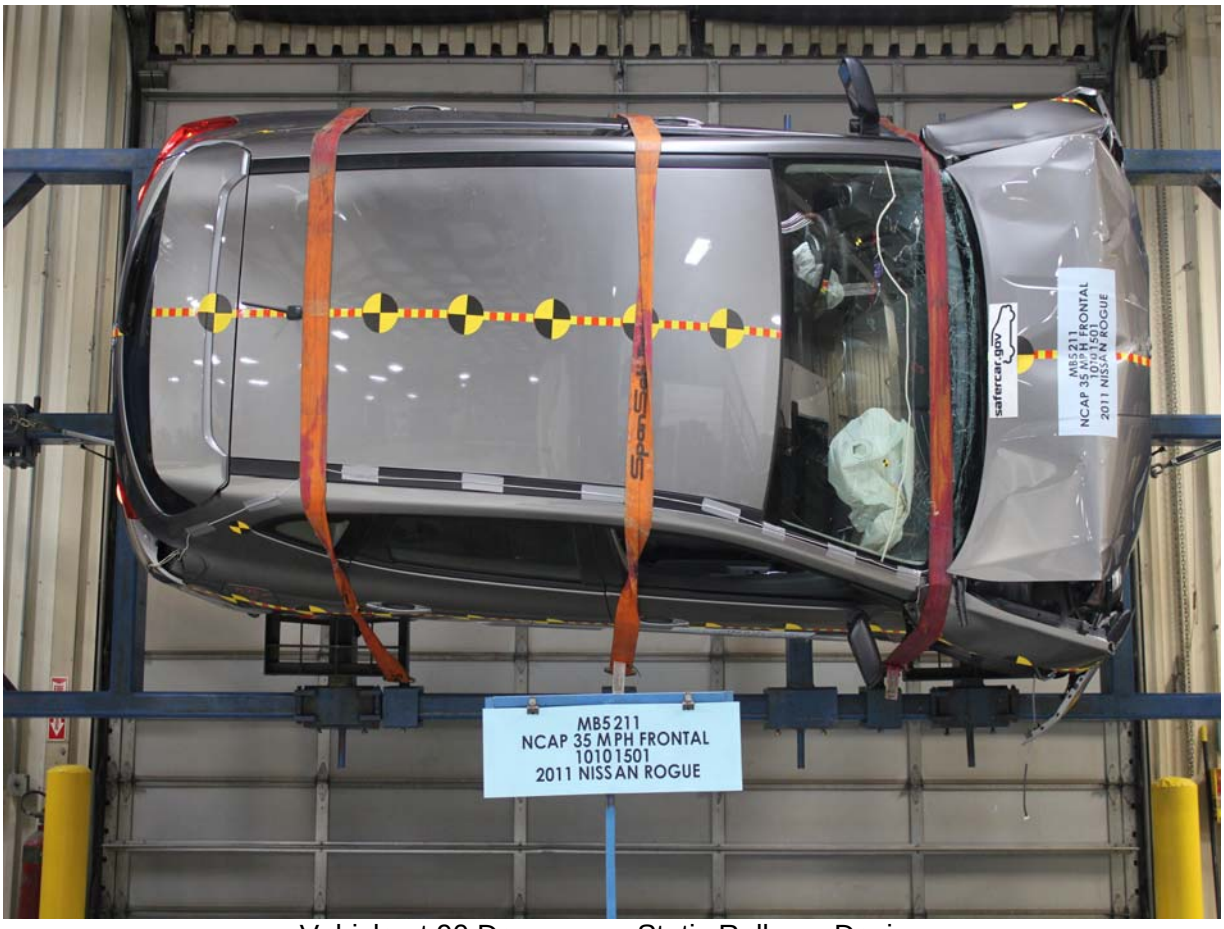
Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

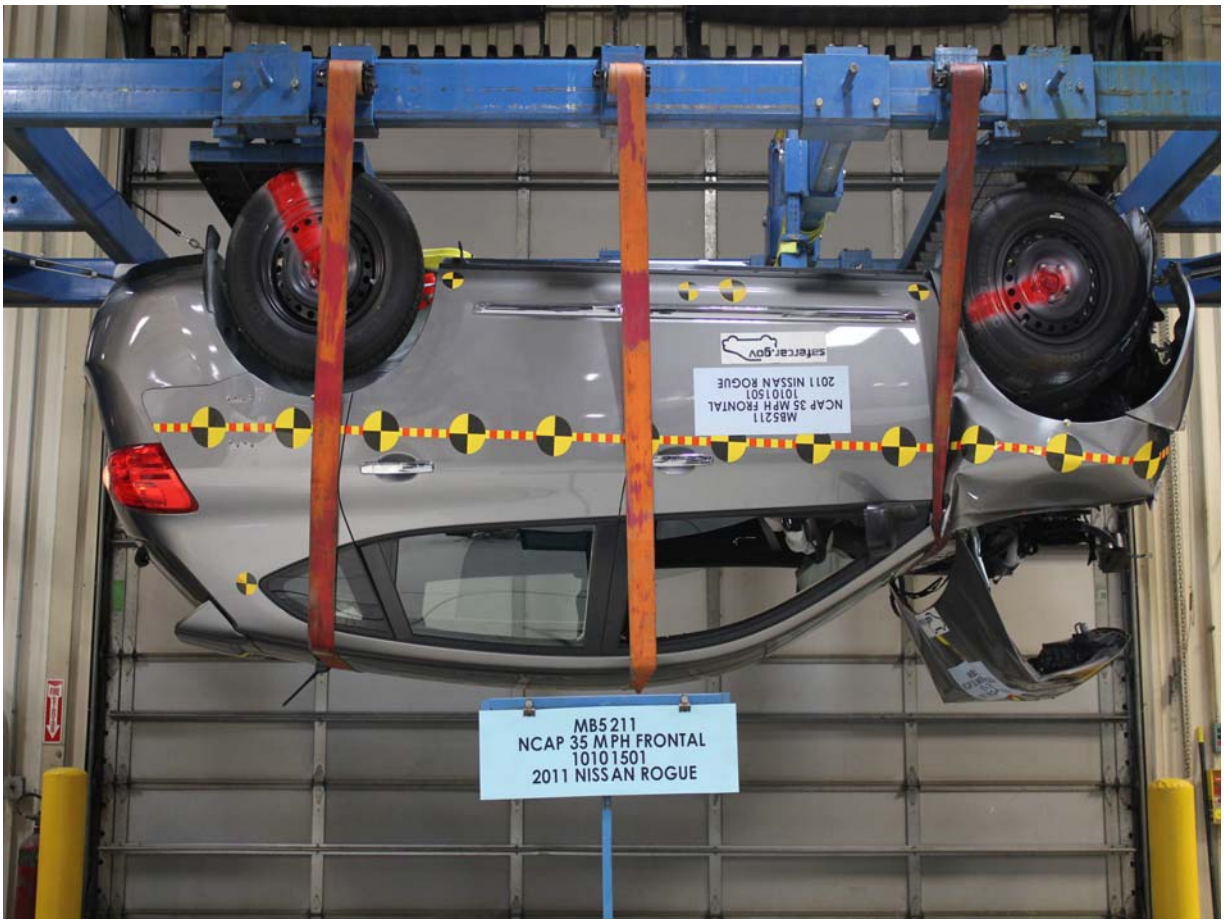
Post-Test Stoddard Solvent Spillage Location View


Post-Test Speed Trap Read-Out

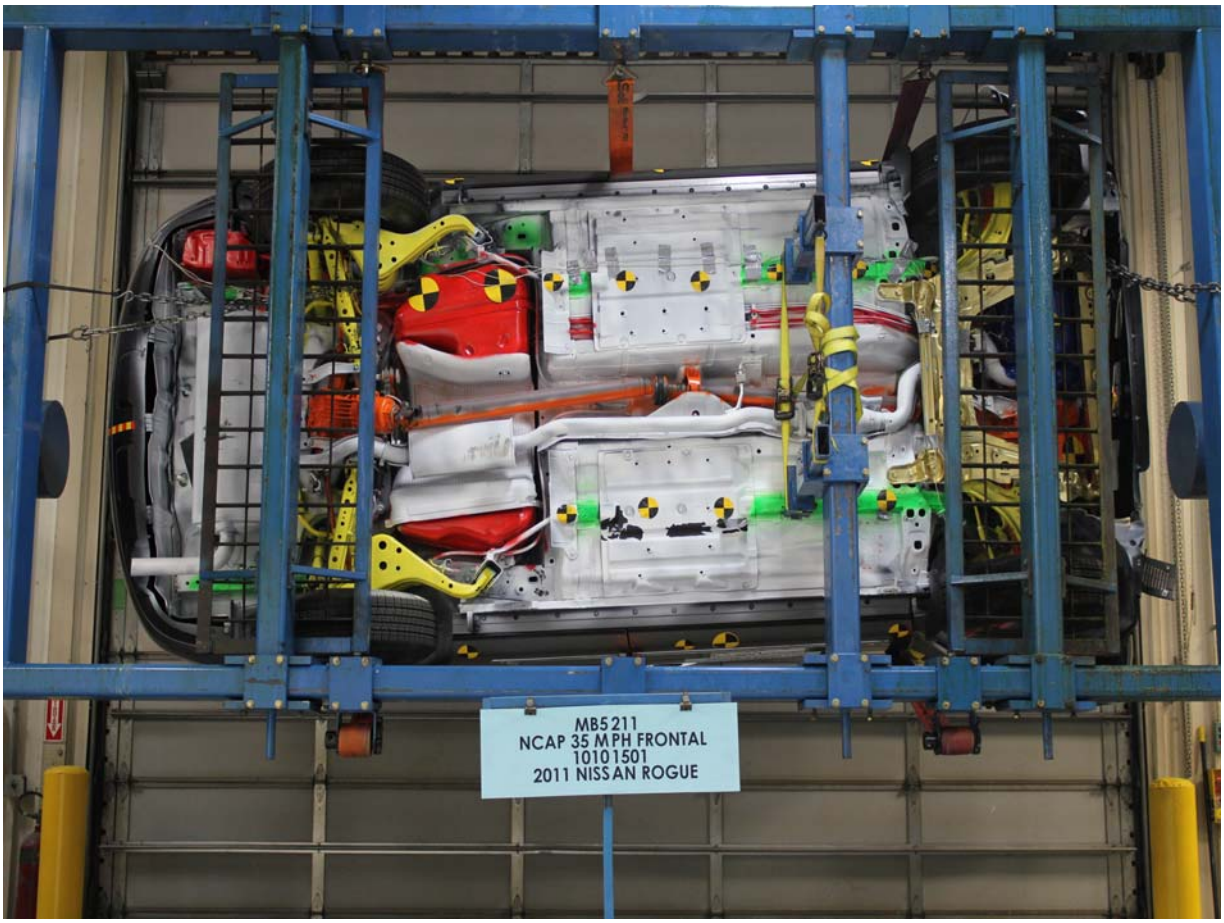
Vehicle at 0 Degrees on Static Rollover Device



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

Vehicle Impact

# 2011 ROGUE S AWD

## As versatile as you are.

**Standard Equipment Included at No Extra Charge**

**MECHANICAL & PERFORMANCE**
- 2.5-liter DOHC 4-Cylinder Engine
- 170 Horsepower and 175 lb-ft of Torque
- Xtronic CVT® (Continuously Variable Transmission)
- Intuitive All-Wheel Drive
- Power-Assisted Rack-and-Pinion Steering
- Independent Strut Front Suspension with Coil Springs and Stabilizer Bar
- Independent Multi-Link Rear Suspension with Stabilizer Bar
- 4-Wheel Vented Disc Brakes
- 16" Steel Wheels with Full Wheel Covers
- P215/70R16 Tires
- Temporary Use Spare Tire
- 15.9-Gallon Fuel Tank

**SAFETY & SECURITY**
- Nissan Advanced Air Bag System (AABS)
- Front Seat-Mounted Side-Impact Supplemental Air Bags
- Roof-Mounted Curtain Side-Impact/ Rollover Supplemental Air Bags for Outboard Occupant Head Protection
- Front Seat Belts with Pretensioners, Load Limiters & Adjustable Upper Anchors
- Front-Seat Active Head Restraints
- 3-Point Seat Belts with ALR/ELR (Driver ELR Only)
- Lower Anchors and Tethers for CHildren (LATCH)
- Child Safety Rear Door Locks
- Energy-Absorbing Steering Column
- Zone Body Construction with Front and Rear Crumple Zones and Reinforced Passenger Compartment
- 4-Wheel Anti-Lock Braking System (ABS)
- Vehicle Dynamic Control (VDC) with Traction Control System (TCS)
- Electronic Brake force Distribution (EBD) & Brake Assist (BA)
- Tire Pressure Monitoring System (TPMS)
- Vehicle Security System (VSS)
- Nissan Vehicle Immobilizer System

**COMFORT & CONVENIENCE**
- 6-Way Manual Driver Seat
- 4-Way Manual Front Passenger Seat
- 60/40 Split Fold-Down Rear Seat
- Manual Tilt Steering Column
- Cruise Control with Steering-Wheel-Mounted Controls
- 4-Speaker AM/FM/CD Audio System
- Auxiliary Audio Input Jack
- Interface System for iPod®
- Tachometer, Odometer, Dual Trip Odometers, Fuel Level Gauge
- Multi-Function Trip Computer with Outside Temperature Display
- Air Conditioning with In-Cabin Microfilter
- Rear-Seat Heating/Cooling Ducts
- Remote Keyless Entry System with Selective Unlocking Feature
- Power Windows with Driver's Window One-Touch Auto-Up/Down
- Power Door Locks with Auto-Locking Feature
- Dual Overhead Map Lights
- Illuminated Visor Vanity Mirrors
- Sunglasses Holder
- Dual Front and Rear Cup Holders
- Front Seatback Map Pockets
- Front Door Map Pockets
- Front Console with Integrated Armrest and Storage Compartments
- Cargo Area Storage Tray (Under Floor)
- Cargo Floor Hooks
- (2) 12-Volt DC Power Outlets

**EXTERIOR**
- Halogen Headlights
- Dual Power Outside Mirrors
- Body-Color Bumpers
- Body-Color Rear Spoiler
- Chrome Grille, Door Handles, Body Side Moldings, and License Plate Finisher
- Variable Intermittent Front Windshield Wipers
- Intermittent Rear Window Wiper

| | |
|---|---|
| **Manufacturer's Suggested Retail Base Price:** | $22,060.00 |
| **Options Included by Manufacturer** | |
| SPLASH GUARDS | 125.00 |
| REAR BUMPER PROTECTOR | 60.00 |
| FLOOR MATS & CARGO AREA PROTECTOR | 185.00 |
| **Destination Charges:** | 800.00 |
| **Total*** | **$23,230.00** |

***Does not include dealer installed options and accessories, local taxes or license fees. This label has been applied pursuant to federal law. Do not remove prior to delivery to the ultimate purchaser.**

## EPA Fuel Economy Estimates

CITY MPG **22**

Expected range for most drivers **18** to **26** MPG

**Estimated Annual Fuel Cost**
**$1,876**
based on15,000 miles at $3.00 per gallon

**Combined Fuel Economy**
**This Vehicle 24**
10 — 32
All **SUVS**

HIGHWAY MPG **26**

Expected range for most drivers **21** to **31** MPG

**Your actual mileage will vary** depending on how you drive and maintain your vehicle.

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

## GOVERNMENT SAFETY RATINGS

| | | |
|---|---|---|
| **Frontal Crash** | Driver | **To Be Rated** |
| | Passenger | **To Be Rated** |

Star ratings based on the risk of injury in a frontal impact. Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

| | | |
|---|---|---|
| **Side Crash** | Front seat | **To Be Rated** |
| | Rear seat | **To Be Rated** |

Star ratings based on the risk of injury in a side impact.

**Rollover** ★★★★

Star ratings 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 qualifies for Nissan's

**Security+Plus Vehicle Protection Plan**

The only service agreement backed by Nissan! Ask your dealer for details, or call 1-800-NISSAN-1 for more information

## DELIVERY

**VEHICLE COLORS:**
EXT: PLATINUM GRAPHI
INT: BLACK

**FINAL ASSEMBLY POINT:**
LOS ANGELES

**TRANSPORT METHOD:**
TRUCK

**DEALER:**
ROSEN NISSAN OF GURNEE
7000 GRAND AVENUE
GURNEE IL
60031

**VIN:** JN8AS5MV4BW253585
**EMS:** 50 STATE EMISSIONS
**MDL:** 22211-253585 K51-G
**OPT:** A-B10B94C03L92

20100810231514RF5033

Monroney Label

# APPENDIX B

# DUMMY RESPONSE DATA

## TABLE OF DATA PLOTS

**The following 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 Shoulder Belt Force

Driver Lap Belt Force

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

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 Lap Belt Force

Passenger Shoulder Belt Force – not installed

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

Left Rear Seat Crossmember X

Left Rear Seat Crossmember Z

Right Rear Seat Crossmember X

Right Rear Seat Crossmember Z

Vehicle Engine Top X

Vehicle Engine Bottom X

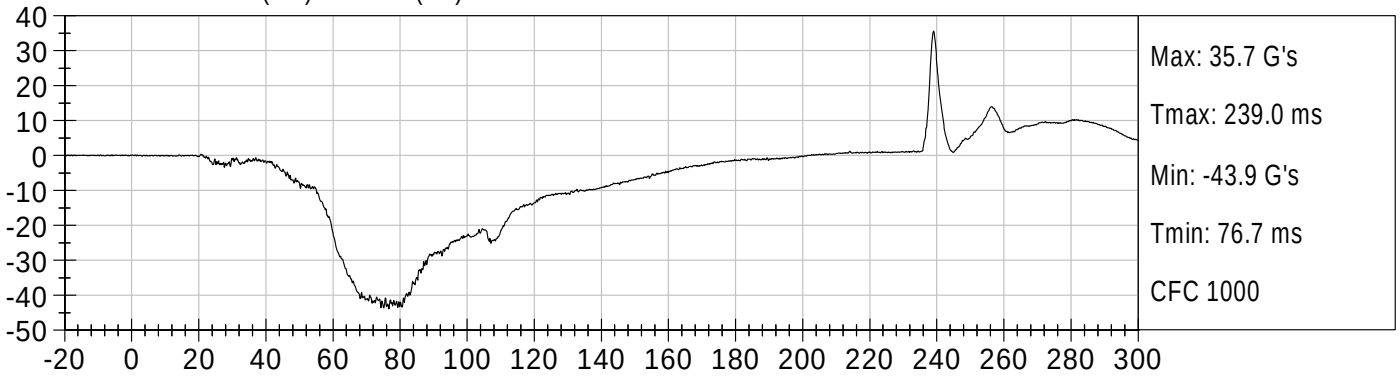
Vehicle Left Brake Caliper X

Vehicle Right Brake Caliper X

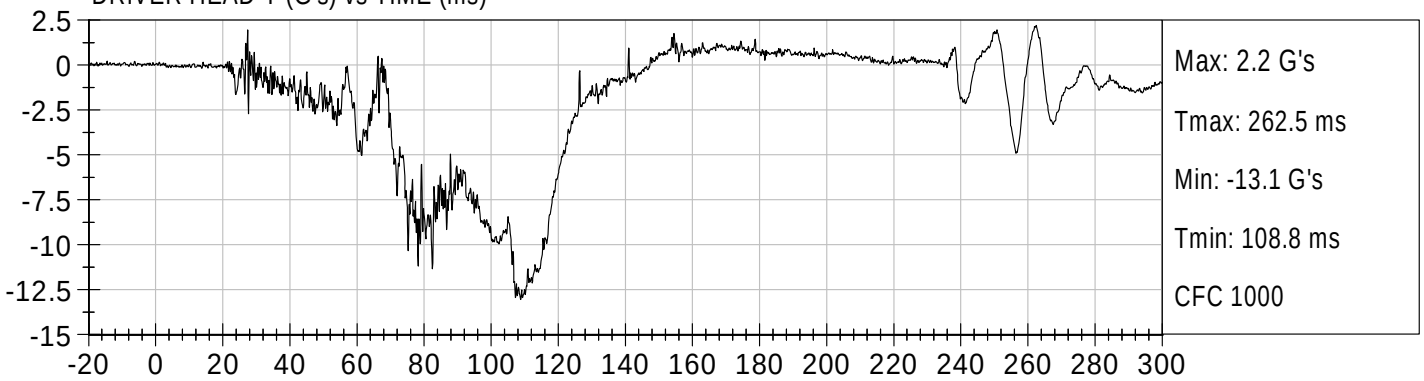
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

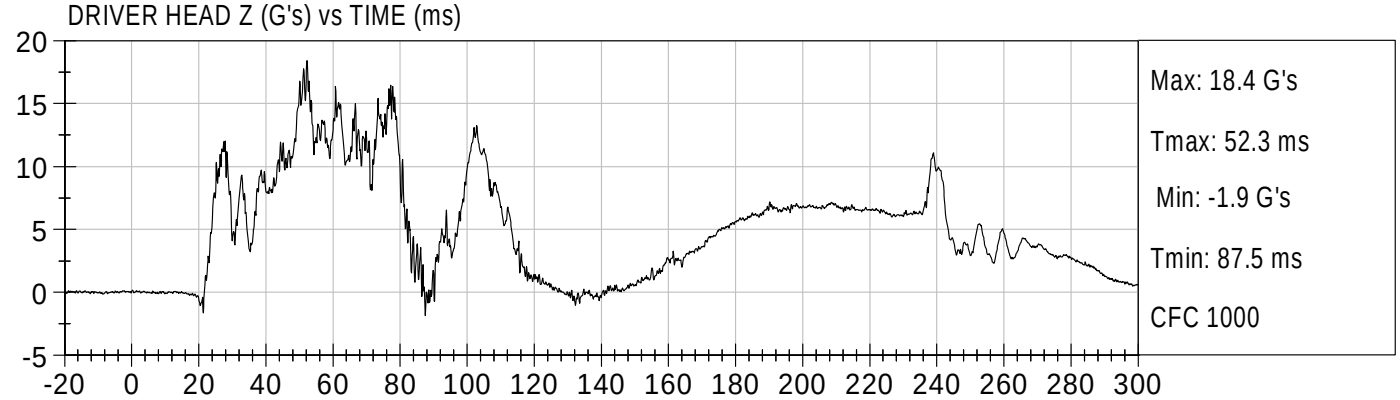
DRIVER HEAD X (G's) vs TIME (ms)



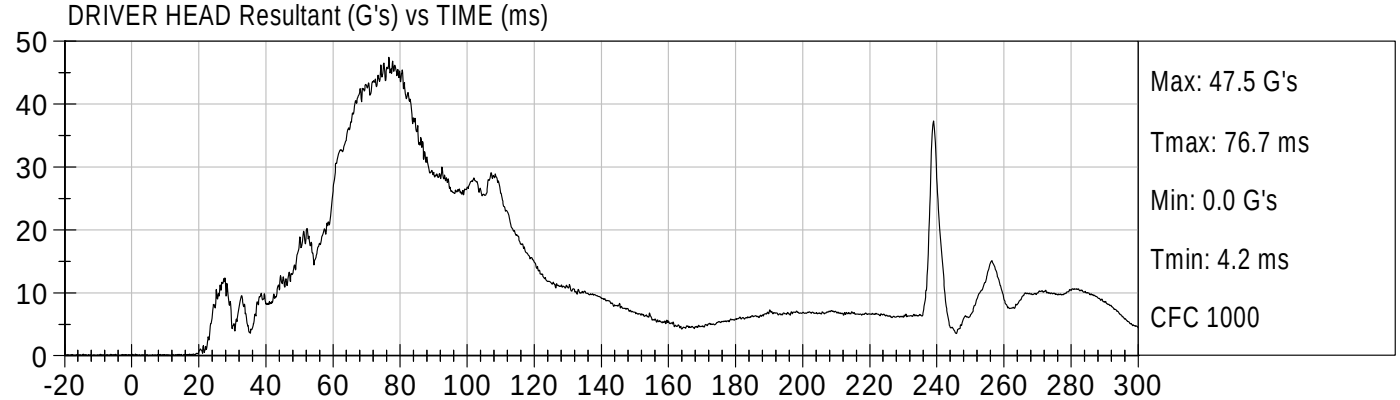

DRIVER HEAD Y (G's) vs TIME (ms)




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



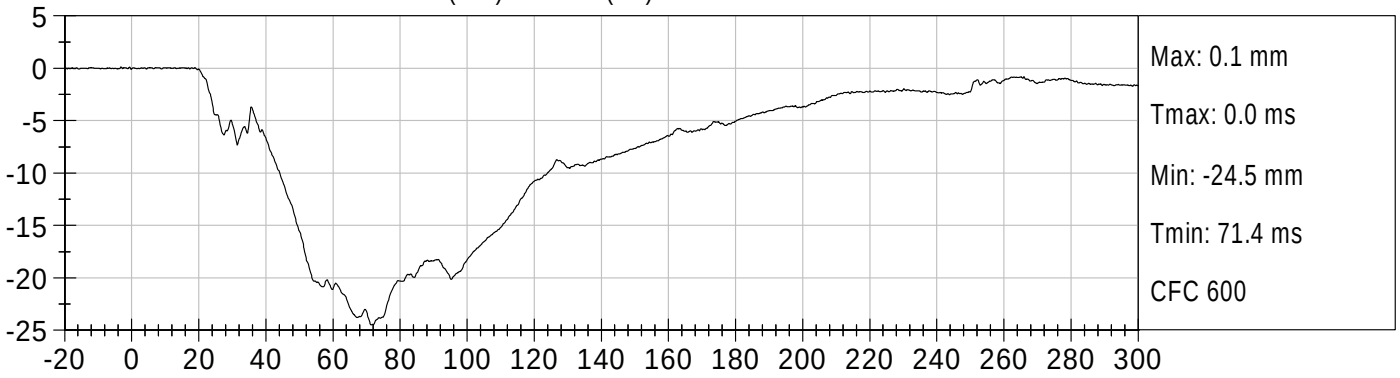

DRIVER HEAD Resultant (G's) vs TIME (ms)



NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

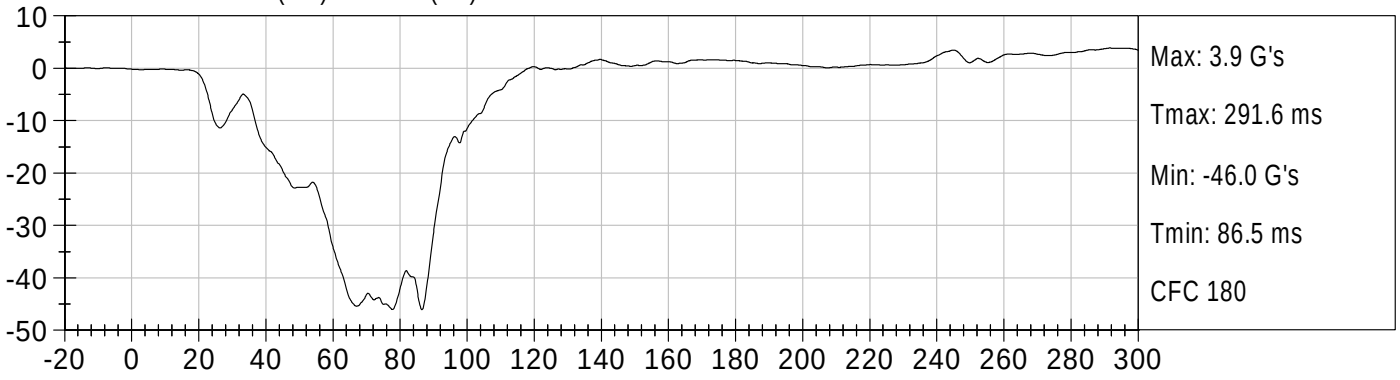
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)



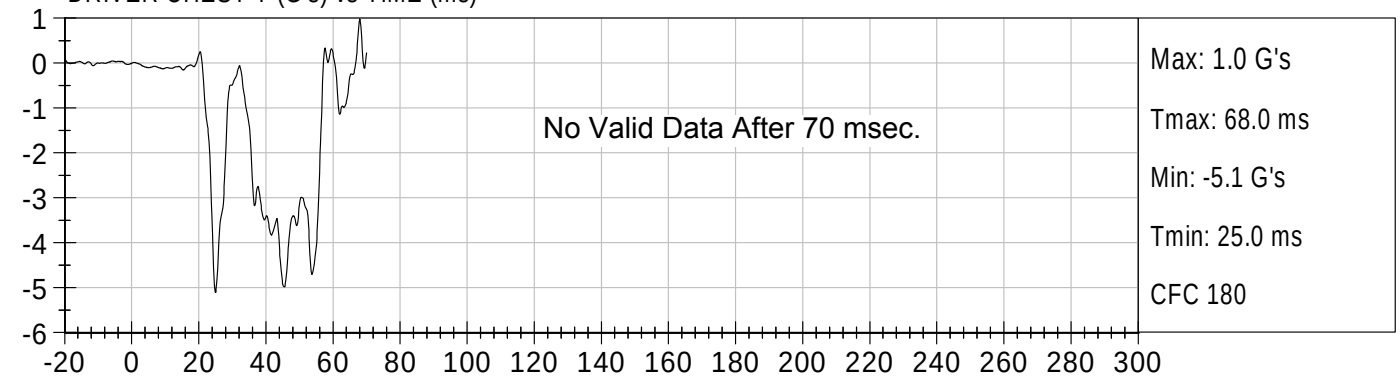
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

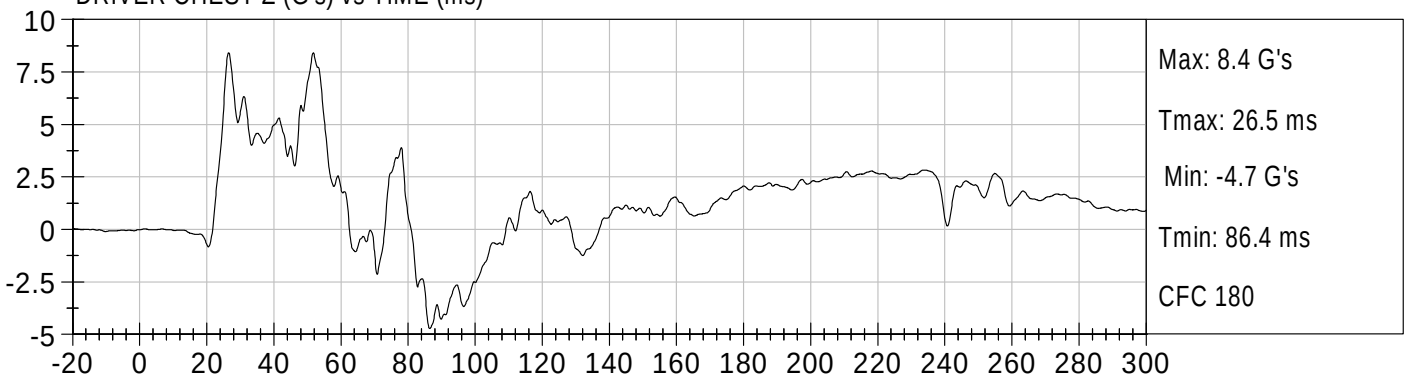
DRIVER CHEST X (G's) vs TIME (ms)



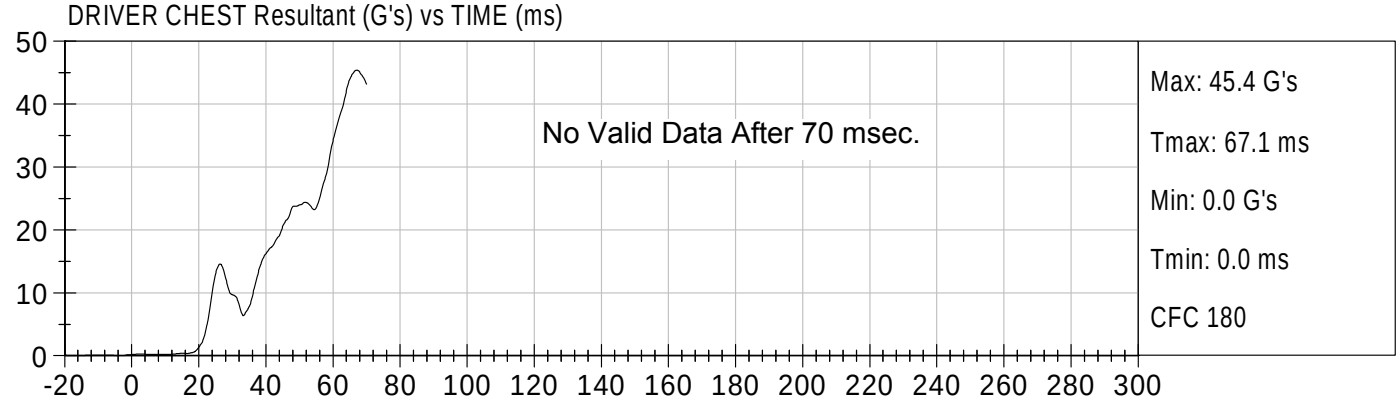

DRIVER CHEST Y (G's) vs TIME (ms)




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



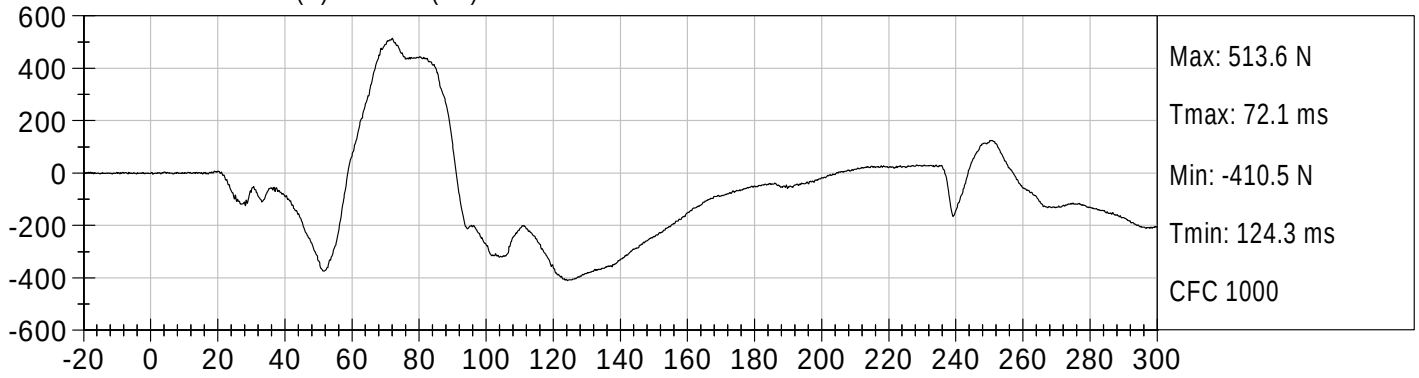

DRIVER CHEST Resultant (G's) vs TIME (ms)



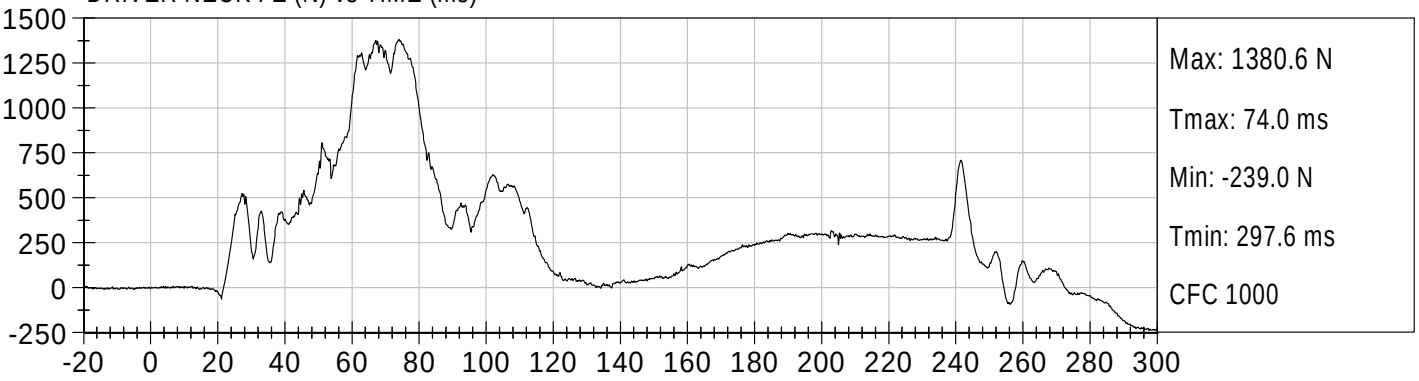
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

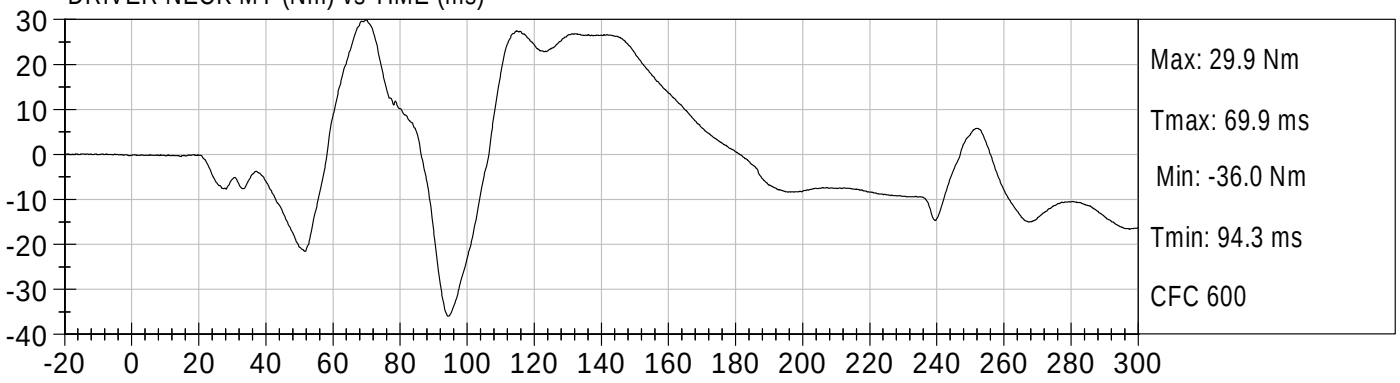
DRIVER NECK FX (N) vs TIME (ms)

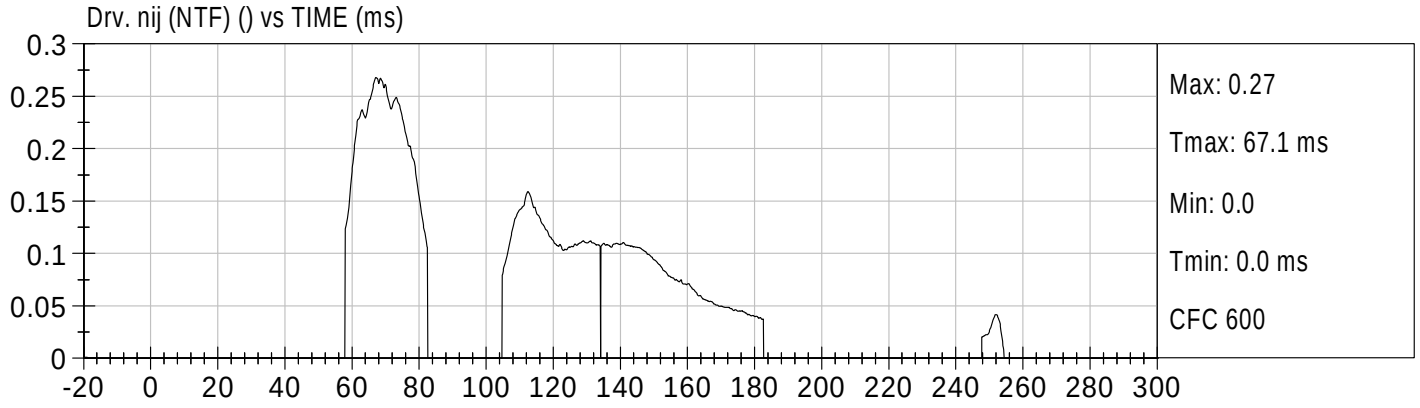


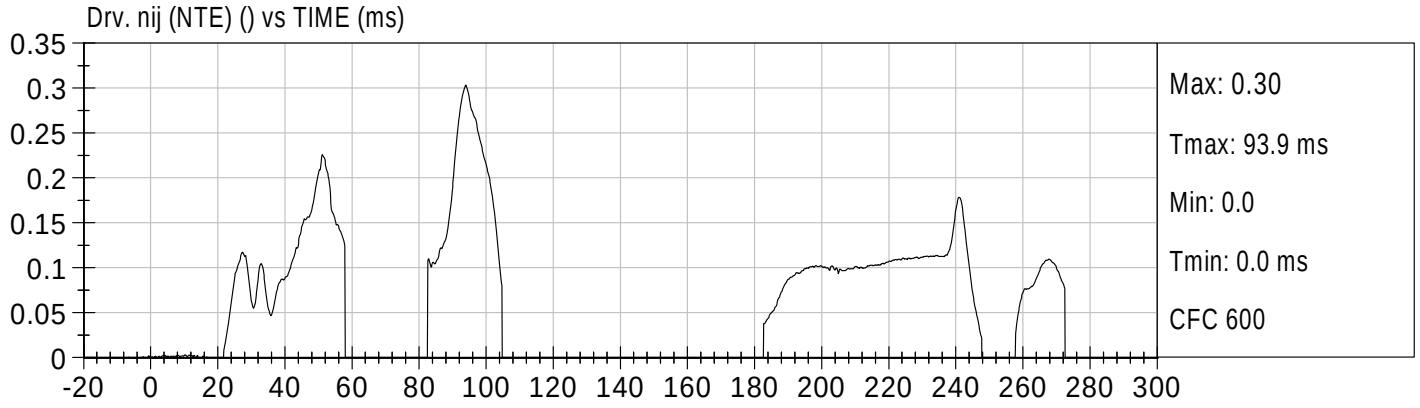

DRIVER NECK FZ (N) vs TIME (ms)

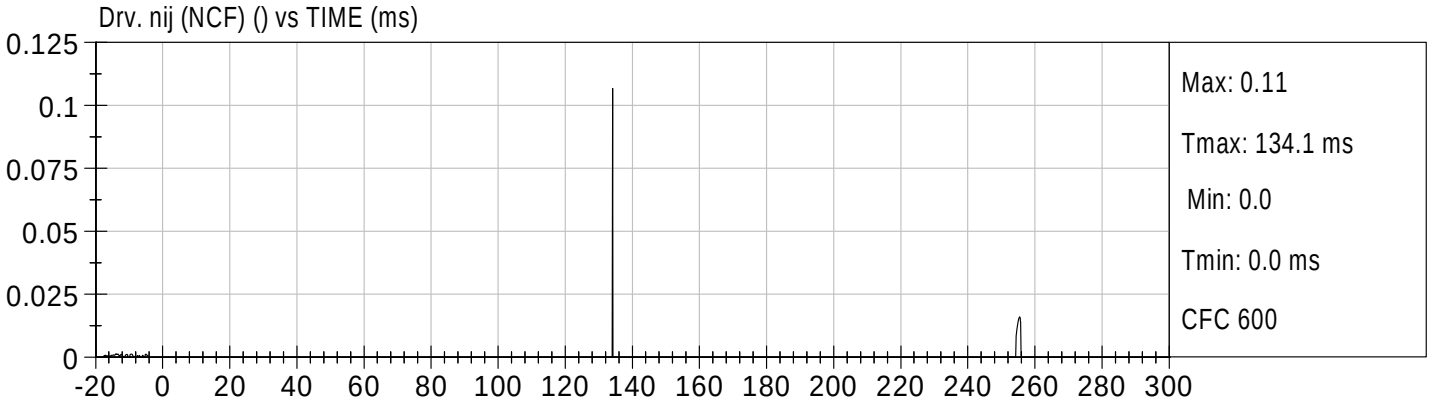


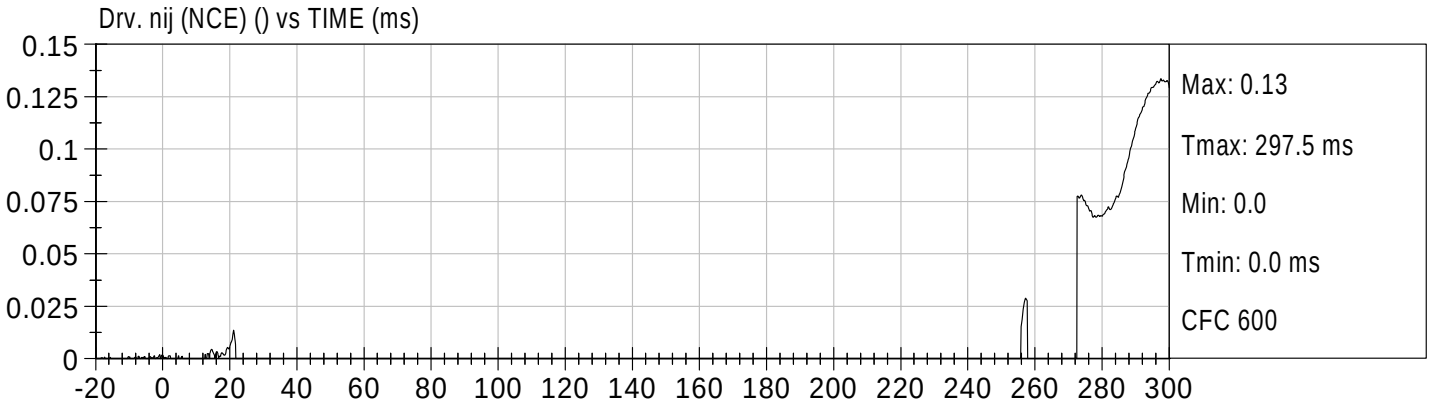

DRIVER NECK MY (Nm) vs TIME (ms)




Drv. nij (NTF) () vs TIME (ms)
0.3
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: 0.27
Tmax: 67.1 ms
Min: 0.0
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: 0.30
Tmax: 93.9 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

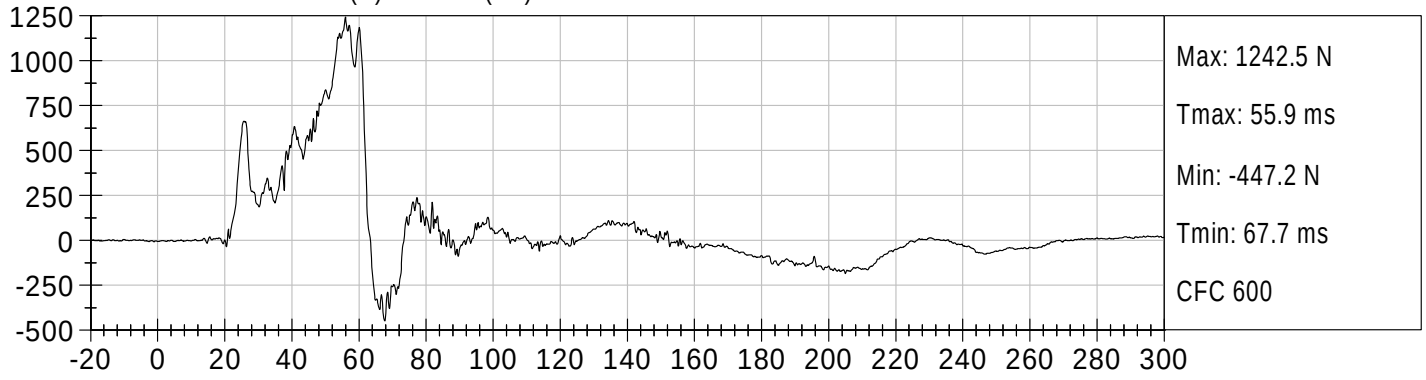

Drv. nij (NCF) () vs TIME (ms)
0.125
0.1
0.075
0.05
0.025
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.11
Tmax: 134.1 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600


Drv. nij (NCE) () 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: 297.5 ms
Min: 0.0
Tmin: 0.0 ms
CFC 600

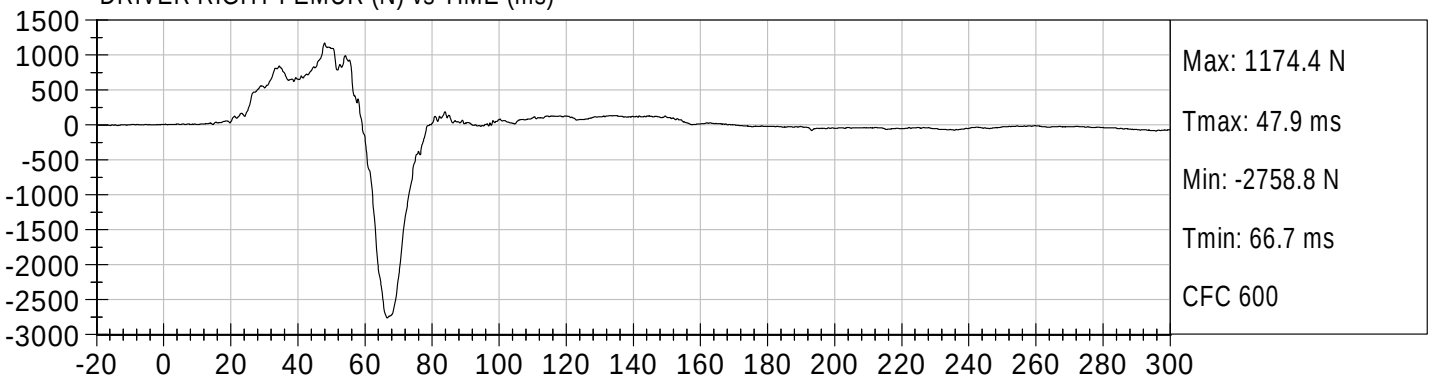
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

DRIVER LEFT FEMUR (N) vs TIME (ms)



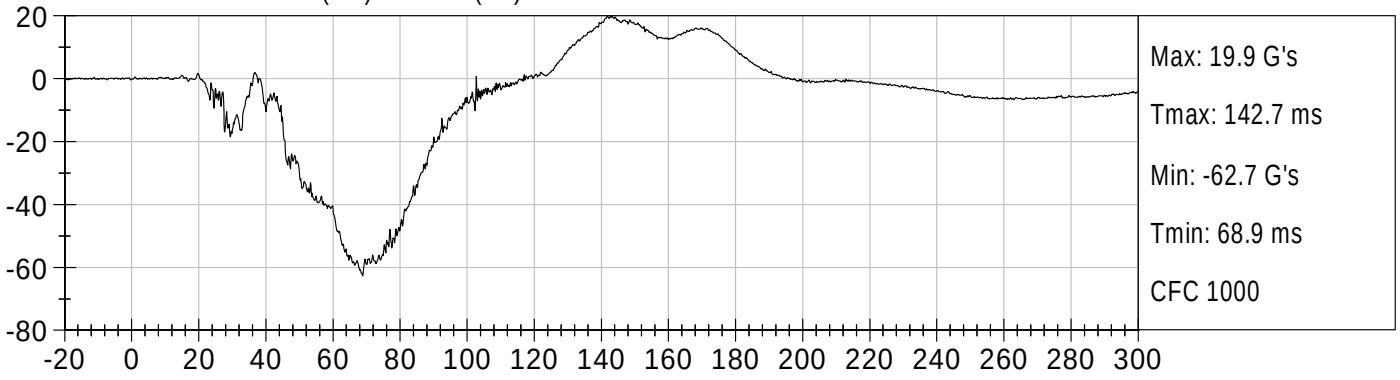

DRIVER RIGHT FEMUR (N) vs TIME (ms)



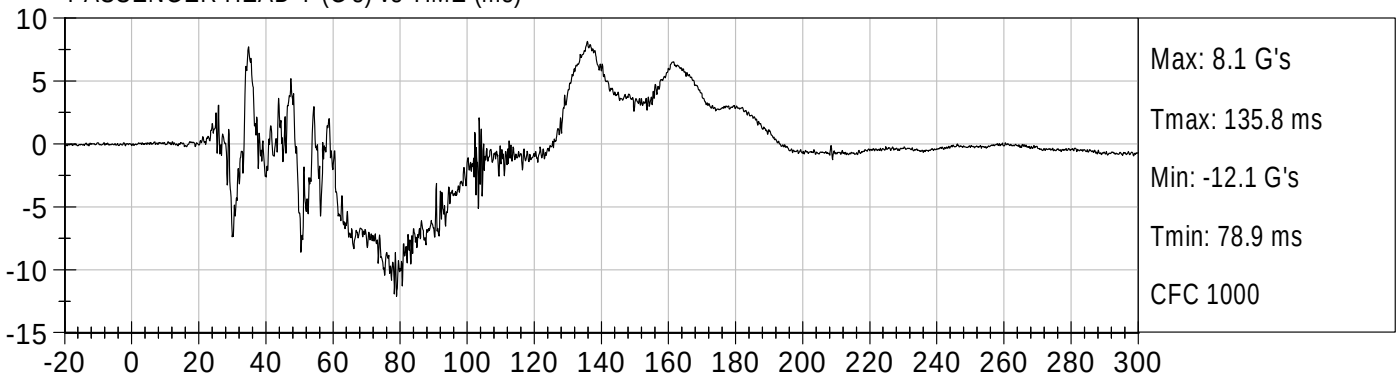
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

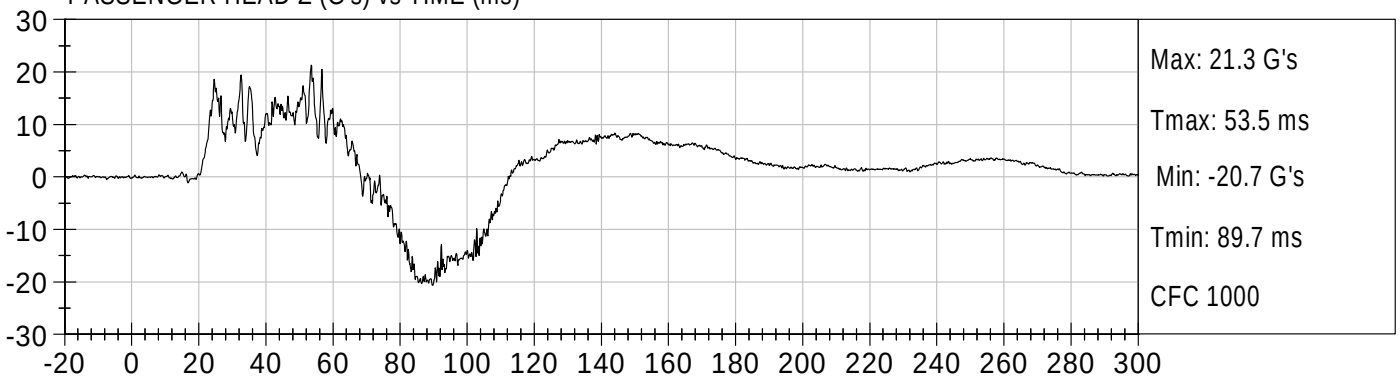
PASSENGER HEAD X (G's) vs TIME (ms)



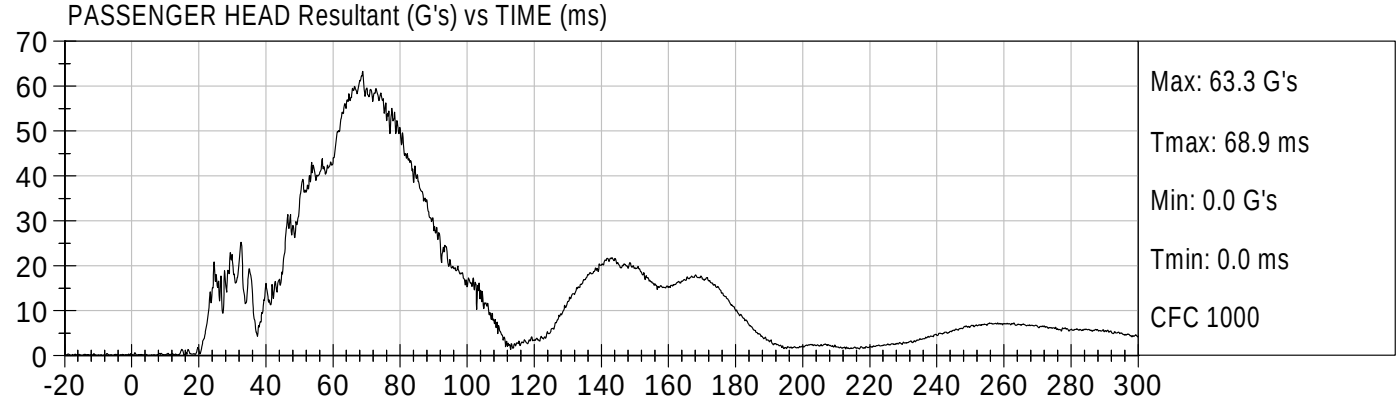

PASSENGER HEAD Y (G's) vs TIME (ms)

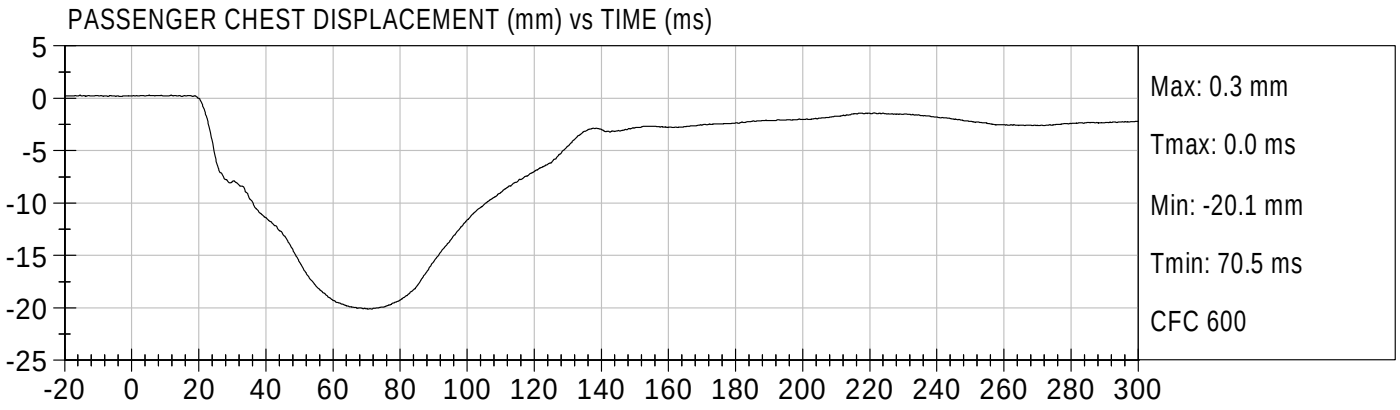



PASSENGER HEAD Z (G's) vs TIME (ms)




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

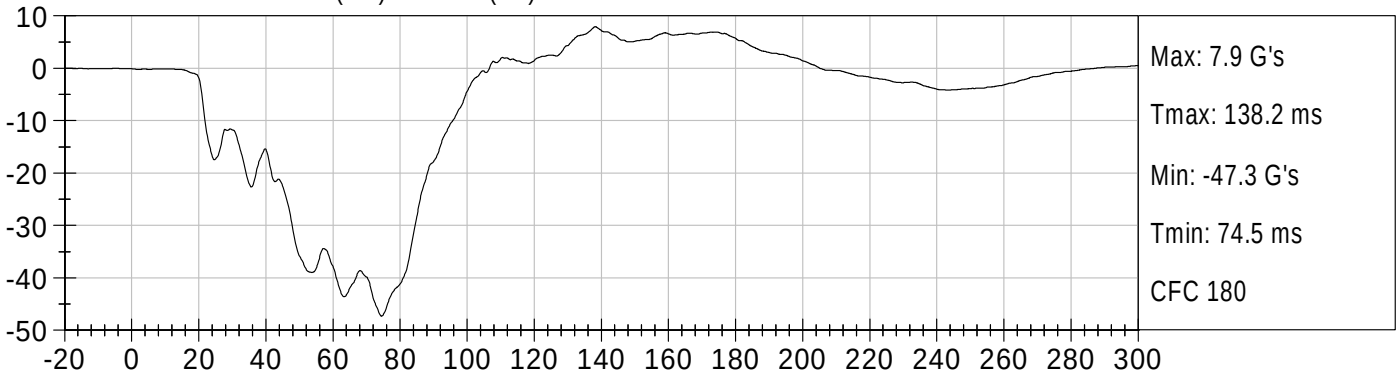



PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)
5
0
-5
-10
-15
-20
-25
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
Max: 0.3 mm
Tmax: 0.0 ms
Min: -20.1 mm
Tmin: 70.5 ms
CFC 600

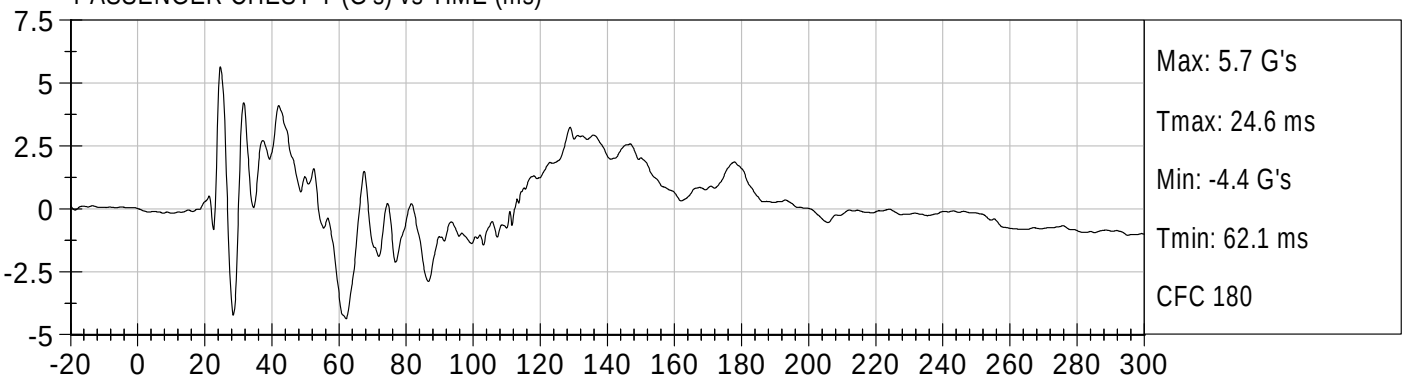
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

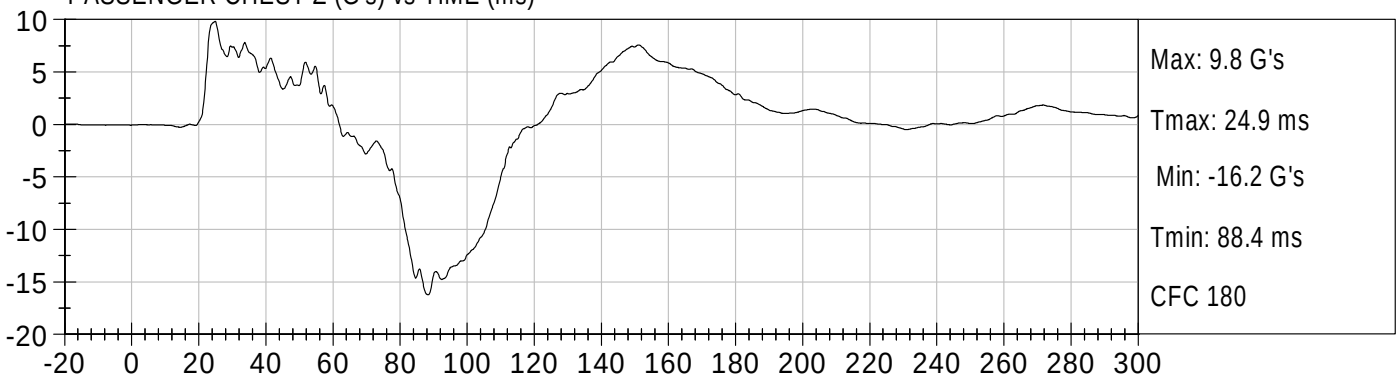
PASSENGER CHEST X (G's) vs TIME (ms)



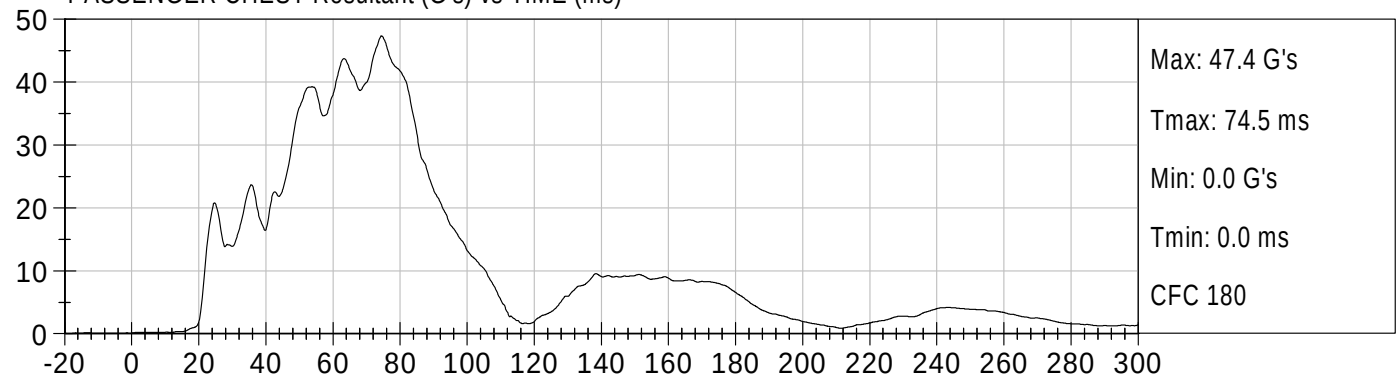

PASSENGER CHEST Y (G's) vs TIME (ms)




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



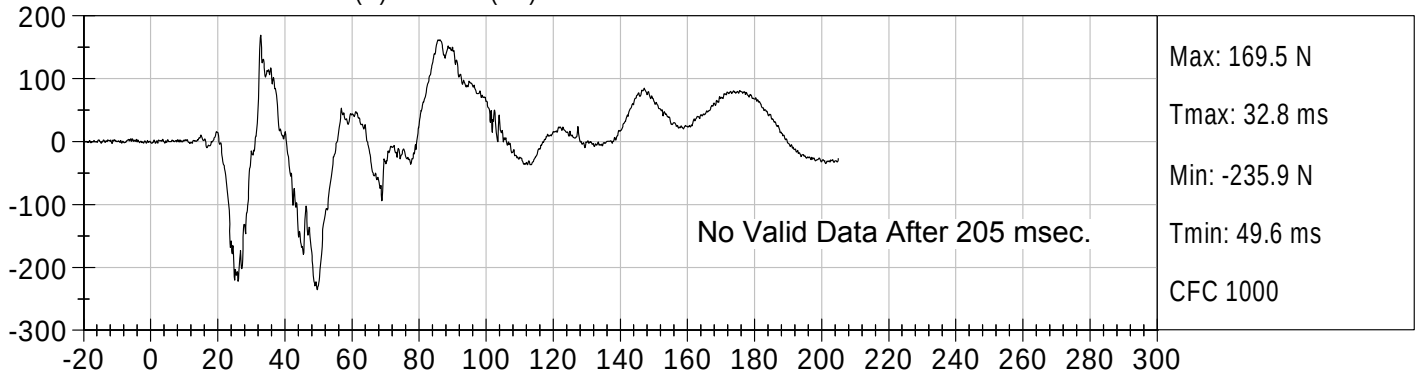

PASSENGER CHEST Resultant (G's) vs TIME (ms)



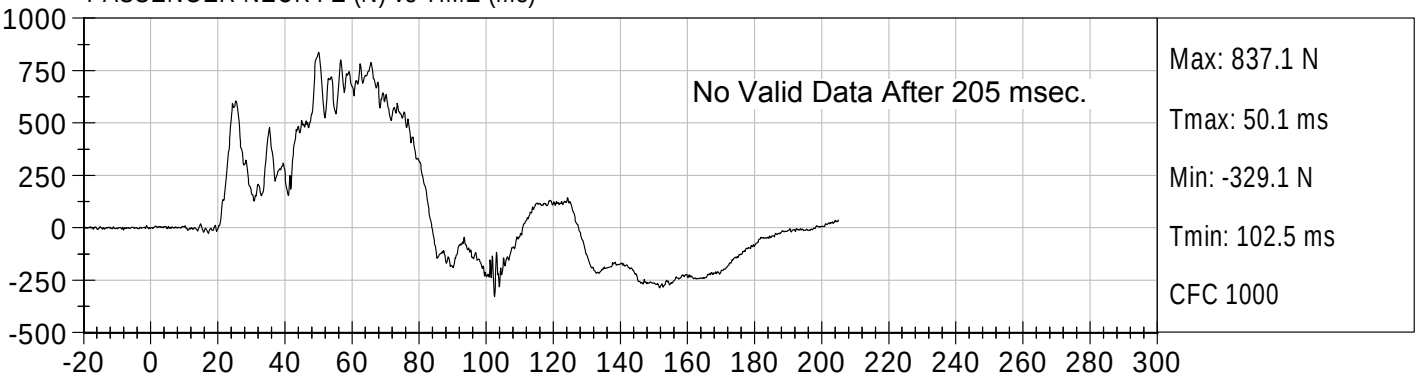
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

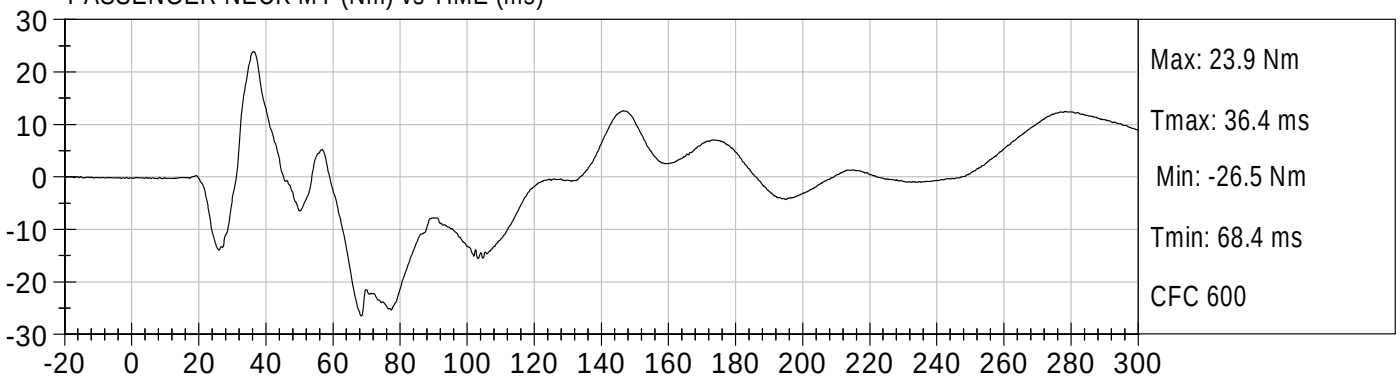
PASSENGER NECK FX (N) vs TIME (ms)




PASSENGER NECK FZ (N) vs TIME (ms)

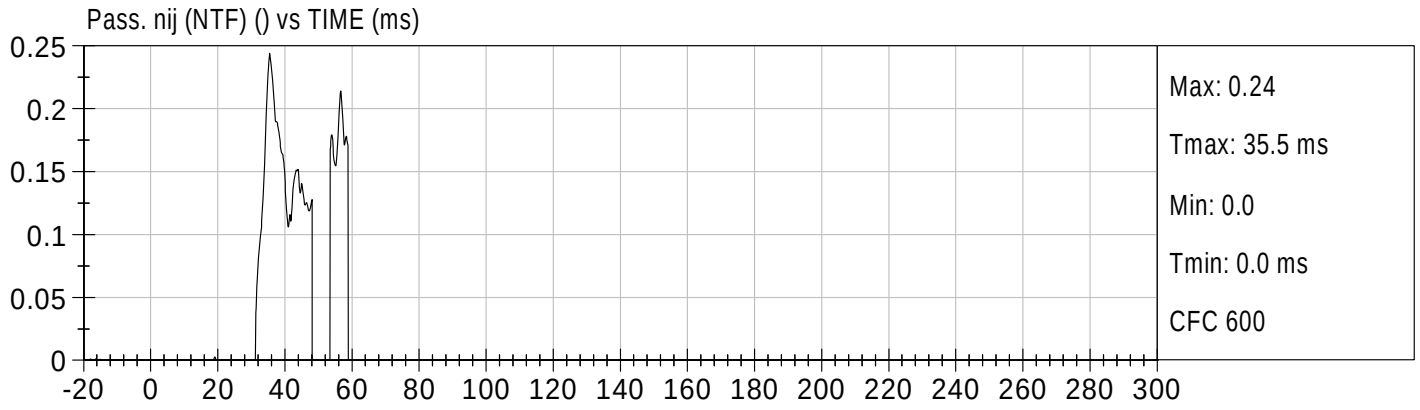


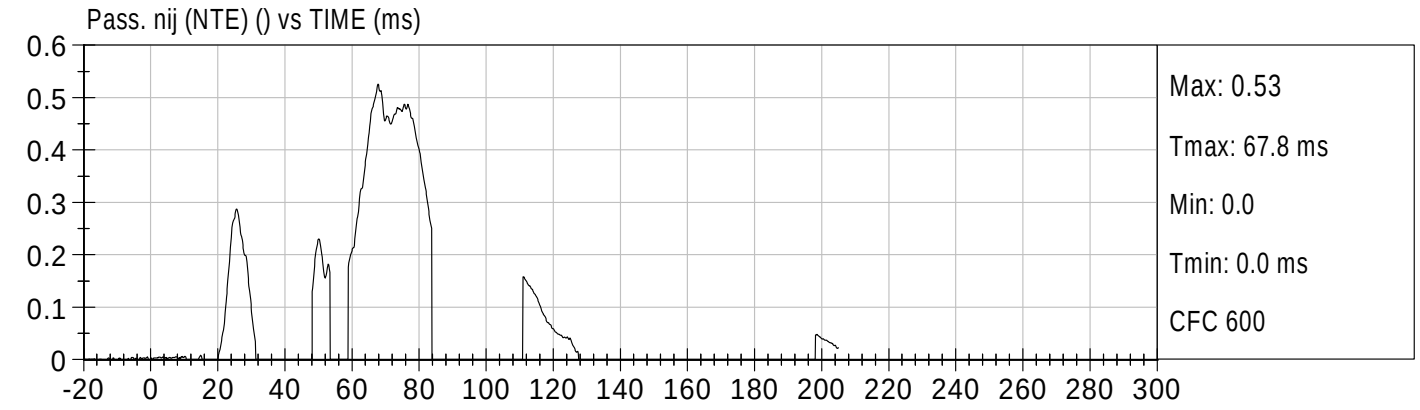

PASSENGER NECK MY (Nm) vs TIME (ms)

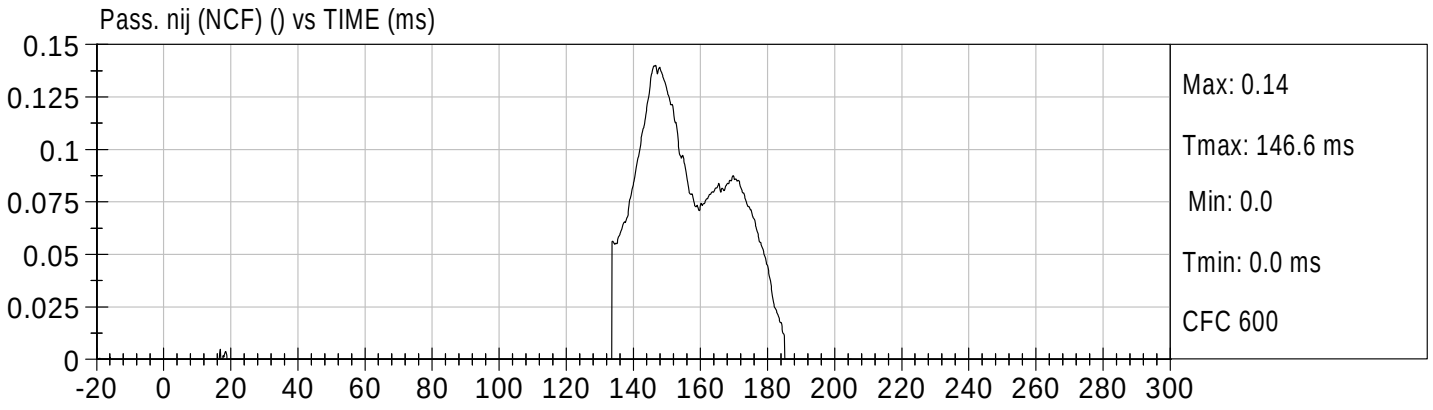


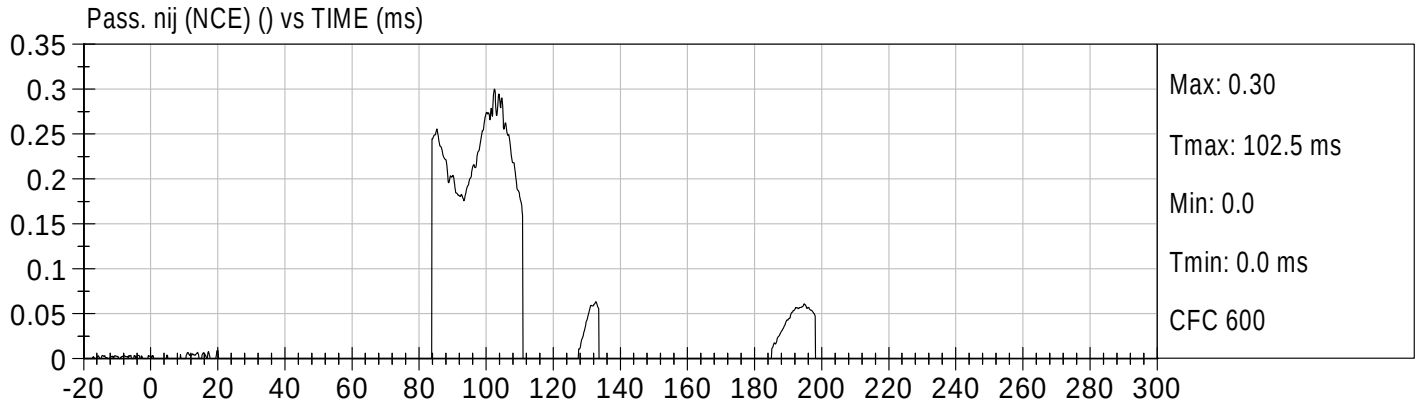
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)



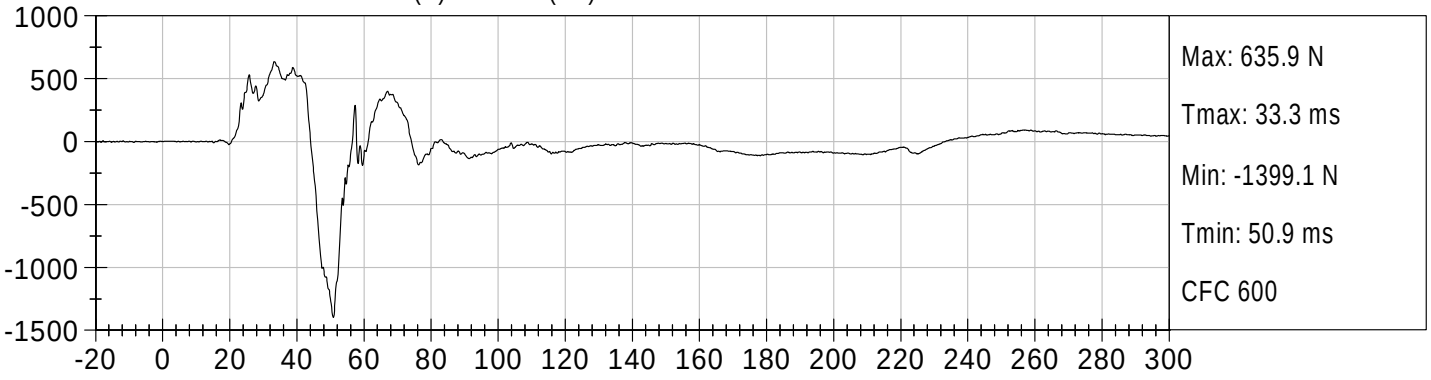



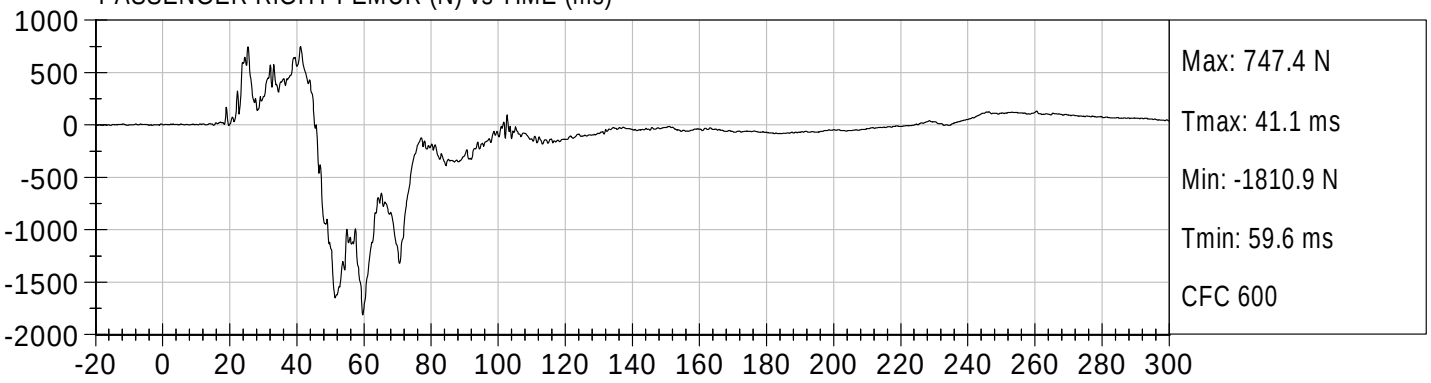
NCAP 35mph Frontal
2011 Nissan Rogue - MB5211

Test Date: 10/15/2010
Speed: 34.9 mph (56.2 km/h)

PASSENGER LEFT FEMUR (N) vs TIME (ms)




PASSENGER RIGHT FEMUR (N) vs TIME (ms)



# APPENDIX C

# DUMMY CALIBRATION DATA

**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test ID:** D103321

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.6 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 37 | Pass |
| Peak Resultant Acceleration | G's | 225 - 275 | 254 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | 6.6 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

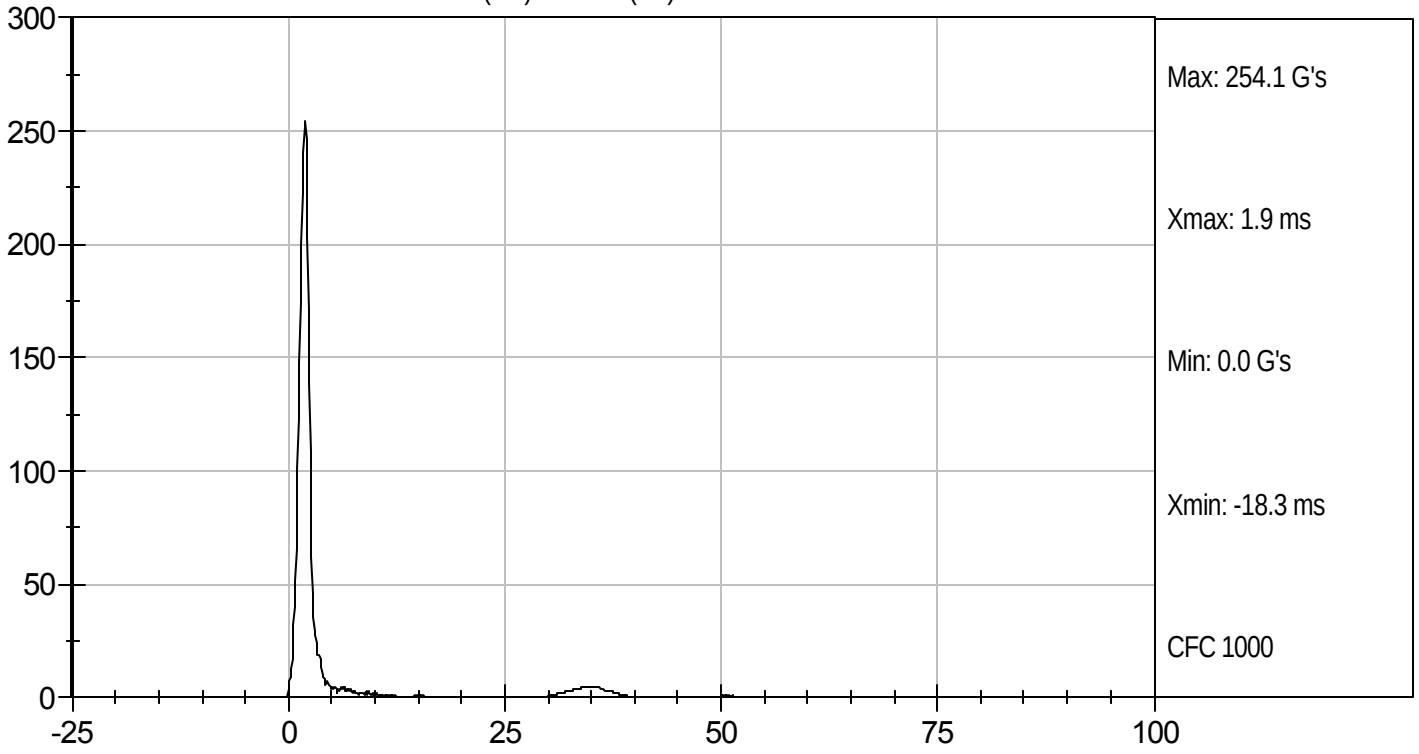
10/1/10
Test Date

David Winkelbauer
Approved By

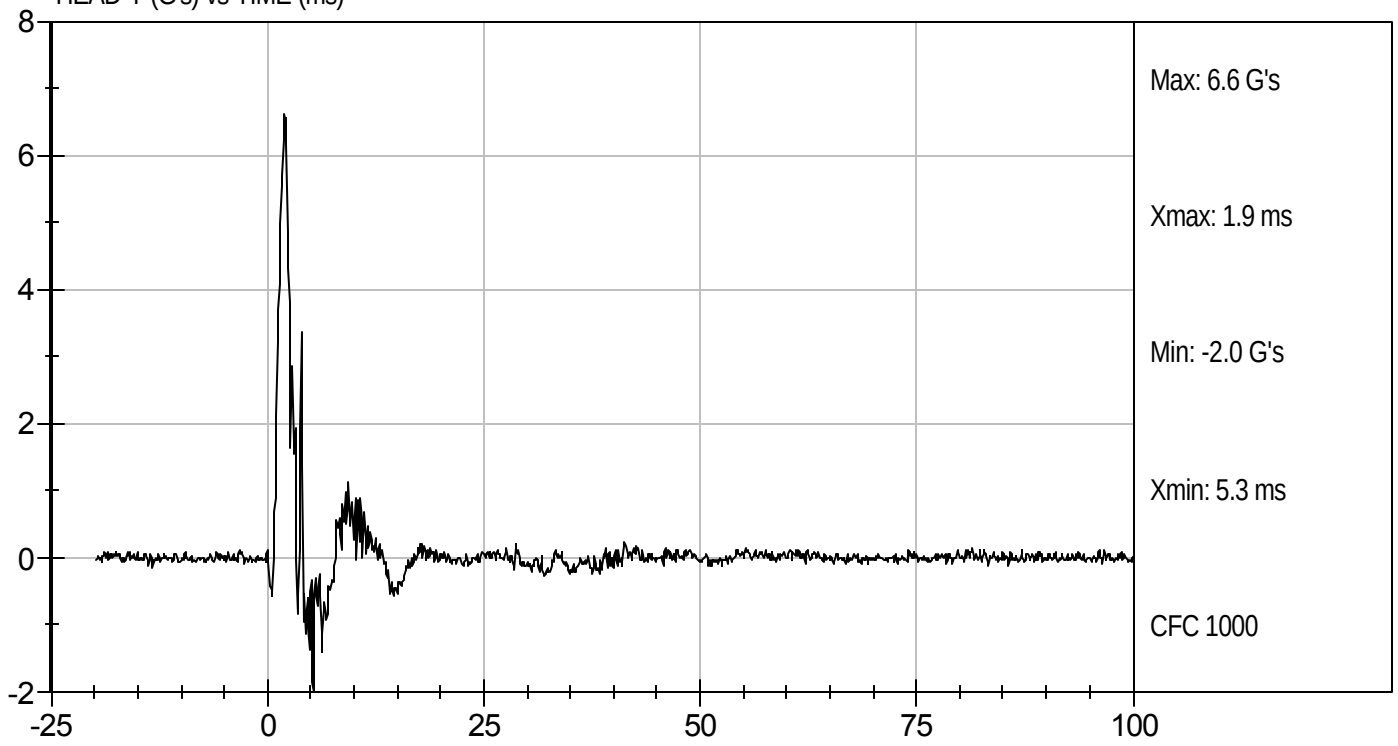
Test Desc: Head Drop
Component ID: D103321

Test Date: 10/1/10
Velocity: 0 ft/s, 0.00 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:** 351 **Test I.D:** D103322

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 44 | Pass |
| Pendulum Velocity | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Deceleration | 10 ms | G's | 22.50 to 27.50 | 23.82 | Pass |
| | 20 ms | G's | 17.60 to 22.60 | 18.66 | Pass |
| | 30 ms | G's | 12.50 to 18.50 | 15.23 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 29.0 | 15.19 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 34.0 to 42.0 | 34.8 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 64.0 to 78.0 | 65.7 | Pass |
| | Time | ms | 57.0 to 64.0 | 60.9 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 113.0 to 128.0 | 113.2 | Pass |
| Moment About Occipital Condyle | Maximum | N m | 88.1 to 108.5 | 94.4 | Pass |
| | Time | ms | 47.0 to 58.0 | 47.1 | Pass |
| Positive Moment Decay Time To Zero Crossing | | ms | 97.0 to 107.0 | 99.3 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

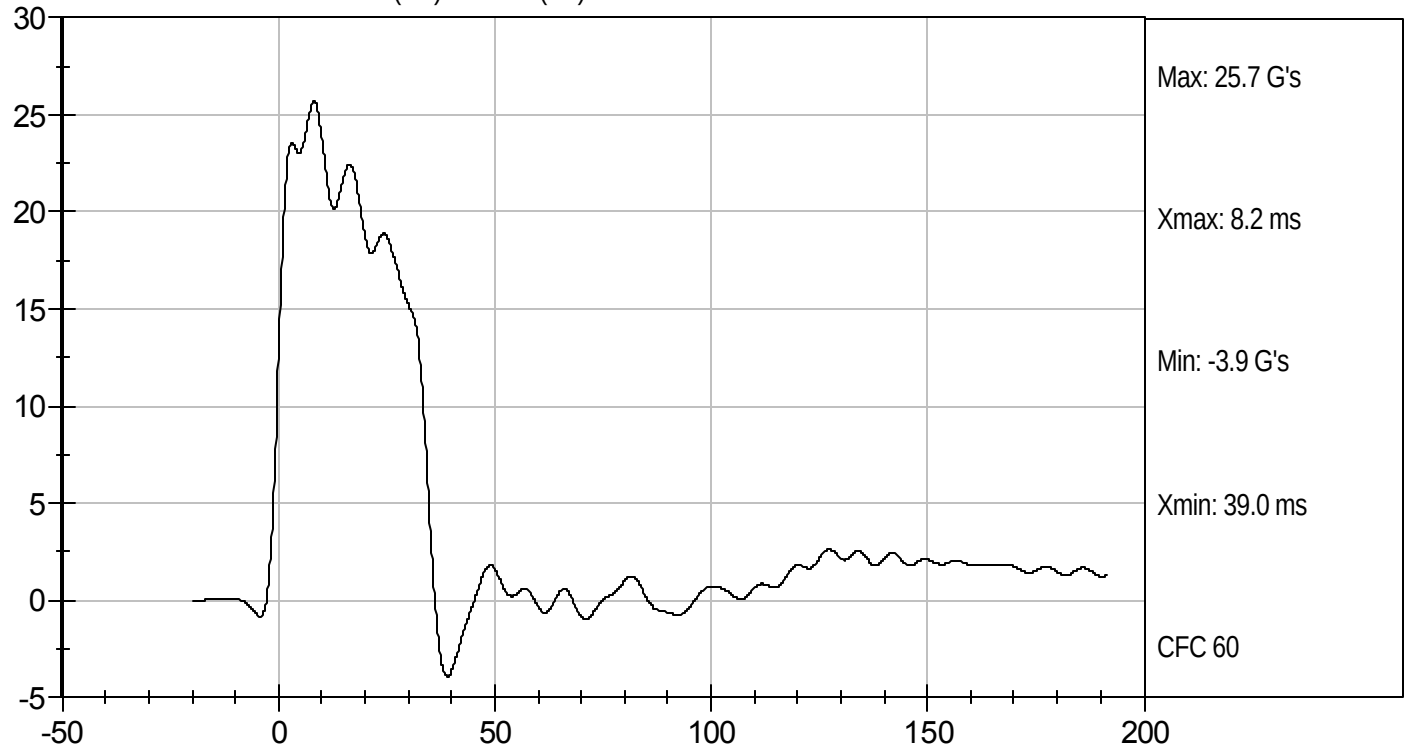
10/1/10
Test Date

David Winkelbauer
Approved By

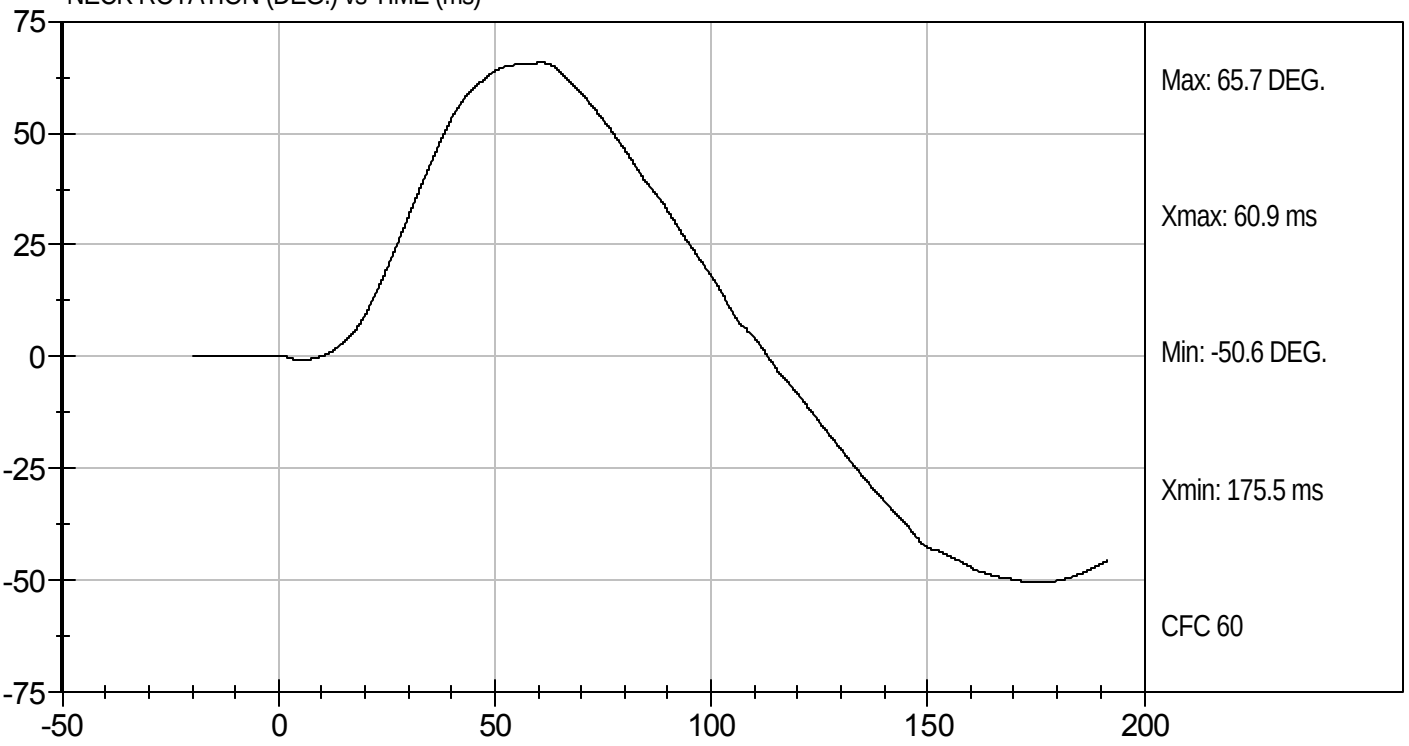
Test Desc: Neck Flexion
Component ID: D103322

Test Date: 10/1/10
Velocity: 23.15 ft/s, 7.06 m/s

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

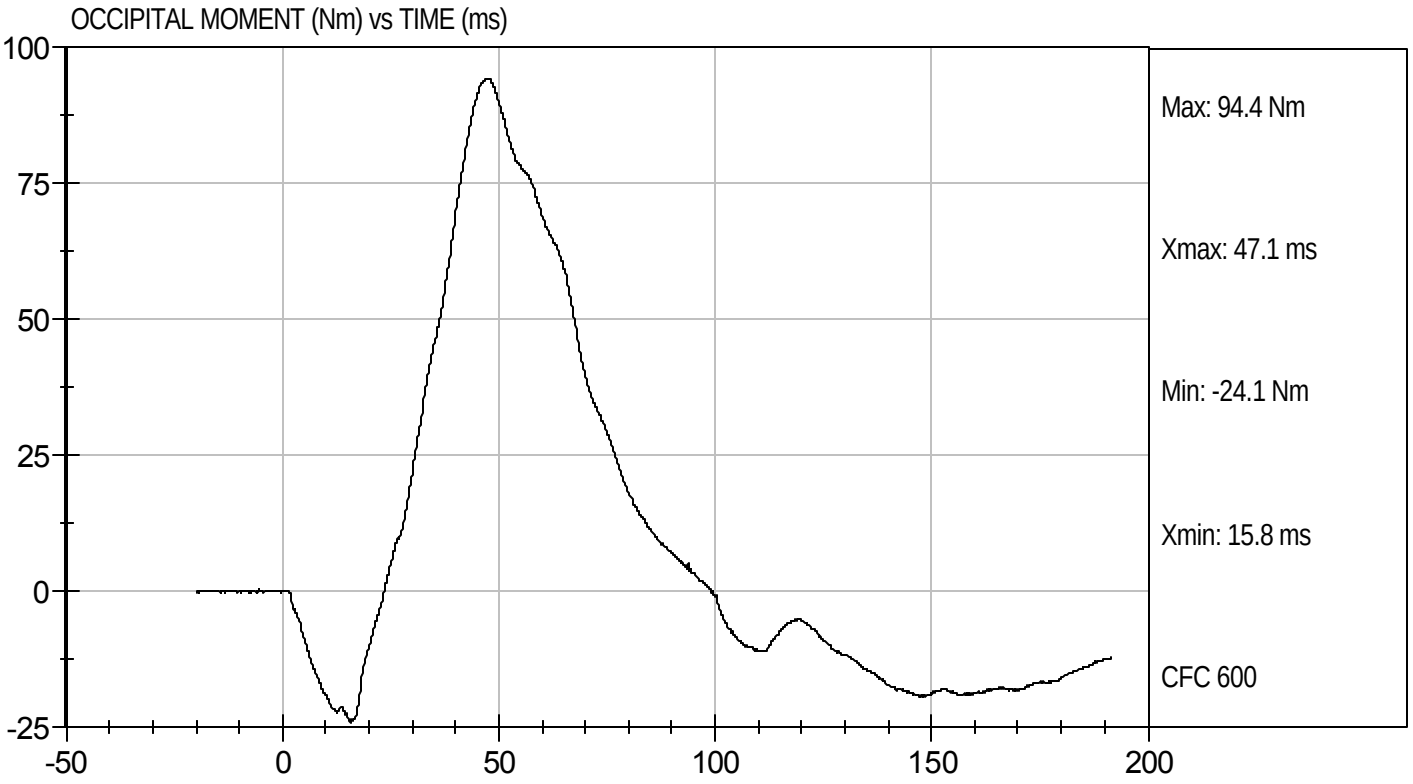



NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D103322

Test Date: 10/1/10
Velocity: 23.15 ft/s, 7.06 m/s



**MGA RESEARCH CORPORATION**

**NECK EXTENSION TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103323

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 44 | Pass |
| Pendulum Velocity | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Deceleration | 10 ms | G's | 17.20 to 21.20 | 20.86 | Pass |
| | 20 ms | G's | 14.00 to 19.00 | 16.51 | Pass |
| | 30 ms | G's | 11.00 to 16.00 | 13.45 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 22.0 | 13.40 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 38.0 to 46.0 | 38.6 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 81.0 to 106.0 | 96.8 | Pass |
| | Time | ms | 72.0 to 82.0 | 76.0 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 147.0 to 174.0 | 153.9 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | -52.9 to -79.9 | -61.2 | Pass |
| | Time | ms | 65.0 to 79.0 | 68.9 | Pass |
| Negative Moment Decay Time To Zero Crossing | | ms | 120.0 to 148.0 | 140.2 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

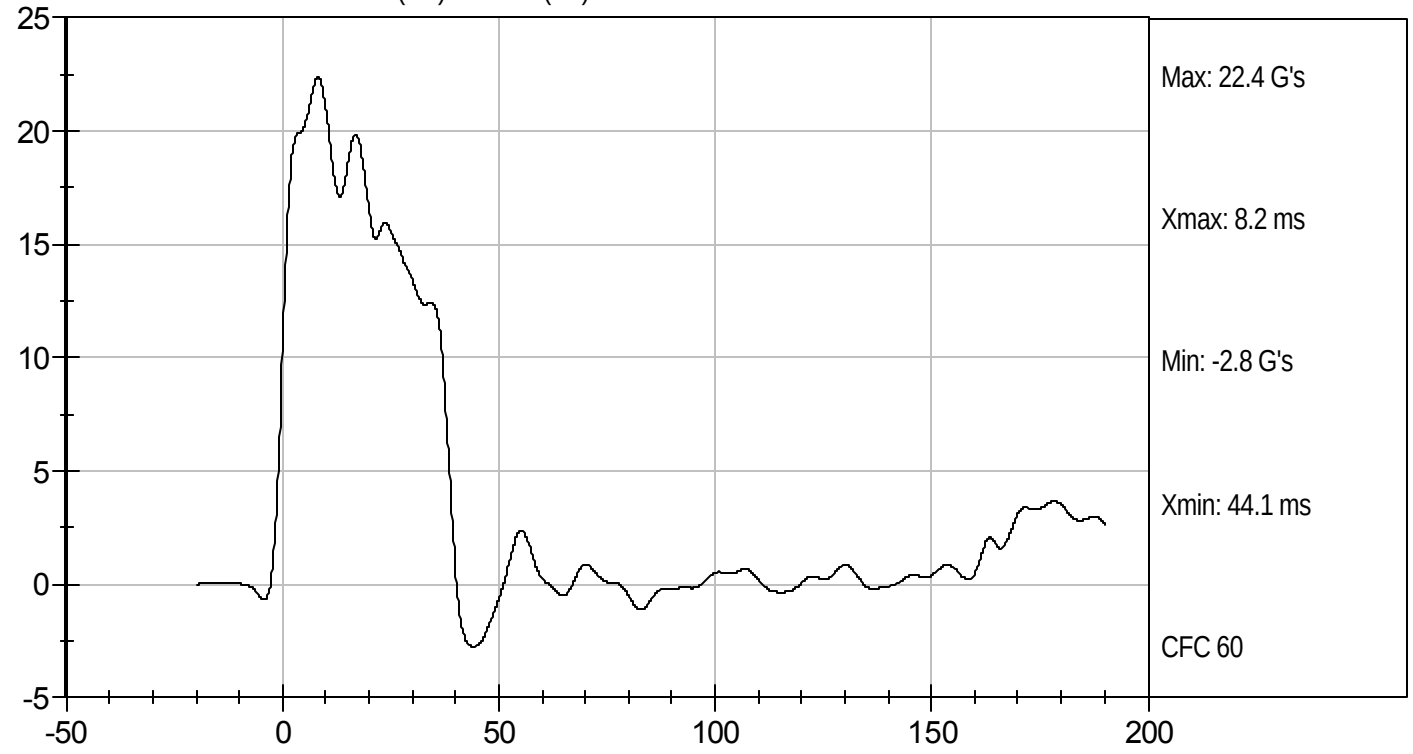
10/1/10
Test Date

David Winkelbauer
Approved By

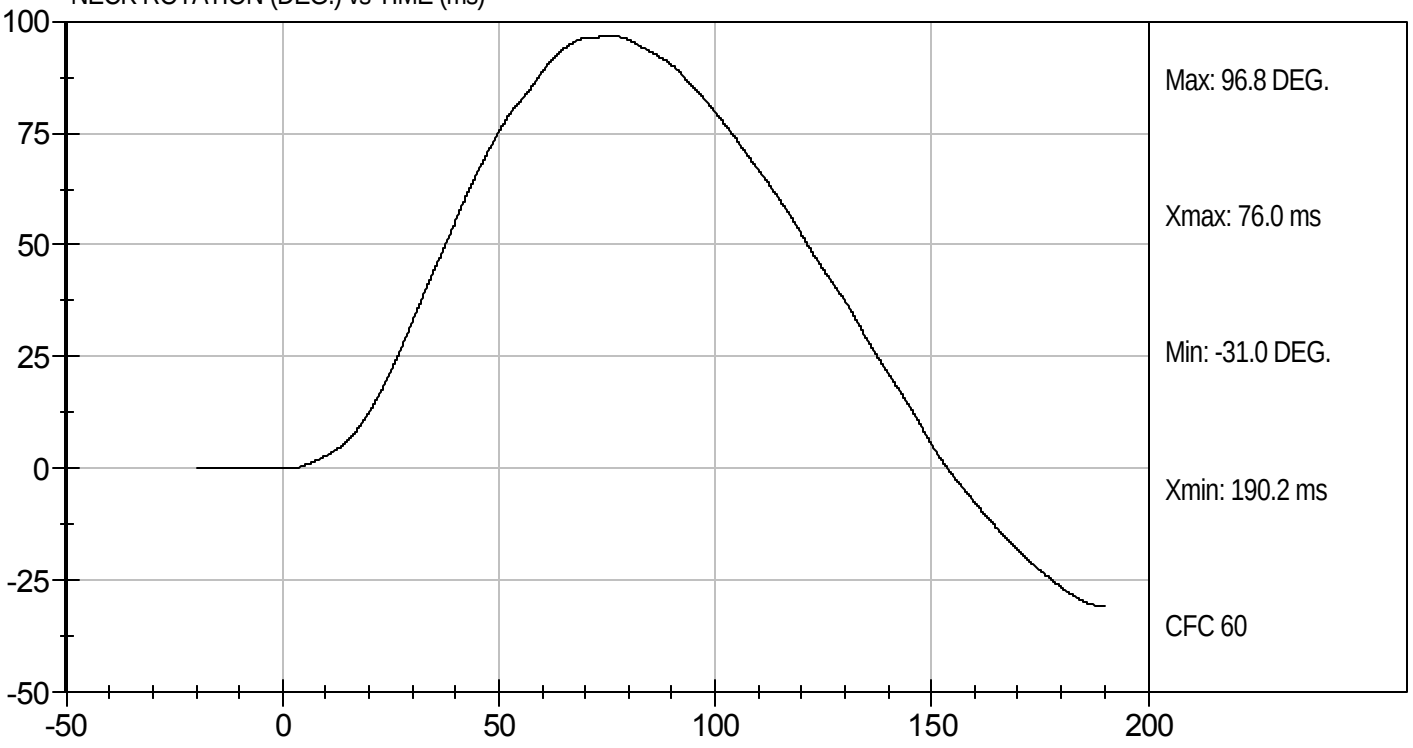
Test Desc: Neck Extension
Component ID: D103323

Test Date: 10/1/10
Velocity: 20.08 ft/s, 6.12 m/s

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

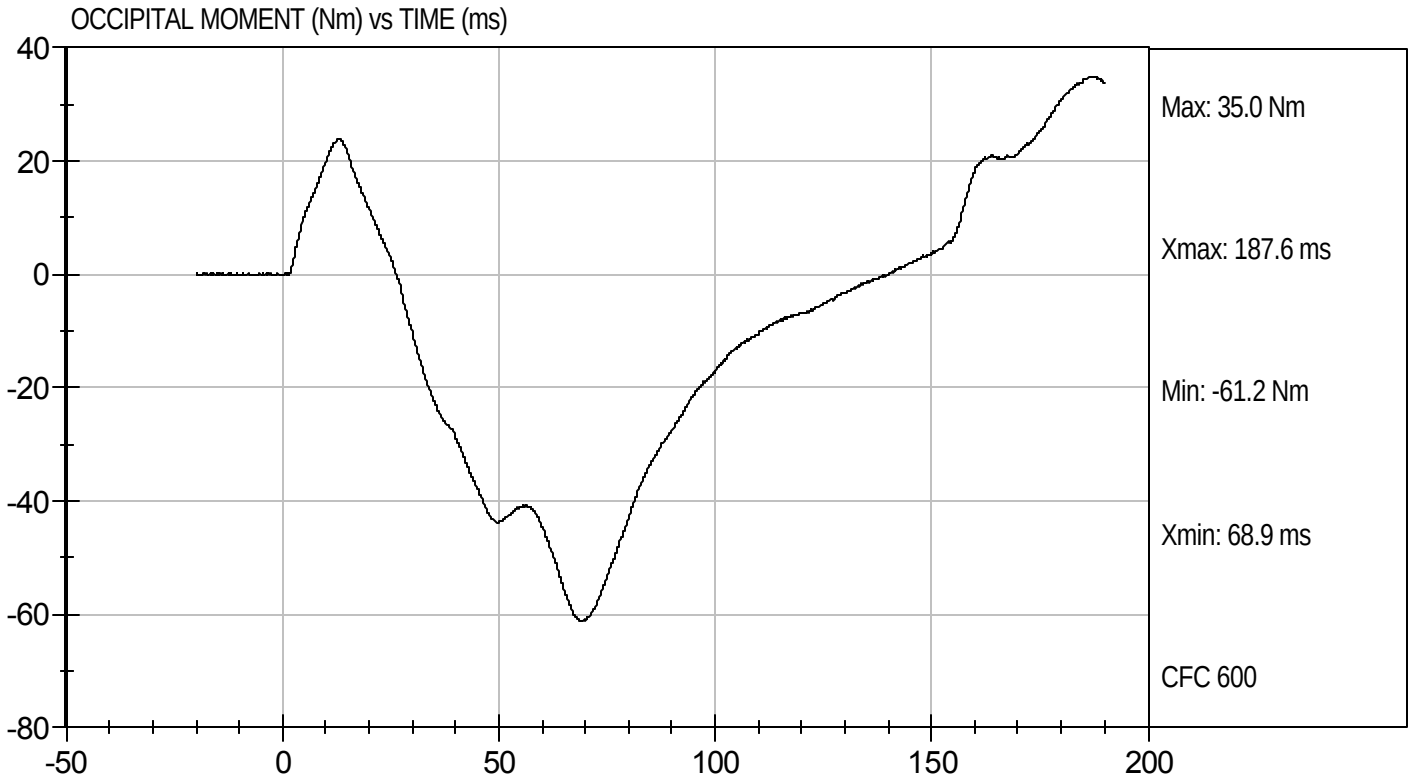



NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D103323

Test Date: 10/1/10
Velocity: 20.08 ft/s, 6.12 m/s



**MGA RESEARCH CORPORATION**

**THORAX IMPACT**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103324

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 36 | Pass |
| Probe Velocity | m/s | 6.58 to 6.82 | 6.77 | Pass |
| Peak Probe Force | N | 5159 to 5893 | 5,356 | Pass |
| Peak Sternum Displacement | cm | 6.35 to 7.26 | 6.55 | Pass |
| Internal Hysteresis | % | 69 to 85 | 70 | Pass |
| | | Overall Test Results | | Pass |

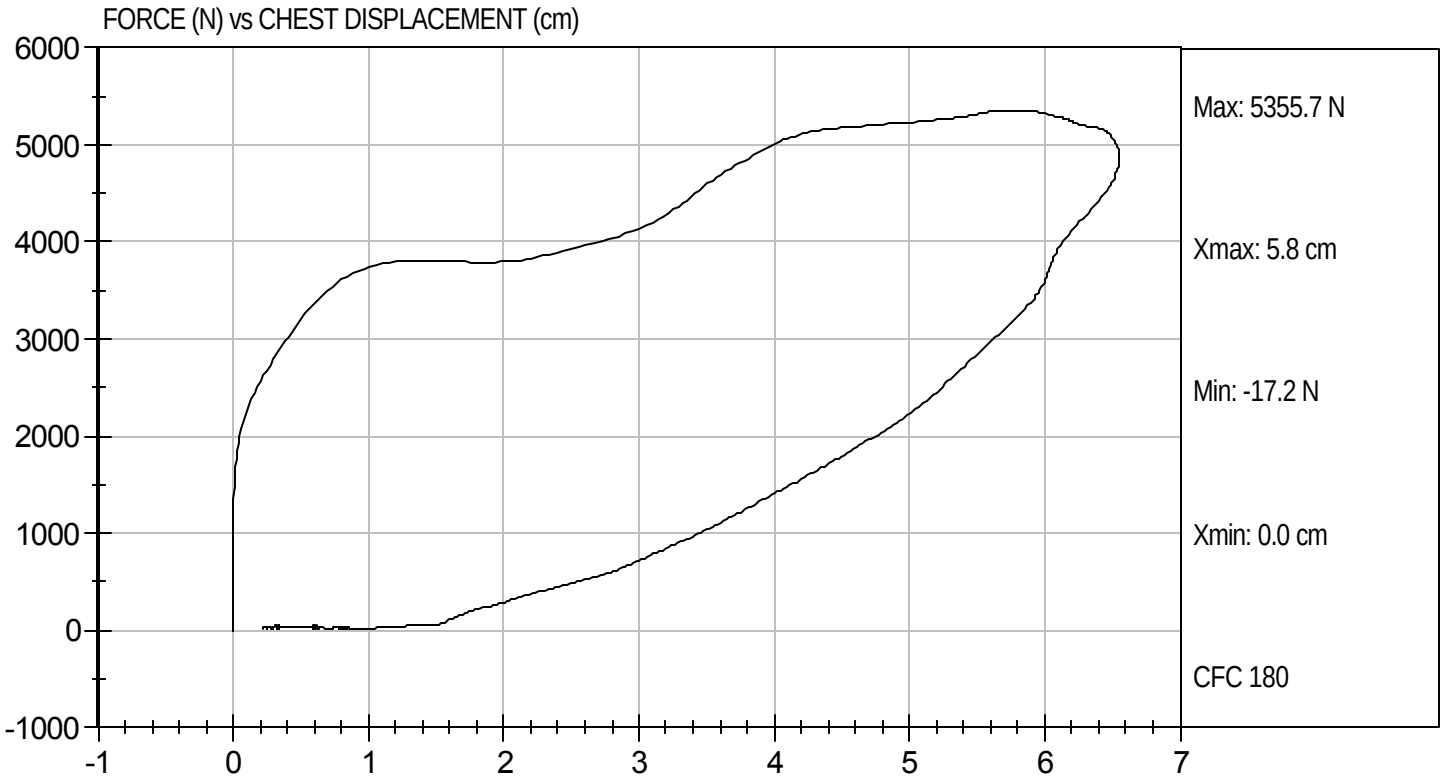
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D103324

Test Date: 10/1/10
Velocity: 22.22 ft/s, 6.77 m/s



**MGA RESEARCH CORPORATION**

**RIGHT KNEE IMPACT TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103325

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 21.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 37 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.11 | Pass |
| Peak Probe Force | Newtons | 4715 to 5782 | 5,266 | Pass |
| | | Overall Test Results | | Pass |

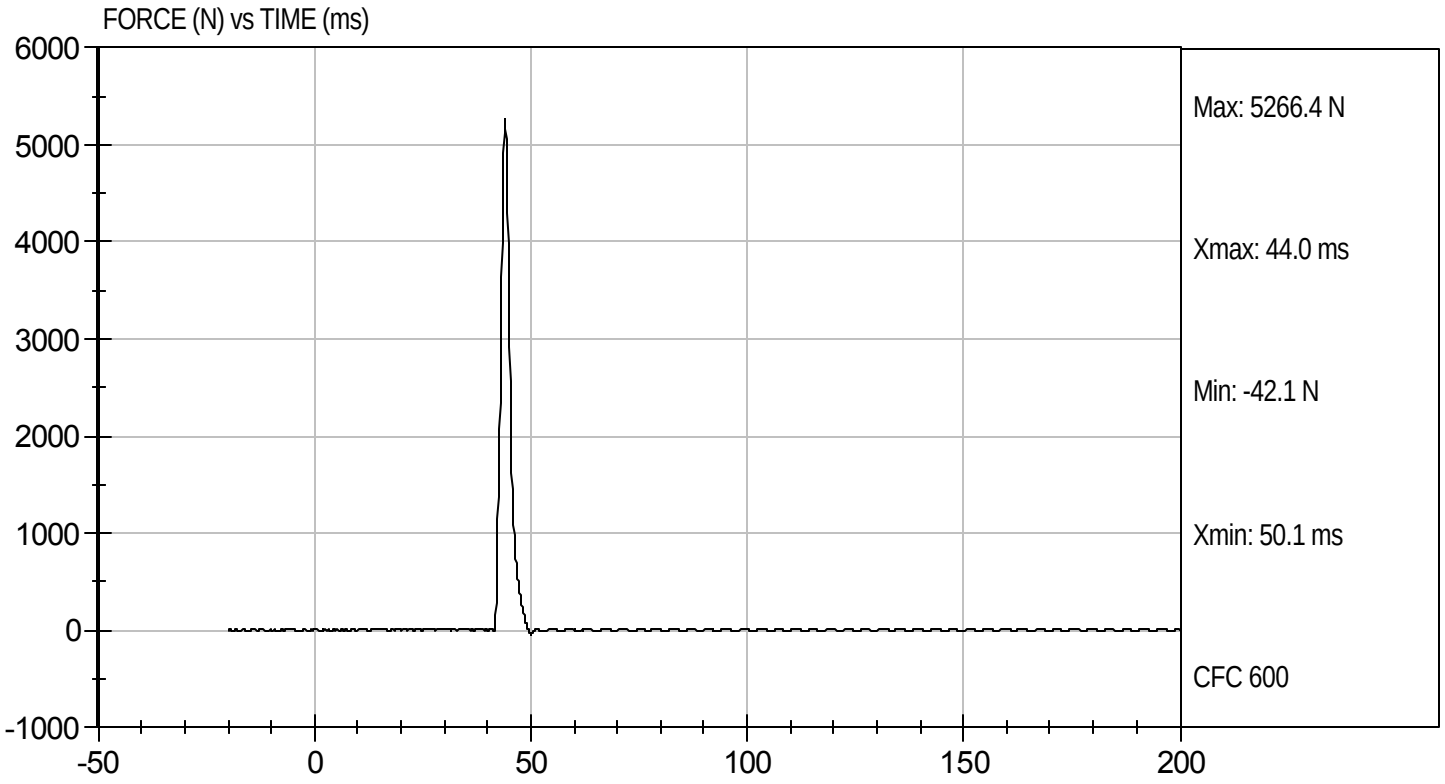
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D103325

Test Date: 10/1/10
Velocity: 6.92 ft/s, 2.11 m/s



**MGA RESEARCH CORPORATION**

**LEFT KNEE IMPACT TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103326

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 21.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 37 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.08 | Pass |
| Peak Probe Force | Newtons | 4715 to 5782 | 5,396 | Pass |
| | | Overall Test Results | | Pass |

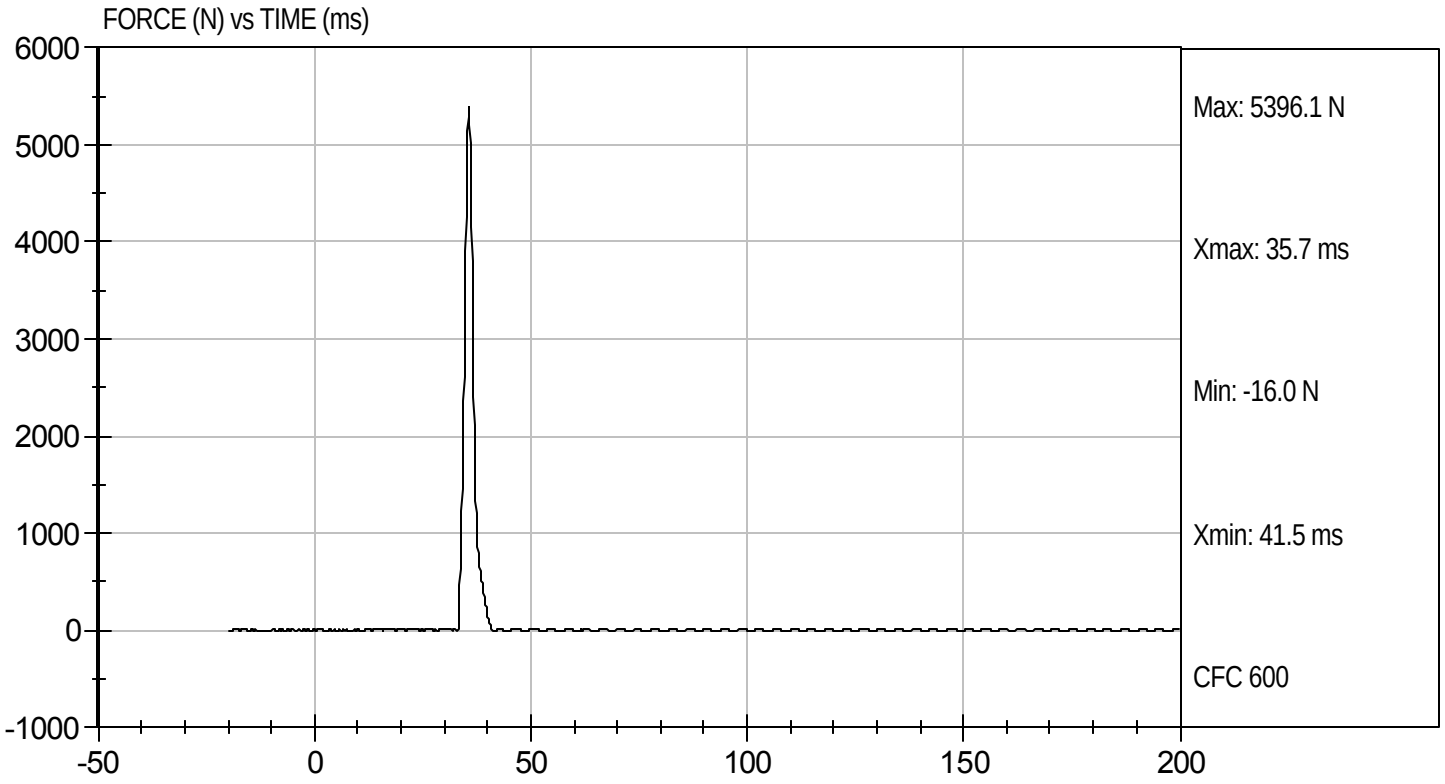
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D103326

Test Date: 10/1/10
Velocity: 6.83 ft/s, 2.08 m/s



**MGA RESEARCH CORPORATION**

**HIP-FEMUR FLEXION TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103320

| Tested Parameter | Units | Specification | Result | | Pass/Fail |
|---|---|---|---|---|---|
| | | | Right | Left | |
| Laboratory Temperature | deg C | 18.9 to 25.6 | 22.0 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 38 | 38 | Pass |
| Rotation Rate | deg/s | 5 -10 | 8 | 8 | Pass |
| 30 Degrees | Nm | 94.9 Nm Max | 55.8 | 44.1 | Pass |
| 150 ft-lbf / 203.4 Nm | Deg | 40- 50 Degree Max Rotation | 46 | 49 | Pass |
| | | Overall Test Results | | | Pass |

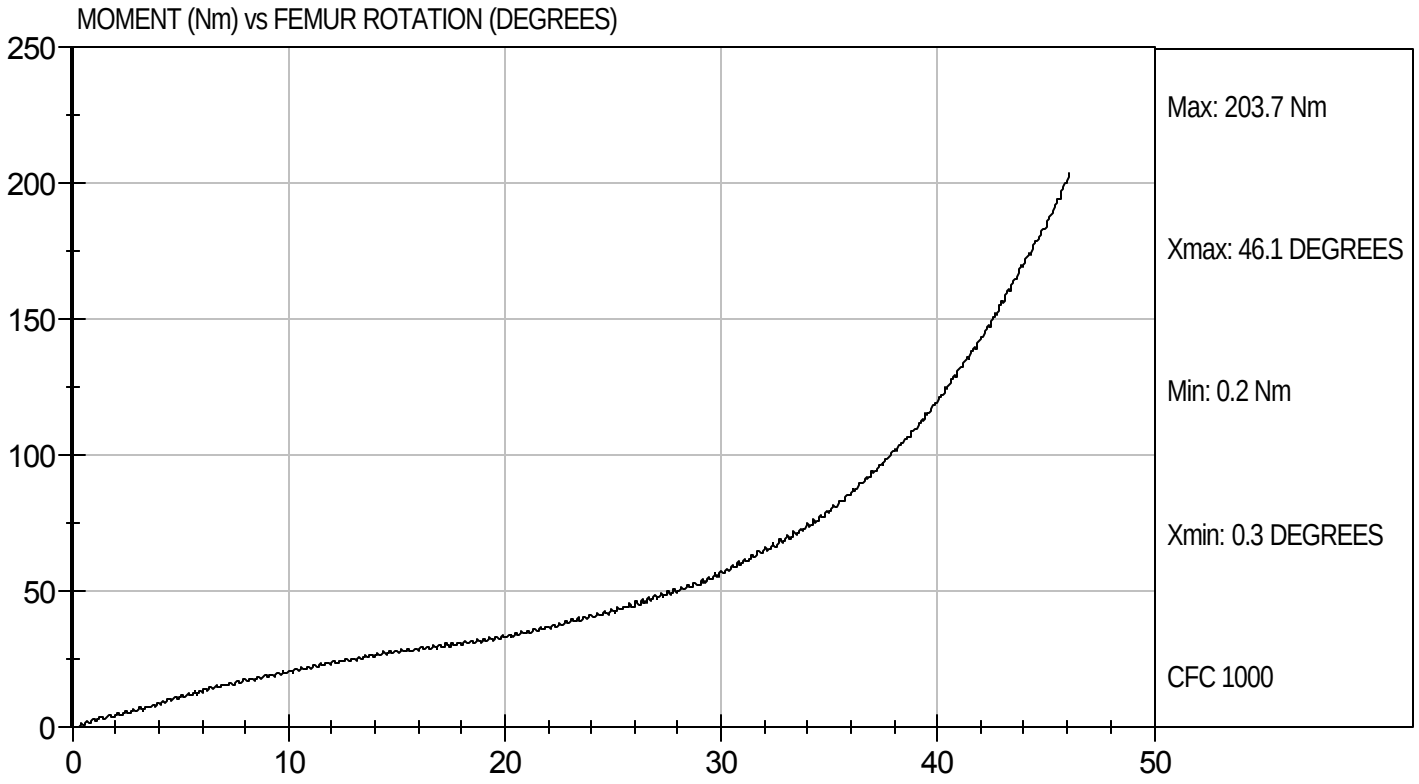
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

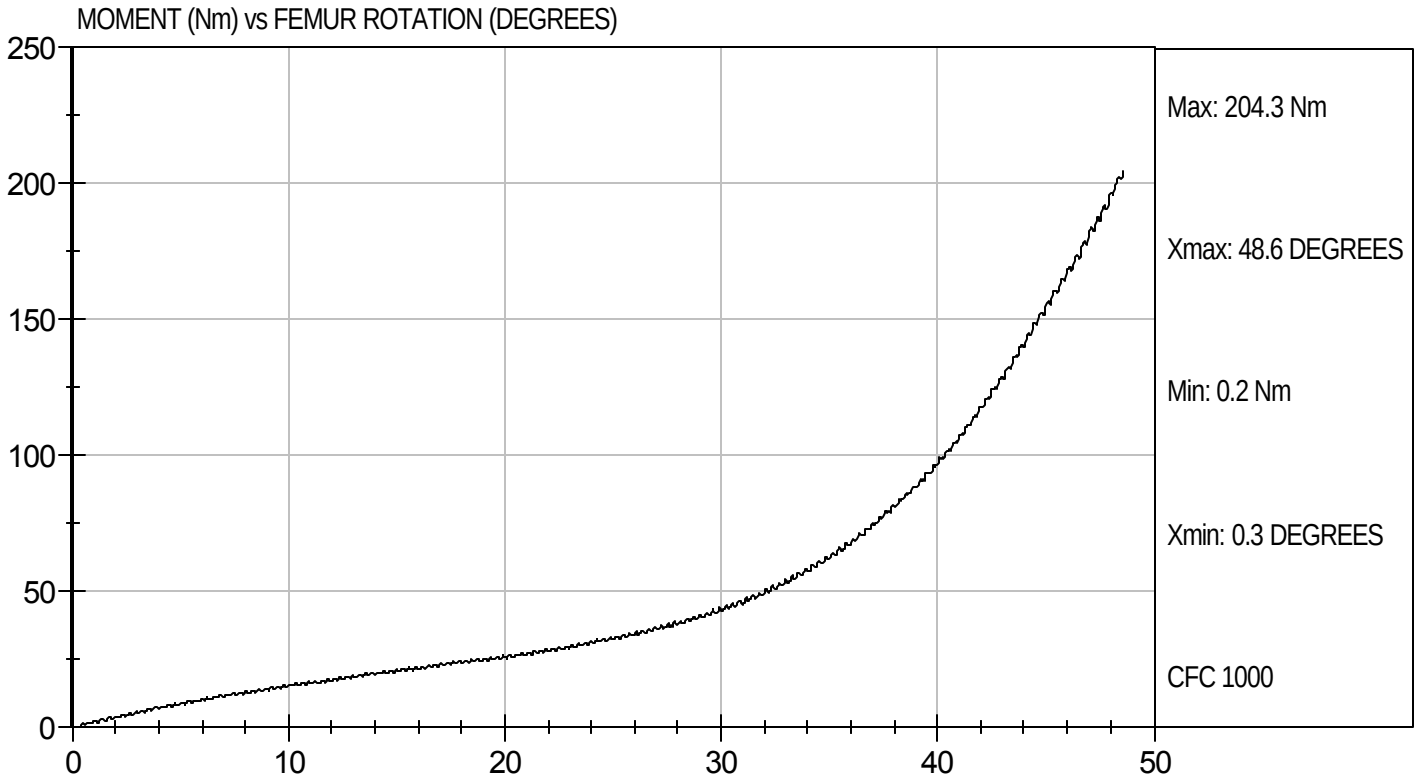
Test Desc: Hip Femur Flexion
Component ID: D103329

Test Date: 10/1/10
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D103320

Test Date: 10/1/10
Velocity: 0 ft/s, 0.00 m/s



**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test ID:** D103541

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.6 | 21.3 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 32 | Pass |
| Peak Resultant Acceleration | G's | 225 - 275 | 275 | Pass |
| Peak Lateral Acceleration | G's | <= +/- 15.0 | -5.4 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

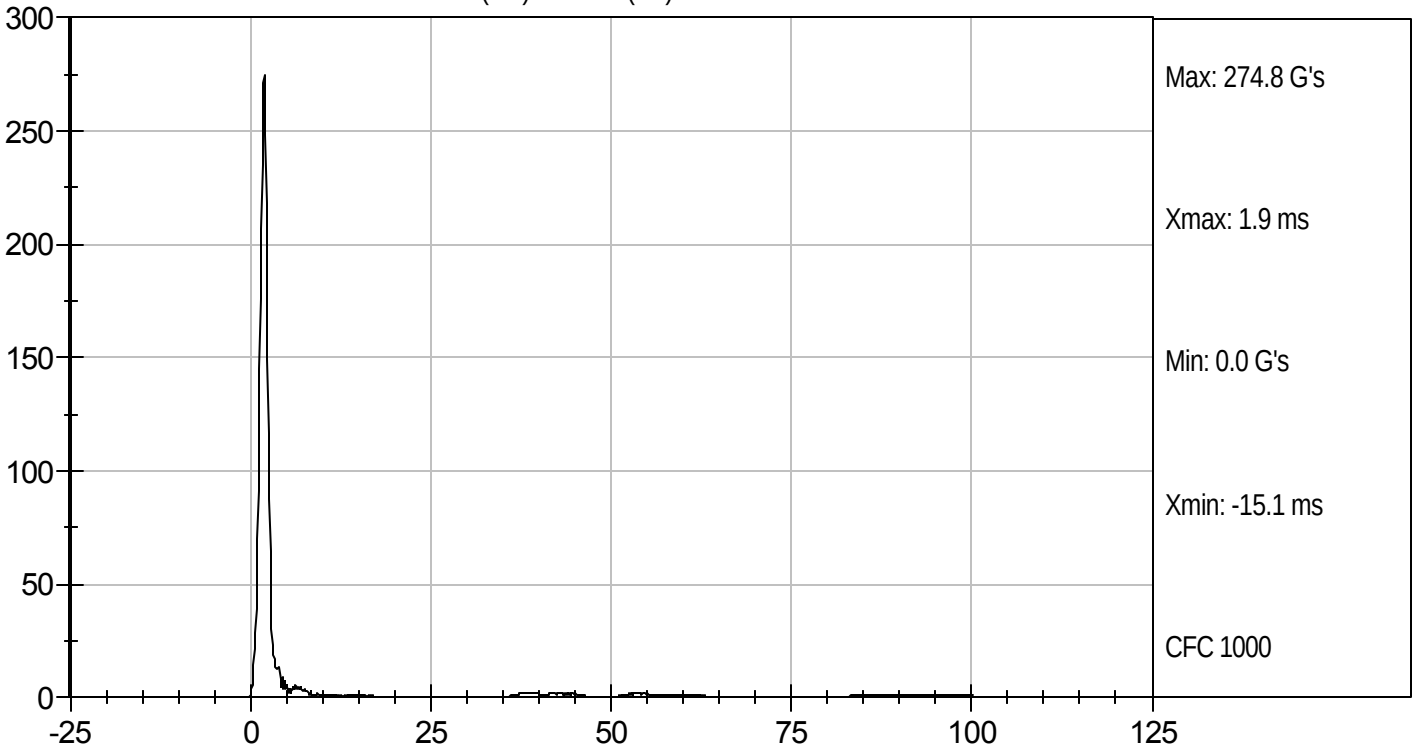
10/18/10
Test Date

David Winkelbauer
Approved By

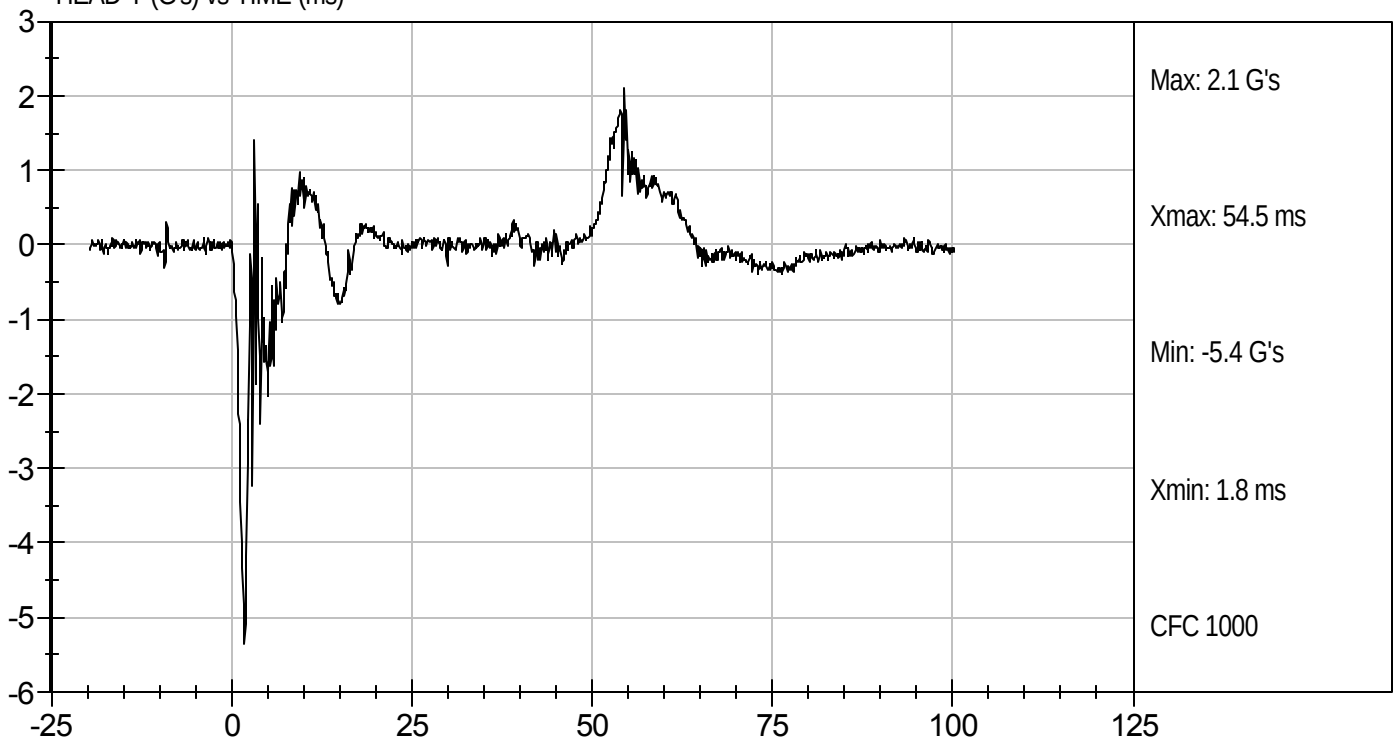
Test Desc: Head Drop
Component ID: D103541

Test Date: 10/18/10
Velocity: 0 ft/s, 0.00 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:** 351 **Test I.D:** D103542

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 32 | Pass |
| Pendulum Velocity | | m/s | 6.89 to 7.13 | 6.95 | Pass |
| Pendulum Deceleration | 10 ms | G's | 22.50 to 27.50 | 22.65 | Pass |
| | 20 ms | G's | 17.60 to 22.60 | 18.41 | Pass |
| | 30 ms | G's | 12.50 to 18.50 | 13.62 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 29.0 | 13.92 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 34.0 to 42.0 | 37.7 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 64.0 to 78.0 | 69.0 | Pass |
| | Time | ms | 57.0 to 64.0 | 57.7 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 113.0 to 128.0 | 113.6 | Pass |
| Moment About Occipital Condyle | Maximum | N m | 88.1 to 108.5 | 94.1 | Pass |
| | Time | ms | 47.0 to 58.0 | 50.3 | Pass |
| Positive Moment Decay Time To Zero Crossing | | ms | 97.0 to 107.0 | 100.9 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

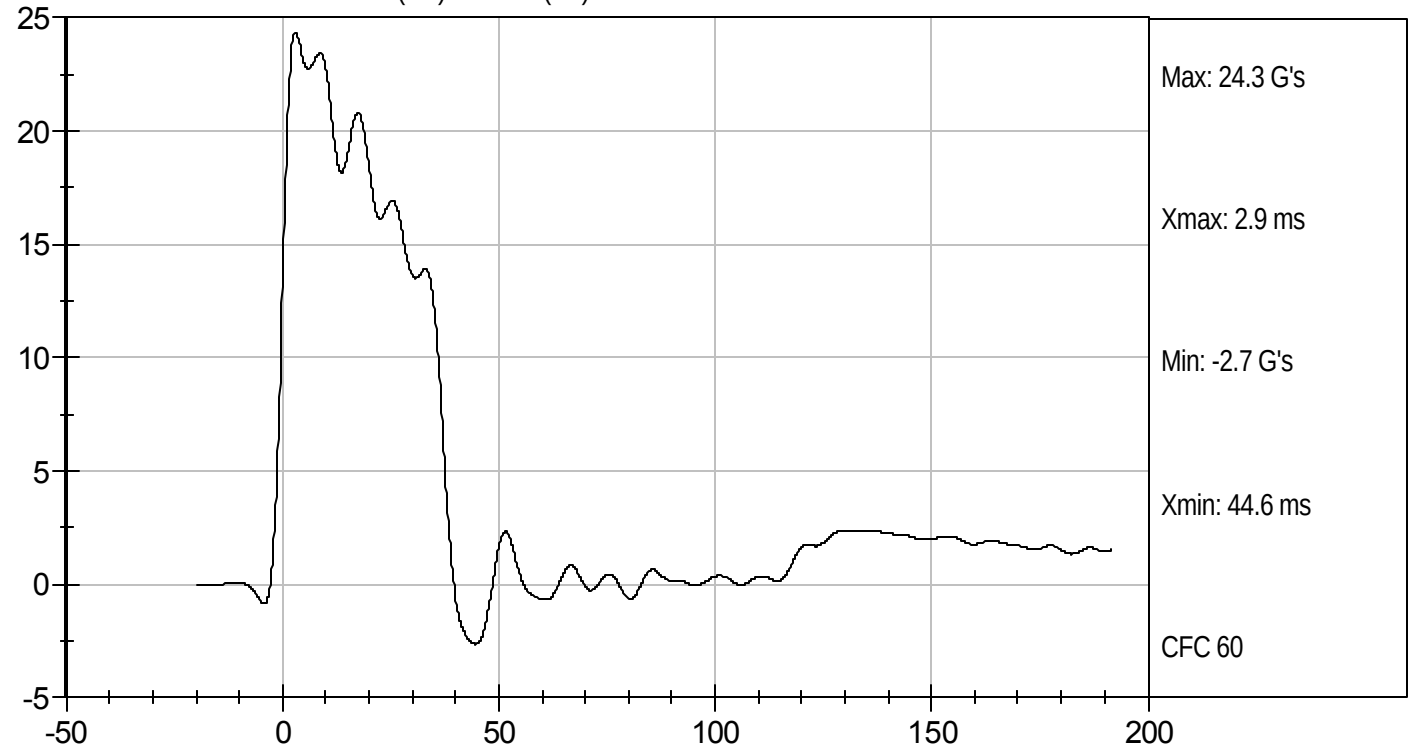
10/19/10
Test Date

David Winkelbauer
Approved By

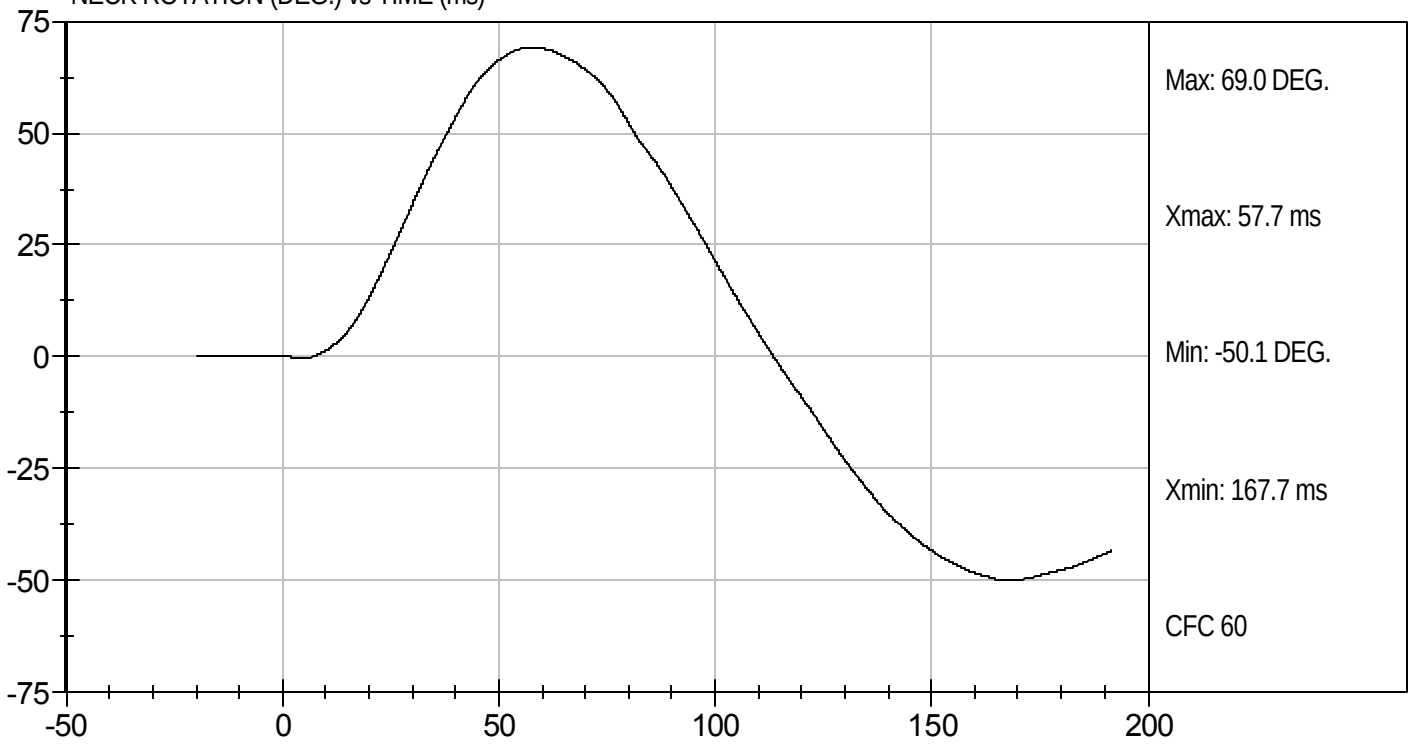
Test Desc: Neck Flexion
Component ID: D103542

Test Date: 10/19/10
Velocity: 22.8 ft/s, 6.95 m/s

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

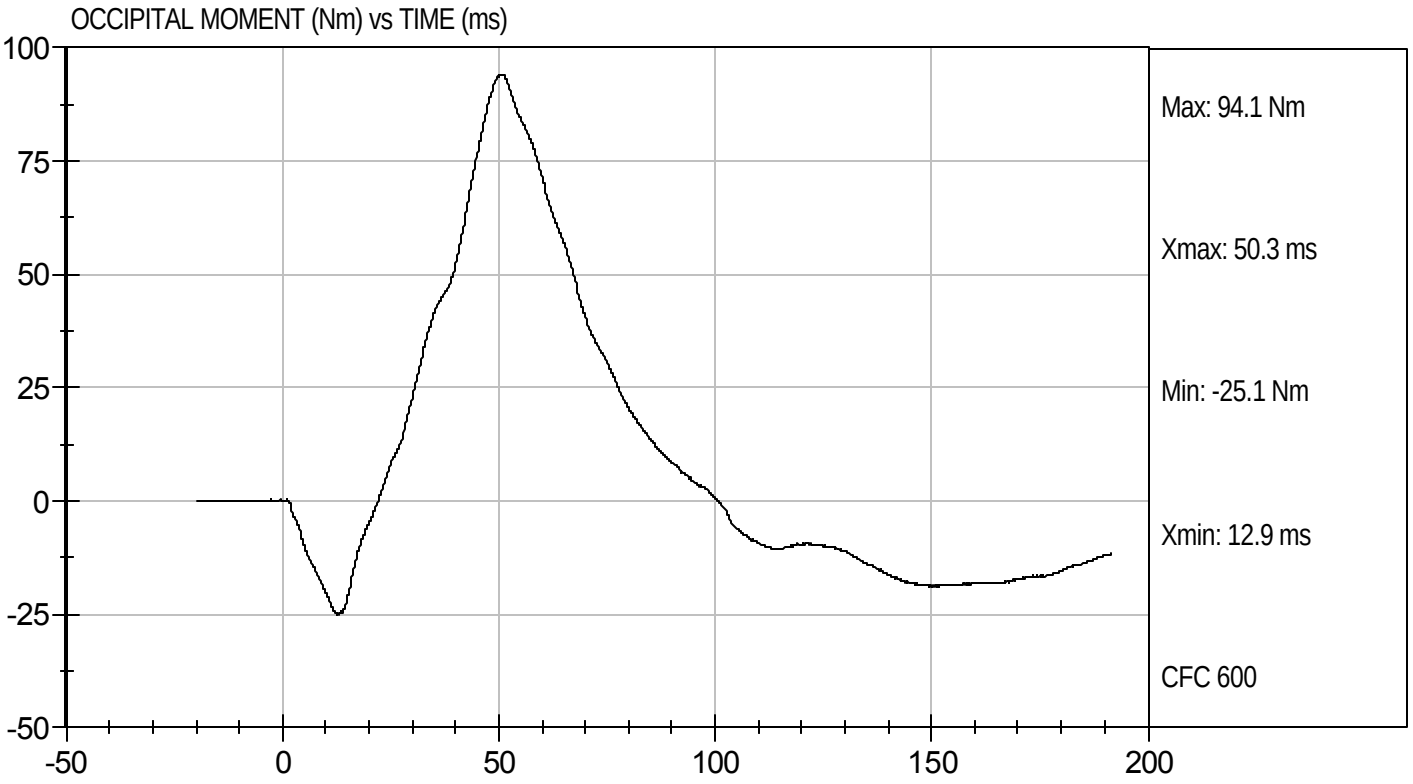



NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D103542

Test Date: 10/19/10
Velocity: 22.8 ft/s, 6.95 m/s



**MGA RESEARCH CORPORATION**

**NECK EXTENSION TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103543

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 32 | Pass |
| Pendulum Velocity | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Deceleration | 10 ms | G's | 17.20 to 21.20 | 17.89 | Pass |
| | 20 ms | G's | 14.00 to 19.00 | 14.84 | Pass |
| | 30 ms | G's | 11.00 to 16.00 | 11.95 | Pass |
| Peak Pendulum Deceleration After 30 ms | | G's | <= 22.0 | 12.17 | Pass |
| Deceleration Decay Time to Cross 5 G's | | ms | 38.0 to 46.0 | 43.5 | Pass |
| Maximum "D" Plane Rotation | Maximum | Degrees | 81.0 to 106.0 | 97.3 | Pass |
| | Time | ms | 72.0 to 82.0 | 80.0 | Pass |
| "D" Plane Rotation Decay Time To Zero Crossing | | ms | 147.0 to 174.0 | 156.9 | Pass |
| Moment About Occipital Condyle | Maximum | Nm | -52.9 to -79.9 | -60.6 | Pass |
| | Time | ms | 65.0 to 79.0 | 74.7 | Pass |
| Negative Moment Decay Time To Zero Crossing | | ms | 120.0 to 148.0 | 146.9 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

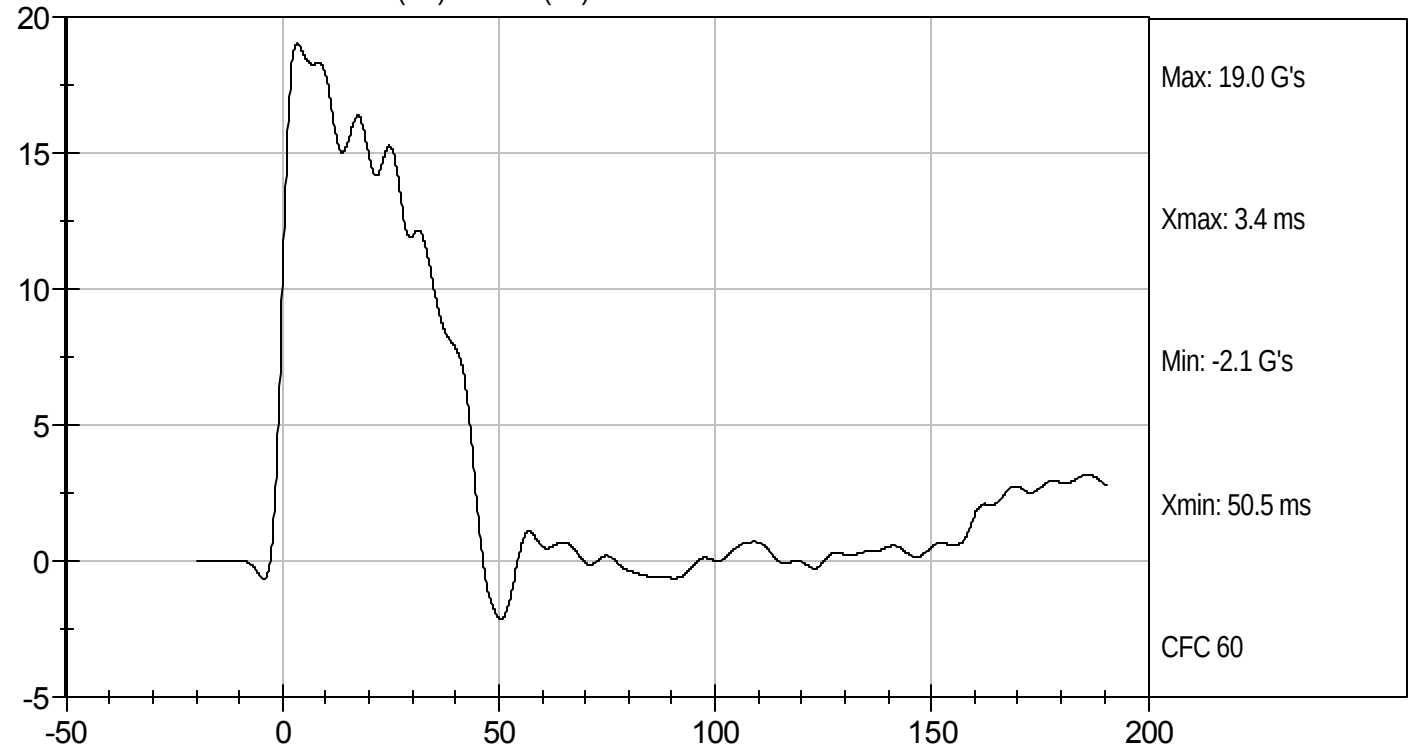
10/19/10
Test Date

David Winkelbauer
Approved By

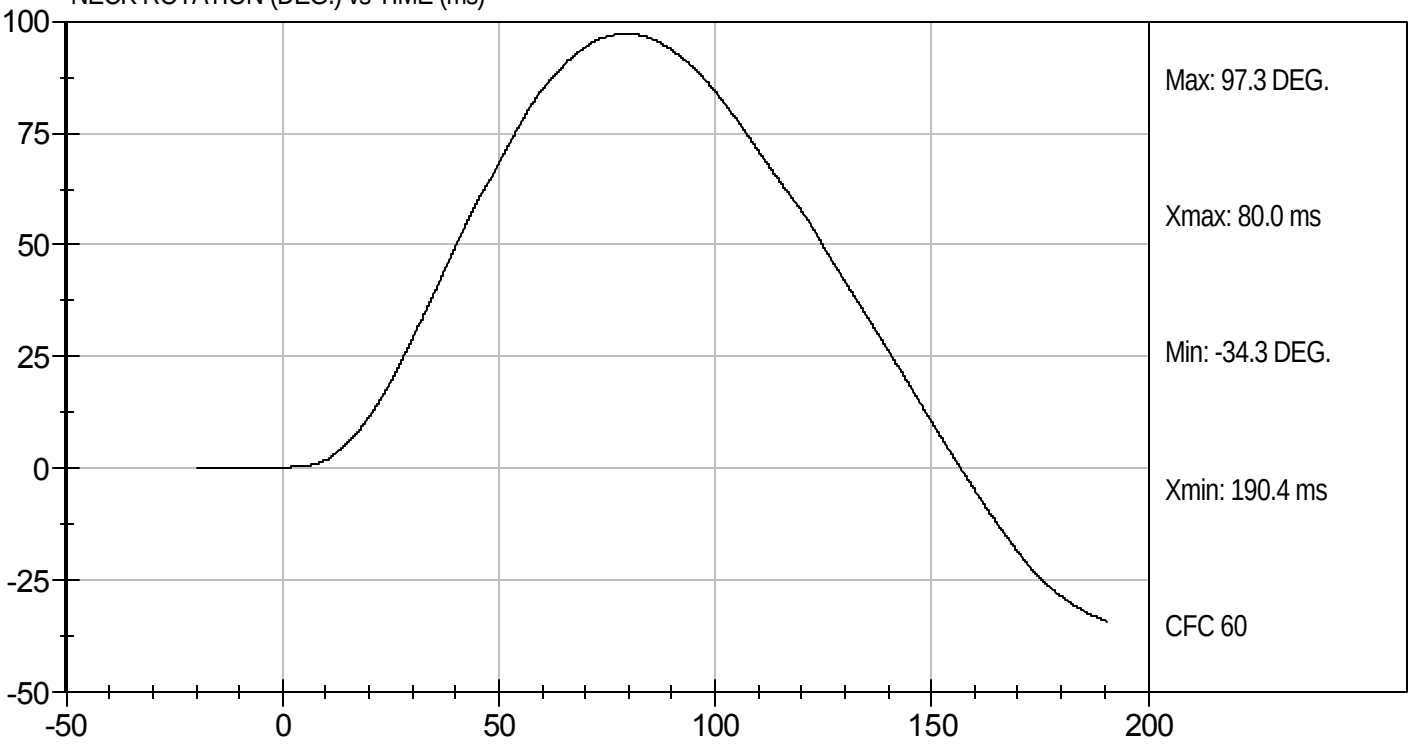
Test Desc: Neck Extension
Component ID: D103543

Test Date: 10/19/10
Velocity: 20.08 ft/s, 6.12 m/s

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

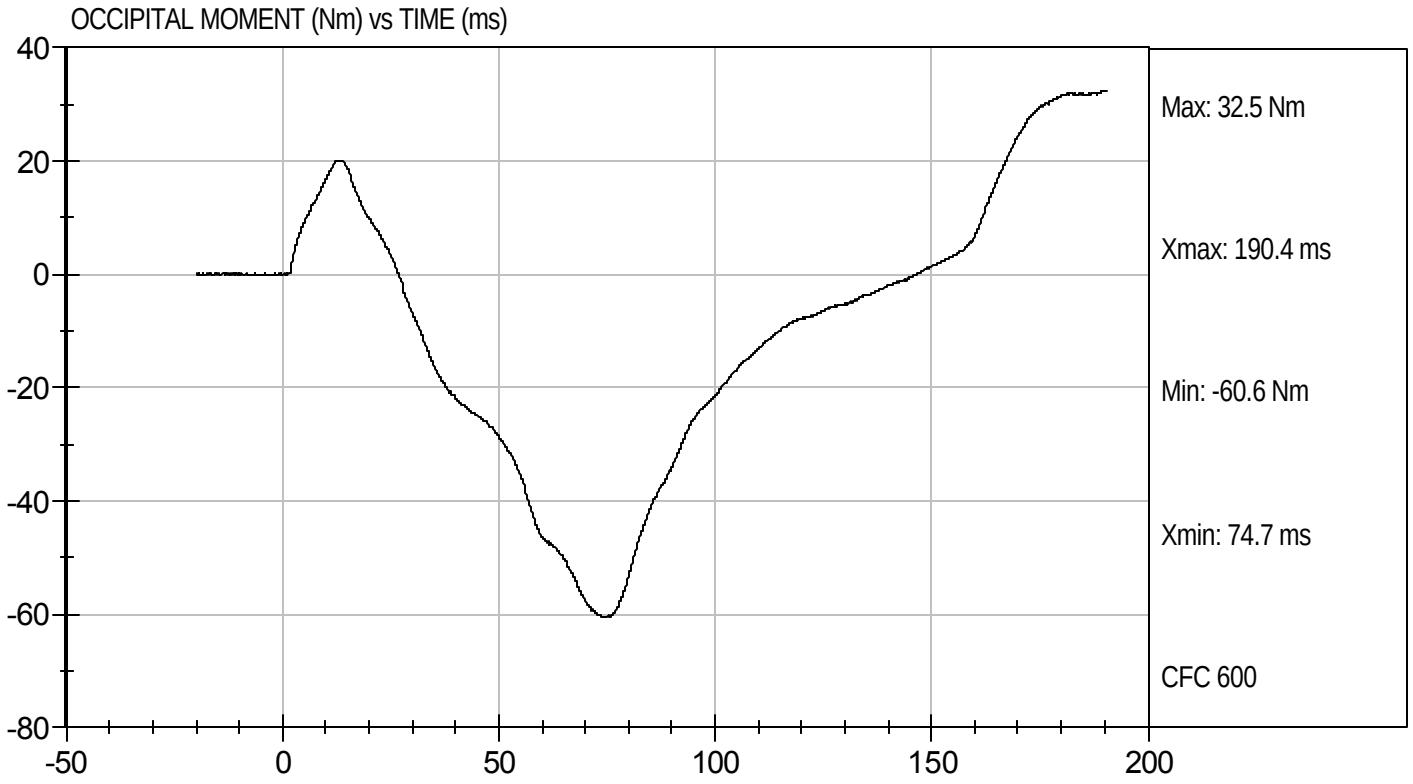



NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D103543

Test Date: 10/19/10
Velocity: 20.08 ft/s, 6.12 m/s



**MGA RESEARCH CORPORATION**

**THORAX IMPACT**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103544

| 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 | 33 | Pass |
| Probe Velocity | m/s | 6.58 to 6.82 | 6.68 | Pass |
| Peak Probe Force | N | 5159 to 5893 | 5,251 | Pass |
| Peak Sternum Displacement | cm | 6.35 to 7.26 | 6.56 | Pass |
| Internal Hysteresis | % | 69 to 85 | 71 | Pass |
| | | Overall Test Results | | Pass |

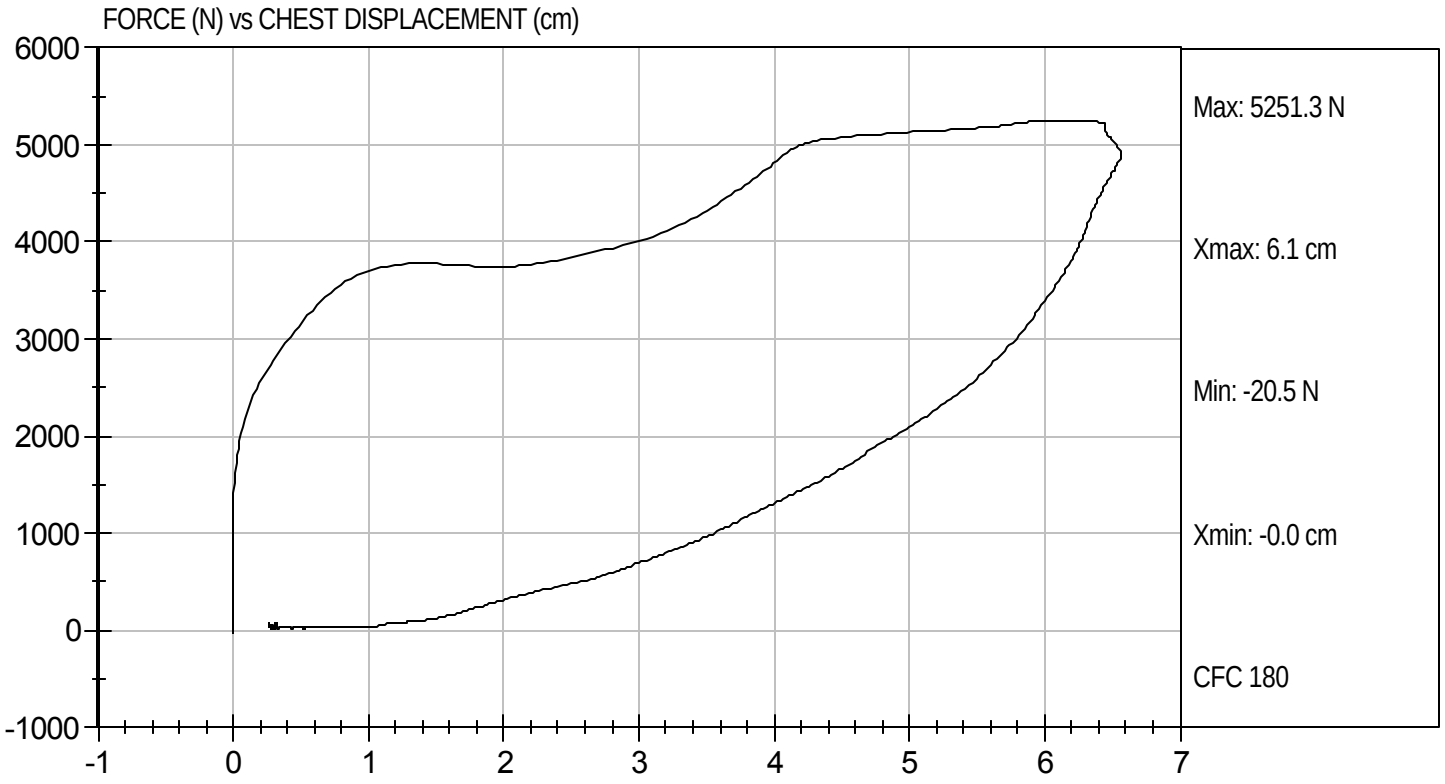
Jessica Gall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D103544

Test Date: 10/18/10
Velocity: 21.93 ft/s, 6.68 m/s



**MGA RESEARCH CORPORATION**

**RIGHT KNEE IMPACT TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103545

| 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 | 32 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.11 | Pass |
| Peak Probe Force | Newtons | 4715 to 5782 | 5,238 | Pass |
| | | Overall Test Results | | Pass |

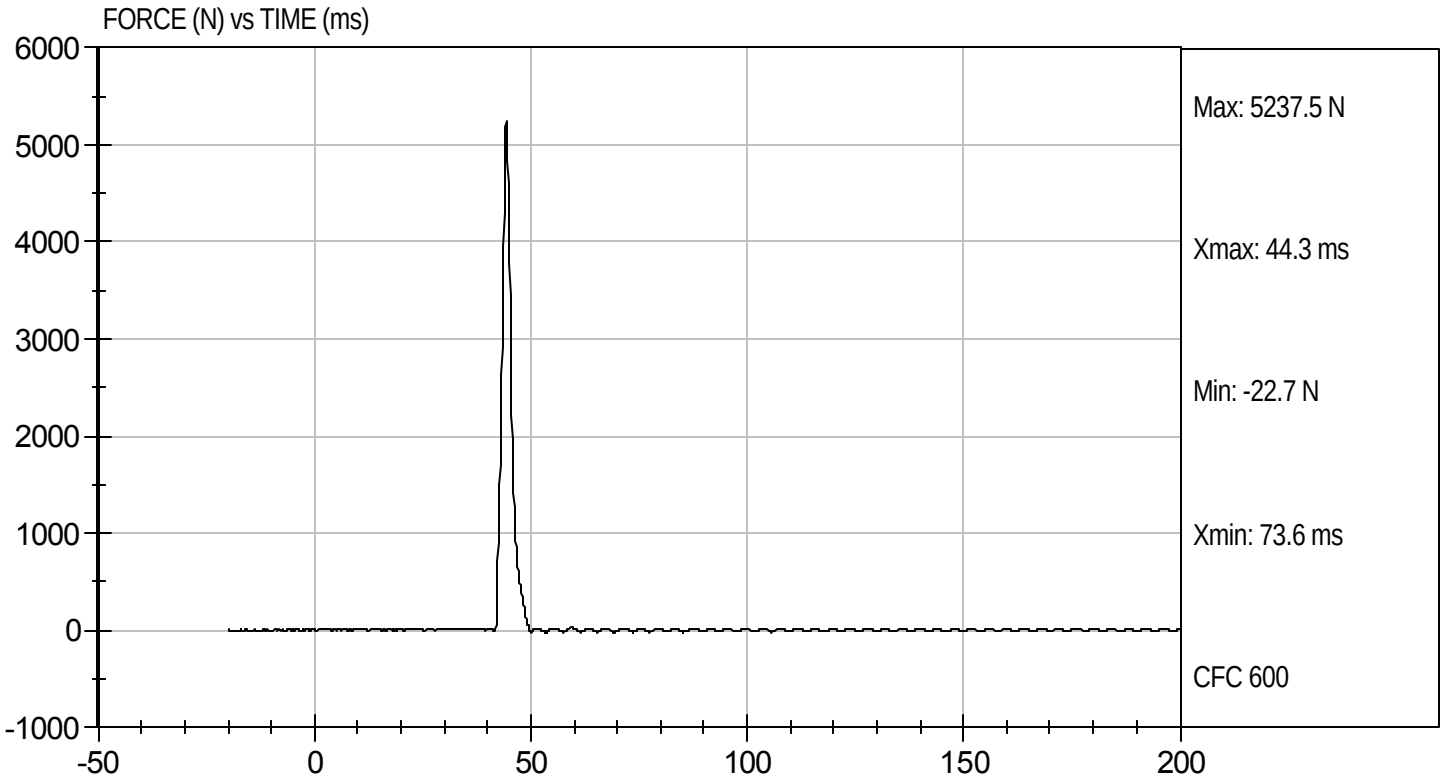
Jessica Gall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D103545

Test Date: 10/18/10
Velocity: 6.92 ft/s, 2.11 m/s



**MGA RESEARCH CORPORATION**

**LEFT KNEE IMPACT TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103546

| 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 | 32 | Pass |
| Probe Velocity | m/s | 2.07 to 2.13 | 2.07 | Pass |
| Peak Probe Force | Newtons | 4715 to 5782 | 5,320 | Pass |
| | | Overall Test Results | | Pass |

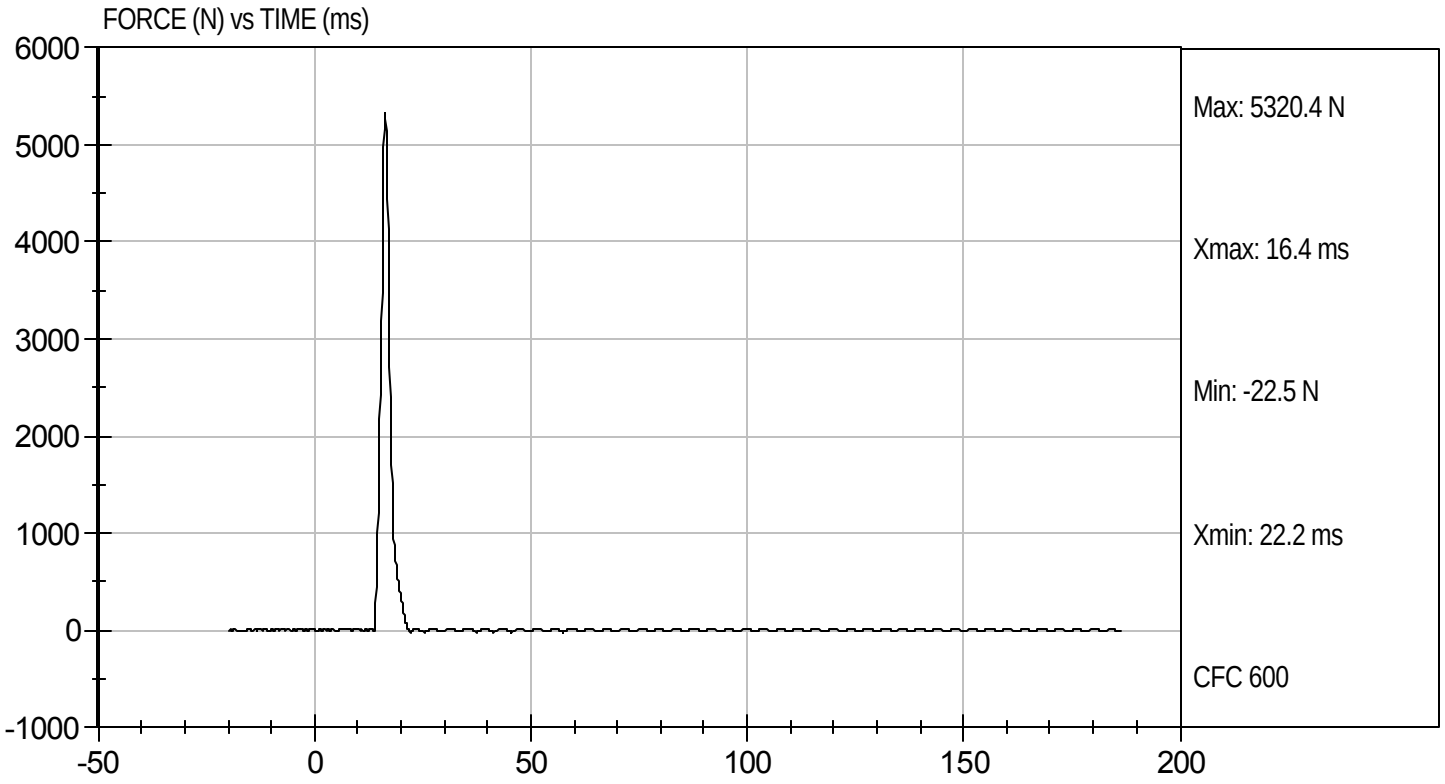
Jessica Gall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D103546

Test Date: 10/18/10
Velocity: 6.80 ft/s, 2.07 m/s



**MGA RESEARCH CORPORATION**

**HIP-FEMUR FLEXION TEST**

**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351 **Test I.D:** D103540

| Tested Parameter | Units | Specification | Result | | Pass/Fail |
|---|---|---|---|---|---|
| | | | Right | Left | |
| Laboratory Temperature | deg C | 18.9 to 25.6 | 20.9 | 20.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 32 | 32 | Pass |
| Rotation Rate | deg/s | 5 -10 | 8 | 8 | Pass |
| 30 Degrees | Nm | 94.9 Nm Max | 44.7 | 48.1 | Pass |
| 150 ft-lbf / 203.4 Nm | Deg | 40- 50 Degree Max Rotation | 47 | 48 | Pass |
| | | Overall Test Results | | | Pass |

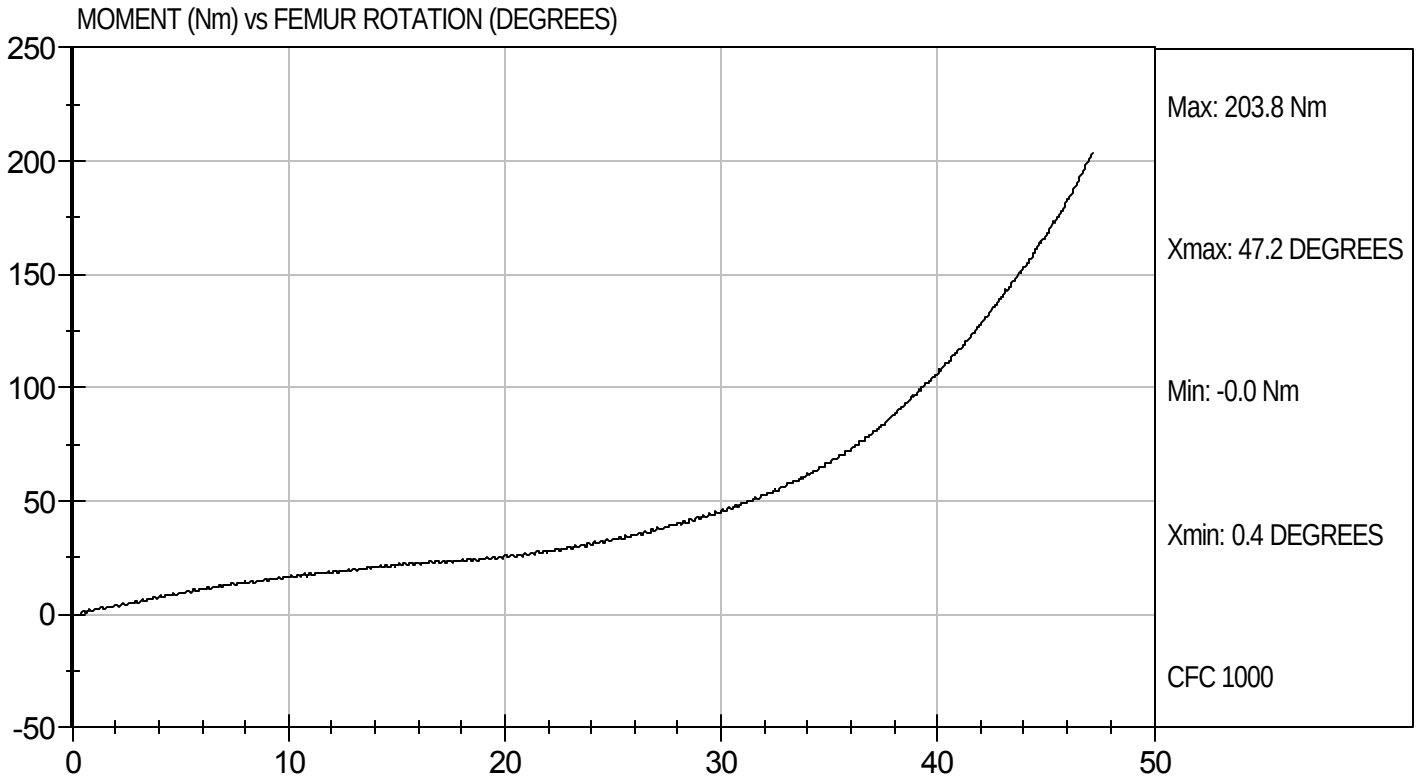
Jessica Hall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

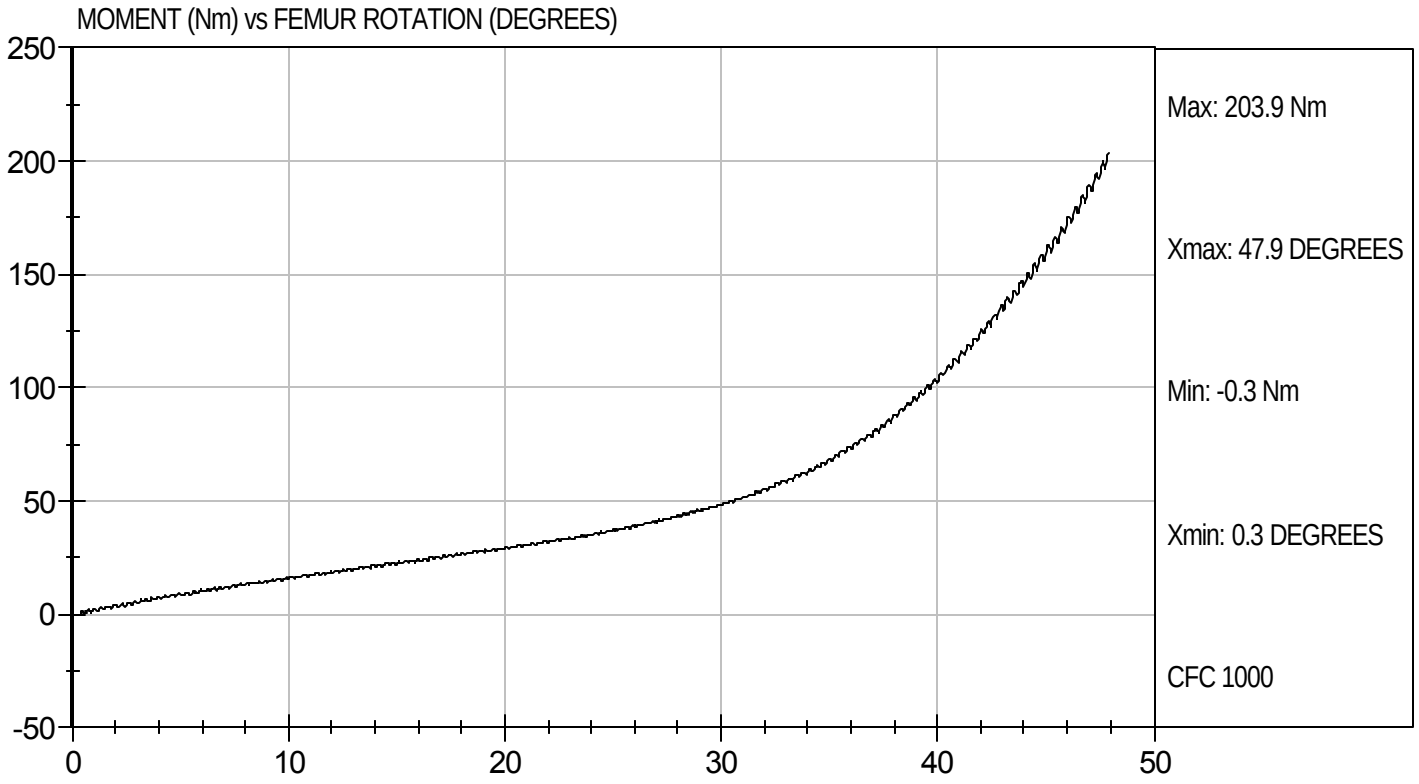
Test Desc: Hip Femur Flexion
Component ID: D103549

Test Date: 10/18/10
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D103540

Test Date: 10/18/10
Velocity: 0 ft/s, 0.00 m/s



**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test ID:** D103311

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 22.1 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 38 | Pass |
| Peak Resultant Acceleration | G's | 250 to 300 | 276 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | 10.5 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

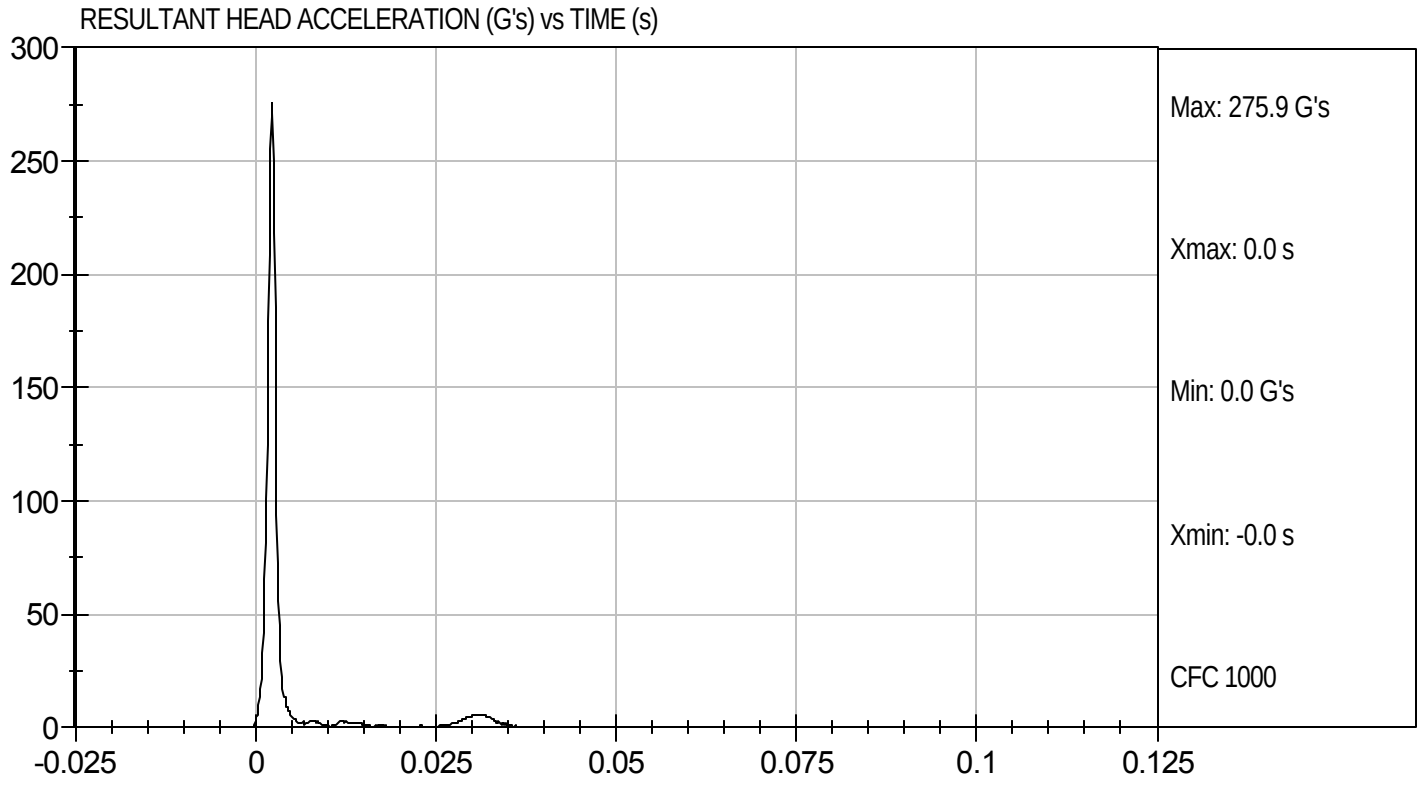
Jessica Hall
Laboratory Technician

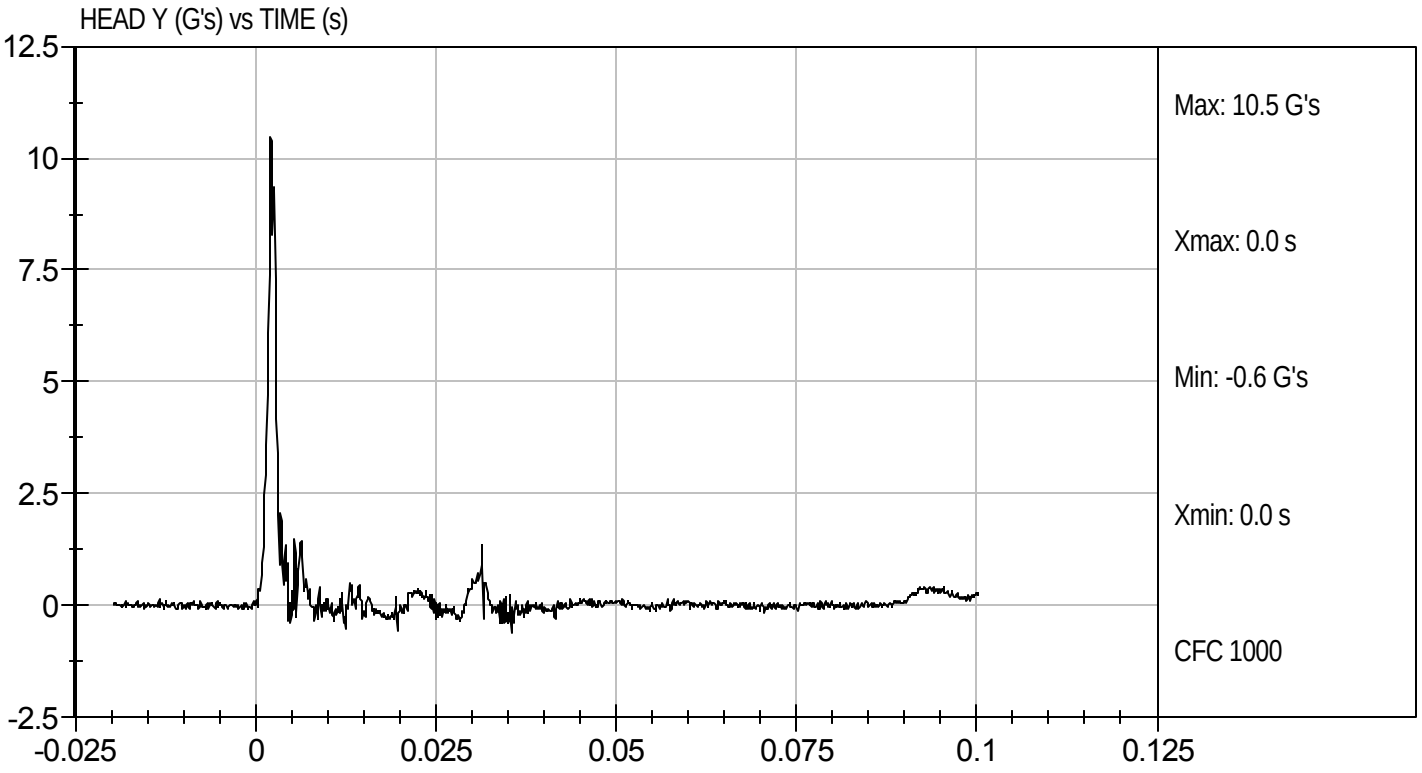
10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Head Drop
Component ID: D103311

Test Date: 10/1/10
Velocity: 0 ft/s, 0.00 m/s



**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103312

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 20.9 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 44 | Pass |
| Pendulum Speed | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Deceleration | 10 ms | m/s | 2.1 to 2.5 | 2.4 | Pass |
| | 20 ms | m/s | 4.0 to 5.0 | 4.5 | Pass |
| | 30 ms | m/s | 5.8 to 7.0 | 6.2 | Pass |
| D Plane Rotation | Max | deg | 77 to 91 | 81 | 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 | 89 | Pass |
| | | | Overall Results | | Pass |

Jessica Hall
Laboratory Technician

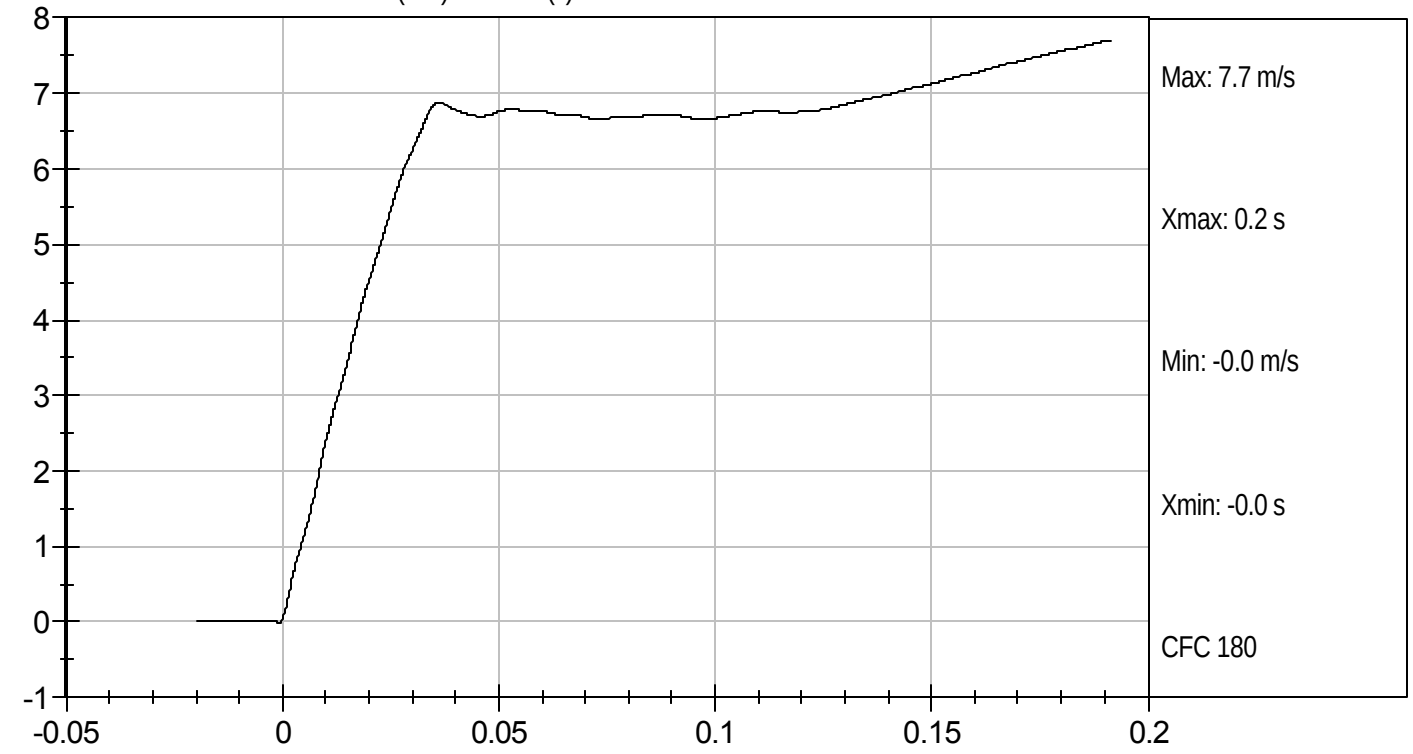
10/1/10
Test Date

David Winkelbauer
Approved By

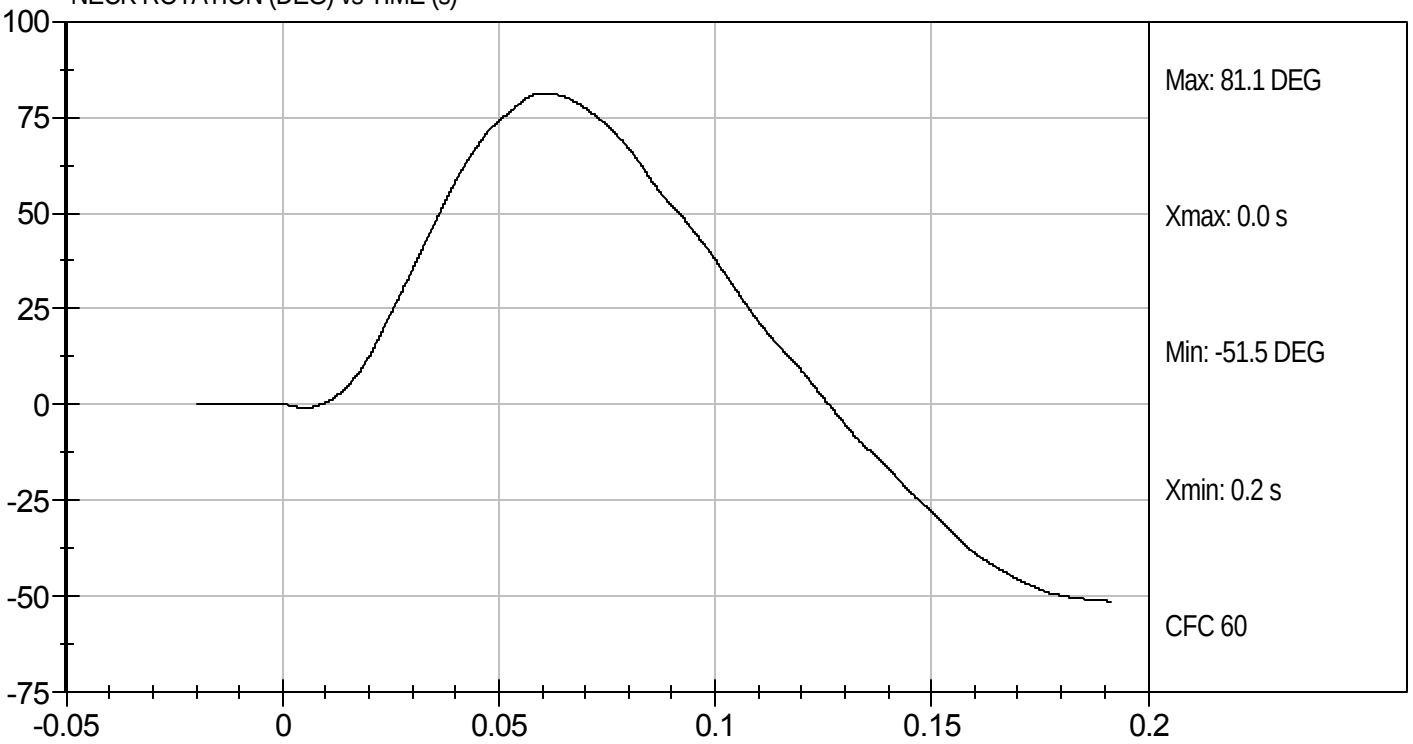
Test Desc: Neck Flexion
Component ID: D103312

Test Date: 10/1/10
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

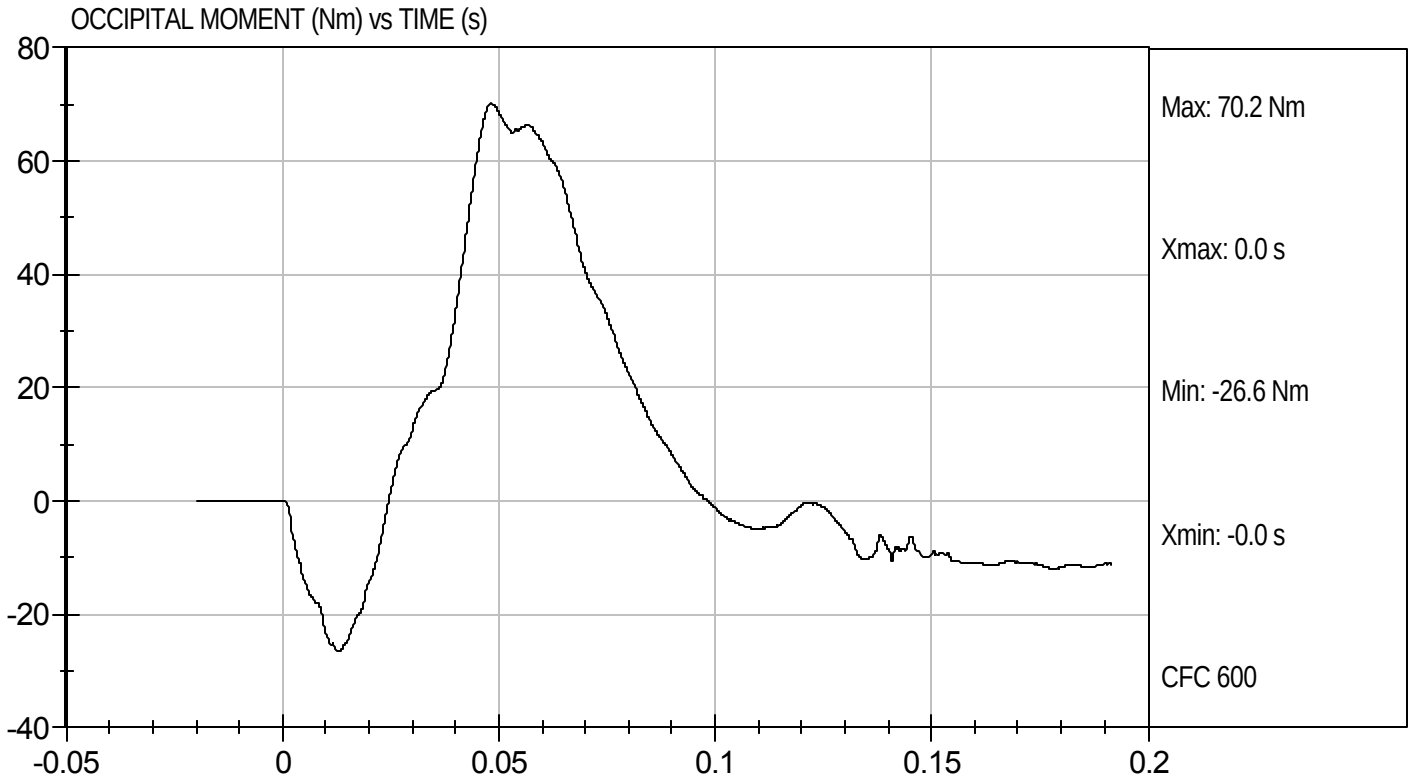



NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D103312

Test Date: 10/1/10
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:** D103313

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 20.9 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 44 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.19 | 6.12 | Pass |
| Pendulum Deceleration | 10 ms | m/s | 1.5 to 1.9 | 1.9 | Pass |
| | 20 ms | m/s | 3.1 to 3.9 | 3.7 | Pass |
| | 30 ms | m/s | 4.6 to 5.6 | 5.2 | Pass |
| D Plane Rotation | Max | deg | 99 to 114 | 99 | Pass |
| Occipital Condyle Moment within Deflection Corridor | | Nm | -65 to -53 | -54 | Pass |
| Negative Moment Time Curve Decay to -10 Nm | | ms | 94 to 114 | 101 | Pass |
| | | | Overall Results | | Pass |

Jessica Gall
Laboratory Technician

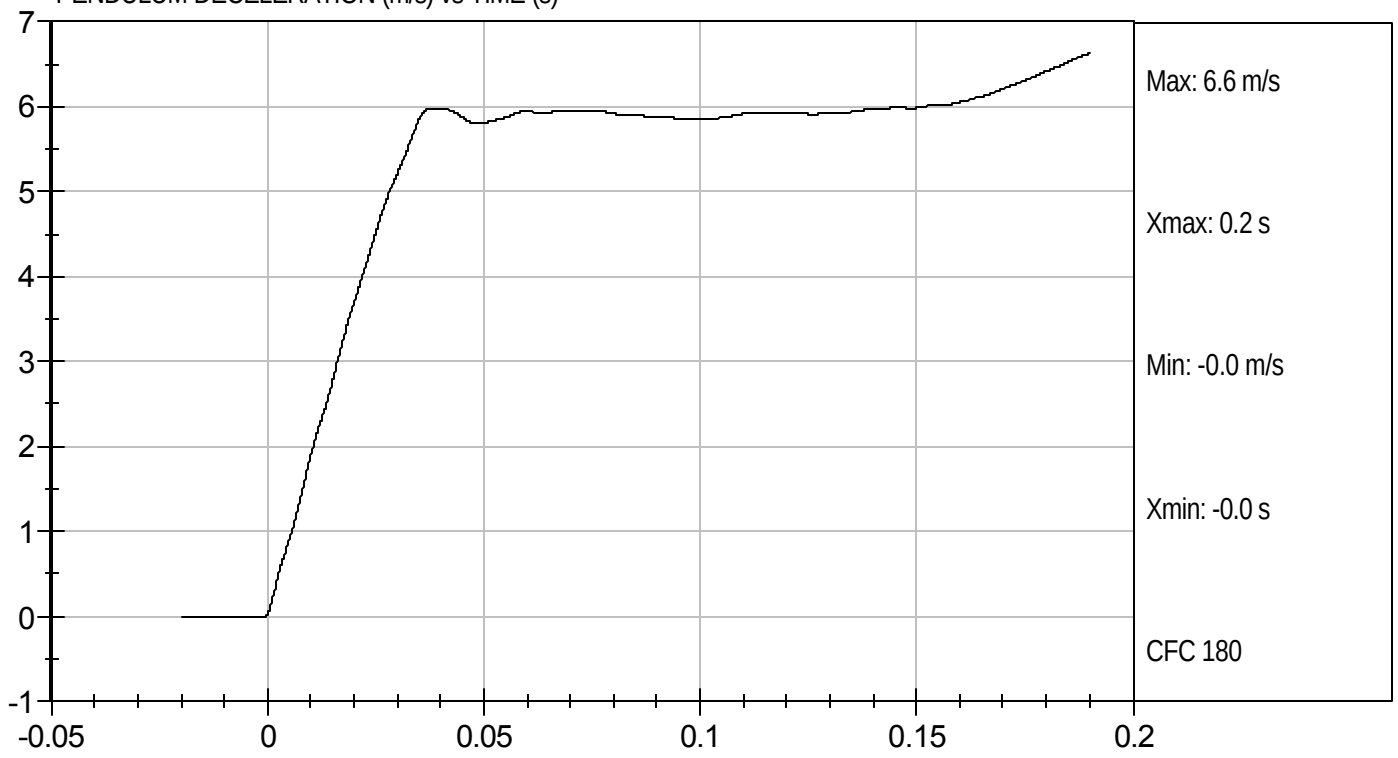
10/1/10
Test Date

David Winkelbauer
Approved By

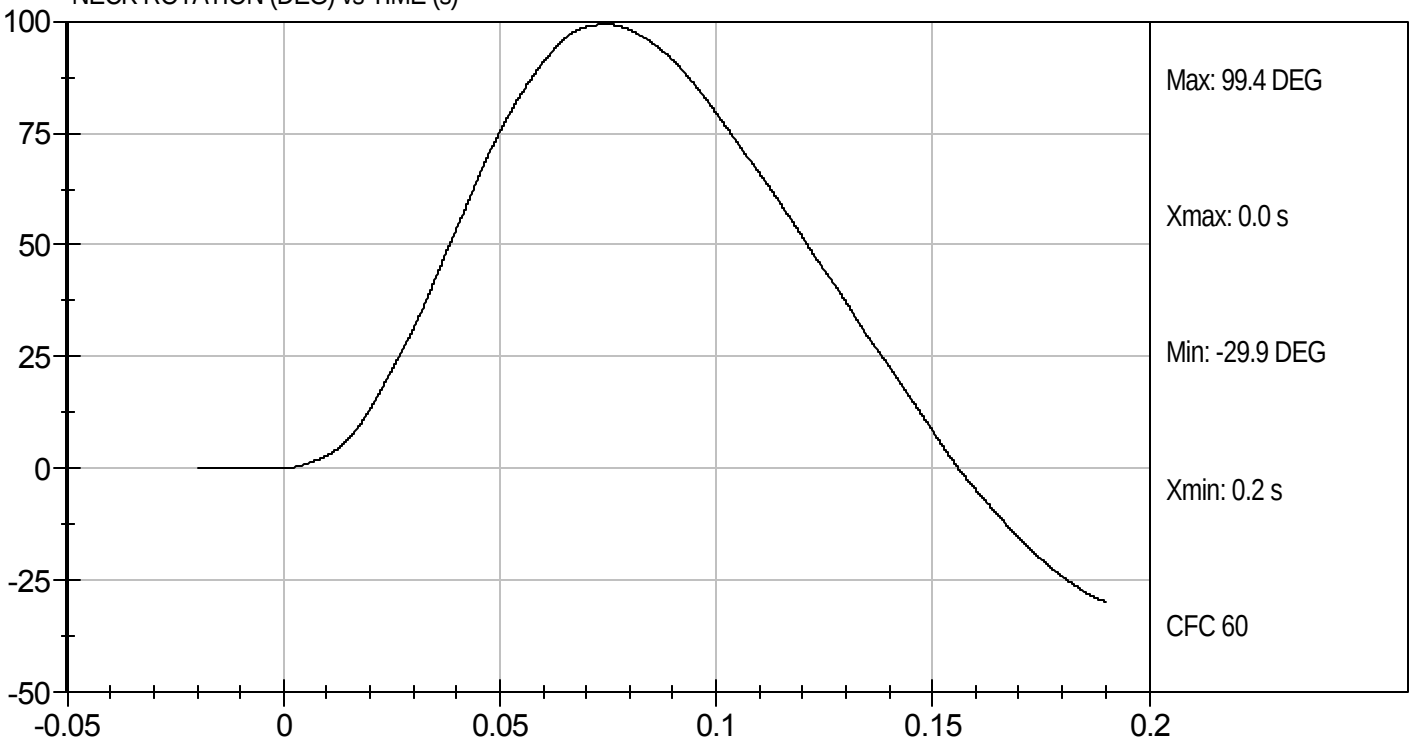
Test Desc: Neck Extension
Component ID: D103313

Test Date: 10/1/10
Velocity: 20.08 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

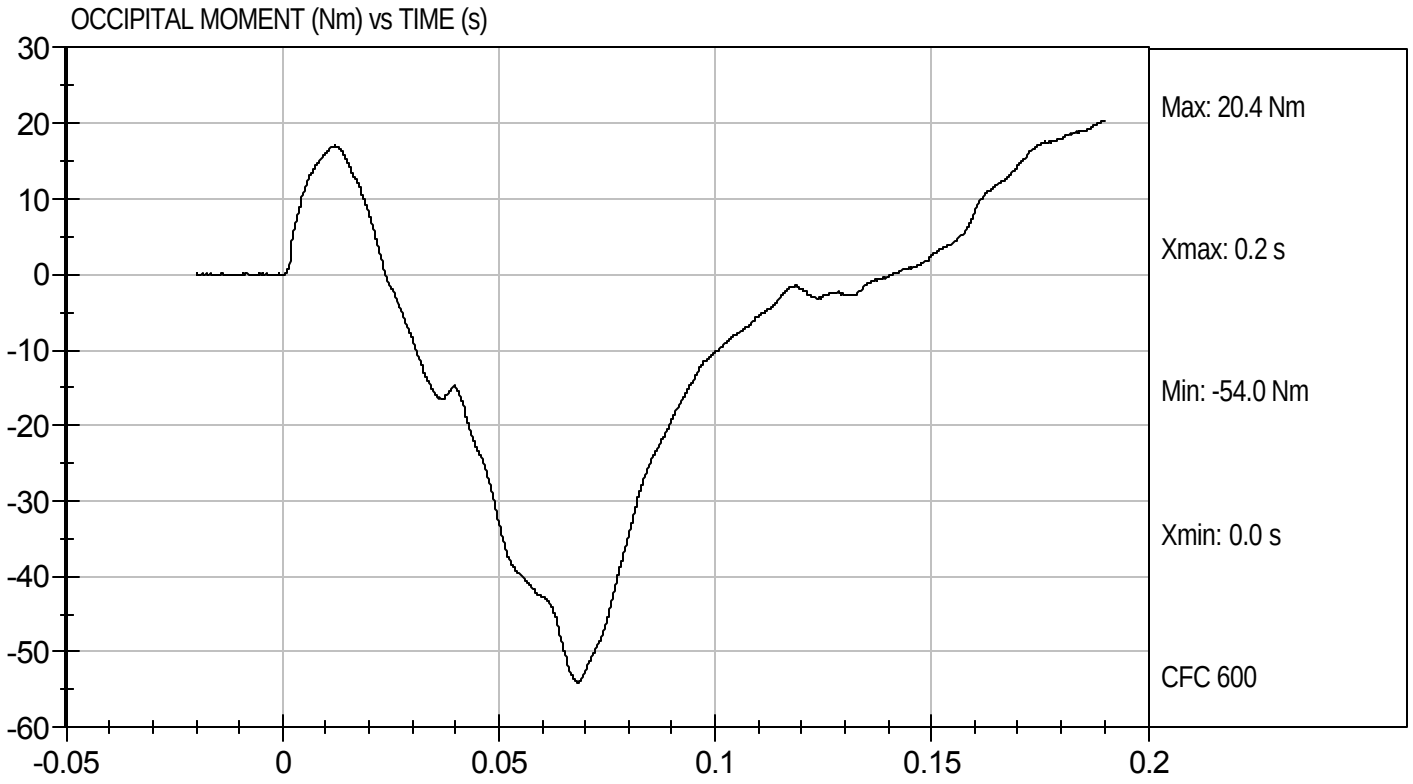



NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D103313

Test Date: 10/1/10
Velocity: 20.08 ft/s, 6.12 m/s



**MGA RESEARCH CORPORATION**

**THORAX IMPACT**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103314

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 22.1 | Pass |
| Relative Humidity | % | 10 to 70 | 37 | Pass |
| Probe Speed | m/s | 6.59 to 6.83 | 6.77 | Pass |
| Peak Deflection | mm | 50 to 58 | 54 | Pass |
| Peak Resistive Force w/in Deflection Corridor | kN | 3.9 to 4.4 | 4.20 | Pass |
| Internal Hysteresis | % | 69 to 85 | 69 | Pass |
| Peak Force 18 mm - 50 mm | N | <= 4,600 N | 4132 | Pass |
| | | Overall Test Results | | Pass |

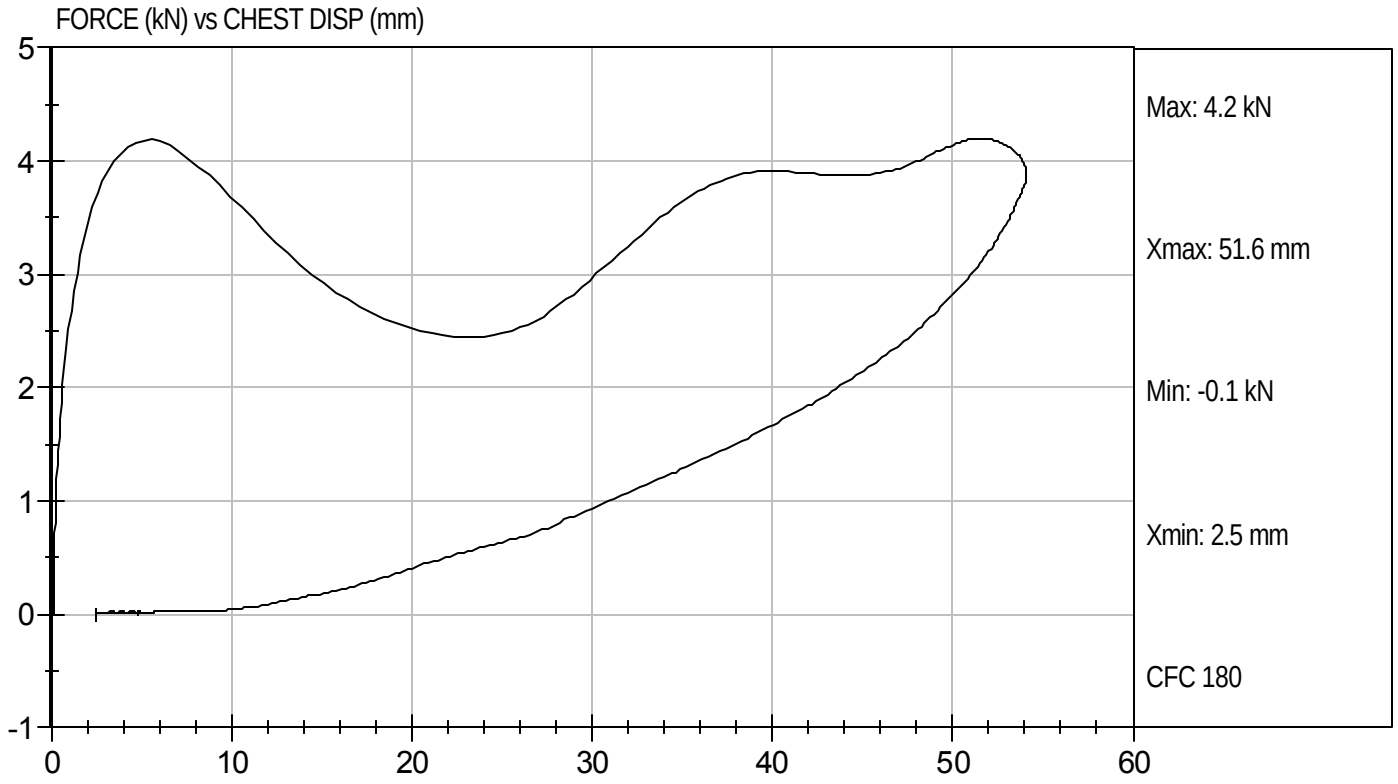
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D103314

Test Date: 10/1/10
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:** D103315

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 37 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.08 | Pass |
| Maximum Force | kN | 3.45 to 4.06 | 3.91 | Pass |
| | | Overall Test Results | | Pass |

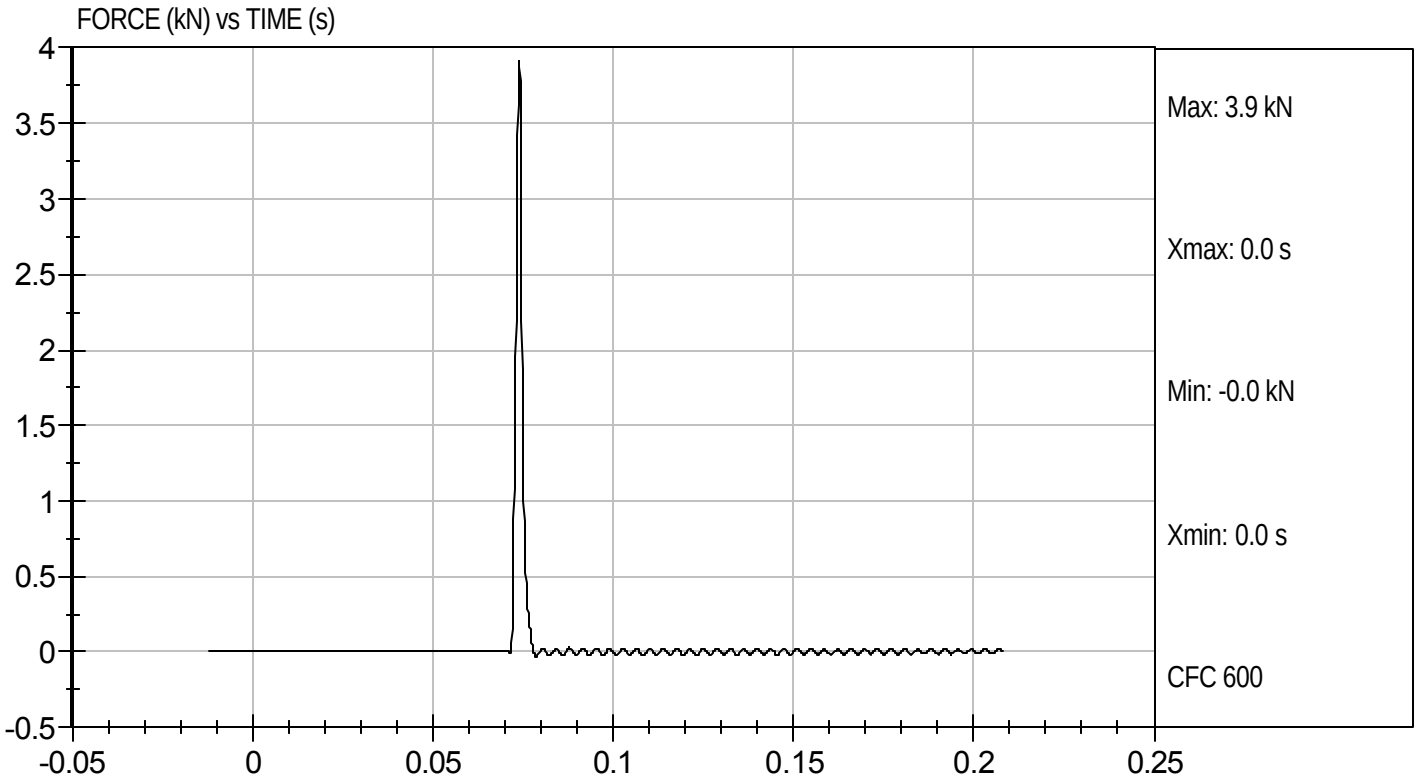
Jessica Gall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D103315

Test Date: 10/1/10
Velocity: 6.83 ft/s, 2.08 m/s



**MGA RESEARCH CORPORATION**

**LEFT KNEE IMPACT TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103316

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 37 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.08 | Pass |
| Maximum Force | kN | 3.45 to 4.06 | 3.51 | Pass |
| | | Overall Test Results | | Pass |

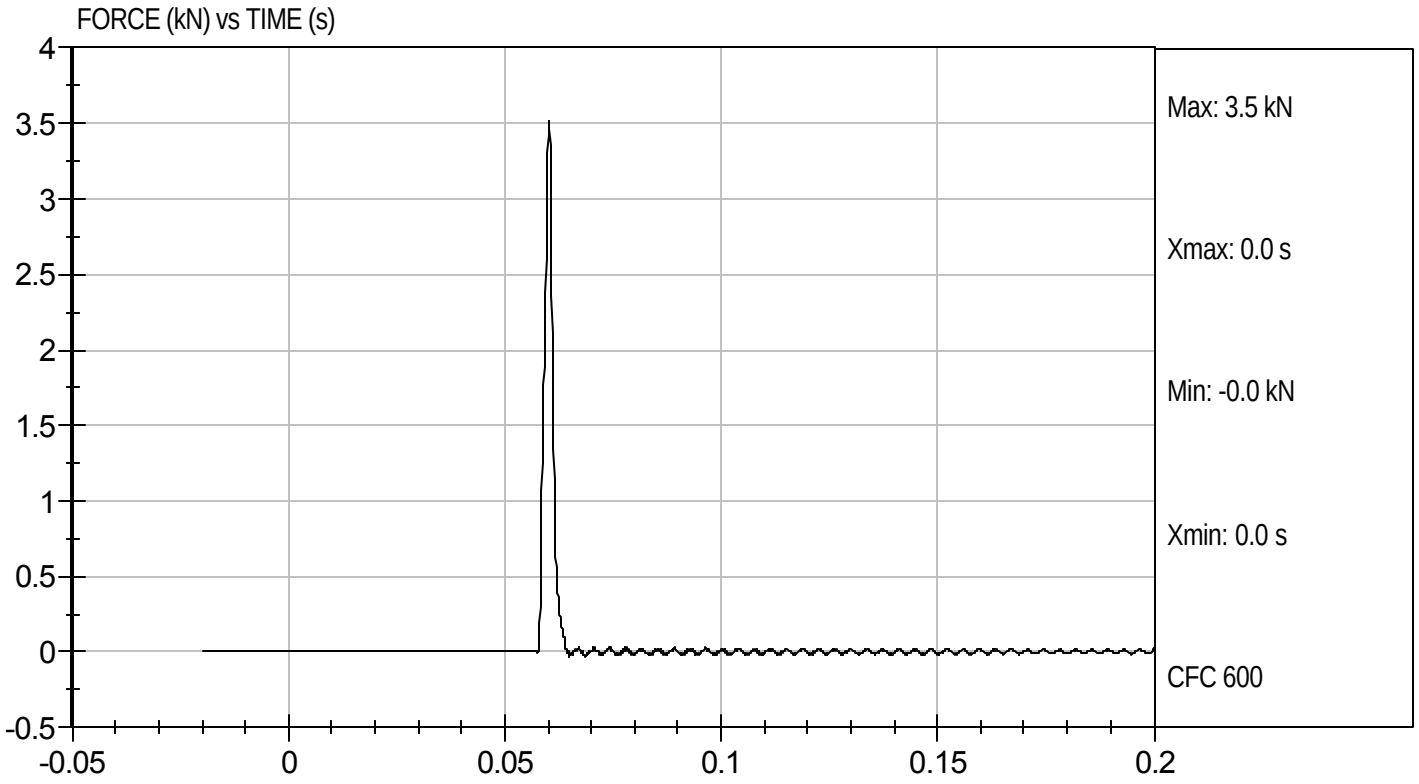
Jessica Hall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D103316

Test Date: 10/1/10
Velocity: 6.83 ft/s, 2.08 m/s



**MGA RESEARCH CORPORATION**

**TORSO FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103317

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 22.1 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 39 | Pass |
| Initial Angle | deg | 0 to 20 | 17 | Pass |
| Return Angle | deg | +/- 8 | 7 | Pass |
| Force at 45 deg | N | 320 to 390 | 335 | Pass |
| Upper Torso Deflection Rate | Deg/sec | 0.5 to 1.5 | 1.0 | Pass |
| | | Overall Result | | Pass |

Jessica Hall
Laboratory Technician

10/1/10
Test Date

David Winkelbauer
Approved By

**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test ID:** D103551

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 32 | Pass |
| Peak Resultant Acceleration | G's | 250 to 300 | 278 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | 1.4 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 10% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

Jessica Gall
Laboratory Technician

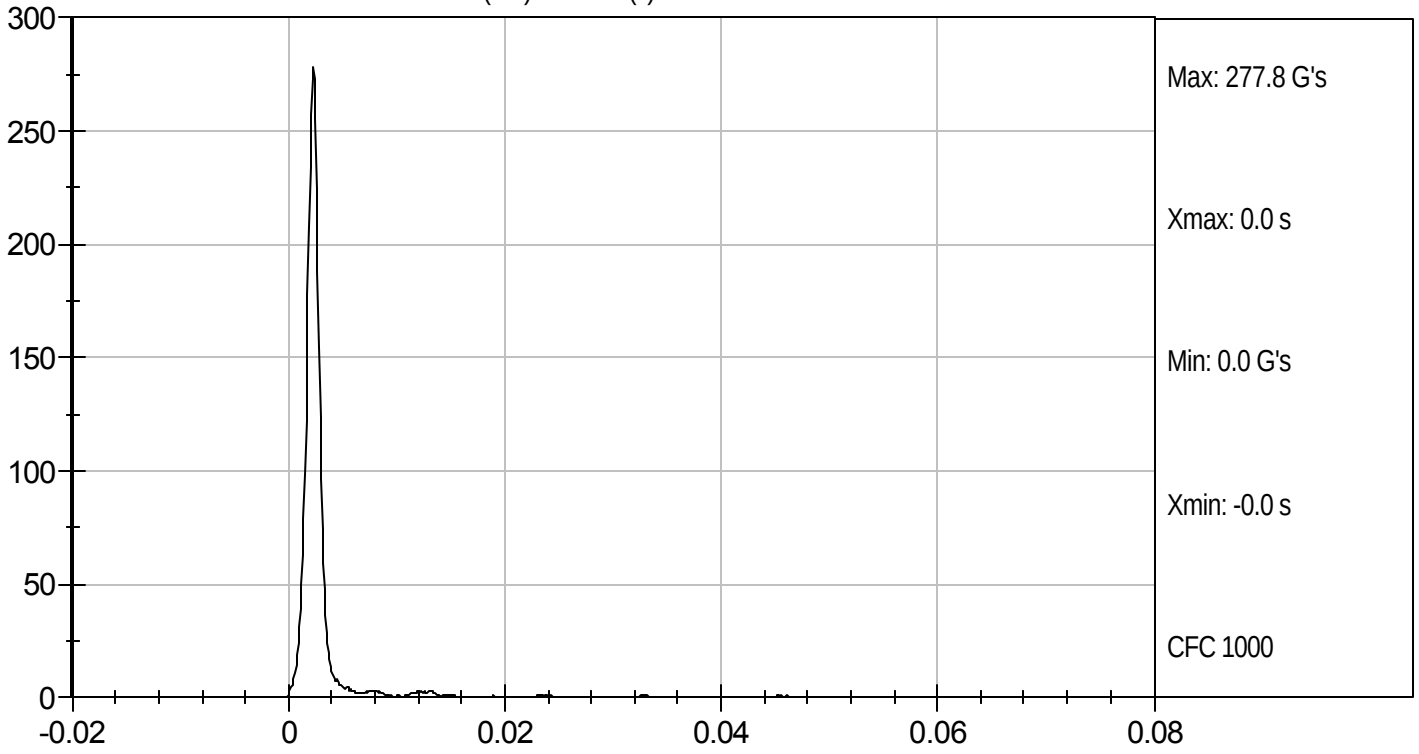
10/18/10
Test Date

David Winkelbauer
Approved By

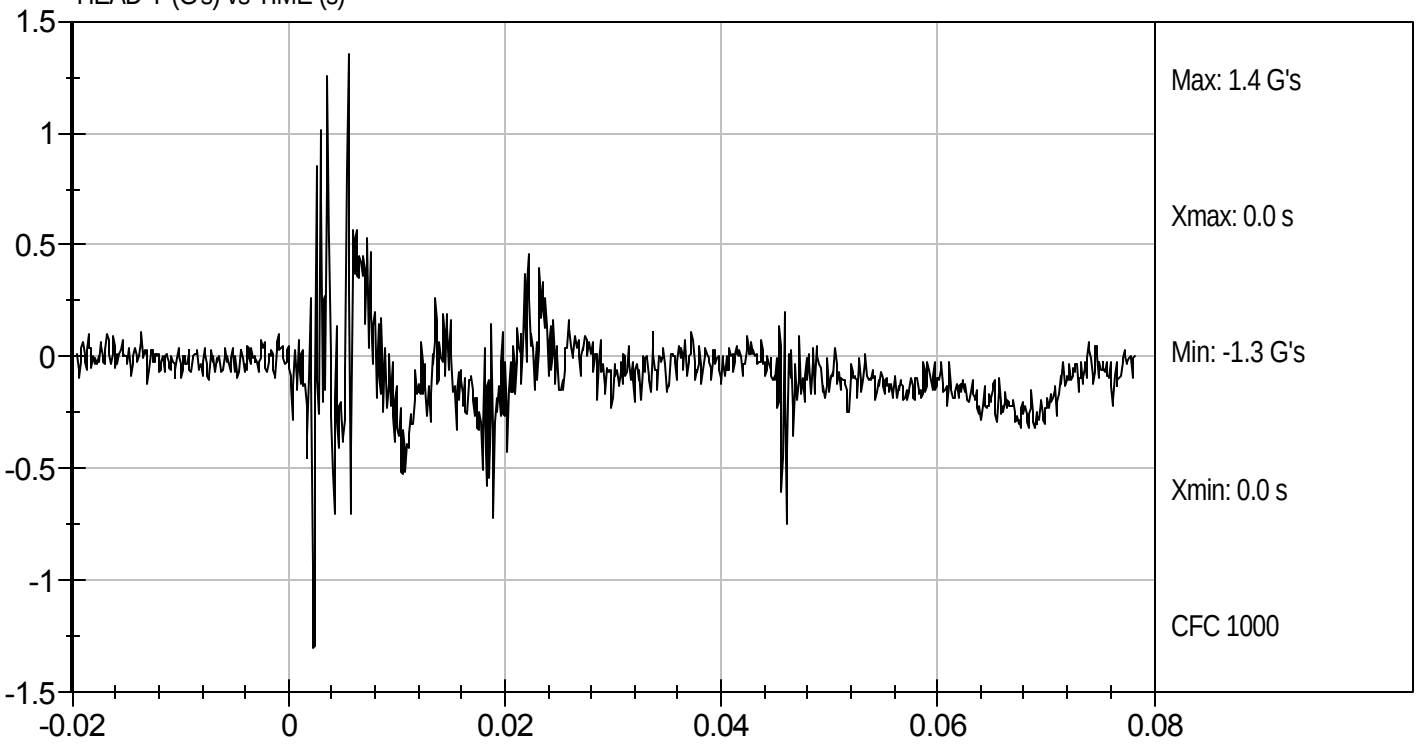
Test Desc: Head Drop
Component ID: D103551

Test Date: 10/18/10
Velocity: 0 ft/s, 0 m/s

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




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



**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103552

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 32 | Pass |
| Pendulum Speed | | m/s | 6.89 to 7.13 | 7.04 | Pass |
| Pendulum Deceleration | 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 | 6.5 | Pass |
| D Plane Rotation | Max | deg | 77 to 91 | 80 | 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 | 85 | Pass |
| | | | Overall Results | | Pass |

Jessica Hall
Laboratory Technician

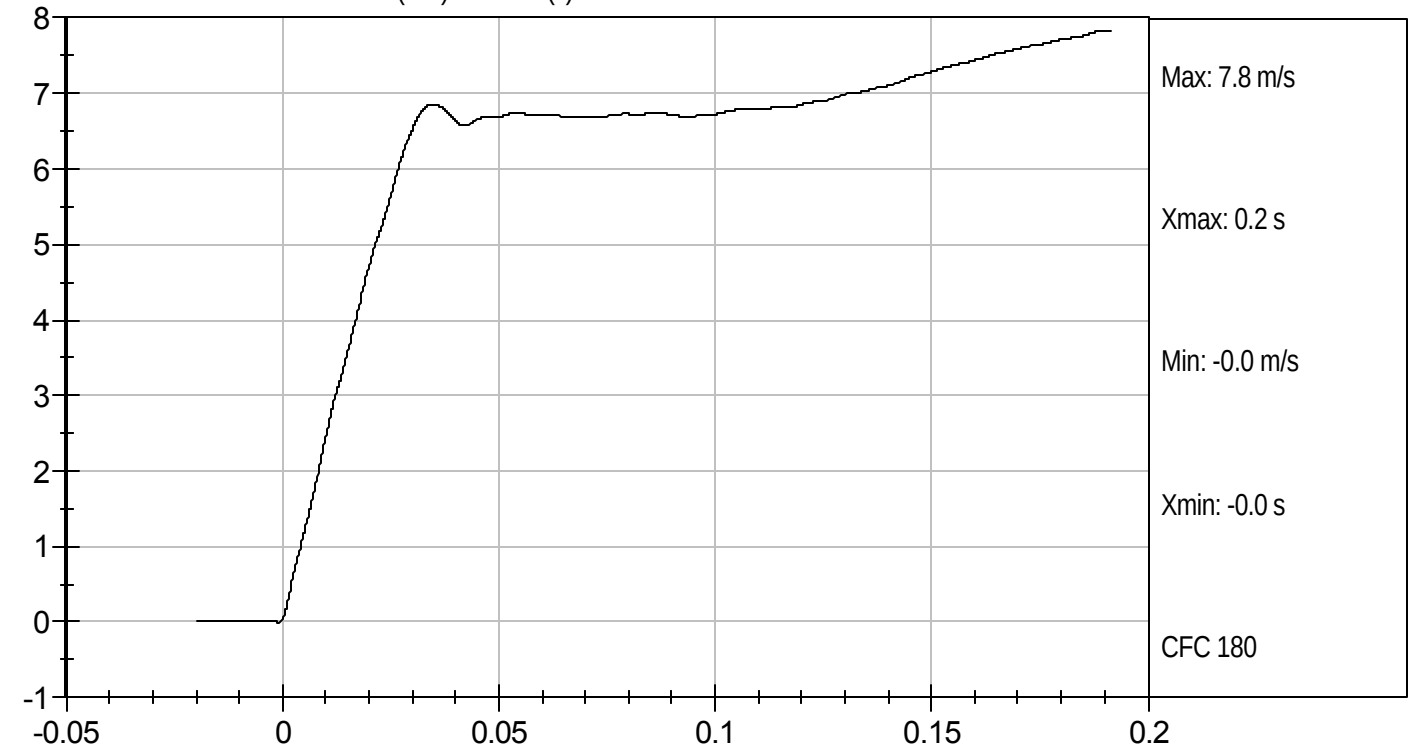
10/18/10
Test Date

David Winkelbauer
Approved By

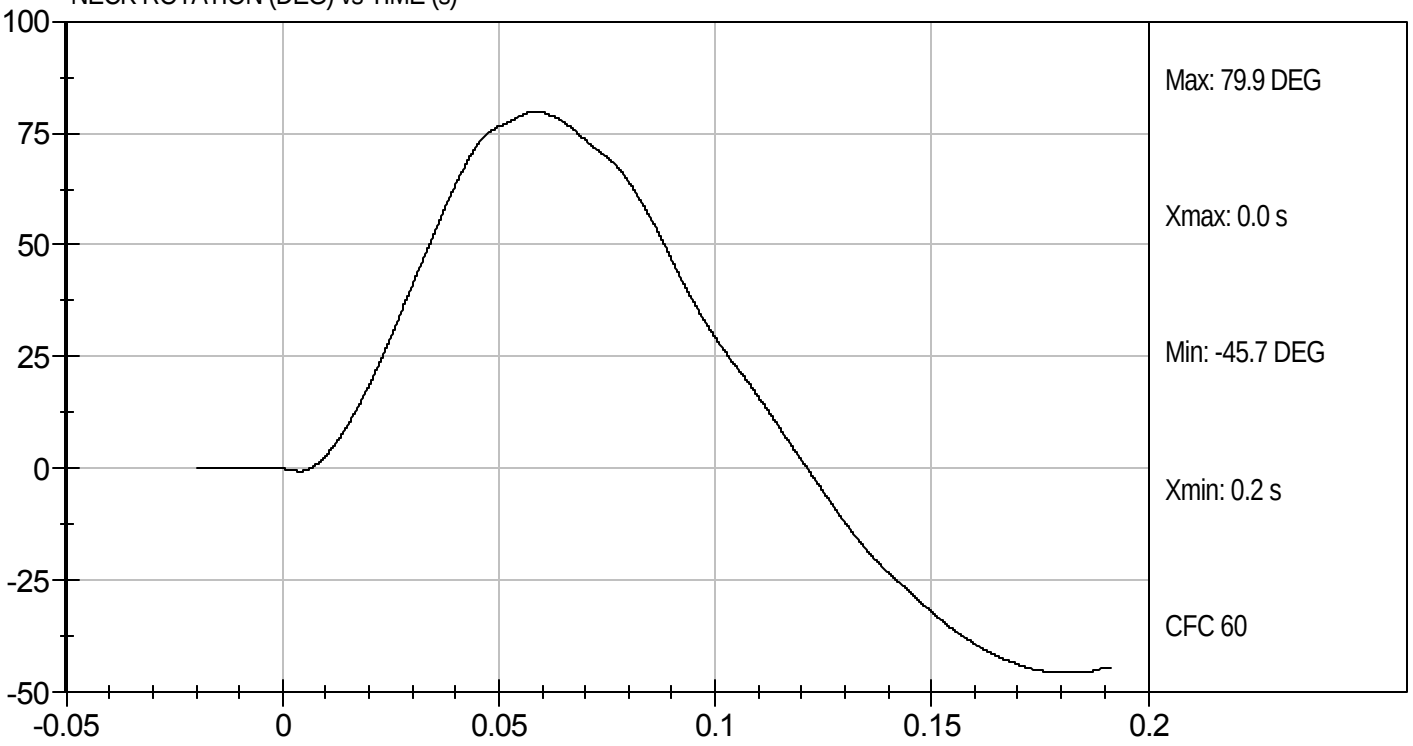
Test Desc: Neck Flexion
Component ID: D103552

Test Date: 10/18/10
Velocity: 23.1 ft/s, 7.04 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

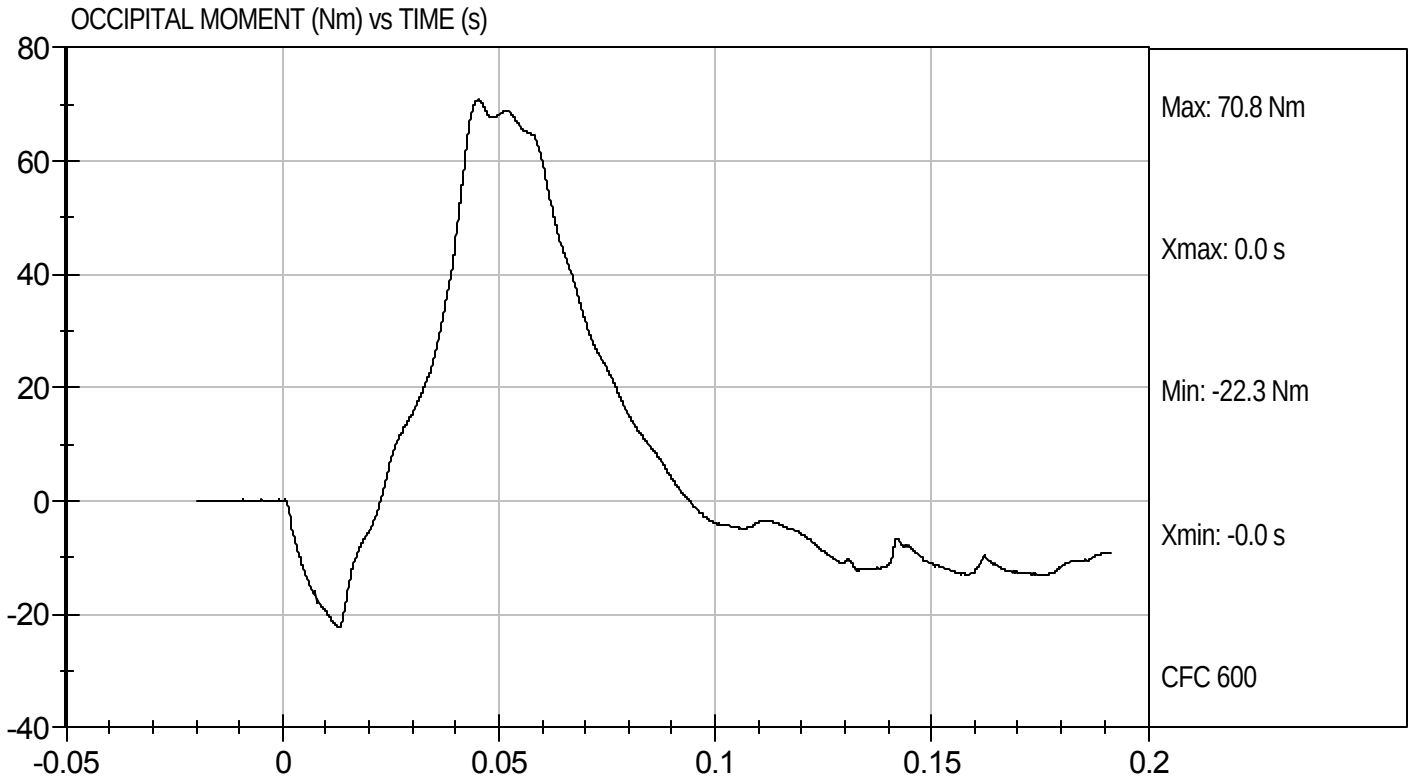



NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Flexion
Component ID: D103552

Test Date: 10/18/10
Velocity: 23.1 ft/s, 7.04 m/s



**MGA RESEARCH CORPORATION**

**NECK EXTENSION TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103553

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 32 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.19 | 6.05 | Pass |
| Pendulum Deceleration | 10 ms | m/s | 1.5 to 1.9 | 1.9 | Pass |
| | 20 ms | m/s | 3.1 to 3.9 | 3.7 | Pass |
| | 30 ms | m/s | 4.6 to 5.6 | 5.1 | Pass |
| D Plane Rotation | Max | deg | 99 to 114 | 103 | Pass |
| Occipital Condyle Moment within Deflection Corridor | | Nm | -65 to -53 | -54 | Pass |
| Negative Moment Time Curve Decay to -10 Nm | | ms | 94 to 114 | 101 | Pass |
| | | | Overall Results | | Pass |

Jessica Gall
Laboratory Technician

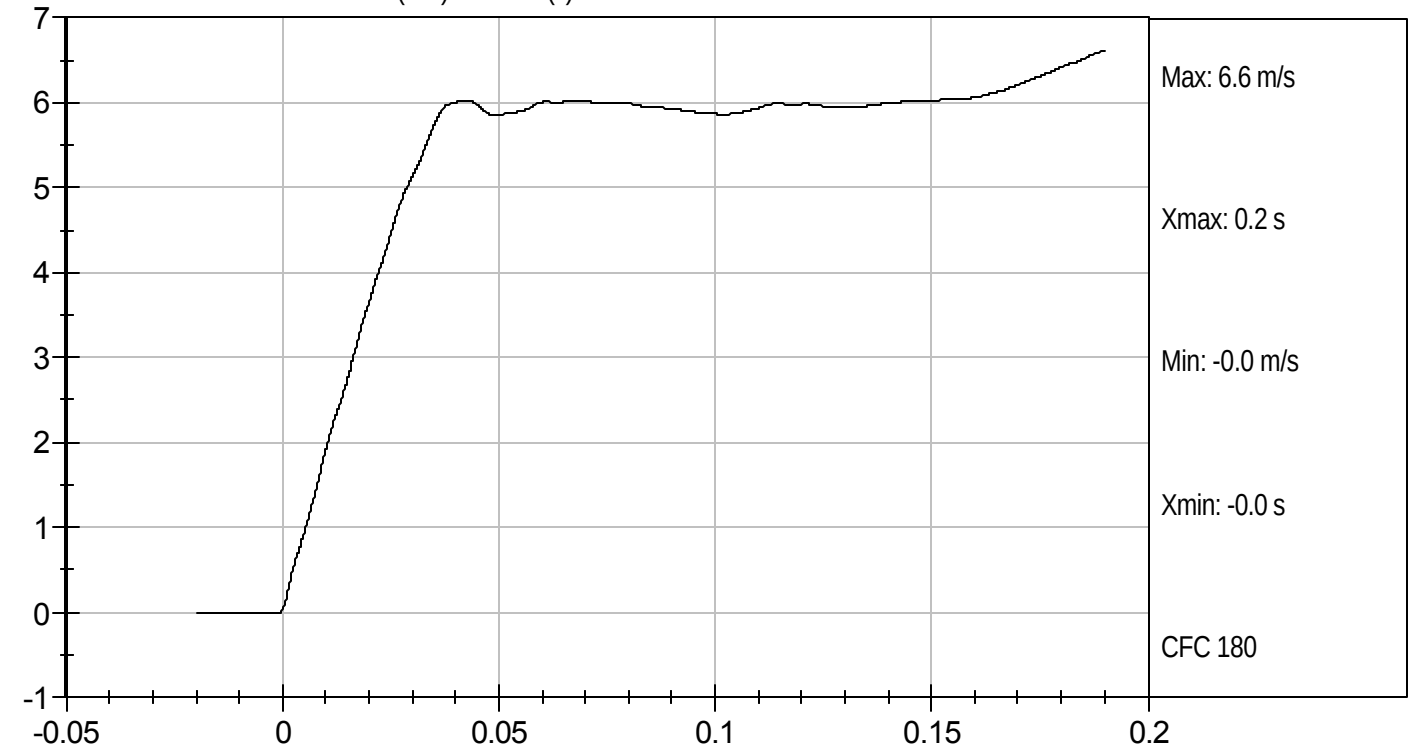
10/18/10
Test Date

David Winkelbauer
Approved By

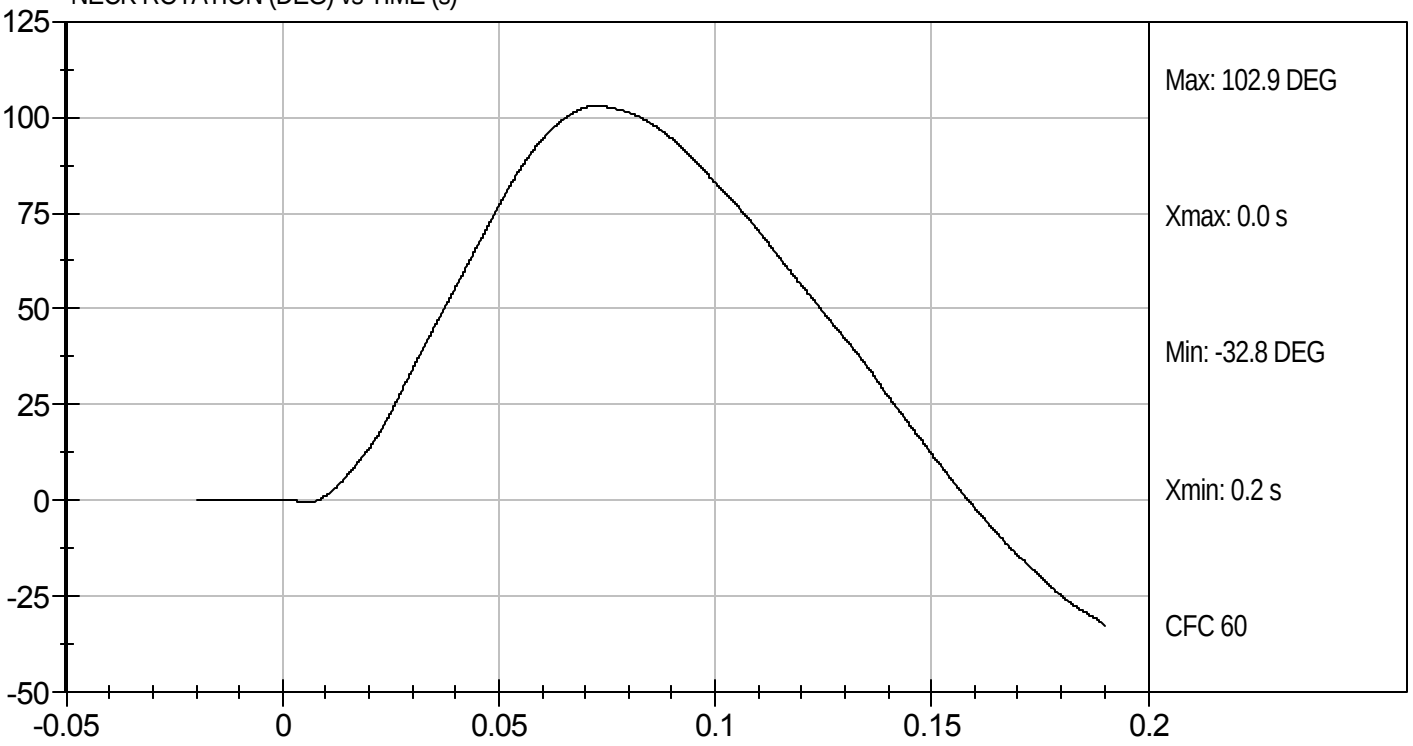
Test Desc: Neck Extension
Component ID: D103553

Test Date: 10/18/10
Velocity: 19.84 ft/s, 6.05 m/s

PENDULUM DECELERATION (m/s) vs TIME (s)

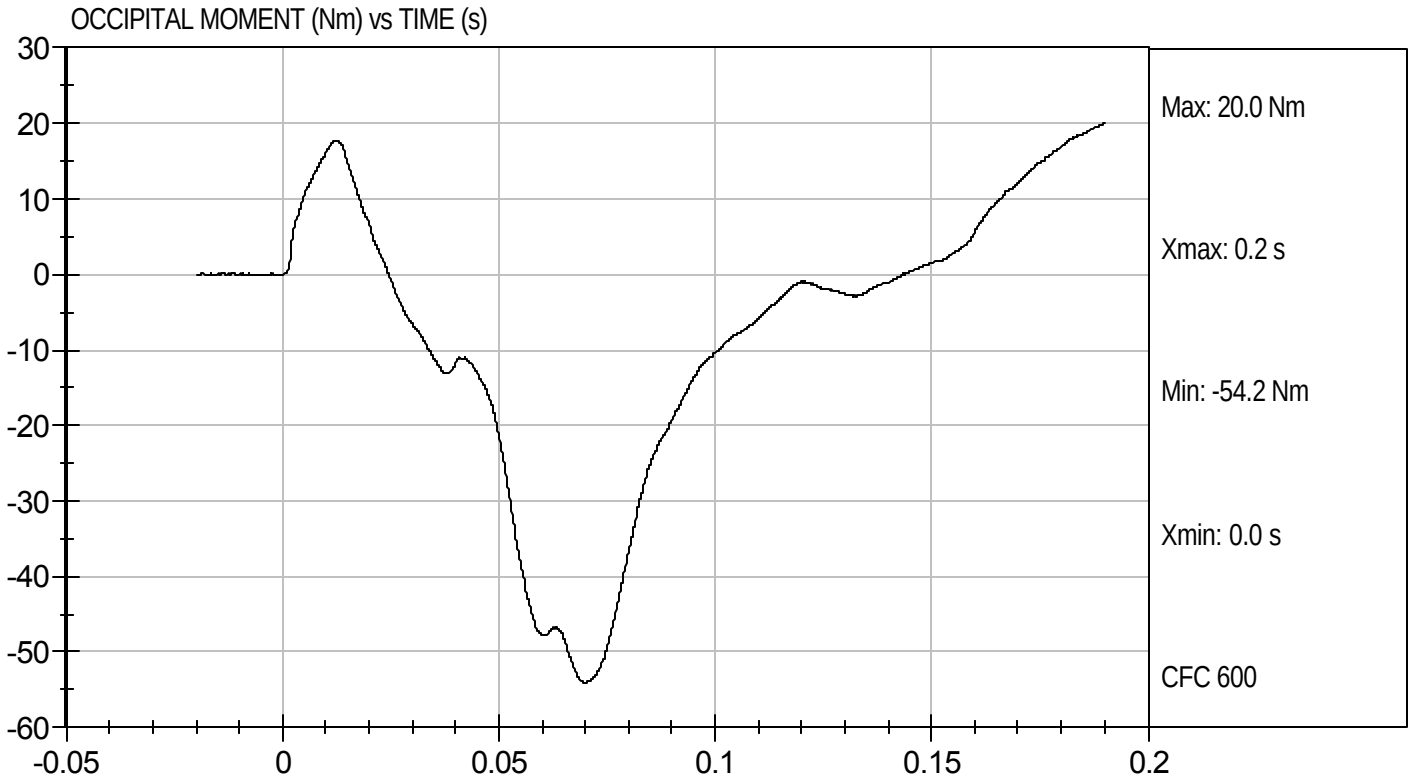



NECK ROTATION (DEG) vs TIME (s)



Test Desc: Neck Extension
Component ID: D103553

Test Date: 10/18/10
Velocity: 19.84 ft/s, 6.05 m/s



**MGA RESEARCH CORPORATION**

**THORAX IMPACT**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103554

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 20.9 | Pass |
| Relative Humidity | % | 10 to 70 | 32 | Pass |
| Probe Speed | m/s | 6.59 to 6.83 | 6.77 | Pass |
| Peak Deflection | mm | 50 to 58 | 54 | Pass |
| Peak Resistive Force w/in Deflection Corridor | kN | 3.9 to 4.4 | 4.27 | Pass |
| Internal Hysteresis | % | 69 to 85 | 70 | Pass |
| Peak Force 18 mm - 50 mm | N | <= 4,600 N | 4219 | Pass |
| | | Overall Test Results | | Pass |

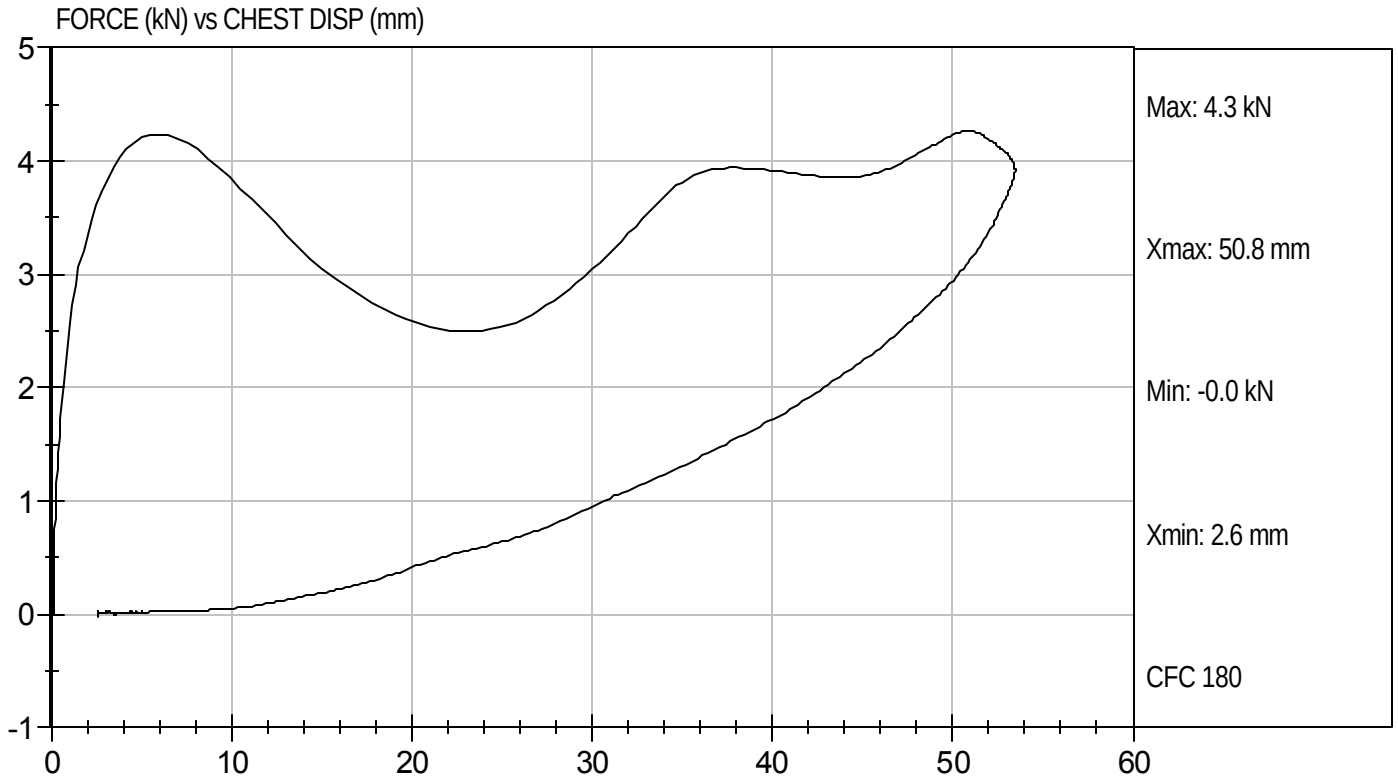
Jessica Hall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D103554

Test Date: 10/18/10
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:** D103555

| 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 | 32 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.12 | Pass |
| Maximum Force | kN | 3.45 to 4.06 | 3.72 | Pass |
| | | Overall Test Results | | Pass |

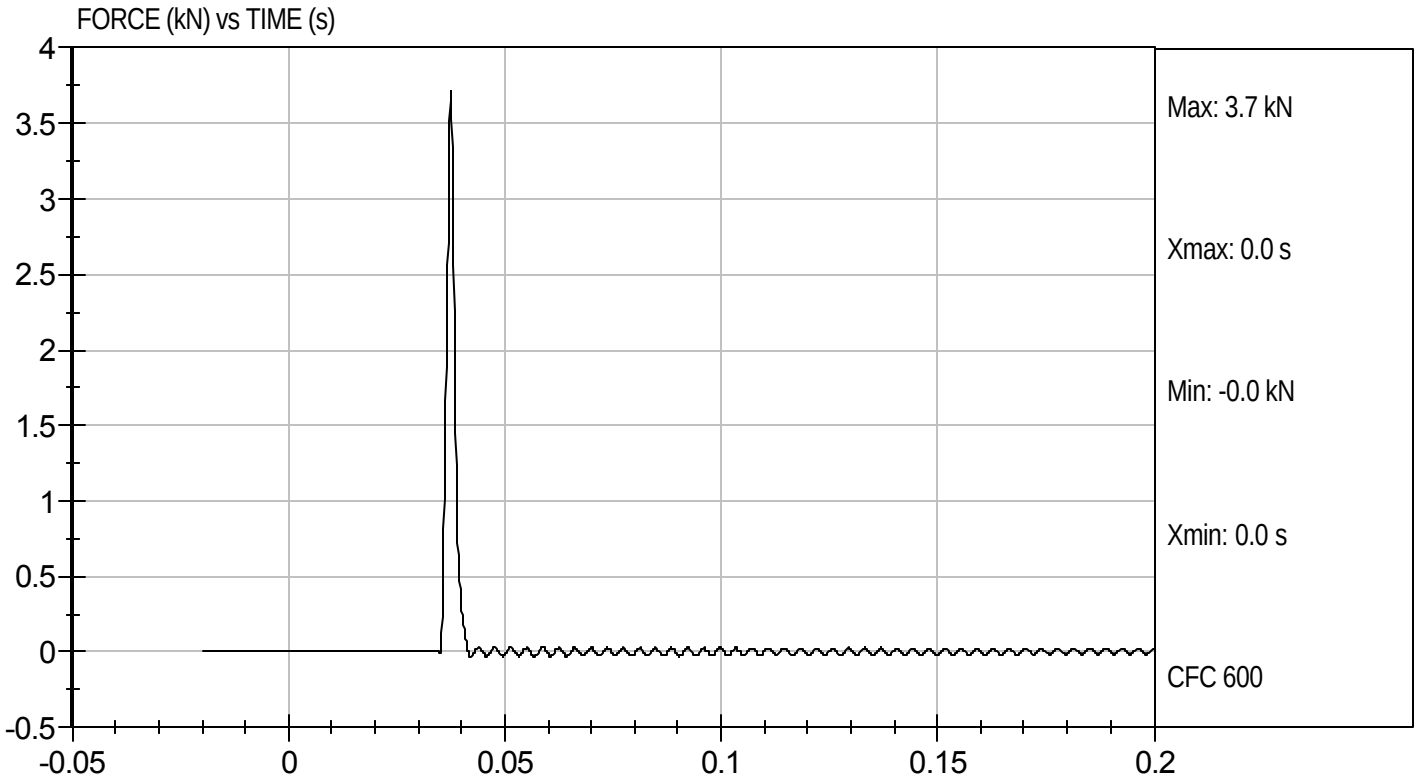
Jessica Hall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D103555

Test Date: 10/18/10
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:** D103556

| 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 | 32 | Pass |
| Probe Speed | m/s | 2.07 to 2.13 | 2.10 | Pass |
| Maximum Force | kN | 3.45 to 4.06 | 3.92 | Pass |
| | | Overall Test Results | | Pass |

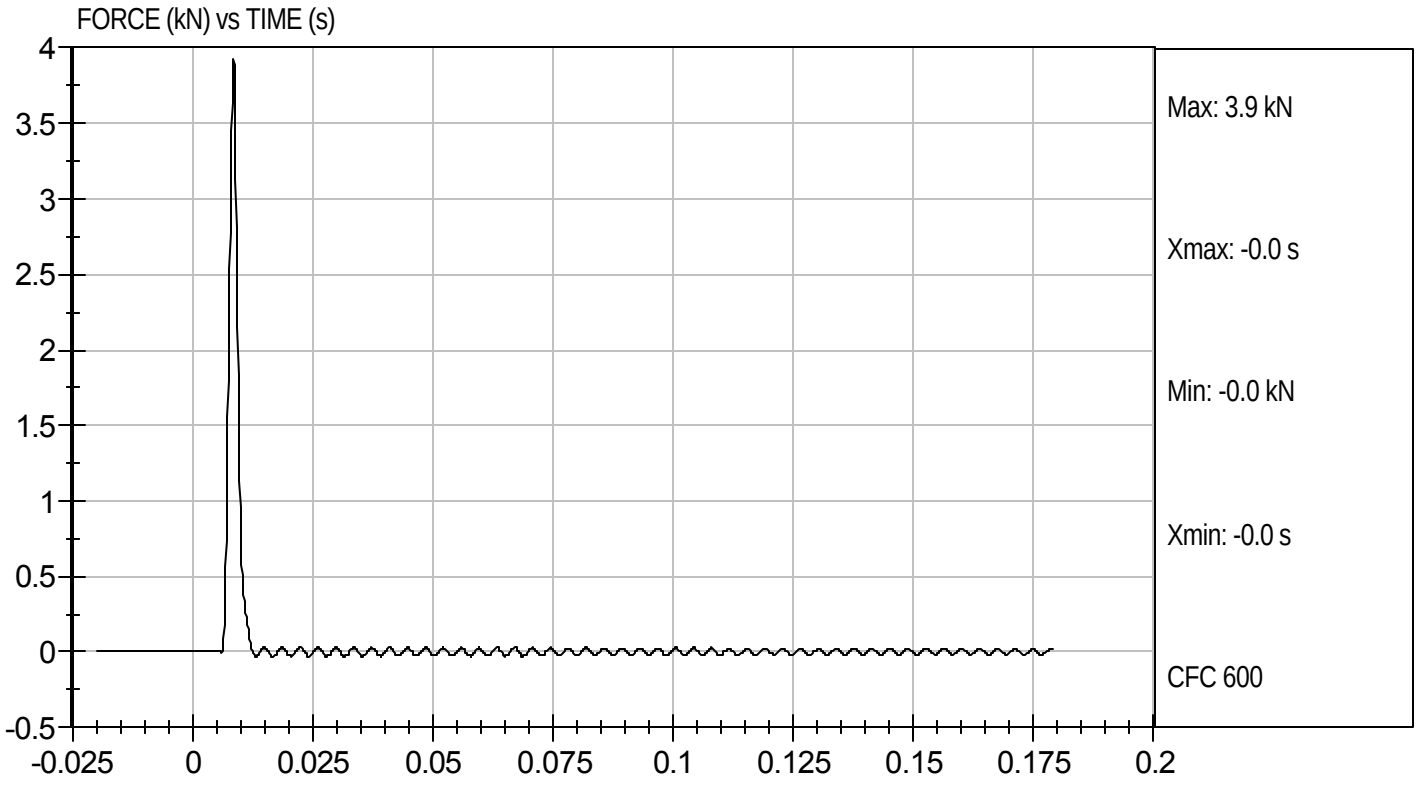
Jessica Hall
Laboratory Technician

10/18/10
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D103556

Test Date: 10/18/10
Velocity: 6.89 ft/s, 2.10 m/s



**MGA RESEARCH CORPORATION**

**TORSO FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 634 **Test I.D:** D103557

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.6 | 20.9 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 33 | Pass |
| Initial Angle | deg | 0 to 20 | 17 | Pass |
| Return Angle | deg | +/- 8 | 5 | Pass |
| Force at 45 deg | N | 320 to 390 | 381 | Pass |
| Upper Torso Deflection Rate | Deg/sec | 0.5 - 1.5 | 1.0 | Pass |
| | | Overall Result | | Pass |

Jessica Hall
Laboratory Technician

10/18/2010
Test Date

David Winkelbauer
Approved By