

REPORT NUMBER: 214P-MGA-2011-006

**SAFETY COMPLIANCE TESTING FOR FMVSS 214
DYNAMIC SIDE IMPACT PROTECTION
RIGID POLE**

**CHRYSLER GROUP LLC
2011 DODGE CHARGER SE 4-DR SEDAN
NHTSA NUMBER: CB0305**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**




Test Date: May 13, 2011


Report Date: June 7, 2011

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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| | | 15. Supplementary Notes No. | | | | | | | | | | | | | | | | |
| 16. Abstract A 32 km/h (20 mph), 75° oblique impact compliance test was conducted on the subject 2011 Dodge Charger SE 4-Dr Sedan in accordance with the specifications of the Office of Vehicle Safety Compliance TP-214P-01 for the determination of FMVSS No. 214 Side Impact Protection compliance. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on May 13, 2011. The impact velocity was 31.5 km/h, and the ambient temperature at the struck (driver's) side of the test vehicle at the time of impact was 21°C. The test vehicle post-test maximum crush was 373 mm at level 3. The test vehicle's performance follows: | | | | | | | | | | | | | | | | | | |
| <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">331</td> </tr> <tr> <td>Max. Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">35</td> </tr> <tr> <td>Sum of Abdomen Forces</td> <td style="text-align: center;">N</td> <td style="text-align: center;">1949</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2159</td> </tr> </tbody> </table> | | | | Measurement Description | Units | Result | Head Injury Criteria (HIC ₃₆) | N/A | 331 | Max. Rib Deflection | mm | 35 | Sum of Abdomen Forces | N | 1949 | Pubic Symphysis Force | N | 2159 |
| Measurement Description | Units | Result | | | | | | | | | | | | | | | | |
| Head Injury Criteria (HIC ₃₆) | N/A | 331 | | | | | | | | | | | | | | | | |
| Max. Rib Deflection | mm | 35 | | | | | | | | | | | | | | | | |
| Sum of Abdomen Forces | N | 1949 | | | | | | | | | | | | | | | | |
| Pubic Symphysis Force | N | 2159 | | | | | | | | | | | | | | | | |
| The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite side doors did not open during the side impact event. | | | | | | | | | | | | | | | | | | |
| 17. Key Words Compliance Testing Side Impact Protection Pole Test ES-2re SID-IIs | | 18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services (TIS) Room E12-100 East Building 1200 New Jersey Ave. Washington, D.C. 20590 Telephone No. (202) 366-2588 | | | | | | | | | | | | | | | | |
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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test is part of the FY 2011 FMVSS 214 Side Impact Protection Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-07-D-00062. The purpose of this test was to evaluate side impact protection in a 2011 Dodge Charger SE 4-Dr Sedan. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-214P-01, dated January 2010).

SUMMARY

A rigid pole side impact test was conducted on a 2011 Dodge Charger SE 4-Dr Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 31.5 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on May 13, 2011. Pre-test and post-test photographs of the test vehicle and side impact dummy are included in Appendix A of this report.

One Part 572U dummy was placed in the left front outboard designated seating position according to instructions specified in TP-214P-01, dated January 2010. The side impact event was documented by ten (10) cameras.

The ES-2re male dummy was instrumented with a triaxial accelerometer pack located in the head, 3 rib displacement transducers located in the chest, 3 load cells located in the abdomen and a load cell located in the pubic symphysis.

A summary of the test results follows:

DUMMY INJURY VALUES

| Dummy | HIC (36ms) | Thorax Deflection (mm) | | Abdomen Forces (N) | | Pubic Symphysis (N) |
|--|---------------|---------------------------|------|-----------------------|--------|------------------------|
| ES-2re 50 th Percentile Male | 331 | Upper | 34.7 | Front | 162.2 | 2158.8 |
| | | Middle | 27.7 | Mid | 676.3 | |
| | | Lower | 28.2 | Rear | 1148.2 | |
| | | Max. | 34.7 | Sum | 1949.2 | |

GENERAL COMMENTS

There was no valid data collected for:
 A Pillar Mid Y after 35 msec.
 B Pillar Mid Y after 10 msec.
 Seat Y after 20 msec.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan NHTSA No. CB0305
 Test Program: FMVSS 214 Pole Test Date: 5/13/2011

| VEHICLE INFORMATION | |
|----------------------------|-------------------|
| Make | Dodge |
| Model | Charger |
| Body Style | Sedan |
| VIN | 2B3CL3CG8BH517030 |
| Body Color | Tungsten Metallic |
| Engine Displacement (L) | 3.6 |
| # of Cylinders | 6 |
| Engine Placement | Longitudinal |
| Transmission Type | Automatic |
| Transmission Speeds | 5 |
| Overdrive | Yes |
| Final Drive | Rear |
| Odometer Reading | 157 miles |

| OPTIONS | |
|--|-----|
| ESC | Yes |
| All Wheel Drive | No |
| Power Steering | Yes |
| Tilt Steering Wheel | Yes |
| Driver Side Curtain Airbag | Yes |
| Driver Side Torso/Pelvis Airbag | Yes |
| Driver Knee Bag | Yes |
| Driver Seat Belt Pretensioners | Yes |
| Driver Seat Belt Load Limiters | Yes |
| Driver Power Seat | Yes |
| Rear Pass. Curtain Airbag | Yes |
| Rear Pass. Side Torso Airbag | No |
| Rear Pass. Seat Belt Pretensioners | No |
| Rear Pass. Seat Belt Load Limiters | No |
| Rear Pass. Power Seats | No |
| Power Windows | Yes |
| Air Conditioning | Yes |
| AM/FM CD | Yes |
| Automatic Door Locks (ADL) | Yes |
| Does owner's manual provide instructions to disable ADL's? | Yes |
| Anti-Lock Brakes | Yes |

DATA FROM CERTIFICATION LABEL

| | |
|---------------------|--------------------|
| Manufactured By | Chrysler Group LLC |
| Date of Manufacture | 2-11 |

| | |
|-----------------|------|
| GVWR (kg) | 2314 |
| GAWR Front (kg) | 1275 |
| GAWR Rear (kg) | 1275 |

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|----------------------------|--------|-------------|-------|-------|
| Type of Seats | Bucket | 60/40 Split | | |
| Number of Occupants | 2 | 3 | | 5 |
| Capacity Weight (VCW) (kg) | | | | 392 |
| Cargo Weight (RCLW) (kg) | | | | 52 |

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan NHTSA No. CB0305
 Test Program: FMVSS 214 Pole Test Date: 5/13/2011

TIRE PRESSURES

| | Units | LF | RF | RR | LR |
|--------------|-------|-----|-----|-----|-----|
| As Delivered | kPa | 210 | 210 | 210 | 210 |
| As Tested | kPa | 210 | 210 | 210 | 210 |

TEST VEHICLE WEIGHTS

| | Units | As Delivered | | | Fully Loaded | | | As Tested | | |
|--------|-------|--------------|-----------|--------|--------------|-----------|--------|------------|-----------|--------|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 460.4 | 429.6 | | 491.7 | 482.6 | | 494.4 | 475.4 | |
| Right | kg | 465.4 | 440.4 | | 469.5 | 481.3 | | 474.5 | 473.5 | |
| Ratio | % | 51.6 | 48.4 | | 49.9 | 50.1 | | 50.5 | 49.5 | |
| Totals | kg | 925.8 | 870.0 | 1795.8 | 961.2 | 963.9 | 1925.1 | 968.9 | 948.9 | 1917.8 |

TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

| Measured Parameter | Units | Value |
|--|-------|--------|
| As Delivered Weight | kg | 1795.8 |
| Weight of 1 P572U ATD (ES-2re) Dummy | kg | 77.1 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 52 |
| Calculated Target Vehicle Test Weight (TVTW) | kg | 1924.9 |

TEST VEHICLE ATTITUDES

| | Units | LF | RF | RR | LR |
|--------------|-------|-----|-----|-----|-----|
| Fully Loaded | mm | 760 | 762 | 768 | 760 |
| As Tested | mm | 760 | 762 | 768 | 777 |
| Difference | mm | 0 | 0 | 0 | -17 |

CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE

| Measurement Parameter | Units | Value |
|--|-------|-------|
| Test Vehicle Wheel Base | mm | 3050 |
| Vertical Impact Reference Line (Aft of Front Axle) | mm | 1620 |

**WEIGHT of BALLAST and VEHICLE COMPONENTS
REMOVED TO MEET VEHICLE TEST WEIGHT**

| Description of Component | Weight (kg) |
|---|-------------|
| Ballast | 0 |
| No vehicle components removed to meet VTW | 0 |

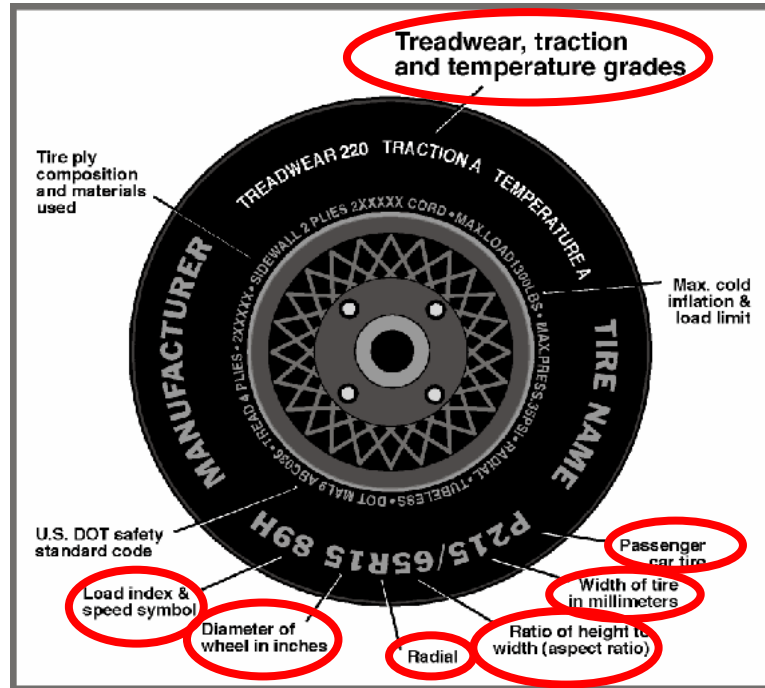
DATA SHEET NO. 3

VEHICLE TIRE INFORMATION

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

VEHICLE TIRE INFORMATION



| Measured Parameter | Front | Rear |
|--------------------------|--------------|--------------|
| Max. Tire Pressure (kPa) | 300 | 300 |
| Cold Pressure (kPa) | 210 | 210 |
| Recommended Tire Size | P215/65R17 | P215/65R17 |
| Tire Size on Vehicle | P215/65R17 | P215/65R17 |
| Tire Manufacturer | Michelin | Michelin |
| Tire Name | Energy Saver | Energy Saver |
| Tire Type | Passenger | Passenger |
| Tire Width | 215 | 215 |
| Aspect Ratio | 65 | 65 |
| Radial | Yes | Yes |
| Wheel Diameter | 17 | 17 |
| Load Index/Speed Symbol | 98T | 98T |
| Treadwear | 480 | 480 |
| Traction Grade | A | A |
| Temperature Grade | B | B |

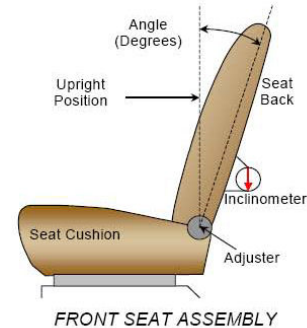
DATA SHEET NO. 4
SEAT AND SEAT BELT ADJUSTMENT DATA

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

NORMAL DESIGN RIDING POSITION

The driver seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Seat back angle is measured at the headrest post by using inclinometer zeroed at the door sill. Set the seat back at 15.5 degrees.



SEAT BACK ANGLE

| | Degrees | Detents |
|-----------------------------|------------------------|--|
| Driver without Seated Dummy | 14.9° at headrest post | 7 th notch (1 st as 0) |

SEAT FORE/AFT POSITION

The method used for determining seat fore/aft position is as follows: For seat track adjustments, set in mid track position.

SEAT FORE/AFT POSITIONING

| | Total Fore/Aft Travel | Placed in Position # |
|------------|-----------------------|----------------------------|
| Front Seat | 270 mm | 135 mm (forward-most as 0) |

SEAT BELT UPPER ANCHORAGE

The method of positioning the seat belt upper anchorage is as follows: Detents to the nominal design position are measured with respect to the uppermost detent. Place at 1st detent for the 50th percentile male.

SEAT BELT UPPER ANCHORAGE

| | Total # of Positions | Placed in Position # |
|-------------|----------------------|---|
| Driver Seat | 4 detents | 1 st detent (uppermost detent defined as 0) |

HEADREST RESTRAINT

The headrest was placed in the uppermost position.

DATA SHEET NO. 5

FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

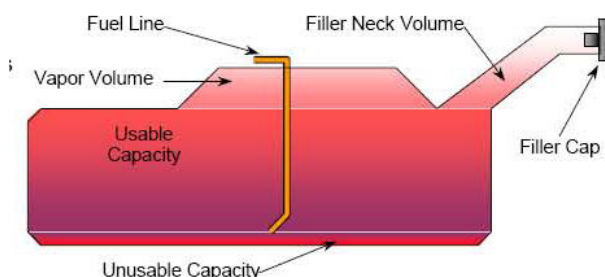
NHTSA No. CB0305
 Test Date: 5/13/2011

FUEL TANK CAPACITY

| | Liters |
|----------------------------------|--------------|
| Usable Capacity (Form 1) | 72.3 |
| Usable Capacity (Owner's Manual) | 72.3 |
| 92-94% of Usable Capacity | 66.5 to 68.0 |
| Actual Amount of Solvent Used | 67.2 |

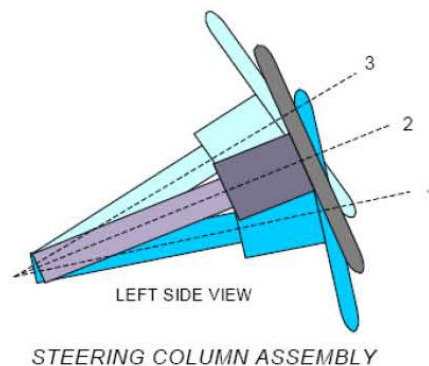
FUEL PUMP

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The test vehicle is equipped with an electric fuel pump. The fuel pump starts pumping fuel when the key is "ON" position. The fuel pipe is on the left side.



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves 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.



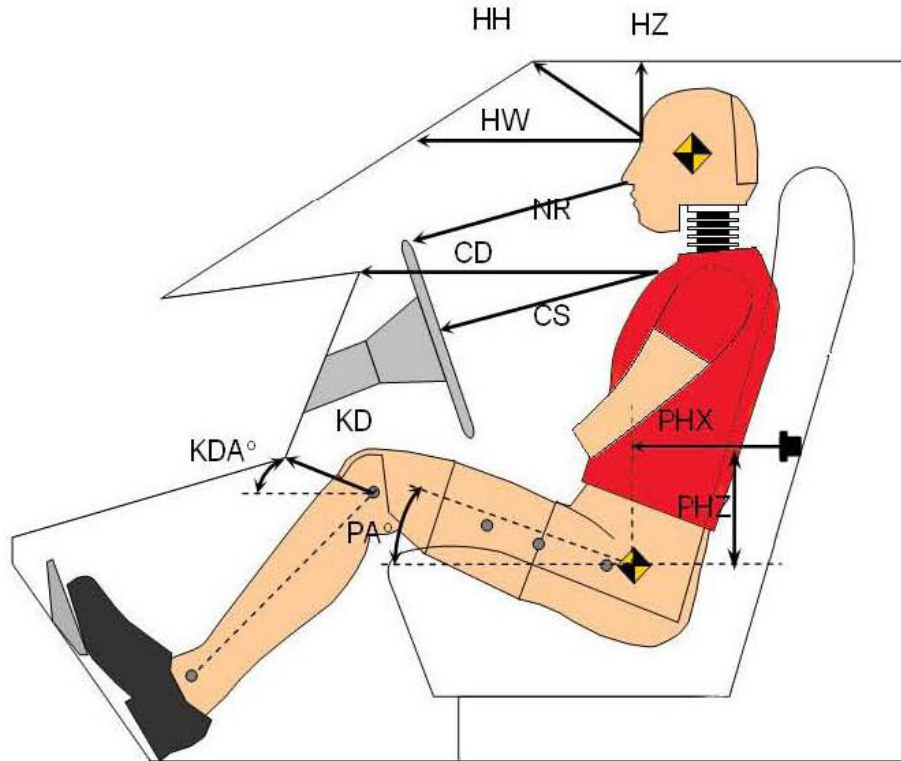
STEERING COLUMN POSITIONING

| | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost - Position 1 | 70.0 | 145 |
| Geometric Center – Position 2 | 67.5 | 115 |
| Uppermost – Position 3 | 65.0 | 85 |
| Telescoping Steering Wheel Travel | | 60 |
| Test Position | 67.5 | 115 |

.DATA SHEET NO. 6
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

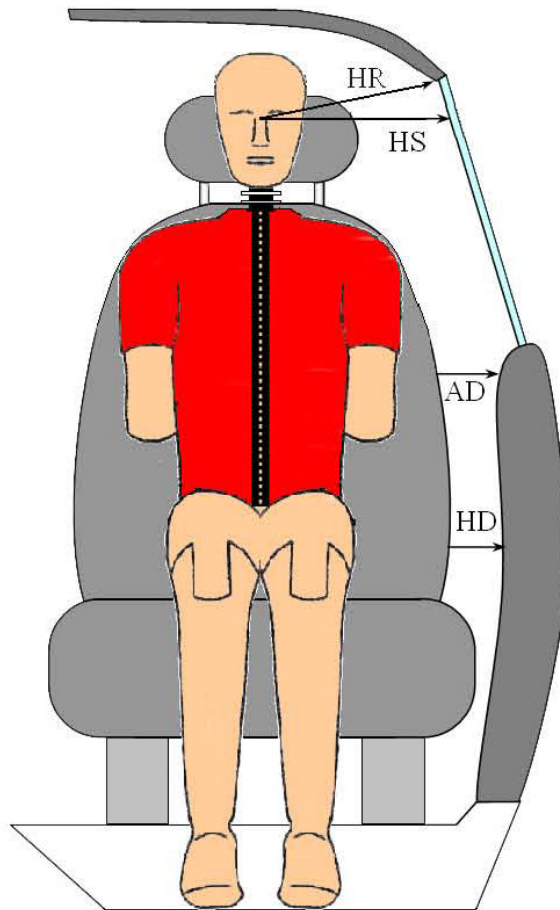


| Driver Code | Measurement Description | Length (mm) | Angle (°) |
|-------------|-----------------------------|-------------|-----------|
| HH | Head to Header | 481 | |
| HW | Head to Windshield | 716 | |
| HZ | Head to Roof | 167 | |
| NR | Nose to Rim | 468 | |
| CD | Chest to Dash | 568 | |
| CS | Chest to Steering Wheel | 341 | |
| KDL | Left Knee to Dash | 166 | 34.7 |
| KDR | Right Knee to Dash | 165 | 32.0 |
| PA | Pelvis Angle X | | 24.0 |
| | Torso Angle Y | | 0.8 |
| PHX | H-Point to Striker (X-Axis) | 178 | |
| PHZ | H-Point to Striker (Z-Axis) | 156 | |

DATA SHEET NO. 7
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

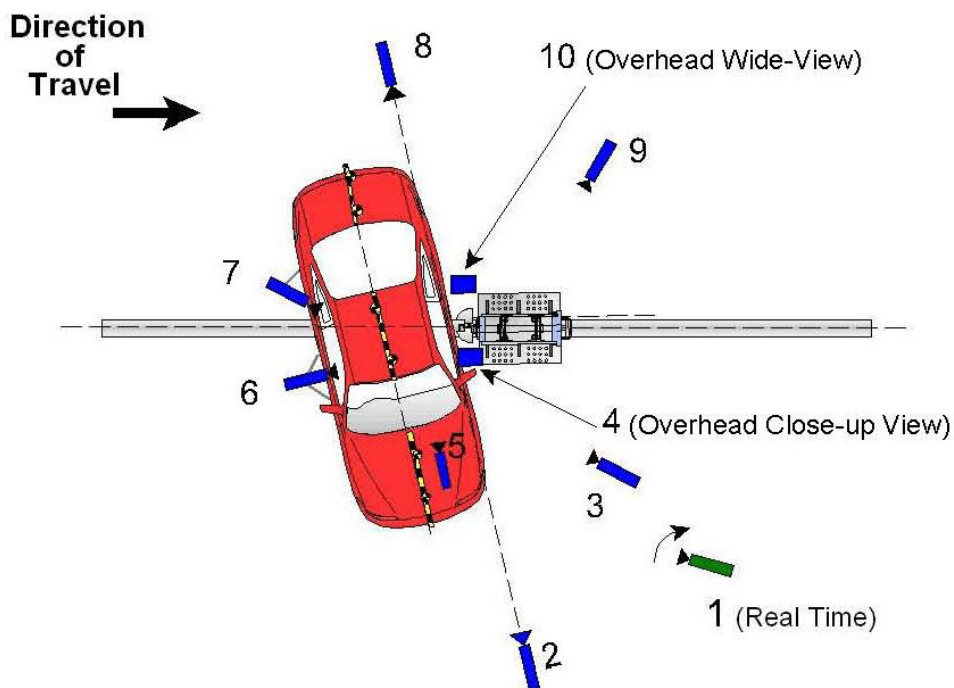


| Code | Measurement Description | Units | Front Occupant |
|------|-------------------------|-------|----------------|
| HR | Head to Side Header | mm | 150 |
| HS | Head to Side Window | mm | 312 |
| AD | Arm to Door | mm | 111 |
| HD | H-Point to Door | mm | 135 |

DATA SHEET NO. 8
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011



Reference: From Point of Impact for X and Y; from Ground for Z):
 +X = Right of Impact, + Y = Forward of Impact, +Z = Up

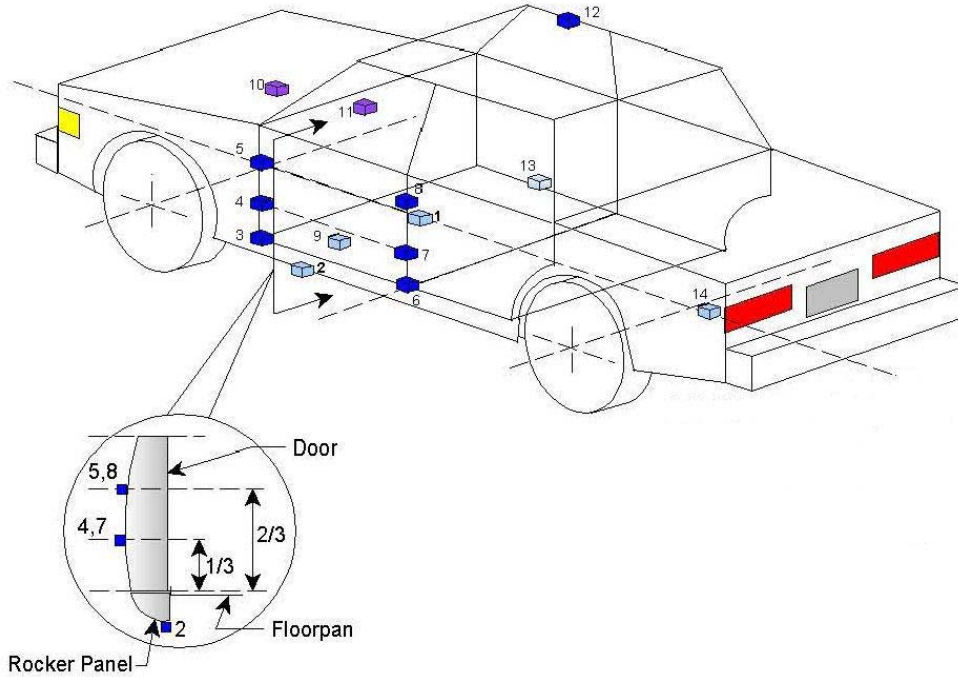
| Camera No. | View | Coordinates (mm) | | | Lens (mm) | Film Speed (fps) |
|------------|--------------------------|------------------|------|------|-----------|------------------|
| | | X | Y | Z | | |
| 1 | Real-Time | | | | | 30 |
| 2 | Front Ground Level | 5860 | -40 | 1760 | 24 | 1000 |
| 3 | Impact Side 45° Forward | 4490 | 2150 | 1900 | 20 | 1000 |
| 4 | Overhead Closeup | 0 | 60 | 4460 | 50 | 1000 |
| 5 | Onboard – Driver Front | | | | 16 | 1000 |
| 6 | Onboard – Driver Side | | | | 8 | 1000 |
| 7 | Onboard – Driver Rear | | | | 8 | 1000 |
| 8 | Rear Ground Level | -5700 | -50 | 1770 | 24 | 1000 |
| 9 | Impact Side 45° Rearward | -3860 | 3790 | 1910 | 20 | 1000 |
| 10 | Overhead Wide | 130 | -280 | 4960 | 14 | 1000 |

DATA SHEET NO. 9

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011



| Loc. No. | Accelerometer Location | | | |
|----------|------------------------|------------------|------|-------|
| | ID | Coordinates (mm) | | |
| | | X | Y | Z |
| 1 | Vehicle CG | 2602 | -240 | -181 |
| 2 | Left Floor Sill | 3048 | -770 | -185 |
| 3 | A Pillar Sill | 3536 | -770 | -175 |
| 4 | A Pillar Low | 3310 | -737 | -555 |
| 5 | A Pillar Mid | 3466 | -837 | -787 |
| 6 | B Pillar Sill | 2399 | -773 | -185 |
| 7 | B Pillar Low | 2202 | -735 | -563 |
| 8 | B Pillar Mid | 2202 | -735 | -862 |
| 9 | Seat | 2312 | -580 | -320 |
| 10 | Engine | 4236 | 0 | -970 |
| 11 | Firewall | 3675 | 0 | -825 |
| 12 | Roof | 2102 | 600 | -1490 |
| 13 | Floor Sill | 2277 | 773 | -180 |
| 14 | Rear Deck | 746 | 0 | -555 |

Reference: X – Test Vehicle Rear Bumper (+ forward)
 Y – Test Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

DATA SHEET NO. 10
TEST VEHICLE ACCELEROMETER DATA SUMMARY

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

| Loc. No. | Description | Peak Values (g's) | | | |
|----------|---------------------|-------------------|-----------|-------|-----------|
| | | Max | Time (ms) | Min | Time (ms) |
| 1 | Vehicle CG (X) | 9.4 | 67.5 | -12.7 | 46.8 |
| | Vehicle CG (Y) | 73.5 | 32.1 | -12.5 | 47.2 |
| | Vehicle CG (Z) | 12.5 | 27.6 | -15.3 | 34.2 |
| | Resultant | 73.5 | 32.1 | | |
| 2 | Left Floor Sill (Y) | 27.9 | 22.0 | -9.2 | 26.2 |
| 3 | A Pillar Sill (Y) | 22.2 | 21.4 | -6.3 | 6.5 |
| 4 | A Pillar Low (Y) | 18.6 | 35.6 | -25.2 | 23.9 |
| 5 | A Pillar Mid (Y) | (1) | (1) | (1) | (1) |
| 6 | B Pillar Sill (Y) | 42.6 | 12.8 | -20.8 | 37.6 |
| 7 | B Pillar Low (Y) | 44.7 | 13.4 | -5.0 | 26.5 |
| 8 | B Pillar Mid (Y) | (2) | (2) | (2) | (2) |
| 9 | Seat (Y) | (3) | (3) | (3) | (3) |
| 10 | Engine (X) | 2.3 | 143.6 | -10.0 | 50.8 |
| | Engine (Y) | 20.7 | 65.8 | -6.9 | 25.9 |
| 11 | Firewall (Y) | 11.2 | 32.5 | -1.5 | 300.0 |
| 12 | Roof (Y) | 16.5 | 45.1 | -2.7 | 10.5 |
| 13 | Floor Sill (Y) | 17.5 | 52.7 | -1.2 | 297.6 |
| 14 | Rear Deck (X) | 1.6 | 207.2 | -6.6 | 34.6 |
| | Rear Deck (Y) | 14.7 | 50.6 | -2.0 | 218.0 |

(1) No valid data collected for A Pillar Mid Y after 35 msec.

(2) No valid data collected for B Pillar Mid Y after 10 msec.

(3) No valid data collected for Seat Y after 20 msec.

DATA SHEET NO. 12
POST TEST OBSERVATIONS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
Test Program: FMVSS 214 Pole

NHTSA No. CB0305
Test Date: 5/13/2011

TEST DUMMY INFORMATION AND CONTACT

| Description | Front Occupant |
|-------------------------|-------------------------------------|
| Dummy Type / Serial No. | ES-2re / 016 |
| Head Contact | Curtain Airbag, Headrest, Headliner |
| Upper Torso Contact | Side Airbag |
| Lower Torso Contact | Side Airbag |
| Left Knee Contact | Door Panel |
| Right Knee Contact | Left Knee |

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

| Description | Front | Rear |
|-----------------------|---------------------------------|---------------------------------|
| Left Side Doors | Remained closed and jammed shut | Remained closed and jammed shut |
| Right Side Doors | Remained closed and operational | Remained closed and operational |
| Hatch and Other Doors | | |
| Seat Movement | 0 | 0 |
| Seat Back Failure | None | None |

POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|--|
| Pillar Performance | No Separation |
| Sill Separation | None |
| Windshield Damage | Cracked |
| Window Damage | Left Front Window Cracked / Left Rear Window Broke |
| Other Notable Effects | None |

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Type | Front Occupant | |
|--------------------------|----------------|----------|
| | Installed | Operated |
| Frontal Airbag | Yes | No |
| Side Torso/Pelvis Airbag | Yes | Yes |
| Head Airbag | No | |
| Curtain Airbag | Yes | Yes |
| Knee Airbag | Yes | No |
| Seat Belt Pretensioner | Yes | Yes |
| Seat Belt Load Limiter | Yes | |

DATA SHEET NO. 13

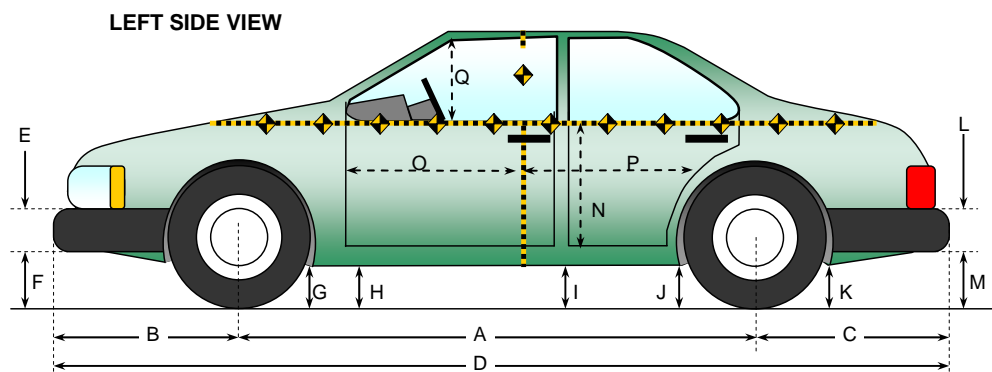
VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan

NHTSA No. CB0305

Test Program: FMVSS 214 Pole

Test Date: 5/13/2011

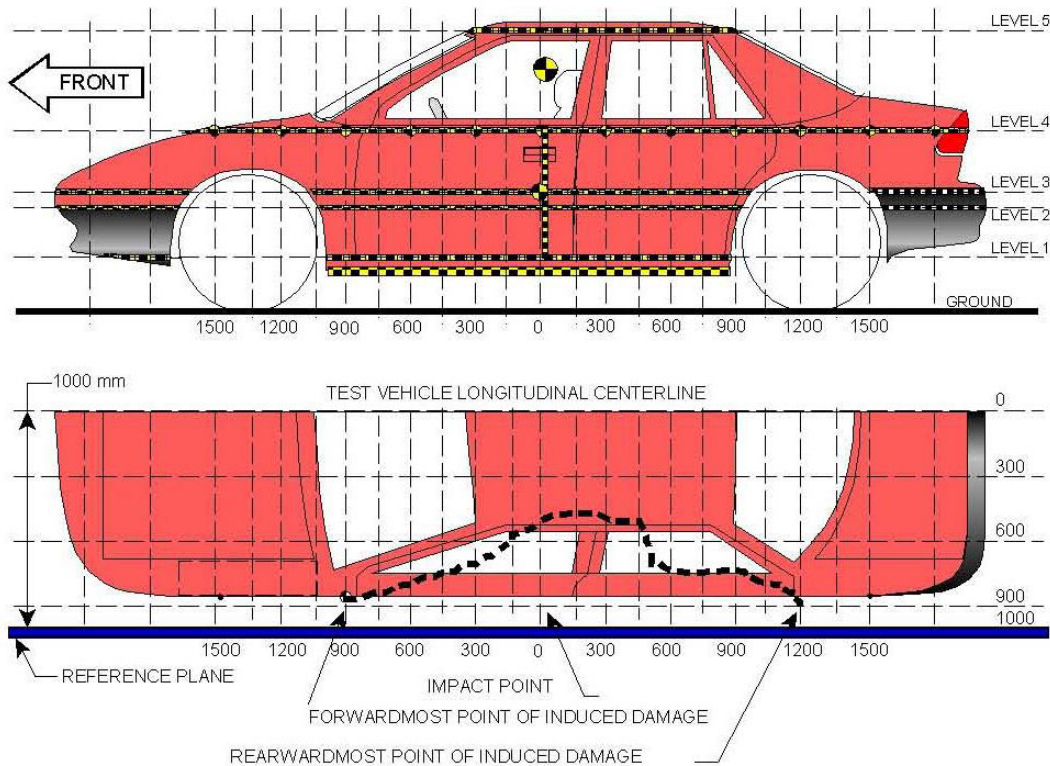


| Code | Measurement Description | Pre-Test (mm) | Post-Test (mm) | Difference (mm) |
|------|--|---------------|----------------|-----------------|
| A | Wheelbase | 3050 | 2940 | 110 |
| B | Front Axle to FSOV | 930 | 930 | 0 |
| C | Rear Axle to RSOV | 1100 | 1100 | 0 |
| D | Total Vehicle Length at Centerline | 5080 | 4970 | 110 |
| E | Front Bumper Thickness | 130 | 130 | 0 |
| F | Front Bumper Bottom to Ground | 191 | 213 | -22 |
| G | Sill Height at Front Wheel Well | 147 | 147 | 0 |
| H | Sill Height at Front Door Leading Edge | 147 | 150 | -3 |
| I | Sill Height at B Pillar | 165 | 167 | -2 |
| J1 | Sill Height at Rear Wheel Well | 182 | 192 | -10 |
| J2 | Pinch Weld Height at Rear Wheel Well | 176 | 190 | -14 |
| K | Sill Height Aft of Rear Wheel Well | 228 | 230 | -2 |
| L | Rear Bumper Thickness | 108 | 108 | 0 |
| M | Rear Bumper Bottom to Ground | 262 | 252 | 10 |
| N | Sill Height to Window Bottom Sill | 780 | 740 | 40 |
| O | Front Door Leading Edge to Impact CL | 930 | 928 | 2 |
| P | Rear Door Trailing Edge to Impact CL | 1185 | 1280 | -95 |
| Q | Front Window Opening | 455 | 425 | 30 |
| R | Right Side Length | 4495 | 4502 | -7 |
| S | Left Side Length | 4495 | 4370 | 125 |
| T | Vehicle Width at B Post | 1895 | 1690 | 205 |

DATA SHEET NO. 14
EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011



NOTE: All measurements are in millimeters (mm)

Maximum Exterior Crush Measurements

| Level | Measurement Description | Maximum Exterior Static Crush | Distance from Impact | Height Above Ground (mm) |
|-------|-------------------------|-------------------------------|----------------------|--------------------------|
| 1 | Sill Top | 303 | 0 | 240 |
| 2 | Occupant H-Point | 364 | 0 | 550 |
| 3 | Mid-Door | 373 | 0 | 642 |
| 4 | Window Sill | 313 | 0 | 975 |
| 5 | Window Top | 143 | 0 | 1410 |

DATA SHEET NO. 15

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

| | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
|---------------------------|---------|---------|---------|---------|---------|
| Maximum Crush (mm) | 303 | 364 | 373 | 313 | 143 |
| Distance From Impact (mm) | 0 | 0 | 0 | 0 | 0 |

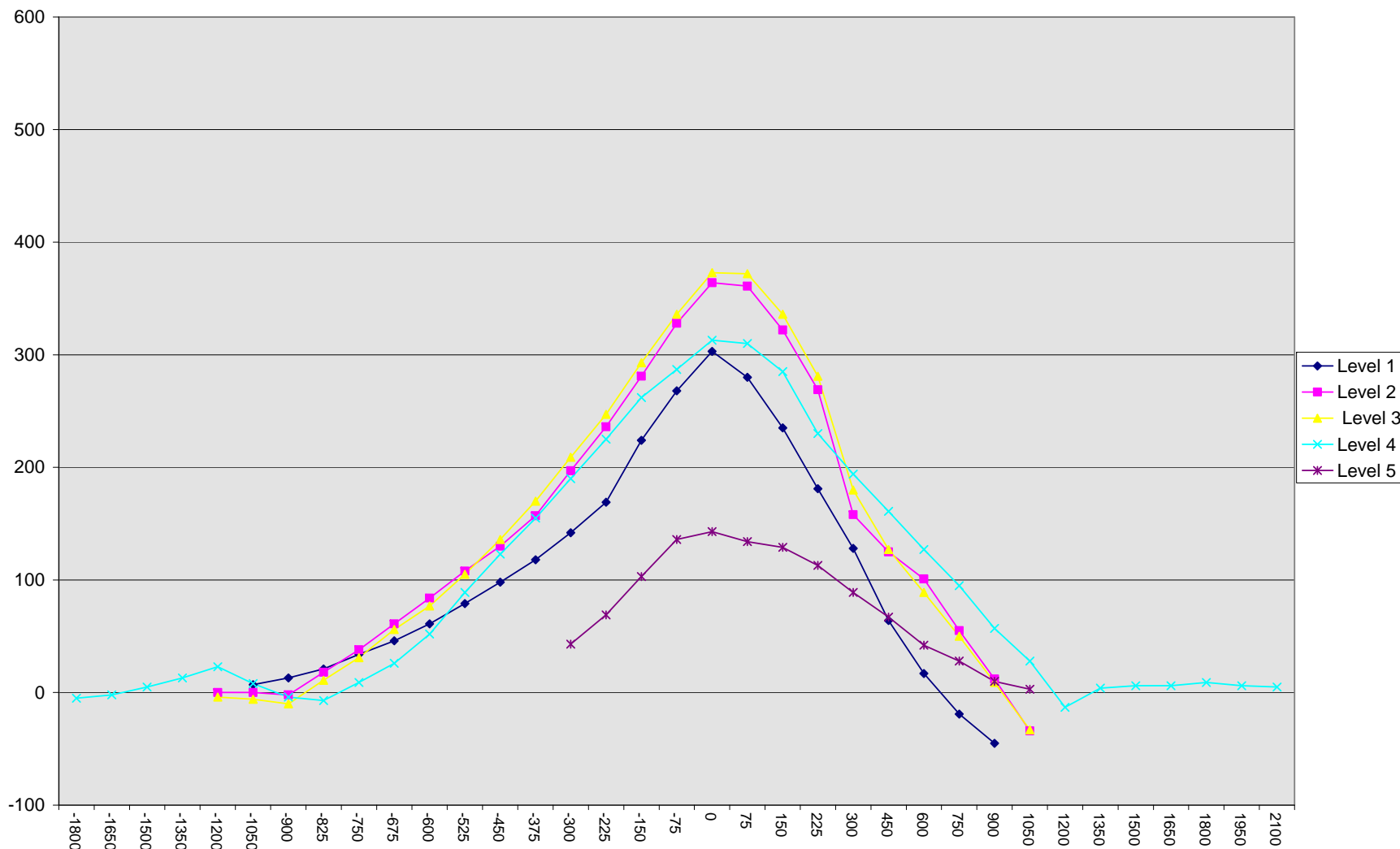
| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|-------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|------------|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -1800 | | | | 284 | | | | | 279 | | | | | | -5 |
| -1650 | | | | 277 | | | | | 275 | | | | | | -2 |
| -1500 | | | | 267 | | | | | 272 | | | | | | 5 |
| -1350 | | | | 263 | | | | | 276 | | | | | | 13 |
| -1200 | | 160 | 158 | 259 | | | 160 | 154 | 282 | | | 0 | -4 | 23 | |
| -1050 | 206 | 160 | 158 | 254 | | 213 | 160 | 152 | 262 | | 7 | 0 | -6 | 8 | |
| -900 | 211 | 159 | 157 | 249 | | 224 | 157 | 147 | 245 | | 13 | -2 | -10 | -4 | |
| -825 | 214 | 159 | 156 | 247 | | 235 | 177 | 167 | 240 | | 21 | 18 | 11 | -7 | |
| -750 | 215 | 159 | 156 | 248 | | 249 | 197 | 187 | 257 | | 34 | 38 | 31 | 9 | |
| -675 | 216 | 172 | 171 | 248 | | 262 | 233 | 227 | 274 | | 46 | 61 | 56 | 26 | |
| -600 | 216 | 175 | 170 | 245 | | 277 | 259 | 247 | 297 | | 61 | 84 | 77 | 52 | |
| -525 | 217 | 174 | 168 | 239 | | 296 | 282 | 273 | 328 | | 79 | 108 | 105 | 89 | |
| -450 | 217 | 172 | 166 | 239 | | 315 | 302 | 302 | 362 | | 98 | 130 | 136 | 123 | |
| -375 | 218 | 170 | 165 | 239 | | 336 | 327 | 335 | 394 | | 118 | 157 | 170 | 155 | |
| -300 | 219 | 169 | 163 | 238 | 472 | 361 | 366 | 372 | 428 | 515 | 142 | 197 | 209 | 190 | 43 |
| -225 | 219 | 168 | 162 | 234 | 470 | 388 | 404 | 409 | 459 | 539 | 169 | 236 | 247 | 225 | 69 |
| -150 | 216 | 166 | 160 | 233 | 468 | 440 | 447 | 453 | 495 | 571 | 224 | 281 | 293 | 262 | 103 |
| -75 | 217 | 165 | 159 | 231 | 467 | 485 | 493 | 495 | 518 | 603 | 268 | 328 | 336 | 287 | 136 |
| 0 | 216 | 164 | 158 | 230 | 467 | 519 | 528 | 531 | 543 | 610 | 303 | 364 | 373 | 313 | 143 |
| 75 | 216 | 164 | 156 | 228 | 467 | 496 | 525 | 528 | 538 | 601 | 280 | 361 | 372 | 310 | 134 |
| 150 | 217 | 162 | 156 | 227 | 466 | 452 | 484 | 492 | 512 | 595 | 235 | 322 | 336 | 285 | 129 |
| 225 | 215 | 161 | 155 | 225 | 467 | 396 | 430 | 436 | 455 | 580 | 181 | 269 | 281 | 230 | 113 |
| 300 | 215 | 160 | 155 | 223 | 466 | 343 | 318 | 335 | 417 | 555 | 128 | 158 | 180 | 194 | 89 |
| 450 | 214 | 159 | 154 | 220 | 465 | 278 | 284 | 281 | 381 | 532 | 64 | 125 | 127 | 161 | 67 |
| 600 | 210 | 156 | 153 | 217 | 465 | 227 | 257 | 242 | 344 | 505 | 17 | 101 | 89 | 127 | 42 |
| 750 | 205 | 155 | 152 | 214 | 466 | 186 | 210 | 202 | 309 | 494 | -19 | 55 | 50 | 95 | 28 |
| 900 | 200 | 152 | 150 | 212 | 472 | 155 | 164 | 159 | 269 | 482 | -45 | 12 | 9 | 57 | 10 |
| 1050 | | 149 | 148 | 207 | 480 | | 115 | 115 | 235 | 483 | | -34 | -33 | 28 | 3 |
| 1200 | | | | 206 | | | | | 193 | | | | | | -13 |
| 1350 | | | | 207 | | | | | 211 | | | | | | 4 |
| 1500 | | | | 209 | | | | | 215 | | | | | | 6 |
| 1650 | | | | 213 | | | | | 219 | | | | | | 6 |
| 1800 | | | | 221 | | | | | 230 | | | | | | 9 |
| 1950 | | | | 234 | | | | | 240 | | | | | | 6 |
| 2100 | | | | 250 | | | | | 255 | | | | | | 5 |

DATA SHEET NO. 15 (CONTINUED)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
Test Program: FMVSS 214 Pole

NHTSA No. CB0305
Test Date: 5/13/2011

18



DATA SHEET NO. 16

SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

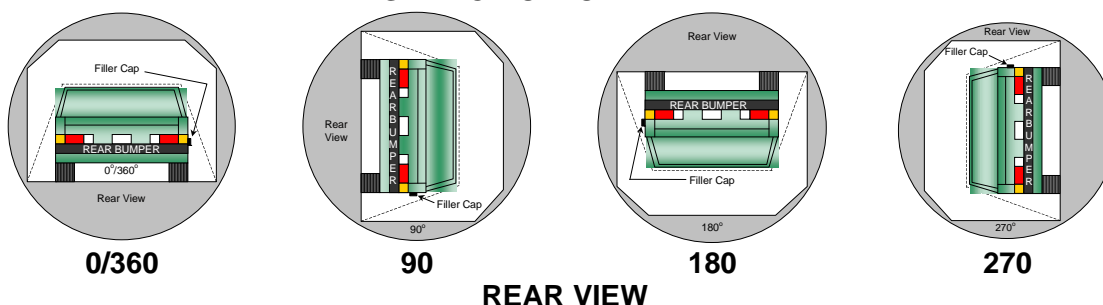
Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

FUEL SYSTEM INTEGRITY POST IMPACT DATA

| Time Interval | FMVSS 301 Maximum Allowable Spillage | Spillage (g) |
|-------------------------------------|--------------------------------------|--------------|
| Impact Until Motion Ceases | 28 g | 0 |
| First Five Minutes Following Impact | 142 g | 0 |
| Next 25 Minutes | 28 g / 1 minute | 0 |

STATIC ROLLOVER DATA



| Rollover Stage | Rotation Time (spec. 1-3 min) | | | | FMVSS 301 Hold Time | | Total Time | | | | Next Whole Minute Interval | |
|----------------|-------------------------------|---------|----|---------|---------------------|---------|------------|---------|----|---------|----------------------------|---------|
| 0° - 90° | 1 | minutes | 59 | seconds | 5 | minutes | 6 | minutes | 59 | seconds | 7 | minutes |
| 90° - 180° | 1 | minutes | 58 | seconds | 5 | minutes | 6 | minutes | 58 | seconds | 7 | minutes |
| 180° - 270° | 1 | minutes | 51 | seconds | 5 | minutes | 6 | minutes | 51 | seconds | 7 | minutes |
| 270° - 360° | 1 | minutes | 55 | seconds | 5 | minutes | 6 | minutes | 55 | seconds | 7 | minutes |

| Rollover Stage | Spillage (g) | | | |
|--|-------------------------------------|----------------------|----------------------|------------------------------------|
| | First 5 min. from onset of rotation | 6 th min. | 7 th min. | 8 th min. (if required) |
| 0° - 90° | 0 | 0 | 0 | |
| 90° - 180° | 0 | 0 | 0 | |
| 180° - 270° | 0 | 0 | 0 | |
| 270° - 360° | 0 | 0 | 0 | |
| FMVSS 301 Maximum Allowable (for each 90° stage) | 142 | 28 | 28 | 28 |

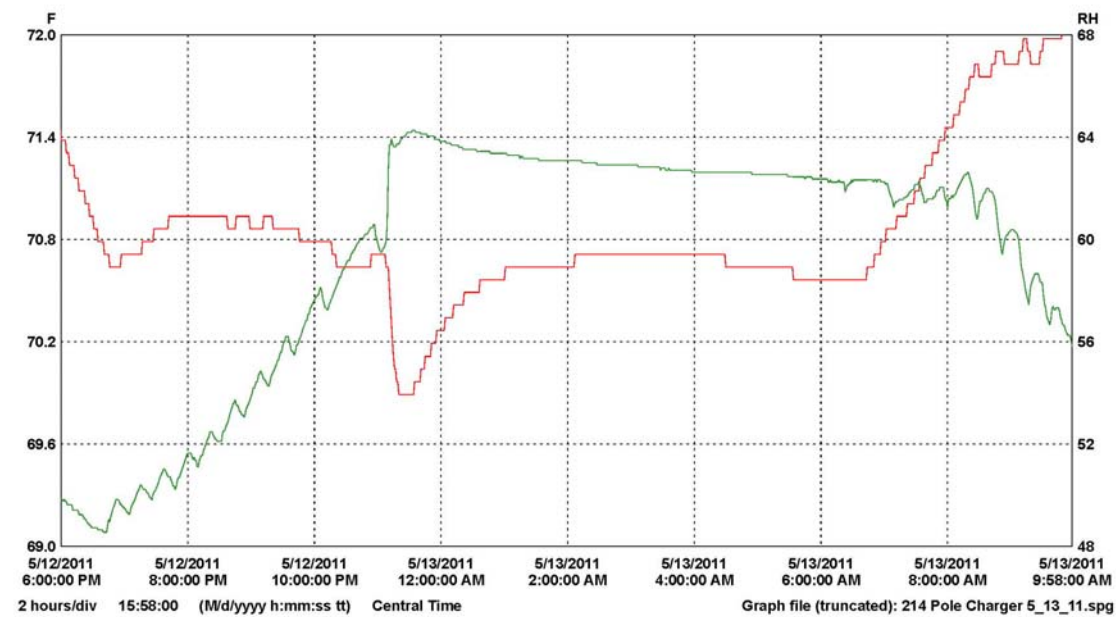
| Rollover Stage | Spillage Location(s) |
|----------------|----------------------|
| 0° to 90° | None |
| 90° to 180° | None |
| 180° to 270° | None |
| 270° to 360° | None |

DATA SHEET NO. 17
TEMPERATURE AND HUMIDITY TRACES

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan
 Test Program: FMVSS 214 Pole

NHTSA No. CB0305
 Test Date: 5/13/2011

Time of Impact: 9:58 am



2 hours/div 15:58:00 (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): 214 Pole Charger 5_13_11.spg

| LN | Serial # | Description | CH | Value | Maximum | Average | Minimum | Units | CH description | Logger file |
|----|----------|----------------|----|-------|---------|---------|---------|-------------|---------------------------|-------------|
| 1 | 10102056 | Vehicle Prep 1 | 1 | 72.05 | 70.85 | 69.89 | F | Temperature | 10102056_Vehicle_Prep.spl | |
| 2 | 10102056 | Vehicle Prep 2 | 2 | 64.3 | 59.4 | 48.6 | RH | Humidity | 10102056_Vehicle_Prep.spl | |

APPENDIX A
PHOTOGRAPHS

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| Photo No. 3. | Pre-Test Rear View of Test Vehicle | A-2 |
| Photo No. 4. | Post-Test Rear View of Test Vehicle | A-2 |
| Photo No. 5. | Pre-Test Impacted Side View of Test Vehicle | A-3 |
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| Photo No. 29. | Post-Test Vehicle at 270 Degree Rollover | A-16 |
| Photo No. 30. | Post-Test Vehicle at 360 Degree Rollover | A-16 |



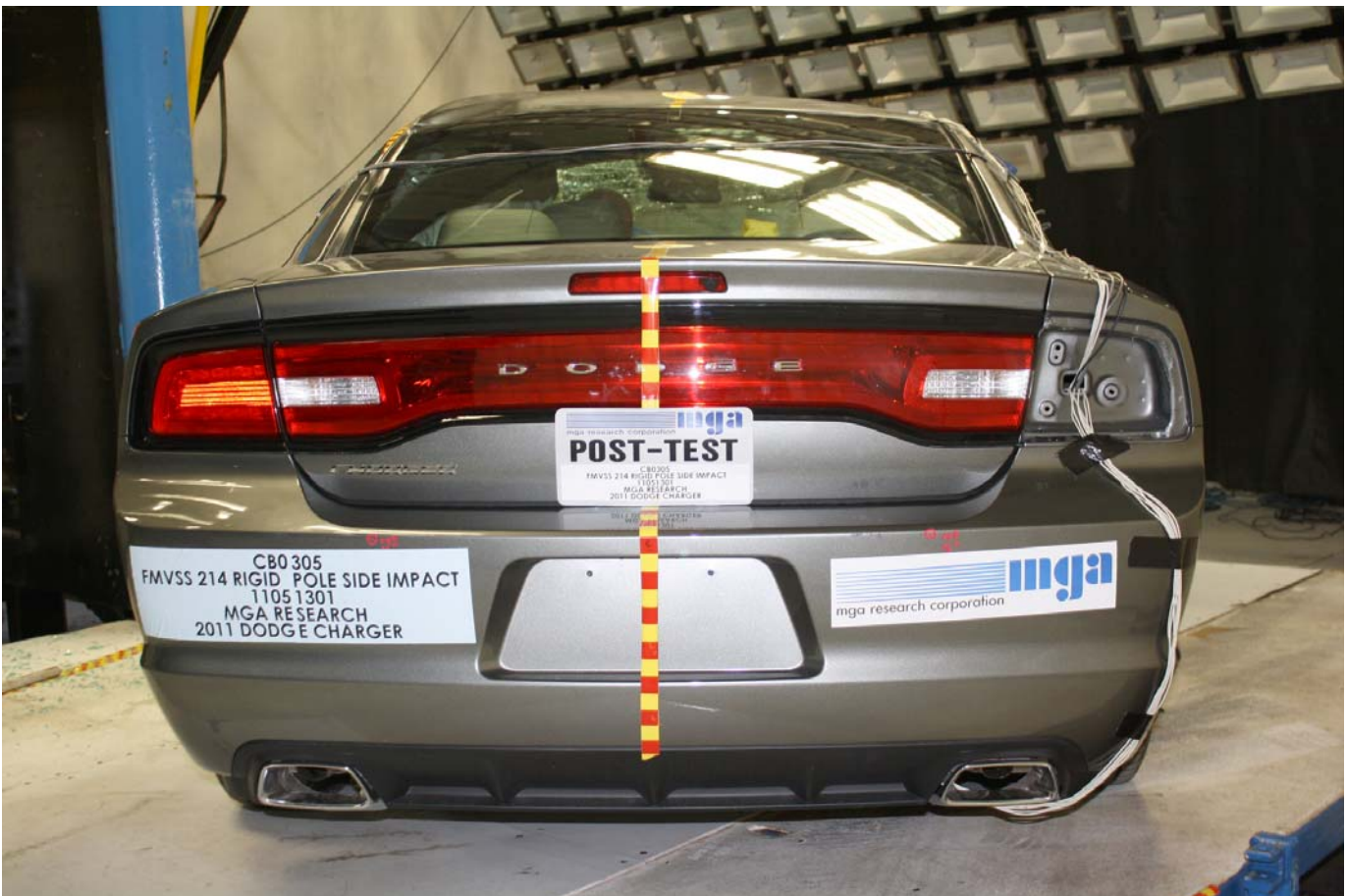
Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



Pre-Test Impacted Side View of Test Vehicle



Post-Test Impacted Side View of Test Vehicle



Pre-Test Left $\frac{3}{4}$ Front View of Vehicle and Pole



Pre-Test Left $\frac{3}{4}$ Rear View of Vehicle and Pole



Pre-Test Overhead View of Test Vehicle



Post-Test Overhead View of Test Vehicle



Pre-Test Dummy Through Opposite Window



Post-Test Dummy Through Opposite Window



Pre-Test Close-up of Dummy with Door Closed (Impact Side)



Post-Test Dummy with Door Closed (Impact Side)



Pre-Test Dummy Door Open



Pre-Test Dummy Shoulder and Door Top View



Post-Test Dummy Shoulder and Door Top View



Pre-Test Interior of Front Door Closed



Post-Test Interior of Front Door Showing Dummy Impact Locations



Impact Event



Post-Test Impact Zone Close-up View



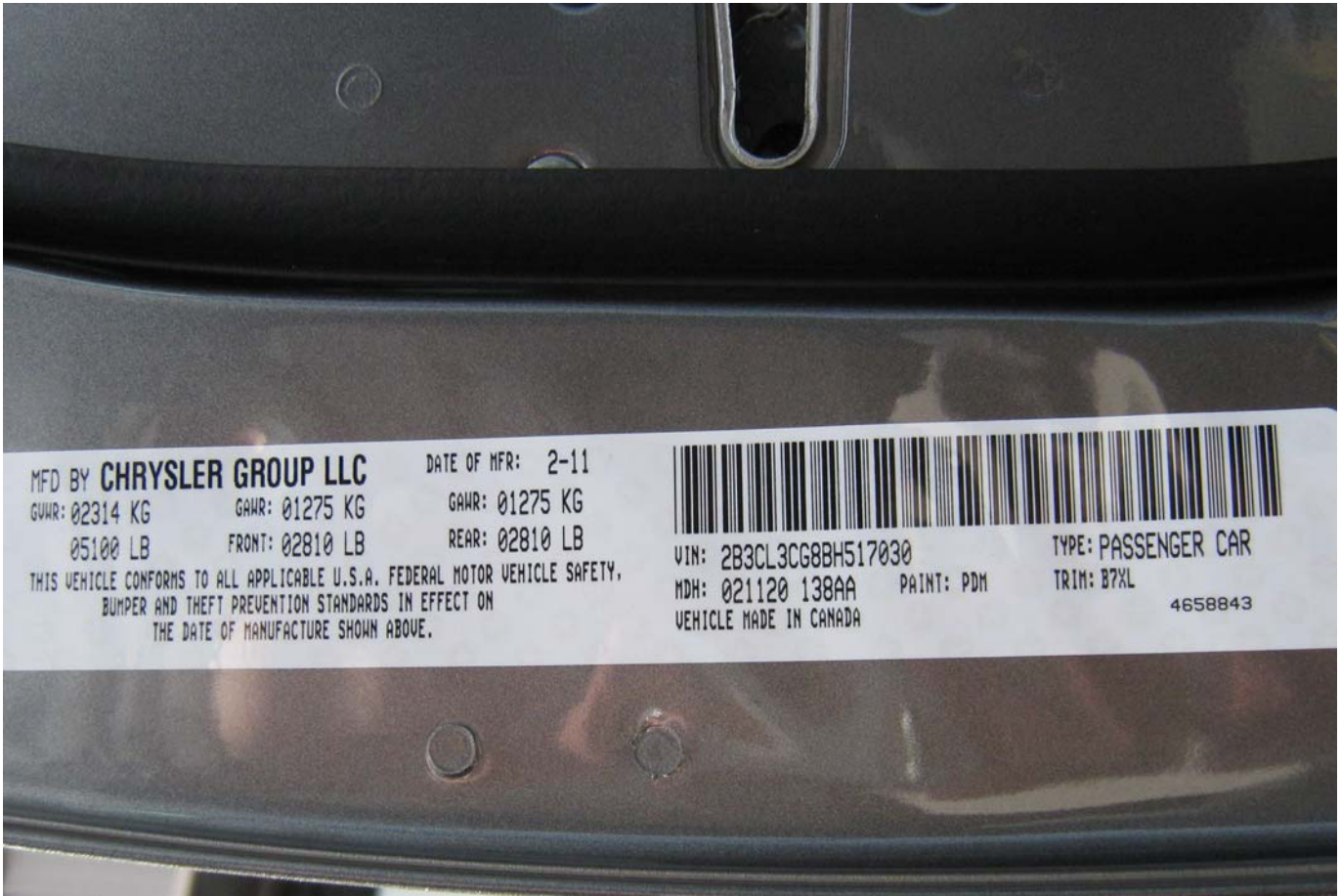
Post-Test $\frac{3}{4}$ Front View of Impact Zone



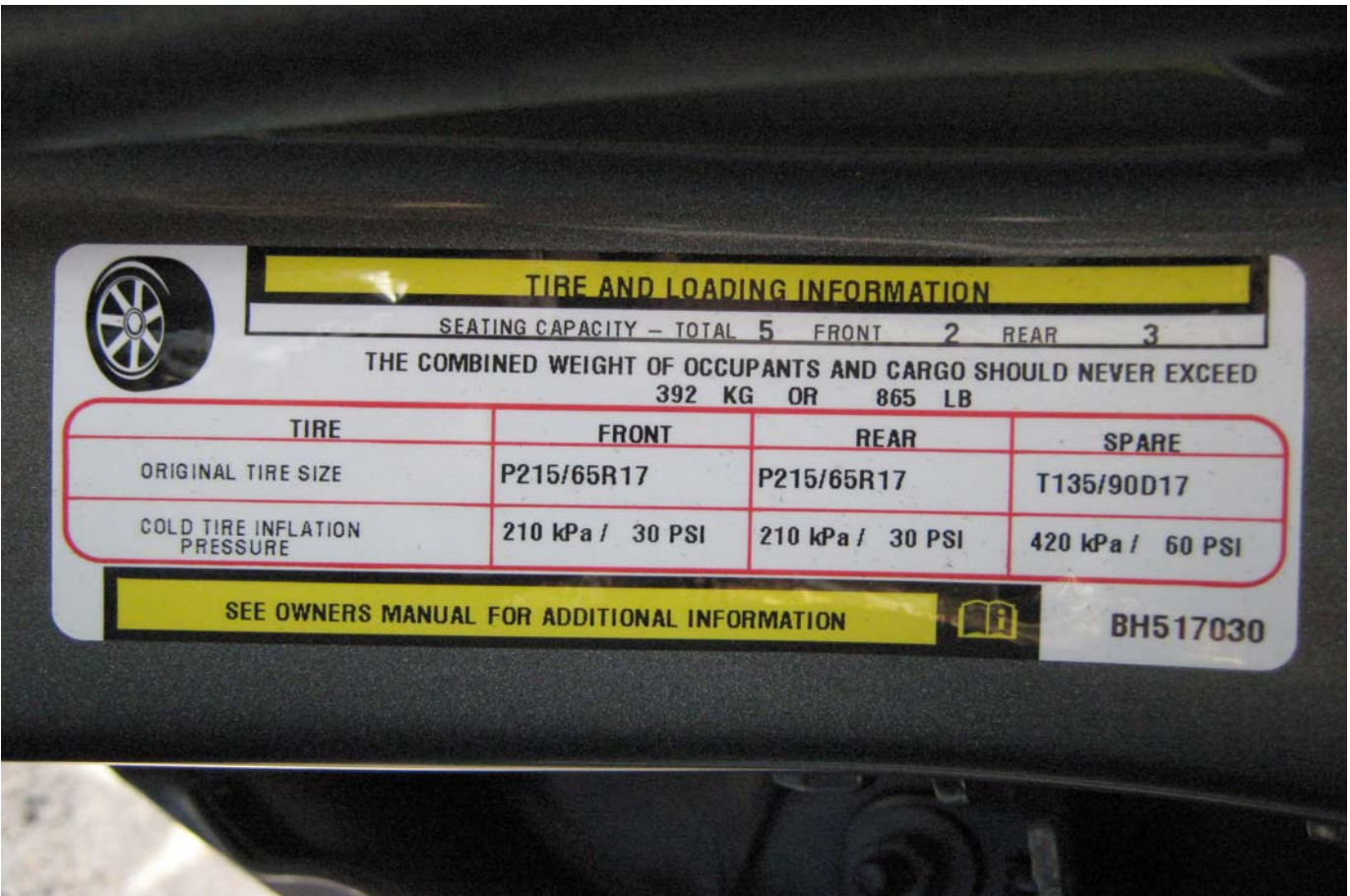
Post-Test $\frac{3}{4}$ Rear View of Impact Zone



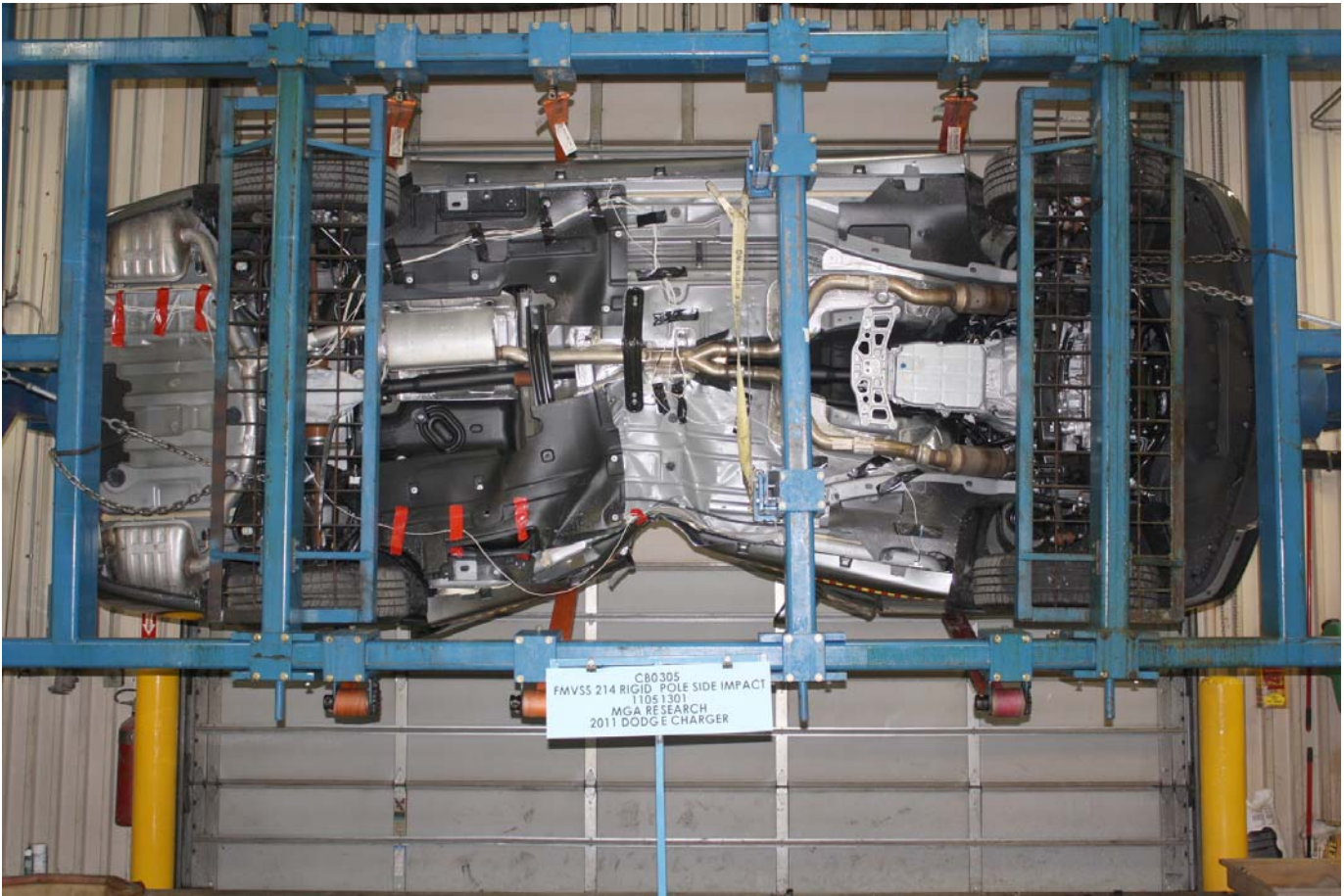
Post-Test Close-up View of Impact Point Target



Close-up View of Vehicle's Certification Label



Close-up View of Vehicle's Tire Placard Label



Post-Test Vehicle at 90 Degree Rollover



Post-Test Vehicle at 180 Degree Rollover



Post-Test Vehicle at 270 Degree Rollover



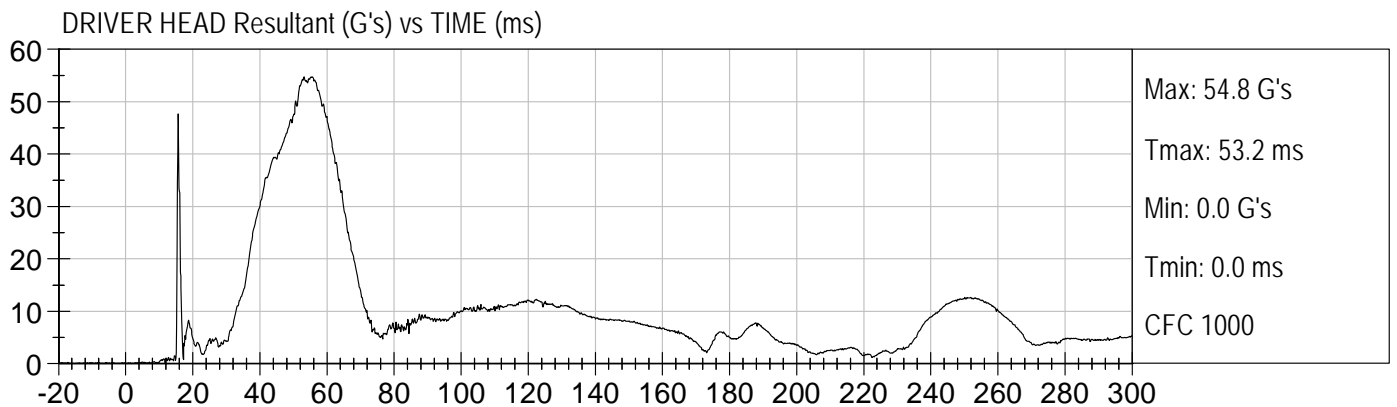
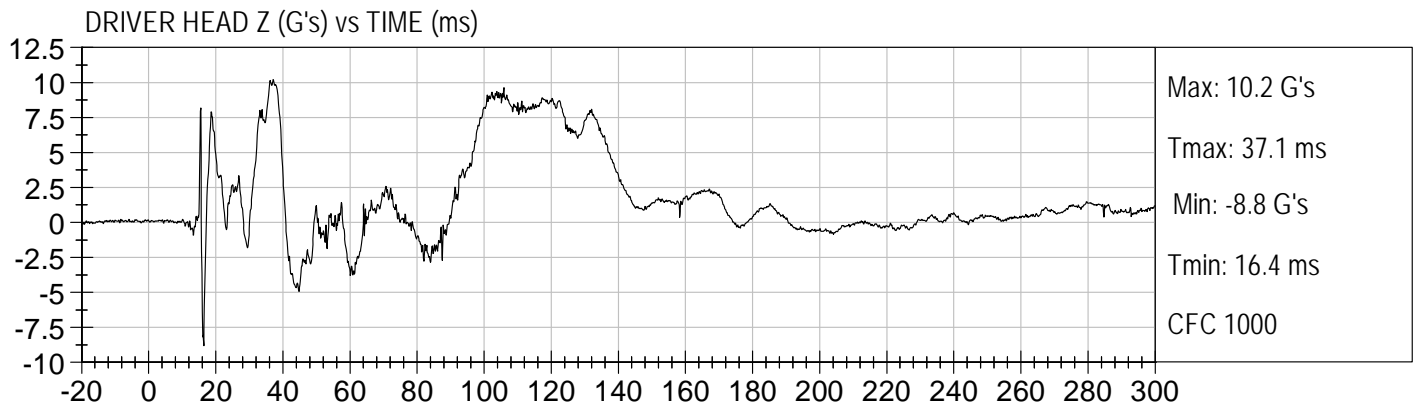
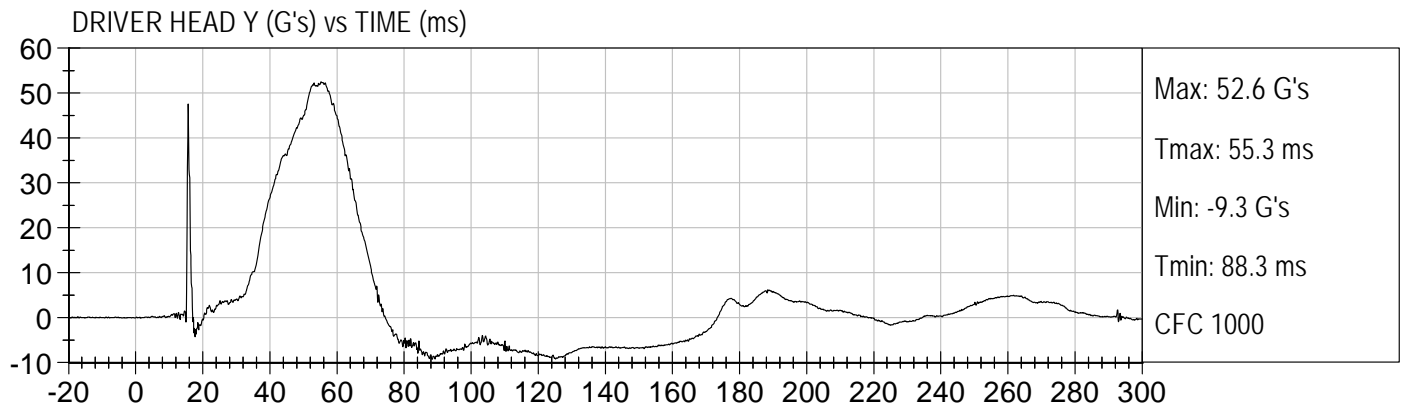
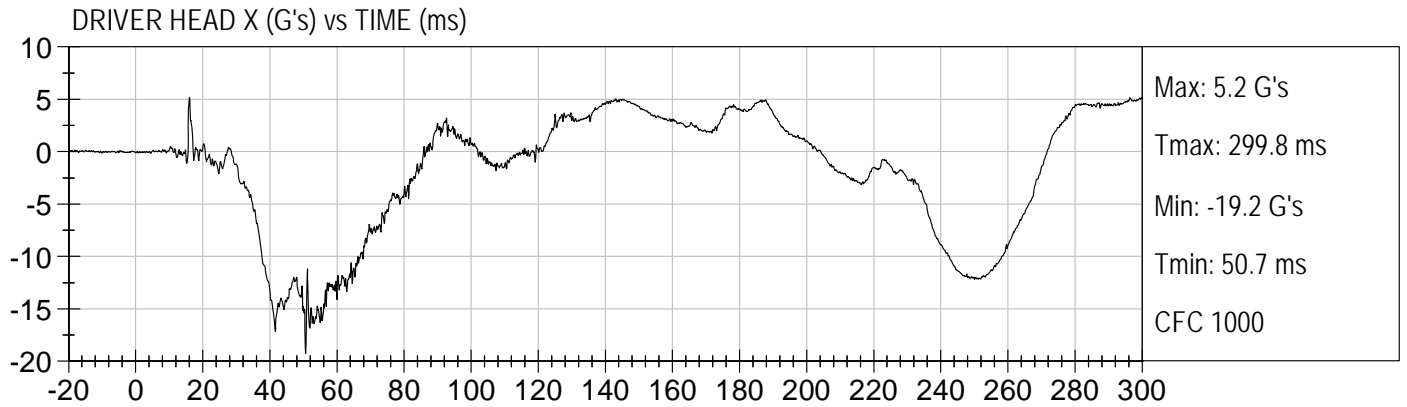
Post-Test Vehicle at 360 Degree Rollover

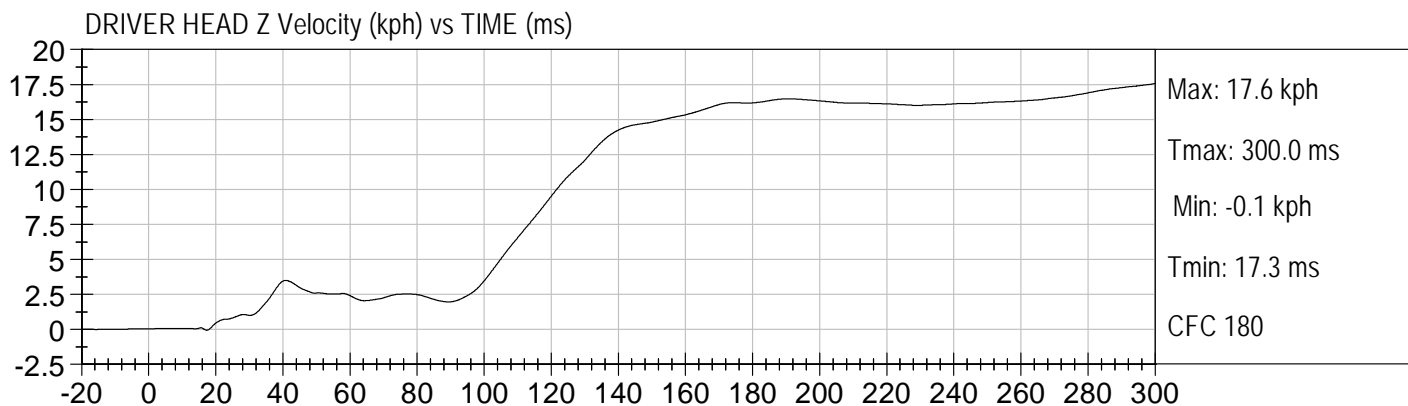
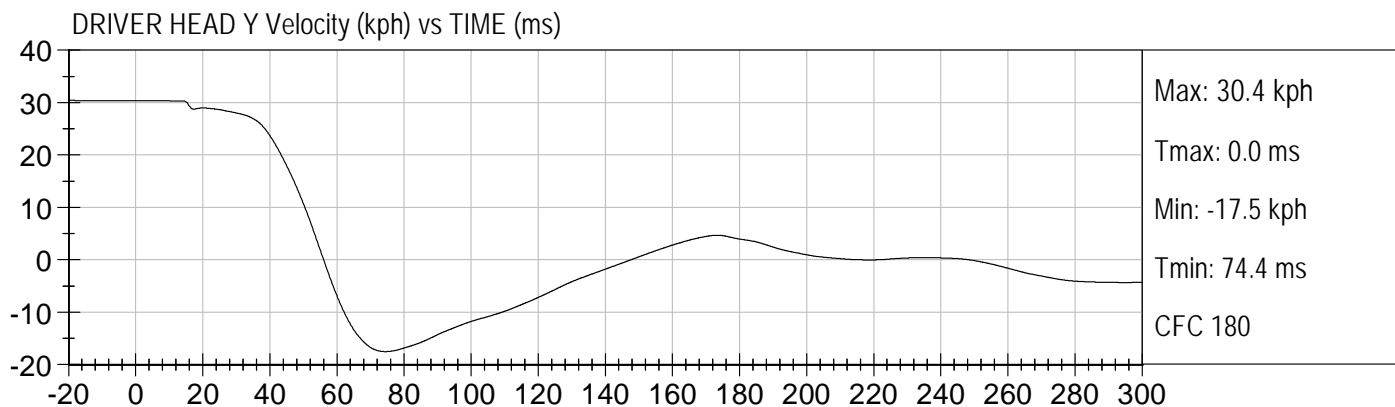
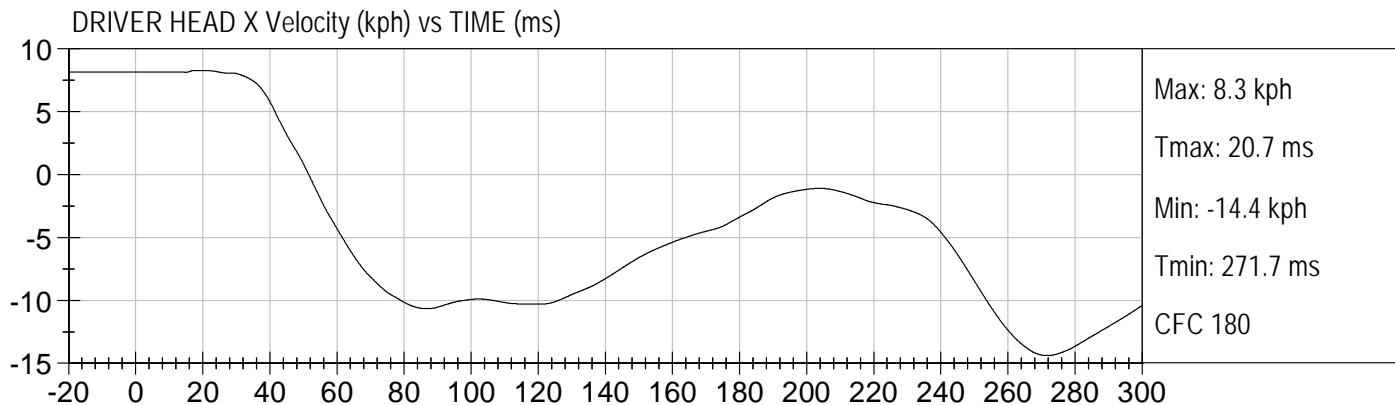
APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

Dummy Instrumentation Plots FILTERED DATA

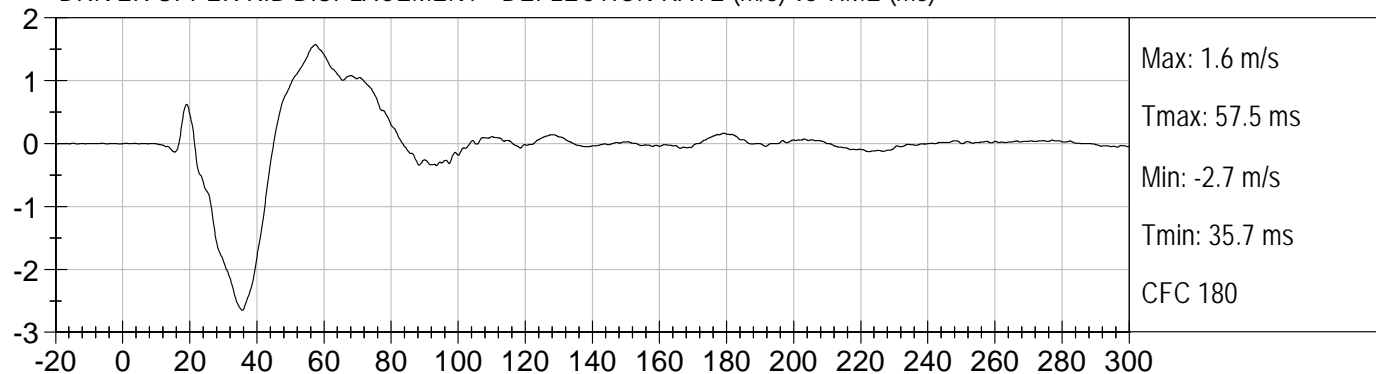
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| Figure No. 2. | ES-2re Head (Y) Acceleration vs. Time | B-1 |
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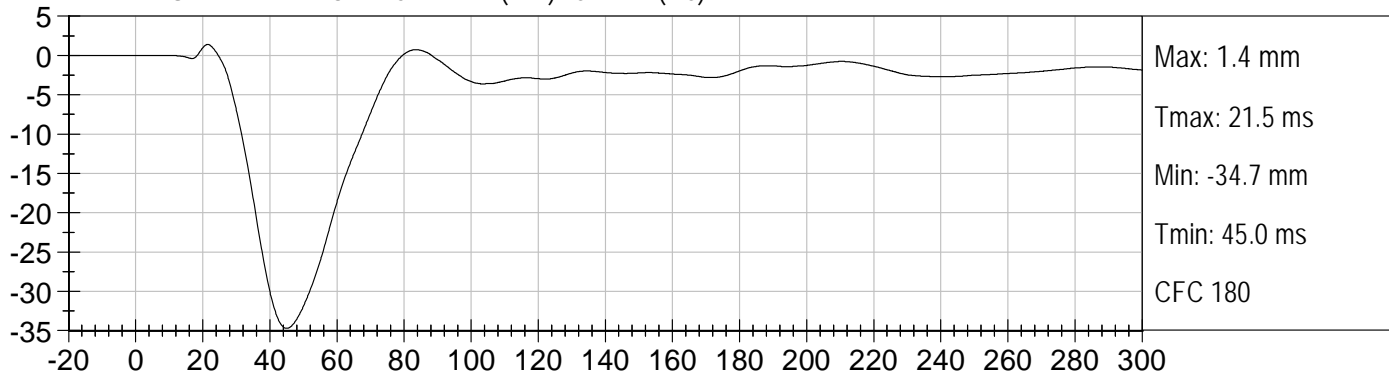




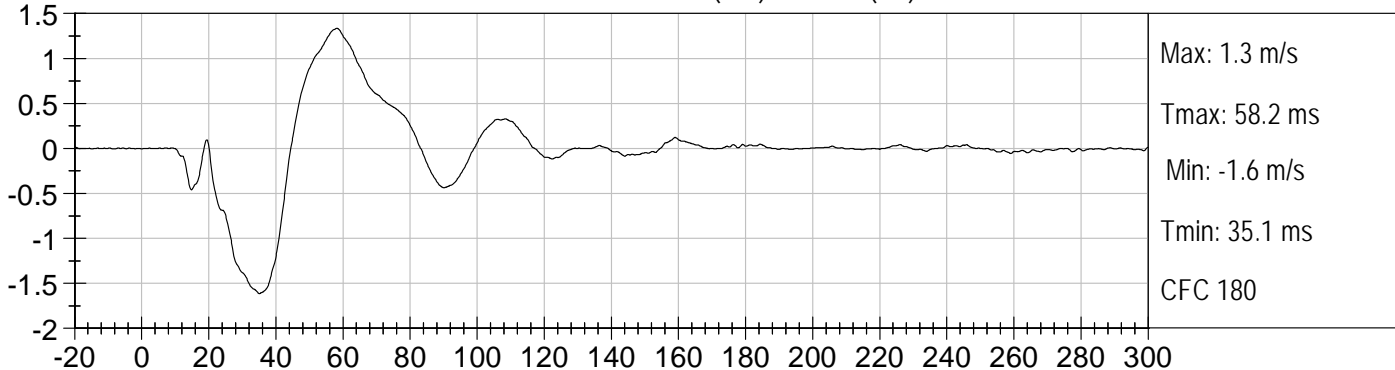
DRIVER UPPER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



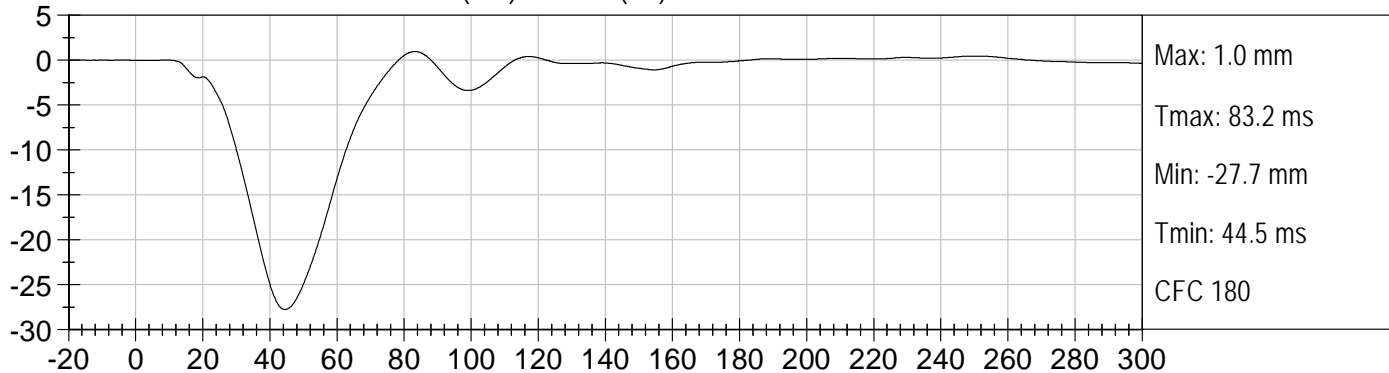
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)

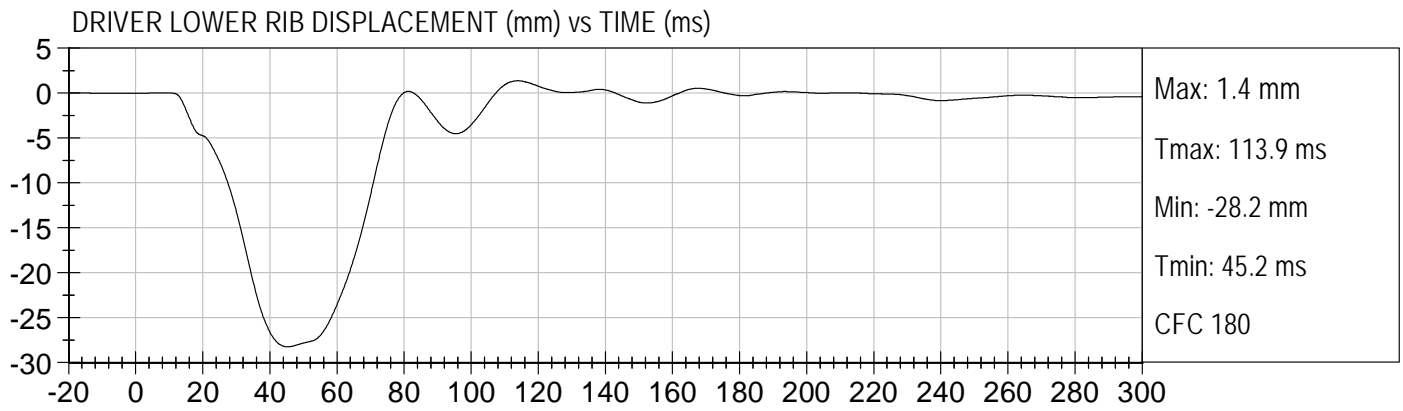
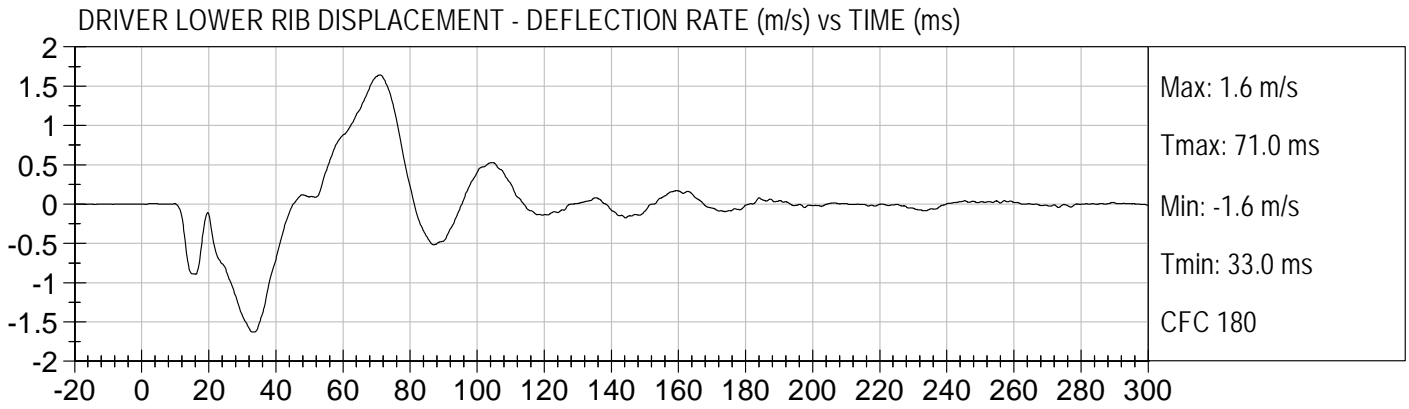


DRIVER MID RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



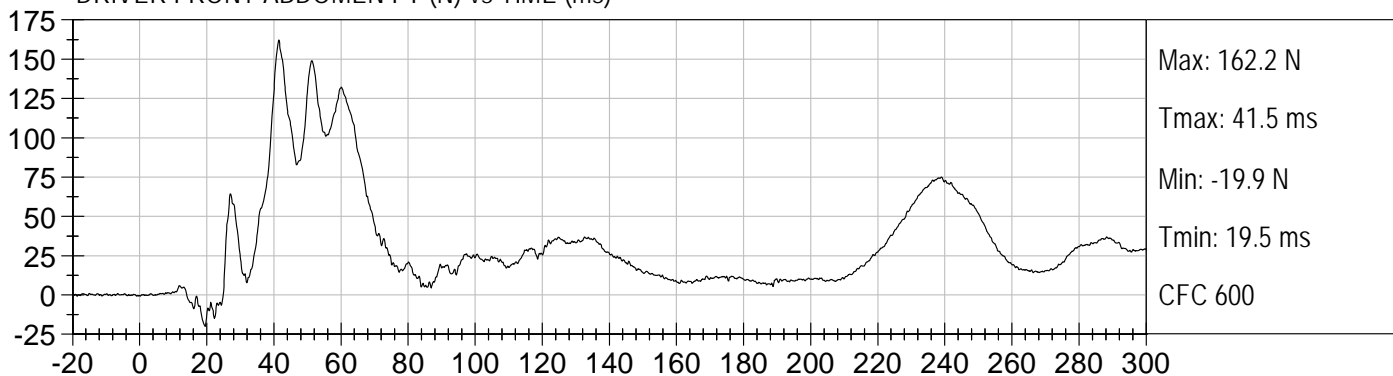
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



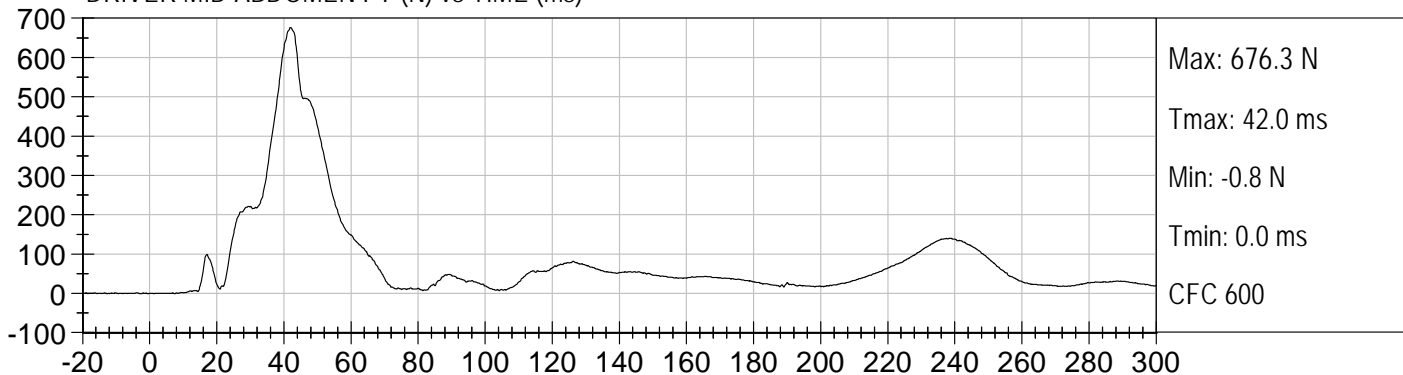




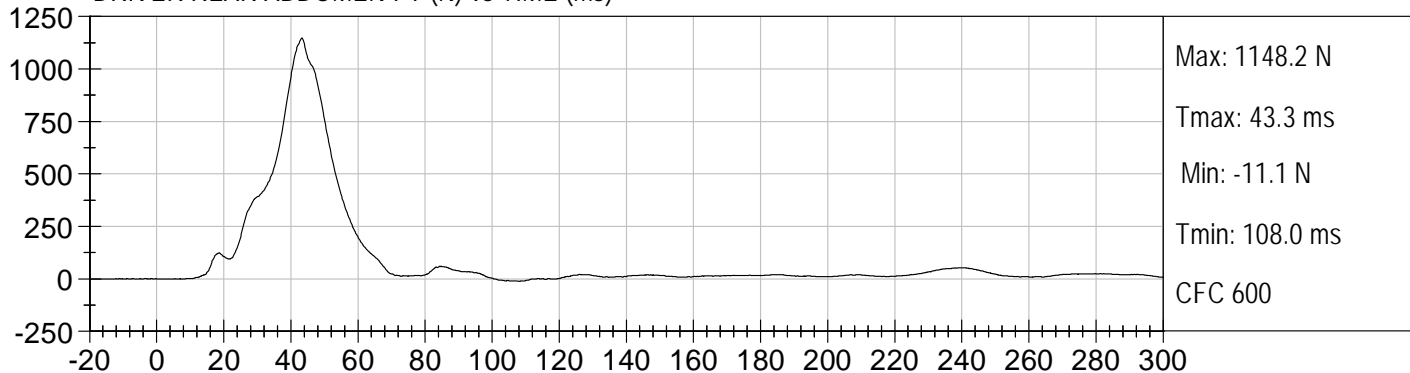
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



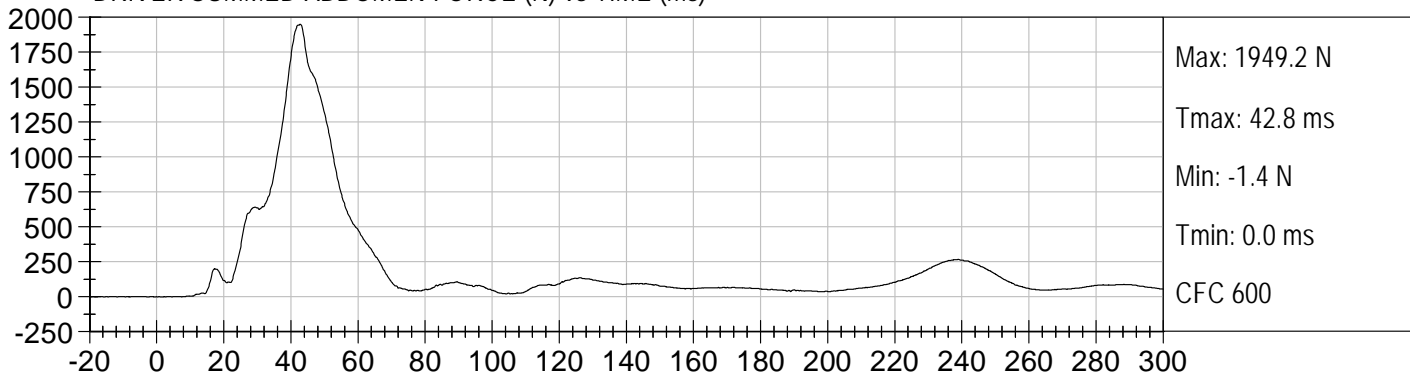
DRIVER MID ABDOMEN FY (N) vs TIME (ms)

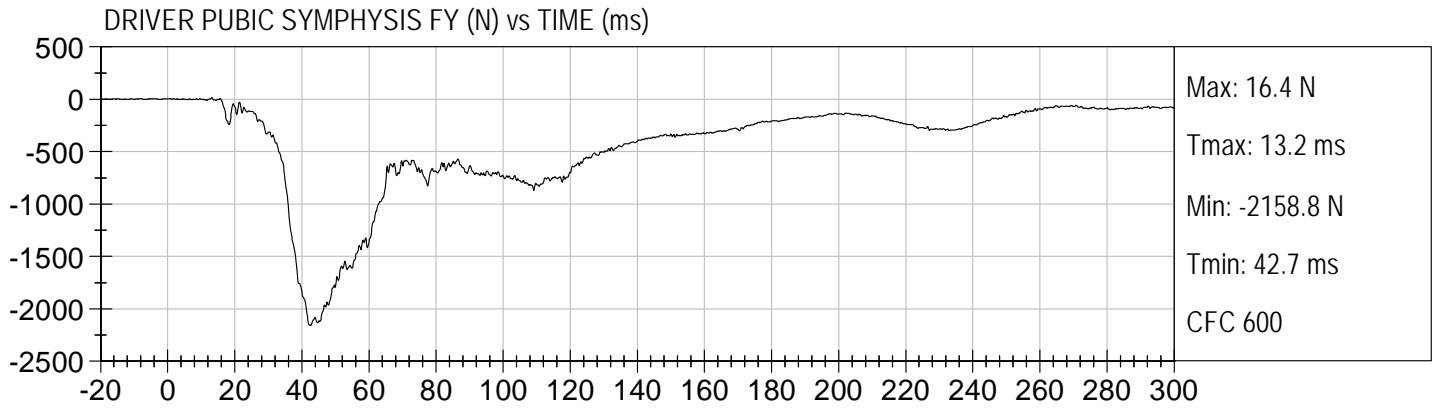


DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)





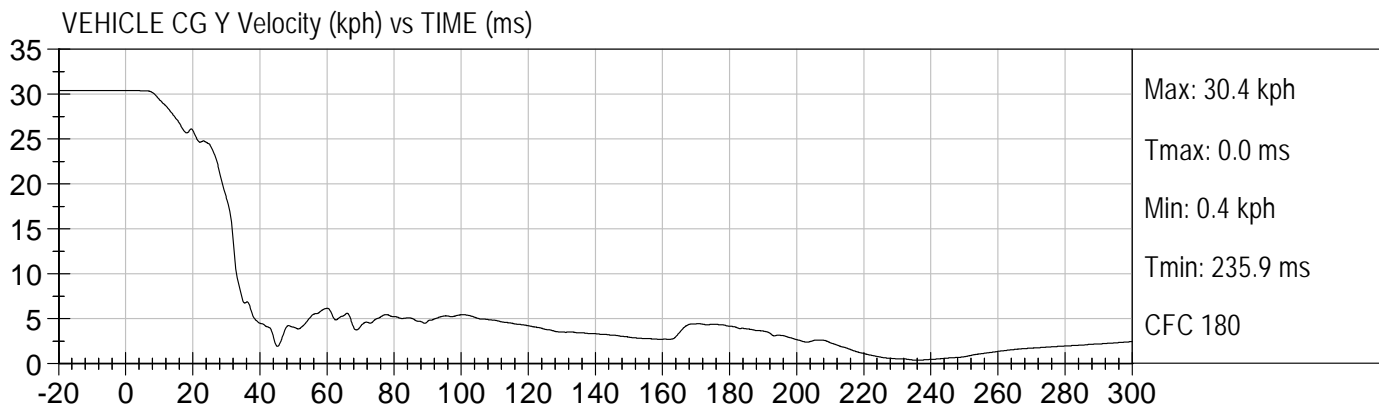
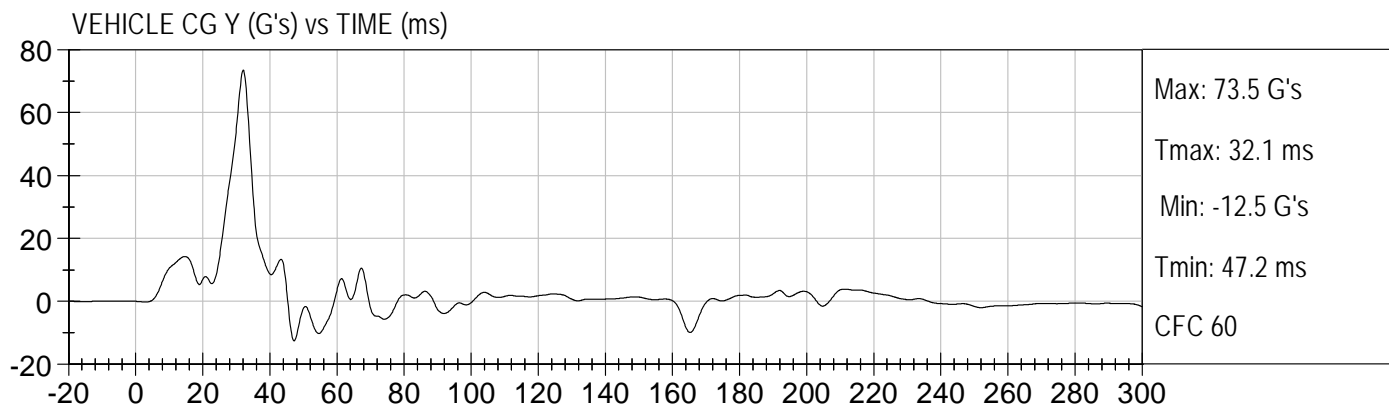
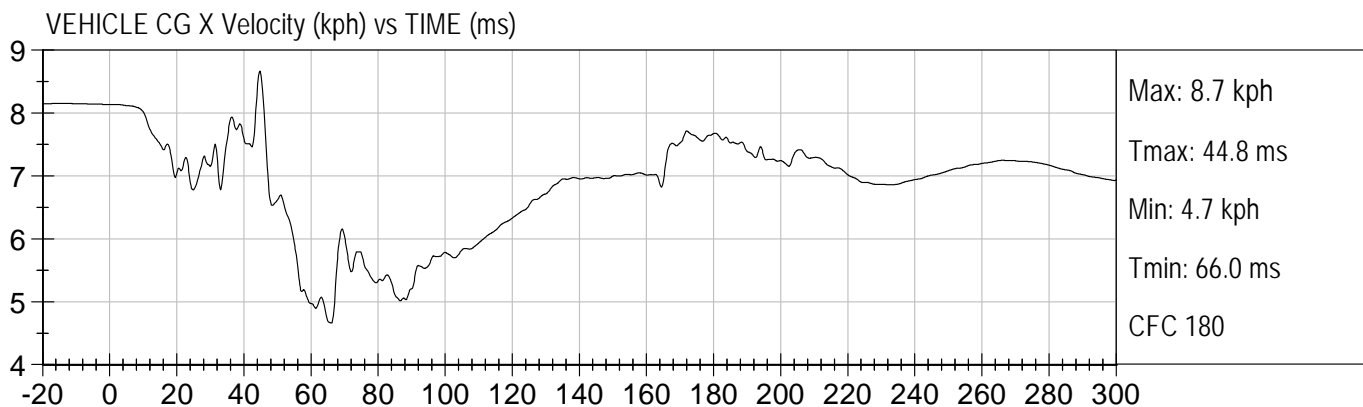
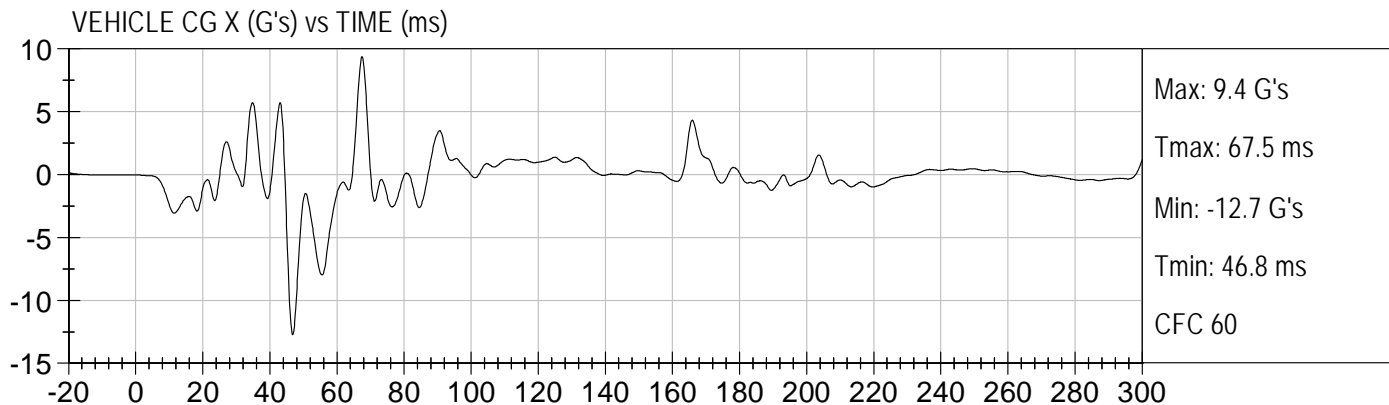
APPENDIX C

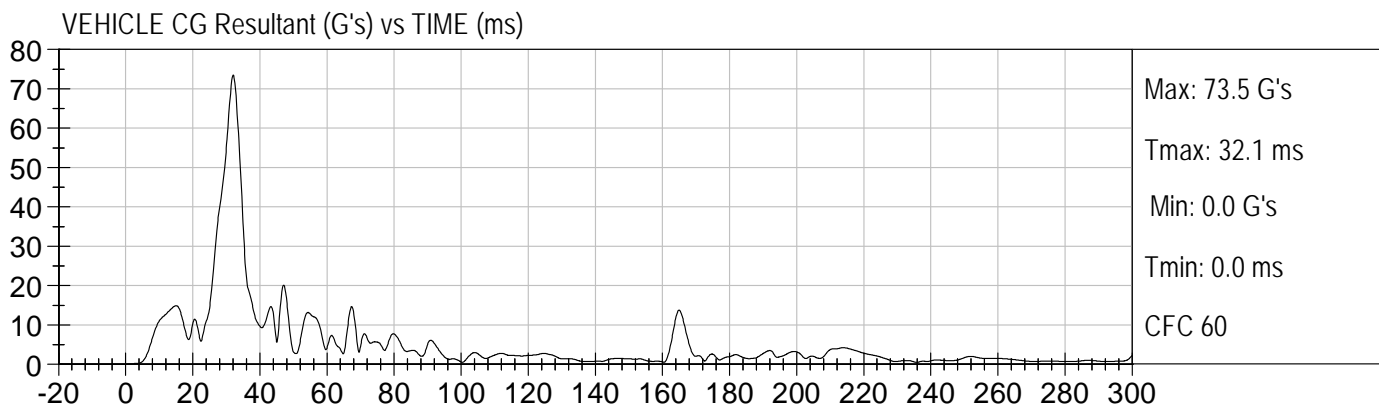
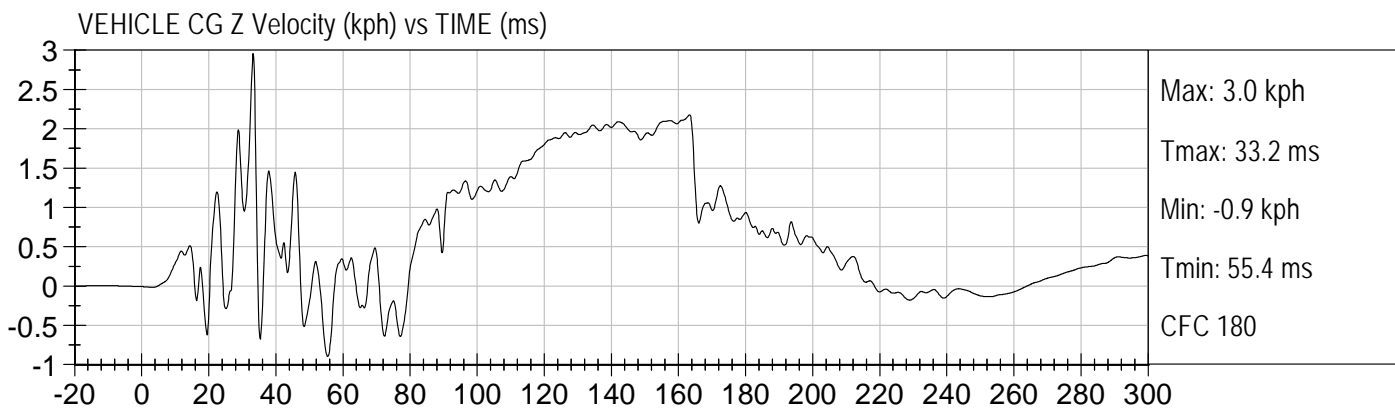
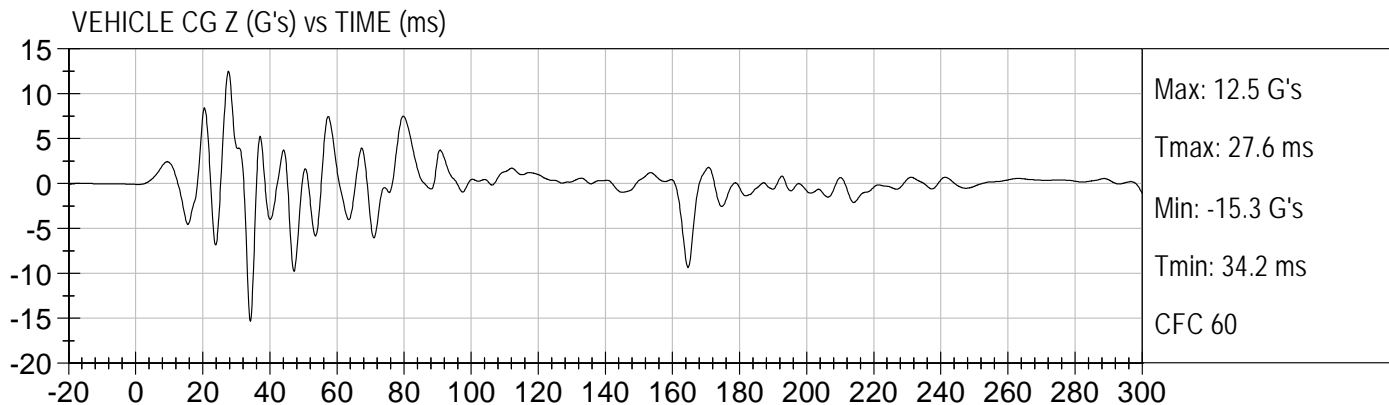
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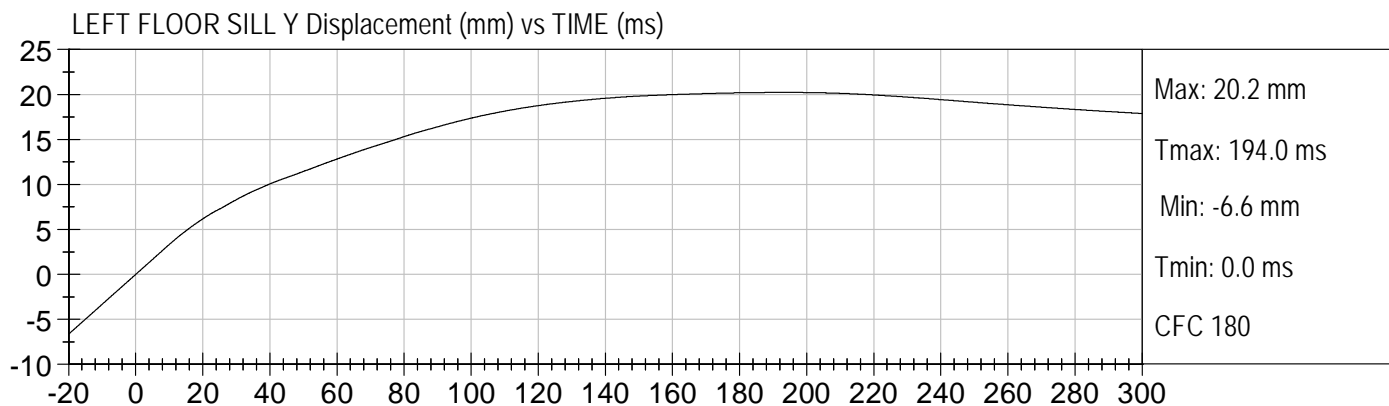
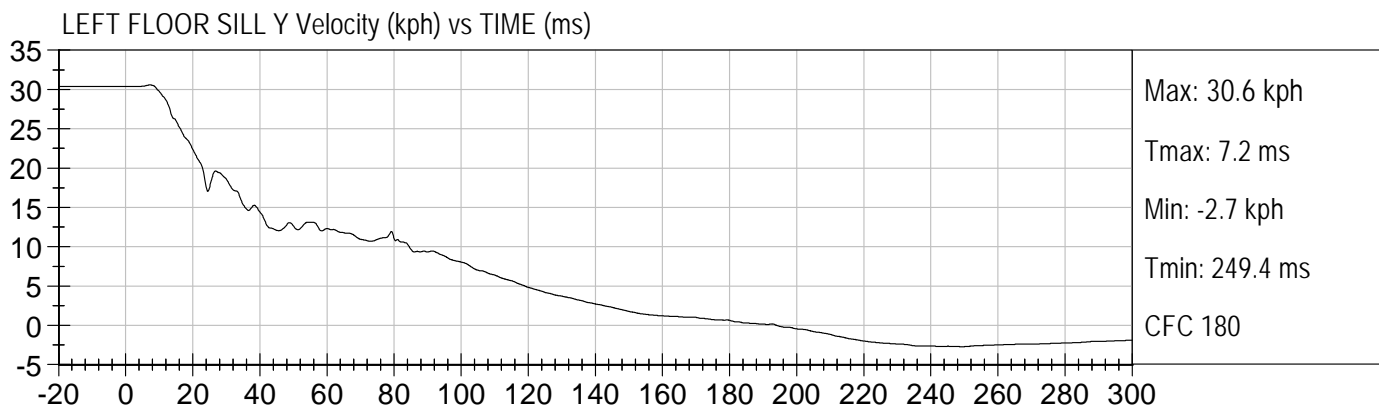
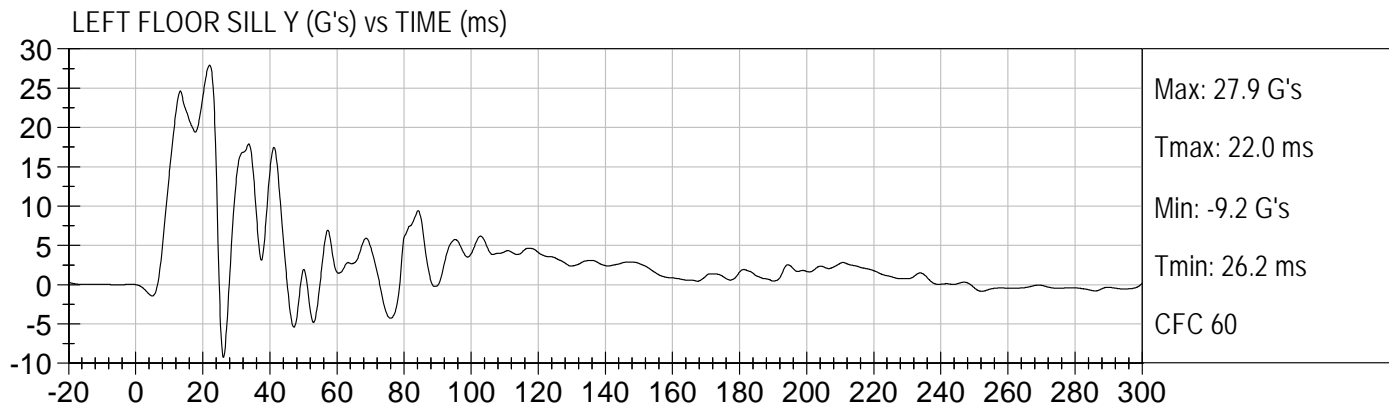
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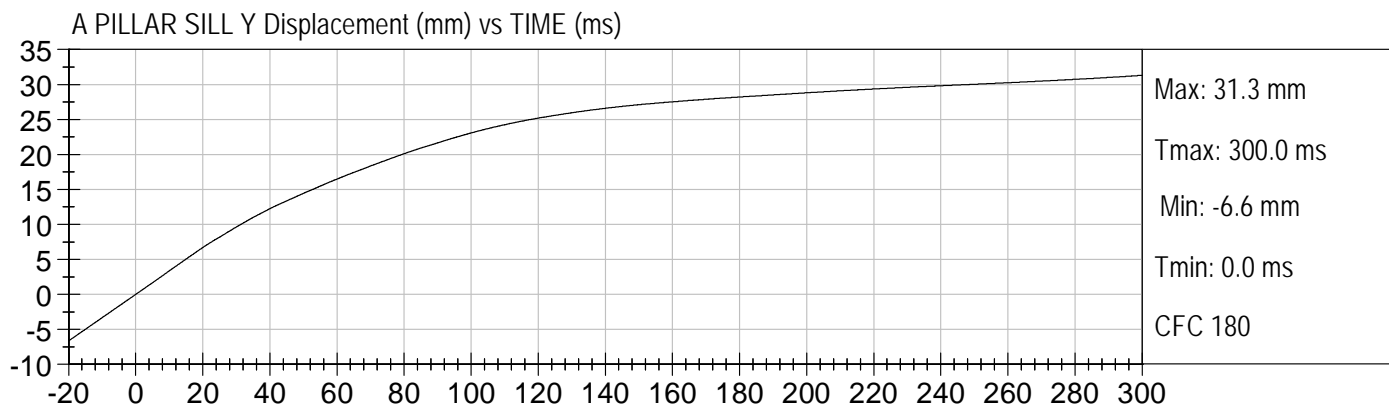
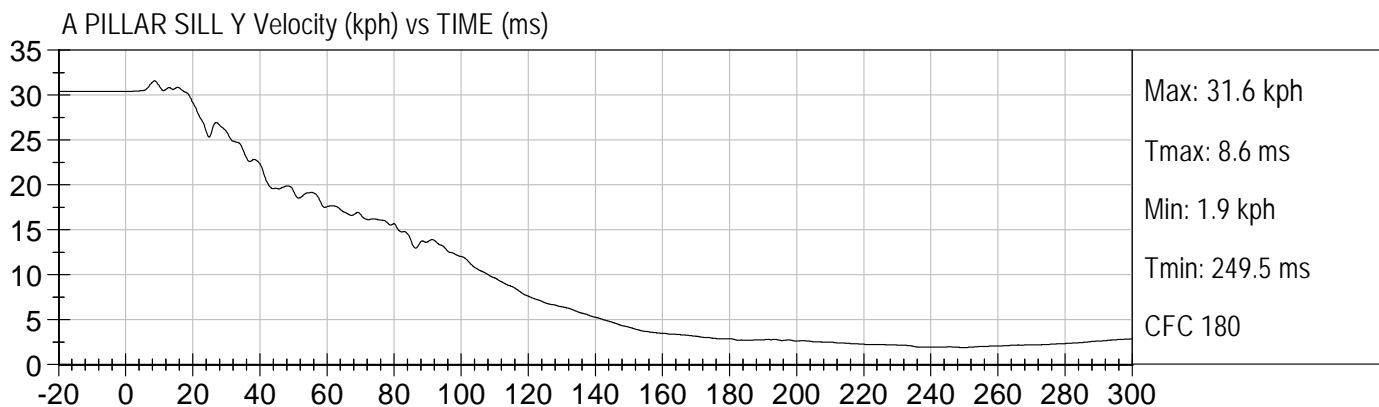
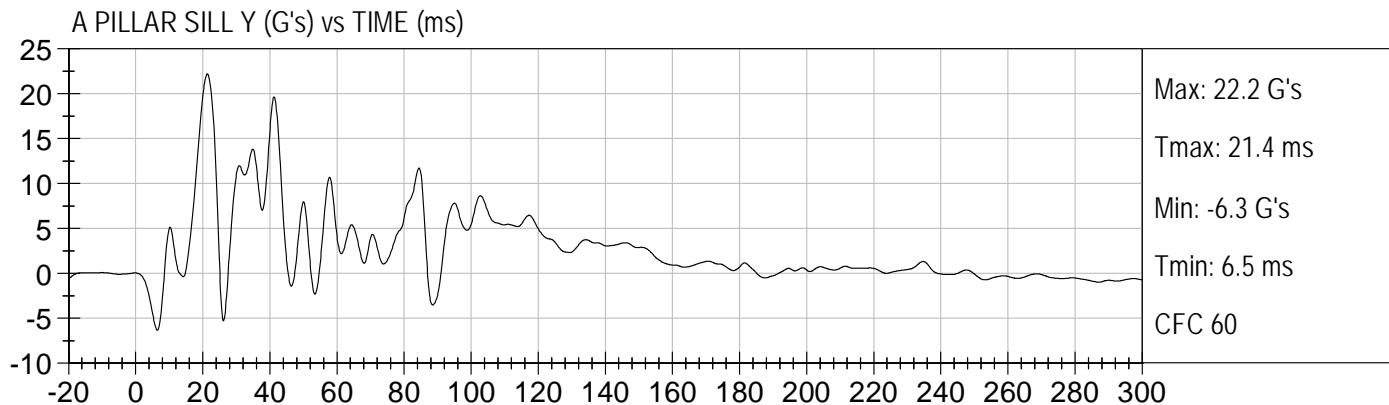
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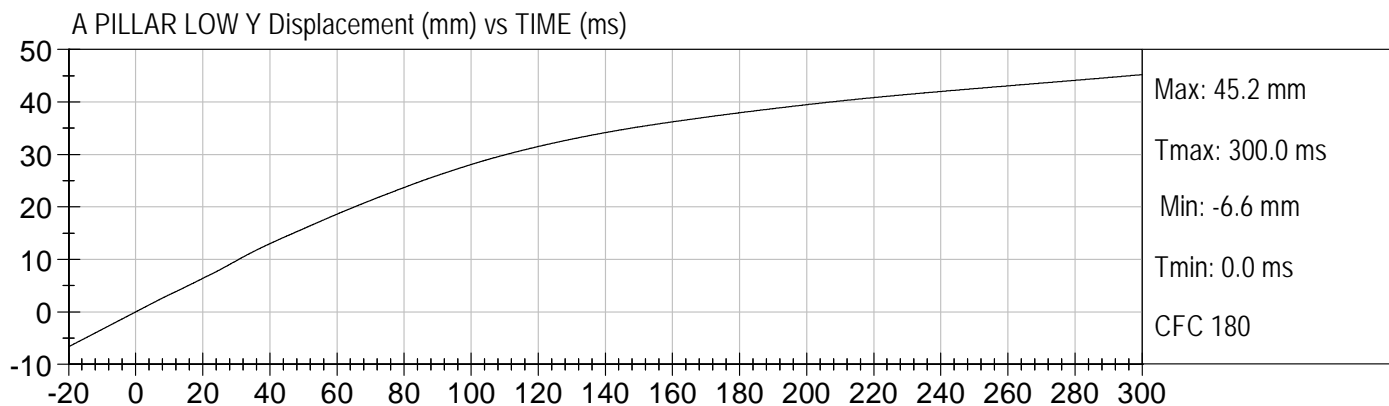
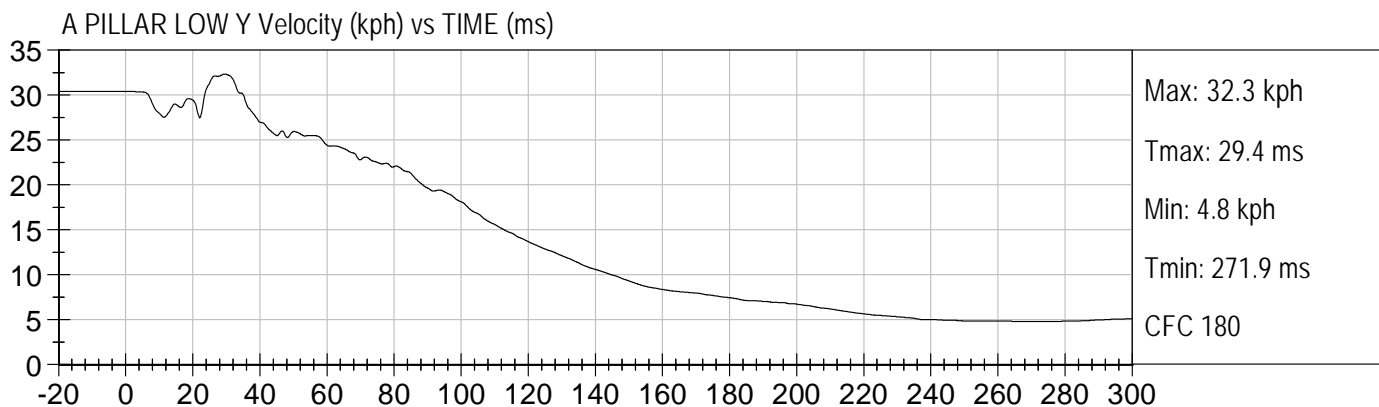
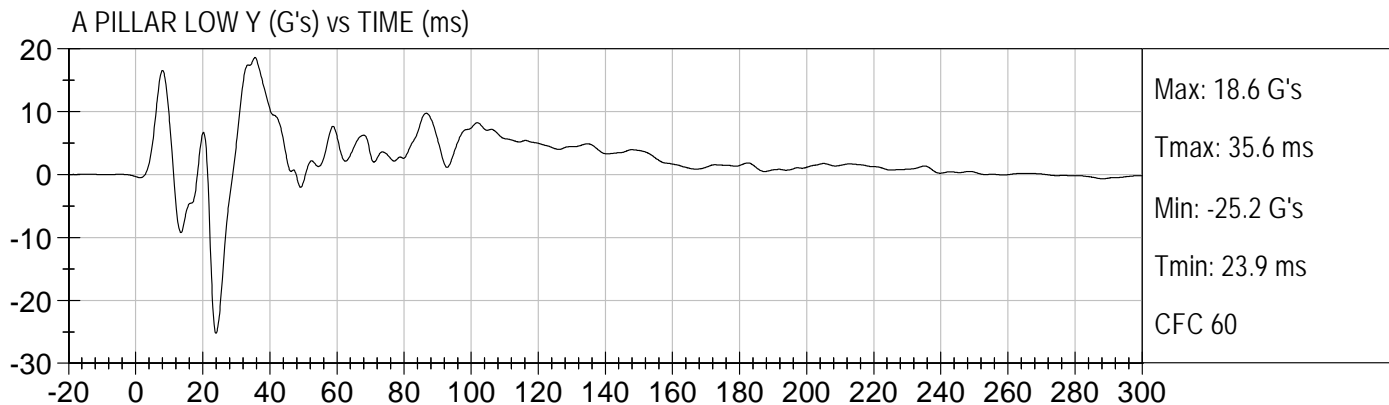
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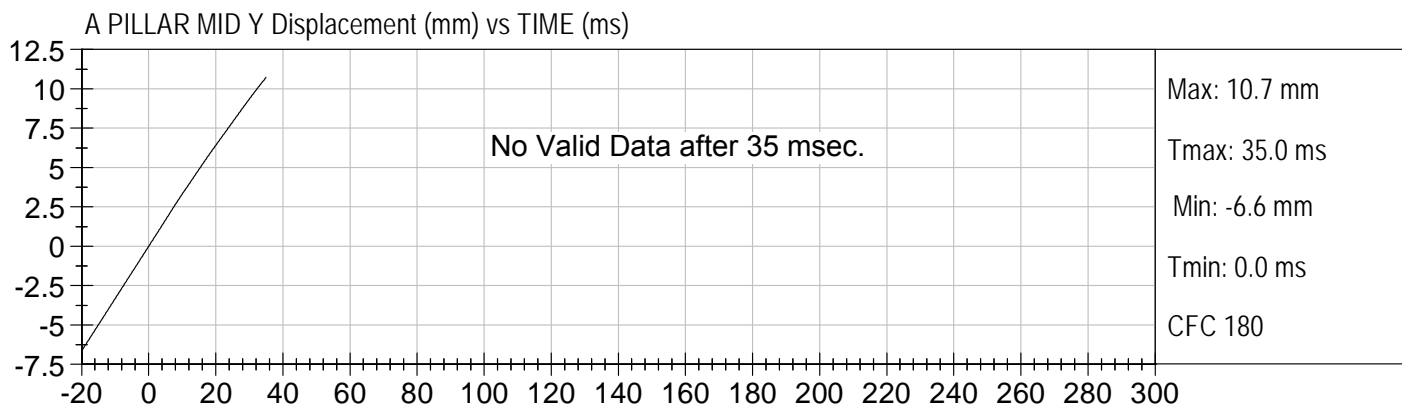
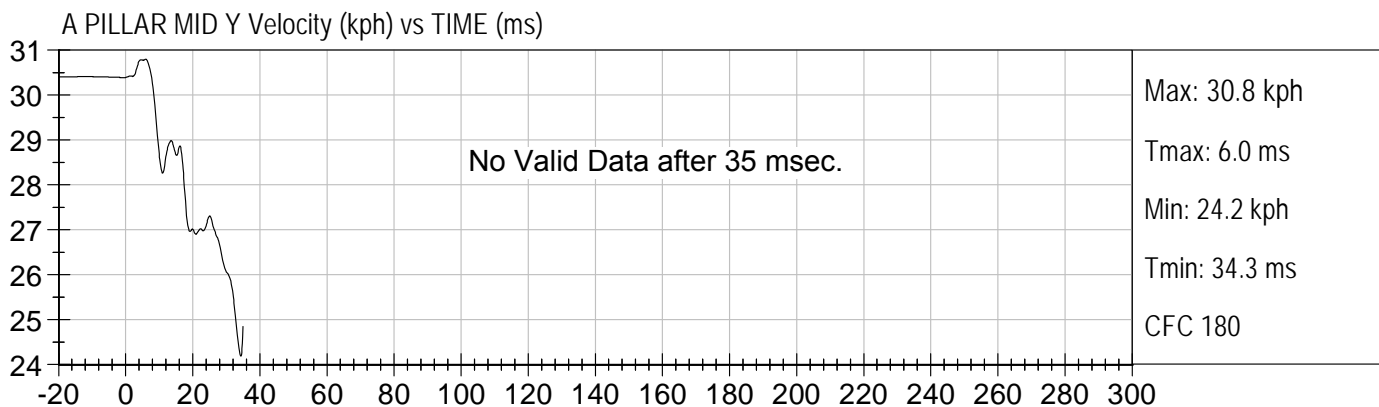
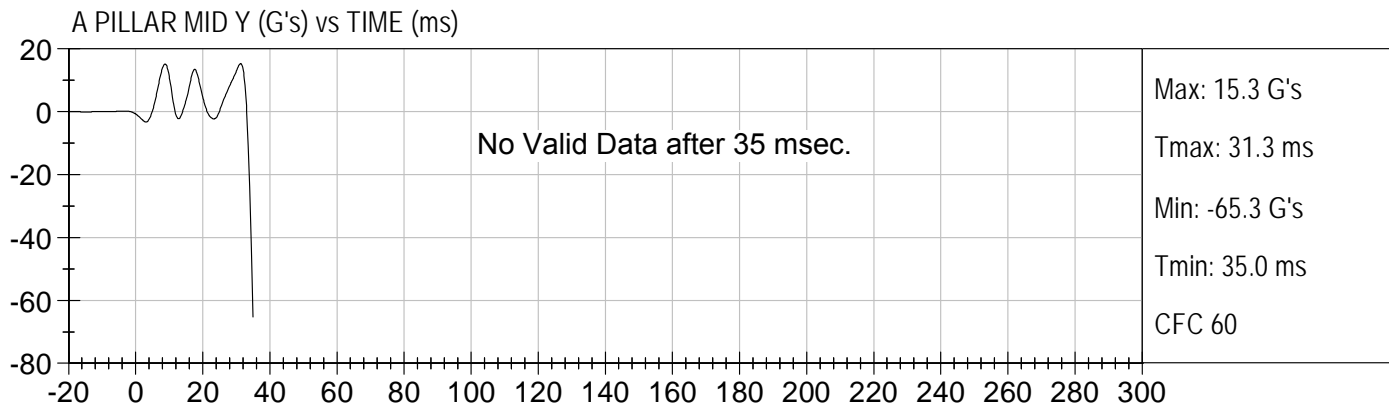


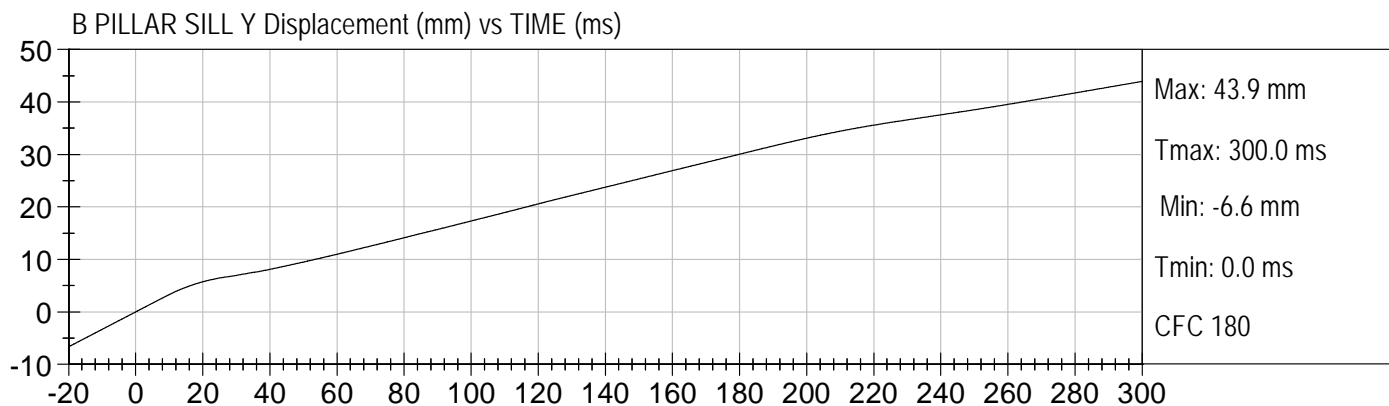
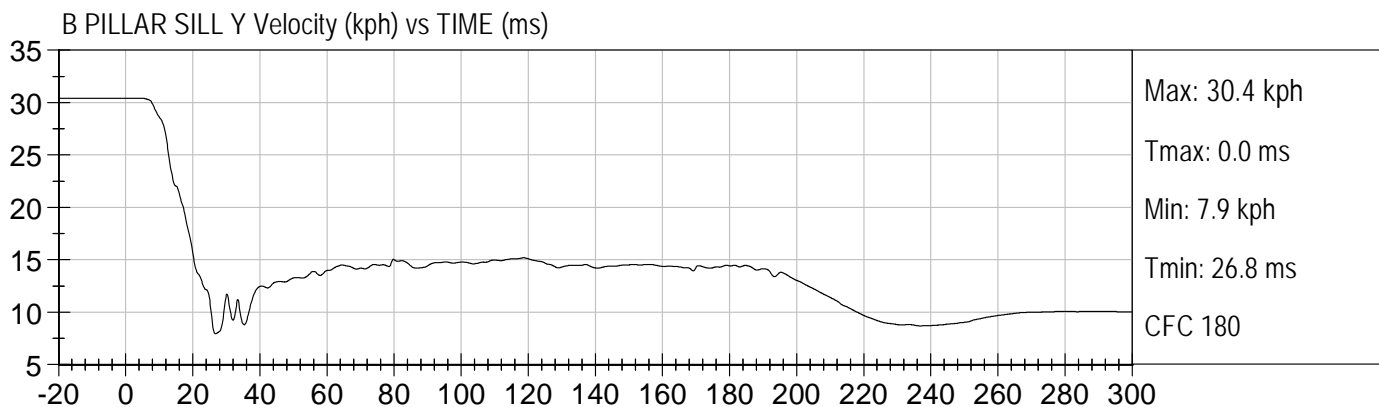
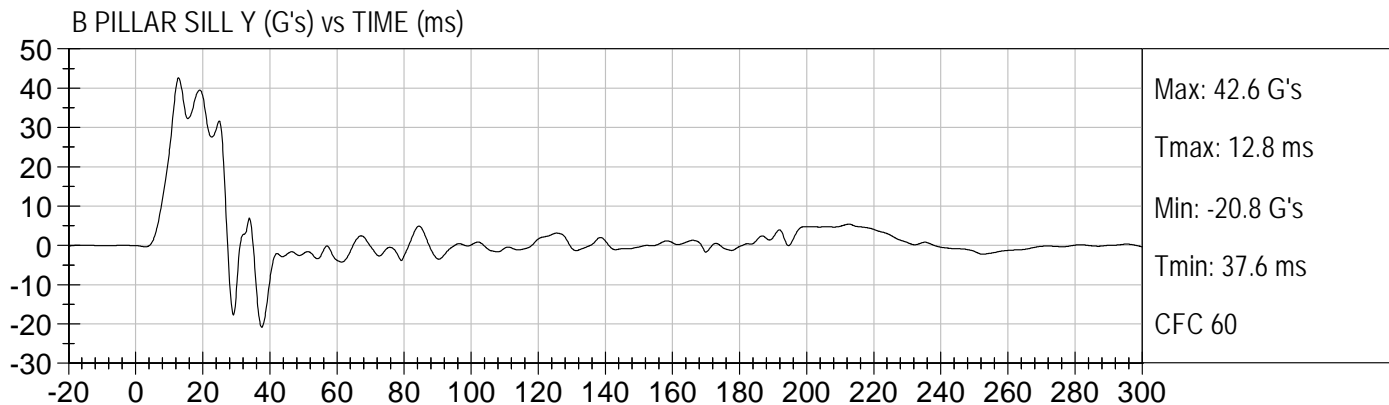


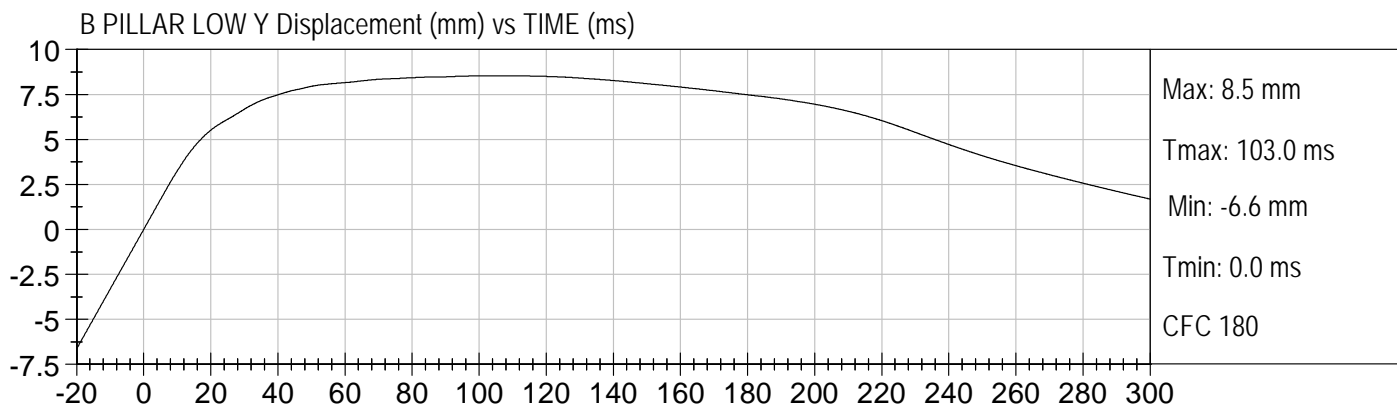
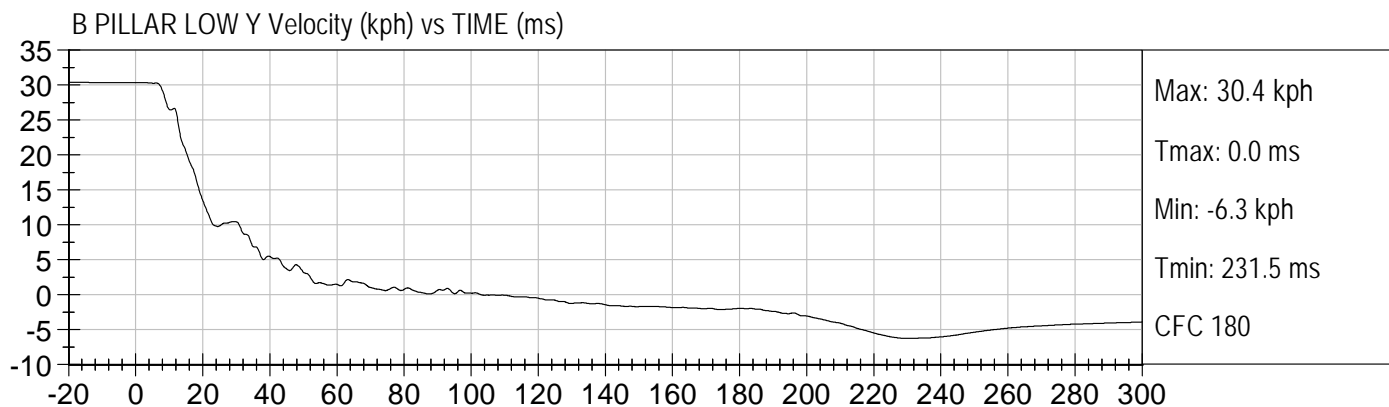
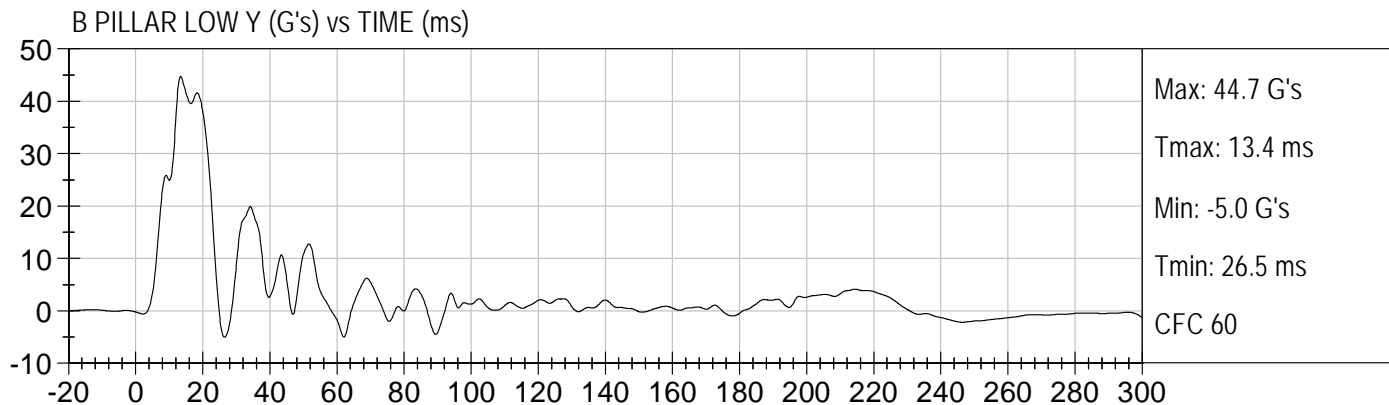


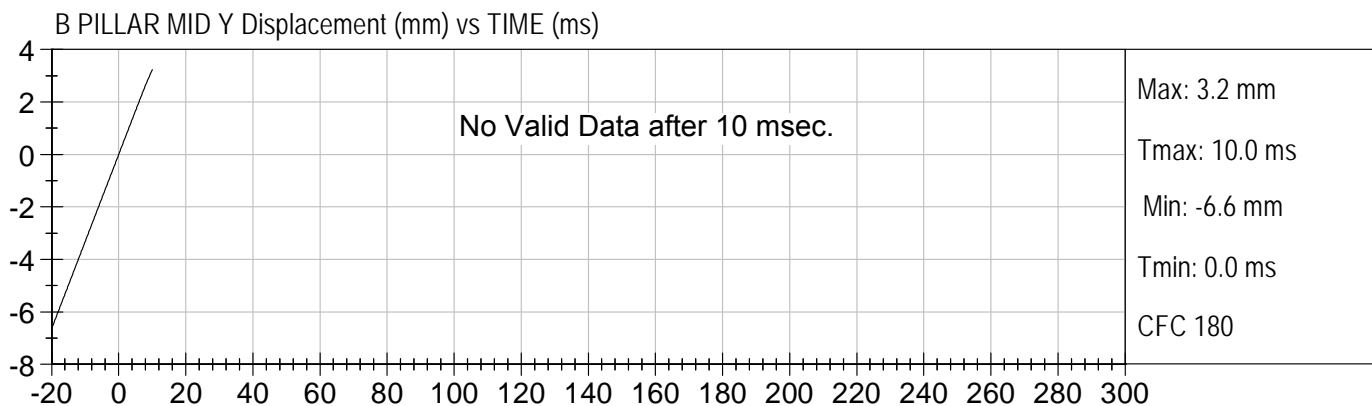
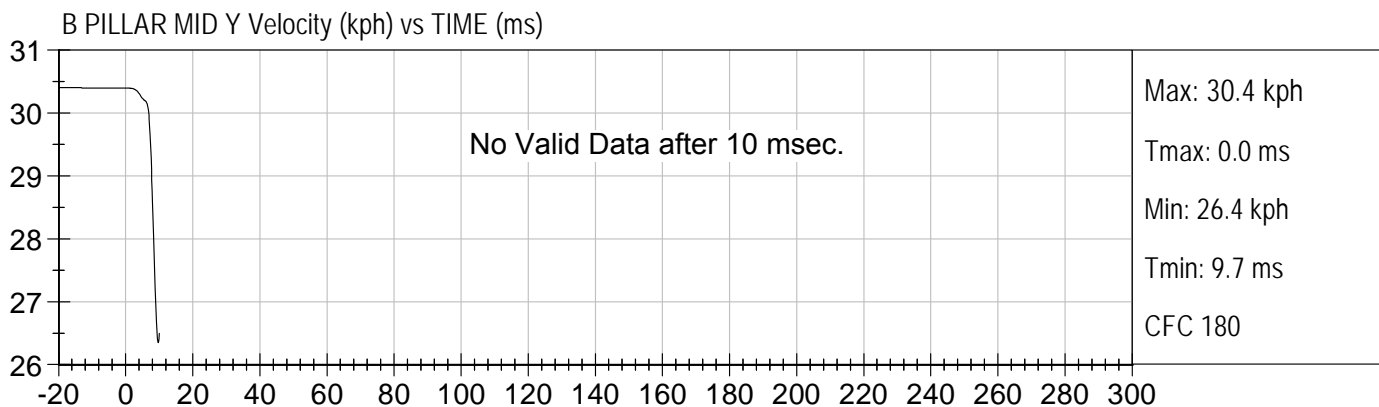
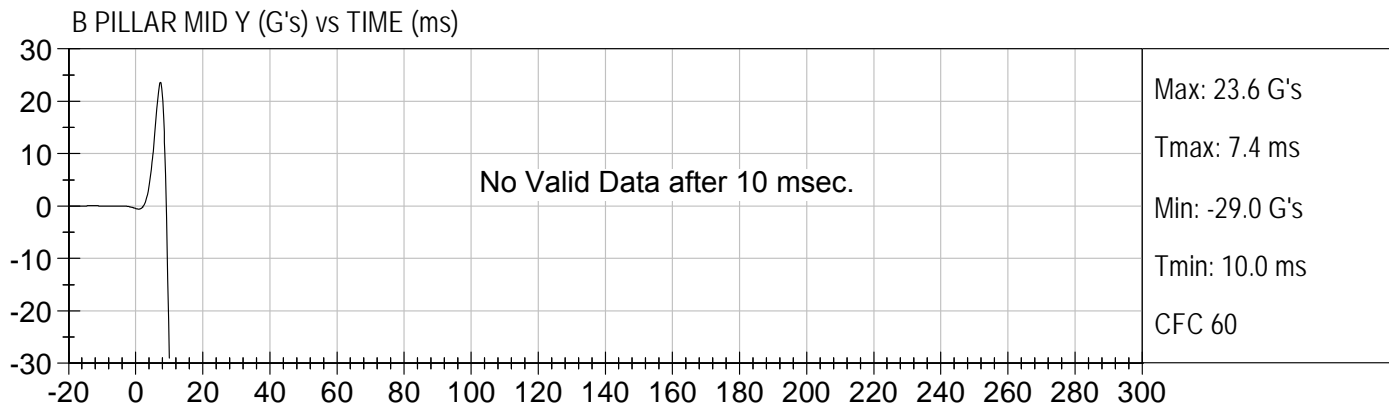


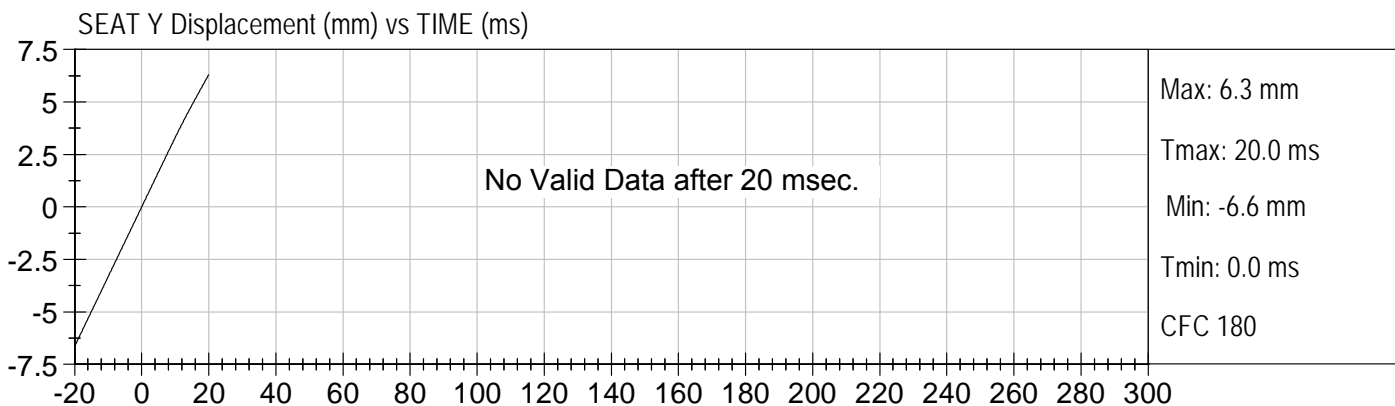
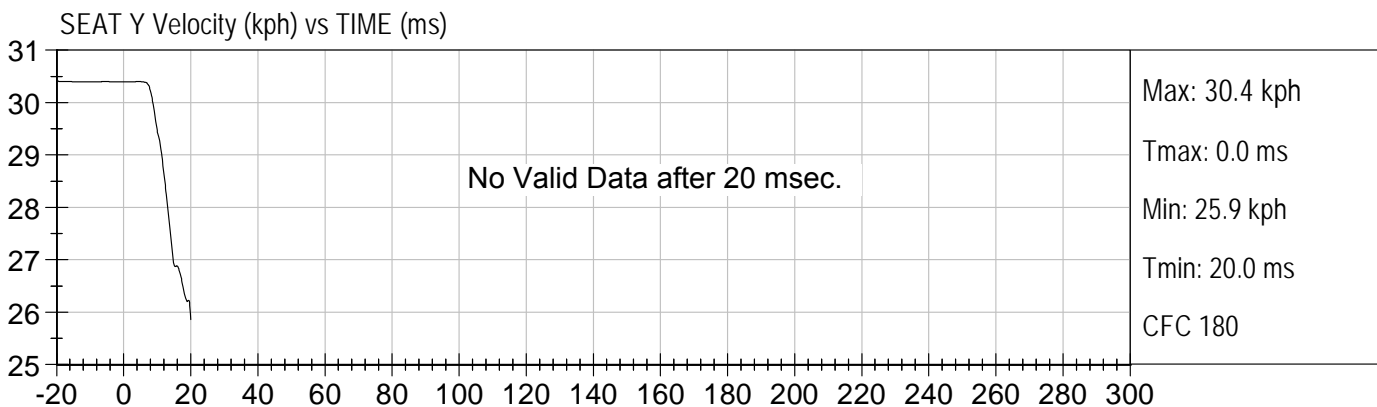
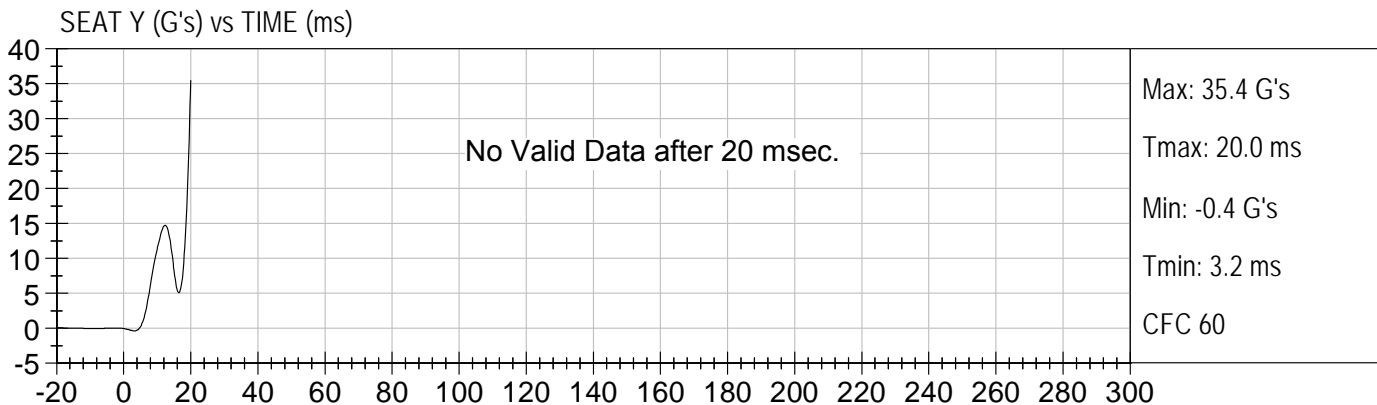


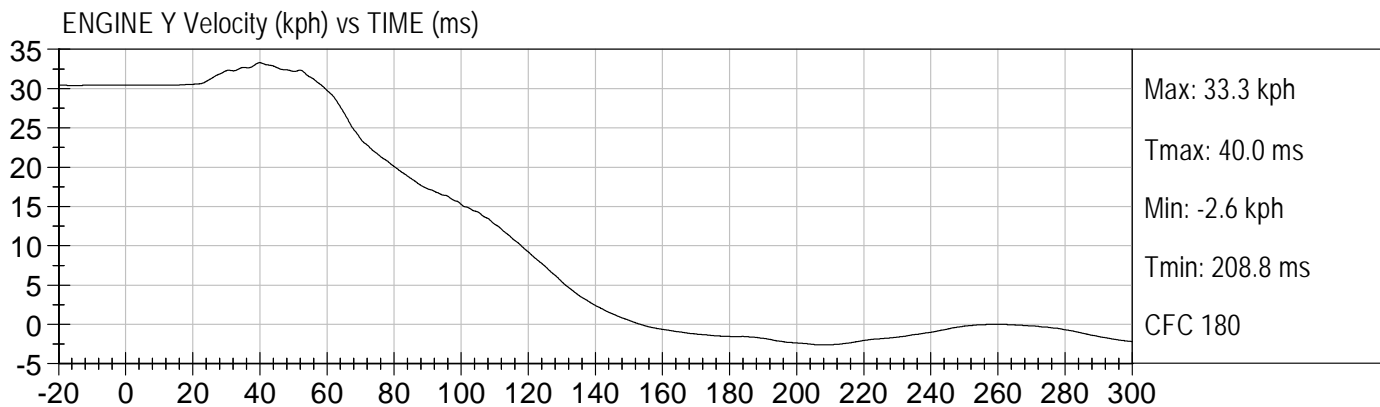
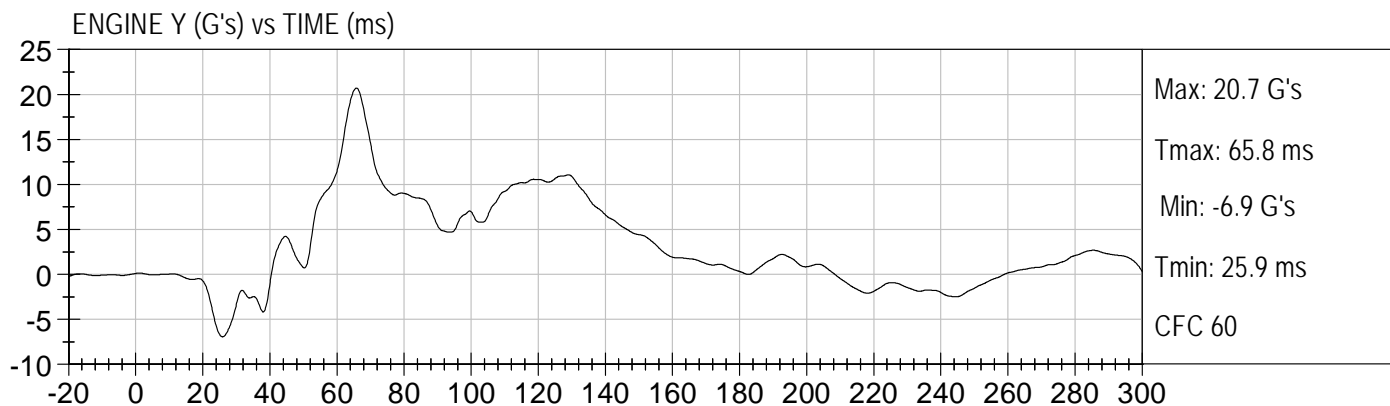
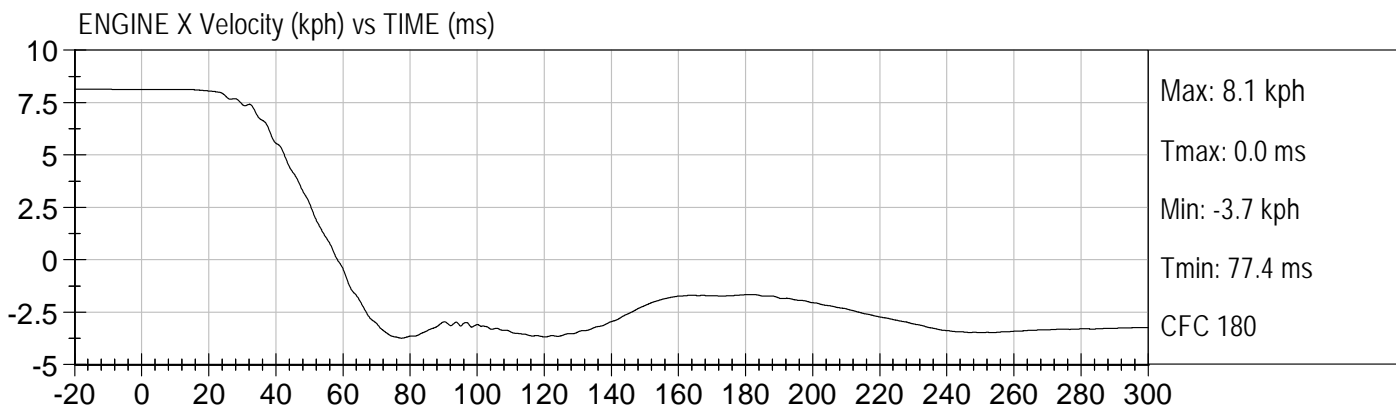
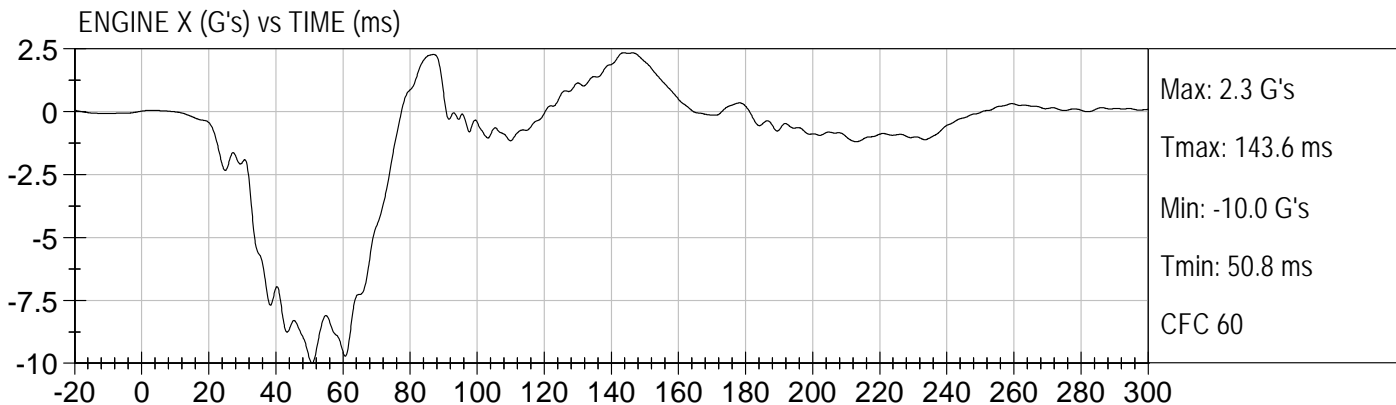


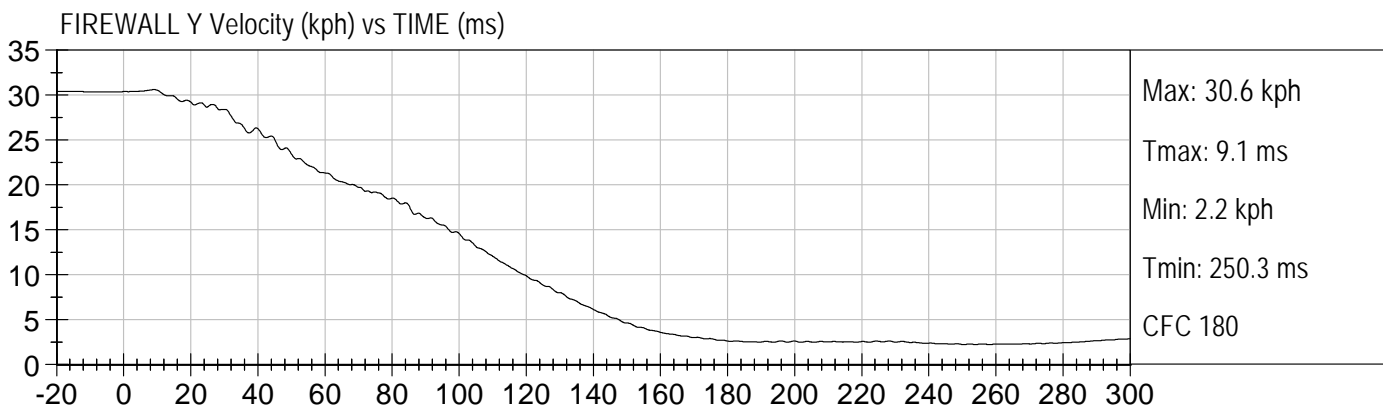


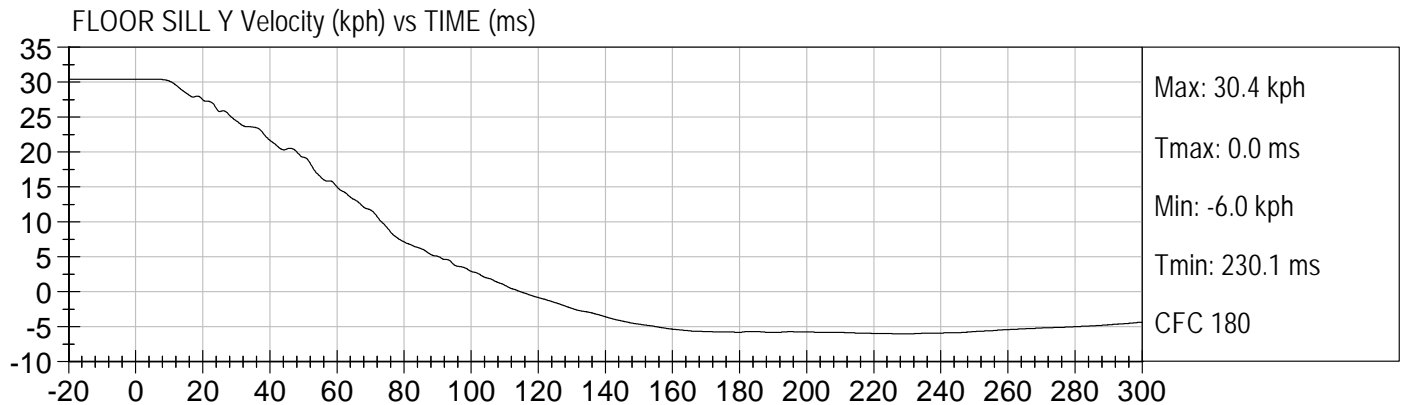
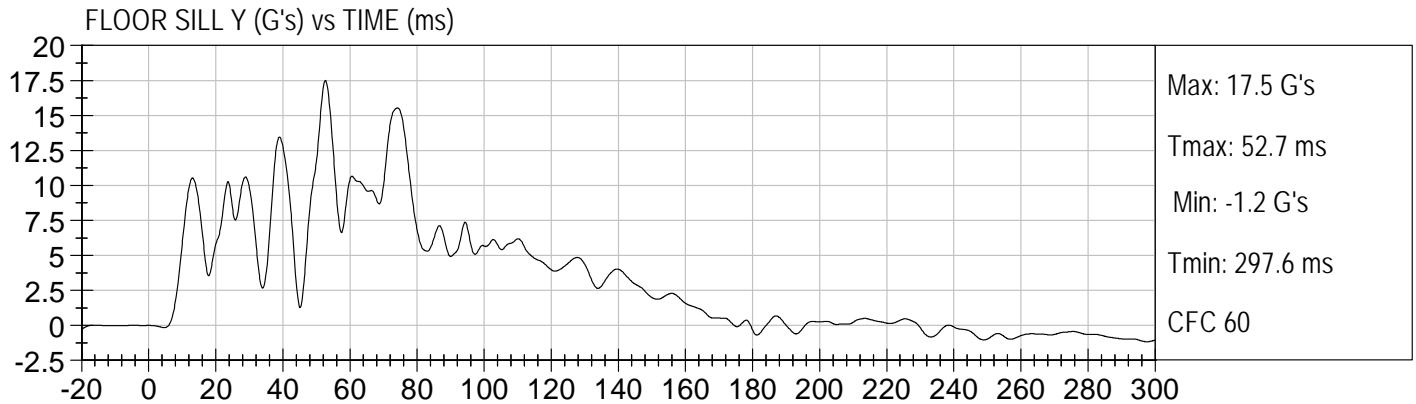
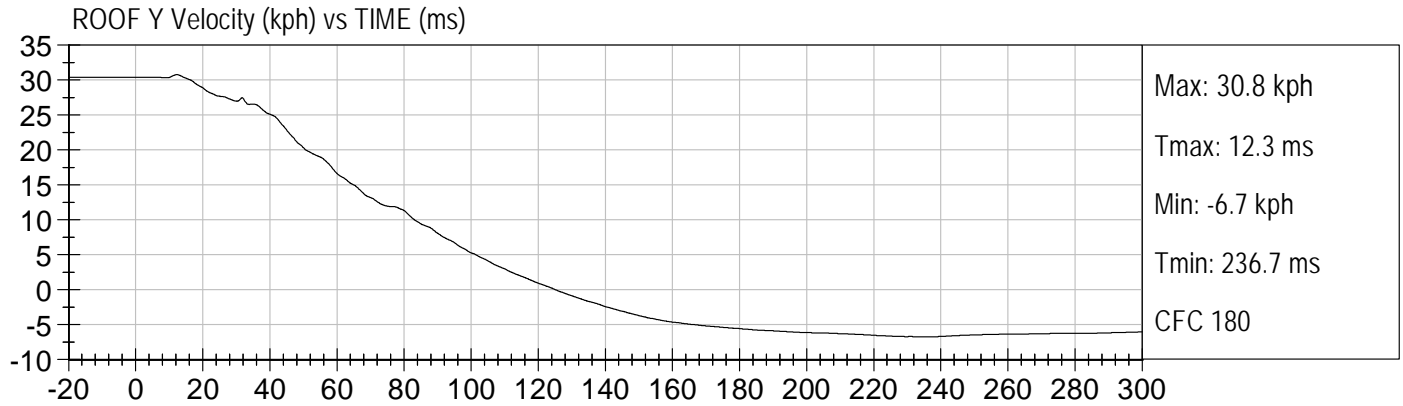
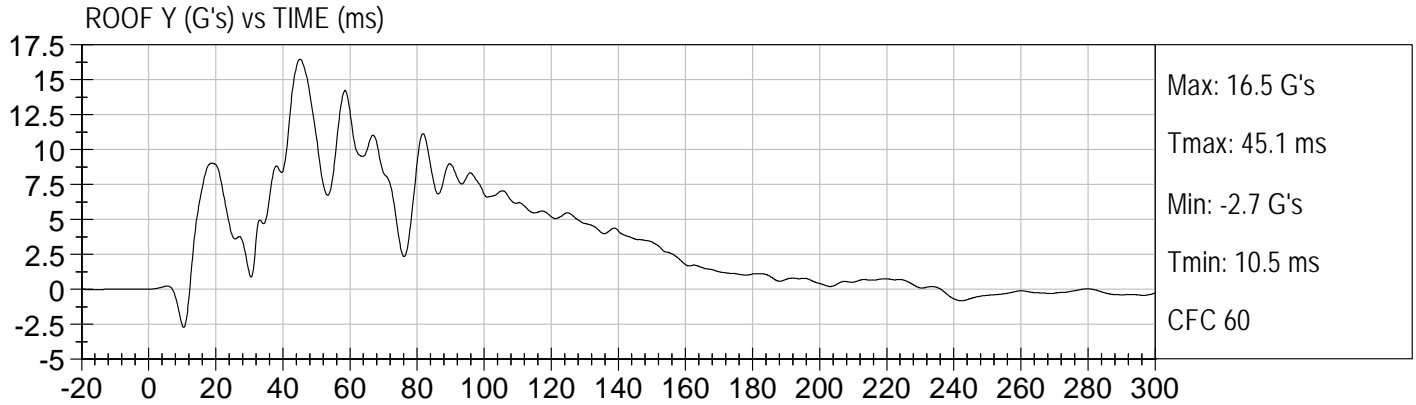


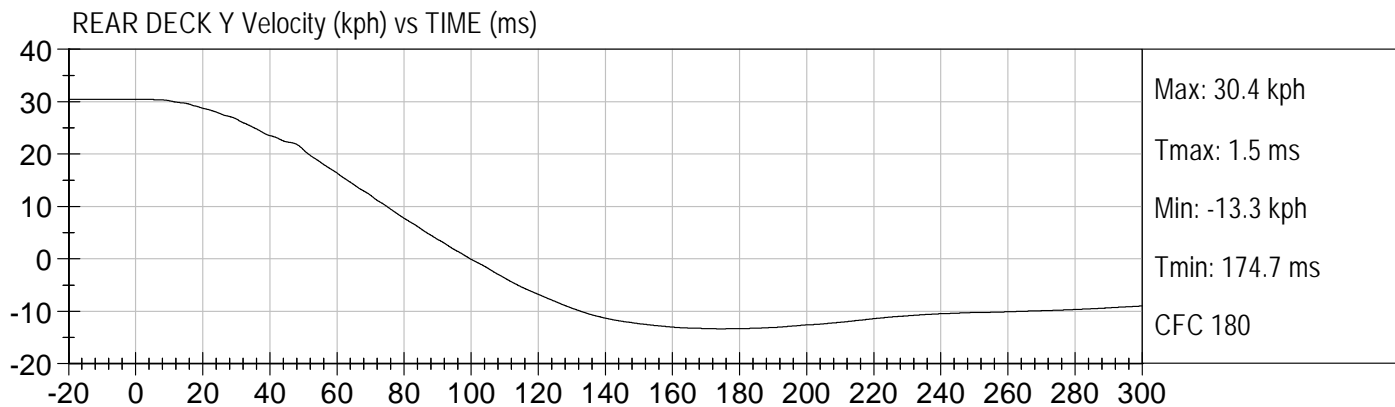
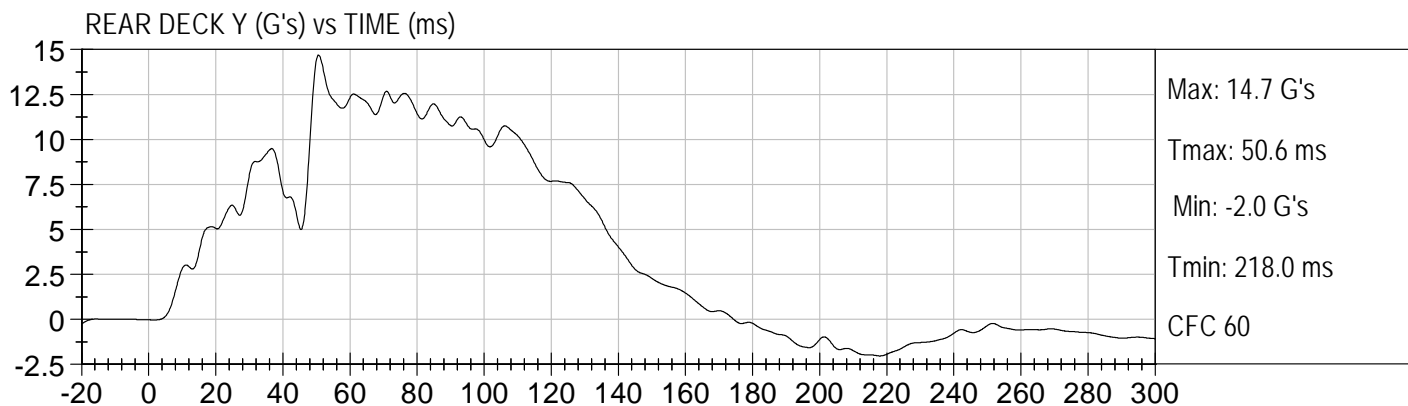
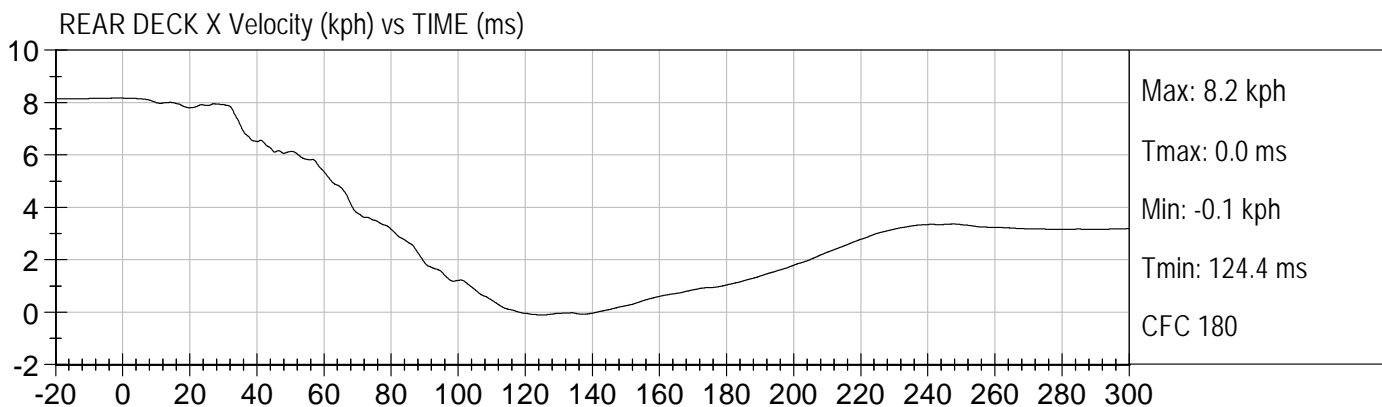
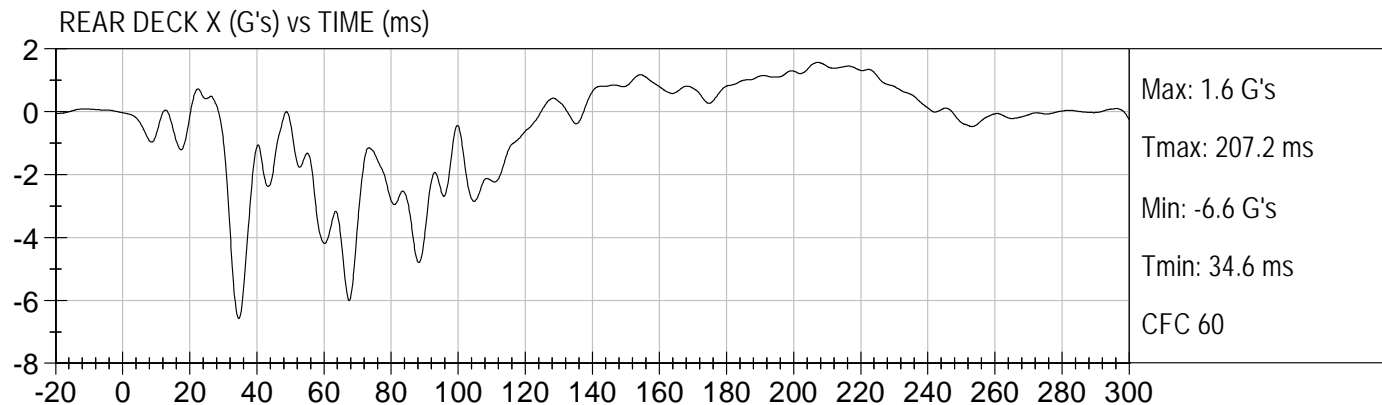












APPENDIX D

DUMMY PERFORMANCE CALIBRATION TEST DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 016

Test ID: D111721

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 50 | Pass |
| Peak Resultant Acceleration | G's | 125 to 155 | 147 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | -10.1 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 15% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |



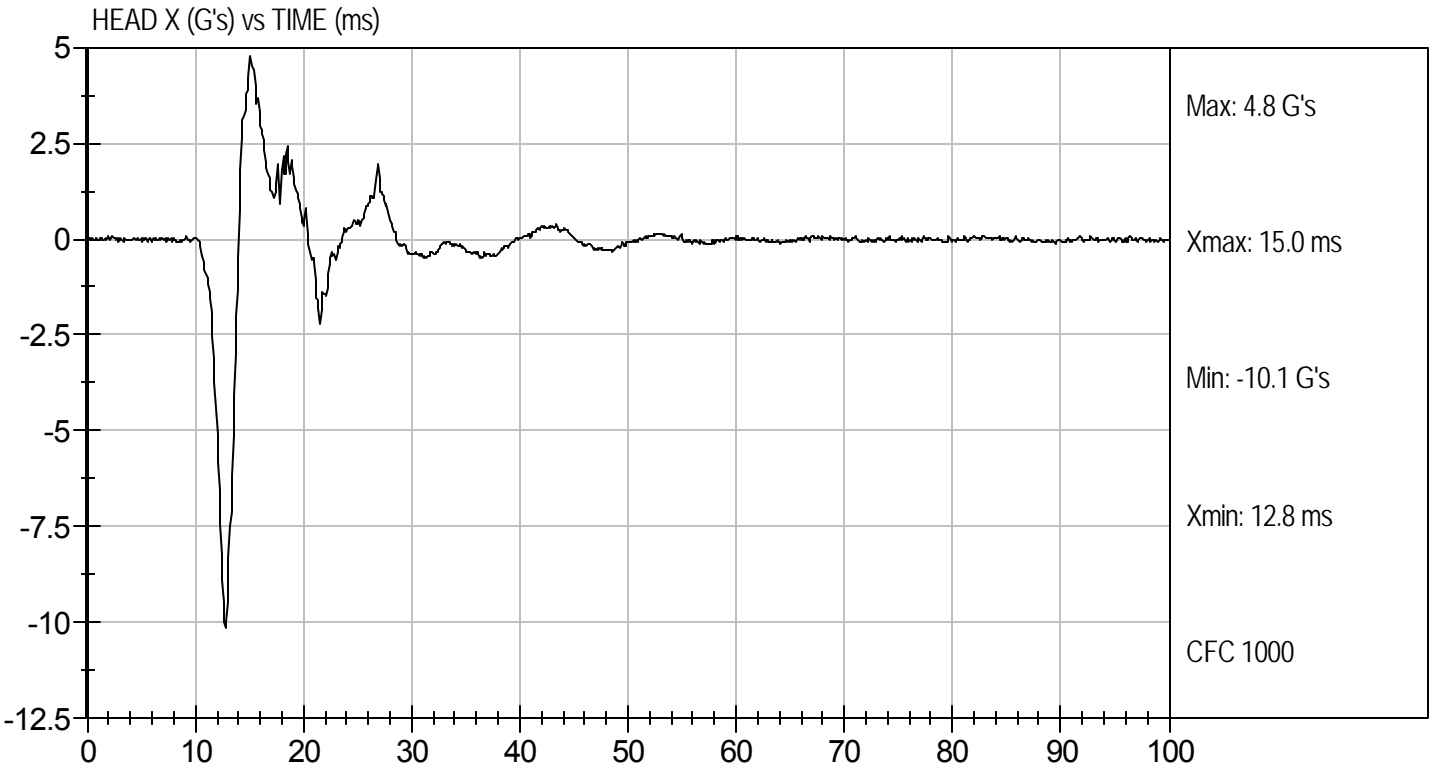
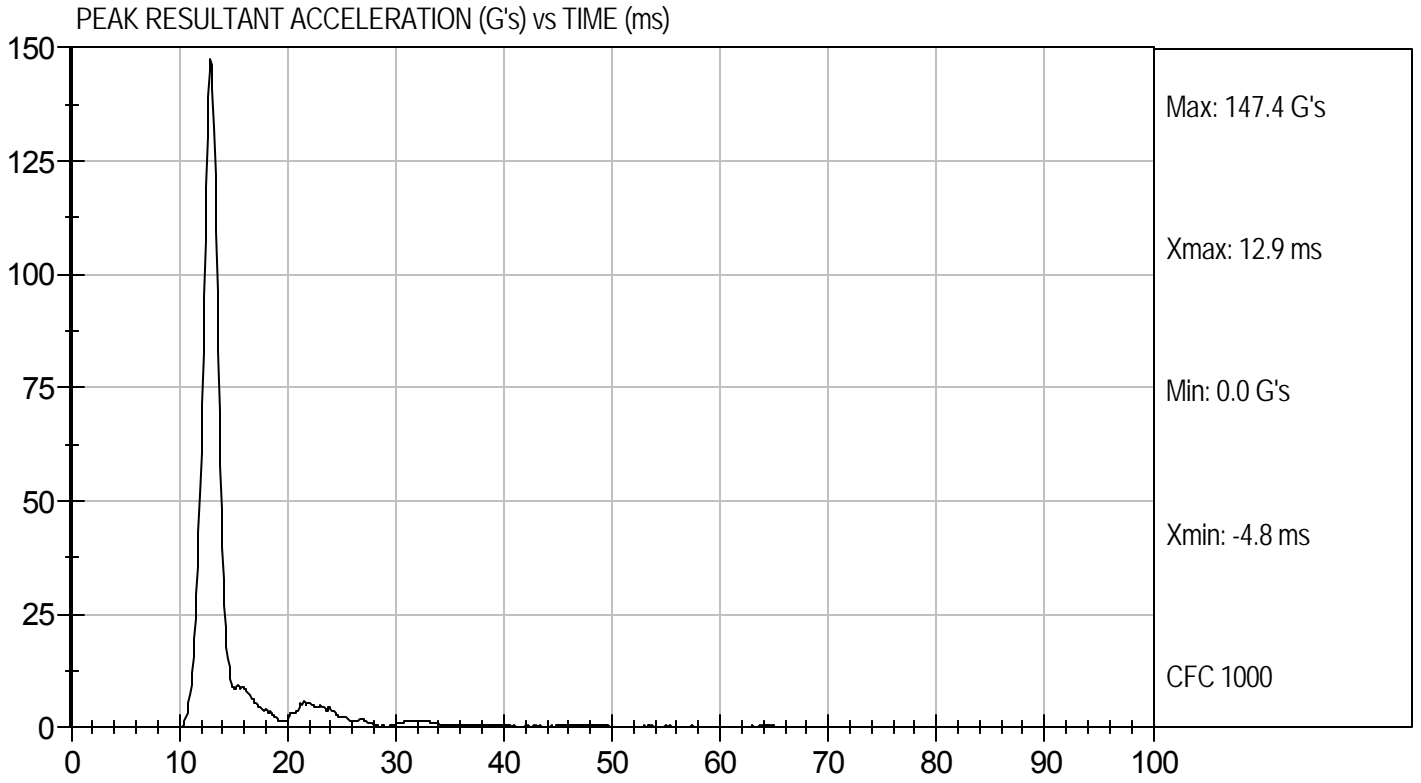
 Laboratory Technician

5/10/11

 Test Date



 Approved By



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D.: D111722

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature | | deg C | 18.0 to 22.0 | 21.9 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 47 | Pass |
| Pendulum Speed | | m/s | 3.3 to 3.5 | 3.5 | Pass |
| Pendulum Deceleration | 1 ms | m/s | 0.00 to -0.05 | -0.02 | Pass |
| | 3 ms | m/s | -0.25 to -0.375 | -0.32 | Pass |
| | 14 ms | m/s | -3.20 to -3.70 | -3.29 | Pass |
| Maximum Flexion Angle | | deg | 49.0 to 59.0 | 50.7 | Pass |
| Time of Maximum Flexion Angle | | ms | 54.0 to 66.0 | 61.4 | Pass |
| Head Rotation Decay Time to 0 degree | | ms | 53.0 to 88.0 | 55.1 | Pass |
| Overall Test Results | | | | | Pass |

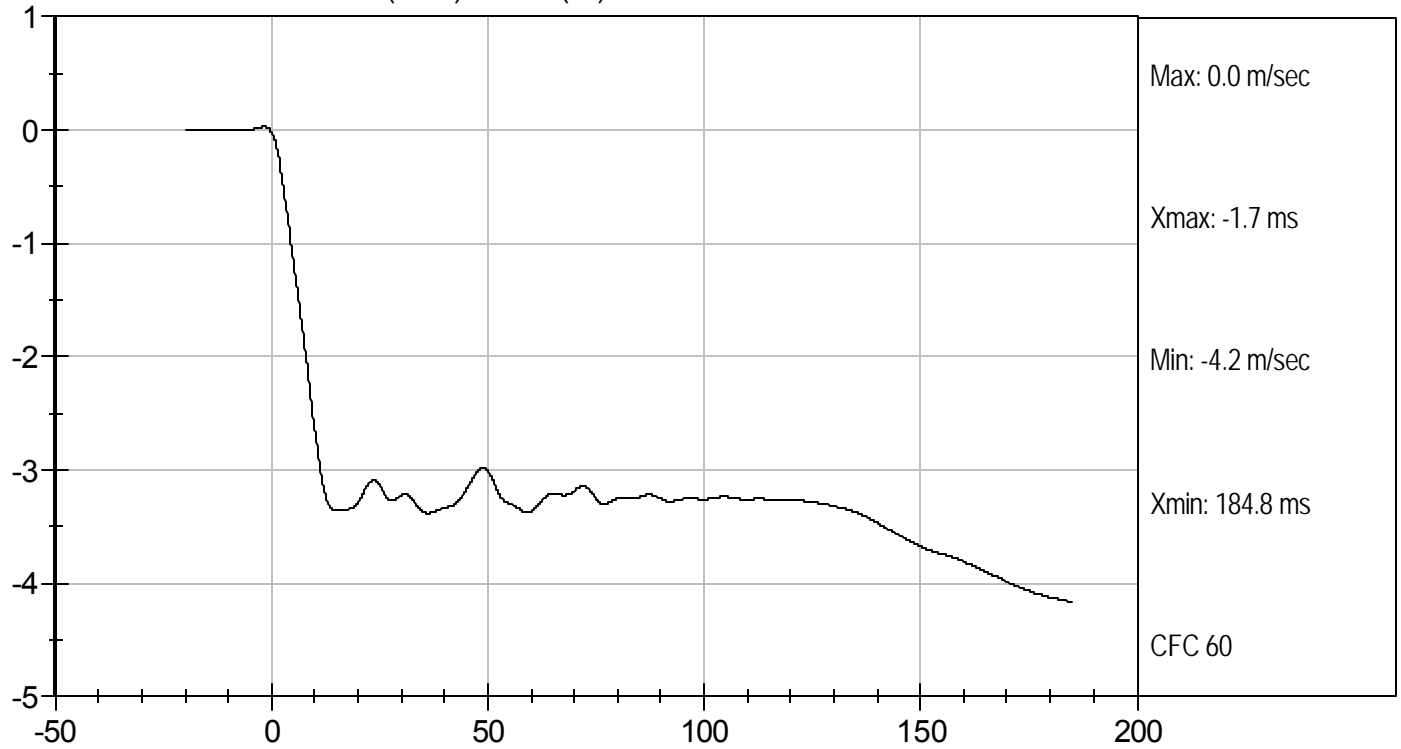

 Laboratory Technician

5/10/11
 Test Date

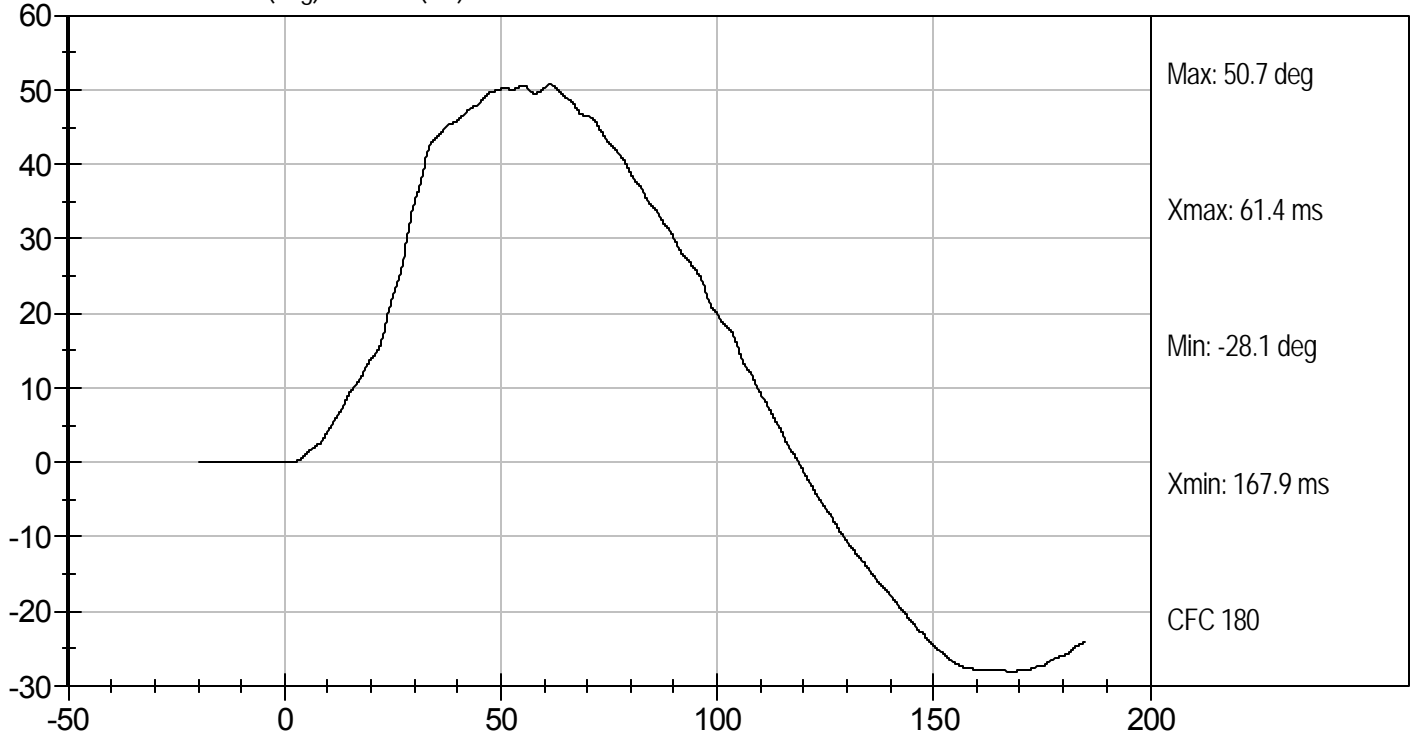

 Approved By



PENDULUM DECELERATION (m/sec) vs TIME (ms)



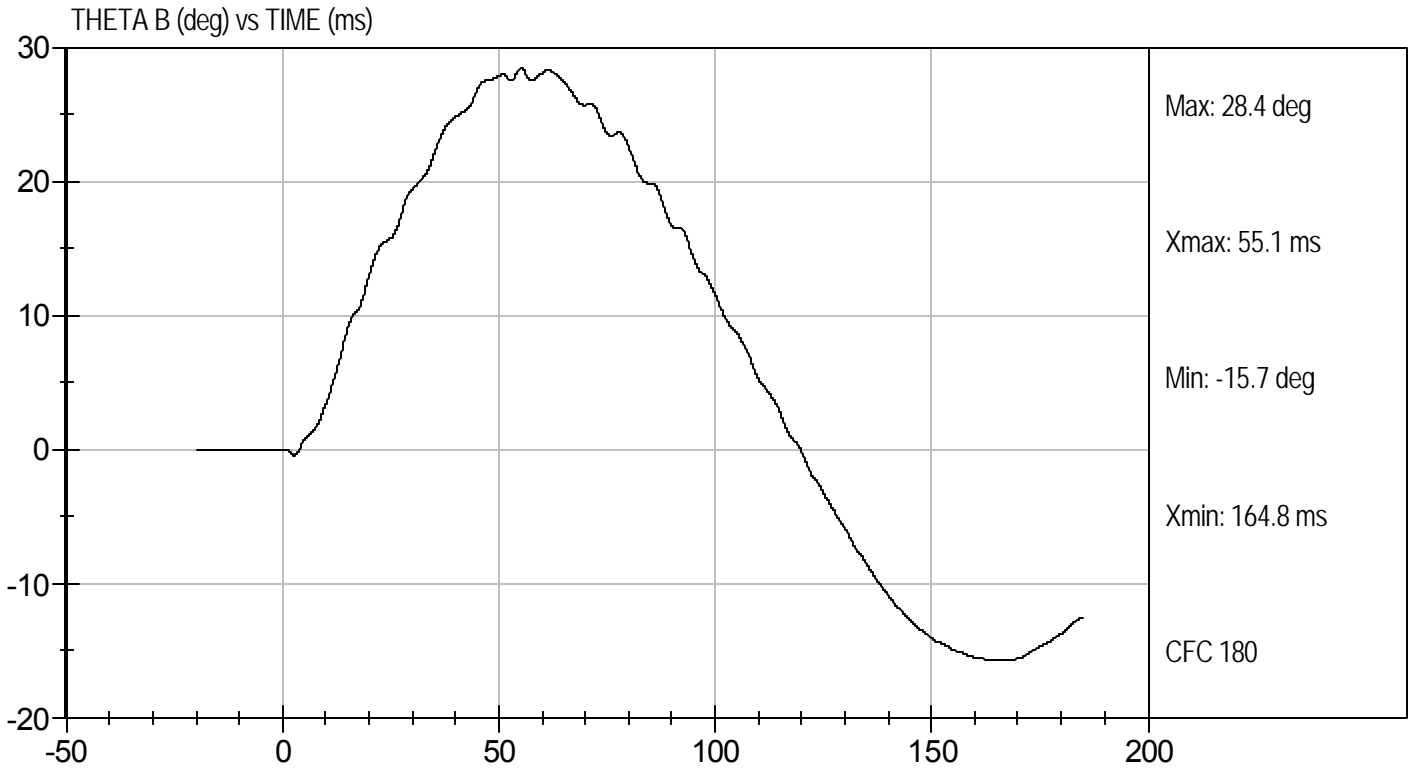
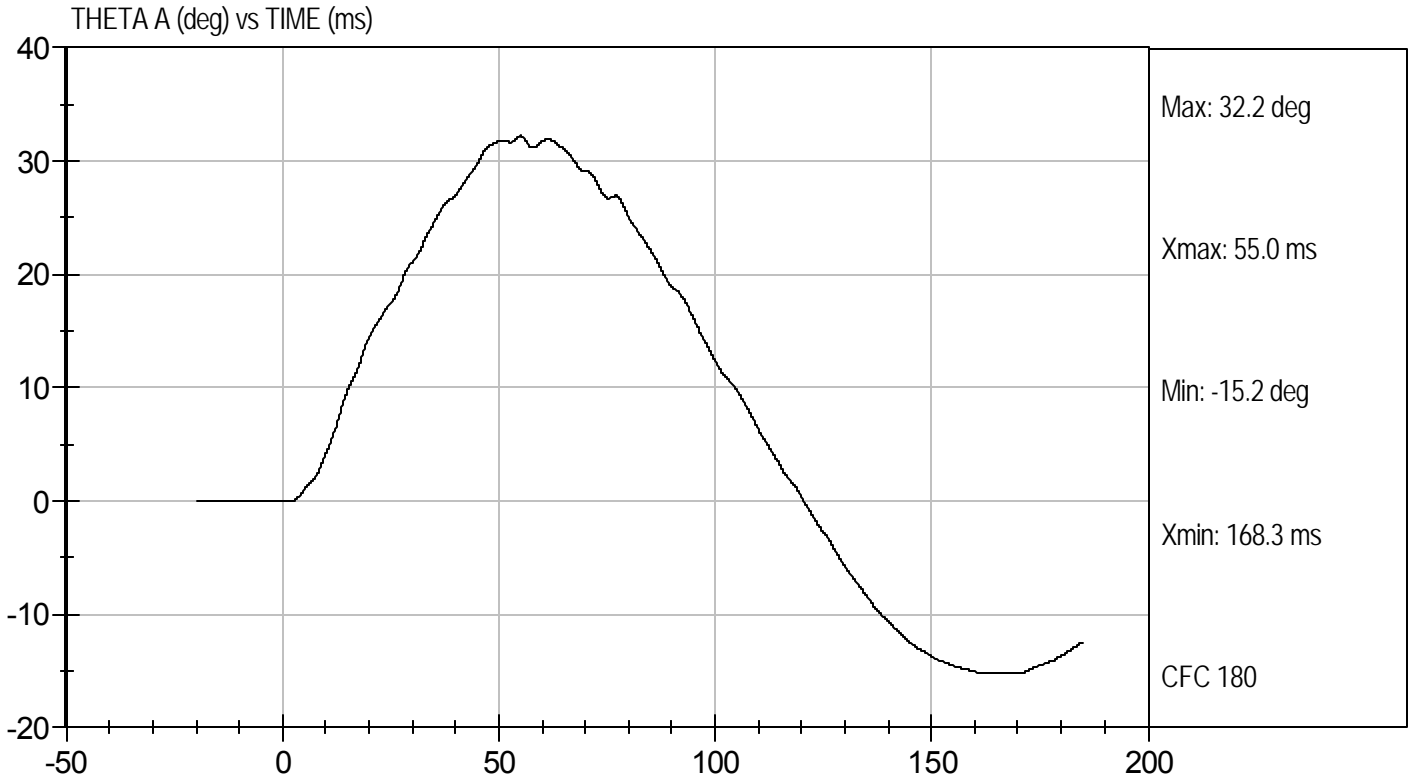
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Neck Bending
Component ID: D111722

Test Date: 5/10/11
Velocity: 11.42 ft/s, 3.48 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111723

| 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 | 44 | Pass |
| Pendulum Speed | m/s | 4.2 to 4.4 | 4.4 | Pass |
| Peak Shoulder Acceleration | G's | 7.5 to 10.5 | 9.2 | Pass |
| Time of Peak Shoulder Acceleration | ms | NA | 18.6 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
 Laboratory Technician

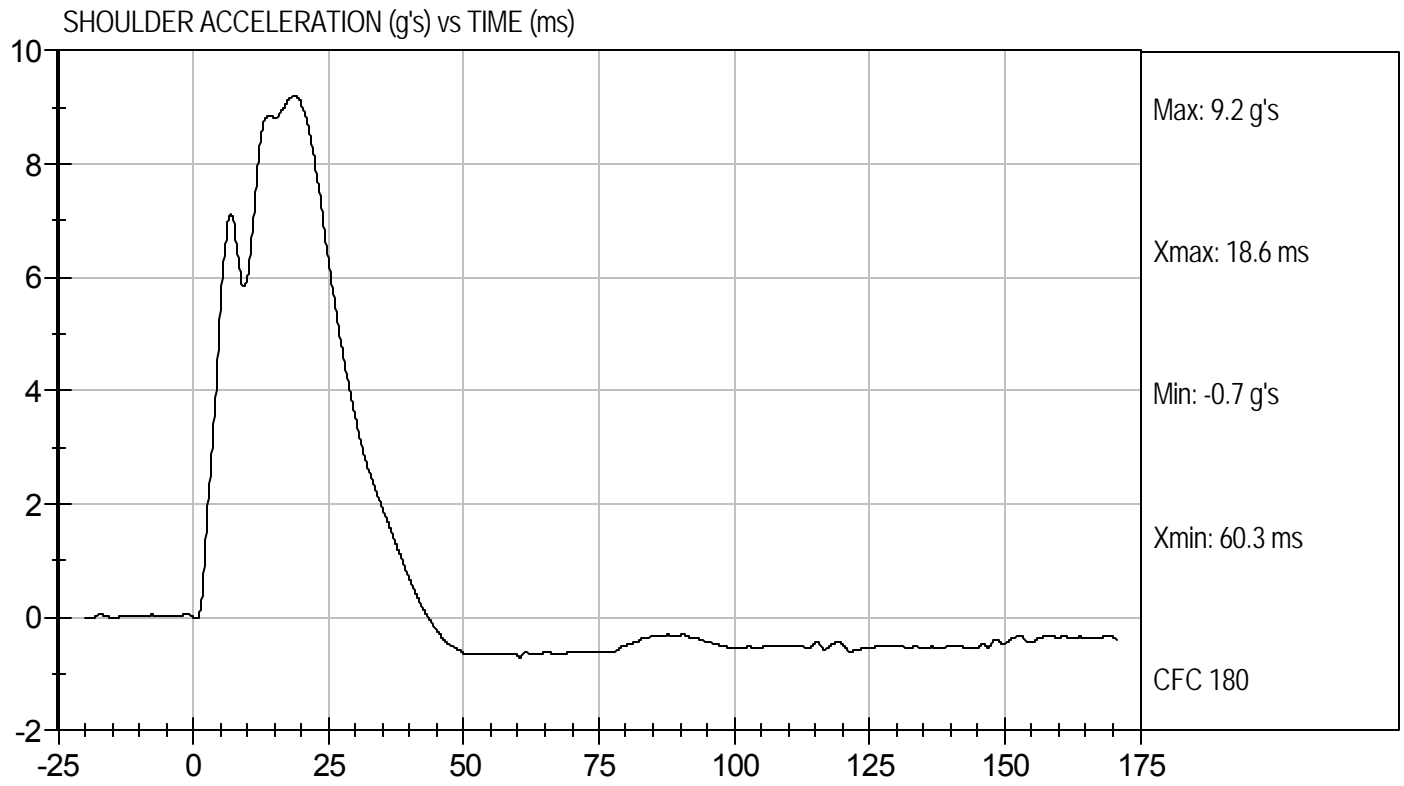
5/10/11
 Test Date

David Winkelbauer
 Approved By



Test Desc: Shoulder Impact
Component ID: D111723

Test Date: 5/10/11
Velocity: 14.36 ft/s, 4.4 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111724

| 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 | 50 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 39.2 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 47.9 | Pass |
| Overall Test Results | | | | Pass |

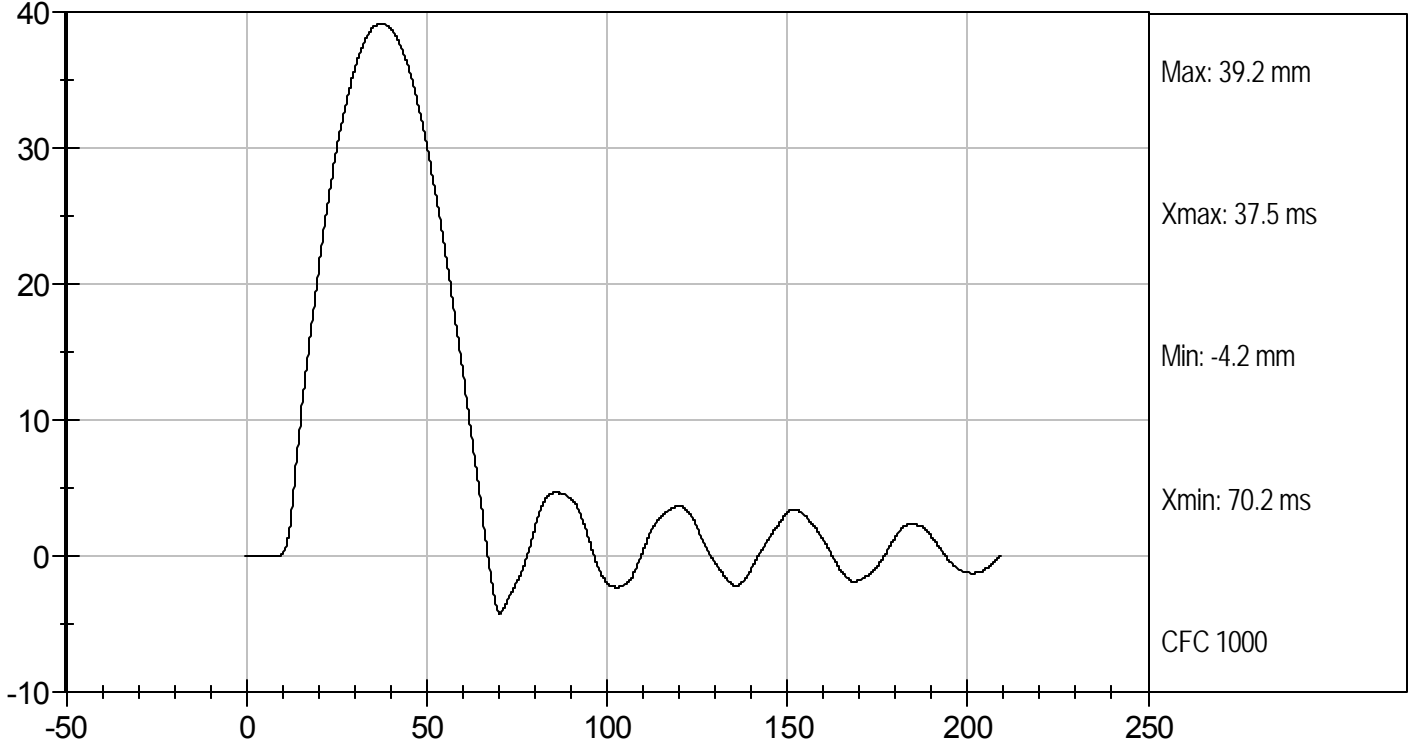
Jessica Gall
Laboratory Technician

5/10/11
Test Date

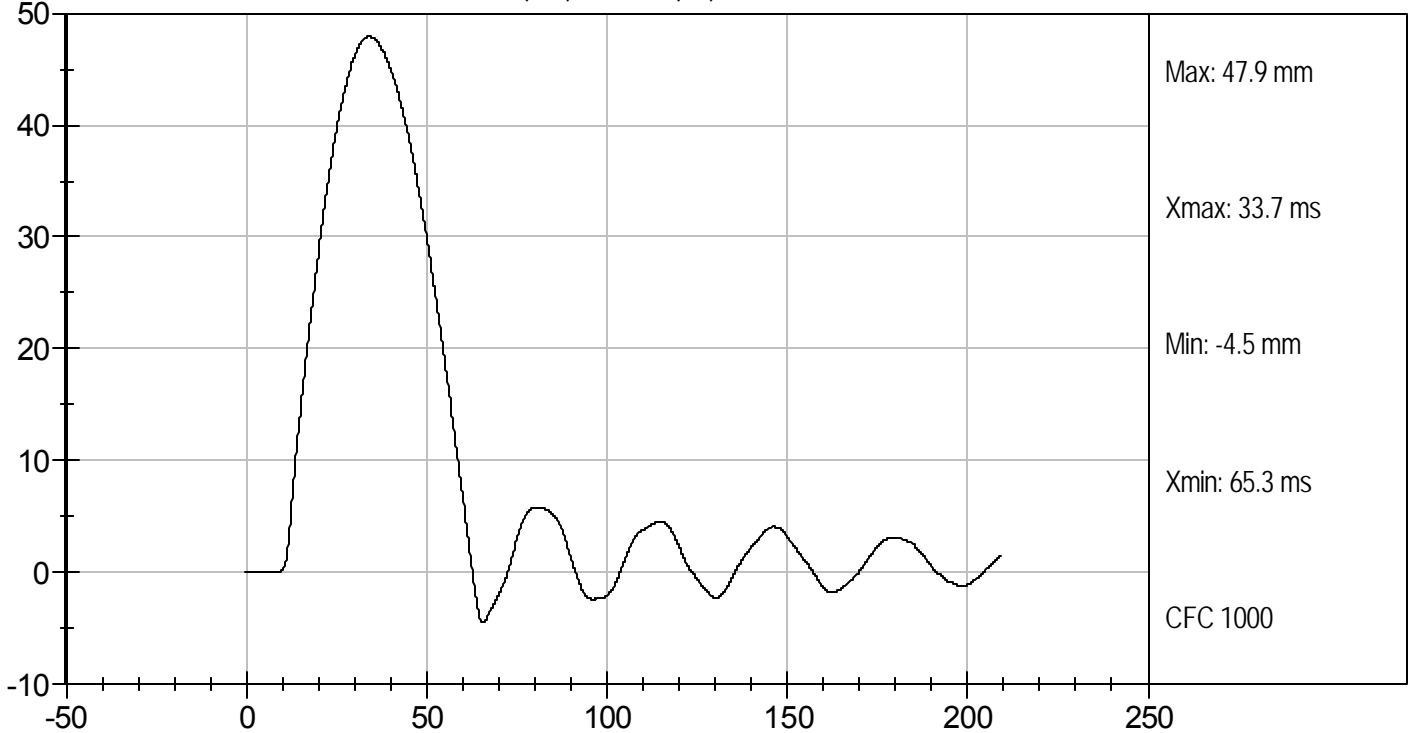
David Winkelbauer
Approved By



UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111725

| 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 | 50 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.3 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 48.7 | Pass |
| Overall Test Results | | | | Pass |

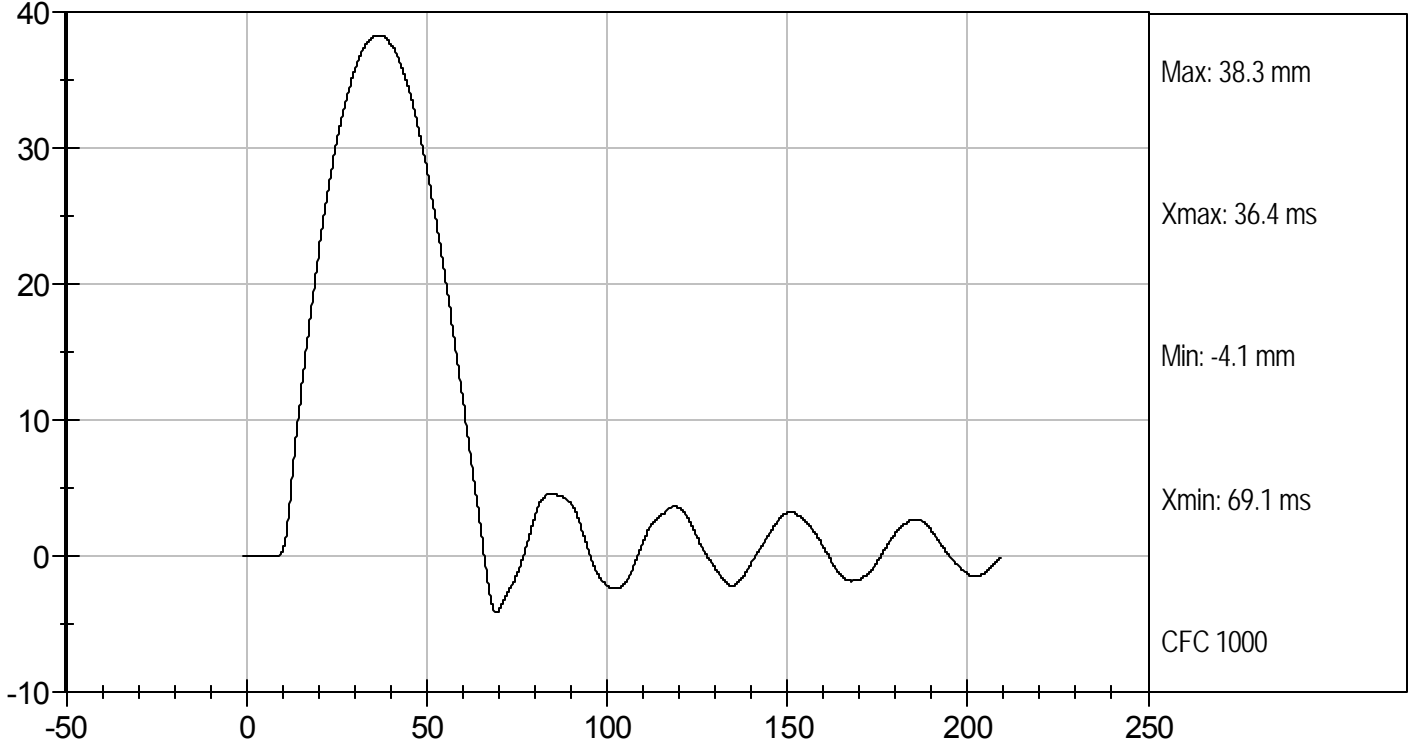
Jessica Gall
Laboratory Technician

5/10/11
Test Date

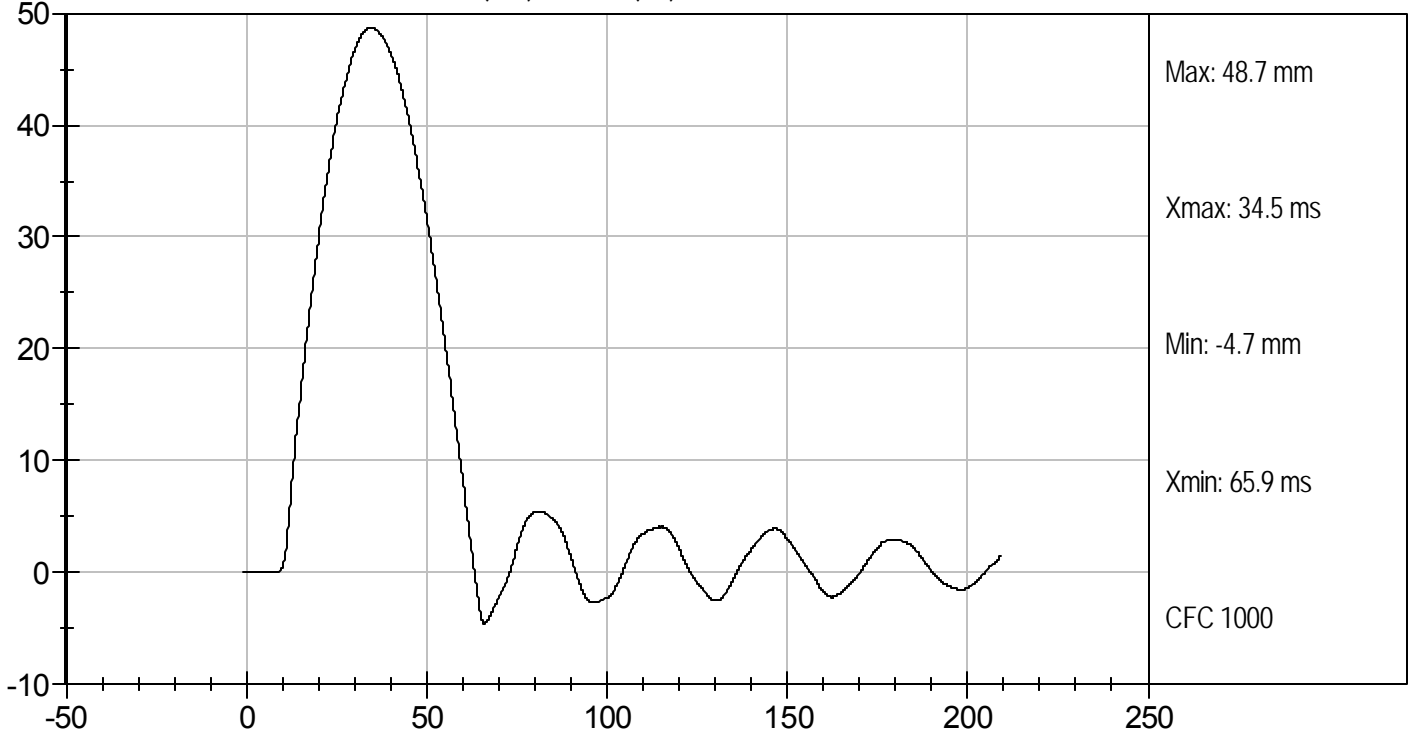
David Winkelbauer
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MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111726

| 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 | 50 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.3 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.7 | Pass |
| Overall Test Results | | | | Pass |

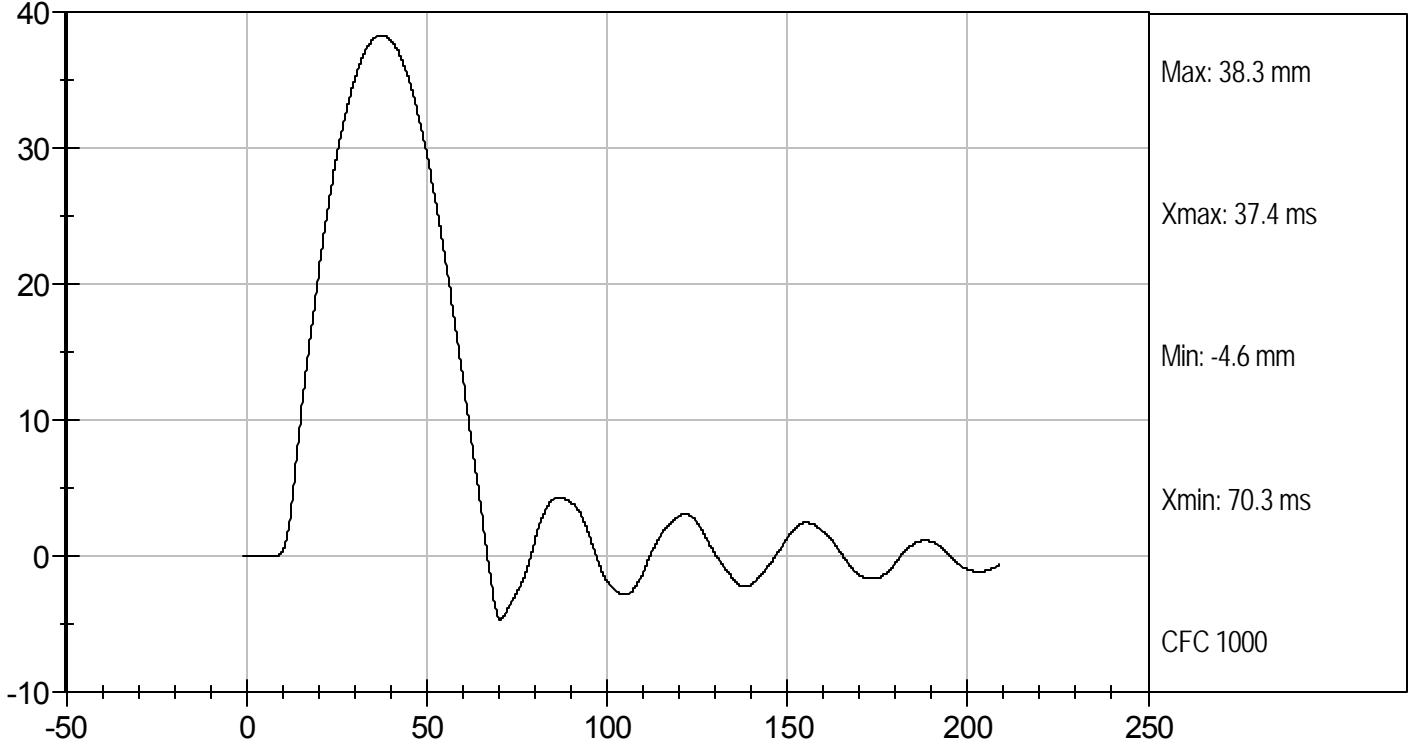
Jessica Hall
Laboratory Technician

5/10/11
Test Date

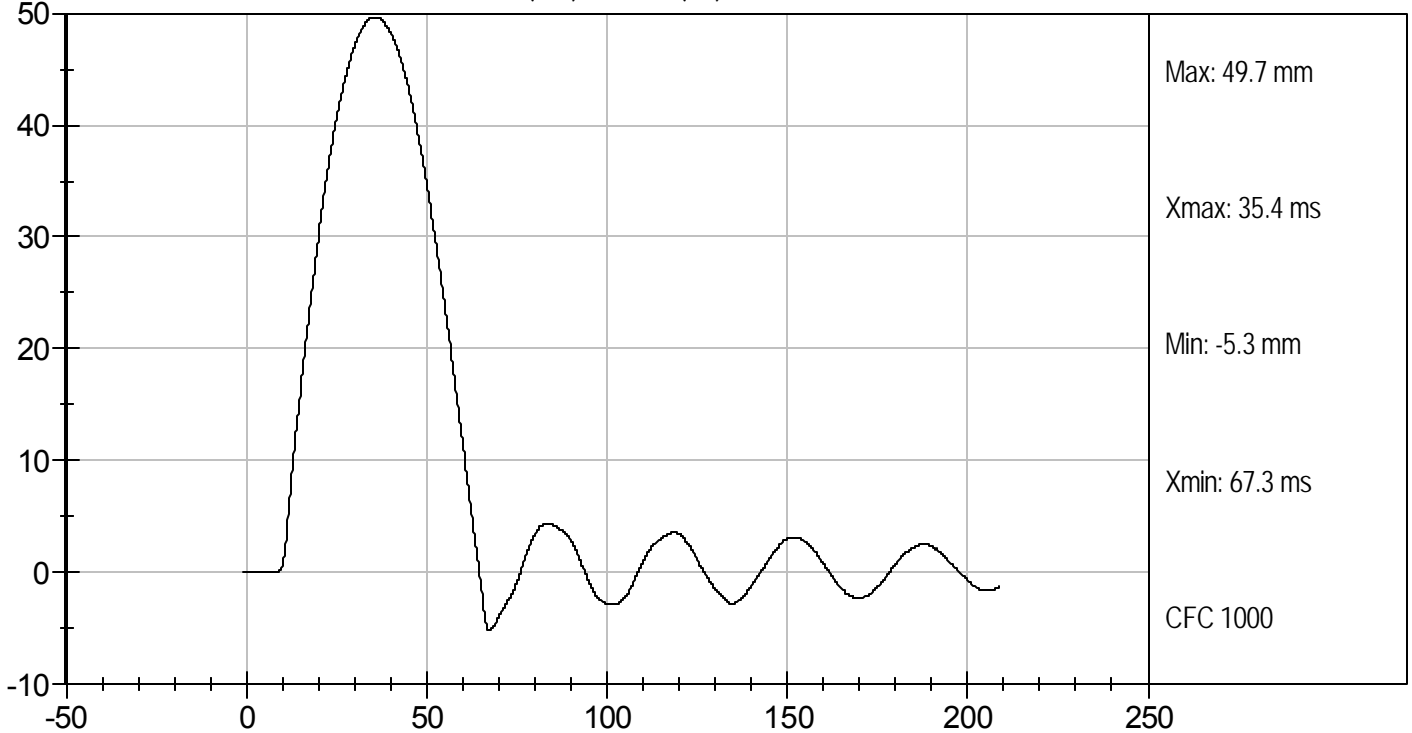
David Winkelbauer
Approved By



LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION


ABDOMEN TEST

ES-2re DUMMY


ATD Serial No: 016

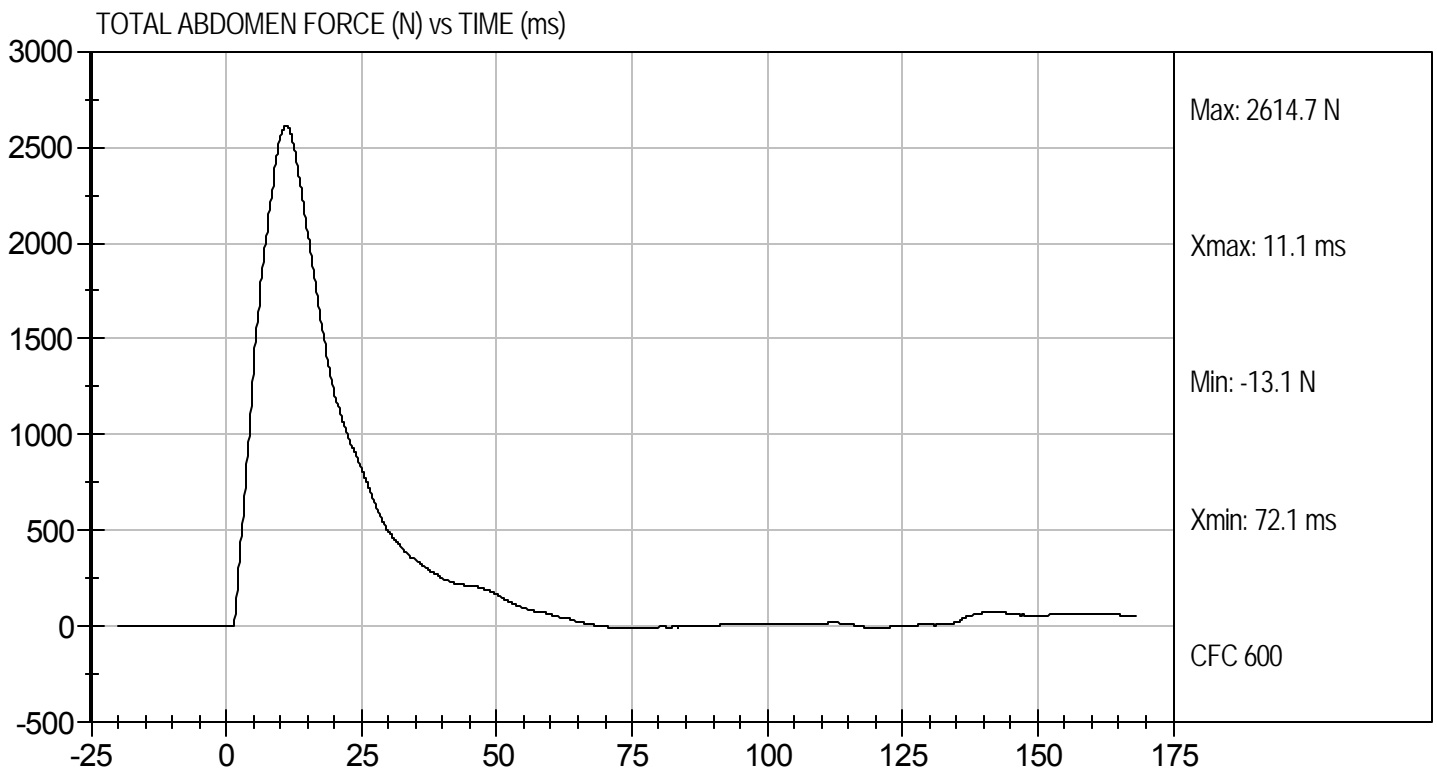
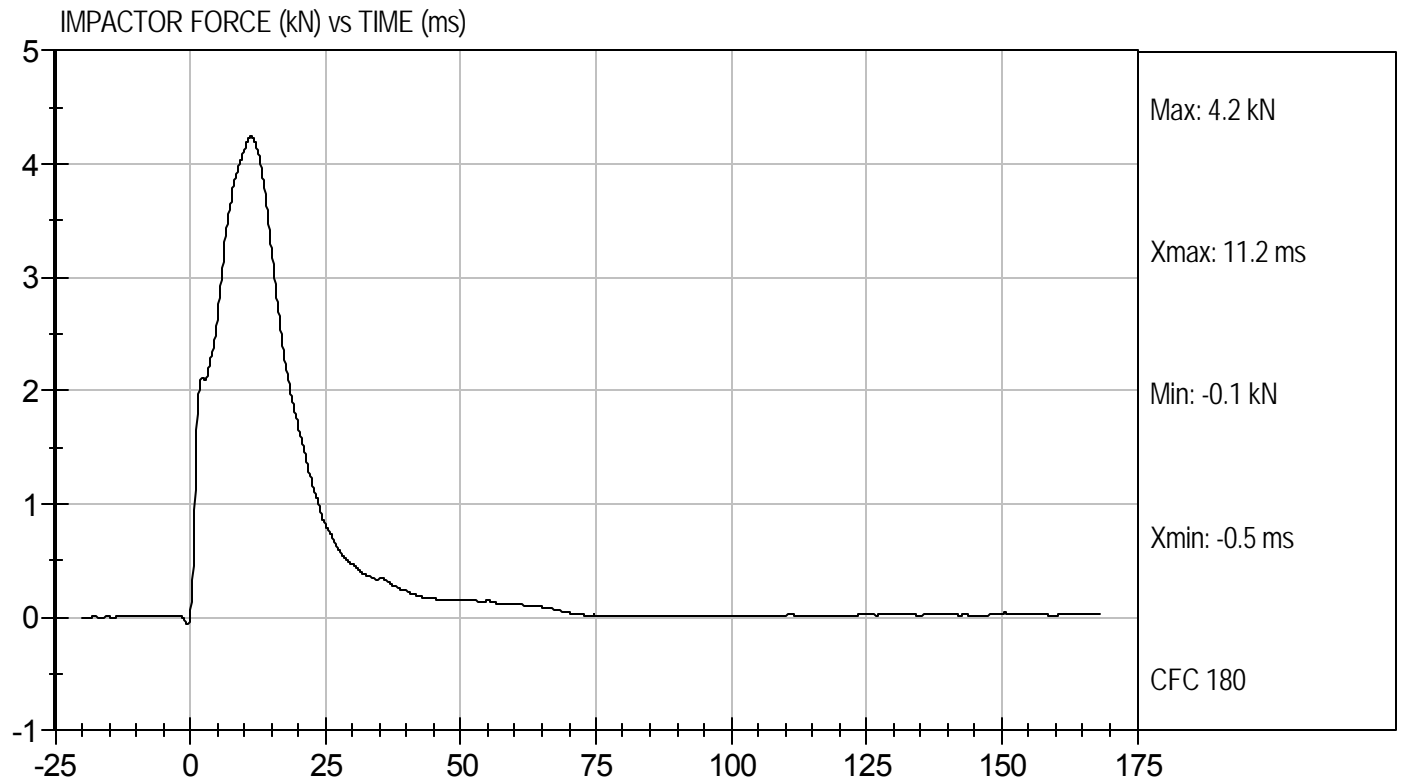
Test I.D: D111727

| 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 | 44 | Pass |
| Probe Speed | m/s | 3.90 to 4.10 | 4.10 | Pass |
| Maximum Impact Force | kN | 4.00 to 4.80 | 4.25 | Pass |
| Time of Maximum Impact Force | ms | 10.60 to 13.00 | 11.20 | Pass |
| Maximum Total Abdomen Force | kN | 2.20 to 2.70 | 2.61 | Pass |
| Time of Maximum Abdomen Force | ms | 10.00 to 12.30 | 11.10 | Pass |
| Overall Test Results | | | | Pass |


Laboratory Technician

5/10/11
Test Date


Approved By



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D.: D111728

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.9 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 47 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.15 | 6.12 | Pass |
| Pendulum Deceleration | 1 ms | m/s | -0.05 to 0.00 | -0.01 | Pass |
| | 3.7 ms | m/s | -0.425 to -0.24 | -0.42 | Pass |
| | 27 ms | m/s | -6.50 to -5.80 | -6.03 | Pass |
| | 30 ms | m/s | >= -6.5 | -6.01 | Pass |
| Maximum Flexion Angle | | deg | 45.0 to 55.0 | 47.9 | Pass |
| Time of Maximum Flexion Angle | | ms | 39.0 to 53.0 | 42.4 | Pass |
| Headform Rotation Decay to Initial Position | | ms | 37 to 57 | 45 | Pass |
| Overall Results | | | | | Pass |

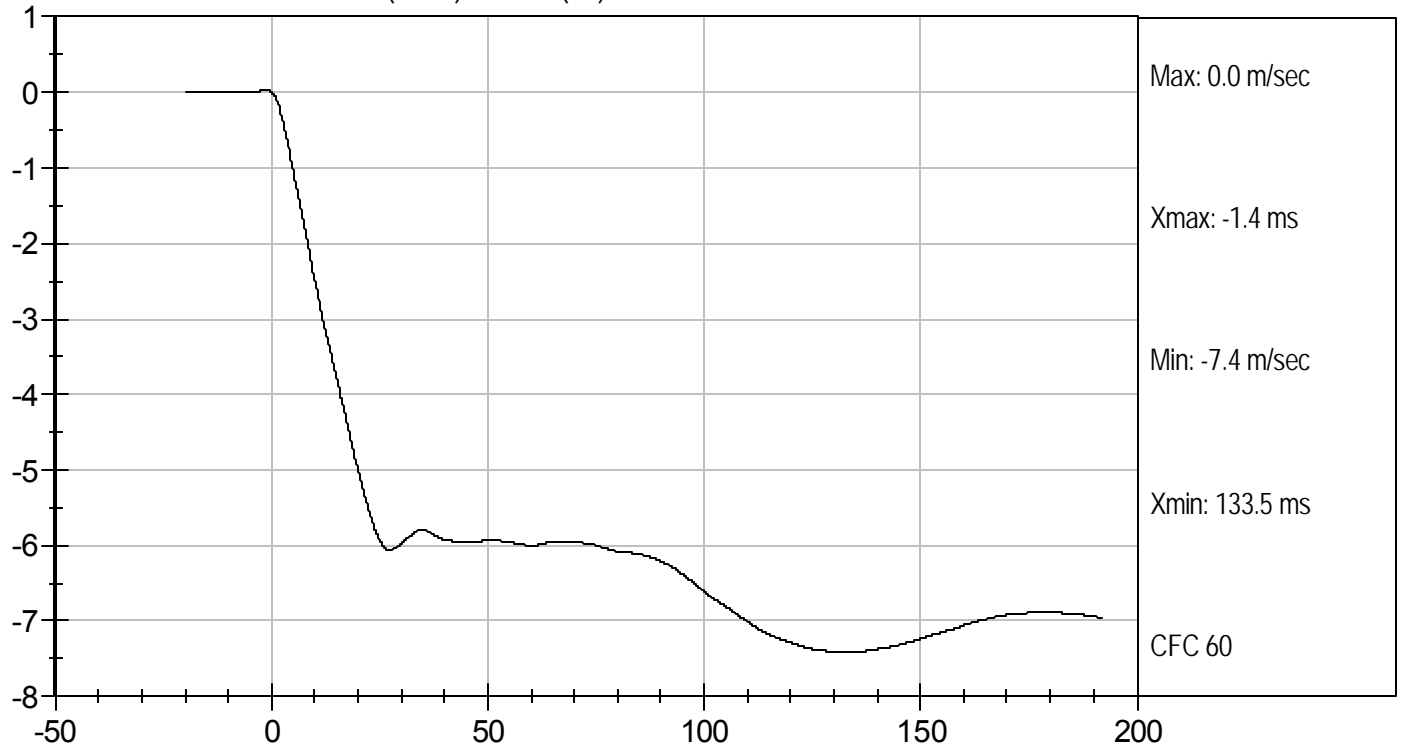
Jessica Hall
 Laboratory Technician

5/10/11
 Test Date

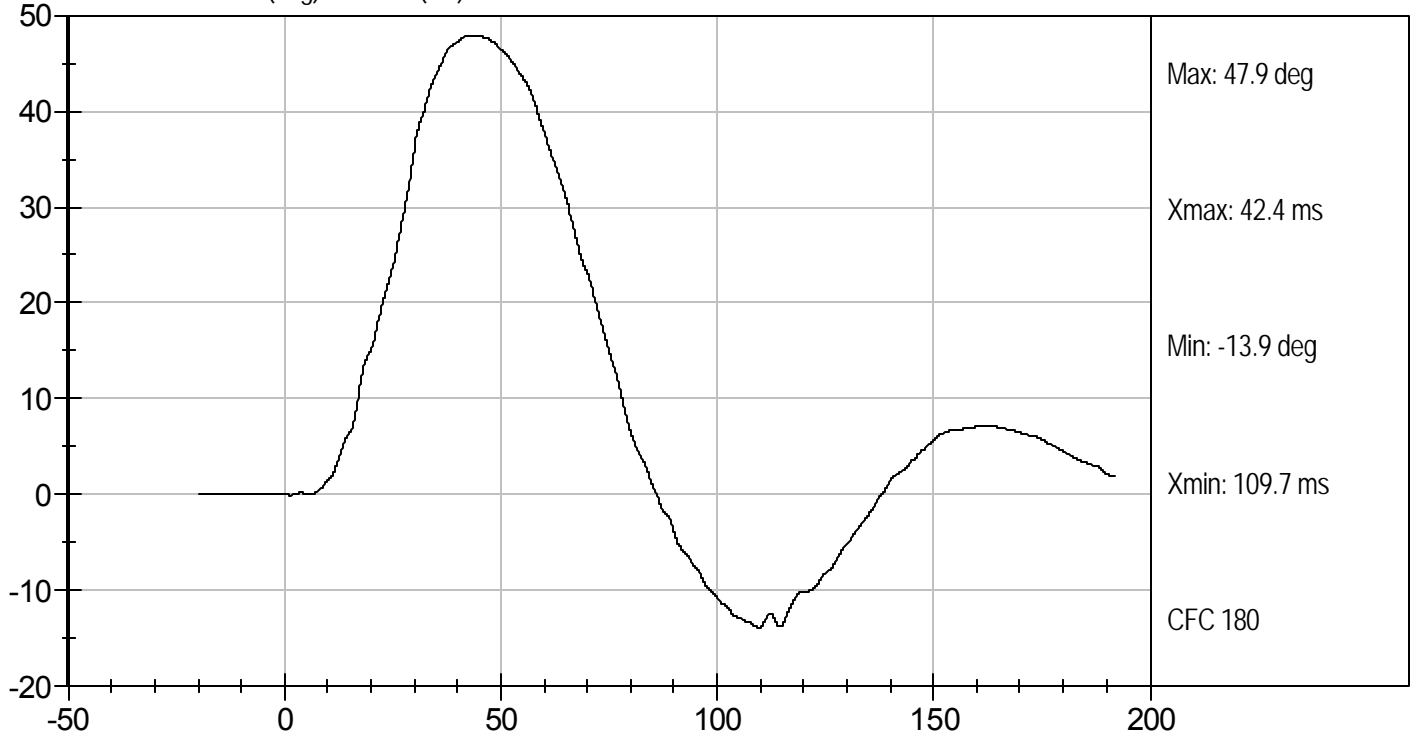
David Winkelbauer
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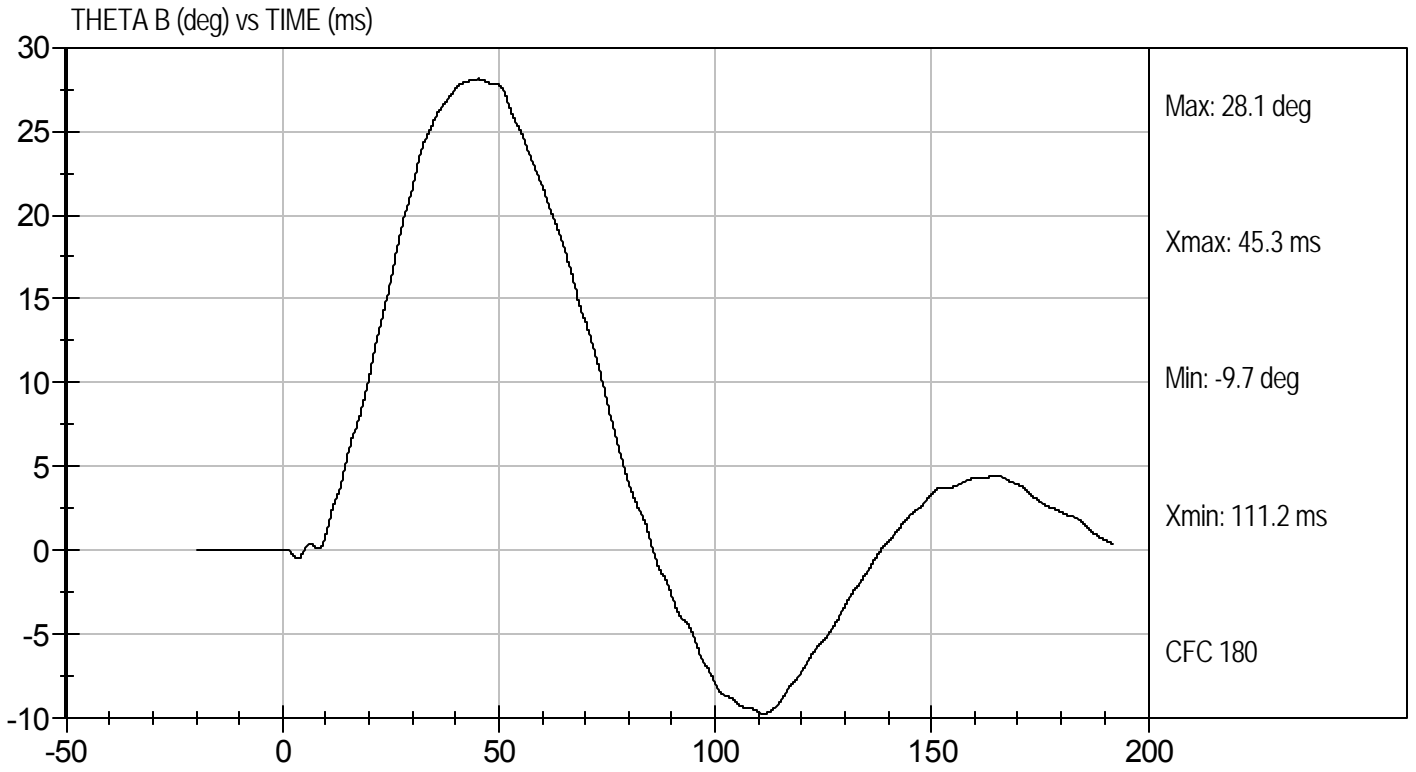
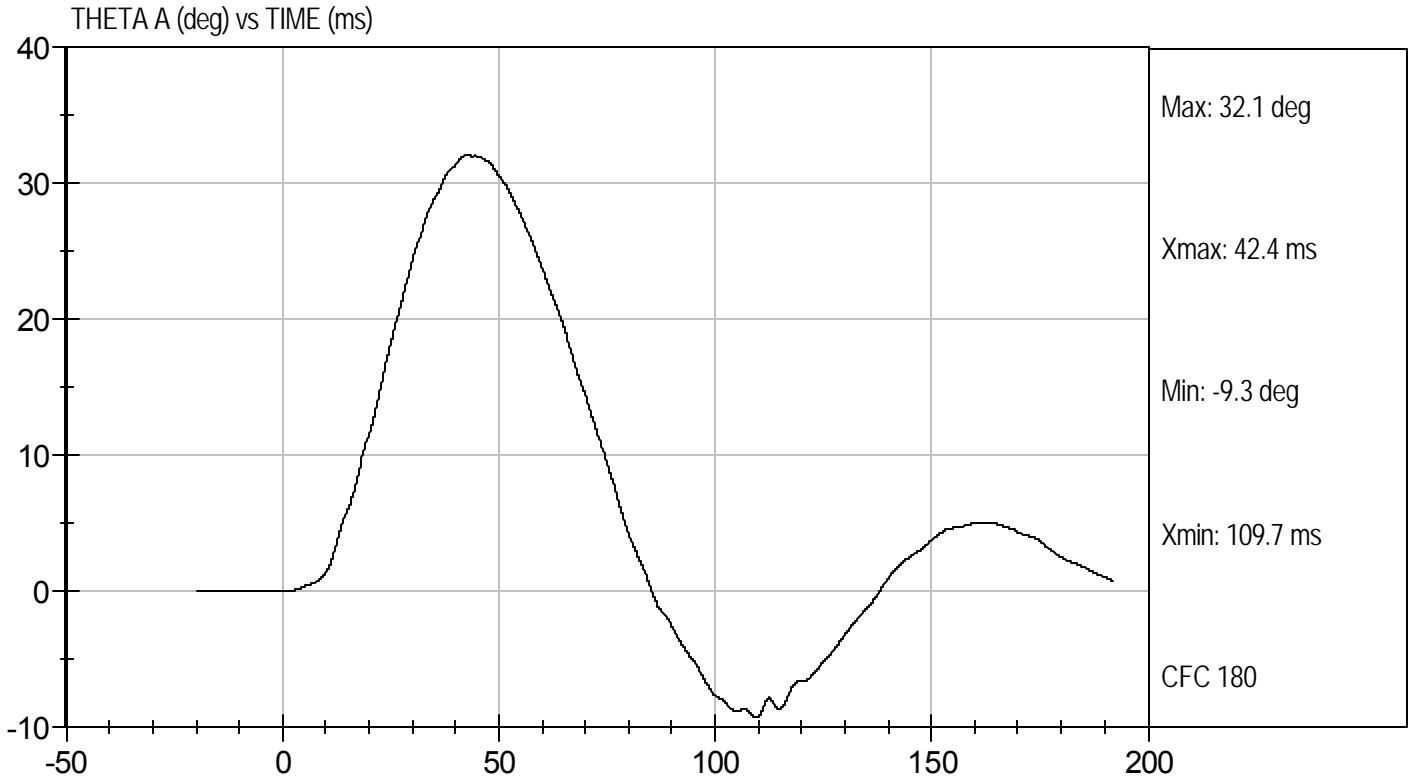


PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)





MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111729

| 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 | 44 | Pass |
| Probe Speed | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Impactor Force | kN | 4.70 to 5.40 | 4.85 | Pass |
| Time of Maximum Impactor Force | ms | 11.80 to 16.10 | 13.70 | Pass |
| Maximum Pubic Force | kN | 1.23 to 1.59 | 1.34 | Pass |
| Time of Maximum Pubic Force | ms | 12.20 to 17.00 | 16.20 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
Laboratory Technician

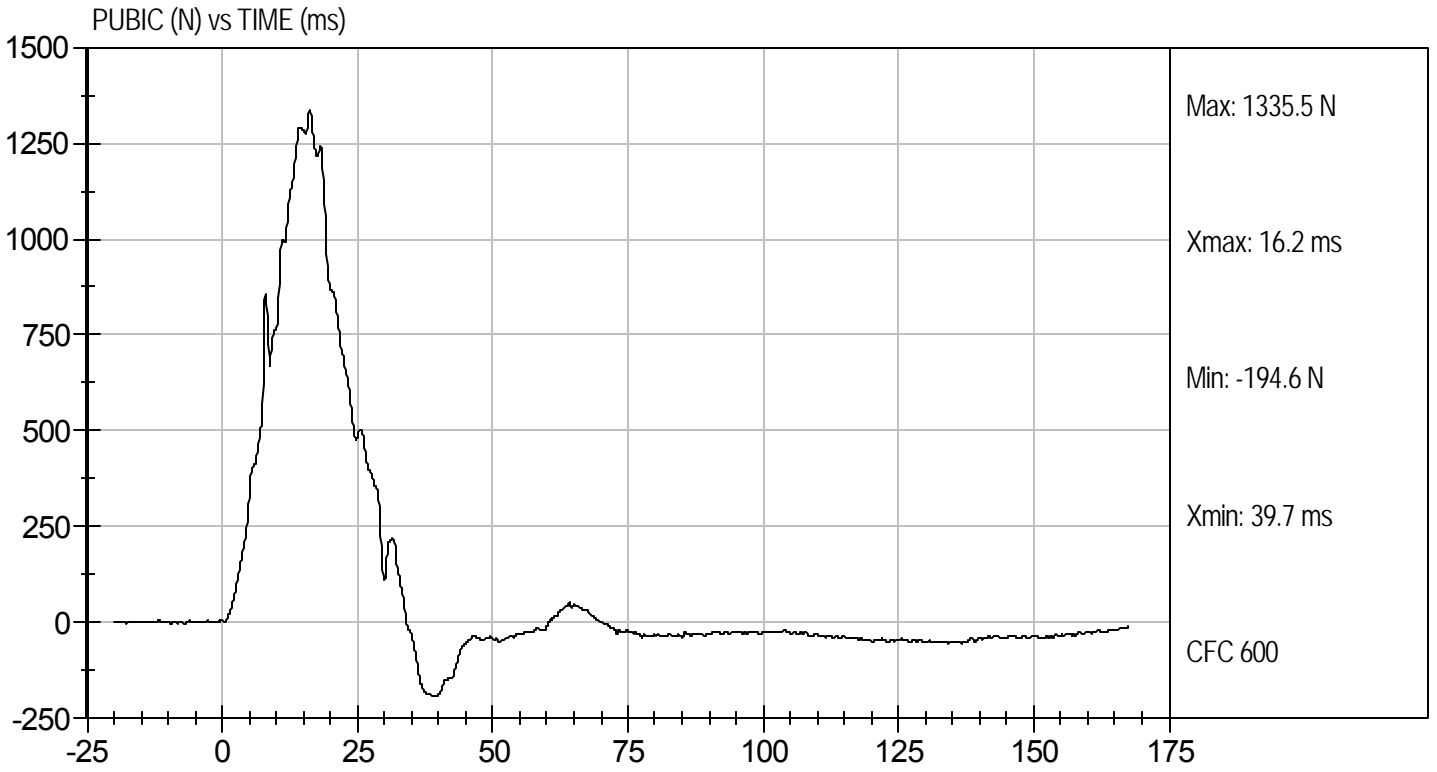
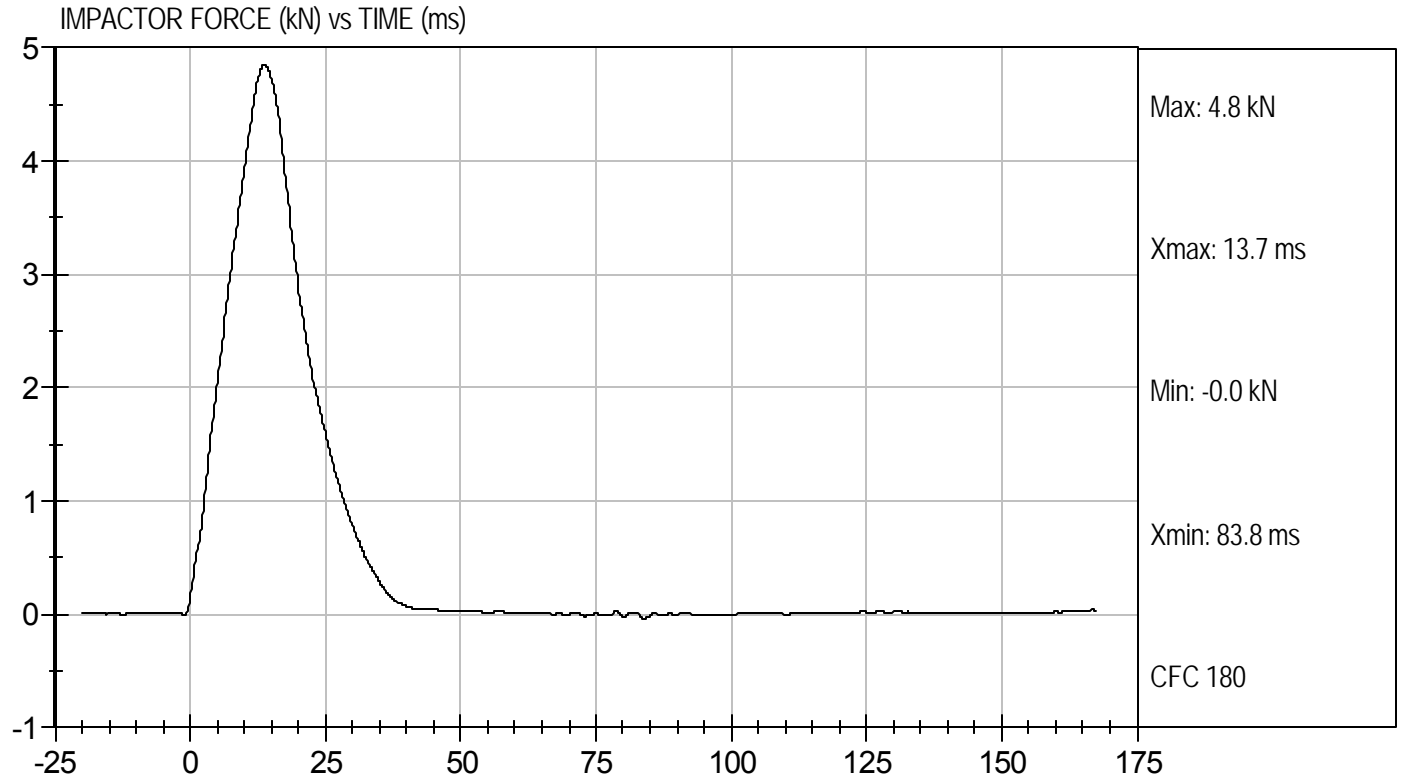
5/10/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D111729

Test Date: 5/10/11
Velocity: 14.24 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111720

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature | deg C | 20.6 to 22.2 | 22.0 | Pass |
| Humidity | % | 10 to 70 | 44 | Pass |
| Probe Speed | m/s | 5.40 to 5.60 | 5.58 | Pass |
| Maximum Impactor Force (after 6 ms) | kN | 5.10 to 6.20 | 5.20 | Pass |
| Upper Rib Displacement | mm | 34.0 to 41.0 | 39.2 | Pass |
| Middle Rib Displacement | mm | 37.0 to 45.0 | 41.1 | Pass |
| Lower Rib Displacement | mm | 37.0 to 44.0 | 40.2 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
 Laboratory Technician

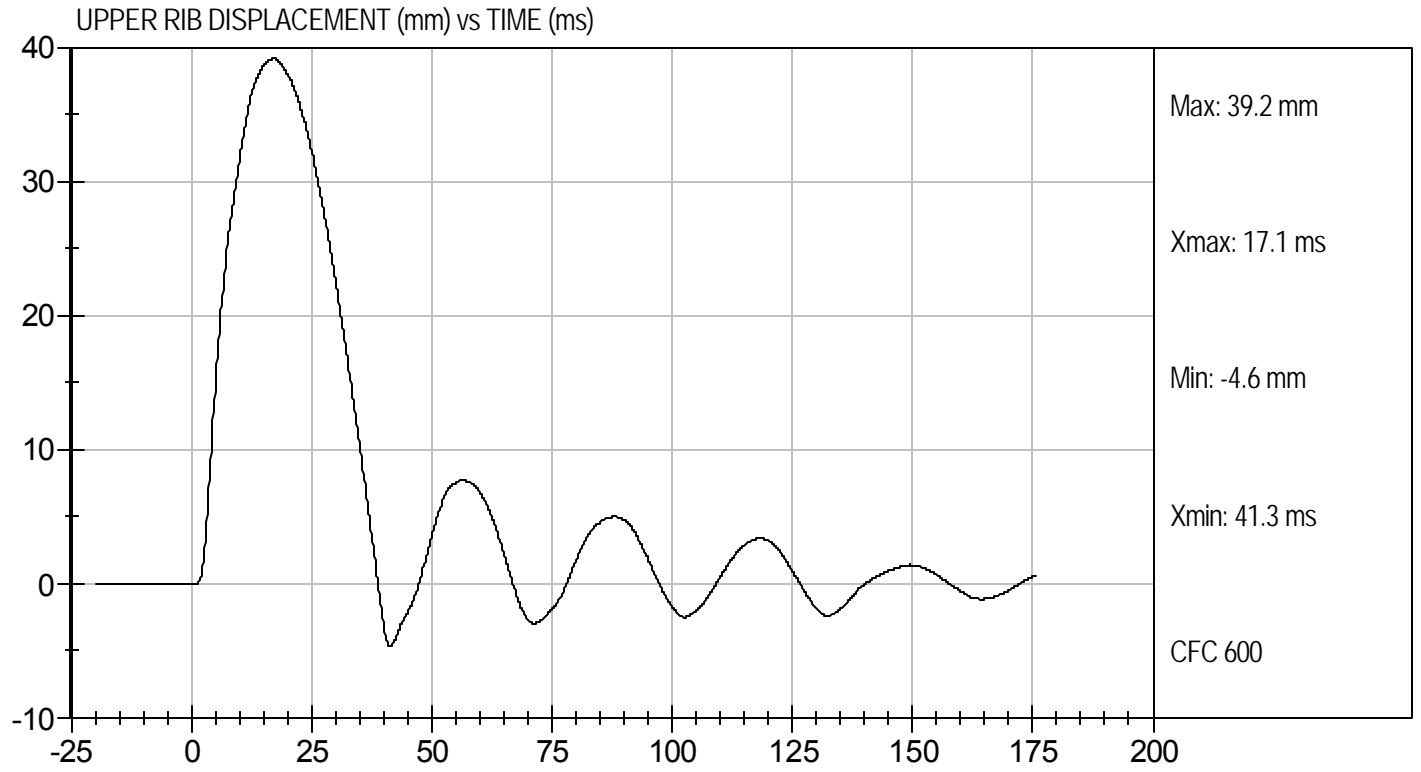
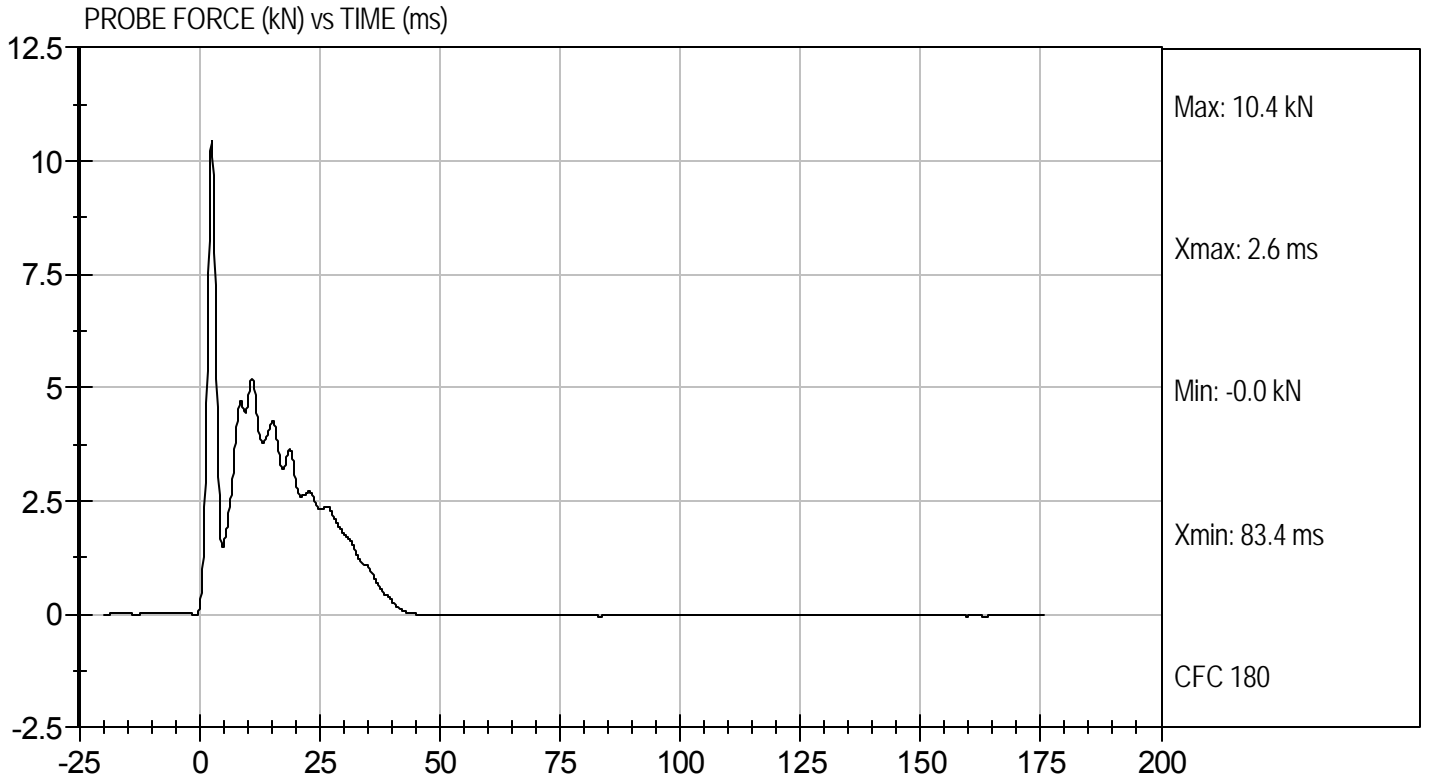
5/10/11
 Test Date

David Winkelbauer
 Approved By



Test Desc: Thorax Impact
Component ID: D111720

Test Date: 5/10/11
Velocity: 18.31 ft/s, 5.58 m/s

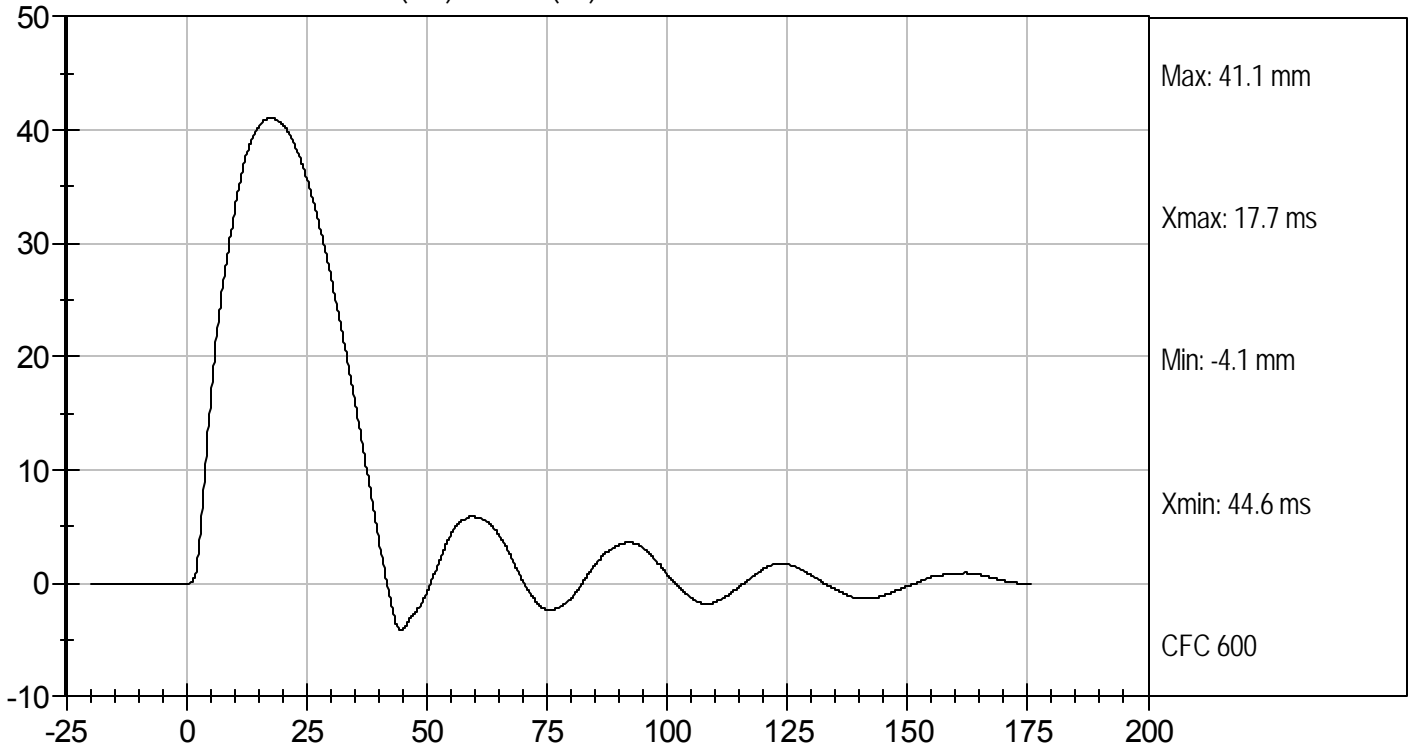




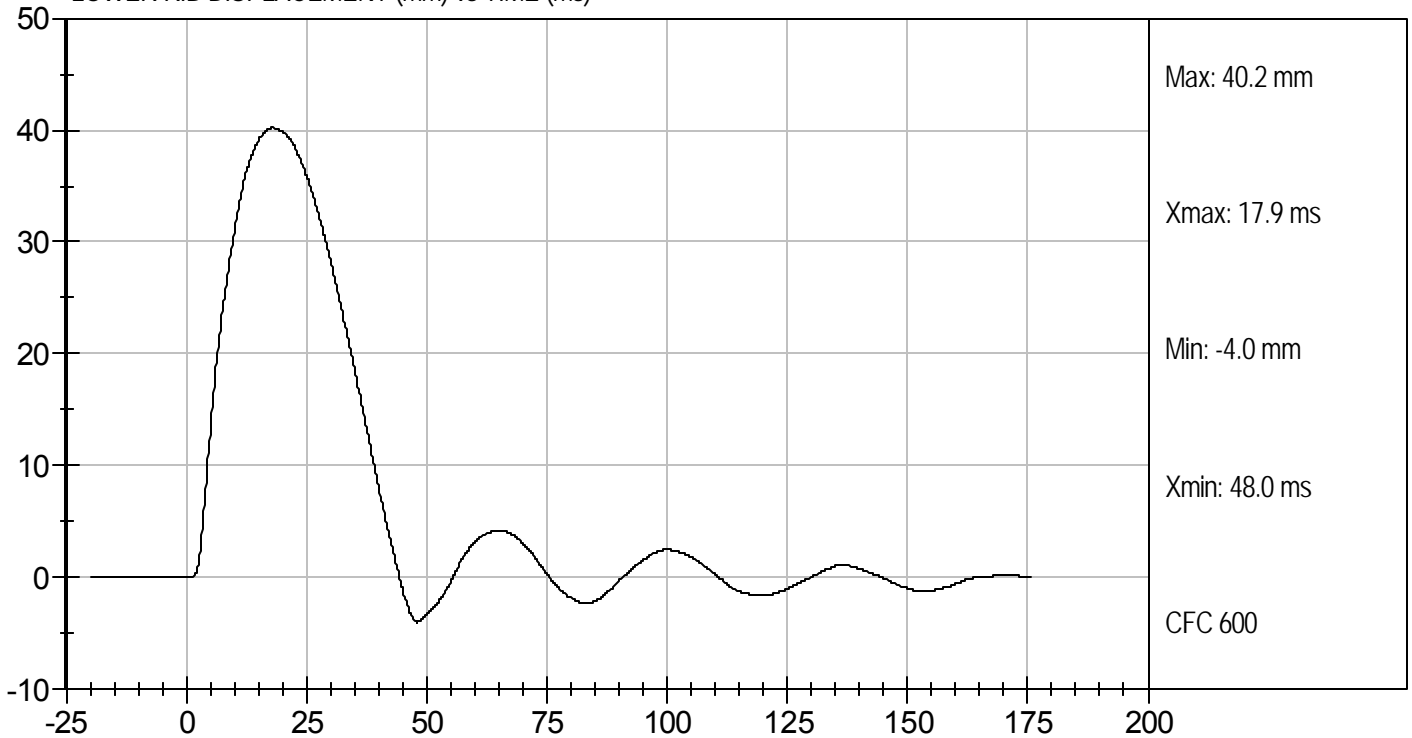
Test Desc: Thorax Impact
Component ID: D111720

Test Date: 5/10/11
Velocity: 18.31 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: 016

Test ID: D111791

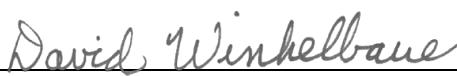
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|--------------------|--------|-----------|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.8 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 28 | Pass |
| Peak Resultant Acceleration | G's | 125 to 155 | 144 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | -11.2 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 15% of peak | Yes | Pass |
| Overall Test Results | | | | Pass |



 Laboratory Technician

5/16/11

 Test Date

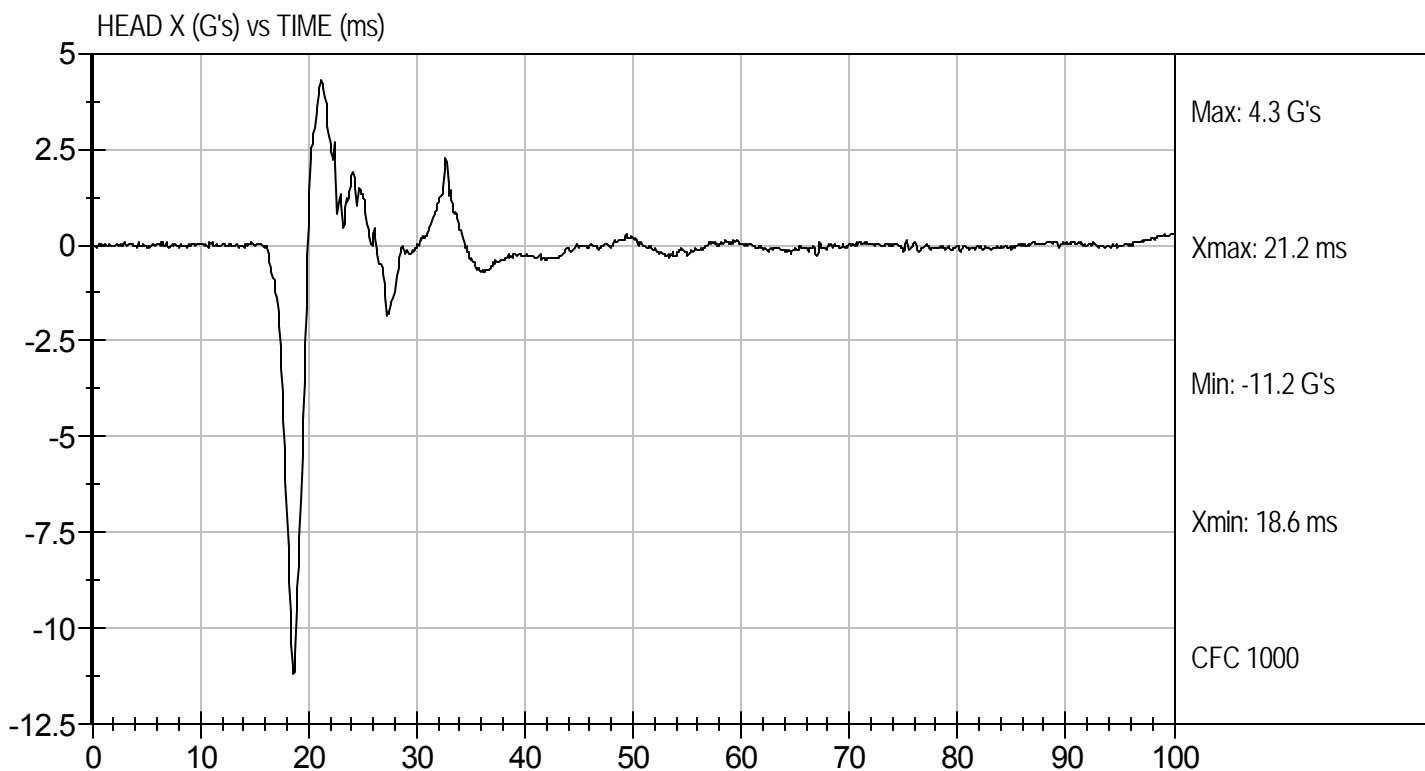
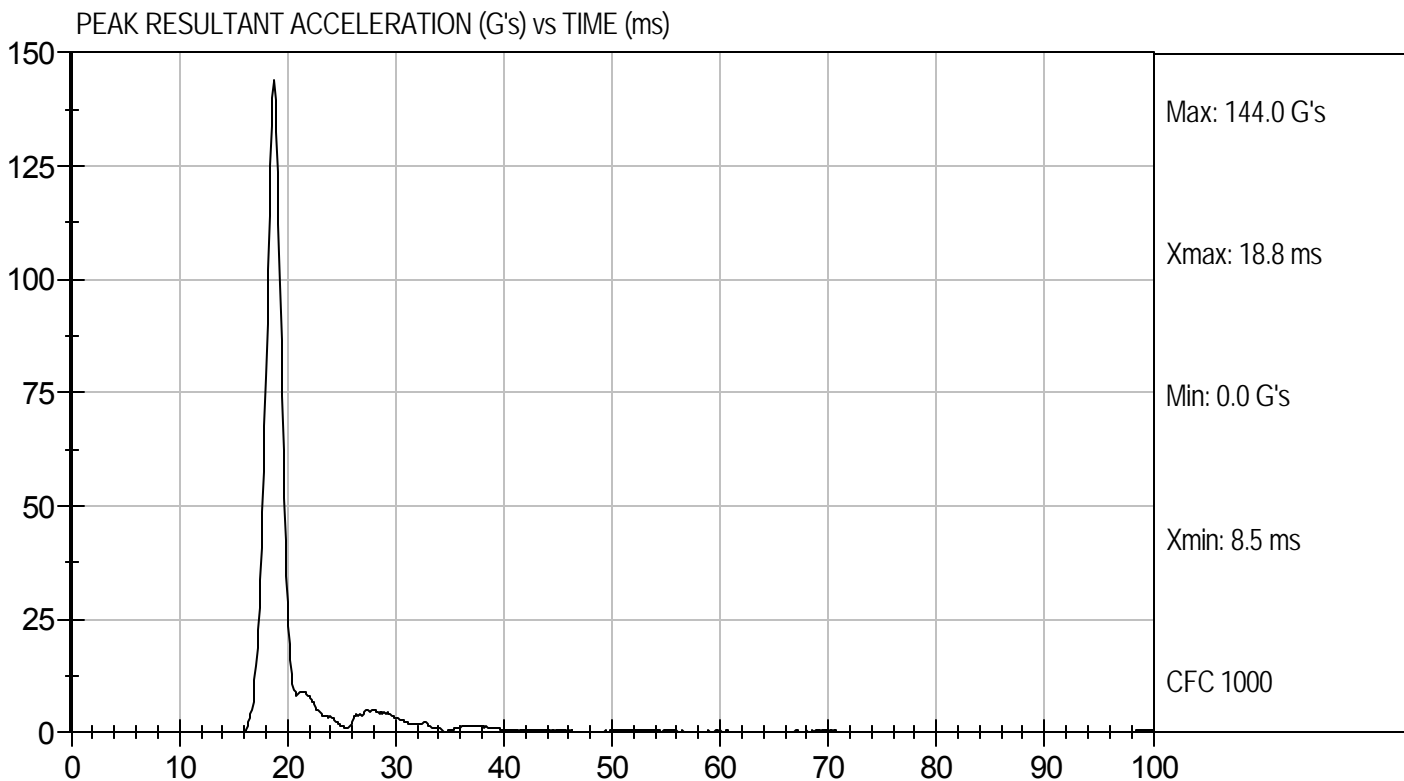


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Test Desc: Head Drop
Component ID: D111791

Test Date: 5/16/11
Velocity: 0 ft/s, 0 m/s



**MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY**

ATD Serial No: 016

Test I.D.: D111792

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature | | deg C | 18.0 to 22.0 | 21.8 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 28 | Pass |
| Pendulum Speed | | m/s | 3.3 to 3.5 | 3.4 | Pass |
| Pendulum Deceleration | 1 ms | m/s | 0.00 to -0.05 | -0.02 | Pass |
| | 3 ms | m/s | -0.25 to -0.375 | -0.33 | Pass |
| | 14 ms | m/s | -3.20 to -3.70 | -3.33 | Pass |
| Maximum Flexion Angle | | deg | 49.0 to 59.0 | 51.0 | Pass |
| Time of Maximum Flexion Angle | | ms | 54.0 to 66.0 | 55.9 | Pass |
| Head Rotation Decay Time to 0 degree | | ms | 53.0 to 88.0 | 56.6 | Pass |
| Overall Test Results | | | | | Pass |

Jessica Hall
Laboratory Technician

5/16/11
Test Date

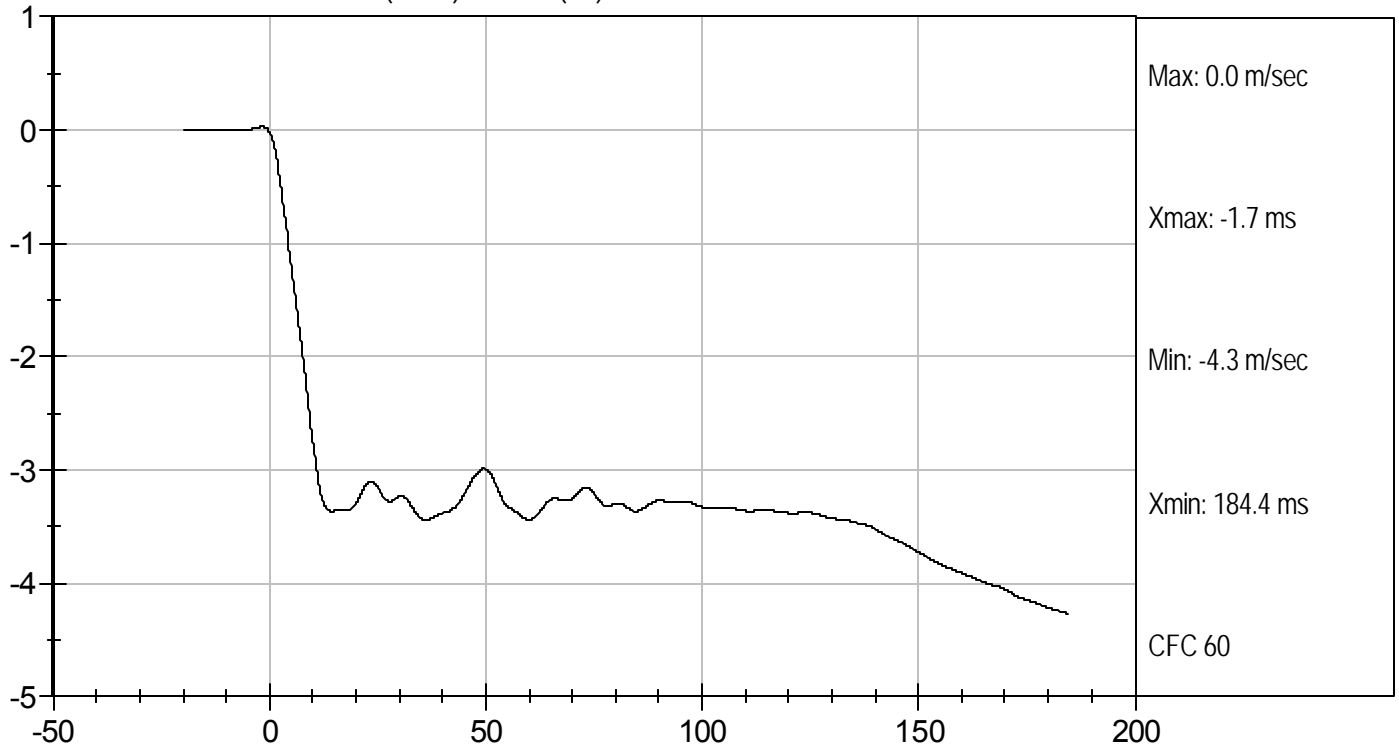
David Winkelbauer
Approved By



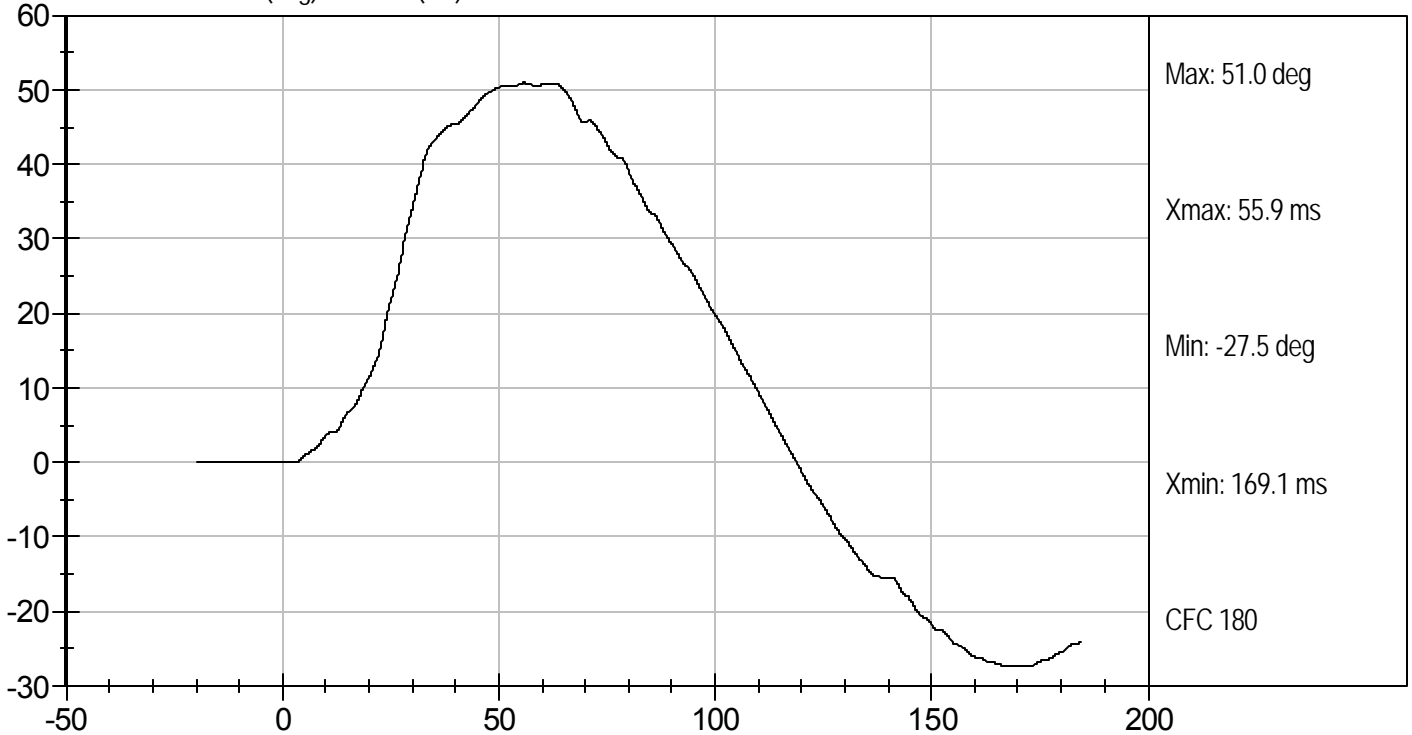
Test Desc: Neck Bending
Component ID: D111792

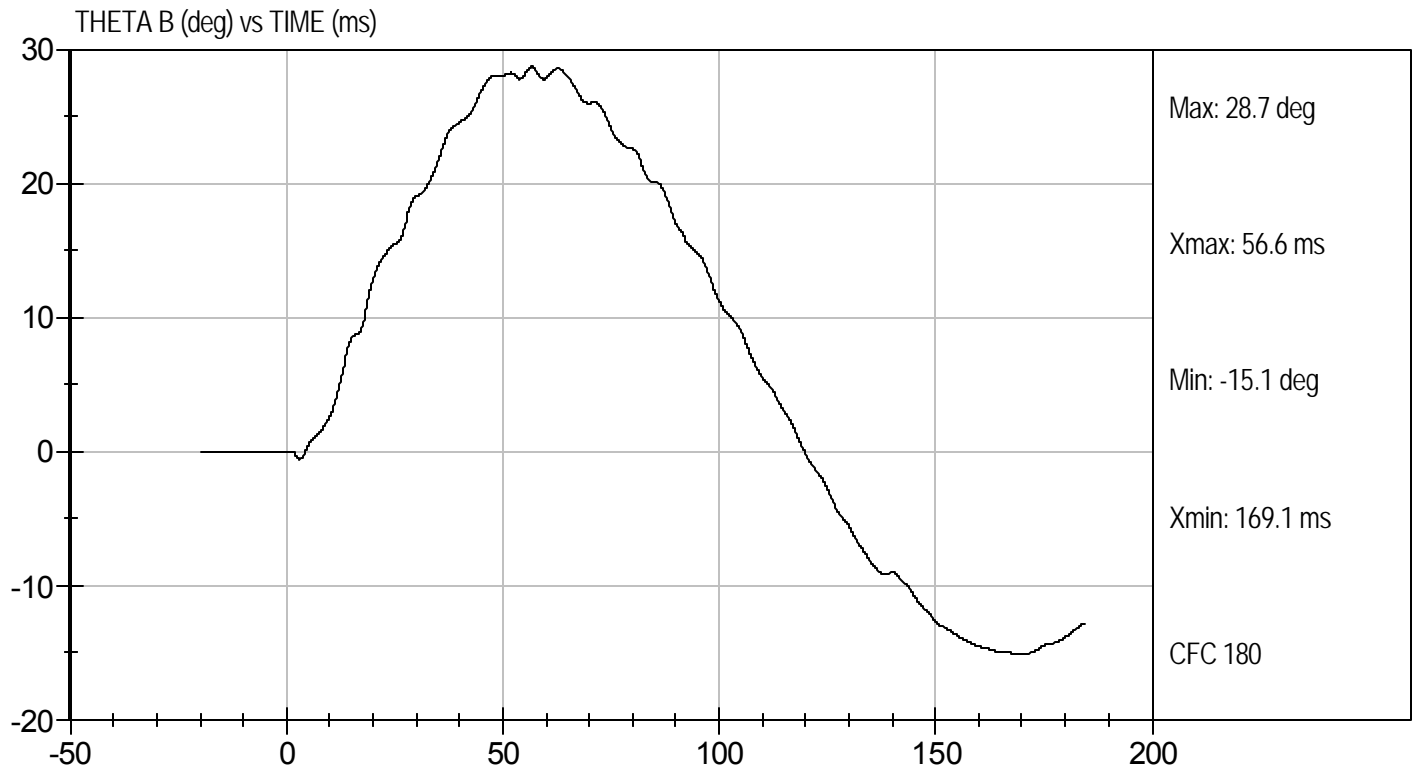
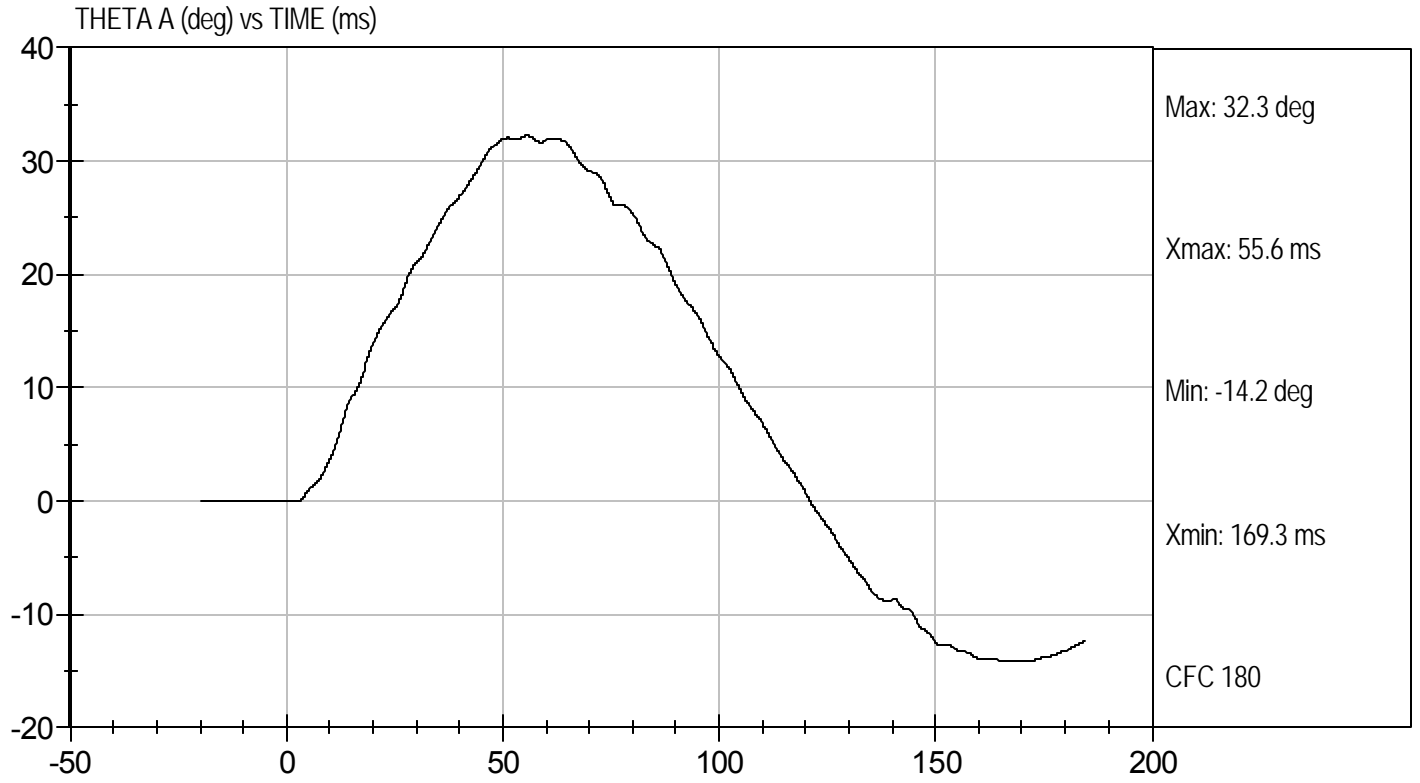
Test Date: 5/16/11
Velocity: 11.16 ft/s, 3.40 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)





MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111793

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 27 | Pass |
| Pendulum Speed | m/s | 4.2 to 4.4 | 4.3 | Pass |
| Peak Shoulder Acceleration | G's | 7.5 to 10.5 | 9.0 | Pass |
| Time of Peak Shoulder Acceleration | ms | NA | 18.2 | Pass |
| Overall Test Results | | | | Pass |

Jessica Gall
 Laboratory Technician

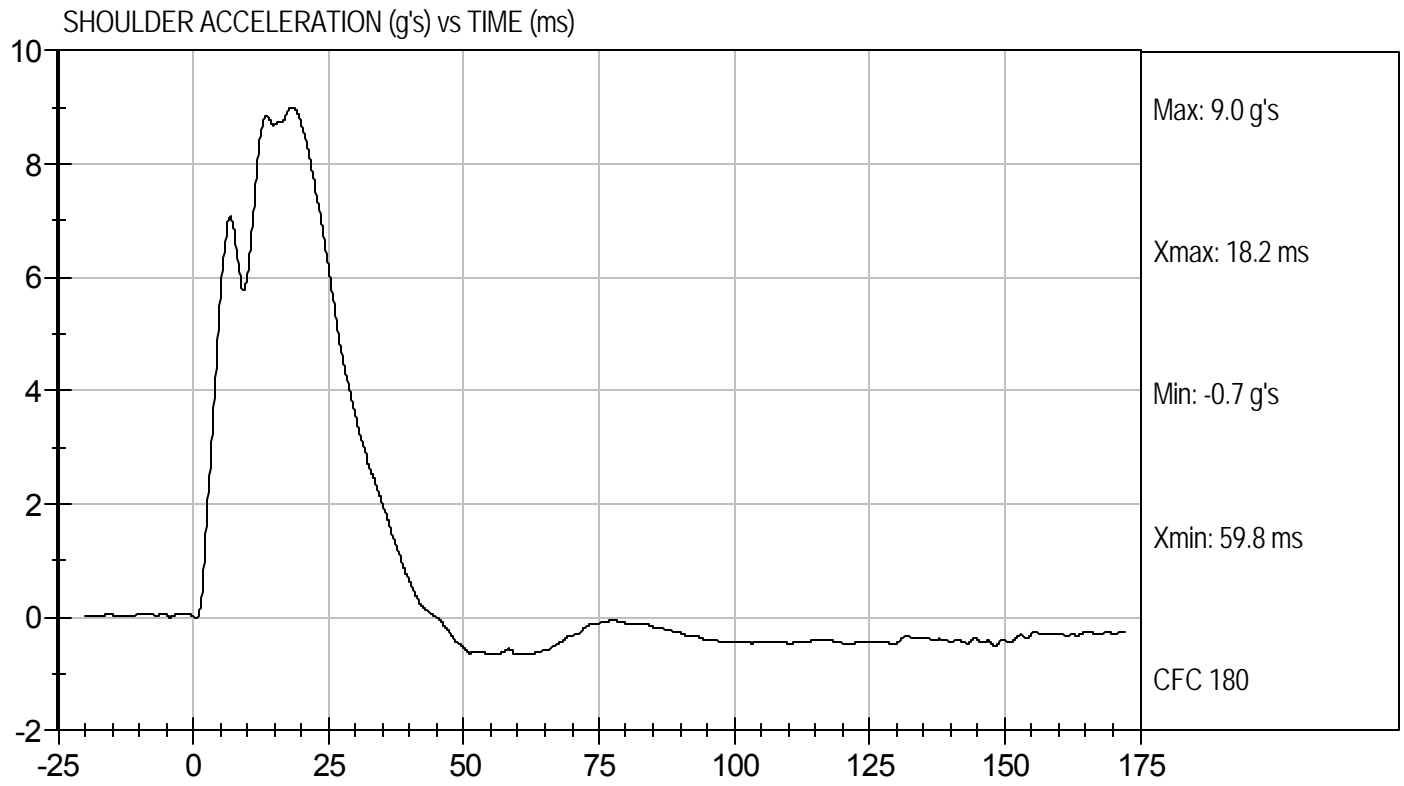
5/16/11
 Test Date

David Winkelbauer
 Approved By



Test Desc: Shoulder Impact
Component ID: D111793

Test Date: 5/16/11
Velocity: 14.24 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111794

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 24 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 39.1 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 48.5 | Pass |
| Overall Test Results | | | | Pass |

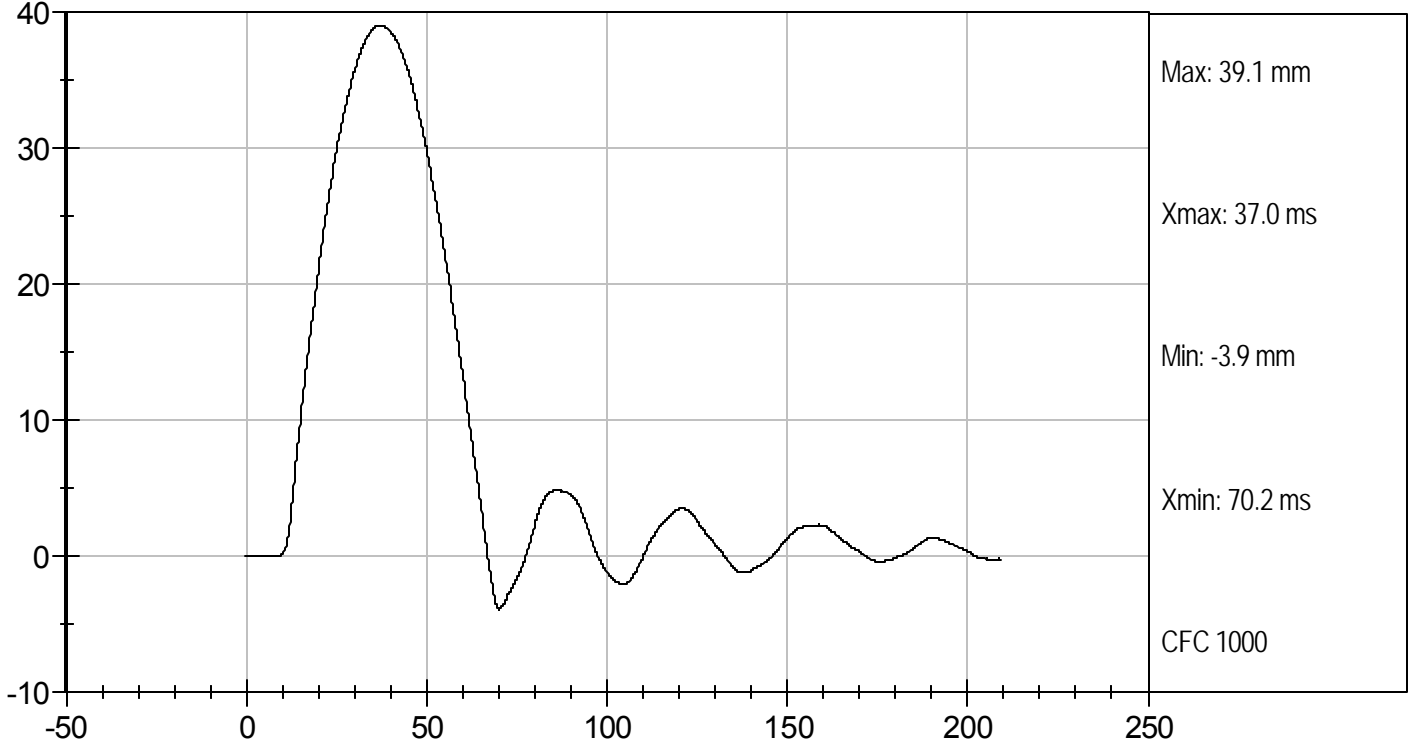
Jessica Gall
Laboratory Technician

5/16/11
Test Date

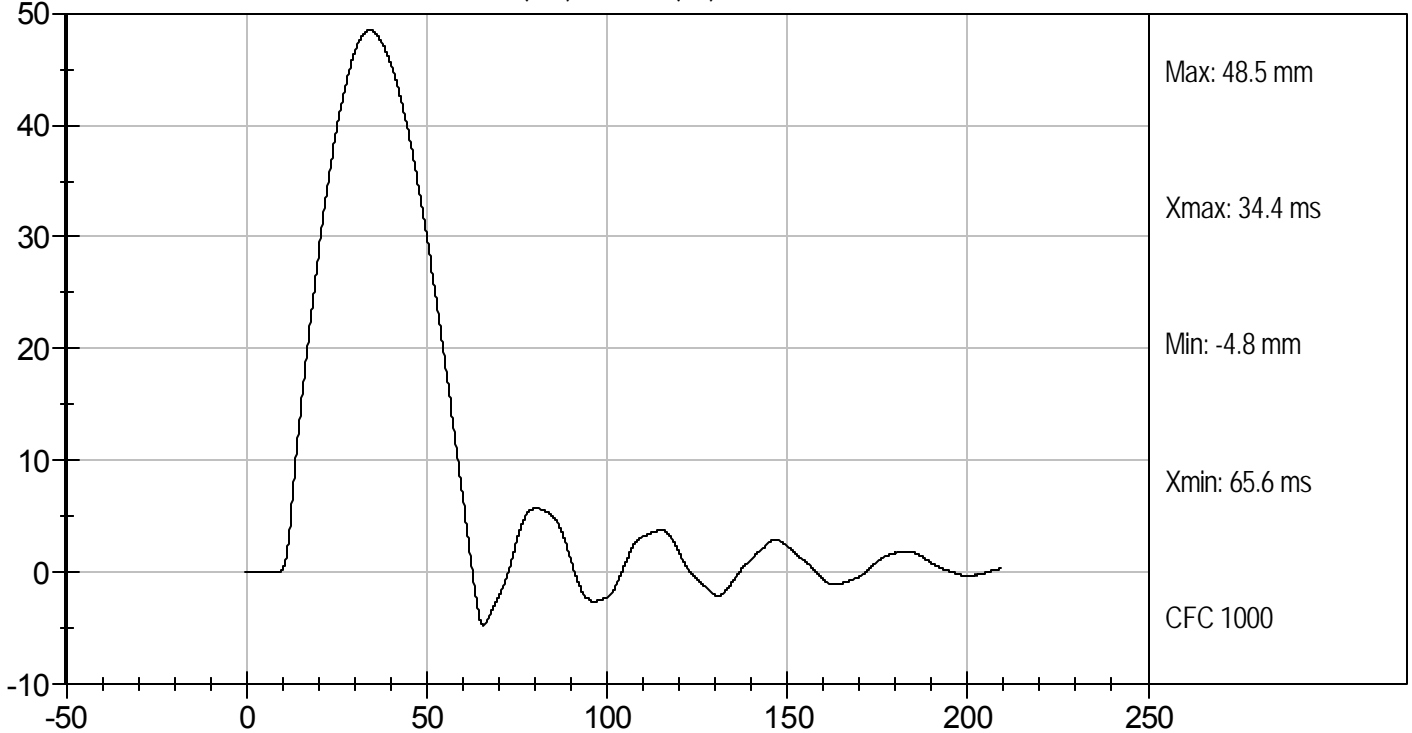
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UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111795

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 24 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.3 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 48.9 | Pass |
| Overall Test Results | | | | Pass |

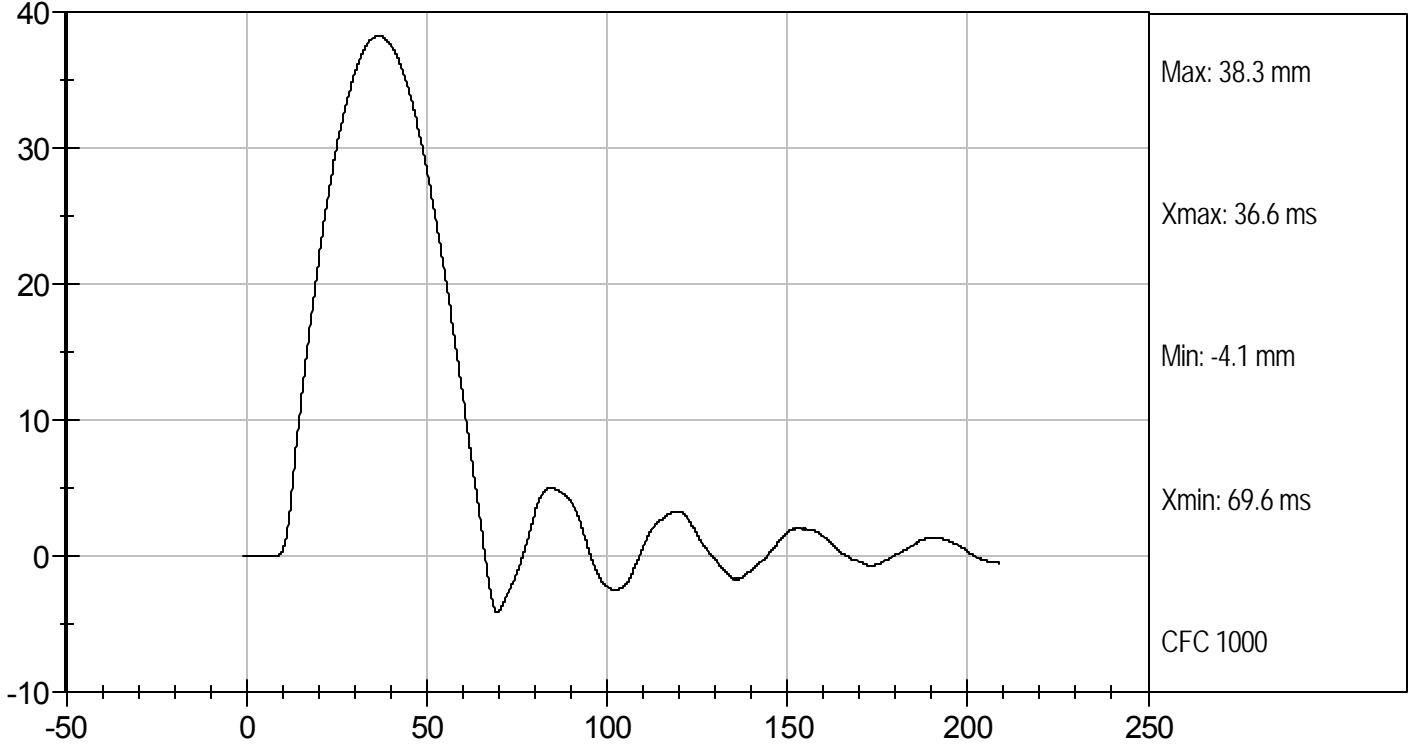
Jessica Gall
Laboratory Technician

5/16/11
Test Date

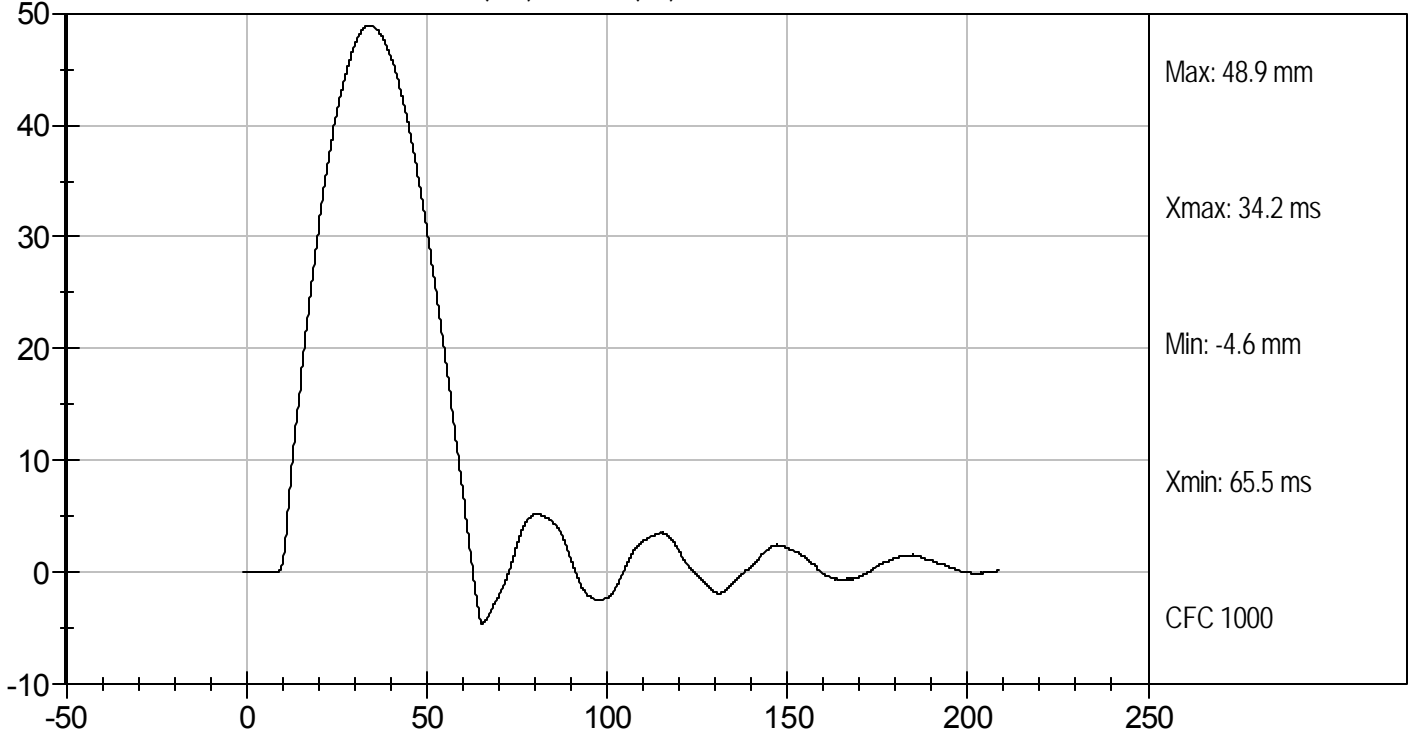
David Winkelbauer
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MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



MID RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111796

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 24 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.8 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.7 | Pass |
| Overall Test Results | | | | Pass |

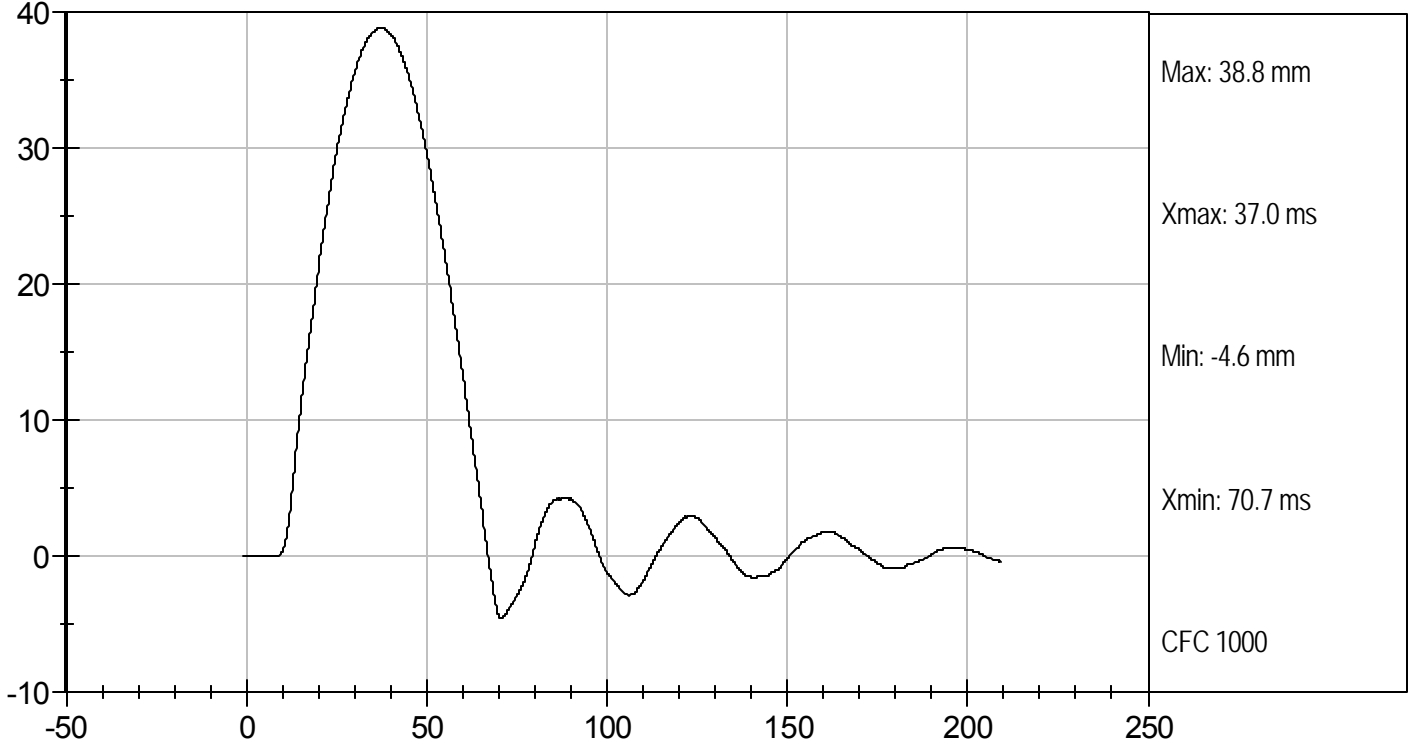
Jessica Hall
Laboratory Technician

5/16/11
Test Date

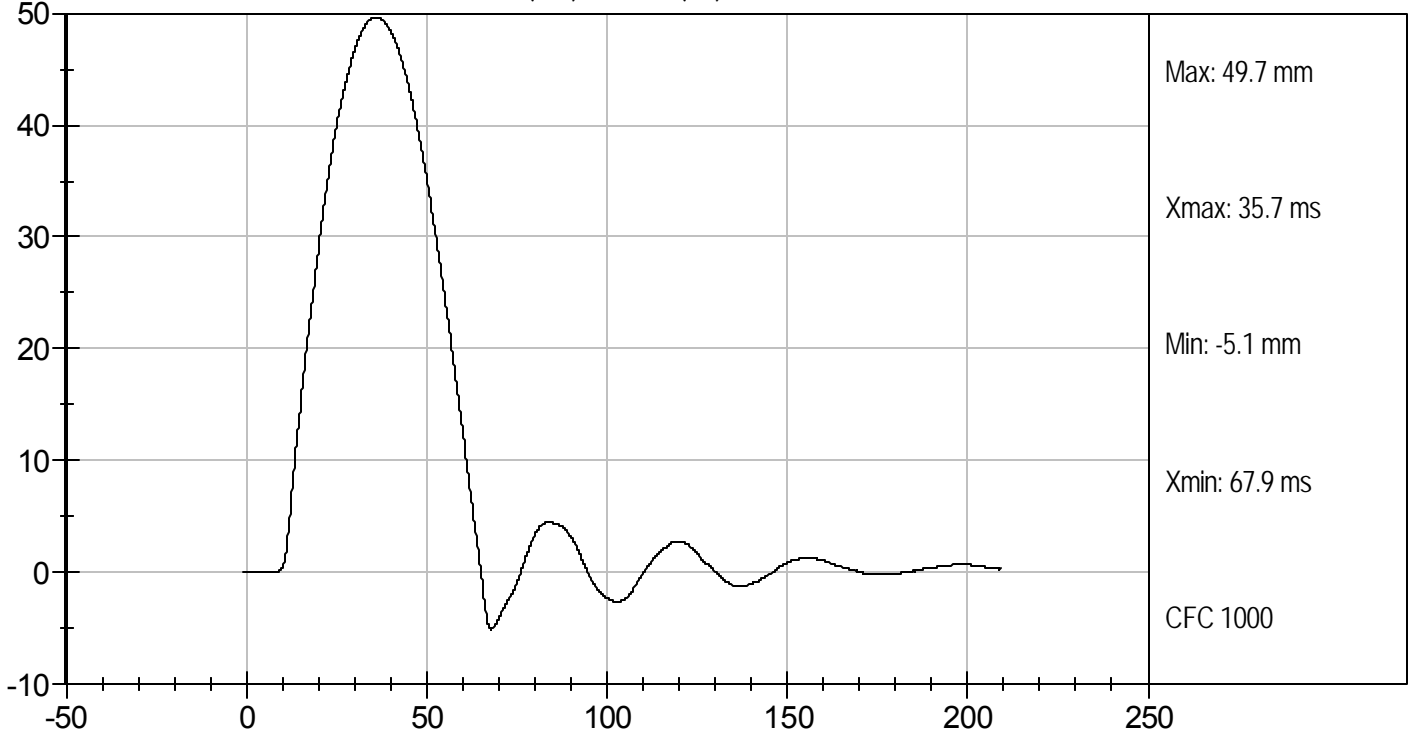
David Winkelbauer
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LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: 016

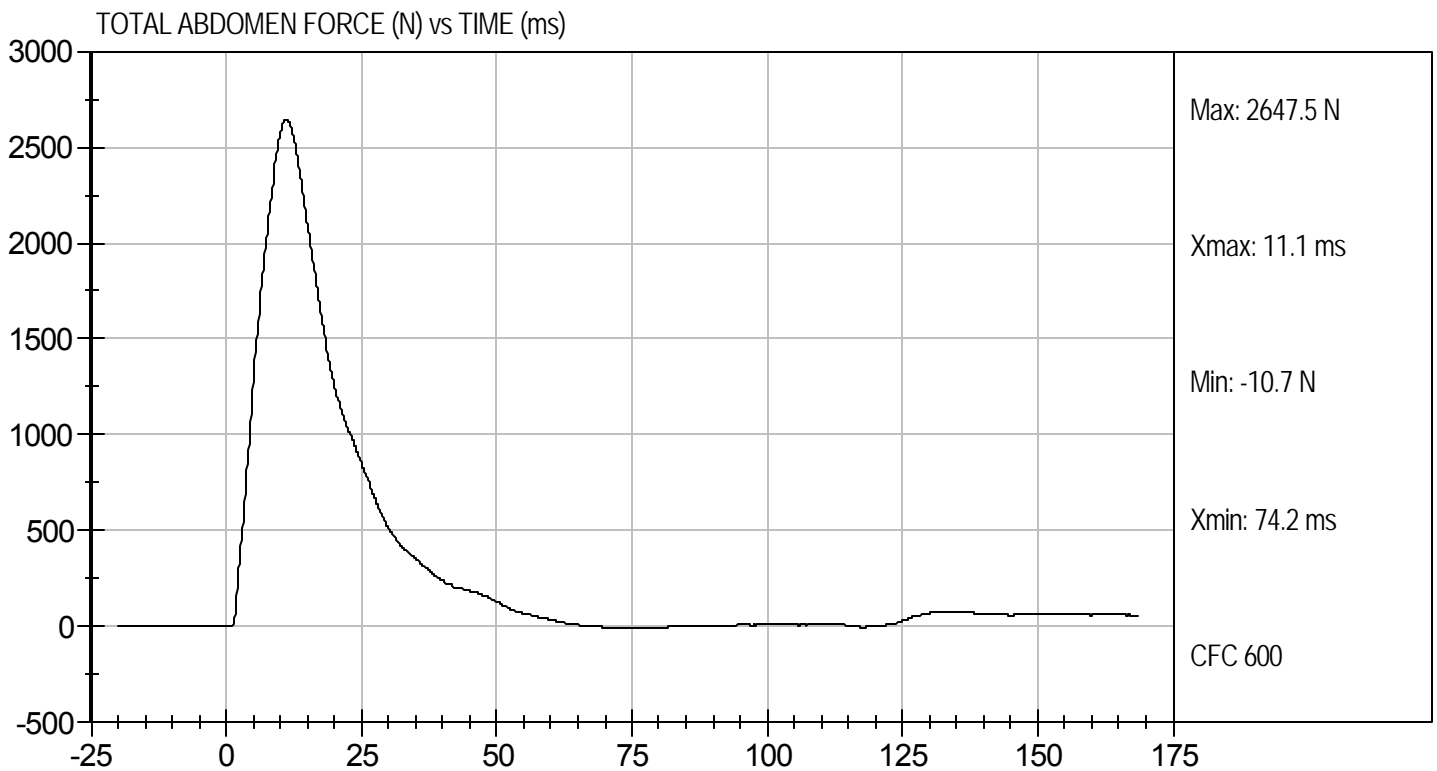
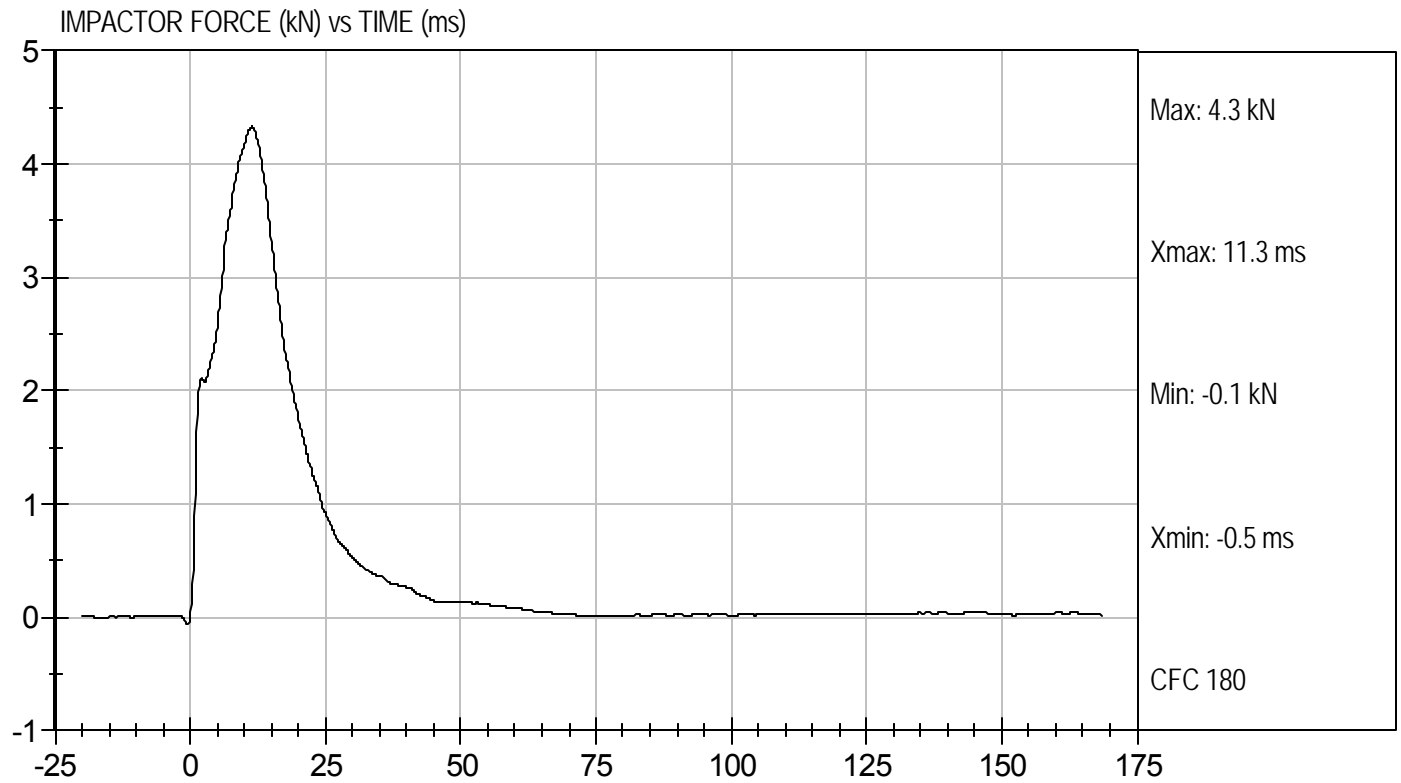
Test I.D: D111797

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|-------------------------------|-------|----------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 27 | Pass |
| Probe Speed | m/s | 3.90 to 4.10 | 4.10 | Pass |
| Maximum Impact Force | kN | 4.00 to 4.80 | 4.33 | Pass |
| Time of Maximum Impact Force | ms | 10.60 to 13.00 | 11.30 | Pass |
| Maximum Total Abdomen Force | kN | 2.20 to 2.70 | 2.65 | Pass |
| Time of Maximum Abdomen Force | ms | 10.00 to 12.30 | 11.10 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
Laboratory Technician

5/16/11
Test Date

David Winkelbauer
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MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D.: D111798

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 28 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.15 | 6.12 | Pass |
| Pendulum Deceleration | 1 ms | m/s | -0.05 to 0.00 | -0.01 | Pass |
| | 3.7 ms | m/s | -0.425 to -0.24 | -0.41 | Pass |
| | 27 ms | m/s | -6.50 to -5.80 | -5.83 | Pass |
| | 30 ms | m/s | >= -6.5 | -6.07 | Pass |
| Maximum Flexion Angle | | deg | 45.0 to 55.0 | 50.6 | Pass |
| Time of Maximum Flexion Angle | | ms | 39.0 to 53.0 | 48.0 | Pass |
| Headform Rotation Decay to Initial Position | | ms | 37 to 57 | 46 | Pass |
| Overall Results | | | | | Pass |

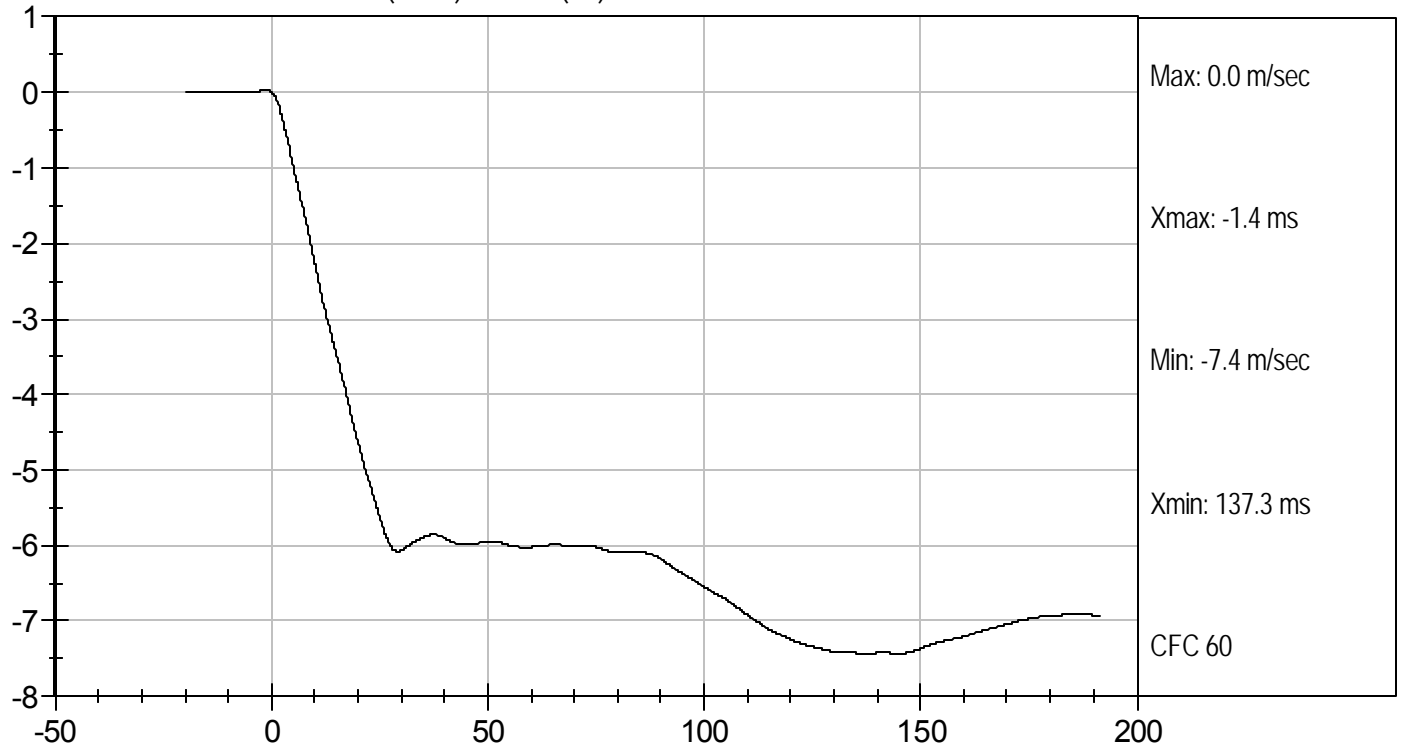
Jessica Hall
Laboratory Technician

5/16/11
Test Date

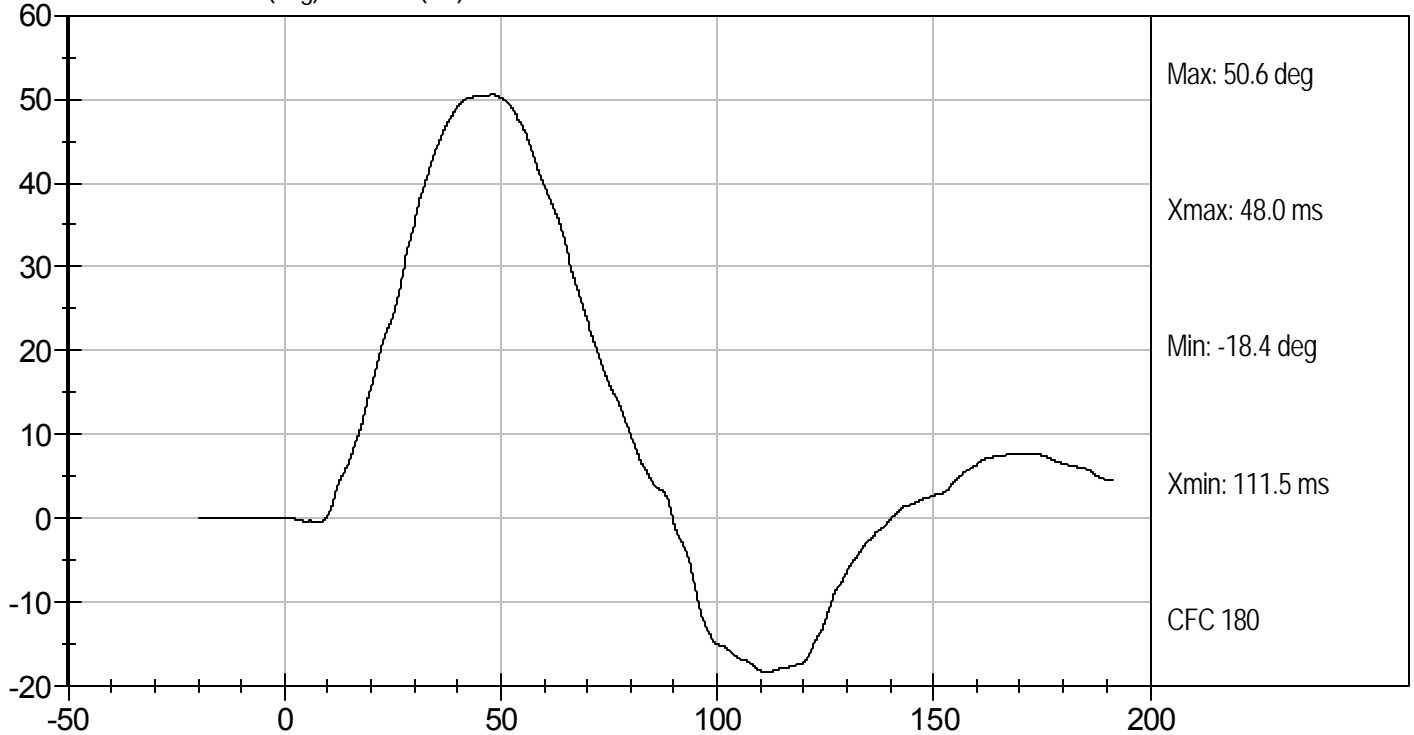
David Winkelbauer
Approved By

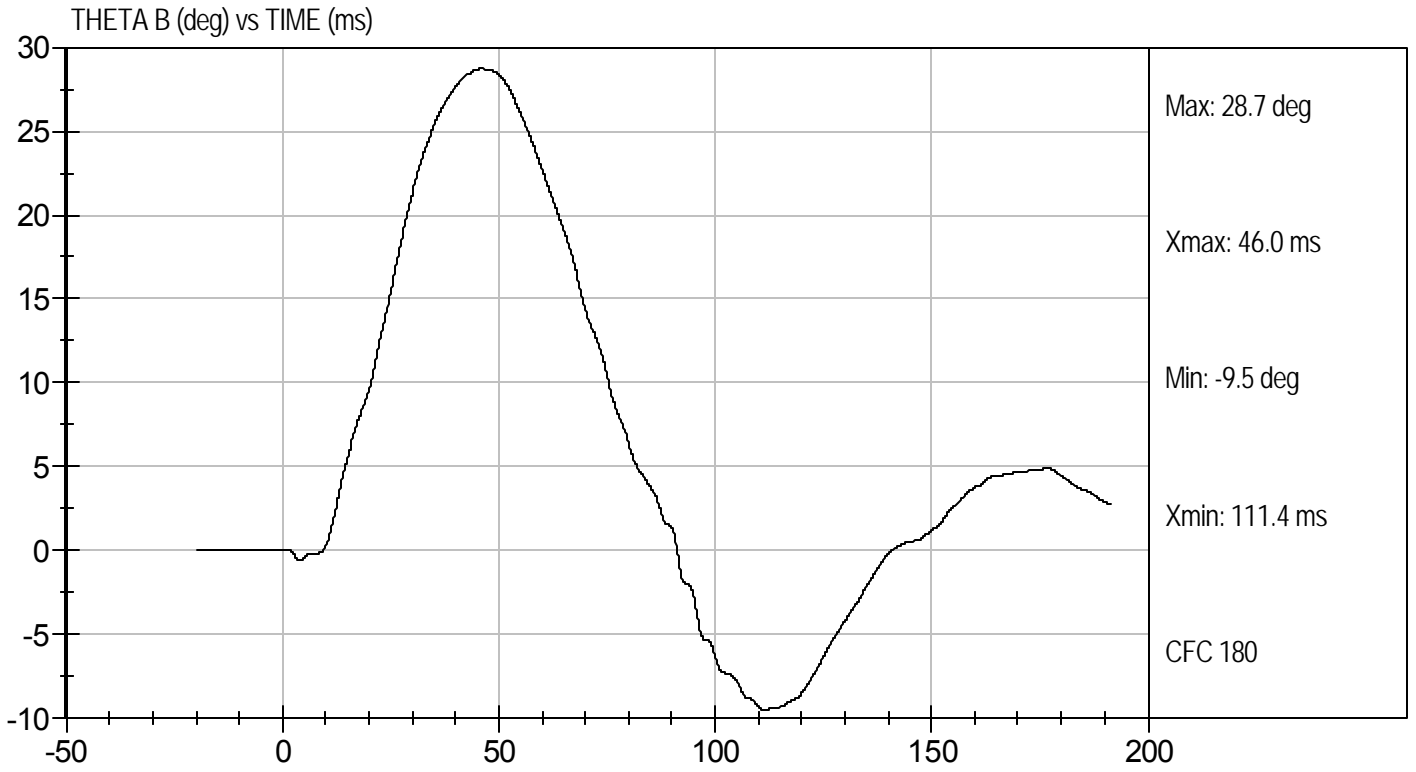
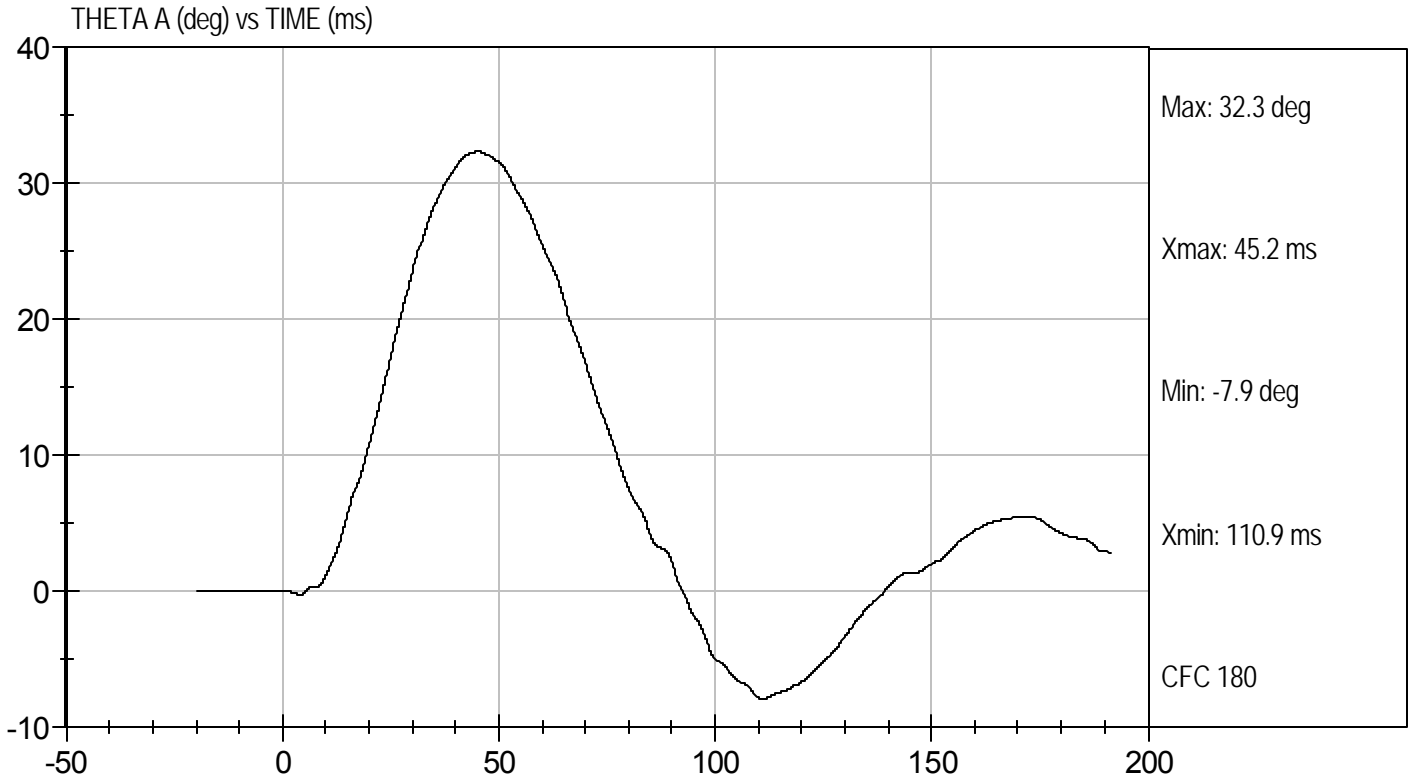


PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)





MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111799

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|----------------|--------|-----------|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 27 | Pass |
| Probe Speed | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Impactor Force | kN | 4.70 to 5.40 | 4.78 | Pass |
| Time of Maximum Impactor Force | ms | 11.80 to 16.10 | 13.30 | Pass |
| Maximum Pubic Force | kN | 1.23 to 1.59 | 1.41 | Pass |
| Time of Maximum Pubic Force | ms | 12.20 to 17.00 | 14.80 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
Laboratory Technician

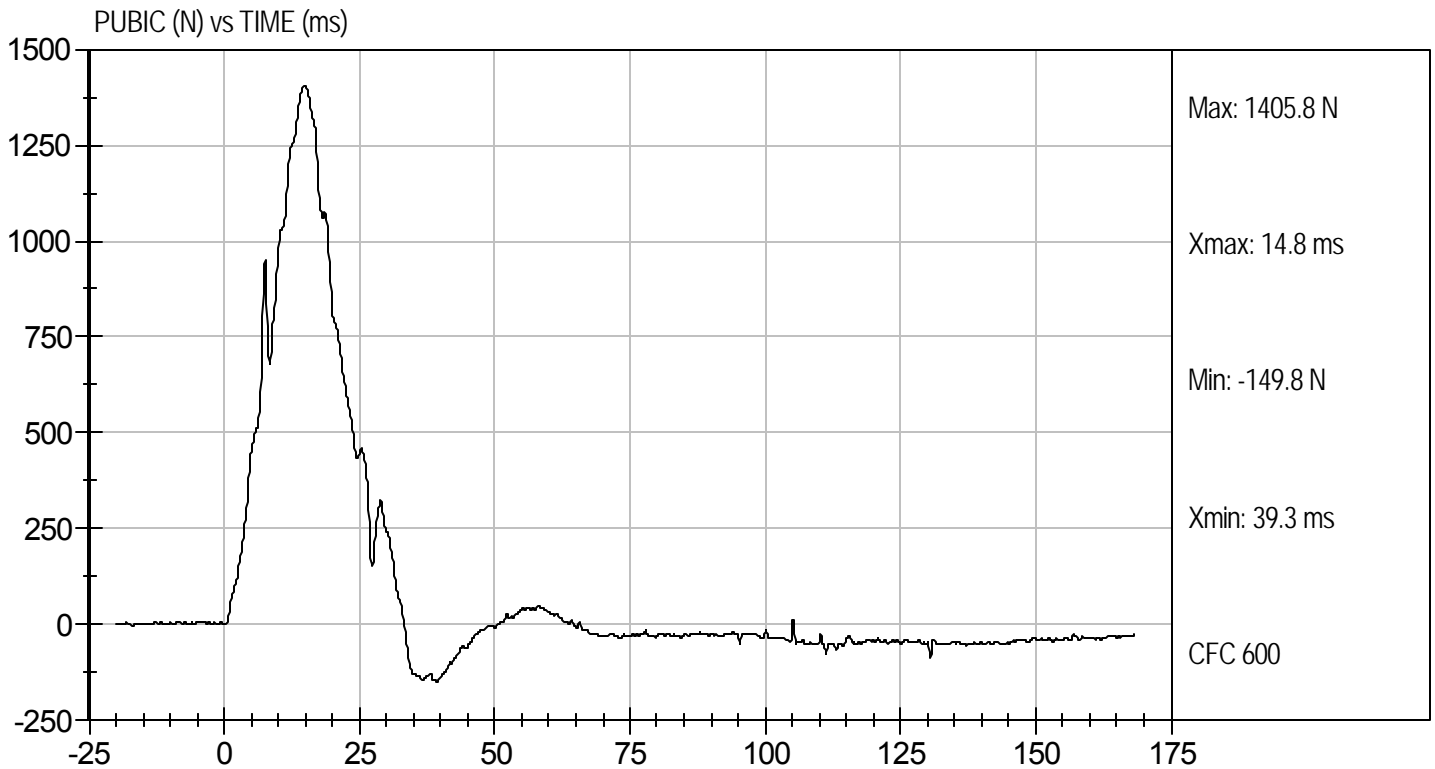
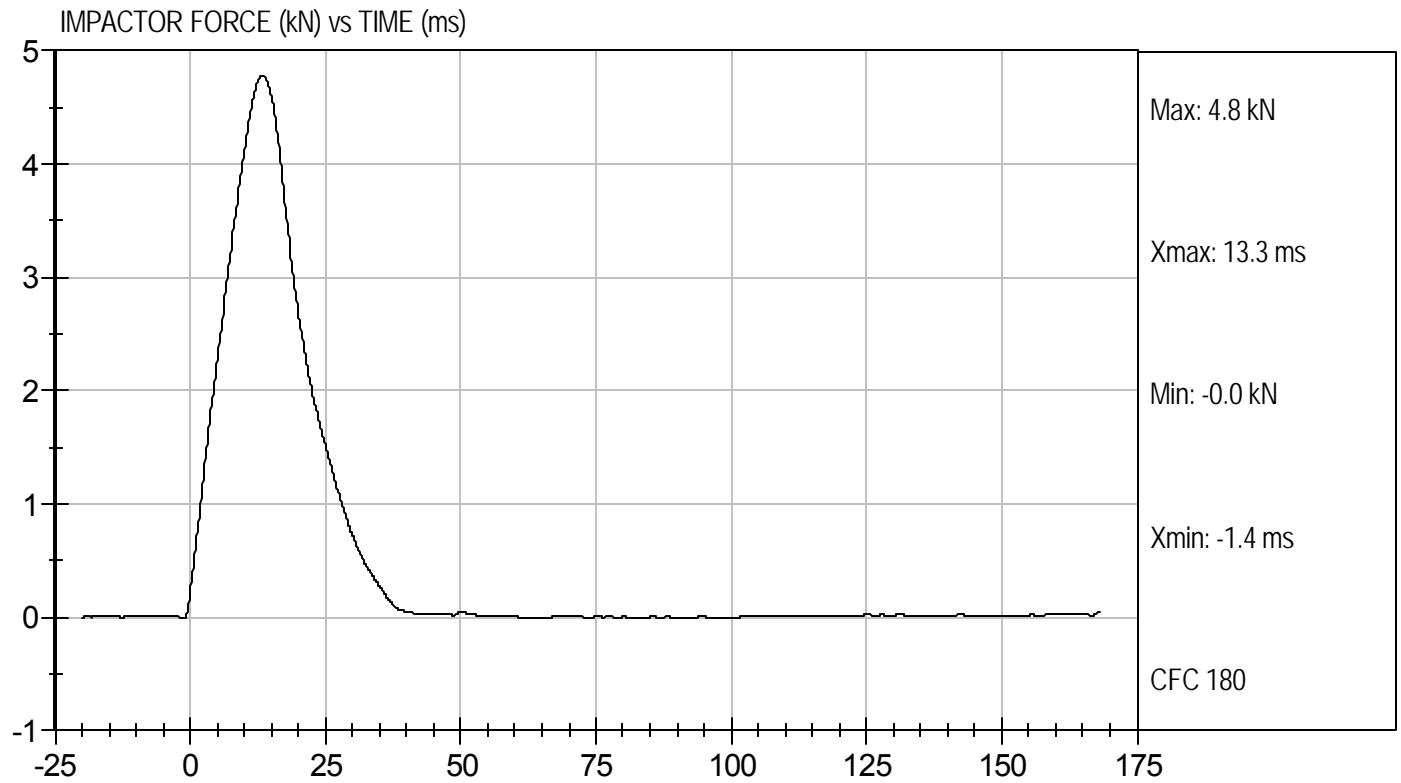
5/16/11
Test Date

David Winkelbauer
Approved By



Test Desc: Pelvis Impact
Component ID: D111799

Test Date: 5/16/11
Velocity: 14.24 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION
FULL BODY THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111790

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Humidity | % | 10 to 70 | 27 | Pass |
| Probe Speed | m/s | 5.40 to 5.60 | 5.58 | Pass |
| Maximum Impactor Force (after 6 ms) | kN | 5.10 to 6.20 | 5.11 | Pass |
| Upper Rib Displacement | mm | 34.0 to 41.0 | 38.8 | Pass |
| Middle Rib Displacement | mm | 37.0 to 45.0 | 41.2 | Pass |
| Lower Rib Displacement | mm | 37.0 to 44.0 | 40.4 | Pass |
| Overall Test Results | | | | Pass |

Jessica Hall
Laboratory Technician

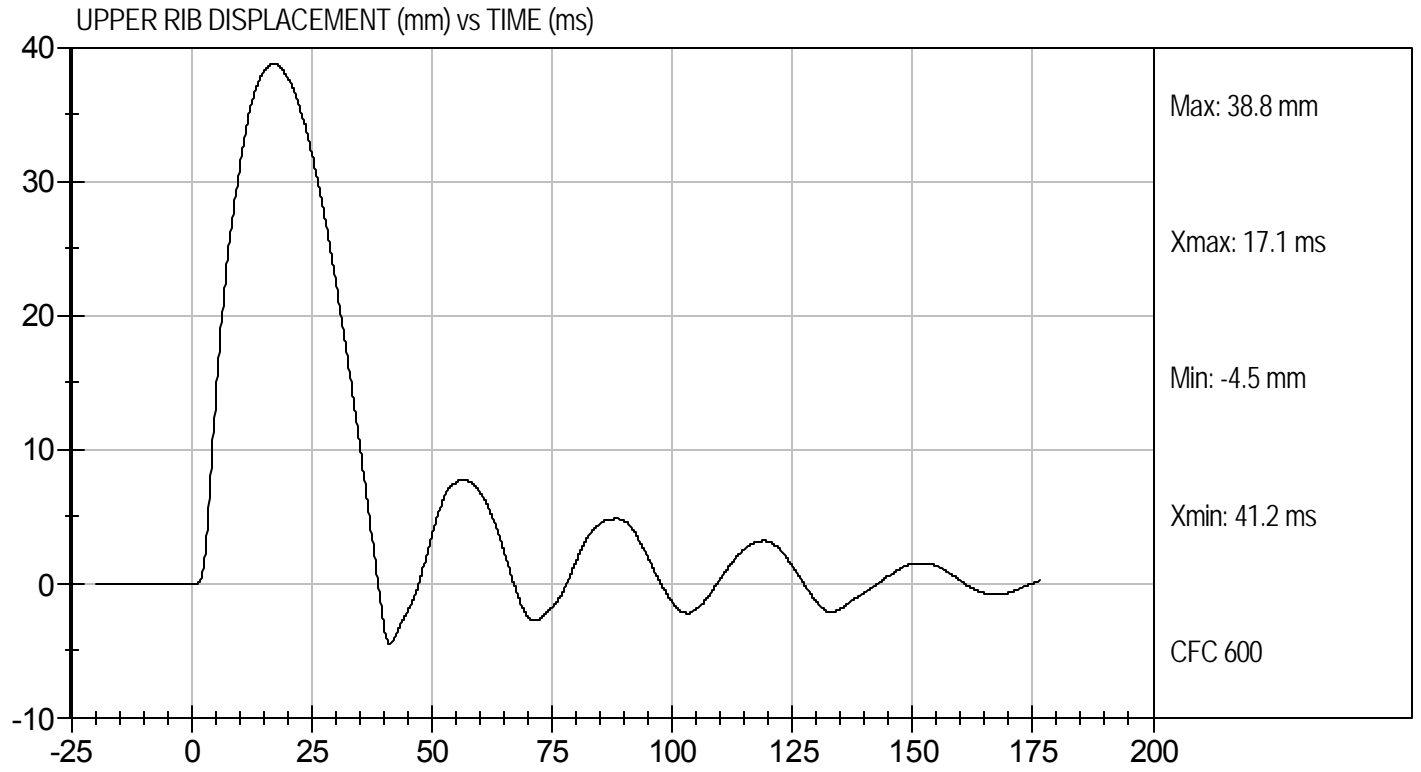
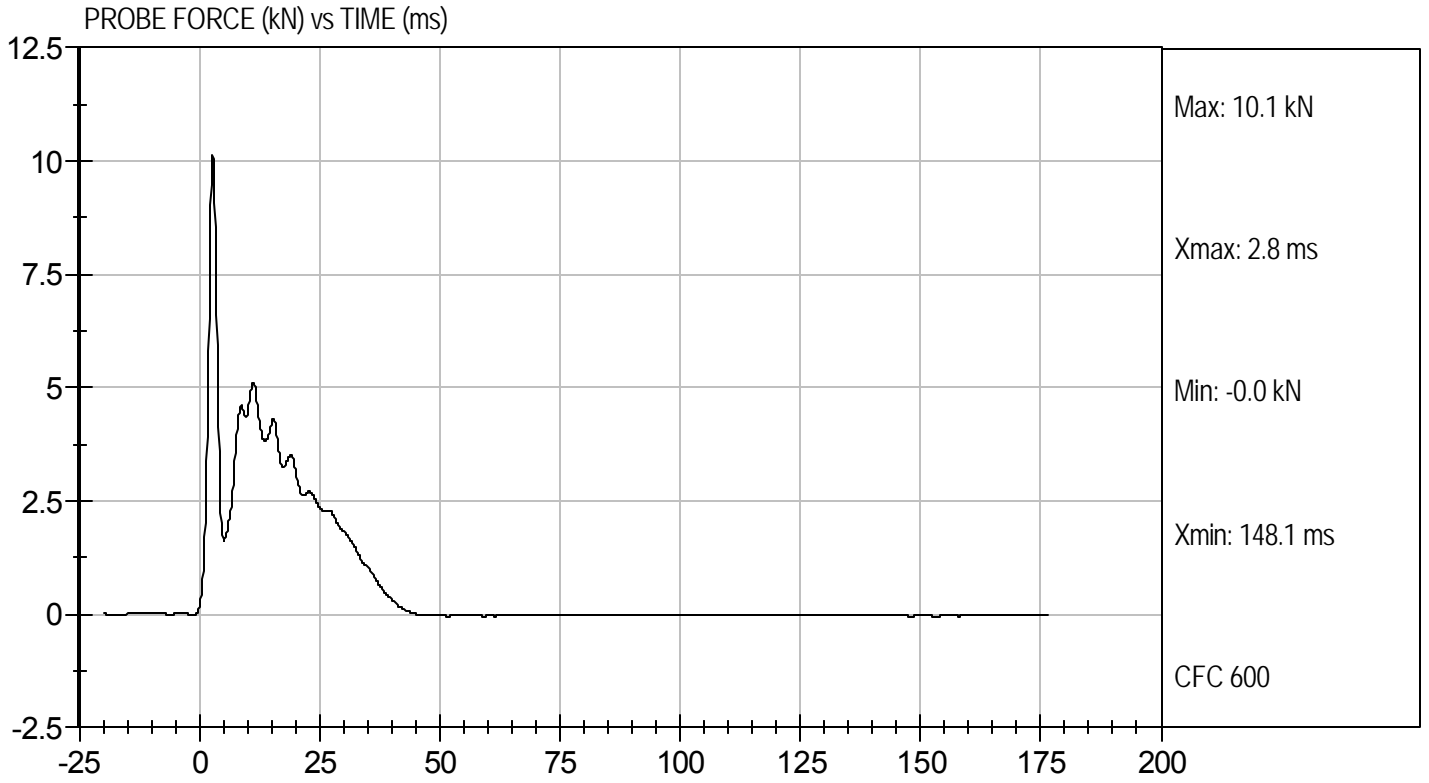
5/16/11
Test Date

David Winkelbauer
Approved By



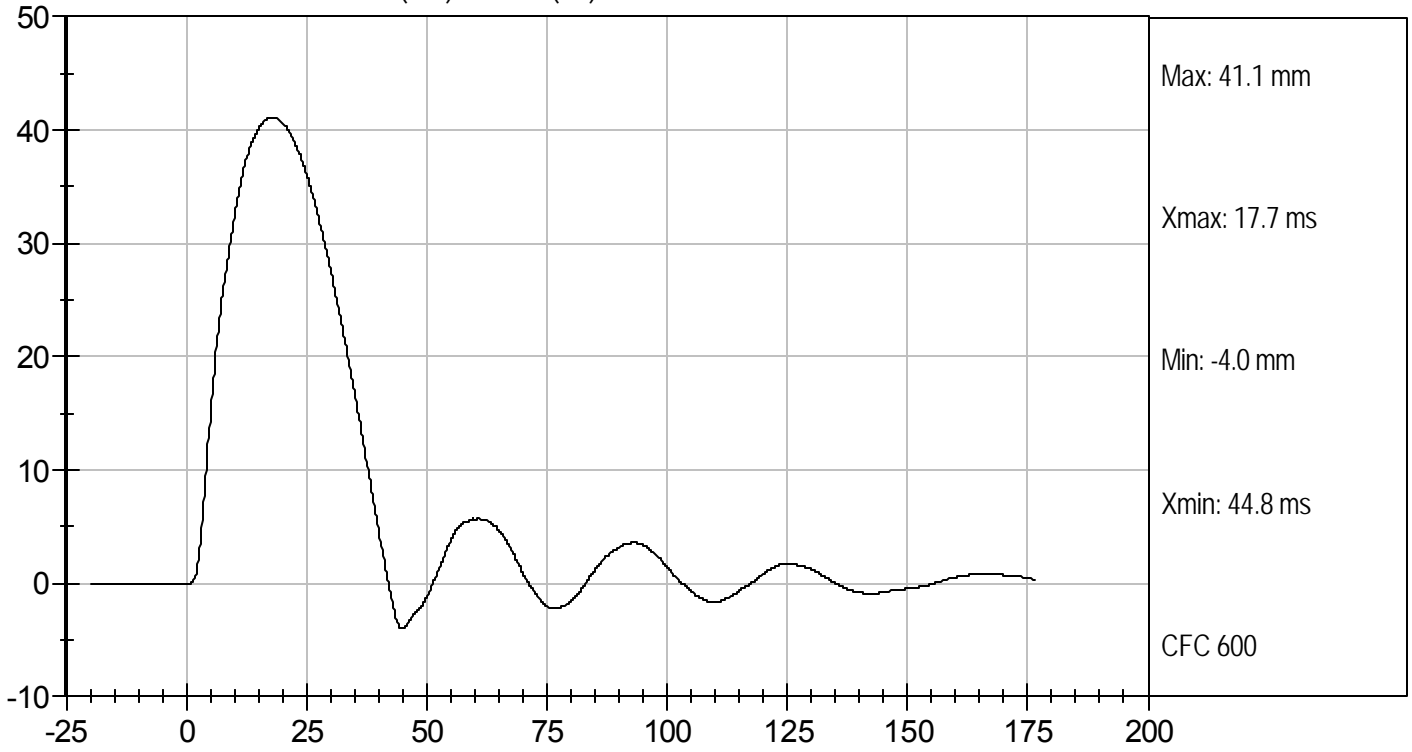
Test Desc: Thorax Impact
Component ID: D111790

Test Date: 5/16/11
Velocity: 18.31 ft/s, 5.58 m/s

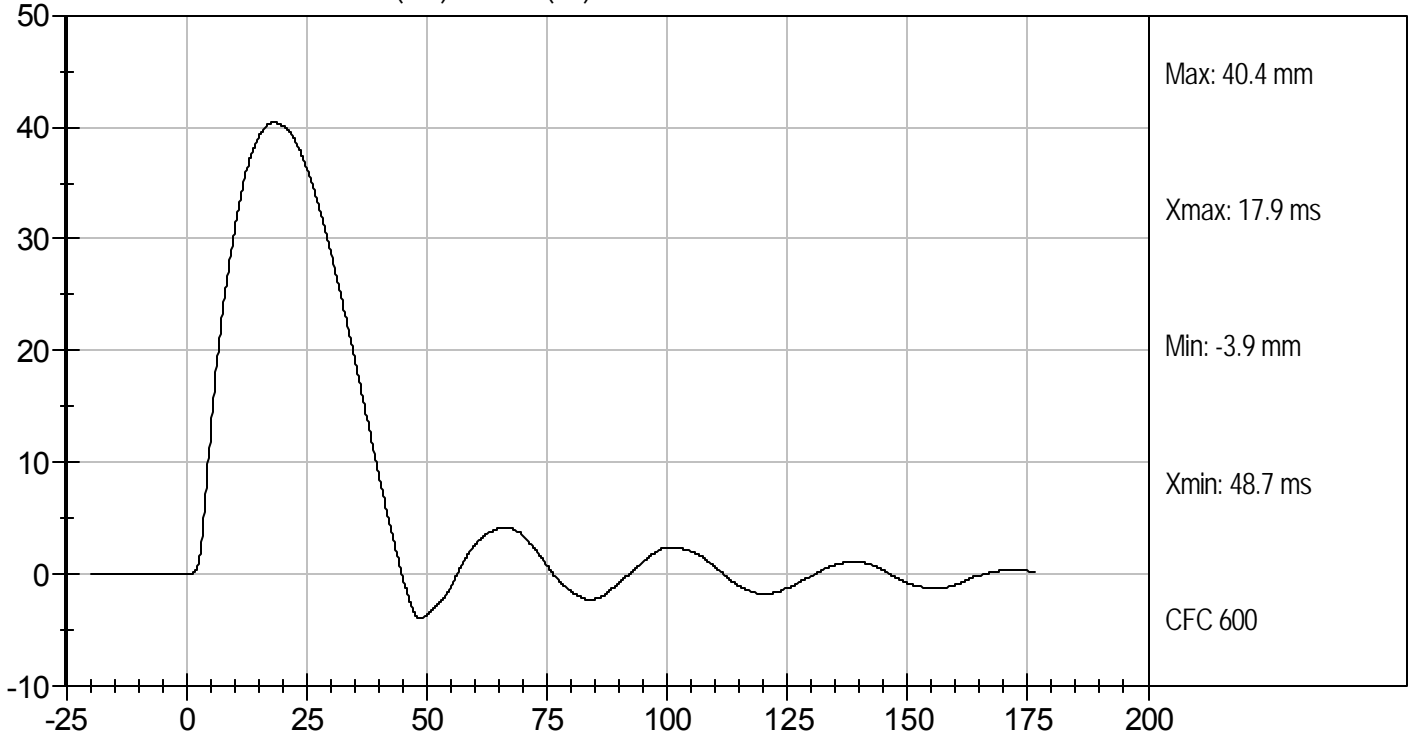




MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



APPENDIX E

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

Table 1 – Dummy Instrumentation

| | | ES-2re S/N: 016 | | |
|-------------------------------|----------------|-----------------|--------------|------------------|
| | | Serial Number | Manufacturer | Calibration Date |
| Head Accelerometers | X | P66854 | Endevco | 2/14/2011 |
| | Y | P66855 | Endevco | 2/14/2011 |
| | Z | P66856 | Endevco | 2/14/2011 |
| Thorax Potentiometers | Upper Rib (Y) | G144 | Honeywell | 2/17/2011 |
| | Middle Rib (Y) | G143 | Honeywell | 2/17/2011 |
| | Lower Rib (Y) | G142 | Honeywell | 2/17/2011 |
| Abdomen Load Cells | Forward (Y) | ABG1667 | Denton | 3/31/2011 |
| | Middle (Y) | ABG1668 | Denton | 3/31/2011 |
| | Rear (Y) | ABG1669 | Denton | 3/31/2011 |
| Pubic Symphysis Load Cell (Y) | | PG431 | Denton | 11/01/2010 |

Table 2 – Vehicle Instrumentation

| | Serial Number | Manufacturer | Calibration Date |
|---------------------|---------------|--------------|------------------|
| Vehicle CG (X) | P59629 | Endevco | 12/29/2010 |
| Vehicle CG (Y) | P59630 | Endevco | 12/29/2010 |
| Vehicle CG (Z) | P59628 | Endevco | 12/29/2010 |
| Left Floor Sill (Y) | P59287 | Endevco | 2/19/2011 |
| A Pillar Sill (Y) | P49506 | Endevco | 4/27/2011 |
| A Pillar Low (Y) | P49453 | Endevco | 1/13/2011 |
| A Pillar Mid (Y) | P49525 | Endevco | 1/13/2011 |
| B Pillar Sill (Y) | P59408 | Endevco | 4/27/2011 |
| B Pillar Low (Y) | P59411 | Endevco | 4/27/2011 |
| B Pillar Mid (Y) | P52194 | Endevco | 3/15/2011 |
| Seat (Y) | P59283 | Endevco | 1/13/2011 |
| Engine (X) | P52281 | Endevco | 12/13/2010 |
| Engine (Y) | P52282 | Endevco | 12/13/2010 |
| Firewall (Y) | P47825 | Endevco | 3/15/2011 |
| Roof (Y) | P59376 | Endevco | 4/27/2011 |
| Floor Sill (Y) | P59285 | Endevco | 2/19/2011 |
| Rear Deck (X) | P59652 | Endevco | 4/27/2011 |
| Rear Deck (Y) | P59653 | Endevco | 4/27/2011 |