**REPORT NUMBER: 214P-MGA-2010-003**

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

**FORD MOTOR COMPANY**
**2010 FORD F-150 4x2 REGULAR CAB**
**NHTSA NUMBER: CA0208**

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

**Test Date: January 25, 2010**

**Report Date: March 3, 2010**

**FINAL REPORT**

**PREPARED FOR:**
**U.S. DEPARTMENT OF TRANSPORTATION**
**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**
**ENFORCEMENT**
**OFFICE OF VEHICLE SAFETY COMPLIANCE**
**1200 NEW JERSEY AVENUE, SE**
**WEST BUILDING (NVS-220)**
**WASHINGTON, DC 20590**

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Approval Date: March 3, 2010

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by: _____

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## Technical Report Documentation Page

| | | | |
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| *1. Report No.*<br>214P-MGA-2010-003 | *2. Government Accession No.* | *3. Recipient's Catalog No.* | |
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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>DTNH22-07-D-00062 | |
| *12. Sponsoring Agency Name and Address*<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Vehicle Safety Compliance (NVS-220)<br>1200 New Jersey Ave, SE<br>Washington, DC 20590 | | *13. Type of Report and Period Covered:*<br>Final Test Report<br>1/25/2010 to 3/03/2010<br>*14. Sponsoring Agency Code*<br>NVS-220 | |
| *15. Supplementary Notes* | | | |

*16. Abstract*

A 32 km/h (20 mph), 75° oblique impact compliance test was conducted on the subject 2010 Ford F-150 4x2 Regular Cab 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 January 25, 2010.

The impact velocity was 32.0 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 399 mm at level 3. The test vehicle's performance follows:

| Measurement Description | Units | Result |
|---|---|---|
| Head Injury Criteria ($HIC_{36}$) | N/A | 516 |
| Max. Rib Deflection | mm | 31 |
| Sum of Abdomen Forces | N | 1349 |
| Pubic Symphysis Force | N | 2575 |

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*<br>Compliance Testing<br>Side Impact Protection<br>Pole Test<br>ES-2re<br>SID-IIs | | *18. Distribution Statement*<br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services (TIS)<br>Room E12-100 East Building<br>1200 New Jersey Ave.<br>Washington, D.C. 20590<br>Telephone No. (202) 366-2588 | |
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Form DOT F1700.7 (8-72)

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## SECTION 1
## PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test is part of the FY 2010 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 2010 Ford F-150 4x2 Regular Cab. 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 2010 Ford F-150 4x2 Regular Cab. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.0 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on January 25, 2010. 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 nine (9) 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 50th Percentile Male | 516 | Upper | 30.9 | Front | 310.5 | 2574.6 |
| | | Middle | 28.3 | Mid | 435.4 | |
| | | Lower | 28.2 | Rear | 672.1 | |
| | | Max. | 30.9 | Sum | 1349.4 | |

## GENERAL COMMENTS

There was no valid data collected for:

Vehicle CG X, Y, Z after 30 msec.
Left Floor Sill Y after 60 msec.
Left A-Post @ Sill Y after 60 msec.
Left B-Post @ Sill Y
Right Sill @ Impact Line Y after 40 msec.

## SECTION 2

## OCCUPANT AND VEHICLE INFORMATION

### DATA SHEET NO. 1

### TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

| VEHICLE INFORMATION | |
|---|---|
| Make | Ford |
| Model | F-150 |
| Body Style | Truck |
| VIN | 1FTMF1CW1AKA18812 |
| Body Color | Ingot Silver |
| Engine Displacement (L) | 4.6 |
| # of Cylinders | 8 |
| Engine Placement | Longitudinal |
| Transmission Type | Automatic |
| Transmission Speeds | 4 |
| Overdrive | Yes |
| Final Drive | Rear |
| Odometer Reading | 125 miles |

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

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | Ford Motor Company |
| Date of Manufacture | 08/09 |

| | |
|---|---|
| GVWR (kg) | 2926 |
| GAWR Front (kg) | 1361 |
| GAWR Rear (kg) | 1588 |

### VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|---|---|---|---|---|
| Type of Seats | Split Bench | | | |
| Number of Occupants | 3 | 0 | | 3 |
| Capacity Weight (VCW) (kg) | | | | 774 |
| Cargo Weight (RCLW) (kg) | | | | 570 |

## DATA SHEET NO. 2

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

### TIRE PRESSURES

| | Units | LF | RF | RR | LR |
|---|---|---|---|---|---|
| As Delivered | kPa | 260 | 260 | 260 | 260 |
| As Tested | kPa | 260 | 260 | 260 | 260 |

### 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 | 608.7 | 470.8 | | 653.6 | 558.4 | | 654.5 | 538.4 | |
| Right | kg | 600.1 | 455.9 | | 607.8 | 532.5 | | 627.3 | 520.7 | |
| Ratio | % | 56.6 | 43.4 | | 53.6 | 46.4 | | 54.8 | 45.2 | |
| Totals | kg | 1208.8 | 926.7 | 2135.5 | 1261.4 | 1090.9 | 2352.3 | 1281.8 | 1059.1 | 2340.9 |

### TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

| Measured Parameter | Units | Value |
|---|---|---|
| As Delivered Weight | kg | 2135.5 |
| Weight of 1 P572U ATD (ES-2re) Dummy | kg | 77.1 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 136.1 |
| Calculated Target Vehicle Test Weight (TVTW) | kg | 2348.7 |

### TEST VEHICLE ATTITUDES

| | Units | LF | RF | RR | LR |
|---|---|---|---|---|---|
| Fully Loaded | mm | 891 | 898 | 945 | 937 |
| As Tested | mm | 897 | 900 | 946 | 954 |
| Difference | mm | -6 | -2 | -1 | -17 |

### CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE

| Measurement Parameter | Units | Value |
|---|---|---|
| Test Vehicle Wheel Base | mm | 3205 |
| Vertical Impact Reference Line (Aft of Front Axle) | mm | 1395 |

### WEIGHT of BALLAST and VEHICLE COMPONENTS REMOVED TO MEET TVTW

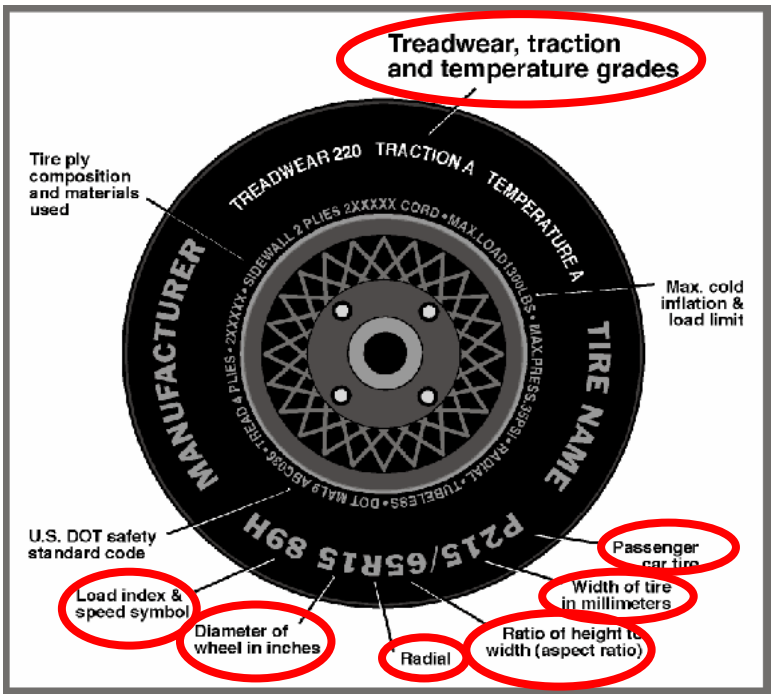
| Description of Component | Weight (kg) |
|---|---|
| Ballast | 68.0 |
| RF Side Mirror | 2.3 |

**DATA SHEET NO. 3**

**VEHICLE TIRE INFORMATION**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

**VEHICLE TIRE INFORMATION**




| Measured Parameter | Front | Rear |
|---|---|---|
| Max. Tire Pressure (kPa) | 280 | 280 |
| Cold Pressure (kPa) | 260 | 260 |
| Recommended Tire Size | P235/70R17 | P235/70R17 |
| Tire Size on Vehicle | P235/70R17 | P235/70R17 |
| Tire Manufacturer | Hankook | Hankook |
| Tire Name | Dyna Pro HS | Dyna Pro HS |
| Tire Type | Passenger | Passenger |
| Tire Width | 235 | 235 |
| Aspect Ratio | 70 | 70 |
| Radial | Yes | Yes |
| Wheel Diameter | 17 | 17 |
| Load Index/Speed Symbol | 108S | 108S |
| Treadwear | 440 | 440 |
| Traction Grade | B | B |
| Temperature Grade | A | A |

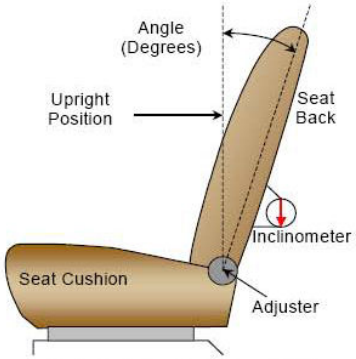
**DATA SHEET NO. 4**

**SEAT AND SEAT BELT ADJUSTMENT DATA**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

**NORMAL DESIGN RIDING POSITION**

The driver seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set at 17.9 degrees on the seat back frame. This angle is relative to door sill, and measured at a location 330 mm above seat back pivot point.



*FRONT SEAT ASSEMBLY*

**SEAT BACK ANGLES**

| | Degrees | Detents |
|---|---|---|
| Driver with Seated Dummy | 17.9° on seat back frame | N/A |

**SEAT FORE/AFT POSITIONS**

The method used for determining seat fore/aft positions is as follows: For manual seat track adjustments, test detent is measured from forward-most detent, which is defined as 0. Place in 27$^{th}$ detent for 50$^{th}$ percentile male.

**SEAT FORE/AFT POSITIONING**

| | Total Fore/Aft Travel | Placed in Position # |
|---|---|---|
| Front Seat | 54 detents | 27$^{th}$ detent |

**SEAT BELT UPPER ANCHORAGES**

The method of positioning the seat belt upper anchorages is as follows: Detents to the nominal design position are measured with respect to the upper-most detents, which is defined as 0. Place at 1 for the 50$^{th}$ percentile male.

**SEAT BELT UPPER ANCHORAGES**

| | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 67.5 mm / 4 detents | 22.5 mm / 1$^{st}$ detent |

**HEADREST RESTRAINT**

The headrest was placed in the full up position.

## DATA SHEET NO. 5

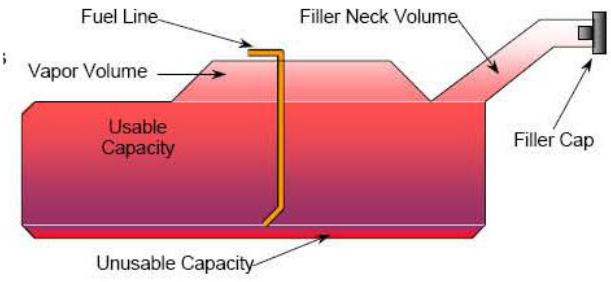
## FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

### FUEL TANK CAPACITY

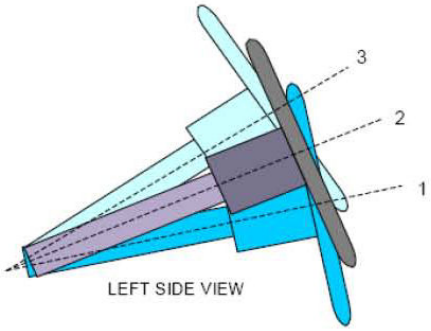
| | Liters |
|---|---|
| Usable Capacity (Form 1) | 98.4 |
| Usable Capacity (Owner's Manual) | 98.4 |
| 92-94% of Usable Capacity | 90.5 to 92.5 |
| Actual Amount of Solvent Used | 91.5 |

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The electric fuel pump operates for 3 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 3 seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, a fuel pump shut-off algorithm is embedded in the restraint control module and is designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. 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 ASSEMBLY*

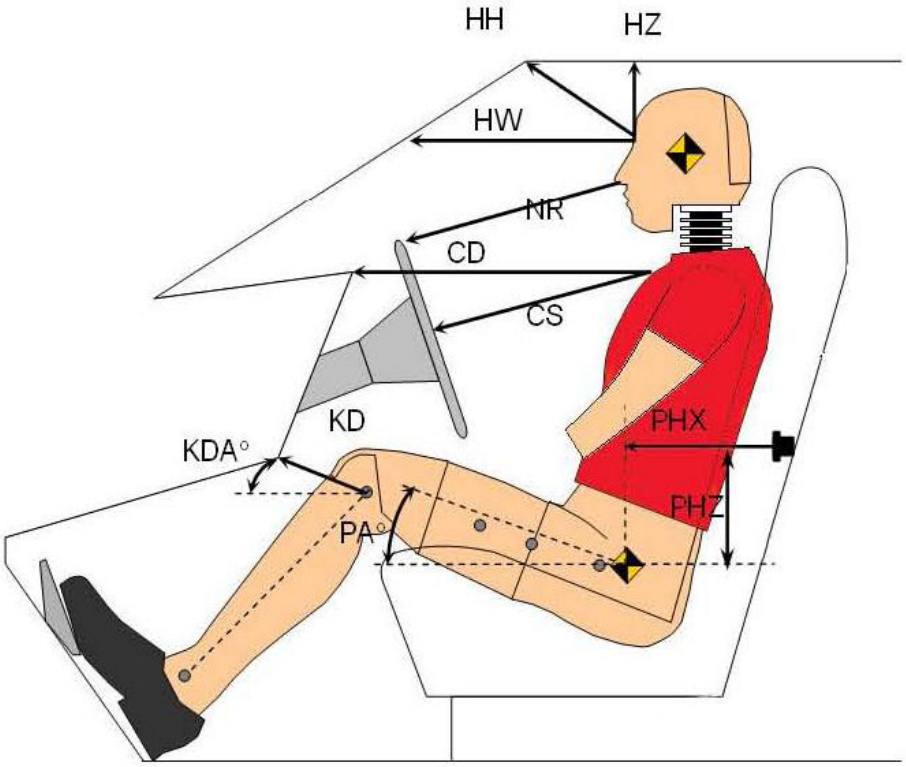
### STEERING COLUMN POSITIONING

| | Degrees | Fore/Aft Position (mm) |
|---|---|---|
| Lowermost - Position 1 | 77.6 | |
| Geometric Center – Position 2 | 67.6 | |
| Uppermost – Position 3 | 57.6 | |
| Telescoping Steering Wheel Travel | Fixed | |
| Test Position | 67.6 | |

## .DATA SHEET NO. 6

## DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

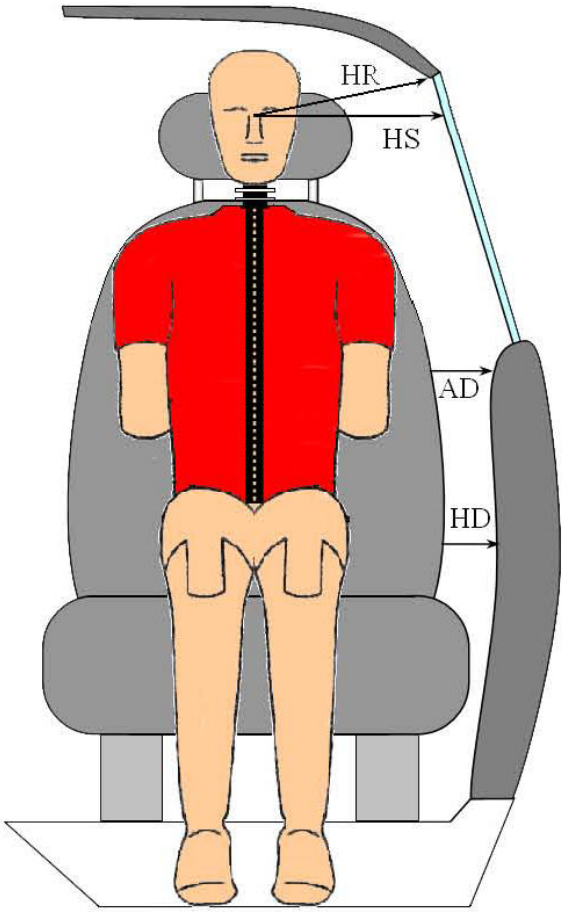



| Driver Code | Measurement Description | Length (mm) | Angle (°) |
|---|---|---|---|
| HH | Head to Header | 430 | |
| HW | Head to Windshield | 643 | |
| HZ | Head to Roof | 210 | |
| NR | Nose to Rim | 446 | |
| CD | Chest to Dash | 592 | |
| CS | Chest to Steering Wheel | 399 | |
| KDL | Left Knee to Dash | 185 | 23.6 |
| KDR | Right Knee to Dash | 155 | 34.2 |
| PA | Pelvic Angle | | 22.3 |
| PHX | H-Point to Striker (X-Axis) | 349 | |
| PHZ | H-Point to Striker (Z-Axis) | 29 | |

**DATA SHEET NO. 7**

**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

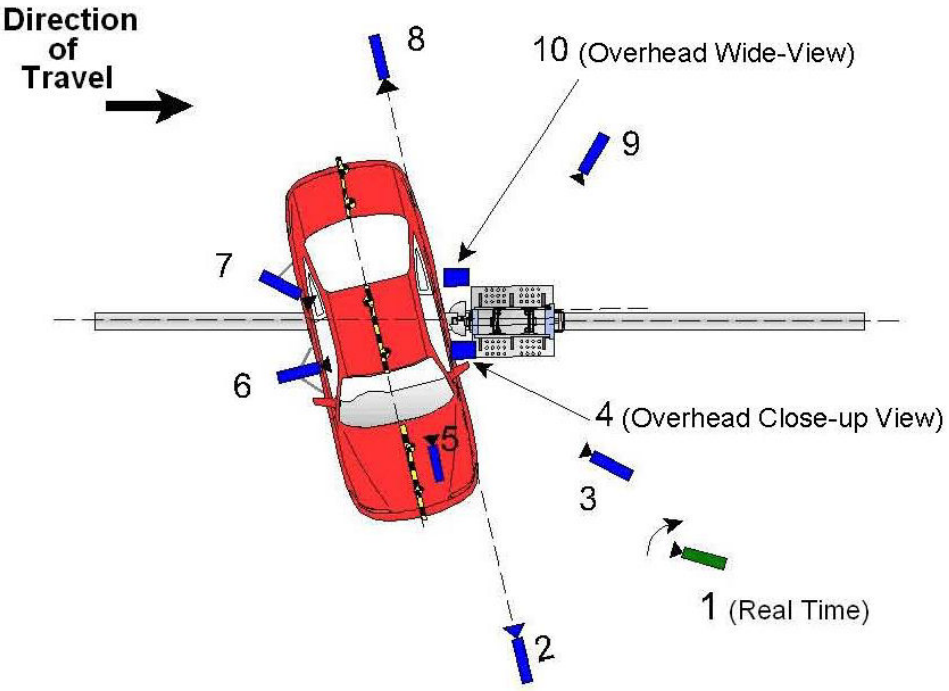



| Code | Measurement Description | Units | Front Occupant |
|---|---|---|---|
| HR | Head to Side Header | mm | 197 |
| HS | Head to Side Window | mm | 352 |
| AD | Arm to Door | mm | 138 |
| HD | H-Point to Door | mm | 158 |

**DATA SHEET NO. 8**

**HIGH SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010



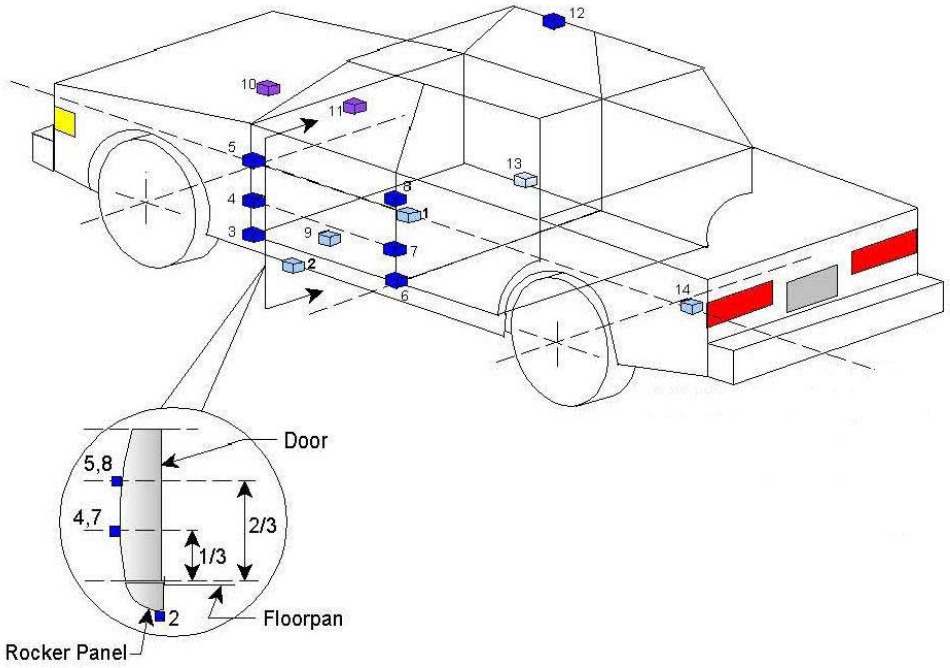

Reference: From Point of Impact for X and Y; from Ground for Z):
+X = Forward of Impact, + Y = Right of Impact, +Z = Down

| Camera No. | View | Coordinates (mm) | | | Lens (mm) | Film Speed (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Real-Time | | | | 13 | 24 |
| 2 | Front Ground Level | 1660 | 5540 | -1720 | 24 | 1000 |
| 3 | Impact Side 45° Forward | 3030 | 3440 | -1860 | 20 | 1000 |
| 4 | Overhead Closeup | -50 | 0 | -4520 | 50 | 1000 |
| 5 | Onboard – Driver Front | | | | 12.5 | 1000 |
| 6 | Onboard – Driver Side | | | | 8 | 1000 |
| 7 | Onboard – Driver Rear | | | | | |
| 8 | Rear Ground Level | -1810 | -7140 | -1680 | 24 | 1000 |
| 9 | Impact Side 45° Rearward | 2910 | -3730 | -1800 | 20 | 1000 |
| 10 | Overhead Wide | -410 | 0 | -4890 | 14 | 1000 |

**DATA SHEET NO. 9**

**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010




| Loc. No. | Accelerometer Location | | | |
|---|---|---|---|---|
| | ID | Coordinates (mm) | | |
| | | X | Y | Z |
| 1 | Vehicle CG | 2954 | 0 | -615 |
| 2 | Left Floor Sill | 3461 | -872 | -449 |
| 3 | A Pillar Sill | 3913 | -872 | -455 |
| 4 | A Pillar Low | 3762 | -791 | -783 |
| 5 | A Pillar Mid | 3802 | -877 | -1000 |
| 6 | B Pillar Sill | 2372 | -872 | -480 |
| 7 | B Pillar Low | 2630 | -829 | -803 |
| 8 | B Pillar Mid | 2624 | -824 | -1075 |
| 9 | Seat | 2899 | -635 | -194 |
| 10 | Engine | 4280 | 0 | -1033 |
| 11 | Firewall | 4270 | 0 | -1178 |
| 12 | Roof | 2705 | 634 | -1853 |
| 13 | Floor Sill | 3046 | 872 | -410 |
| 14 | Rear Deck | 915 | 0 | -802 |

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: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

| Loc. No. | Description | Peak Values (g's) | | | |
|---|---|---|---|---|---|
| | | Max | Time (ms) | Min | Time (ms) |
| 1 | Vehicle CG (X) | (1) | (1) | (1) | (1) |
| | Vehicle CG (Y) | (1) | (1) | (1) | (1) |
| | Vehicle CG (Z) | (1) | (1) | (1) | (1) |
| | Resultant | (1) | (1) | (1) | (1) |
| 2 | Left Floor Sill (Y) | (2) | (2) | (2) | (2) |
| 3 | A Pillar Sill (Y) | (3) | (3) | (3) | (3) |
| 4 | A Pillar Low (Y) | 19.9 | 43.1 | -3.2 | 53.5 |
| 5 | A Pillar Mid (Y) | 18.8 | 12.7 | -1.2 | 1.0 |
| 6 | B Pillar Sill (Y) | (4) | (4) | (4) | (4) |
| 7 | B Pillar Low (Y) | 67.9 | 13.3 | -26.5 | 24.1 |
| 8 | B Pillar Mid (Y) | 61.6 | 13.2 | -32.1 | 21.3 |
| 9 | Seat (Y) | 86.4 | 70.2 | -49.6 | 94.0 |
| 10 | Engine (X) | 3.6 | 112.4 | -11.9 | 69.0 |
| | Engine (Y) | 20.1 | 60.0 | -6.1 | 38.0 |
| 11 | Firewall (Y) | 10.7 | 54.0 | -1.8 | 4.9 |
| 12 | Roof (Y) | 26.5 | 36.8 | -1.3 | 296.5 |
| 13 | Floor Sill (Y) | (5) | (5) | (5) | (5) |
| 14 | Rear Deck (X) | 2.6 | 68.3 | -4.7 | 49.6 |
| | Rear Deck (Y) | 21.1 | 55.4 | -1.6 | 259.9 |

(1) Vehicle CG X, Y, Z no valid data after 30 msec.
(2) Left Floor Sill Y no valid data after 60 msec.
(3) Left A Post @ Sill Y no valid data after 60 msec.
(4) Left B-Post @ Sill Y – no valid data
(5) Right Sill @ Impact Line Y no valid data after 40 msec.

**DATA SHEET NO. 11**

**DUMMY INJURY RESPONSE DATA**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

| Dummy S/N 016 | Positive | | Negative | |
|---|---|---|---|---|
| | **MAX** | **TIME (ms)** | **MAX** | **TIME (ms)** |
| **HEAD ACCELERATION (G)** | | | | |
| Longitudinal (X) | 6.4 | 133.7 | 31.8 | 59.7 |
| Lateral (Y) | 72.7 | 53.1 | 14.6 | 111.9 |
| Vertical (Z) | 14.6 | 111.9 | 7.4 | 61.5 |
| Resultant (R) | 75.3 | 53.1 | | |
| HIC36 (t1, t2) | 516 | | t1 = 44.4 | t2 = 65.0 |
| **THORAX DEFLECTION (mm)** | | | | |
| Upper Rib | | | 30.9 | 54.3 |
| Middle Rib | | | 28.3 | 53.2 |
| Lower Rib | | | 28.2 | 52.0 |
| **ABDOMINAL FORCES (N)** | | | | |
| Front | 310.5 | 50.0 | | |
| Middle | 435.4 | 47.1 | | |
| Rear | 672.1 | 43.6 | | |
| Sum | 1349.4 | 45.7 | | |
| **PELVIS FORCE (N)** | | | | |
| Pubic Symphysis | | | 2574.6 | 53.8 |

Reference: Positive Direction -Longitudinal (X) = forward
-Lateral (Y) = to right
-Vertical (Z) = down

**DATA SHEET NO. 12**

**POST TEST OBSERVATIONS**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

**TEST DUMMY INFORMATION AND CONTACT**

| Description | Front Occupant |
|---|---|
| Dummy Type / Serial No. | ES-2re / 016 |
| Head Contact | Curtain Airbag, Headliner, Headrest |
| Upper Torso Contact | Side Airbag, Door Panel |
| Lower Torso Contact | Side Airbag, Door Panel |
| 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 | |
| Right Side Doors | Remained closed and operational | |
| Hatch and Other Doors | Remained closed and operational | |
| Seat Movement | 0 | |
| Seat Back Failure | 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 Broke |
| Other Notable Effects | None |

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

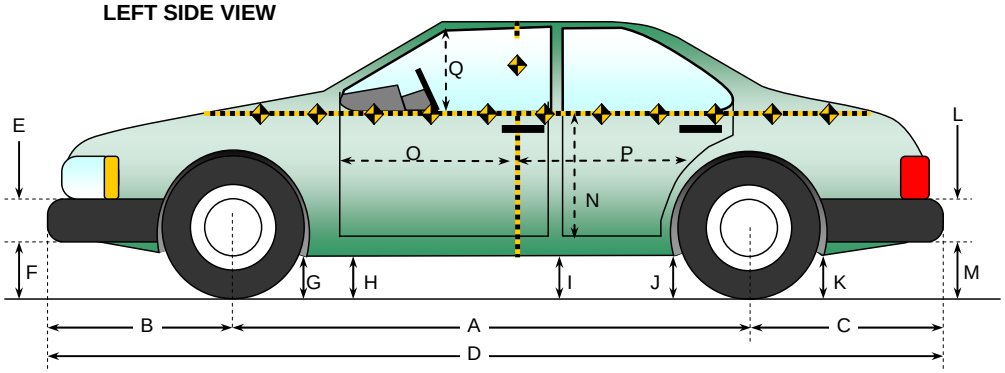
| Restraint Type | Front Occupant | |
|---|---|---|
| | Installed | Operated |
| Frontal Airbag | Yes | No |
| Side Torso Airbag | Yes | Yes |
| Head Airbag | No | |
| Curtain Airbag | Yes | Yes |
| Seat Belt Pretensioner | Yes | Yes |
| Seat Belt Load Limiter | Yes | |

## DATA SHEET NO. 13

## VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

LEFT SIDE VIEW

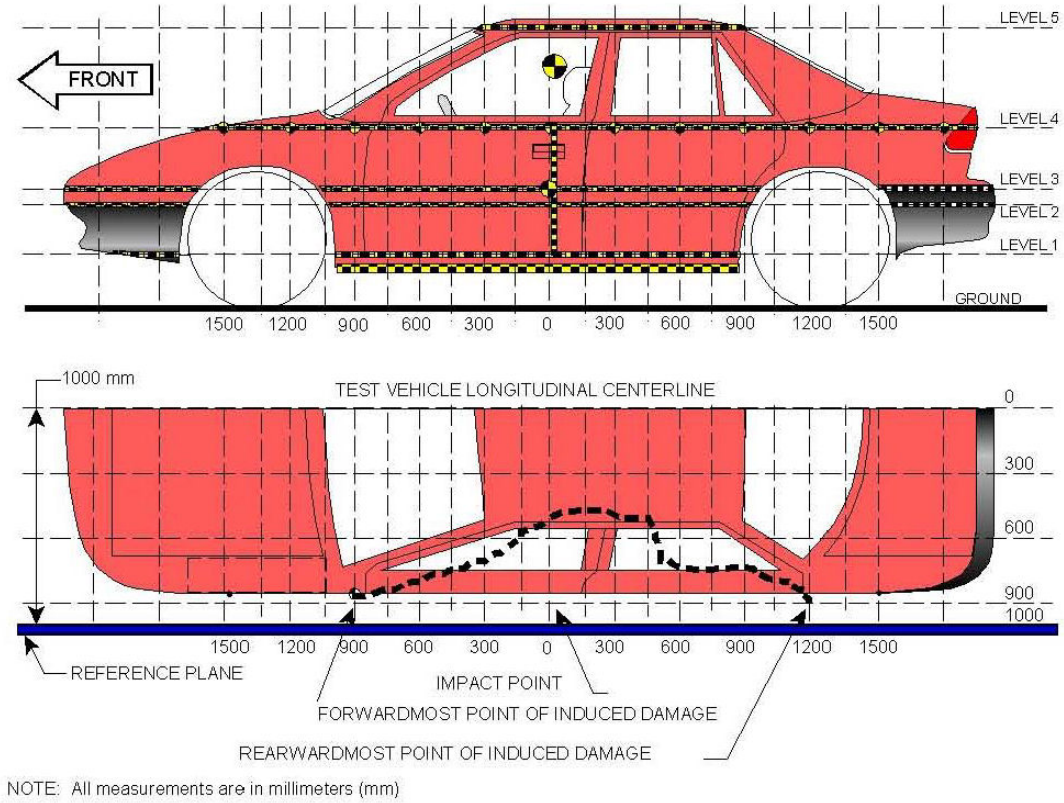



| Code | Measurement Description | Pre-Test (mm) | Post-Test (mm) | Difference (mm) |
|---|---|---|---|---|
| A | Wheelbase | 3205 | 3072 | -133 |
| B | Front Axle to FSOV | 981 | 962 | -19 |
| C | Rear Axle to RSOV | 1230 | 1224 | -6 |
| D | Total Vehicle Length at Centerline | 5416 | 5258 | -158 |
| E | Front Bumper Thickness | 265 | 265 | 0 |
| F | Front Bumper Bottom to Ground | 302 | 323 | 21 |
| G | Sill Height at Front Wheel Well | 349 | 350 | 1 |
| H | Sill Height at Front Door Leading Edge | 219 | 192 | -27 |
| I | Sill Height at B Pillar | 382 | 360 | -22 |
| J1 | Sill Height at Rear Wheel Well | 432 | 403 | -29 |
| J2 | Pinch Weld Height at Rear Wheel Well | 328 | 300 | -28 |
| K | Sill Height Aft of Rear Wheel Well | 460 | 479 | 19 |
| L | Rear Bumper Thickness | 210 | 210 | 0 |
| M | Rear Bumper Bottom to Ground | 212 | 205 | -7 |
| N | Sill Height to Window Bottom Sill | 825 | 826 | 1 |
| O | Front Door Leading Edge to Impact CL | 803 | 801 | -2 |
| P | Rear Door Trailing Edge to Impact CL | 462 | 455 | -7 |
| Q | Front Window Opening | 476 | 473 | -3 |
| R | Right Side Length | 4463 | 4511 | 48 |
| S | Left Side Length | 4463 | 4205 | -258 |
| T | Vehicle Width at B Post | 1979 | 1902 | -77 |

**DATA SHEET NO. 14**

**EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010




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 | 376 | 0 | 456 |
| 2 | Occupant H-Point | 398 | 0 | 833 |
| 3 | Mid-Door | 399 | 0 | 906 |
| 4 | Window Sill | 380 | 75 | 1195 |
| 5 | Window Top | 184 | -75 | 1804 |

**DATA SHEET NO. 15**

**VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

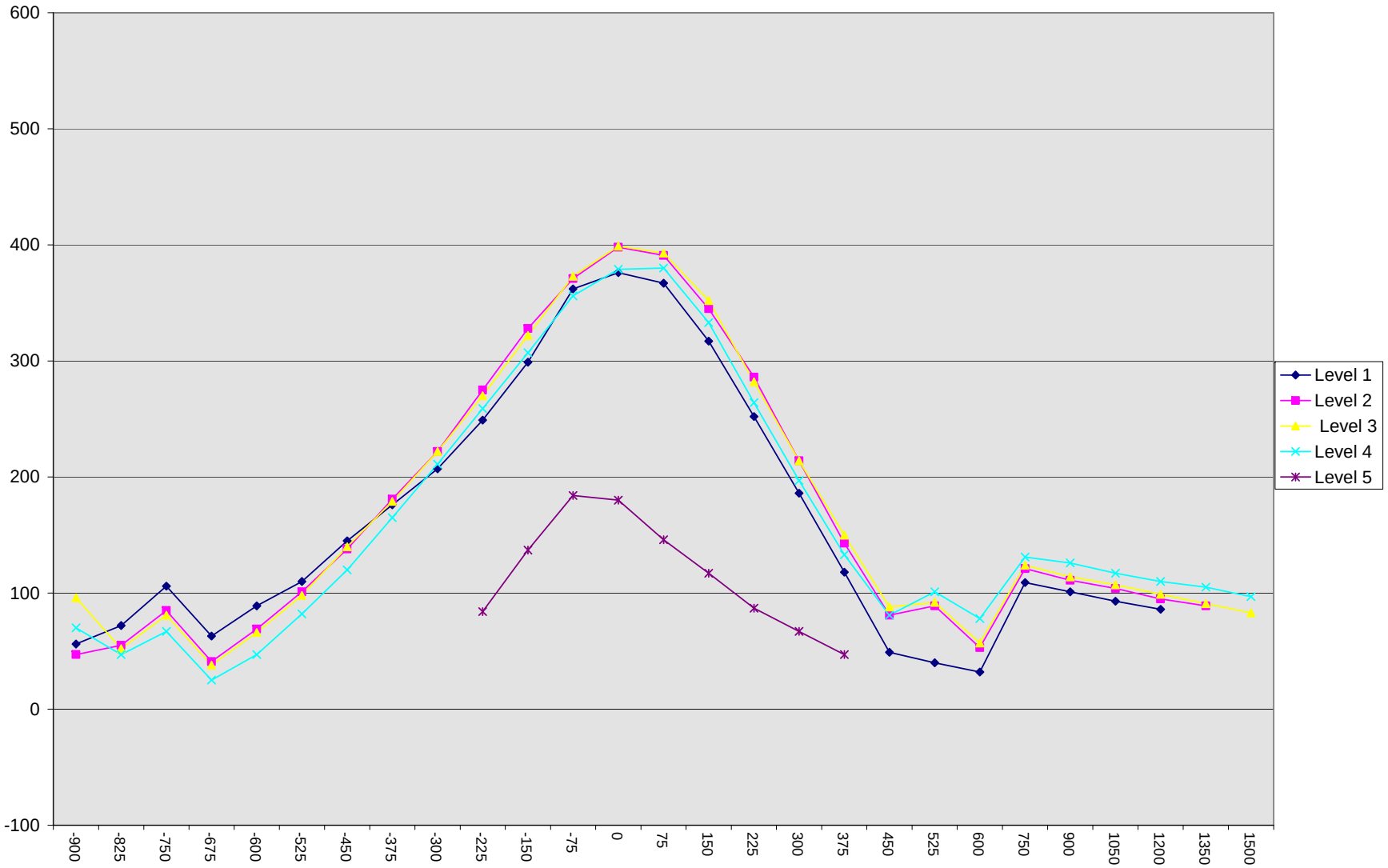
| | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
|---|---|---|---|---|---|
| Maximum Crush (mm) | 376 | 398 | 399 | 380 | 184 |
| Distance From Impact (mm) | 0 | 0 | 0 | 75 | -75 |

| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -900 | 173 | 151 | 150 | 167 | | 100 | 198 | 256 | 237 | | 56 | 47 | 96 | 70 | |
| -825 | 174 | 150 | 148 | 164 | | 102 | 205 | 200 | 311 | | 72 | 55 | 52 | 47 | |
| -750 | 168 | 148 | 146 | 162 | | 104 | 233 | 227 | 229 | | 106 | 85 | 81 | 67 | |
| -675 | 167 | 146 | 144 | 160 | | 230 | 187 | 182 | 185 | | 63 | 41 | 38 | 25 | |
| -600 | 164 | 143 | 142 | 159 | | 253 | 212 | 205 | 206 | | 89 | 69 | 66 | 47 | |
| -525 | 162 | 141 | 139 | 157 | | 272 | 242 | 237 | 239 | | 110 | 101 | 98 | 82 | |
| -450 | 161 | 139 | 137 | 154 | | 306 | 277 | 277 | 274 | | 145 | 138 | 140 | 120 | |
| -375 | 159 | 137 | 135 | 152 | | 335 | 331 | 314 | 317 | | 176 | 181 | 179 | 165 | |
| -300 | 158 | 136 | 134 | 151 | | 365 | 358 | 356 | 363 | | 207 | 222 | 222 | 211 | |
| -225 | 156 | 134 | 132 | 149 | 398 | 405 | 409 | 402 | 408 | 482 | 249 | 275 | 270 | 259 | 84 |
| -150 | 154 | 133 | 131 | 148 | 395 | 453 | 461 | 453 | 455 | 532 | 299 | 328 | 322 | 307 | 137 |
| -75 | 153 | 132 | 130 | 147 | 394 | 515 | 503 | 503 | 503 | 578 | 362 | 371 | 373 | 356 | 184 |
| 0 | 152 | 131 | 129 | 146 | 394 | 528 | 529 | 528 | 204 | 574 | 376 | 398 | 399 | 379 | 180 |
| 75 | 150 | 130 | 128 | 144 | 393 | 203 | 203 | 521 | 524 | 539 | 367 | 391 | 393 | 380 | 146 |
| 150 | 149 | 129 | 128 | 143 | 394 | 466 | 474 | 480 | 476 | 511 | 317 | 345 | 352 | 333 | 117 |
| 225 | 149 | 129 | 127 | 141 | 396 | 401 | 204 | 409 | 405 | 483 | 252 | 286 | 282 | 264 | 87 |
| 300 | 147 | 128 | 126 | 141 | 395 | 333 | 342 | 340 | 338 | 462 | 186 | 214 | 214 | 197 | 67 |
| 375 | 147 | 128 | 126 | 141 | 395 | 265 | 271 | 276 | 274 | 442 | 118 | 143 | 150 | 133 | 47 |
| 450 | 147 | 128 | 125 | 141 | | 196 | 209 | 213 | 222 | | 49 | 81 | 88 | 81 | |
| 525 | 149 | 127 | 124 | 140 | | 219 | 216 | 217 | 241 | | 40 | 89 | 92 | 101 | |
| 600 | 150 | 127 | 121 | 141 | | 182 | 180 | 385 | 219 | | 32 | 53 | 57 | 78 | |
| 750 | 149 | 131 | 129 | 145 | | 258 | 252 | 253 | 279 | | 109 | 121 | 124 | 131 | |
| 900 | 149 | 130 | 127 | 144 | | 250 | 241 | 241 | 270 | | 101 | 111 | 114 | 126 | |
| 1050 | 147 | 128 | 126 | 143 | | 240 | 232 | 233 | 260 | | 93 | 104 | 107 | 117 | |
| 1200 | 145 | 126 | 125 | 143 | | 231 | 221 | 224 | 253 | | 86 | 95 | 99 | 110 | |
| 1350 | | 105 | 114 | 143 | | | 194 | 205 | 247 | | | 89 | 91 | 105 | |
| 1500 | | | 96 | 143 | | | | 179 | 240 | | | | 83 | 97 | |

## DATA SHEET NO. 15 (CONTINUED)

## VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010



## DATA SHEET NO. 16

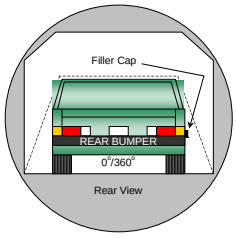
## SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010

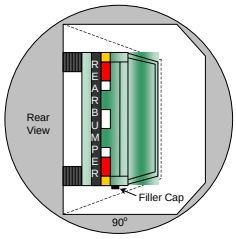
### FUEL SYSTEM INTEGRITY POST IMPACT DATA

| 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 |

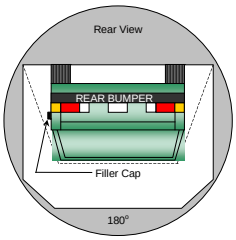
### STATIC ROLLOVER DATA



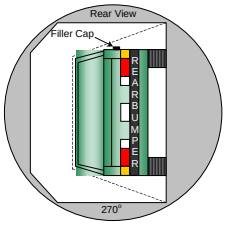

**0/360**




**90**




**180**




**270**

**REAR VIEW**

| Rollover Stage | Rotation Time (spec. 1-3 min) | | | | FMVSS 301 Hold Time | | Total Time | | | | Next Whole Minute Interval | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° - 90° | 2 | minutes | 47 | seconds | 5 | minutes | 7 | minutes | 47 | seconds | 8 | minutes |
| 90° - 180° | 2 | minutes | 30 | seconds | 5 | minutes | 7 | minutes | 30 | seconds | 8 | minutes |
| 180° - 270° | 2 | minutes | 13 | seconds | 5 | minutes | 7 | minutes | 13 | seconds | 8 | minutes |
| 270° - 360° | 2 | minutes | 35 | seconds | 5 | minutes | 7 | minutes | 35 | seconds | 8 | minutes |

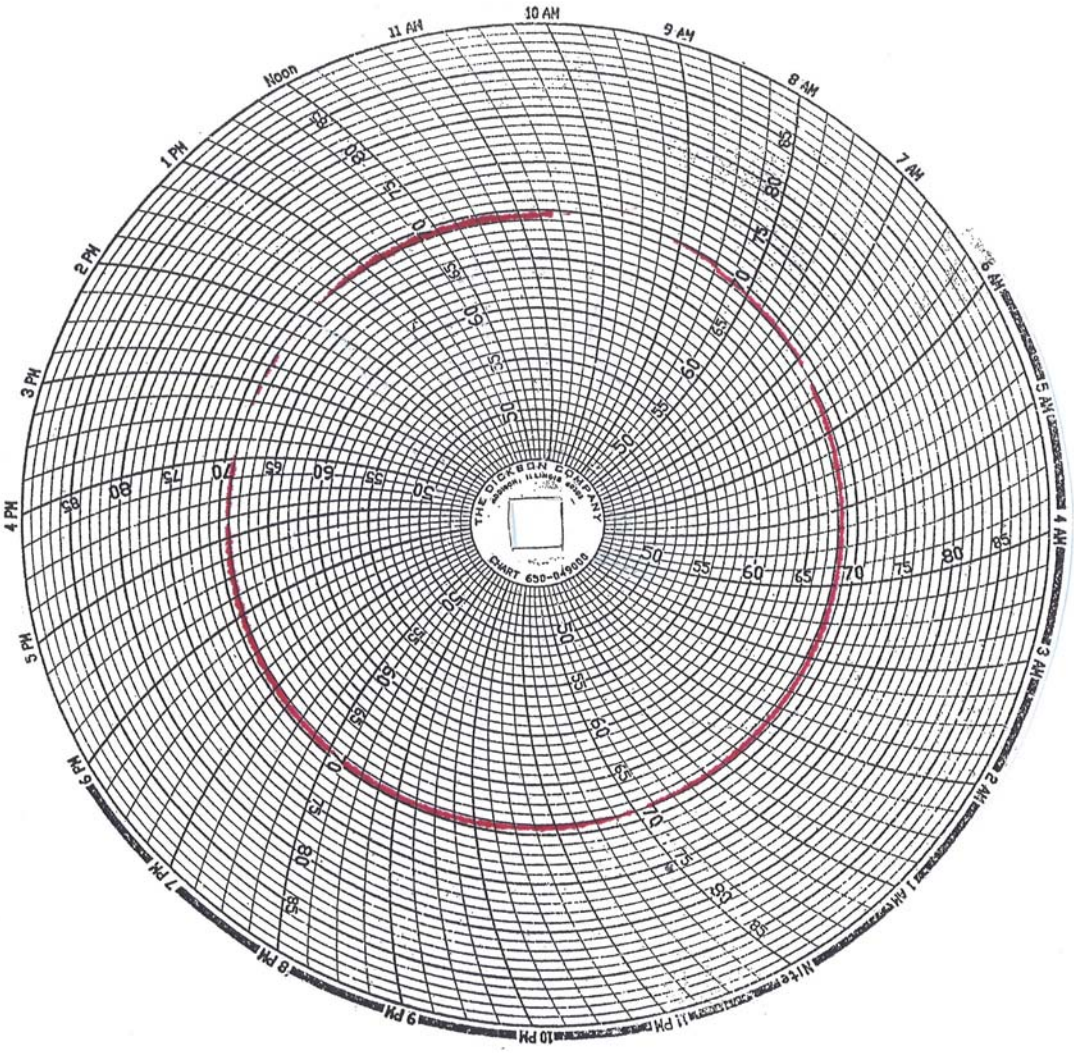
| Rollover Stage | Spillage (g) | | | |
|---|---|---|---|---|
| | First 5 min. from onset of rotation | 6th min. | 7th min. | 8th min. (if required) |
| 0° - 90° | 0 | 0 | 0 | |
| 90° - 180° | 0 | 0 | 0 | |
| 180° - 270° | 0 | 0 | 0 | |
| 270° - 360° | 0 | 0 | 0 | |
| FMVSS 301 Maximum Allowable (for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

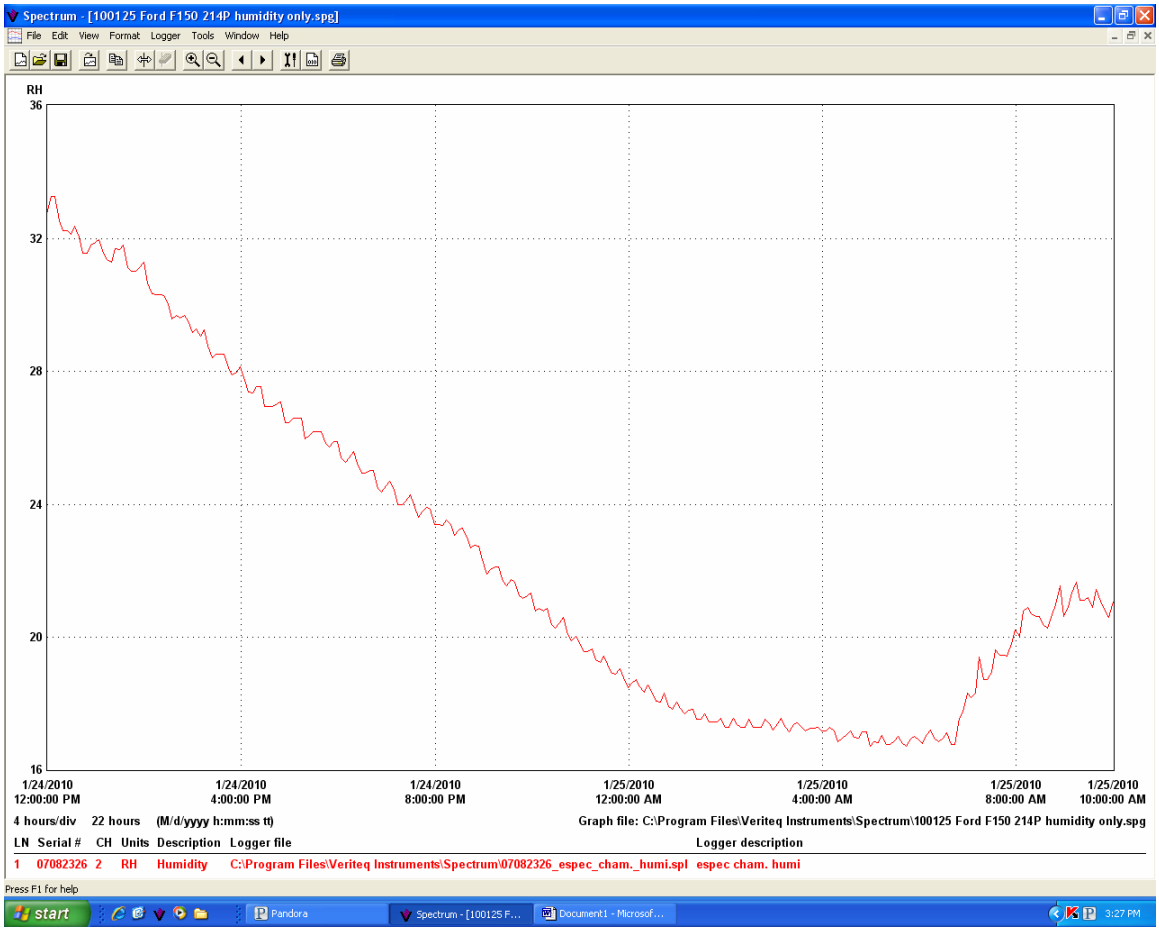
| | | | |
|---|---|---|---|
| Test Vehicle: | 2010 Ford F-150 4x2 Regular Cab | NHTSA No. | CA0208 |
| Test Program: | FMVSS 214 Pole | Test Date: | 1/25/2010 |



## DATA SHEET NO. 17 (CONTINUED)

## TEMPERATURE AND HUMIDITY TRACES

Test Vehicle: 2010 Ford F-150 4x2 Regular Cab NHTSA No. CA0208
Test Program: FMVSS 214 Pole Test Date: 1/25/2010



# APPENDIX A

# PHOTOGRAPHS

TABLE OF PHOTOGRAPHS


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 ¾ Front View of Vehicle and Pole

Post-Test Left ¾ Front View of Vehicle and Pole

Pre-Test Overhead View of Test Vehicle

Post-Test Overhead View of Test Vehicle

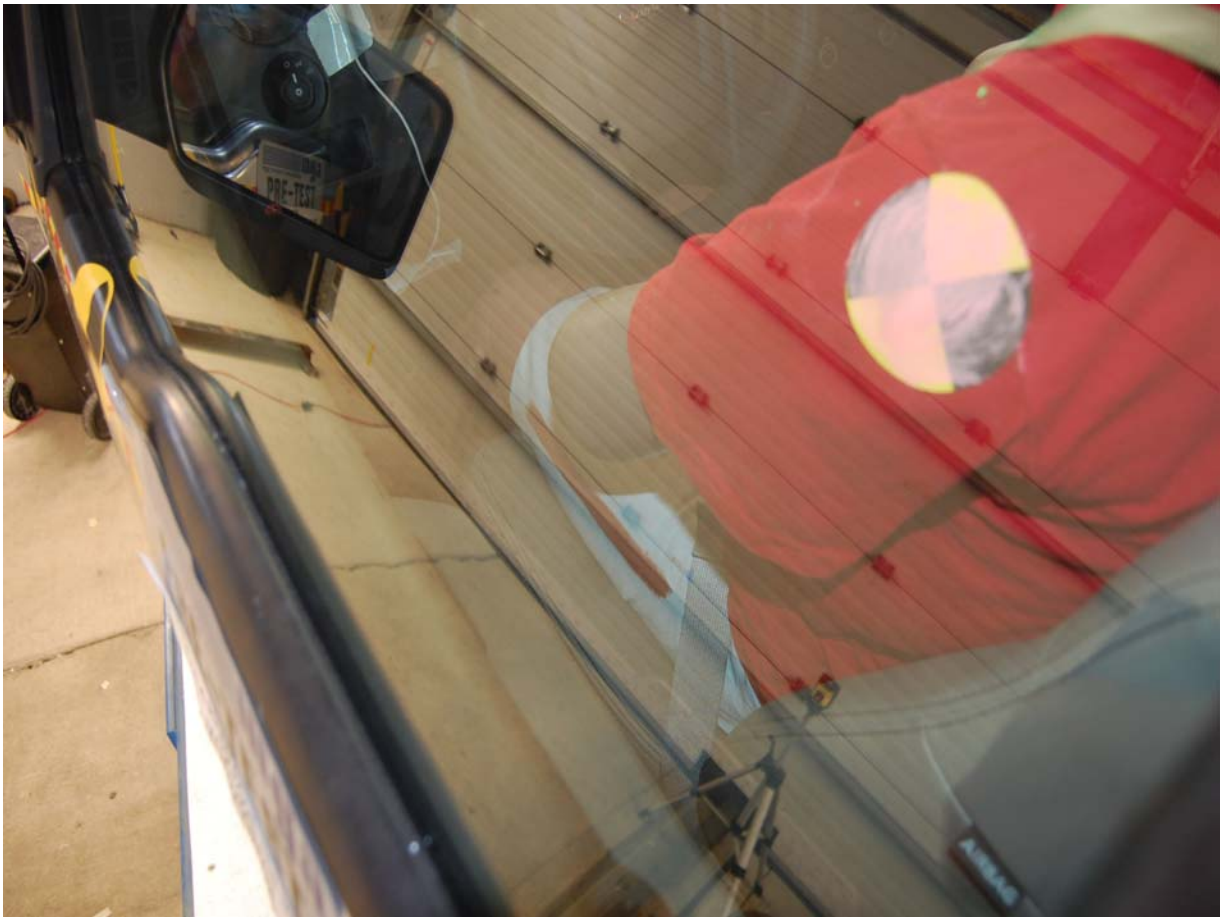
Pre-Test Dummy Through Opposite Window

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)

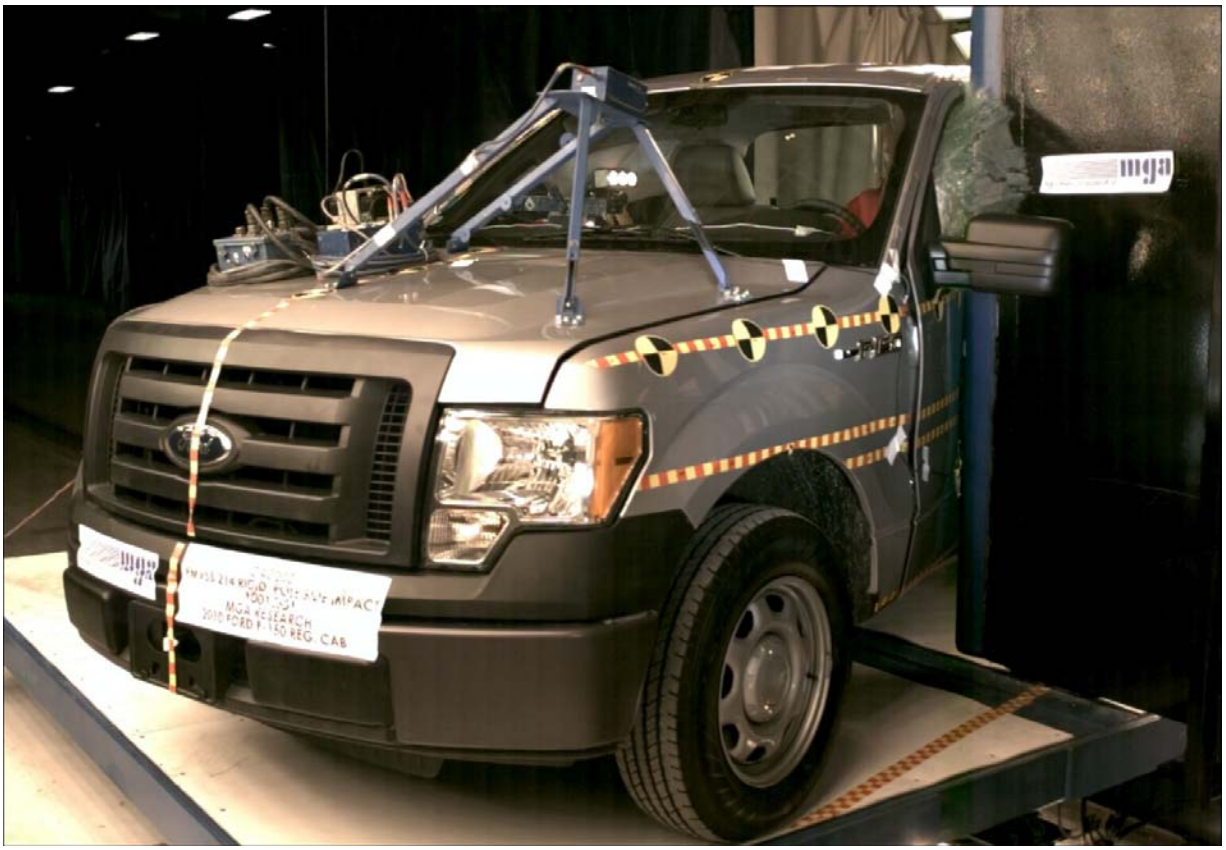
Pre-Test Dummy Door Open




Pre-Test Dummy Shoulder and Door Top View


Post-Test Dummy Shoulder and Door Top View

Post-Test Interior of Front Door Showing Dummy Impact Locations

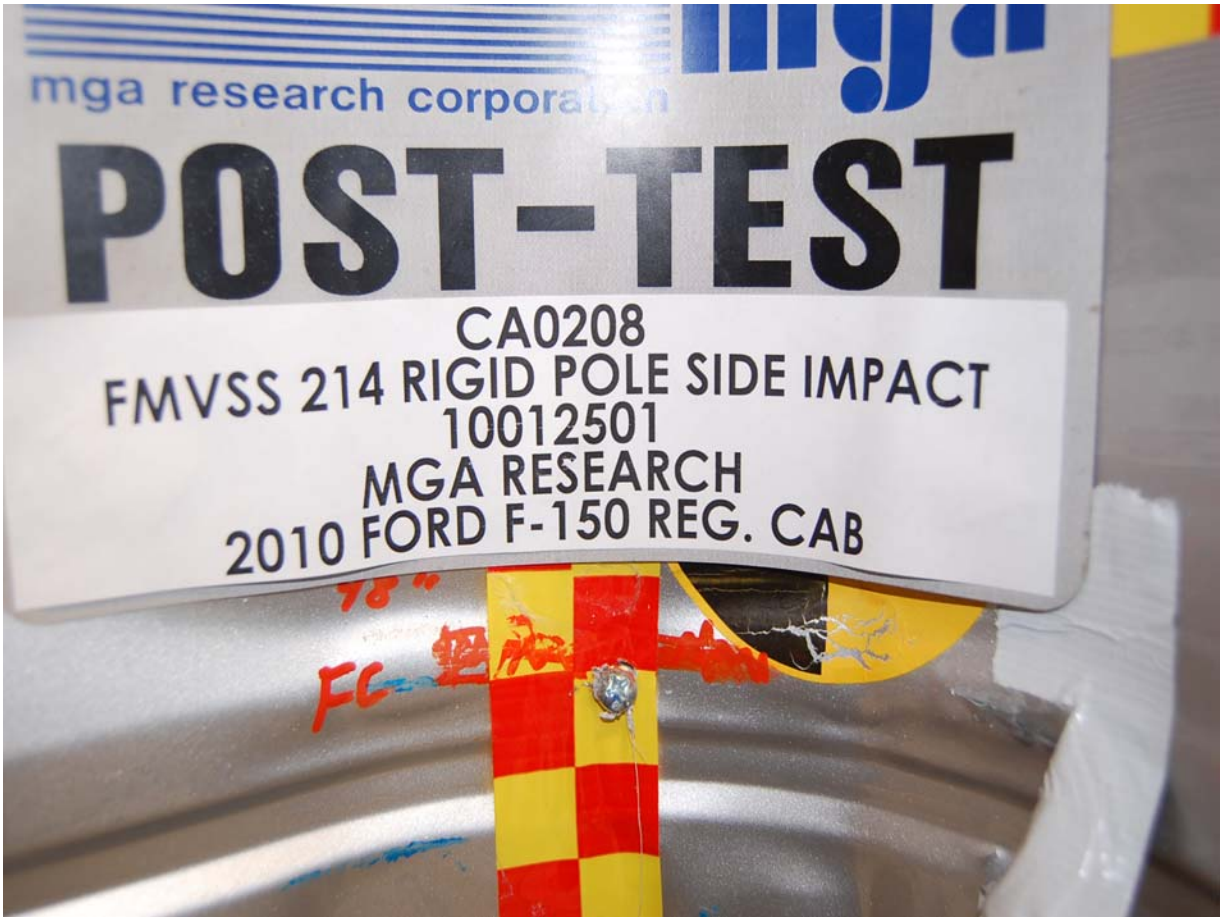


Impact Event (Struck Side)

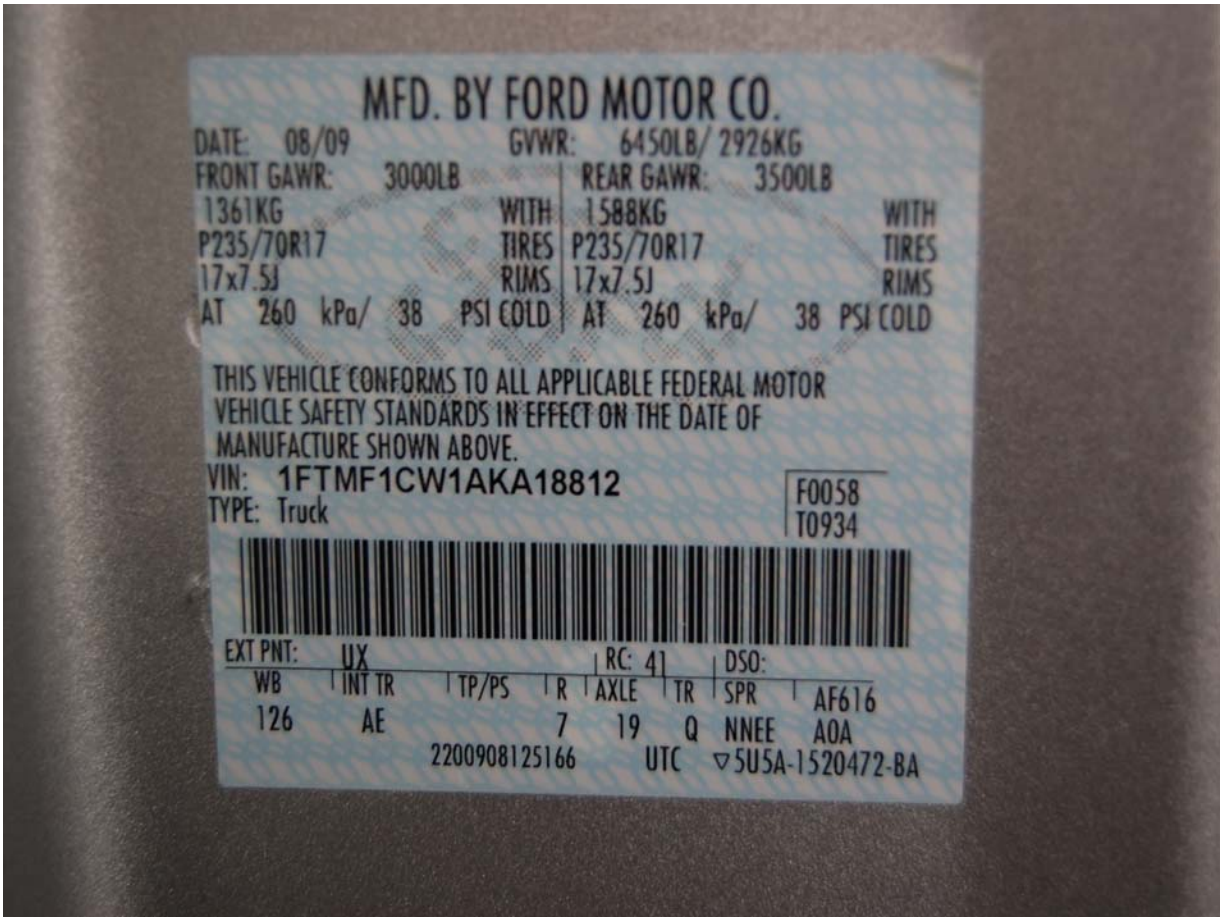

Post-Test Impact Zone Close-up View


Post-Test ¾ Front View of Impact Zone


Post-Test ¾ Rear View of Impact Zone

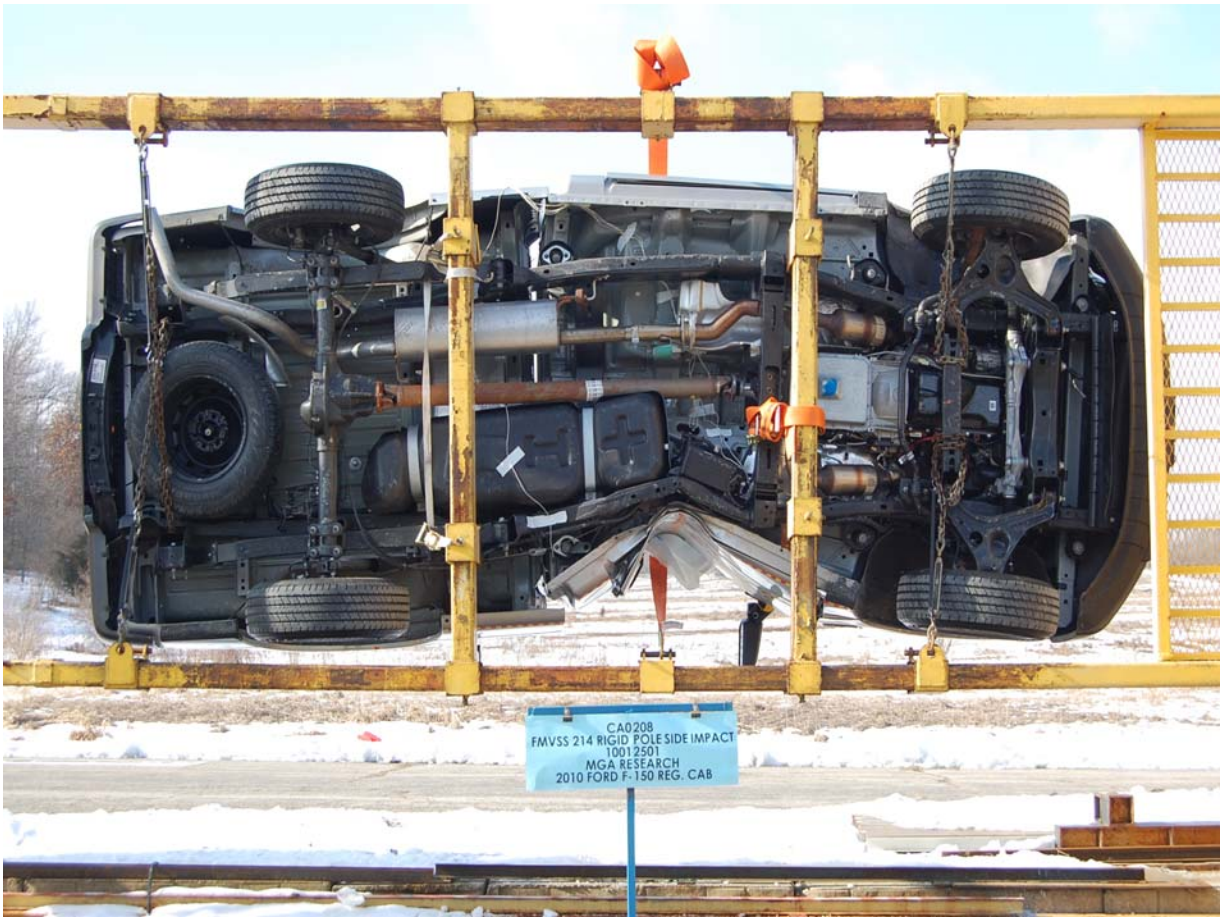


Post-Test Close-up View of Impact Point Target



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

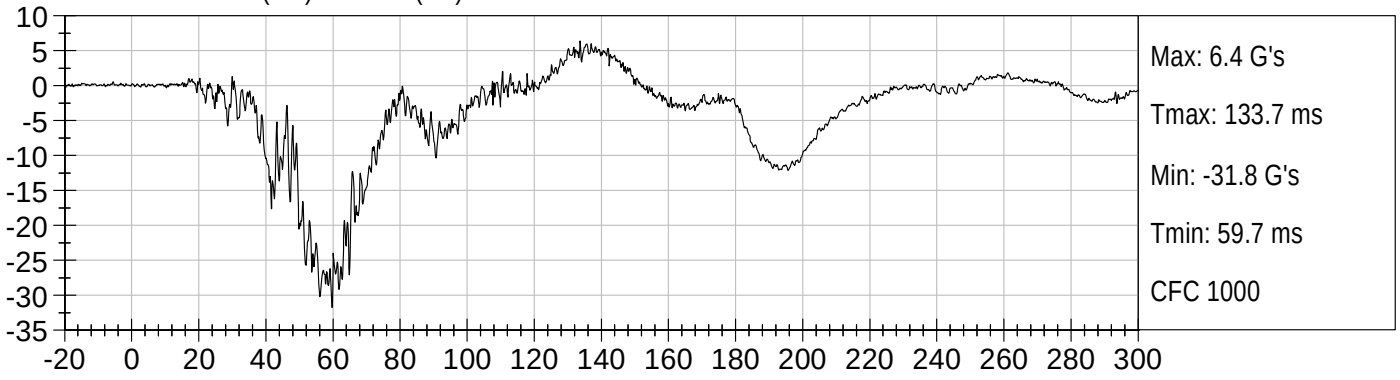
## TABLE OF DATA PLOTS

### Dummy Instrumentation Plots
### FILTERED DATA

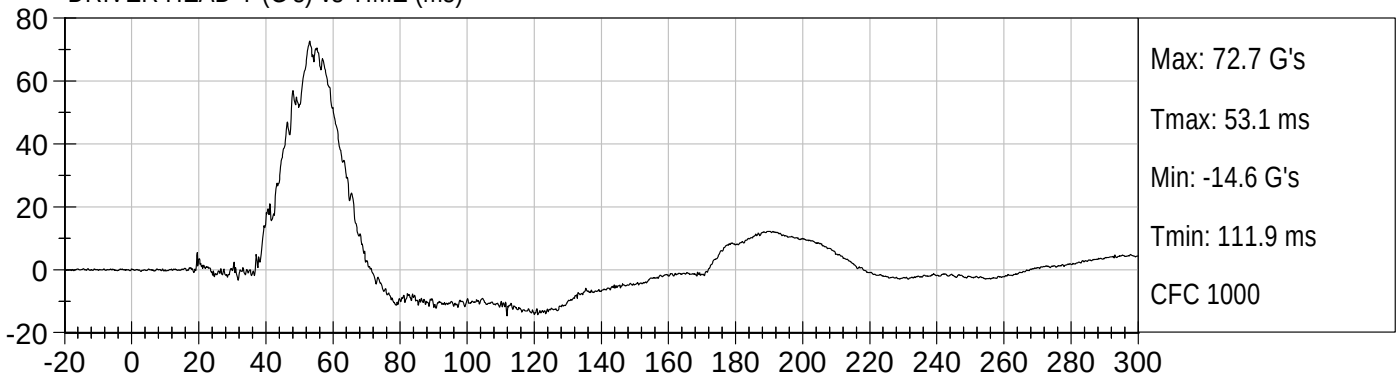
FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

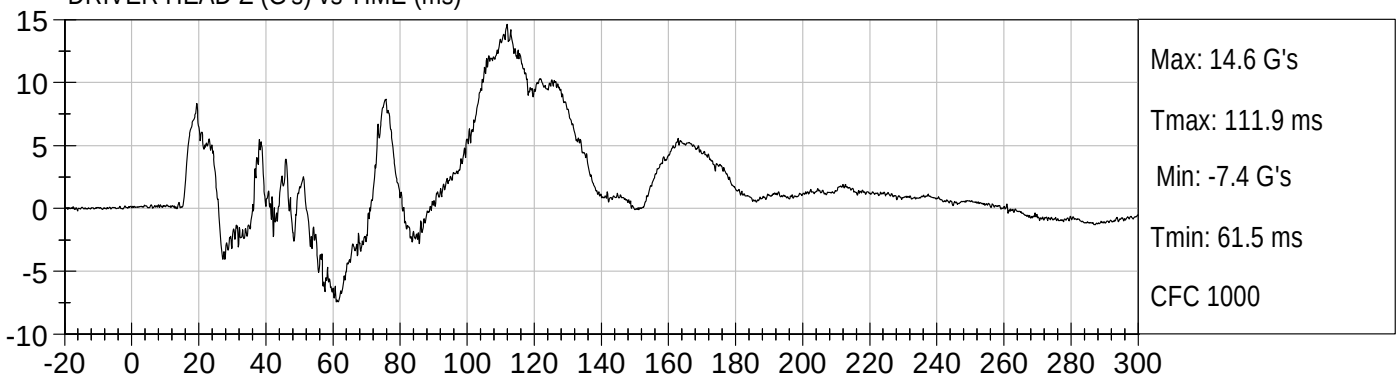
DRIVER HEAD X (G's) vs TIME (ms)



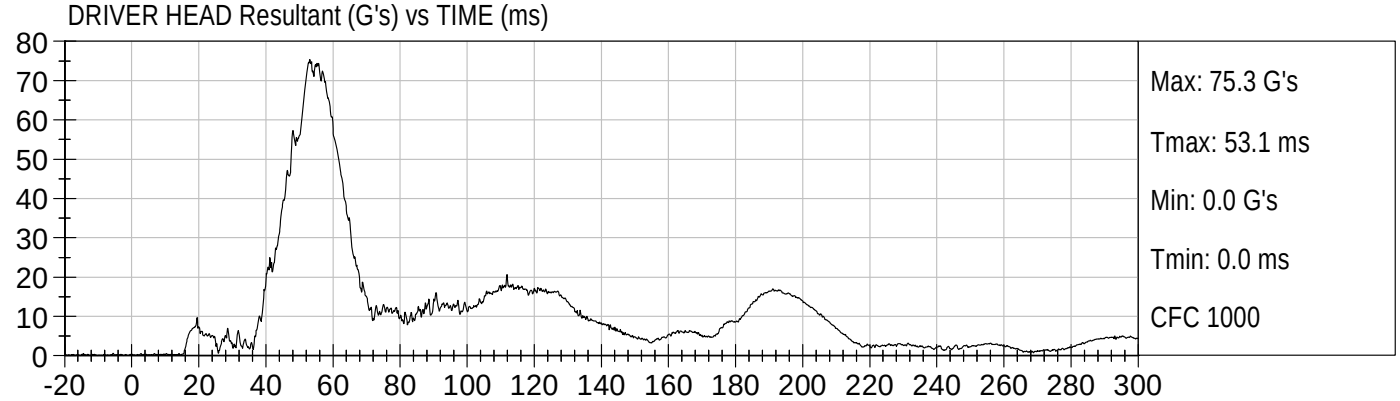

DRIVER HEAD Y (G's) vs TIME (ms)



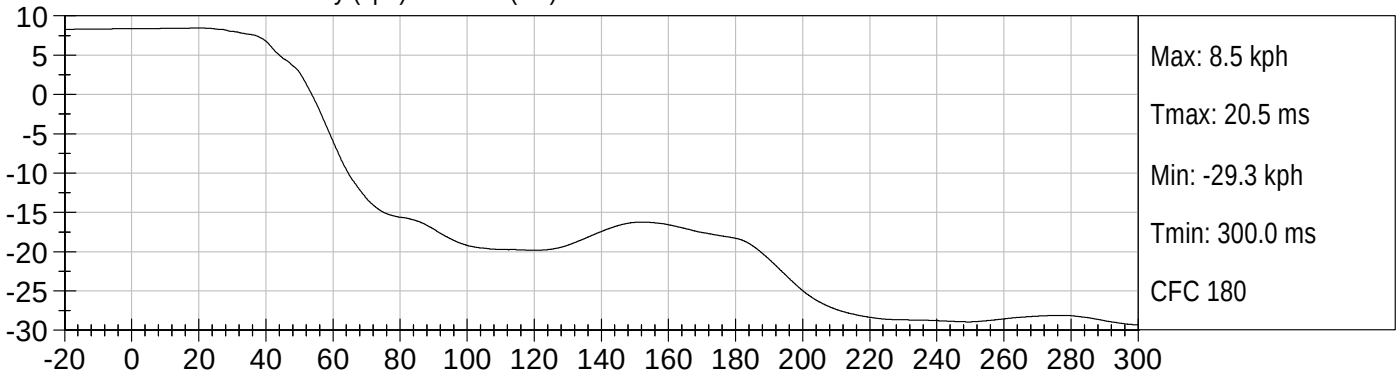

DRIVER HEAD Z (G's) vs TIME (ms)



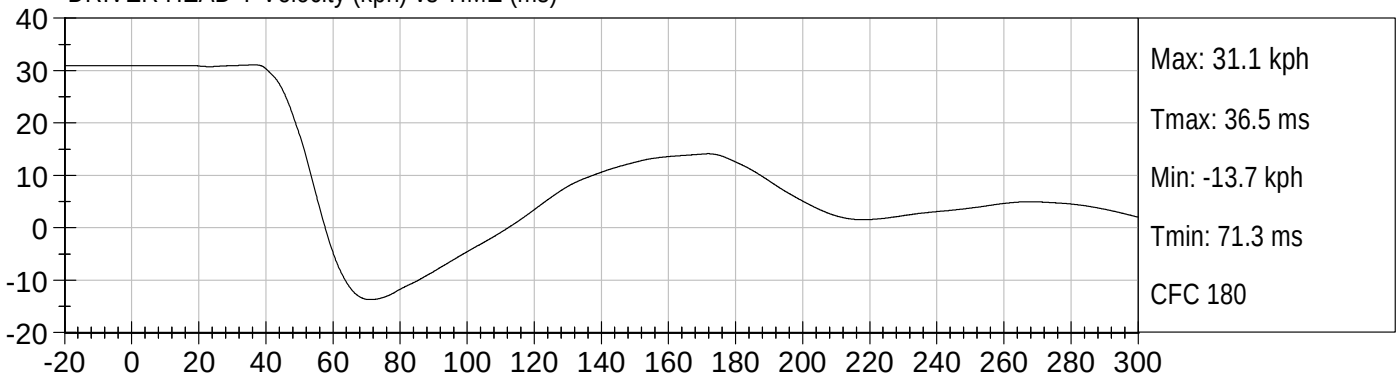

DRIVER HEAD Resultant (G's) vs TIME (ms)



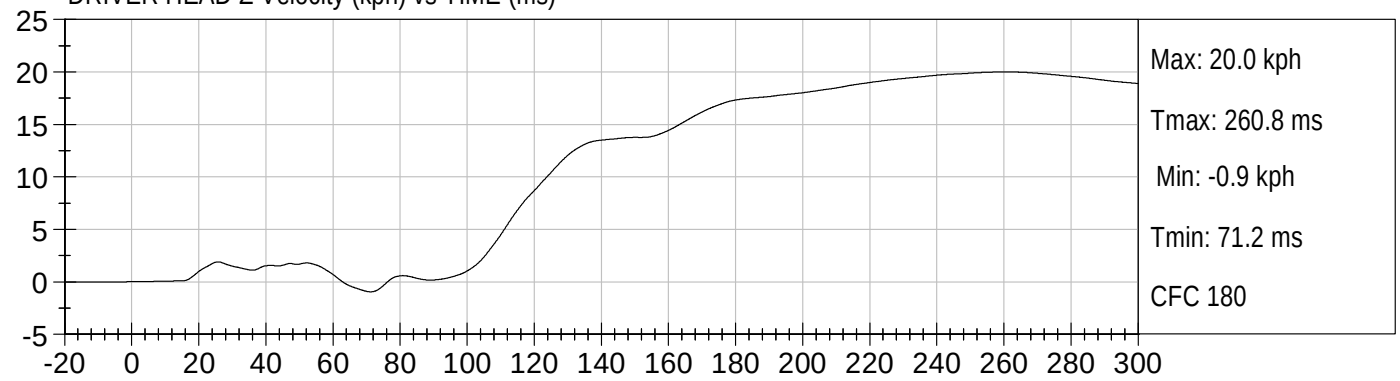
DRIVER HEAD X Velocity (kph) vs TIME (ms)



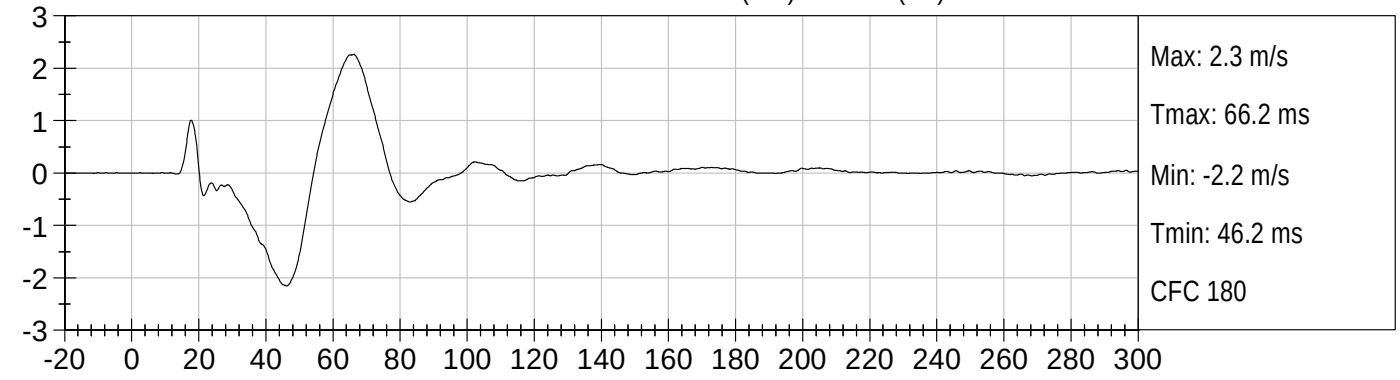

DRIVER HEAD Y Velocity (kph) vs TIME (ms)



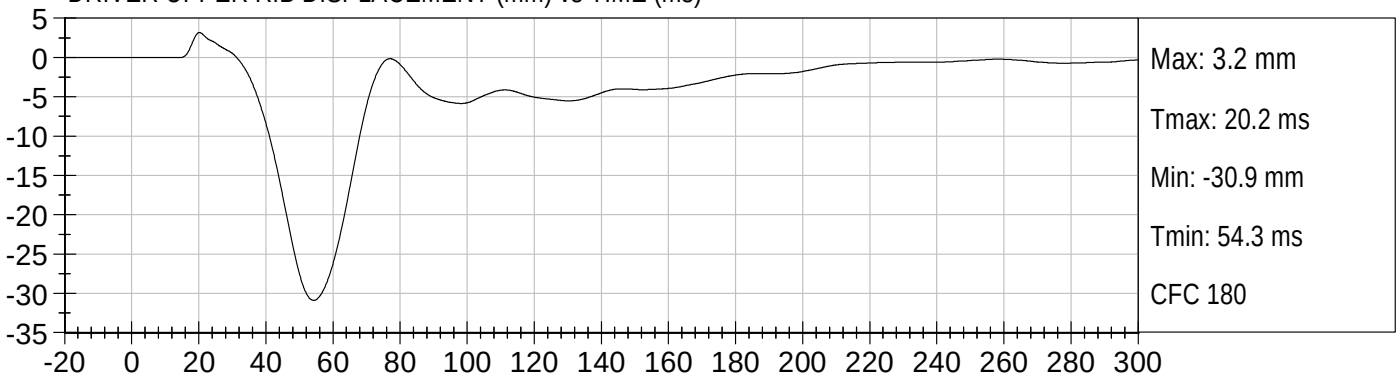

DRIVER HEAD Z Velocity (kph) vs TIME (ms)



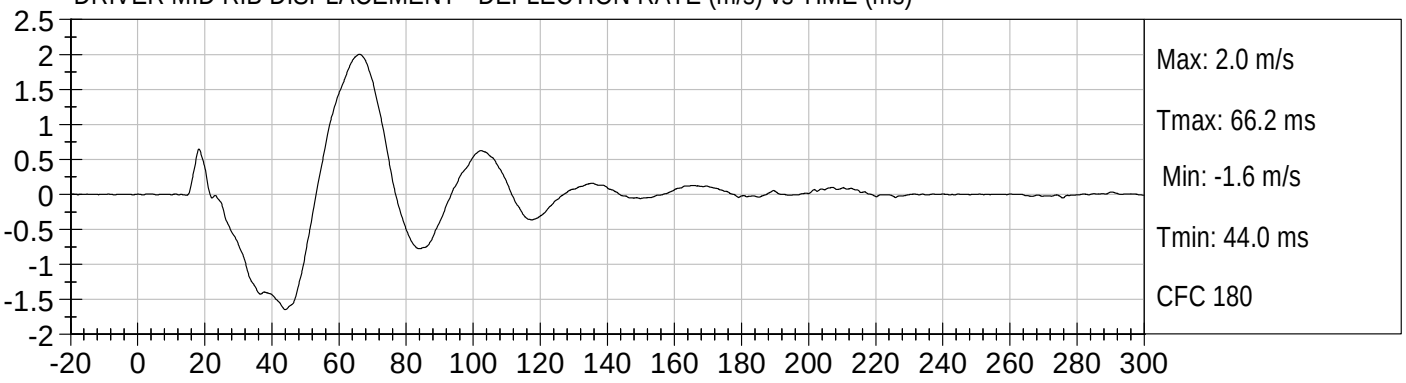
DRIVER UPPER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



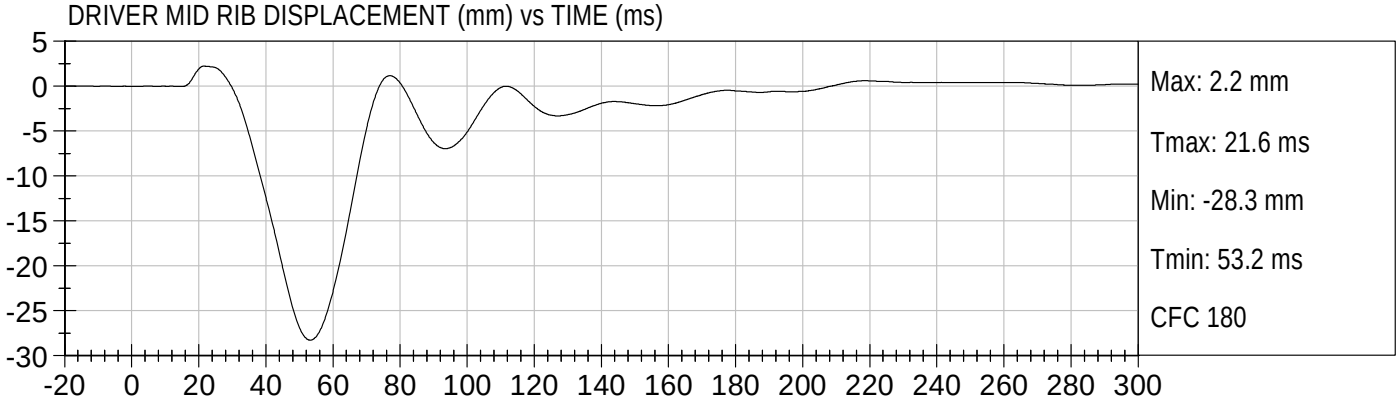

DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



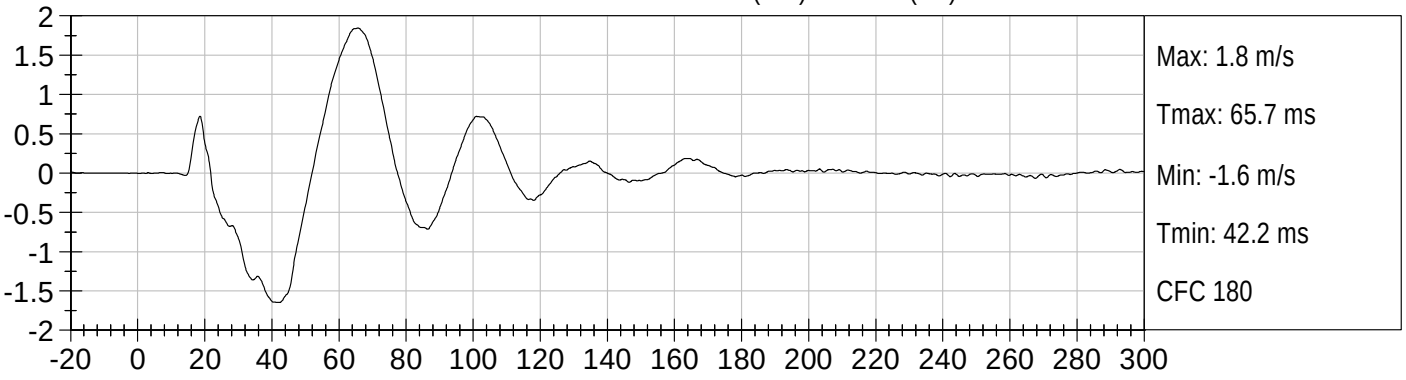

DRIVER MID RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



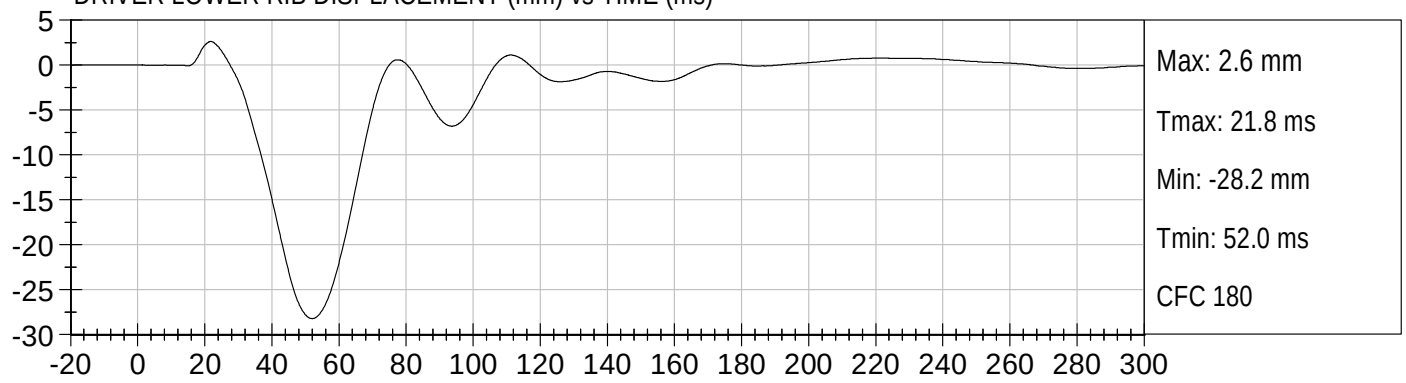

DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



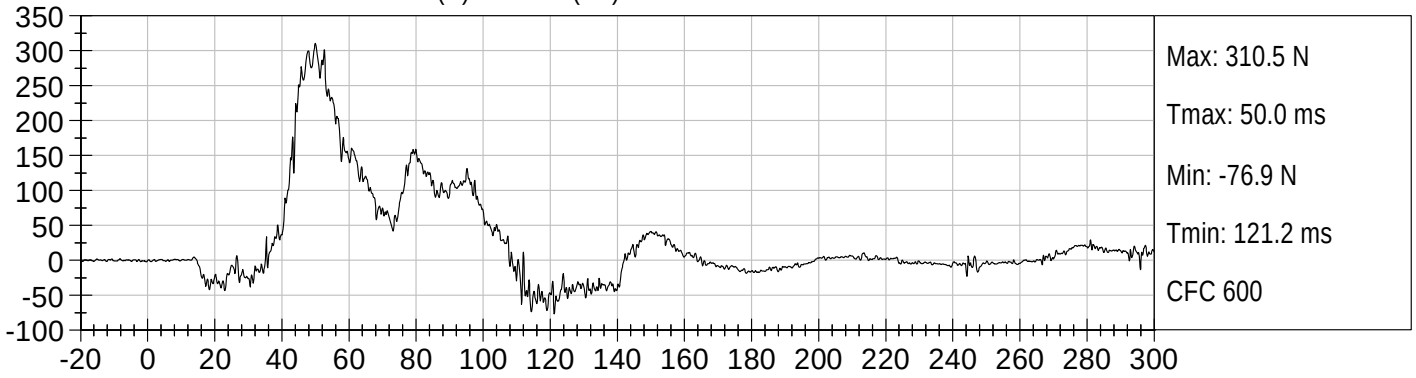
DRIVER LOWER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



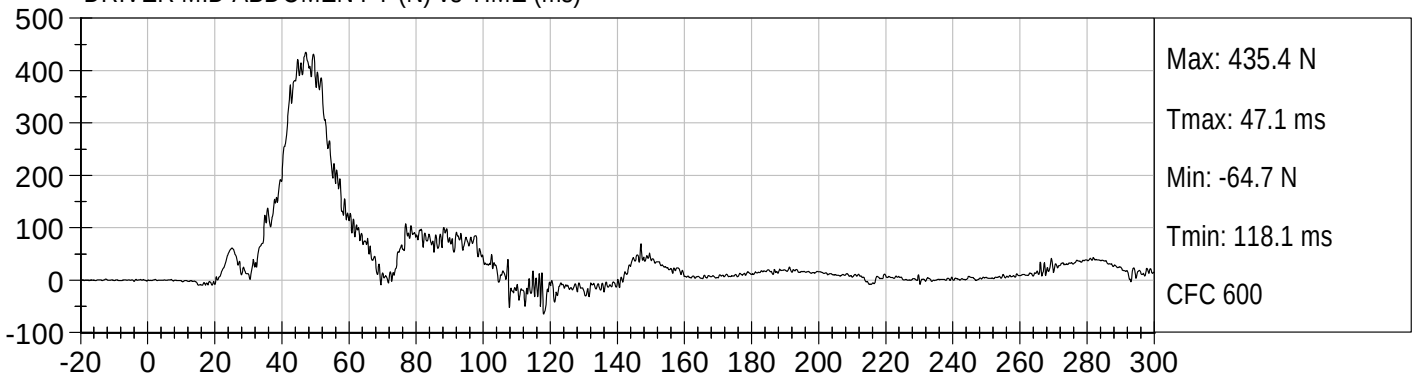

DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



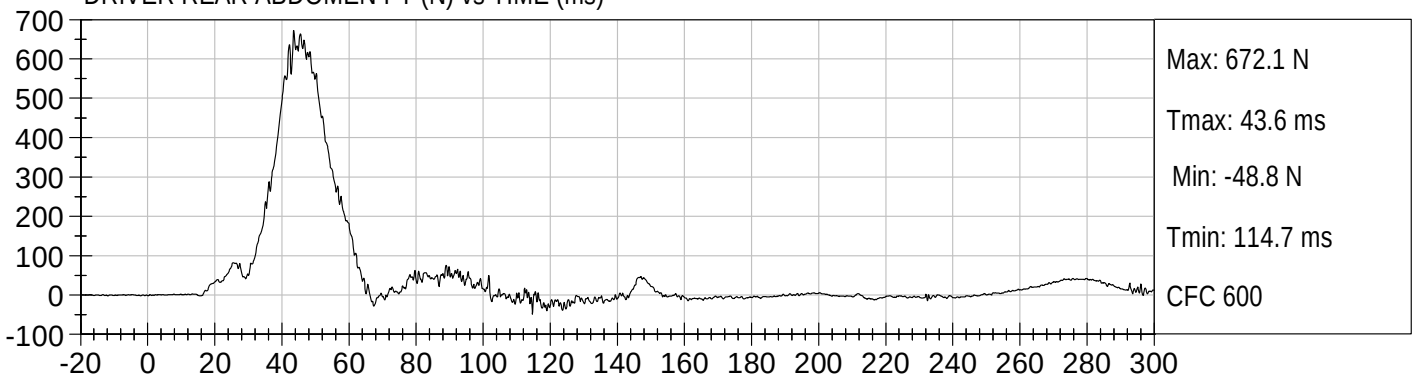
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



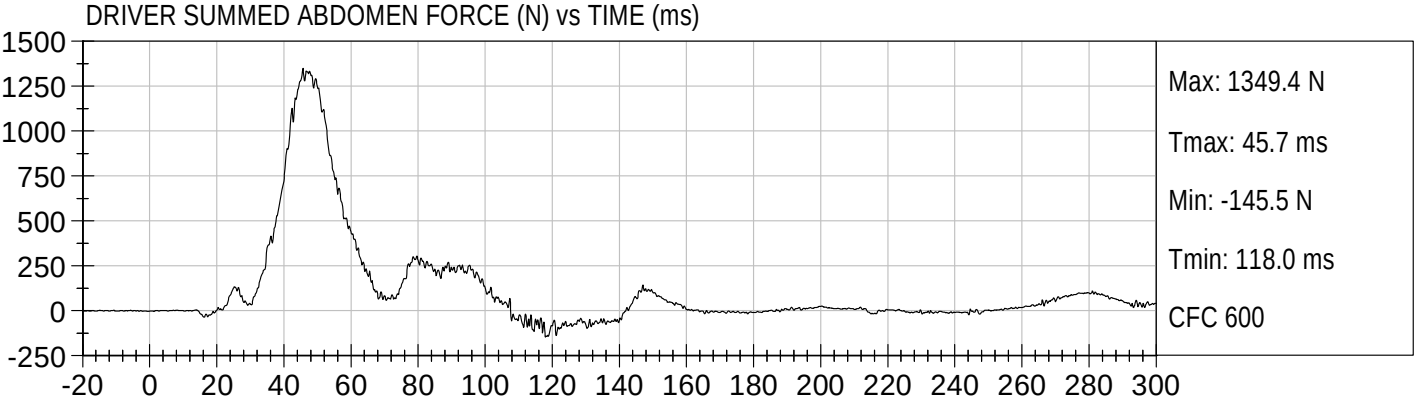

DRIVER MID ABDOMEN FY (N) vs TIME (ms)




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

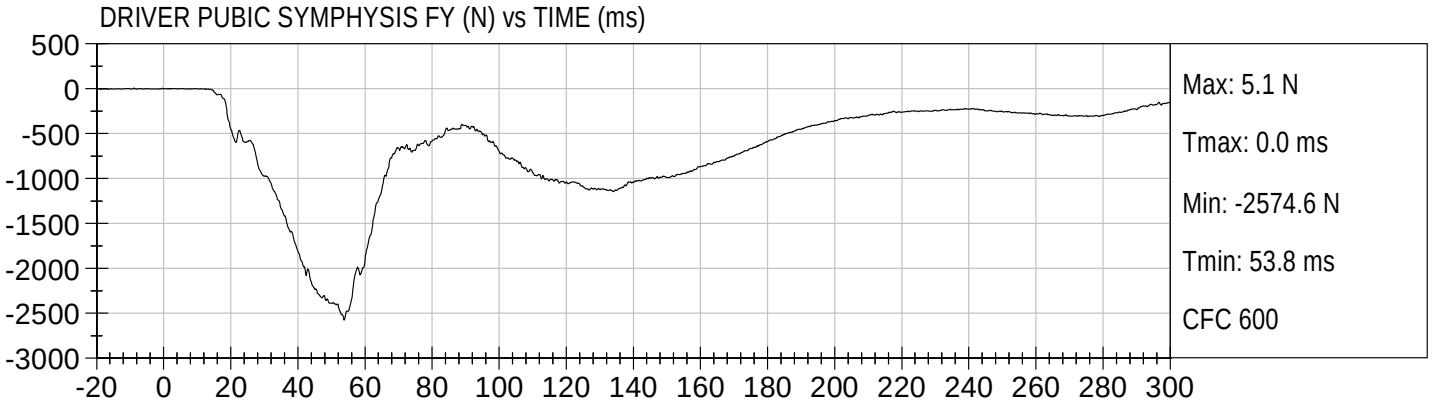



DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)



# APPENDIX C

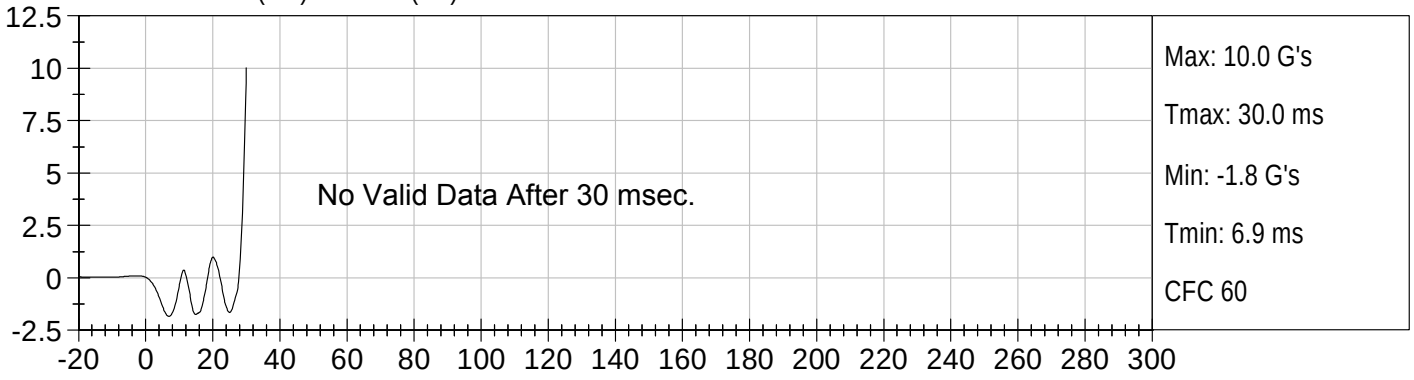
# VEHICLE ACCELEROMETER RESPONSE DATA

## TABLE OF DATA PLOTS

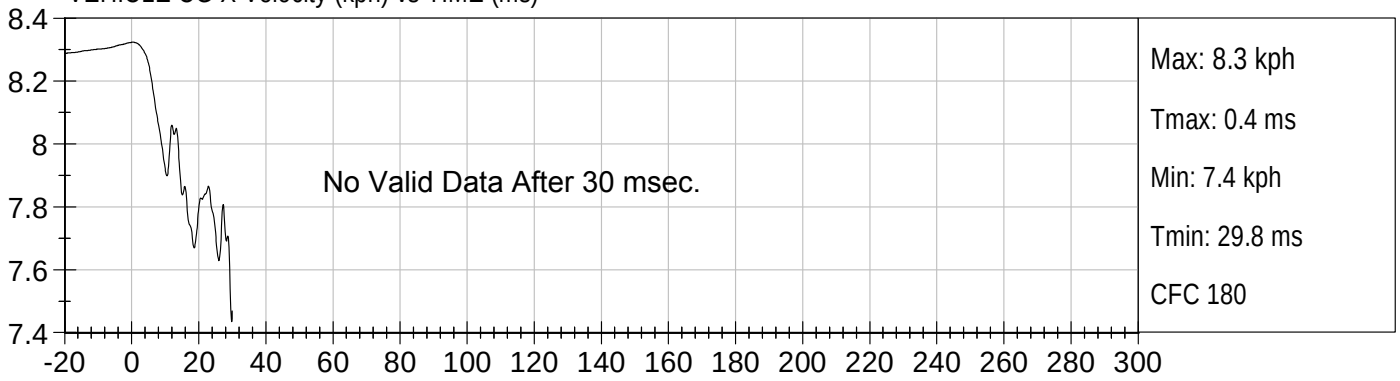
FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

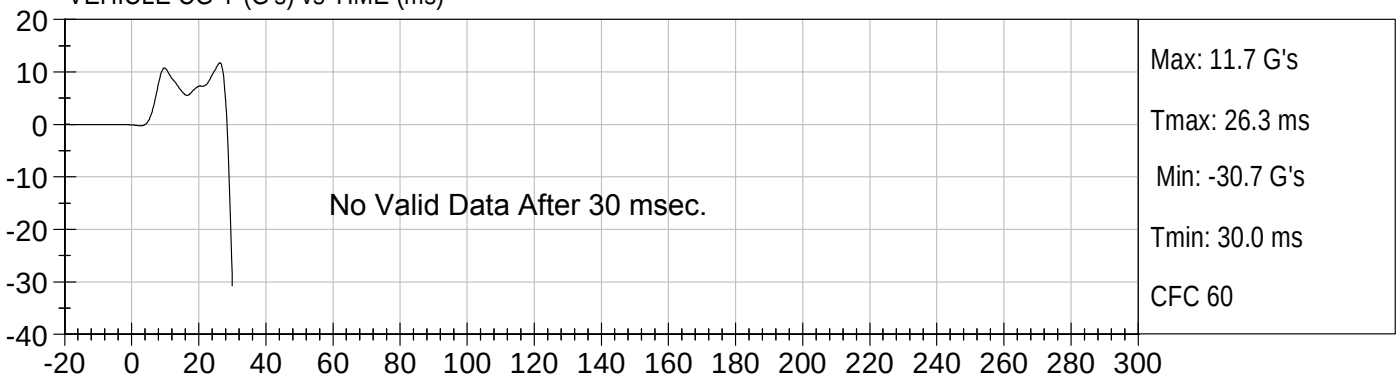
VEHICLE CG X (G's) vs TIME (ms)



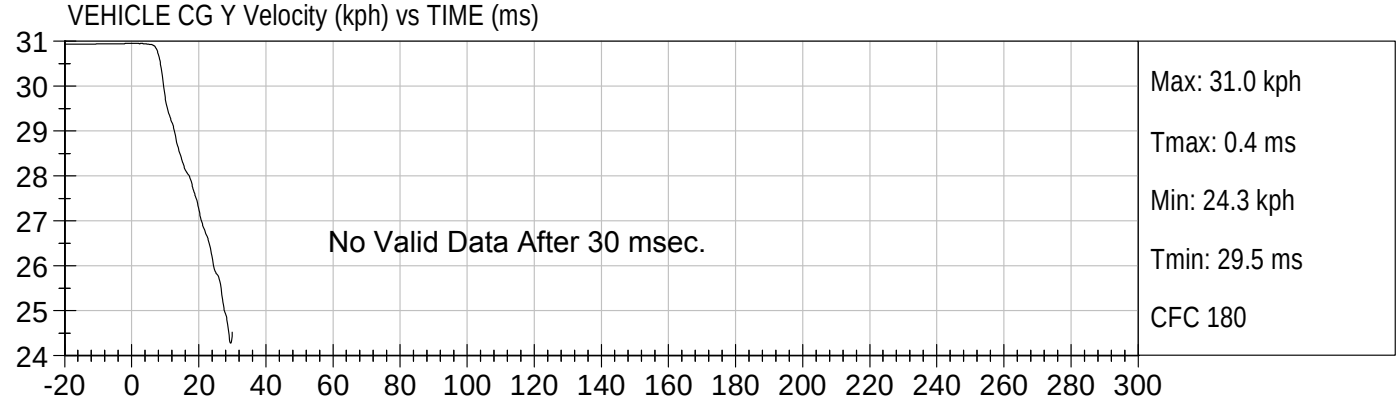

VEHICLE CG X Velocity (kph) vs TIME (ms)



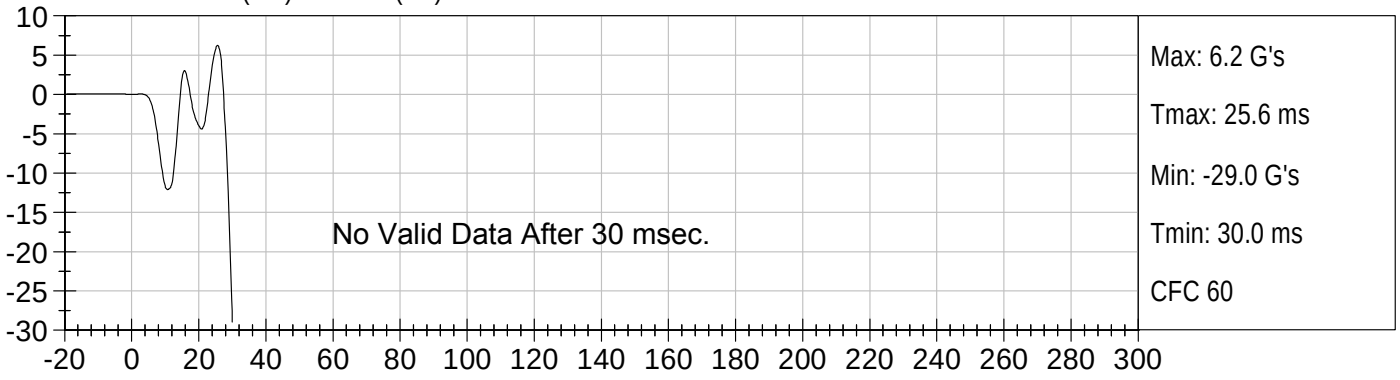

VEHICLE CG Y (G's) vs TIME (ms)



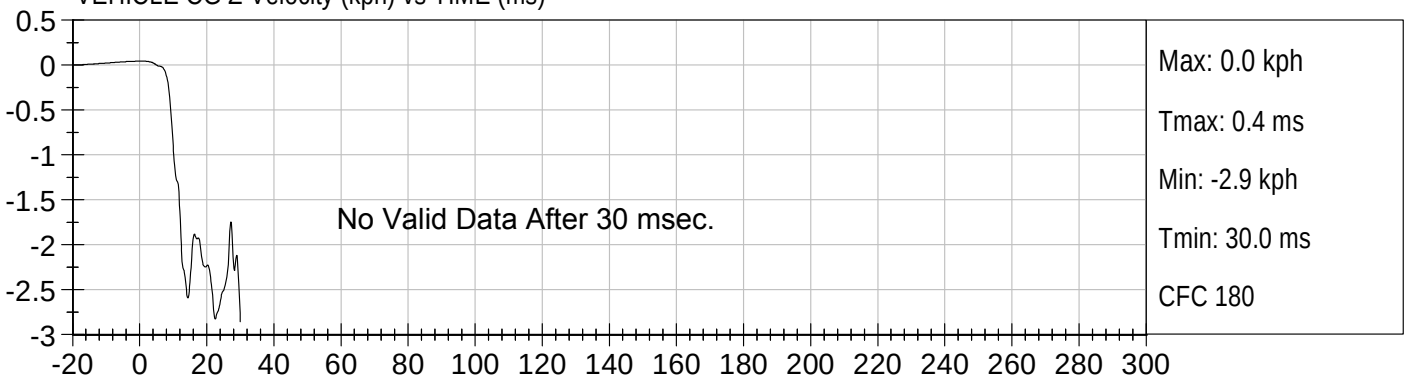

VEHICLE CG Y Velocity (kph) vs TIME (ms)



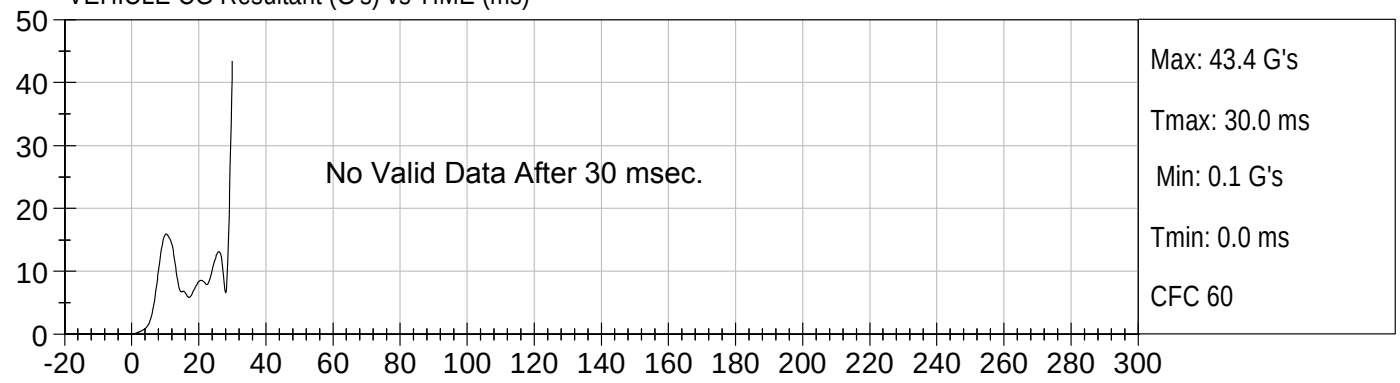
VEHICLE CG Z (G's) vs TIME (ms)



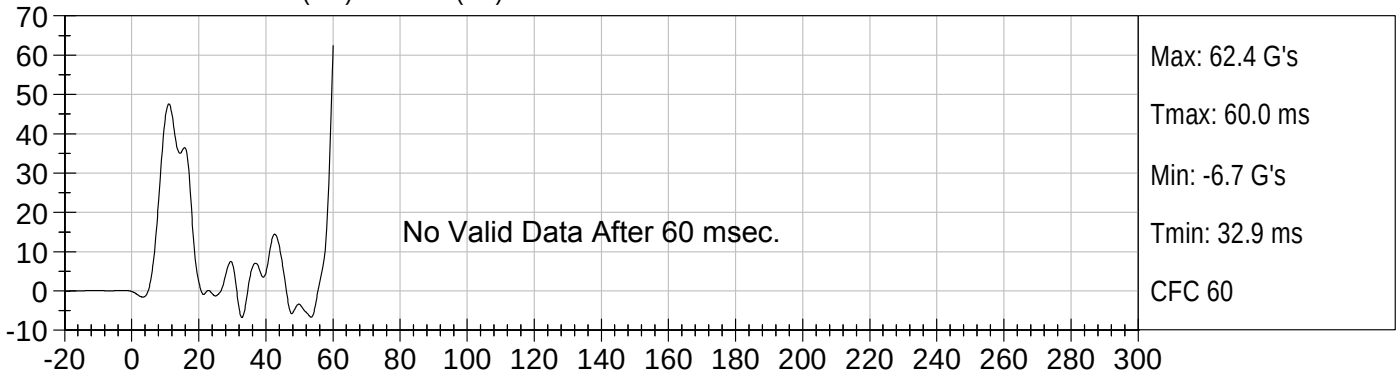

VEHICLE CG Z Velocity (kph) vs TIME (ms)



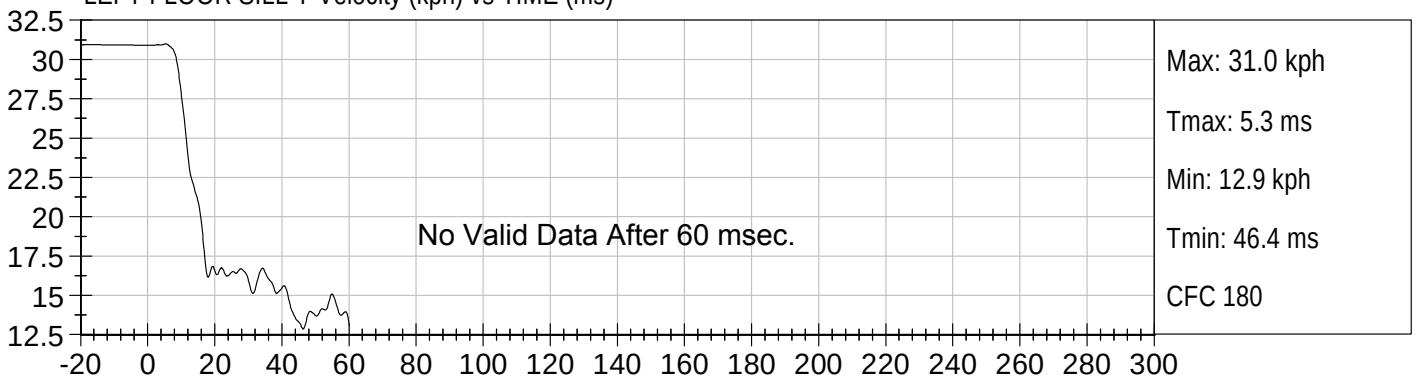

VEHICLE CG Resultant (G's) vs TIME (ms)



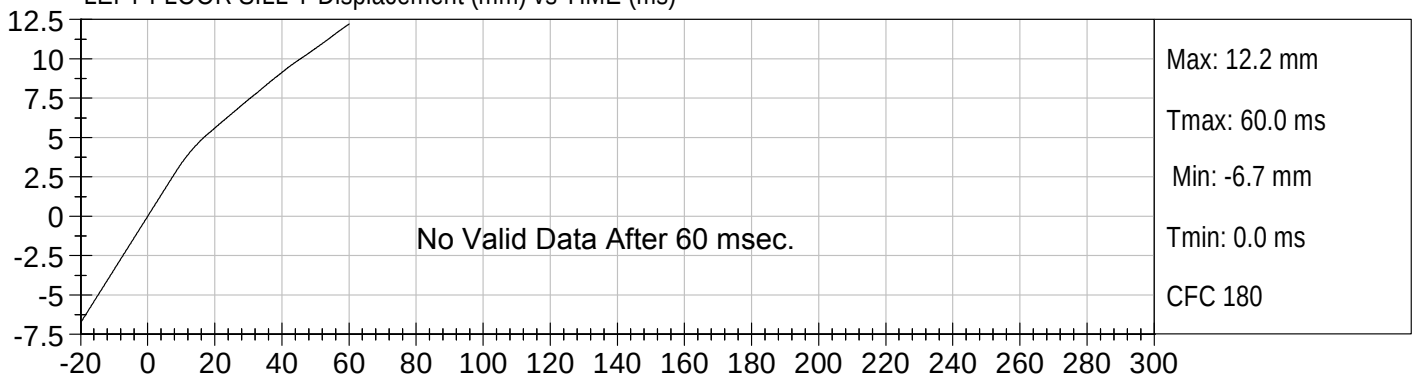
LEFT FLOOR SILL Y (G's) vs TIME (ms)



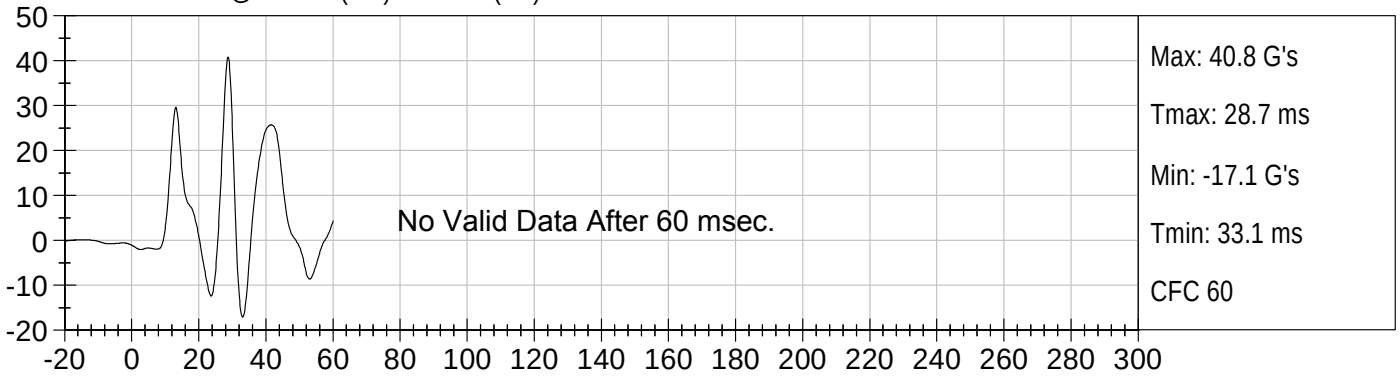

LEFT FLOOR SILL Y Velocity (kph) vs TIME (ms)



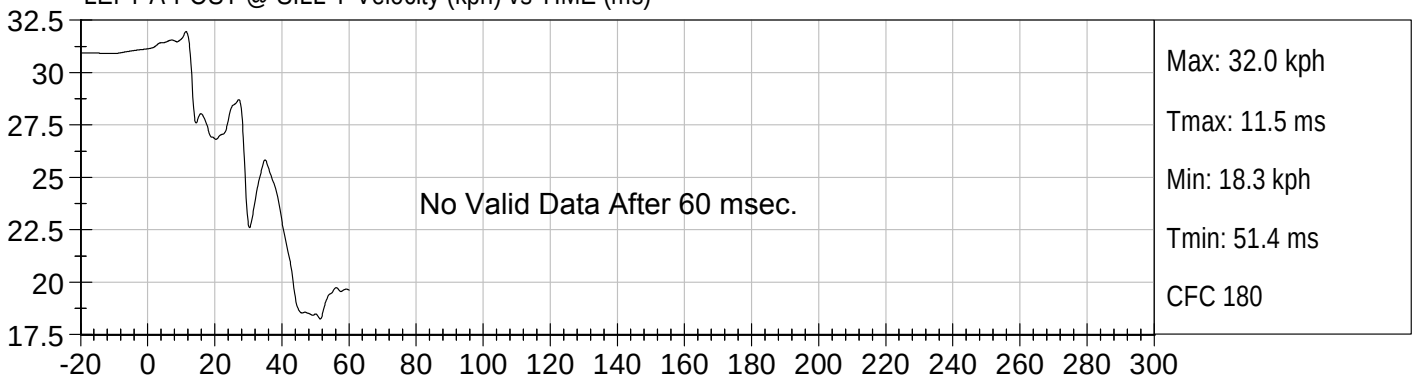

LEFT FLOOR SILL Y Displacement (mm) vs TIME (ms)



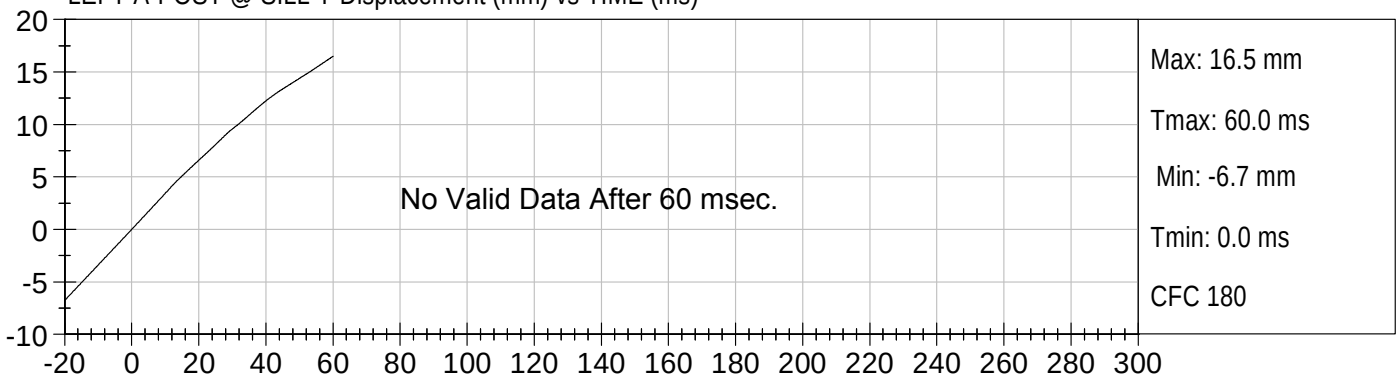
LEFT A-POST @ SILL Y (G's) vs TIME (ms)



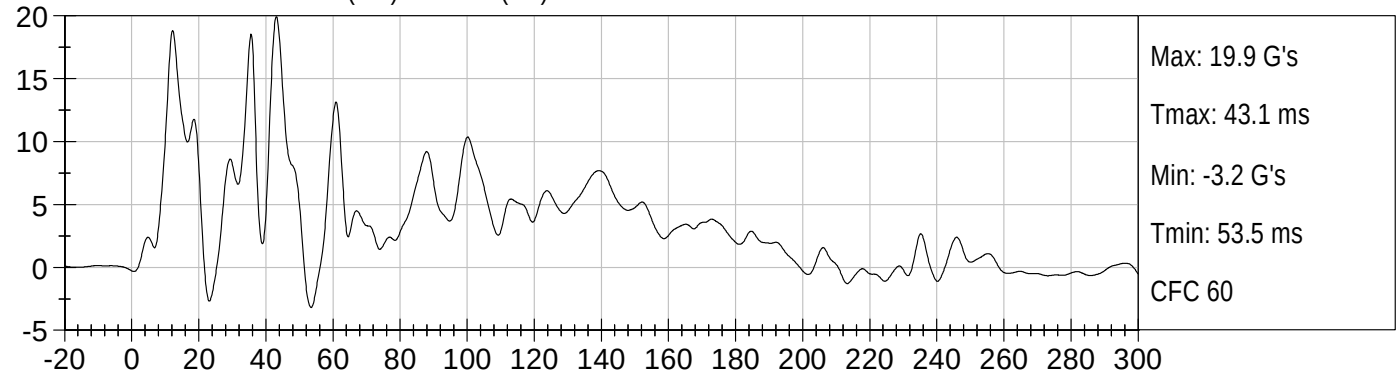

LEFT A-POST @ SILL Y Velocity (kph) vs TIME (ms)



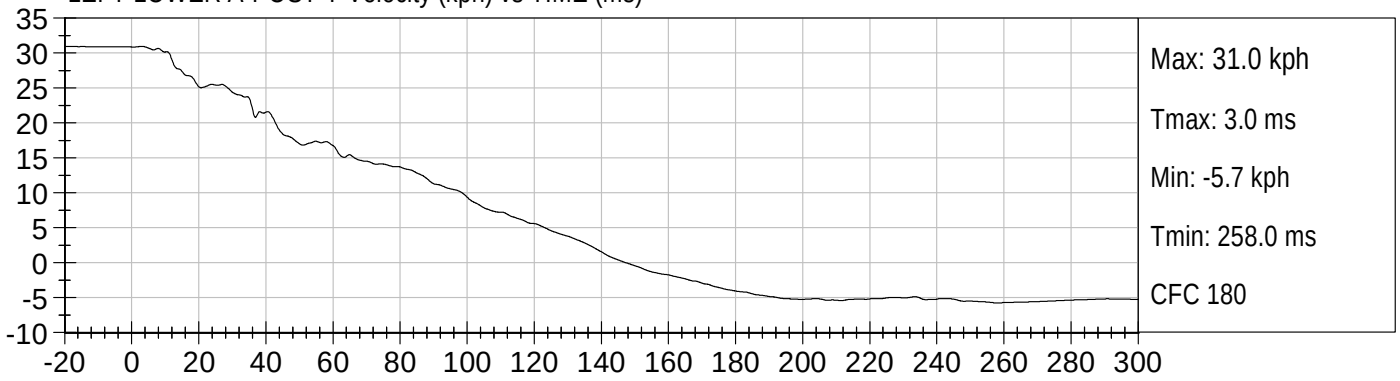

LEFT A-POST @ SILL Y Displacement (mm) vs TIME (ms)



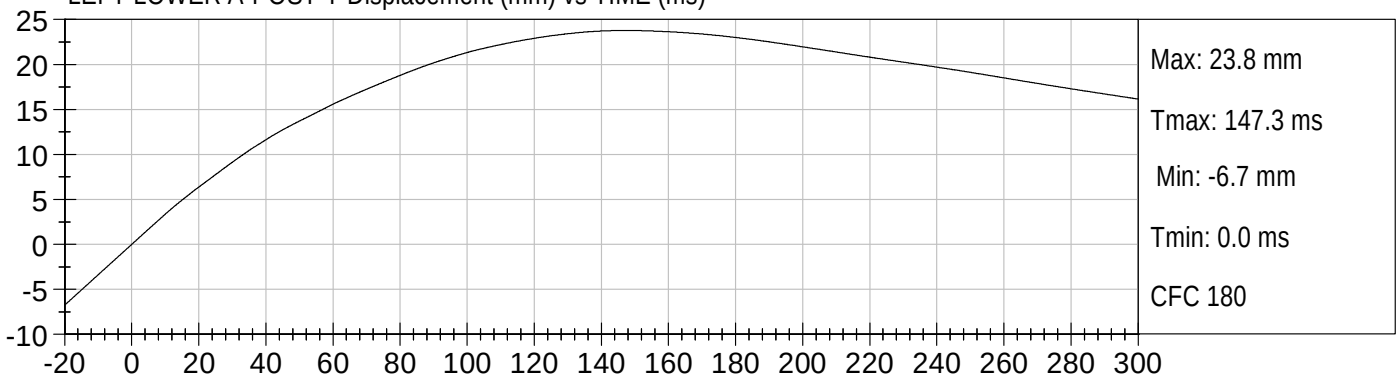
LEFT LOWER A-POST Y (G's) vs TIME (ms)



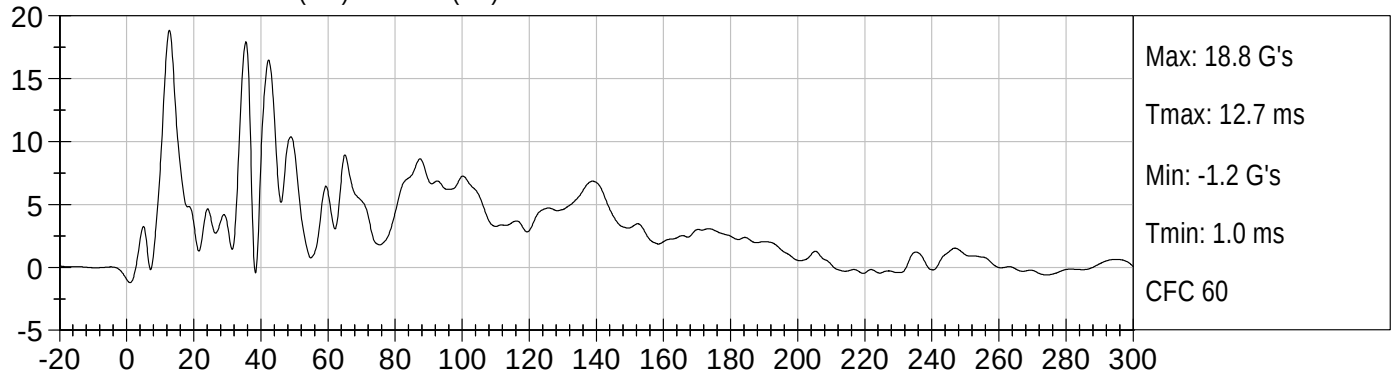

LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)



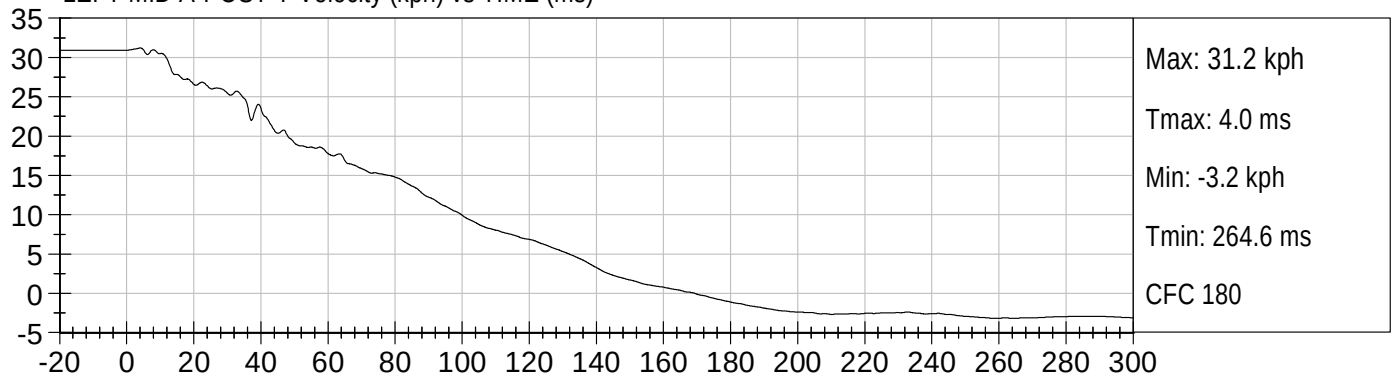

LEFT LOWER A-POST Y Displacement (mm) vs TIME (ms)



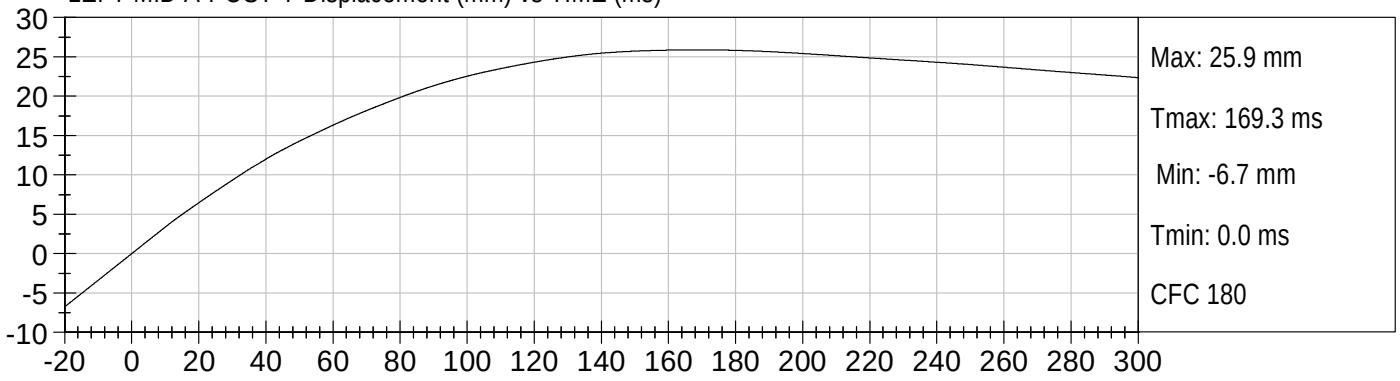
LEFT MID A-POST Y (G's) vs TIME (ms)



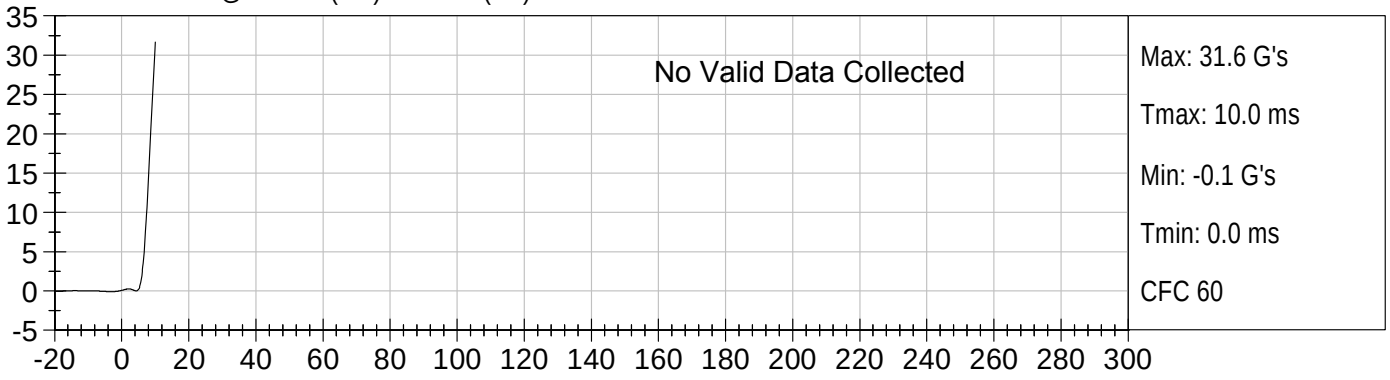

LEFT MID A-POST Y Velocity (kph) vs TIME (ms)



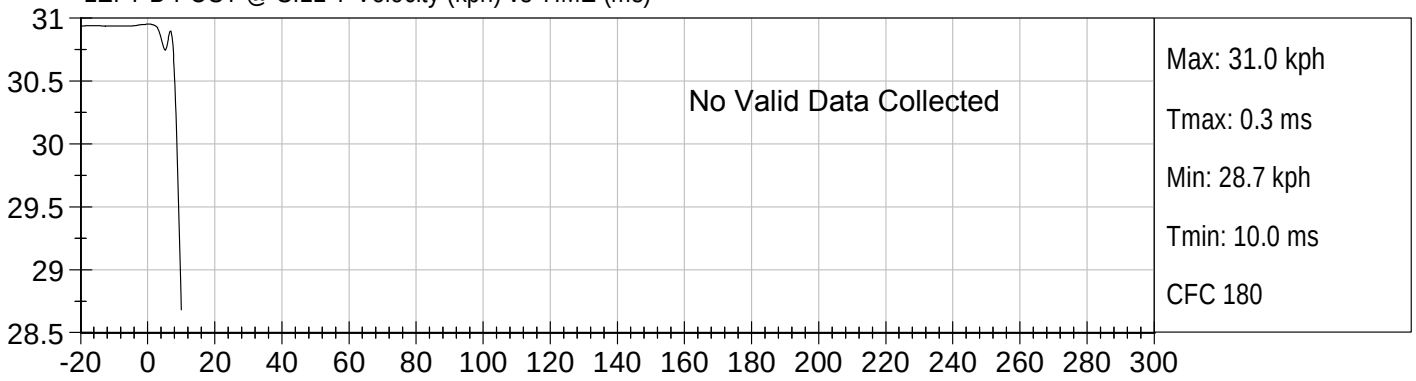

LEFT MID A-POST Y Displacement (mm) vs TIME (ms)



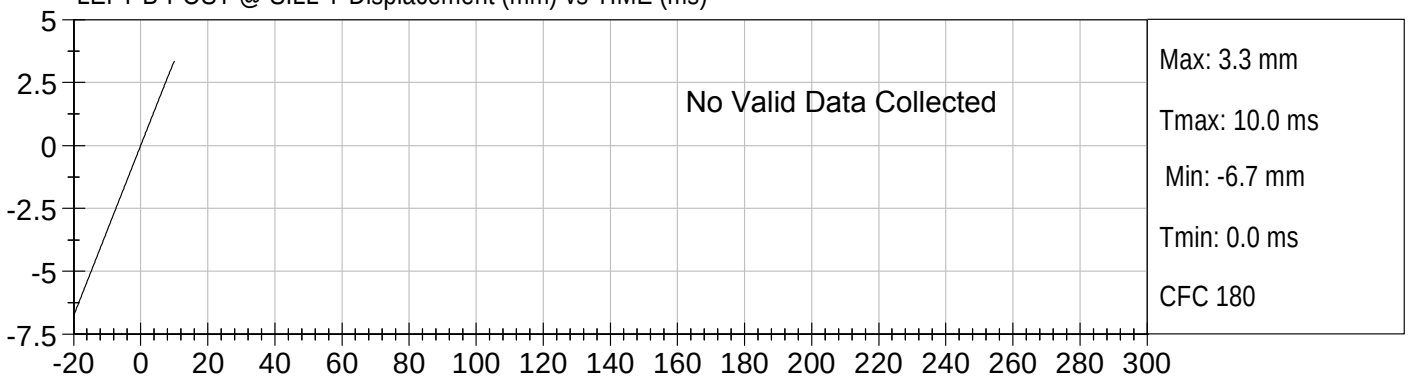
LEFT B-POST @ SILL Y (G's) vs TIME (ms)




LEFT B-POST @ SILL Y Velocity (kph) vs TIME (ms)



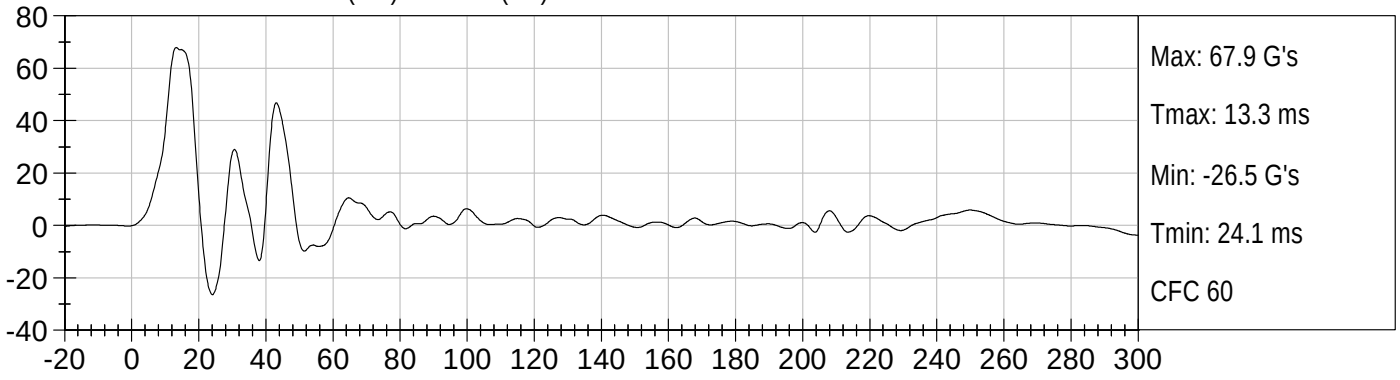

LEFT B-POST @ SILL Y Displacement (mm) vs TIME (ms)



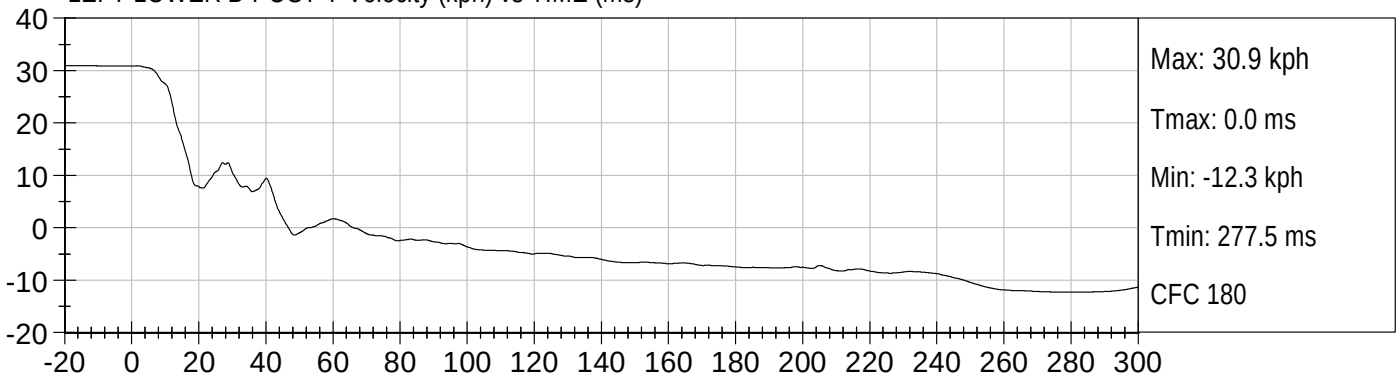
FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

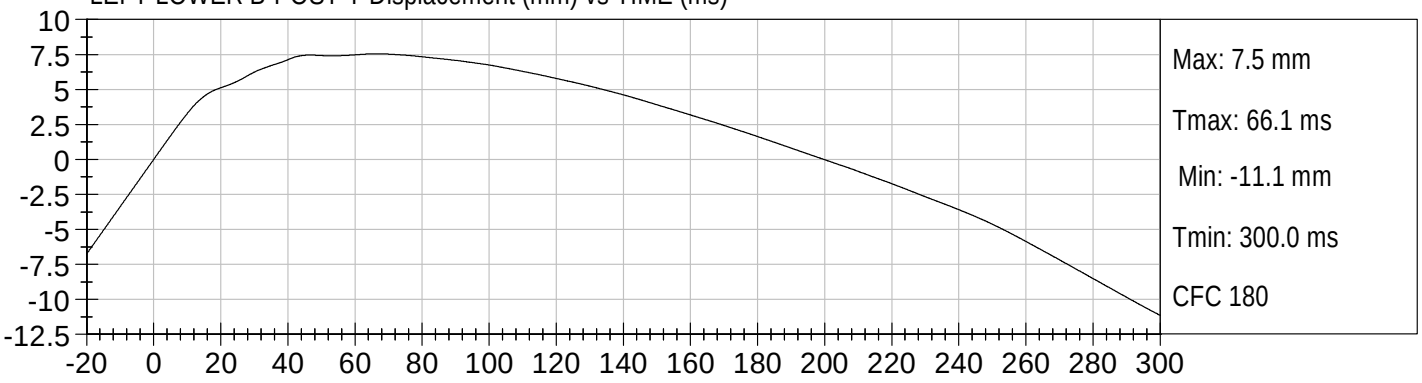
LEFT LOWER B-POST Y (G's) vs TIME (ms)



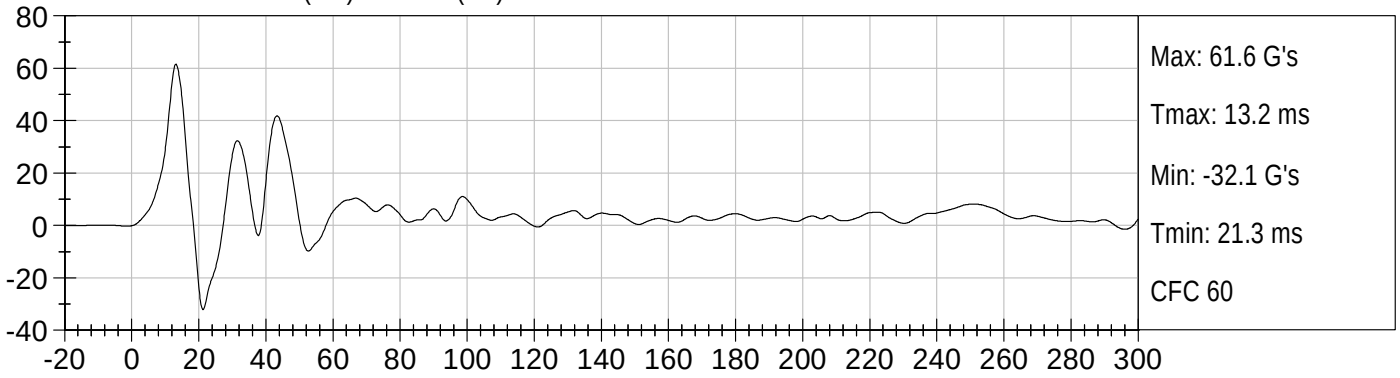

LEFT LOWER B-POST Y Velocity (kph) vs TIME (ms)



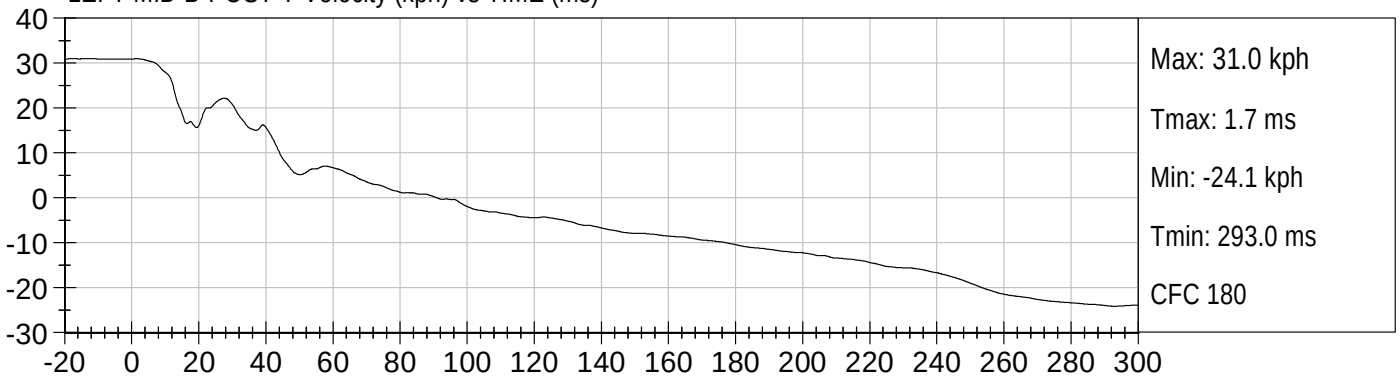

LEFT LOWER B-POST Y Displacement (mm) vs TIME (ms)



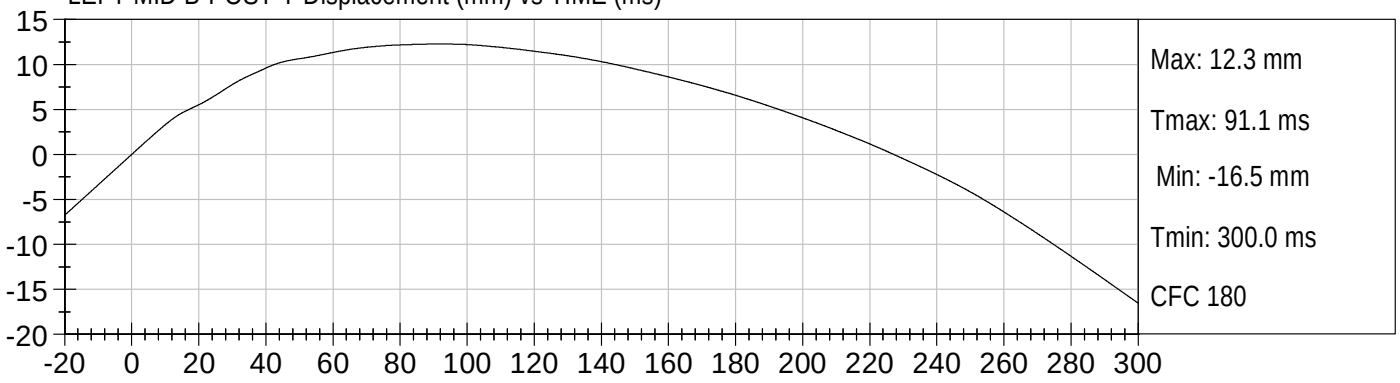
LEFT MID B-POST Y (G's) vs TIME (ms)




LEFT MID B-POST Y Velocity (kph) vs TIME (ms)



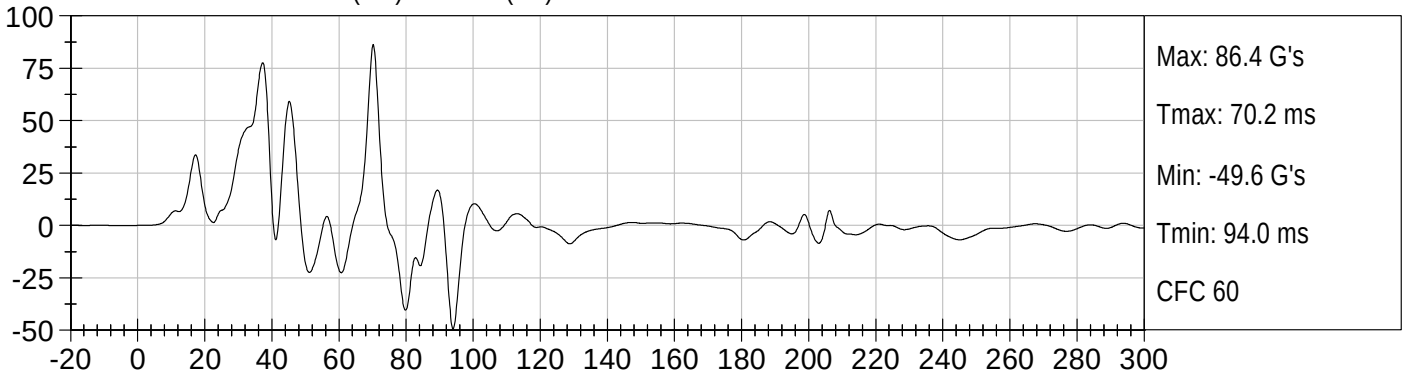

LEFT MID B-POST Y Displacement (mm) vs TIME (ms)



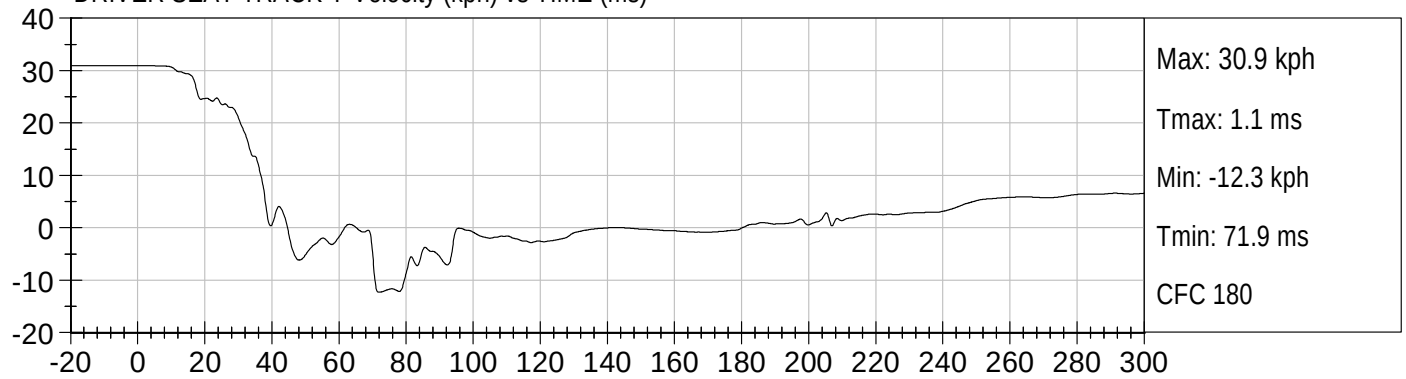
FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

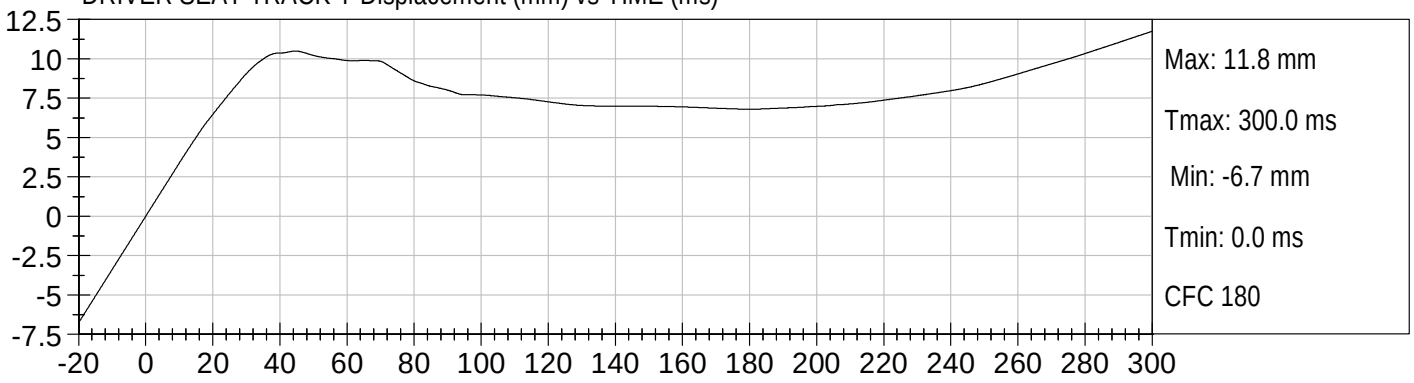
DRIVER SEAT TRACK Y (G's) vs TIME (ms)



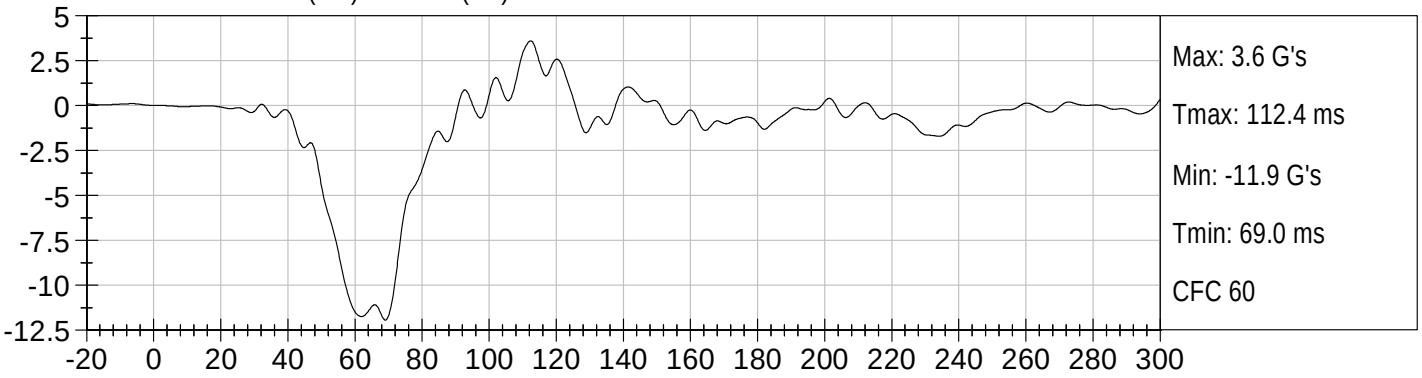

DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)



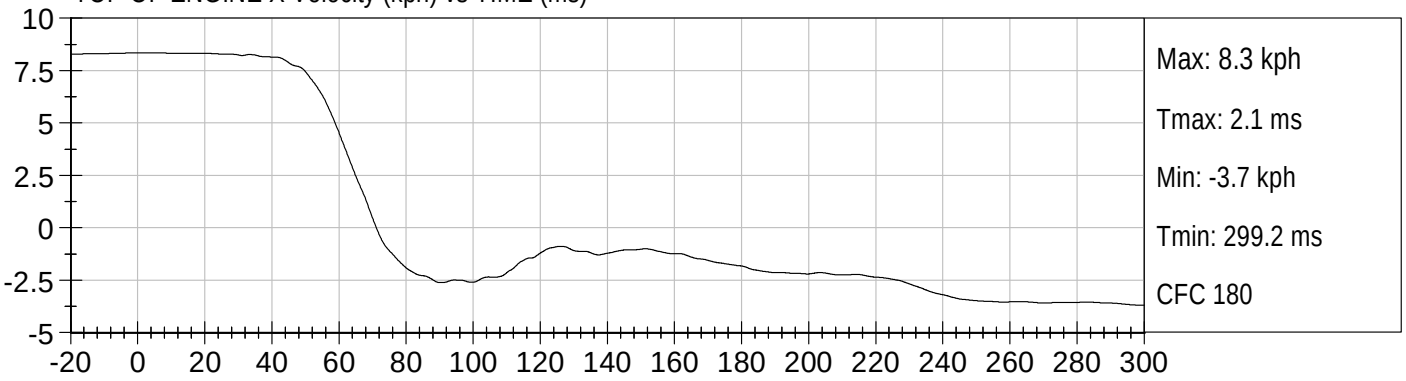

DRIVER SEAT TRACK Y Displacement (mm) vs TIME (ms)



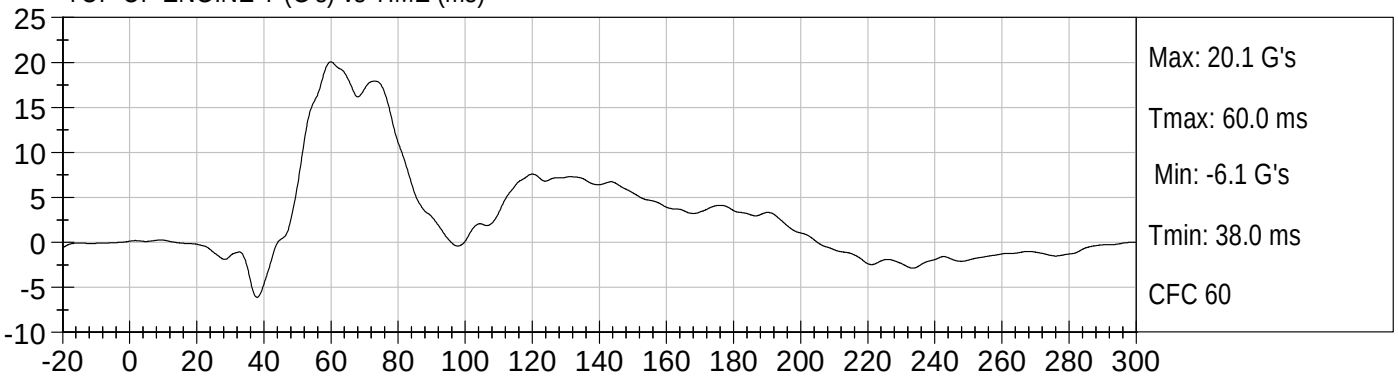
TOP OF ENGINE X (G's) vs TIME (ms)



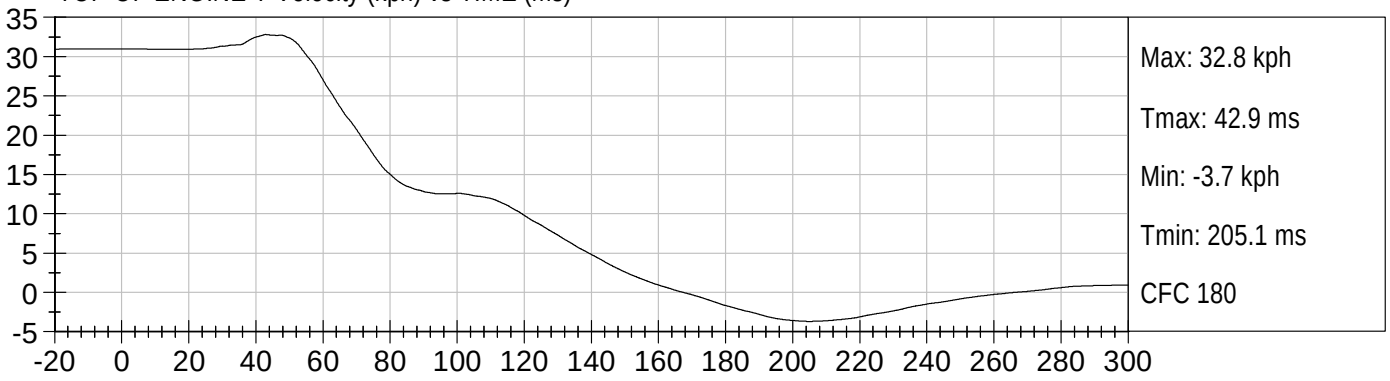

TOP OF ENGINE X Velocity (kph) vs TIME (ms)




TOP OF ENGINE Y (G's) vs TIME (ms)

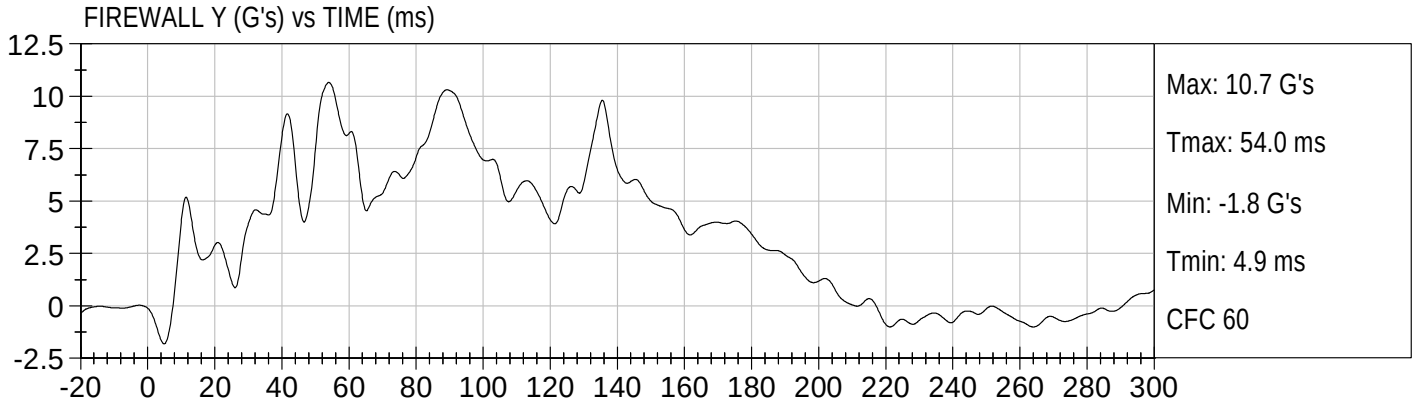


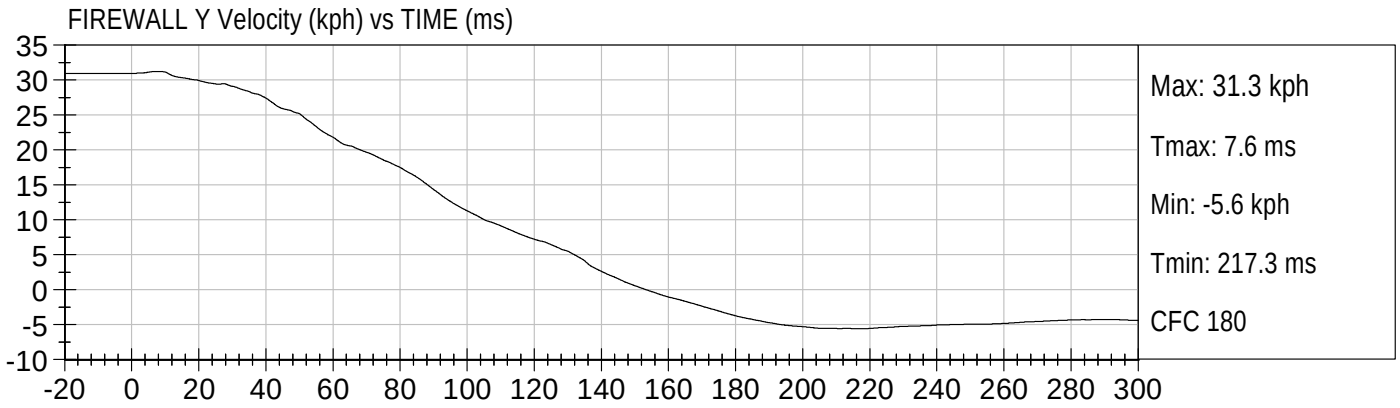

TOP OF ENGINE Y Velocity (kph) vs TIME (ms)



FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

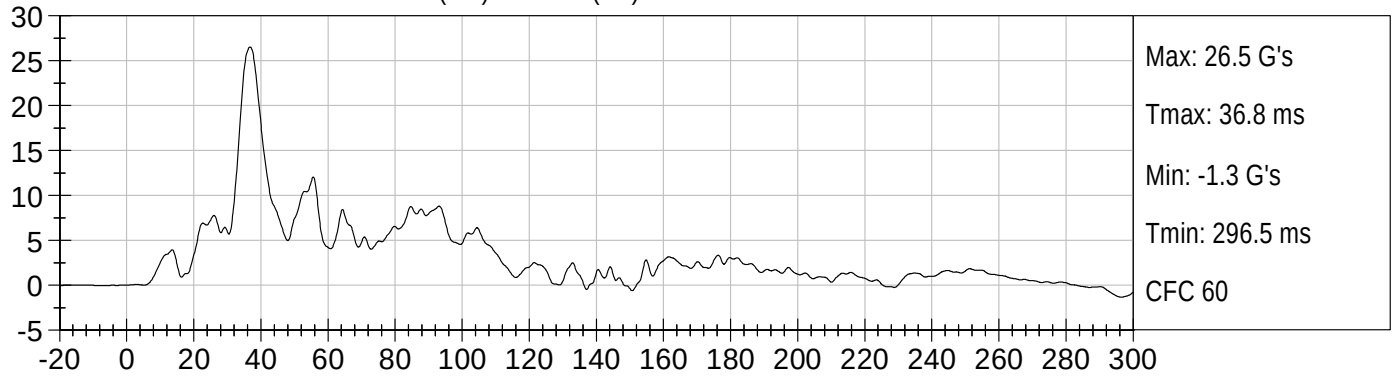


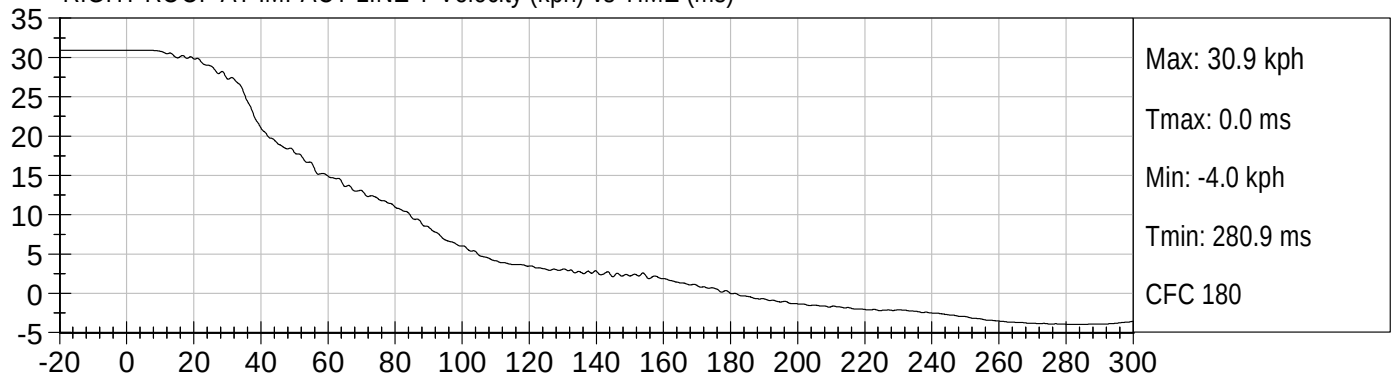
FMVSS 214 Rigid Pole Side Impact
2010 Ford F-150 - CA0208

Test Date: 01/25/2010
Speed: 19.9 mph (32.0 km/h)

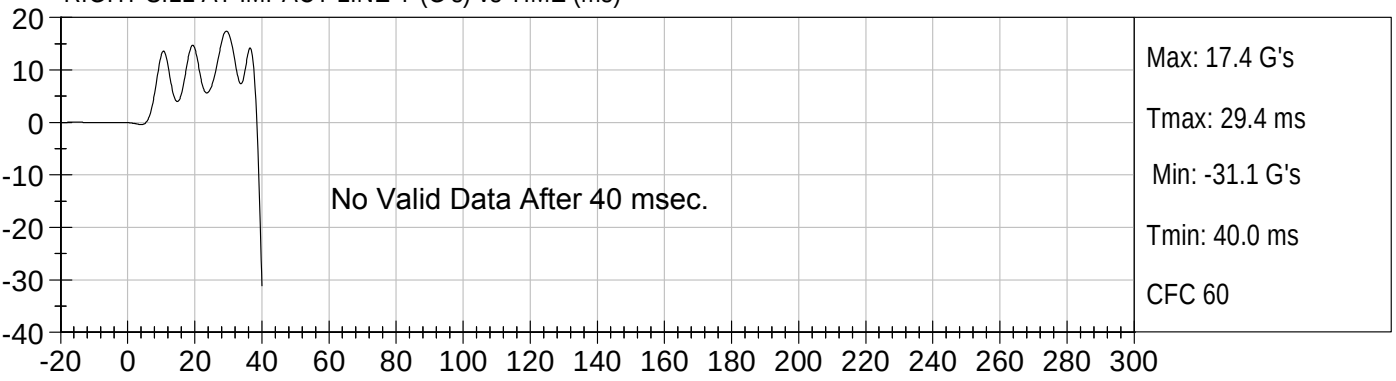
RIGHT ROOF AT IMPACT LINE Y (G's) vs TIME (ms)



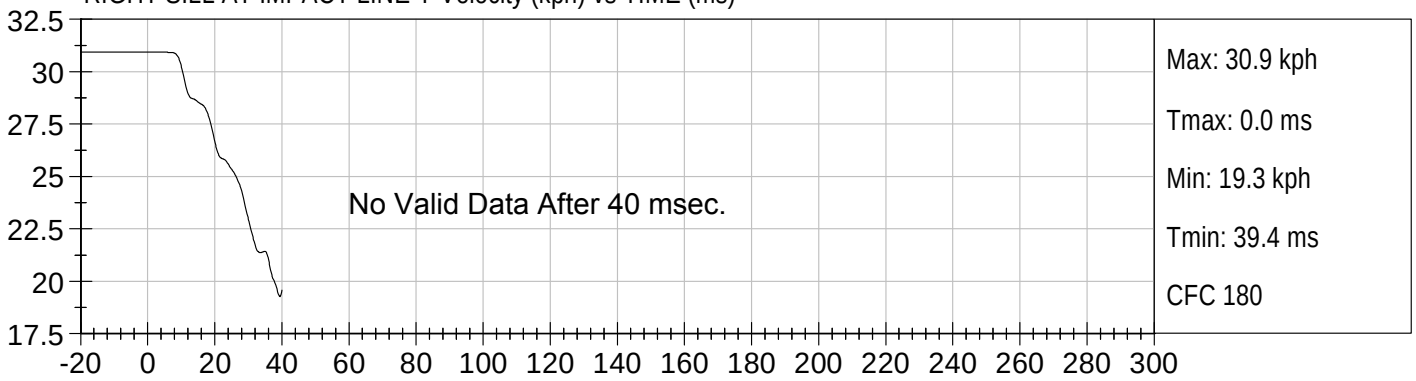

RIGHT ROOF AT IMPACT LINE Y Velocity (kph) vs TIME (ms)



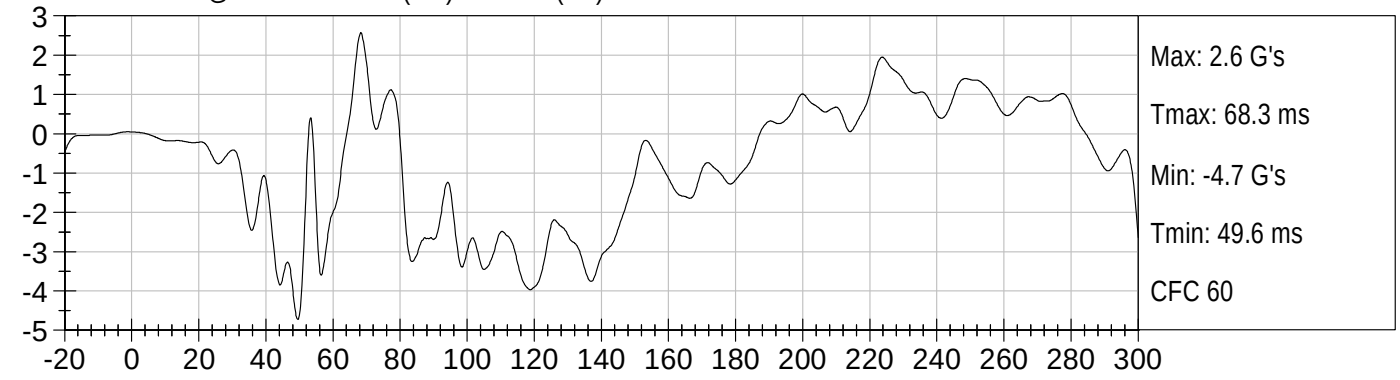

RIGHT SILL AT IMPACT LINE Y (G's) vs TIME (ms)



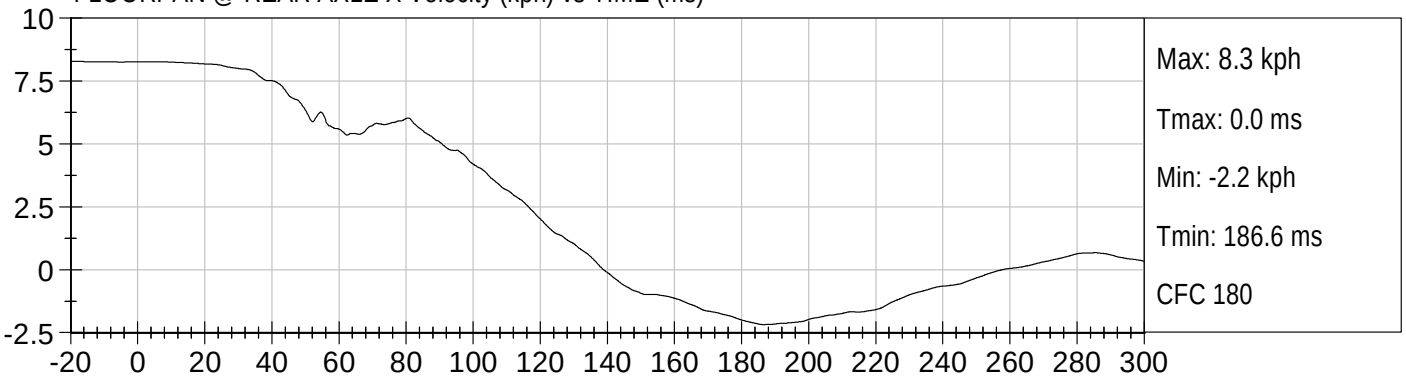

RIGHT SILL AT IMPACT LINE Y Velocity (kph) vs TIME (ms)



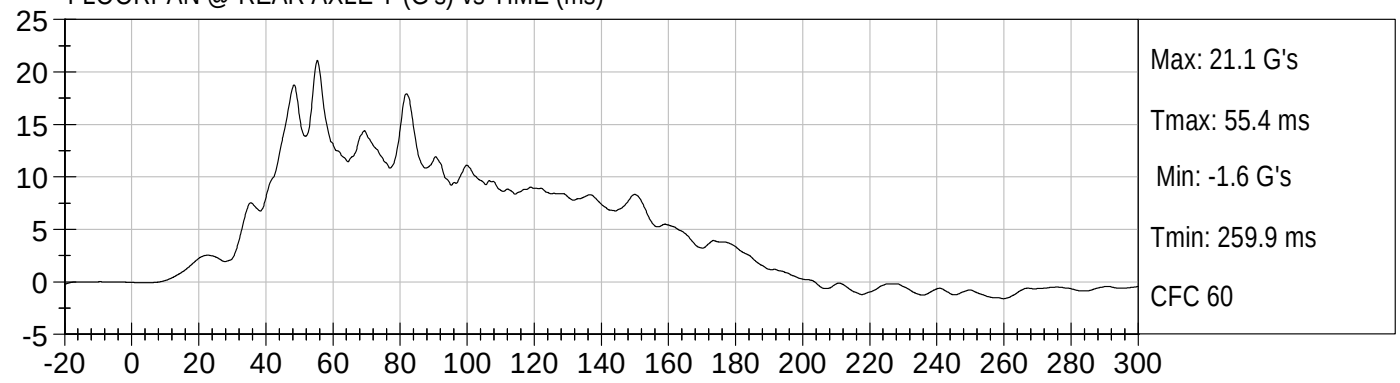
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



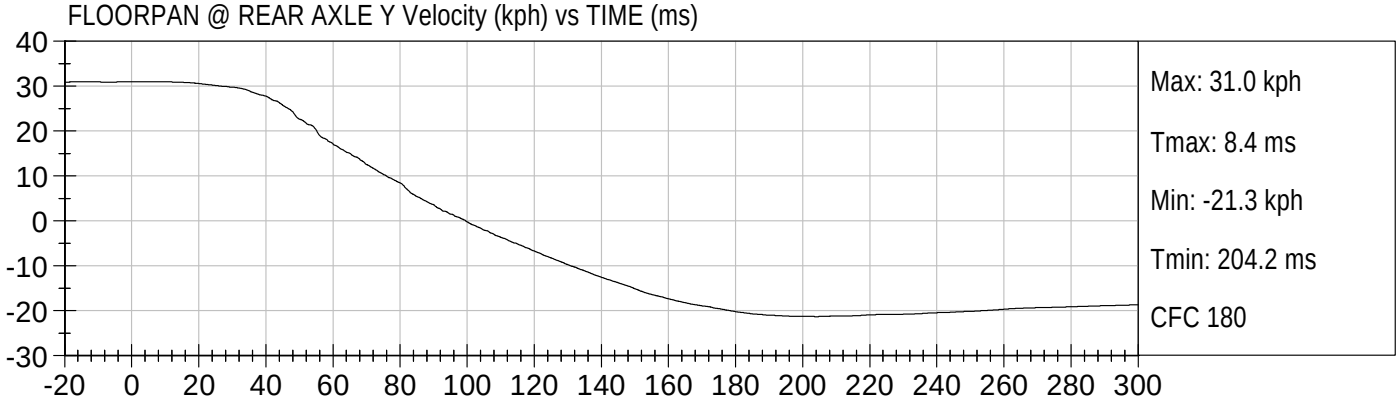

FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)




FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)




FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)



# APPENDIX D

# DUMMY PERFORMANCE CALIBRATION TEST DATA

**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test ID:** D10161

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.6 | 21.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 24 | Pass |
| Peak Resultant Acceleration | G's | 125 to 155 | 149 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | 5.9 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 15% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

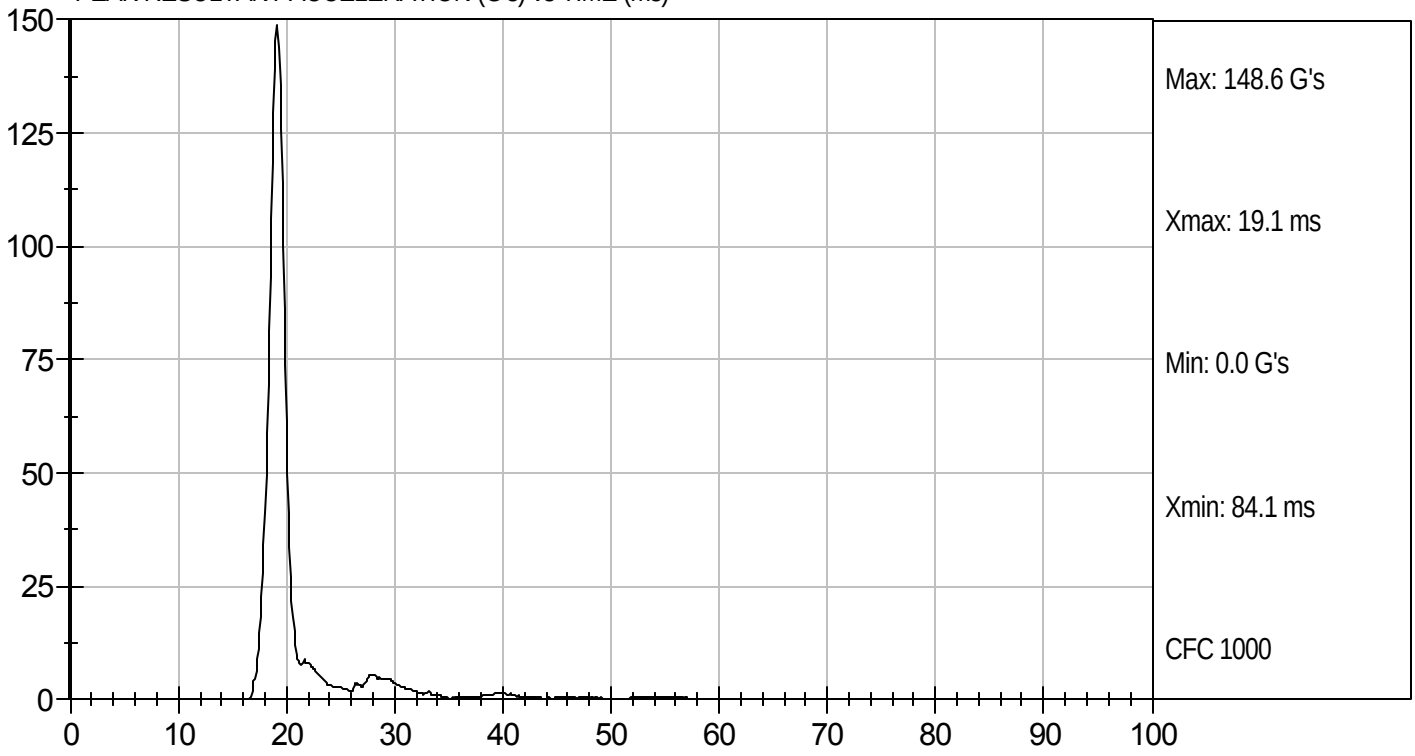
1/22/10
Test Date

David Winkelbauer
Approved By

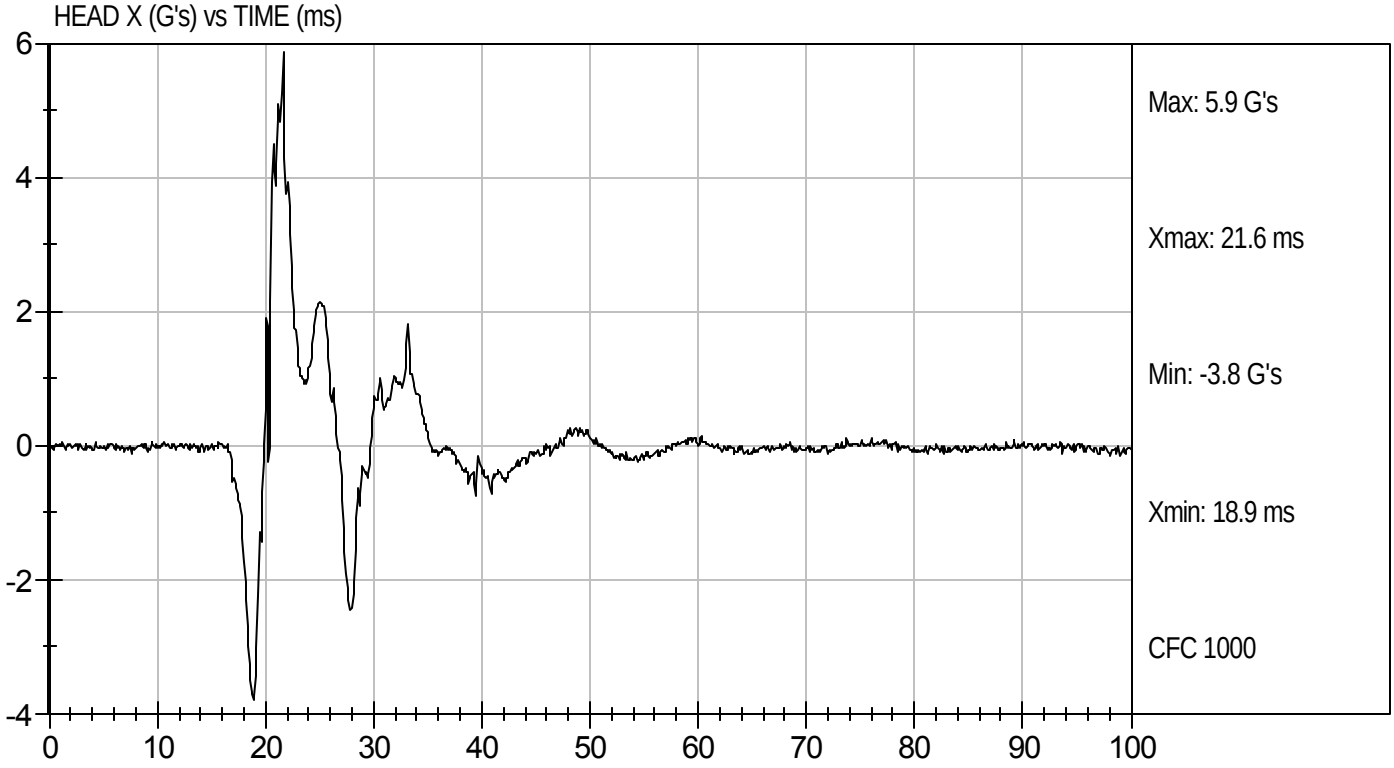
Test Desc: Head Drop
Component ID: D10161

Test Date: 1/22/10
Velocity: 0 ft/s, 0 m/s

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




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



**MGA RESEARCH CORPORATION**

**NECK PENDULUM TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10162

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 18.0 to 22.0 | 21.4 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 23 | 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 | -0.33 | Pass |
| | 14 ms | m/s | -3.20 to -3.70 | -3.32 | Pass |
| Maximum Flexion Angle | | deg | 49.0 to 59.0 | 51.6 | Pass |
| Time of Maximum Flexion Angle | | ms | 54.0 to 66.0 | 60.5 | Pass |
| Head Rotation Decay Time to 0 degree | | ms | 53.0 to 88.0 | 56.3 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

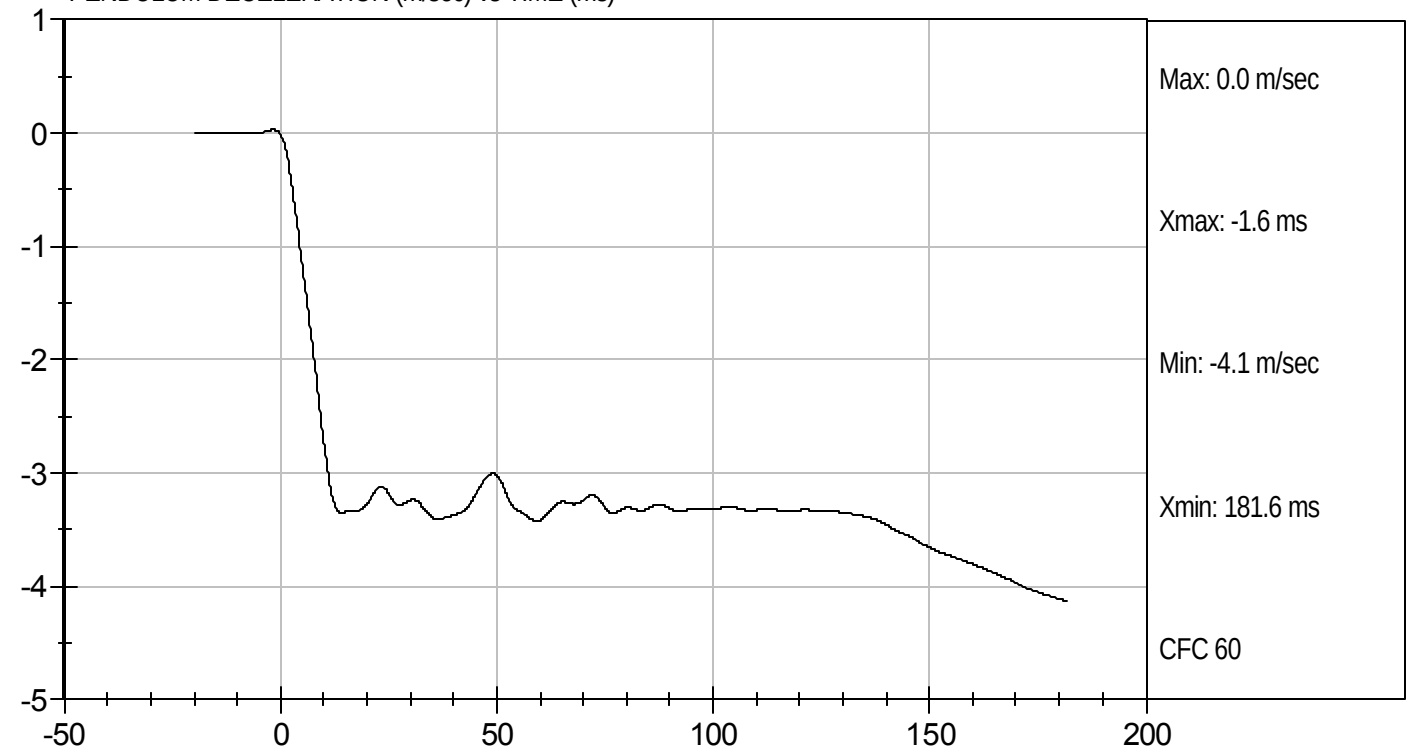
1/22/10
Test Date

David Winkelbauer
Approved By

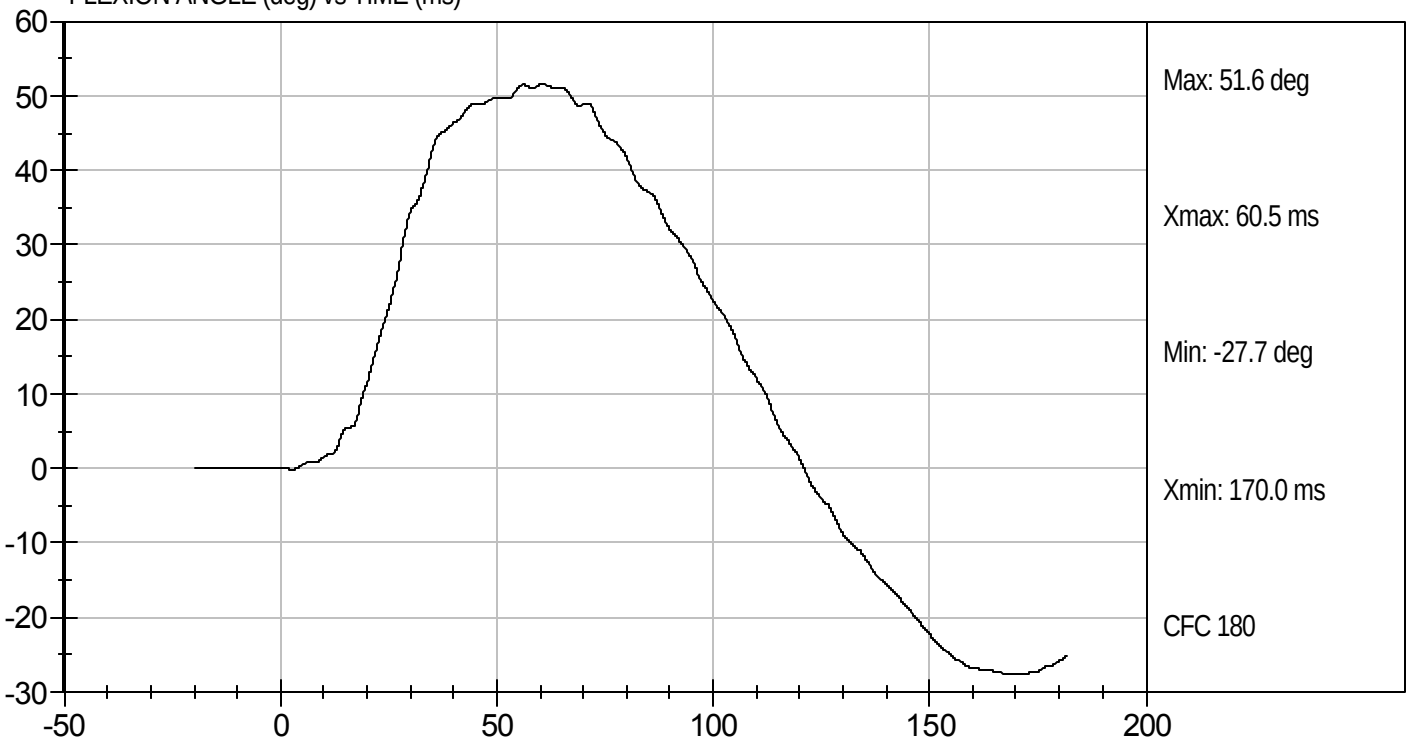
Test Desc: Neck Bending
Component ID: D10162

Test Date: 1/22/10
Velocity: 11.42 ft/s, 3.5 m/s

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

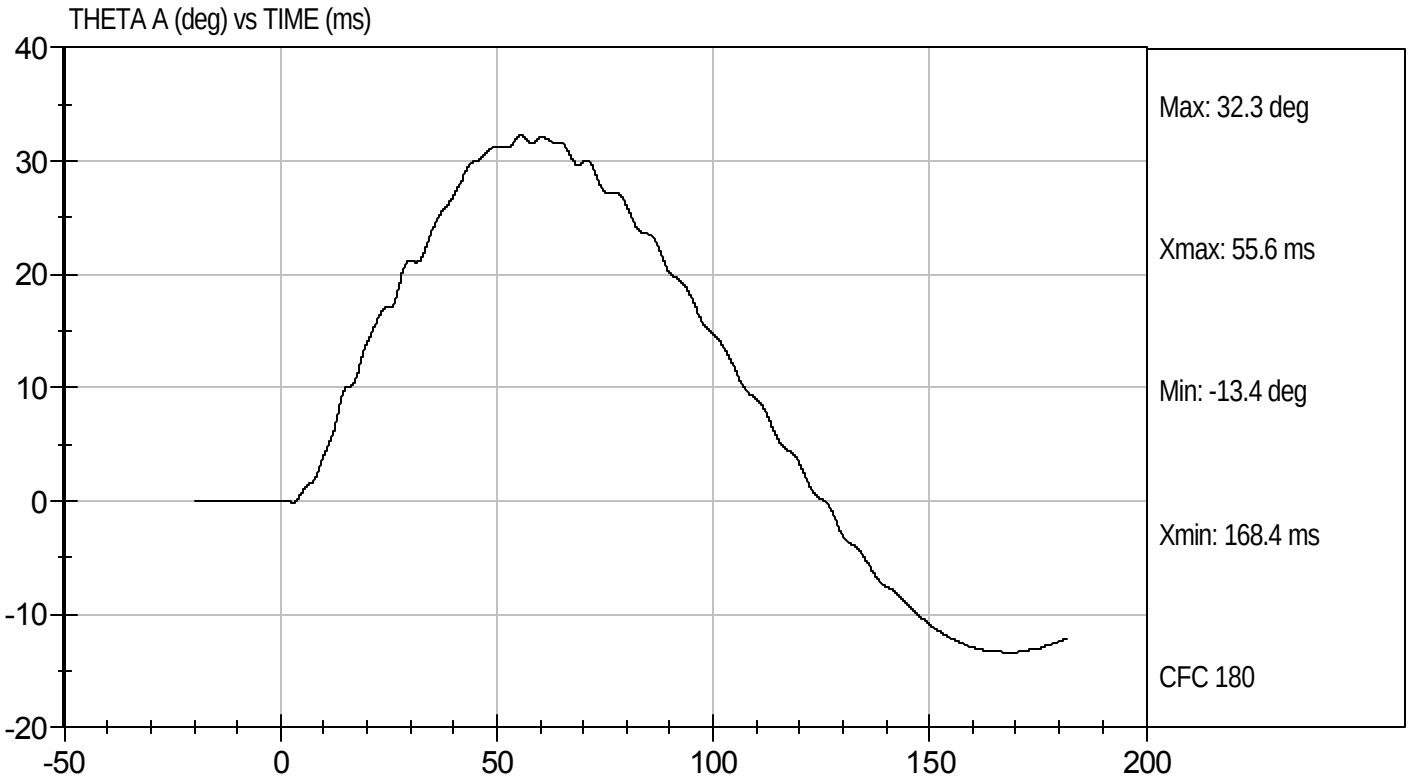


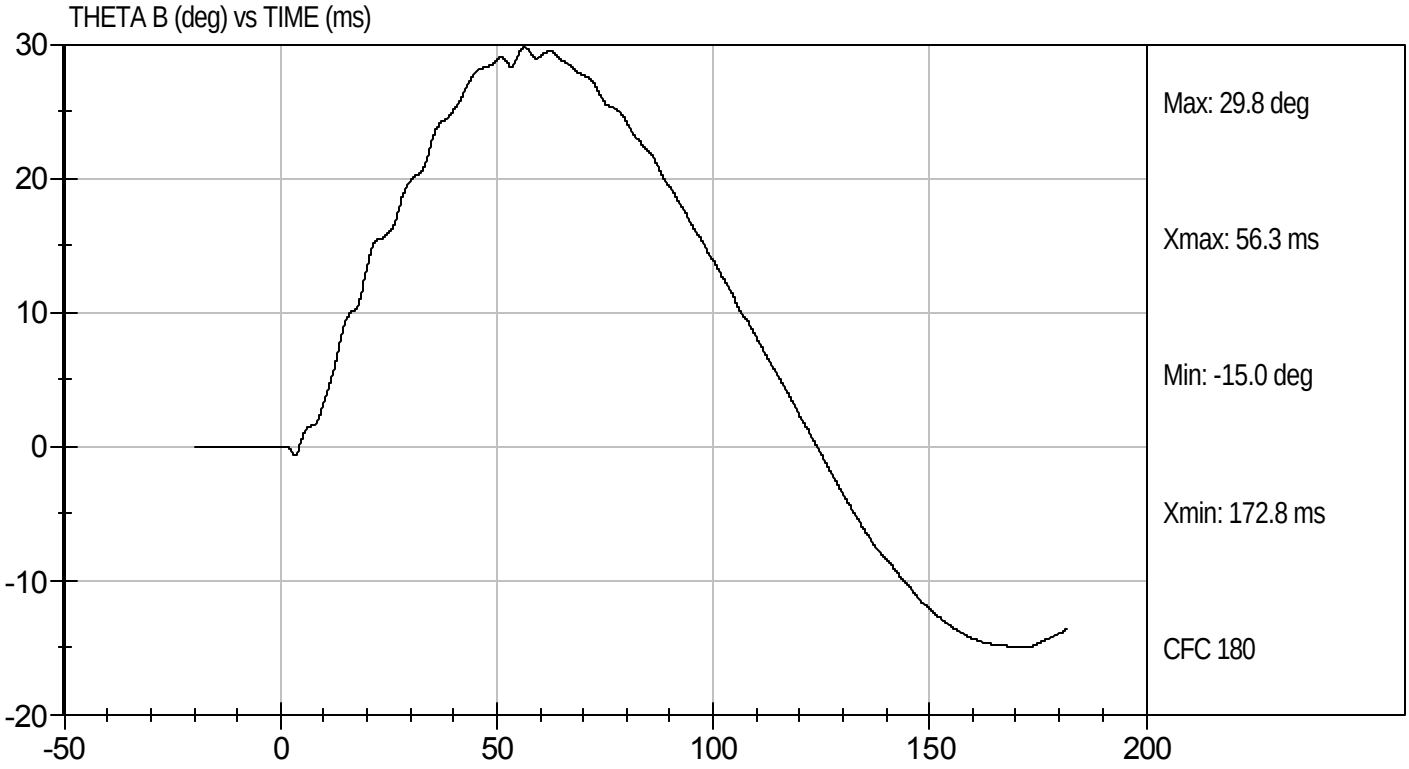

FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D10162

Test Date: 1/22/10
Velocity: 11.42 ft/s, 3.5 m/s



**MGA RESEARCH CORPORATION**

**SHOULDER IMPACT TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10163

| 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 | 23 | Pass |
| Pendulum Speed | m/s | 4.2 to 4.4 | 4.3 | Pass |
| Peak Shoulder Acceleration | G's | 7.5 to 10.5 | 7.8 | Pass |
| Time of Peak Shoulder Acceleration | ms | NA | 13.4 | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

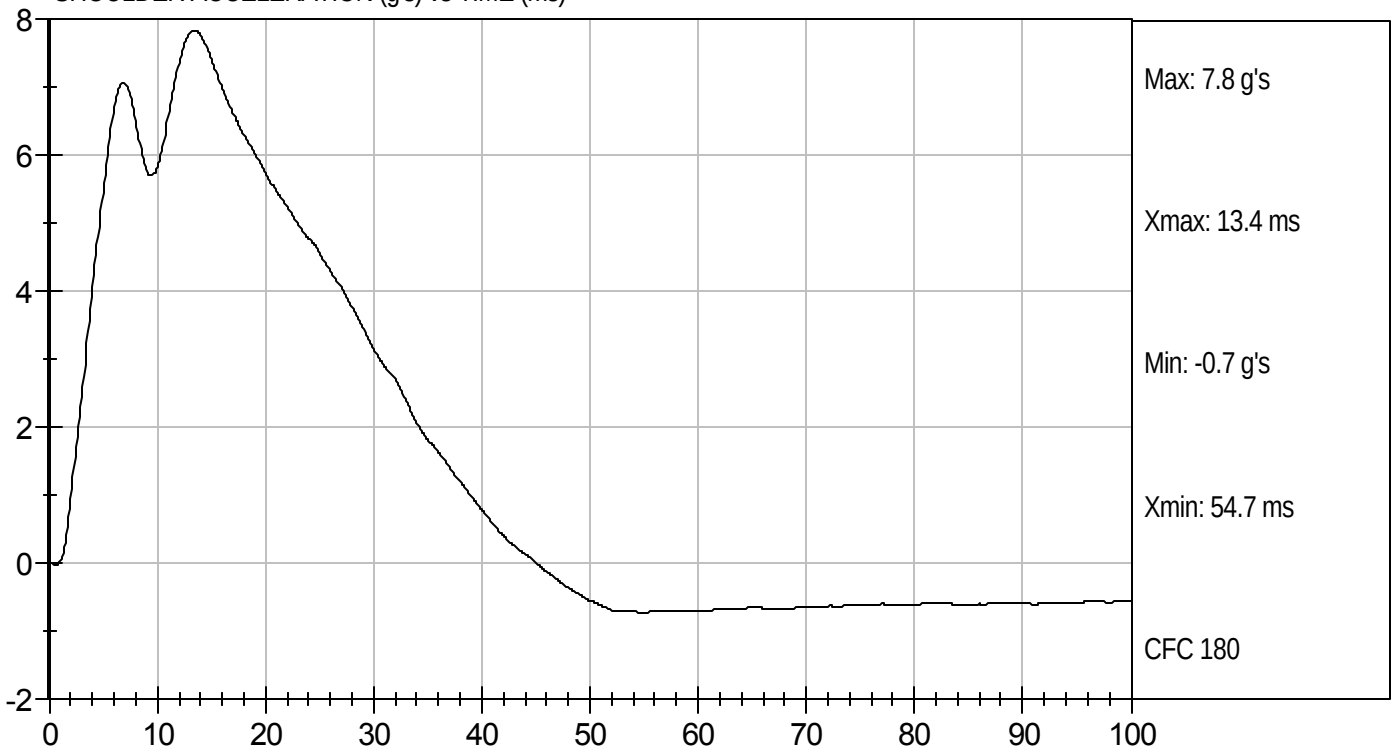
1/22/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D10163

Test Date: 1/22/10
Velocity: 14.12 ft/s, 4.3 m/s

SHOULDER ACCELERATION (g's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10164

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 23 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 37.5 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.0 | Pass |
| | | Overall Test Results | | Pass |

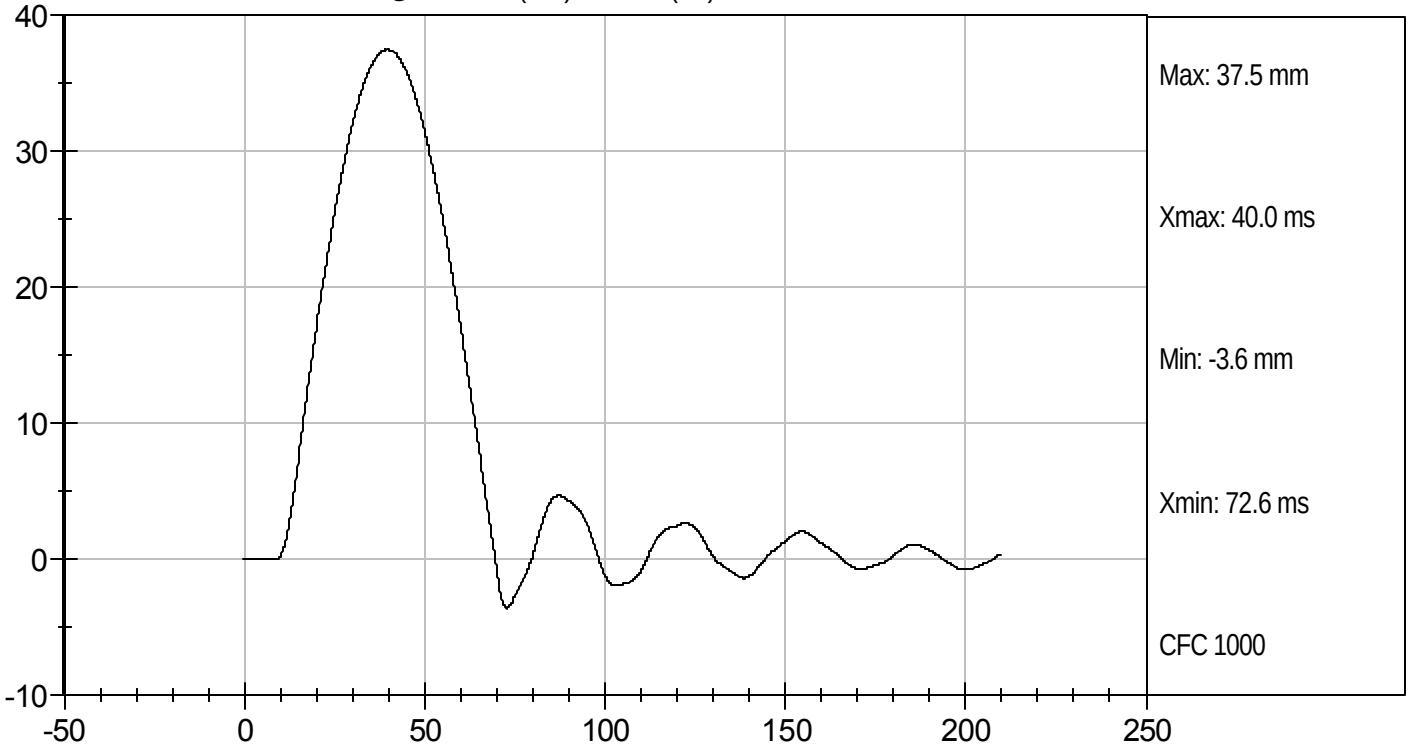
Jessica Gall
Laboratory Technician

1/22/10
Test Date

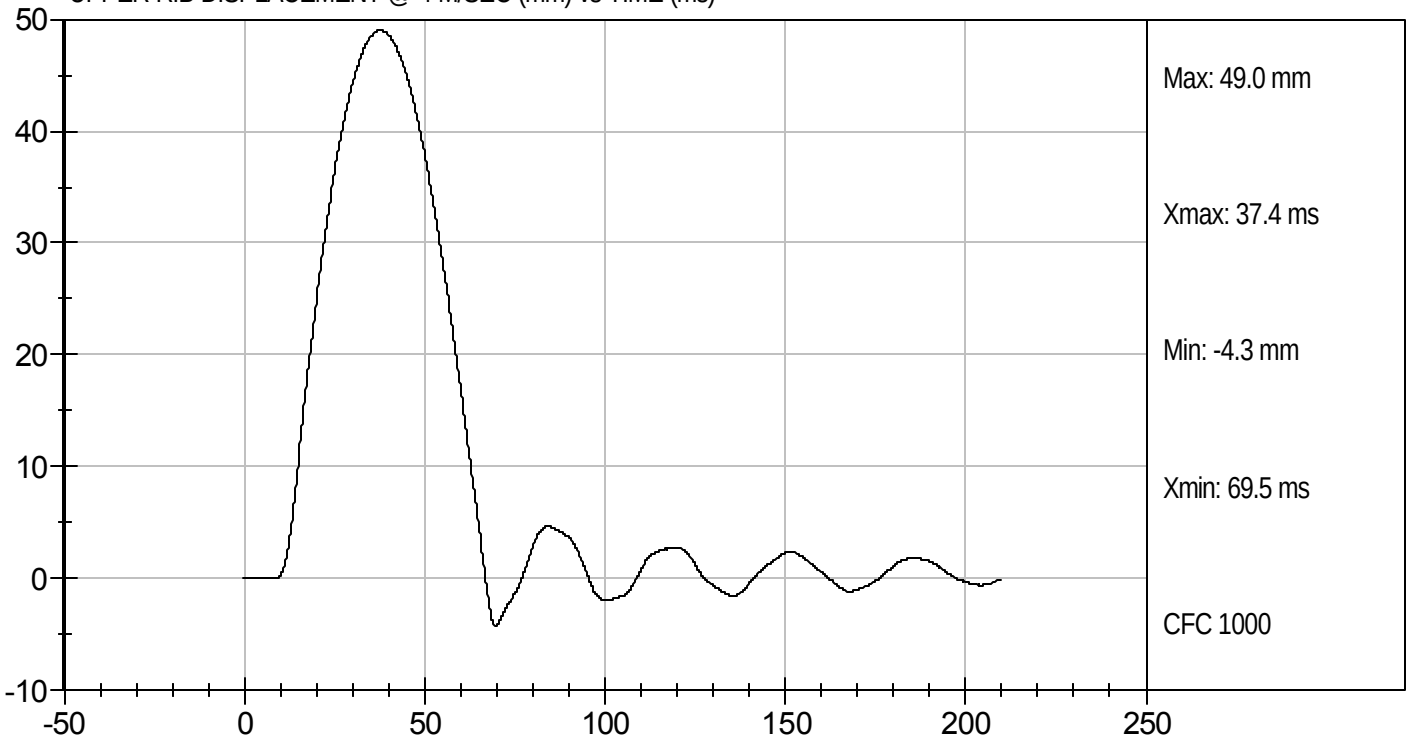
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D10164
Test Date: 1/22/10

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:** D10165

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 23 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 37.7 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.6 | Pass |
| | | Overall Test Results | | Pass |

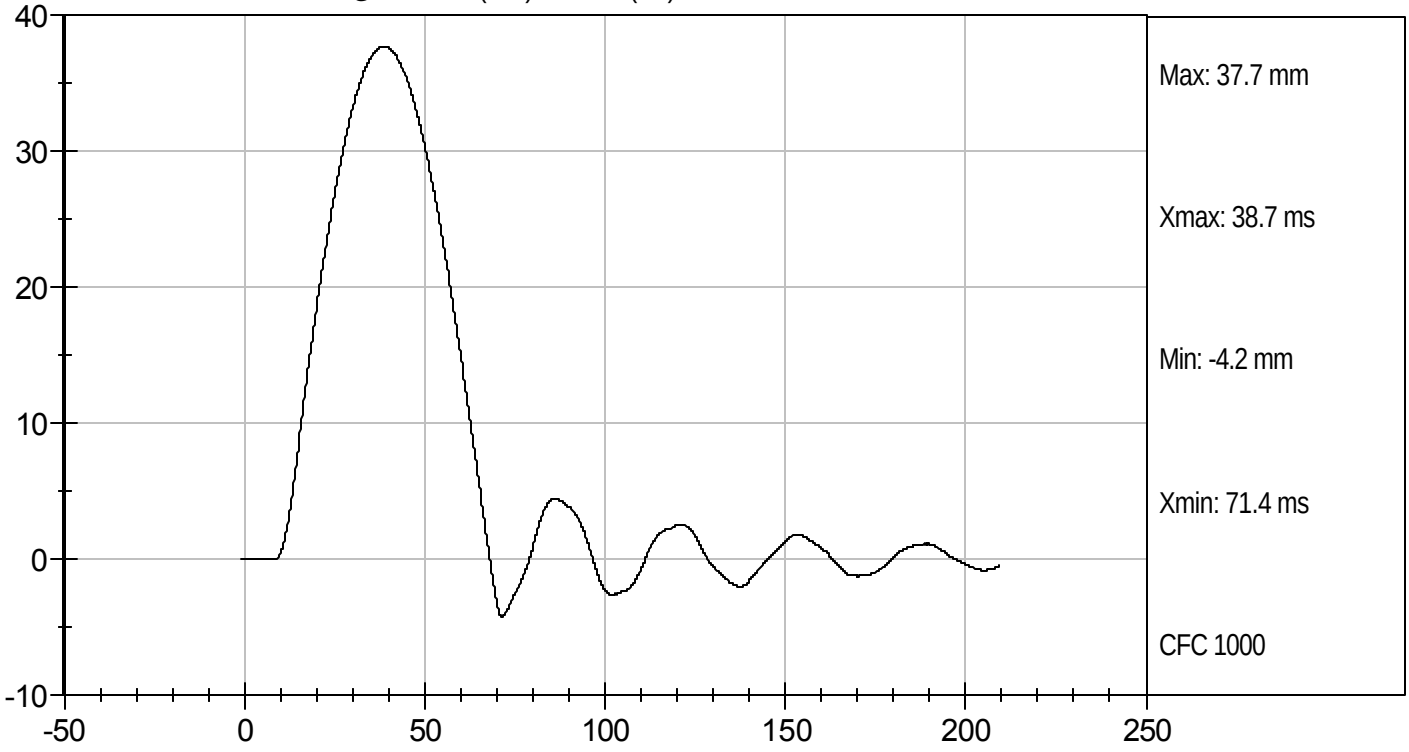
Jessica Gall
Laboratory Technician

1/22/10
Test Date

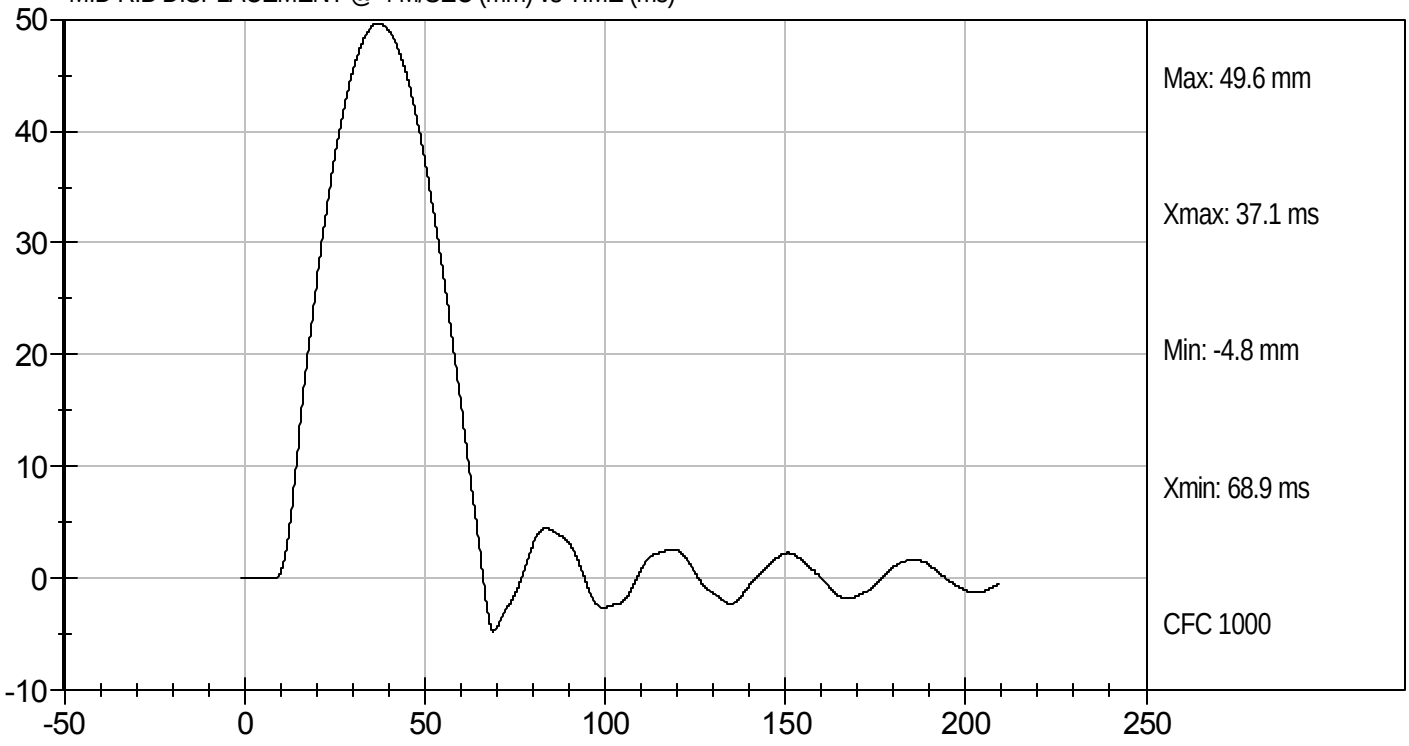
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D10165
Test Date: 1/22/10

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:** D10166

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 23 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 36.6 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 48.3 | Pass |
| | | Overall Test Results | | Pass |

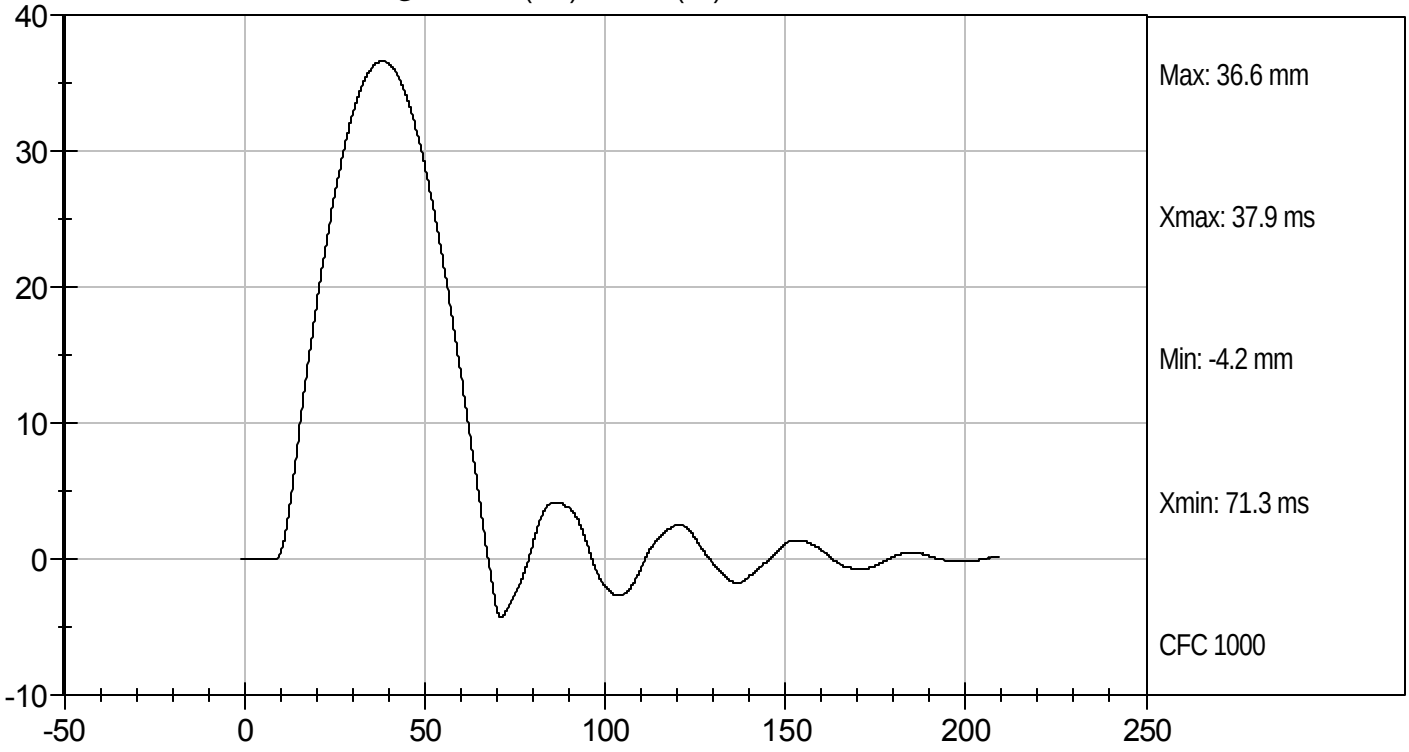
Jessica Gall
Laboratory Technician

1/22/10
Test Date

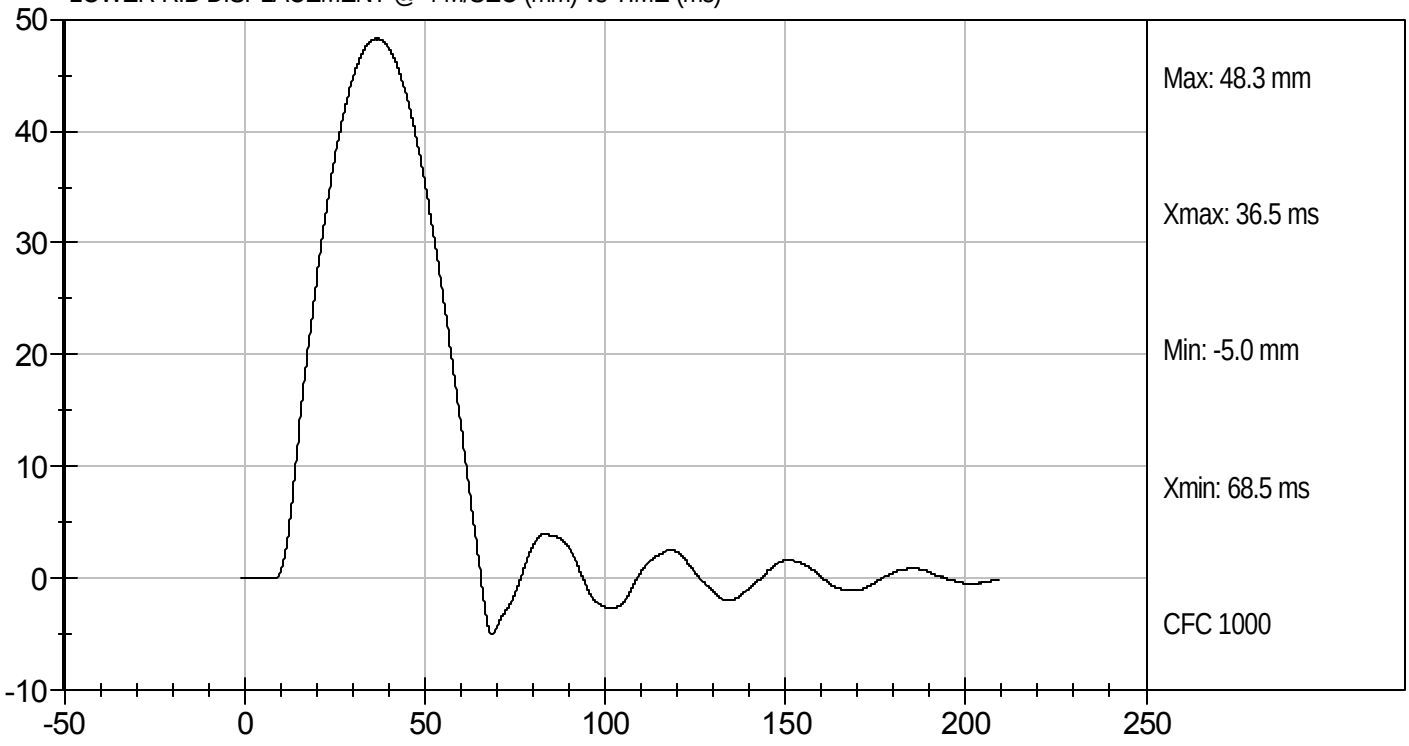
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D10166
Test Date: 1/22/10

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:** D10167

| 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 | 25 | Pass |
| Probe Speed | m/s | 3.90 to 4.10 | 4.03 | Pass |
| Maximum Impact Force | kN | 4.00 to 4.80 | 4.24 | Pass |
| Time of Maximum Impactor Force | ms | 10.60 to 13.00 | 10.70 | Pass |
| Maximum Total Abdomen Force | kN | 2.20 to 2.70 | 2.53 | Pass |
| Time of Maximum Abdomen Force | ms | 10.00 to 12.30 | 11.00 | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

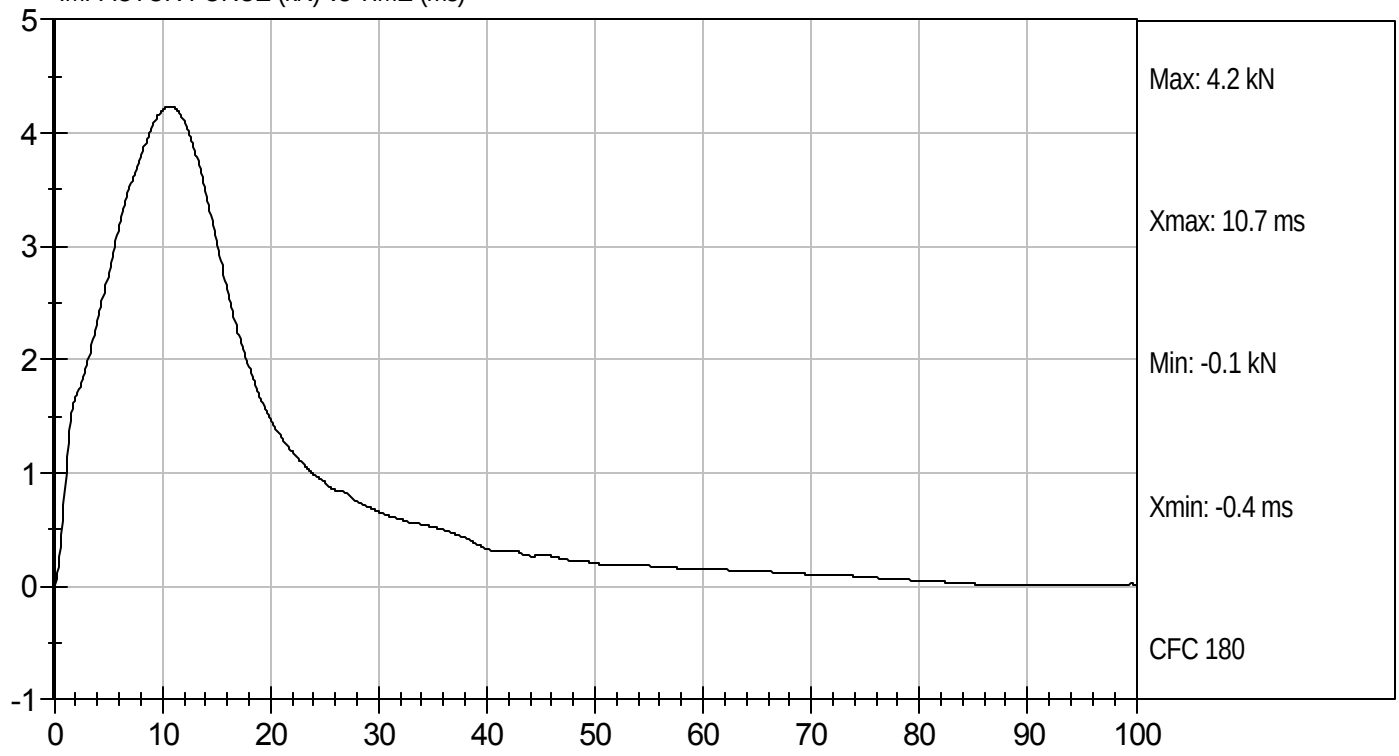
1/22/10
Test Date

David Winkelbauer
Approved By

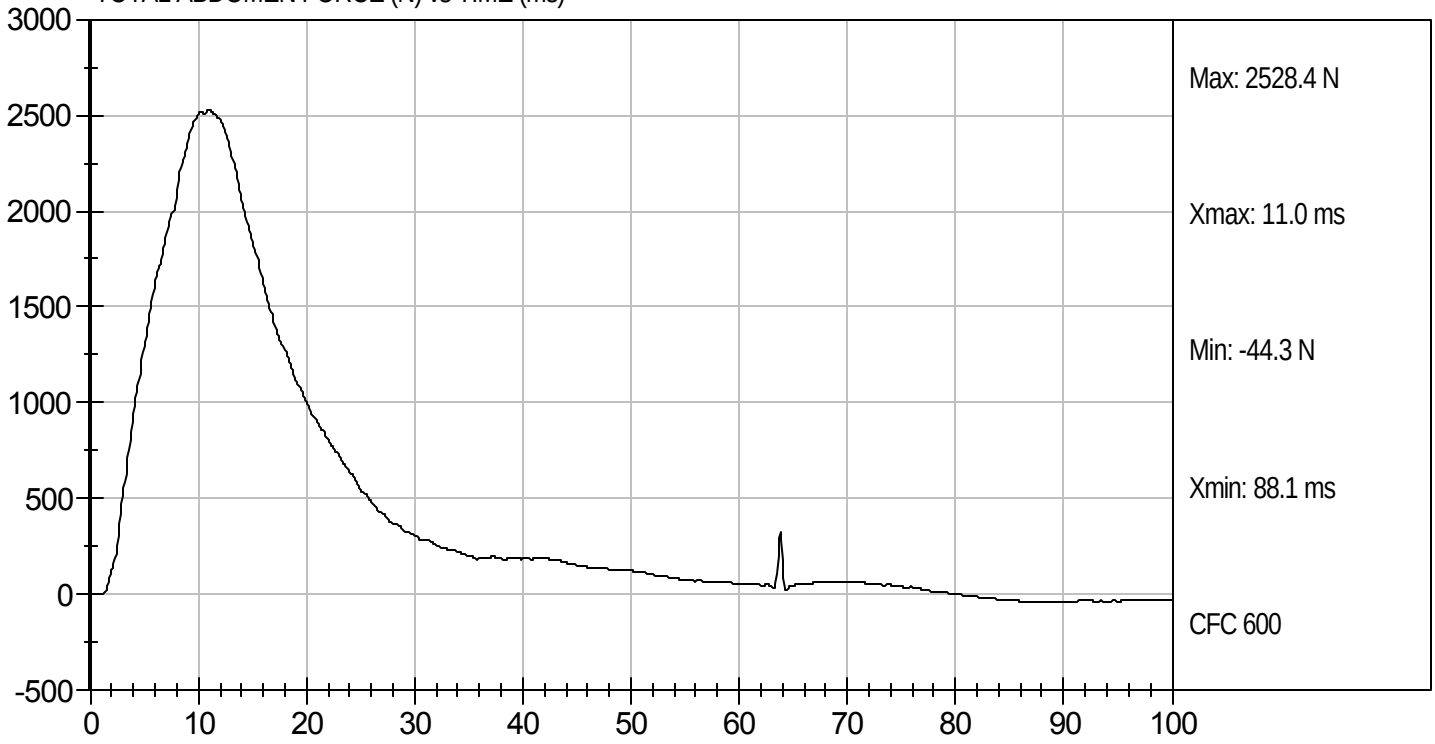
Test Desc: Abdomen Impact
Component ID: D10167

Test Date: 1/22/10
Velocity: 13.23 ft/s, 4.03 m/s

IMPACTOR FORCE (kN) vs TIME (ms)




TOTAL ABDOMEN FORCE (N) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**LUMBAR SPINE TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10168

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 23 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.15 | 6.12 | Pass |
| Pendulum Deceleration | 1 ms | m/s | -0.05 to 0.00 | -0.02 | Pass |
| | 3.7 ms | m/s | -0.425 to -0.24 | -0.416 | Pass |
| | 27 ms | m/s | -6.50 to -5.80 | -5.97 | Pass |
| | 30 ms | m/s | >= -6.5 | -5.99 | Pass |
| Maximum Flexion Angle | | deg | 45.0 to 55.0 | 45.9 | Pass |
| Time of Maximum Flexion Angle | | ms | 39.0 to 53.0 | 43.4 | Pass |
| Headform Rotation Decay to Initial Position | | ms | 37 to 57 | 44 | Pass |
| | | | Overall Results | | Pass |

Jessica Hall
Laboratory Technician

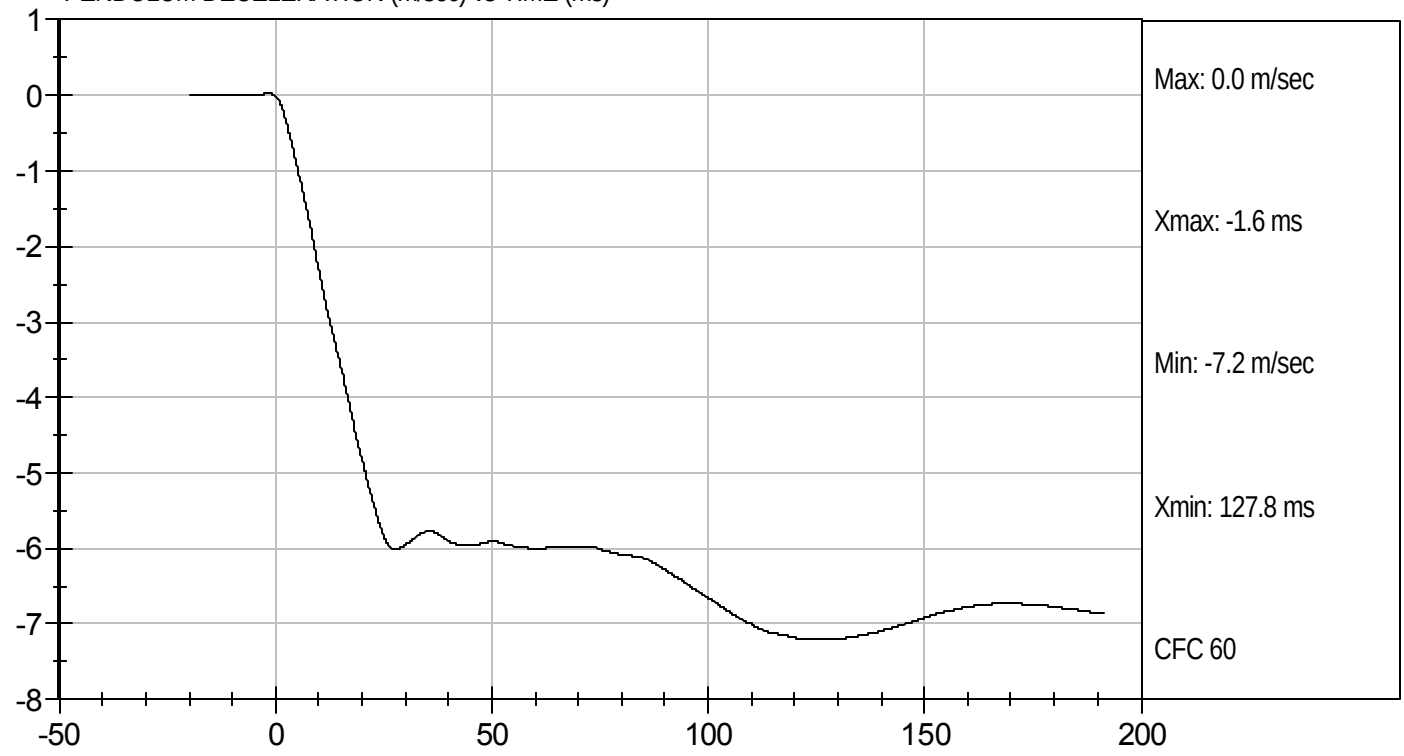
1/22/10
Test Date

David Winkelbauer
Approved By

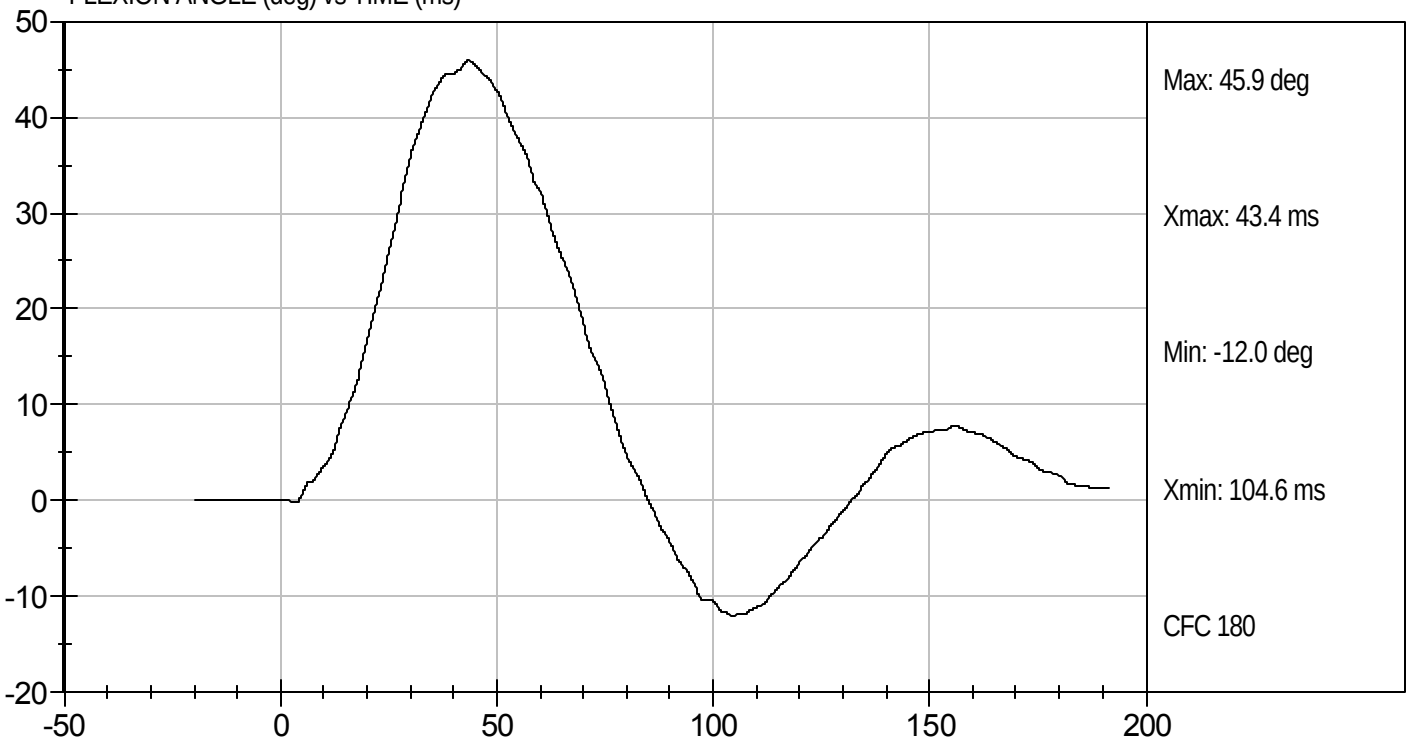
Test Desc: Lumbar Bending
Component ID: D10168

Test Date: 1/22/10
Velocity: 20.08 ft/s, 6.12 m/s

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

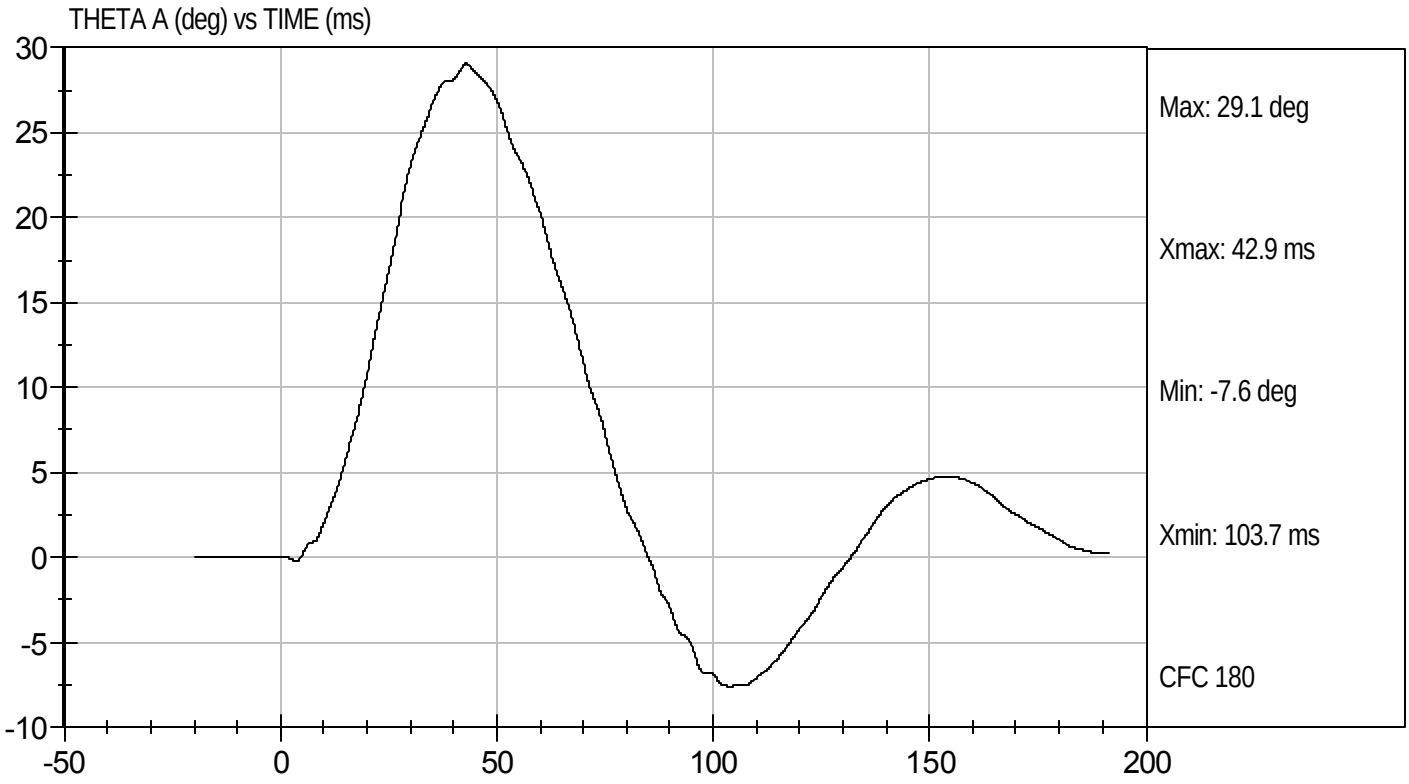


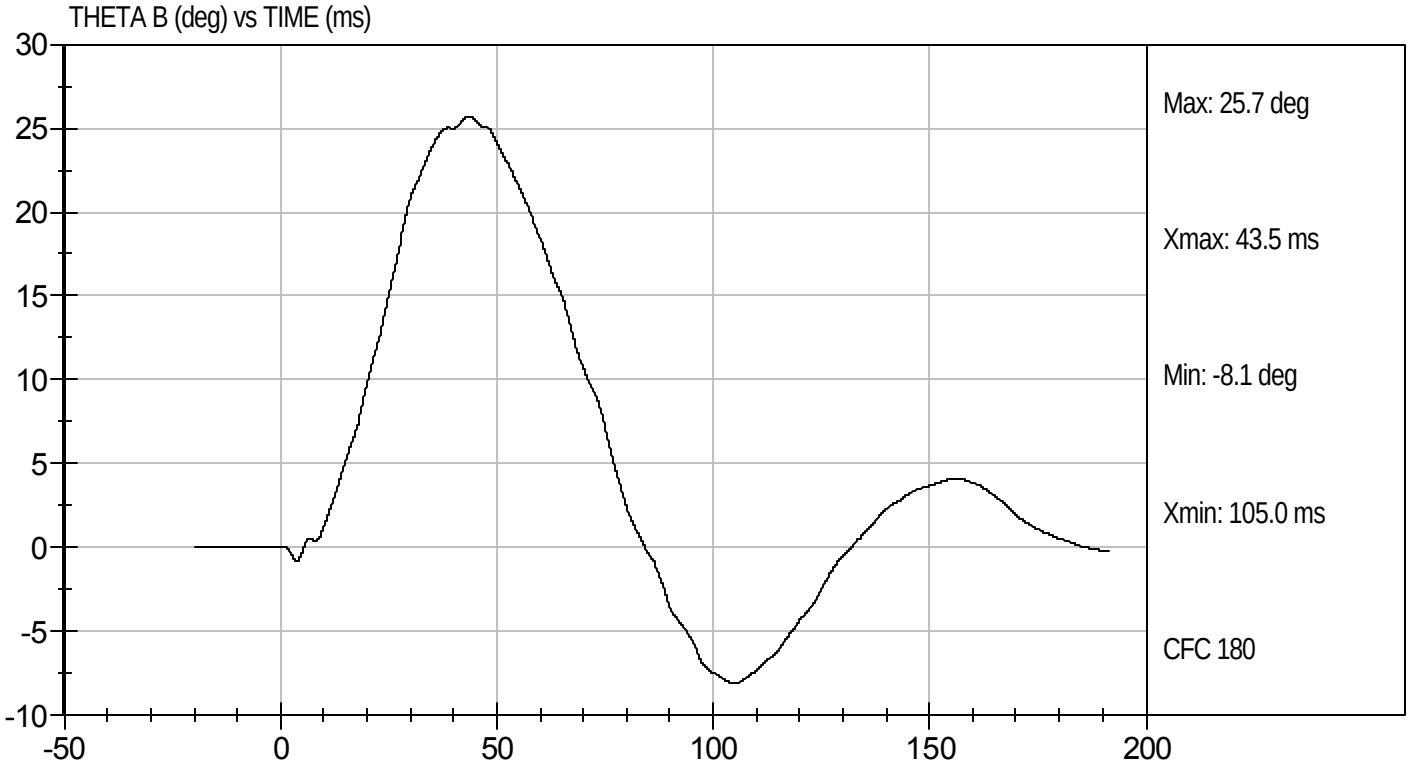

FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D10168

Test Date: 1/22/10
Velocity: 20.08 ft/s, 6.12 m/s



**MGA RESEARCH CORPORATION**

**PELVIS TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10169

| 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 | 23 | Pass |
| Probe Speed | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Impactor Force | kN | 4.70 to 5.40 | 4.81 | Pass |
| Time of Maximum Impactor Force | ms | 11.80 to 16.10 | 12.90 | Pass |
| Maximum Pubic Force | kN | 1.23 to 1.59 | 1.37 | Pass |
| Time of Maximum Pubic Force | ms | 12.20 to 17.00 | 13.90 | Pass |
| | | Overall Test Results | | Pass |

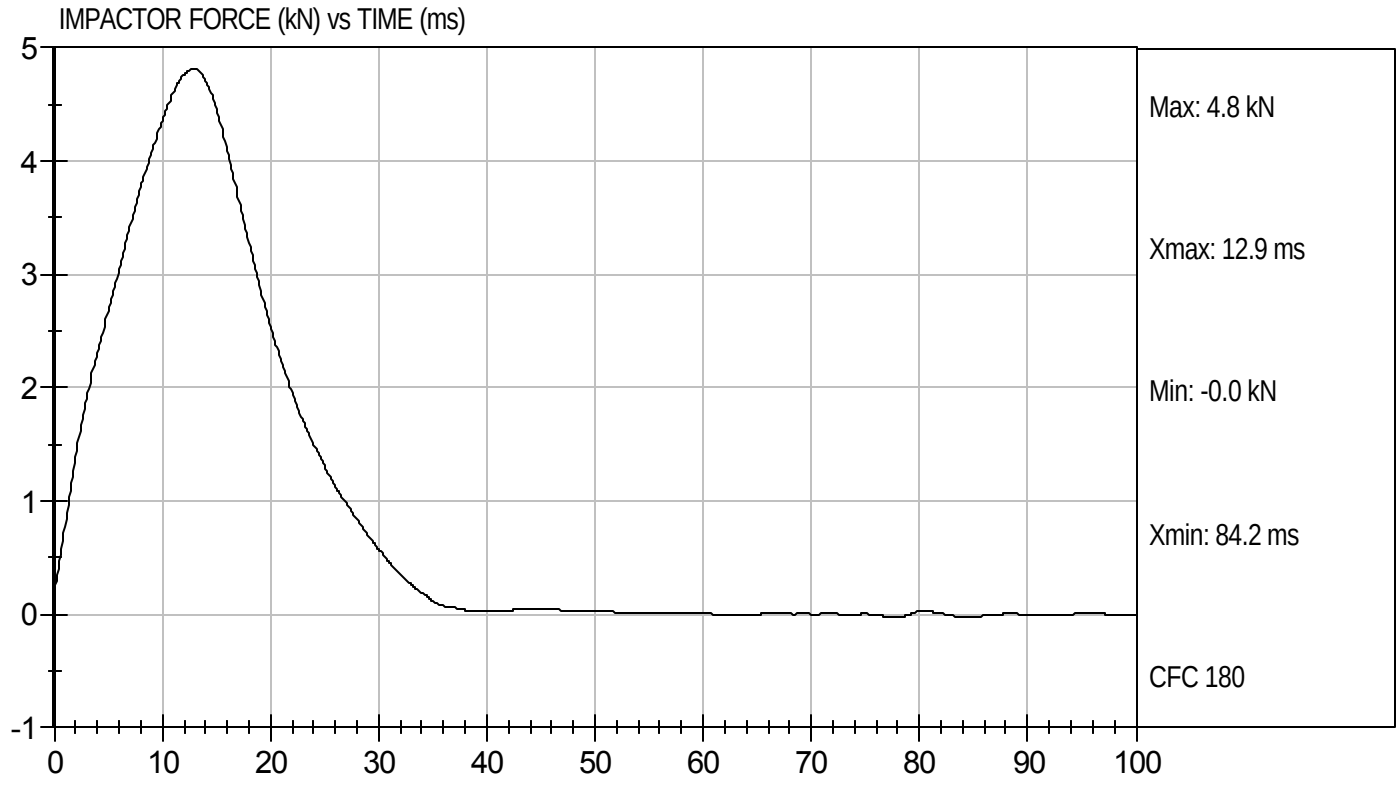
Jessica Hall
Laboratory Technician

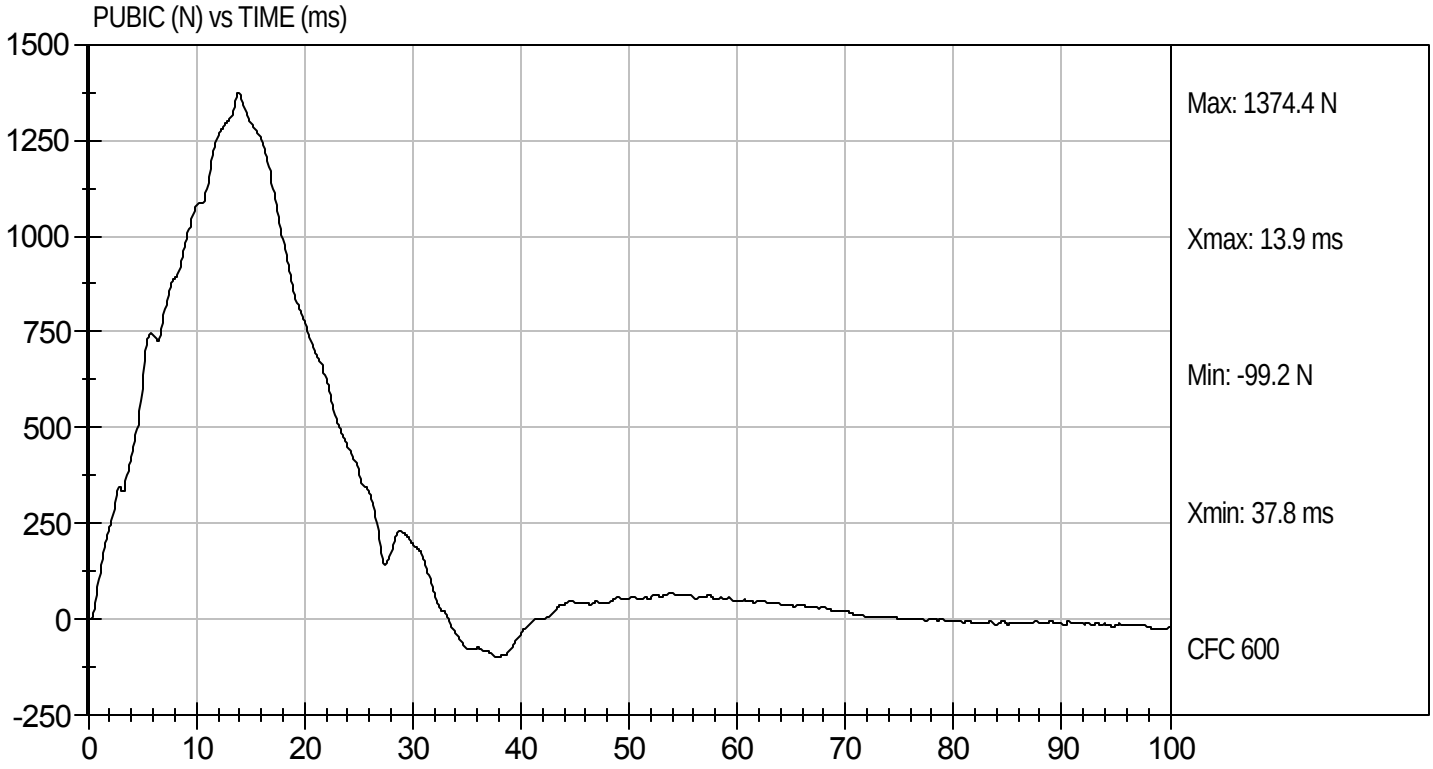
1/22/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D10169

Test Date: 1/22/10
Velocity: 14.25 ft/s, 4.34 m/s



**MGA RESEARCH CORPORATION**

**FULL BODY THORAX IMPACT TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10160

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Humidity | % | 10 to 70 | 23 | 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 | 5.28 | Pass |
| Upper Rib Displacement | mm | 34.0 to 41.0 | 38.6 | Pass |
| Middle Rib Displacement | mm | 37.0 to 45.0 | 40.7 | Pass |
| Lower Rib Displacement | mm | 37.0 to 44.0 | 40.2 | Pass |
| | | Overall Test Results | | Pass |

Jessica Gall
Laboratory Technician

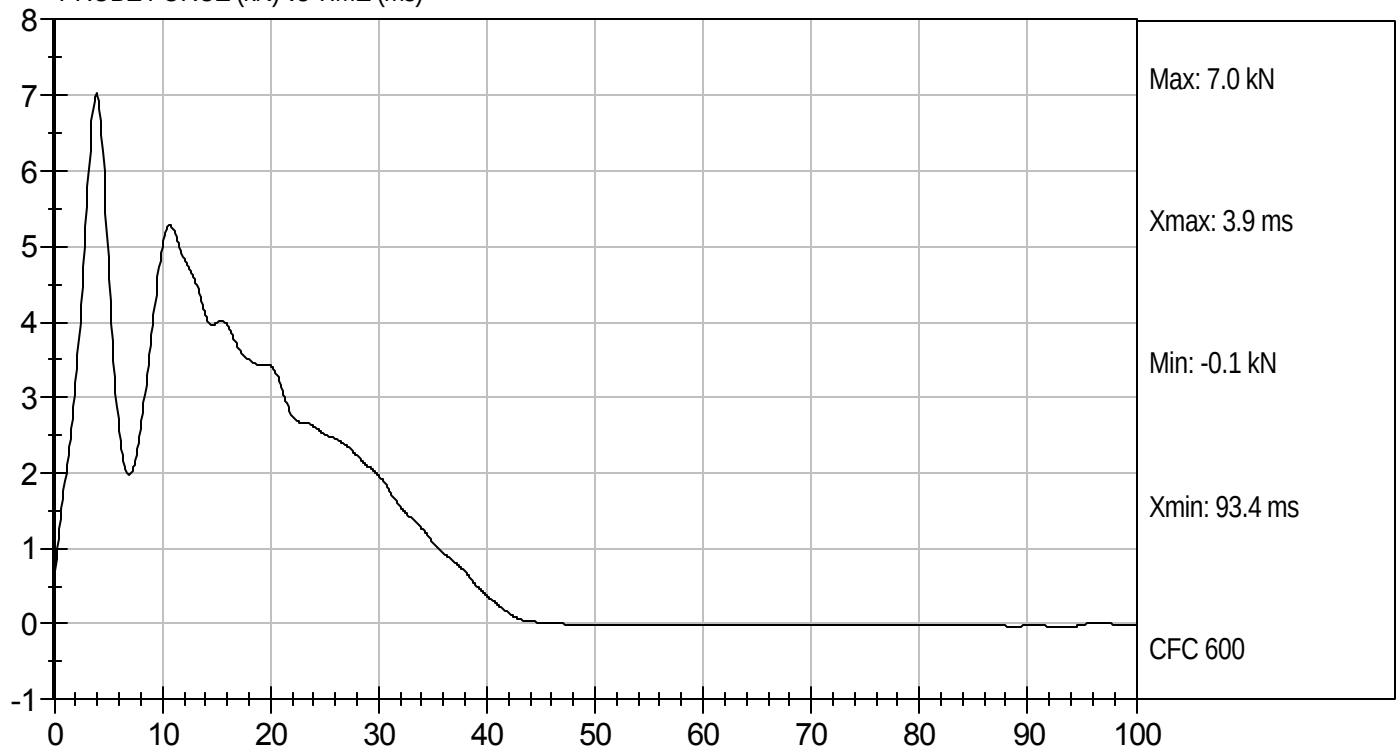
1/22/10
Test Date

David Winkelbauer
Approved By

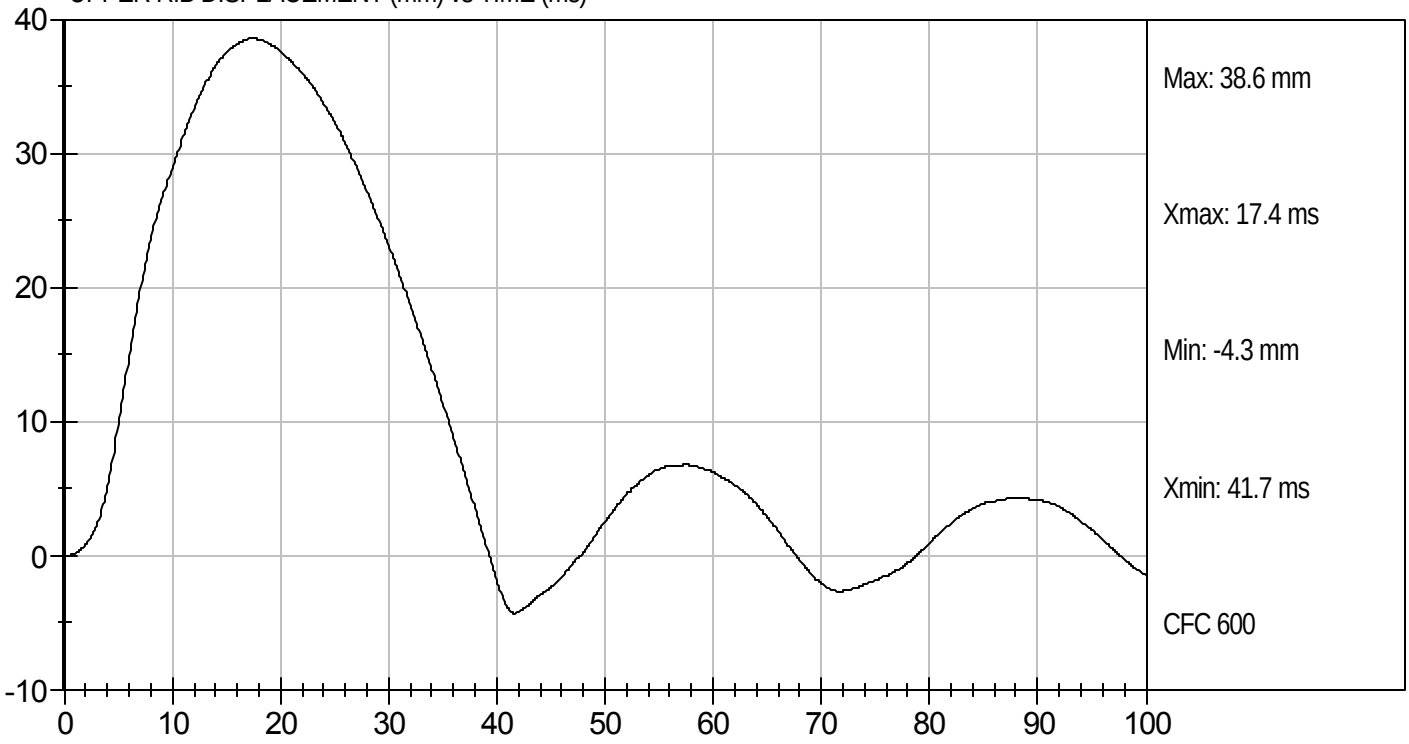
Test Desc: Thorax Impact
Component ID: D10160

Test Date: 1/22/10
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



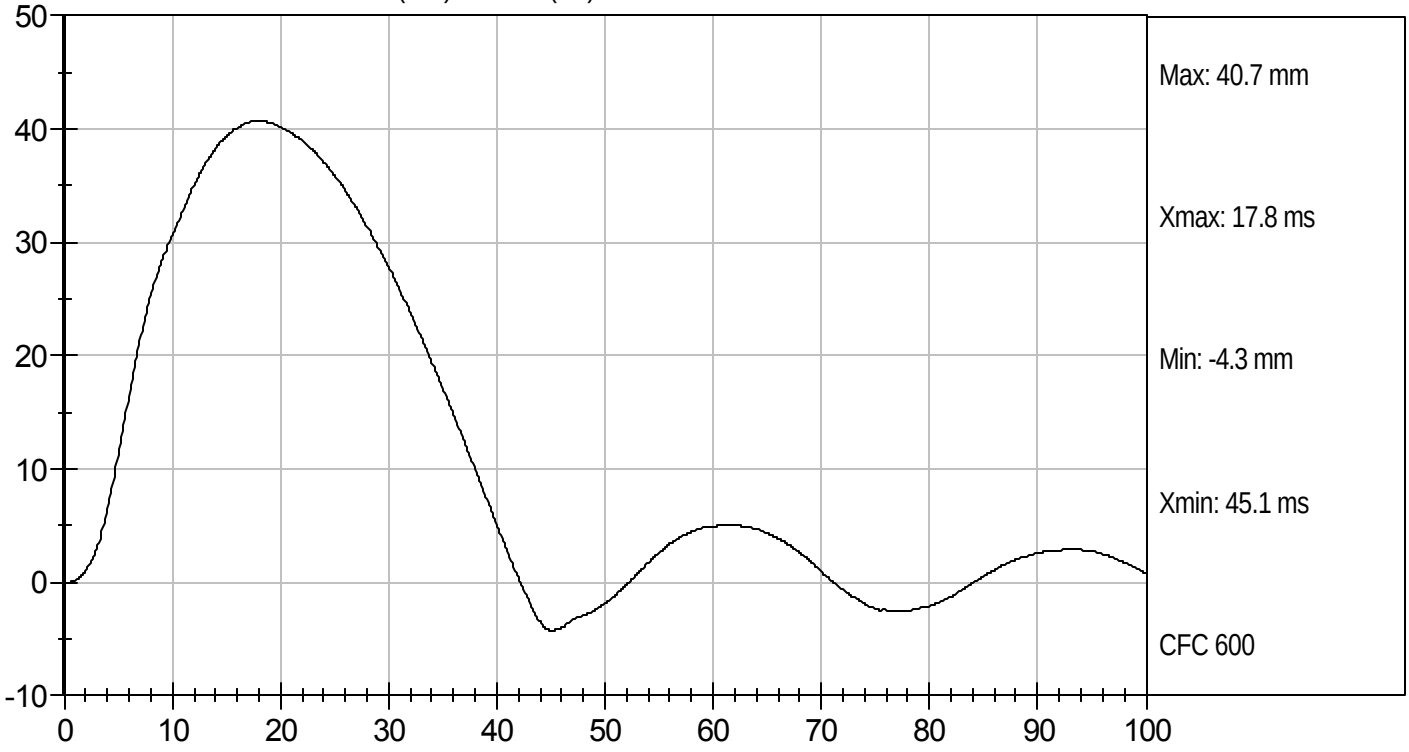

UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



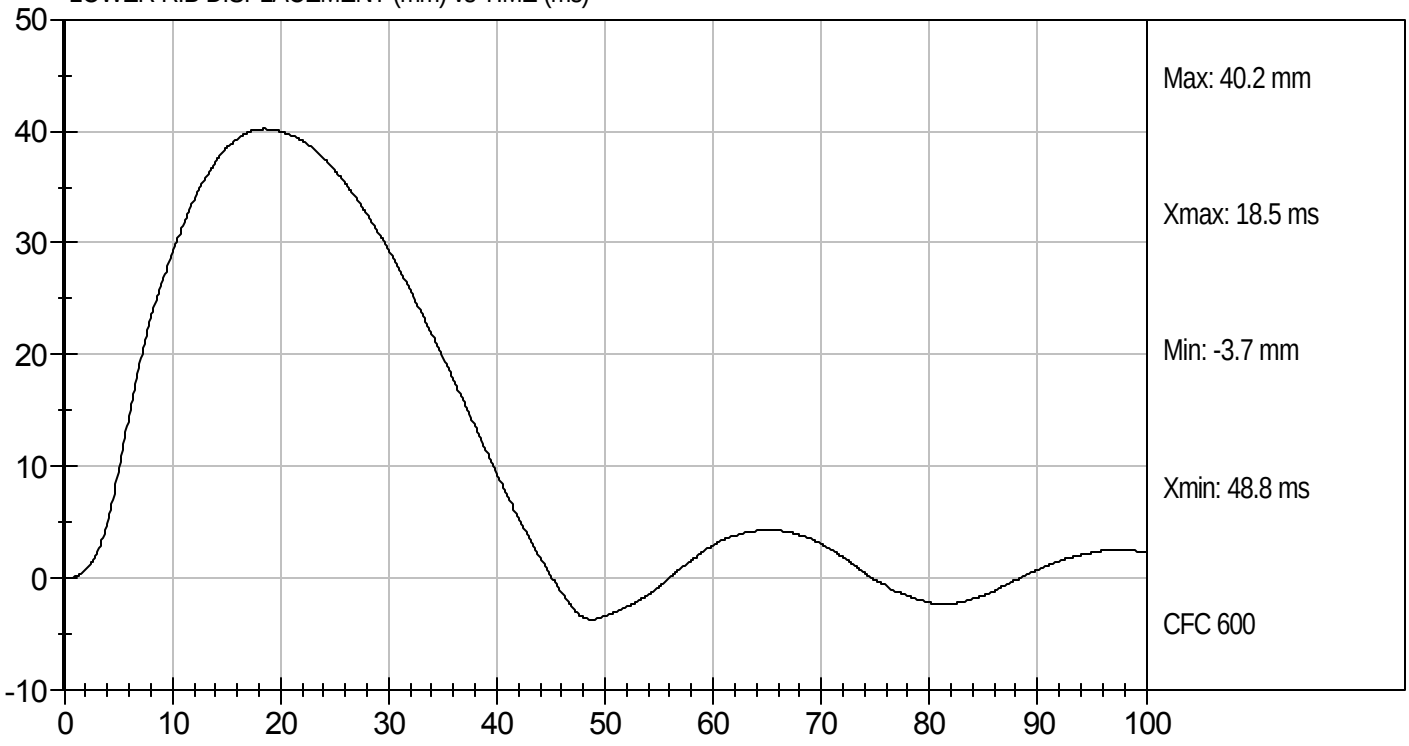
Test Desc: Thorax Impact
Component ID: D10160

Test Date: 1/22/10
Velocity: 18.32 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:** D10171

| 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 | 11 | Pass |
| Peak Resultant Acceleration | G's | 125 to 155 | 145 | Pass |
| Peak Lateral Acceleration | G's | +/- 15 | -6.2 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | within 15% of peak | Yes | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

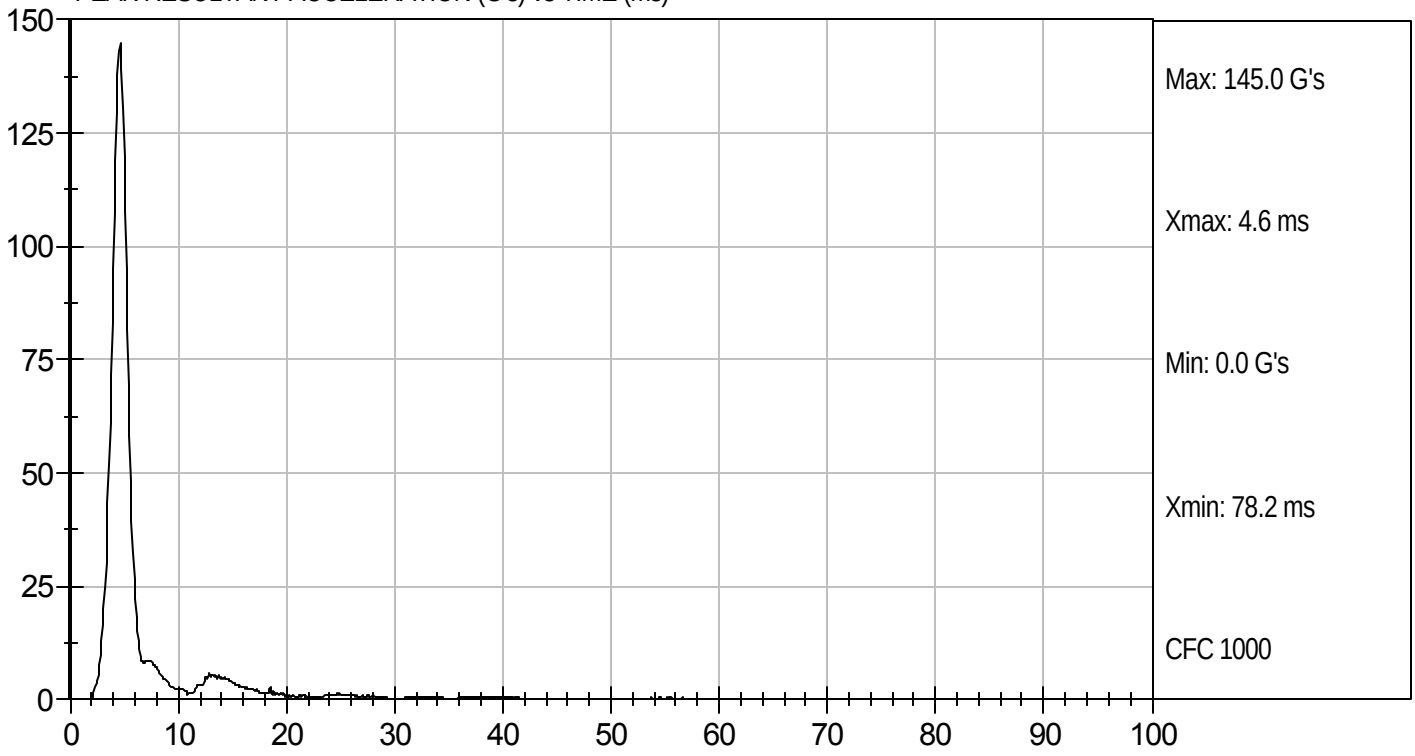
1/27/10
Test Date

David Winkelbauer
Approved By

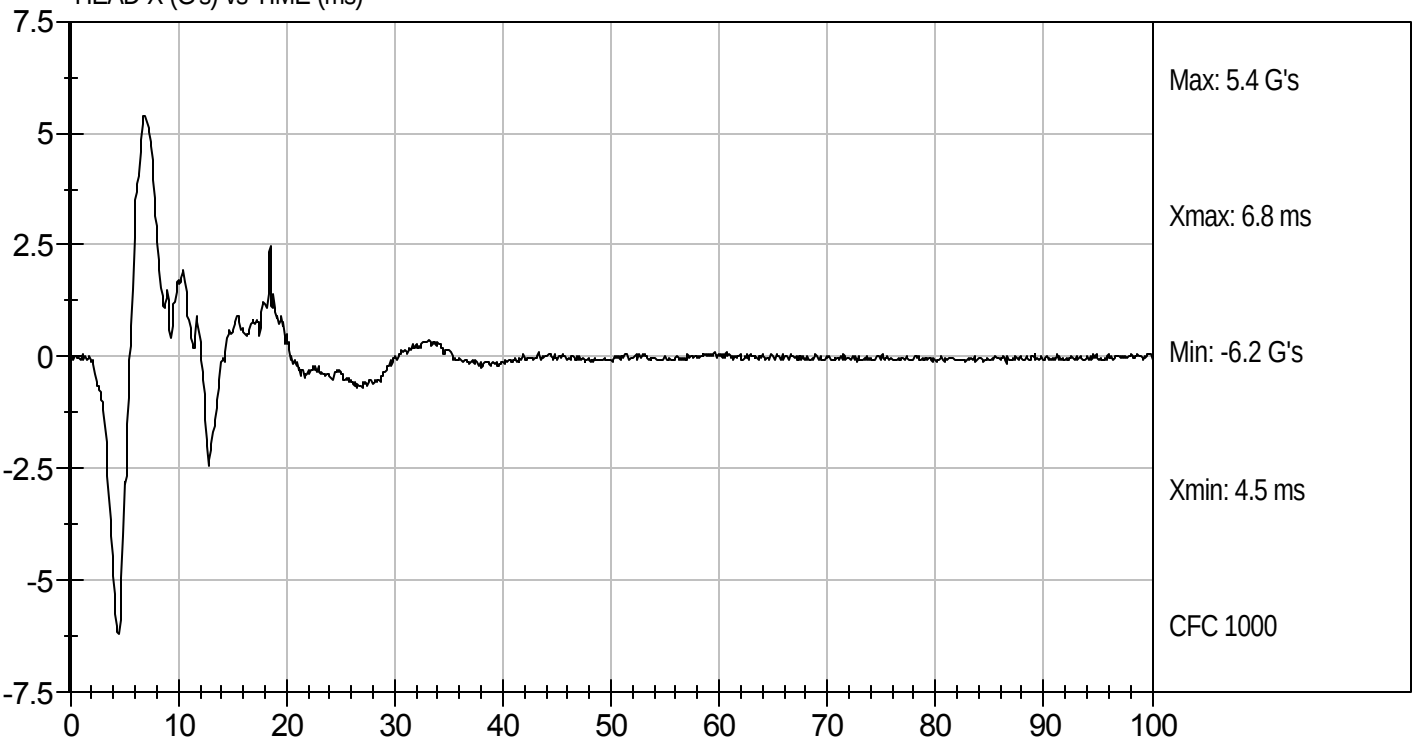
Test Desc: Head Drop
Component ID: D10171

Test Date: 1/27/10
Velocity: 0 ft/s,0 m/s

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




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



**MGA RESEARCH CORPORATION**

**NECK PENDULUM TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10172

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 18.0 to 22.0 | 22.0 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 22 | Pass |
| Pendulum Speed | | m/s | 3.3 to 3.5 | 3.5 | Pass |
| Pendulum Deceleration | 1 ms | m/s | 0.00 to -0.05 | -0.03 | Pass |
| | 3 ms | m/s | -0.25 to -0.375 | -0.32 | Pass |
| | 14 ms | m/s | -3.20 to -3.70 | -3.26 | Pass |
| Maximum Flexion Angle | | deg | 49.0 to 59.0 | 52.5 | Pass |
| Time of Maximum Flexion Angle | | ms | 54.0 to 66.0 | 56.1 | Pass |
| Head Rotation Decay Time to 0 degree | | ms | 53.0 to 88.0 | 56.6 | Pass |
| | | | Overall Test Results | | Pass |

Jessica Gall
Laboratory Technician

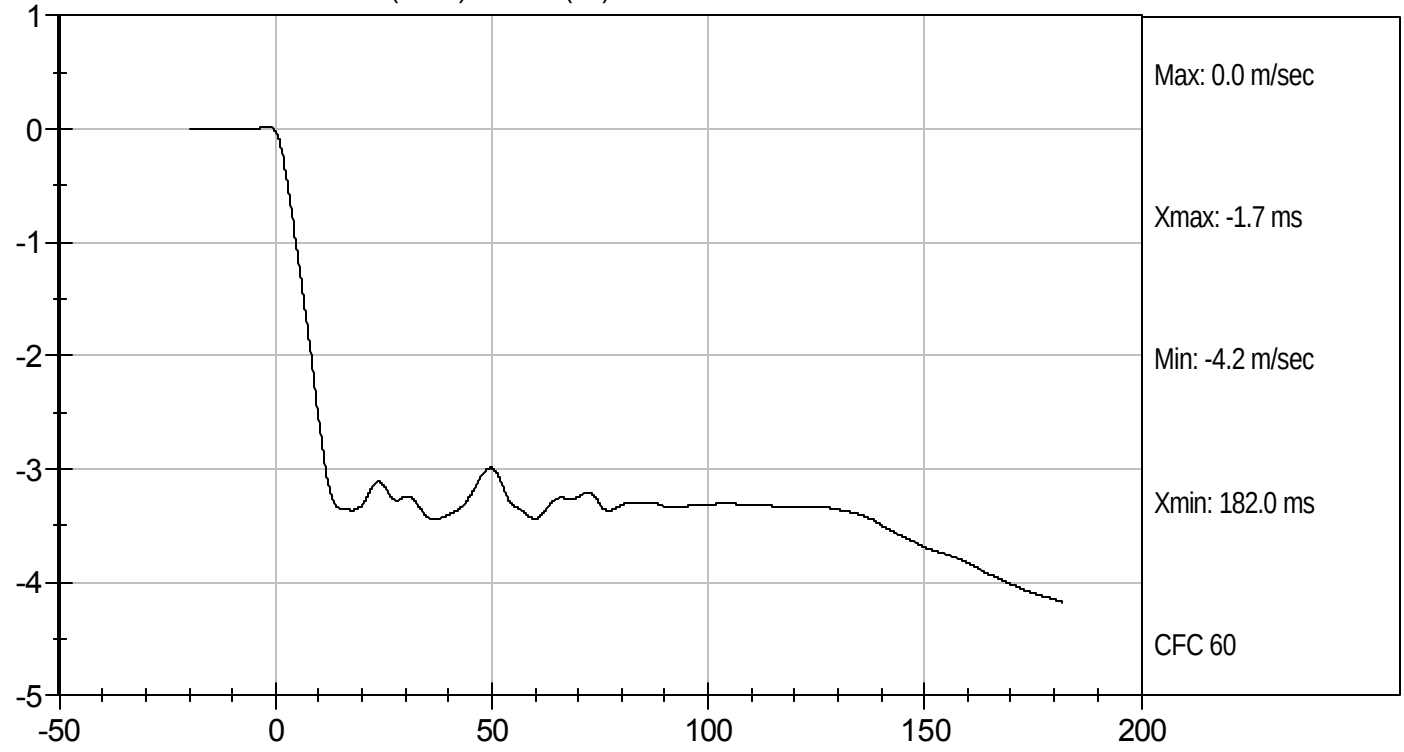
1/25/10
Test Date

David Winkelbauer
Approved By

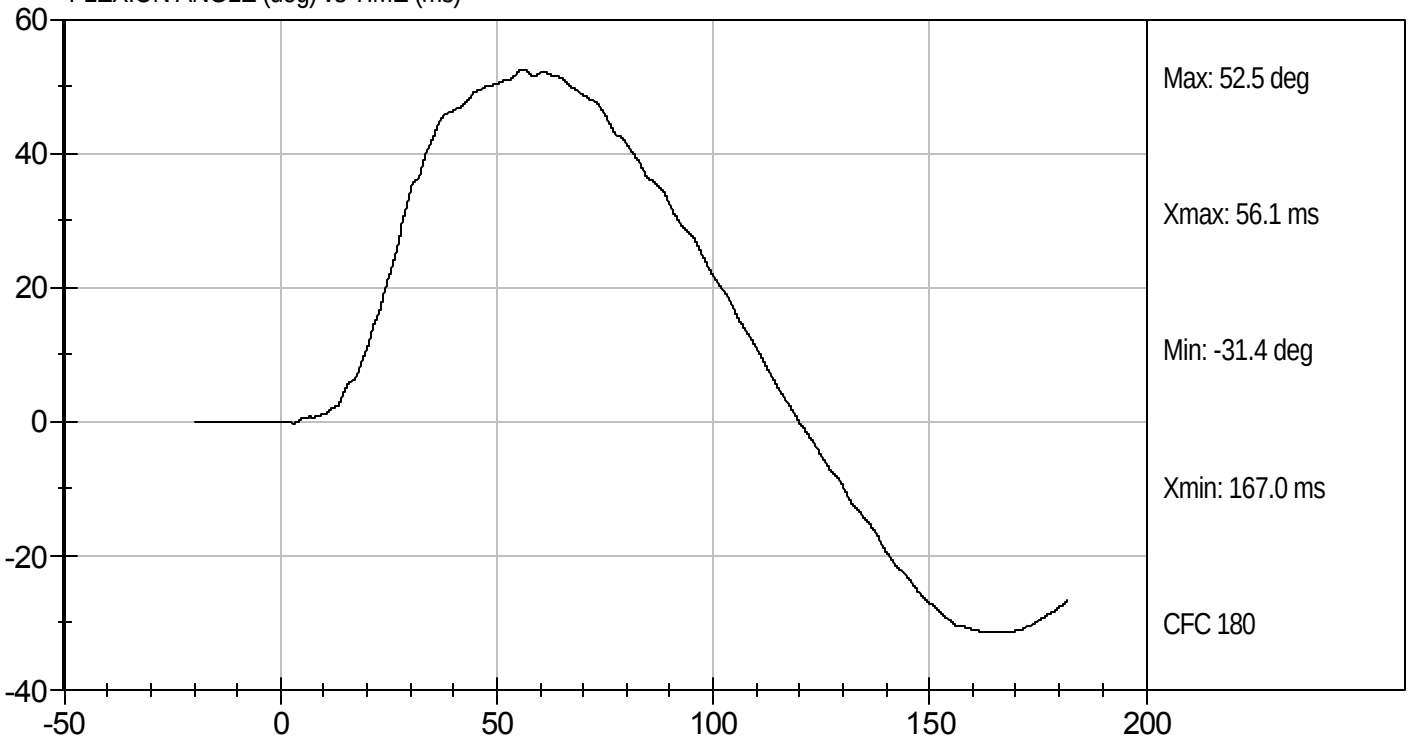
Test Desc: Neck Bending
Component ID: D10172

Test Date: 1/25/10
Velocity: 11.33 ft/s, 3.5 m/s

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

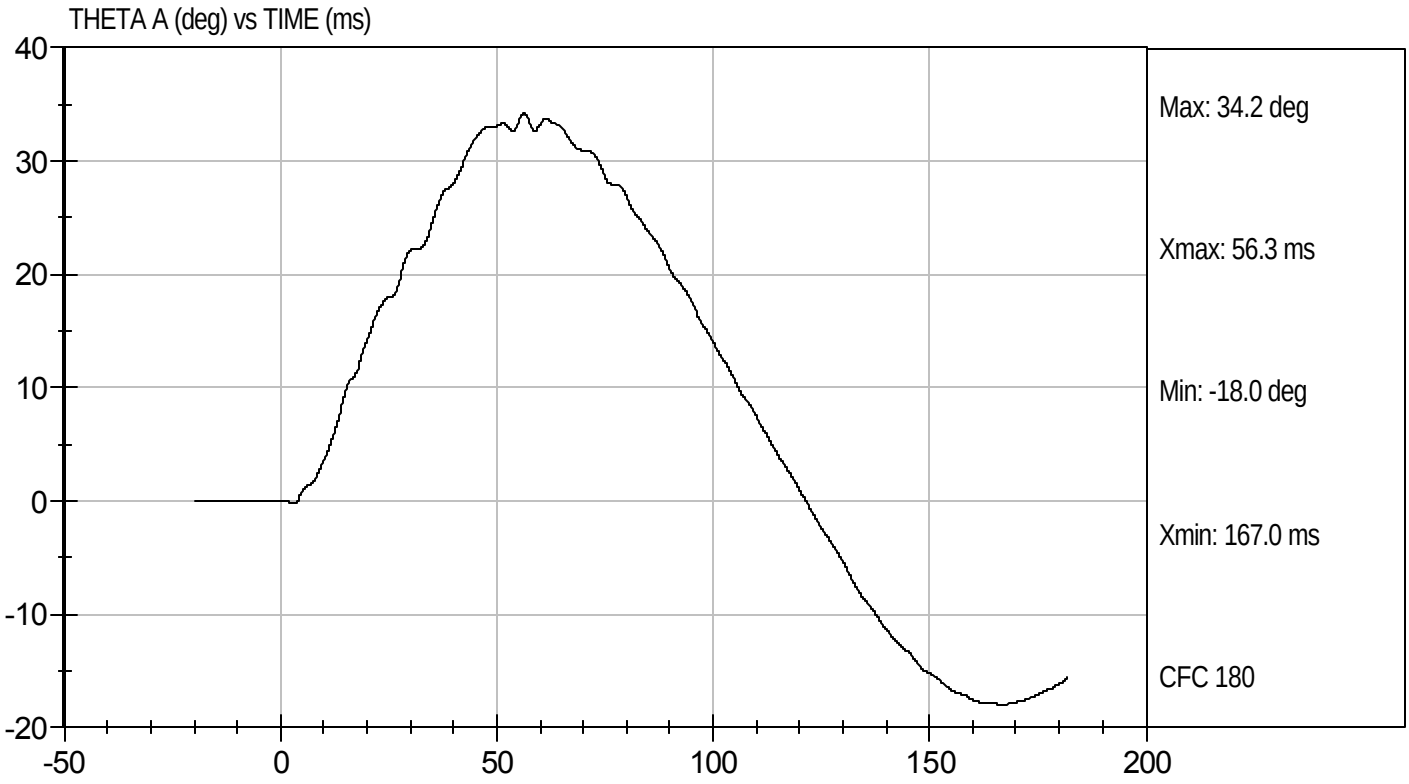


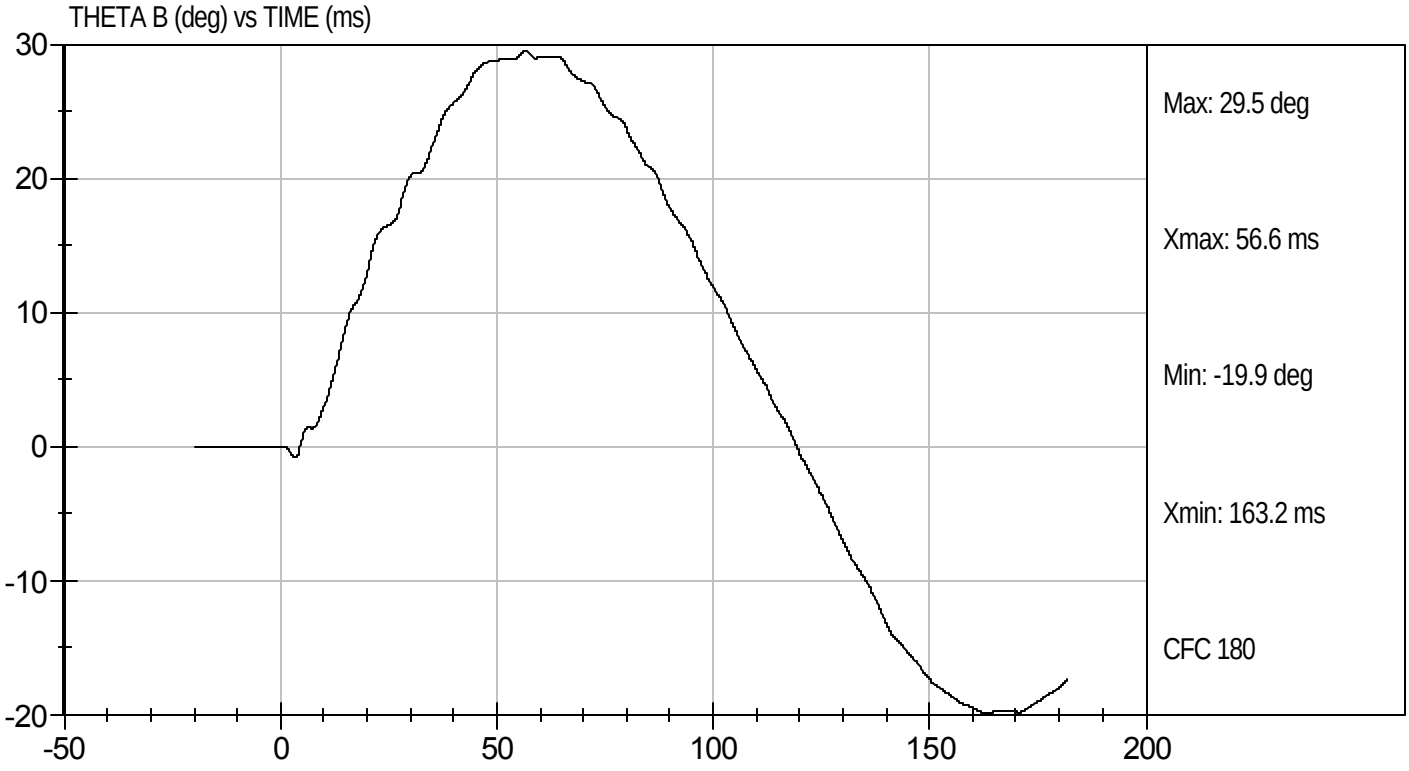

FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D10172

Test Date: 1/25/10
Velocity: 11.33 ft/s, 3.5 m/s



**MGA RESEARCH CORPORATION**

**SHOULDER IMPACT TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10173

| 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 | 12 | Pass |
| Pendulum Speed | m/s | 4.2 to 4.4 | 4.3 | Pass |
| Peak Shoulder Acceleration | G's | 7.5 to 10.5 | 9.2 | Pass |
| Time of Peak Shoulder Acceleration | ms | NA | 13.1 | Pass |
| | | Overall Test Results | | Pass |

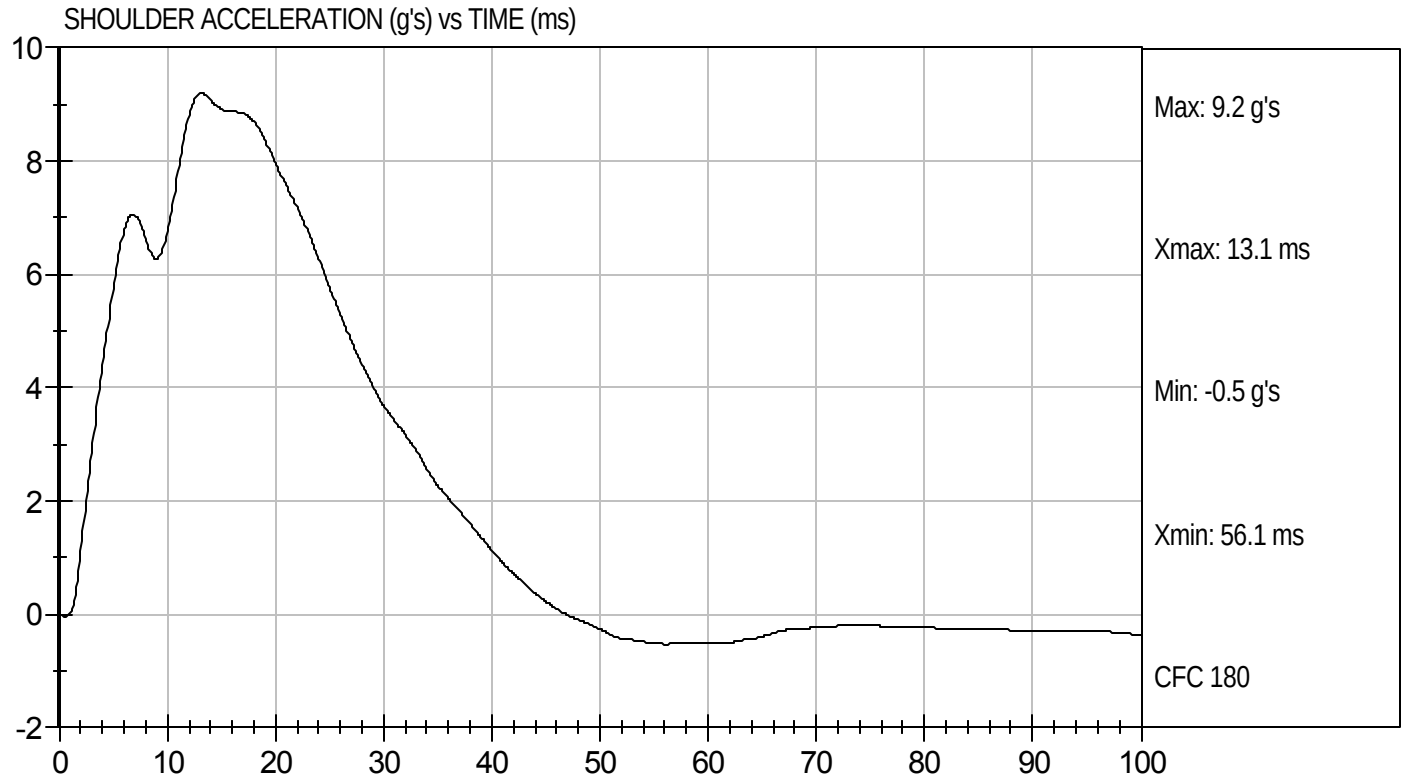
Jessica Gall
Laboratory Technician

1/27/10
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D10173

Test Date: 1/27/10
Velocity: 14.25 ft/s, 4.3 m/s



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**EUROSID 2 DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10174

| 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 | 22 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.0 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.4 | Pass |
| | | Overall Test Results | | Pass |

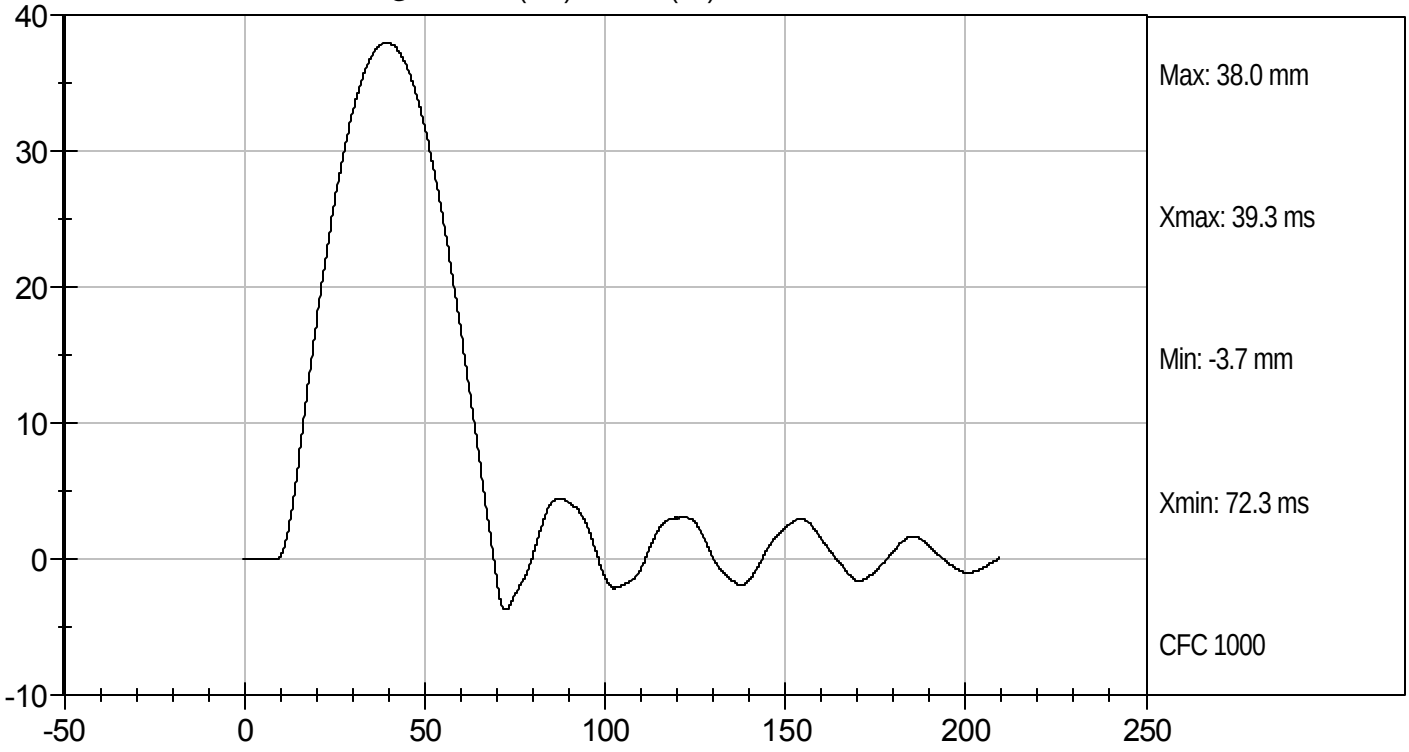
Jessica Gall
Laboratory Technician

1/25/10
Test Date

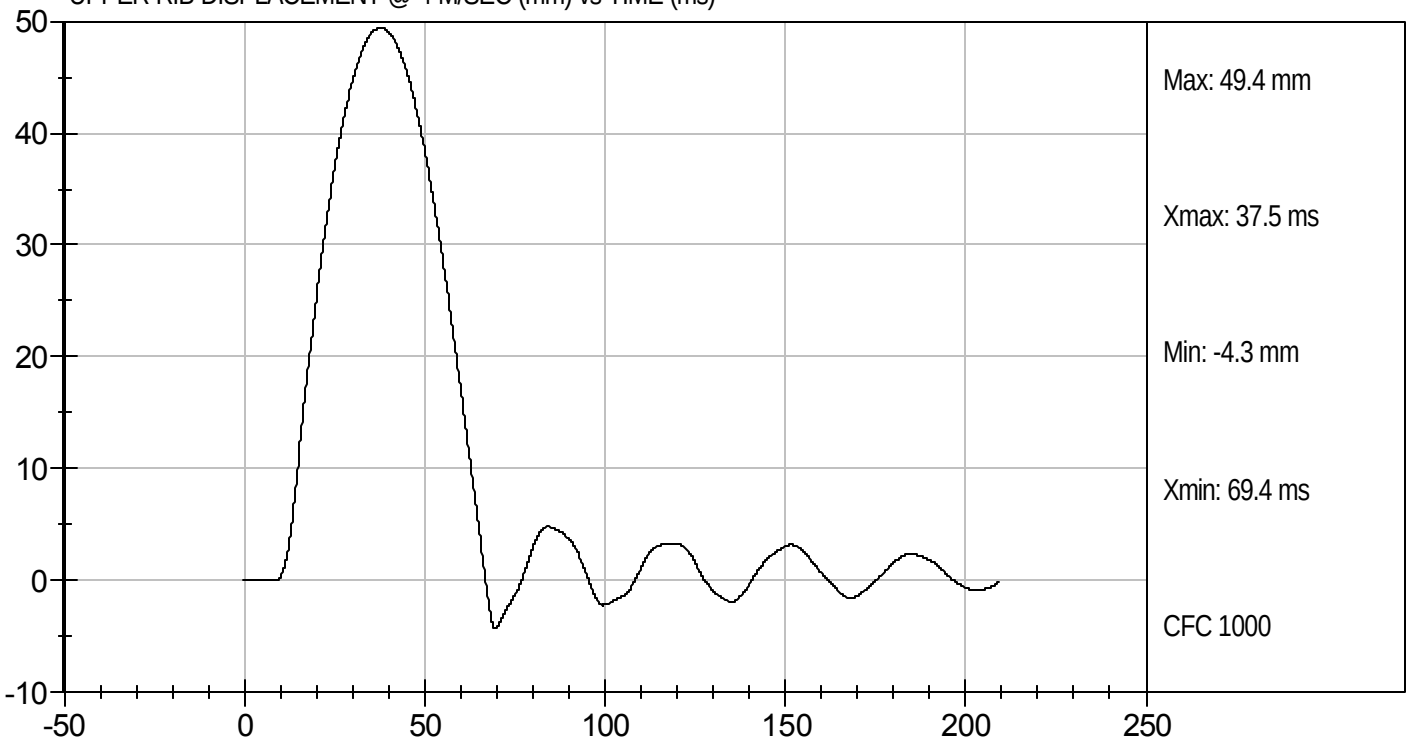
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D10174
Test Date: 1/25/10

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**

**EUROSID 2 DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10175

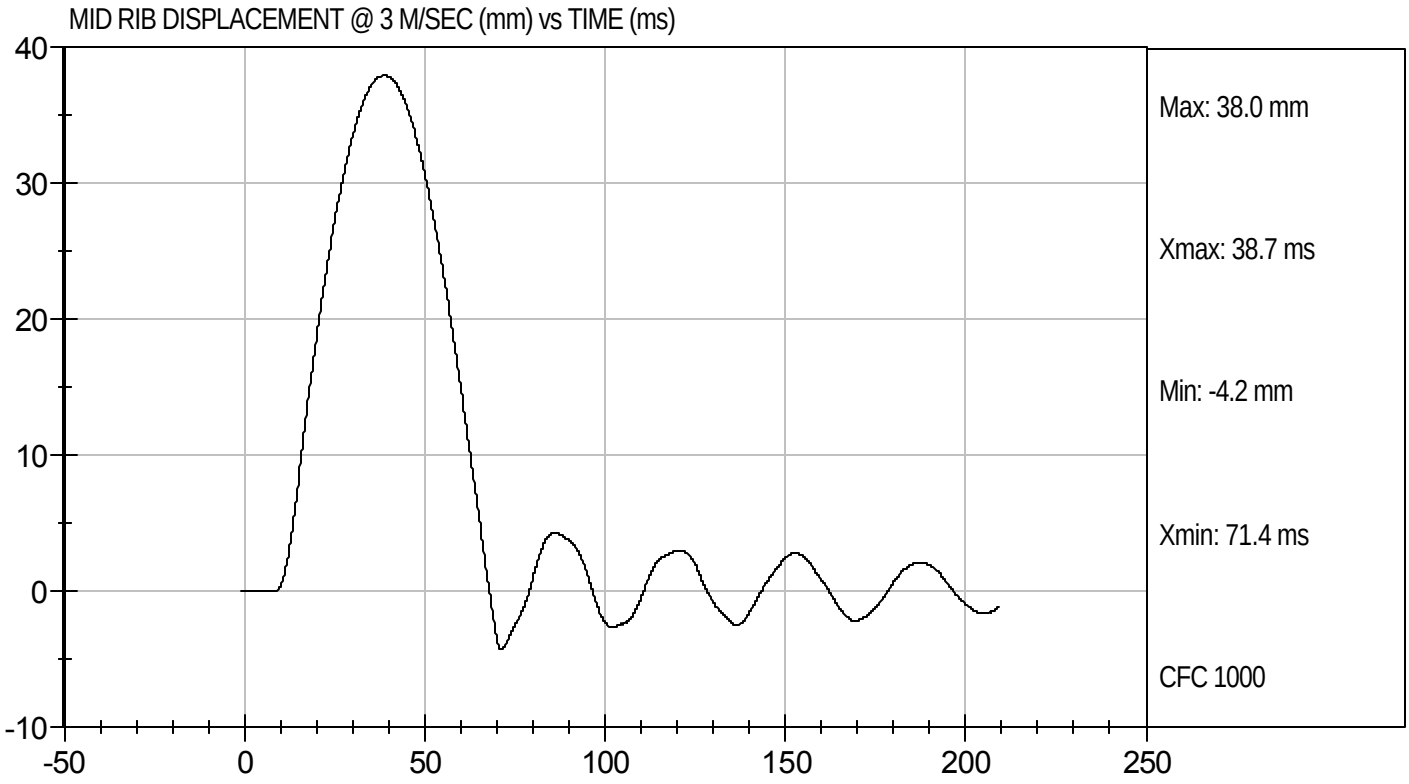
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 22 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 38.0 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 49.9 | Pass |
| | | Overall Test Results | | Pass |

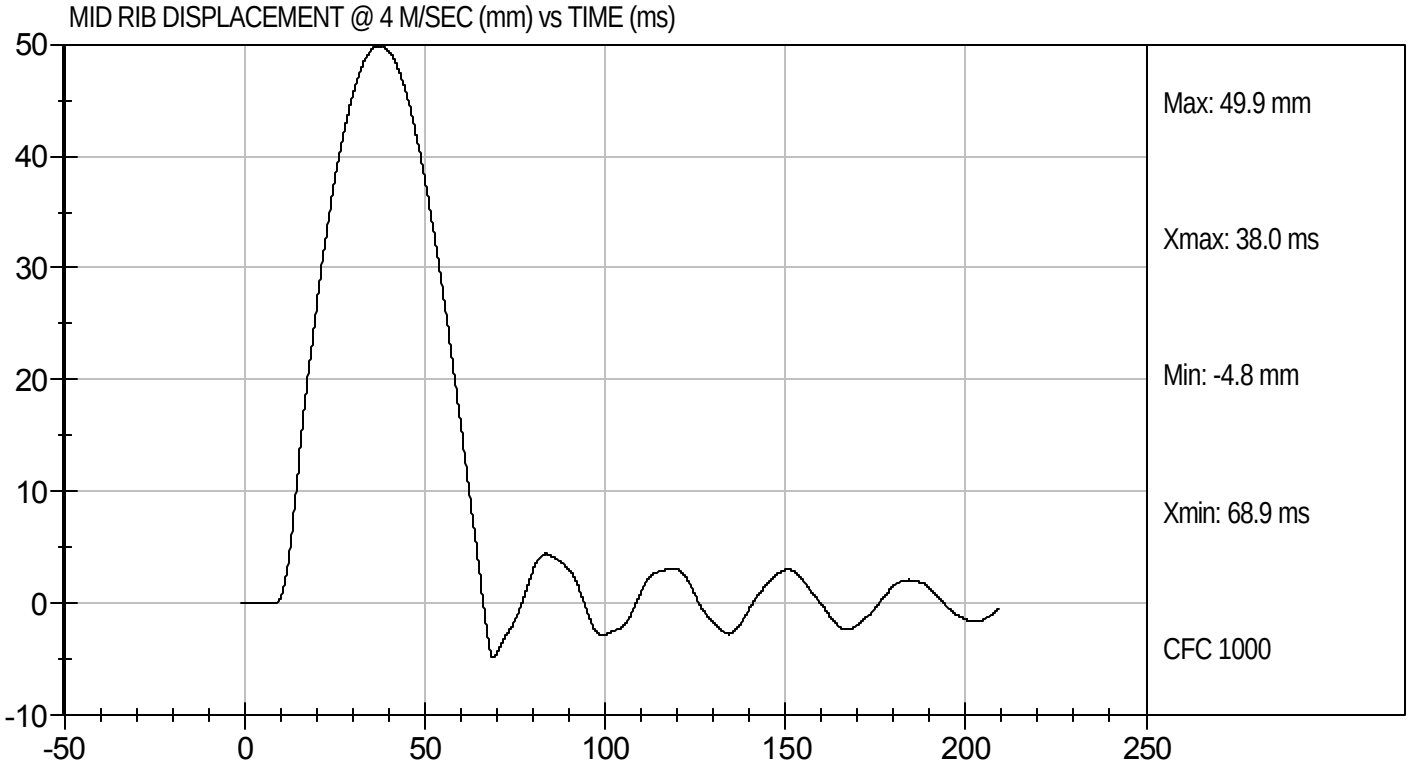
Jessica Gall
Laboratory Technician

1/25/10
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D10175
Test Date: 1/25/10



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**EUROSID 2 DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10176

| 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 | 22 | Pass |
| Displacement at 3 m/s | mm | 36.0 to 40.0 | 36.5 | Pass |
| Displacement at 4 m/s | mm | 46.0 to 51.0 | 48.2 | Pass |
| | | Overall Test Results | | Pass |

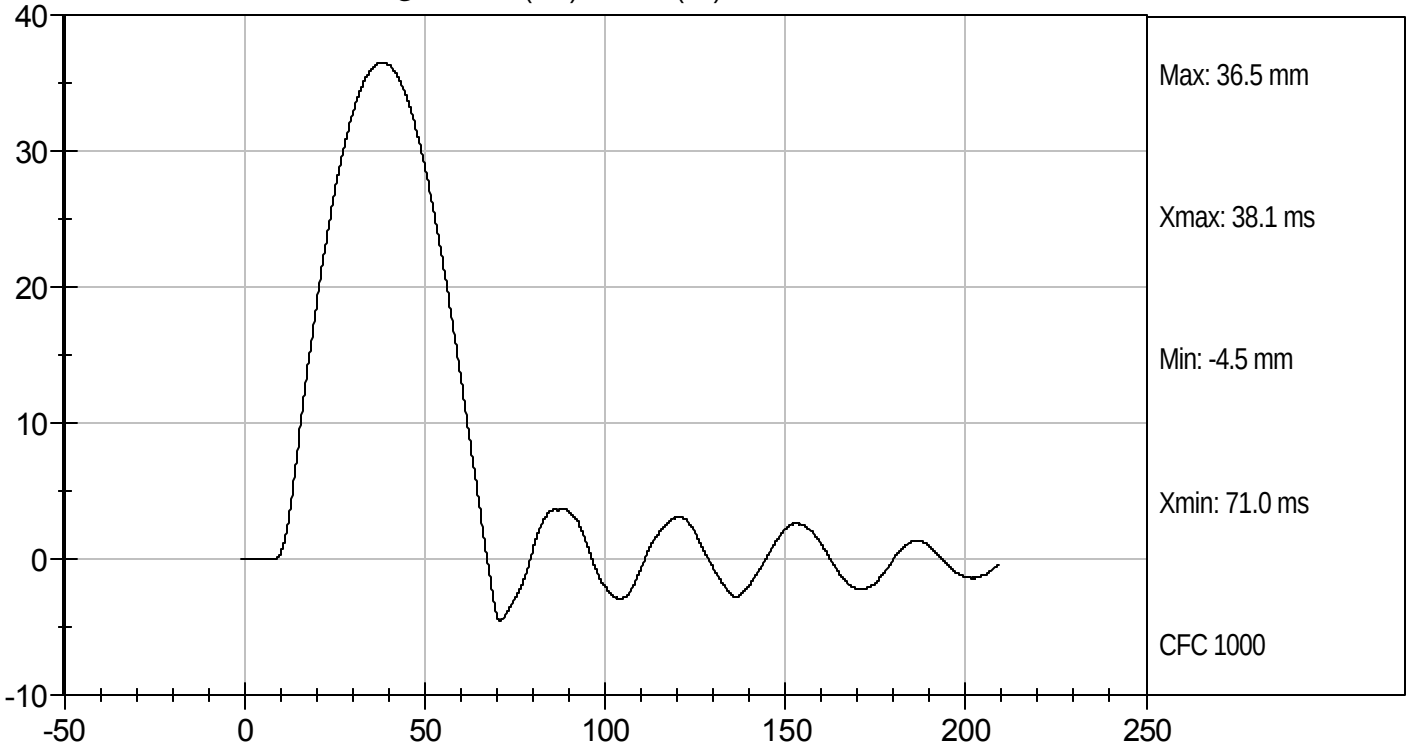
Jessica Hall
Laboratory Technician

1/25/10
Test Date

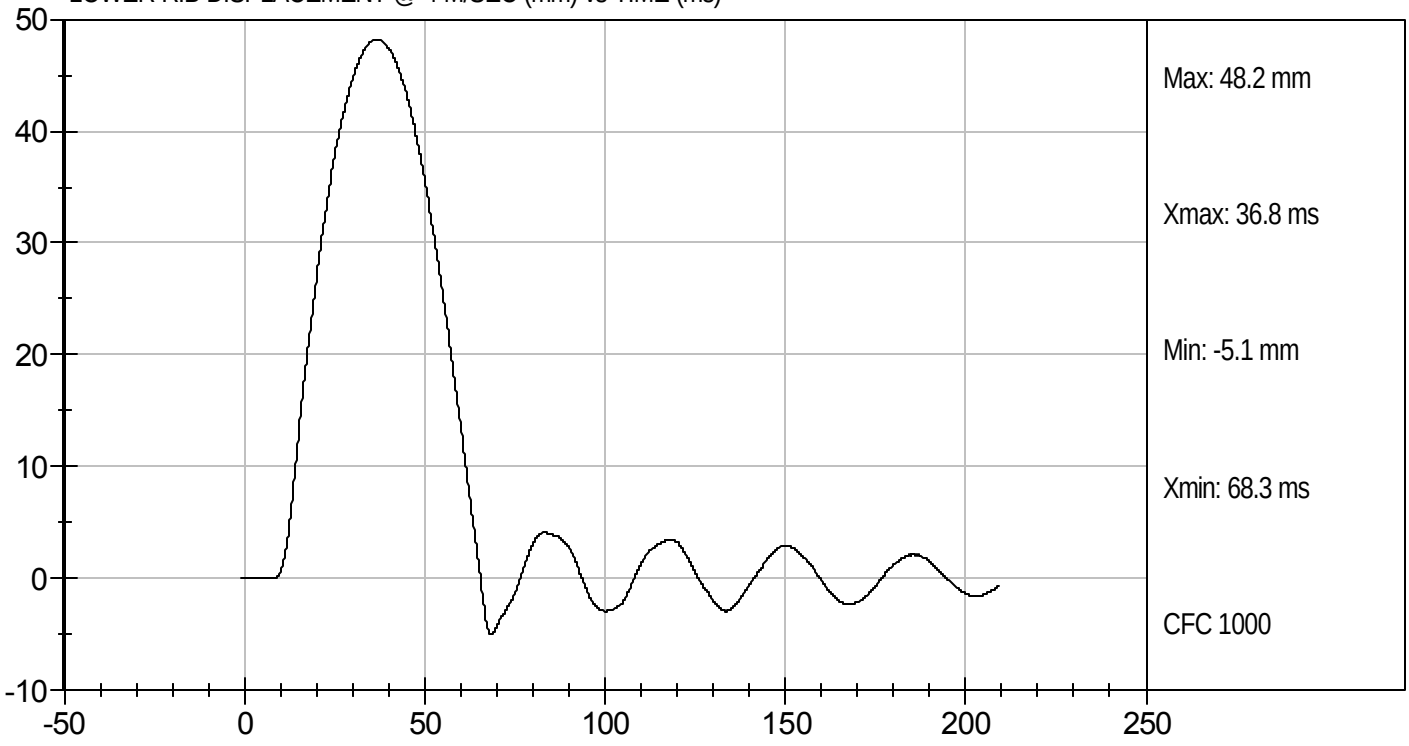
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D10176
Test Date: 1/25/10

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:** D10177

| 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 | 12 | Pass |
| Probe Speed | m/s | 3.90 to 4.10 | 4.10 | Pass |
| Maximum Impact Force | kN | 4.00 to 4.80 | 4.21 | Pass |
| Time of Maximum Impactor Force | ms | 10.60 to 13.00 | 10.90 | Pass |
| Maximum Total Abdomen Force | kN | 2.20 to 2.70 | 2.55 | Pass |
| Time of Maximum Abdomen Force | ms | 10.00 to 12.30 | 12.00 | Pass |
| | | Overall Test Results | | Pass |

Jessica Hall
Laboratory Technician

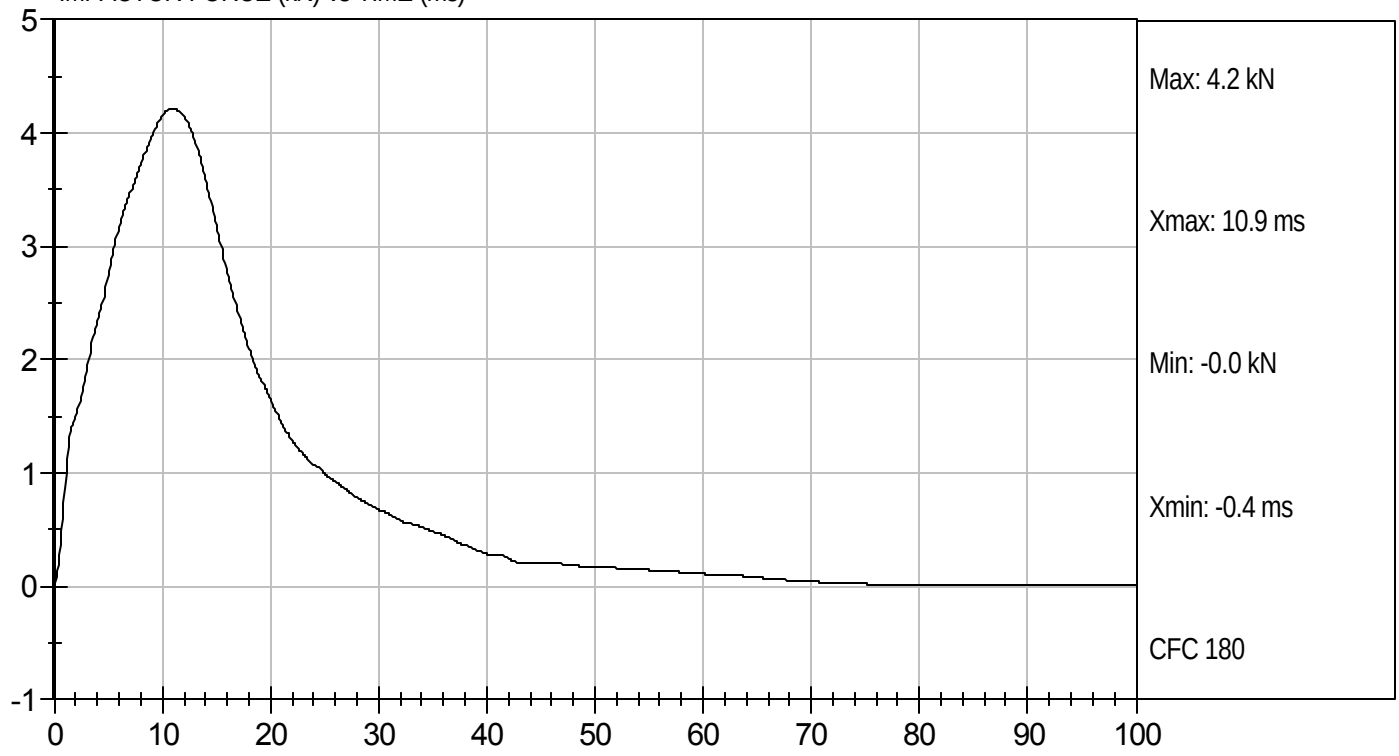
1/27/10
Test Date

David Winkelbauer
Approved By

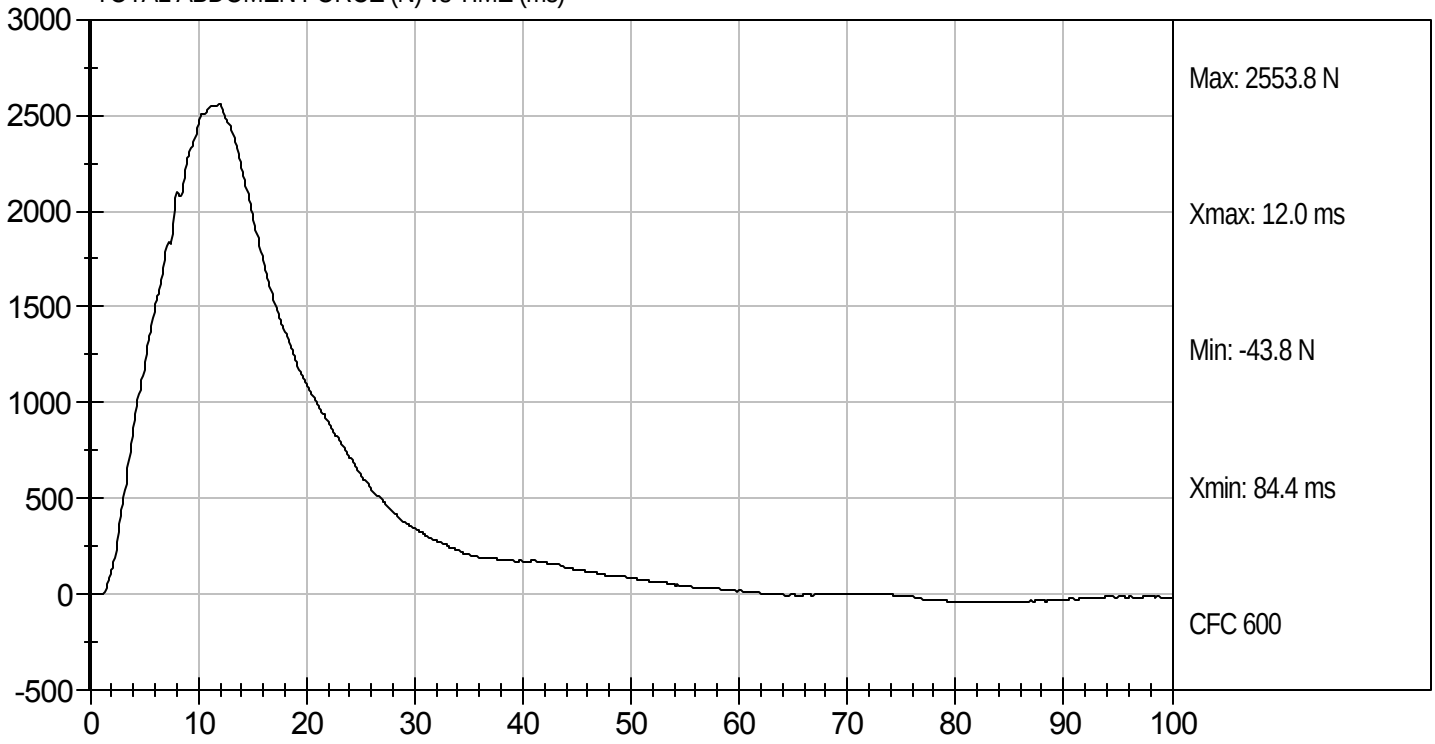
Test Desc: Abdomen Impact
Component ID: D10177

Test Date: 1/27/10
Velocity: 13.44 ft/s, 4.10 m/s

IMPACTOR FORCE (kN) vs TIME (ms)




TOTAL ABDOMEN FORCE (N) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**LUMBAR SPINE TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10178

| 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 | 22 | Pass |
| Pendulum Speed | | m/s | 5.95 to 6.15 | 6.12 | Pass |
| Pendulum Deceleration | 1 ms | m/s | -0.05 to 0.00 | -0.02 | Pass |
| | 3.7 ms | m/s | -0.425 to -0.24 | -0.417 | Pass |
| | 27 ms | m/s | -6.50 to -5.80 | -5.85 | Pass |
| | 30 ms | m/s | >= -6.5 | -5.97 | Pass |
| Maximum Flexion Angle | | deg | 45.0 to 55.0 | 45.3 | Pass |
| Time of Maximum Flexion Angle | | ms | 39.0 to 53.0 | 43.0 | Pass |
| Headform Rotation Decay to Initial Position | | ms | 37 to 57 | 45 | Pass |
| | | | Overall Results | | Pass |

Jessica Hall
Laboratory Technician

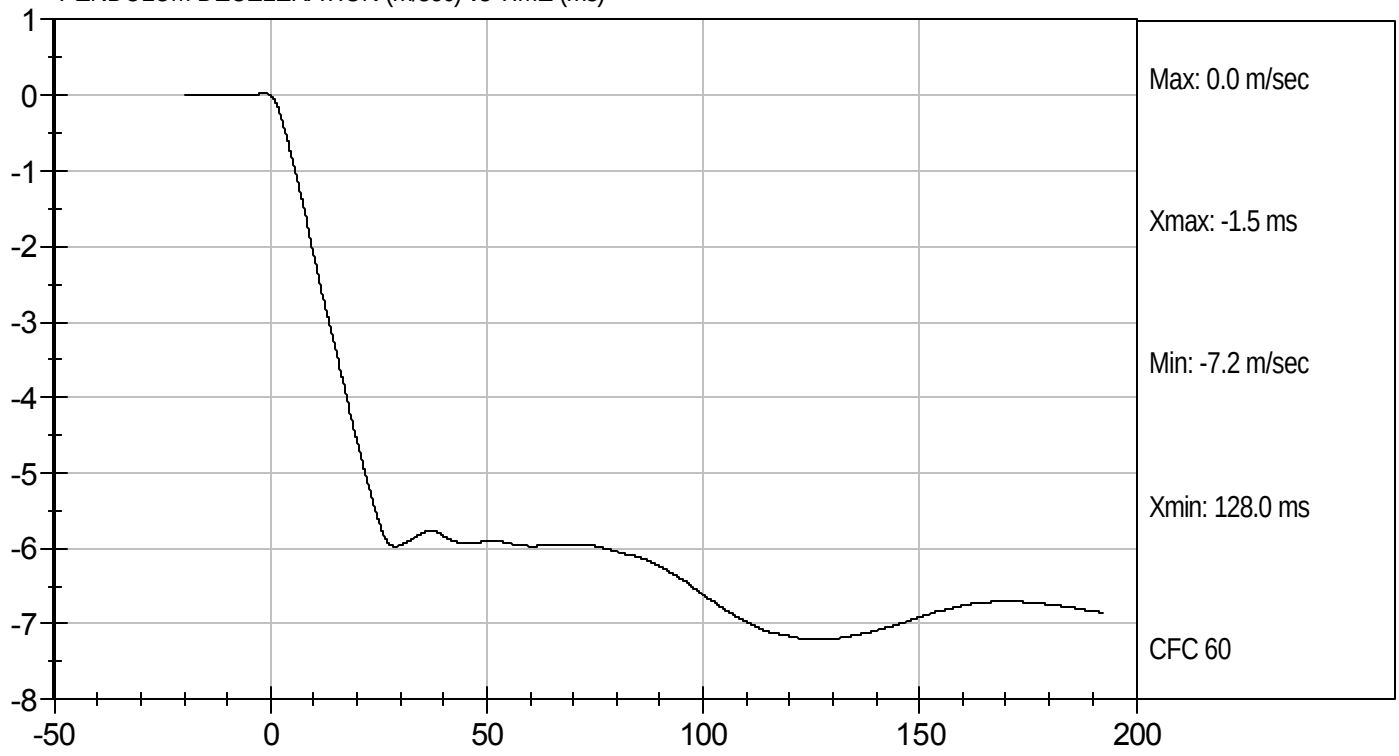
1/25/10
Test Date

David Winkelbauer
Approved By

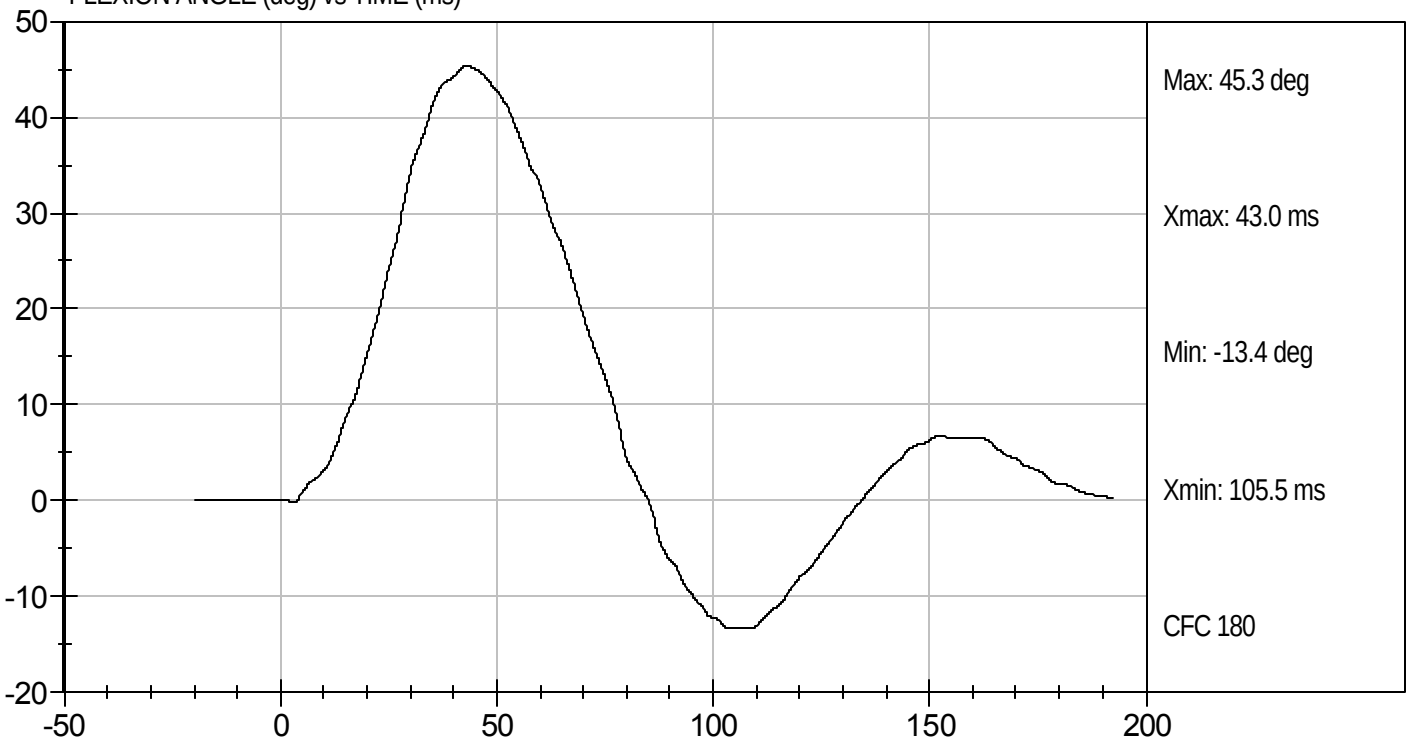
Test Desc: Lumbar Bending
Component ID: D10178

Test Date: 1/25/10
Velocity: 20.08 ft/s, 6.12 m/s

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

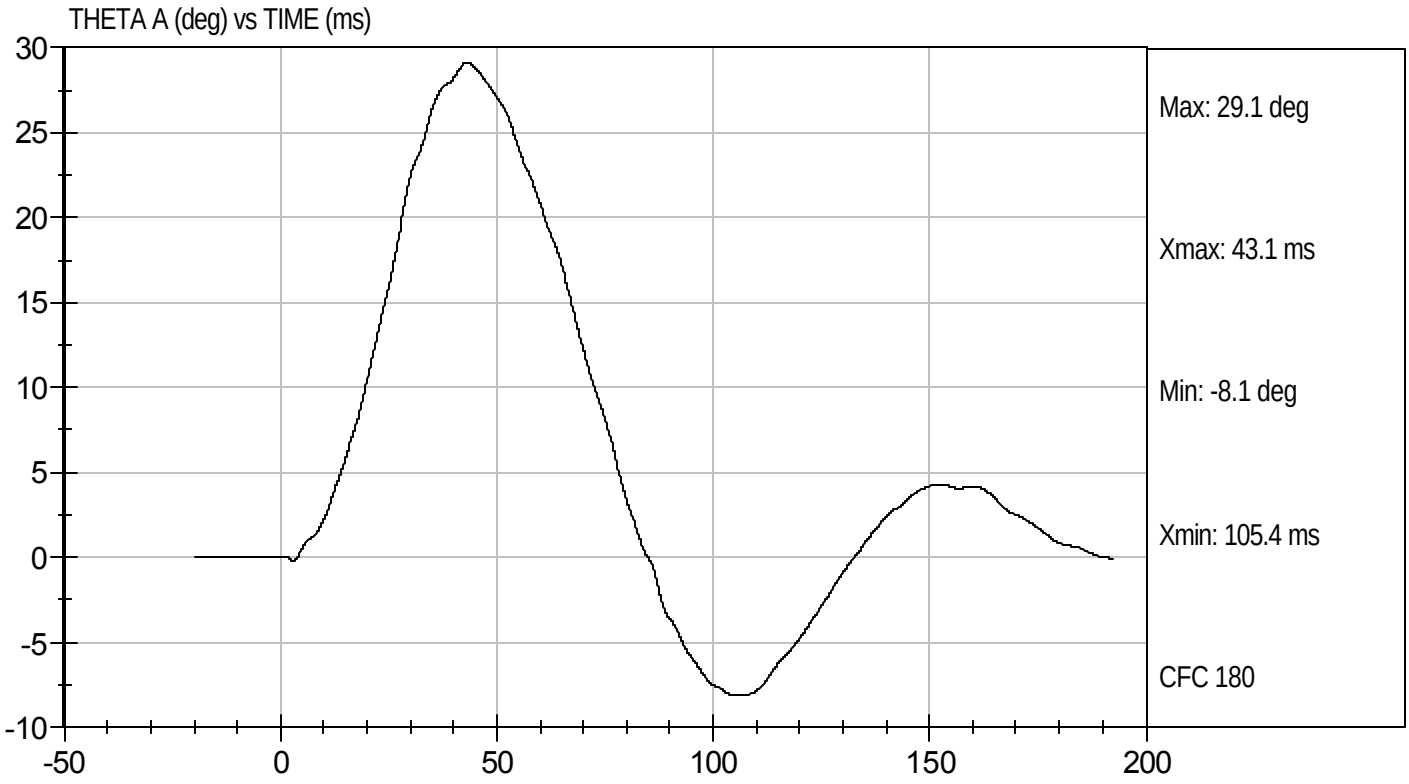


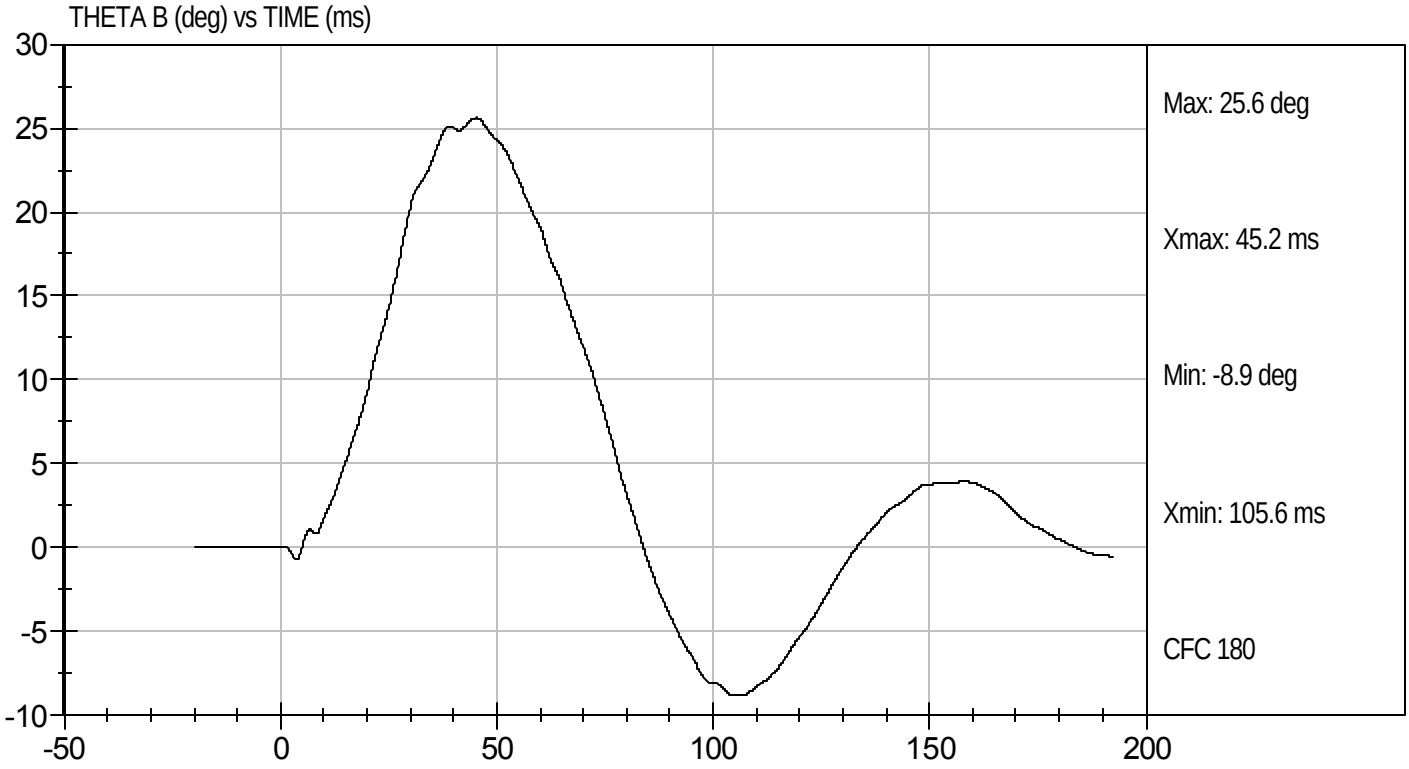

FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D10178

Test Date: 1/25/10
Velocity: 20.08 ft/s, 6.12 m/s



**MGA RESEARCH CORPORATION**

**PELVIS TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10179

| 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 | 12 | Pass |
| Probe Speed | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Impactor Force | kN | 4.70 to 5.40 | 4.87 | Pass |
| Time of Maximum Impactor Force | ms | 11.80 to 16.10 | 13.20 | Pass |
| Maximum Pubic Force | kN | 1.23 to 1.59 | 1.34 | Pass |
| Time of Maximum Pubic Force | ms | 12.20 to 17.00 | 13.80 | Pass |
| | | Overall Test Results | | Pass |

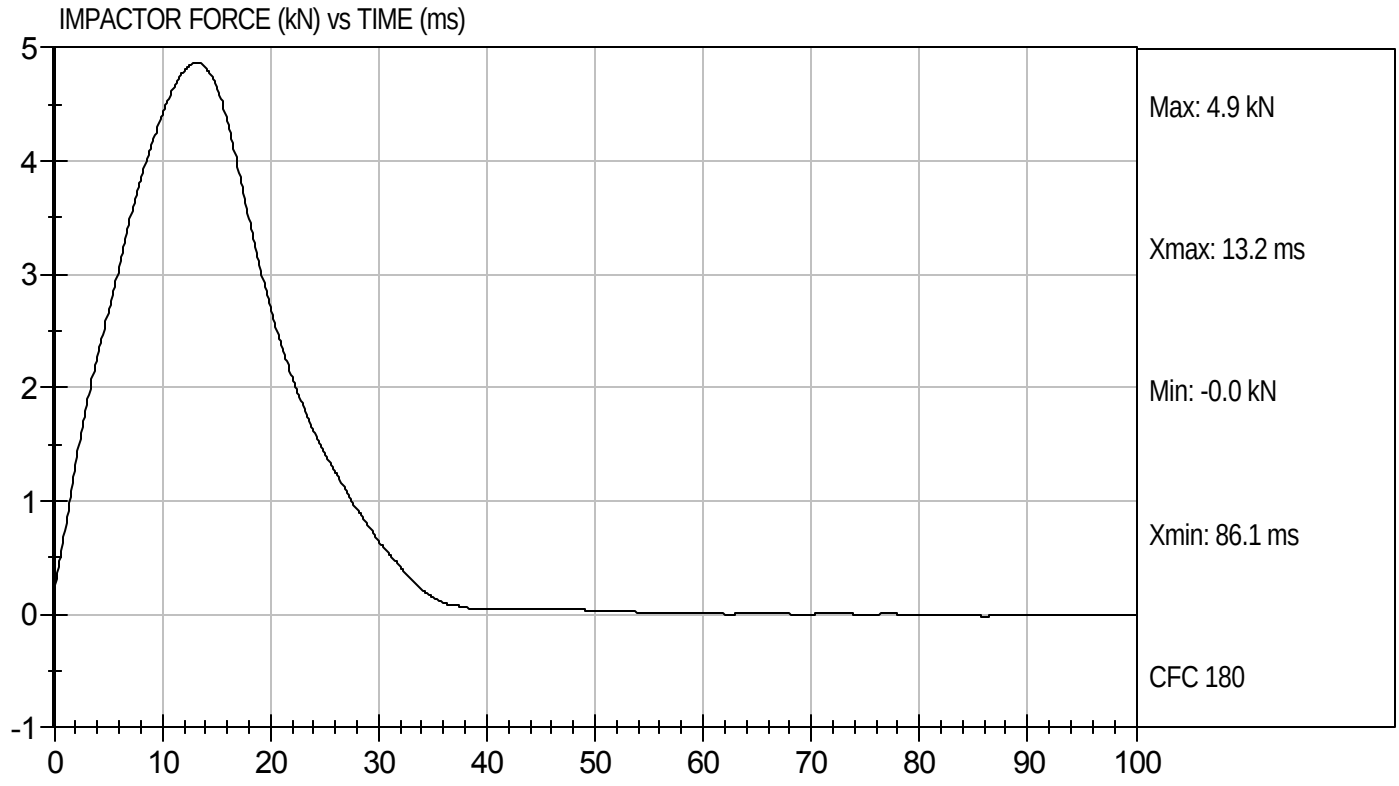
Jessica Hall
Laboratory Technician

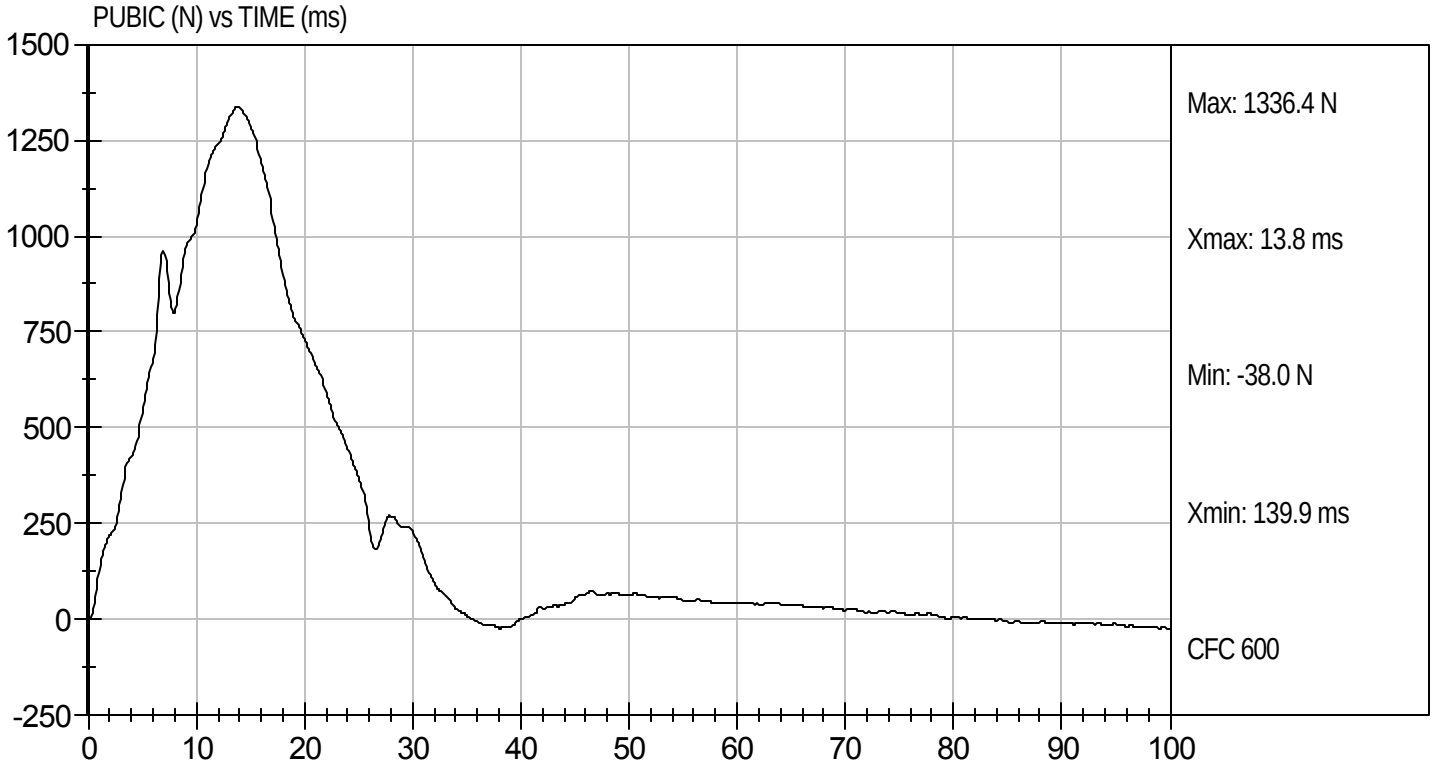
1/27/10
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D10179

Test Date: 1/27/10
Velocity: 14.25 ft/s, 4.34 m/s



**MGA RESEARCH CORPORATION**

**FULL BODY THORAX IMPACT TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016 **Test I.D:** D10170

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 22.0 | Pass |
| Humidity | % | 10 to 70 | 12 | 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 | 5.22 | Pass |
| Upper Rib Displacement | mm | 34.0 to 41.0 | 39.0 | Pass |
| Middle Rib Displacement | mm | 37.0 to 45.0 | 41.4 | Pass |
| Lower Rib Displacement | mm | 37.0 to 44.0 | 40.7 | Pass |
| | | Overall Test Results | | Pass |

Jessica Gall
Laboratory Technician

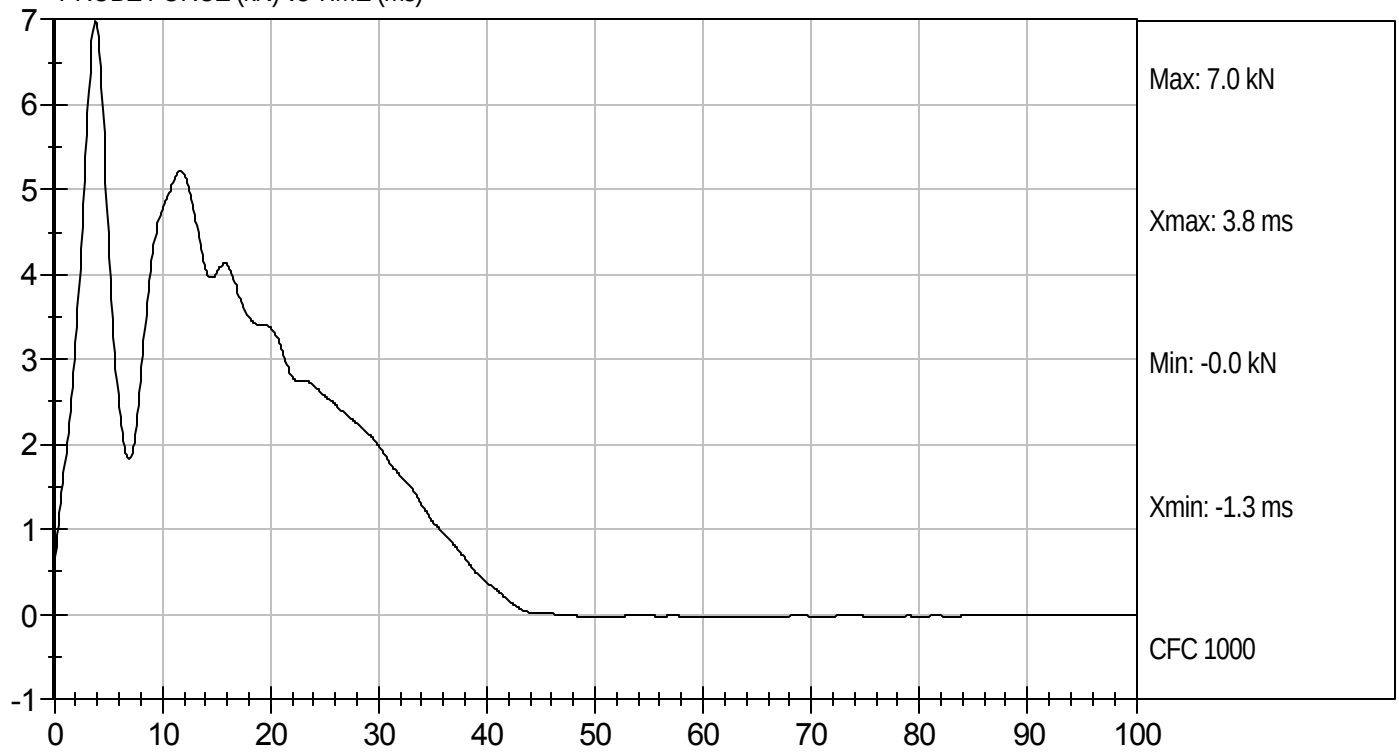
1/27/10
Test Date

David Winkelbauer
Approved By

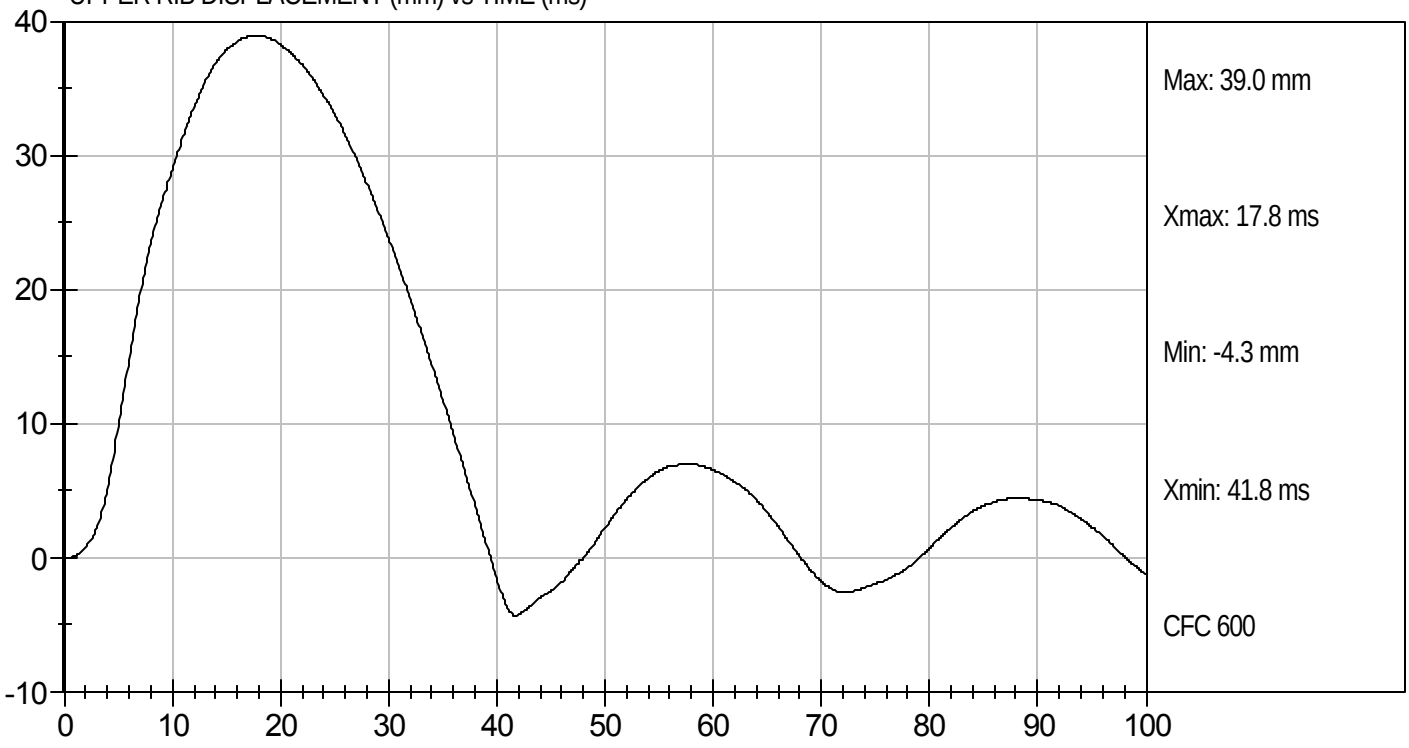
Test Desc: Thorax Impact
Component ID: D10170

Test Date: 1/27/10
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



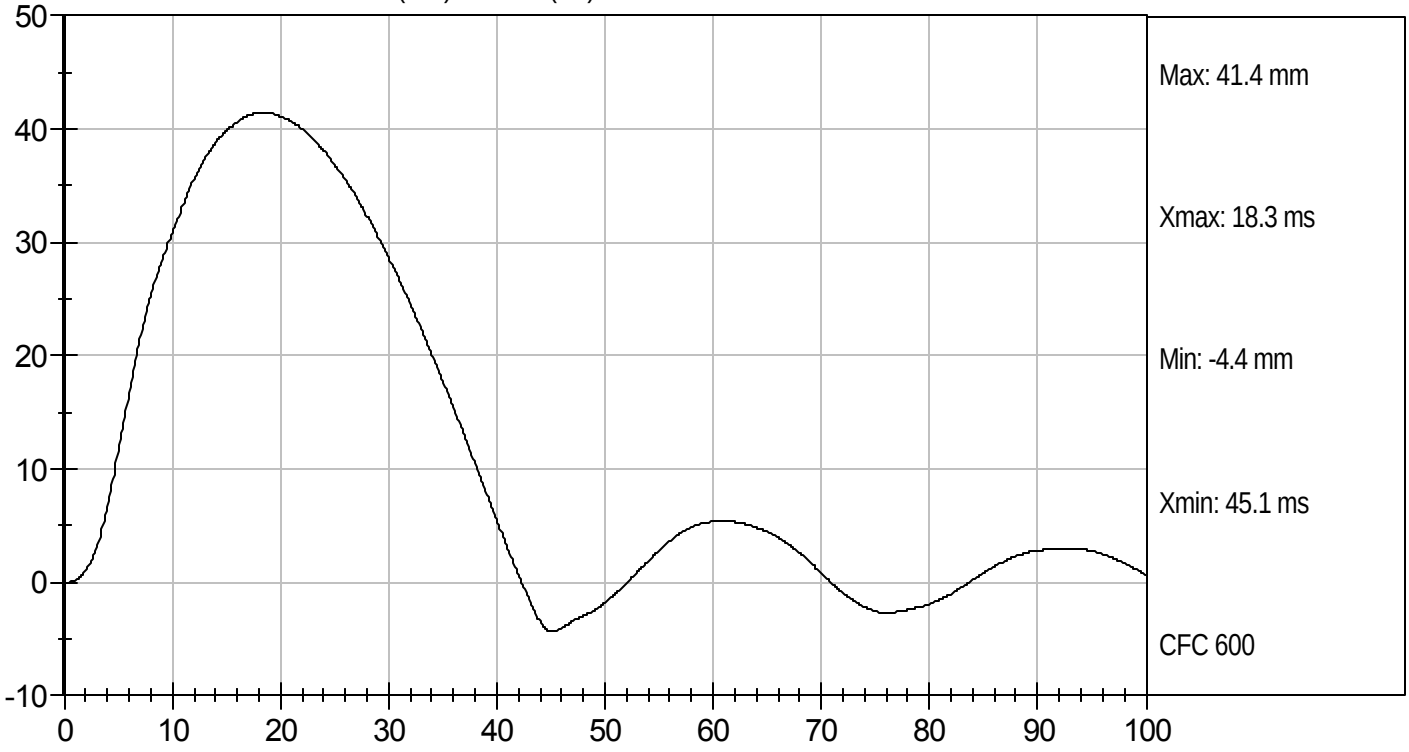

UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



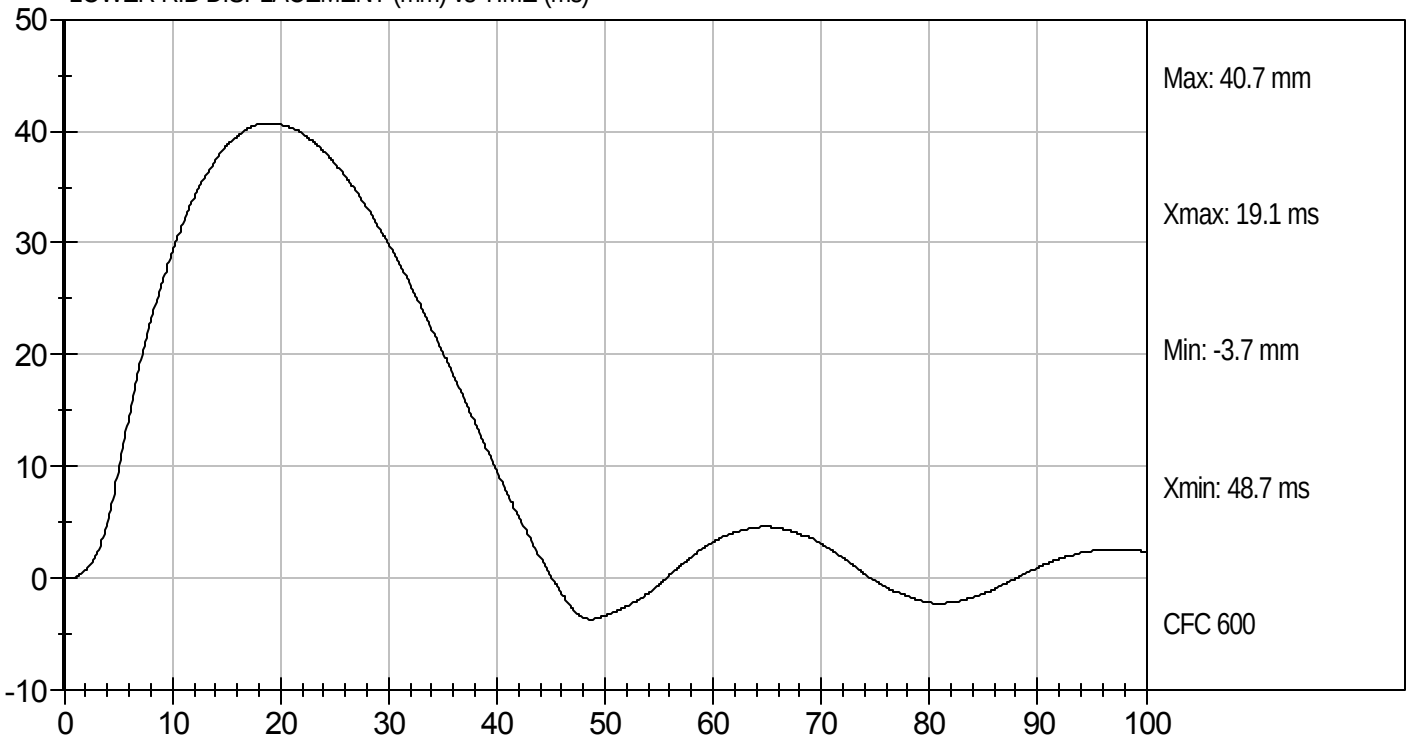
Test Desc: Thorax Impact
Component ID: D10170

Test Date: 1/27/10
Velocity: 18.32 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 CALIBRATON

**Table 1 – Dummy Instrumentation**

| | | ES-2re S/N: 016 | | |
|---|---|---|---|---|
| | | Serial Number | Manufacturer | Calibration Date |
| Head Accelerometers | X | P63402 | Endevco | 1/05/2010 |
| | Y | P63403 | Endevco | 1/05/2010 |
| | Z | P63404 | Endevco | 1/05/2010 |
| Thorax Potentiometers | Upper Rib (Y) | G144 | Honeywell | 11/17/2009 |
| | Middle Rib (Y) | G143 | Honeywell | 11/17/2009 |
| | Lower Rib (Y) | G142 | Honeywell | 11/17/2009 |
| Abdomen Load Cells | Forward (Y) | ABG119 | FTSS | 3/19/2009 |
| | Middle (Y) | ABG120 | FTSS | 3/19/2009 |
| | Rear (Y) | ABG121 | FTSS | 3/19/2009 |
| Pubic Symphysis Load Cell (Y) | | PG431 | Denton | 3/19/2009 |

**Table 2 – Vehicle Instrumentation**

| | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|
| Vehicle CG (X) | P47110 | Endevco | 12/30/2009 |
| Vehicle CG (Y) | P47108 | Endevco | 12/30/2009 |
| Vehicle CG (Z) | P47109 | Endevco | 12/30/2009 |
| Left Floor Sill (Y) | J07-Z17 | Entran | 12/30/2009 |
| A Pillar Sill (Y) | P55706 | Endevco | 11/23/2009 |
| A Pillar Low (Y) | D12-X25 | Entran | 12/30/2009 |
| A Pillar Mid (Y) | ET21195 | Entran | 9/15/2009 |
| B Pillar Sill (Y) | P55715 | Endevco | 11/23/2009 |
| B Pillar Low (Y) | P47854 | Endevco | 12/30/2009 |
| B Pillar Mid (Y) | G29-X39 | Entran | 10/18/2009 |
| Seat (Y) | J23-M06 | Entran | 10/18/2009 |
| Engine (X) | J23-M04 | Entran | 1/20/2010 |
| Engine (Y) | J23-M05 | Entran | 1/20/2010 |
| Firewall (Y) | L02-Z42 | Entran | 10/18/2009 |
| Roof (Y) | P47880 | Endevco | 8/11/2009 |
| Floor Sill (Y) | P47972 | Endevco | 9/15/2009 |
| Rear Deck (X) | P47086 | Endevco | 1/20/2010 |
| Rear Deck (Y) | P47087 | Endevco | 1/20/2010 |