REPORT NUMBER: 201-MGA-2009-002

# SAFETY COMPLIANCE TESTING FOR FMVSS 201
# RIGID POLE SIDE IMPACT TEST

GENERAL MOTORS CORPORATION
2009 CHEVROLET TRAILBLAZER 1LT 2WD
NHTSA NUMBER: C90111

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

TEST DATE: March 12, 2009

REPORT DATE: June 12, 2009

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WASHINGTON, D.C. 20590

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Prepared by: _____ Date: June 12, 2009
Ben Fischer, Project Engineer

Reviewed by: David Winkelbauer Date: June12, 2009
David Winkelbauer, Director of Operations

FINAL REPORT ACCEPTED BY:

_____
COTR, Side Impact

_____
Date of Acceptance

**Technical Report Documentation Page**

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| *15. Supplementary Notes* | | |

*16. Abstract*


A rigid pole side impact test was conducted on a 2009 Chevrolet Trailblazer 1LT 2WD in accordance with FMVSS 201, "Occupant Protection in Interior Impact", S6.2(b)(3) and the Office of Vehicle Safety Compliance Test Procedure No. TP-201P-02 "Rigid Pole Side Impact Test". The test was conducted at MGA Research Corporation in Burlington, Wisconsin on March 12, 2009.

The impact velocity of the vehicle was 28.2 kph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 21°C. The post-test maximum crush was 404 mm at level 2. The test vehicle's occupant performance is as follows:

| | REQUIREMENT | DRIVER |
|---|---|---|
| HIC | ≤ 1000 | 480 |

The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.


| | | | |
|---|---|---|---|
| *17. Key Words*<br>Compliance Testing<br>Rigid Pole Side Impact Test<br>FMVSS 201 | | *18. Distribution Statement*<br>Copies of this report are available from:<br>National Highway Traffic Safety Adm.<br>Technical Ref. Division, (NPO-230)<br>1200 New Jersey Avenue, SE<br>Washington, D.C. 20590 | |
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# SECTION 1
# PURPOSE AND TEST PROCEDURE

## 1.1 PURPOSE

This rigid pole side impact test is conducted as part of the FY' 2009 test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract No. DTNH22-06-C-00030. The purpose of this test was to evaluate occupant protection in interior impact in a 2009 Chevrolet Trailblazer 1LT 2WD manufactured by General Motors Corporation.

## 1.2 TEST PROCEDURE

The rigid pole side impact test was conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC), laboratory test procedure TP-201P-02, dated October 21, 2001 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA8. The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

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

## SECTION 2
## SUMMARY OF RIGID POLE SIDE IMPACT TEST

### 2.1 SUMMARY OF RIGID POLE SIDE IMPACT TEST

A rigid pole side impact test was performed on a 2009 Chevrolet Trailblazer 1LT 2WD. The subject vehicle was towed into a rigid pole at a velocity of 28.2 km/h. The specified impact velocity range is from 27.2 to 28.8 km/h. The test vehicle was positioned 90° to the line of forward motion. The weight of the vehicle as tested was 2183.5 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on March 12, 2009.

One (1) real-time motion picture camera and eleven (11) high-speed motion picture cameras were used to document the impact event. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and SID/HIII can be found in Appendix A. One SID/HIII was placed in the left front outboard designated seating position according to instructions specified in the TP-201P-02 dated October 21, 2001. The SID/HIII was instrumented in the following locations:

- Head Center of Gravity (CG) tri-axial accelerometers (X, Y, and Z axis)
- Upper Neck 6 channel load cell (X, Y, Z force and moment)
- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)

The test vehicle was instrumented with eighteen (18) structural accelerometers. All data channels were recorded with a fully self contained on-board DTS TDAS Pro. The data was digitally sampled at 10,000 samples per second and processed per Section 12.2 of the OVSC Test Procedure.

## 2.2 GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 404 mm at level 2, at the vertical impact line. The driver SID/HIII, Serial No. 037, was calibrated just prior to this test. The SID/HIII's injury criteria are summarized as follows:

| Measurements | Units | Driver |
|---|---|---|
| HIC | | 480 |
| TTI* | G's | 90.7 |
| Pelvis* | G's | 62.8 |
| Neck Force X* | N | -383 |
| Neck Force Y* | N | -537 |
| Neck Force Z* | N | 1264 |
| Neck Moment X* | Nm | -66.6 |
| Neck Moment Y* | Nm | 16.1 |
| Neck Moment Z* | Nm | 33.6 |

* For Information Purposes Only

Test summaries and post-test observations are presented in Section 3. The vehicle, camera, and occupant measurements are presented in Section 4. Appendix A contains the still photograph prints. Appendix B contains the SID/HIII and vehicle data traces. Appendix C contains the SID/HIII's configuration and performance verification data. Appendix D contains the calibration information data.

## TEST NOTES

The following channels were not used in this test:

Driver Door Lower
Driver Door Mid
Driver Door Upper

There was no valid data collected for:

Left Front Door Y after 60 msec
Left Mid B-Post Y after 30 msec

## SECTION 3

## SIDE IMPACT DUMMY (SID/HIII) AND VEHICLE TEST DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

### CONVERSION FACTORS USED IN THIS REPORT*

| Quantity | Typical Application | English Units | Metric Unit | Multiply By |
|---|---|---|---|---|
| Mass | Vehicle Weight | lb | kg | 0.4536 |
| Linear Velocity | Impact Velocity | mile/h | km/h | 1.609 |
| Length or Distance | Measurements | in | mm | 25.4 |
| Volume | Small Fluids | oz | mL | 29.573 |
| Pressure | Tire Pressure | $lbf/in^2$ | kPa | 7.0 |
| Volume | Liquid | gal | liter | 3.785 |
| Temperature | General Use | °F | °C | =(tf -32)/1.8 |
| Force | Dynamic Forces | lbf | N | 4.448 |
| Moment | Torque | lbf/ft | Nm | 1.355 |

*Based on the Recommended Practice in SAE J916, May 85

## DATA SHEET NO. 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD
Test Program: FMVSS 201P
NHTSA No. C90111
Test Date: March 12, 2009

### TEST VEHICLE INFORMATION

| | |
|---|---|
| Make | Chevrolet |
| Model | Trailblazer |
| Body Style | SUV |
| NHTSA No. | C90111 |
| VIN | 1GNDS33S792102964 |
| Color | Sand Beige Metallic |
| Delivery Date | 2/6/2009 |
| Odometer Reading (mile) | 102 |
| Dealer | Advantage Chevrolet |
| Transmission | Automatic |
| Final Drive | 2WD |
| Number of Cylinders | 6 |
| Engine Displacement (L) | 4.2 |
| Engine Placement | Longitudinal |

### TEST VEHICLE OPTIONS

| | |
|---|---|
| Front Airbag | Yes |
| Side Curtain Airbag | Yes |
| Power Windows | Yes |
| Power Steering | Yes |
| Power Door Locks | Yes |
| Tilt Wheel | Yes |
| Air Conditioning | Yes |
| Power Brakes | Yes |
| Disc Brakes, Front | Yes |
| Disc Brakes, Rear | Yes |
| Anti-lock Brakes | Yes |
| AM/FM/CD | Yes |
| Anti-theft System | Yes |
| Cruise Control | Yes |

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | General Motors Corporation |
| Date of Manufacture | 08/08 |

| | |
|---|---|
| GVWR (kg) | 2518 |
| GAWR Front (kg) | 1338 |
| GAWR Rear (kg) | 1452 |

### DATA FROM TIRE PLACARD

| Measured Parameter | Front | Rear |
|---|---|---|
| Maximum Tire Pressure (kPa) | 210 | 240 |
| Cold Pressure (kPa) | 210 | 240 |
| Recommended Tire Size | P245/65R17 | P245/65R17 |
| Tire Size on Vehicle | P245/65R17 | P245/65R17 |
| Tire Manufacturer | Michelin | Michelin |

| Measured Parameter | Front | Rear | Third | Total |
|---|---|---|---|---|
| Type of Seats | Bucket | Bench | | |
| Number Of Occupants | 2 | 3 | | 5 |
| Capacity Wt. (VCW) (kg) | | | | 501 |
| Cargo Wt. (RCLW) (kg) | | | | 136 |

## DATA SHEET NO. 1... (continued)

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

### TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) (Axle) | | | As Tested (ATW) (Axle) | | |
|---|---|---|---|---|---|---|---|
| | | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 534.3 | 460.9 | | 564.7 | 541.1 | |
| Right | kg | 521.2 | 456.3 | | 544.3 | 533.4 | |
| Ratio | % | 53.5 | 46.5 | | 50.8 | 49.2 | |
| Totals | kg | 1055.5 | 917.2 | 1972.7 | 1109.0 | 1074.5 | 2183.5 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value |
|---|---|---|
| Total Delivered Weight (UVW) | kg | 1972.7 |
| Weight of SID/HIII Side Impact Dummy | kg | 80.7 |
| Rated Cargo/Luggage Weight (RCLW) | kg | 136 |
| Calculated Vehicle Target Weight (TVTW) | kg | 2189.4 |

### TEST VEHICLE ATTITUDES

| | Units | As Delivered | Fully Loaded | Ready For Test |
|---|---|---|---|---|
| Right Front | mm | 853 | 848 | 910 |
| Left Front | mm | 852 | 843 | 913 |
| Right Rear | mm | 880 | 843 | 922 |
| Left Rear | mm | 870 | 829 | 925 |
| Right Door Sill Angle | deg | 0.8 ND | 0.1 ND | 0.5 ND |
| Left Door Sill Angle | deg | 1.1 ND | 0.4 ND | 0.6 ND |
| Front Bumper Angle | deg | 0.7 RD | 0.6 RD | 0.6 RD |
| Rear Bumper Angle | deg | 0.1 LD | 0.4 LD | 0.2 LD |

ND = NOSE DOWN, NU = NOSE UP, BD = BACK DOWN, LD = LEFT DOWN, RD = RIGHT DOWN, RU = RIGHT UP

### GENERAL TEST VEHICLE DATA

| Measurement Description | Units | Value |
|---|---|---|
| Test Vehicle Wheel Base | mm | 2876 |
| Total Vehicle Length at Left Side | mm | 4136 |
| Total Vehicle Length at Centerline | mm | 4854 |
| Total Vehicle Length at Right Side | mm | 4136 |
| Total Vehicle Width at B-Post | mm | 1846 |
| Weight of Ballast in Cargo Area | kg | 45.4 |
| Amount of Stoddard Solvent in Fuel Tank | liters | 75.7 |

## DATA SHEET NO. 1... (Continued)

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

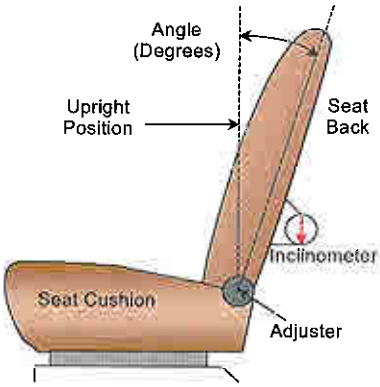
### TEST VEHICLE VERTICAL IMPACT LINE DATA

| Measurement Description | Units | Value |
|---|---|---|
| Target Impact Point Aft of Front Axle | mm | 1543 |
| Actual Impact Point Aft of Front Axle | mm | 1543 |

### NORMAL DESIGN RIDING POSITION

The driver's seat back is positioned to the manufacturer's designated angle. The procedure for the seat is as follows: Start with the seat in its most forward, latched position. Rotate the seat back rearward 12.5 degrees. This will put the back angle at 18.5 degrees on seat frame (0.3 degrees on headrest post).

Initial driver seat back angle: 0.3 degrees on head rest post
Final driver seat back angle: 4.0 degrees on head rest post



*FRONT SEAT ASSEMBLY*

### SEAT FORE/AFT POSITIONS

Initial Seat position: 110 mm from forward most position
Final Seat position: 110 mm from forward most position

### SEAT BELT UPPER ANCHORAGE

The test vehicle was not equipped with adjustable "D" ring anchorage for the driver's seat position.

## DATA SHEET NO. 1... (continued)

## GENERAL TEST AND VEHICLE PARAMETER DATA

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer 1LT 2WD | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |

### FUEL TANK CAPACITY DATA

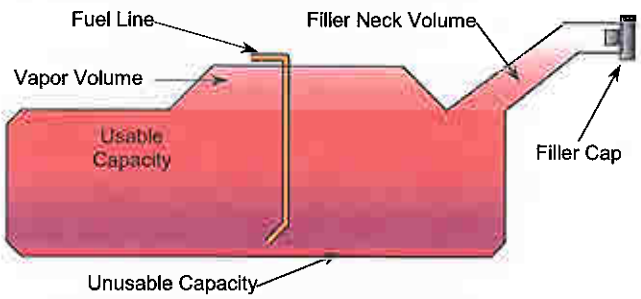
The "Usable Capacity" of the standard equipment fuel tank is: 81.0 liters

The "Usable Capacity" of any optional equipment fuel tank is: N/A liters

92-94% of "Usable Capacity" for certification to FMVSS 301 requirements: 74.5 – 76.1 liters

Actual amount of Stoddard solvent added to vehicle for certification test 75.7 liters

The vehicle is equipped with electric fuel pump. The pump operates when the engine is running.

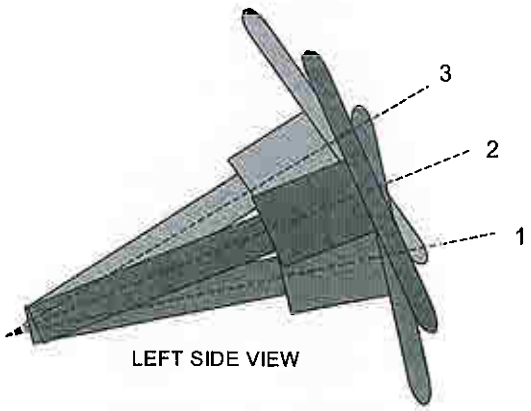



*VEHICLE FUEL TANK ASSEMBLY*

### STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes, when it is moved through its full range of motion.

The steering column was placed in detent 3 with the upper most defined as 0 (68.7°).




*STEERING COLUMN ASSEMBLY*

## DATA SHEET NO. 2

## TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

### TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | |
|---|---|---|---|---|---|---|---|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 534.3 | 460.9 | | 564.7 | 541.1 | |
| Right | kg | 521.2 | 456.3 | | 544.3 | 533.4 | |
| Weight Ratio | % | 53.5 | 46.5 | | 50.8 | 49.2 | |
| Totals | kg | 1055.5 | 917.2 | 1972.7 | 1109.0 | 1074.5 | 2183.5 |

### MAXIMUM EXTERIOR STATIC CRUSH

| Level | Measured Parameter | Units | Maximum Crush | Above Ground |
|---|---|---|---|---|
| Level 1 | Sill Top Height | mm | 365 | 482 |
| Level 2 | Occupant H-Point | mm | 404 | 832 |
| Level 3 | Mid Door | mm | 401 | 857 |
| Level 4 | Window Sill | mm | 340 | 1186 |
| Level 5 | Window Top | mm | 201 | 1743 |
| N/A | Maximum Penetration | mm | 404 | 857 |

### INSTRUMENTATION

| | |
|---|---|
| SID/HIII Instrumentation | 17 |
| Vehicle Structure Accelerometers | 18 |
| Total | 35 |

### HIGH SPEED CAMERAS

| | |
|---|---|
| Onboard Vehicle | 3 |
| Offboard Vehicle | 8 |
| Total | 11 |

### IMPACT POINT DATA

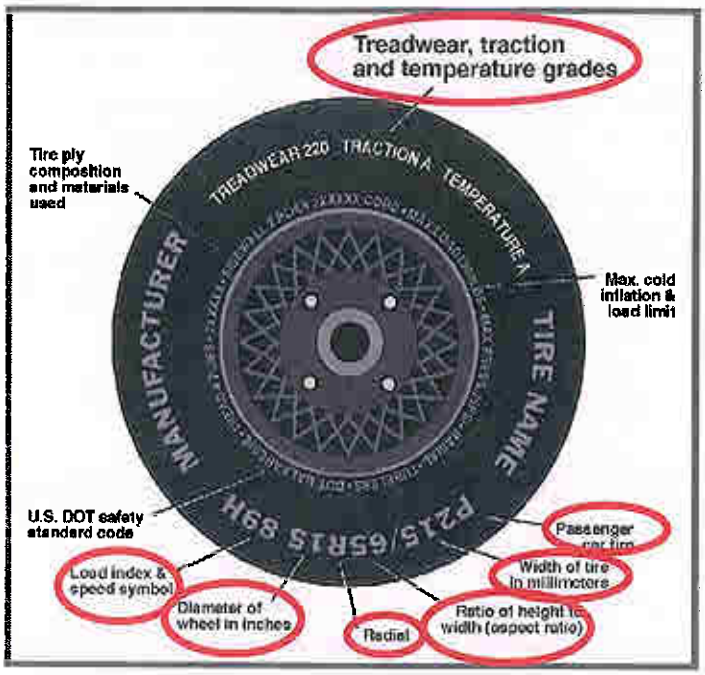
| Measured Parameter | Units | Requirement | Value |
|---|---|---|---|
| Horizontal Offset | mm | +/- 38 | 0 forward |

## DATA SHEET NO. 3

## TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

| | | | |
|---|---|---|---|
| Vehicle Year | 2009 | Vehicle Make | Chevrolet |
| VIN | 1GNDS33S792102964 | Vehicle Model | Trailblazer 1LT 2WD |




| | Front | Rear |
|---|---|---|
| Tire Manufacturer | Michelin | Michelin |
| Tire Name | Cross Terrain | Cross Terrain |
| Tire Type | P | P |
| Tire Width (mm) | 245 | 245 |
| Ratio of Height to Width (aspect ratio) | 65 | 65 |
| Radial | R | R |
| Wheel Diameter | 17 | 17 |
| Load Index & Speed Symbol | 105S | 105S |
| Treadwear | 420 | 420 |
| Traction Grade | A | A |
| Temperature Grade | B | B |

## DATA SHEET NO. 4

## POST TEST OBSERVATIONS

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

### TEST DUMMY INFORMATION AND CONTACT POINTS

| Description | Left Front Seating Position |
|---|---|
| Dummy Type / Serial No. | SID/HIII / 037 |
| Head Contact | Curtain Airbag, Headrest |
| Upper Torso Contact | Side Airbag |
| Lower Torso Contact | 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 Door Opening | Door remained closed and latched | Door remained closed and latched |
| Right Side Door Opening | Door remained closed and latched | Door remained closed and latched |
| Seat Movement | 0 | 0 |
| Seat Back Failure | None | None |

### POST TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|---|---|
| Pillar Performance | No failures |
| Sill Separation | None |
| Windshield Damage | Cracked |
| Window Damage | Left side windows down for test |
| Other Notable Effects | None |

### AIRBAG DEPLOYMENT

| | Driver |
|---|---|
| Front | No |
| Side | No |
| Curtain | Yes |

### ARMREST LOCATION AND SEAT CRUSH

| | Driver |
|---|---|
| Front Armrest (from bottom of window) | 180 |
| Front Seat Back Crush | 165 |
| Front Seat Cushion Crush | 105 |

## SECTION 4
## OCCUPANT AND VEHICLE INFORMATION

## DATA SHEET NO. 5

## SID/HIII INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

### THORAX AND PELVIS PEAK ACCELERATIONS (FIR 100 Filtered)

| Location | Axis | Units | Driver | | | |
|---|---|---|---|---|---|---|
| | | | Max | Time | Min | Time |
| Upper Rib (LUR) | Y | G's | 97.4 | 45 | -11.6 | 133 |
| Upper Rib (LUR) (R) | Y | G's | 98.3 | 45 | -12.1 | 133 |
| Lower Rib (LLR) | Y | G's | 90.4 | 45 | -12.6 | 133 |
| Lower Rib (LLR) (R) | Y | G's | 92.1 | 45 | -13.2 | 133 |
| Lower Spine ($T_{12}$) | Y | G's | 84.0 | 50 | -21.5 | 79 |
| Lower Spine ($T_{12}$) (R) | Y | G's | 83.9 | 50 | -10.5 | 83 |
| Pelvis (PEV) | Y | G's | 62.8 | 51 | -13.4 | 81 |
| Pelvis (PEV) (R) | Y | G's | 62.9 | 51 | -13.6 | 81 |

### THORACIC TRAUMA INDEX (TTI) AND PELVIC ACCELERATION (FIR 100 Filtered)

| Location | Driver | | | |
|---|---|---|---|---|
| | LUR | $T_{12}$ | TTI(g) | PEV(g) |
| Rib, Spine, and Pelvis | 97.4 | 84.0 | 90.7 | 62.8 |
| Rib, Spine, and Pelvis (R) | 98.3 | 83.9 | 91.1 | 62.9 |

### UPPER NECK FORCES AND MOMENTS (SAE CLASS 1000/600 Filtered)

| Location | Axis | Units | Driver | | | |
|---|---|---|---|---|---|---|
| | | | Max | Time | Min | Time |
| Neck Force | X | N | 75 | 205 | -383 | 81 |
| Neck Force | Y | N | 503 | 62 | -537 | 163 |
| Neck Force | Z | N | 1264 | 56 | -177 | 258 |
| Neck Moment | X | Nm | 9.2 | 117 | -66.6 | 57 |
| Neck Moment | Y | Nm | 16.1 | 100 | -15.8 | 57 |
| Neck Moment | Z | Nm | 33.6 | 71 | -14.7 | 142 |

### HEAD CG PEAK ACCELERATIONS (SAE CLASS 1000 Filtered)

| Location | Axis | Units | Driver | | | |
|---|---|---|---|---|---|---|
| | | | Max | Time | Min | Time |
| Head CG | X | G's | 5.4 | 235 | -8.4 | 86 |
| Head CG | Y | G's | 64.9 | 66 | -13.1 | 165 |
| Head CG | Z | G's | 18.5 | 52 | -4.9 | 67 |
| Head CG Resultant | | G's | 65.2 | 66 | | |

### HEAD INJURY CRITERIA (SAE CLASS 1000 Filtered)

| Location | Driver | | |
|---|---|---|---|
| | HIC | T1 | T2 |
| Head CG Resultant | 480 | 51.4 | 76.6 |

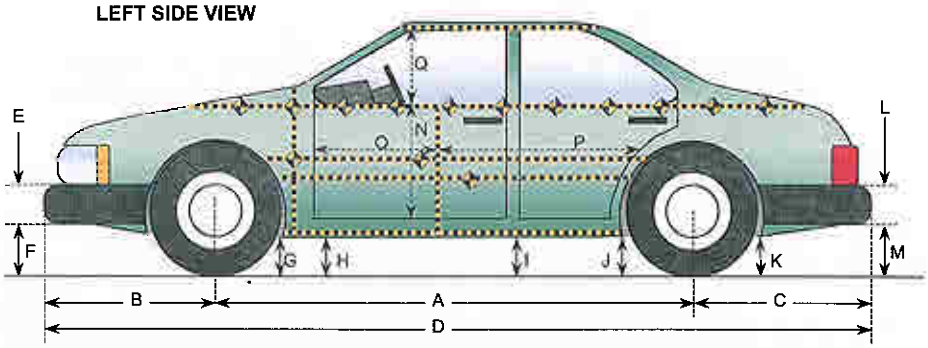
Positive Acceleration Polarities: Longitudinal (X) = + Forward
(Conforms to SAE J211) Lateral (Y) = + Right
Vertical (Z) = + Down

## DATA SHEET NO. 6

## VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 12, 2009

LEFT SIDE VIEW



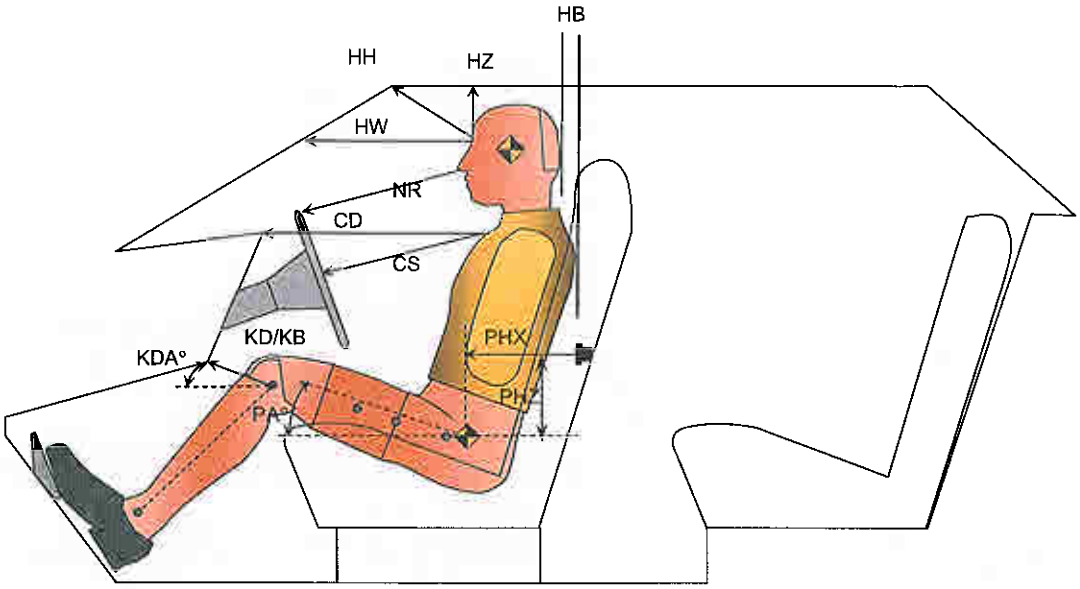

All Measurements in mm

| Code | Measurement Description | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|
| A | Wheelbase | 2876 | 2832 | 44 |
| B | Front Axle to FSOV | 899 | 948 | -49 |
| C | Rear Axle to RSOV | 1079 | 1052 | 27 |
| D | Total Length at Centerline | 4854 | 4832 | 22 |
| E | Front Bumper Thickness | 132 | 132 | 0 |
| F | Front Bumper Bottom to Ground | 410 | 413 | -3 |
| G | Sill Height at Front Wheel Well | 368 | 381 | -13 |
| H | Sill Height at Front Door Leading Edge | 369 | 383 | -14 |
| I | Sill Height at "B" Pillar | 385 | 365 | 20 |
| J1 | Sill Height at Rear Wheel Well | 382 | 391 | -9 |
| J2 | Pinch Weld Height at Rear Wheel Well | 381 | 390 | -9 |
| K | Sill Height Aft of Rear Wheel Well | 540 | 551 | -11 |
| L | Rear Bumper Thickness | 170 | 170 | 0 |
| M | Rear Bumper Bottom to Ground | 489 | 510 | -21 |
| N | Sill Height to Window Bottom Sill | 790 | 728 | 62 |
| O | Front Door Leading Edge to Impact CL | 960 | 961 | -1 |
| P | Rear Door Trailing Edge to Impact CL | 1006 | 1041 | -35 |
| Q | Front Window Opening | 510 | 476 | 34 |
| R | Right Side Length | 4136 | 4149 | -13 |
| S | Left Side Length | 4136 | 4012 | 124 |
| T | Vehicle Width at "B" Post | 1846 | 1543 | 303 |

## DATA SHEET NO. 7

## SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

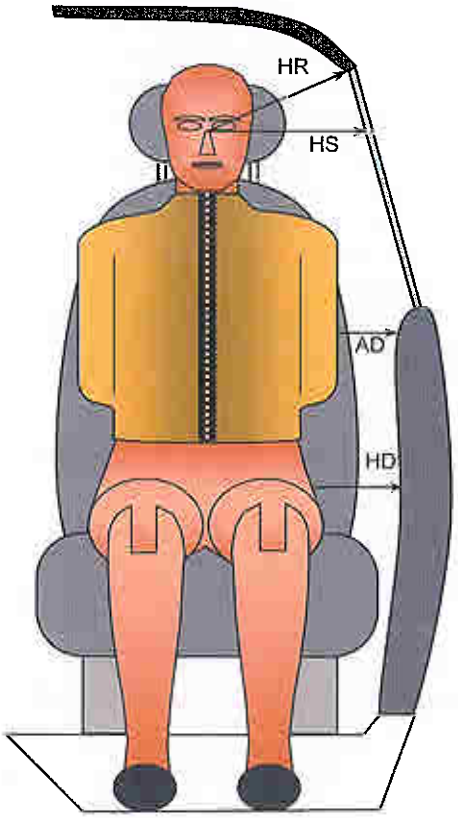



| Driver Code | Measurement Description | Driver | |
|---|---|---|---|
| | | Length (mm) | Angle (°) |
| HH | Head to Header | 422 | |
| HW | Head to Windshield | 611 | |
| HZ | Head to Roof | 181 | |
| NR | Nose to Rim | 375 | |
| CD | Chest to Dash | 547 | |
| CS | Chest to Steering Wheel | 305 | |
| KDL | Left Knee to Dash | 174 | 27.3 |
| KDR | Right Knee to Dash | 169 | 23.4 |
| PA | Pelvic Angle | | 23.8 |
| PHX | H-Point to Striker (X-Axis) | 281 | |
| PHZ | H-Point to Striker (Z-Axis) | 35 | |
| HB | Head to Seatback Clearance | 50 | |

**DATA SHEET NO. 8**

**SID/HIII LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009




*FRONT VIEW OF DUMMY*

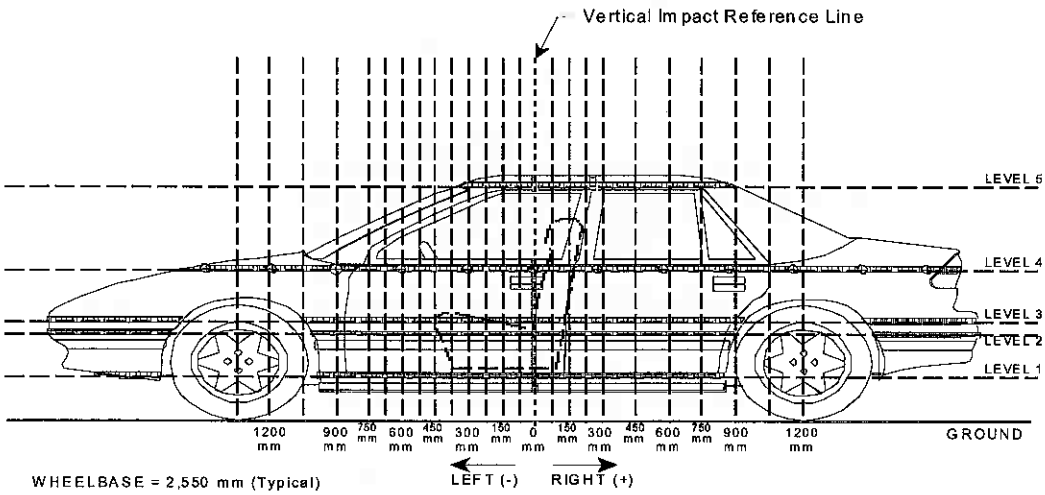
| Code | Measurement Description | Units | Driver |
|---|---|---|---|
| HR | Head to Side Header | mm | 202 |
| HS | Head to Side Window | mm | 332 |
| AD | Arm to Door | mm | 117 |
| HD | H-Point to Door | mm | 200 |

**DATA SHEET NO. 9**

**VEHICLE SIDE MEASUREMENTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer 1LT 2WD | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS




LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 0 mm.

| Level | Measurement Description | Units | Height Above Ground |
|---|---|---|---|
| 5 | Window | mm | 1743 |
| 4 | Window Sill | mm | 1186 |
| 3 | Mid Door | mm | 857 |
| 2 | Occupant H-Point | mm | 832 |
| 1 | Sill Top | mm | 482 |

**DATA SHEET NO. 10**

**VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -1800 | | | | 285 | | | | | 286 | | | | | 1 | |
| -1650 | | | | 275 | | | | | 283 | | | | | 8 | |
| -1500 | | | | 269 | | | | | 288 | | | | | 19 | |
| -1350 | | | | 261 | | | | | 290 | | | | | 29 | |
| -1200 | | | 152 | 255 | | | | 174 | 279 | | | | 22 | 24 | |
| -1050 | 206 | 170 | 174 | 251 | | 214 | 184 | 187 | 266 | | 8 | 14 | 13 | 15 | |
| -900 | 265 | 185 | 185 | 251 | | 282 | 202 | 201 | 260 | | 17 | 17 | 16 | 9 | |
| -825 | 266 | 185 | 185 | 252 | | 302 | 218 | 218 | 268 | | 36 | 33 | 33 | 16 | |
| -750 | 267 | 185 | 185 | 250 | | 320 | 250 | 253 | 273 | | 53 | 65 | 68 | 23 | |
| -675 | 265 | 185 | 184 | 251 | | 330 | 283 | 285 | 295 | | 65 | 98 | 101 | 44 | |
| -600 | 264 | 185 | 184 | 250 | | 345 | 314 | 318 | 326 | | 81 | 129 | 134 | 76 | |
| -525 | 264 | 184 | 184 | 250 | | 354 | 345 | 350 | 357 | | 90 | 161 | 166 | 107 | |
| -450 | 264 | 184 | 183 | 249 | | 367 | 379 | 387 | 386 | | 103 | 195 | 204 | 137 | |
| -375 | 263 | 183 | 183 | 249 | 460 | 385 | 416 | 414 | 421 | 459 | 119 | 233 | 231 | 172 | -1 |
| -300 | 265 | 183 | 183 | 249 | 445 | 387 | 450 | 447 | 453 | 485 | 122 | 267 | 264 | 204 | 40 |
| -225 | 264 | 183 | 184 | 249 | 445 | 440 | 491 | 488 | 494 | 526 | 176 | 308 | 304 | 245 | 81 |
| -150 | 263 | 183 | 184 | 250 | 441 | 487 | 526 | 522 | 531 | 527 | 224 | 343 | 338 | 281 | 86 |
| -75 | 262 | 182 | 183 | 251 | 441 | 544 | 560 | 558 | 571 | 610 | 282 | 378 | 375 | 320 | 169 |
| -0 | 260 | 182 | 184 | 250 | 440 | 570 | 586 | 585 | 590 | 641 | 310 | 404 | 401 | 340 | 201 |
| 75 | 261 | 182 | 184 | 252 | 440 | 626 | 567 | 565 | 570 | 602 | 365 | 385 | 381 | 318 | 162 |
| 150 | 261 | 183 | 184 | 251 | 440 | 508 | 519 | 513 | 527 | 573 | 247 | 336 | 329 | 276 | 133 |
| 225 | 261 | 184 | 184 | 250 | 436 | 467 | 452 | 449 | 498 | 544 | 206 | 268 | 265 | 248 | 108 |
| 300 | 262 | 183 | 183 | 250 | 436 | 396 | 363 | 367 | 465 | 515 | 134 | 180 | 184 | 215 | 79 |
| 375 | 261 | 183 | 184 | 249 | 434 | 374 | 344 | 348 | 438 | 501 | 113 | 161 | 164 | 189 | 67 |
| 450 | 264 | 182 | 184 | 250 | 435 | 357 | 330 | 335 | 425 | 497 | 93 | 148 | 151 | 175 | 62 |
| 525 | 264 | 182 | 183 | 250 | 436 | 339 | 310 | 318 | 404 | 489 | 75 | 128 | 135 | 154 | 53 |
| 600 | 261 | 181 | 182 | 251 | 436 | 314 | 290 | 298 | 384 | 483 | 53 | 109 | 116 | 133 | 47 |
| 750 | 233 | 178 | 178 | 252 | 437 | 245 | 243 | 249 | 344 | 465 | 12 | 65 | 71 | 92 | 28 |
| 900 | | 160 | 161 | 251 | 437 | | 188 | 192 | 306 | 441 | | 28 | 31 | 55 | 4 |
| 1050 | | | | 253 | 442 | | | | 270 | 449 | | | | 17 | 7 |
| 1200 | | | | 255 | 448 | | | | 238 | 452 | | | | -17 | 4 |
| 1350 | | | | 260 | 451 | | | | 265 | 453 | | | | 5 | 2 |
| 1500 | | | | 264 | 458 | | | | 265 | 455 | | | | 1 | -3 |
| 1650 | | | | 273 | 464 | | | | 269 | 455 | | | | -4 | -9 |

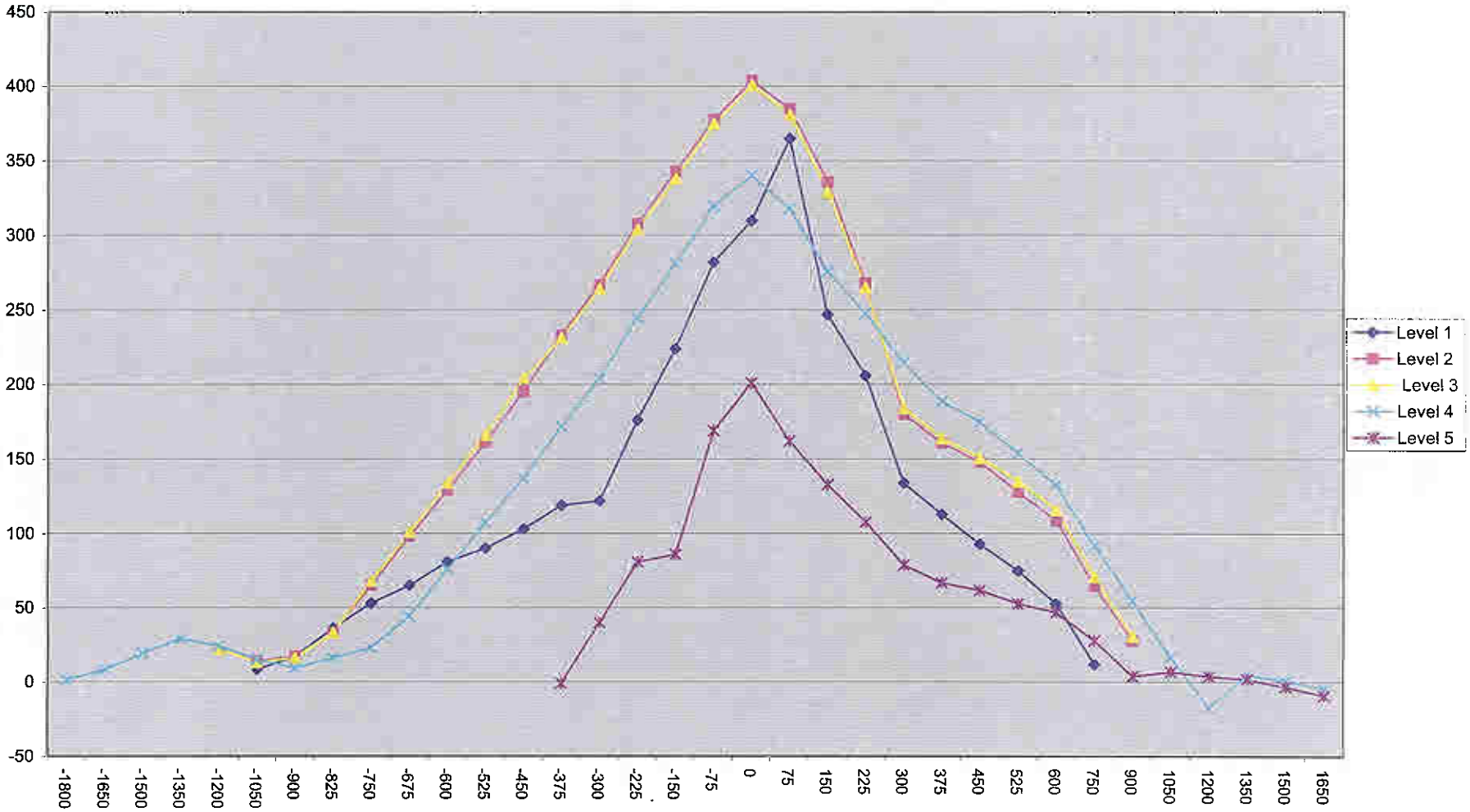
Reference plane is parallel to test vehicle longitudinal centerline Units = mm

Given dimensions = Reference plane to car body

**DATA SHEET NO. 10... (continued)**

**VEHICLE EXTERIOR CRUSH PROFILES**

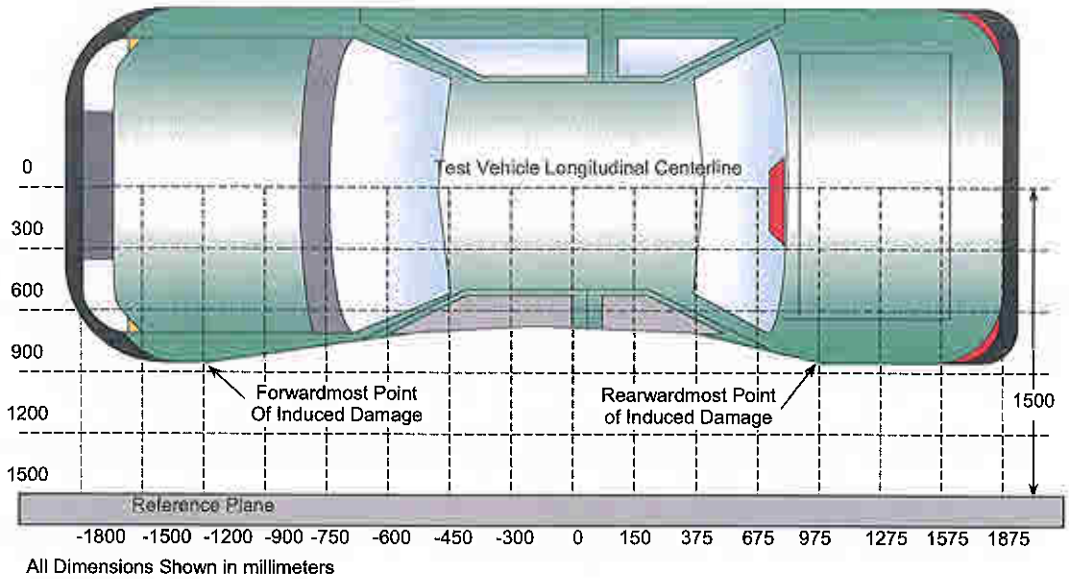
| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer 1LT 2WD | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |



## DATA SHEET NO. 11

## VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009




**TOP VIEW**

**Damage Profile Distances**

| DPD | Distance from Impact Point in mm | Level | Pre-Test (mm) | Post-Test (mm) | Max Static Crush (mm) |
|---|---|---|---|---|---|
| 1 | 1650 | 4 | 273 | 269 | -4 |
| 2 | 950 | 4 | 252 | 294 | 42 |
| 3 | 260 | 4 | 250 | 481 | 231 |
| 4 | -430 | 3 | 183 | 396 | 213 |
| 5 | -1120 | 4 | 253 | 272 | 19 |
| 6 | -1800 | 4 | 285 | 286 | 1 |

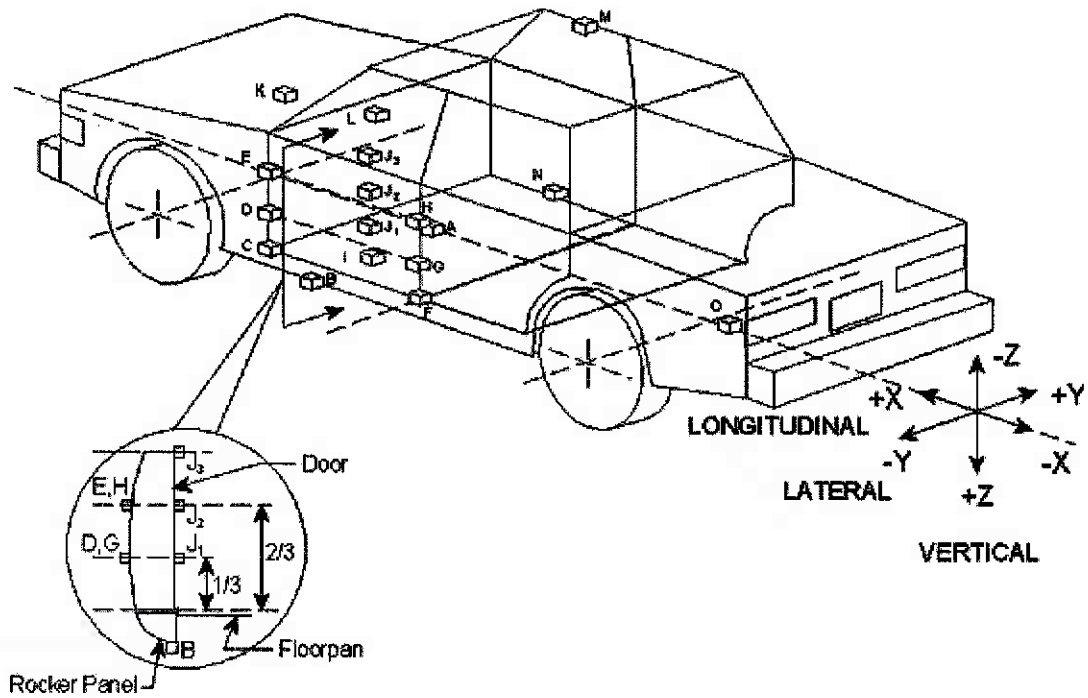
Reference plane is parallel to test vehicle longitudinal centerline

Given dimensions = Reference plane to car body

**DATA SHEET NO. 12**

**VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer 1LT 2WD | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |




| No. | Location |
|---|---|
| A | Vehicle CG |
| B | Left Floor Sill |
| C | A Pillar Sill |
| D | A Pillar Low |
| E | A Pillar Mid |
| F | B Pillar Sill |
| G | B Pillar Low |
| H | B Pillar Mid |
| I | Driver Seat |

| No. | Location |
|---|---|
| J1 | Driver Door Lower / Knee |
| J2 | Driver Door Mid / Pelvis |
| J3 | Driver Door Upper / Rib |
| K | Engine |
| L | Firewall |
| M | Right Roof |
| N | Right Floor Sill |
| O | Rear Deck |

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

**VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY**

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

**VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS**

| Loc. No. | Accelerometer Location | Peak Values (G's) | | | | |
|---|---|---|---|---|---|---|
| | | Axis | Max | Time | Min | Time |
| A | Vehicle CG | X | 5.9 | 82 | -12.1 | 32 |
| | | Y | 15.8 | 60 | -14.9 | 73 |
| | | Z | 13.3 | 67 | -7.3 | 23 |
| | | RES | 18.8 | 68 | | |
| B | Left Floor | Y | * | * | * | * |
| C | A Pillar Sill | Y | 16.3 | 48 | -9.1 | 19 |
| D | A Pillar Low | Y | 18.2 | 17 | -5.5 | 11 |
| E | A Pillar Mid | Y | 12.5 | 62 | -4.1 | 3 |
| F | B Pillar Sill | Y | 50.2 | 14 | -23.3 | 35 |
| G | B Pillar Low | Y | 57.9 | 21 | -6.4 | 38 |
| H | B Pillar Mid | Y | ** | ** | ** | ** |
| I | Driver Seat | Y | 38.8 | 37 | -14.4 | 45 |
| J1 | Driver Door Lower / Knee | Y | | | | |
| J2 | Driver Door Mid / Pelvis | Y | | | | |
| J3 | Driver Door Upper / Rib | Y | | | | |
| K | Engine | X | 5.0 | 90 | -4.0 | 70 |
| | | Y | 19.7 | 72 | -7.2 | 38 |
| L | Firewall | Y | 12.2 | 83 | -1.4 | 5 |
| M | Right Roof | Y | 15.2 | 41 | -2.6 | 23 |
| N | Right Floor Sill | Y | 17.5 | 99 | -1.1 | 193 |
| O | Rear Deck | X | 3.7 | 48 | -3.2 | 42 |
| | | Y | 11.1 | 102 | -1.1 | 204 |

Positive Acceleration Polarities: Longitudinal (X) = + Forward
(Conforms to SAE J211) Lateral (Y) = + Right
Vertical (Z) = + Down

* No Valid Data after 60 msec

** No Valid Data after 30 msec

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

**VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY**

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

**VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS**

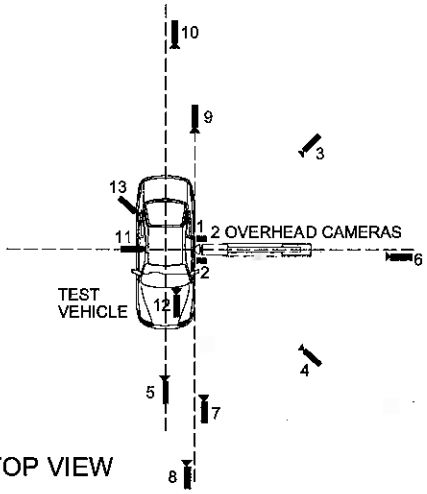
| Loc. No. | Accelerometer Location | Measurements (mm) | | | |
|---|---|---|---|---|---|
| | | Axis | Pre-Test | Post-Test | Difference |
| A | Vehicle CG | X | 2734 | 2646 | -88 |
| | | Y | 0 | 0 | 0 |
| | | Z | 645 | 630 | 15 |
| B | Left Floor Sill | X | 2945 | 2842 | -103 |
| | | Y | -737 | -684 | 53 |
| | | Z | 350 | 375 | -25 |
| C | A Pillar Sill | X | 3404 | 3273 | -131 |
| | | Y | -737 | -695 | 42 |
| | | Z | 325 | 355 | -30 |
| D | A Pillar Low | X | 3269 | 3140 | -129 |
| | | Y | -783 | -715 | 68 |
| | | Z | 620 | 635 | -15 |
| E | A Pillar Mid | X | 3272 | 3139 | -133 |
| | | Y | -826 | -836 | 10 |
| | | Z | 1016 | 1028 | -12 |
| F | B Pillar Sill | X | 2166 | 2194 | 28 |
| | | Y | 730 | -635 | 95 |
| | | Z | 350 | 342 | 8 |
| G | B Pillar Low | X | 2155 | 2204 | 49 |
| | | Y | -716 | -585 | 131 |
| | | Z | 673 | 700 | -27 |
| H | B Pillar Mid | X | 2164 | 2200 | 36 |
| | | Y | -785 | -610 | 175 |
| | | Z | 890 | 915 | -25 |
| I | Driver Seat | X | 2297 | 2285 | -12 |
| | | Y | -578 | -524 | 54 |
| | | Z | 521 | 580 | -59 |
| J1 | Driver Door Lower / Knee | | | | |
| J2 | Driver Door Mid / Pelvis | | | | |
| J3 | Driver Door Upper / Rib | | | | |
| K | Engine | X | 4203 | 4091 | -112 |
| | | Y | 0 | 0 | 0 |
| | | Z | 1030 | 1060 | -30 |
| L | Firewall | X | 3774 | 3665 | -109 |
| | | Y | 0 | 0 | 0 |
| | | Z | 1080 | 1122 | -42 |
| M | Right Roof | X | 2351 | 2371 | 20 |
| | | Y | 585 | 586 | 1 |
| | | Z | 1726 | 1740 | -14 |
| N | Right Floor | X | 2467 | 2475 | 8 |
| | | Y | 730 | 662 | -68 |
| | | Z | 350 | 360 | -10 |
| O | Rear Deck | X | 937 | 935 | -2 |
| | | Y | 0 | 0 | 0 |
| | | Z | 800 | 800 | 0 |

Ref. Points: X-Rear of Vehicle (+ forward); Y-Vehicle Centerline (+ to right); Z-Ground Plane (+ down)

## DATA SHEET NO. 13

## HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009




TOP VIEW

| No. | Camera View | Location (mm) | | | Lens (mm) | Film Speed (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Overhead Overall | 380 | 0 | 5050 | 14 | 1000 |
| 2 | Overhead Close-Up | 25 | -120 | 5050 | 50 | 1000 |
| 3 | Left Side 45° Rearward Pole View | -2385 | 3985 | 1345 | 20 | 1000 |
| 4 | Right Side 45° Forward Pole View | -2285 | -3895 | 1310 | 20 | 1000 |
| 5 | Real Time | | | | 13 | 24 |
| 6* | Left Side Rear Pole View | | | | | |
| 7 | Front Ground Level Vehicle/Pole Impact | 280 | -1200 | 1620 | 35 | 1000 |
| 8 | Front Ground Level Vehicle Roof Targets and Vehicle/Pole Impact | 35 | -1595 | 1365 | 24 | 1000 |
| 9 | Rear Ground Level Vehicle/Pole Impact | -75 | 1715 | 1375 | 24 | 1000 |
| 10 | Rear Ground Level | 260 | 1220 | 1630 | 35 | 1000 |
| 11 | Test Vehicle Onboard Driver Side View | | | | 12.5 | 1000 |
| 12 | Test Vehicle Onboard Driver Front View | | | | 8 | 1000 |
| 13 | Test Vehicle Onboard Driver ¾ Rear View | | | | 8 | 1000 |

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Ground Plane Down

* Camera 6 was not used for this test.

## DATA SHEET NO. 14

## FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer 1LT 2WD | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |

Test Time: 10:05 AM  Temperature at Time of Impact: 21°C

### Stoddard Solvent Spillage Measurements

A. From impact until vehicle motion ceases: 0
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0
(Maximum allowable = 5 ounces)

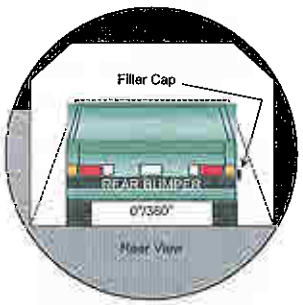
C. For the following 25 minutes: 0
(Maximum allowable = 1 oz./minute)

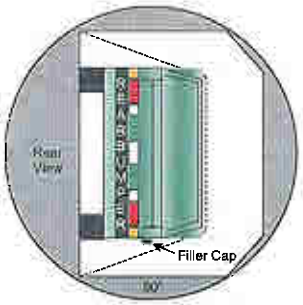
D. Spillage Details: None

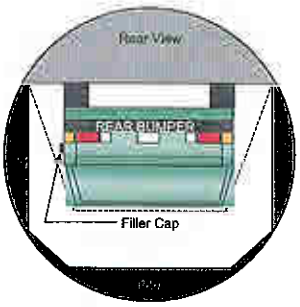
**DATA SHEET NO. 15**

**FMVSS 301 STATIC ROLLOVER DATA SHEET**

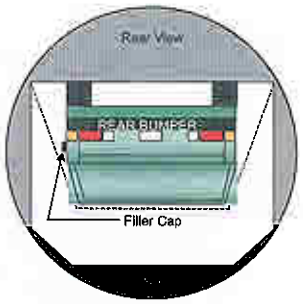
Test Vehicle: 2009 Chevrolet Trailblazer 1LT 2WD NHTSA No. C90111
Test Program: FMVSS 201P Test Date: March 12, 2009

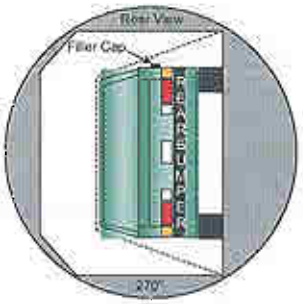


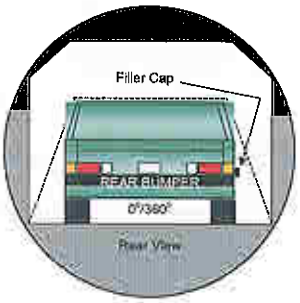




0° to 90° 90° to 180°




180° to 270° 270° to 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage locations: None

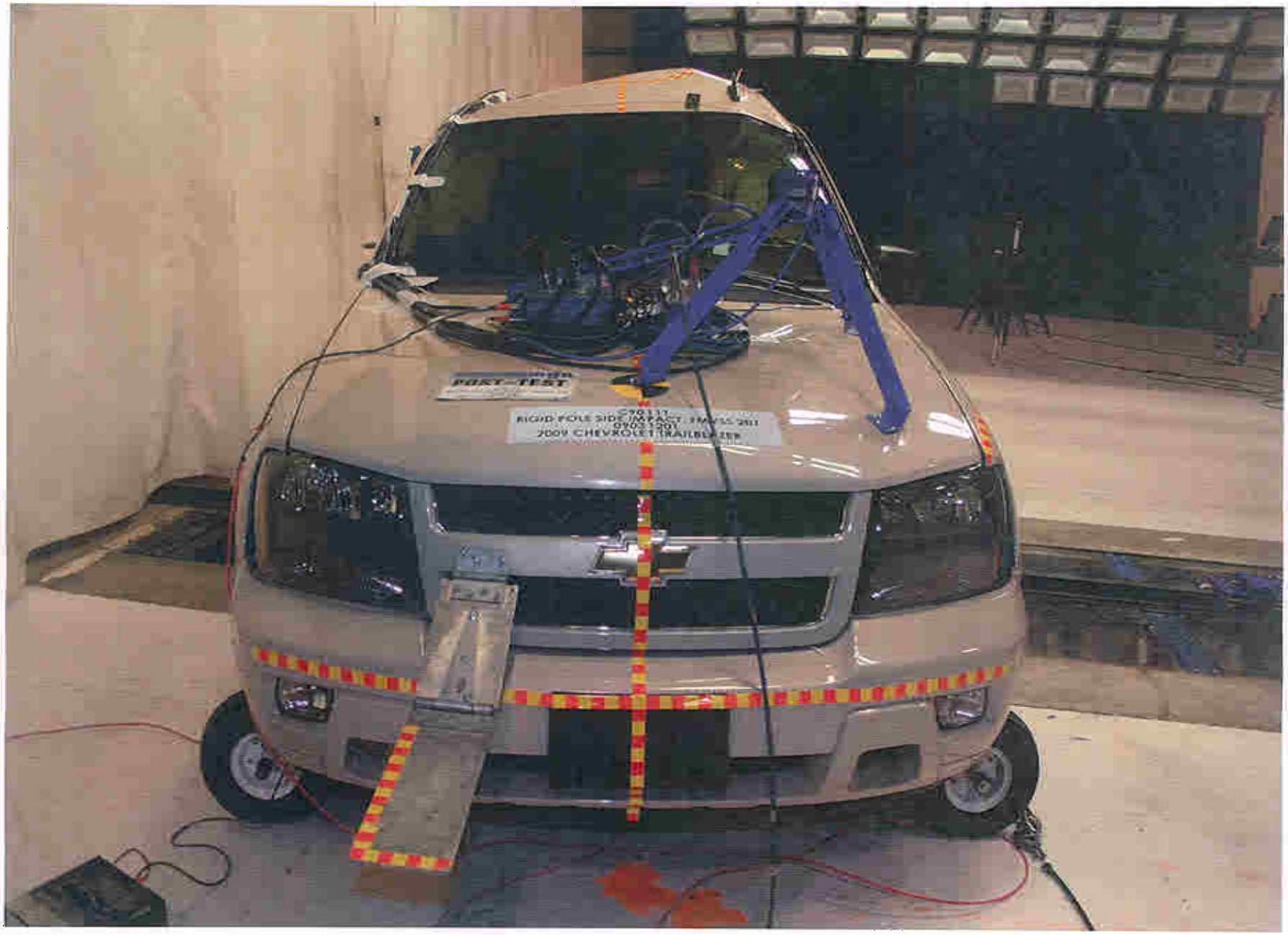
| Rollover Test Phase | Rotation Time (sec.) | Hold Time (sec.) | Spillage (oz.) |
|---|---|---|---|
| 0° to 90° | 119 | 300 | 0 |
| 90° to 180° | 117 | 300 | 0 |
| 180° to 270° | 113 | 300 | 0 |
| 270° to 360° | 120 | 300 | 0 |

# APPENDIX A

# PHOTOGRAPHS

TABLE OF PHOTOGRAPHS


Pre-Test Front View of Test Vehicle




Post-Test Front View of Test Vehicle


Pre-Test Rear View of Test Vehicle


Post-Test Rear View of Test Vehicle


Pre-Test Left Side View of Test Vehicle


Pre-Test Right Side View of Test Vehicle


Post-Test Right Side View of Test Vehicle


Pre-Test Left Rear Three-Quarter View


Post-Test Left Rear Three-Quarter View


Pre-Test Left Front Three-Quarter View


Post-Test Left Front Three-Quarter View

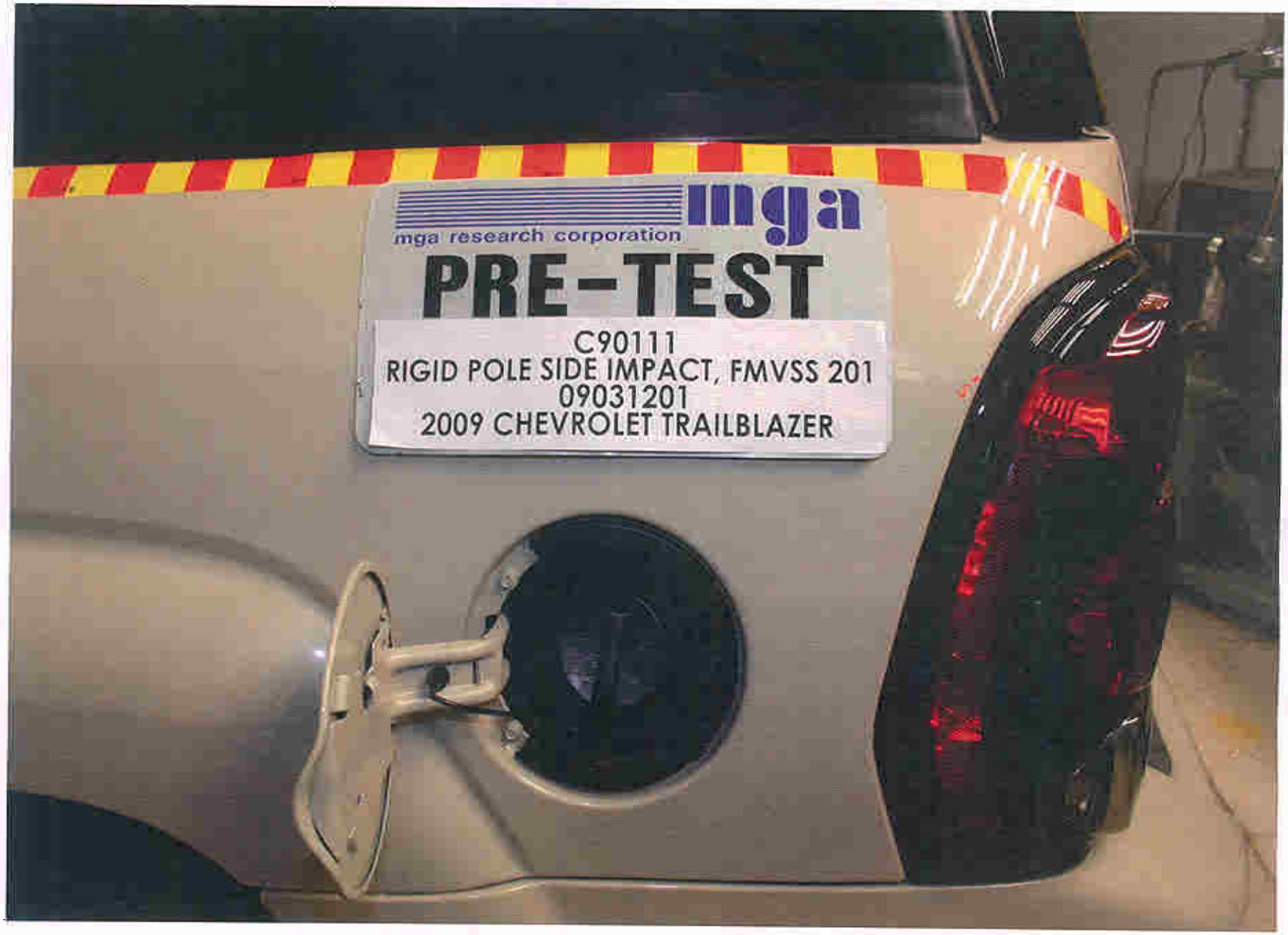

Pre-Test Right Rear Three-Quarter View


Post-Test Right Rear Three-Quarter View


Pre-Test Right Front Three-Quarter View


Post-Test Right Front Three-Quarter View


Pre-Test Overhead View of Test Vehicle



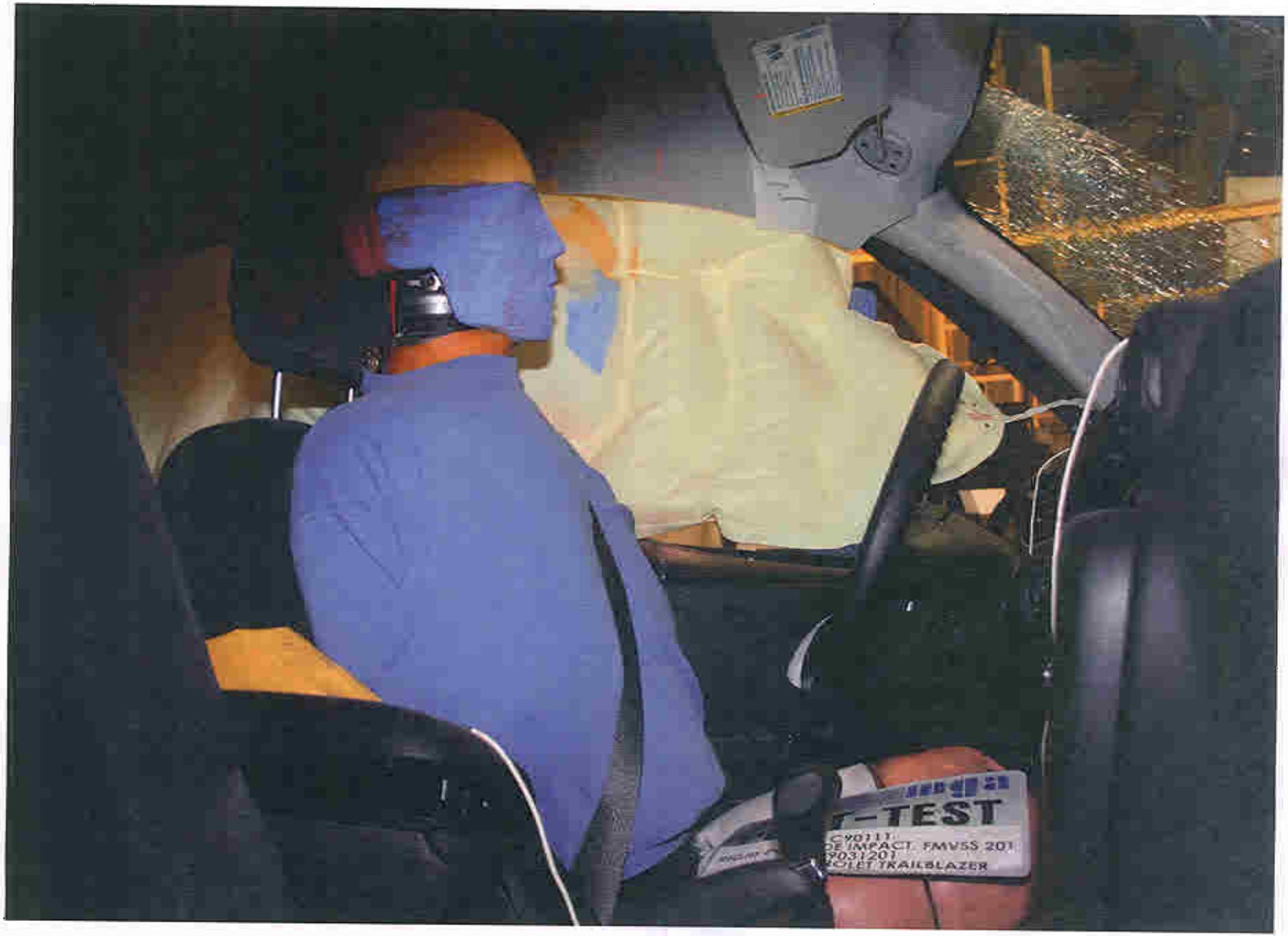

Pre-Test Fuel Filler Cap


Post-Test Overhead View of Test Vehicle


Pre-Test Overhead View of Test Vehicle (Closeup)


Post-Test Overhead View of Test Vehicle (Closeup)


Pre-Test Driver Dummy Right Side View




Post-Test Driver Dummy Right Side View


Pre-Test Driver Dummy Left Side View


Post-Test Driver Dummy Left Side View


Pre-Test Driver Dummy Left Side View (Door Open)


Pre-Test Driver Dummy Shoulder and Door Top View

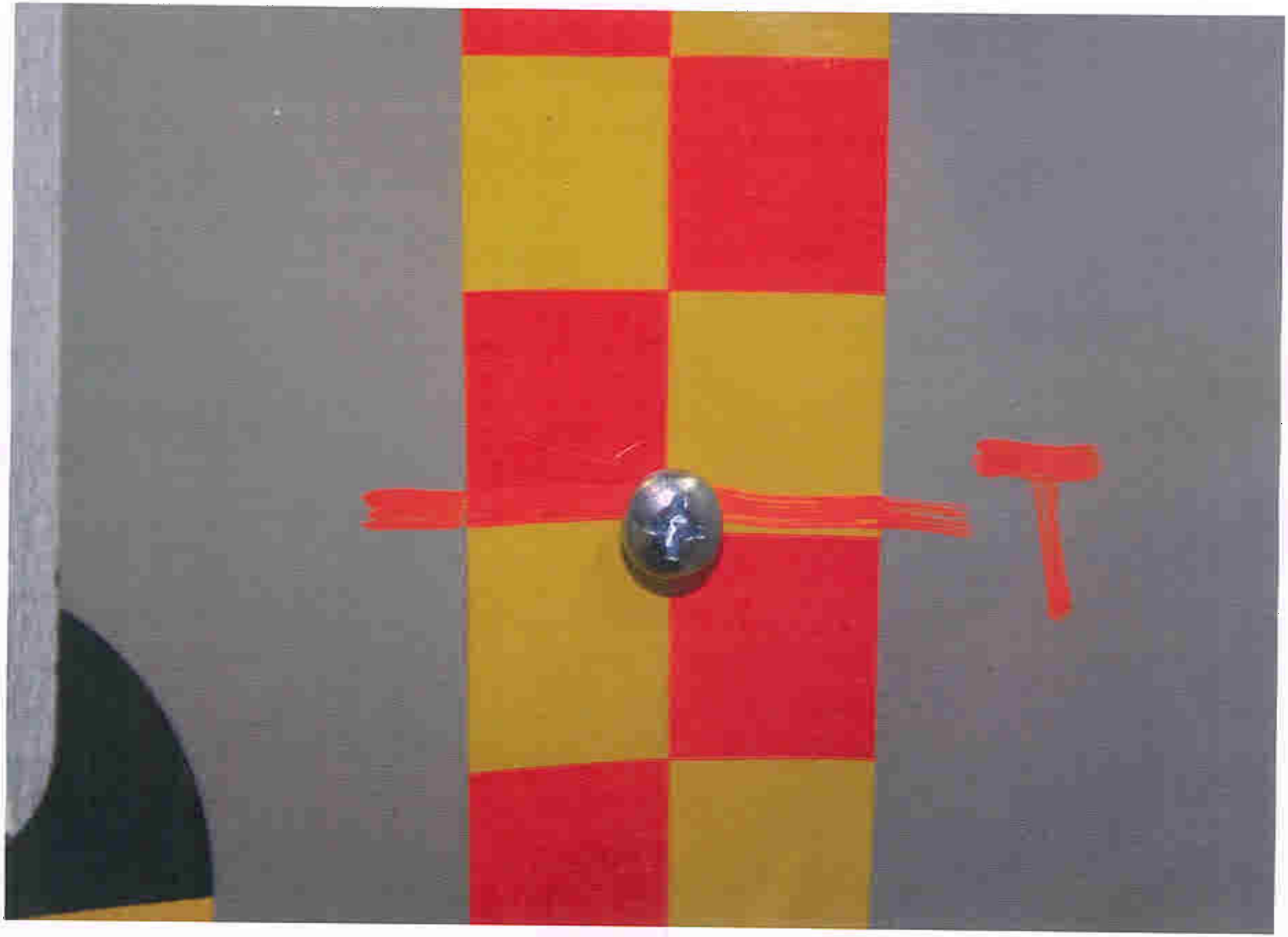
Post-Test Driver Dummy Head Contact (CAB)

Post-Test Driver Dummy Head Contact (Headrest)

Post-Test Driver Dummy Upper Thorax Contact


Post-Test Driver Dummy Lower Thorax Contact

Post-Test Driver Dummy Contact



Post-Test Impact Point on Vehicle


Pre-Test Impact Zone Close-up View


Post-Test Impact Zone Close-up View

Vehicle Impact

MFD BY GENERAL MOTORS CORP. 08/08

| GVWR | GAWR FRT | GAWR RR |
|---|---|---|
| 2518KG(5550LB) | 1338KG(2950LB) | 1452KG(3200LB) |

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

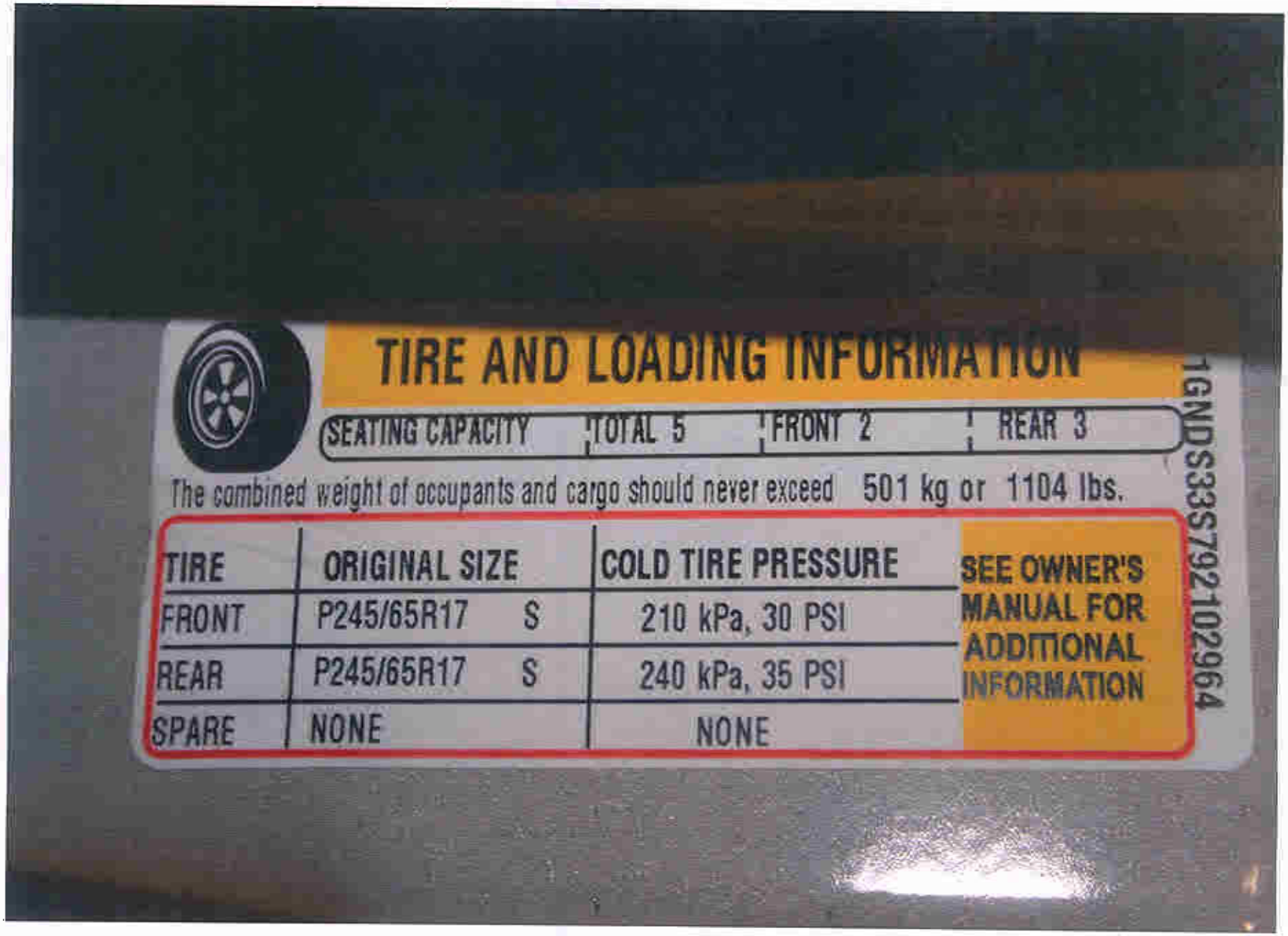
1GNDS33S792102964 TYPE: M.P.V.

MODEL: S15506

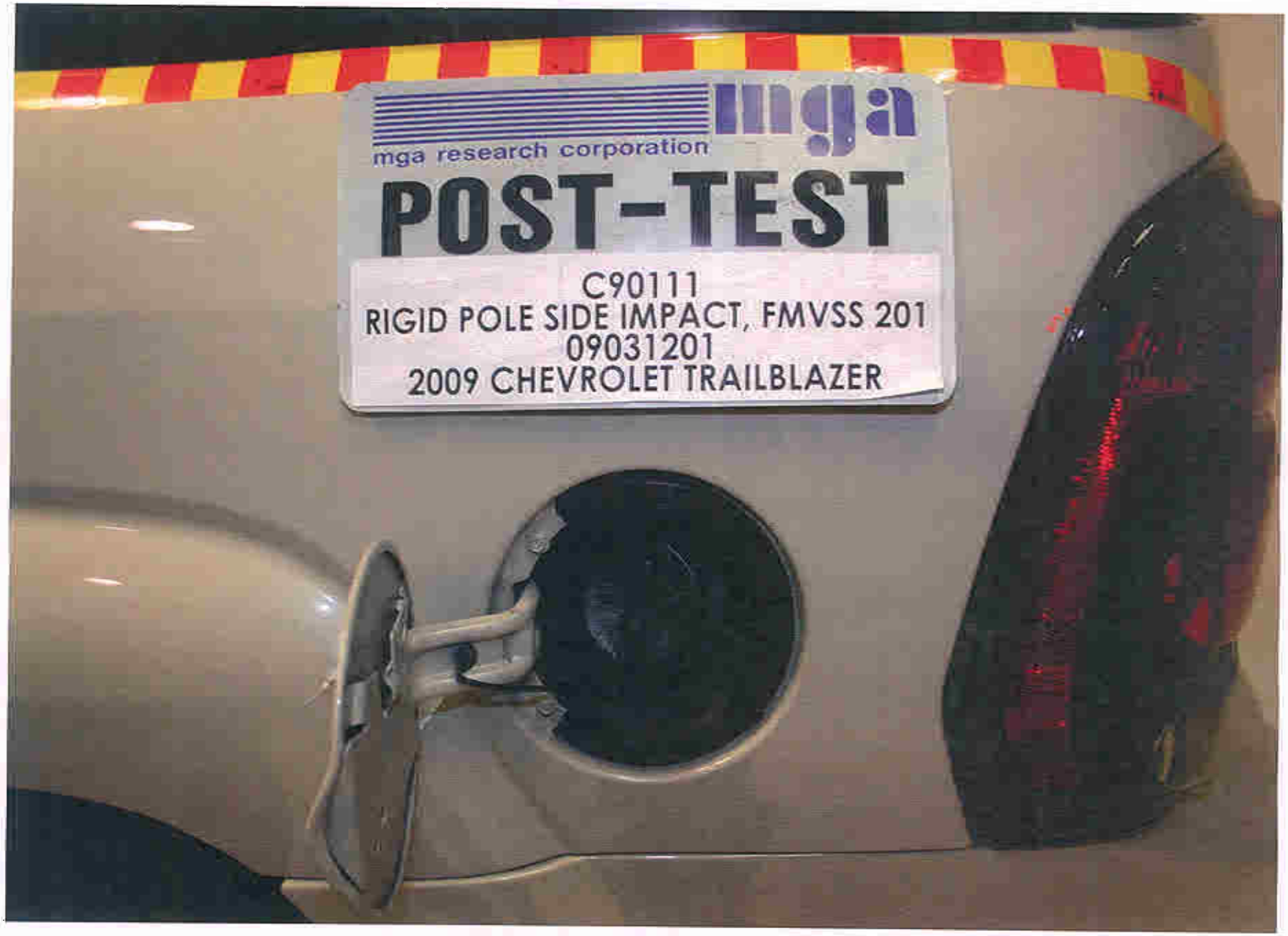
| SBR6 | TIRE SIZE | SPEED RTG | RIM | COLD TIRE PRESSURE |
|---|---|---|---|---|
| FRT | P245/65R17 | S | 17X7J | 210KPA(30PSI) |
| RR | P245/65R17 | S | 17X7J | 240KPA(35PSI) |
| SPA | NONE | | NO RIMKPA(PSI) | |

SEE OWNER'S MANUAL FOR MORE INFORMATION.

Vehicle Certification Label




Tire Placard




Post-Test Fuel Filler Cap


Pre-Test Left Front Wheel Dolly


Post-Test Left Front Wheel Dolly


Pre-Test Left Rear Wheel Dolly


Post-Test Left Rear Wheel Dolly


Pre-Test Right Front Wheel Dolly


Post-Test Right Front Wheel Dolly


Pre-Test Right Rear Wheel Dolly


Post-Test Right Rear Wheel Dolly


Rollover 90 Degrees


Rollover 180 Degrees

Rollover 270 Degrees


Rollover 360 Degrees

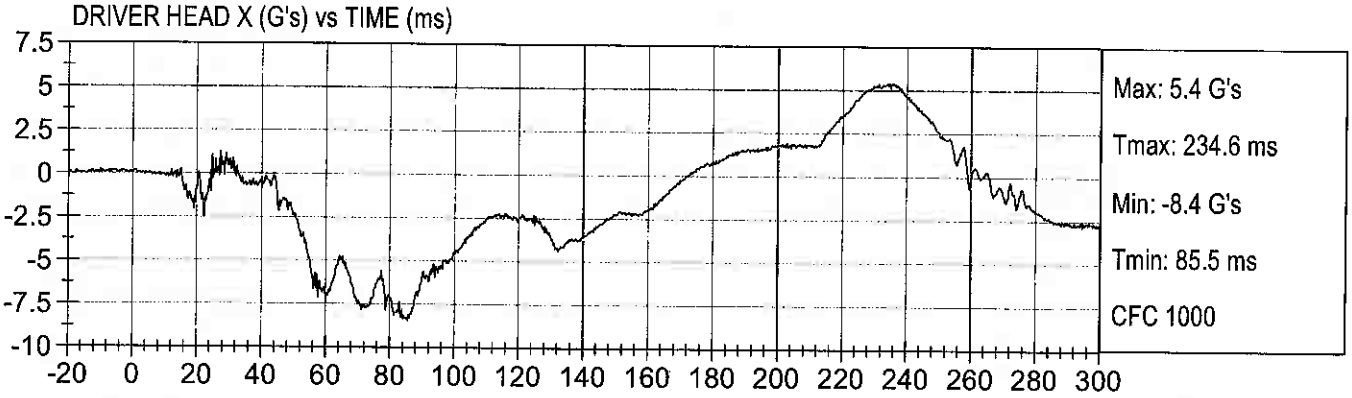
# APPENDIX B

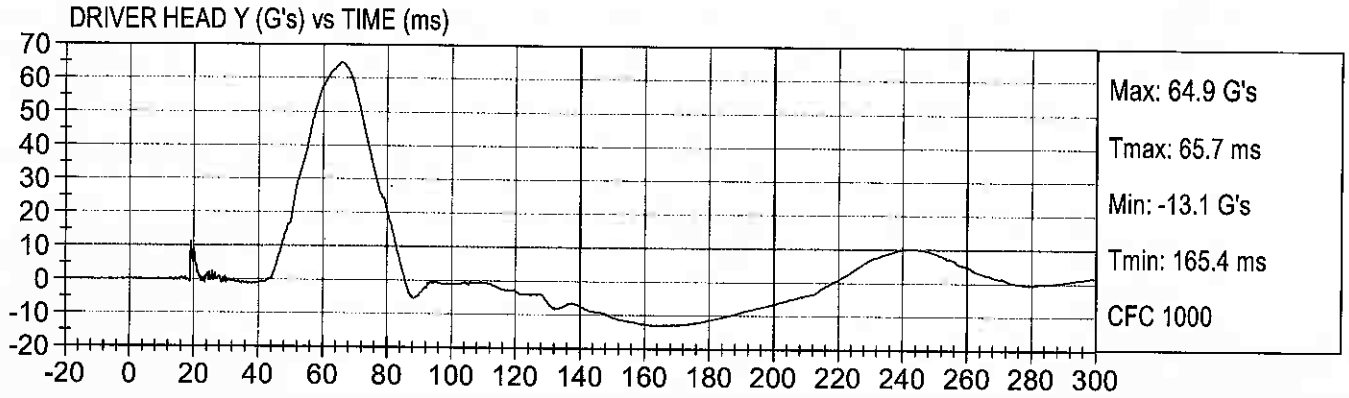
## SID/HIII AND VEHICLE RESPONSE DATA

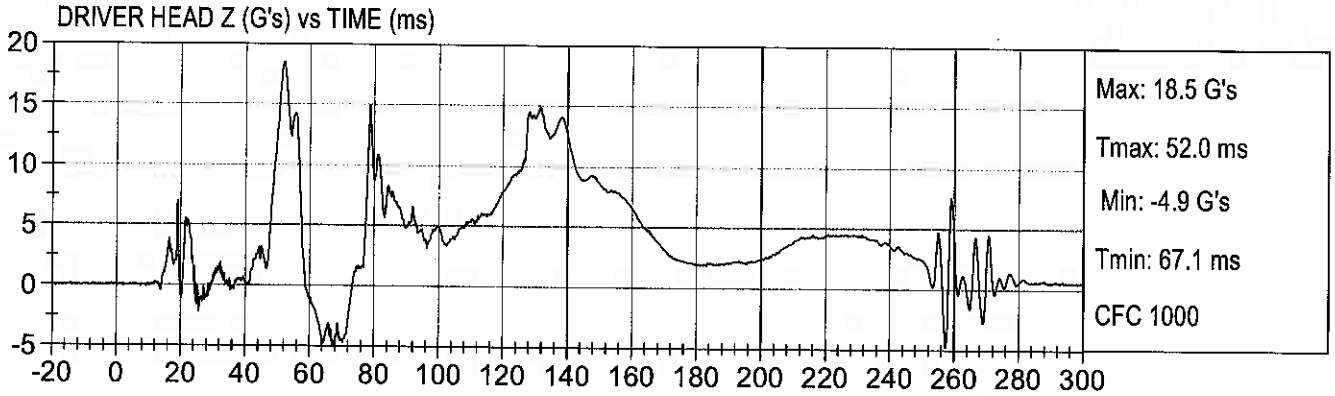
## TABLE OF DATA PLOTS

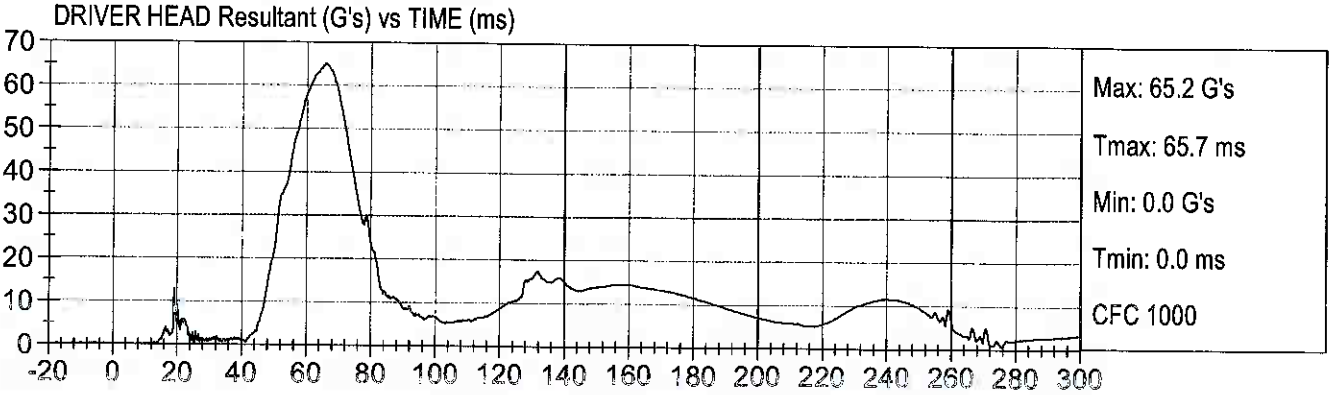
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



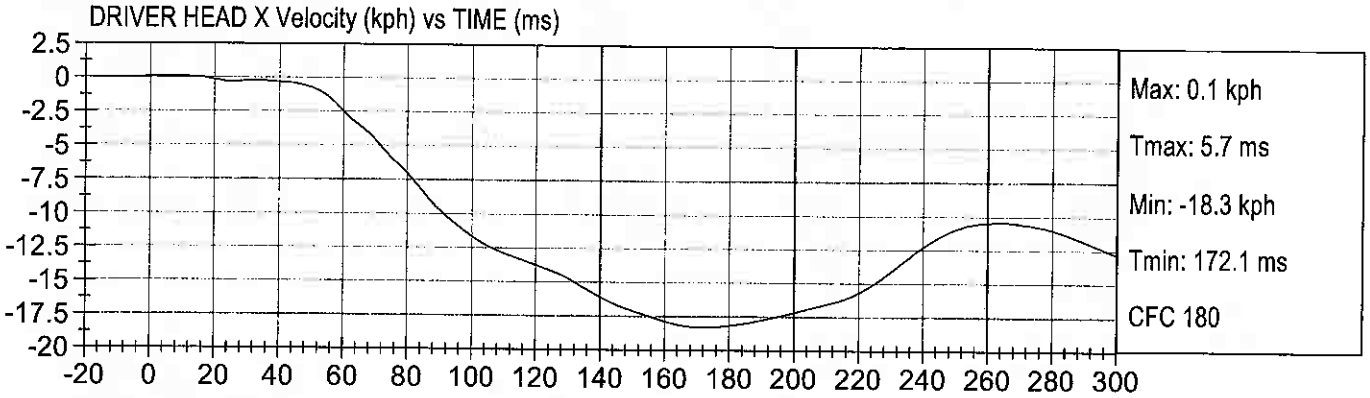



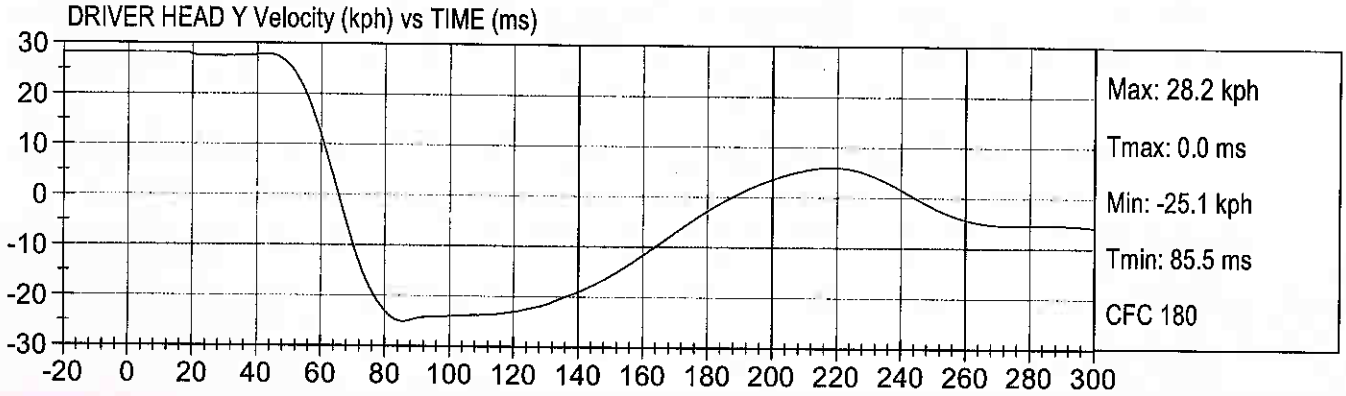



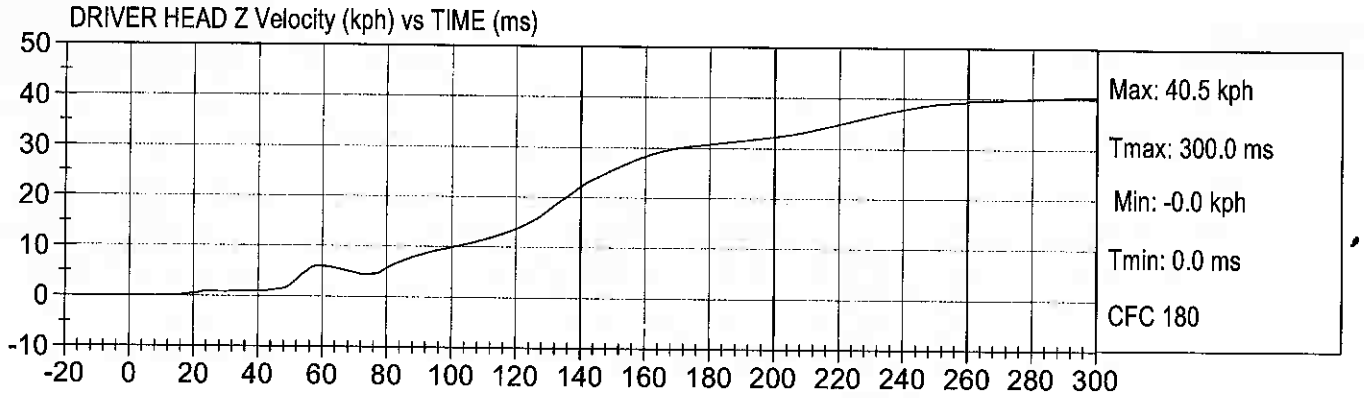



FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)

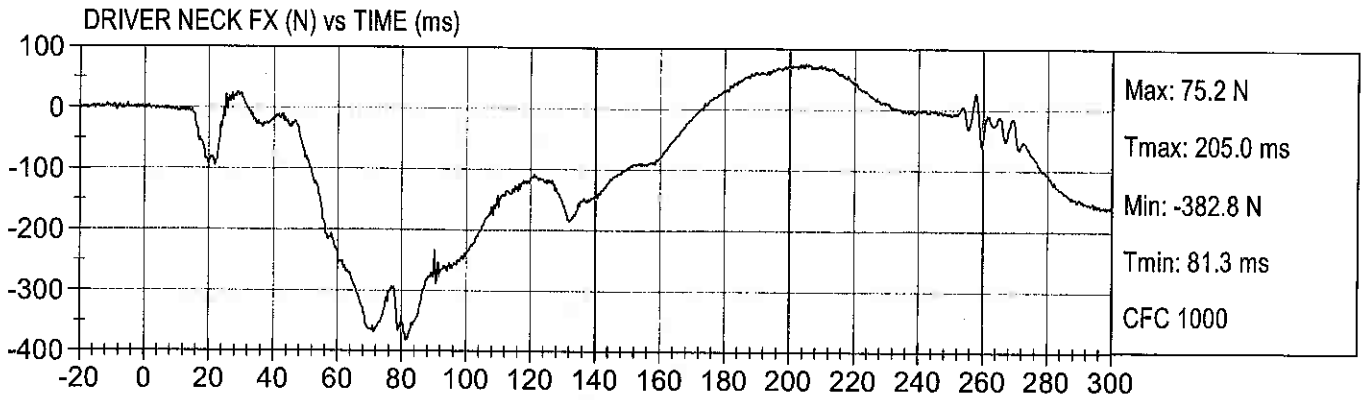


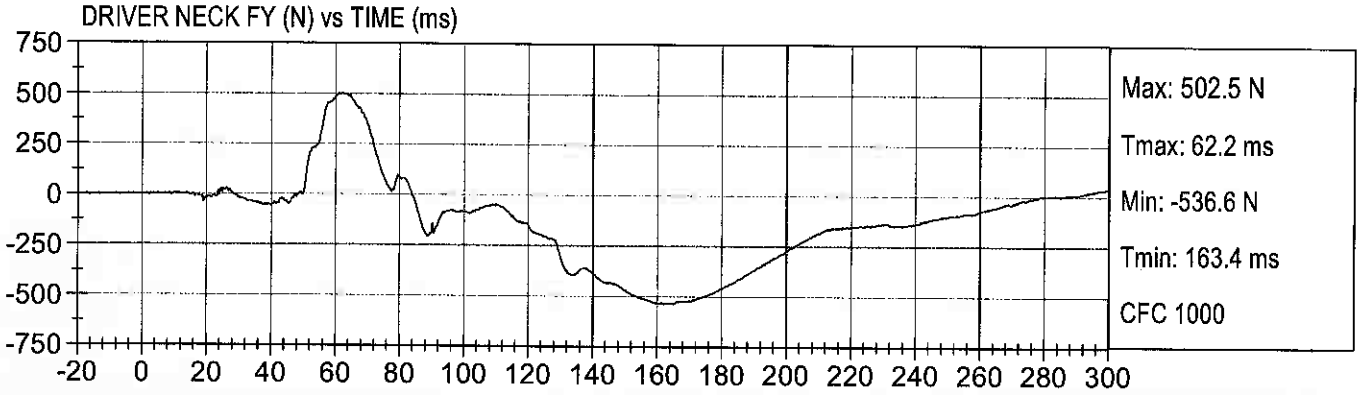



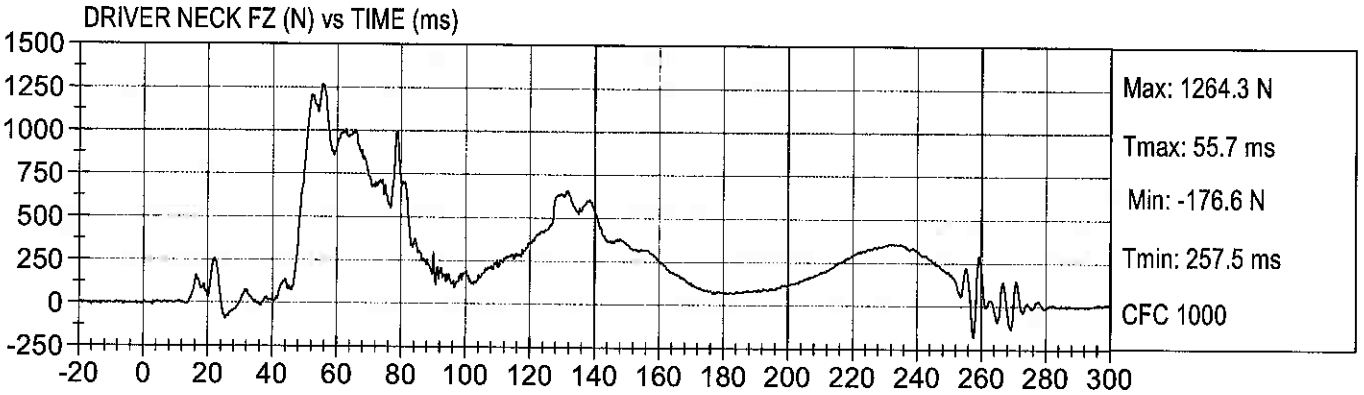



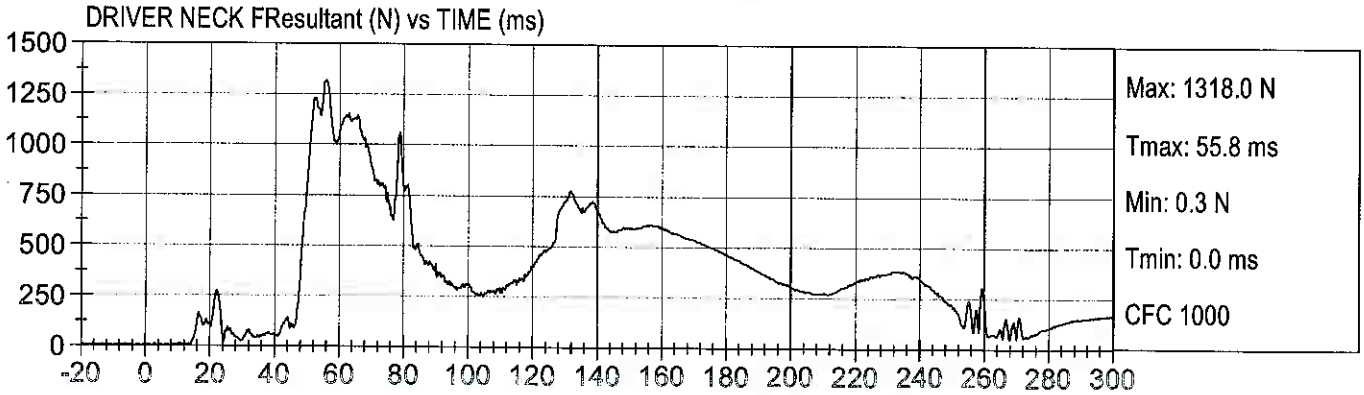
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



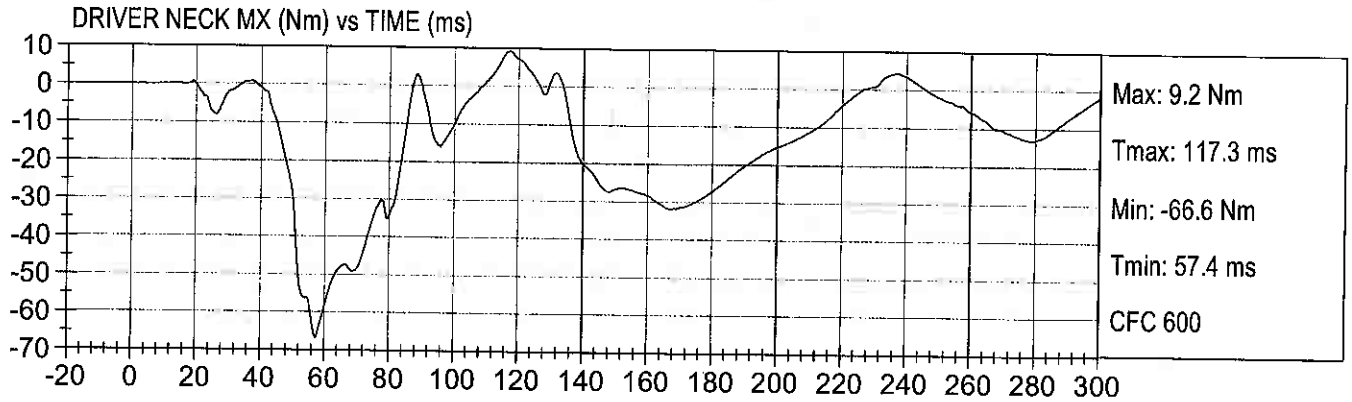



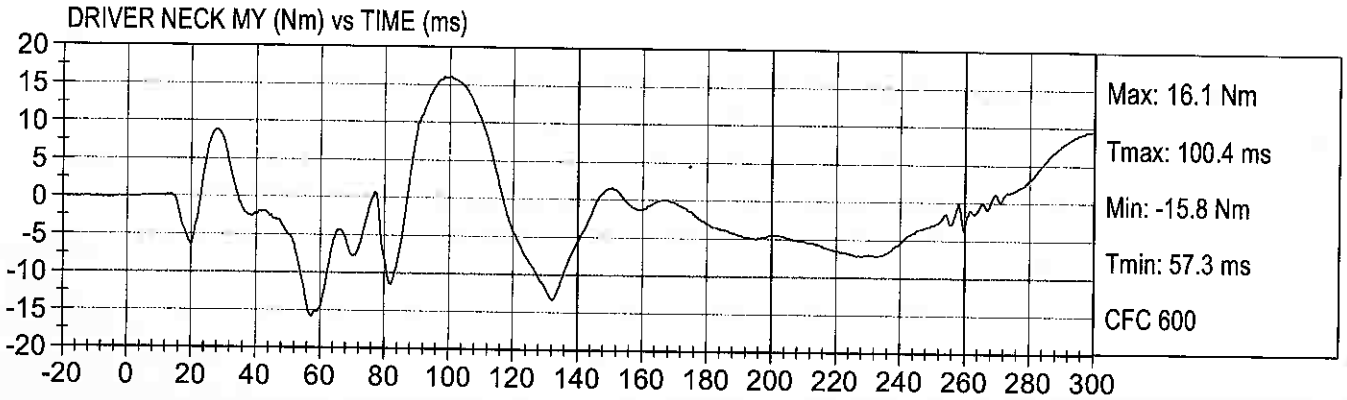



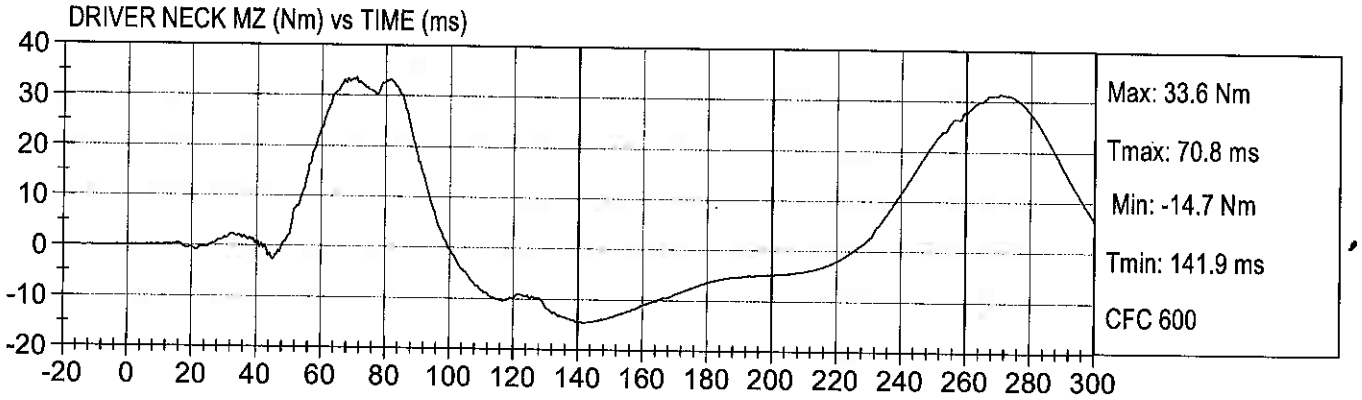



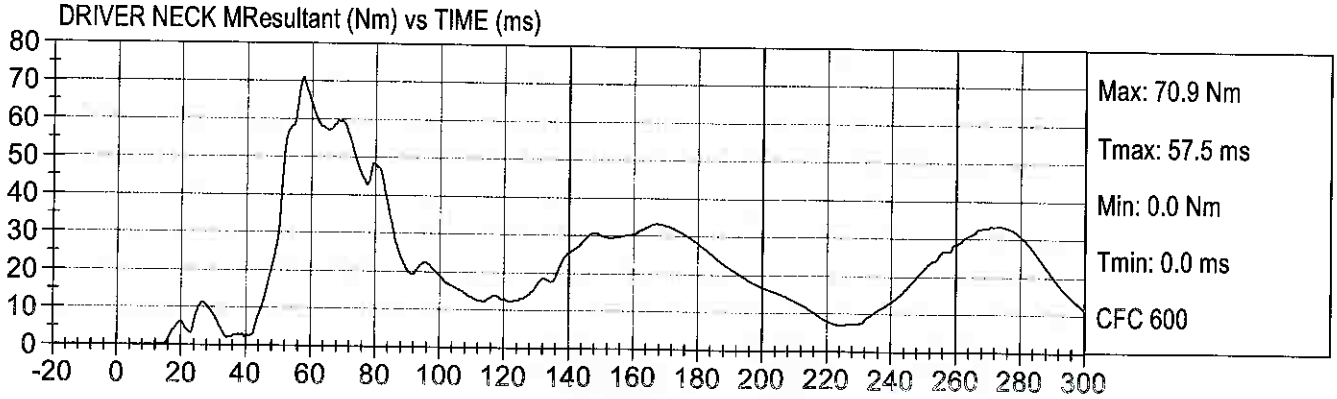
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



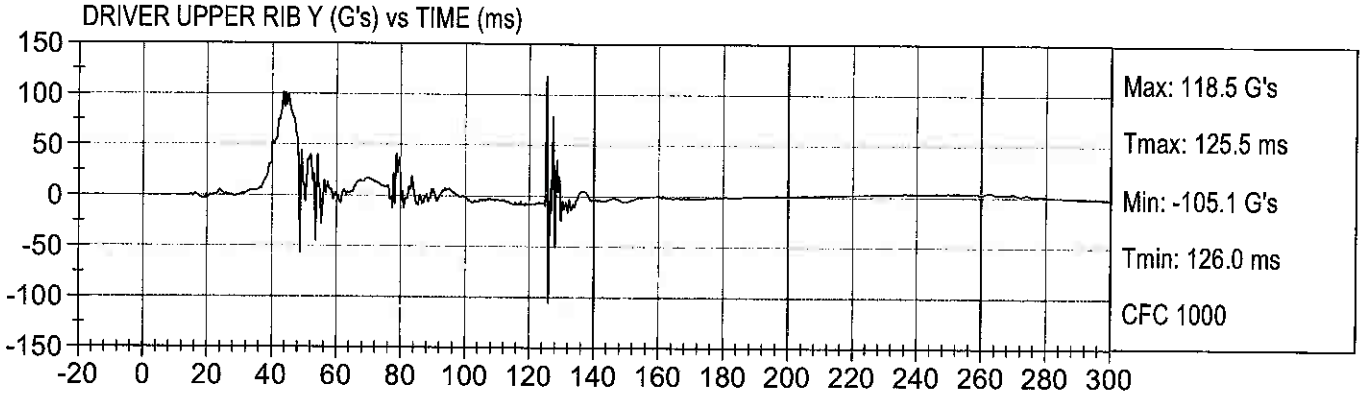



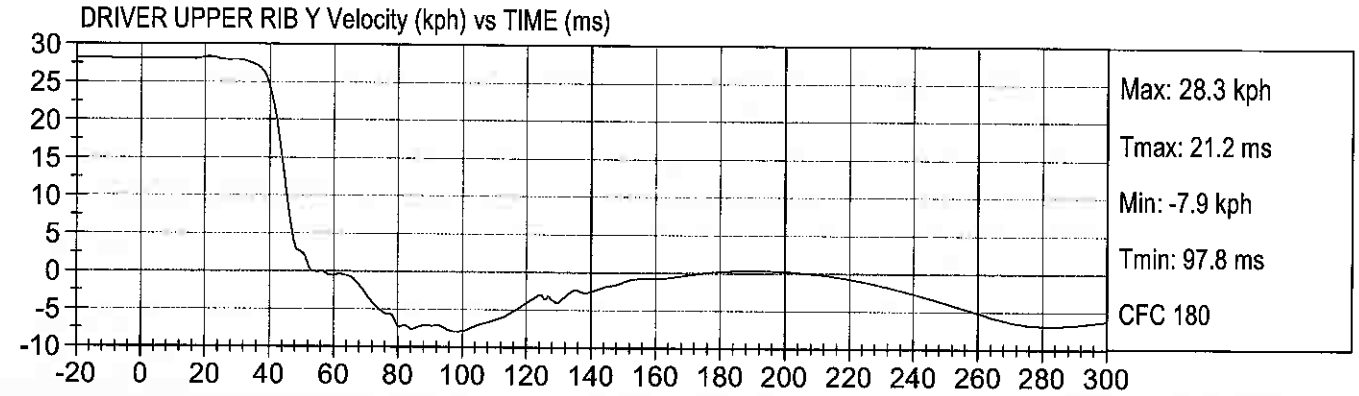



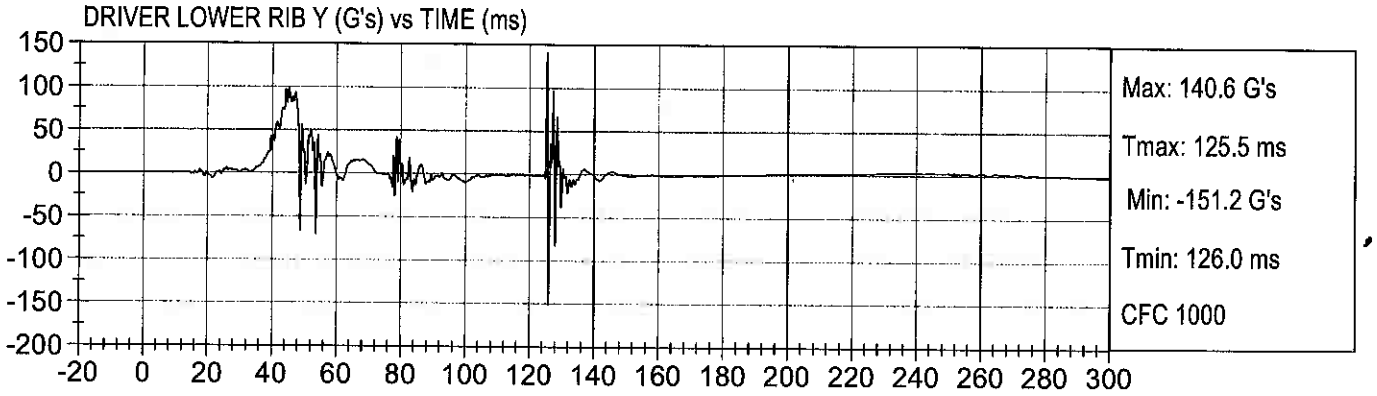



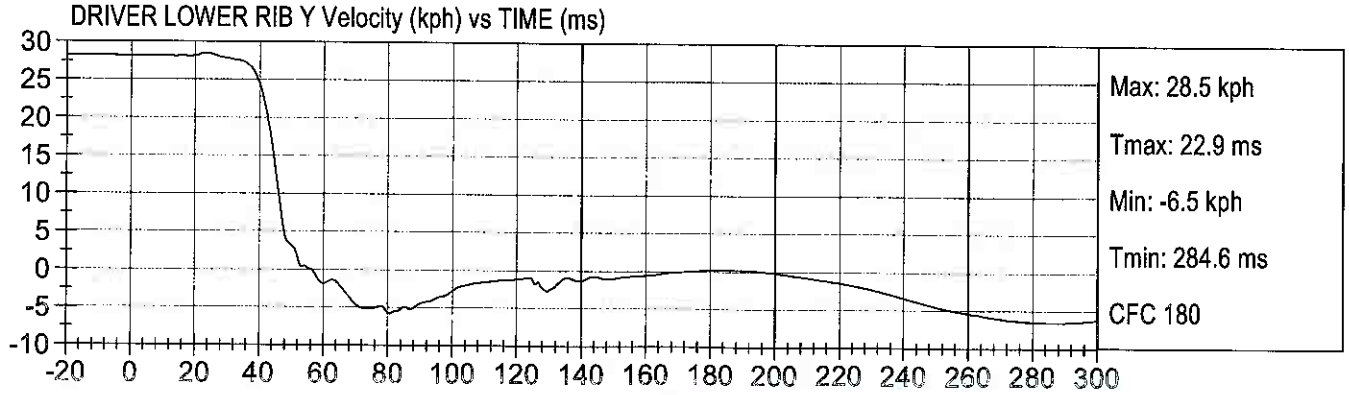
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



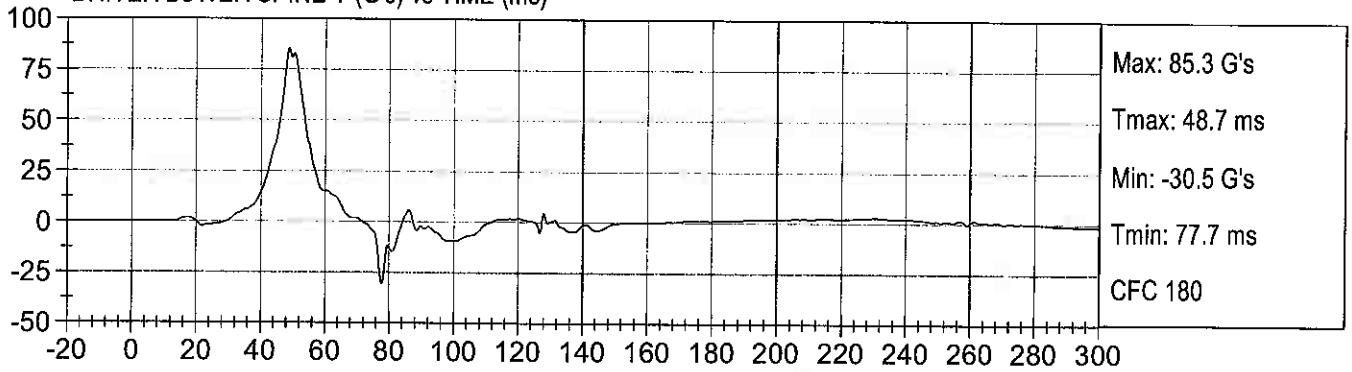



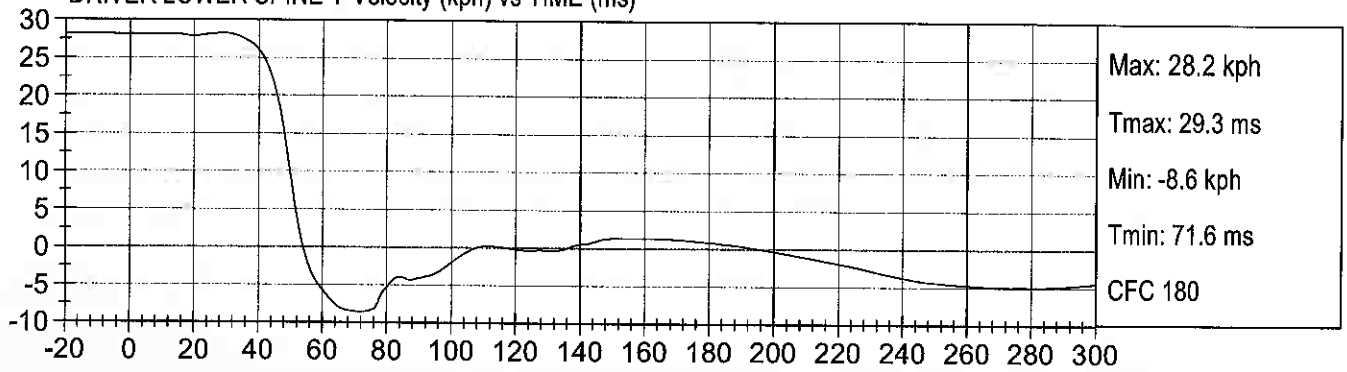
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)

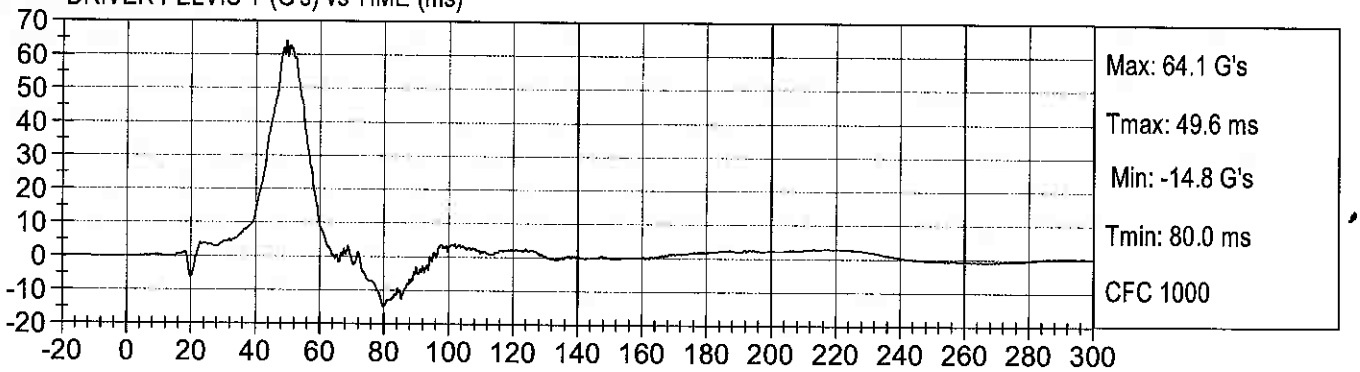
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



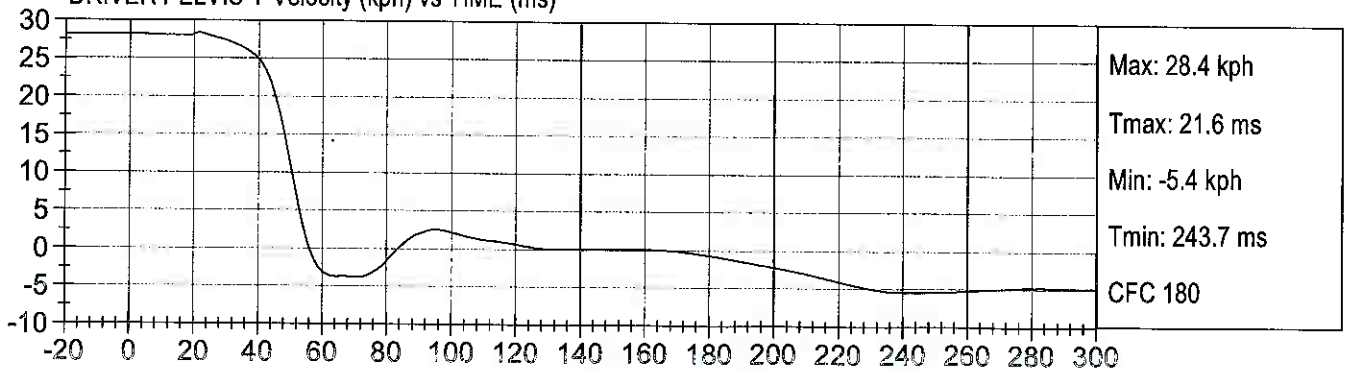

DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)




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

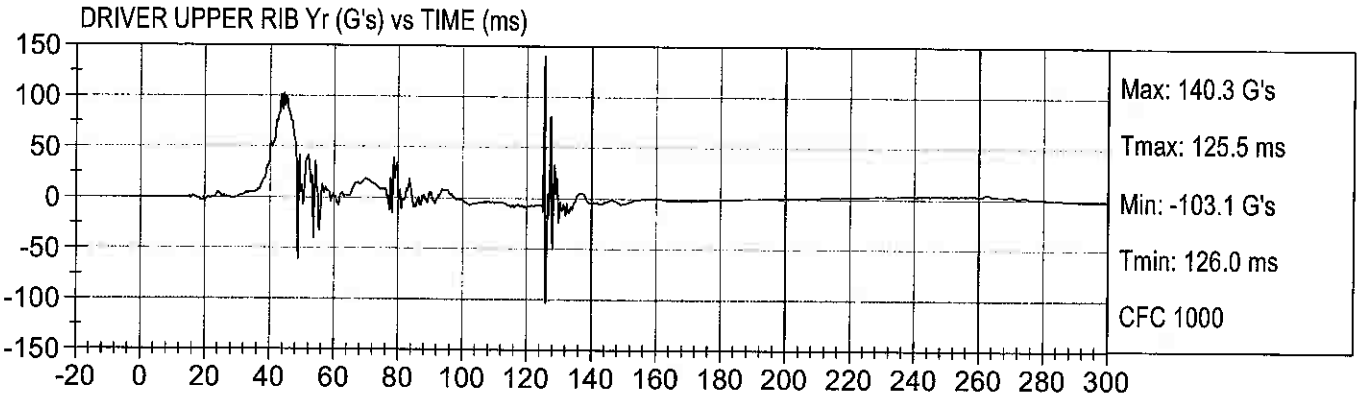


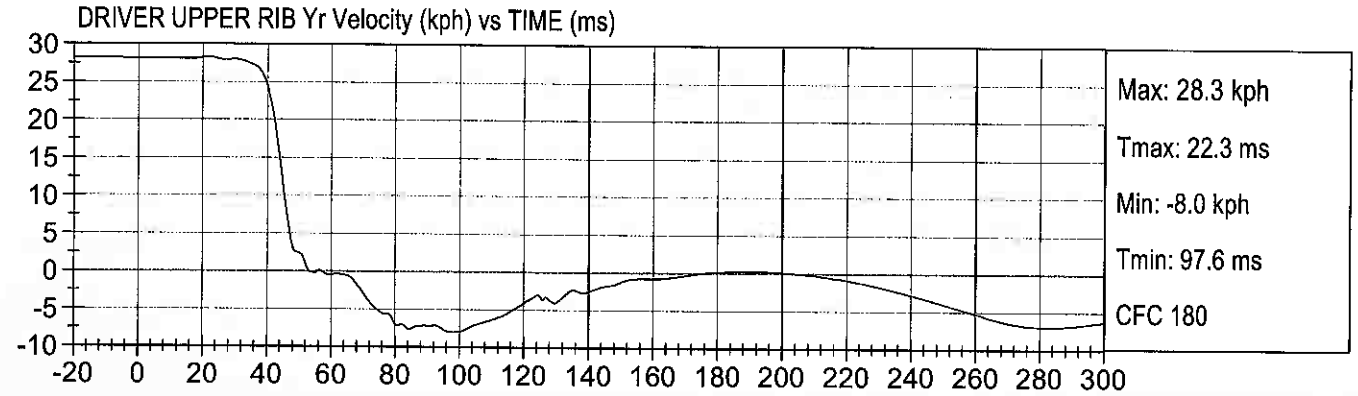

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)

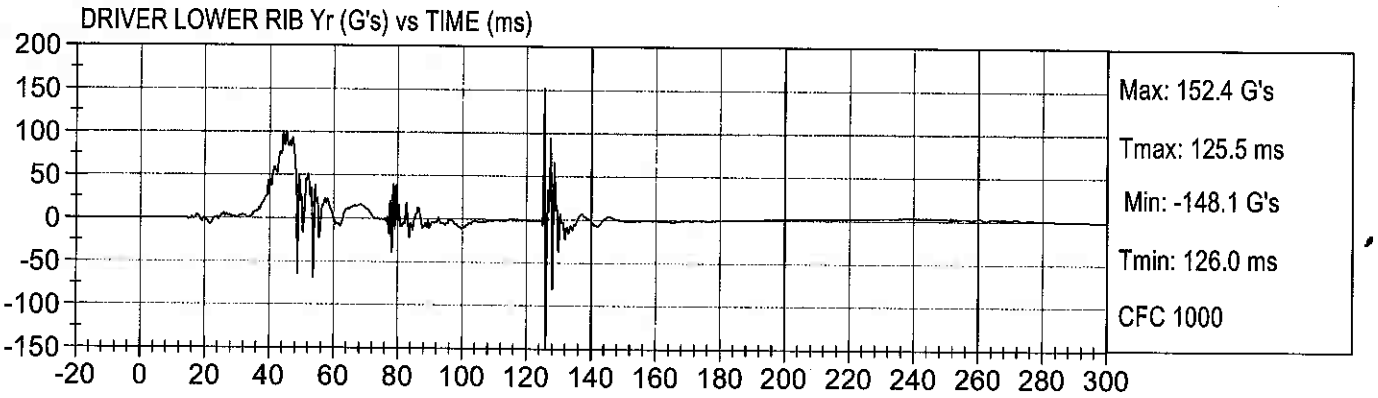


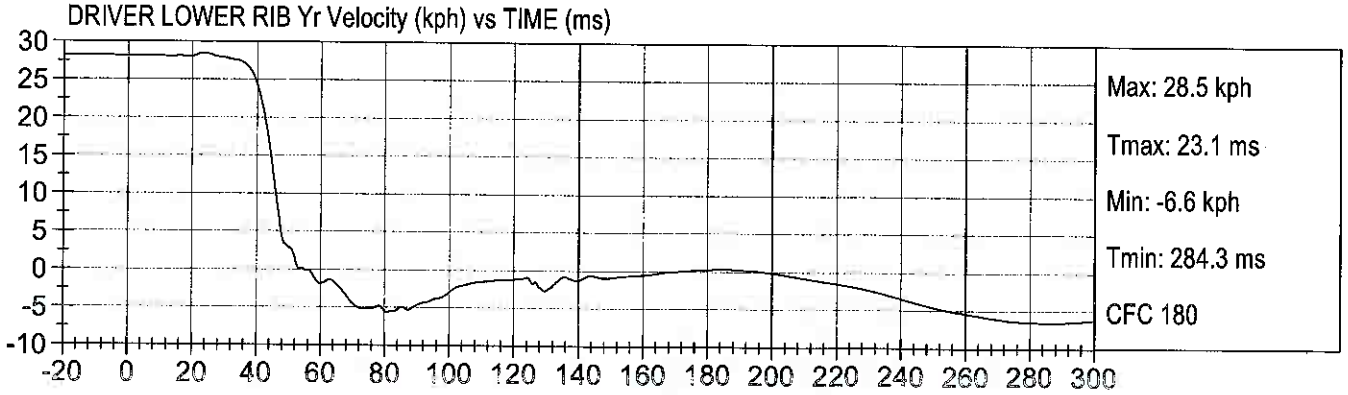
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



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2009 CHEVROLET TRAILBLAZER C90111

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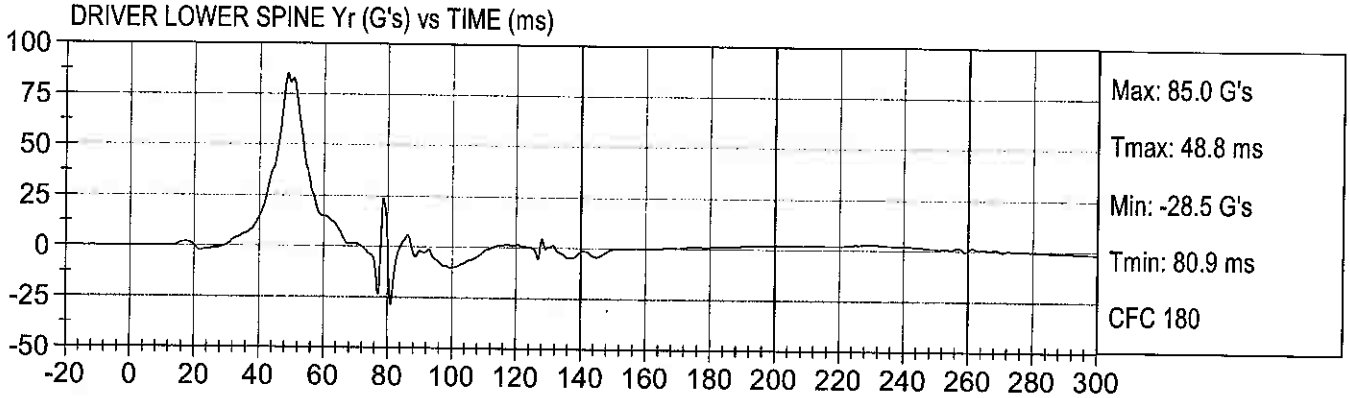
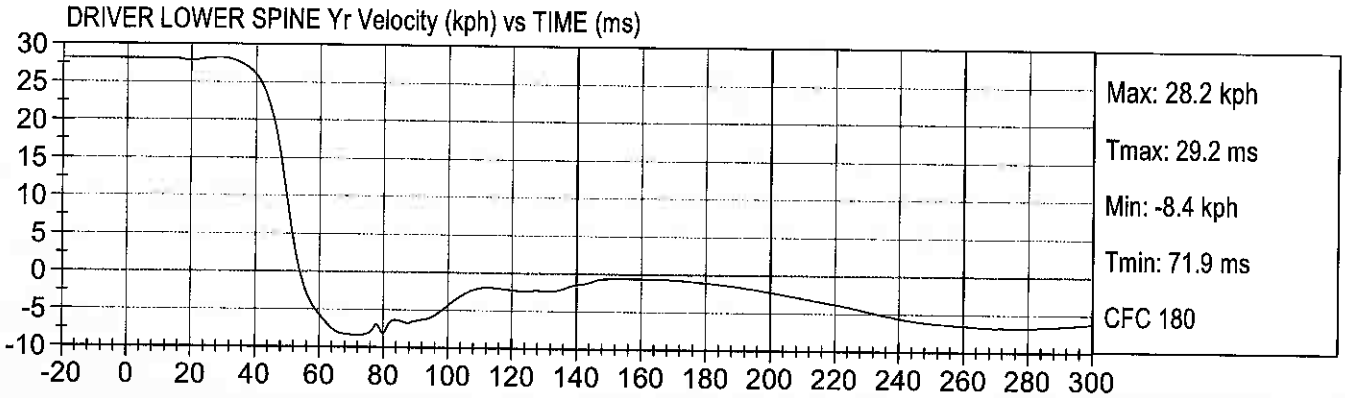
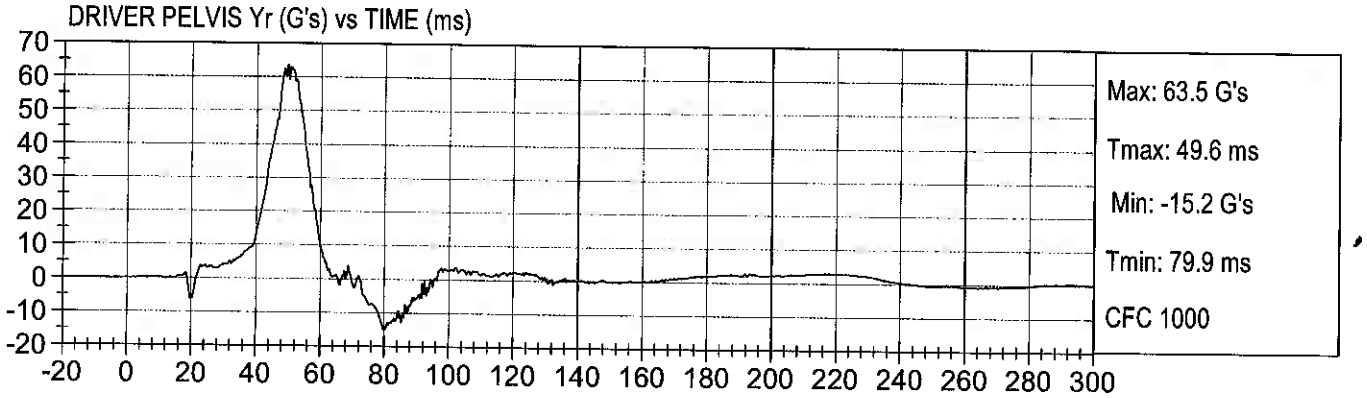
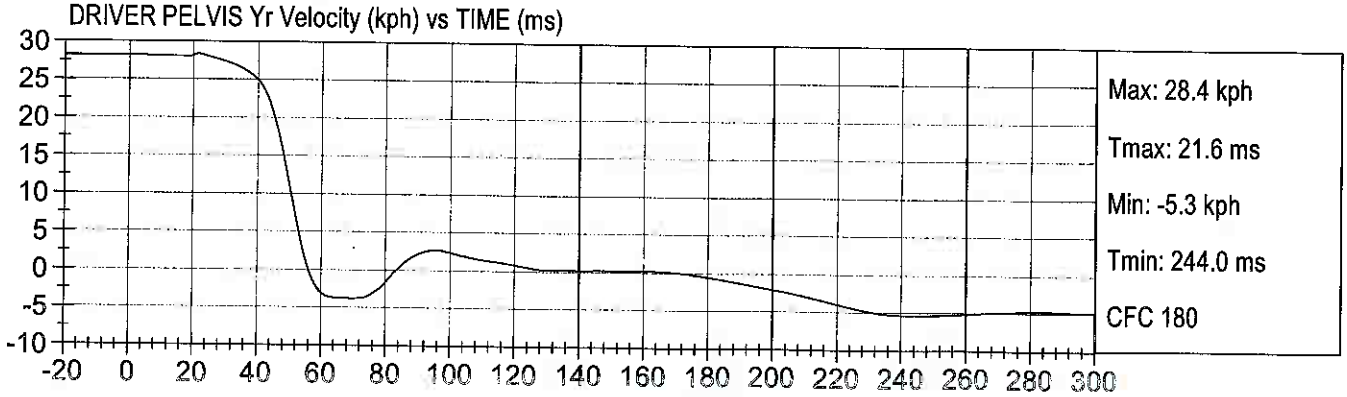
Speed: 17.5 mph (28.2 km/h)



FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
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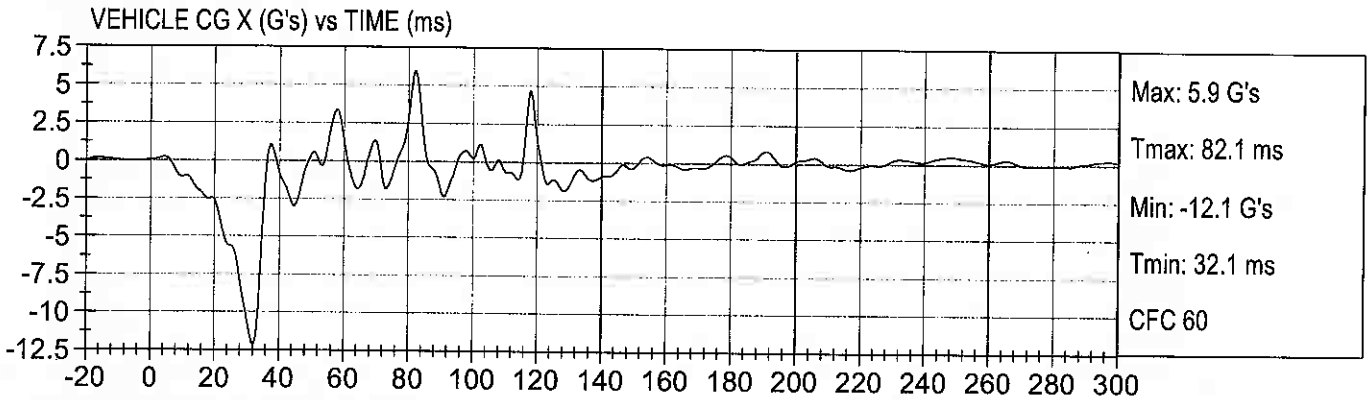


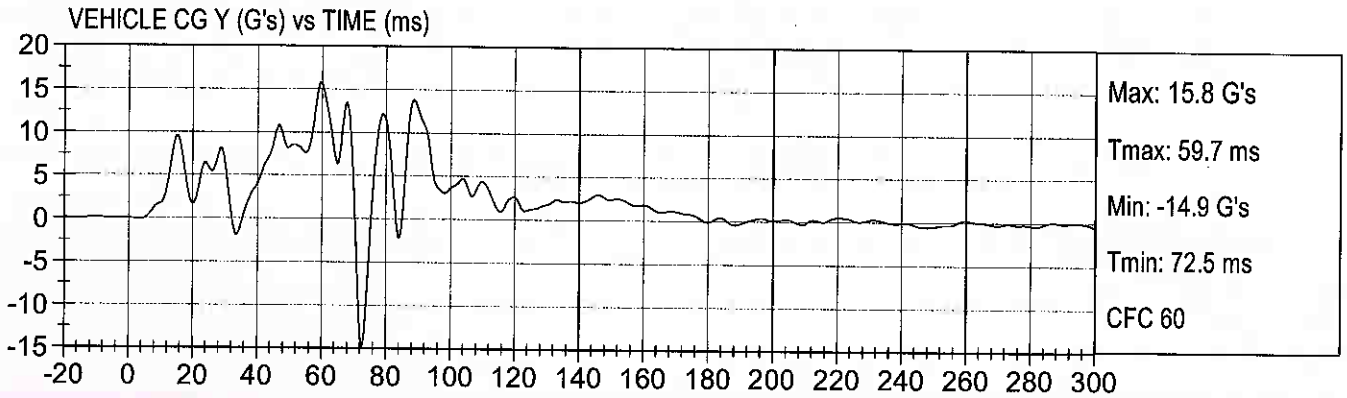


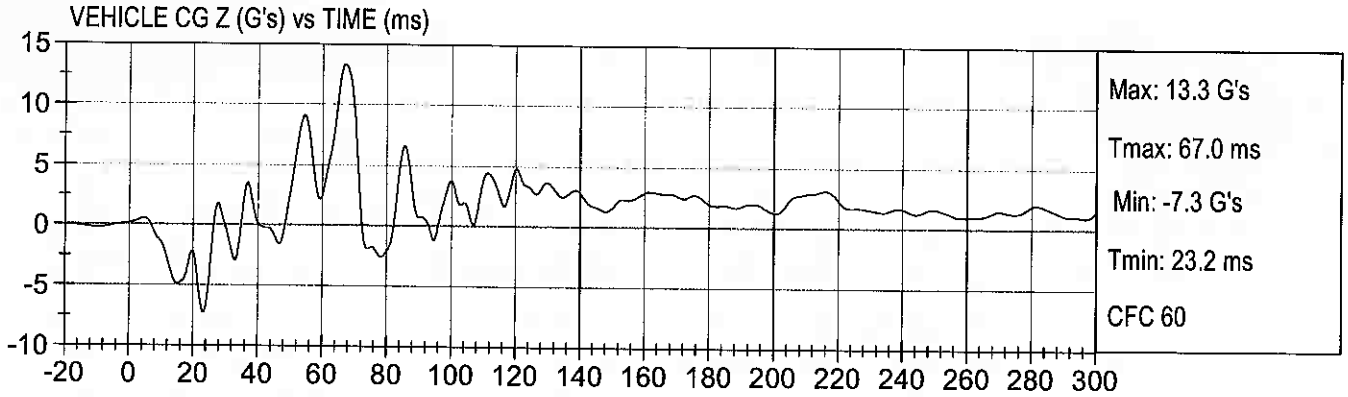


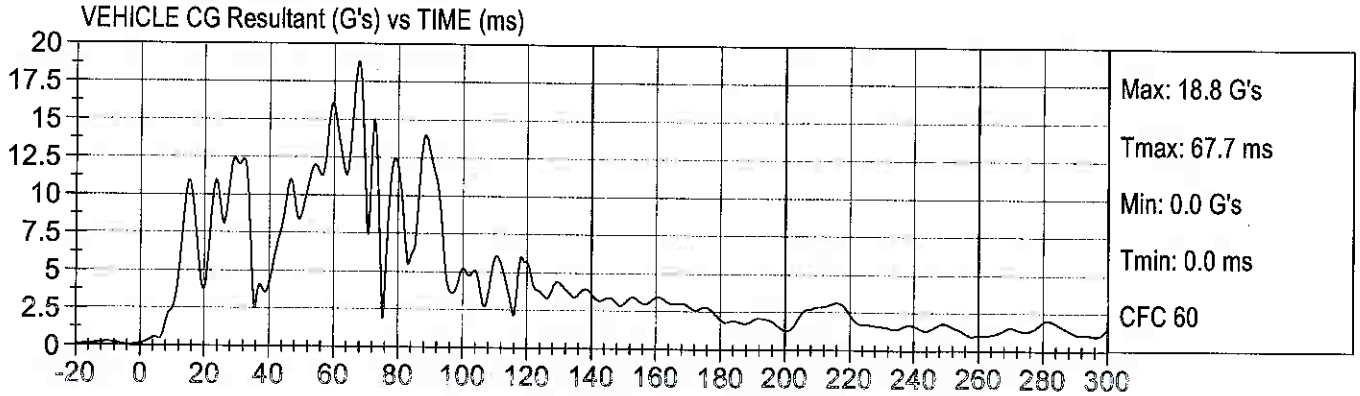

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Test Date: 03/12/2009
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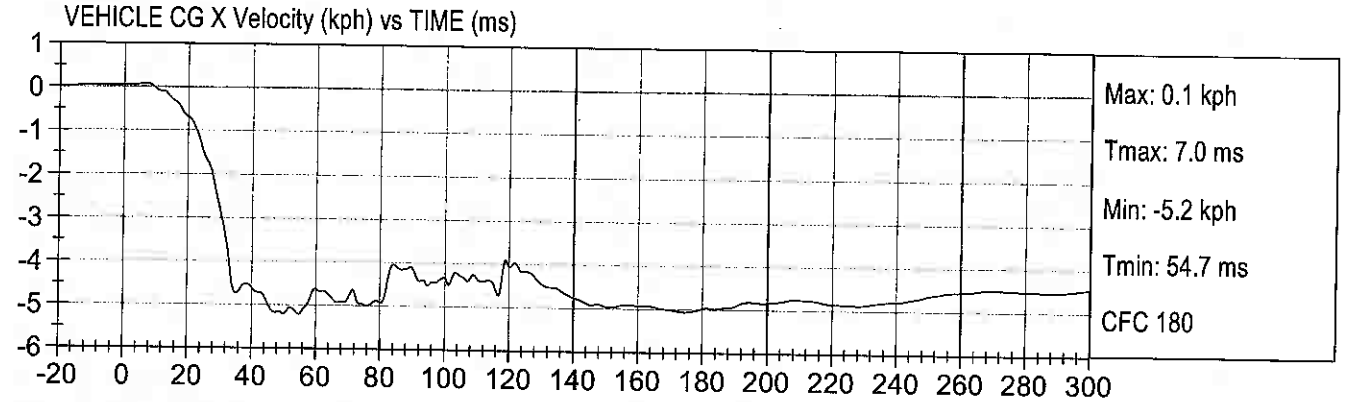
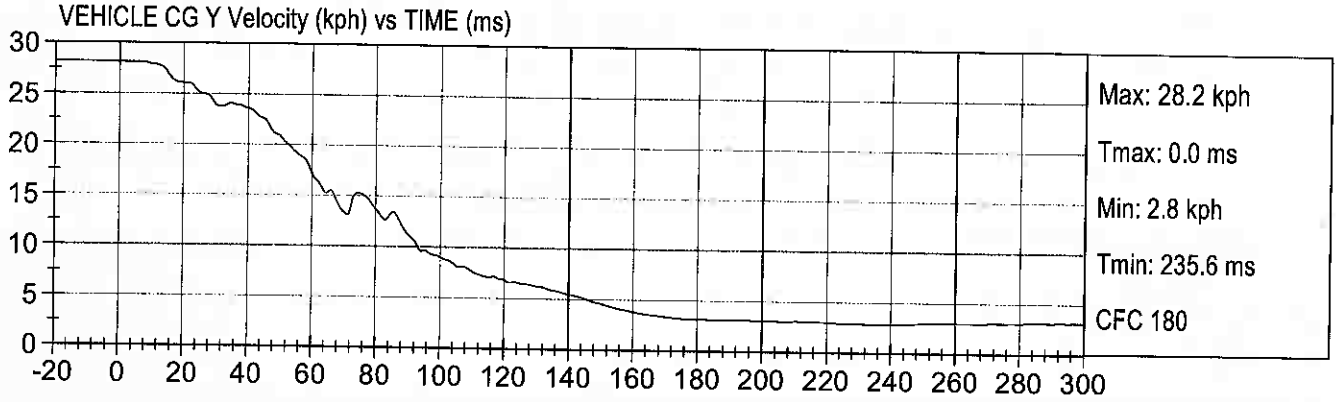
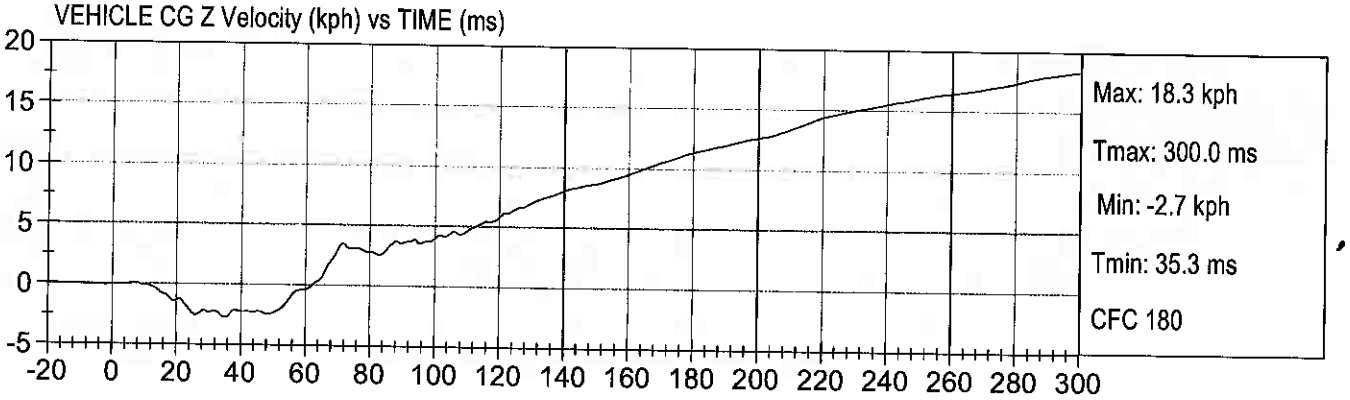


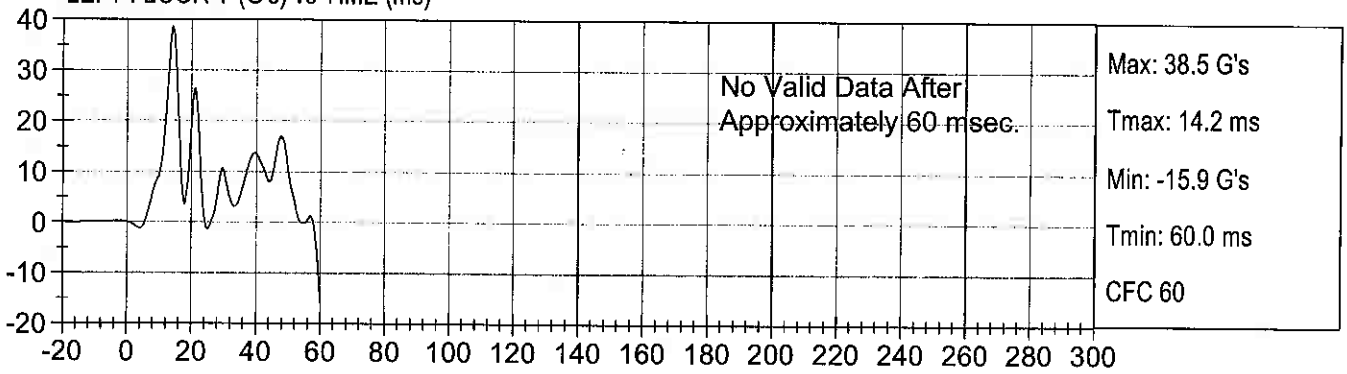



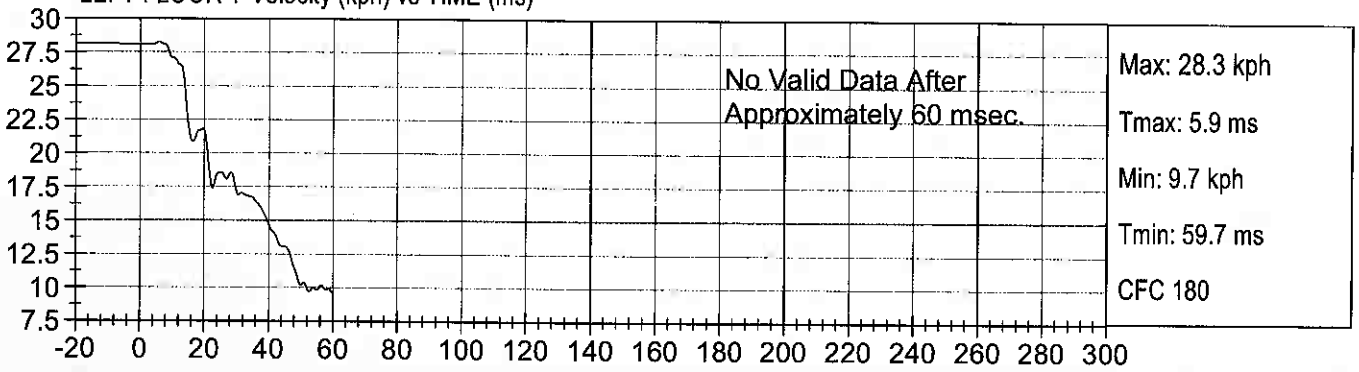
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)

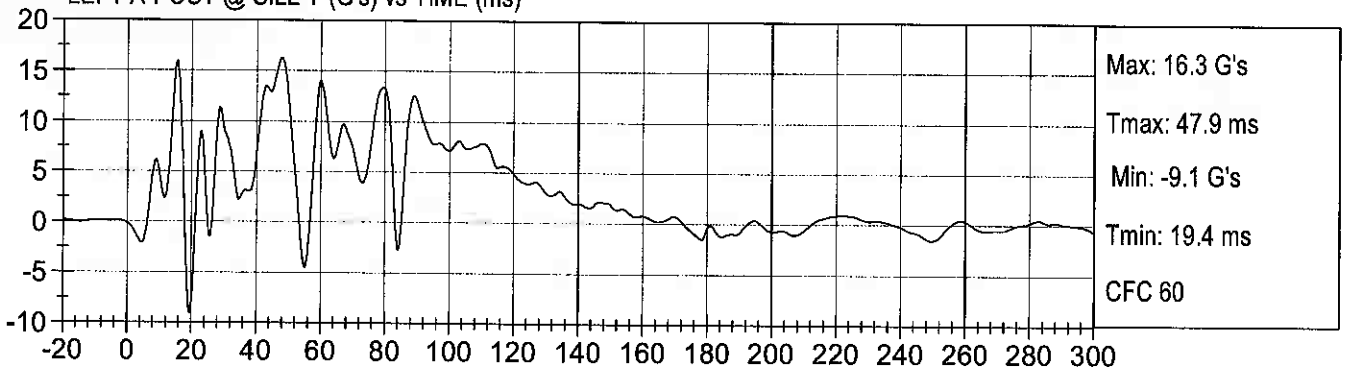
LEFT FLOOR Y (G's) vs TIME (ms)



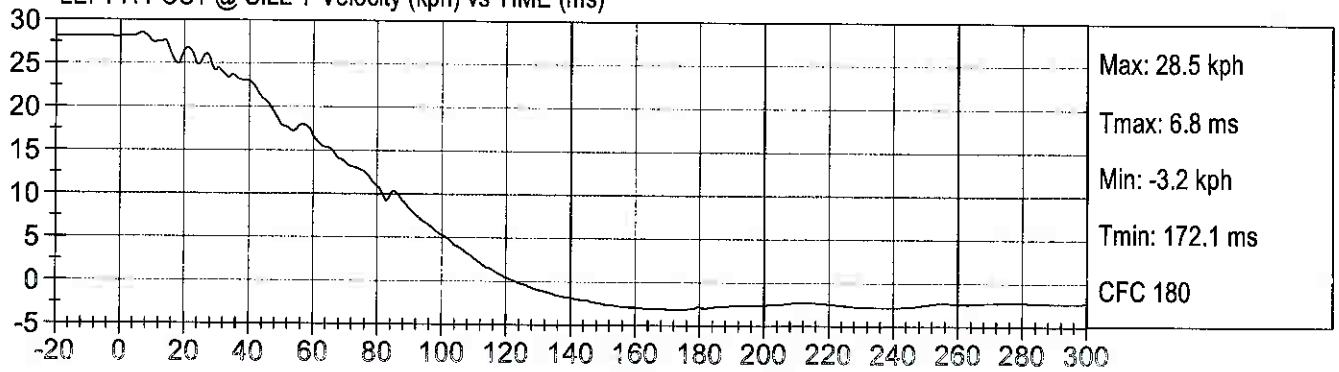

LEFT FLOOR Y Velocity (kph) vs TIME (ms)




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

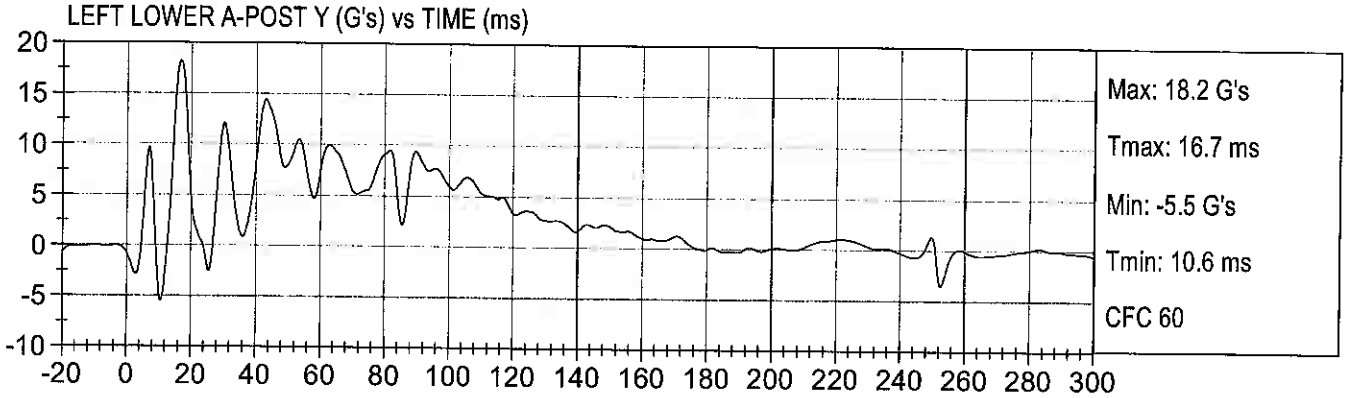


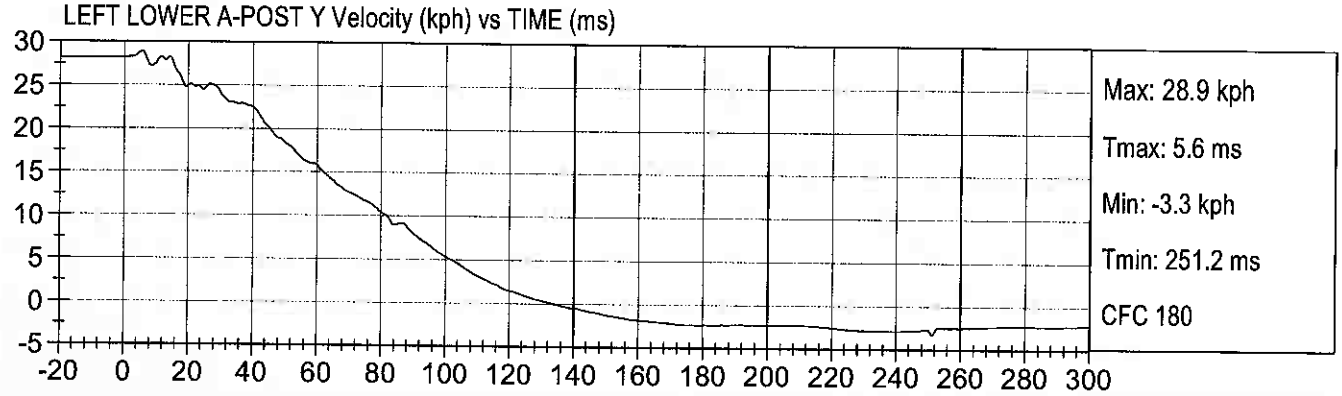

LEFT A-POST @ SILL Y Velocity (kph) vs TIME (ms)

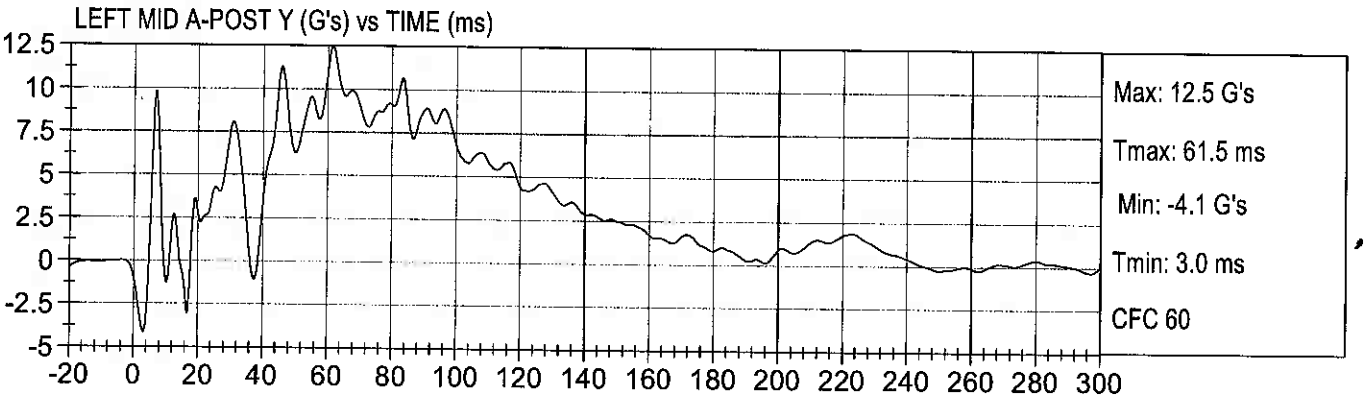


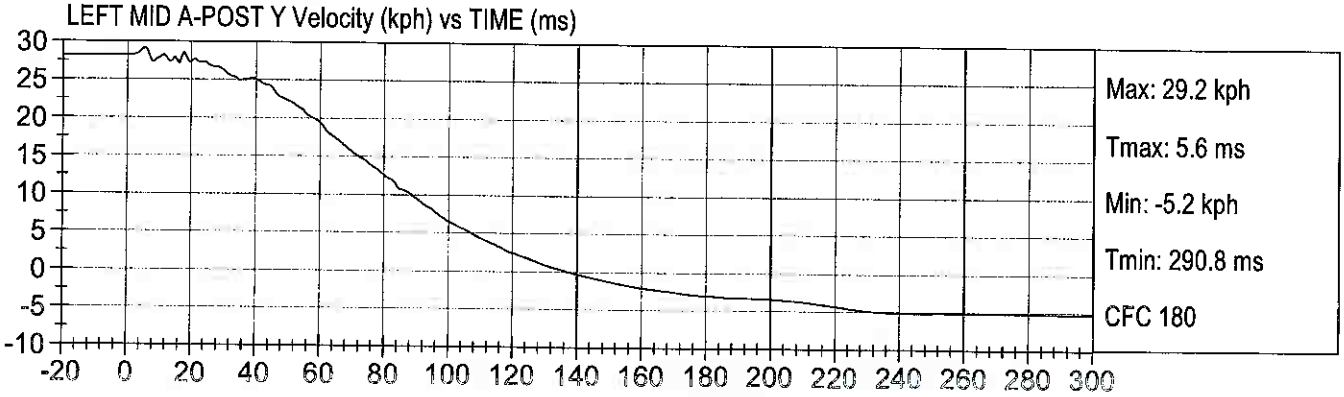
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



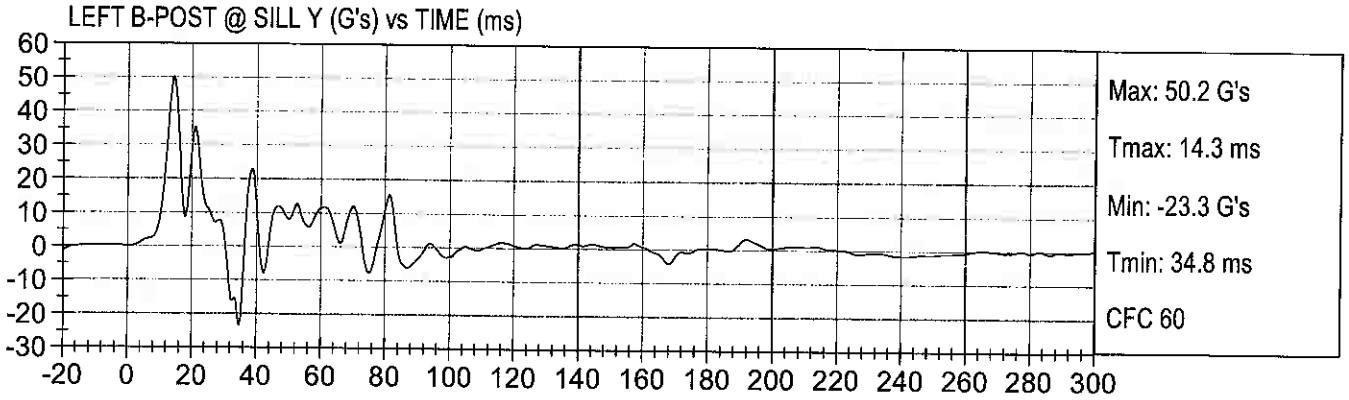



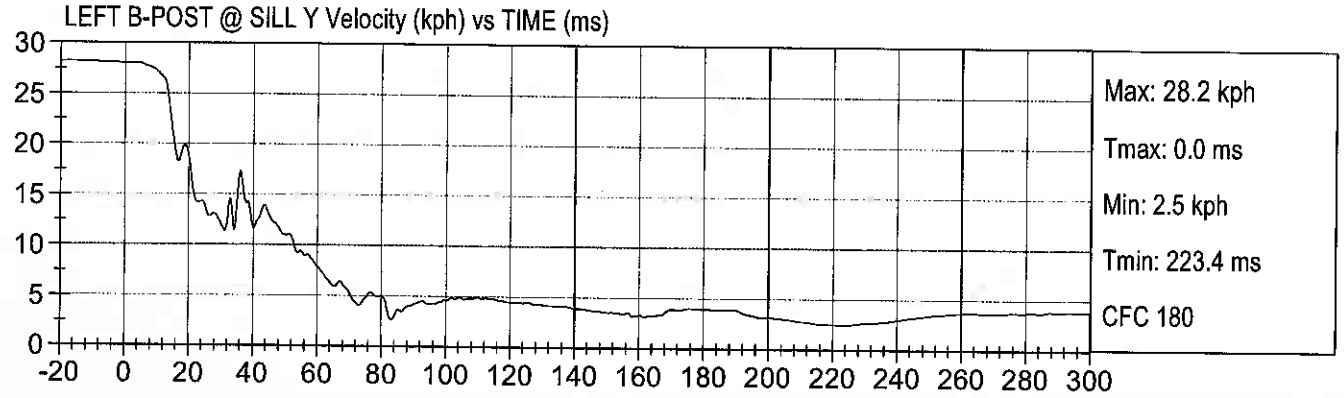



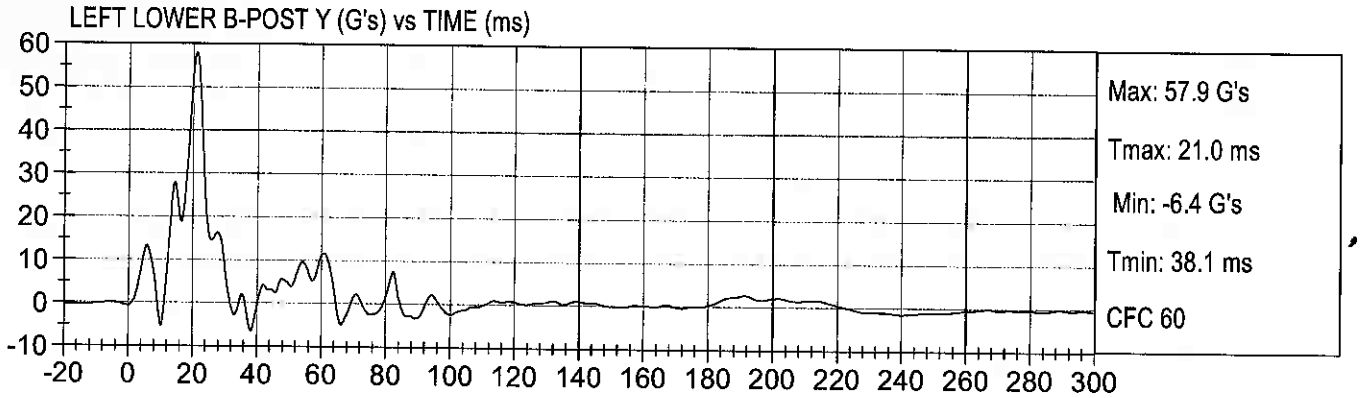



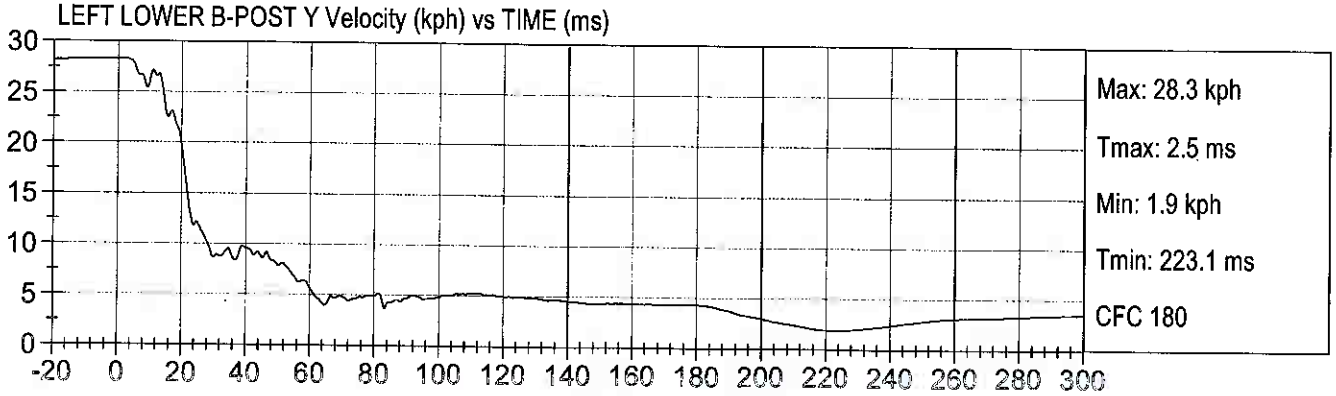
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



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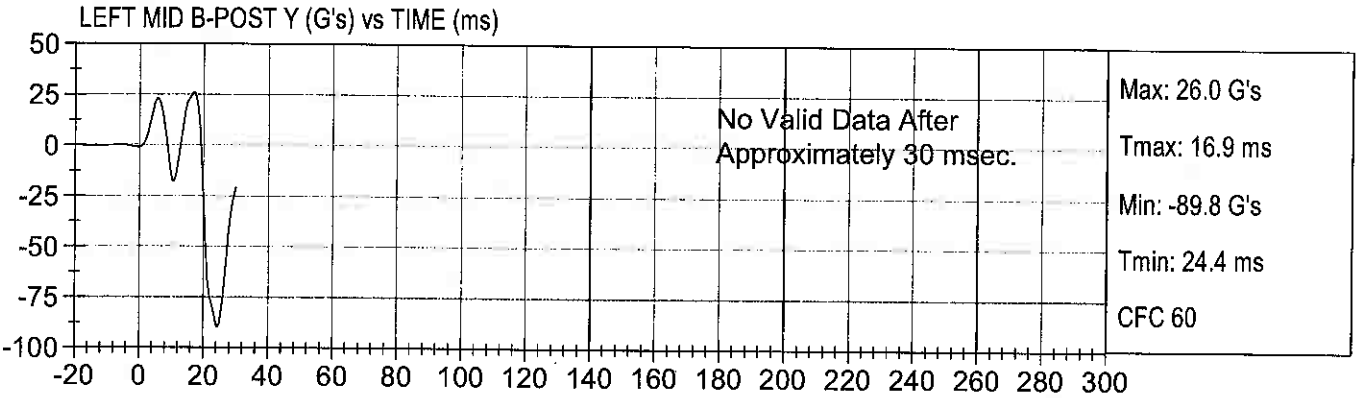
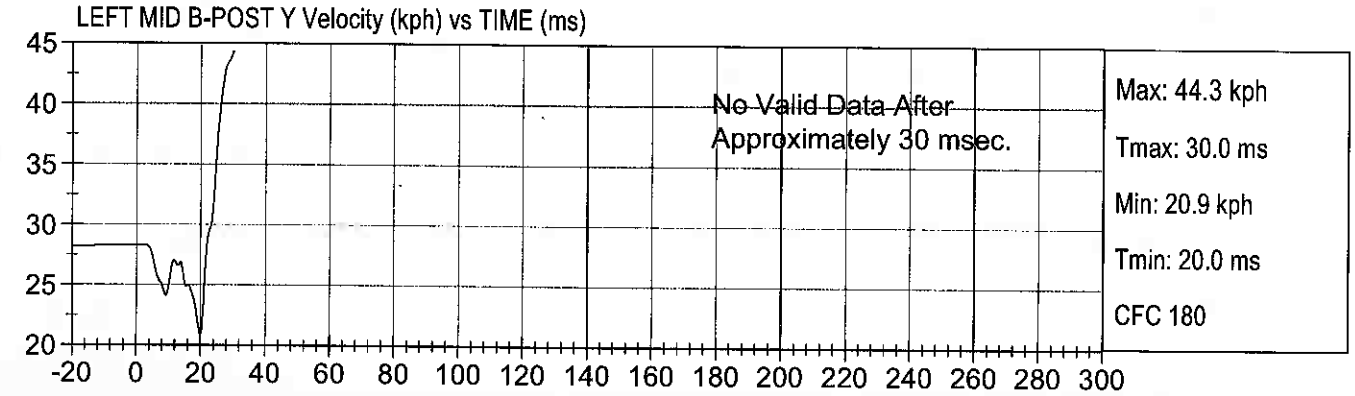
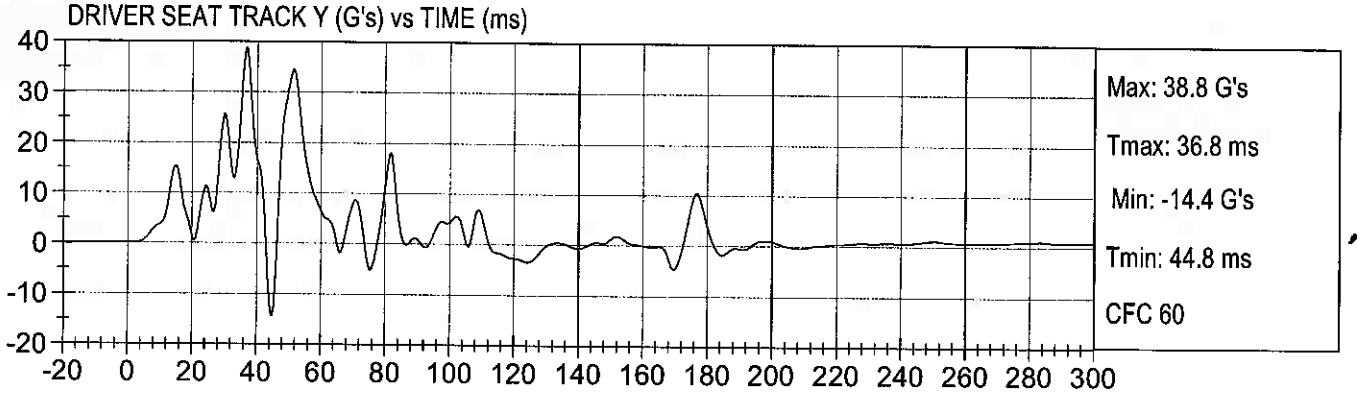
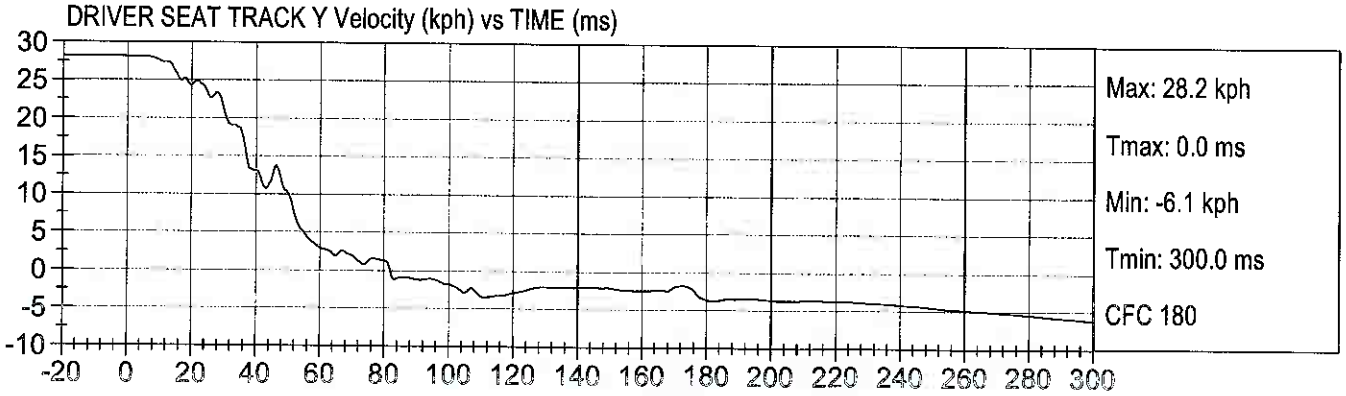
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



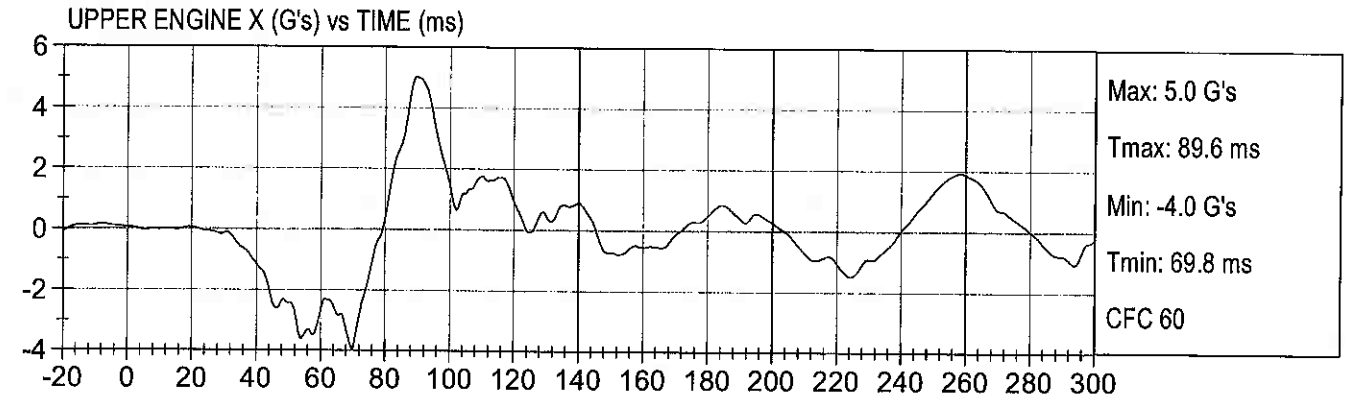



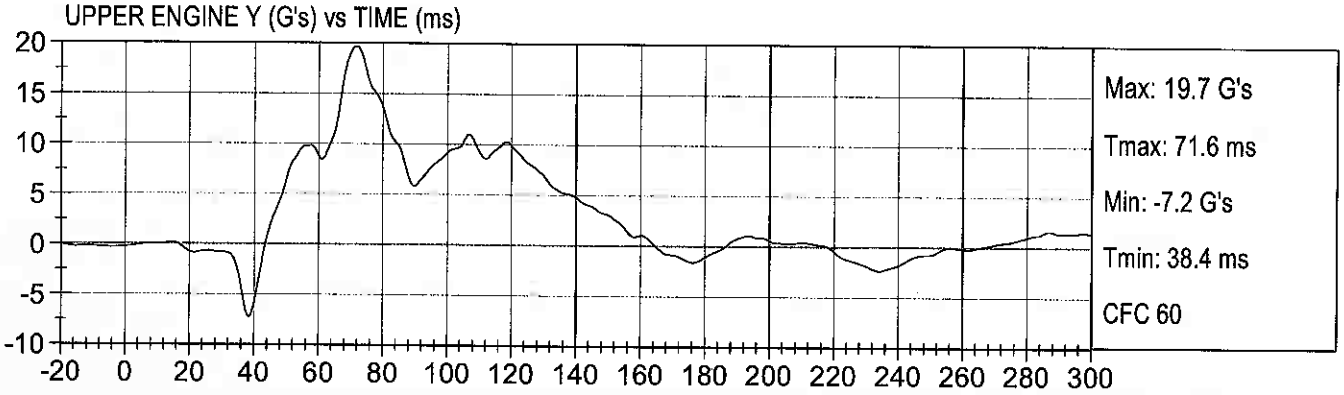



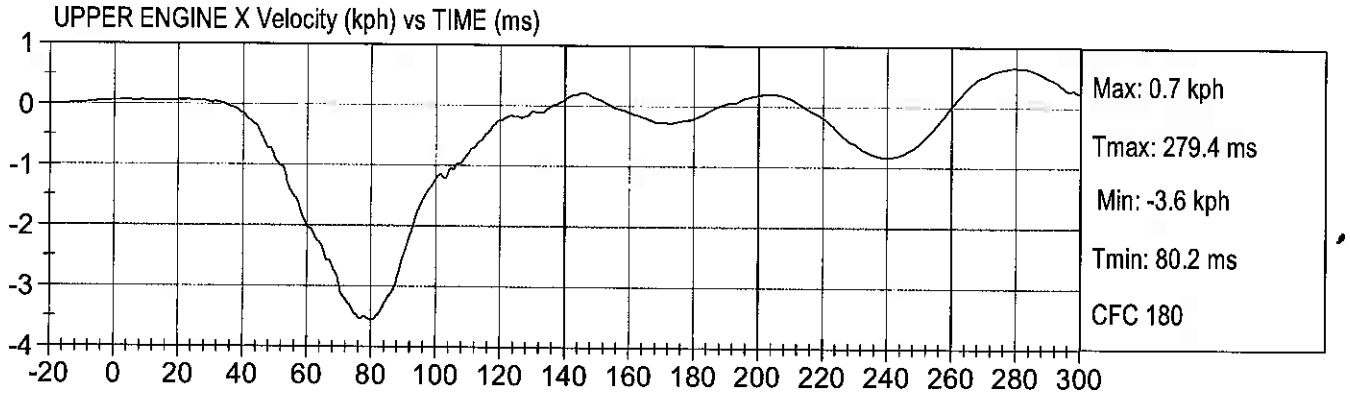



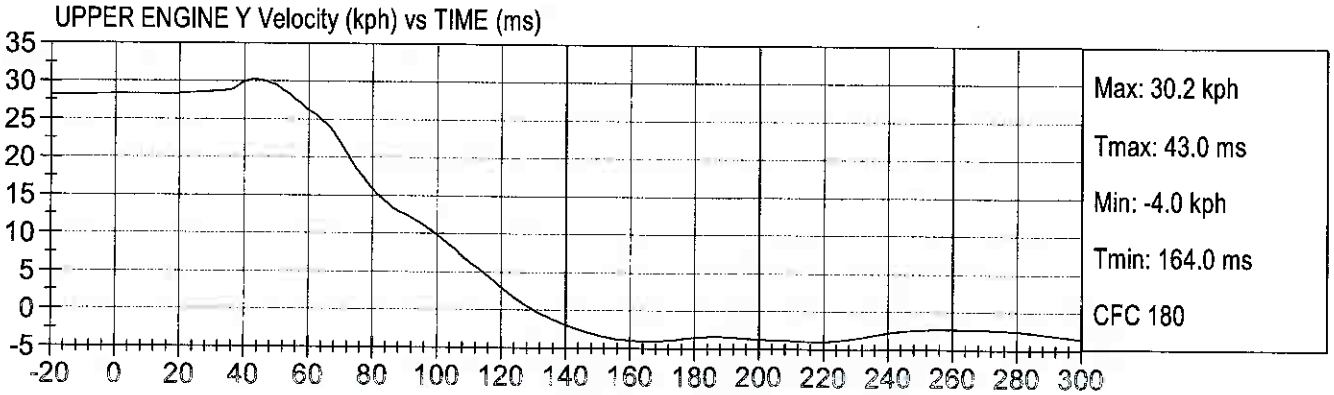
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



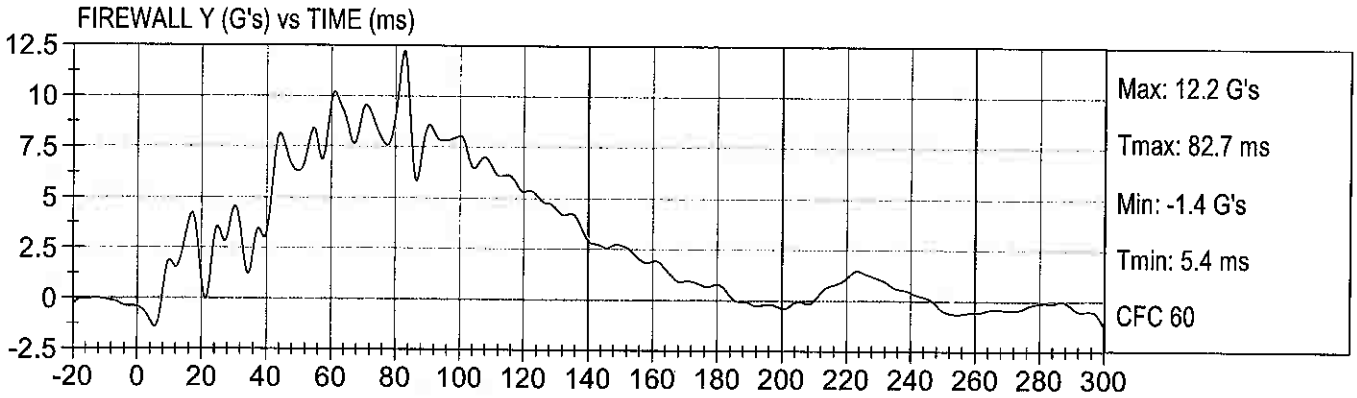



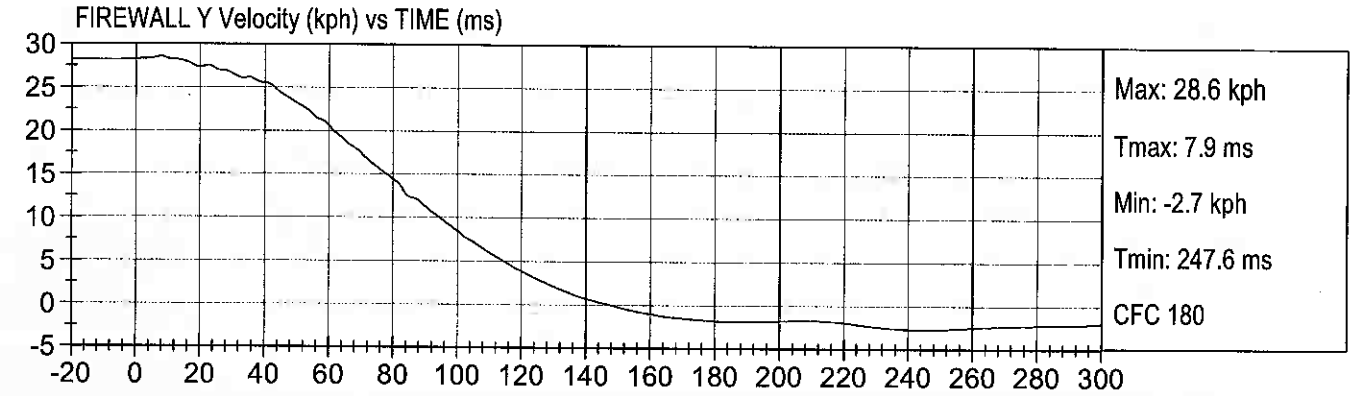



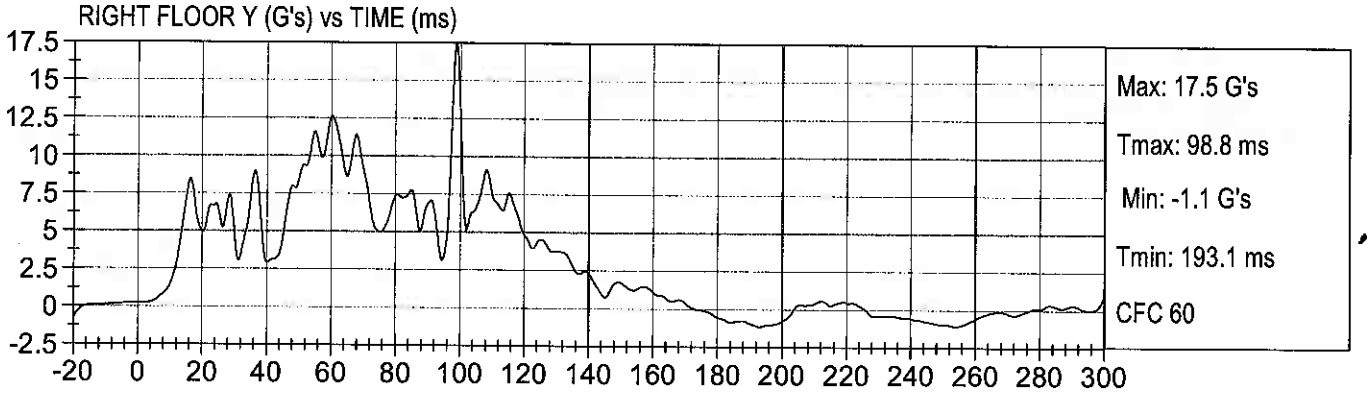



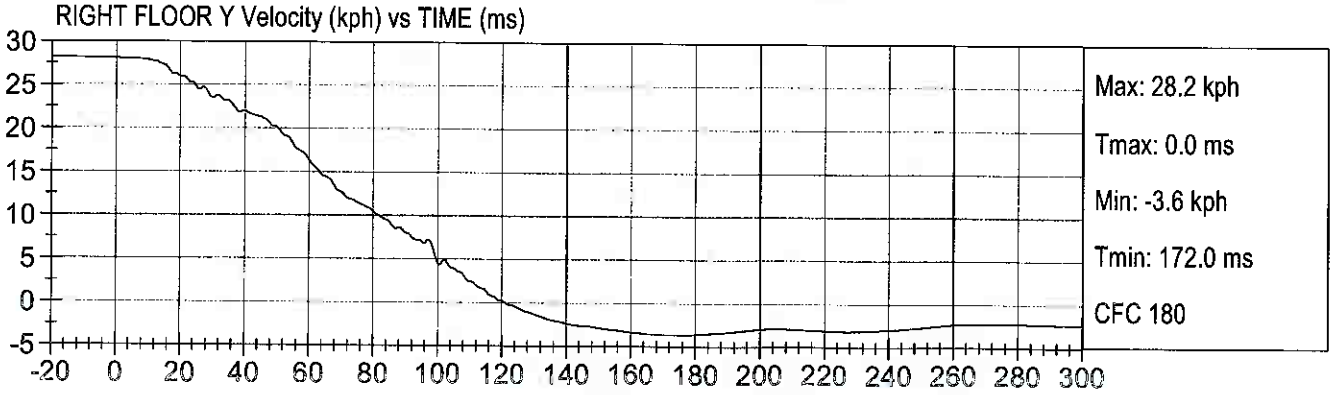
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



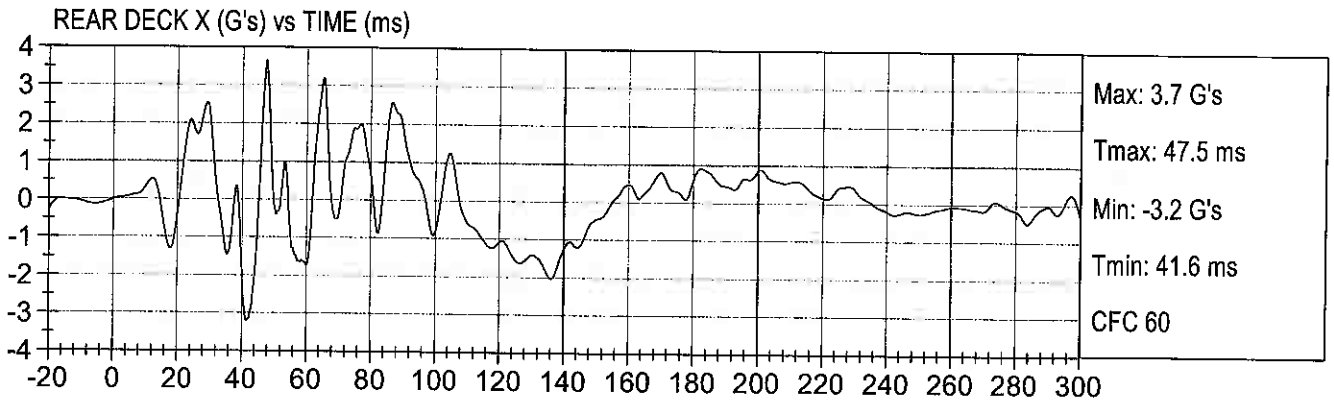



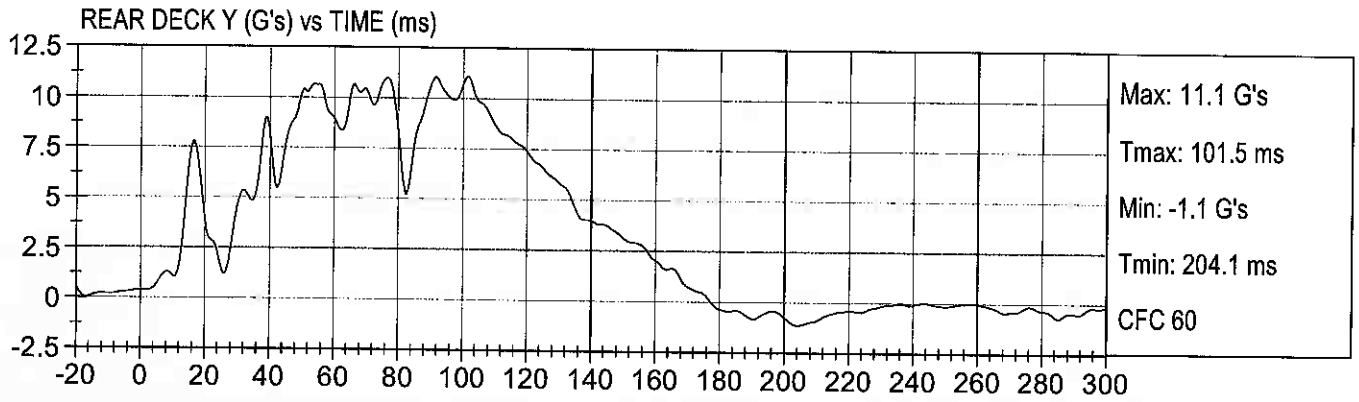



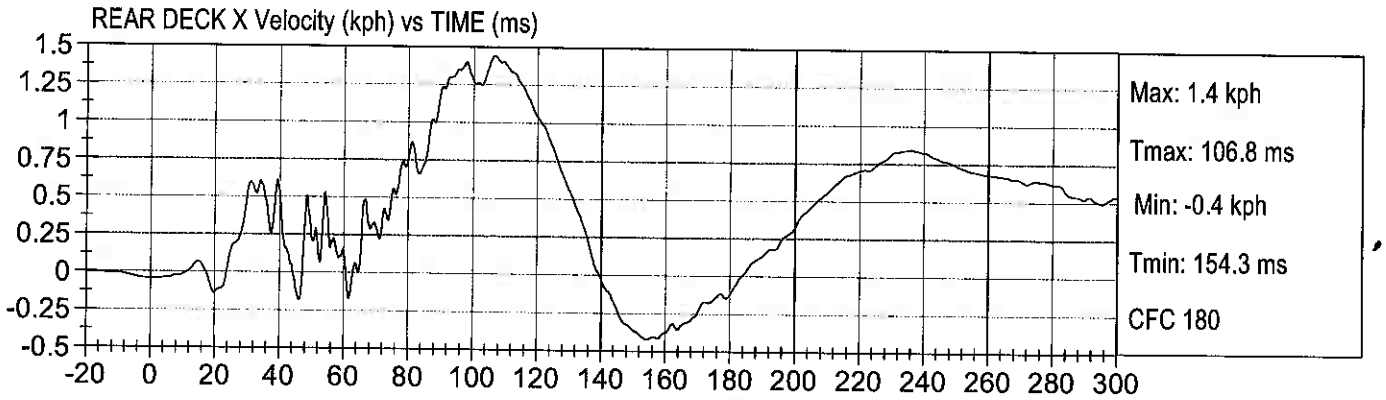



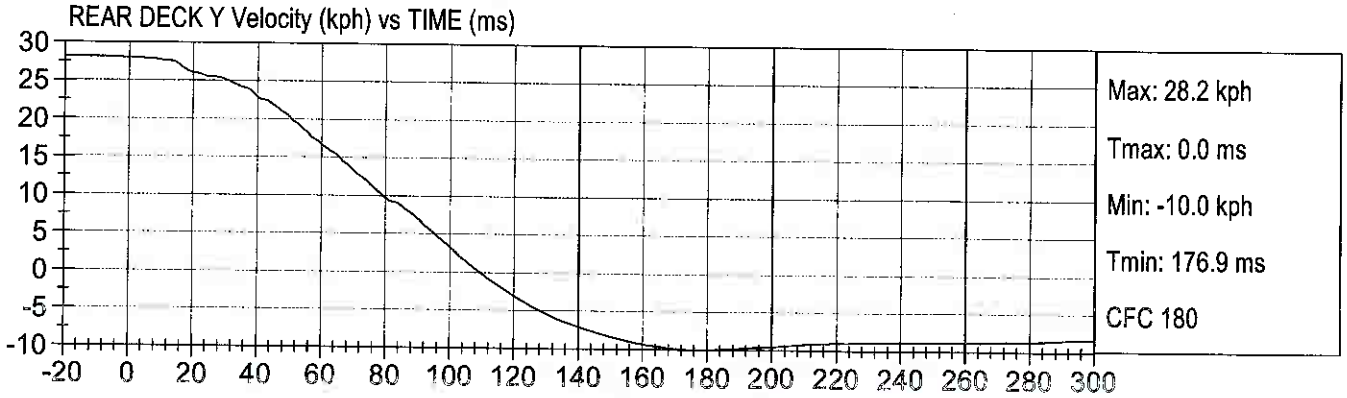
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



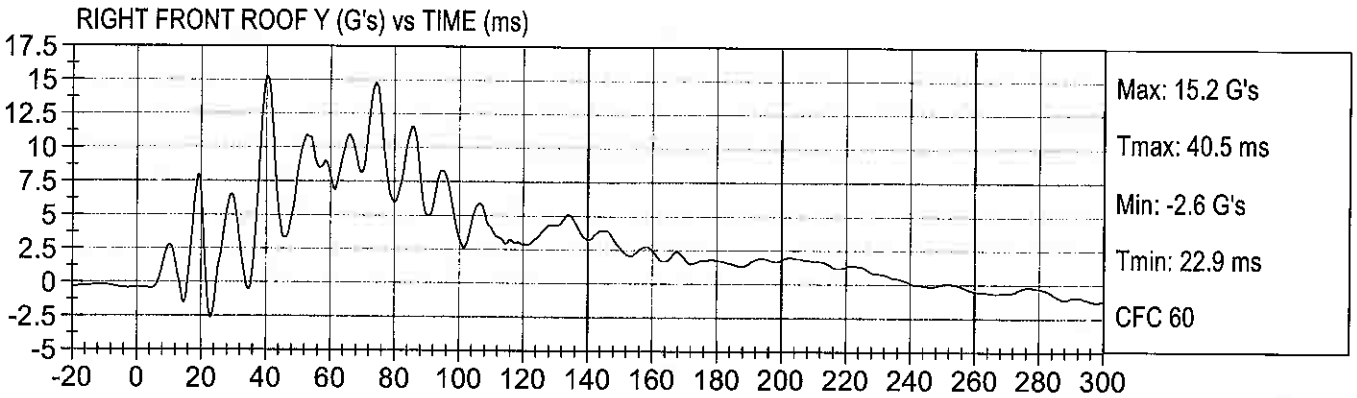



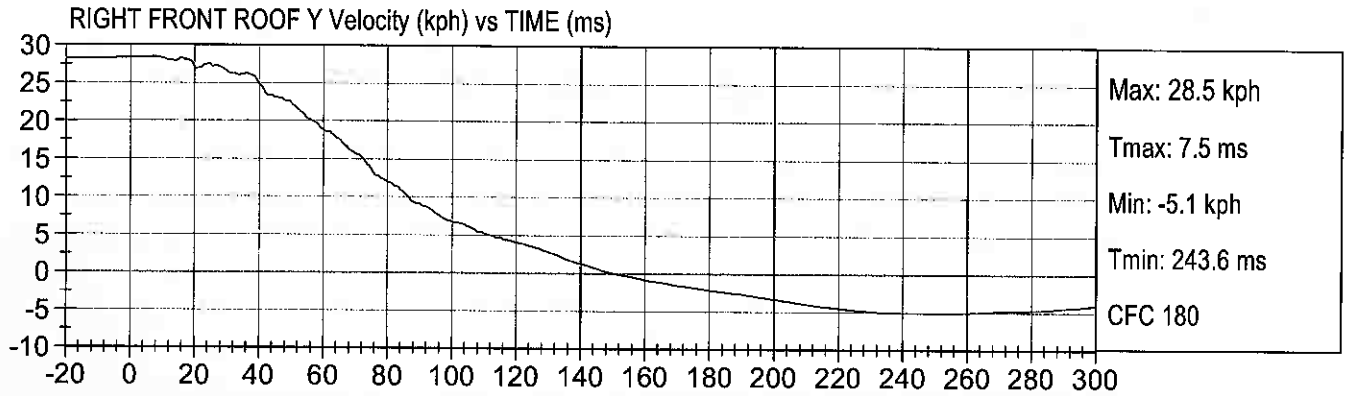



FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

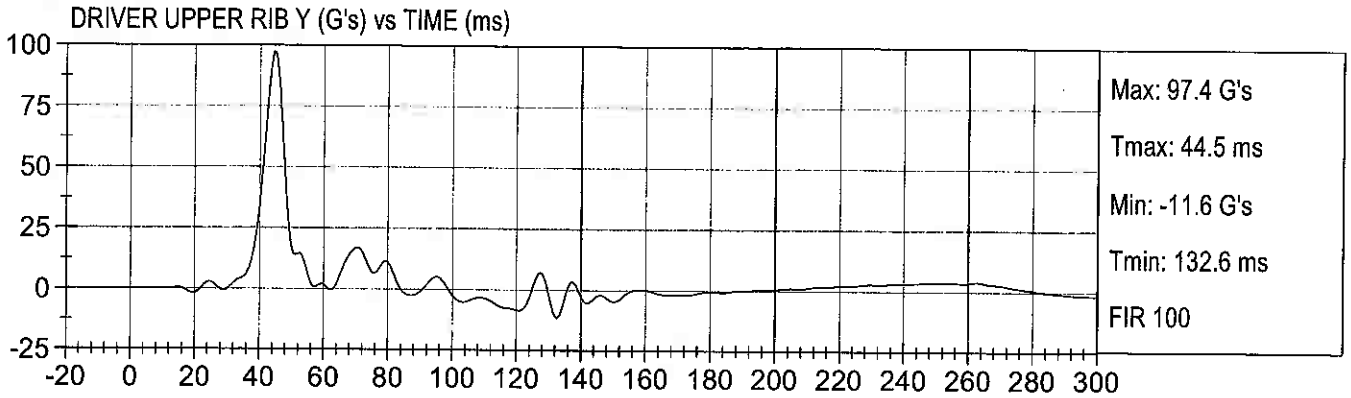
Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)

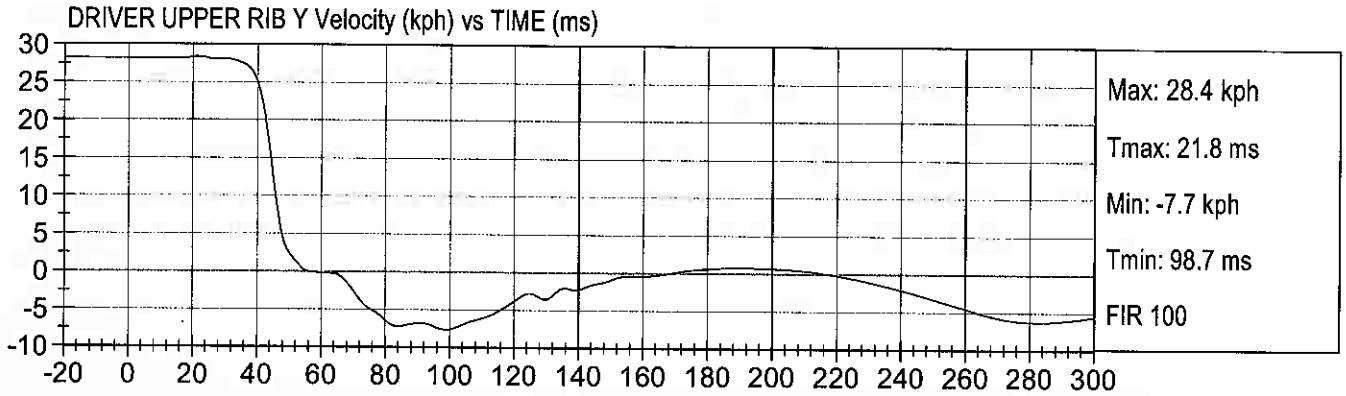


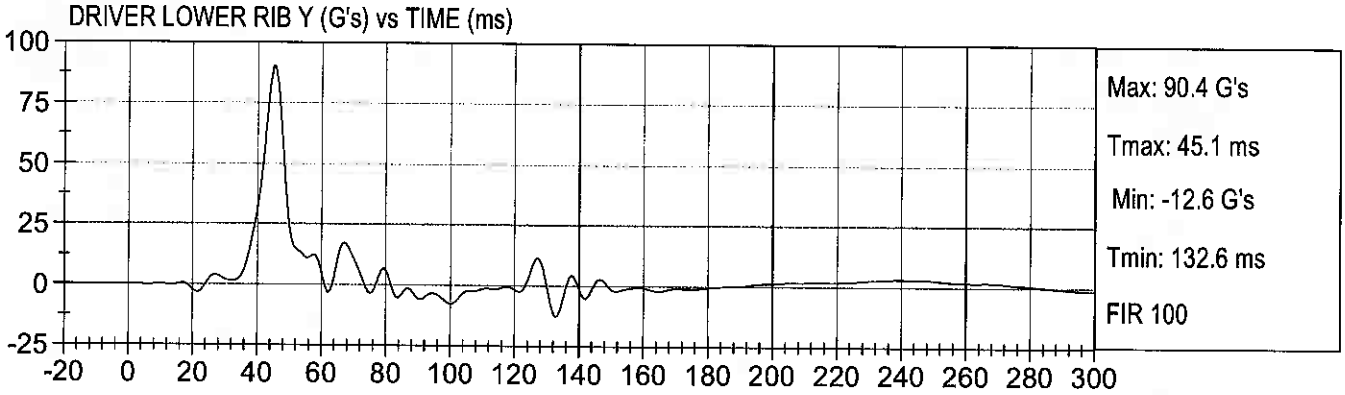



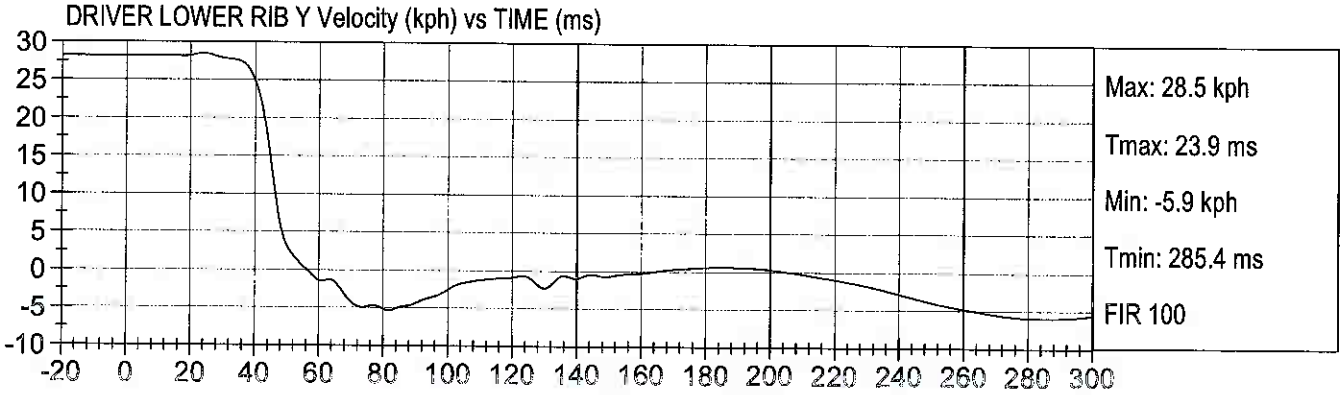
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



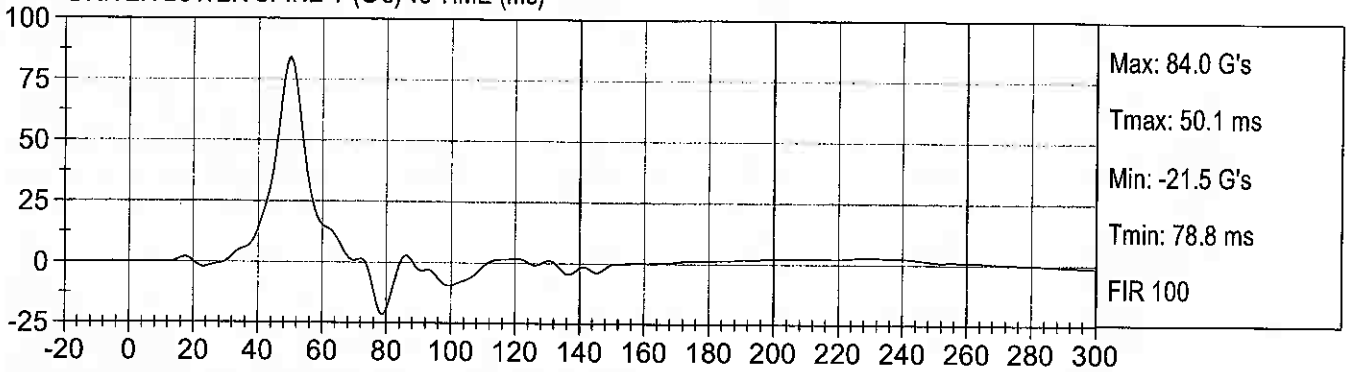



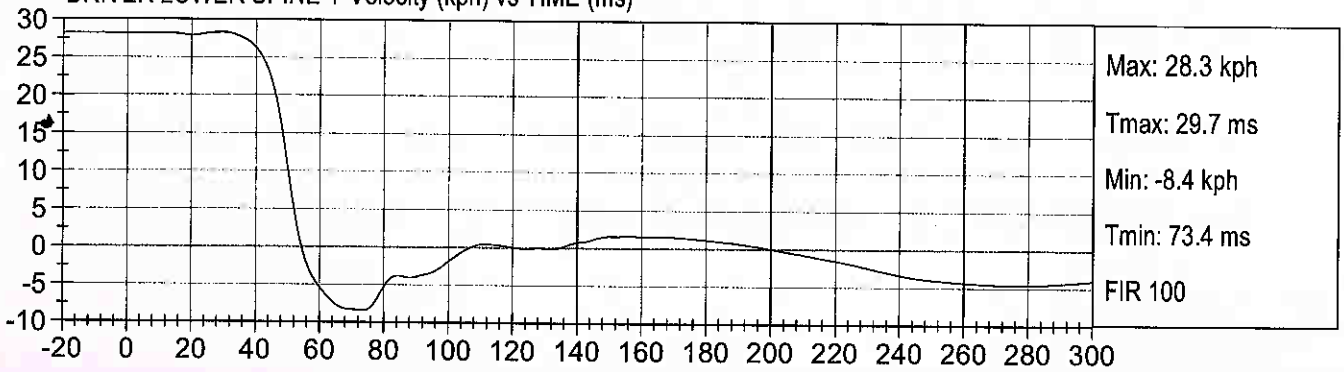
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)

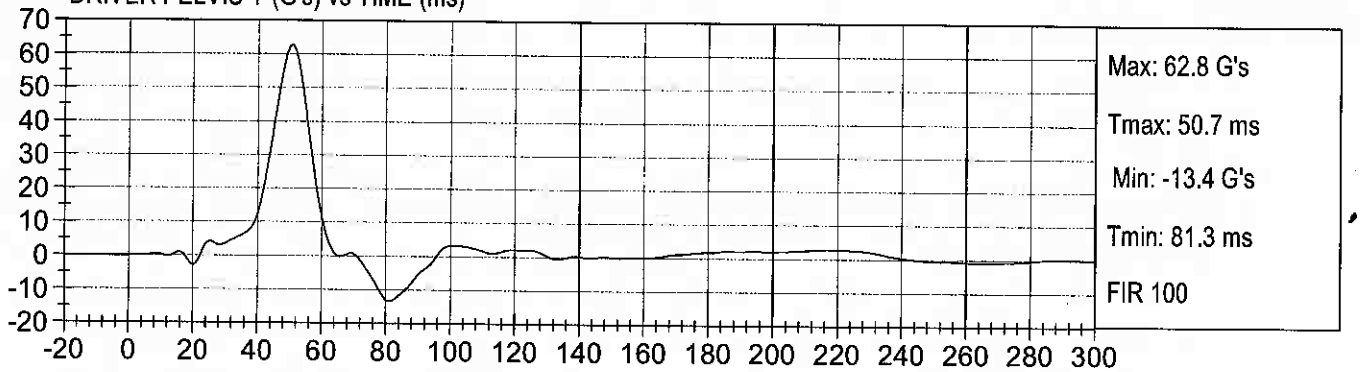
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



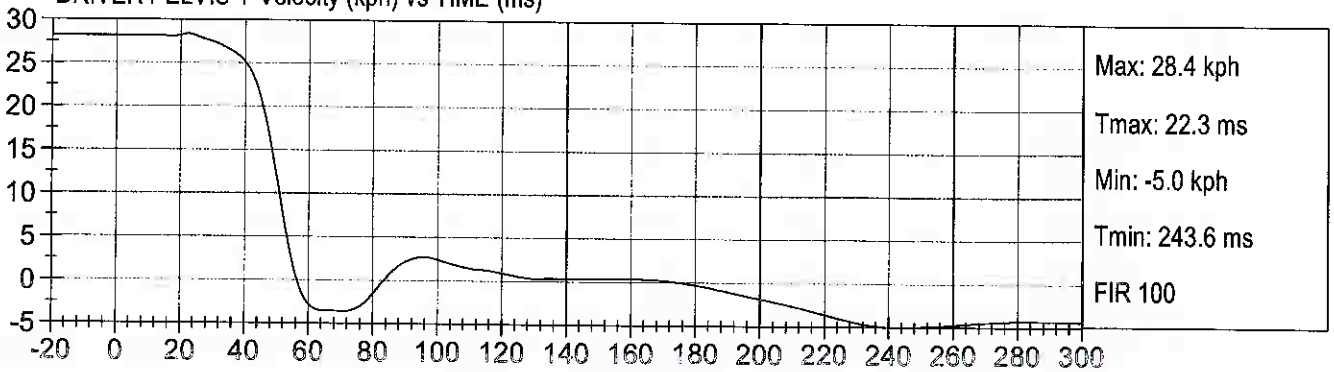

DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)




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

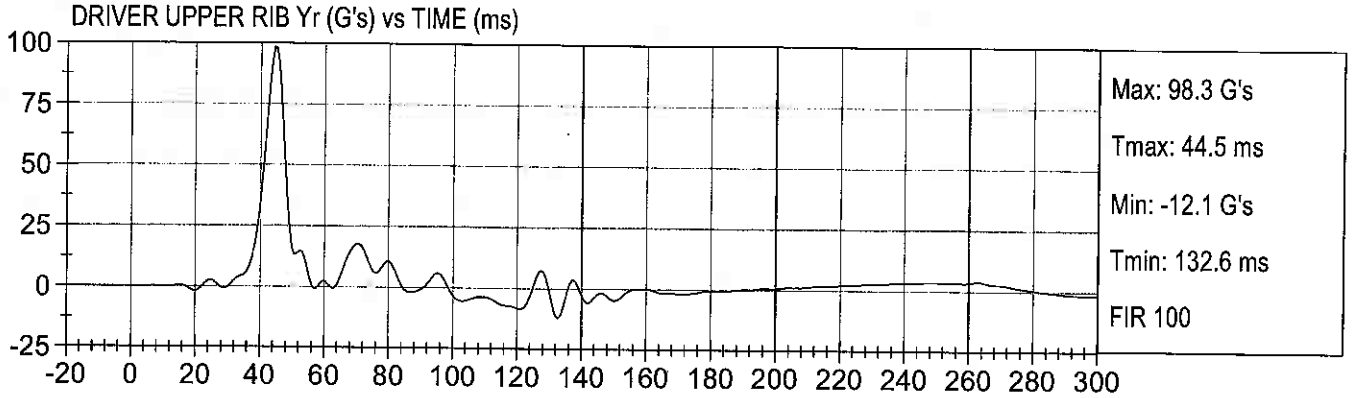


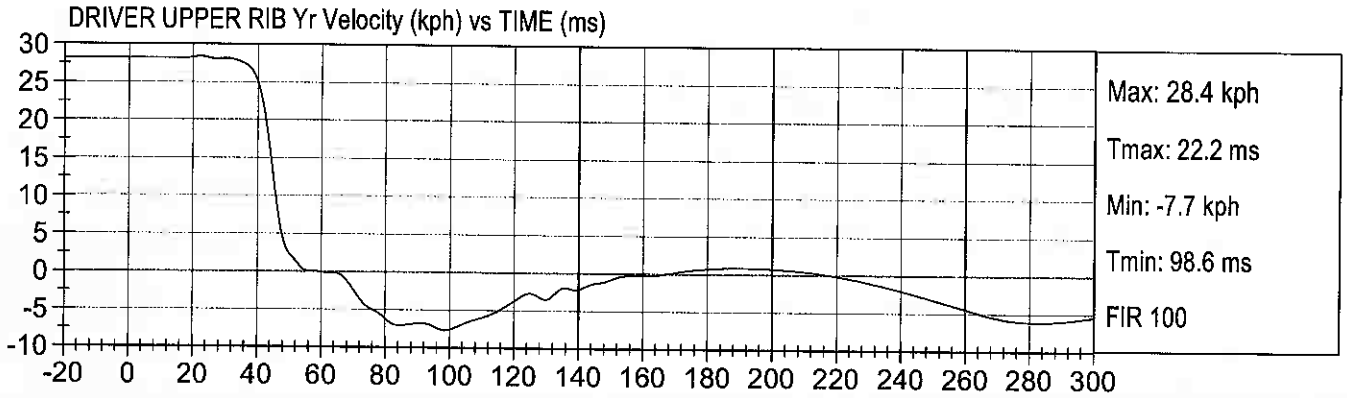

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)

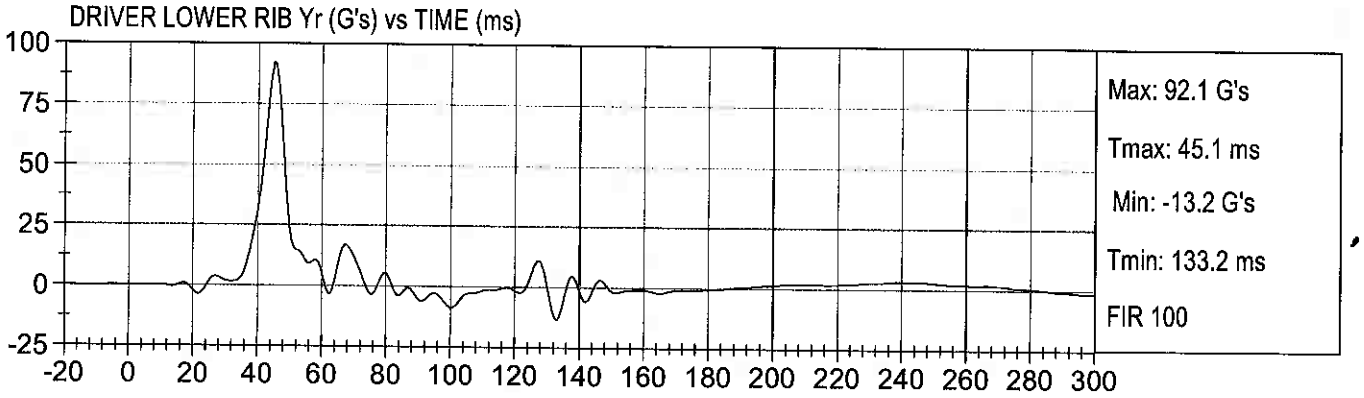


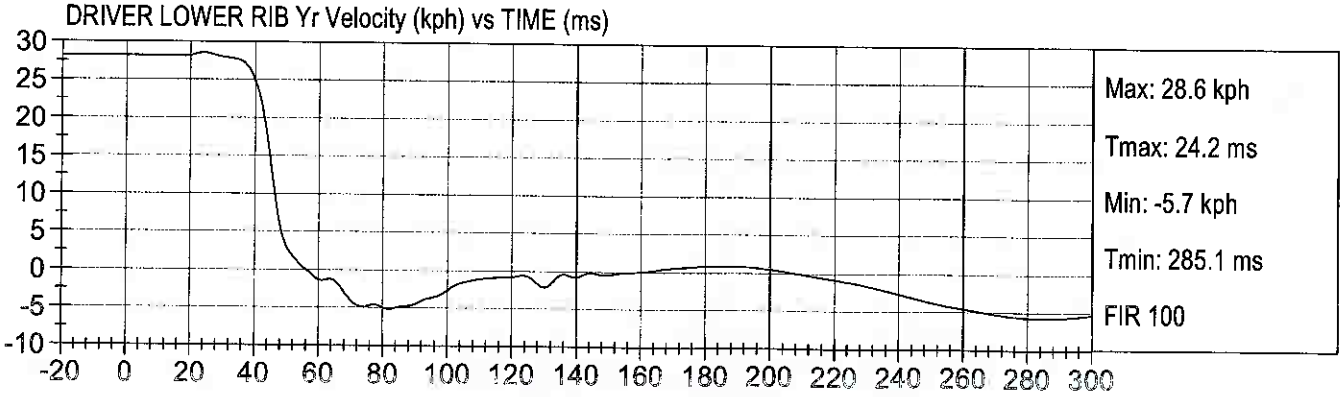
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



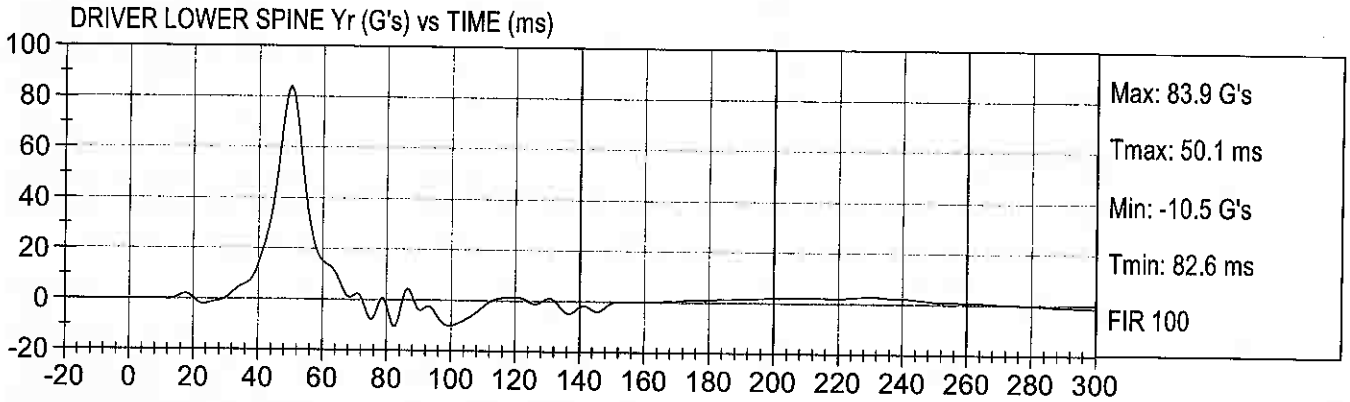



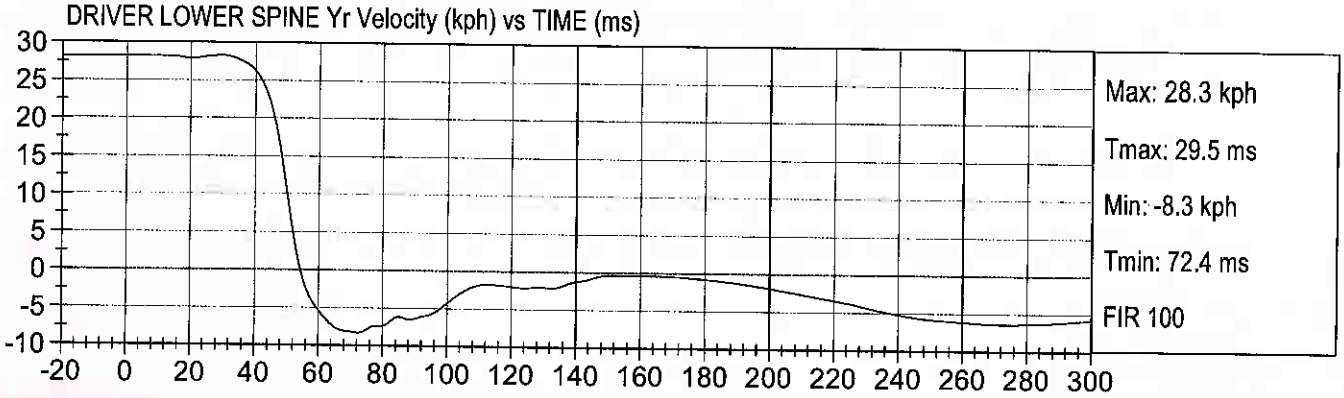



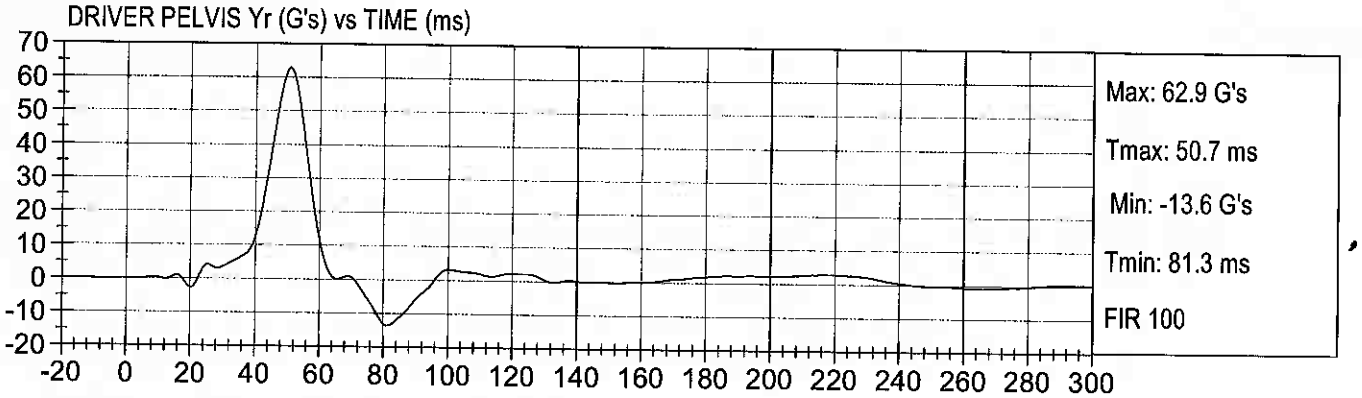



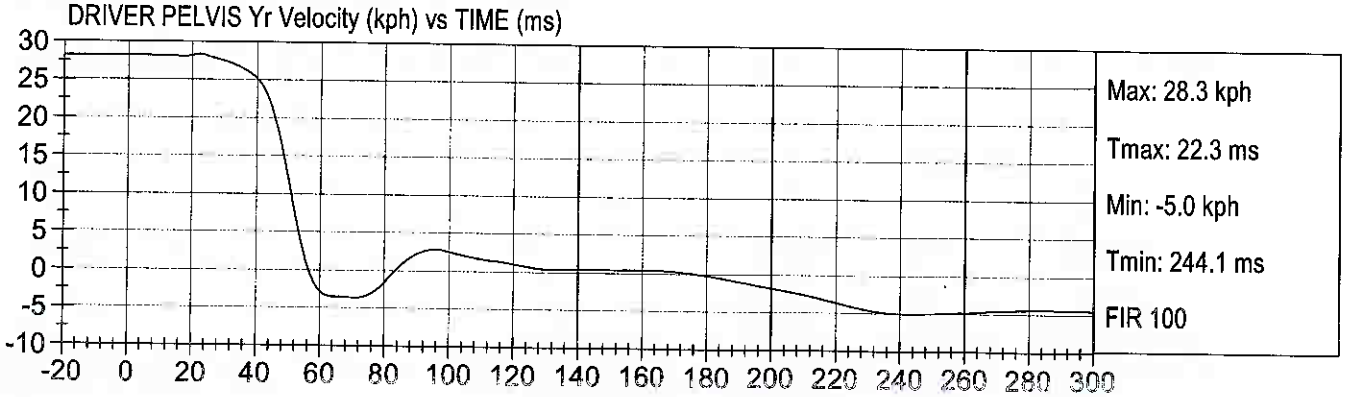
FMVSS 201 RIGID POLE
2009 CHEVROLET TRAILBLAZER C90111

Test Date: 03/12/2009
Speed: 17.5 mph (28.2 km/h)



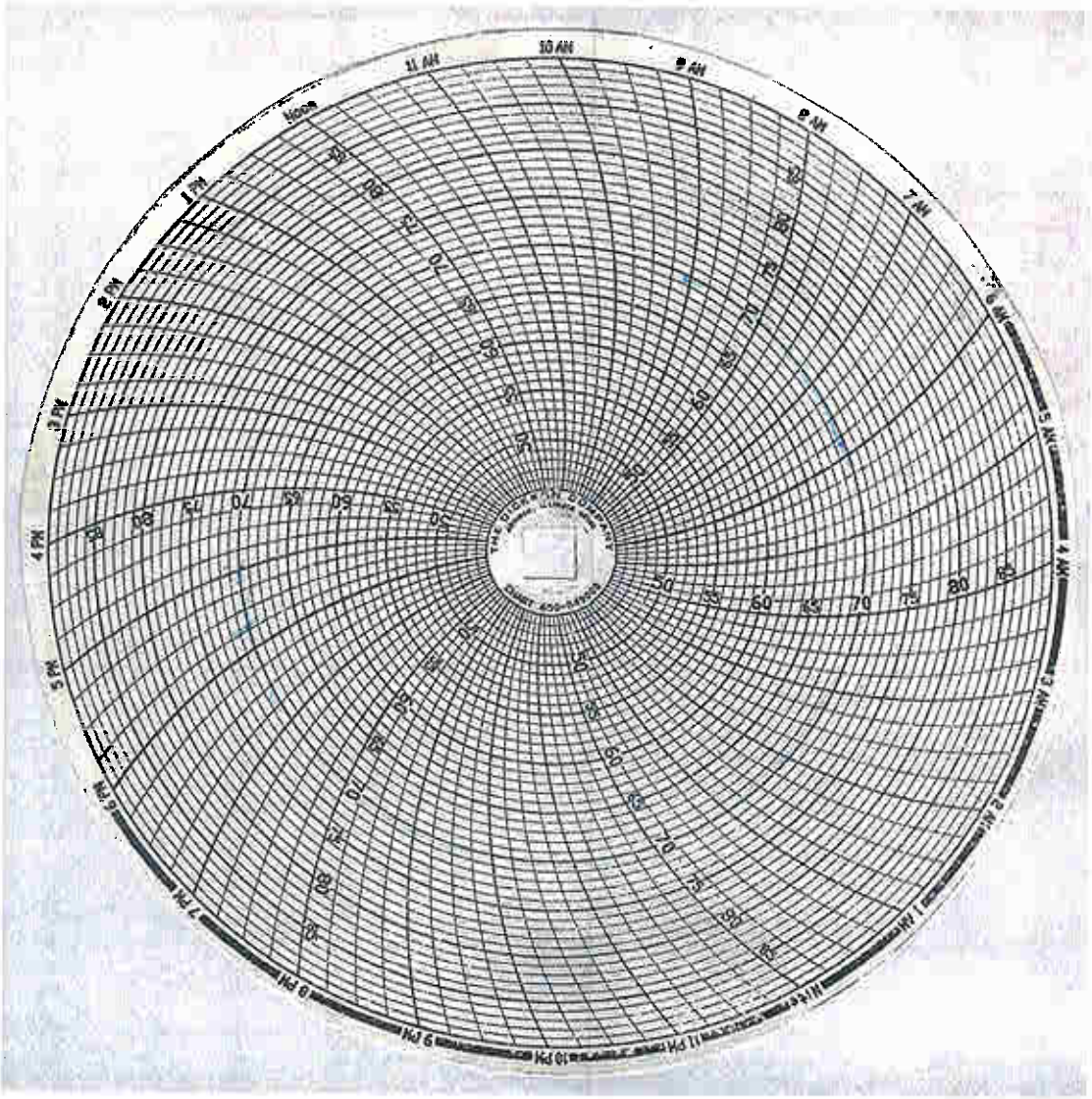



# APPENDIX C

## SID/HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

## Vehicle and Dummy Temperature

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Chevrolet Trailblazer | NHTSA No. | C90111 |
| Test Program: | FMVSS 201P | Test Date: | March 12, 2009 |



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Head Drop Calibration (Lateral)**

**ATD Serial No:** 037 **Test I.D:** D09271

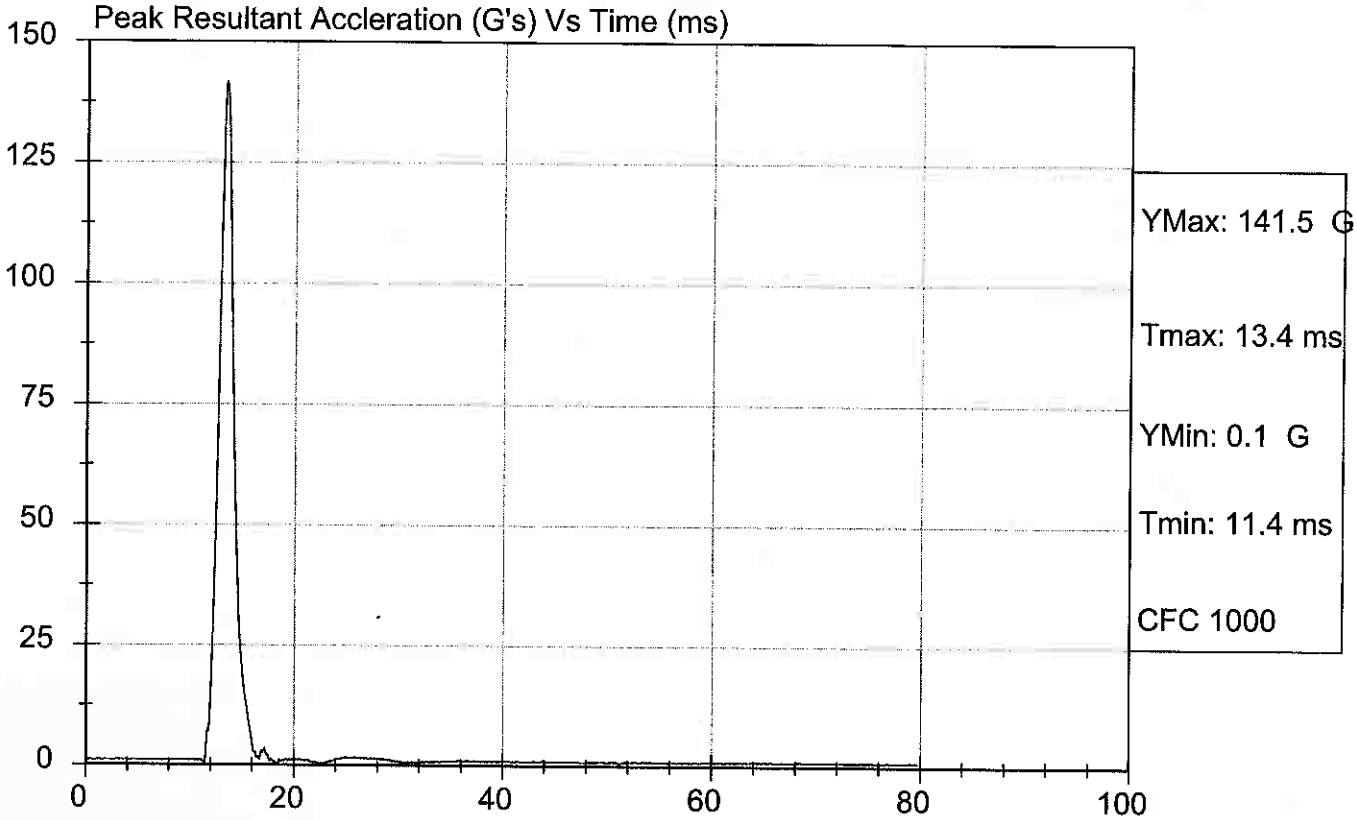
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 22.3 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 25 | Pass |
| Peak Resultant Acceleration | G's | 120 to 150 | 142 | Pass |
| Is Resultant Curve Unimodal? | N/A | 15% of peak | Yes | Pass |
| Peak Longitudnal Acceleration | G's | +/- 15 | -5.1 | Pass |
| | | Overall Test Results | | Pass |

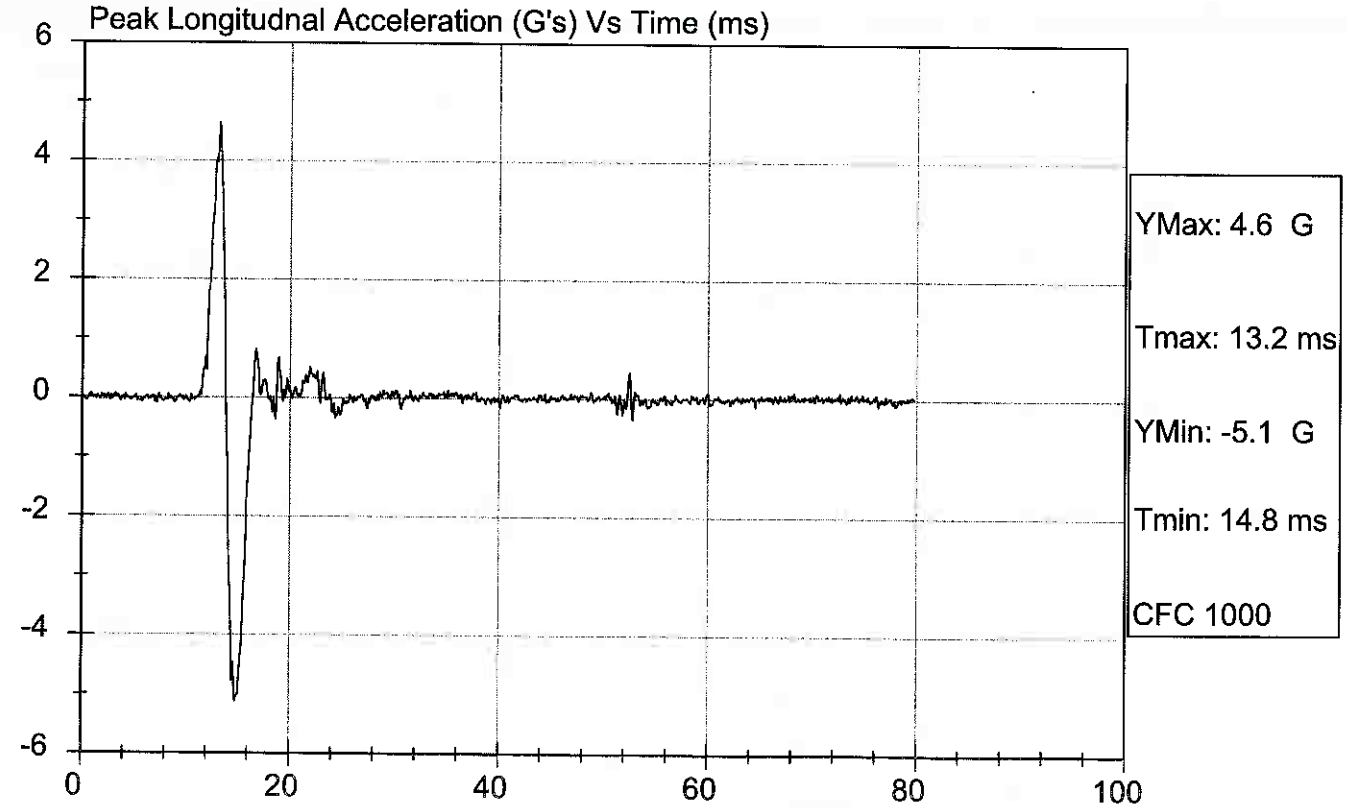
Tim Brat
Laboratory Technician

2/12/09
Test Date

David Winkelbauer
Approved By

| | | |
|---|---|---|
| mga | Test Description: Head Drop | Test Date: 2/12/09 |
| | Component: D09271 | Speed: 0 ft/sec, 0 m/s |



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Thorax Impact Test**

**ATD Serial No:** 037 **Test I.D:** D09272

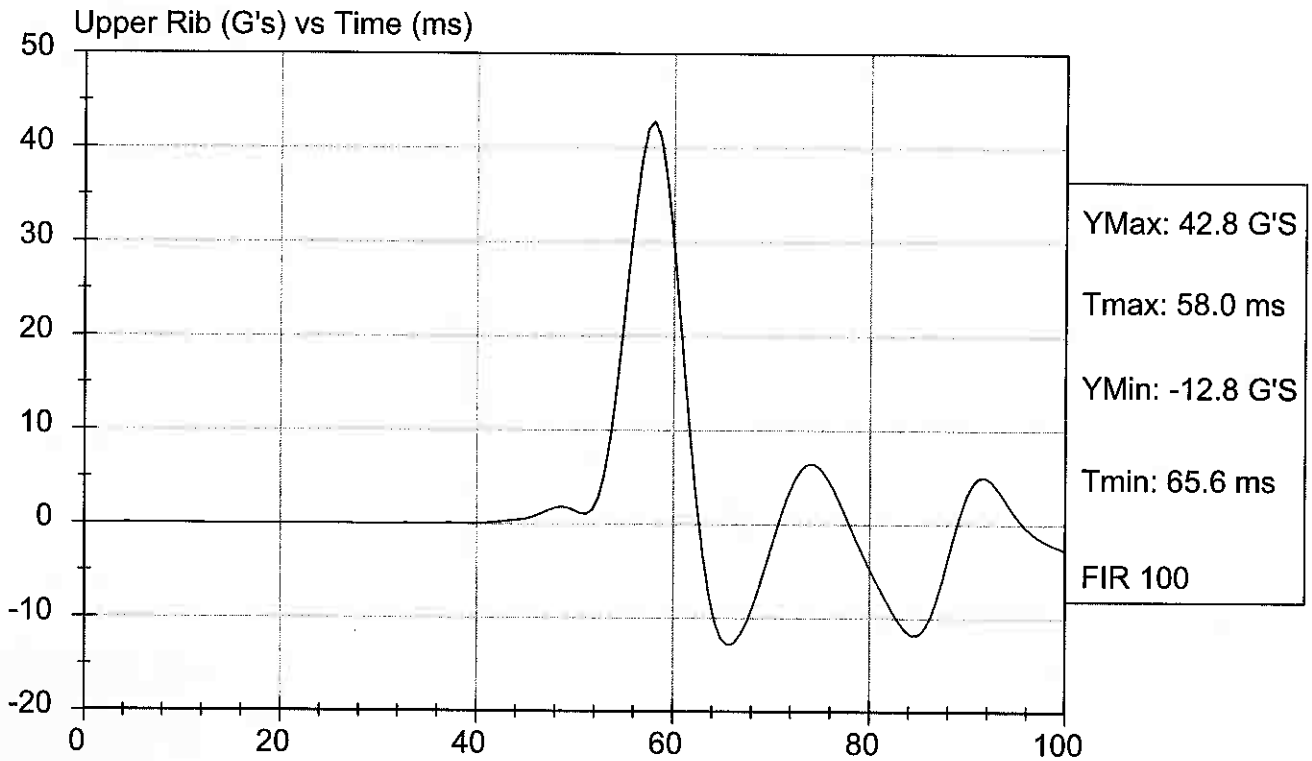
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 17 | Pass |
| Probe Velocity | m/s | 4.22 - 4.31 | 4.27 | Pass |
| Upper Rib | G's | 37 - 46 | 43 | Pass |
| Lower Rib | G's | 37 - 46 | 42 | Pass |
| Lower Spine | G's | 15 - 22 | 21 | Pass |
| | | Overall Test Results | | Pass |

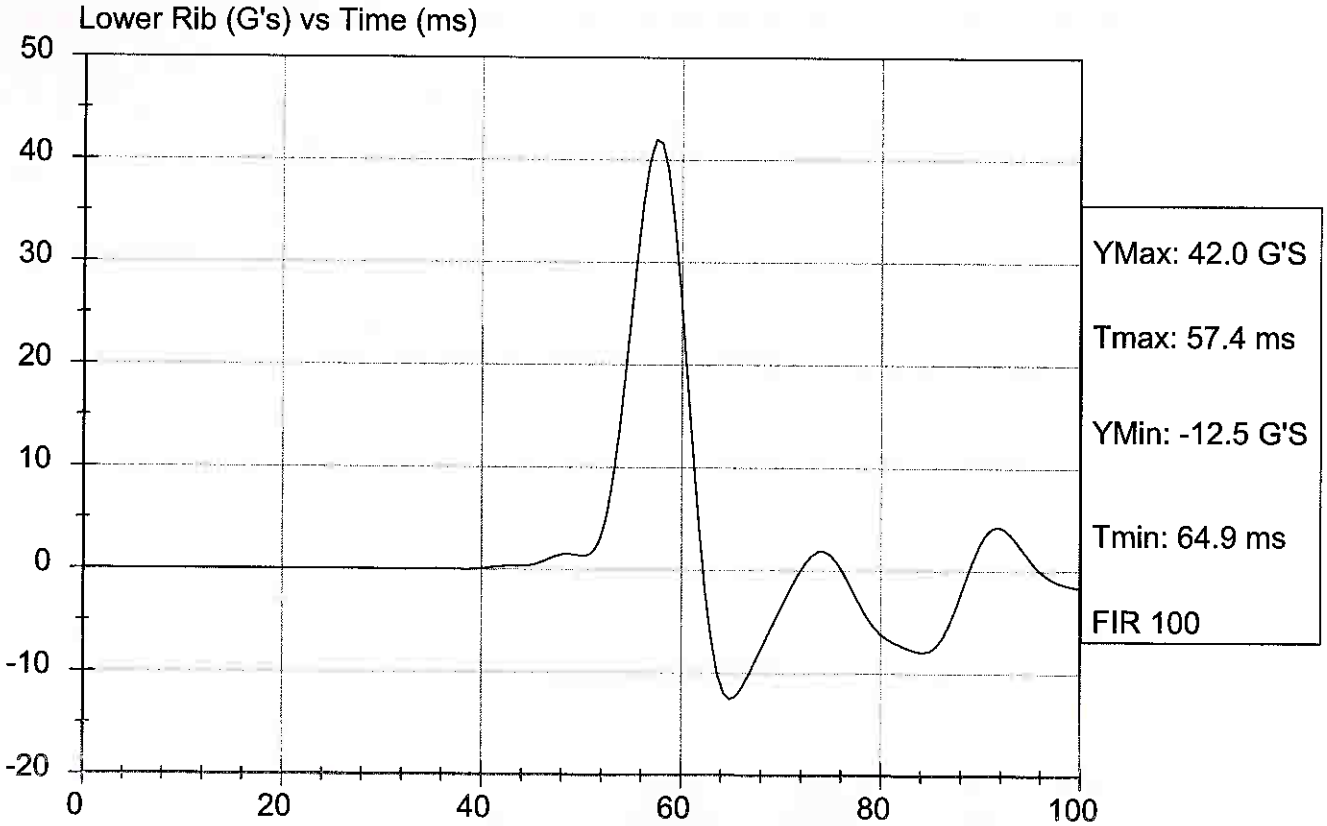
Tim Brat
Laboratory Technician

2/16/09
Test Date

David Winkelbauer
Approved By

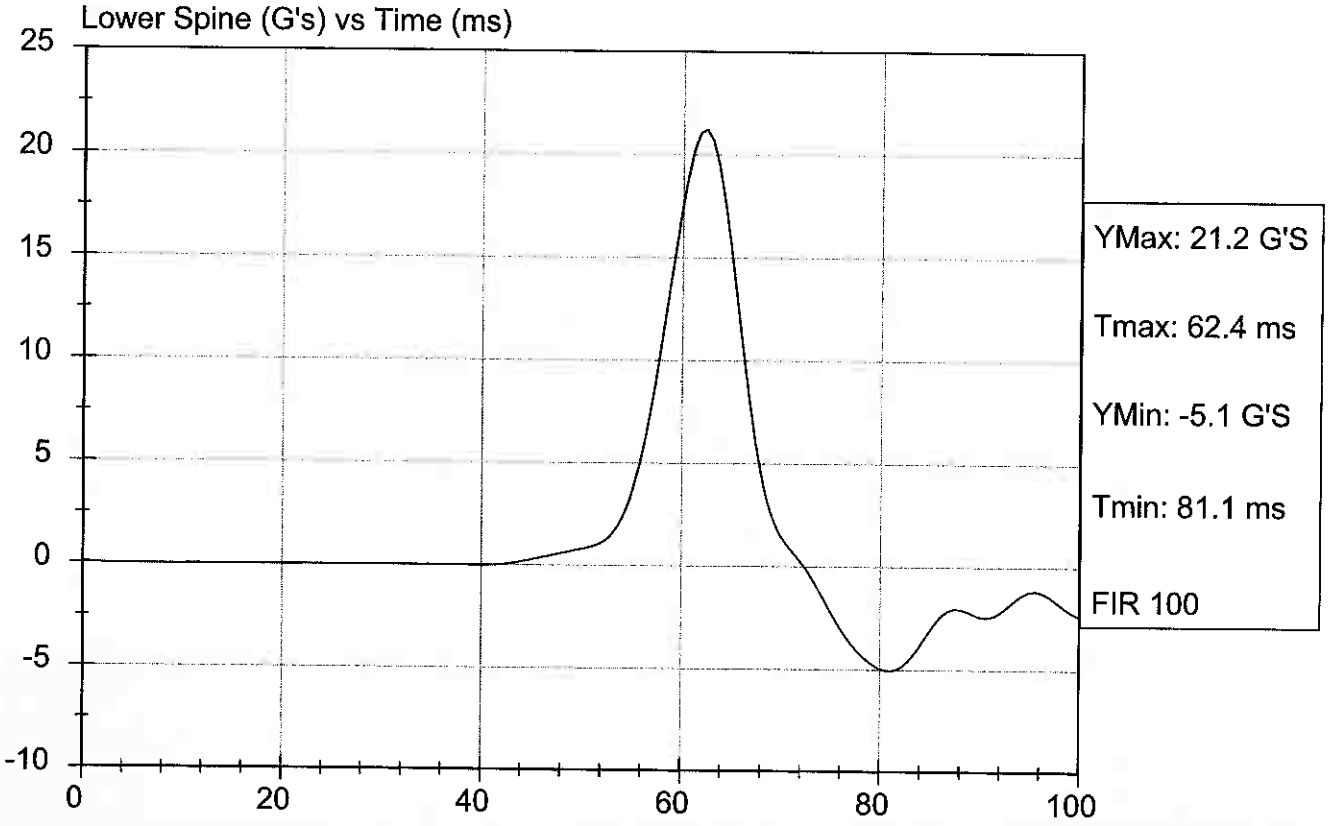
| | | |
|---|---|---|
| | Test Desc: Thorax Impact<br>Component ID: D09272 | Test Date: 2/16/09<br>Speed: 14.01 ft/sec, 4.27 m/s |



Test Desc: Thorax Impact
Component ID: D09272

Test Date: 2/16/09
Speed: 14.01 ft/sec, 4.27 m/s



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Pelvis Impact Test**

**ATD Serial No:** 037 **Test I.D:** D09273

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 21.5 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 17 | Pass |
| Probe Velocity | m/s | 4.27 - 4.33 | 4.30 | Pass |
| Pelvis Acceleration | G's | 40 - 60 | 41 | Pass |
| | | Overall Test Results | | Pass |

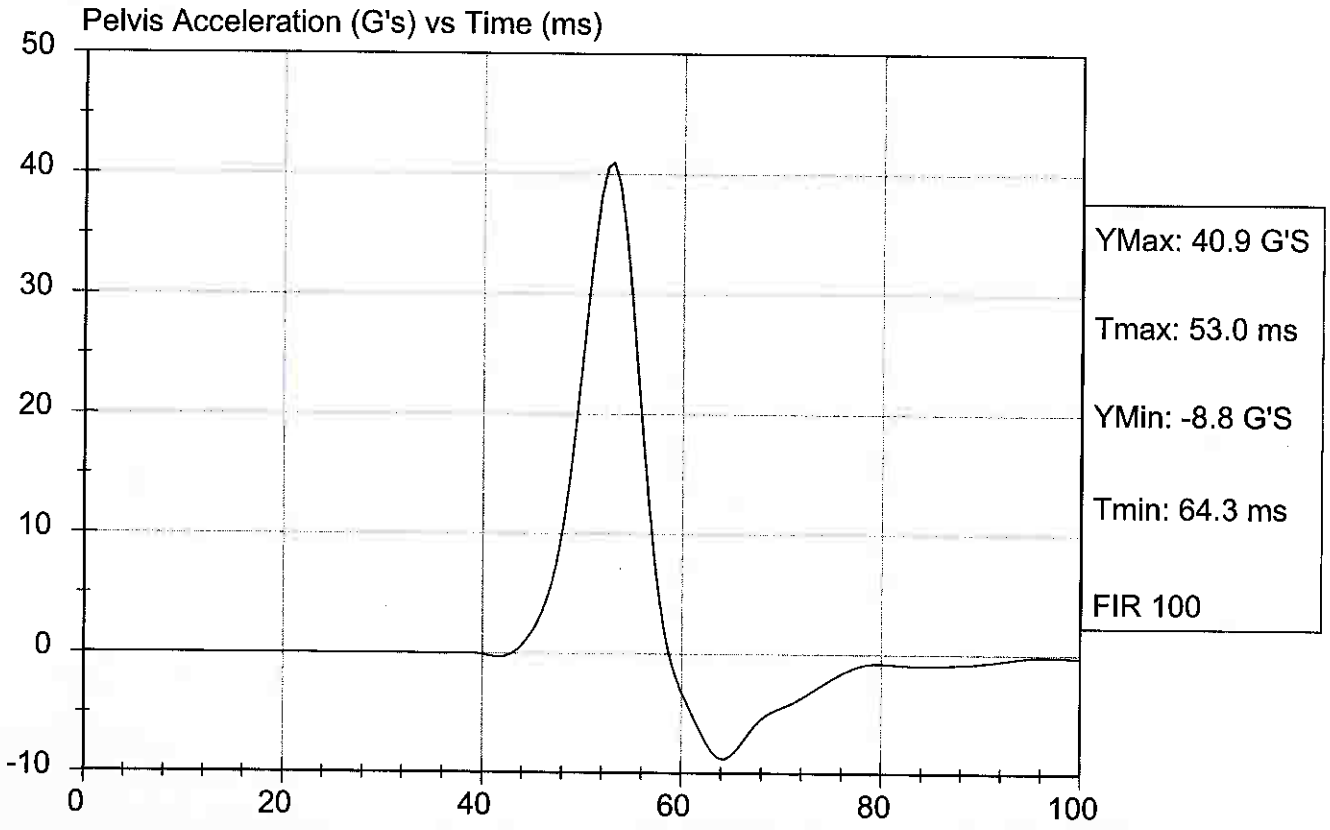
Tim Brady
Laboratory Technician

2/16/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D09273

Test Date: 2/16/09
Speed: 14.12 ft/sec, 4.30 m/s



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

**ATD Serial No:** 037 **Test I.D:** D09274

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 22.0 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 25 | Pass |
| Force At 12.7 mm | N | 104 -162 | 137 | Pass |
| Force At 19 mm | N | 163 - 222 | 198 | Pass |
| Force At 25.4 mm | N | 222 - 280 | 274 | Pass |
| Force At 33 mm | N | 325 - 391 | 376 | Pass |
| | | Overall Test Results | | Pass |

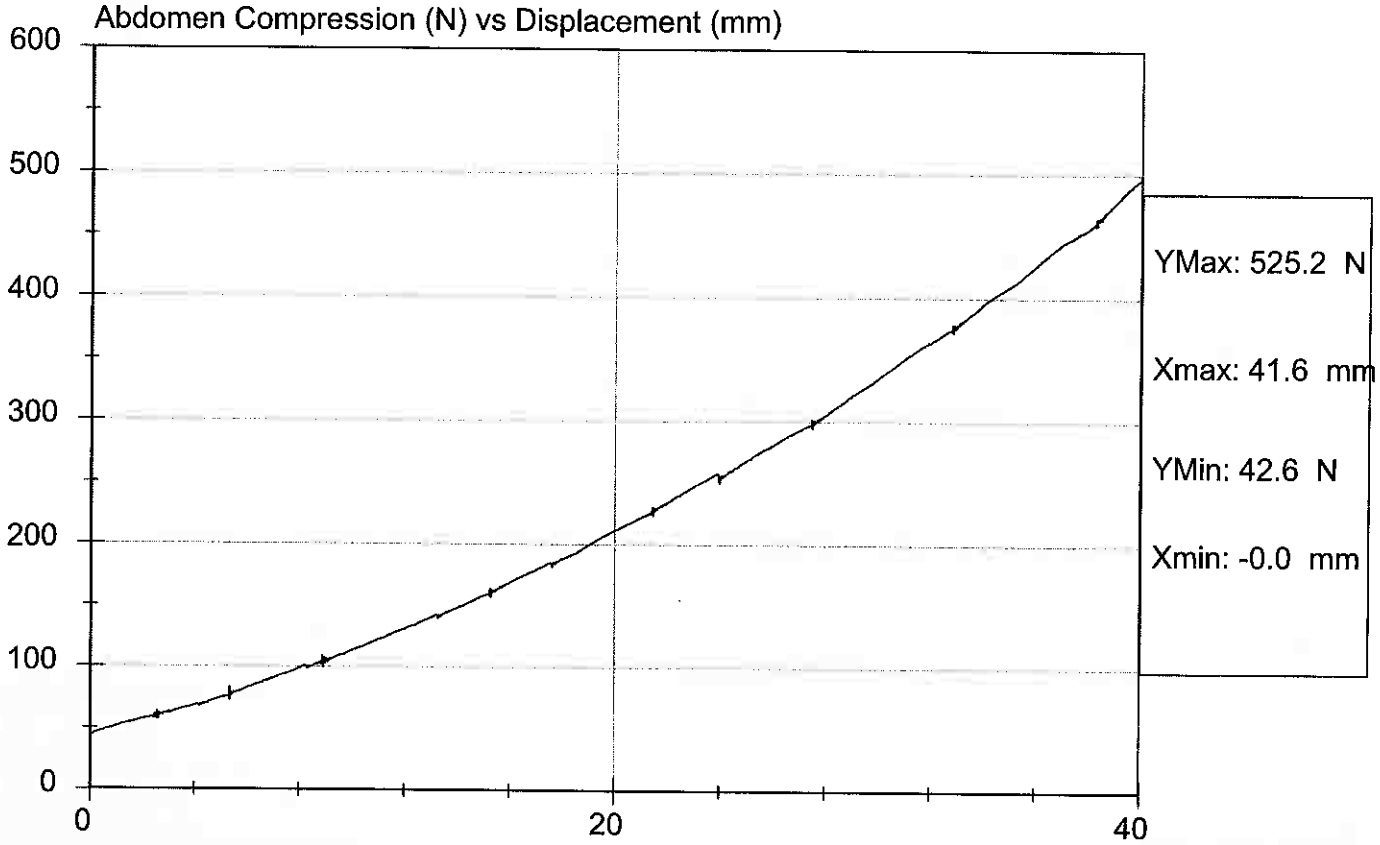
Tim Brady
Laboratory Technician

2/12/09
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 2/12/09

Component: D09274 Speed: 0 ft/sec, 0 m/s



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Lumbar Flexion Calibration**

**ATD Serial No:** 037 **Test I.D:** D09275

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 21.8 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 20 | Pass |
| Force At 0 deg | N | 0.0 - 26.7 | 0.0 | Pass |
| Force At 20 deg | N | 97.9 - 151.2 | 122.0 | Pass |
| Force At 30 deg | N | 151.2 - 204.6 | 164.8 | Pass |
| Force At 40 deg | N | 204.6 - 258.0 | 237.5 | Pass |
| Return Angle | deg | 12 Maximum | 1 | Pass |
| | | Overall Test Results | | Pass |

Tim Brady
Laboratory Technician

2/13/09
Test Date

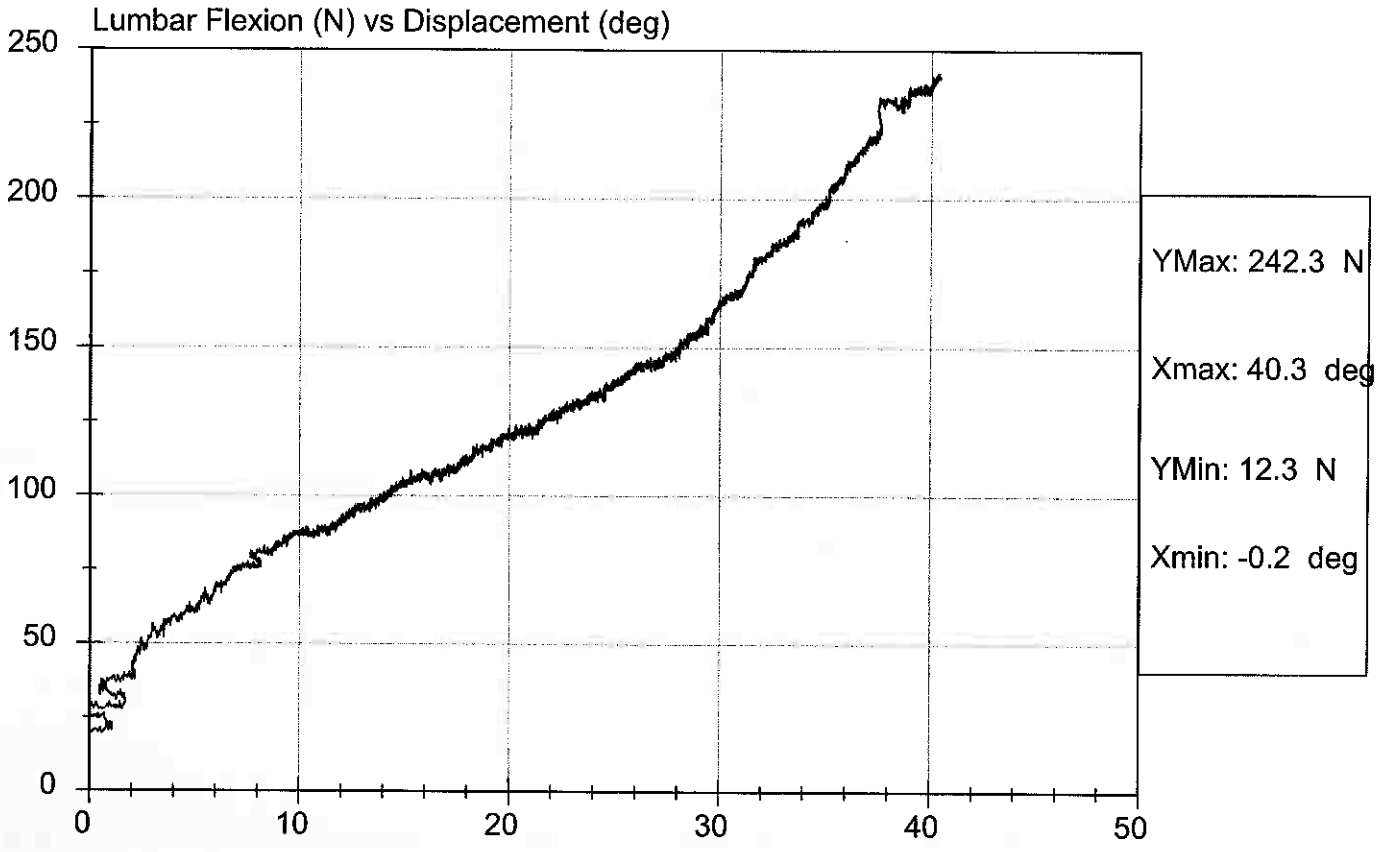
David Winkelbauer
Approved By

Test Description: Lumbar Flexion

Test Date: 2/13/09

Component: D09275

Speed: 0 ft/sec, 0 m/s



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Neck Pendulum Test**

**ATD Serial No:** 037 **Test I.D:** D09279

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | | deg C | 20.6 to 22.2 | 22.1 | Pass |
| Laboratory Relative Humidity | | % | 10 to 70 | 20 | Pass |
| Impact Velocity | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Deceleration | 10 ms | m/s | 1.96 to 2.55 | 2.49 | Pass |
| | 20 ms | m/s | 4.12 to 5.10 | 4.77 | Pass |
| | 30 ms | m/s | 5.73 to 7.01 | 6.52 | Pass |
| | 40 to 70 ms | m/s | 6.27 to 7.64 | 6.91 | Pass |
| Midsaggital Plane Max Rotation | | deg | 66 to 82 | 72 | Pass |
| Head Rotation Peak to Zero - Decay Time | | ms | 58 to 67 | 63 | Pass |
| Max. Mx at Occipital Condyles | | Nm | 73 to 88 | 75 | Pass |
| Mx Peak To Zero - Decay Time | | ms | 49 to 64 | 56 | Pass |
| Mx Peak to Max. Head Rotation | | ms | 2 to 16 | 13 | Pass |

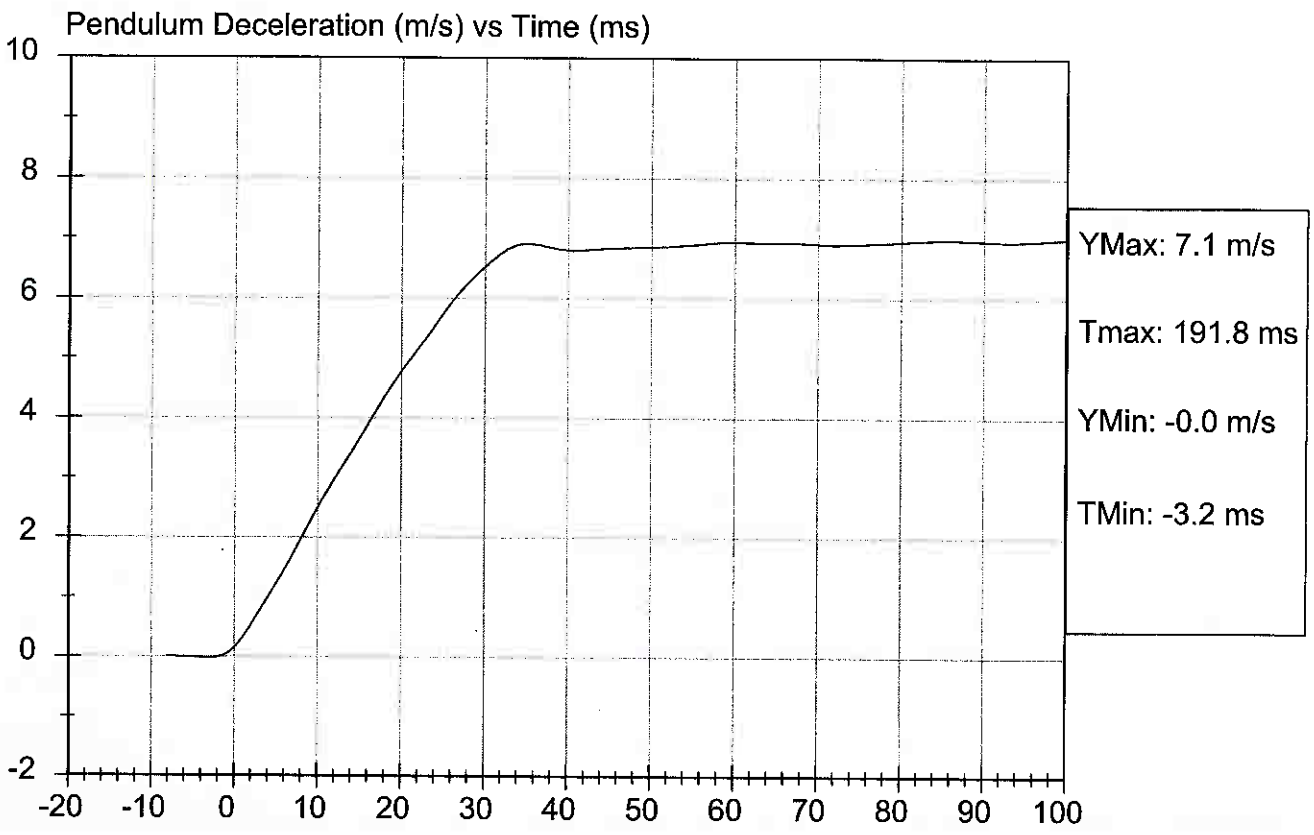
Tim Brady
Laboratory Technician

2/13/09
Test Date

David Winkelbauer
Approved By

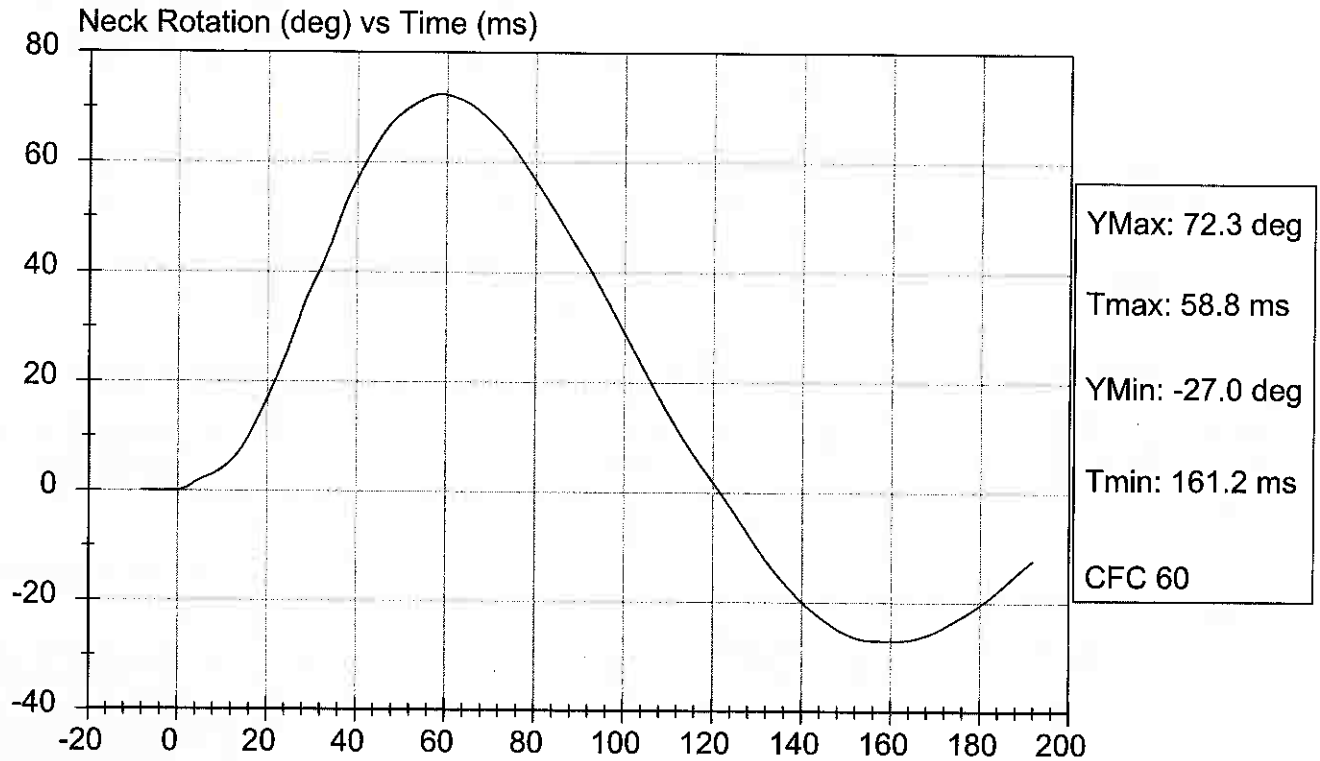
Test Desc: Neck Bending
Component ID: D09279

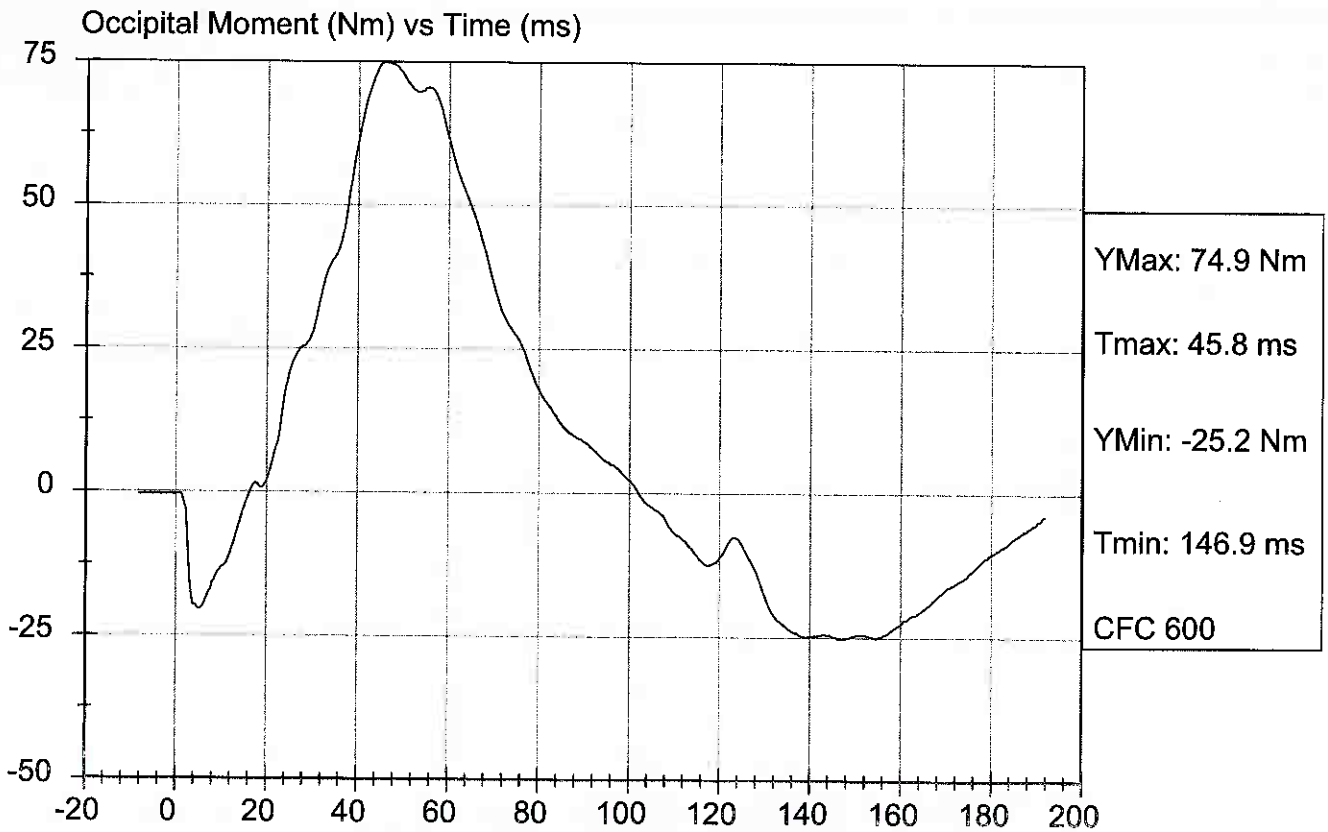
Test Date: 2/13/09
Speed: 23.15 ft/sec, 7.06 m/s



Test Desc: Neck Bending
Component ID: D09279

Test Date: 2/13/09
Speed: 23.15 ft/sec, 7.06 m/s



**SID/HIII Calibration Data Sheet**

**Side Impact Dummy**

**Head Drop Calibration (Lateral)**

**ATD Serial No:** 037 **Test I.D:** D09561

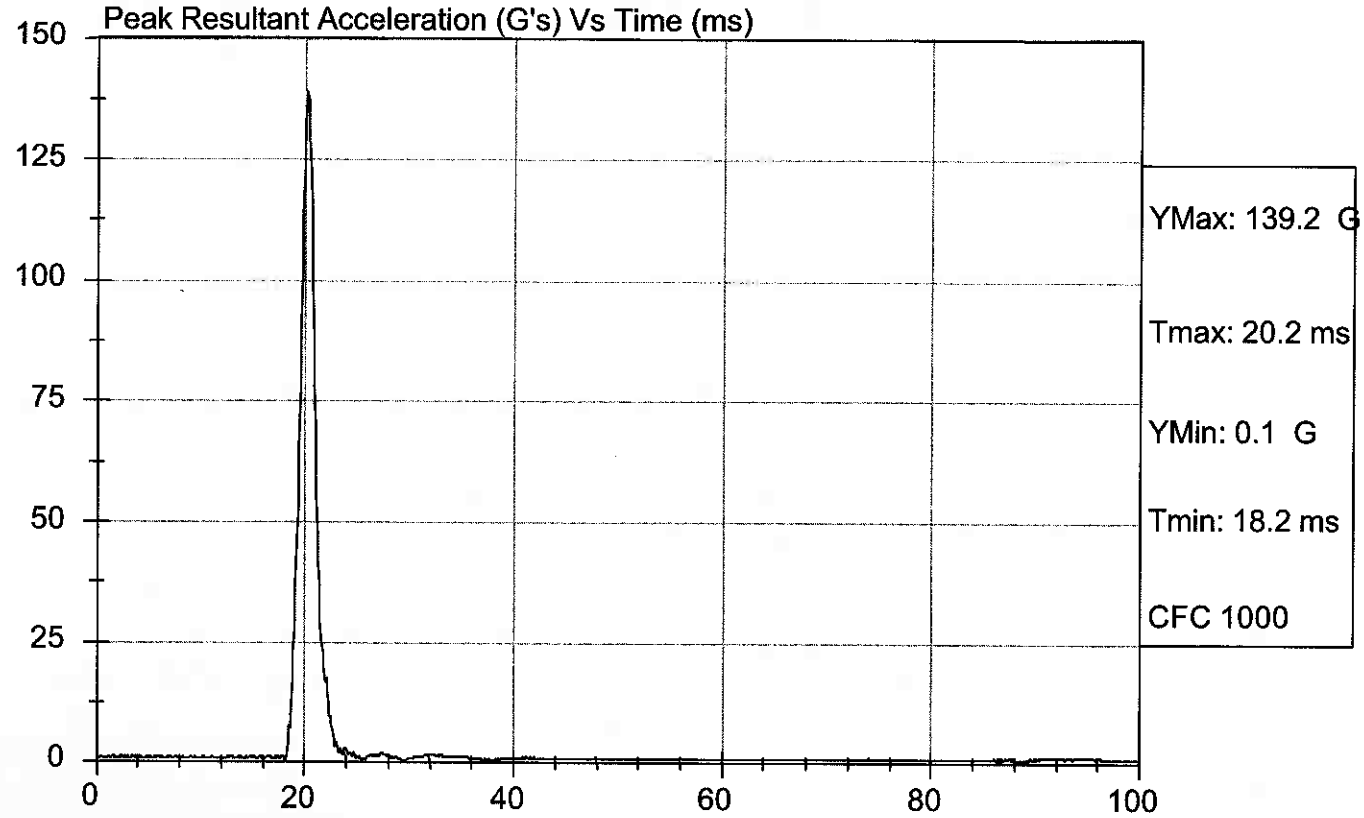
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 33 | Pass |
| Peak Resultant Acceleration | G's | 120 to 150 | 139 | Pass |
| Is Resultant Curve Unimodal? | N/A | 15% of peak | Yes | Pass |
| Peak Longitudnal Acceleration | G's | +/- 15 | -9.4 | Pass |
| | | Overall Test Results | | Pass |

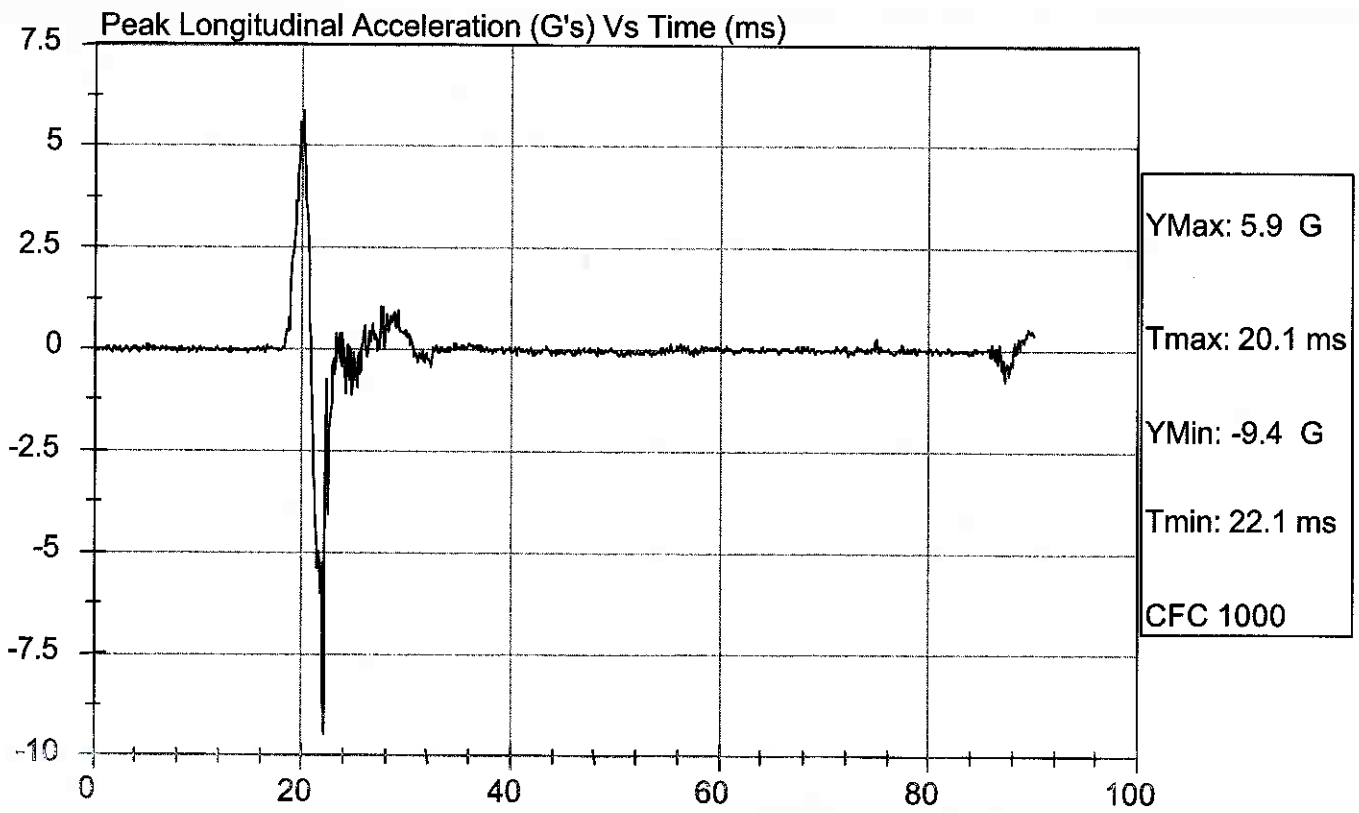
Tim Brak
Laboratory Technician

3/18/09
Test Date

David Winkelbauer
Approved By

| | | |
|---|---|---|
| mga | Test Description: Head Drop | Test Date: 3/18/09 |
| | Component: D09561 | Speed: 0 ft/s, 0 m/s |



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Thorax Impact Test**

**ATD Serial No:** 037 **Test I.D:** D09562

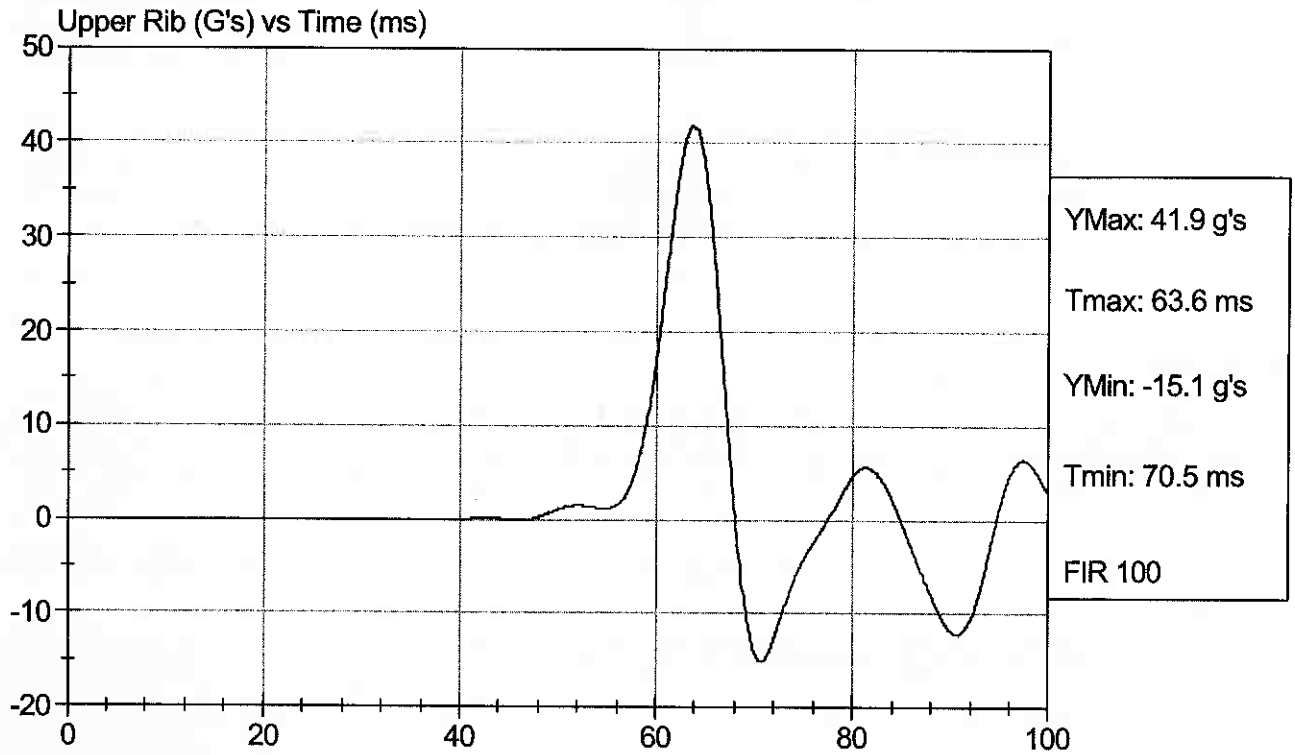
| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 20.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 21 | Pass |
| Probe Velocity | m/s | 4.22 - 4.31 | 4.27 | Pass |
| Upper Rib | G's | 37 - 46 | 42 | Pass |
| Lower Rib | G's | 37 - 46 | 40 | Pass |
| Lower Spine | G's | 15 - 22 | 21 | Pass |
| | | Overall Test Results | | Pass |

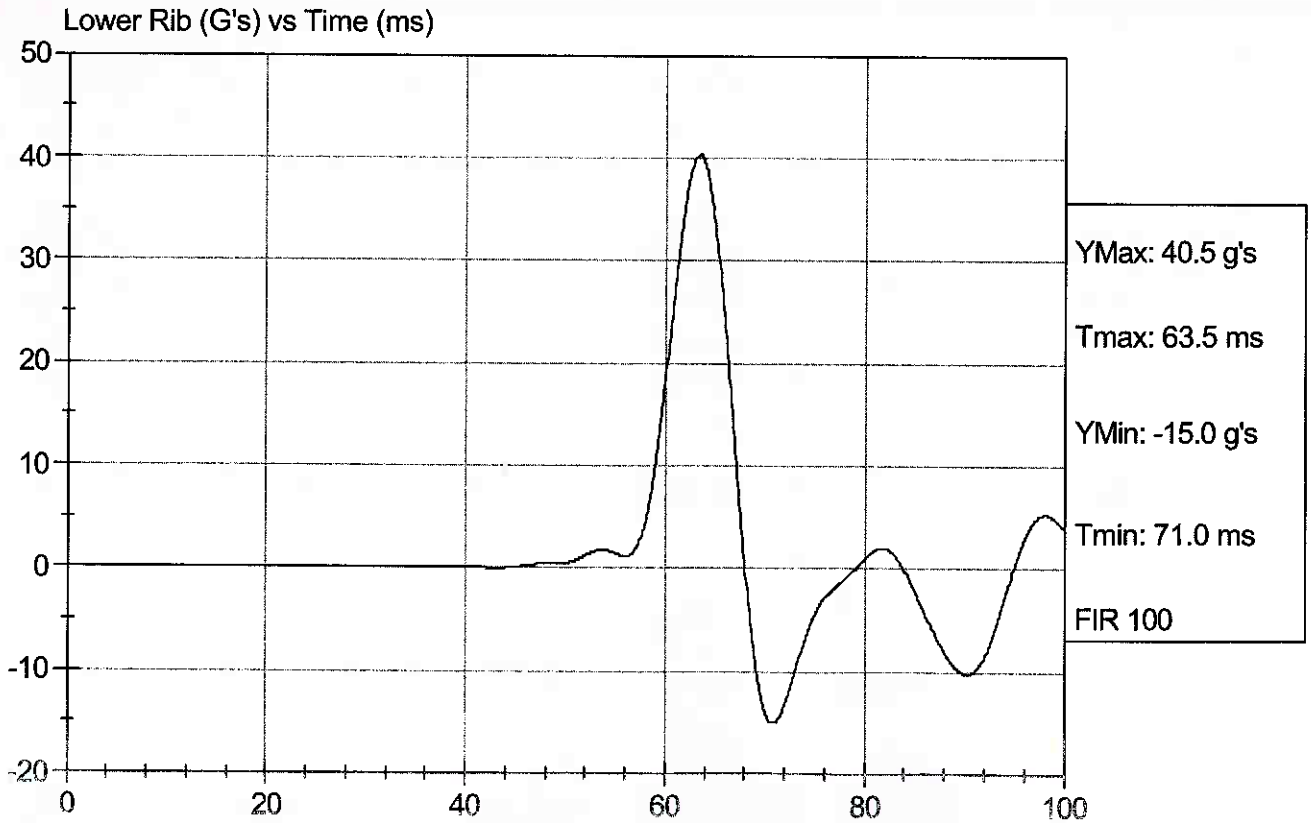
Laboratory Technician

3/18/09
Test Date

David Winkelbauer
Approved By

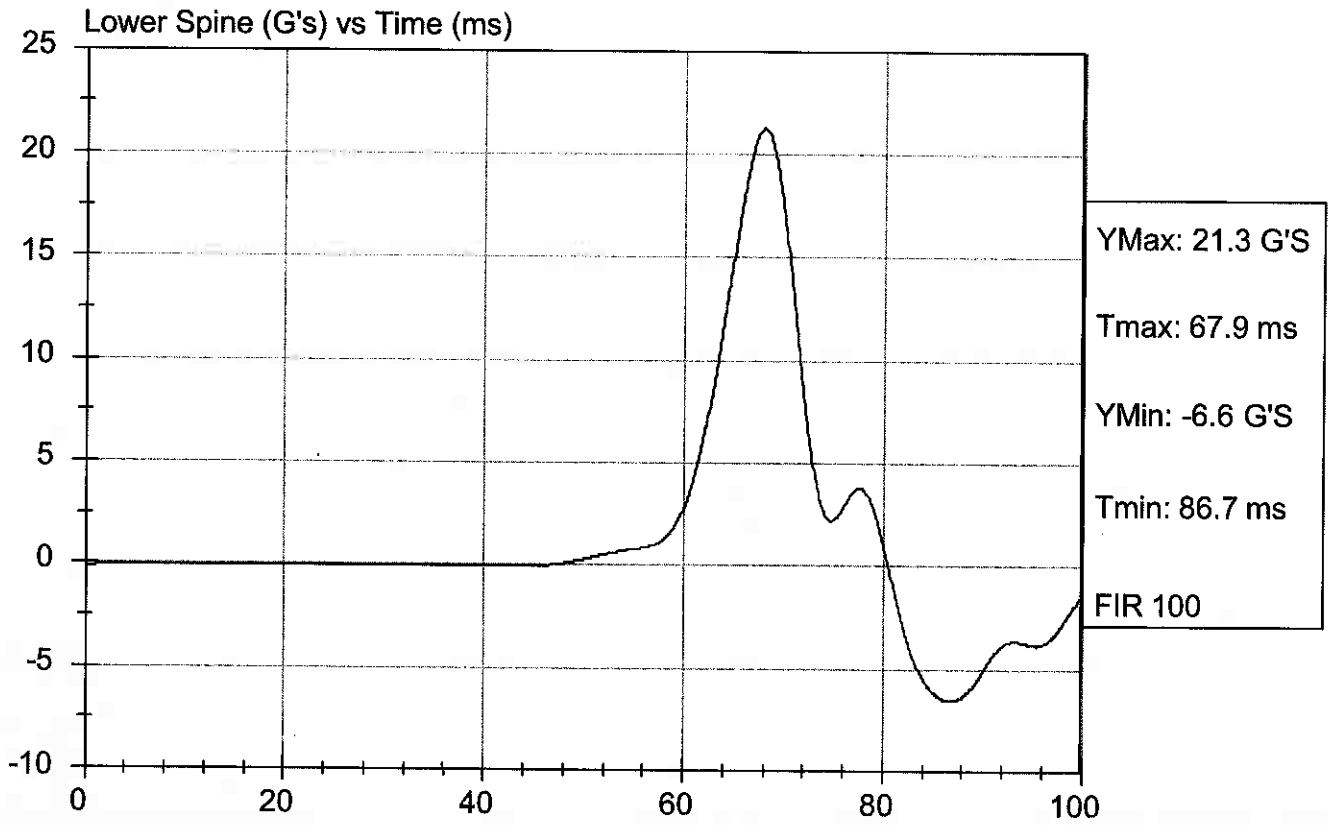
| | | |
|---|---|---|
| mga | Test Desc: Thorax Impact<br>Component ID: D09562 | Test Date: 3/18/09<br>Speed: 14.01 ft/sec, 4.27 m/s |



Test Desc: Thorax Impact
Component ID: D09562

Test Date: 3/18/09
Speed: 14.01 ft/sec, 4.27 m/s



**SID/HIII Calibration Data Sheet**

**Side Impact Dummy**

**Pelvis Impact Test**

**ATD Serial No:** 037 **Test I.D:** D09563

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 to 25.5 | 20.6 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 21 | Pass |
| Probe Velocity | m/s | 4.27 - 4.33 | 4.27 | Pass |
| Pelvis Acceleration | G's | 40 - 60 | 43 | Pass |
| | | Overall Test Results | | Pass |

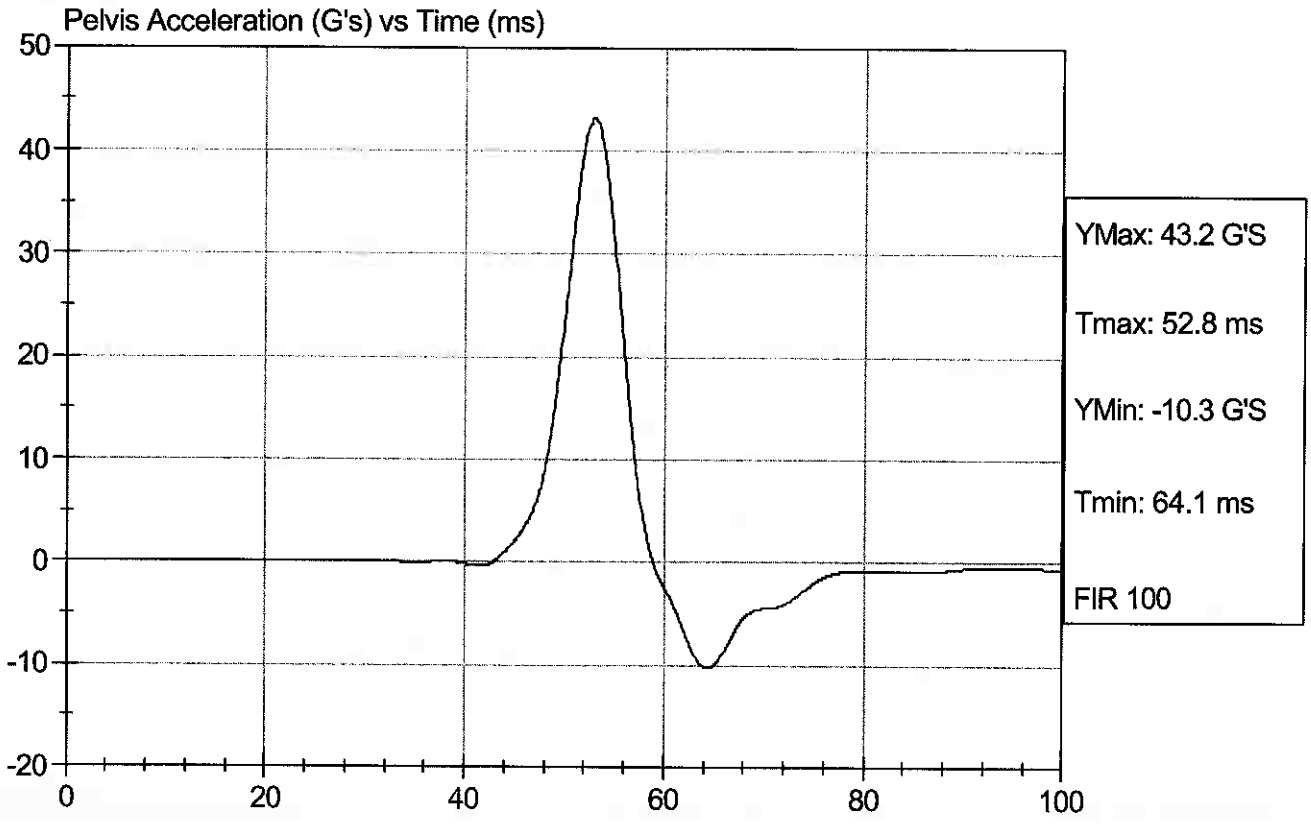
Tim Brat
Laboratory Technician

3/18/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D09563

Test Date: 3/18/09
Speed: 14.01 ft/sec, 4.27 m/s



**SID Calibration Data Sheet**

**Side Impact Dummy**

**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

**ATD Serial No:** 037 **Test I.D:** D09564

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 31 | Pass |
| Force At 12.7 mm | N | 104 -162 | 127 | Pass |
| Force At 19 mm | N | 163 - 222 | 192 | Pass |
| Force At 25.4 mm | N | 222 - 280 | 273 | Pass |
| Force At 33 mm | N | 325 - 391 | 387 | Pass |
| | | Overall Test Results | | Pass |

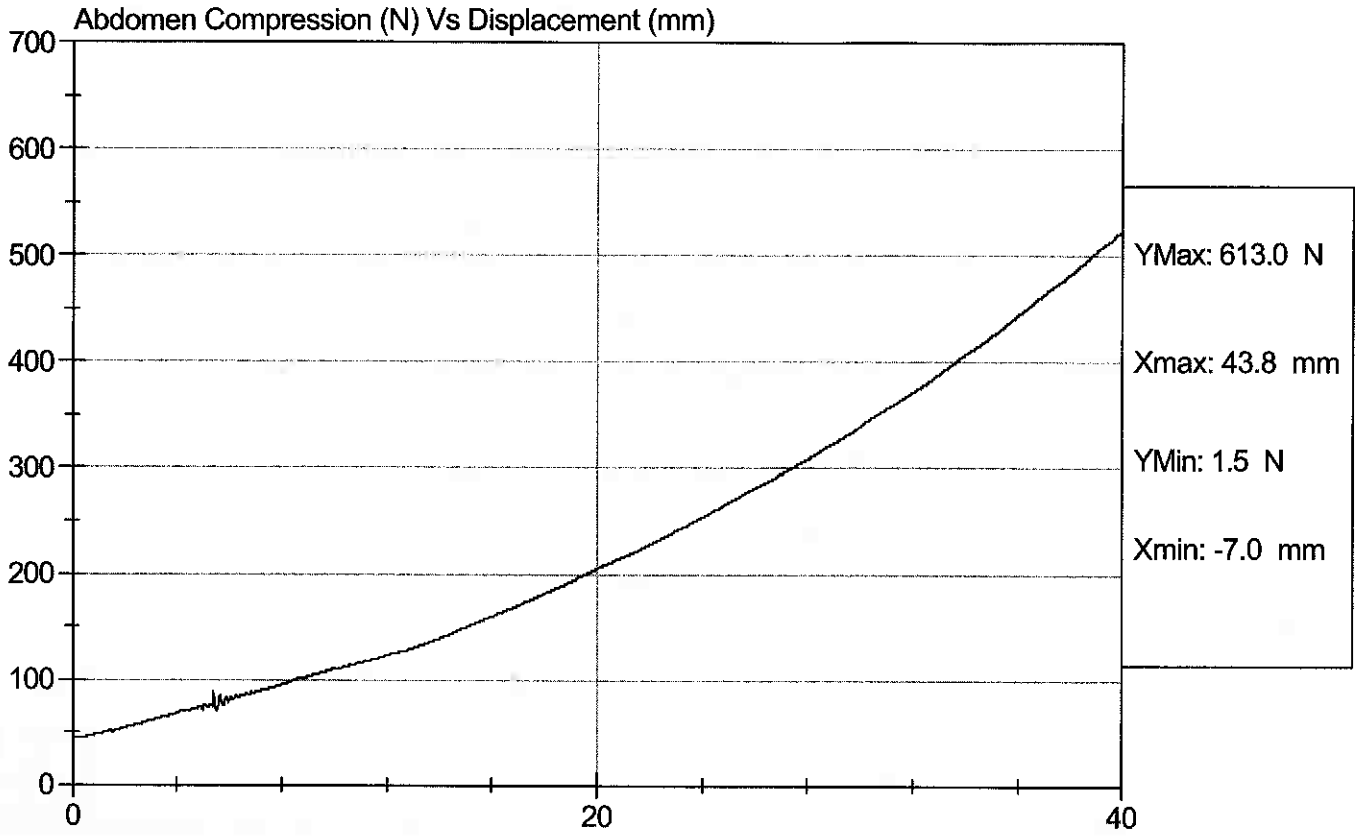
Tim Brady
Laboratory Technician

3/18/09
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression | Test Date: 3/18/09

Component: D09564 | Speed: 0 ft/sec, 0 m/s



**SID Calibration Data Sheet**

**Side Impact Dummy**

**Lumbar Flexion Calibration**

**ATD Serial No:** 037 **Test I.D:** D09565

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 18.9 - 25.5 | 21.1 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 34 | Pass |
| Force At 0 deg | N | 0 - 26.7 | 0 | Pass |
| Force At 20 deg | N | 97.9 - 151.2 | 121.0 | Pass |
| Force At 30 deg | N | 151.2 - 204.6 | 167.4 | Pass |
| Force At 40 deg | N | 204.6 - 258.0 | 237.6 | Pass |
| Return Angle | Deg | 12 Maximum | 6 | Pass |
| | | Overall Test Results | | Pass |

Tim Brady
Laboratory Technician

3/18/09
Test Date

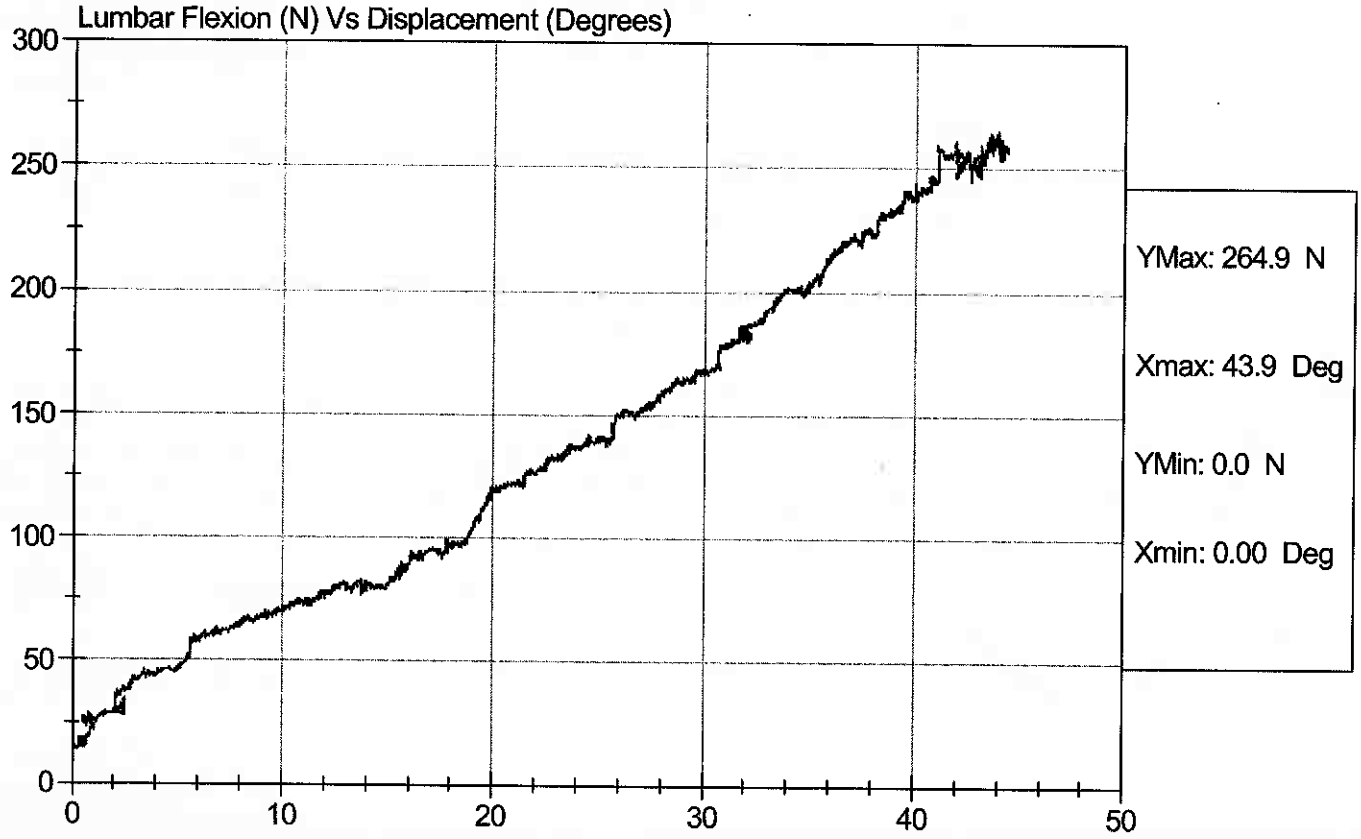
David Winkelbauer
Approved By

Test Description: Lumbar Flexion

Test Date: 3/18/09

Component: D09565

Speed: 0 ft/sec, 0 m/s



**SID/HIII Calibration Data Sheet**
**Side Impact Dummy**
**Neck Pendulum Test**

**ATD Serial No:** 037 **Test I.D:** D09569

| 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 | 30 | Pass |
| Impact Velocity | | m/s | 6.89 to 7.13 | 7.06 | Pass |
| Pendulum Deceleration | 10 ms | m/s | 1.96 to 2.55 | 2.32 | Pass |
| | 20 ms | m/s | 4.12 to 5.10 | 4.55 | Pass |
| | 30 ms | m/s | 5.73 to 7.01 | 6.31 | Pass |
| | 40 to 70 ms | m/s | 6.27 to 7.64 | 6.99 | Pass |
| Midsaggital Plane Max Rotation | | deg | 66 to 82 | 67 | Pass |
| Head Rotation Peak to Zero - Decay Time | | ms | 58 to 67 | 59 | Pass |
| Max. Mx at Occipital Condyles | | Nm | 73 to 88 | 74 | Pass |
| Mx Peak To Zero - Decay Time | | ms | 49 to 64 | 56 | Pass |
| Mx Peak to Max. Head Rotation | | ms | 2 to 16 | 12 | Pass |

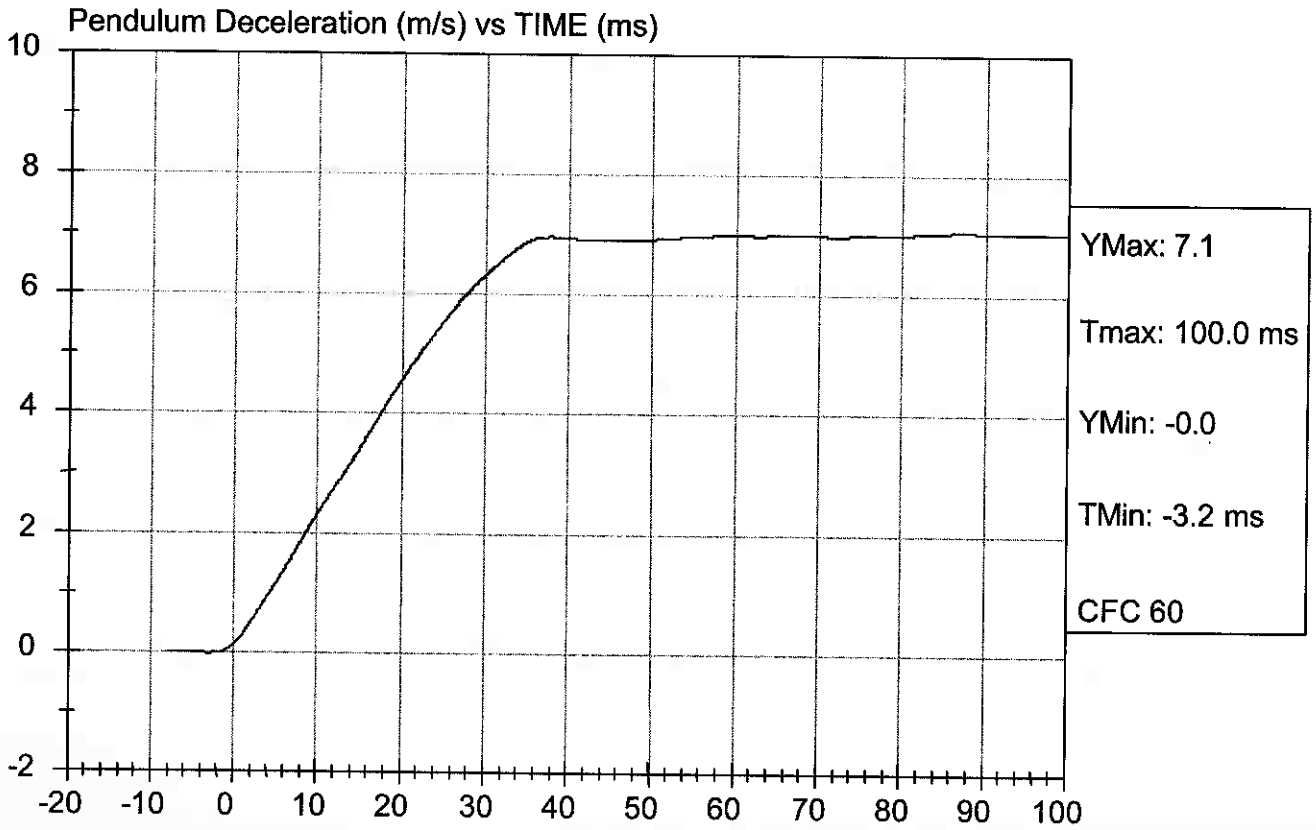
Tim Brat
Laboratory Technician

3/18/09
Test Date

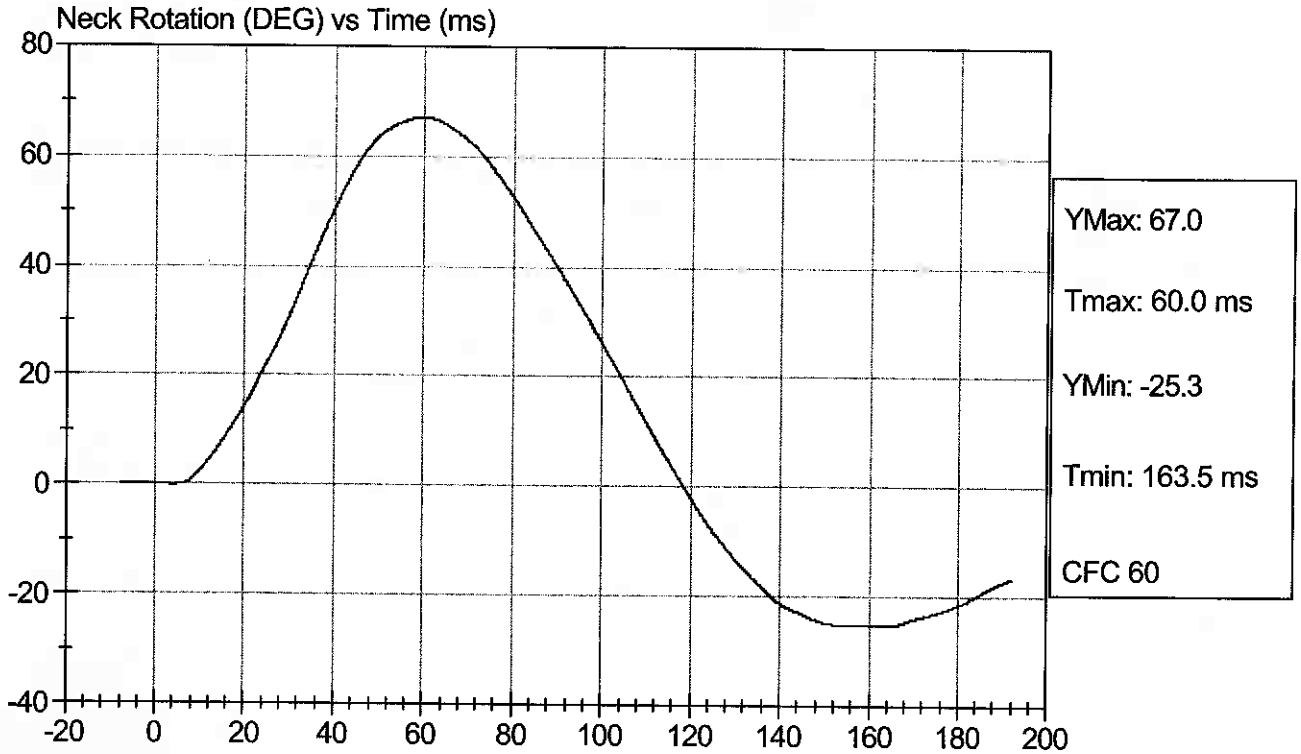
David Winkelbauer
Approved By

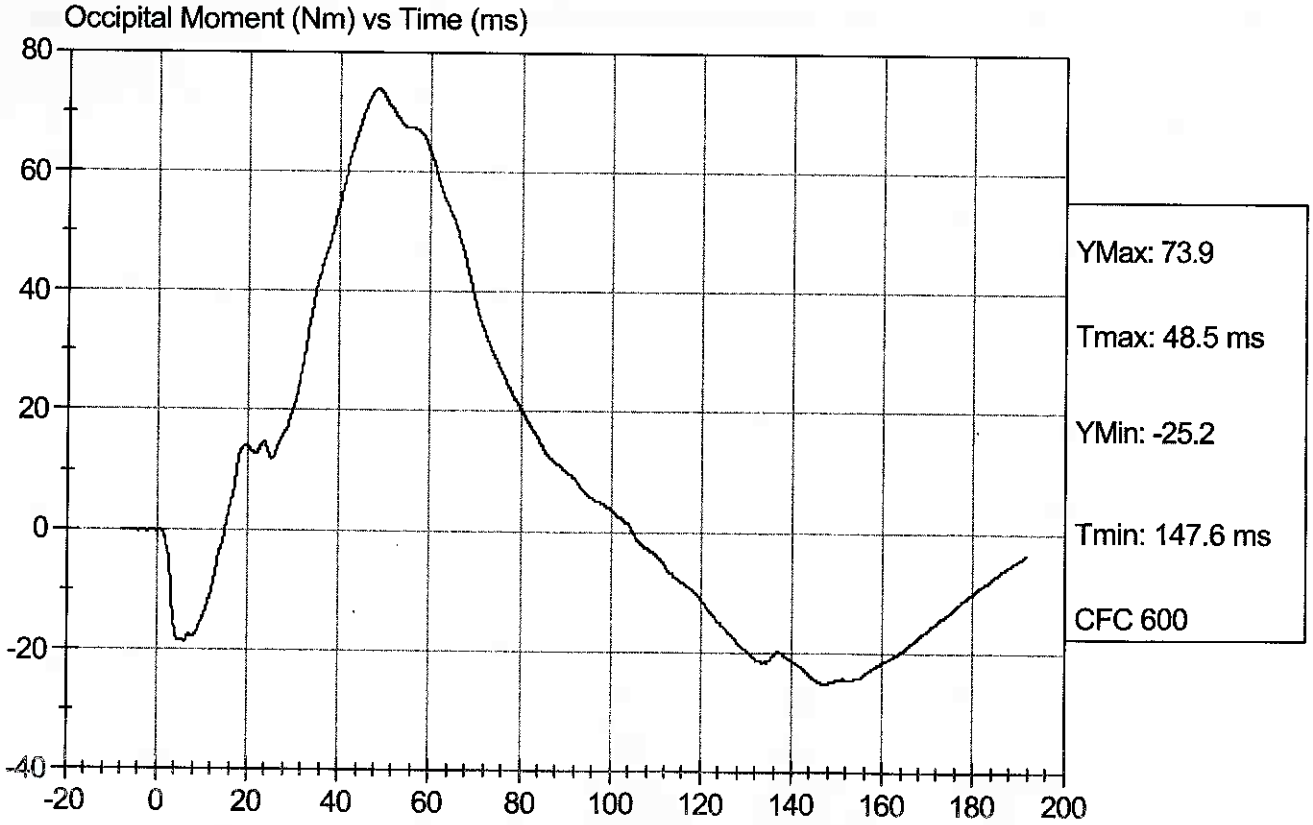
Test Desc: Neck Bending
Component ID: D09569

Test Date: 3/18/09
Speed: 23.15 ft/sec, 7.06 m/s



| | | |
|---|---|---|
| | Test Desc: Neck Bending<br>Component ID: D09569 | Test Date: 3/18/09<br>Speed: 23.15 ft/sec, 7.06 m/s |



# APPENDIX D

# CALIBRATION INFORMATION DATA

DUMMY AND VEHICLE CALIBRATION DATA

| | INSTRUMENTS FOR DRIVER S/N 037 | | |
|---|---|---|---|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Head CG X | AH5L1 | Endevco | 2/23/2009 |
| Head CG Y | AH5N9 | Endevco | 2/23/2009 |
| Head CG Z | C12811 | Endevco | 2/23/2009 |
| Neck Load Cell | 1561 | Denton | 9/30/2008 |
| Upper Rib Y | P63210 | Endevco | 2/10/2009 |
| Lower Rib Y | P63206 | Endevco | 2/10/2009 |
| Lower Spine Y | P52257 | Endevco | 12/5/2008 |
| Pelvis Y | P59283 | Endevco | 12/5/2008 |
| Upper Rib Redundant Y | P63213 | Endevco | 2/10/2009 |
| Lower Rib Redundant Y | P63215 | Endevco | 2/10/2009 |
| Lower Spine Redundant Y | P52282 | Endevco | 12/5/2008 |
| Pelvis Redundant Y | P59321 | Endevco | 12/5/2008 |

VEHICLE INSTRUMENT CALIBRATION

| | VEHICLE ACCELEROMETERS | | |
|---|---|---|---|
| | SERIAL NO. | MANUFACTURER | CALIBRATION DATE |
| Vehicle CG X | G04-Z29 | Entran | 9/11/2008 |
| Vehicle CG Y | B10-Z22 | Entran | 9/11/2008 |
| Vehicle CG Z | G06-X05 | Entran | 9/11/2008 |
| Left Floor Y | A008123 | MSI | 11/13/2008 |
| Left A-Post @ Sill Y | ANAT6 | Endevco | 12/13/2008 |
| Left Lower A-Post Y | J14774 | Endevco | 9/11/2008 |
| Left Mid A-Post Y | P27024 | Endevco | 11/13/2008 |
| Left B-Post @ Sill Y | J35916 | Endevco | 12/13/2008 |
| Left Lower B-Post Y | AKAD6 | Endevco | 10/7/2008 |
| Left Mid B-Post Y | P27029 | Endevco | 11/13/2008 |
| Driver Seat Track Y | F29-X13 | Entran | 1/14/2009 |
| Upper Engine X | F25-L05 | Entran | 12/18/2008 |
| Upper Engine Y | J26-H07 | Entran | 12/18/2008 |
| Firewall Y | H11-L04 | Entran | 12/18/2008 |
| Right Front Roof Y | P24216 | Endevco | 9/4/2008 |
| Right Floor Y | E05-Z14 | Entran | 1/13/2009 |
| Rear Deck X | A27-Z13 | Entran | 1/14/2009 |
| Rear Deck Y | E20-R13 | Entran | 1/13/2009 |