

REPORT NUMBER: 201P-CAL-08-02

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

GENERAL MOTORS CORPORATION  
2008 CHEVROLET IMPALA  
4-DOOR SEDAN

NHTSA NUMBER: C80108

CALSPAN TEST NUMBER: 8863-F201P-02

CALSPAN  
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Test Date: 7/08/08

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Enforcement  
Office of Vehicle Safety Compliance  
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December 3, 2008  
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\_\_\_\_\_  
Date of Report Acceptance

# TECHNICAL REPORT STANDARD TITLE PAGE

| 1. Report No.<br>201P-CAL-08-02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           | 2. Government Accession No.                          |  | 3. Recipient's Catalog No.                                                                                                                                                                                             |  |                         |           |          |                                   |      |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------|-----------|----------|-----------------------------------|------|-------|
| 4. Title and Subtitle<br>Final Report of FMVSS 201 Safety Compliance Rigid Pole Side Impact Test of a 2008 Chevrolet Impala, 4-door Sedan, NHTSA No: C80108                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                                                      |  | 5. Report Date<br>7/08/08                                                                                                                                                                                              |  |                         |           |          |                                   |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                      |  | 6. Performing Organization Code<br>CAL                                                                                                                                                                                 |  |                         |           |          |                                   |      |       |
| 7. Author(s)<br>David J. Travale, Program Manager<br>Vincent M. Paolini, Project Engineer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |                                                      |  | 8. Performing Organization Report No.<br>8863-F201P-01                                                                                                                                                                 |  |                         |           |          |                                   |      |       |
| 9. Performing Organization Name and Address<br>Calspan<br>4455 Genesee Street<br>Buffalo, New York 14225                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                                                      |  | 10. Work Unit No.                                                                                                                                                                                                      |  |                         |           |          |                                   |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                      |  | 11. Contract or Grant No.<br>DTNH22-06-C-00031                                                                                                                                                                         |  |                         |           |          |                                   |      |       |
| 12. Sponsoring Agency Name and Address<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Vehicle Safety Compliance<br>Mail Code: NVS-220, West building 4 <sup>th</sup> Floor<br>1200 New Jersey Avenue, SE<br>Washington, D.C. 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                                      |  | 13. Type of Report and Period Covered<br>Final Report<br>July 2008                                                                                                                                                     |  |                         |           |          |                                   |      |       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                      |  | 14. Sponsoring Agency Code<br>NVS-220                                                                                                                                                                                  |  |                         |           |          |                                   |      |       |
| 15. Supplementary Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                                      |  |                                                                                                                                                                                                                        |  |                         |           |          |                                   |      |       |
| 16. Abstract<br>A rigid pole side impact test was conducted on the subject 2008 Chevrolet Impala 4-door Sedan 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-201-02 "Rigid Pole Side Impact Test". The test was conducted at the Calspan's facility in Buffalo, New York on July 8, 2008.<br>The impact velocity of the vehicle was 28.42 kph, and the ambient temperature at the struck side (Driver) of the target vehicle at the time of impact was 22°C. The post test maximum crush was 351 mm at level 3. The test vehicle's performance follows:<br><table border="1"> <thead> <tr> <th>Measurement Description</th> <th>Threshold</th> <th>P1 (270)</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC- 36 ms)</td> <td>1000</td> <td>224.0</td> </tr> </tbody> </table> Test Failures: None<br><br>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 side impact event. |           |                                                      |  |                                                                                                                                                                                                                        |  | Measurement Description | Threshold | P1 (270) | Head Injury Criteria (HIC- 36 ms) | 1000 | 224.0 |
| Measurement Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Threshold | P1 (270)                                             |  |                                                                                                                                                                                                                        |  |                         |           |          |                                   |      |       |
| Head Injury Criteria (HIC- 36 ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1000      | 224.0                                                |  |                                                                                                                                                                                                                        |  |                         |           |          |                                   |      |       |
| 17. Key Words<br>Compliance Testing<br>Rigid Pole Side Impact Test<br>FMVSS 201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |                                                      |  | 18. Distribution Statement<br><u>Copies of this report are available from:</u><br>NHTSA Technical Information Services<br>National Highway Traffic Safety Admin.<br>1200 New Jersey Avenue, SE<br>Washington, DC 20590 |  |                         |           |          |                                   |      |       |
| 19. Security Classif. (of this report)<br>UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           | 20. Security Classif. (of this page)<br>UNCLASSIFIED |  | 21. No. of Pages<br>109                                                                                                                                                                                                |  |                         |           |          |                                   |      |       |
| 22. Price                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |                                                      |  |                                                                                                                                                                                                                        |  |                         |           |          |                                   |      |       |

**Form DOT F1700.7 (8-69)**

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## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

This side impact test is part of the FY FMVSS 201 “Occupant protection in interior impact” compliance test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract No. DTNH22-06-C-00031. The purpose of this test was to evaluate the dynamic head protection system in a 2008 Chevrolet Impala 4-door Sedan, NHTSA Number: C80108. The rigid pole side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-201P-02, dated October 21, 2001).

## SECTION 2

### SUMMARY OF RIGID POLE SIDE IMPACT TEST

A rigid pole side impact test was conducted on a 2008 Chevrolet Impala 4-door Sedan. The subject vehicle was towed into the rigid pole at a velocity of 28.42 kph. The test was conducted by Calspan in Buffalo, New York, on July 8, 2008.

Pretest and post test photographs of the test vehicle, and the side impact dummy (SID/HIII) are included in Appendix A of this report.

One SID/HIII was placed in the LEFT front outboard designated seating position according to instructions specified in TP201P-02 dated (October 21, 2001). The side impact event was documented by thirteen (13) cameras. Camera locations and other pertinent camera information are included in this report.

The SID/HIII was instrumented with the following accelerometers:

1. Head CG triaxial accelerometers
2. Upper neck 6 channel load cell (X,Y and Z force and moment)
3. Left Upper Rib (LUR) uniaxial accelerometer (Y-direction)
4. Left Lower Rib (LLR) uniaxial accelerometer (Y-direction)
5. Lower Thoracic Spine (T12) uniaxial accelerometer (Y-direction)
6. Pelvic (PEV) section uniaxial accelerometer (Y-direction)

Appendix B contains the vehicle and dummy response data traces. A summary of the side impact dummy (SID/HIII) configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report.

The following table summarizes the results of the test.

| INJURY CRITERIA                  | P1 SID/HIII (270) |
|----------------------------------|-------------------|
| HIC ( $\leq 1000$ )              | 224.0             |
| TTI (g) <sup>1</sup>             | 81                |
| Pelvic (g) <sup>1</sup>          | 68                |
| Neck X Force (N) <sup>1</sup>    | -375.7            |
| Neck Y Force (N) <sup>1</sup>    | -342.0            |
| Neck Z Force (N) <sup>1</sup>    | -628.1            |
| Neck X Moment (N-m) <sup>1</sup> | -77.9             |
| Neck Y Moment (N-m) <sup>1</sup> | -33.4             |
| Neck Z Moment (N-m) <sup>1</sup> | 299.2             |

<sup>1</sup> Information purposes only.

## **SECTION 3**

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

# DATA SHEET 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

### TEST VEHICLE INFORMATION:

Vehicle Manufacturer: General Motors Corporation  
 Year/Make/Model/Body Style: 2008 Chevrolet Impala 4-door Sedan  
 Vehicle Body Color: Brown VIN: 2G1WB58K381222404  
 Vehicle NHTSA No.: C80108 Month & Year of Manufacture: 02/08  
 Engine Data: 6 Cylinders; - CID; 3.5 Liters; - cc  
 Engine Placement: - Longitudinal; or X Lateral  
 Transmission: 4 Speed; - Manual; X Automatic; - Overdrive  
 Final Drive: - Rear Wheel Drive; X Front Wheel Drive; - Four Wheel Drive  
 Odometer Reading                      km  
 Options: X A/C; X Power Steering; X Power Brakes; X Power Windows

### DATA FROM TIRE PLACARD

Tire Pressure\* (at capacity); 210 kPa FRONT  
210 kPa REAR  
 Recommended Tire Size: P225/60R16  
 Tires on Test Vehicle: P225/60R16 ; Manufacturer: Goodyear  
 Vehicle Capacity Data:  
 Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 Total  
 Type of Front Seats: X Bucket; - Bench; - Split Bench  
 Type of Front Seat Back: - Fixed; X Adjustable with X Lever or - Knob  
 Vehicle Max Capacity Loading = 428.0 kg (A)  
 No. of Occupants x 68.04 kg. = 340.20 kg (B)  
 Vehicle Cargo Capacity = 87.80 kg (A-B)

### TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

|                | LEFT SIDE (kg) | RIGHT SIDE (kg) | TOTAL (kg) | PERCENT |
|----------------|----------------|-----------------|------------|---------|
| <b>FRONT =</b> | 490.0          | 508.0           | 998.0      | 62.0%   |
| <b>REAR=</b>   | 304.0          | 308.0           | 612.0      | 38.0%   |

**TOTAL DELIVERED WEIGHT (UDW) :** 1610.0 kg

\* Tire pressure used in test.

# DATA SHEET 1

## GENERAL TEST AND VEHICLE PARAMETER DATA (Continued)

### CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

|                                                      |   |        |            |
|------------------------------------------------------|---|--------|------------|
| Total Test Vehicle Delivered Weight with Max. Fluids | = | 1610   | kg (A)     |
| Maximum Cargo Carrying Capacity of Test Vehicle      | = | 87.8   | kg (B)     |
| Weight of instrumented SID H3 (81.2 kg)              | = | 81.2   | kg (C)     |
| TEST VEHICLE TARGET WEIGHT:                          | = | 1779.0 | kg (A+B+C) |

### FULLY LOADED TEST VEHICLE (UDVW + SID H3 + CARGO):

|         | LEFT SIDE | RIGHT SIDE (kg) | TOTAL (kg) | PERCENT |
|---------|-----------|-----------------|------------|---------|
| FRONT = | 522.0     | 518.0           | 1040.0     | 58.3%   |
| REAR =  | 378.0     | 365.0           | 743.0      | 41.7%   |

TOTAL FULLY LOADED WEIGHT : 1783.0 kg

### AS TESTED WEIGHT OF TEST VEHICLE (1 SID H3 + CARGO + EQUIPMENT & INSTRUMENTATION

|         | LEFT SIDE | RIGHT SIDE (kg) | TOTAL (kg) | PERCENT |
|---------|-----------|-----------------|------------|---------|
| FRONT = | 520.5     | 519.0           | 1039.5     | 58.7%   |
| REAR =  | 370.5     | 360.5           | 731.0      | 41.3%   |

TOTAL TEST WEIGHT: 1770.5 kg

### TEST VEHICLE ATTITUDE:

|                      | As Delivered | Fully Loaded | Ready for Test |
|----------------------|--------------|--------------|----------------|
| Left Front (mm)      | 756          | 745          | 755            |
| Left Rear (mm)       | 765          | 727          | 734            |
| Right Front (mm)     | 755          | 725          | 754            |
| Right Rear (mm)      | 755          | 749          | 749            |
| Front Bumper Angle   | -0.2 deg     | 0.1 deg      | 0.1 deg        |
| Left Door Sill Angle | -0.3 deg     | 0.3 deg      | 0.2 deg        |
| Rear Bumper Angle    | 0.5 deg      | 0.2 deg      | 0.2 deg        |
| Right Door Sill      | 0.1 deg      | -0.4 deg     | -0.2 deg       |

Test Vehicle Wheelbase: 2810 millimeters

C.G. = 1160.2 millimeters rearward of front wheel centerline

**DATA SHEET 1**  
**GENERAL TEST AND VEHICLE PARAMETER DATA (Continued)**

**TOTAL VEHICLE LENGTH: (Pre Test)**

Right Side = 4969 mm  
Centerline = 5098 mm  
Left Side = 4971 mm

**FRONT SEAT CUSHION PLACEMENT:**

Total Length of Adjustment Travel = 286 mm  
Total Number of Adjustment Positions or Detents = N/A (Power seat)

As-Tested Position:

Detent: Mid-position  
Distance from full forward: 143 mm

**FRONT SEAT BACK ADJUSTMENT POSITION:**

Seat Back Torso Angle = 15.2\* degrees

As-Tested Position:

Seat Back Torso Angle = 15.2\* degrees

*\* Seat back was reclined 15.2 degrees from full forward position. Measurement was taken from the head restraint post*

**ADJUSTABLE STEERING COLUMN POSITION:**

Detent: \*\*  
Test Angle: 23.4 deg

\*\* 4<sup>th</sup> detent from uppermost position (uppermost position = 0)

**WINDOW POSITIONS:**

Right Front = Open      Right Rear = Open  
Left Front = Open      Left Rear = Open

**AMOUNT OF STODDARD SOLVENT IN FUEL TANK:**

Capacity = 66.24 L  
Test Volume = 60.94 L (92% to 94% of Useable Capacity)

**LOCATION OF IMPACT POINT ON TEST VEHICLE SIDE TO BE IMPACTED:**

Wheelbase = 2810 mm  
Impact Reference Line is 1408 mm rearward of front axle centerline

**DATA SHEET 2**  
**TEST VEHICLE SUMMARY OF RESULTS**

VEHICLE IDENTIFICATION:

Vehicle Year/Make/Model: 2008 Chevrolet Impala

Body Style: 4-door Sedan

VIN: 2G1WB58K381222404

NHTSA No.: 2G1WB58K381222404

Test Date: 7/08/08

Overall Length = 5098 millimeters; Overall Width = 1836 millimeters

VEHICLE TEST WEIGHT (Pre-Test):

Left Front = 520.5 kg      Left Rear = 370.5 kg

Right Front = 519.0 kg      Right Rear = 360.5 kg

TOTAL FRONT = 1039.5 kg      TOTAL REAR = 731.0 kg

TOTAL VEHICLE WEIGHT 1770.5 kg

Wheelbase = 2810 millimeters

Longitudinal C.G. from Center of Front Axle = 1160.2 millimeters

Impact Angle with Respect to Impactor = 90 degrees

ACTUAL IMPACT POINT

Actual Impact Point is 10 mm forward of nominal impact ref. line (Lateral)

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 ( 250 mm above ground) = 267 millimeters

2. LEVEL 2 ( 501 mm above ground) = 337 millimeters

3. LEVEL 3 ( 620 mm above ground) = 351 millimeters

4. LEVEL 4 ( 875 mm above ground) = 330 millimeters

5. LEVEL 5 ( 1398 mm above ground) = 134 millimeters

Maximum Post-Test Intrusion = 351 millimeters

OCCUPANTS:

Left Front:

Dummy Identification 270

Restraints Used 3-Point, SRS Side Curtain, SRS Torso Airbag, Head Restraint

INSTRUMENTATION:

Number of Data Channels: = 42

Number of Cameras:      Onboard = 3

                                 Offboard = 10

                                 TOTAL = 13

**DATA SHEET 3**  
**POST TEST OBSERVATIONS**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108

VISIBLE DUMMY CONTACT POINTS:

SID HIII

|              |                                    |
|--------------|------------------------------------|
| Head:        | Side Curtain Airbag                |
| Upper Torso: | Seat Torso Airbag / Left Side Door |
| Lower Torso: | Seat Torso Airbag / Left Side Door |
| Left Knee:   | Left Side Door / Armrest           |
| Right Knee:  | Left Knee                          |

DOOR OPENING:

LEFT DOOR

RIGHT DOOR

|        |                        |                                     |
|--------|------------------------|-------------------------------------|
| Front: | Closed, Tools required | Closed, Operable, No tools required |
| Rear:  | Closed, Tools required | Closed, Operable, No tools required |

ARM REST LOCATIONS:

|        |         |
|--------|---------|
| Front: | Inboard |
| Rear:  | Inboard |

SEAT MOVEMENT:

|        |                  |
|--------|------------------|
| Front: | Lateral movement |
| Rear:  | None             |

GLAZING DAMAGE:

|             |                              |
|-------------|------------------------------|
| Windshield: | Severe cracking on left side |
| Window:     | Not Applicable               |

PILLAR PERFORMANCE:

No Separation

SILL SEPARATION:

No Separation

AIR BAG DEPLOYMENT STATUS:

|       | DRIVER         | FRONT PASSENGER | REAR PASSENGER |
|-------|----------------|-----------------|----------------|
| FRONT | Did not Deploy | Did not Deploy  | Not Applicable |
| SIDE  | Deployed       | Deployed        | Deployed       |

OTHER NOTABLE IMPACT EFFECTS:

The non-struck side side curtain airbag deployed during test event

## **SECTION 4**

### **OCCUPANT AND VEHICLE INFORMATION**

# **DATA SHEET 4** **SID/HIII INSTRUMENTATION DATA**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108

|                              | Front Dummy ID# 270 |        |                |        |
|------------------------------|---------------------|--------|----------------|--------|
|                              | Pos. Direction      |        | Neg. Direction |        |
|                              | Max                 | Time   | Max            | Time   |
| <b>HEAD ACCELERATIONS:</b>   | (g)                 | (msec) | (g)            | (msec) |
| Longitudinal X               | 9.4                 | 23.3   | -15.1          | 60     |
| Lateral Y                    | 48.4                | 52.9   | -9.4           | 177.8  |
| Vertical Z                   | 12.4                | 43.2   | -16.9          | 55.3   |
| Resultant R                  | 51.9                | 54.3   | 0.1            | 18.6   |
| HIC                          | 224.0               |        |                |        |
| <b>NECK LOADS:</b>           | (N)                 | (msec) | (N)            | (msec) |
| Longitudinal X               | 410.7               | 173.2  | -375.7         | 59.3   |
| Lateral Y                    | 166.7               | 54.0   | -426.6         | 173.2  |
| Vertical Z                   | 6266.8              | 173.3  | -5746          | 172.9  |
| Resultant R                  | 6286.9              | 173.3  | 5.0            | -55.1  |
| <b>NECK MOMENTS:</b>         | (N-m)               | (msec) | (N-m)          | (msec) |
| Longitudinal X               | 15.3                | 32.0   | -77.9          | 53.3   |
| Lateral Y                    | 21.3                | 100.6  | -33.4          | 58.3   |
| Vertical Z                   | 299.2               | 60.3   | -93.1          | 118.8  |
| Resultant R                  | 301.9               | 60.2   | 0.6            | -59.2  |
| <b>RIB ACCELERATIONS:</b>    | (g)                 | (msec) | (g)            | (msec) |
| Upper Rib Lateral Y          | 86.5                | 40.6   | -11.8          | 145.6  |
| Upper Rib Lateral Y(R)       | 87.9                | 40.6   | -12.0          | 88.7   |
| Lower Rib Lateral Y          | 71.1                | 43.1   | -11.8          | 88.7   |
| Lower Rib Lateral Y(R)       | 70                  | 43.1   | -12.4          | 88.7   |
| <b>SPINE ACCELERATIONS:</b>  | (g)                 | (msec) | (g)            | (msec) |
| Lower Lateral Y              | 76.4                | 45.0   | -16.5          | 81.2   |
| Lower Lateral Y(R)           | 76.8                | 45.0   | -16.3          | 81.2   |
| <b>PELVIC ACCELERATIONS:</b> | (g)                 | (msec) | (g)            | (msec) |
| Lateral Y                    | 68.4                | 40.6   | -6.6           | 66.9   |
| Lateral Y(R)                 | 68.5                | 40.6   | -6.9           | 66.9   |

REFERENCE: Positive Direction –

Longitudinal (X) = forward

Lateral (Y) = to right

Vertical (Z) = down

Note: Above data has been FIR filtered, Y(R) denotes redundant Y direction accelerometer.

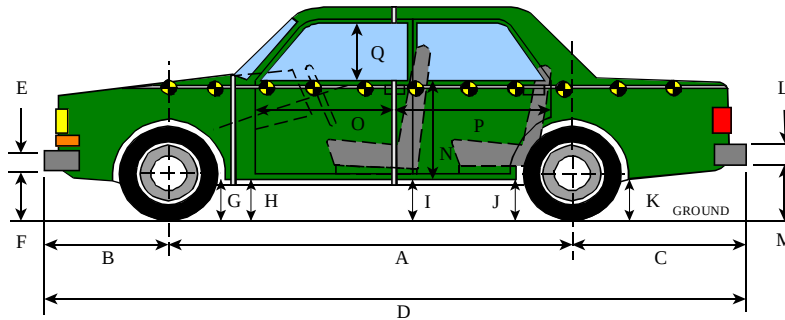
Head Accelerations are filtered at SAE Class 1000, Neck Force uses Class 1000, Neck Moment uses Class 600

## DATA SHEET 5

### VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



#### LEFT SIDE VIEW

NOTE: all dimensions are in millimeters with tolerance of  $\pm 3$  mm

|    | PRE-TEST<br>(as delivered) | PRE-TEST<br>(as tested) | POST-TEST<br>(as tested) | CHANGE |
|----|----------------------------|-------------------------|--------------------------|--------|
| A  | 2808                       | 2810                    | 2713                     | -97    |
| B  | 1085                       | 1085                    | 1077                     | -8     |
| C  | 1202                       | 1202                    | 1208                     | 6      |
| D  | 5098                       | 5098                    | 5048                     | -50    |
| E  | 85                         | 85                      | 85                       | 0      |
| F  | 483                        | 483                     | 490                      | 7      |
| G  | 212                        | 197                     | 206                      | 9      |
| H  | 212                        | 194                     | 205                      | 11     |
| I  | 222                        | 197                     | 191                      | -6     |
| J1 | 221                        | 191                     | 231                      | 40     |
| J2 | 227                        | 195                     | 241                      | 46     |
| K  | 298                        | 257                     | 305                      | 48     |
| L  | 125                        | 125                     | 125                      | 0      |
| M  | 372                        | 330                     | 347                      | 17     |
| N  | 696                        | 696                     | 441                      | -255   |
| O  | 918                        | 918                     | 902                      | -16    |
| P  | 1052                       | 1052                    | 1041                     | -11    |
| Q  | 441                        | 441                     | 445                      | 4      |
| R  | 4969                       | 4969                    | 4952                     | -17    |
| S  | 4971                       | 4971                    | 4887                     | -84    |
| T  | 1836                       | 1836                    | 1593                     | -243   |

D = Length at Centerline

E&L = Bumper Thickness

R = Right Side Length

S = Left Side Length

T = Width at B-Pillar

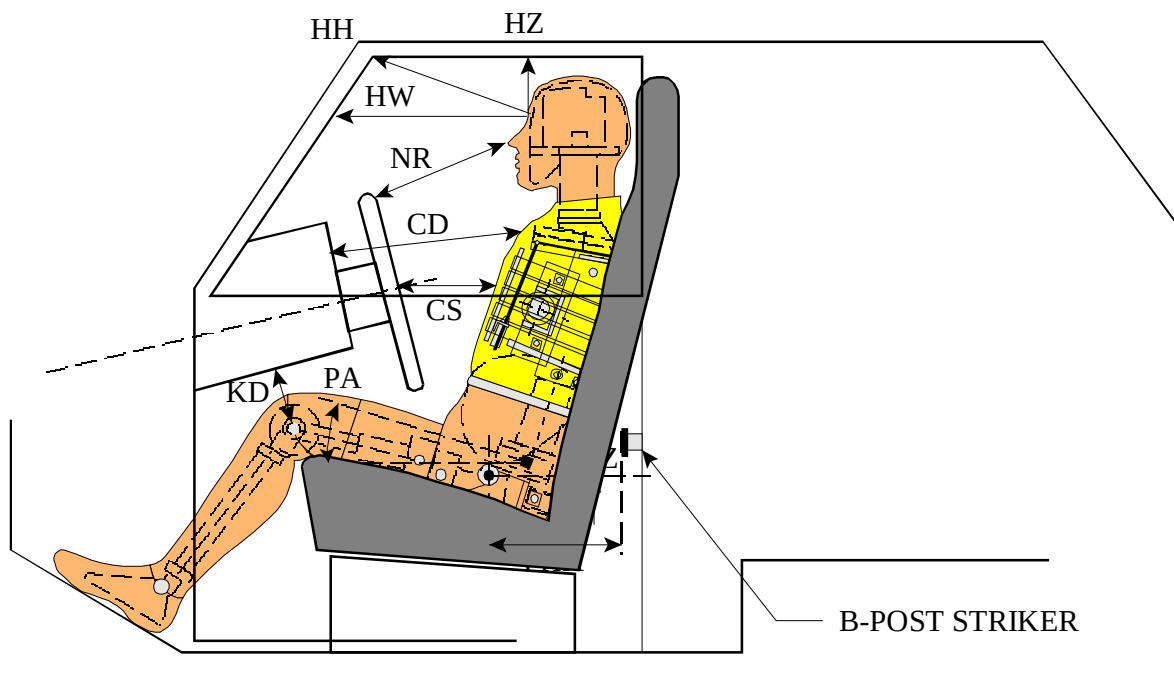
J1 = To Pinch Weld

J2 = To Sill

# **DATA SHEET 6** **SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



## **LEFT SIDE VIEW**

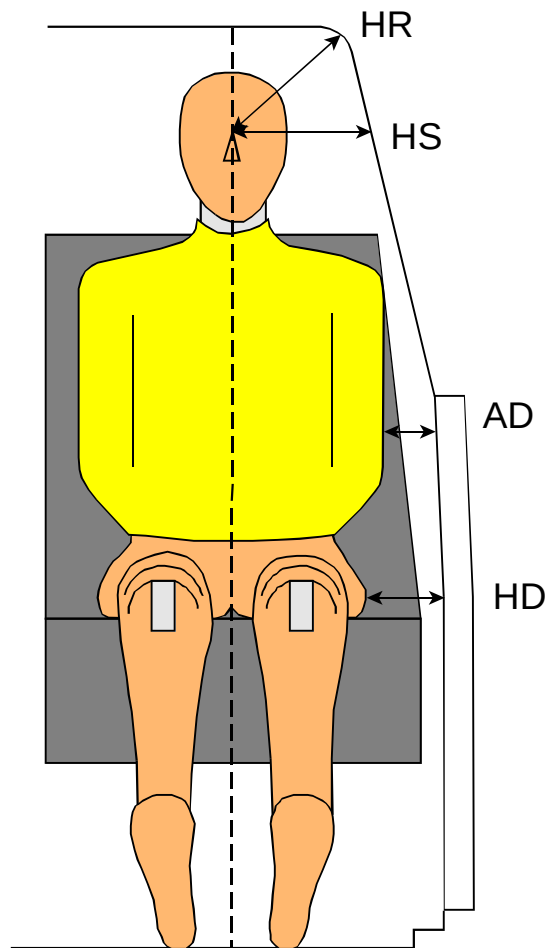
NOTE: All dimensions are in millimeters with tolerance of  $\pm 3$  mm

|                     | SID/HIII ID# 270 |
|---------------------|------------------|
| HH                  | 309              |
| HW                  | 612              |
| HZ                  | 155              |
| NR/NB               | 381              |
| CD/CB               | 533              |
| CS                  | 294              |
| KDL(KDA°)/KBL(KDA°) | 213 / ( 39 °)    |
| KDR(KBA°)/KBR(KBA°) | 204 / ( 42 °)    |
| PA°                 | 23.3 °           |
| PHX                 | 185              |
| PHZ                 | 115              |

# **DATA SHEET 7** **SID/HIII LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



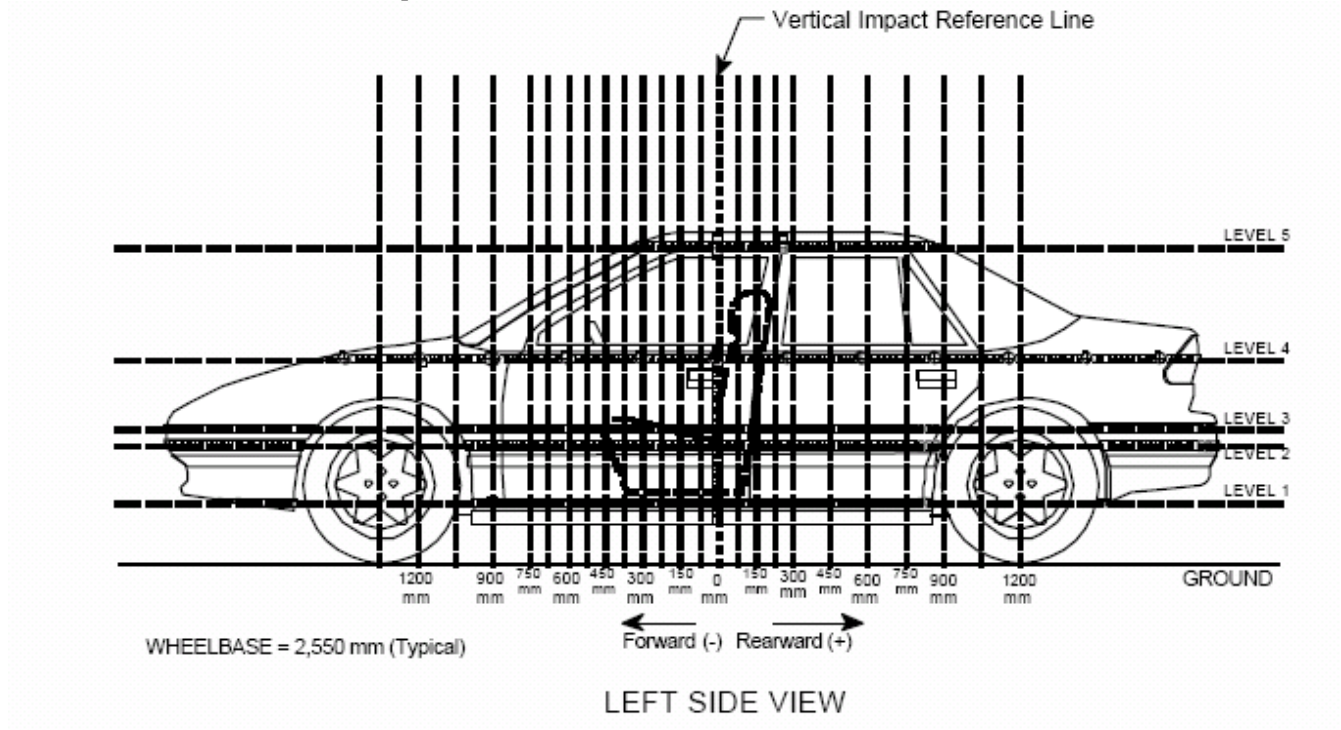
NOTE: All dimensions are in millimeters with tolerance of  $\pm 3$  mm

| SID HIII ID # 270 |     |
|-------------------|-----|
| HR                | 185 |
| HS                | 328 |
| AD*               | 122 |
| HD                | 168 |

# **DATA SHEET 8** **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



MEASUREMENTS ARE TAKEN WHEN THE VEHICLE IS IN THE "AS TESTED" CONFIGURATION.

Measurements Along the Vertical 0 mm Line Shown Above:

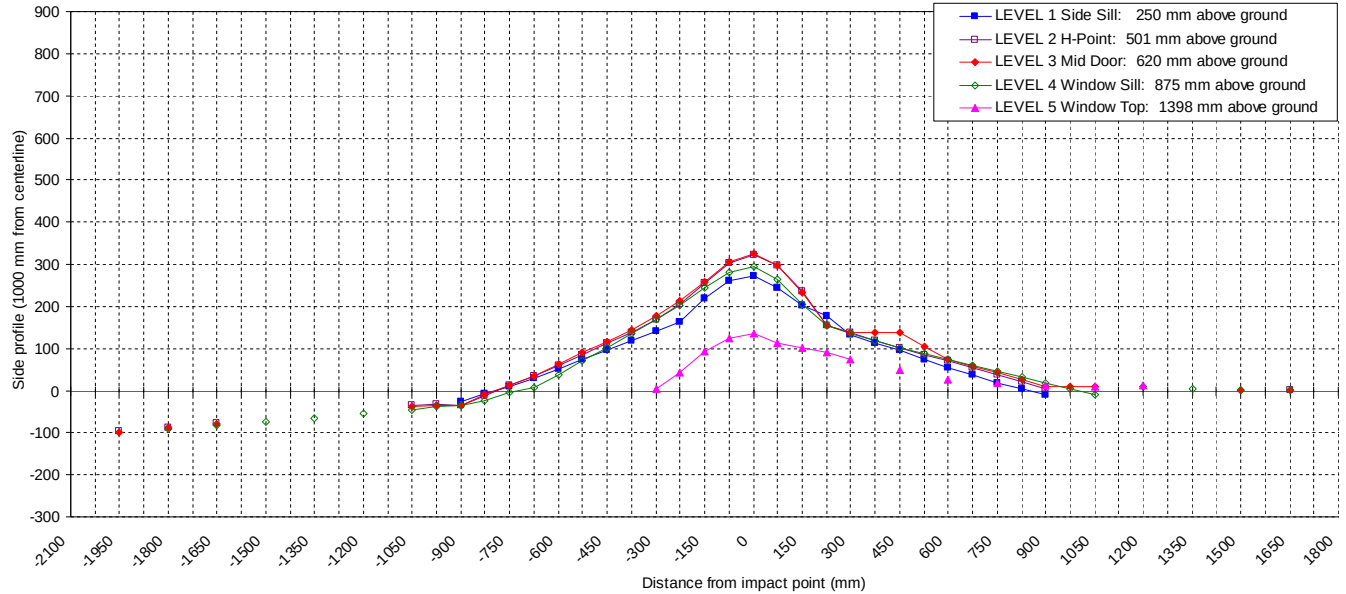
|                            |   |             |             |
|----------------------------|---|-------------|-------------|
| Level 5 @ Window Top       | = | <u>1398</u> | millimeters |
| Level 4 @ Window Sill      | = | <u>875</u>  | millimeters |
| Level 3 @ Mid Door         | = | <u>620</u>  | millimeters |
| Level 2 @ Occupant H-Point | = | <u>501</u>  | millimeters |
| Level 1 @ Sill Top Height  | = | <u>250</u>  | millimeters |

# DATA SHEET 9

## VEHICLE EXTERIOR CRUSH PROFILES - ALL LEVELS

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108

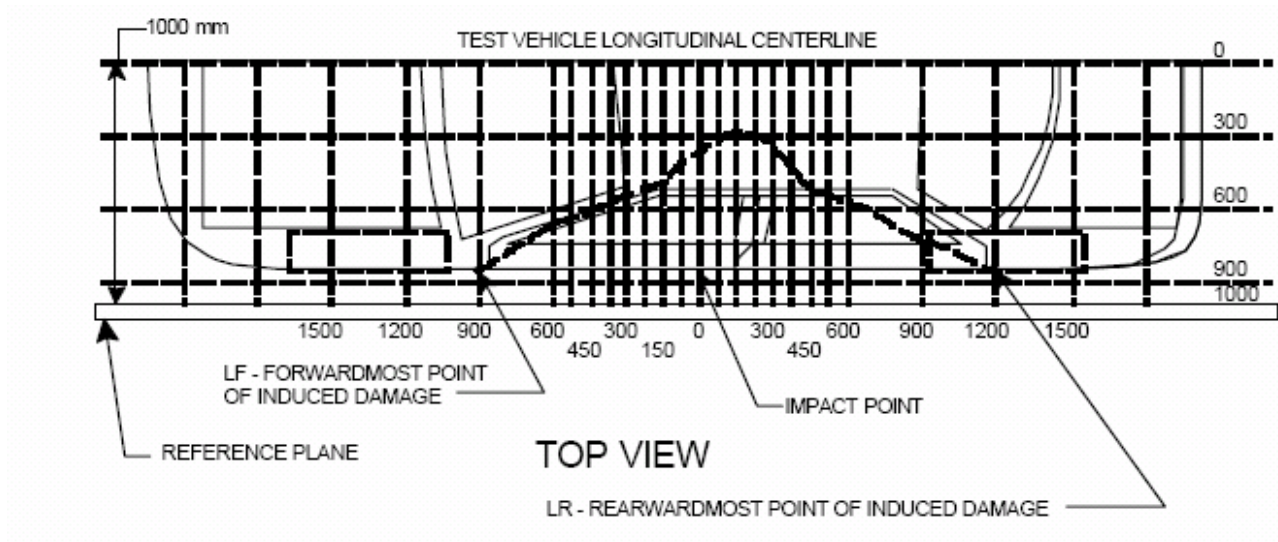


|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | DISTANCE IN MILLIMETERS (mm) FROM IMPACT POINT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | </ |
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# **DATA SHEET 10** **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



## **MEASUREMENT CONVENTIONS:**

Forward of the impact point (towards front of vehicle) is considered positive (-).

Rearward of the impact point (toward rear of vehicle) is considered negative (+).

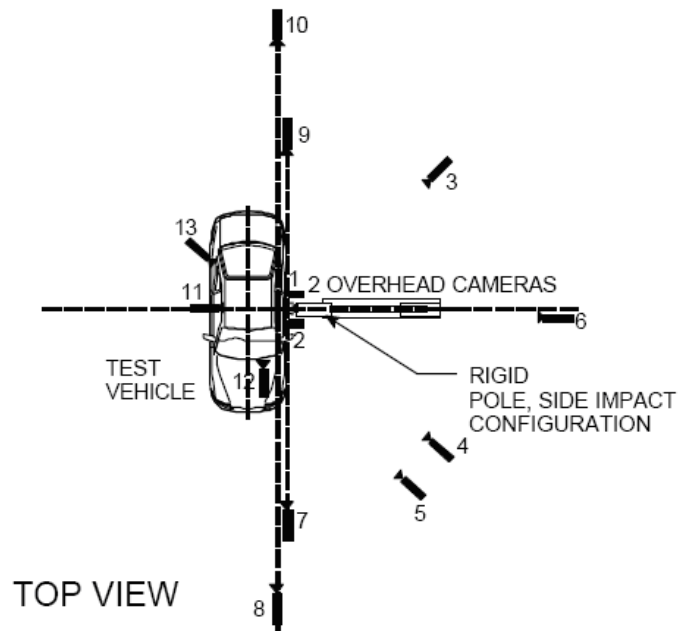
NOTE: All dimensions are in millimeters with tolerance of  $\pm 3$  mm.

| DPD MEASUREMENTS (mm) |      | POST TEST (mm) | PRETEST (mm) | STATIC CRUSH (mm) |
|-----------------------|------|----------------|--------------|-------------------|
| 1 (LR)                | 900  | 210            | 192          | 18                |
| 2                     | 585  | 234            | 155          | 79                |
| 3                     | 270  | 332            | 182          | 150               |
| 4                     | -45  | 465            | 152          | 313               |
| 5                     | -360 | 303            | 154          | 149               |
| 6 (LF)                | -675 | 193            | 157          | 36                |

# **DATA SHEET 11** **HIGH SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



| Camera No. | View                                                              | Coordinates (millimeters) |      |       | Angle (deg.) | Lens (mm) | Film Speed (fps) |
|------------|-------------------------------------------------------------------|---------------------------|------|-------|--------------|-----------|------------------|
|            |                                                                   | X*                        | Y*   | Z*    |              |           |                  |
| 1          | Overhead view of test vehicle                                     | 970                       | 180  | -4375 | 90           | 8         | 1000             |
| 2          | Overhead closeup view of impact plane                             | 390                       | 180  | -4375 | 90           | 28        | 1000             |
| 3          | Left side 45° – rearward pole view                                | 2241                      | 2509 | 1241  | -6           | 24        | 1000             |
| 4          | Left side 45° – forward pole view                                 | 2669                      | 2989 | 1333  | -5           | 24        | 1000             |
| 5          | Real time (30 fps) film coverage of test                          | -                         | -    | -     | -            | -         | 30               |
| 6          | Left side – rear pole view                                        | 615                       | 1736 | 2030  | -22          | 24        | 1000             |
| 7          | Front ground level – vehicle/pole impact                          | 9508                      | 120  | 910   | -2           | 50        | 1000             |
| 8          | Front ground level – vehicle roof targets and vehicle/pole impact | 9708                      | 410  | 1080  | -2           | 24        | 1000             |
| 9          | Rear ground level – vehicle/pole impact                           | 7259                      | 665  | 924   | -3           | 50        | 1000             |
| 10         | Rear ground level – view of rear roof targets                     | 7548                      | 348  | 927   | -1           | 28        | 1000             |
| 11         | Test vehicle onboard -- side view of SID H3                       | 1722                      | 261  | 1069  | 5            | 12        | 1000             |
| 12         | Test vehicle onboard– front view of SID H3                        | 471                       | 1561 | 1249  | 9.5          | 25        | 1000             |
| 13         | Test vehicle onboard– 3/4 rear view of SID H3                     | 1753                      | 661  | 1141  | 7            | 12.5      | 1000             |

\* Reference (from point of impact); all measurements accurate to within  $\pm 6$  mm.

+X = Film plane to impact location

+Y = Film plane to monorail centerline

+Z = film plane to ground (excluding moving cart height)

**DATA SHEET 12**  
**DUMMY DAMAGE CHECKLIST – SID/HIII**

Dummy Serial No. 270 Date: July 8, 2008

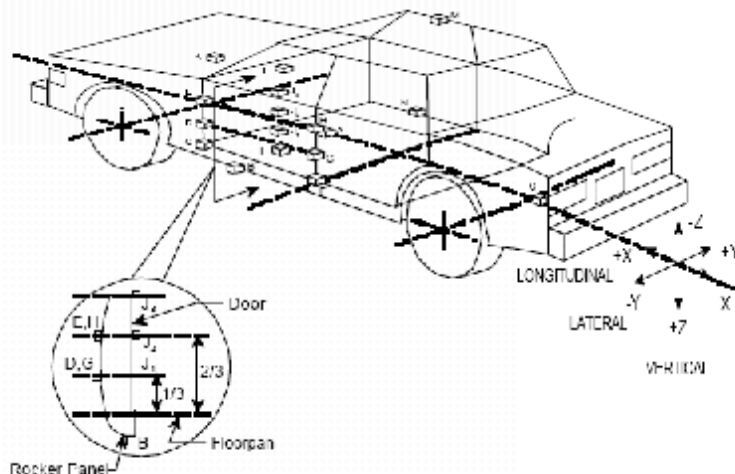
OK      Damaged    (Begin with general cleaning)

|          |          |                                                                       |
|----------|----------|-----------------------------------------------------------------------|
| <u>X</u> | <u>-</u> | Outer skin on entire dummy (gashes, rips, etc.)                       |
| <u>X</u> | <u>-</u> | Head - Check that ballast is secure                                   |
| <u>X</u> | <u>-</u> | Gashes, rips, general appearances, etc                                |
| <u>X</u> | <u>-</u> | Neck - Broken or cracks in rubber                                     |
| <u>X</u> | <u>-</u> | Check that upper neck bracket is firmly attached to lower neck        |
| <u>X</u> | <u>-</u> | Check for looseness at the condyle joint                              |
| <u>X</u> | <u>-</u> | Nodding blocks – cracked or out of position                           |
| <u>X</u> | <u>-</u> | Spine - Broken or cracks in rubber                                    |
| <u>X</u> | <u>-</u> | Ribs - Check all ribs and rib supports for damage (bent or broken)    |
| <u>X</u> | <u>-</u> | Check damping material or separation or cracks                        |
| <u>X</u> | <u>-</u> | Three rubber bumpers in place                                         |
| <u>X</u> | <u>-</u> | Lateral Shock Absorber - Bent or broken                               |
| <u>X</u> | <u>-</u> | Transducer Leads - Torn cables                                        |
| <u>X</u> | <u>-</u> | Accelerometer Mountings - (head, ribs, spine, and pelvis)             |
|          |          | - Check for secure mounting).                                         |
| <u>X</u> | <u>-</u> | Knees- Check outer skin, insert and casting (without removing insert) |
| <u>X</u> | <u>-</u> | Limbs- Check for normal movement and adjustment                       |
| <u>X</u> | <u>-</u> | Head / Neck bracket attachment                                        |
|          |          | - Check to see if cracked or broken                                   |

# **DATA SHEET 13** **TEST VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108



| Accelerometer Location |                                             | Pre-Test (mm) |      |      | Post Test (mm) |      |      |
|------------------------|---------------------------------------------|---------------|------|------|----------------|------|------|
|                        |                                             | X             | Y    | Z    | X              | Y    | Z    |
| A                      | Vehicle CG X,Y,Z                            | 2756          | -25  | 470  | 2706           | 28   | 411  |
| B                      | Struck Side Front Sill Y                    | 2756          | -25  | 470  | 2706           | 28   | 411  |
| C                      | Struck Side A-Pillar Sill Y                 | 3229          | -702 | 288  | -              | -    | -    |
| D                      | Struck Side Lower A-Pillar Y                | 3491          | -706 | 349  | -              | -    | -    |
| E                      | Struck Side Middle A-Pillar Y               | 3495          | -713 | 523  | -              | -    | -    |
| F                      | Struck Side B-Pillar Sill Y                 | 3340          | -663 | 1031 | -              | -    | -    |
| G                      | Struck Side Lower B-Pillar Y                | 2395          | -714 | 390  | -              | -    | -    |
| H                      | Struck Side Middle B-Pillar Y               | 2400          | -714 | 595  | 2344           | -569 | 597  |
| I                      | Front Outboard Seat Track Y at H-point X    | 2370          | -714 | 886  | 2339           | -564 | 868  |
| J                      | Front Door Y (3) – 480 mm forward of impact | -             | -    | -    | -              | -    | -    |
| K                      | Top of Engine X,Y                           | 4378          | 105  | 756  | 4338           | -20  | 729  |
| L                      | Center of Firewall Y                        | 3895          | 75   | 855  | 3853           | 1    | 829  |
| M                      | Unstruck Side Roof Rail Y at impact line    | 2599          | 585  | 1417 | 2593           | 568  | 1414 |
| N                      | Unstuck Side Floor Sill Y at impact line    | 2561          | 714  | 418  | -              | -    | -    |
| O                      | Rear Axle Floorpan X,Y                      | 1483          | -3   | 500  | 1453           | -4   | 524  |

\*Reference: X - Rear Bumper (Positive Forward)  
Y - Vehicle Centerline (Positive To Right)  
Z - Ground Level (Positive Up)

**DATA SHEET 13**  
**TEST VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY (Continued)**

Test Vehicle: 2008 Chevrolet Impala 4-door Sedan

NHTSA No. C80108

| Accelerometer |      | Longitudinal |             | Lateral |             | Vertical |             | Resultant |             |
|---------------|------|--------------|-------------|---------|-------------|----------|-------------|-----------|-------------|
|               |      | Max (g)      | Time (msec) | Max (g) | Time (msec) | Max (g)  | Time (msec) | Max (g)   | Time (msec) |
| A             | Pos. | 28.4         | 85.5        | 64.4    | 28.2        | 23.3     | 29.3        | 68.4      | 28.4        |
|               | Neg. | -24.2        | 60.4        | -58.4   | 102         | -23.8    | 85.3        | -         | -           |
| B             | Pos. | -            | -           | 16.8    | 28.5        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -4      | 37.4        | -        | -           | -         | -           |
| C             | Pos. | -            | -           | 14.6    | 25.5        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -2.8    | 11.1        | -        | -           | -         | -           |
| D             | Pos. | -            | -           | 17.3    | 52.2        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -2.4    | 11.4        | -        | -           | -         | -           |
| E             | Pos. | -            | -           | 28.1    | 37.7        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -15.8   | 30.8        | -        | -           | -         | -           |
| F             | Pos. | -            | -           | 88.9    | 22.2        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -14.9   | 27.9        | -        | -           | -         | -           |
| G             | Pos. | -            | -           | 49.7    | 13.6        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -87.1   | 26.6        | -        | -           | -         | -           |
| H             | Pos. | -            | -           | 80.8    | 16.7        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -155.5  | 23.1        | -        | -           | -         | -           |
| I             | Pos. | -            | -           | 49.5    | 20.5        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -75.1   | 72.6        | -        | -           | -         | -           |
| J             | Pos. | -            | -           | -       | -           | -        | -           | -         | -           |
|               | Neg. | -            | -           | -       | -           | -        | -           | -         | -           |
| K             | Pos. | 3.3          | 94.9        | 21.6    | 65.6        | -        | -           | -         | -           |
|               | Neg. | -4.5         | 72.4        | -1.9    | 234.1       | -        | -           | -         | -           |
| L             | Pos. | -            | -           | 11.1    | 46.5        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -0.8    | 326.1       | -        | -           | -         | -           |
| M             | Pos. | -            | -           | 14.6    | 53.1        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -3.4    | 26.3        | -        | -           | -         | -           |
| N             | Pos. | -            | -           | 14      | 48.8        | -        | -           | -         | -           |
|               | Neg. | -            | -           | -0.7    | 164.7       | -        | -           | -         | -           |
| O             | Pos. | -0.7         | 164.7       | 13.4    | 64.2        | -        | -           | -         | -           |
|               | Neg. | -5.9         | 60.9        | -1.7    | 189.2       | -        | -           | -         | -           |

## **SECTION 5**

### **FMVSS NO. 301 DATA**

## DATA SHEET 14

### SUMMARY OF FMVSS NO. 301 DATA

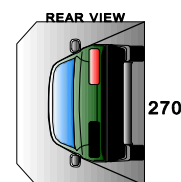
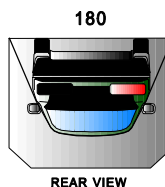
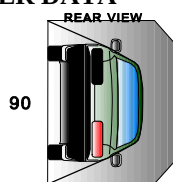
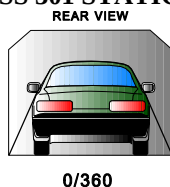
NHTSA TEST No.: \_\_\_\_\_ C80108 \_\_\_\_\_ TEST DATE: \_\_\_\_\_ 7/08/08 \_\_\_\_\_  
 VEHICLE MAKE/MODEL: \_\_\_\_\_ 2008 Chevrolet Impala 4-door Sedan \_\_\_\_\_  
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

#### FUEL SPILLAGE MEASUREMENT:

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

SOLVENT SPILLAGE DETAILS: None

#### **FMVSS 301 STATIC ROLLOVER DATA**



#### I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

| Rollover Stage | Rotation Time (spec. 1 -3 min) |         |    |         | FMVSS 301 Hold Time |         | Total Time |         |    |         | Next Whole Minute Interval |         |
|----------------|--------------------------------|---------|----|---------|---------------------|---------|------------|---------|----|---------|----------------------------|---------|
| 0° - 90°       | 1                              | minutes | 07 | seconds | 5                   | minutes | 6          | minutes | 7  | seconds | 7                          | minutes |
| 90° - 180°     | 1                              | minutes | 04 | seconds | 5                   | minutes | 6          | minutes | 4  | seconds | 7                          | minutes |
| 180°-270°      | 1                              | minutes | 06 | seconds | 5                   | minutes | 6          | minutes | 6  | seconds | 7                          | minutes |
| 270°-360°      | 1                              | minutes | 10 | seconds | 5                   | minutes | 6          | minutes | 10 | seconds | 7                          | minutes |

#### II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

|                                        |          |          |                        |
|----------------------------------------|----------|----------|------------------------|
| First 5 minutes from onset of rotation | 6th min. | 7th min. | 8th min. (if required) |
| 142 g                                  | 28 g     | 28 g     | 28 g                   |

#### III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

| Rollover Stage | First 5 minutes from onset of rotation (g) | 6th min. (g) | 7th min. (g) | 8th min. (if required) (g) |
|----------------|--------------------------------------------|--------------|--------------|----------------------------|
| 0° - 90°       | 0                                          | 0            | 0            | N/A                        |
| 90° - 180°     | 0                                          | 0            | 0            | N/A                        |
| 180°-270°      | 0                                          | 0            | 0            | N/A                        |
| 270°-360°      | 0                                          | 0            | 0            | N/A                        |

Note: Record spillage for whole minute intervals only as determined above.

#### IV. SOLVENT SPILLAGE LOCATION(S):

| Rollover Stage | Spillage Location |
|----------------|-------------------|
| 0° - 90°       | None              |
| 90° - 180°     | None              |
| 180°-270°      | None              |
| 270°-360°      | None              |

**APPENDIX A**  
**PHOTOGRAPHS**

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| FIGURE | TITLE                                                | PAGE |
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| A-33   | Post-Test Dummy Shoulder and Door Top View           | A-20 |

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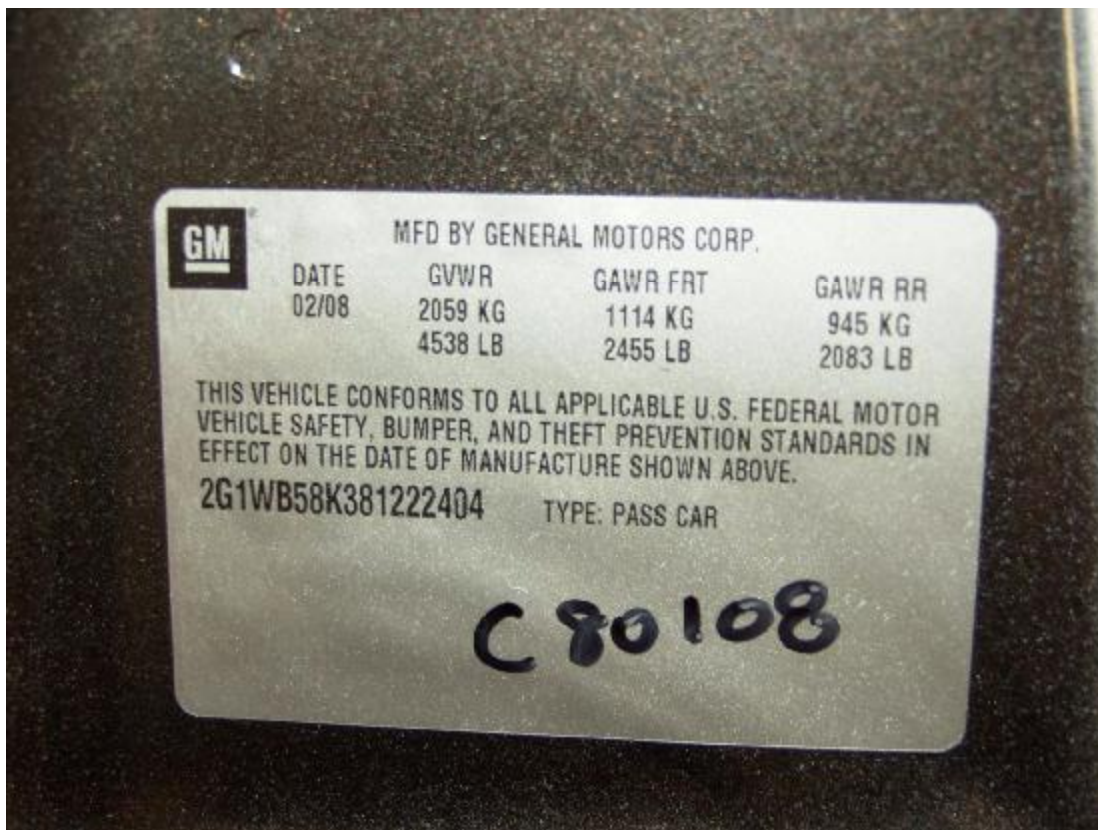
| <b>FIGURE</b> | <b>TITLE</b>                                           | <b>PAGE</b> |
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| A-44          | Impact Photo                                           | A-26        |



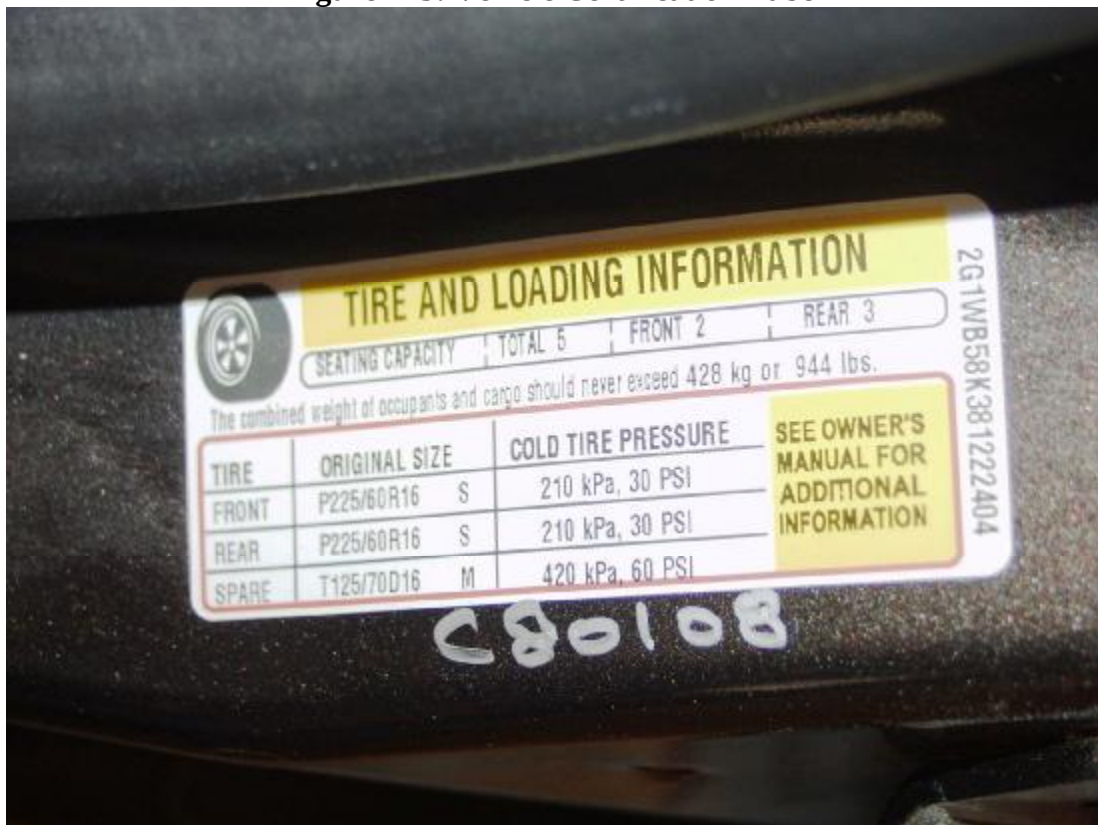
**Figure A-1: As Received Left Front  $\frac{3}{4}$  View**



**Figure A-2: As Received Right Rear  $\frac{3}{4}$  View**



**Figure A-3: Vehicle Certification Label**



**Figure A-4: Vehicle Tire Placard Label**



**Figure A-5: Pre-Test Front View**



**Figure A-6: Post-Test Front View**



**Figure A-7: Pre-Test Left Front  $\frac{3}{4}$  View**



**Figure A-8: Post-Test Left Front  $\frac{3}{4}$  View**



**Figure A-9: Pre-Test Left Side View**



**Figure A-10: Post-Test Left Side View**



**Figure A-11: Pre-Test Left Rear ¾ View**



**Figure A-12: Post-Test Left Rear ¾ View**



**Figure A-13: Pre-Test Rear View**



**Figure A-14: Post-Test Rear View**



**Figure A-15: Pre-Test Right Rear  $\frac{3}{4}$  View**



**Figure A-16: Post-Test Right Rear  $\frac{3}{4}$  View**



**Figure A-17: Pre-Test Right Side View**



**Figure A-18: Post-Test Right Side View**



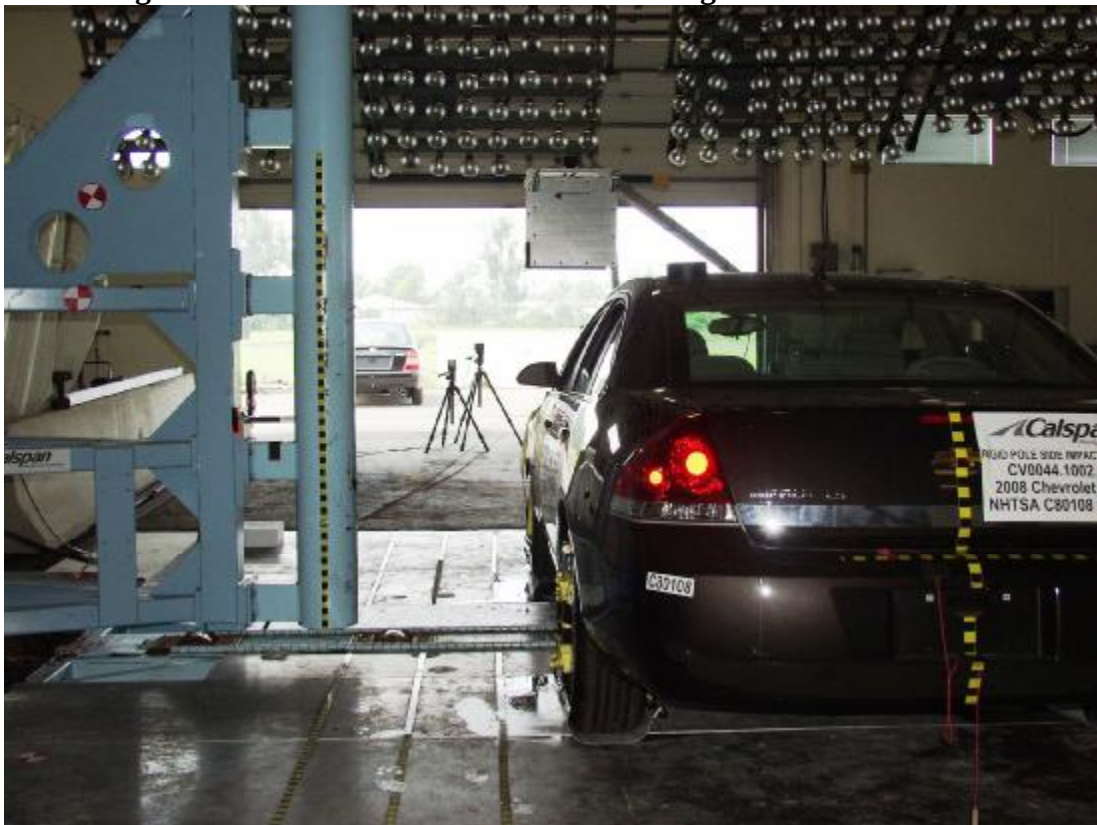
**Figure A-19: Pre-Test Right Front  $\frac{3}{4}$  View**



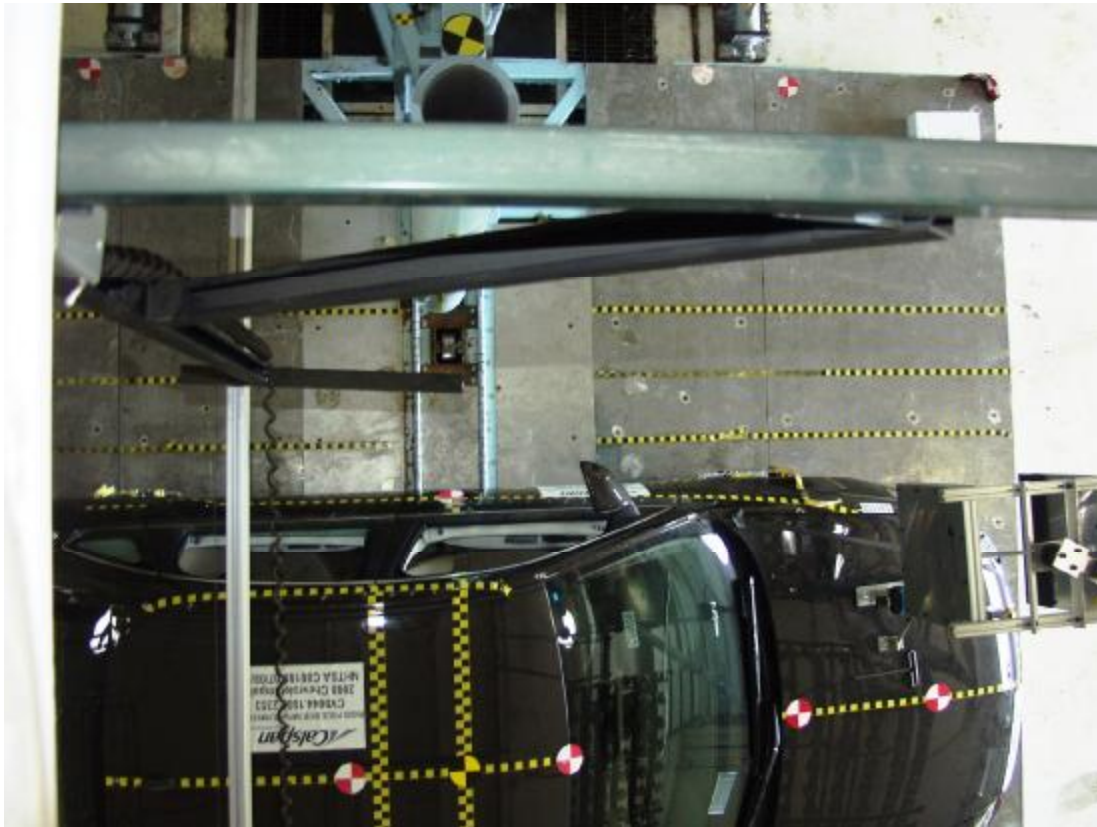
**Figure A-20: Post-Test Right Front  $\frac{3}{4}$  View**



**Figure A-21: Pre-Test Left Side View of Aligned Vehicle and Pole**



**Figure A-22: Pre-Test Right Side View of Aligned Vehicle and Pole**



**Figure A-23: Pre-Test Overhead View of Aligned Vehicle and Pole**



**Figure A-24: Post-Test Overhead View of Vehicle and Pole**



**Figure A-25: Pre-Test Close-Up View of Impact Point Target**



**Figure A-26: Post-Test Close-Up View of Impact Point Target**



**Figure A-27: Pre-Test Opposite Side View of SID HIII**



**Figure A-28: Post-Test Opposite Side View of SID HIII**



**Figure A-29: Pre-Test Impact Side View of SID HIII with Door Open**



**Figure A-30: Pre-Test Impact Side View of SID HIII**



**Figure A-31: Post-Test Impact Side View of SID HIII**



**Figure A-32: Pre-Test Dummy Shoulder and Door Top View**



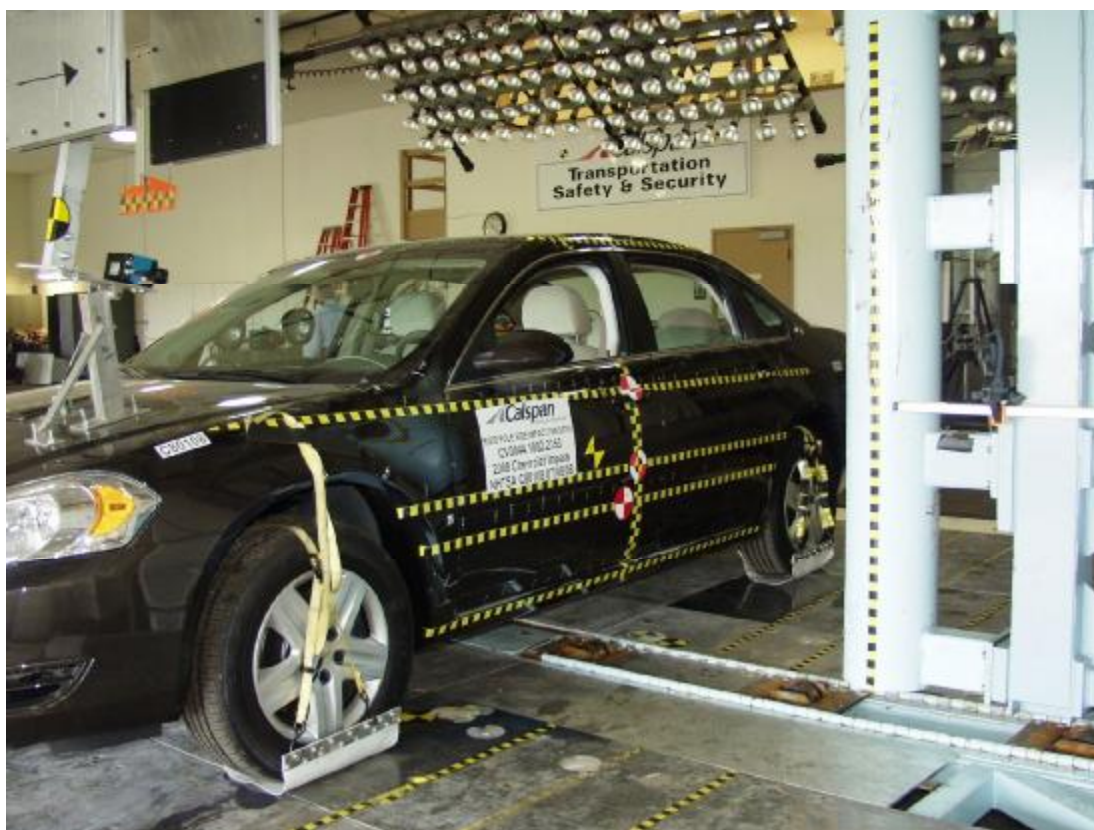
**Figure A-33: Post-Test Dummy Shoulder and Door Top View**



**Figure A-34: Pre-Test Impact Side Front Interior Trim**



**Figure A-35: Post-Test Impact Side Front Interior Trim**



**Figure A-36: Pre-Test Left Front  $\frac{3}{4}$  View of Impact Zone**



**Figure A-37: Post-Test Left Front  $\frac{3}{4}$  View of Impact Zone**



**Figure A-38: Pre-Test Left Rear  $\frac{3}{4}$  View of Impact Zone**



**Figure A-39: Post-Test Left Rear  $\frac{3}{4}$  View of Impact Zone**



**Figure A-40: Rollover 90 Degrees**



**Figure A-41: Rollover 180 Degrees**



**Figure A-42: Rollover 270 Degrees**



**Figure A-43: Rollover 360 Degrees**



**Figure A-44: Impact Photo**

## **APPENDIX B**

### **SID/HIII AND VEHICLE RESPONSE DATA**

**(SAE sign convention)**

### DATA CHANNEL FILTER CLASS SUMMARY

| Data Type                | SAE Filter Class |
|--------------------------|------------------|
| Dummy Head Accelerations | CFC 1000         |
| Rib Accelerations        | FIR 100          |
| Spine Accelerations      | FIR 100          |
| Pelvis Accelerations     | FIR 100          |

### DATA CHANNEL TITLE KEY

| Prefix                                       | Suffix                         |
|----------------------------------------------|--------------------------------|
|                                              | Ax = Acceleration, X-direction |
| V1 = Vehicle 1 (Test Vehicle)                | Ay = Acceleration, Y-direction |
| P1 = Left Front Seating Position (Driver)    | Az = Acceleration, Z-direction |
| P2 = Left Front Seating Position (Passenger) | Fx = Force, X-direction        |
| A1-A17 = Accelerometer Location Number       | Fy = Force, Y-direction        |
|                                              | Fz = Force, Z-direction        |
|                                              | Mx = Moment about X            |
|                                              | My = Moment about Y            |
|                                              | Mz = Moment about Z            |
|                                              | Vx = Velocity, X-direction     |
|                                              | Vy = Velocity, Y-direction     |
|                                              | Vz = Velocity, Z-direction     |
|                                              | R = Redundant                  |

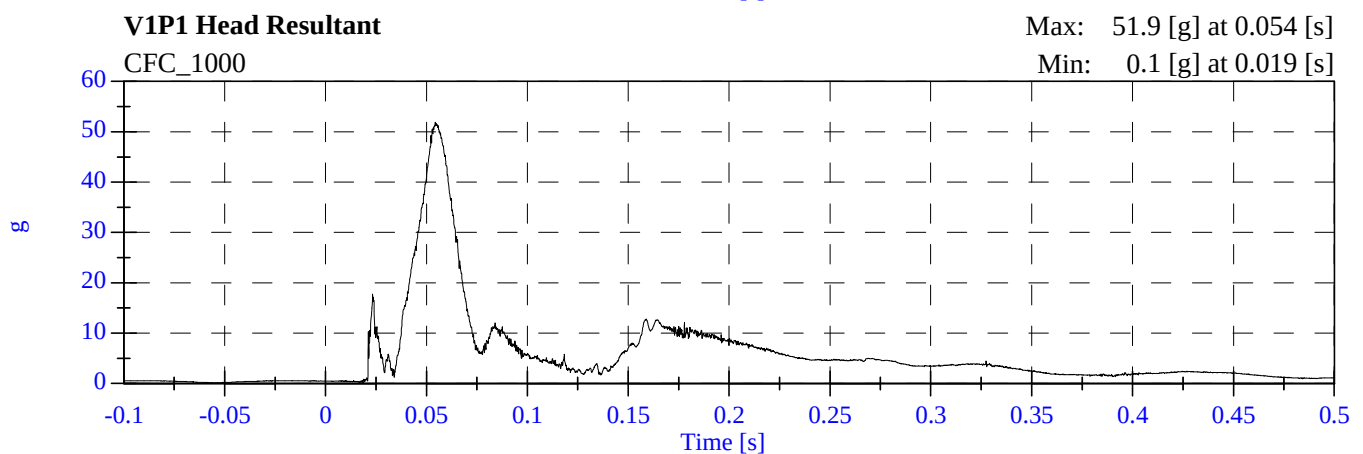
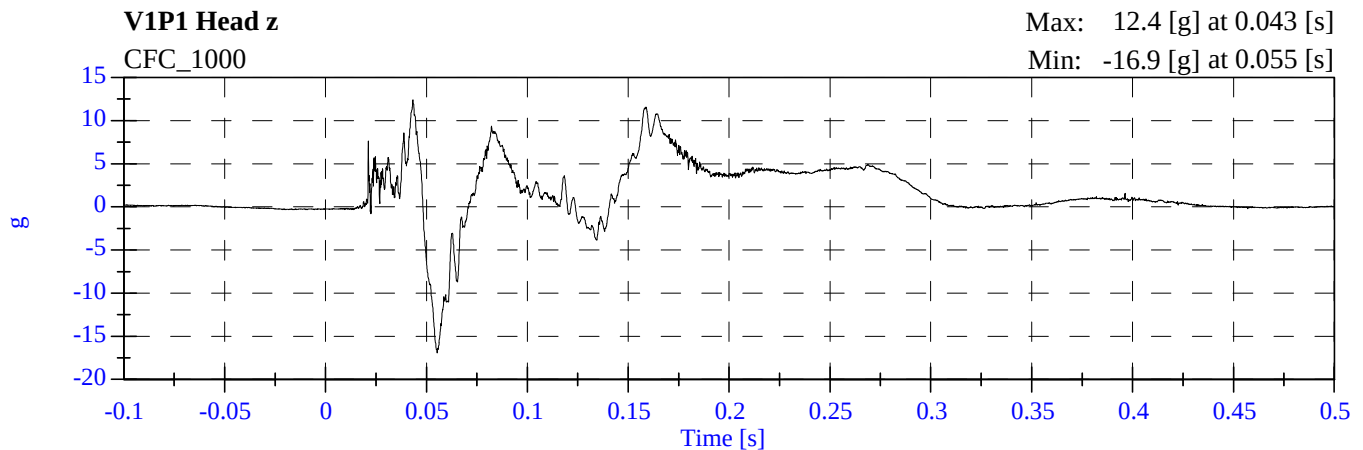
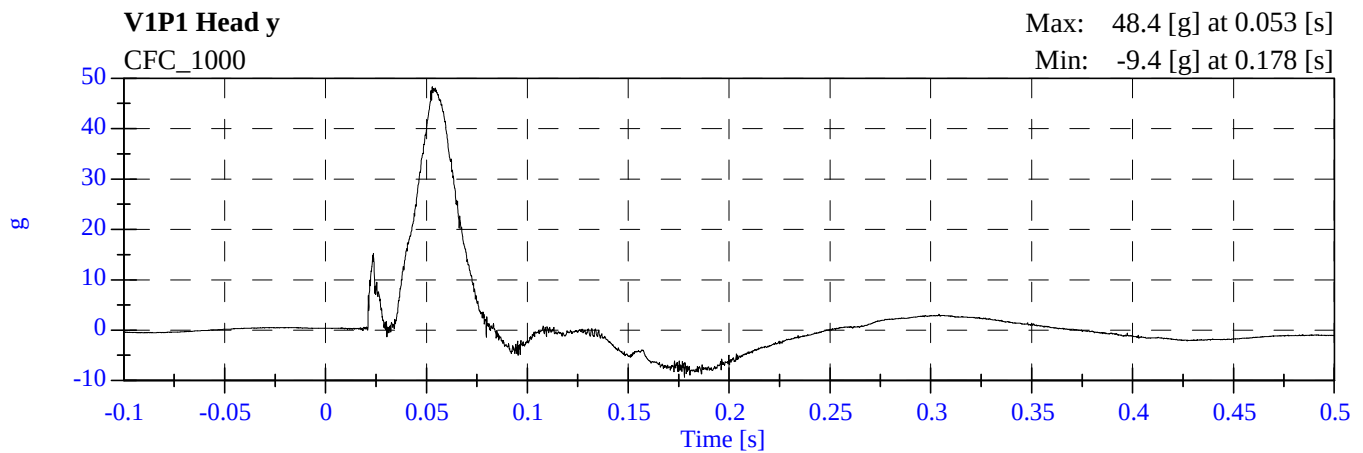
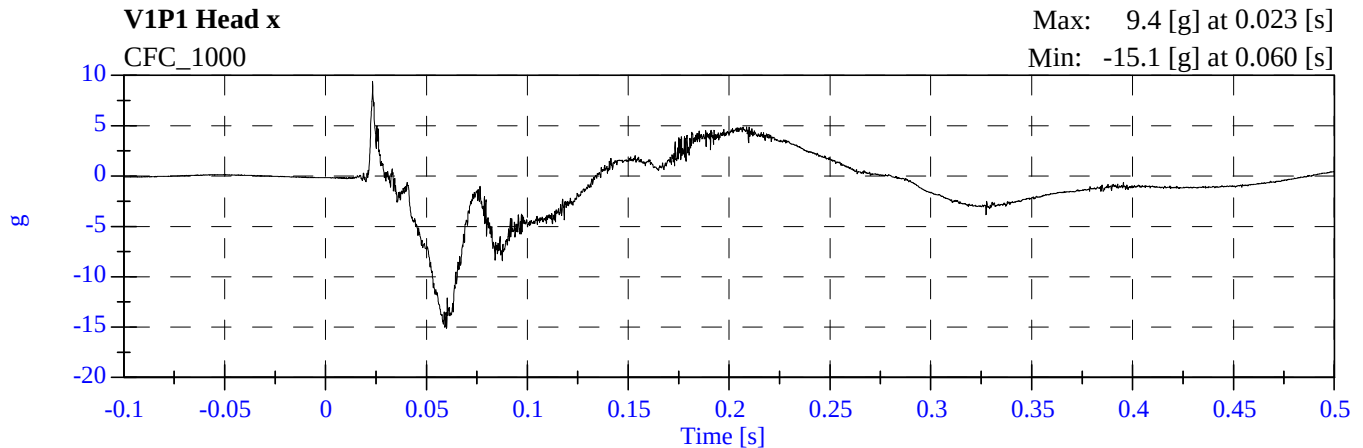
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| PLOT | PLOT NAME[UNITS, CHANNEL FILTER CLASS]      | PAGE |
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| 1    | V1P1 Head x [g, CFC_1000]                   | B-5  |
| 2    | V1P1 Head y [g, CFC_1000]                   | B-5  |
| 3    | V1P1 Head z [g, CFC_1000]                   | B-5  |
| 4    | V1P1 Head Resultant [g, CFC_1000]           | B-5  |
| 5    | V1P1 Head x Velocity [kph, CFC_180]         | B-6  |
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| 8    | V1P1 Upper Neck Fx [N, CFC_1000]            | B-7  |
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| 19   | V1P1 Lower Rib y Velocity [kph, CFC_180]    | B-9  |
| 20   | V1P1 Lower Spine y [g, CFC_180]             | B-10 |
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| 22   | V1P1 Pelvic y [g, CFC_1000]                 | B-10 |
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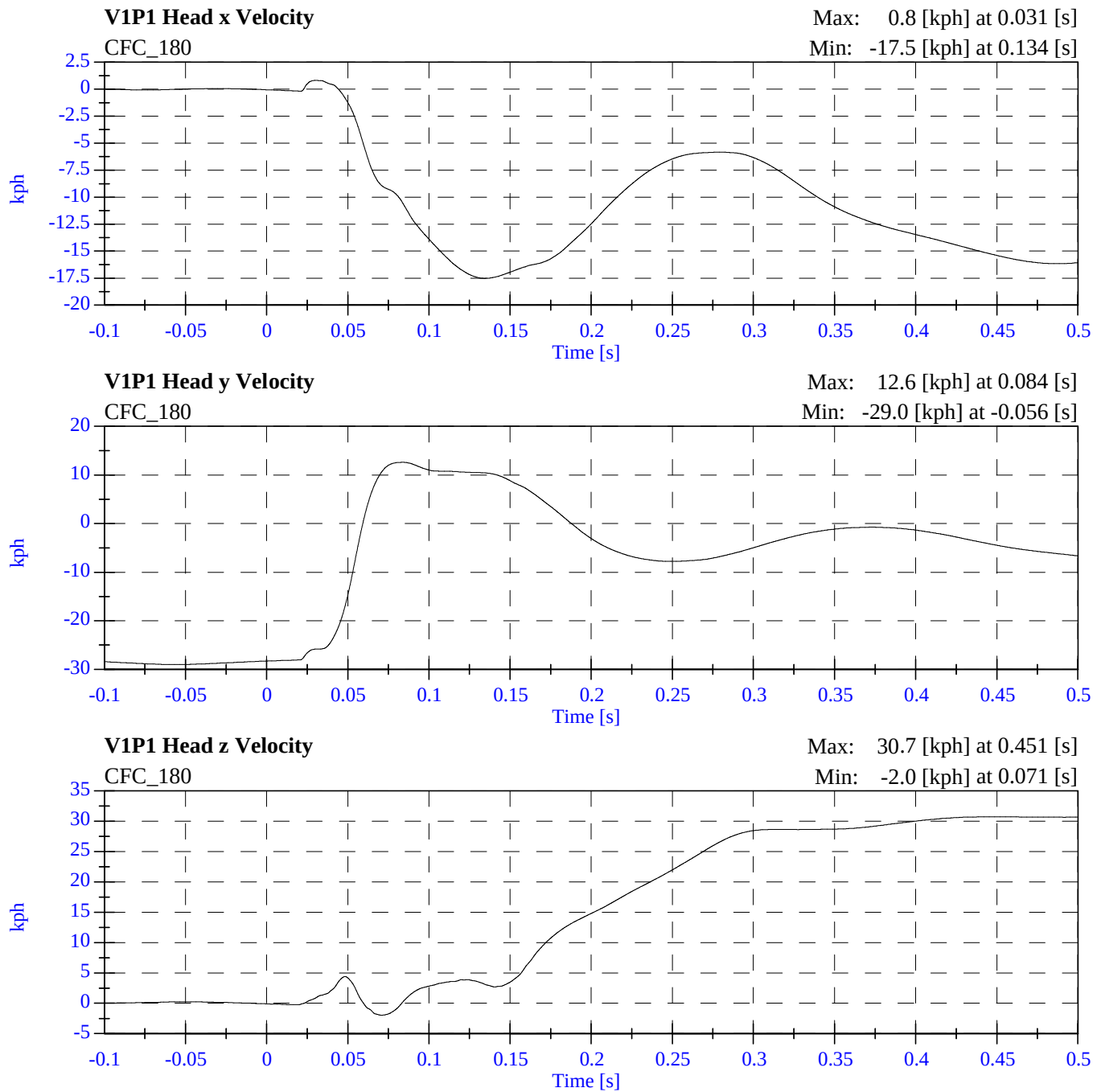
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| 51          | V1 A9 B Pillar Mid y [g, CFC_60]                    | B-18        |
| 52          | V1 A9 B Pillar Mid y Velocity [kph, CFC_180]        | B-18        |
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| 55          | V1 A11 Engine Top x [g, CFC_60]                     | B-19        |
| 56          | V1 A11 Engine Top y [g, CFC_60]                     | B-19        |
| 57          | V1 A11 Engine Top x Velocity [kph, CFC_180]         | B-19        |
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| 66          | V1 A15 Rear Deck y [g, CFC_60]                      | B-22        |
| 67          | V1 A15 Rear Deck x Velocity [kph, CFC_180]          | B-22        |
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| 75          | V1P1 Lower Spine Ry [g, FIR_100]                    | B-24        |
| 76          | V1P1 Pelvic Ry [g, FIR_100]                         | B-24        |

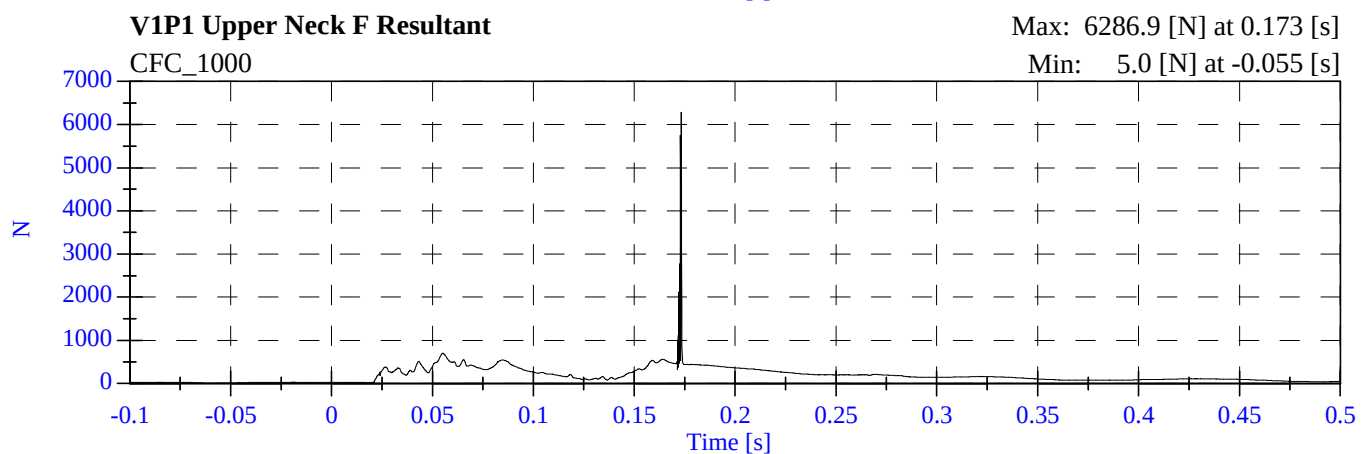
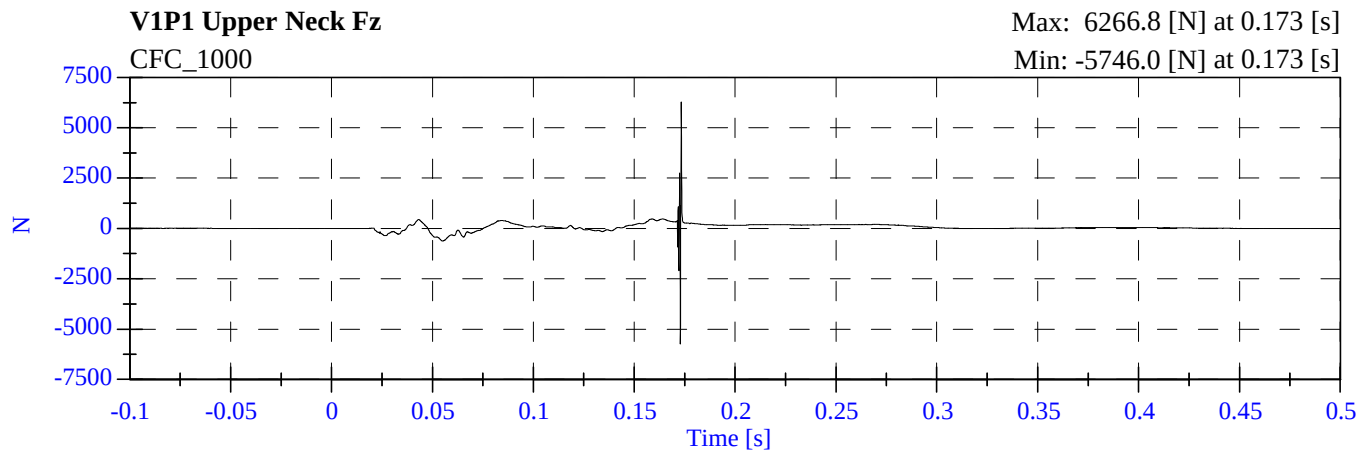
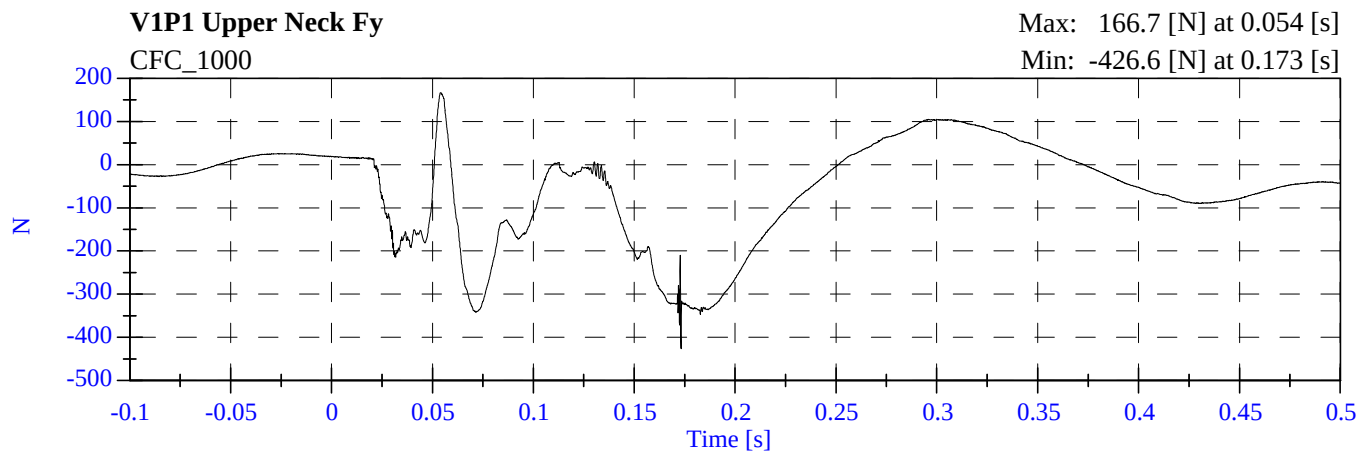
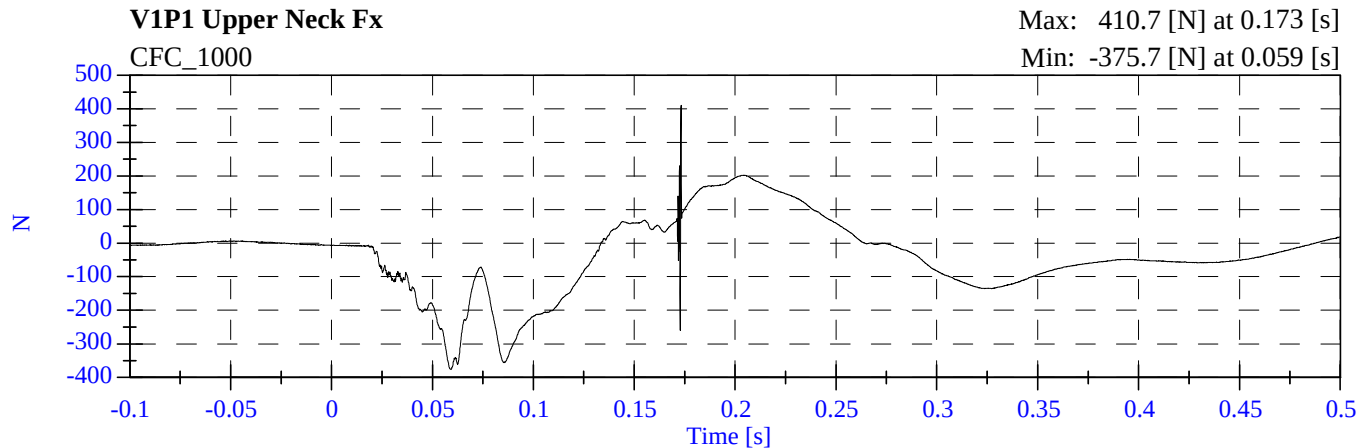
# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



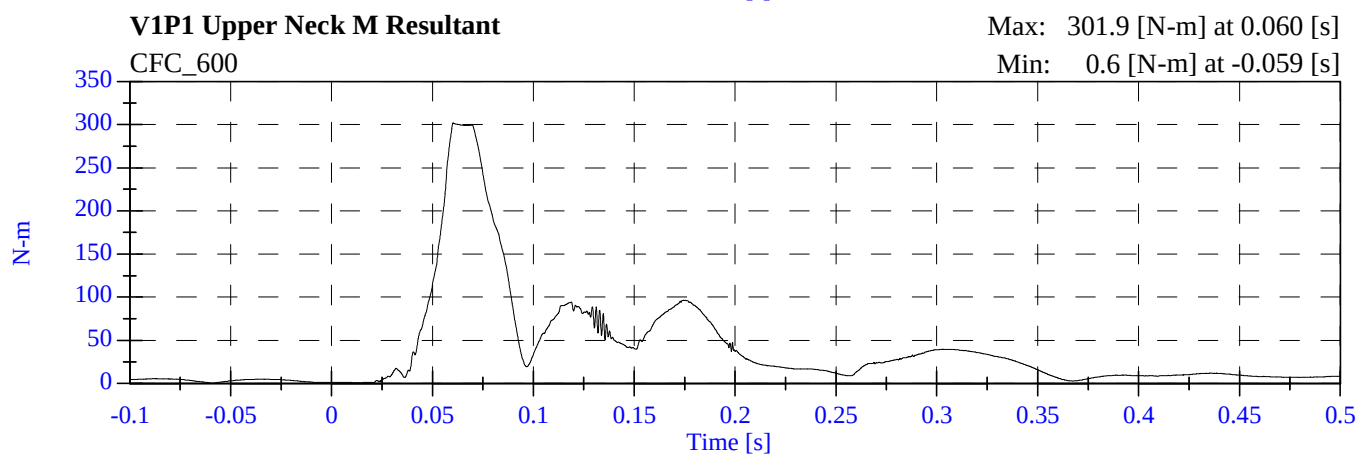
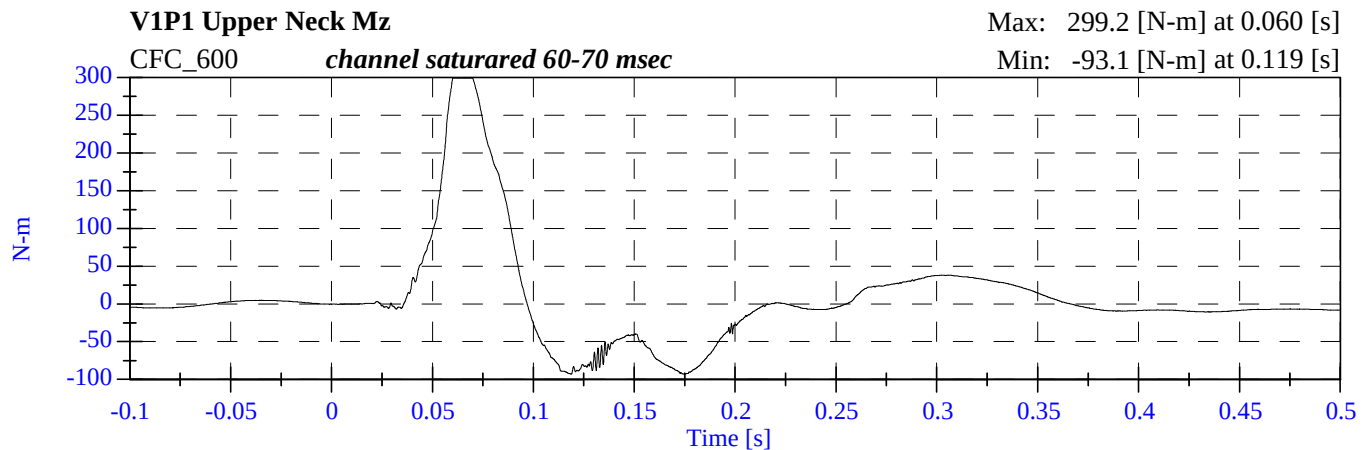
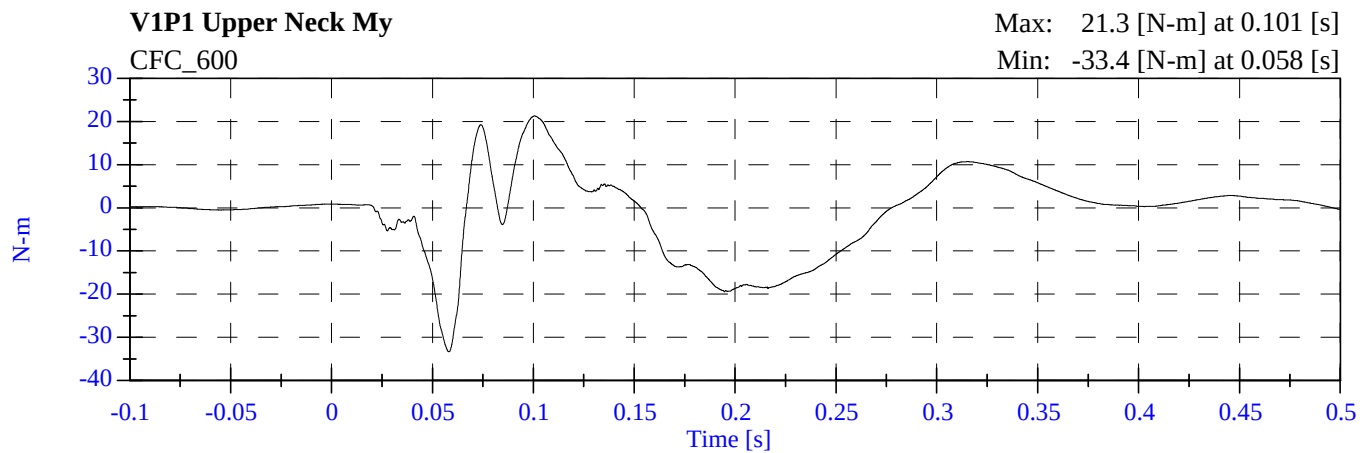
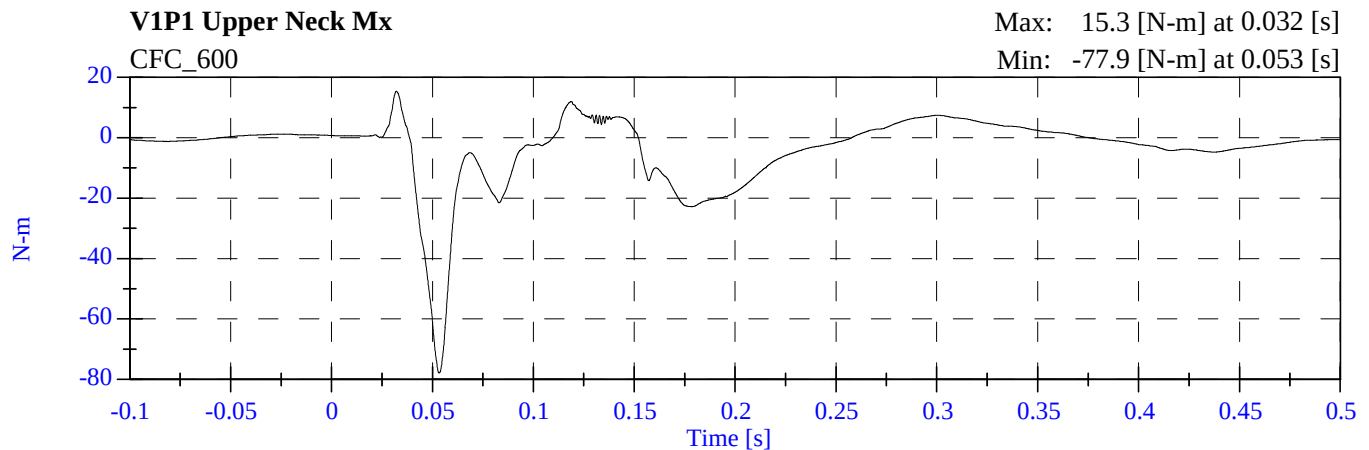
# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



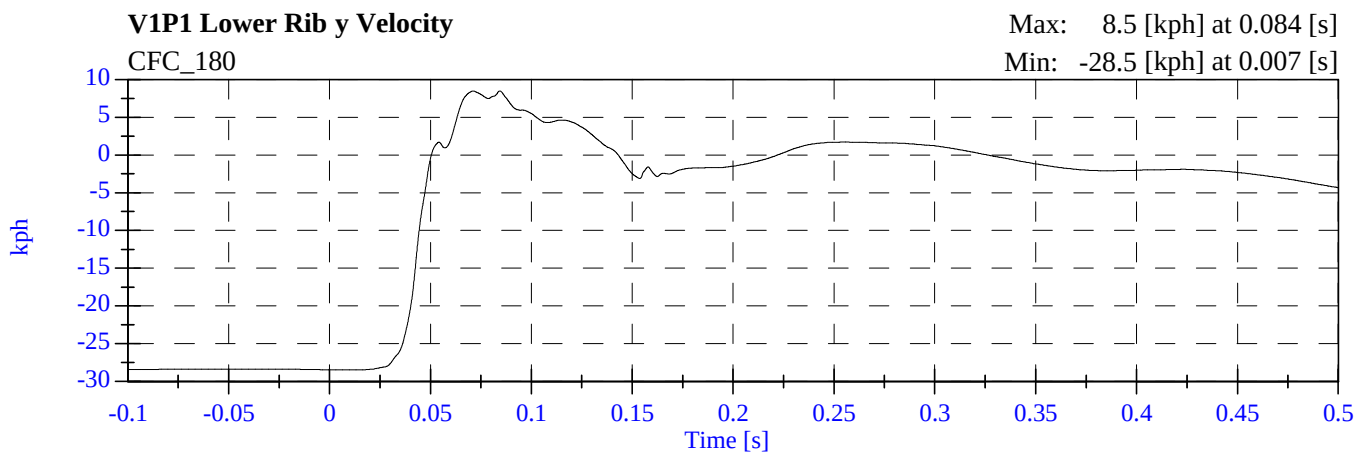
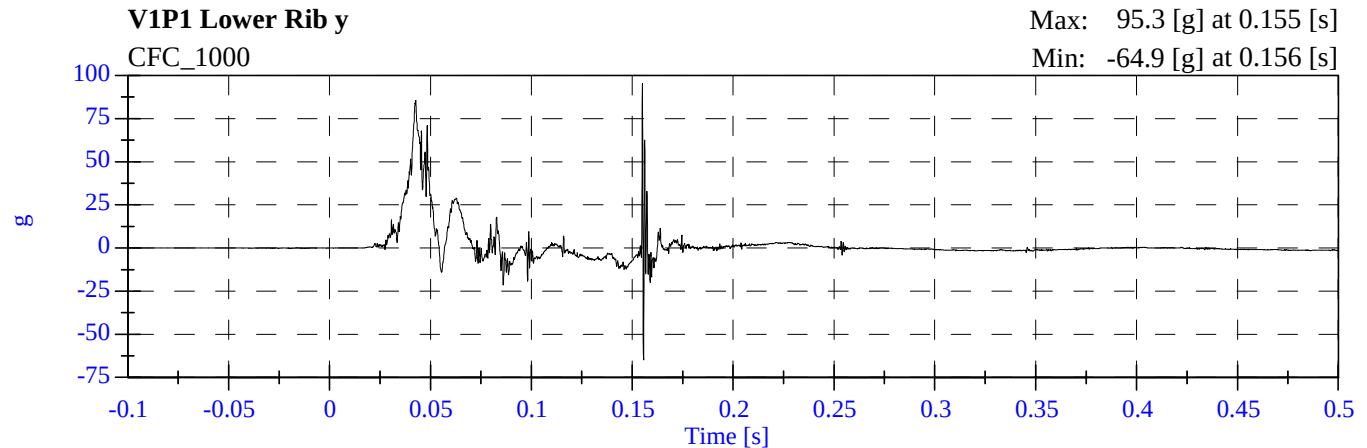
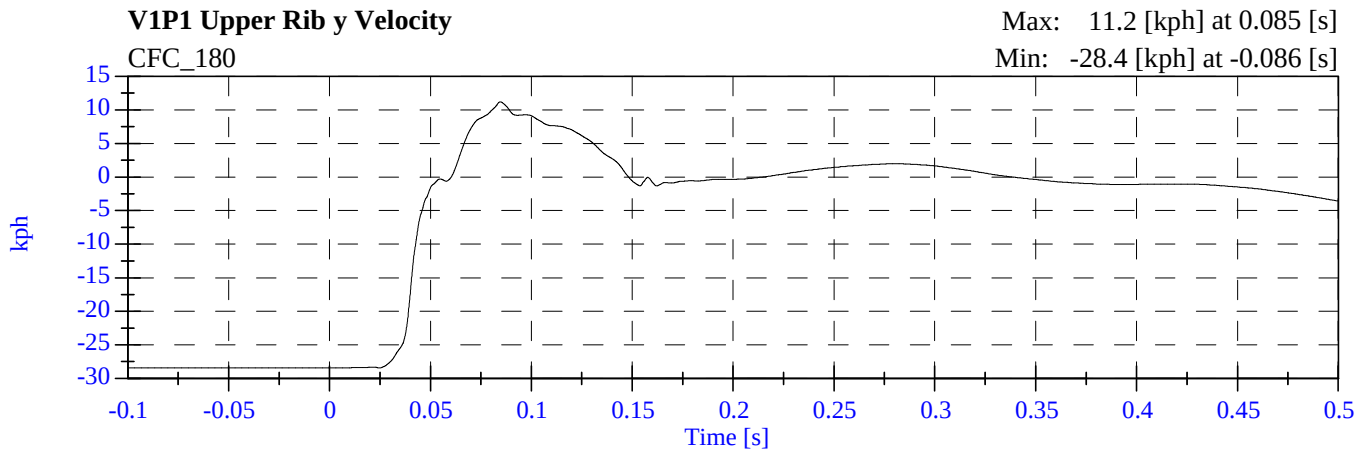
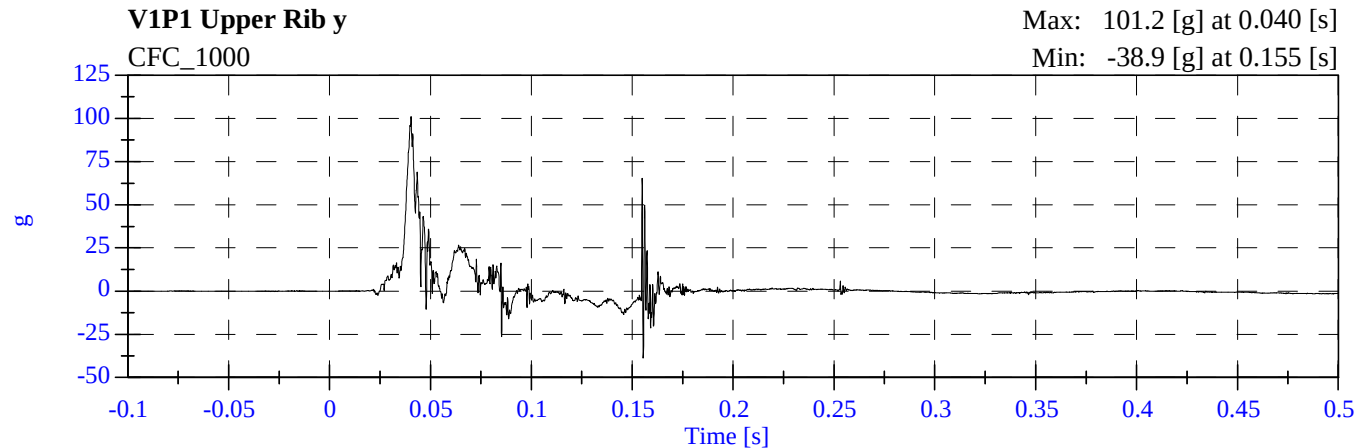
# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008

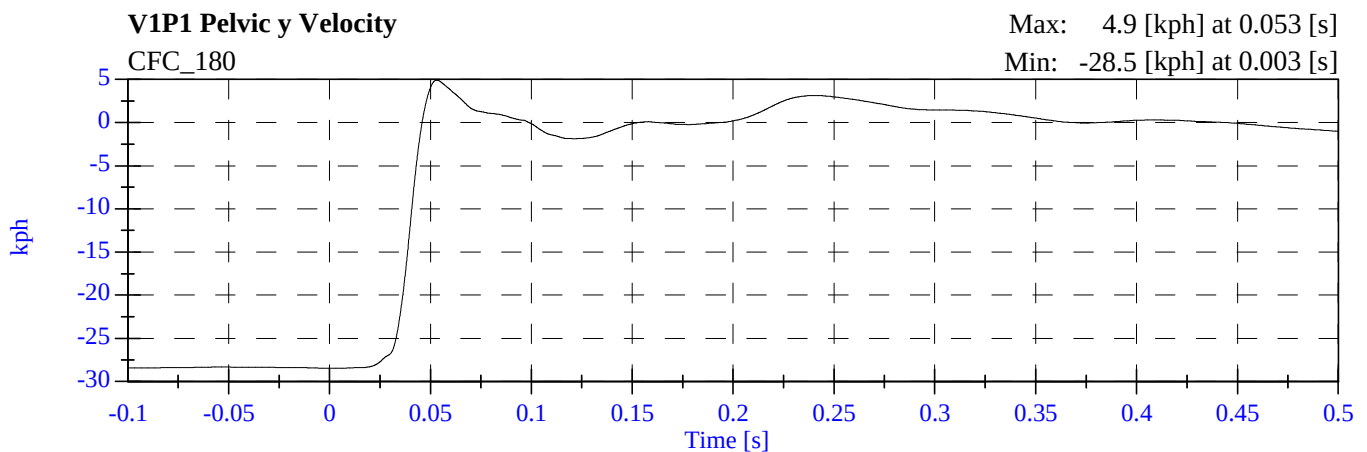
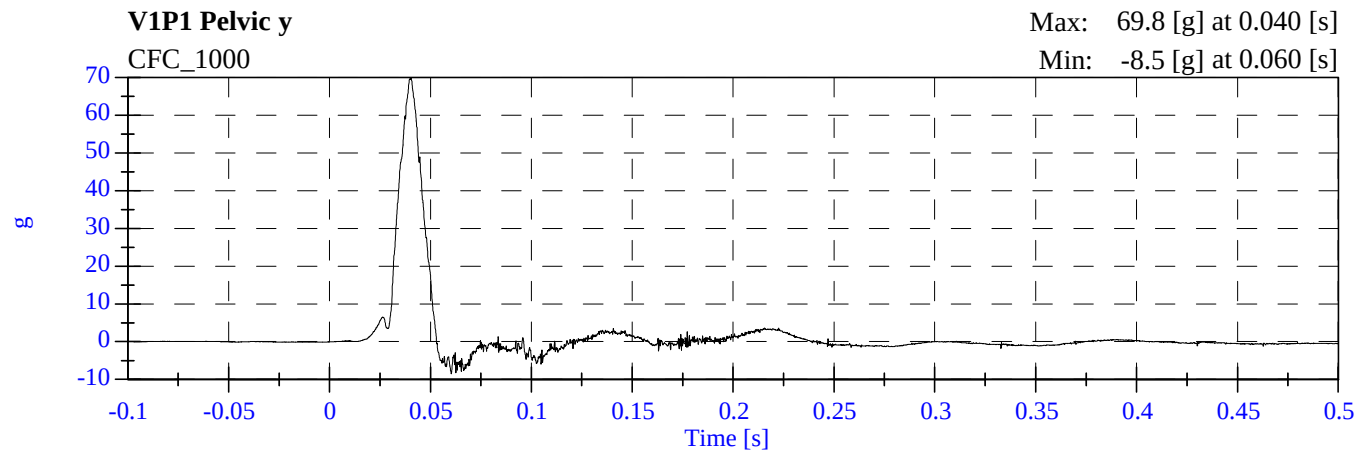
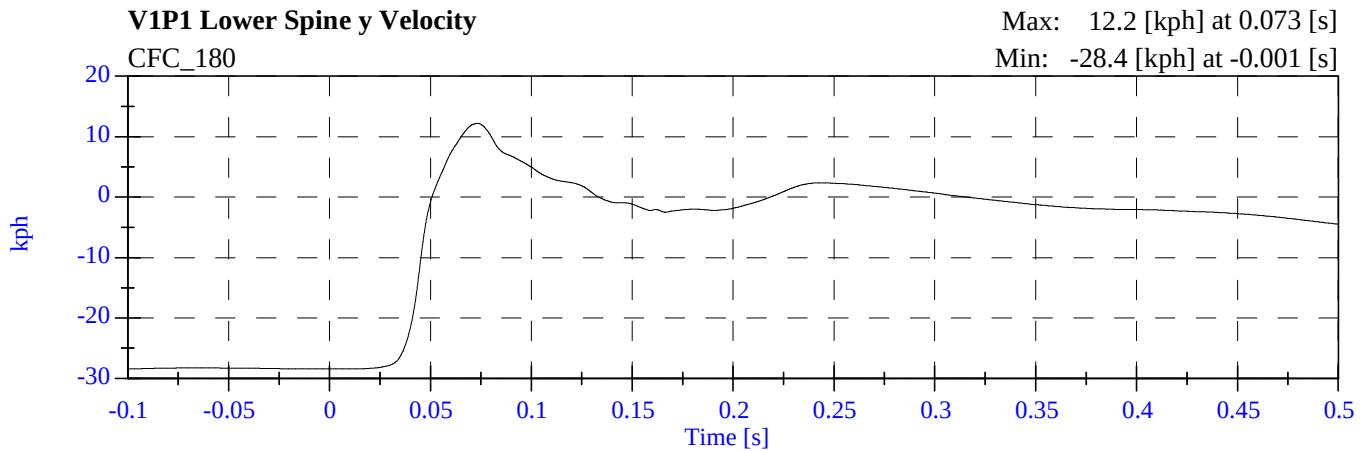
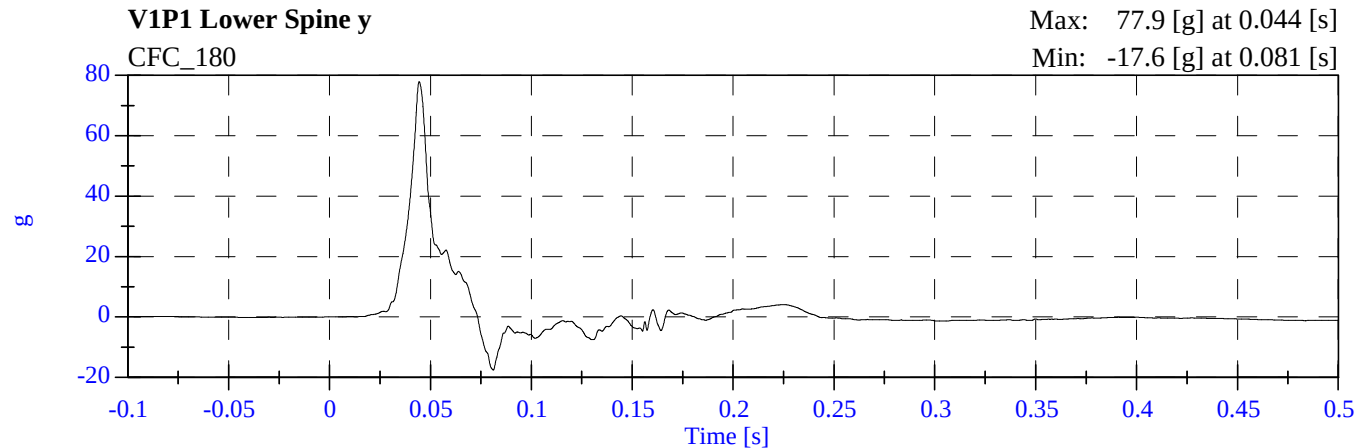


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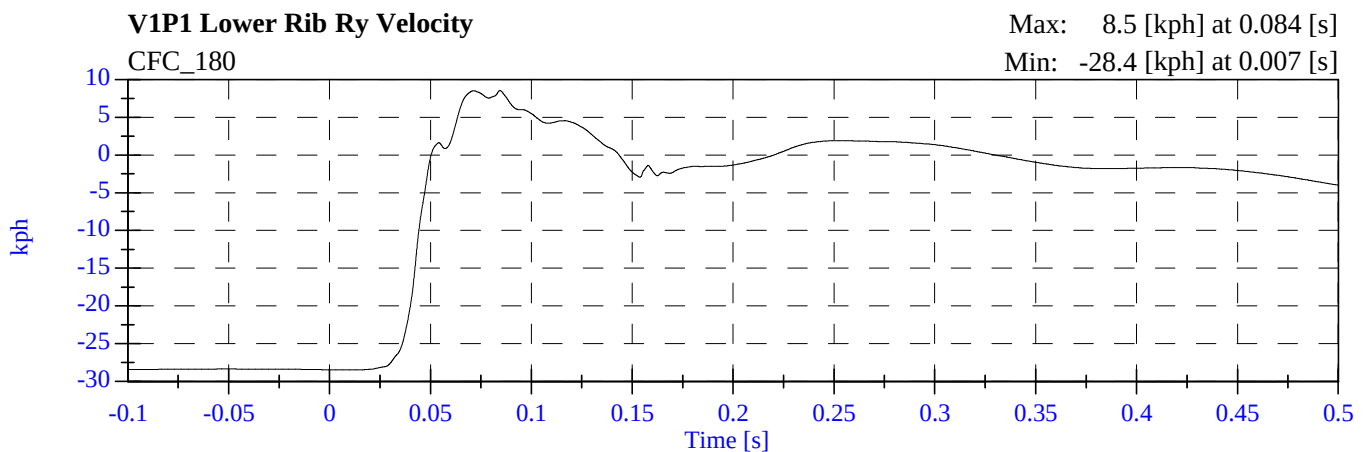
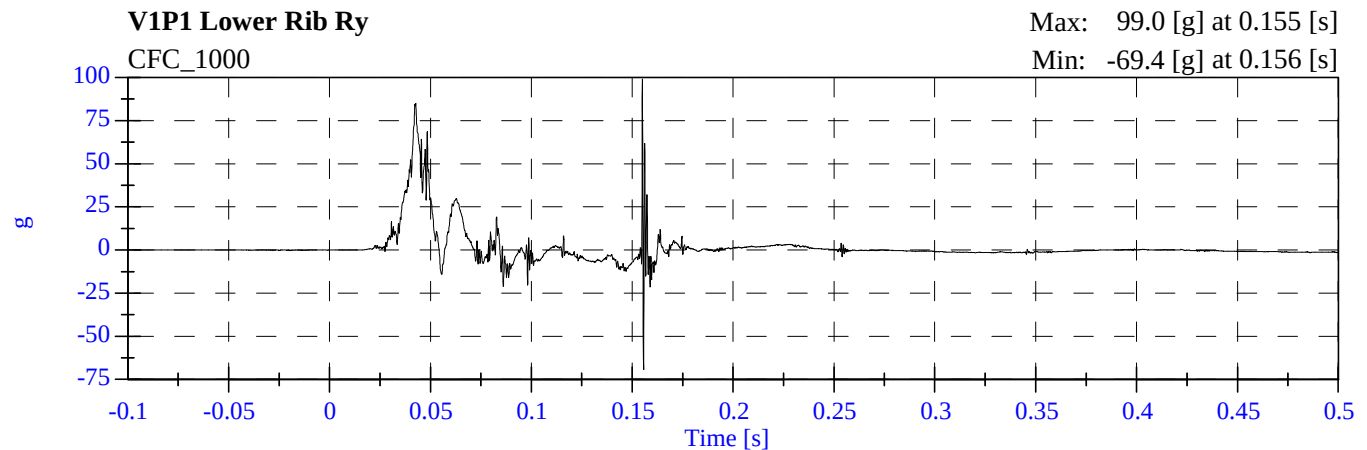
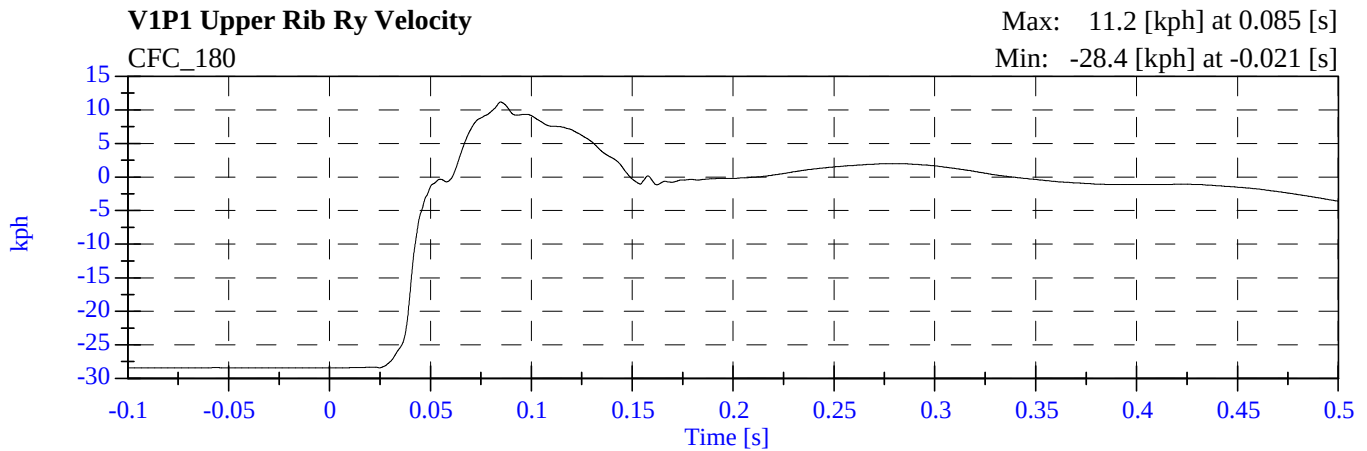
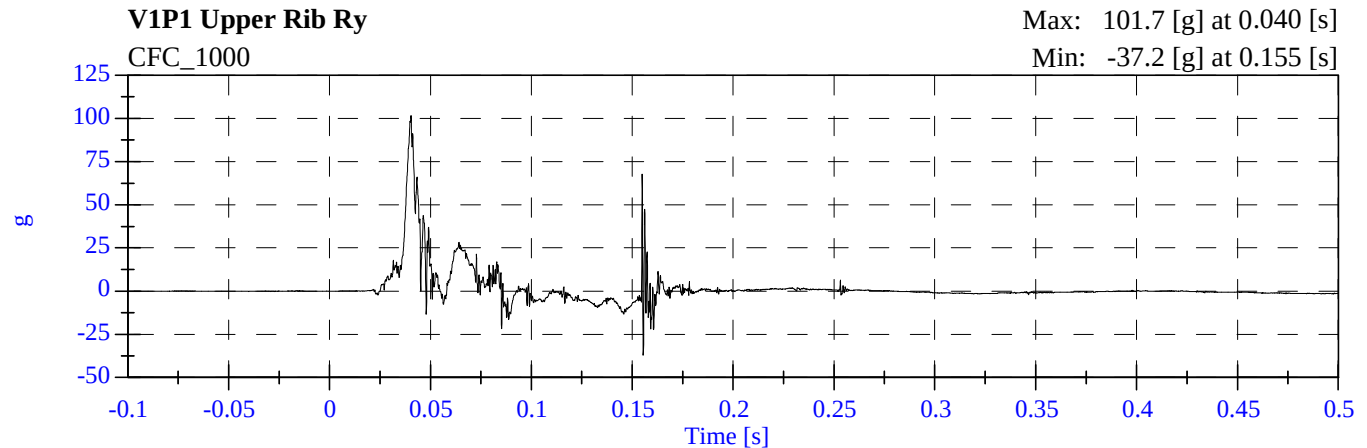


# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala

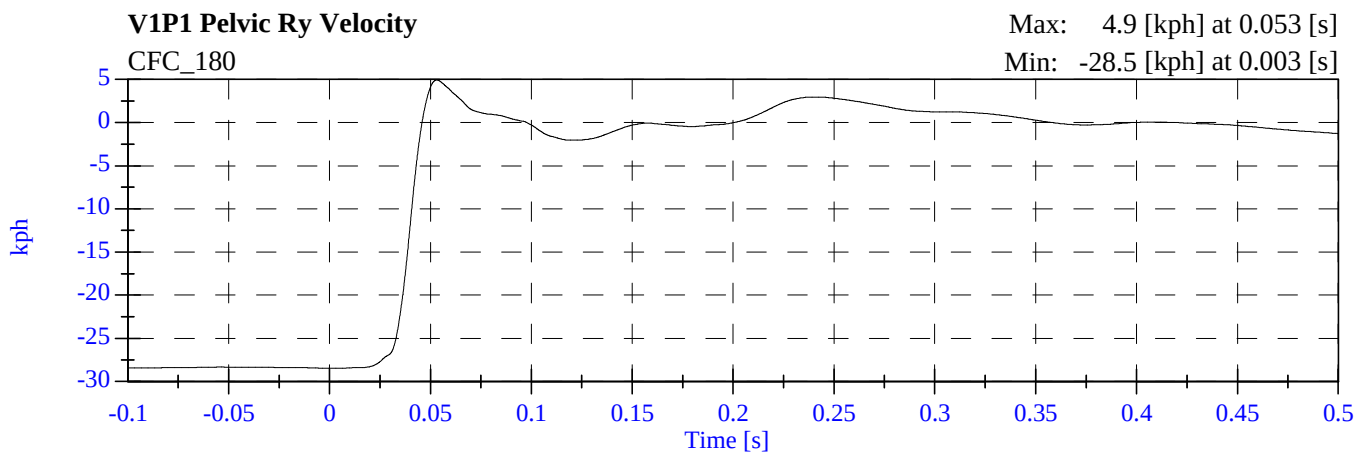
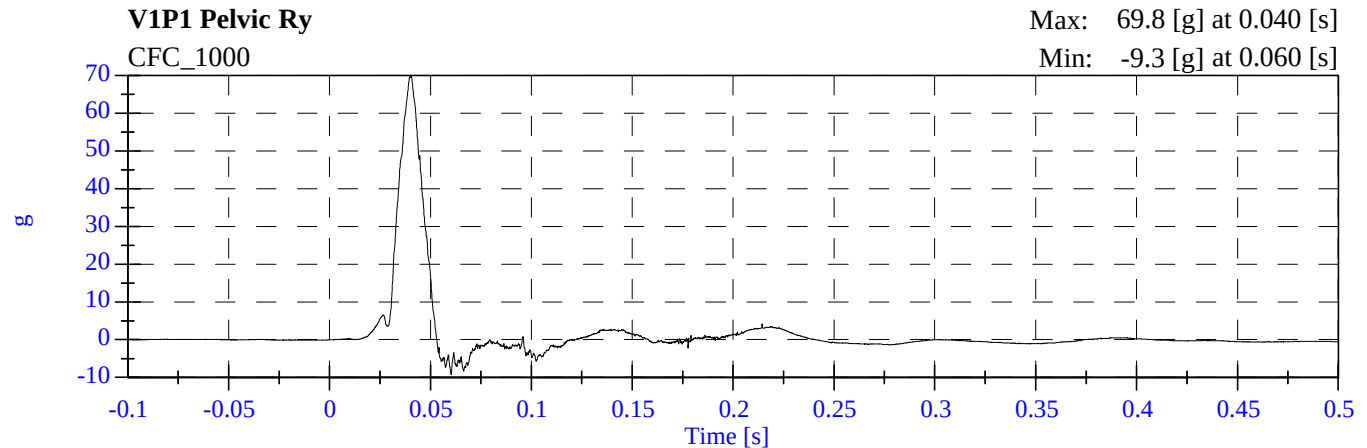
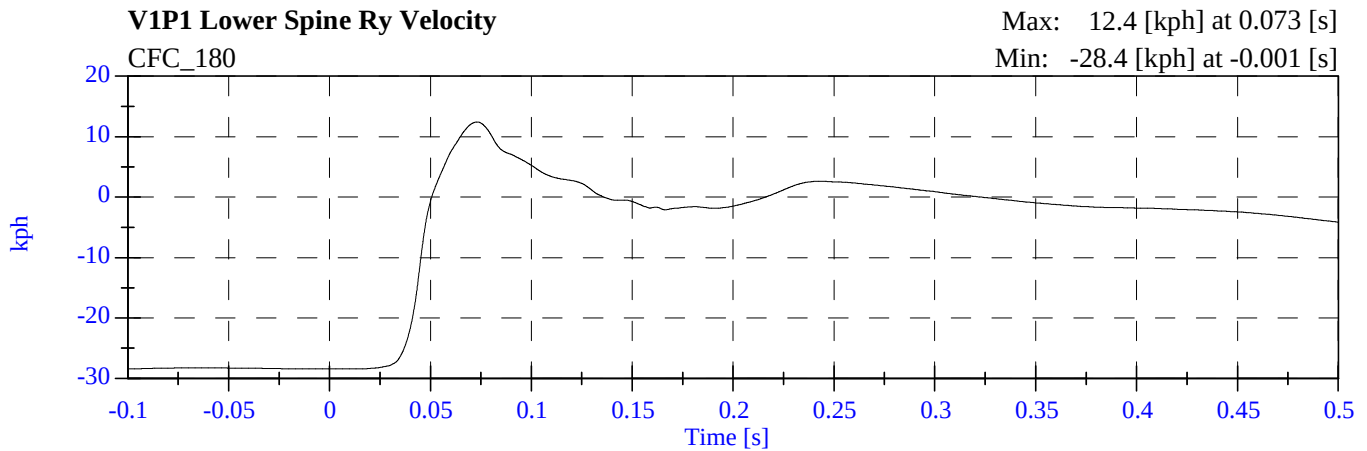
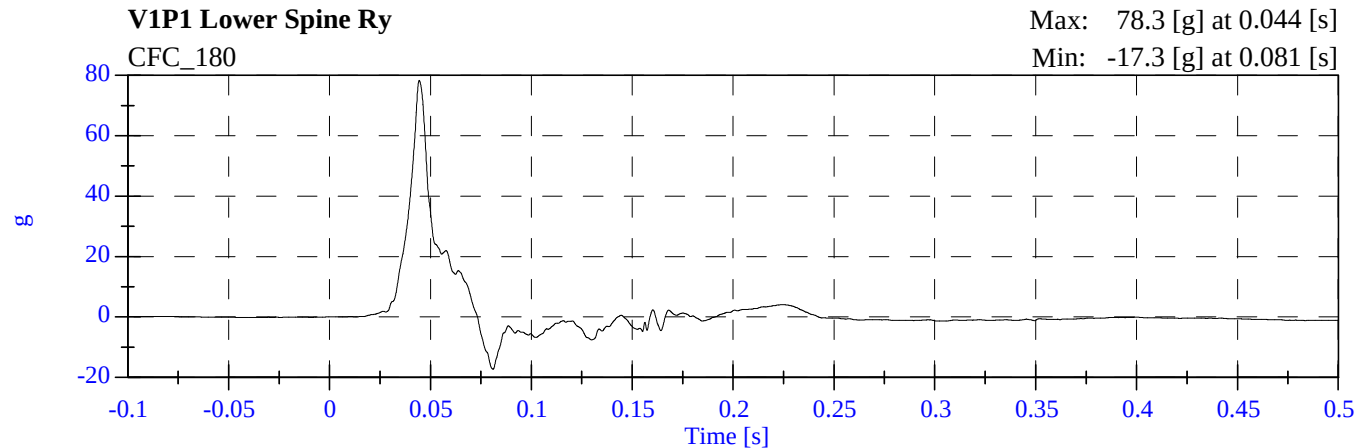
## C80108 - July 08, 2008



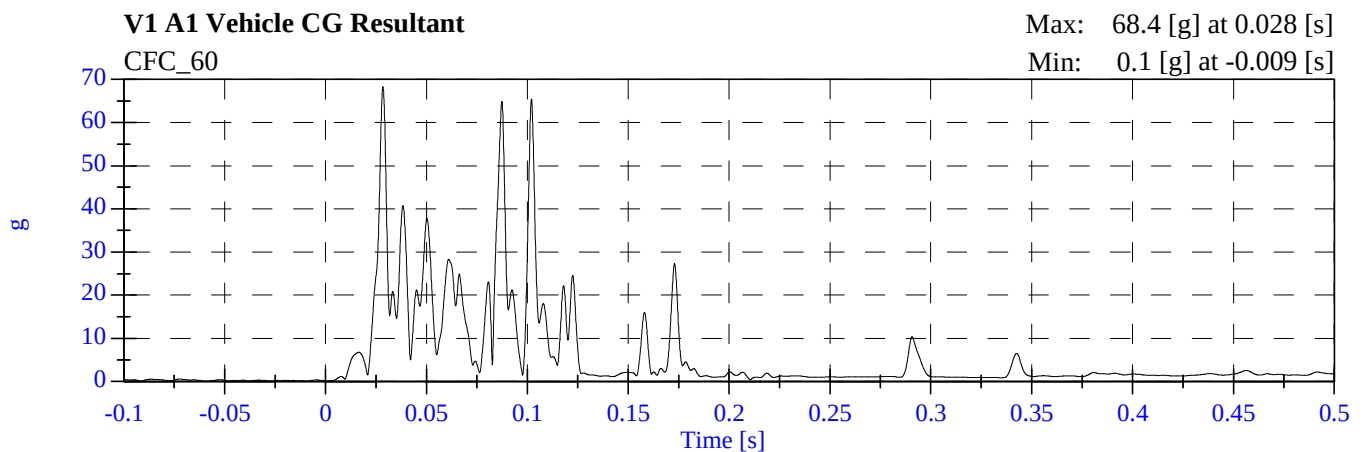
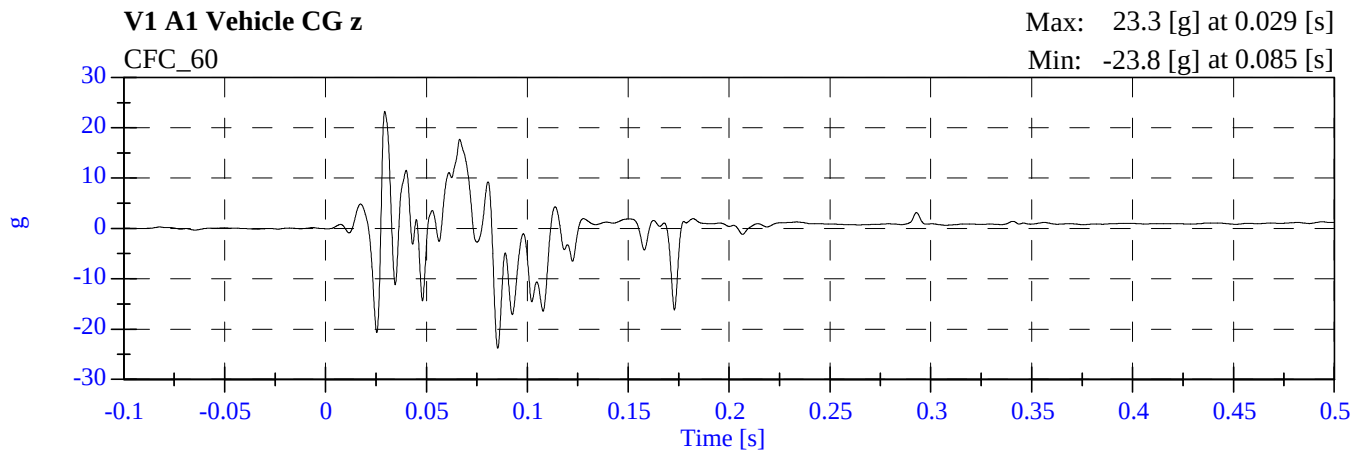
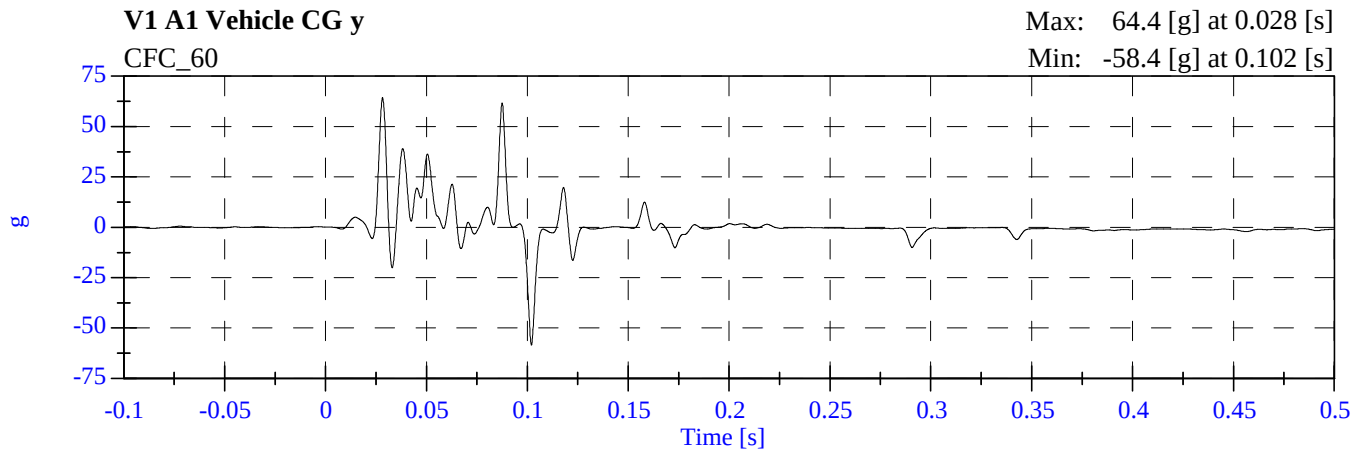
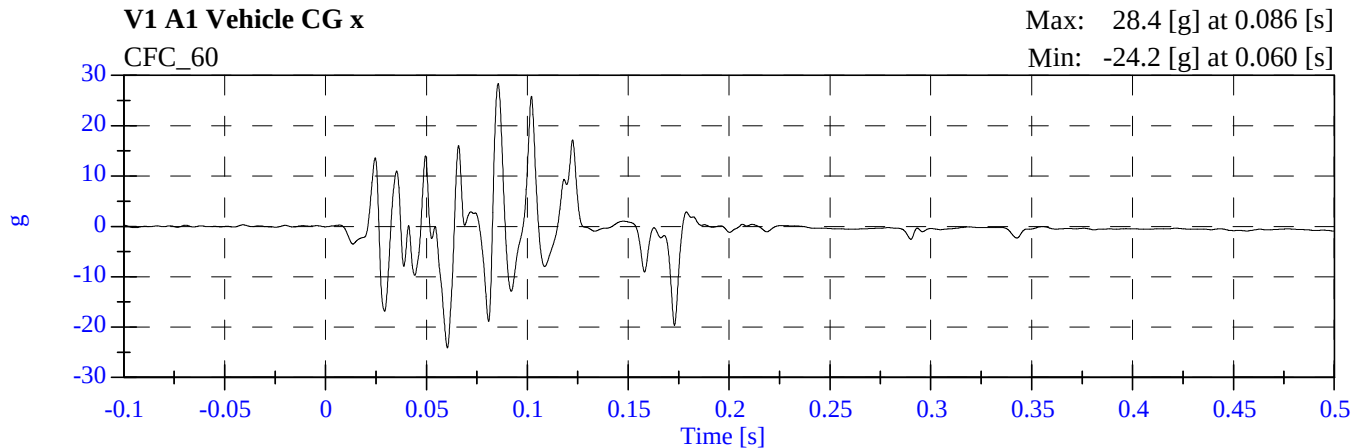
# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



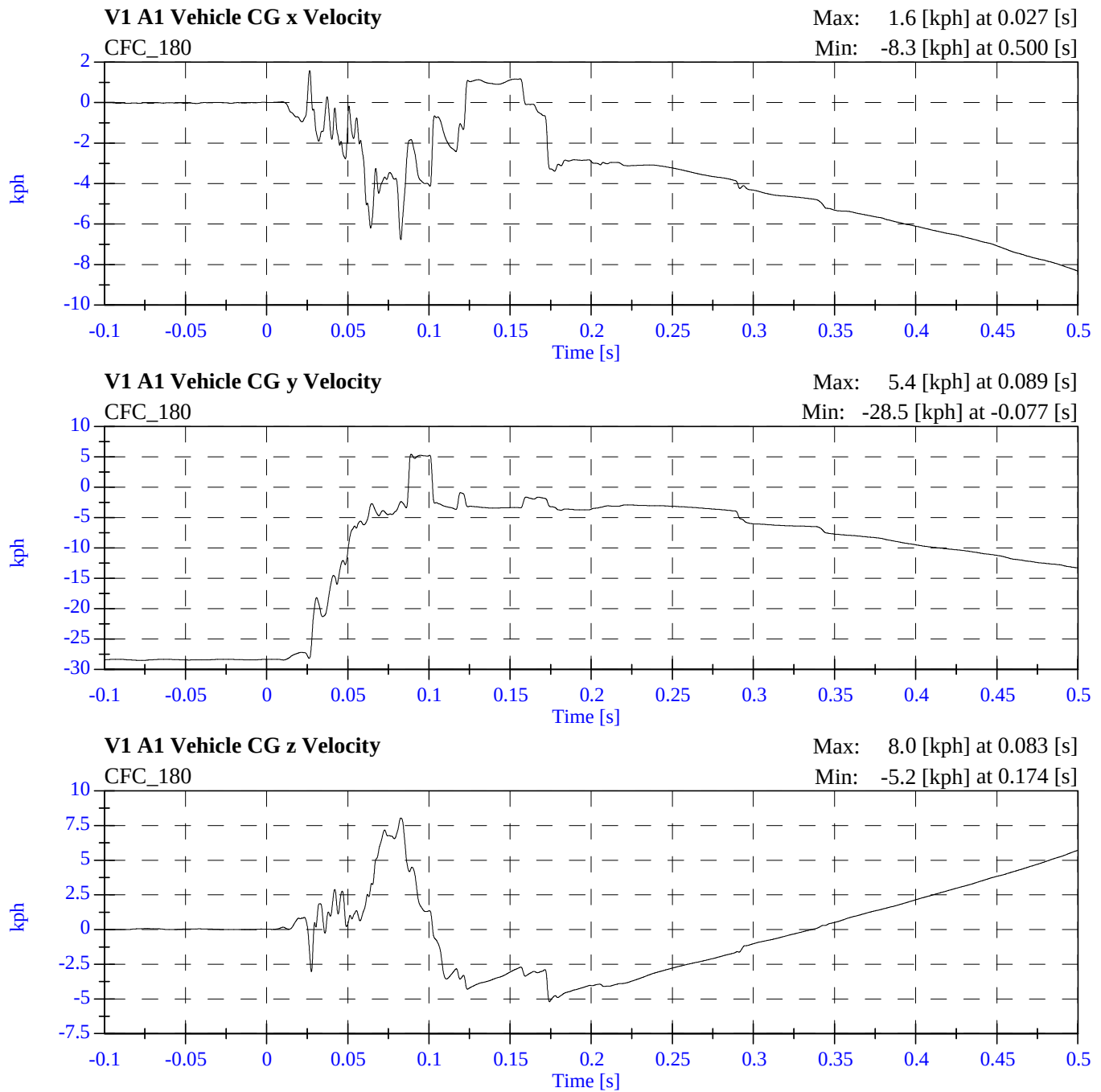
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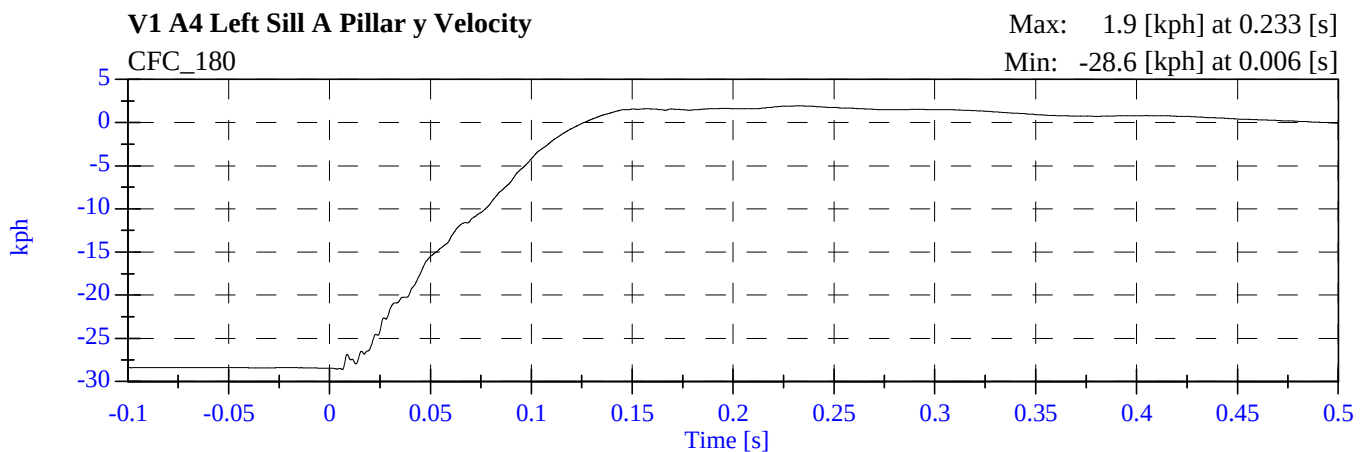
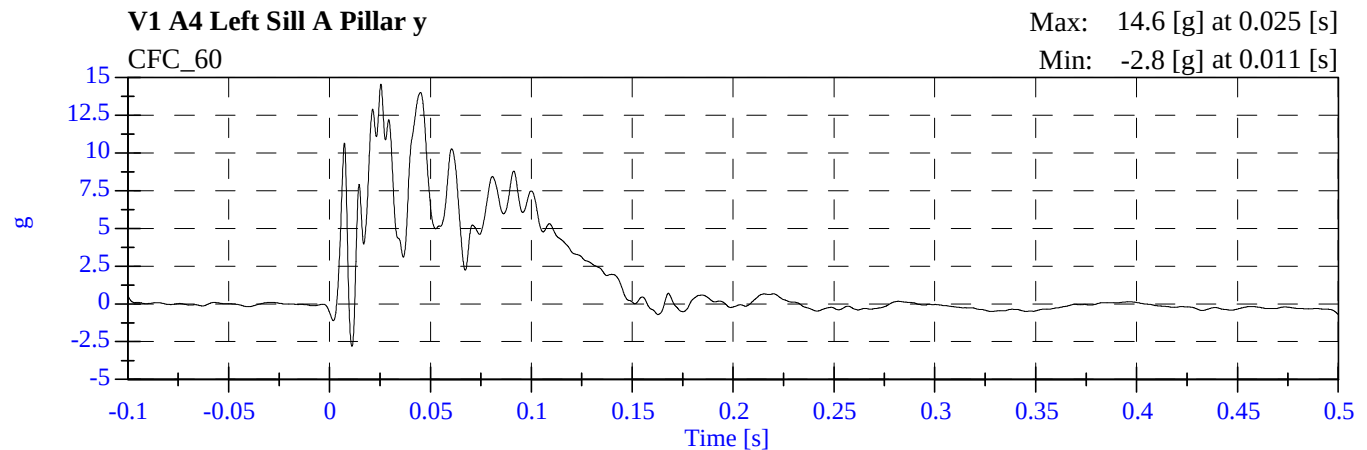
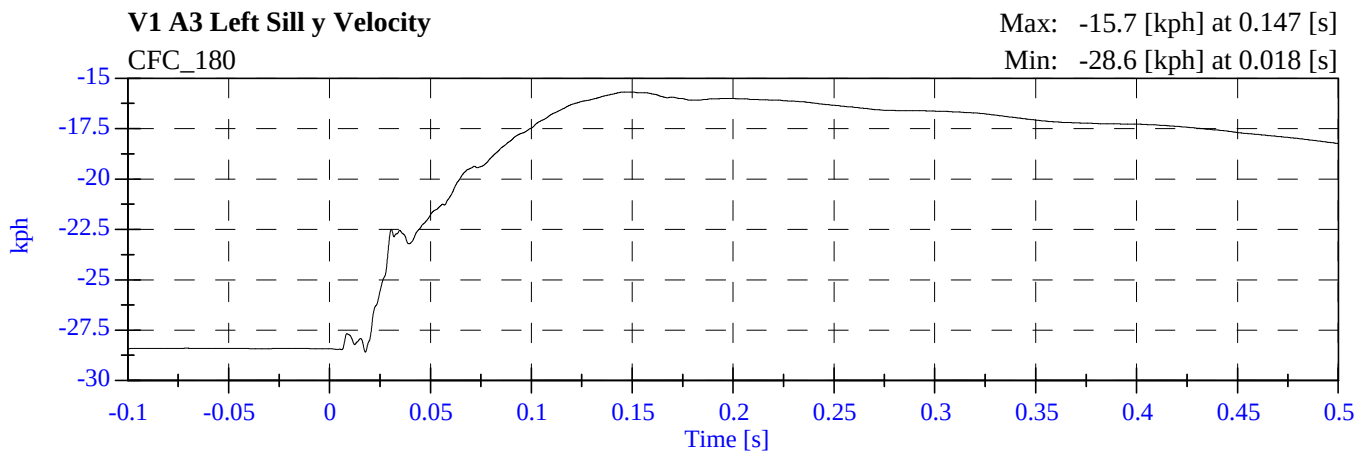
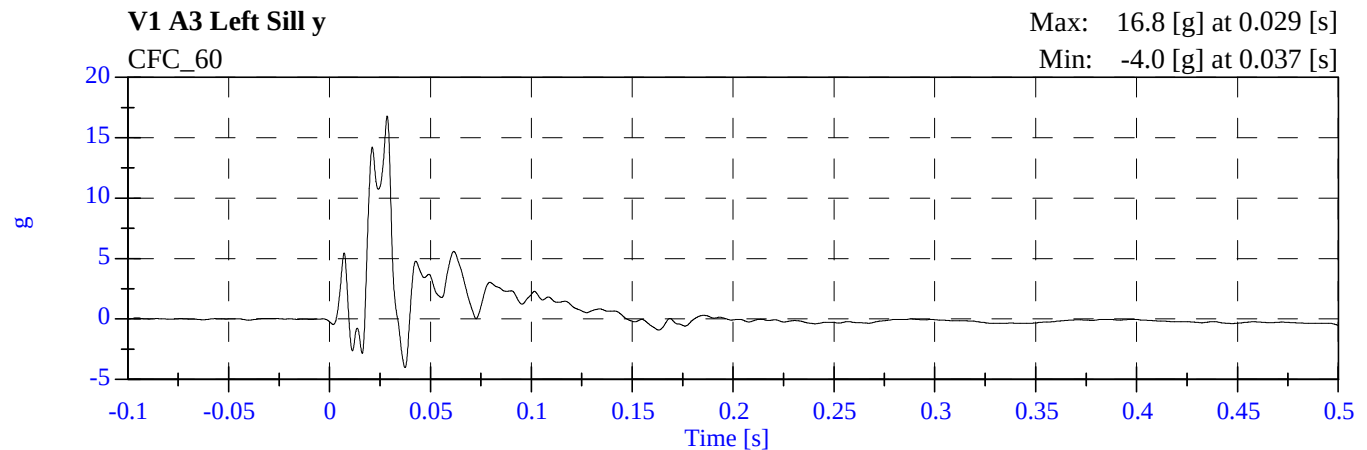
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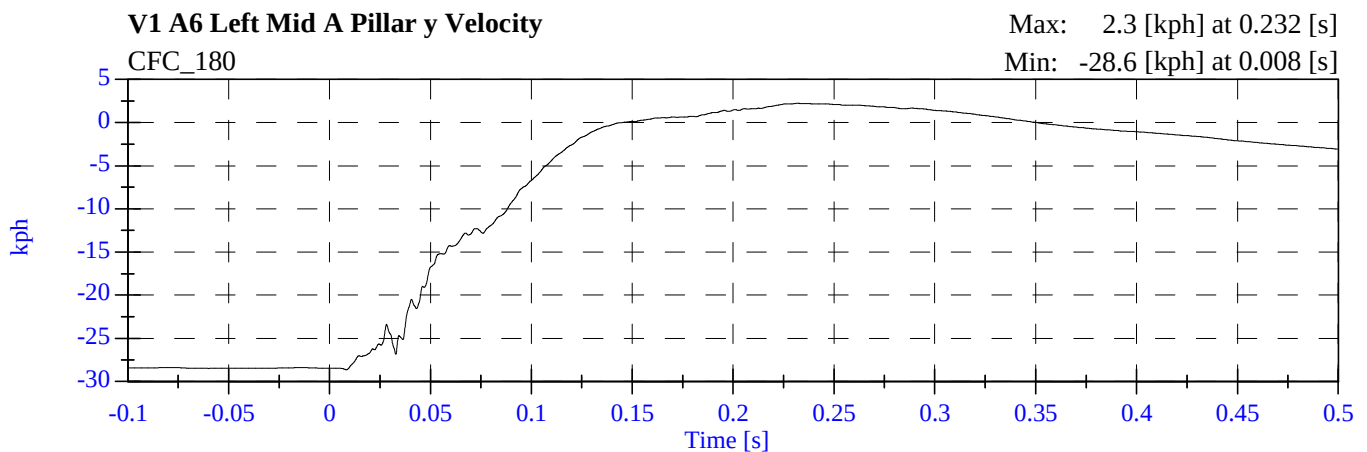
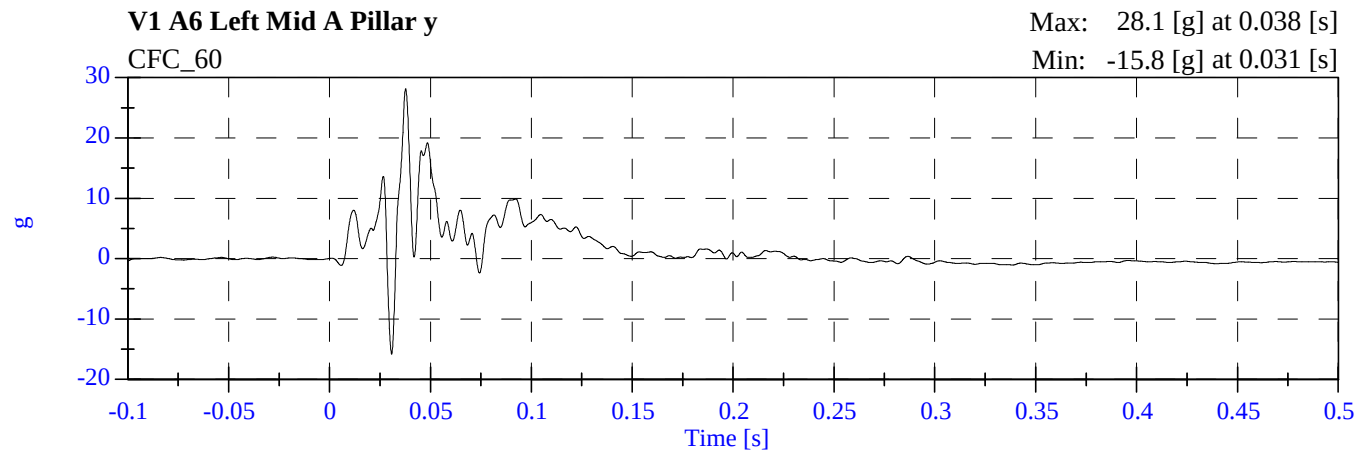
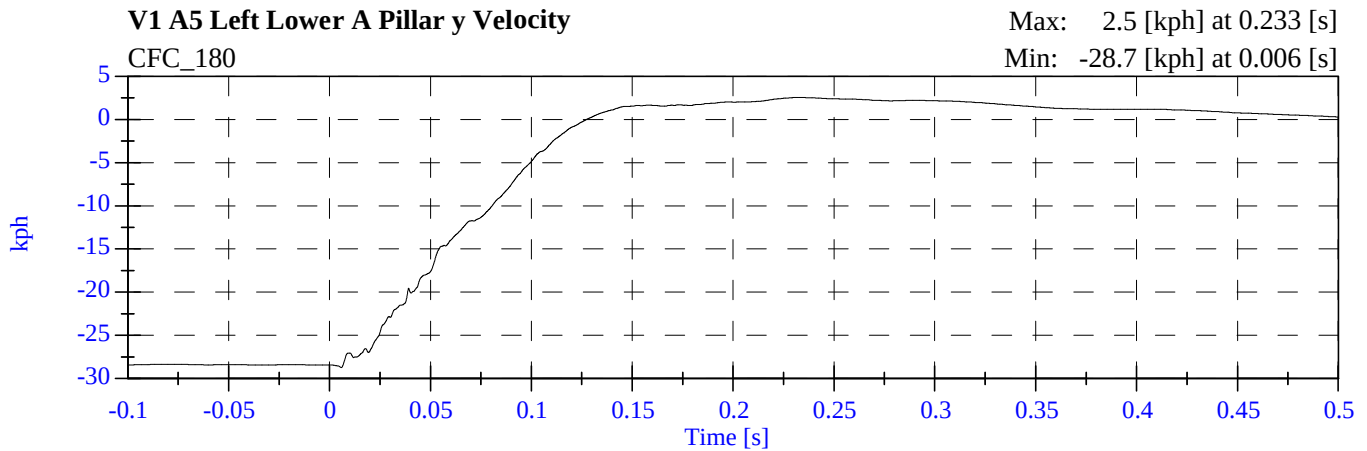
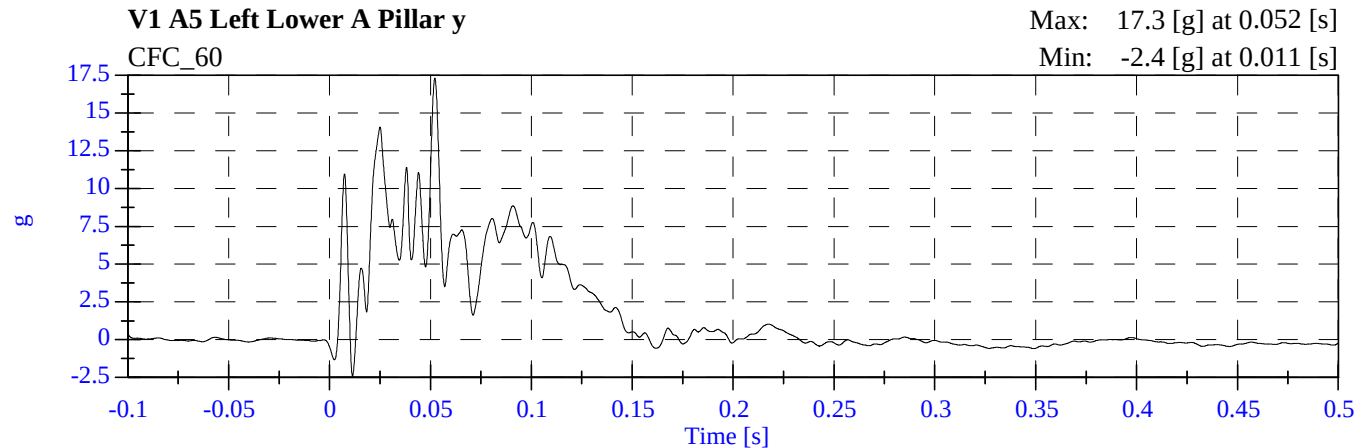
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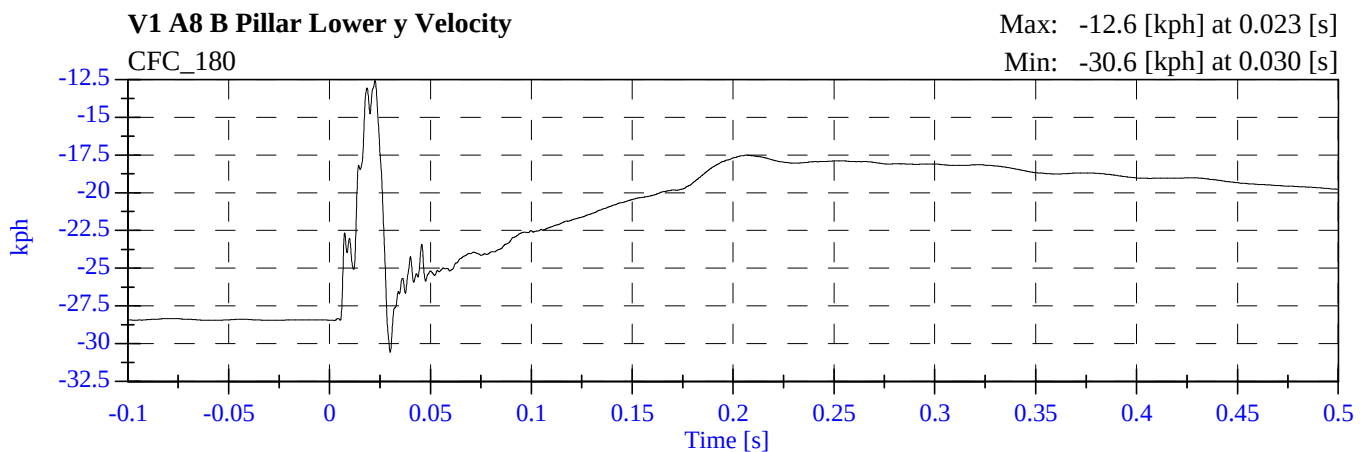
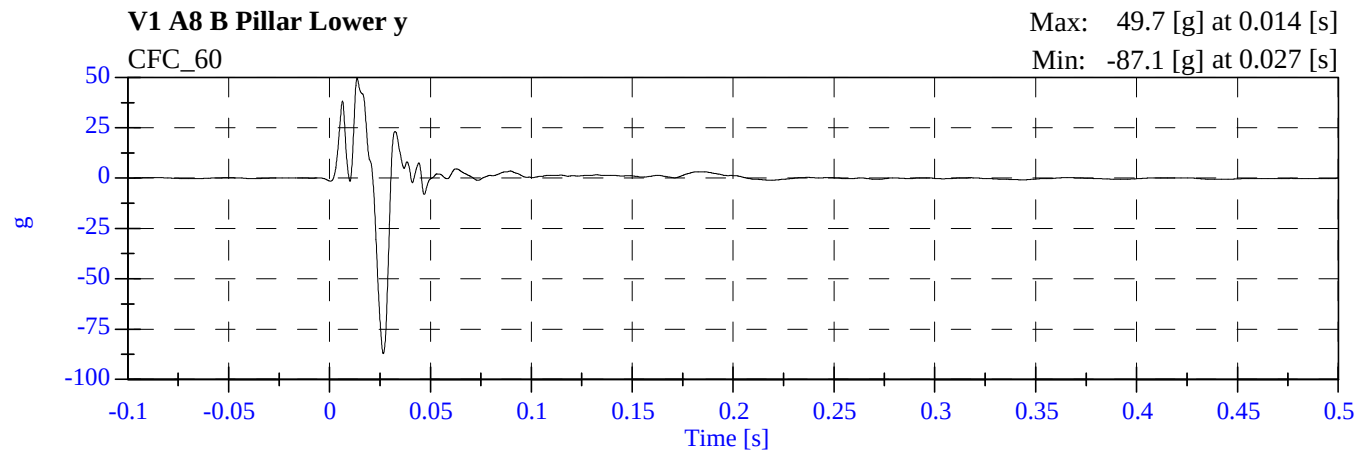
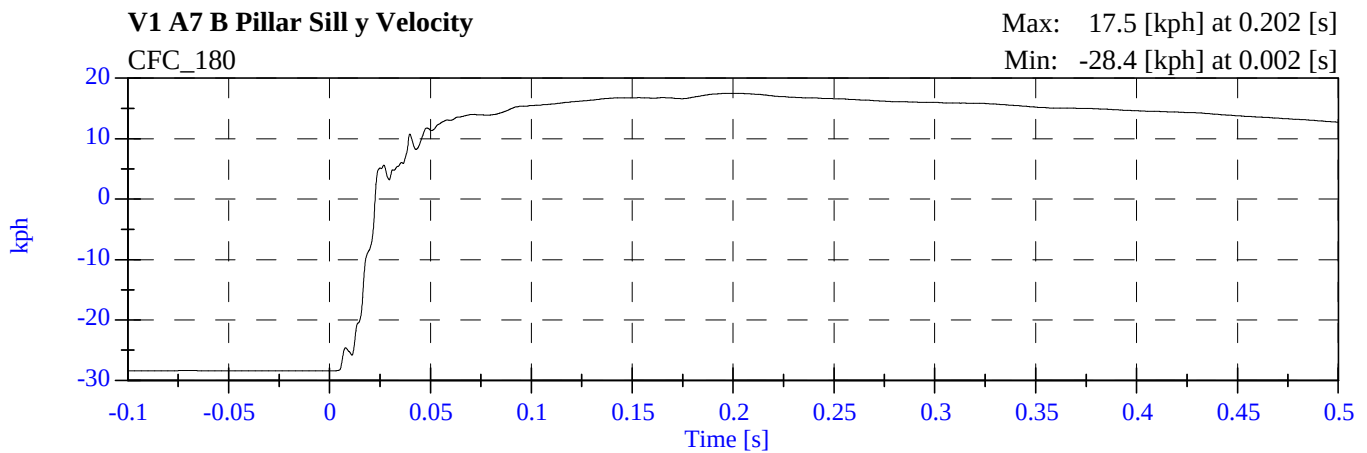
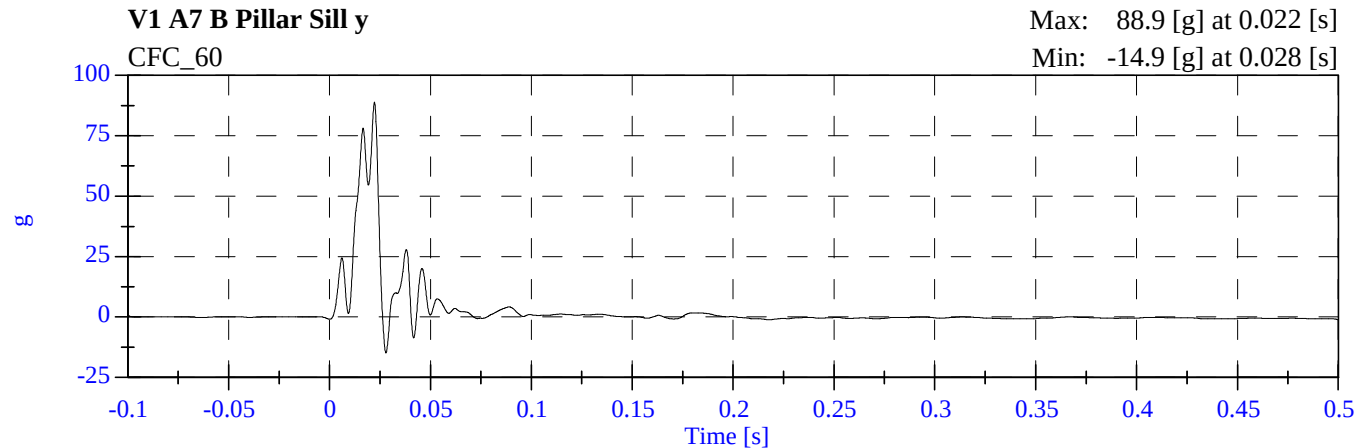


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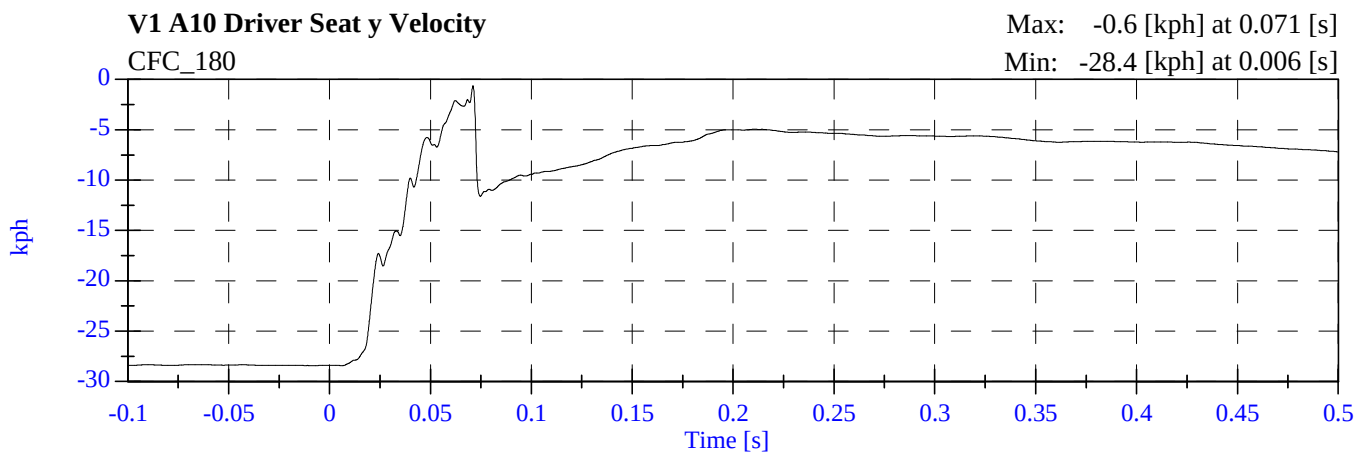
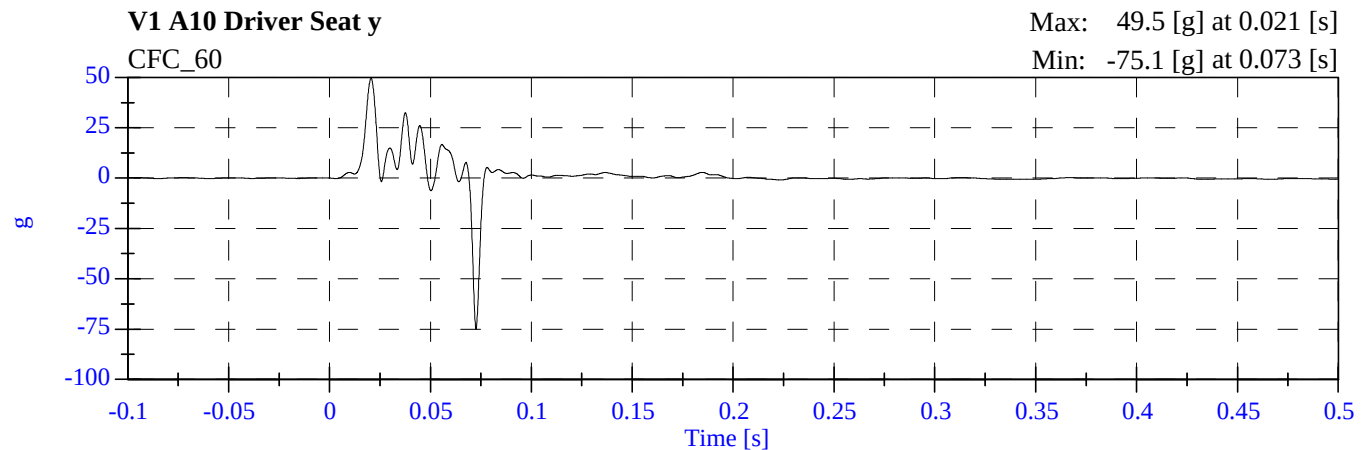
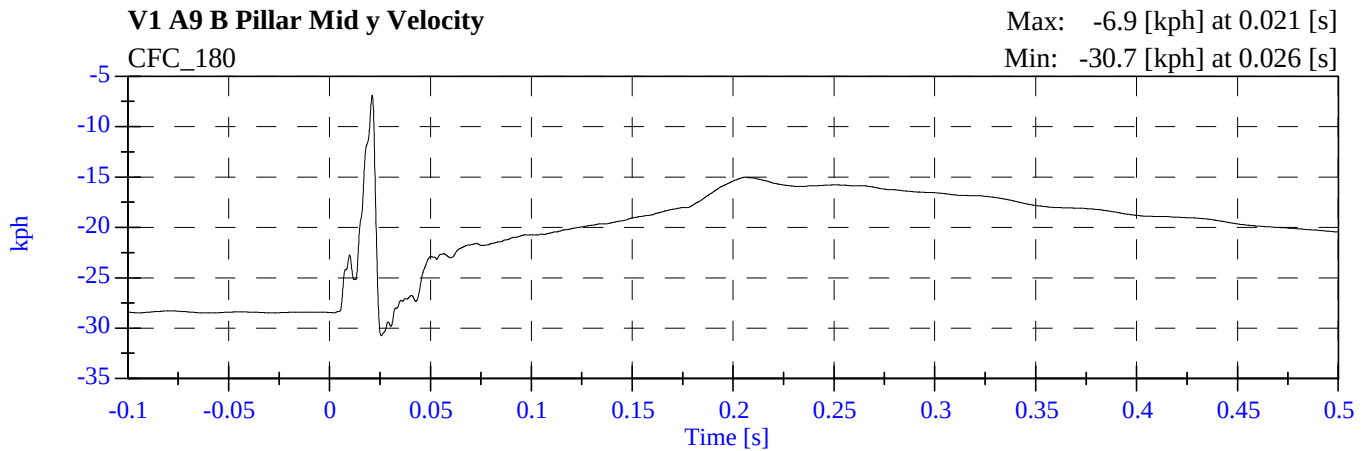
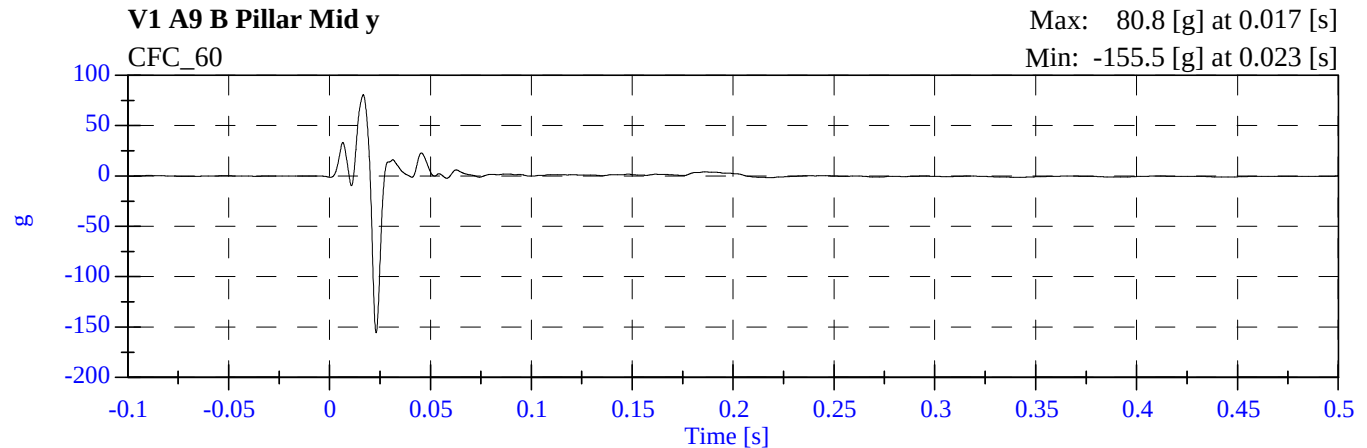


# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala

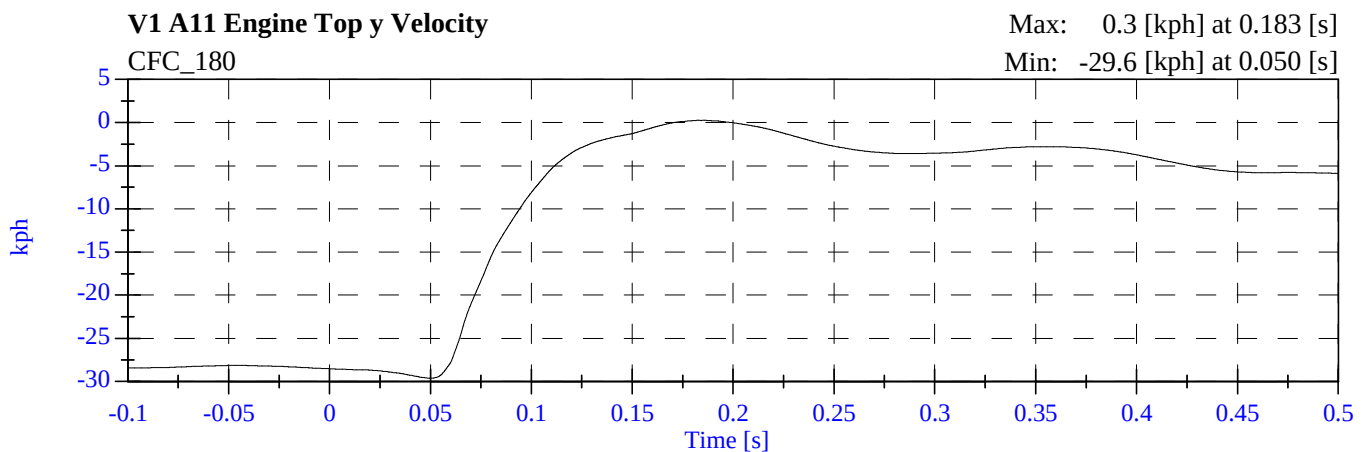
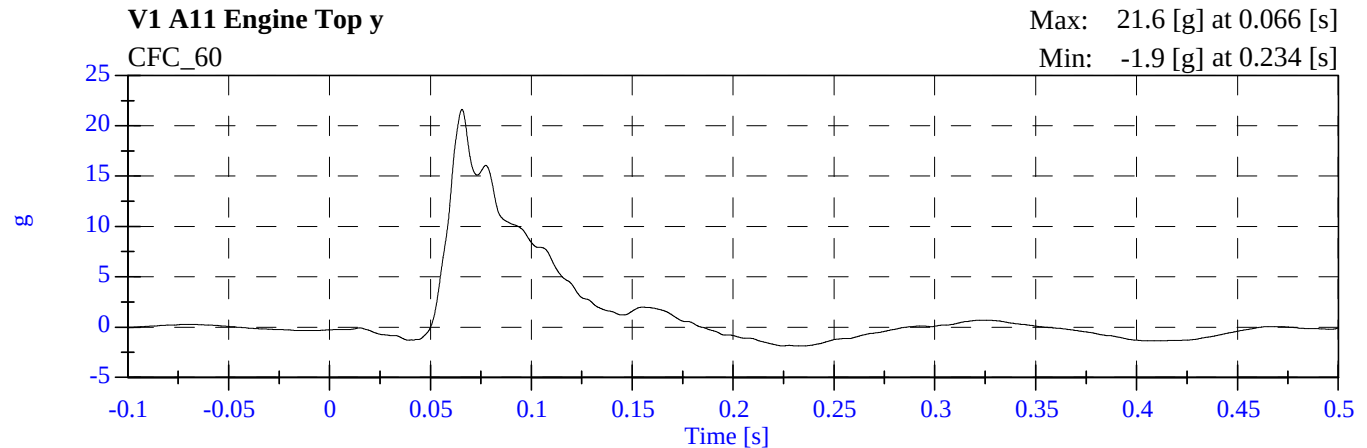
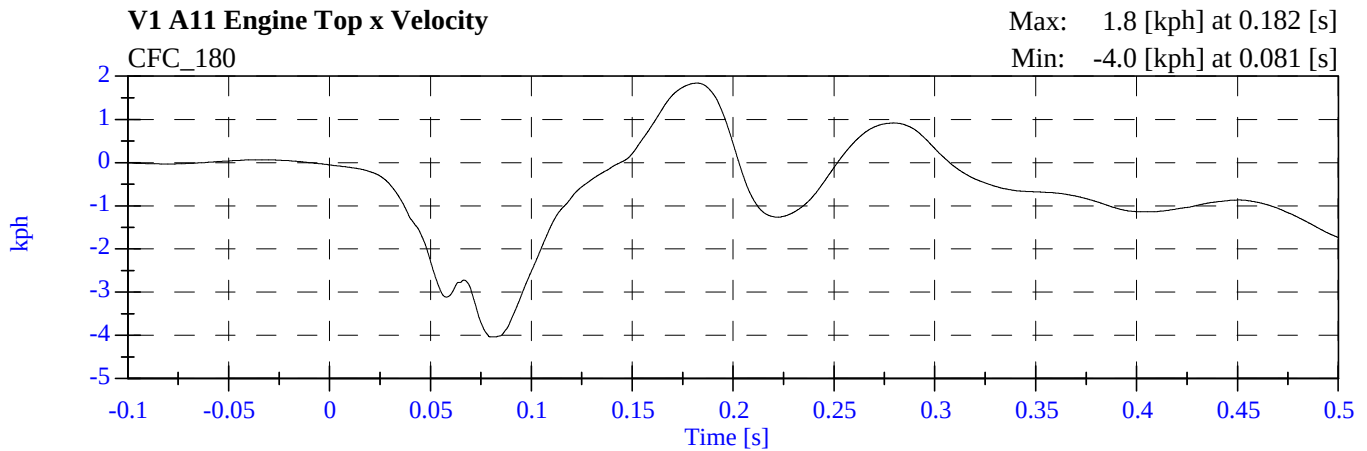
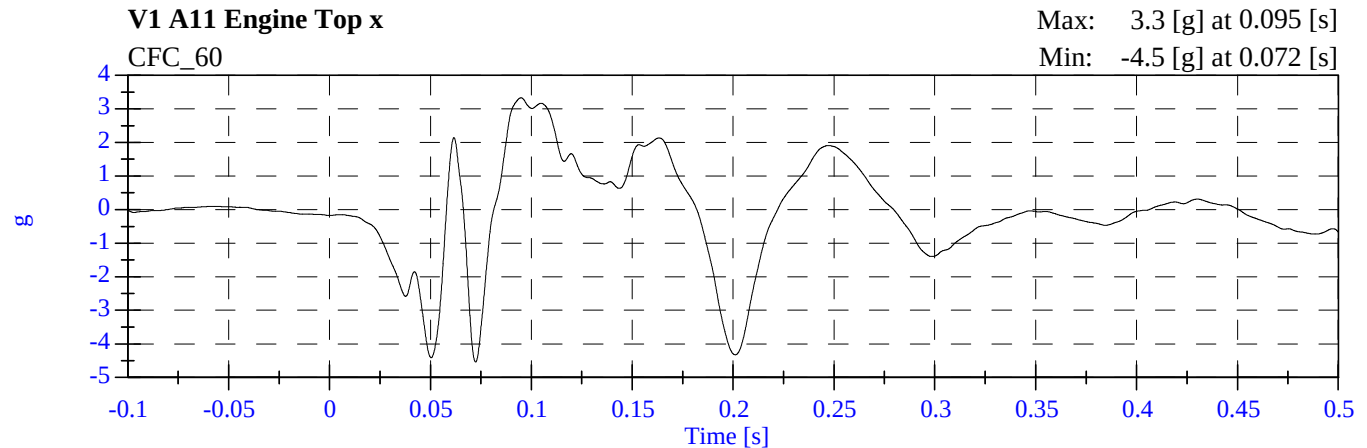
## C80108 - July 08, 2008



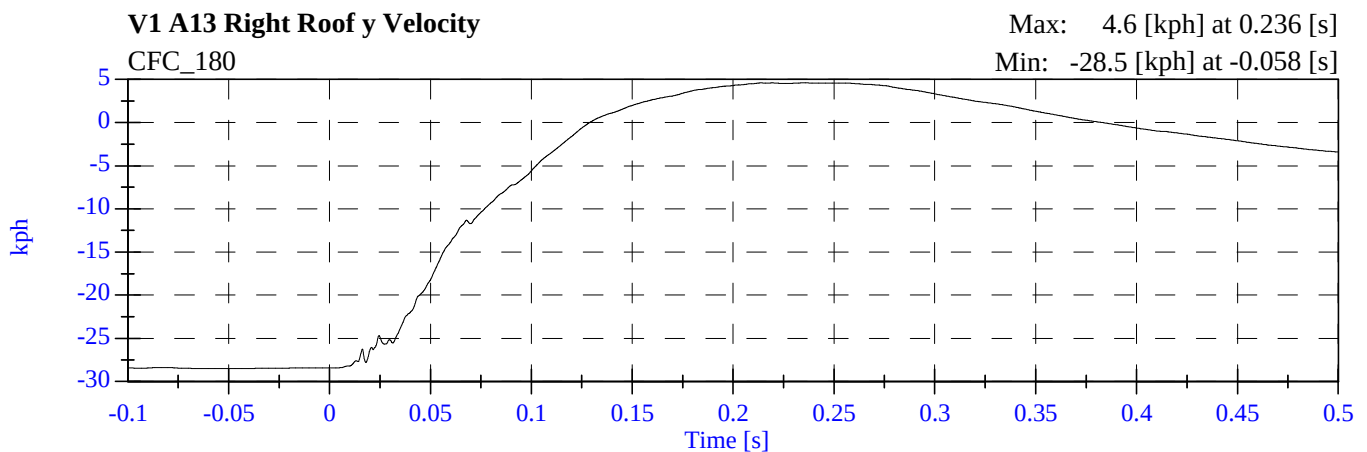
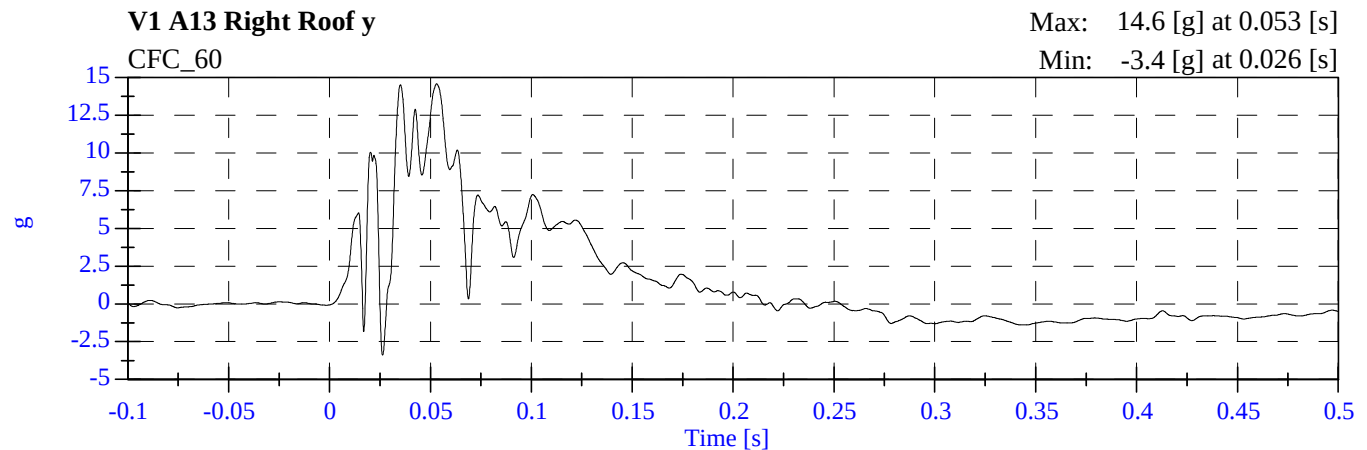
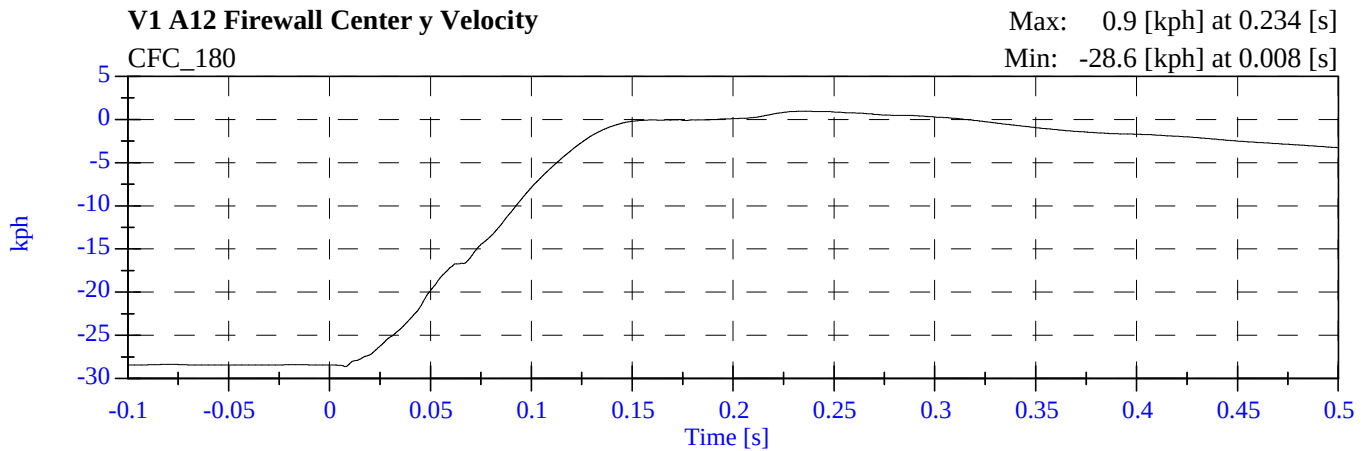
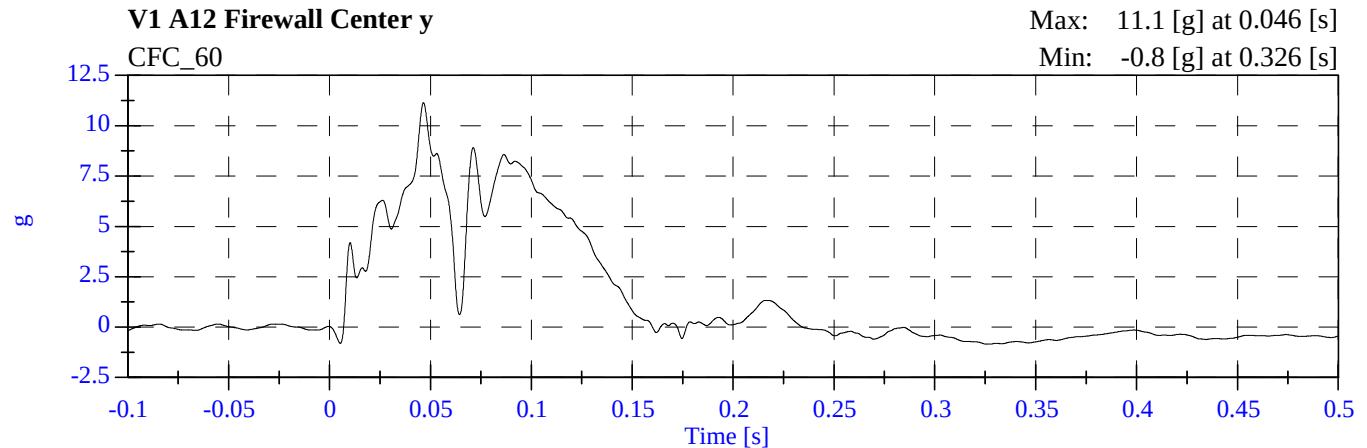
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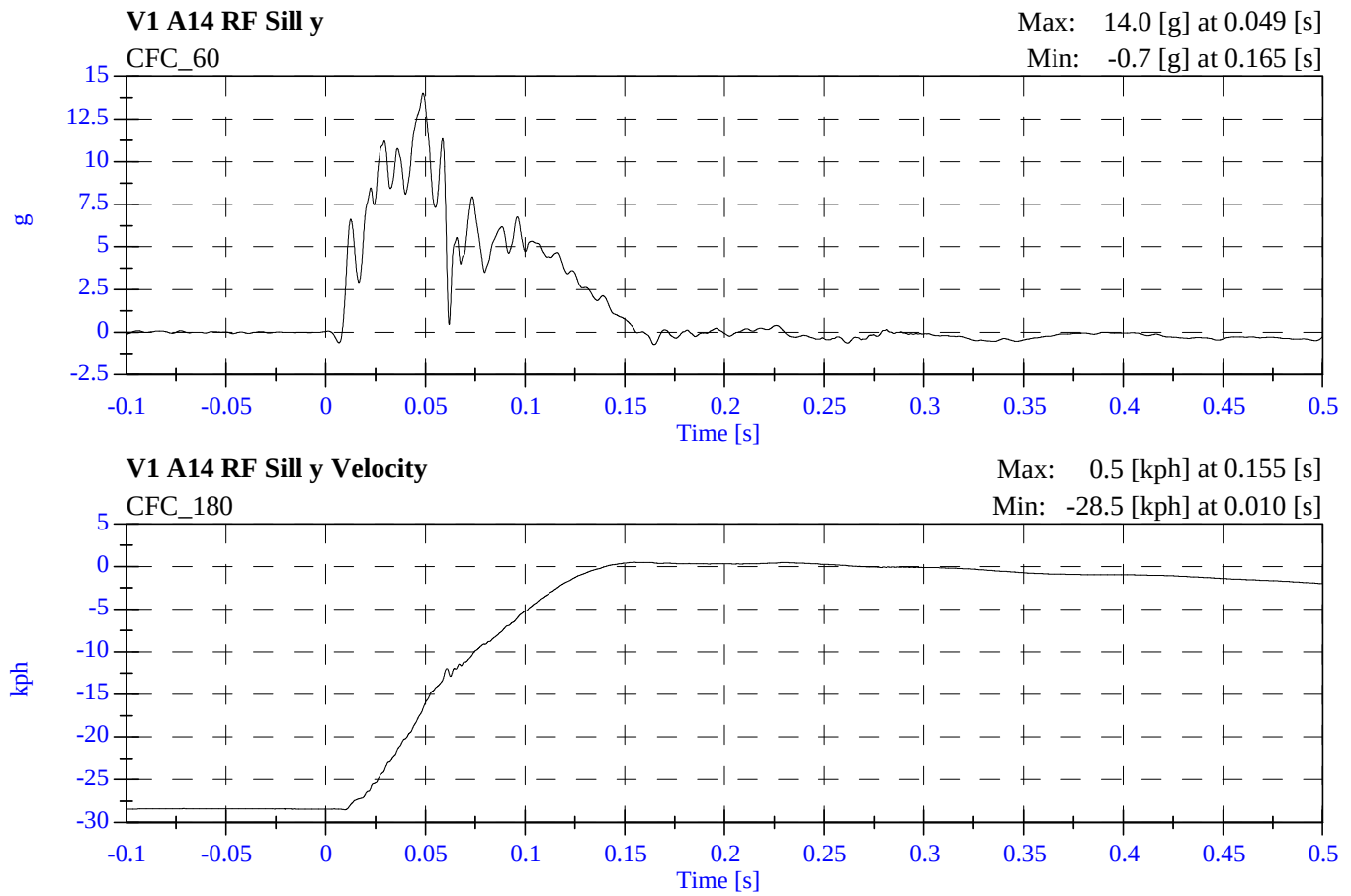
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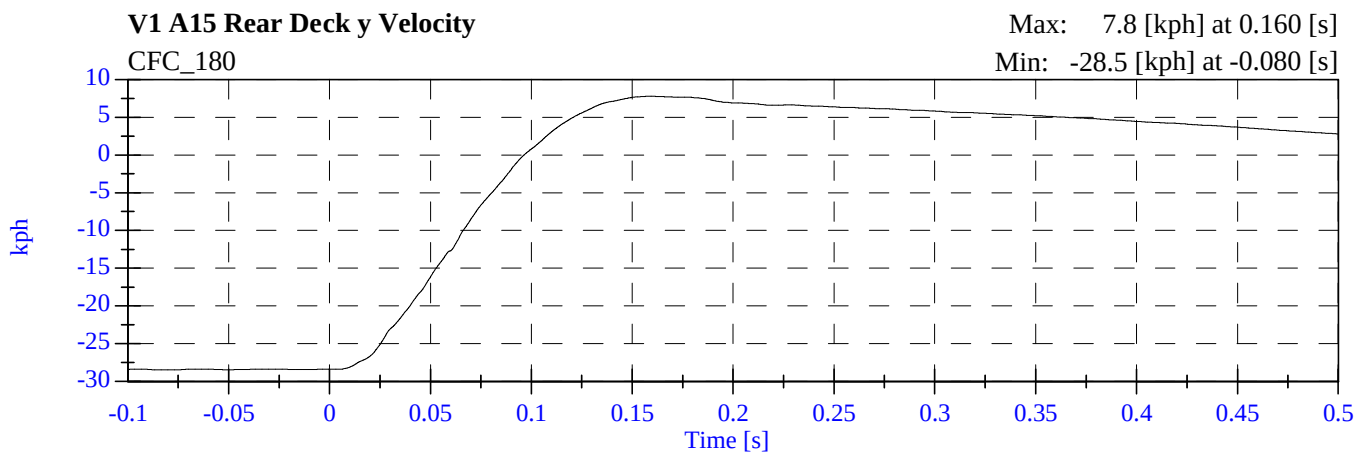
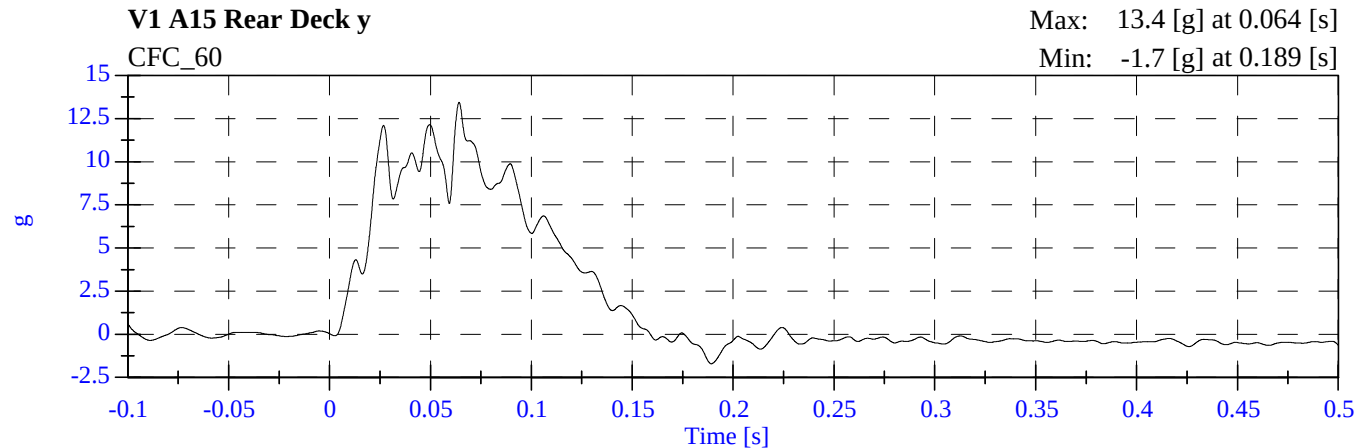
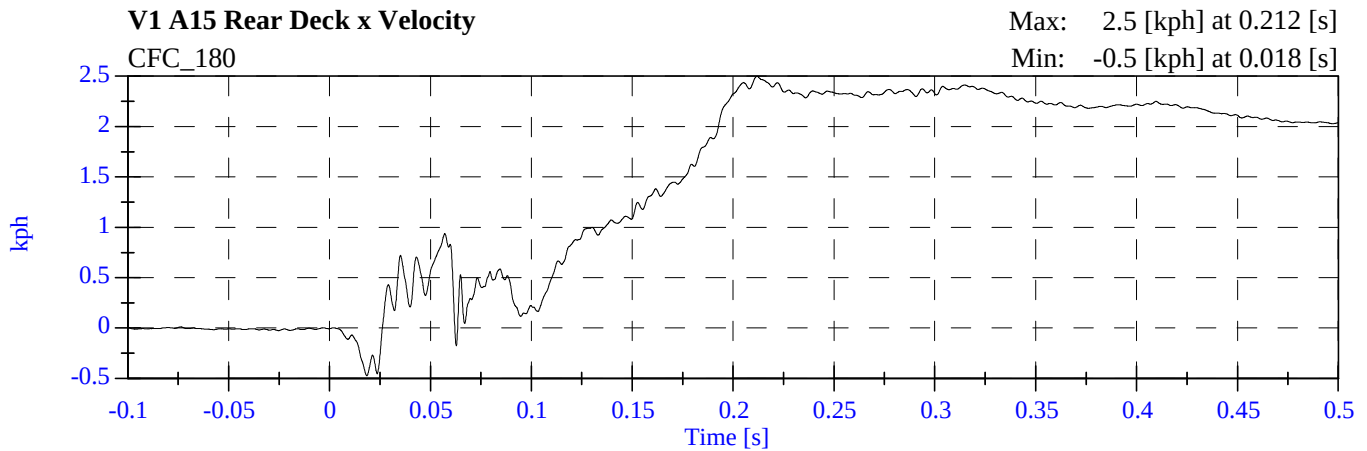
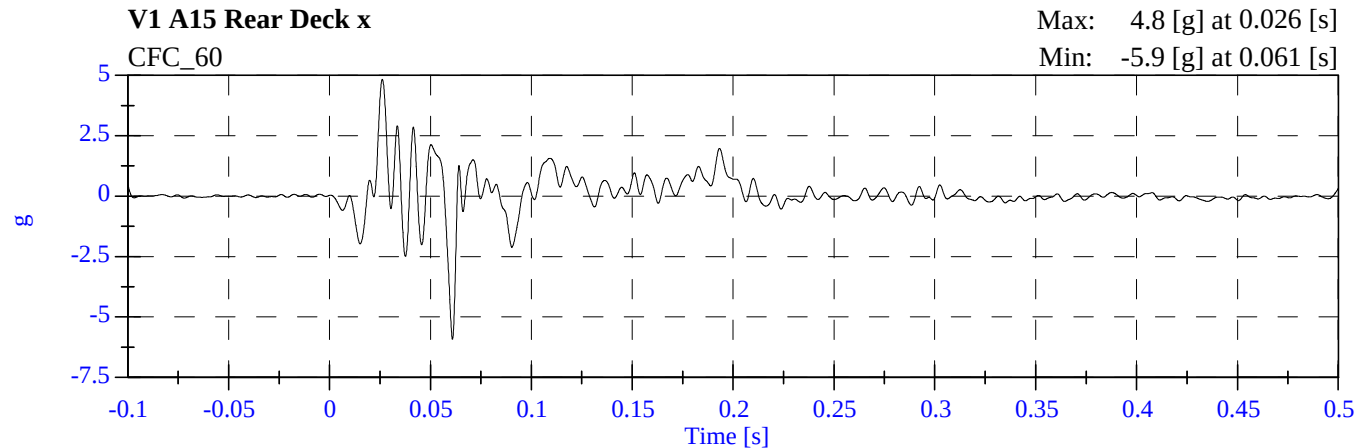
# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



**2009 FMVSS 201P Test 3 2008 Chevrolet Impala**  
**C80108 - July 08, 2008**

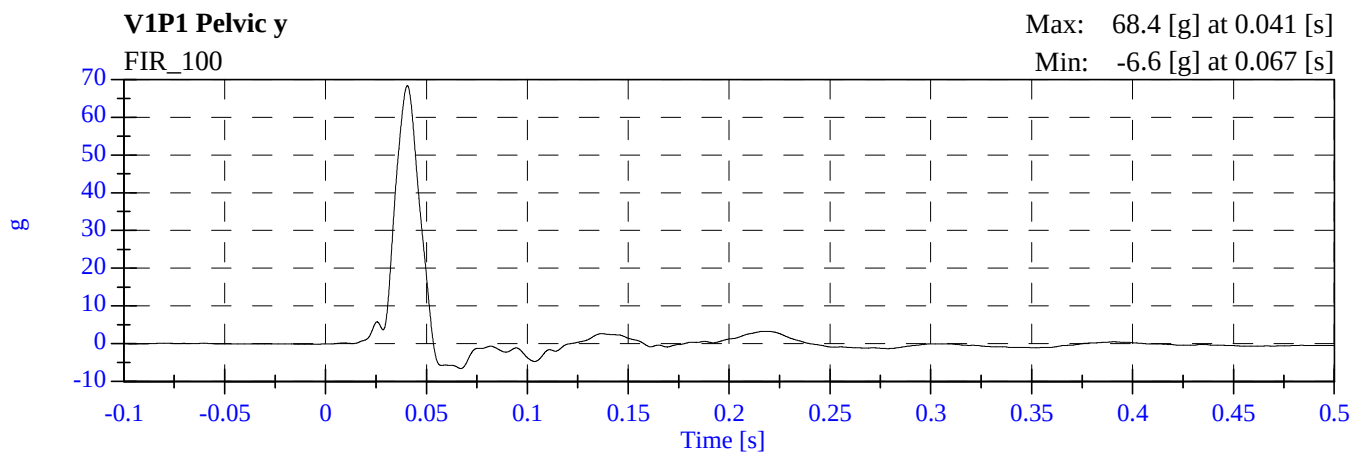
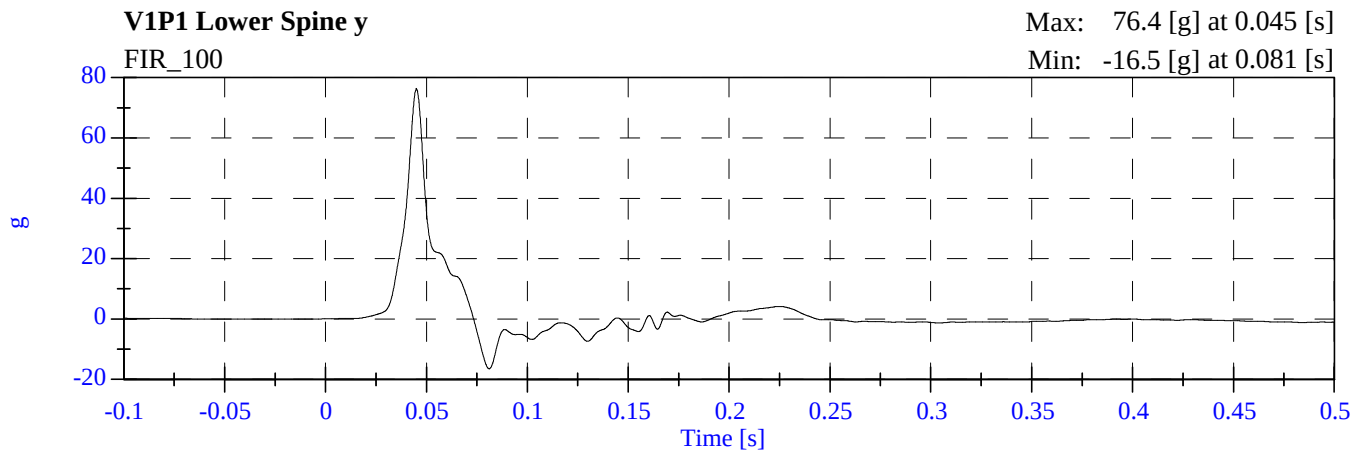
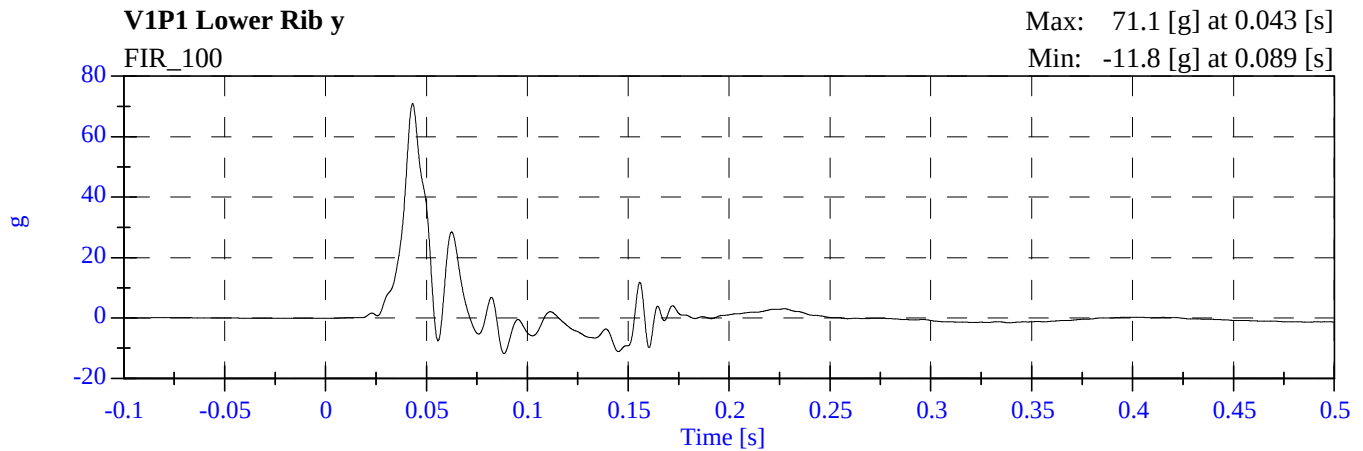
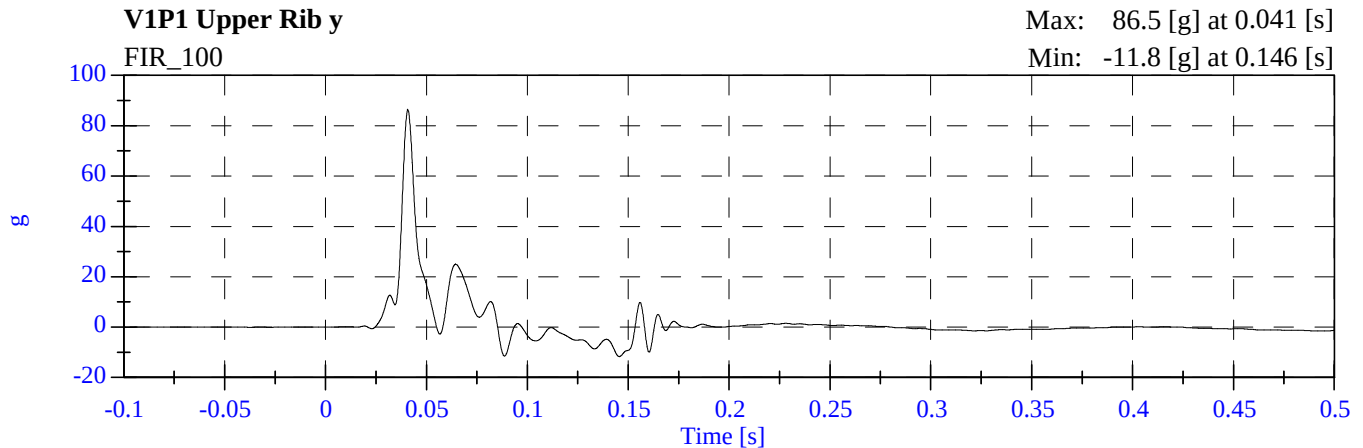


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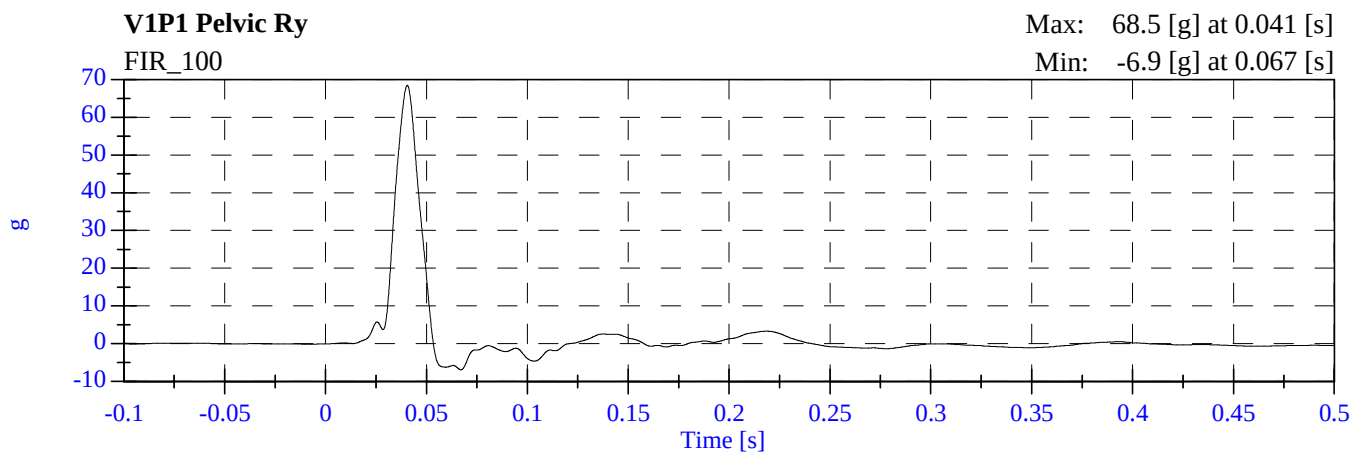
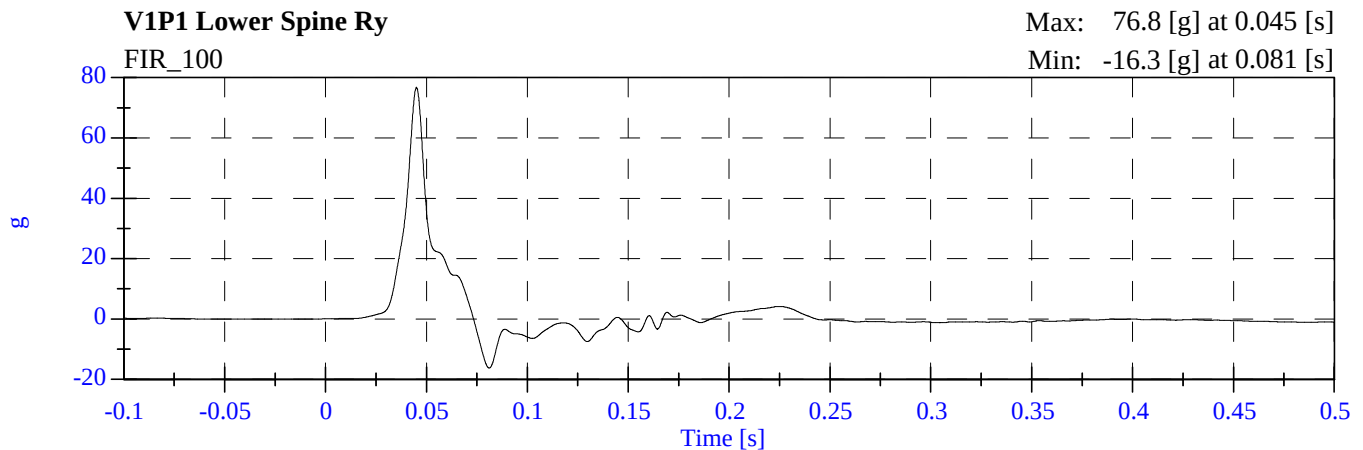
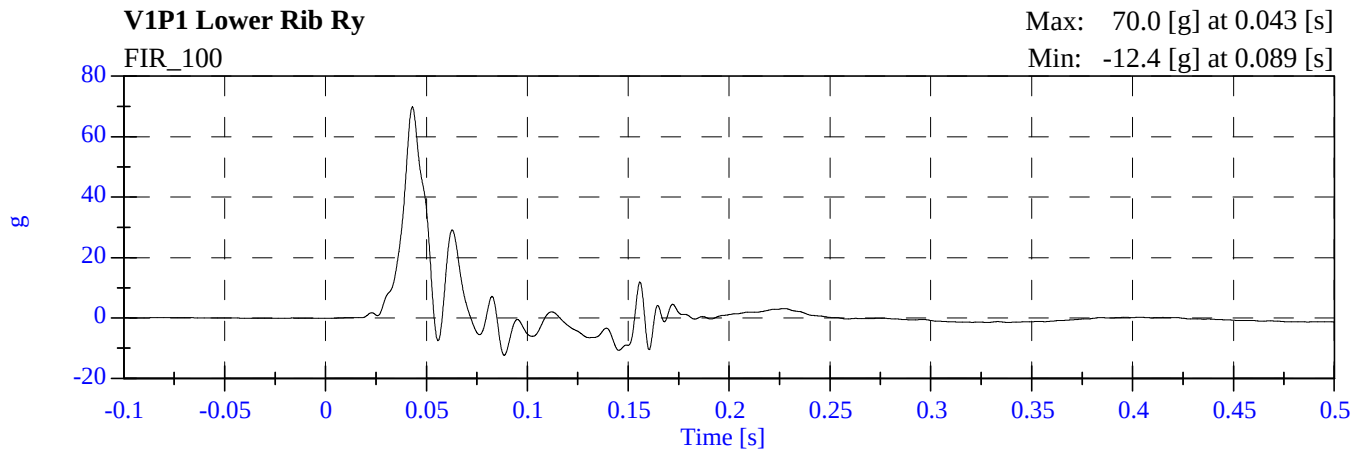
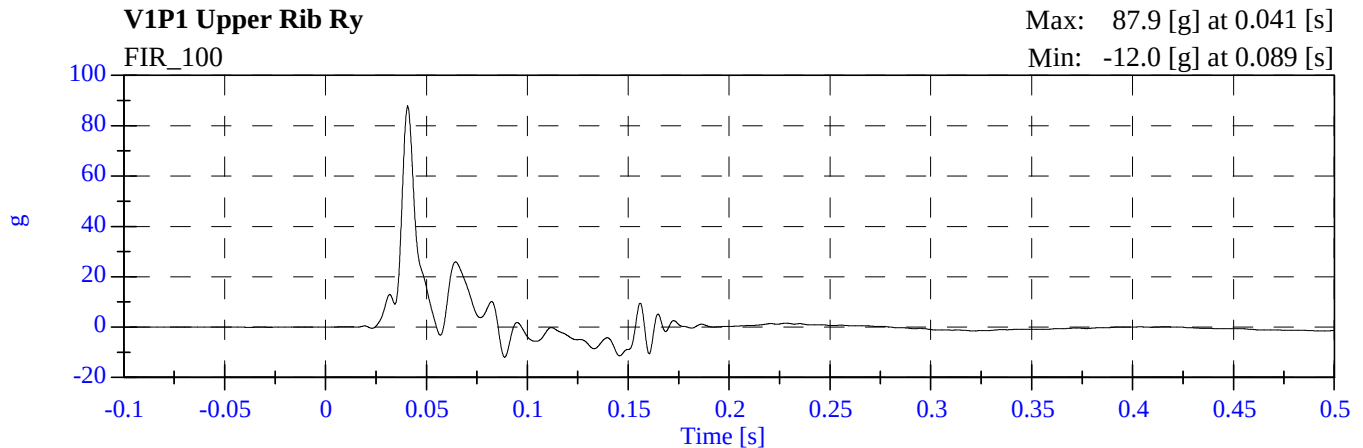


# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala

## C80108 - July 08, 2008



# 2009 FMVSS 201P Test 3 2008 Chevrolet Impala C80108 - July 08, 2008



## **APPENDIX C**

### **DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA**

**SUMMARY**  
**SID H3 PRE & POST TEST CALIBRATION**  
**CONFIGURED FOR LEFT SIDE IMPACT**

Date: 6/30/08; 7/16/08 Sequential Test Number: 1  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER                     | SPECIFICATION | SID H3 NO.: 270 | SID H3 NO.: 270 |
|------------------------------------|---------------|-----------------|-----------------|
|                                    |               | PRE TEST        | POST TEST       |
| SH- Seated Height (mm)             | 889 - 909     | 899             | 899             |
| RH- Rib Height (mm)                | 501 - 520     | 505             | 505             |
| HP- Hip Pivot Height (mm)          | 99 ref.       | 99              | 99              |
| RD- Rib from Back Line (mm)        | 229 - 241     | 230             | 234             |
| KH- Knee Pivot from Back Line (mm) | 511 - 526     | 518             | 518             |
| KV- Knee Pivot to Floor (mm)       | 490 - 505     | 495             | 495             |
| HW- Hip Width (mm)                 | 356 - 391     | 394             | 384             |
| <b>HEAD DROP</b>                   |               |                 |                 |
| TEMPERATURE (C)                    | 18.9 - 25.6   | 21.7            | 21.7            |
| RELATIVE. HUMIDITY (%)             | 10 -70        | 65.00           | 52.00           |
| PEAK RESULTANT ACCELERATION.       | 120-150 Gs    | 128.03          | 128.92          |
| PEAK LATERAL ACCELERATION          | 15 Gs Max     | 3.89            | 0.47            |
| CURVE PERCENT NONMODAL             | < 15%         | 2.75            | 2.87            |
| <b>NECK TEST</b>                   |               |                 |                 |
| TEMPERATURE (C°)                   | 20.6 – 22.2   | 21.7            | 21.7            |
| HUMIDITY (%)                       | 10-70%        | 65.00           | 53.00           |
| IMPACT VELOCITY (m/s)              | 6.89-7.13     | 7.02            | 6.99            |
| <b>PENDULUM DELTA V</b>            |               |                 |                 |
| DELTA V at 10 ms.                  | 1.96-2.55 m/s | 2.24            | 2.12            |
| DELTA V at 20 ms.                  | 4.12-5.10 m/s | 4.49            | 4.34            |
| DELTA V at 30 ms.                  | 5.73-7.01 m/s | 6.35            | 6.19            |
| DELTA V between 40-70 ms.          | 6.27-7.64 m/s | 6.96            | 7.03            |

**SUMMARY (cont'd)**  
**SID H3 PRE & POST TEST CALIBRATION**

|                                                                    |               |       |       |
|--------------------------------------------------------------------|---------------|-------|-------|
| <i>D PLANE ROTATION</i>                                            |               |       |       |
| MAXIMUM ROTATION (deg.)                                            | 66.0-82.0     | 72.41 | 71.10 |
| ROTATION ANGLE DECAY                                               | 58.0-67.0 ms  | 60.60 | 60.00 |
| <i>MOMENT ABOUT THE OCCIPITAL CONDYLE</i>                          |               |       |       |
| MAX OCCIPITAL MOMENT                                               | 73.0-88.0 N-m | 83.62 | 83.48 |
| OCCIPITAL MOMENT DECAY                                             | 49.0-64.0 ms  | 53.40 | 54.80 |
| <i>HEAD ROTATION TIME WITH RESPECT TO OCCIPITAL CONDYLE MOMENT</i> |               |       |       |
| MOMENT TO ROTATION PEAK                                            | 2.0-16.0 ms   | 9.30  | 8.90  |
| <b>THORAX IMPACTS</b>                                              |               |       |       |
| TEMPERATURE (C)                                                    | 18.9 - 25.5   | 21.7  | 21.7  |
| RELATIVE HUMIDITY (%)                                              | 10 - 70       | 65.00 | 50.00 |
| PROBE SPEED (m/s)                                                  | 4.27 - 4.33   | 4.31  | 4.31  |
| UPPER RIB (g's)                                                    | 37 - 46       | 39.84 | 42.93 |
| LOWER RIB (g's)                                                    | 37 - 46       | 41.15 | 39.27 |
| LOWER SPINE (g's)                                                  | 15 - 22       | 21.37 | 20.32 |
| <b>PELVIS IMPACT</b>                                               |               |       |       |
| TEMPERATURE (C)                                                    | 18.9 - 25.5   | 21.7  | 21.7  |
| RELATIVE HUMIDITY (%)                                              | 10 - 70       | 65.00 | 51.00 |
| PROBE SPEED (m/s)                                                  | 4.27 - 4.33   | 4.29  | 4.30  |
| PELVIS (g's)                                                       | 40 - 60       | 47.33 | 43.11 |

**REMARKS:** None

## **CALIBRATION TEST RESULTS**

### **PRE-TEST**

**SID H3 NO.: 270**

**CONFIGURED FOR LEFT SIDE IMPACT**

**CALIBRATION TEST RESULTS SUMMARY  
PRE-TEST**

**CONFIGURED FOR LEFT SIDE IMPACT**

SID H3 Serial No.: 270

Sequential Test Number: 1

Date: 6-30-08

Laboratory Technician: A. Rudniski

| TEST                         | COMMENTS                 |
|------------------------------|--------------------------|
| EXTERNAL DIMENSIONS          | Passed all requirements. |
| THORACIC SHOCK ABSORBER TEST | Passed all requirements. |
| LATERAL THORAX IMPACT TEST   | Passed all requirements. |
| LATERAL PELVIS IMPACT TEST   | Passed all requirements. |
| HEAD DROP TEST               | Passed all requirements. |
| LATERAL NECK BEND TEST       | Passed all requirements. |
| ABDOMINAL COMPRESSION TEST   | Passed all requirements. |
| LUMBAR FLEXION TEST          | Passed all requirements. |

**REMARKS:** None

**CONFIGURED FOR LEFT SIDE IMPACT**

Sequential Test Number: 1

Date: 6-30-08

Laboratory Technician: A. Rudniski

| TEST PARAMETER                     | SPECIFICATION | TEST RESULTS |
|------------------------------------|---------------|--------------|
| SH- Seated Height (mm)             | 889 – 909     | 899          |
| RH- Rib Height (mm)                | 502 – 520     | 505          |
| HP- Hip Pivot Height (mm)          | 99 ref.       | 99           |
| RD- Rib from Back Line (mm)        | 229 – 241     | 230          |
| KH- Knee Pivot from Back Line (mm) | 511 – 526     | 518          |
| KV- Knee Pivot to Floor (mm)       | 490 – 505     | 495          |
| HW- Hip Width (mm)                 | 356 - 391     | 394          |

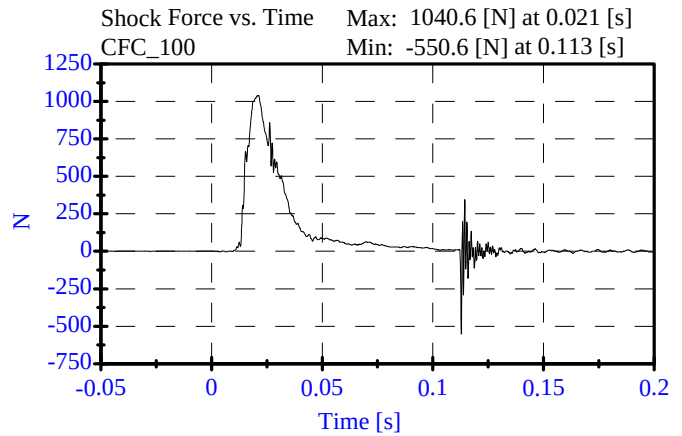
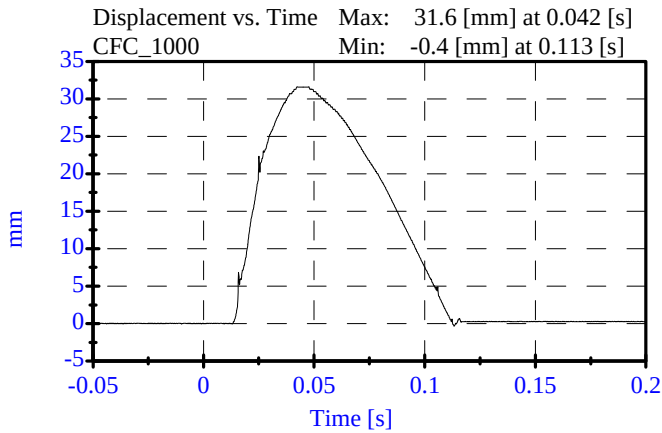
REMARKS: None

**Shock Test Low ( 3.05 m/s )**  
**PRE TEST**  
**CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 02-04-08

Sequential Test Number: 1    File: 270 Shock Low 02-04-08  
Laboratory Technician: B. Swiecicki

| <u>TEST PARAMETER</u>  | <u>SPECIFICATION</u> | <u>TEST RESULTS</u> | <u>STATUS</u> |
|------------------------|----------------------|---------------------|---------------|
| Lab Temperature:       | 18.9-25.5 C          | 21.1 C              | Passed        |
| Lab Humidity:          | 10-70 %              | 18.00 %             | Passed        |
| Displacement:          | 30.00-35.00 mm       | 31.63 mm            | Passed        |
| Maximum Force:         | 836.00-1125.00 N     | 1040.57 N           | Passed        |
| Impact Test Velocity:  | 3.05 m/s             |                     |               |
| Damper Identification: | 270                  |                     |               |
| Damper Setting:        | 5                    |                     |               |



## Shock Test Medium ( 4.27 m/s )

### PRE TEST

### CONFIGURED FOR LEFT SIDE IMPACT

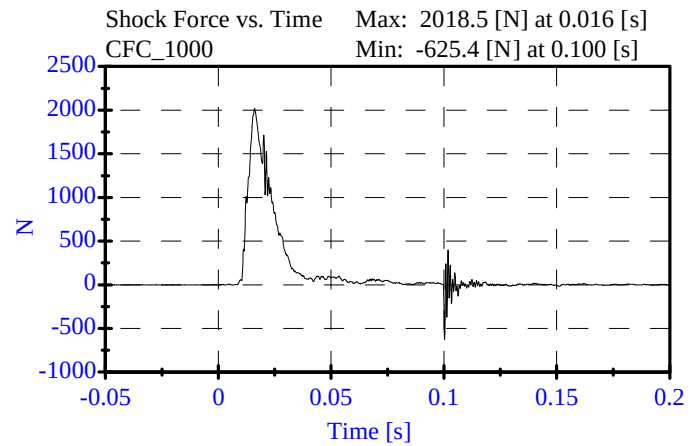
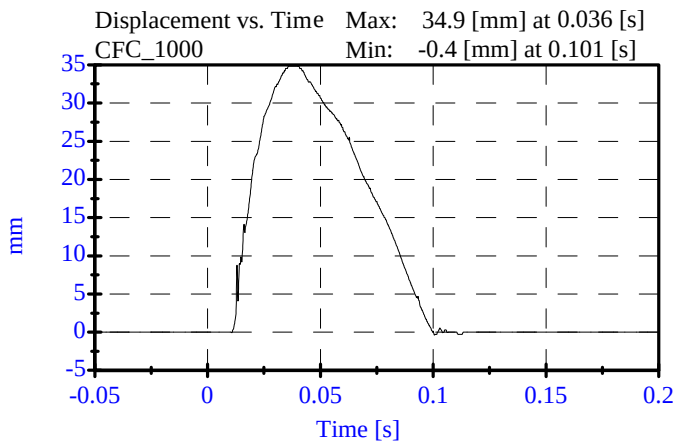
ATD Serial No: 270

Date: 02-04-08

Sequential Test Number: 1 File: 270 Shock Med 02-04-(

Laboratory Technician: B. Swiecicki

| TEST PARAMETER         | SPECIFICATION     | TEST RESULTS | STATUS |
|------------------------|-------------------|--------------|--------|
| Lab Temperature:       | 18.9-25.5 C       | 21.1 C       | Passed |
| Lab Humidity:          | 10-70 %           | 19.00 %      | Passed |
| Displacement:          | 32.00-37.00 mm    | 34.87 mm     | Passed |
| Maximum Force:         | 1730.00-2099.00 N | 2018.50 N    | Passed |
| Impact Test Velocity:  | 4.27 m/s          |              |        |
| Damper Identification: | 270               |              |        |
| Damper Setting:        | 5                 |              |        |

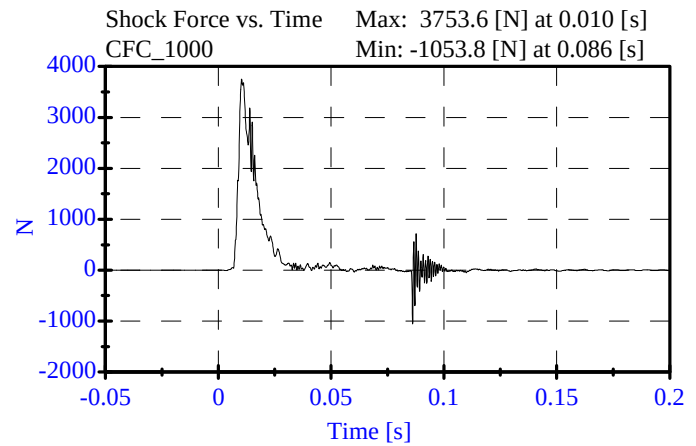
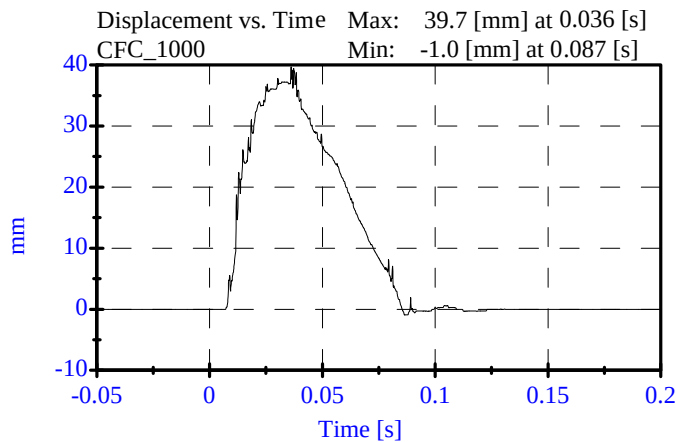


**Shock Test High ( 6.10 m/s )**  
**PRE TEST**  
**CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 02-04-08

Sequential Test Number: 1 File: 270 Shock High2 02-04  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER         | SPECIFICATION     | TEST RESULTS | STATUS |
|------------------------|-------------------|--------------|--------|
| Lab Temperature:       | 18.9-25.5 C       | 21.1 C       | Passed |
| Lab Humidity:          | 10-70 %           | 19.00 %      | Passed |
| Displacement:          | 33.00-40.00 mm    | 39.70 mm     | Passed |
| Maximum Force:         | 3741.00-4448.00 N | 3753.63 N    | Passed |
| Impact Test Velocity:  | 6.10 m/s          |              |        |
| Damper Identification: | 270               |              |        |
| Damper Setting:        | 5                 |              |        |

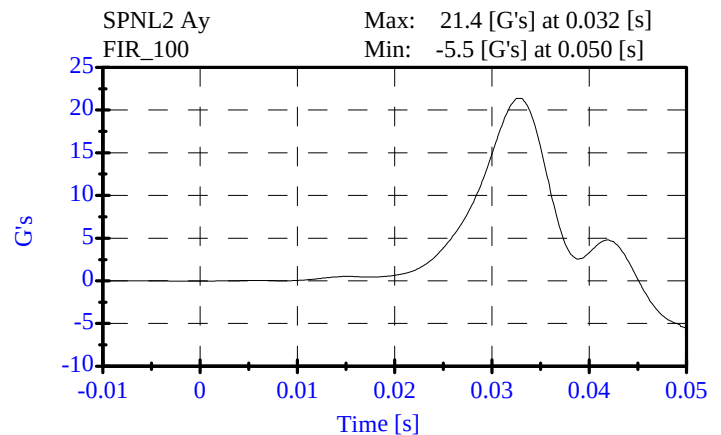
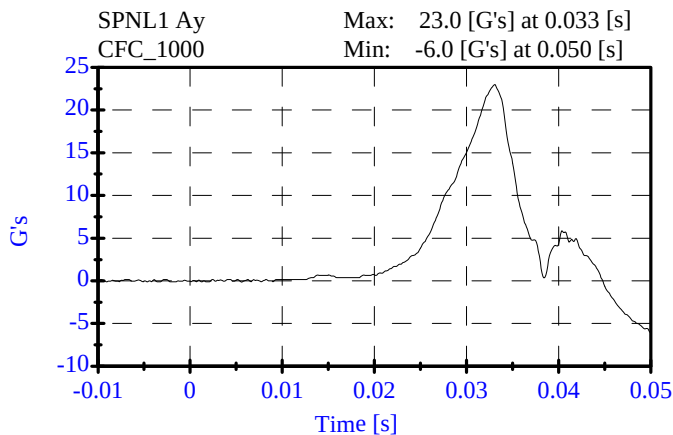
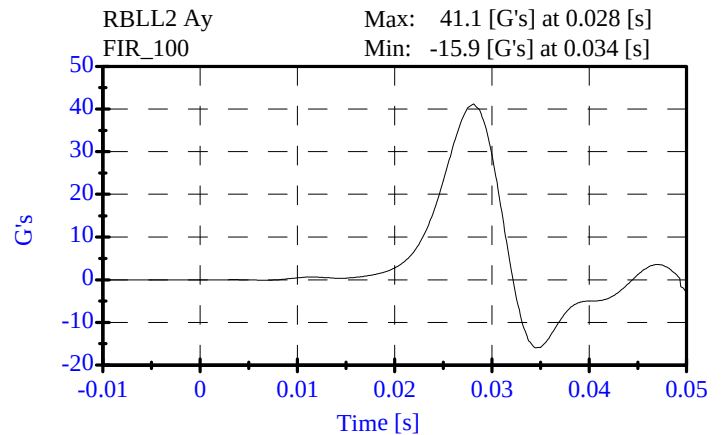
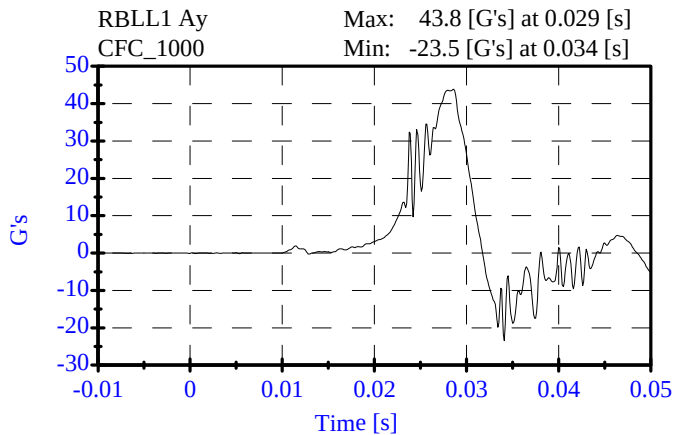
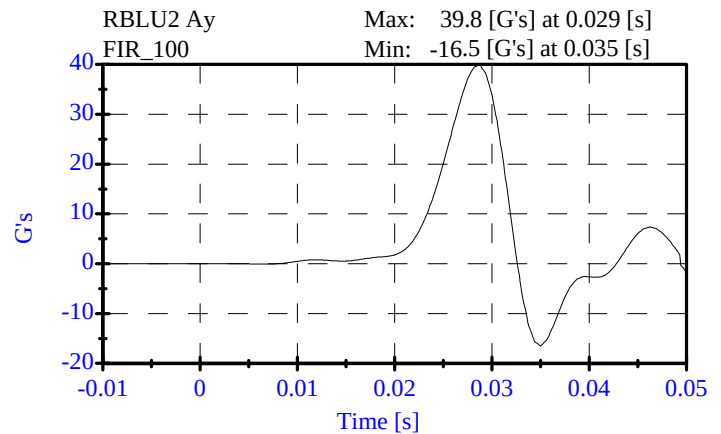
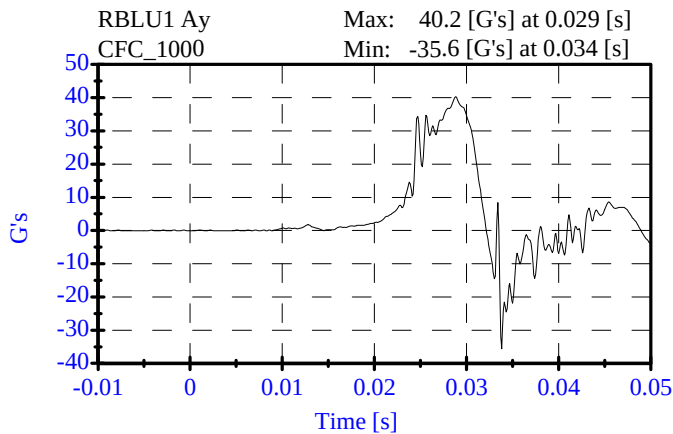


**Thorax Impact**  
**Pre-Test**  
**CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 06-30-08

Sequential Test Number: 1 File: 270T 06-30-08  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER            | SPECIFICATION   | TEST RESULTS | STATUS |
|---------------------------|-----------------|--------------|--------|
| Lab Temperature:          | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:             | 10-70 %         | 65.00 %      | Passed |
| Probe Velocity:           | 4.27- 4.33 m/s  | 4.31 m/s     | Passed |
| Upper Rib Acceleration:   | 37.00-46.00 G's | 39.84 G's    | Passed |
| Lower Rib Acceleration:   | 37.00-46.00 G's | 41.15 G's    | Passed |
| Lower Spine Acceleration: | 15.00-22.00 G's | 21.37 G's    | Passed |



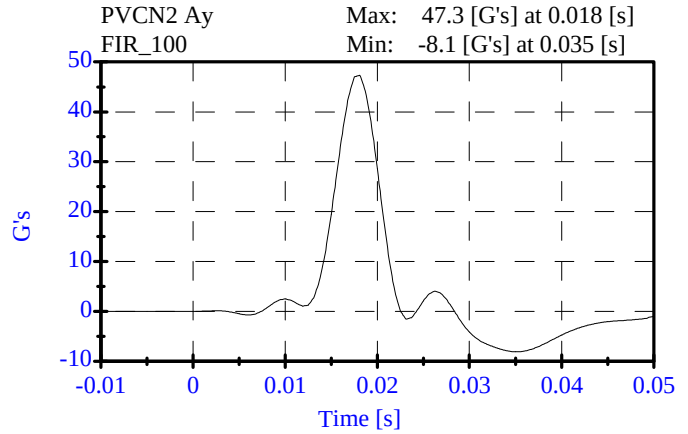
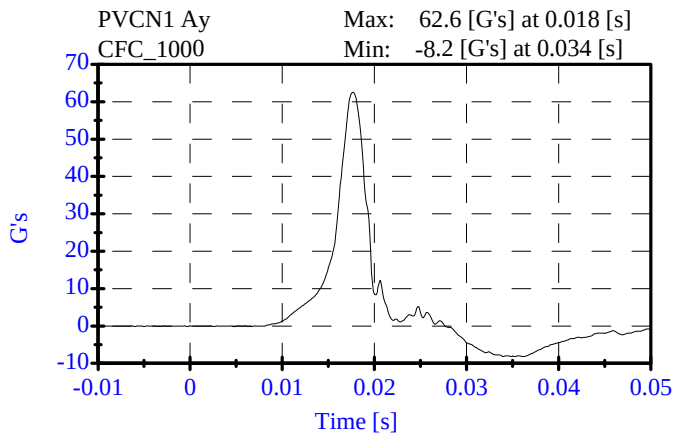
**Pelvis Impact  
Pre-Test**

**CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 06-30-08

Sequential Test Number: 1    File: 270P 06-30-08  
Laboratory Technician: B. Swiecicki

| <u>TEST PARAMETER</u>  | <u>SPECIFICATION</u> | <u>TEST RESULTS</u> | <u>STATUS</u> |
|------------------------|----------------------|---------------------|---------------|
| Lab Temperature:       | 18.9-25.5 C          | 21.7 C              | Passed        |
| Lab Humidity:          | 10-70 %              | 65.00 %             | Passed        |
| Probe Velocity:        | 4.27- 4.33 m/s       | 4.29 m/s            | Passed        |
| Pelvis Y Acceleration: | 40.00-60.00 G's      | 47.33 G's           | Passed        |
| Time Above 20 Gs       | 3.0-7.0 ms           | 5.5 ms              | Passed        |

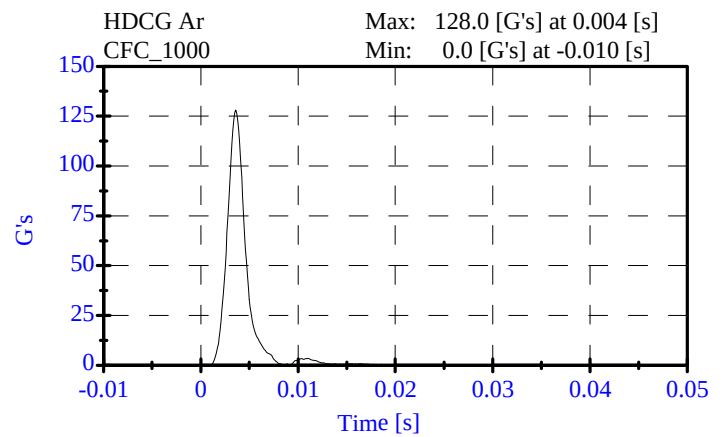
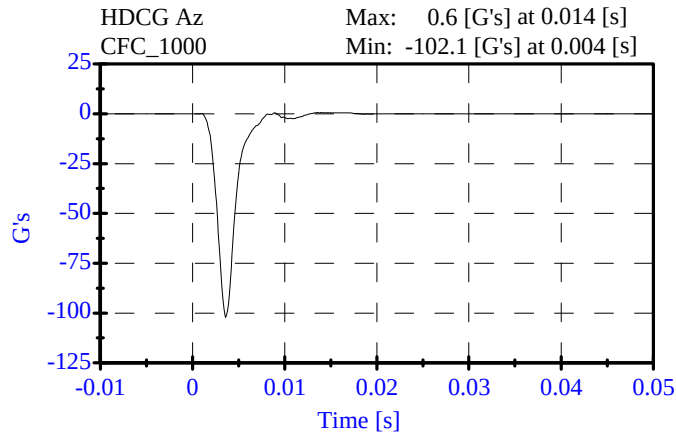
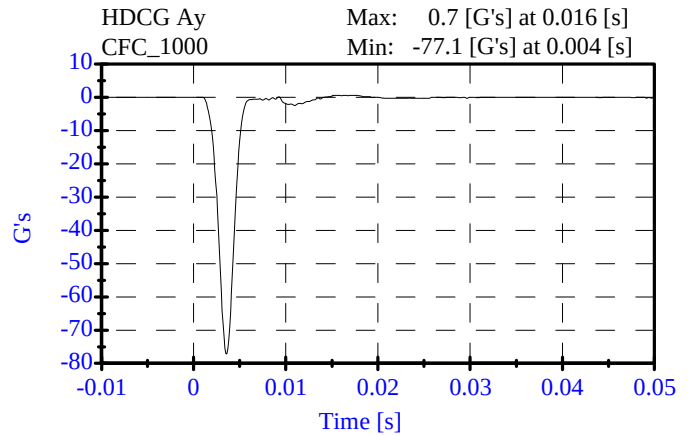
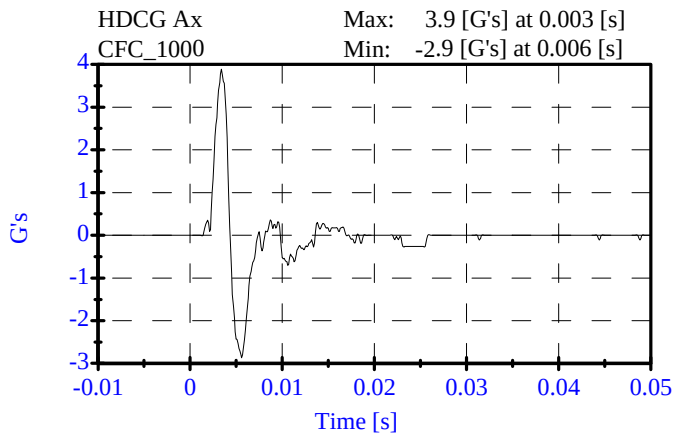


# **Head Drop** **Pre-Test** **CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 06-30-08

Sequential Test Number: 1 File: 270H 06-30-08  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER          | SPECIFICATION | TEST RESULTS | STATUS |
|-------------------------|---------------|--------------|--------|
| Lab Temperature:        | 18.9-25.6 C   | 21.7 C       | Passed |
| Lab Humidity:           | 10-70 %       | 65.00 %      | Passed |
| Peak Resultant Accel.:  | 120-150 Gs    | 128.03 Gs    | Passed |
| Peak Lateral Accel.:    | 15 Gs Max     | 3.89 Gs      | Passed |
| Curve PerCent NonModal: | < 15%         | 2.75 %       | Passed |



**Neck Test****Pre-Test****CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270

Date: 06-30-08

Sequential Test Number: 1 File: 270N 06-30-08

Laboratory Technician: B. Swiecicki

| <u>TEST PARAMETER</u>                                           | <u>SPECIFICATION</u> | <u>TEST RESULTS</u> | <u>STATUS</u> |
|-----------------------------------------------------------------|----------------------|---------------------|---------------|
| Lab Temperature:                                                | 20.6-22.2 C          | 21.7 C              | Passed        |
| Lab Humidity:                                                   | 10-70 %              | 65.00 %             | Passed        |
| Impact Velocity:                                                | 6.89- 7.13 m/s       | 7.02 m/s            | Passed        |
| PENDULUM DELTA V                                                |                      |                     |               |
| Delta V at 10 ms:                                               | 1.96- 2.55 m/s       | 2.24 m/s            | Passed        |
| Delta V at 20 ms:                                               | 4.12- 5.10 m/s       | 4.49 m/s            | Passed        |
| Delta V at 30 ms:                                               | 5.73- 7.01 m/s       | 6.35 m/s            | Passed        |
| Delta V between 40-70 ms:                                       | 6.27- 7.64 m/s       | 6.96 m/s            | Passed        |
| D PLANE ROTATION                                                |                      |                     |               |
| Maximum Rotation:                                               | 66.0-82.0 Deg        | 72.41 Deg           | Passed        |
| Rotation Angle Decay:                                           | 58.0-67.0 ms         | 60.60 ms            | Passed        |
| MOMENT ABOUT THE OCCIPITAL CONDYLE                              |                      |                     |               |
| Max Occipital Moment:                                           | 73.00- 88.00 N-m     | 83.62 N-m           | Passed        |
| Occipital Moment Decay:                                         | 49.0-64.0 ms         | 53.40 ms            | Passed        |
| HEAD ROTATION TIME WITH RESPECT TO THE OCCIPITAL CONDYLE MOMENT |                      |                     |               |
| Moment to Rotation Peak:                                        | 2.0-16.0 ms          | 9.30 ms             | Passed        |

Neck Test  
Pre-Test

CONFIGURED FOR LEFT SIDE IMPACT

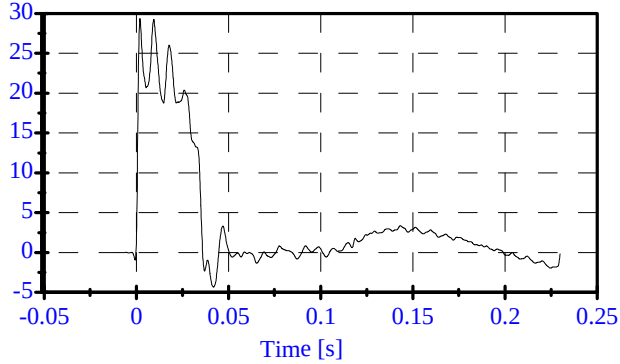
ATD Serial No: 270

Date: 06-30-08

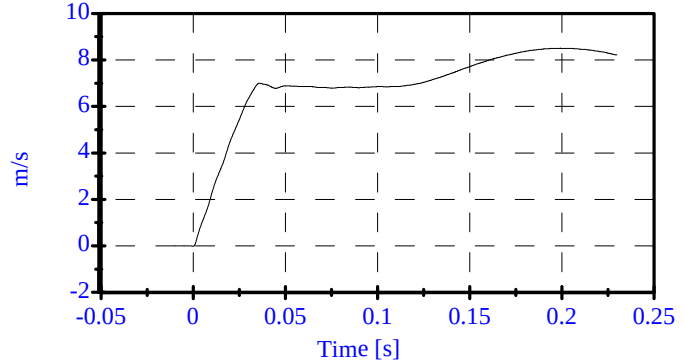
Sequential Test Number: 1 File: 270N 06-30-08

Laboratory Technician: B. Swiecicki

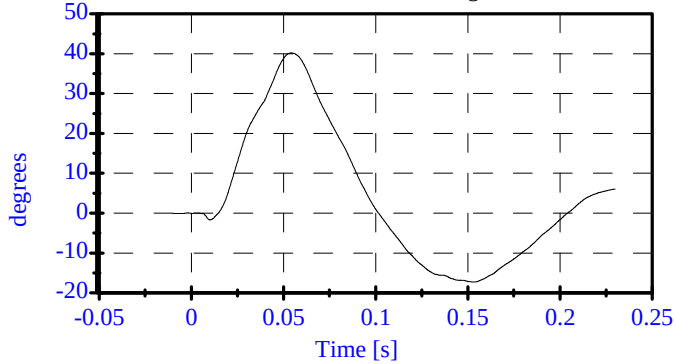
Pend Ax  
CFC\_180  
Max: 29.4 [ ] at 0.002 [s]  
Min: -4.3 [ ] at 0.042 [s]



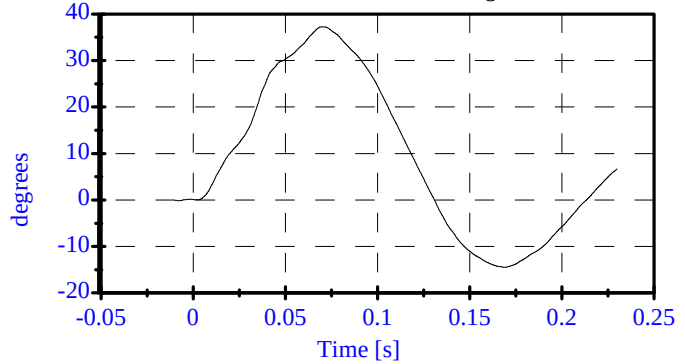
Pend Vx  
CFC\_180  
Max: 8.5 [m/s] at 0.199 [s]  
Min: -0.0 [m/s] at -0.000 [s]



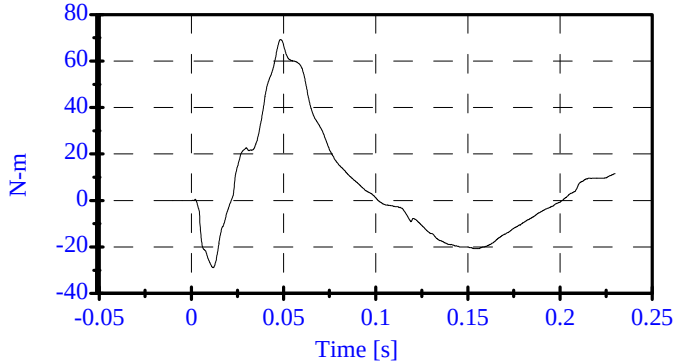
Head Rot  
CFC\_180  
Max: 40.2 [degrees] at 0.054 [s]  
Min: -17.3 [degrees] at 0.153 [s]



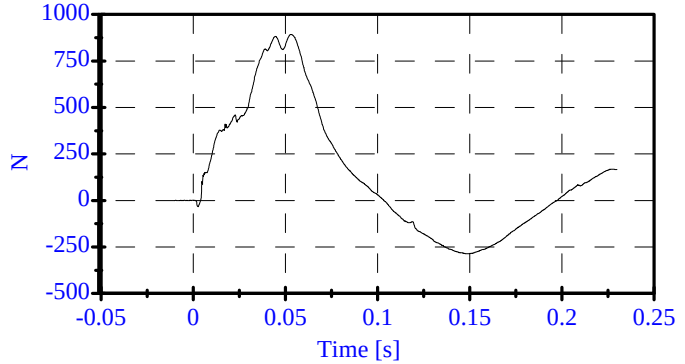
Arm Rot  
CFC\_180  
Max: 37.3 [degrees] at 0.070 [s]  
Min: -14.5 [degrees] at 0.169 [s]



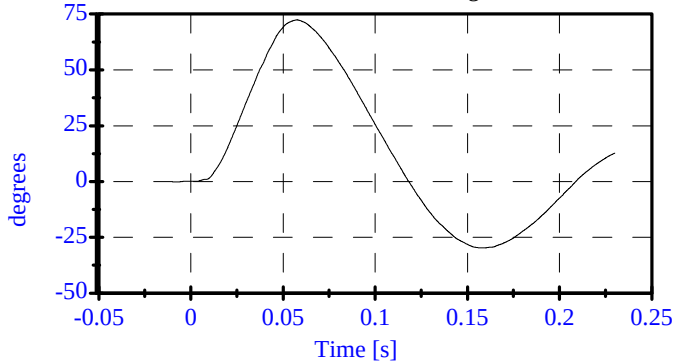
Neck Mx  
CFC\_600  
Max: 69.2 [N-m] at 0.048 [s]  
Min: -29.0 [N-m] at 0.012 [s]



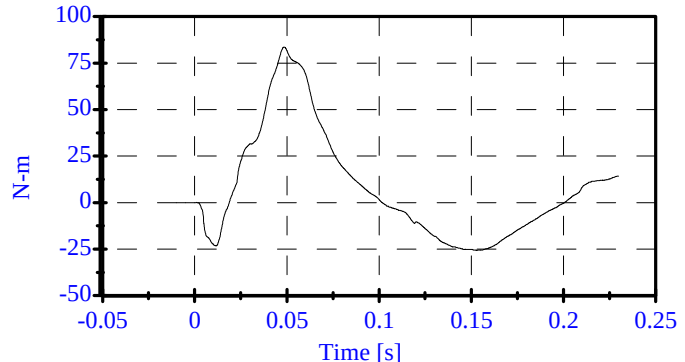
Neck Fy  
CFC\_1000  
Max: 892.8 [N] at 0.053 [s]  
Min: -287.7 [N] at 0.148 [s]



Tot Rot  
CFC\_180  
Max: 72.4 [degrees] at 0.058 [s]  
Min: -29.7 [degrees] at 0.159 [s]



MOCX  
Max: 83.6 [N-m] at 0.048 [s]  
Min: -25.6 [N-m] at 0.153 [s]



## Abdominal Compression Test

### Pre-Test

#### CONFIGURED FOR LEFT SIDE IMPACT

ATD Serial No: 270

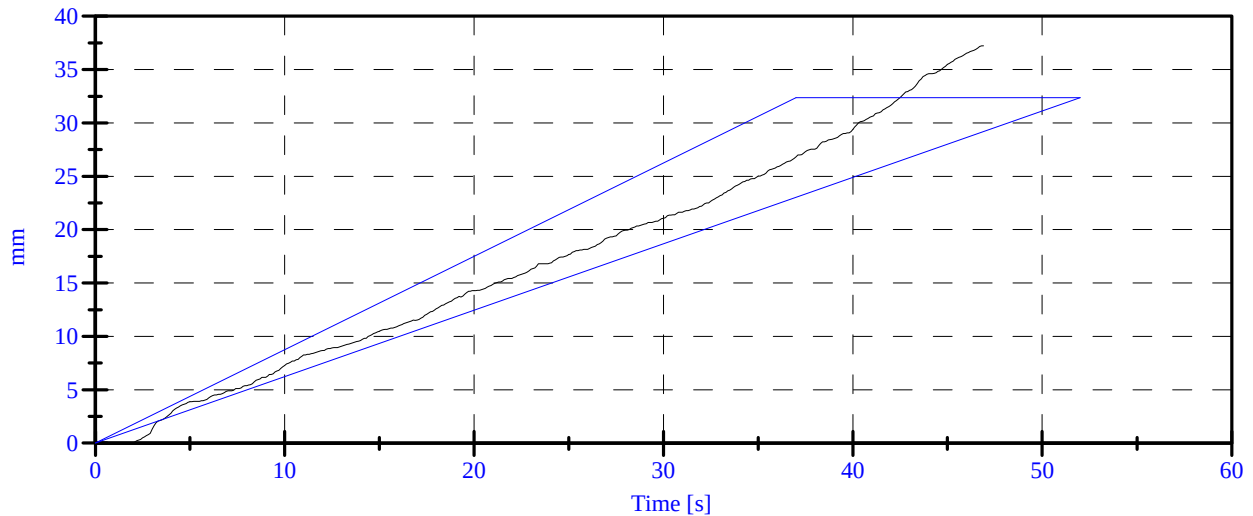
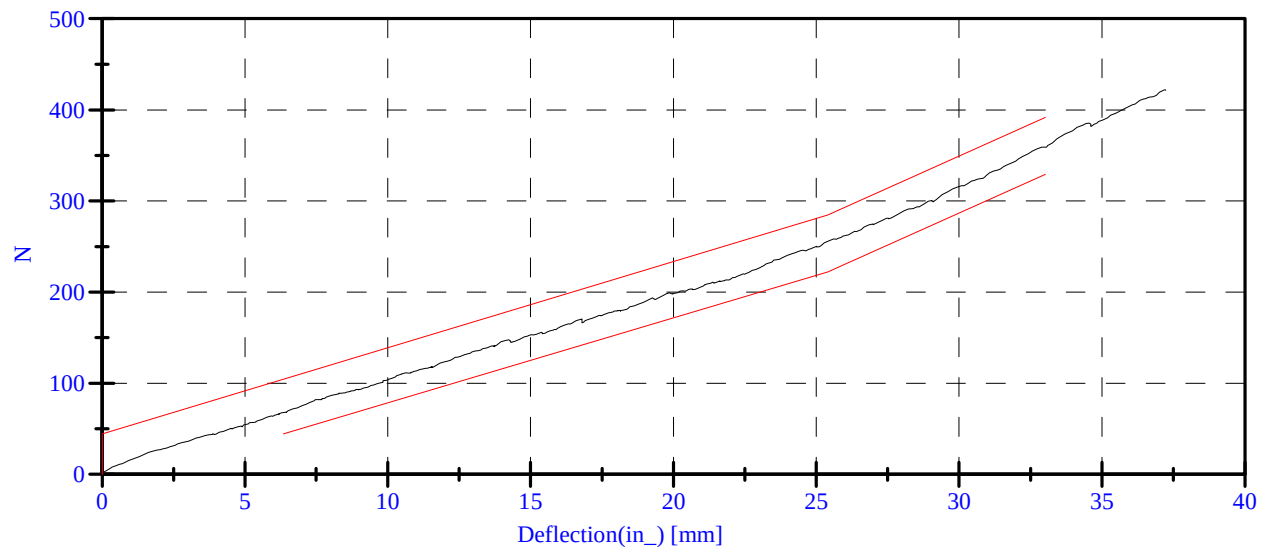
Date: 07-01-08

Sequential Test Number: 1 File: 270 Ab 07-01-08

Laboratory Technician: B. Swiecicki

| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS | STATUS |
|---------------------|-----------------|--------------|--------|
| Lab Temperature:    | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:       | 10-70 %         | 64.00 %      | Passed |
| Force at 12.95 mm : | 104.00-162.00 N | 134.28 N     | Passed |
| Force at 19.05 mm : | 162.98-220.99 N | 191.19 N     | Passed |
| Force at 25.40 mm : | 221.97-280.02 N | 256.80 N     | Passed |
| Force at 33.02 mm : | 324.99-391.00 N | 359.02 N     | Passed |

## ABDOMINAL COMPRESSION TEST



## Lumbar Spine Test

### Pre-Test

#### CONFIGURED FOR LEFT SIDE IMPACT

ATD Serial No: 270

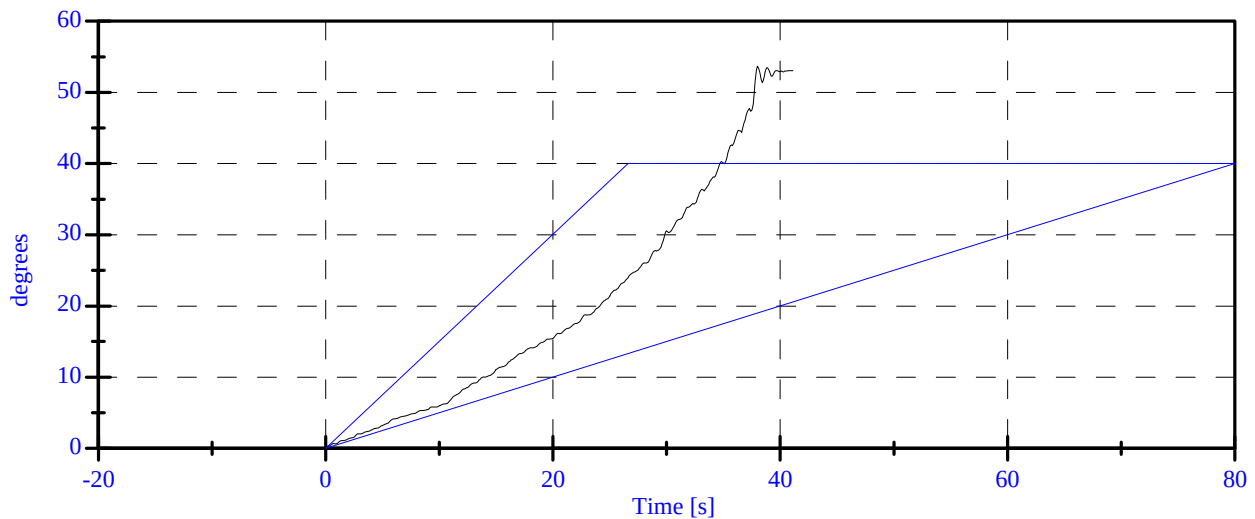
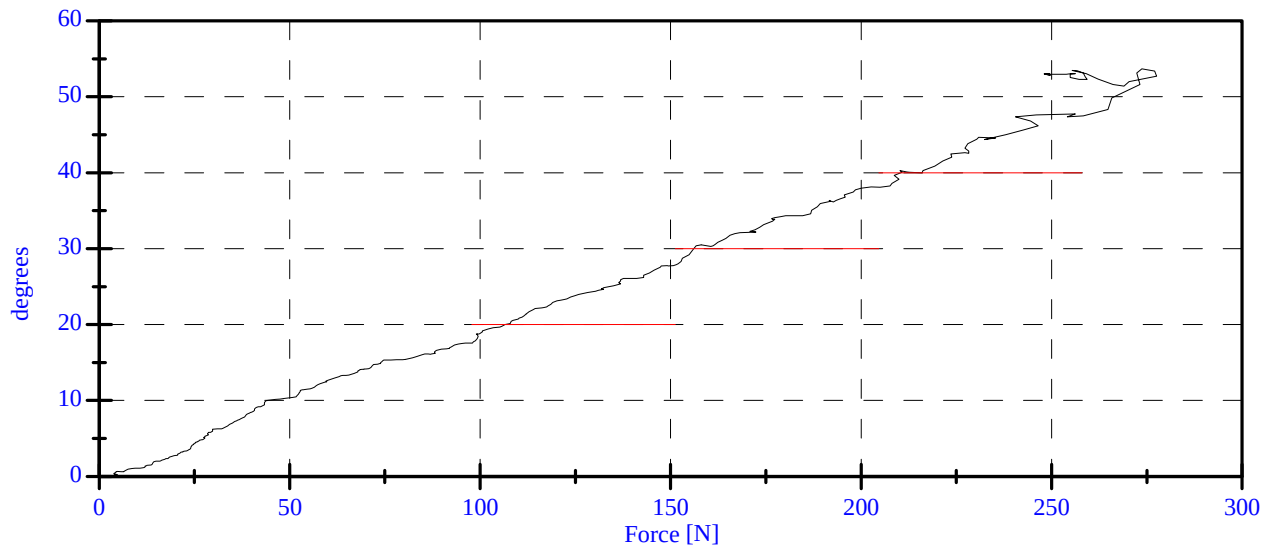
Date: 06-30-08

Sequential Test Number: 1 File: 270 Spine 06-30-08

Laboratory Technician: B. Swiecicki

| TEST PARAMETER   | SPECIFICATION   | TEST RESULTS | STATUS |
|------------------|-----------------|--------------|--------|
| Lab Temperature: | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:    | 10-70 %         | 65.00 %      | Passed |
| Force at 0 Deg:  | 0.00-26.69 N    | 4.70 N       | Passed |
| Force at 20 Deg: | 97.86-151.24 N  | 106.55 N     | Passed |
| Force at 30 Deg: | 151.24-204.62 N | 155.91 N     | Passed |
| Force at 40 Deg: | 204.62-258.00 N | 215.97 N     | Passed |
| Return Angle     | 12 Deg Max      | 5.53 deg     | Passed |

### LUMBAR SPINE FLEXION TEST



## PRE-TEST DUMMY INSPECTION LIST

### CONFIGURED FOR LEFT SIDE IMPACT

SID H3 Serial No.: 270 Sequential Test Number: 1  
Date: 6-30-08 Laboratory Technician: A. Rudniski

| PART         | ITEMS CHECKED                                        | COMMENTS |
|--------------|------------------------------------------------------|----------|
| SKIN         | VISUAL INSPECTION                                    | OK       |
| HEAD         | VISUAL, BALLAST,<br>ACCELEROMETER MOUNT              | OK       |
| NECK         | VISUAL, CABLE TORQUE                                 | OK       |
| SPINE BOX    | VISUAL, BALLAST,<br>WELDMENT,<br>ACCELEROMETER MOUNT | OK       |
| RIB CAGE     | VISUAL, MEASURE,<br>STIFFENERS                       | OK       |
| STERNUM      | VISUAL                                               | OK       |
| LUMBAR SPINE | VISUAL                                               | OK       |
| ABDOMEN      | VISUAL                                               | OK       |
| PELVIS       | VISUAL, PALPATE,<br>ACCELEROMETER MOUNT              | OK       |
| UPPER LEGS   | VISUAL                                               | OK       |
| KNEES        | VISUAL, STOPS, INSERTS                               | OK       |
| LOWER LEGS   | VISUAL, RANGE OF MOTION                              | OK       |
| ANKLES       | VISUAL, RANGE OF MOTION                              | OK       |
| FEET         | VISUAL, RANGE OF MOTION                              | OK       |
| JOINTS       | 1 TO 2 g RANGE                                       | OK       |
| OTHER        | NONE                                                 | -        |

**REMARKS:** None

**CALIBRATION TEST RESULTS**  
**POST TEST**

**SID H3 NO.: 270**

**CONFIGURED FOR LEFT SIDE IMPACT**

**CALIBRATION TEST RESULTS SUMMARY  
POST TEST**

**CONFIGURED FOR LEFT SIDE IMPACT**

SID H3 Serial No.: 270 Sequential Test Number: 1  
Date: 7-16-08 Laboratory Technician: A. Rudniski

| TEST                        | COMMENTS                 |
|-----------------------------|--------------------------|
| EXTERNAL DIMENSIONS         | Passed all requirements. |
| LATERAL THORAX IMPACT TEST  | Passed all requirements. |
| LATERAL PELVIS IMPACT TEST  | Passed all requirements. |
| HEAD DROP TEST*             | Passed all requirements. |
| LATERAL NECK BEND TEST*     | Passed all requirements. |
| ABDOMINAL COMPRESSION TEST* | Passed all requirements. |
| LUMBAR FLEXION TEST*        | Passed all requirements. |

\* Test not required for SID certification.

**REMARKS:** None

**EXTERNAL DIMENSIONS  
POST TEST**

**CONFIGURED FOR LEFT SIDE IMPACT**

SID H3 Serial No.: 270 Sequential Test Number: 1  
Date: 7-16-08 Laboratory Technician: A. Rudniski

| TEST PARAMETER                     | SPECIFICATION | TEST RESULTS |
|------------------------------------|---------------|--------------|
| SH- Seated Height (mm)             | 889 - 909     | 899          |
| RH- Rib Height (mm)                | 502 - 520     | 505          |
| HP- Hip Pivot Height (mm)          | 99 ref.       | 99           |
| RD- Rib from Back Line (mm)        | 229 - 241     | 234          |
| KH- Knee Pivot from Back Line (mm) | 511 - 526     | 518          |
| KV- Knee Pivot to Floor (mm)       | 490 - 505     | 495          |
| HW- Hip Width (mm)                 | 356 - 391     | 384          |

**REMARKS:** None

# Thorax Impact

## Post-Test

### CONFIGURED FOR LEFT SIDE IMPACT

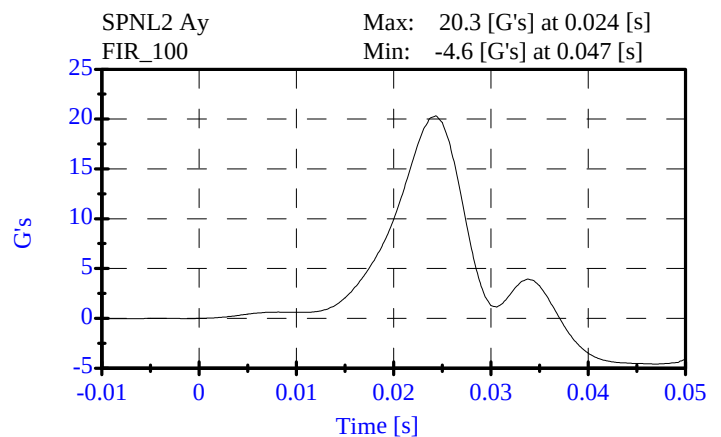
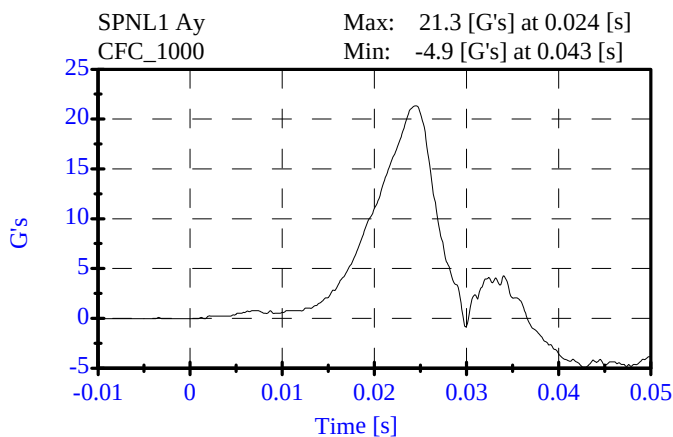
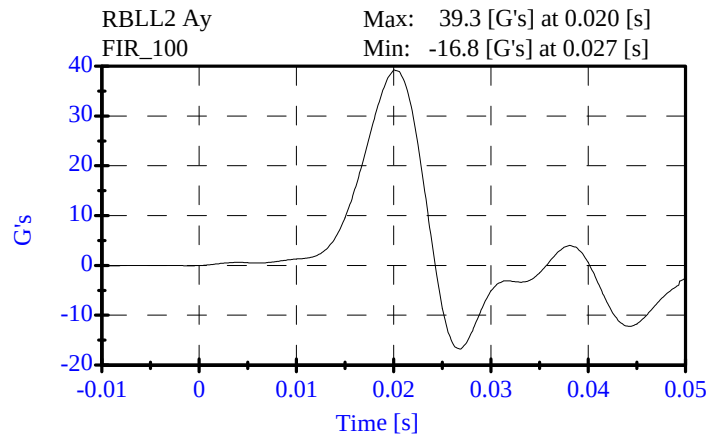
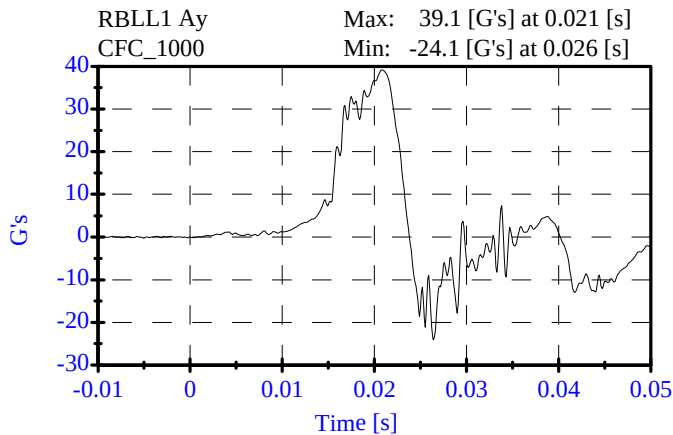
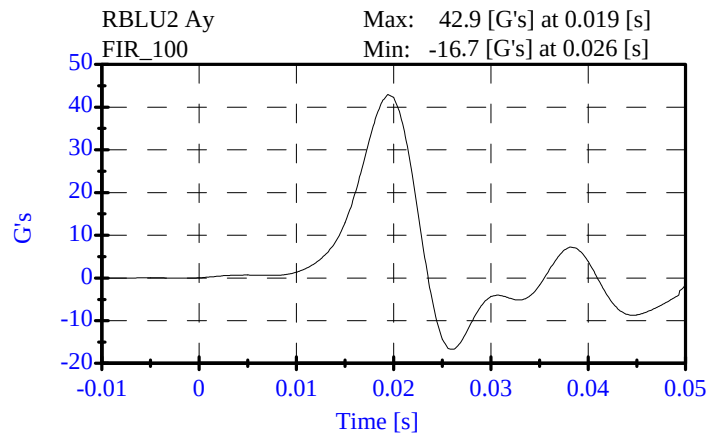
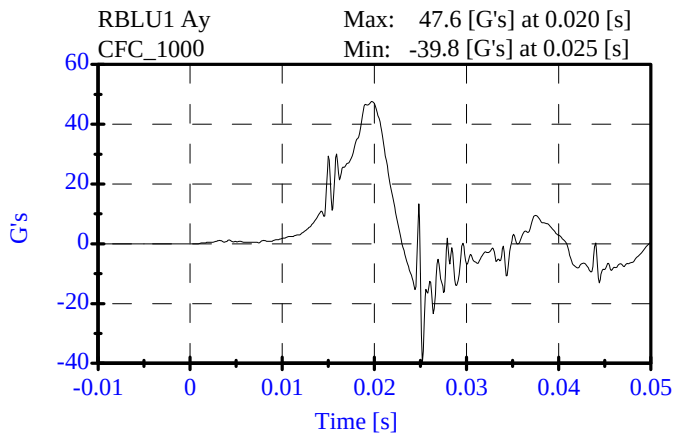
ATD Serial No: 270

Date: 07-15-08

Sequential Test Number: 1 File: 270T 07-15-08

Laboratory Technician: B. Swiecicki

| TEST PARAMETER            | SPECIFICATION   | TEST RESULTS | STATUS |
|---------------------------|-----------------|--------------|--------|
| Lab Temperature:          | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:             | 10-70 %         | 50.00 %      | Passed |
| Probe Velocity:           | 4.27- 4.33 m/s  | 4.31 m/s     | Passed |
| Upper Rib Acceleration:   | 37.00-46.00 G's | 42.93 G's    | Passed |
| Lower Rib Acceleration:   | 37.00-46.00 G's | 39.27 G's    | Passed |
| Lower Spine Acceleration: | 15.00-22.00 G's | 20.32 G's    | Passed |



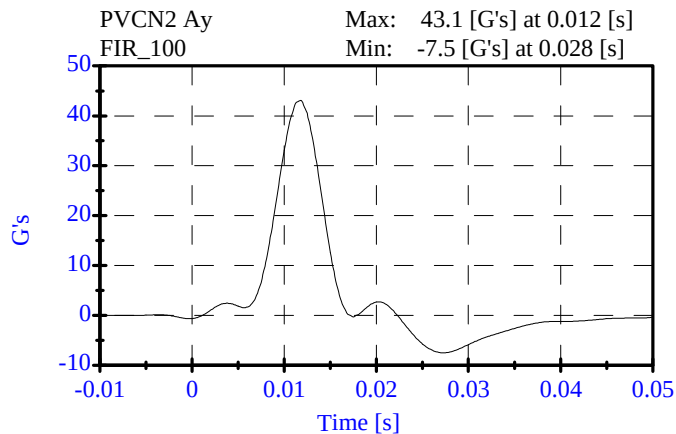
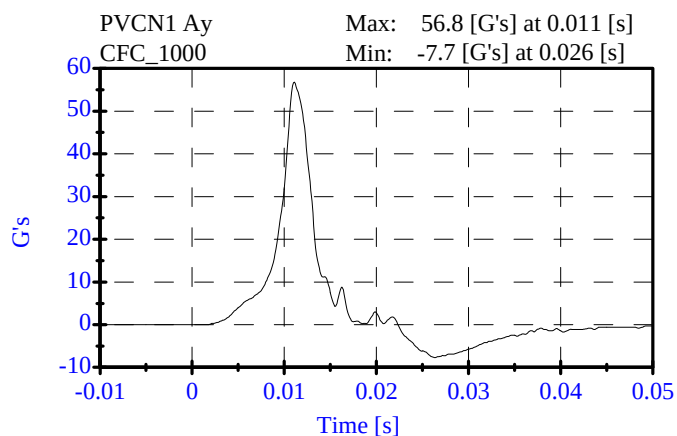
# **Pelvis Impact** **Post-Test**

## **CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 07-15-08

Sequential Test Number: 1 File: 270P 07-15-08  
Laboratory Technician: B. Swiecicki

| <u>TEST PARAMETER</u>  | <u>SPECIFICATION</u> | <u>TEST RESULTS</u> | <u>STATUS</u> |
|------------------------|----------------------|---------------------|---------------|
| Lab Temperature:       | 18.9-25.5 C          | 21.7 C              | Passed        |
| Lab Humidity:          | 10-70 %              | 51.00 %             | Passed        |
| Probe Velocity:        | 4.27- 4.33 m/s       | 4.30 m/s            | Passed        |
| Pelvis Y Acceleration: | 40.00-60.00 G's      | 43.11 G's           | Passed        |
| Time Above 20 Gs       | 3.0-7.0 ms           | 5.5 ms              | Passed        |



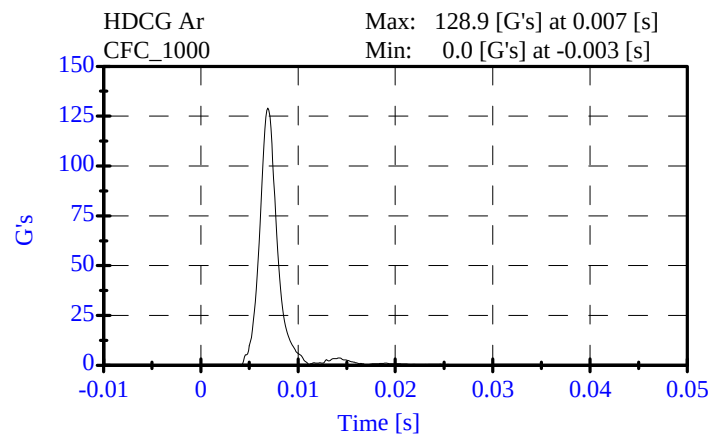
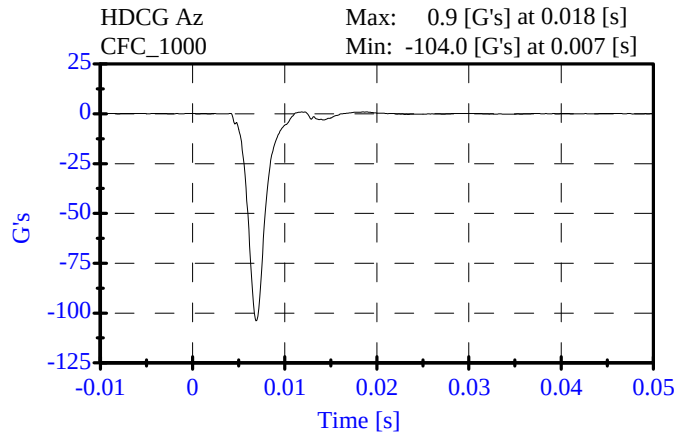
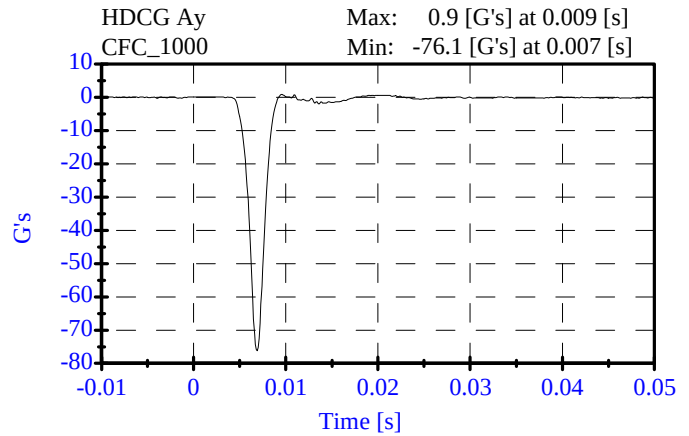
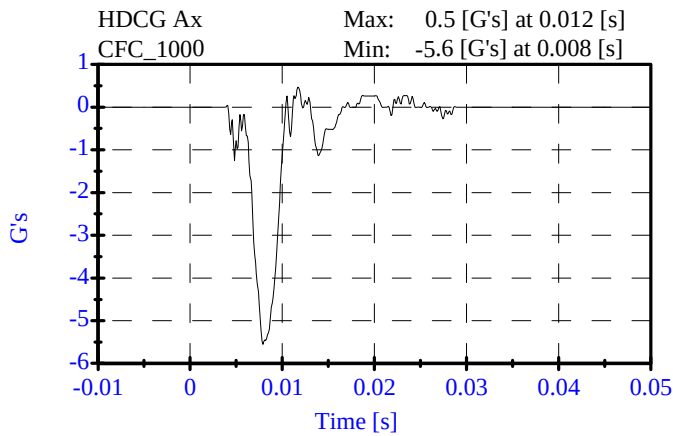
# **Head Drop** **Post-Test**

## **CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 07-14-08

Sequential Test Number: 1 File: 270H 07-14-08  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER          | SPECIFICATION | TEST RESULTS | STATUS |
|-------------------------|---------------|--------------|--------|
| Lab Temperature:        | 18.9-25.6 C   | 21.7 C       | Passed |
| Lab Humidity:           | 10-70 %       | 52.00 %      | Passed |
| Peak Resultant Accel.:  | 120-150 Gs    | 128.92 Gs    | Passed |
| Peak Lateral Accel.:    | 15 Gs Max     | 0.47 Gs      | Passed |
| Curve PerCent NonModal: | < 15%         | 2.87 %       | Passed |



**Neck Test****Post-Test****CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270

Date: 07-15-08

Sequential Test Number: 1 File: 270N1 07-15-08

Laboratory Technician: B. Swiecicki

| <u>TEST PARAMETER</u>                                           | <u>SPECIFICATION</u> | <u>TEST RESULTS</u> | <u>STATUS</u> |
|-----------------------------------------------------------------|----------------------|---------------------|---------------|
| Lab Temperature:                                                | 20.6-22.2 C          | 21.7 C              | Passed        |
| Lab Humidity:                                                   | 10-70 %              | 53.00 %             | Passed        |
| Impact Velocity:                                                | 6.89- 7.13 m/s       | 6.99 m/s            | Passed        |
| PENDULUM DELTA V                                                |                      |                     |               |
| Delta V at 10 ms:                                               | 1.96- 2.55 m/s       | 2.12 m/s            | Passed        |
| Delta V at 20 ms:                                               | 4.12- 5.10 m/s       | 4.34 m/s            | Passed        |
| Delta V at 30 ms:                                               | 5.73- 7.01 m/s       | 6.19 m/s            | Passed        |
| Delta V between 40-70 ms:                                       | 6.27- 7.64 m/s       | 7.03 m/s            | Passed        |
| D PLANE ROTATION                                                |                      |                     |               |
| Maximum Rotation:                                               | 66.0-82.0 Deg        | 71.10 Deg           | Passed        |
| Rotation Angle Decay:                                           | 58.0-67.0 ms         | 60.00 ms            | Passed        |
| MOMENT ABOUT THE OCCIPITAL CONDYLE                              |                      |                     |               |
| Max Occipital Moment:                                           | 73.00- 88.00 N-m     | 83.48 N-m           | Passed        |
| Occipital Moment Decay:                                         | 49.0-64.0 ms         | 54.80 ms            | Passed        |
| HEAD ROTATION TIME WITH RESPECT TO THE OCCIPITAL CONDYLE MOMENT |                      |                     |               |
| Moment to Rotation Peak:                                        | 2.0-16.0 ms          | 8.90 ms             | Passed        |

## Neck Test

## Post-Test

### CONFIGURED FOR LEFT SIDE IMPACT

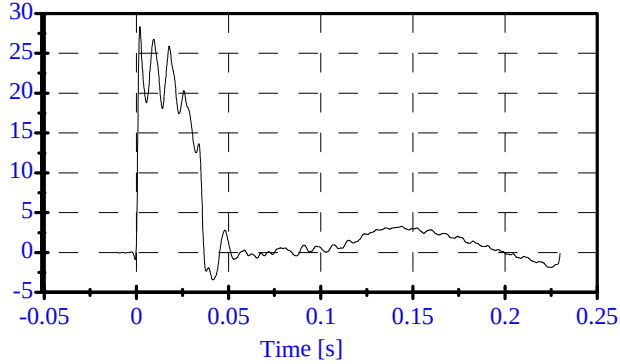
ATD Serial No: 270

Date: 07-15-08

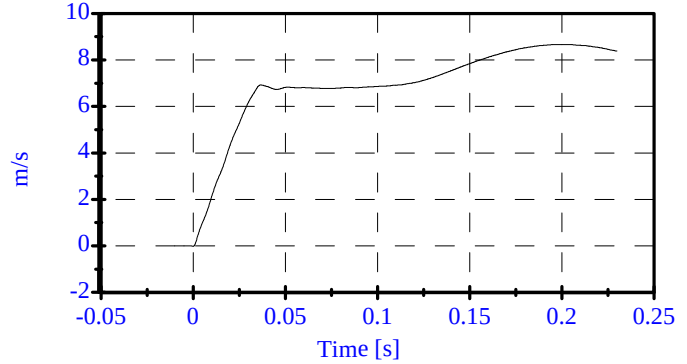
Sequential Test Number: 1 File: 270N1 07-15-08

Laboratory Technician: B. Swiecicki

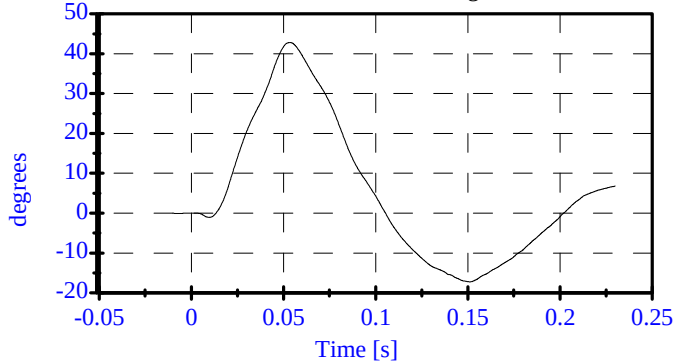
Pend Ax  
CFC\_180  
Max: 28.3 [ ] at 0.002 [s]  
Min: -3.4 [ ] at 0.042 [s]



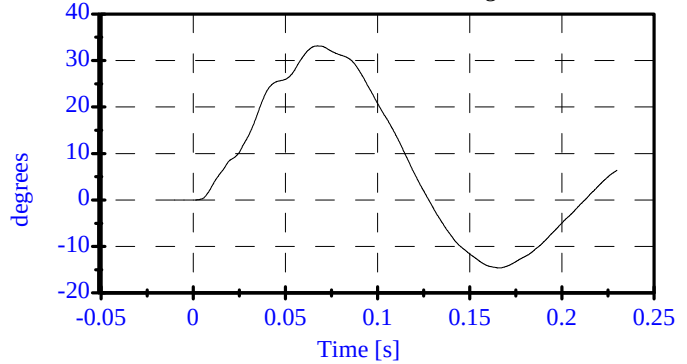
Pend Vx  
CFC\_180  
Max: 8.7 [m/s] at 0.200 [s]  
Min: -0.0 [m/s] at -0.000 [s]



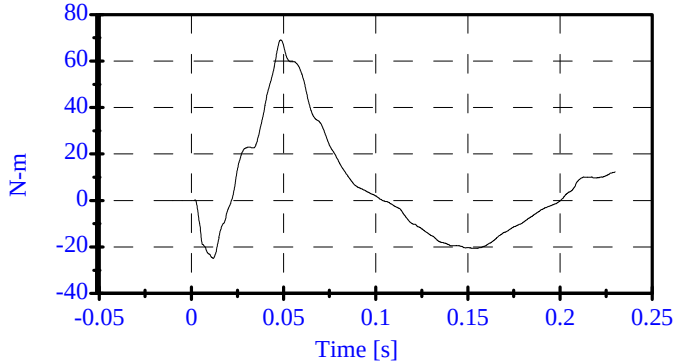
Head Rot  
CFC\_180  
Max: 42.8 [degrees] at 0.054 [s]  
Min: -17.2 [degrees] at 0.151 [s]



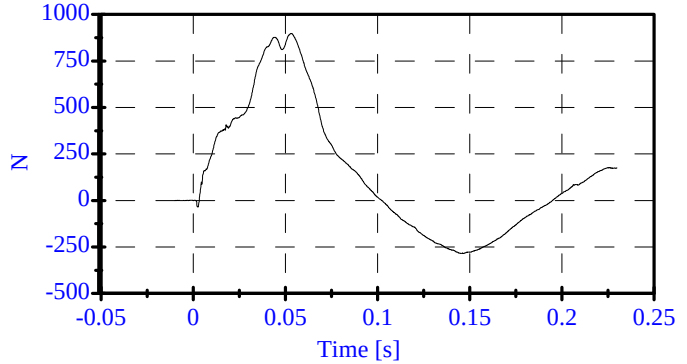
Arm Rot  
CFC\_180  
Max: 33.1 [degrees] at 0.067 [s]  
Min: -14.6 [degrees] at 0.166 [s]



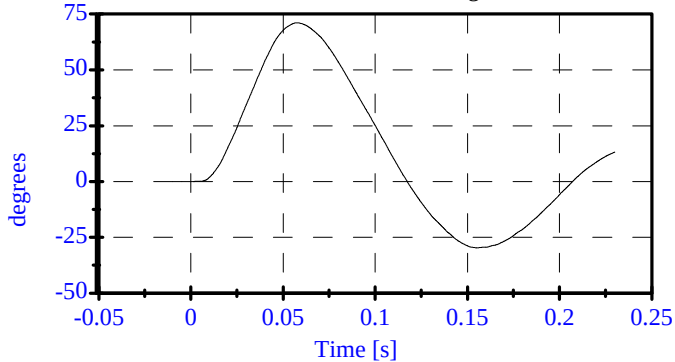
Neck Mx  
CFC\_600  
Max: 69.0 [N-m] at 0.049 [s]  
Min: -25.0 [N-m] at 0.012 [s]



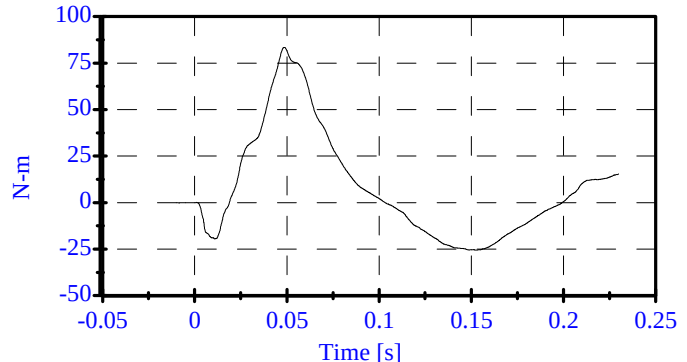
Neck Fy  
CFC\_1000  
Max: 897.7 [N] at 0.053 [s]  
Min: -284.0 [N] at 0.145 [s]



Tot Rot  
CFC\_180  
Max: 71.1 [degrees] at 0.057 [s]  
Min: -29.6 [degrees] at 0.155 [s]



MOCX  
Max: 83.5 [N-m] at 0.049 [s]  
Min: -25.5 [N-m] at 0.152 [s]



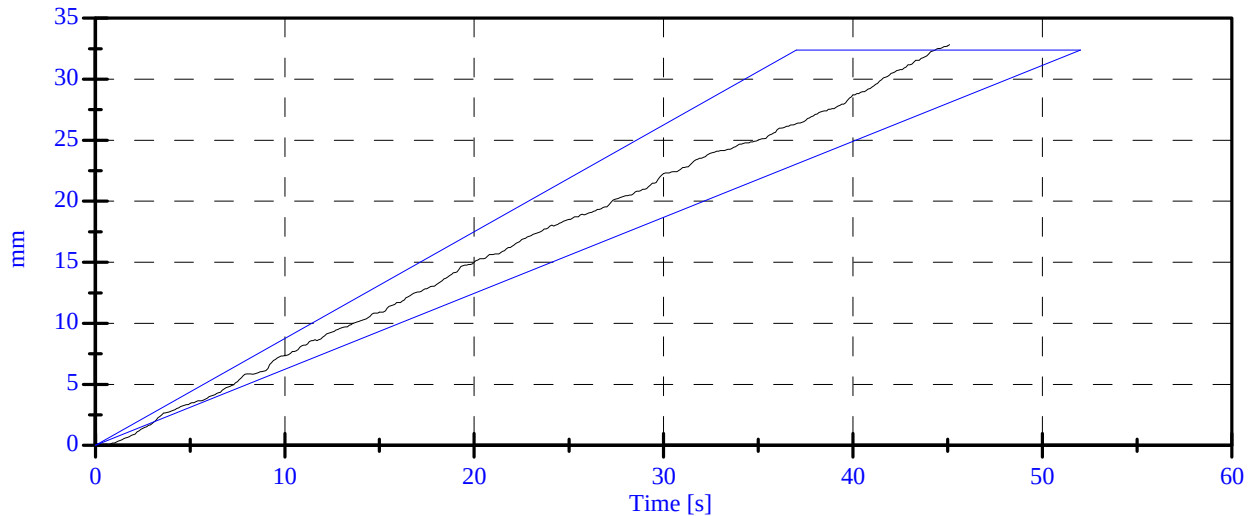
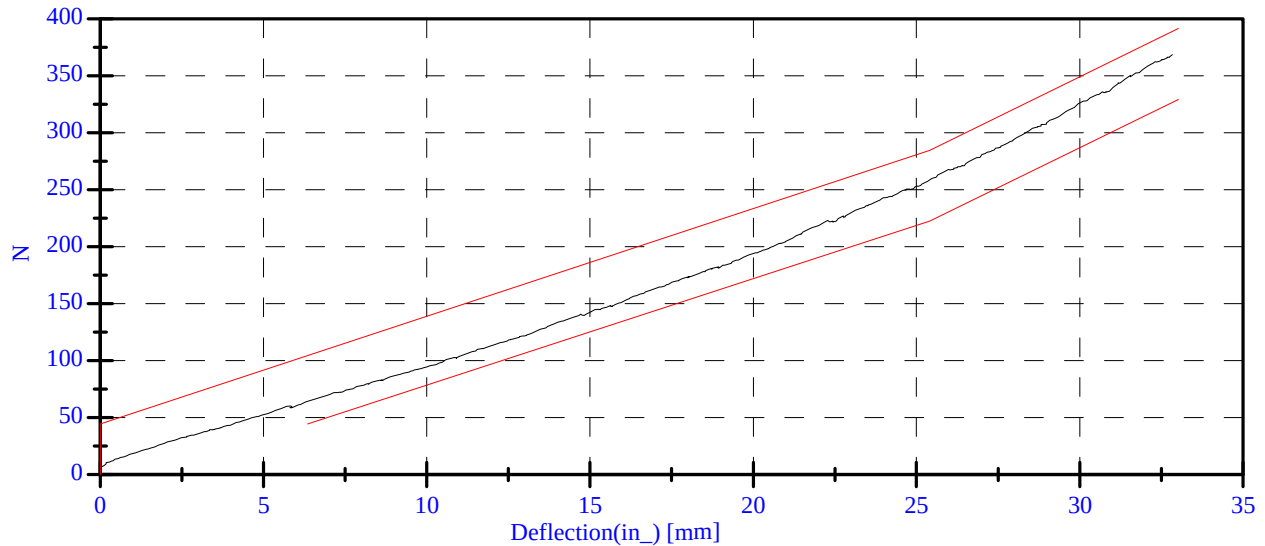
**Abdominal Compression Test**  
**Post-Test**  
**CONFIGURED FOR LEFT SIDE IMPACT**

ATD Serial No: 270  
Date: 07-16-08

Sequential Test Number: 1 File: 270 Ab 07-16-08  
Laboratory Technician: B. Swiecicki

| TEST PARAMETER      | SPECIFICATION   | TEST RESULTS | STATUS |
|---------------------|-----------------|--------------|--------|
| Lab Temperature:    | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:       | 10-70 %         | 56.00 %      | Passed |
| Force at 12.95 mm : | 104.00-162.00 N | 121.72 N     | Passed |
| Force at 19.05 mm : | 162.98-220.99 N | 183.78 N     | Passed |
| Force at 25.40 mm : | 221.97-280.02 N | 259.34 N     | Passed |
| Force at 33.02 mm : | 324.99-391.00 N | 368.49 N     | Passed |

**ABDOMINAL COMPRESSION TEST**



## Lumbar Spine Test

### Post-Test

#### CONFIGURED FOR LEFT SIDE IMPACT

ATD Serial No: 270

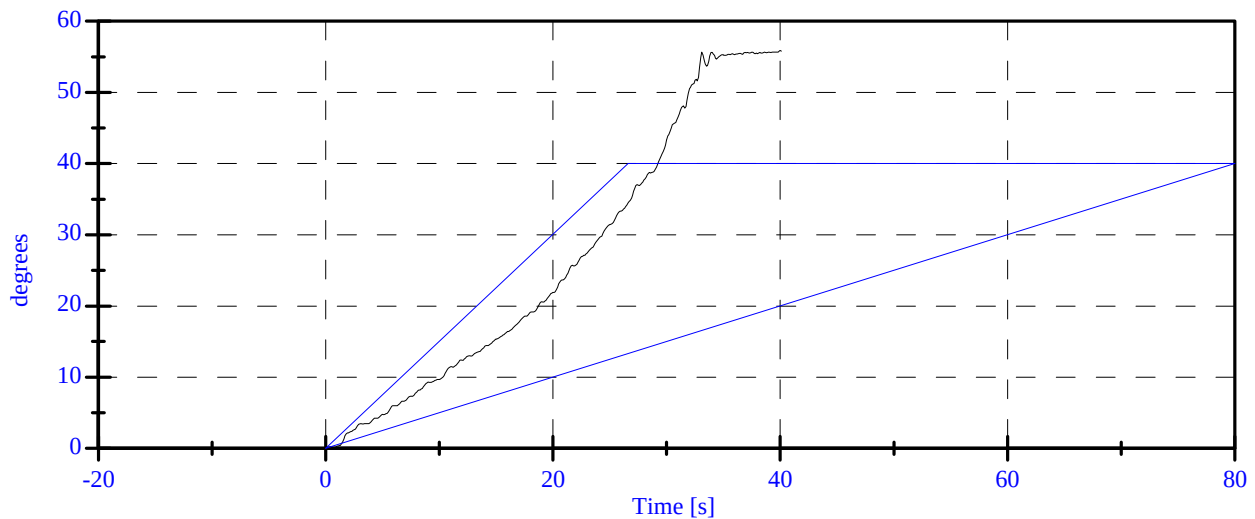
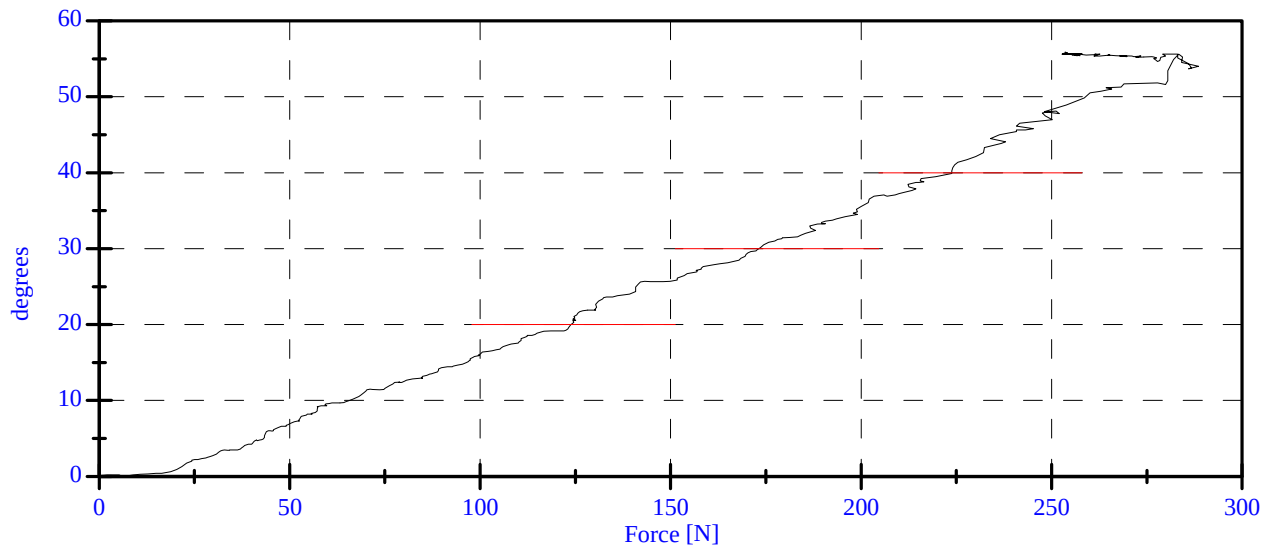
Date: 07-16-08

Sequential Test Number: 1 File: 270 Spine 07-16-08

Laboratory Technician: B. Swiecicki

| TEST PARAMETER   | SPECIFICATION   | TEST RESULTS | STATUS |
|------------------|-----------------|--------------|--------|
| Lab Temperature: | 18.9-25.5 C     | 21.7 C       | Passed |
| Lab Humidity:    | 10-70 %         | 56.00 %      | Passed |
| Force at 0 Deg:  | 0.00-26.69 N    | 2.87 N       | Passed |
| Force at 20 Deg: | 97.86-151.24 N  | 123.79 N     | Passed |
| Force at 30 Deg: | 151.24-204.62 N | 173.67 N     | Passed |
| Force at 40 Deg: | 204.62-258.00 N | 223.81 N     | Passed |
| Return Angle     | 12 Deg Max      | 7.03 deg     | Passed |

### LUMBAR SPINE FLEXION TEST



## POST TEST DUMMY INSPECTION LIST

### CONFIGURED FOR LEFT SIDE IMPACT

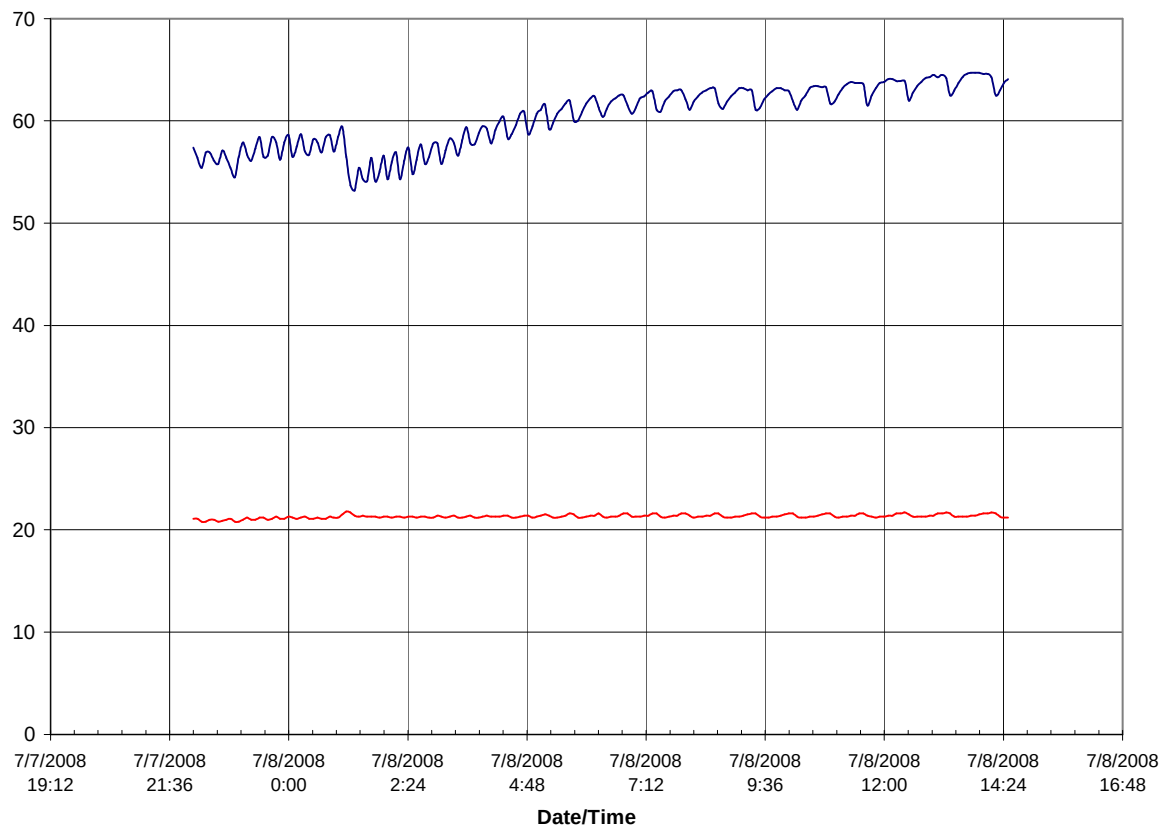
SID H3 Serial No.: 270 Sequential Test Number: 1  
Date: 7-16-08 Laboratory Technician: A. Rudniski

| PART         | ITEMS CHECKED                                        | COMMENTS |
|--------------|------------------------------------------------------|----------|
| SKIN         | VISUAL INSPECTION                                    | OK       |
| HEAD         | VISUAL, BALLAST,<br>ACCELEROMETER MOUNT              | OK       |
| NECK         | VISUAL, CABLE TORQUE                                 | OK       |
| SPINE BOX    | VISUAL, BALLAST,<br>WELDMENT,<br>ACCELEROMETER MOUNT | OK       |
| RIB CAGE     | VISUAL, MEASURE,<br>STIFFENERS                       | OK       |
| STERNUM      | VISUAL                                               | OK       |
| LUMBAR SPINE | VISUAL                                               | OK       |
| ABDOMEN      | VISUAL                                               | OK       |
| PELVIS       | VISUAL, PALPATE,<br>ACCELEROMETER MOUNT              | OK       |
| UPPER LEGS   | VISUAL                                               | OK       |
| KNEES        | VISUAL, STOPS, INSERTS                               | OK       |
| LOWER LEGS   | VISUAL, RANGE OF MOTION                              | OK       |
| ANKLES       | VISUAL, RANGE OF MOTION                              | OK       |
| FEET         | VISUAL, RANGE OF MOTION                              | OK       |
| JOINTS       | 1 TO 2 g RANGE                                       | OK       |
| OTHER        | NONE                                                 | -        |

**REMARKS:** None

# TEMPERATURE TRACE

## 2008 Chevrolet Impala C81018 Environmental Conditions



## **APPENDIX D**

### **TEST EQUIPMENT AND CALIBRATION INFORMATION**

## TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

### SID/HIII INSTRUMENTATION

|                       | SID/HIII NO.: 270 |              |                  |
|-----------------------|-------------------|--------------|------------------|
|                       | SERIAL NUMBER     | MANUFACTURER | CALIBRATION DATE |
| HEAD AX               | AC-P58998         | ENDEVCO      | 07-Mar-08        |
| HEAD AY               | AC-P58909         | ENDEVCO      | 07-Mar-08        |
| HEAD AZ               | AC-P51279         | ENDEVCO      | 01-Apr-08        |
| HEAD AX REDUNDANT     | AC-P58780         | ENDEVCO      | 06-Mar-08        |
| HEAD AY REDUNDANT     | AC-P58997         | ENDEVCO      | 07-Mar-08        |
| HEAD AZ REDUNDANT     | AC-P58912         | ENDEVCO      | 07-Mar-08        |
| UPPER NECK FX         | 03-Apr-08         | DENTON       | LC-498Fx         |
| UPPER NECK FY         | 03-Apr-08         | DENTON       | LC-498Fy         |
| UPPER NECK FZ         | 03-Apr-08         | DENTON       | LC-498Fz         |
| UPPER NECK MX         | 03-Apr-08         | DENTON       | LC-498Mx         |
| UPPER NECK MY         | 03-Apr-08         | DENTON       | LC-498My         |
| UPPER NECK MZ         | 03-Apr-08         | DENTON       | LC-498Mz         |
| UPPER RIB             | 01-Apr-08         | ENDEVCO      | AC-P51969        |
| LOWER RIB             | AC-P51969         | ENDEVCO      | 01-Apr-08        |
| LOWER SPINE           | AC-P51959         | ENDEVCO      | 04-Apr-08        |
| PELVIS                | AC-P51970         | ENDEVCO      | 01-Apr-08        |
| UPPER RIB REDUNDANT   | AC-P51946         | ENDEVCO      | 01-Apr-08        |
| LOWER RIB REDUNDANT   | AC-P51948         | ENDEVCO      | 01-Apr-08        |
| LOWER SPINE REDUNDANT | AC-P51238         | ENDEVCO      | 01-Apr-08        |
| PELVIS REDUNDANT      | AC-P51965         | ENDEVCO      | 01-Apr-08        |

**REMARKS:** None

# TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

## VEHICLE INSTRUMENTATION

|                         | VEHICLE AND MDB INSTRUMENTS |              |                  |
|-------------------------|-----------------------------|--------------|------------------|
|                         | SERIAL NUMBER               | MANUFACTURER | CALIBRATION DATE |
| VEHICLE CG (AX)         | AC-P32455                   | ENDEVCO      | 01-Feb-08        |
| VEHICLE CG (AY)         | AC-P32464                   | ENDEVCO      | 28-Feb-08        |
| VEHICLE CG (AZ)         | AC-P32139                   | ENDEVCO      | 01-Feb-08        |
| VEHICLE CG RATE (VX)    | ARS-0323                    | ATA          | 05-Oct-07        |
| VEHICLE CG RATE (VY)    | ARS-0336                    | ATA          | 05-Oct-07        |
| VEHICLE CG RATE (VZ)    | ARS-0321                    | ATA          | 05-Oct-07        |
| STRUCK SIDE SILL (AY)   | AC-P23156                   | ENDEVCO      | 16-Jun-08        |
| A-PILLAR SILL (AY)      | AC-P16576                   | ENDEVCO      | 07-Mar-08        |
| A-PILLAR LOWER (AY)     | AC-P39740                   | ENDEVCO      | 16-Jun-08        |
| A-PILLAR MIDDLE (AY)    | AC-P19222                   | ENDEVCO      | 16-Jun-08        |
| B-PILLAR SILL (AY)      | AC-P32204                   | ENDEVCO      | 01-May-08        |
| B-PILLAR LOWER (AY)     | AC-P13323                   | ENDEVCO      | 25-Mar-08        |
| B-PILLAR MIDDLE (AY)    | AC-P23873                   | ENDEVCO      | 03-Mar-08        |
| SEAT TRACK HP (AY)      | AC-P22639                   | ENDEVCO      | 07-Mar-08        |
| DOOR LOWER (AY)         | AC-P23993                   | ENDEVCO      | 01-Feb-08        |
| DOOR MIDDLE (AY)        | AC-P23164                   | ENDEVCO      | 01-Feb-08        |
| DOOR UPPER (AY)         | AC-P24145                   | ENDEVCO      | 11-Apr-08        |
| ENGINE (AX)             | AC-P39731                   | ENDEVCO      | 07-Feb-08        |
| ENGINE (AY)             | AC-P38132                   | ENDEVCO      | 16-Jun-08        |
| FIREWALL (AY)           | AC-P32455                   | ENDEVCO      | 01-Feb-08        |
| OPPOSITE SIDE ROOF (AY) | AC-P32464                   | ENDEVCO      | 28-Feb-08        |
| OPPOSITE SIDE SILL (AY) | AC-P32139                   | ENDEVCO      | 01-Feb-08        |
| TRUNK (AX)              | AC-P23134                   | ENDEVCO      | 01-Jul-08        |
| TRUNK (AY)              | AC-P18792                   | ENDEVCO      | 01-Jul-08        |

**REMARKS:** None