

**REPORT NUMBER: 214P-MGA-2011-006**

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

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

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




**Test Date: May 13, 2011**


**Report Date: June 7, 2011**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
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### Technical Report Documentation Page

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

### **PURPOSE AND SUMMARY OF TEST**

#### PURPOSE

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

#### SUMMARY

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

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

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

A summary of the test results follows:

#### DUMMY INJURY VALUES

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

#### GENERAL COMMENTS

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

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

**SECTION 2**  
**OCCUPANT AND VEHICLE INFORMATION**

**DATA SHEET NO. 1**

**TEST VEHICLE INFORMATION AND OPTIONS**

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

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

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

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Chrysler Group LLC
Date of Manufacture	2-11

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

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

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

**DATA SHEET NO. 2**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

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

**TIRE PRESSURES**

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

**TEST VEHICLE WEIGHTS**

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

**TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION**

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

**TEST VEHICLE ATTITUDES**

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

**CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE**

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

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

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



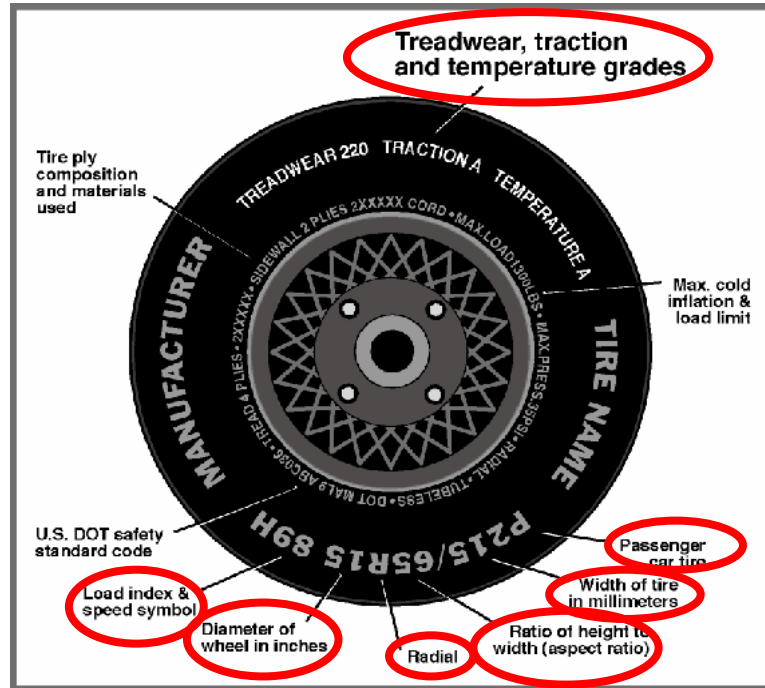
### DATA SHEET NO. 3

#### VEHICLE TIRE INFORMATION

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

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

#### VEHICLE TIRE INFORMATION



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

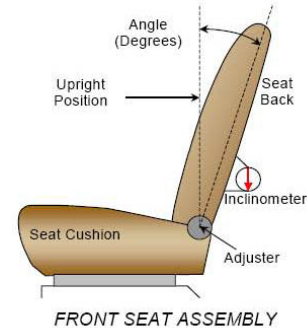
**DATA SHEET NO. 4**  
**SEAT AND SEAT BELT ADJUSTMENT DATA**

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

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

**NORMAL DESIGN RIDING POSITION**

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



**SEAT BACK ANGLE**

	Degrees	Detents
Driver without Seated Dummy	14.9° at headrest post	7 <sup>th</sup> notch (1 <sup>st</sup> as 0)

**SEAT FORE/AFT POSITION**

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

**SEAT FORE/AFT POSITIONING**

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

**SEAT BELT UPPER ANCHORAGE**

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

**SEAT BELT UPPER ANCHORAGE**

	Total # of Positions	Placed in Position #
Driver Seat	4 detents	1 <sup>st</sup> detent (uppermost detent defined as 0)

**HEADREST RESTRAINT**

The headrest was placed in the uppermost position.

## DATA SHEET NO. 5

### FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

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

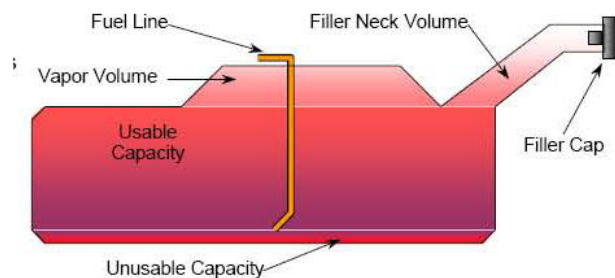
NHTSA No. CB0305  
 Test Date: 5/13/2011

#### FUEL TANK CAPACITY

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

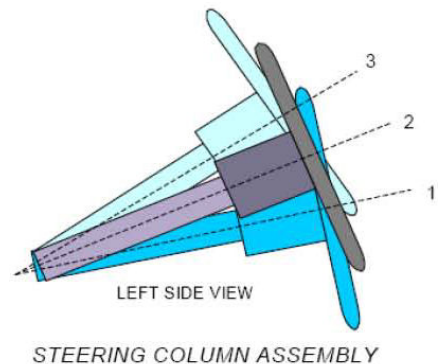
#### FUEL PUMP

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



#### STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



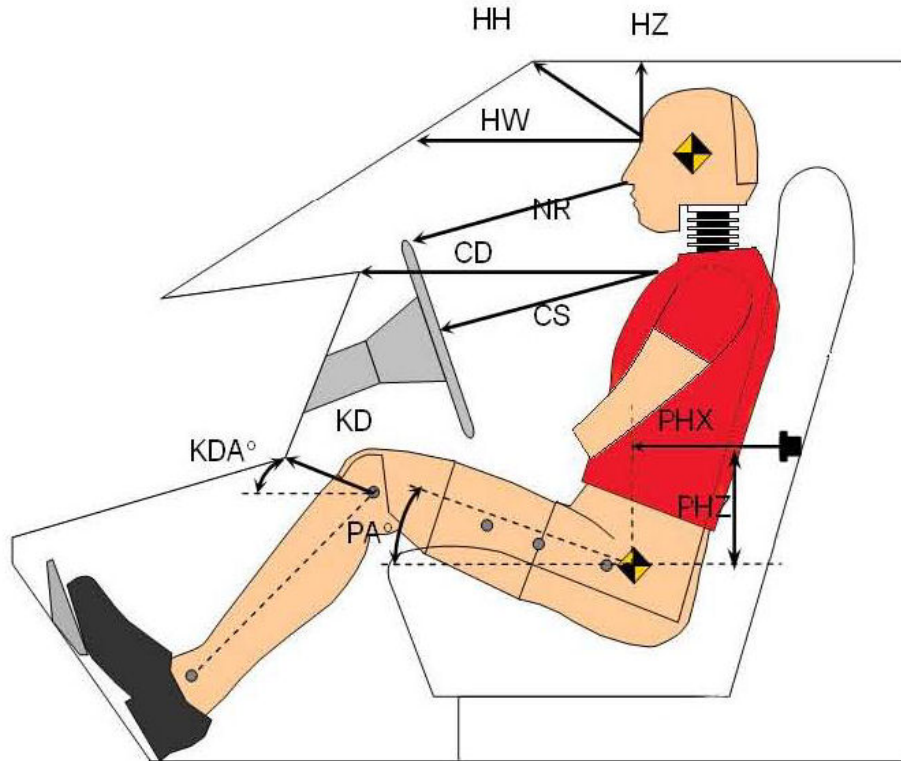
#### STEERING COLUMN POSITIONING

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

**.DATA SHEET NO. 6**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

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

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

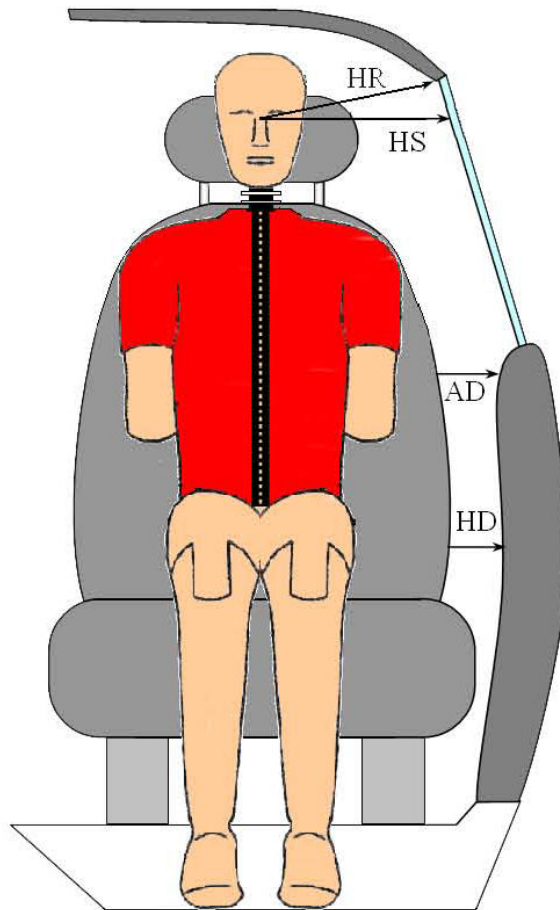


Driver Code	Measurement Description	Length (mm)	Angle (°)
HH	Head to Header	481	
HW	Head to Windshield	716	
HZ	Head to Roof	167	
NR	Nose to Rim	468	
CD	Chest to Dash	568	
CS	Chest to Steering Wheel	341	
KDL	Left Knee to Dash	166	34.7
KDR	Right Knee to Dash	165	32.0
PA	Pelvis Angle X		24.0
	Torso Angle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

**DATA SHEET NO. 7**  
**DUMMY LATERAL CLEARANCE DIMENSIONS**

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

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

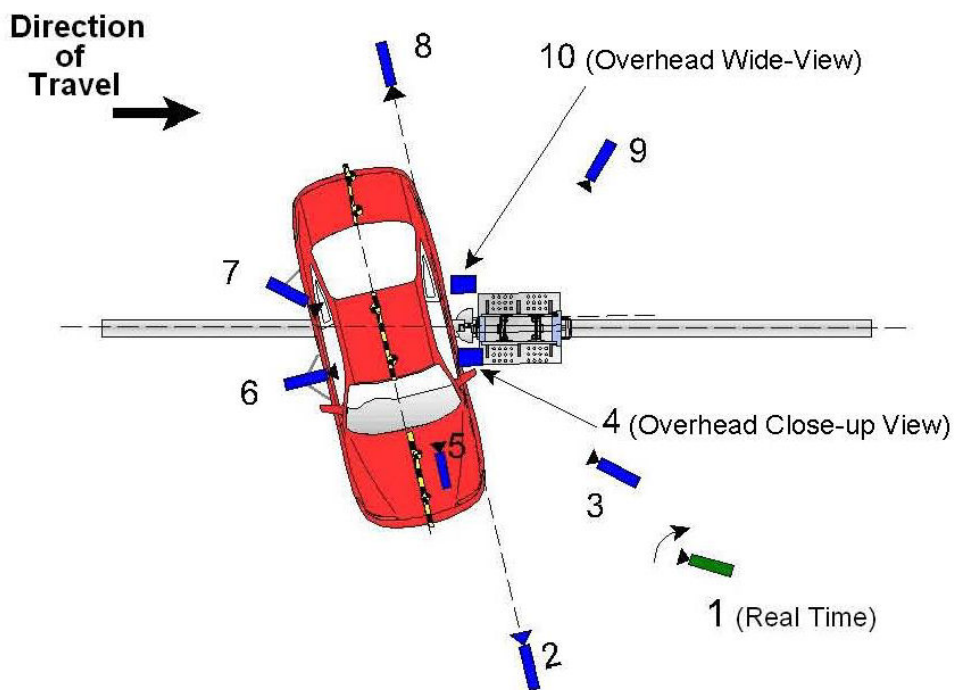


Code	Measurement Description	Units	Front Occupant
HR	Head to Side Header	mm	150
HS	Head to Side Window	mm	312
AD	Arm to Door	mm	111
HD	H-Point to Door	mm	135

**DATA SHEET NO. 8**  
**HIGH SPEED CAMERA LOCATIONS AND DATA**

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

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



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

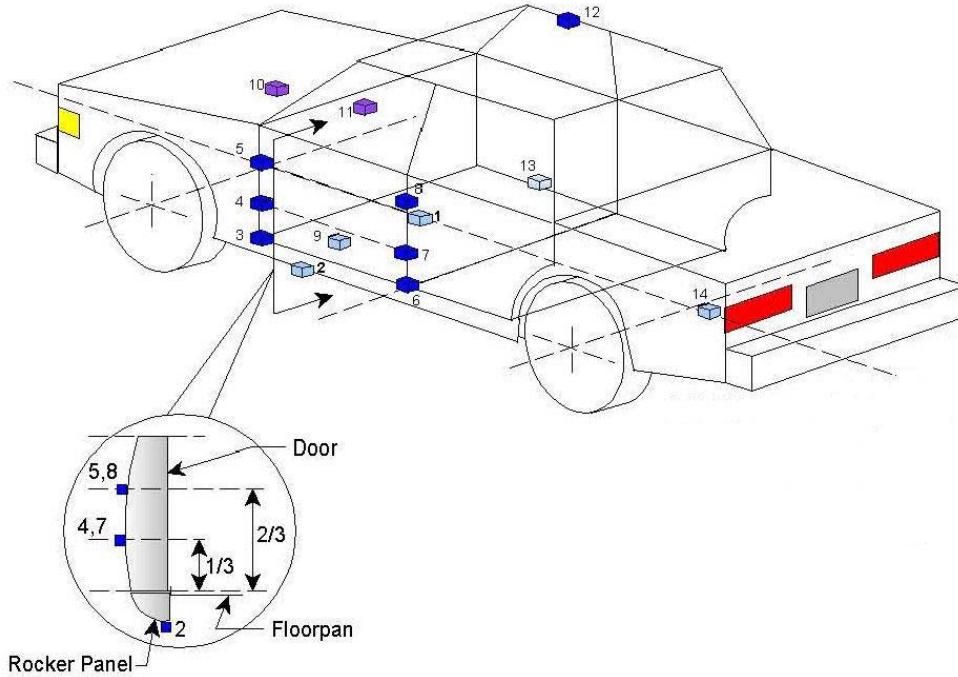
Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Real-Time					30
2	Front Ground Level	5860	-40	1760	24	1000
3	Impact Side 45° Forward	4490	2150	1900	20	1000
4	Overhead Closeup	0	60	4460	50	1000
5	Onboard – Driver Front				16	1000
6	Onboard – Driver Side				8	1000
7	Onboard –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

## DATA SHEET NO. 9

### TEST VEHICLE ACCELEROMETER LOCATIONS

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

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



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

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

**DATA SHEET NO. 10**  
**TEST VEHICLE ACCELEROMETER DATA SUMMARY**

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

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

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

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

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

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



**DATA SHEET NO. 11**  
**DUMMY INJURY RESPONSE DATA**

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

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

Dummy S/N	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
<b>HEAD ACCELERATION (G)</b>				
Longitudinal (X)	5.2	299.8	19.2	50.7
Lateral (Y)	52.6	55.3	9.3	88.3
Vertical (Z)	10.2	37.1	8.8	16.4
Resultant (R)	54.8	53.2		
HIC36 (t1, t2)	331		t1 = 38.1	t2 = 66.0
<b>THORAX DEFLECTION (mm)</b>				
Upper Rib			34.7	45.0
Middle Rib			27.7	44.5
Lower Rib			28.2	45.2
<b>ABDOMINAL FORCES (N)</b>				
Front	162.2	41.5		
Middle	676.3	42.0		
Rear	1148.2	43.3		
Sum	1949.2	42.8		
<b>PELVIS FORCE (N)</b>				
Pubic Symphysis			2158.8	42.7

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

**DATA SHEET NO. 12**  
**POST TEST OBSERVATIONS**

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

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

**TEST DUMMY INFORMATION AND CONTACT**

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

**POST TEST DOOR OPENING AND SEAT TRACK INFORMATION**

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

**POST-TEST STRUCTURAL OBSERVATIONS**

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

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

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

## DATA SHEET NO. 13

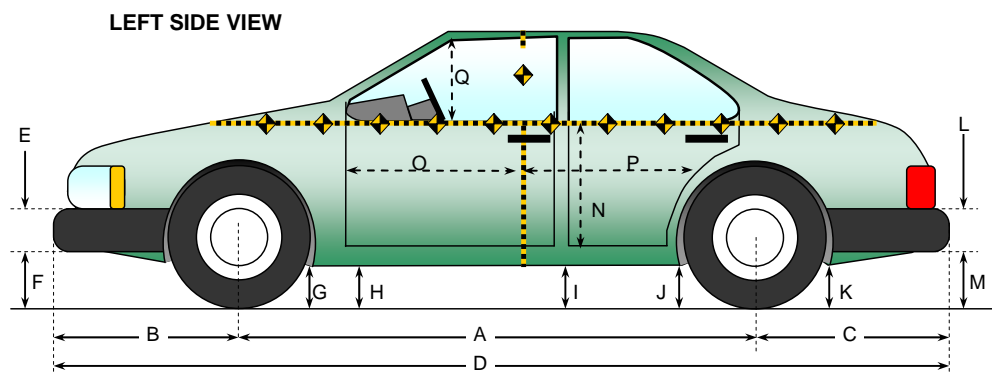
### VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan

NHTSA No. CB0305

Test Program: FMVSS 214 Pole

Test Date: 5/13/2011

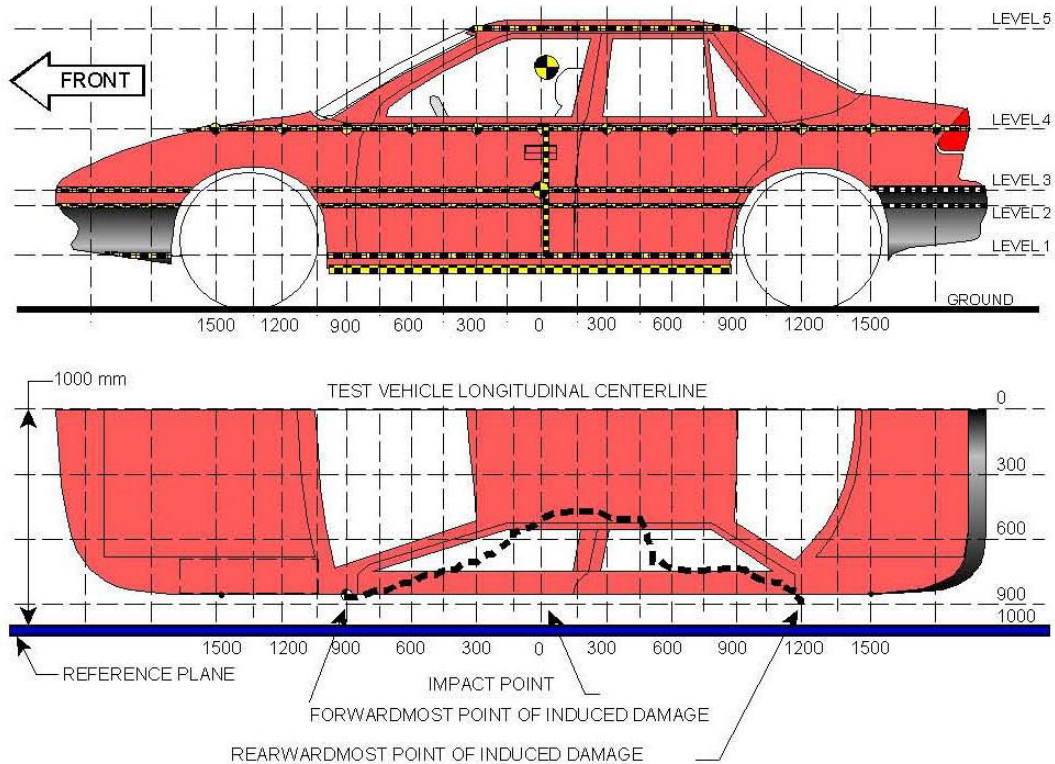


Code	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	Wheelbase	3050	2940	110
B	Front Axle to FSOV	930	930	0
C	Rear Axle to RSOV	1100	1100	0
D	Total Vehicle Length at Centerline	5080	4970	110
E	Front Bumper Thickness	130	130	0
F	Front Bumper Bottom to Ground	191	213	-22
G	Sill Height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

**DATA SHEET NO. 14**  
**EXTERIOR CRUSH MEASUREMENTS**

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

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



NOTE: All measurements are in millimeters (mm)

**Maximum Exterior Crush Measurements**

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

## DATA SHEET NO. 15

### VEHICLE EXTERIOR CRUSH PROFILES

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

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

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

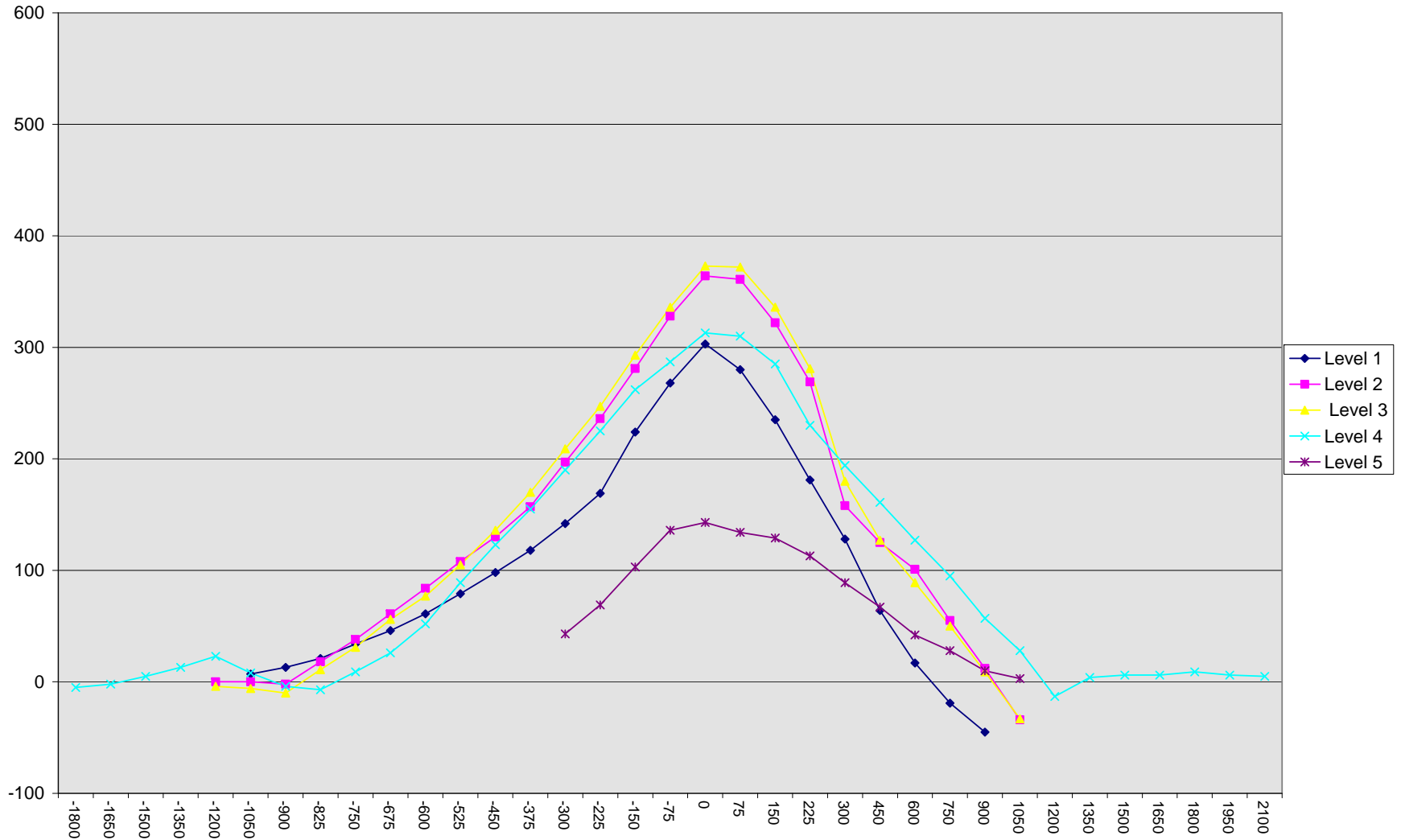
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1800				284					279						-5
-1650				277					275						-2
-1500				267					272						5
-1350				263					276						13
-1200		160	158	259			160	154	282			0	-4	23	
-1050	206	160	158	254		213	160	152	262		7	0	-6	8	
-900	211	159	157	249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

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

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

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

18



## DATA SHEET NO. 16

### SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

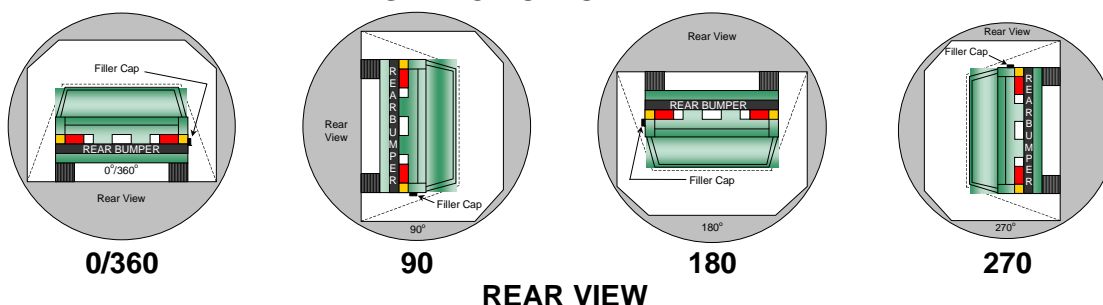
Test Vehicle: 2011 Dodge Charger SE 4-Dr Sedan  
 Test Program: FMVSS 214 Pole

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

#### FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

#### STATIC ROLLOVER DATA



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

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

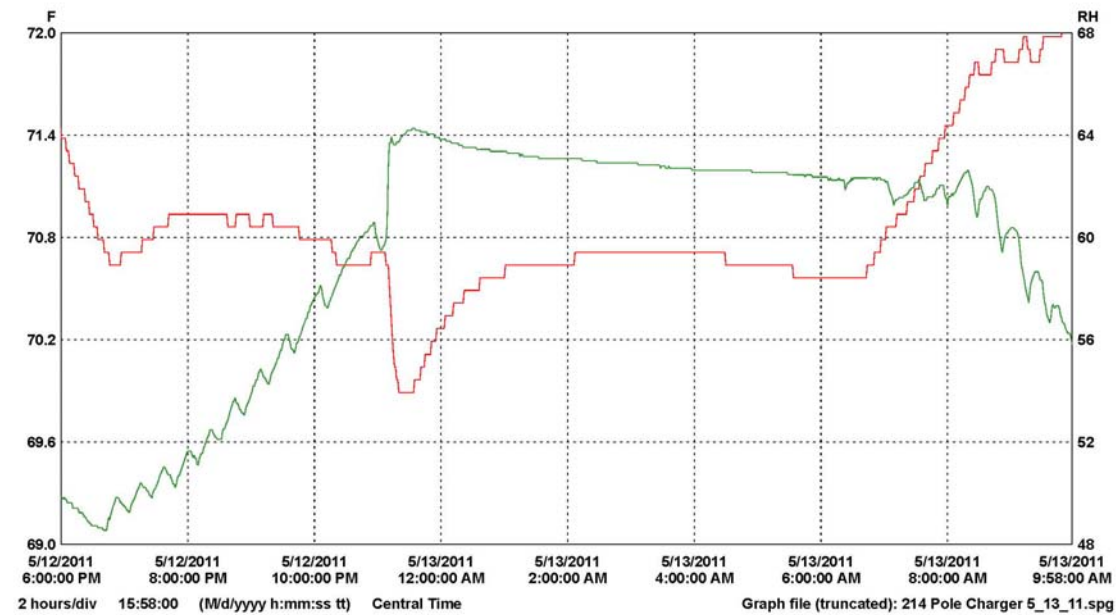
Rollover Stage	Spillage Location(s)
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

**DATA SHEET NO. 17**  
**TEMPERATURE AND HUMIDITY TRACES**

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

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

Time of Impact: 9:58 am



2 hours/div 15:58:00 (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): 214 Pole Charger 5\_13\_11.spg

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



**APPENDIX A**  
**PHOTOGRAPHS**

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Pre-Test Frontal View of Test Vehicle

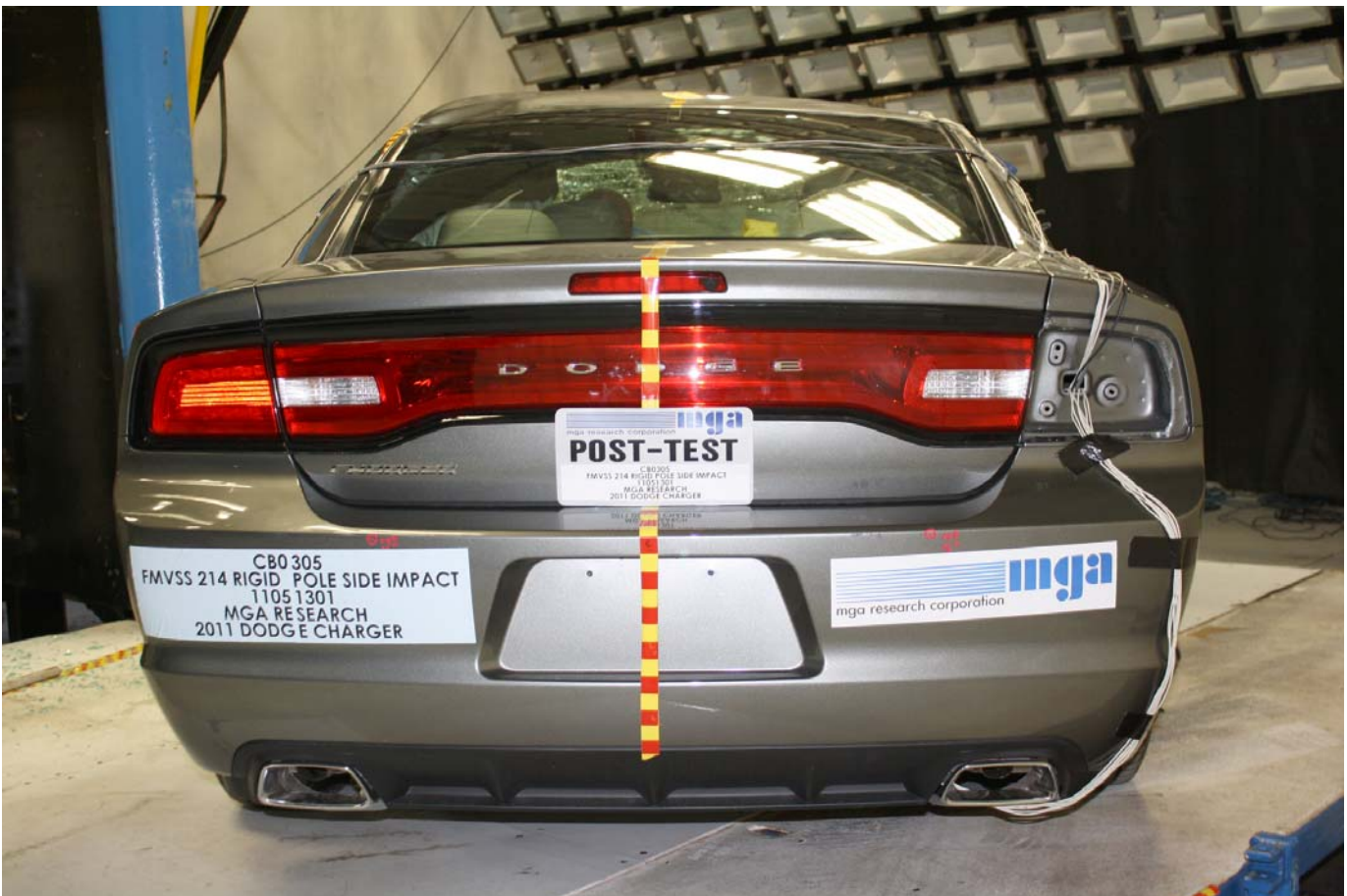


Post-Test Frontal View of Test Vehicle





Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle





Pre-Test Impacted Side View of Test Vehicle



Post-Test Impacted Side View of Test Vehicle





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



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





Pre-Test Overhead View of Test Vehicle



Post-Test Overhead View of Test Vehicle





Pre-Test Dummy Through Opposite Window



Post-Test Dummy Through Opposite Window





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



Post-Test Dummy with Door Closed (Impact Side)



Pre-Test Dummy Door Open





Pre-Test Dummy Shoulder and Door Top View



Post-Test Dummy Shoulder and Door Top View





Pre-Test Interior of Front Door Closed



Post-Test Interior of Front Door Showing Dummy Impact Locations





Impact Event



Post-Test Impact Zone Close-up View





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

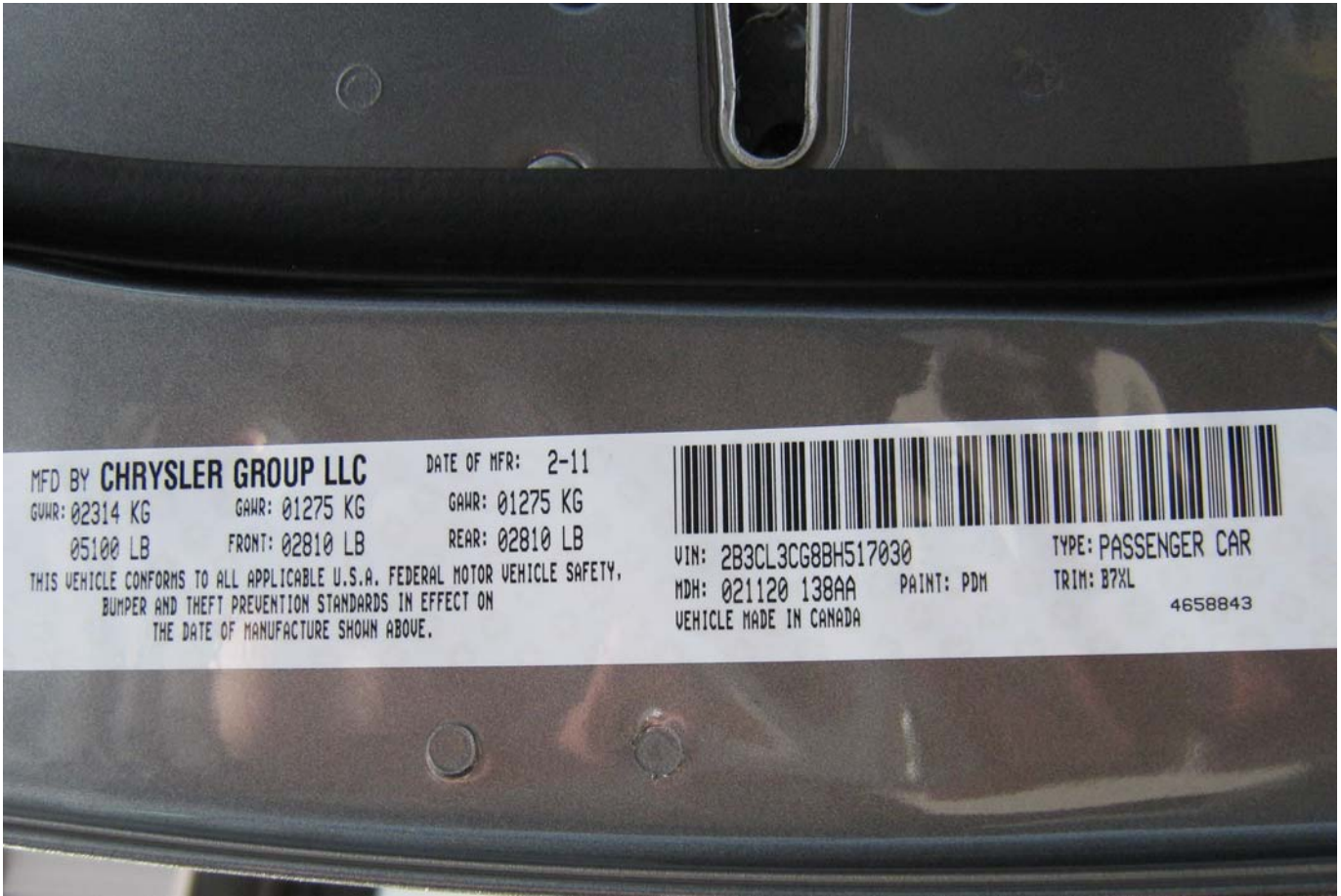


Post-Test  $\frac{3}{4}$  Rear View of Impact Zone



Post-Test Close-up View of Impact Point Target



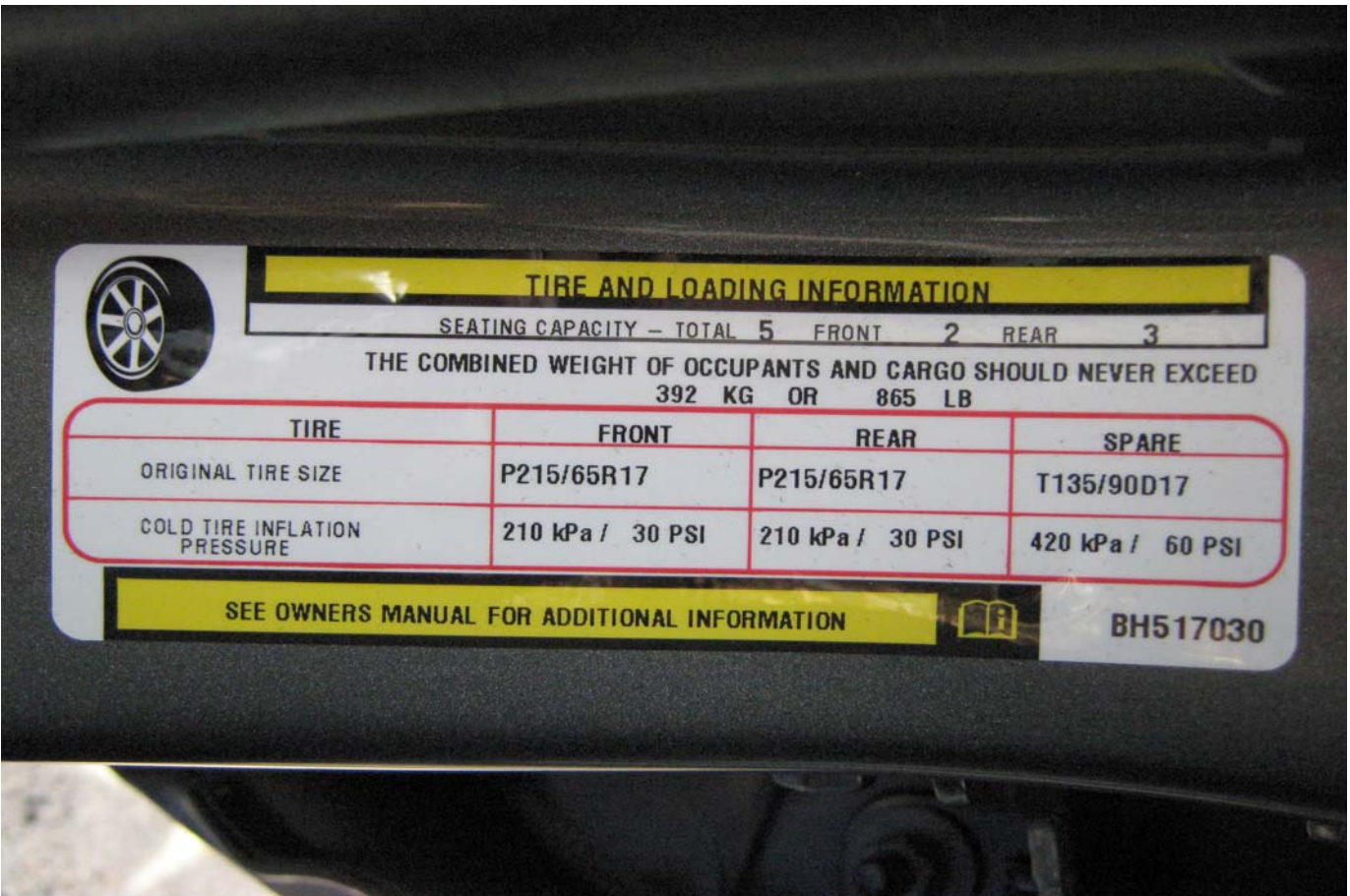


MFD BY **CHRYSLER GROUP LLC**  
 GAWR: 02314 KG      GAWR: 01275 KG      GAWR: 01275 KG  
 05100 LB      FRONT: 02810 LB      REAR: 02810 LB  
 THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL MOTOR VEHICLE SAFETY,  
 BUMPER AND THEFT PREVENTION STANDARDS IN EFFECT ON  
 THE DATE OF MANUFACTURE SHOWN ABOVE.



VIN: 2B3CL3CG8BH517030      TYPE: PASSENGER CAR  
 MDH: 021120 138AA      PAINT: PDM      TRIM: B7XL  
 VEHICLE MADE IN CANADA      4658843

Close-up View of Vehicle's Certification Label




**TIRE AND LOADING INFORMATION**

SEATING CAPACITY – TOTAL 5 FRONT 2 REAR 3

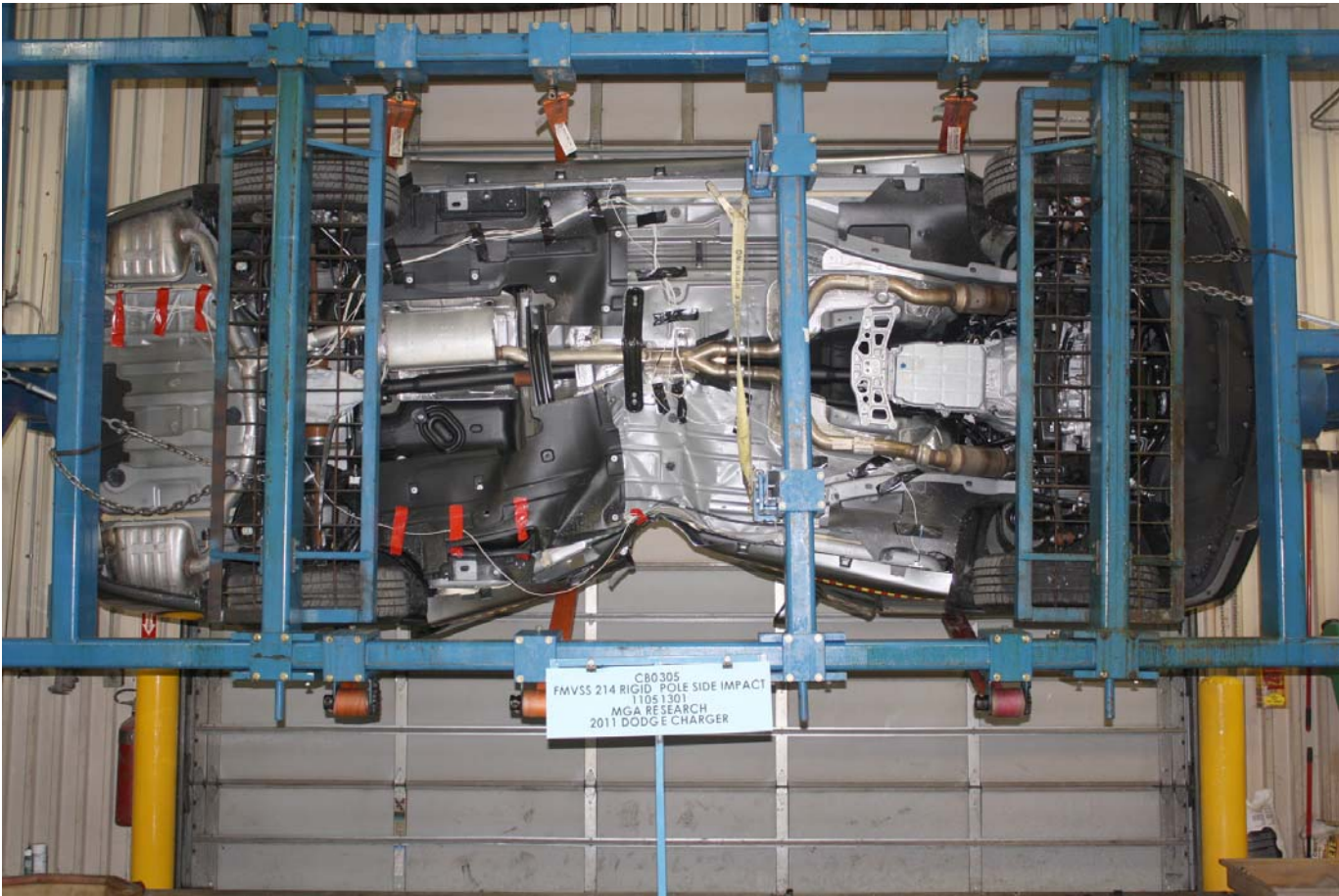
THE COMBINED WEIGHT OF OCCUPANTS AND CARGO SHOULD NEVER EXCEED  
 392 KG OR 865 LB

TIRE	FRONT	REAR	SPARE
ORIGINAL TIRE SIZE	P215/65R17	P215/65R17	T135/90D17
COLD TIRE INFLATION PRESSURE	210 kPa / 30 PSI	210 kPa / 30 PSI	420 kPa / 60 PSI

SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION  BH517030

Close-up View of Vehicle's Tire Placard Label





Post-Test Vehicle at 90 Degree Rollover



Post-Test Vehicle at 180 Degree Rollover





Post-Test Vehicle at 270 Degree Rollover



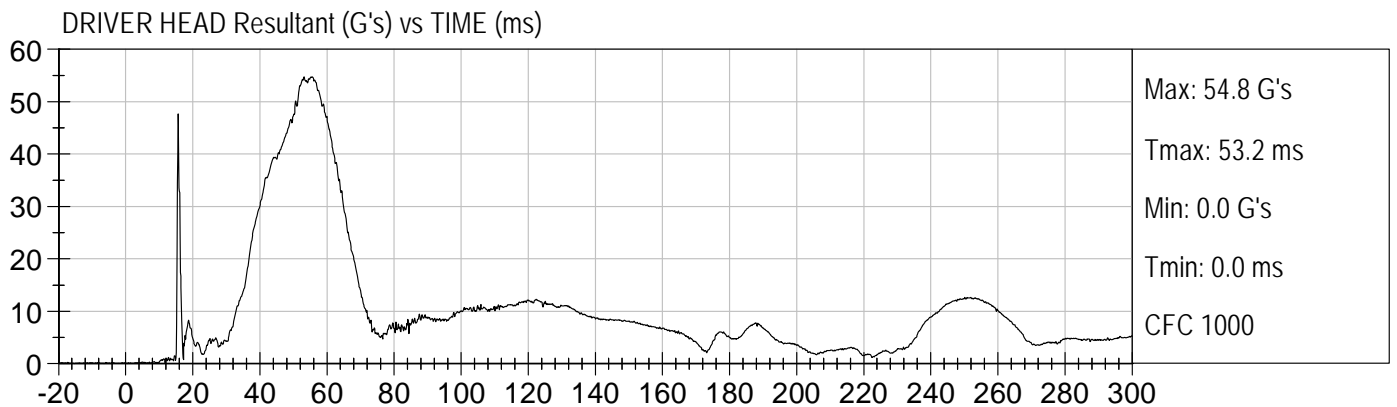
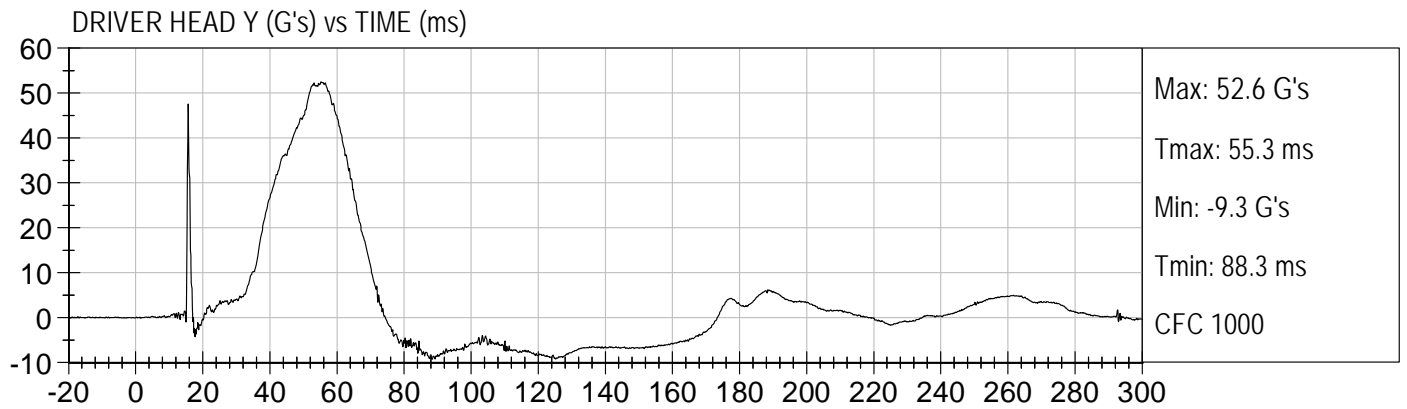
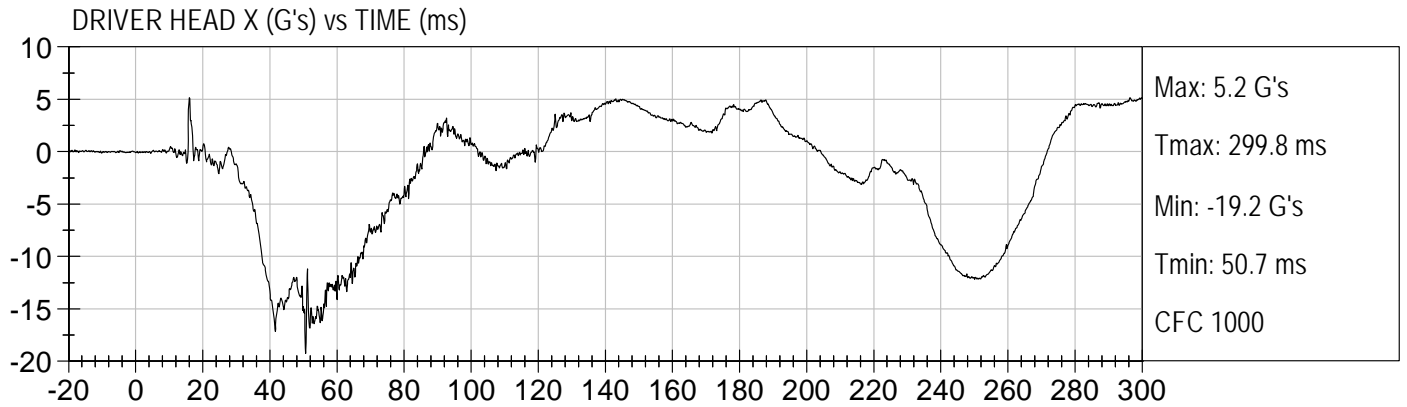
Post-Test Vehicle at 360 Degree Rollover

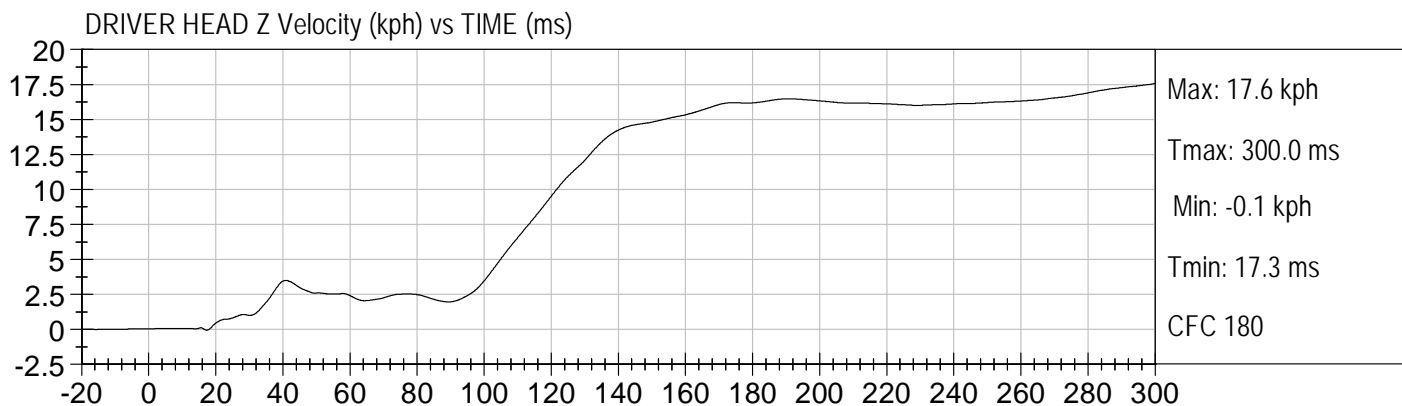
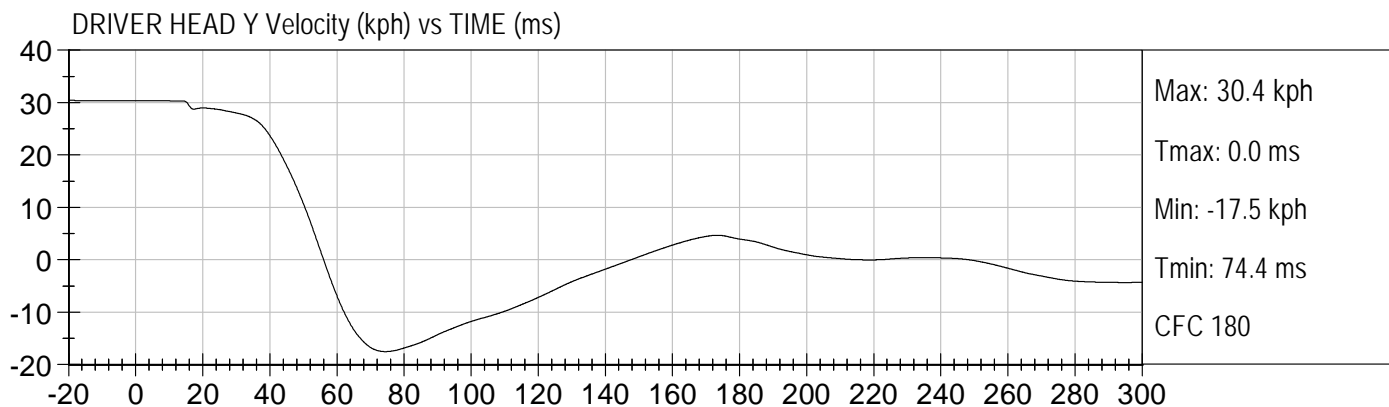
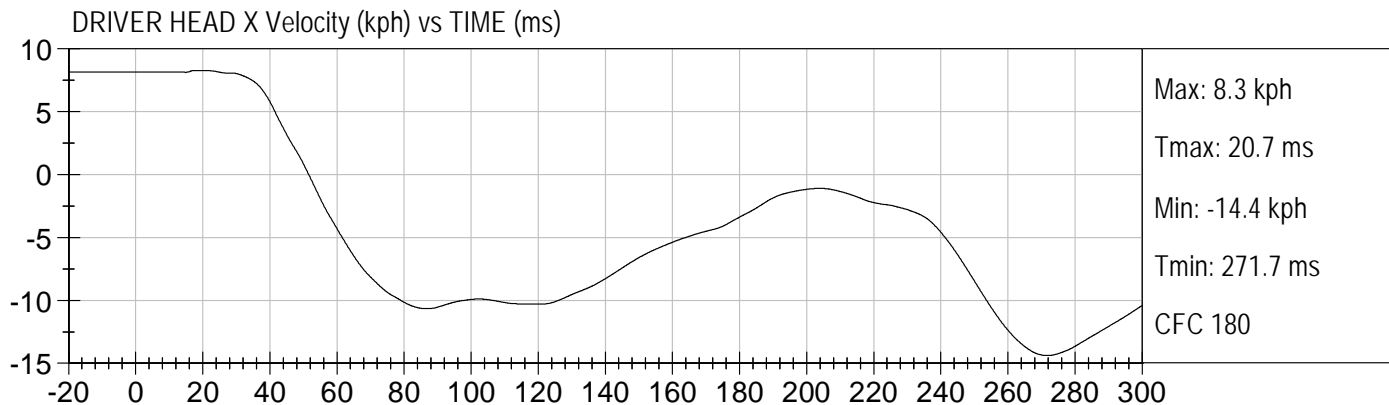
**APPENDIX B**  
**DUMMY RESPONSE DATA**

## TABLE OF DATA PLOTS

### Dummy Instrumentation Plots FILTERED DATA

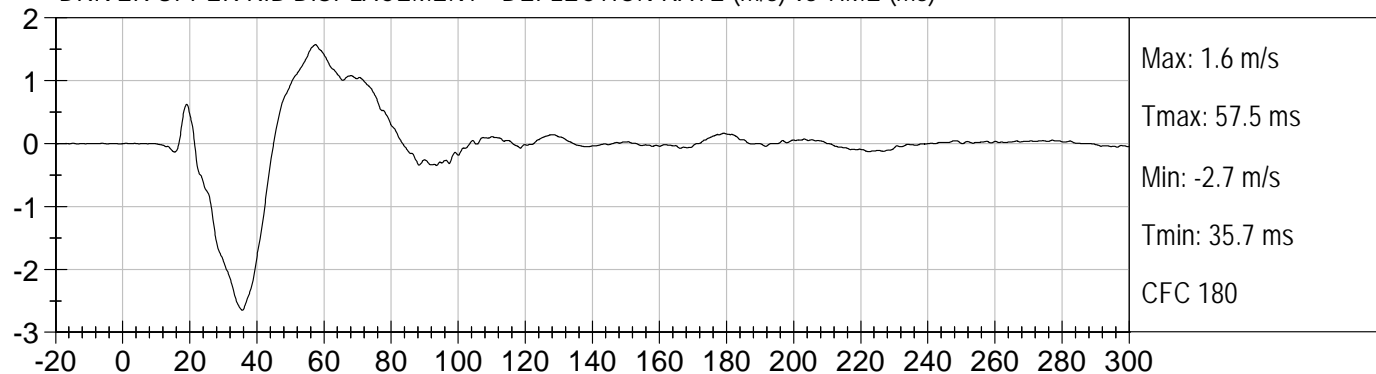
		<u>Page No.</u>
Figure No. 1.	ES-2re Head (X) Acceleration vs. Time	B-1
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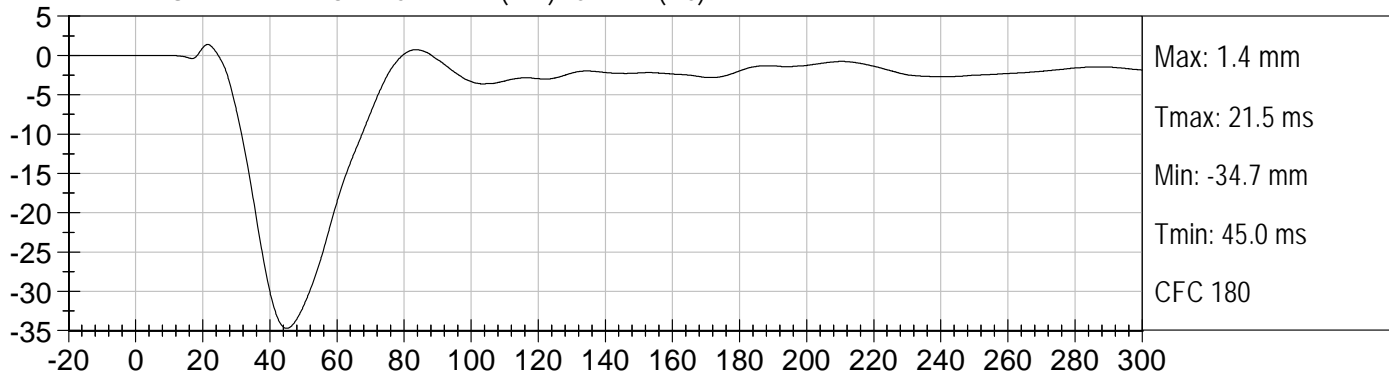




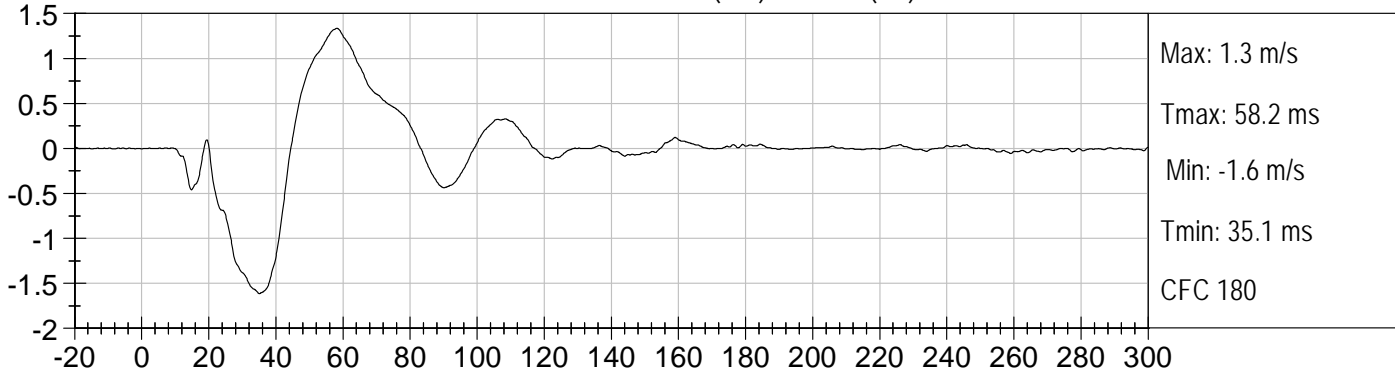
DRIVER UPPER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



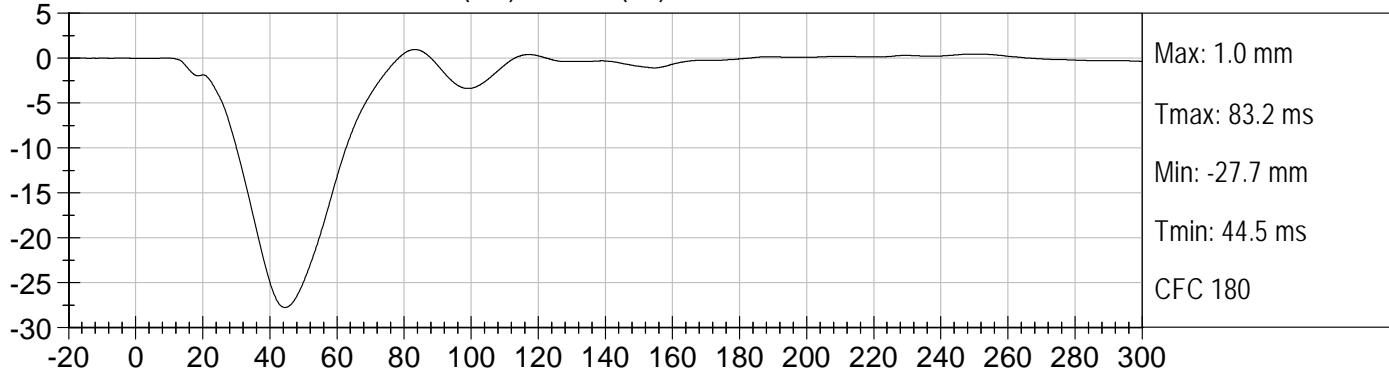
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)

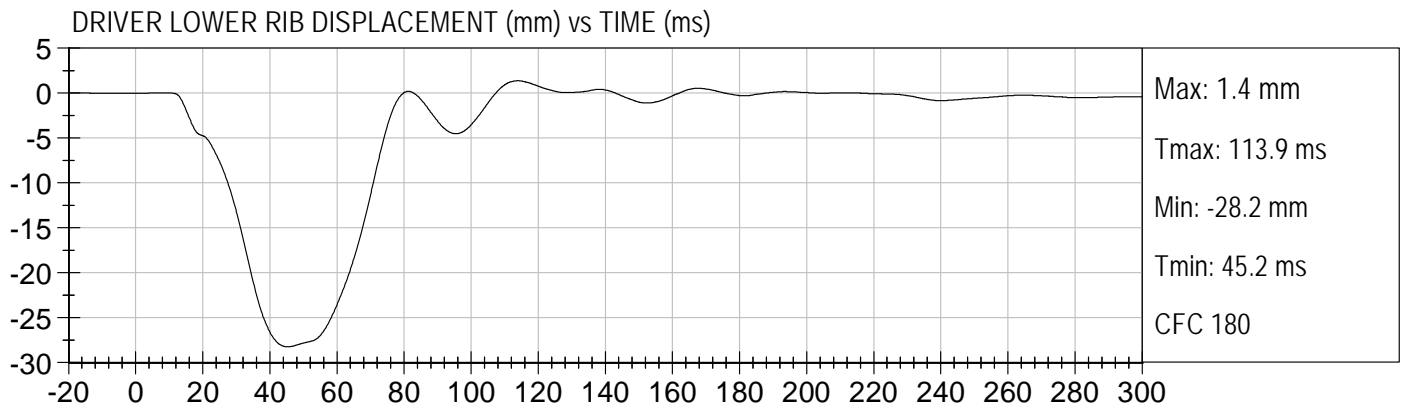
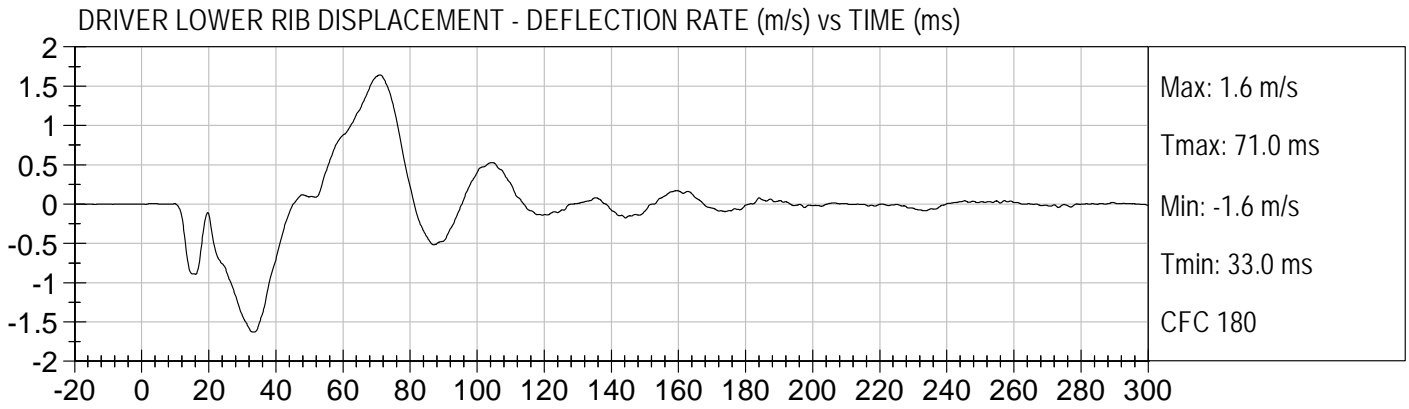


DRIVER MID RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



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

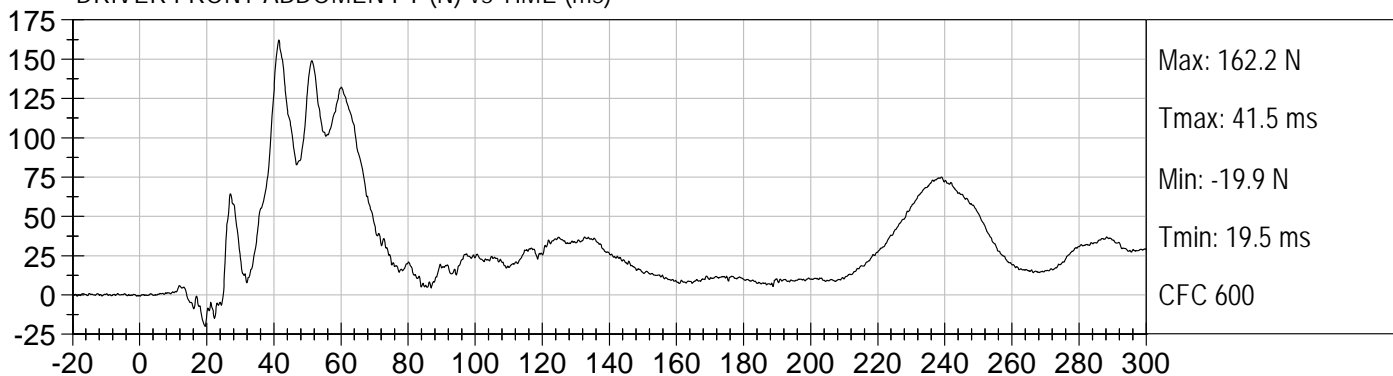




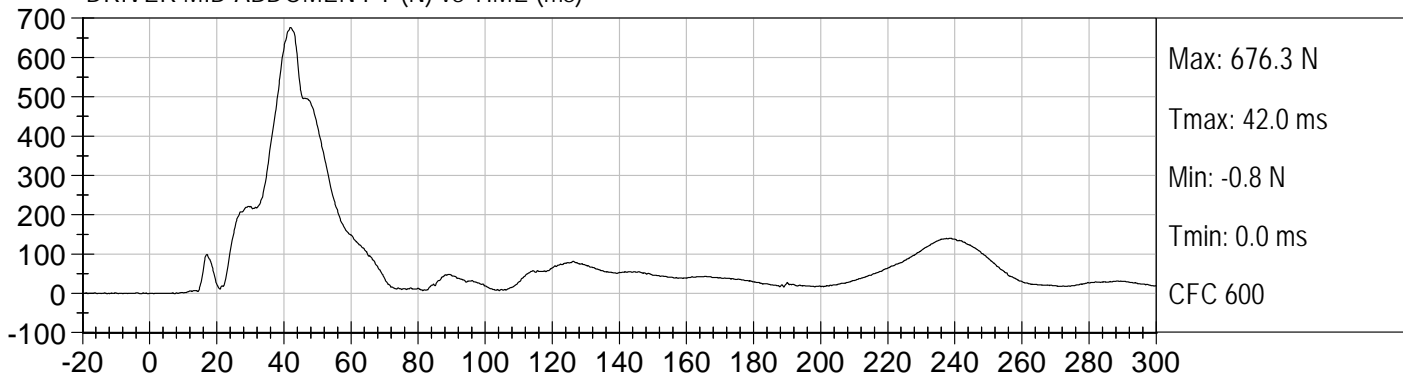




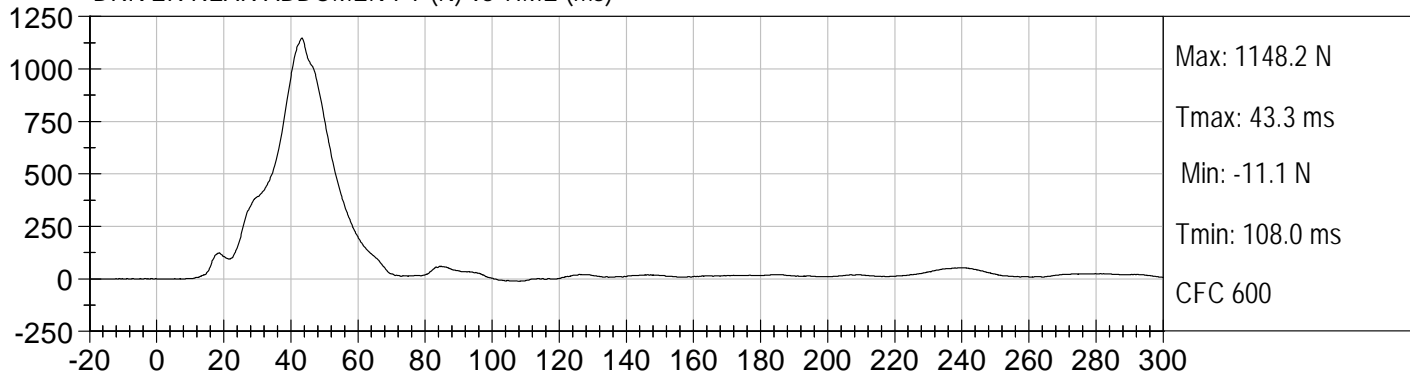
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



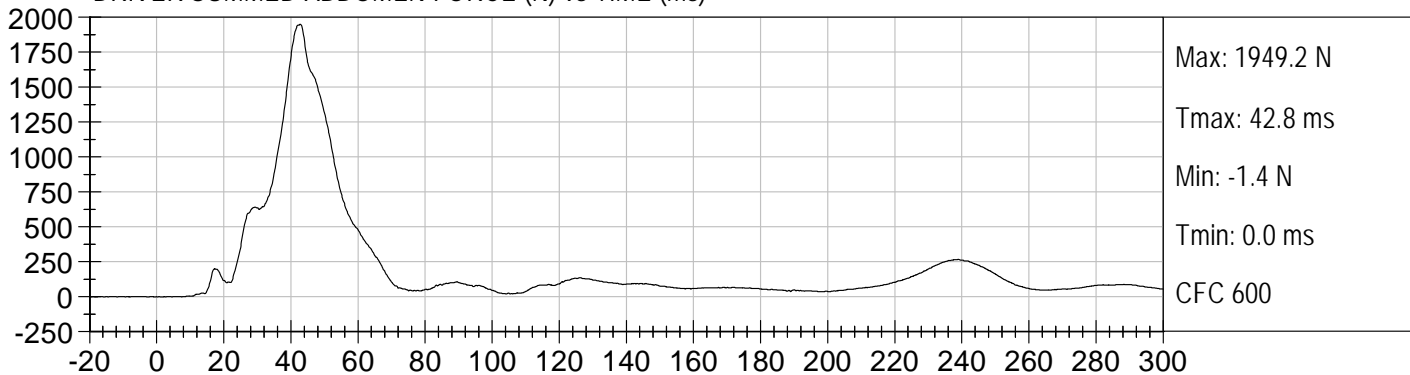
DRIVER MID ABDOMEN FY (N) vs TIME (ms)

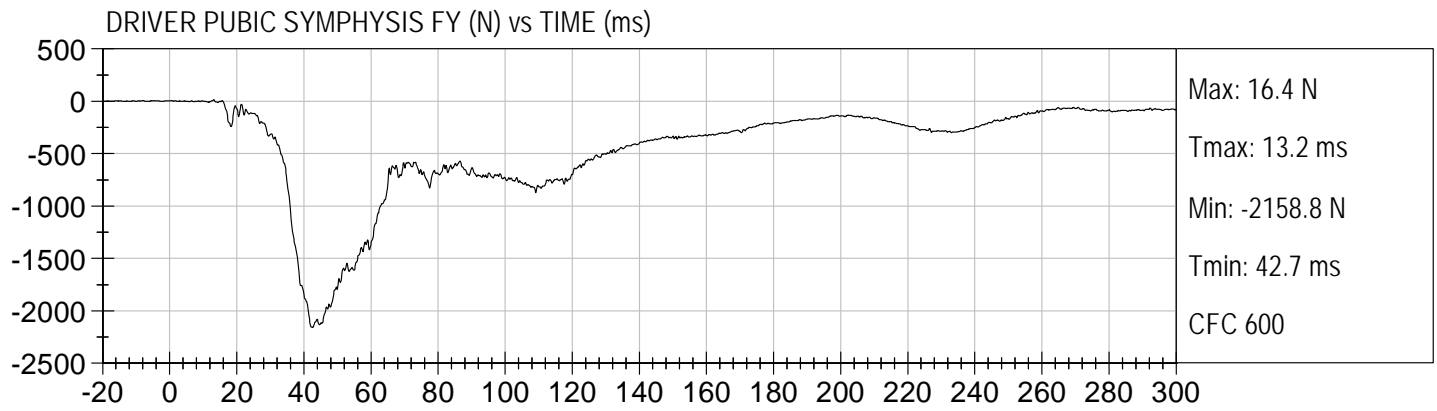


DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



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





**APPENDIX C**

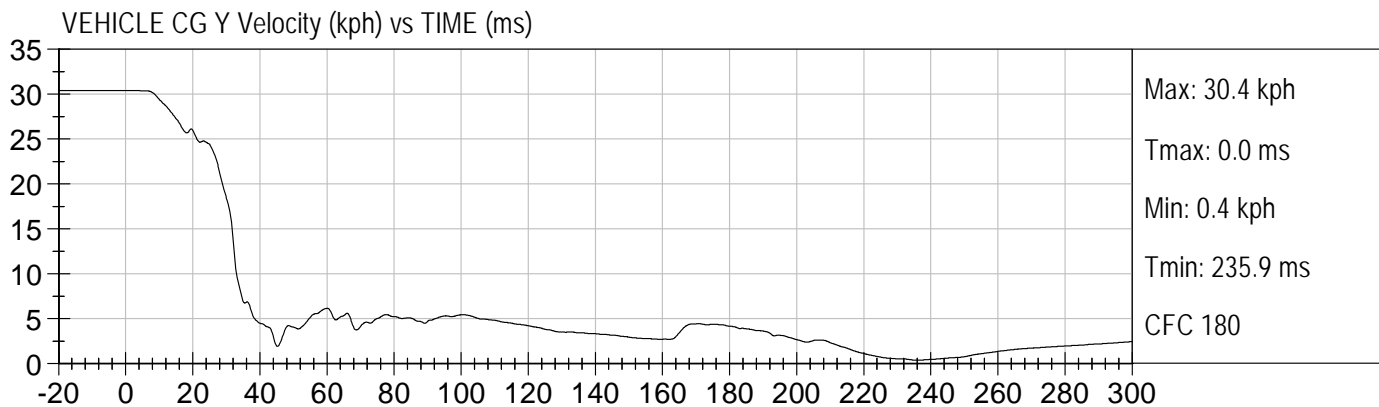
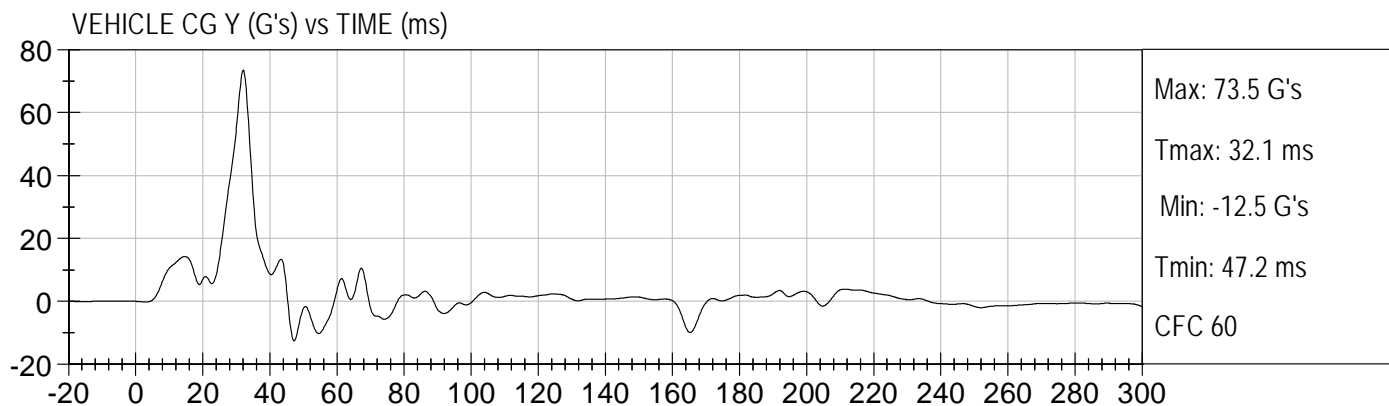
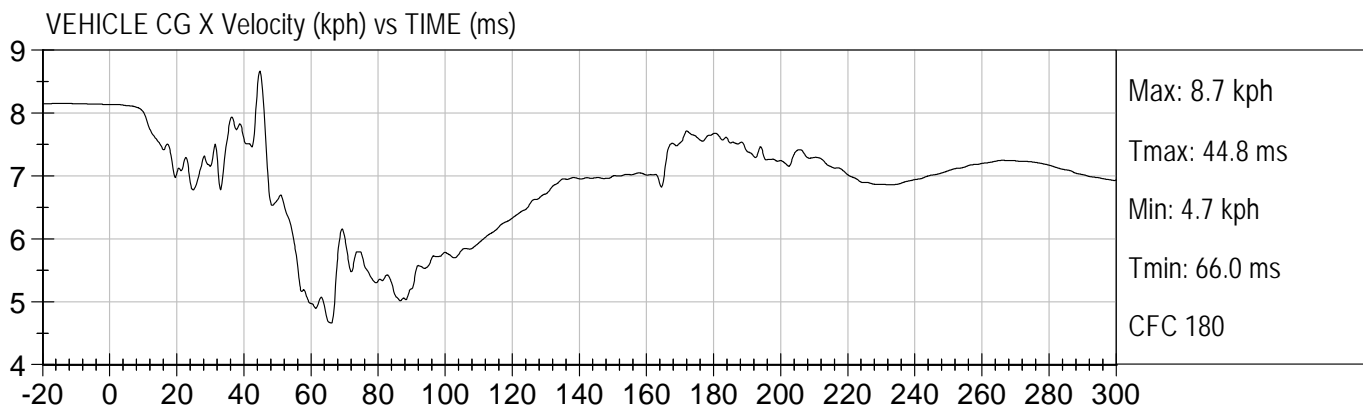
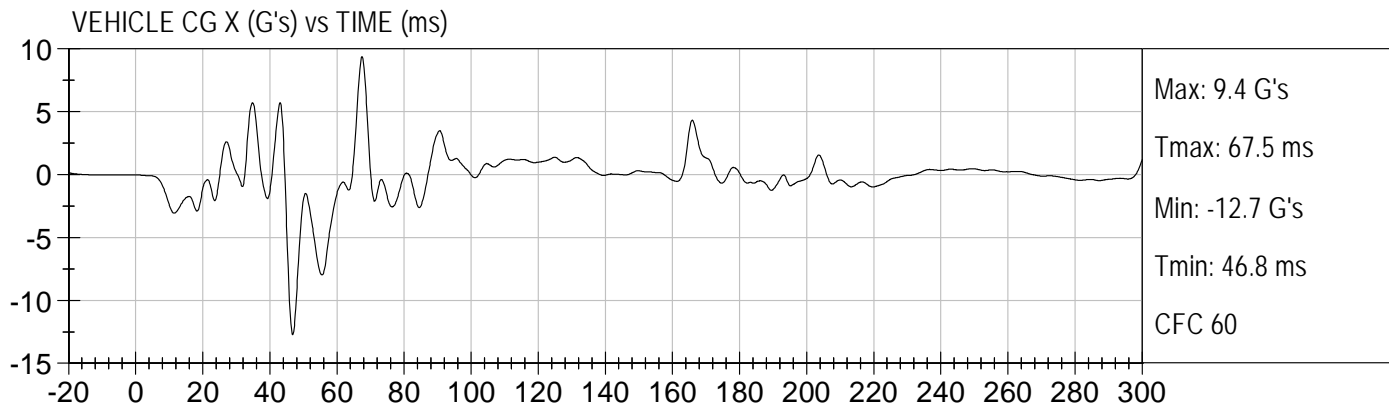
**VEHICLE ACCELEROMETER RESPONSE DATA**

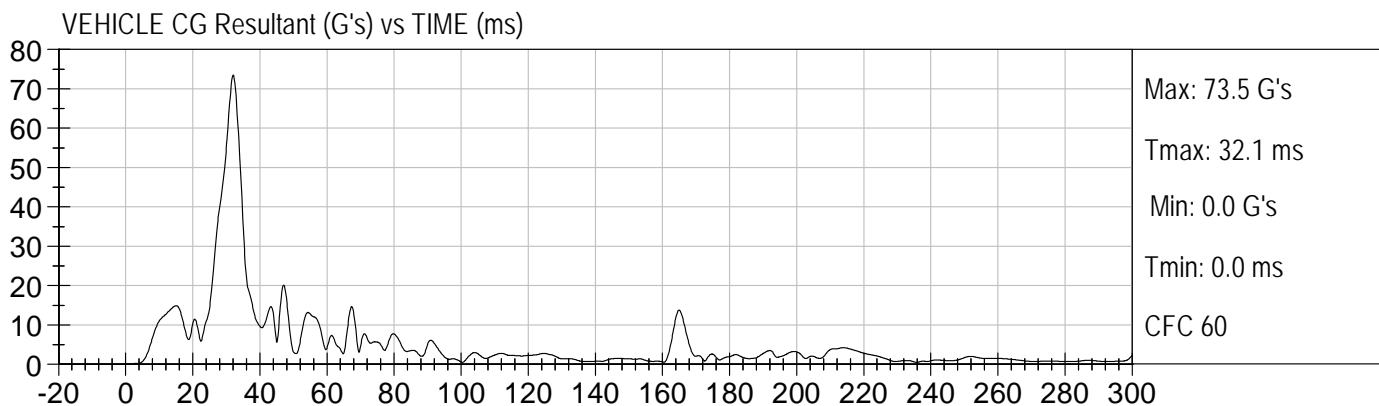
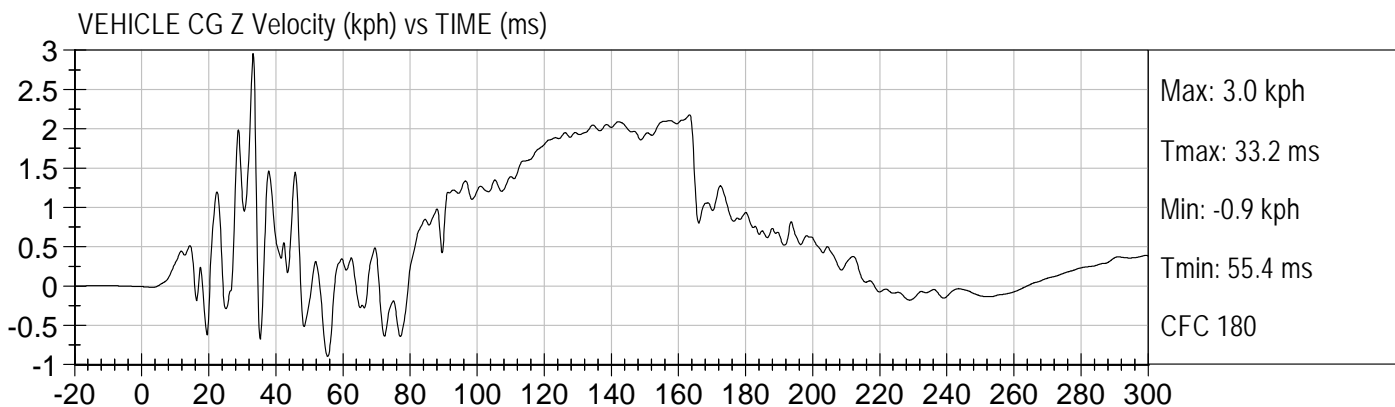
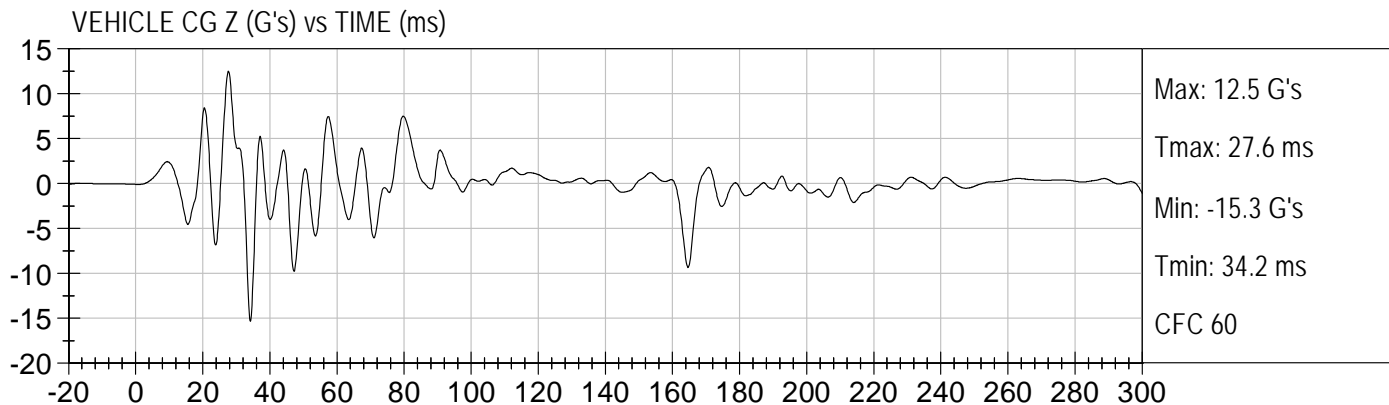
## TABLE OF DATA PLOTS

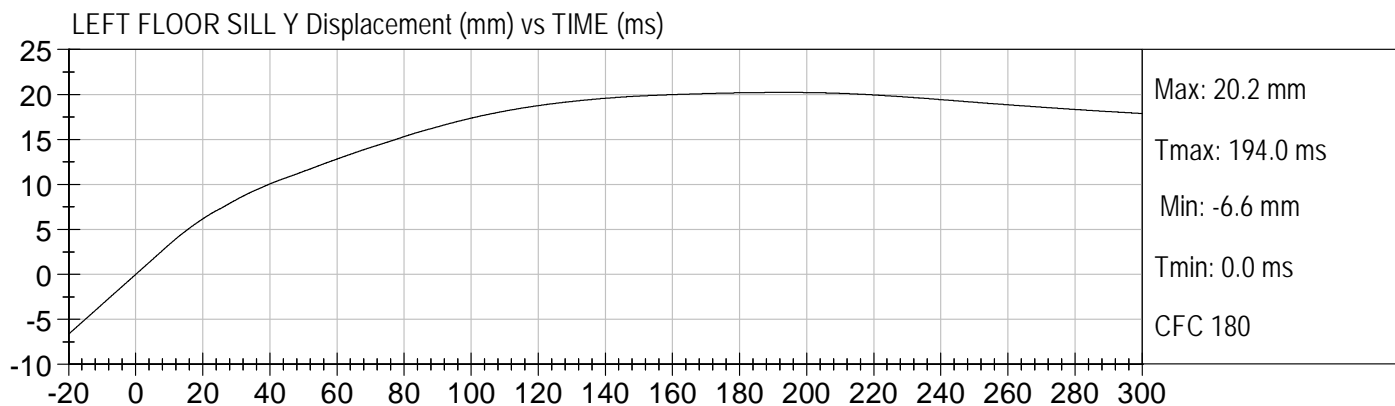
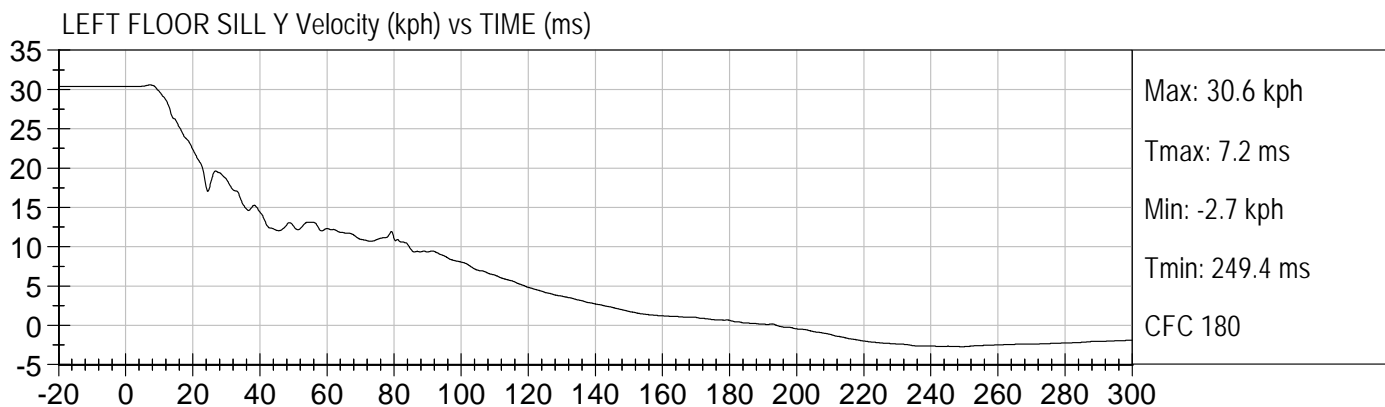
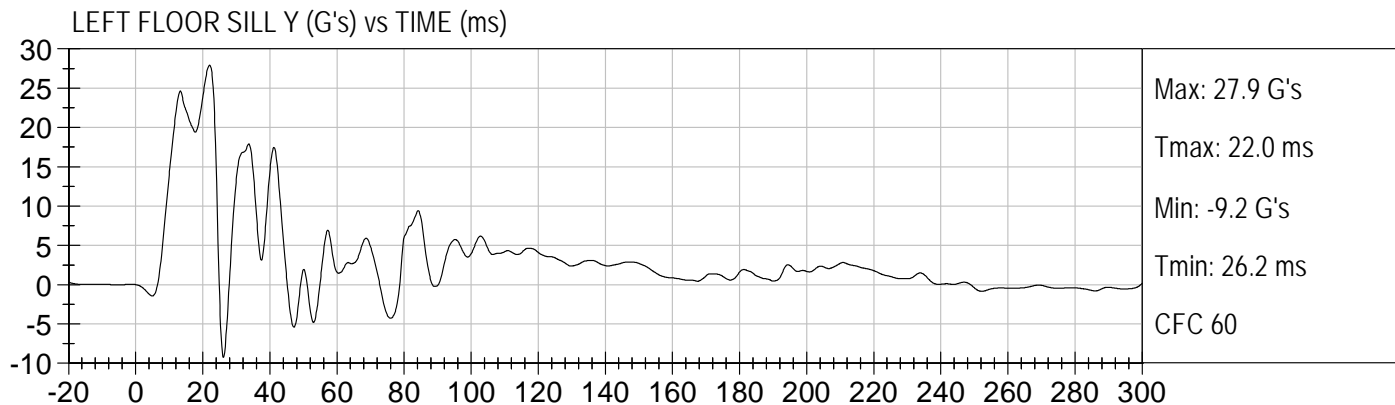
		<u>Page No.</u>
Figure No. 1.	Vehicle Center of Gravity (X) Acceleration vs. Time	C-1
Figure No. 2.	Vehicle Center of Gravity (X) Velocity vs. Time	C-1
Figure No. 3.	Vehicle Center of Gravity (Y) Acceleration vs. Time	C-1
Figure No. 4.	Vehicle Center of Gravity (Y) Velocity vs. Time	C-1
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Figure No. 6.	Vehicle Center of Gravity (Z) Velocity vs. Time	C-2
Figure No. 7.	Vehicle Center of Gravity Resultant Acceleration vs. Time	C-2
Figure No. 8.	Left Floor Sill (Y) Acceleration vs. Time	C-3
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Figure No. 28.	Left Mid B-Pillar (Y) Displacement vs. Time	C-9

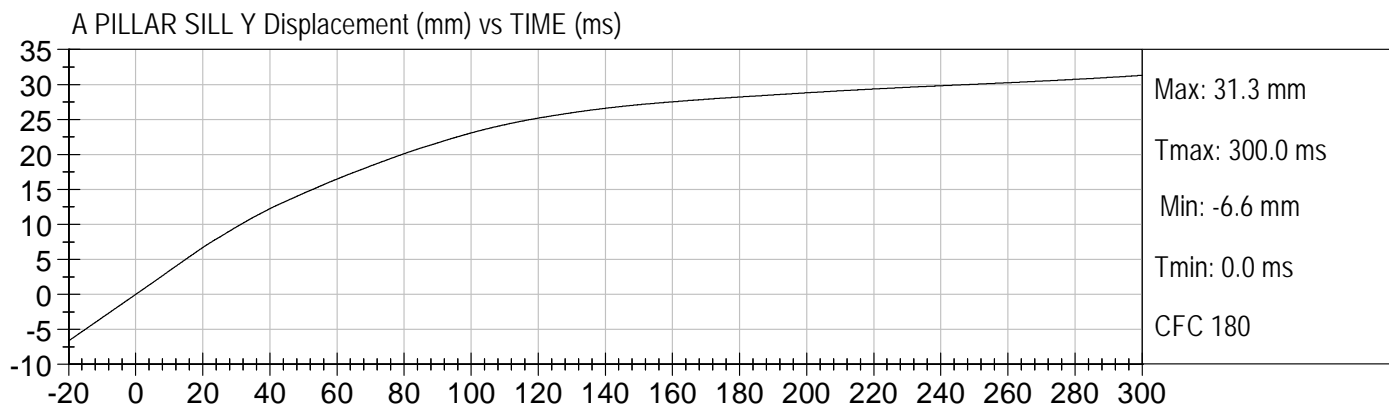
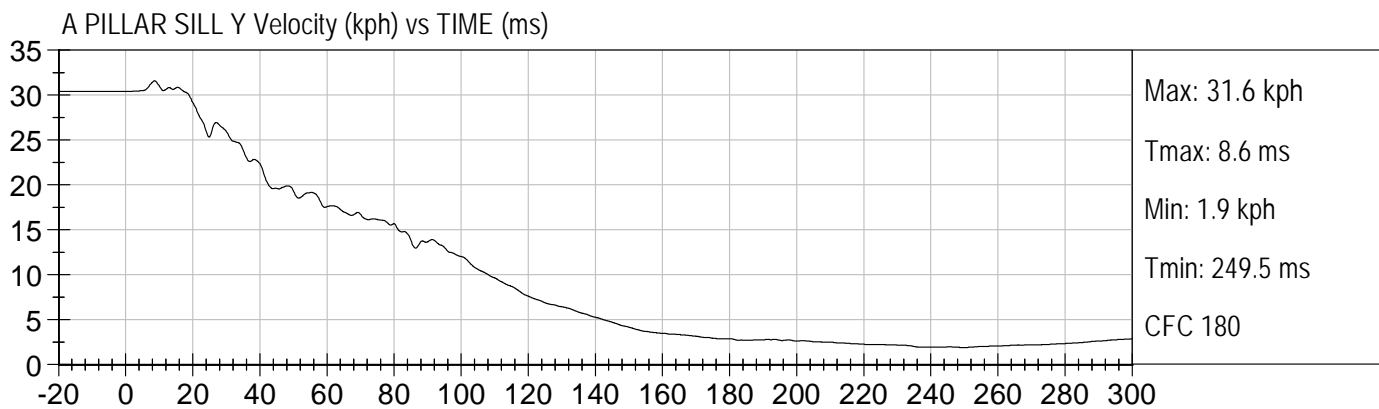
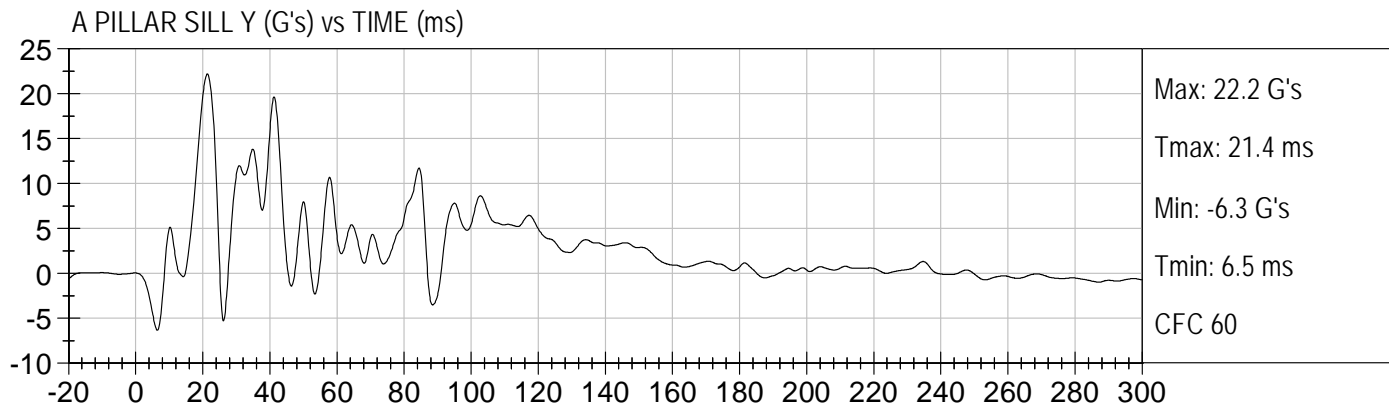
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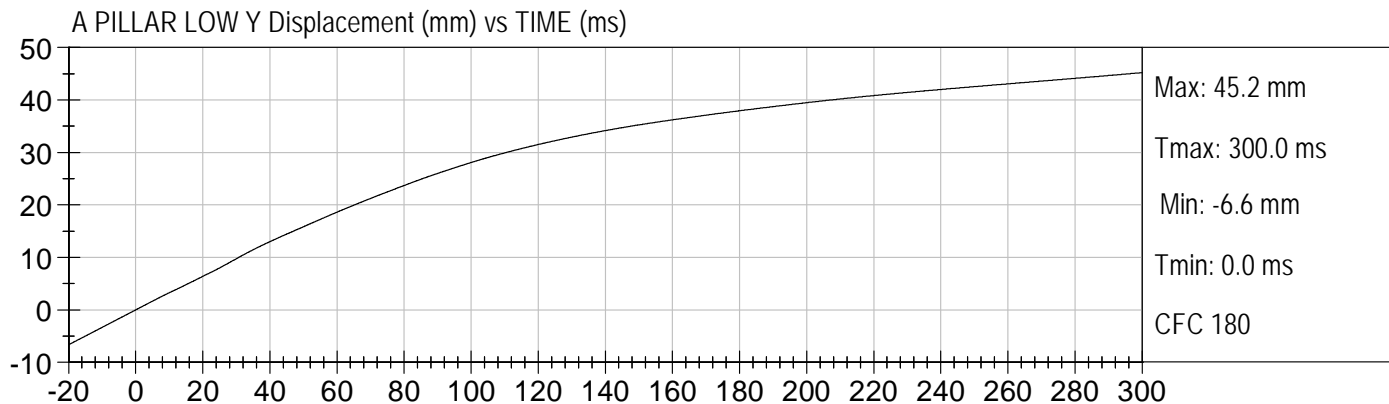
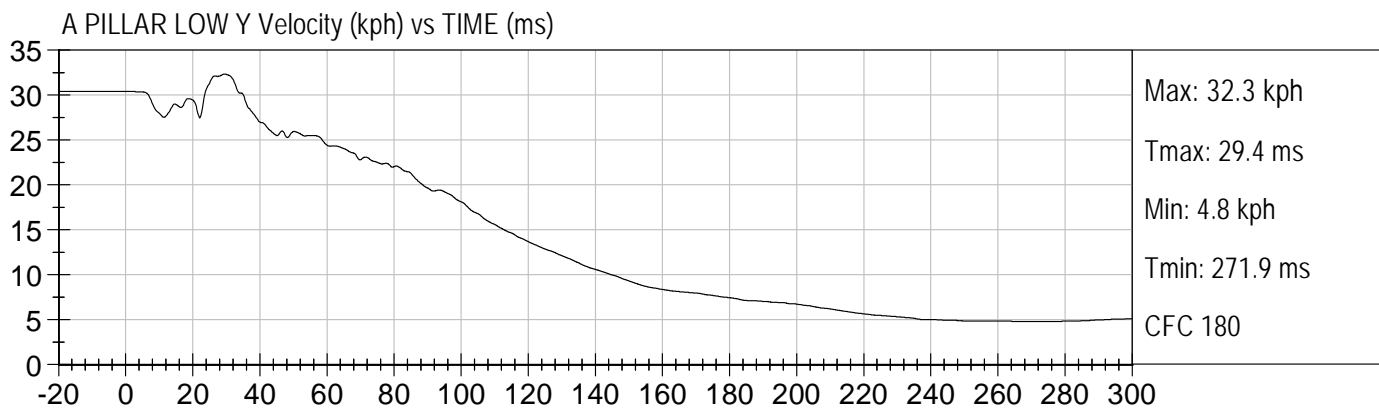
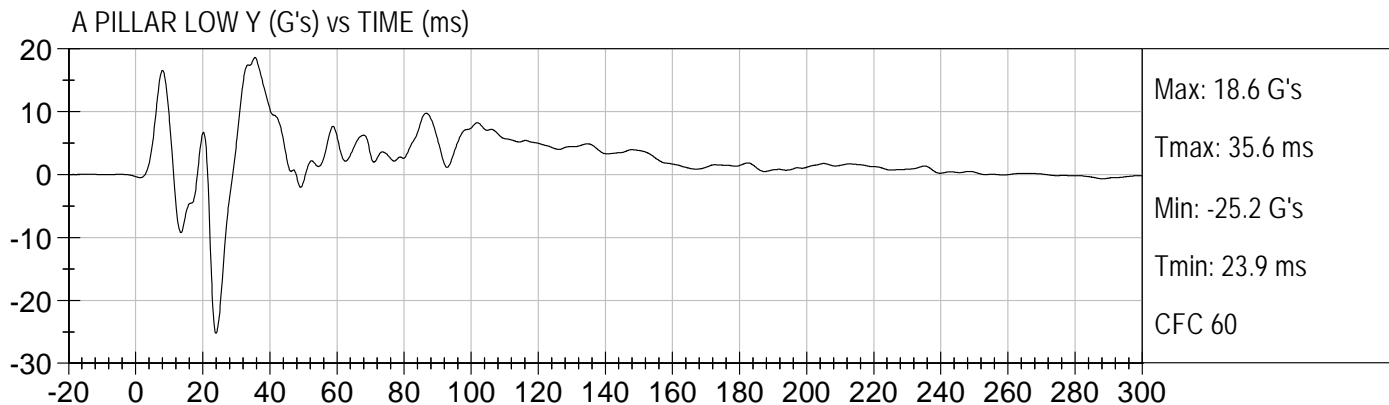


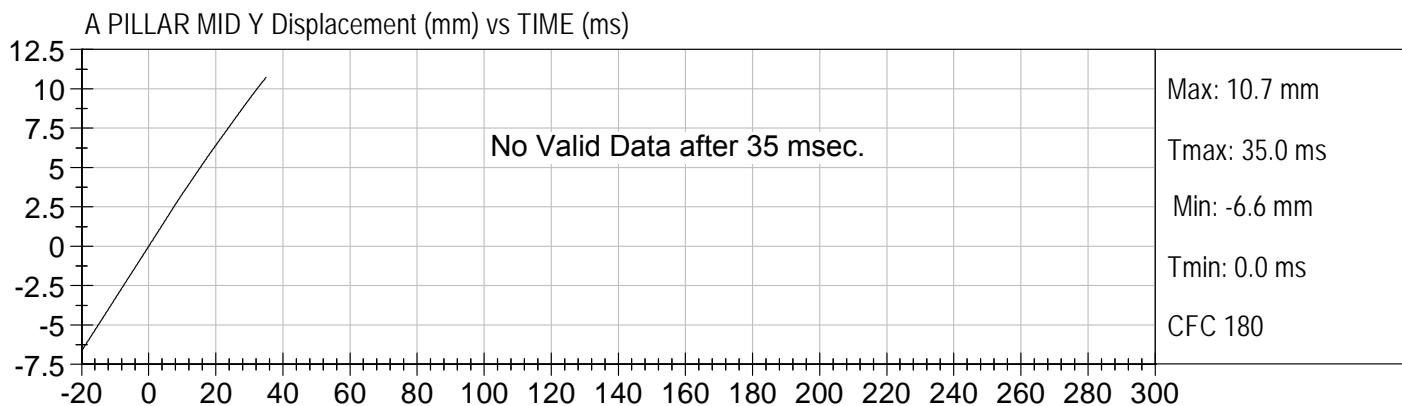
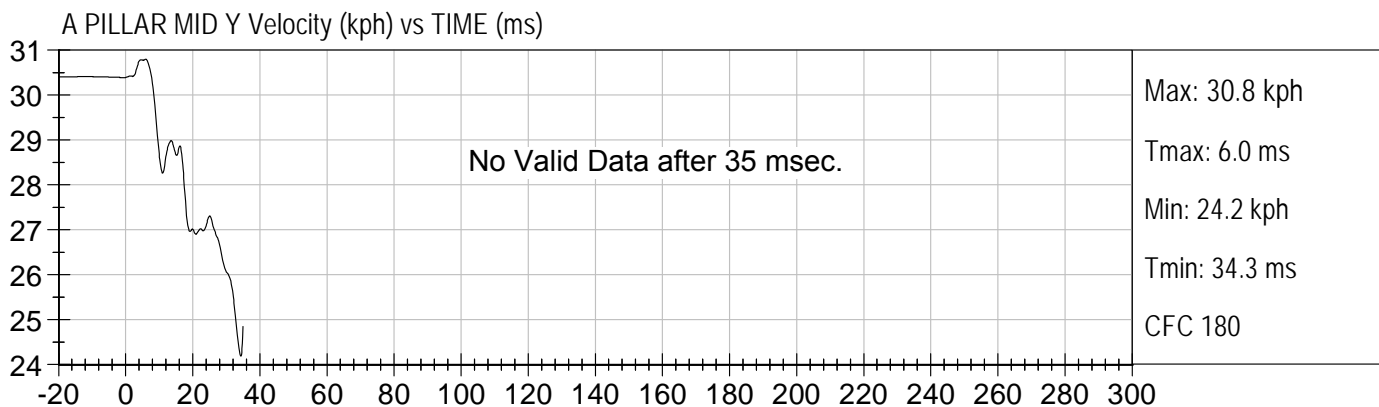
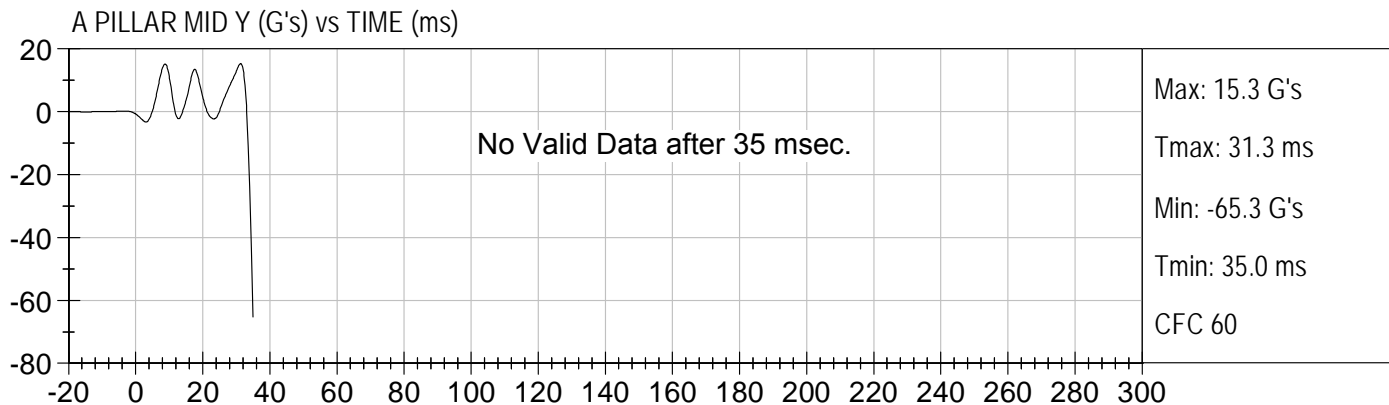




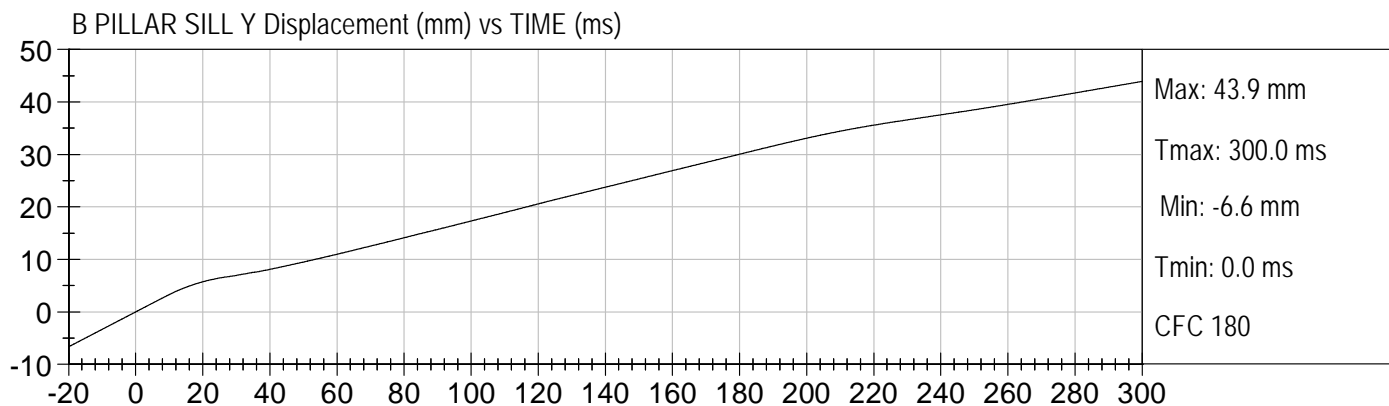
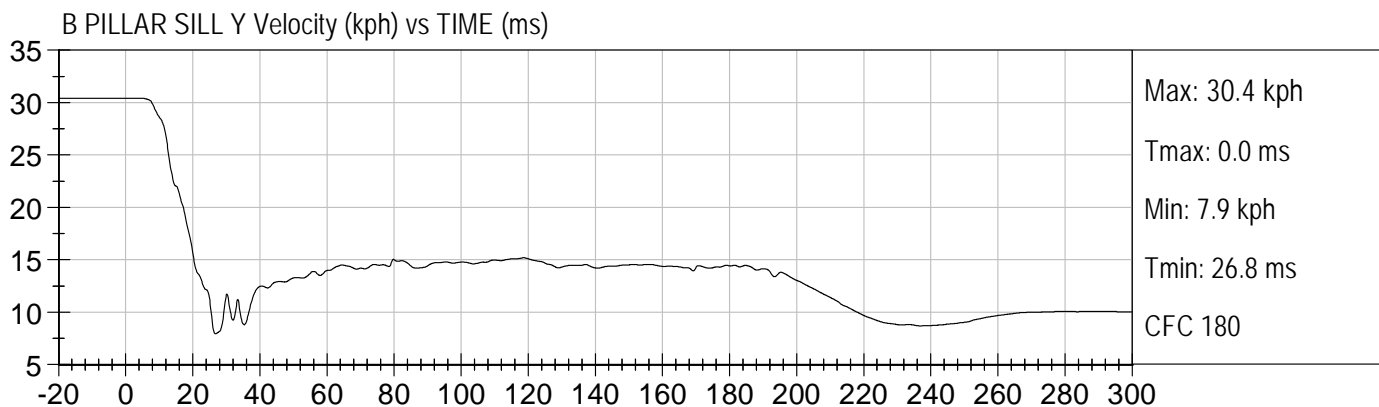
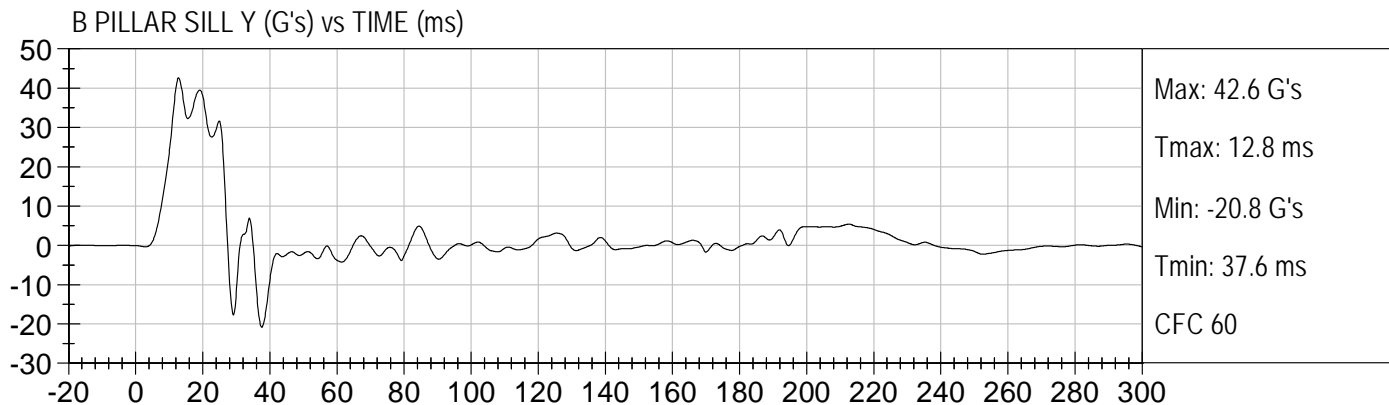


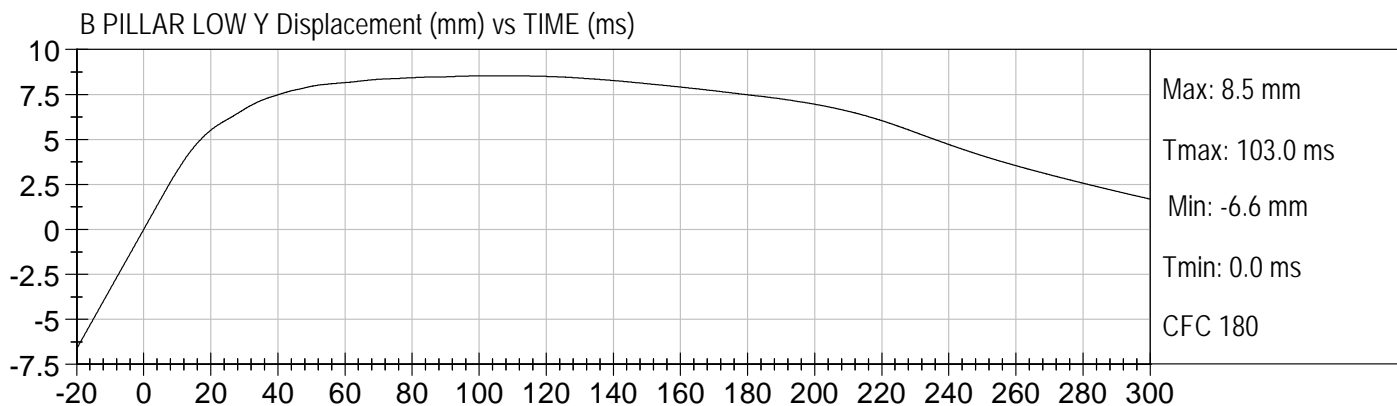
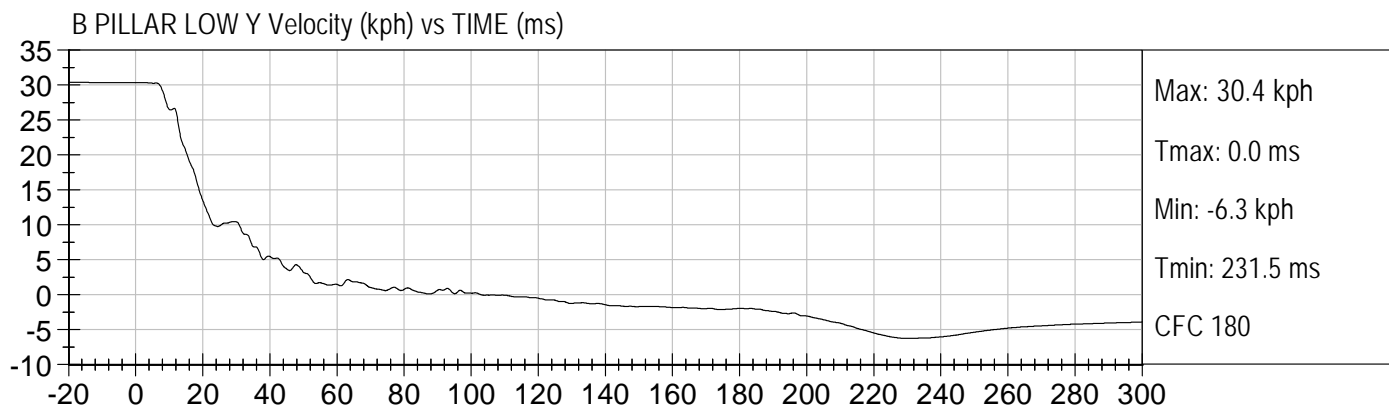
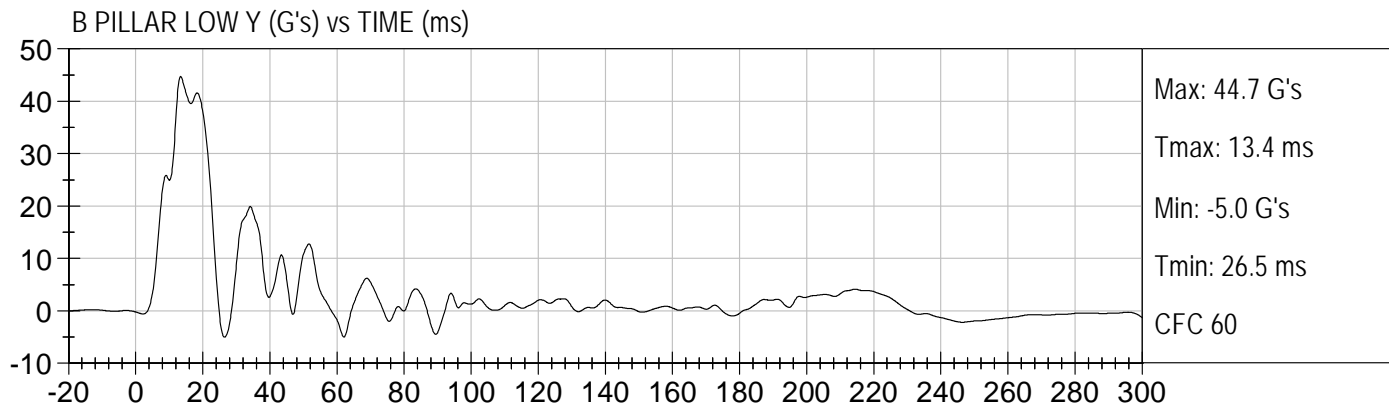


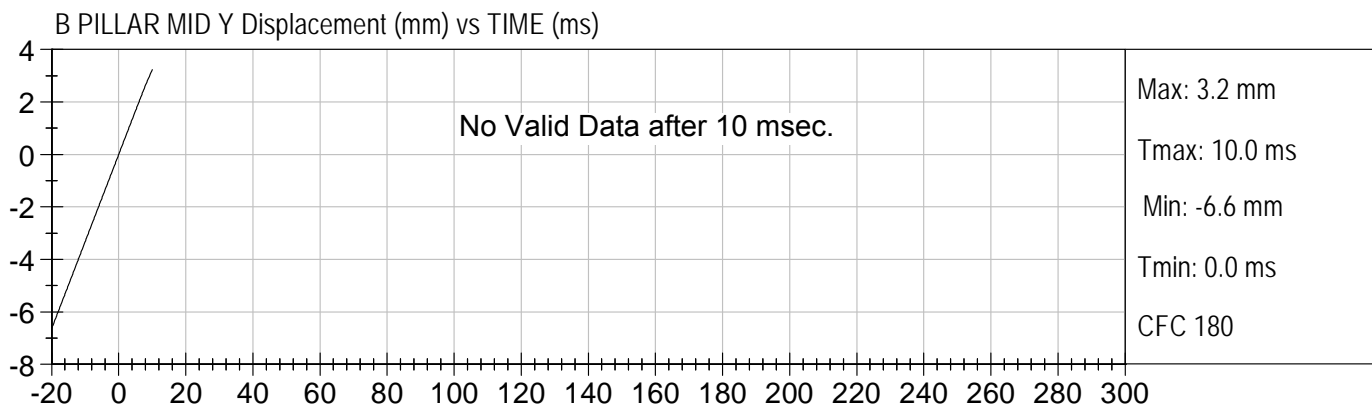
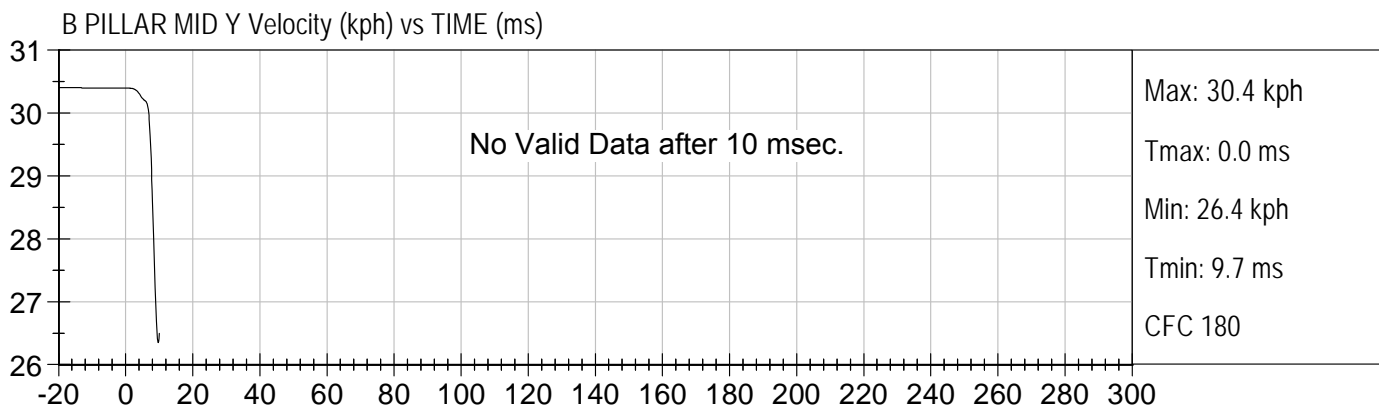
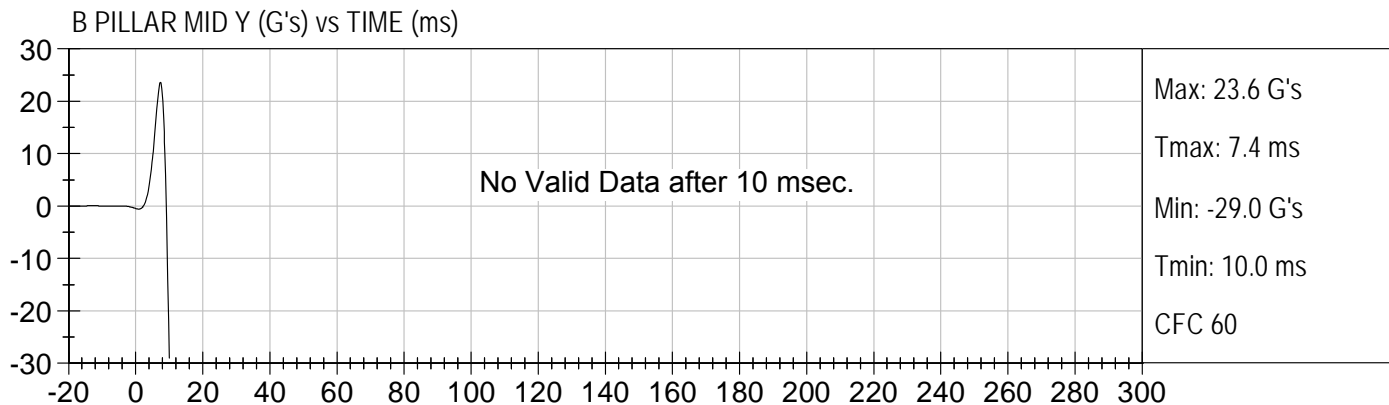


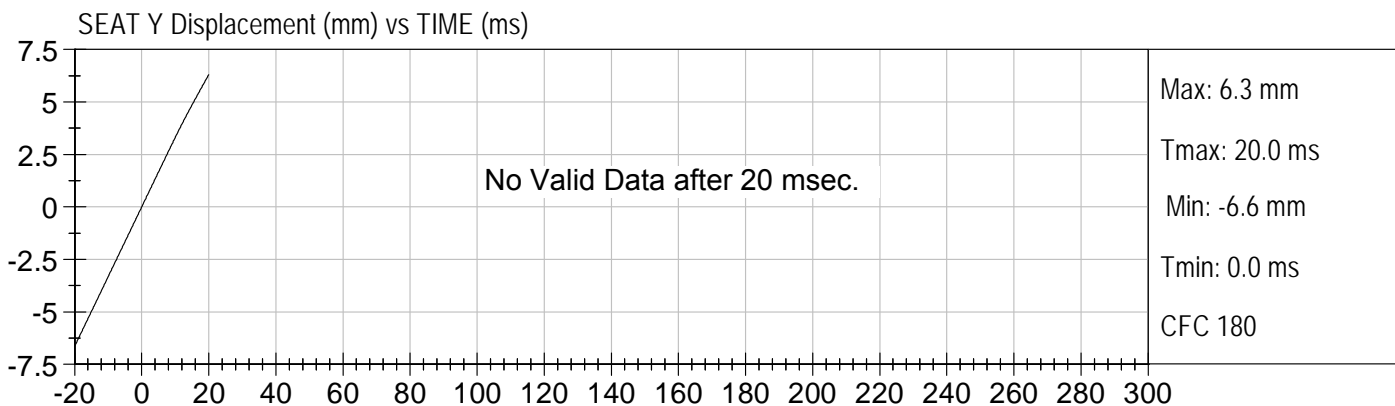
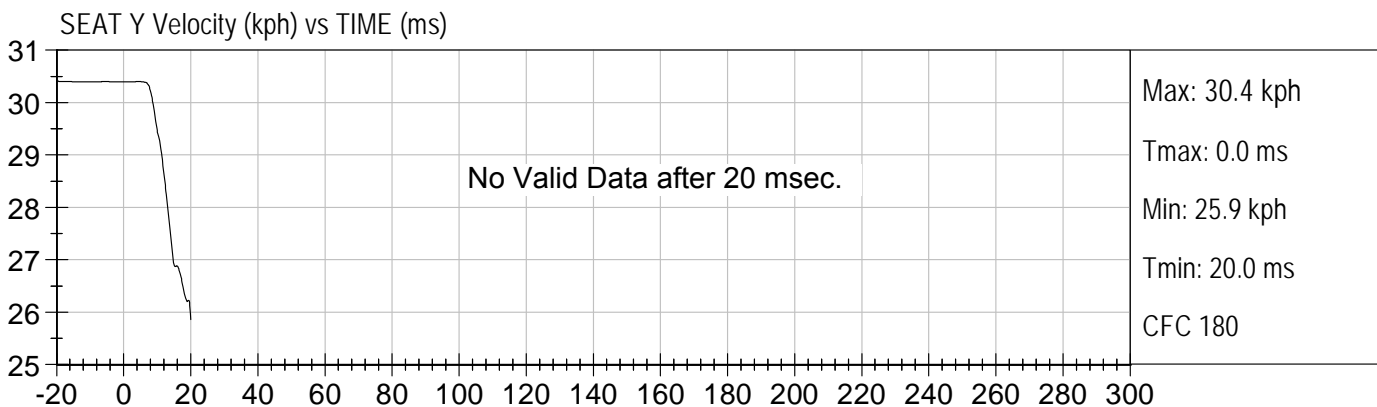
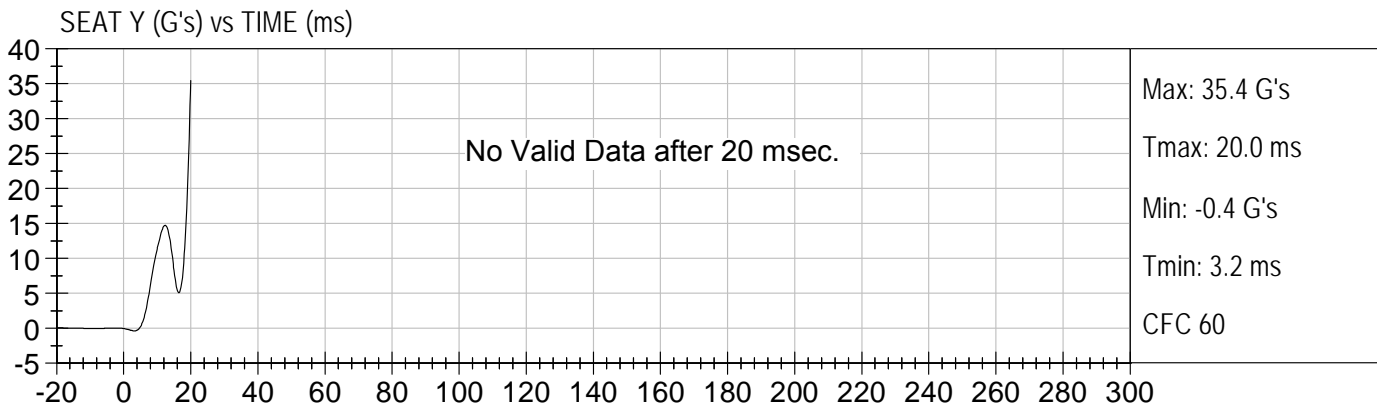




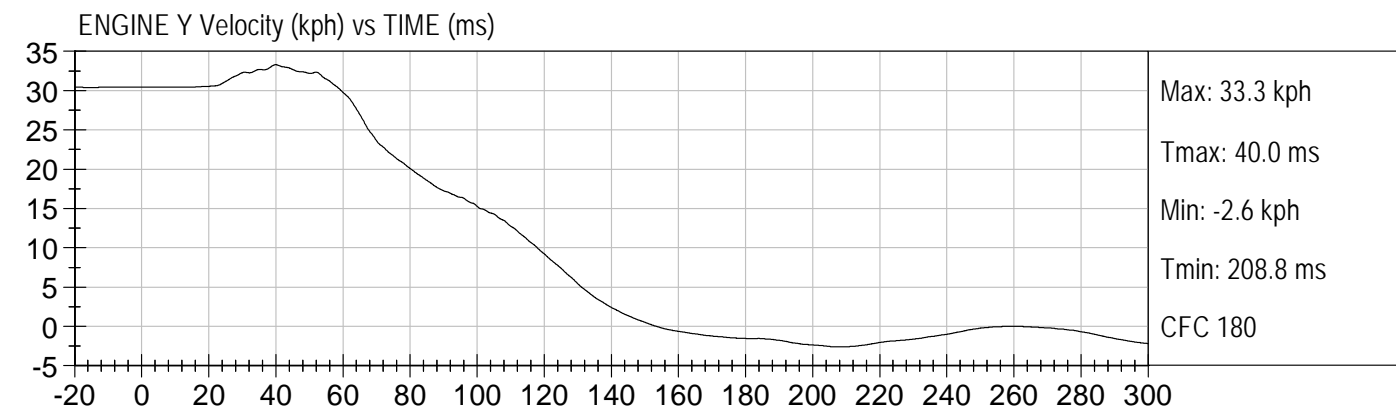
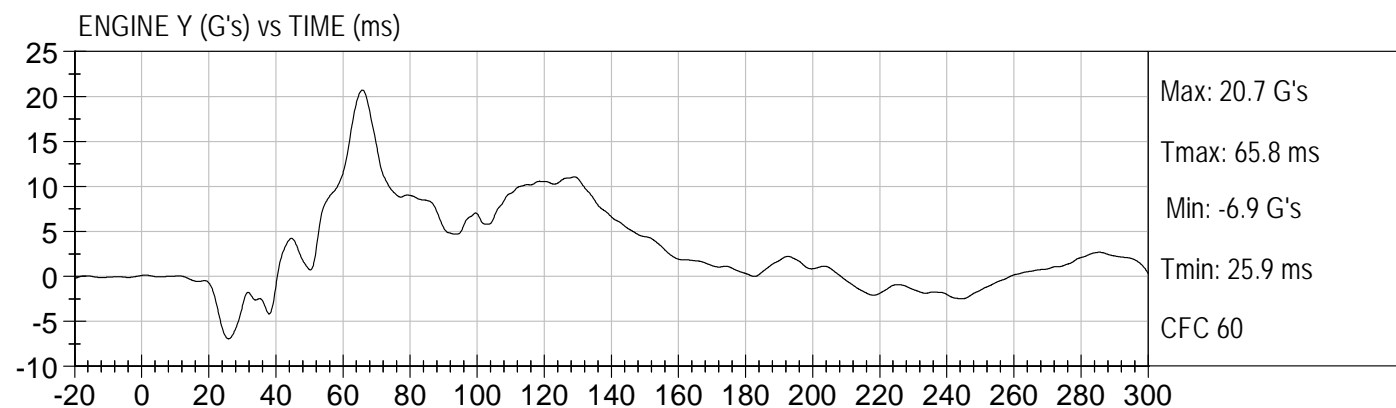
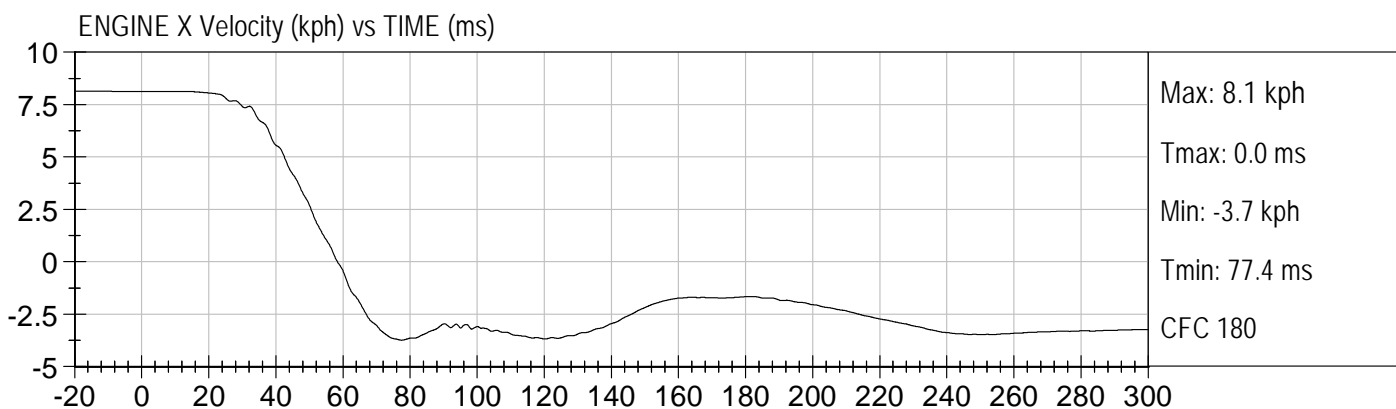
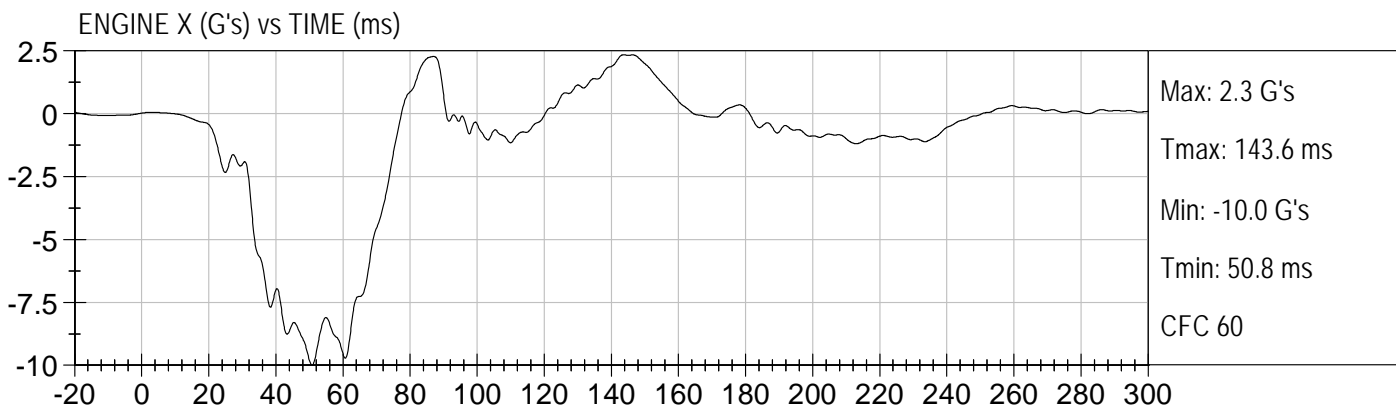


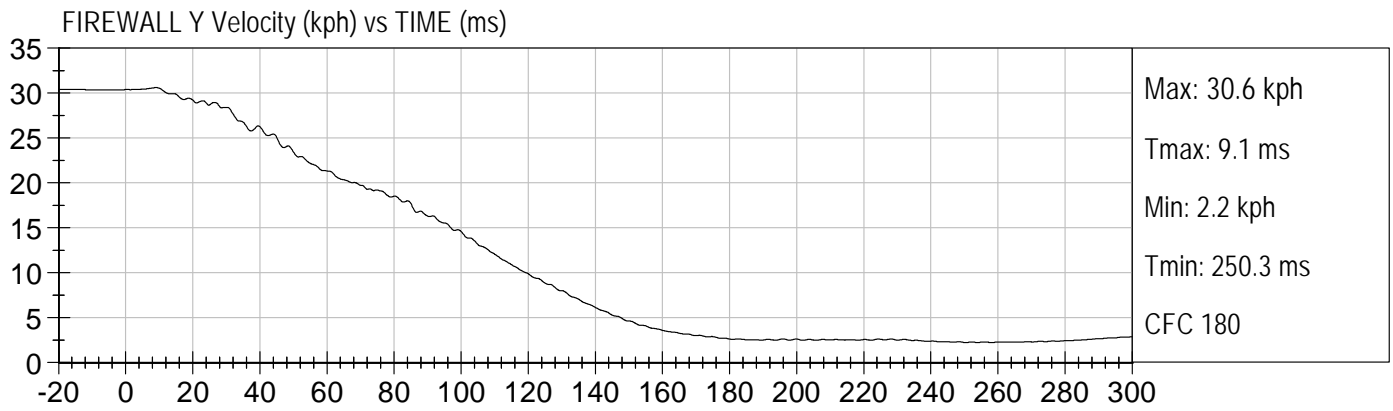


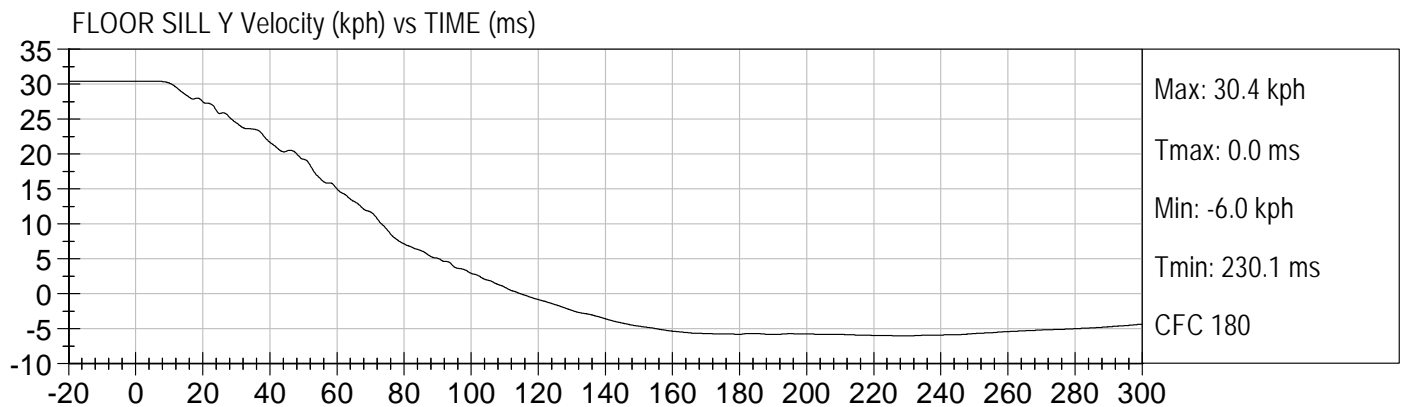
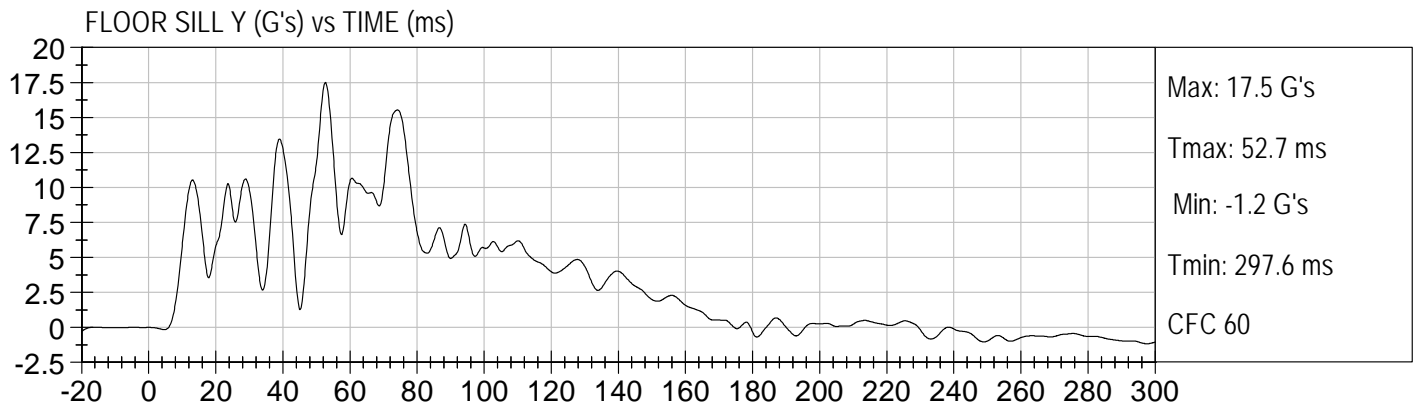
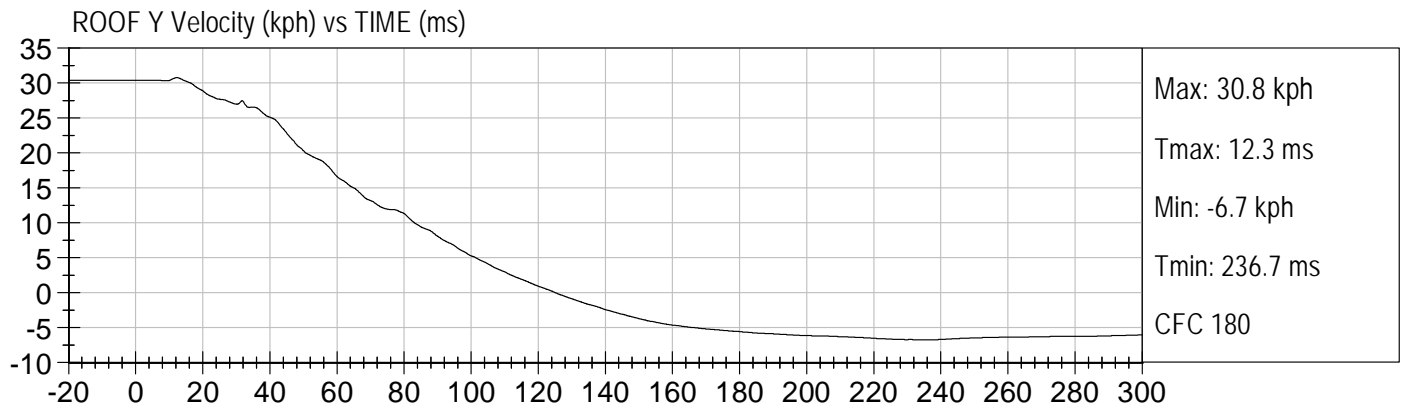
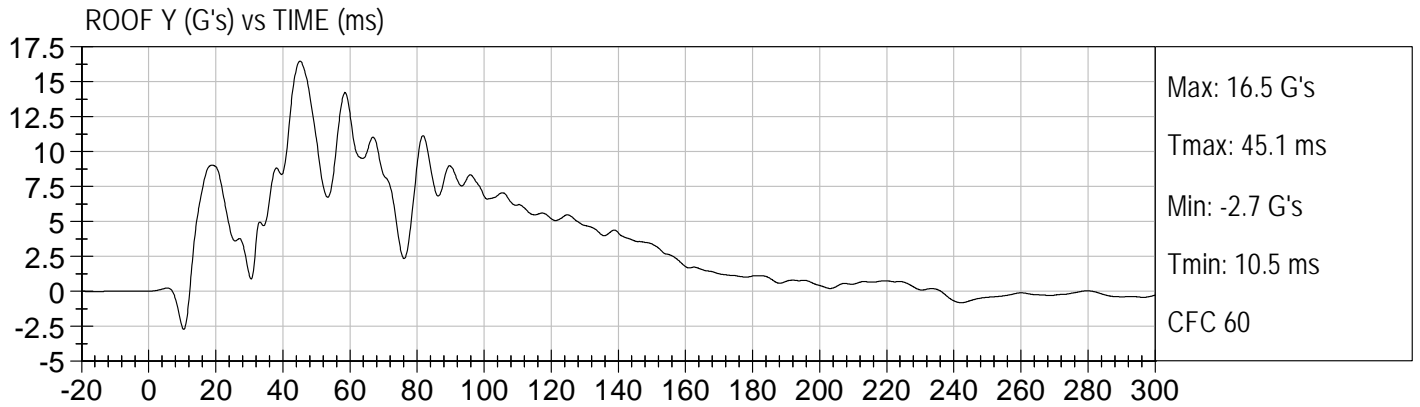


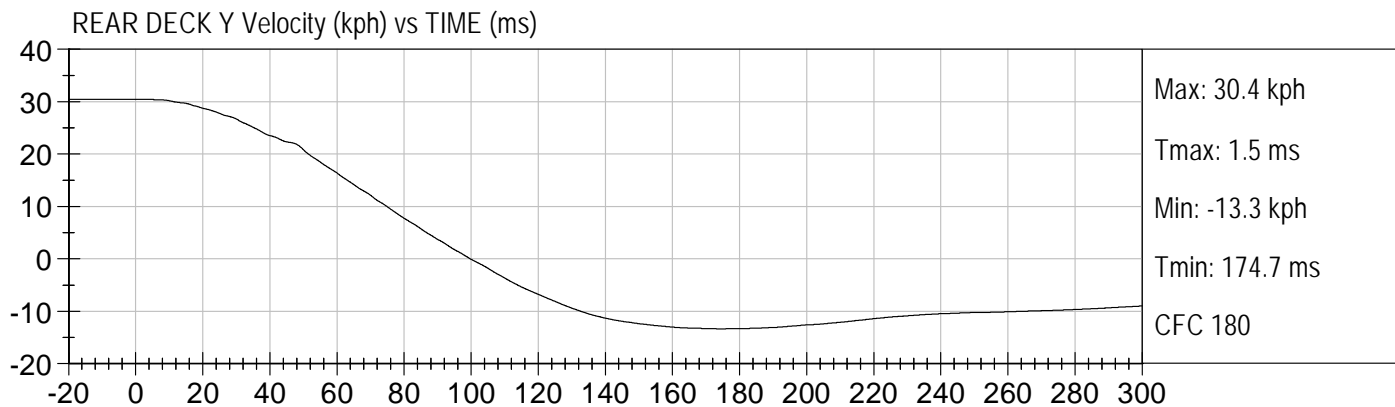
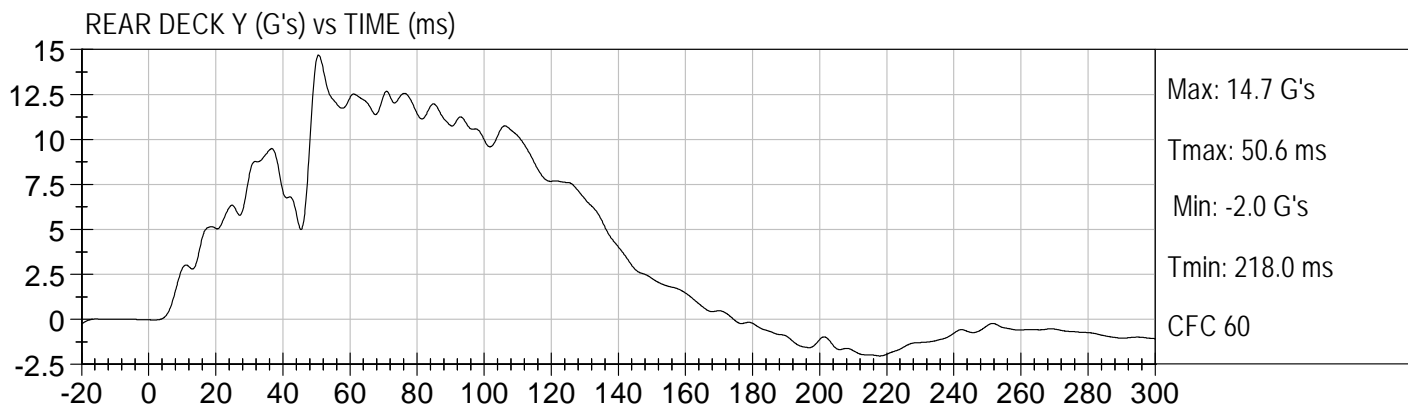
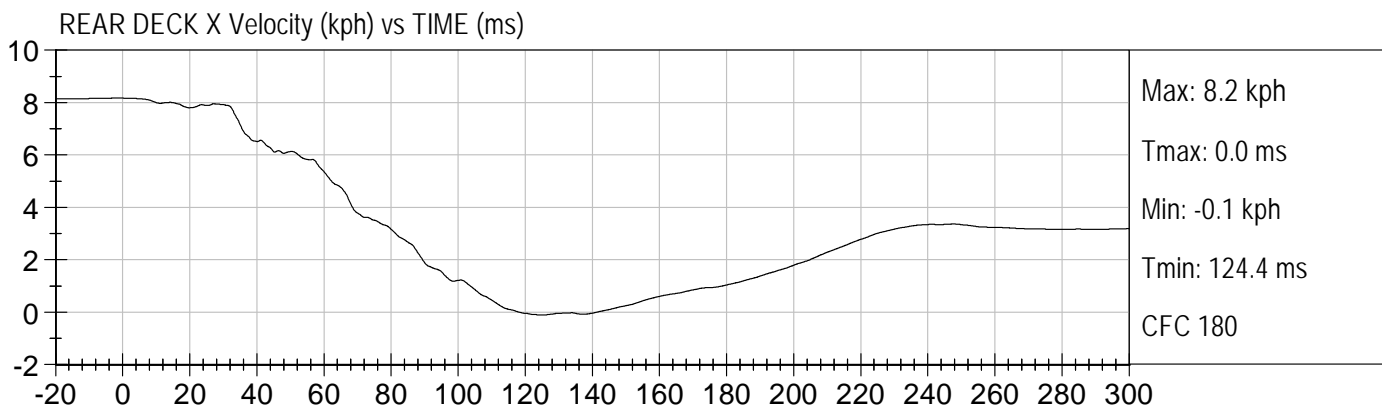
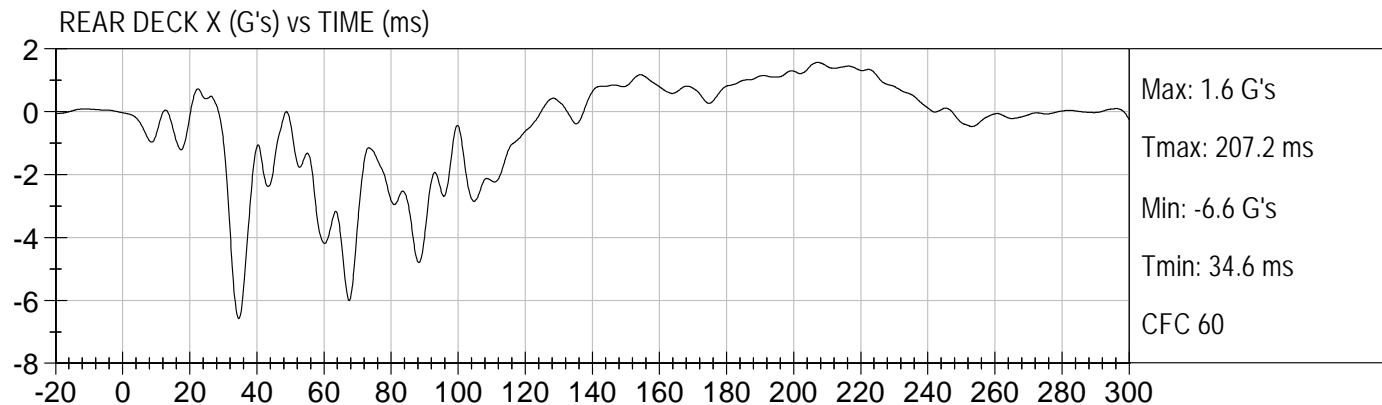












**APPENDIX D**

**DUMMY PERFORMANCE CALIBRATION TEST DATA**



**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

ATD Serial No: 016

Test ID: D111721

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

Jessica Hall  
 Laboratory Technician

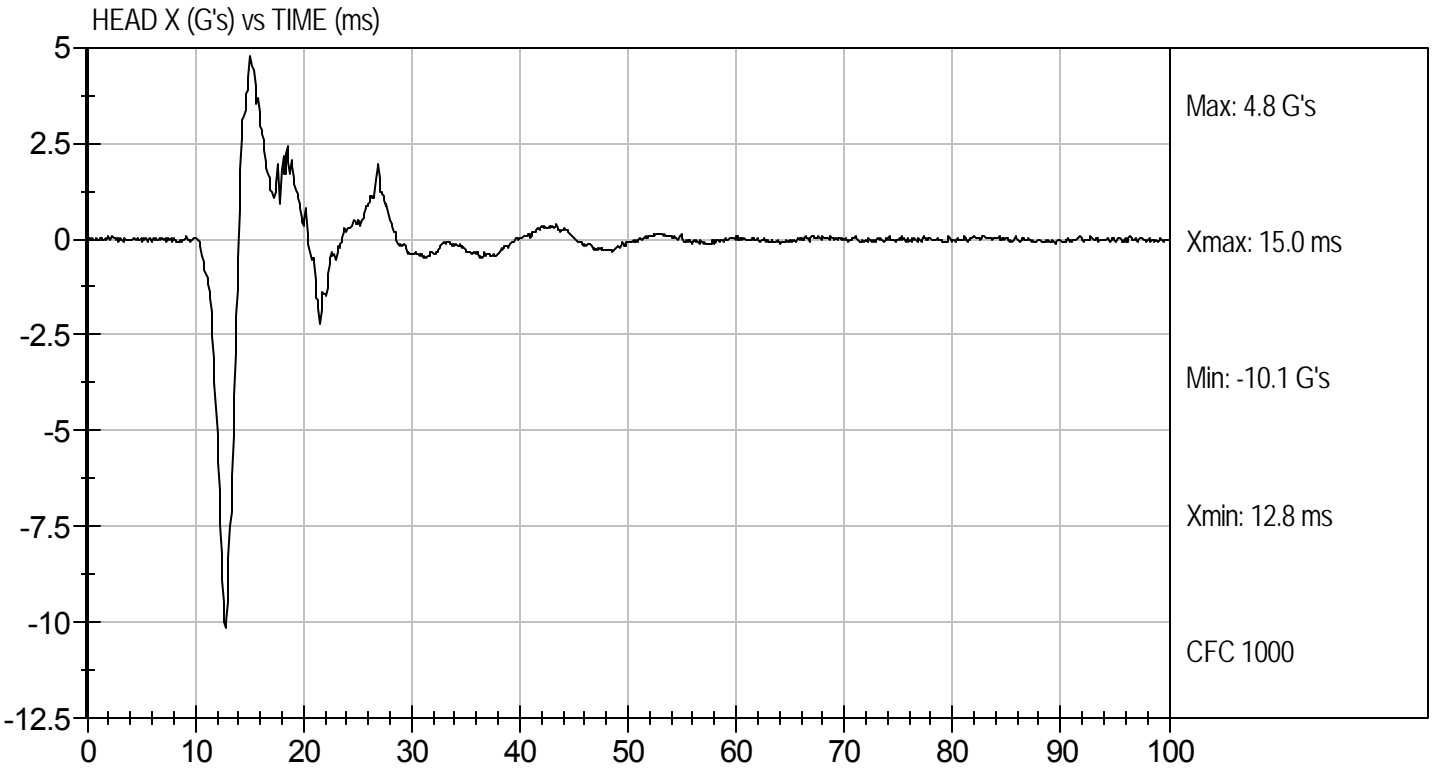
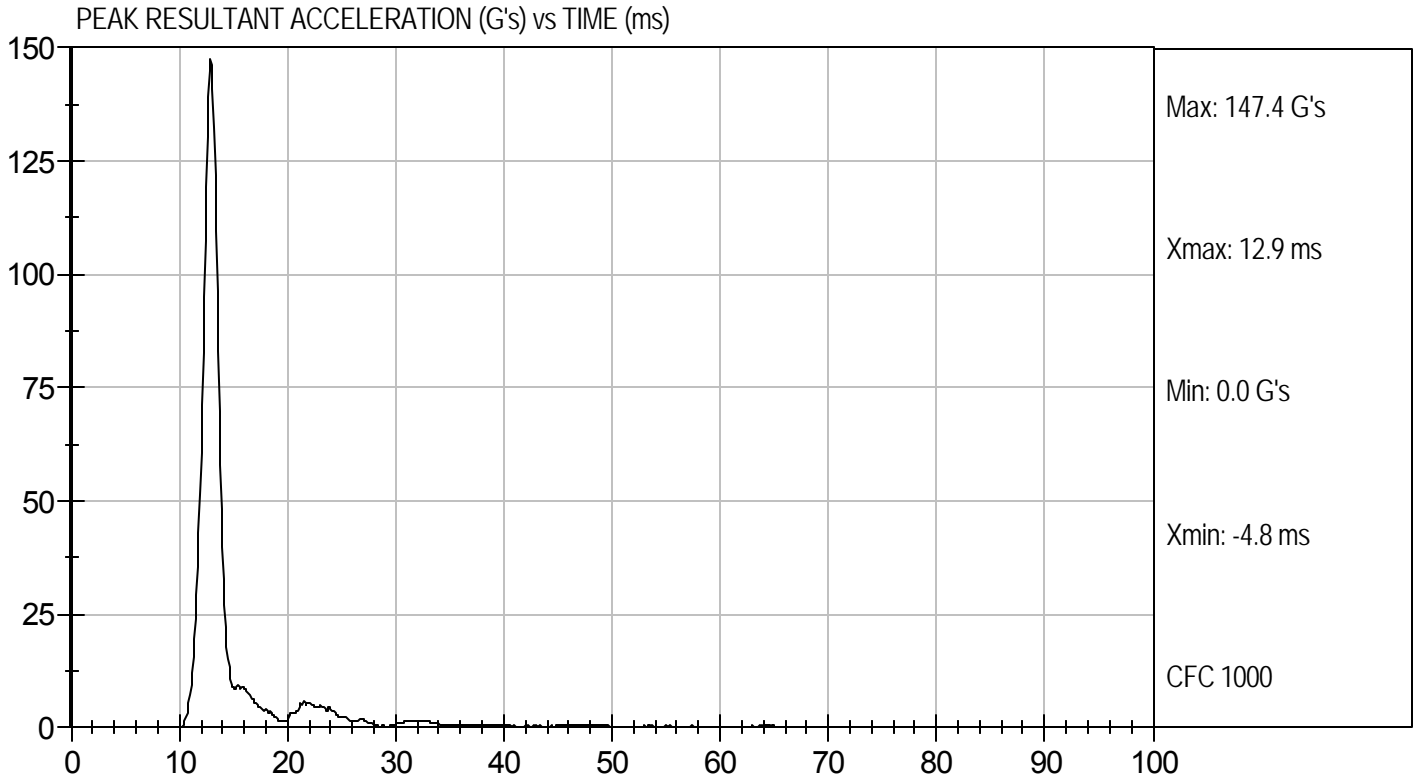
5/10/11  
 Test Date

David Winkelbauer  
 Approved By



Test Desc: Head Drop  
Component ID: D111721

Test Date: 5/10/11  
Velocity: 0 ft/s, 0 m/s



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

ATD Serial No: 016

Test I.D.: D111722

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

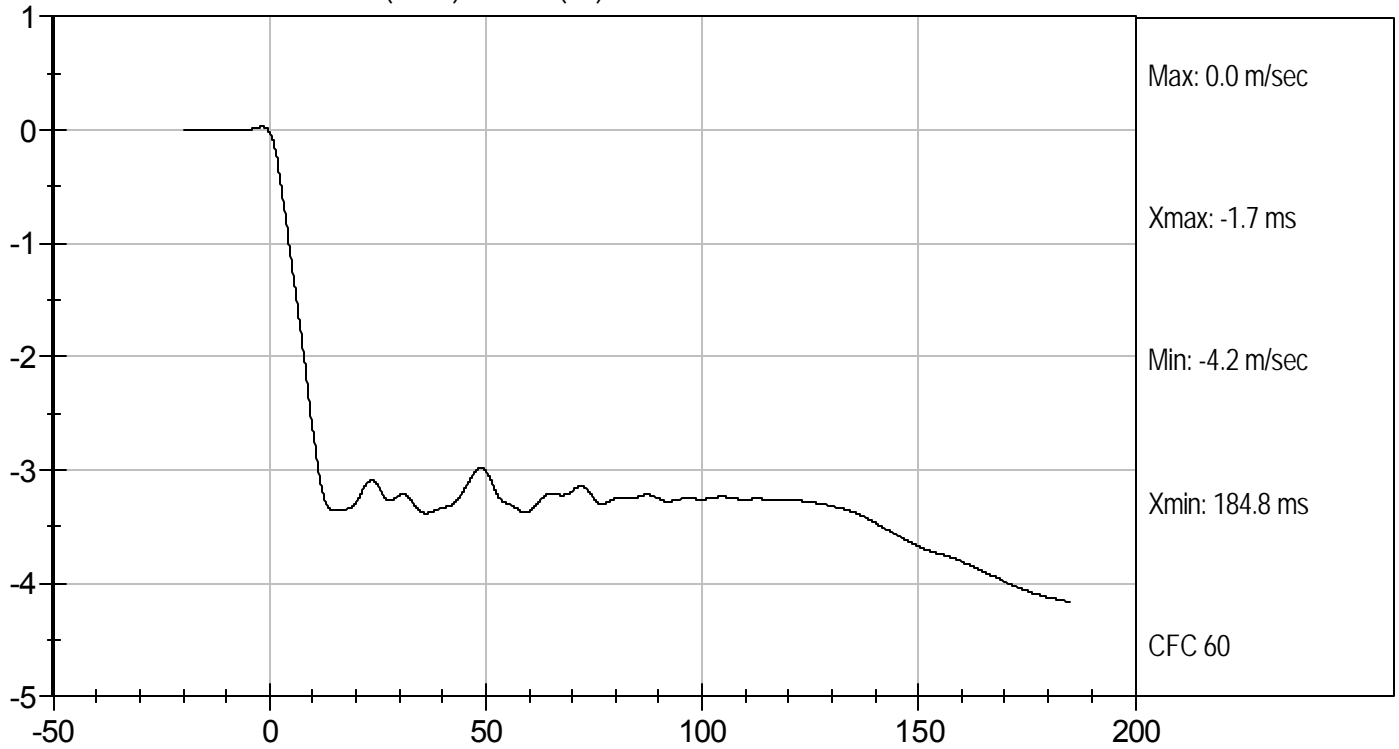
Jessica Hall  
Laboratory Technician

5/10/11  
Test Date

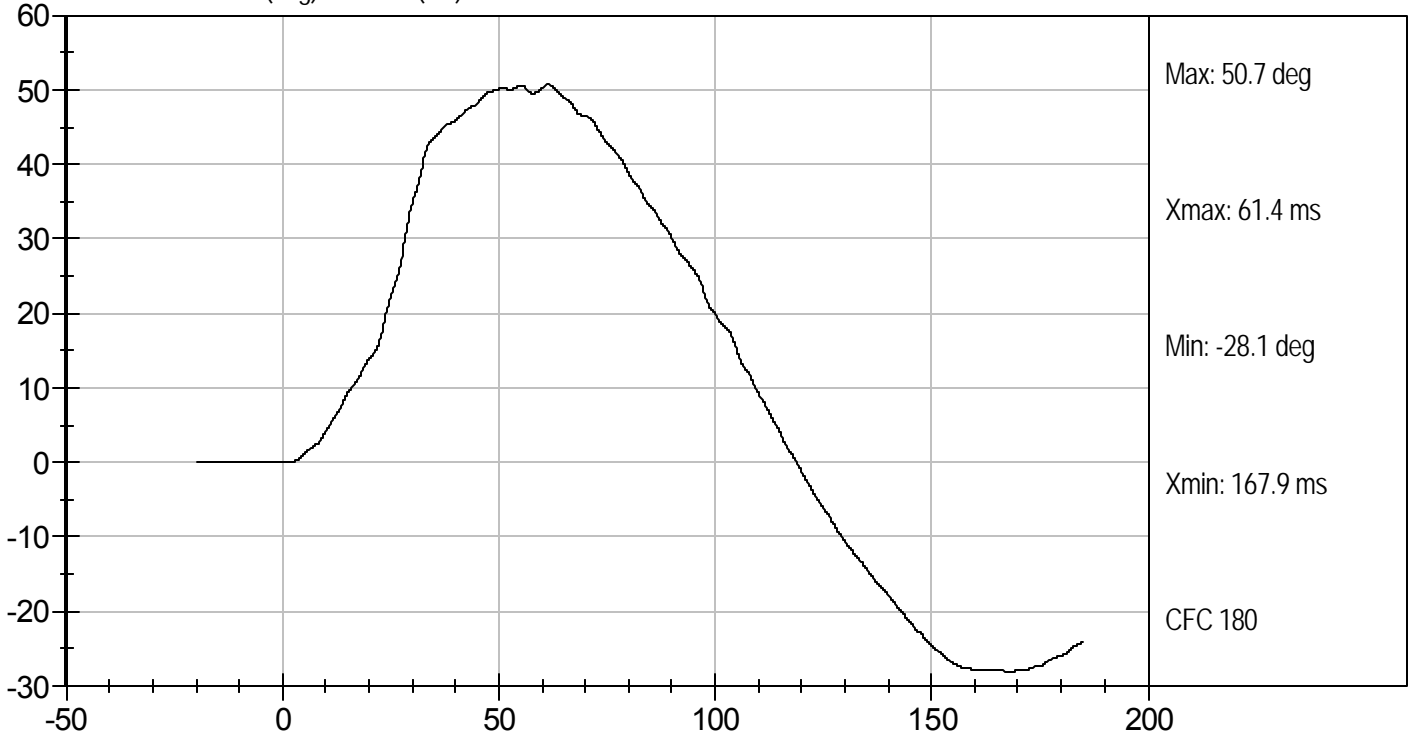
David Winkelbauer  
Approved By

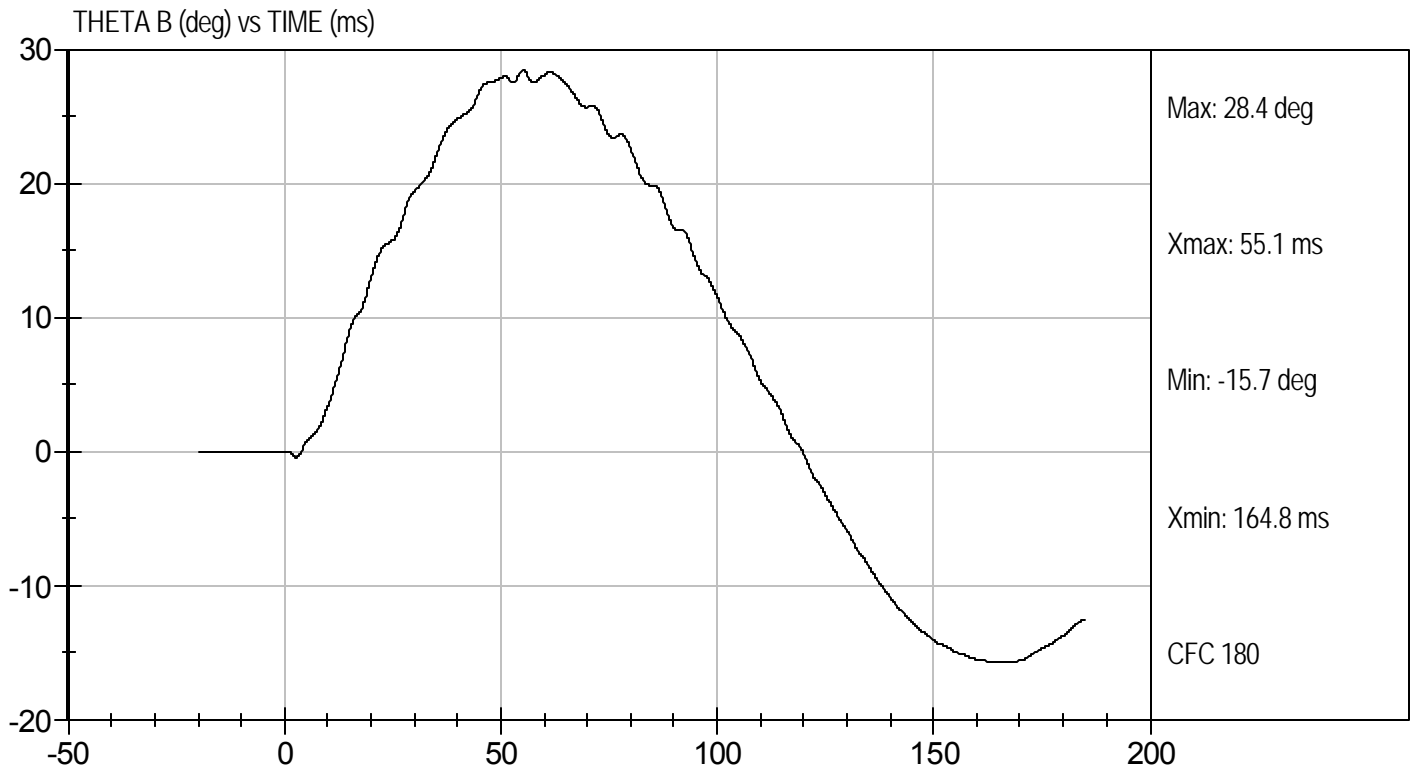
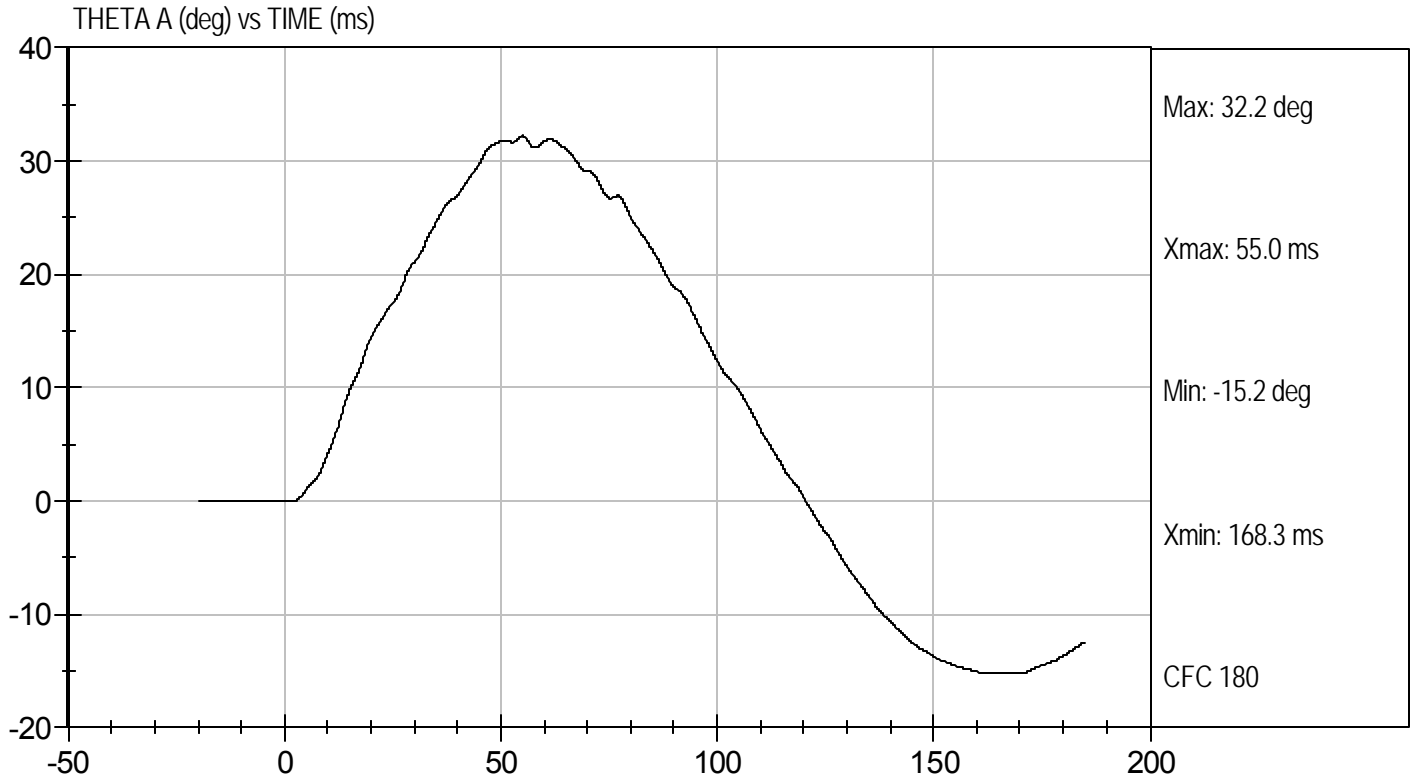


PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)







**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111723

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.4	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.2	Pass
Time of Peak Shoulder Acceleration	ms	NA	18.6	Pass
Overall Test Results				Pass

*Jessica Hall*  
 Laboratory Technician

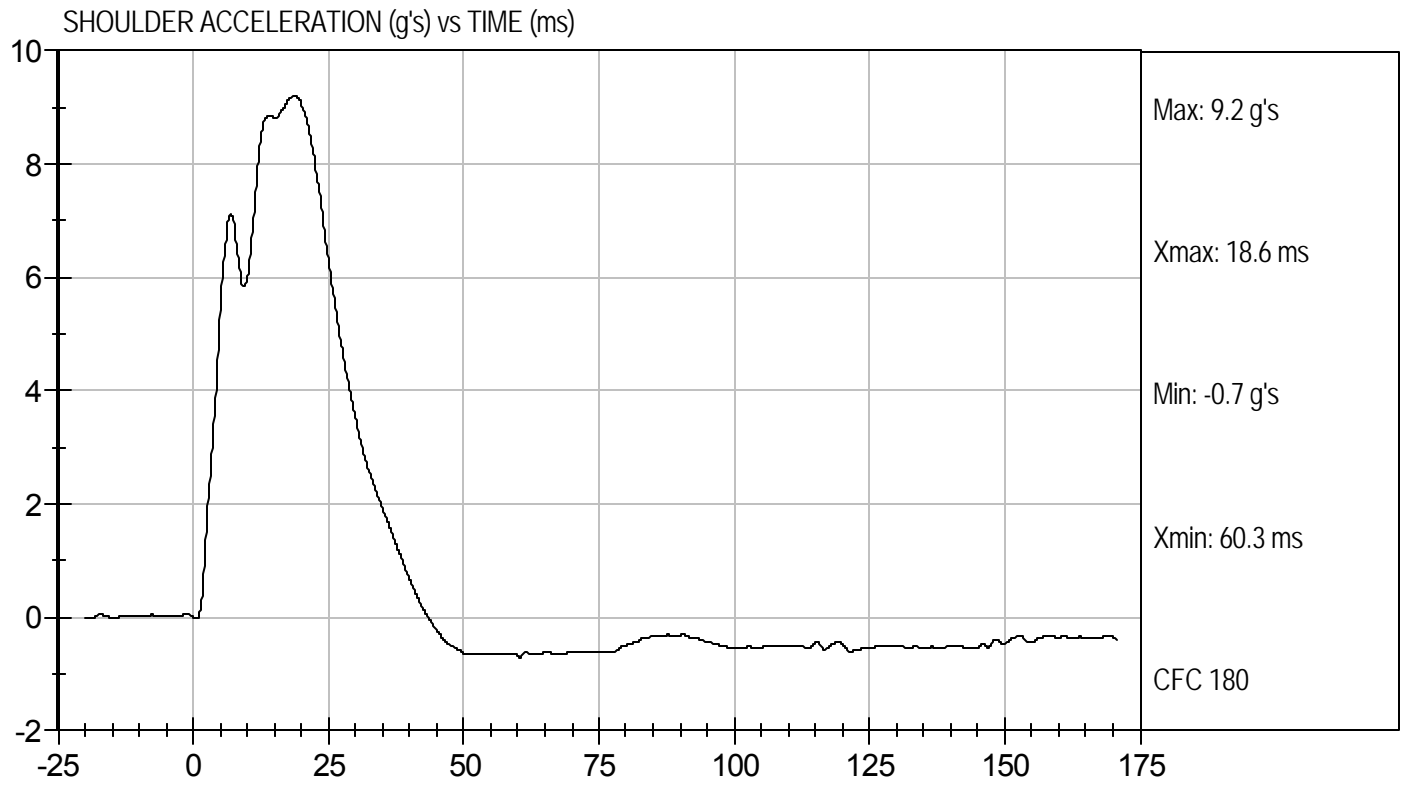
5/10/11  
 Test Date

*David Winkelbauer*  
 Approved By



Test Desc: Shoulder Impact  
Component ID: D111723

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



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111724

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	39.2	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.9	Pass
Overall Test Results				Pass

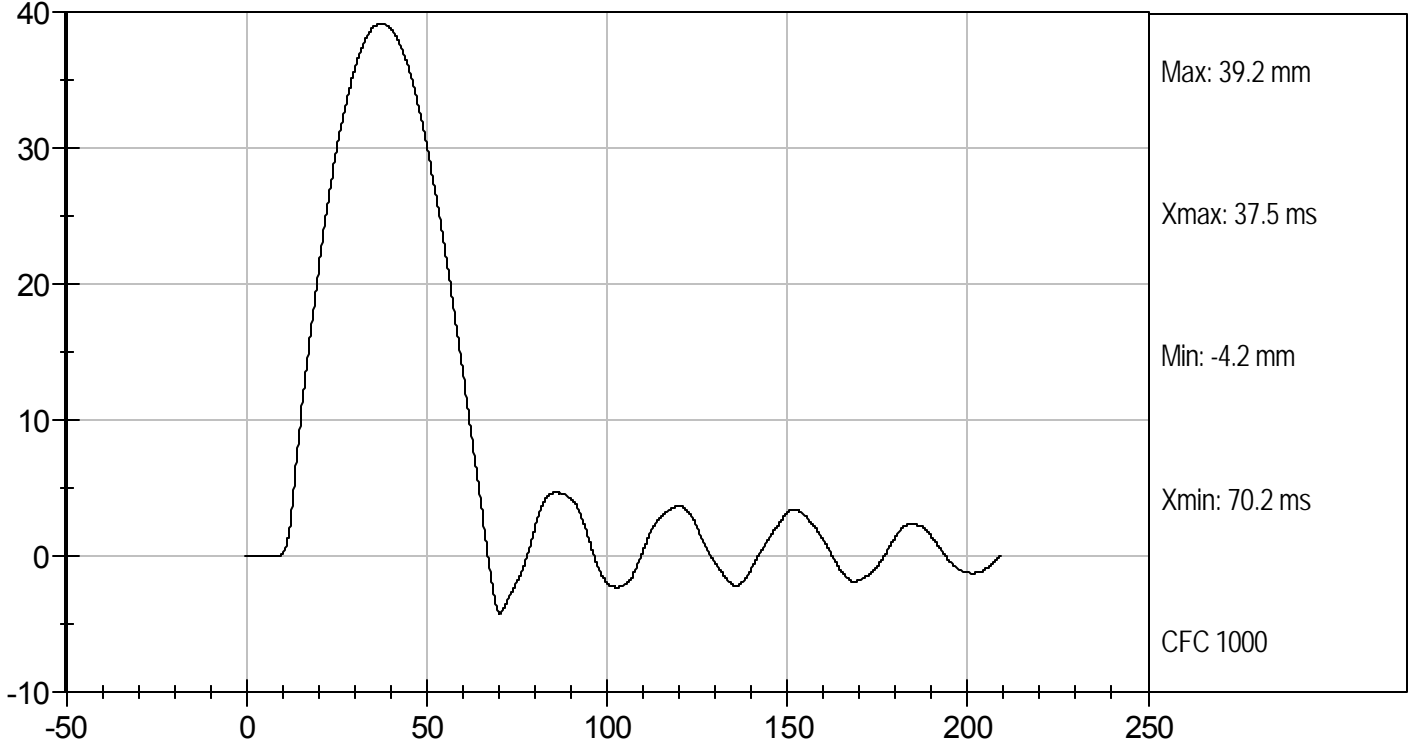
Jessica Gall  
Laboratory Technician

5/10/11  
Test Date

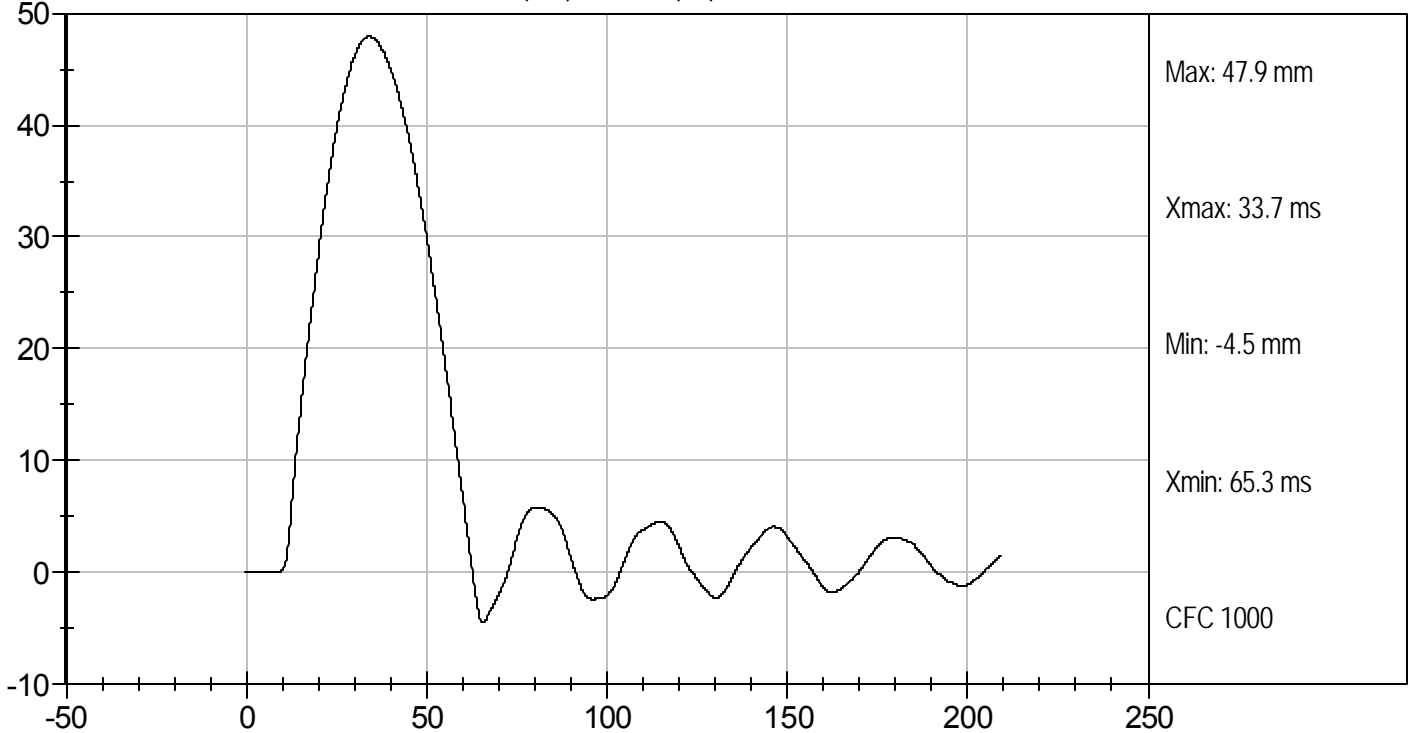
David Winkelbauer  
Approved By



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



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



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111725

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.7	Pass
Overall Test Results				Pass

Jessica Gall  
Laboratory Technician

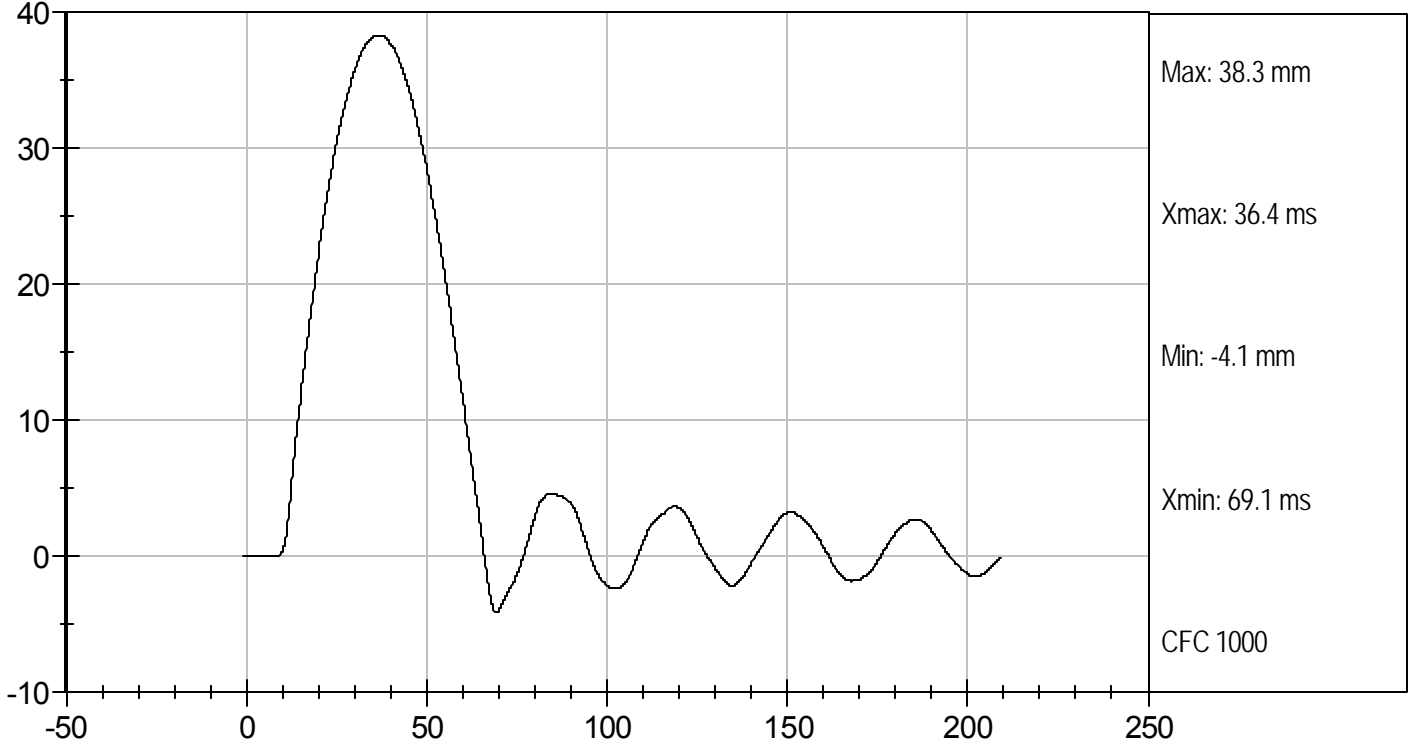
5/10/11  
Test Date

David Winkelbauer  
Approved By

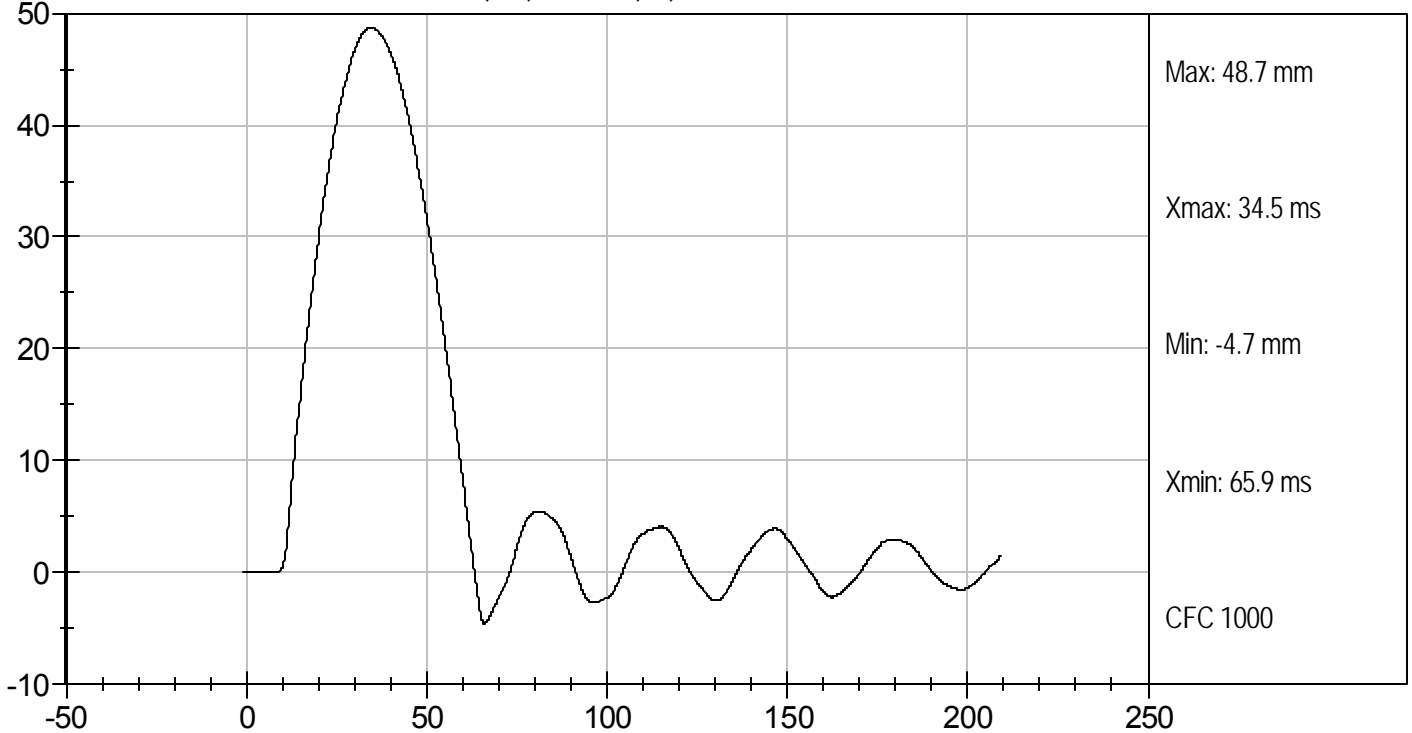




MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111726

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.7	Pass
Overall Test Results				Pass

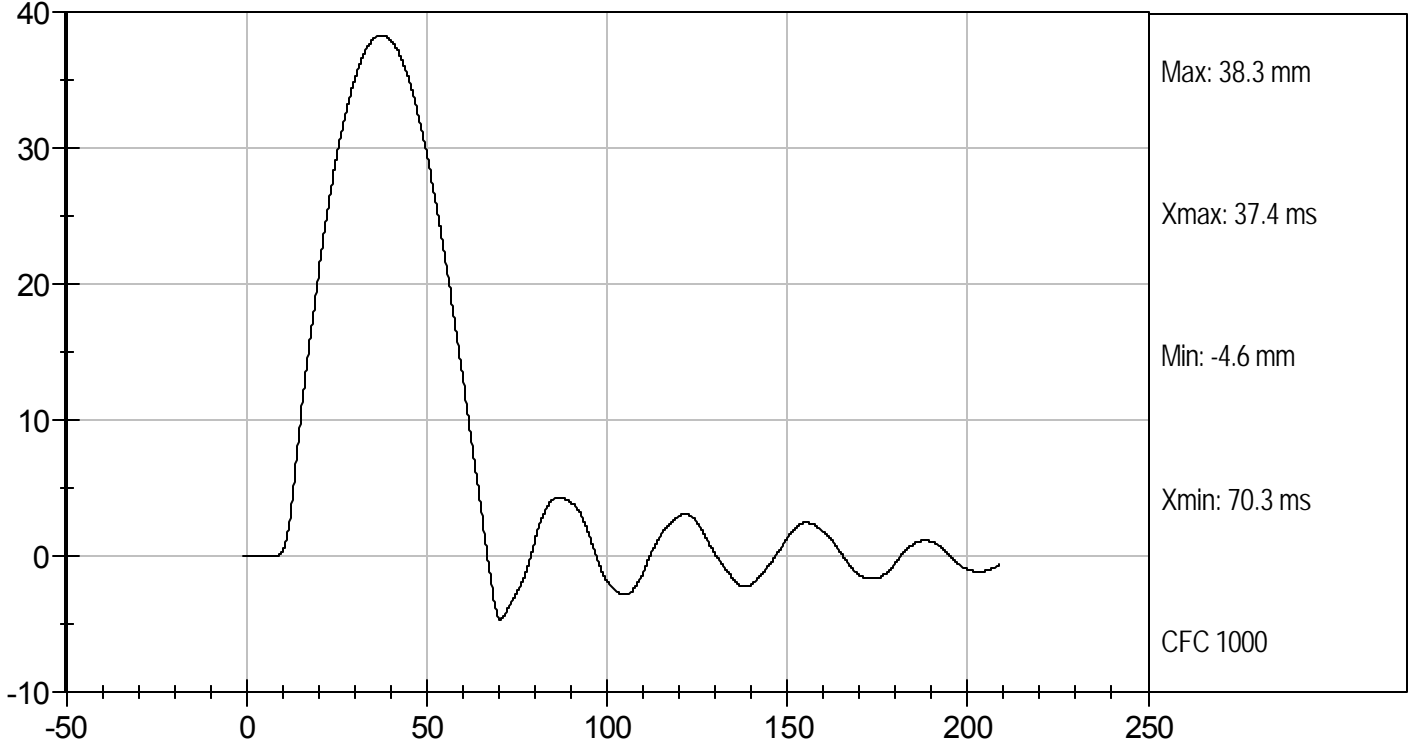
Jessica Hall  
Laboratory Technician

5/10/11  
Test Date

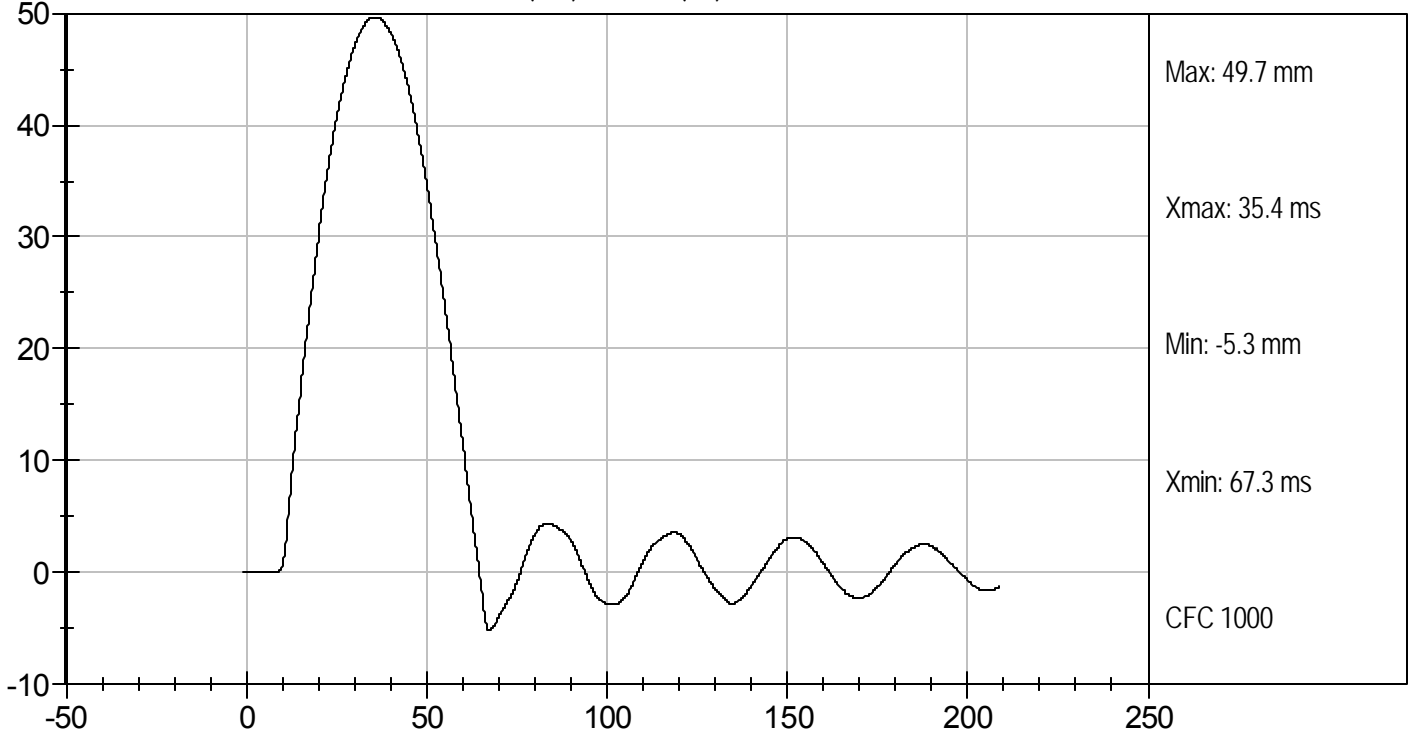
David Winkelbauer  
Approved By



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



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



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

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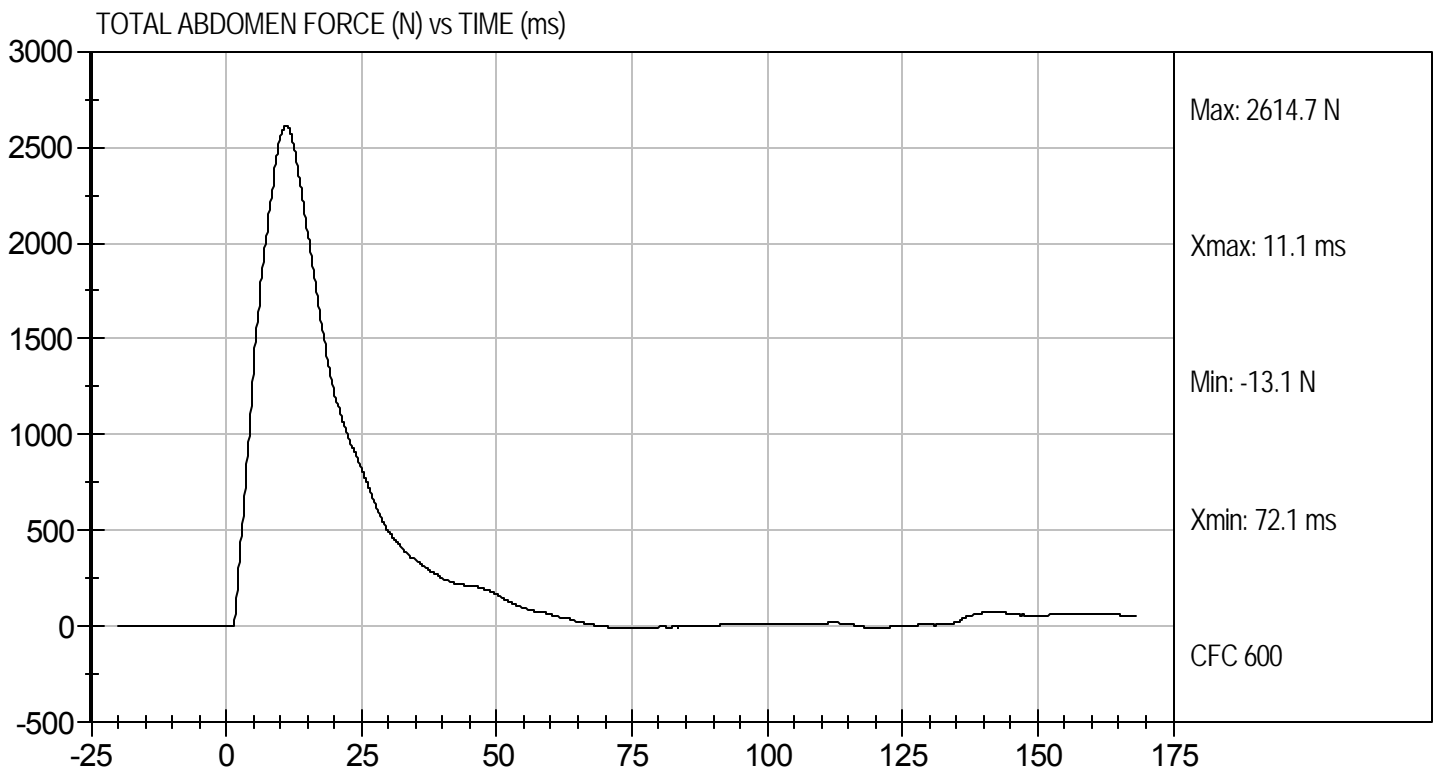
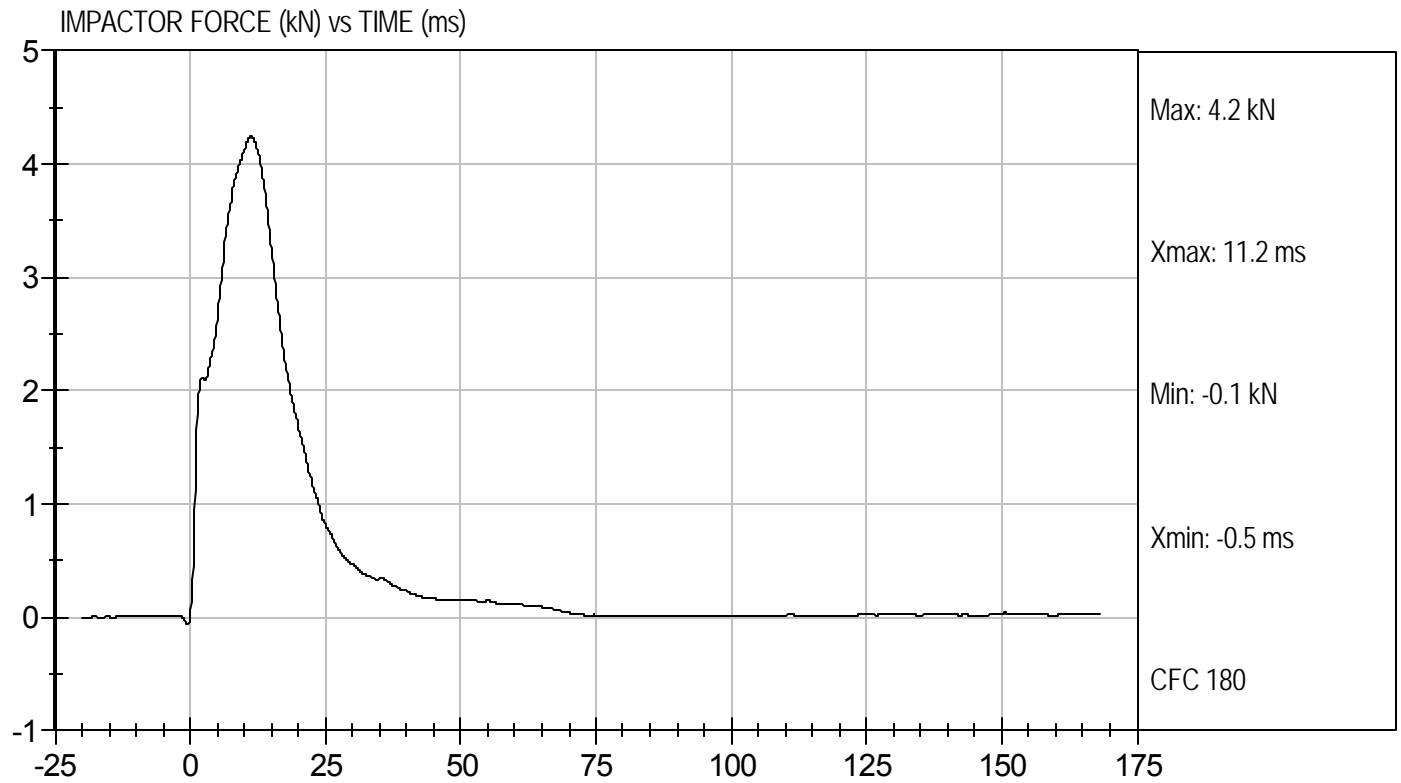
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Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.25	Pass
Time of Maximum Impact Force	ms	10.60 to 13.00	11.20	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.61	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.10	Pass
Overall Test Results				Pass

Jessica Hall  
Laboratory Technician

5/10/11  
Test Date

David Winkelbauer  
Approved By





**MGA RESEARCH CORPORATION  
LUMBAR SPINE TEST  
ES-2re DUMMY**

ATD Serial No: 016

Test I.D.: D111728

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

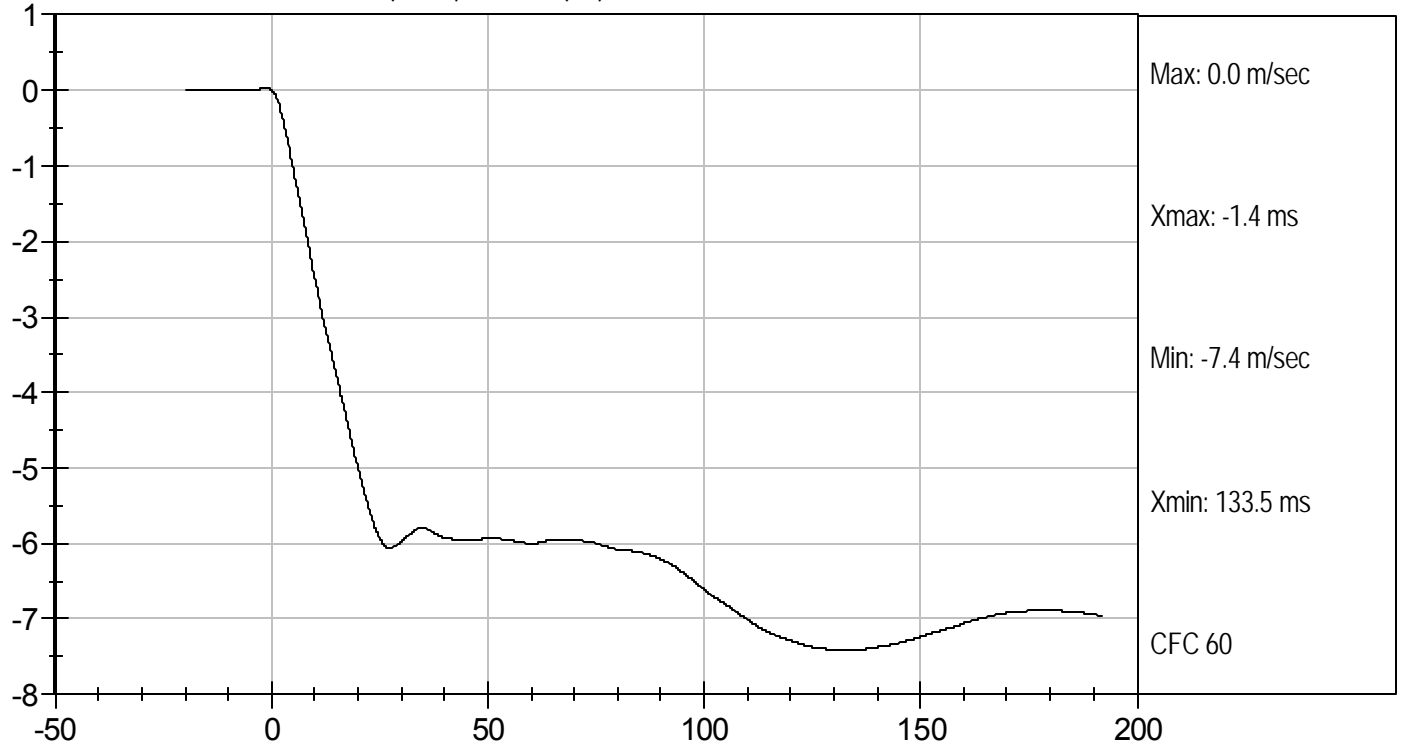
Jessica Hall  
Laboratory Technician

5/10/11  
Test Date

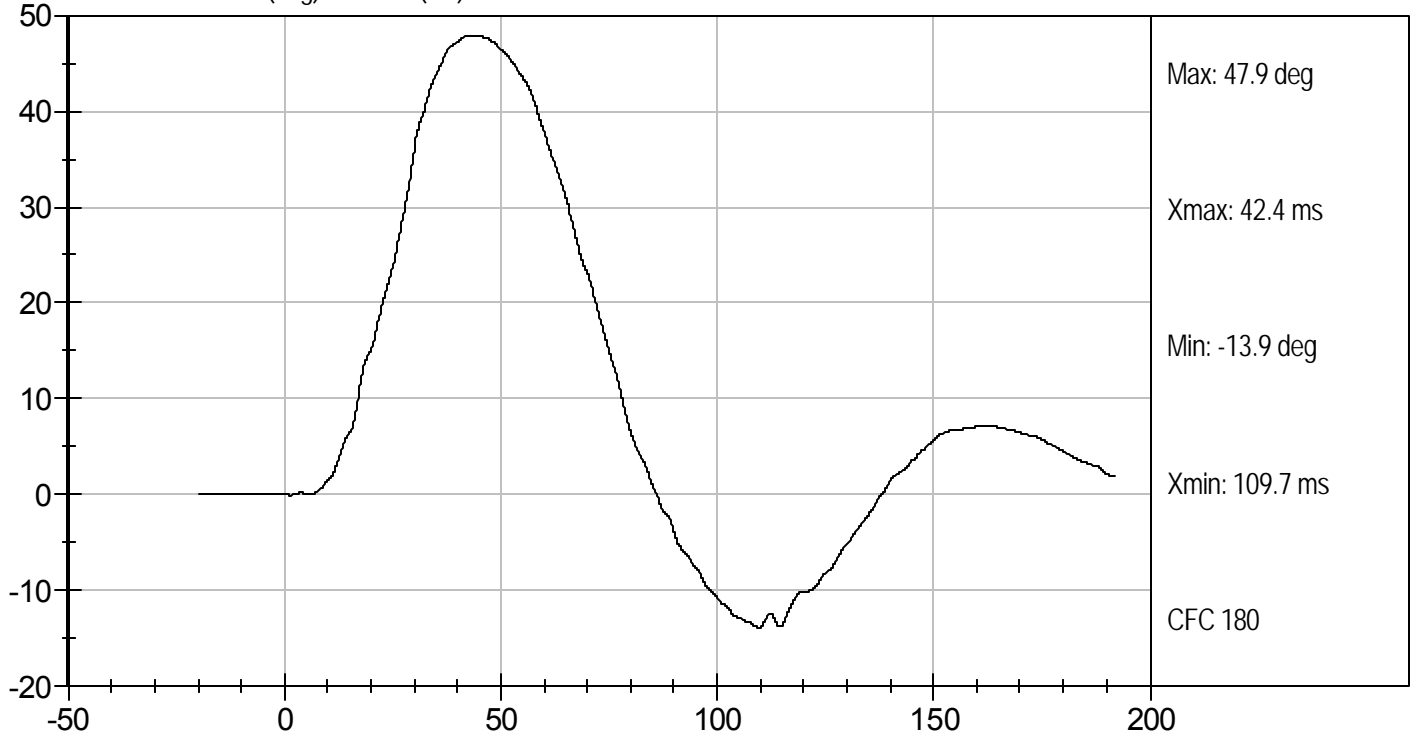
David Winkelbauer  
Approved By

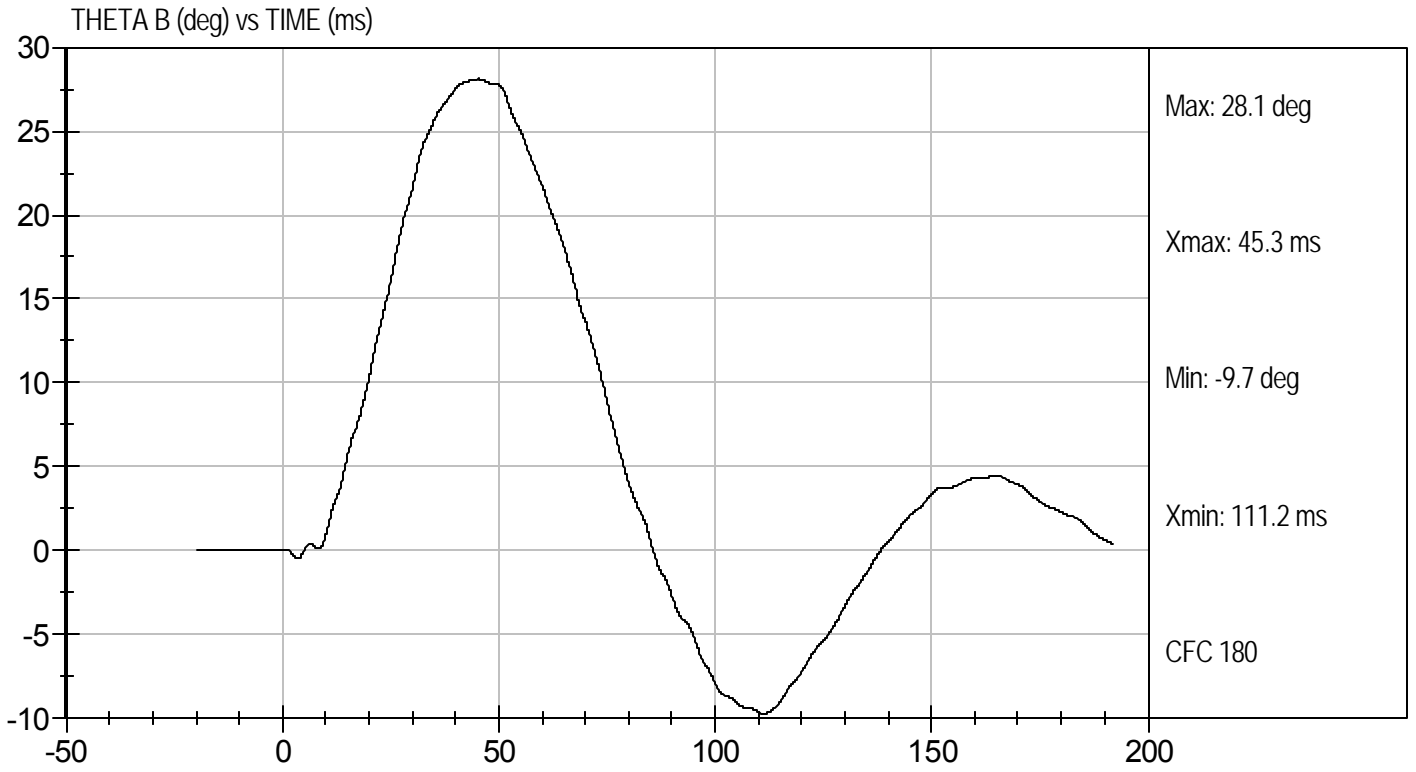
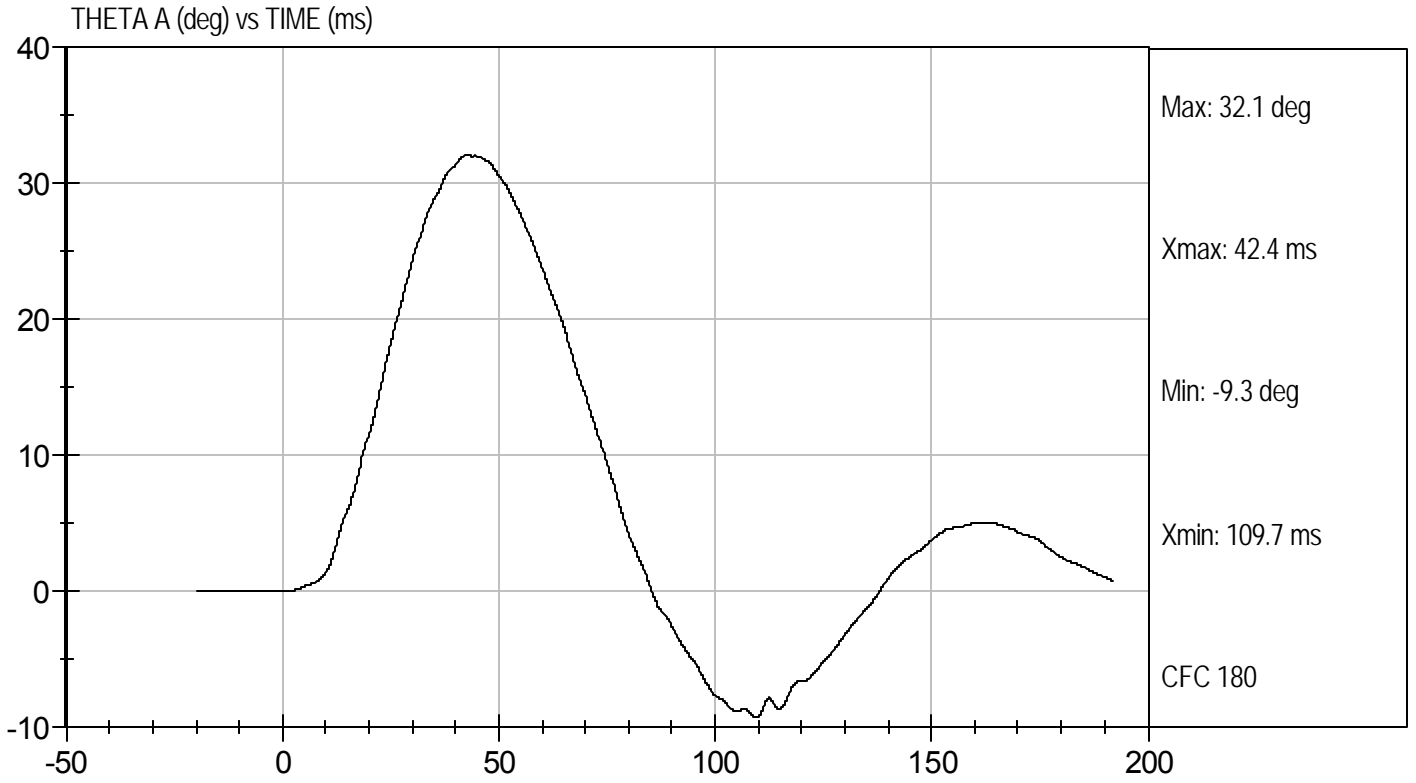


PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)





**MGA RESEARCH CORPORATION**

**PELVIS TEST  
ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111729

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.85	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.70	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.34	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	16.20	Pass
Overall Test Results				Pass

Jessica Hall  
Laboratory Technician

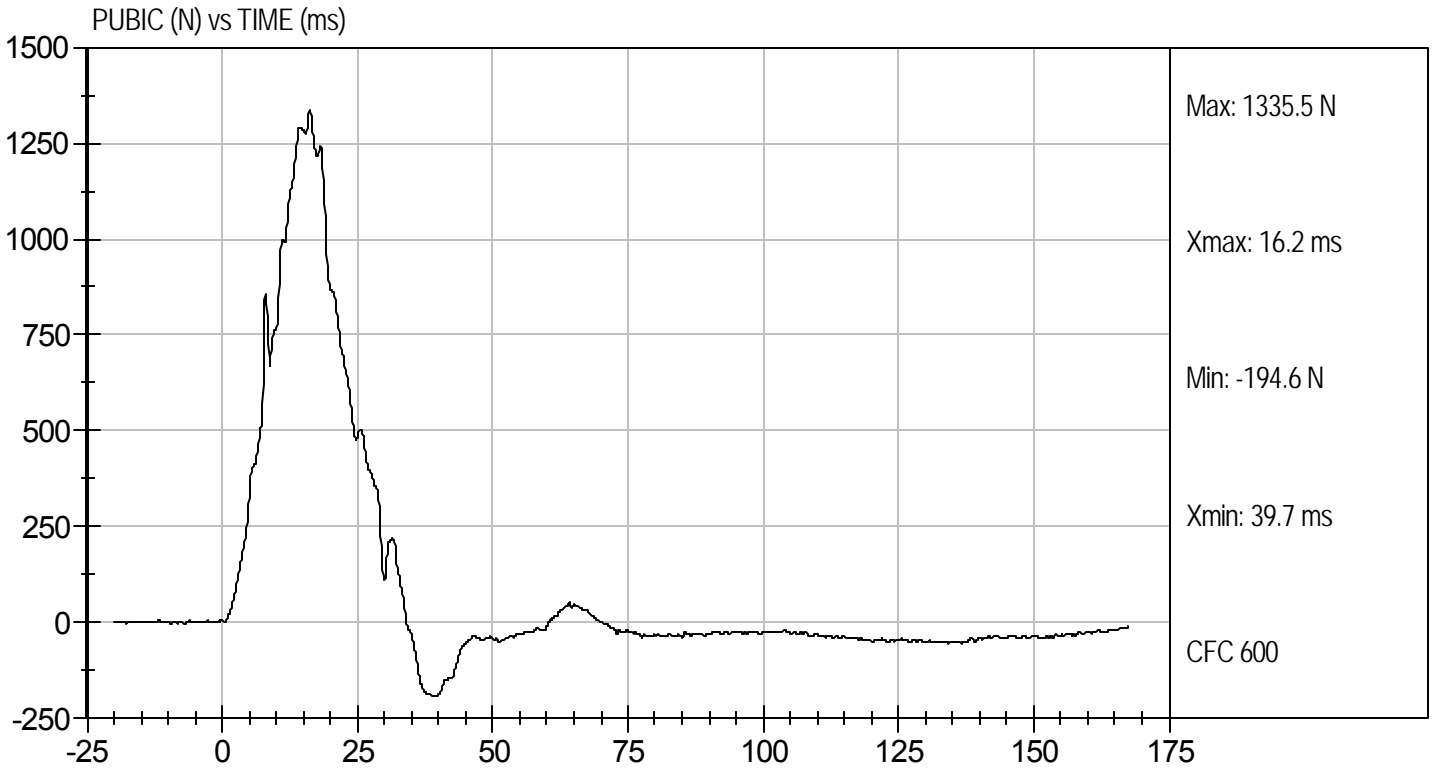
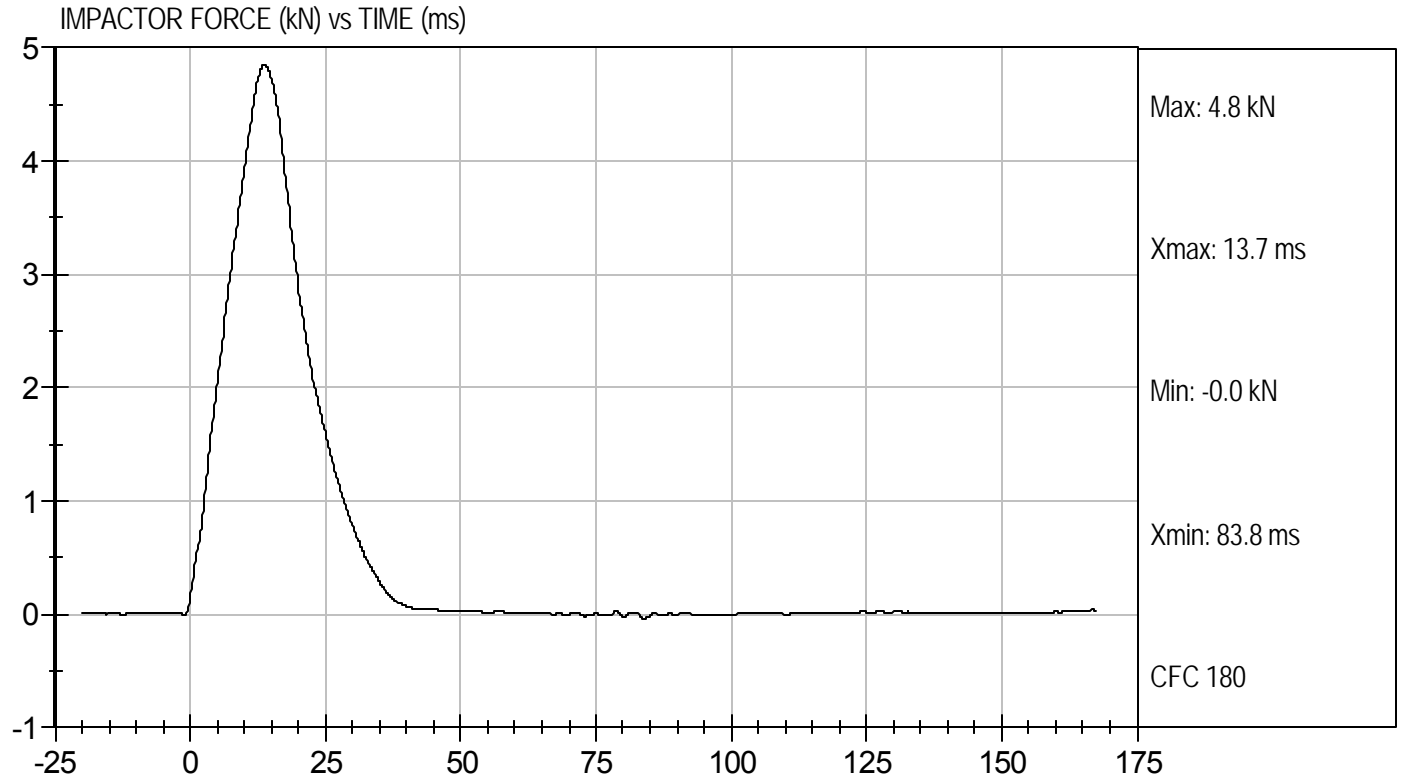
5/10/11  
Test Date

David Winkelbauer  
Approved By



Test Desc: Pelvis Impact  
Component ID: D111729

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



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

ATD Serial No: 016

Test I.D: D111720

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

Jessica Hall  
Laboratory Technician

5/10/11  
Test Date

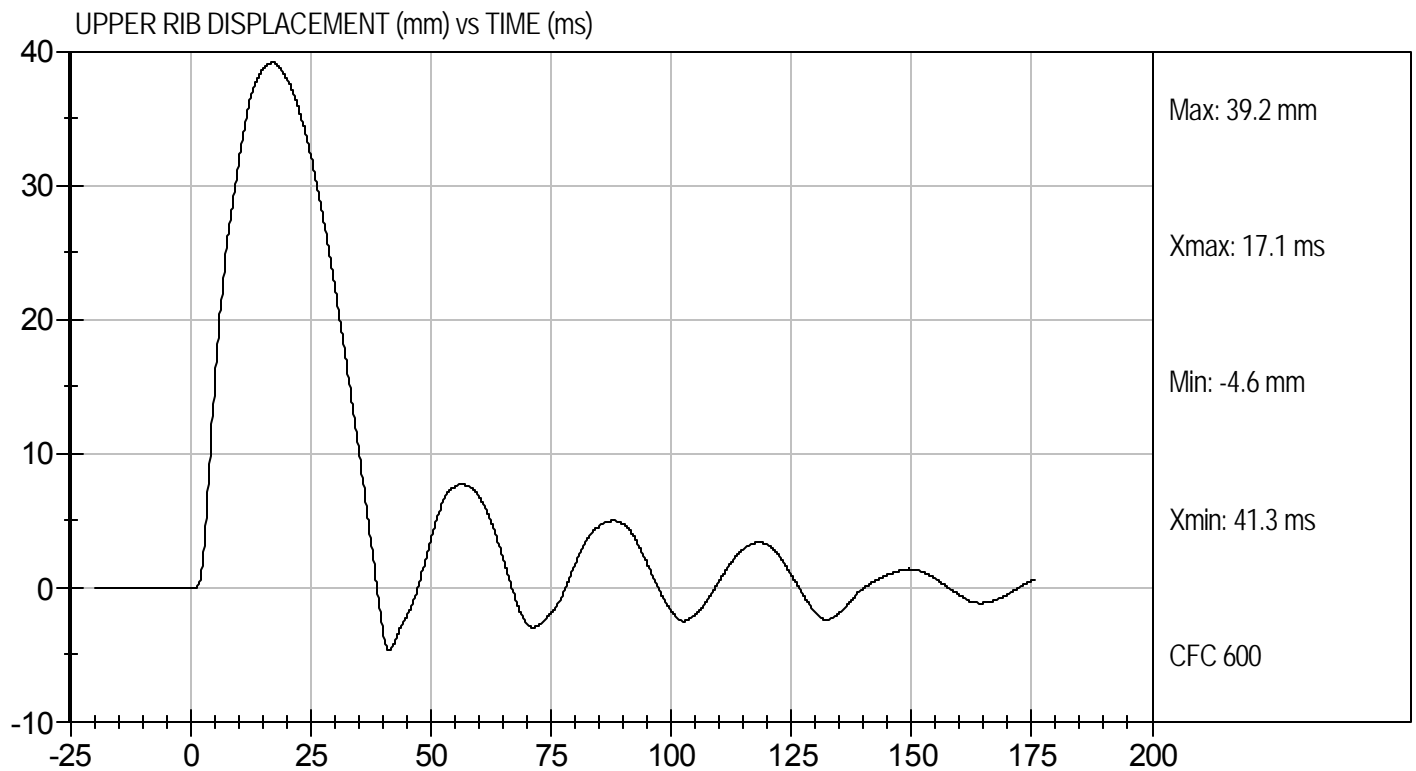
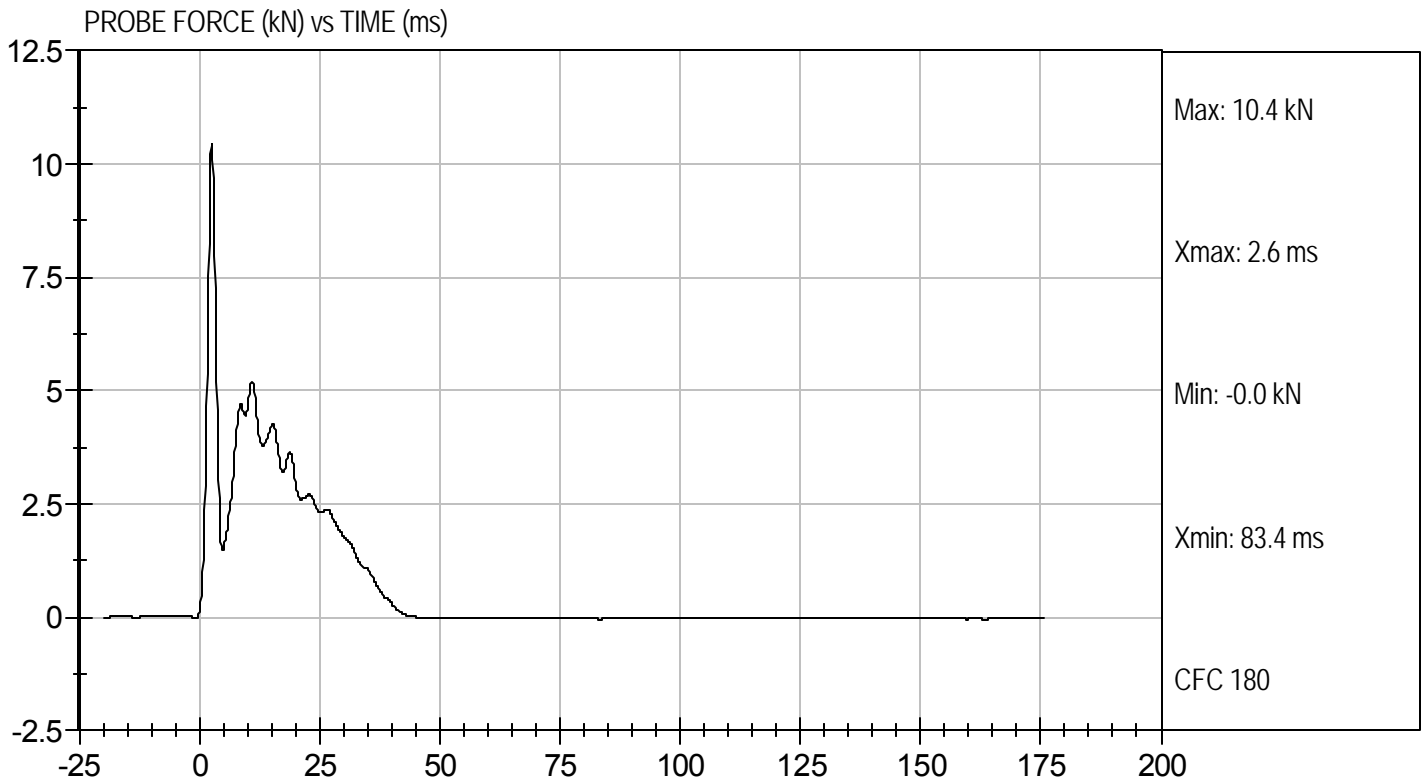
David Winkelbauer  
Approved By





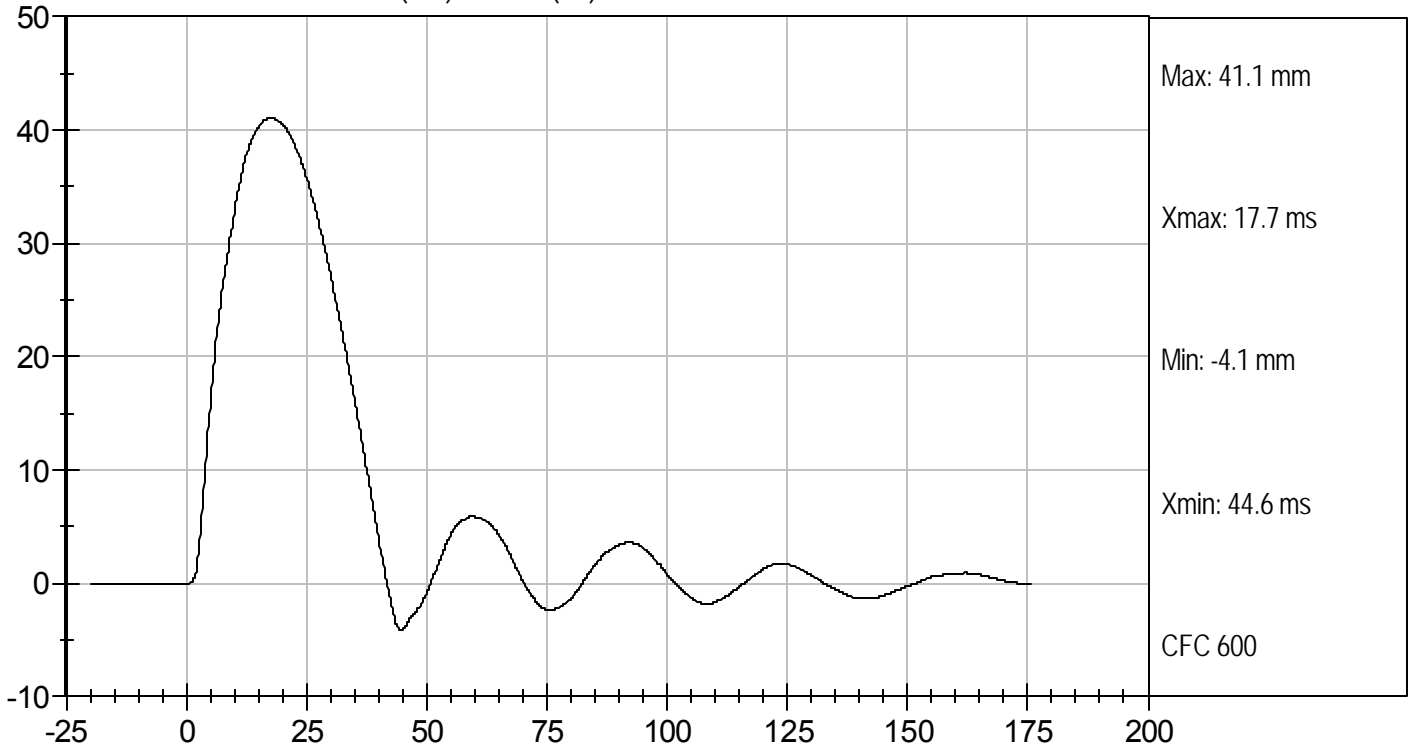
Test Desc: Thorax Impact  
Component ID: D111720

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

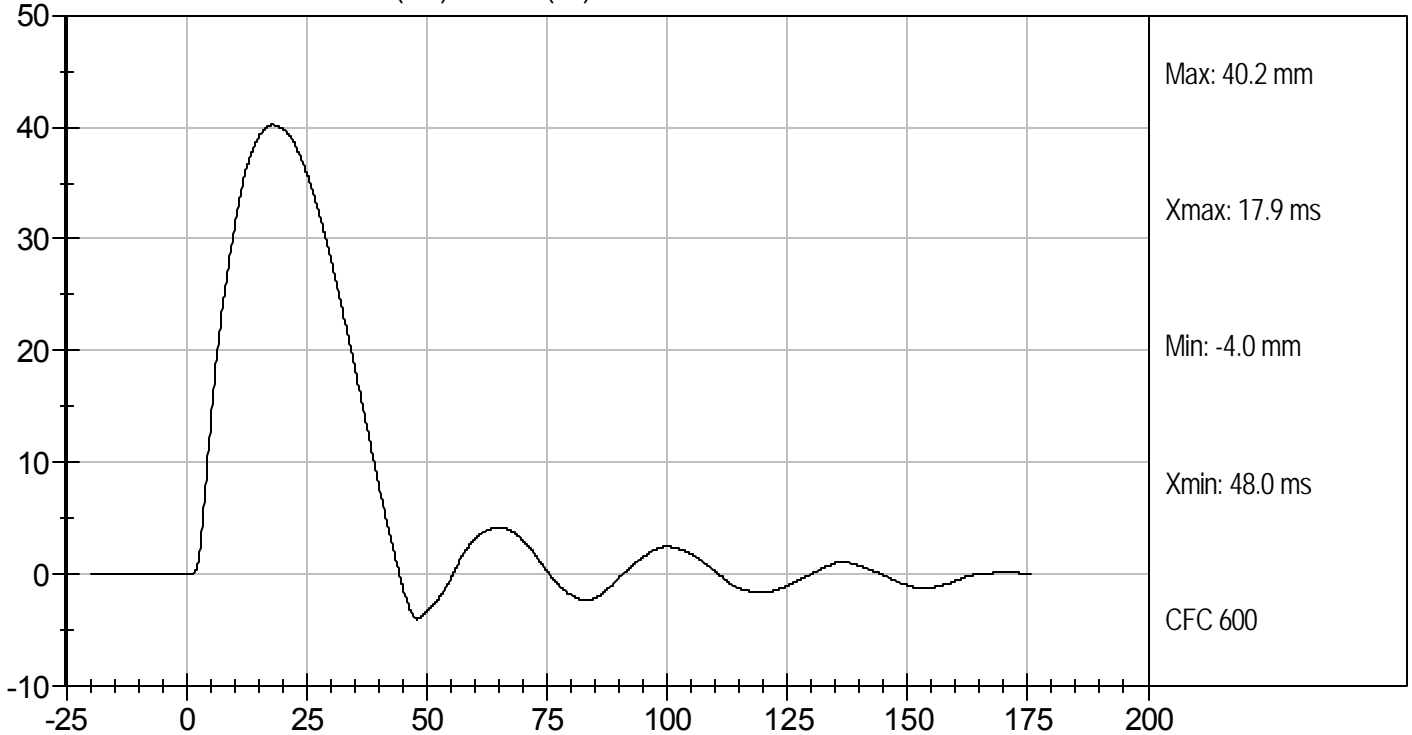




MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**


ATD Serial No: 016

Test ID: D111791

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

  
 \_\_\_\_\_  
 Laboratory Technician

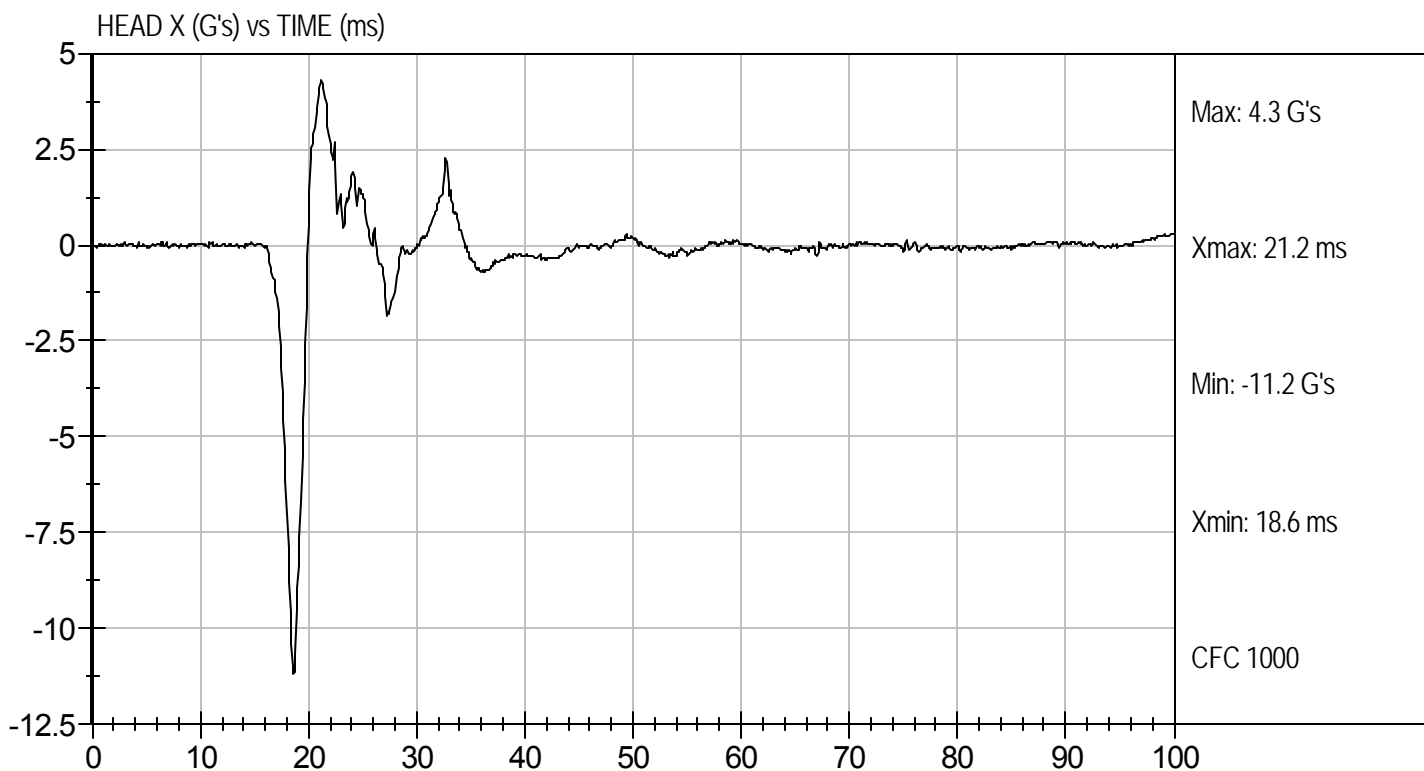
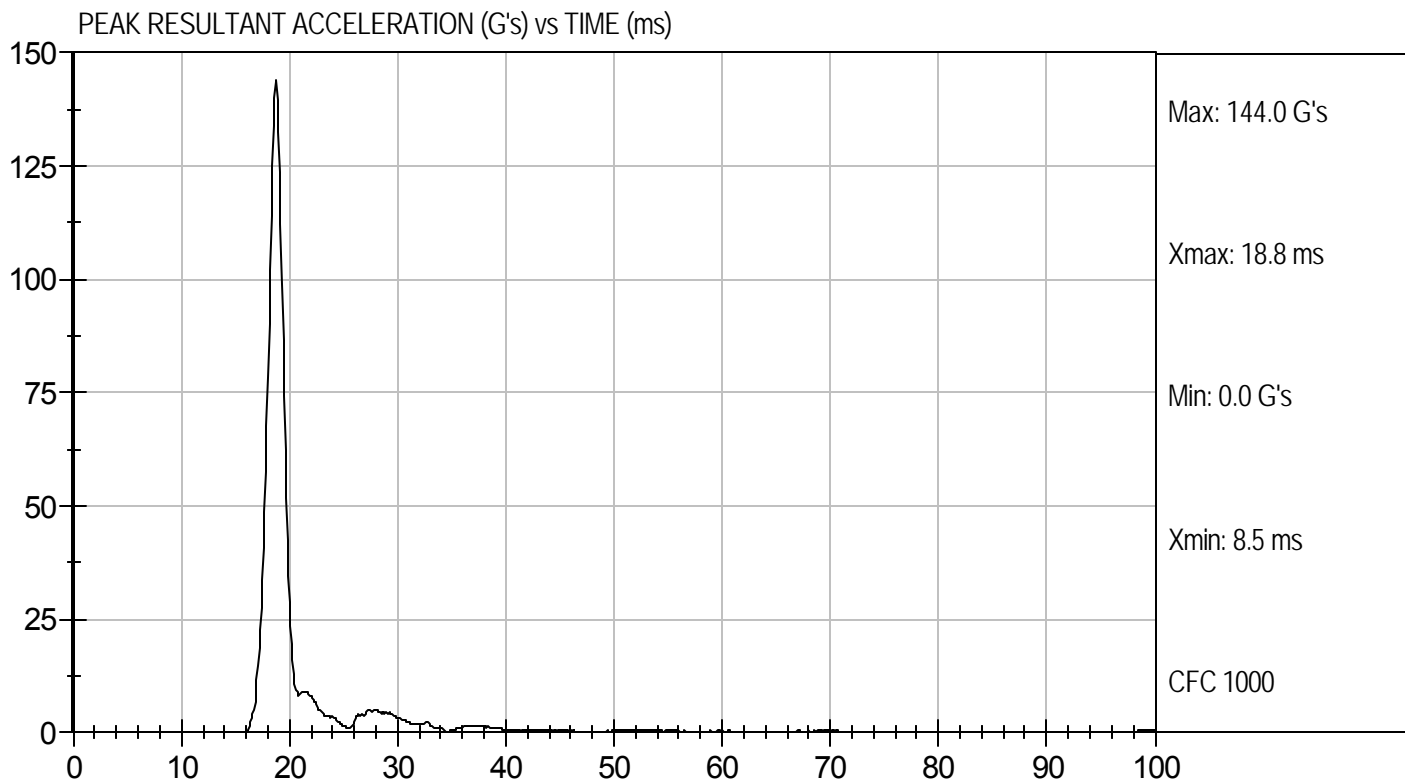
5/16/11  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By



Test Desc: Head Drop  
Component ID: D111791

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



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

ATD Serial No: 016

Test I.D.: D111792

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

Jessica Hall  
Laboratory Technician

5/16/11  
Test Date

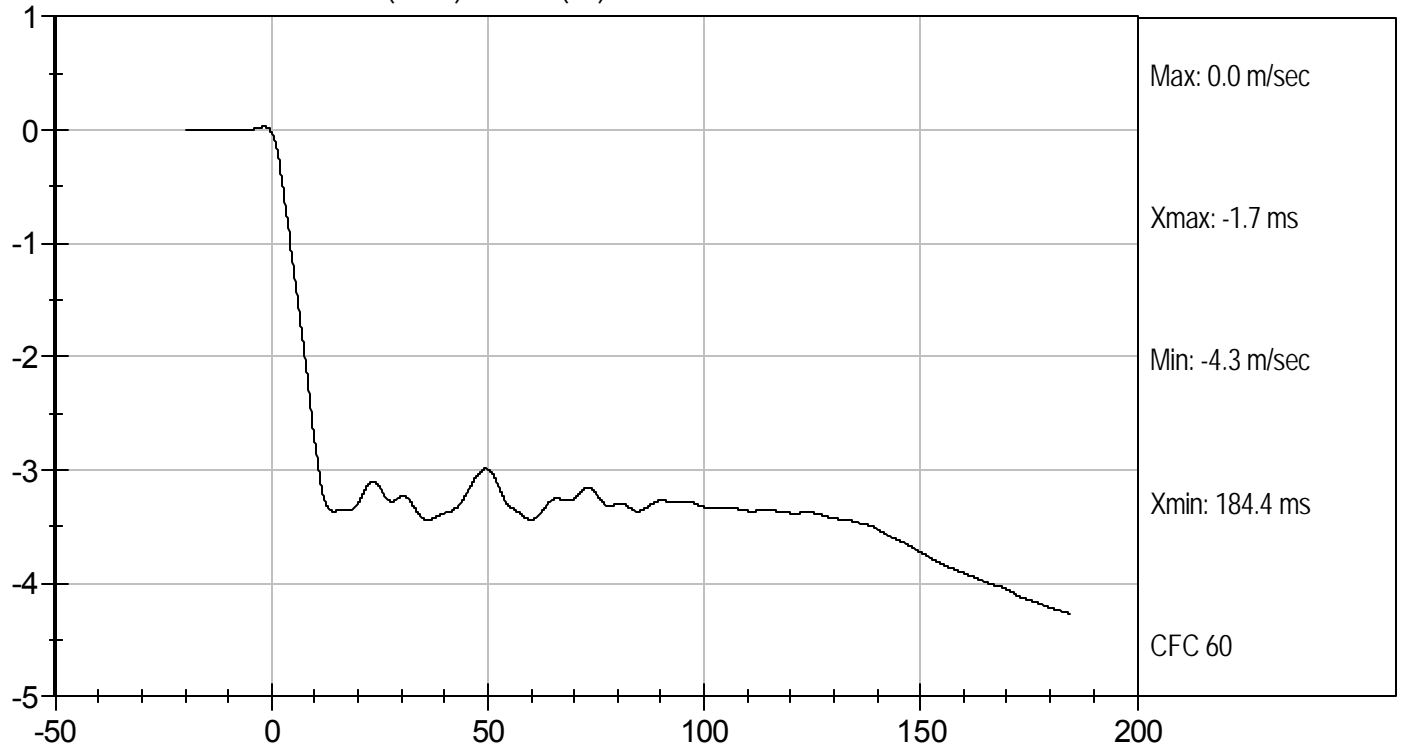
David Winkelbauer  
Approved By



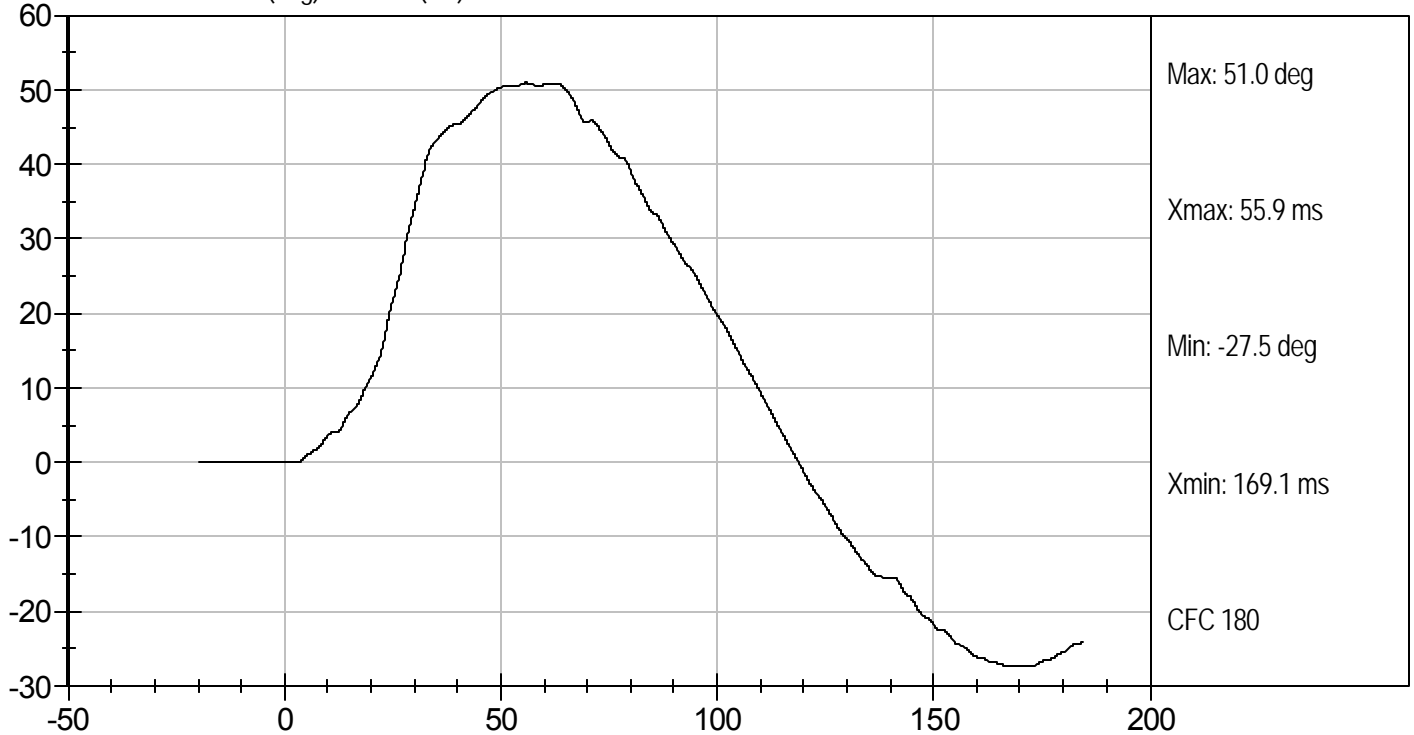
Test Desc: Neck Bending  
Component ID: D111792

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

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



FLEXION ANGLE (deg) vs TIME (ms)

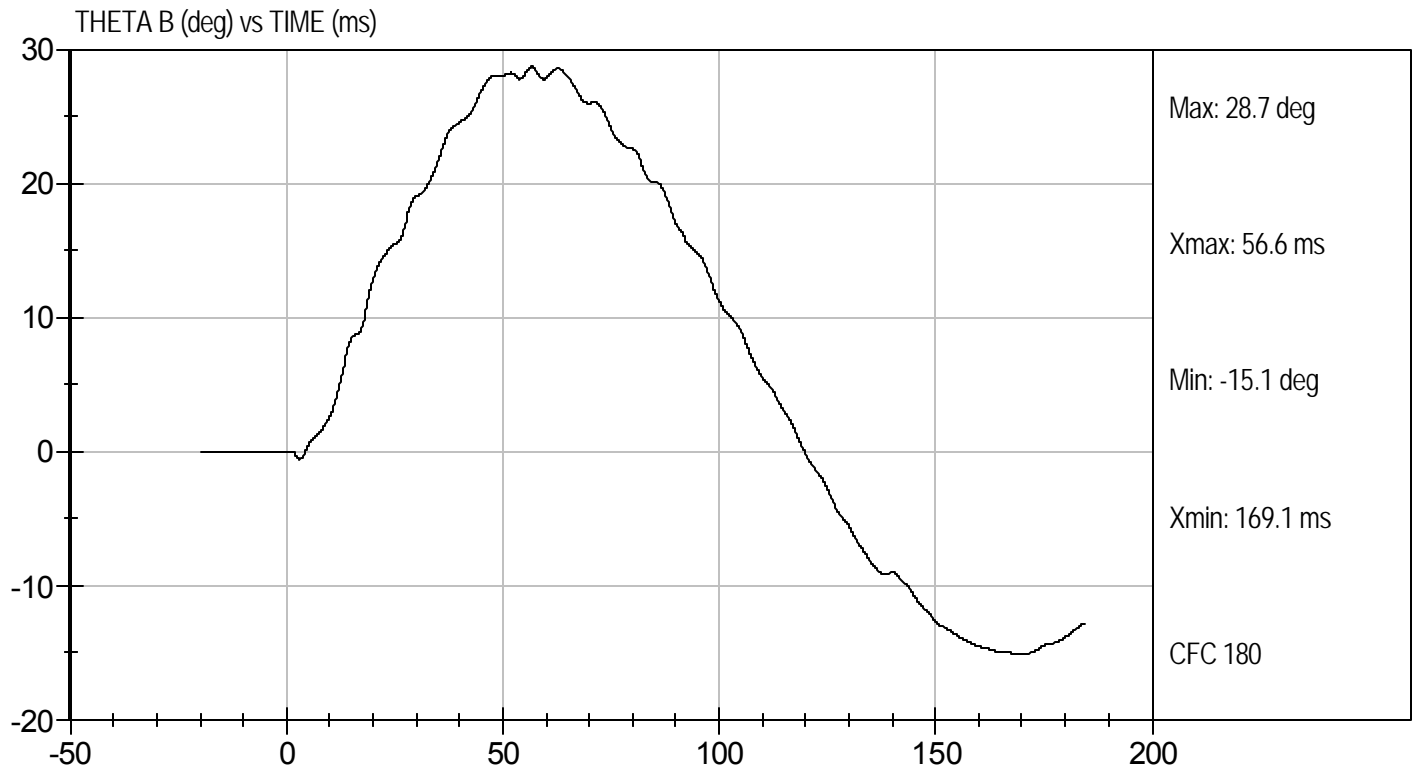
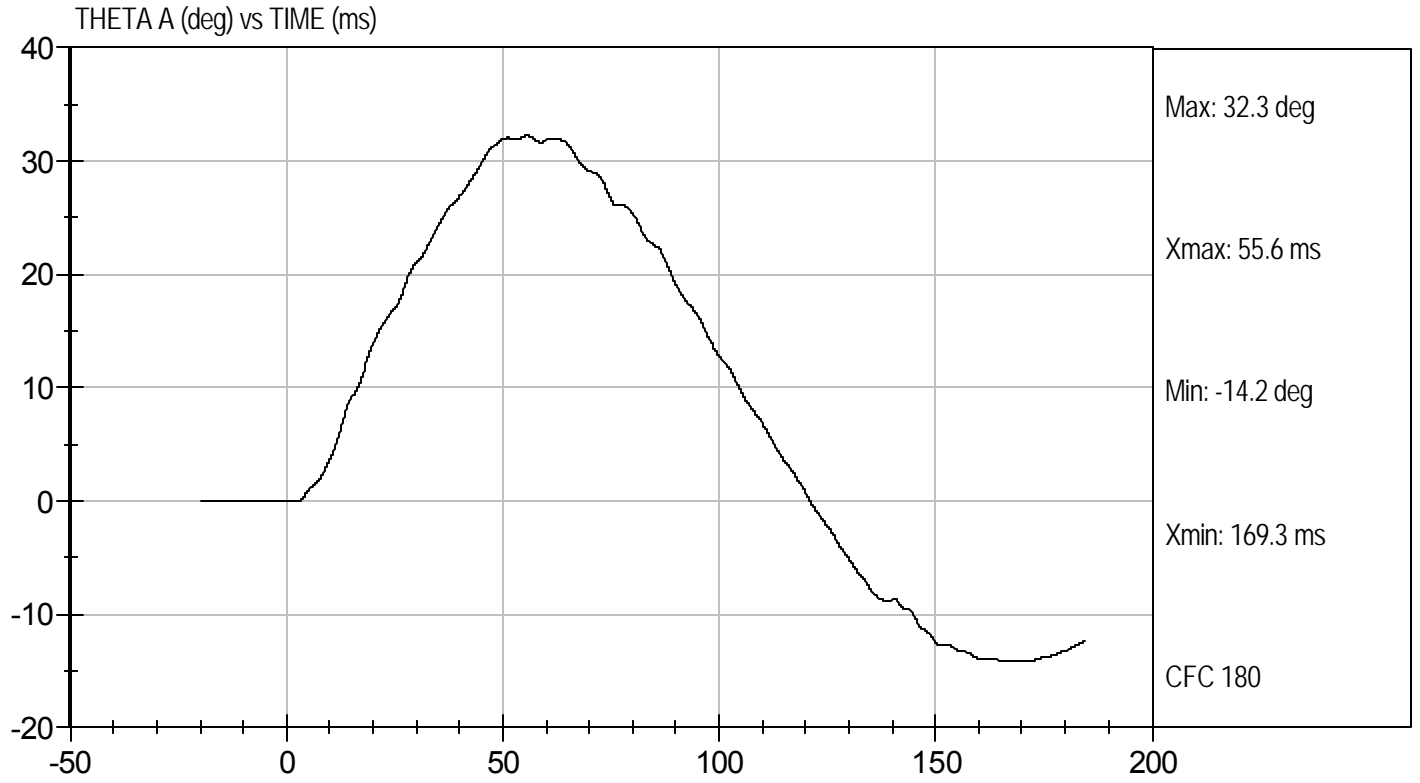






Test Desc: Neck Bending  
Component ID: D111792

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



**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111793

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

*Jessica Gall*  
 Laboratory Technician

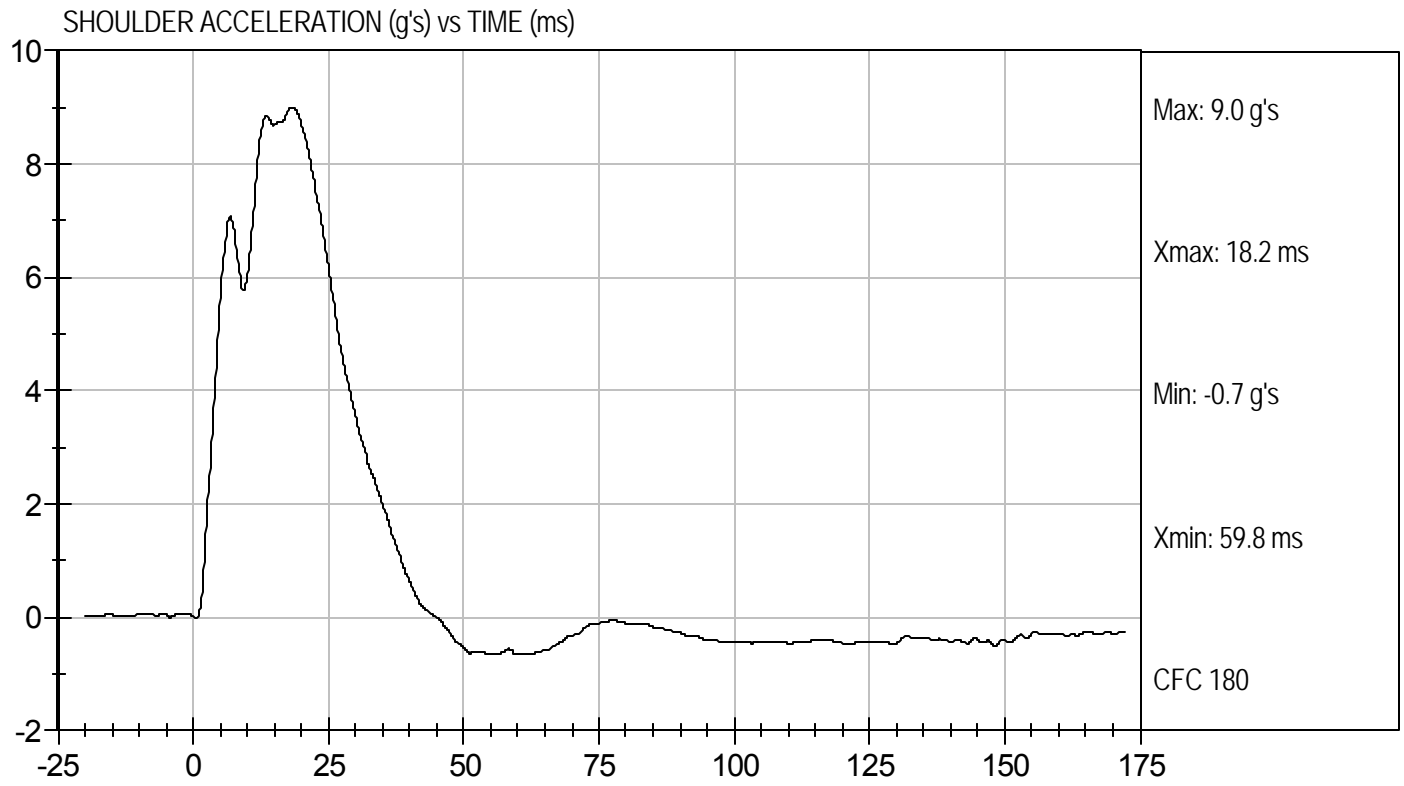
5/16/11  
 Test Date

*David Winkelbauer*  
 Approved By



Test Desc: Shoulder Impact  
Component ID: D111793

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



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111794

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

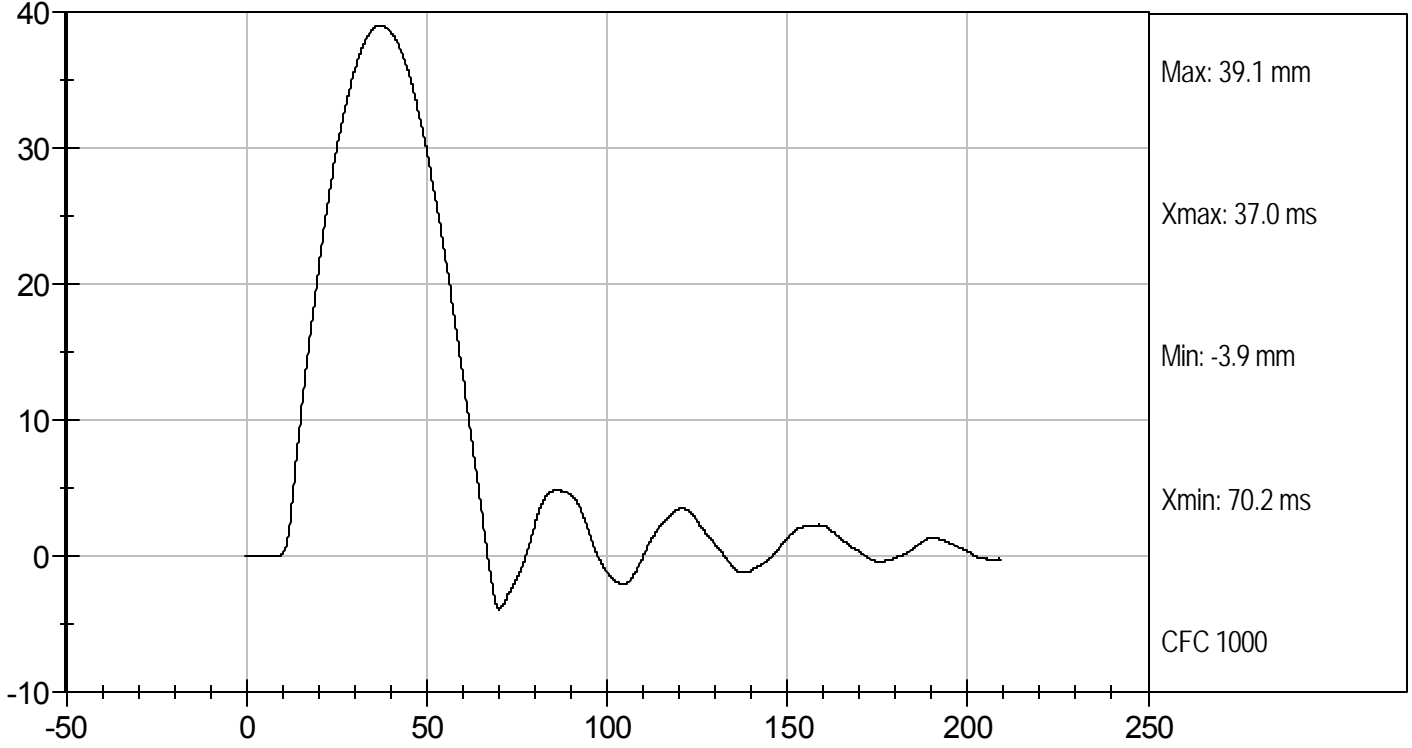
Jessica Gall  
Laboratory Technician

5/16/11  
Test Date

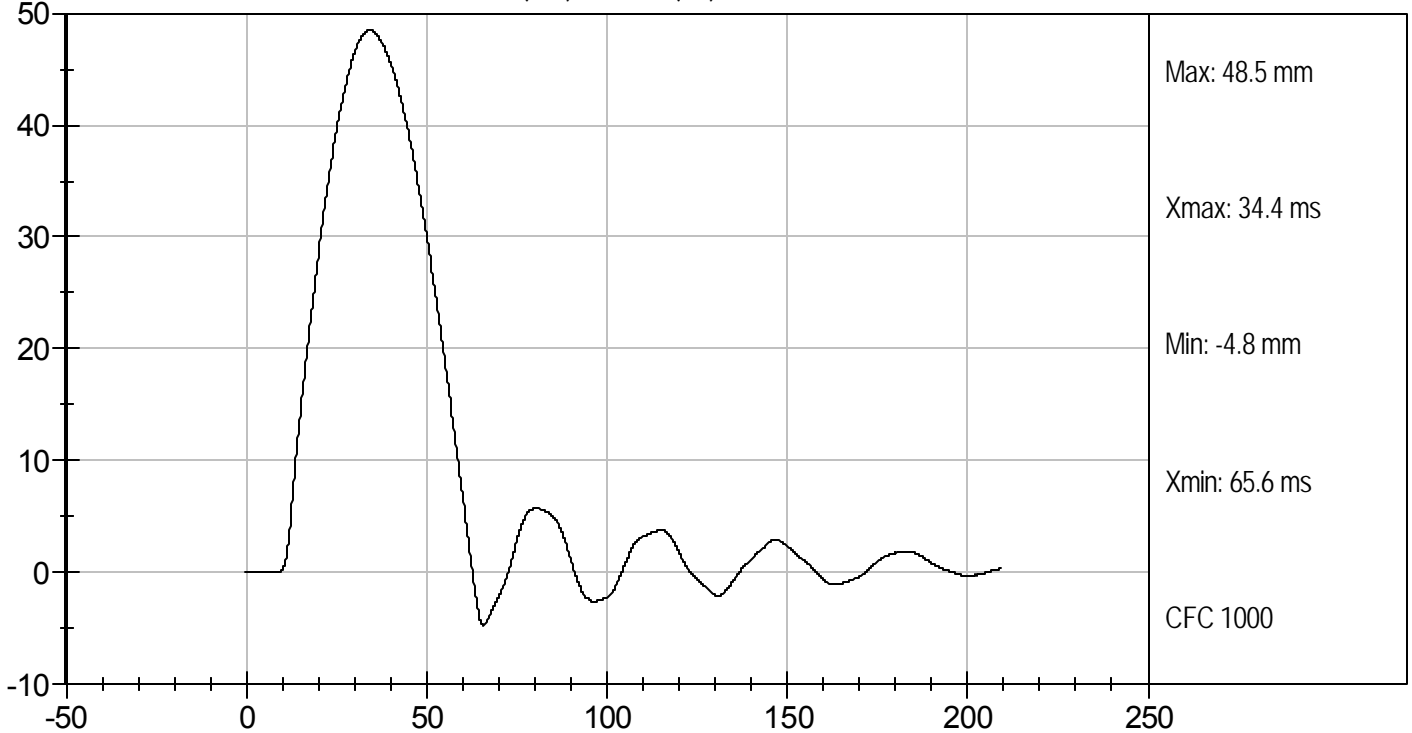
David Winkelbauer  
Approved By



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



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



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111795

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

Jessica Gall  
Laboratory Technician

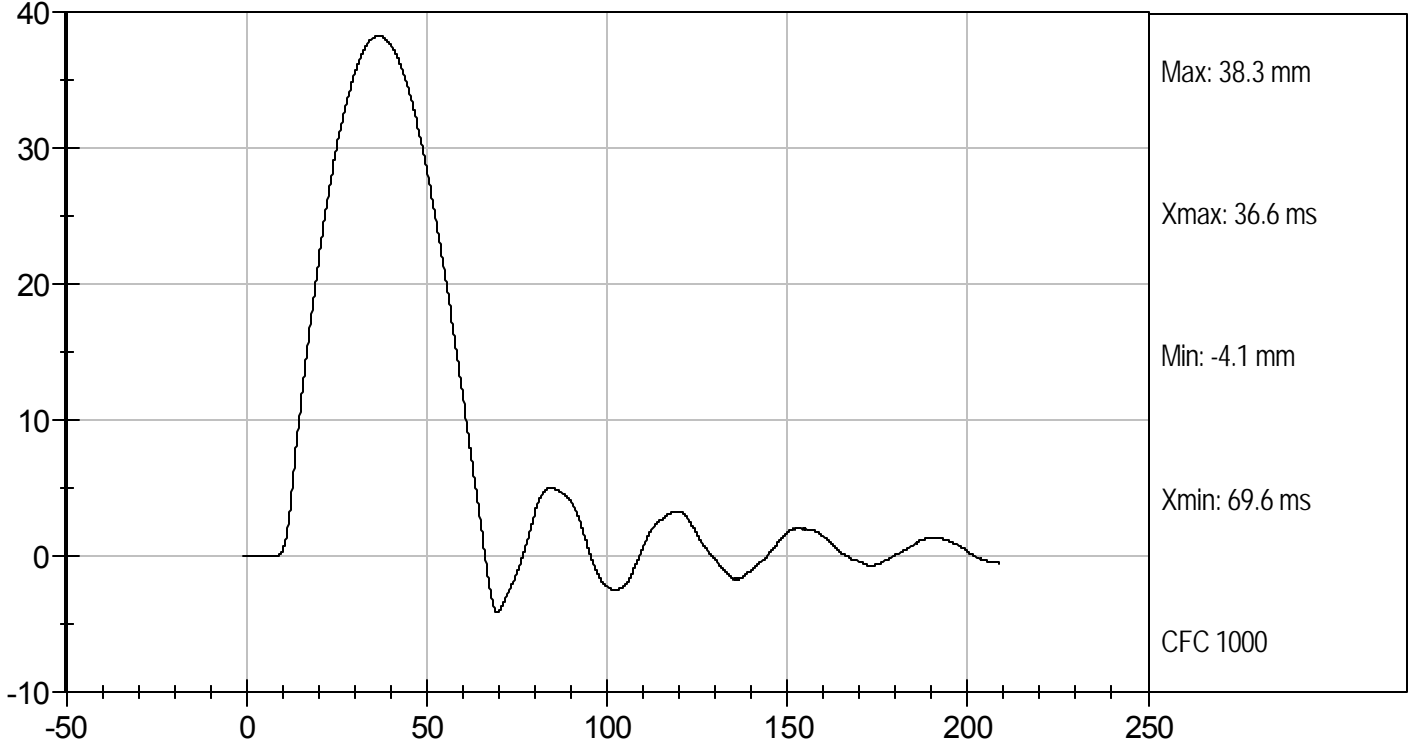
5/16/11  
Test Date

David Winkelbauer  
Approved By

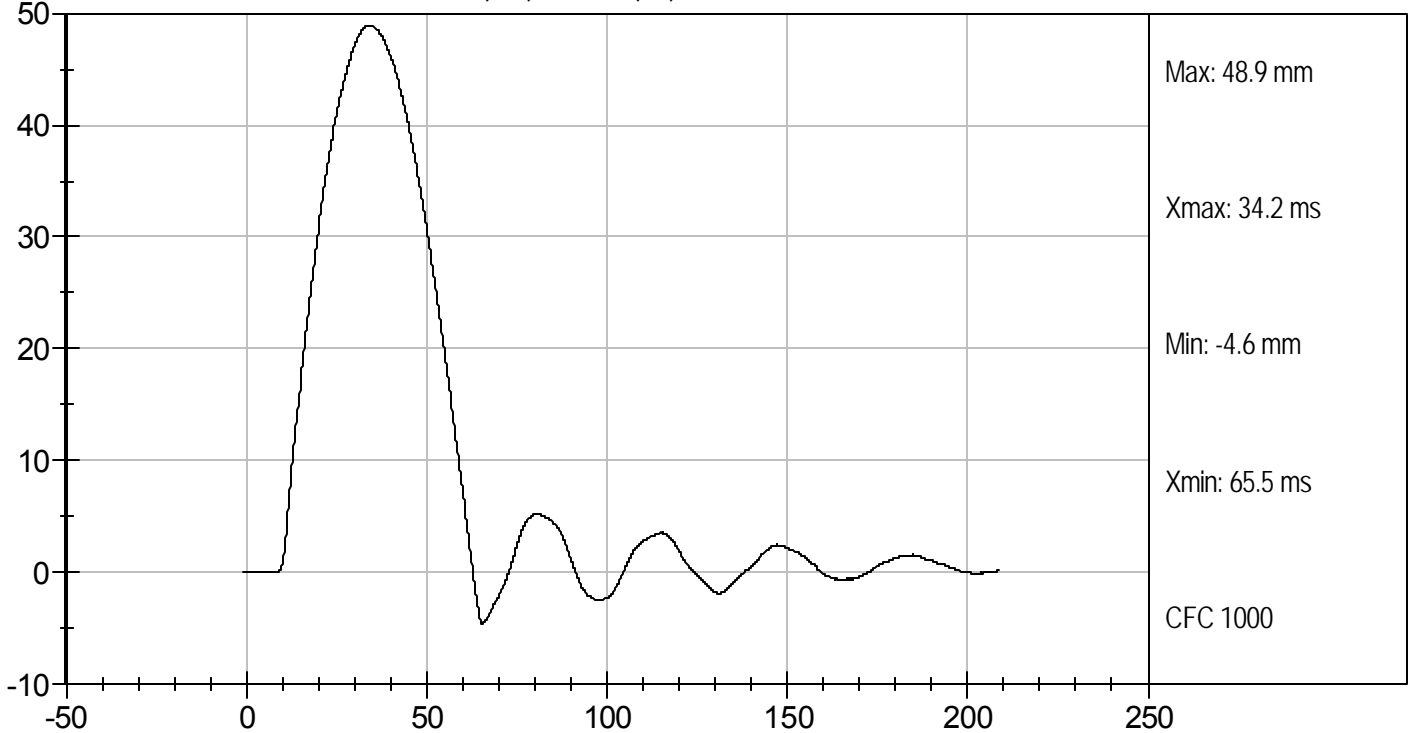




MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



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



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: 016

Test I.D: D111796

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

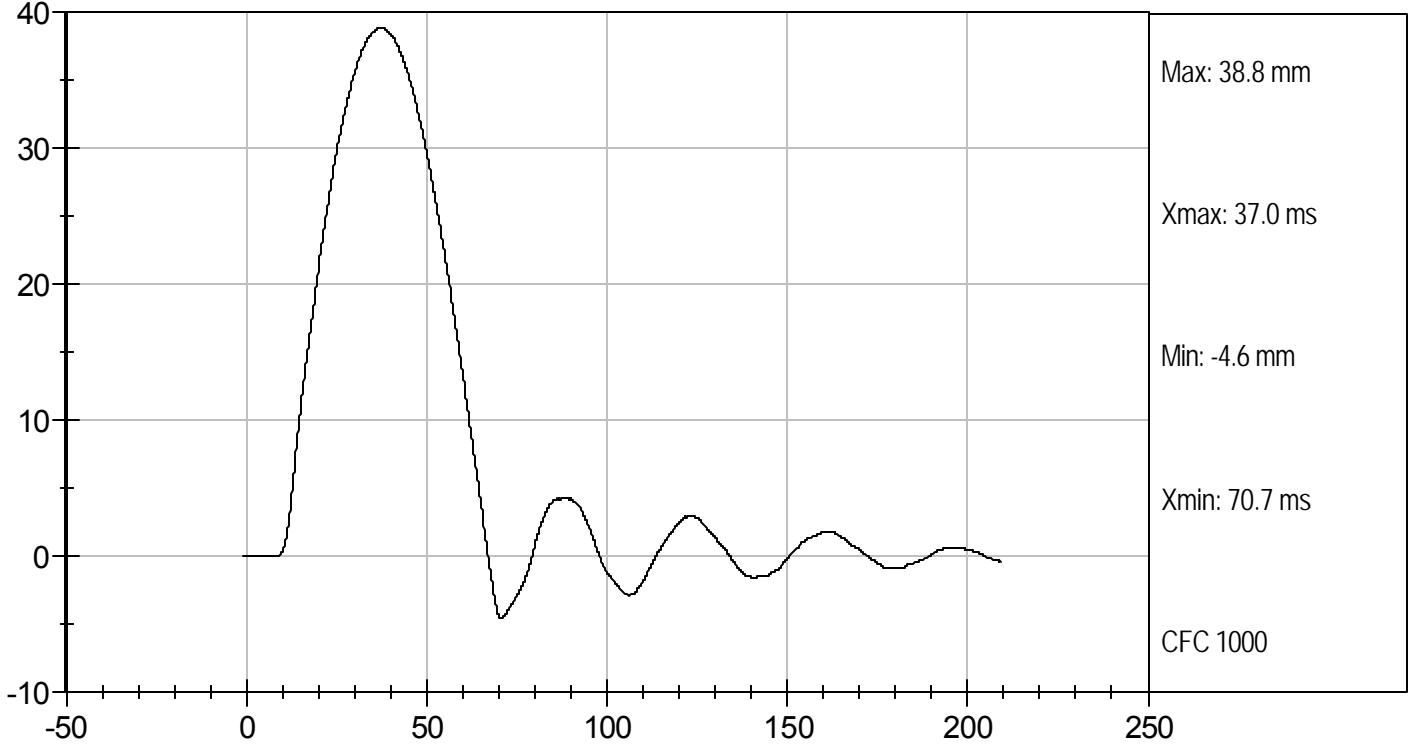
Jessica Hall  
Laboratory Technician

5/16/11  
Test Date

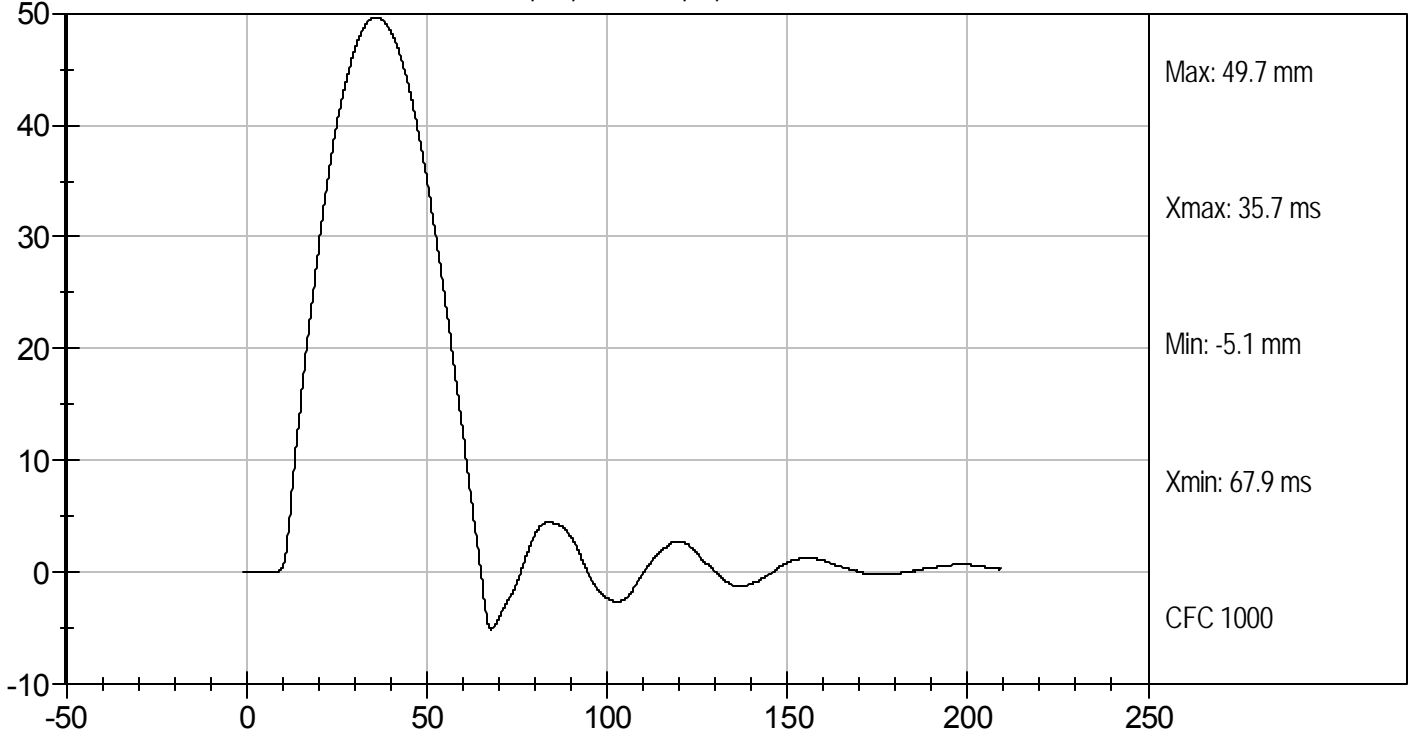
David Winkelbauer  
Approved By



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



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



**MGA RESEARCH CORPORATION**

**ABDOMEN TEST**

**ES-2re DUMMY**

**ATD Serial No:** 016

**Test I.D:** D111797

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

*Jessica Hall*  
Laboratory Technician

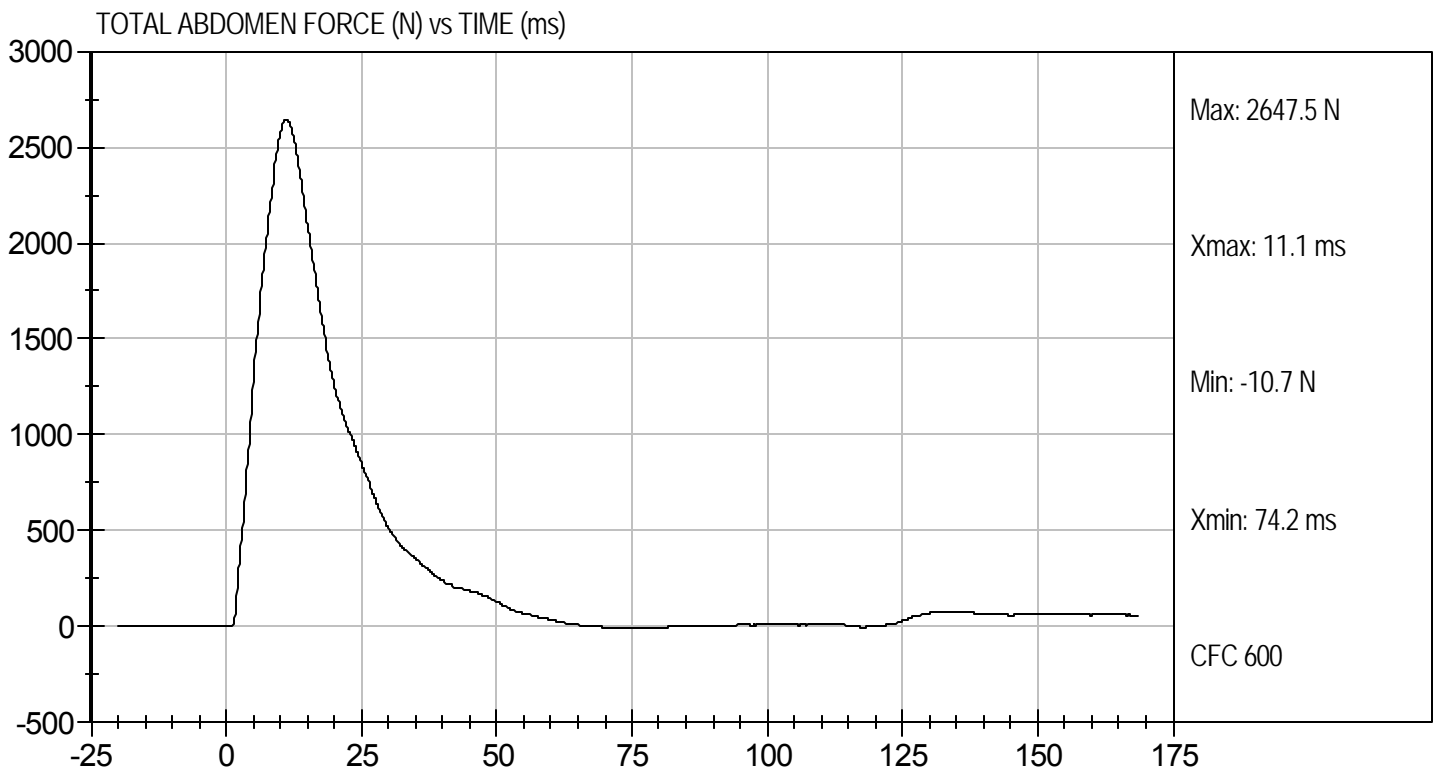
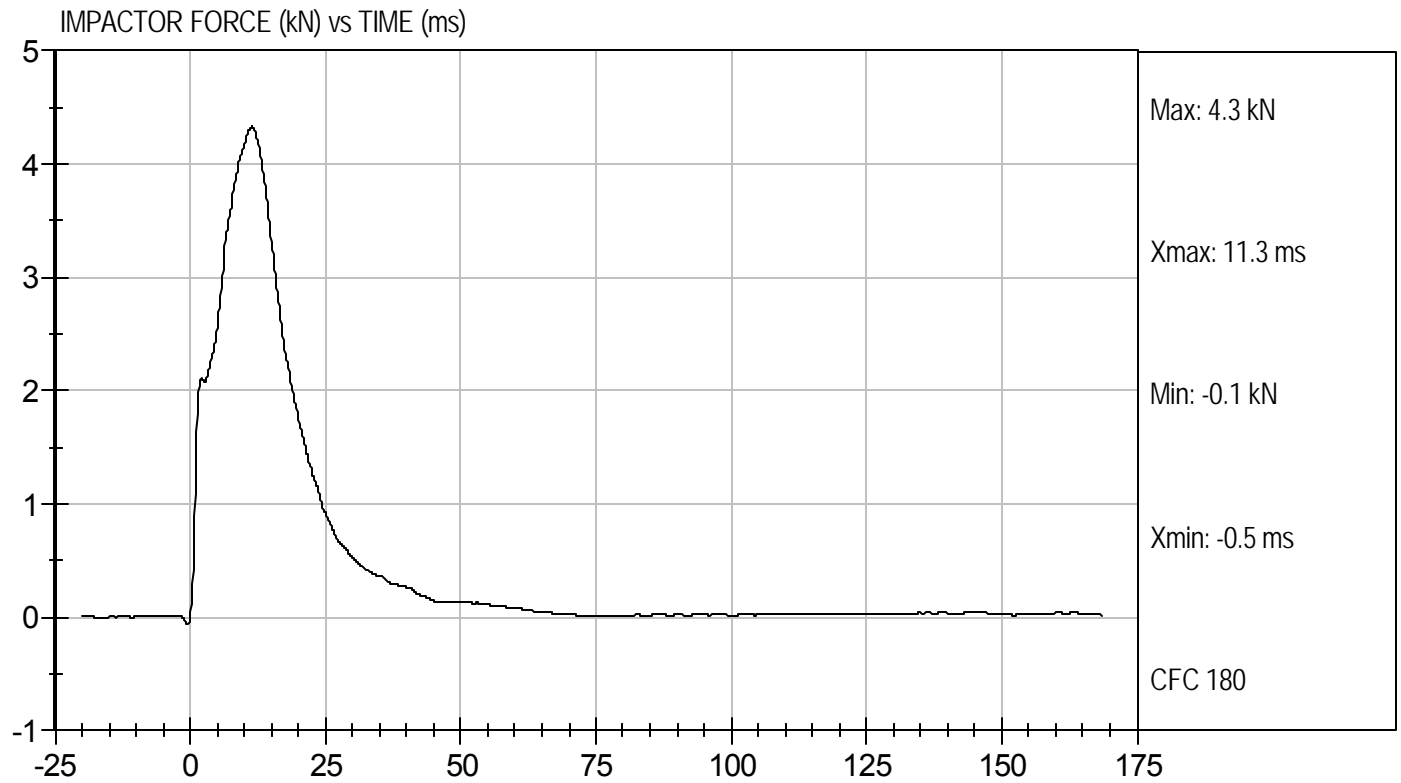
5/16/11  
Test Date

*David Winkelbauer*  
Approved By



Test Desc: Abdomen Impact  
Component ID: D111797

Test Date: 5/16/11  
Velocity: 13.44 ft/s, 4.1 m/s



**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

ATD Serial No: 016

Test I.D.: D111798

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

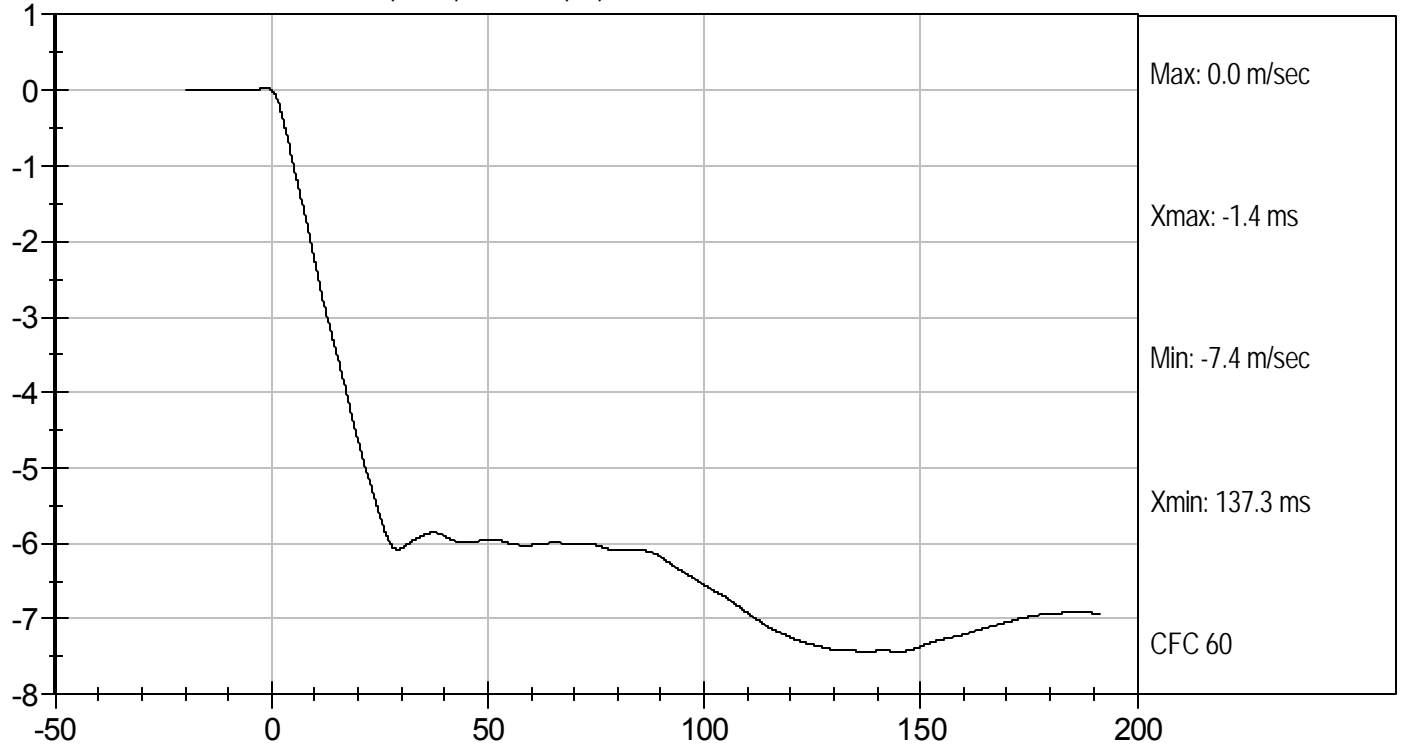
Jessica Hall  
Laboratory Technician

5/16/11  
Test Date

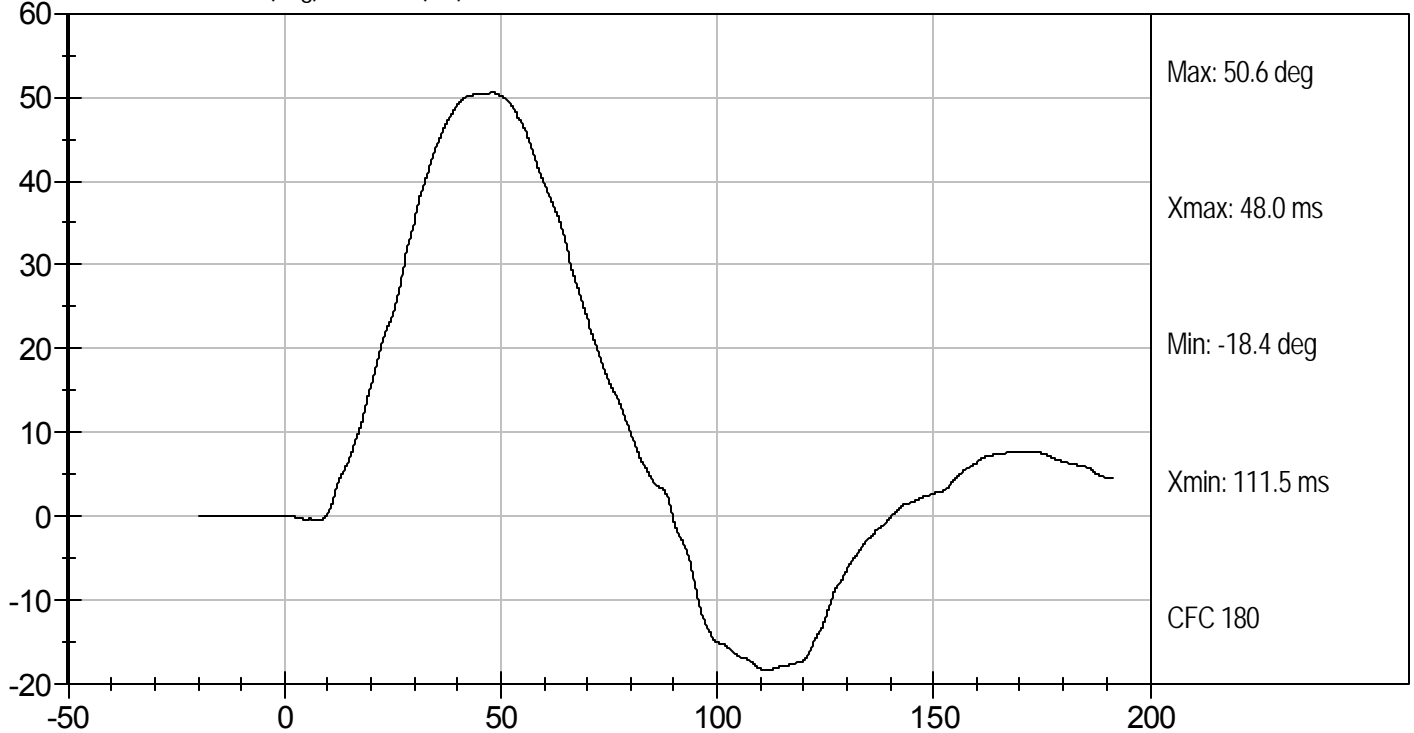
David Winkelbauer  
Approved By



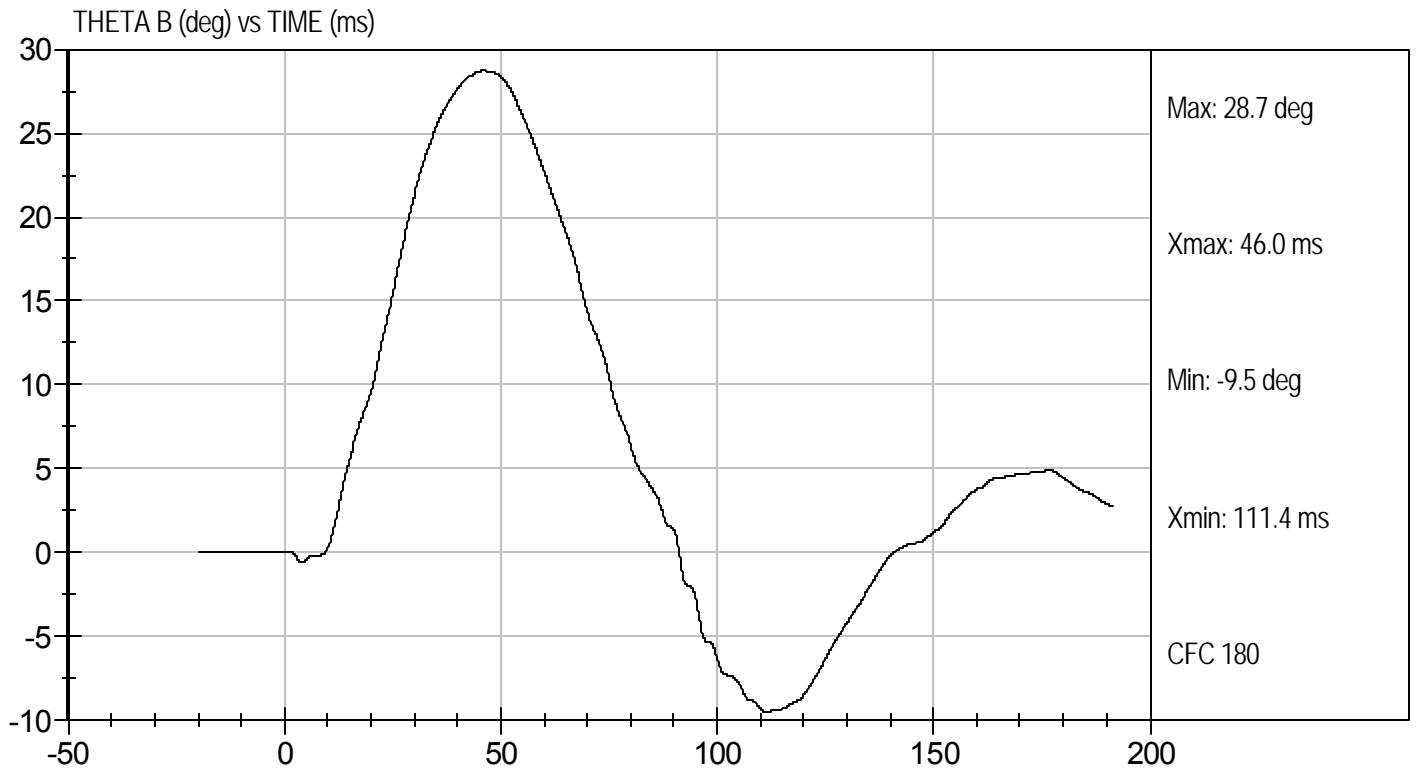
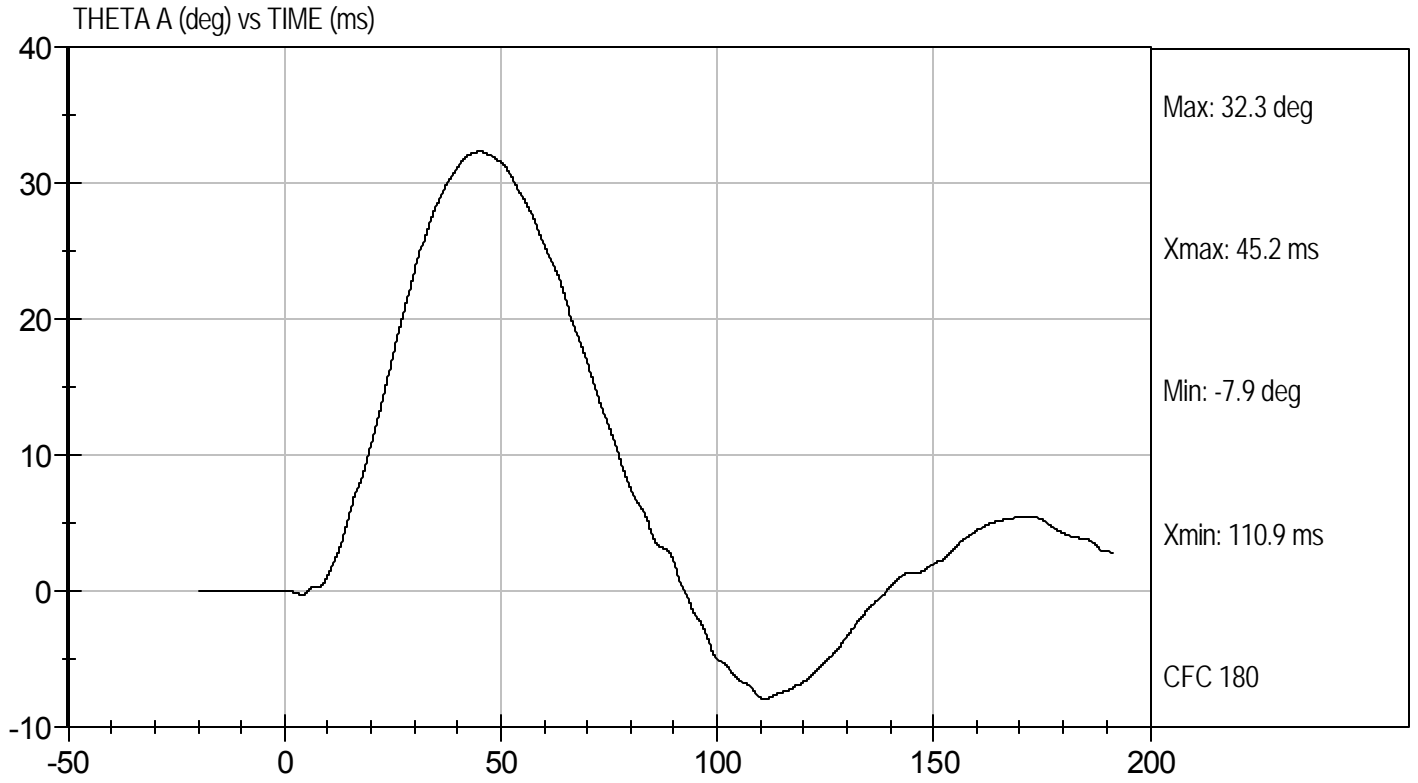
PENDULUM DECELERATION (m/sec) vs TIME (ms)



FLEXION ANGLE (deg) vs TIME (ms)







**MGA RESEARCH CORPORATION**

**PELVIS TEST  
ES-2re DUMMY**

ATD Serial No: 016

Test I.D: D111799

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

Jessica Hall  
Laboratory Technician

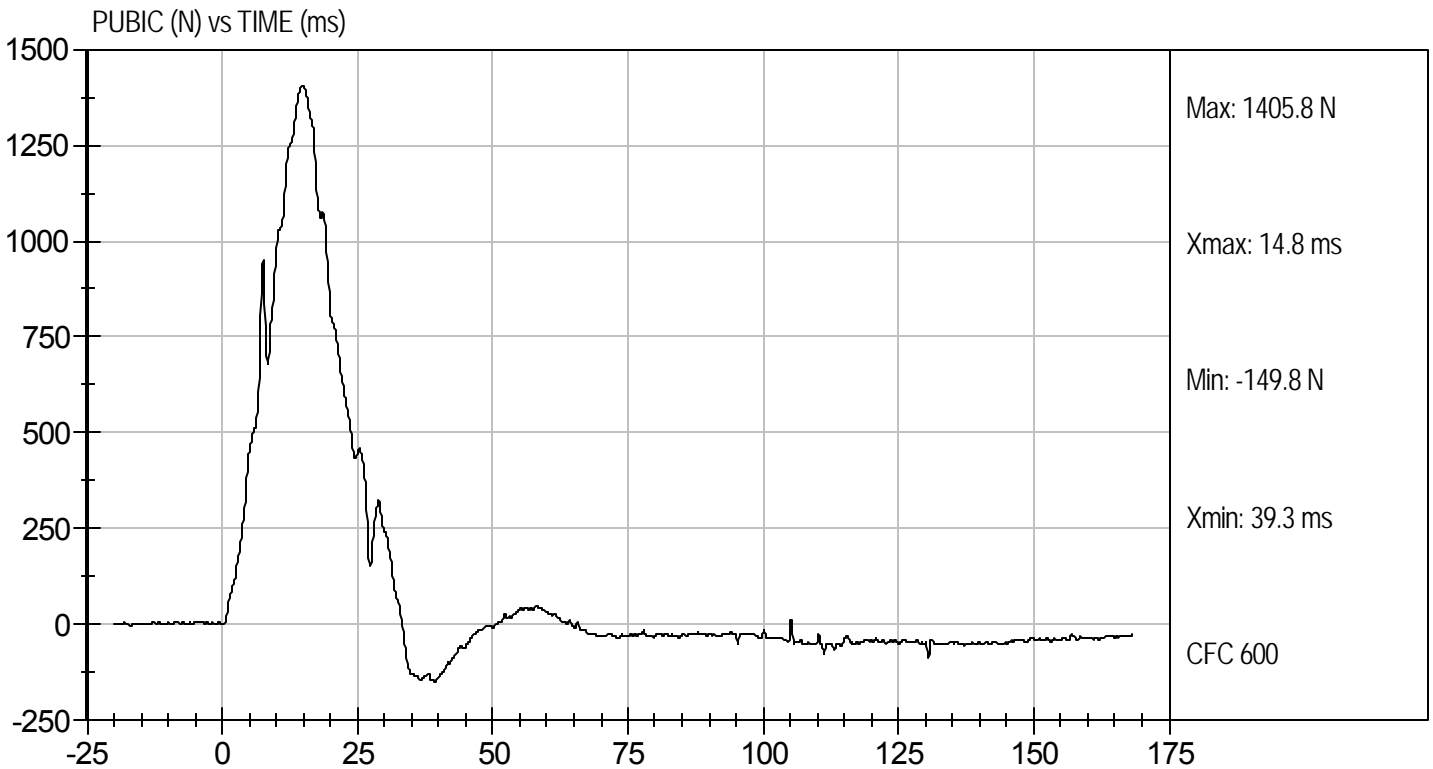
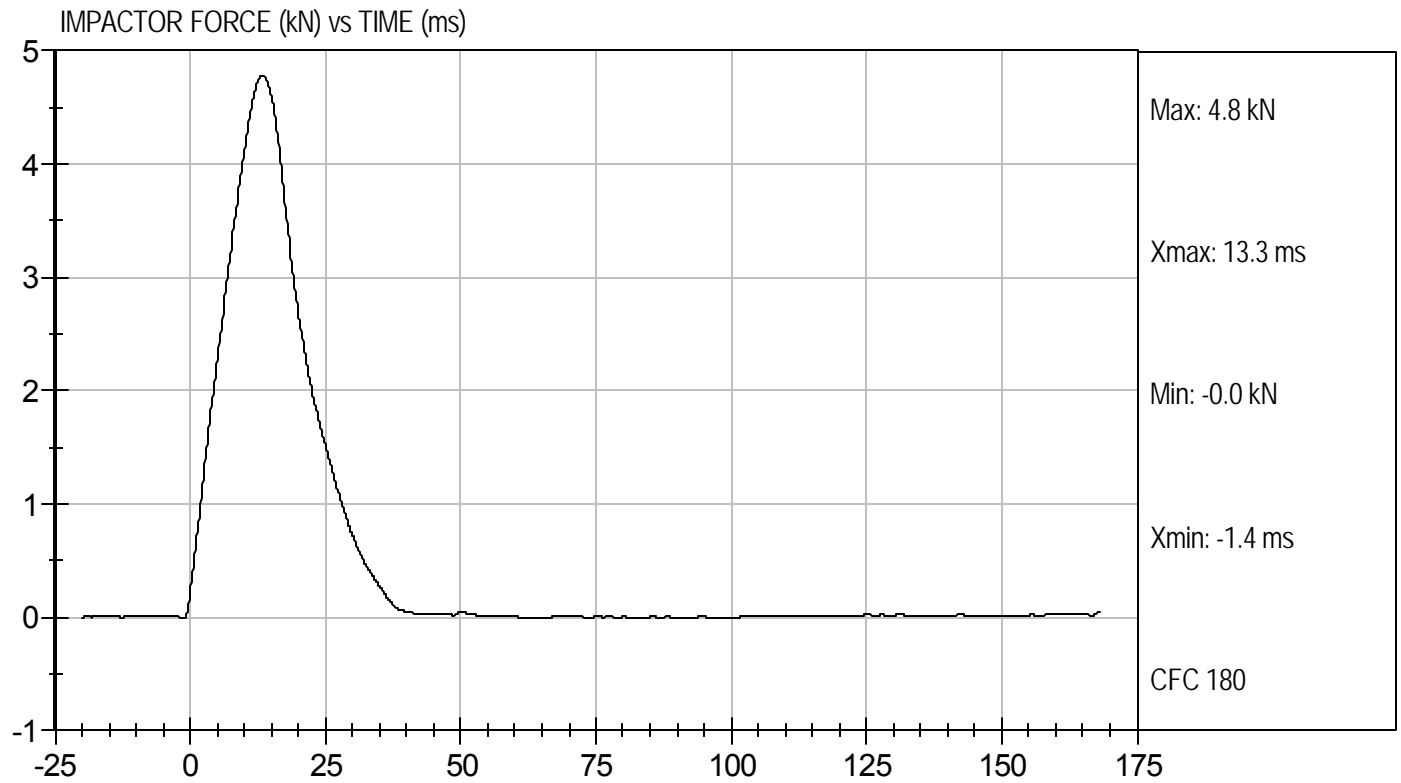
5/16/11  
Test Date

David Winkelbauer  
Approved By



Test Desc: Pelvis Impact  
Component ID: D111799

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



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

ATD Serial No: 016

Test I.D: D111790

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

Jessica Hall  
Laboratory Technician

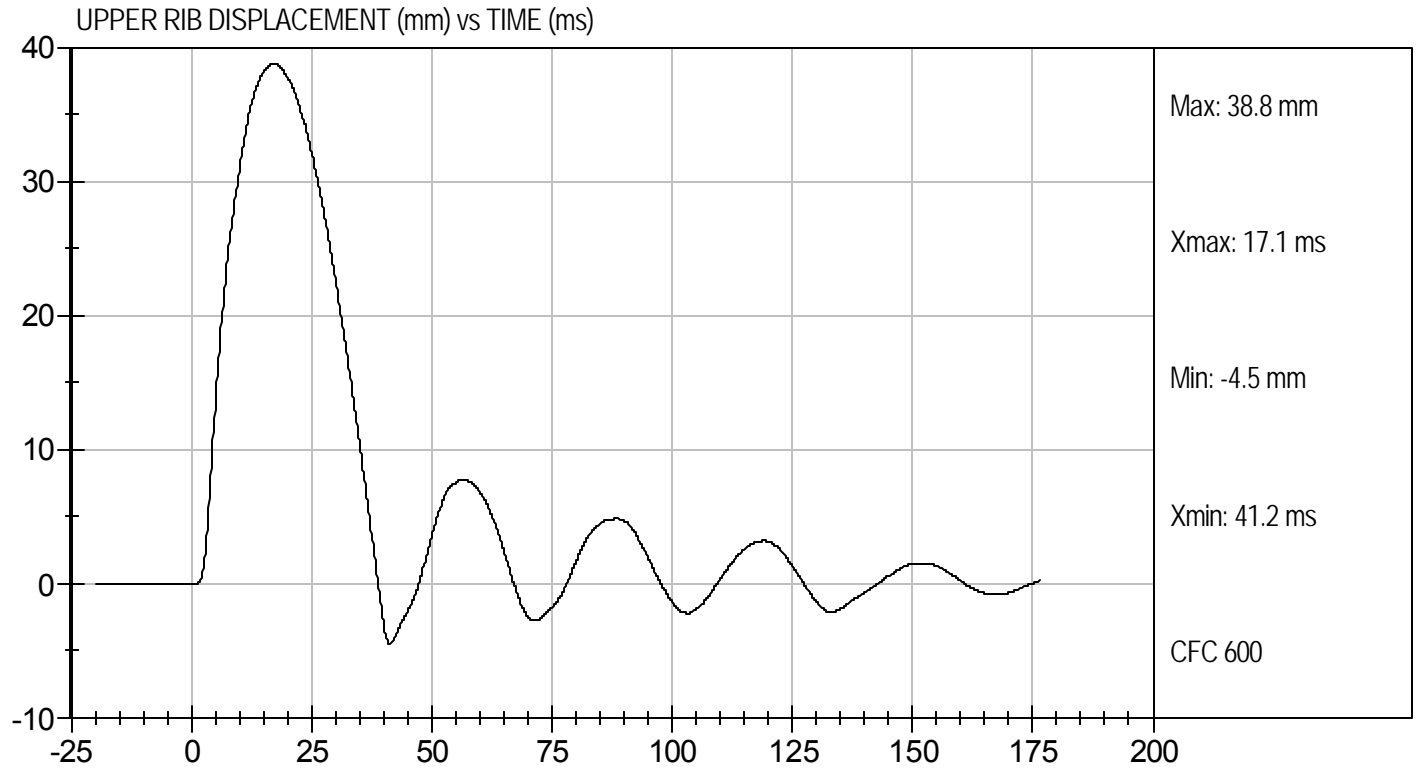
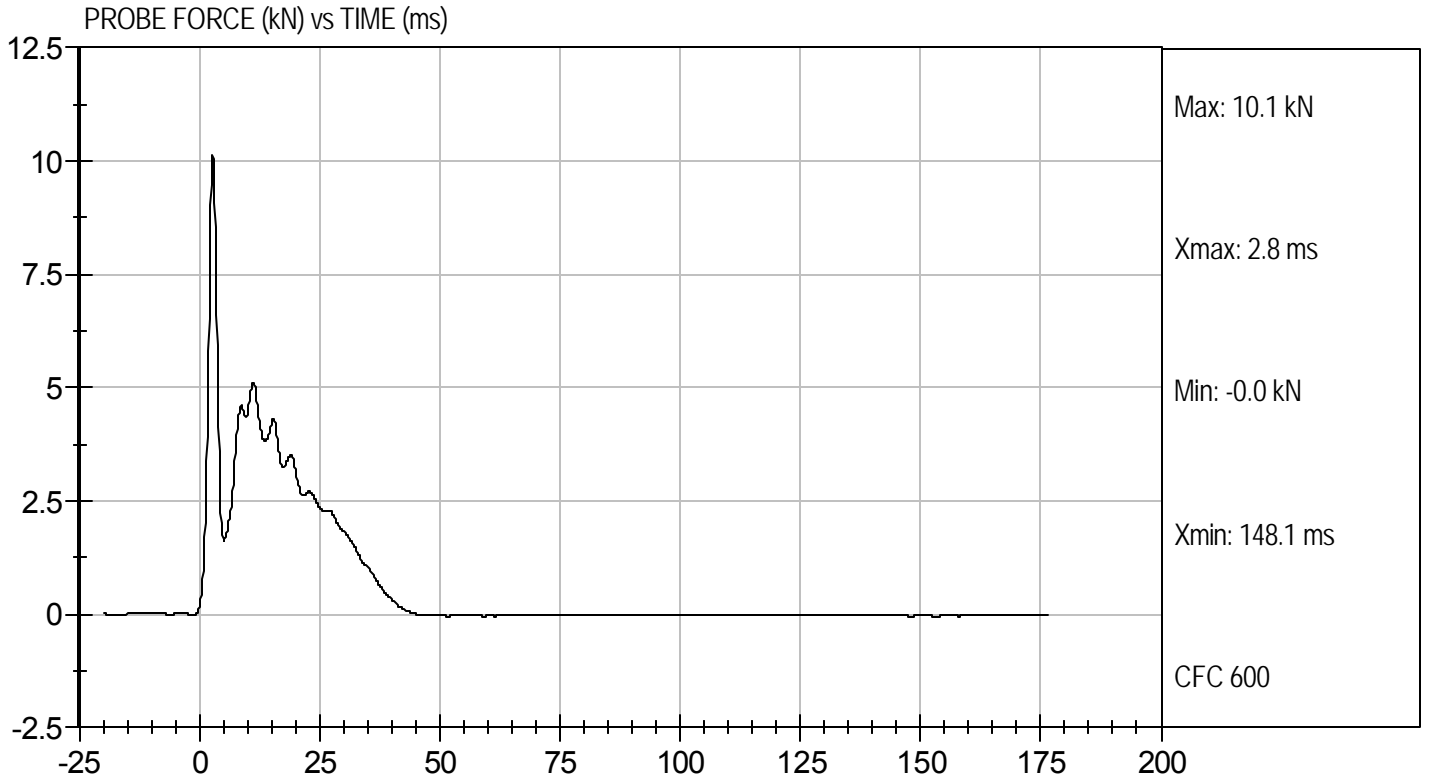
5/16/11  
Test Date

David Winkelbauer  
Approved By



Test Desc: Thorax Impact  
Component ID: D111790

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

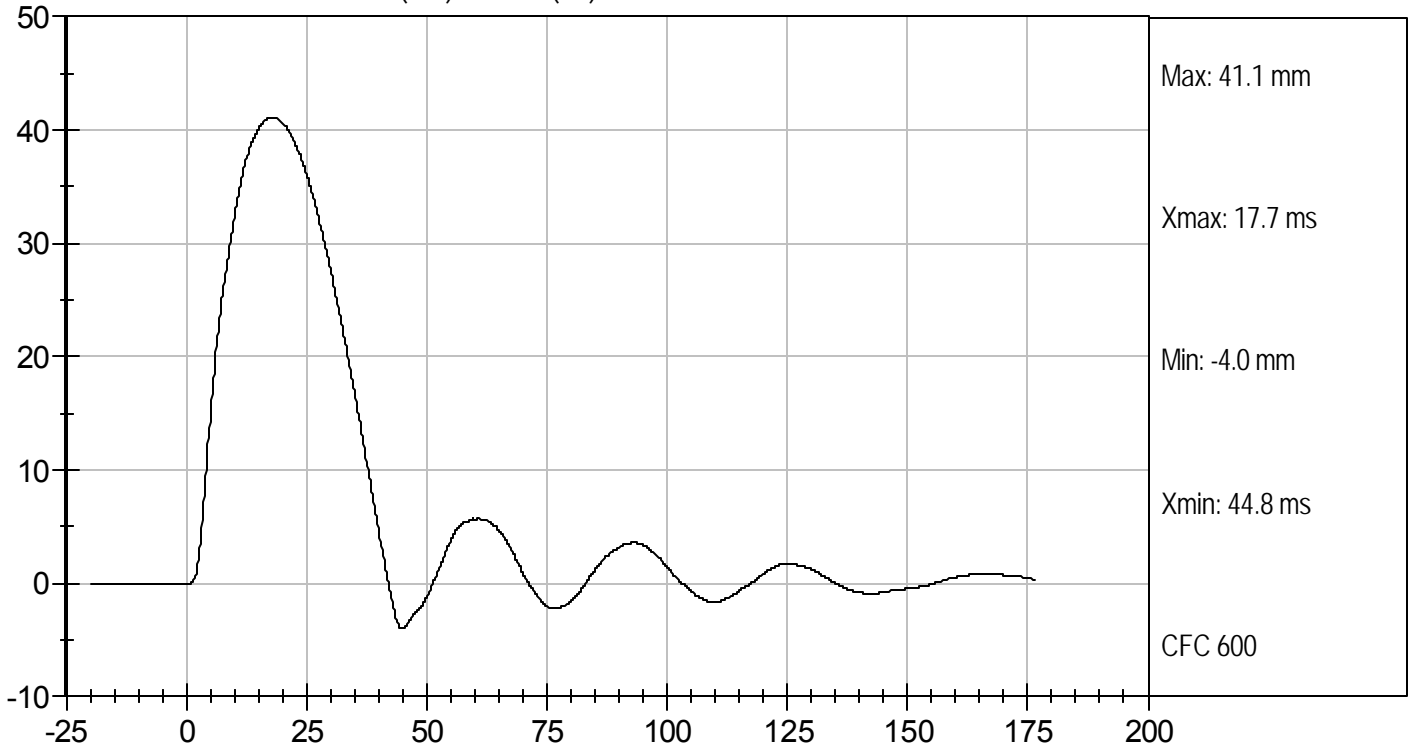




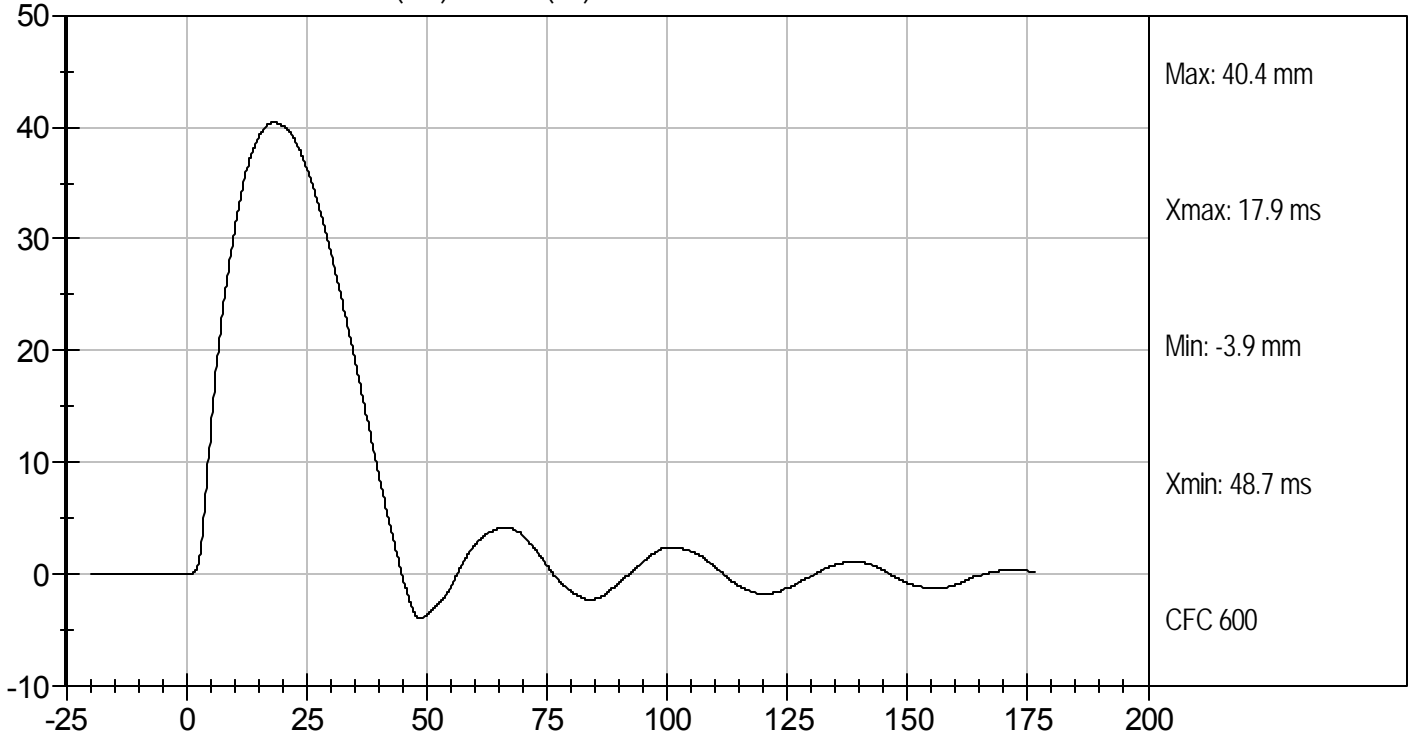
Test Desc: Thorax Impact  
Component ID: D111790

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

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



**APPENDIX E**

**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION**



**Table 1 – Dummy Instrumentation**

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

**Table 2 – Vehicle Instrumentation**

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