REPORT NUMBER: 214P-MGA-2011-017

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

FORD MOTOR COMPANY
2011 FORD EXPLORER SUV
NHTSA NUMBER: CB0205

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

Test Date: May 3, 2011

Report Date: May 18, 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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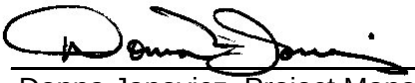
Prepared by: 
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Approved by: 
Joe Fleck, Project Engineer

Approval Date: May 18, 2011

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by: James A. Jones

Acceptance Date: 5-25-2011

Technical Report Documentation Page

1. Report No. 214P-MGA-2011-017	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of FMVSS 214P Compliance Test Side Impact Protection Testing of 2011 Ford Explorer SUV; NHTSA No.: CB0205		*5. Report Date* May 18, 2011 *6. Performing Organization Code* MGA
7. Author(s) Donna Janovicz, Project Manager Joe Fleck, Project Engineer		*8. Performing Organization Report No.* 214P-MGA-2011-017
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-07-D-00062
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NVS-220) 1200 New Jersey Ave, SE Washington, DC 20590		*13. Type of Report and Period Covered:* Final Test Report 5/03/2011 to 5/18/2011 *14. Sponsoring Agency Code* NVS-220
15. Supplementary Notes		

16. Abstract

A 32 km/h (20 mph), 75° oblique impact compliance test was conducted on the subject 2011 Ford Explorer SUV 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 3, 2011.

The impact velocity was 31.4 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 363 mm at level 3. The test vehicle's performance follows:

Measurement Description	Units	Result
Head Injury Criteria (HIC_{36})	N/A	311
Max. Rib Deflection	mm	25
Sum of Abdomen Forces	N	818
Pubic Symphysis Force	N	2969

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

17. Key Words Compliance Testing Side Impact Protection Pole Test ES-2re SID-IIs		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services (TIS) Room E12-100 East Building 1200 New Jersey Ave. Washington, D.C. 20590 Telephone No. (202) 366-2588	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 116	22. Price

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

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 Ford Explorer SUV. 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 Ford Explorer SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 31.4 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on May 3, 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 50th Percentile Male	311	Upper	24.6	Front	89.2	2969.3
		Middle	14.1	Mid	299.5	
		Lower	17.0	Rear	491.7	
		Max.	24.6	Sum	818.1	

GENERAL COMMENTS

There was no valid data collected for:
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 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

VEHICLE INFORMATION	
Make	Ford
Model	Explorer
Body Style	Truck
VIN	1FMHK7B87BGA06778
Body Color	Kona Blue Metallic
Engine Displacement (L)	3.5
# of Cylinders	6
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	Front
Odometer Reading	183 miles

OPTIONS	
ESC	Yes
All Wheel Drive	No
Power Steering	Yes
Tilt Steering Wheel	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso/Pelvis Airbag	Yes
Driver Knee Bag	No
Driver Seat Belt Pretentioners	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 Pretentioners	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	Ford Motor Company
Date of Manufacture	11/10

GVWR (kg)	2794
GAWR Front (kg)	1397
GAWR Rear (kg)	1497

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Bench	
Number of Occupants	2	3	2	7
Capacity Weight (VCW) (kg)				698
Cargo Weight (RCLW) (kg)				221

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

TIRE PRESSURES

	Units	LF	RF	RR	LR
As Delivered	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

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	559.3	455.4		575.6	559.3		575.2	554.8	
Right	kg	558.8	445.4		556.1	541.1		553.8	541.6	
Ratio	%	55.4	44.6		50.7	49.3		50.7	49.3	
Totals	kg	1118.1	900.8	2018.9	1131.7	1100.4	2232.1	1129.0	1096.4	2225.4

TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

Measured Parameter	Units	Value
As Delivered Weight	kg	2018.9
Weight of 1 P572U ATD (ES-2re) Dummy	kg	77.1
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Target Vehicle Test Weight (TVTW)	kg	2232.0

TEST VEHICLE ATTITUDES

	Units	LF	RF	RR	LR
Fully Loaded	mm	815	816	820	818
As Tested	mm	816	817	827	838
Difference	mm	-1	-1	-7	-20

CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE

Measurement Parameter	Units	Value
Test Vehicle Wheel Base	mm	2870
Vertical Impact Reference Line (Aft of Front Axle)	mm	1278

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

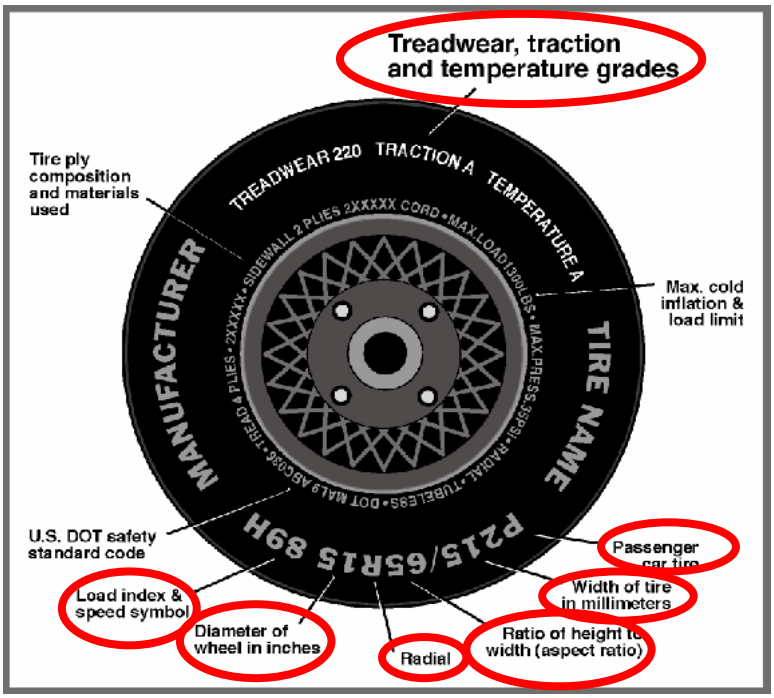
Description of Component	Weight (kg)
Ballast	79.8
No vehicle components removed to meet VTW	0

DATA SHEET NO. 3

VEHICLE TIRE INFORMATION

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P245/65R17	P245/65R17
Tire Size on Vehicle	P245/65R17	P245/65R17
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Fortera	Fortera
Tire Type	Passenger	Passenger
Tire Width	245	245
Aspect Ratio	65	65
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index/Speed Symbol	105T	105T
Treadwear	540	540
Traction Grade	A	A
Temperature Grade	B	B

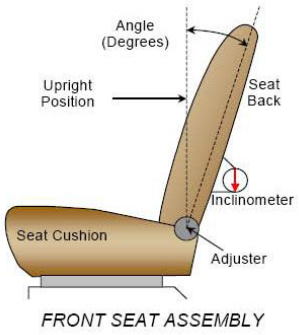
DATA SHEET NO. 4

SEAT AND SEAT BELT ADJUSTMENT DATA

Test Vehicle:	2011 Ford Explorer SUV	NHTSA No.	CB0205
Test Program:	FMVSS 214 Pole	Test Date:	5/03/2011

NORMAL DESIGN RIDING POSITION

The driver seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set the seat back angle at 16.7 degrees. The seat back angle is measured at head rest post angle. The references used for measuring is the vehicle's rocker sill.



SEAT BACK ANGLE

	Degrees	Detents
Driver with Seated Dummy	15.8° at headrest post	8th detent (forward-most 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	272 mm	136 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 in the 2nd detent for the 50th percentile male.

SEAT BELT UPPER ANCHORAGE

	Total # of Positions	Placed in Position #
Driver Seat	4 detents	2nd detent (uppermost detent defined as 0)

HEADREST RESTRAINT

The headrest was placed in the uppermost position.

DATA SHEET NO. 5

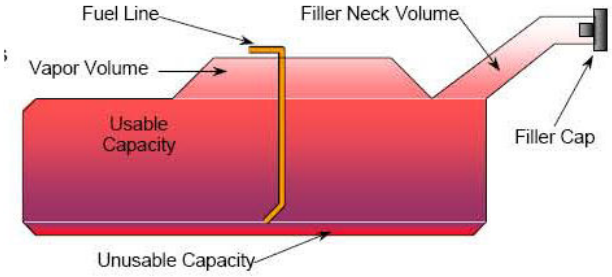
FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

FUEL TANK CAPACITY

	Liters
Usable Capacity (Form 1)	70.4
Usable Capacity (Owner's Manual)	70.4
92-94% of Usable Capacity	64.8 to 66.2
Actual Amount of Solvent Used	65.4

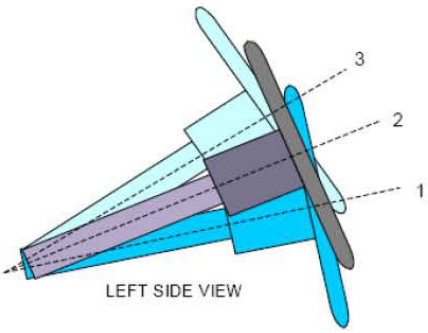
FUEL PUMP



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 electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls the fuel pump is deactivated. Also, a fuel pump shut-off system is provided and designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the right side.

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

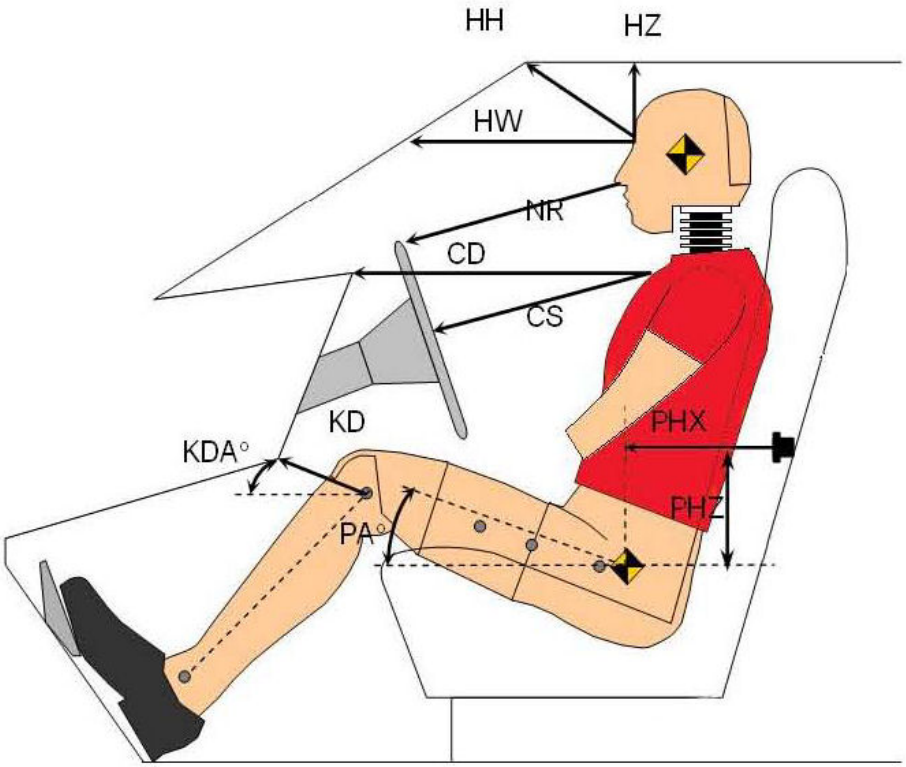
STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	65.0	206
Geometric Center – Position 2	62.0	181
Uppermost – Position 3	59.0	156
Telescoping Steering Wheel Travel		50
Test Position	62.0	181

.DATA SHEET NO. 6

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Explorer SUV
Test Program: FMVSS 214 Pole
NHTSA No. CB0205
Test Date: 5/03/2011

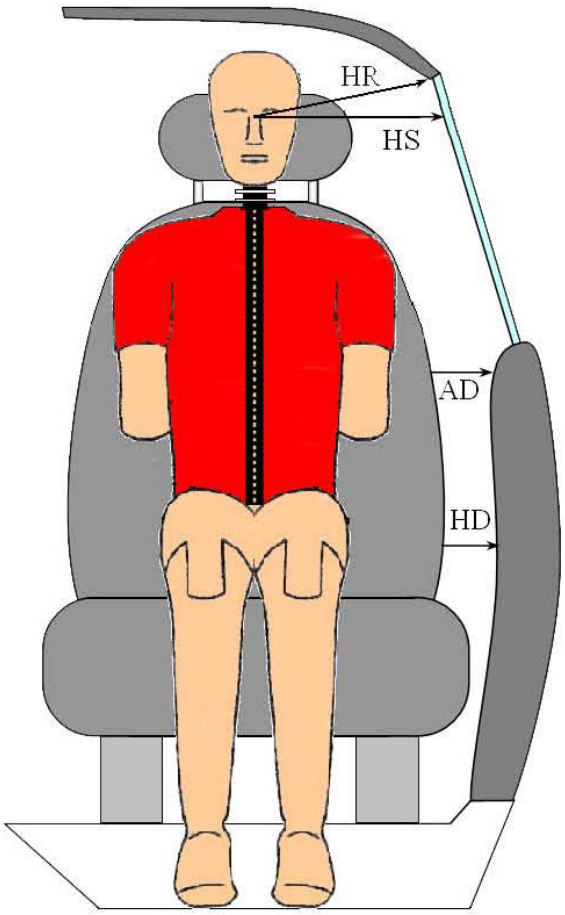


Driver Code	Measurement Description	Length (mm)	Angle (°)
HH	Head to Header	413	
HW	Head to Windshield	680	
HZ	Head to Roof	232	
NR	Nose to Rim	427	
CD	Chest to Dash	573	
CS	Chest to Steering Wheel	341	
KDL	Left Knee to Dash	152	25.4
KDR	Right Knee to Dash	135	24.4
PA	Pelvis Angle X		21.5
	Torso Angle Y		-0.7
PHX	H-Point to Striker (X-Axis)	192	
PHZ	H-Point to Striker (Z-Axis)	106	

DATA SHEET NO. 7

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

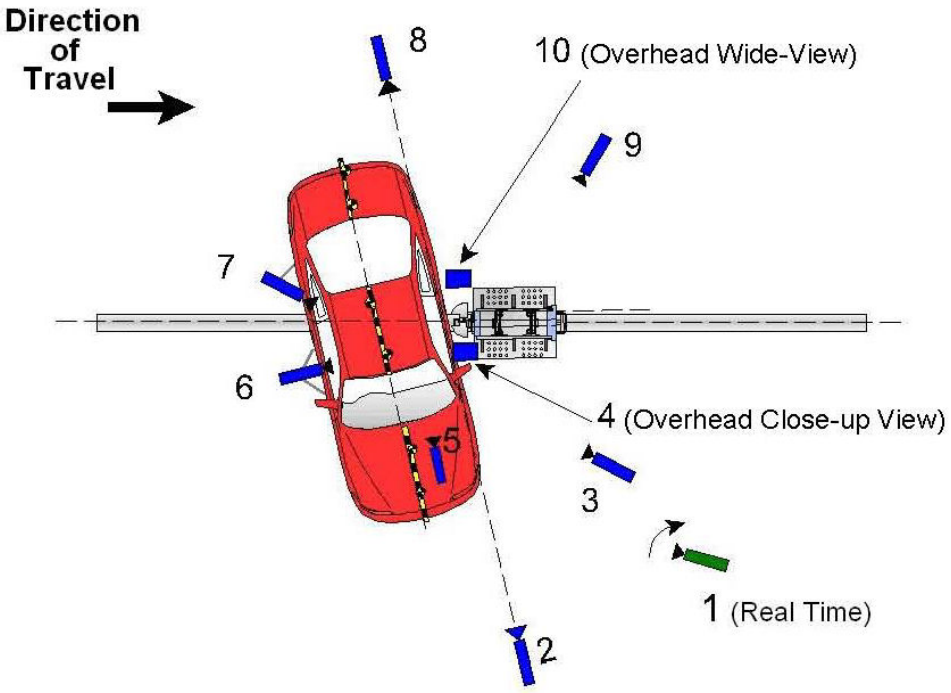


Code	Measurement Description	Units	Front Occupant
HR	Head to Side Header	mm	244
HS	Head to Side Window	mm	398
AD	Arm to Door	mm	149
HD	H-Point to Door	mm	178

DATA SHEET NO. 8

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011



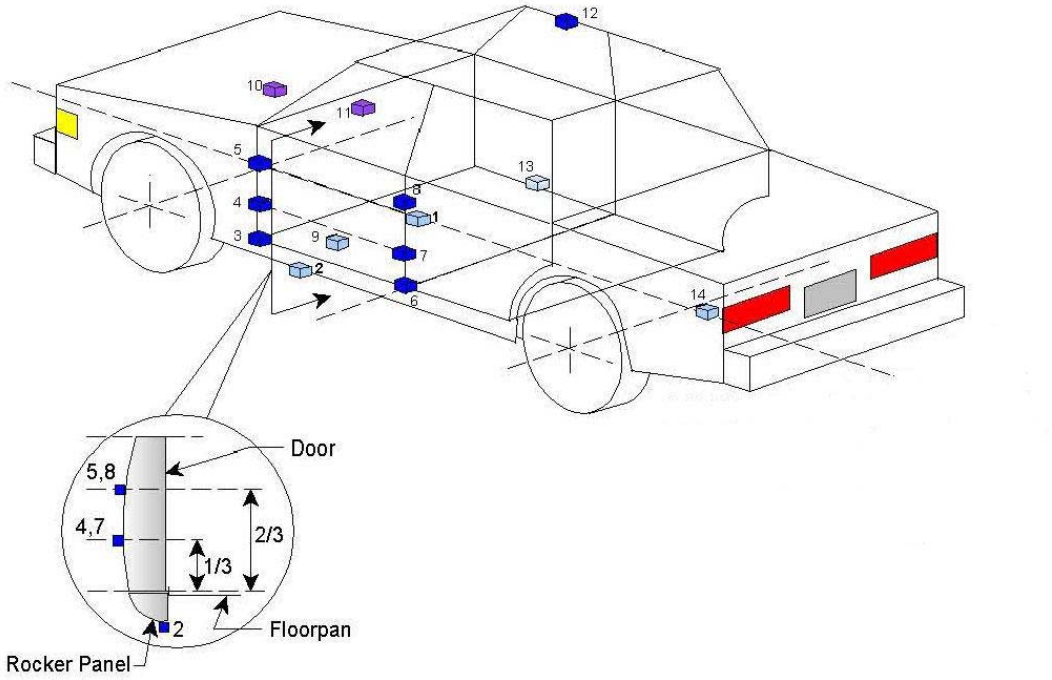
Reference: From Point of Impact for X and Y; from Ground for Z):
+X = Right of Impact, + Y = Forward of Impact, +Z = Up

Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Real-Time					30
2	Front Ground Level	5820	-30	1770	24	1000
3	Impact Side 45° Forward	4390	2130	1910	20	1000
4	Overhead Closeup	0	50	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	-6480	-20	1770	24	1000
9	Impact Side 45° Rearward	-3250	3830	1910	20	1000
10	Overhead Wide	110	290	4960	14	1000

DATA SHEET NO. 9

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011



Loc. No.	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2595	-190	-285
2	Left Floor Sill	2920	-795	-275
3	A Pillar Sill	3510	-795	-245
4	A Pillar Low	3375	-700	-670
5	A Pillar Mid	3440	-875	-986
6	B Pillar Sill	2420	-795	-280
7	B Pillar Low	2340	-775	-728
8	B Pillar Mid	2340	-765	-950
9	Seat	2490	-565	-520
10	Engine	4110	0	-995
11	Firewall	3880	0	-1038
12	Roof	2374	555	-1750
13	Floor Sill	2367	795	-280
14	Rear Deck	341	0	-390

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 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

Loc. No.	Description	Peak Values (g's)			
		Max	Time (ms)	Min	Time (ms)
1	Vehicle CG (X)	16.1	101.0	-22.9	40.4
	Vehicle CG (Y)	71.2	43.1	-11.2	54.0
	Vehicle CG (Z)	29.8	51.2	-48.3	39.7
	Resultant	76.7	42.9		
2	Left Floor Sill (Y)	60.1	18.3	-6.5	70.8
3	A Pillar Sill (Y)	27.8	33.3	-8.1	42.9
4	A Pillar Low (Y)	22.4	34.9	-10.7	39.0
5	A Pillar Mid (Y)	36.1	42.0	-1.0	296.8
6	B Pillar Sill (Y)	55.1	18.5	-8.3	70.3
7	B Pillar Low (Y)	48.9	23.9	-14.9	82.2
8	B Pillar Mid (Y)	49.9	20.6	-10.5	80.5
9	Seat (Y)	(1)	(1)	(1)	(1)
10	Engine (X)	18.8	106.3	-22.9	39.4
	Engine (Y)	15.4	54.6	-6.0	230.5
11	Firewall (Y)	15.7	43.5	-1.0	294.9
12	Roof (Y)	36.1	40.6	-2.4	19.4
13	Floor Sill (Y)	23.8	21.9	-2.2	300.0
14	Rear Deck (X)	2.8	162.0	-12.3	60.7
	Rear Deck (Y)	14.9	78.0	-2.3	216.5

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

DATA SHEET NO. 11

DUMMY INJURY RESPONSE DATA

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

Dummy S/N	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (G)				
Longitudinal (X)	18.5	157.3	43.0	57.2
Lateral (Y)	43.1	53.0	13.1	141.6
Vertical (Z)	26.5	49.6	3.1	163.4
Resultant (R)	61.2	56.4		
HIC36 (t1, t2)	311		t1 = 47.6	t2 = 66.4
THORAX DEFLECTION (mm)				
Upper Rib			24.6	57.6
Middle Rib			14.1	57.9
Lower Rib			17.0	51.8
ABDOMINAL FORCES (N)				
Front	89.2	73.7		
Middle	299.5	55.2		
Rear	491.7	55.9		
Sum	818.1	55.0		
PELVIS FORCE (N)				
Pubic Symphysis			2969.3	64.2

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

DATA SHEET NO. 12

POST TEST OBSERVATIONS

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Front Occupant
Dummy Type / Serial No.	ES-2re / 016
Head Contact	Curtain Airbag, Headrest
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		Remained closed and operational
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 Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

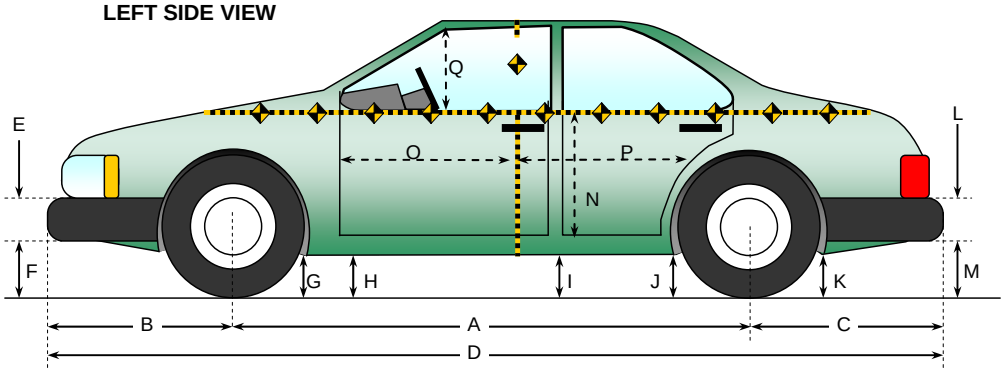
Restraint Type	Front Occupant	
	Installed	Operated
Frontal Airbag	Yes	No
Side Torso/Pelvis Airbag	Yes	Yes
Head Airbag	No	
Curtain Airbag	Yes	Yes
Knee Airbag	No	
Seat Belt Pretensioner	Yes	Yes
Seat Belt Load Limiter	Yes	

DATA SHEET NO. 13

VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

LEFT SIDE VIEW

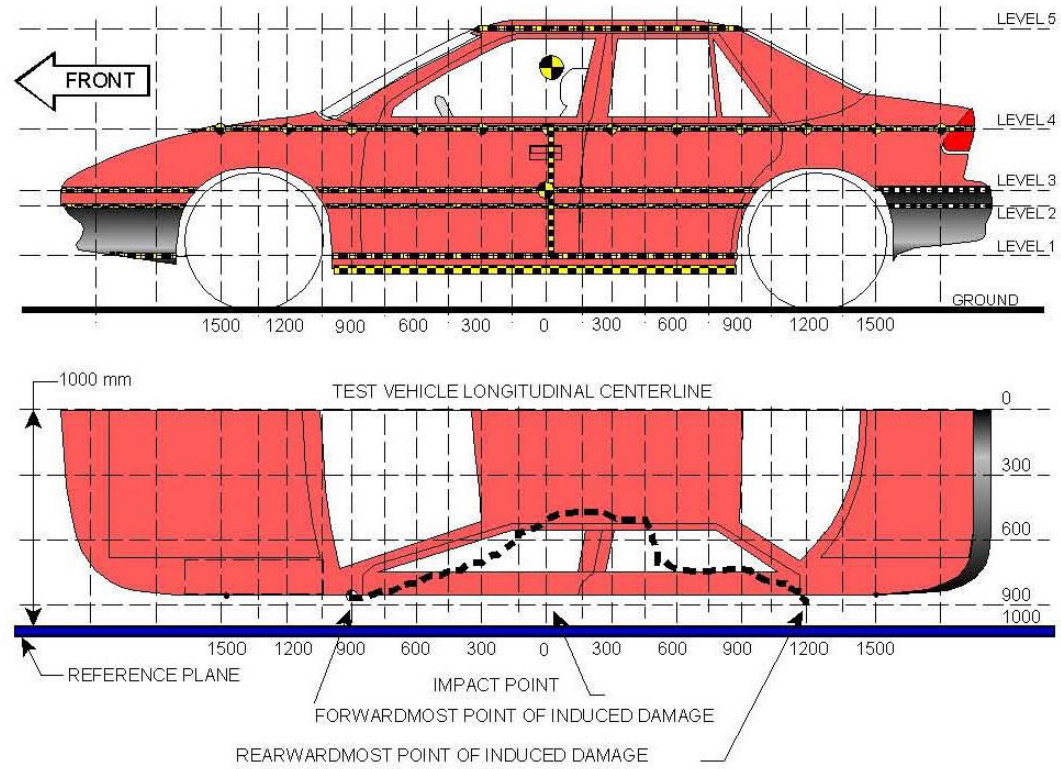


Code	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	Wheelbase	2870	2775	95
B	Front Axle to FSOV	980	980	0
C	Rear Axle to RSOV	1155	1155	0
D	Total Vehicle Length at Centerline	5005	4910	95
E	Front Bumper Thickness	150	150	0
F	Front Bumper Bottom to Ground	311	350	-39
G	Sill Height at Front Wheel Well	230	250	-20
H	Sill Height at Front Door Leading Edge	254	247	7
I	Sill Height at B Pillar	256	275	-19
J1	Sill Height at Rear Wheel Well	263	280	-17
J2	Pinch Weld Height at Rear Wheel Well	272	275	-3
K	Sill Height Aft of Rear Wheel Well	323	332	-9
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	402	380	22
N	Sill Height to Window Bottom Sill	970	970	0
O	Front Door Leading Edge to Impact CL	775	775	0
P	Rear Door Trailing Edge to Impact CL	1300	1355	-55
Q	Front Window Opening	515	478	37
R	Right Side Length	3704	3715	-11
S	Left Side Length	3704	3603	101
T	Vehicle Width at B Post	1970	1830	140

DATA SHEET NO. 14

EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011



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	311	0	386
2	Mid-Door	352	0	720
3	H-Point	363	0	776
4	Window Sill	310	0	1184
5	Window Top	112	0	1676

DATA SHEET NO. 15

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

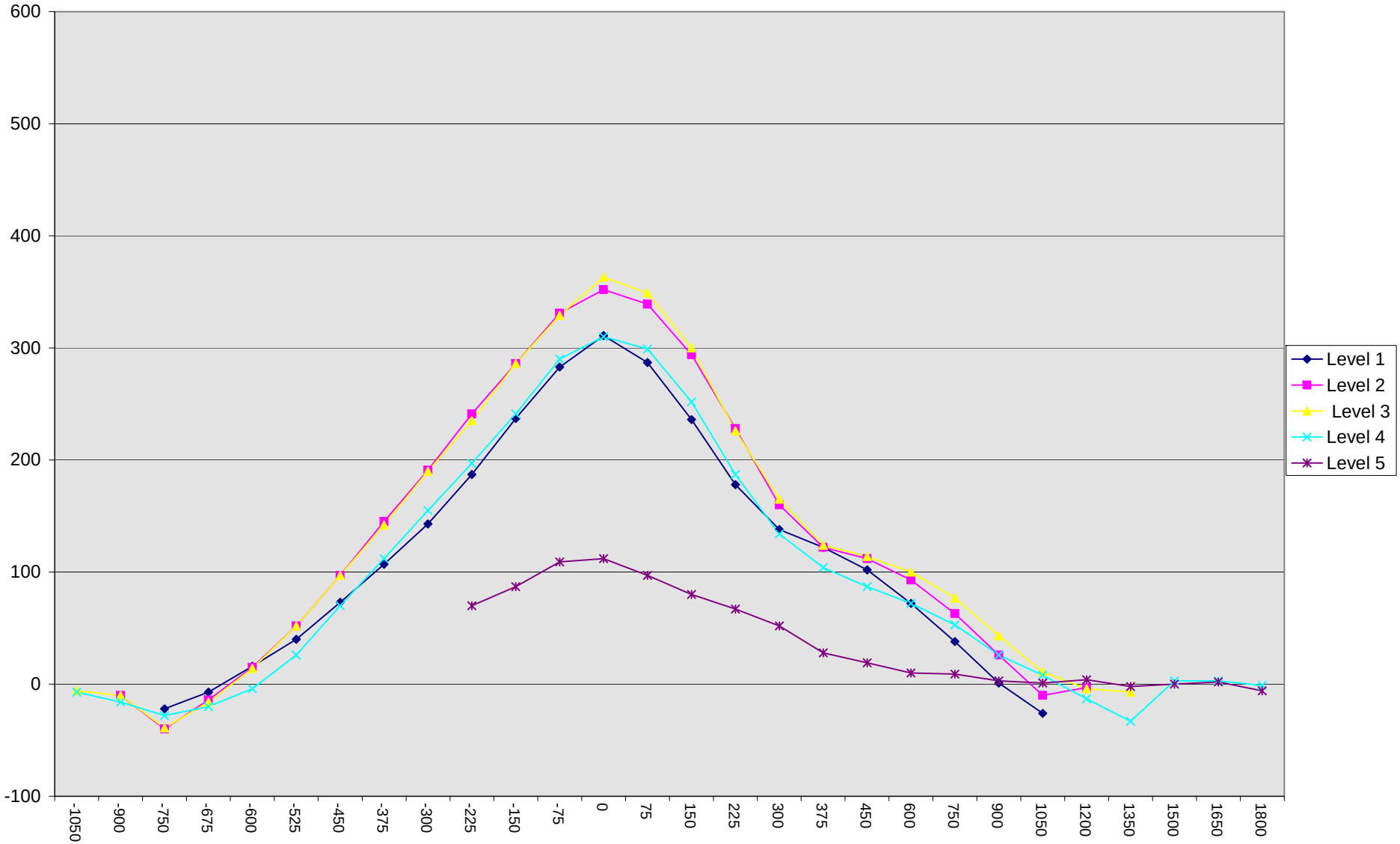
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	311	352	363	310	112
Distance From Impact (mm)	0	0	0	0	0

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1050			100	206				94	199				-6	-7	
-900		104	106	200			94	96	184			-10	-10	-16	
-750	156	121	124	192		134	81	85	164		-22	-40	-39	-28	
-675	164	128	128	189		157	114	112	169		-7	-14	-16	-20	
-600	165	130	129	185		181	145	143	181		16	15	14	-4	
-525	164	130	128	185		204	182	180	211		40	52	52	26	
-450	162	130	126	182		234	227	223	252		73	97	97	70	
-375	161	129	126	180		268	274	268	292		107	145	142	112	
-300	161	129	125	178		304	320	315	333		143	191	190	155	
-225	159	128	125	176	434	346	369	360	373	504	187	241	235	197	70
-150	159	127	125	177	416	396	413	411	418	503	237	286	286	241	87
-75	158	127	125	178	410	441	458	454	468	519	283	331	329	290	109
0	156	127	124	177	408	467	479	487	487	520	311	352	363	310	112
75	156	127	124	177	408	443	466	473	476	505	287	339	349	299	97
150	155	127	124	176	408	391	421	424	428	488	236	294	300	252	80
225	153	128	124	177	406	331	356	350	364	473	178	228	226	187	67
300	158	129	124	177	406	296	289	289	311	458	138	160	165	134	52
375	156	130	125	180	406	278	252	249	284	434	122	122	124	104	28
450	156	130	125	180	406	258	242	239	267	425	102	112	114	87	19
600	156	130	126	181	407	228	223	226	253	417	72	93	100	72	10
750	155	132	128	182	406	193	195	205	235	415	38	63	77	53	9
900	152	132	130	189	409	153	158	173	215	412	1	26	43	26	3
1050	142	114	118	192	412	116	104	129	200	413	-26	-10	11	8	1
1200		102	103	197	415		99	99	184	419		-3	-4	-13	4
1350			97	195	422			90	162	420			-7	-33	-2
1500				203	428				206	428				3	0
1650				211	434				214	436				3	2
1800				225	447				224	441				-1	-6

DATA SHEET NO. 15 (CONTINUED)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011



DATA SHEET NO. 16

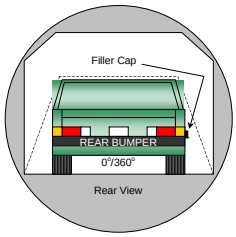
SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

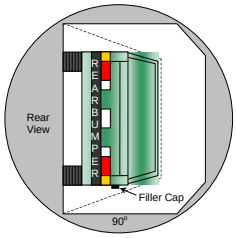
FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

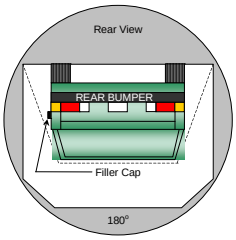
STATIC ROLLOVER DATA



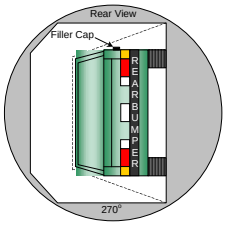
0/360



90



180



270

REAR VIEW

Rollover Stage	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	1	minutes	59	seconds	5	minutes	6	minutes	59	seconds	7	minutes
90° - 180°	1	minutes	55	seconds	5	minutes	6	minutes	55	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	6th min.	7th min.	8th min. (if required)
0° - 90°	0	0	0	
90° - 180°	0	0	0	
180° - 270°	0	0	0	
270° - 360°	0	0	0	
FMVSS 301 Maximum Allowable (for each 90° stage)	142	28	28	28

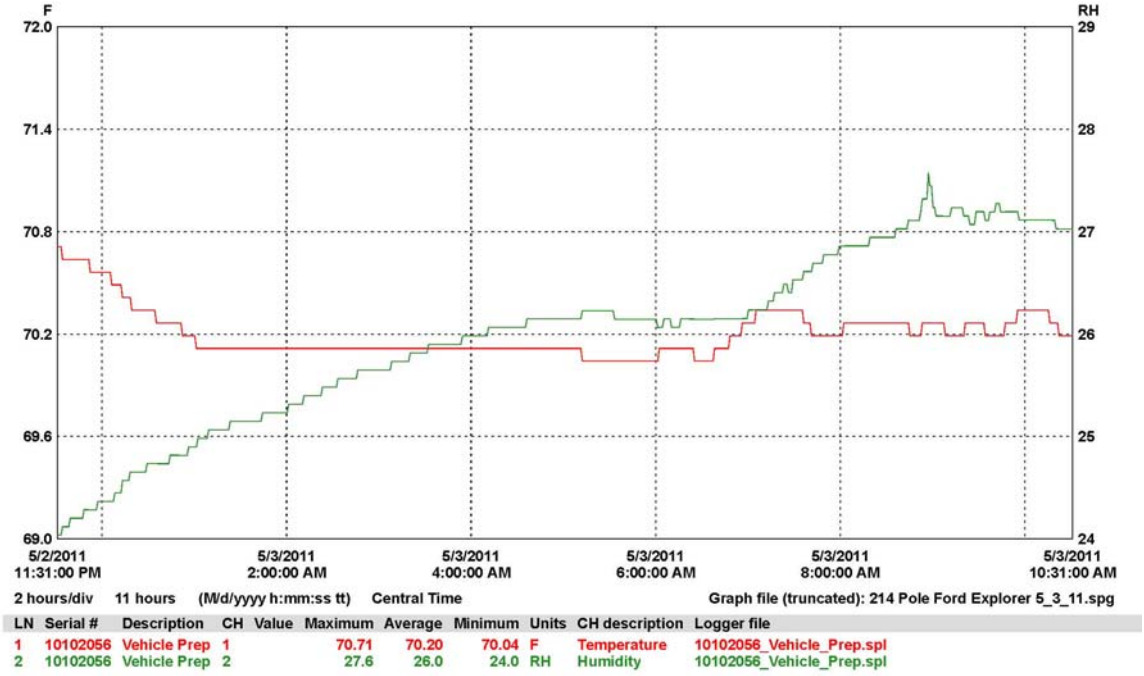
Rollover Stage	Spillage Location(s)
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17

TEMPERATURE AND HUMIDITY TRACES

Test Vehicle: 2011 Ford Explorer SUV NHTSA No. CB0205
Test Program: FMVSS 214 Pole Test Date: 5/03/2011

Time of Impact: 10:31 am



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102056	Vehicle Prep	1		70.71	70.20	70.04	F	Temperature	10102056_Vehicle_Prep.spl
2	10102056	Vehicle Prep	2		27.6	26.0	24.0	RH	Humidity	10102056_Vehicle_Prep.spl

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Pre-Test Frontal View of Test Vehicle

Post-Test Frontal View of Test Vehicle

Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle

Pre-Test Impacted Side View of Test Vehicle

Post-Test Impacted Side View of Test Vehicle

Pre-Test Left ¾ Front View of Vehicle and Pole

Pre-Test Left ¾ 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

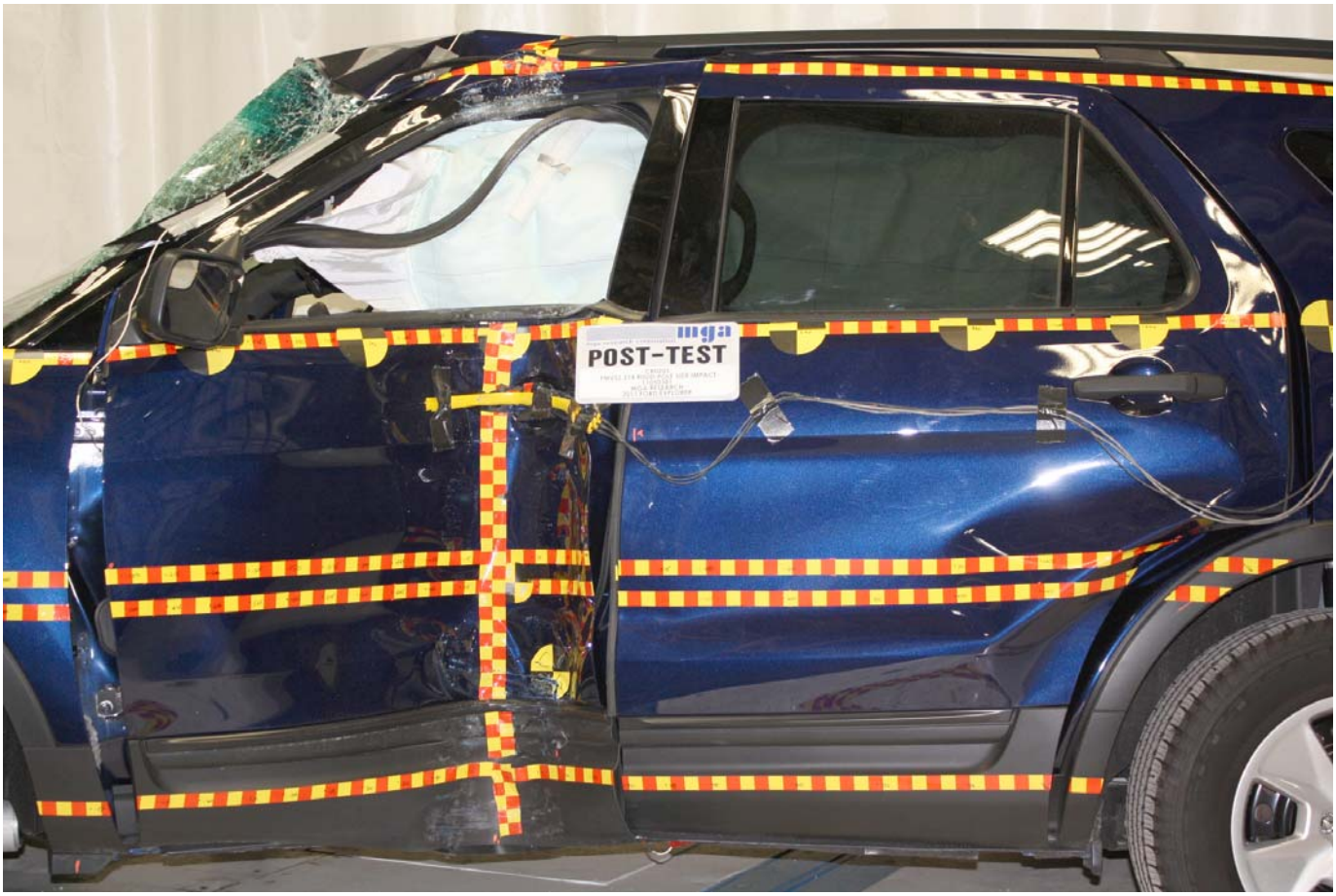
Pre-Test Dummy Shoulder and Door Top View

Post-Test Dummy Shoulder and Door Top View

Pre-Test Interior of Front Door Closed

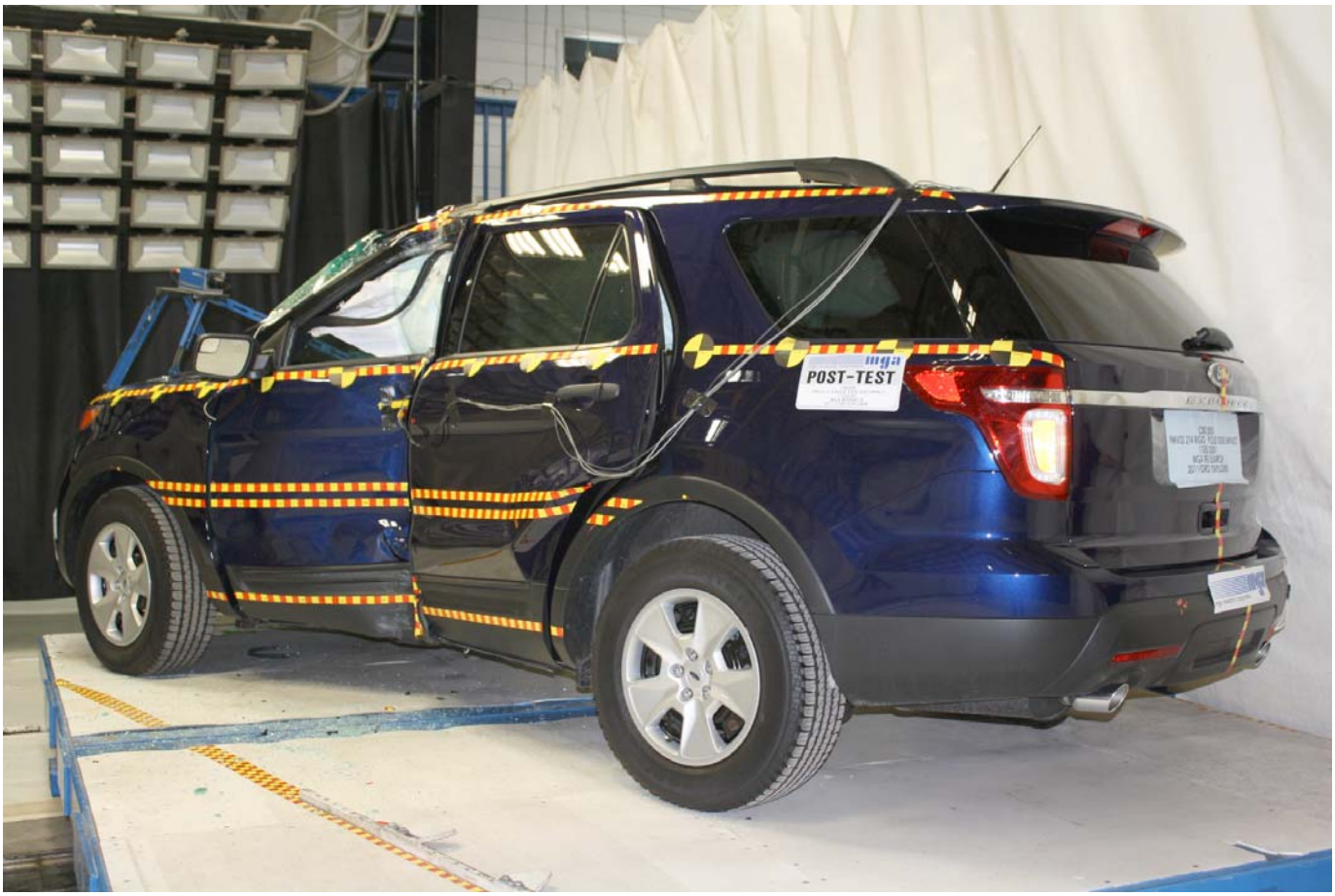
Post-Test Interior of Front Door Showing Dummy Impact Locations

Impact Event



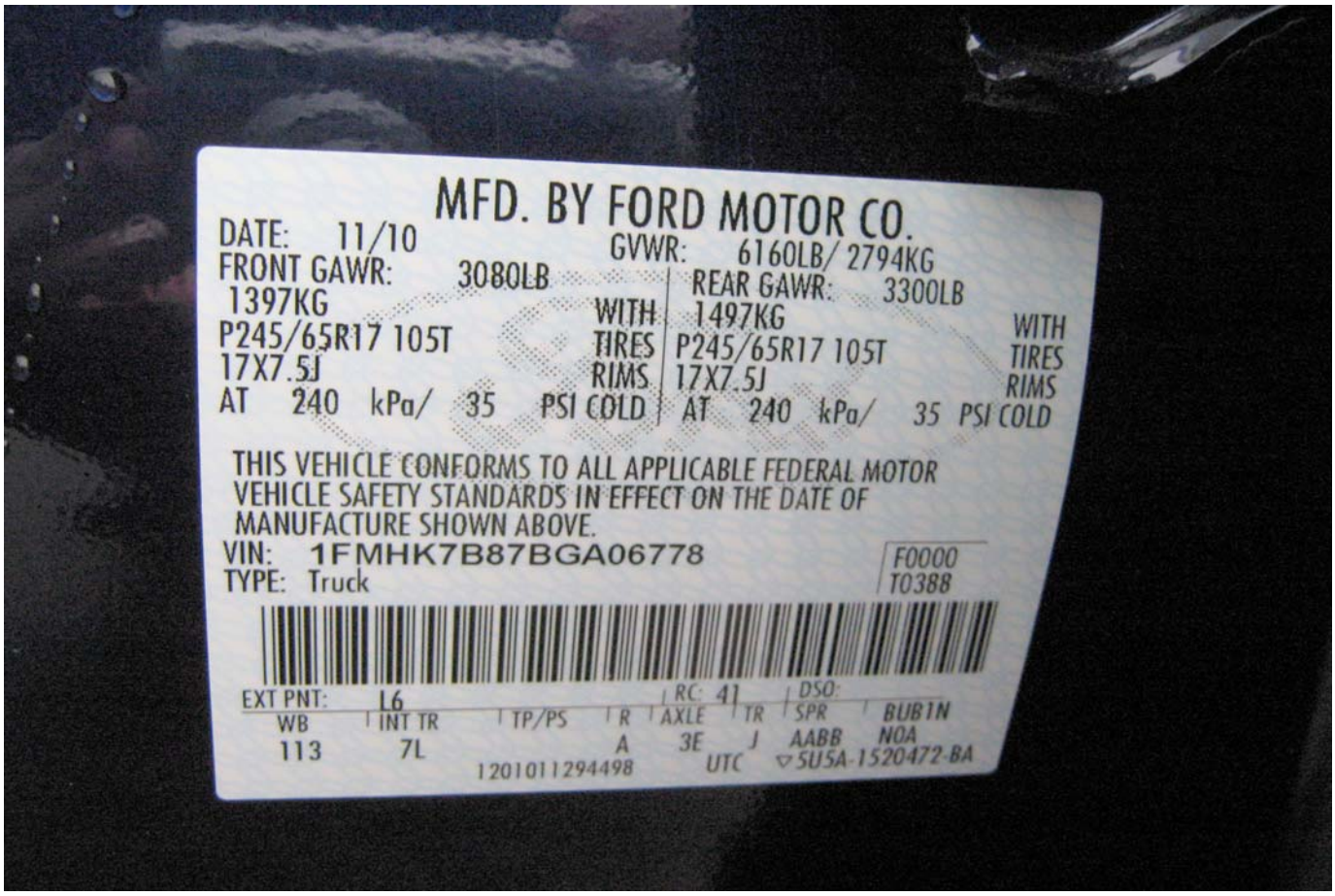
Post-Test Impact Zone Close-up View

Post-Test ¾ Front View of Impact Zone



Post-Test ¾ Rear View of Impact Zone

Post-Test Close-up View of Impact Point Target

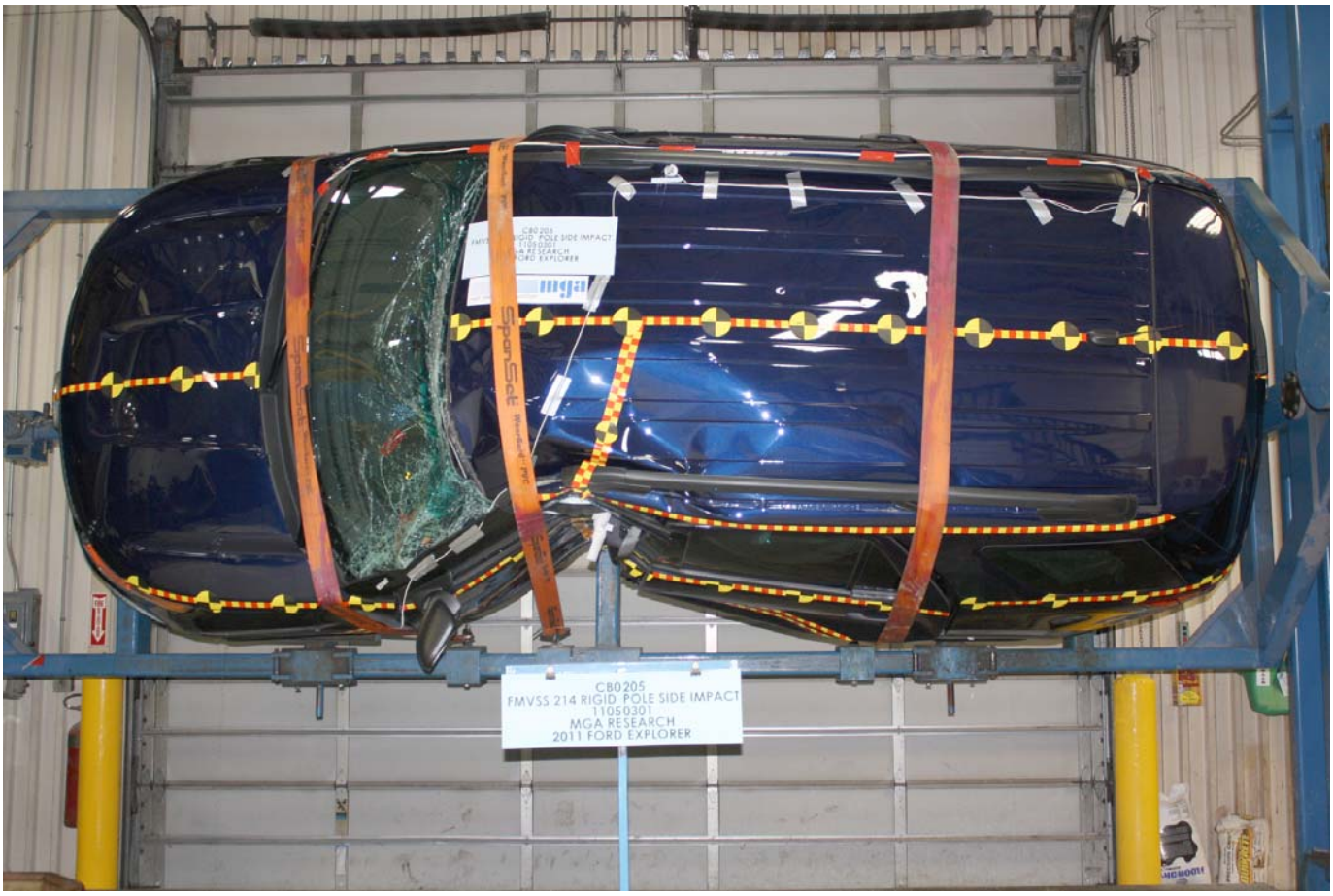


Close-up View of Vehicle's Certification Label

Close-up View of Vehicle's Tire Placard Label

Post-Test Vehicle at 90 Degree Rollover

Post-Test Vehicle at 180 Degree Rollover



Post-Test Vehicle at 270 Degree Rollover

Post-Test Vehicle at 360 Degree Rollover

APPENDIX B

DUMMY RESPONSE DATA

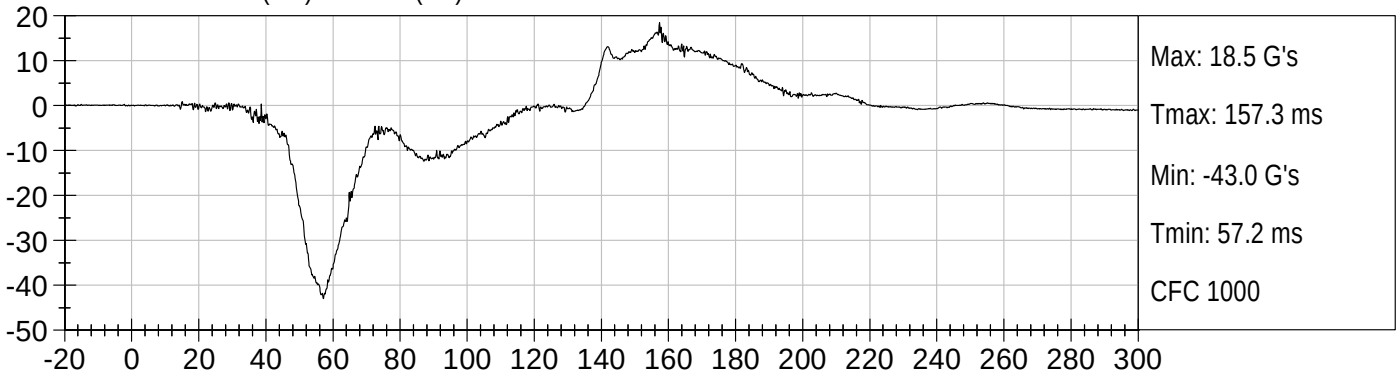
TABLE OF DATA PLOTS

Dummy Instrumentation Plots
FILTERED DATA

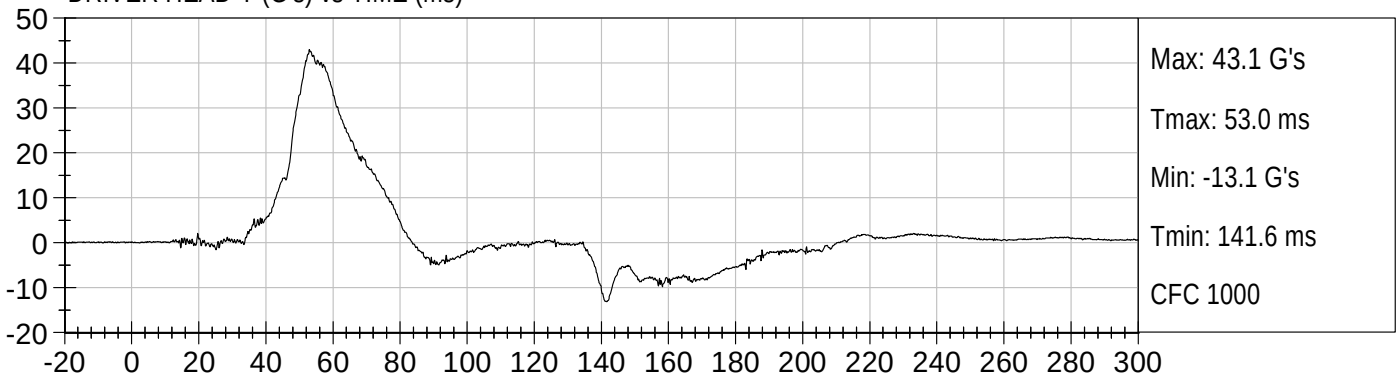
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

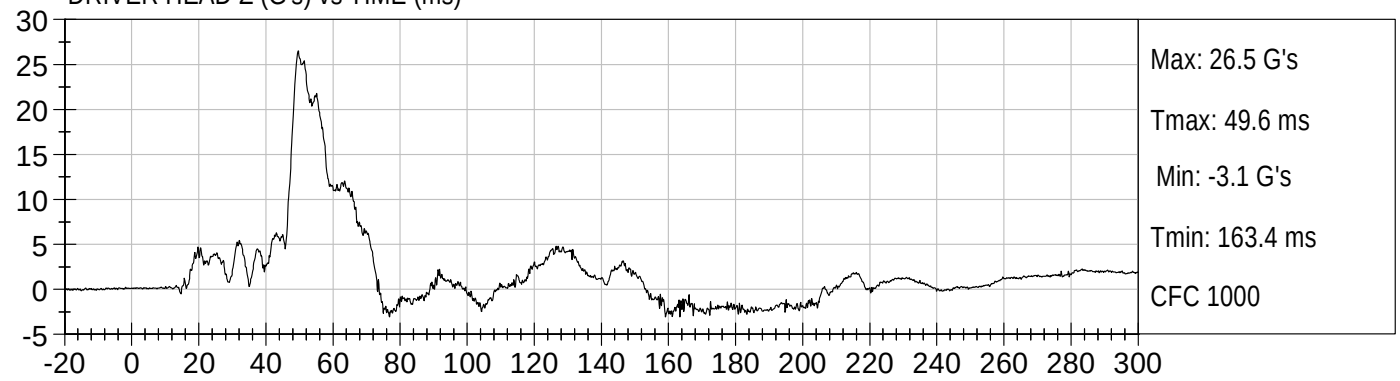
DRIVER HEAD X (G's) vs TIME (ms)



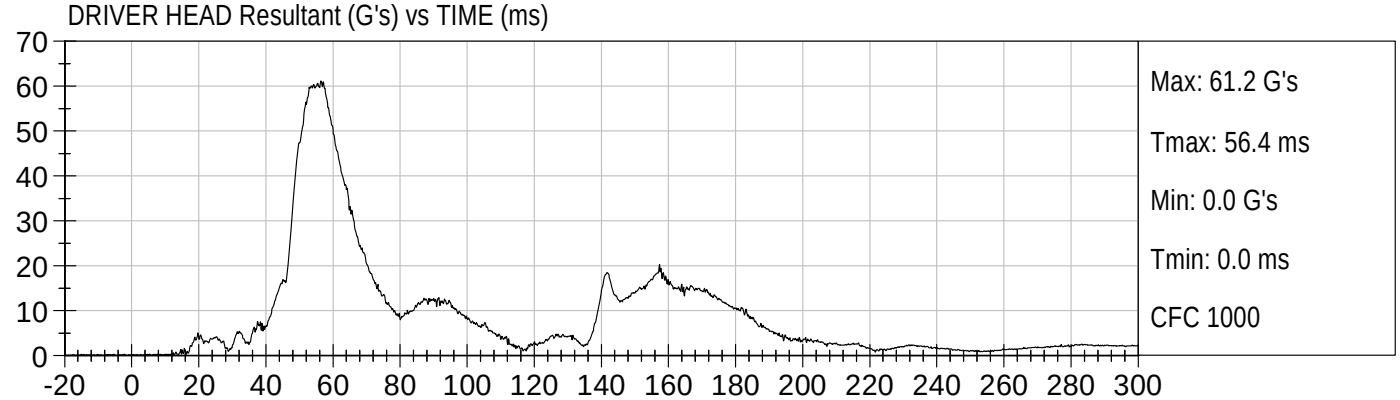
DRIVER HEAD Y (G's) vs TIME (ms)



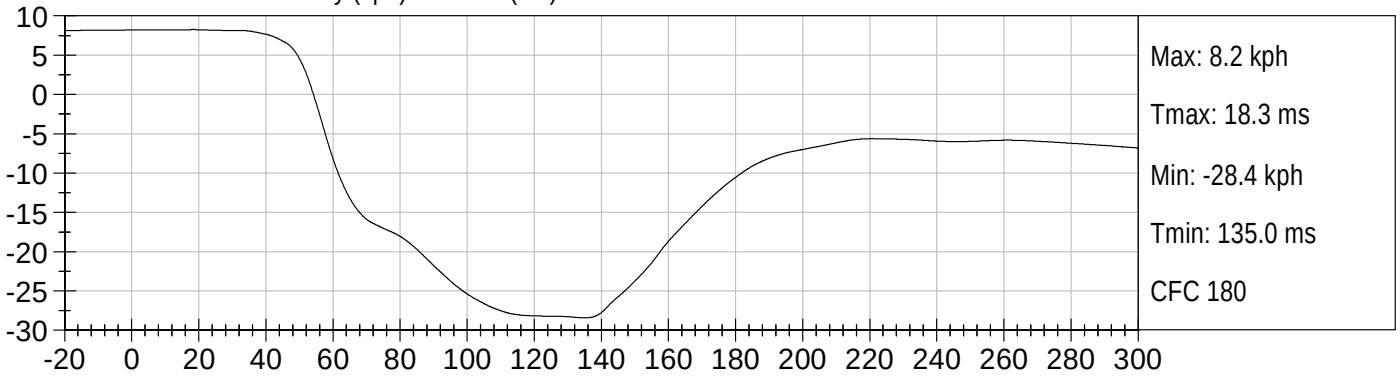
DRIVER HEAD Z (G's) vs TIME (ms)



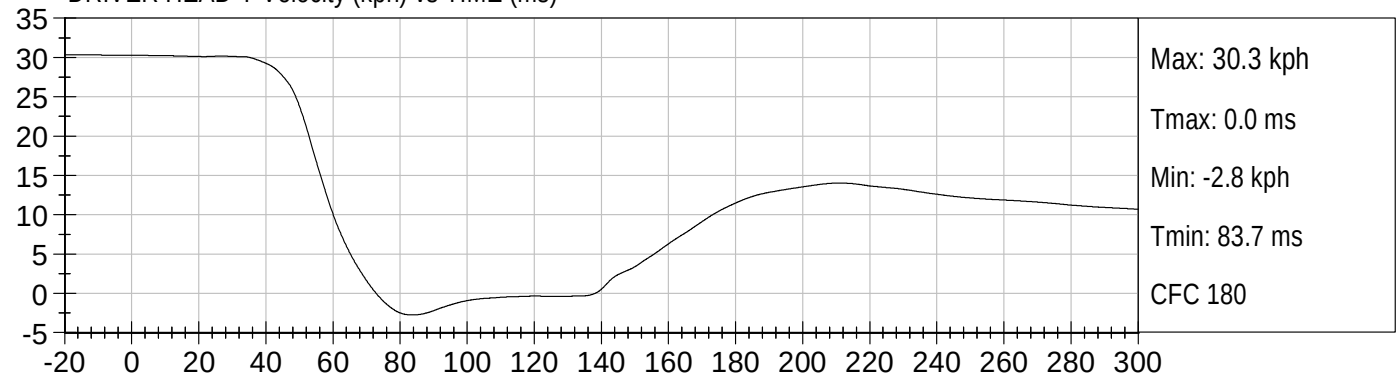
DRIVER HEAD Resultant (G's) vs TIME (ms)



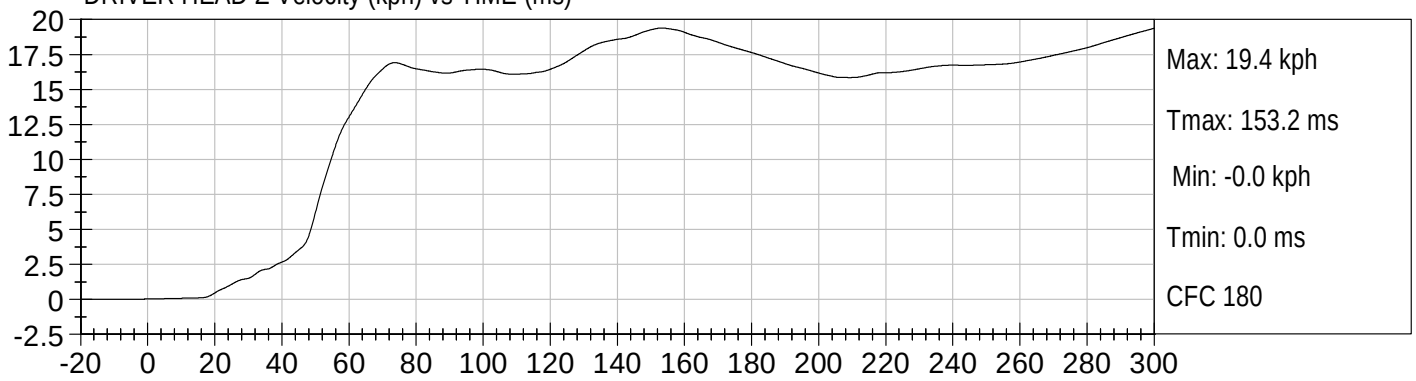
DRIVER HEAD X Velocity (kph) vs TIME (ms)



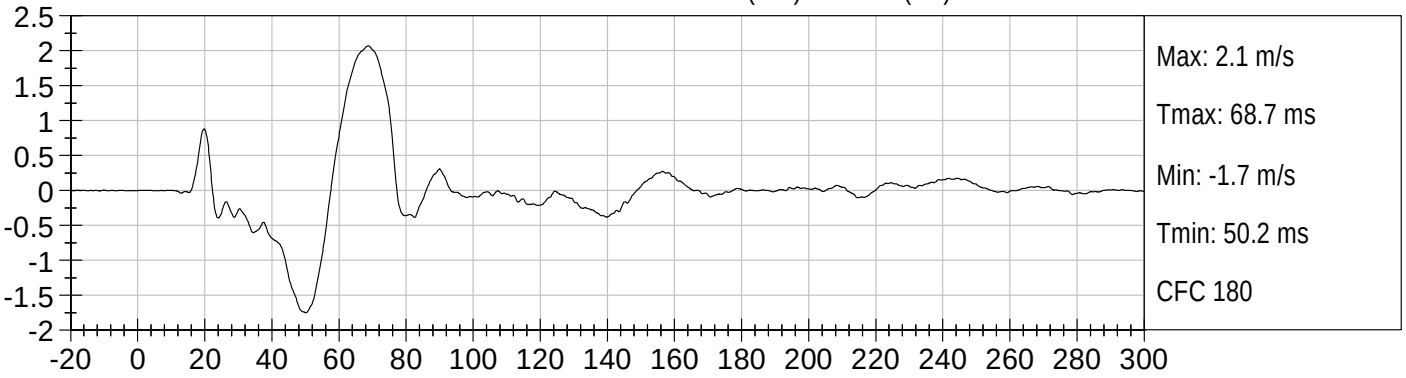
DRIVER HEAD Y Velocity (kph) vs TIME (ms)



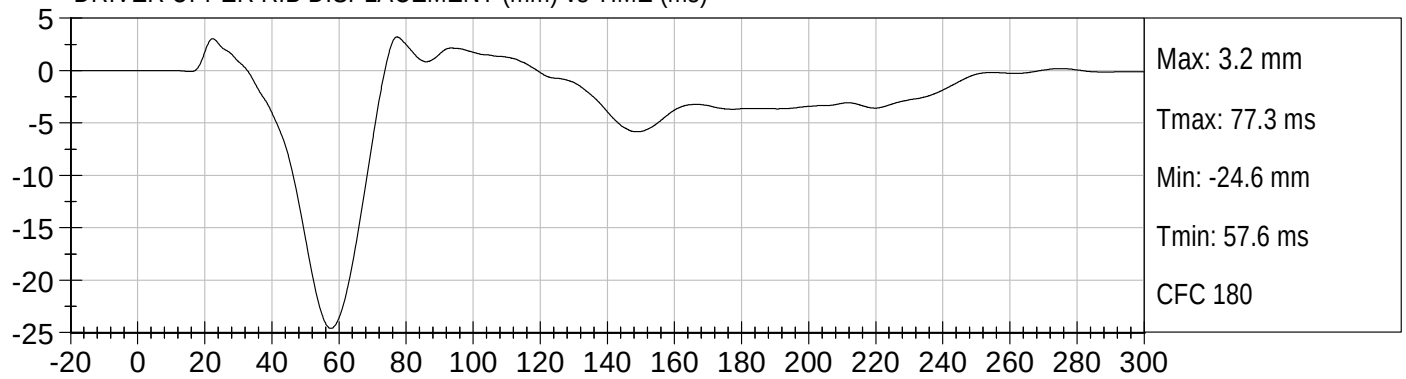
DRIVER HEAD Z Velocity (kph) vs TIME (ms)



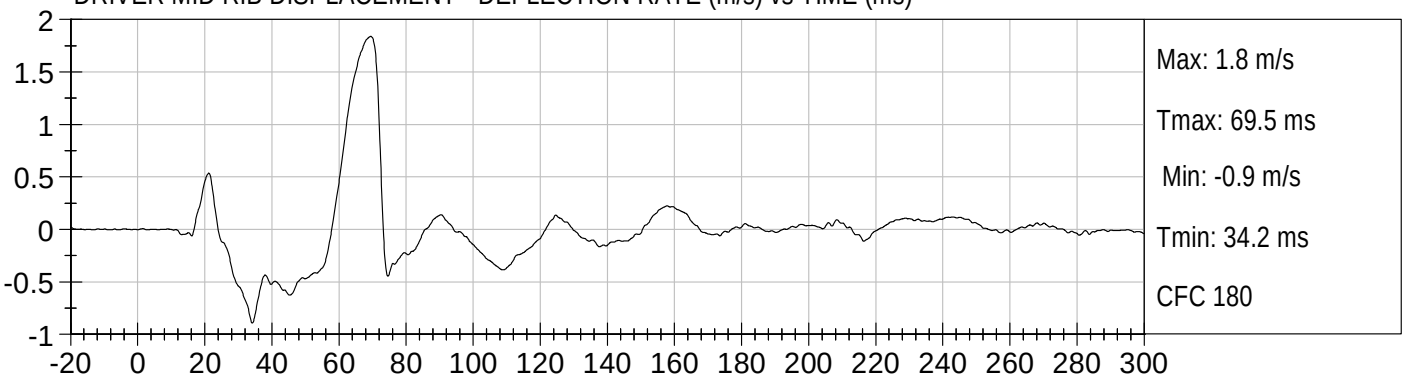
DRIVER UPPER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



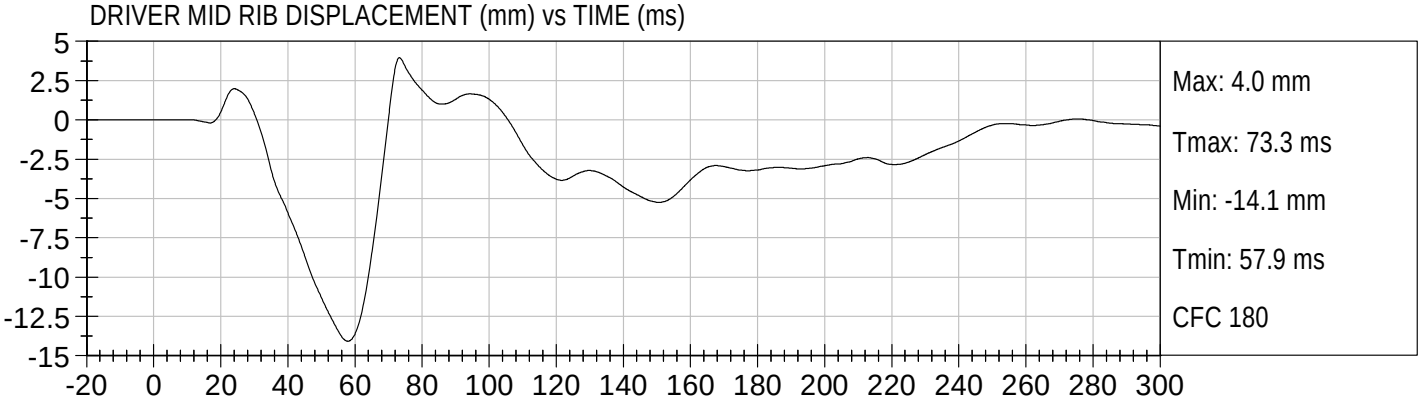
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



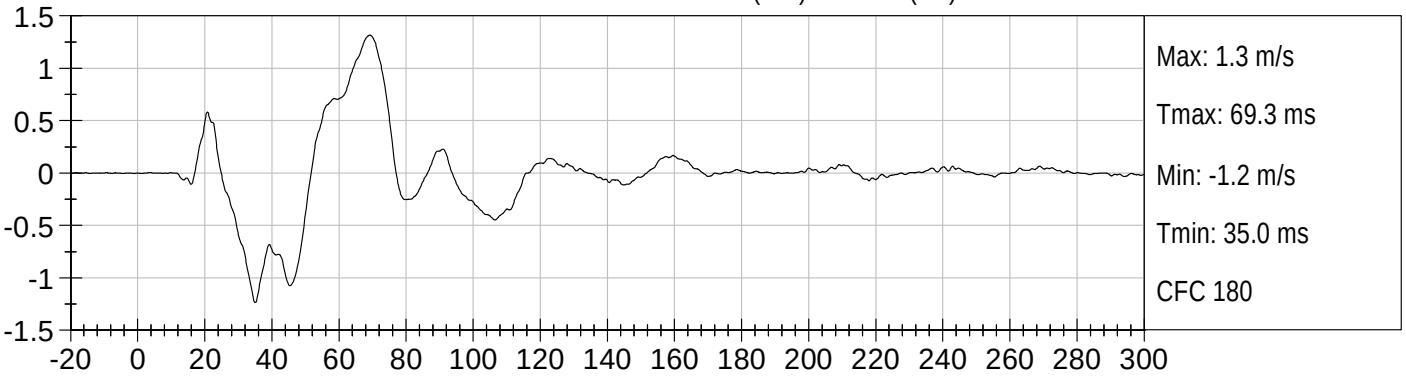
DRIVER MID RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



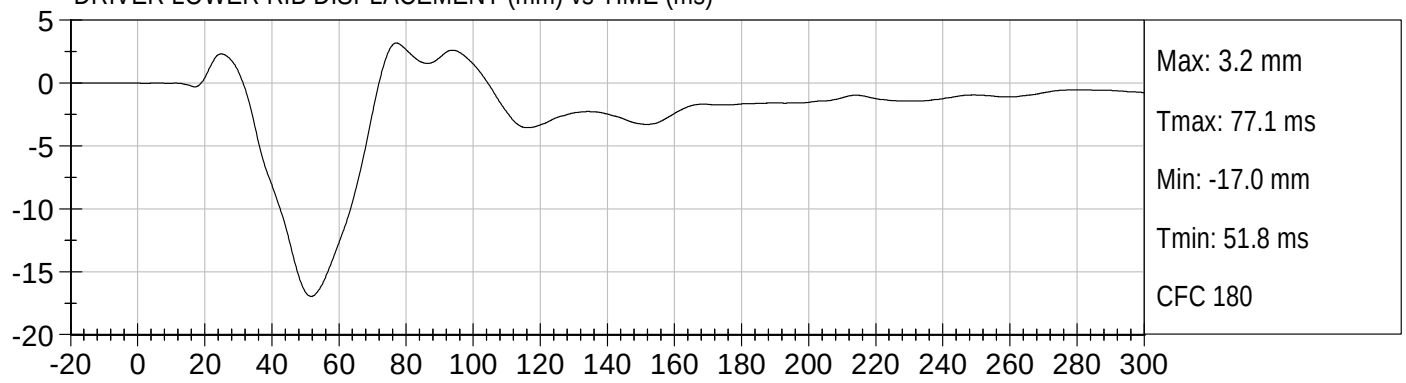
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



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



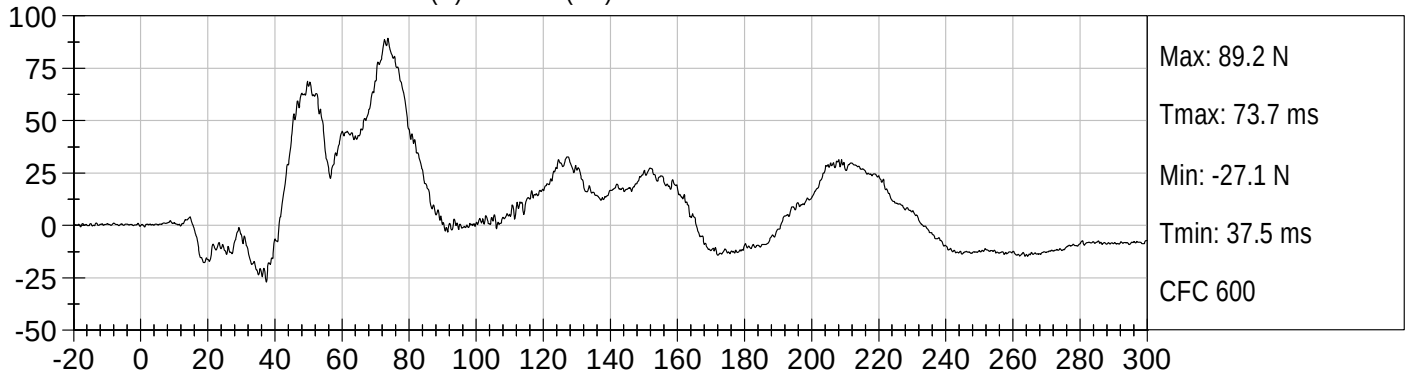
DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



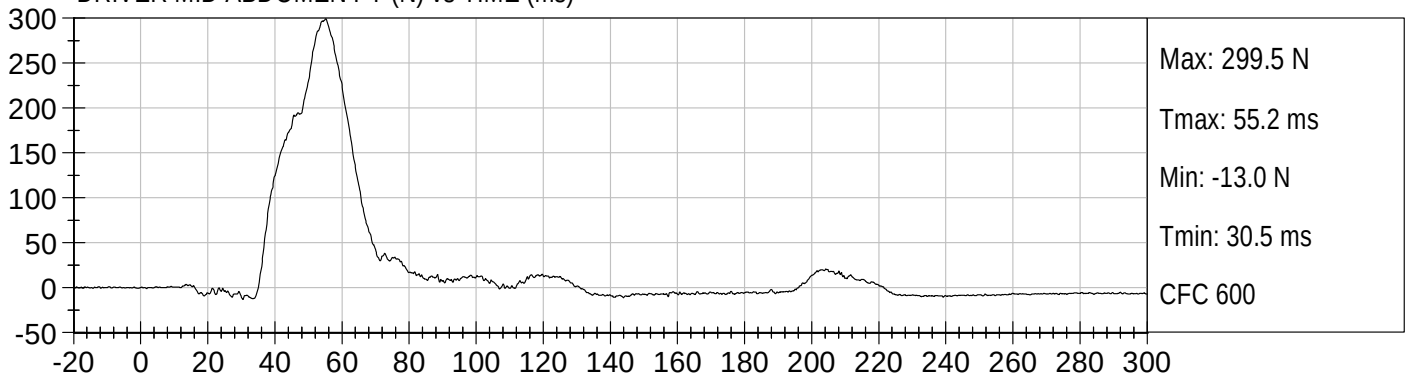
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

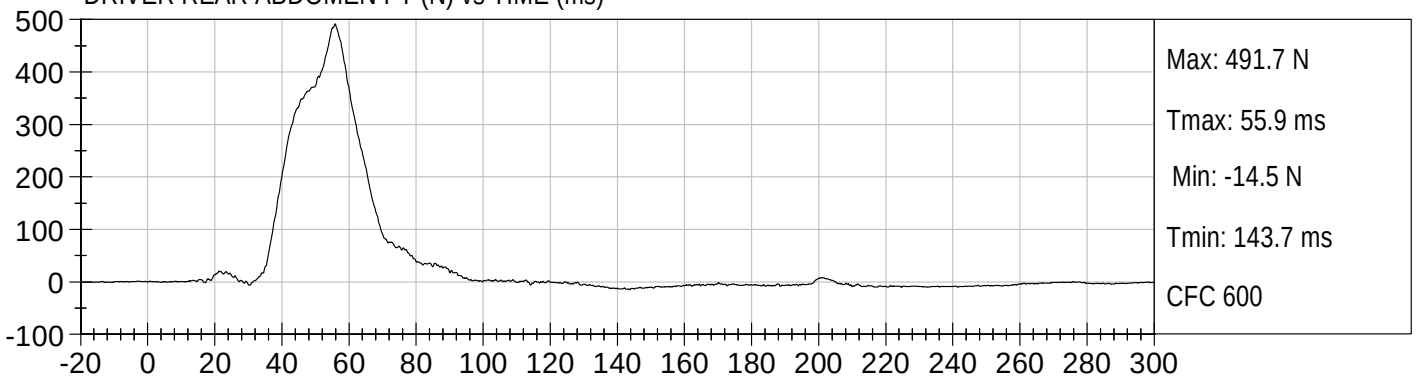
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



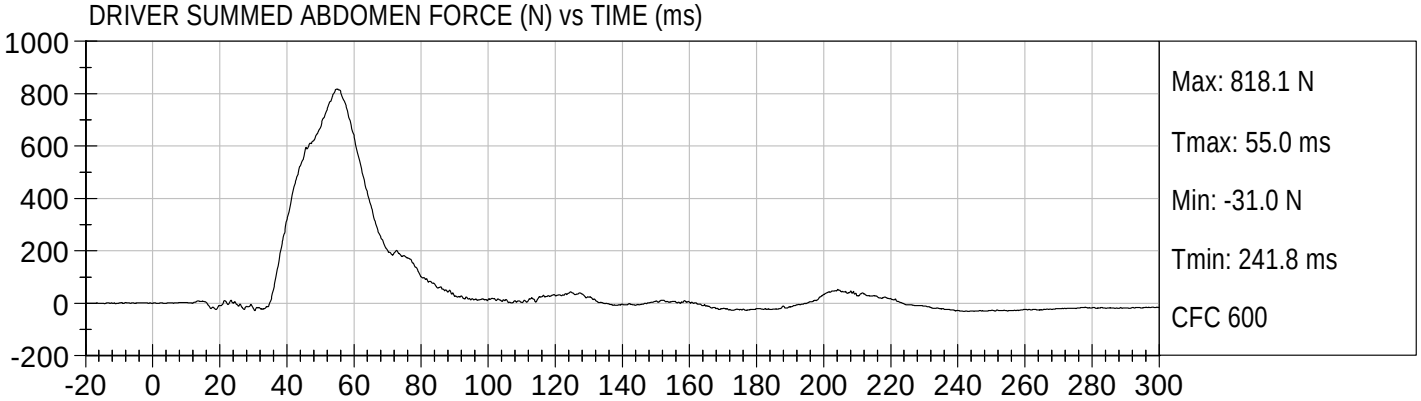
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

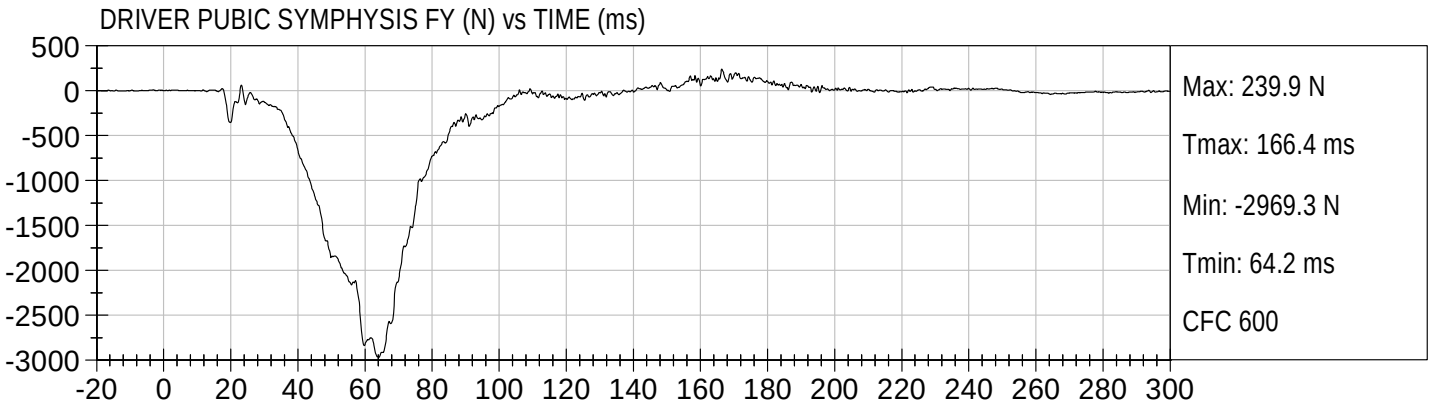


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)



APPENDIX C

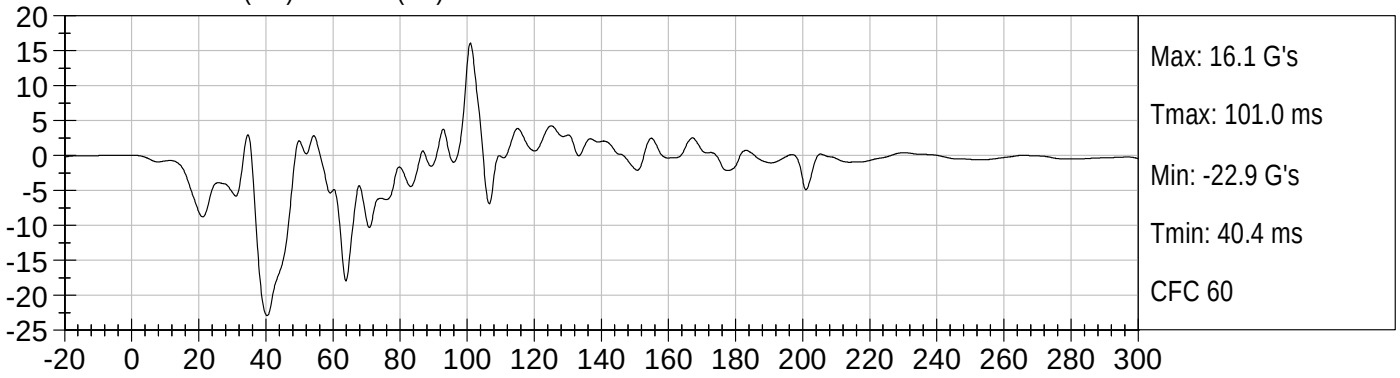
VEHICLE ACCELEROMETER RESPONSE DATA

TABLE OF DATA PLOTS

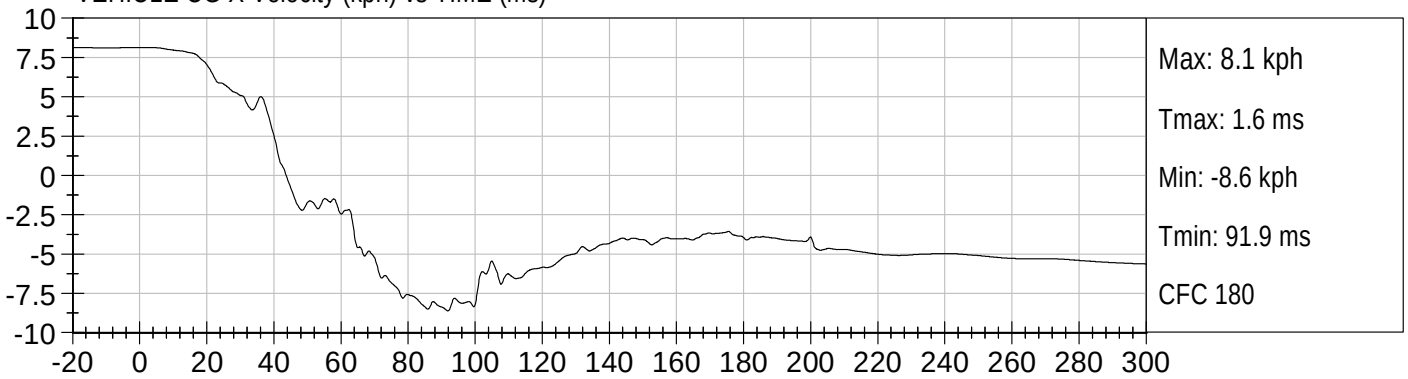
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

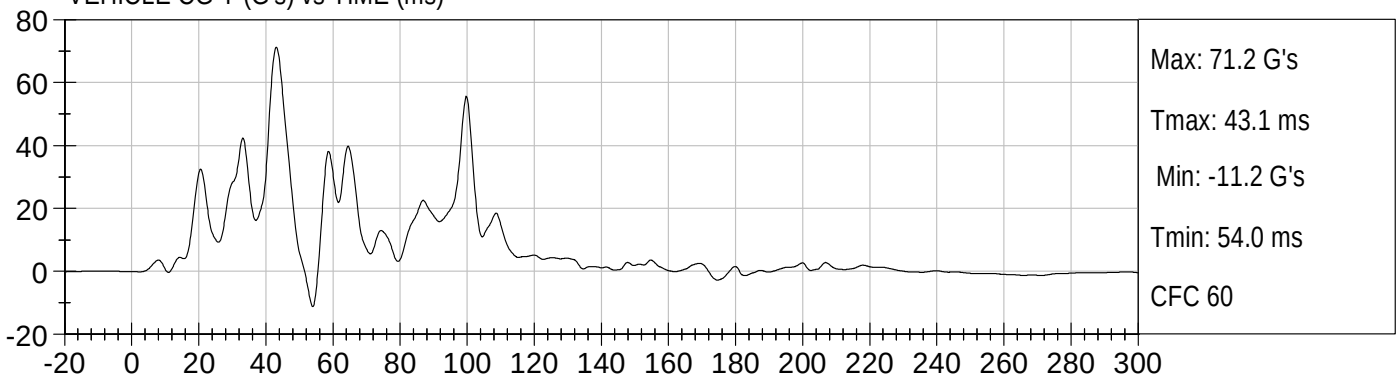
VEHICLE CG X (G's) vs TIME (ms)



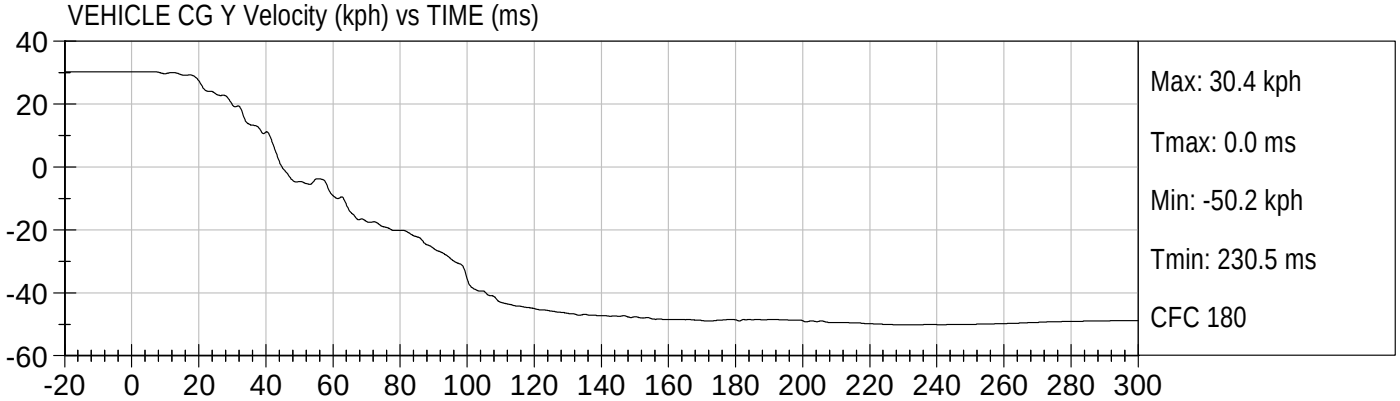
VEHICLE CG X Velocity (kph) vs TIME (ms)



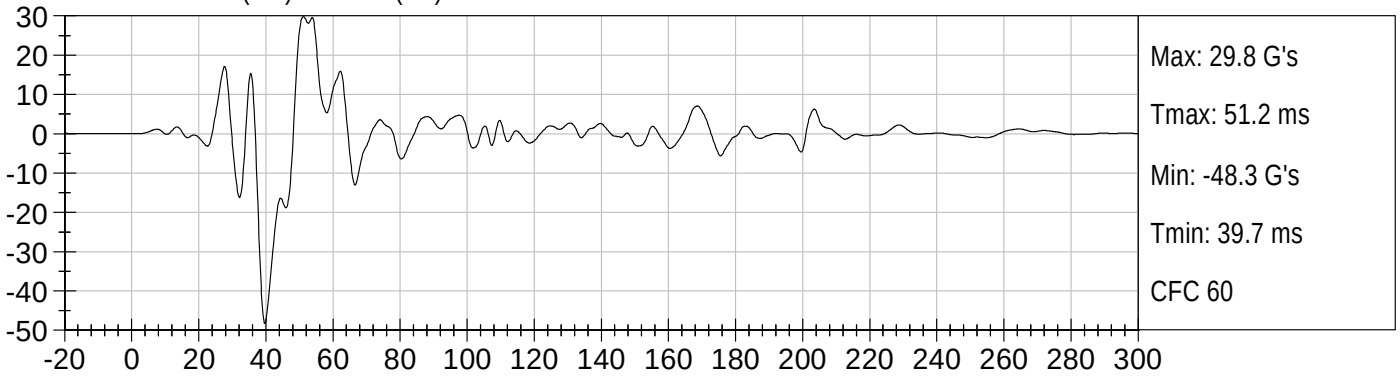
VEHICLE CG Y (G's) vs TIME (ms)



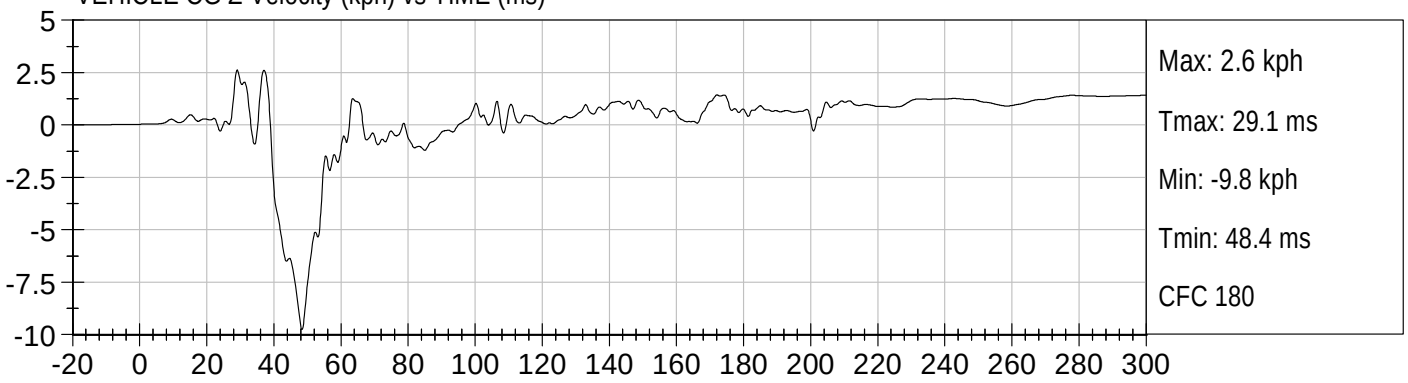
VEHICLE CG Y Velocity (kph) vs TIME (ms)



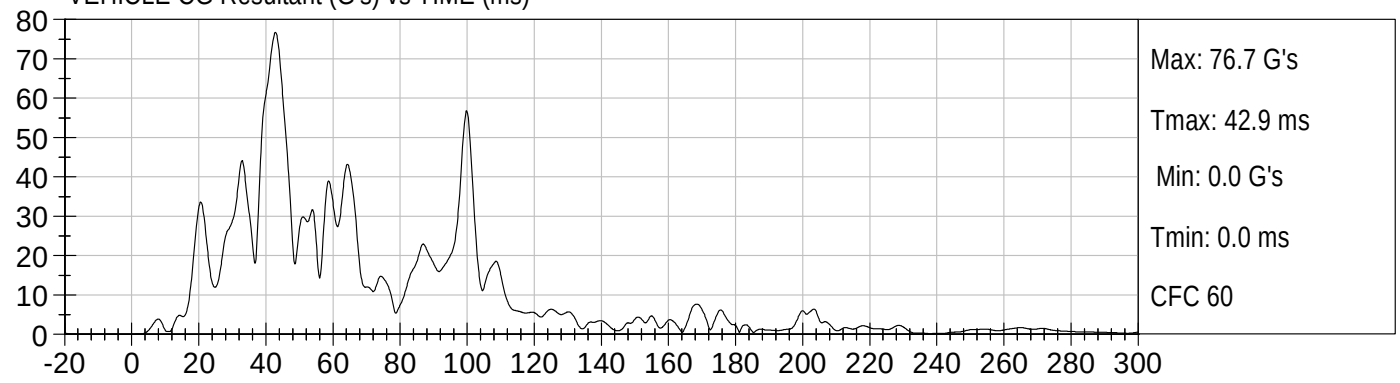
VEHICLE CG Z (G's) vs TIME (ms)



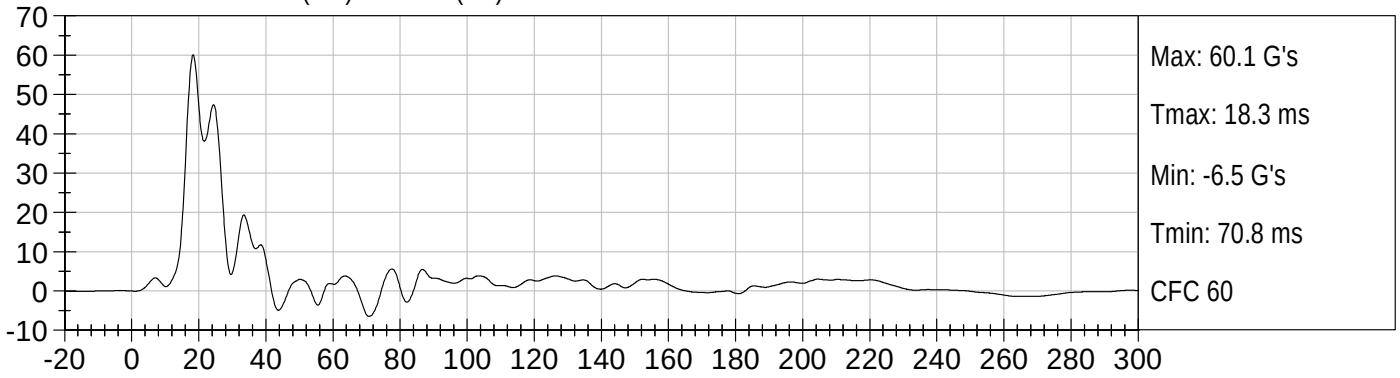
VEHICLE CG Z Velocity (kph) vs TIME (ms)



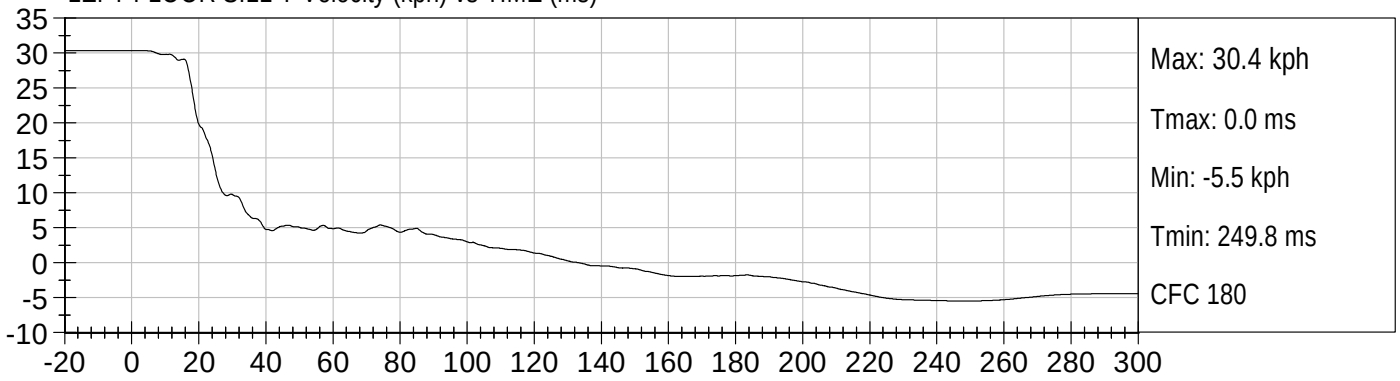
VEHICLE CG Resultant (G's) vs TIME (ms)



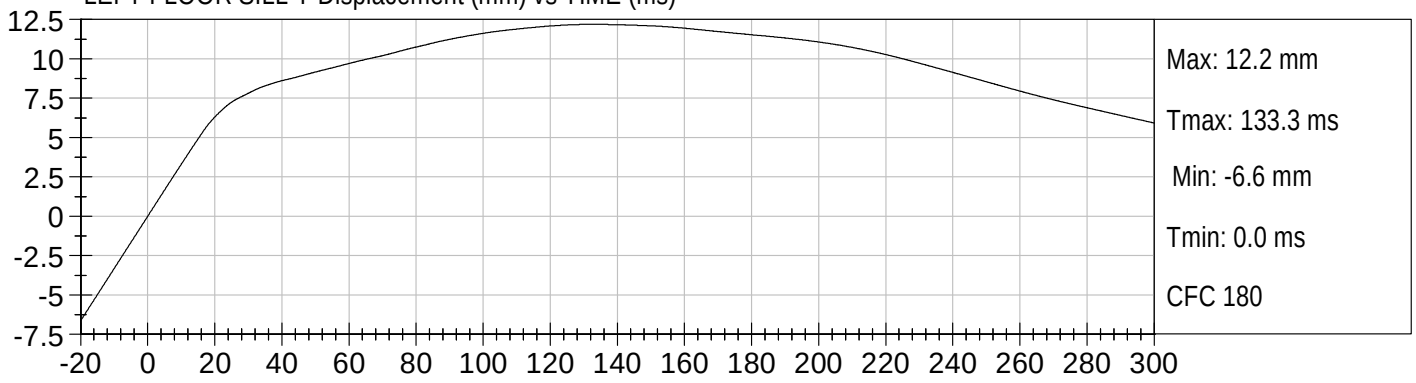
LEFT FLOOR SILL Y (G's) vs TIME (ms)



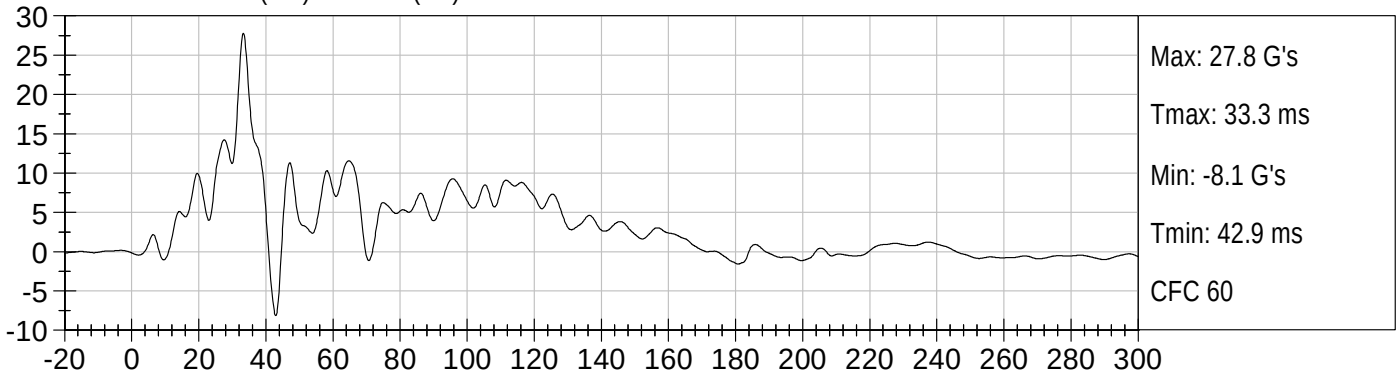
LEFT FLOOR SILL Y Velocity (kph) vs TIME (ms)



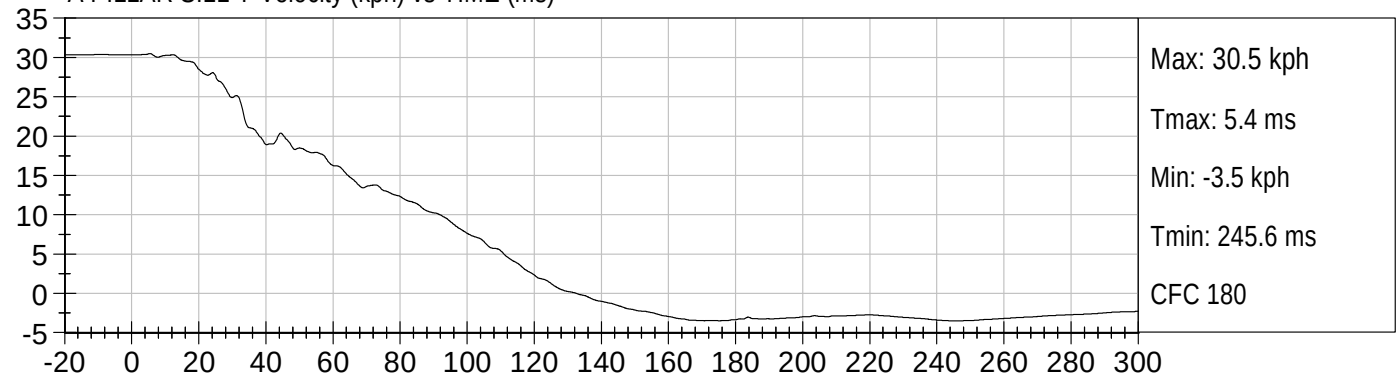
LEFT FLOOR SILL Y Displacement (mm) vs TIME (ms)



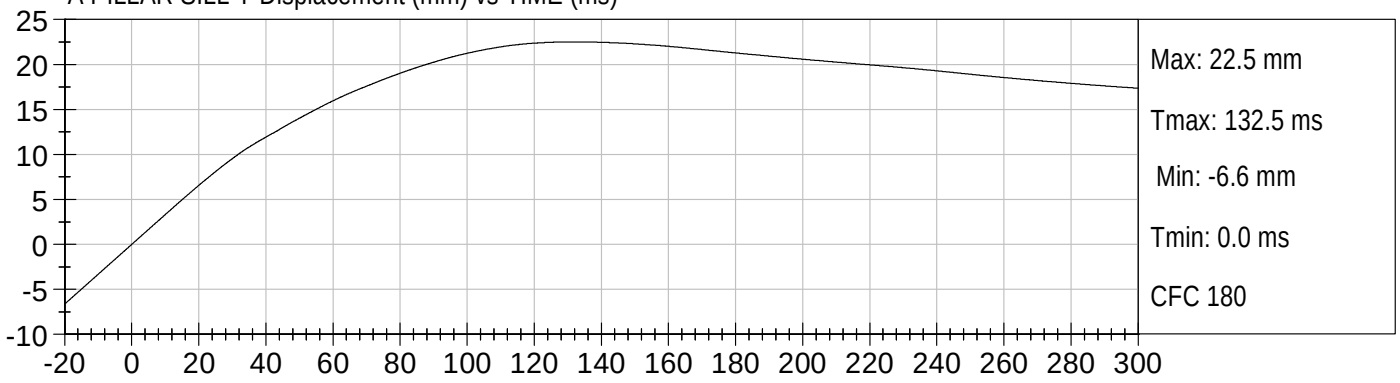
A PILLAR SILL Y (G's) vs TIME (ms)



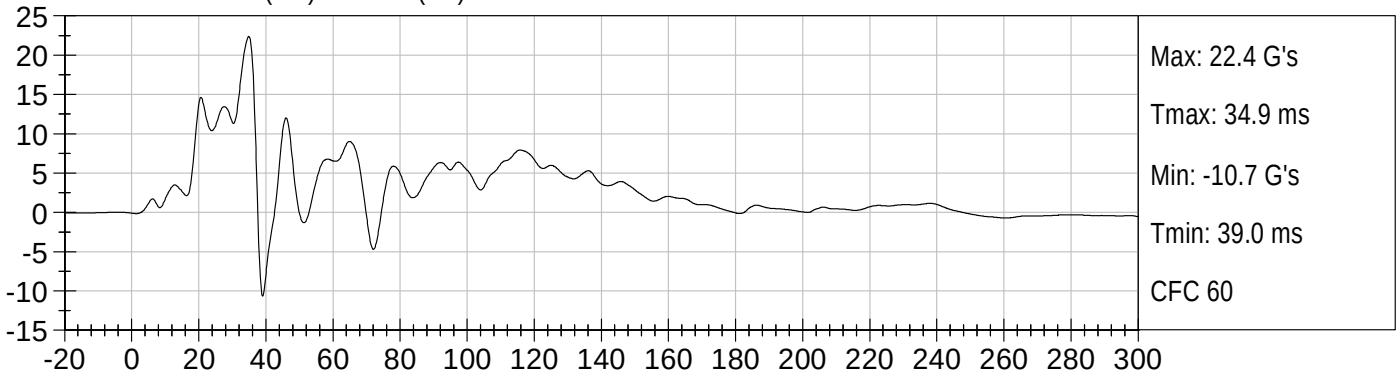
A PILLAR SILL Y Velocity (kph) vs TIME (ms)



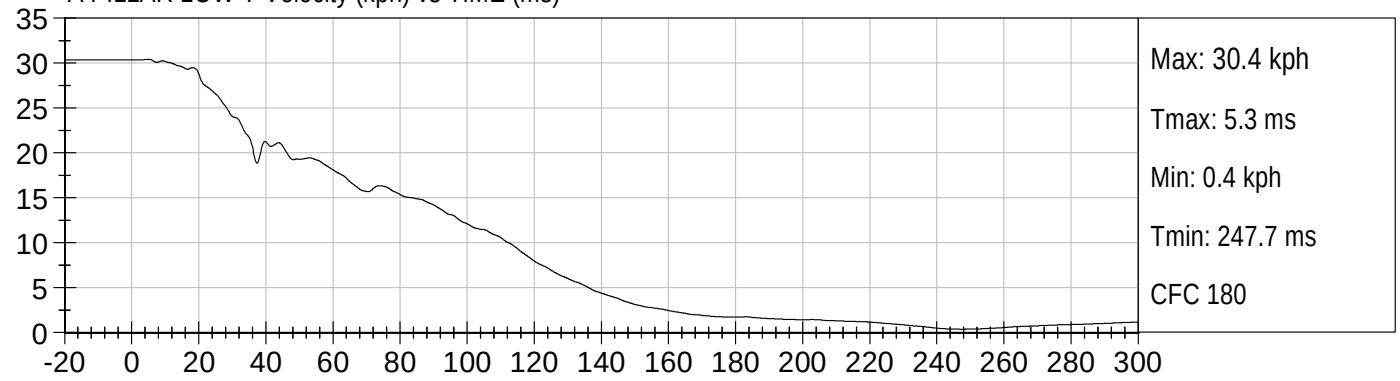
A PILLAR SILL Y Displacement (mm) vs TIME (ms)



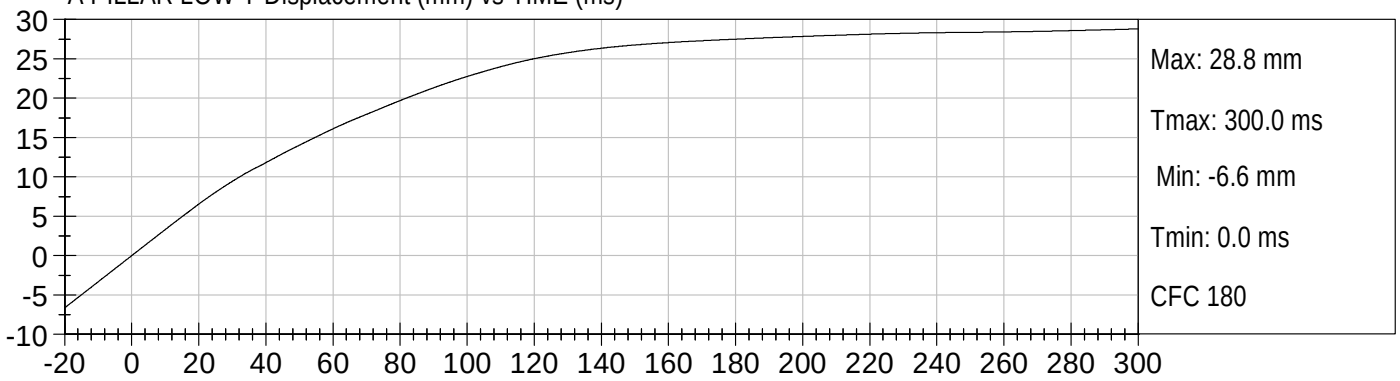
A PILLAR LOW Y (G's) vs TIME (ms)



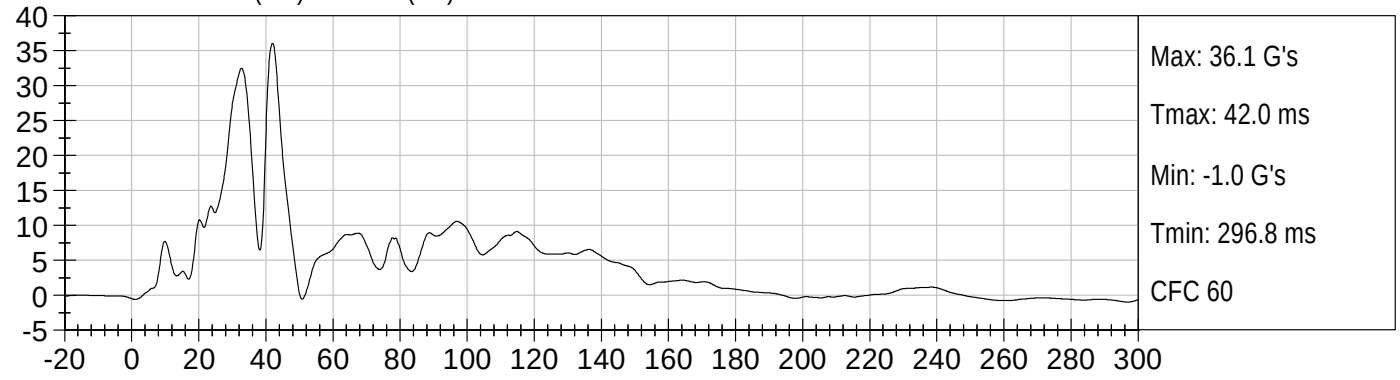
A PILLAR LOW Y Velocity (kph) vs TIME (ms)



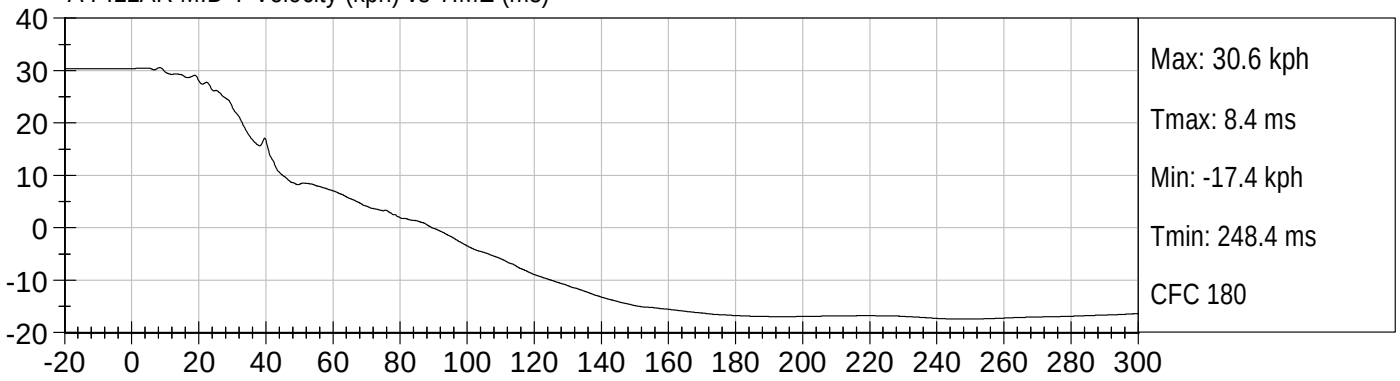
A PILLAR LOW Y Displacement (mm) vs TIME (ms)



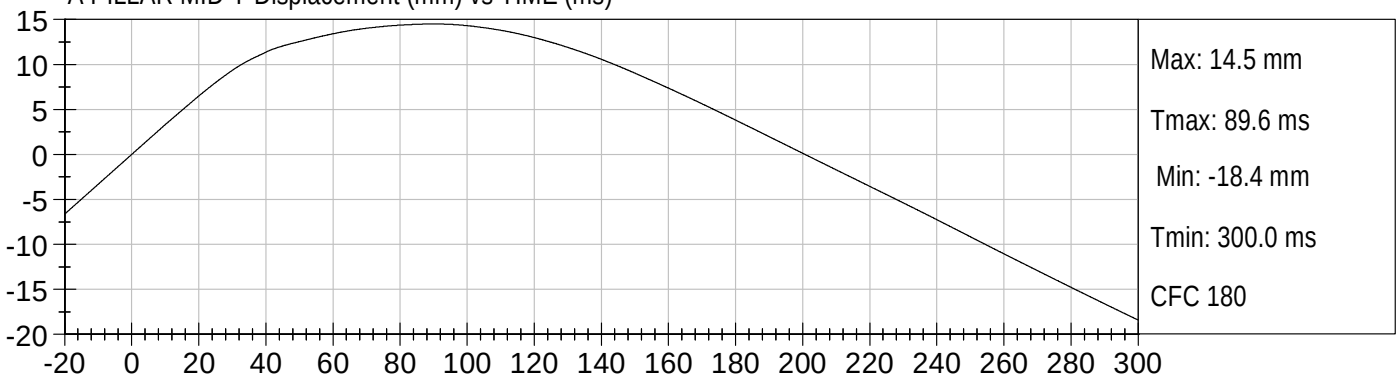
A PILLAR MID Y (G's) vs TIME (ms)



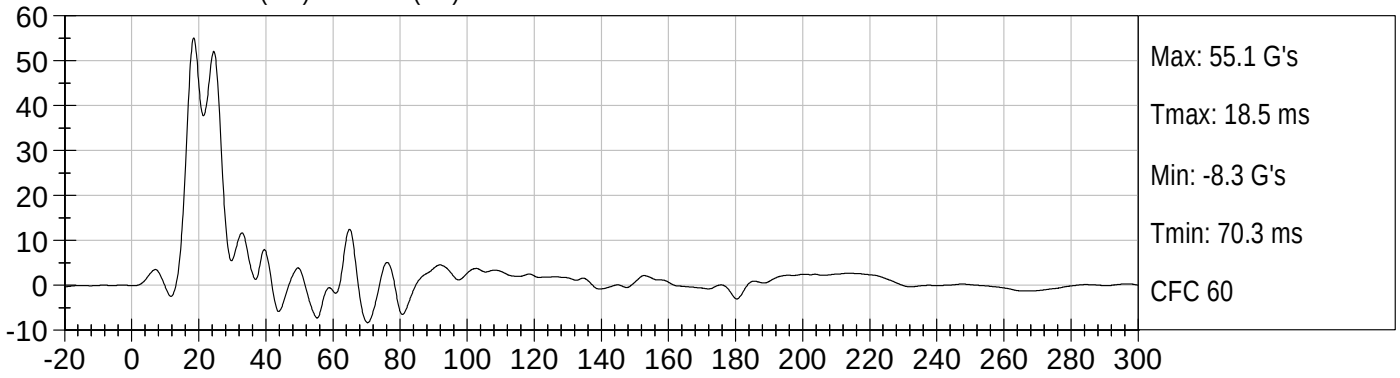
A PILLAR MID Y Velocity (kph) vs TIME (ms)



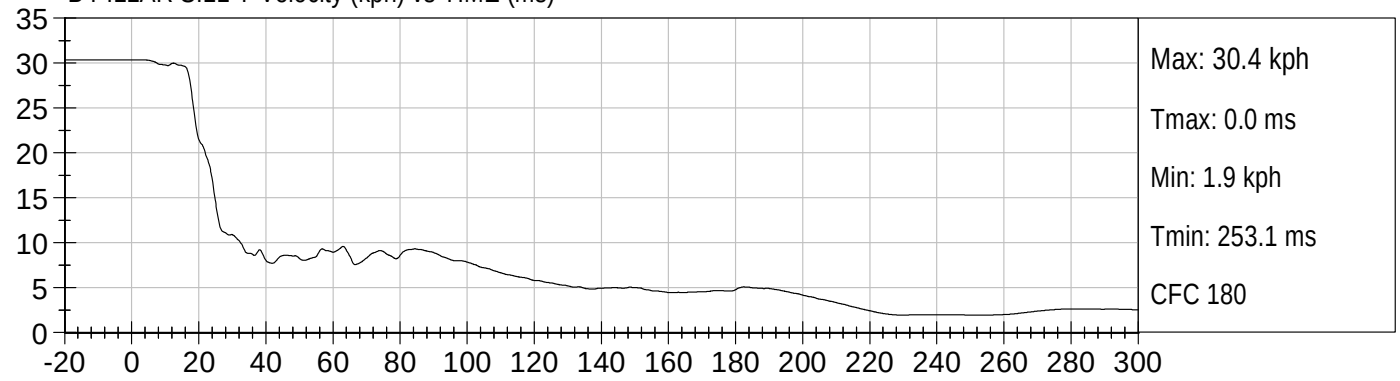
A PILLAR MID Y Displacement (mm) vs TIME (ms)



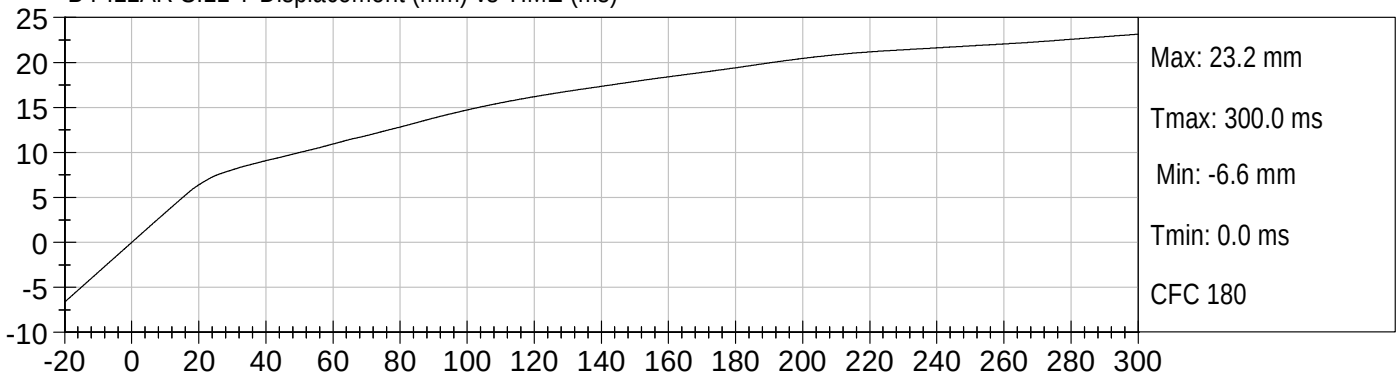
B PILLAR SILL Y (G's) vs TIME (ms)



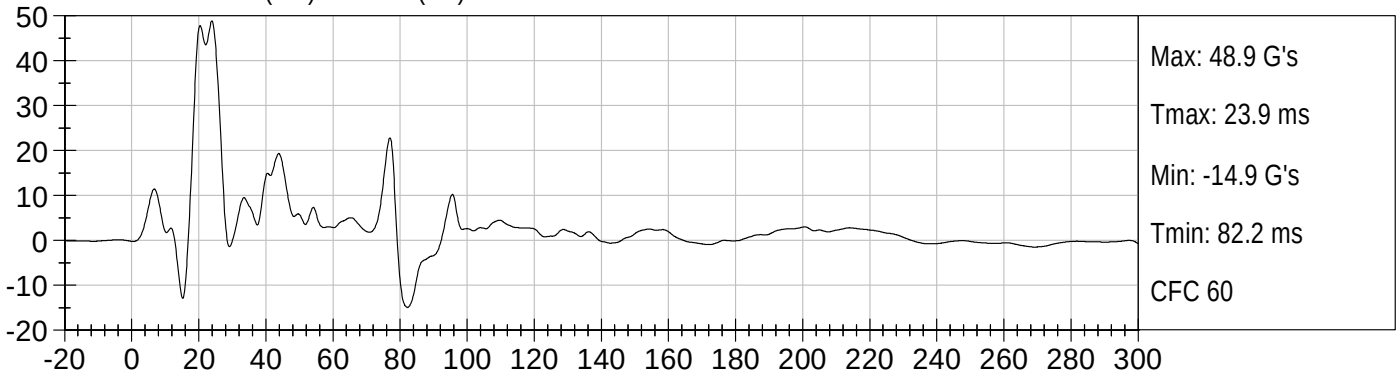
B PILLAR SILL Y Velocity (kph) vs TIME (ms)



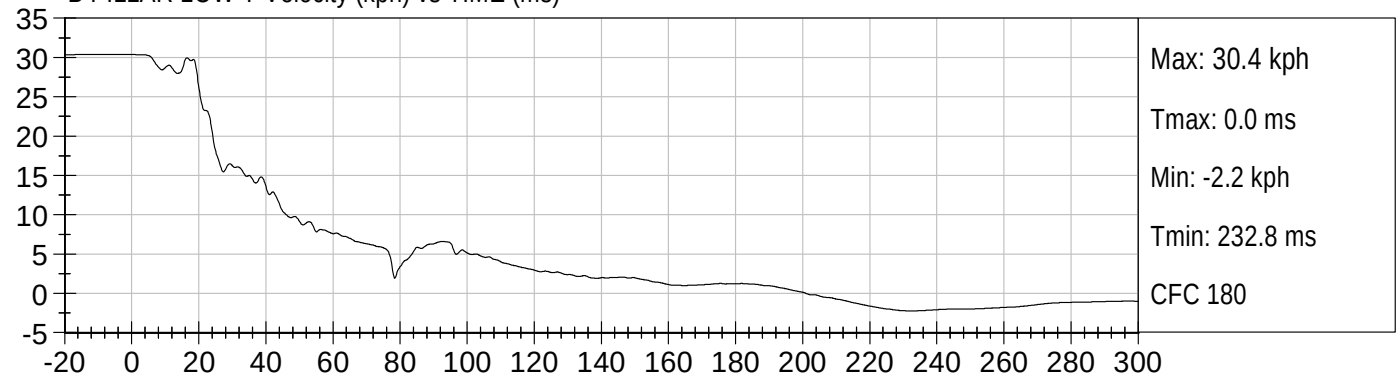
B PILLAR SILL Y Displacement (mm) vs TIME (ms)



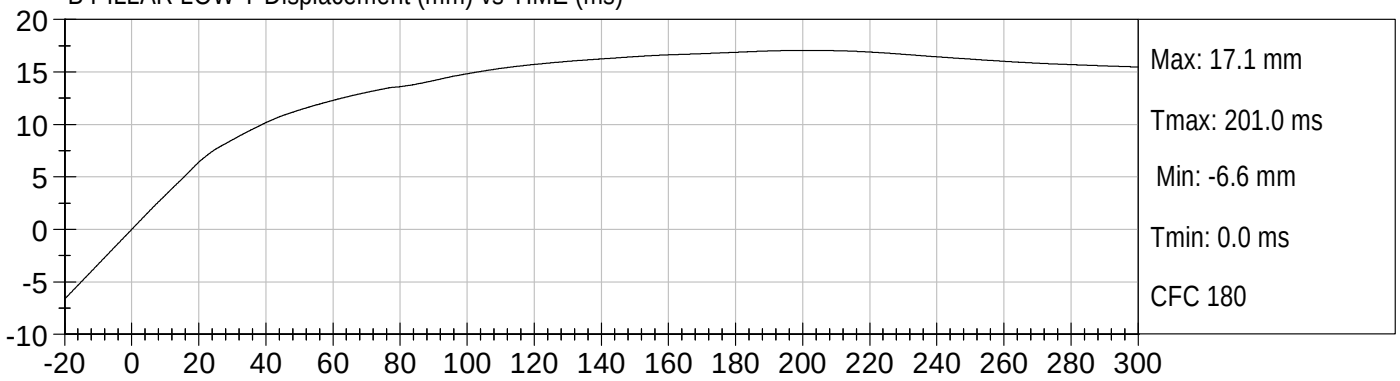
B PILLAR LOW Y (G's) vs TIME (ms)



B PILLAR LOW Y Velocity (kph) vs TIME (ms)



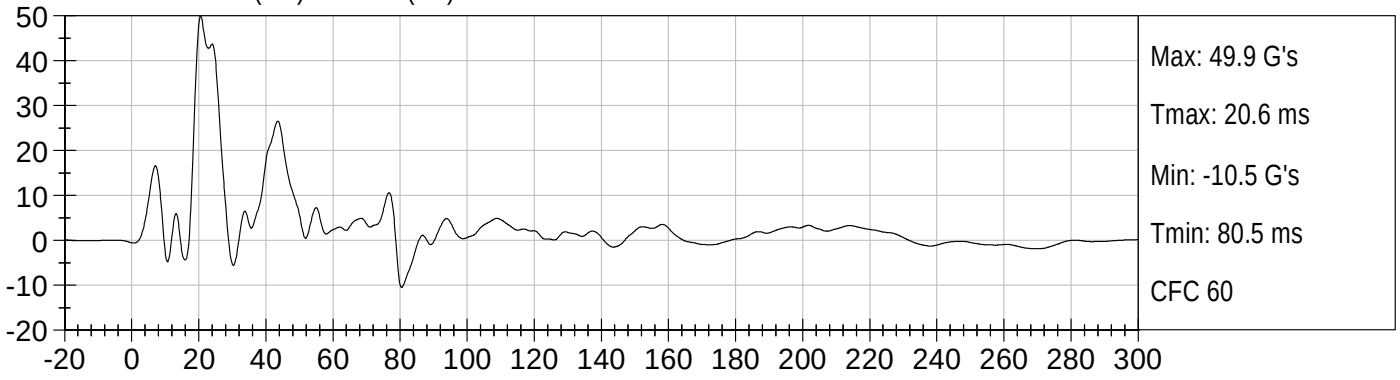
B PILLAR LOW Y Displacement (mm) vs TIME (ms)



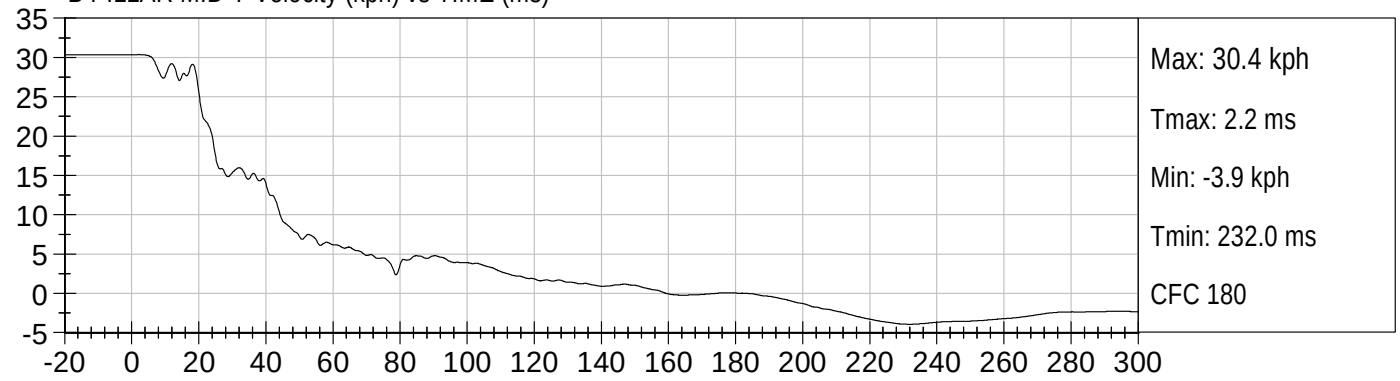
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

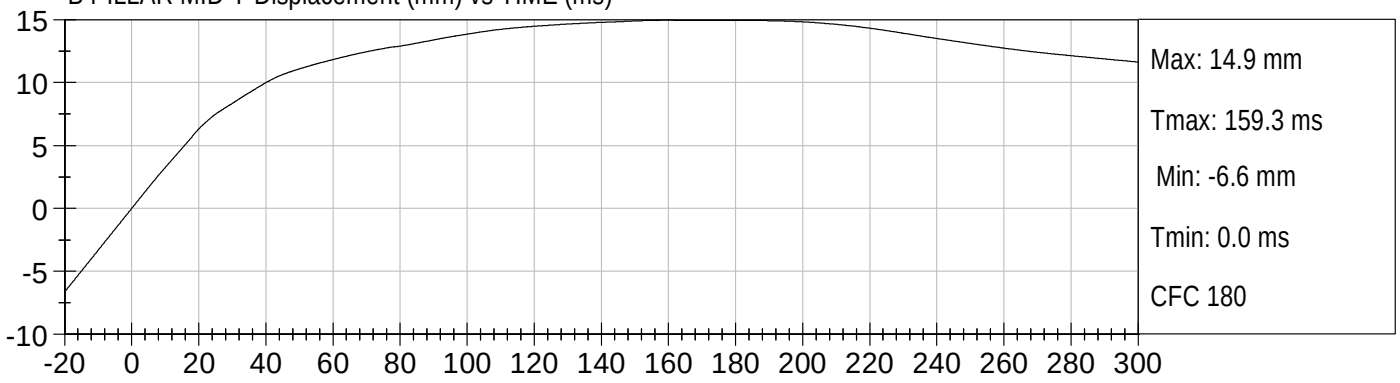
B PILLAR MID Y (G's) vs TIME (ms)



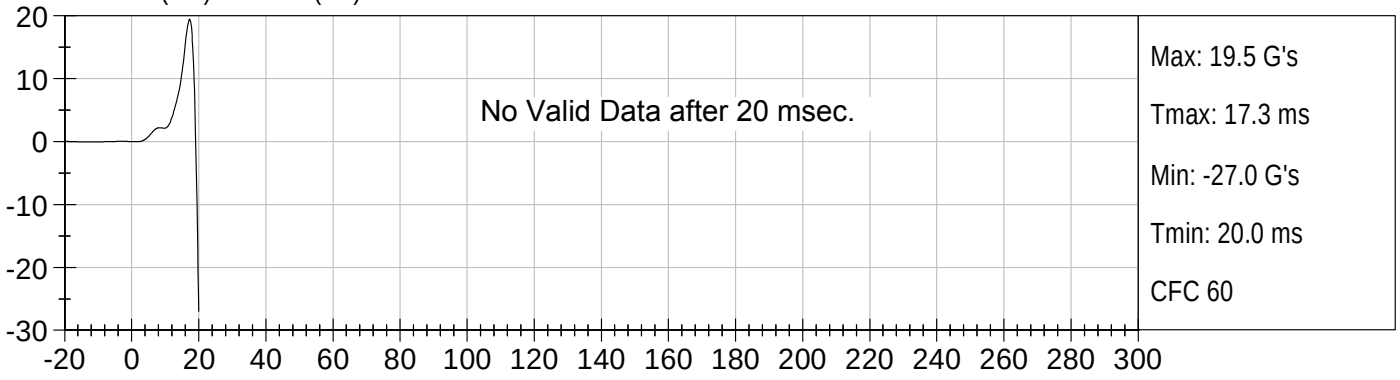
B PILLAR MID Y Velocity (kph) vs TIME (ms)



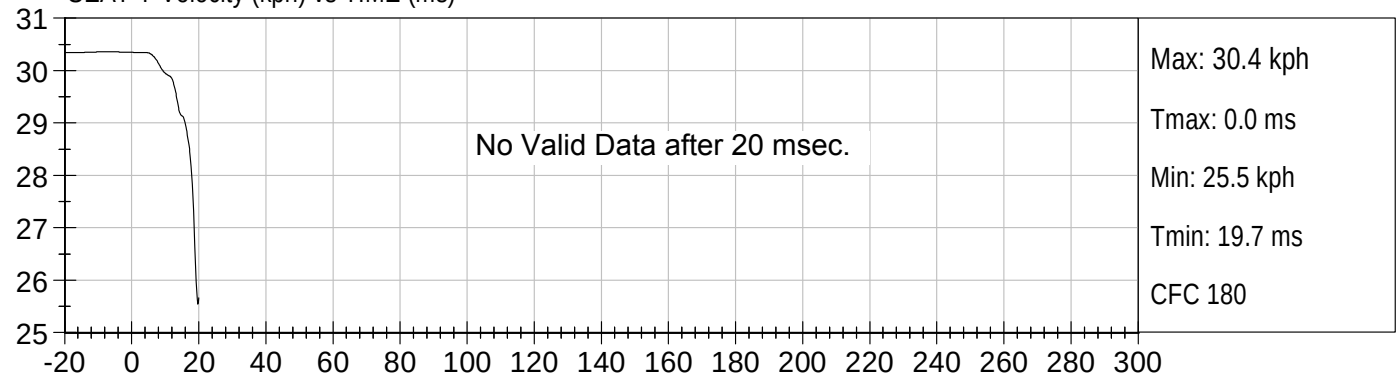
B PILLAR MID Y Displacement (mm) vs TIME (ms)



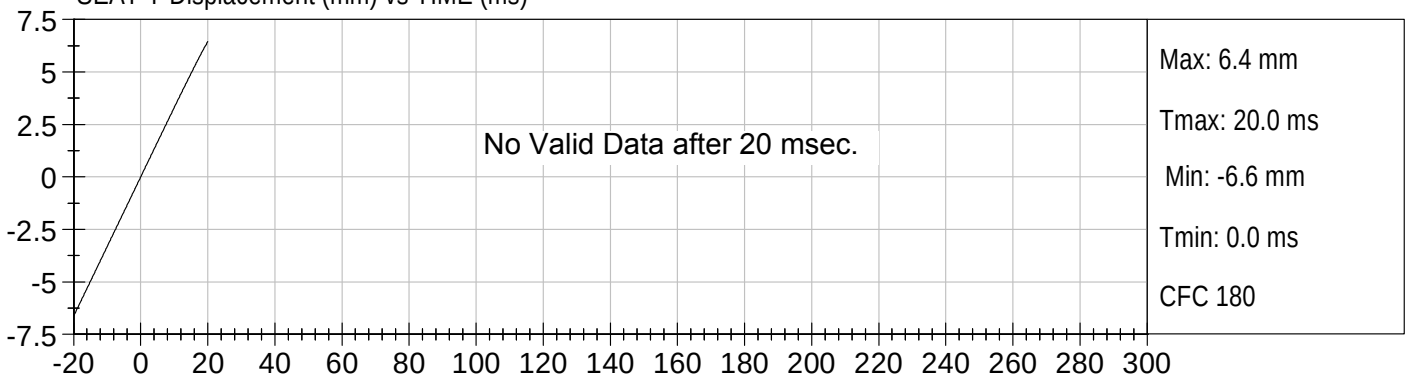
SEAT Y (G's) vs TIME (ms)



SEAT Y Velocity (kph) vs TIME (ms)



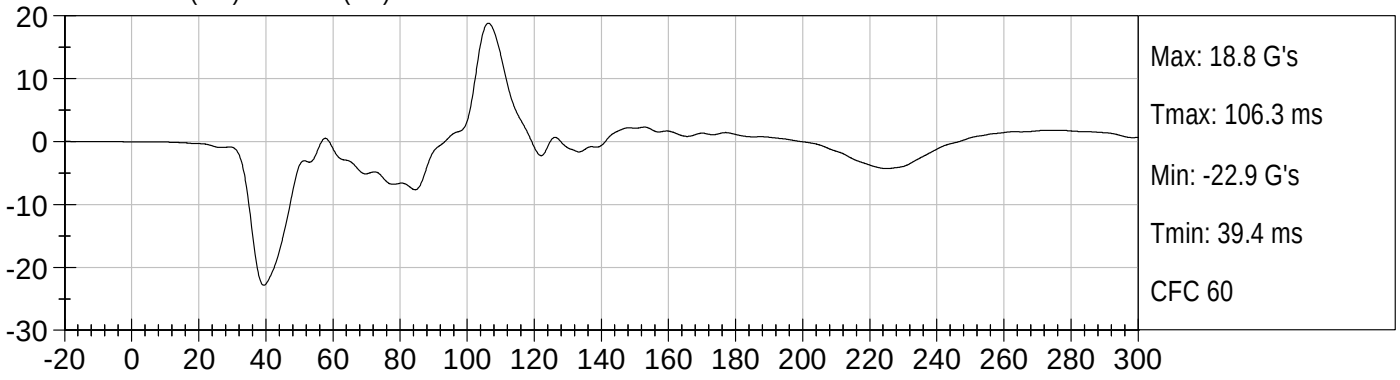
SEAT Y Displacement (mm) vs TIME (ms)



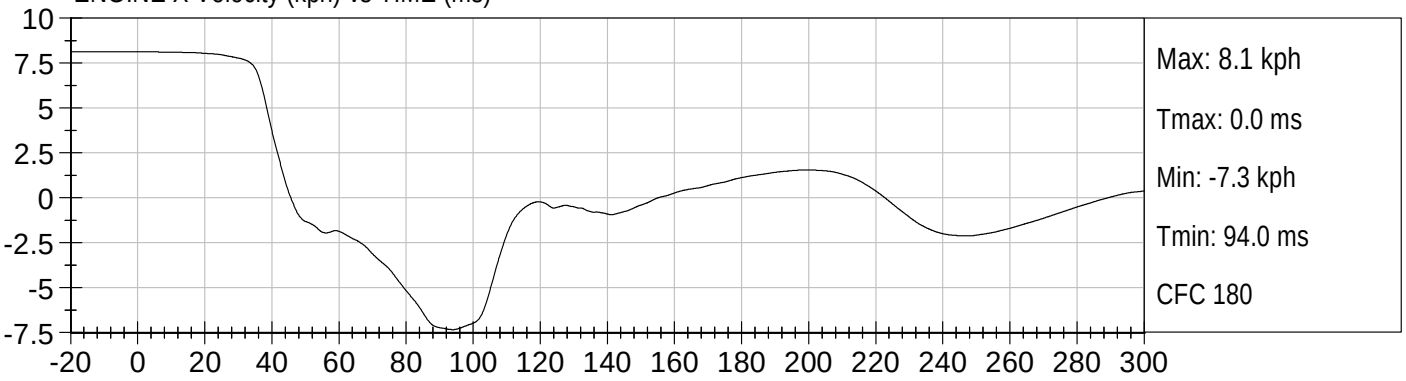
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

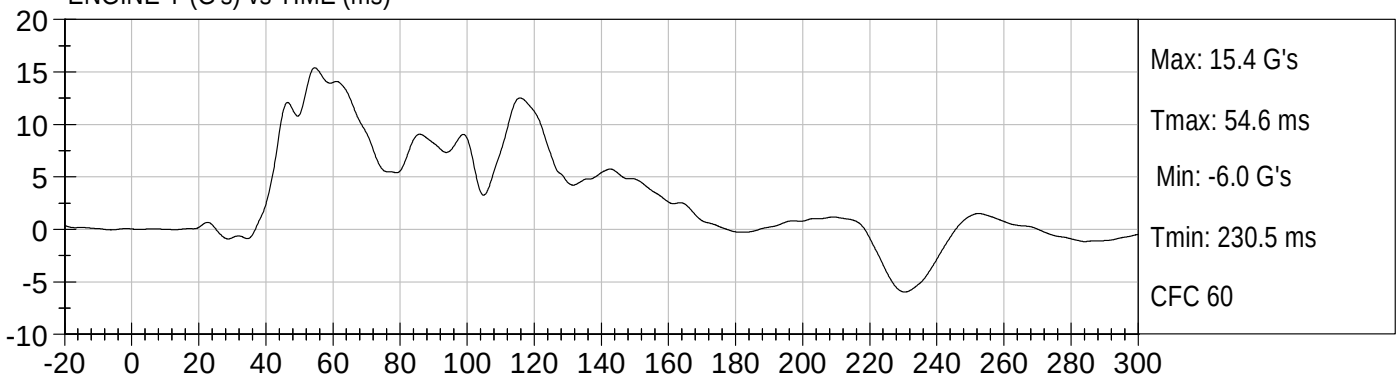
ENGINE X (G's) vs TIME (ms)



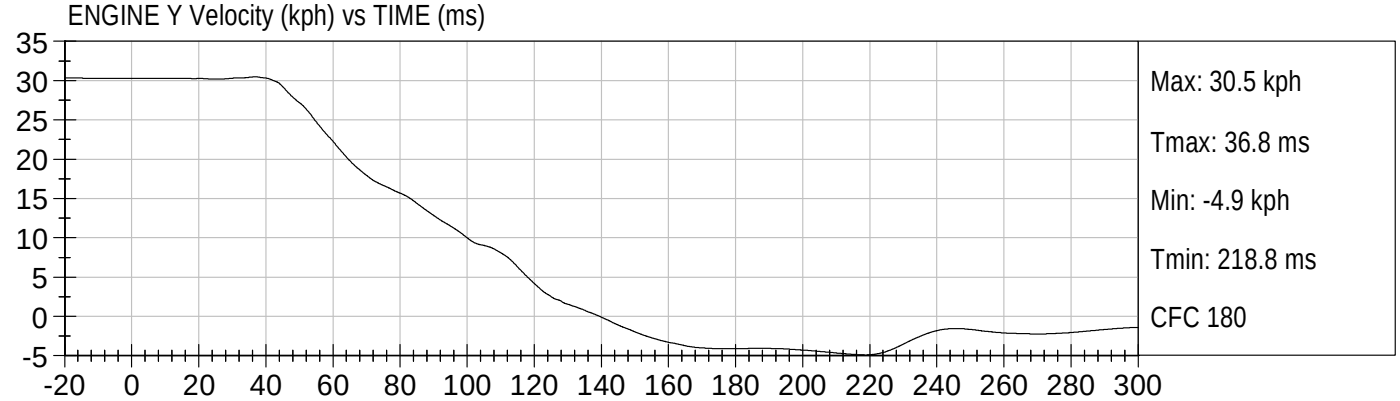
ENGINE X Velocity (kph) vs TIME (ms)



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

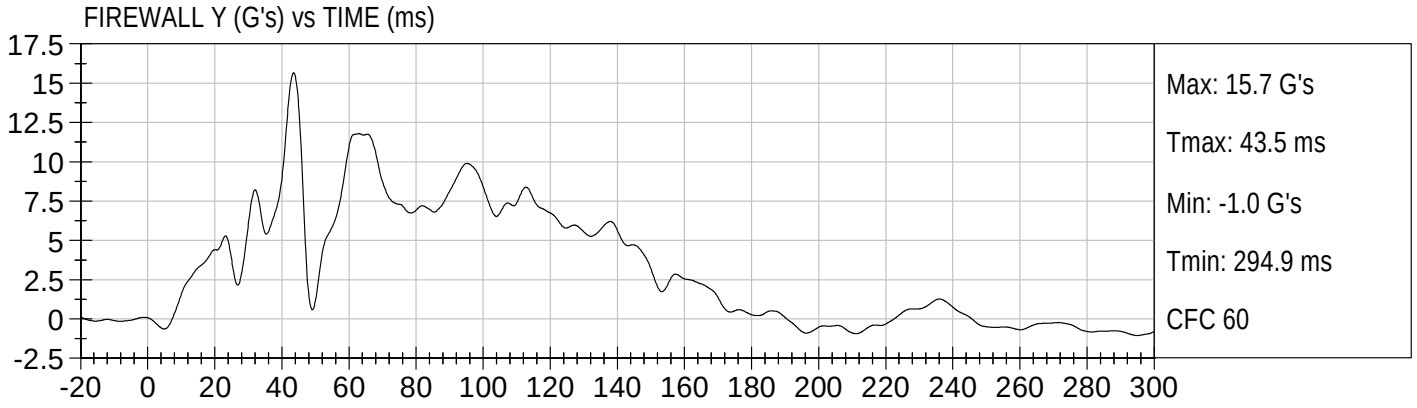


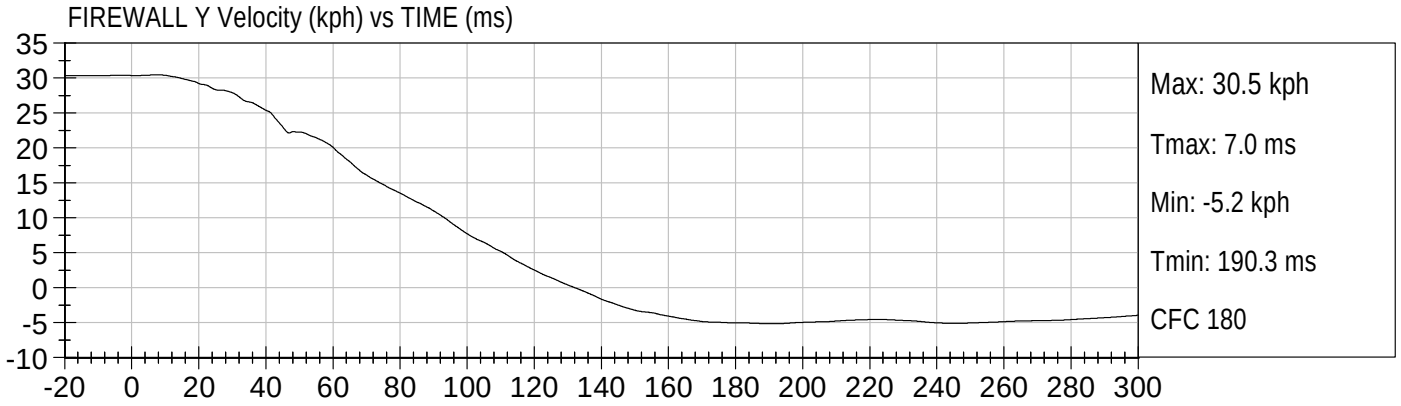
ENGINE Y Velocity (kph) vs TIME (ms)



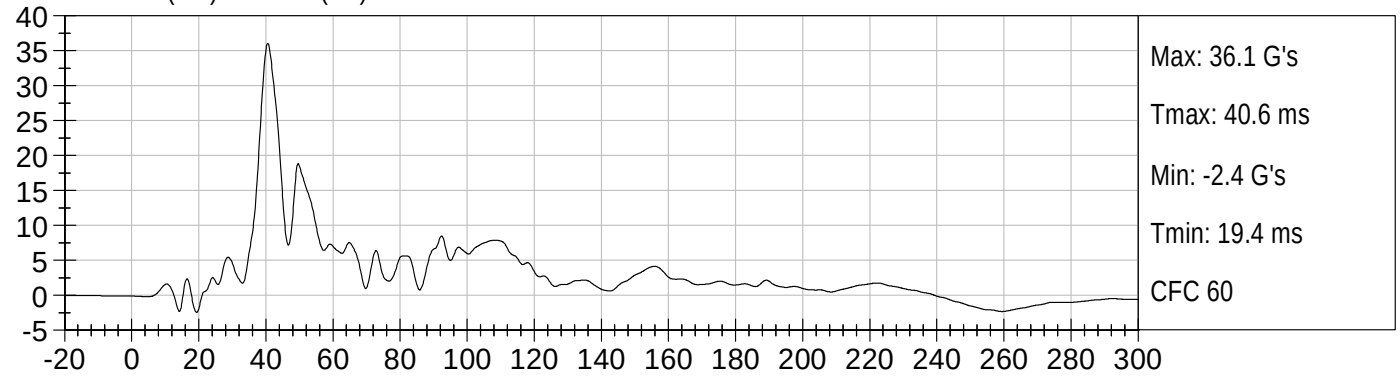
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

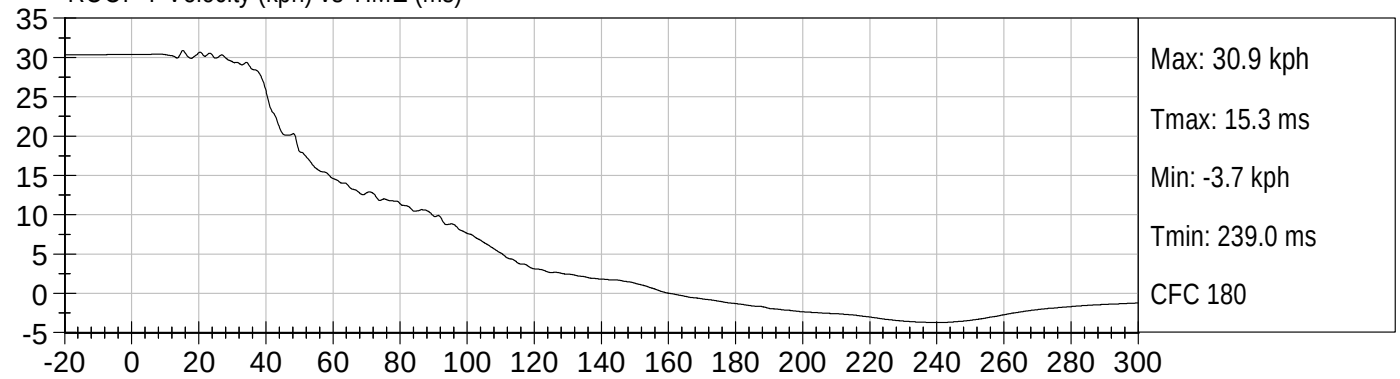




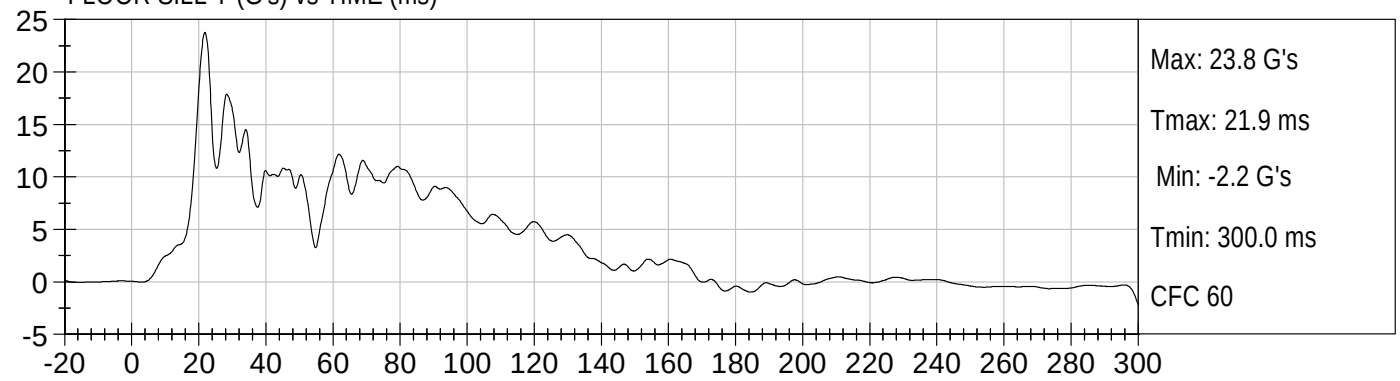
ROOF Y (G's) vs TIME (ms)



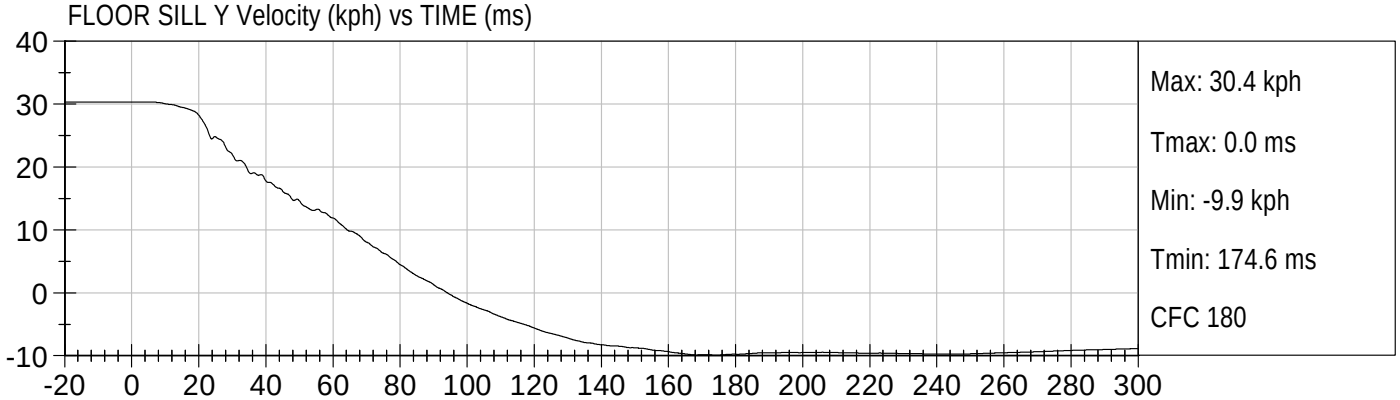
ROOF Y Velocity (kph) vs TIME (ms)



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



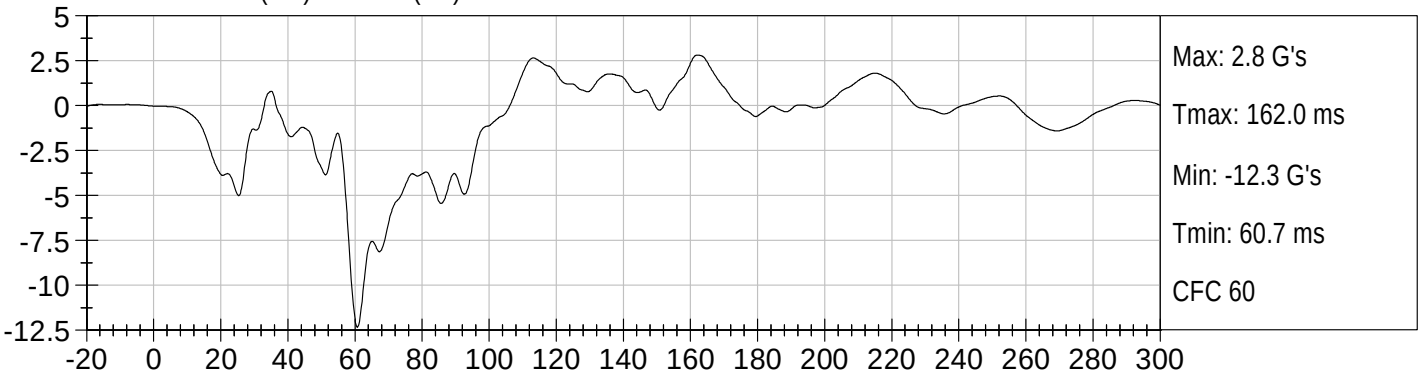
FLOOR SILL Y Velocity (kph) vs TIME (ms)



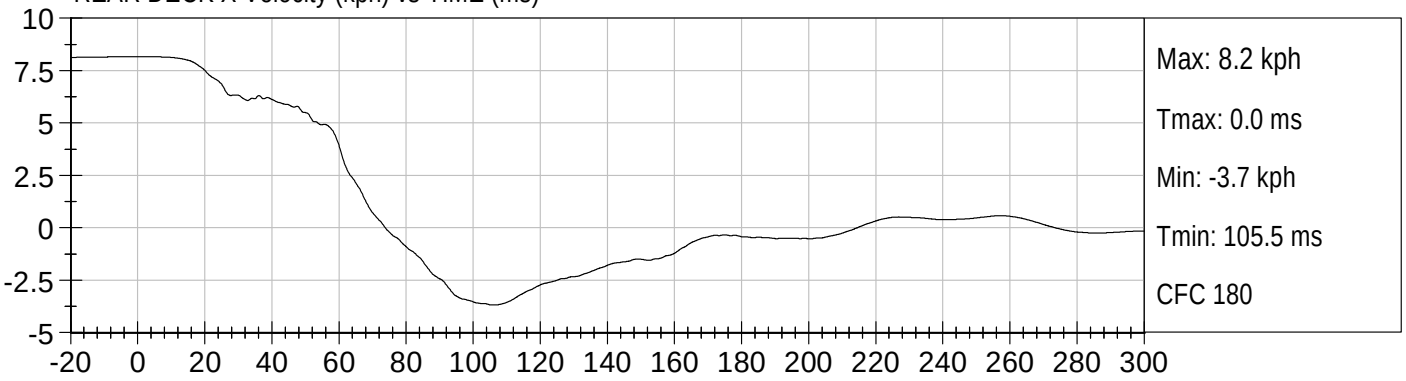
FMVSS 214 Rigid Pole Side Impact
2011 Ford Explorer - CB0205

Test Date: 05/03/2011
Speed: 19.5 mph (31.4 km/h)

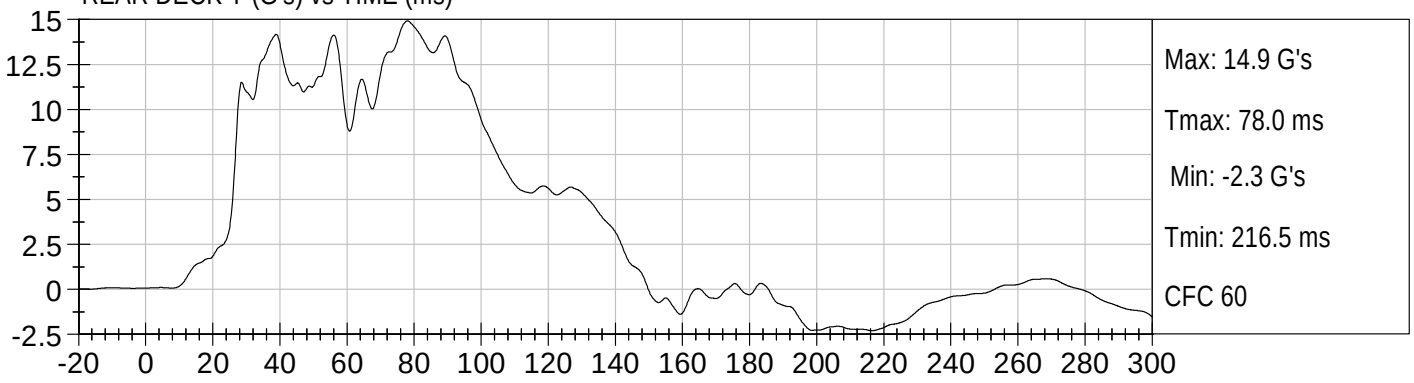
REAR DECK X (G's) vs TIME (ms)



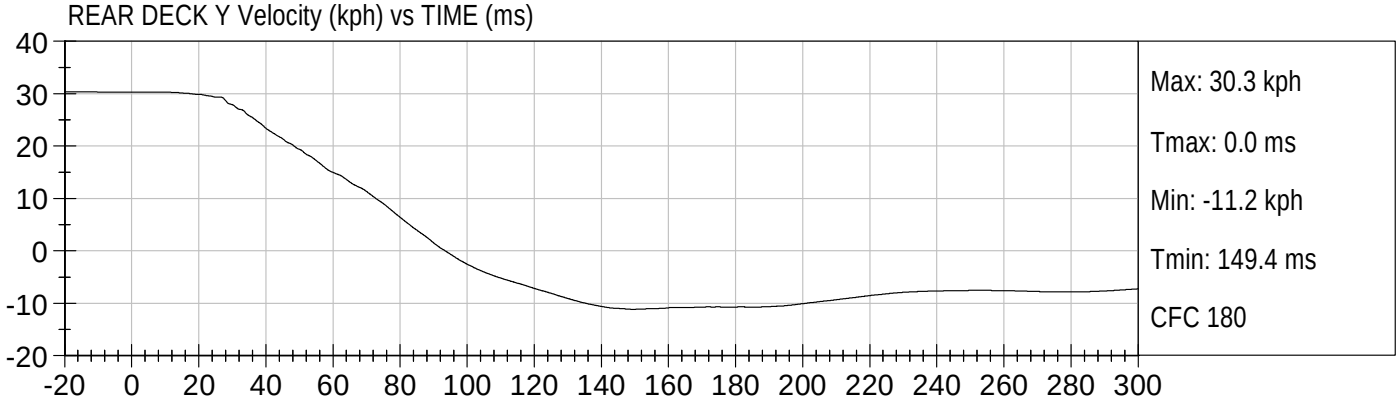
REAR DECK X Velocity (kph) vs TIME (ms)



REAR DECK Y (G's) vs TIME (ms)



REAR DECK Y Velocity (kph) vs TIME (ms)



APPENDIX D

DUMMY PERFORMANCE CALIBRATION TEST DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 016 **Test ID:** D111591

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	125 to 155	145	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

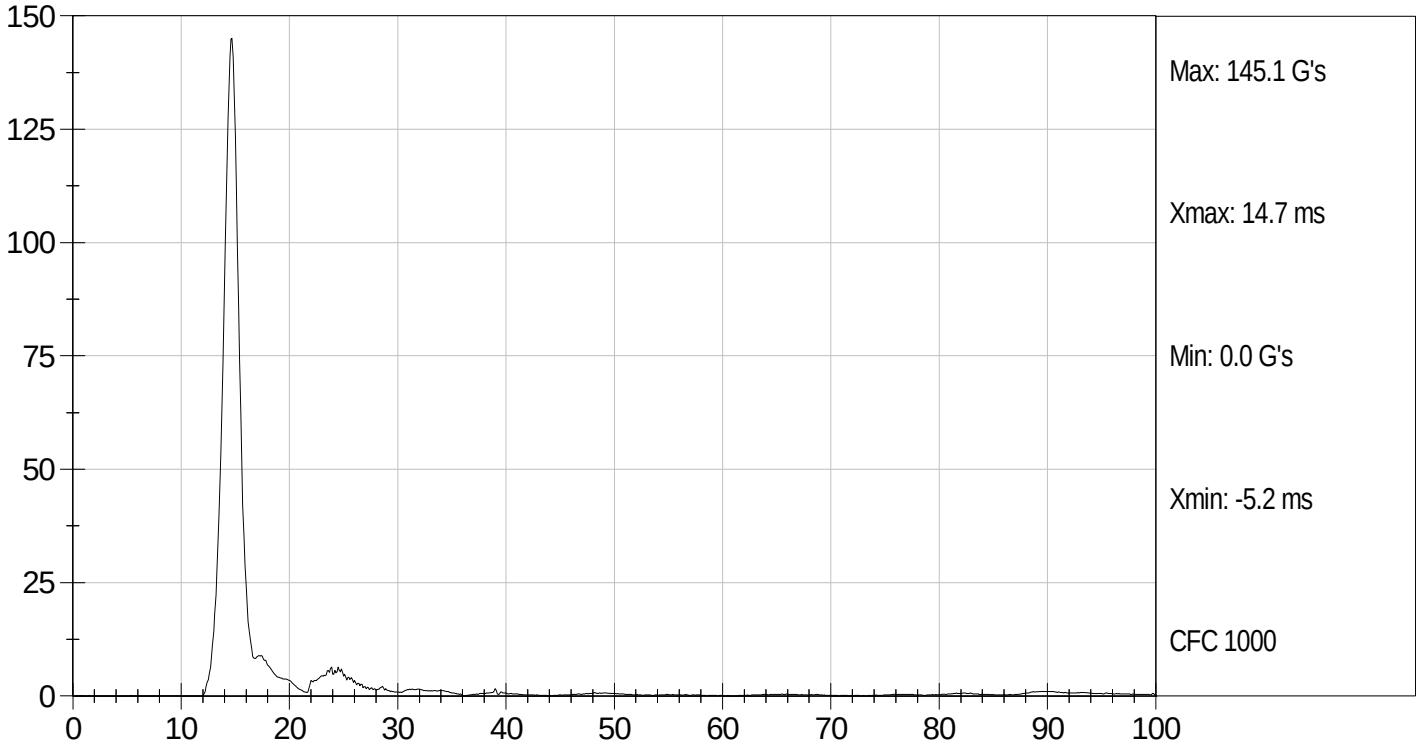
4/29/11
Test Date

David Winkelbauer
Approved By

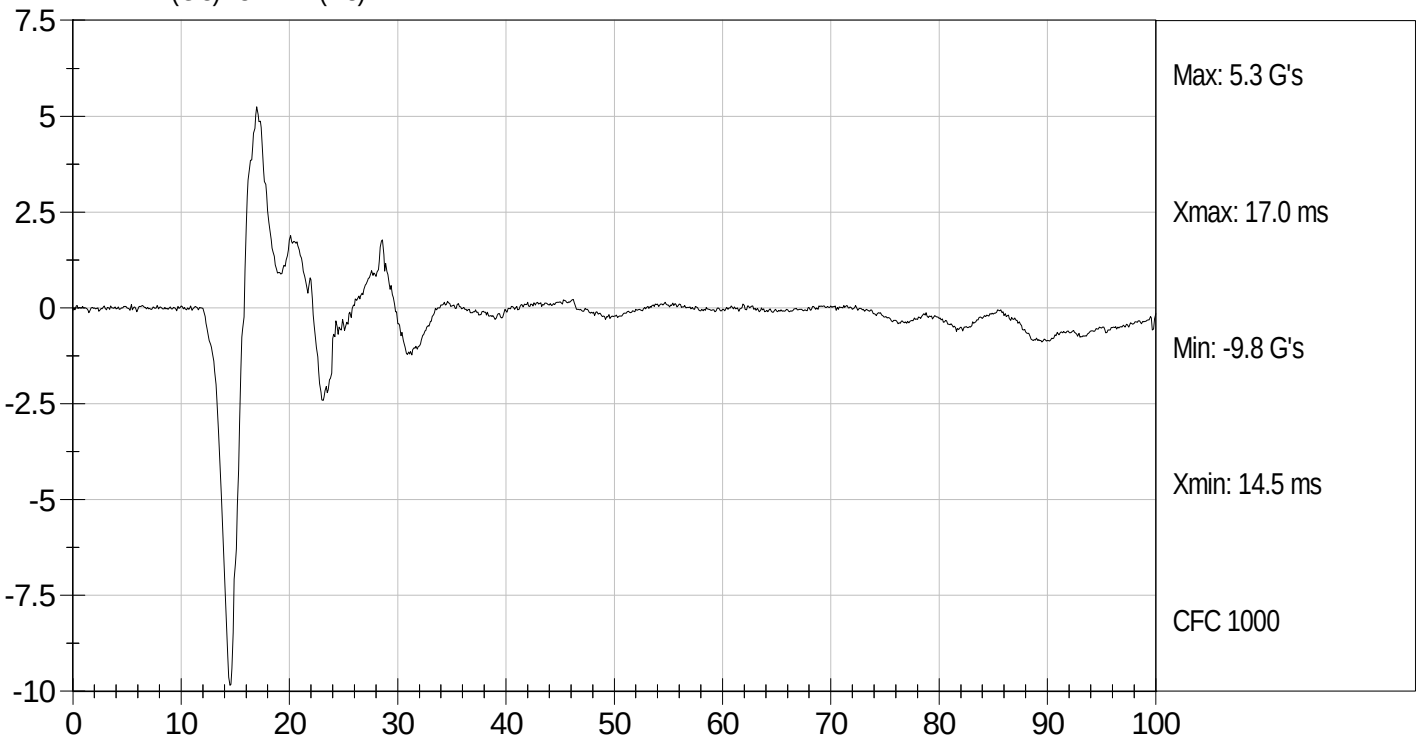
Test Desc: Head Drop
Component ID: D111591

Test Date: 4/29/11
Velocity: 0 ft/s, 0 m/s

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111592

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	33	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	-3.37	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.1	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	62.3	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	58.6	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

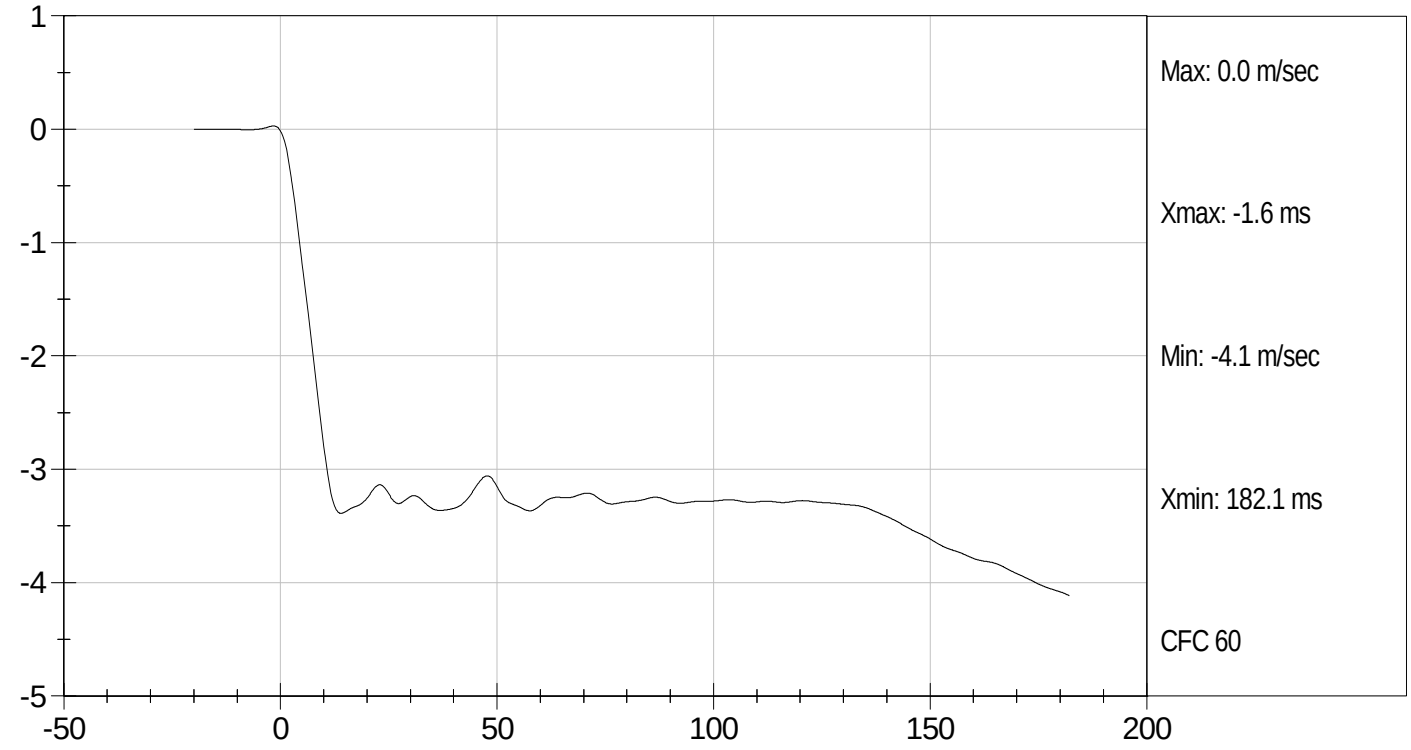
4/29/11
Test Date

David Winkelbauer
Approved By

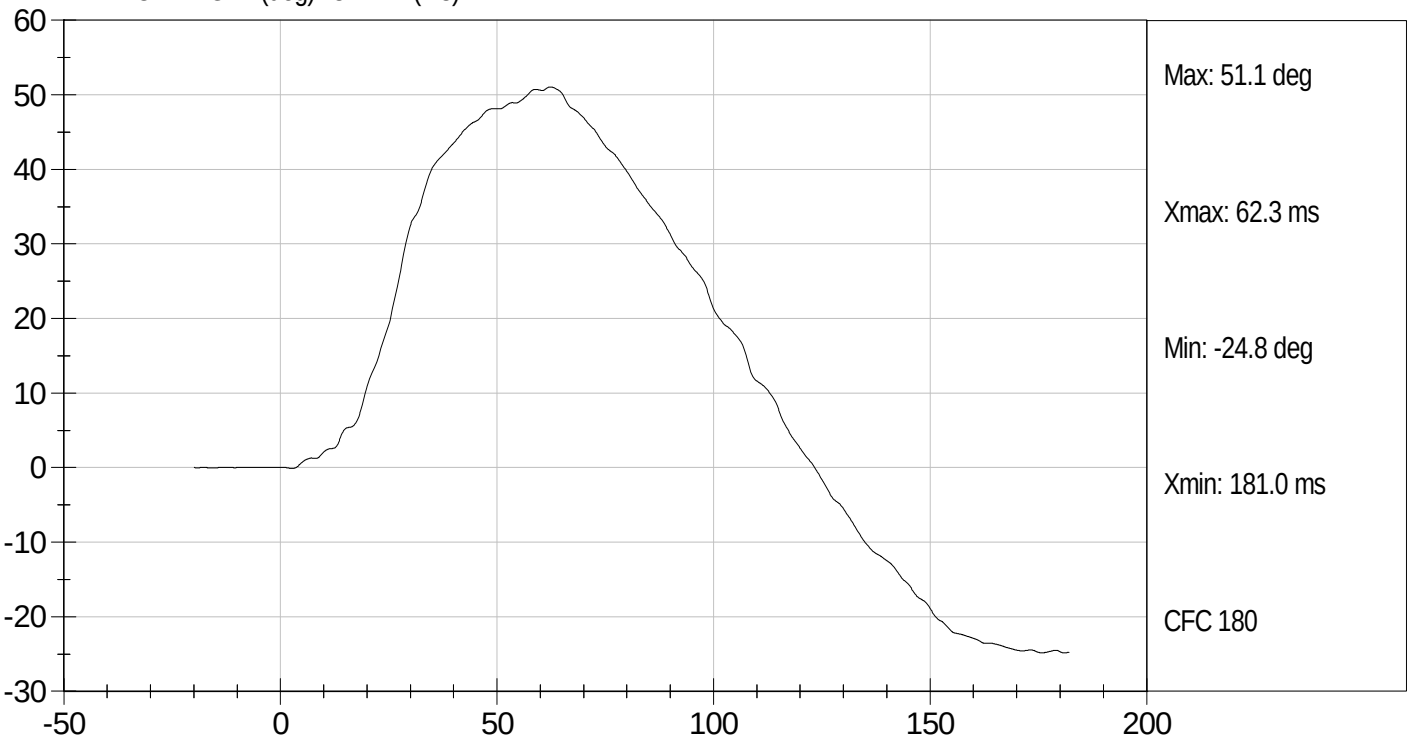
Test Desc: Neck Bending
Component ID: D111592

Test Date: 4/29/11
Velocity: 11.42 ft/s, 3.5 m/s

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



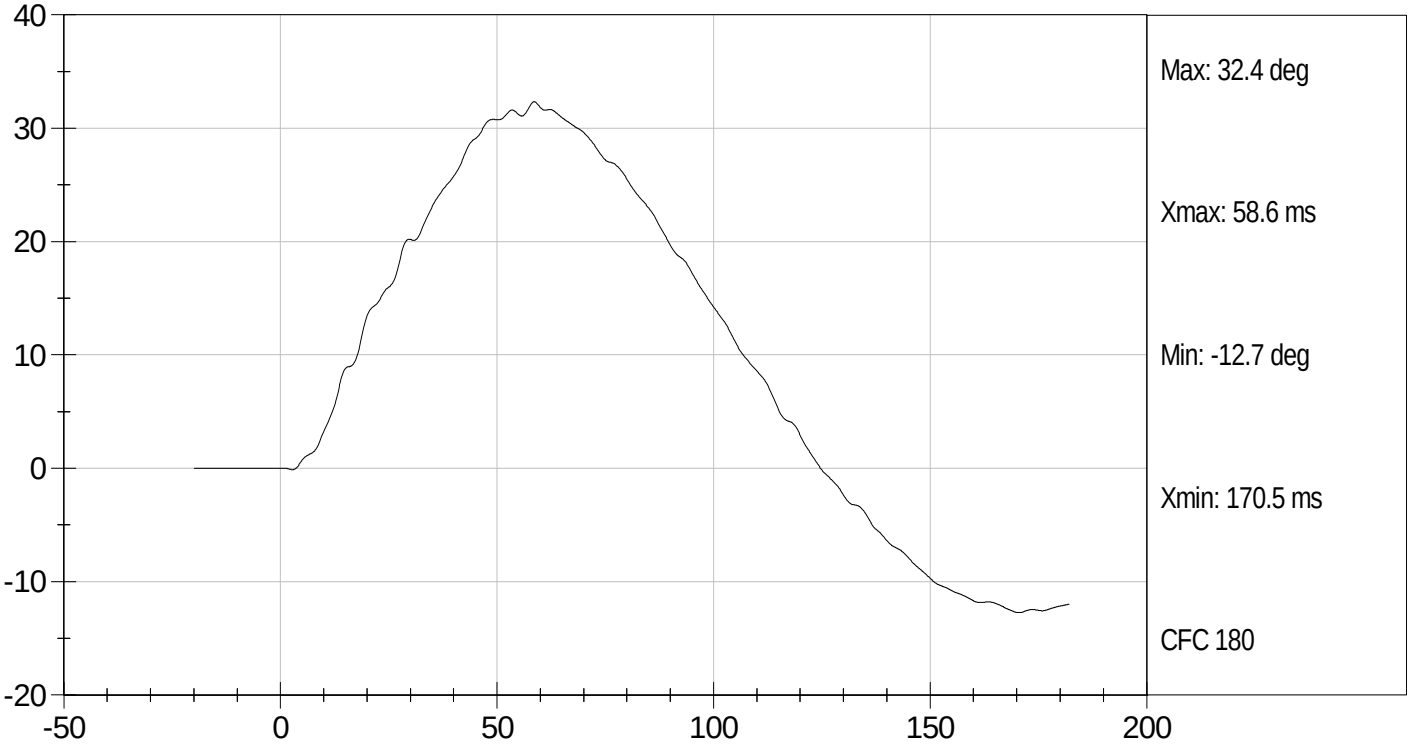
FLEXION ANGLE (deg) vs TIME (ms)



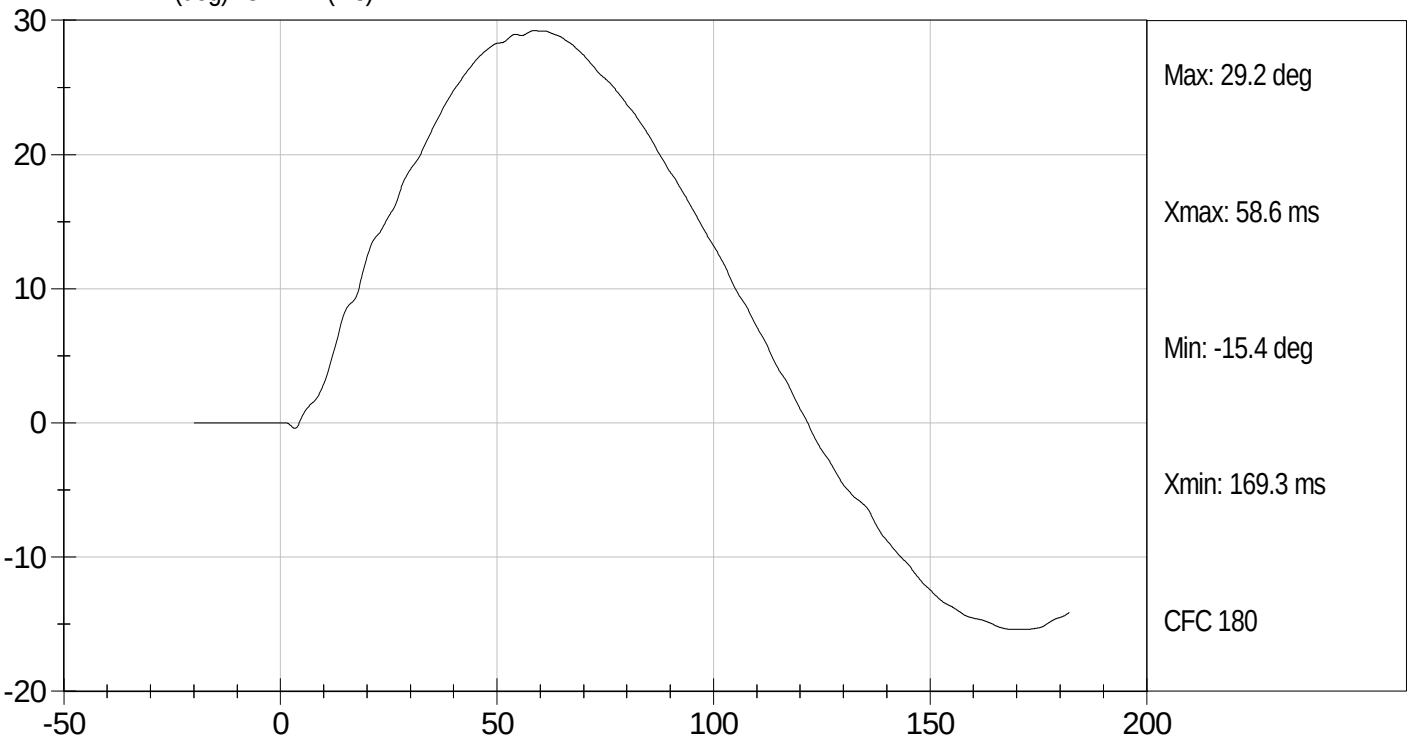
Test Desc: Neck Bending
Component ID: D111592

Test Date: 4/29/11
Velocity: 11.42 ft/s, 3.5 m/s

THETA A (deg) vs TIME (ms)



THETA B (deg) vs TIME (ms)



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111593

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	32	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	8.8	Pass
Time of Peak Shoulder Acceleration	ms	NA	18.5	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

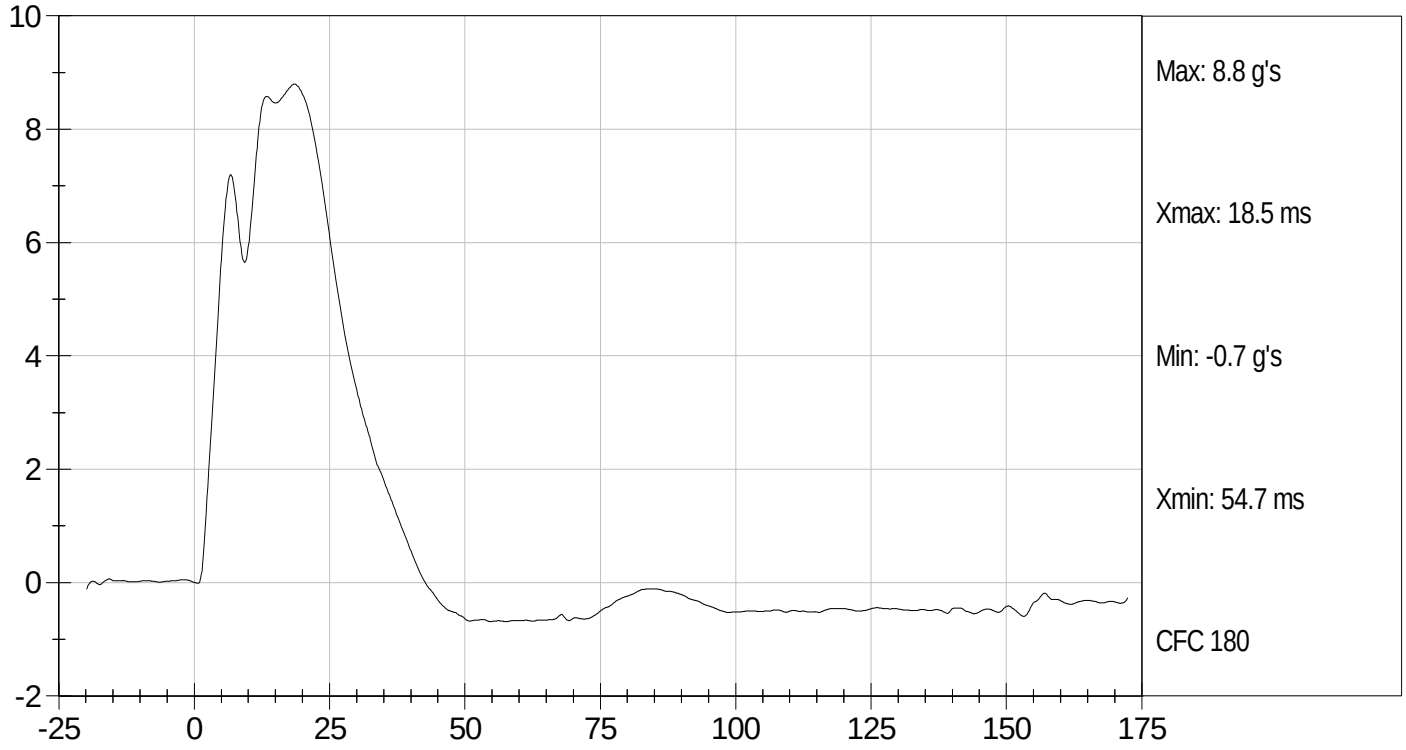
4/29/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D111593

Test Date: 4/29/11
Velocity: 14.24 ft/s, 4.3 m/s

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



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111594

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	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.7	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.6	Pass
		Overall Test Results		Pass

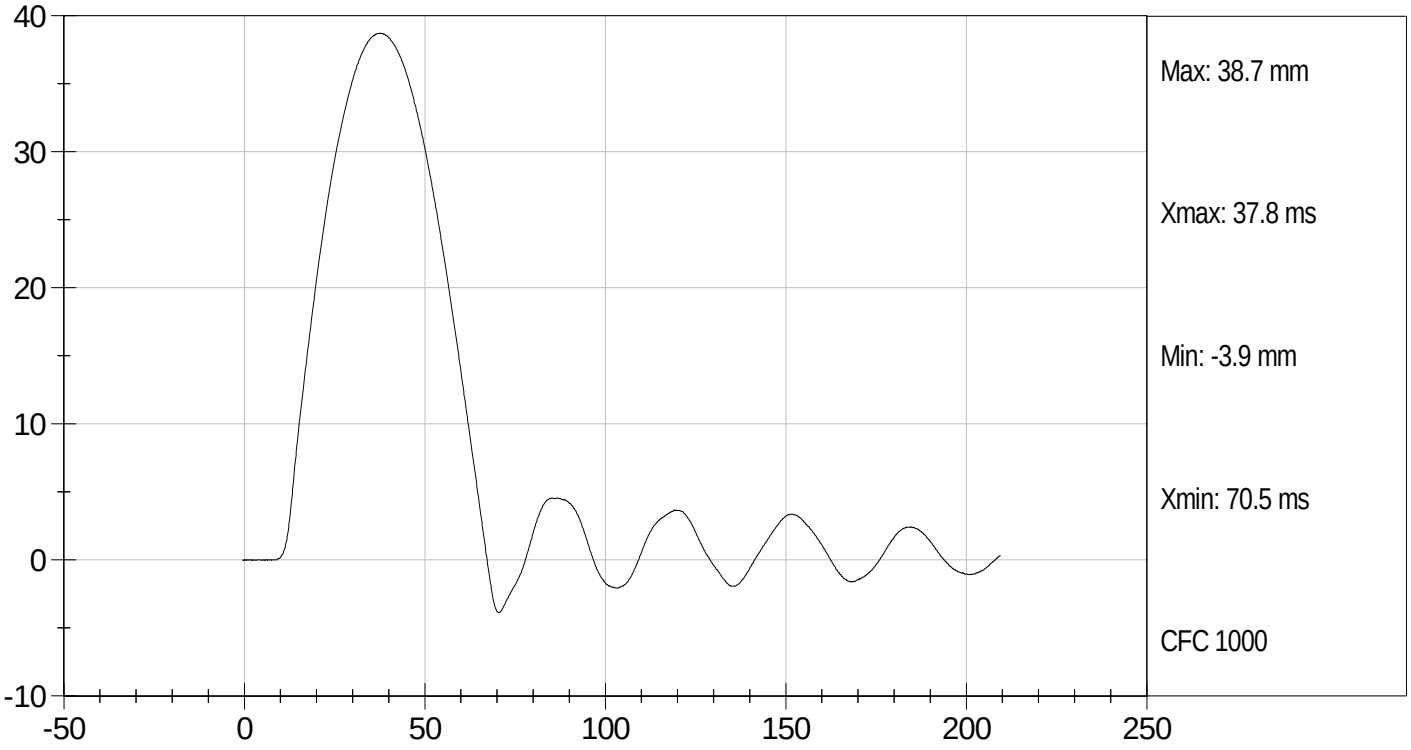
Jessica Hall
Laboratory Technician

4/29/11
Test Date

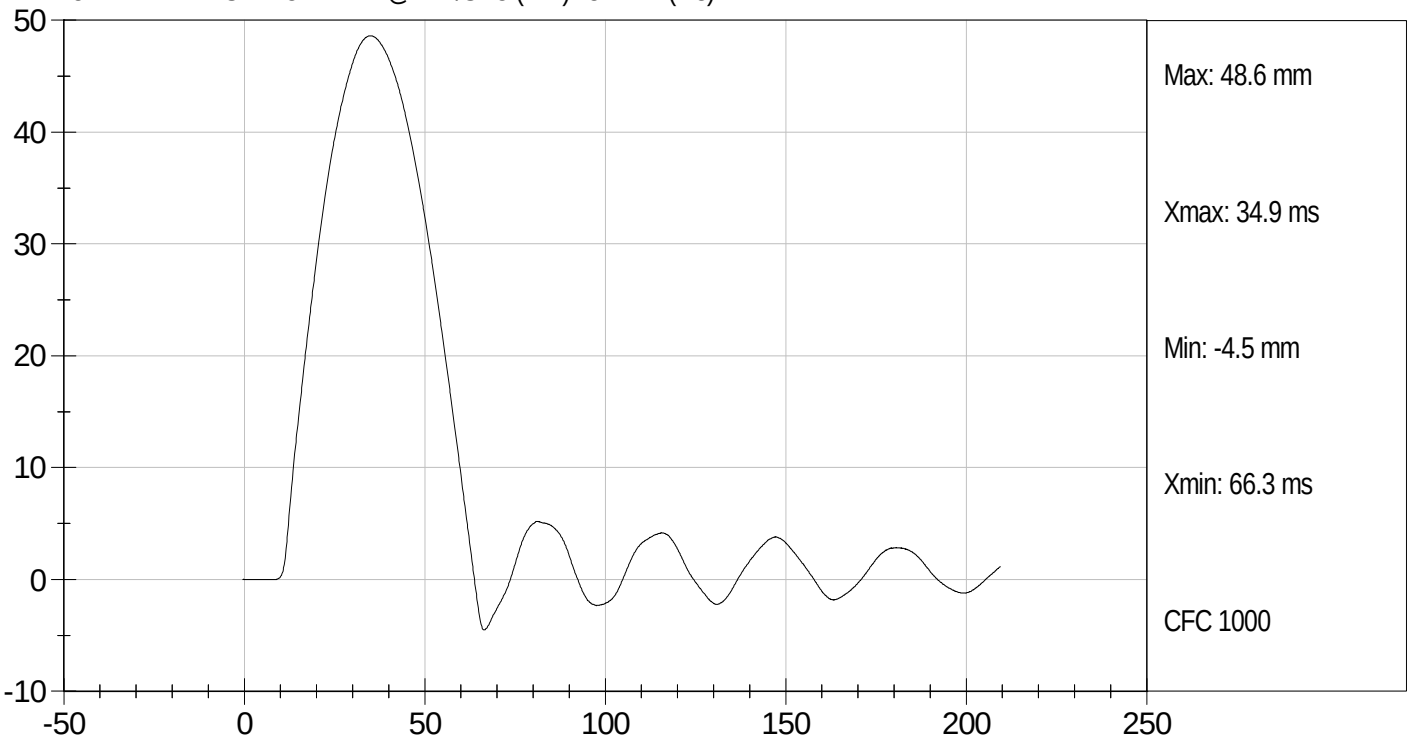
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D111594
Test Date: 4/29/11

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:** D111595

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	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.0	Pass
		Overall Test Results		Pass

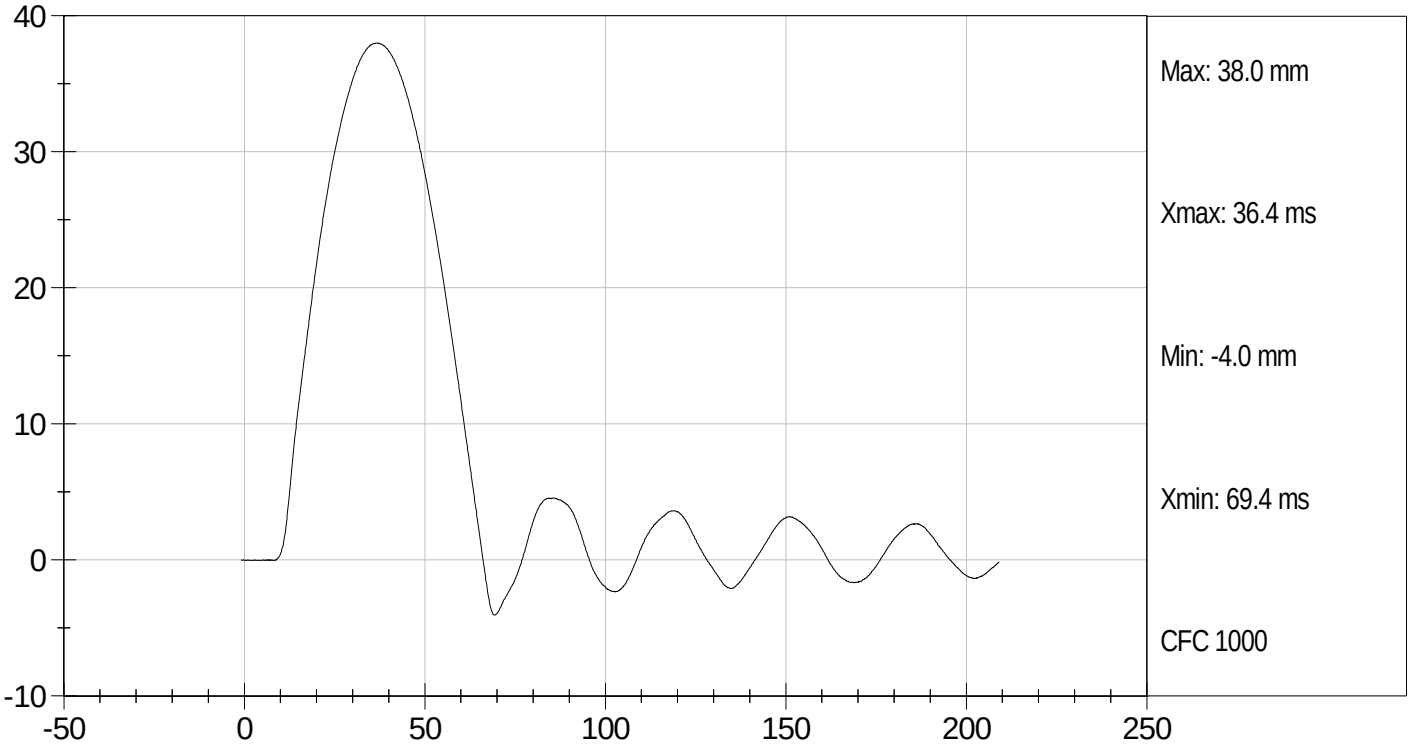
Jessica Hall
Laboratory Technician

4/29/11
Test Date

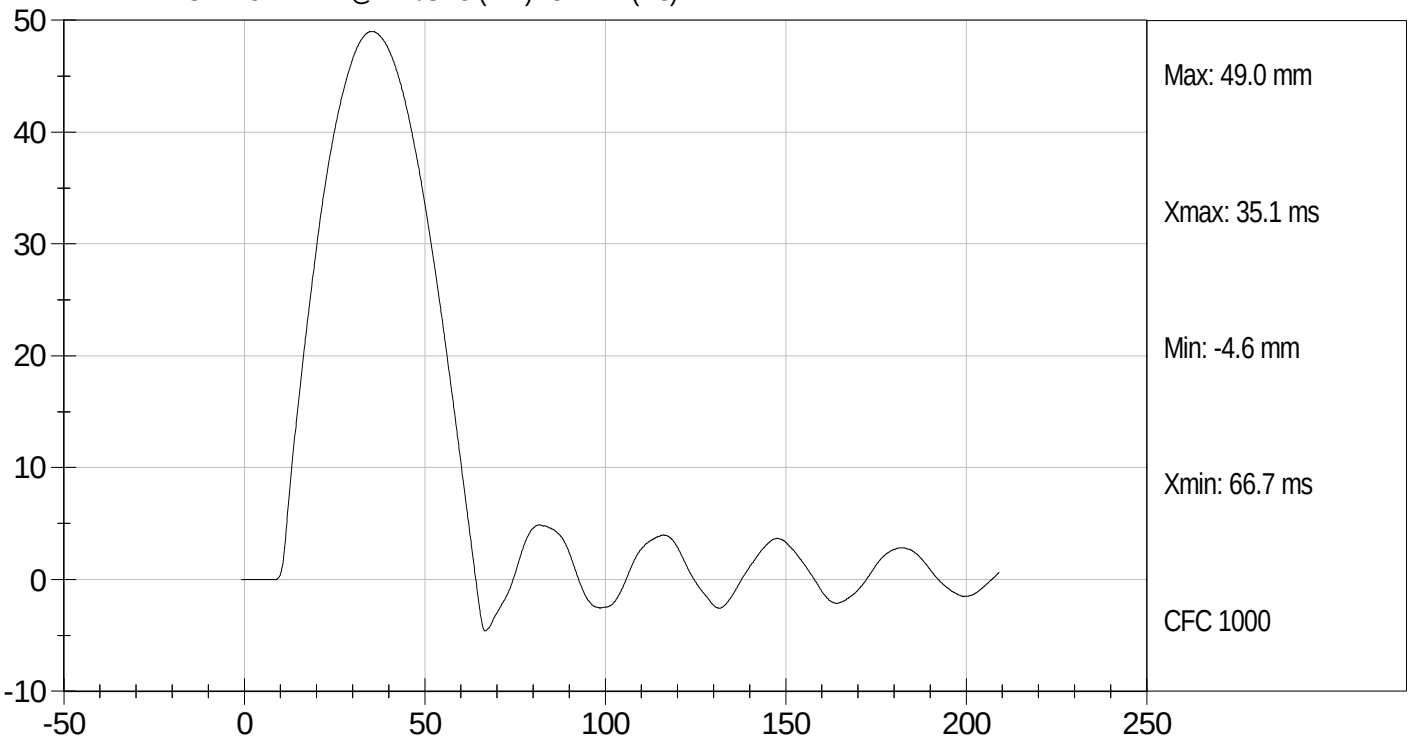
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D111595
Test Date: 4/29/11

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:** D111596

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	32	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.6	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.4	Pass
		Overall Test Results		Pass

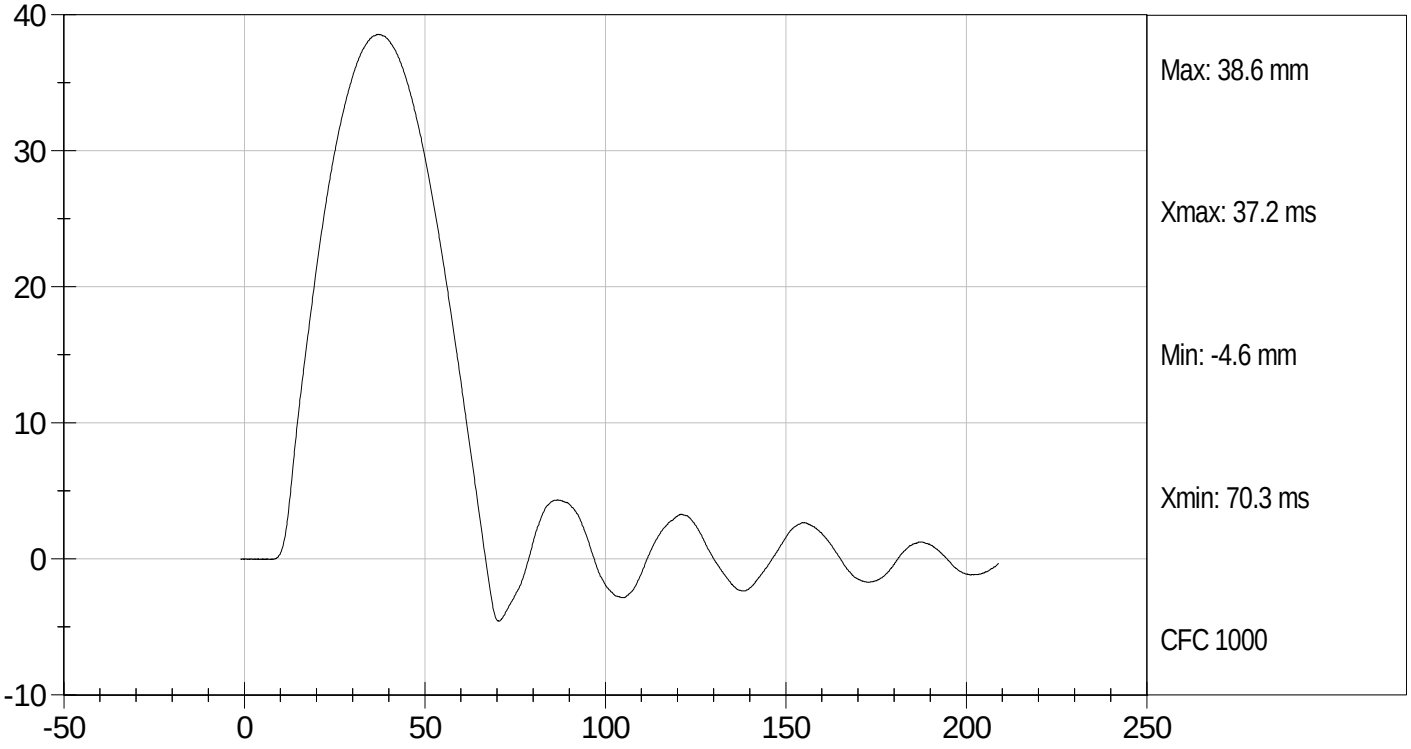
Jessica Hall
Laboratory Technician

4/29/11
Test Date

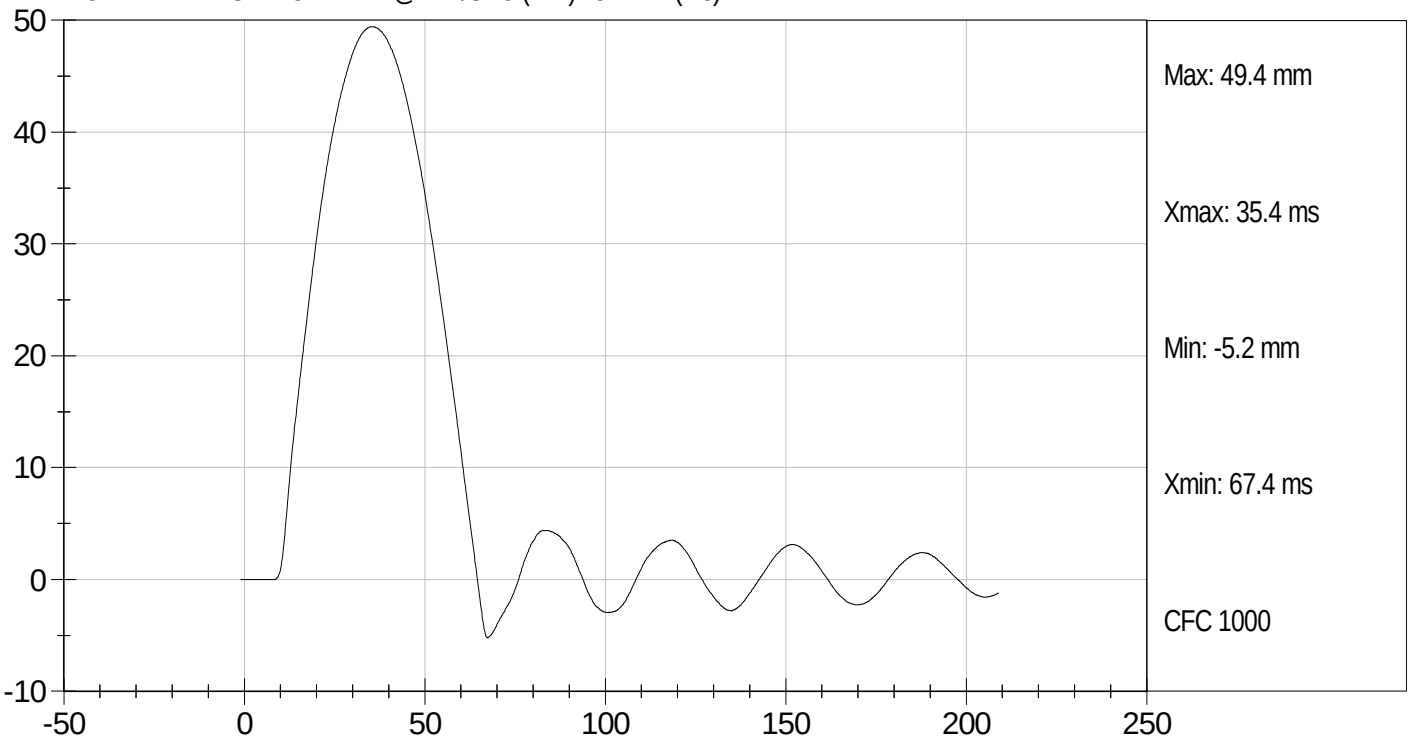
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D111596
Test Date: 4/29/11

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:** D111597

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	32	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.22	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.50	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.60	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	11.40	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

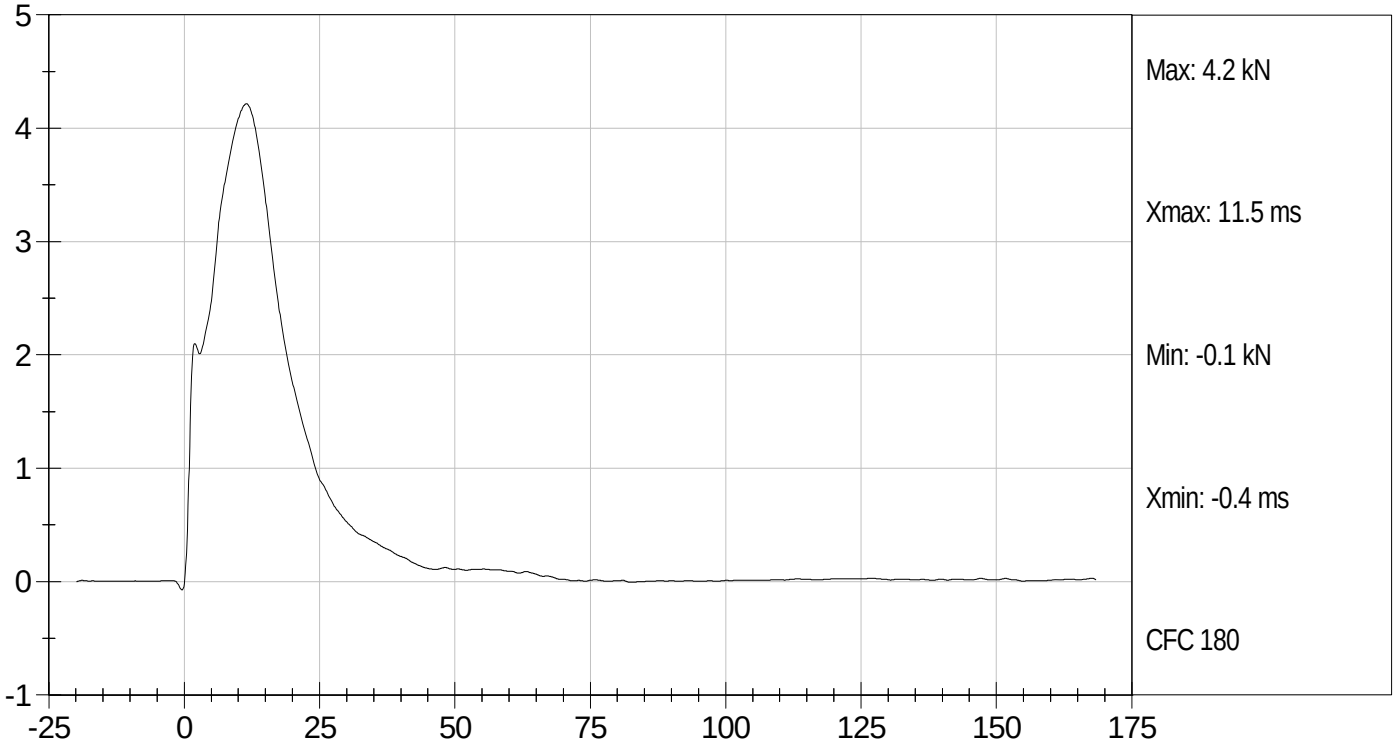
4/29/11
Test Date

David Winkelbauer
Approved By

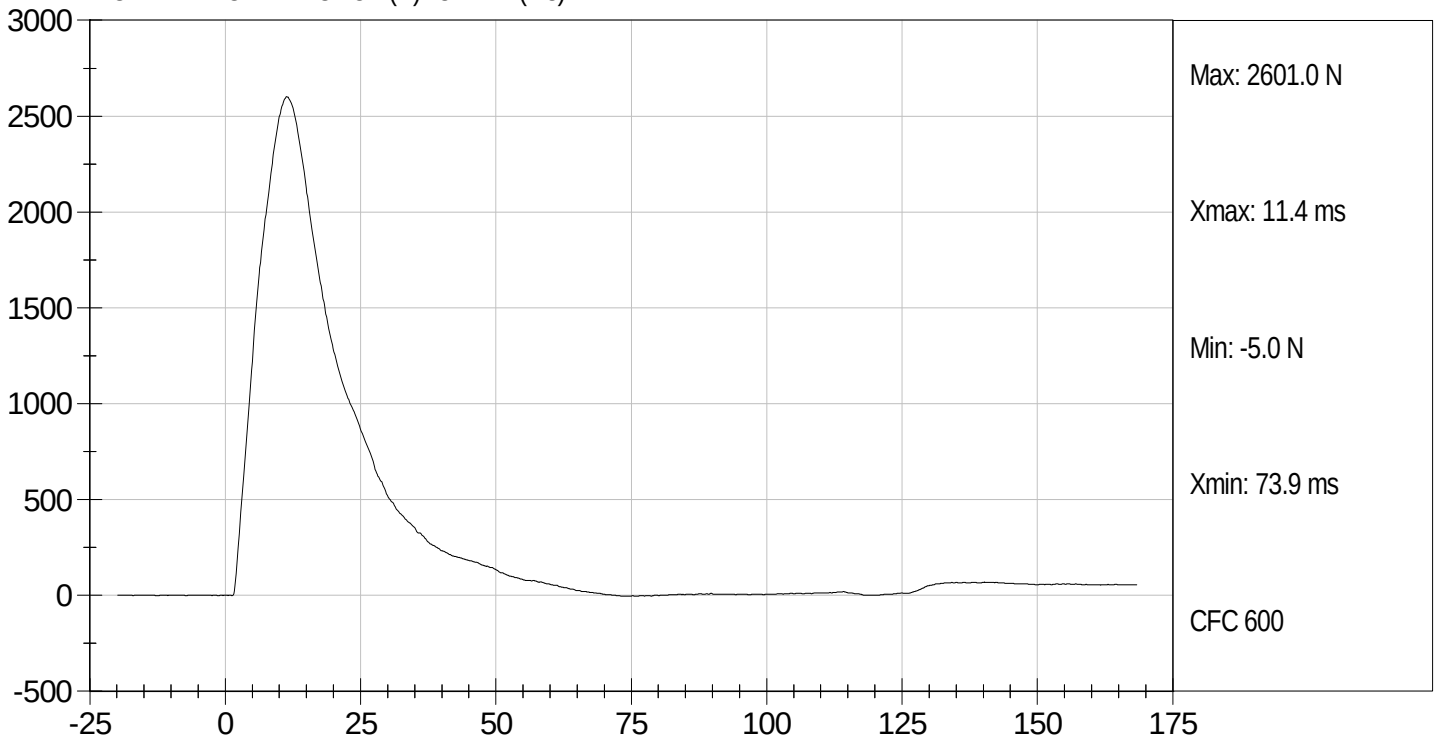
Test Desc: Abdomen Impact
Component ID: D111597

Test Date: 4/29/11
Velocity: 13.44 ft/s, 4.1 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111598

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	33	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	-5.80	Pass
	30 ms	m/s	>= -6.5	-6.07	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	46.0	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.4	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

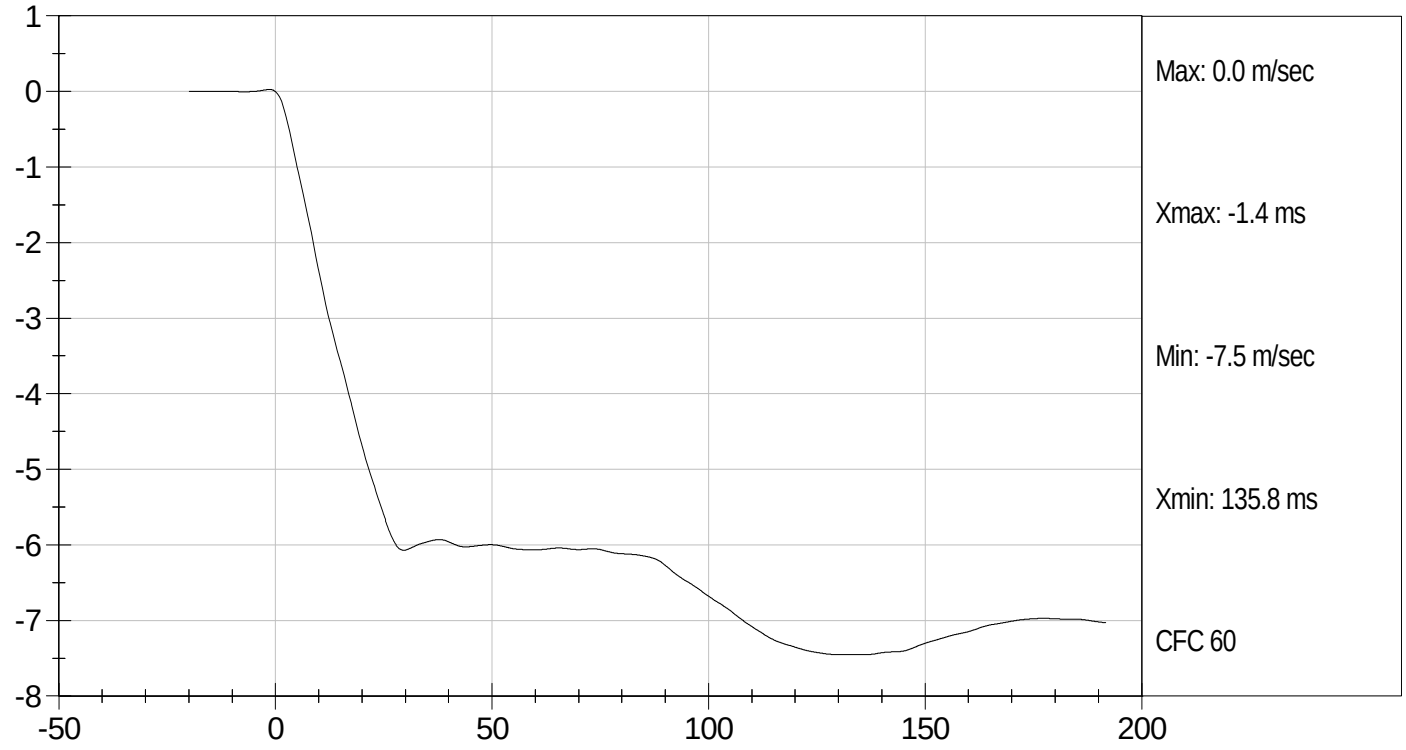
4/29/11
Test Date

David Winkelbauer
Approved By

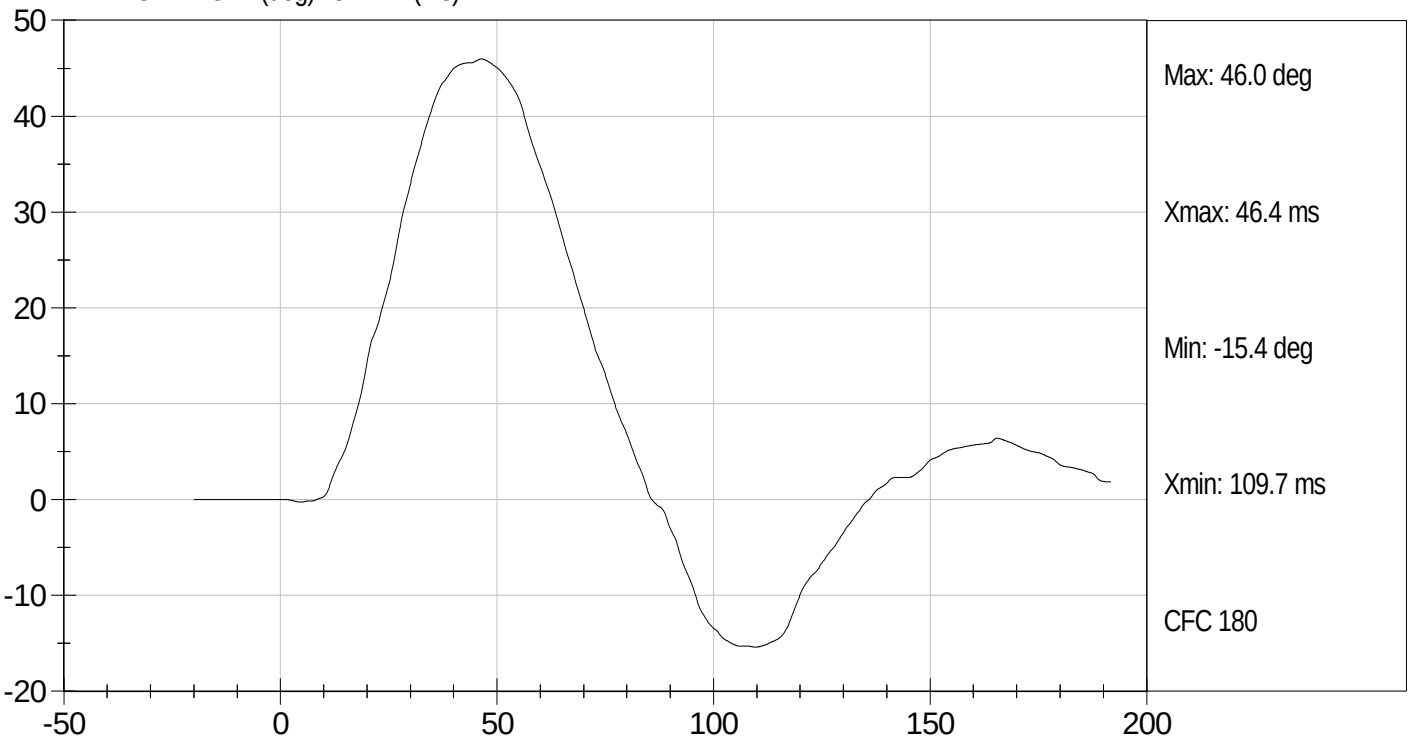
Test Desc: Lumbar Bending
Component ID: D111598

Test Date: 4/29/11
Velocity: 20.08 ft/s, 6.12 m/s

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



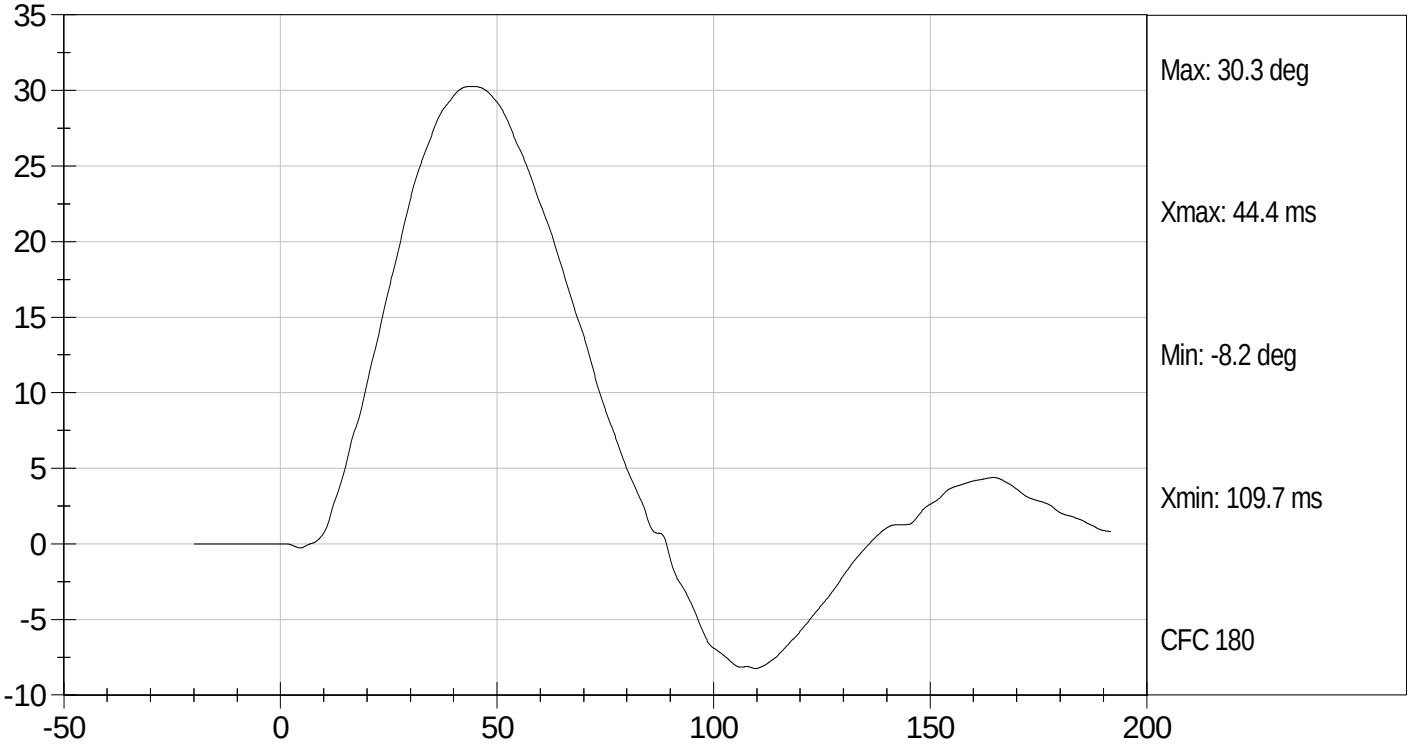
FLEXION ANGLE (deg) vs TIME (ms)



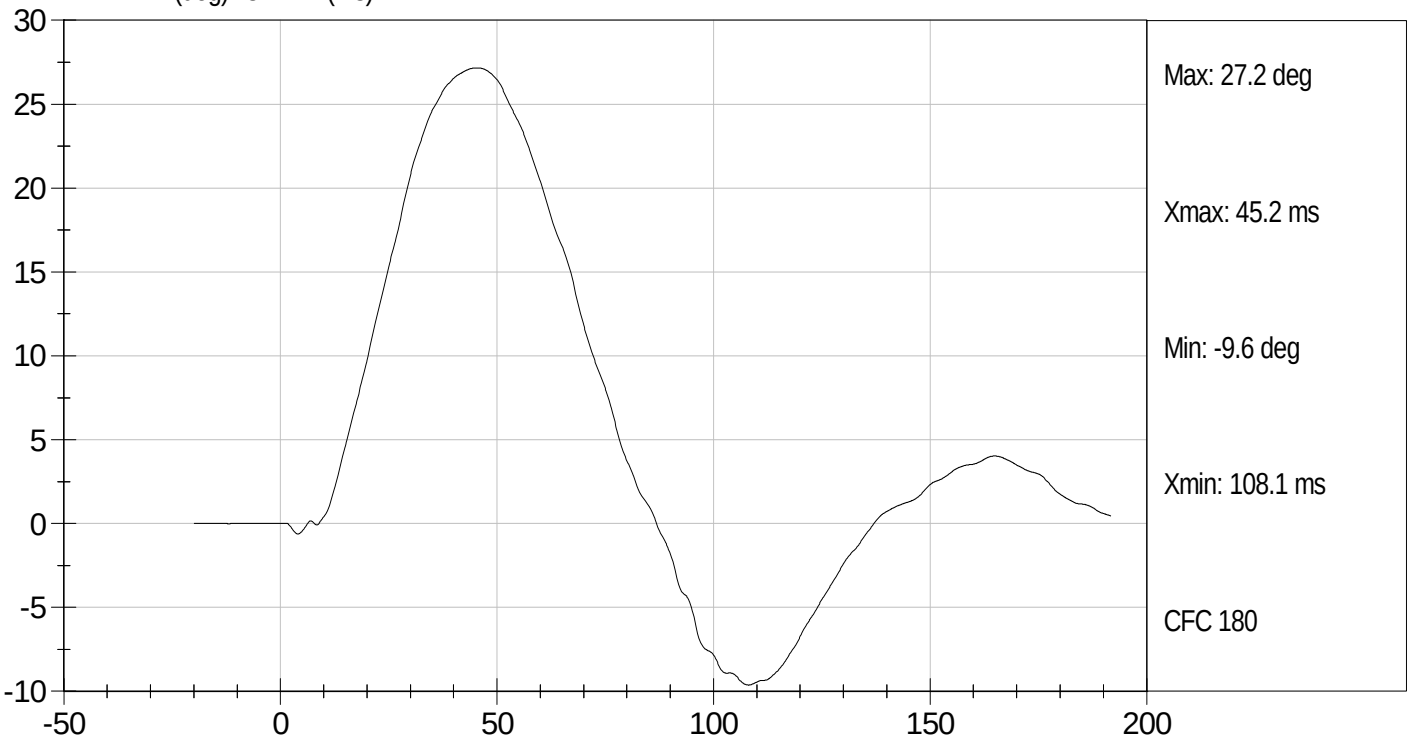
Test Desc: Lumbar Bending
Component ID: D111598

Test Date: 4/29/11
Velocity: 20.08 ft/s, 6.12 m/s

THETA A (deg) vs TIME (ms)



THETA B (deg) vs TIME (ms)



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111599

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	32	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.74	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.40	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.35	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	15.70	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

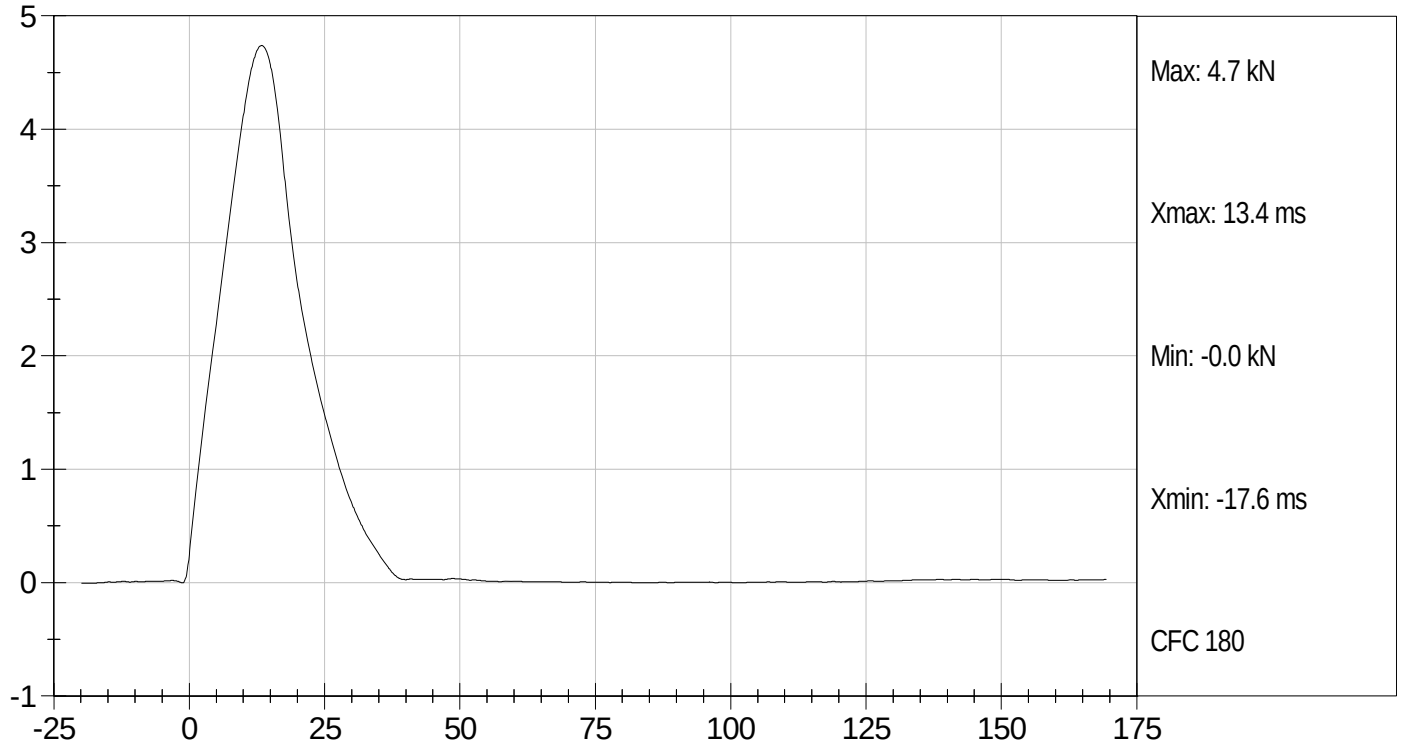
4/29/11
Test Date

David Winkelbauer
Approved By

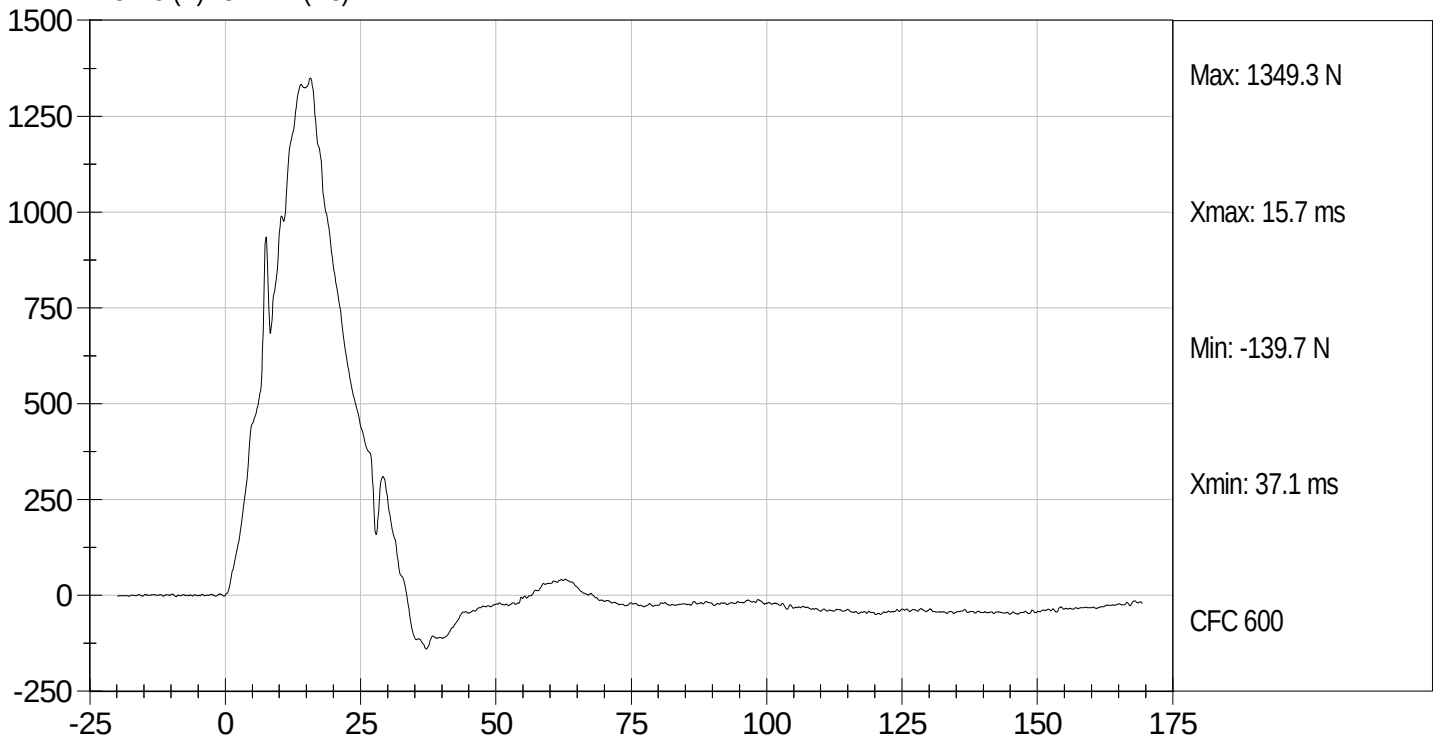
Test Desc: Pelvis Impact
Component ID: D111599

Test Date: 4/29/11
Velocity: 14.24 ft/s, 4.34 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111590

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	32	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	5.15	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.4	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.1	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.4	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

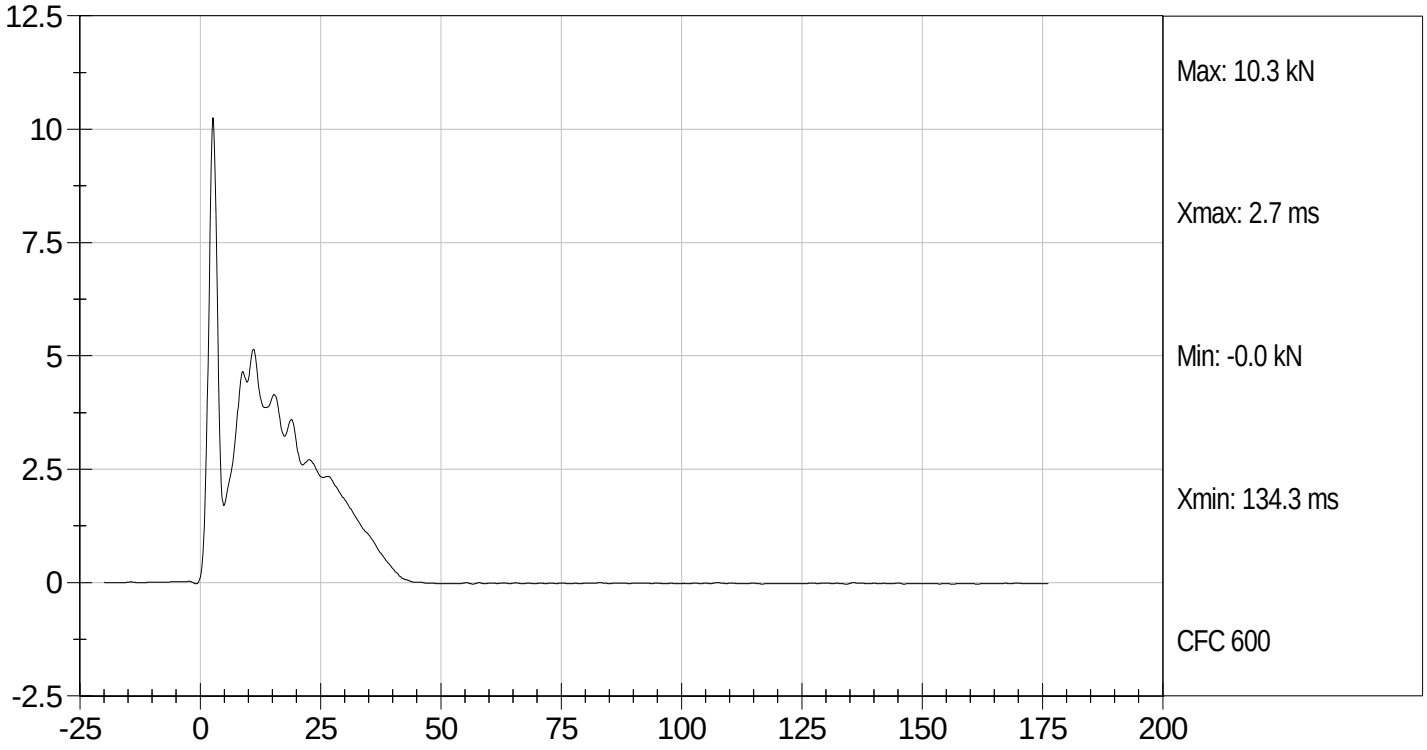
4/29/11
Test Date

David Winkelbauer
Approved By

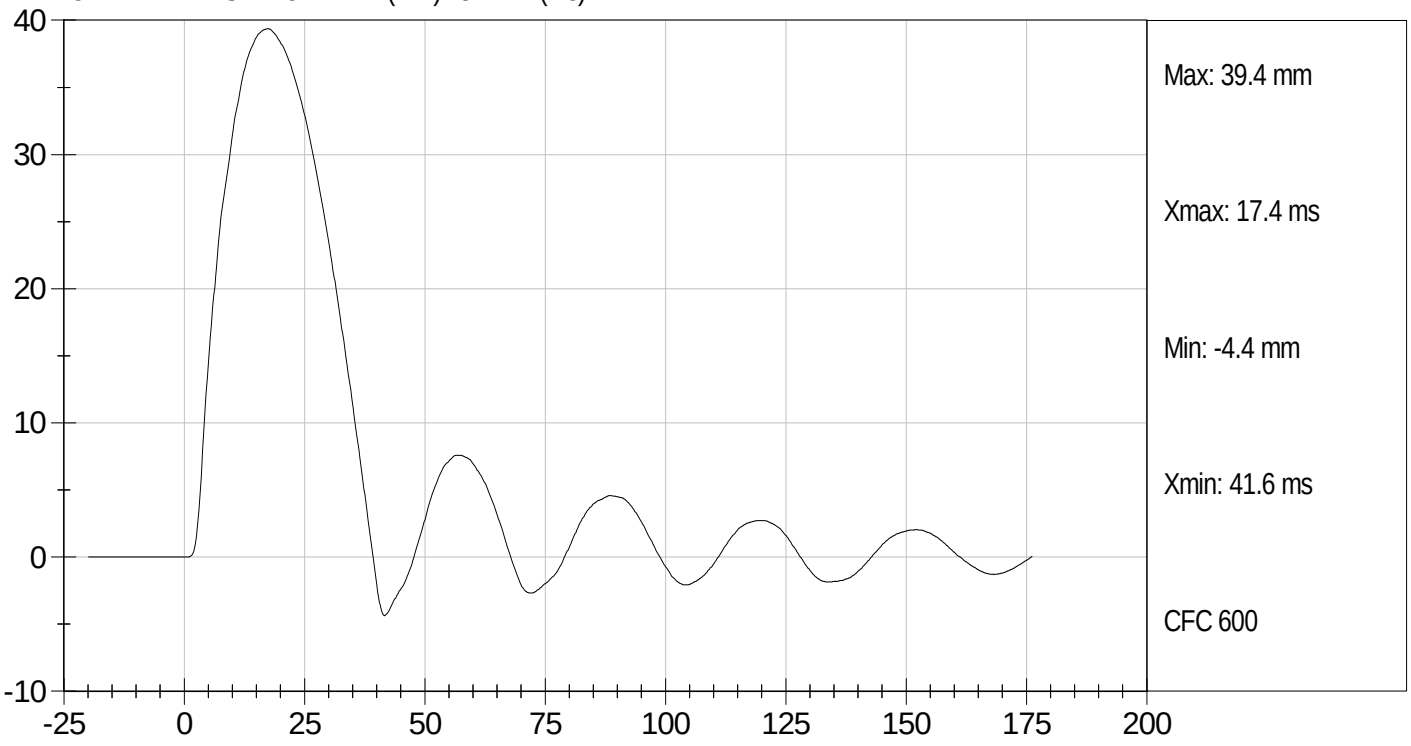
Test Desc: Thorax Impact
Component ID: D111590

Test Date: 4/29/11
Velocity: 18.31 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



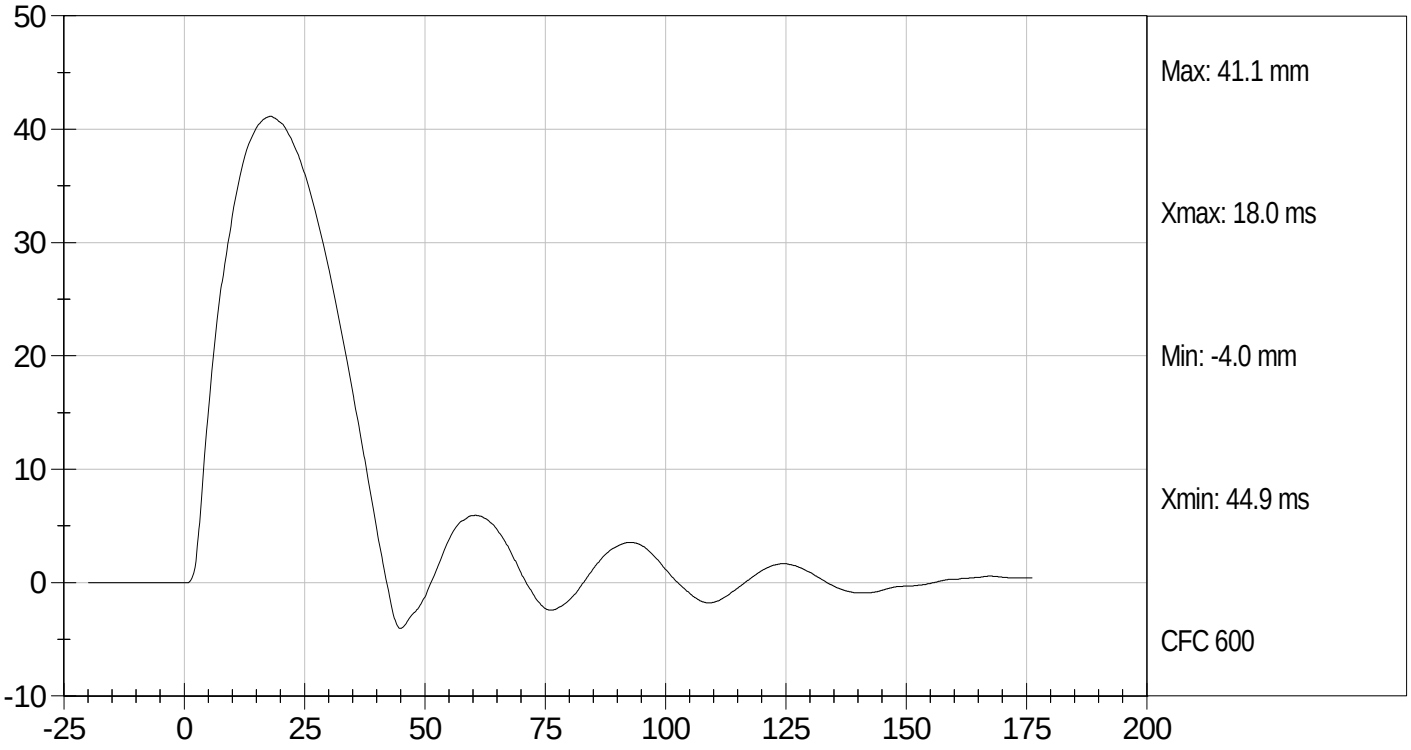
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



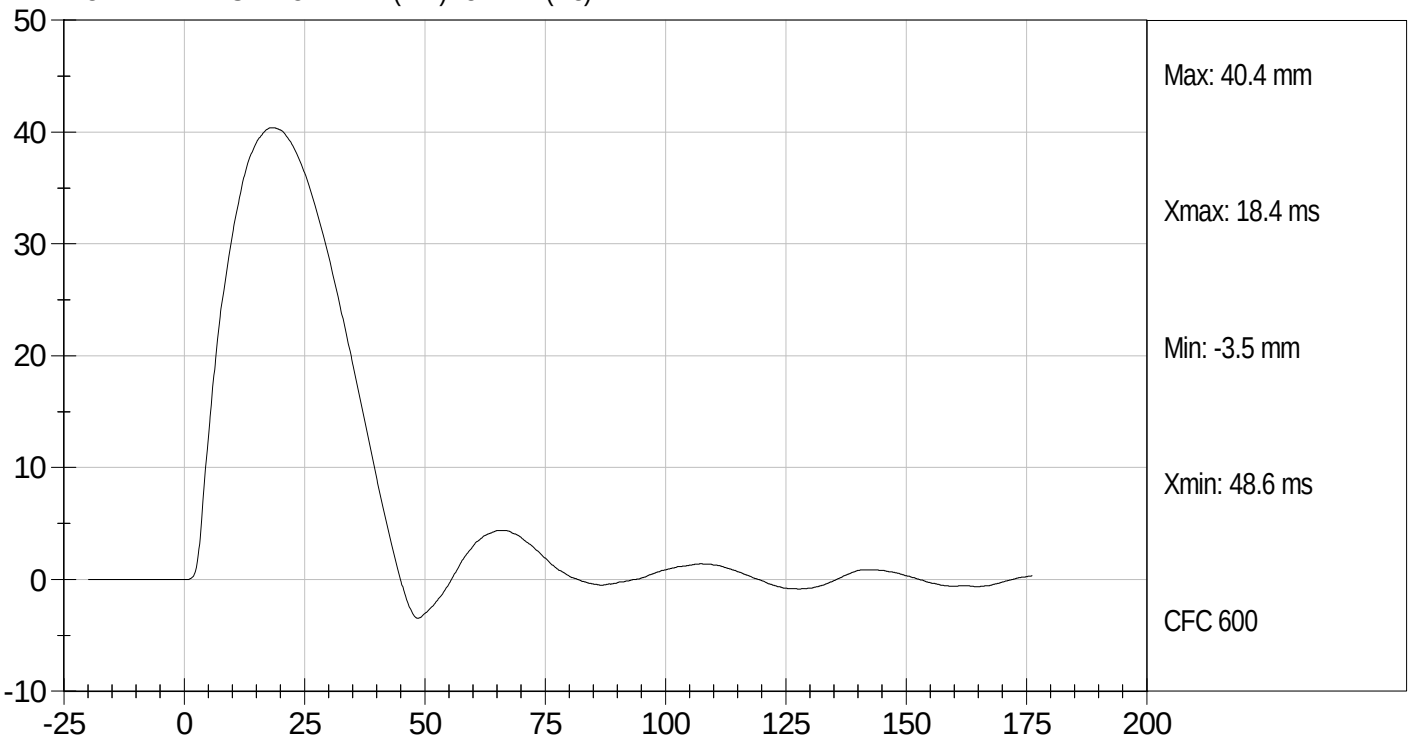
Test Desc: Thorax Impact
Component ID: D111590

Test Date: 4/29/11
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:** D111641

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	125 to 155	149	Pass
Peak Lateral Acceleration	G's	+/- 15	-7.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

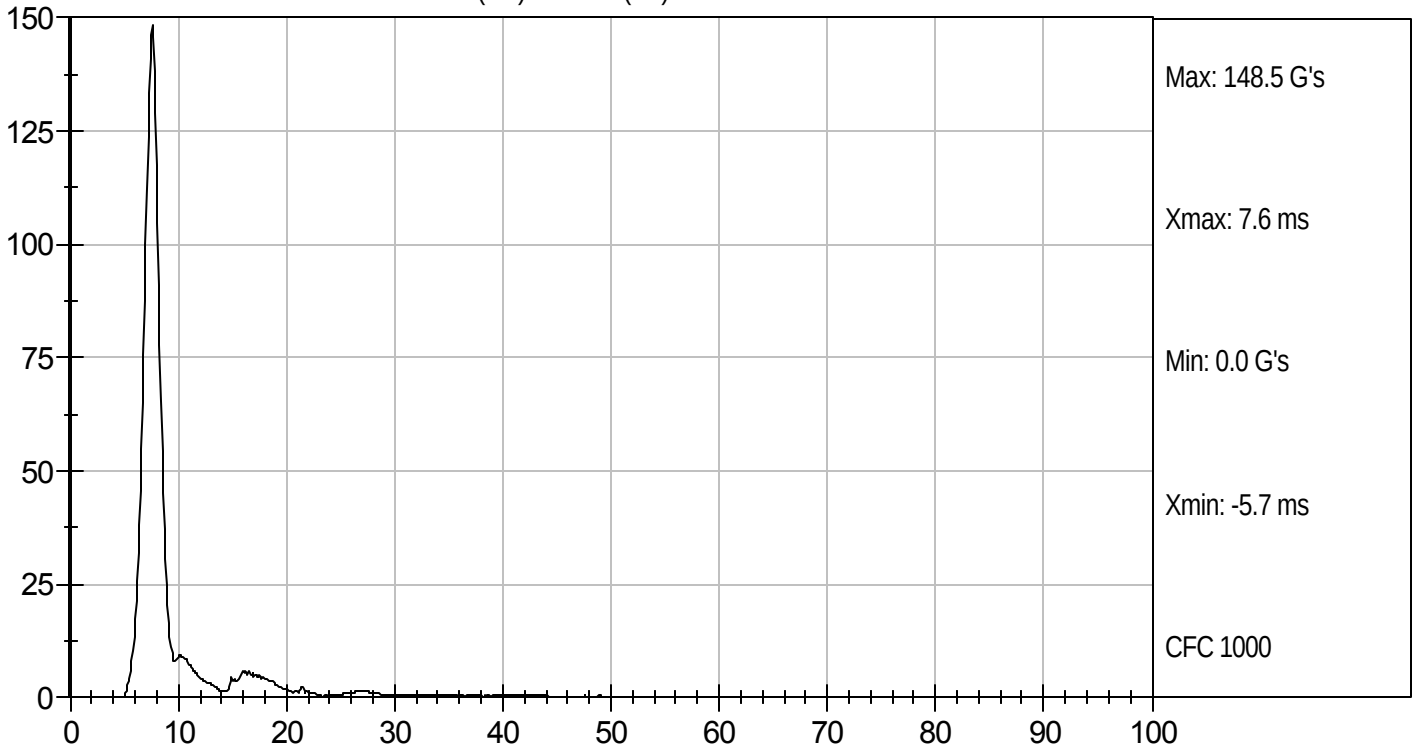
5/3/11
Test Date

David Winkelbauer
Approved By

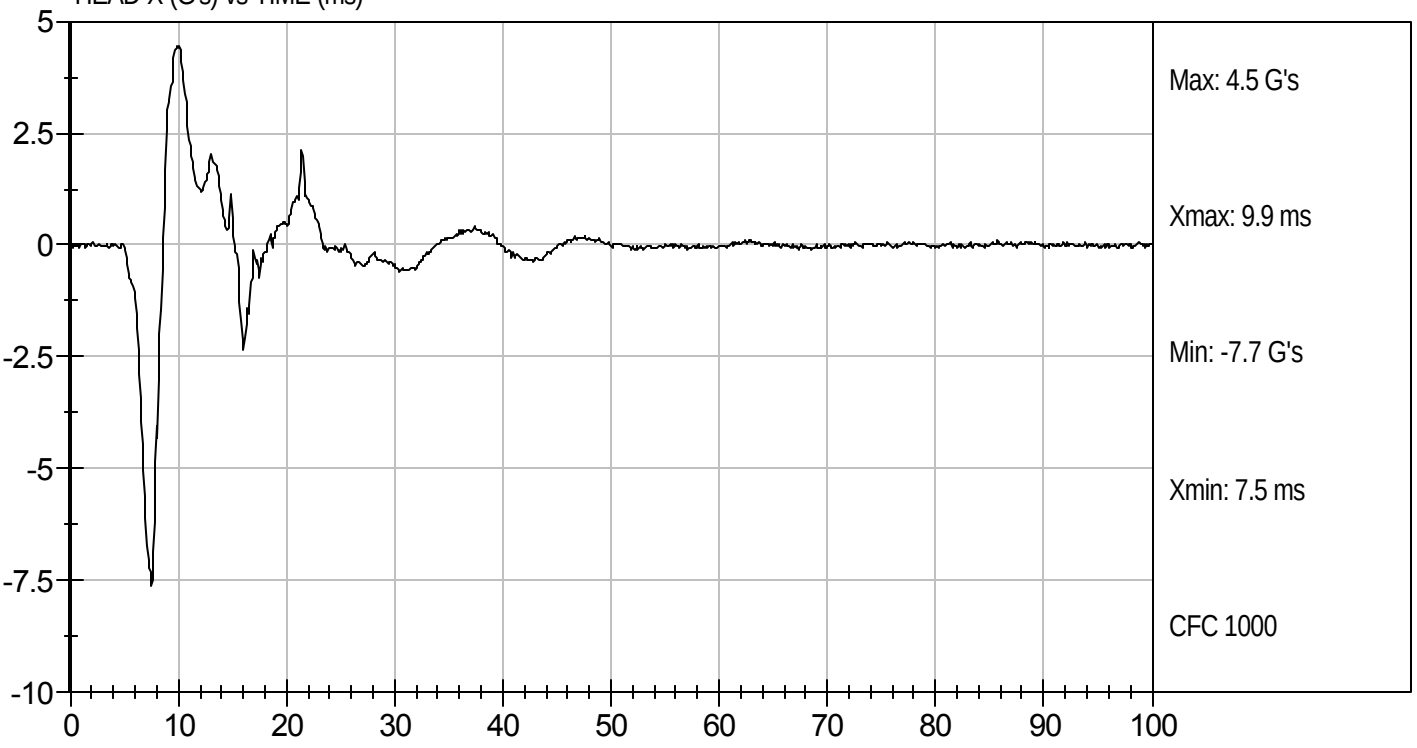
Test Desc: Head Drop
Component ID: D111641

Test Date: 5/3/11
Velocity: 0 ft/s, 0 m/s

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



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



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111642

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	25	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	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.32	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	60.7	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	60.9	Pass
			Overall Test Results		Pass

Jessica Gall
Laboratory Technician

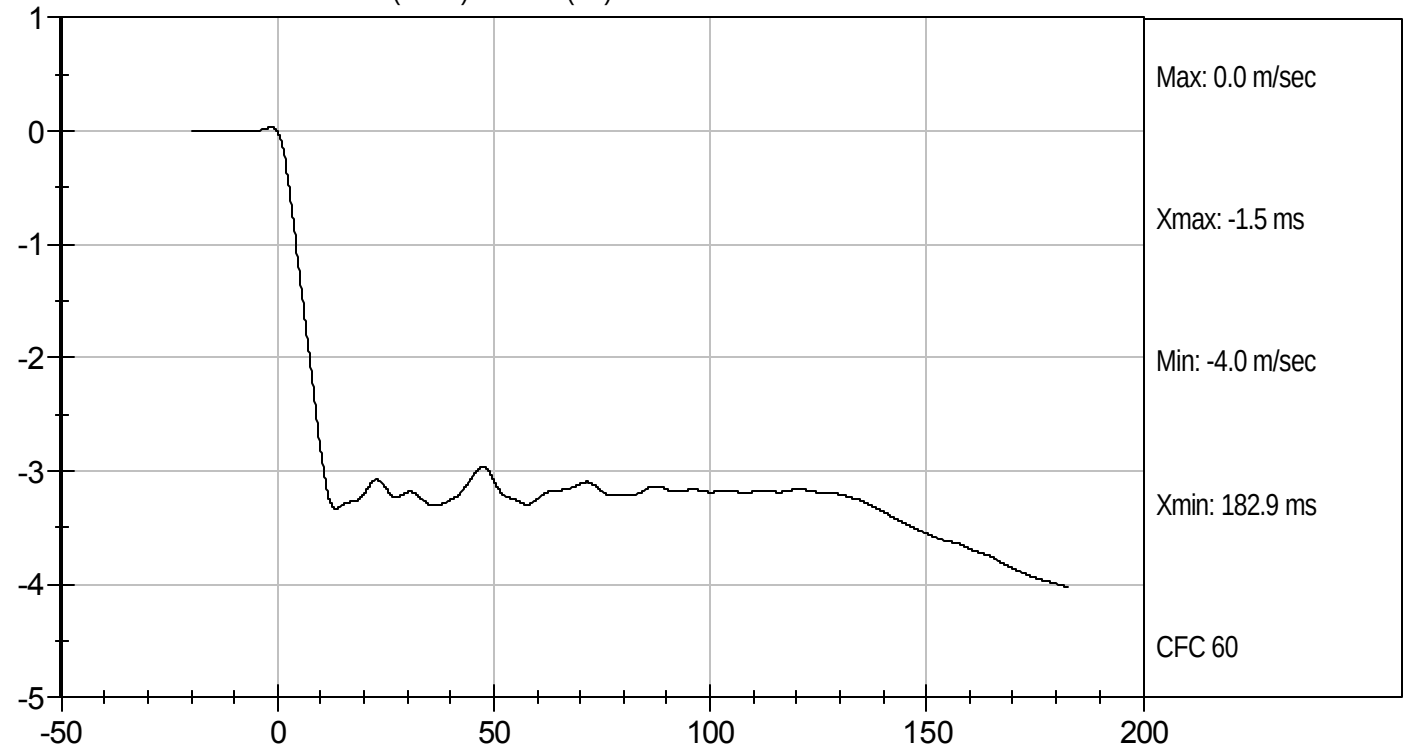
5/3/11
Test Date

David Winkelbauer
Approved By

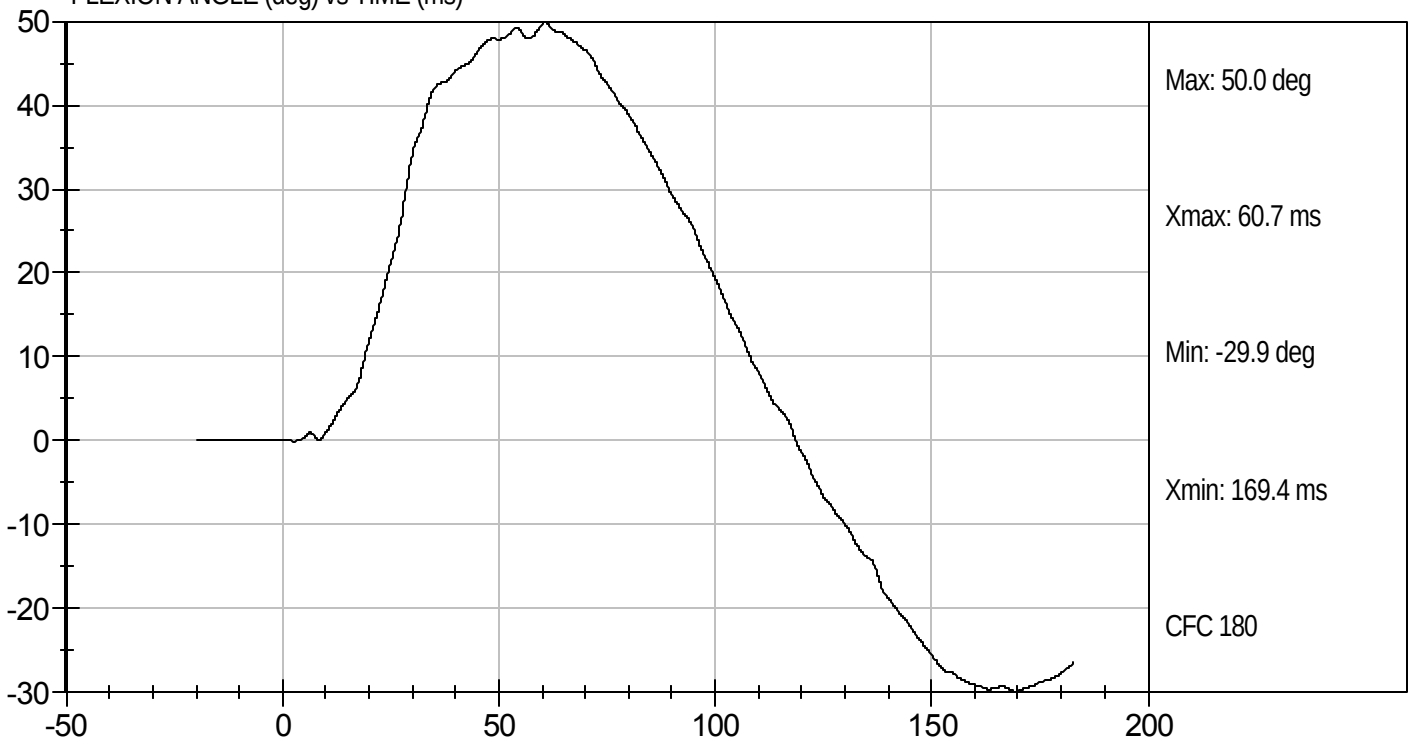
Test Desc: Neck Bending
Component ID: D111642

Test Date: 5/3/11
Velocity: 11.42 ft/s, 3.5 m/s

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

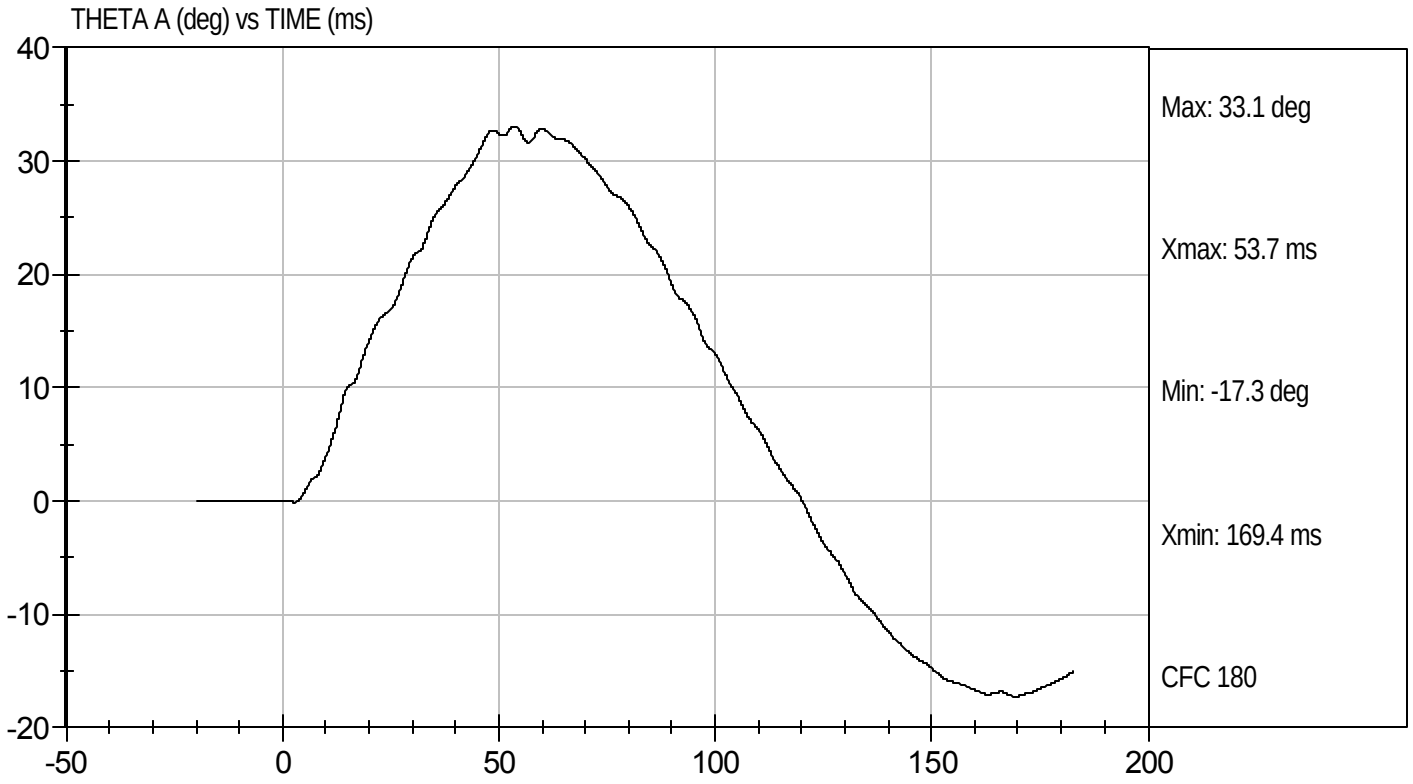


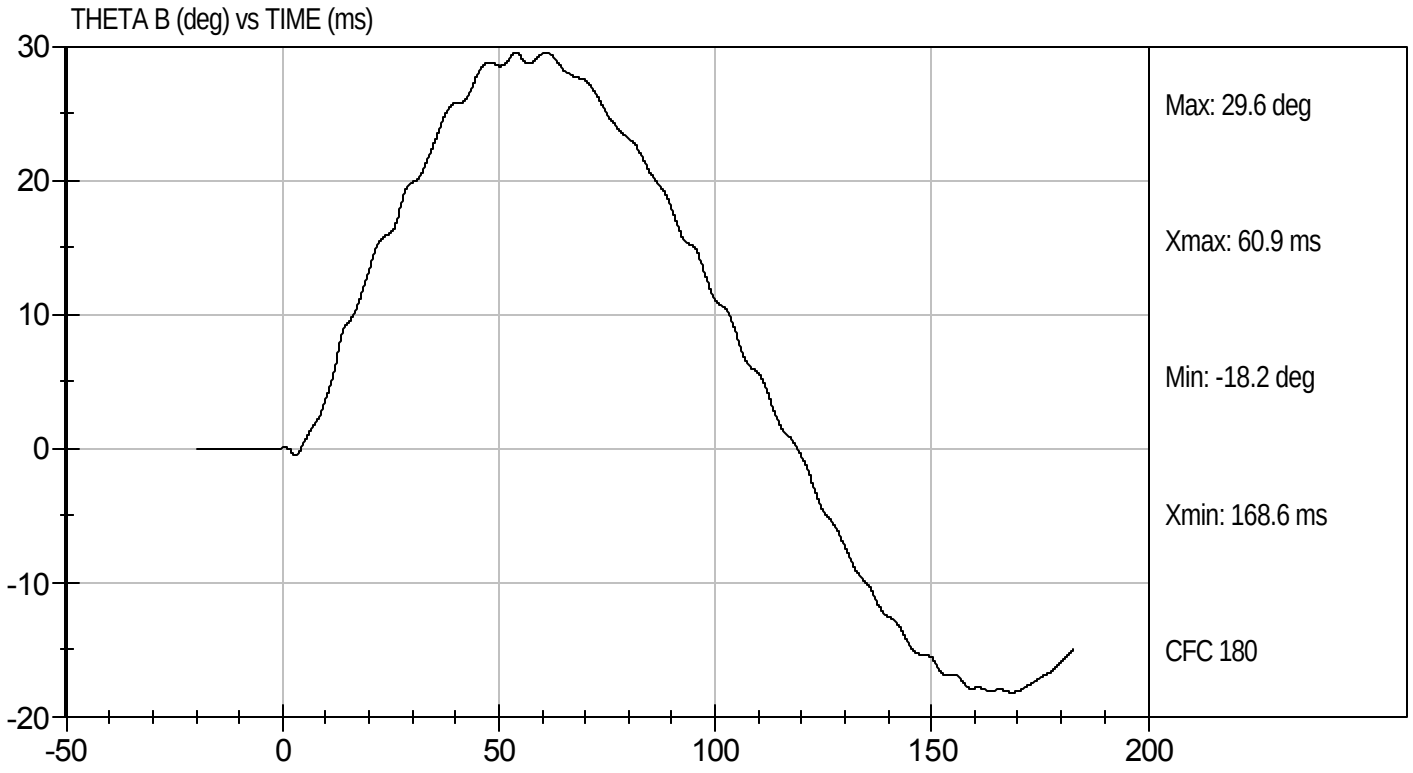
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D111642

Test Date: 5/3/11
Velocity: 11.42 ft/s, 3.5 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111643

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.4	Pass
Time of Peak Shoulder Acceleration	ms	NA	18.6	Pass
		Overall Test Results		Pass

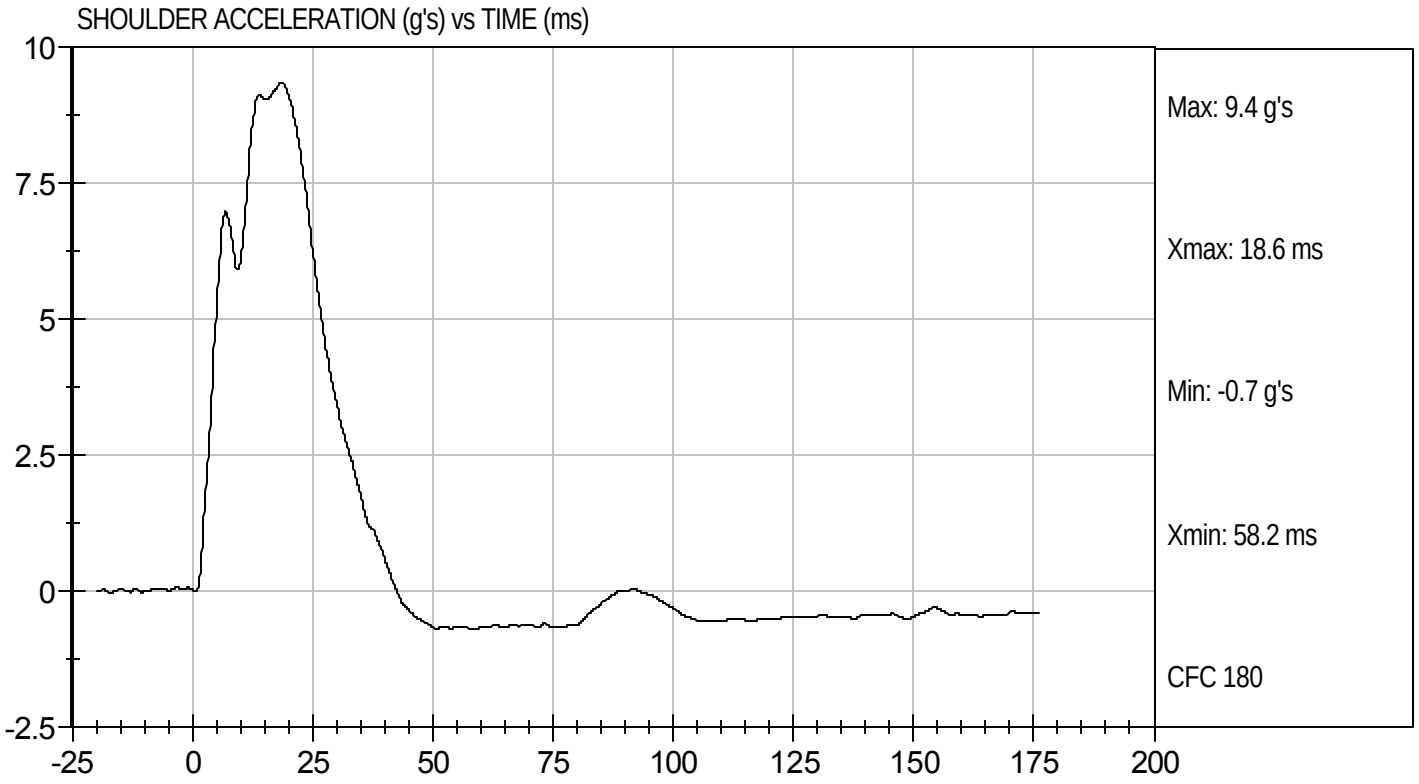
Jessica Hall
Laboratory Technician

5/3/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D111643

Test Date: 5/3/11
Velocity: 14.25 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111644

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	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	49.0	Pass
		Overall Test Results		Pass

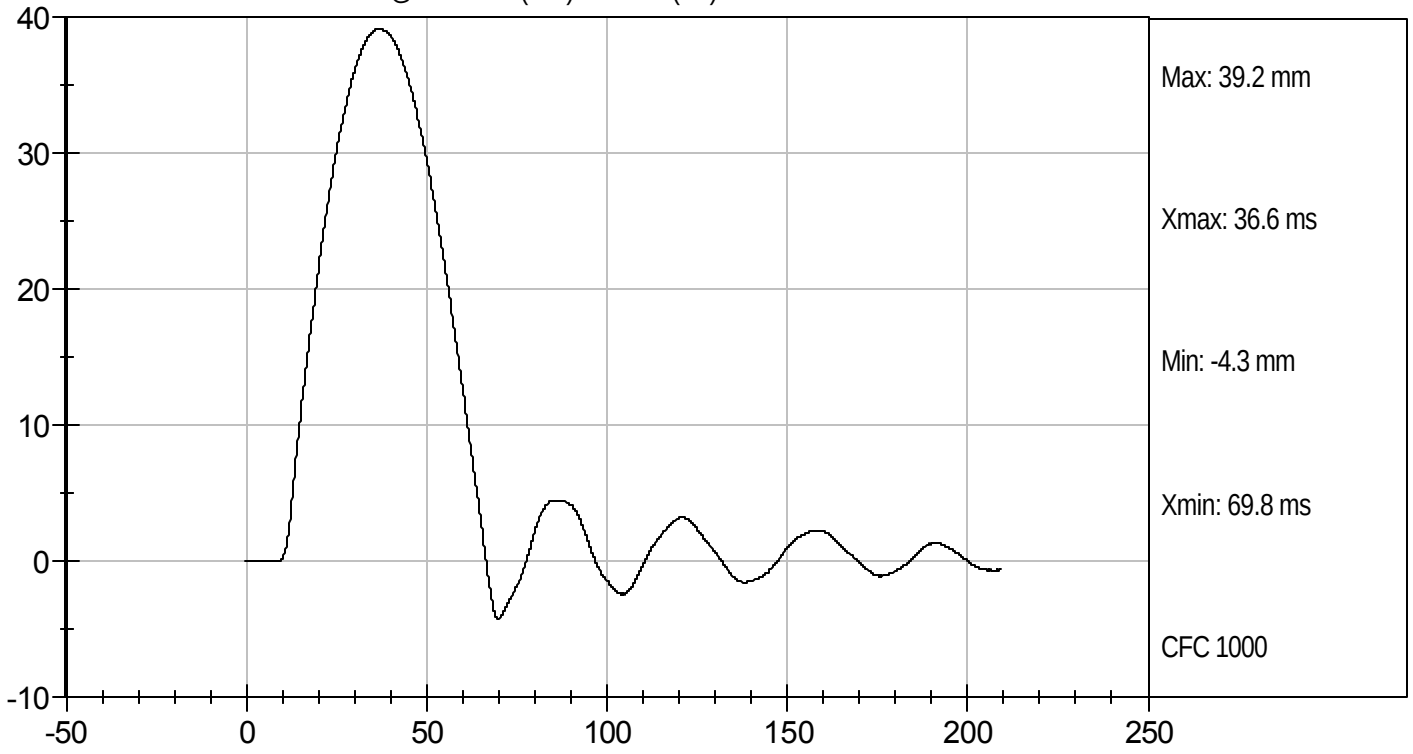
Jessica Gall
Laboratory Technician

5/3/11
Test Date

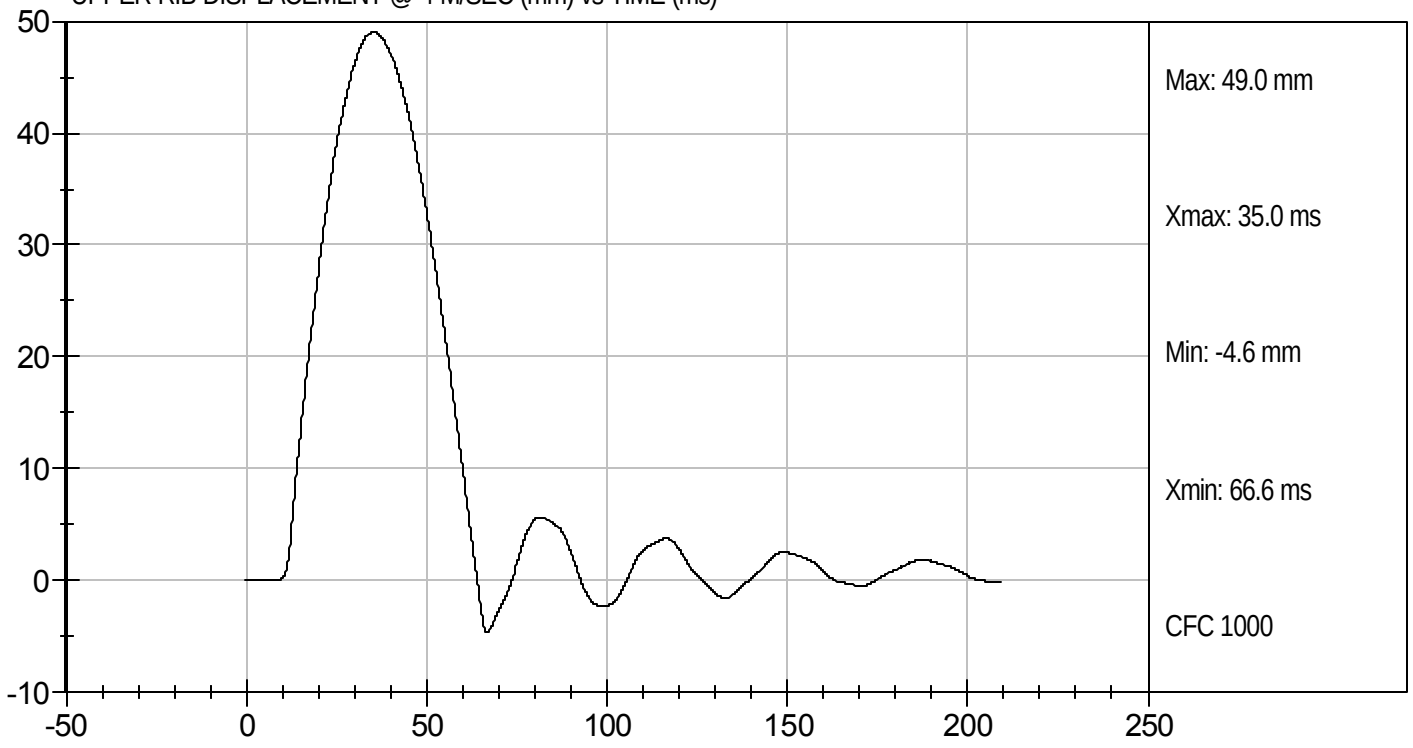
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D111644
Test Date: 5/3/11

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:** D111645

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.1	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.2	Pass
		Overall Test Results		Pass

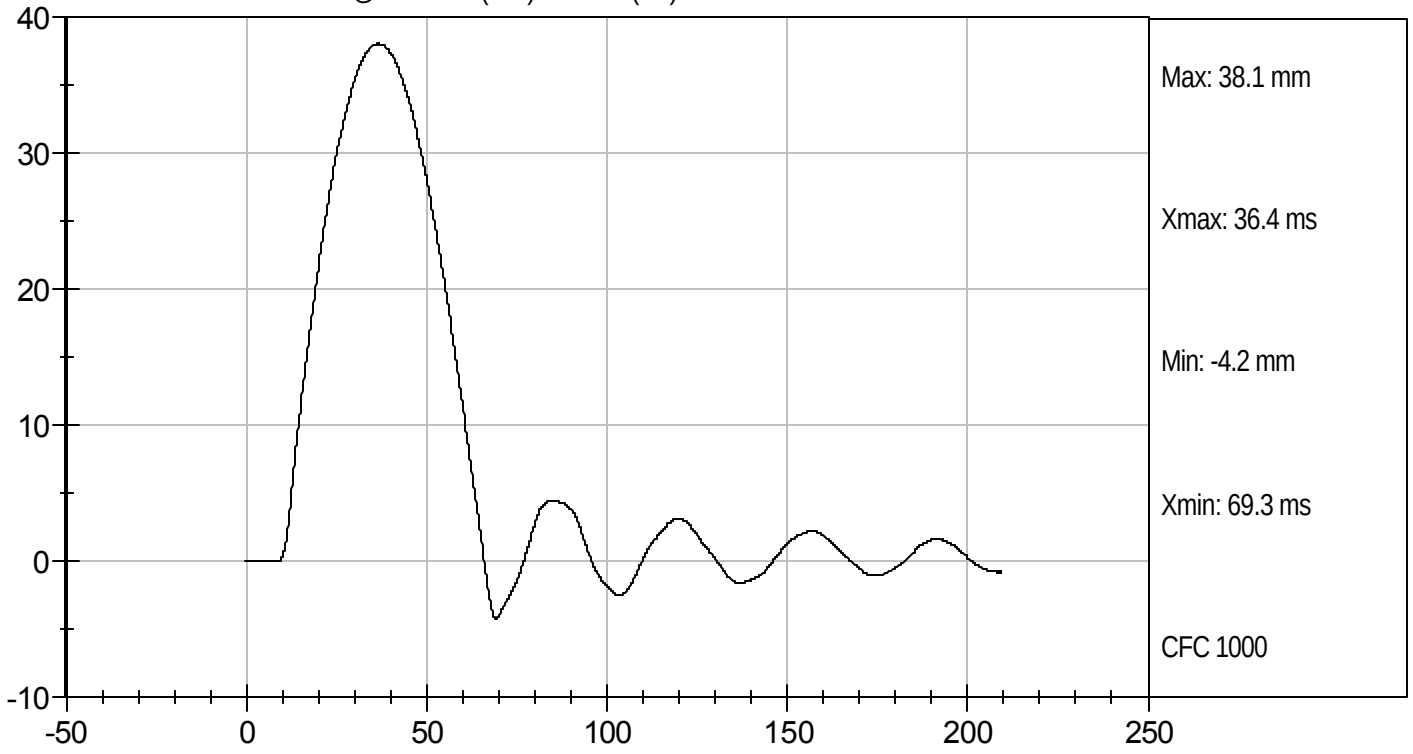
Jessica Hall
Laboratory Technician

5/3/11
Test Date

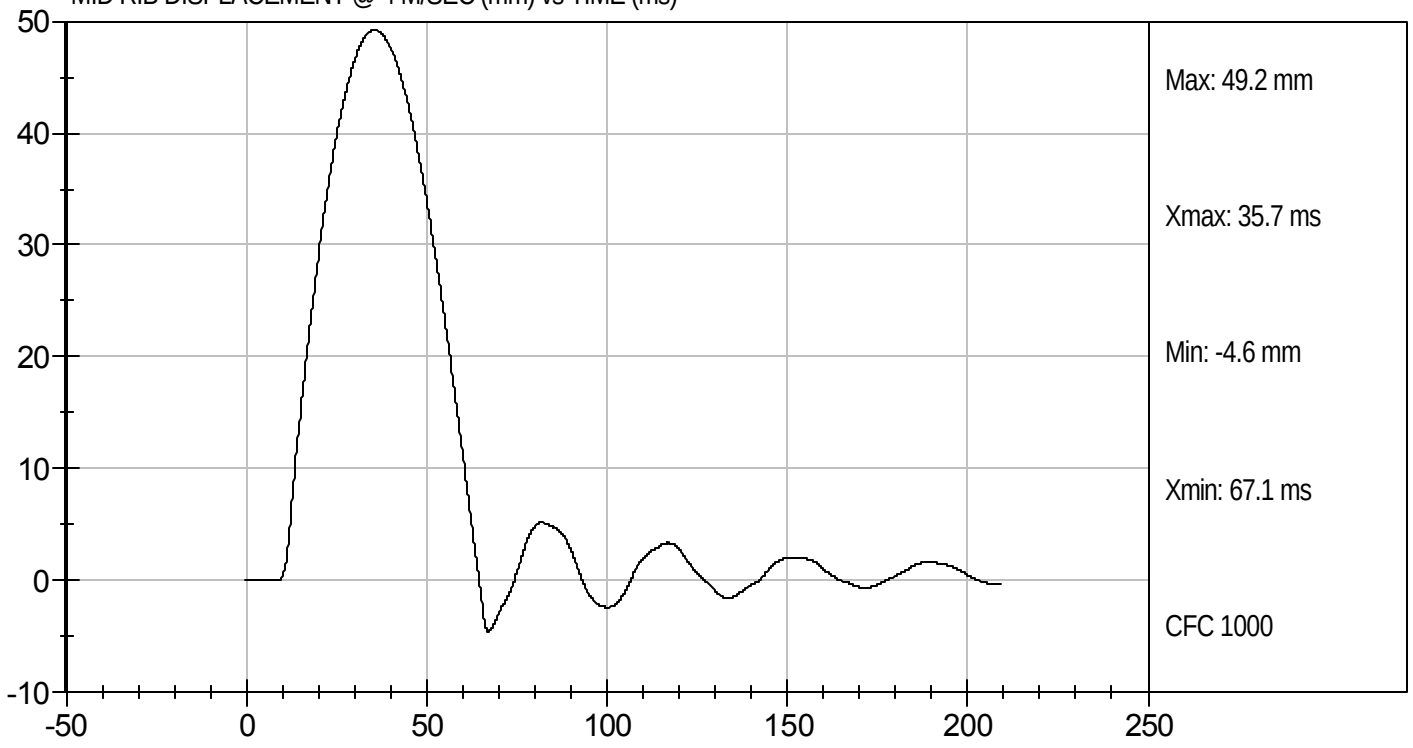
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D111645
Test Date: 5/3/11

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:** D111646

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	39.0	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	49.6	Pass
		Overall Test Results		Pass

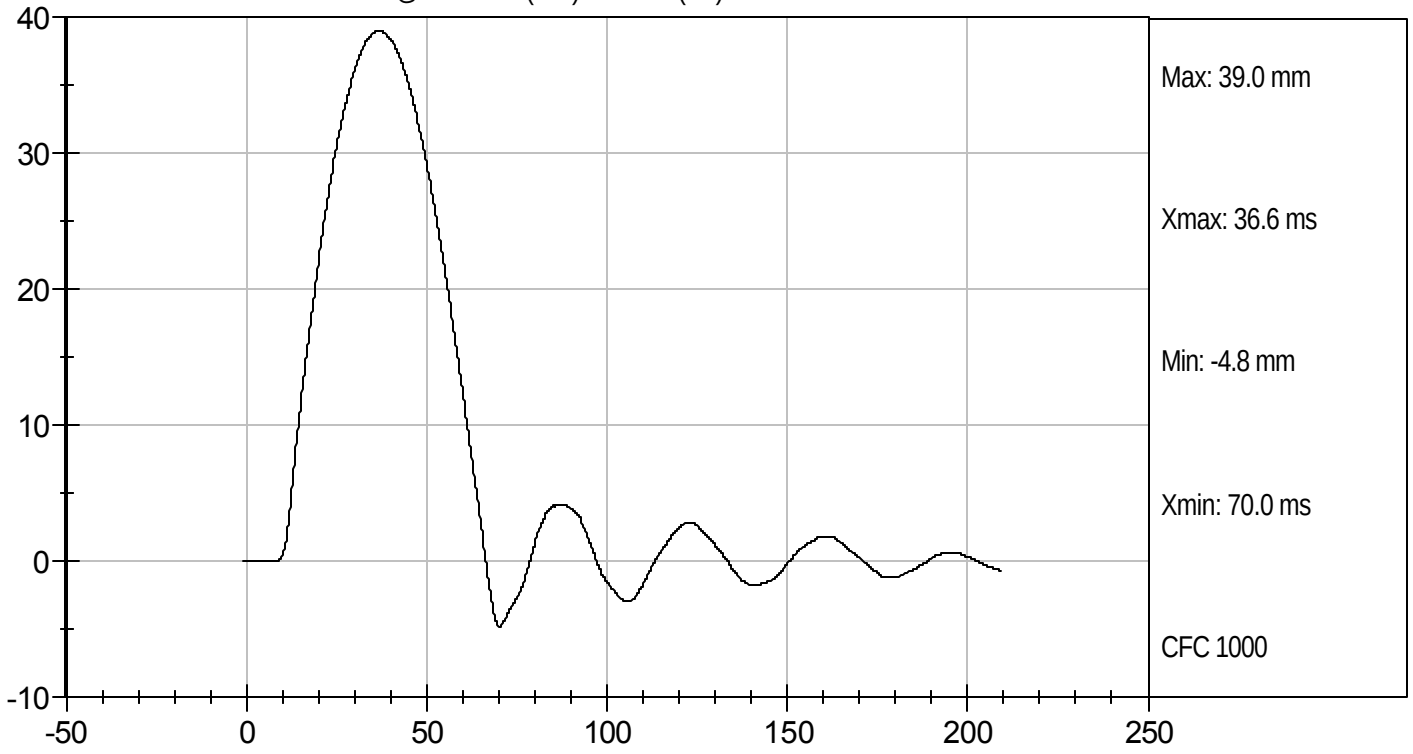
Jessica Hall
Laboratory Technician

5/3/11
Test Date

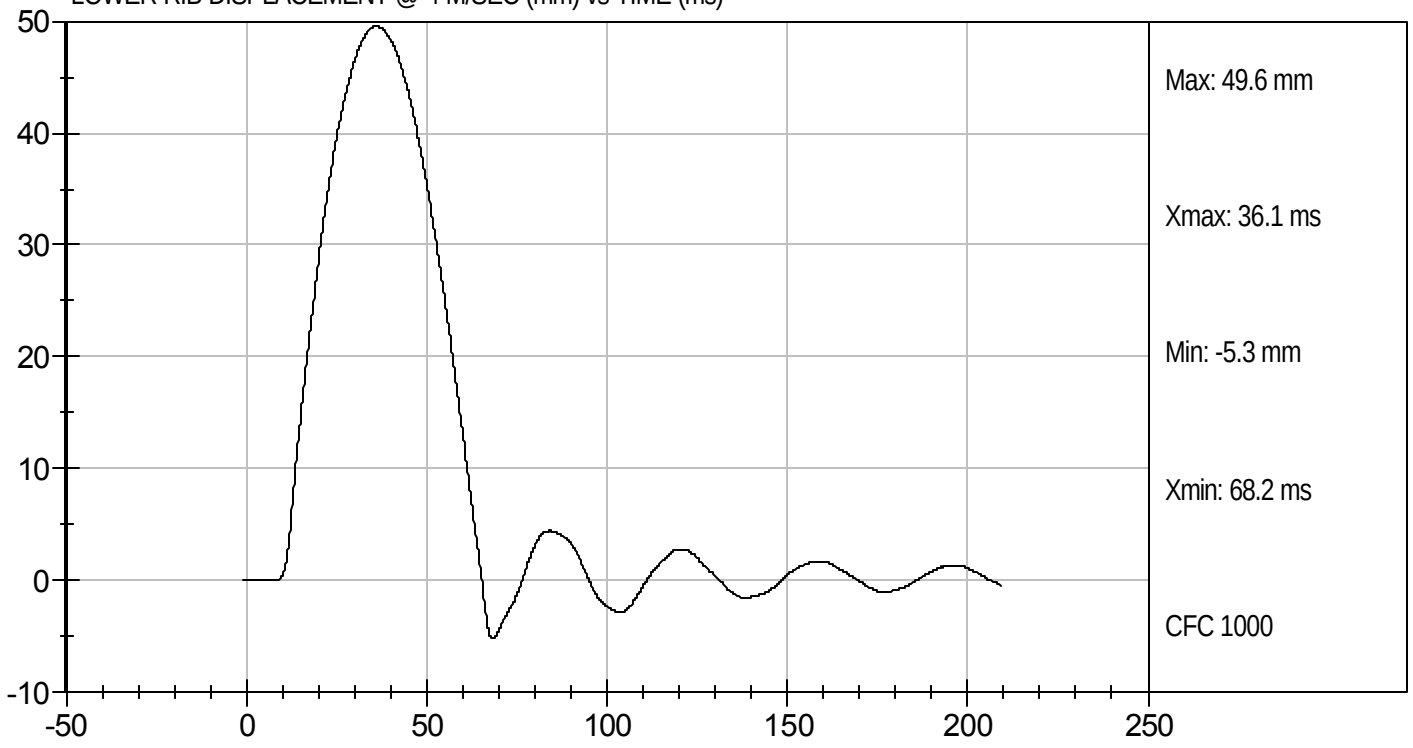
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D111646
Test Date: 5/3/11

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:** D111647

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.33	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.30	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.64	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.90	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

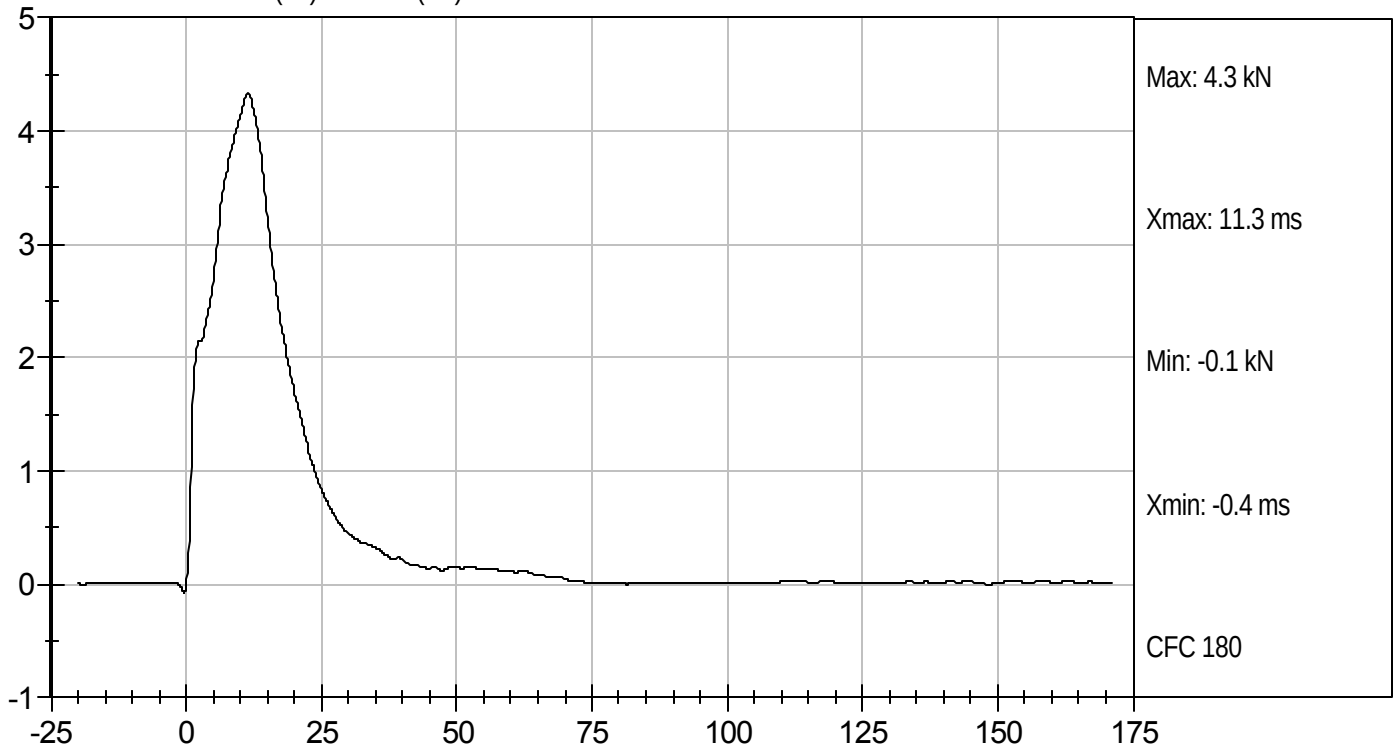
5/3/11
Test Date

David Winkelbauer
Approved By

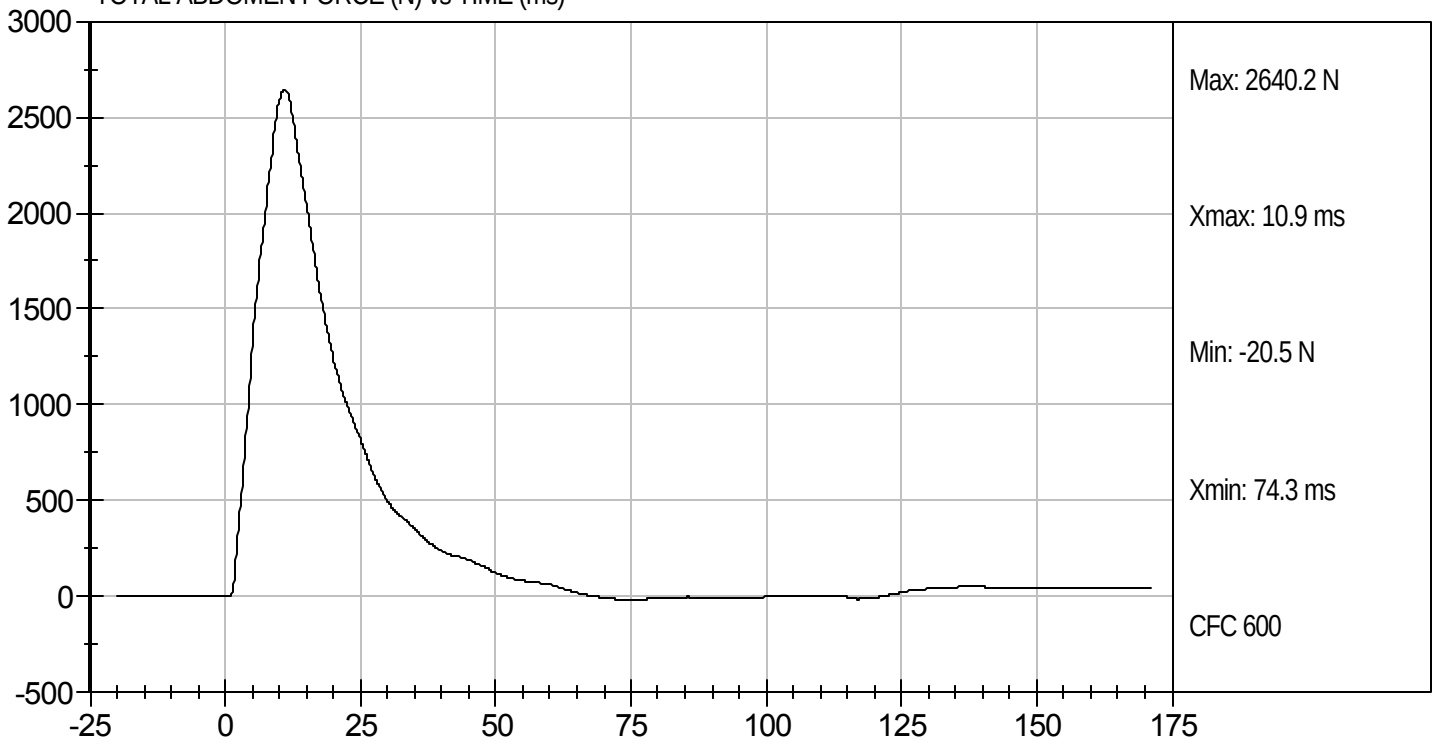
Test Desc: Abdomen Impact
Component ID: D111647

Test Date: 5/3/11
Velocity: 13.33 ft/s, 4.06 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111648

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	25	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	-6.08	Pass
	30 ms	m/s	>= -6.5	-6.05	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.4	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.4	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	43	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

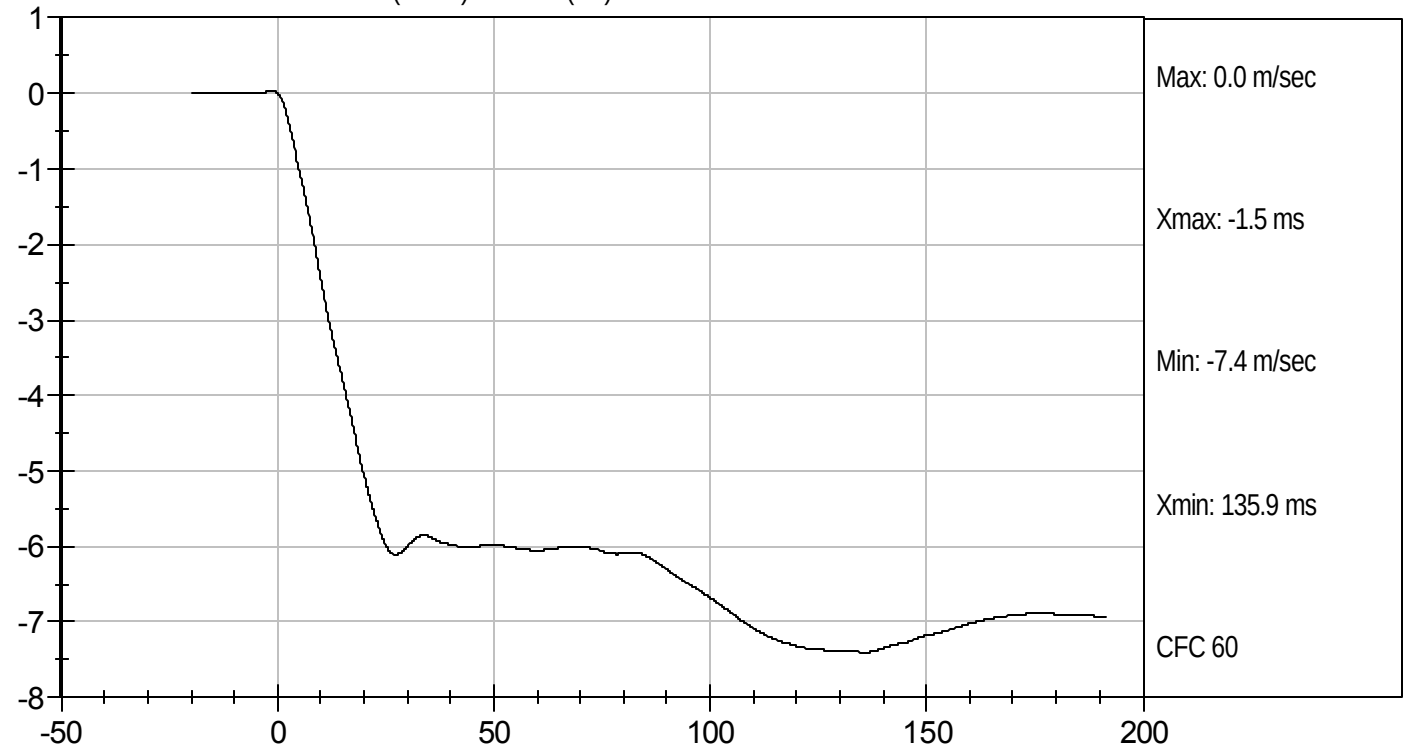
5/3/11
Test Date

David Winkelbauer
Approved By

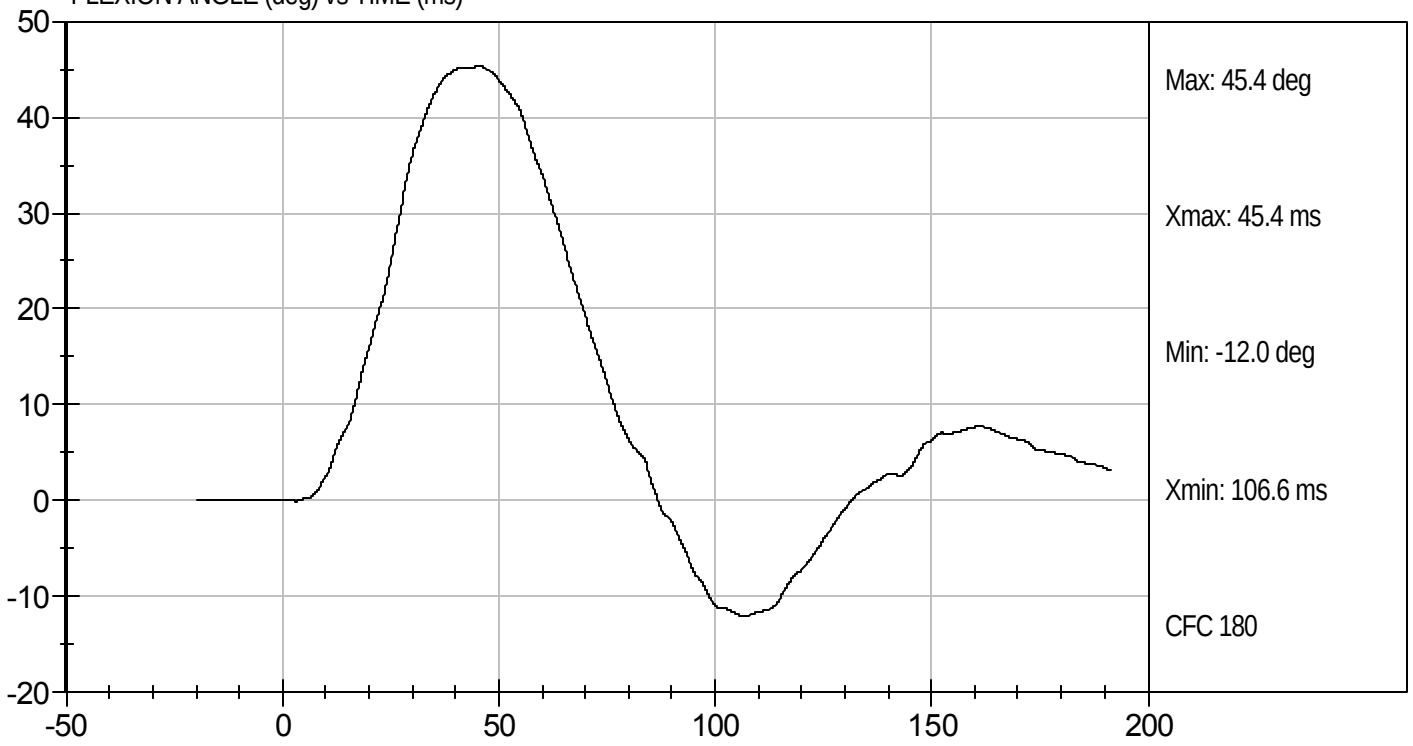
Test Desc: Lumbar Bending
Component ID: D111648

Test Date: 5/3/11
Velocity: 20.08 ft/s, 6.12 m/s

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

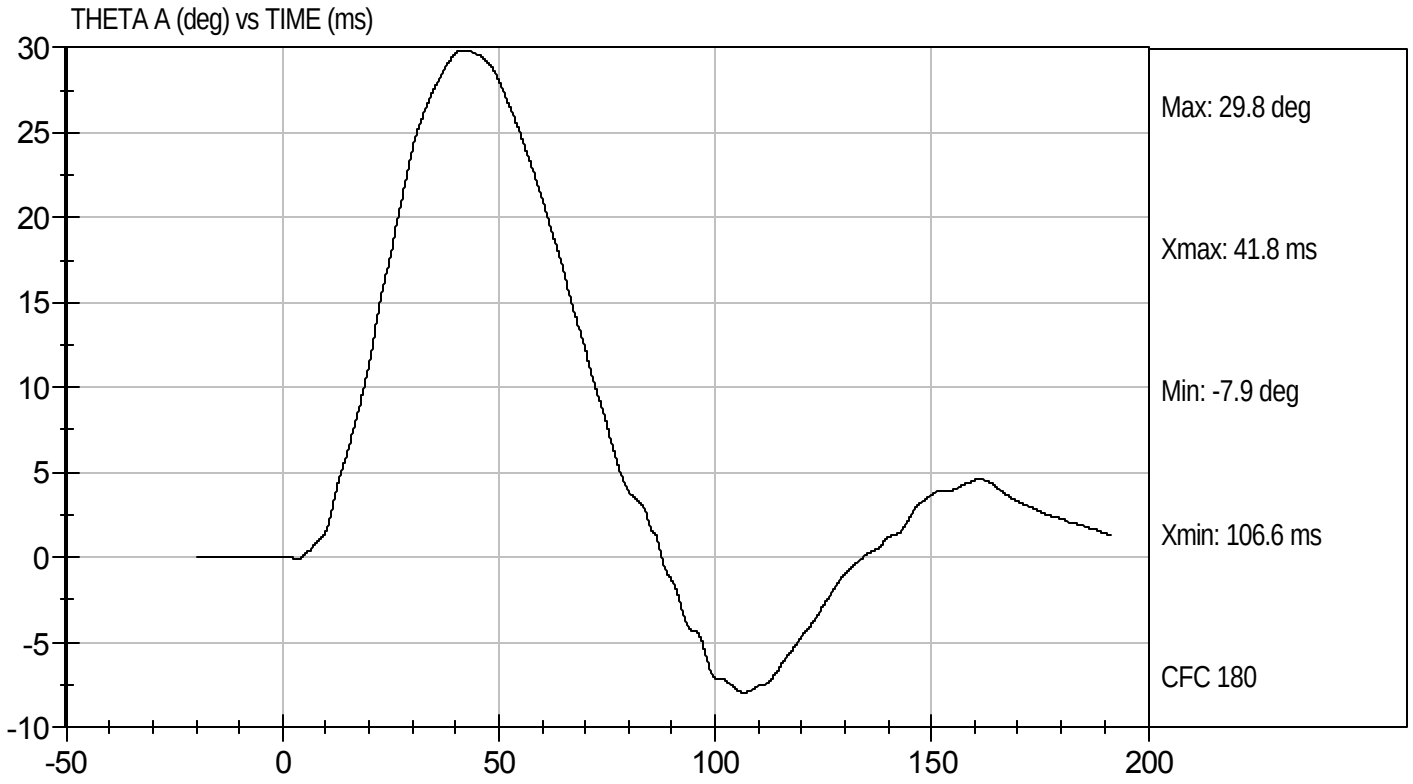


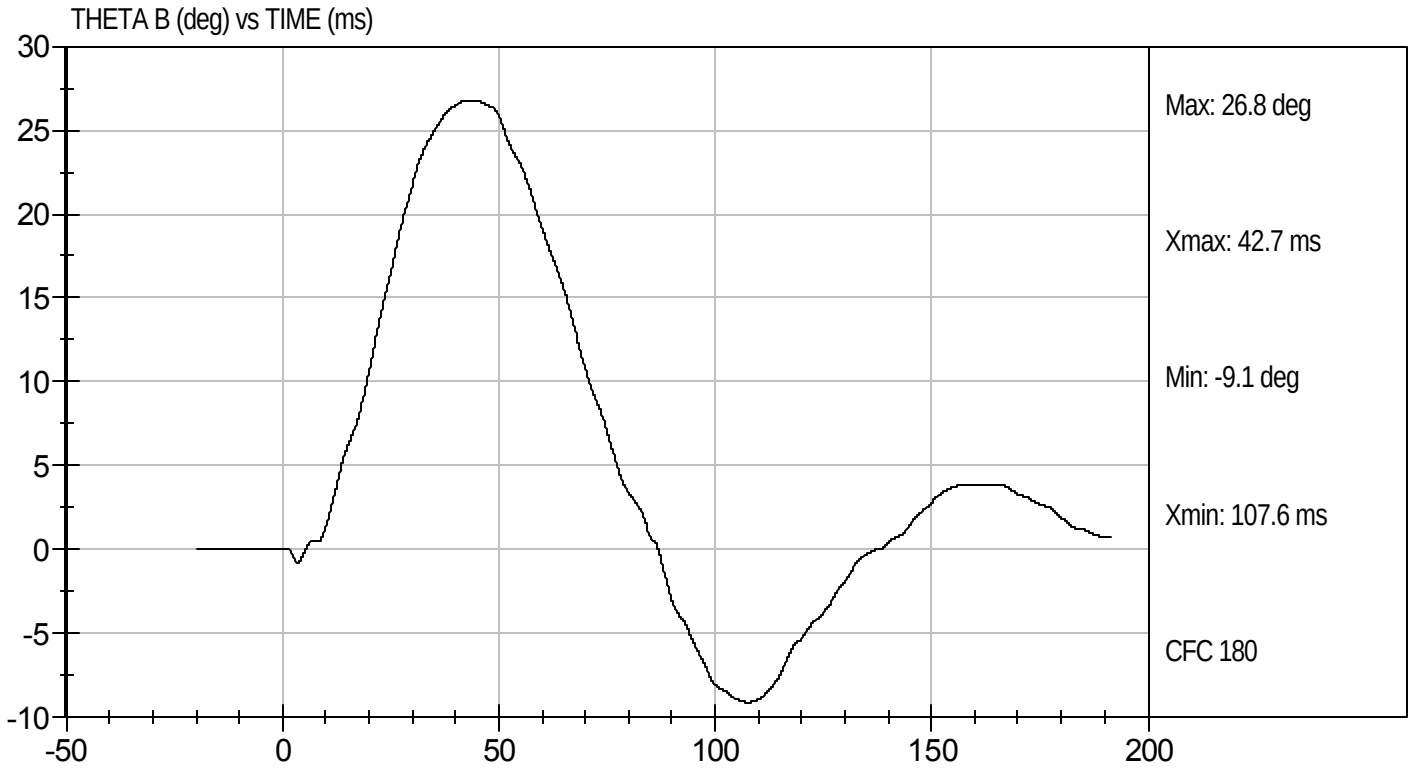
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D111648

Test Date: 5/3/11
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111649

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	25	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.79	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.90	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.39	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	15.90	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

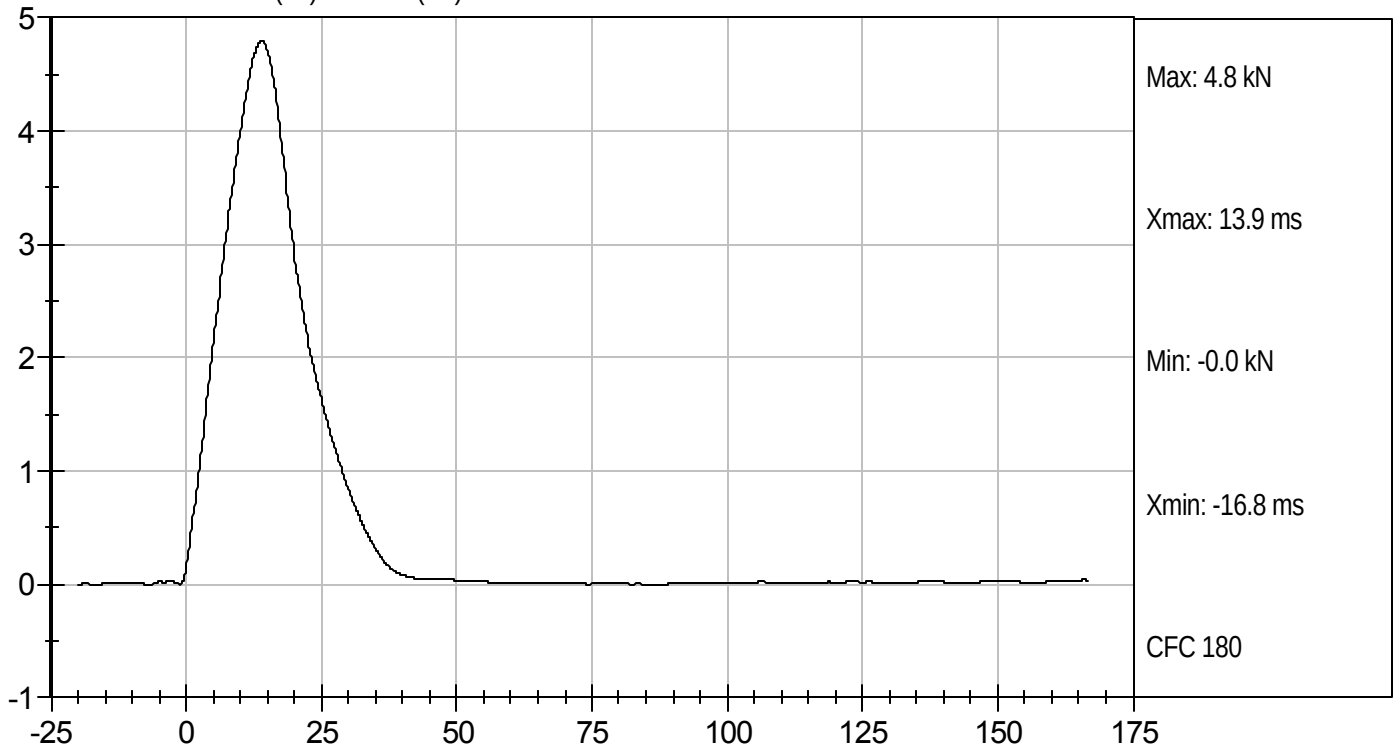
5/3/11
Test Date

David Winkelbauer
Approved By

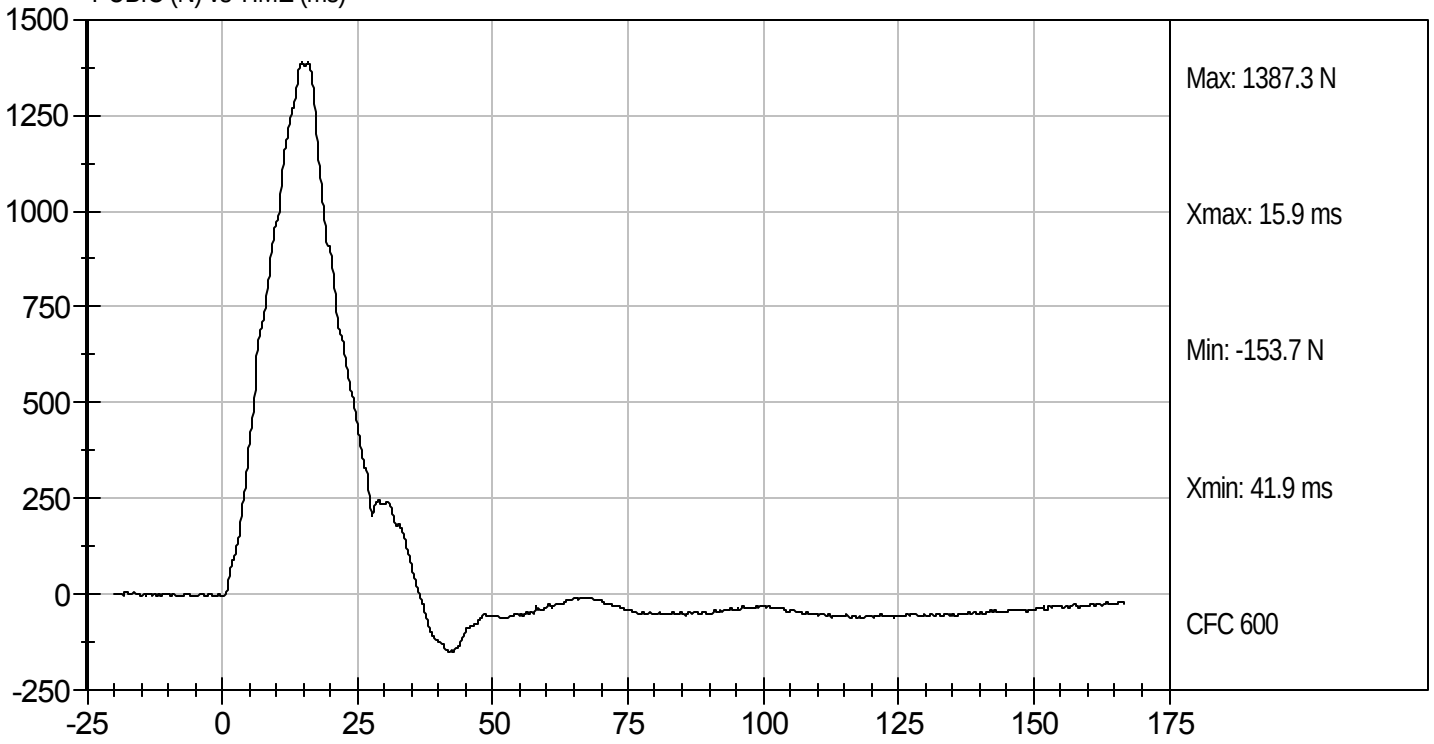
Test Desc: Pelvis Impact
Component ID: D111649

Test Date: 5/3/11
Velocity: 14.25 ft/s, 4.34 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111640

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	25	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	5.10	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.7	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.9	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

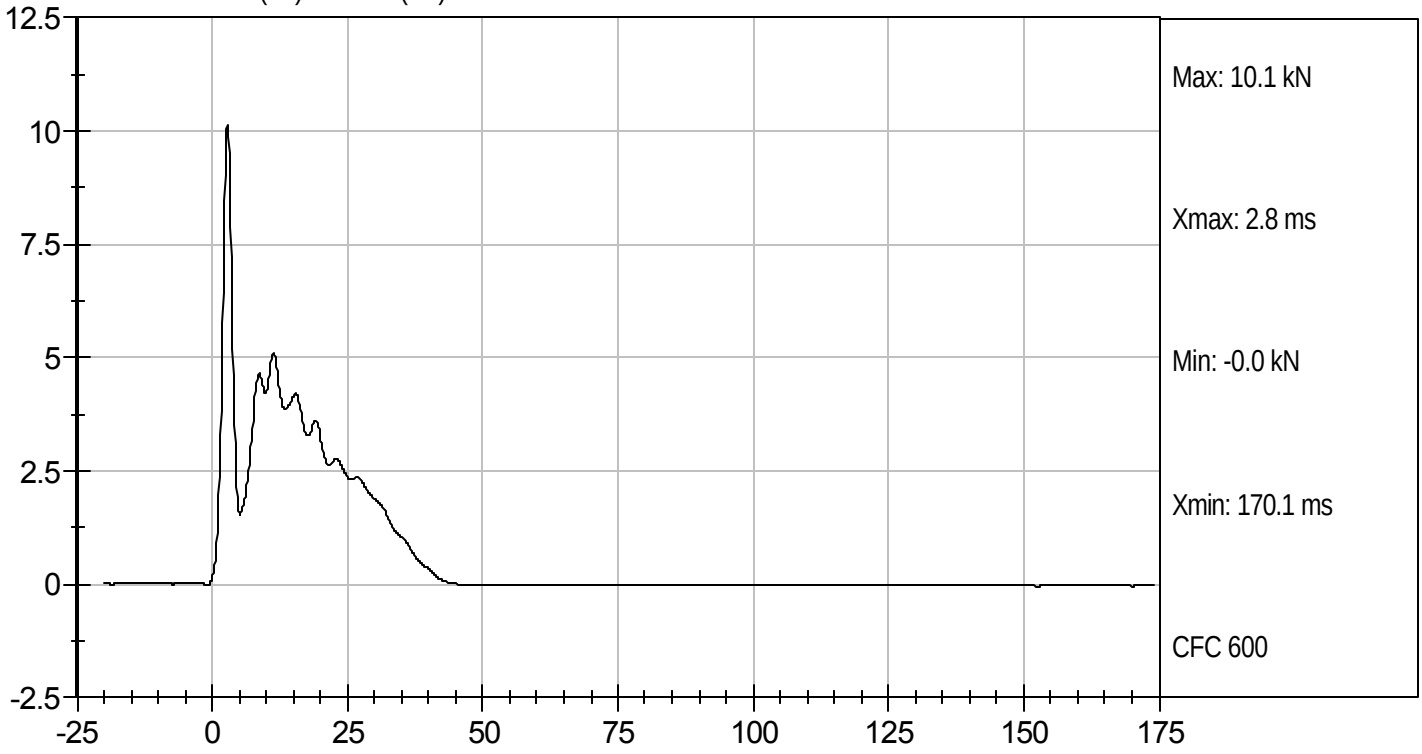
5/3/11
Test Date

David Winkelbauer
Approved By

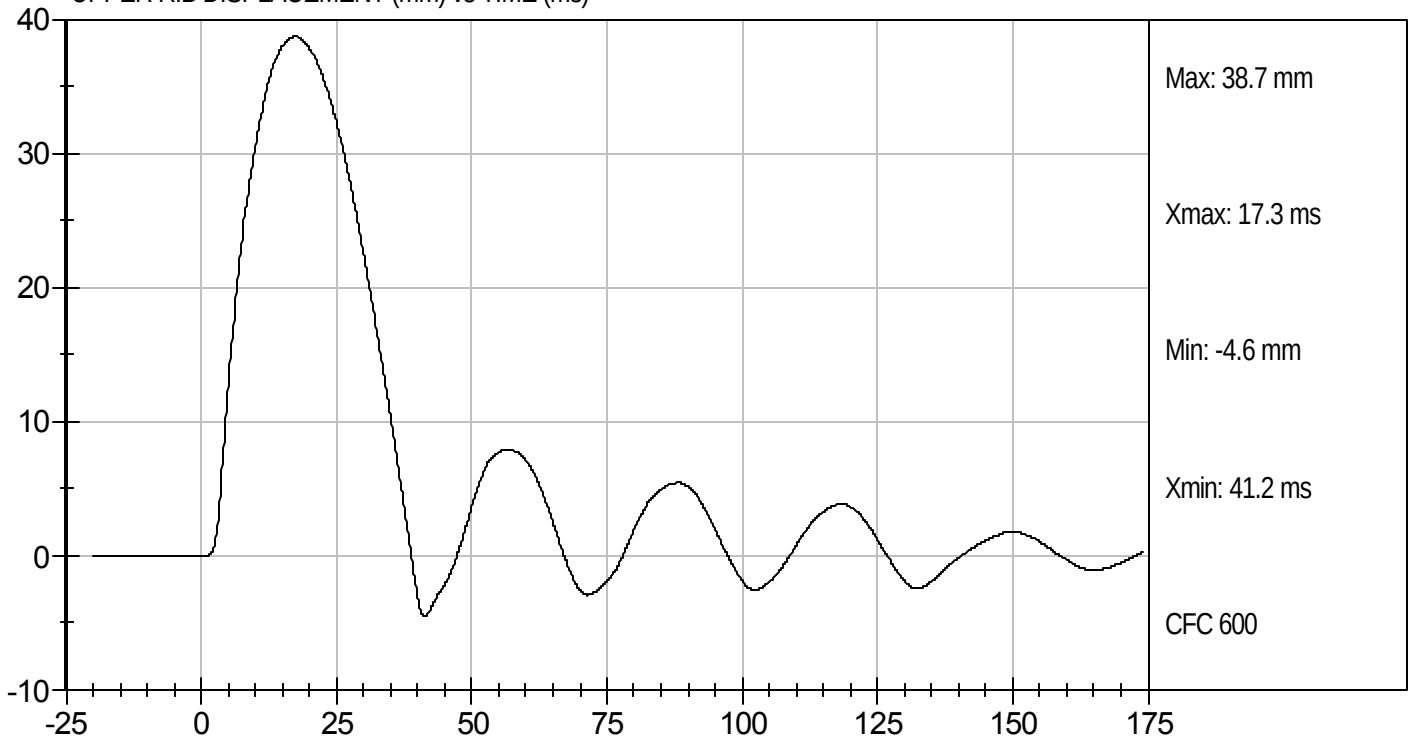
Test Desc: Thorax Impact
Component ID: D111640

Test Date: 5/3/11
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



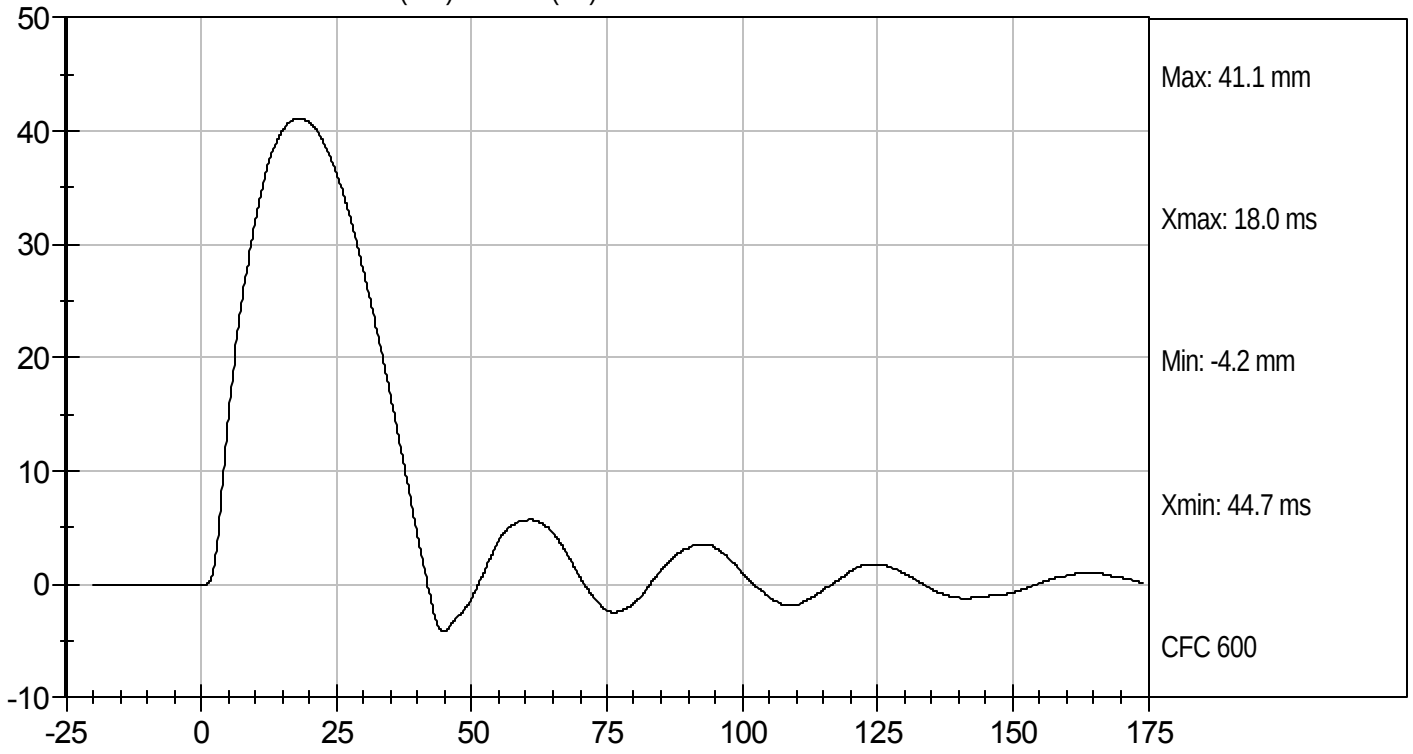
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



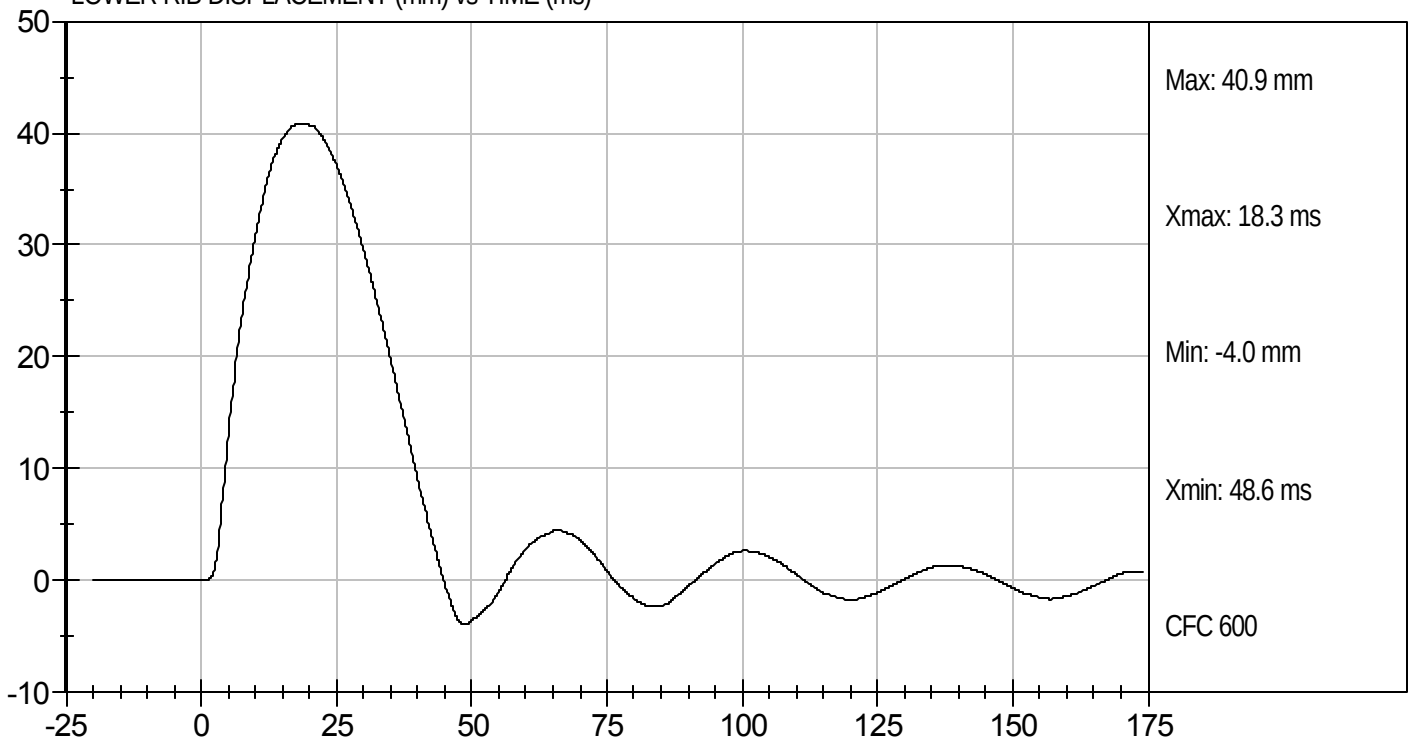
Test Desc: Thorax Impact
Component ID: D111640

Test Date: 5/3/11
Velocity: 18.32 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



APPENDIX E

TEST EQUIPMENT AND INSTRUMENTATION 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)	P59350	Endevco	1/13/2011
A Pillar Sill (Y)	P49503	Endevco	1/13/2011
A Pillar Low (Y)	P49518	Endevco	12/22/2010
A Pillar Mid (Y)	P52194	Endevco	3/15/2011
B Pillar Sill (Y)	P49506	Endevco	4/27/2011
B Pillar Low (Y)	P59285	Endevco	2/19/2011
B Pillar Mid (Y)	P59283	Endevco	1/13/2011
Seat (Y)	P59287	Endevco	2/19/2011
Engine (X)	P59652	Endevco	4/27/2011
Engine (Y)	P59653	Endevco	4/27/2011
Firewall (Y)	P59411	Endevco	4/27/2011
Roof (Y)	P59376	Endevco	4/27/2011
Floor Sill (Y)	P59408	Endevco	4/27/2011
Rear Deck (X)	P52281	Endevco	12/13/2010
Rear Deck (Y)	P52282	Endevco	12/13/2010