REPORT NUMBER: 214P-MGA-2011-007

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

HONDA MOTOR CO., LTD
2011 HONDA CR-Z 3-DR HATCHBACK
NHTSA NUMBER: CB5302

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

Test Date: March 23, 2011

Report Date: April 6, 2011

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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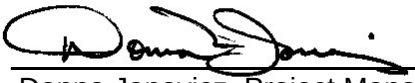
Prepared by: 
Donna Janovicz, Project Manager

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Joe Fleck, Project Engineer

Approval Date: April 6, 2011

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by: James A. Jones

Acceptance Date: April 13, 2011

Technical Report Documentation Page

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4. Title and Subtitle Final Report of FMVSS 214P Compliance Test Side Impact Protection Testing of 2011 Honda CR-Z 3-Dr Hatchback; NHTSA No.: CB5302		*5. Report Date* April 6, 2011 *6. Performing Organization Code* MGA
7. Author(s) Donna Janovicz, Project Manager Joe Fleck, Project Engineer		*8. Performing Organization Report No.* 214P-MGA-2011-007
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 3/23/2011 to 4/06/2011 *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 Honda CR-Z 3-Dr Hatchback 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 March 23, 2011.

The impact velocity was 31.6 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 292 mm at level 3. The test vehicle's performance follows:

Measurement Description	Units	Result
Head Injury Criteria (HIC_{36})	N/A	238
Max. Rib Deflection	mm	32
Sum of Abdomen Forces	N	1212
Pubic Symphysis Force	N	2349

The door on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite side door 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	
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Form DOT F1700.7 (8-72)

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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 Honda CR-Z 3-Dr Hatchback. 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 Honda CR-Z 3-Dr Hatchback. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 31.6 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on March 23, 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	238	Upper	30.0	Front	333.0	2348.7
		Middle	28.8	Mid	395.3	
		Lower	31.9	Rear	578.5	
		Max.	31.9	Sum	1211.7	

GENERAL COMMENTS

There was no valid data collected for:

A Pillar Mid Y after 5 msec.
Seat Y after 25 msec.

The Onboard – Driver Rear high speed camera did not run.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

VEHICLE INFORMATION	
Make	Honda
Model	CR-Z
Body Style	3-Dr Hatchback
VIN	JHMZF1D44BS005488
Body Color	North Shore Blue
Engine Displacement (L)	1.5
# of Cylinders	4
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	Front
Odometer Reading	44 miles

OPTIONS	
ESC	Yes
All Wheel Drive	No
Power Steering	Yes
Tilt Steering Wheel	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Driver Knee Bag	No
Driver Seat Belt Pretentioners	Yes
Driver Seat Belt Load Limiters	Yes
Driver Power Seat	No
Rear Pass. Curtain Airbag	
Rear Pass. Side Torso Airbag	
Rear Pass. Seat Belt Pretentioners	
Rear Pass. Seat Belt Load Limiters	
Rear Pass. Power Seats	
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	Honda Motor Co., Ltd.
Date of Manufacture	09/10

GVWR (kg)	1435
GAWR Front (kg)	815
GAWR Rear (kg)	625

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket			
Number of Occupants	2			2
Capacity Weight (VCW) (kg)				181
Cargo Weight (RCLW) (kg)				45

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

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	366.1	253.1		394.2	303.4		395.5	299.8	
Right	kg	358.3	236.3		368.8	269.9		364.7	269.9	
Ratio	%	59.7	40.3		57.1	42.9		57.2	42.8	
Totals	kg	724.4	489.4	1213.8	763.0	573.3	1336.3	760.2	569.7	1329.9

TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

Measured Parameter	Units	Value
As Delivered Weight	kg	1213.8
Weight of 1 P572U ATD (ES-2re) Dummy	kg	77.1
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Target Vehicle Test Weight (TVTW)	kg	1335.9

TEST VEHICLE ATTITUDES

	Units	LF	RF	RR	LR
Fully Loaded	mm	638	653	655	645
As Tested	mm	647	653	660	655
Difference	mm	-9	0	-5	-10

CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE

Measurement Parameter	Units	Value
Test Vehicle Wheel Base	mm	2430
Vertical Impact Reference Line (Aft of Front Axle)	mm	1275

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

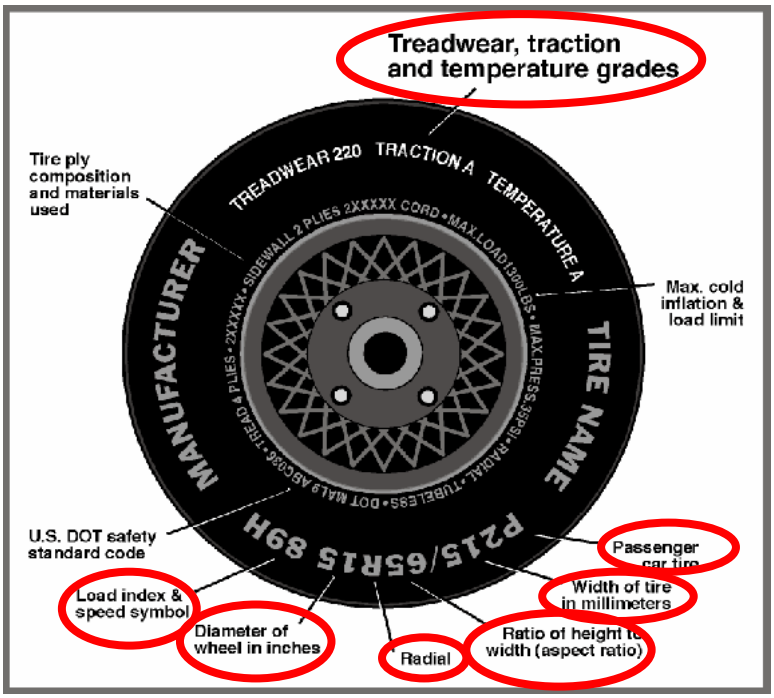
Description of Component	Weight (kg)
Ballast	0
Passenger Headrest/Floor Mat	1.8
Right Rear Speaker/Left Tail Light/C-Post Trim/Trunk Trim	7.3

DATA SHEET NO. 3

VEHICLE TIRE INFORMATION

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	210	210
Recommended Tire Size	P195/55R16	P195/55R16
Tire Size on Vehicle	P195/55R16	P195/55R16
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Turanza	Turanza
Tire Type	Passenger	Passenger
Tire Width	195	195
Aspect Ratio	55	55
Radial	Yes	Yes
Wheel Diameter	16	16
Load Index/Speed Symbol	86V	86V
Treadwear	260	260
Traction Grade	A	A
Temperature Grade	A	A

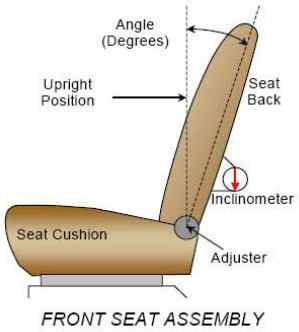
DATA SHEET NO. 4

SEAT AND SEAT BELT ADJUSTMENT DATA

Test Vehicle:	2011 Honda CR-Z 3-Dr Hatchback	NHTSA No.	CB5302
Test Program:	FMVSS 214 Pole	Test Date:	3/23/2011

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 10.0 degrees.



FRONT SEAT ASSEMBLY

SEAT BACK ANGLE

	Degrees	Detents
Driver without Seated Dummy	9.0° at headrest post	4th detent rearward from the first locking detent

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	25 detents (1st as 1)	12th detent (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. The seat belt upper anchorage was non-adjustable.

SEAT BELT UPPER ANCHORAGE

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	

HEADREST RESTRAINT

The headrest was non-adjustable.

DATA SHEET NO. 5

FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

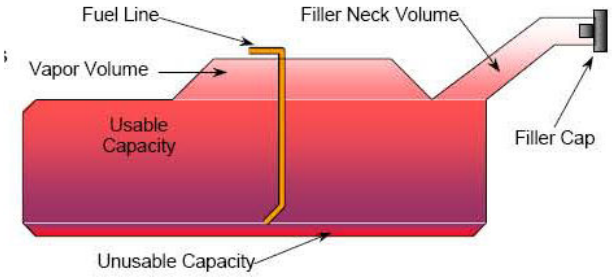
Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

FUEL TANK CAPACITY

	Liters
Usable Capacity (Form 1)	40.0
Usable Capacity (Owner's Manual)	40.0
92-94% of Usable Capacity	36.8 to 37.6
Actual Amount of Solvent Used	37.2

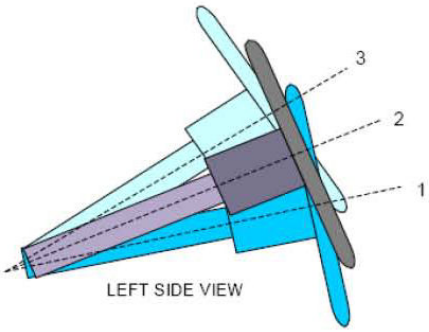
FUEL PUMP

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. After the ignition key is turned from LOCK(0) to ON(II) position, the fuel pump will be filled up for two seconds, and then the pressure is maintained. The fuel pipe is on the left side.



STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

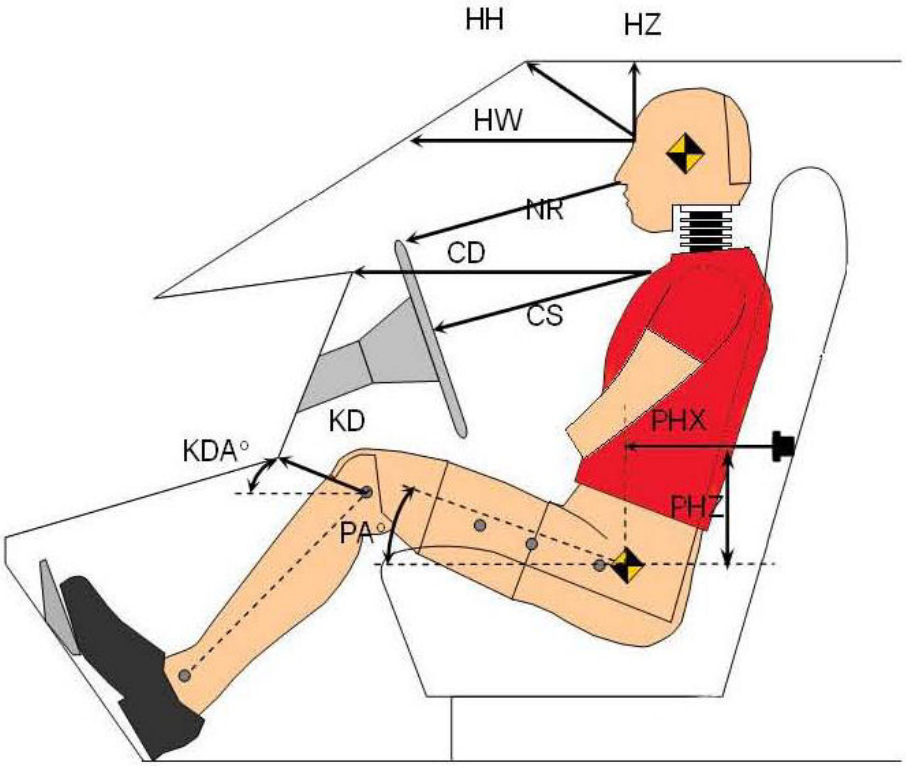
STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	74.8	132
Geometric Center – Position 2	72.8	116
Uppermost – Position 3	70.8	100
Telescoping Steering Wheel Travel		32
Test Position	72.8	116

.DATA SHEET NO. 6

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

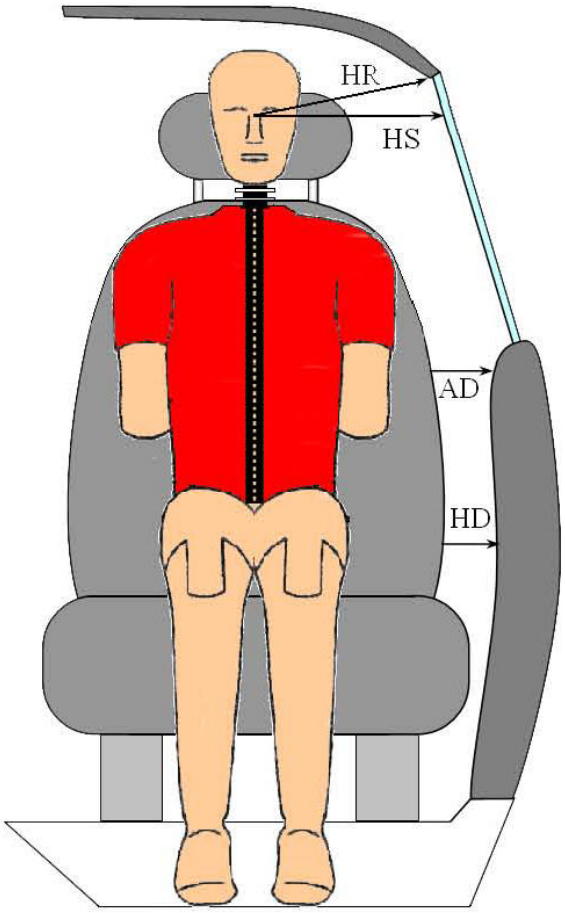


Driver Code	Measurement Description	Length (mm)	Angle (°)
HH	Head to Header	414	
HW	Head to Windshield	602	
HZ	Head to Roof	124	
NR	Nose to Rim	415	
CD	Chest to Dash	522	
CS	Chest to Steering Wheel	328	
KDL	Left Knee to Dash	126	49.9
KDR	Right Knee to Dash	109	40.6
PA	Pelvic Angle		
PHX	H-Point to Striker (X-Axis)	479	
PHZ	H-Point to Striker (Z-Axis)	300	

DATA SHEET NO. 7

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

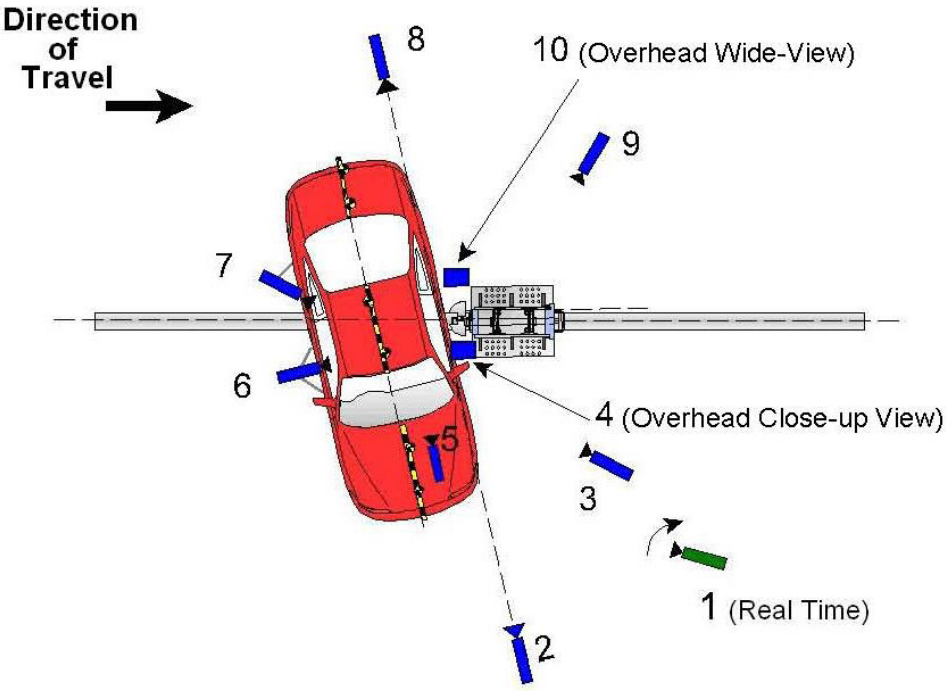


Code	Measurement Description	Units	Front Occupant
HR	Head to Side Header	mm	144
HS	Head to Side Window	mm	286
AD	Arm to Door	mm	95
HD	H-Point to Door	mm	148

DATA SHEET NO. 8

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011



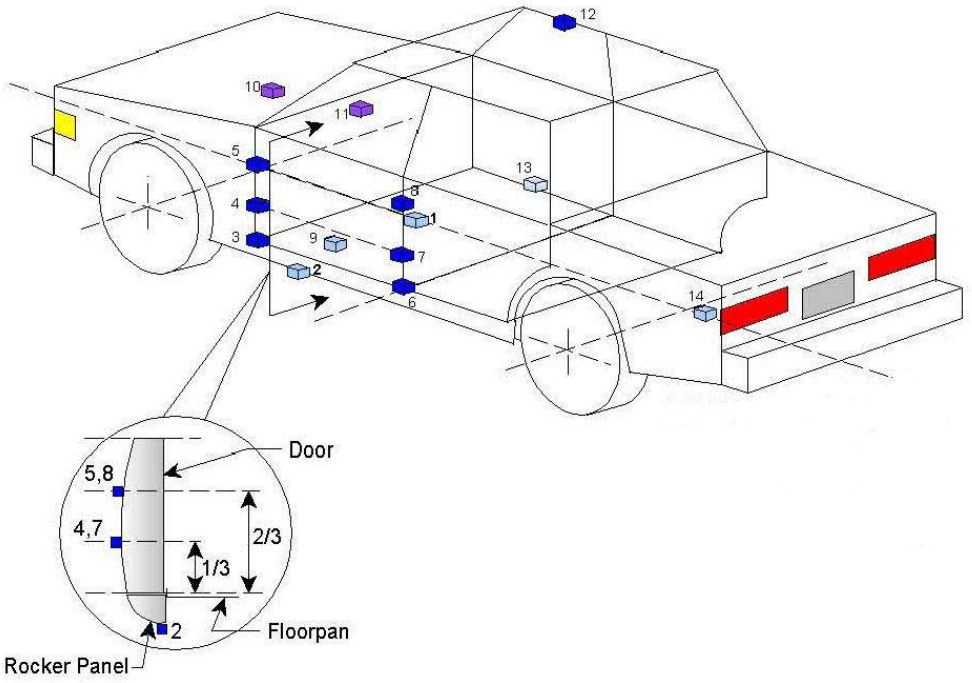
Reference: From Point of Impact for X and Y; from Ground for Z):
+X = Right of Impact, + Y = Forward of Impact, +Z = Up

Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Real-Time					30
2	Front Ground Level	5630	40	1750	24	1000
3	Impact Side 45° Forward	4050	2420	1880	20	1000
4	Overhead Closeup	0	50	4520	50	1000
5	Onboard – Driver Front				16	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	-5320	60	1780	24	1000
9	Impact Side 45° Rearward	-3660	2210	1910	20	1000
10	Overhead Wide	0	-250	4610	14	1000

DATA SHEET NO. 9

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011



Loc. No.	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2294	-185	-155
2	Left Floor Sill	2123	-705	-195
3	A Pillar Sill	2530	-705	-195
4	A Pillar Low	2599	-700	-434
5	A Pillar Mid	2647	-769	-702
6	B Pillar Sill	1466	-705	-205
7	B Pillar Low	1531	-676	-510
8	B Pillar Mid	1436	-665	-755
9	Seat	1679	-516	-210
10	Engine	3321	0	-841
11	Firewall	3189	0	-884
12	Roof	1464	510	-1333
13	Floor Sill	1515	705	-205
14	Rear Deck	245	0	-265

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 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

Loc. No.	Description	Peak Values (g's)			
		Max	Time (ms)	Min	Time (ms)
1	Vehicle CG (X)	2.7	118.8	-9.5	14.5
	Vehicle CG (Y)	39.1	8.8	-4.1	18.5
	Vehicle CG (Z)	16.0	8.7	-10.7	13.2
	Resultant	42.3	8.8		
2	Left Floor Sill (Y)	67.4	7.1	-18.0	37.2
3	A Pillar Sill (Y)	23.4	7.8	-1.1	1.5
4	A Pillar Low (Y)	41.9	15.5	-9.9	20.2
5	A Pillar Mid (Y)	(1)	(1)	(1)	(1)
6	B Pillar Sill (Y)	39.8	39.7	-18.4	44.7
7	B Pillar Low (Y)	94.3	24.3	-18.0	28.9
8	B Pillar Mid (Y)	85.0	6.9	-30.7	11.5
9	Seat (Y)	(2)	(2)	(2)	(2)
10	Engine (X)	3.7	96.3	-10.0	31.9
	Engine (Y)	14.7	77.9	-2.5	183.9
11	Firewall (Y)	10.9	48.3	-1.7	37.2
12	Roof (Y)	26.2	43.3	-1.1	274.7
13	Floor Sill (Y)	43.2	26.1	-1.4	150.4
14	Rear Deck (X)	5.8	120.4	-4.3	61.0
	Rear Deck (Y)	21.5	42.2	-2.2	130.4

(1) No valid data collected for A Pillar Mid Y after 5 msec.
(2) No valid data collected for Seat Y after 25 msec.

DATA SHEET NO. 11

DUMMY INJURY RESPONSE DATA

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

Dummy S/N	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (G)				
Longitudinal (X)	6.3	103.5	25.1	50.5
Lateral (Y)	45.9	52.2	12.8	87.0
Vertical (Z)	6.4	17.0	6.7	56.7
Resultant (R)	51.9	50.5		
HIC36 (t1, t2)	238		t1 = 39.2	t2 = 64.2
THORAX DEFLECTION (mm)				
Upper Rib			30.0	49.8
Middle Rib			28.8	46.5
Lower Rib			31.9	44.8
ABDOMINAL FORCES (N)				
Front	333.0	51.2		
Middle	395.3	41.4		
Rear	578.5	41.9		
Sum	1211.7	41.9		
PELVIS FORCE (N)				
Pubic Symphysis			2348.7	44.7

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

DATA SHEET NO. 12

POST TEST OBSERVATIONS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Front Occupant
Dummy Type / Serial No.	ES-2re / 016
Head Contact	Curtain Airbag, Headrest, Side Header
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	
Right Side Doors	Remained closed and operational	
Hatch and Other Doors	Remained closed and operational	
Seat Movement	0	
Seat Back Failure	None	

POST-TEST STRUCTURAL OBSERVATIONS

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

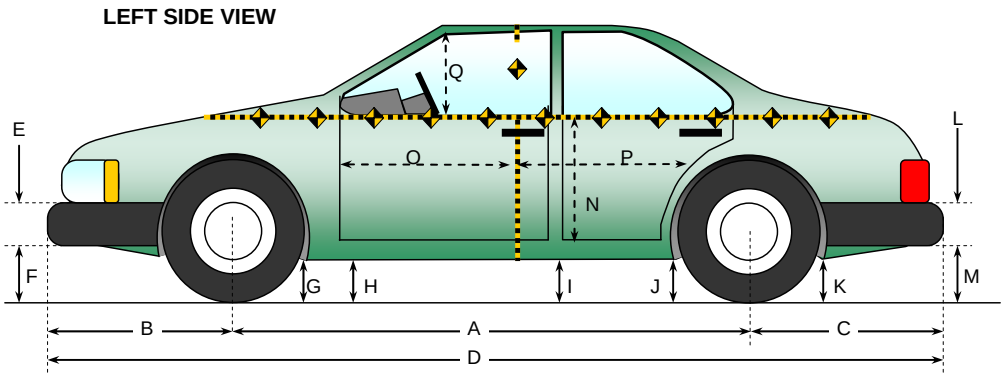
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 13

VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

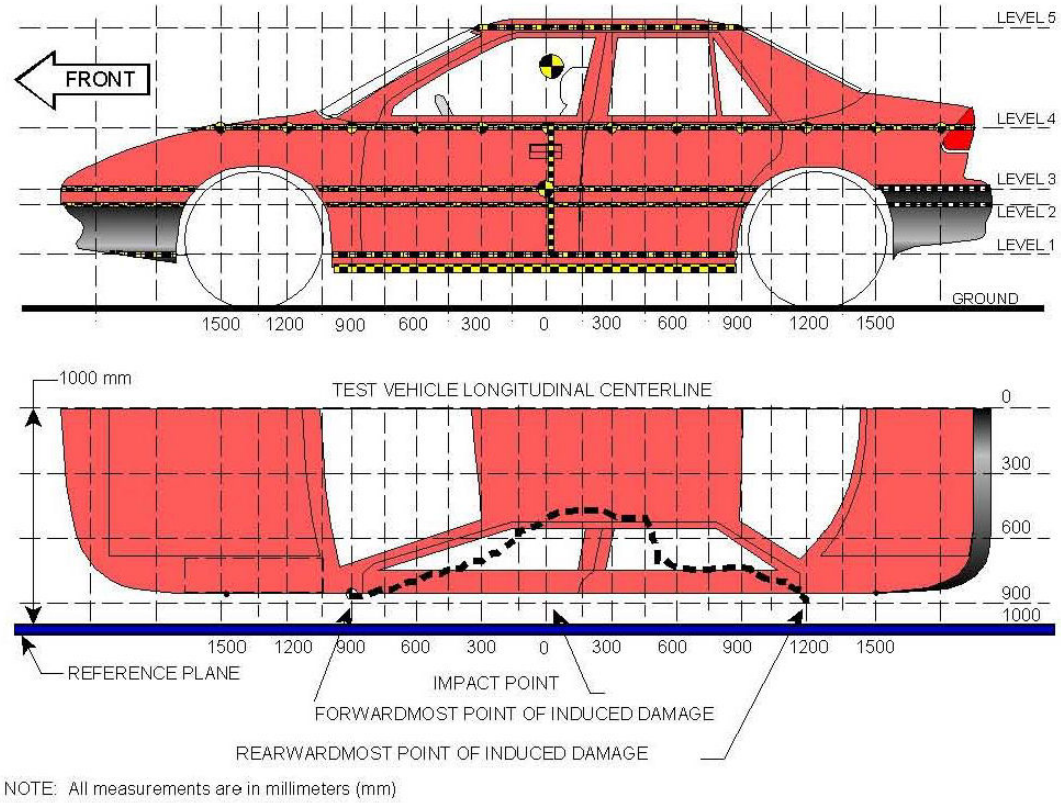


Code	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	Wheelbase	2430	2400	30
B	Front Axle to FSOV	945	945	0
C	Rear Axle to RSOV	700	694	6
D	Total Vehicle Length at Centerline	4075	4039	36
E	Front Bumper Thickness	140	140	0
F	Front Bumper Bottom to Ground	160	160	0
G	Sill Height at Front Wheel Well	145	115	30
H	Sill Height at Front Door Leading Edge	160	168	-8
I	Sill Height at B Pillar	162	137	25
J1	Sill Height at Rear Wheel Well	178	184	-6
J2	Pinch Weld Height at Rear Wheel Well	170	174	-4
K	Sill Height Aft of Rear Wheel Well	255	245	10
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	272	272	0
N	Sill Height to Window Bottom Sill	658	660	-2
O	Front Door Leading Edge to Impact CL	860	855	5
P	Front Door Trailing Edge to Impact CL (2-Dr)	480	472	8
Q	Front Window Opening	405	345	60
R	Right Side Length	2788	2797	-9
S	Left Side Length	2788	2695	93
T	Vehicle Width at B Post	1734	1726	8

DATA SHEET NO. 14

EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011



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	254	0	263
2	Occupant H-Point	281	0	465
3	Mid-Door	292	0	595
4	Window Sill	257	0	863
5	Window Top	94	-75	1262

DATA SHEET NO. 15

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

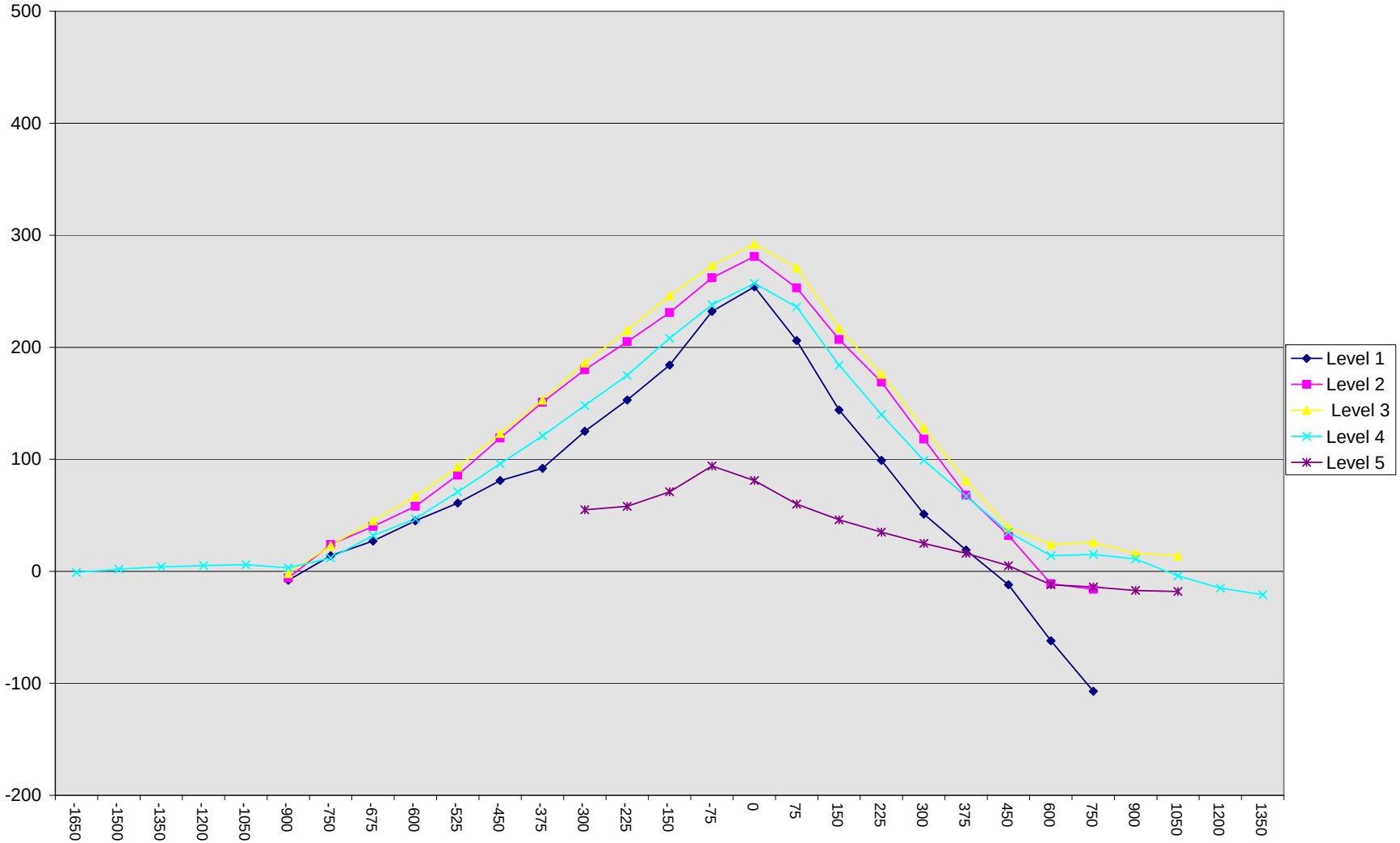
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	254	281	292	257	94
Distance From Impact (mm)	0	0	0	0	-75

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1650				337					336					-1	
-1500				314					316					2	
-1350				298					302					4	
-1200				292					297					5	
-1050				291					297					6	
-900	254	231	230	294		246	225	228	297		-8	-6	-2	3	
-750	256	236	235	292		270	260	258	304		14	24	23	12	
-675	259	239	236	288		286	279	281	320		27	40	45	32	
-600	259	239	236	291		304	297	303	338		45	58	67	47	
-525	260	240	236	288		321	326	329	359		61	86	93	71	
-450	259	241	236	287		340	360	359	383		81	119	123	96	
-375	259	241	237	286		351	392	390	407		92	151	153	121	
-300	260	244	238	287	530	385	424	424	435	585	125	180	186	148	55
-225	259	246	239	288	530	412	451	454	463	588	153	205	215	175	58
-150	260	248	240	289	531	444	479	486	497	602	184	231	246	208	71
-75	260	249	242	289	533	492	511	515	527	627	232	262	273	238	94
0	260	251	244	291	538	514	532	536	548	619	254	281	292	257	81
75	260	252	245	293	542	466	505	516	529	602	206	253	271	236	60
150	260	254	246	298	545	404	461	463	482	591	144	207	217	184	46
225	260	255	248	302	555	359	424	424	442	590	99	169	176	140	35
300	260	256	249	309	556	311	374	377	408	581	51	118	128	99	25
375	260	254	250	313	562	279	322	331	380	578	19	68	81	67	16
450	259	251	250	316	566	247	283	289	351	571	-12	32	39	35	5
600	254	245	246	325	582	192	234	270	339	570	-62	-11	24	14	-12
750	249	231	239	332	601	142	215	265	347	587	-107	-16	26	15	-14
900			228	342	623			244	353	606			16	11	-17
1050			226	355	637			240	351	619			14	-4	-18
1200				371					356					-15	
1350				391					370					-21	

DATA SHEET NO. 15 (CONTINUED)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011



DATA SHEET NO. 16

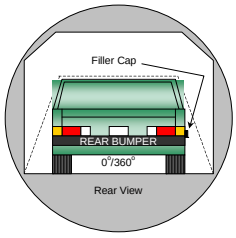
SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

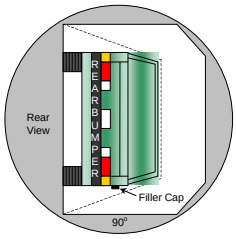
FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

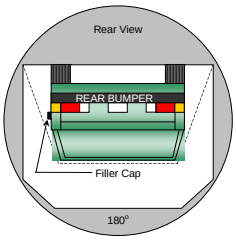
STATIC ROLLOVER DATA



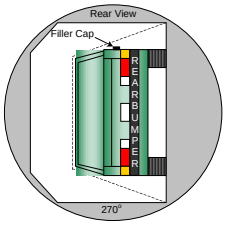
0/360



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°	2	minutes	02	seconds	5	minutes	7	minutes	02	seconds	8	minutes
90° - 180°	2	minutes	00	seconds	5	minutes	7	minutes	00	seconds	8	minutes
180° - 270°	1	minutes	44	seconds	5	minutes	6	minutes	44	seconds	7	minutes
270° - 360°	1	minutes	56	seconds	5	minutes	6	minutes	56	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

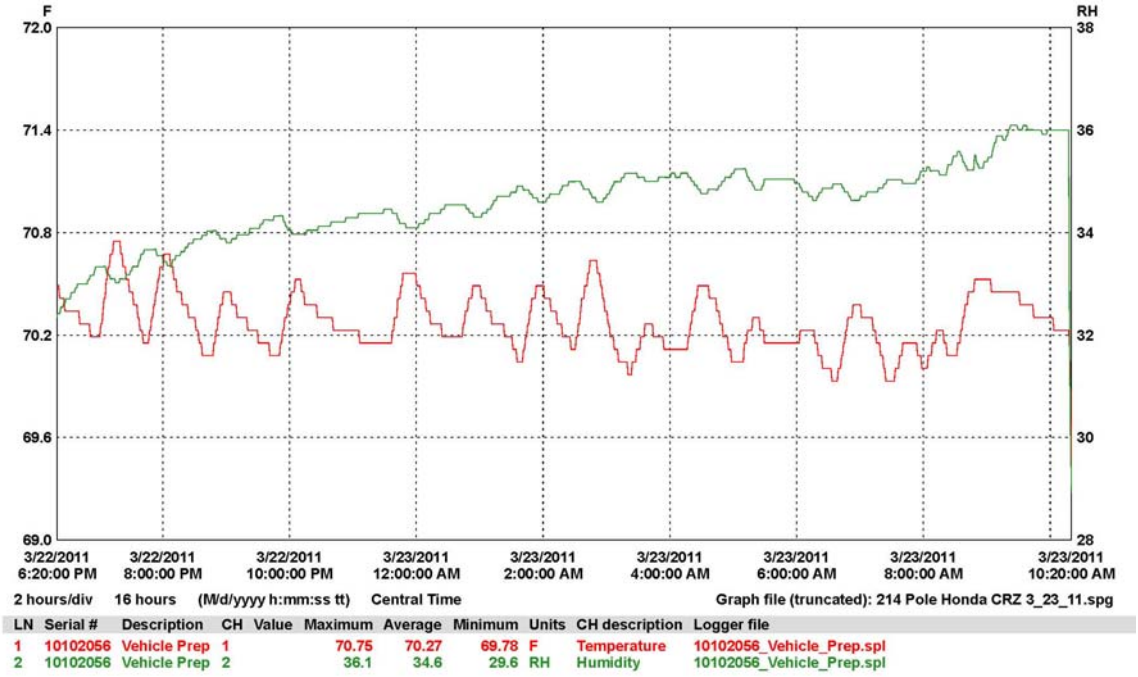
Rollover Stage	Spillage Location(s)
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17

TEMPERATURE AND HUMIDITY TRACES

Test Vehicle: 2011 Honda CR-Z 3-Dr Hatchback NHTSA No. CB5302
Test Program: FMVSS 214 Pole Test Date: 3/23/2011

Time of Impact: 10:16 am



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102056	Vehicle Prep	1		70.75	70.27	69.78	F	Temperature	10102056_Vehicle_Prep.spl
2	10102056	Vehicle Prep	2		36.1	34.6	29.6	RH	Humidity	10102056_Vehicle_Prep.spl

APPENDIX A

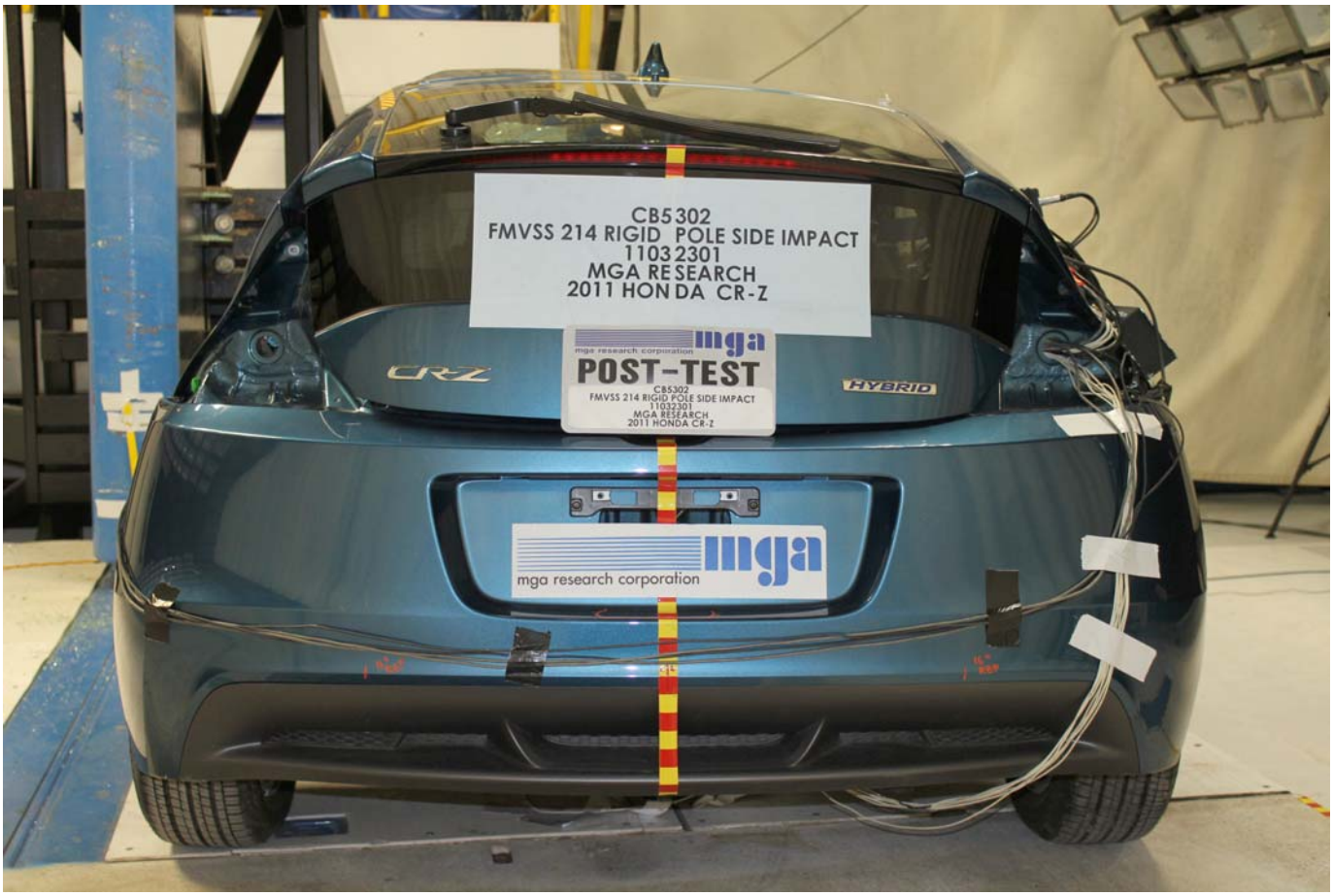
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

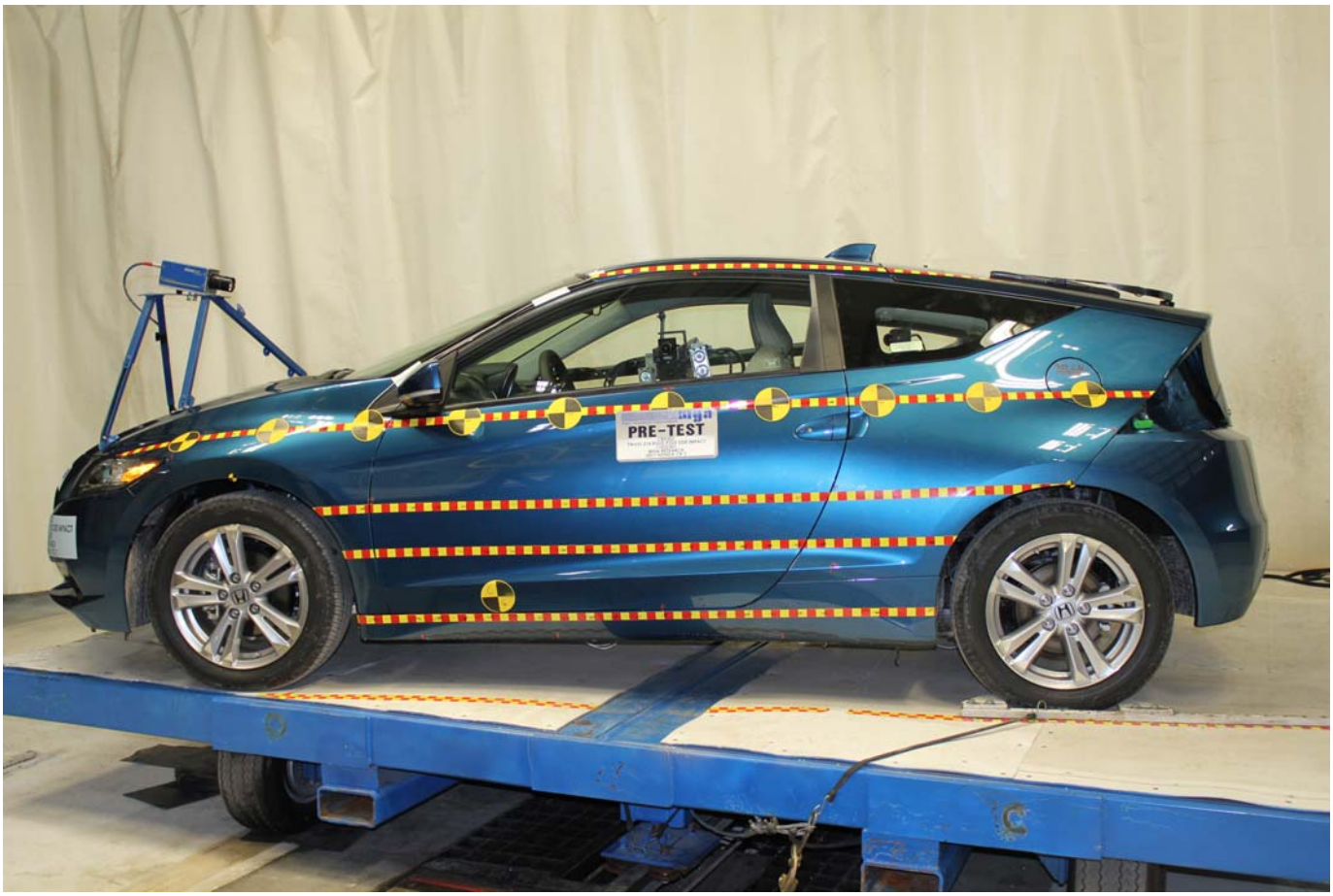
Pre-Test Frontal View of Test Vehicle

Post-Test Frontal View of Test Vehicle

Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



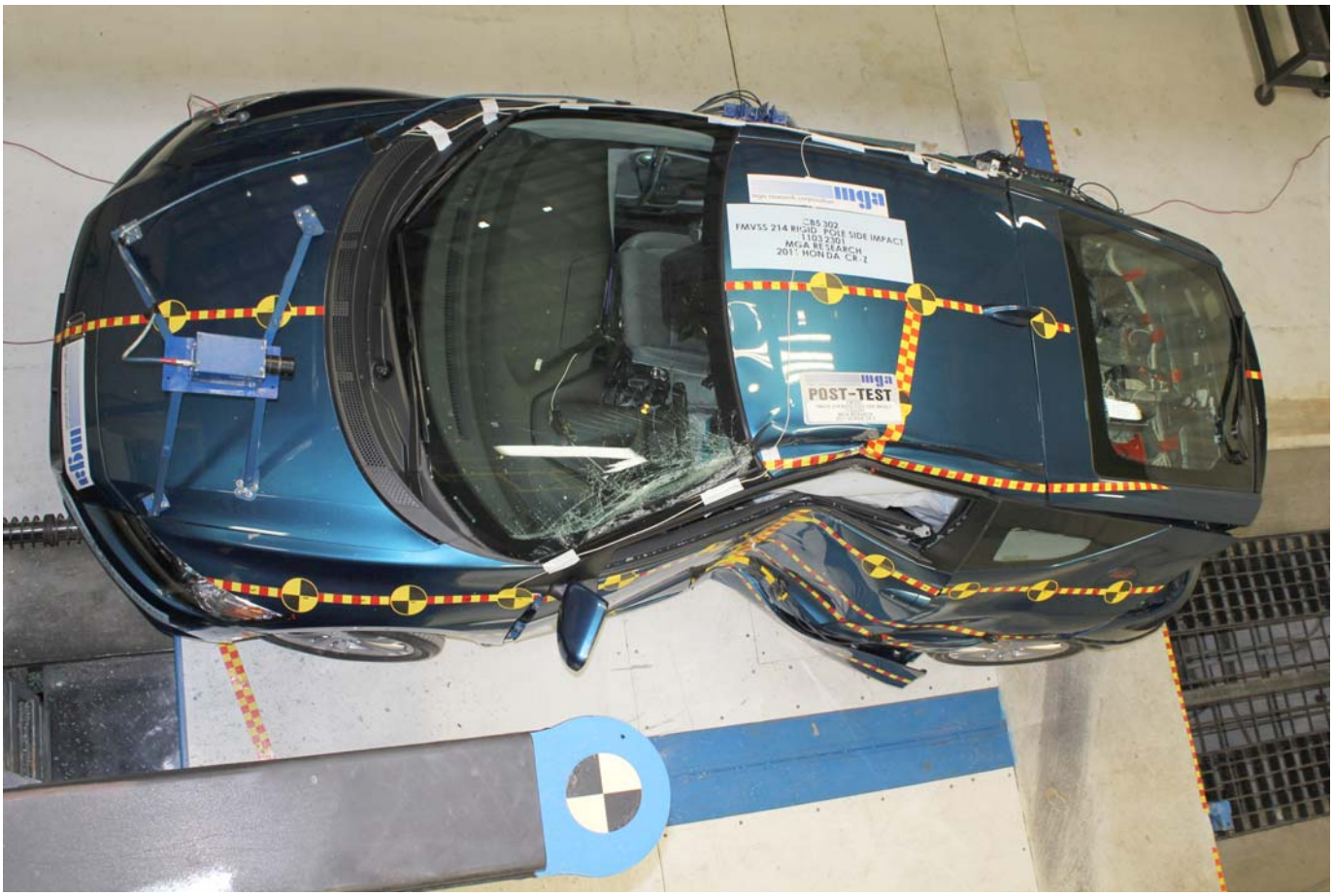
Pre-Test Impacted Side View of Test Vehicle

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



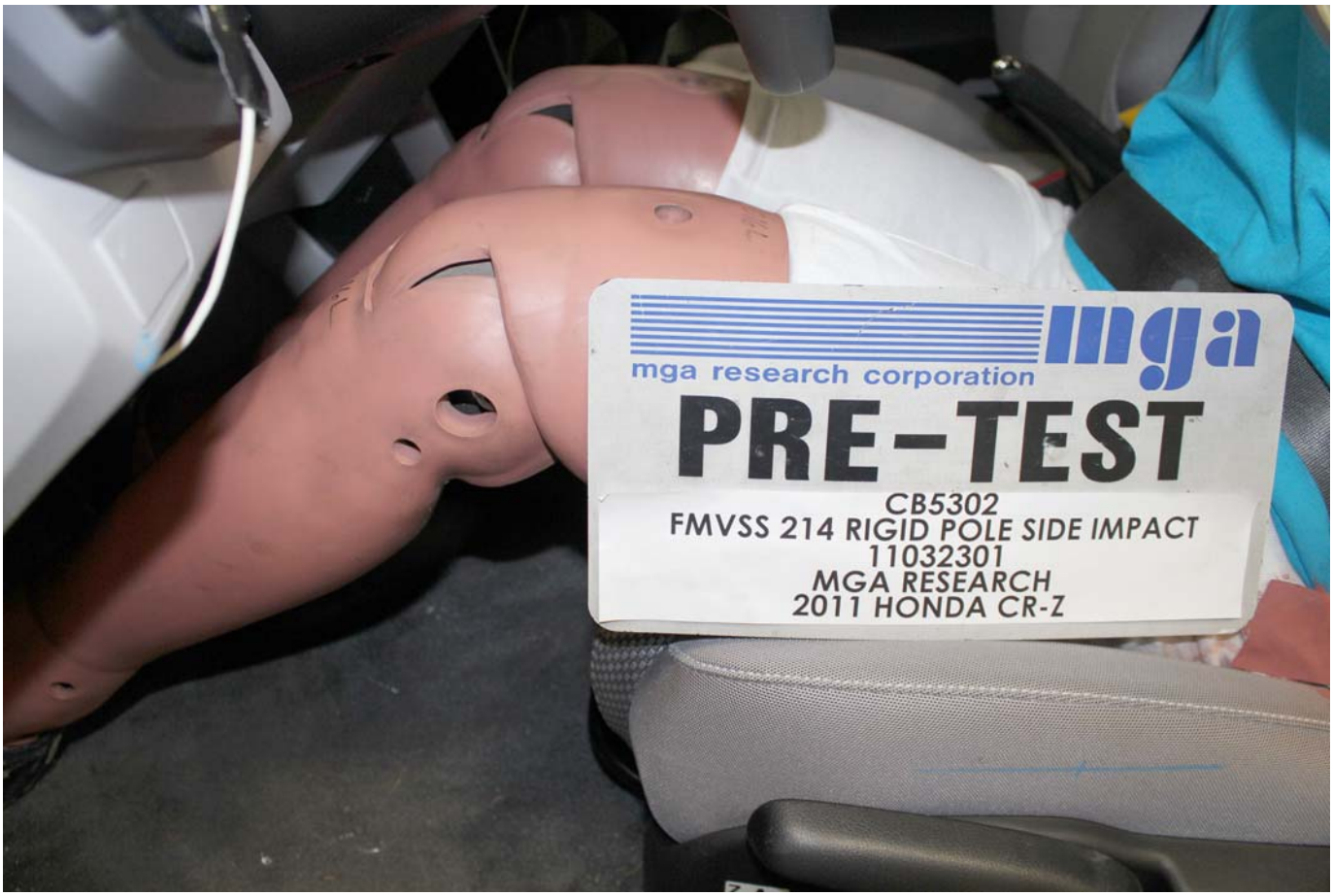
Post-Test Overhead View of Test Vehicle

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 Door Open

Pre-Test Dummy Door Open

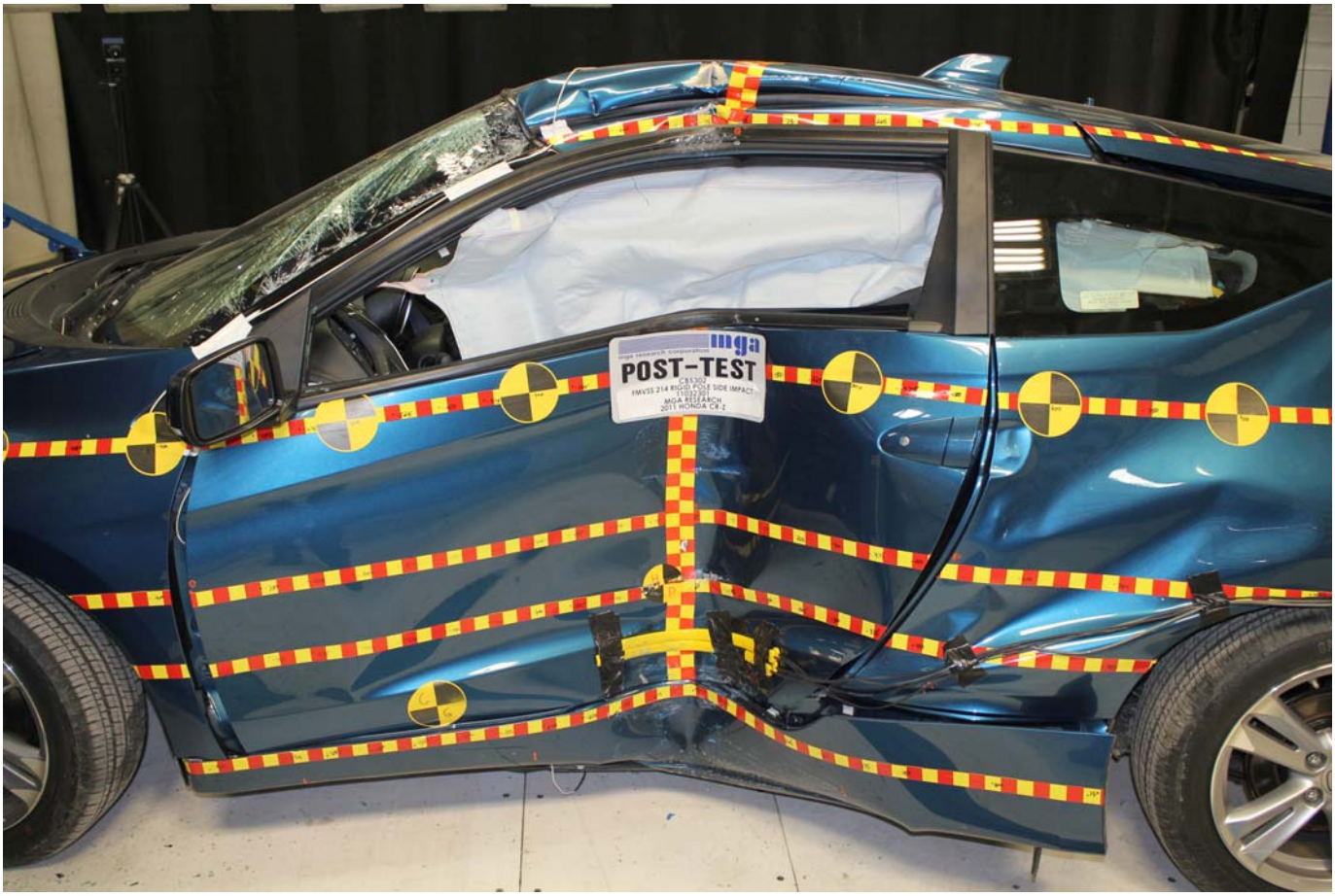
Pre-Test Dummy Shoulder and Door Top View

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



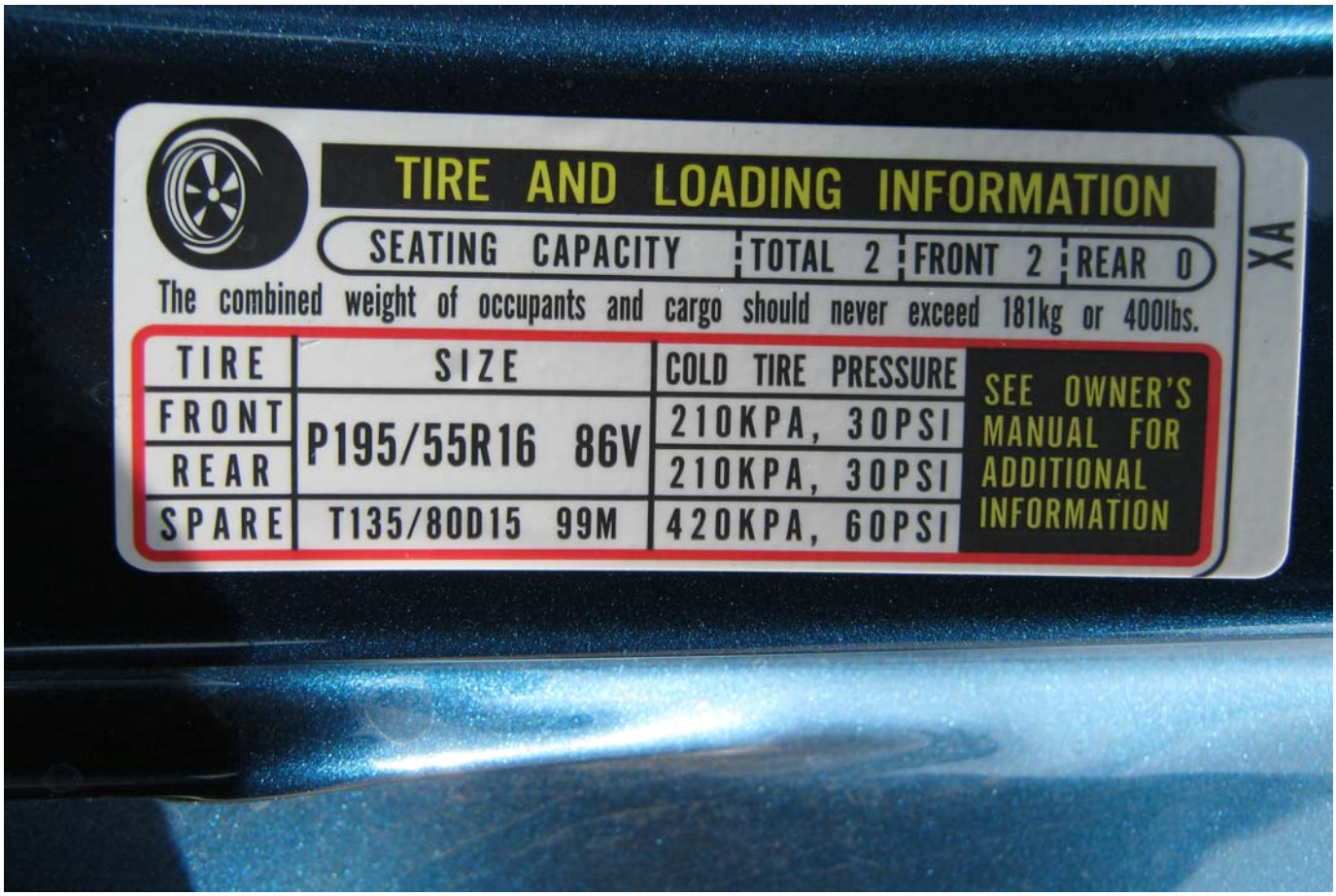
Post-Test Impact Zone Close-up View

Post-Test ¾ Front View of Impact Zone

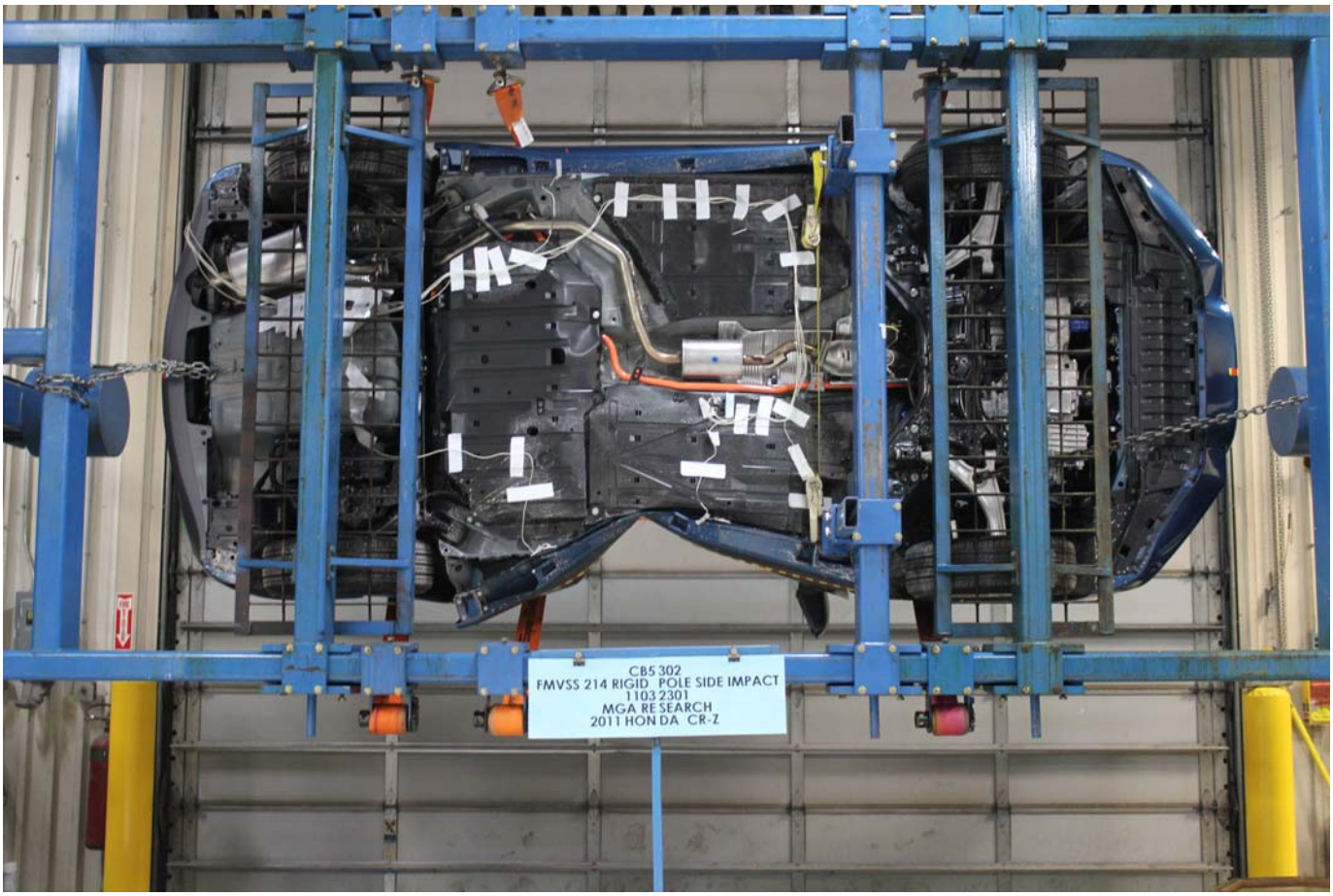
Post-Test ¾ Rear View of Impact Zone

Post-Test Close-up View of Impact Point Target

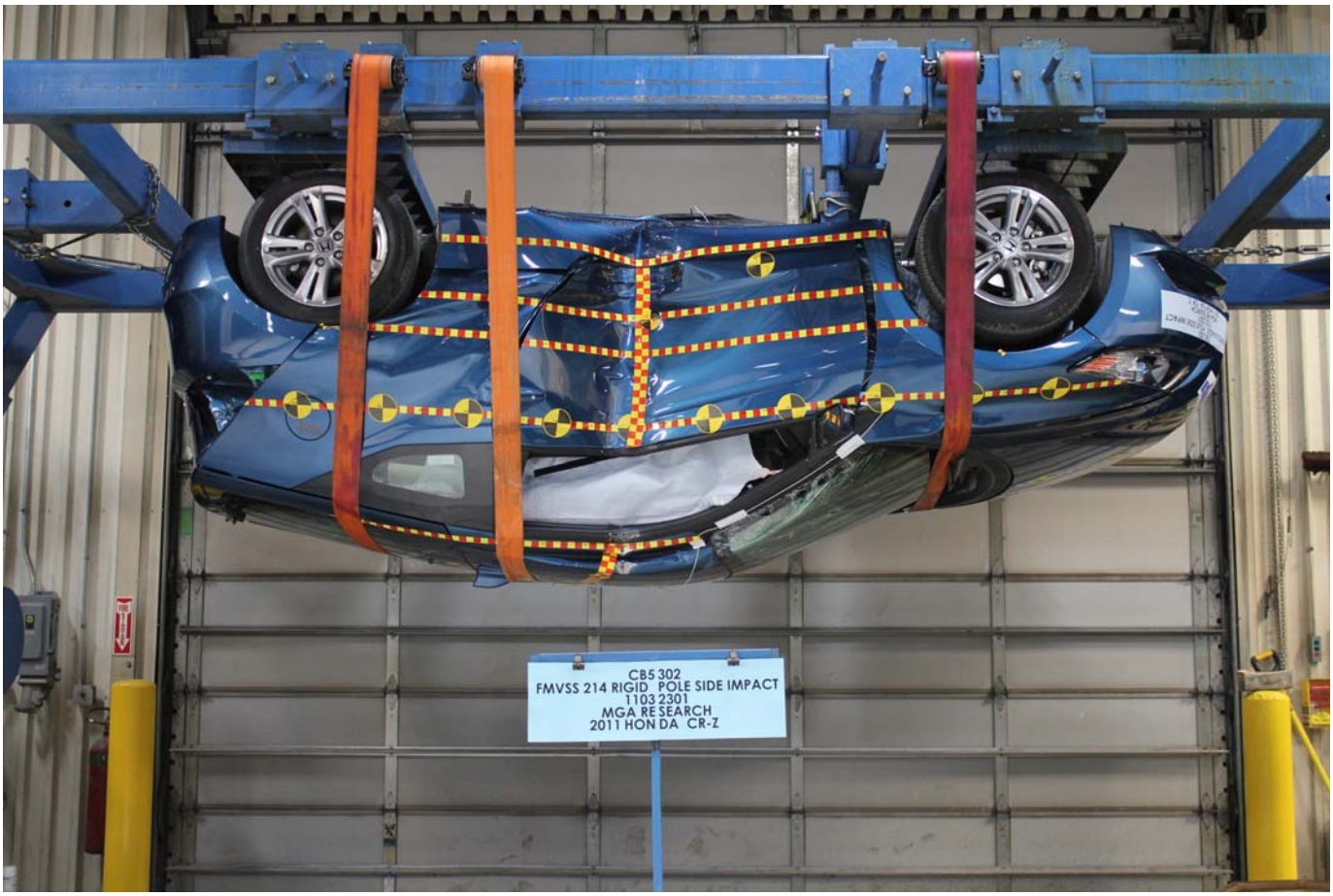
Close-up View of Vehicle's Certification Label



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

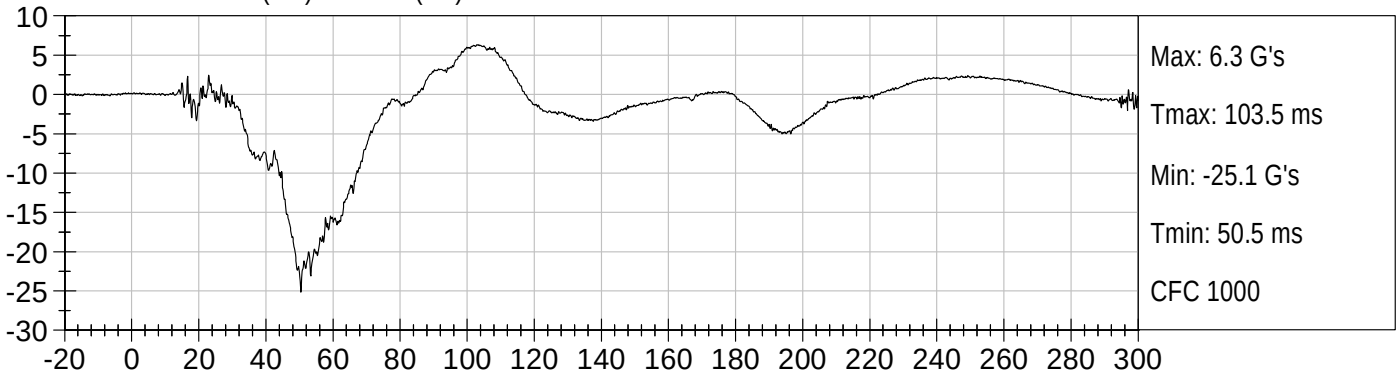
TABLE OF DATA PLOTS

Dummy Instrumentation Plots
FILTERED DATA

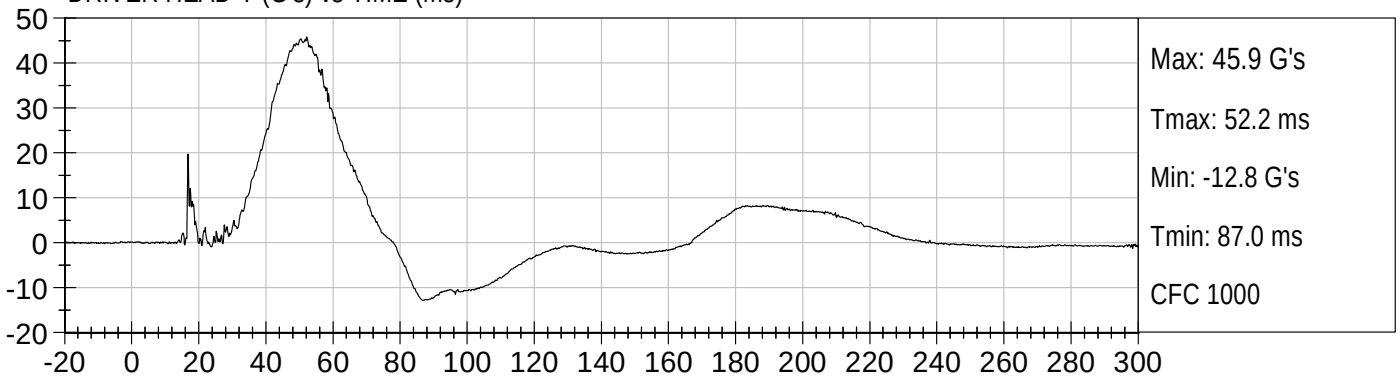
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

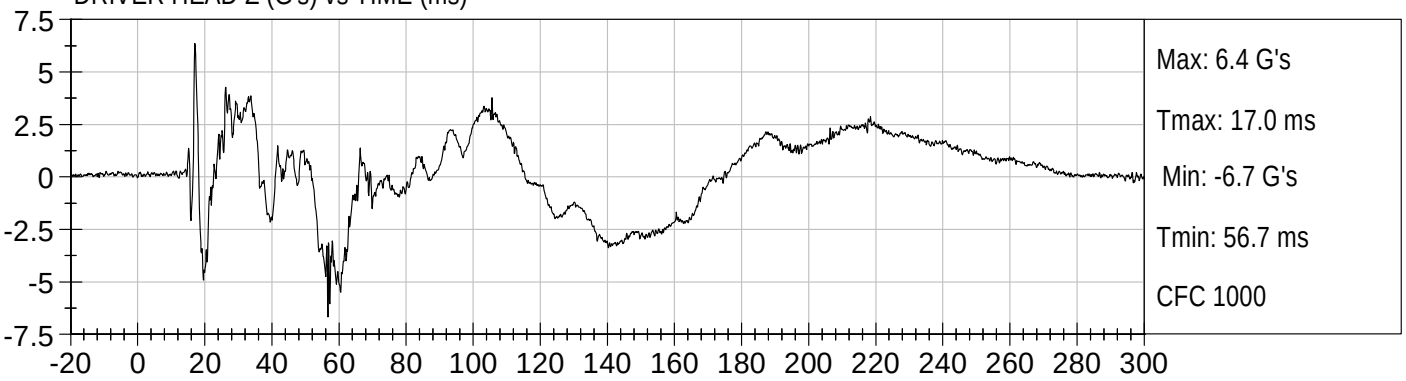
DRIVER HEAD X (G's) vs TIME (ms)



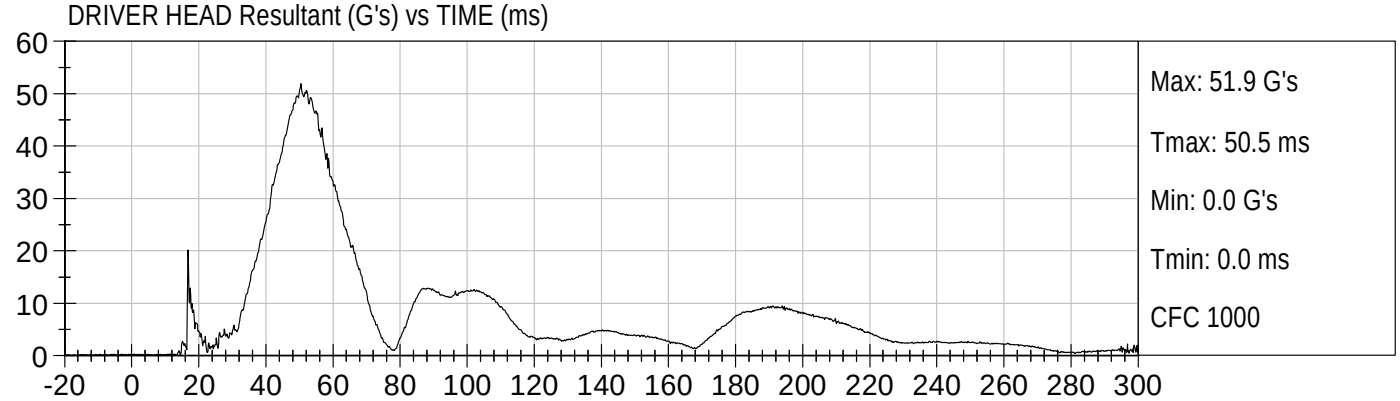
DRIVER HEAD Y (G's) vs TIME (ms)



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



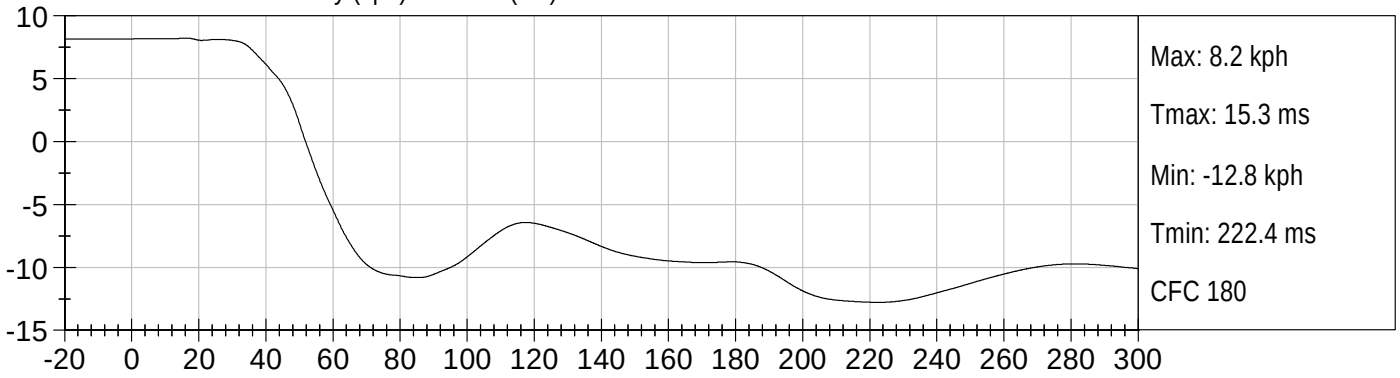
DRIVER HEAD Resultant (G's) vs TIME (ms)



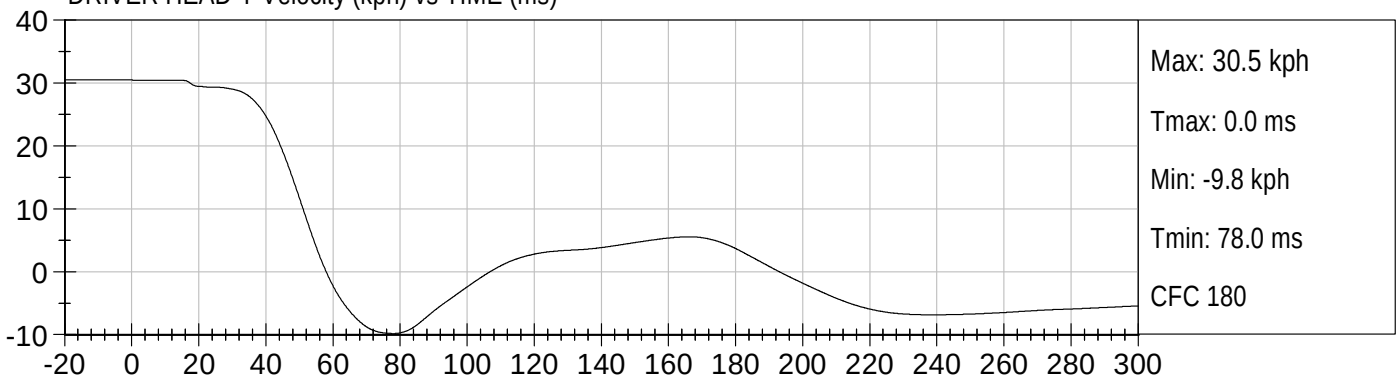
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

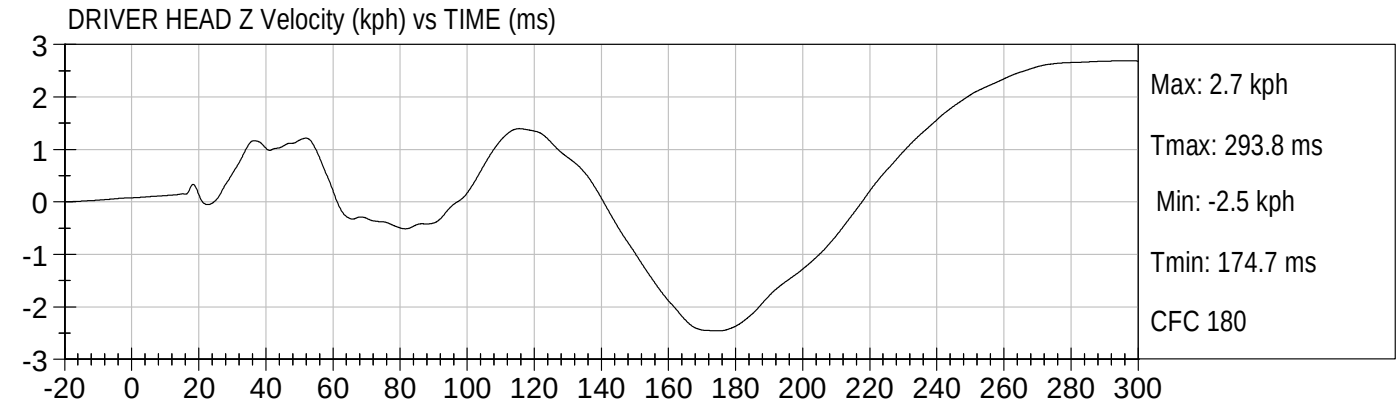
DRIVER HEAD X Velocity (kph) vs TIME (ms)



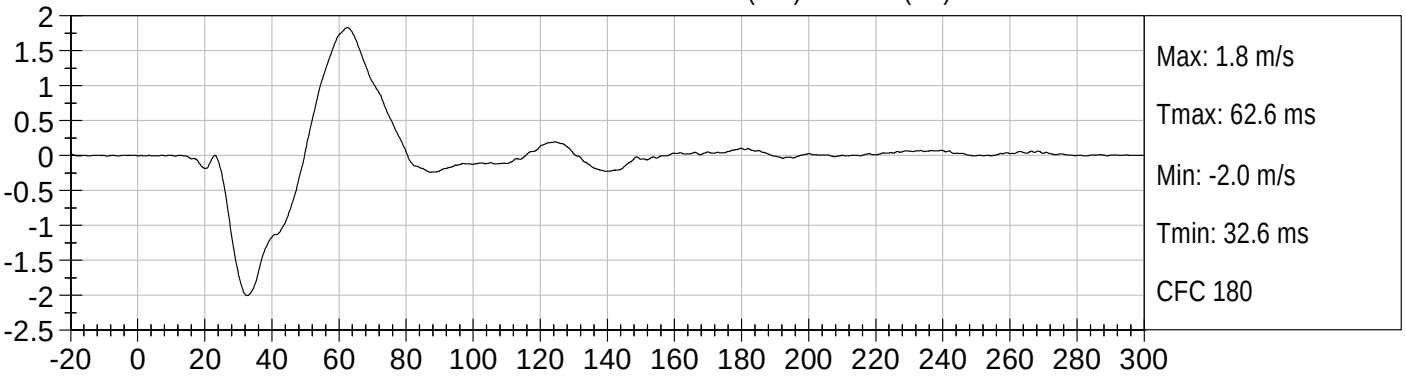
DRIVER HEAD Y Velocity (kph) vs TIME (ms)



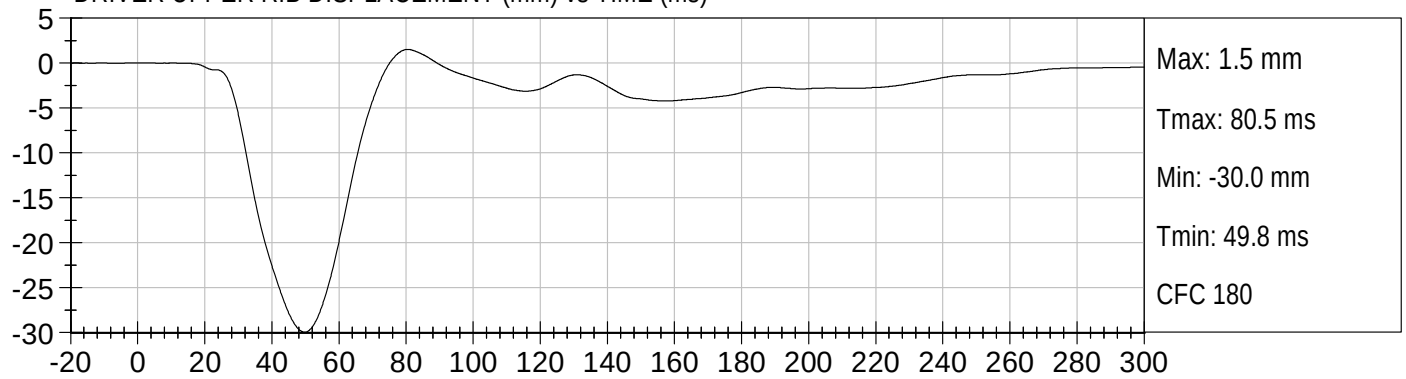
DRIVER HEAD Z Velocity (kph) vs TIME (ms)



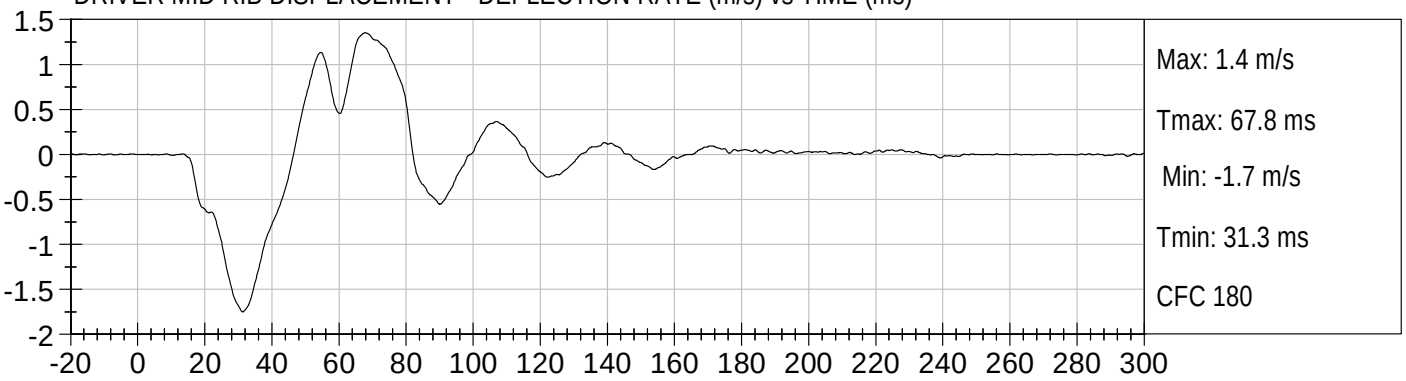
DRIVER UPPER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



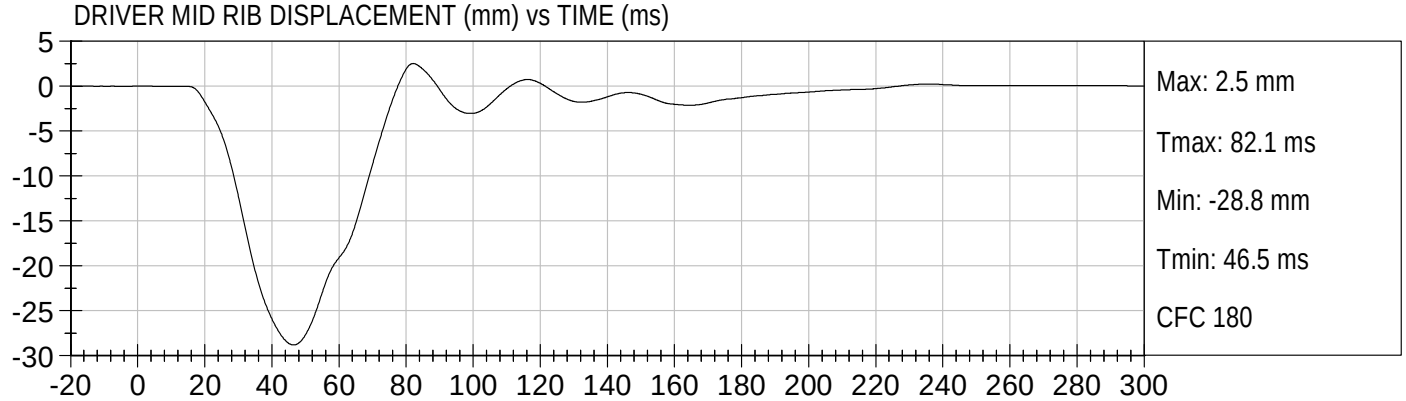
DRIVER UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



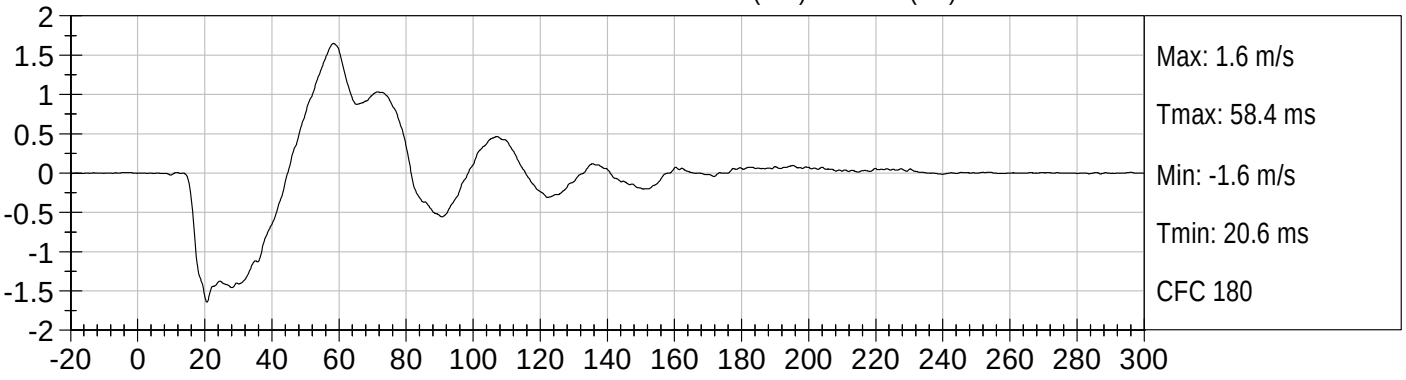
DRIVER MID RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



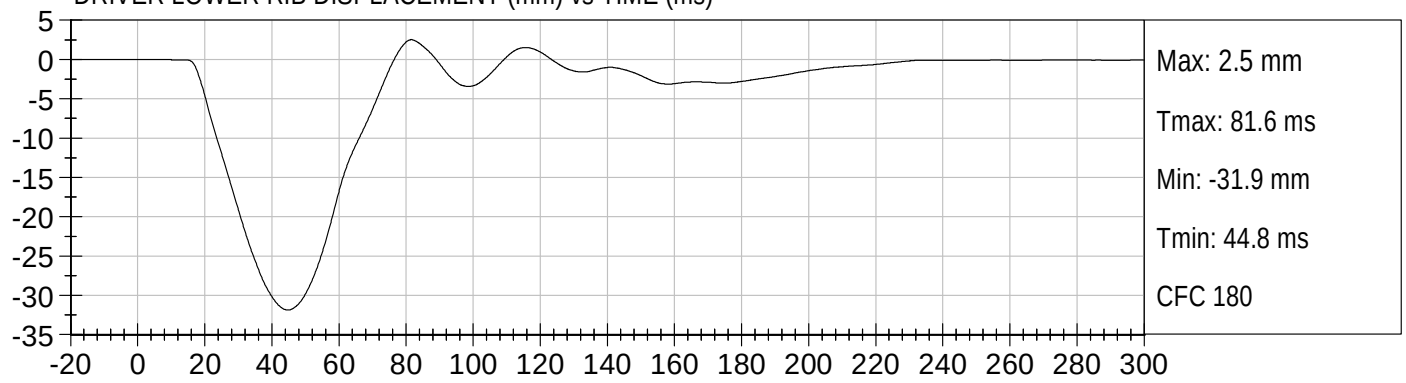
DRIVER MID RIB DISPLACEMENT (mm) vs TIME (ms)



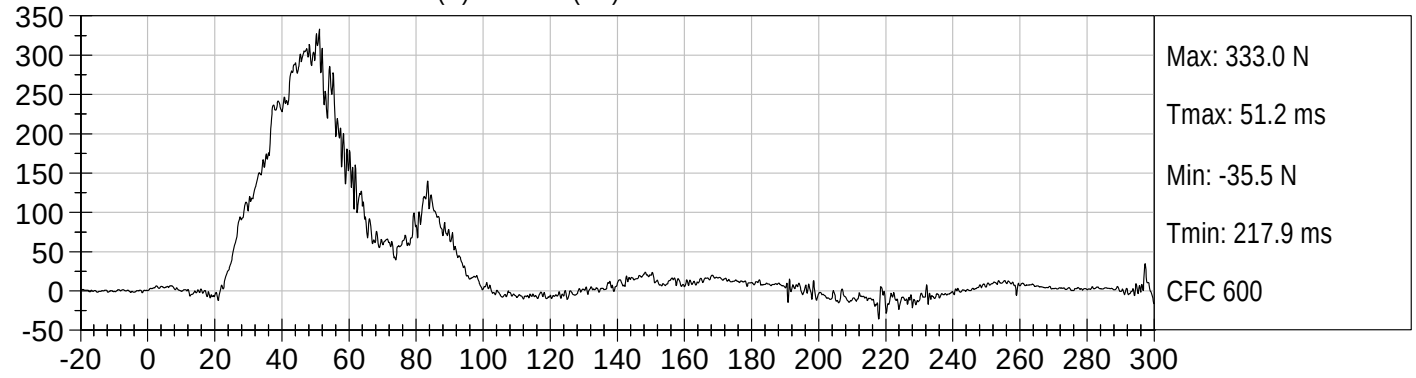
DRIVER LOWER RIB DISPLACEMENT - DEFLECTION RATE (m/s) vs TIME (ms)



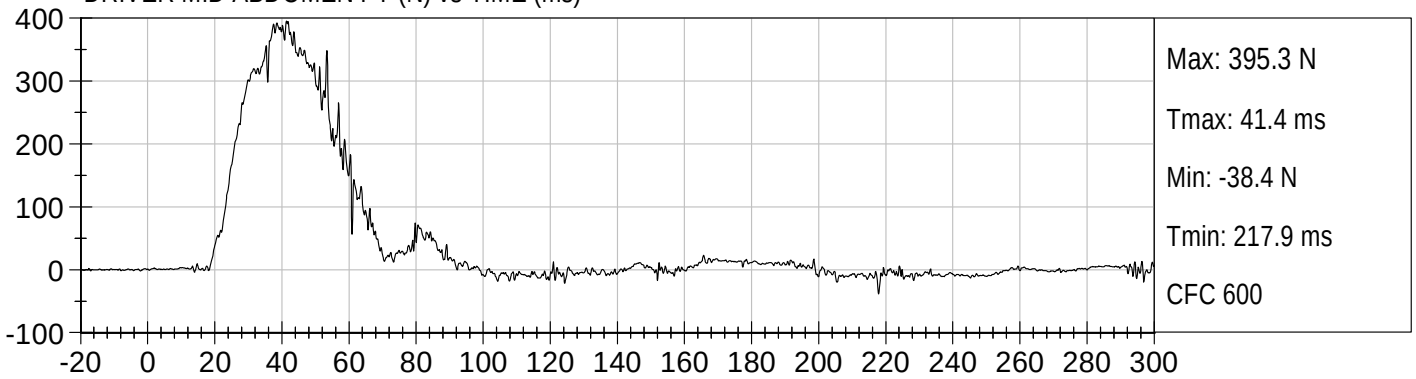
DRIVER LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



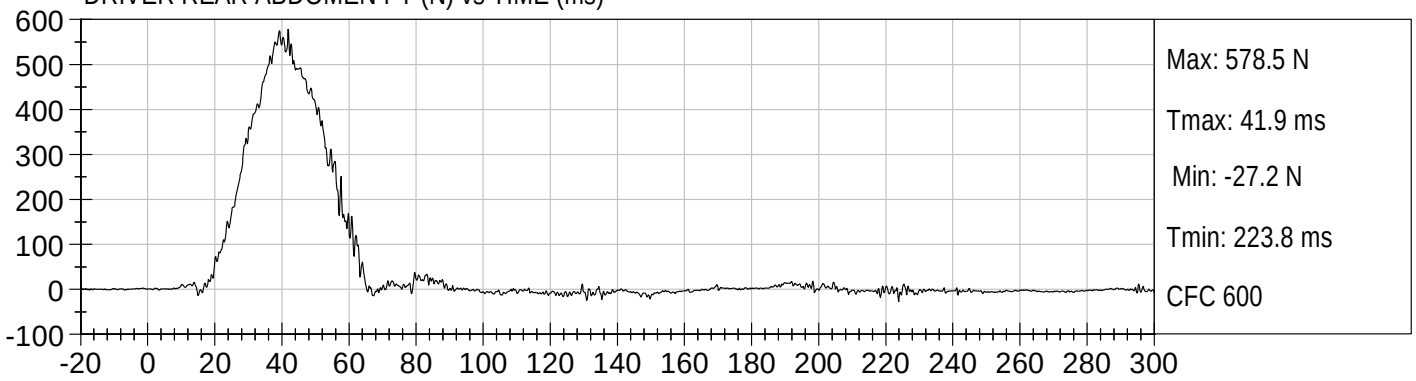
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



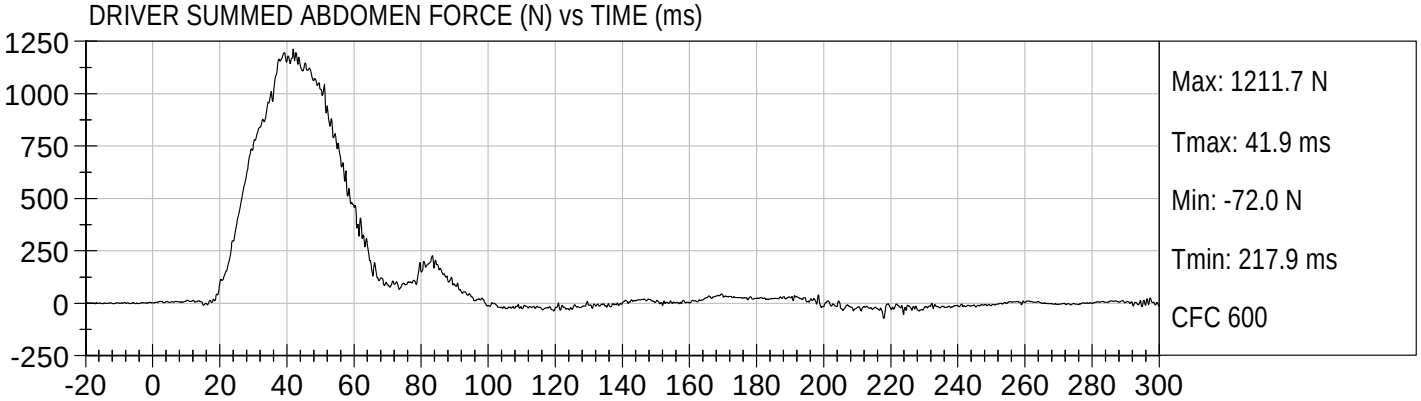
DRIVER MID ABDOMEN FY (N) vs TIME (ms)

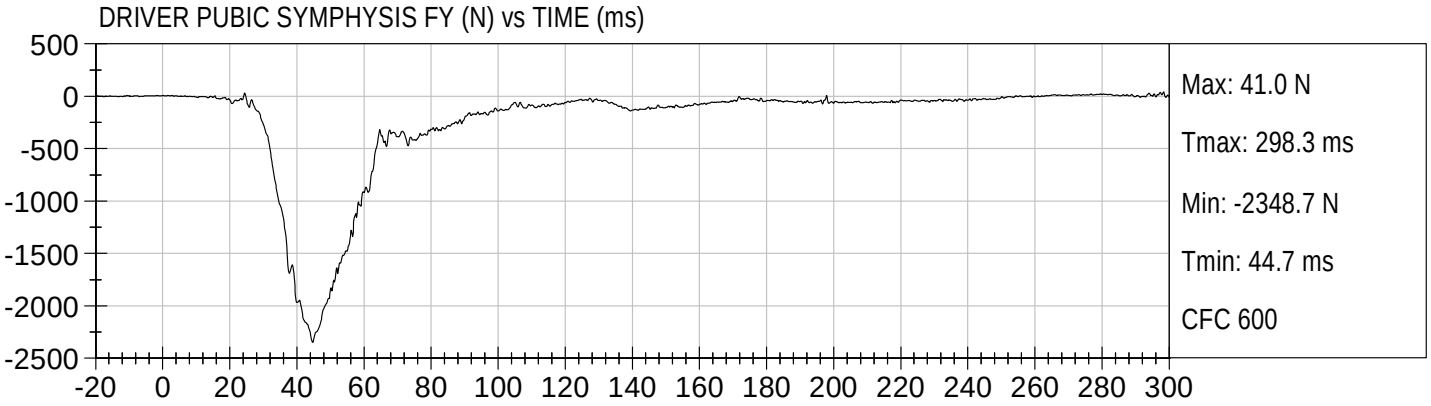


DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



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




DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)
500
0
-500
-1000
-1500
-2000
-2500
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
Max: 41.0 N
Tmax: 298.3 ms
Min: -2348.7 N
Tmin: 44.7 ms
CFC 600

APPENDIX C

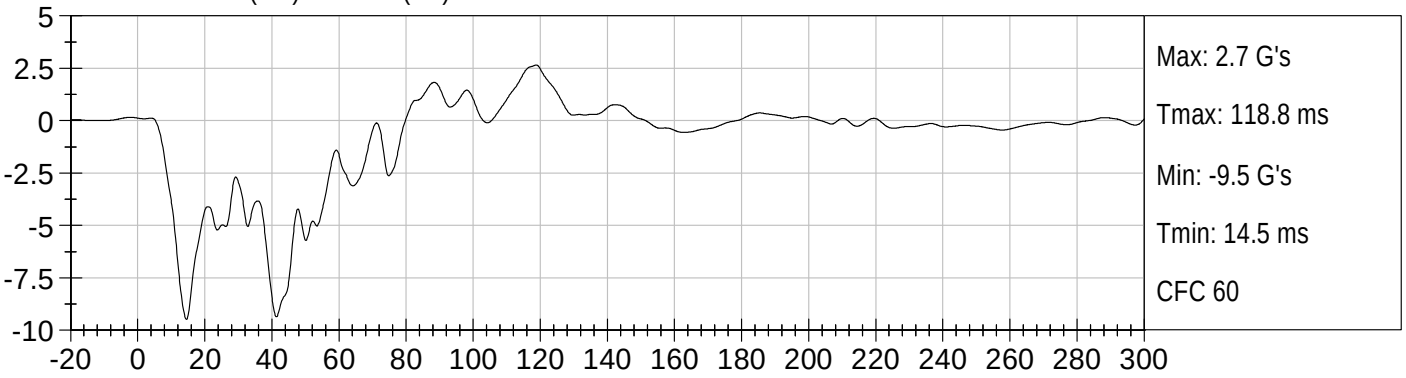
VEHICLE ACCELEROMETER RESPONSE DATA

TABLE OF DATA PLOTS

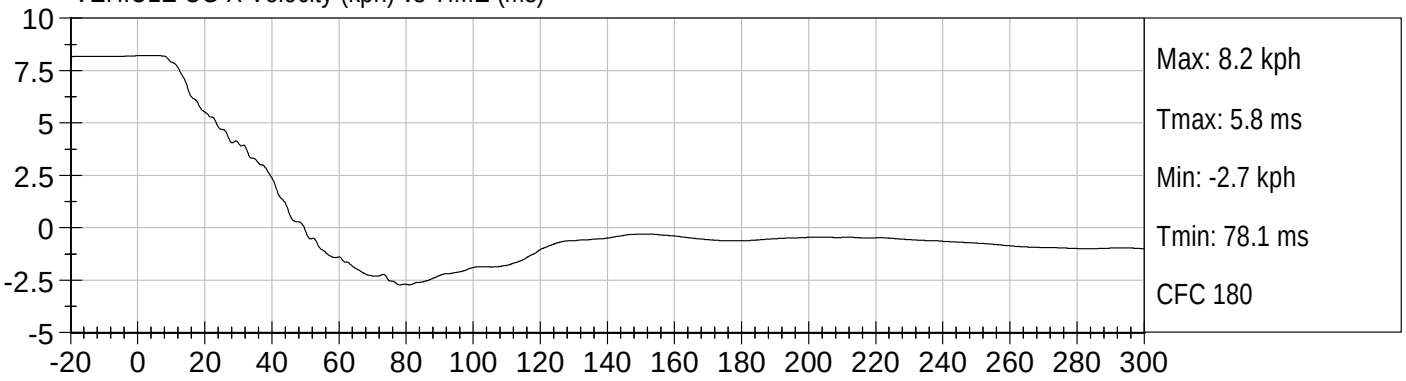
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

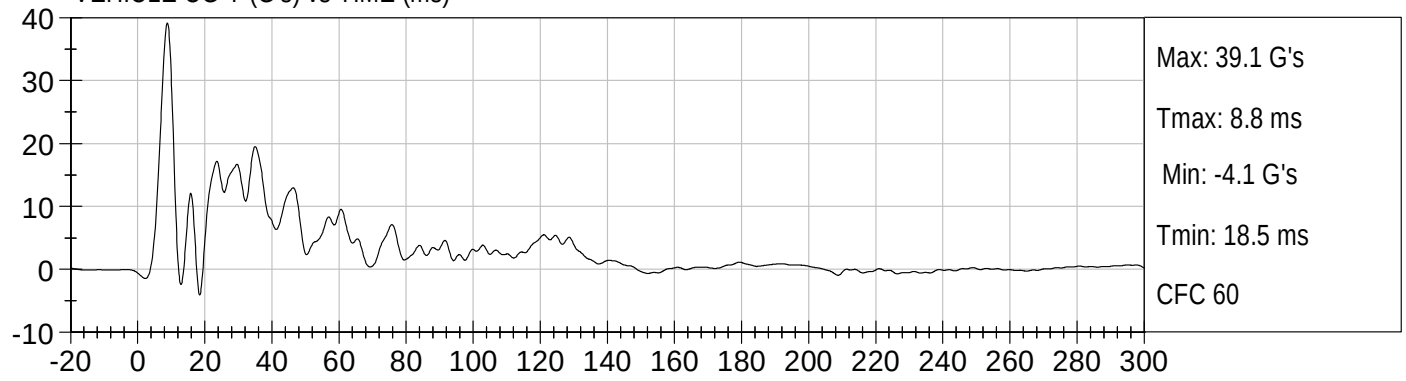
VEHICLE CG X (G's) vs TIME (ms)



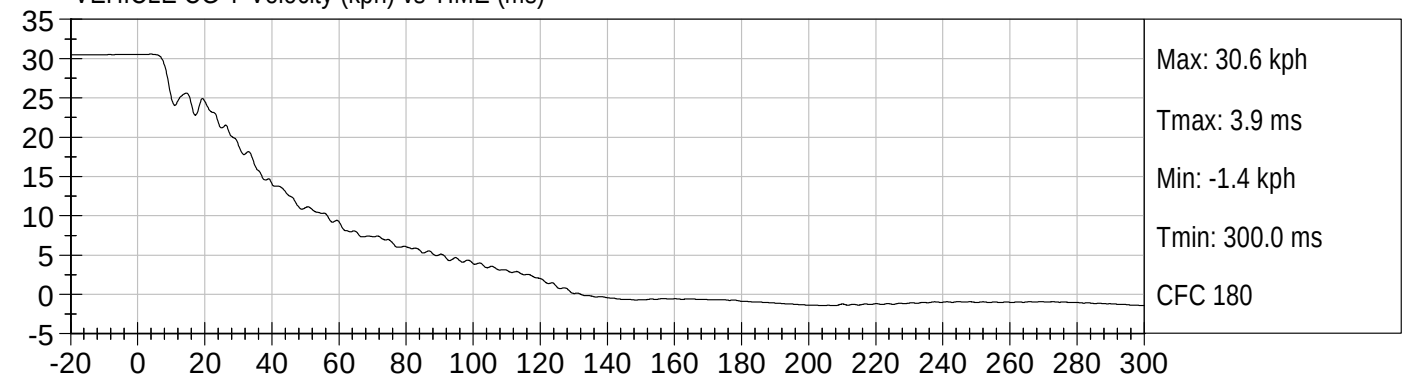
VEHICLE CG X Velocity (kph) vs TIME (ms)



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



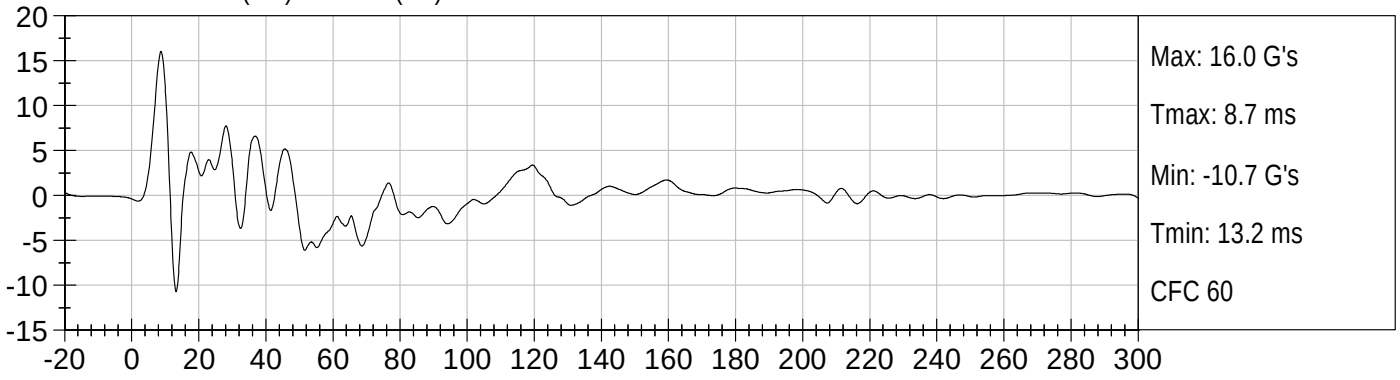
VEHICLE CG Y Velocity (kph) vs TIME (ms)



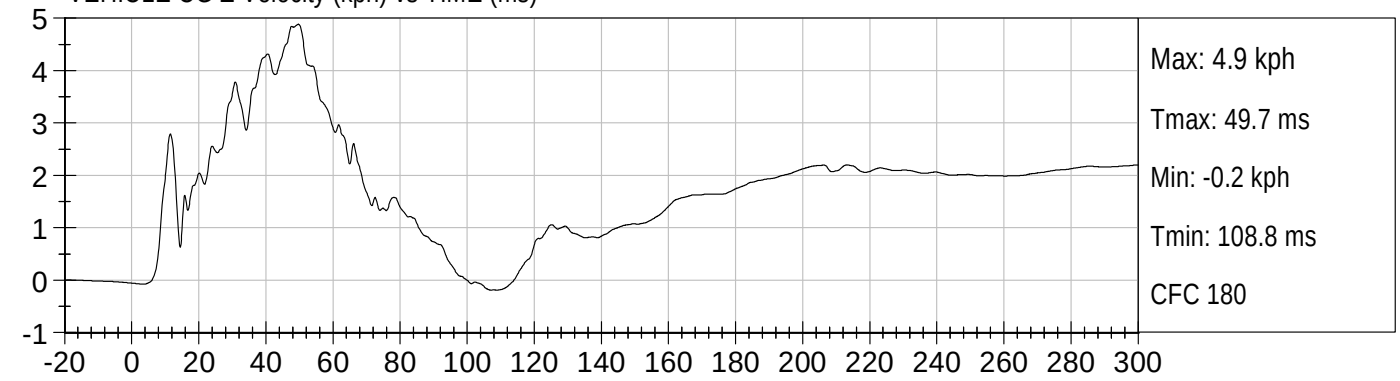
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

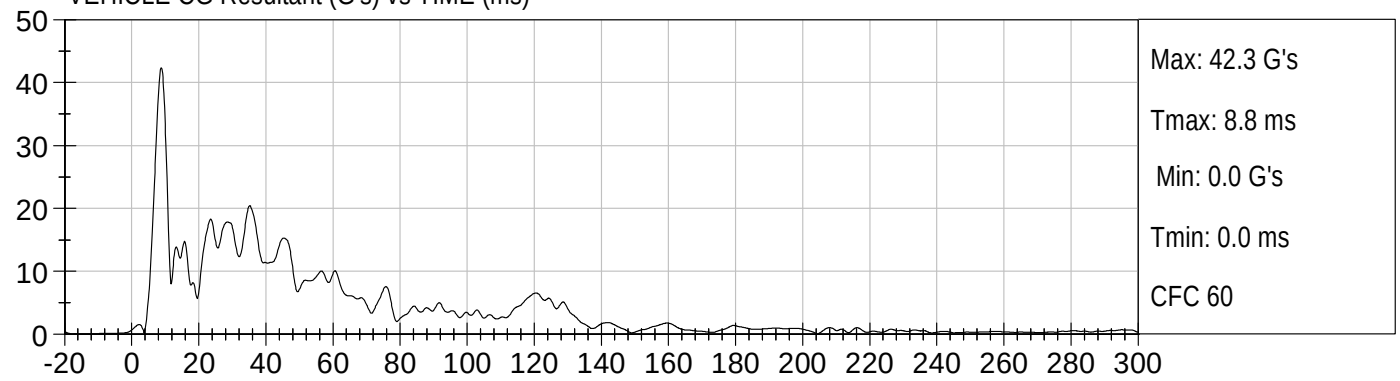
VEHICLE CG Z (G's) vs TIME (ms)



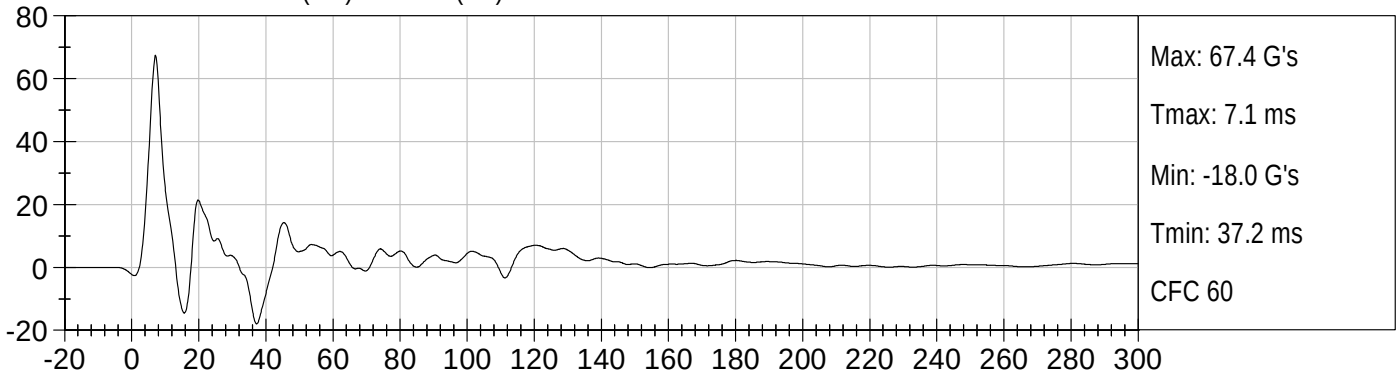
VEHICLE CG Z Velocity (kph) vs TIME (ms)



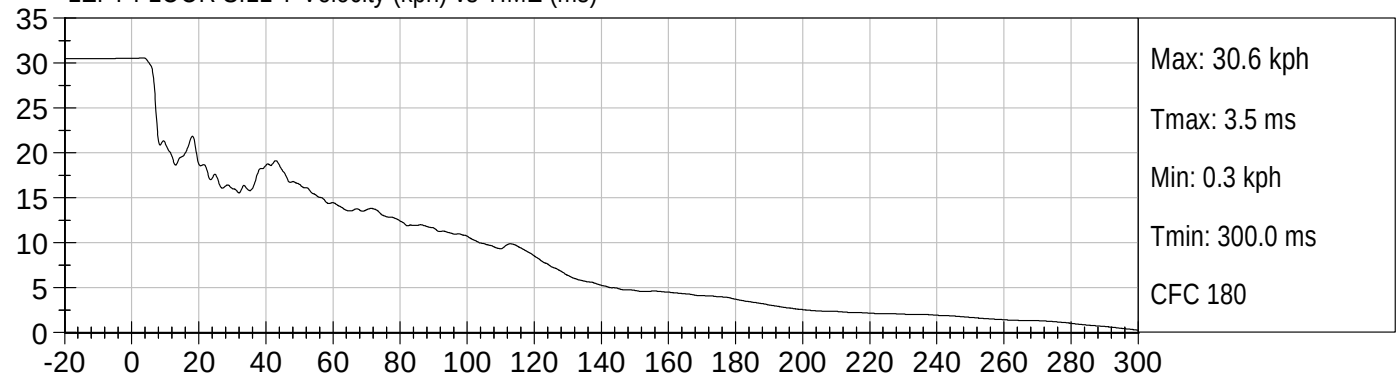
VEHICLE CG Resultant (G's) vs TIME (ms)



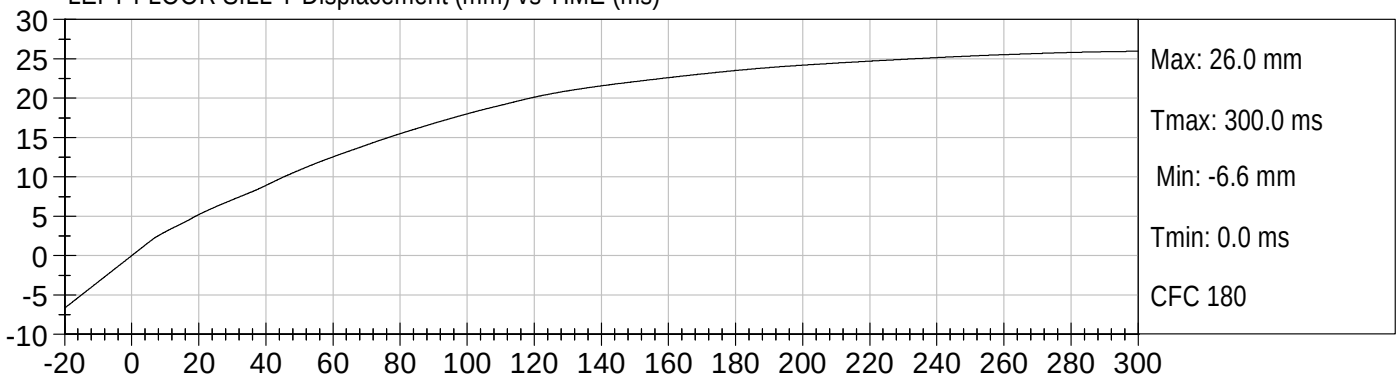
LEFT FLOOR SILL Y (G's) vs TIME (ms)



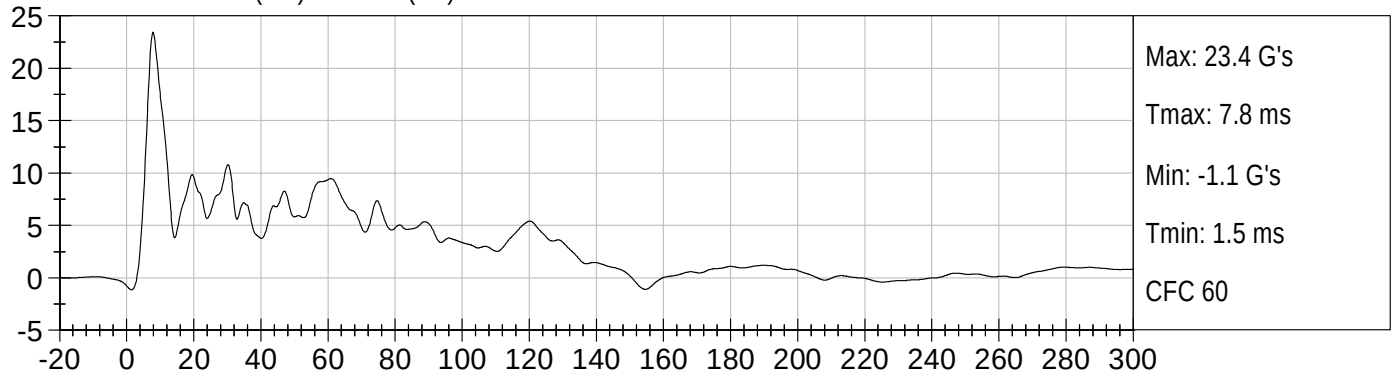
LEFT FLOOR SILL Y Velocity (kph) vs TIME (ms)



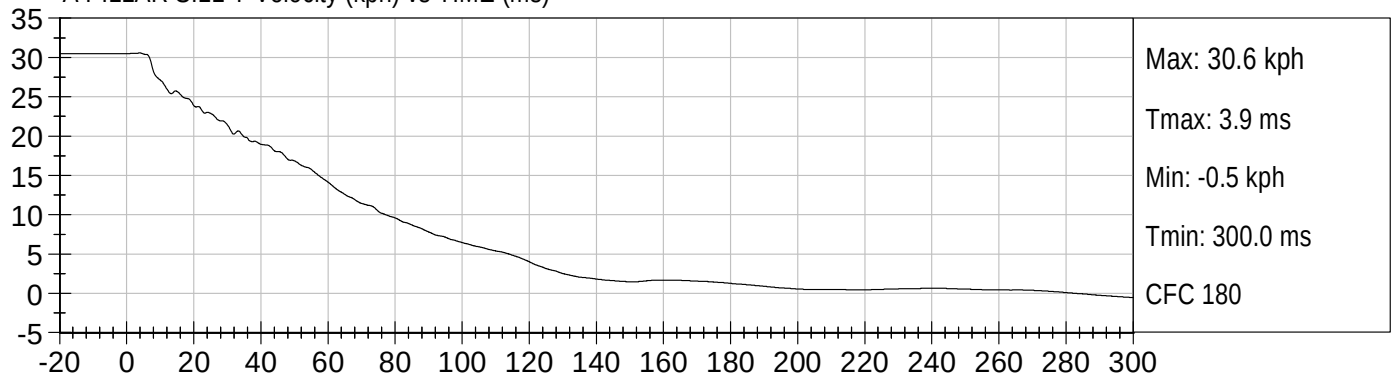
LEFT FLOOR SILL Y Displacement (mm) vs TIME (ms)



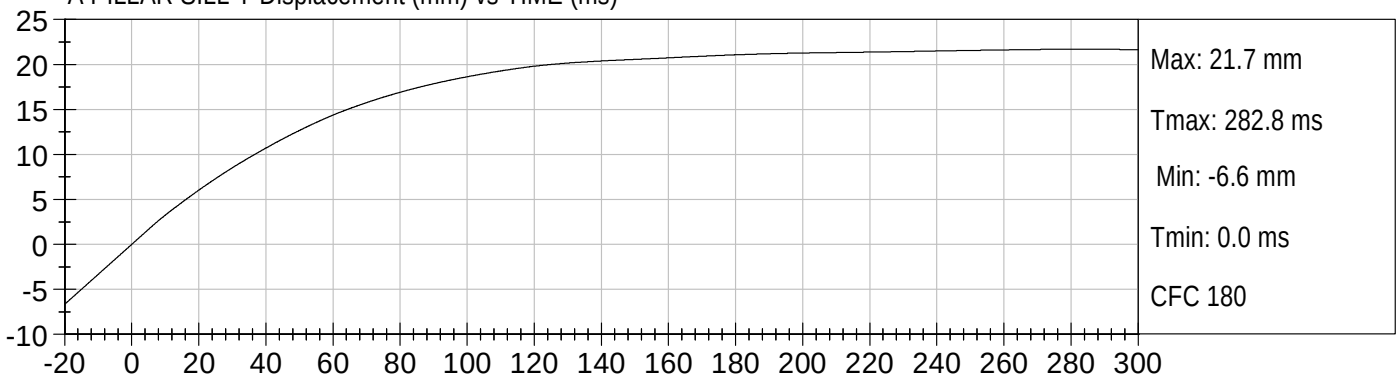
A PILLAR SILL Y (G's) vs TIME (ms)



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



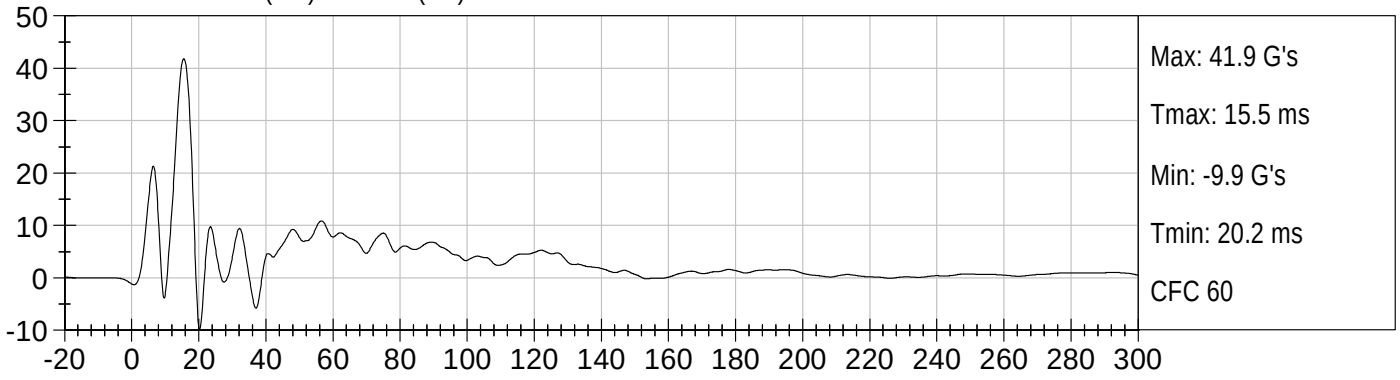
A PILLAR SILL Y Displacement (mm) vs TIME (ms)



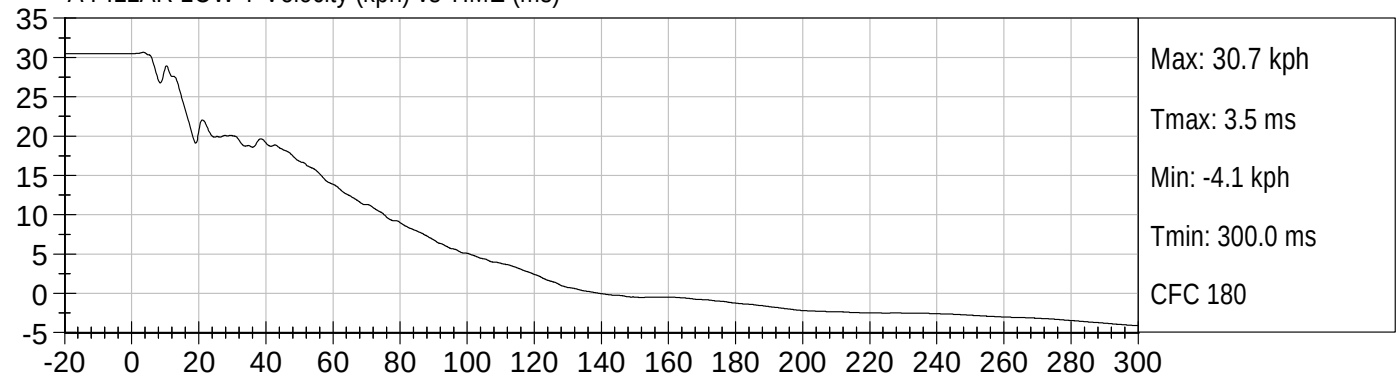
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

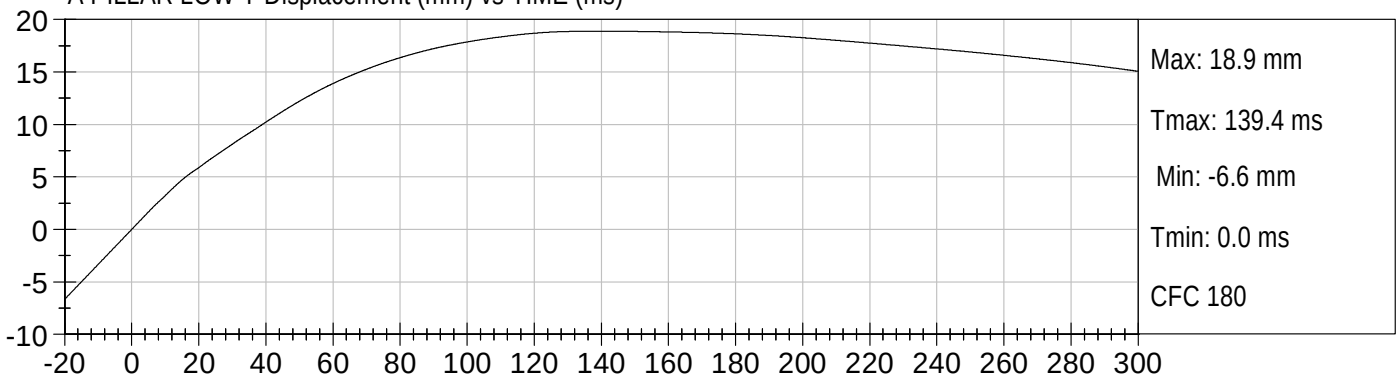
A PILLAR LOW Y (G's) vs TIME (ms)



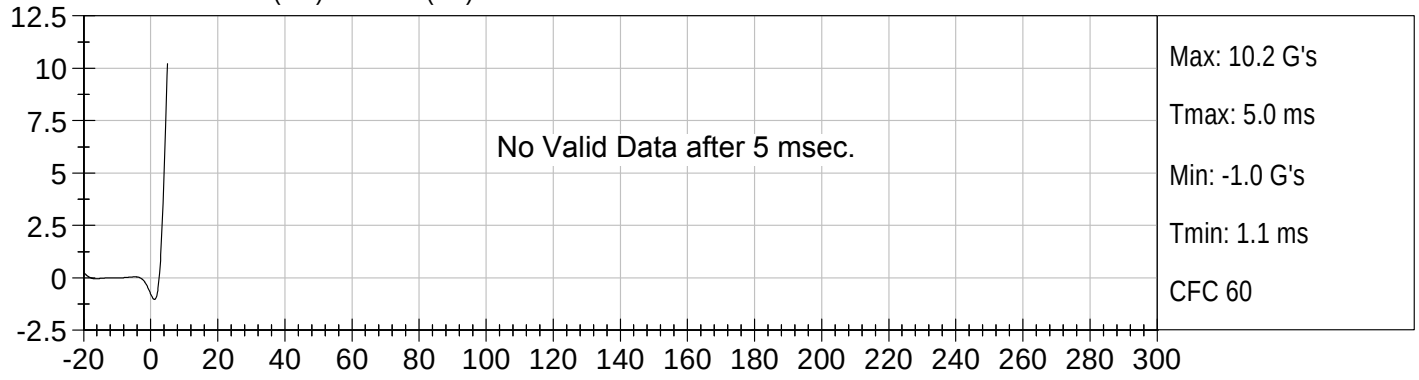
A PILLAR LOW Y Velocity (kph) vs TIME (ms)



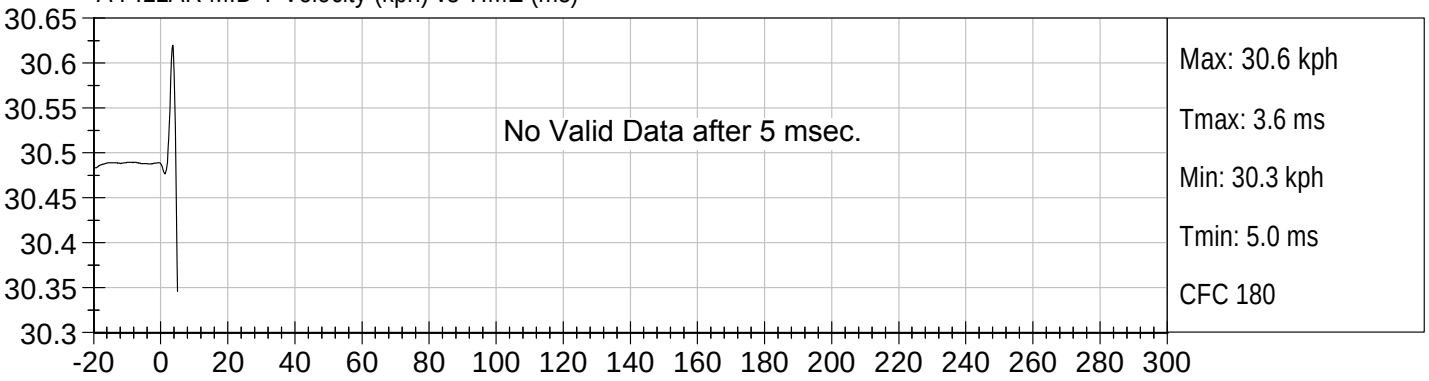
A PILLAR LOW Y Displacement (mm) vs TIME (ms)



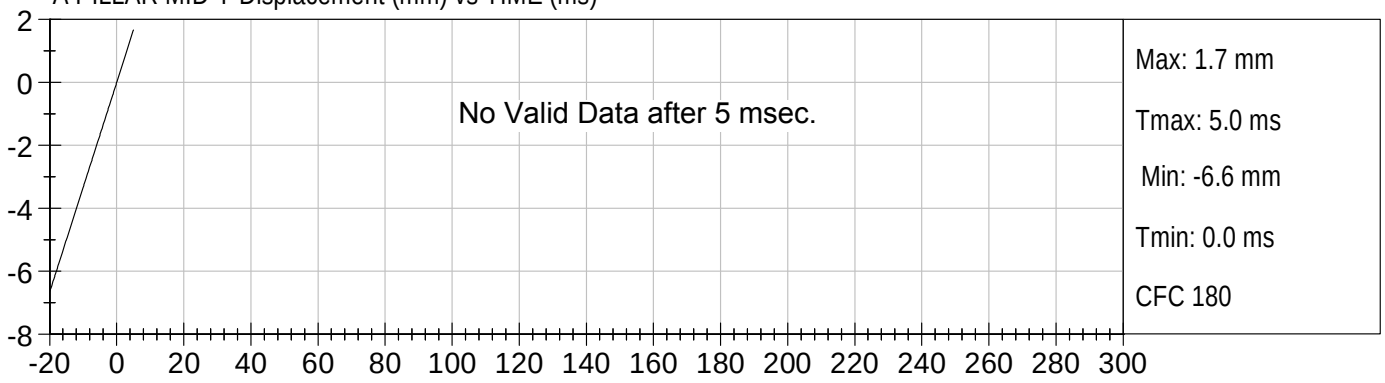
A PILLAR MID Y (G's) vs TIME (ms)



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



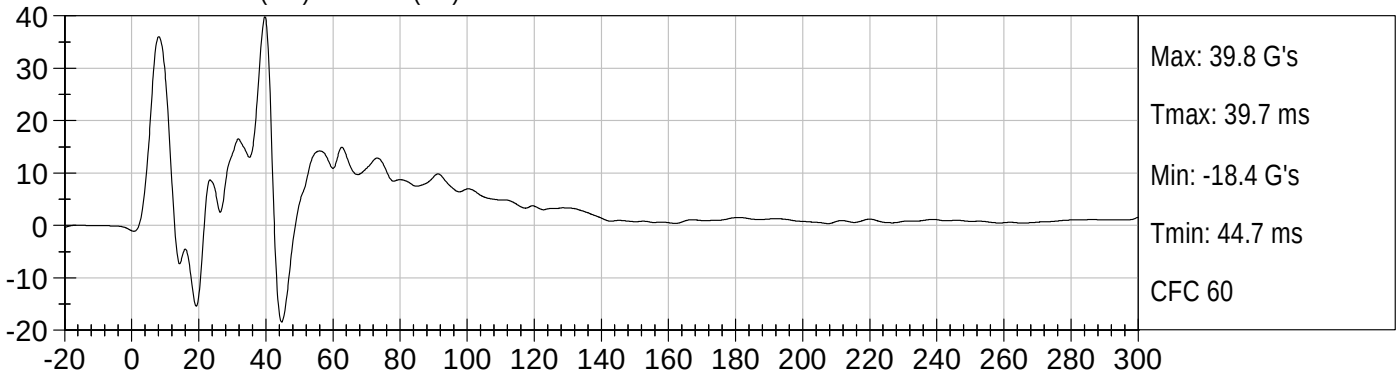
A PILLAR MID Y Displacement (mm) vs TIME (ms)



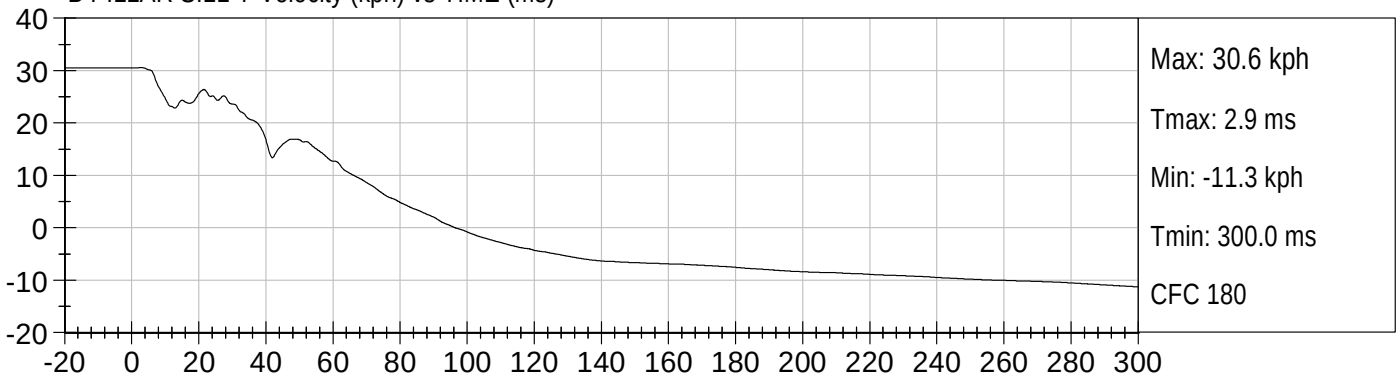
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

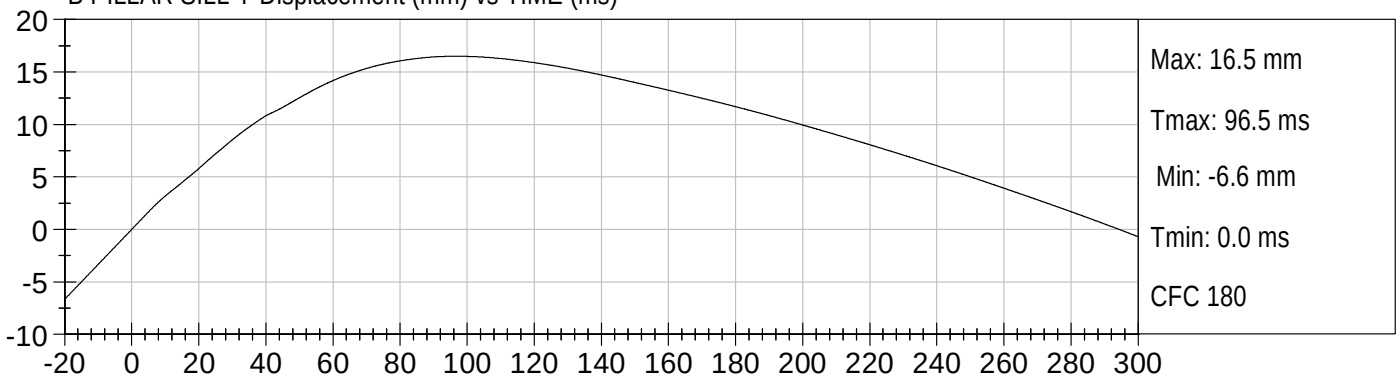
B PILLAR SILL Y (G's) vs TIME (ms)



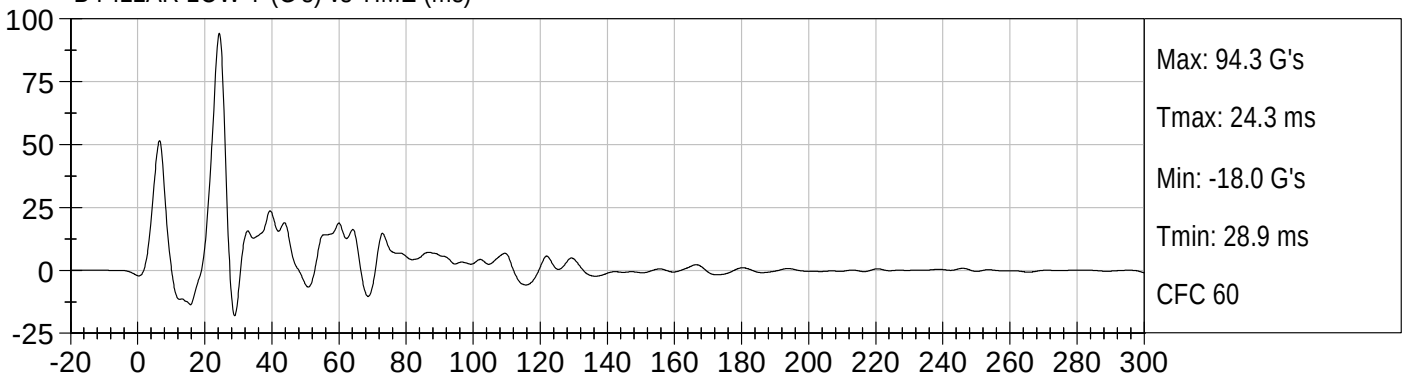
B PILLAR SILL Y Velocity (kph) vs TIME (ms)



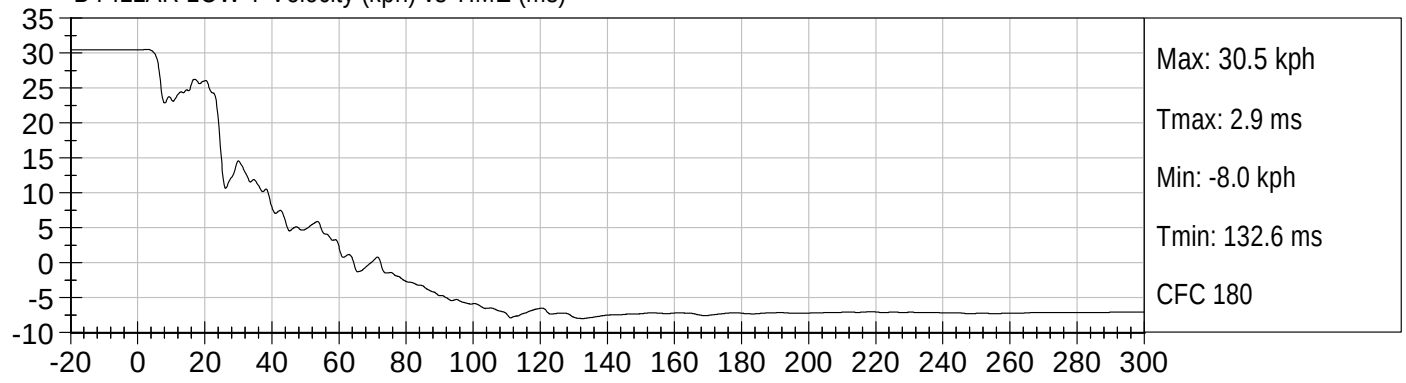
B PILLAR SILL Y Displacement (mm) vs TIME (ms)



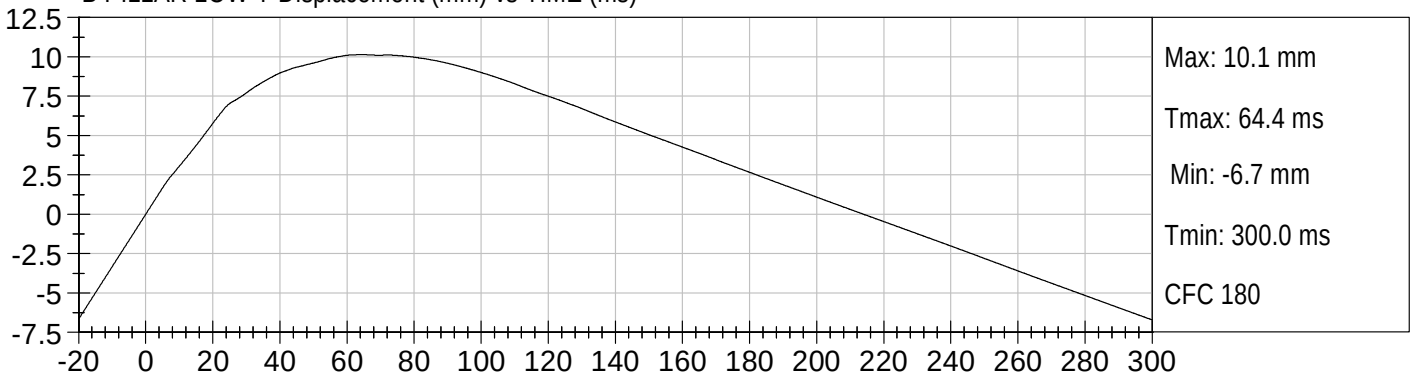
B PILLAR LOW Y (G's) vs TIME (ms)



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



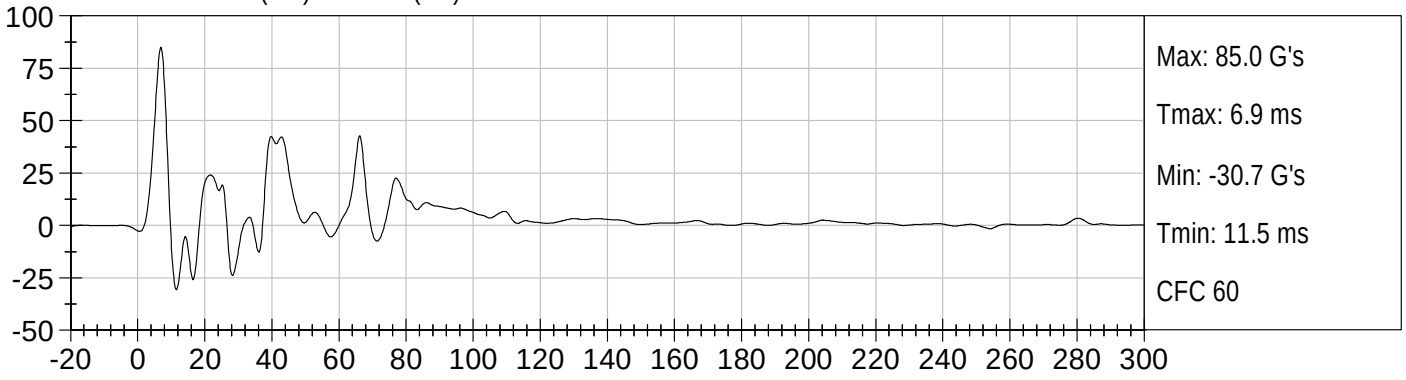
B PILLAR LOW Y Displacement (mm) vs TIME (ms)



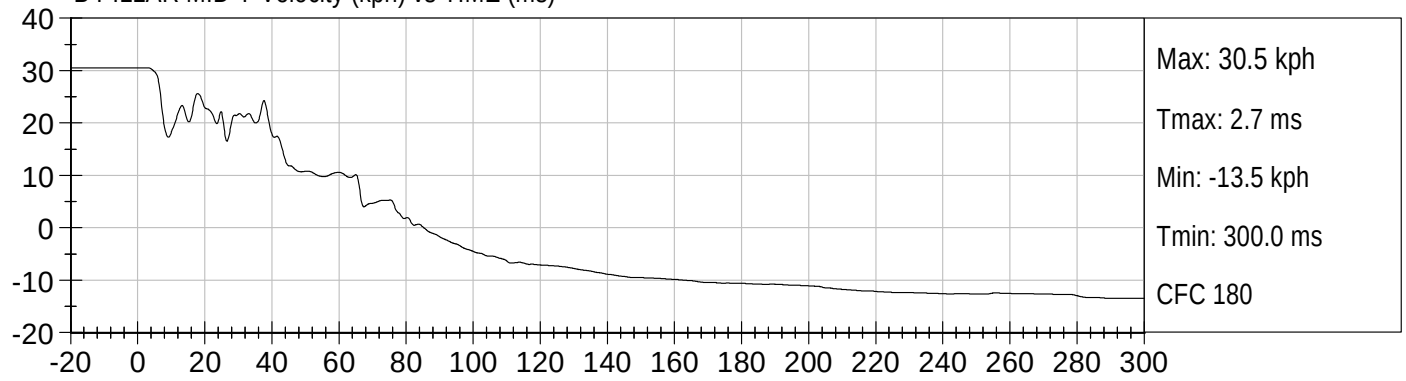
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

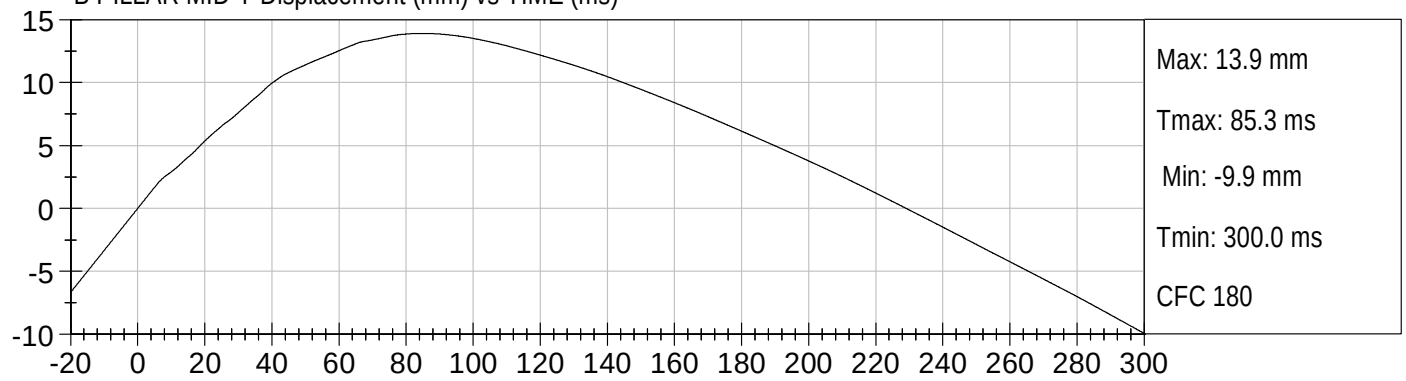
B PILLAR MID Y (G's) vs TIME (ms)



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



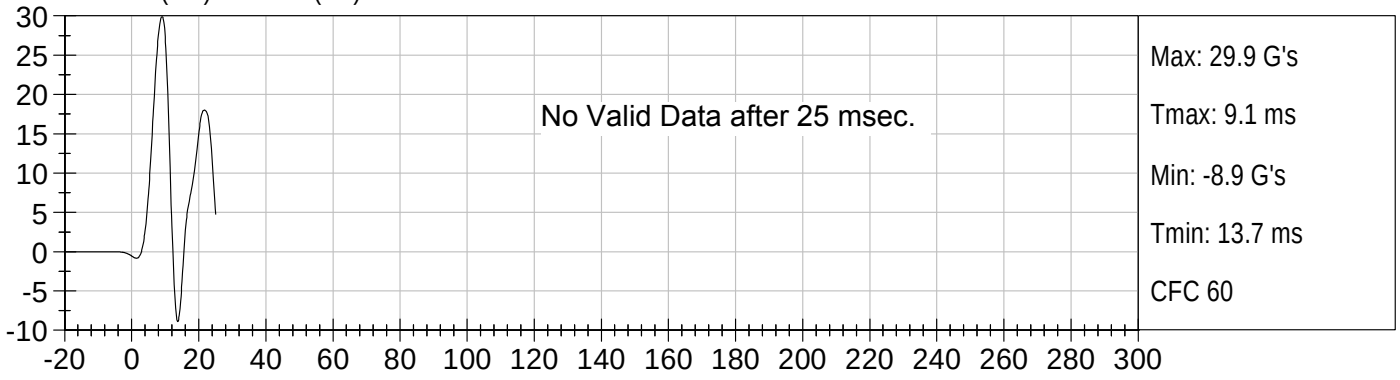
B PILLAR MID Y Displacement (mm) vs TIME (ms)



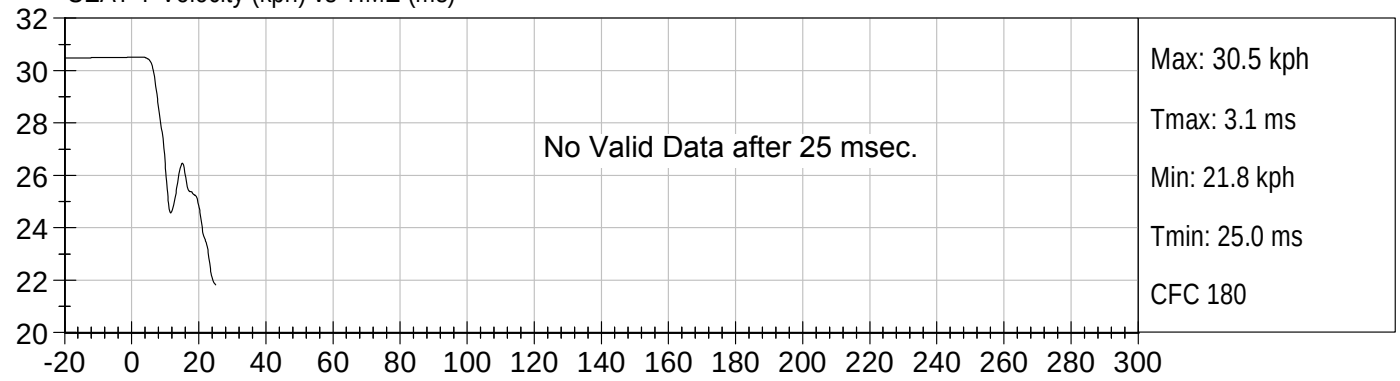
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

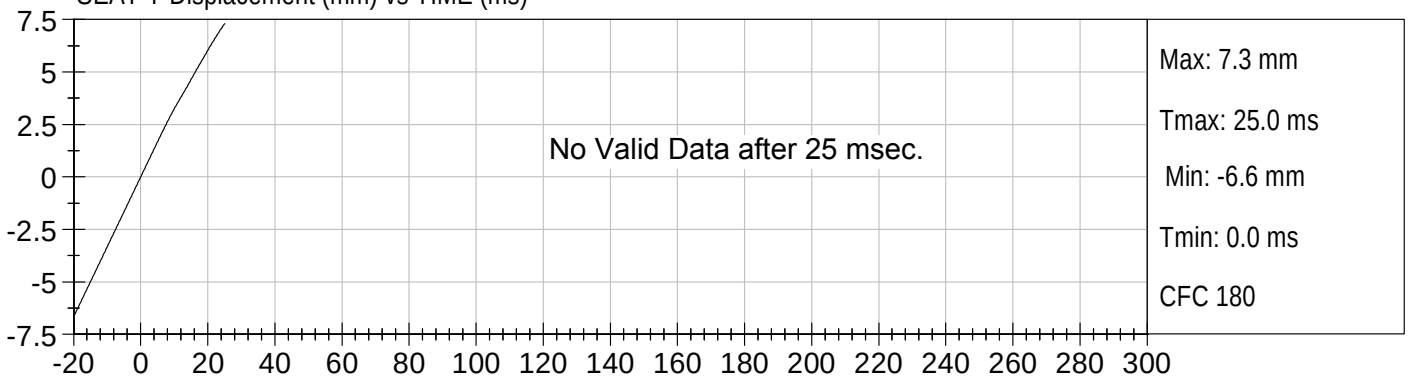
SEAT Y (G's) vs TIME (ms)



SEAT Y Velocity (kph) vs TIME (ms)



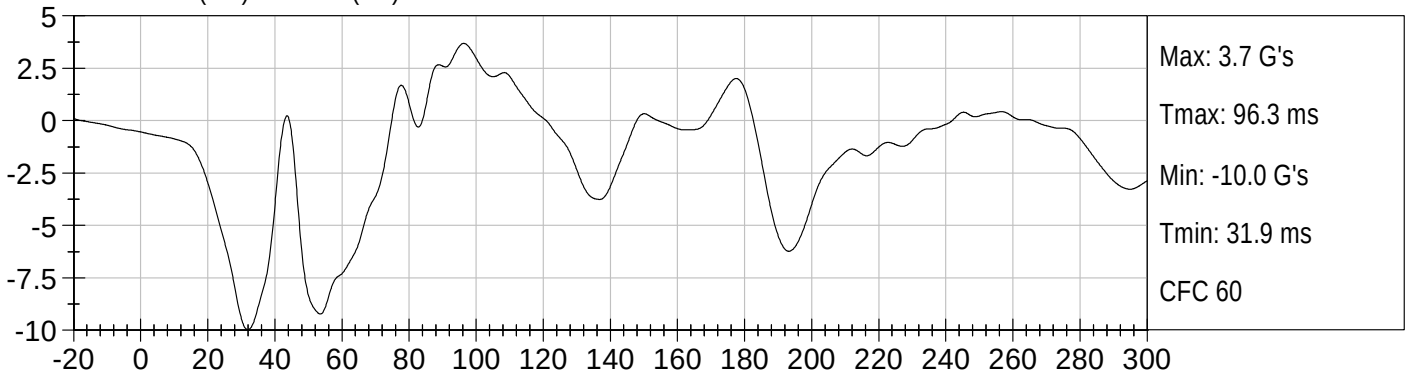
SEAT Y Displacement (mm) vs TIME (ms)



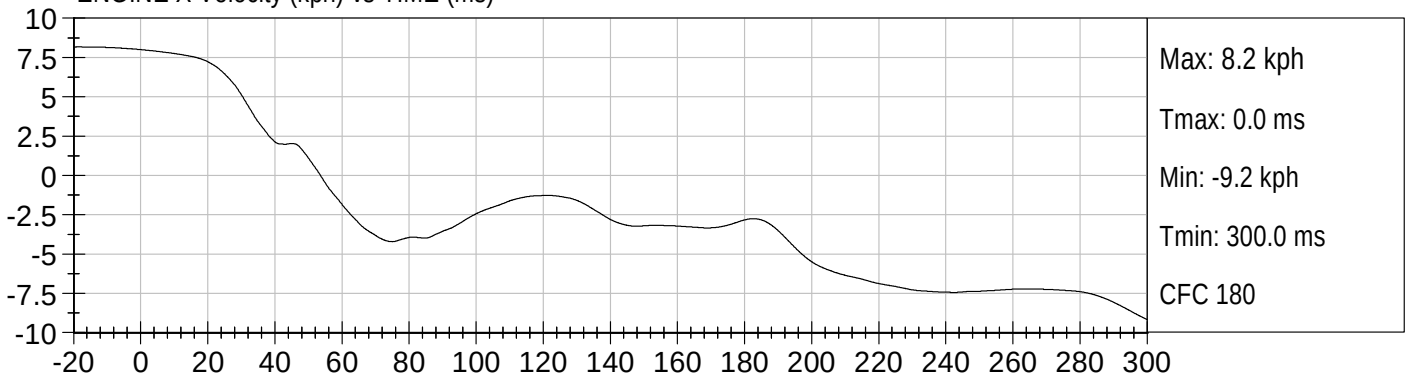
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

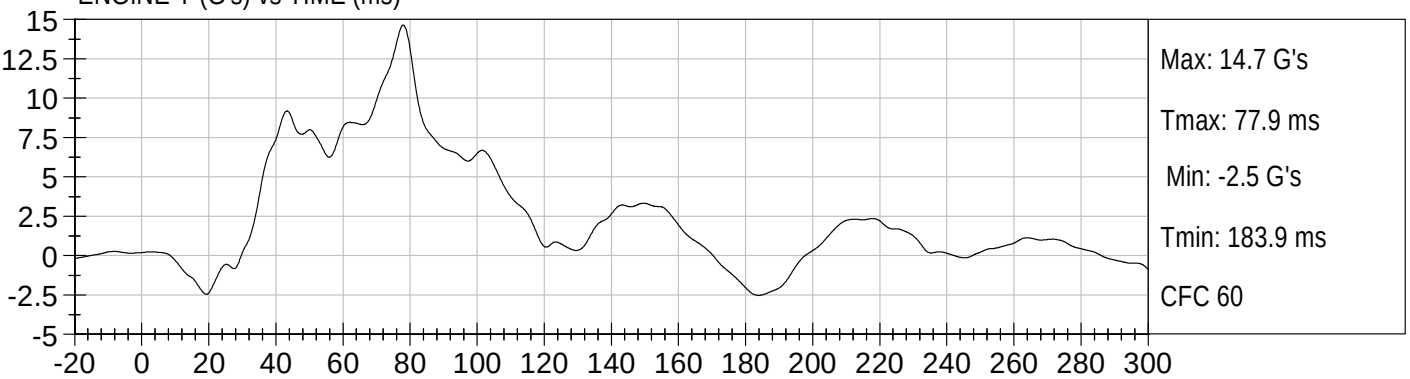
ENGINE X (G's) vs TIME (ms)



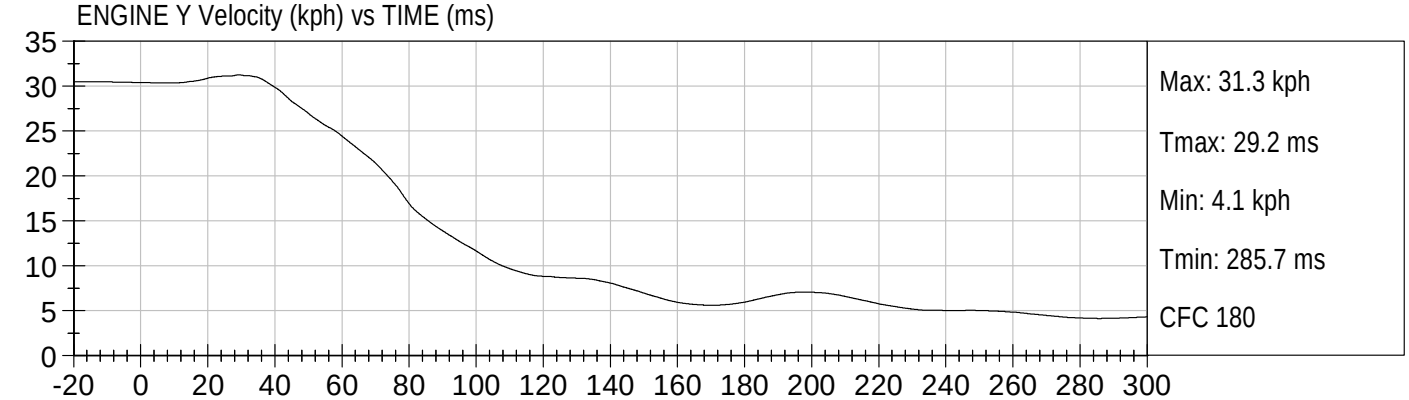
ENGINE X Velocity (kph) vs TIME (ms)



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

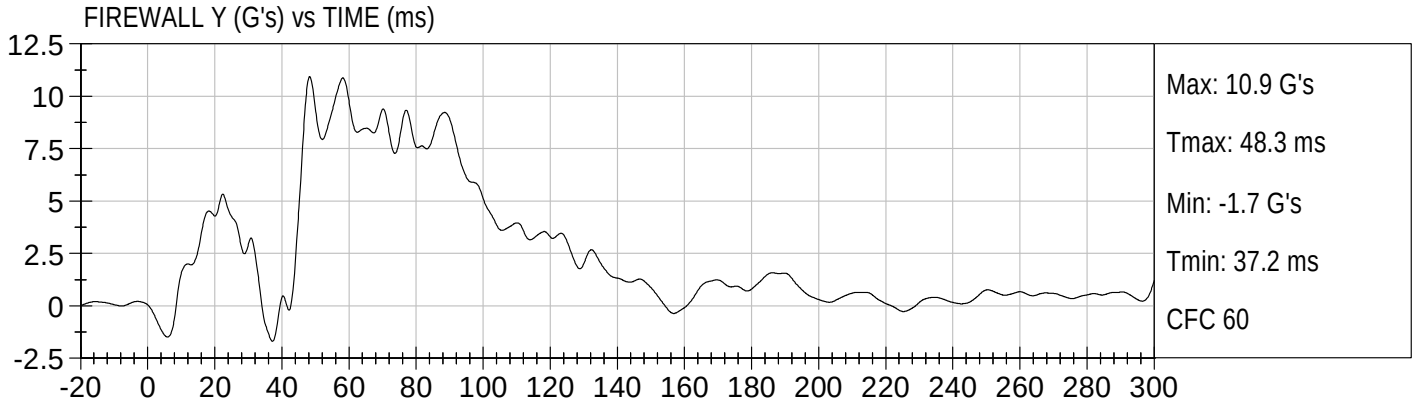


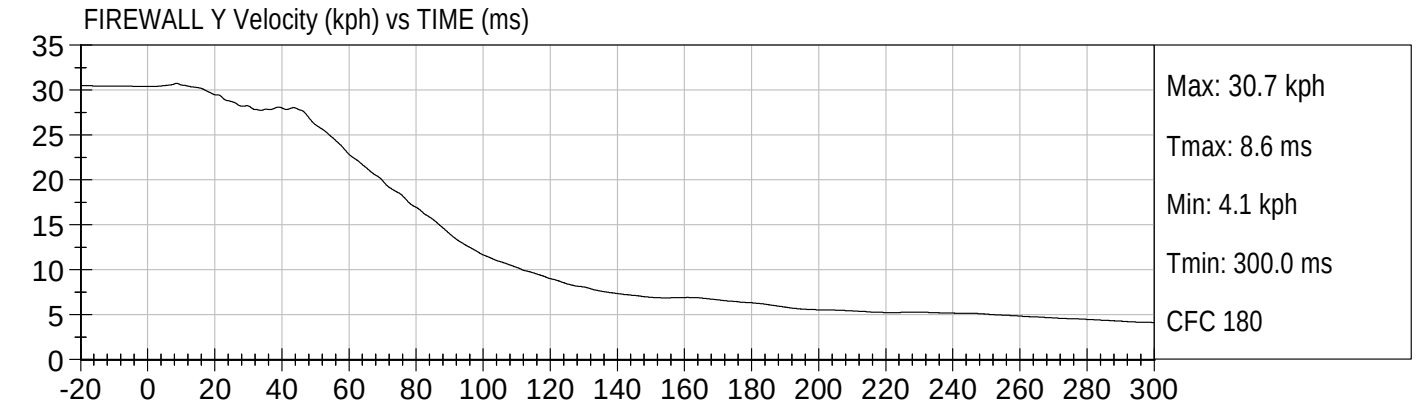
ENGINE Y Velocity (kph) vs TIME (ms)



FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

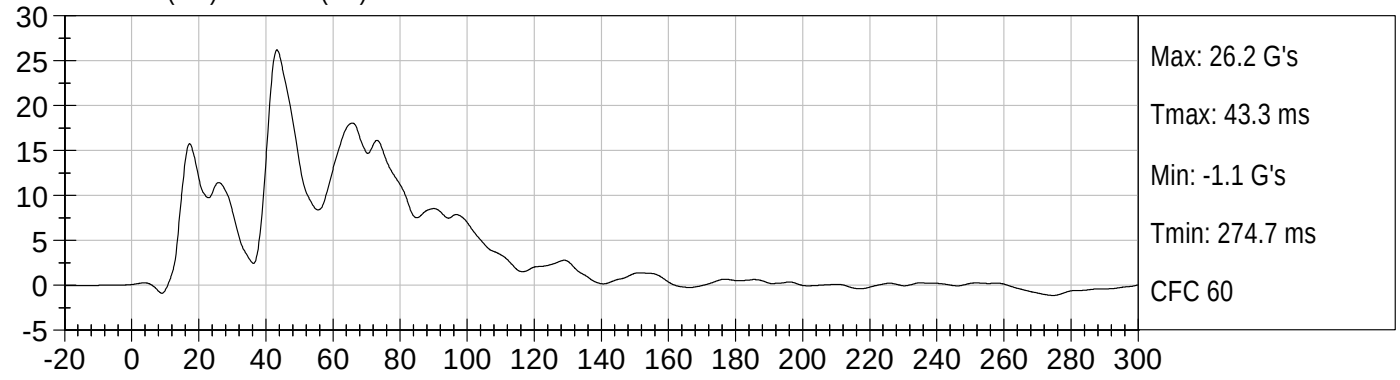




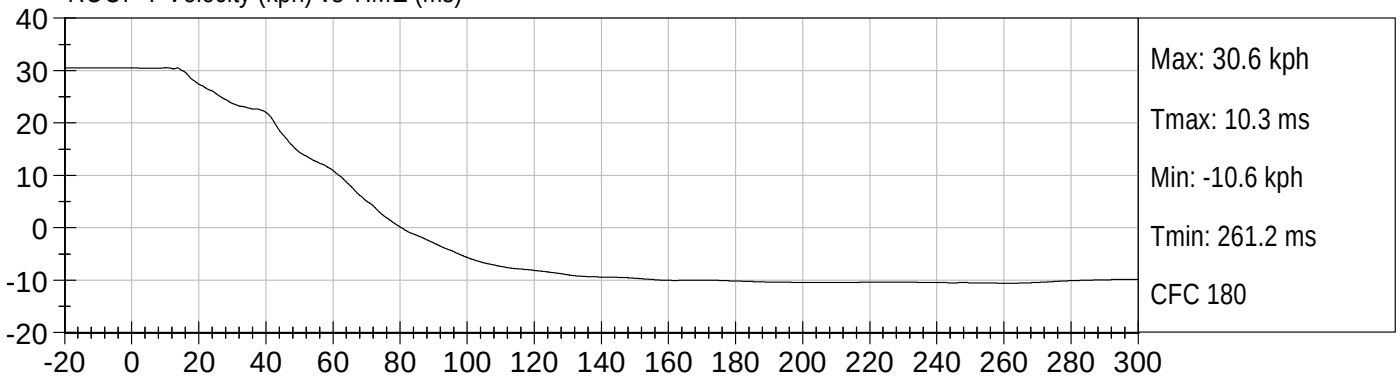
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

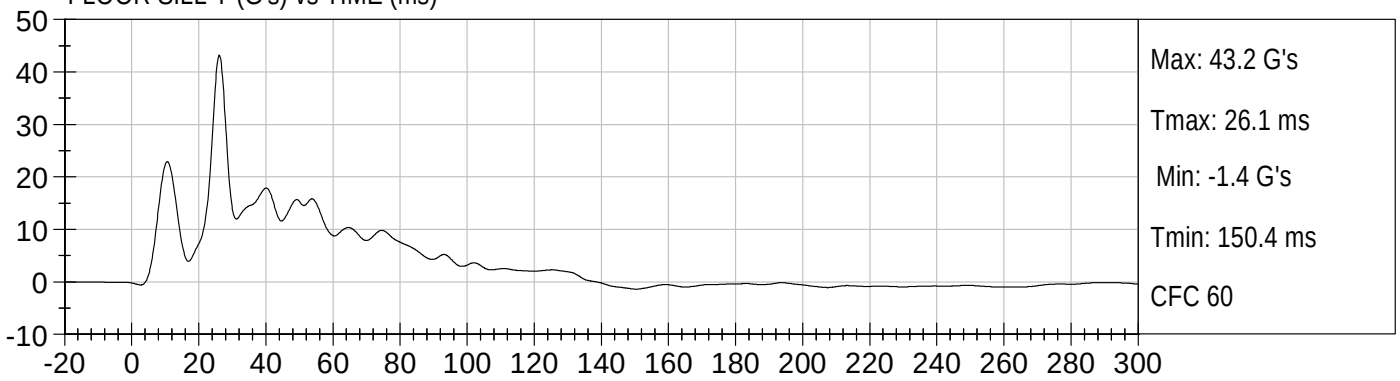
ROOF Y (G's) vs TIME (ms)



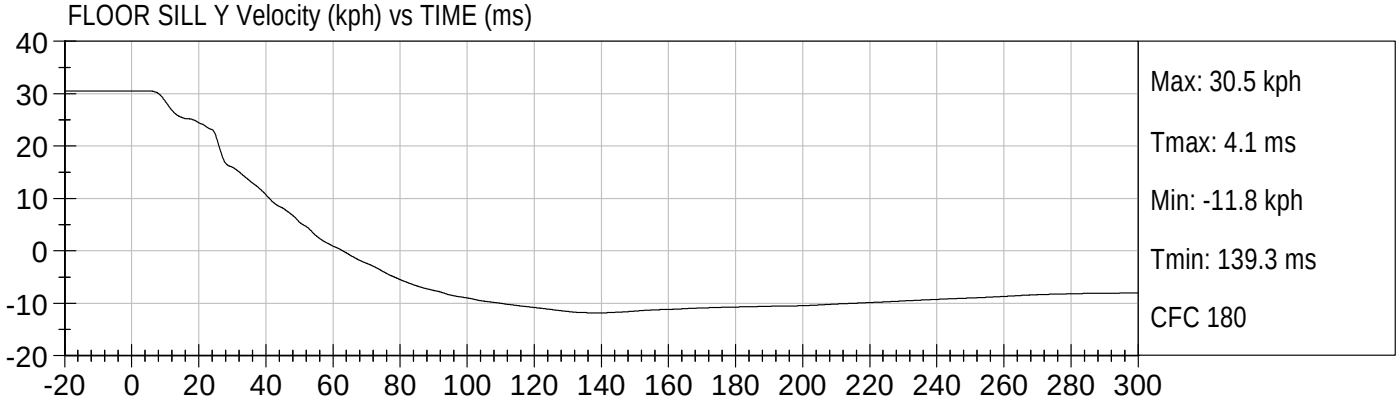
ROOF Y Velocity (kph) vs TIME (ms)



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



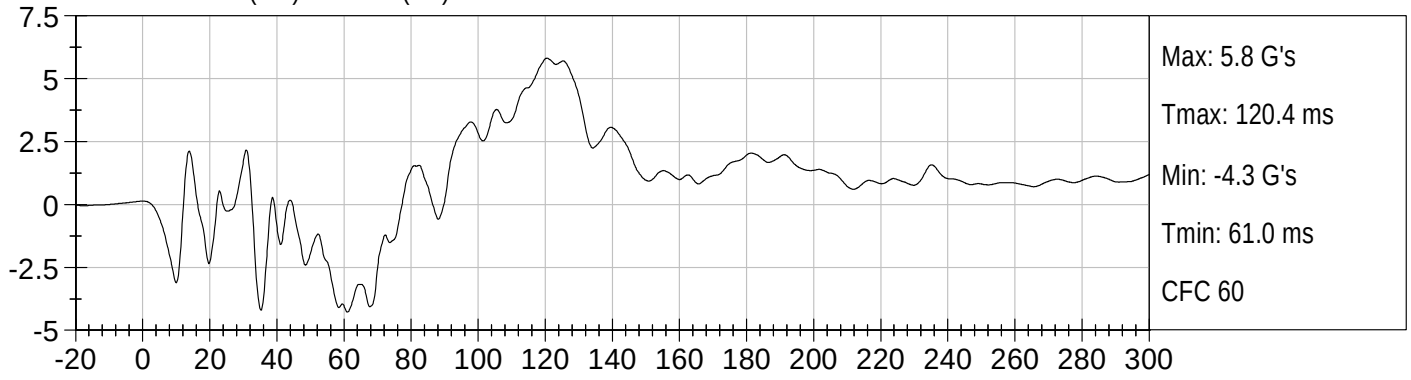
FLOOR SILL Y Velocity (kph) vs TIME (ms)



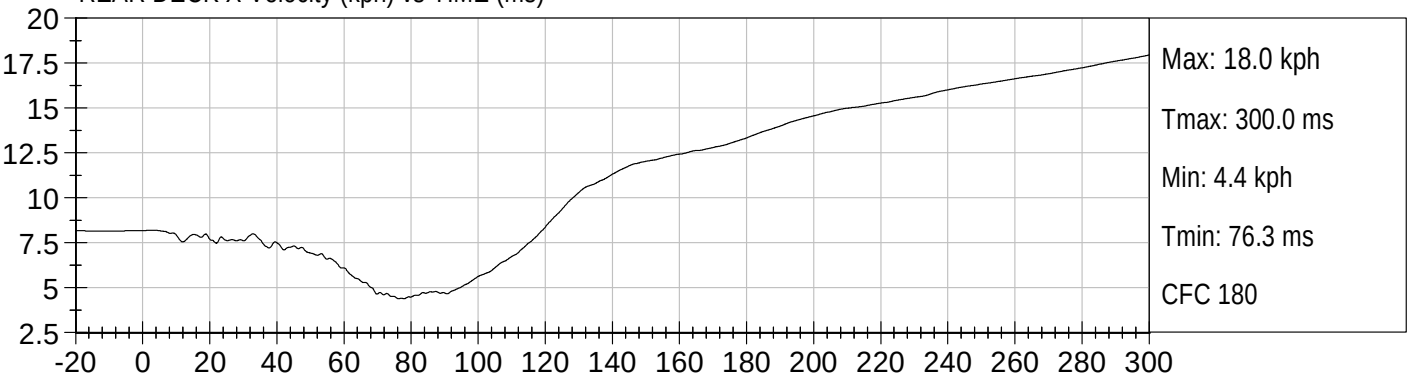
FMVSS 214 Rigid Pole Side Impact
2011 Honda CR-Z - CB5302

Test Date: 03/23/2011
Speed: 19.6 mph (31.6 km/h)

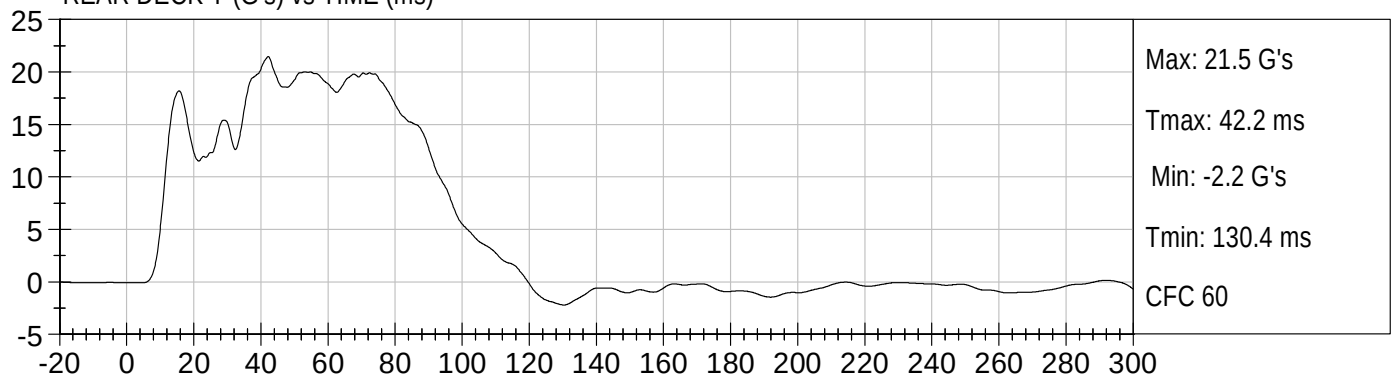
REAR DECK X (G's) vs TIME (ms)



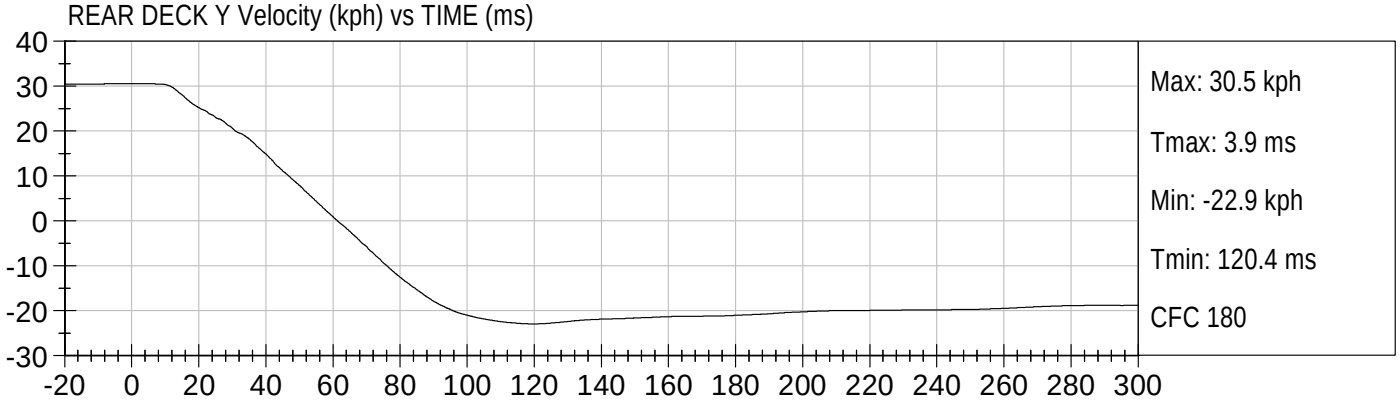
REAR DECK X Velocity (kph) vs TIME (ms)



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:** D111071

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	35	Pass
Peak Resultant Acceleration	G's	125 to 155	150	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

Jessica Hall
Laboratory Technician

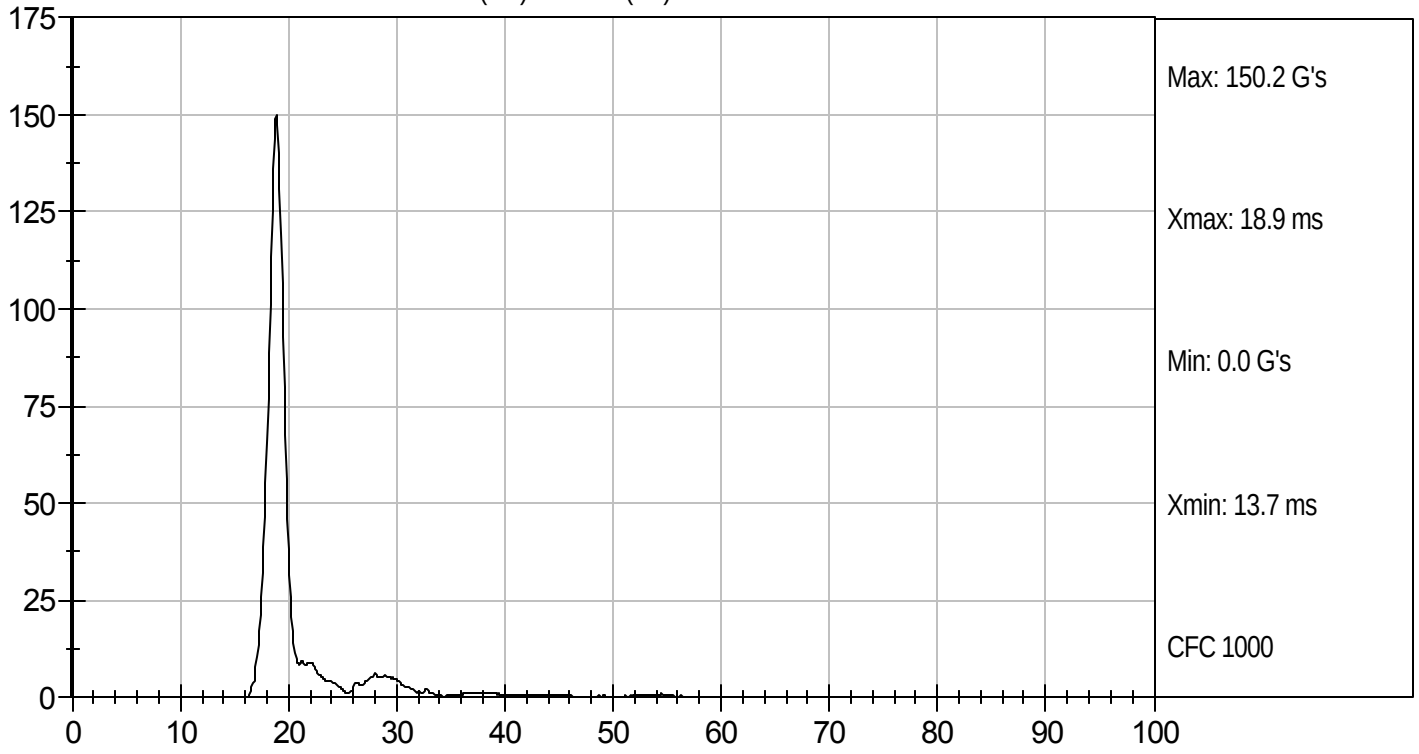
3/21/11
Test Date

David Winkelbauer
Approved By

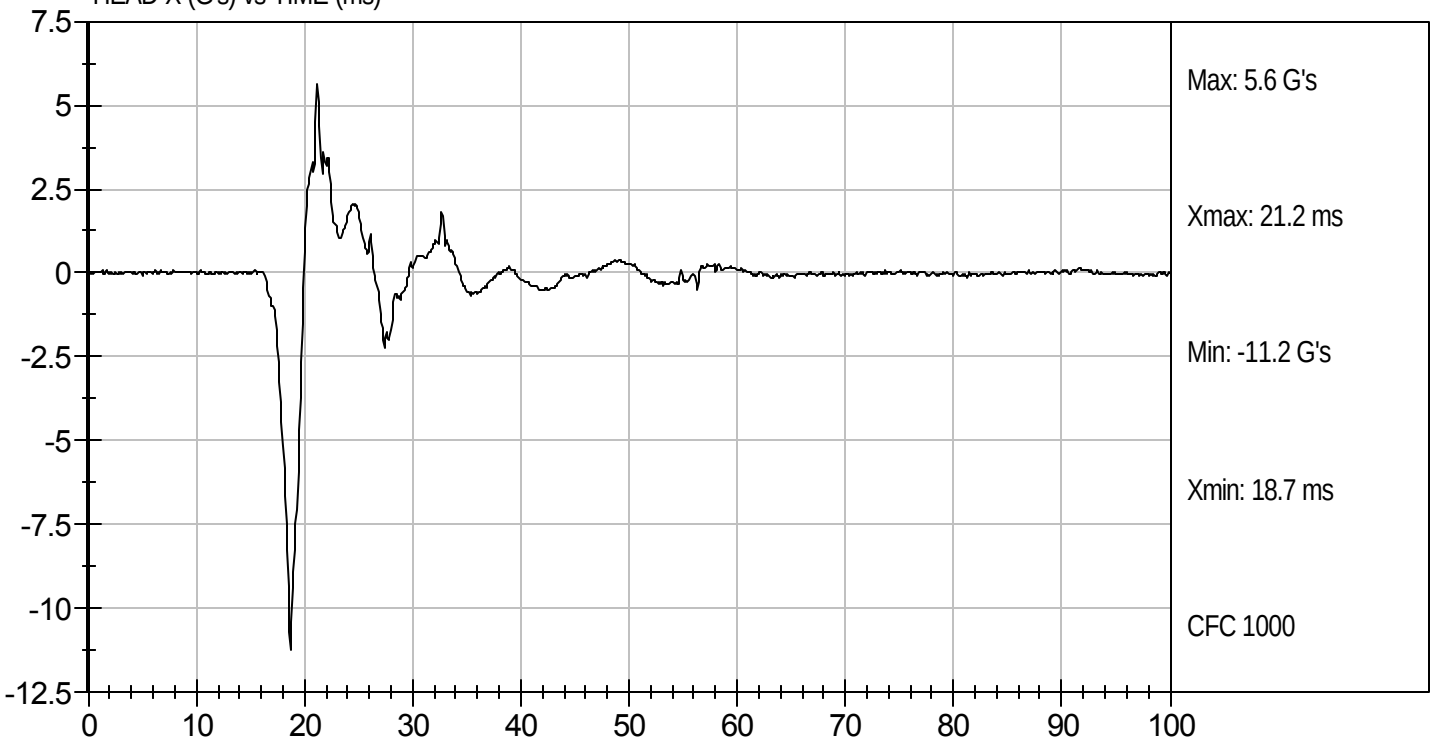
Test Desc: Head Drop
Component ID: D111071

Test Date: 3/21/11
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:** D111072

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	38	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.31	Pass
	14 ms	m/s	-3.20 to -3.70	-3.39	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.3	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.9	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	60.7	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

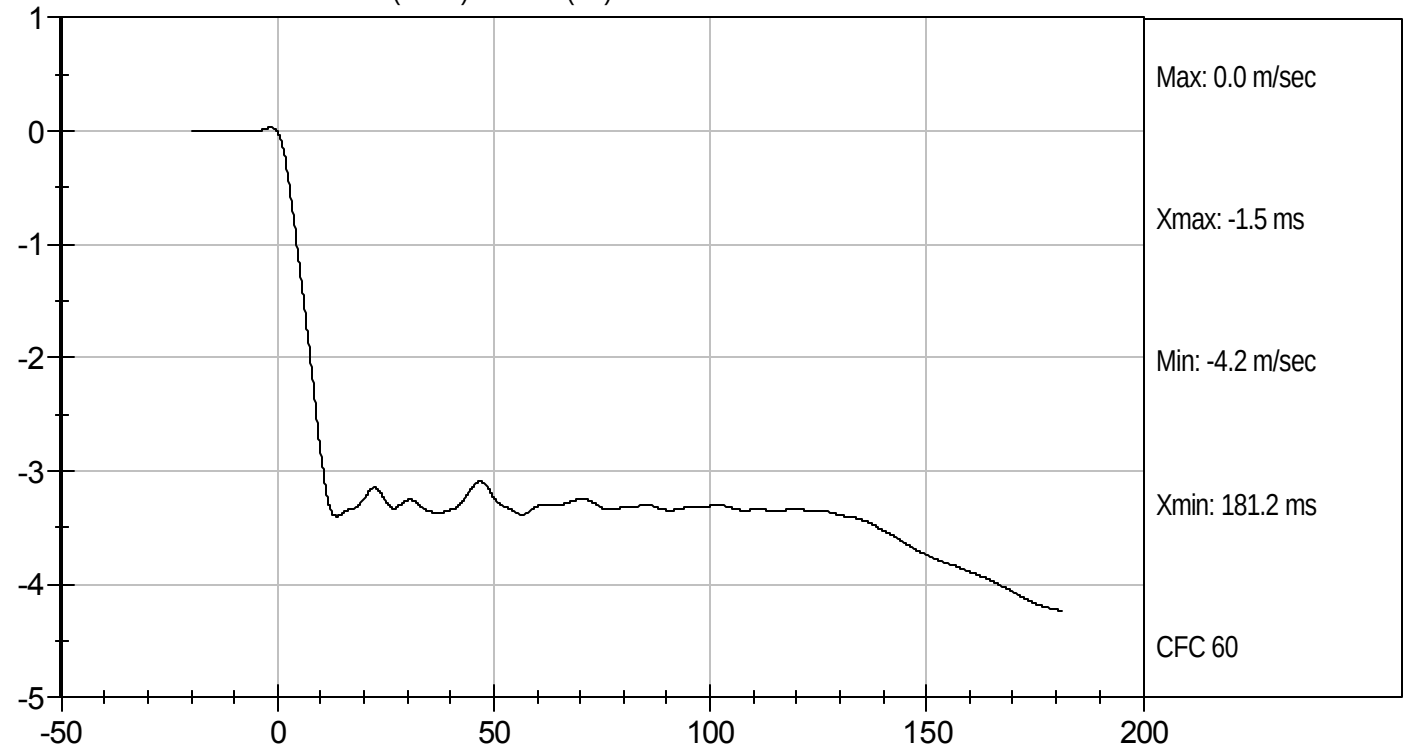
3/21/11
Test Date

David Winkelbauer
Approved By

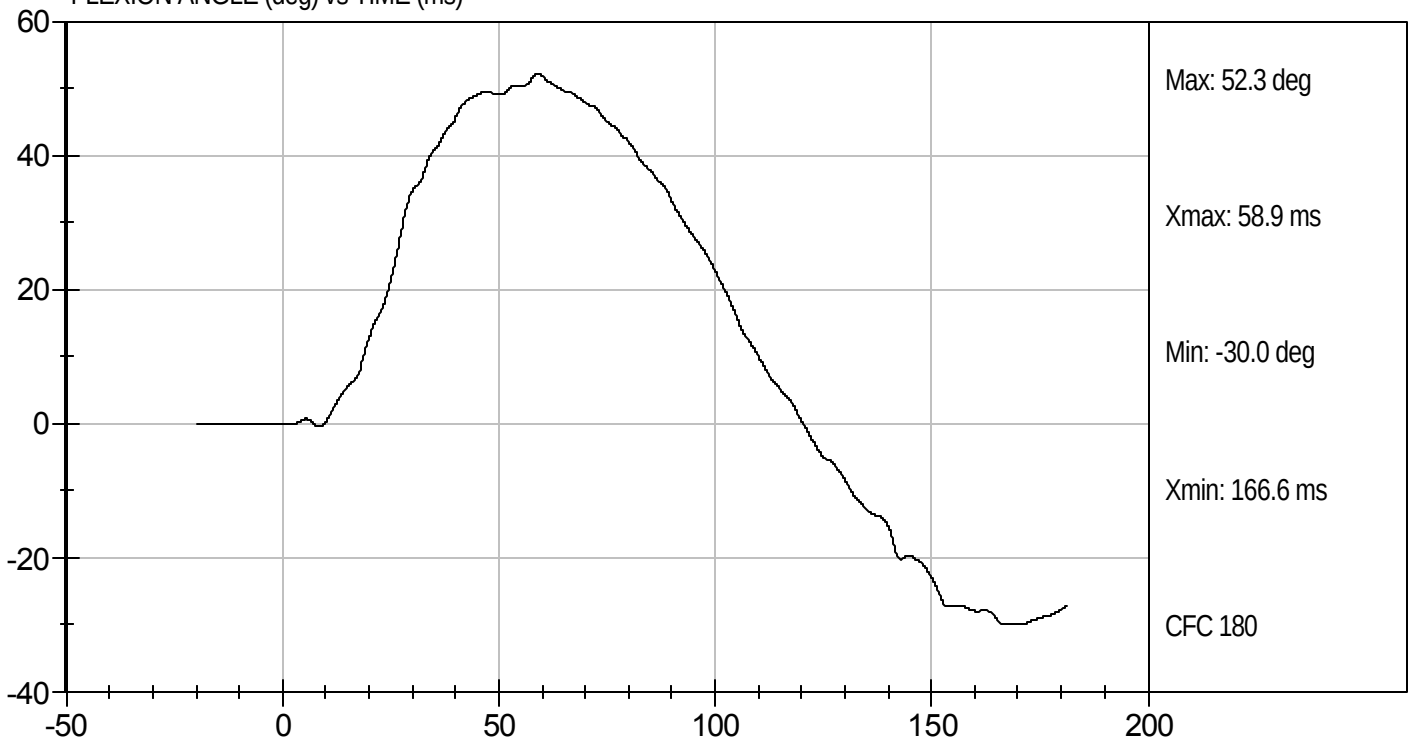
Test Desc: Neck Bending
Component ID: D111072

Test Date: 3/21/11
Velocity: 11.34 ft/s, 3.5 m/s

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

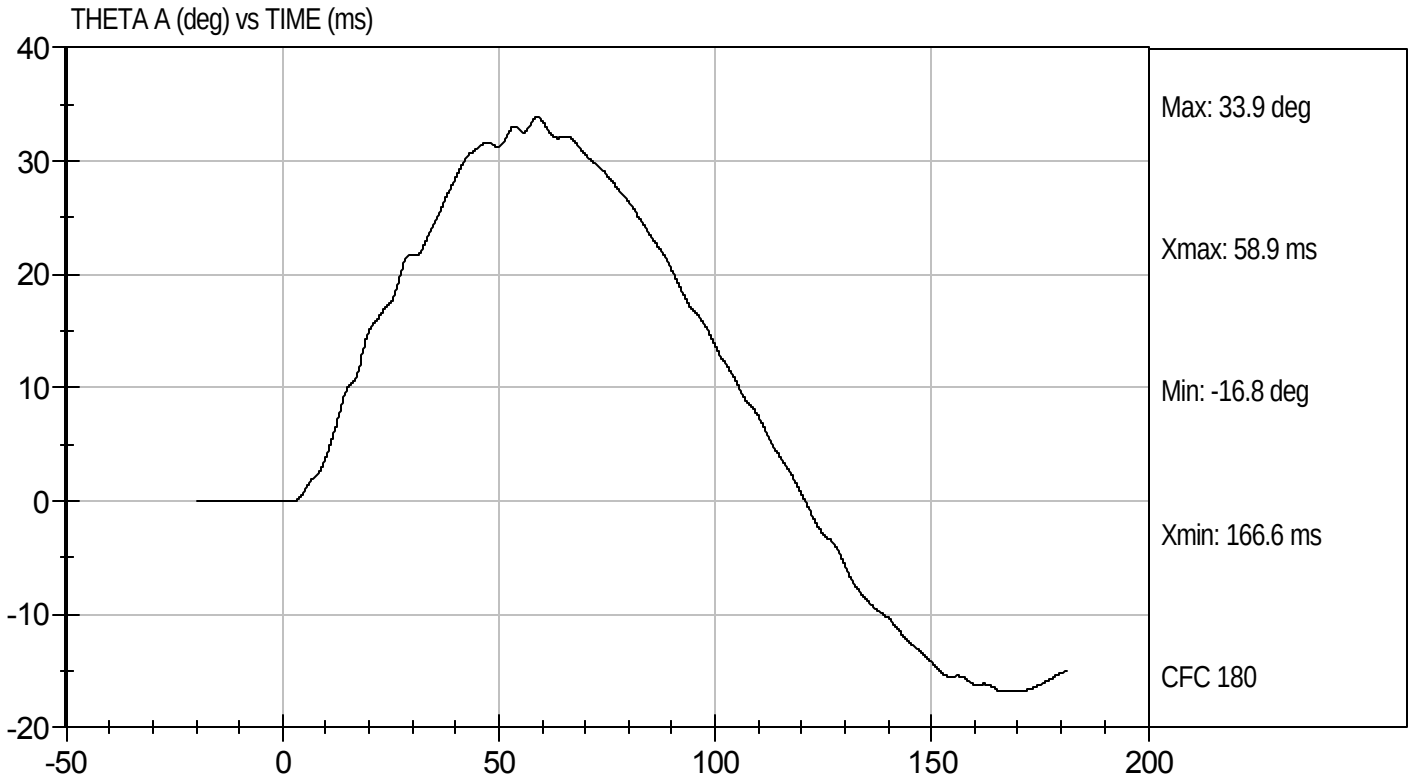


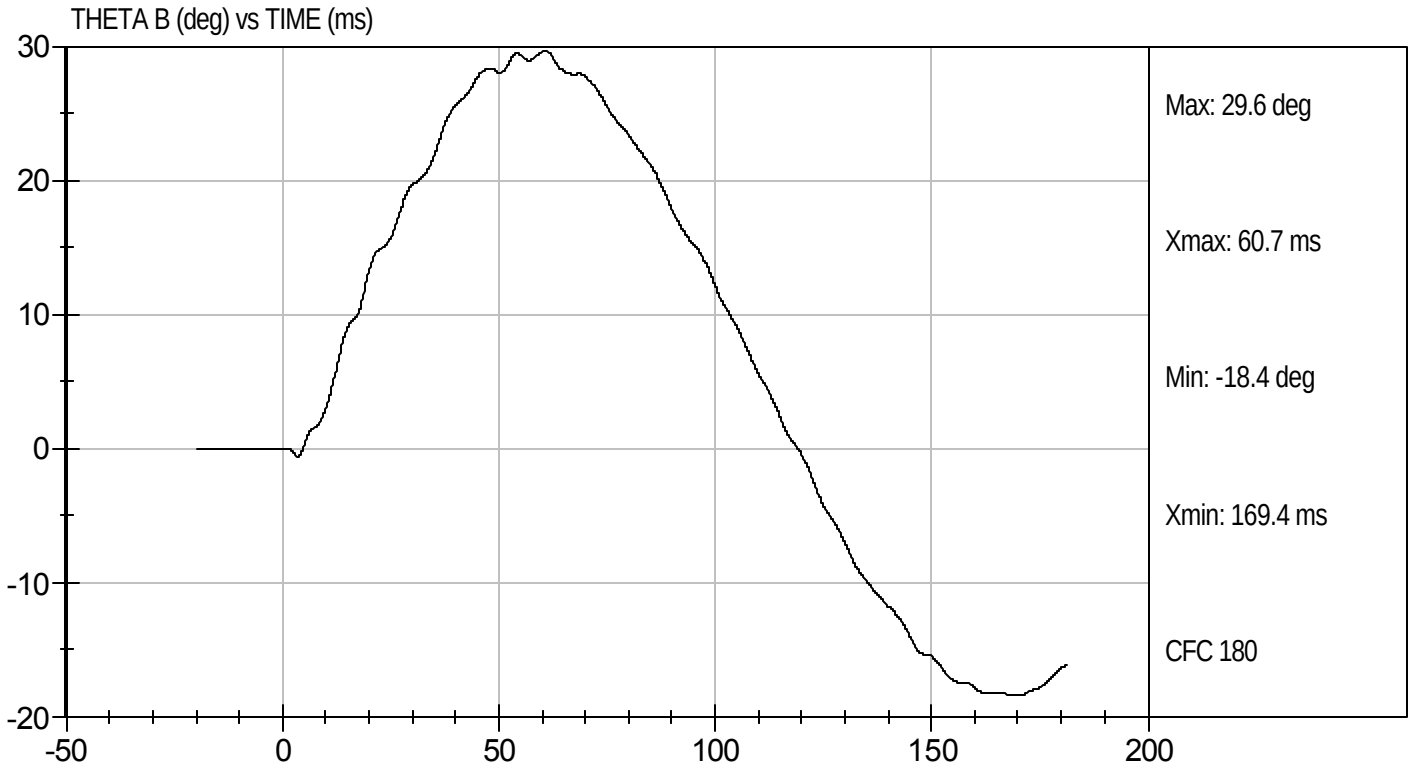
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D111072

Test Date: 3/21/11
Velocity: 11.34 ft/s, 3.5 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111073

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.4	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	8.8	Pass
Time of Peak Shoulder Acceleration	ms	NA	18.3	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

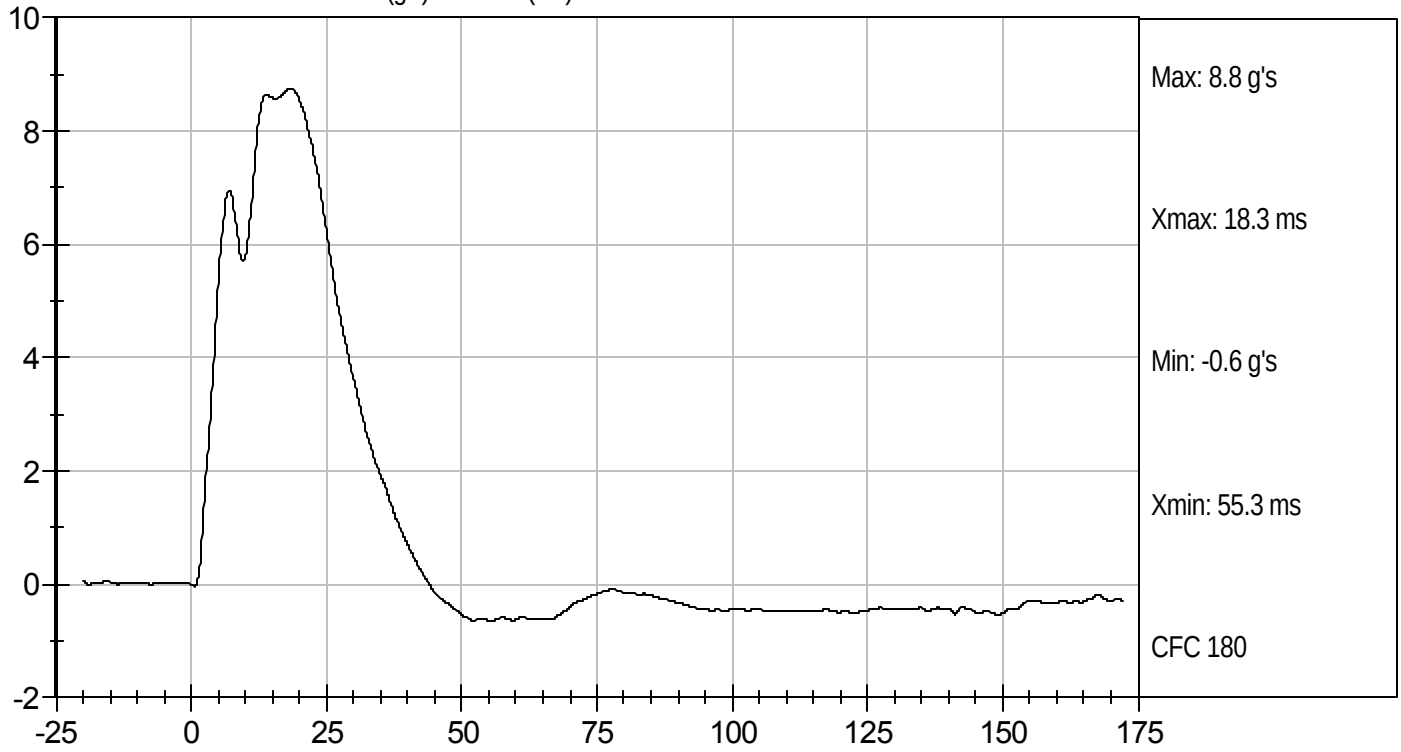
3/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D111073

Test Date: 3/21/11
Velocity: 14.37 ft/s, 4.4 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:** D111074

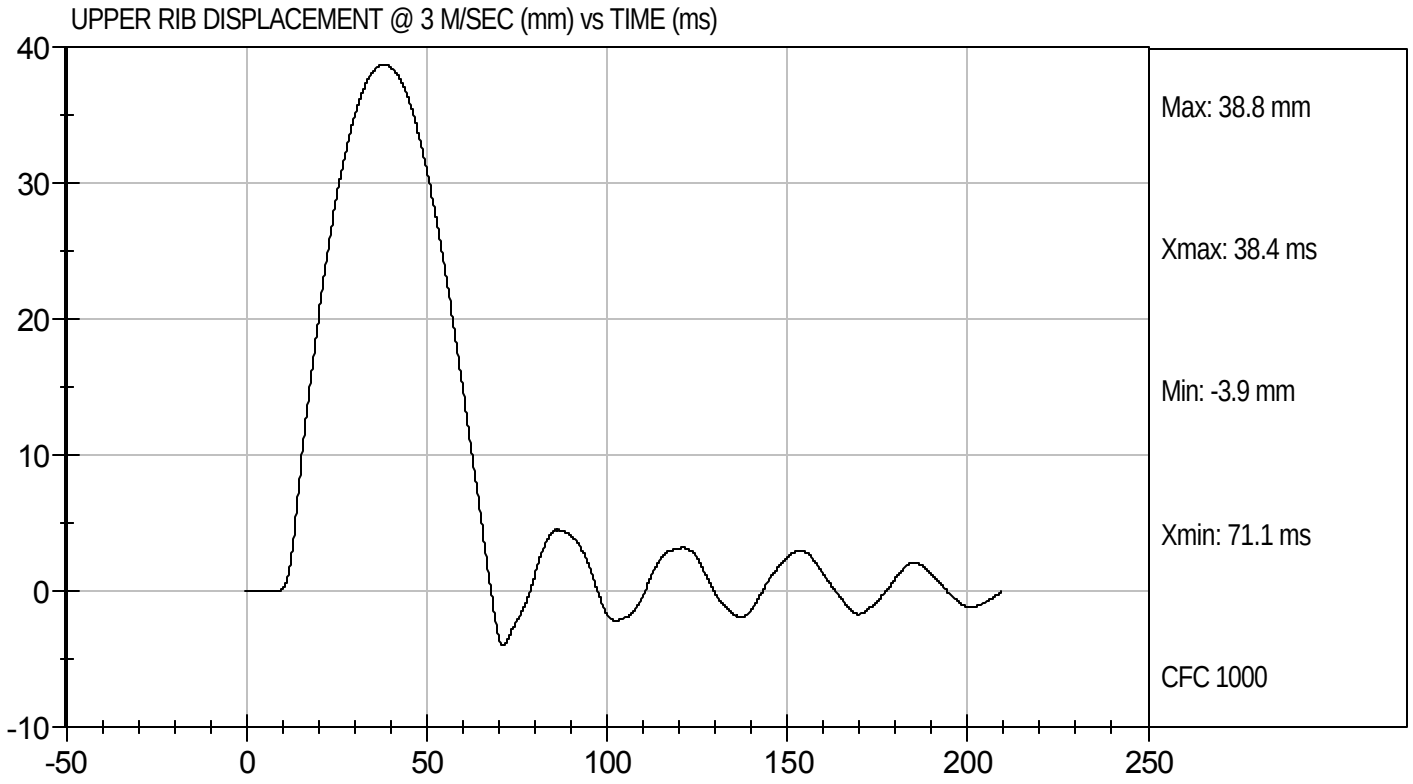
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	38.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.7	Pass
		Overall Test Results		Pass

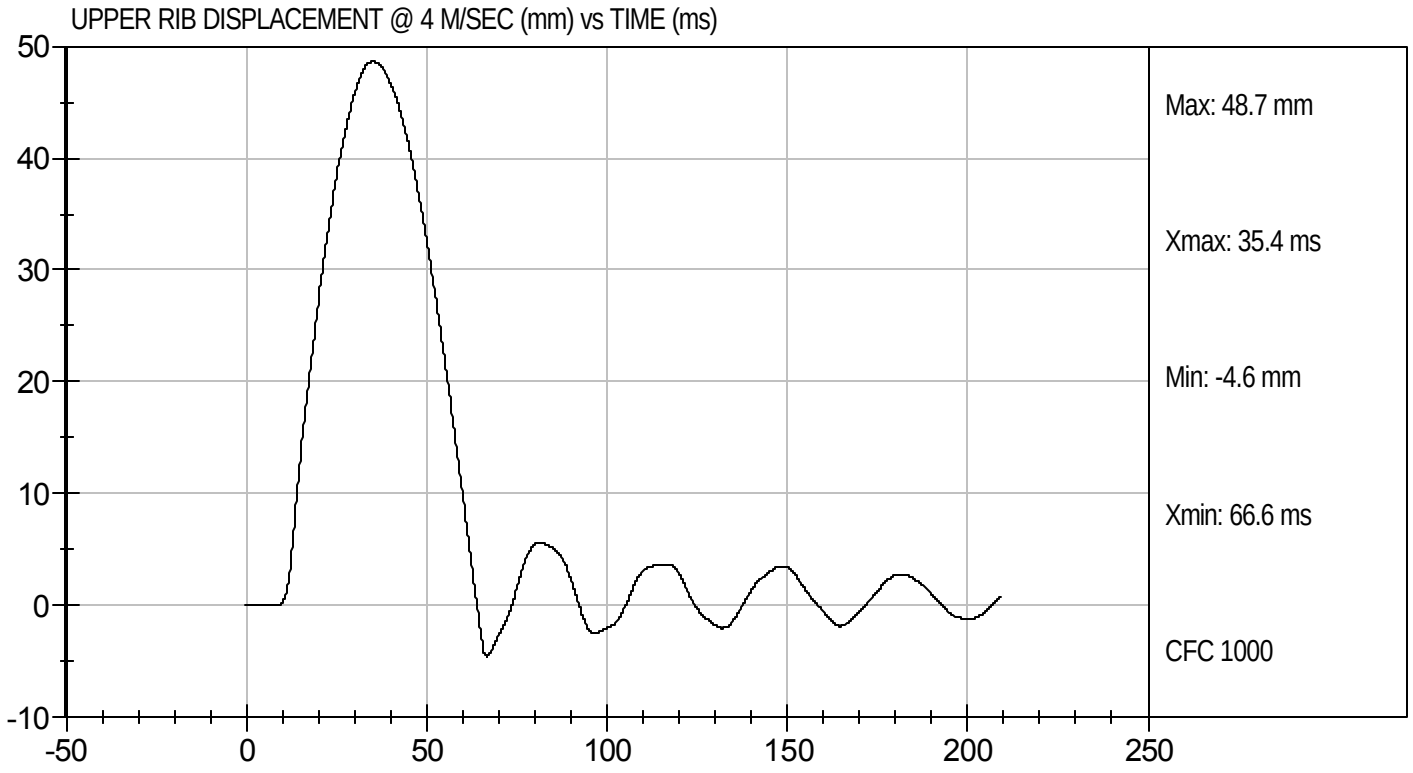
Jessica Hall
Laboratory Technician

3/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D111074
Test Date: 3/21/11





MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111075

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	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	49.4	Pass
		Overall Test Results		Pass

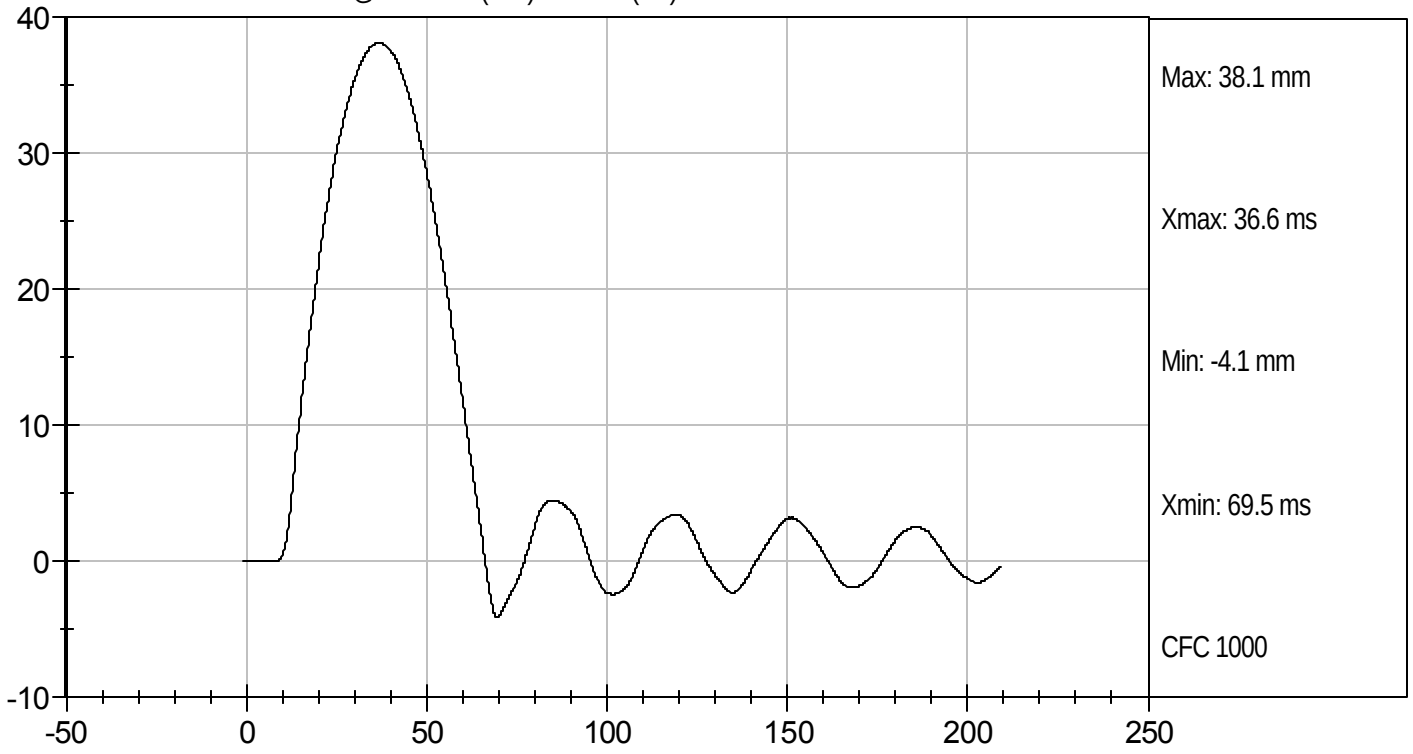
Jessica Hall
Laboratory Technician

3/21/11
Test Date

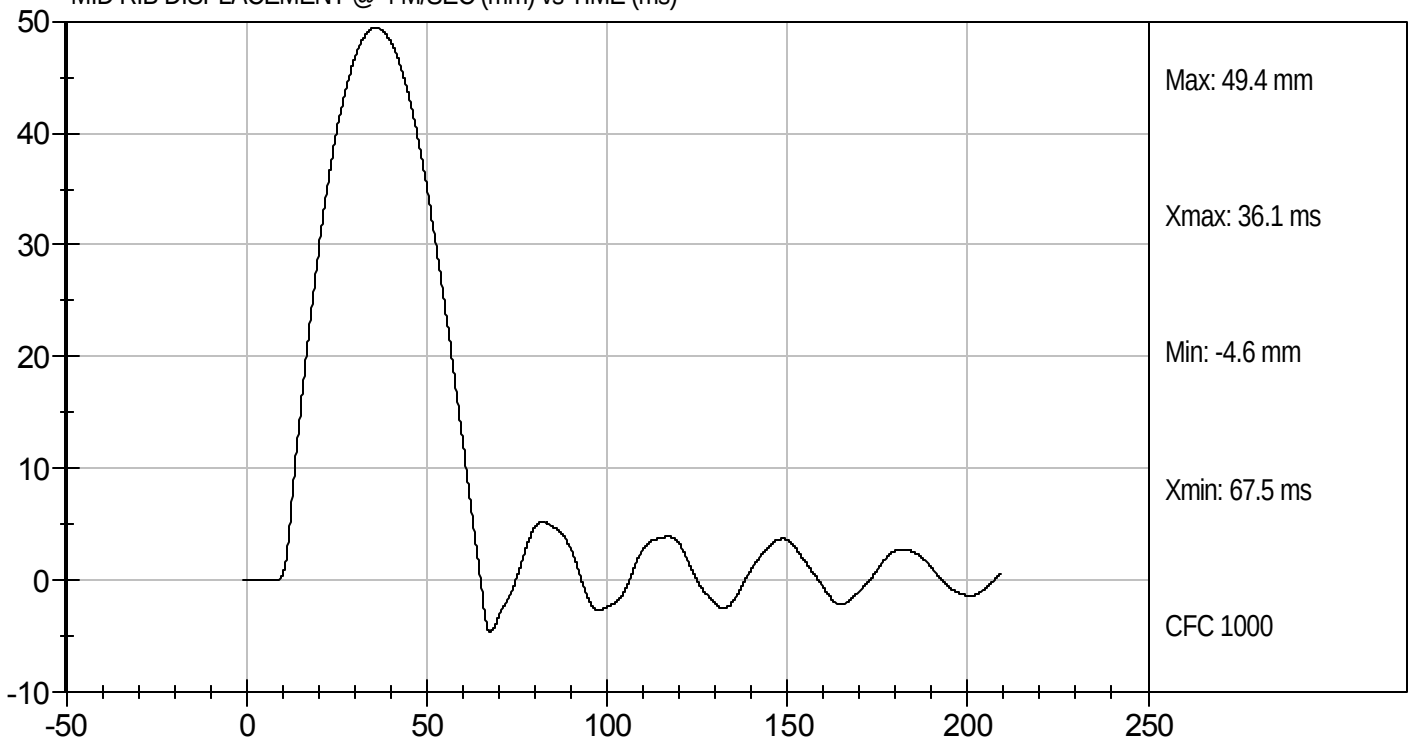
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D111075
Test Date: 3/21/11

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:** D111076

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	36	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	48.5	Pass
		Overall Test Results		Pass

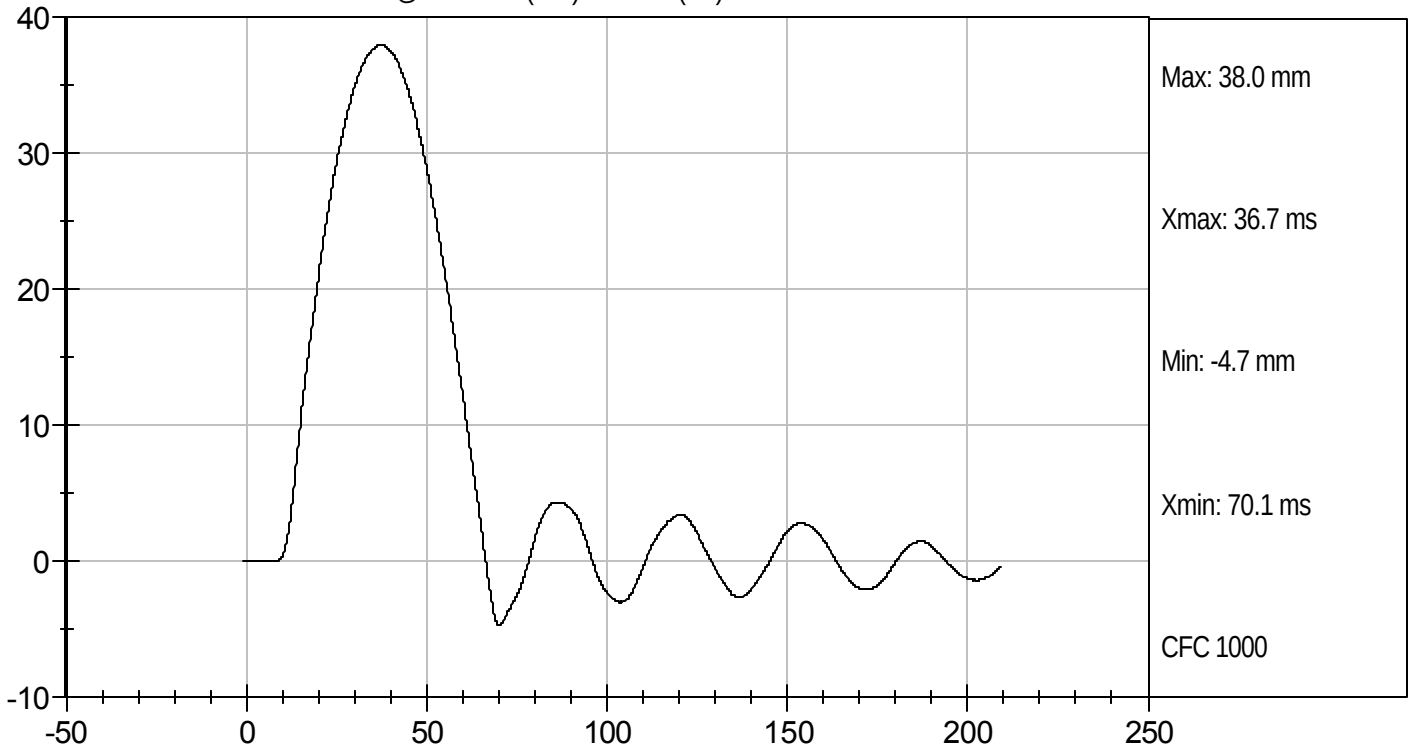
Jessica Gall
Laboratory Technician

3/21/11
Test Date

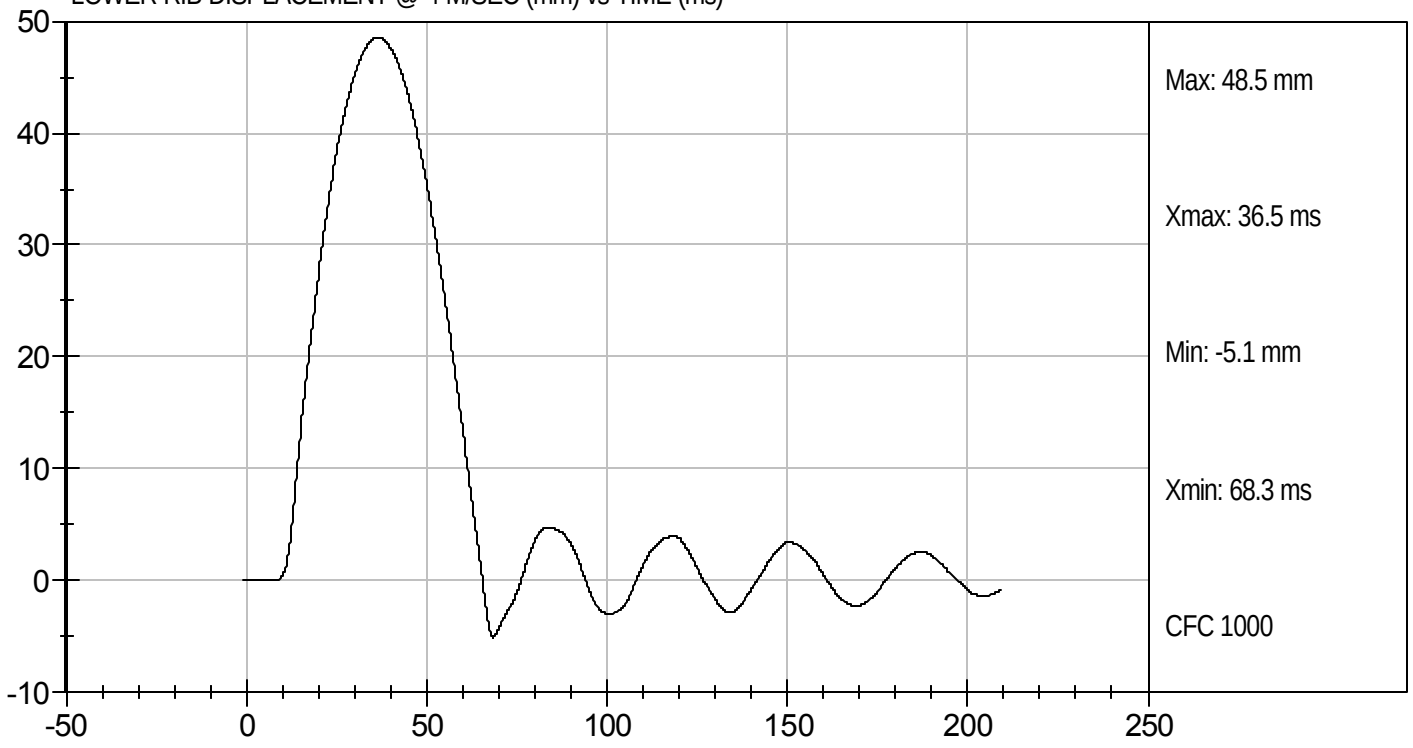
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D111076
Test Date: 3/21/11

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:** D111077

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	36	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.11	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	10.90	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.44	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.40	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

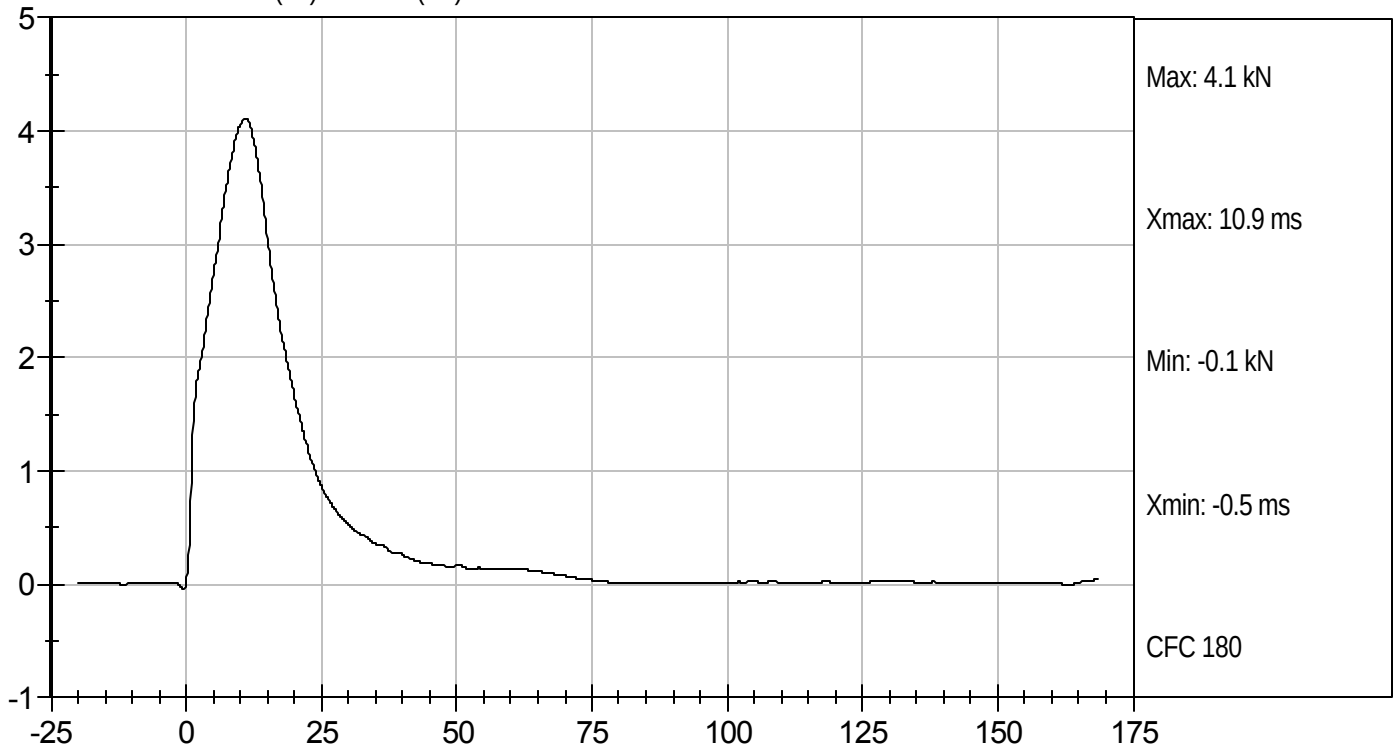
3/21/11
Test Date

David Winkelbauer
Approved By

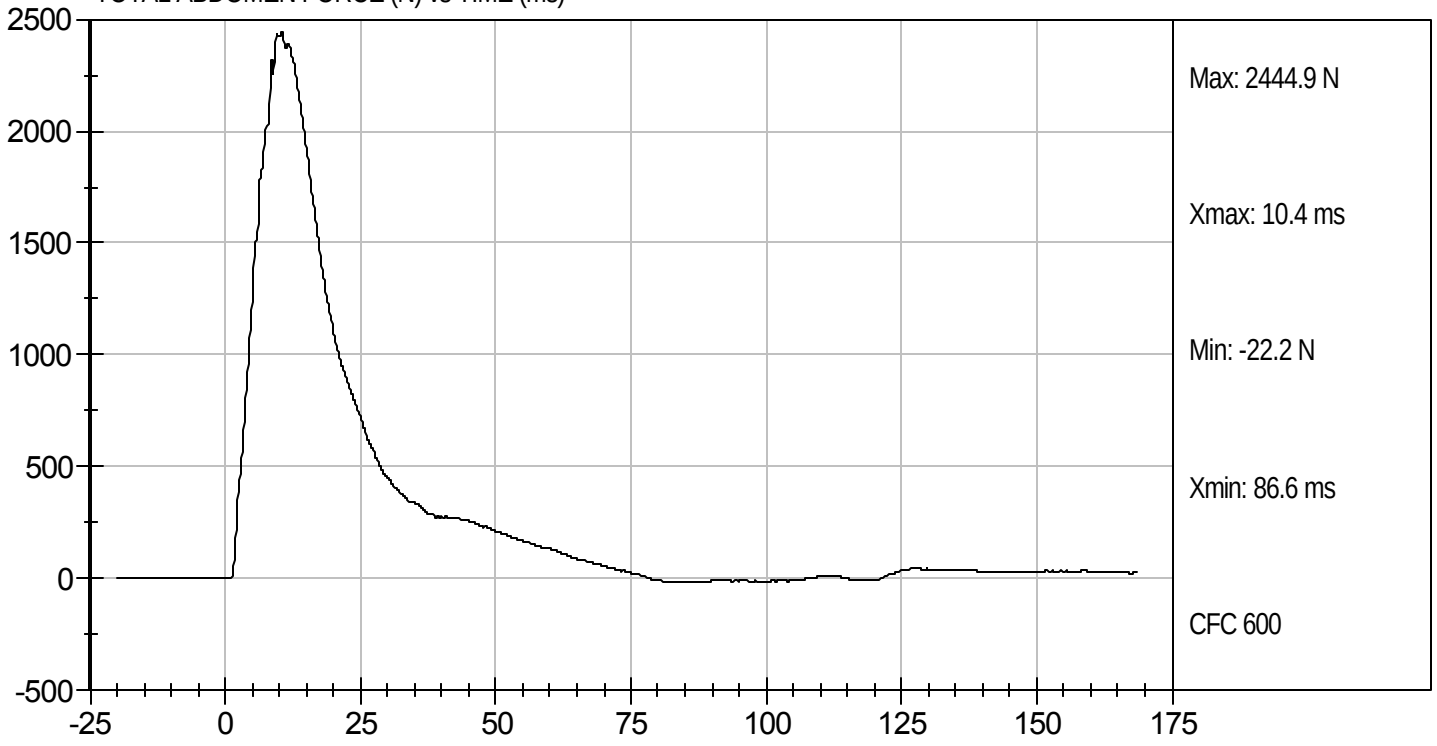
Test Desc: Abdomen Impact
Component ID: D111077

Test Date: 3/21/11
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:** D111078

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	38	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.41	Pass
	27 ms	m/s	-6.50 to -5.80	-5.94	Pass
	30 ms	m/s	>= -6.5	-6.11	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.2	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	45	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

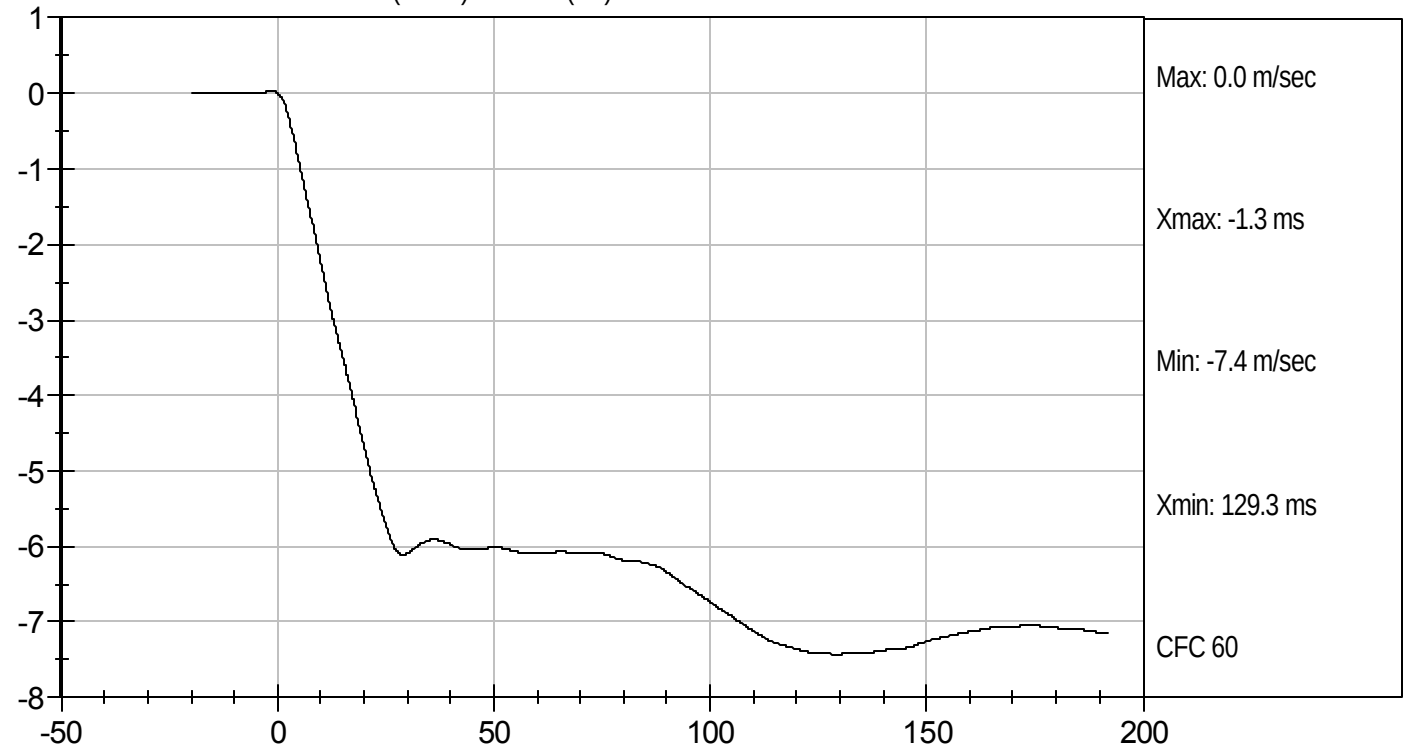
3/21/11
Test Date

David Winkelbauer
Approved By

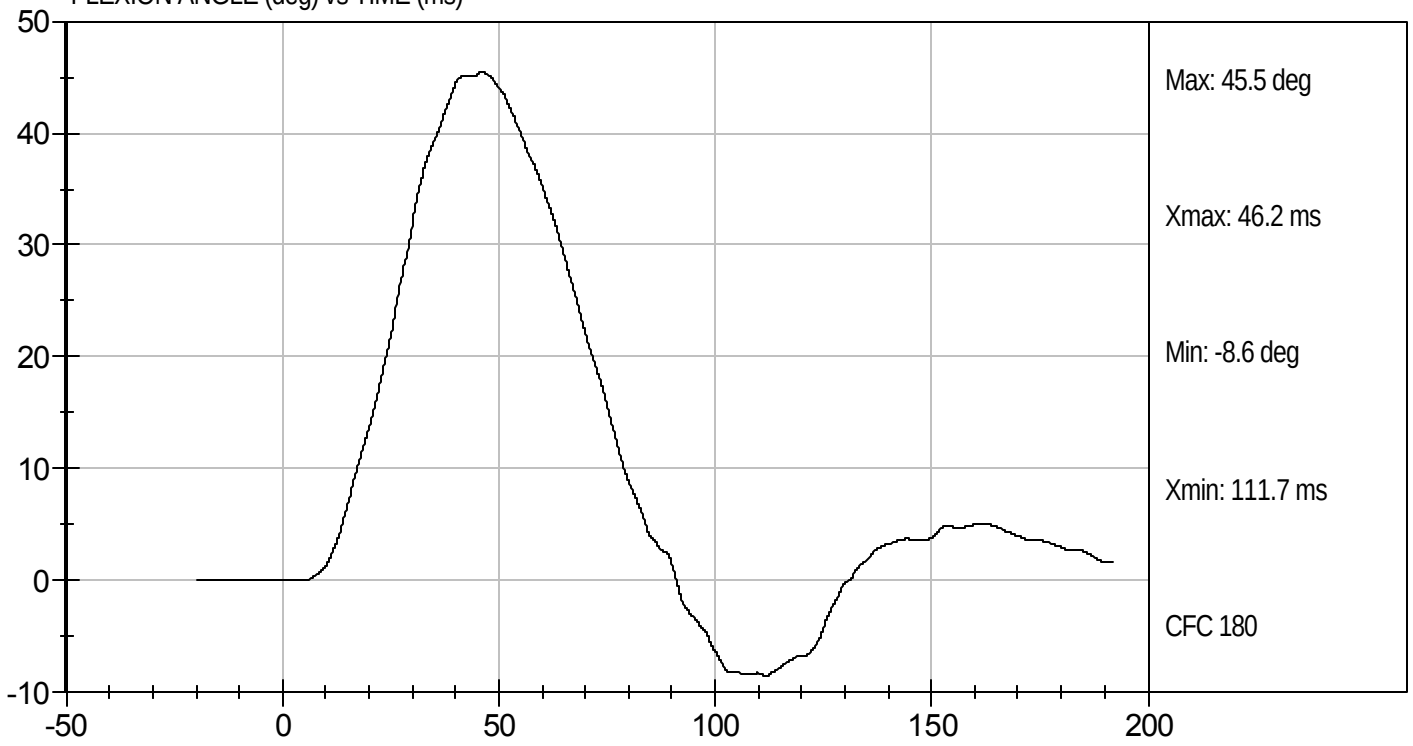
Test Desc: Lumbar Bending
Component ID: D111078

Test Date: 3/21/11
Velocity: 20.08 ft/s, 6.12 m/s

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

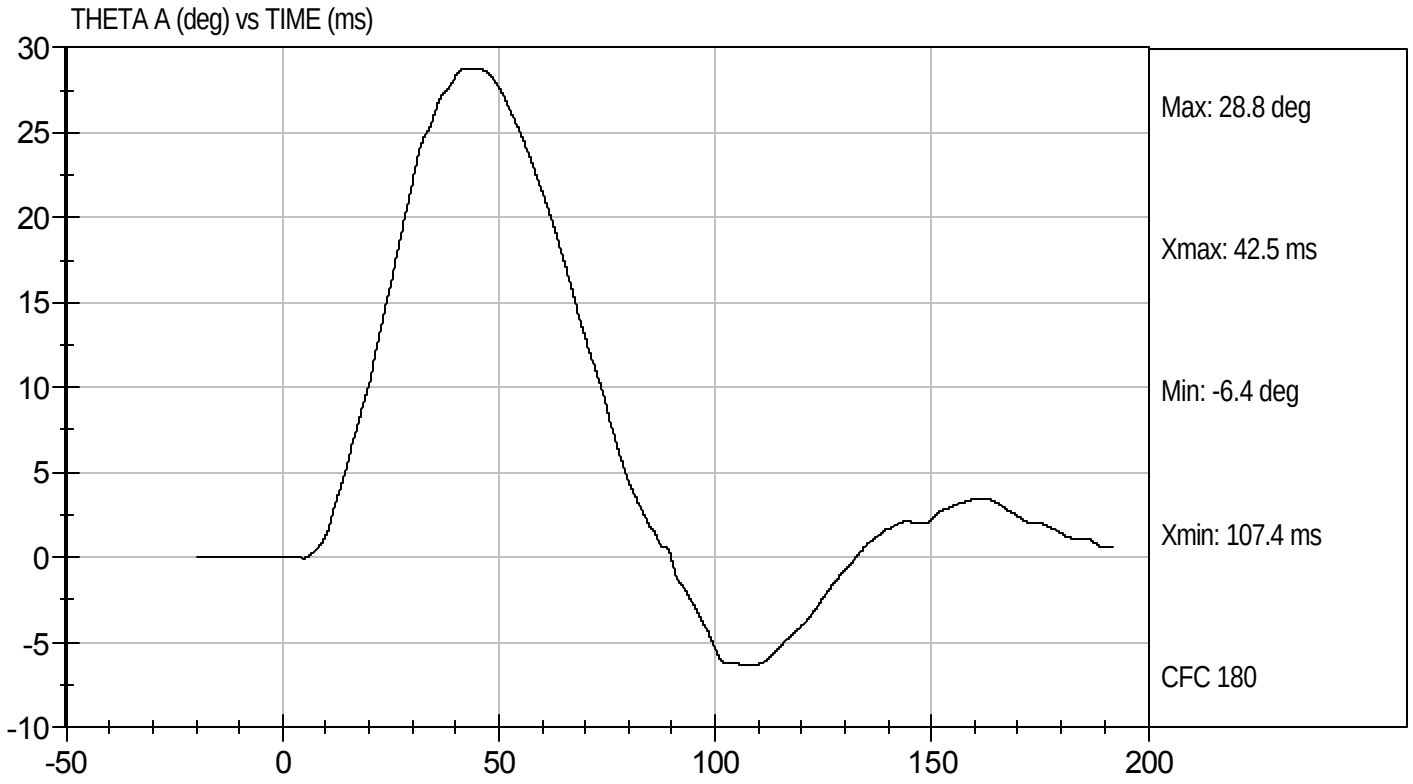


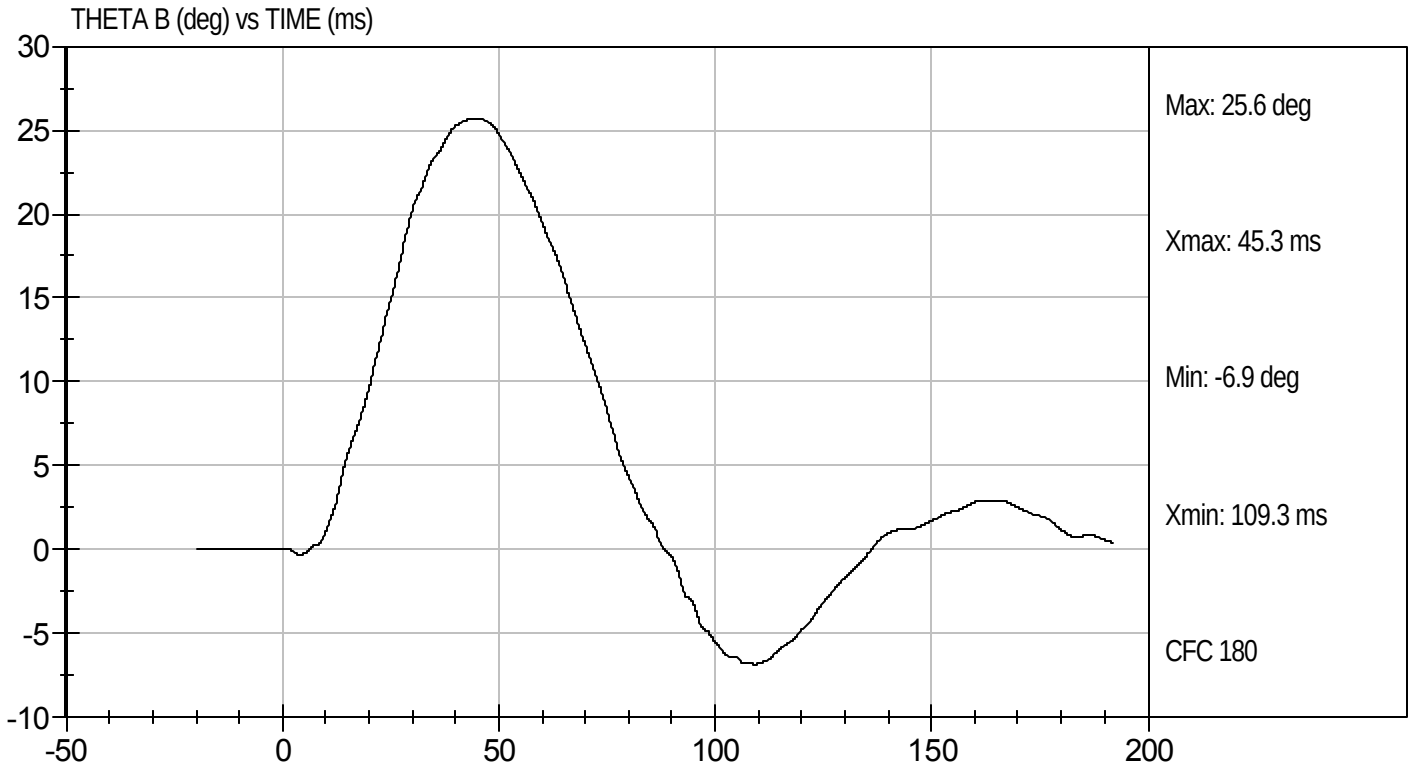
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D111078

Test Date: 3/21/11
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111079

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.84	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.90	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.41	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.60	Pass
		Overall Test Results		Pass

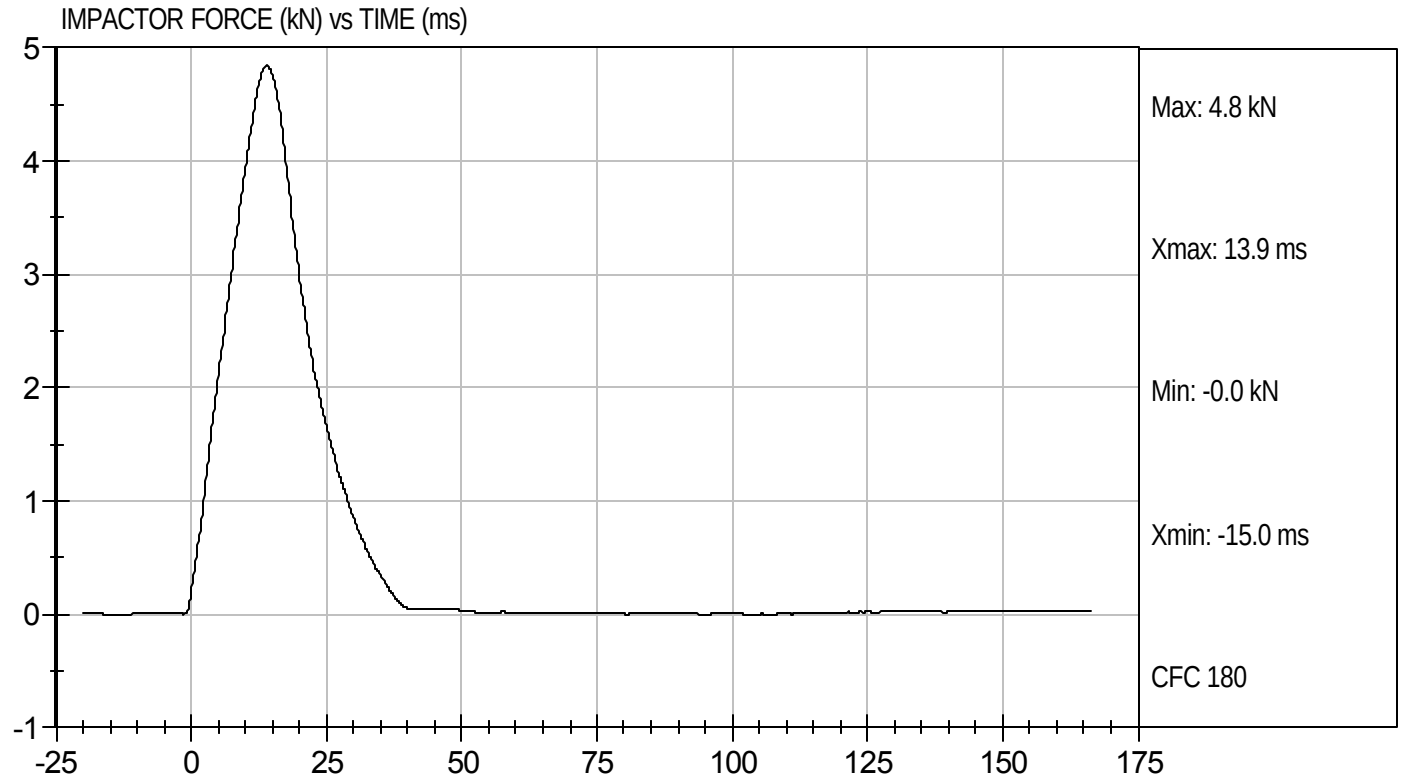
Jessica Gall
Laboratory Technician

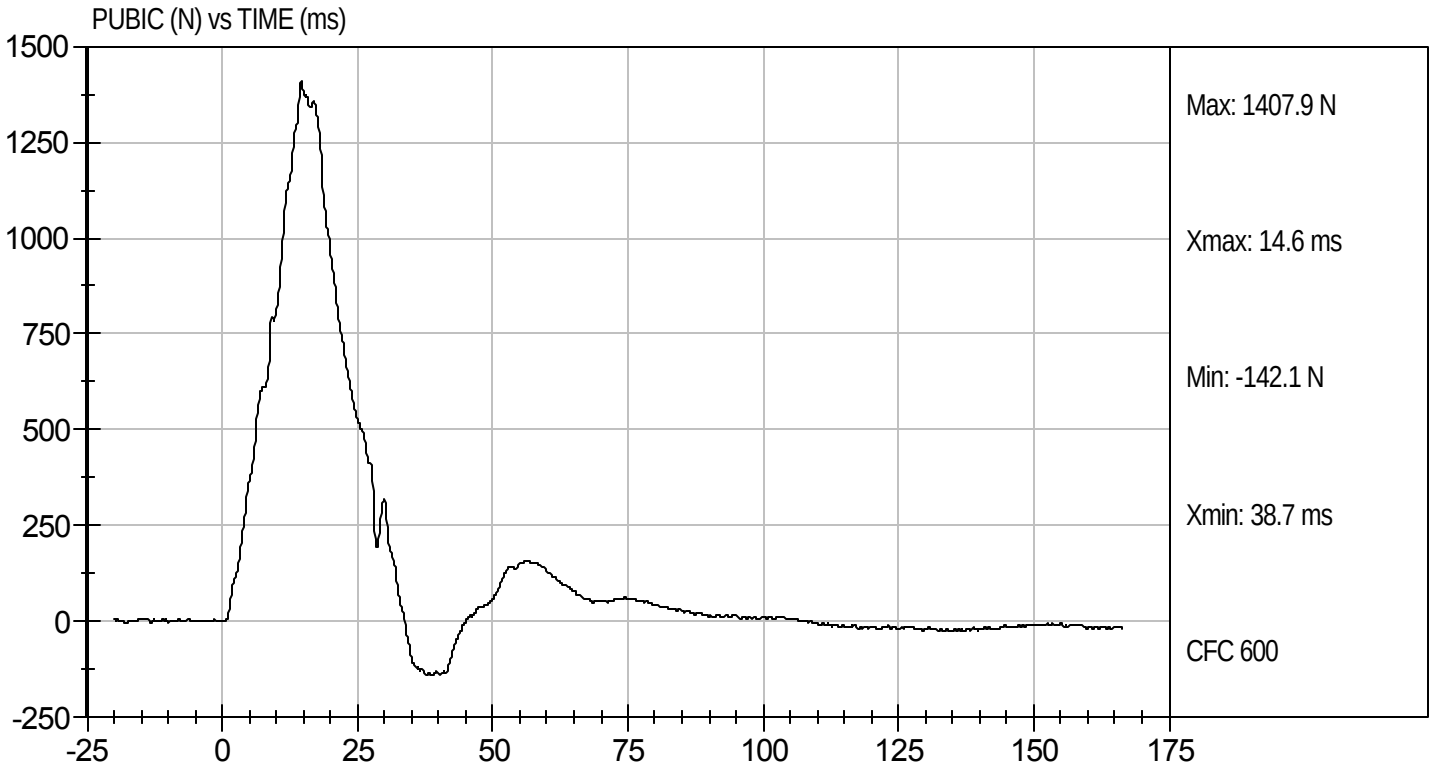
3/21/11
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D111079

Test Date: 3/21/11
Velocity: 14.25 ft/s, 4.34 m/s





MGA RESEARCH CORPORATION

FULL BODY THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111070

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	kN	5.10 to 6.20	5.22	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.9	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.2	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.6	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

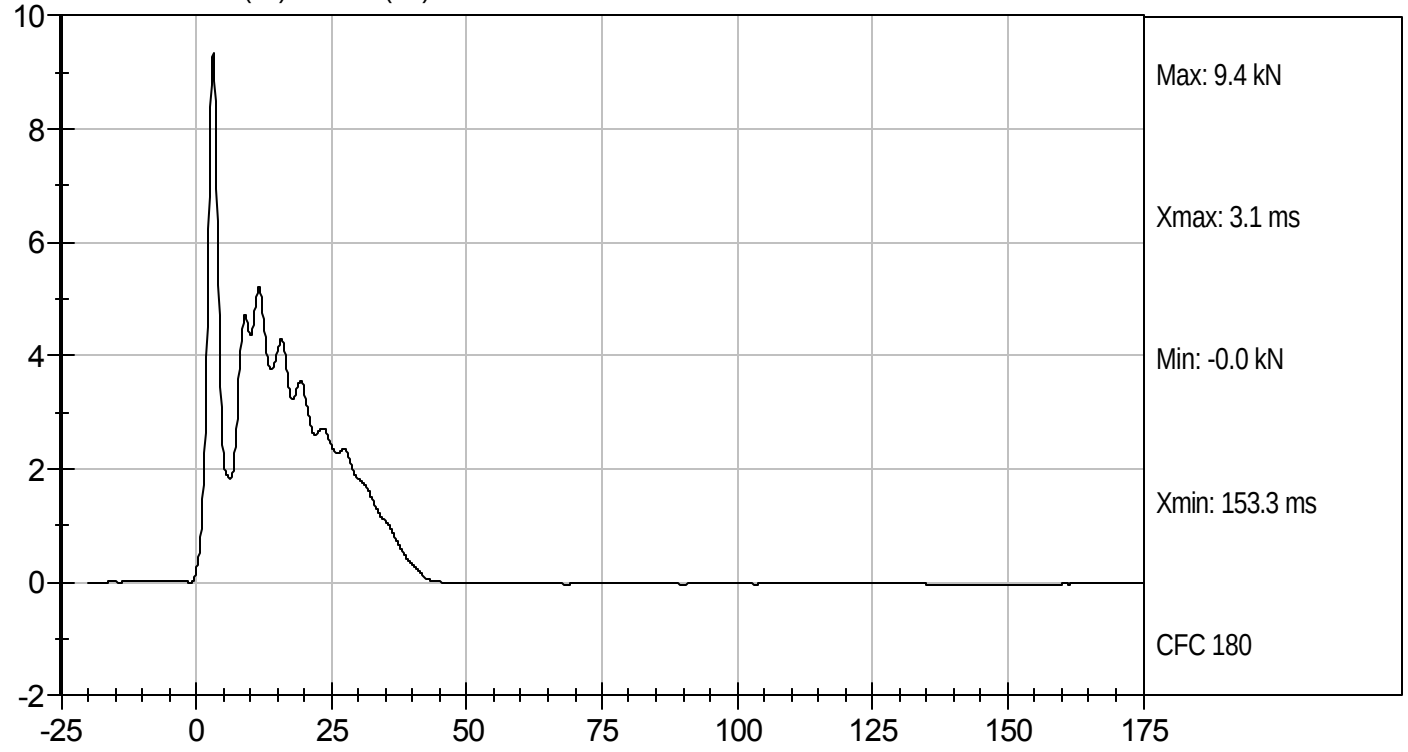
3/21/11
Test Date

David Winkelbauer
Approved By

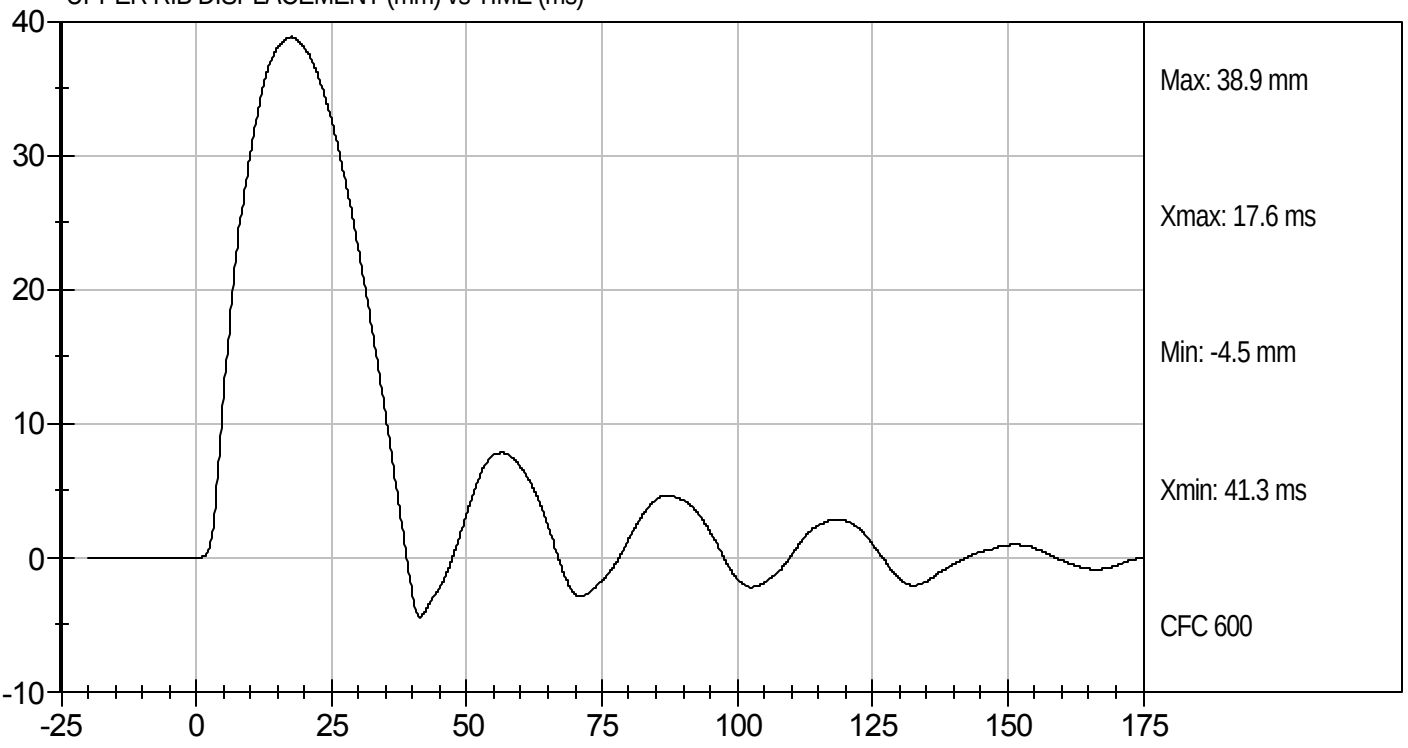
Test Desc: Thorax Impact
Component ID: D111070

Test Date: 3/21/11
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



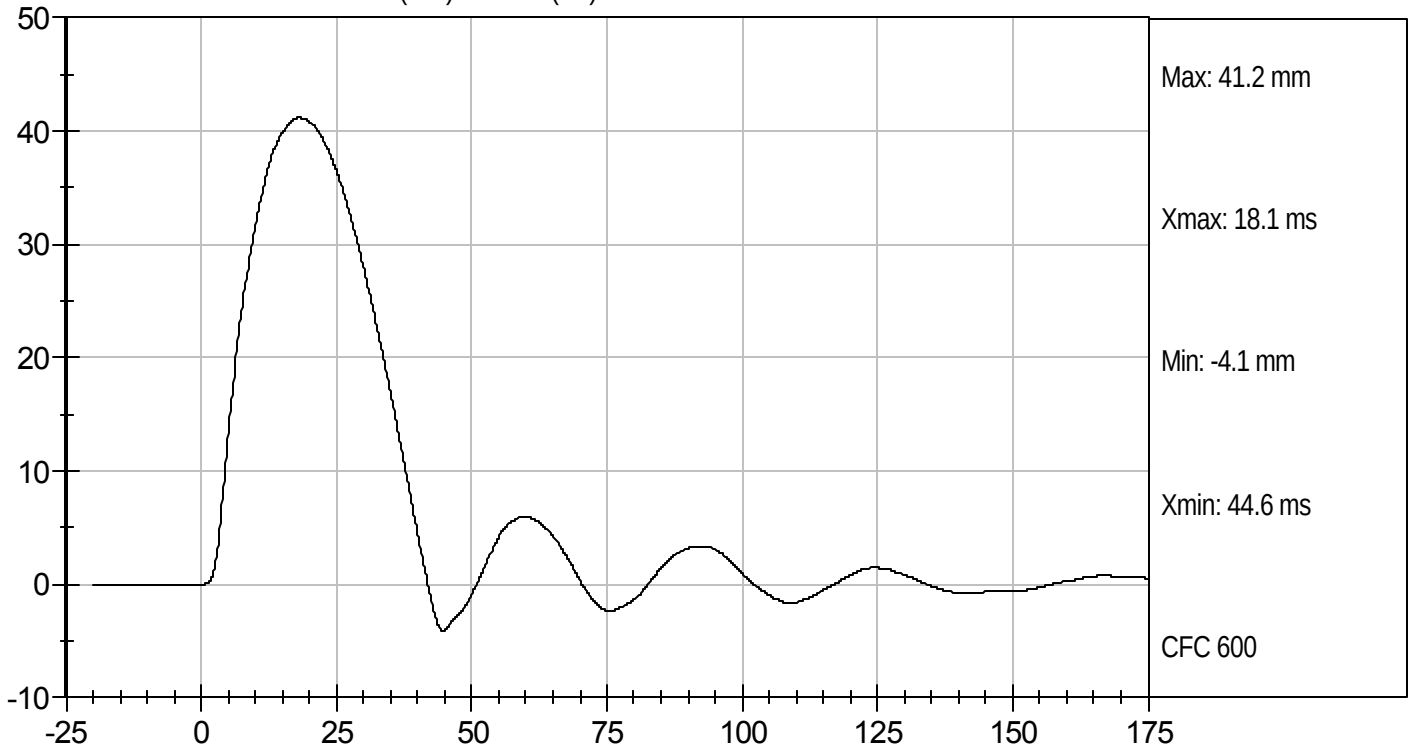
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



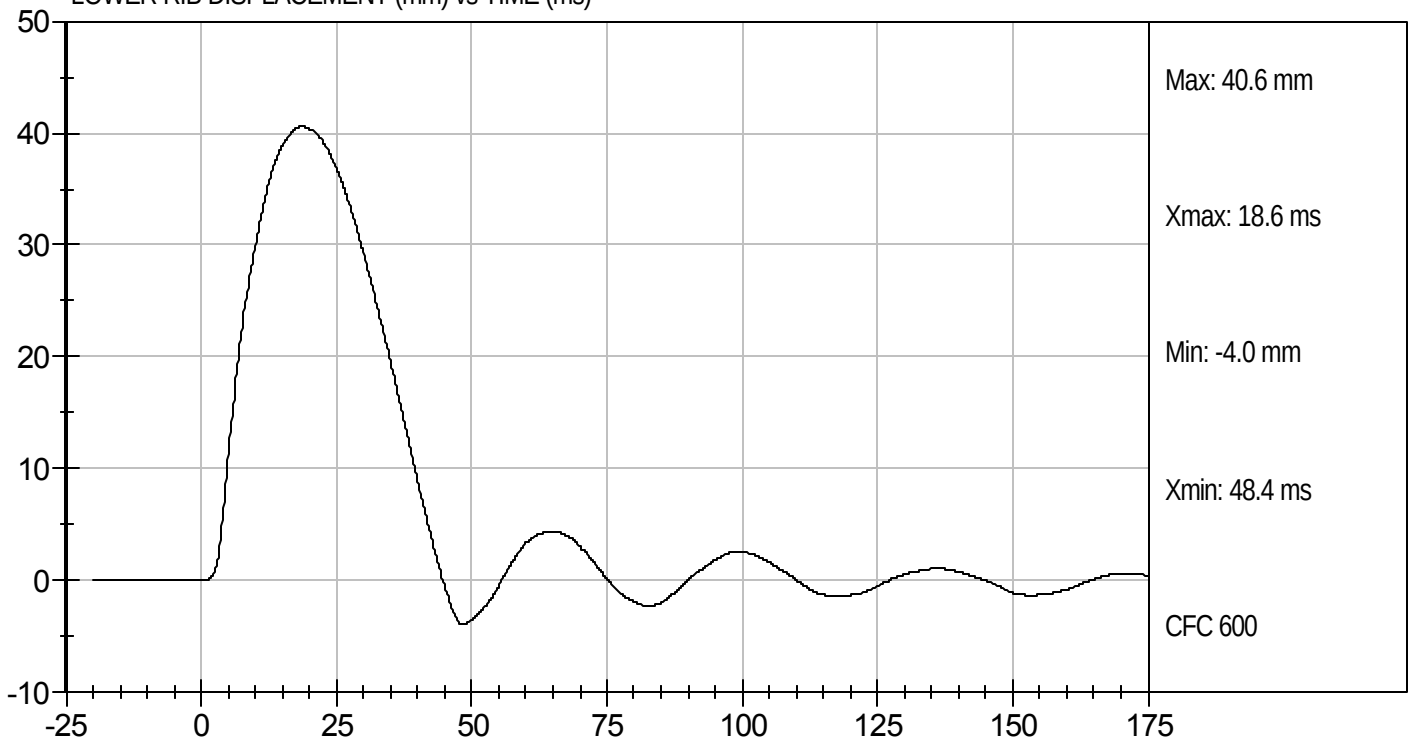
Test Desc: Thorax Impact
Component ID: D111070

Test Date: 3/21/11
Velocity: 18.32 ft/s, 5.58 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: 016 **Test ID:** D111111

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	151	Pass
Peak Lateral Acceleration	G's	+/- 15	-9.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Jessica Hall
Laboratory Technician

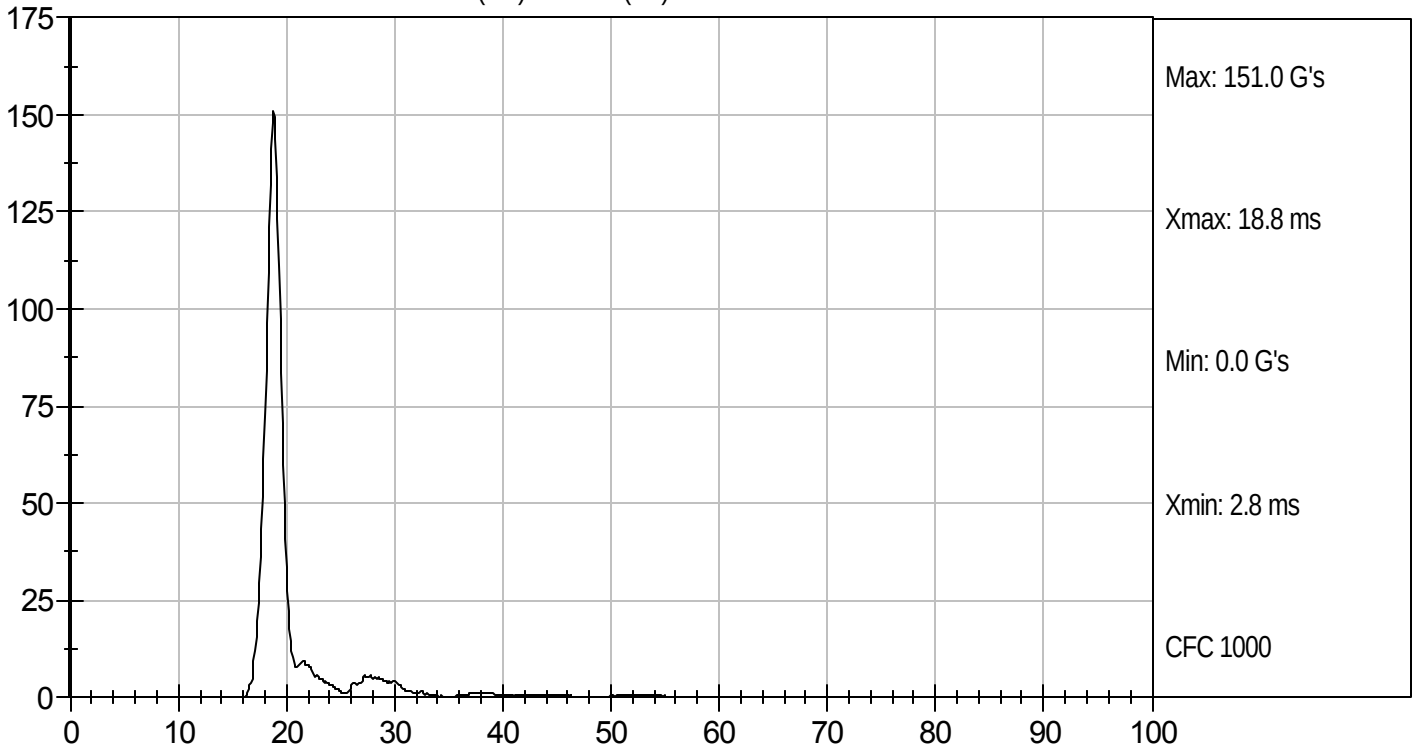
3/23/11
Test Date

David Winkelbauer
Approved By

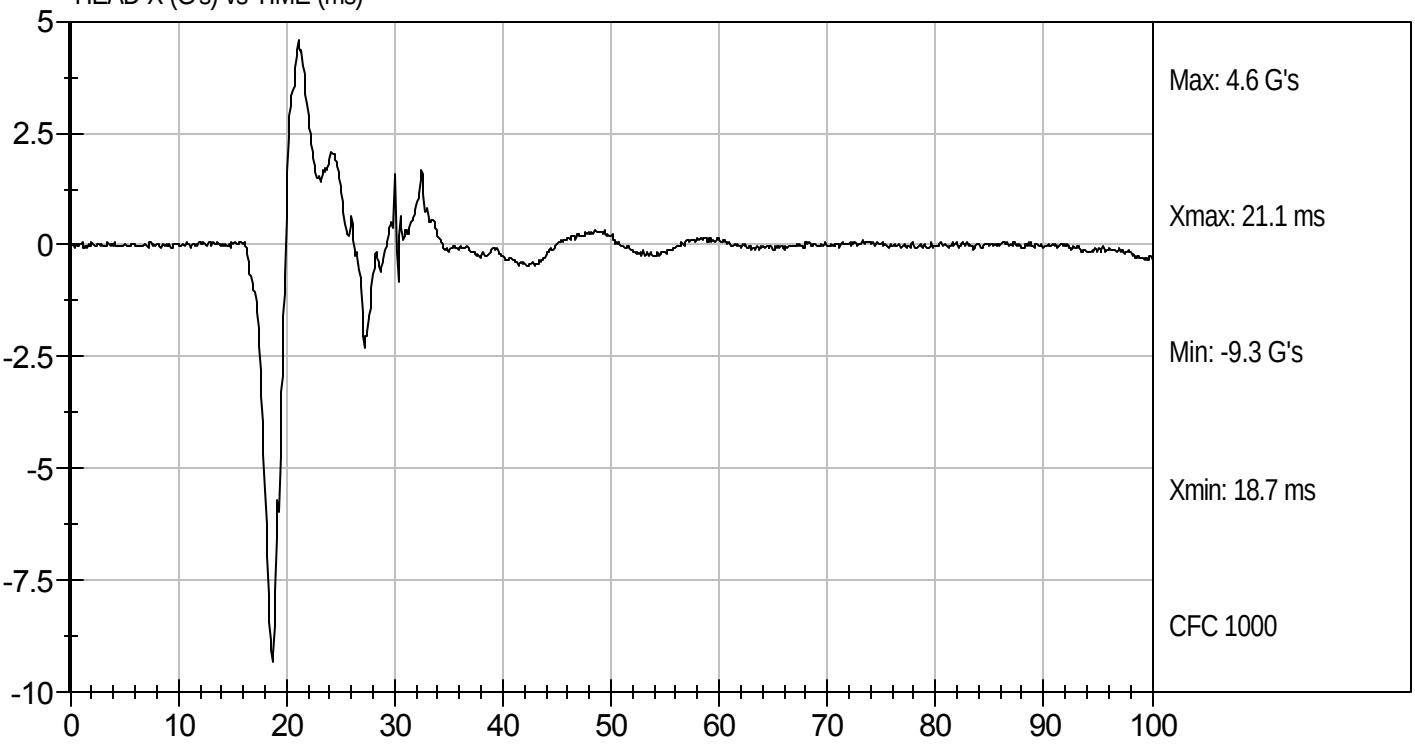
Test Desc: Head Drop
Component ID: D111111

Test Date: 3/23/11
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:** D111112

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	29	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	1 ms	m/s	0.00 to -0.05	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.38	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.8	Pass
Head Rotation Decay Time to 0 degree		ms	53.0 to 88.0	60.6	Pass
			Overall Test Results		Pass

Jessica Hall
Laboratory Technician

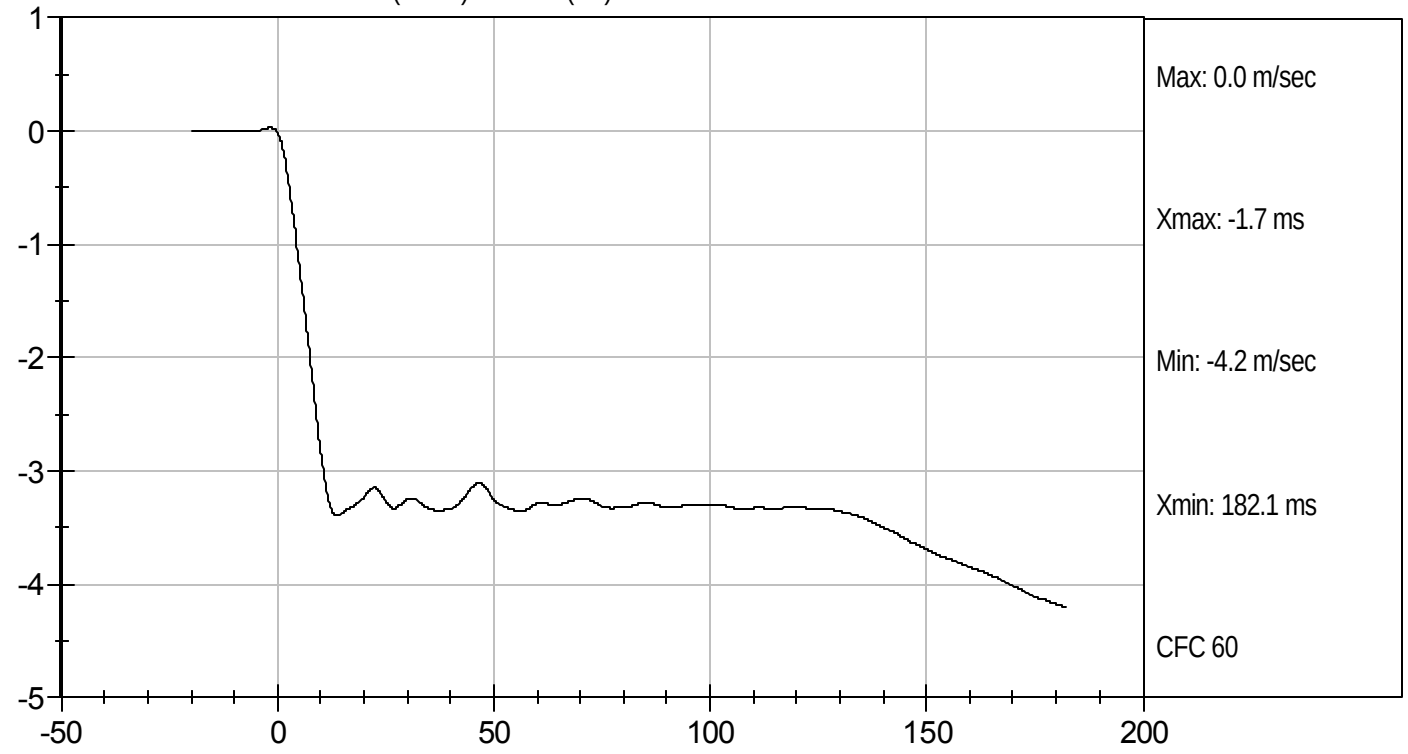
3/23/11
Test Date

David Winkelbauer
Approved By

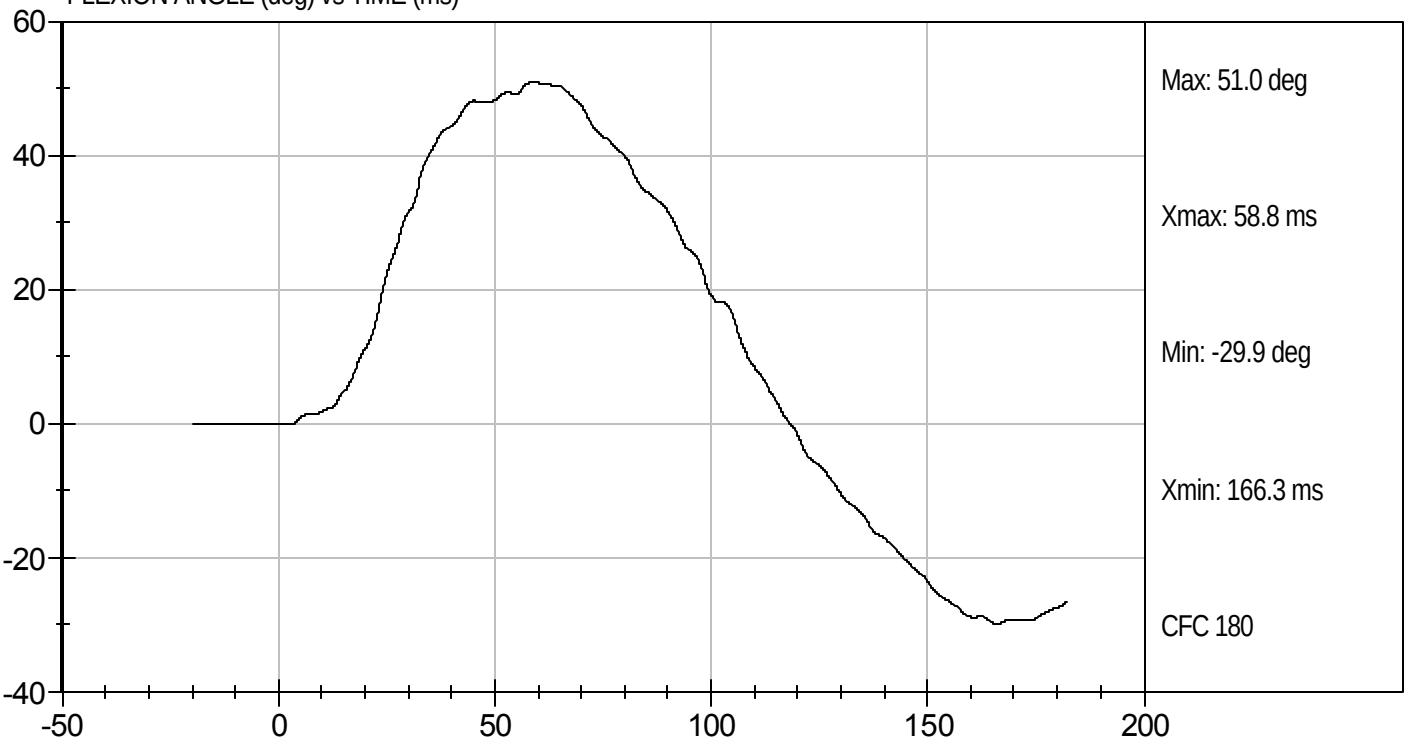
Test Desc: Neck Bending
Component ID: D111112

Test Date: 3/23/11
Velocity: 11.42 ft/s, 3.5 m/s

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

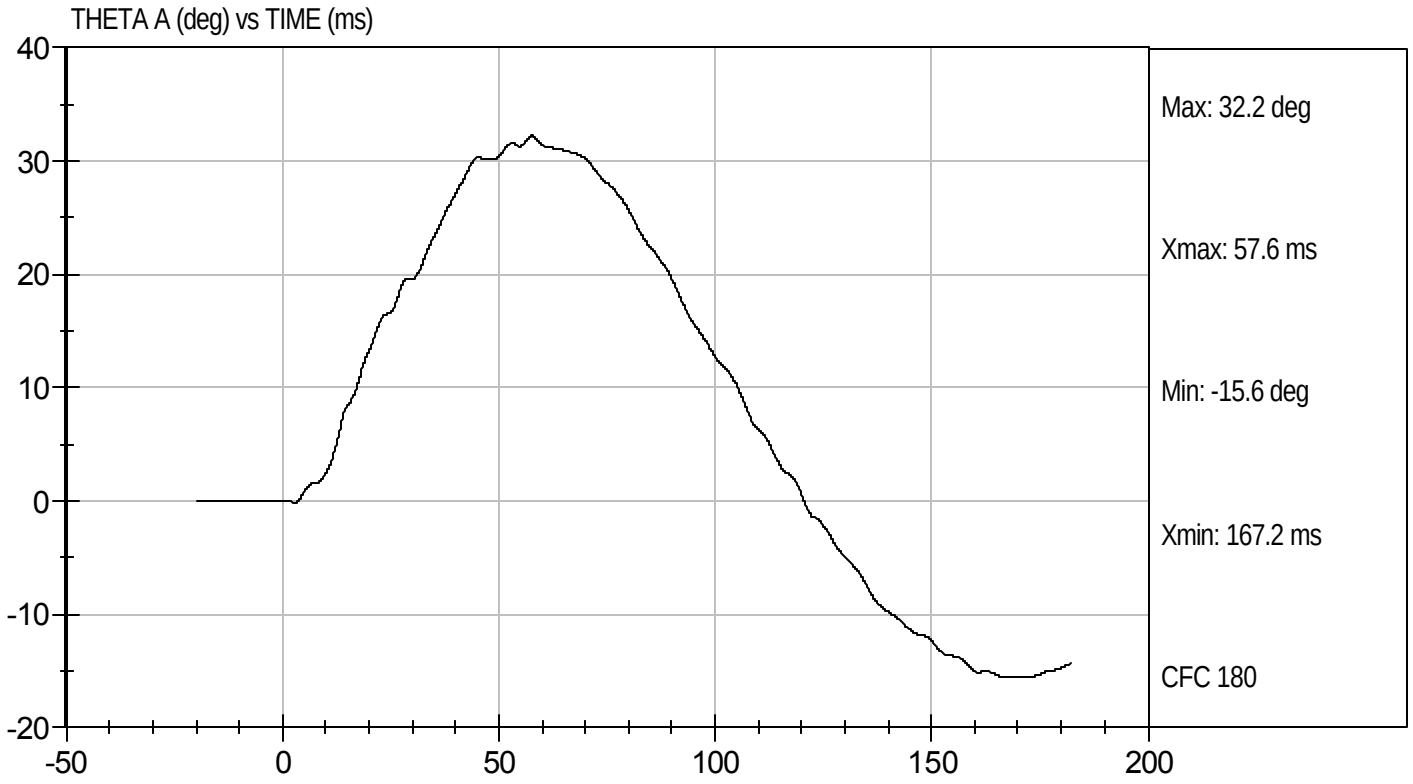


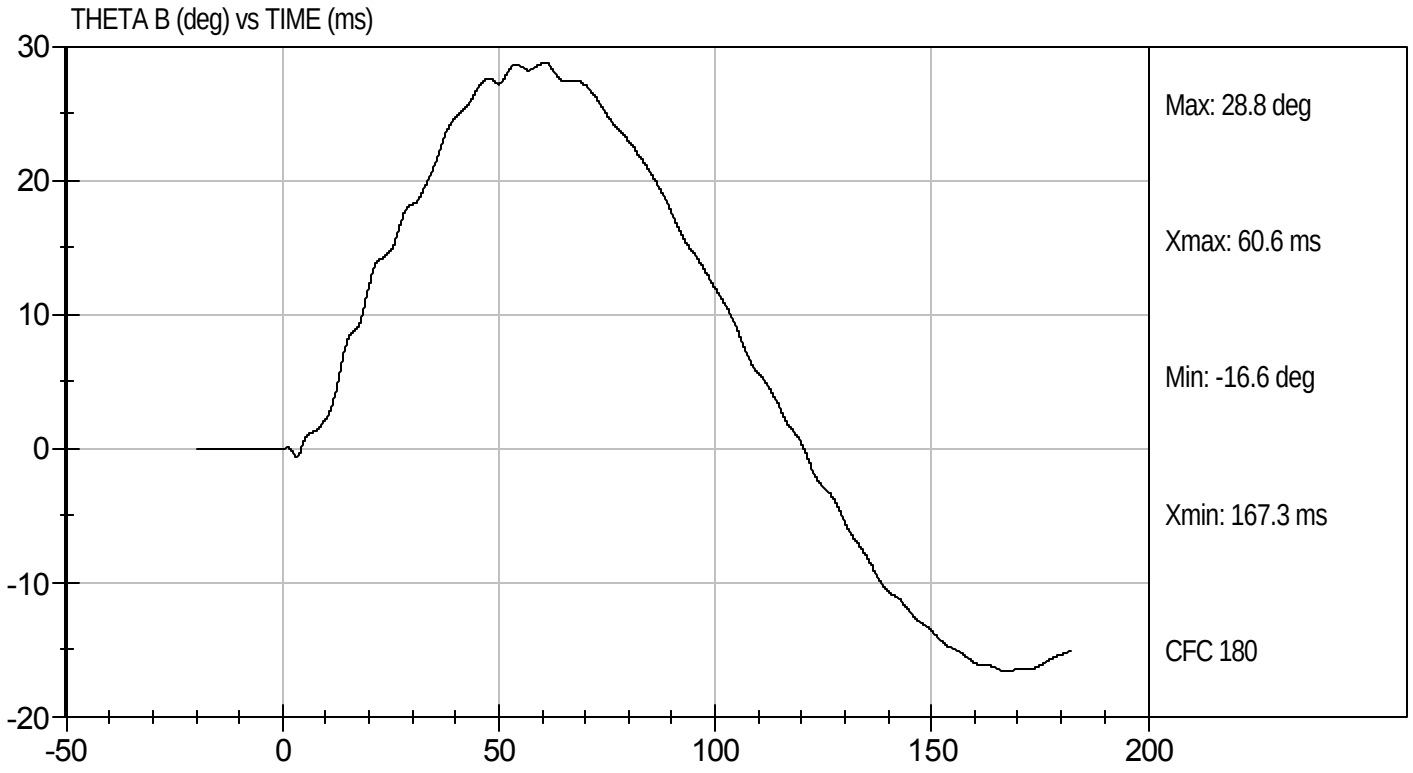
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Component ID: D111112

Test Date: 3/23/11
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:** D111113

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	10.1	Pass
Time of Peak Shoulder Acceleration	ms	NA	18.4	Pass
		Overall Test Results		Pass

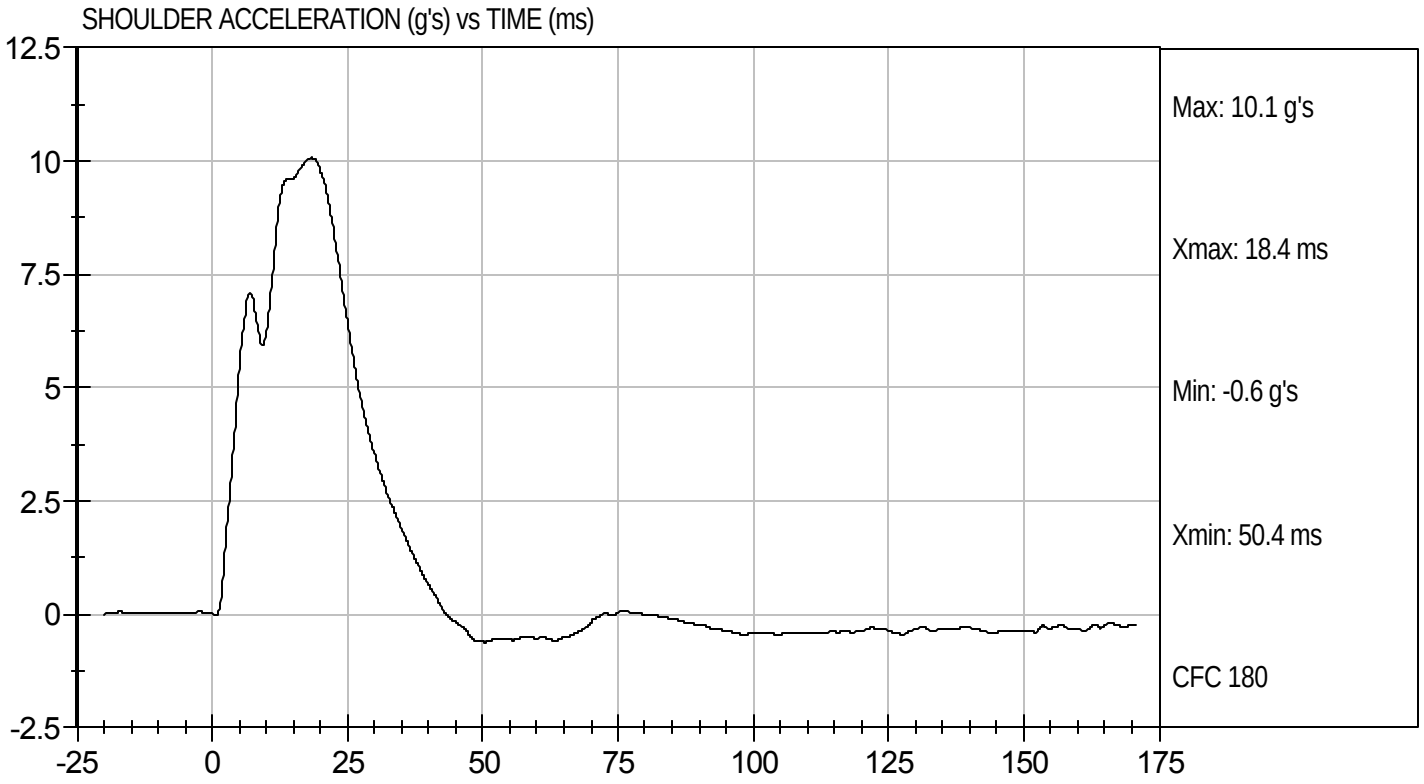
Jessica Hall
Laboratory Technician

3/24/11
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Component ID: D111113

Test Date: 3/24/11
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:** D111114

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	22	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

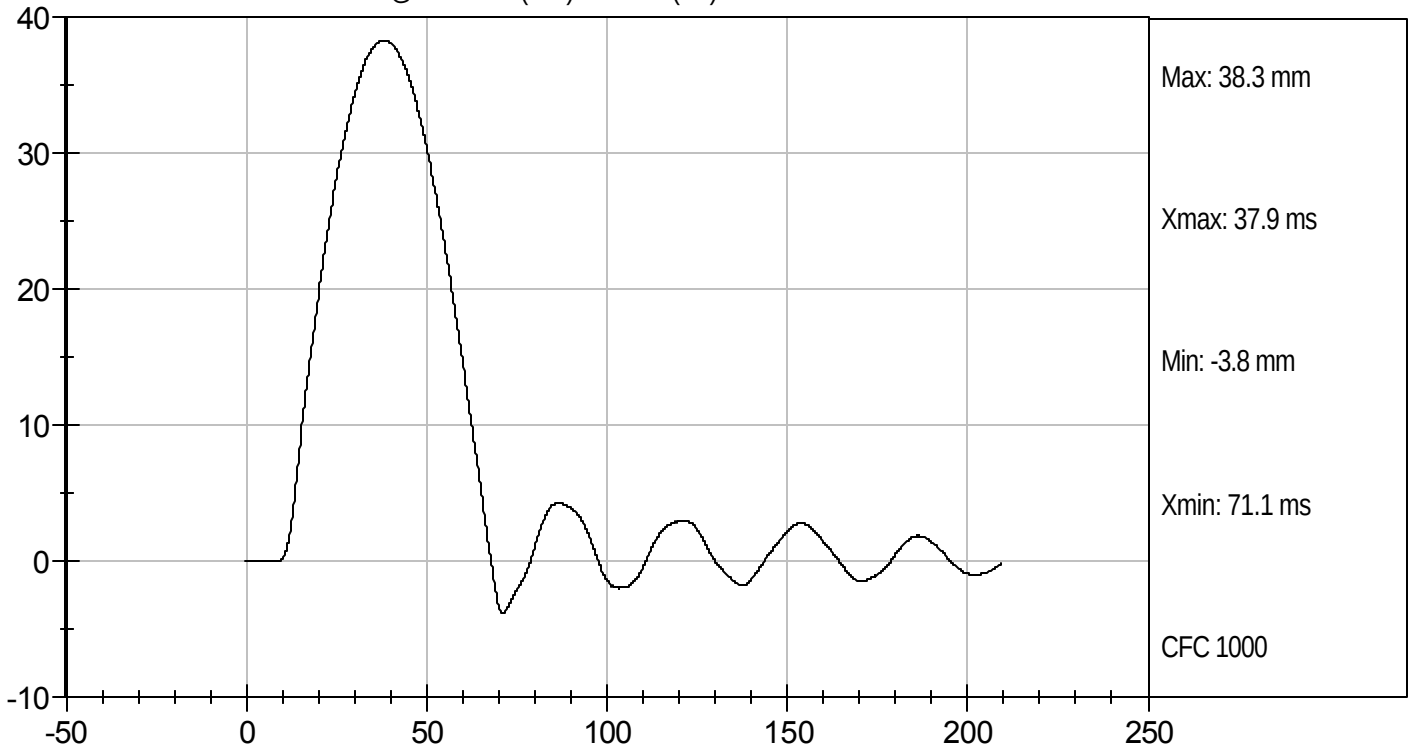
Jessica Hall
Laboratory Technician

3/24/11
Test Date

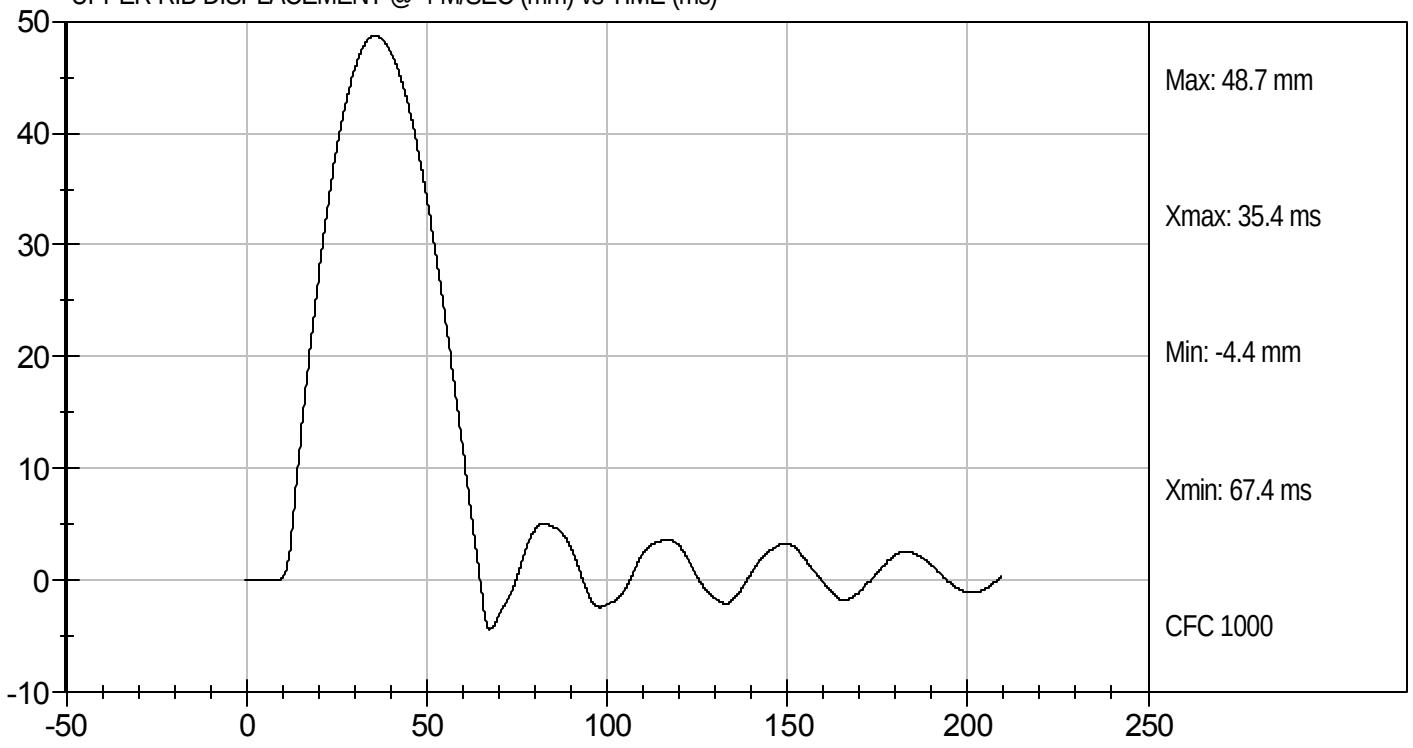
David Winkelbauer
Approved By

Test Desc: Rib Impact - Upper
Component ID: D111114
Test Date: 3/24/11

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:** D111115

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	22	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.9	Pass
		Overall Test Results		Pass

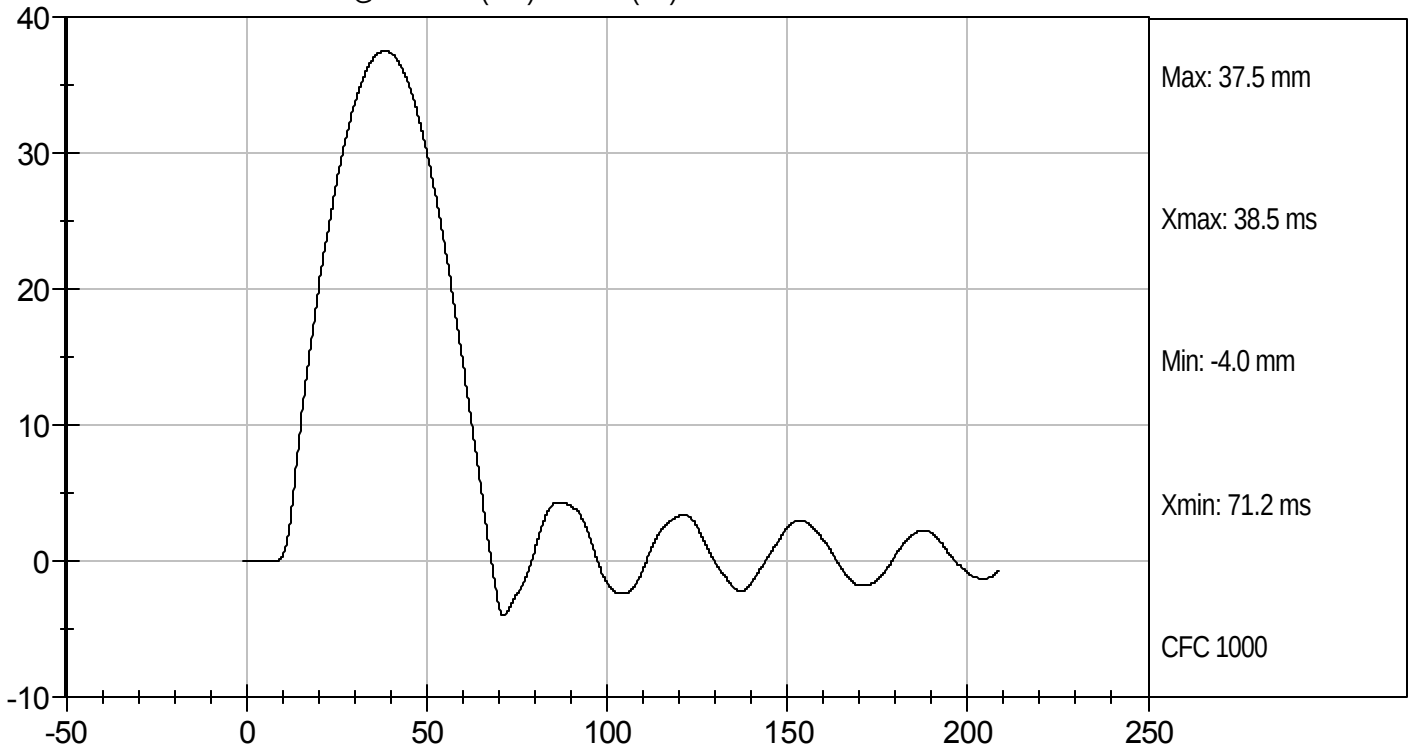
Jessica Gall
Laboratory Technician

3/24/11
Test Date

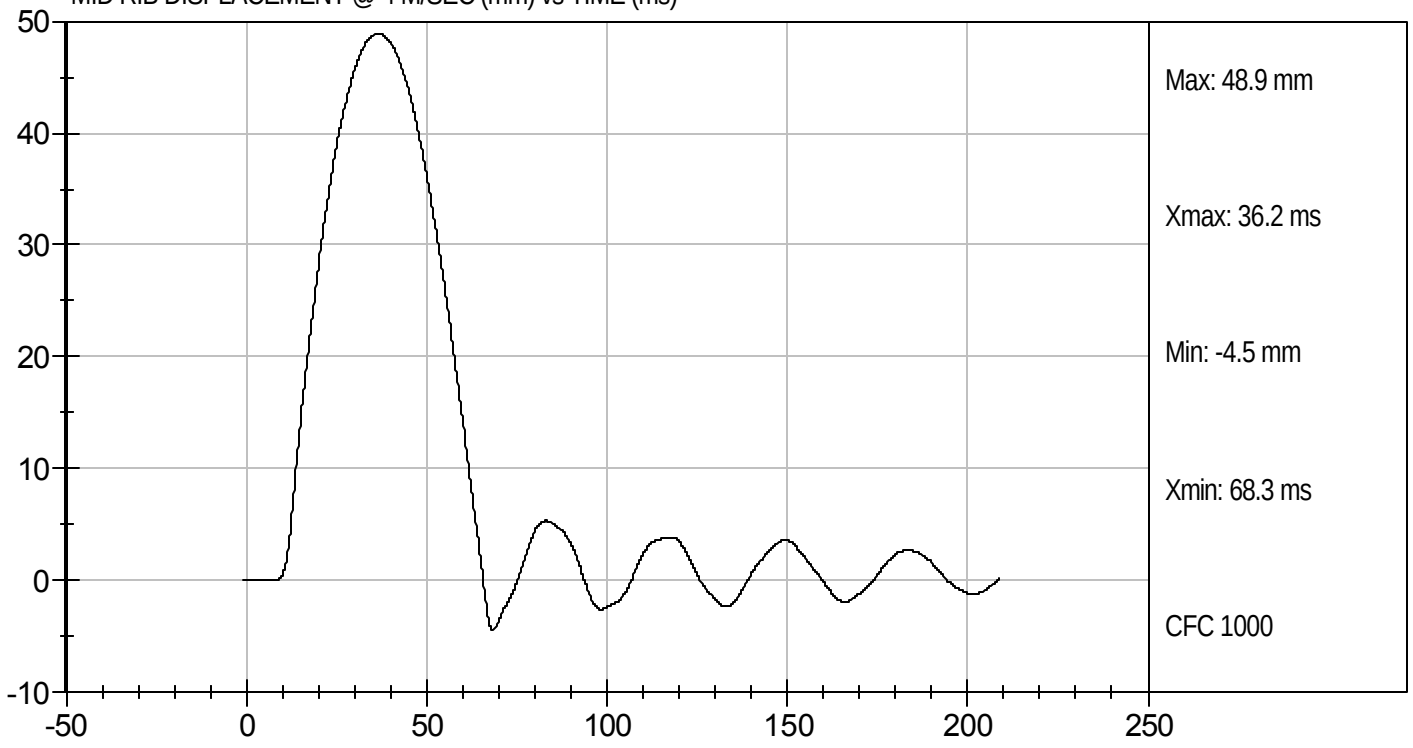
David Winkelbauer
Approved By

Test Desc: Rib Impact - Mid
Component ID: D111115
Test Date: 3/24/11

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:** D111116

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	22	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.6	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.7	Pass
		Overall Test Results		Pass

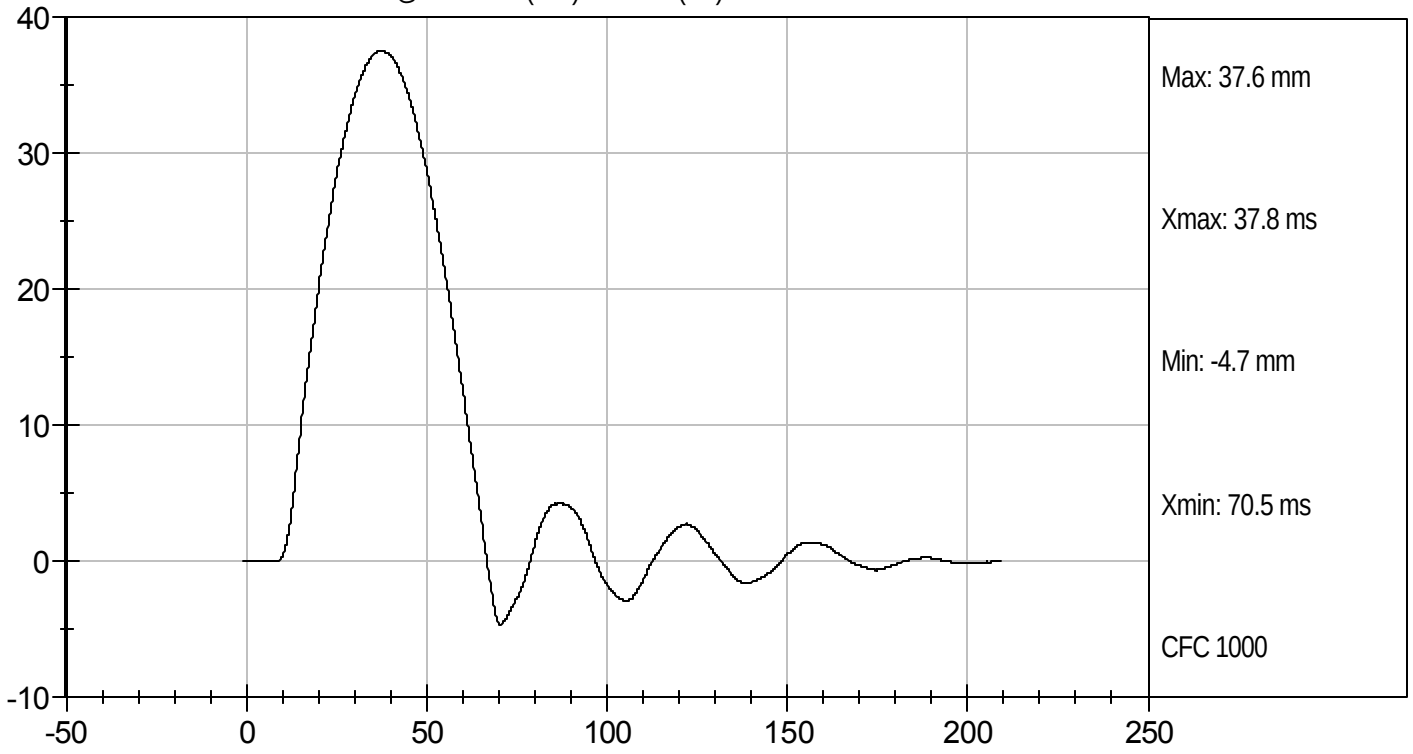
Jessica Hall
Laboratory Technician

3/24/11
Test Date

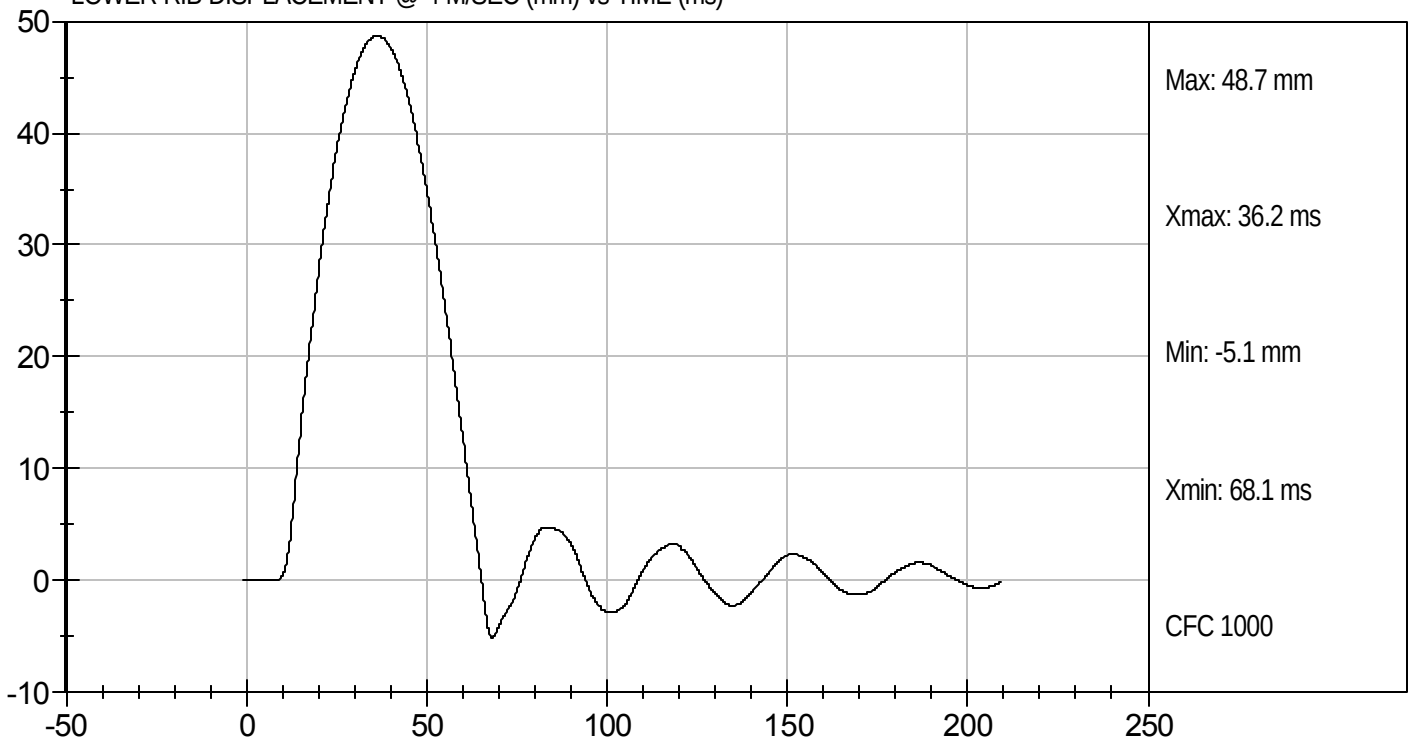
David Winkelbauer
Approved By

Test Desc: Rib Impact - Lower
Component ID: D111116
Test Date: 3/24/11

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:** D111117

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Speed	m/s	3.90 to 4.10	4.1	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.07	Pass
Time of Maximum Impactor Force	ms	10.60 to 13.00	11.20	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.37	Pass
Time of Maximum Abdomen Force	ms	10.00 to 12.30	10.20	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

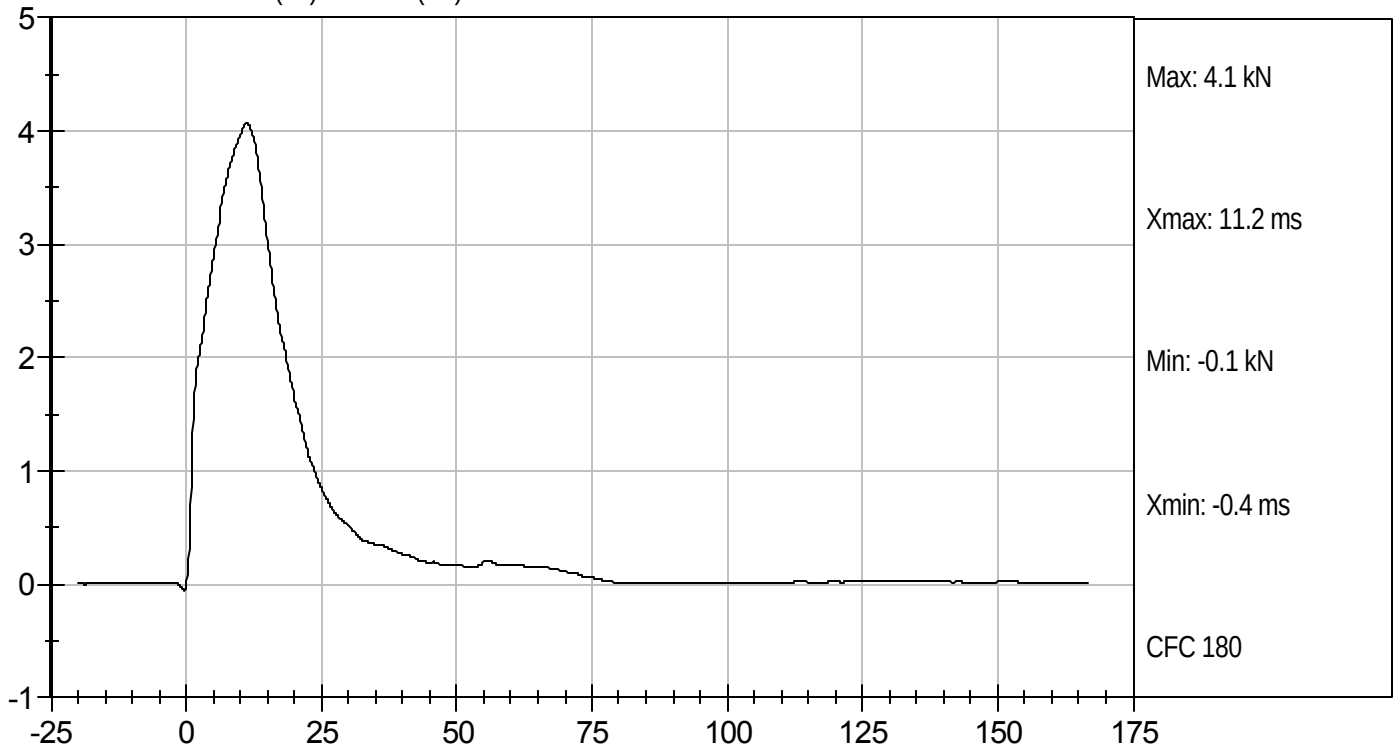
3/24/11
Test Date

David Winkelbauer
Approved By

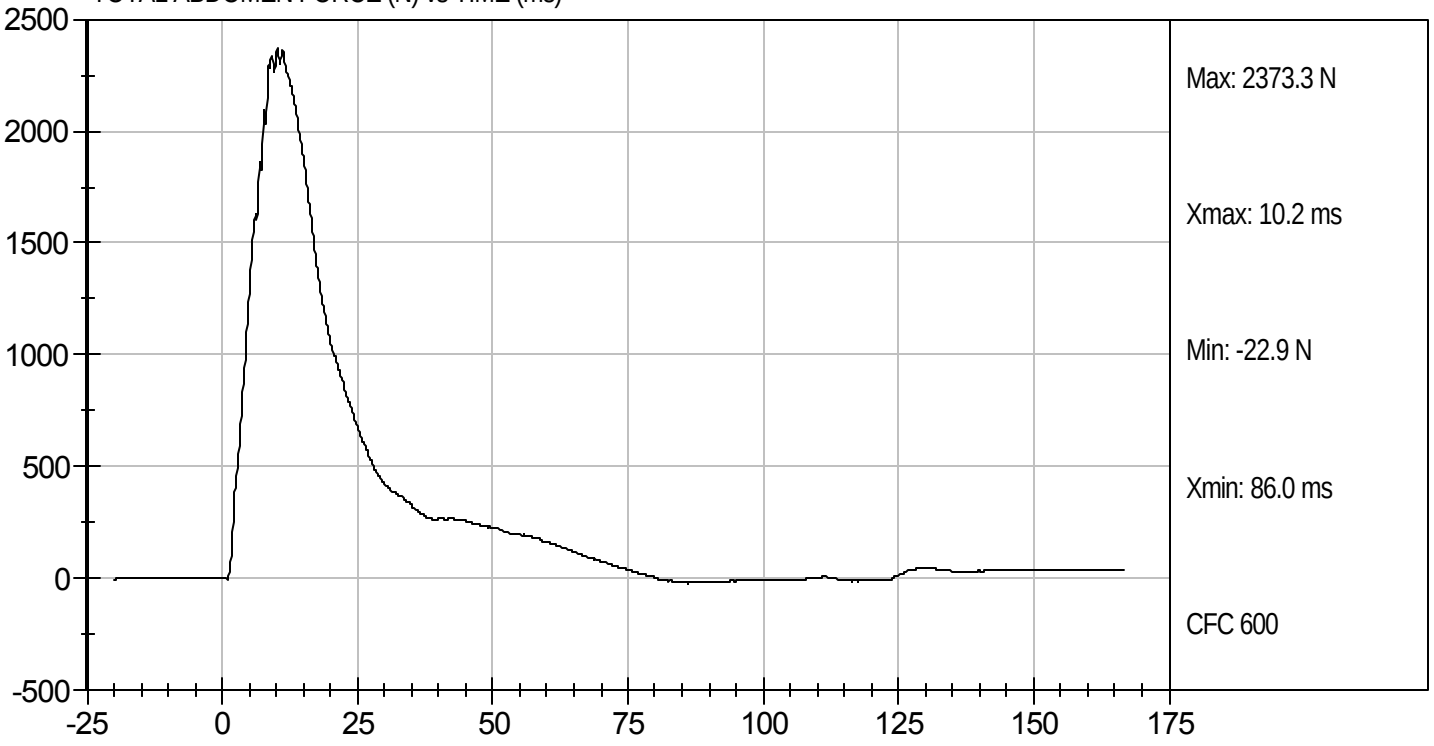
Test Desc: Abdomen Impact
Component ID: D111117

Test Date: 3/24/11
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:** D111118

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	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	-0.00	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.41	Pass
	27 ms	m/s	-6.50 to -5.80	-5.81	Pass
	30 ms	m/s	>= -6.5	-6.07	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	45.5	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	48.5	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	48	Pass
			Overall Results		Pass

Jessica Hall
Laboratory Technician

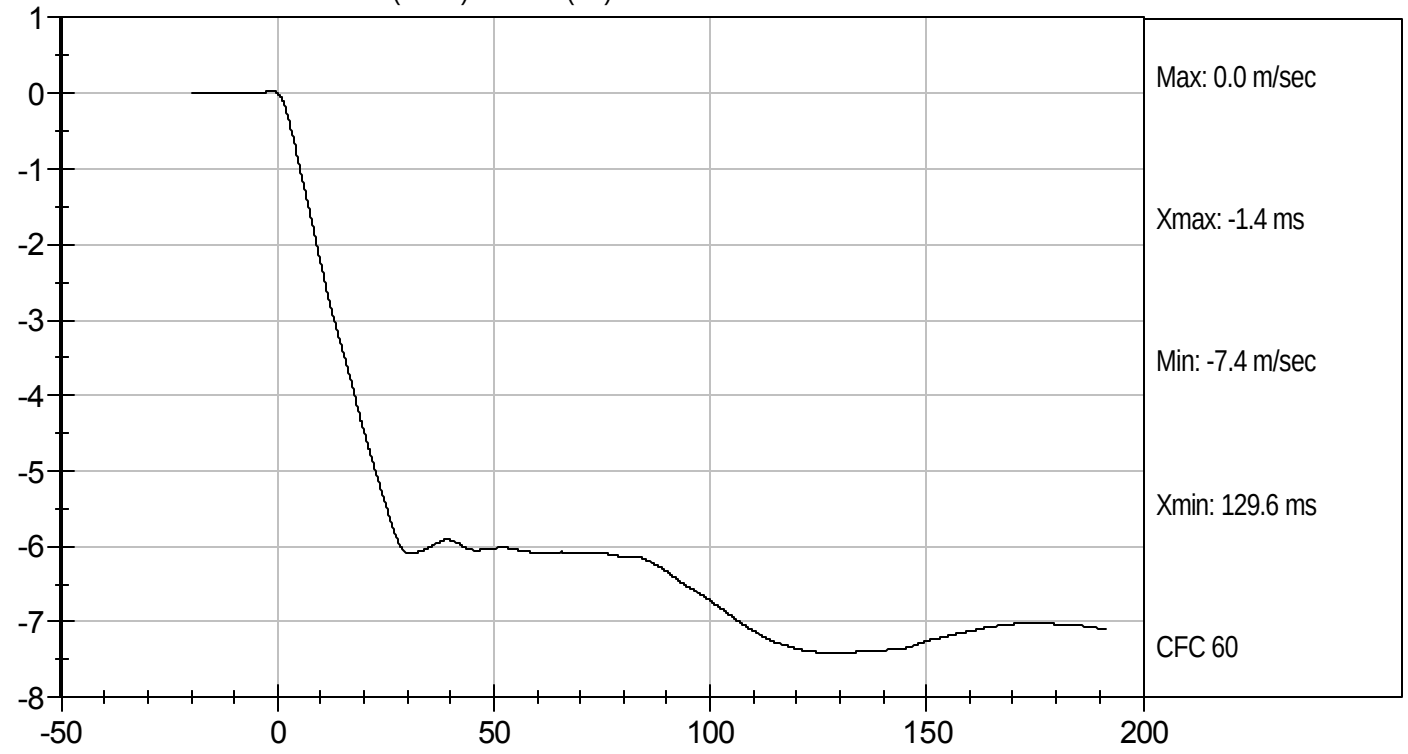
3/23/11
Test Date

David Winkelbauer
Approved By

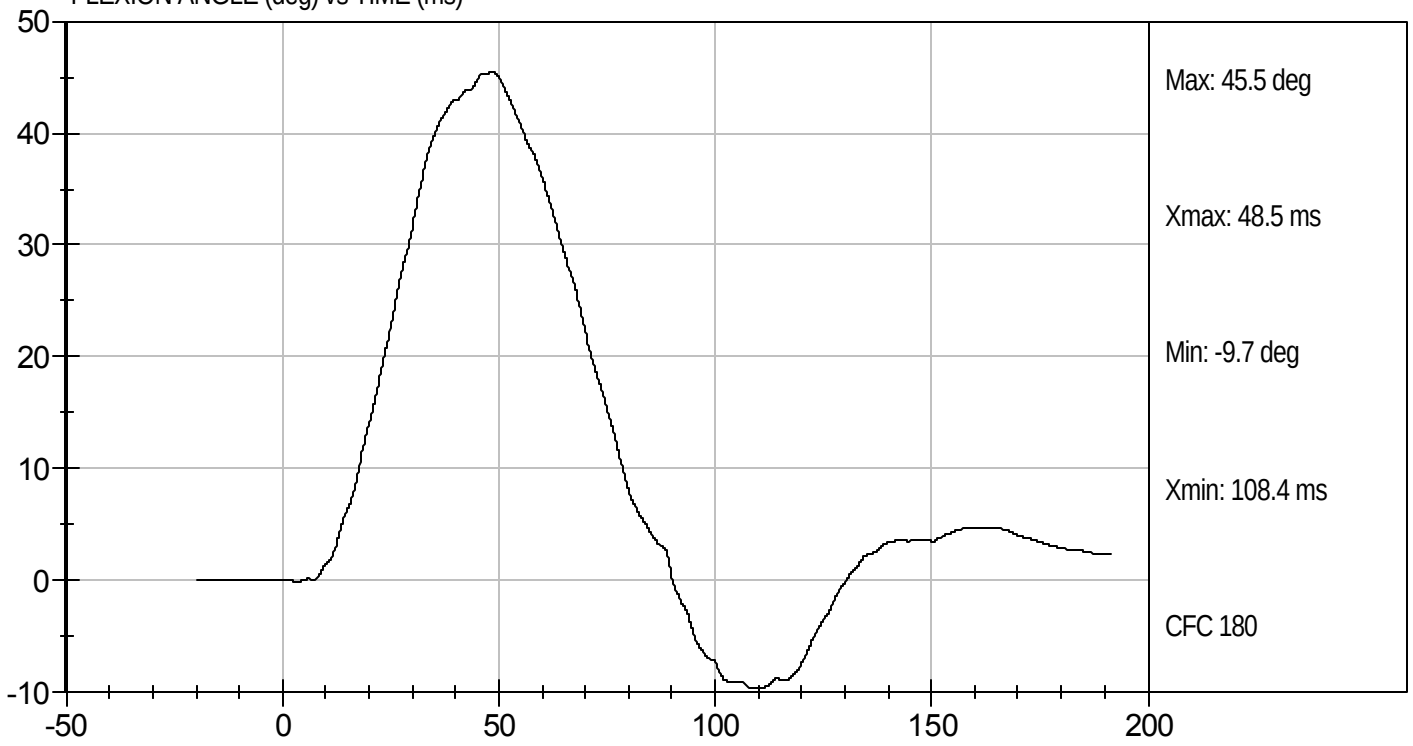
Test Desc: Lumbar Bending
Component ID: D111118

Test Date: 3/23/11
Velocity: 20.08 ft/s, 6.12 m/s

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

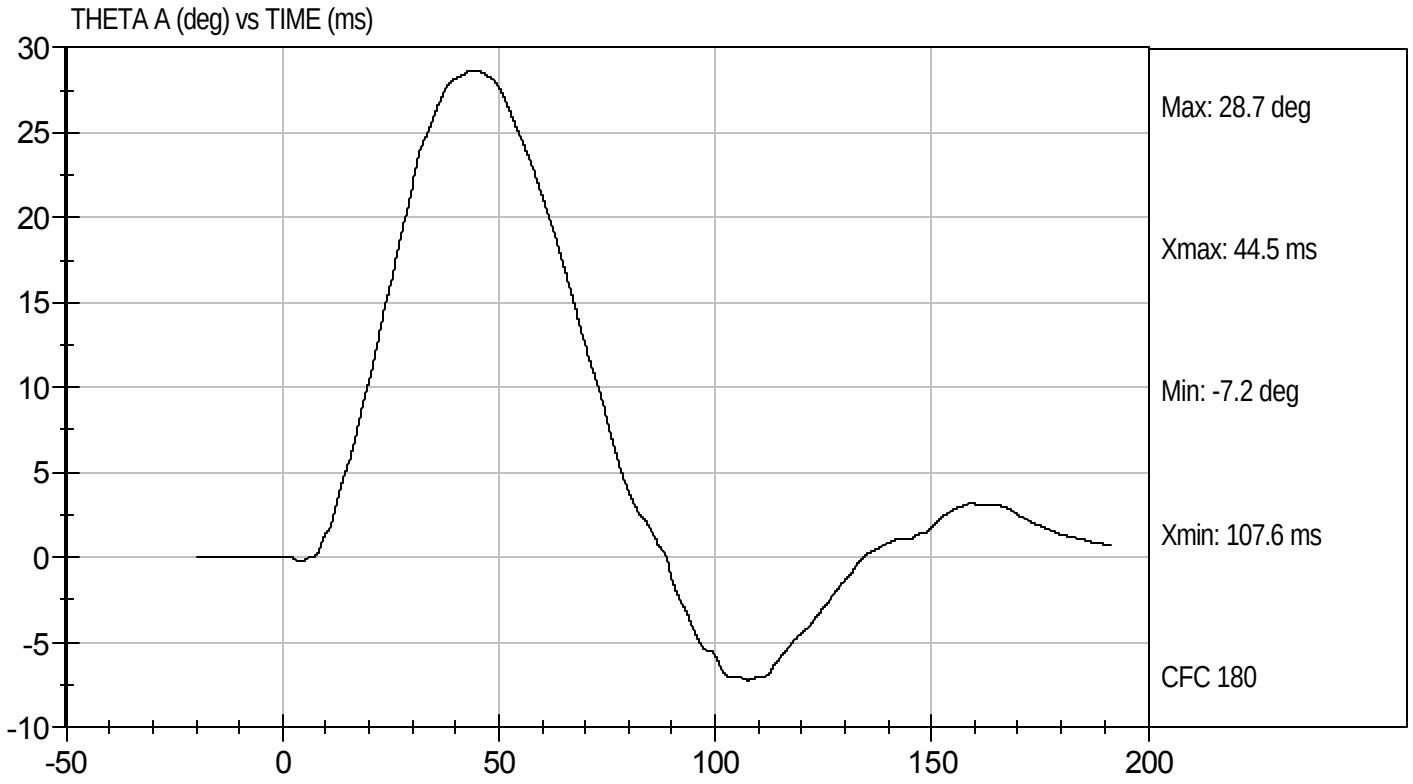


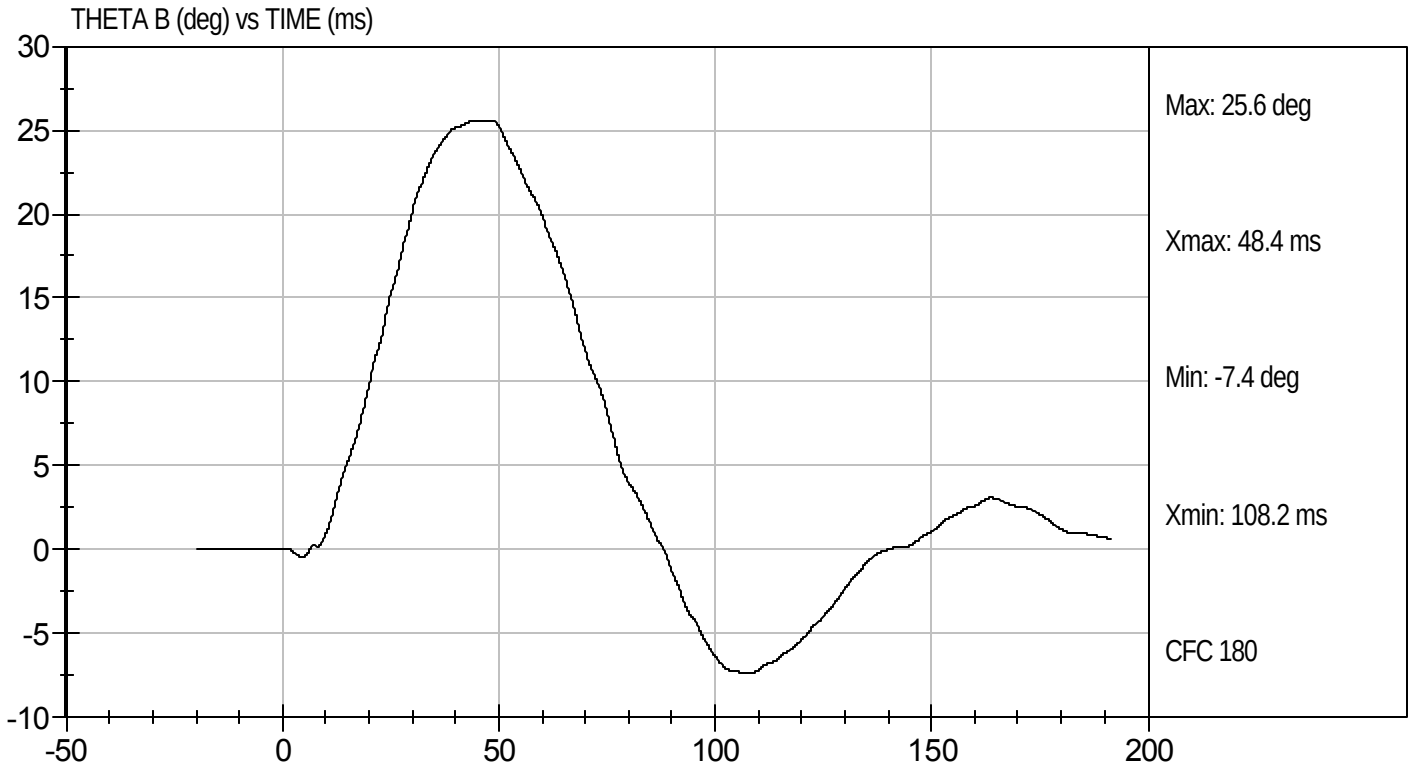
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Component ID: D111118

Test Date: 3/23/11
Velocity: 20.08 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: 016 **Test I.D:** D111119

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	21	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	kN	4.70 to 5.40	4.75	Pass
Time of Maximum Impactor Force	ms	11.80 to 16.10	13.50	Pass
Maximum Pubic Force	kN	1.23 to 1.59	1.41	Pass
Time of Maximum Pubic Force	ms	12.20 to 17.00	14.30	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

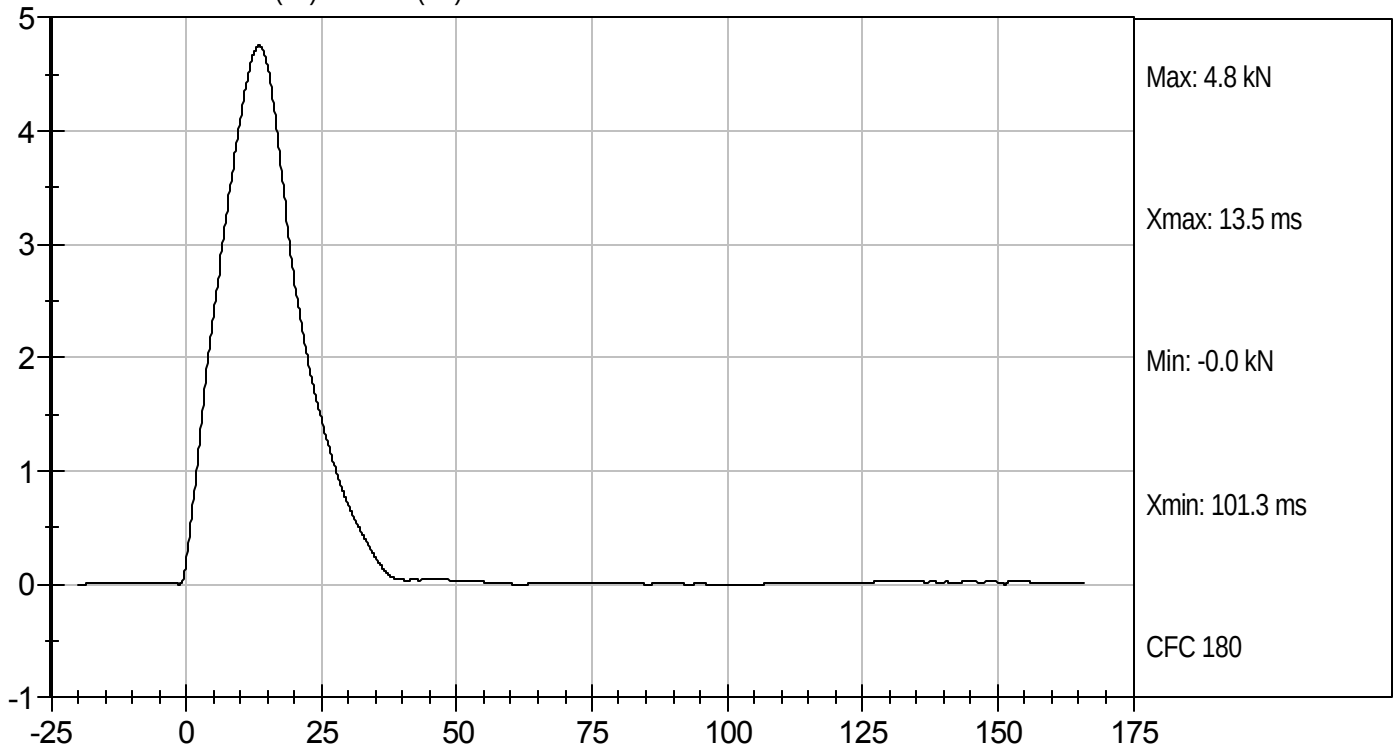
3/24/11
Test Date

David Winkelbauer
Approved By

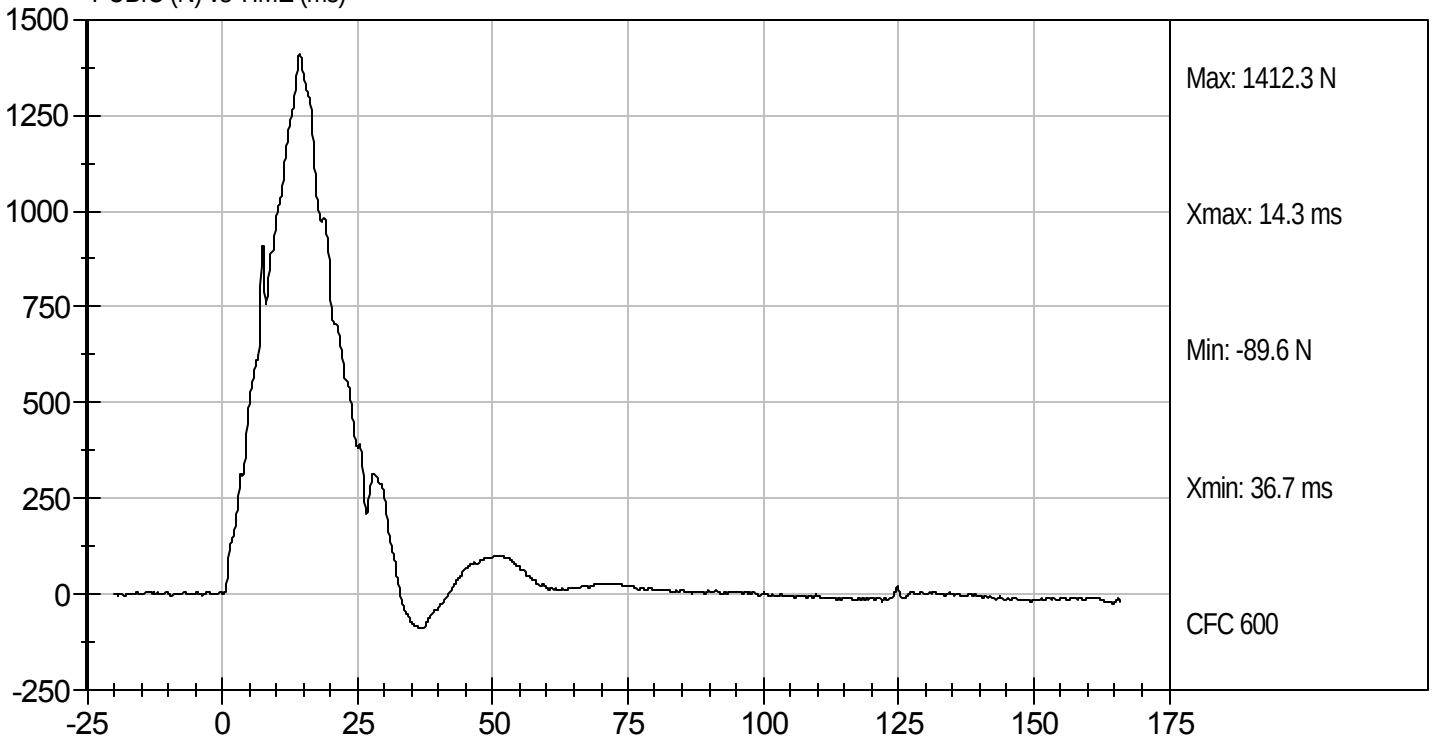
Test Desc: Pelvis Impact
Component ID: D111119

Test Date: 3/24/11
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:** D111110

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	22.0	Pass
Humidity	%	10 to 70	21	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	5.14	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.0	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.0	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

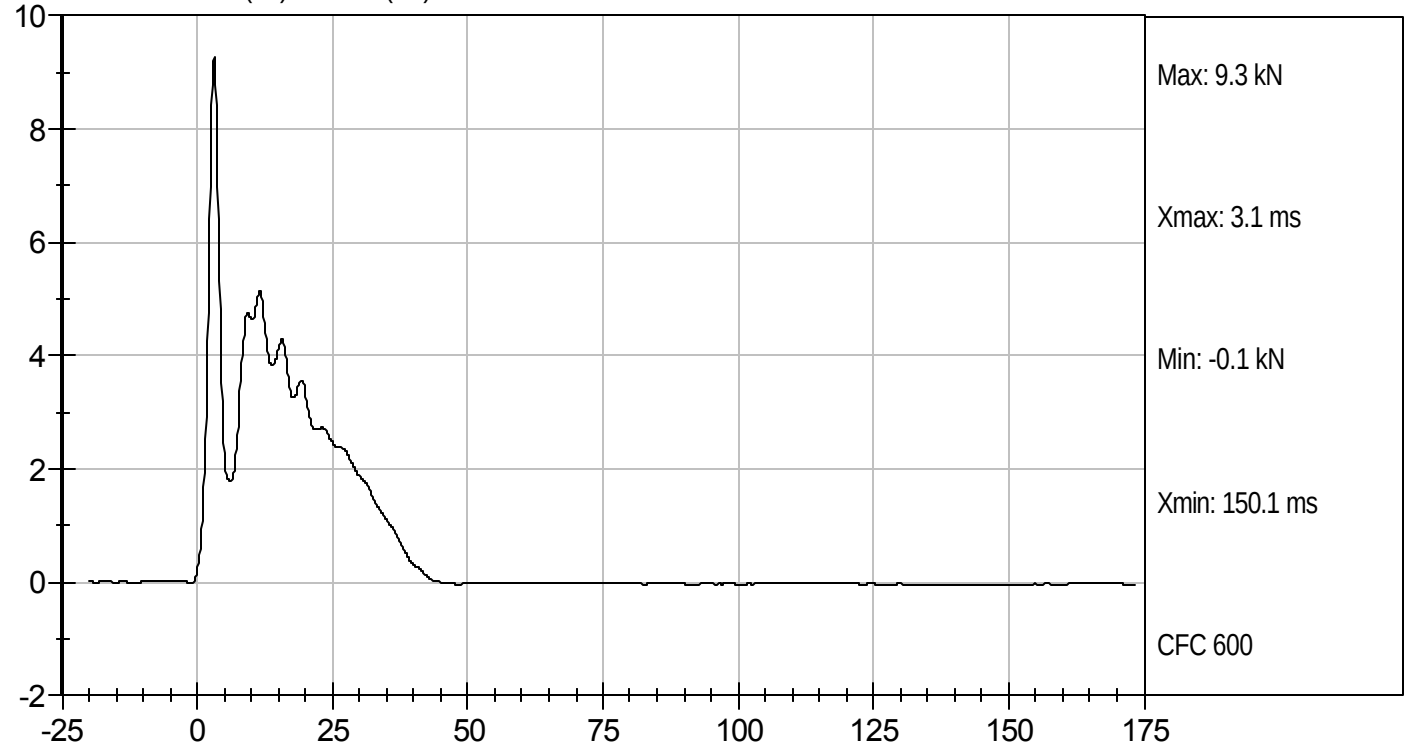
3/24/11
Test Date

David Winkelbauer
Approved By

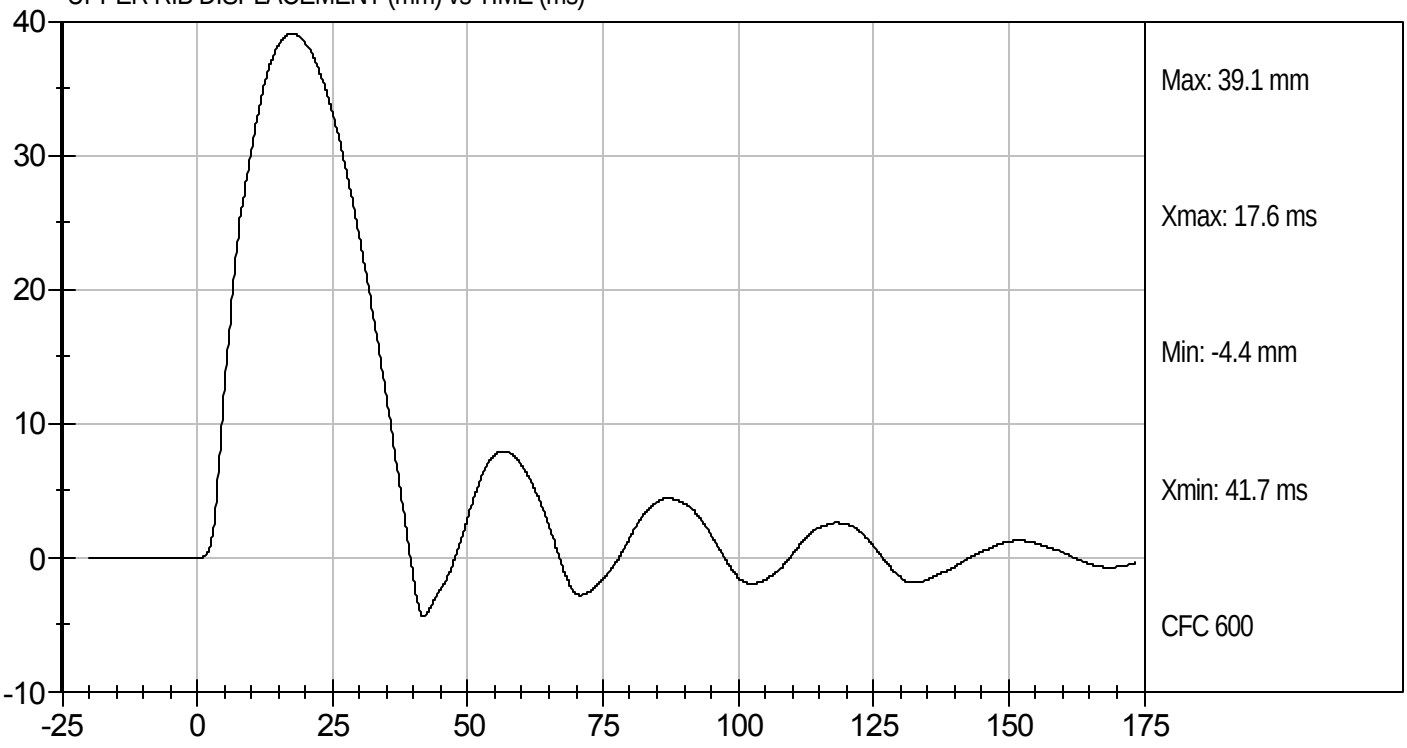
Test Desc: Thorax Impact
Component ID: D111110

Test Date: 3/24/11
Velocity: 18.32 ft/s, 5.58 m/s

PROBE FORCE (kN) vs TIME (ms)



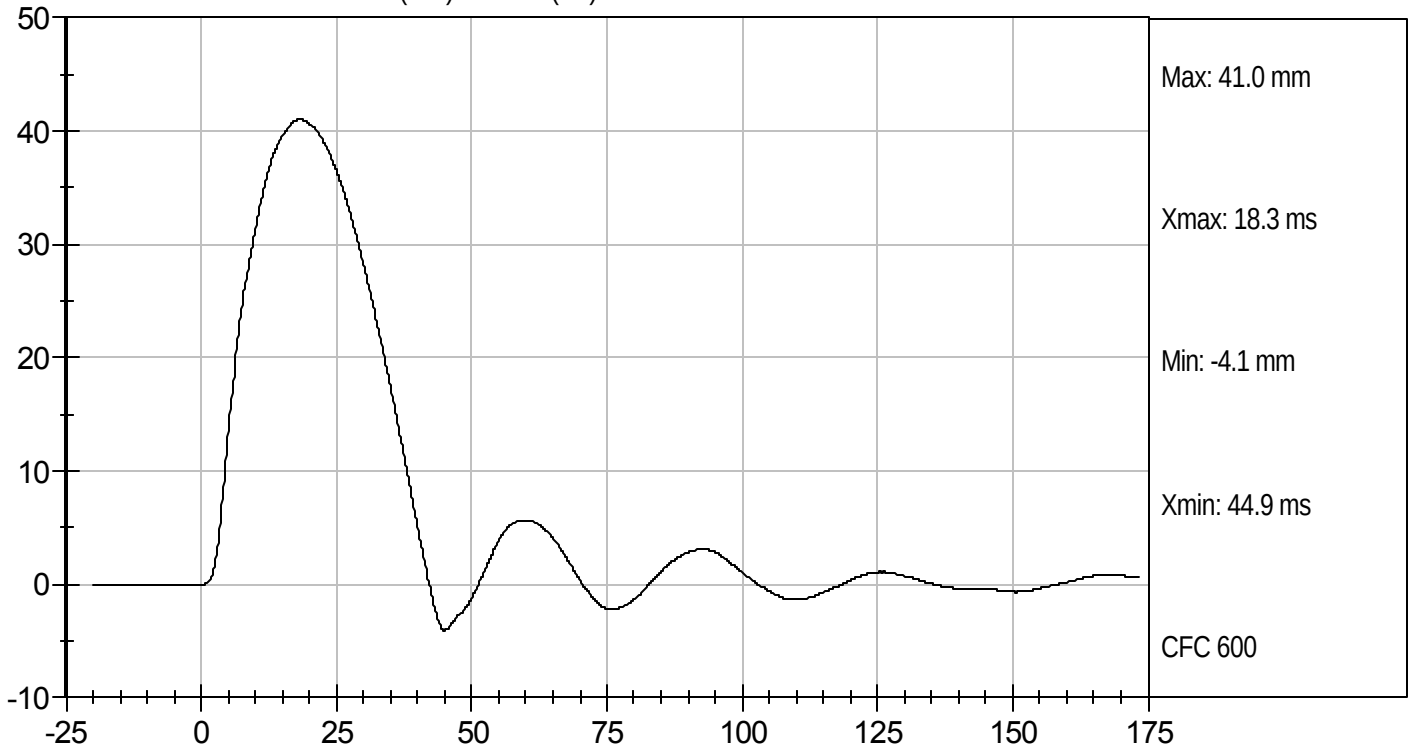
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



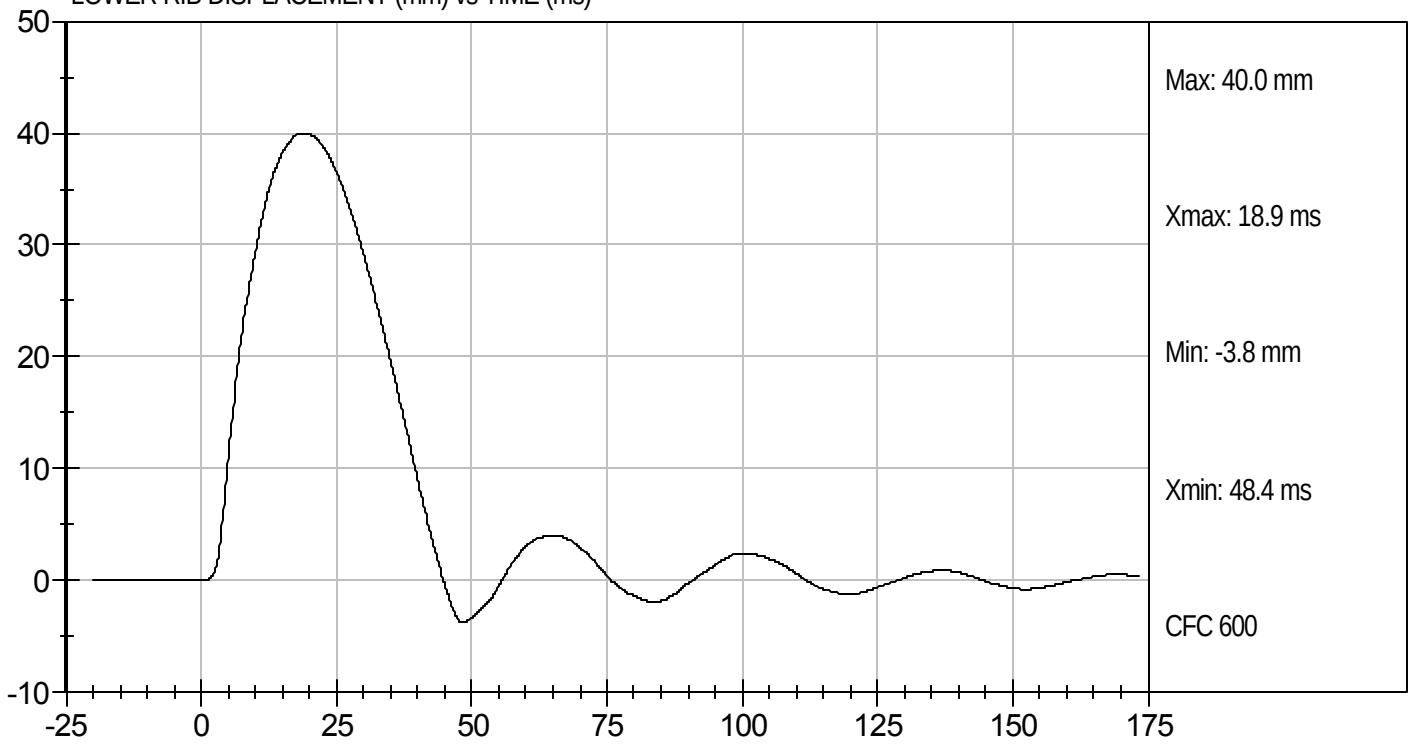
Test Desc: Thorax Impact
Component ID: D111110

Test Date: 3/24/11
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)	ABG119	FTSS	11/01/2010
	Middle (Y)	ABG120	FTSS	11/01/2010
	Rear (Y)	ABG121	FTSS	11/01/2010
Pubic Symphysis Load Cell (Y)		PG431	Denton	11/01/2010

Table 2 – Vehicle Instrumentation

	Serial Number	Manufacturer	Calibration Date
Vehicle CG (X)	P49457	Endevco	12/03/2010
Vehicle CG (Y)	P49456	Endevco	12/03/2010
Vehicle CG (Z)	P49455	Endevco	12/03/2010
Left Floor Sill (Y)	P49447	Endevco	11/05/2010
A Pillar Sill (Y)	P59352	Endevco	1/13/2011
A Pillar Low (Y)	P53288	Endevco	1/13/2011
A Pillar Mid (Y)	P52177	Endevco	12/22/2010
B Pillar Sill (Y)	P59626	Endevco	2/19/2011
B Pillar Low (Y)	P49443	Endevco	11/05/2010
B Pillar Mid (Y)	P59251	Endevco	12/13/2010
Seat (Y)	P59287	Endevco	2/19/2011
Engine (X)	P52277	Endevco	12/03/2010
Engine (Y)	P52278	Endevco	12/03/2010
Firewall (Y)	P49469	Endevco	12/13/2010
Roof (Y)	P52226	Endevco	11/05/2010
Floor Sill (Y)	P49497	Endevco	11/05/2010
Rear Deck (X)	P59399	Endevco	2/19/2011
Rear Deck (Y)	P59398	Endevco	2/19/2011