REPORT NUMBER: TO11-MGA-2003-001

FULL SCALE SIDE IMPACT POLE TESTS OF BASELINE VEHICLES

FORD MOTOR COMPANY
2002 FORD EXPLORER
NHTSA NUMBER: R21309

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

TEST DATE: January 10, 2003

FINAL REPORT SUBMITTED: September 2, 2003

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
55 BROADWAY, KENDALL SQUARE
CAMBRIDGE, MA 02142

This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, in response to Contract Number DTRS57-98-D-00041.

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Prepared by: David Winkelbauer
David Winkelbauer, Project Engineer

Reviewed by: _____
Gary Strassburg, Project Engineer

Approval Date: 1/28/2003

Technicians:	Wayne Dahlke Jordan Haynes Erik Nelson Chris Nowak Eric Peschman
Photographic:	Tammy Brausch Chris Kulis
Instrumentation/ Calibration:	Jamie Aide Tim Michnay
Secretary:	Cyndy Kline

FINAL REPORT ACCEPTED BY:

Accepted By: _____
Contract Technical Manager

Acceptance Date: _____

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-98-D-00041, task order 11, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test is to evaluate the responses of the ES-2 and SID/HIII dummies in a 2002 Ford Explorer, when subjected to a rigid pole side impact at 285 degrees.

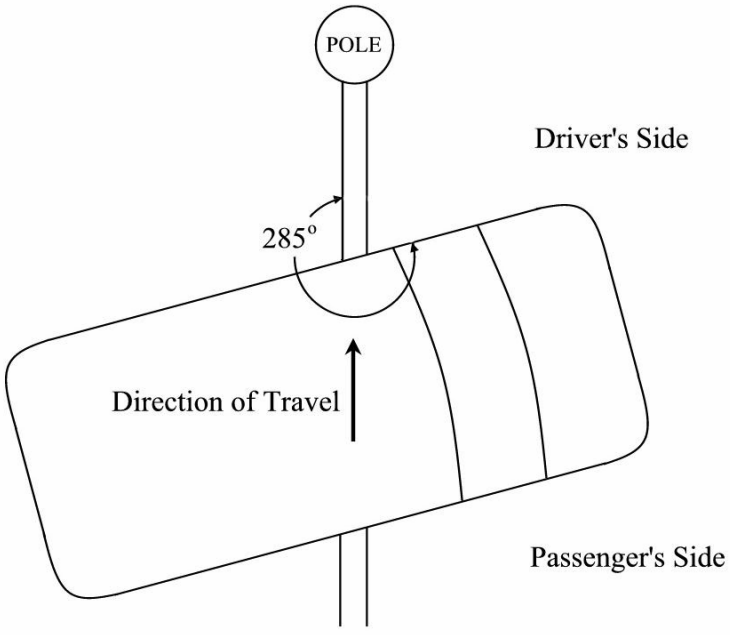
MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 2002 Ford Explorer. The subject vehicle was towed into a rigid pole at a velocity of 31.7 km/h. The weight of the vehicle as tested was 2218.6 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on January 10, 2003. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One ES-2 side impact dummy was placed in the left front designated seating position according to instructions specified in the FMVSS 201P Laboratory Test Procedure which is dated April 21, 2000 and Evaluation of Eurosid-1 Positioning Procedure Appendix A dated February 5, 1997. The side impact event was documented by ten high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Appendix B contains the vehicle and dummy response data traces. A summary of the dummy configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report. Appendix E contains the dummy peak responses.



SECTION 2...continued

SUMMARY OF SIDE IMPACT TEST

The following table summarizes the results of the Left Side Impact Test:

Head Performance Criteria		Left Front
<1000	T1 (msec)	46.2
	T2 (msec)	64.4
	HPC	629
Thorax Performance Criteria		
Chest Deflection <42 mm	Upper Rib Deflection	34.6
	Mid Rib Deflection	38.9
	Lower Rib Deflection	43.0
Viscous Criteria <1.0 (m/sec.)	Upper Rib	0.8
	Mid Rib	0.9
	Lower Rib	1.1
Abdominal Protection Criteria		
Sum < 2500 N	Front Abdominal Force	635.4
	Mid Abdominal Force	994.8
	Rear Abdominal Force	1141.8
	Sum of Abdominal Force	2674.3
Pelvis Performance Criteria		
< 6000 N	Pubic Symphysis Force	2317.7

		Left Front
HIC	T1 (msec)	46.2
	T2 (msec)	64.4
	T2 – T1 (msec)	18.2
	HIC	629

Fir Filtered	Left Front
Upper Rib Y (g's)	159.8
Mid Rib Y (g's)	142.8
Lower Rib Y (g's)	153.2
Upper Spine Y (g's)	75.1
Lower Spine Y (g's)	94.1
Pelvis Y (g's)	68.7
TTI (g's)	127

Contacts	Left Front
Arm (msec)	26.7
Rib (msec)	37.7
Pelvis (msec)	No valid data collected

TEST NOTES

The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:

X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

The following data channels were found to have No Valid Data:

Driver Pelvis Contact
Right Side Sill at Front Seat X

The ES-2 was fitted with prototype rib extensions and a modified backplate.

SECTION 3

SIDE IMPACT DUMMY (ES-2) AND VEHICLE TEST DATA

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

TEST VEHICLE INFORMATION

Make	Ford
Model	Explorer
Body Style	SUV
VIN	1FMDU75WX2ZB55919
Color	Painted Orange
Odometer Reading (mile)	26,829
Transmission	4 Sp Automatic
Final Drive	4 WD
Number of Cylinders	8
Engine Displacement (L)	4.6
Engine Placement	Longitudinal

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Anti-lock Brakes	No
AM/FM/CD	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.
Date of Manufacture	11/01

GVWR (kg)	2648
GAWR Front (kg)	1240
GAWR Rear (kg)	1508

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	207	241
Recommended Tire Size	P245/70R16	P245/70R16
Tire Size on Vehicle	P245/70R16	P245/70R16
Tire Manufacturer	Goodyear	Goodyear

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Bench	
Number Of Occupants x 68.04 kg.	136.1	204.1	136.1	476.3
Capacity Wt. (VCW) (kg)				405.1
Cargo Wt. (RCLW) (kg)				34.0

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	557.0	511.2		617.8	502.1	
Right	kg	558.8	511.7		529.4	569.3	
Ratio	%	52.2	47.8		51.7	48.3	
Totals	kg	1115.8	1022.9	2138.7	1147.2	1071.4	2218.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Vehicle Target Weight	kg	2219*

*Set To Match Previous Tests

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	1.3 ND	1.2 ND	1.2 ND
Left Door Sill Angle	Deg	1.2 ND	1.2 ND	1.2 ND
Front Bumper Angle	Deg	0.4 LD	0.5 LD	0.5 LD
Rear Bumper Angle	Deg	0.2 LD	0.3 LD	0.3 LD

ND=Nose down, BD = Back Down, LD = Left Down, RD = Right Down

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2885
Total Vehicle Length at Left Side	mm	4022
Total Vehicle Length at Centerline	mm	4766
Total Vehicle Length at Right Side	mm	4022
Total Vehicle Width	mm	1828
Weight of Ballast in Cargo Area	kg	0
Amount of water in Fuel Tank	liters	0

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Actual Impact Point	mm	8 Rear

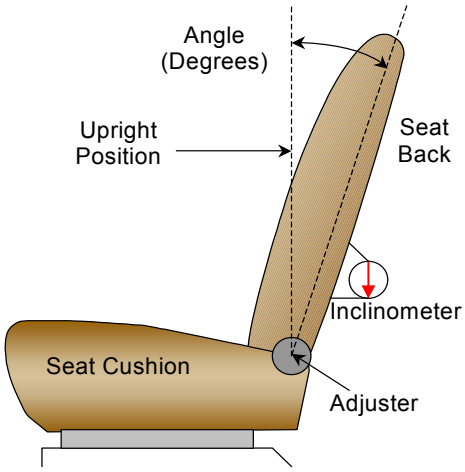
DATA SHEET NO. 1… (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 20.8 degrees on seat frame



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver's seat is electronically operated.

The fore/aft is set to the middle position for the driver's seat.

Driver seat fore/aft total travel: 250 mm

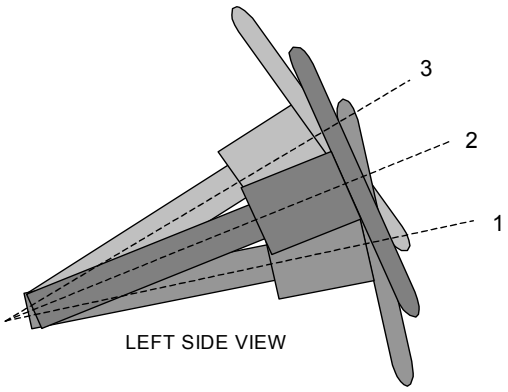
Driver seat fore/aft position: 125 mm

SEAT BELT UPPER ANCHORAGE

The test vehicle "D" ring anchorage for the driver's seat position was placed in the 3rd position or mid.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position of travel.



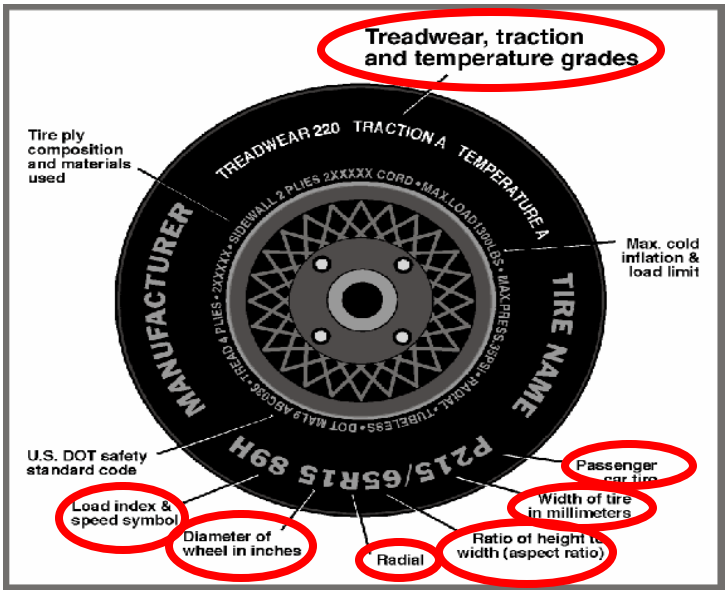
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

Vehicle Year	2002	Vehicle Make	Ford
Vin	1FMDU75WX2ZB55919	Vehicle Model	Explorer



	Front	Rear
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Wrangler AP	Wrangler AP
Tire Type	Passenger	Passenger
Tire Width (mm)	245	245
Ratio of Height to Width (aspect ratio)	70	70
Radial	Radial	Radial
Wheel Diameter	16	16
Load Index & Speed Symbol	106S	106S
Treadwear	340	340
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 3

POST TEST OBSERVATIONS

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES-2
Head Contact	Curtain airbag
Upper Torso Contact	Door trim panel
Lower Torso Contact	Mid door trim panel
Left Knee Contact	Lower door trim panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING

Description	Left Front	Left Rear
Left Side Door Opening	Remained latched and closed	Remained latched and closed
Right Side Door Opening	Remained latched and closed	Remained latched and closed

POST TEST STRUCTURAL OBSERVATIONS

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

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	None
Curtain	Yes

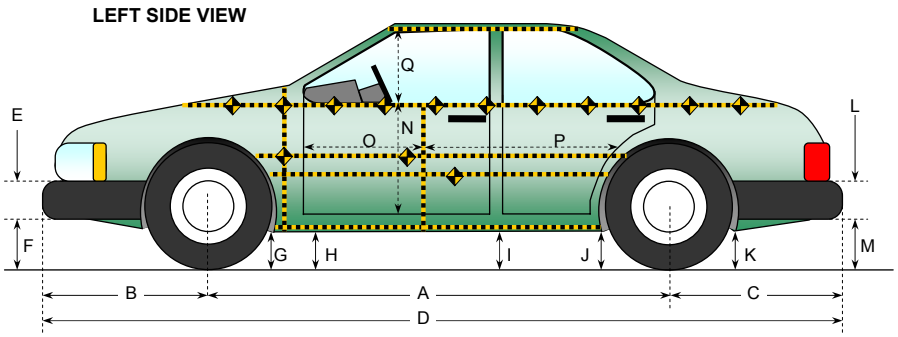
SECTION 4

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003



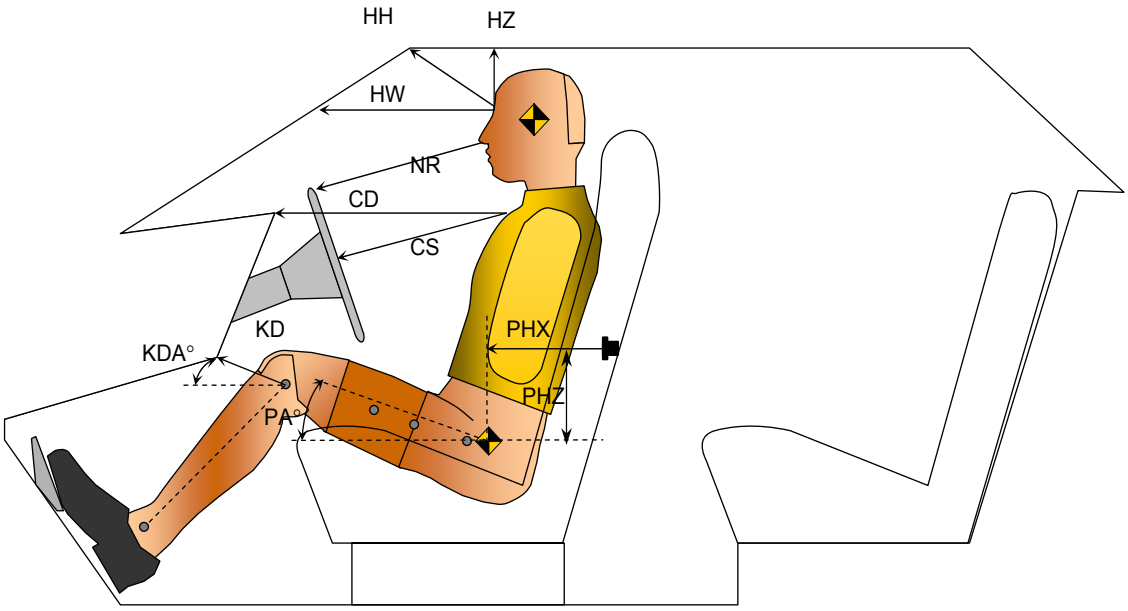
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2885	2805	-80
B	Front Axle to FSOV	784	778	-6
C	Rear Axle to RSOV	1097	1118	21
D	Total Length at Centerline	4766	4701	-65
E	Front Bumper Thickness	353	353	0
F	Front Bumper Bottom to Ground	502	489	-13
G	Sill Height at Front Wheel Well	374	398	24
H	Sill Height at Front Door Leading Edge	341	337	-4
I	Sill Height at "B" Pillar	375	340	-35
J1	Sill Height at Rear Wheel Well	385	411	26
J2	Pinch Weld Height at Rear Wheel Well	383	369	-14
K	Sill Height Aft of Rear Wheel Well	508	532	24
L	Rear Bumper Thickness	96	96	0
M	Rear Bumper Bottom to Ground	588	648	60
N	Sill Height to Window Bottom Sill	797	771	-28
O	Front Door Leading Edge to Impact CL	777	634	-143
P	Rear Door Trailing Edge to Impact CL	1373	1262	-111
Q	Front Window Opening	503	467	-36
R	Right Side Length	4022	4036	14
S	Left Side Length	4022	3882	-140
T	Vehicle Width at "B" Post	1828	1512	-316

DATA SHEET NO. 5

ES-2 LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

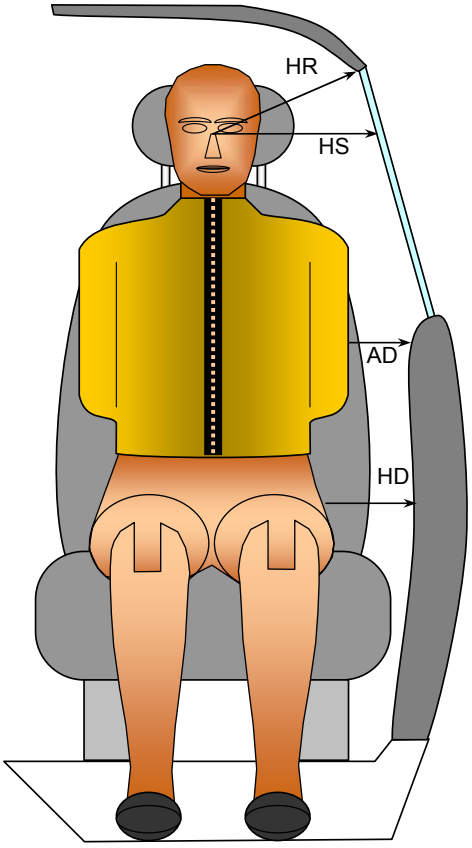


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	375	
HW	Head to Windshield	492	
HZ	Head to Roof	151	
NR	Nose to Rim	392	
CD	Chest to Dash	517	
CS	Chest to Steering Wheel	312	
KDL	Left Knee to Dash	221	0
KDR	Right Knee to Dash	204	0
PA	Pelvic Angle (Longitudinal)		18.8
PA	Pelvic Angle (Lateral)		0.5
SA	Spine Angle (Longitudinal)		21.8
SA	Spine Angle (Lateral)		0.8
PHX	H-Point to Striker (X-Axis)	209	
PHZ	H-Point to Striker (Z-Axis)	29	

DATA SHEET NO. 6

ES-2 LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003



FRONT VIEW OF DUMMY

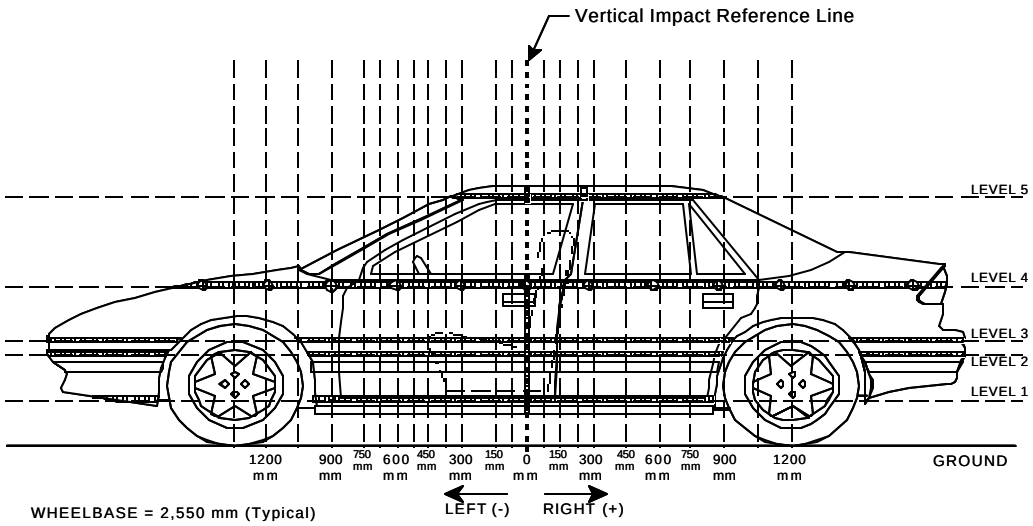
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	188
HS	Head to Side Window	mm	315
AD	Arm to Door	mm	84
HD	H-Point to Door	mm	139

DATA SHEET NO. 7

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



LEFT SIDE VIEW

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

Level	Measurement Description	Height Above Ground
5	Window	1650
4	Window Sill	1110
3	Mid Door	815
2	Occupant H-Point	758
1	Sill Top	430

DATA SHEET NO. 8

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

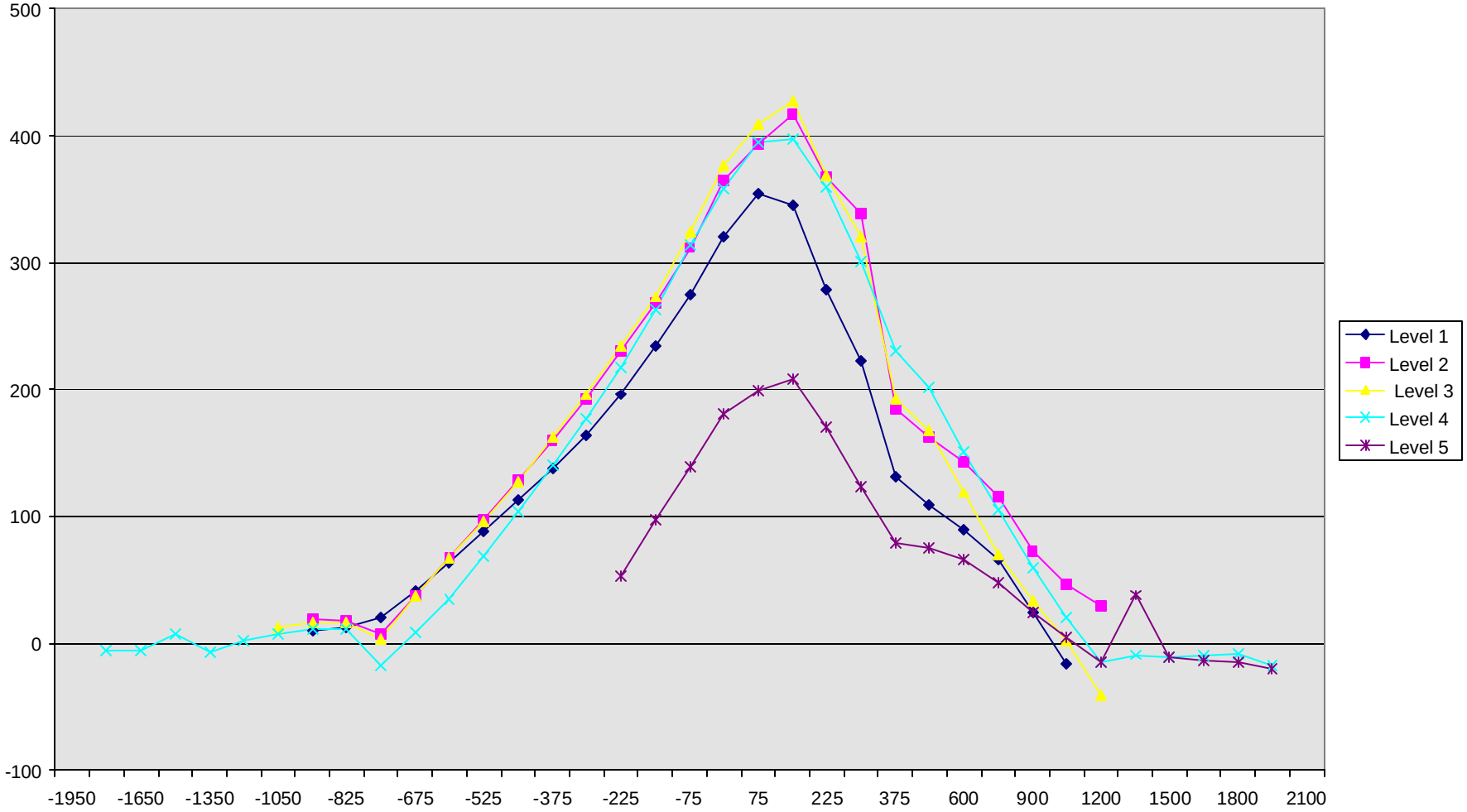
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1950															
-1800				288					282					-6	
-1650				271					266					-5	
-1500				258					265					7	
-1350				257					250					-7	
-1200				241					243					2	
-1050			179	236				192	243				13	7	
-900	229	201	201	232		239	220	218	243		10	19	17	11	
-825	229	206	201	230		242	224	217	241		13	18	16	11	
-750	224	207	201	231		245	214	204	213		21	7	3	-18	
-675	230	206	200	230		272	243	237	238		42	37	37	8	
-600	226	206	200	230		289	274	267	265		63	68	67	35	
-525	226	205	199	229		314	303	295	298		88	98	96	69	
-450	224	203	198	228		337	332	326	332		113	129	128	104	
-375	225	203	197	228		363	363	360	368		138	160	163	140	
-300	225	203	197	227		389	395	393	404		164	192	196	177	
-225	224	202	197	227	440	420	432	431	445	493	196	230	234	218	53
-150	223	202	197	227	433	458	470	470	490	531	235	268	273	263	98
-75	223	202	196	226	431	498	514	521	540	570	275	312	325	314	139
0	223	202	196	226	431	544	567	573	585	612	321	365	377	359	181
75	223	202	196	226	434	577	595	605	621	643	354	393	409	395	199
150	224	202	197	227	434	569	619	624	624	642	345	417	427	397	208
225	225	202	197	227	435	504	570	566	587	605	279	368	369	360	170
300	224	201	197	228	436	447	540	517	529	559	223	339	320	301	123
375	234	201	197	230	438	365	386	389	461	517	131	185	192	231	79
450	225	200	197	230	439	334	362	365	432	514	109	162	168	202	75
600	226	201	198	231	440	316	344	317	382	506	90	143	119	151	66
750	227	205	200	232	440	293	320	270	337	488	66	115	70	105	48
900	228	206	202	232	443	253	279	235	292	468	25	73	33	60	25
1050	230	200	203	234	445	214	246	205	254	450	-16	46	2	20	5
1200		176	194	237	448		206	153	222	433		30	-41	-15	-15
1350				242	451				233	413				-9	38
1500				245	455				234	444				-11	-11
1650				248	459				238	445				-10	-14
1800				251	464				243	449				-8	-15
1950				255	477				238	457				-17	-20
2100															

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body. Measurements in mm.

DATA SHEET NO. 8... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

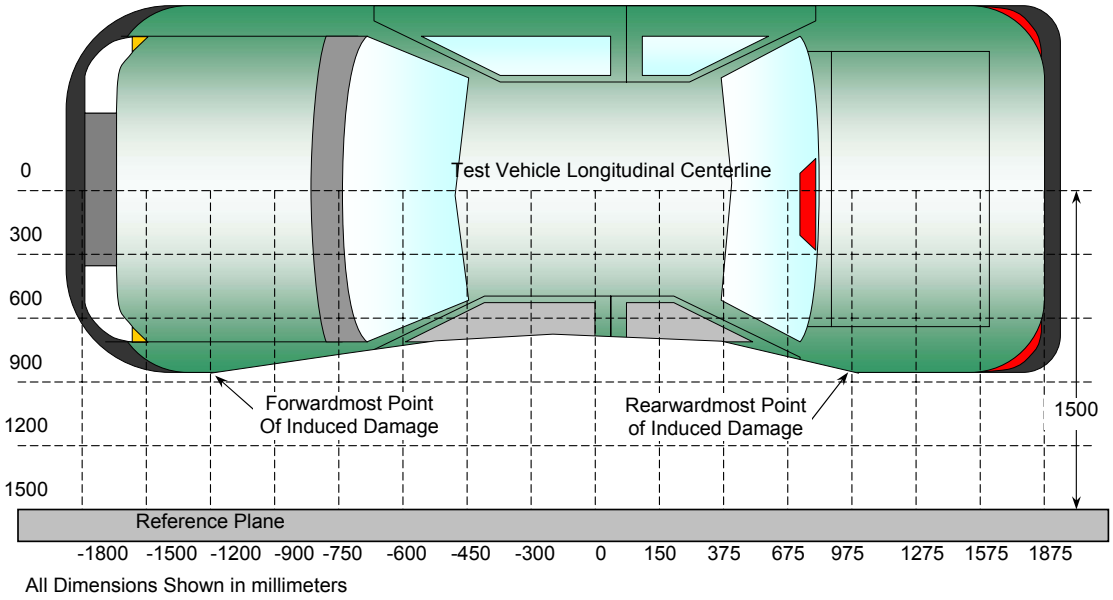


Measurement in mm.

DATA SHEET NO. 9

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2100 mm	4	261	261	0
2	1350 mm	4	275	242	33
3	618 mm	2	393	201	192
4	-275 mm	2	496	203	293
5	-1050 mm	3	236	179	57
6	-1800 mm	4	289	288	1

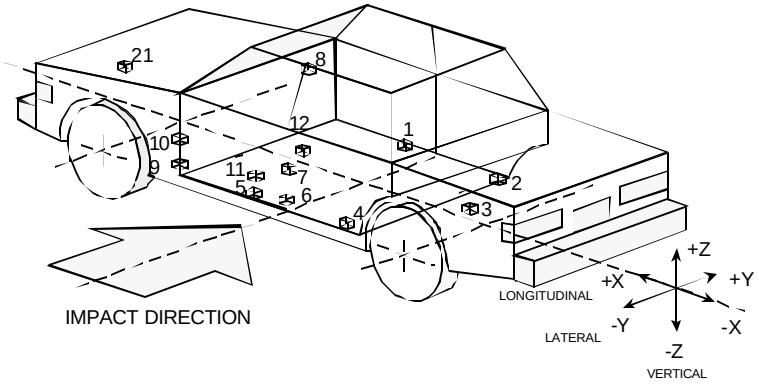
Reference plane is parallel to test vehicle longitudinal centerline.

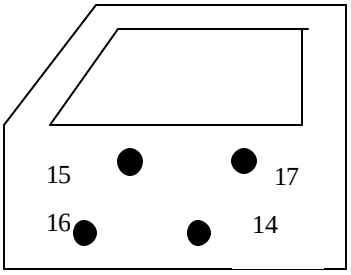
Given dimensions = Reference plane to car body.

DATA SHEET NO. 10

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003





No.	Location
1	Right Side Sill at Front Seat
2	Right Side Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Side Sill at Rear Door
5	Left Side Sill at Front Door
6	Left Lower B-Post
7	Left Mid B-Post
8	Left Upper B-Post
9	Left Lower A-Post
10	Left Mid A-Post
11	Driver Seat Track

No.	Location
12	Vehicle CG
13	Left A-Pillar @ Roof
14	Left Front Door @ Pelvis
15	Left Front Door @ Arm
16	Left Front Door @ Knee
17	Left Front Door @ Rib
19	Left Driver Seat Frame
20	Right Driver Seat Frame
21	Lower Center Radiator Support

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Long (X) Maximums (g's) (CFC 60)		Lat. (Y) Maximums (g's) (CFC 60)		Vert. (Z) Maximums (g's) (CFC 60)		Resultant (g's) (CFC 60)
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Max.
1	Right Side Sill at Front Seat	**	**	21.2	1.6	1.0	3.6	
2	Right Side Sill at Rear Seat	4.1	5.0	19.1	4.3	10.6	6.4	19.4
3	Rear Floorpan Above Axle	1.5	5.2	17.0	2.2	4.3	6.0	17.7
4	Left Side Sill at Rear Door			22.2	10.5			
5	Left Side Sill at Front Door			37.8	12.4			
6	Left Lower B-Post			36.6	21.2			
7	Left Mid B-Post			55.1	11.0			
8	Left Upper B-Post*							
9	Left Lower A-Post			29.7	18.9			
10	Left Mid A-Post			36.6	9.3			
11	Driver Left Seat Track			78.1	31.3			
12	Vehicle CG	17.0	9.6	36.1	15.3	31.0	29.8	42.3
13	Left A-Post at Roof*							
14	Left Front Door at Pelvis			111.2	47.6			
15	Left Front Door at Arm			52.8	19.0			
16	Left Front Door at Knee			53.6	26.8			
17	Left Front Door at Rib			97.5	27.8			
19	Left Driver Seat Frame			53.1	17.1			
20	Right Driver Seat Frame			45.2	14.4			
21	Lower Center Radiator Support	2.1	8.0	10.8	2.2	5.6	3.0	11.9

Sign Convention X - + forward
Y - + to right
Z - + down

*= Not used to avoid interference with restraint system.

**=No valid data collected

Right Side Sill at Front Seat Z – No valid data after 60 msec

Left Front Sill Y – No valid data after 100 msec

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2568	616	420
2	Right Side Sill at Rear Seat	1594	616	473
3	Rear Floorpan Above Axle	1134	0	734
4	Left Side Sill at Rear Door	1612	-652	383
5	Left Side Sill at Front Door	2538	-652	365
6	Left Lower B-Post	2240	-720	608
7	Left Mid B-Post	2262	-738	1158
8	Left Upper B-Post	*	*	*
9	Left Lower A-Post	3208	-732	574
10	Left Mid A-Post	3324	-828	1213
11	Driver Left Seat Track	2495	-559	603
12	Vehicle CG	2512	0	833
13	Left A-Pillar @ Roof	*	*	*
14	Left Door @ Pelvis	2455	-779	854
15	Left Door @ Arm	2792	-769	1094
16	Left Door @ Knee	2222	-574	1104
17	Left Door @ Rib	2222	-193	1109
19	Left Driver Seat Frame	4268	0	246
20	Right Driver Seat Frame	2568	616	420
21	Lower Center Radiator Support	1594	616	473

Sign Convention X – Rear Bumper (+ forward)

Y – Vehicle Centerline (+ to right)

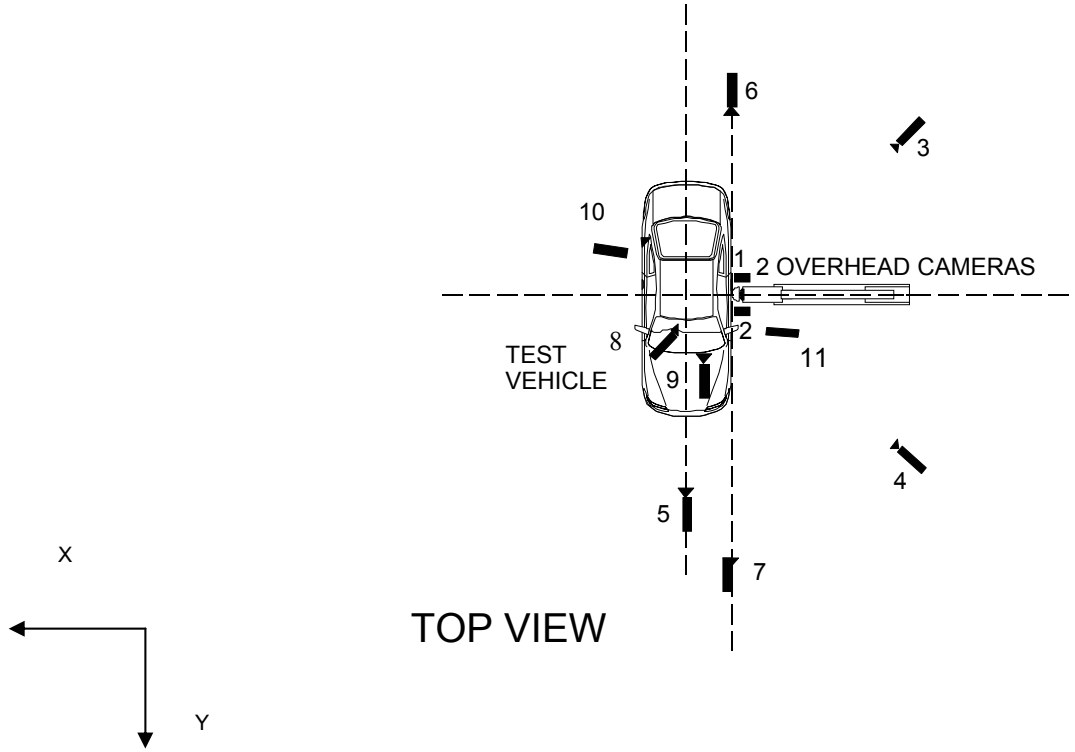
Z – Ground Plane (+ up)

* = Not used to avoid interference with restraint system.

DATA SHEET NO. 11

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2002 Ford Explorer SUV Test Date: January 10, 2003



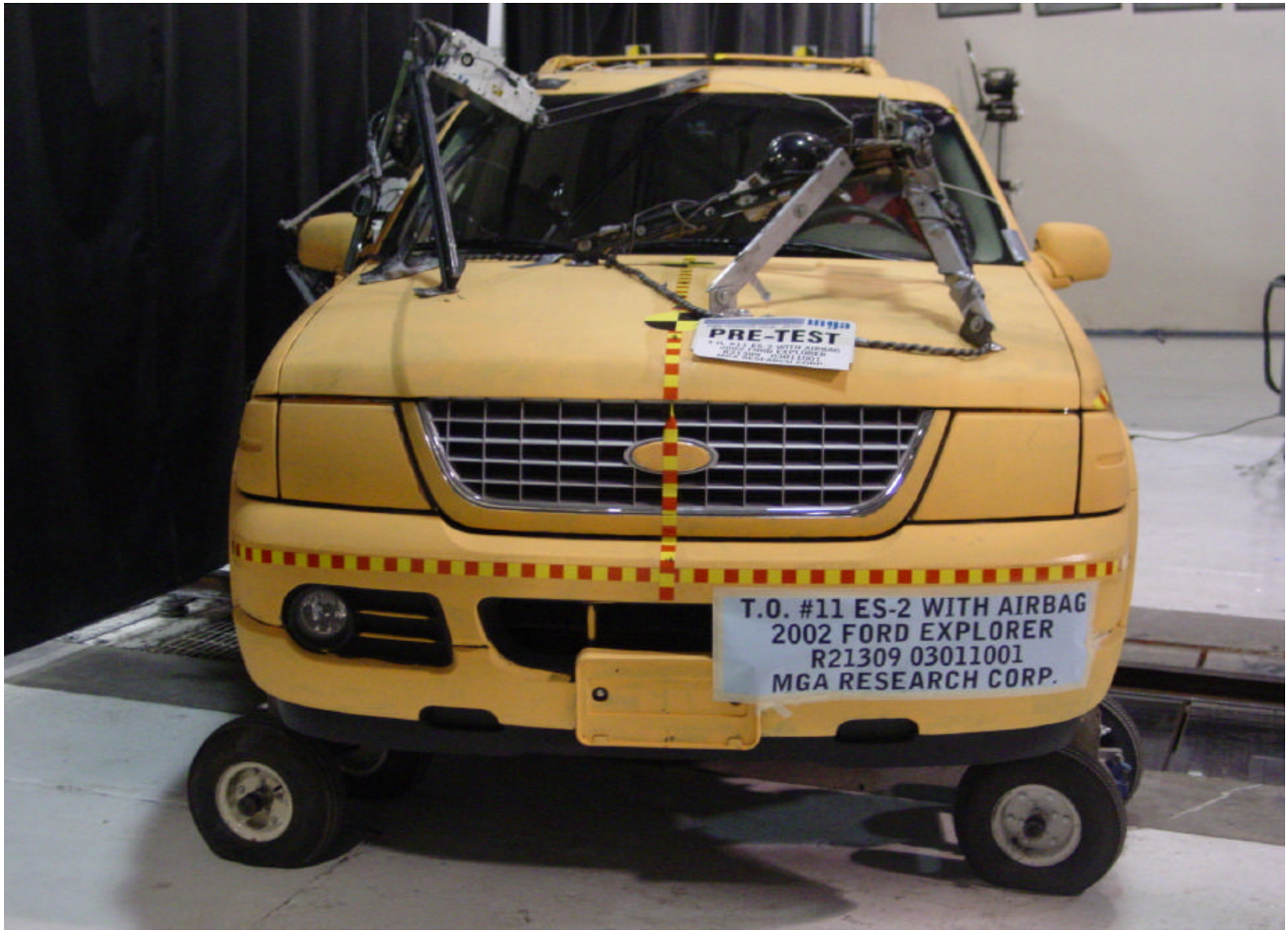
No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	830	0	5000	8	1031
2	Overhead Close-up	0	0	5000	13	881
3	Left Side 45 deg. Rearward Pole View	-3200	-6400	1560	50	1020
4	Left Side 45 deg. Forward Pole View	-3500	5000	1570	50	1026
5	Real Time					
6	Left Side Rear Pole View	770	-9000	1550	25	1005
7	Front Ground Level Vehicle/Pole Impact	6000	9000	1620	25	1036
8	Test Vehicle Onboard Driver Side View				13	500
9	Test Vehicle Onboard Driver Front View				13	518
10	Test Vehicle Onboard Driver ¾ Rear View				13	508
11	Test Vehicle Onboard Driver Door				13	513

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Up from Ground

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

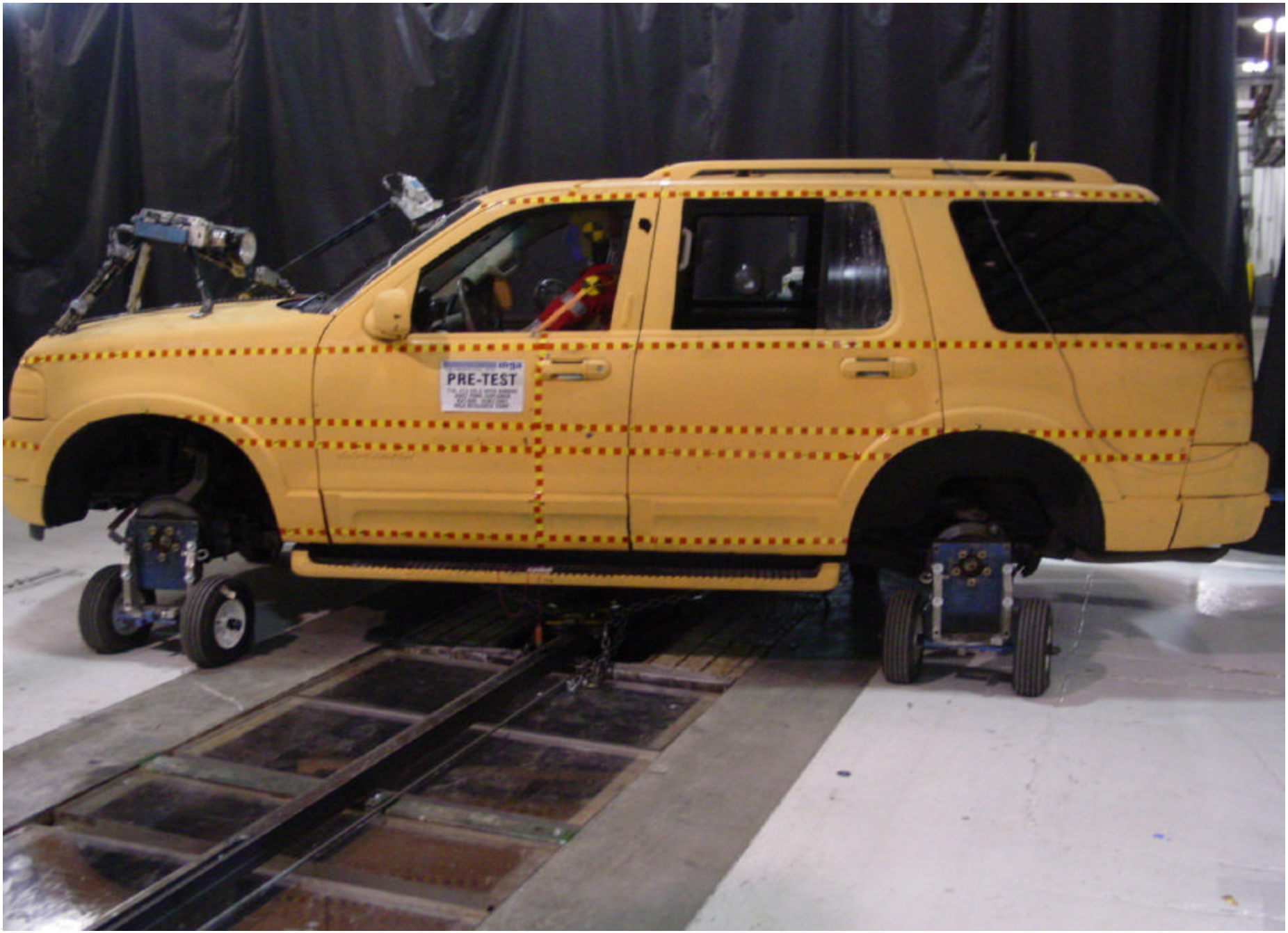


Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle



Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

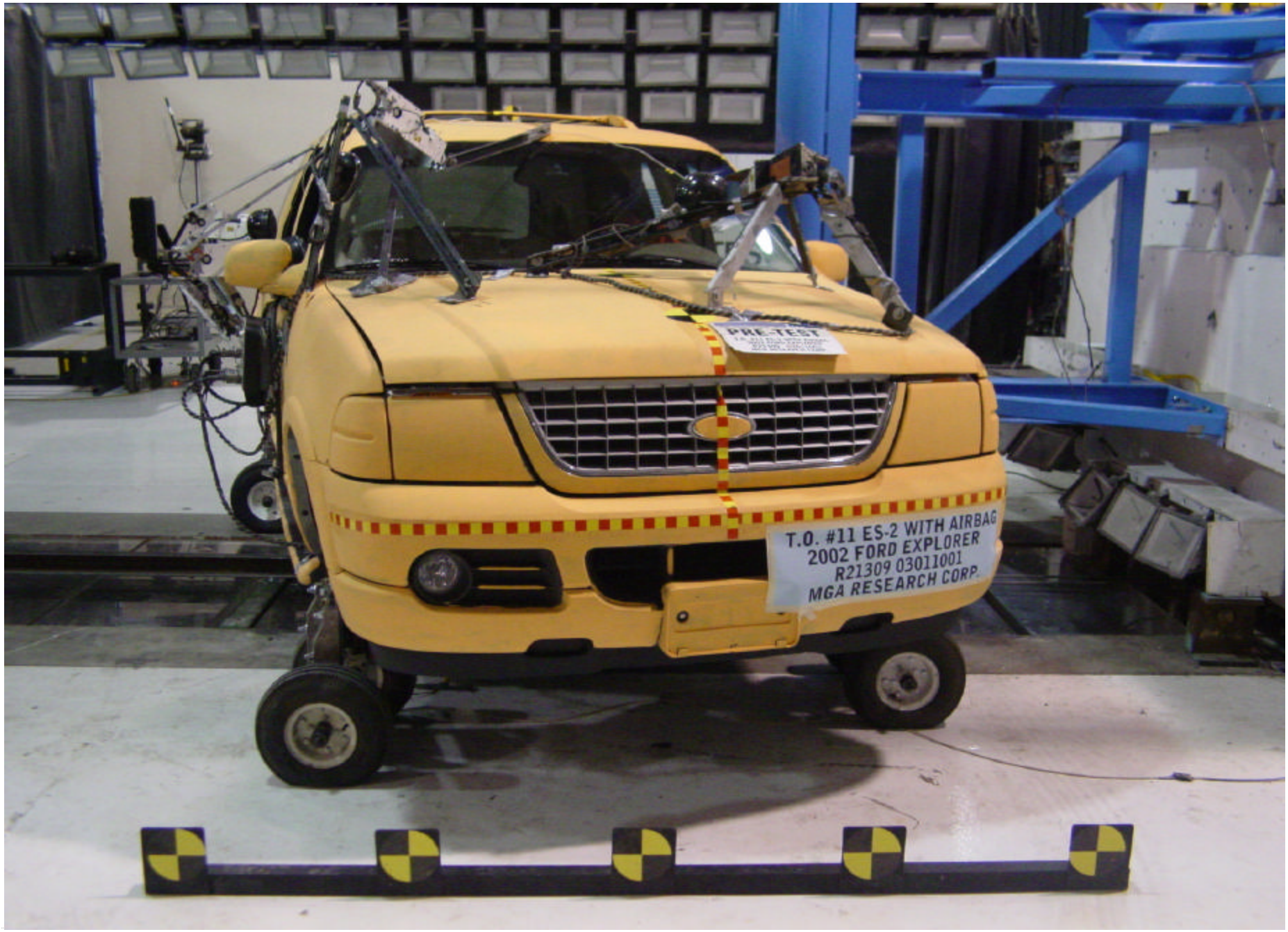
Post-Test Left Side View of Test Vehicle (Close-Up)

Pre-Test Left ¾ Front View of Test Vehicle

Post-Test Left ¾ Front View of Test Vehicle

Pre-Test Left ¾ Rear View of Test Vehicle

Post-Test Left ¾ Rear View of Test Vehicle

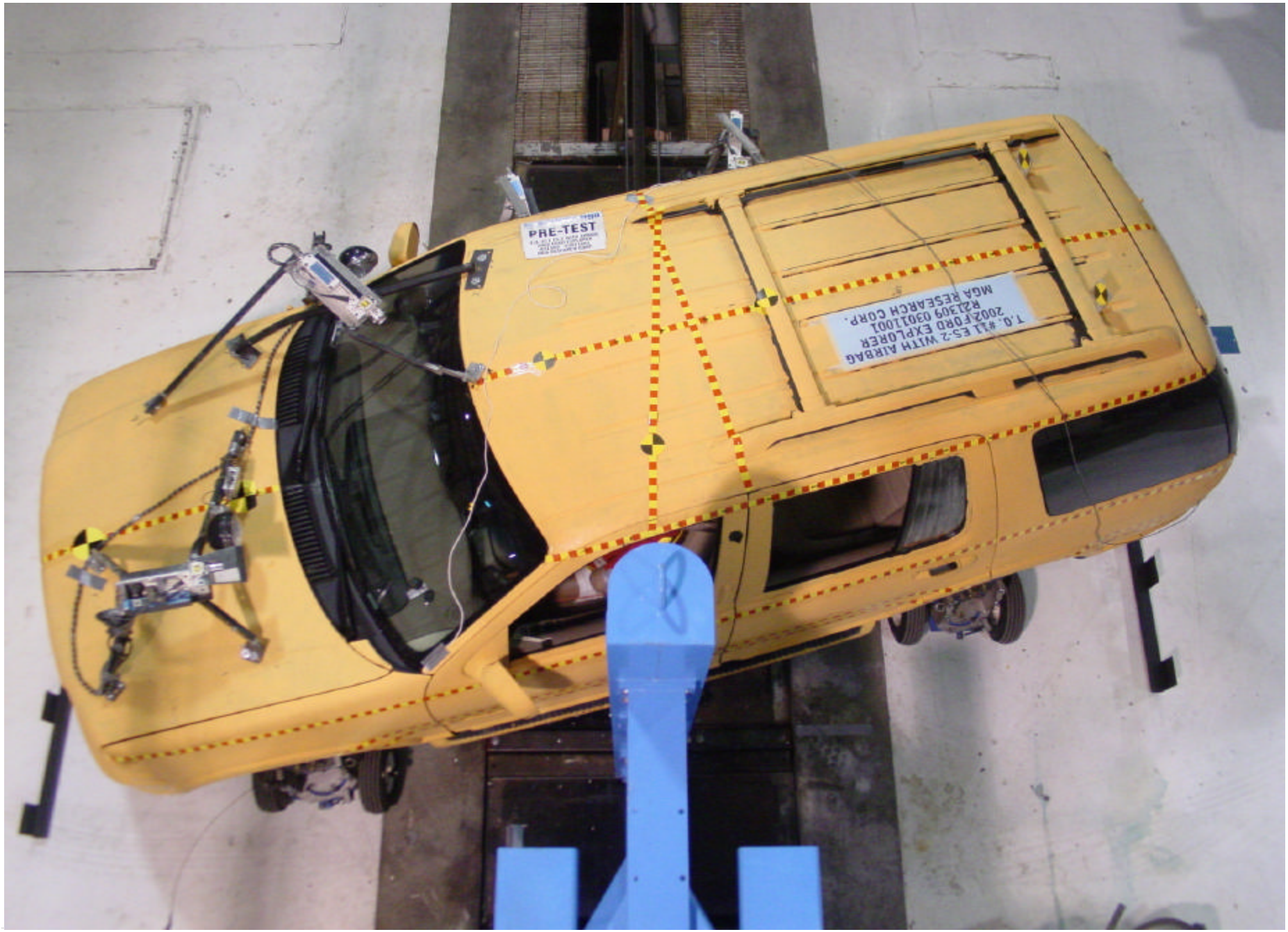


Pre-Test Vehicle Positioned Against Pole (left side)

Post-Test Pole and Vehicle (left side)

Pre-Test Vehicle Positioned Against Pole (right side)

Post-Test Pole and Vehicle (right side)



Pre-Test Vehicle Positioned Against Pole Overhead View

Post-Test Pole and Vehicle Overhead View

Pre-Test Driver Seat Position

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

Post-Test Driver Dummy Left Side View

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Pre-Test Driver Dummy Shoulder and Door Top View

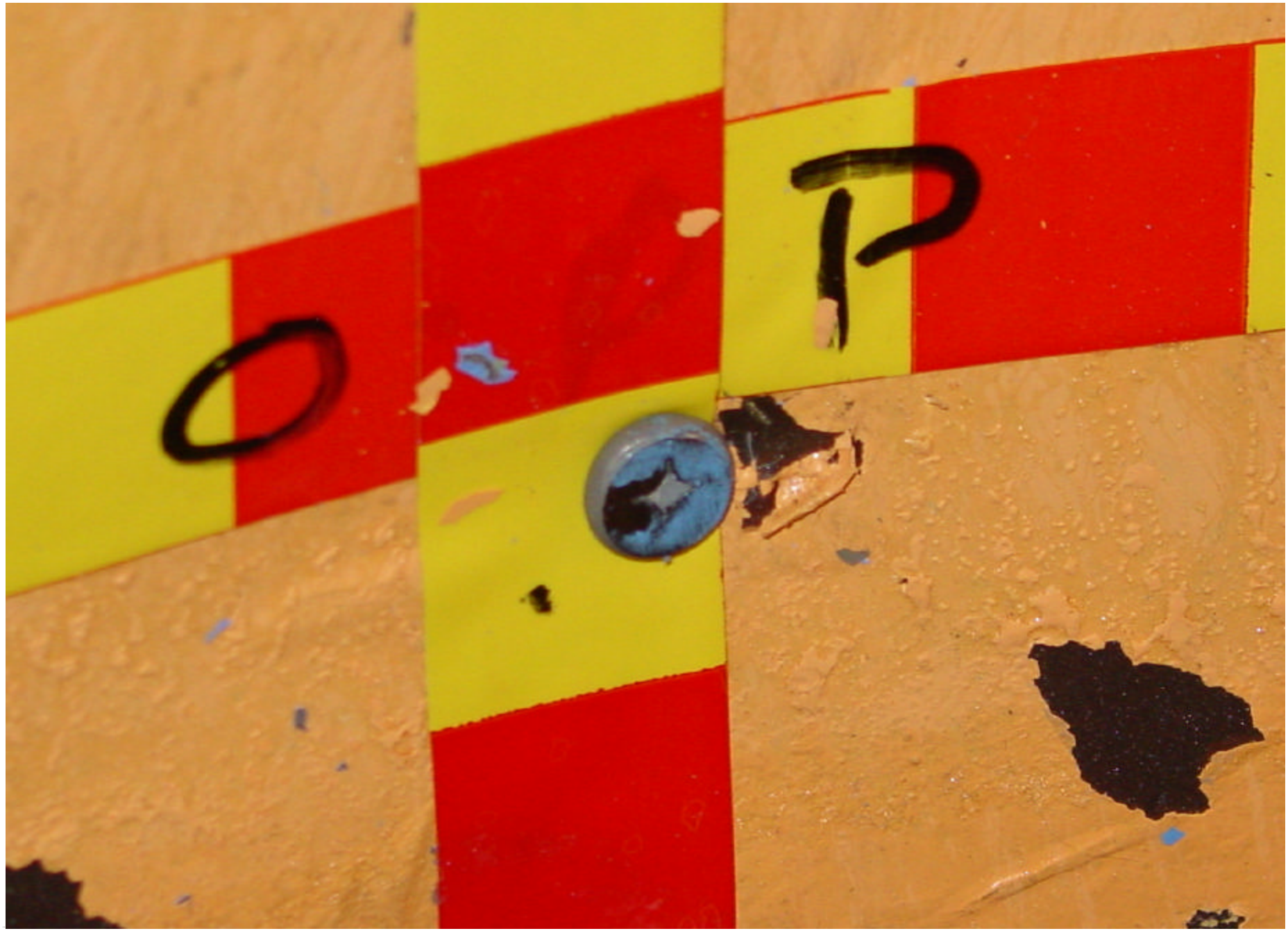
Post-Test Driver Dummy Contact

Post-Test Driver Dummy Lower Body Contact

Post-Test Driver Dummy Head Contact

Pre-Test Impact Point on Vehicle

Post-Test Impact Point on Vehicle



Post-Test Impact Point on Vehicle (Close-up)

Impact

Vehicle Certification Label and Tire Placard

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA TRACES

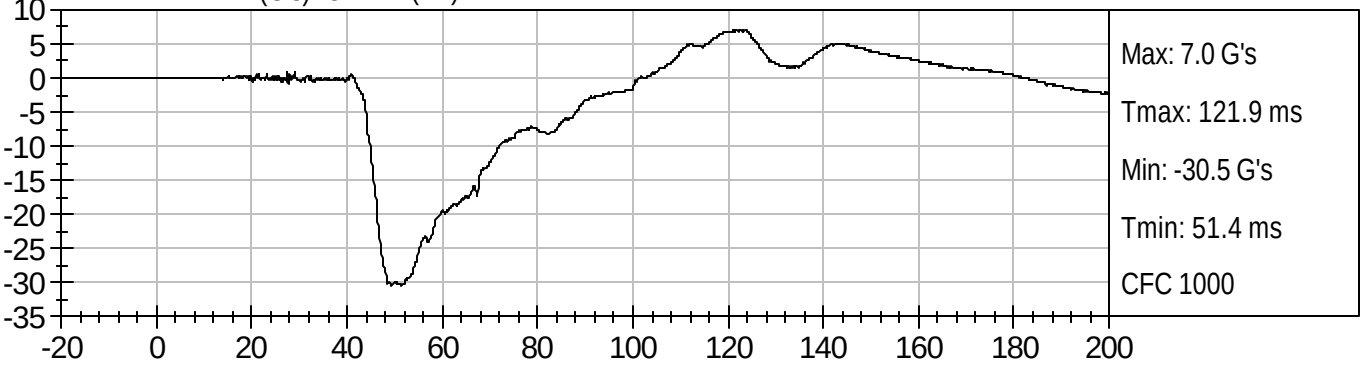
TABLE OF DATA PLOTS

The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:
X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

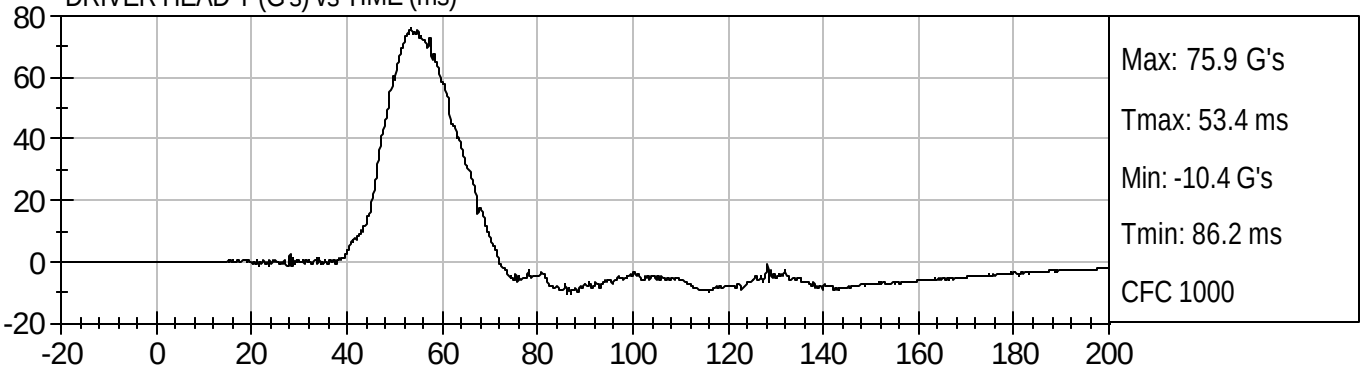
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

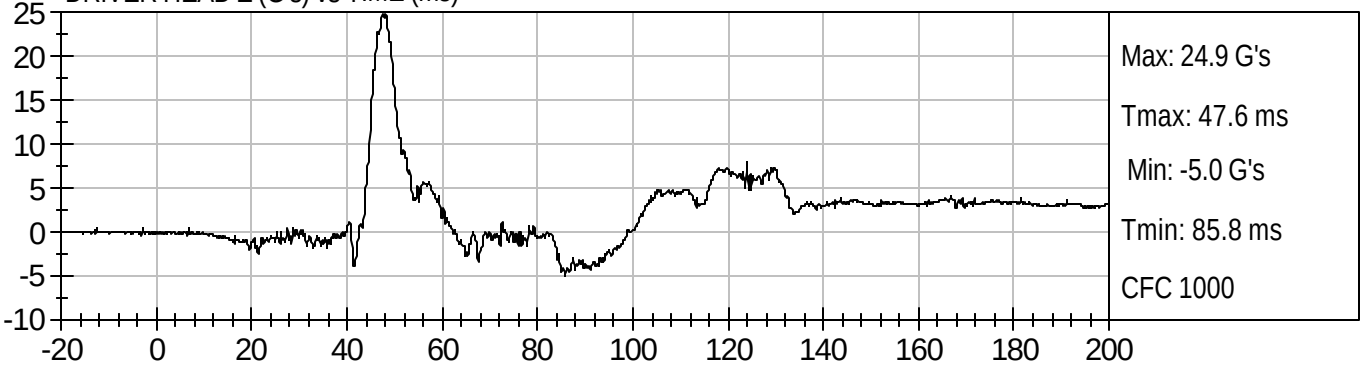
DRIVER HEAD X (G's) vs TIME (ms)



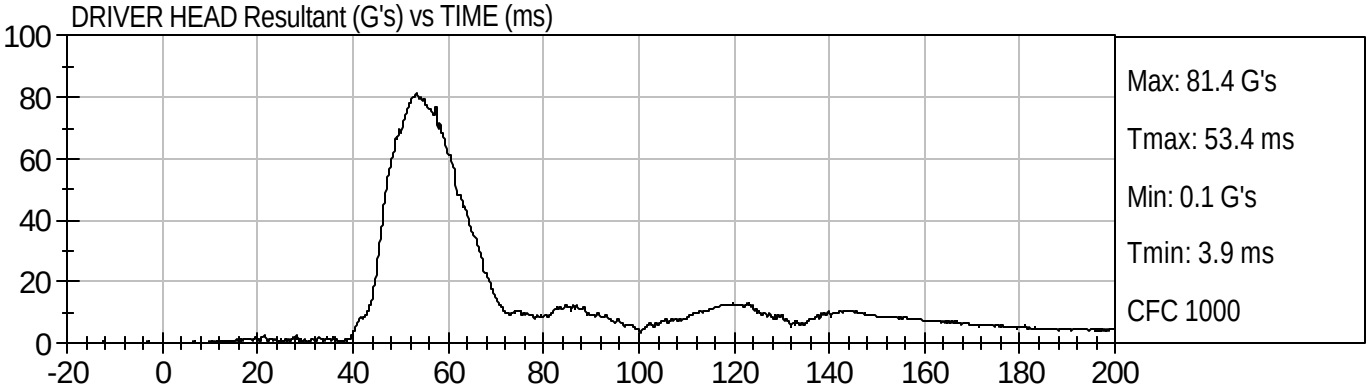
DRIVER HEAD Y (G's) vs TIME (ms)



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



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



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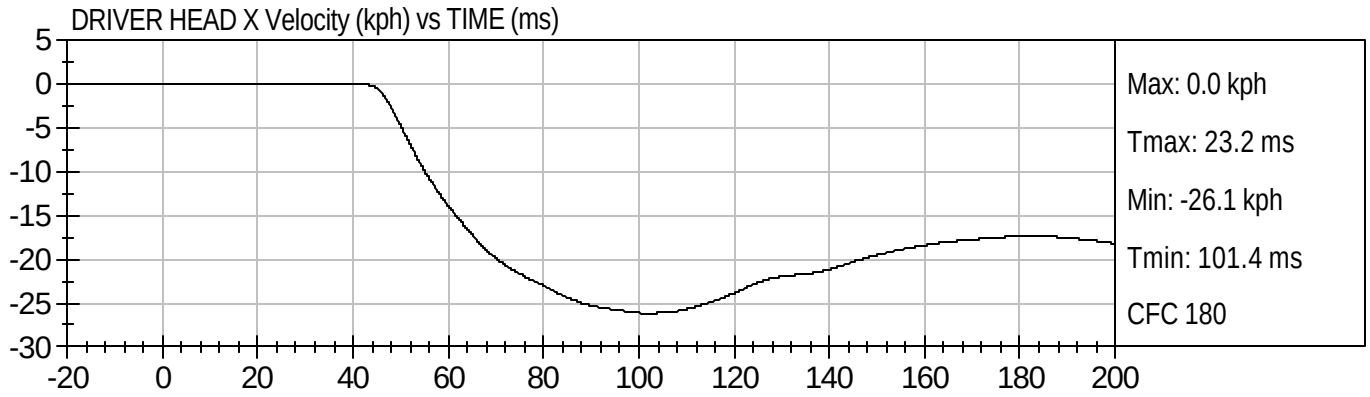
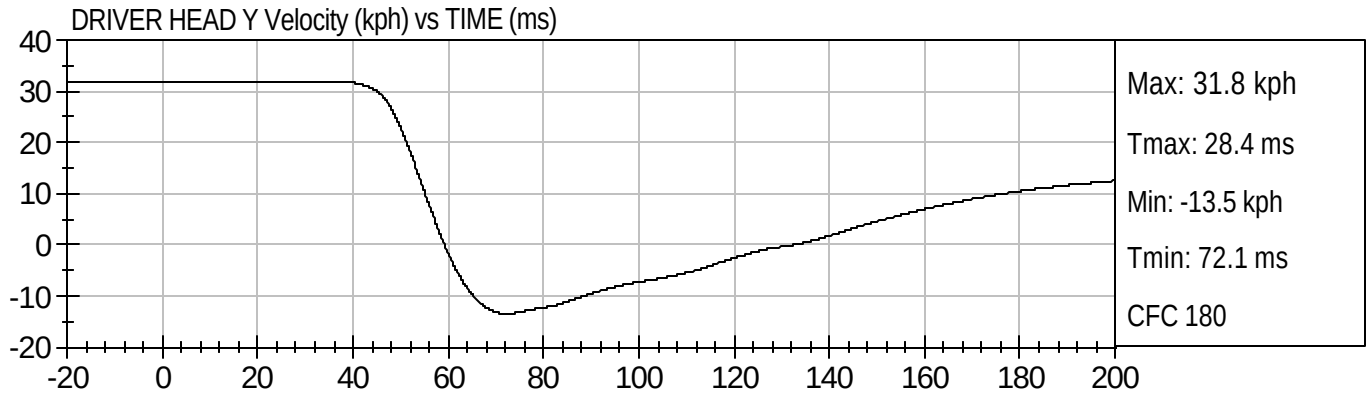
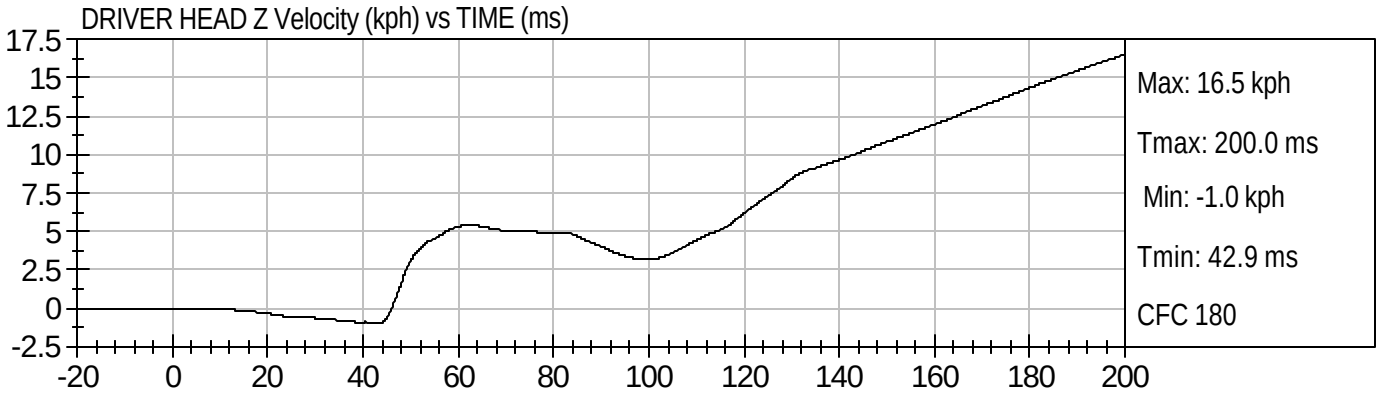
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



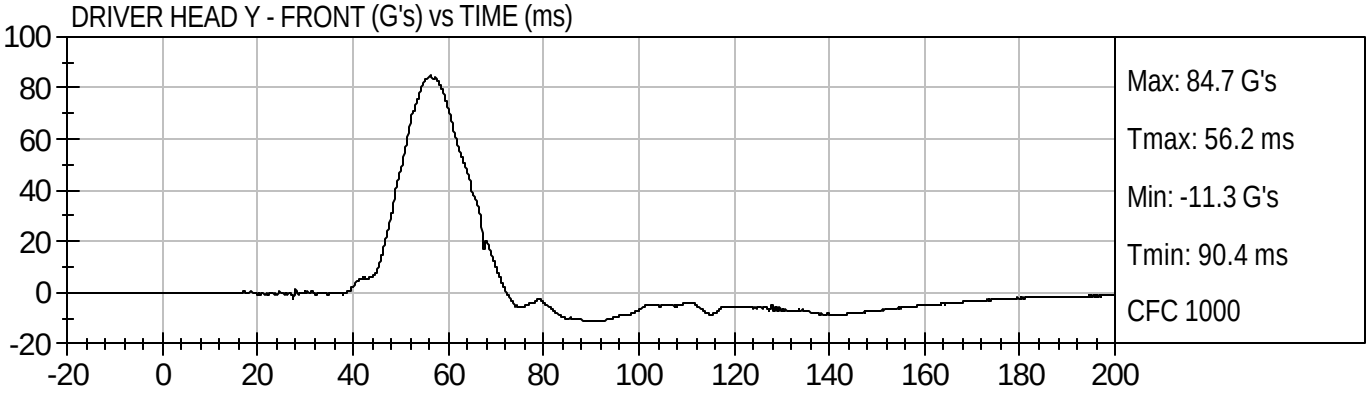




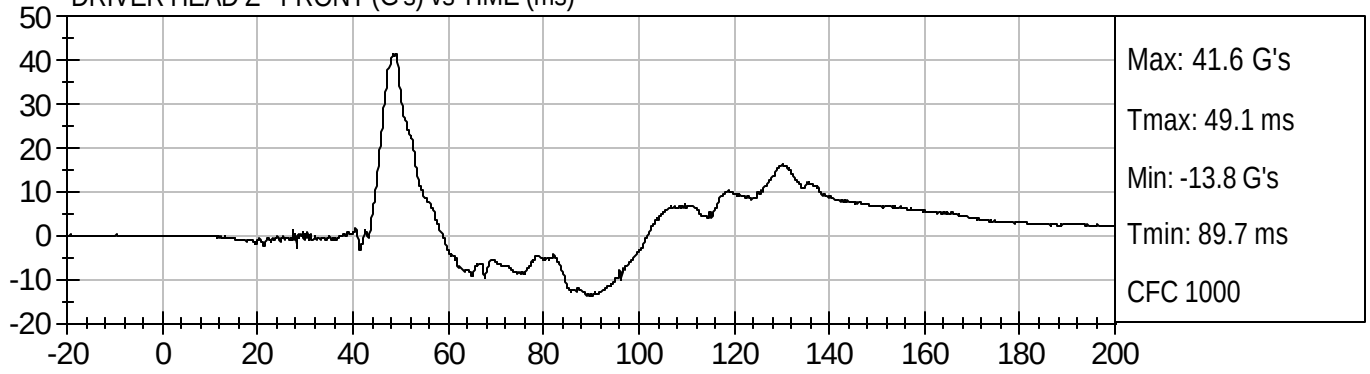
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

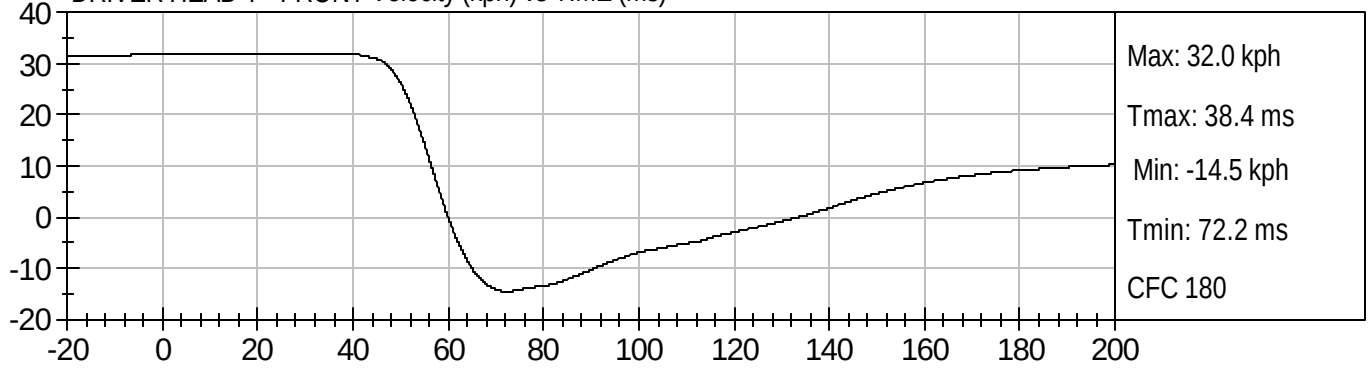
DRIVER HEAD Y - FRONT (G's) vs TIME (ms)



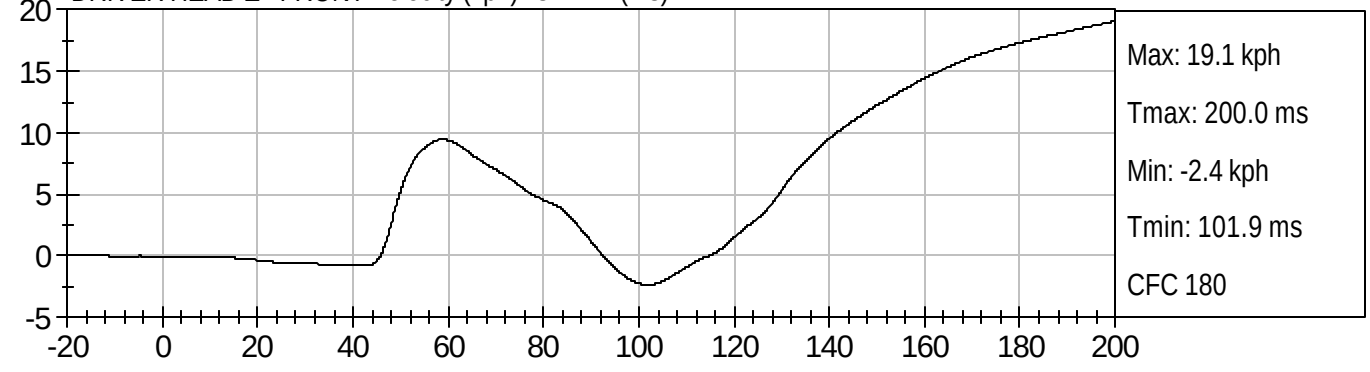
DRIVER HEAD Z - FRONT (G's) vs TIME (ms)



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

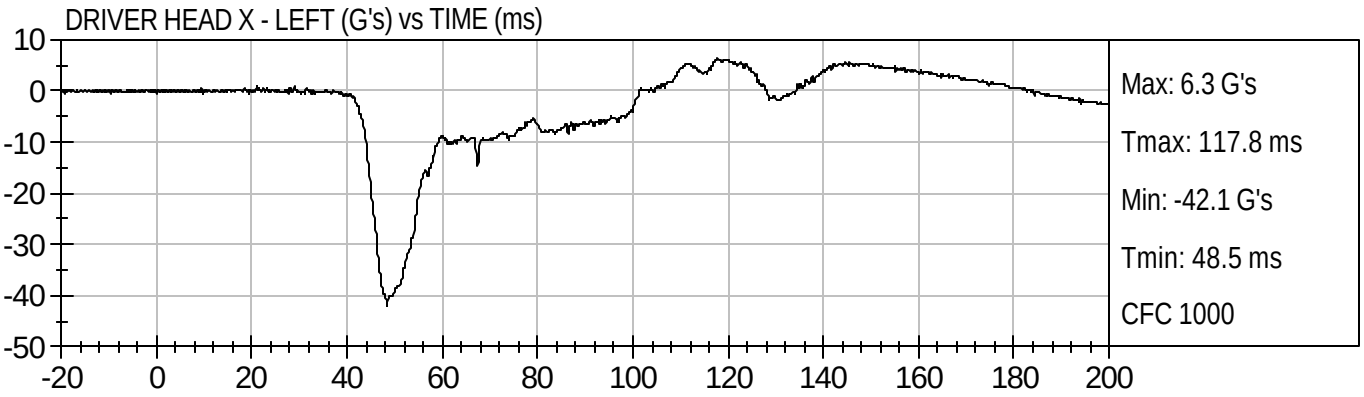


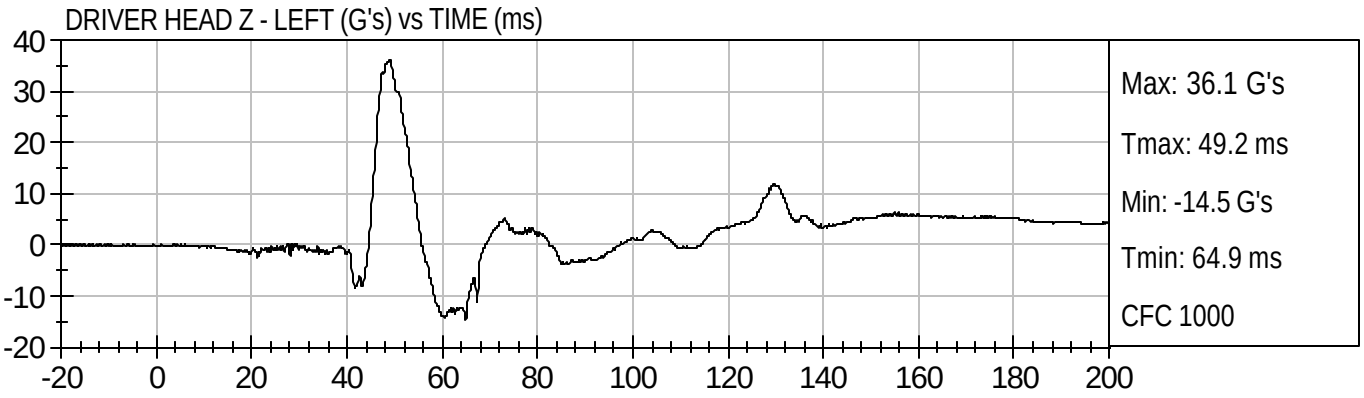
DRIVER HEAD Z - FRONT Velocity (kph) vs TIME (ms)

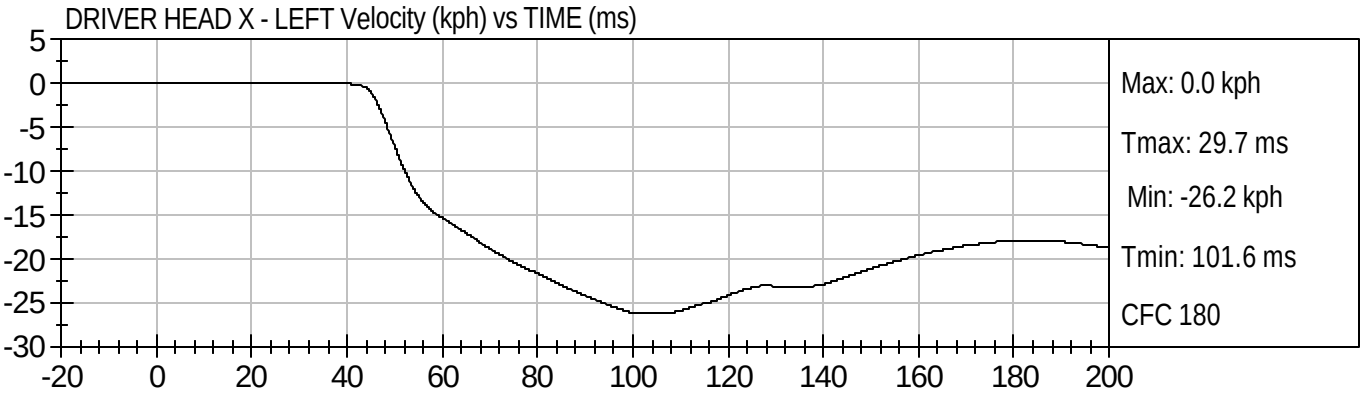


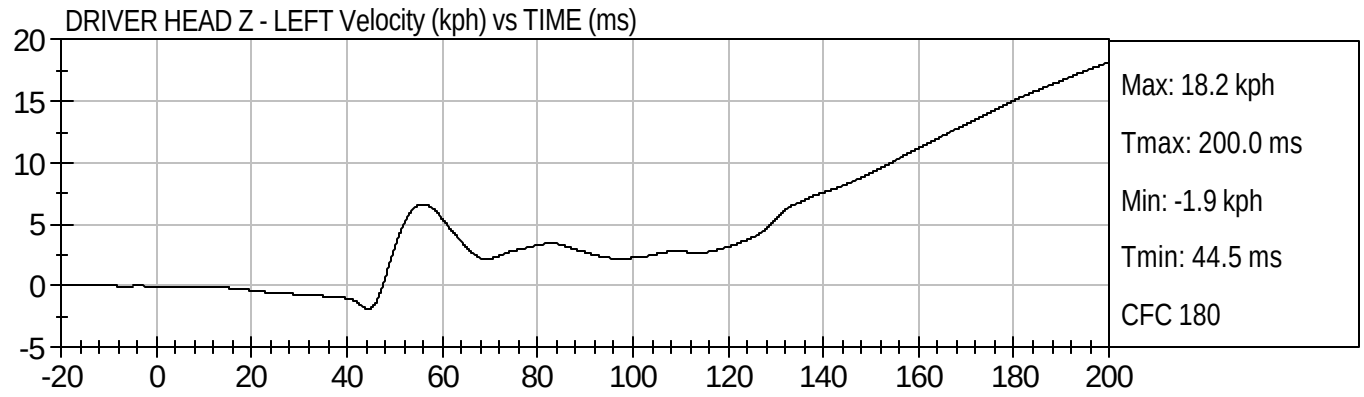
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



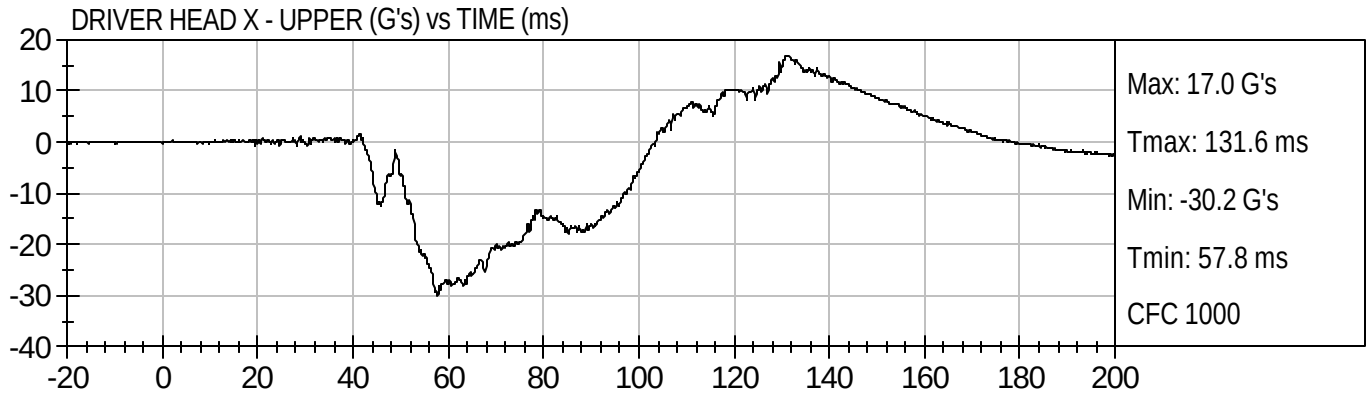


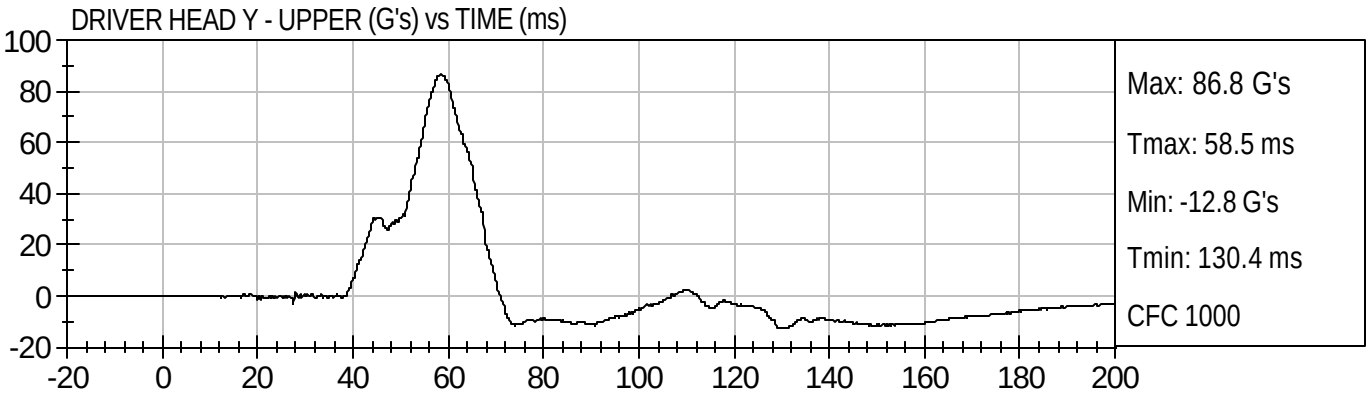


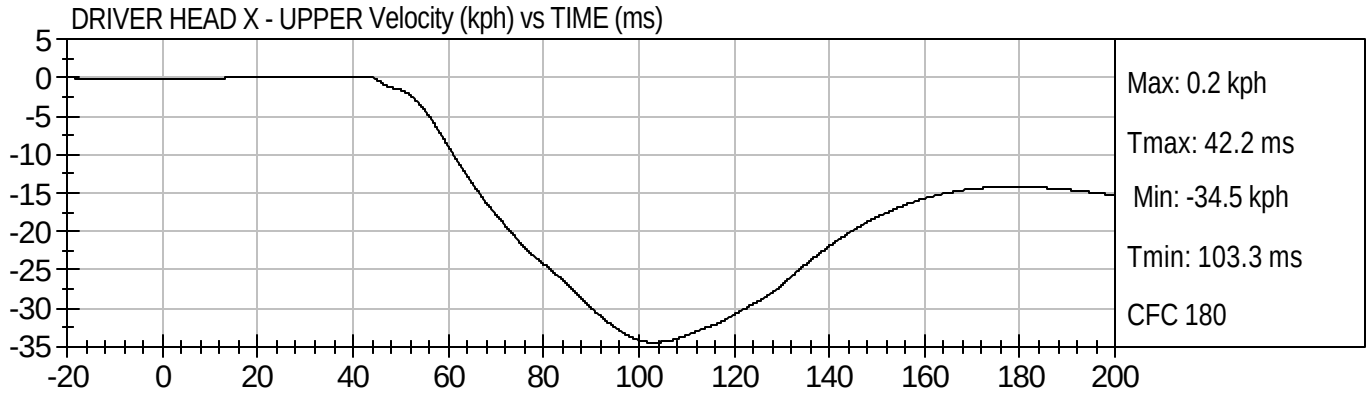


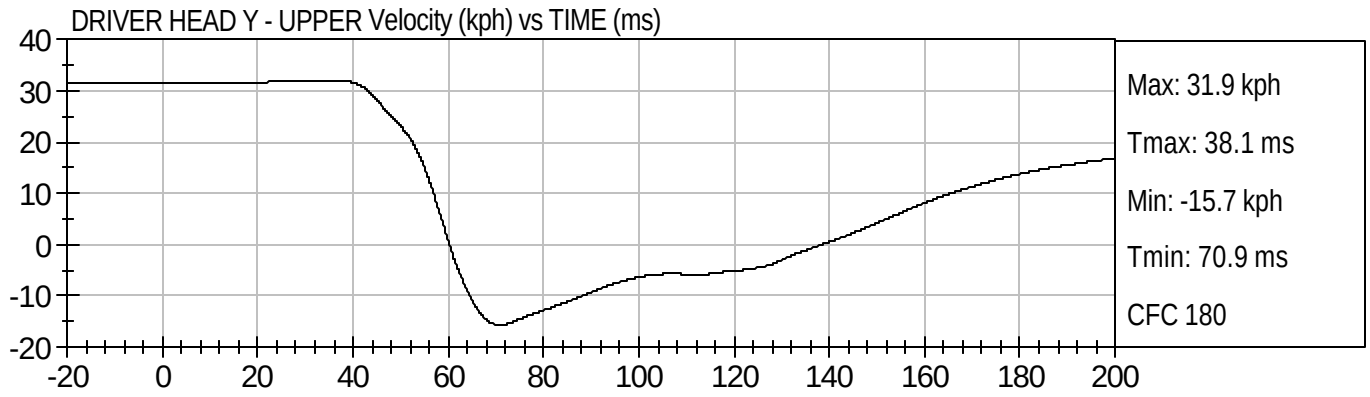
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)





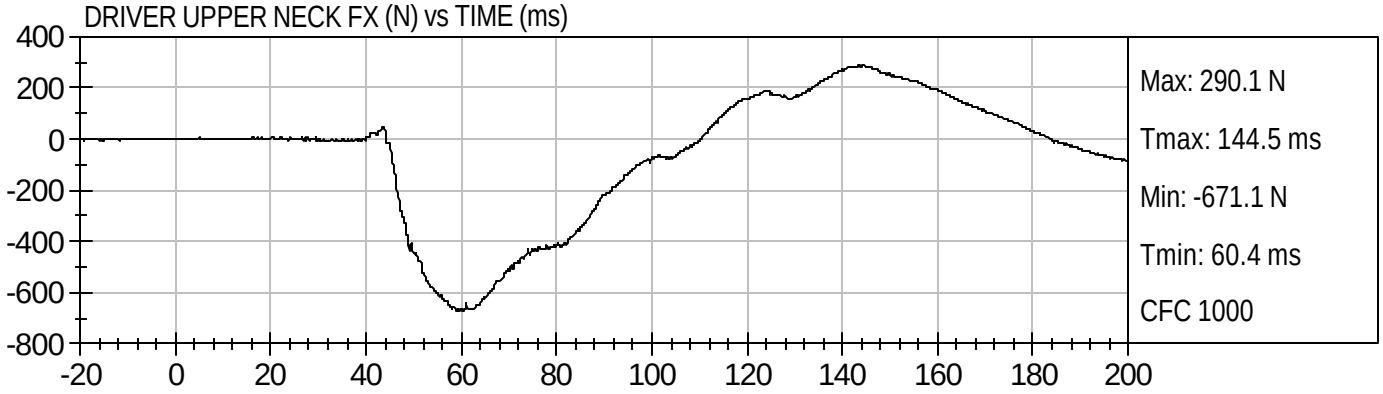




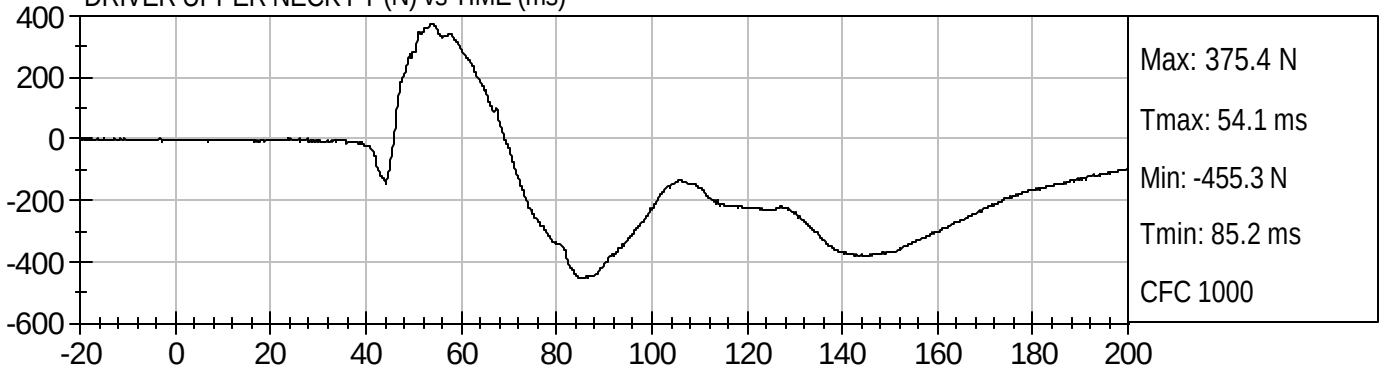
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

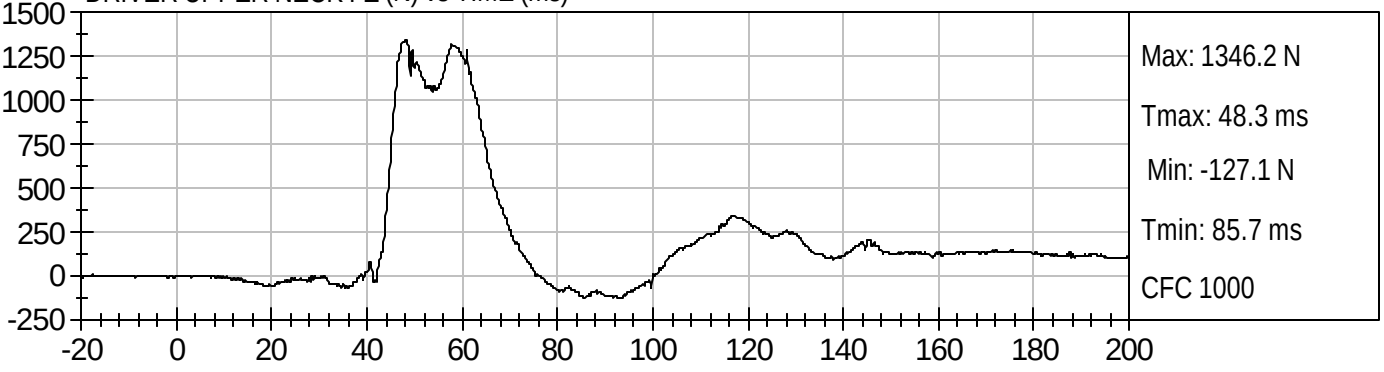
DRIVER UPPER NECK FX (N) vs TIME (ms)



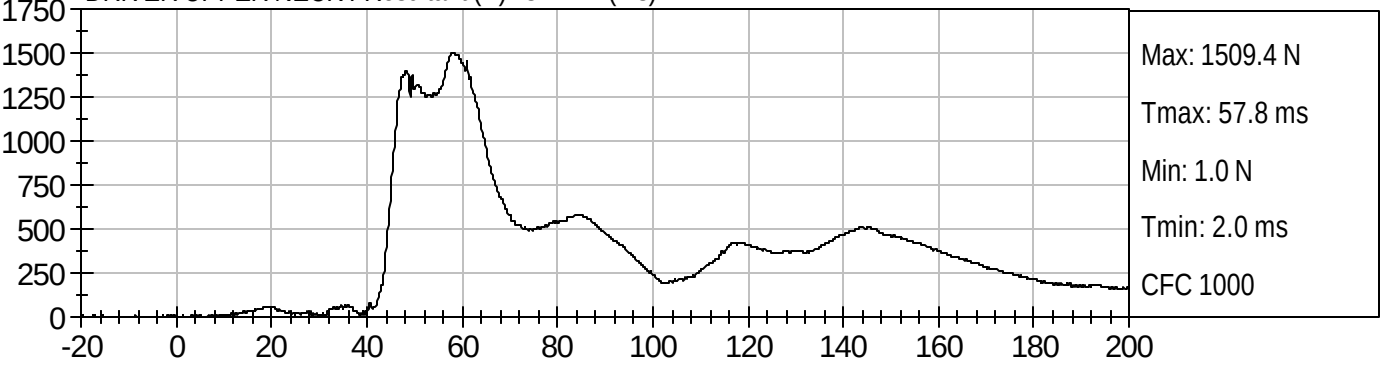
DRIVER UPPER NECK FY (N) vs TIME (ms)



DRIVER UPPER NECK FZ (N) vs TIME (ms)



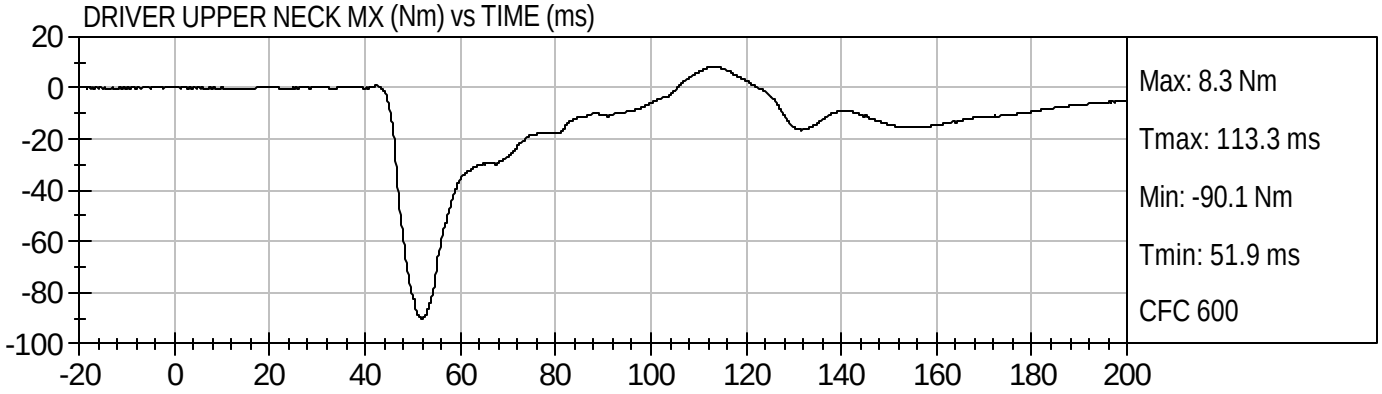
DRIVER UPPER NECK FResultant (N) vs TIME (ms)



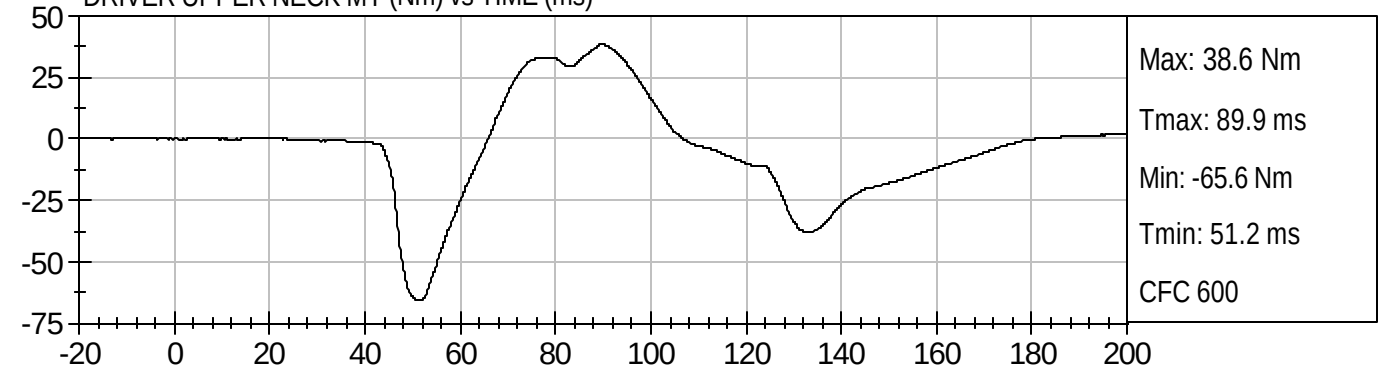
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

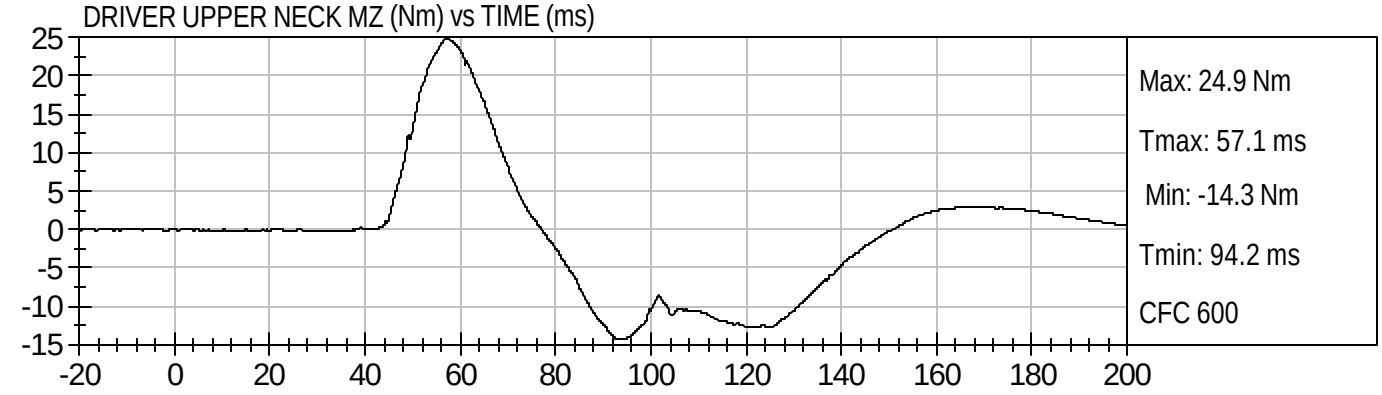
DRIVER UPPER NECK MX (Nm) vs TIME (ms)



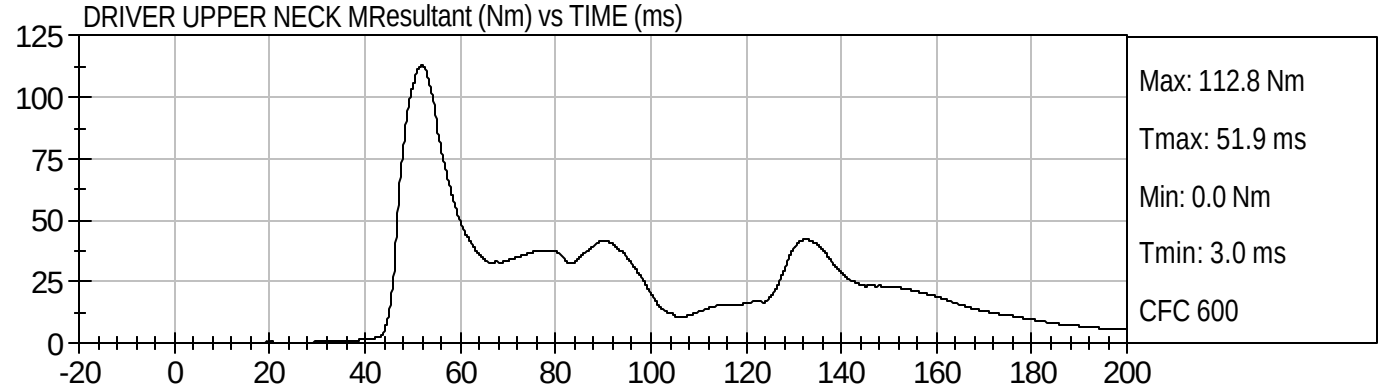
DRIVER UPPER NECK MY (Nm) vs TIME (ms)



DRIVER UPPER NECK MZ (Nm) vs TIME (ms)

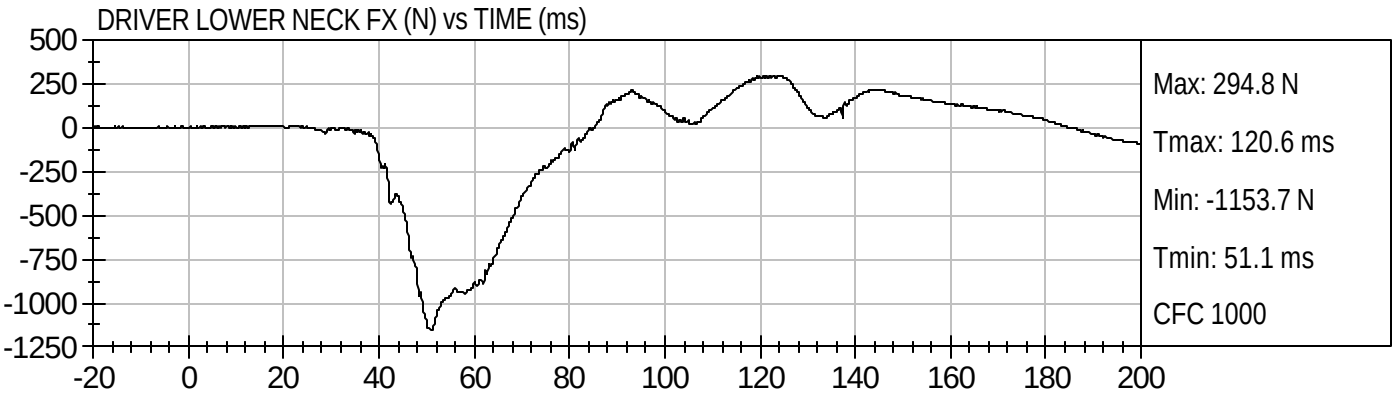


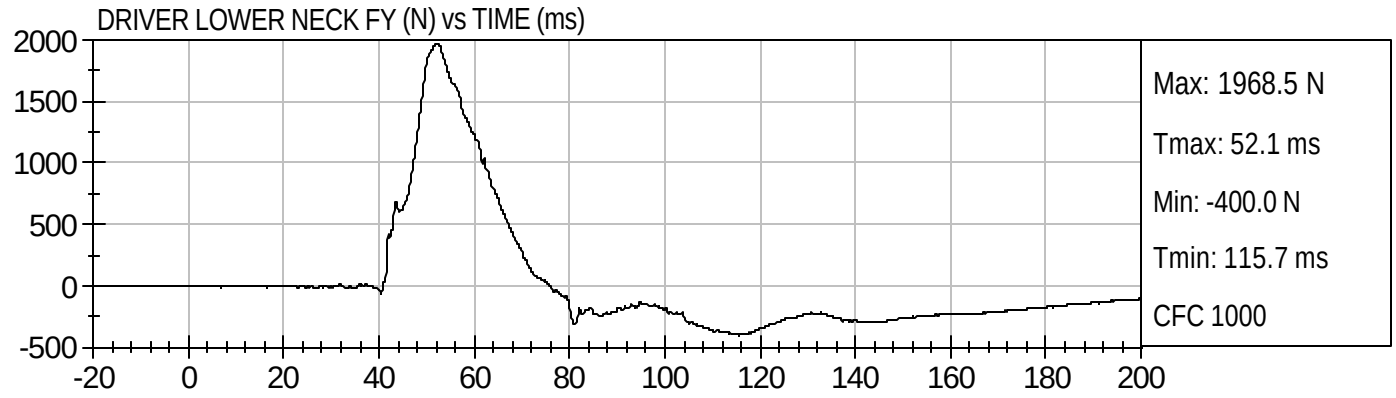
DRIVER UPPER NECK MResultant (Nm) vs TIME (ms)

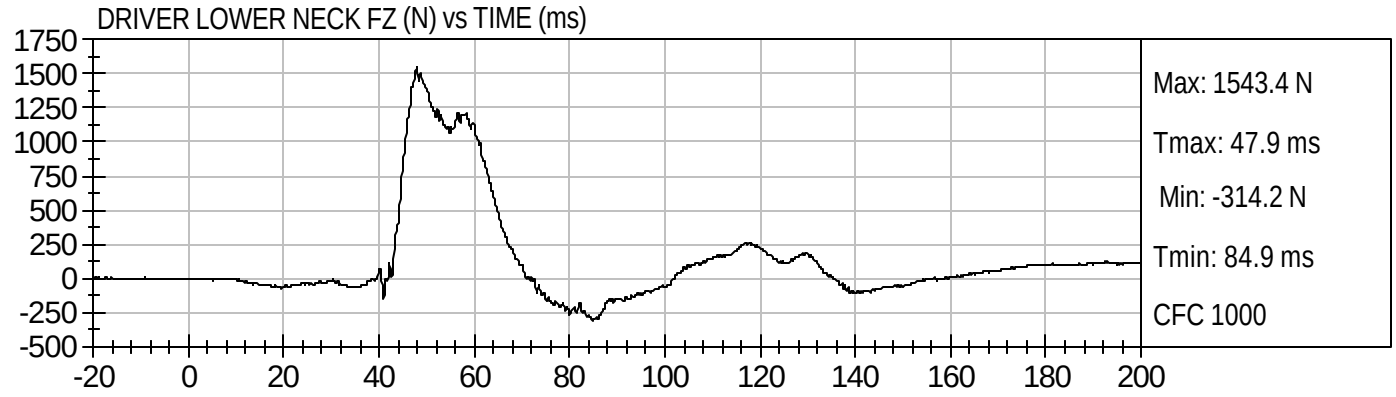


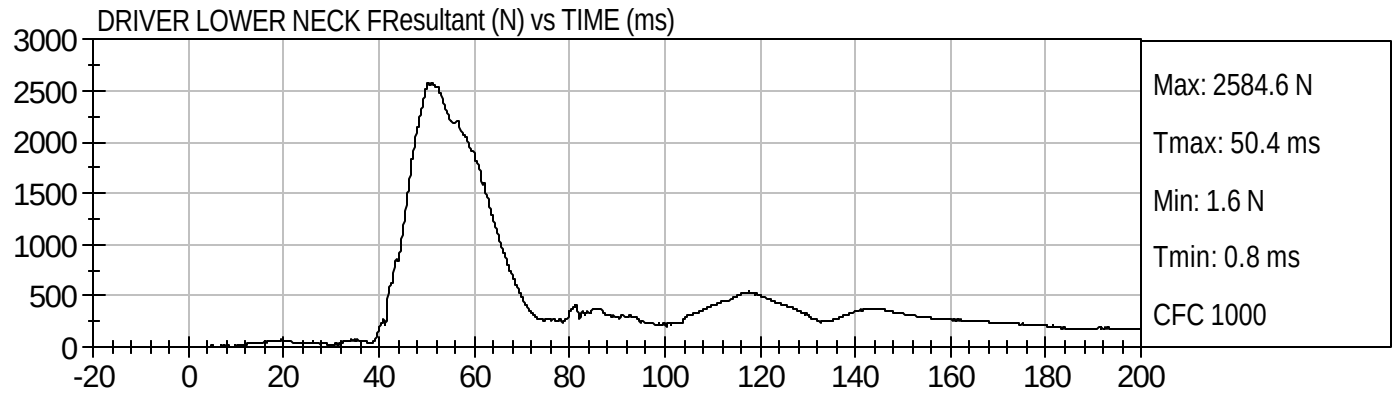
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)





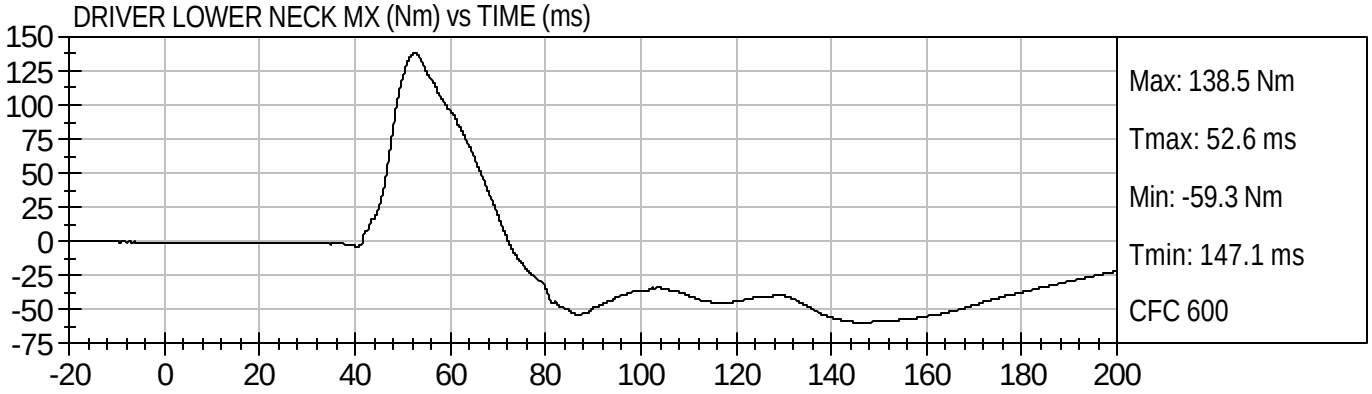




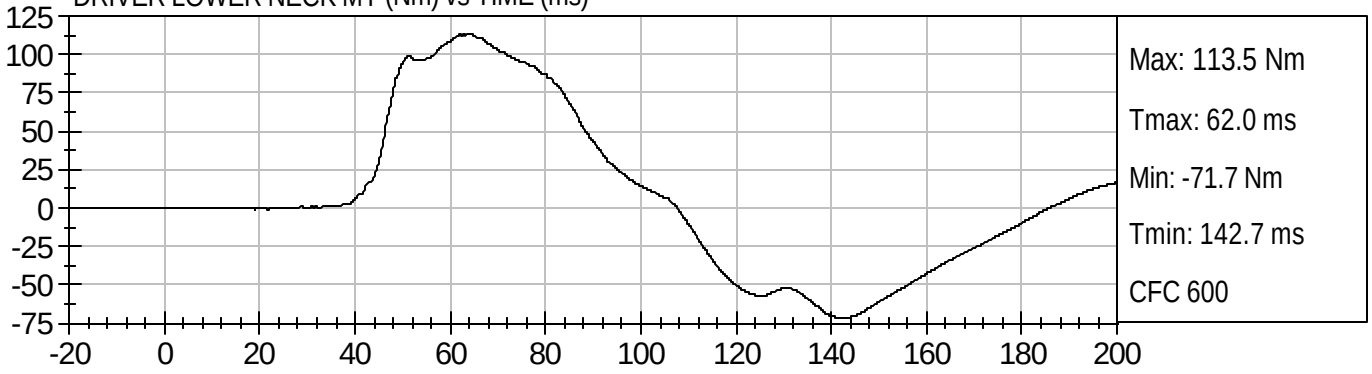
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

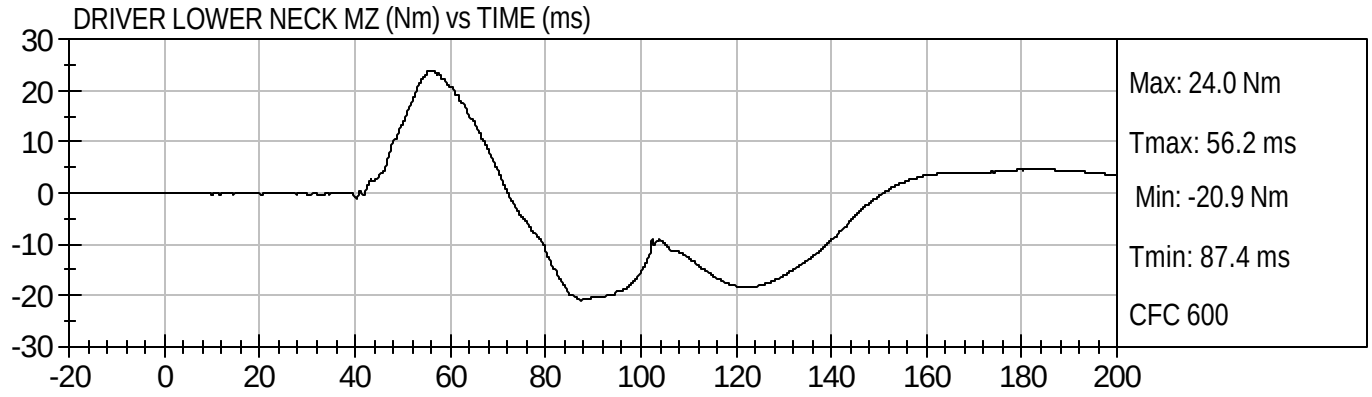
DRIVER LOWER NECK MX (Nm) vs TIME (ms)



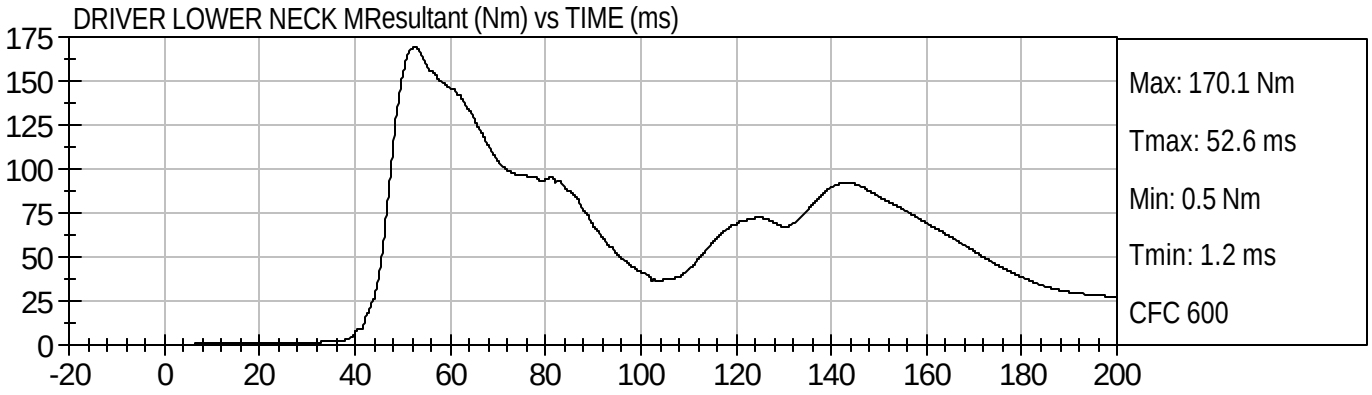
DRIVER LOWER NECK MY (Nm) vs TIME (ms)



DRIVER LOWER NECK MZ (Nm) vs TIME (ms)

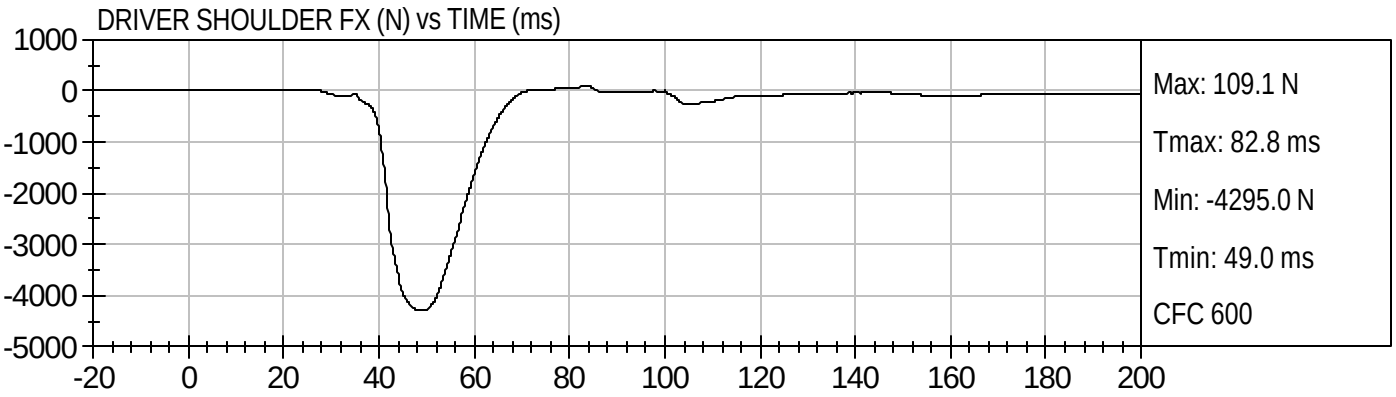


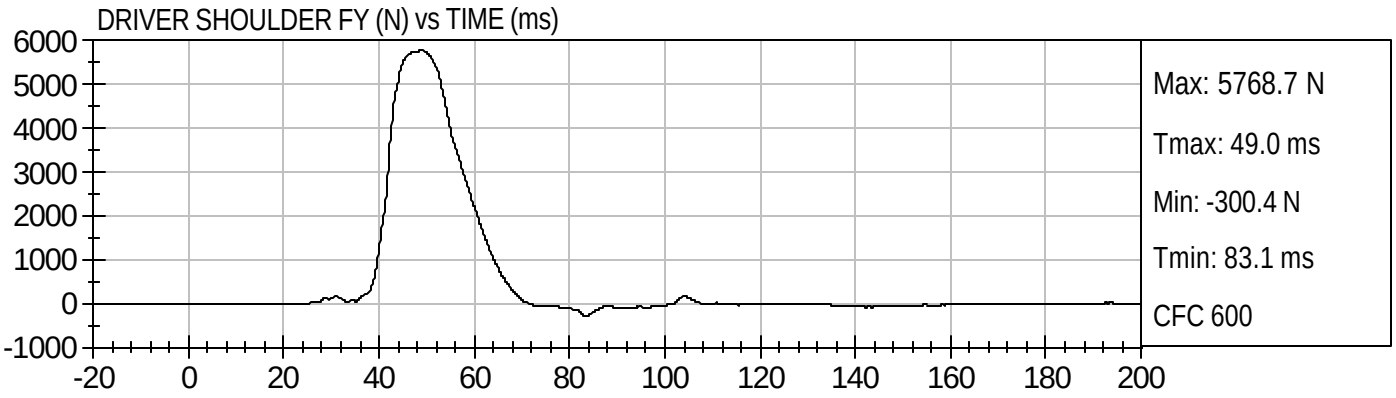
DRIVER LOWER NECK MResultant (Nm) vs TIME (ms)

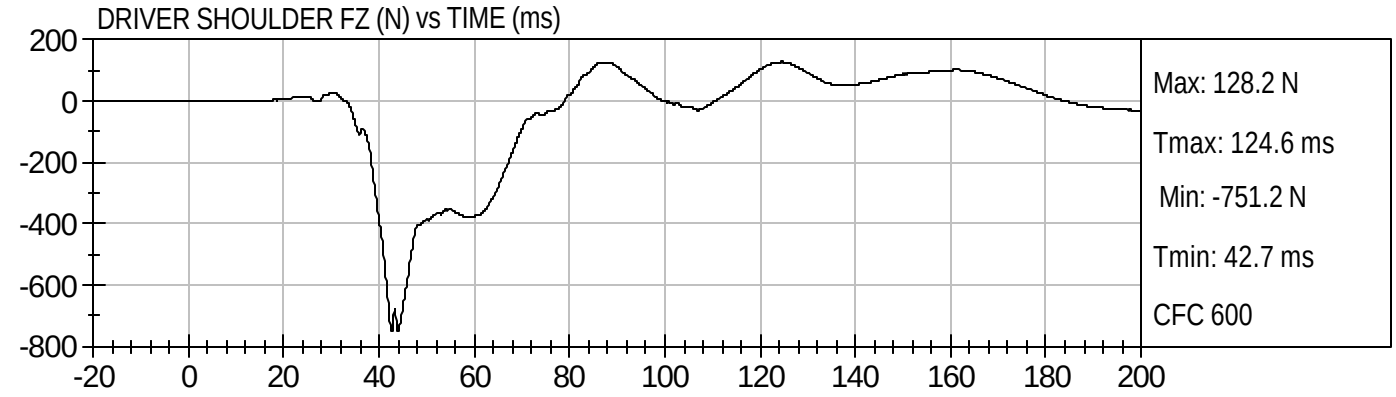


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

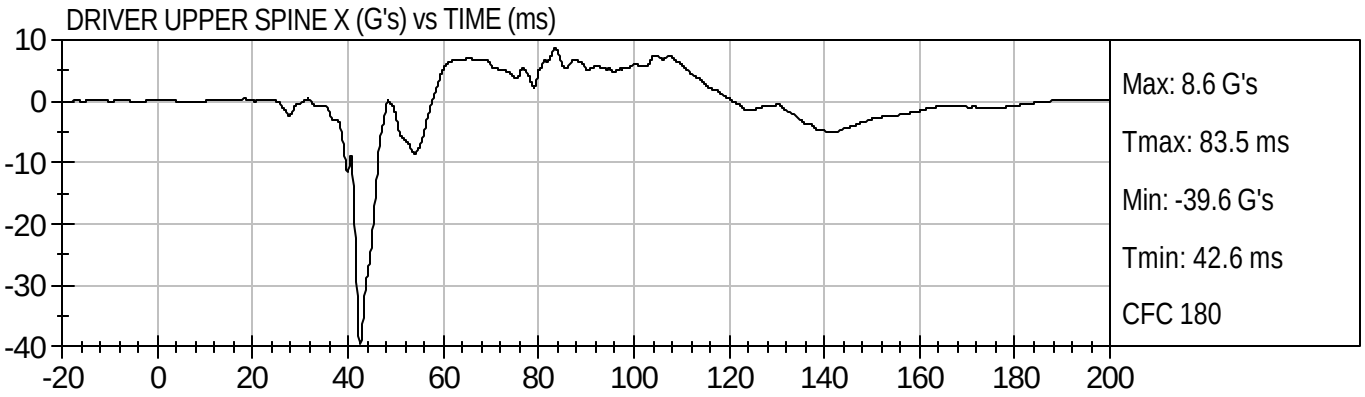


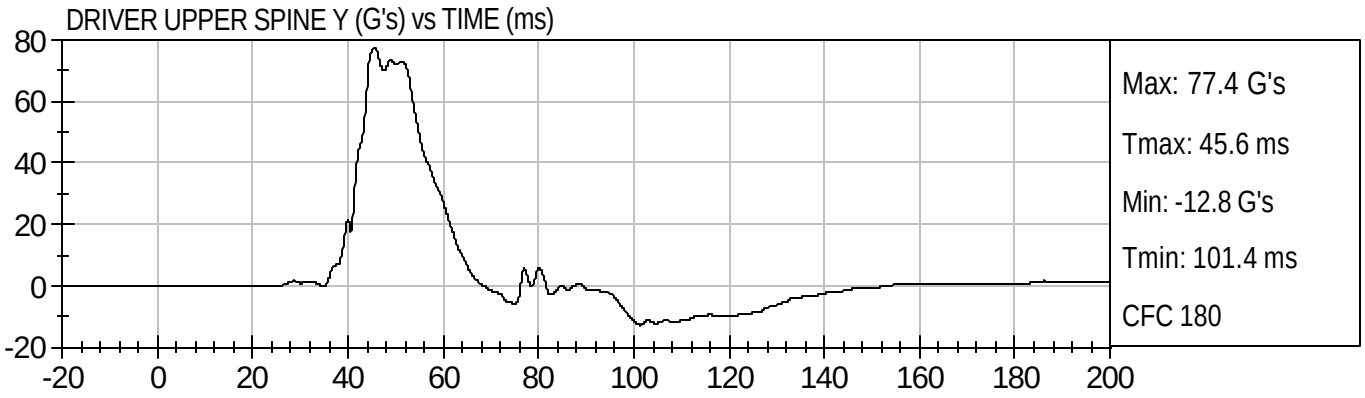


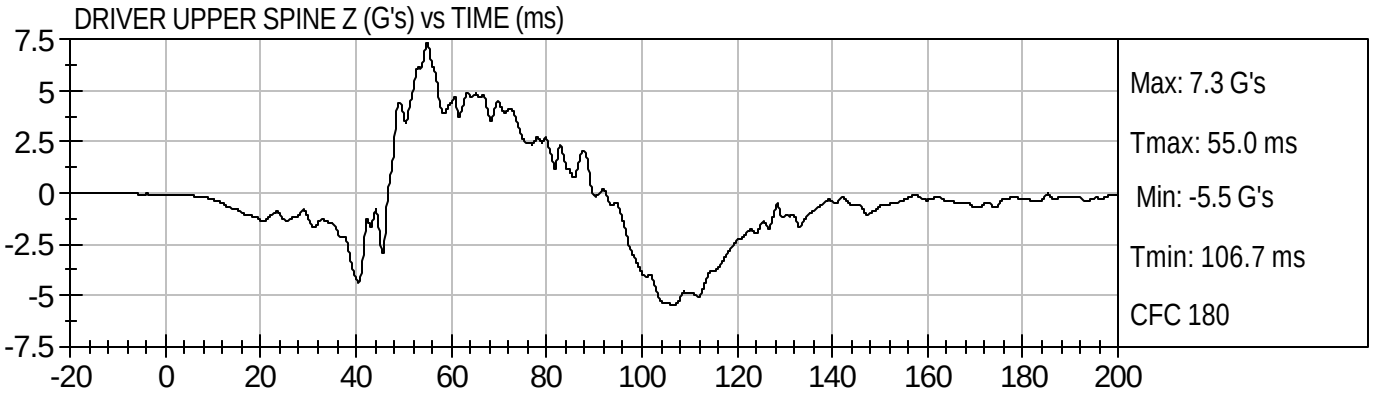


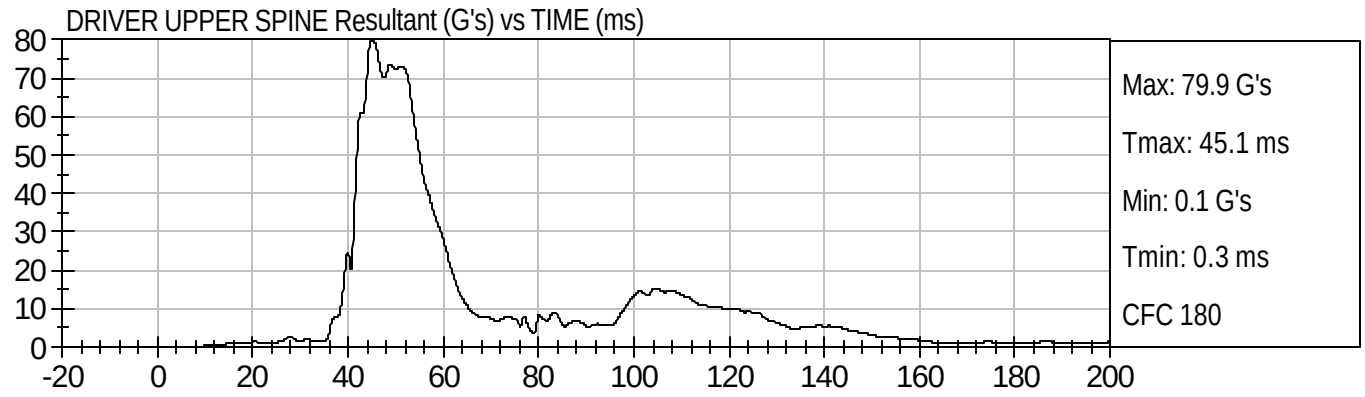
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



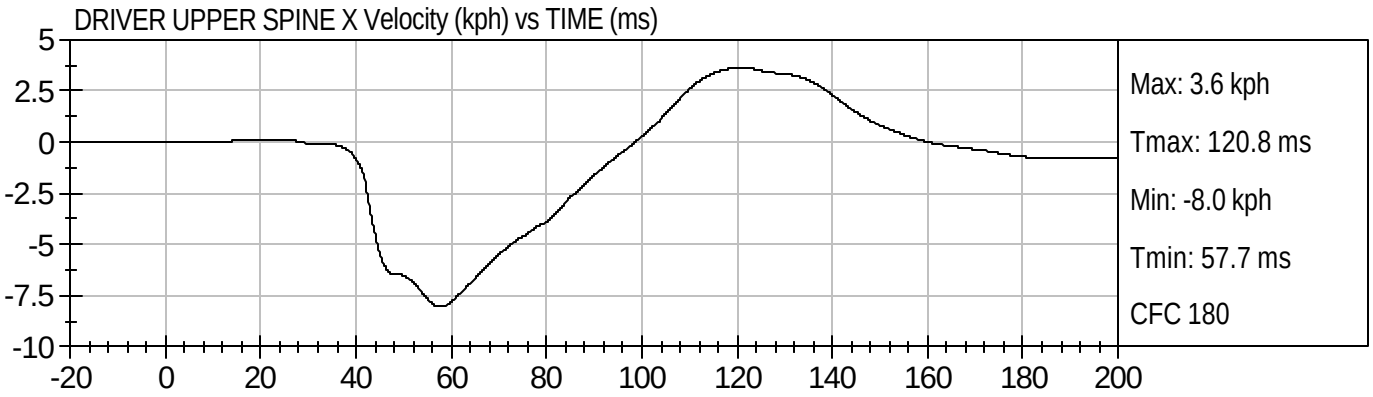


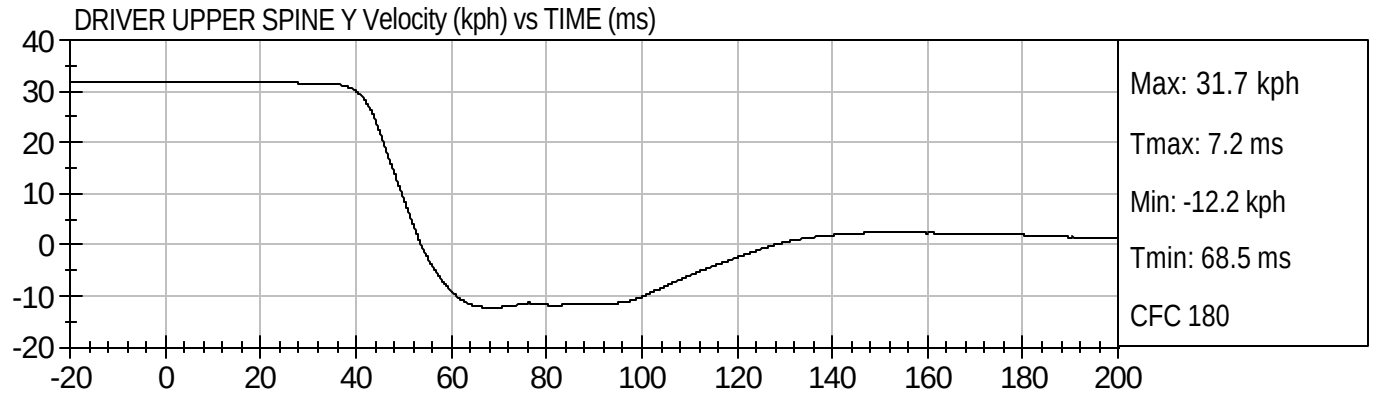


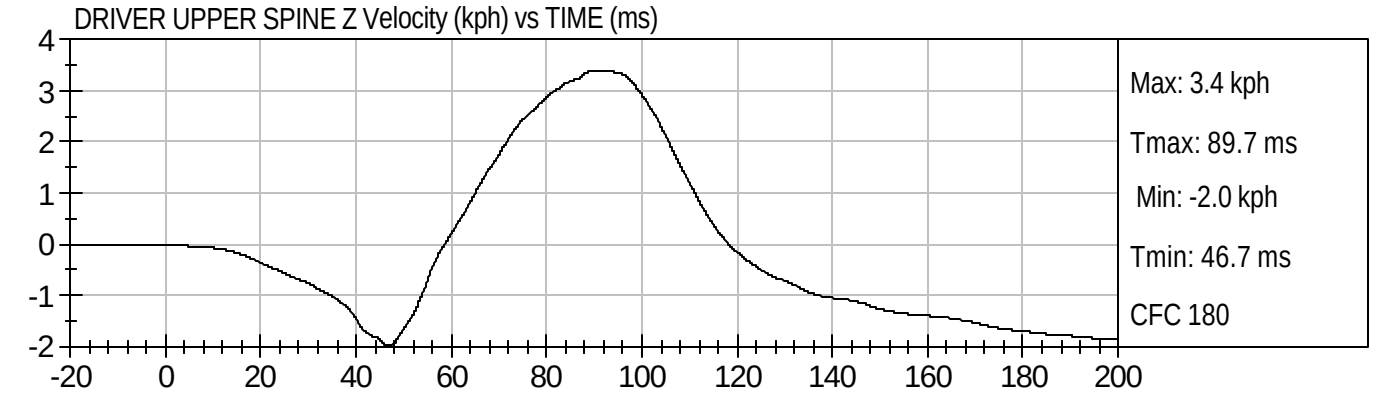


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

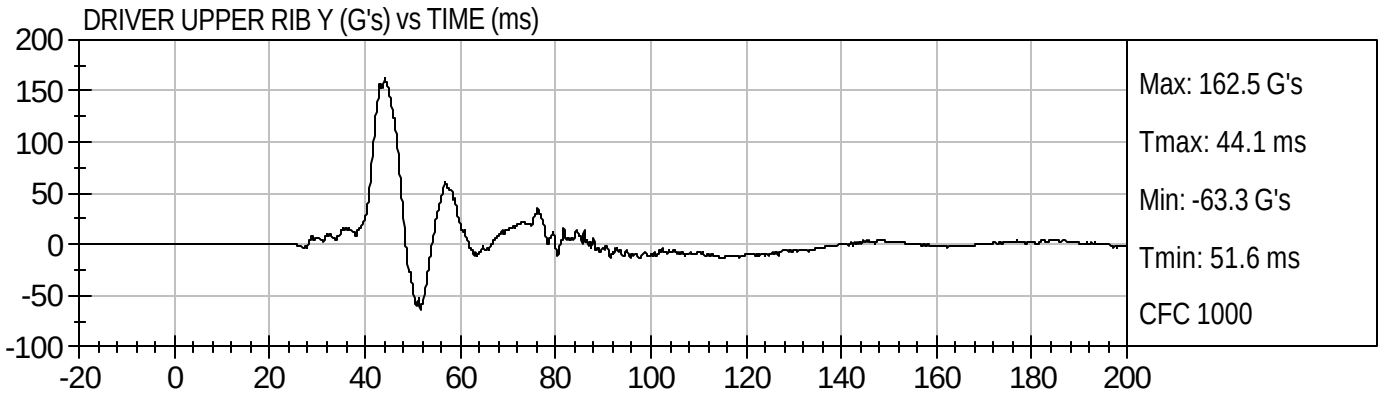


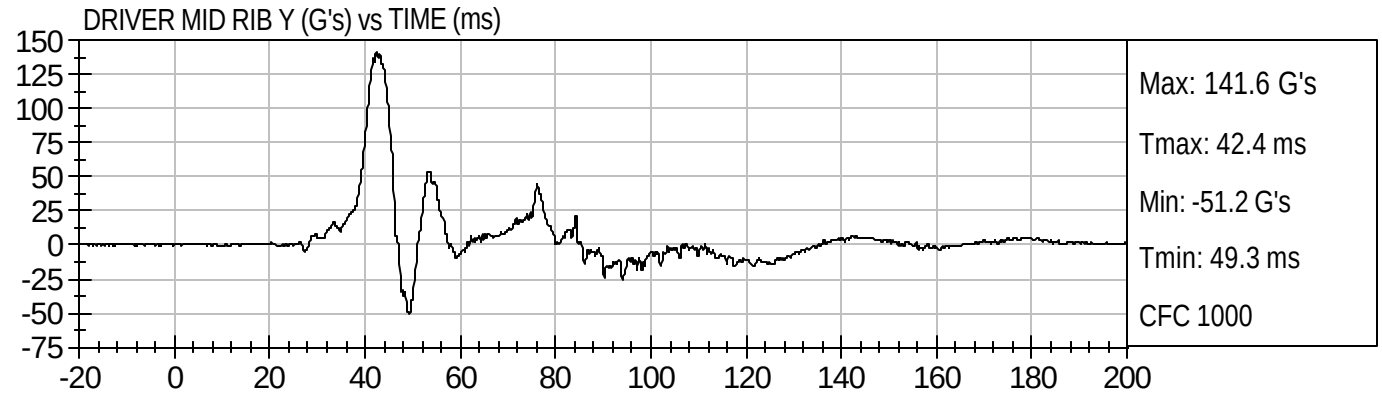


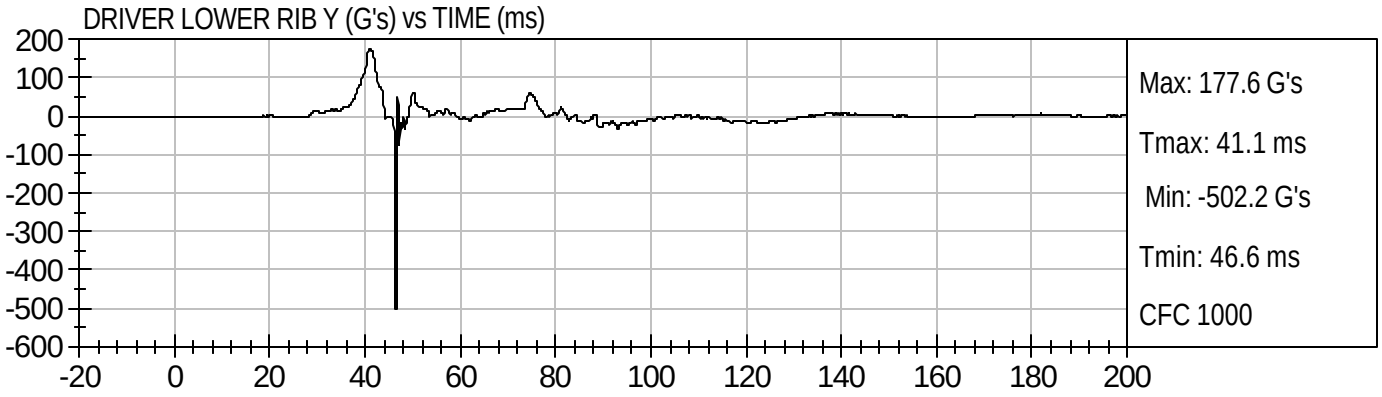


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

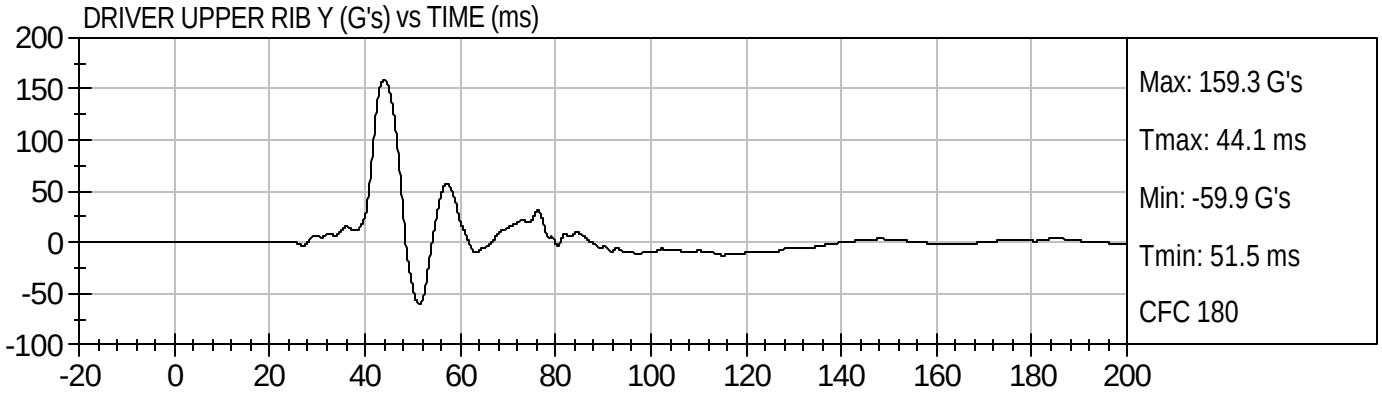


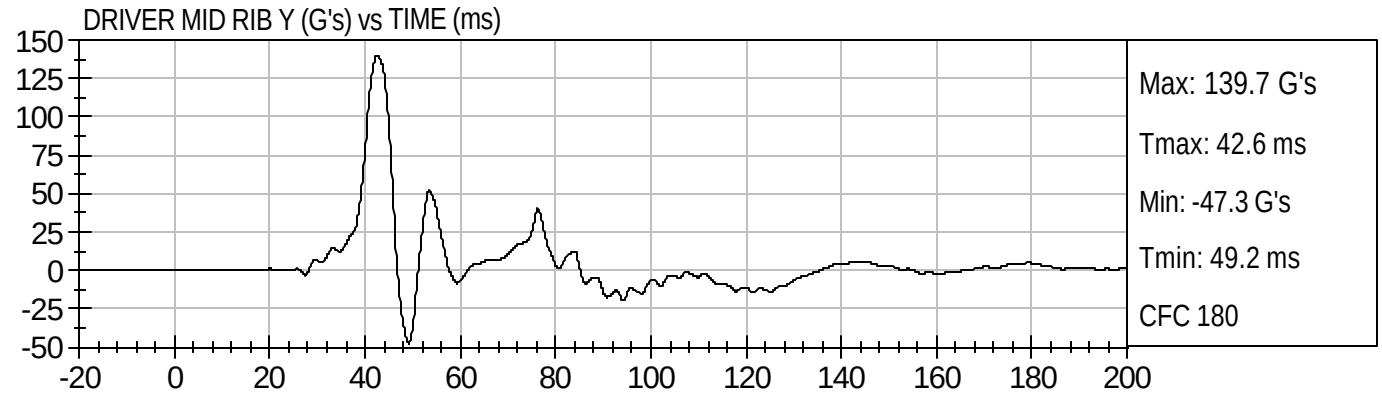


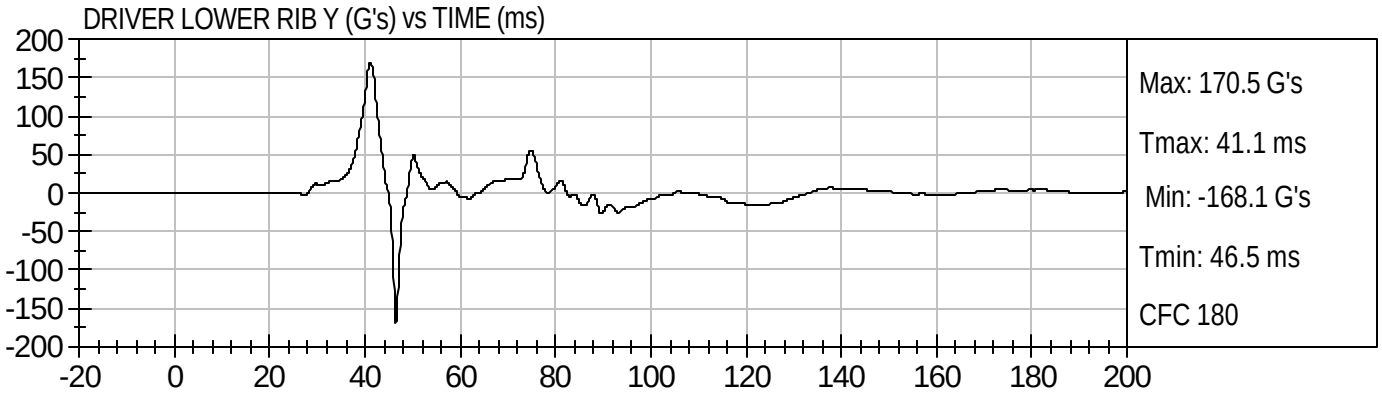


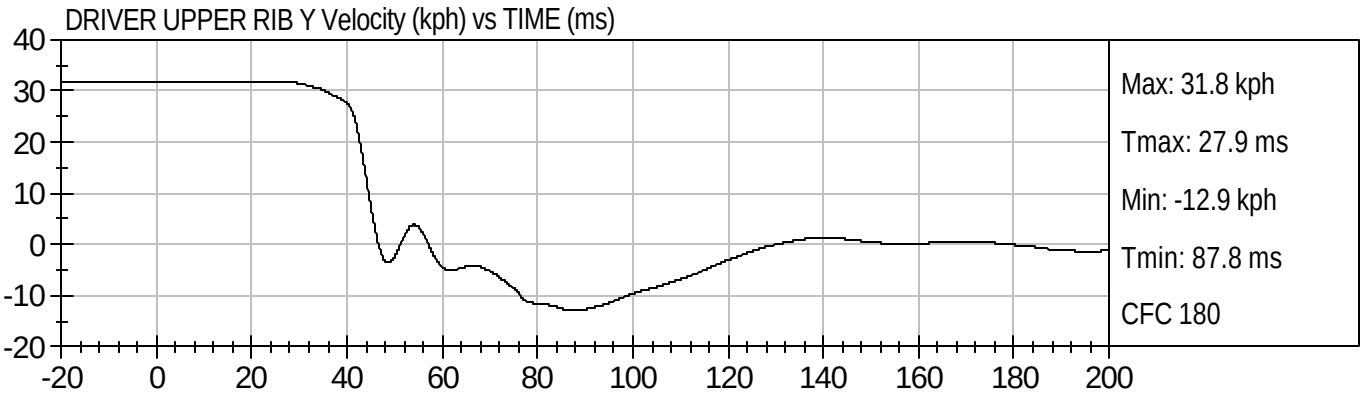
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

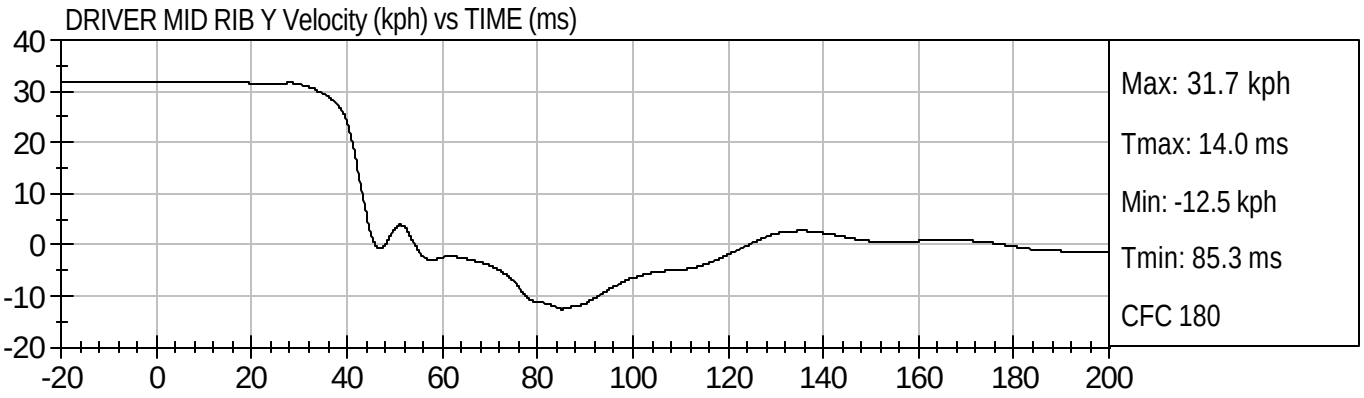
Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

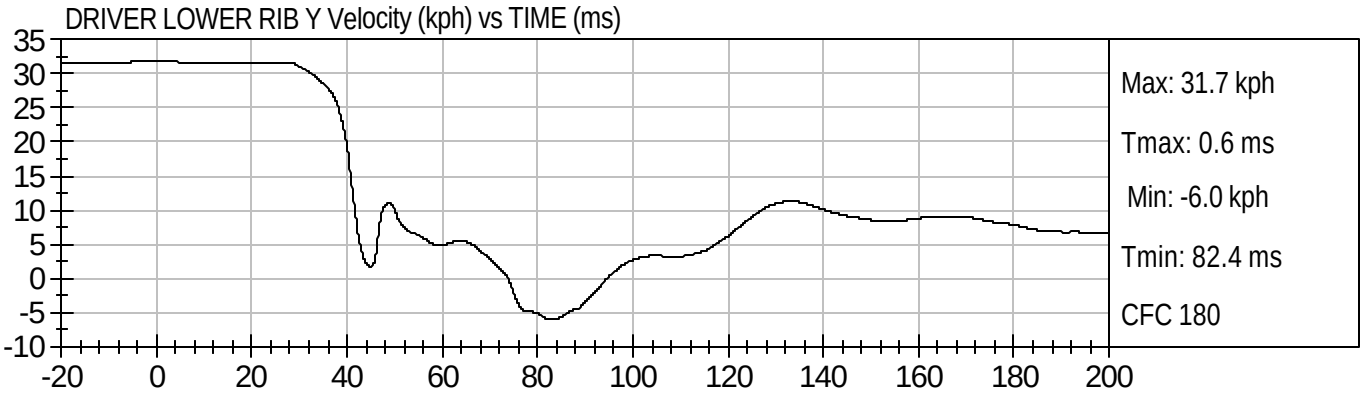







DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 31.8 kph
Tmax: 27.9 ms
Min: -12.9 kph
Tmin: 87.8 ms
CFC 180

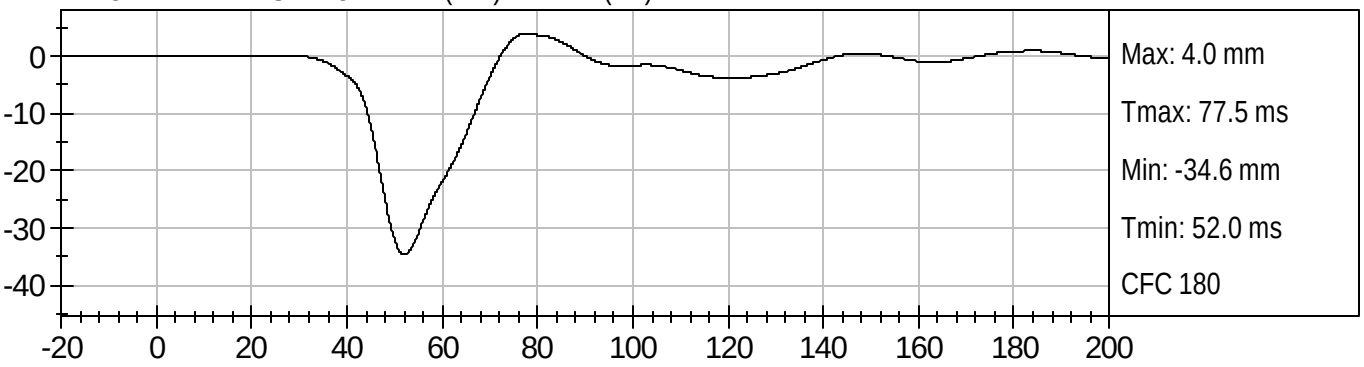

DRIVER MID RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 31.7 kph
Tmax: 14.0 ms
Min: -12.5 kph
Tmin: 85.3 ms
CFC 180


DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-10
-20 0 20 40 60 80 100 120 140 160 180 200
Max: 31.7 kph
Tmax: 0.6 ms
Min: -6.0 kph
Tmin: 82.4 ms
CFC 180

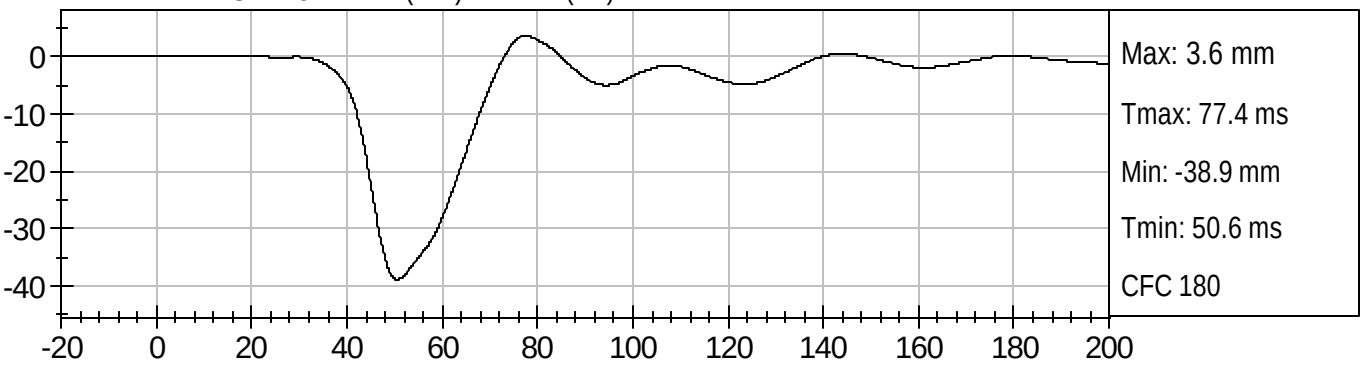
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

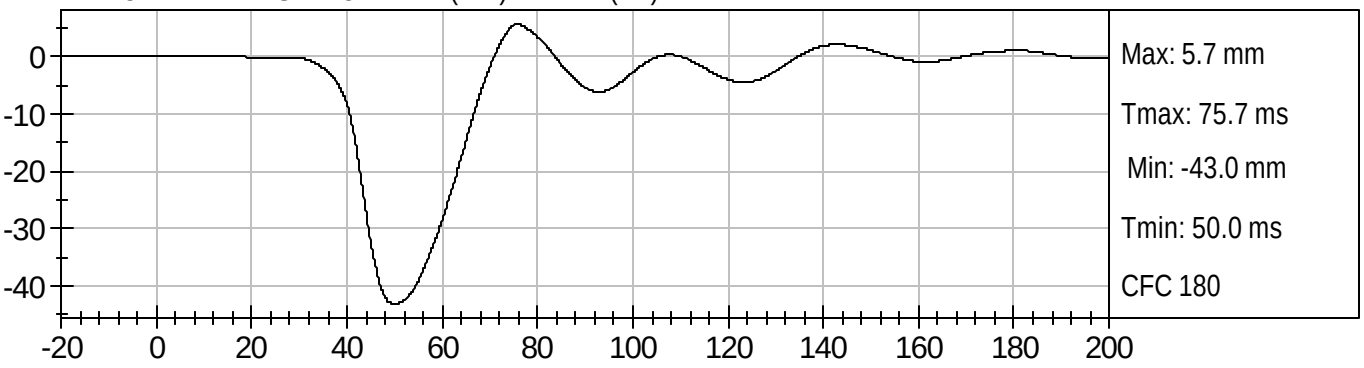
DR UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



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

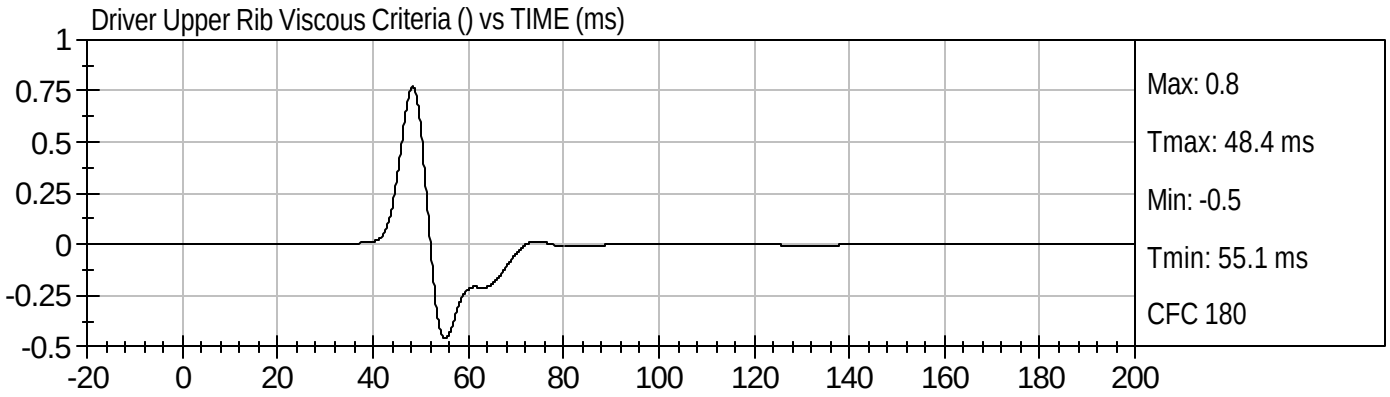


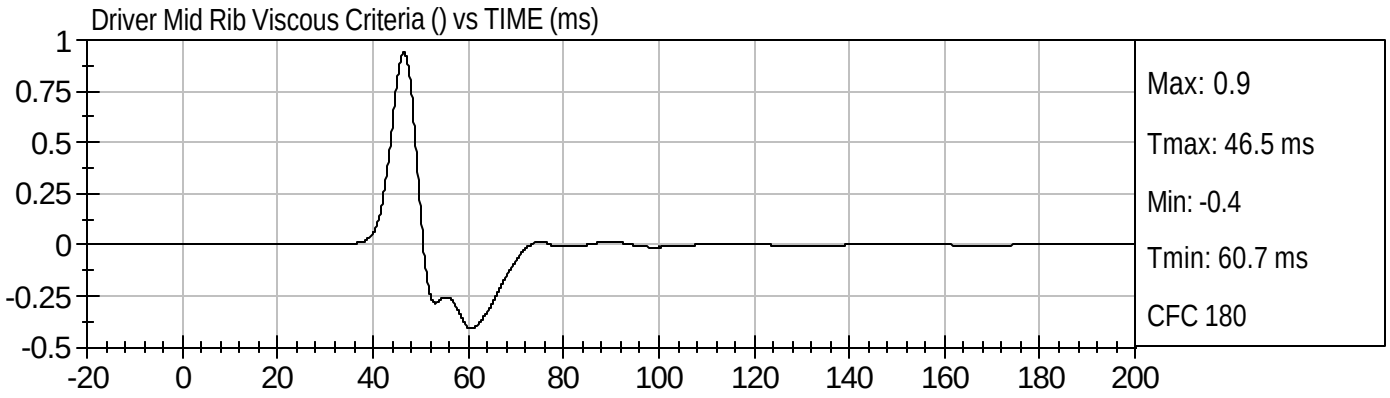
DR LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

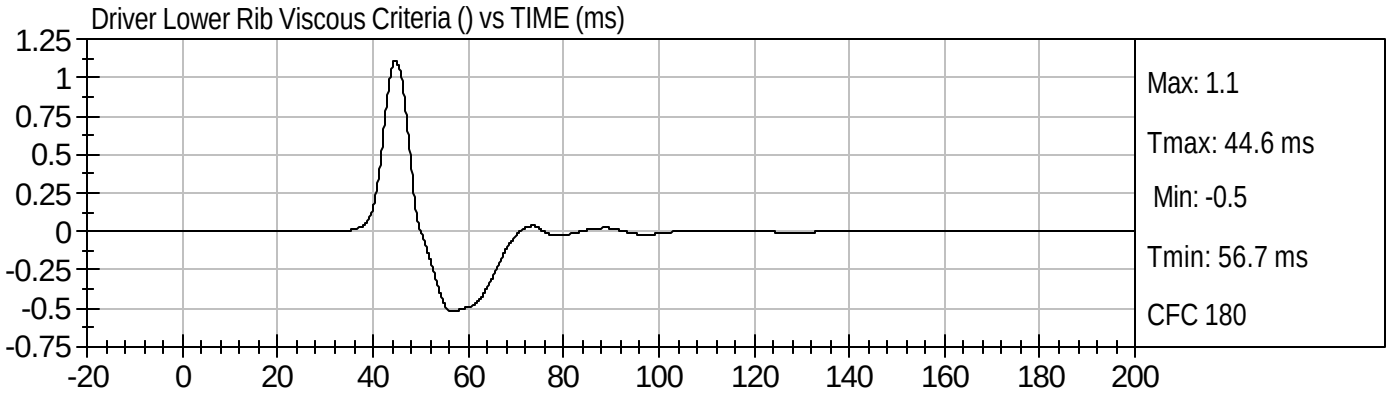


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

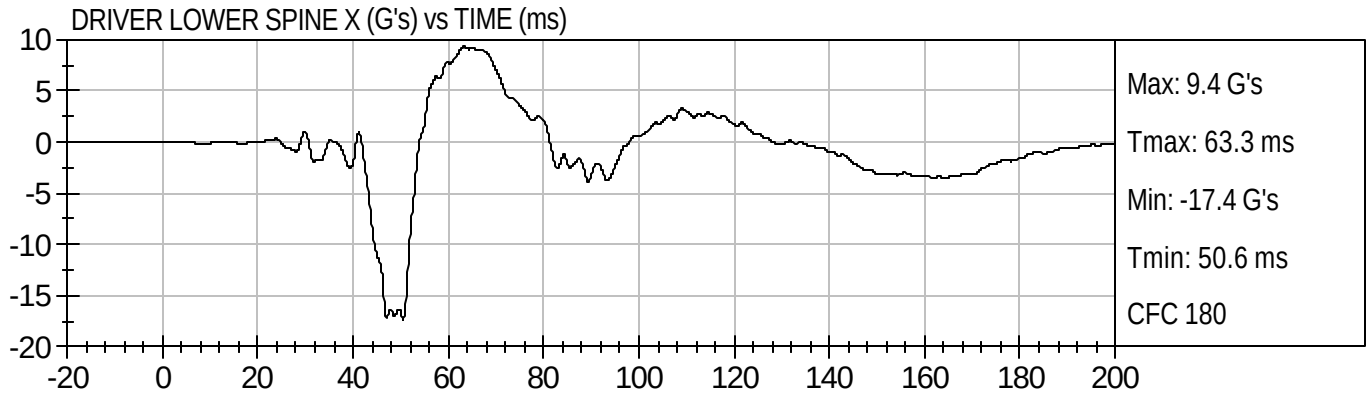


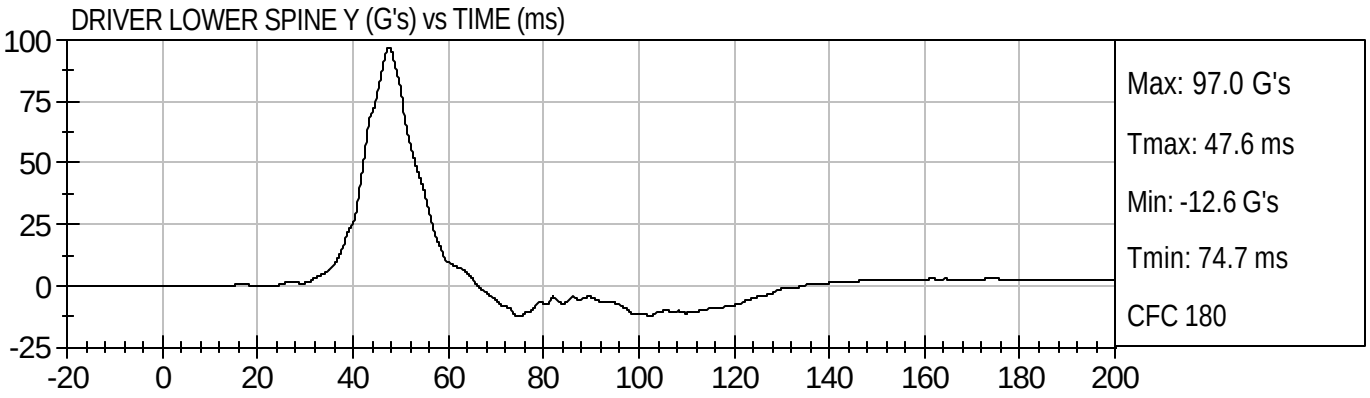


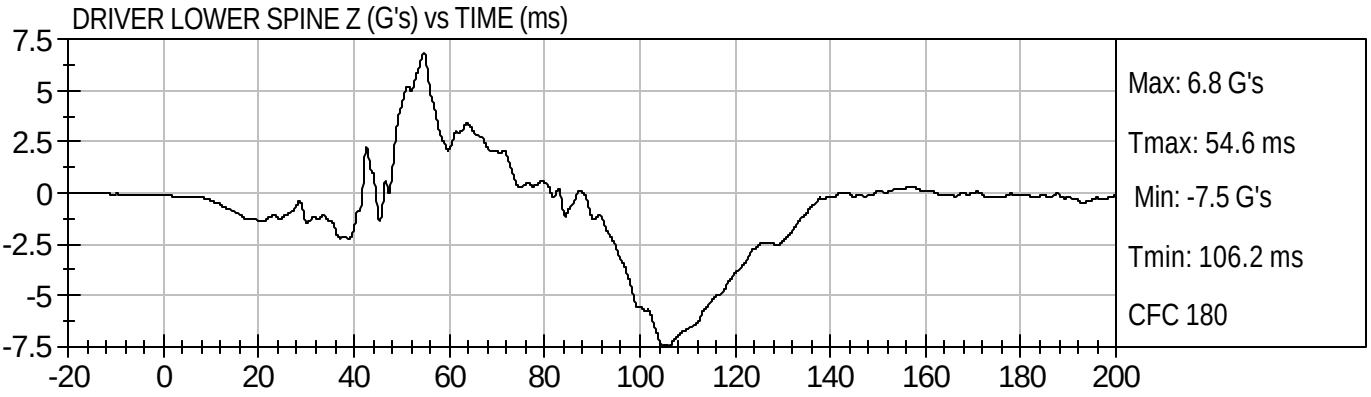


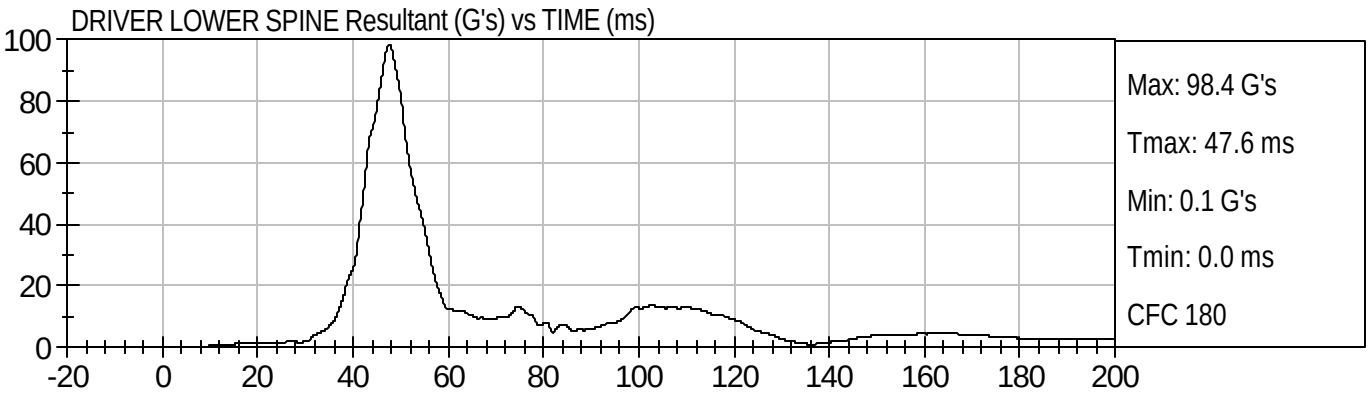
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

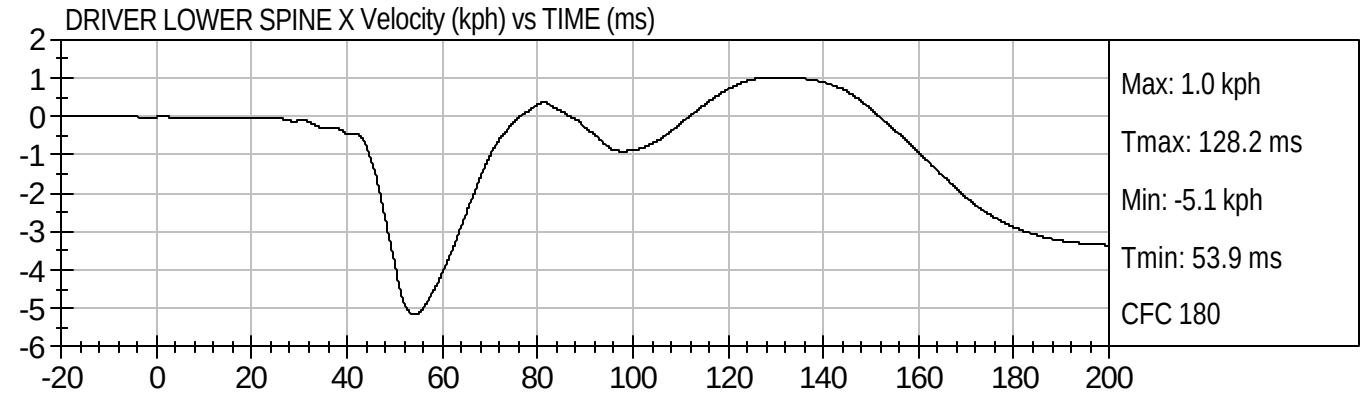
Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

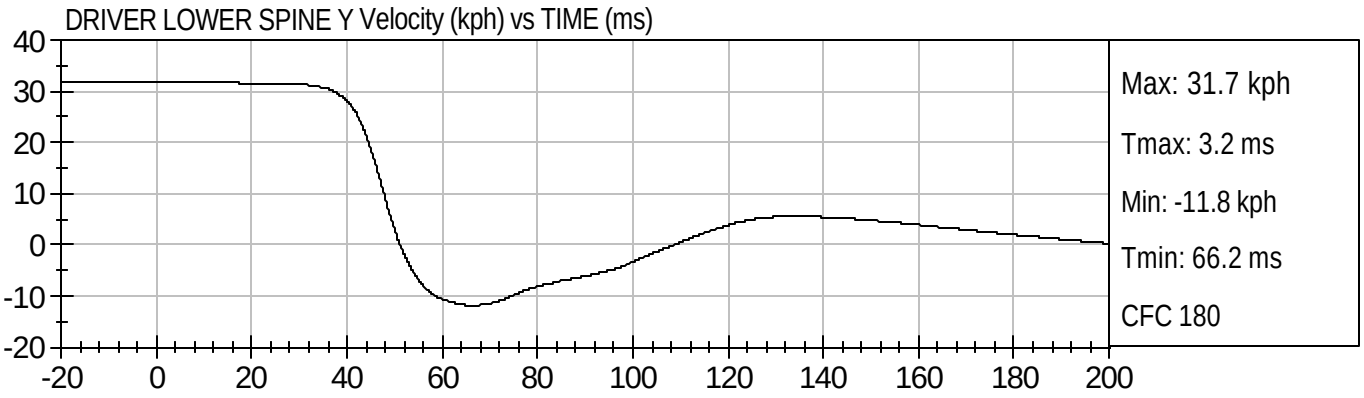


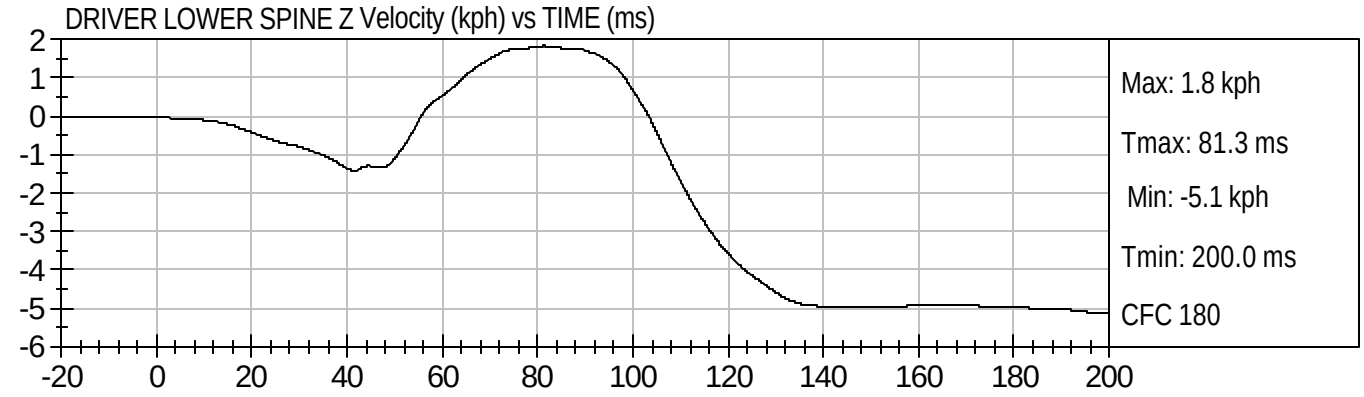






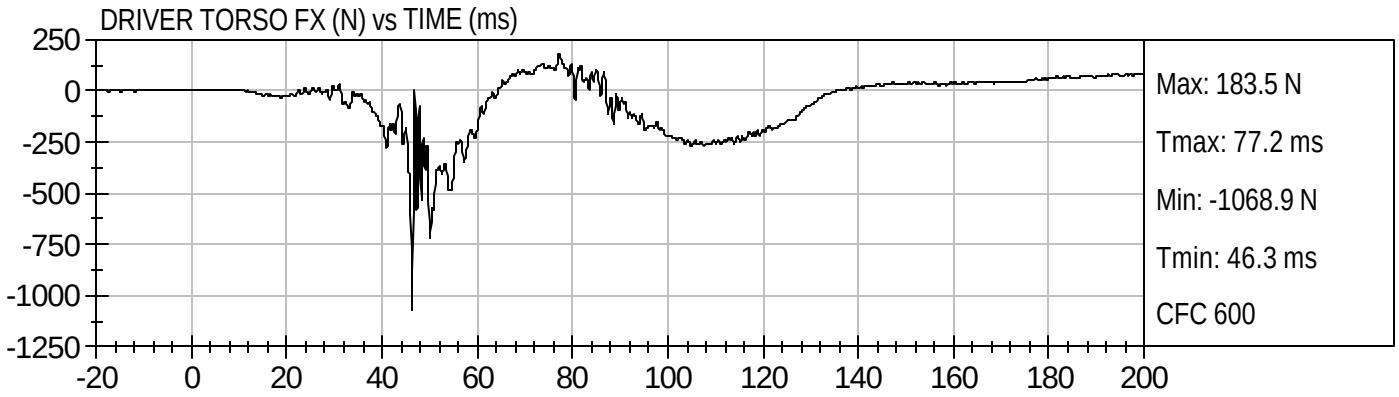

DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)
Max: 1.0 kph
Tmax: 128.2 ms
Min: -5.1 kph
Tmin: 53.9 ms
CFC 180

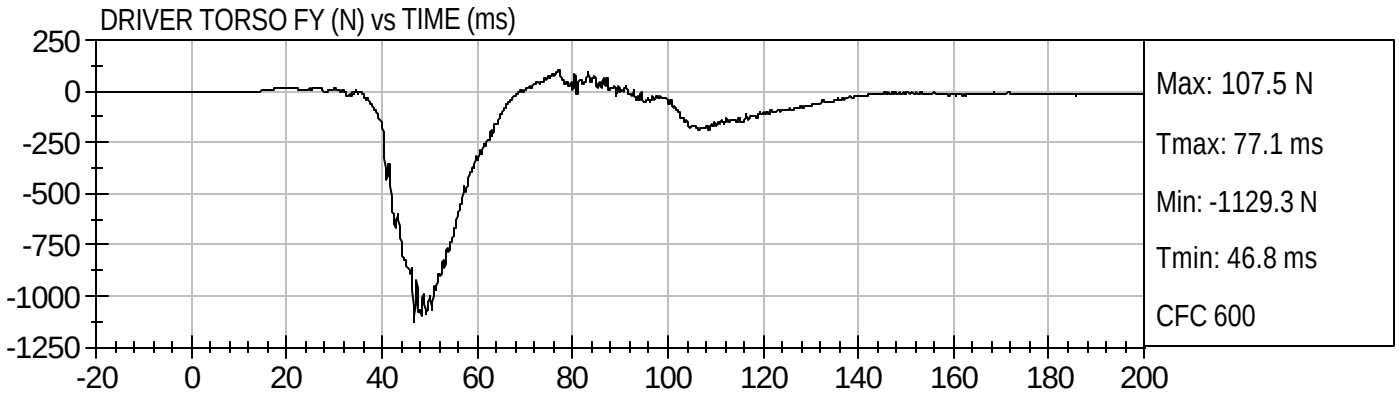

DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)
Max: 31.7 kph
Tmax: 3.2 ms
Min: -11.8 kph
Tmin: 66.2 ms
CFC 180

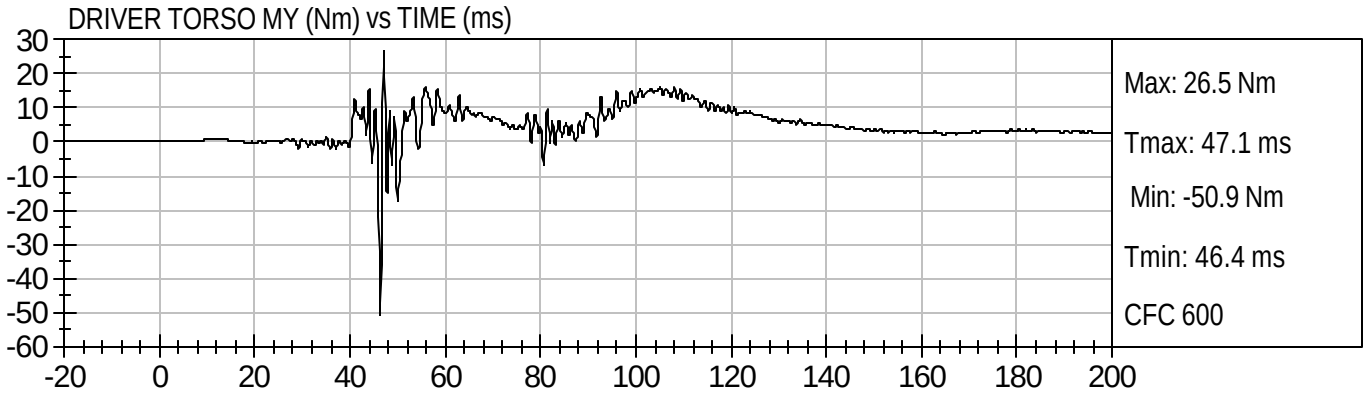

DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)
Max: 1.8 kph
Tmax: 81.3 ms
Min: -5.1 kph
Tmin: 200.0 ms
CFC 180

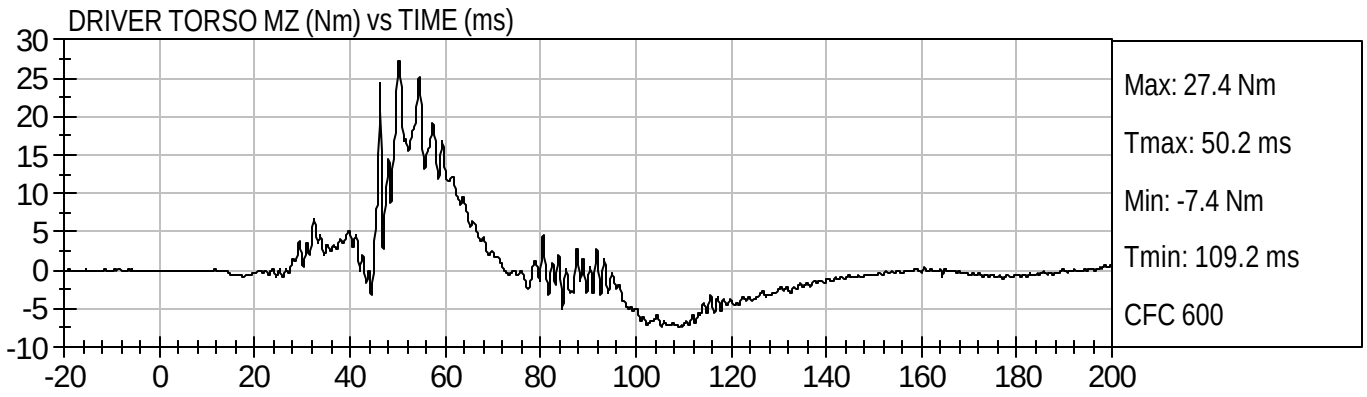
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



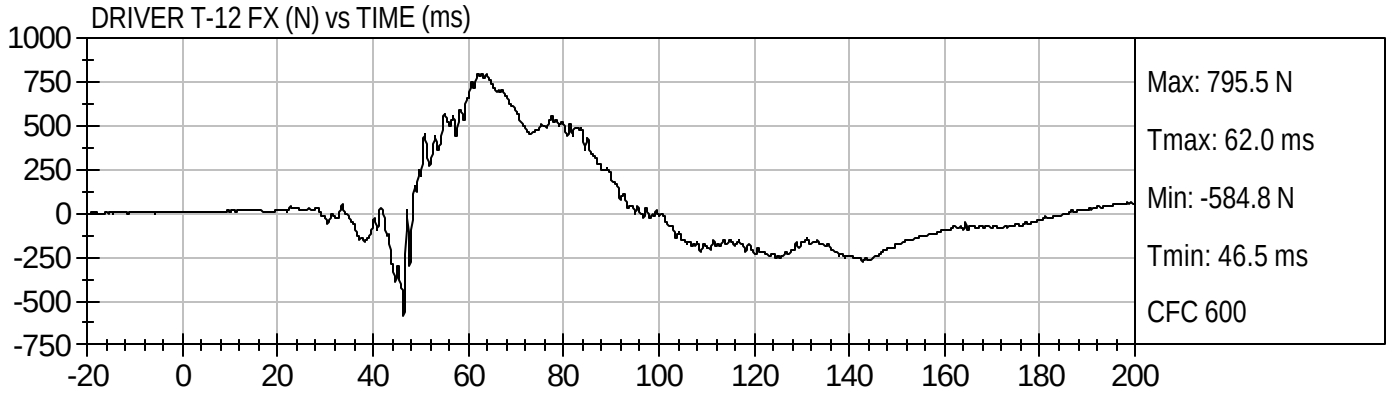


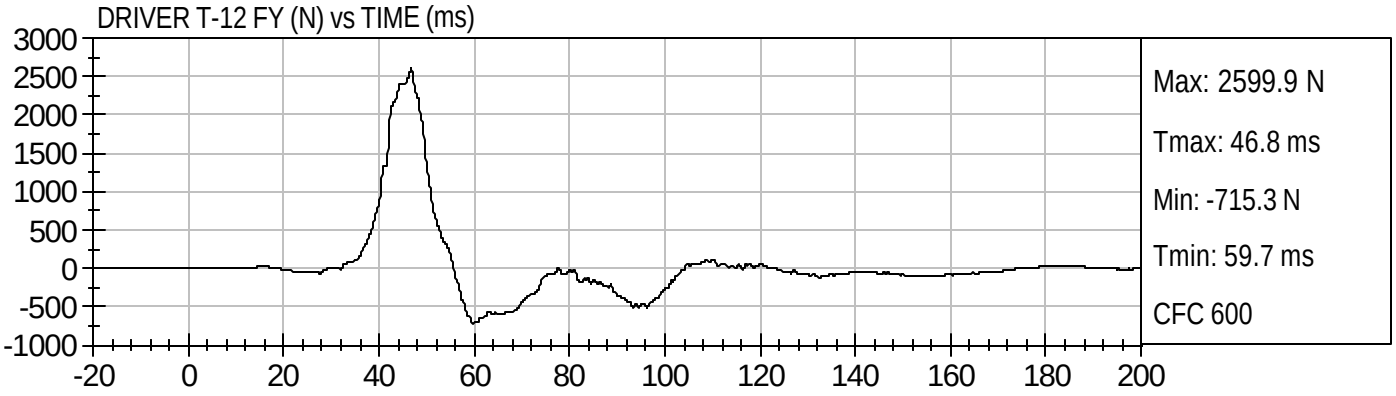


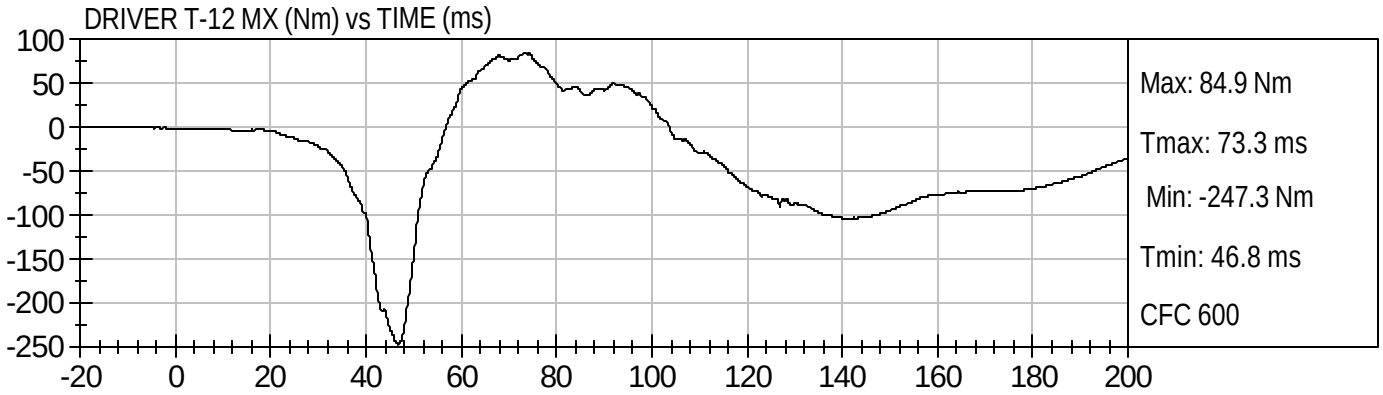


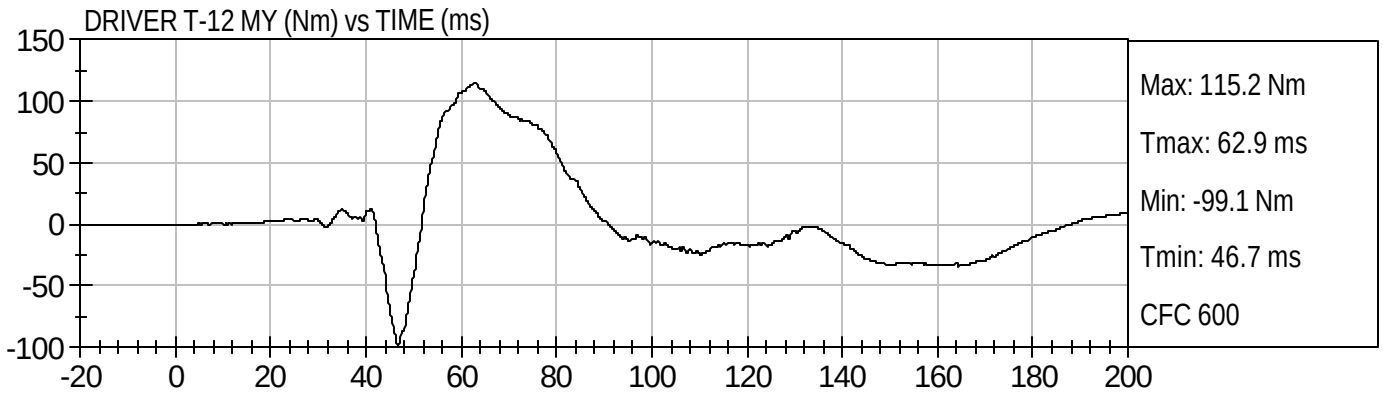
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



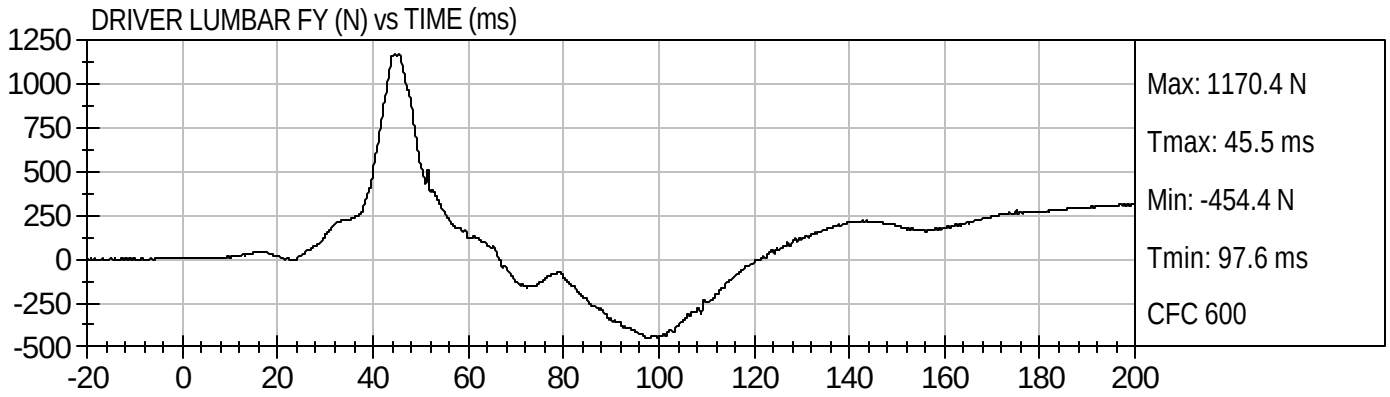


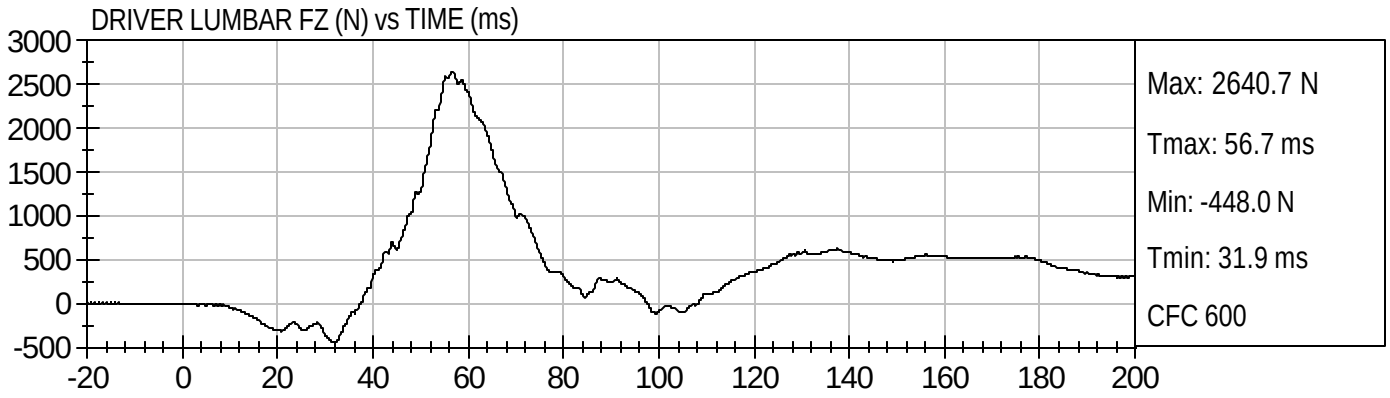


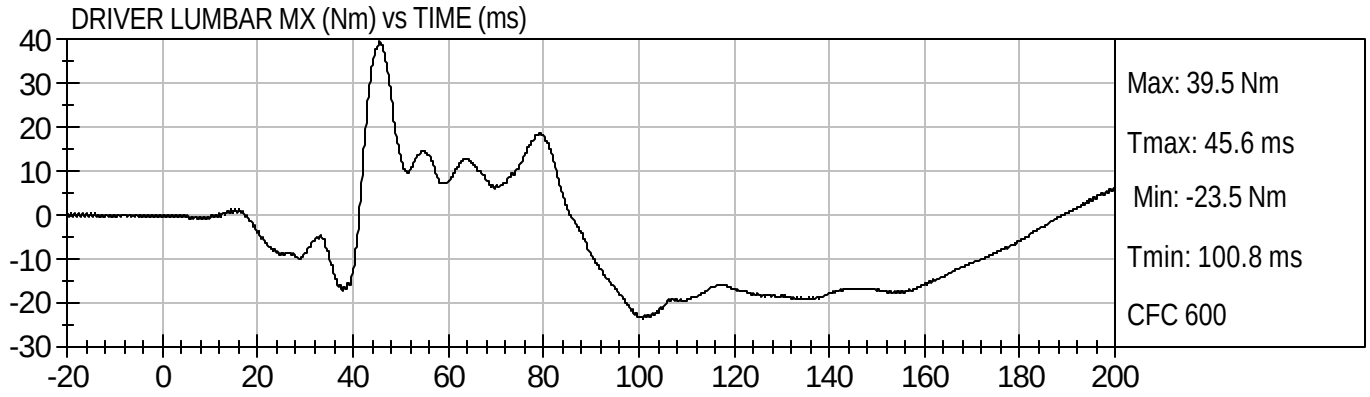


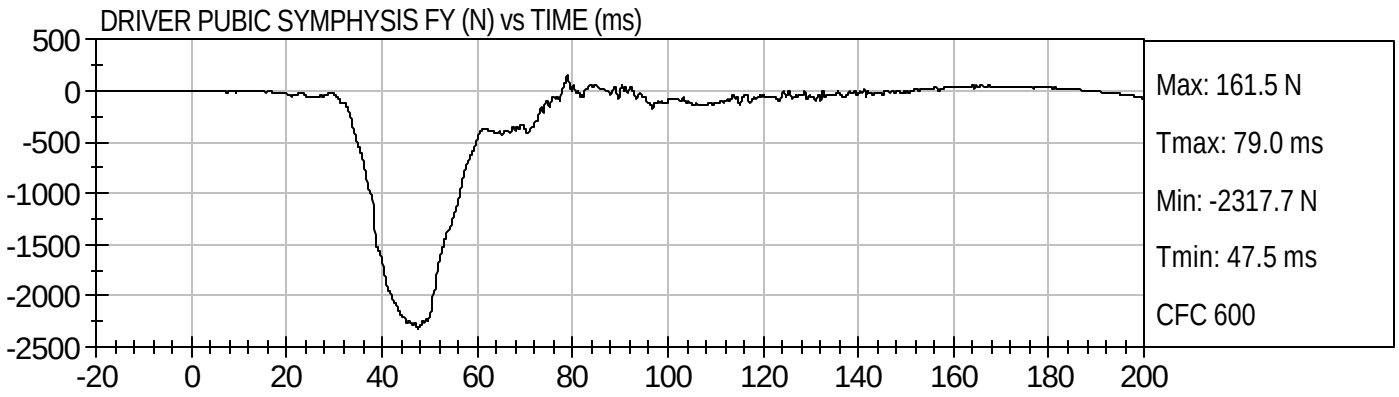
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)





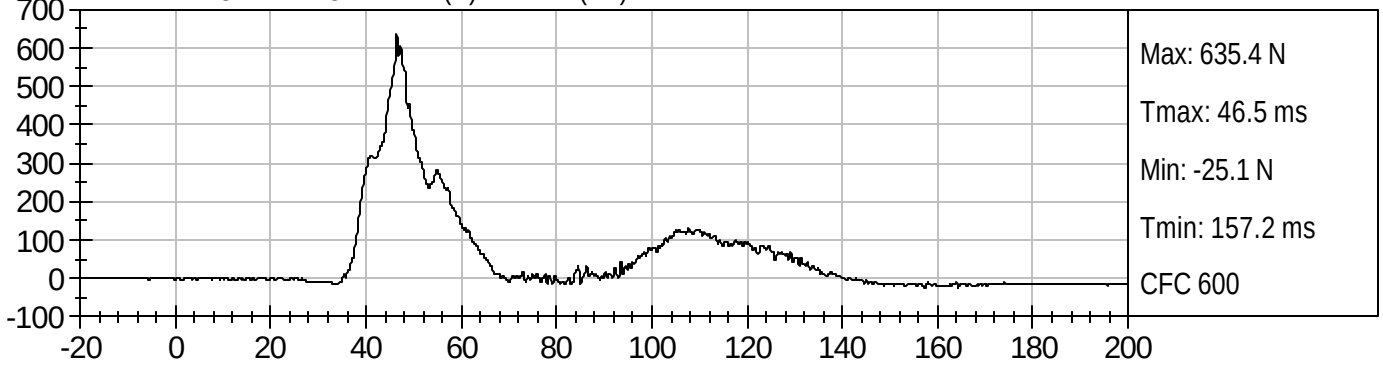




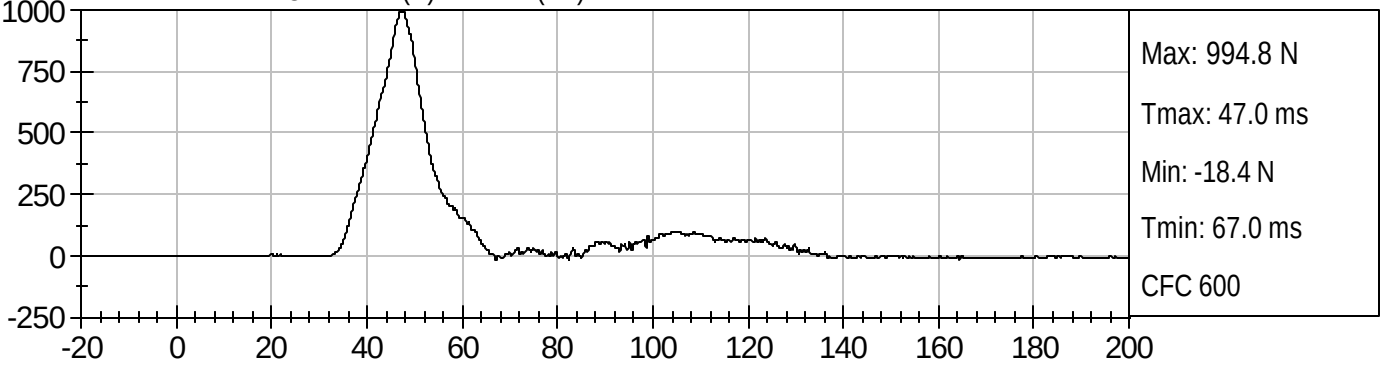
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

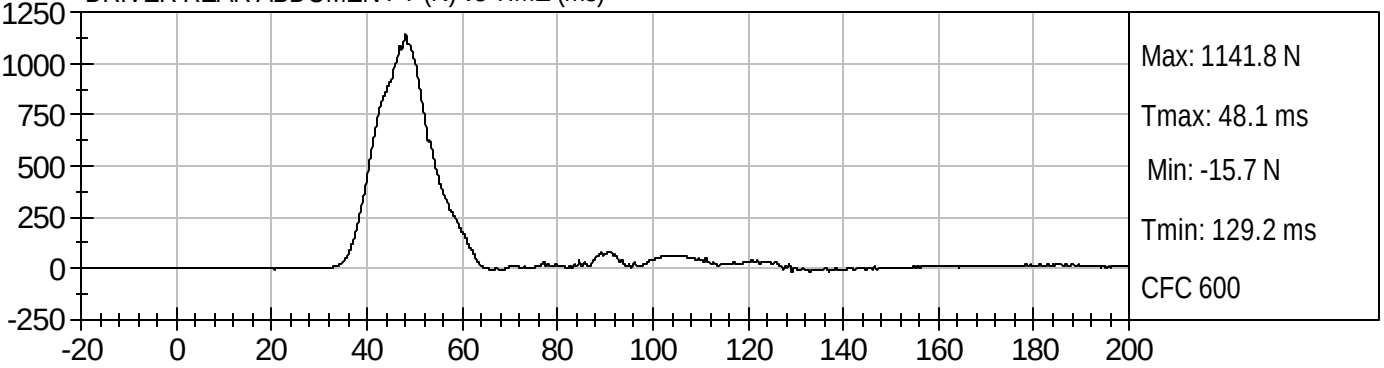
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



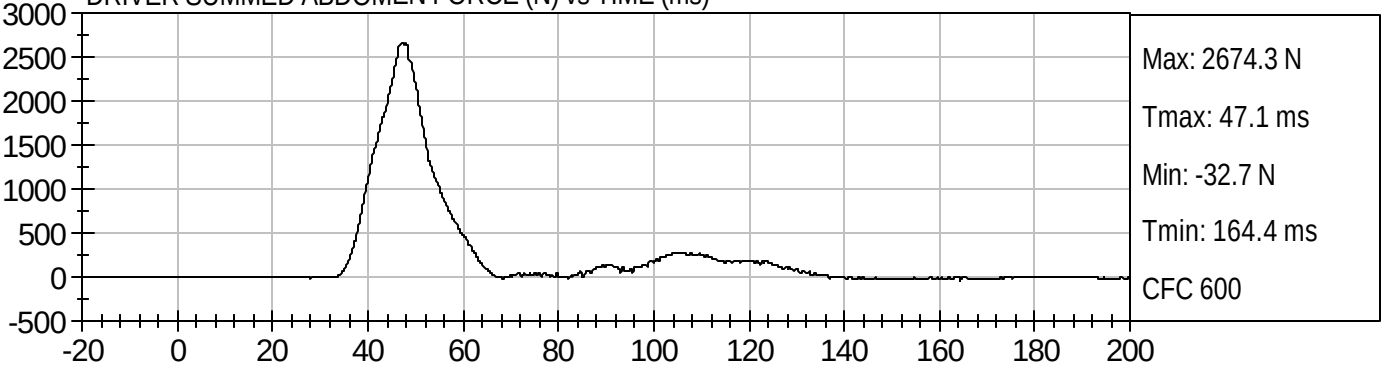
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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



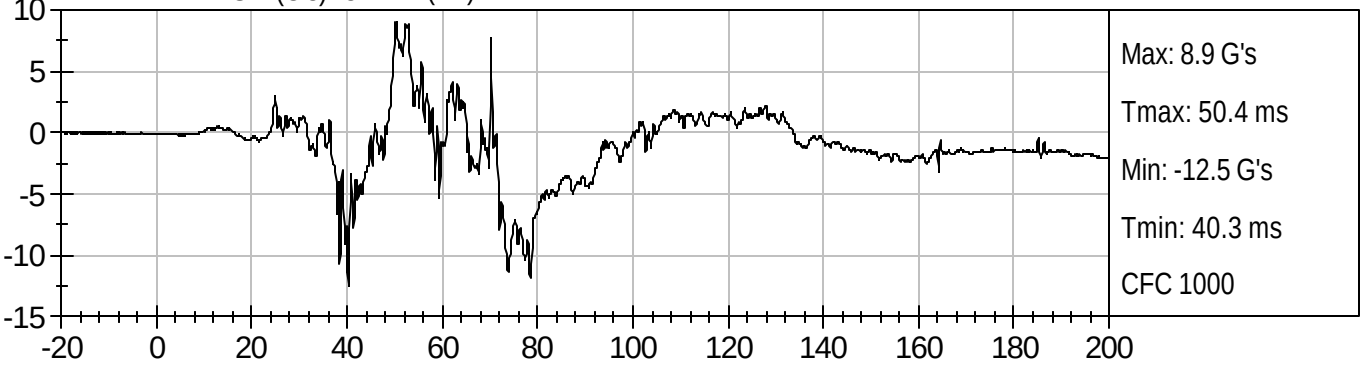
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



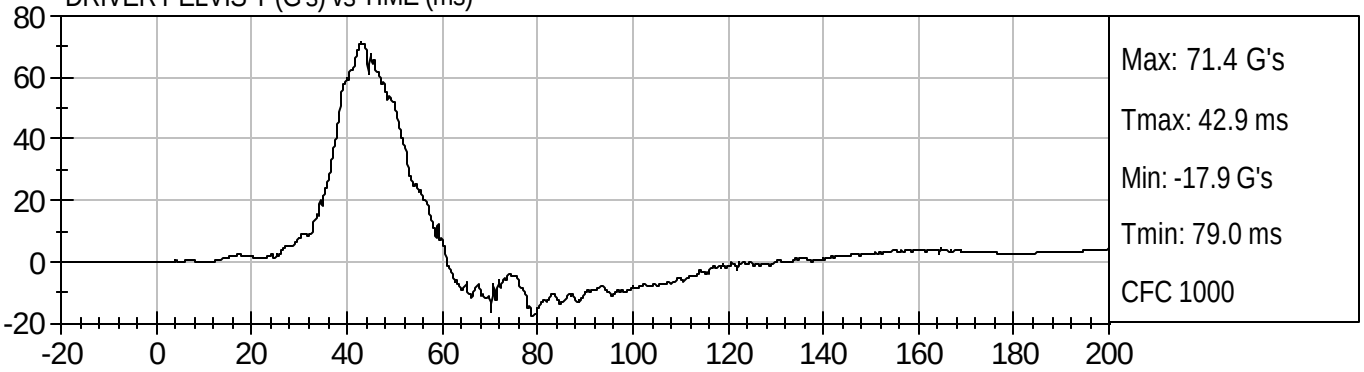
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

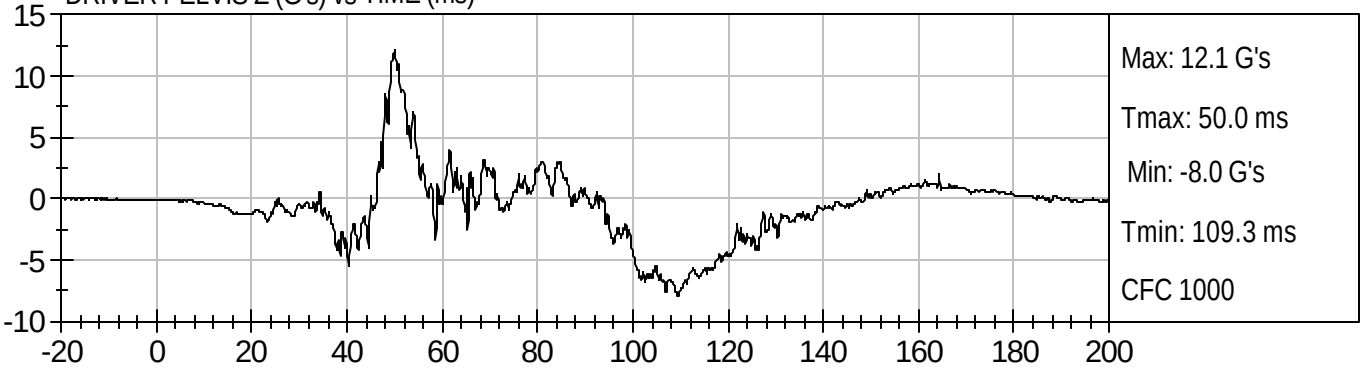
DRIVER PELVIS X (G's) vs TIME (ms)



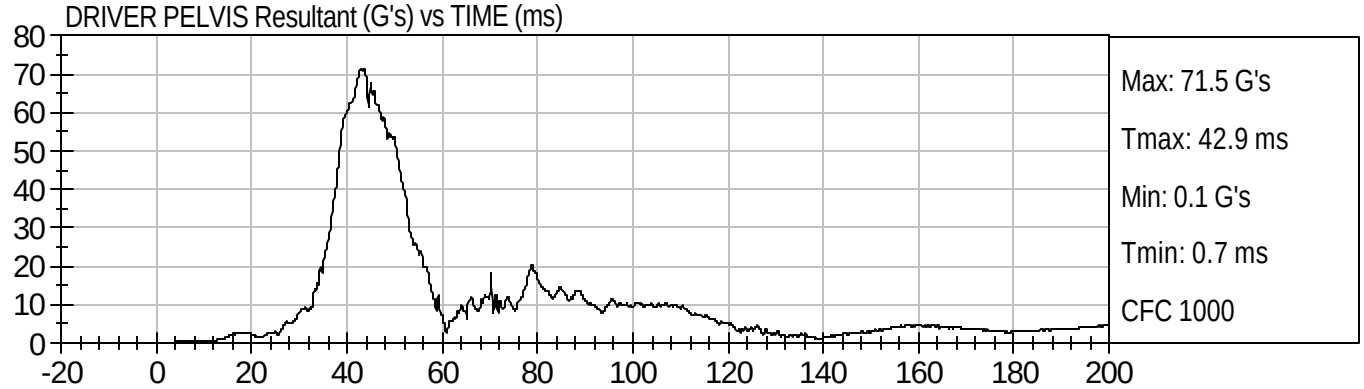
DRIVER PELVIS Y (G's) vs TIME (ms)

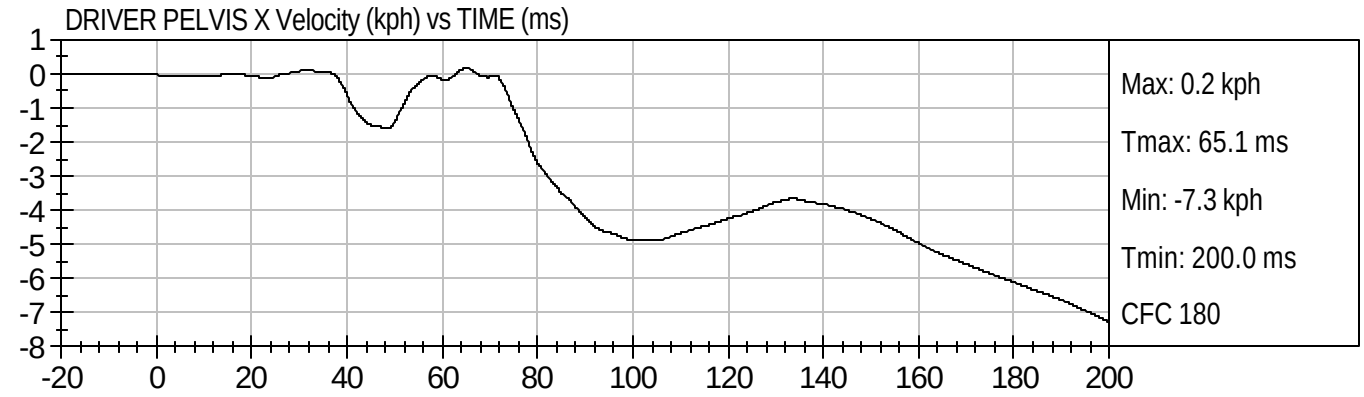


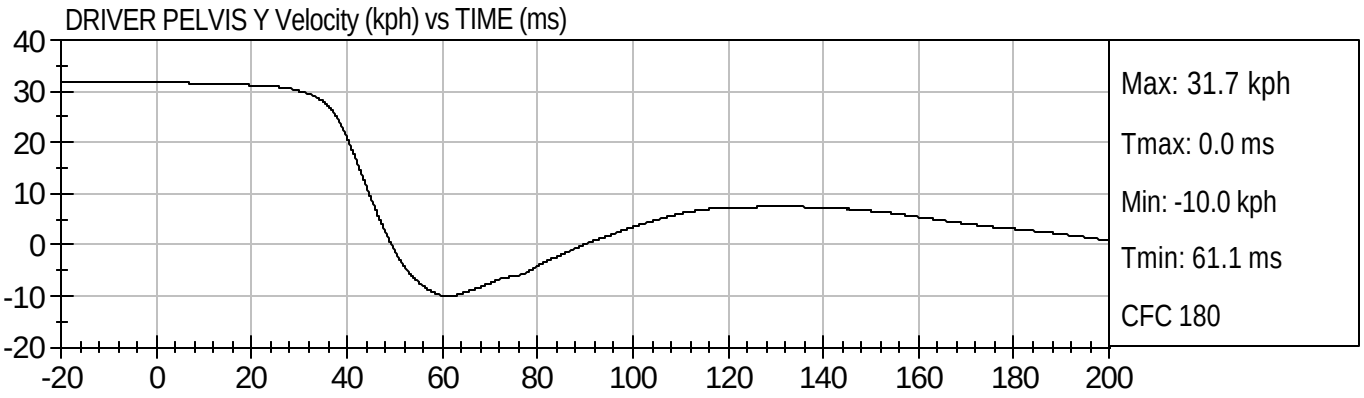
DRIVER PELVIS Z (G's) vs TIME (ms)

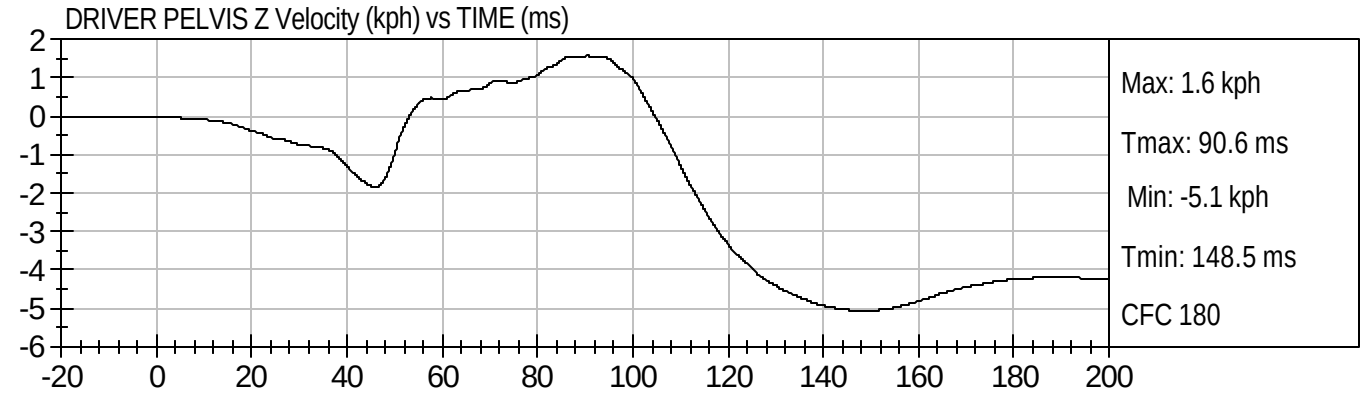


DRIVER PELVIS Resultant (G's) vs TIME (ms)



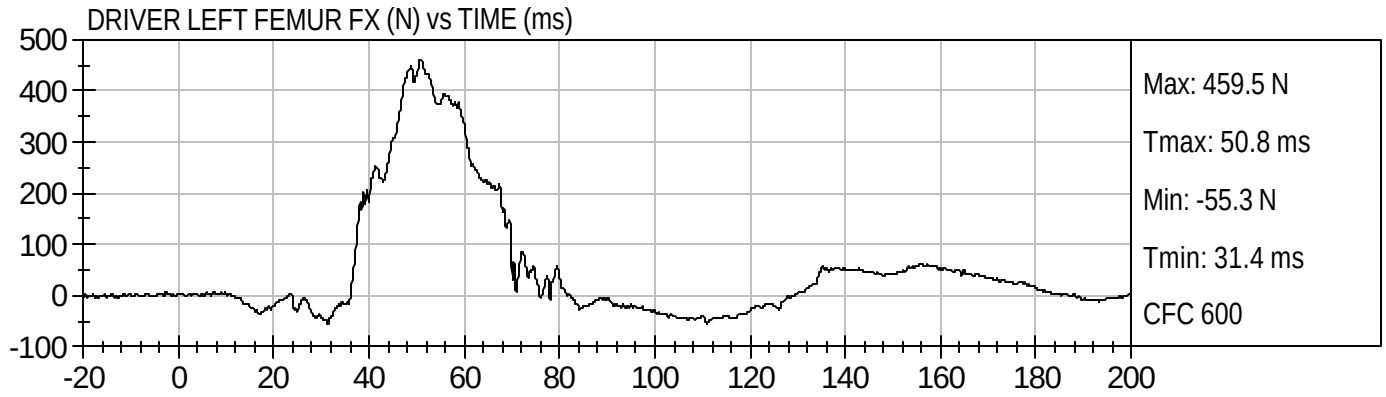

DRIVER PELVIS X Velocity (kph) vs TIME (ms)
Max: 0.2 kph
Tmax: 65.1 ms
Min: -7.3 kph
Tmin: 200.0 ms
CFC 180

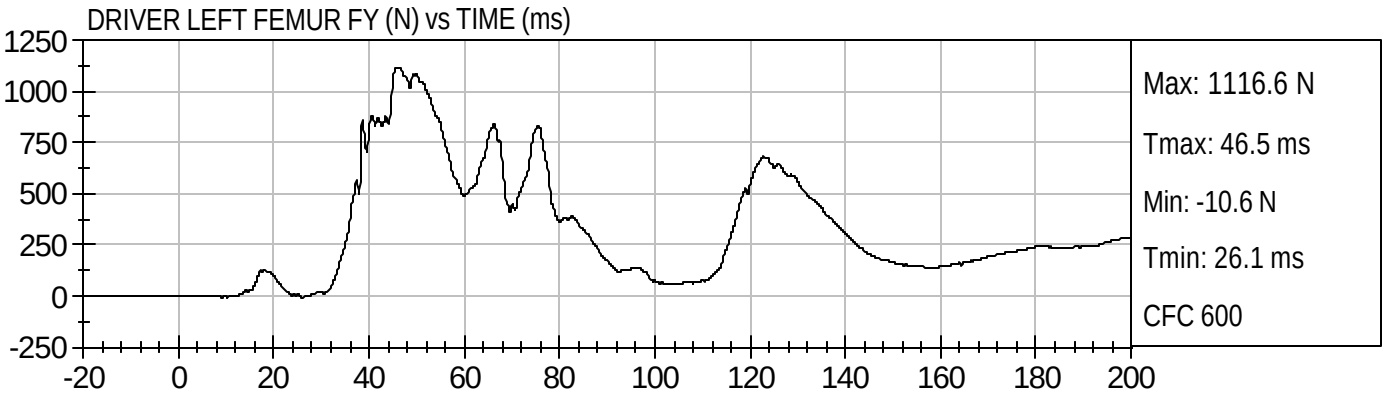

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
Max: 31.7 kph
Tmax: 0.0 ms
Min: -10.0 kph
Tmin: 61.1 ms
CFC 180

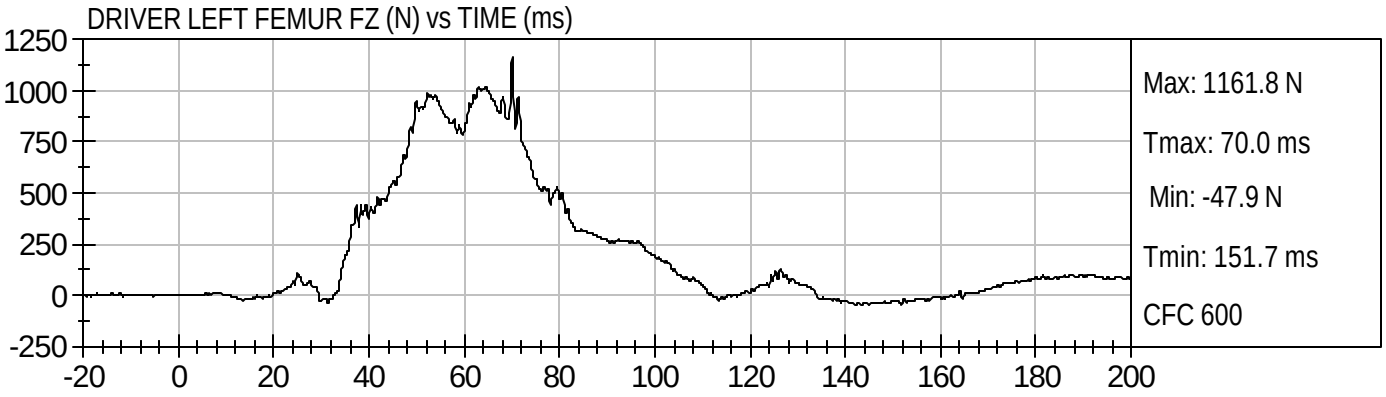

DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
Max: 1.6 kph
Tmax: 90.6 ms
Min: -5.1 kph
Tmin: 148.5 ms
CFC 180

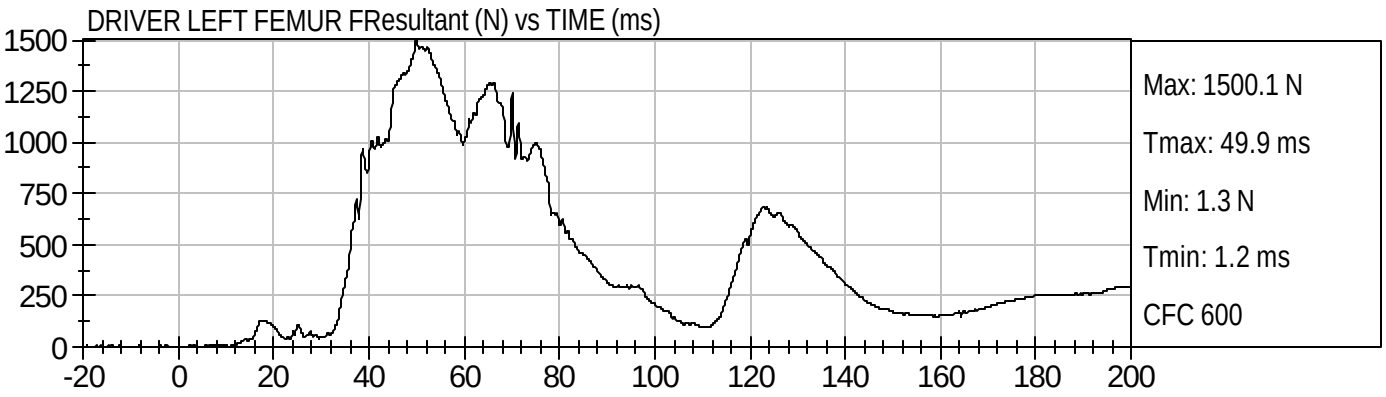
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



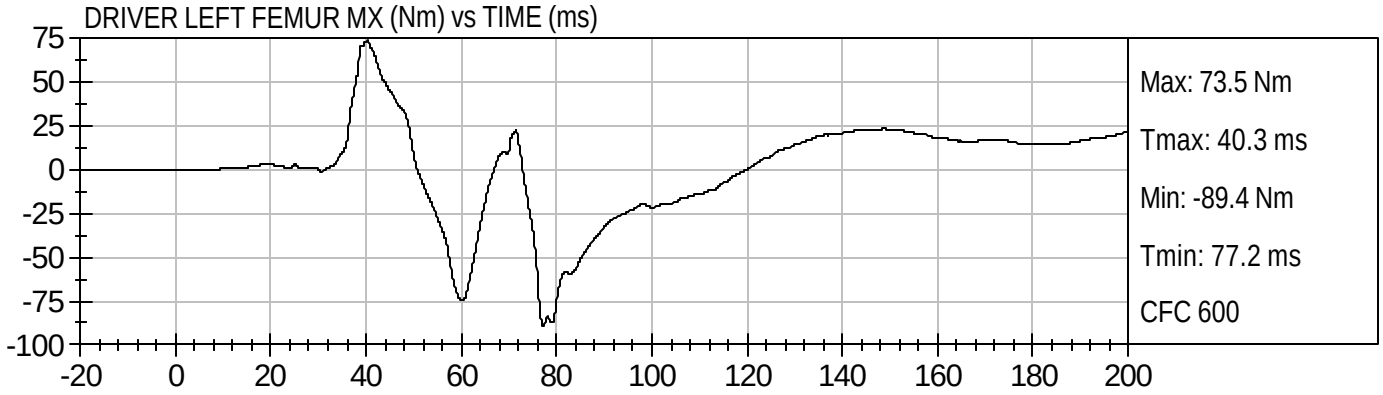


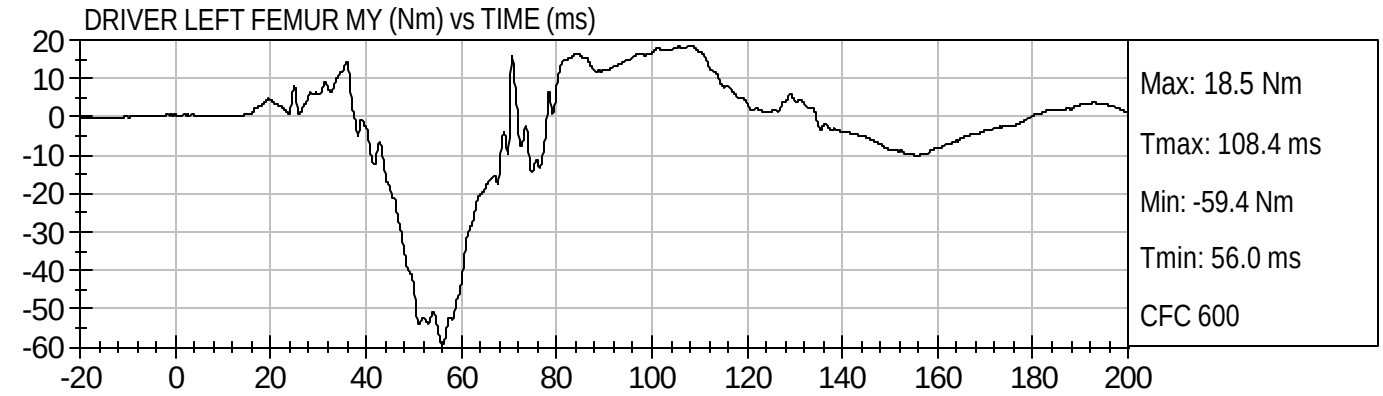


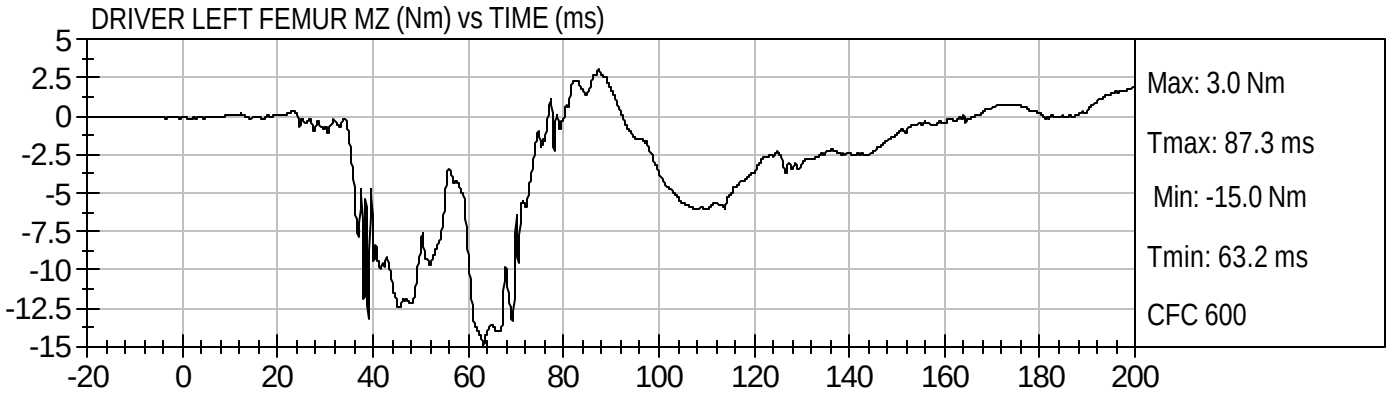


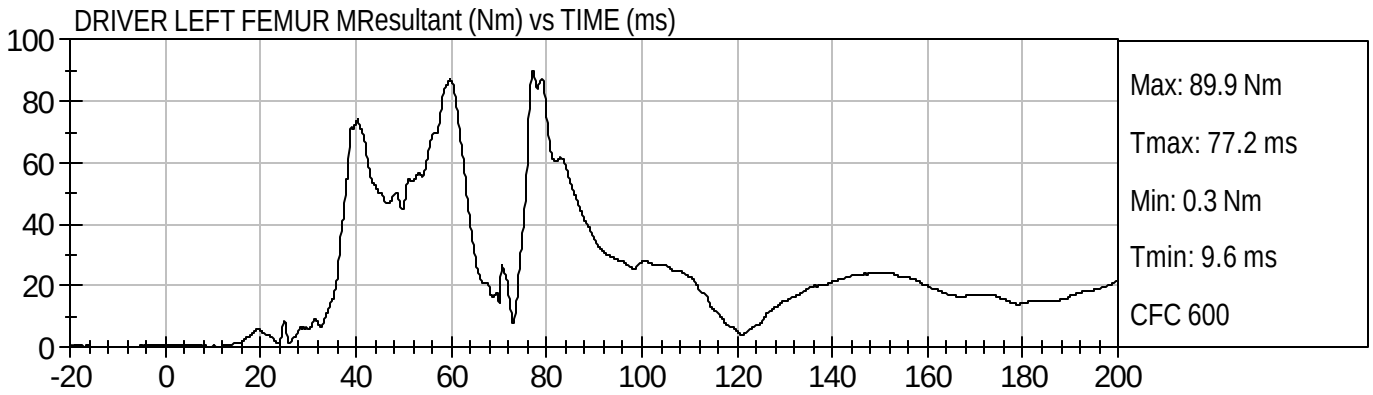
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)





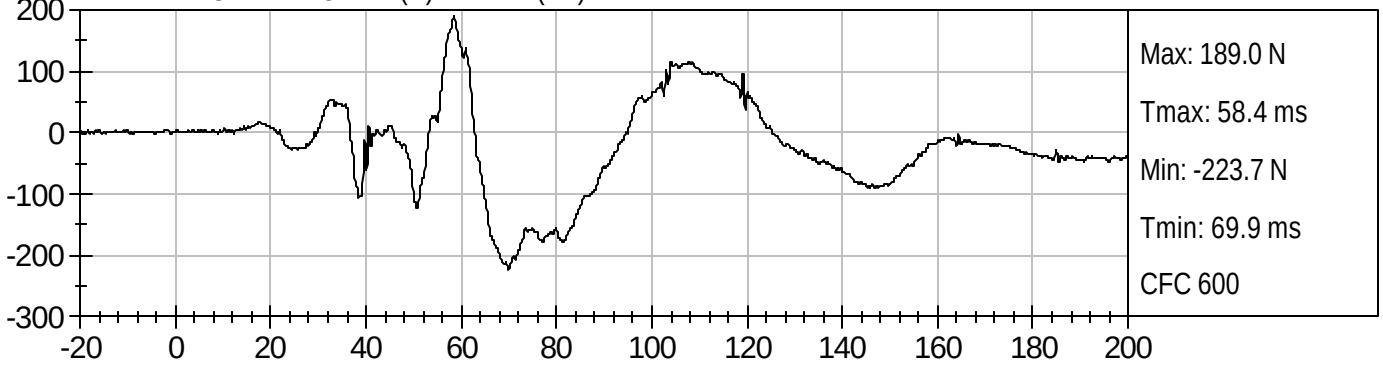




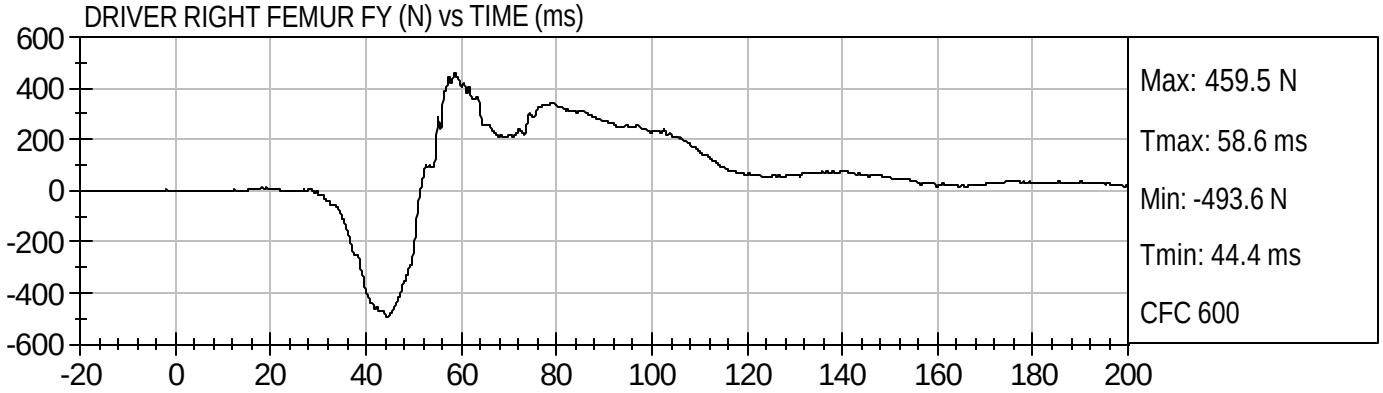
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

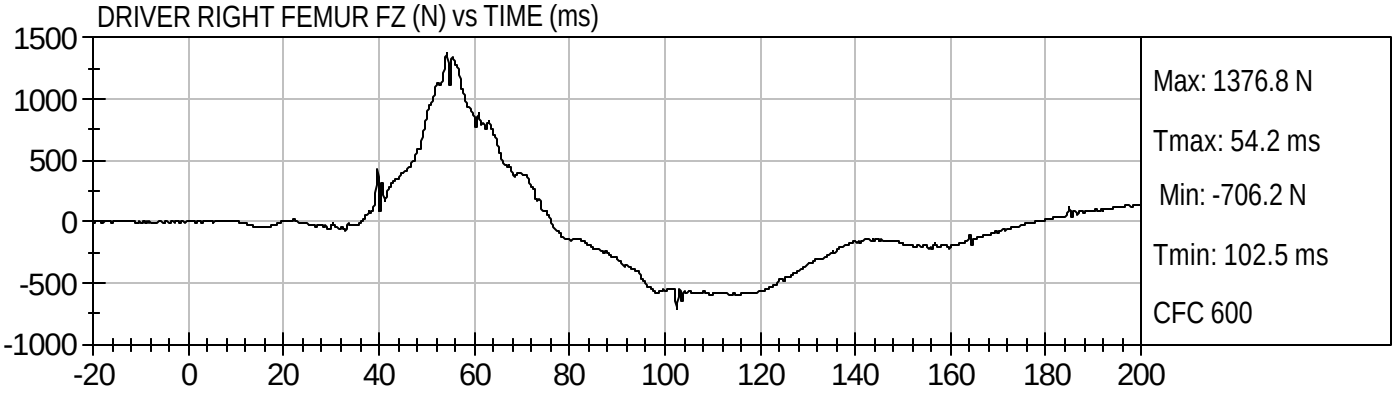
DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



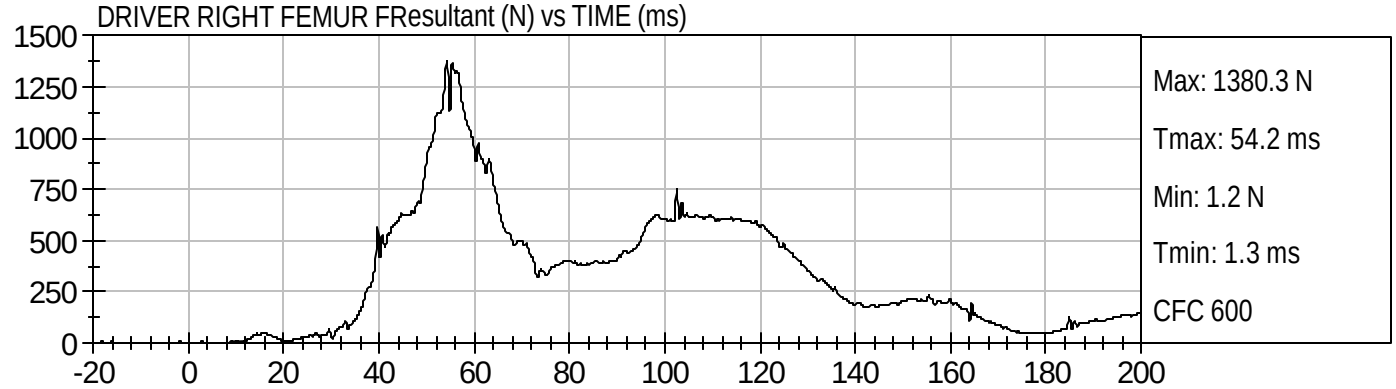
DRIVER RIGHT FEMUR FY (N) vs TIME (ms)



DRIVER RIGHT FEMUR FZ (N) vs TIME (ms)



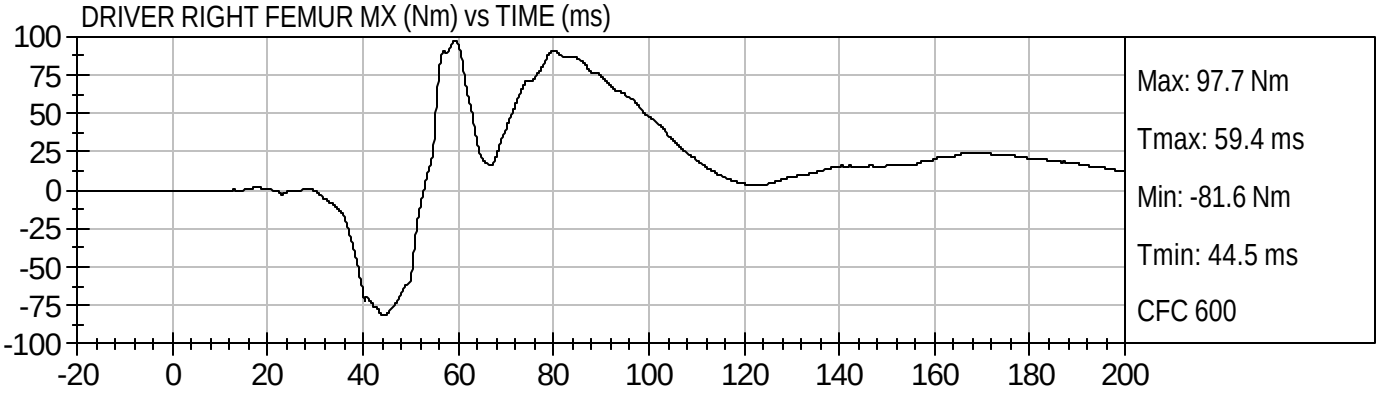
DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)



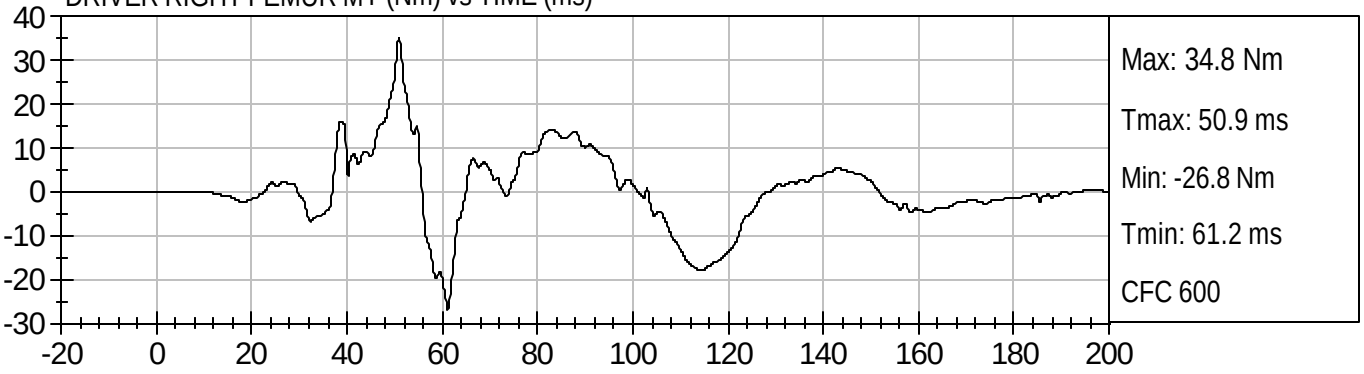
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

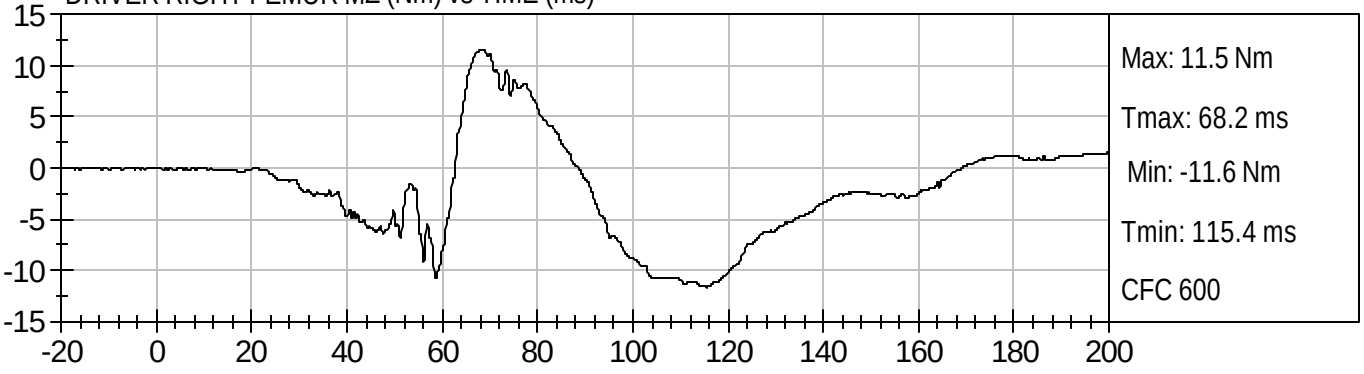
DRIVER RIGHT FEMUR MX (Nm) vs TIME (ms)



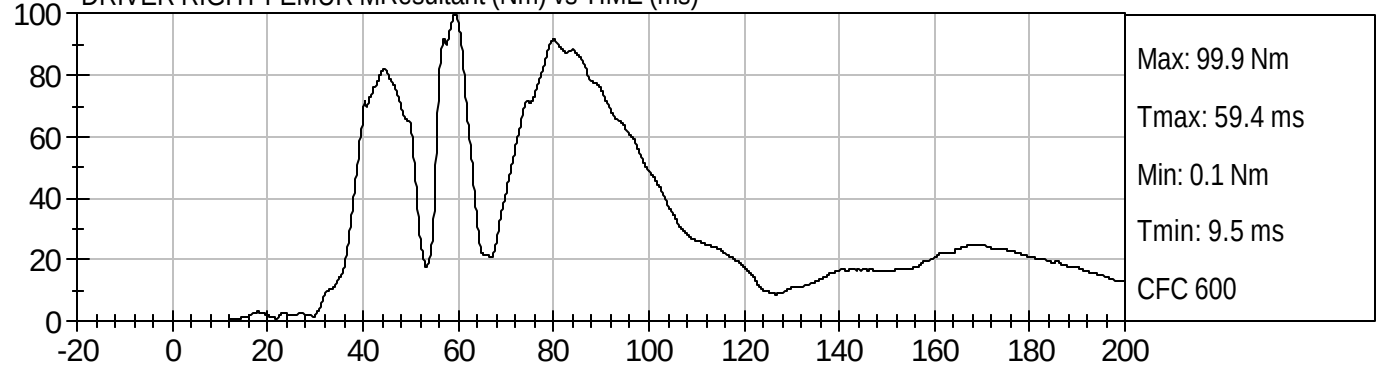
DRIVER RIGHT FEMUR MY (Nm) vs TIME (ms)



DRIVER RIGHT FEMUR MZ (Nm) vs TIME (ms)

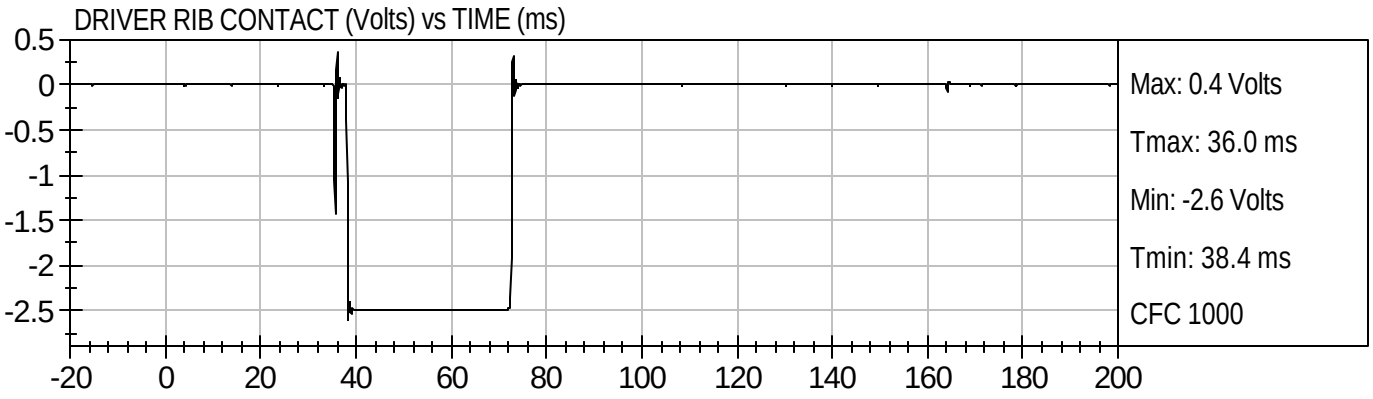


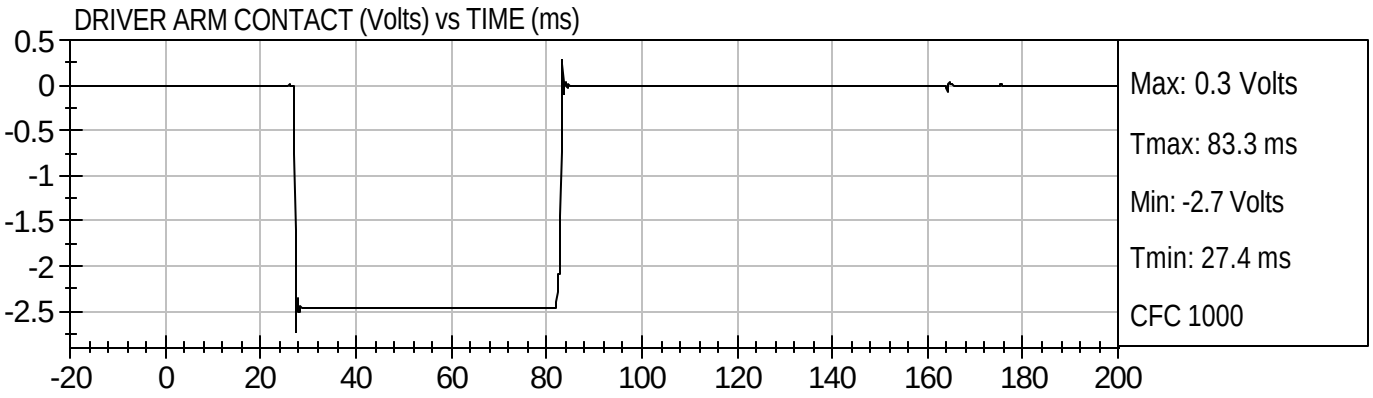
DRIVER RIGHT FEMUR MResultant (Nm) vs TIME (ms)



20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

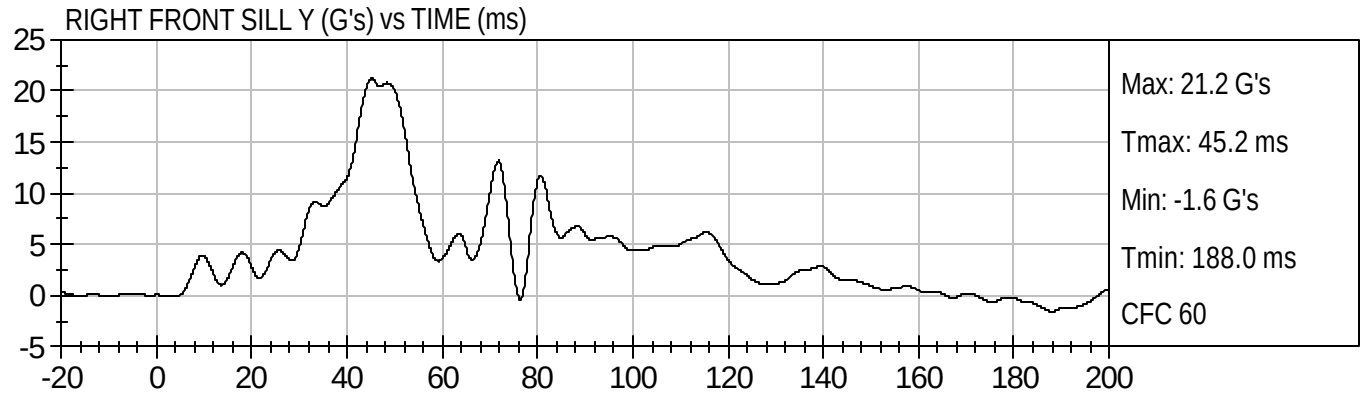
Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

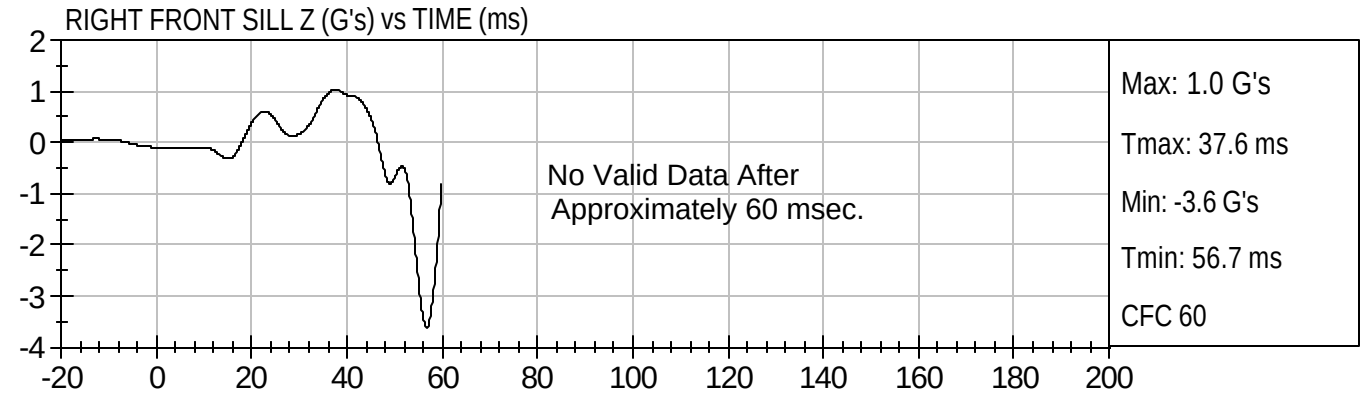


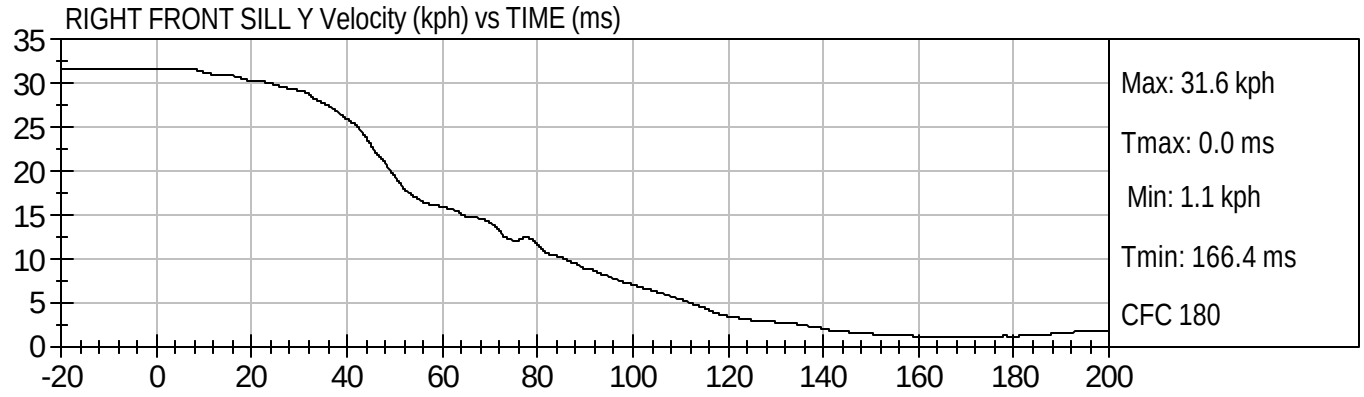


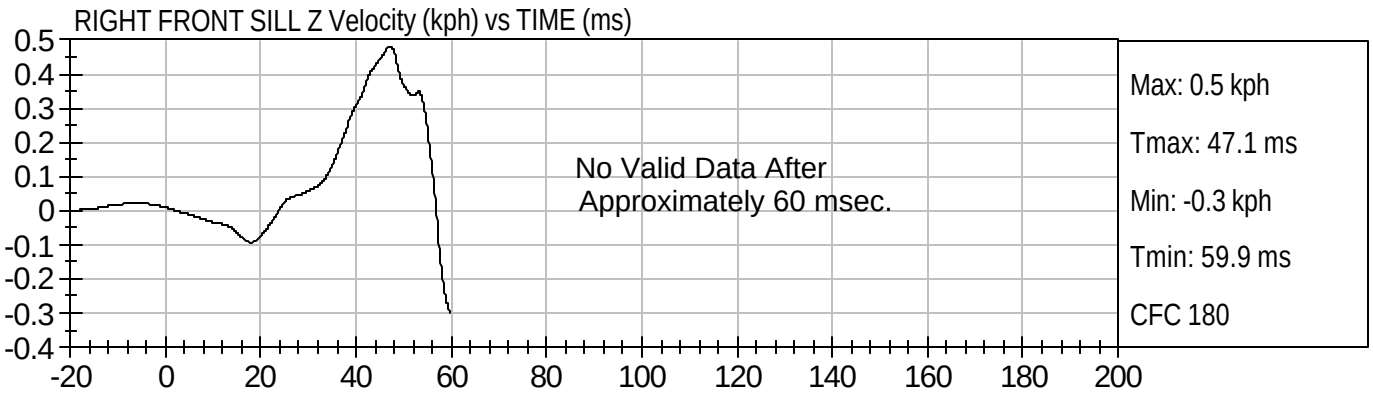
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



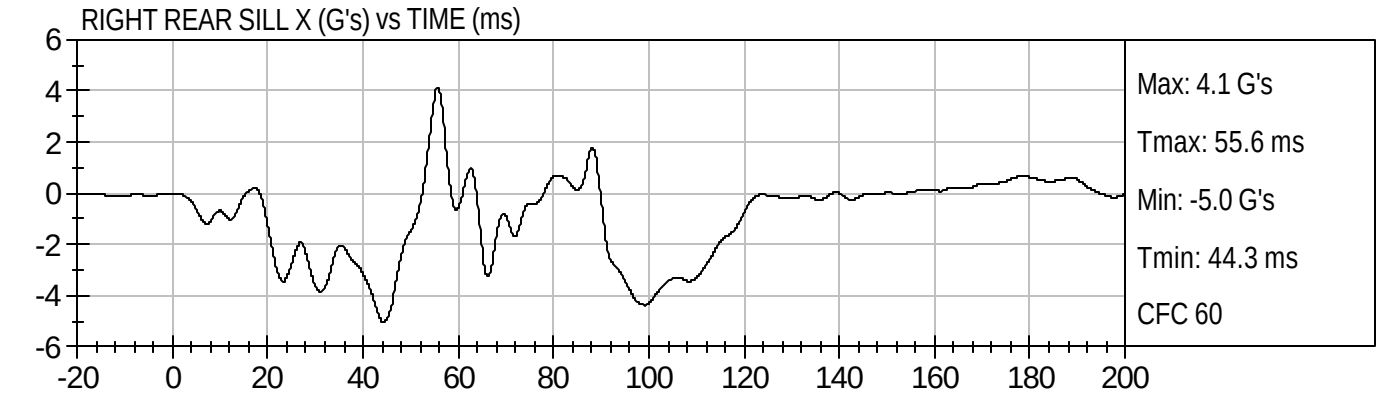


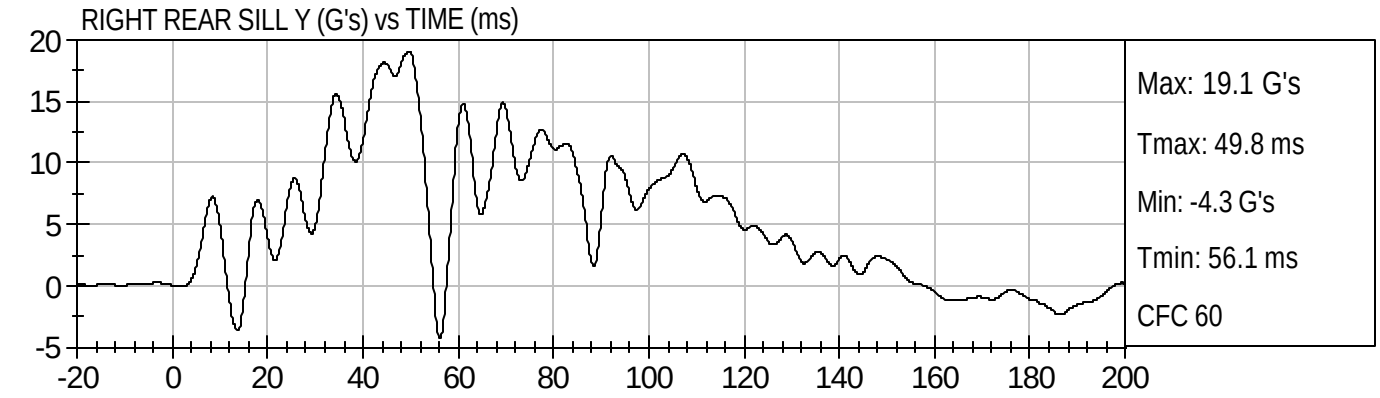


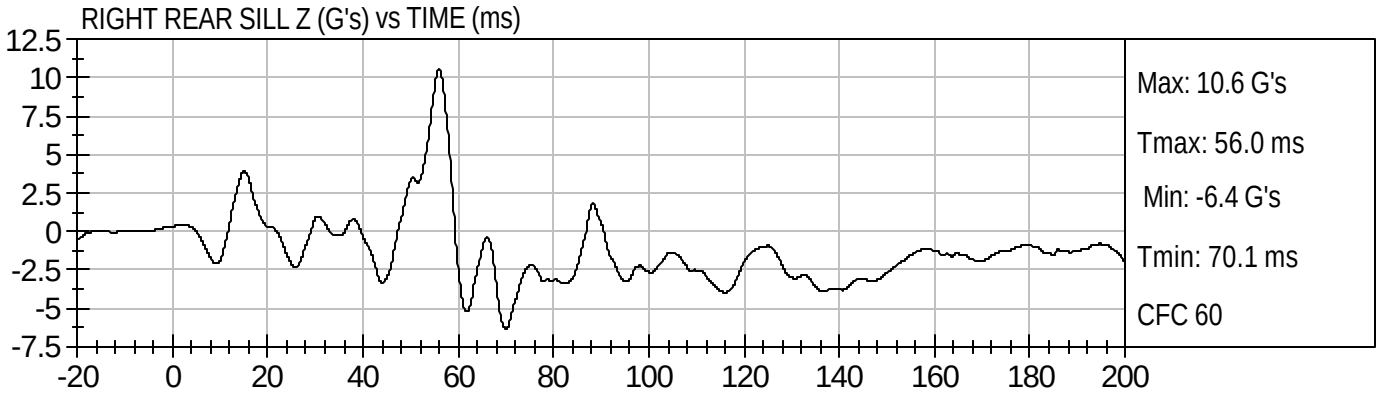


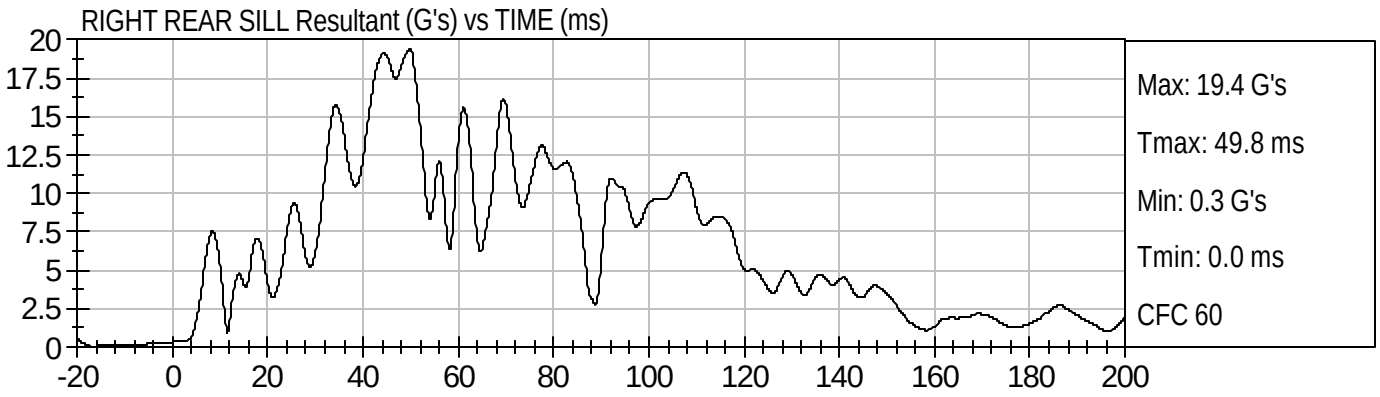
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

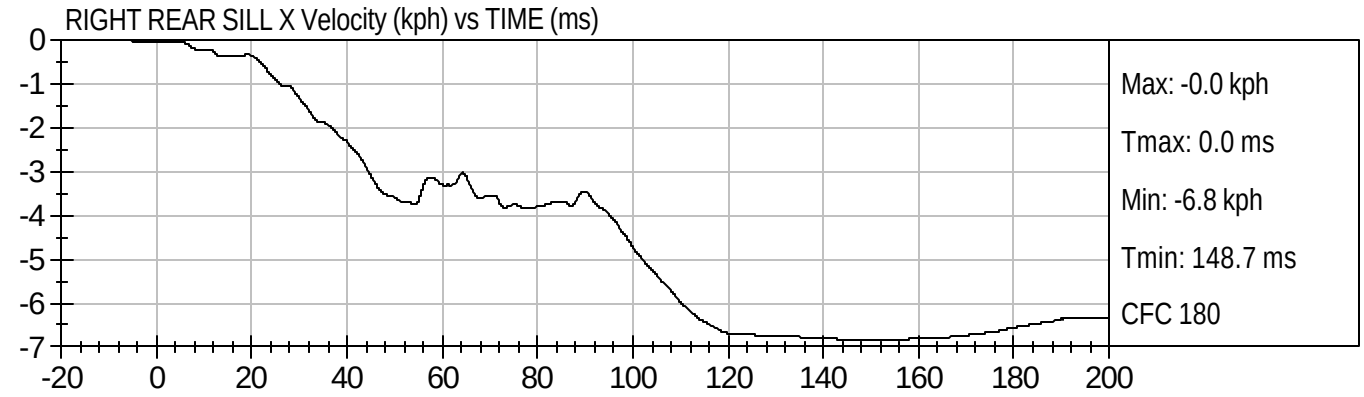
Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

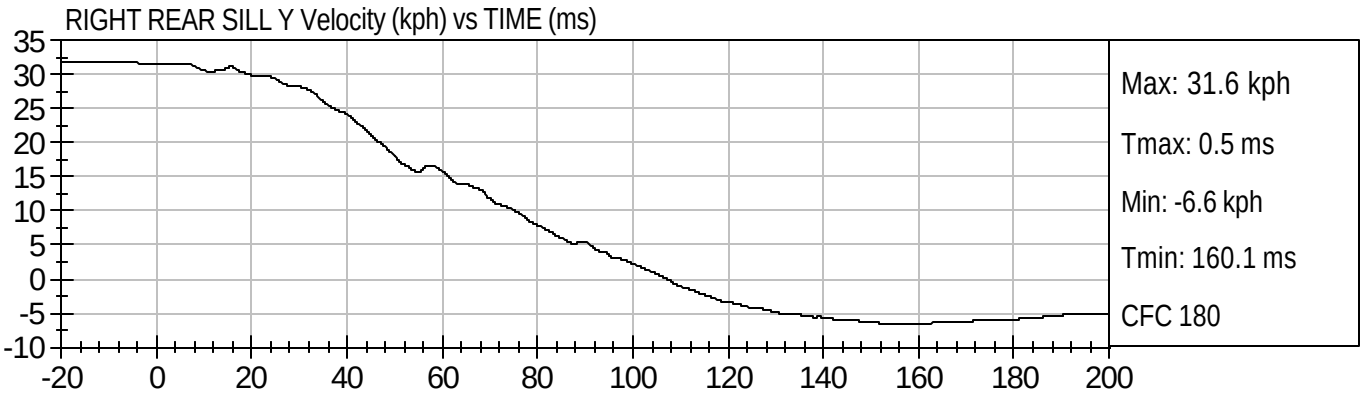


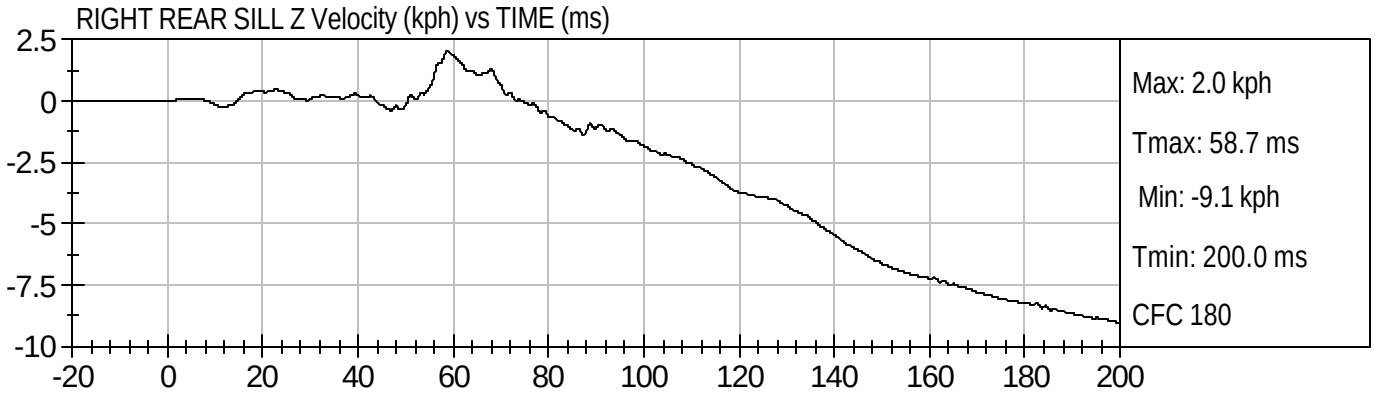







RIGHT REAR SILL X Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 0.0 ms
Min: -6.8 kph
Tmin: 148.7 ms
CFC 180

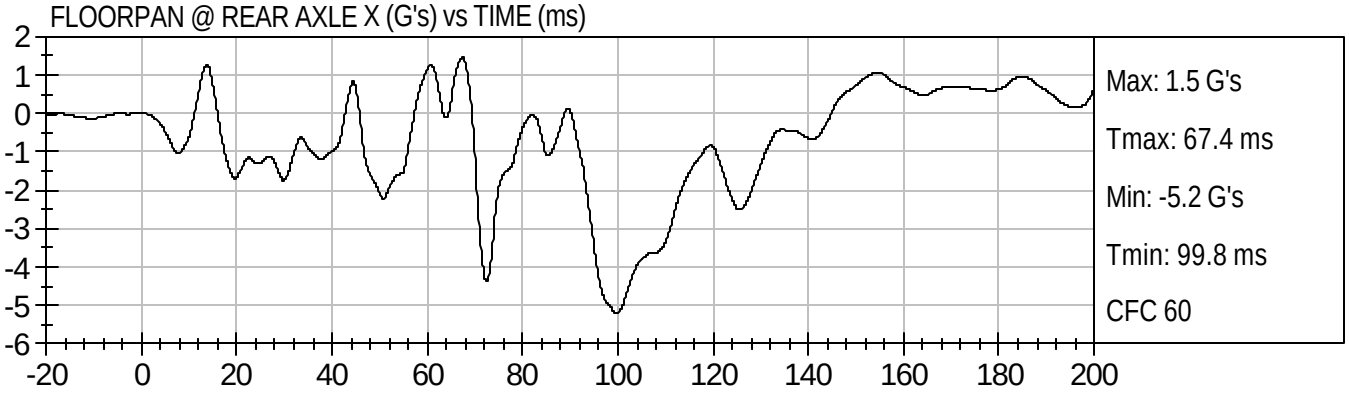

RIGHT REAR SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 31.6 kph
Tmax: 0.5 ms
Min: -6.6 kph
Tmin: 160.1 ms
CFC 180


RIGHT REAR SILL Z Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2.0 kph
Tmax: 58.7 ms
Min: -9.1 kph
Tmin: 200.0 ms
CFC 180

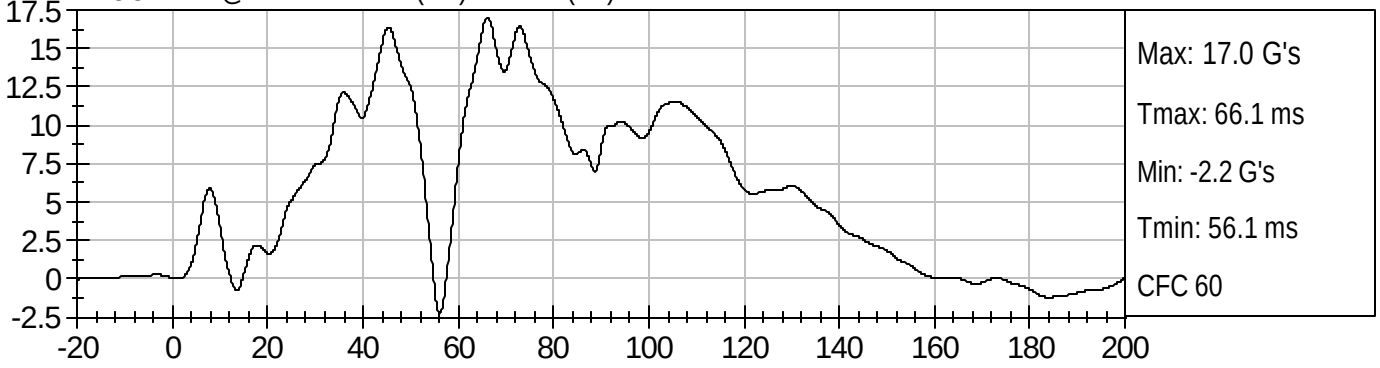
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

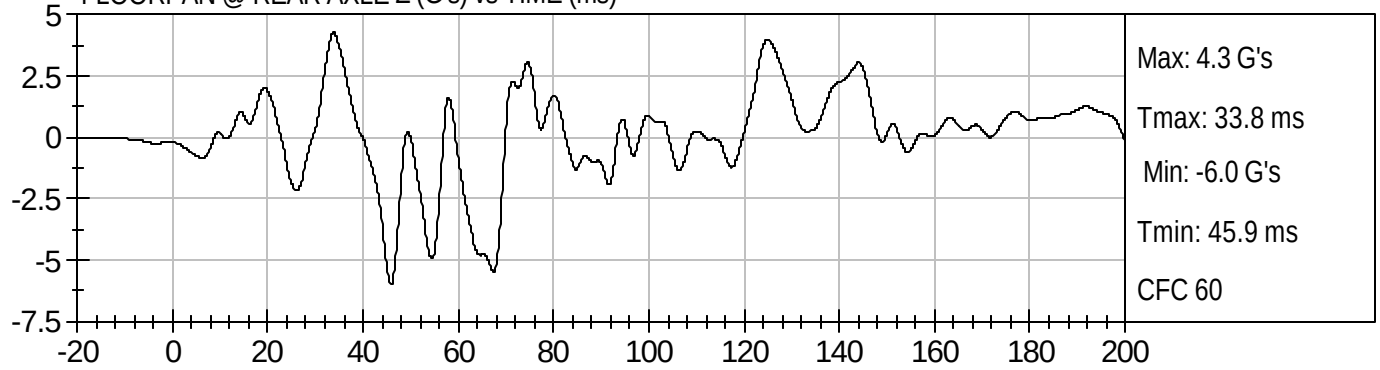
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



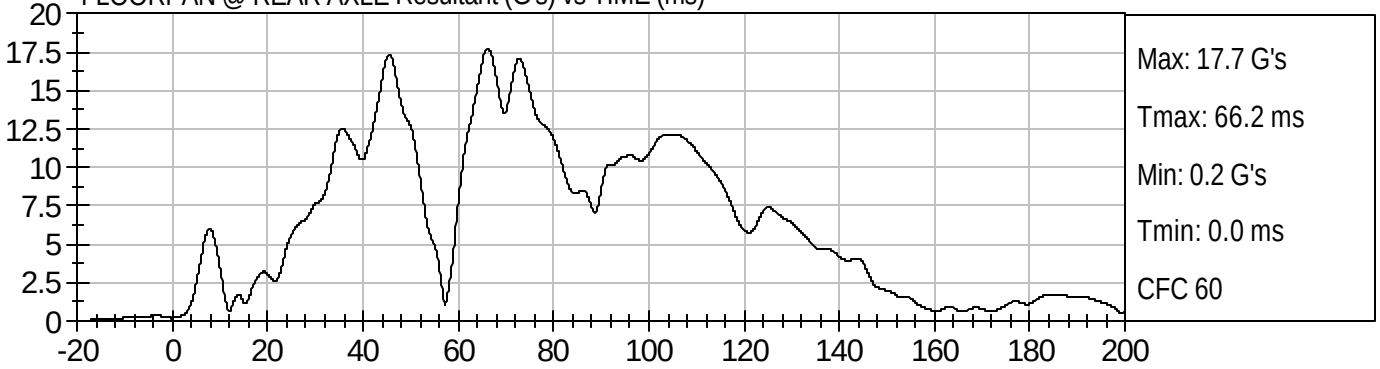
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)

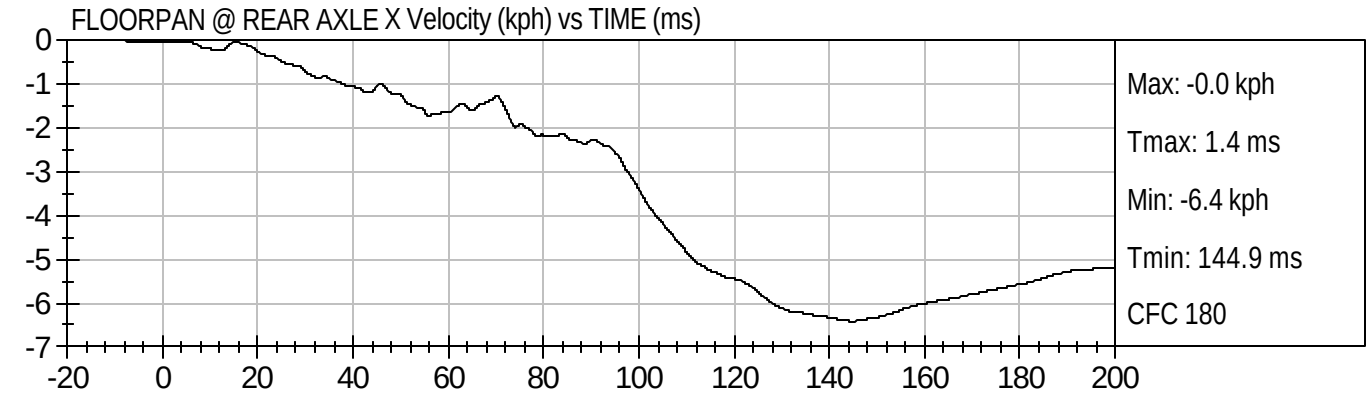


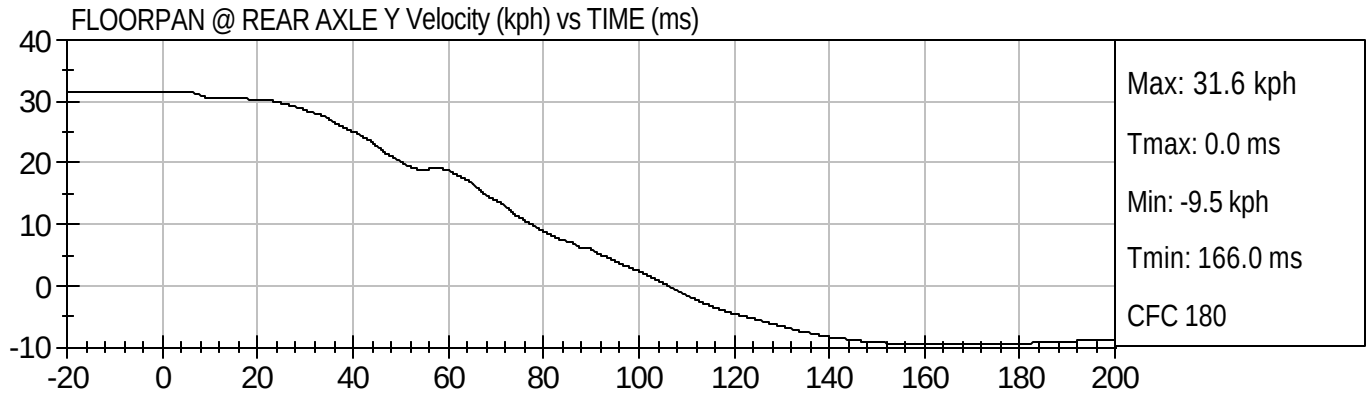
FLOORPAN @ REAR AXLE Z (G's) vs TIME (ms)

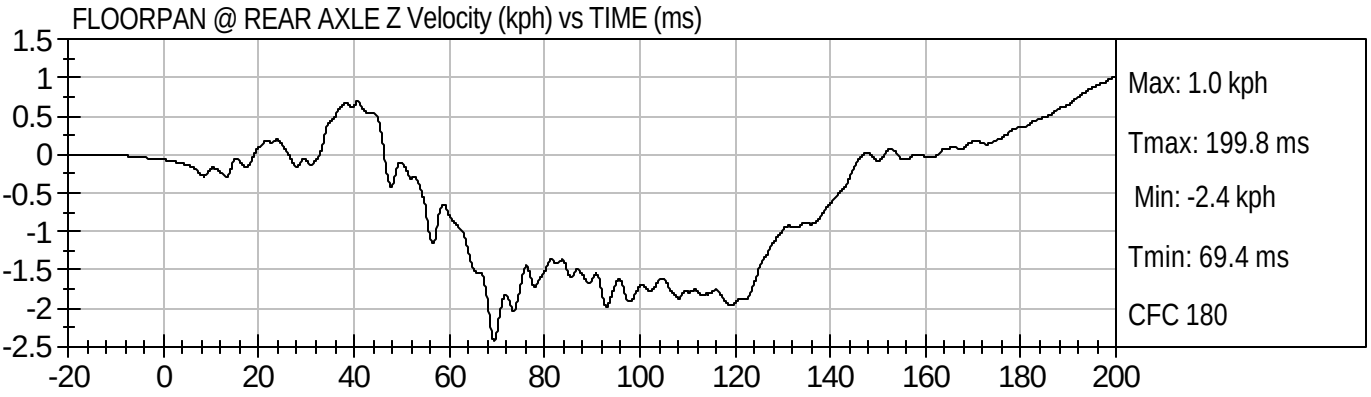


FLOORPAN @ REAR AXLE Resultant (G's) vs TIME (ms)



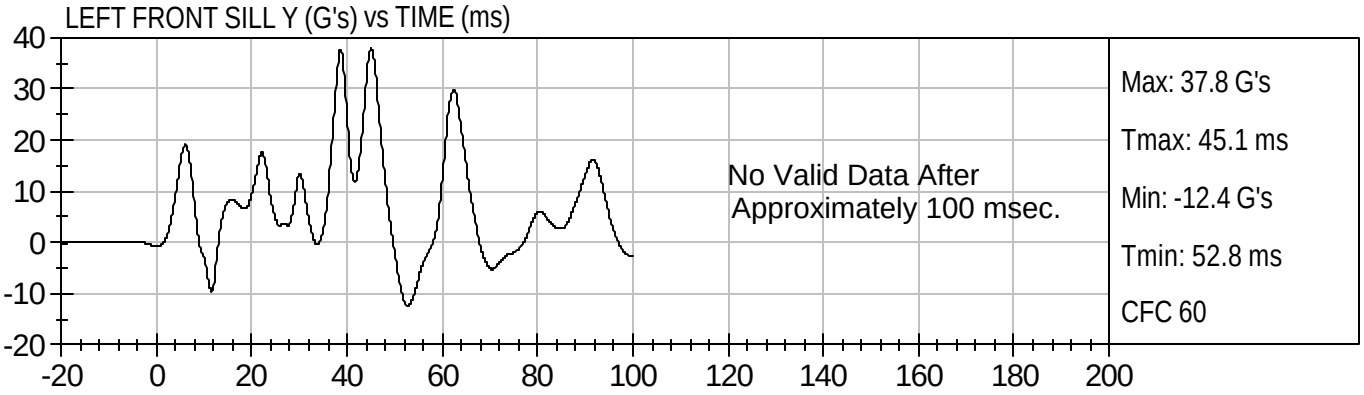

FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 1.4 ms
Min: -6.4 kph
Tmin: 144.9 ms
CFC 180

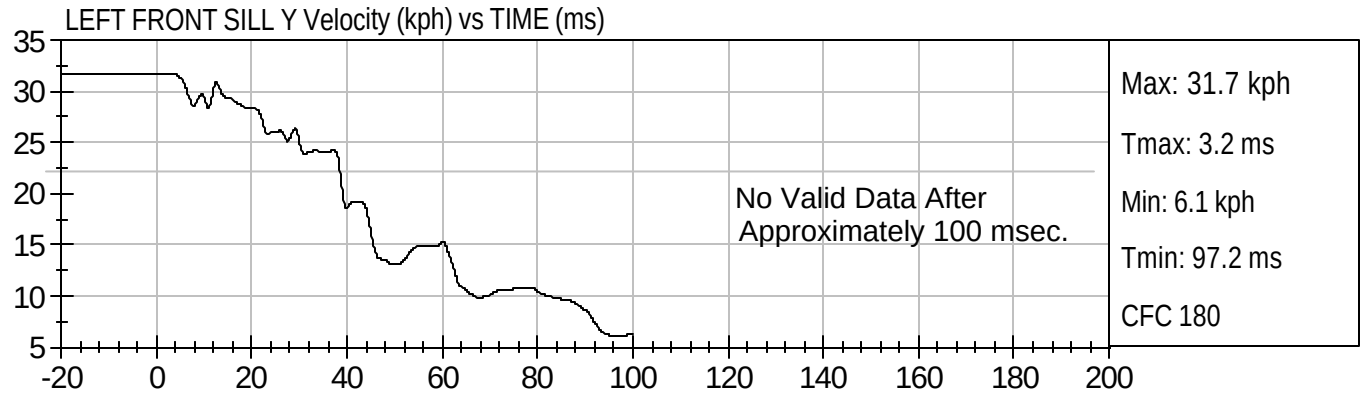

FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 31.6 kph
Tmax: 0.0 ms
Min: -9.5 kph
Tmin: 166.0 ms
CFC 180

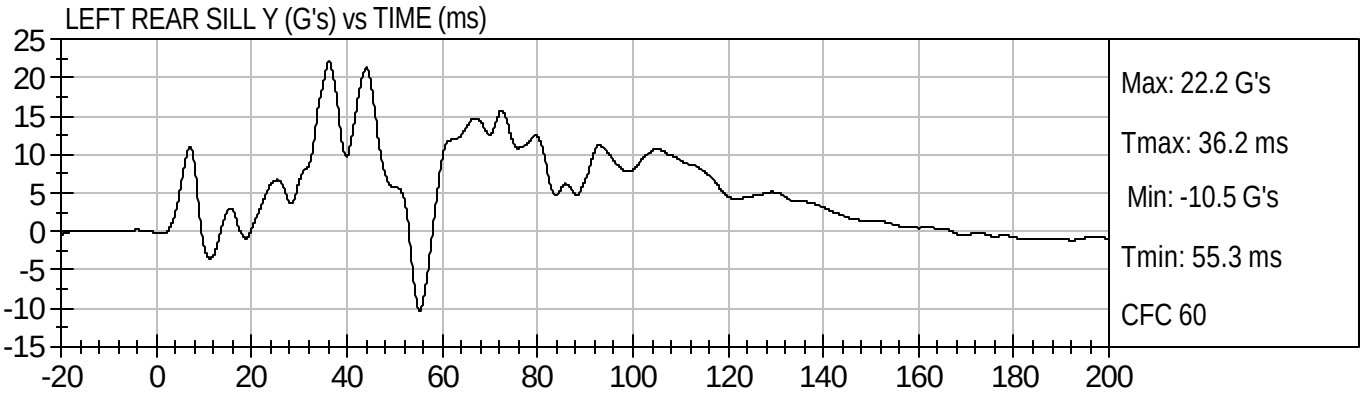

FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.0 kph
Tmax: 199.8 ms
Min: -2.4 kph
Tmin: 69.4 ms
CFC 180

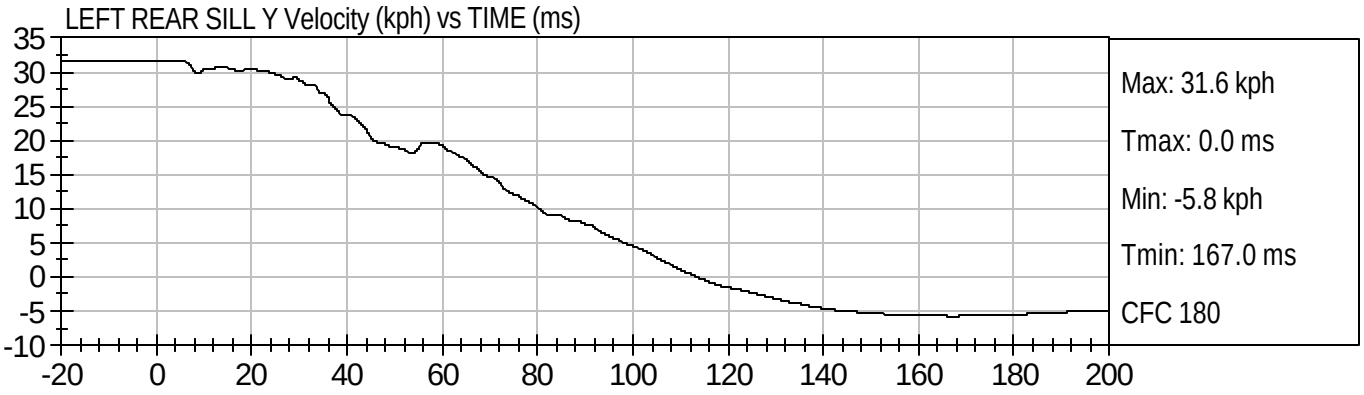
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



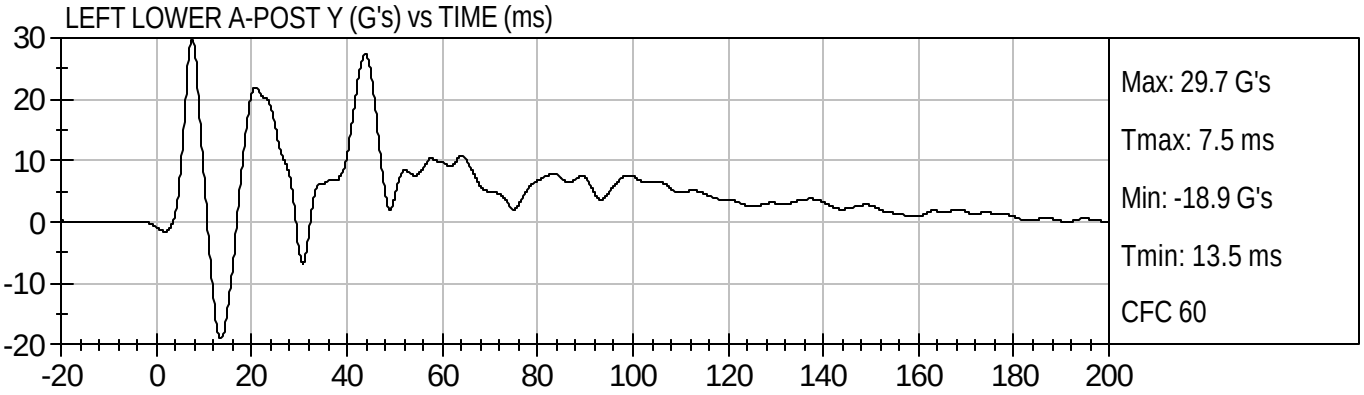


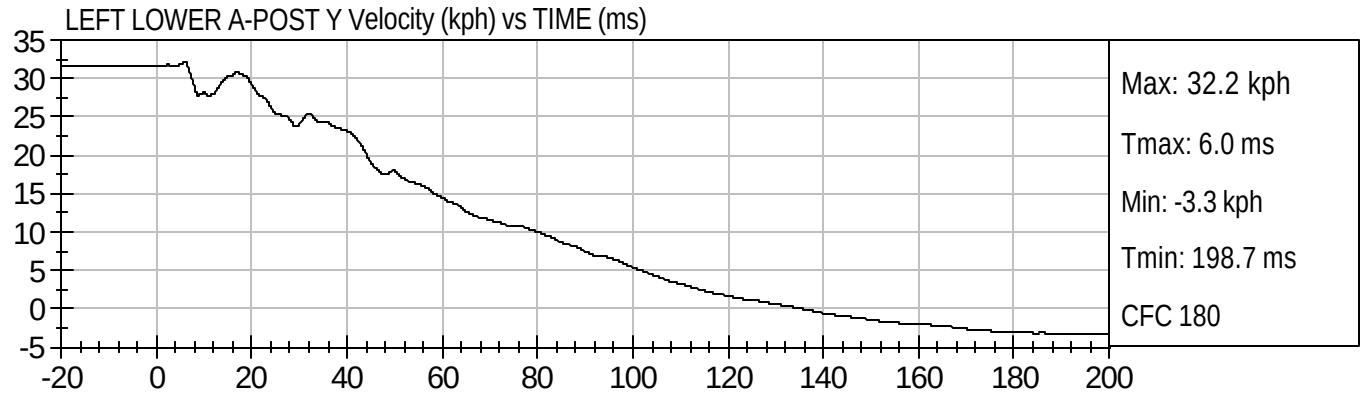


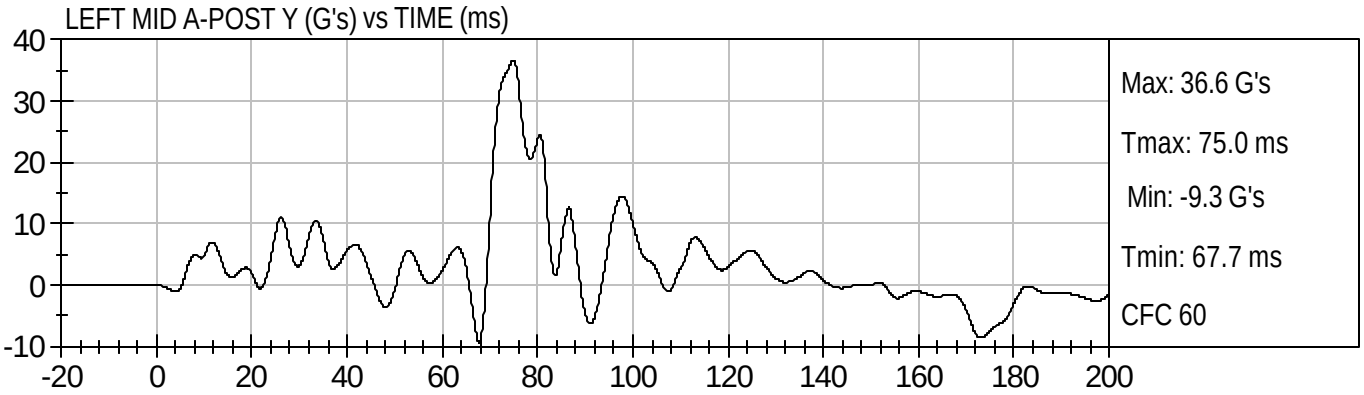


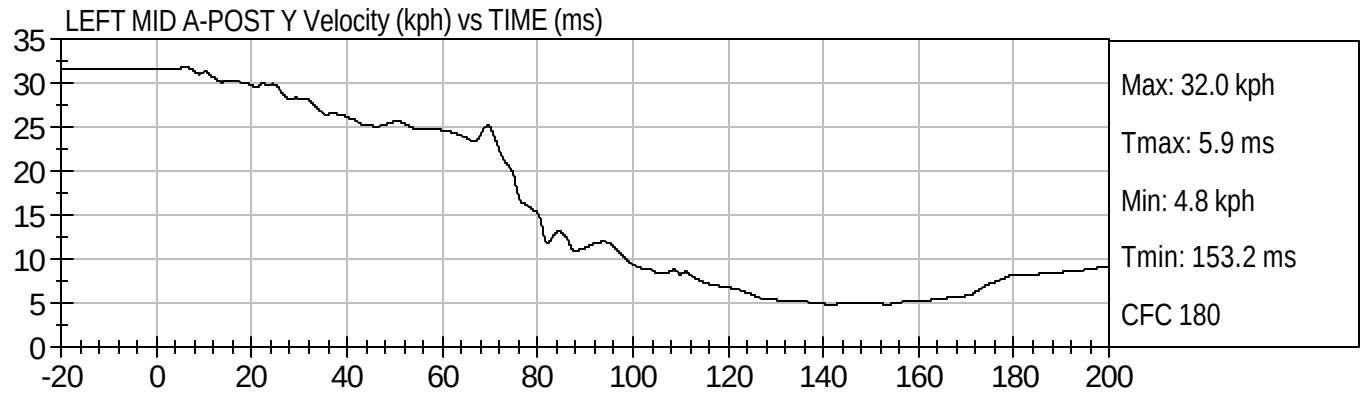
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

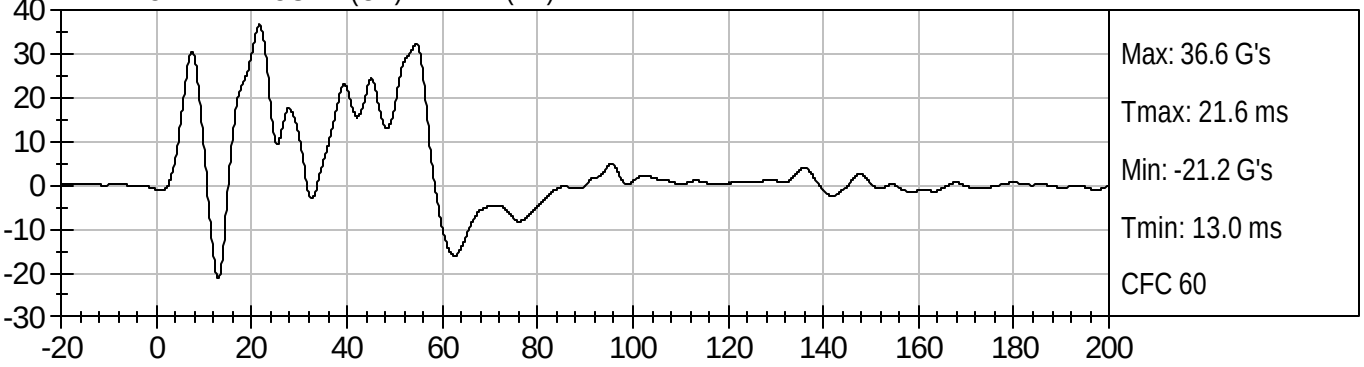




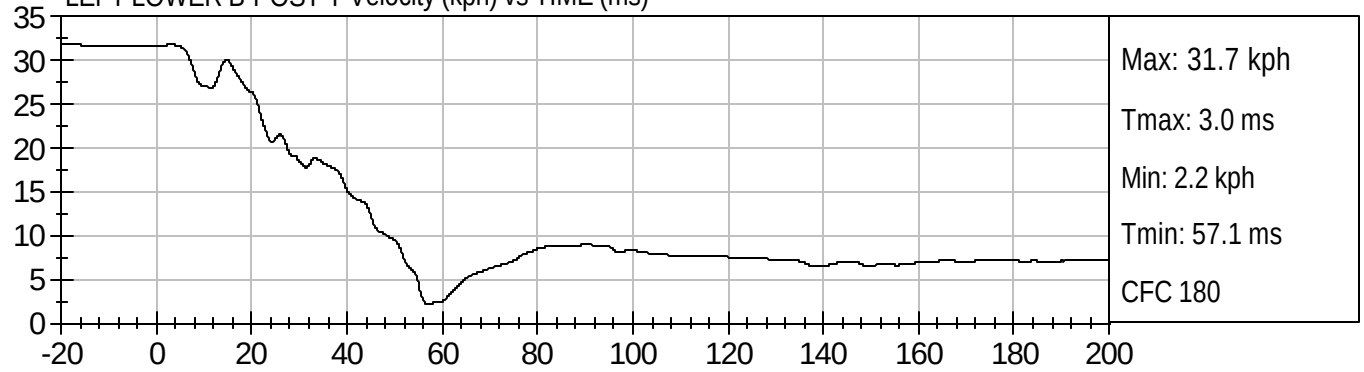




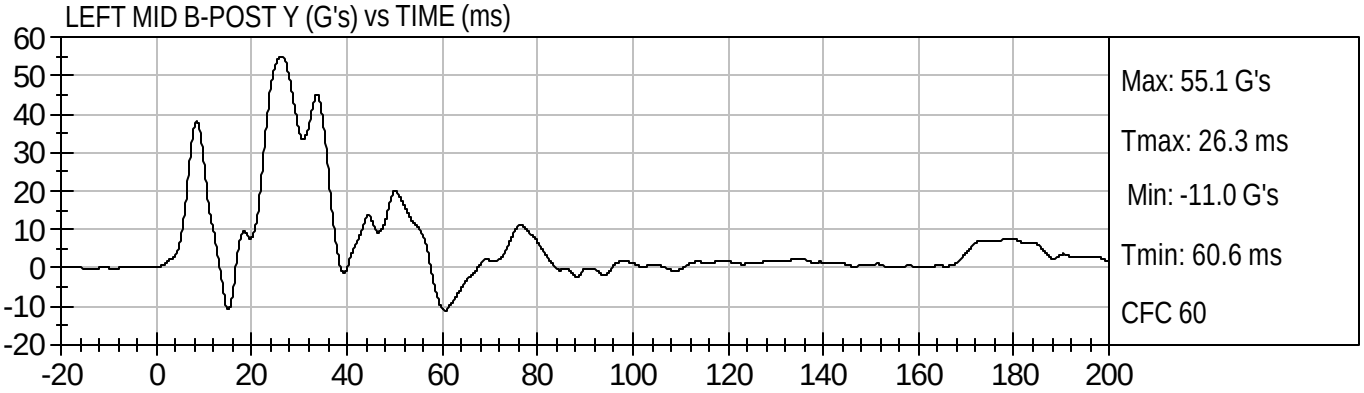
LEFT LOWER B-POST Y (G's) vs TIME (ms)



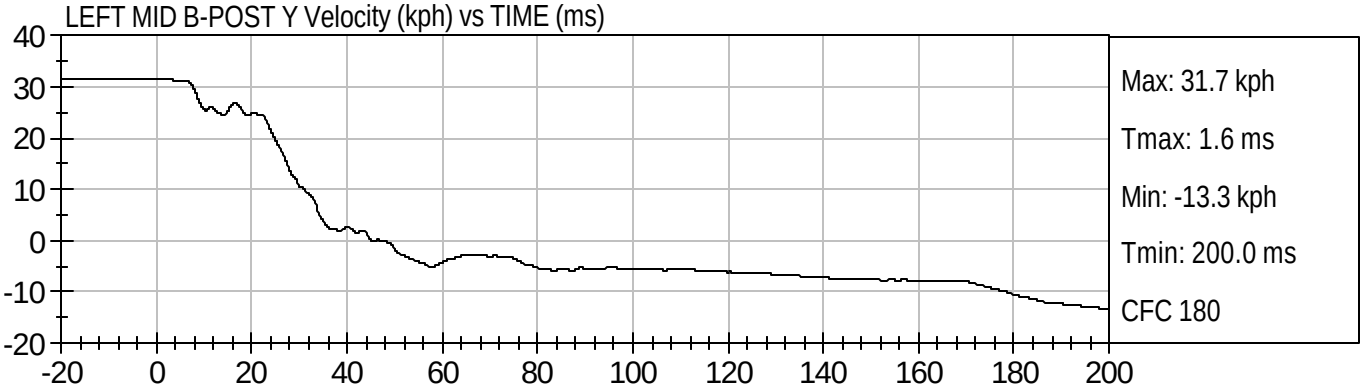
LEFT LOWER B-POST Y Velocity (kph) vs TIME (ms)



LEFT MID B-POST Y (G's) vs TIME (ms)

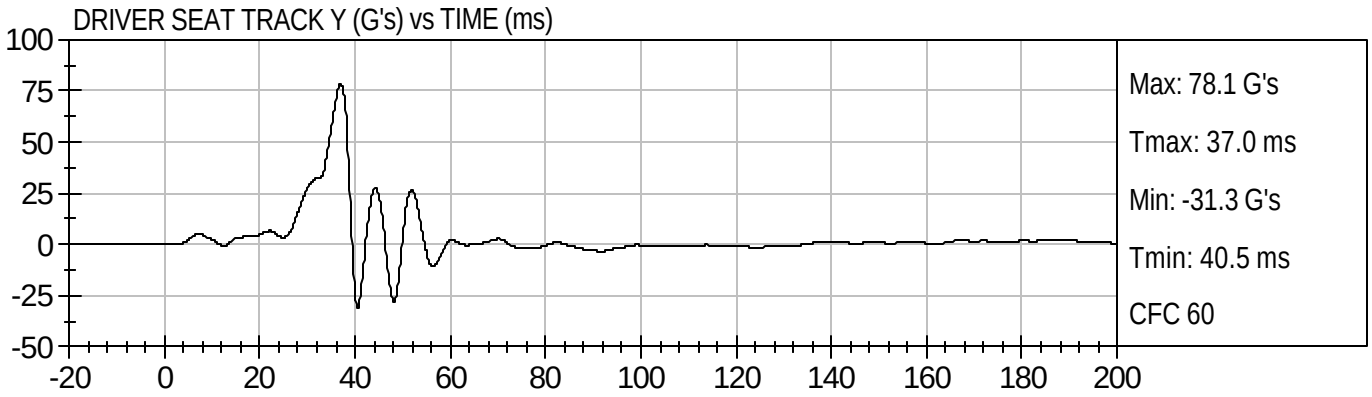


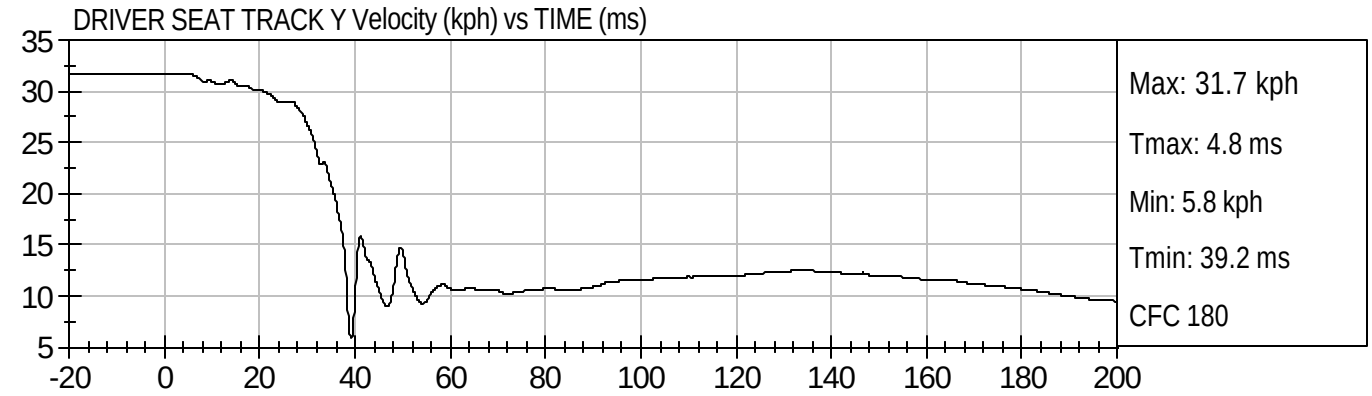
LEFT MID B-POST Y Velocity (kph) vs TIME (ms)



20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

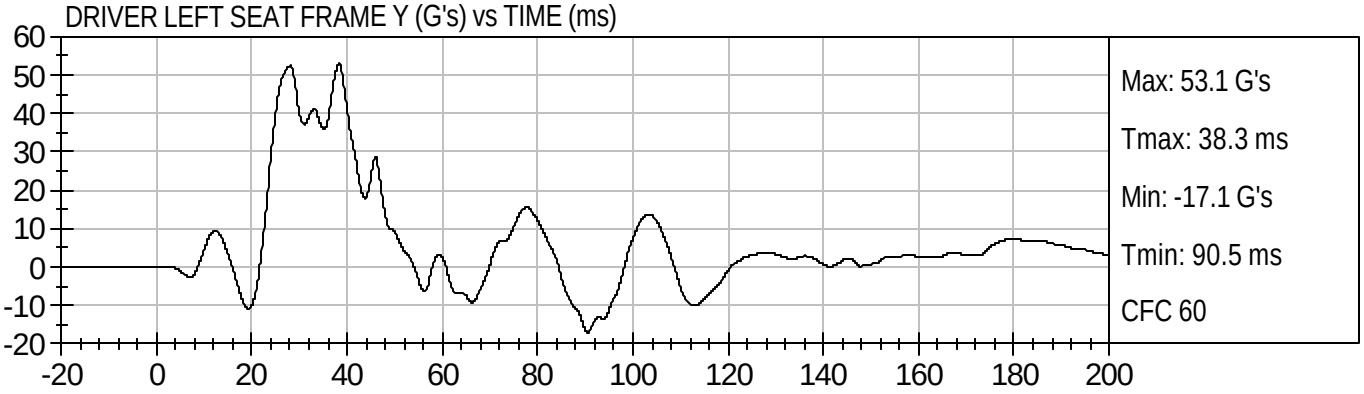




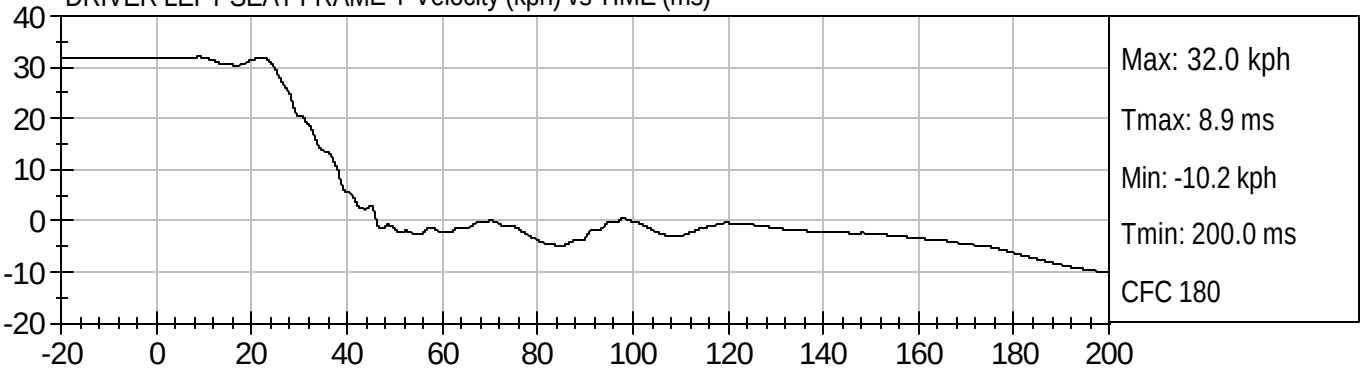
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

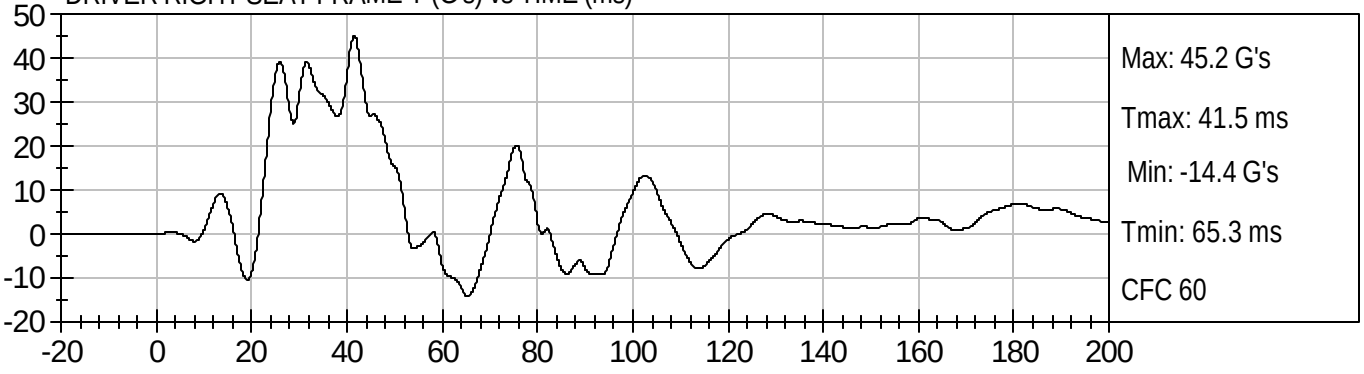
DRIVER LEFT SEAT FRAME Y (G's) vs TIME (ms)



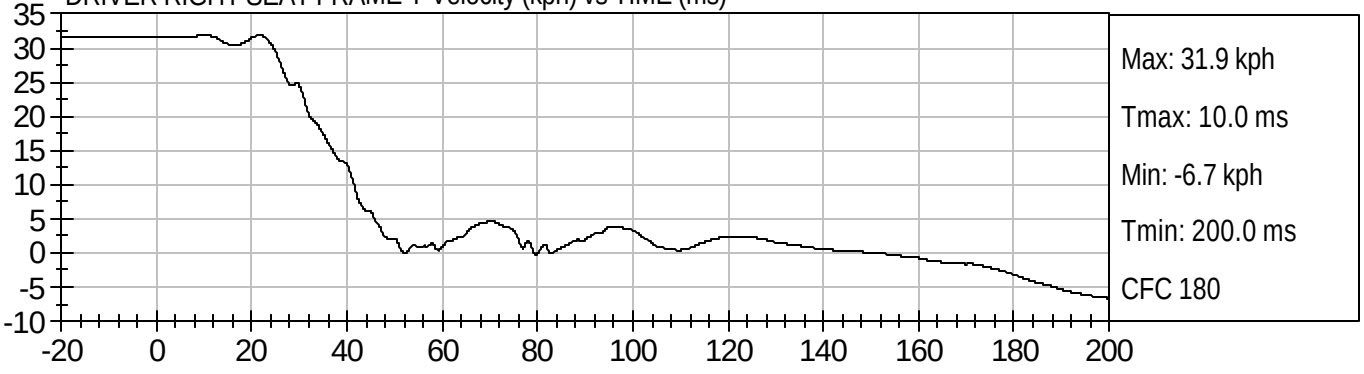
DRIVER LEFT SEAT FRAME Y Velocity (kph) vs TIME (ms)



DRIVER RIGHT SEAT FRAME Y (G's) vs TIME (ms)

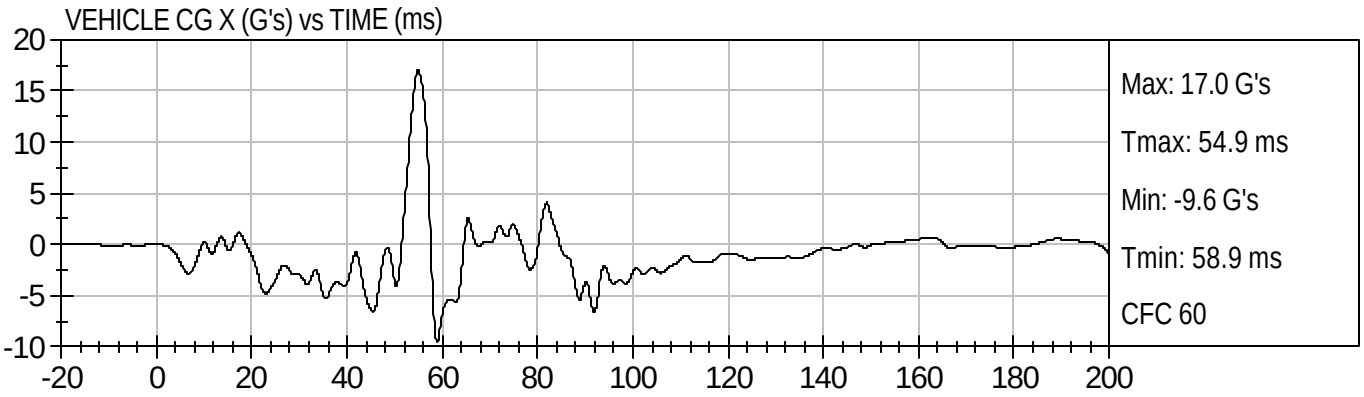


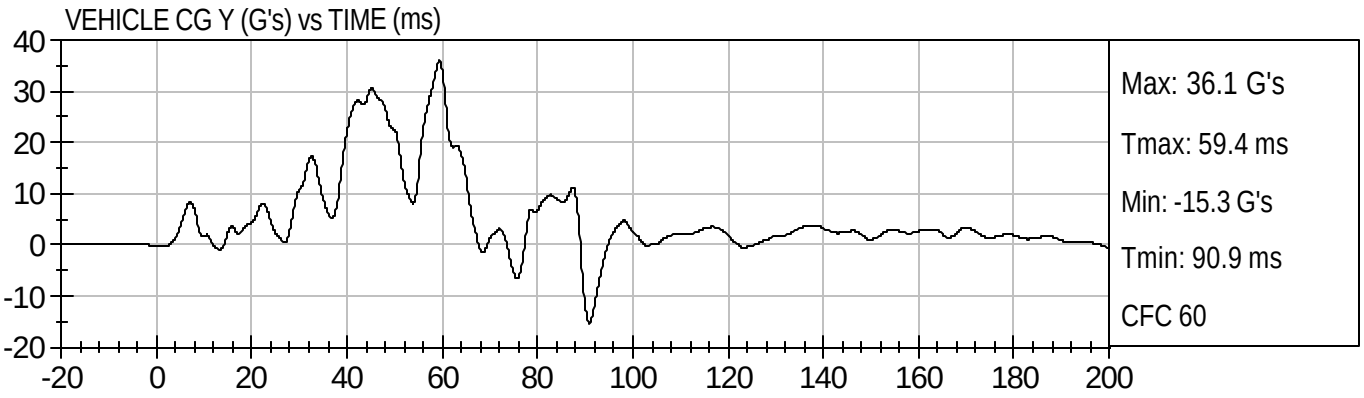
DRIVER RIGHT SEAT FRAME Y Velocity (kph) vs TIME (ms)

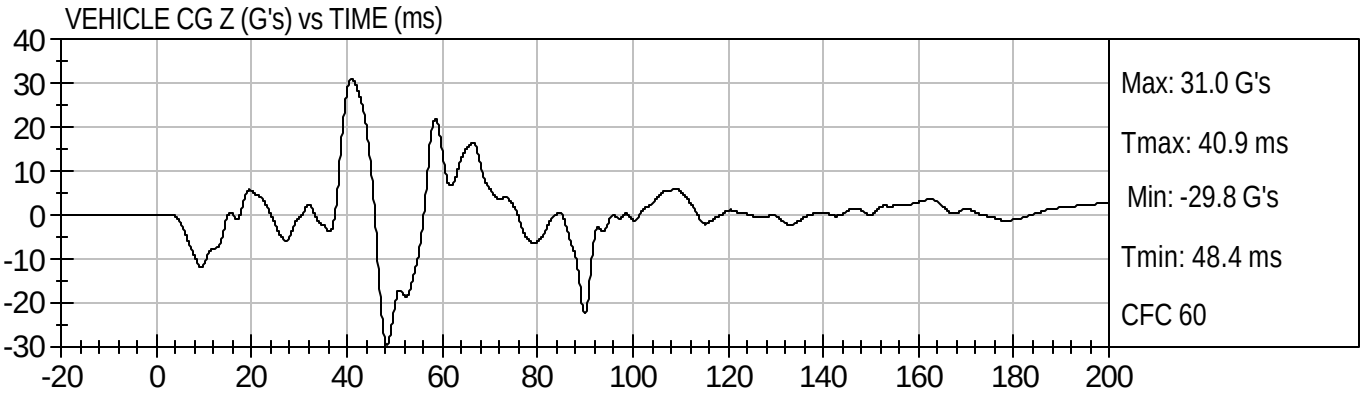


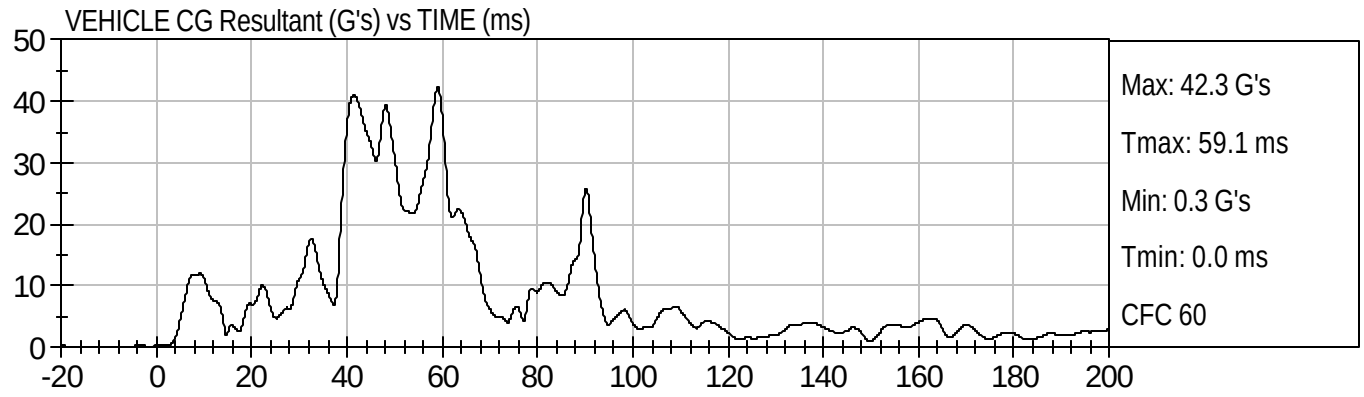
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

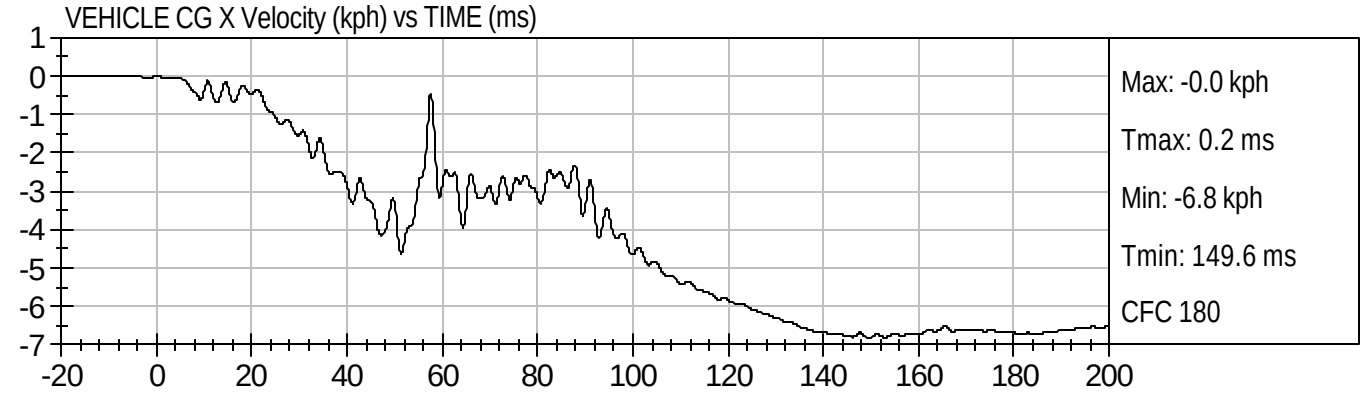
Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

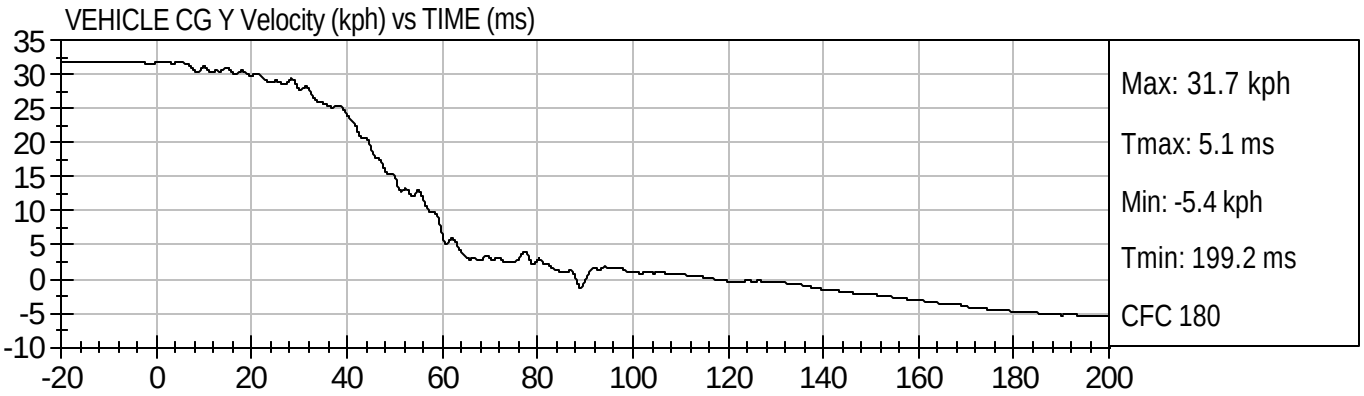


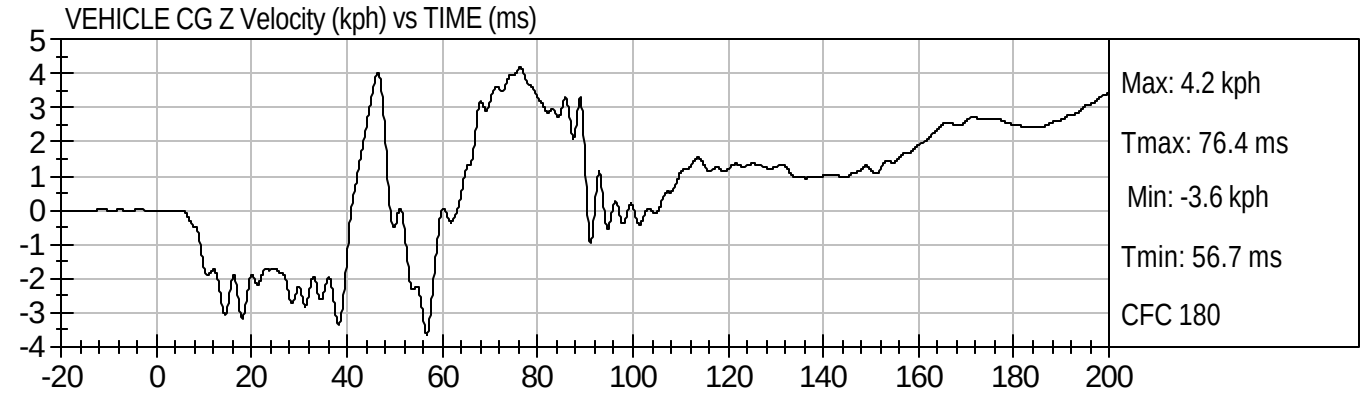






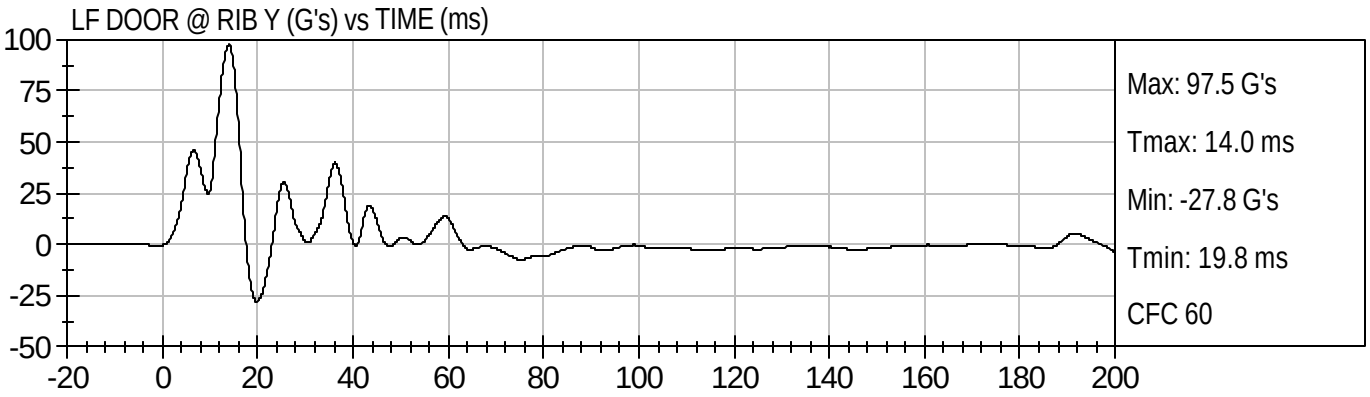

VEHICLE CG X Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 0.2 ms
Min: -6.8 kph
Tmin: 149.6 ms
CFC 180

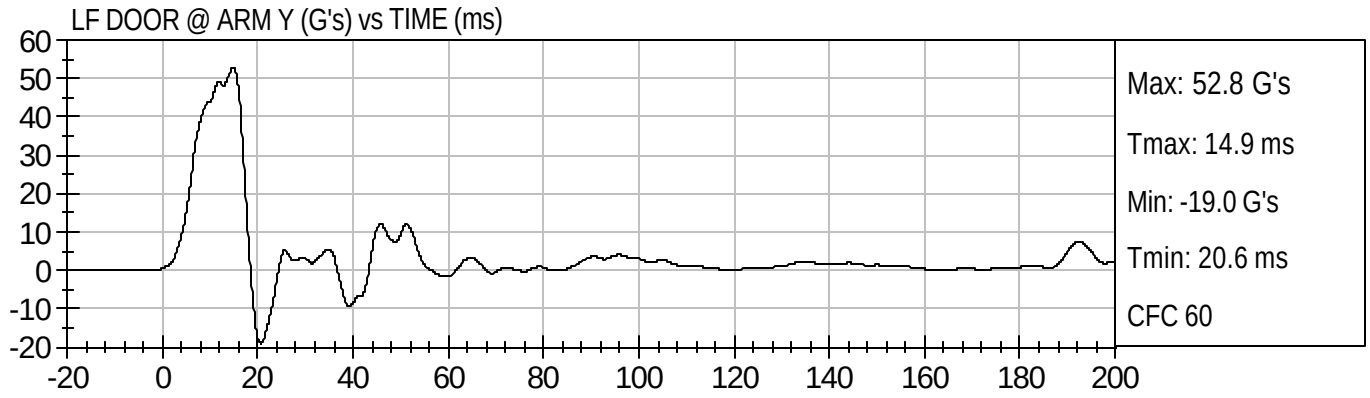

VEHICLE CG Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 31.7 kph
Tmax: 5.1 ms
Min: -5.4 kph
Tmin: 199.2 ms
CFC 180

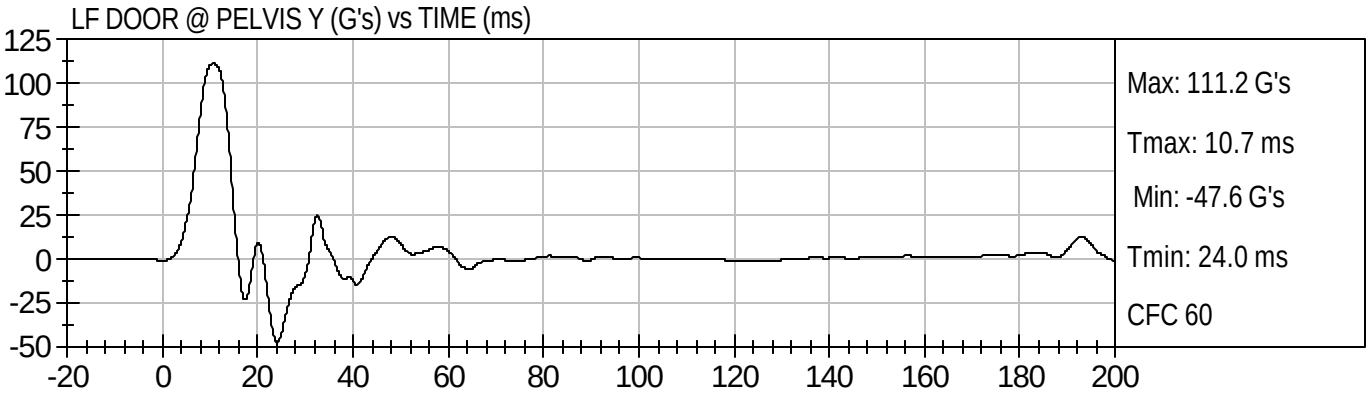

VEHICLE CG Z Velocity (kph) vs TIME (ms)
5
4
3
2
1
0
-1
-2
-3
-4
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.2 kph
Tmax: 76.4 ms
Min: -3.6 kph
Tmin: 56.7 ms
CFC 180

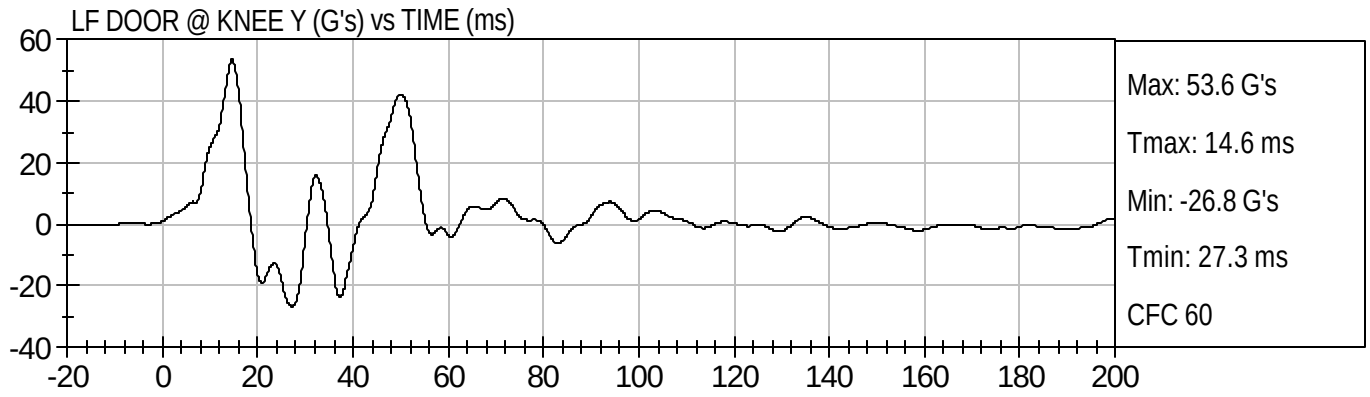
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)





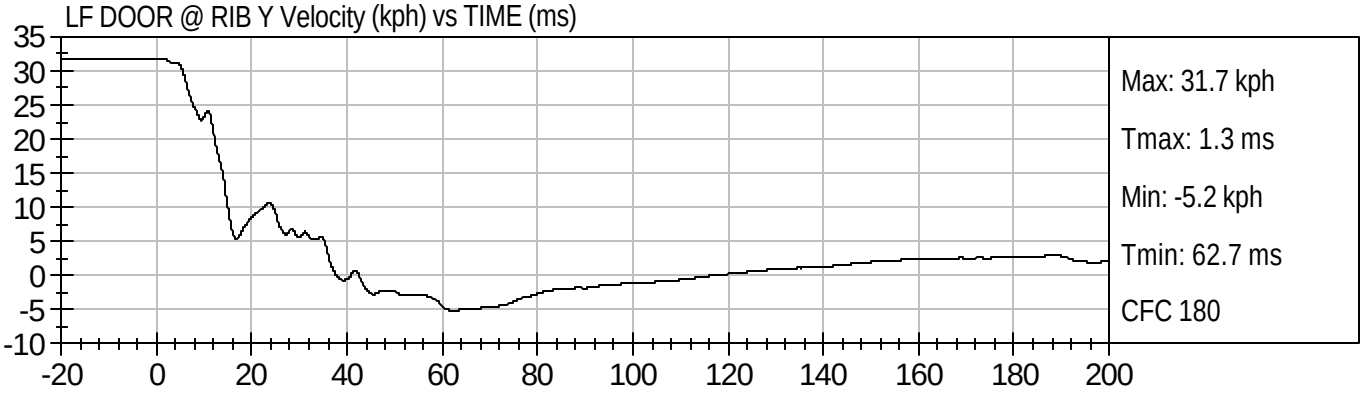




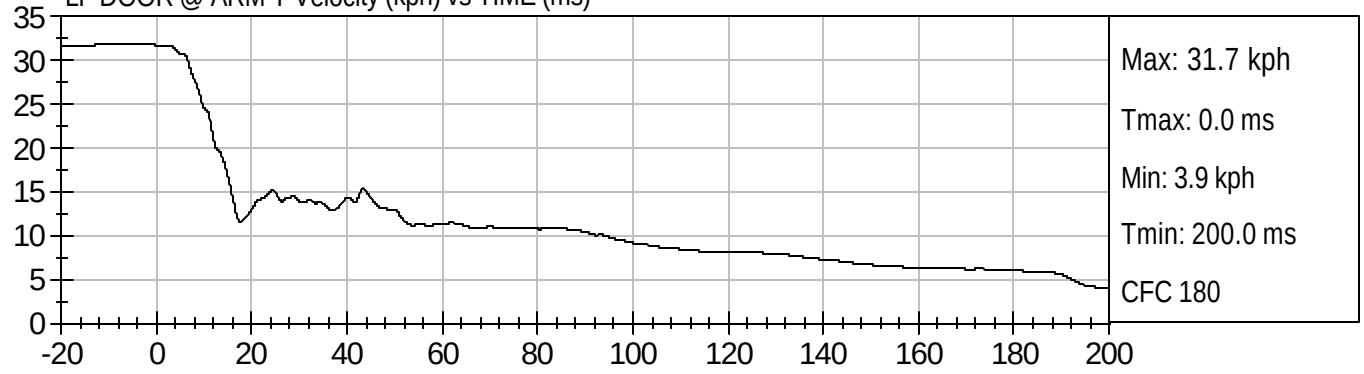
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

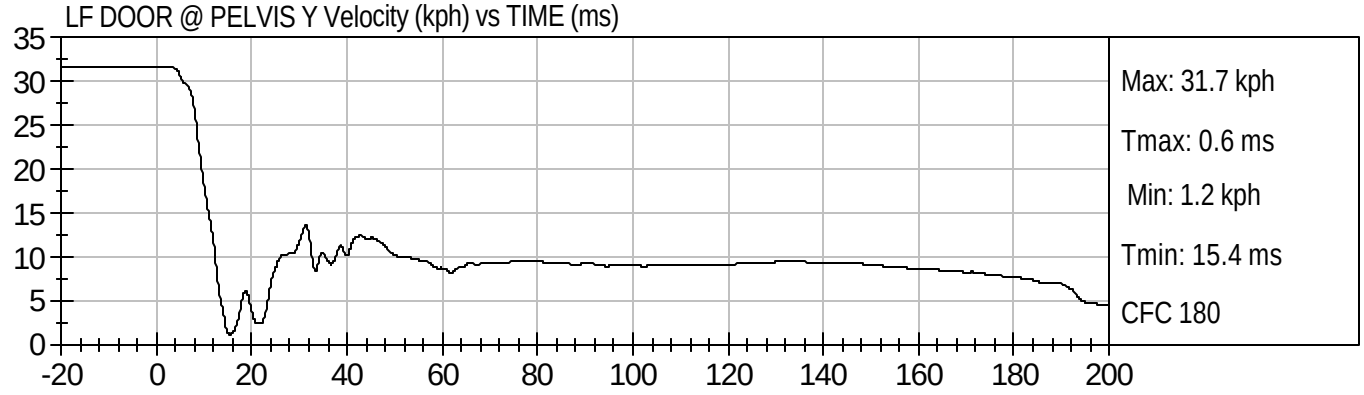
LF DOOR @ RIB Y Velocity (kph) vs TIME (ms)



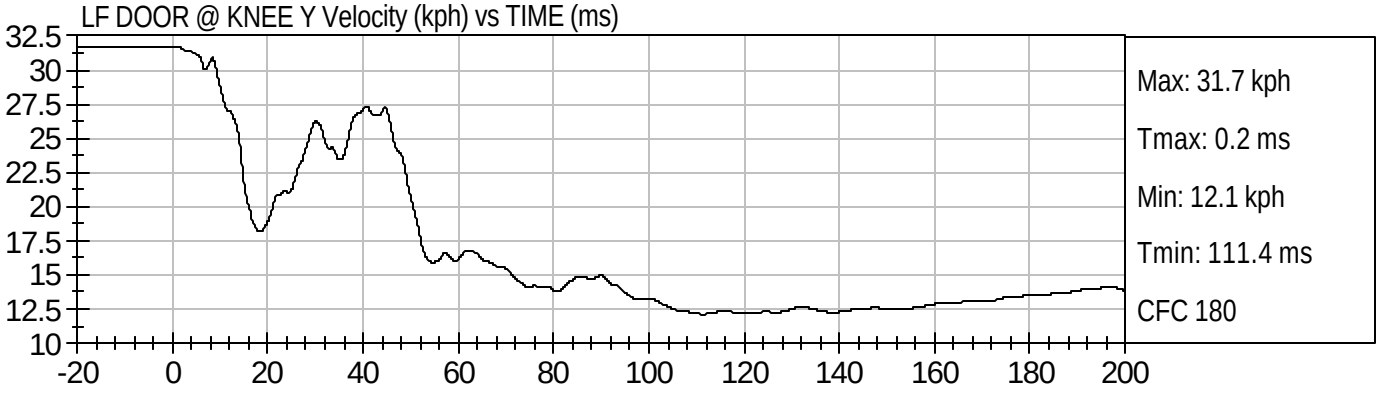
LF DOOR @ ARM Y Velocity (kph) vs TIME (ms)



LF DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)



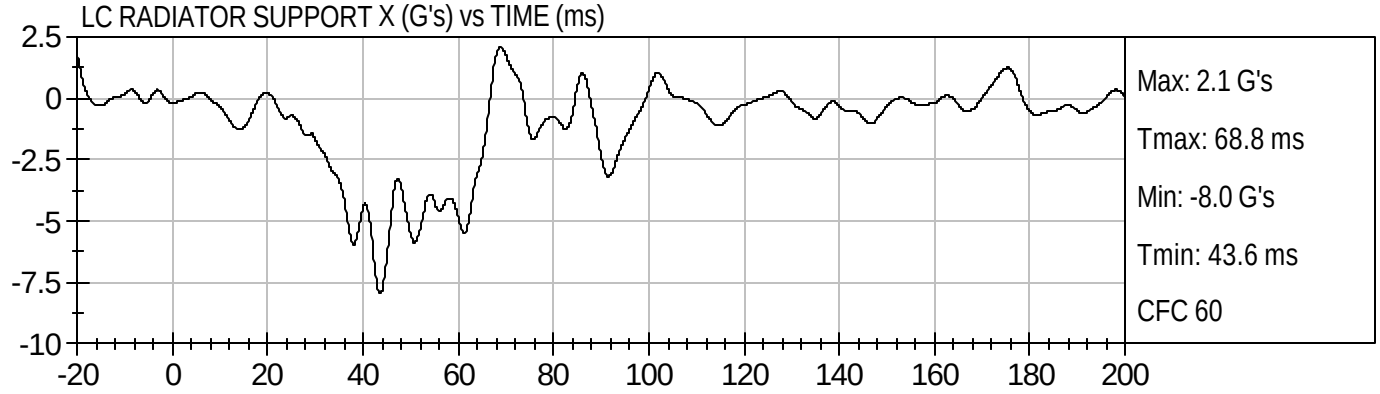
LF DOOR @ KNEE Y Velocity (kph) vs TIME (ms)



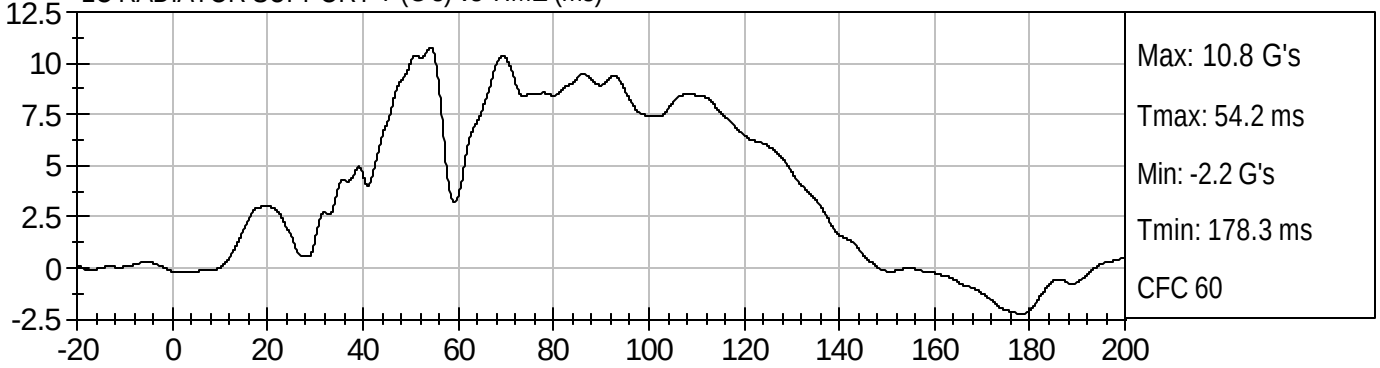
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

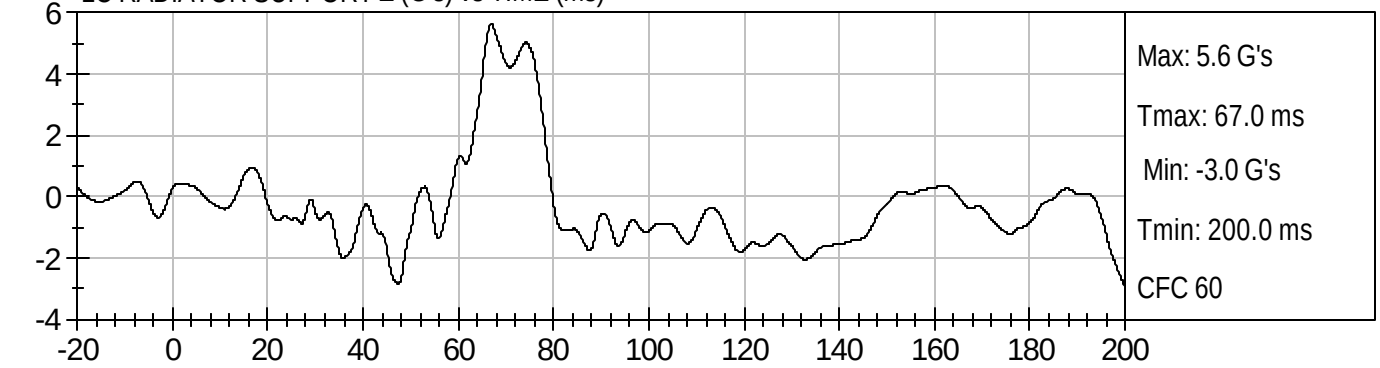
LC RADIATOR SUPPORT X (G's) vs TIME (ms)



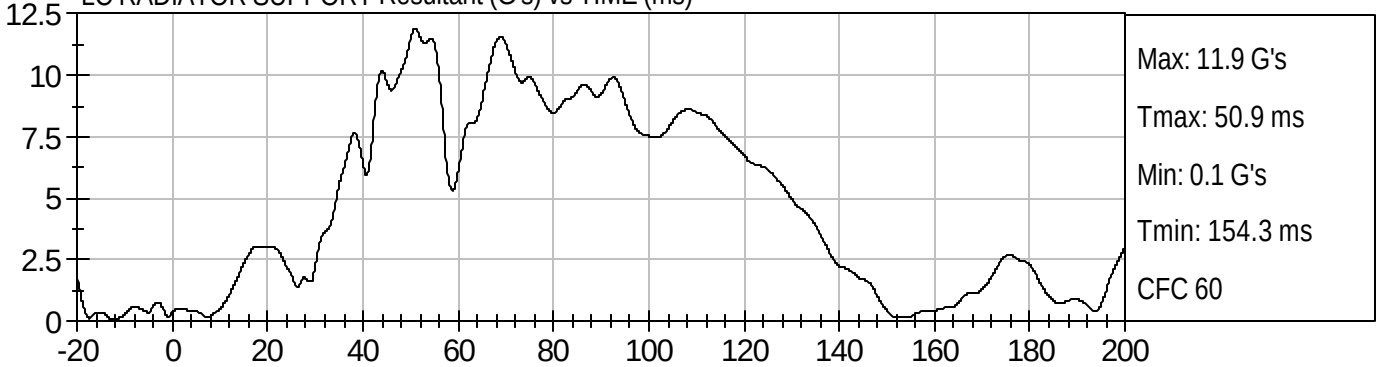
LC RADIATOR SUPPORT Y (G's) vs TIME (ms)



LC RADIATOR SUPPORT Z (G's) vs TIME (ms)

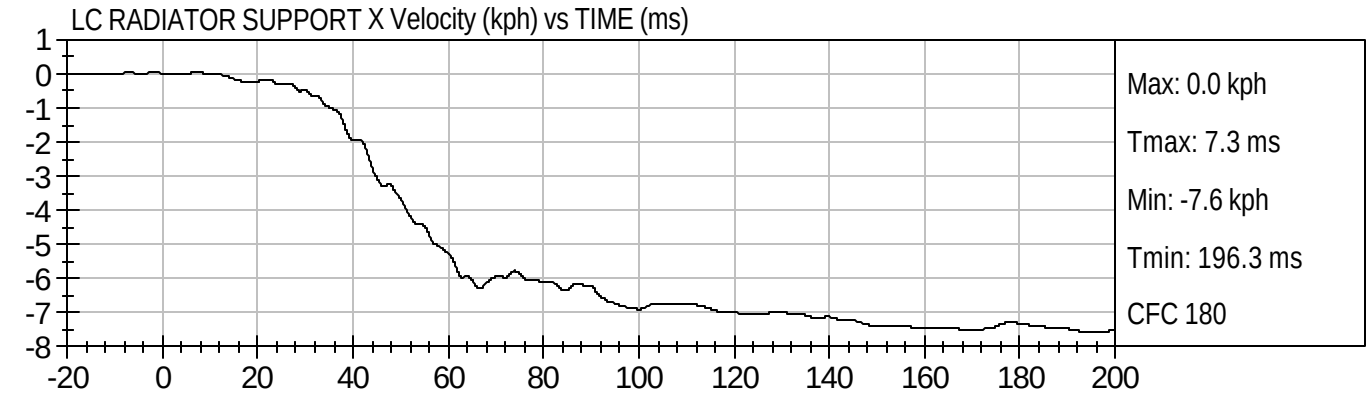


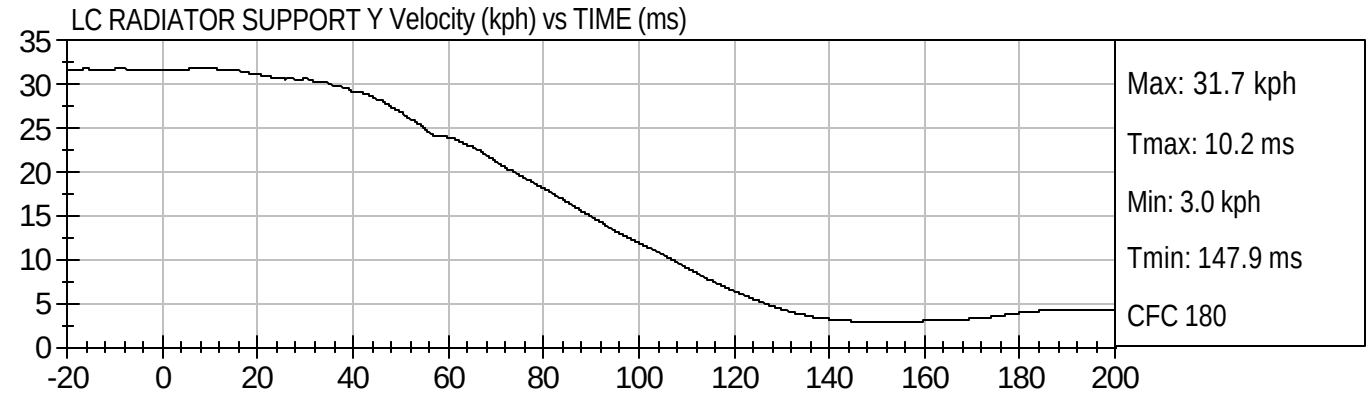
LC RADIATOR SUPPORT Resultant (G's) vs TIME (ms)

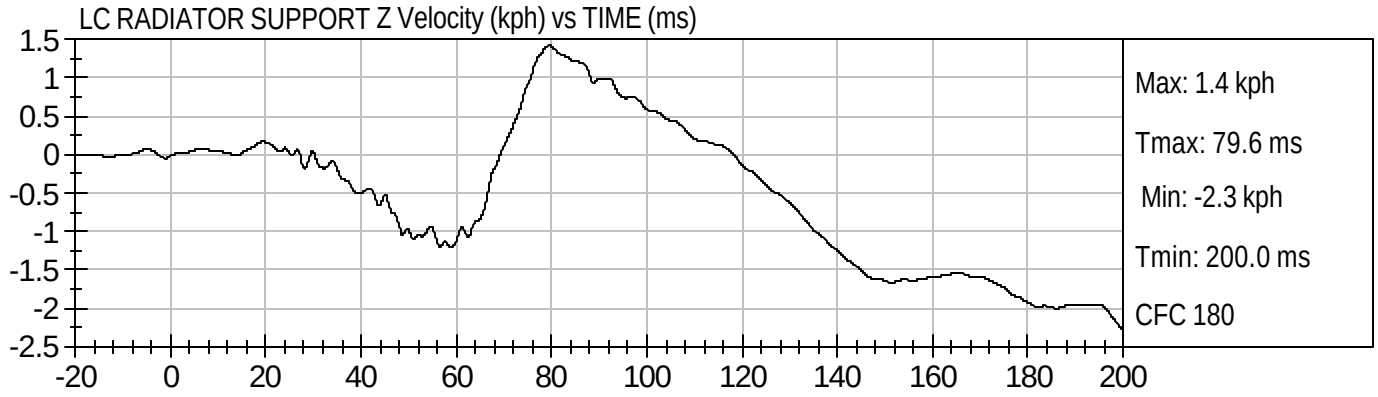


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

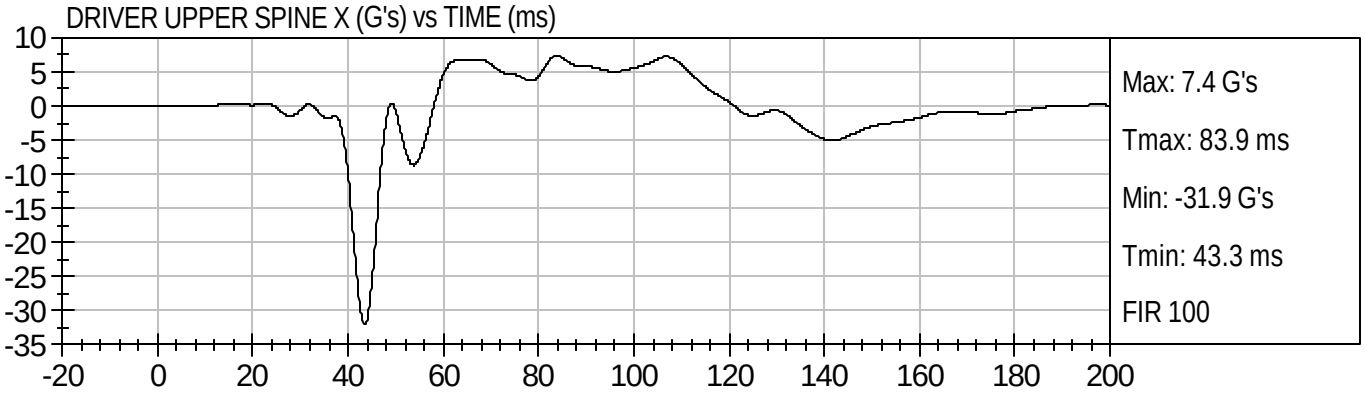


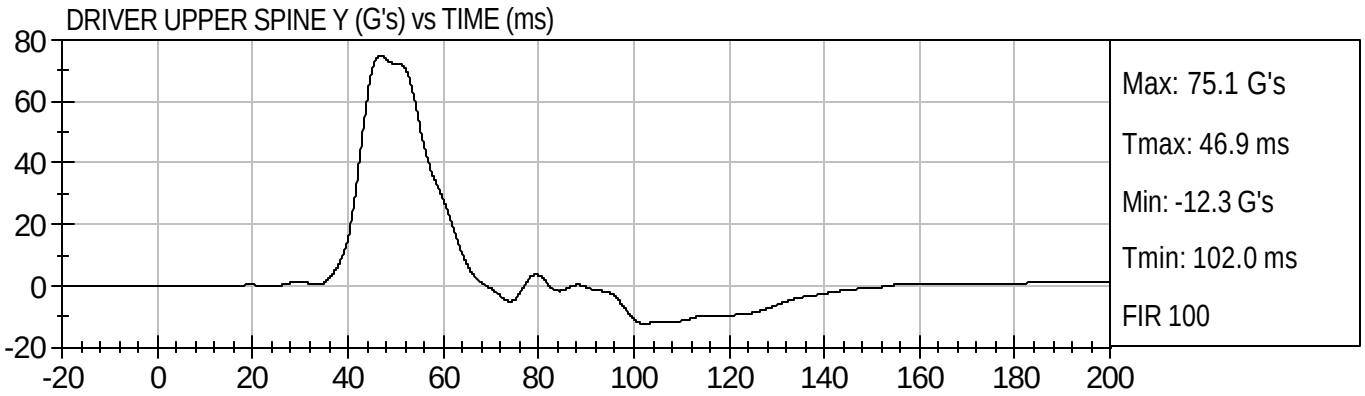


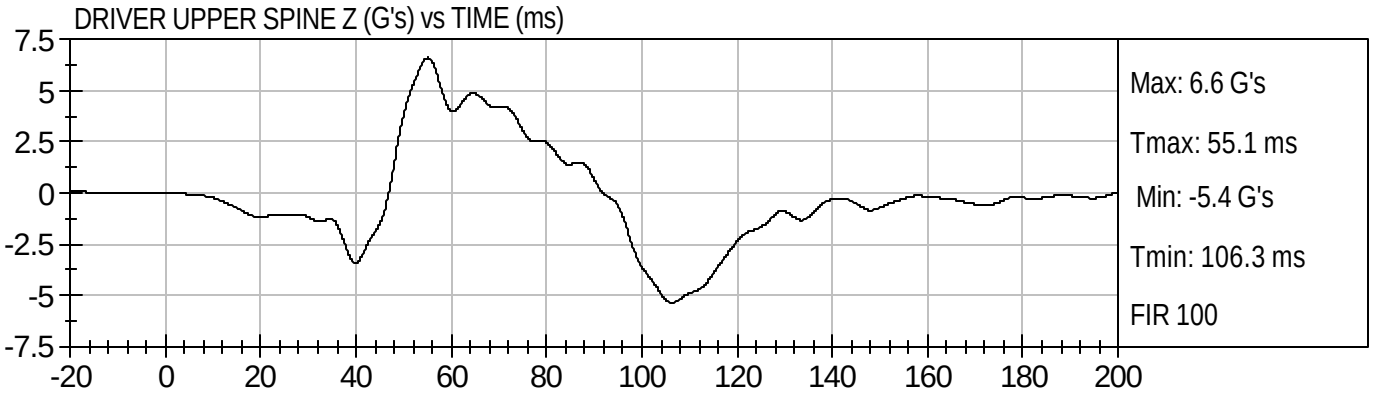


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

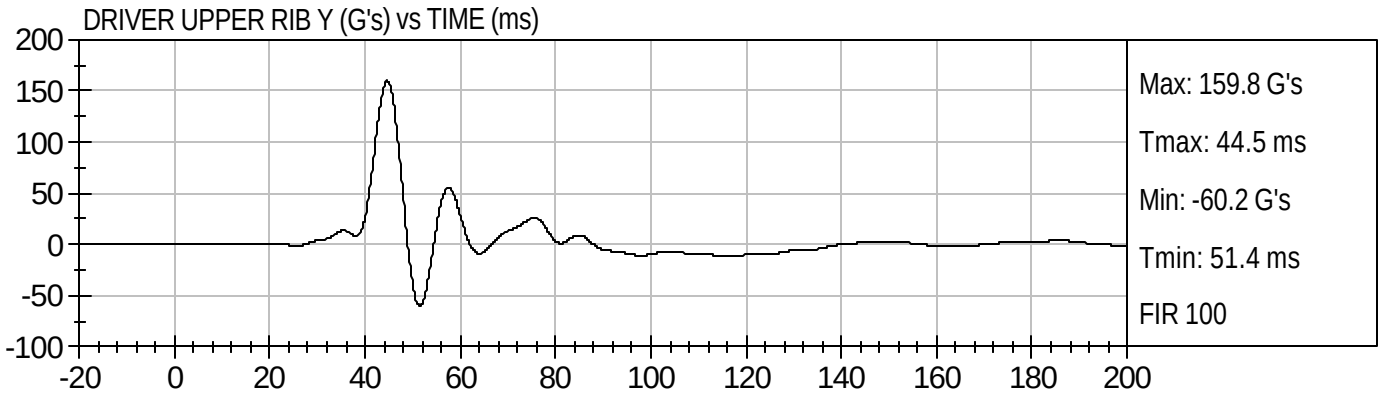


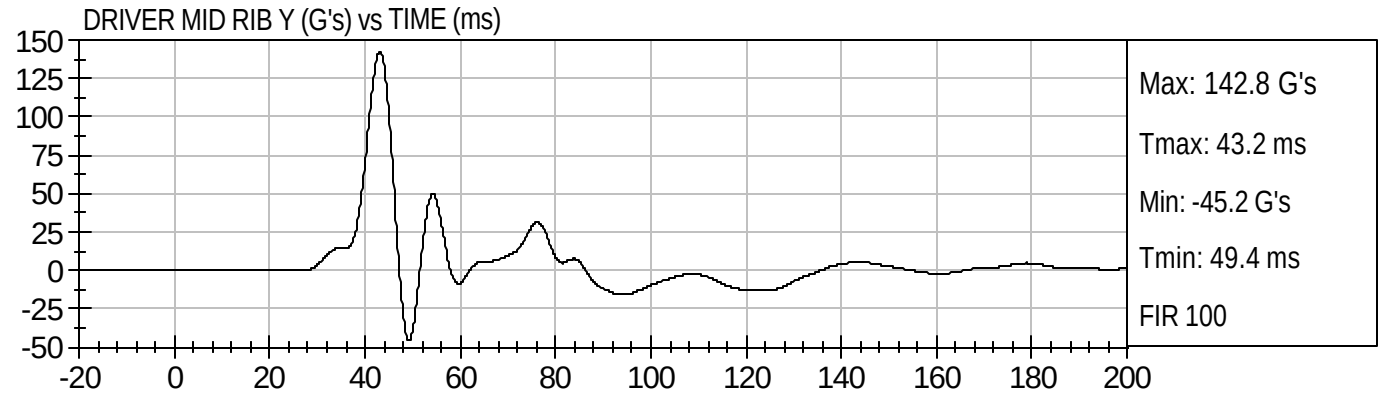


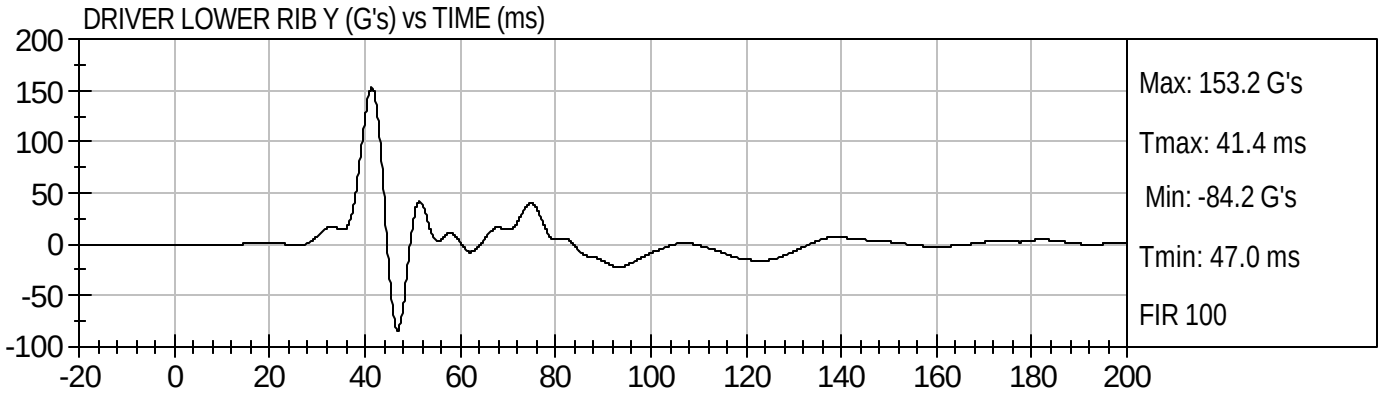


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

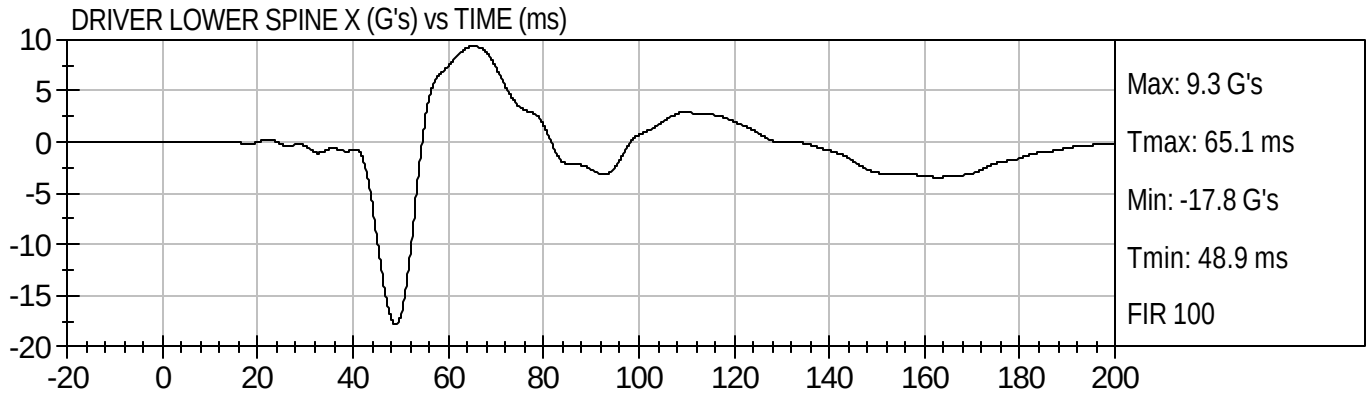


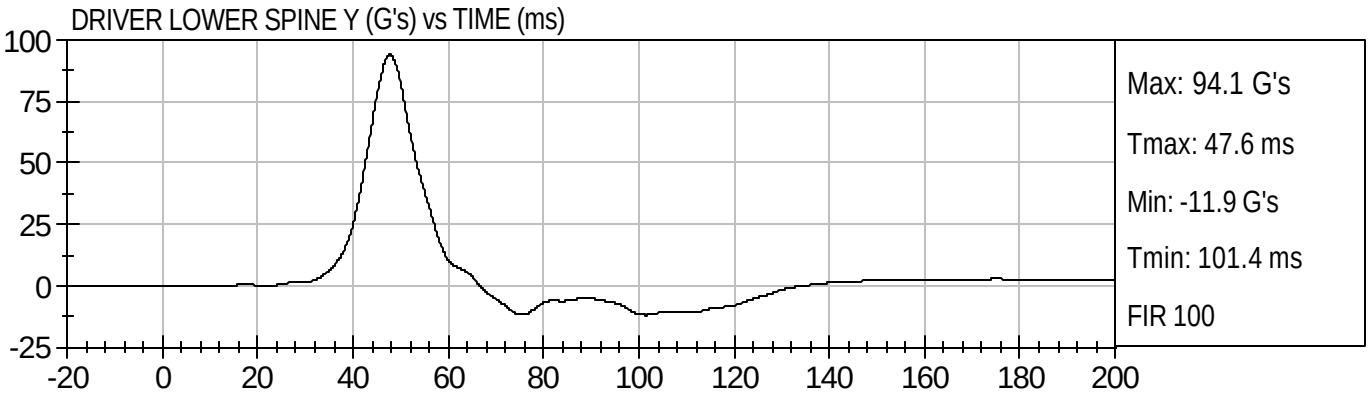


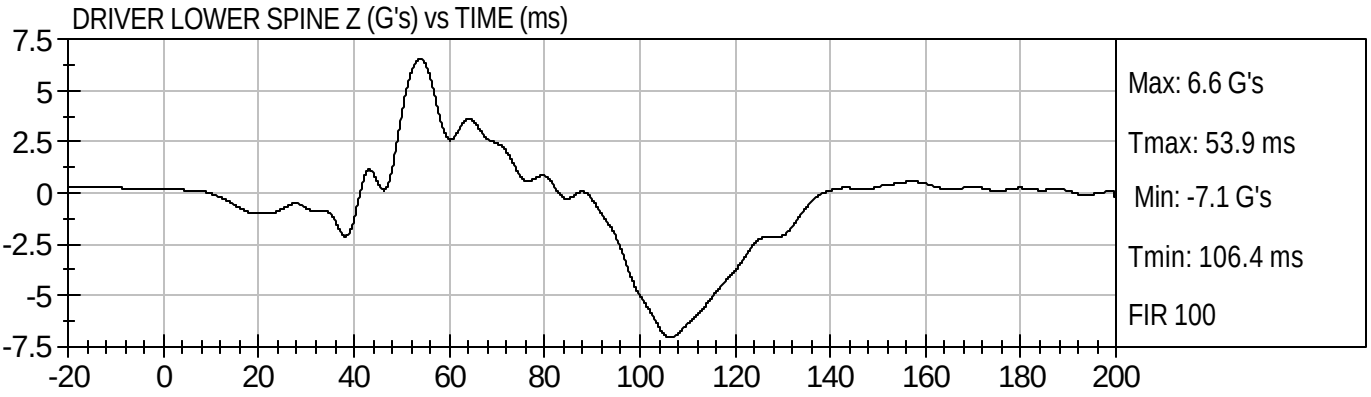


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

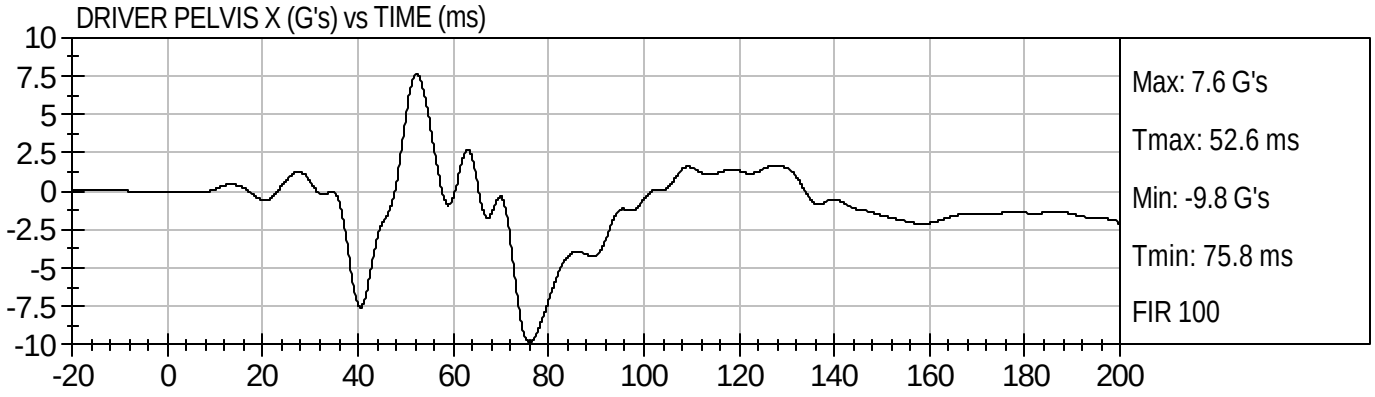


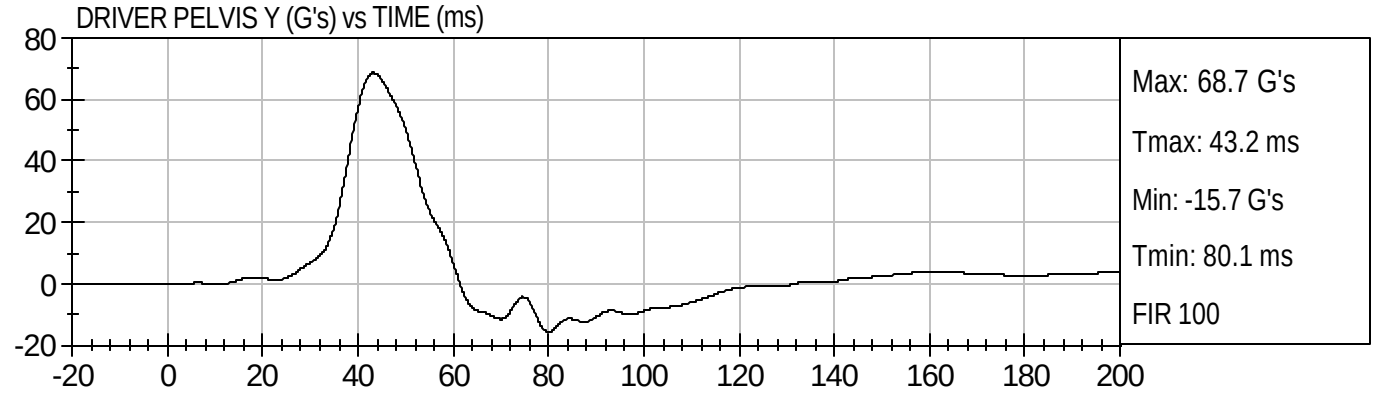


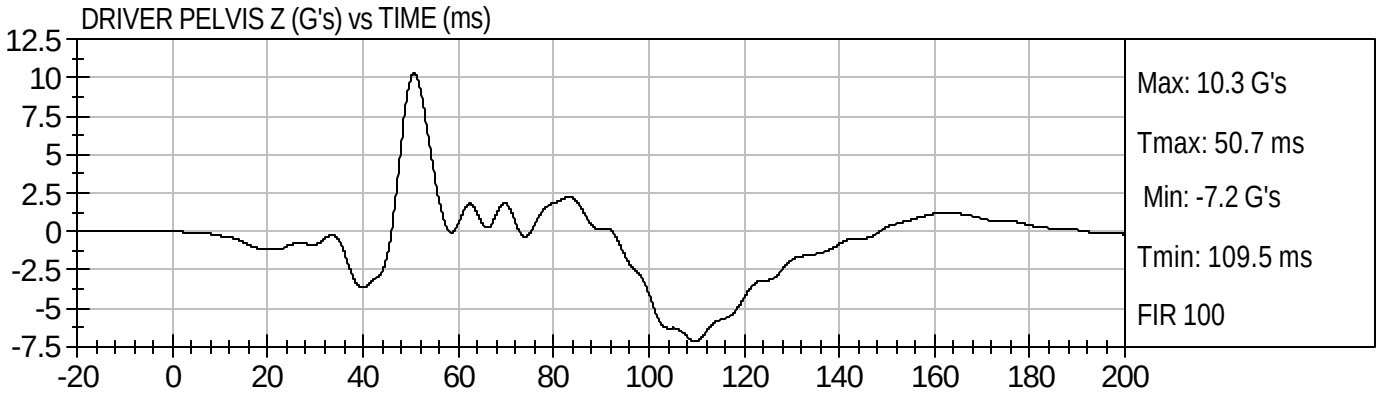


20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)



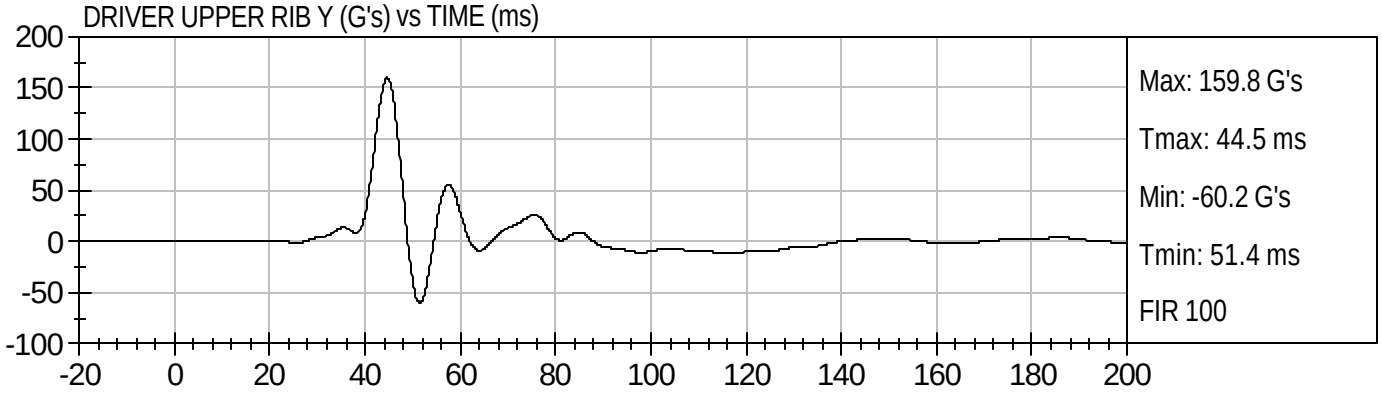




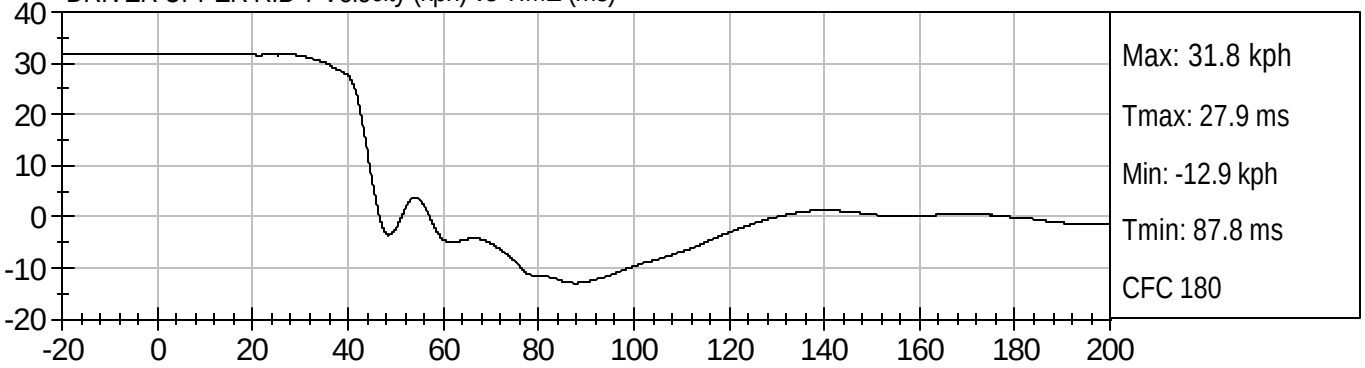
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

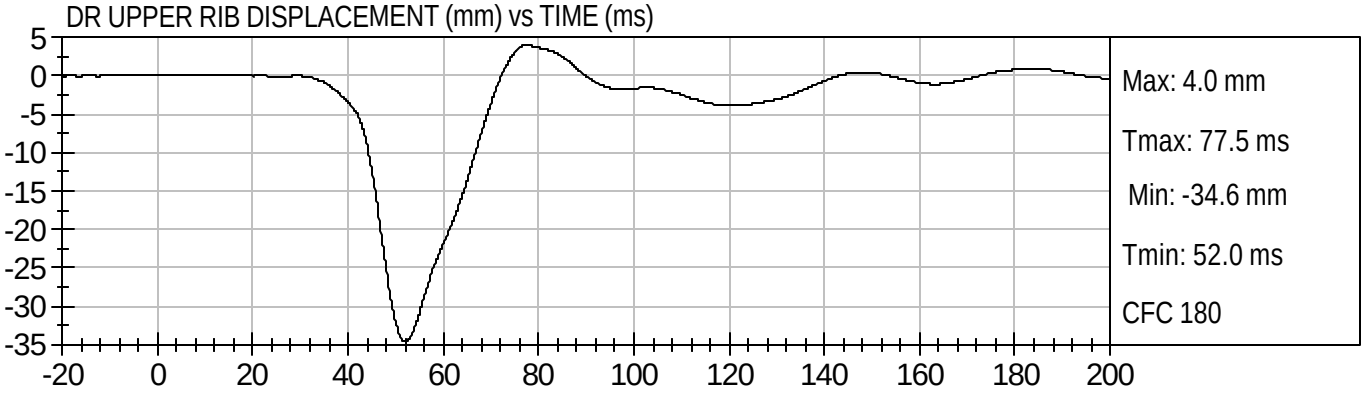
DRIVER UPPER RIB Y (G's) vs TIME (ms)



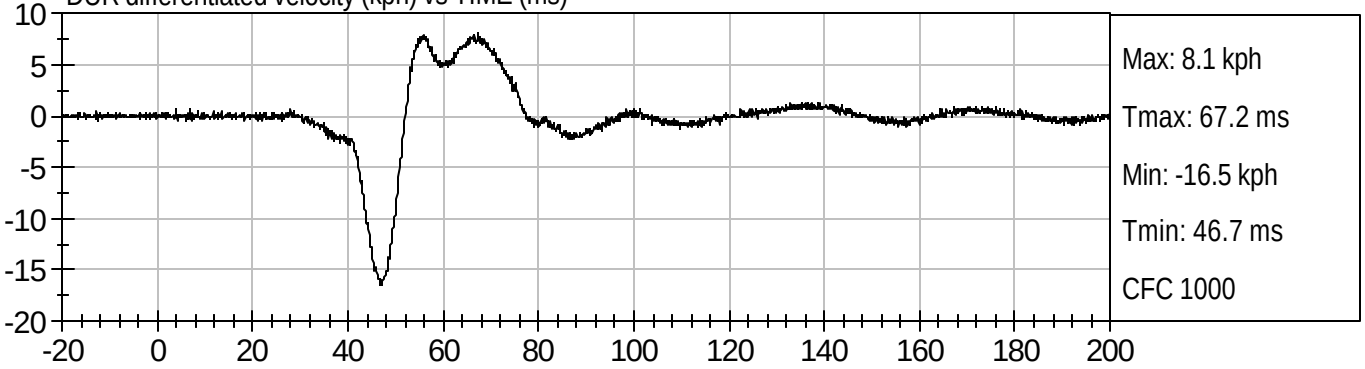
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



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



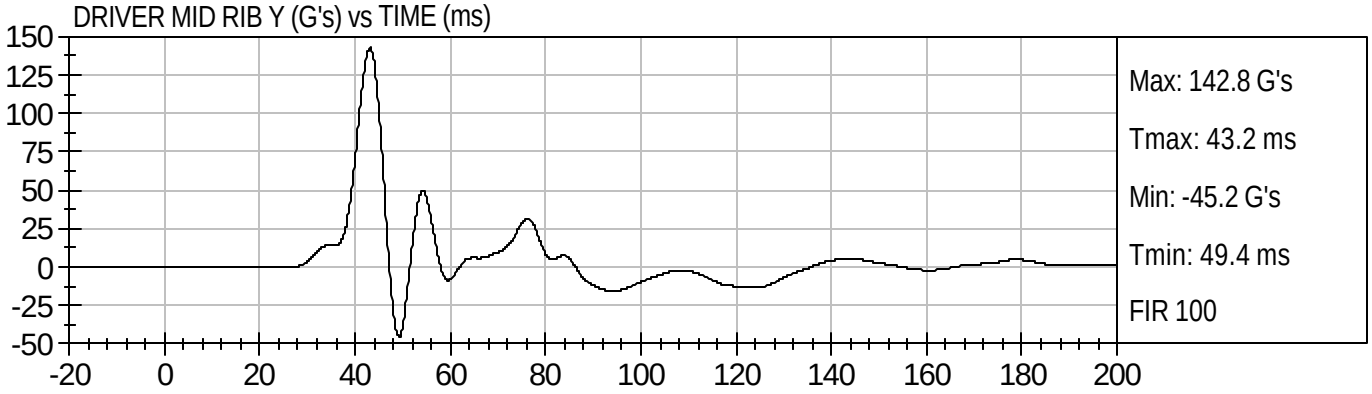
DUR differentiated velocity (kph) vs TIME (ms)



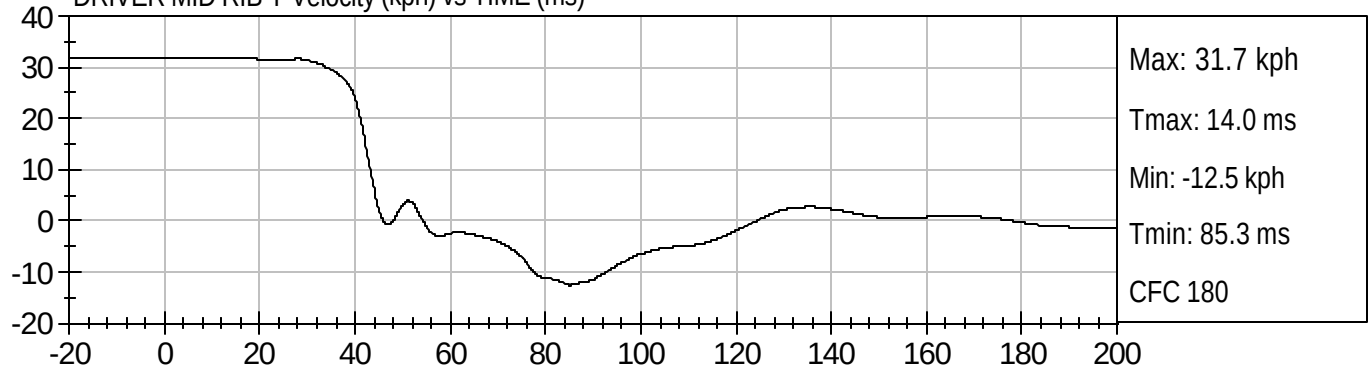
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

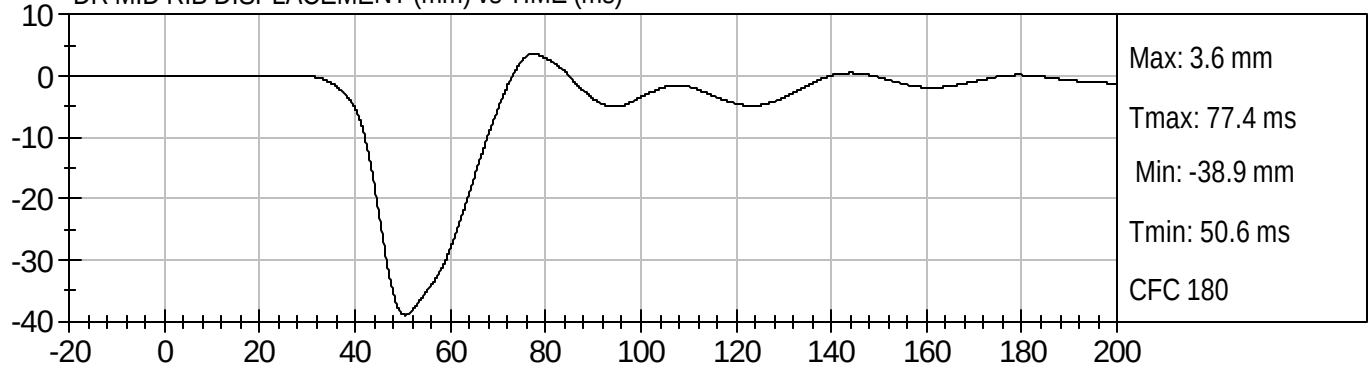
DRIVER MID RIB Y (G's) vs TIME (ms)



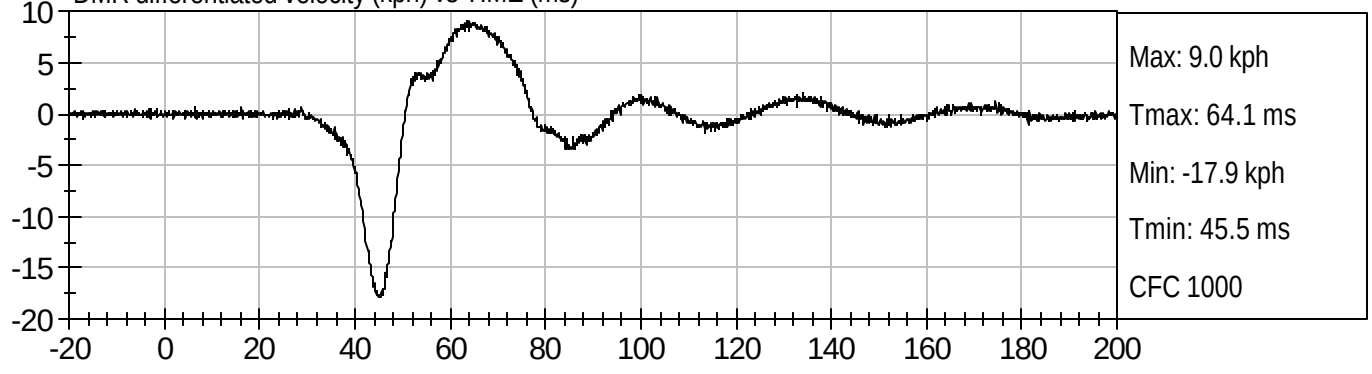
DRIVER MID RIB Y Velocity (kph) vs TIME (ms)



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



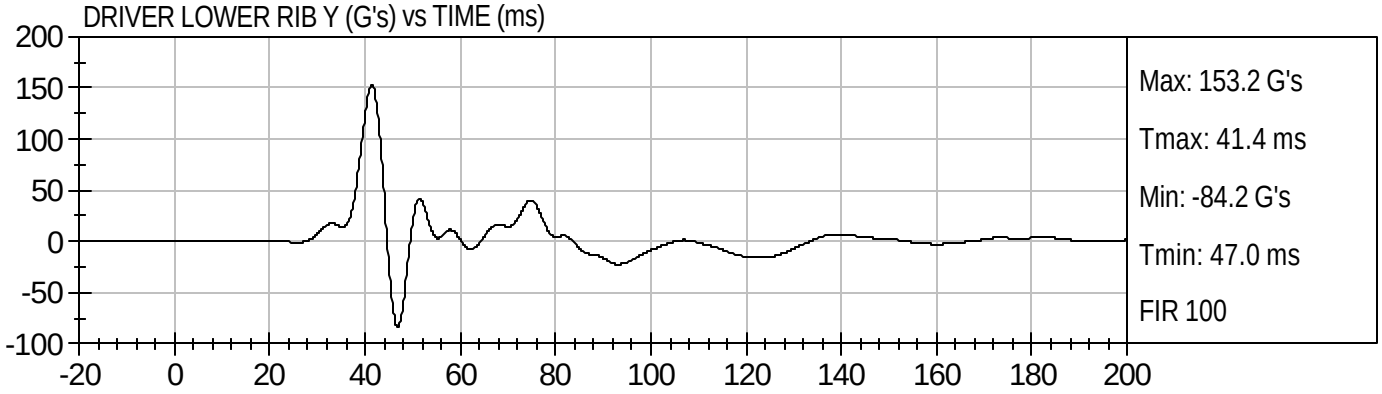
DMR differentiated velocity (kph) vs TIME (ms)



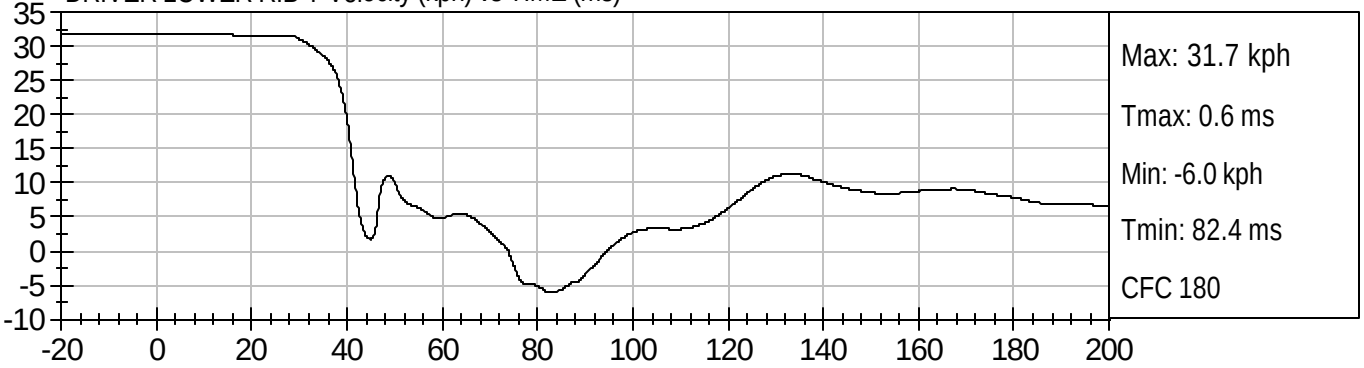
20 MPH SIDE POLE IMPACT
2002 FORD EXPLORER (R21309)

Test Date: 1/13/2003
Speed: 19.7 mph (31.7 km/h)

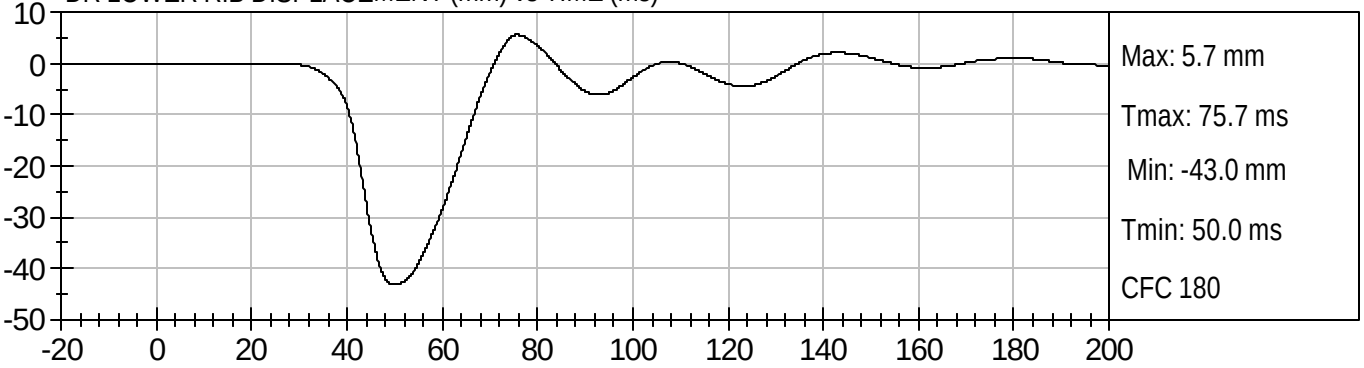
DRIVER LOWER RIB Y (G's) vs TIME (ms)



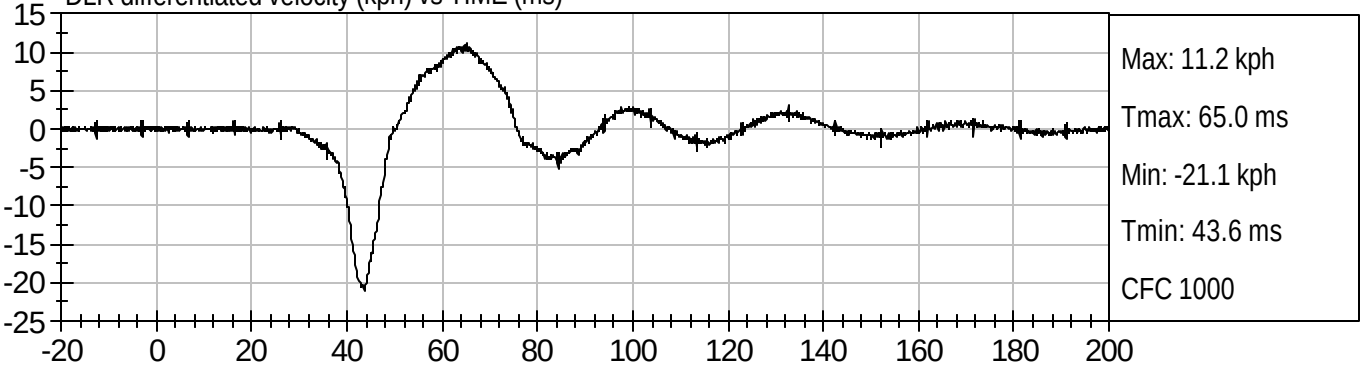
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



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



DLR differentiated velocity (kph) vs TIME (ms)



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

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HEAD DROP TEST

EUROSID 2 DUMMY

Date: 1/9/03

Dummy Serial Number: 009

Test Number: D03001

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	22
Peak Resultant Acceleration	100 – 150 g's	134
Time of Max. Res. Acceleration	msec	24.6

TEST MEETS SPECIFICATIONS

Technician: _____

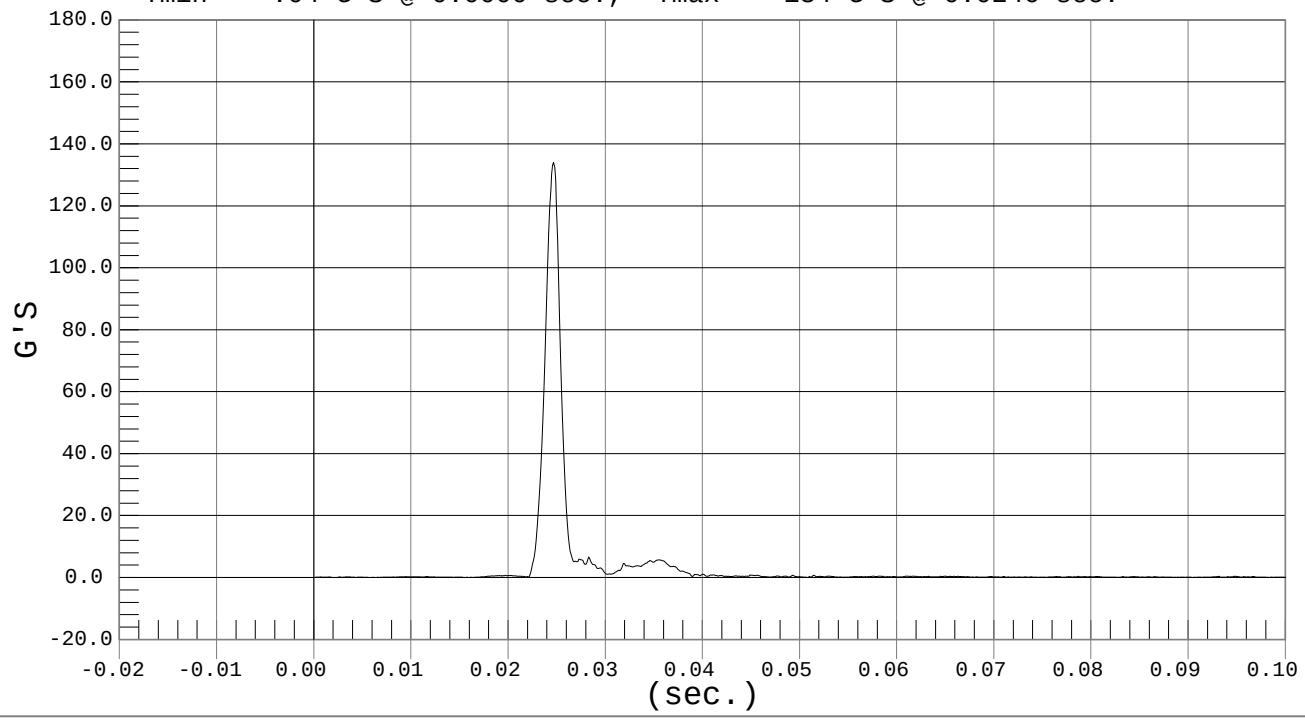
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 01-09-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .04 G'S @ 0.0000 sec., Ymax = 134 G'S @ 0.0246 sec.



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NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 1/9/03

Dummy Serial Number: 009

Test Number: D03002

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.3
Relative Humidity (%)		10 – 70	23
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.35
	8 msec	¯1.59 - ¯2.04 m/sec	-1.72
	14 msec	¯3.20 - ¯3.85 m/sec	-3.37
Maximum Flexion Angle		49.0 – 59.0 deg	57.0
Time of Max. Flexion Angle		54.0 – 66.0 ms	59.8
Maximum Angle Theta (A)		32.0 – 37.0 deg	34.9
Time of Max. Theta (A)		53.0 – 63.0 ms	58.8
Maximum Angle Theta (B)		30.02 – 32.52 deg	31.68
Time of Max. Theta (B)		54.0 – 64.0 ms	57.2

TEST MEETS SPECIFICATIONS

Technician: _____

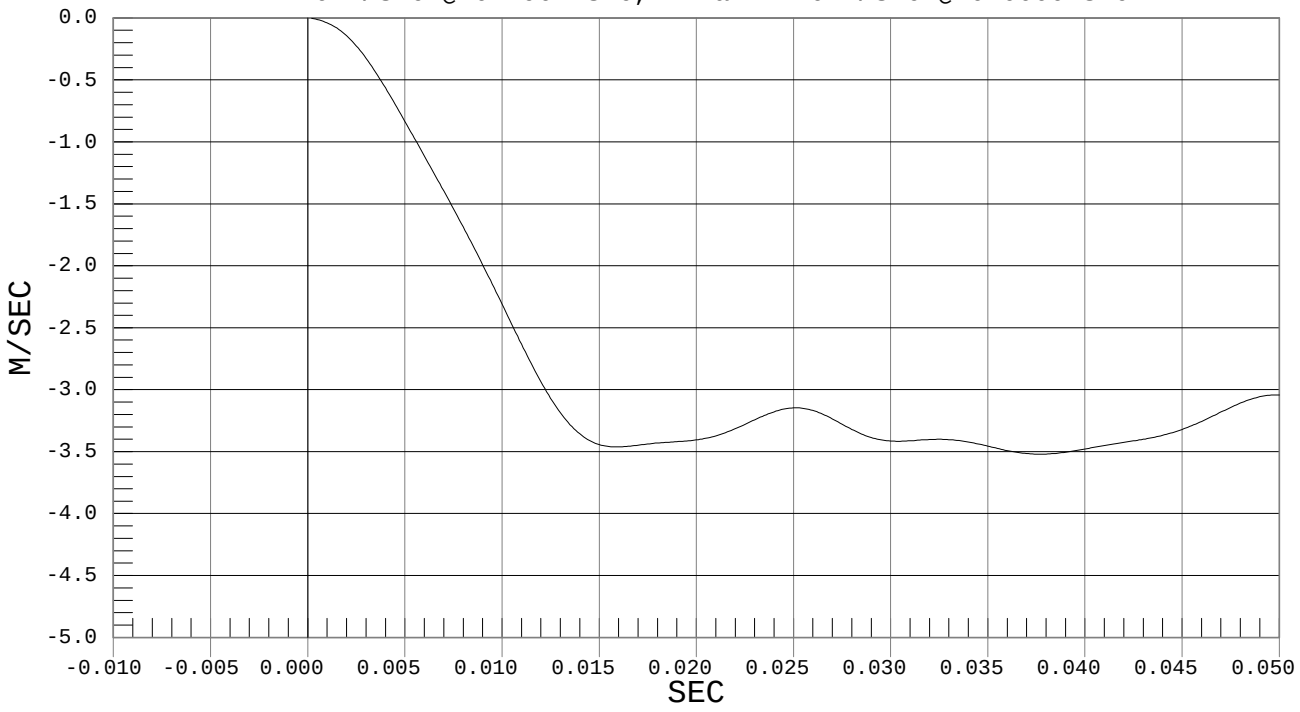
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-09-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -4.26 M/SEC @ 0.1902 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

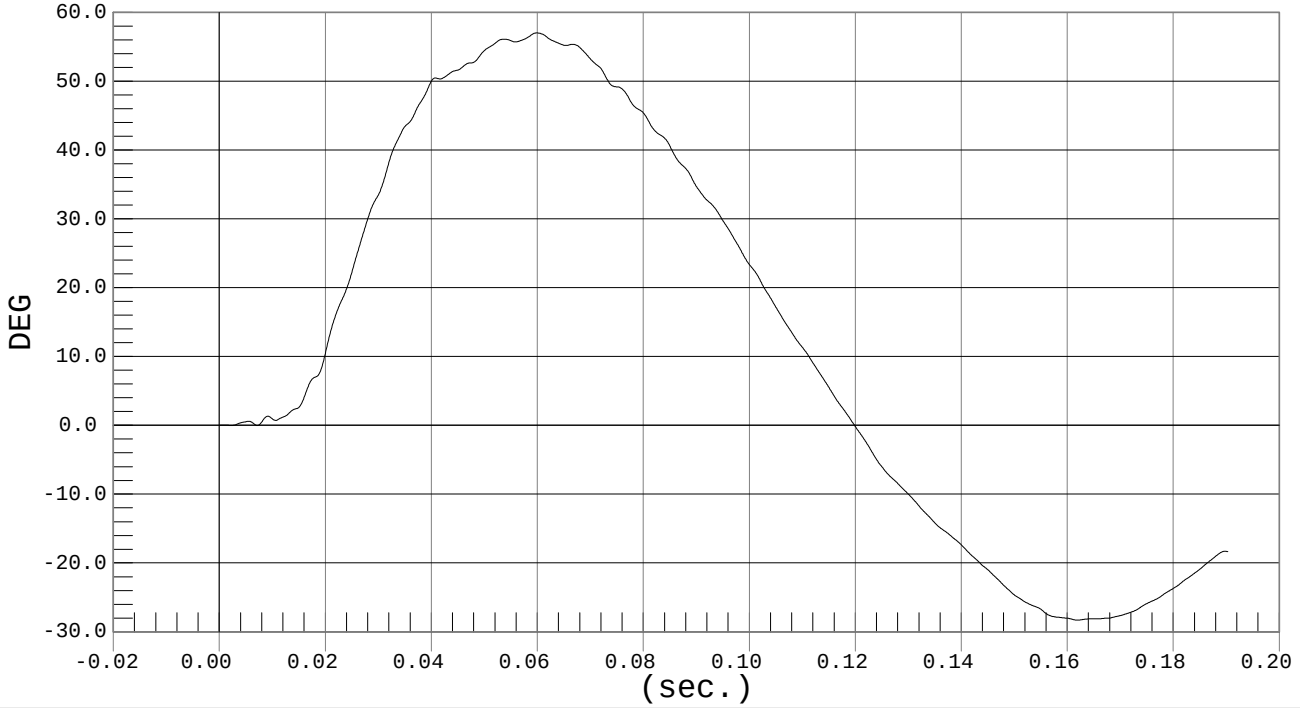


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-09-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -28.31 DEG @ 0.1618 sec., Ymax = 57 DEG @ 0.0598 sec.

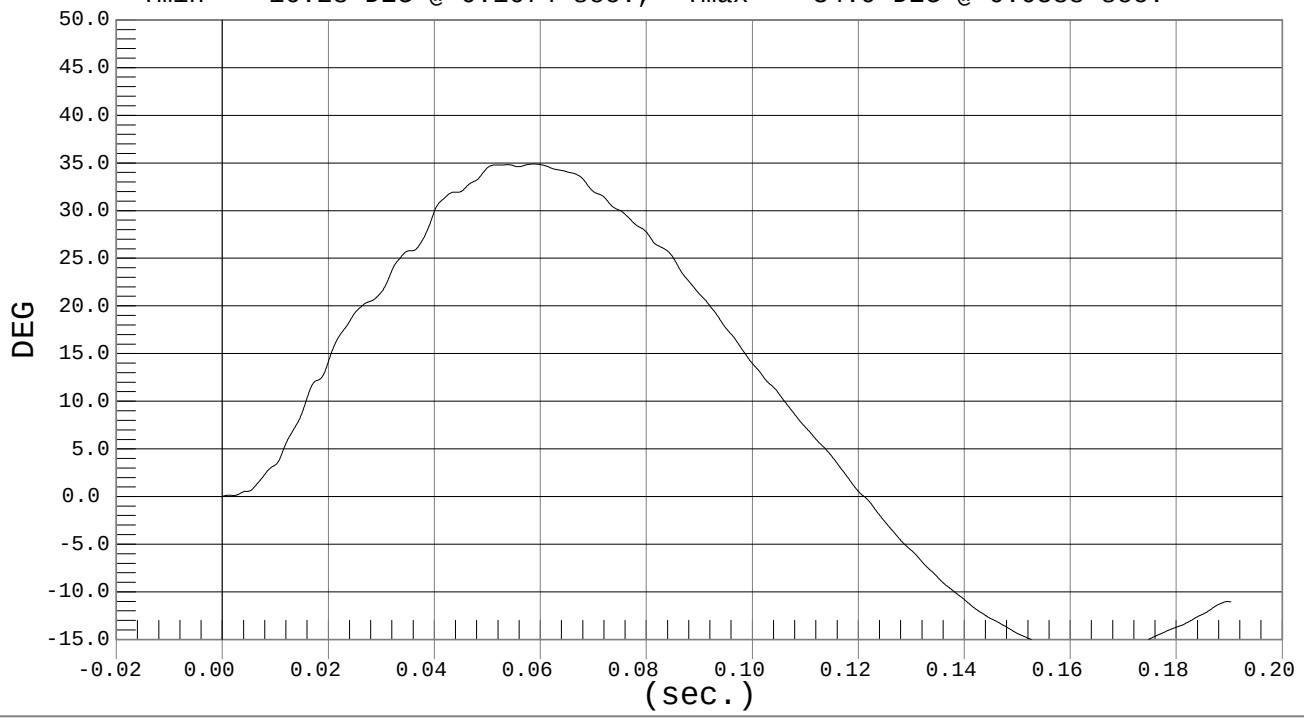


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-09-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -16.28 DEG @ 0.1674 sec., Ymax = 34.9 DEG @ 0.0588 sec.

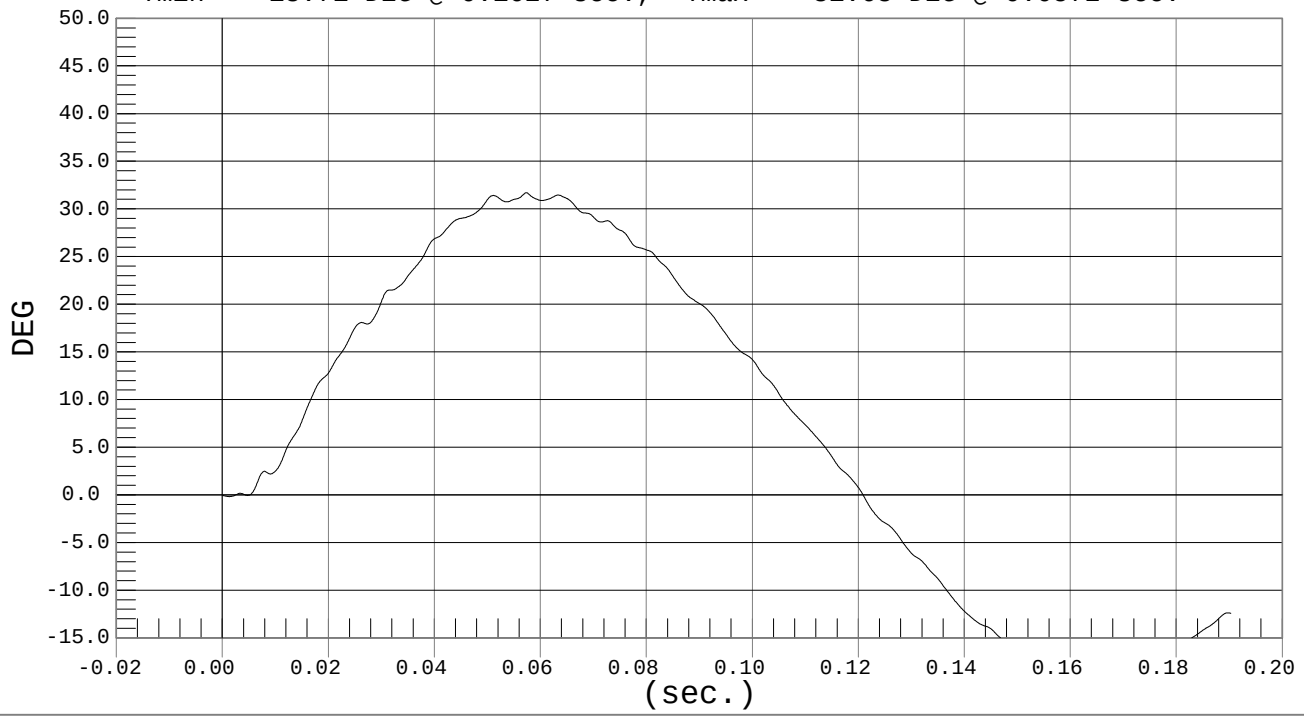


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-09-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -18.71 DEG @ 0.1627 sec., Ymax = 31.68 DEG @ 0.0572 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 1/7/03

Dummy Serial Number: 009

Test Number: D03003

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	19.2
Relative Humidity (%)	10 – 70	23
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	8.9
Time of Max. Pendulum Acceleration	msec	11.4

TEST MEETS SPECIFICATIONS

Technician: _____

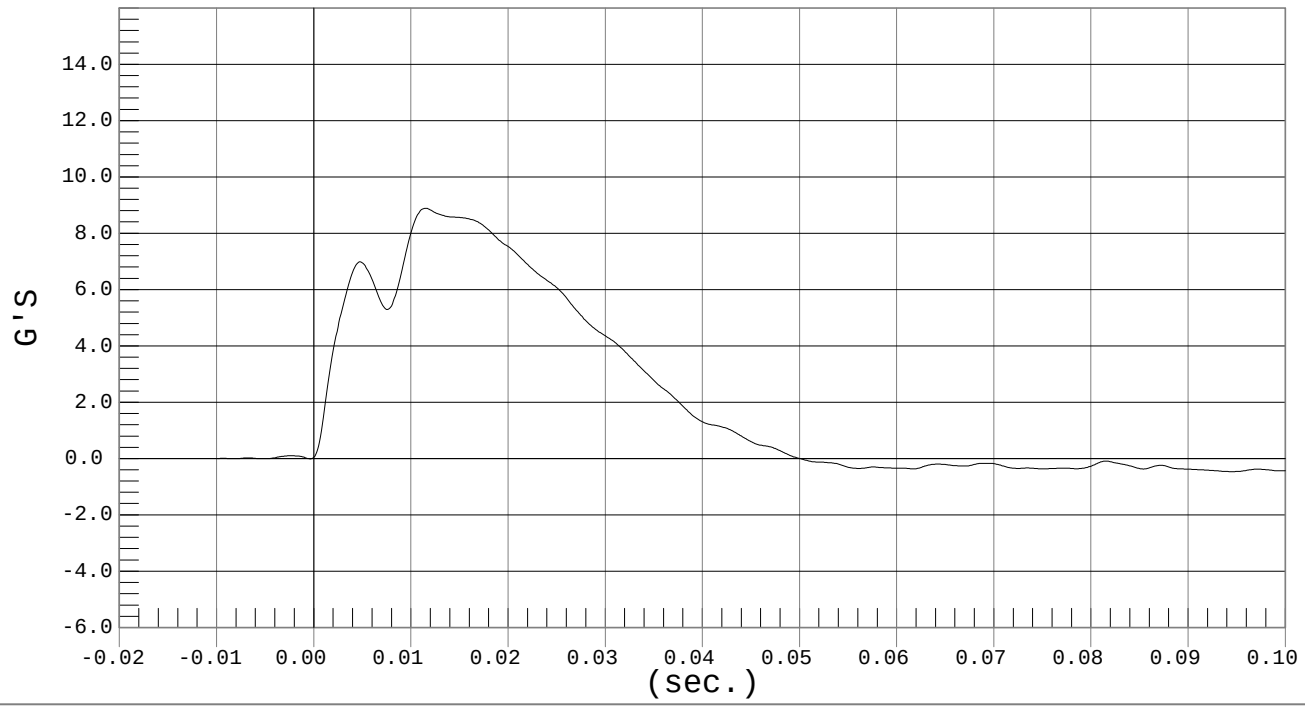
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 01-07-03
Speed: 14.1 fps, 4.29 M/s

Ymin = -.5 G'S @ 0.1018 sec., Ymax = 8.89 G'S @ 0.0114 sec.



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UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 1/9/03

Dummy Serial Number: 009

Test Number: D03004/5/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.6
Relative Humidity (%)	10 – 70	22
Displacement at 2 m/s	23.5 – 27.5 mm	26.8
Displacement at 3 m/s	36.0 – 40.0 mm	39.6
Displacement at 4 m/s	46.0 – 51.0 mm	50.4

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.6
Relative Humidity (%)	10 – 70	22
Displacement at 2 m/s	23.5 – 27.5 mm	25.9
Displacement at 3 m/s	36.0 – 40.0 mm	37.7
Displacement at 4 m/s	46.0 – 51.0 mm	49.2

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.6
Relative Humidity (%)	10 – 70	22
Displacement at 2 m/s	23.5 – 27.5 mm	25.3
Displacement at 3 m/s	36.0 – 40.0 mm	37.4
Displacement at 4 m/s	46.0 – 51.0 mm	48.0

TEST MEETS SPECIFICATIONS

Technician: _____

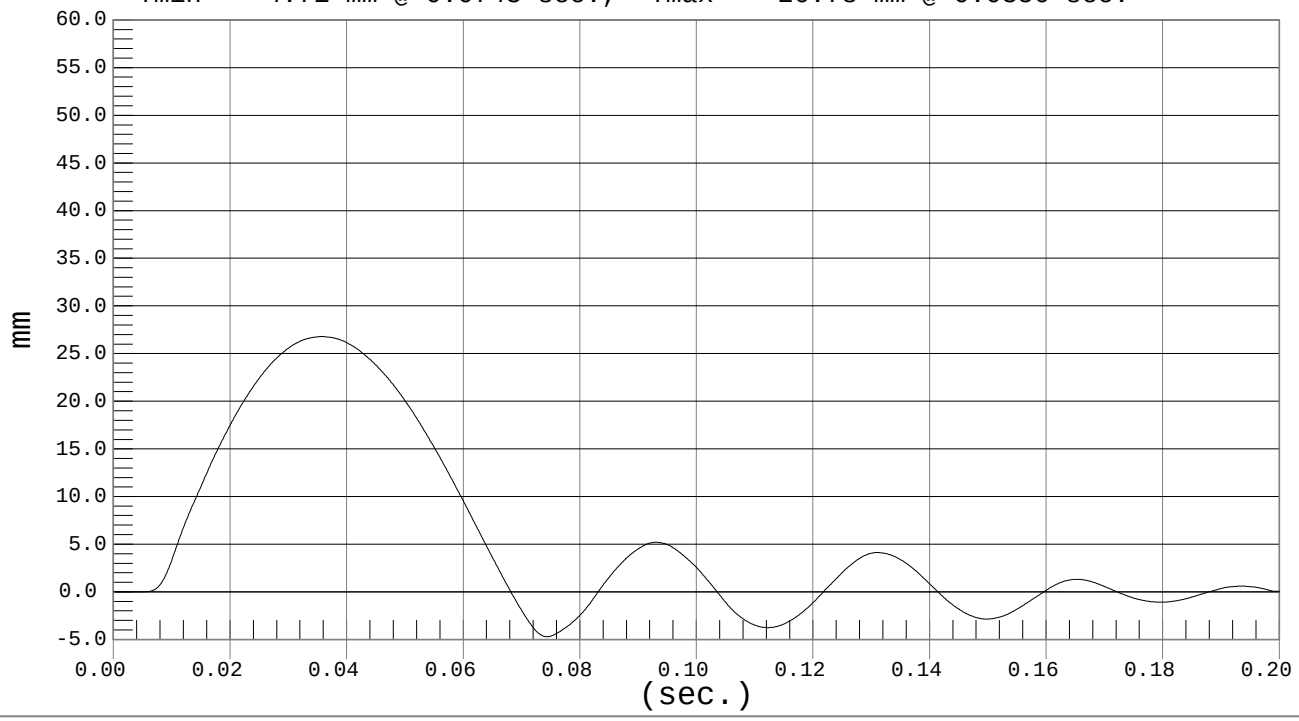
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.71 mm @ 0.0743 sec., Ymax = 26.78 mm @ 0.0356 sec.

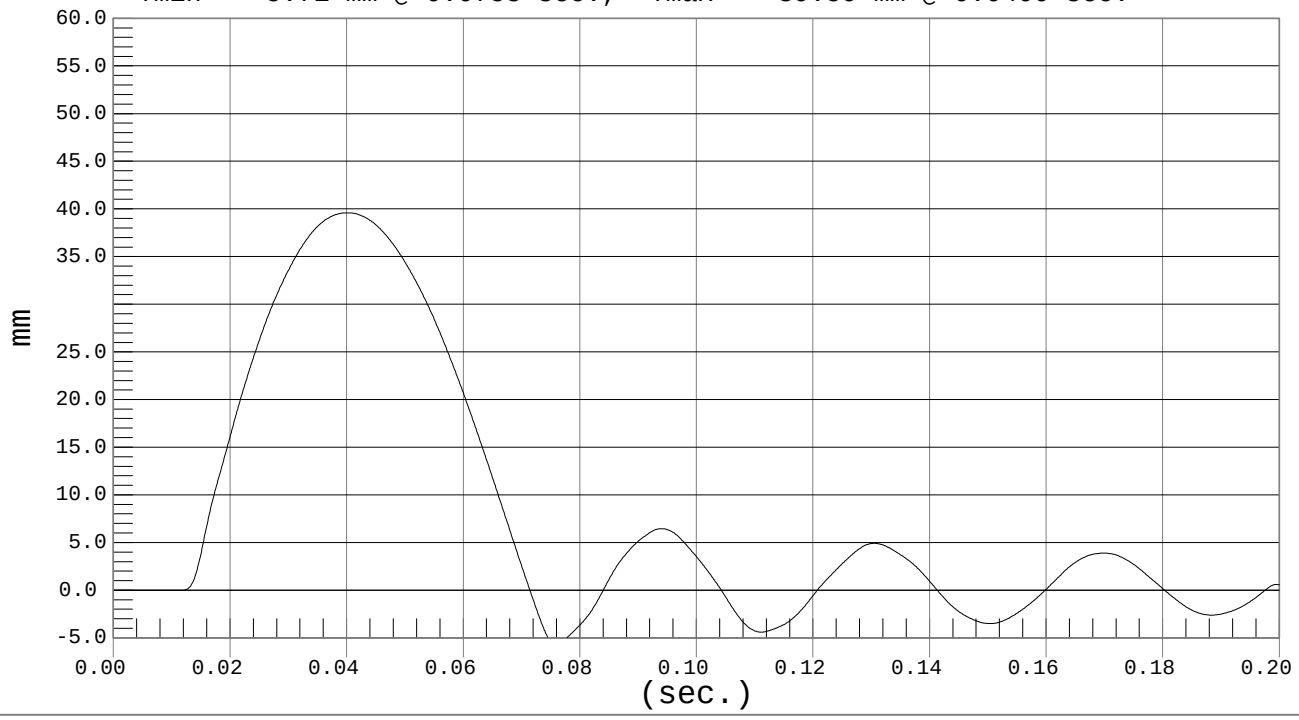


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.71 mm @ 0.0758 sec., Ymax = 39.59 mm @ 0.0400 sec.

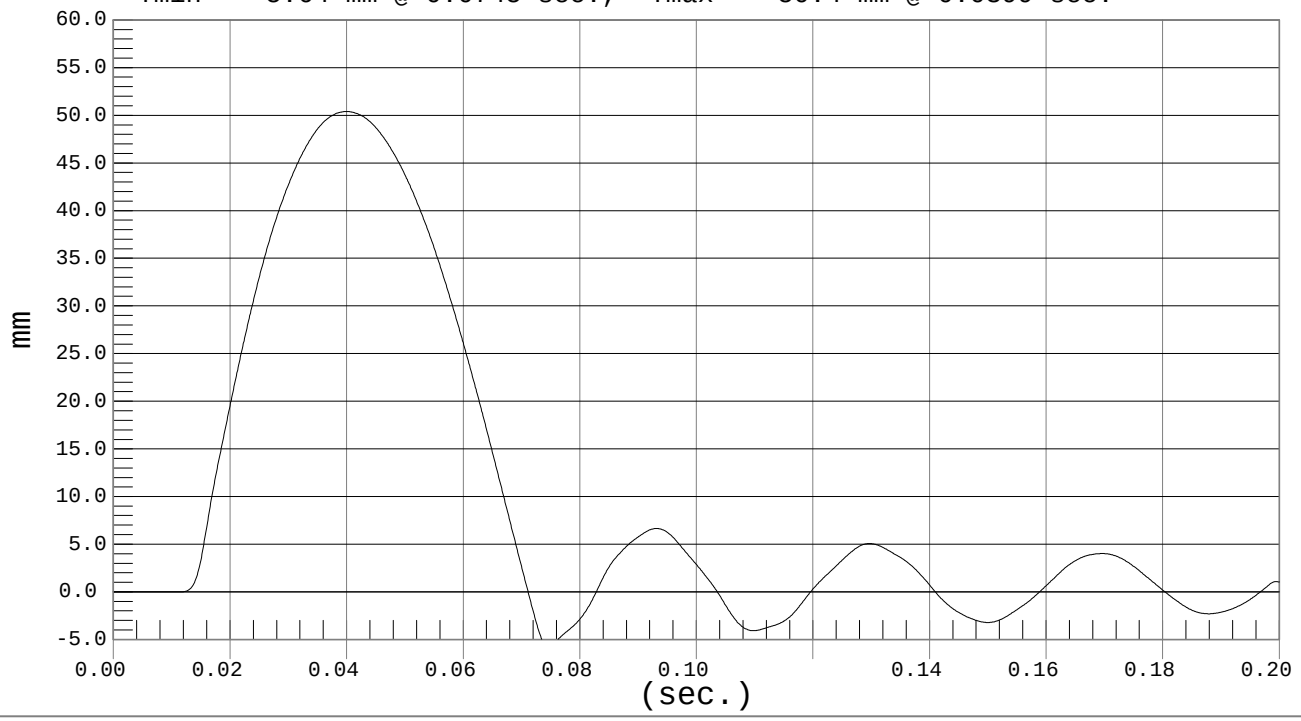


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.64 mm @ 0.0745 sec., Ymax = 50.4 mm @ 0.0399 sec.

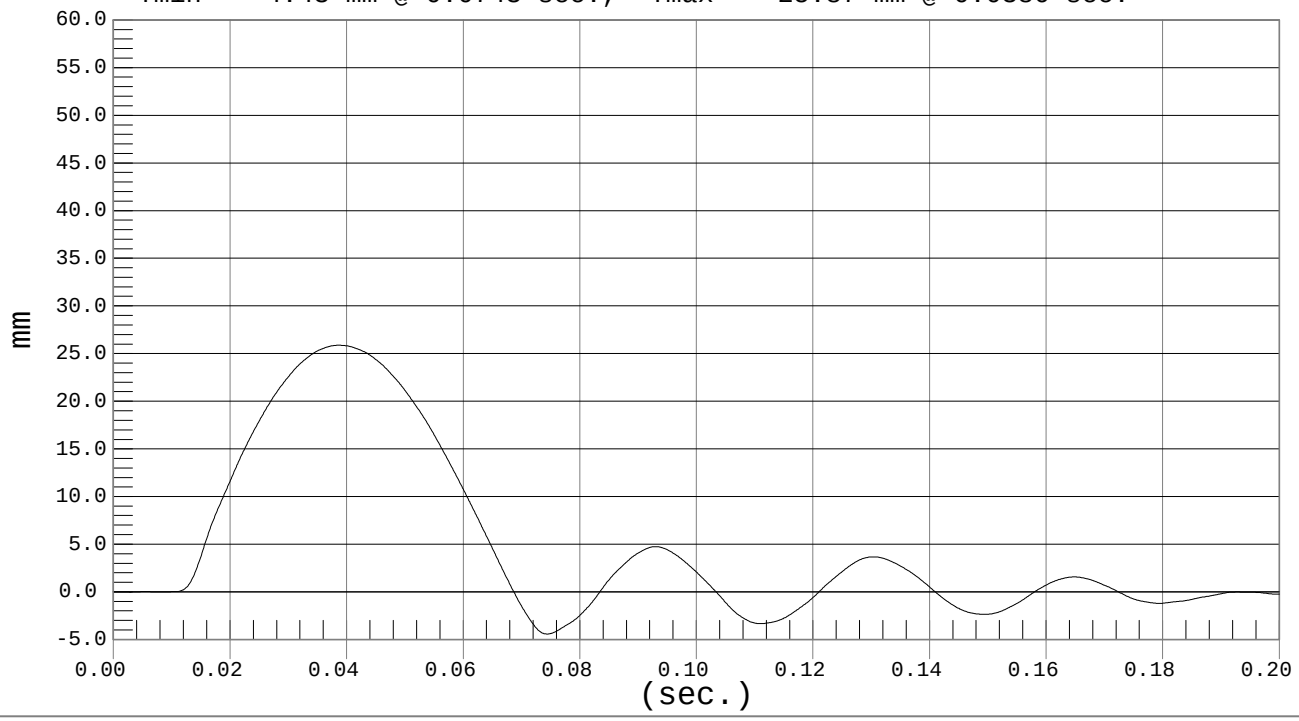


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.43 mm @ 0.0743 sec., Ymax = 25.87 mm @ 0.0386 sec.

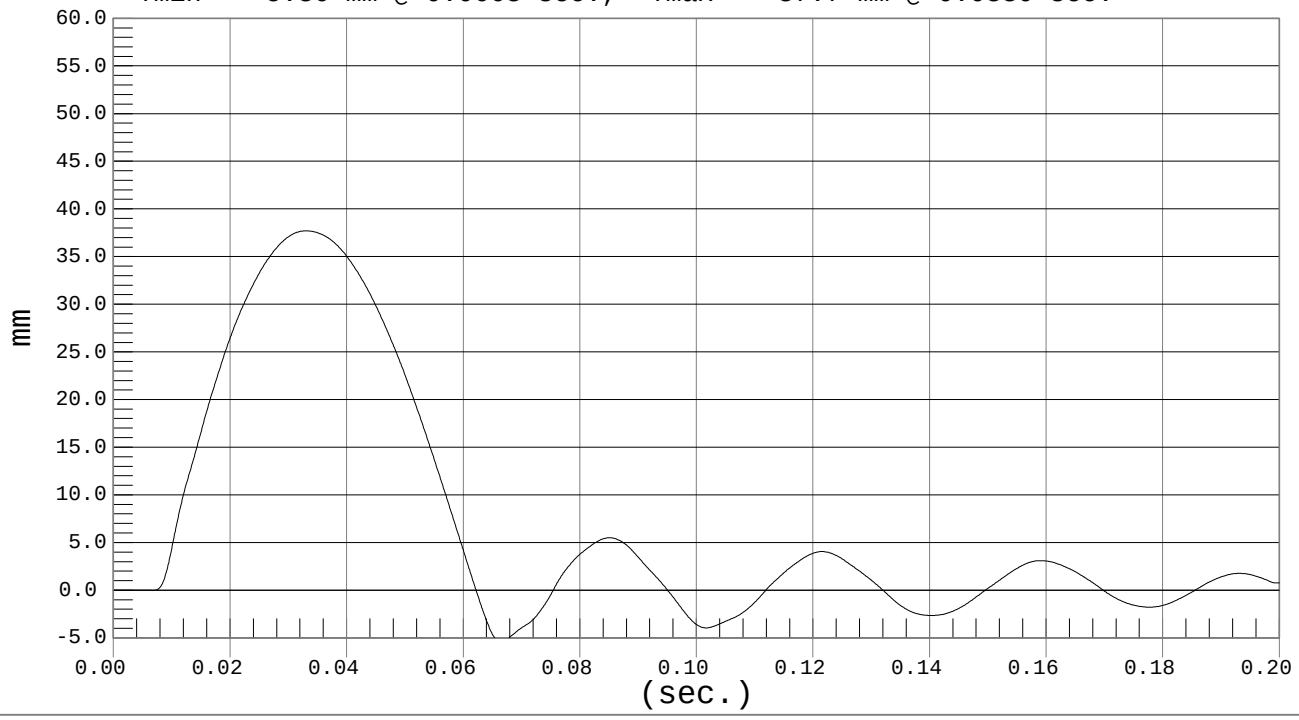


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.36 mm @ 0.0663 sec., Ymax = 37.7 mm @ 0.0330 sec.

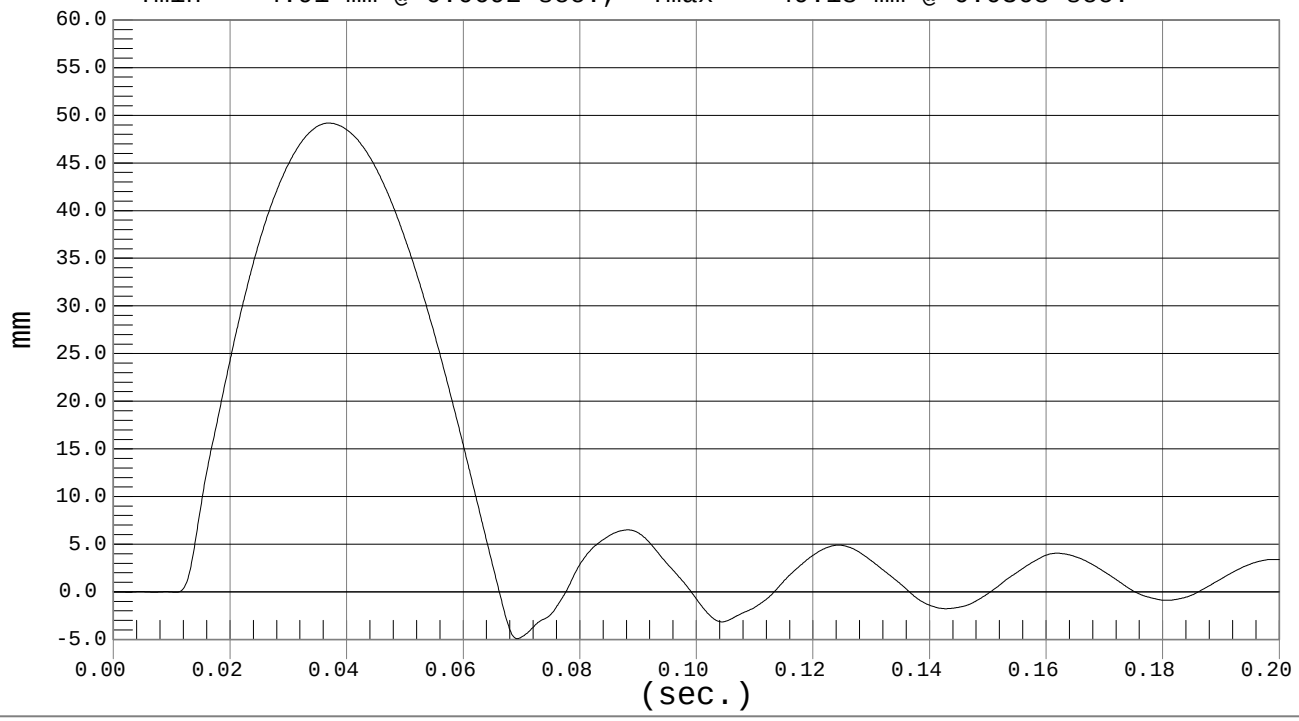


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 13.9 fps, 4.23 M/s

Ymin = -4.91 mm @ 0.0692 sec., Ymax = 49.18 mm @ 0.0368 sec.

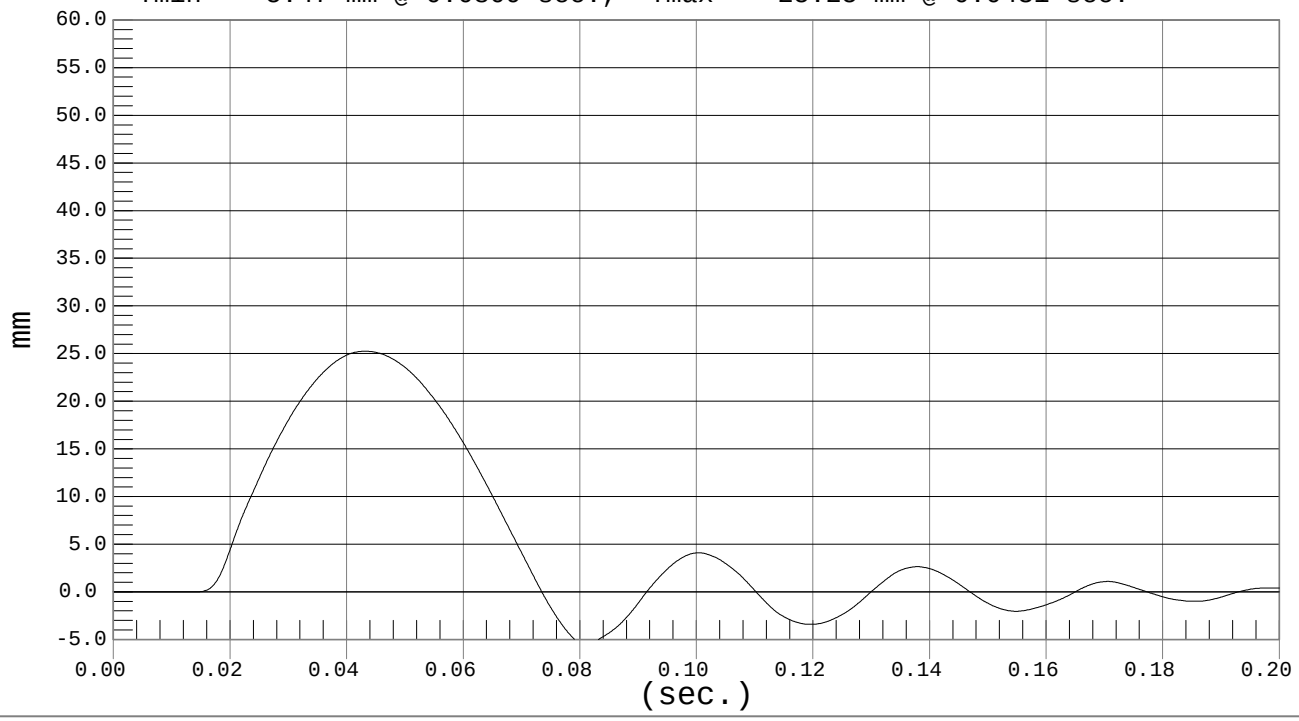


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.47 mm @ 0.0809 sec., Ymax = 25.25 mm @ 0.0431 sec.

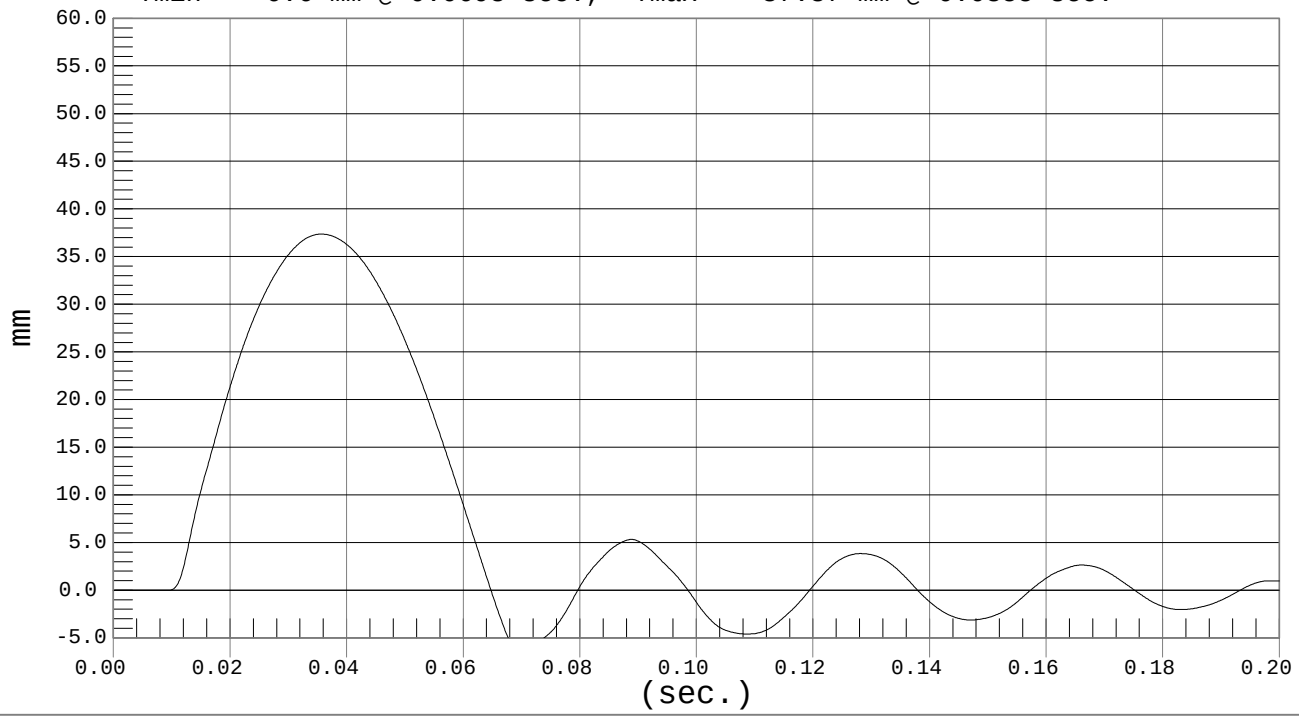


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.6 mm @ 0.0698 sec., Ymax = 37.37 mm @ 0.0355 sec.

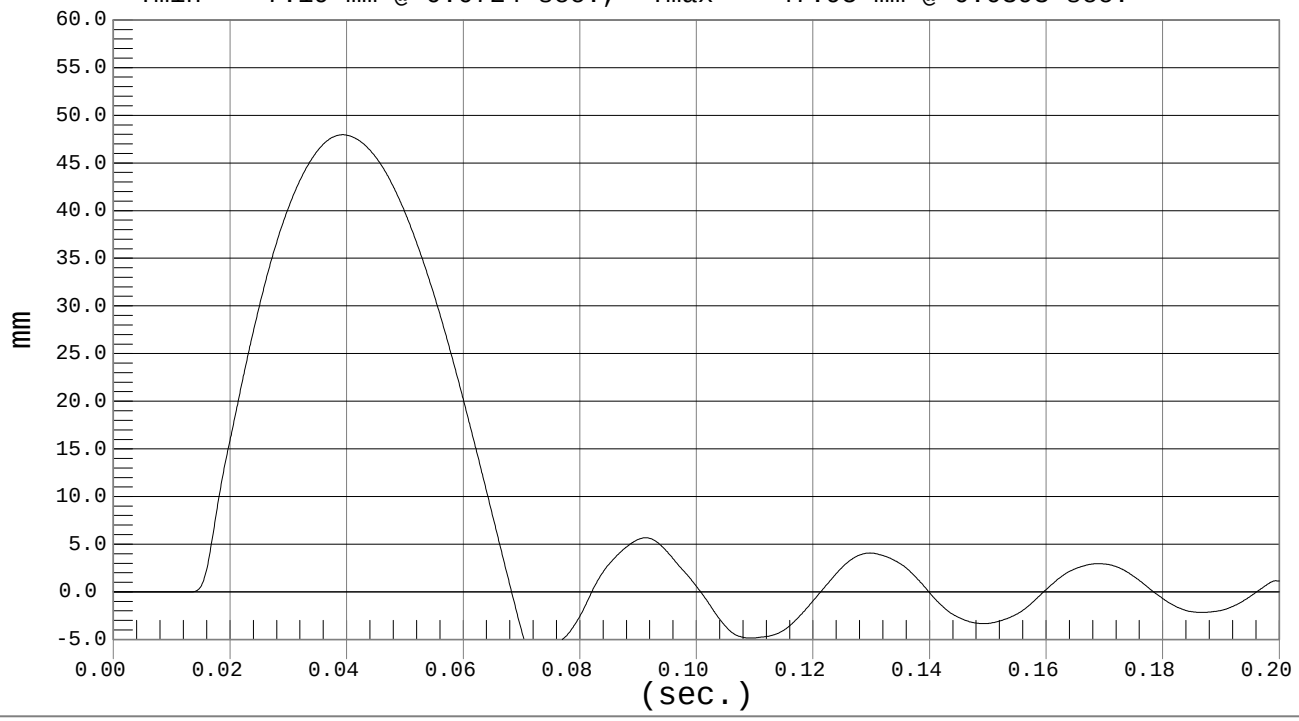


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-09-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -7.19 mm @ 0.0724 sec., Ymax = 47.95 mm @ 0.0393 sec.



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

Date: 1/7/03

Dummy Serial Number: 009

Test Number: D03007

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	19.3
Relative Humidity (%)	10 – 70	23
Probe Speed (m/s)	3.90 – 4.10	4.02
Maximum Impact Force	4.00 – 4.80 kN	4.62
Time of Maximum Force	10.60 – 13.00 ms	10.70
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.38
Time of Max. Total Force	10.00 – 12.30 ms	10.60

TEST MEETS SPECIFICATIONS

Technician: _____

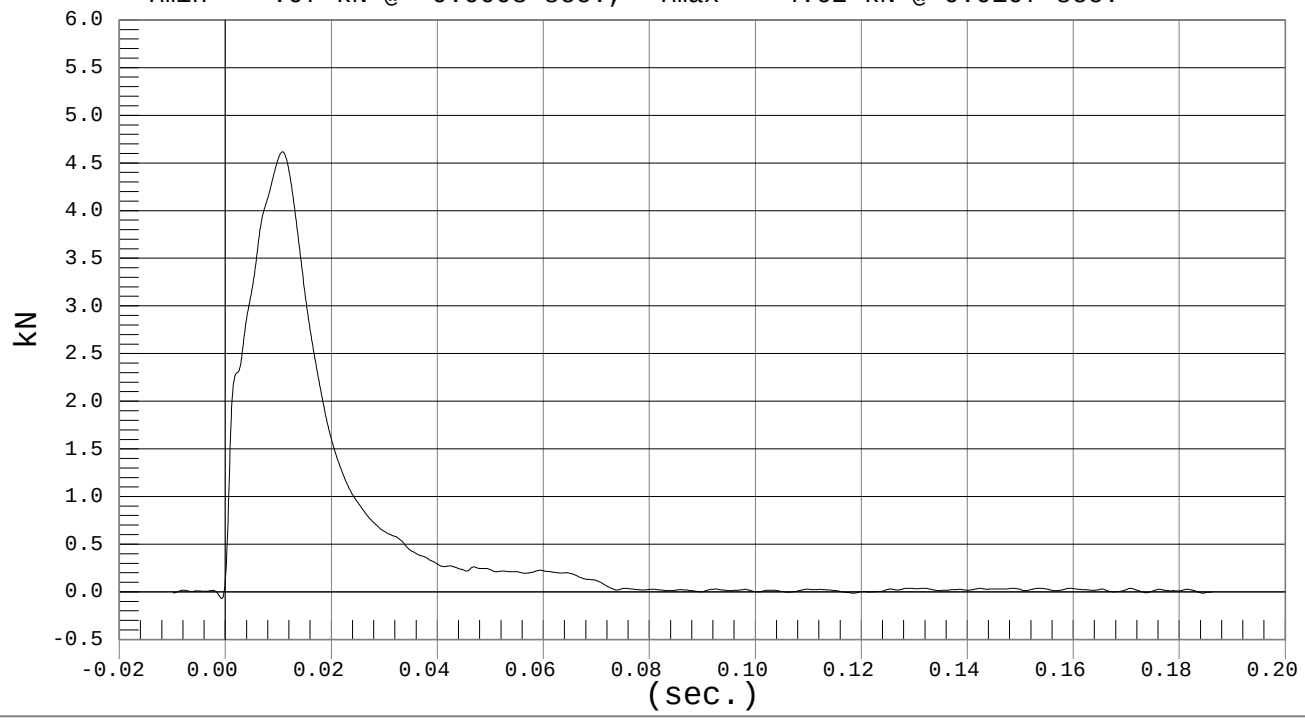
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 01-07-03
Speed: 13.2 fps, 4.02 M/s

Ymin = -.07 kN @ -0.0008 sec., Ymax = 4.62 kN @ 0.0107 sec.

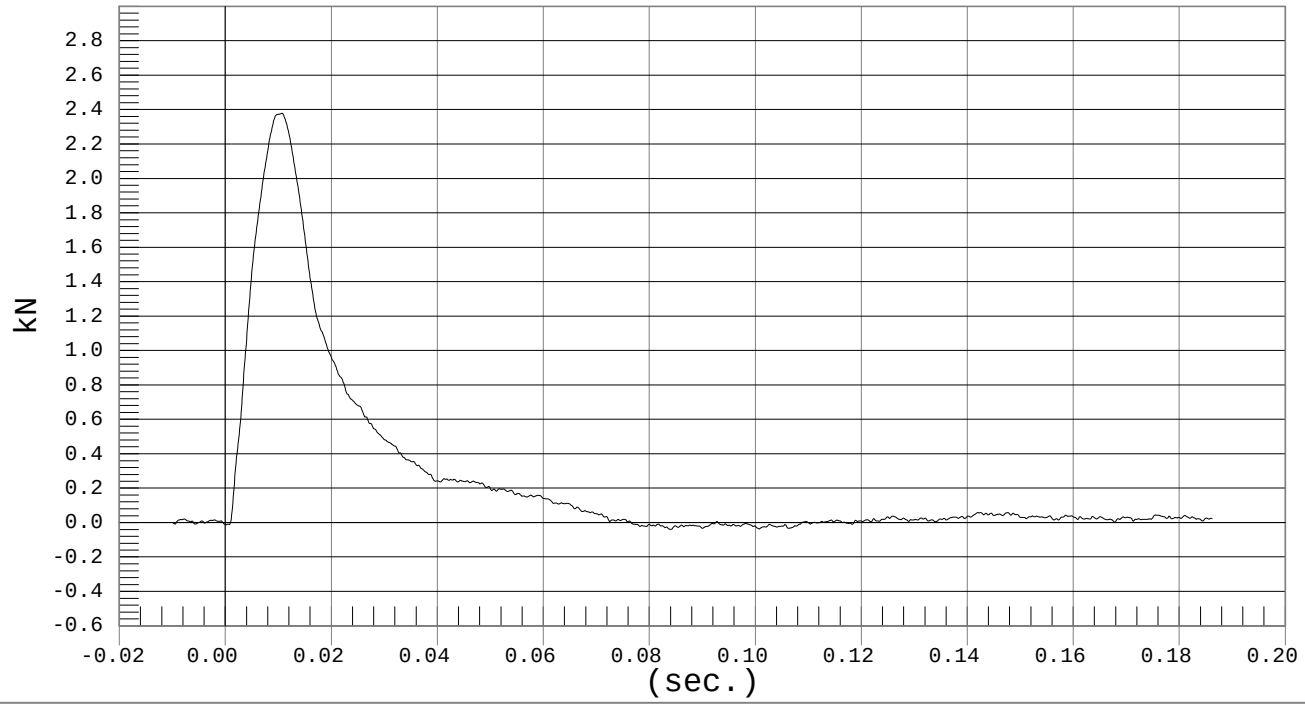


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 01-07-03
Speed: 13.2 fps, 4.02 M/s

Ymin = -.04 kN @ 0.0840 sec., Ymax = 2.38 kN @ 0.0106 sec.



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 1/9/03

Dummy Serial Number: 009

Test Number: D03008

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.9
Relative Humidity (%)		10 – 70	22
Pendulum Speed		5.95 – 6.15	5.99
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-2.12
	20 msec	-5.25 - -4.07 m/sec	-4.81
	25 msec	-6.64 - -5.30 m/sec	-5.91
	30 msec	≥ -6.5 m/sec	-6.18
Maximum Flexion Angle		45.0 – 55.0 deg	48.8
Time of Max. Flexion Angle		39.0 – 53.0 ms	43.7
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.5
Time of Max. Theta (A)		44.0 – 52.0 ms	44.6
Maximum Angle Theta (B)		27.20– 29.70 deg	27.66
Time of Max. Theta (B)		44.0 – 52.0 ms	44.6

TEST MEETS SPECIFICATIONS

Technician: _____

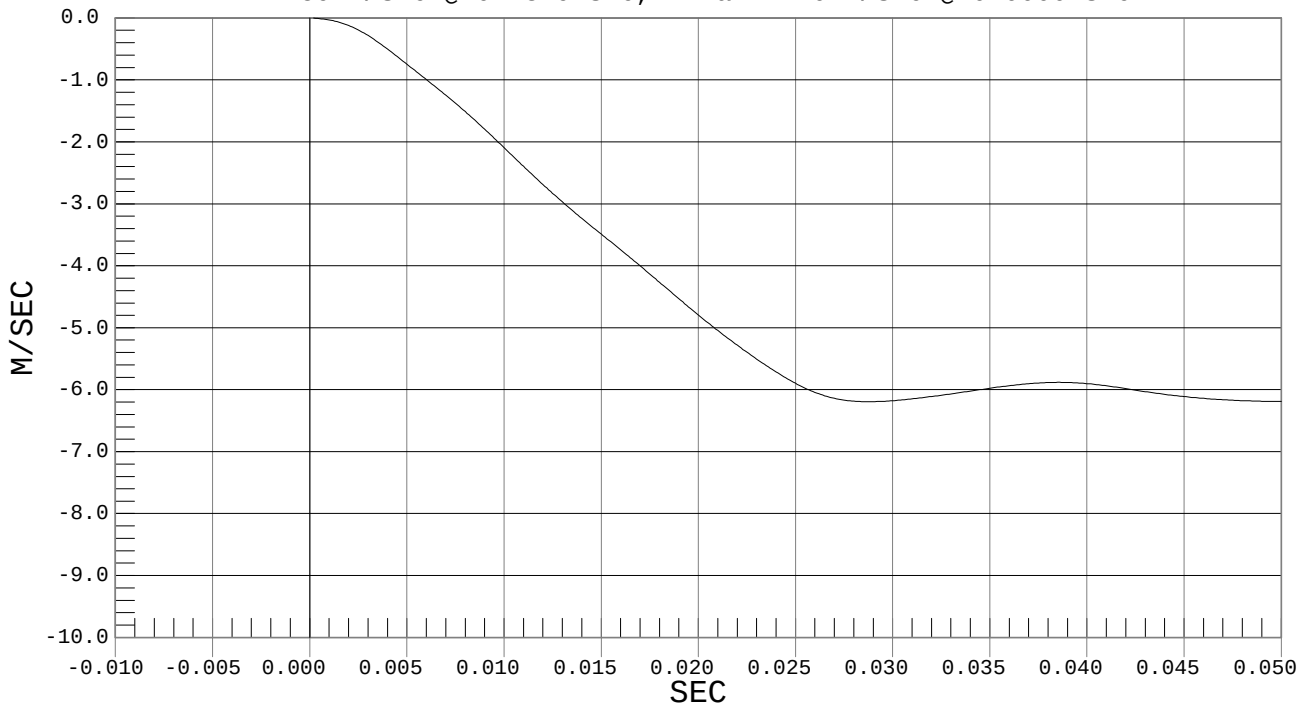
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-09-03
Speed: 19.7 fps, 5.99 M/s

Ymin = -7.59 M/SEC @ 0.1379 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

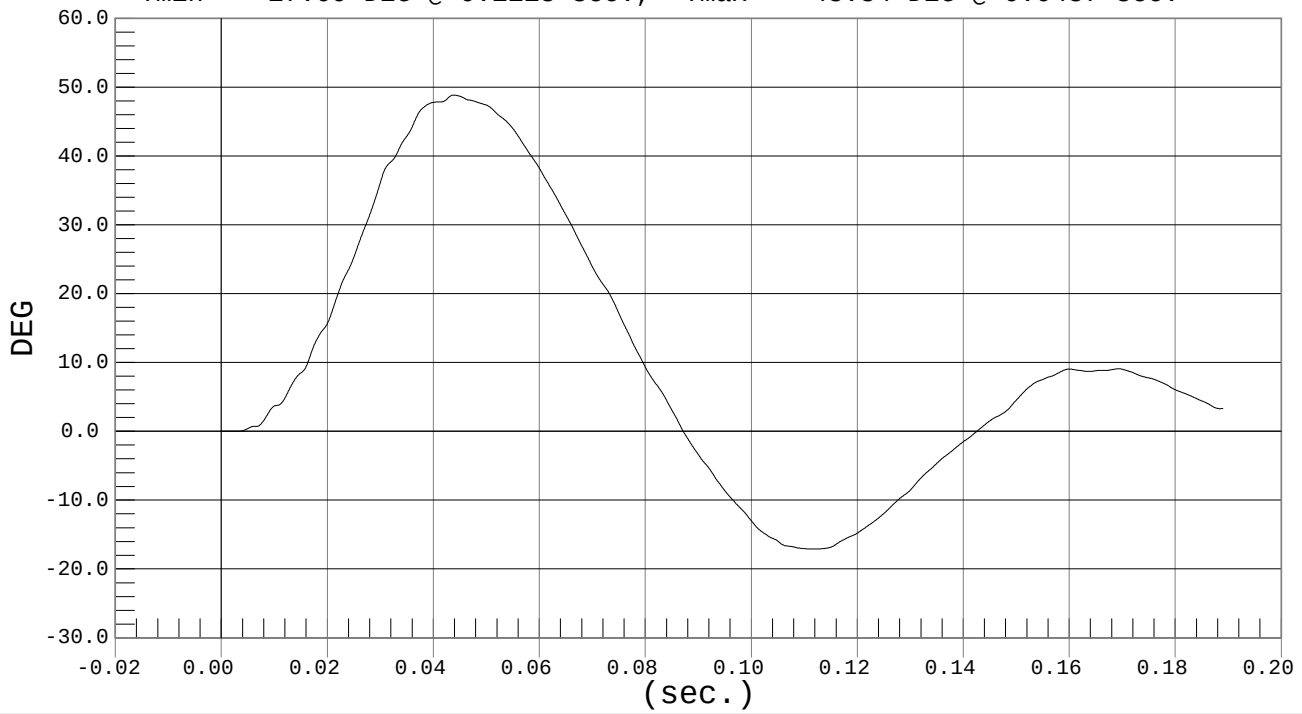


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-09-03
Speed: 19.7 fps, 5.99 M/s

Ymin = -17.09 DEG @ 0.1113 sec., Ymax = 48.84 DEG @ 0.0437 sec.

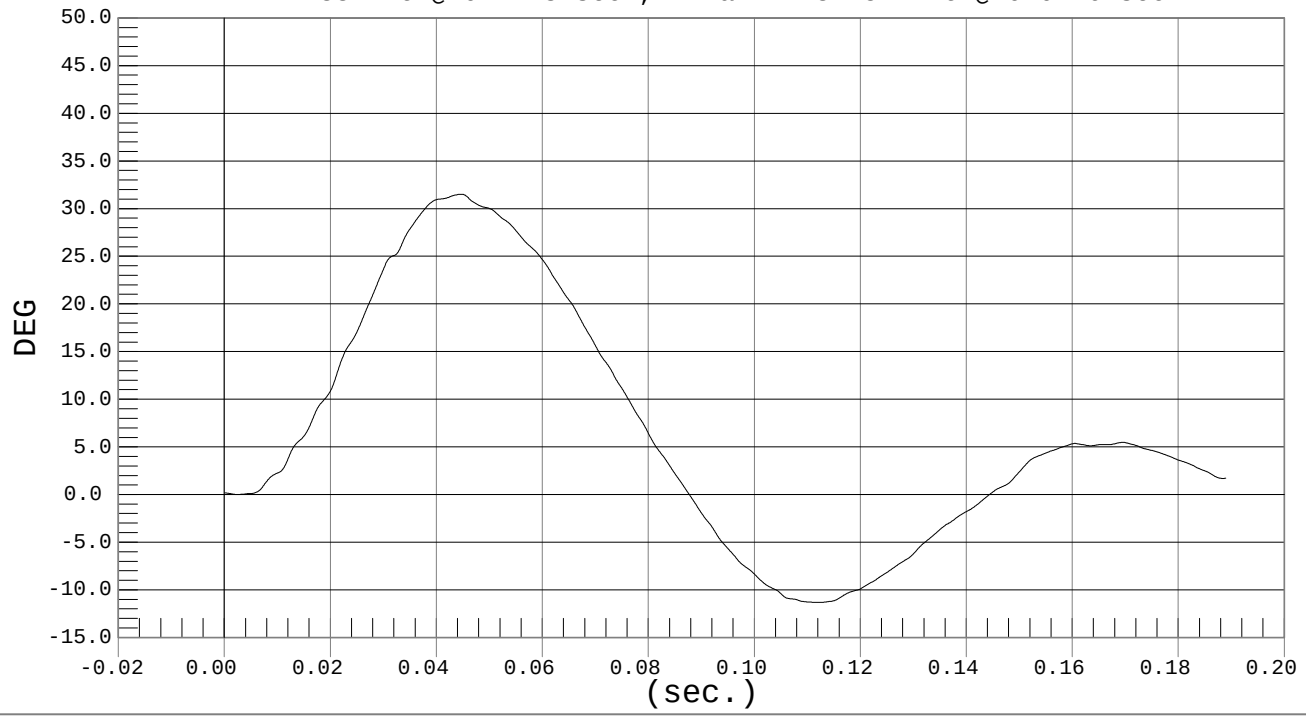


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-09-03
Speed: 19.7 fps, 5.99 M/s

Ymin = -11.33 DEG @ 0.1118 sec., Ymax = 31.52 DEG @ 0.0446 sec.

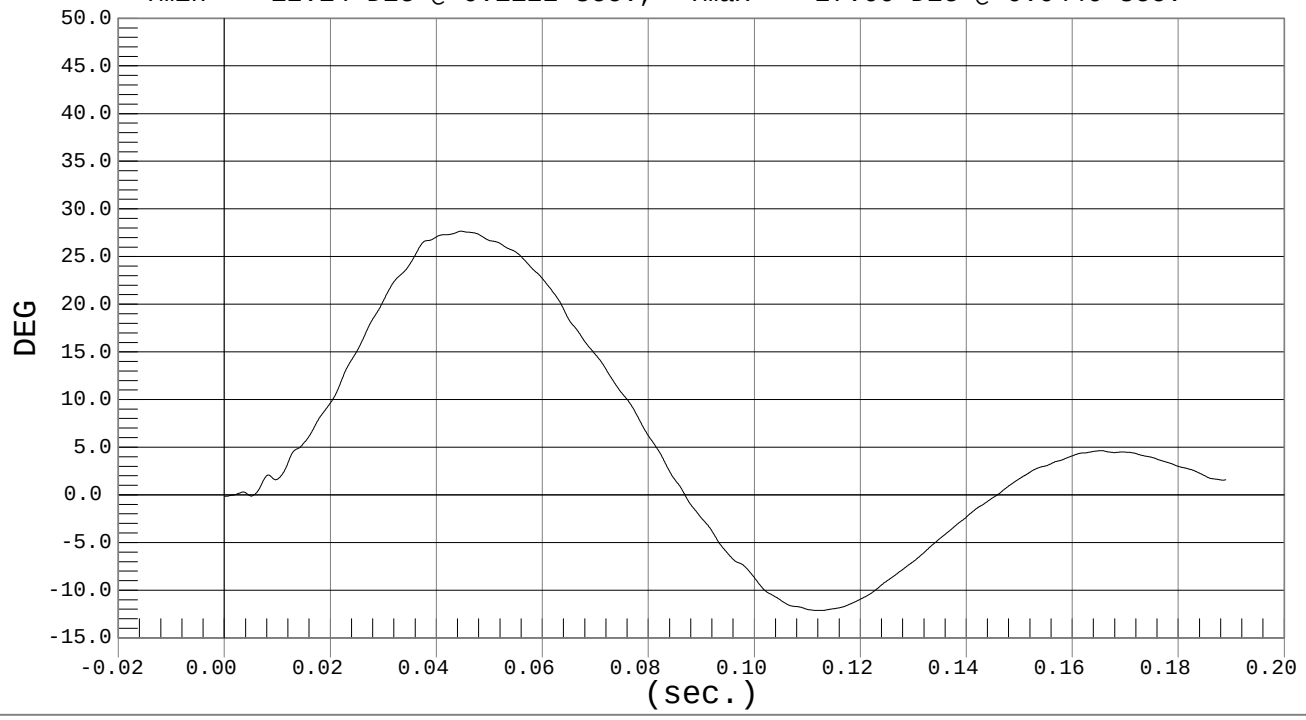


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-09-03
Speed: 19.7 fps, 5.99 M/s

Ymin = -12.14 DEG @ 0.1122 sec., Ymax = 27.66 DEG @ 0.0446 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 1/7/03

Dummy Serial Number: 009

Test Number: D03009

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	19.1
Relative Humidity (%)	10 – 70	23
Pendulum Speed	4.20 – 4.40 m/s	4.30
Maximum Impactor Force	4.40 – 5.40 kN	4.78
Time of Max. Impactor Force	10.30 – 15.50 ms	14.50
Maximum Pubic Force	1.04 – 1.64 kN	1.32
Time of Max. Pubic Force	9.90 – 15.90 ms	14.10

TEST MEETS SPECIFICATIONS

Technician: _____

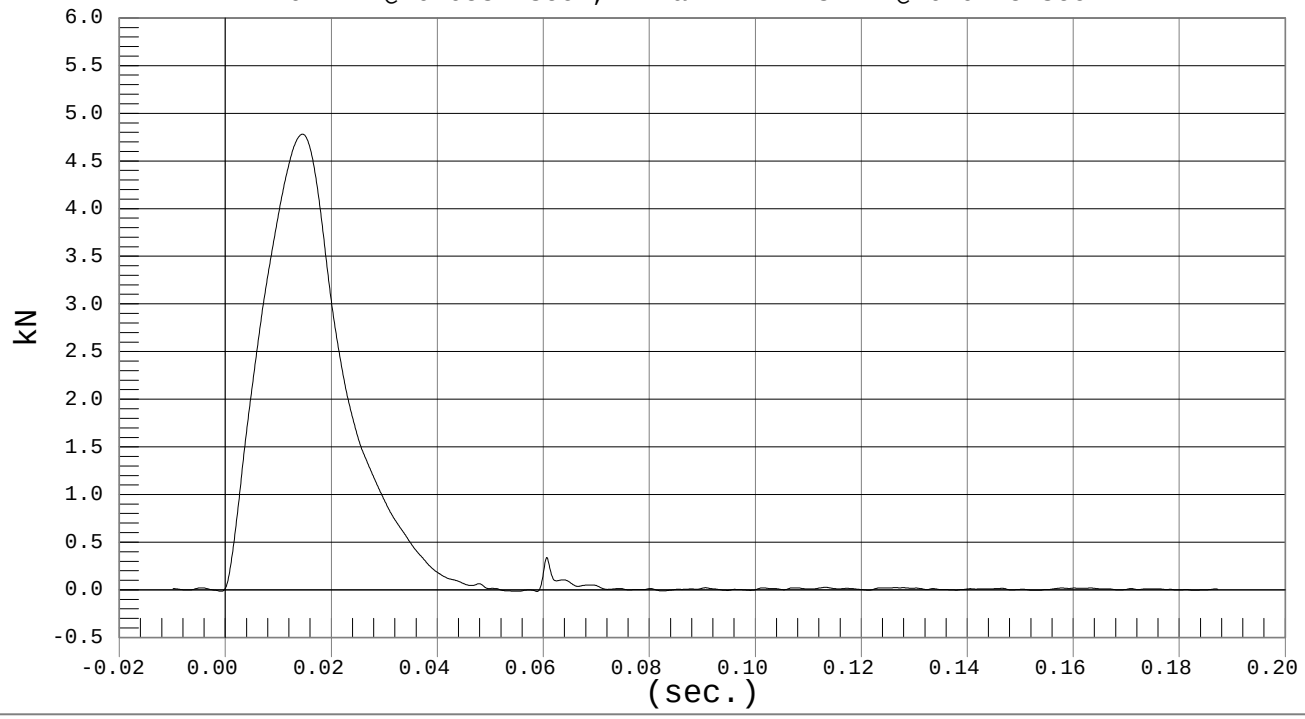
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 01-07-03
Speed: 14.1 fps, 4.30 M/s

Ymin = -.02 kN @ 0.0587 sec., Ymax = 4.78 kN @ 0.0145 sec.

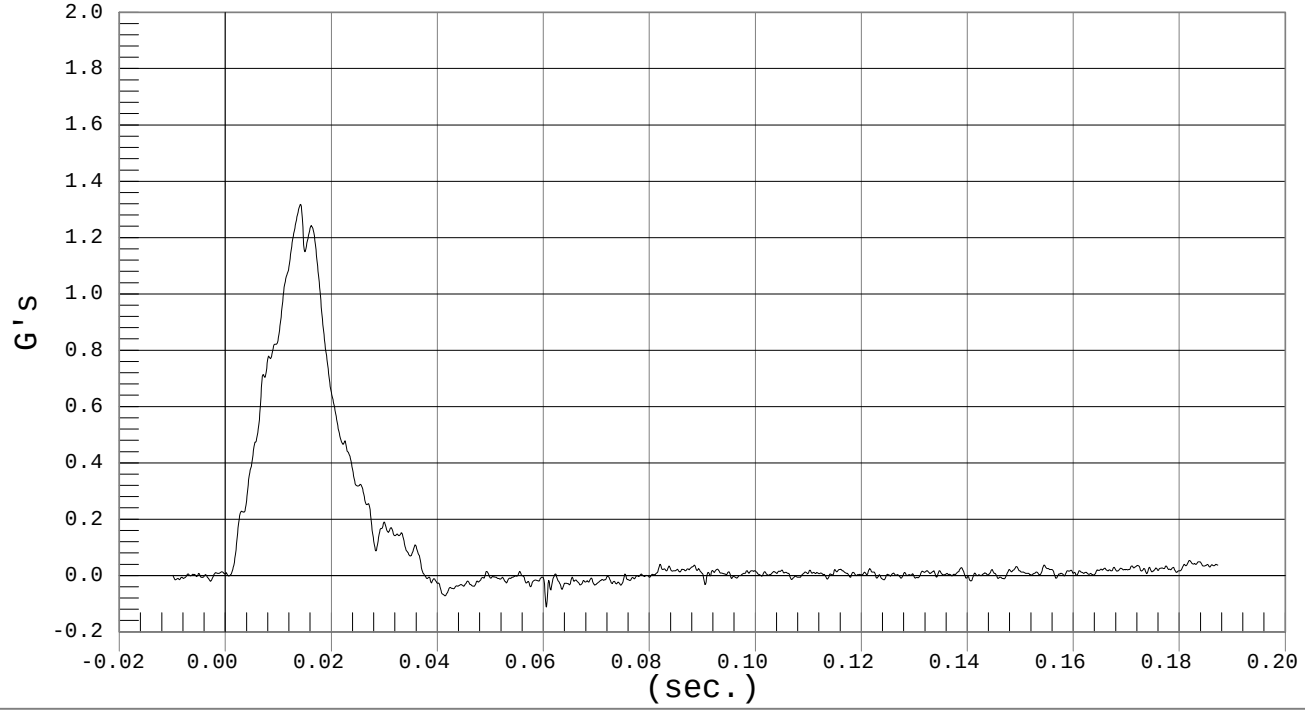


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 01-07-03
Speed: 14.1 fps, 4.30 M/s

Ymin = -.11 G's @ 0.0605 sec., Ymax = 1.32 G's @ 0.0141 sec.



CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Post -Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

Date: 1/23/03

Dummy Serial Number: 009

Test Number: D03061

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.3
Relative Humidity (%)	10 – 70	13
Peak Resultant Acceleration	100 – 150 g's	142
Time of Max. Res. Acceleration	msec	2.5

TEST MEETS SPECIFICATIONS

Technician: _____

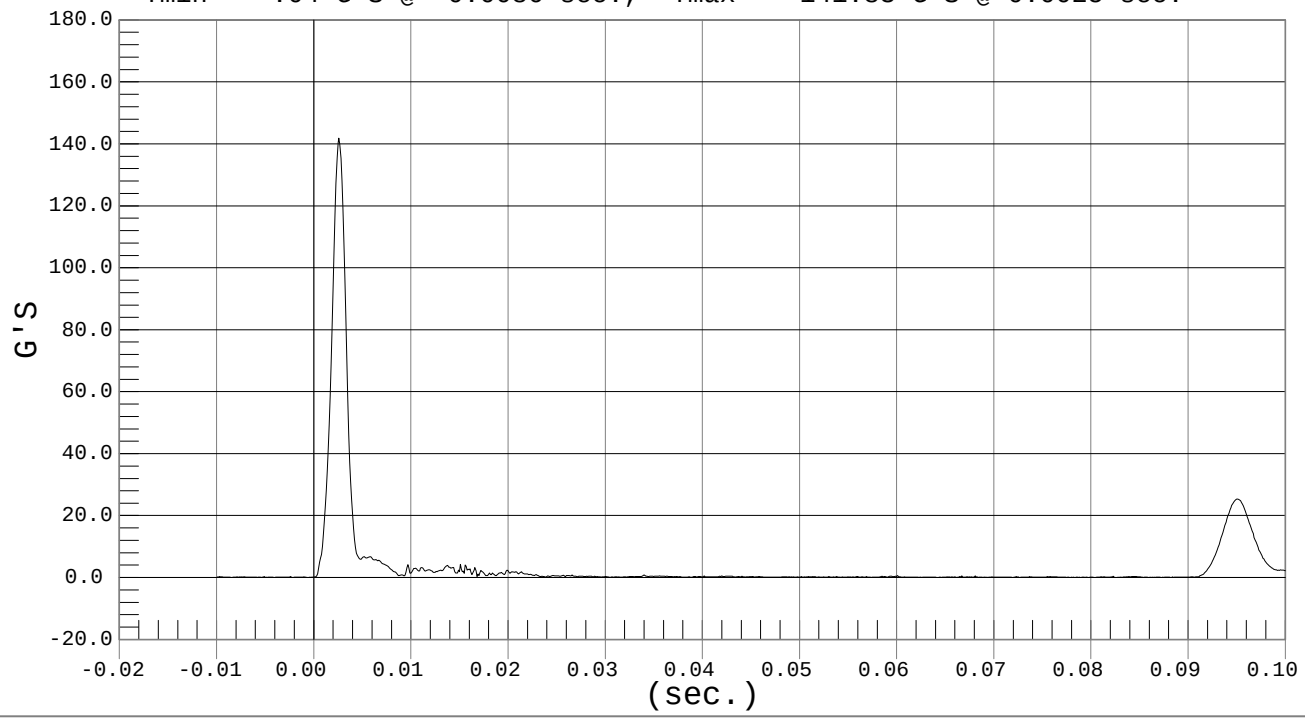
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 01-23-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .04 G'S @ -0.0086 sec., Ymax = 141.83 G'S @ 0.0025 sec.



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 1/23/03

Dummy Serial Number: 0009

Test Number: D03062

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.3
Relative Humidity (%)		10 – 70	12
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.32
	8 msec	¯1.59 - ¯2.04 m/sec	-1.64
	14 msec	¯3.20 - ¯3.85 m/sec	-3.35
Maximum Flexion Angle		49.0 – 59.0 deg	56.1
Time of Max. Flexion Angle		54.0 – 66.0 ms	59.3
Maximum Angle Theta (A)		32.0 – 37.0 deg	34.5
Time of Max. Theta (A)		53.0 – 63.0 ms	59.1
Maximum Angle Theta (B)		29.70 – 32.20 deg	31.5
Time of Max. Theta (B)		54.0 – 64.0 ms	58.7

TEST MEETS SPECIFICATIONS

Technician: _____

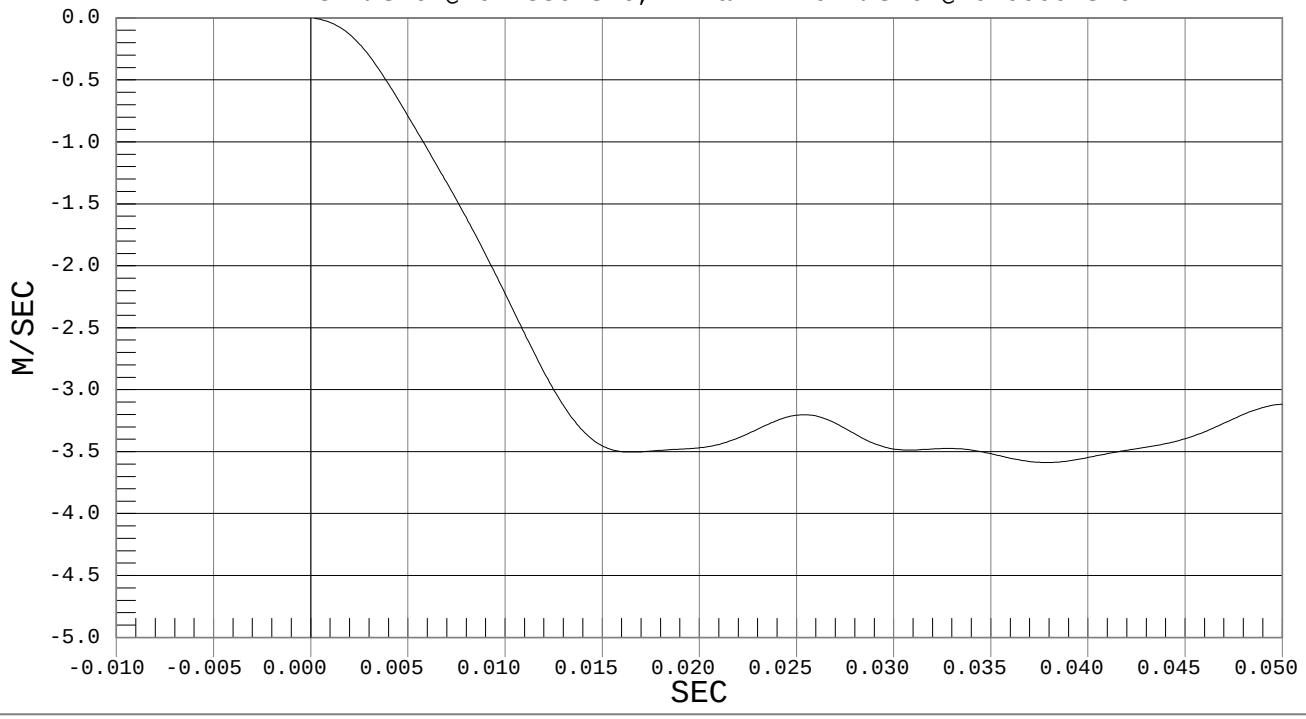
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-23-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -4.48 M/SEC @ 0.1886 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

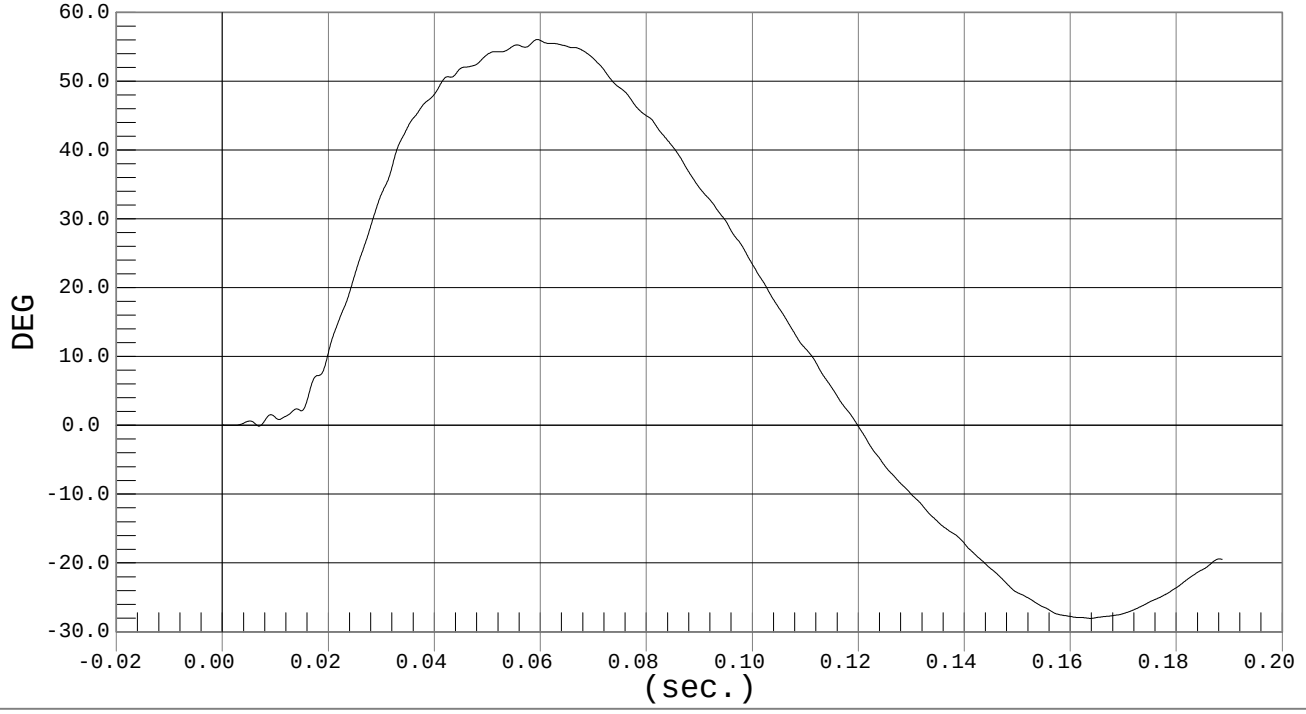


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-23-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -28.06 DEG @ 0.1638 sec., Ymax = 56.05 DEG @ 0.0593 sec.

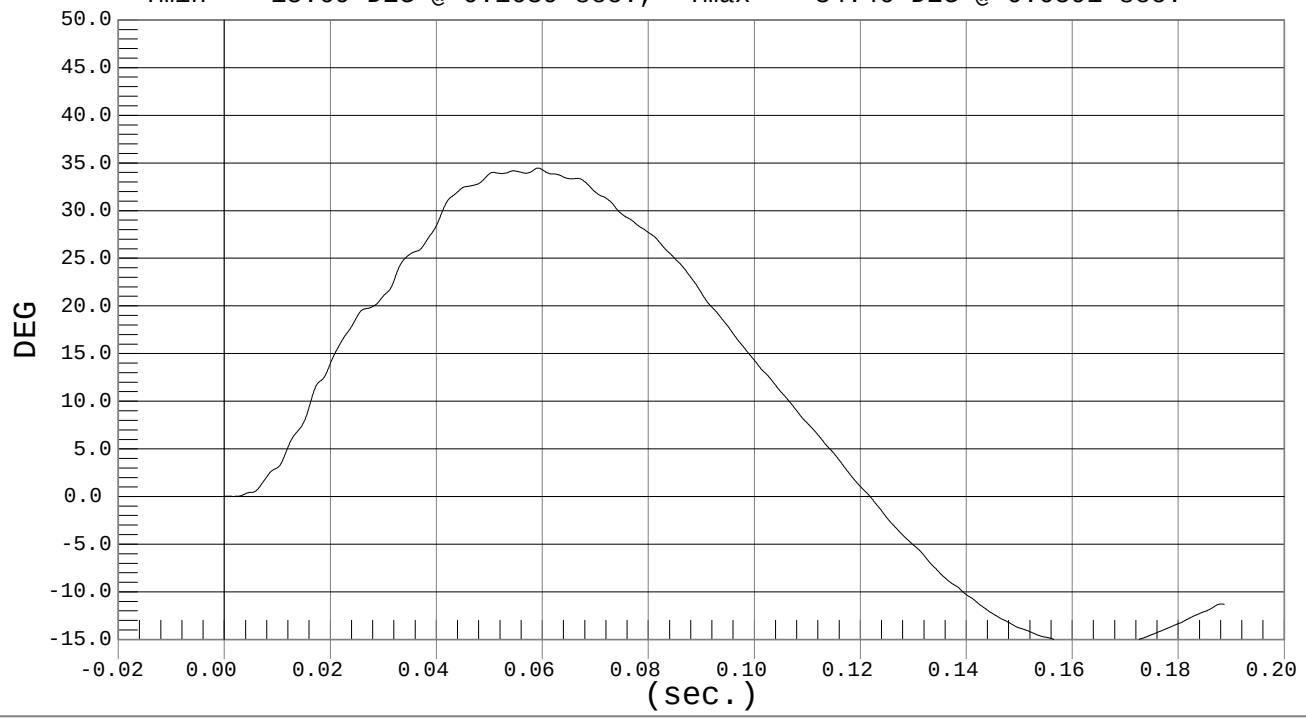


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-23-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -15.69 DEG @ 0.1639 sec., Ymax = 34.46 DEG @ 0.0591 sec.

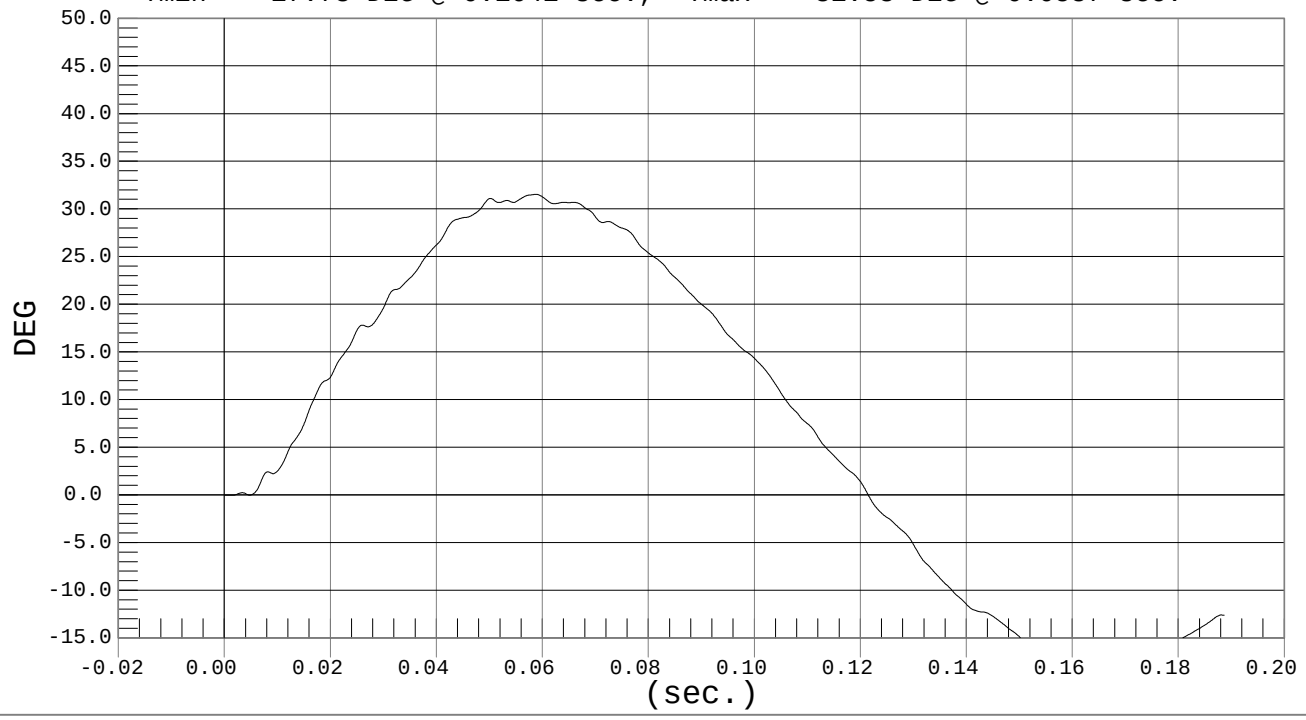


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 01-23-03
Speed: 11.1 fps, 3.38 M/s

Ymin = -17.73 DEG @ 0.1641 sec., Ymax = 31.53 DEG @ 0.0587 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 1/22/03

Dummy Serial Number: 009

Test Number: D03063

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	14
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.5
Time of Max. Pendulum Acceleration	msec	11.7

TEST MEETS SPECIFICATIONS

Technician: _____

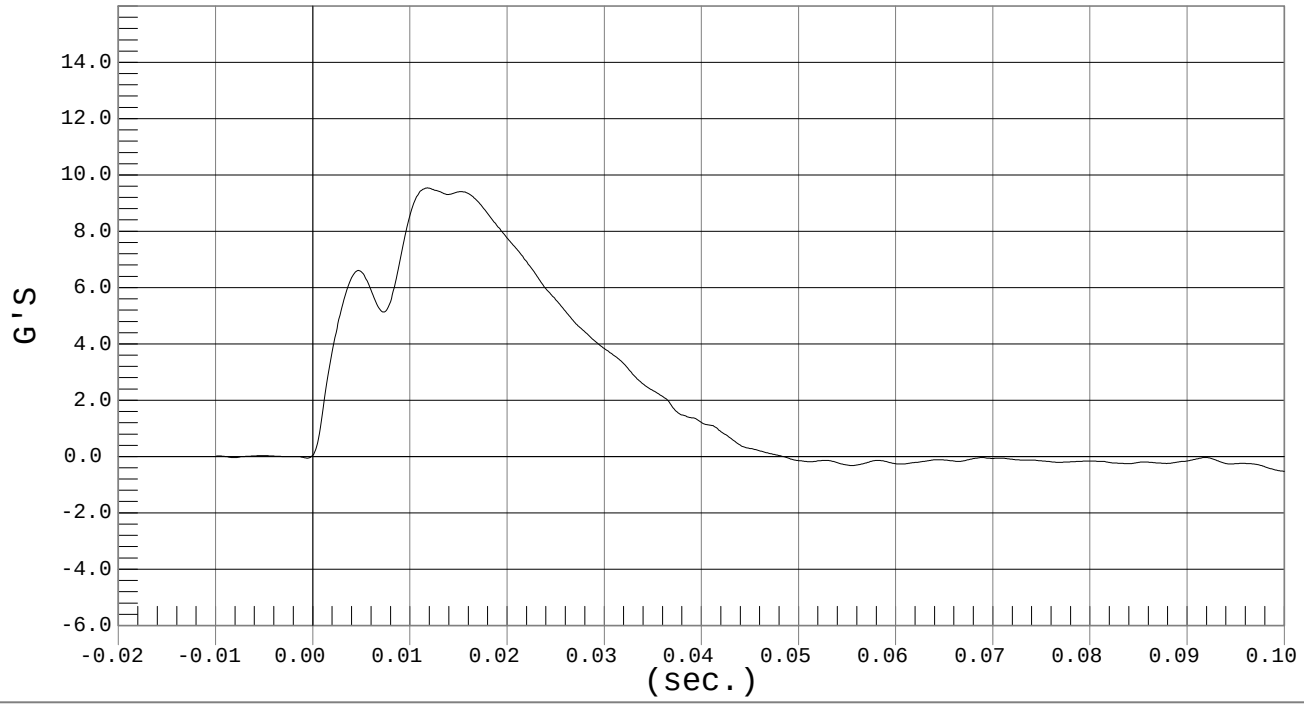
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 01-22-03
Speed: 14.0 fps, 4.28 M/s

Ymin = -.53 G'S @ 0.1001 sec., Ymax = 9.54 G'S @ 0.0117 sec.



MGA RESEARCH CORPORATION

UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 1/23/03

Dummy Serial Number: 009

Test Number: D03064/5/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	16
Displacement at 2 m/s	23.5 – 27.5 mm	26.7
Displacement at 3 m/s	36.0 – 40.0 mm	39.4
Displacement at 4 m/s	46.0 – 51.0 mm	50.2

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	16
Displacement at 2 m/s	23.5 – 27.5 mm	25.4
Displacement at 3 m/s	36.0 – 40.0 mm	37.6
Displacement at 4 m/s	46.0 – 51.0 mm	48.3

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	16
Displacement at 2 m/s	23.5 – 27.5 mm	25.1
Displacement at 3 m/s	36.0 – 40.0 mm	36.8
Displacement at 4 m/s	46.0 – 51.0 mm	47.4

TEST MEETS SPECIFICATIONS

Technician: _____

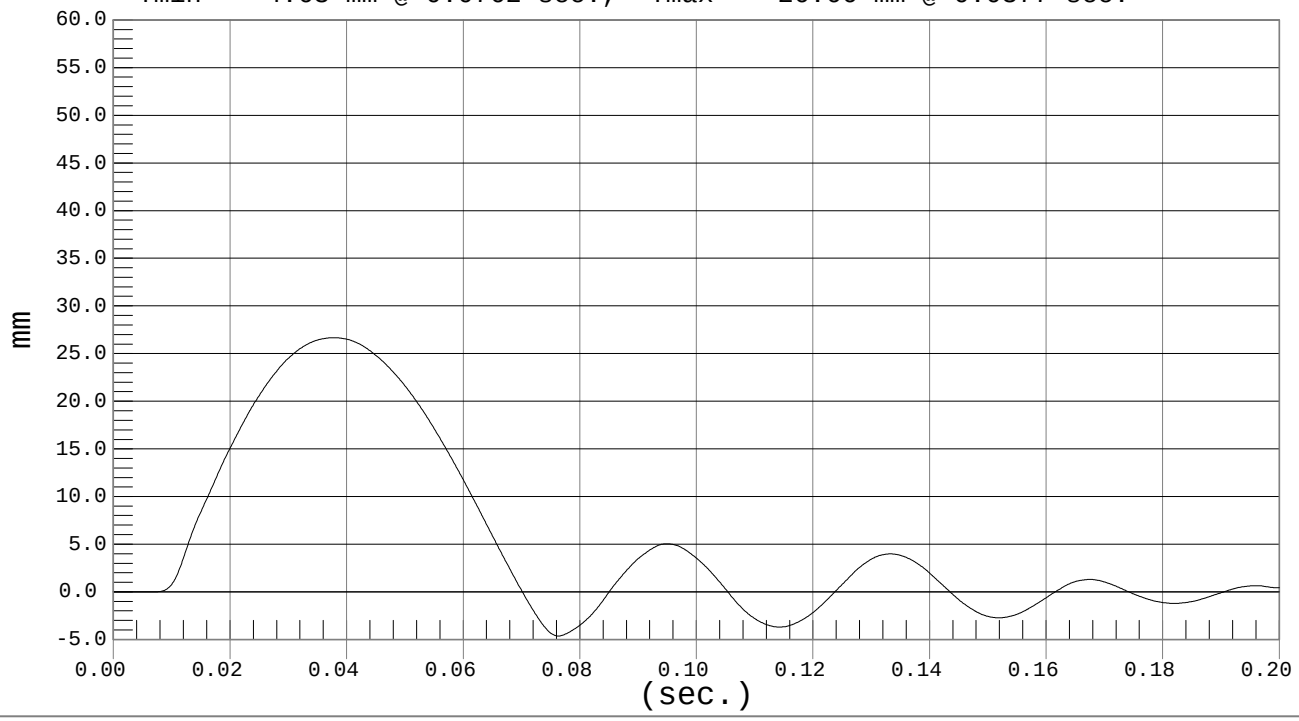
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.63 mm @ 0.0762 sec., Ymax = 26.66 mm @ 0.0377 sec.

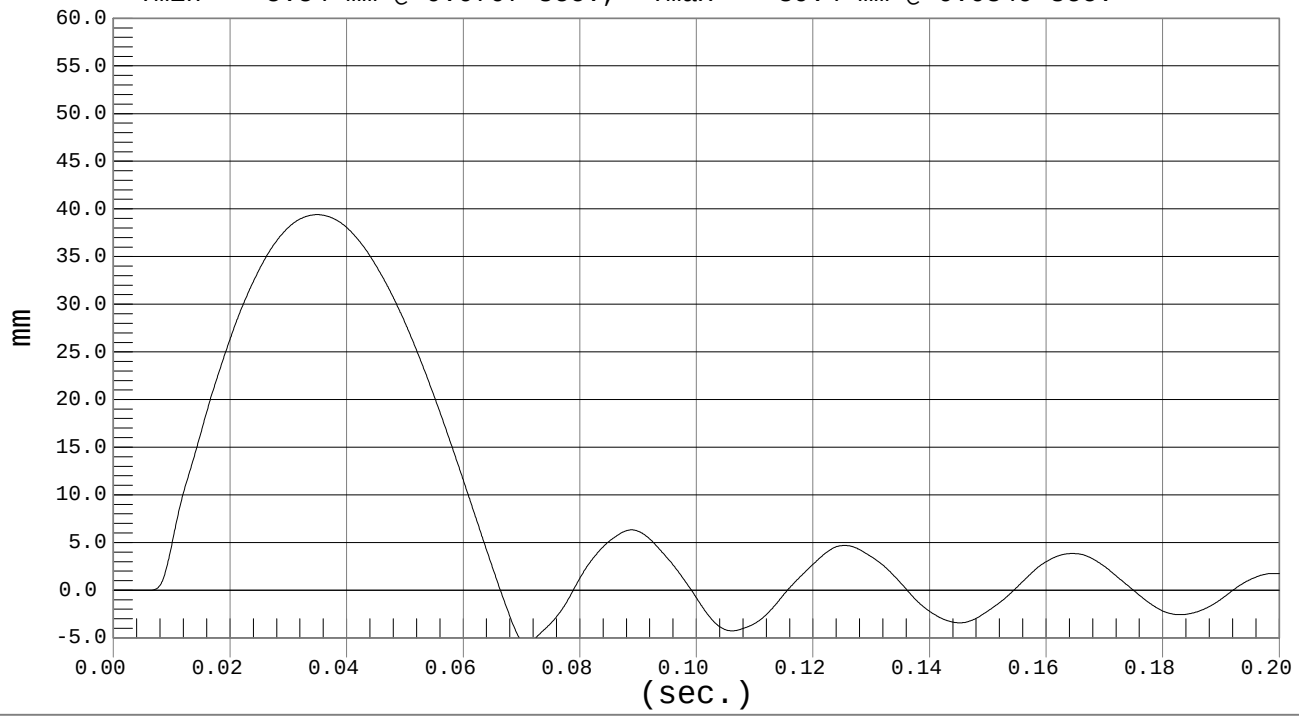


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.54 mm @ 0.0707 sec., Ymax = 39.4 mm @ 0.0349 sec.

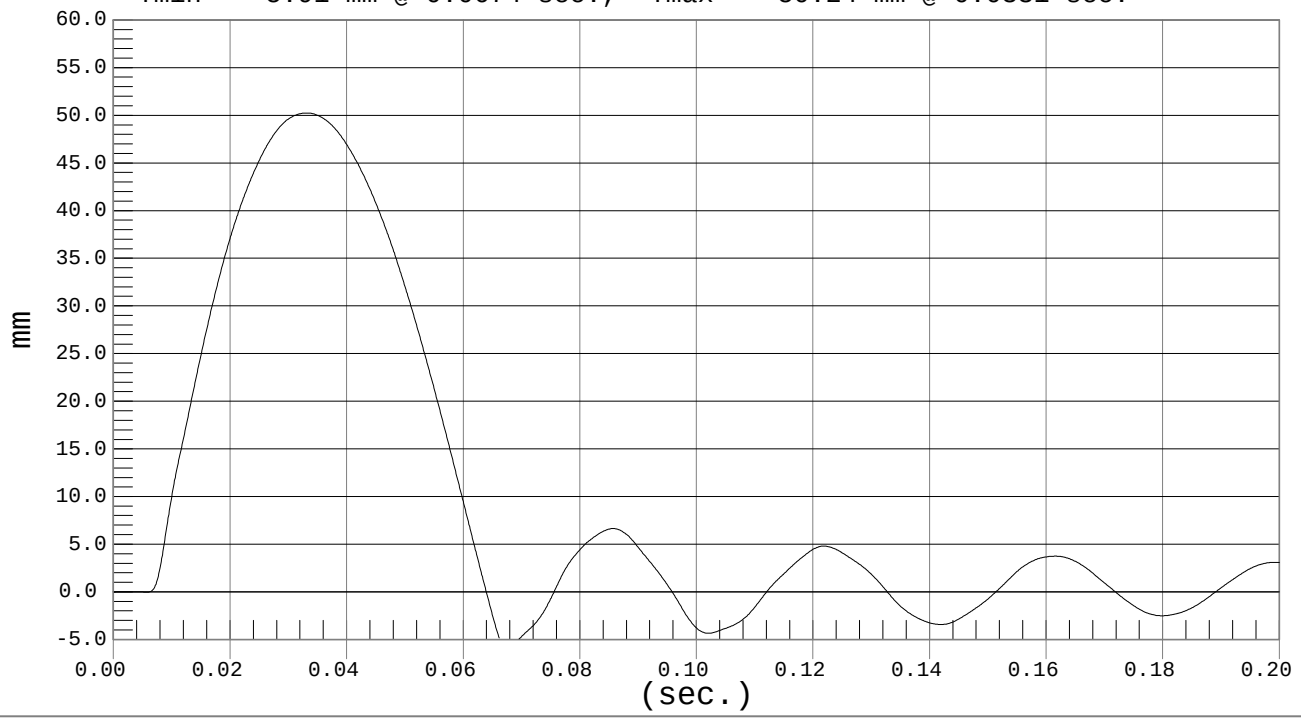


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.91 mm @ 0.0674 sec., Ymax = 50.24 mm @ 0.0331 sec.

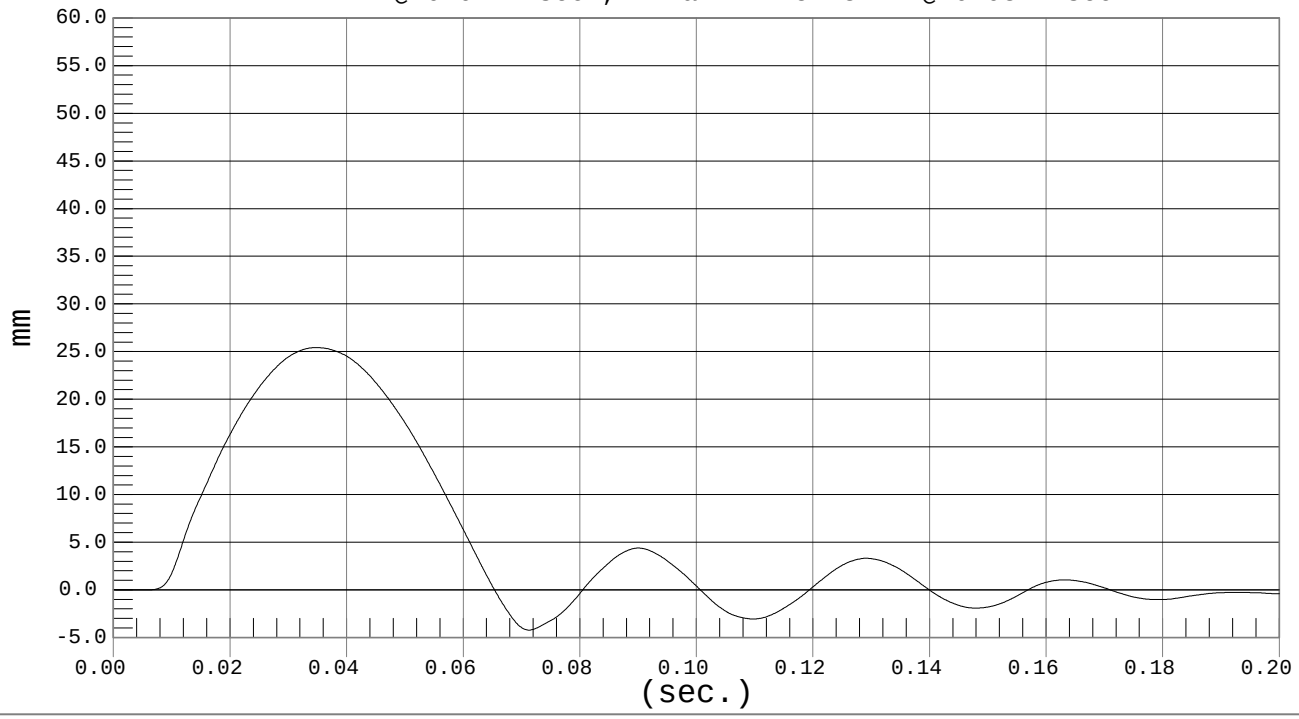


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.22 mm @ 0.0712 sec., Ymax = 25.43 mm @ 0.0347 sec.

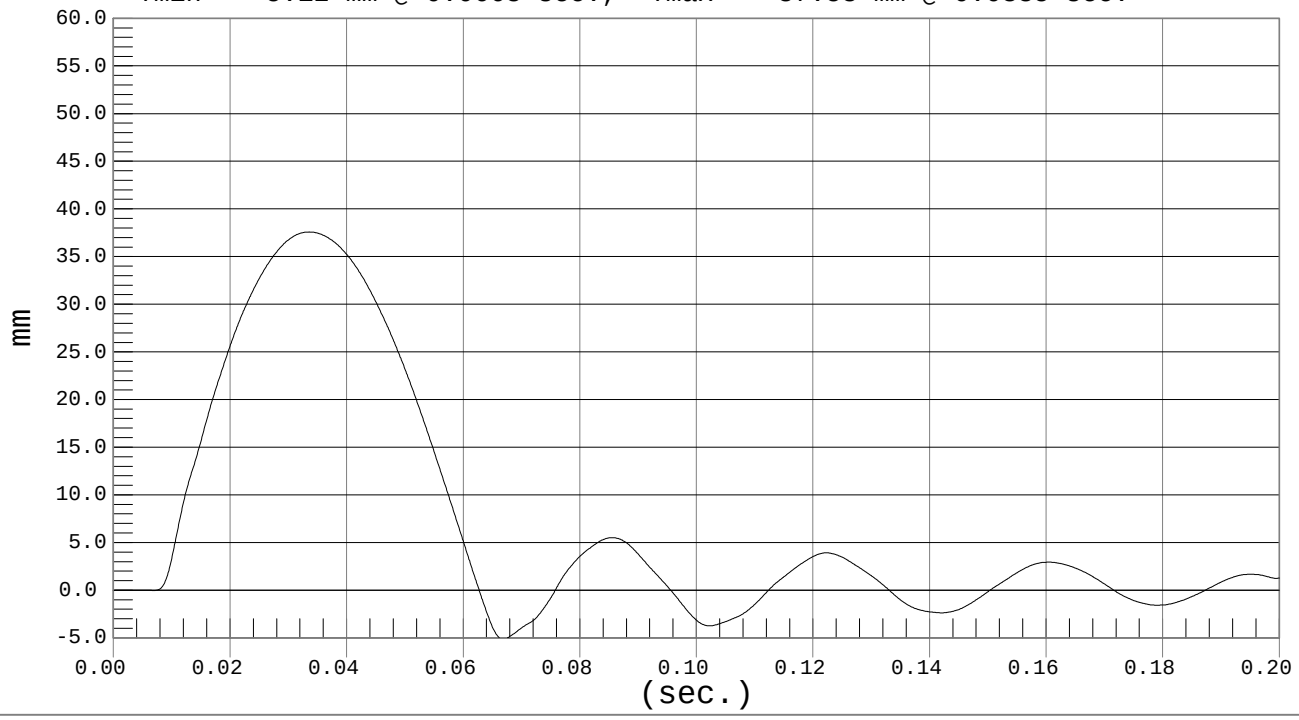


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.12 mm @ 0.0668 sec., Ymax = 37.58 mm @ 0.0335 sec.

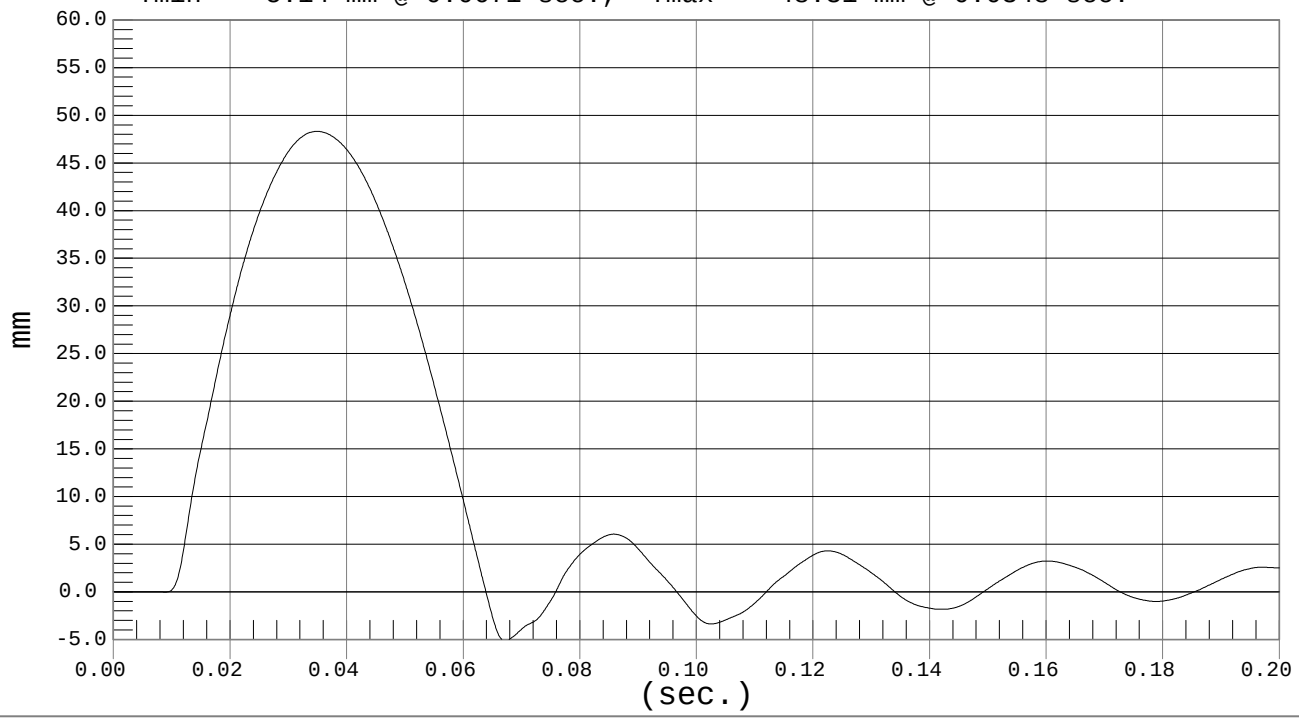


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.14 mm @ 0.0671 sec., Ymax = 48.31 mm @ 0.0348 sec.

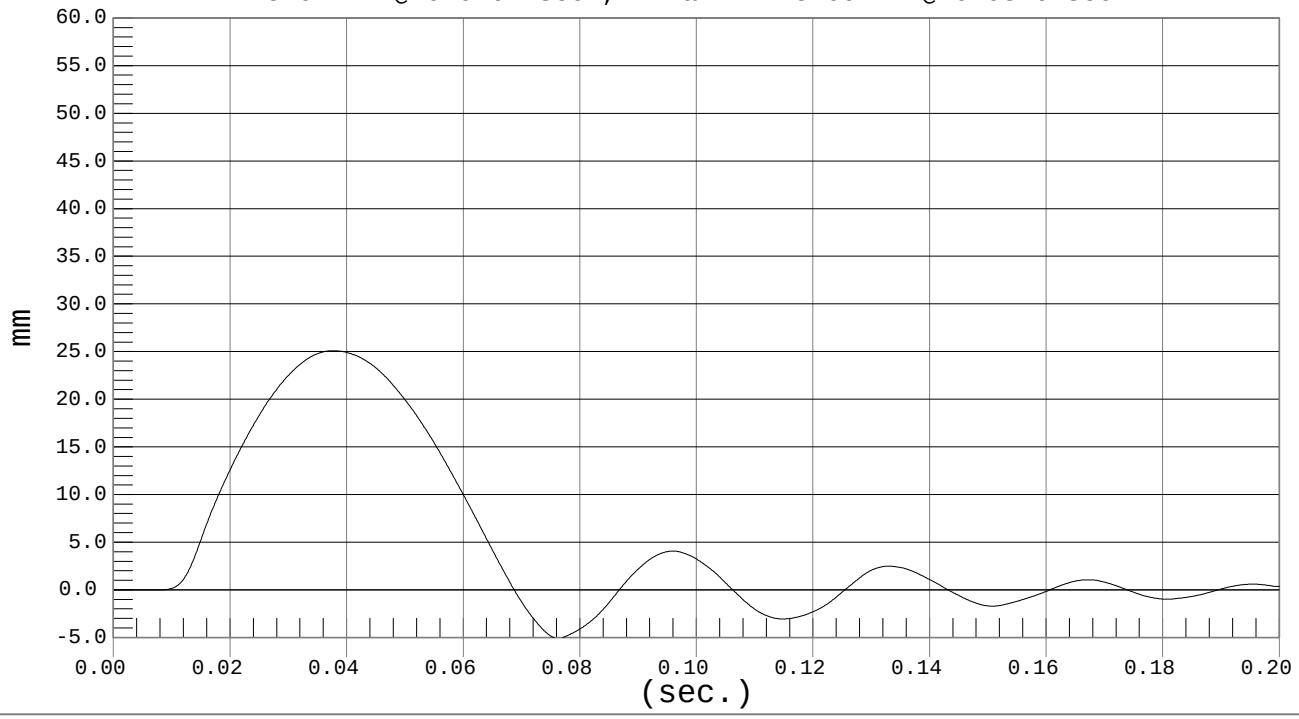


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.07 mm @ 0.0762 sec., Ymax = 25.09 mm @ 0.0376 sec.

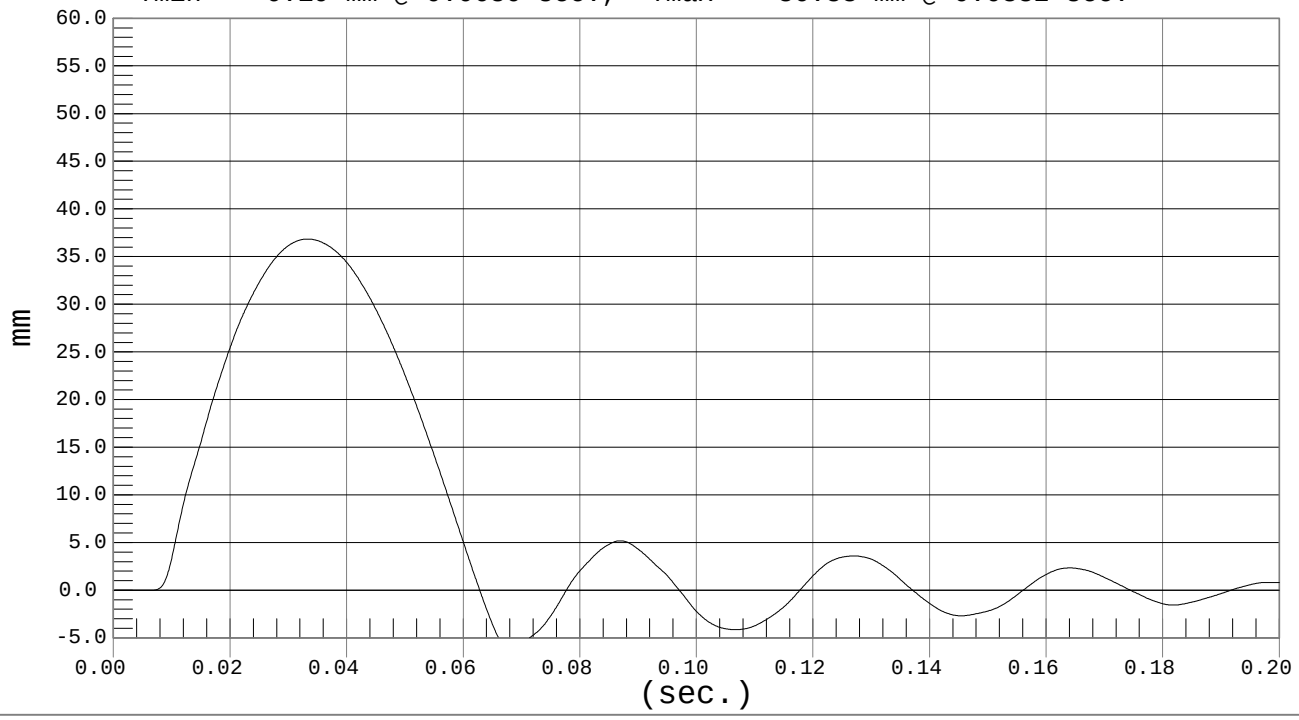


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.19 mm @ 0.0680 sec., Ymax = 36.83 mm @ 0.0332 sec.

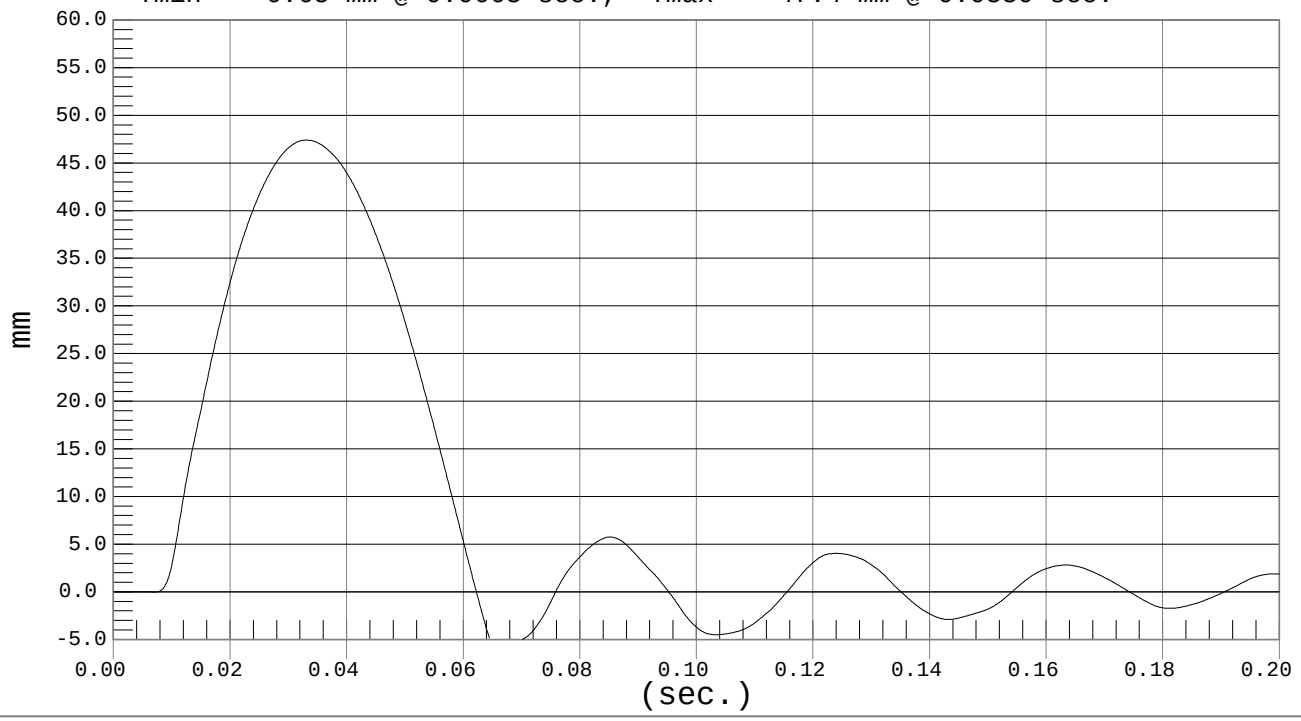


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 01-23-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -6.65 mm @ 0.0663 sec., Ymax = 47.4 mm @ 0.0330 sec.



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

Date: 1/22/03

Dummy Serial Number: 009

Test Number: D03067

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.5
Relative Humidity (%)	10 – 70	13
Probe Speed (m/s)	3.90 – 4.10	3.97
Maximum Impact Force	4.00 – 4.80 kN	4.38
Time of Maximum Force	10.60 – 13.00 ms	11.10
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.30
Time of Max. Total Force	10.00 – 12.30 ms	10.20

TEST MEETS SPECIFICATIONS

Technician: _____

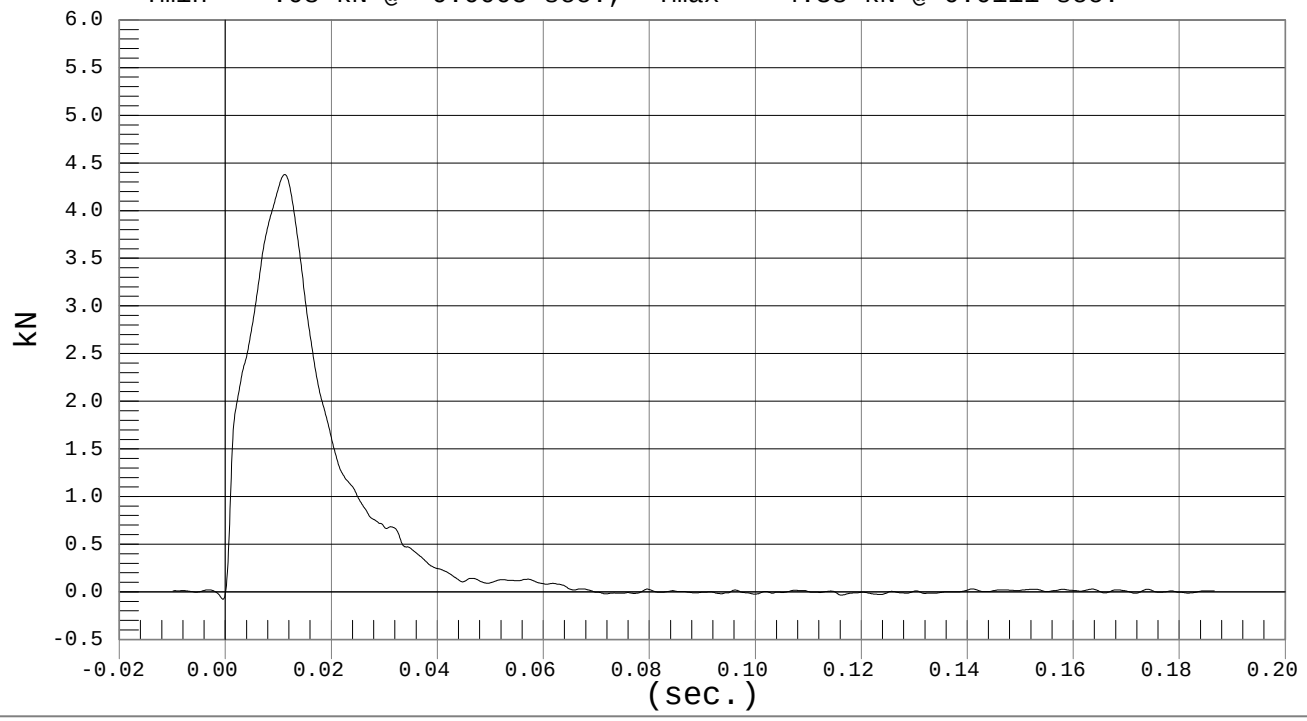
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 01-22-03
Speed: 13.0 fps, 3.97 M/s

Ymin = -.08 kN @ -0.0005 sec., Ymax = 4.38 kN @ 0.0111 sec.

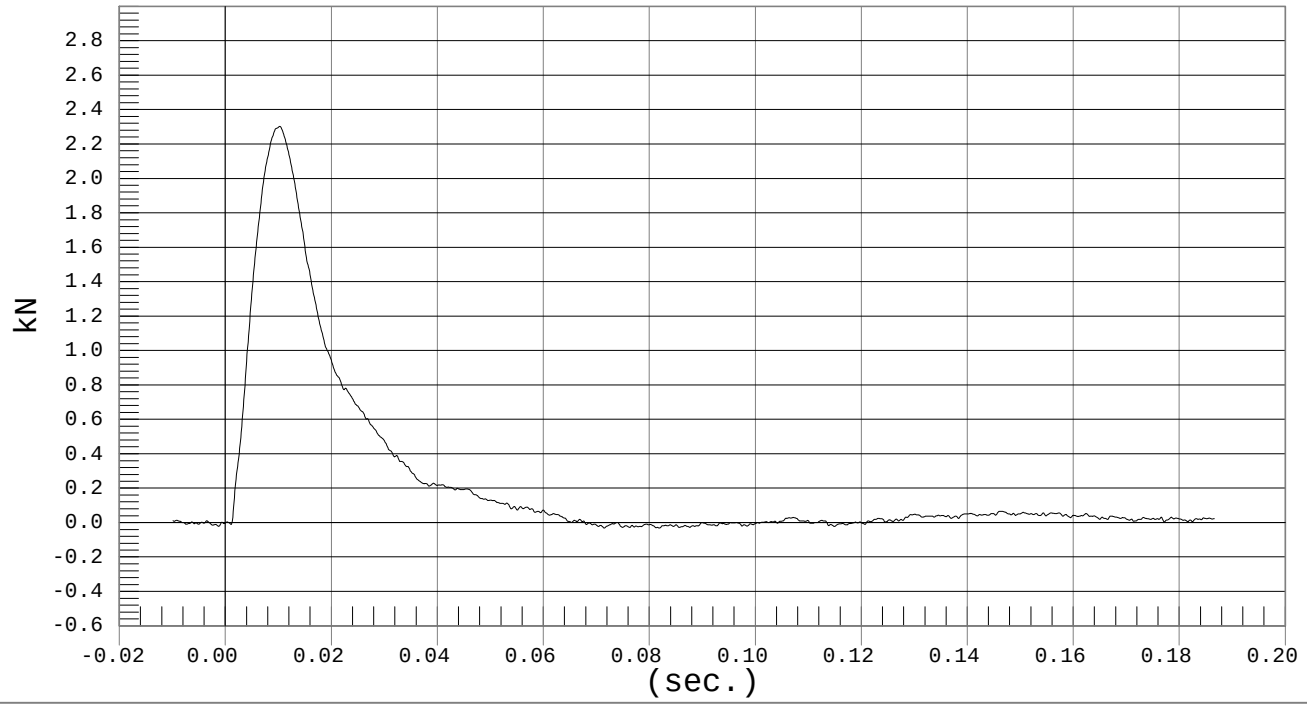


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 01-22-03
Speed: 13.0 fps, 3.97 M/s

Ymin = -.03 kN @ 0.0714 sec., Ymax = 2.3 kN @ 0.0102 sec.



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 1/23/03

Dummy Serial Number: 009

Test Number: D03068

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.4
Relative Humidity (%)		10 – 70	13
Pendulum Speed		5.95 – 6.15	6.12
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-1.97
	20 msec	-5.25 - -4.07 m/sec	-4.47
	25 msec	-6.64 - -5.30 m/sec	-5.59
	30 msec	≥ -6.5 m/sec	-6.24
Maximum Flexion Angle		45.0 – 55.0 deg	48.6
Time of Max. Flexion Angle		39.0 – 53.0 ms	45.0
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.4
Time of Max. Theta (A)		44.0 – 52.0 ms	45.0
Maximum Angle Theta (B)		27.12– 29.62 deg	28.43
Time of Max. Theta (B)		44.0 – 52.0 ms	44.5

TEST MEETS SPECIFICATIONS

Technician: _____

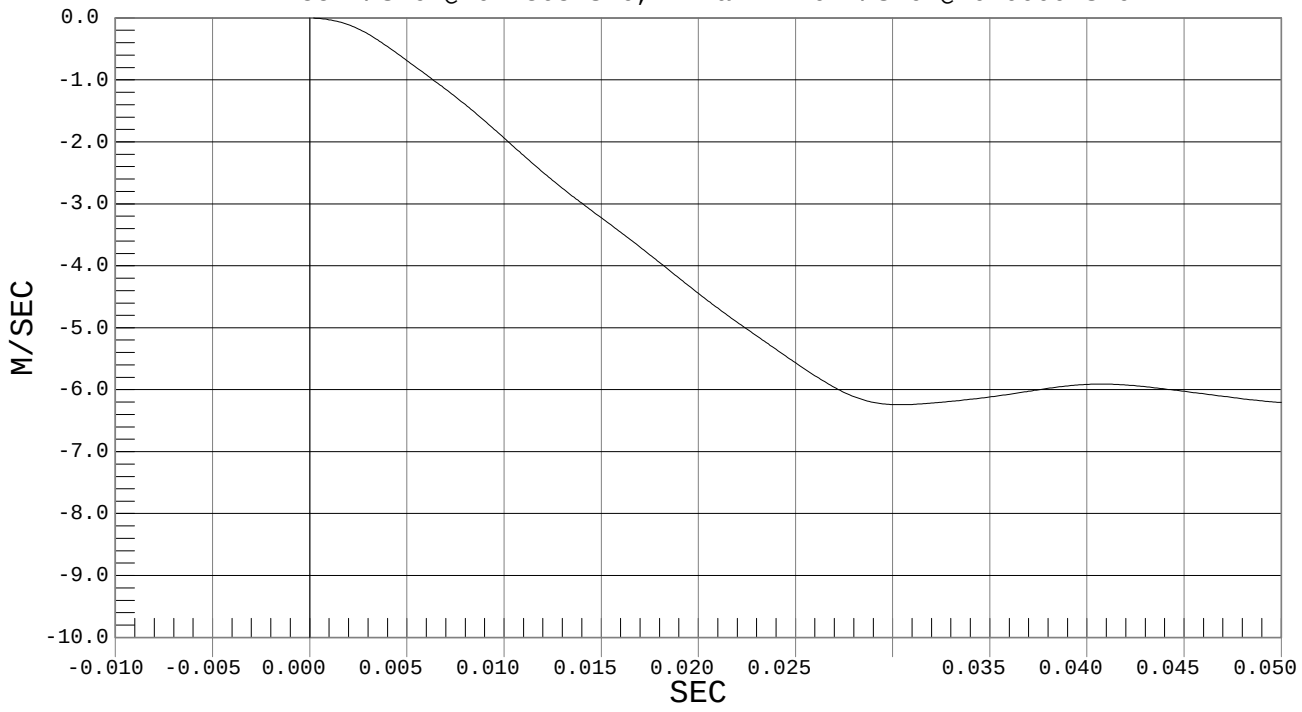
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-23-03
Speed: 20.1 fps, 6.12 M/s

Ymin = -7.55 M/SEC @ 0.1368 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

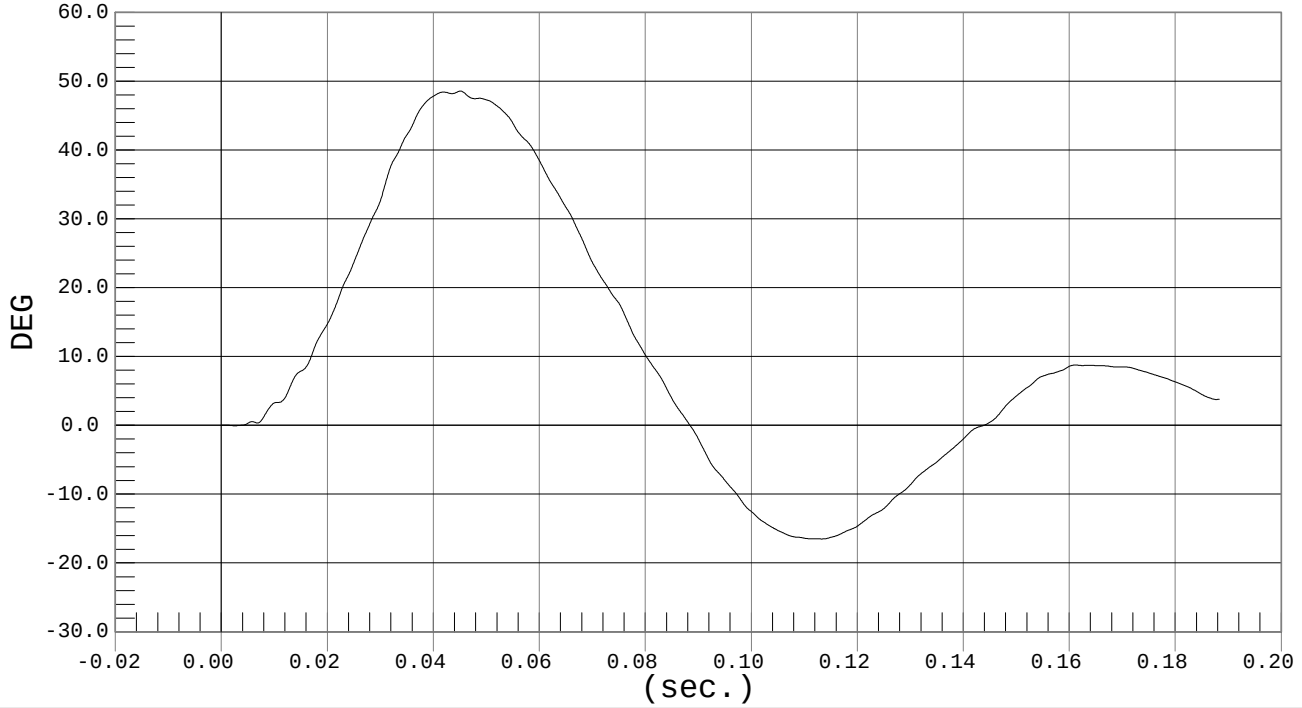


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-23-03
Speed: 20.1 fps, 6.12 M/s

Ymin = -16.52 DEG @ 0.1132 sec., Ymax = 48.55 DEG @ 0.0450 sec.

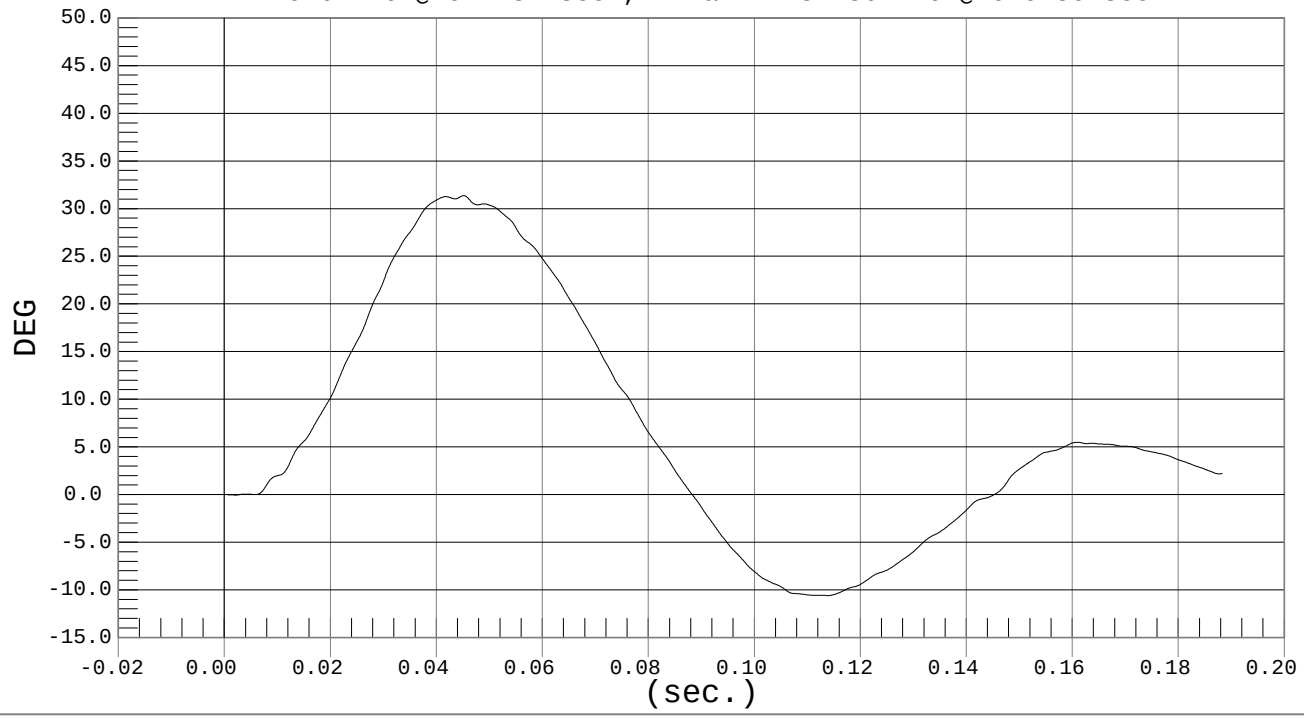


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-23-03
Speed: 20.1 fps, 6.12 M/s

Ymin = -10.6 DEG @ 0.1137 sec., Ymax = 31.36 DEG @ 0.0450 sec.

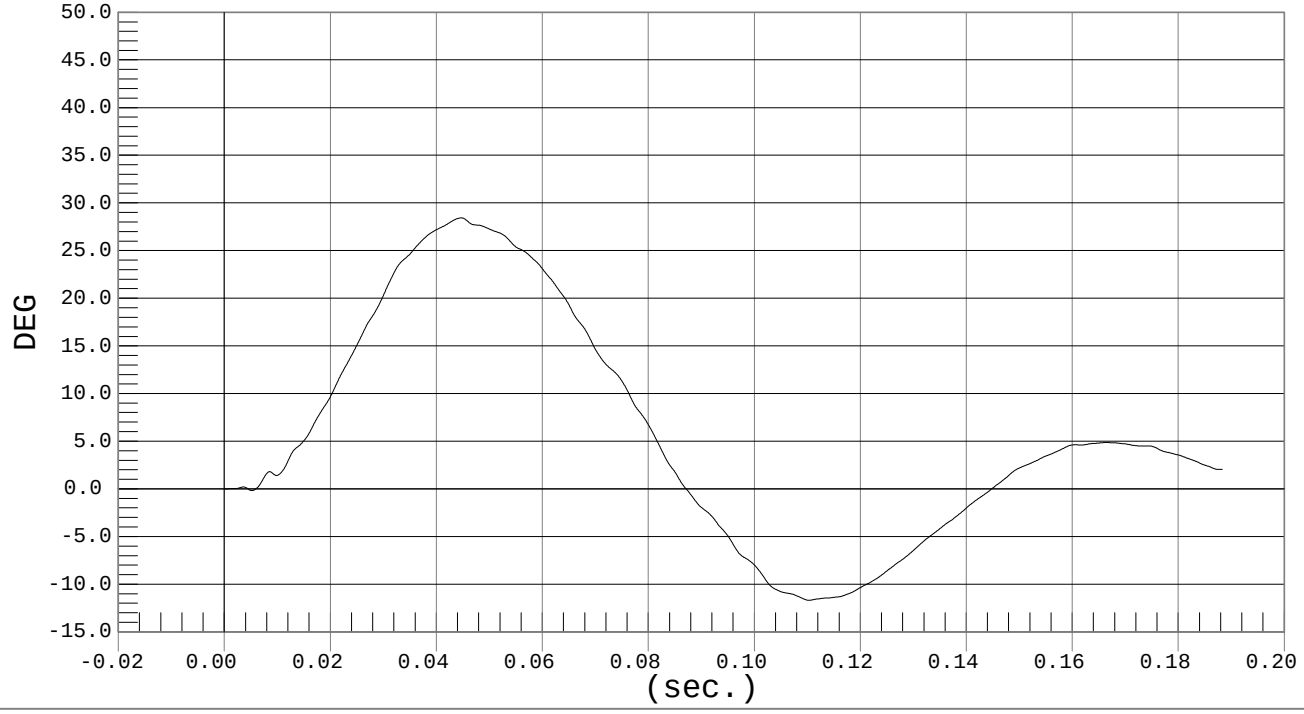


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 01-23-03
Speed: 20.1 fps, 6.12 M/s

Ymin = -11.69 DEG @ 0.1102 sec., Ymax = 28.43 DEG @ 0.0445 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 1/22/03

Dummy Serial Number: 009

Test Number: D03069

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	14
Pendulum Speed	4.20 – 4.40 m/s	4.29
Maximum Impactor Force	4.40 – 5.40 kN	4.49
Time of Max. Impactor Force	10.30 – 15.50 ms	15.00
Maximum Pubic Force	1.04 – 1.64 kN	1.33
Time of Max. Pubic Force	9.90 – 15.90 ms	14.70

TEST MEETS SPECIFICATIONS

Technician: _____

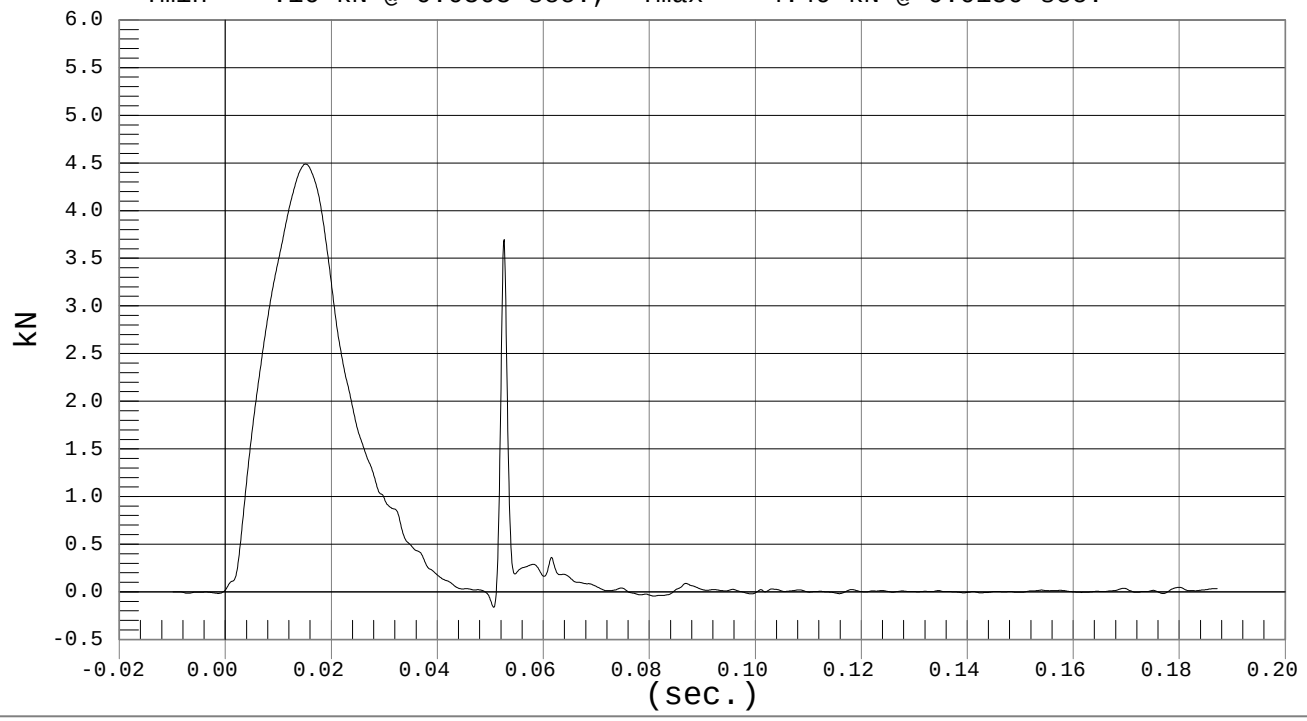
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 01-22-03
Speed: 14.1 fps, 4.29 M/s

Ymin = -.16 kN @ 0.0505 sec., Ymax = 4.49 kN @ 0.0150 sec.

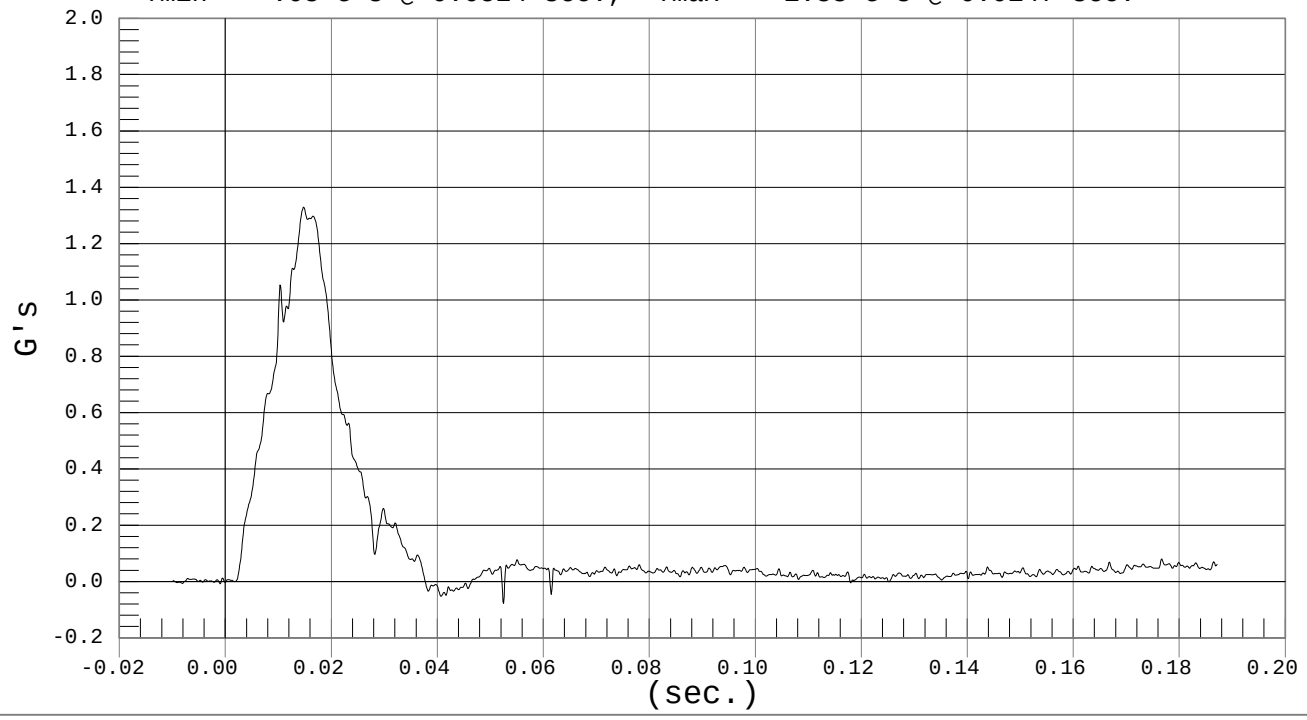


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 01-22-03
Speed: 14.1 fps, 4.29 M/s

Ymin = -.08 G's @ 0.0524 sec., Ymax = 1.33 G's @ 0.0147 sec.



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	AHRP5	Endevco	9/6/02
Head Y Accelerometer	ALB87	Endevco	9/6/02
Head Z Accelerometer	AJ9T6	Endevco	9/6/02
Driver Head Y – Front	ALEC1	Endevco	9/9/02
Driver Head Z – Front	J14896	Endevco	1/8/03
Driver Head X – Left	AJ9D9	Endevco	9/6/02
Driver Head Z – Left	AGM47	Endevco	9/6/02
Driver Head X – Upper	ANAN3	Endevco	10/16/02
Driver Head Y – Upper	ANAN6	Endevco	10/16/02
Upper Neck Force X Load Cell	N105FX	FTSS	5/13/02
Upper Neck Force Y Load Cell	N105FY	FTSS	5/13/02
Upper Neck Force Z Load Cell	N105FZ	FTSS	5/13/02
Upper Neck Moment X	N105MX	FTSS	5/13/02
Upper Neck Moment Y	N105MY	FTSS	5/13/02
Upper Neck Moment Z	N105MZ	FTSS	5/13/02
Lower Neck Force X Load Cell	N110FX	FTSS	5/16/02
Lower Neck Force Y Load Cell	N110FY	FTSS	5/16/02
Lower Neck Force Z Load Cell	N110FZ	FTSS	5/16/02
Lower Neck Moment X	N110MX	FTSS	5/16/02
Lower Neck Moment Y	N110MY	FTSS	5/16/02
Lower Neck Moment Z	N110MZ	FTSS	5/16/02
Shoulder Force X Load Cell	S119FX	FTSS	5/10/02
Shoulder Force Y Load Cell	S119FY	FTSS	5/10/02
Shoulder Force Z Load Cell	S119FZ	FTSS	5/10/02
Upper Spine X Accelerometer	AP0E1	Endevco	8/8/02
Upper Spine Y Accelerometer	AGP20	Endevco	8/8/02
Upper Spine Z Accelerometer	ALDY8	Endevco	8/8/02
Upper Rib Y Accelerometer	ANAP1	Endevco	9/9/02
Mid Rib Y Accelerometer	AMP12	Endevco	9/9/02
Lower Rib Y Accelerometer	AGWA4	Endevco	9/9/02
Upper Rib Displacement	009U	Honeywell	5/22/02
Mid Rib Displacement	009M	Honeywell	5/22/02
Lower Rib Displacement	009L	Honeywell	5/22/02
Lower Spine X Accelerometer	AKAA6	Endevco	9/9/02
Lower Spine Y Accelerometer	ALBA7	Endevco	9/9/02
Lower Spine Z Accelerometer	AP2C4	Endevco	9/9/02
Torso Force X Load Cell	ET102FX	FTSS	12/6/02
Torso Force Y Load Cell	ET102FY	FTSS	12/6/02
Torso Moment Y Load Cell	ET102MY	FTSS	12/6/02
Torso Moment Z Load Cell	ET102MZ	FTSS	12/6/02
T-12 Force X Load Cell	LS103FX	FTSS	5/13/02

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
T-12 Force Y Load Cell	LS103FY	FTSS	5/13/02
T-12 Moment X Load Cell	LS103MX	FTSS	5/13/02
T-12 Moment Y Load Cell	LS103MY	FTSS	5/13/02
Front Abdomen Load Cell	A122FY	FTSS	5/16/02
Mid Abdomen Load Cell	A123FY	FTSS	5/16/02
Rear Abdomen Load Cell	A124FY	FTSS	5/16/02
Pelvis X Accelerometer	J13650	Endevco	9/9/02
Pelvis Y Accelerometer	J13424	Endevco	9/9/02
Pelvis Z Accelerometer	J14007	Endevco	9/9/02
Right Femur Force X Load Cell	F135FX	FTSS	5/13/02
Right Femur Force Y Load Cell	F135FY	FTSS	5/13/02
Right Femur Force Z Load Cell	F135FZ	FTSS	5/13/02
Right Femur Moment X	F135MX	FTSS	5/13/02
Right Femur Moment Y	F135MY	FTSS	5/13/02
Right Femur Moment Z	F135MZ	FTSS	5/13/02
Left Femur Force X Load Cell	F136FX	FTSS	5/13/02
Left Femur Force Y Load Cell	F136FY	FTSS	5/13/02
Left Femur Force Z Load Cell	F136FZ	FTSS	5/13/02
Left Femur Moment X	F136MX	FTSS	5/13/02
Left Femur Moment Y	F136MY	FTSS	5/13/02
Left Femur Moment Z	F136MZ	FTSS	5/13/02
Lumbar Force Y Load Cell	L104FY	FTSS	5/10/02
Lumbar Force Z Load Cell	L104FZ	FTSS	8/15/02
Lumbar Moment X Load Cell	L104MX	FTSS	8/15/02
Pubic Symphysis Force Y	P115FY	FTSS	5/13/02

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	H01-N25	ENTRAN	10/30/02
Left Lower A-Post Y	H01-N19	ENTRAN	10/31/02
Left Mid B-Post Y	F04-N09	ENTRAN	11/19/02
Left Lower B-Post Y	E03-H04	ENTRAN	11/19/02
Floorpan @ Rear Axle X	H05-F14	ENTRAN	11/19/02
Floorpan @ Rear Axle Y	H01-N23	ENTRAN	11/19/02
Floorpan @ Rear Axle Z	H01-N32	ENTRAN	11/19/02
Driver Seat Track Y	H14-N01	ENTRAN	6/17/02
Right Front Sill Y	H01-N33	ENTRAN	11/19/02
Right Front Sill Z	G23-N10	ENTRAN	9/23/02
Right Rear Sill X	E10-F07	ENTRAN	9/6/02
Right Rear Sill Y	D05-R16	ENTRAN	9/6/02
Right Rear Sill Z	L23-A09	ENTRAN	5/30/02
Left Front Sill Y	K21-N10	ENTRAN	9/6/02
Left Rear Sill Y	G01-N21	ENTRAN	7/23/02
Vehicle CG X	HO1-127	ENTRAN	10/30/02
Vehicle CG Y	K21-N12	ENTRAN	9/6/02
Vehicle CG Z	K21-N20	ENTRAN	10/18/02
Left Front Door @ Mid Rib Y	G03-N12	ENTRAN	10/7/02
Left Front Door @ Pelvis Y	G01-J02	ENTRAN	10/18/02
Left Front Door @ Knee Y	K21-N17	ENTRAN	6/24/02
Left Front Door @ Arm Y	G03-N10	ENTRAN	10/7/02
Lower Center Radiator Support X	G13-F02	ENTRAN	9/6/02
Lower Center Radiator Support Y	K11-J08	ENTRAN	9/6/02
Lower Center Radiator Support Z	K11-N15	ENTRAN	9/6/02
Driver Left Seat Frame Y	A08-A11	ENTRAN	10/7/02
Driver Right Seat Frame Y	99F238	ENTRAN	11/4/02

Note: All Endevco accelerometers are Model No. 7264-2000
All Entran accelerometers are Model No. EGE-72

APPENDIX E
PROCEDURE USED FOR ES-2 POSITIONING

Installation of the Side Impact Dummy (recommended practice)

1. GENERAL

1.1 The dummy to be used for the following installation procedure is described in Annex 6 to this regulation.
1.2 Adjust the knee joints so that they just support the leg when it is extended horizontally (1 to 2 g).
1.3 Clothe the dummy in form fitting cotton stretch mid-calf length pants. Each foot is equipped with a shoe.

2. INSTALLATION

2.1 Place the dummy in the outboard front seat of the impact side as described in the test specifications.
2.2 The mid-sagittal plane of the dummy shall coincide with the centerplane of the occupant (as determined according to Annex 3, paragraph 2.8) with a tolerance of 2°.
2.3 The pelvis of the dummy shall be positioned according to the following:
2.3.1 The pelvis pitch angle shall be 20.0° +/- 2.5°.
2.3.2 A line passing through the dummy H-points shall pass through an imaginary circle in the mid-sagittal plane of the dummy. This circle has a radius of 10 mm and is located 20 mm horizontally forward and 5 mm vertically above the reference H-point, determined by the 3D H-point machine.
2.4 The upper torso of the dummy shall be positioned according to the following:
2.4.1 The upper torso shall be bent forward and then laid back against the seat back. The shoulder of the dummy shall be set fully rearward.
2.4.2 The torso reference line pitch angle shall be 25.0° +/- 2.5°. The torso reference line is defined as the thoracic spine center line.
2.5 The arms shall be positioned in such as way that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40° +/- 5°.

2.6 For the driver's seating position, without inducing pelvis or torso movement, place the right foot of the dummy on the undepressed accelerator pedal with the heel resting as far forward as possible on the floorpan. Set the left foot perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel. Set the knees of the dummy such that their outside surfaces are 150 +/- 10mm from the plane of symmetry of the dummy. If possible, within these constraints, place the thighs of the dummy in contact with the seat cushion.

2.7 For other seating positions, without inducing pelvis or torso movement, place the heels of the dummy as far forward as possible on the floorpan without compressing the seat cushion more than the compression due to the weight of the leg. Set the knees of the dummy such that their outside surfaces are 150 +/- 10 mm from the plane of symmetry of the dummy.

APPENDIX F
DUMMY PEAK RESPONSES

DRIVER (ES-2) PEAK RESPONSE TABLE

	Peak Response								
				2002 Explorer 12/18/2001		2002 Explorer 9/12/2002		2002 Explorer 1/10/2003	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time
Head	1000	X	G	-17.5	72	-22.5	52.7	-30.5	51
	1000	Y	G	45.0	58	51.3	50.4	75.9	53
	1000	Z	G	-17.7	58	22.2	41.6	24.9	48
	1000	RES	G	49.1	58	56.3	52.7	81.4	53
Head Injury Criteria (HIC)				208		330		629	
t1				50.5		41.2		46.2	
t2				73.1		66.7		64.4	
Upper Neck Force	1000	X	N	2401	56	-582	52.5	-671.1	60
	1000	Y	N	-793	55	425	49.0	-455.3	85
	1000	Z	N	2103	67	1331	44.2	1346.2	48
	1000	RES	N	2831	56	1386	44.3	1509.4	58
Upper Neck Moment	600	X	Nm	-10.9	74	-87.7	49.0	-90.1	52
	600	Y	Nm	7.5	54	-42.8	52.1	-65.6	51
	600	Z	Nm	7.9	53	14.2	55.0	24.9	57
	600	RES	Nm	13.0	72	96.3	49.0	112.8	52
Lower Neck Force	1000	X	N	-578	74			-1153.7	51
	1000	Y	N	853	55			1968.5	52
	1000	Z	N	813	52			1543.4	48
	1000	RES	N	1117	54			2584.6	50

	Peak Response								
				2002 Explorer 12/18/2001		2002 Explorer 9/12/2002		2002 Explorer 1/10/2003	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time
Lower Neck Moment	600	X	Nm	50.1	55			138.5	53
	600	Y	Nm	74.7	75			113.5	62
	600	Z	Nm	23.3	65			24.0	56
	600	RES	Nm	76.7	74			170.1	53
Shoulder Force	600	X	N	2219	46			-4295.0	49
	600	Y	N	3871	48			5768.7	49
	600	Z	N	-239	63			-751.2	43
Upper Spine	180	X	G	-19.6	45	-26.3	45.5	-39.6	43
	180	Y	G	52.9	49	84.3	43.7	77.4	46
	180	Z	G	5.4	61	25.3	47.1	7.3	55
	180	Res	G	53.4	49	89.8	43.6	79.9	45
Lower Spine	180	X	G	-7.5	53	32.2	52.0	-17.4	51
	180	Y	G	65.0	53	98.4	41.5	97.0	48
	180	Z	G	4.5	77	17.9	47.1	-7.5	106
	180	Res	G	65.5	63	103.2	41.4	98.4	48
Upper Rib	180	Y	G	145.2	48	121.1	38.1	159.3	44
Mid Rib	180	Y	G	143.2	45			139.7	43
Lower Rib	180	Y	G	238.7	44	118.7	37.2	170.5	41
Upper Rib Deflection	180	Y	mm	25.6	64			-34.6	52

	Peak Response								
				2002 Explorer 12/18/2001		2002 Explorer 9/12/2002		2002 Explorer 1/10/2003	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time
Mid Rib Deflection	180	Y	mm	45.9	58	-49.7	52.7	-38.9	51
Lower Rib Deflection	180	Y	mm	43.1	60			-43.0	50
Upper Rib VC	180	Y	m/sec	0.38	52			.08	48
Mid Rib VC	180	Y	m/sec	0.88	47			.09	47
Lower Rib VC	180	Y	m/sec	0.74	49			1.1	45
Torso Force	600	X	N	308	46			-1068.9	46
	600	Y	N	-542	55			-1129.3	47
Torso Moment	600	Y	Nm	-5.3	46			-50.9	46
	600	Z	Nm	10.6	52			27.4	50
T12 Force	600	X	N	858	72			795.5	62
	600	Y	N	1529	46			2599.9	47
T12 Moment	600	X	Nm					-247.3	47
	600	Y	Nm	119.6	75			115.2	63
Abdomen Front Force	600	Y	N	141	46			635.4	47
Abdomen Mid Force	600	Y	N	637	52			994.8	47
Abdomen Rear Force	600	Y	N	1372	52			1141.8	48
Abdomen Summed Force	600	Y	N	2074	52			2674.3	47
Pubic Symphysis Force	600	Y	N	1262	60			-2317.7	48

	Peak Response								
				2002 Explorer 12/18/2001		2002 Explorer 9/12/2002		2002 Explorer 1/10/2003	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time
Right Femur Force	600	X	N	277	71			-223.7	70
	600	Y	N	-913	74			-493.6	44
	600	Z	N	947	68			1376.8	54
	600	RES	N	1131	71			1380.3	54
Right Femur Moment	600	X	Nm	105.7	72			97.7	59
	600	Y	Nm	-41.9	85			34.8	51
	600	Z	Nm	-55.3	71			-11.6	115
	600	RES	Nm	118.0	72			99.9	59
Left Femur Force	600	X	N	358	61			459.5	51
	600	Y	N	896	135			1116.6	47
	600	Z	N	967	78			1161.8	70
	600	RES	N	990	78			1500.1	50
Left Femur Moment	600	X	Nm	-121	76			-89.4	77
	600	Y	Nm	46.8	65			-59.4	56
	600	Z	Nm	-33.2	62			-15.0	63
	600	RES	Nm	126.7	76			89.0	77
Pelvis	1000	X	G	-14.7	75	11.0	53.8	-12.5	40
	1000	Y	G	48.4	52	90.8	43.1	71.4	43
	1000	Z	G	6.2	77	-21.1	43.5	12.1	50