H-637983

REPORT NUMBER: 201-MGA-2005-002

SAFETY COMPLIANCE TESTING FOR FMVSS 201
RIGID POLE SIDE IMPACT TEST

Ford Motor Company
2004 Ford Freestar
NHTSA NUMBER: C40206

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

May 20, 2005

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW, ROOM 6111 (NVS-220)
WASHINGTON, D.C. 20590

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Date: August 9, 2005

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Date: August 9, 2005

FINAL REPORT ACCEPTED BY:

COTR, Side Impact

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Technical Report Documentation Page

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16. Abstract

A rigid pole side impact test was conducted on a 2004 Ford Freestar in accordance with FMVSS 201, "Occupant Protection in Interior Impact", S6.2(b)(3) and the Office of Vehicle Safety Compliance Test Procedure No. TP-201P-02 "Rigid Pole Side Impact Test". The test was conducted at MGA Research Corporation in Burlington, Wisconsin on May 20, 2005.

The impact velocity of the vehicle was 28.3 kph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 21°C. The post-test maximum crush was 492 mm at level 2. The test vehicle's occupant performance is as follows:

	REQUIREMENT	DRIVER
HIC	≤ 1000	405.8

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

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PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

This rigid pole side impact test is conducted as part of the FY' 2005 test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract No. DTNH22-01-D-01033. The purpose of this test was to evaluate occupant protection in interior impact in a 2004 Ford Freestar manufactured by Ford Motor Company.

1.2 TEST PROCEDURE

The rigid pole side impact test was conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC), laboratory test procedure TP-201P-02, dated October 21, 2001 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA8. The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

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

SECTION 2
SUMMARY OF RIGID POLE SIDE IMPACT TEST

2.1 SUMMARY OF RIGID POLE SIDE IMPACT TEST

A rigid pole side impact test was performed on a 2004 Ford Freestar. The subject vehicle was towed into a rigid pole at a velocity of 28.3 km/h. The specified impact velocity range is from 27.2 to 28.8 km/h. The test vehicle was positioned 90° to the line of forward motion. The weight of the vehicle as tested was 2110.7 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on May 20, 2005.

One (1) real-time motion picture camera and eleven (11) high-speed motion picture cameras were used to document the impact event. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and SID/HIII can be found in Appendix A. One SID/HIII was placed in the left front outboard designated seating position according to instructions specified in the TP-201P-02 dated October 21, 2001. The SID/HIII was instrumented in the following locations:

- Head Center of Gravity (CG) tri-axial accelerometers (X, Y, and Z axis)
- Upper Neck 6 channel load cell (X, Y, Z force and moment)
- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)

The test vehicle was instrumented with twenty (20) structural accelerometers. All data channels were recorded with a fully self contained on-board DTS TDAS Pro. The data was digitally sampled at 10,000 samples per second and processed per Section 12.2 of the Test Procedure.

2.2 GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 492 mm at level 2, at the vertical impact line. The driver SID/HIII, Serial No. 037, was calibrated just prior to this test. The SID/HIII's injury criteria are summarized as follows:

Measurements	Units	Driver
HIC		405.8
TTI*	G's	66.5
Pelvis*	G's	66.4
Neck Force X*	N	-279
Neck Force Y*	N	-242
Neck Force Z*	N	1262
Neck Moment X*	Nm	-73.7
Neck Moment Y*	Nm	-17.4
Neck Moment Z*	Nm	-32.1

* Information Purposes Only

Test summaries and post-test observations are presented in Section 3. The vehicle, camera, and occupant measurements are presented in Section 4. Appendix A contains the still photograph prints. Appendix B contains the SID/HIII and vehicle data traces. Appendix C contains the SID/HIII's configuration and performance verification data. Appendix D contains the calibration information data.

TEST NOTES

The following channels did not collect any valid data:

Driver Pelvis Yr after 55ms
LF Door Accel. #1 Y after 40ms
LF Door Accel. #2 Y after 90ms
LF Door Accel. #3 Y after 10ms
Right Floor Y after 40ms

The following accelerometers were not used for this test:

A Pillar Upper Y
B Pillar Upper Y
Left Roof Y
Right Roof Y

SECTION 3
SIDE IMPACT DUMMY (SID/HIII) AND VEHICLE TEST DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	English Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressure	lbf/in^2	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

*Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

TEST VEHICLE INFORMATION

Make	Ford
Model	Freestar
Body Style	MPV
NHTSA No.	C40206
VIN	2FMDA51684BA06331
Color	Spruce Green
Delivery Date	3/17/05
Odometer Reading (mile)	77
Dealer	Huntington Ford
Transmission	Automatic
Final Drive	Front Wheel
Number of Cylinders	6
Engine Displacement (L)	3.9
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Yes, side & curtain
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	Yes
AM/FM/CD	Yes
Anti-theft System	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	09/03

GVWR (kg)	2567
GAWR Front (kg)	1322
GAWR Rear (kg)	1251

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	240	240
Cold Pressure (kPa)	240	240
Recommended Tire Size	P225/60R16	P225/60R16
Tire Size on Vehicle	P225/60R16	P225/60R16
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Buckets	Split Bench	Split Bench	
Number Of Occupants	2	2	3	7
Capacity Wt. (VCW) (kg)				544
Cargo Wt. (RCLW) (kg)				68.0

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	595.6	399.6		624.2	463.6	
Right	kg	557.0	415.5		554.3	468.6	
Ratio	%	58.6	41.4		55.8	44.2	
Totals	kg	1152.6	815.1	1967.7	1178.5	932.2	2110.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1967.7
Weight of SID/HIII Side Impact Dummy	kg	80.7
Rated Cargo/Luggage Weight (RCLW)	kg	68.0
Calculated Vehicle Target Weight (TVTW)	kg	2116.4

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	Fully Loaded	Ready For Test*
Right Front	mm	736	735	889
Left Front	mm	734	727	898
Right Rear	mm	757	740	886
Left Rear	mm	758	737	884
Right Door Sill Angle	deg	1.1 ND	1.1 ND	1.1 ND
Left Door Sill Angle	deg	0.9 ND	0.5 ND	0.7 ND
Front Bumper Angle	deg	0.1 LD	0.1 LD	0.1 LD
Rear Bumper Angle	deg	0.0	0.2 LD	0.2 LD

ND = NOSE DOWN, BD = BACK DOWN, LD = LEFT DOWN, RD = RIGHT DOWN

* on wheel dollies

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	3062
Total Vehicle Length at Left Side	mm	4320
Total Vehicle Length at Centerline	mm	5062
Total Vehicle Length at Right Side	mm	4320
Total Vehicle Width at B-Post	mm	1942
Weight of Ballast in Cargo Area	kg	56.7
Amount of Stoddard Solvent in Fuel Tank	liters	92.4

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

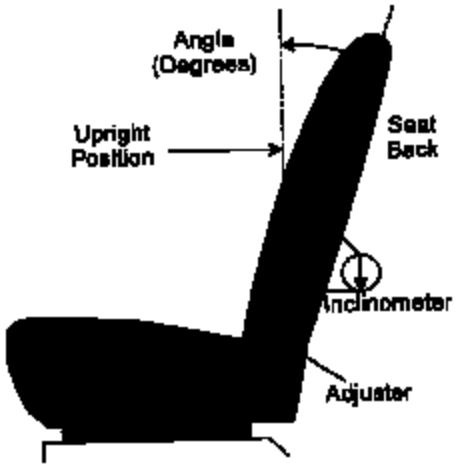
NHTSA No. C40208
Test Date: May 20, 2005

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	1381
Actual Impact Point Aft of Front Axle	mm	1386

NORMAL DESIGN RIDING POSITION

The driver's seat back is positioned to the manufacturer's designated angle. The procedure for the seat is as follows: The seat back is measured relative to the rocker sill. Remove the seat back panel and position inclinometer 13 inches above the back pivot point on the rear outboard seat frame.



FRONT SEAT ASSEMBLY

Driver seat back angle: Initial – 17.0 deg. on headrest post Final – 12.3 deg. on headrest post

SEAT FORE/AFT POSITIONS

The manufacturer's procedure is as follows: Position the seat in the mechanical mid-position. Reference points are scribed on the seat and the seat track. The total seat travel is measured and the seat is then positioned in the center of seat travel. On manual seats, position at the mid-point track location or the next closes position to the rear of the mid-point travel location.

Initial: the fore/aft was set to the middle position for the driver's seat.
Final: the fore/aft was set 1 notch forward from the middle position.

SEAT BELT UPPER ANCHORAGE

The test vehicle is equipped with adjustable "D" ring anchorage for the driver's seat position. The driver's "D" ring anchorage was placed in the second position from bottom position.

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

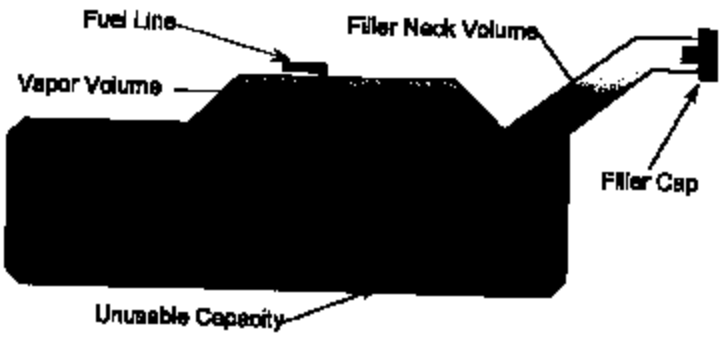
Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 98.4 liters
The "Usable Capacity" of any optional equipment fuel tank is: N/A liters
92-94% of "Usable Capacity" for certification to FMVSS 301 requirements: 90.4 – 92.4 liters
Actual amount of Stoddard solvent added to vehicle for certification test 92.4 liters

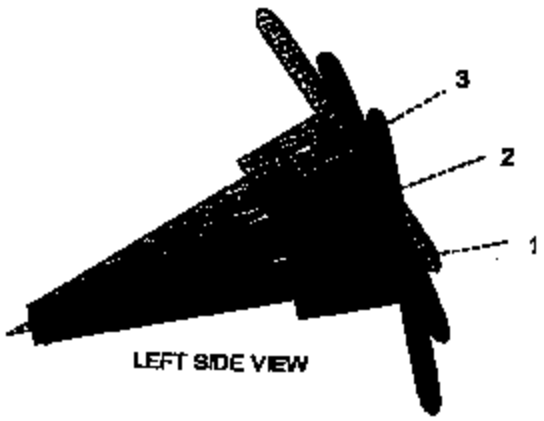
The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following the ignition actuation the fuel pump will shut off. The fuel pump operates continuously while the engine is running.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



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes, when it is moved through its full range of motion. The vehicle is equipped with a 5 position tilt column. Test position is mid-position.



STEERING COLUMN ASSEMBLY

The steering column was set at 26.7° for the test.

DATA SHEET NO. 2

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	595.6	399.6		624.2	463.6	
Right	kg	557.0	415.5		554.3	468.6	
Weight Ratio	%	58.6	41.4		55.8	44.2	
Totals	kg	1152.6	815.1	1967.7	1178.5	932.2	2110.7

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measured Parameter	Units	Maximum Crush	Above Ground
Level 1	Sill Top Height	mm	405	270
Level 2	Occupant H-Point	mm	492	610
Level 3	Mid Door	mm	486	665
Level 4	Window Sill	mm	449	995
Level 5	Window Top	mm	257	1650
N/A	Maximum Penetration	mm	492	610

INSTRUMENTATION

SID/HIII Instrumentation	17
Vehicle Structure Accelerometers	20
Total	37

CAMERAS

Onboard Vehicle	3
Offboard Vehicle	8
Total	11

IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	5 rear

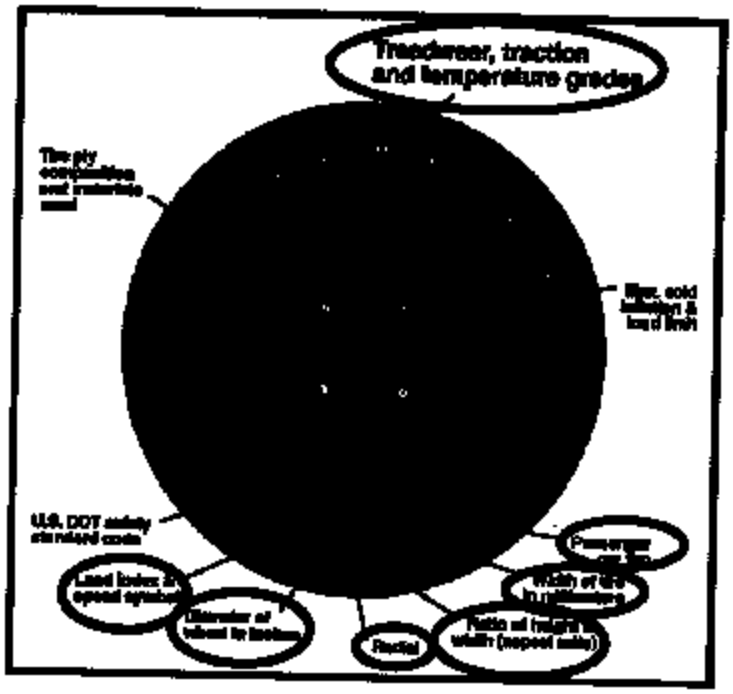
DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

Vehicle Year	2004	Vehicle Make	Ford
VIN	2FMDA51684BA08331	Vehicle Model	Freestar



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	Symmetry	Symmetry
Tire Type	All Season	All Season
Tire Width (mm)	225	225
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	97S	97S
Treadwear	460	460
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 4

POST TEST OBSERVATIONS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front Seating Position
Dummy Type / Serial No.	SID/HIII / 037
Head Contact	Airbag curtain
Upper Torso Contact	Side airbag
Lower Torso Contact	Side airbag
Left Knee Contact	Door trim panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Door Opening	Door remained closed and latched	Door remained closed and latched
Right Side Door Opening	Door remained closed and latched	Door remained closed and latched
Seat Movement	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

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

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	Yes
Curtain	Yes

ARMREST LOCATION AND SEAT CRUSH

	Driver
Front Armrest (from bottom of window)	0
Front Seat Back Crush	35
Front Seat Cushion Crush	5

SECTION 4

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 5

SID/HIII INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

THORAX AND PELVIS PEAK ACCELERATIONS (FIR 100 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Upper Rib (LUR)	Y	G's	55.6	48	-10.8	100
Upper Rib (LUR) (R)	Y	G's	54.1	48	-10.5	100
Lower Rib (LLR)	Y	G's	59.8	48	-10.7	100
Lower Rib (LLR) (R)	Y	G's	57.9	48	-8.1	100
Lower Spine (T_{12})	Y	G's	77.1	53	-7.2	94
Lower Spine (T_{12}) (R)	Y	G's	77.3	53	-7.6	94
Pelvis (PEV)	Y	G's	66.4	53	-8.3	93
Pelvis (PEV) (R)	Y	G's	*	*	*	*

THORACIC TRAUMA INDEX (TTI) AND PELVIC ACCELERATION (FIR 100 Filtered)

Location	Driver			
	LLR	T_{12}	TTI(g)	PEV(g)
Rib, Spine, and Pelvis	59.8	77.1	66.5	66.4
Rib, Spine, and Pelvis (R)	57.9	77.3	67.6	*

* No valid data collected after 55ms

UPPER NECK FORCES AND MOMENTS (SAE CLASS 1000/600 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Neck Force	X	N	1	0	-279	86
Neck Force	Y	N	476	64	-242	191
Neck Force	Z	N	1282	55	-134	158
Neck Moment	X	Nm	16.6	141	-73.7	61
Neck Moment	Y	Nm	12.0	154	-17.4	58
Neck Moment	Z	Nm	7.1	258	-32.1	172

HEAD CG PEAK ACCELERATIONS (SAE CLASS 1000 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Head CG	X	G's	3.7	148	-8.7	86
Head CG	Y	G's	68.6	64	-10.4	152
Head CG	Z	G's	4.7	73	-20.6	55
Head CG Resultant		G's	68.7	64		

HEAD INJURY CRITERIA (SAE CLASS 1000 Filtered)

Location	Driver			
	HIC	T1	T2	Avg G's
Head CG Resultant	406.8	54.9	75.9	51.8

Positive Acceleration Polarities: (Conforms to SAE J211)
Longitudinal (X) = + Forward
Lateral (Y) = + Right
Vertical (Z) = + Down

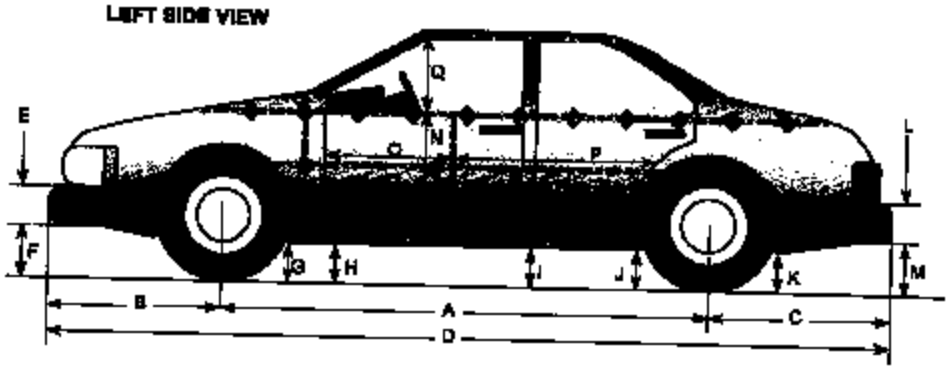
DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

LEFT SIDE VIEW



All Measurements in mm

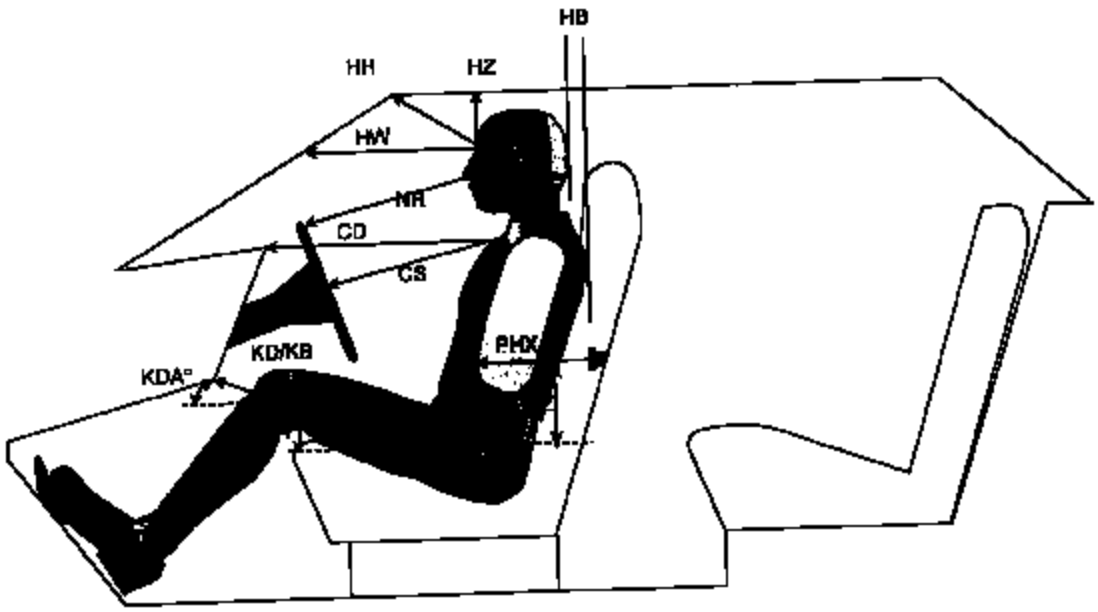
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3082	2930	152
B	Front Axle to FSOV	990	1021	-31
C	Rear Axle to RSOV	990	1013	-23
D	Total Length at Centerline	5062	4964	98
E	Front Bumper Thickness	196	196	0
F	Front Bumper Bottom to Ground	547	588	-41
G	Sill Height at Front Wheel Well	350	339	11
H	Sill Height at Front Door Leading Edge	350	337	13
I	Sill Height at "B" Pillar	370	361	9
J1	Sill Height at Rear Wheel Well	366	375	-9
J2	Pinch Weld Height at Rear Wheel Well	358	372	-14
K	Sill Height Aft of Rear Wheel Well	435	439	-4
L	Rear Bumper Thickness	140	140	0
M	Rear Bumper Bottom to Ground	520	514	6
N	Sill Height to Window Bottom Sill	815	770	45
O	Front Door Leading Edge to Impact CL	1012	800	212
P	Rear Door Trailing Edge to Impact CL	1208	1151	57
Q	Front Window Opening	555	560	-5
R	Right Side Length	4320	4330	-10
S	Left Side Length	4320	4136	184
T	Vehicle Width at "B" Post	1942	1760	182

DATA SHEET NO. 7

SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005



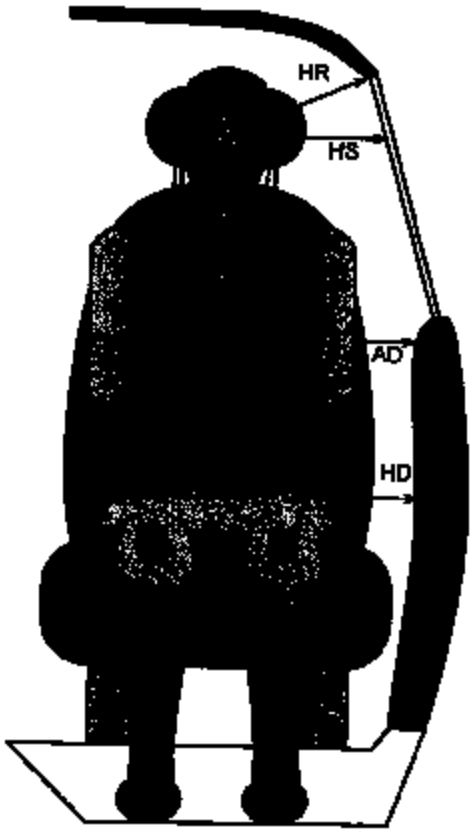
Driver Code	Measurement Description	Driver	
		Length(mm)	Angle(°)
HH	Head to Header	395	
HW	Head to Windshield	578	
HZ	Head to Roof	163	
NR	Nose to Rim	425	
CD	Chest to Dash	515	
CS	Chest to Steering Wheel	327	
KDL	Left Knee to Dash	133	27.4
KDR	Right Knee to Dash	133	28.3
PA	Pelvic Angle		22.8
PHX	H-Point to Striker (X-Axis)	221	
PHZ	H-Point to Striker (Z-Axis)	34	

DATA SHEET NO. 8

SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005



FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	178
HS	Head to Side Window	mm	308
AD	Arm to Door	mm	105
HD	H-Point to Door	mm	195

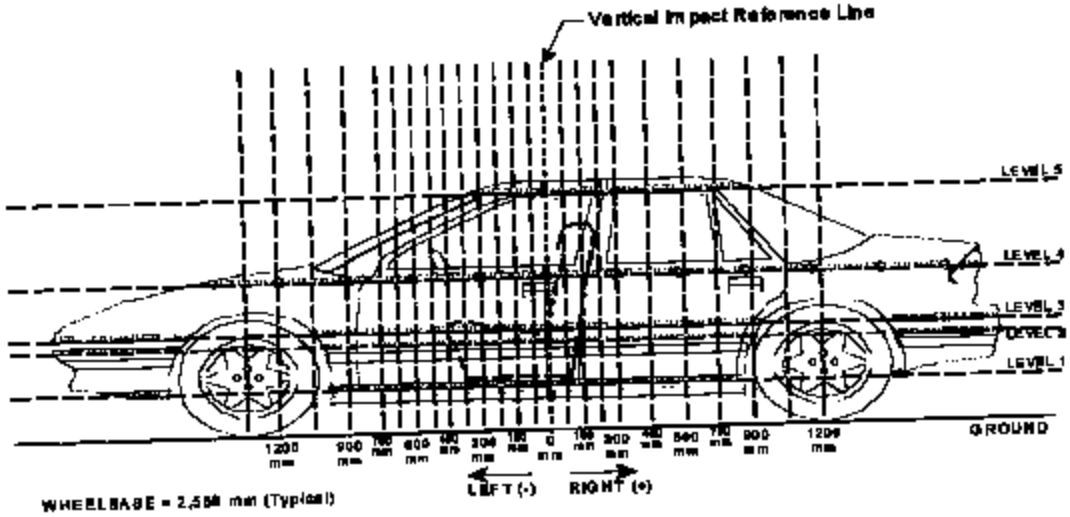
DATA SHEET NO. 9

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

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.

Level	Measurement Description	Units	Height Above Ground
5	Window	mm	1650
4	Window Sill	mm	995
3	Mid Door	mm	665
2	Occupant H-Point	mm	610
1	Sill Top	mm	270

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1800				260					258					-4	
-1650				224					237					13	
-1500				213					224					11	
-1350				207					221					14	
-1200				202					231					29	
-1050		157	156	201			205	200	227			48	45	26	
-900	203	155	161	200		277	212	221	248		74	57	60	48	
-825	203	154	161	200		294	236	244	262		91	82	83	62	
-750	203	152	161	199		313	266	267	287		110	114	106	88	
-675	202	150	160	198		339	295	297	320		137	145	137	122	
-600	202	150	160	198		360	332	338	354		158	182	178	156	
-525	202	149	158	196		381	361	374	379		179	212	216	183	
-450	202	148	158	197		412	408	415	419		210	258	257	222	
-375	202	146	157	197	453	460	458	469	467	537	258	312	312	270	84
-300	202	145	155	197	455	496	496	506	500	560	294	351	351	303	95
-225	202	144	155	198	450	553	542	552	539	577	351	398	397	341	127
-150	201	143	154	198	450	597	584	587	580	629	396	441	433	382	179
-75	202	143	153	198	449	607	622	621	625	676	405	479	468	427	226
0	202	142	153	196	450	595	634	639	645	707	393	492	486	449	257
75	203	142	152	198	451	548	600	602	621	679	345	458	450	423	228
150	203	142	152	200	454	482	535	539	574	649	289	393	387	374	195
225	202	143	152	199	456	449	393	412	516	620	247	250	260	317	164
300	202	144	153	200	458	415	373	392	423	605	213	229	239	223	147
375	202	144	155	202	460	382	351	370	404	590	180	207	215	202	130
450	202	144	156	202	460	357	336	356	392	580	155	192	200	190	120
525	203	145	158	203	461	333	318	337	376	572	130	173	179	173	111
600	203	145	158	203	462	309	294	315	355	555	106	149	157	152	93
750	204	146	160	204	466	271	258	271	319	526	67	110	111	115	60
900	204	149	162	207	470	239	214	232	282	500	35	65	70	75	30
1050	205	151	164	210	471	218	180	197	252	480	13	29	33	42	9
1200		155	162	213	477		182	196	222	457		27	34	9	-20
1350		156	155	219	478		184	186	250	499		28	31	31	21
1500				224	481				252	504				28	23
1650				228	489				252	500				24	11
1800				234	500				242	493				8	-7
1950				240	500				249	500				9	0
2100				242					245					3	

Reference plane is parallel to test vehicle longitudinal centerline

Units = mm

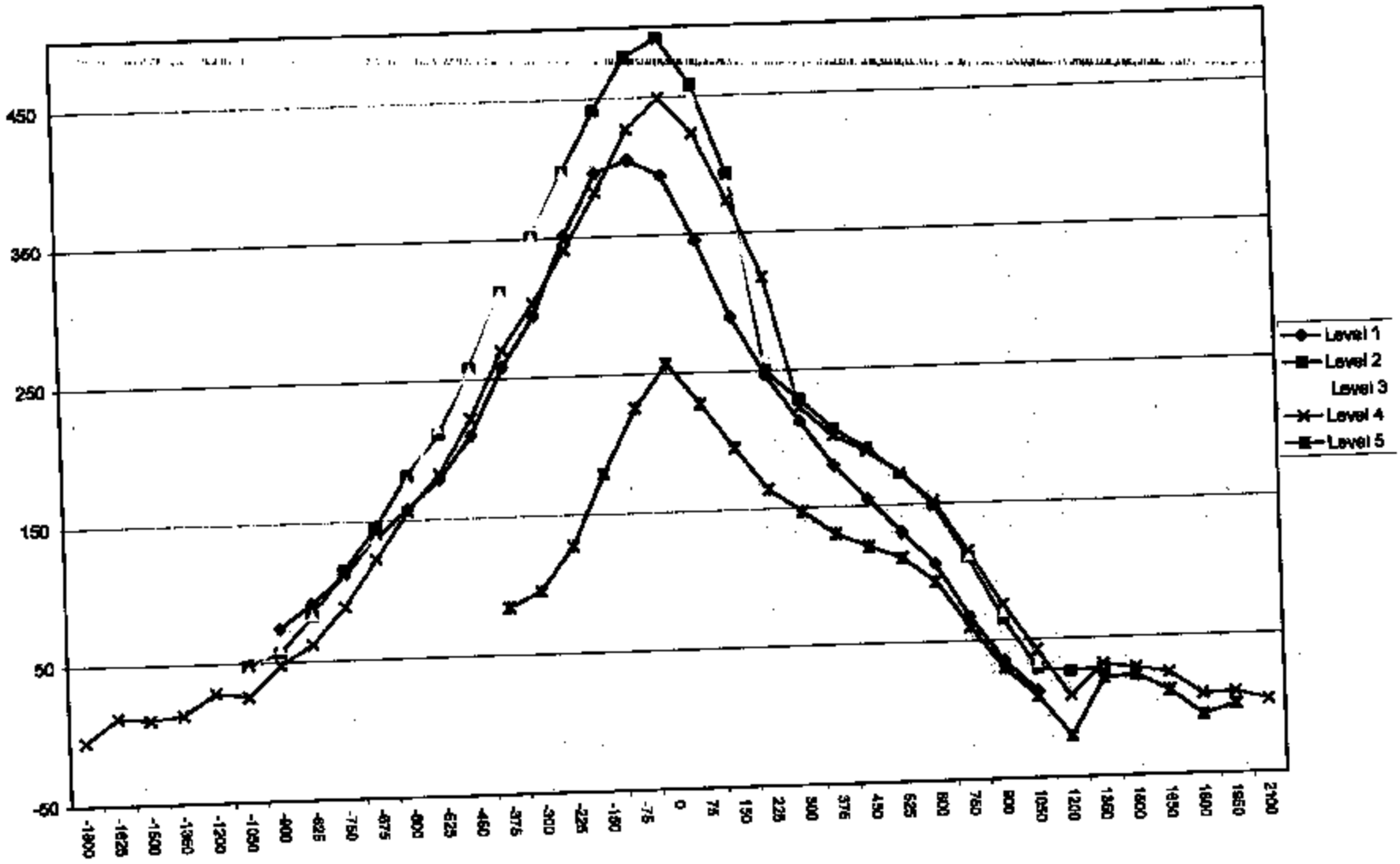
Given dimensions = Reference plane to car body

DATA SHEET NO. 10... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

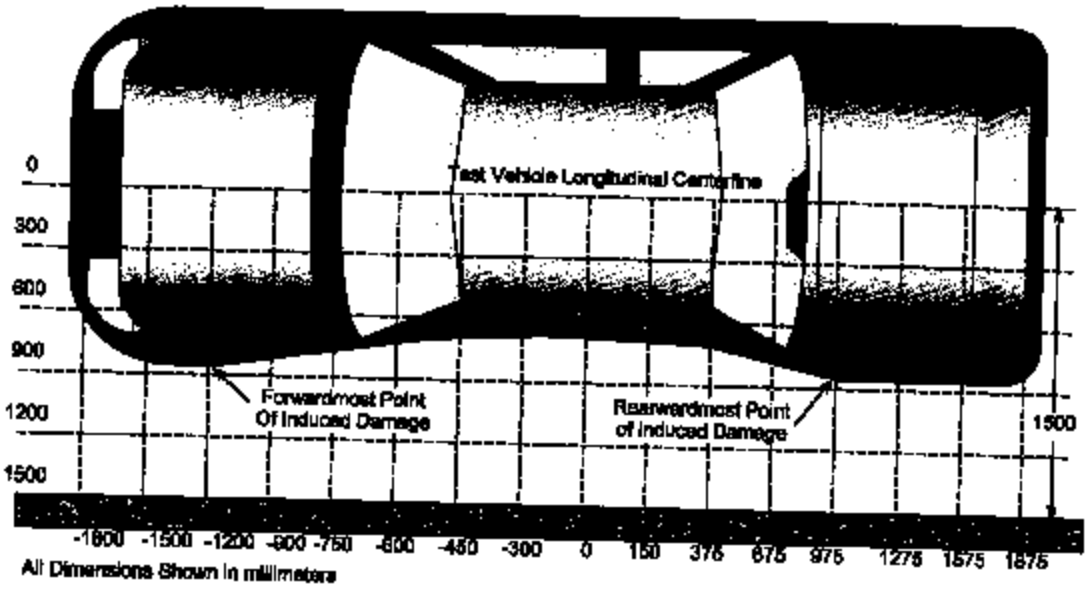


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2250 mm	4	248	269	21
2	1485 mm	4	222	252	30
3	652 mm	3	159	301	142
4	-248 mm	3	155	525	370
5	-1067 mm	4	201	227	26
6	-1875 mm	4	260	256	-4

Reference plane is parallel to test vehicle longitudinal centerline

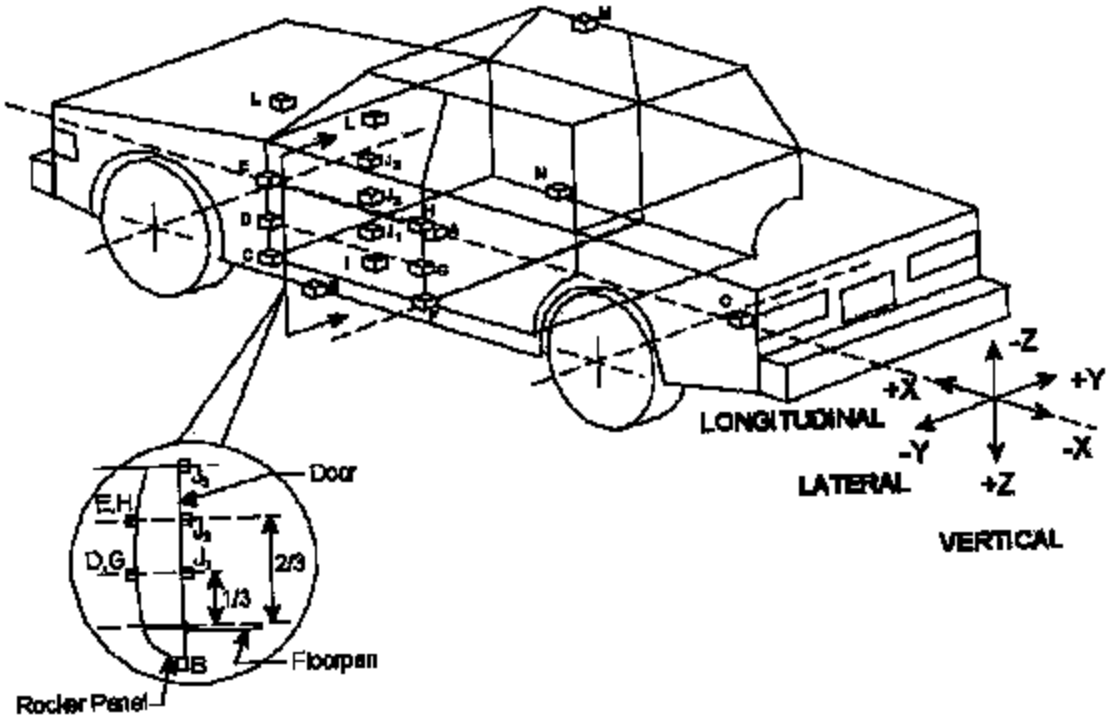
Given dimensions = Reference plane to car body

DATA SHEET NO. 12

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005



No.	Location
A	Vehicle CG
B	Left Floor Sill
C	A Pillar Sill
D	A Pillar Low
E	A Pillar Mid
G	B Pillar Sill
H	B Pillar Low
I	B Pillar Mid

No.	Location
L	Driver Seat
M1	Driver Door Rib
M2	Driver Door Pelvis
M3	Driver Door Knee
N	Engine
O	Firewall
Q	Right Floor Sill
R	Rear Deck

DATA SHEET NO. 12.. (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Peak Values (G's)				
		Axis	Max	Time	Min	Time
A	Vehicle CG	X	5.8	62	-3.7	93
		Y	14.7	56	-0.5	0
		Z	15.4	86	-13.8	45
		RES	19.6	86		
B	Left Floor	Y	13.5	21	-42.6	15
C	A Pillar Sill	Y	37.9	16	-6.3	23
D	A Pillar Low	Y	12.2	19	-3.2	4
E	A Pillar Mid	Y	12.2	19	-3.2	4
G	B Pillar Sill	Y	45.9	17	-10.5	22
H	B Pillar Low	Y	87.4	17	-15.4	28
I	B Pillar Mid	Y	56.7	17	-12.1	28
L	Driver Seat	Y	35.8	44	-10.9	105
M1	Driver Door Rib	Y	*	*	*	*
M2	Driver Door Pelvis	Y	**	**	**	**
M3	Driver Door Knee	Y	***	***	***	***
N	Engine	X	4.2	95	-5.9	57
		Y	10.7	93	-2.5	300
O	Firewall	Y	10.9	89	-2.6	45
Q	Right Floor Sill	Y	****	****	****	****
R	Rear Deck	X	2.1	60	-1.1	87
		Y	6.4	58	-0.5	252

* No valid data collected after 40ms
** No valid data collected after 90ms
*** No valid data collected after 10ms
**** No valid data collected after 40ms

Positive Acceleration Polarities: (Conforms to SAE J211)
Longitudinal (X) = + Forward
Lateral (Y) = + Right
Vertical (Z) = + Down

DATA SHEET NO. 12... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)			
		Axis	Pre-Test	Post-Test	Difference
A	Vehicle CG	X	2791	2897	106
		Y	0	28	28
		Z	420	422	-2
B	Left Floor Sill	X	3034	2887	-147
		Y	-795	-538	257
		Z	226	191	35
C	A Pillar Sill	X	3496	3353	-143
		Y	-786	-663	123
		Z	210	219	-9
D	A Pillar Low	X	3634	3348	-288
		Y	-885	-723	162
		Z	825	675	150
E	A Pillar Mid	X	3643	3359	-284
		Y	-810	-722	88
		Z	1002	841	161
G	B Pillar Sill	X	2404	2354	-50
		Y	-793	-507	286
		Z	235	229	6
H	B Pillar Low	X	2462	2450	-12
		Y	-852	-546	306
		Z	658	642	16
I	B Pillar Mid	X	2454	2439	-15
		Y	-805	-550	255
		Z	896	887	9
L	Driver Seat	X	2728	2624	-104
		Y	-644	-377	267
		Z	761	835	-74
M1	Driver Door Rib	X	2648	2597	-51
		Y	-842	-425	417
		Z	887	886	1
M2	Driver Door Pelvis	X	2659	2609	-50
		Y	-800	-431	369
		Z	713	710	3
M3	Driver Door Knee	X	2643	2584	-59
		Y	-796	-443	353
		Z	550	549	1
N	Engine	X	4363	4278	-85
		Y	40	73	33
		Z	952	949	3
O	Firewall	X	4211	4124	-87
		Y	173	204	31
		Z	990	989	1
Q	Right Floor Sill	X	2811	2859	48
		Y	793	899	106
		Z	235	234	1
R	Rear Deck	X	1006	977	-29
		Y	0	0	0
		Z	610	610	0

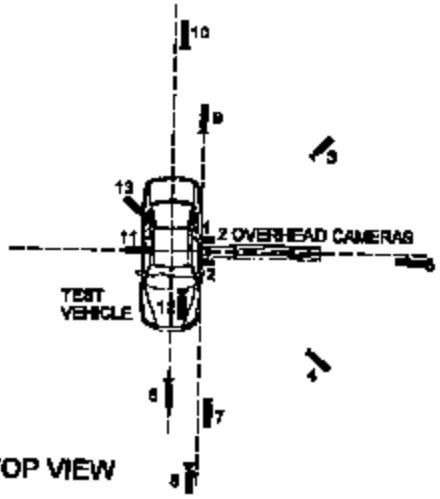
Reference Points
X – Rear of Vehicle (+ forward)
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 13

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	535	-175	5725	14	1000
2	Overhead Close-Up	85	0	5050	19	1000
3	Left Side 45° Rearward Pole View	-2545	-3345	1390	24	1000
4	Right Side 45° Forward Pole View	-2245	3500	1505	24	1000
5	Real Time				13	24
6*	Left Side Rear Pole View					
7	Front Ground Level Vehicle/Pole Impact	385	7415	1520	24	1000
8	Front Ground Level Vehicle Roof Targets and Vehicle/Pole Impact	820	6750	1500	24	1000
9	Rear Ground Level Vehicle/Pole Impact	85	-7845	1490	24	1000
10	Rear Ground Level	500	-9680	1460	35	1000
11	Test Vehicle Onboard Driver Side View				8	500
12	Test Vehicle Onboard Driver Front View				12.5	500
13	Test Vehicle Onboard Driver ¾ Rear View				8	500

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Ground Plane Down

* Camera 6 was not used for this test.

DATA SHEET NO. 14

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

Test Time: 10:15 AM

Temperature at Time of Impact: 21°C

Stoddard Solvent Spillage Measurements

A. From impact until vehicle motion ceases: 0
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0
(Maximum allowable = 5 ounces)

C. For the following 25 minutes: 0
(Maximum allowable = 1 oz./minute)

D. Spillage Details: None

DATA SHEET NO. 15

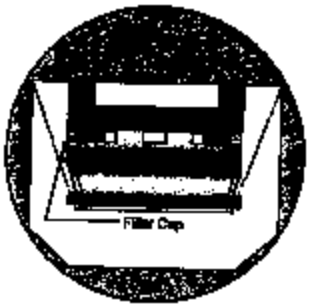
FMVSS 301 STATIC ROLLOVER DATA SHEET

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40206
Test Date: May 20, 2005

0° to 90°

90° to 180°



180° to 270°

270° to 360°

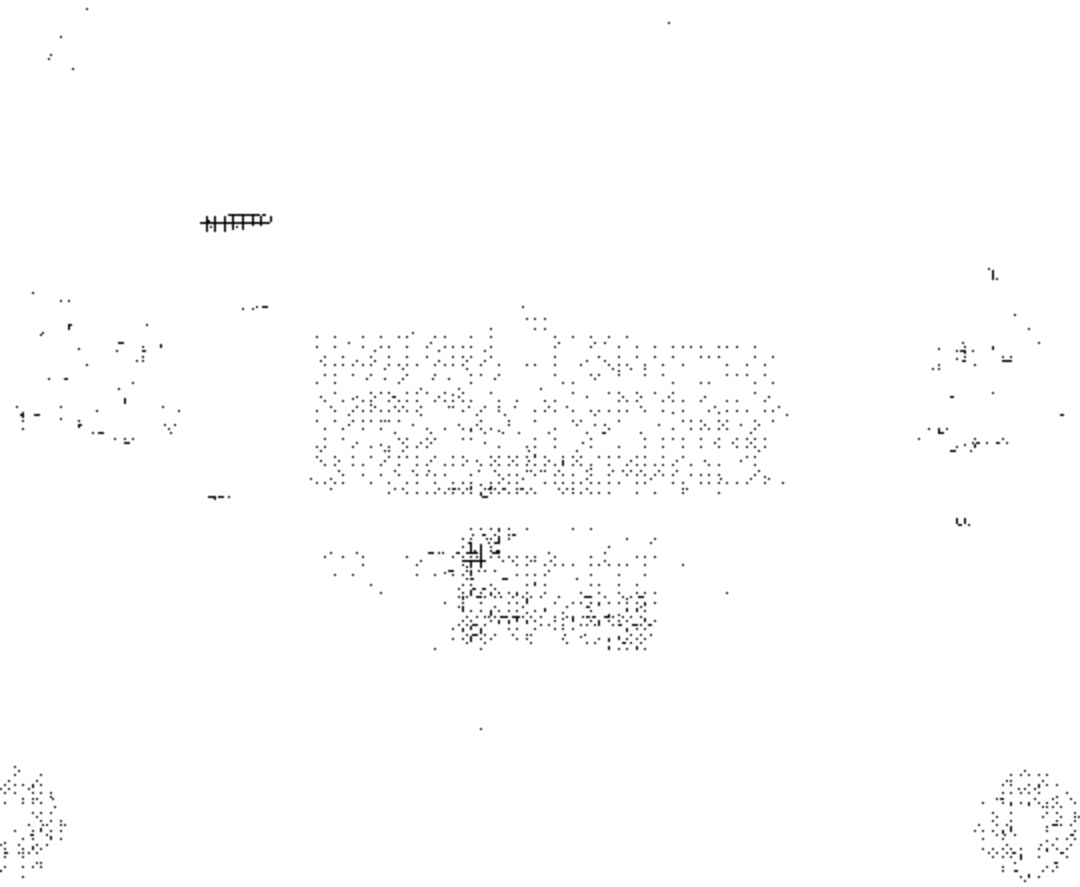
1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage locations: None

Rollover Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	169	300	0
90° to 180°	149	300	0
180° to 270°	144	300	0
270° to 360°	169	300	0

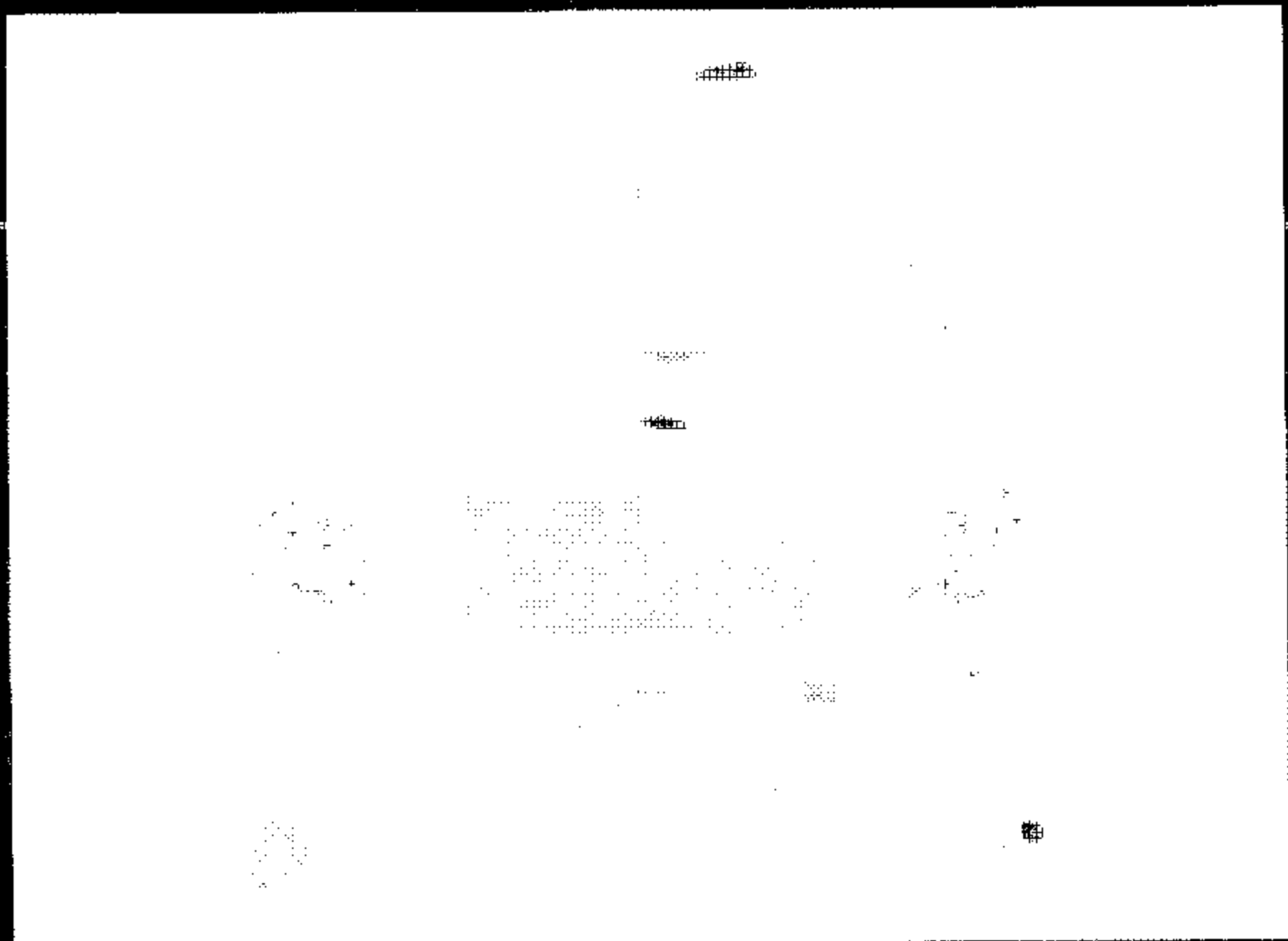
APPENDIX A

PHOTOGRAPHS

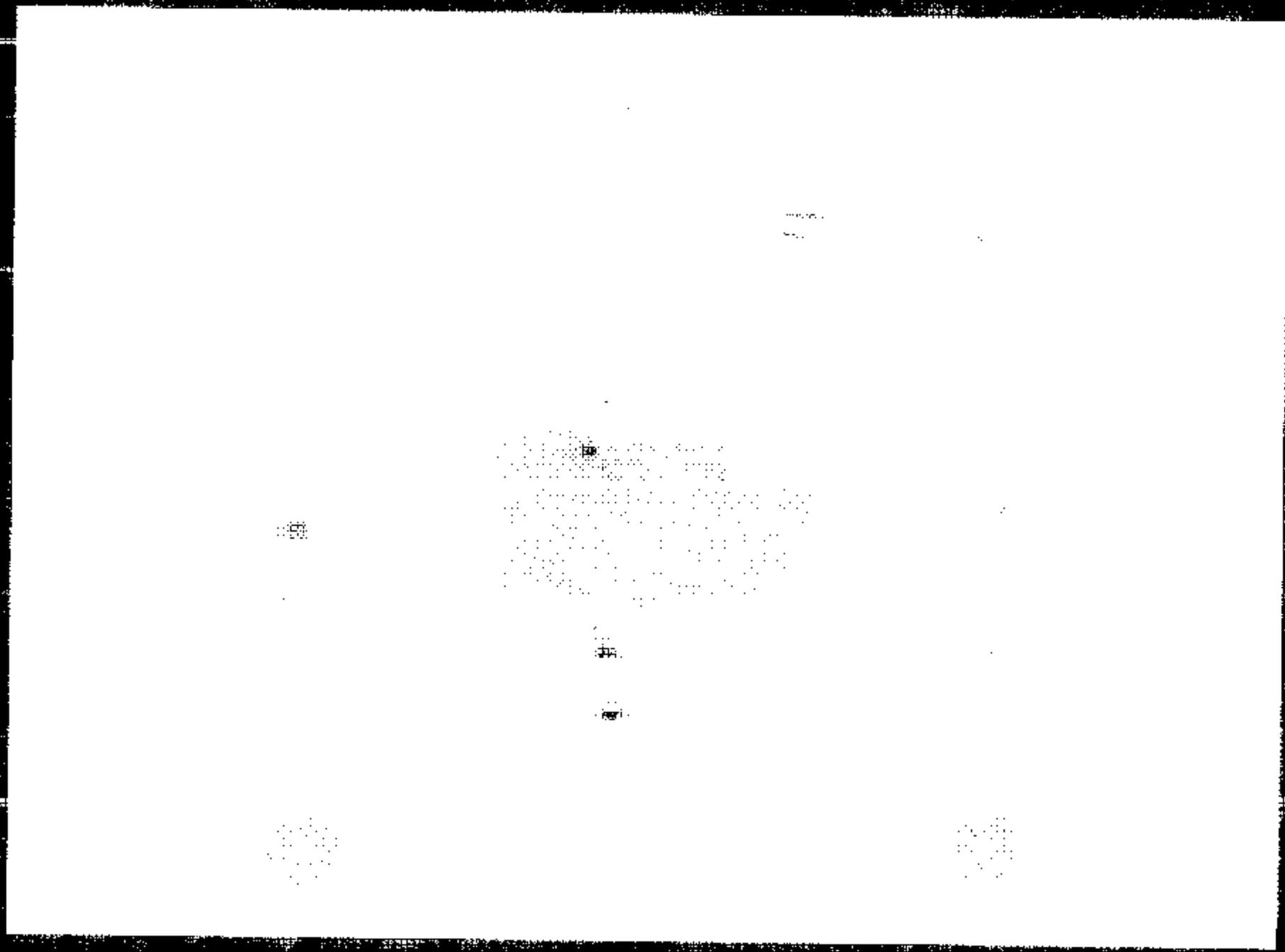
TABLE OF PHOTOGRAPHS



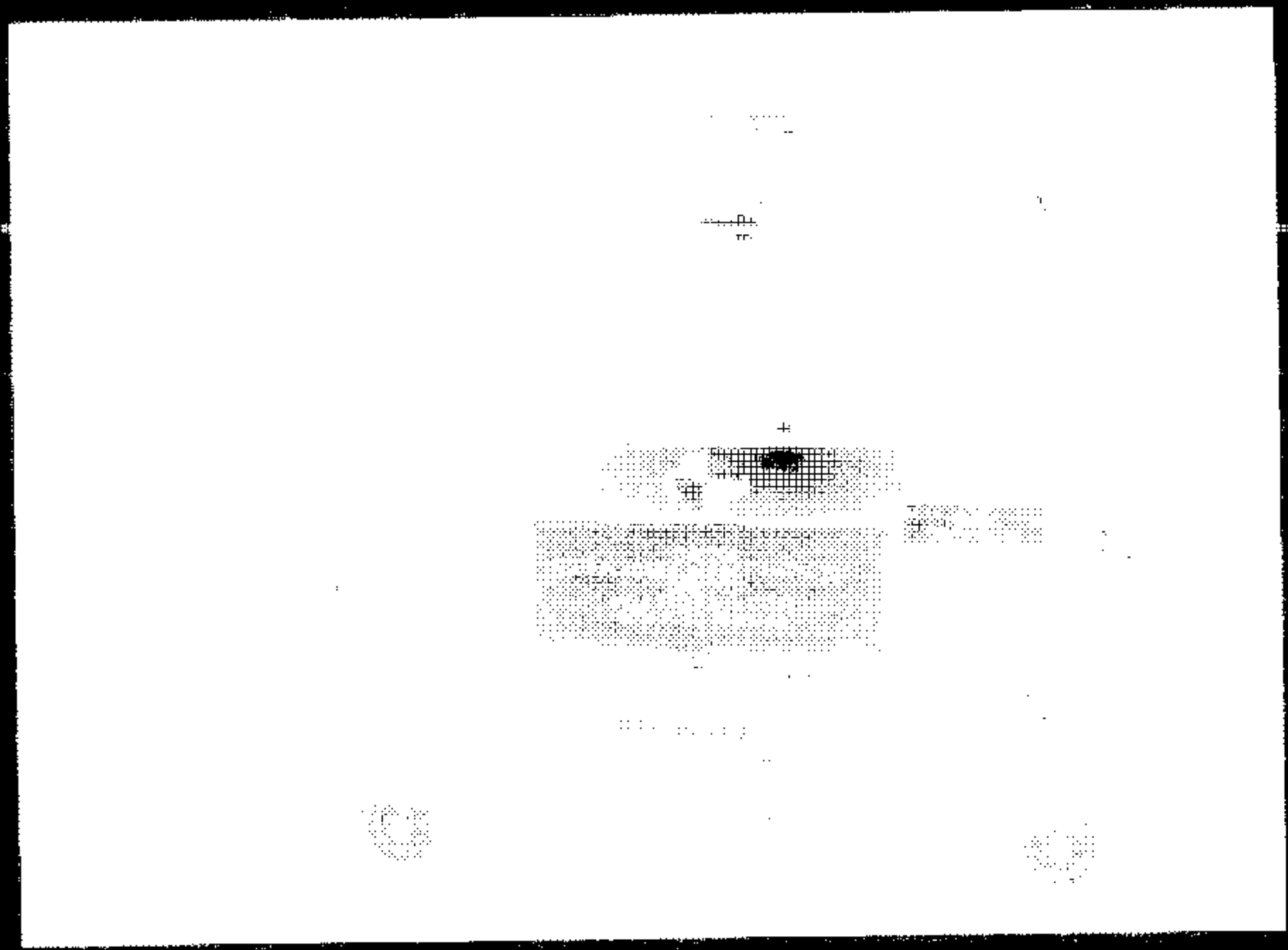
Pre-Test Front View of Test Vehicle



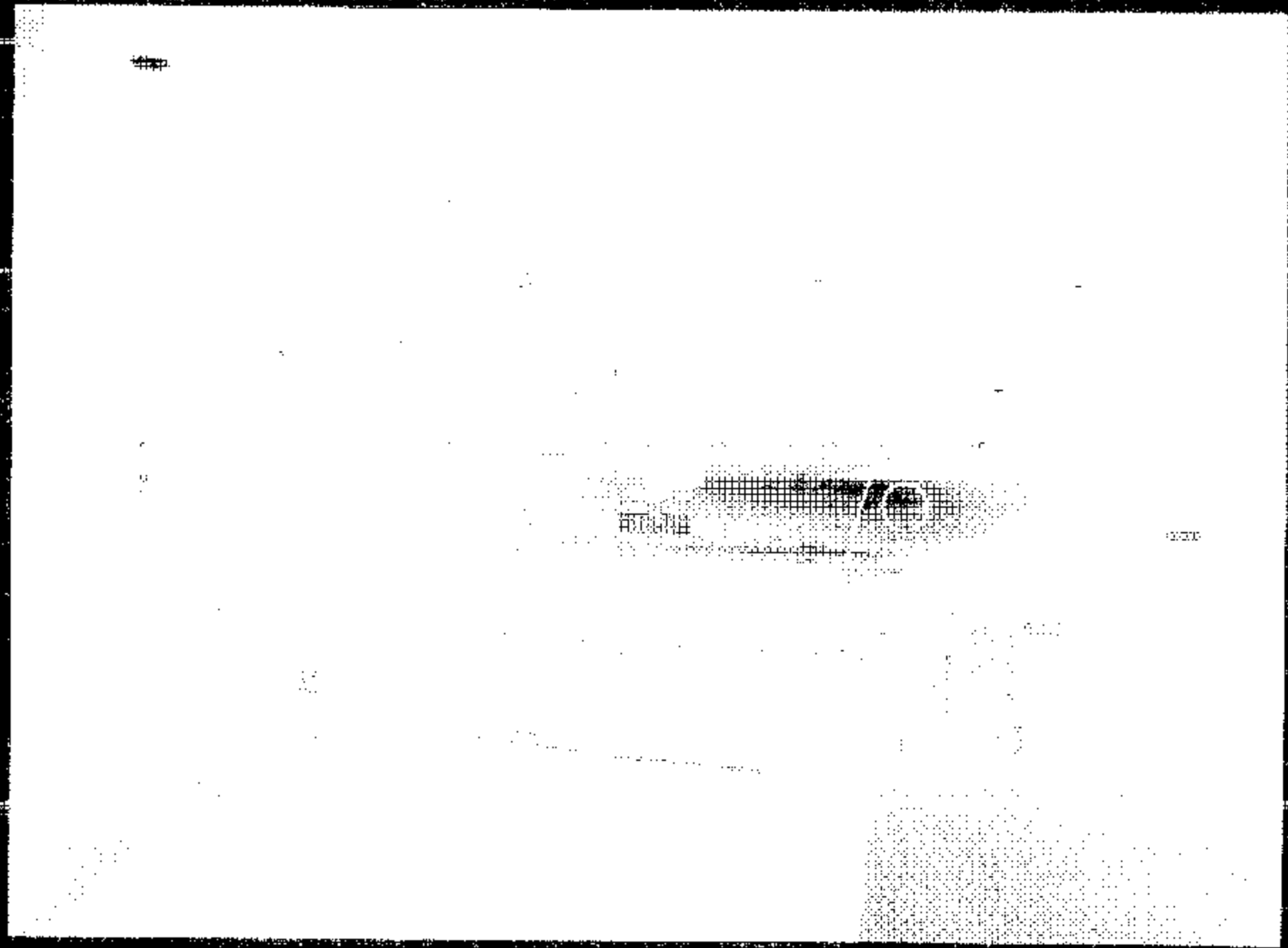
Post-Test Front View of Test Vehicle



Pre-Test Rear View of Test Vehicle

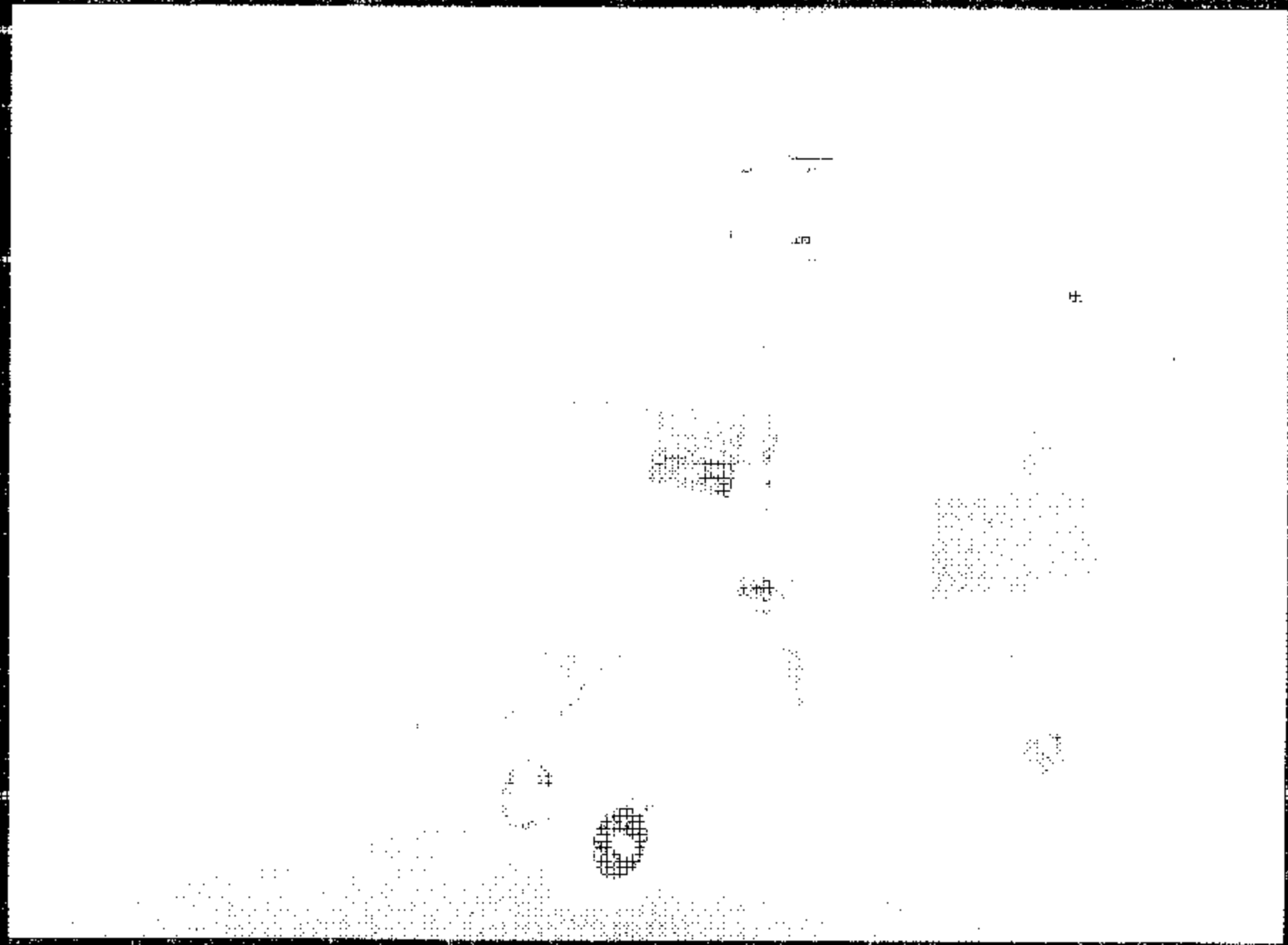


Post-Test Rear View of Test Vehicle

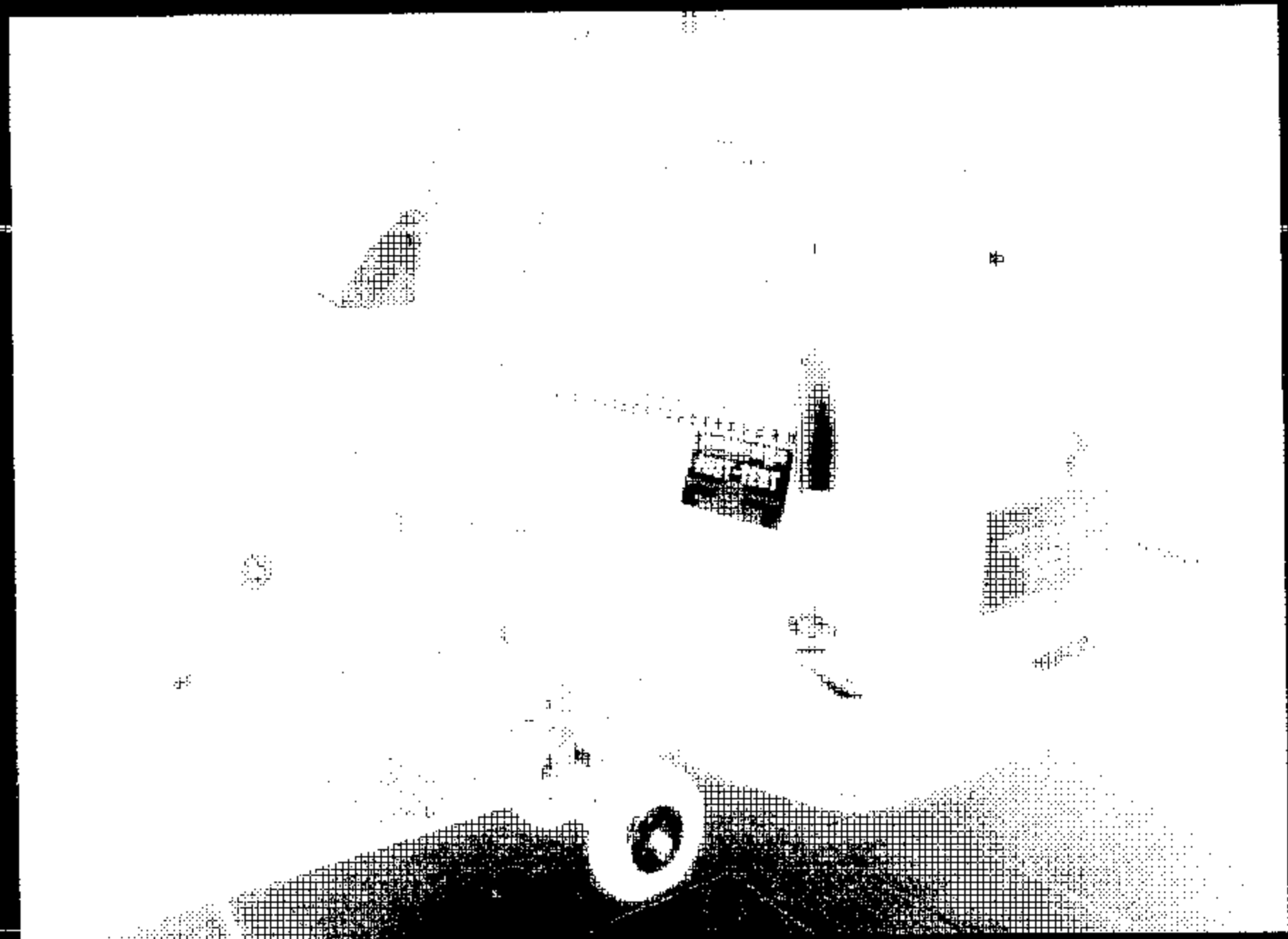


Pre-Test Left Side View of Test Vehicle

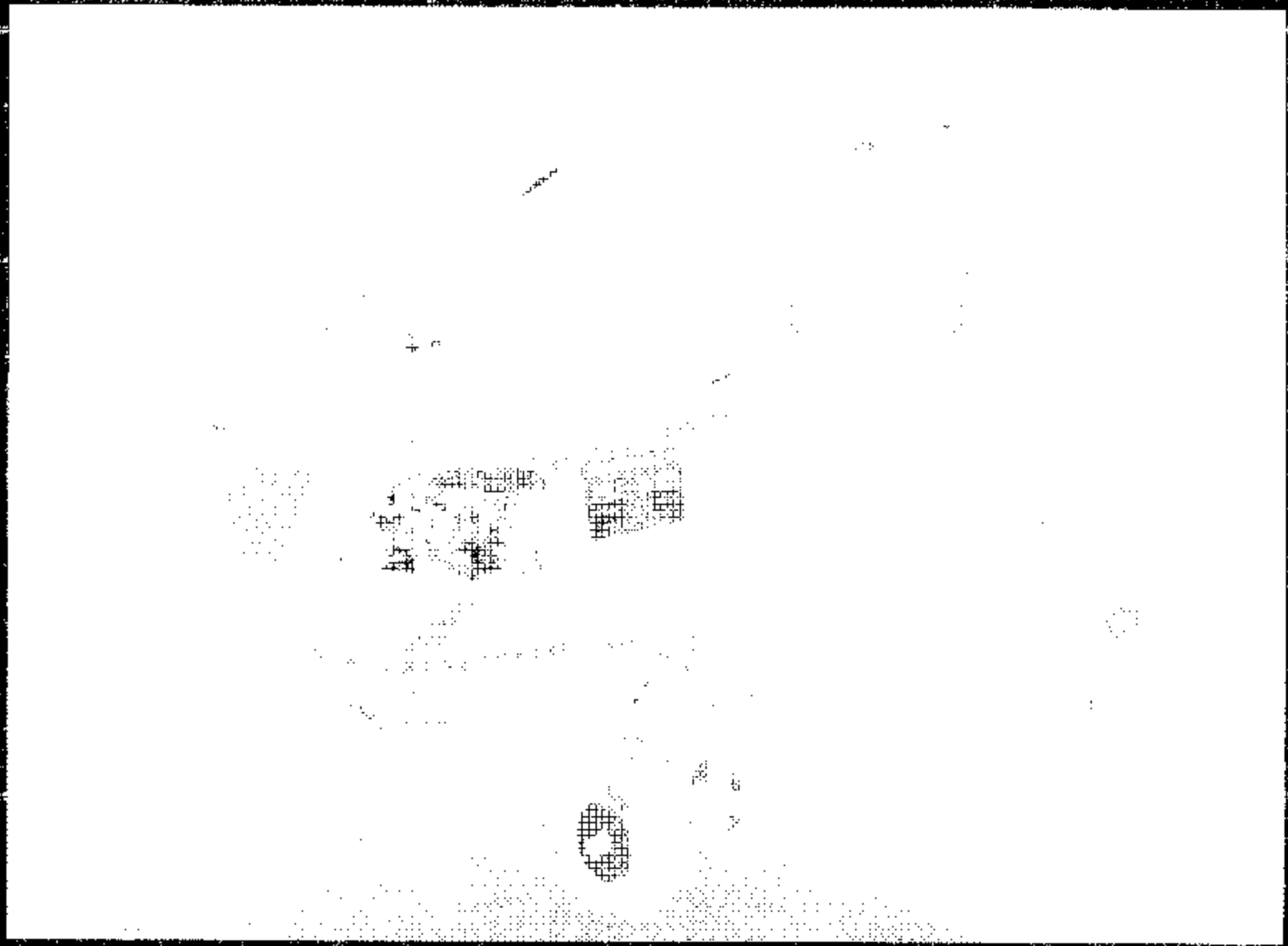
Post-Test Left Side View of Test Vehicle



Pre-Test Left Rear Three-Quarter View

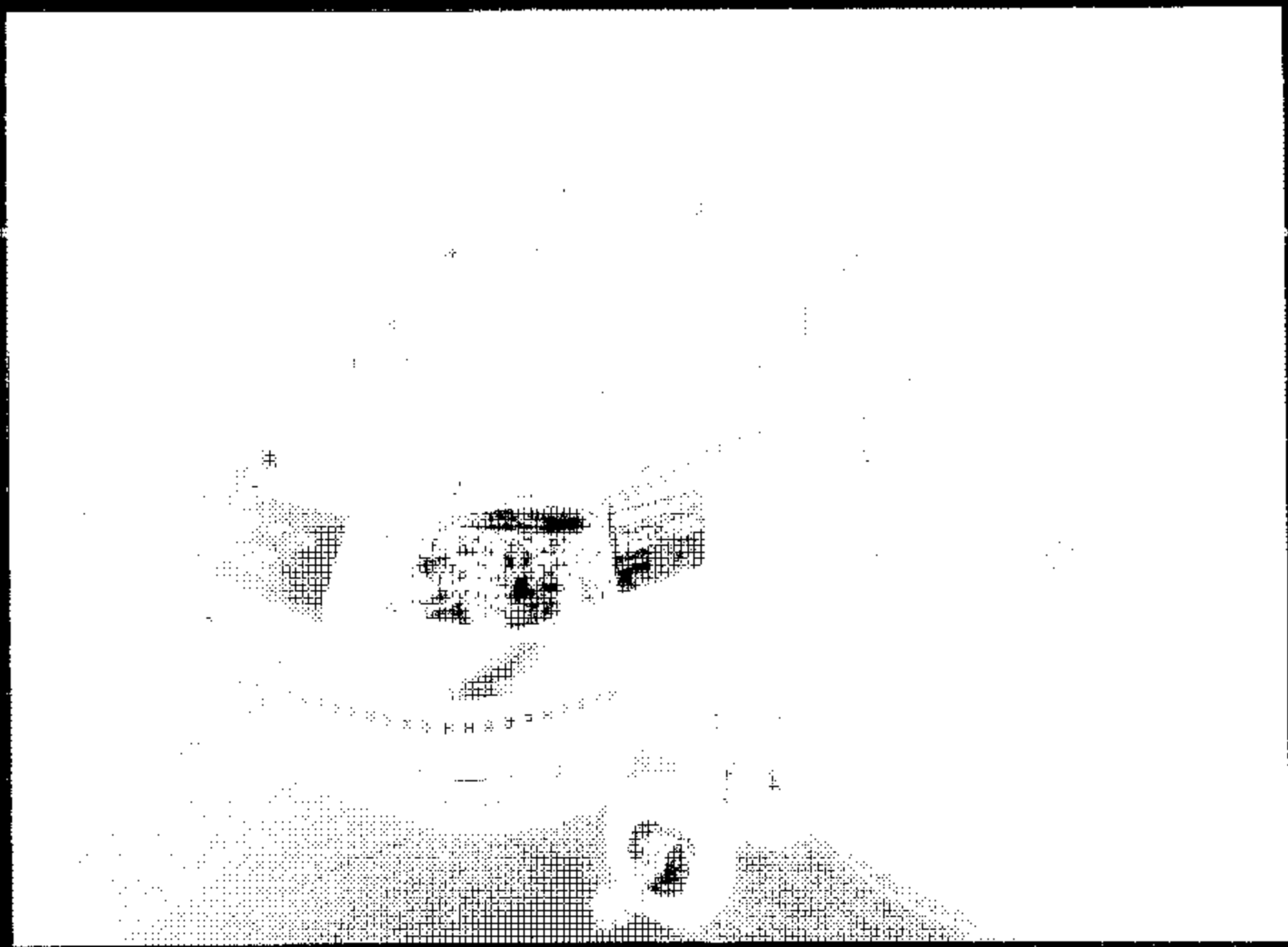


Post-Test Left Rear Three-Quarter View

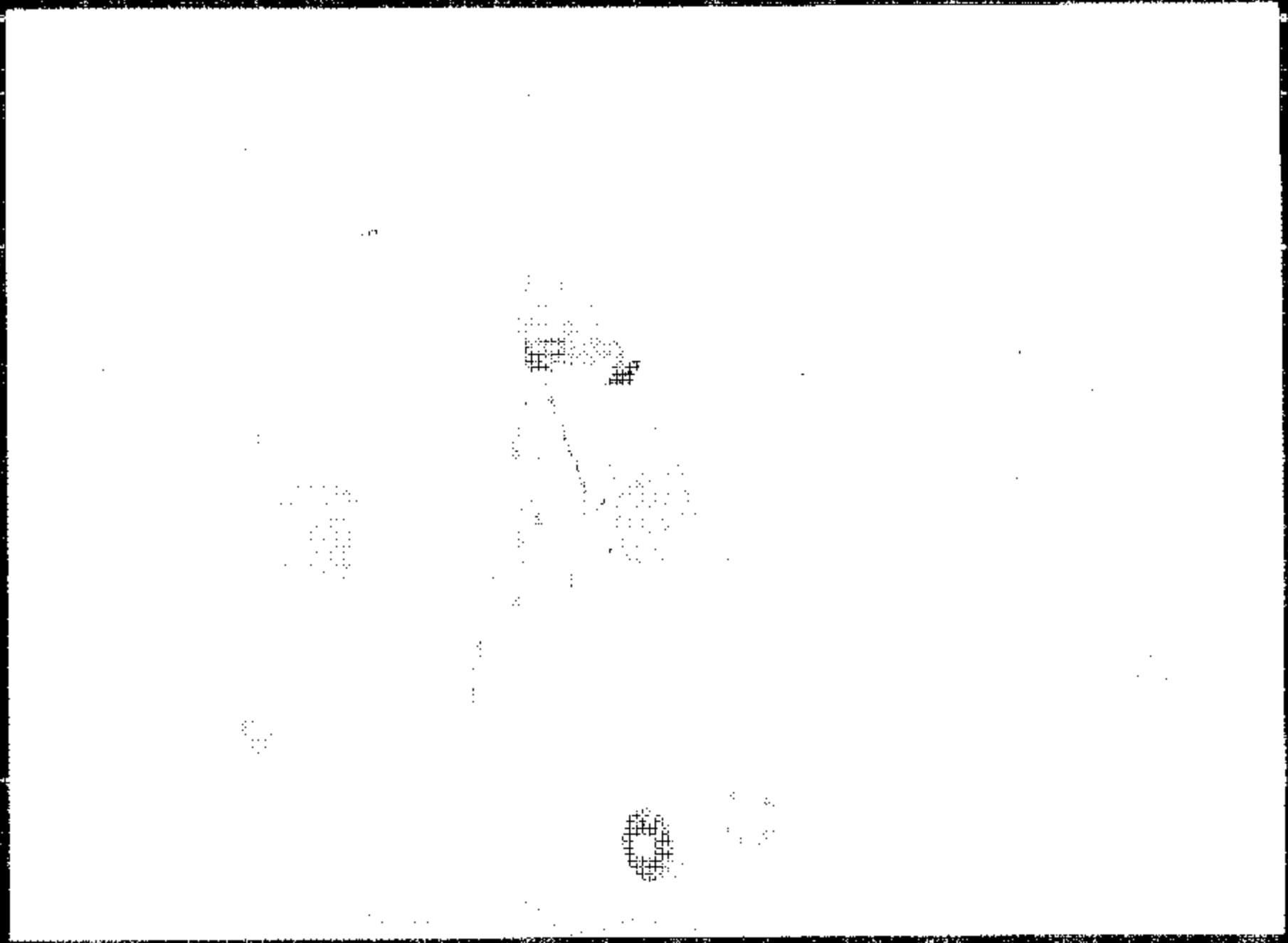


A-9

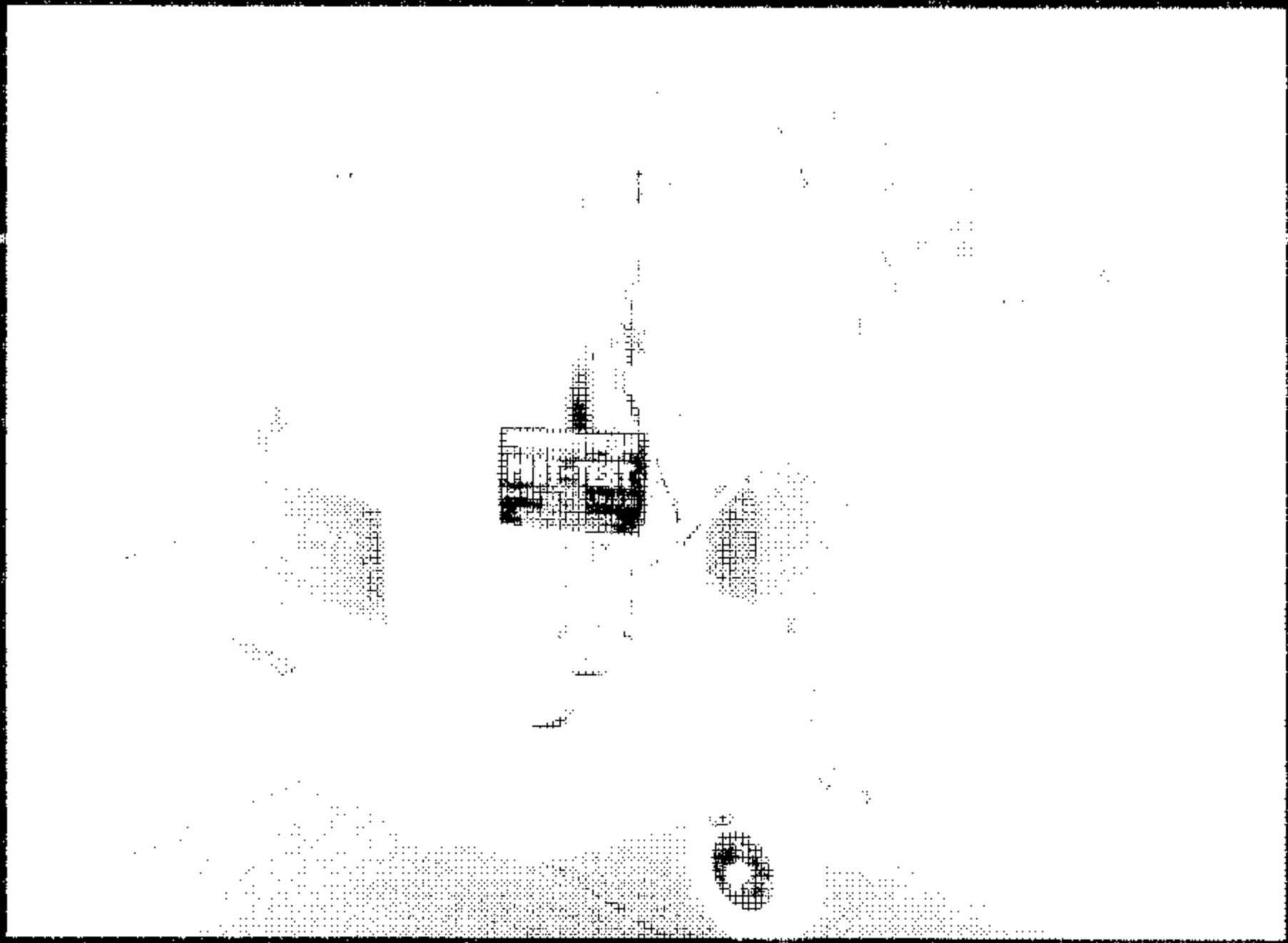
Pre-Test Left Front Three-Quarter View



Post-Test Left Front Three-Quarter View

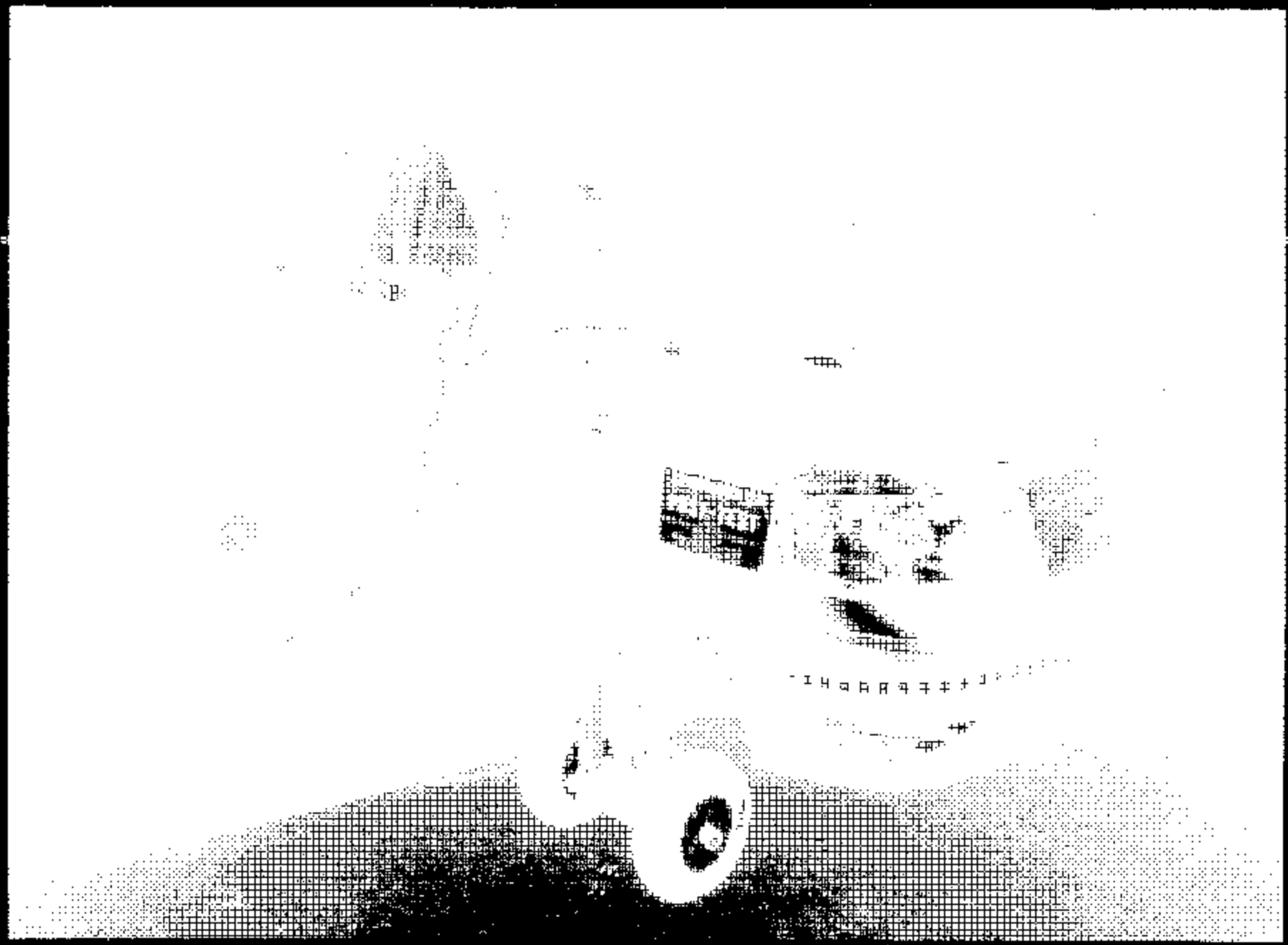


Pre-Test Right Rear Three-Quarter View

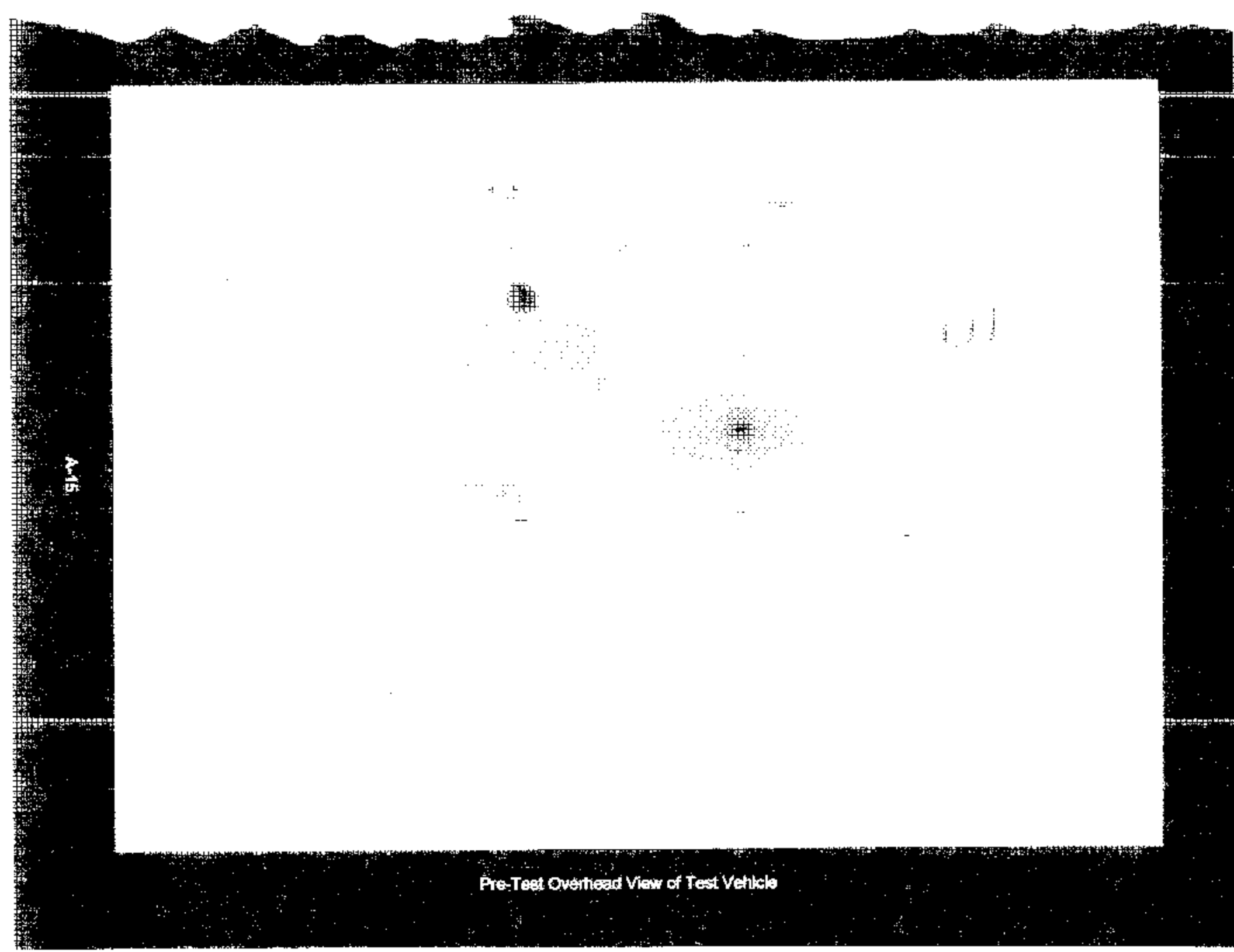


Post-Test Right Rear Three-Quarter View

Pre-Test Right Front Three-Quarter View



Post-Test Right Front Three-Quarter View



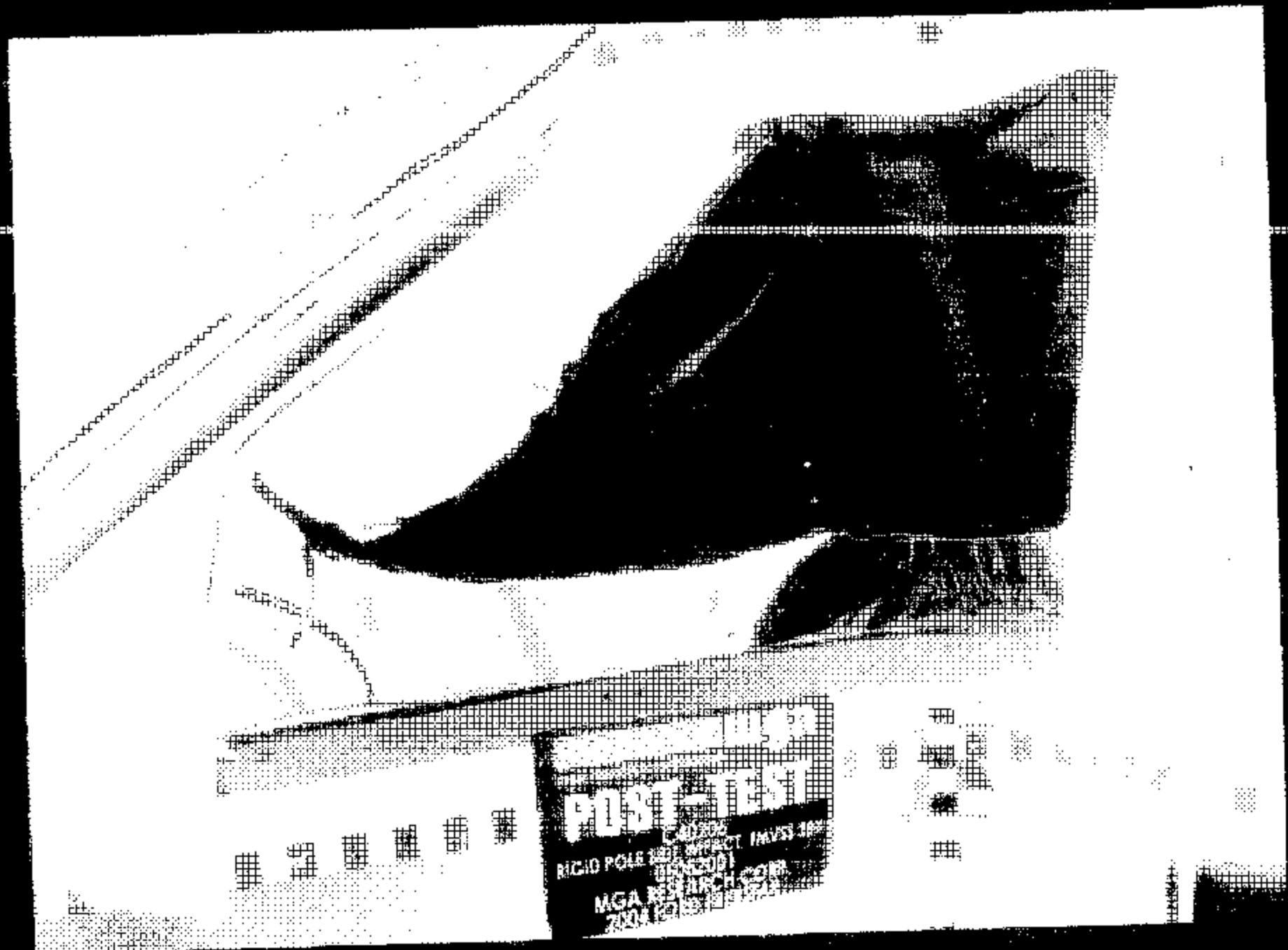
Pre-Test Overhead View of Test Vehicle

Post-Test Overhead View of Test Vehicle

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Pre-Test Driver Dummy Left Side View



Post-Test Driver Dummy Left Side View

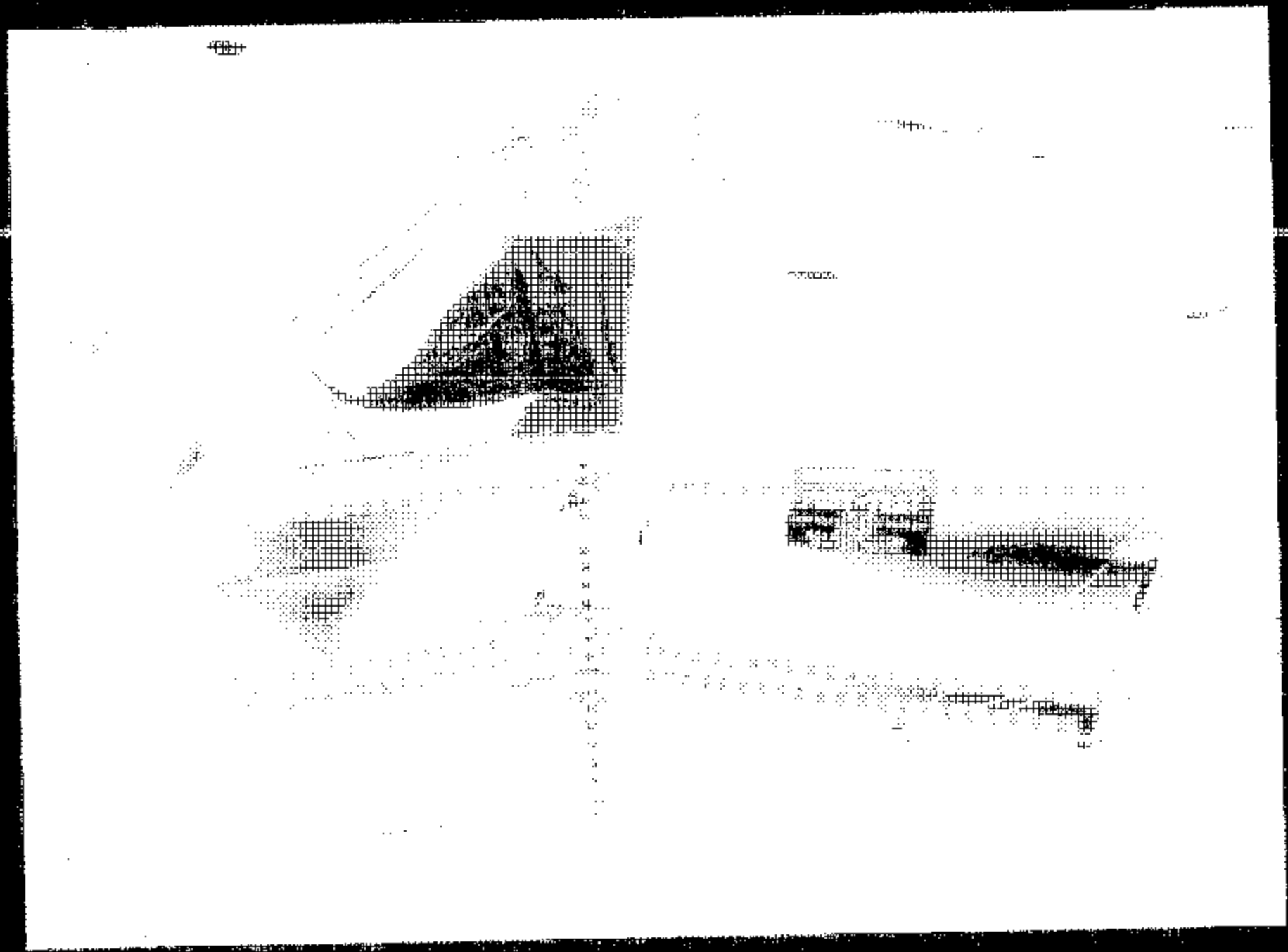
Pre-Test Driver Dummy Left Side View (Door Open)

Pre-Test Driver Dummy Shoulder and Door Top View

Post-Test Driver Dummy Head Contact

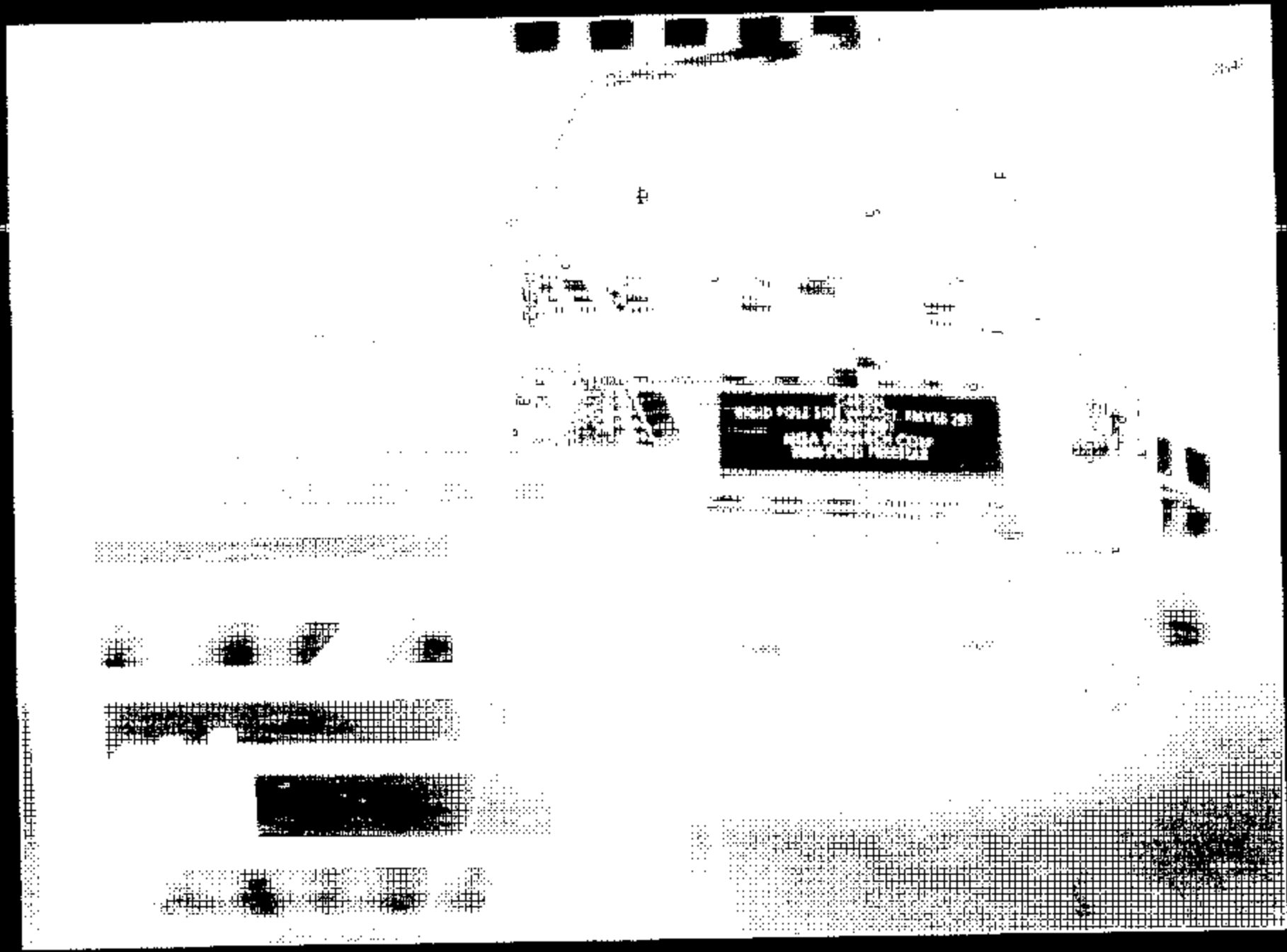
Post-Test Driver Dummy Thorax Contact

Post-Test Driver Dummy Contact



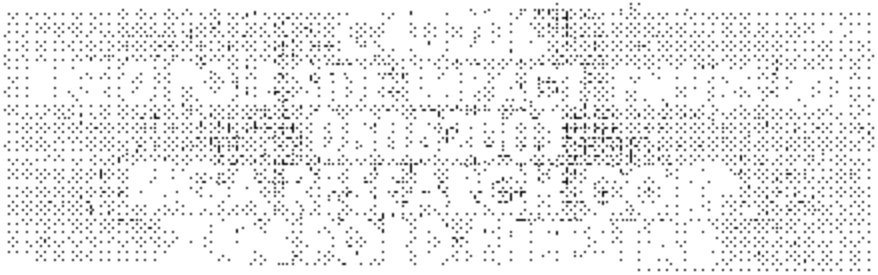
Post-Test Impact Zone Close-up View

Post-Test Impact Point on Vehicle

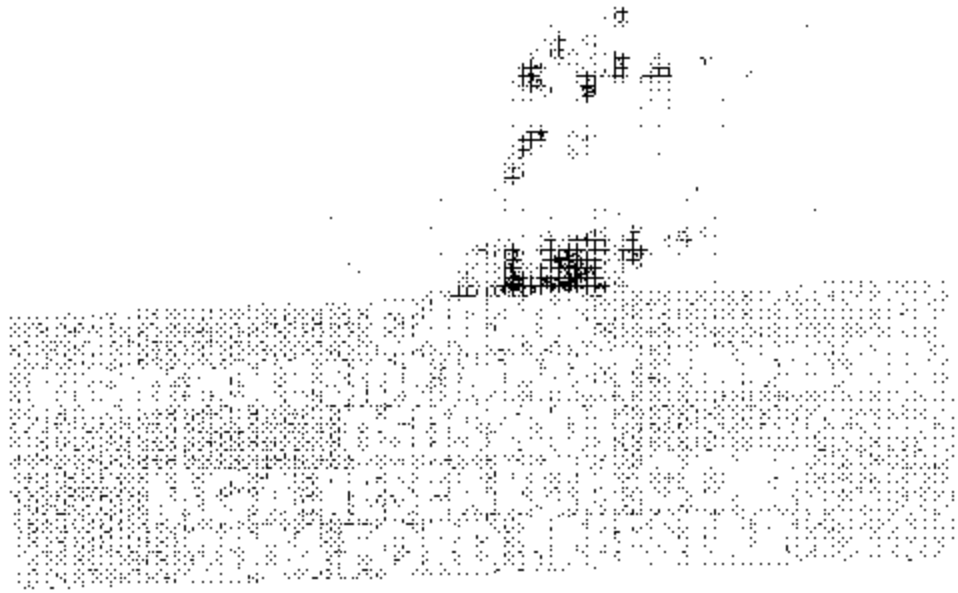


Vehicle Impact

Vehicle Certification Label/Tire Placard

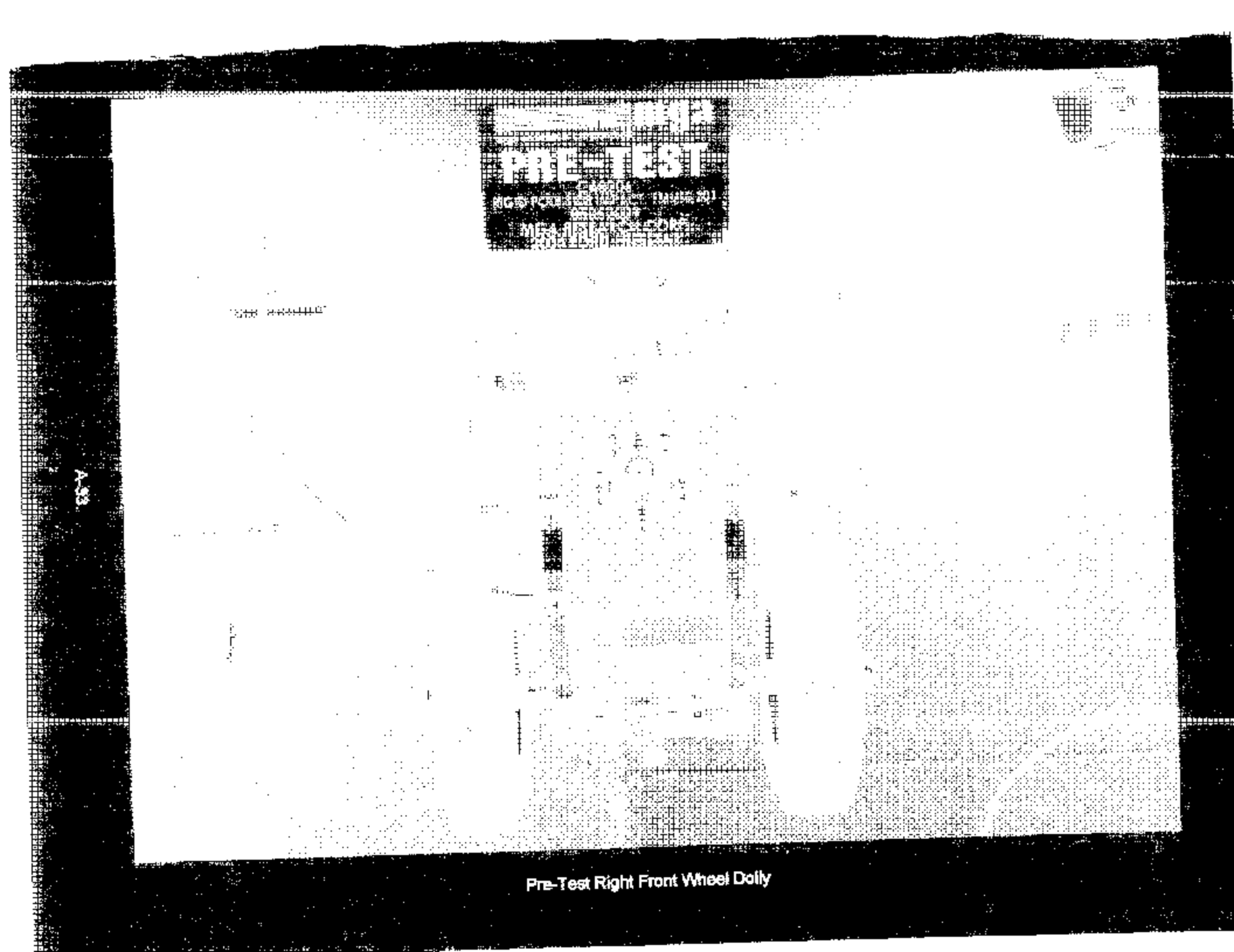


Pre-Test Fuel Filler Cap



Post-Test Fuel Filler Cap

Pre-Test Left Front Wheel Dolly



Pre-Test Right Front Wheel Dolly

Pre-Test Left Rear Wheel Dolly

Pre-Test Right Rear Wheel Dolly

Rollover 90 Degrees

Rollover 180 Degrees

Rollover 270 Degrees

Rollover 360 Degrees

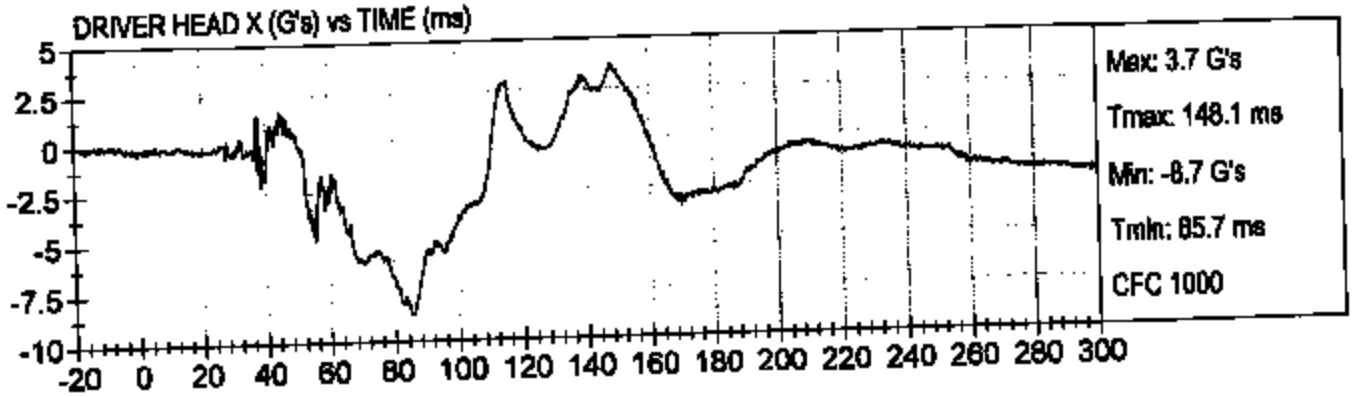
APPENDIX B

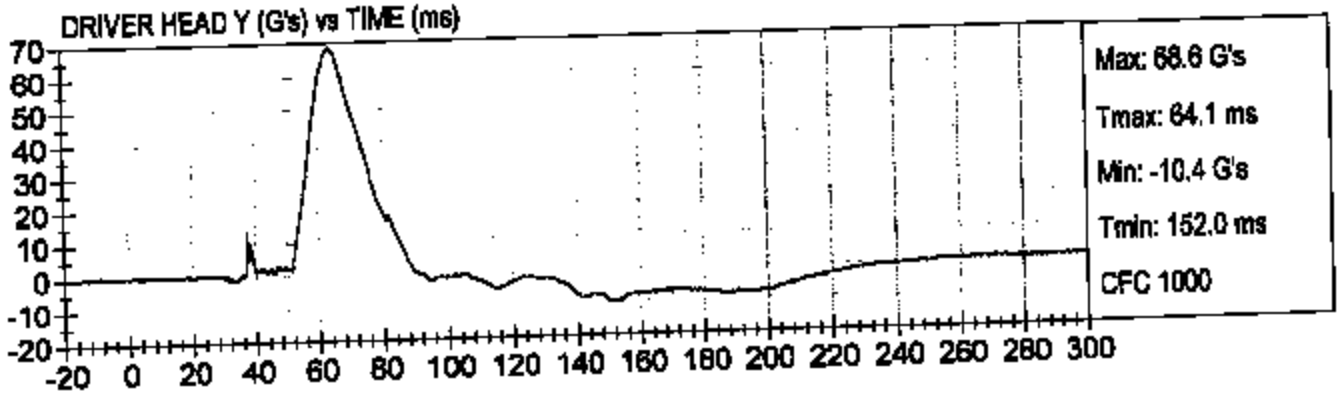
SID/HIII AND VEHICLE RESPONSE DATA

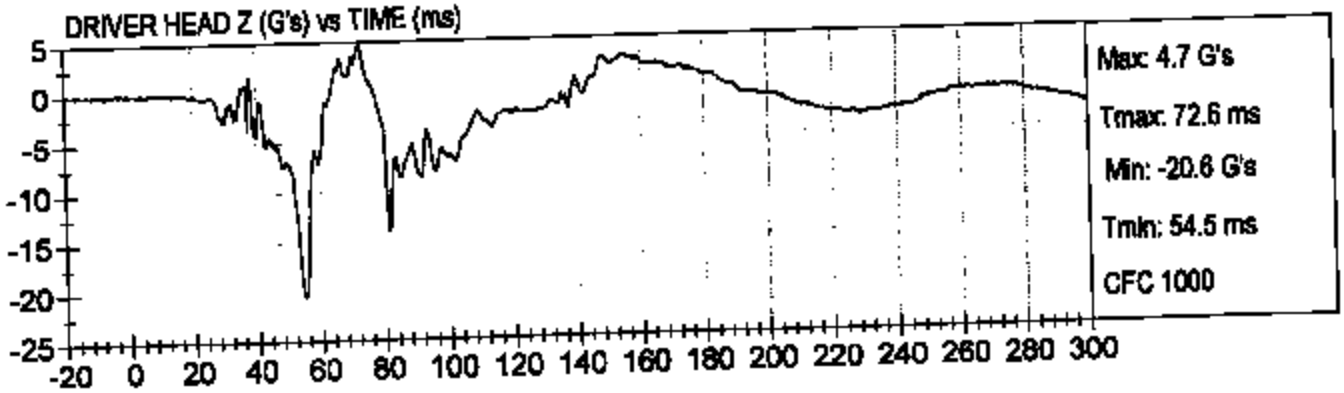
TABLE OF DATA PLOTS

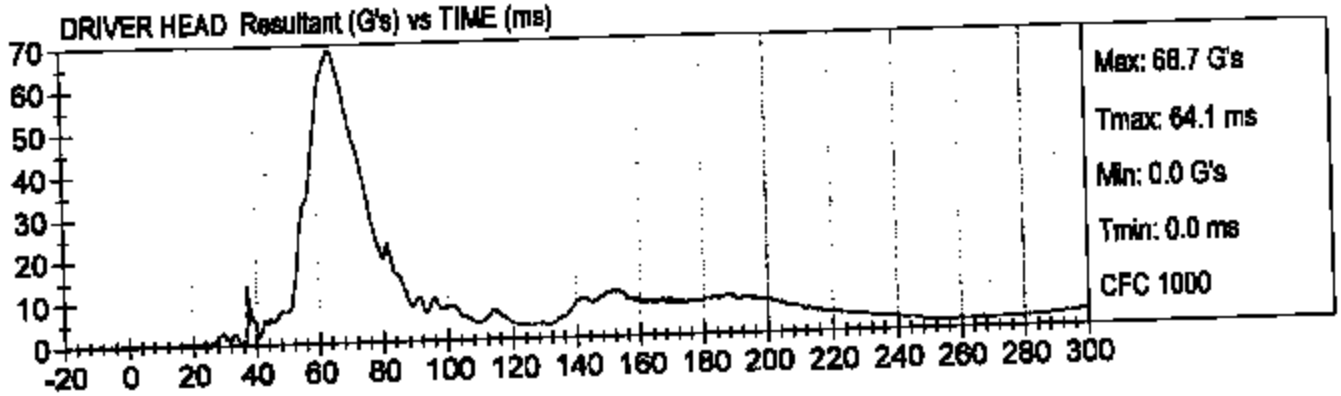
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)



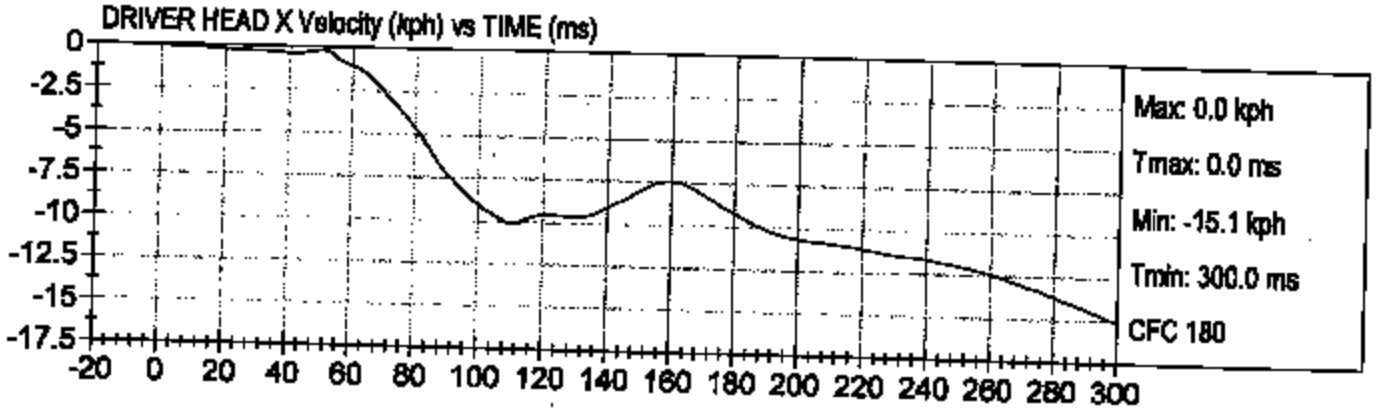


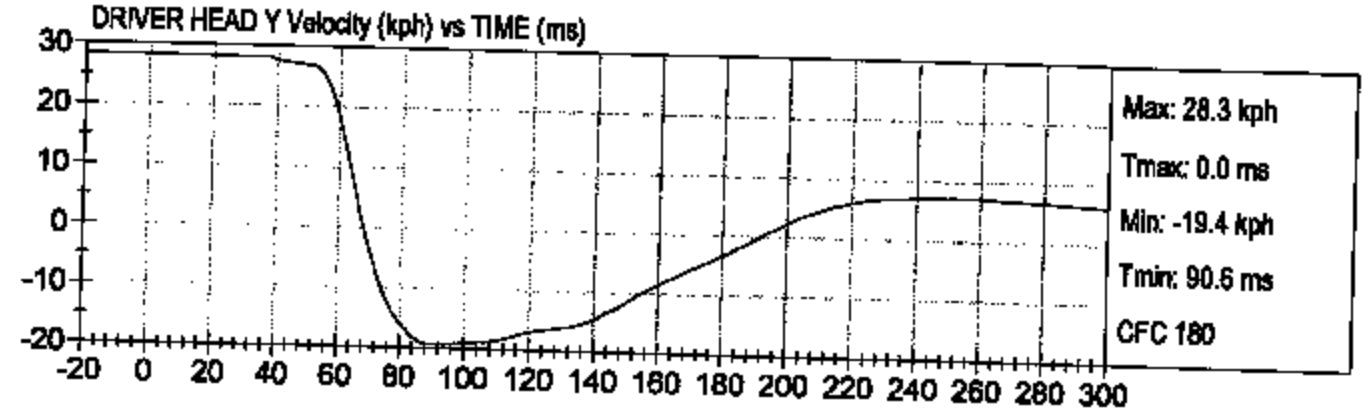


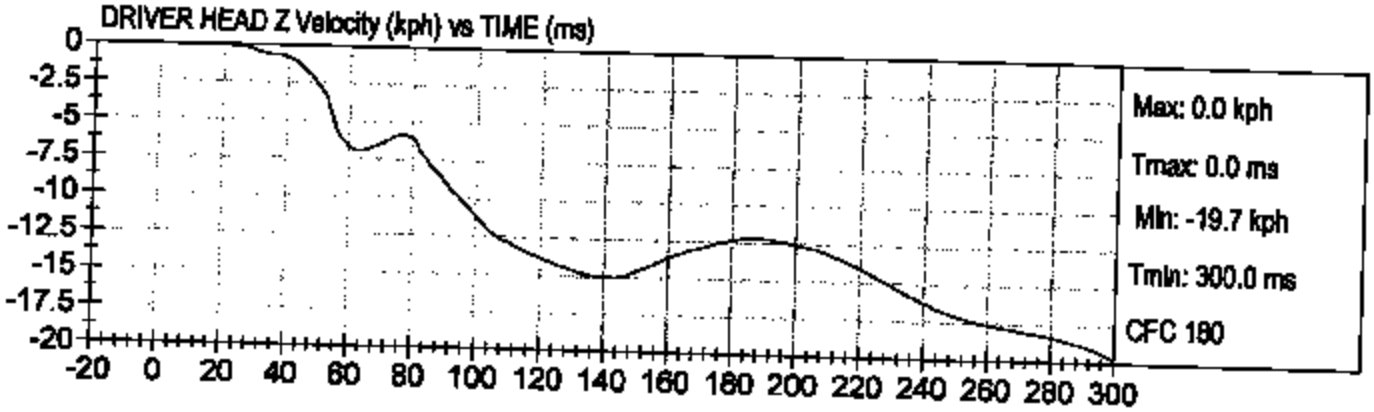


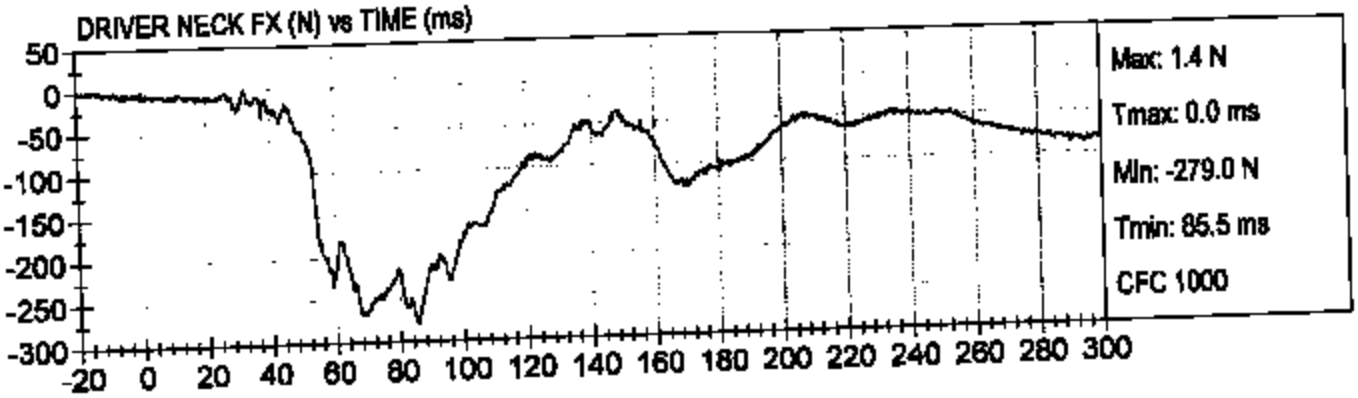
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

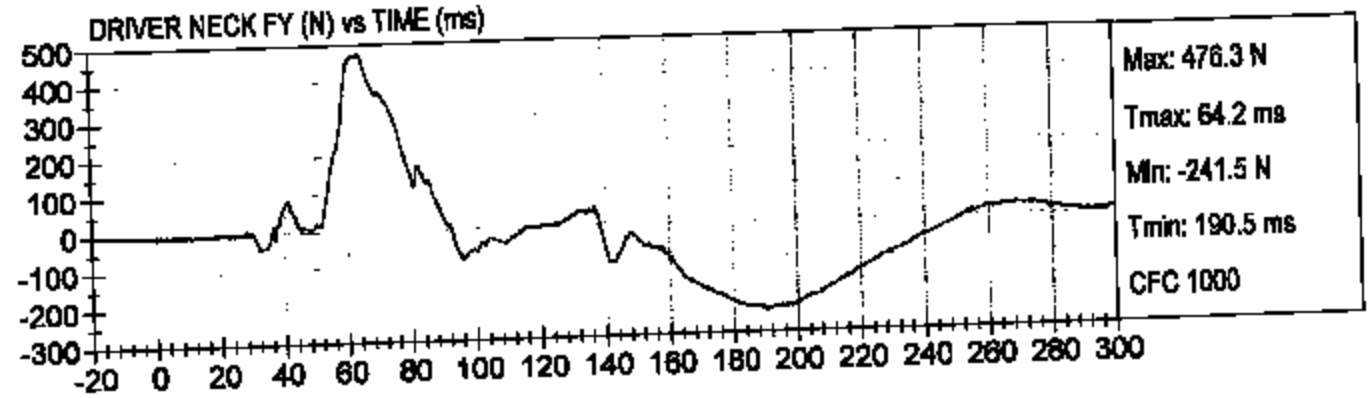
Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

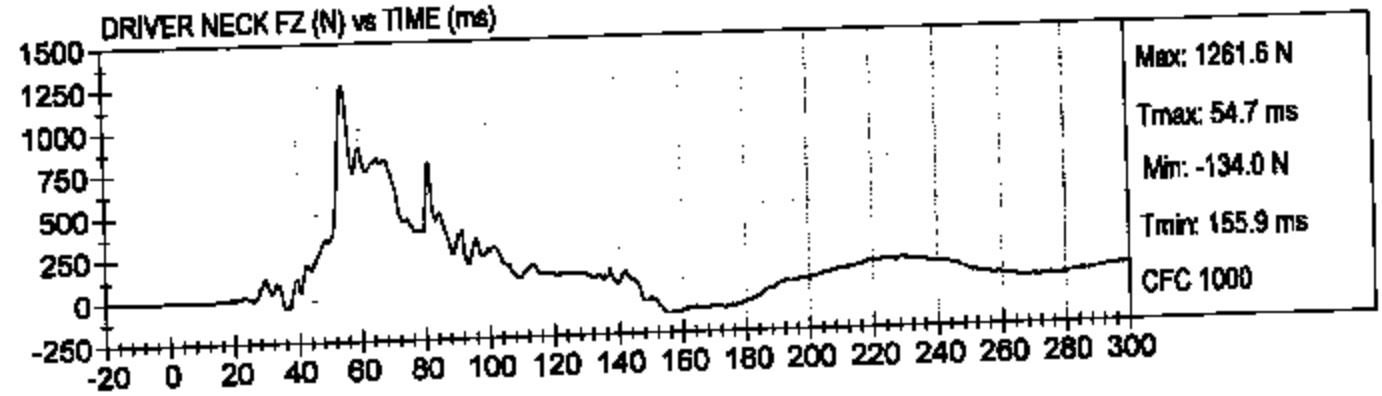


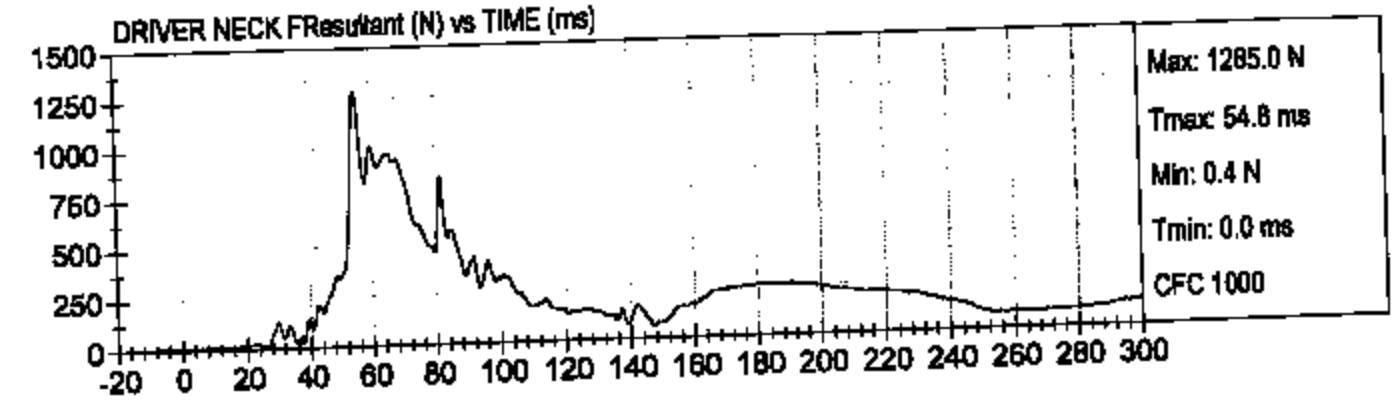





DRIVER NECK FX (N) vs TIME (ms)
Max: 1.4 N
Tmax: 0.0 ms
Min: -279.0 N
Tmin: 85.5 ms
CFC 1000

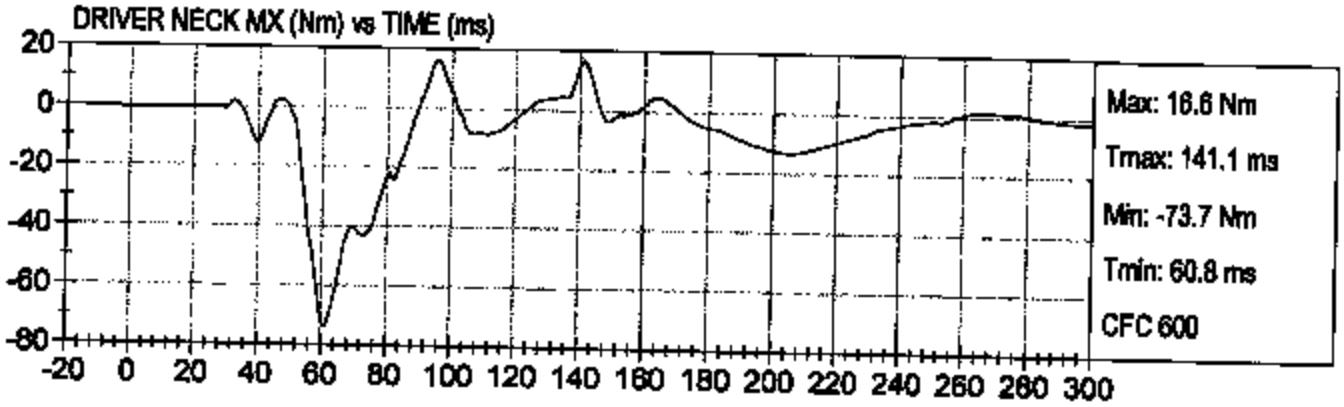

DRIVER NECK FY (N) vs TIME (ms)
Max: 476.3 N
Tmax: 64.2 ms
Min: -241.5 N
Tmin: 190.5 ms
CFC 1000

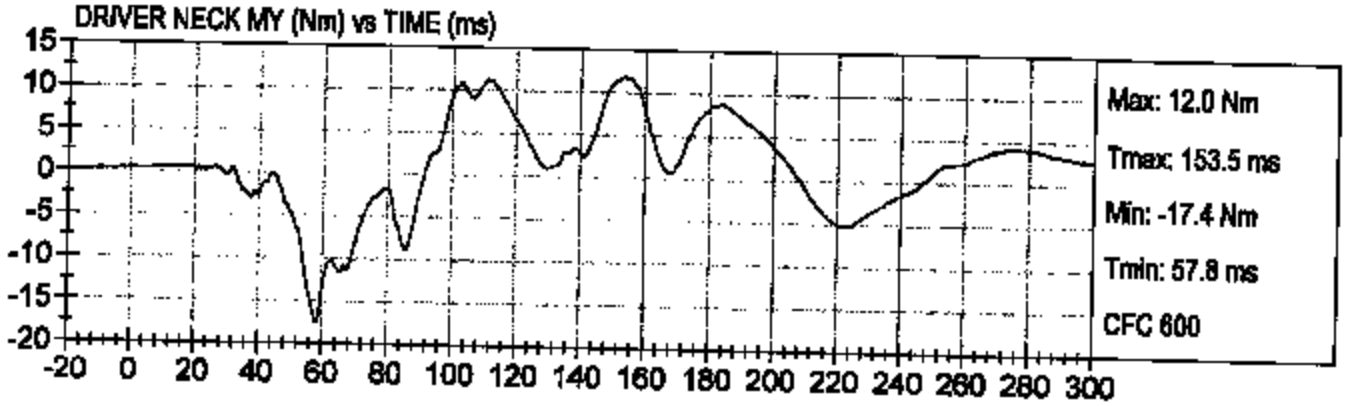

DRIVER NECK FZ (N) vs TIME (ms)
Max: 1261.6 N
Tmax: 54.7 ms
Min: -134.0 N
Tmin: 155.9 ms
CFC 1000

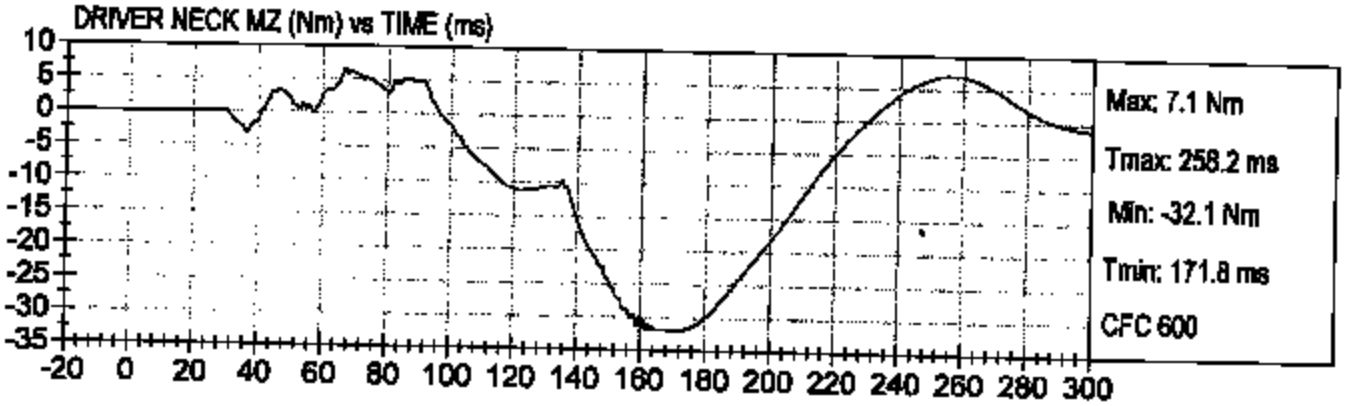

DRIVER NECK FResultant (N) vs TIME (ms)
Max: 1285.0 N
Tmax: 54.8 ms
Min: 0.4 N
Tmin: 0.0 ms
CFC 1000

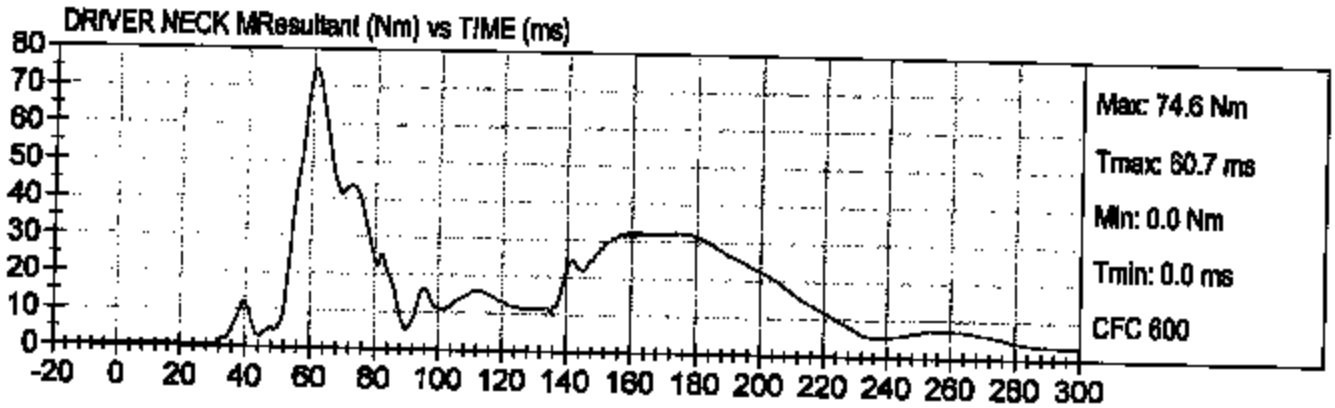
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)





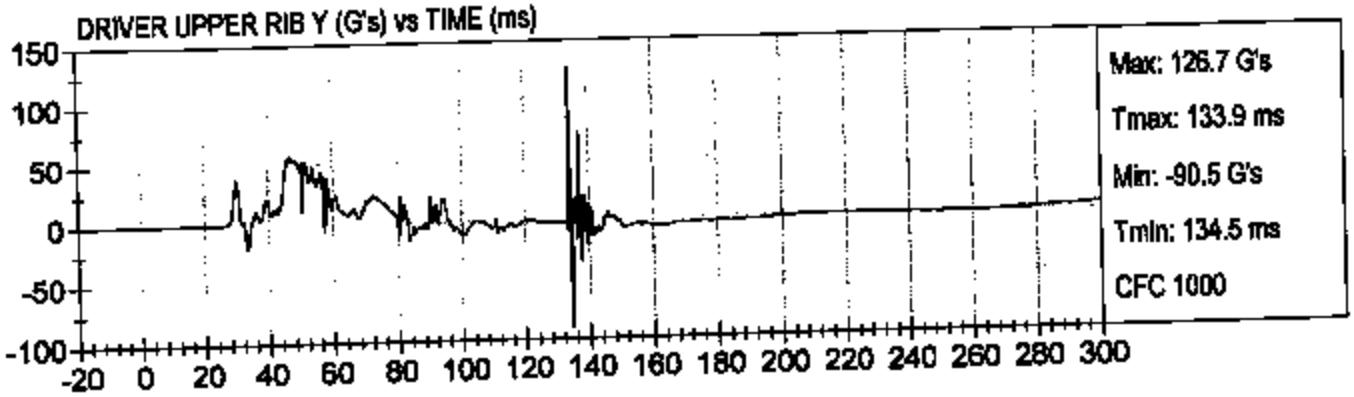




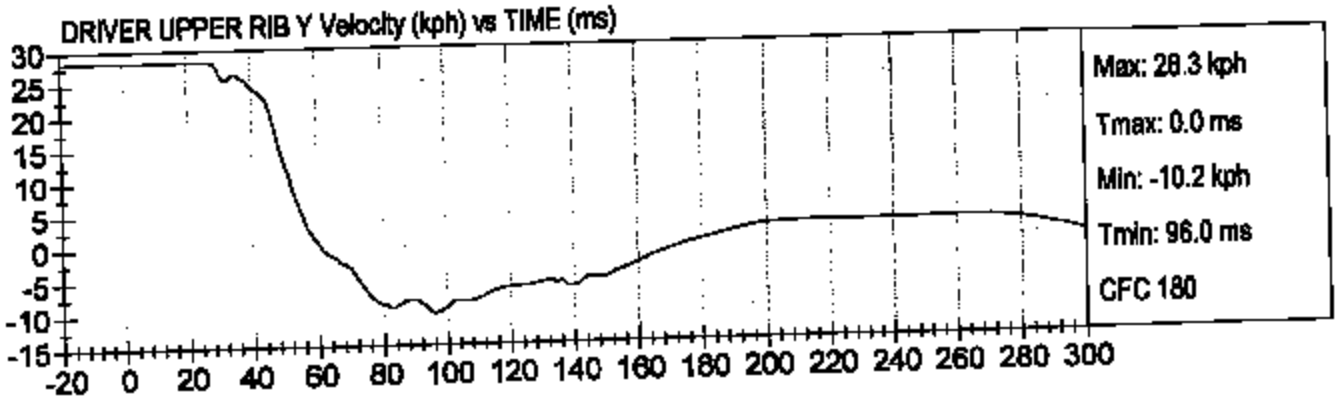
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

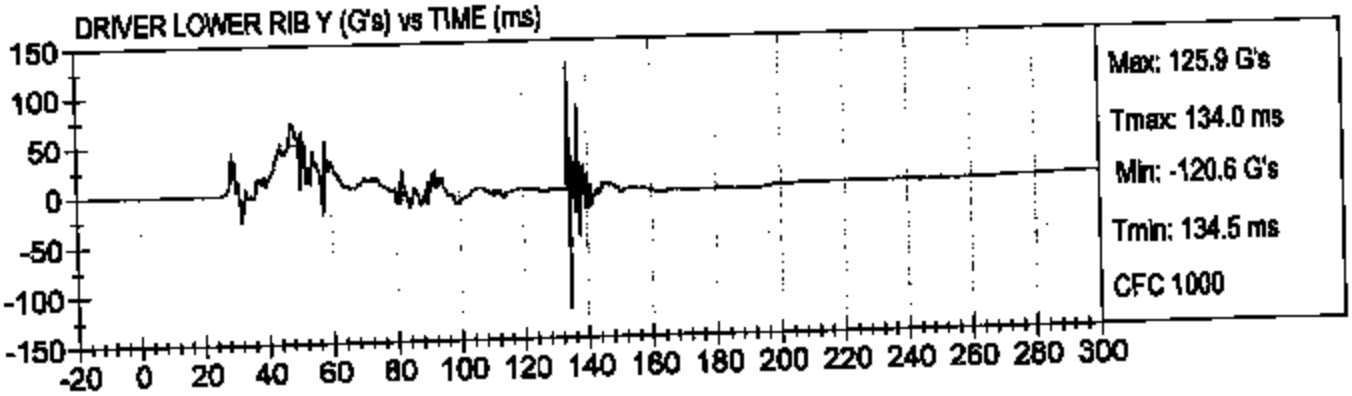
DRIVER UPPER RIB Y (G's) vs TIME (ms)



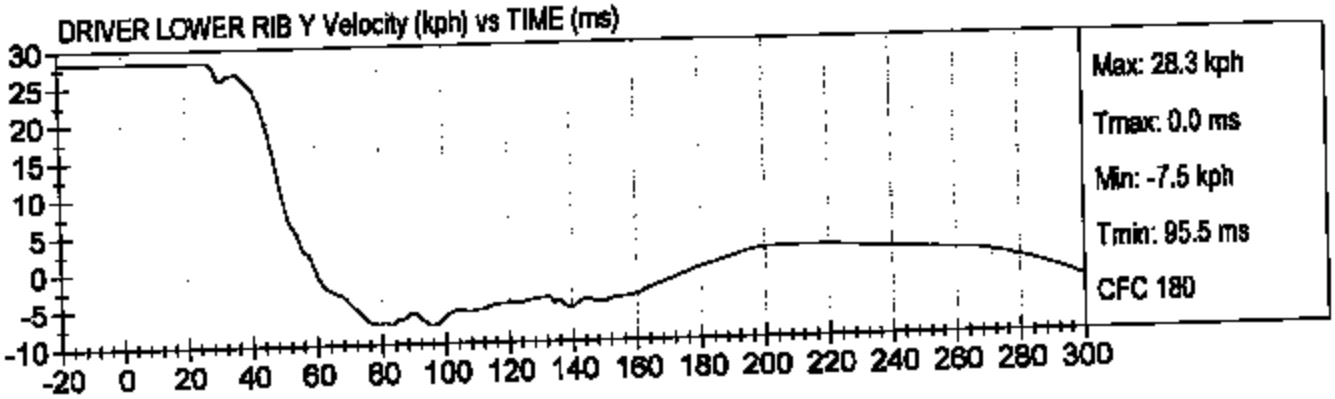
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



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

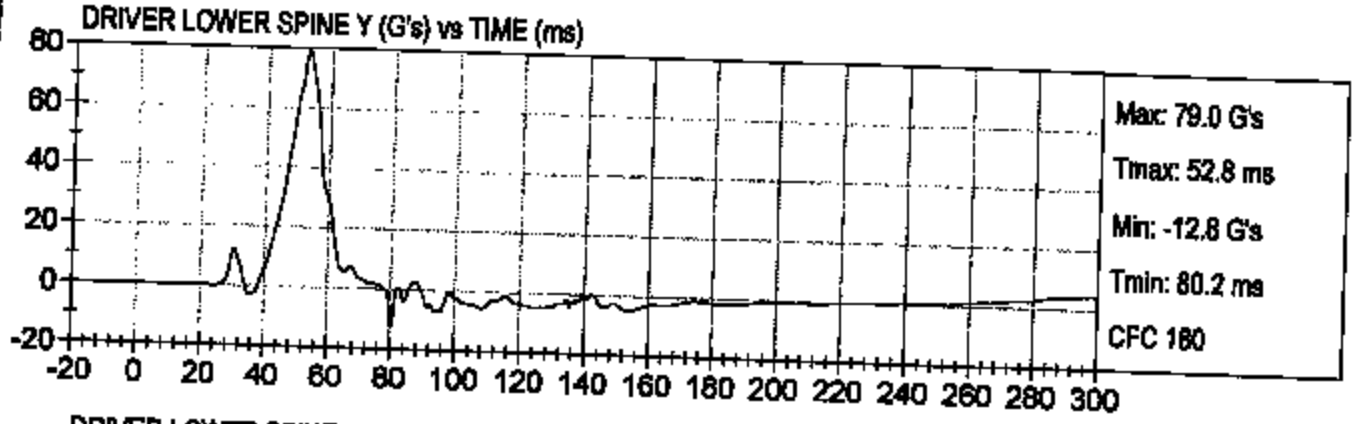


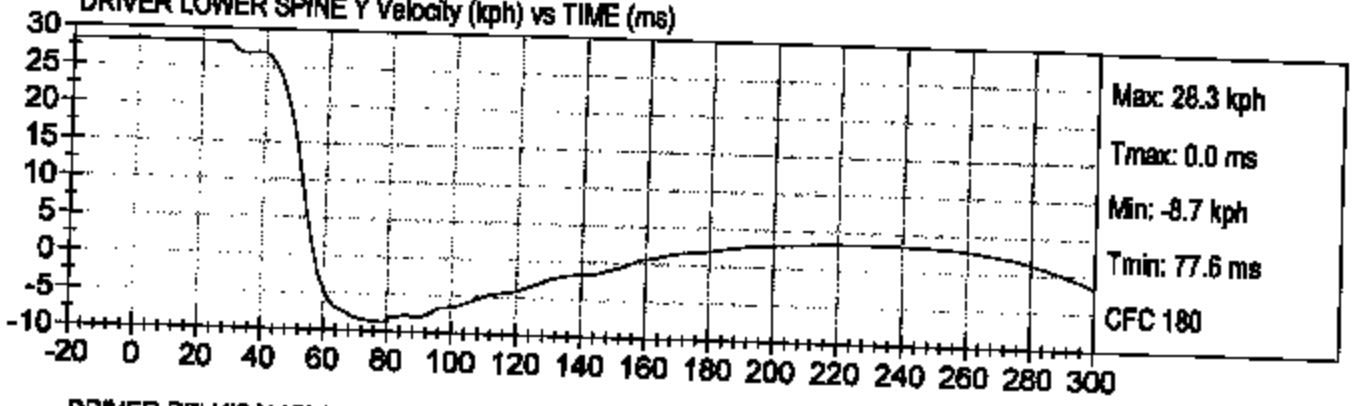
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)

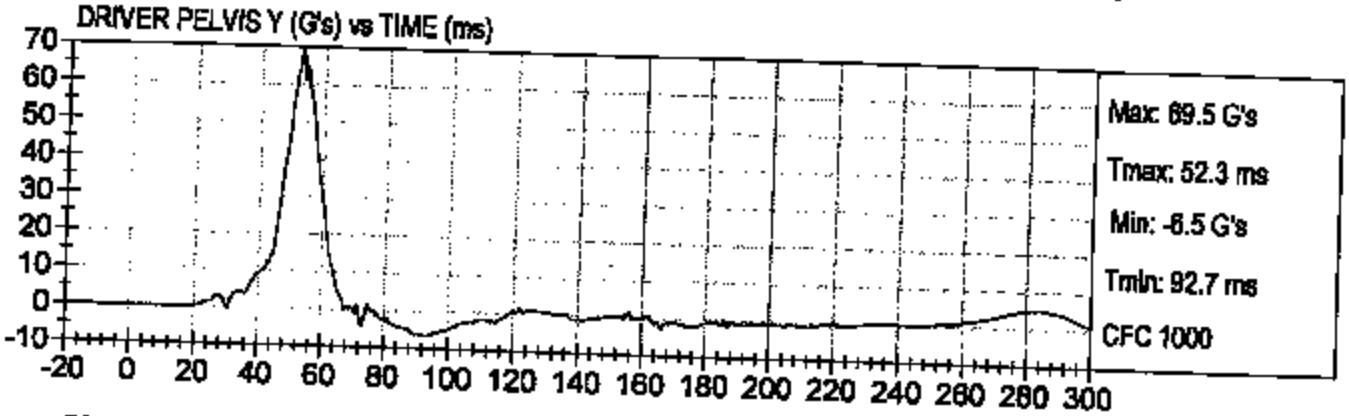


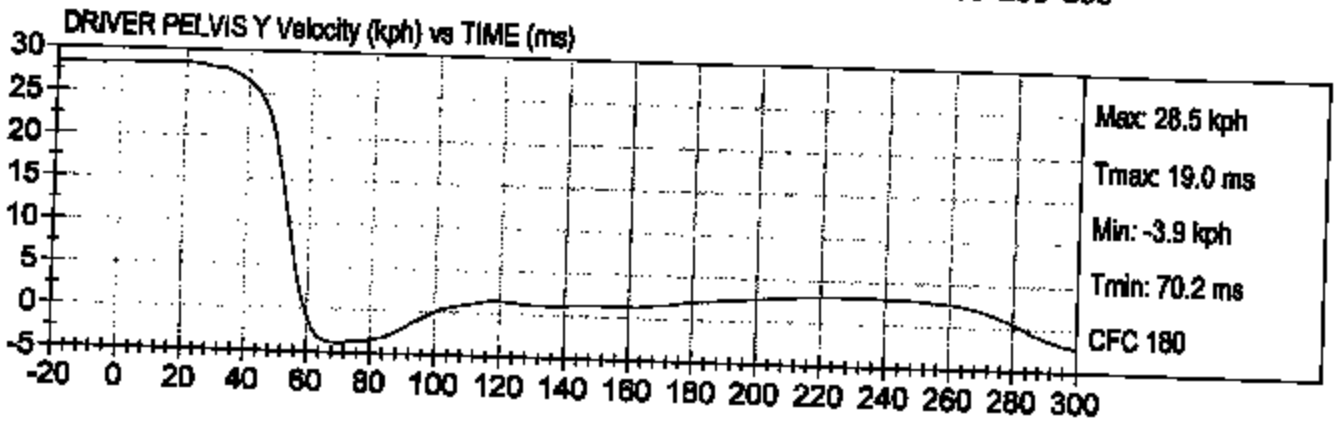
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40208)

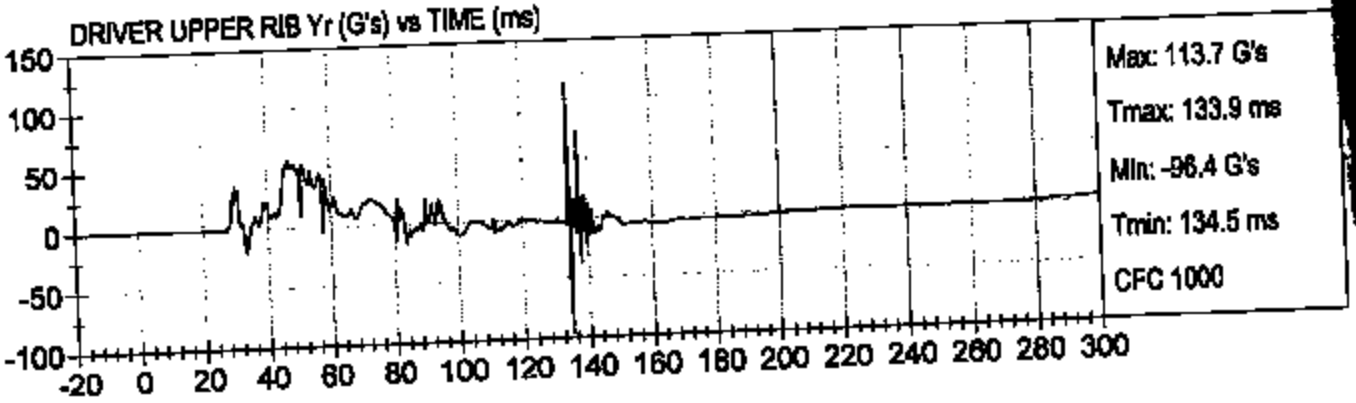
Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

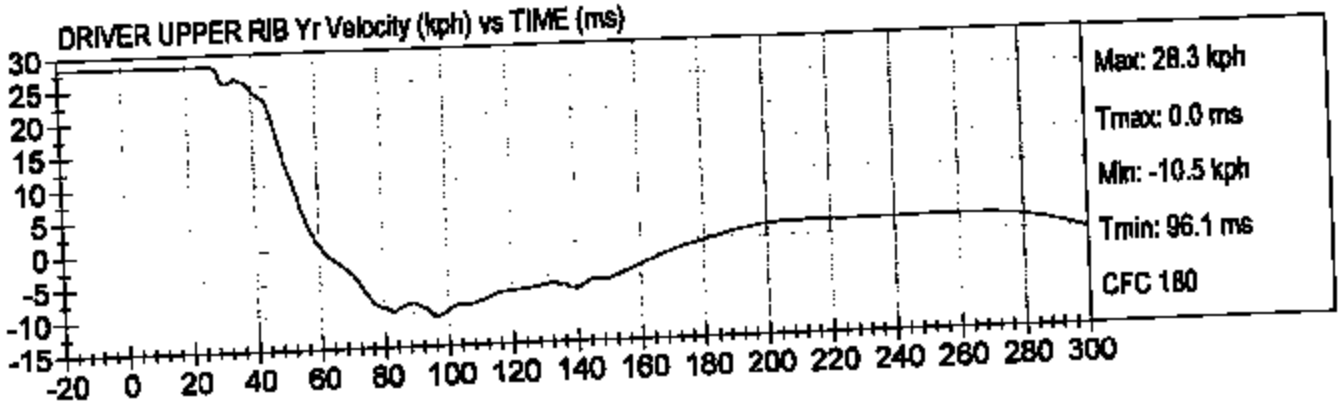


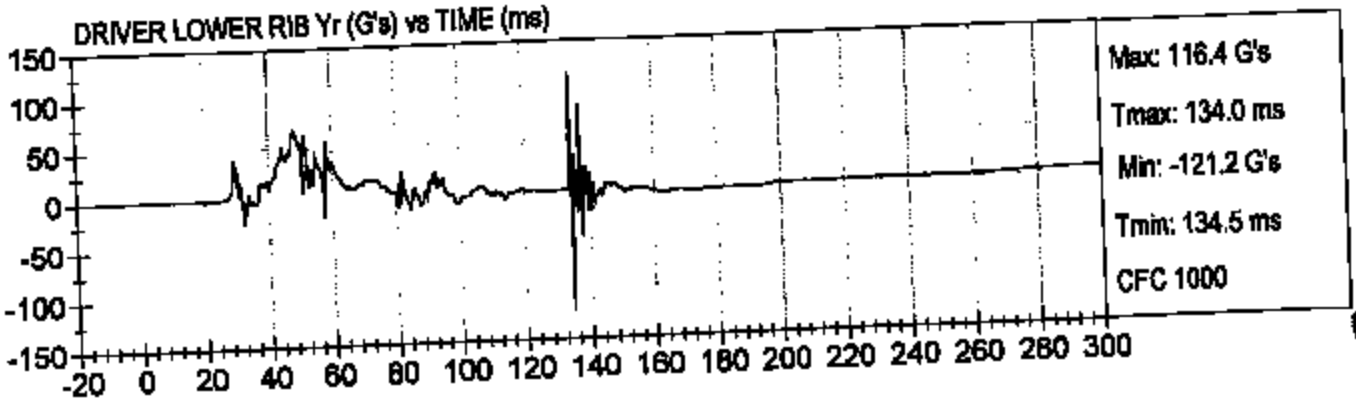


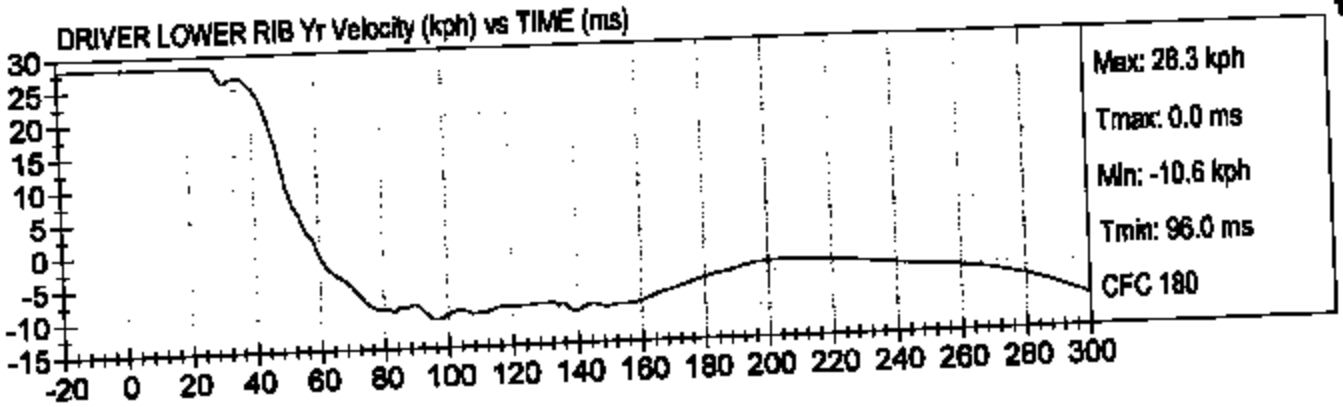





DRIVER UPPER RIB Yr (G's) vs TIME (ms)
Max: 113.7 G's
Tmax: 133.9 ms
Min: -96.4 G's
Tmin: 134.5 ms
CFC 1000

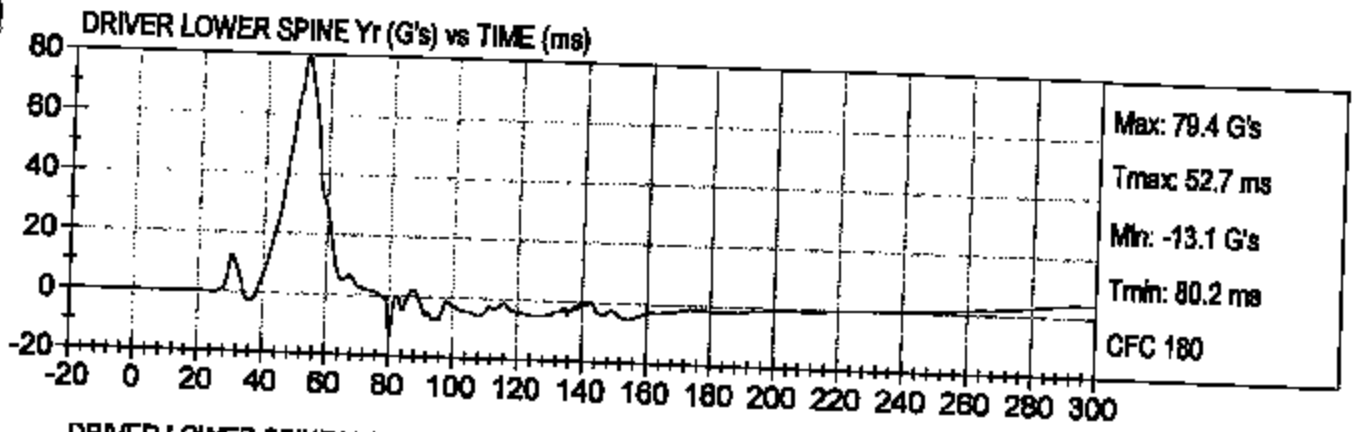

DRIVER UPPER RIB Yr Velocity (kph) vs TIME (ms)
Max: 28.3 kph
Tmax: 0.0 ms
Min: -10.5 kph
Tmin: 96.1 ms
CFC 180

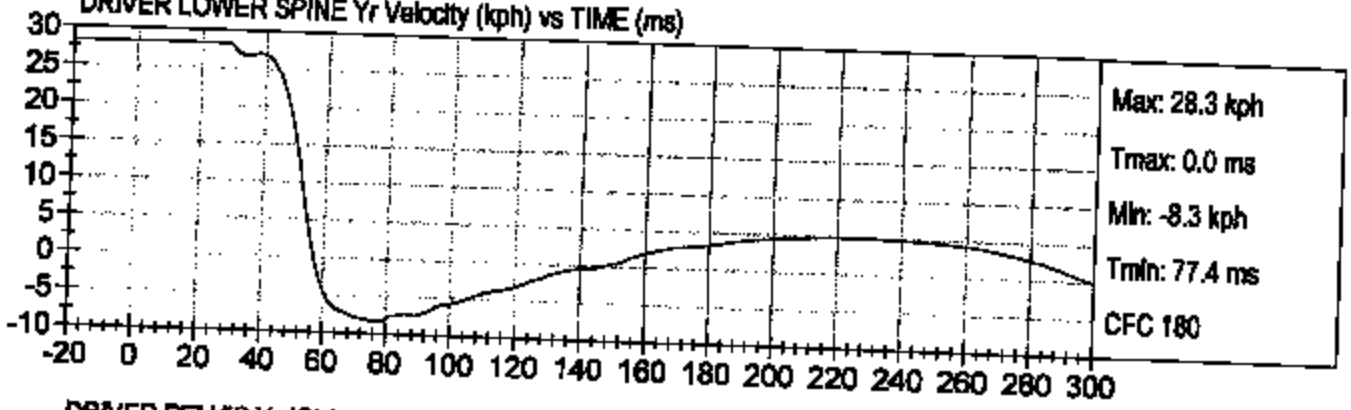

DRIVER LOWER RIB Yr (G's) vs TIME (ms)
Max: 116.4 G's
Tmax: 134.0 ms
Min: -121.2 G's
Tmin: 134.5 ms
CFC 1000

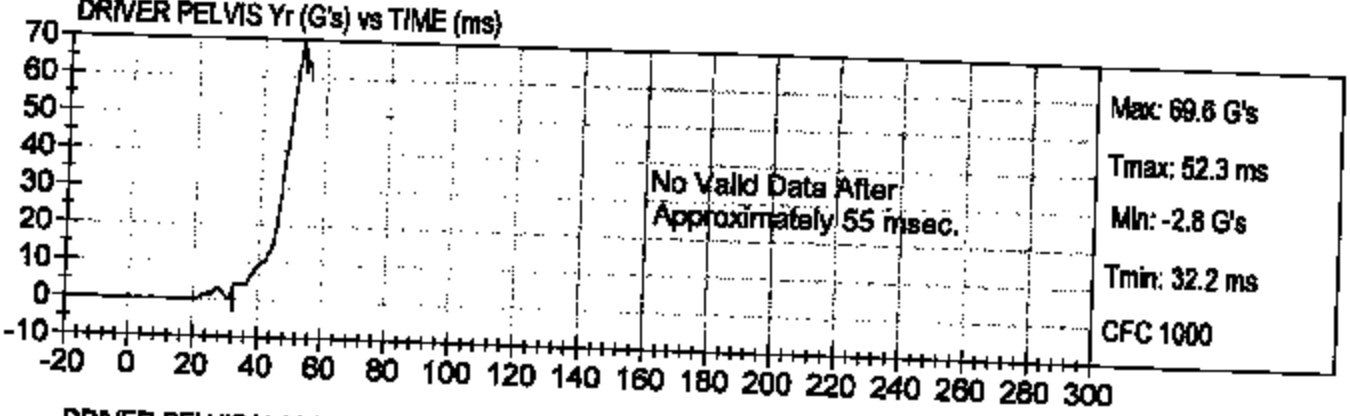

DRIVER LOWER RIB Yr Velocity (kph) vs TIME (ms)
Max: 28.3 kph
Tmax: 0.0 ms
Min: -10.6 kph
Tmin: 96.0 ms
CFC 180

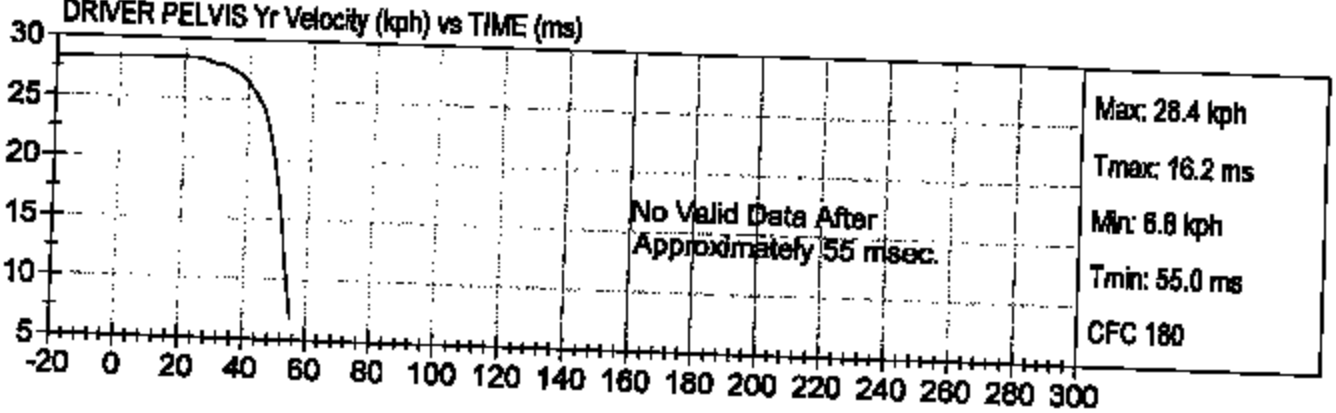
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 06/20/05
Speed: 17.6 mph (28.3 km/h)



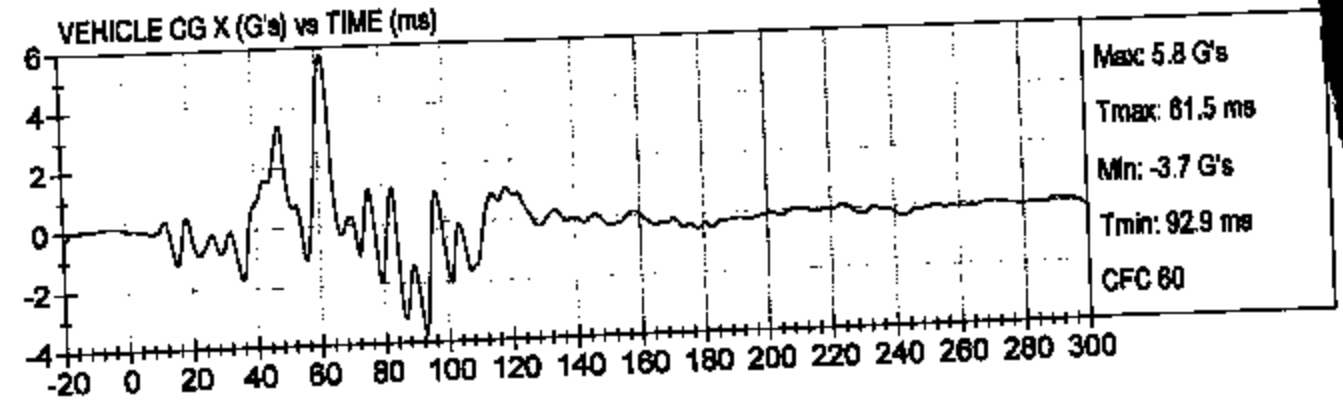


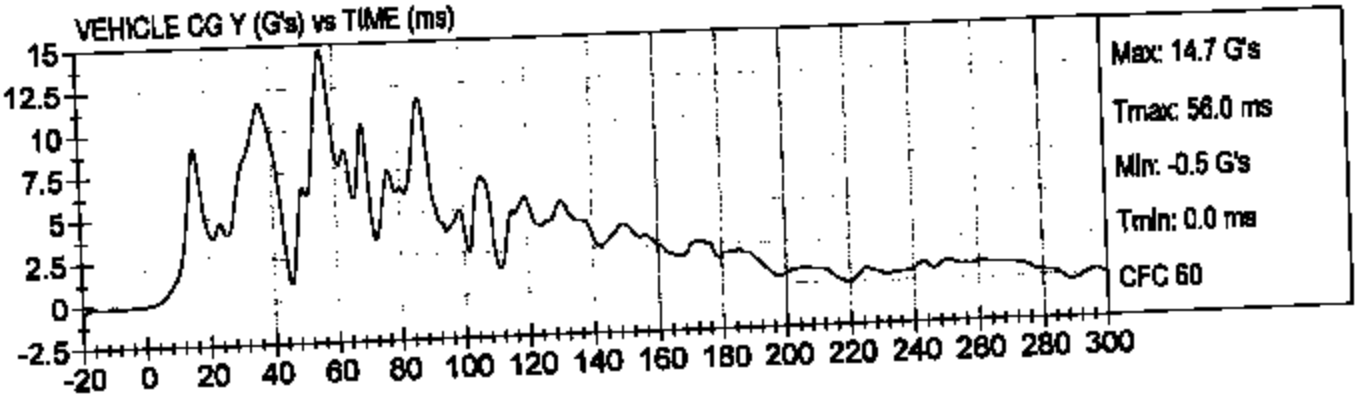


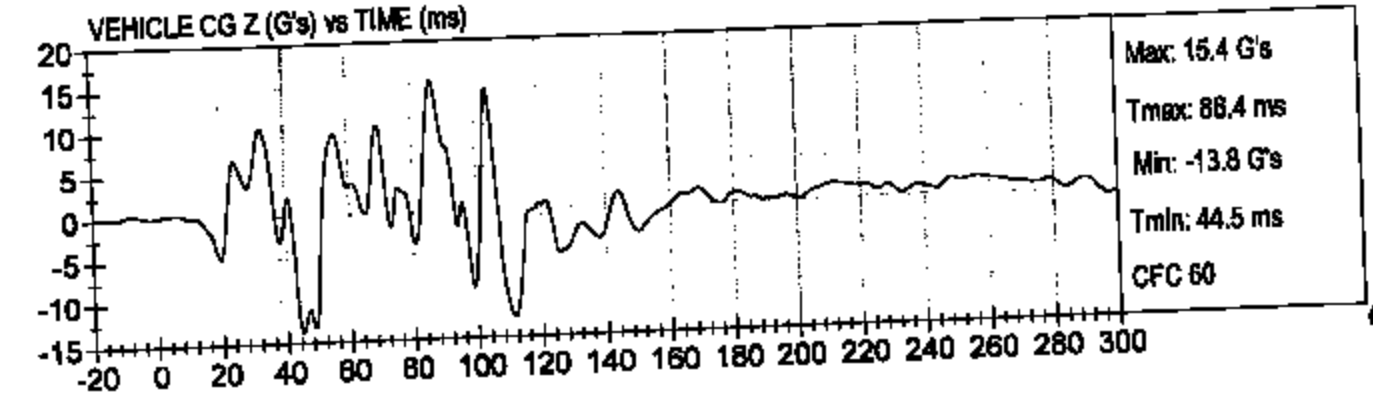


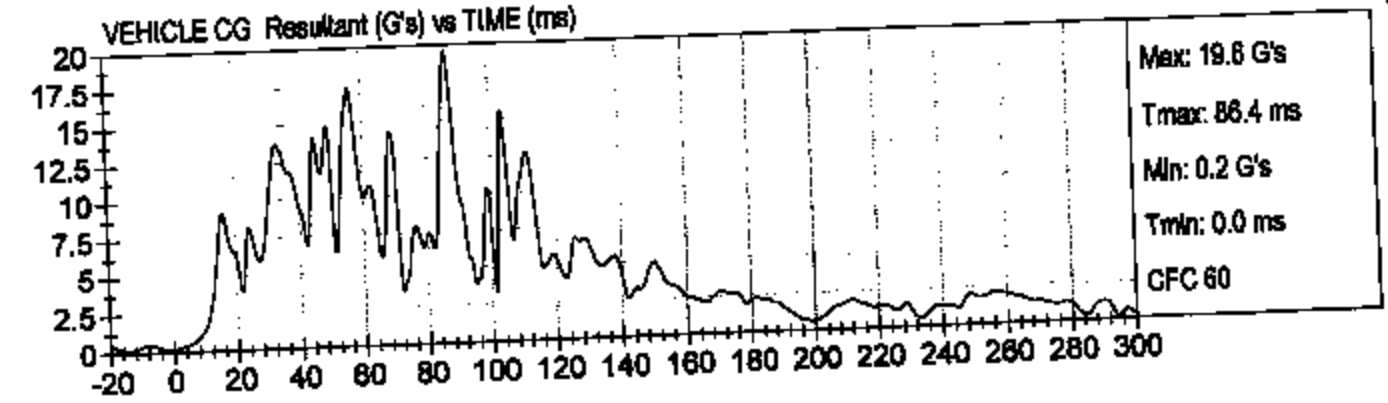
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)



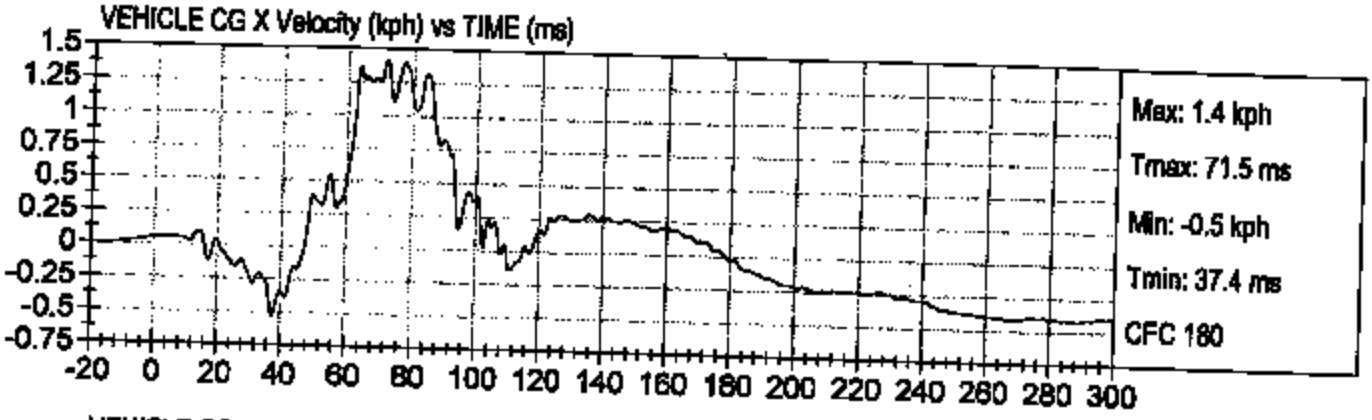


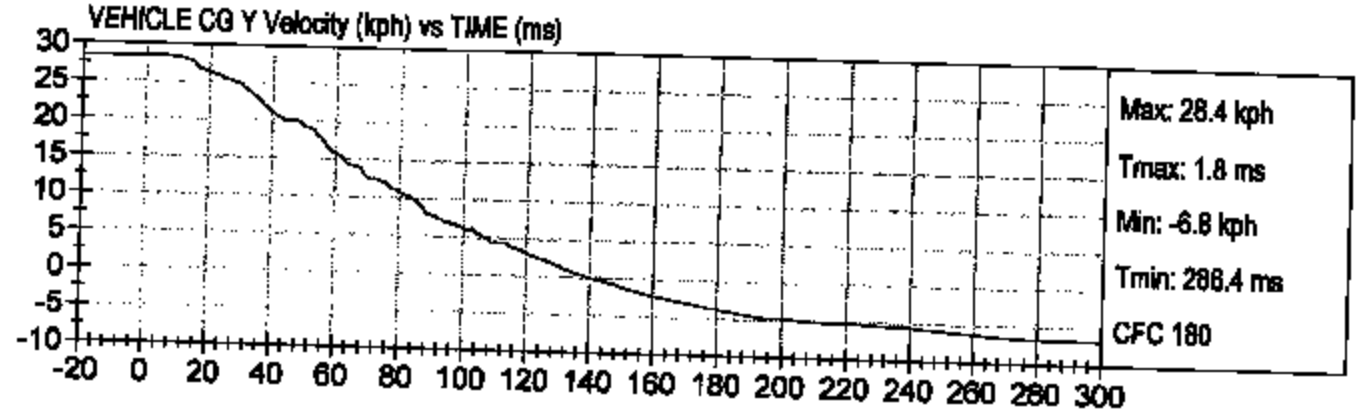


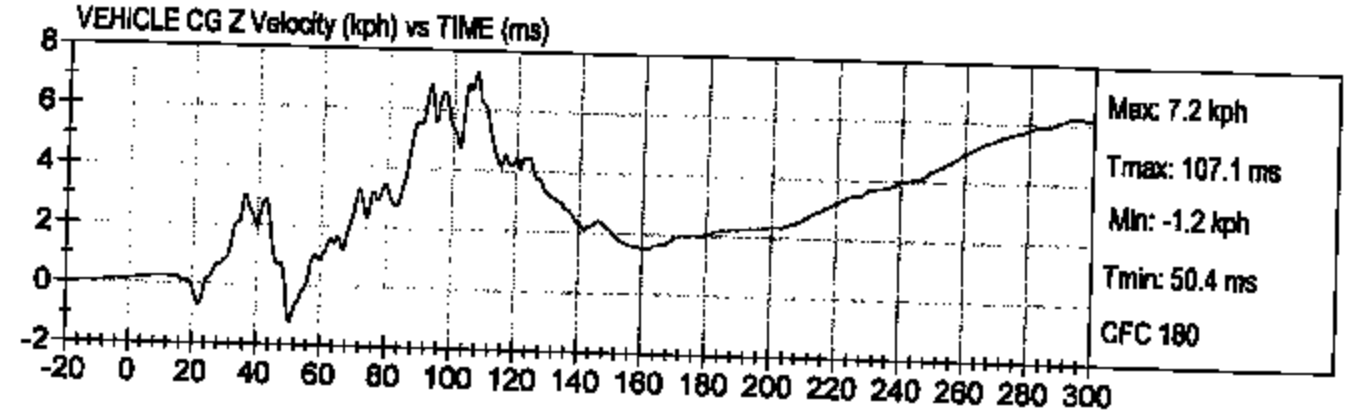


RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

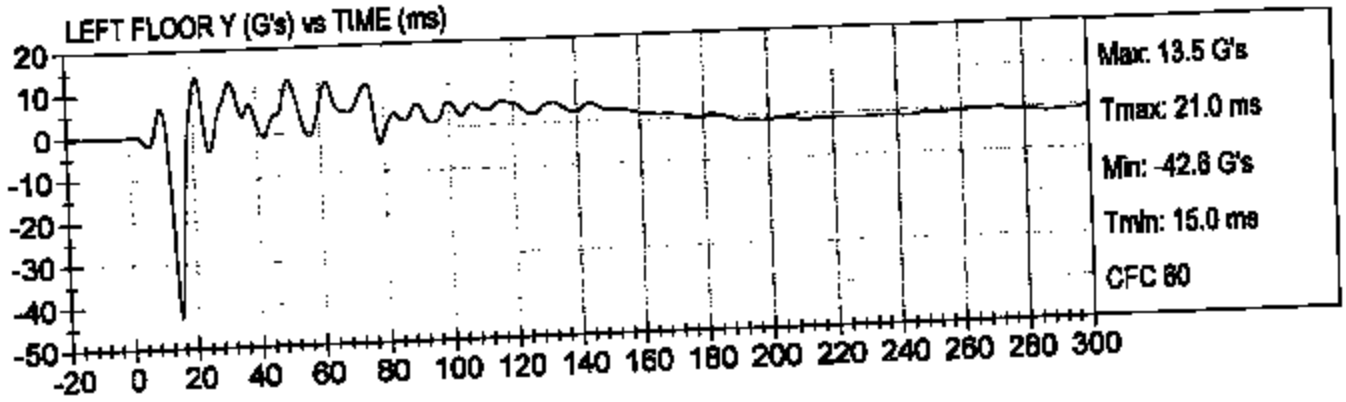


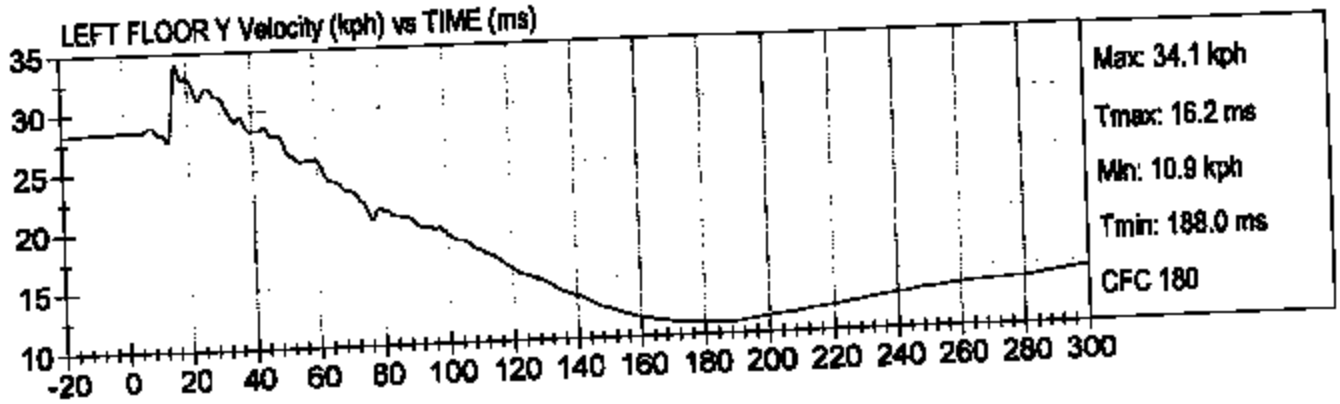


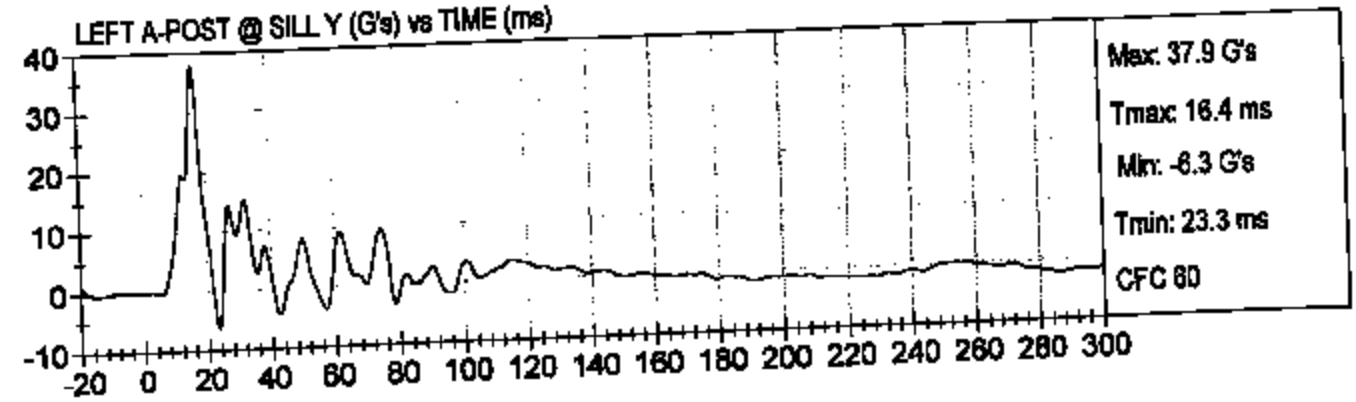


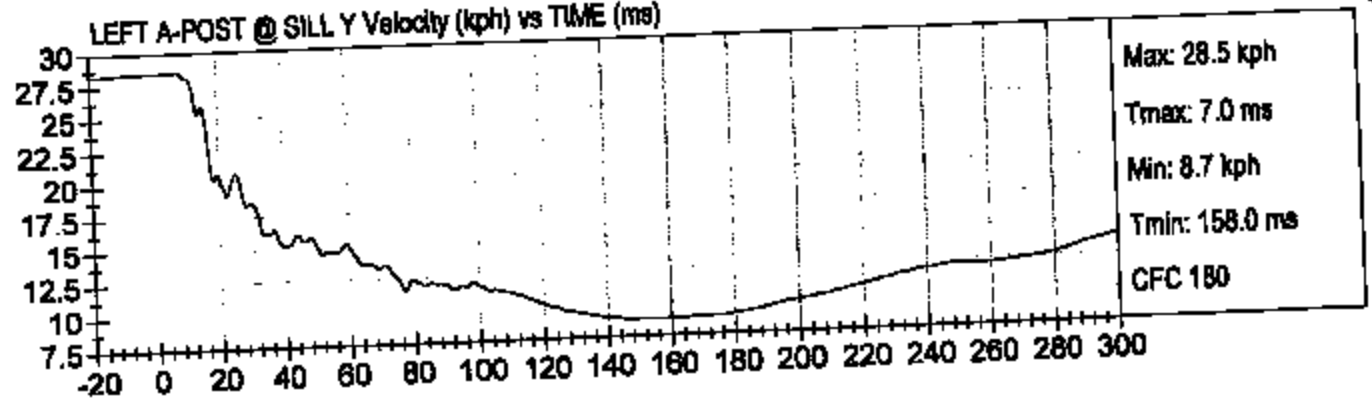
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)



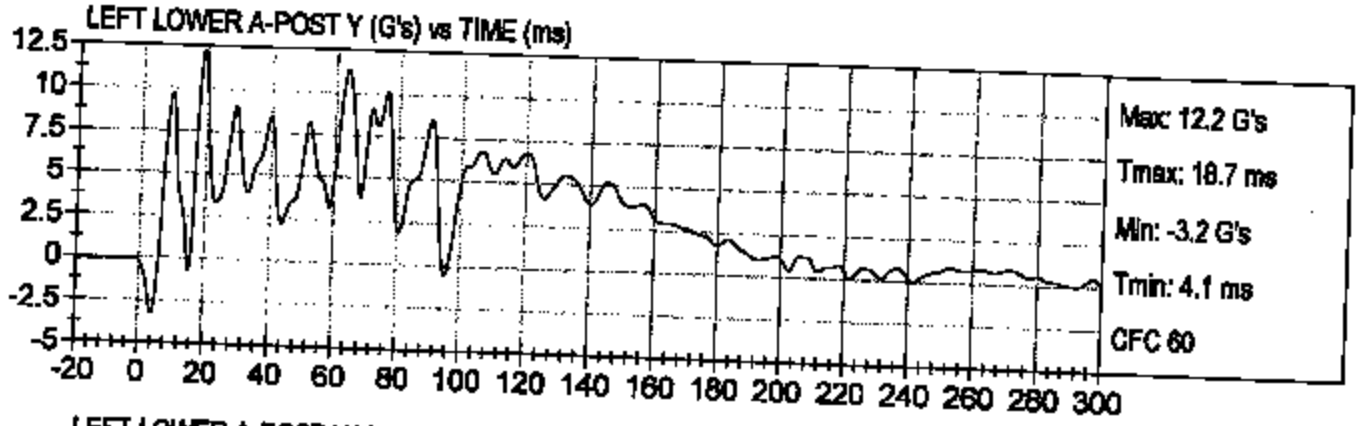


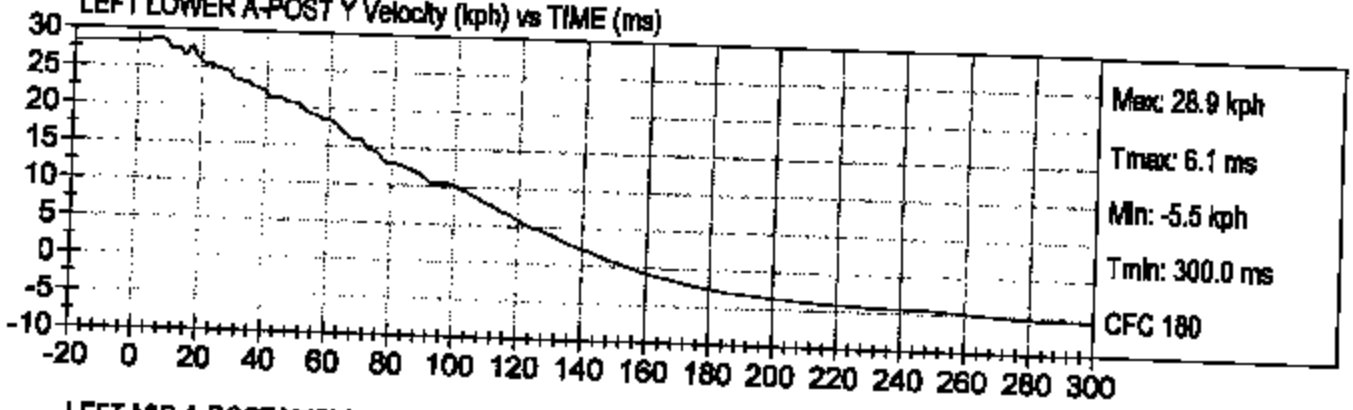


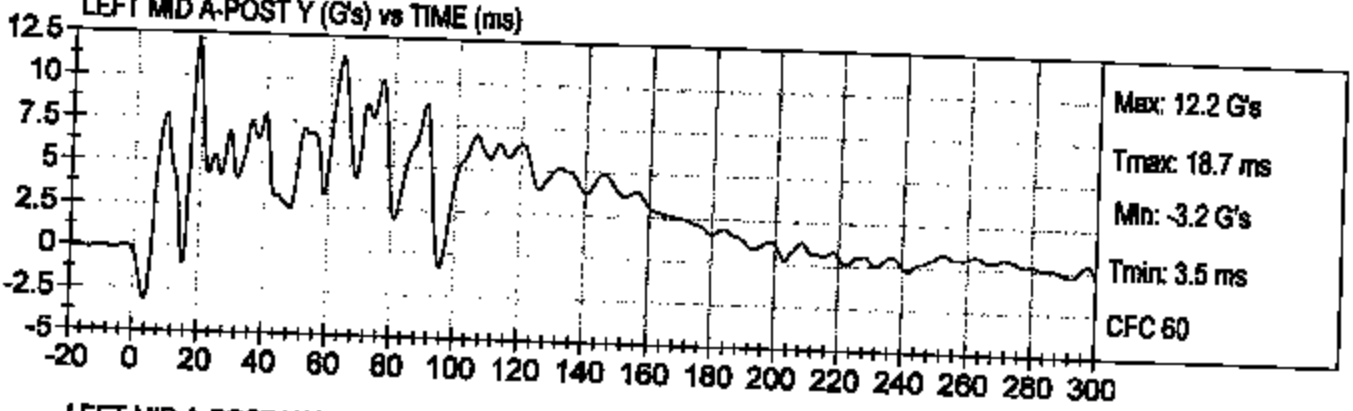


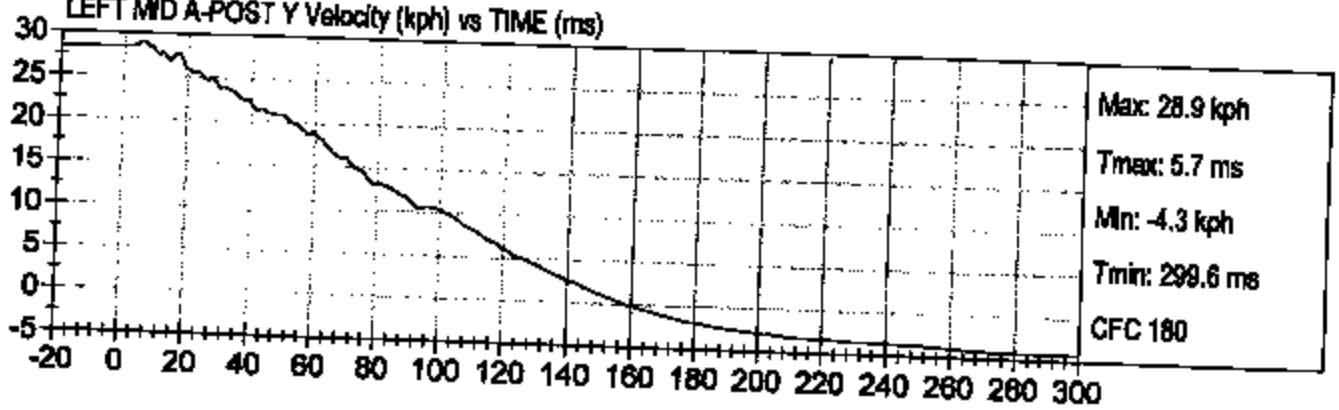
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)



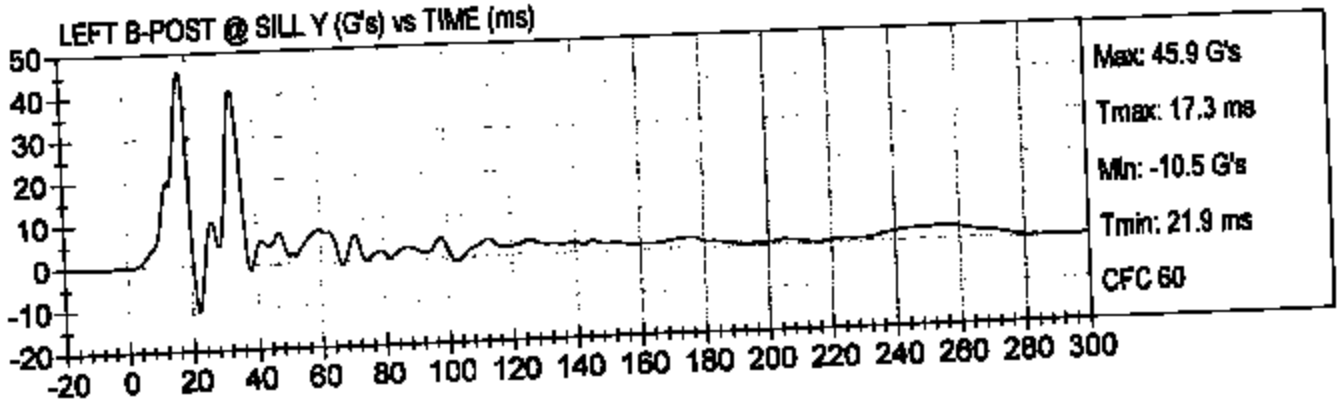


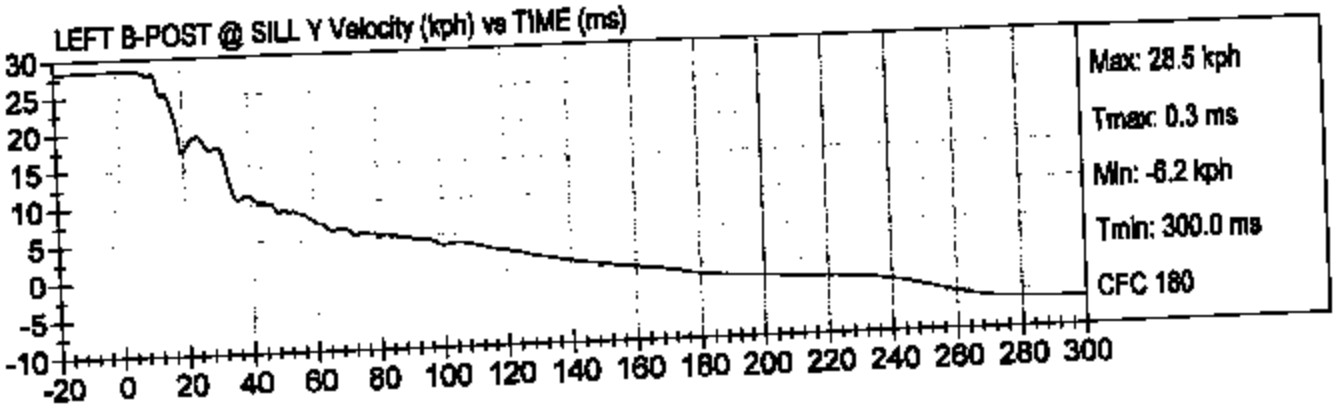


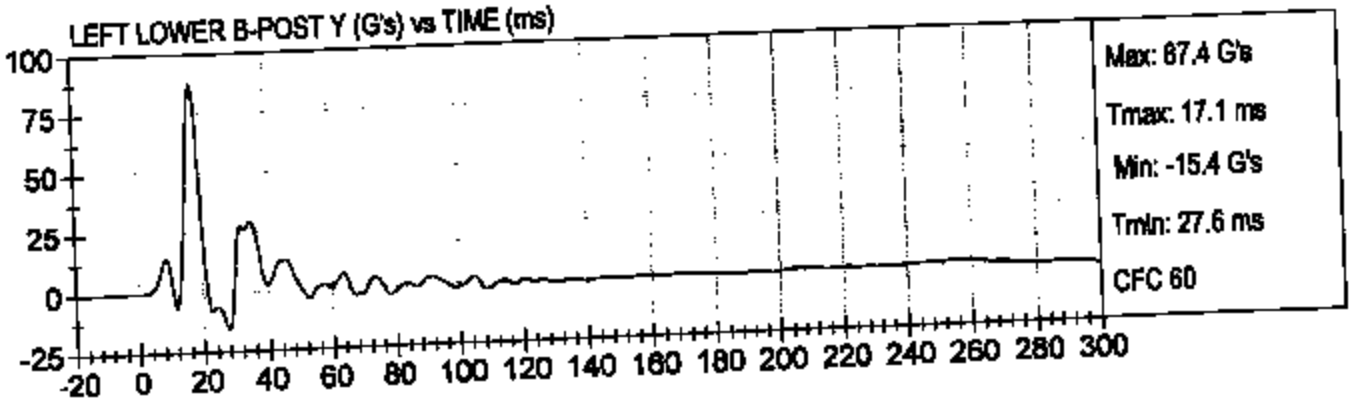


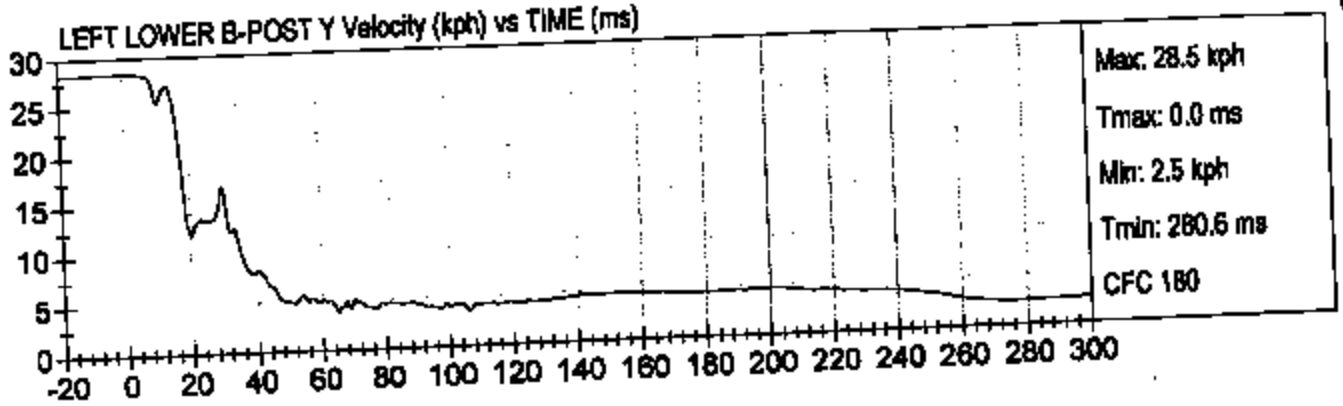
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)





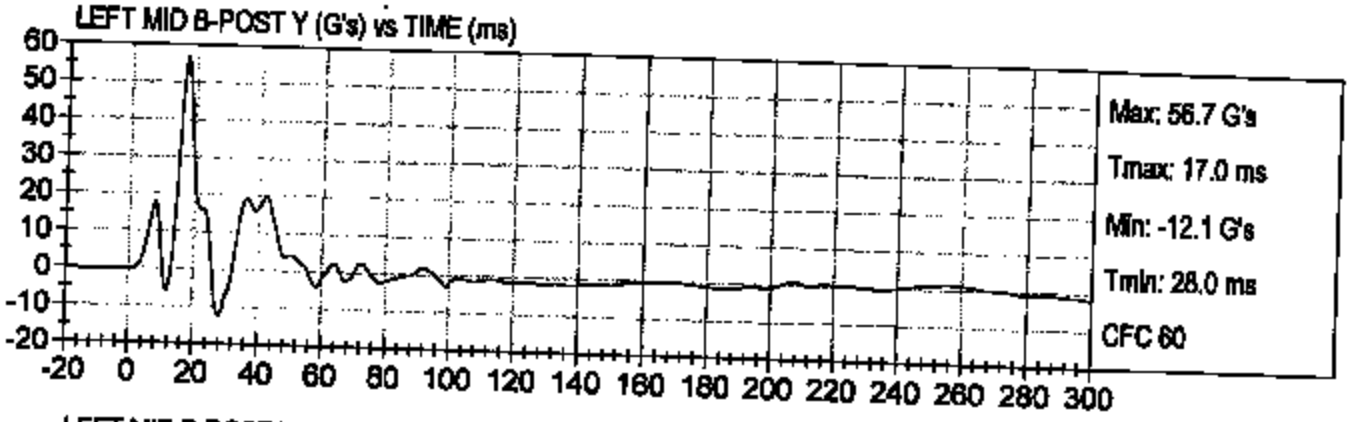




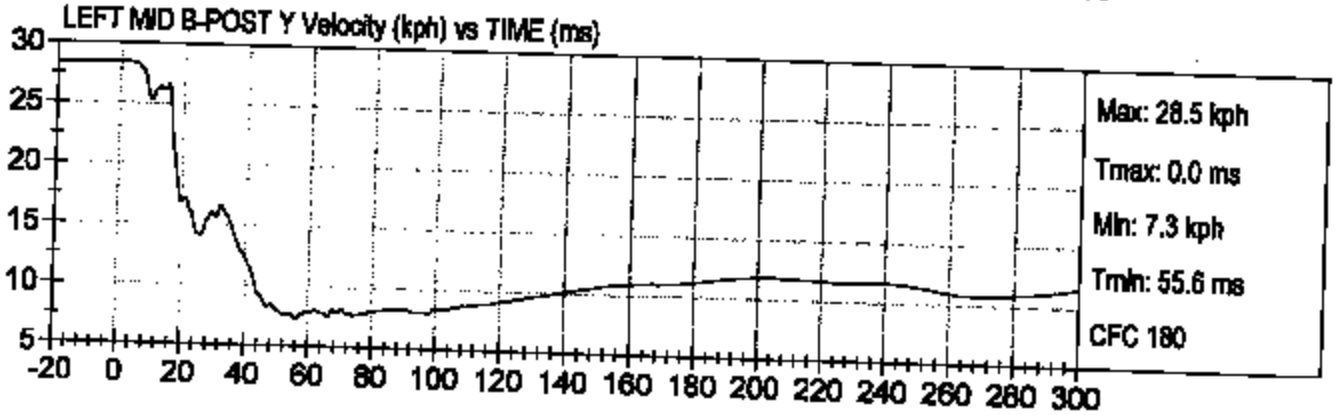
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

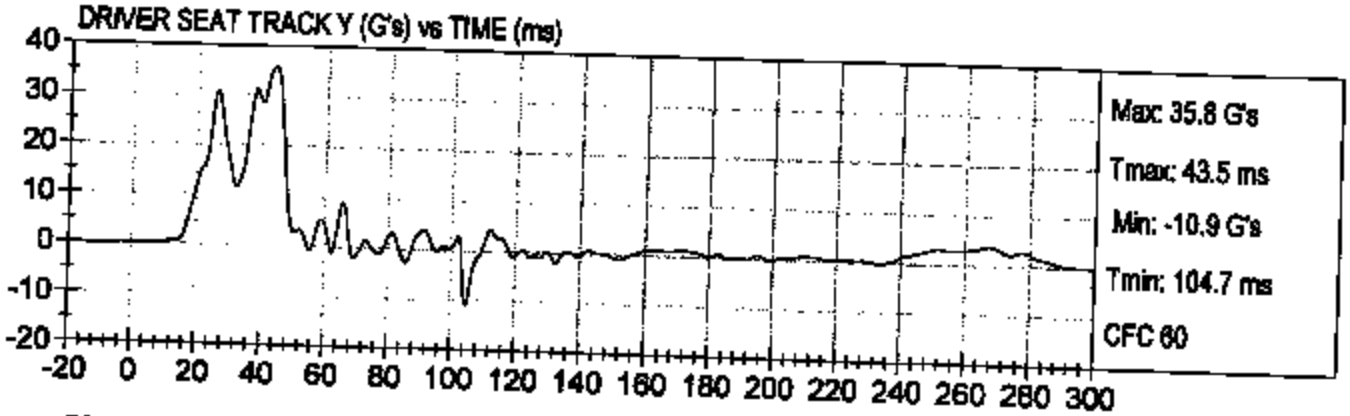
LEFT MID B-POST Y (G's) vs TIME (ms)



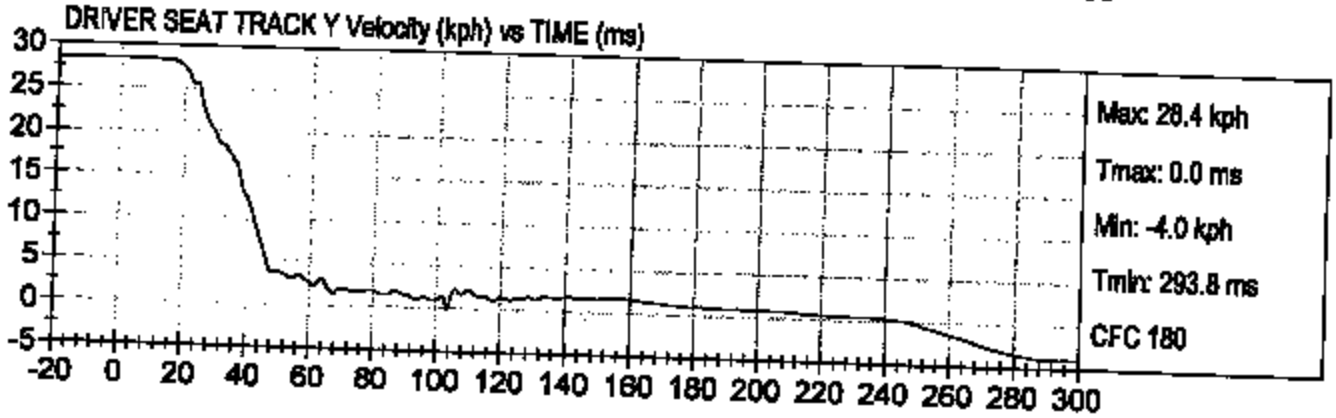
LEFT MID B-POST Y Velocity (kph) vs TIME (ms)



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

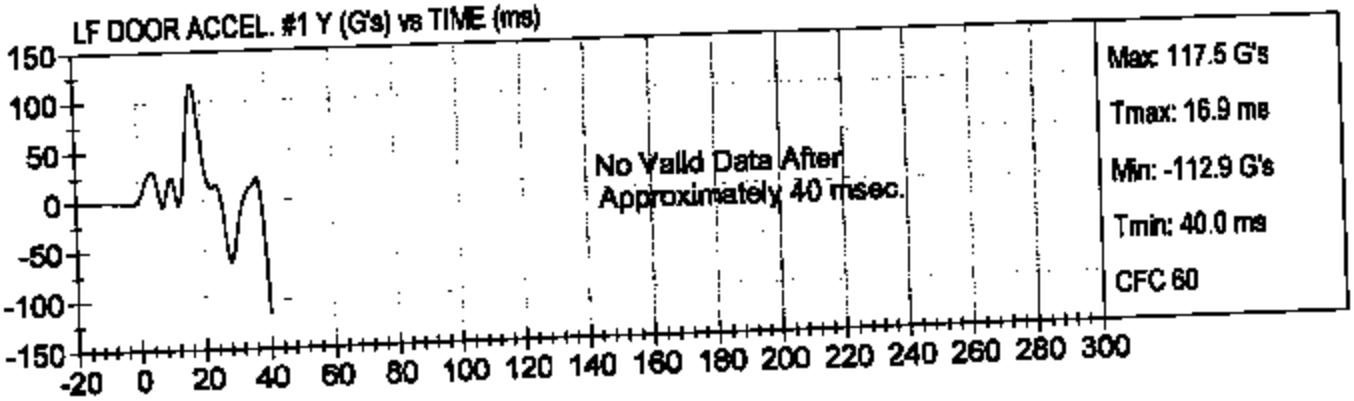


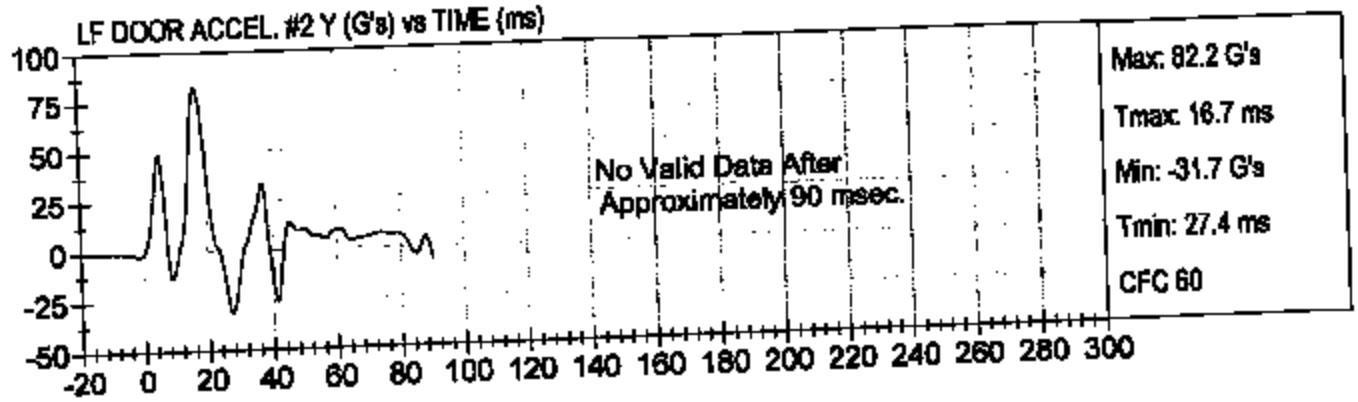
DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)

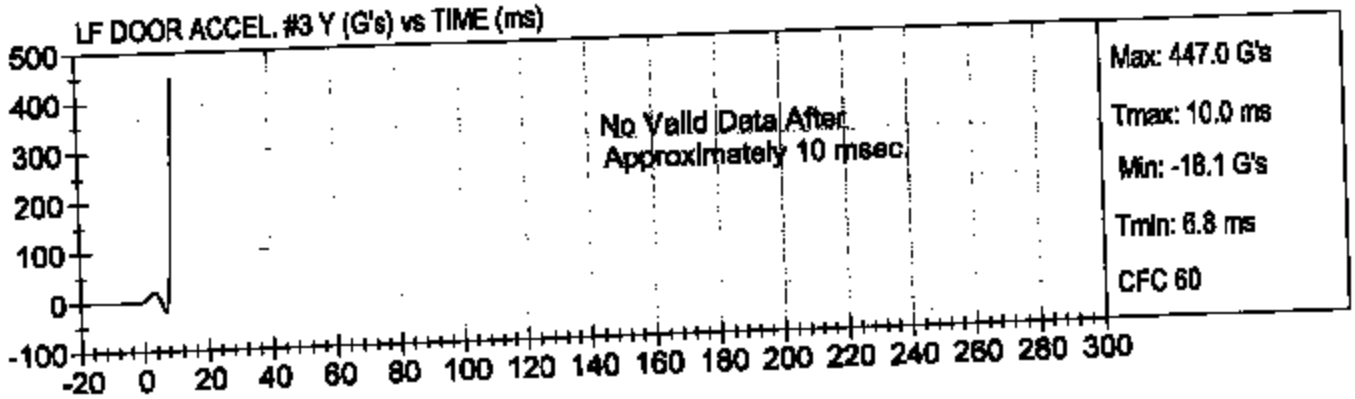


RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

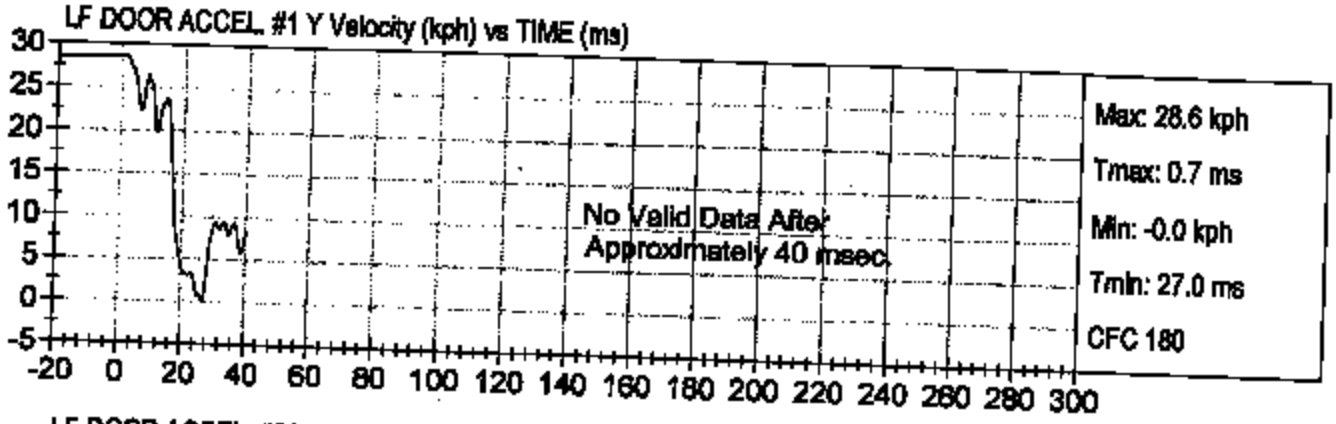


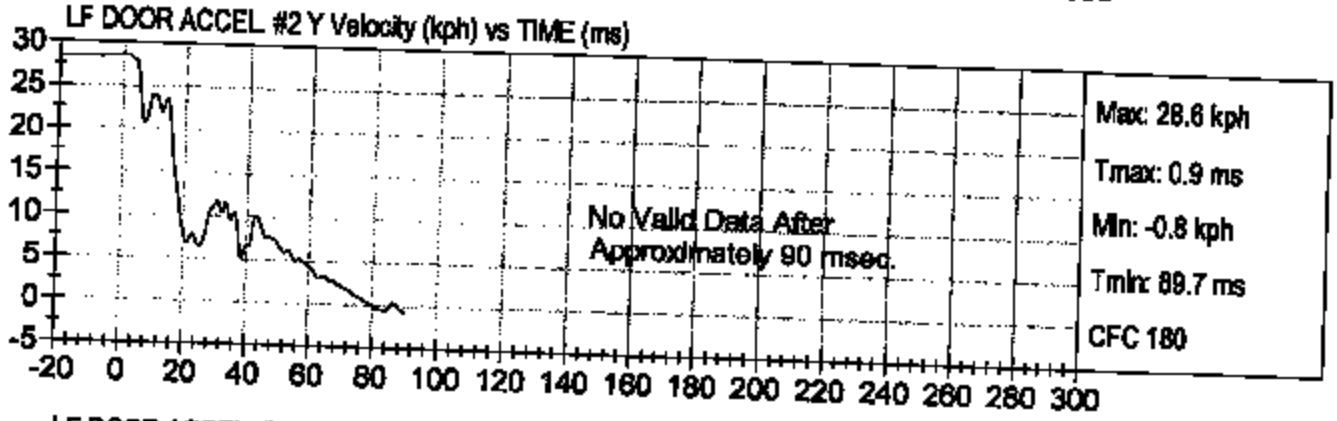


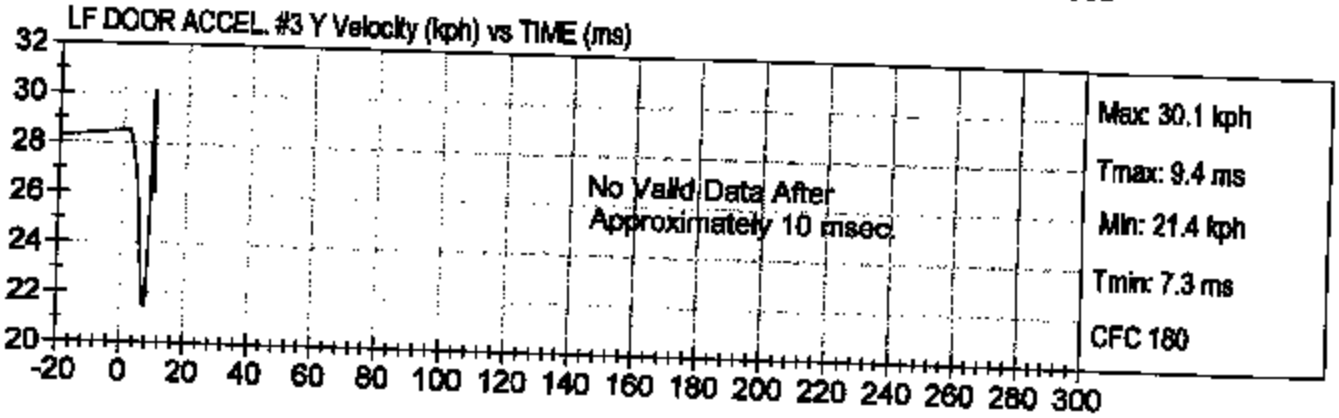


RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

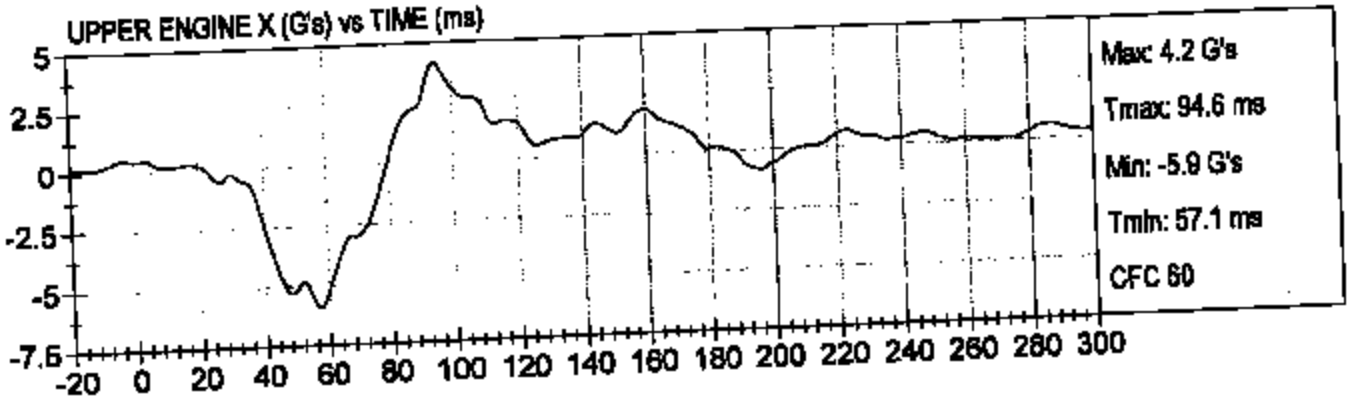


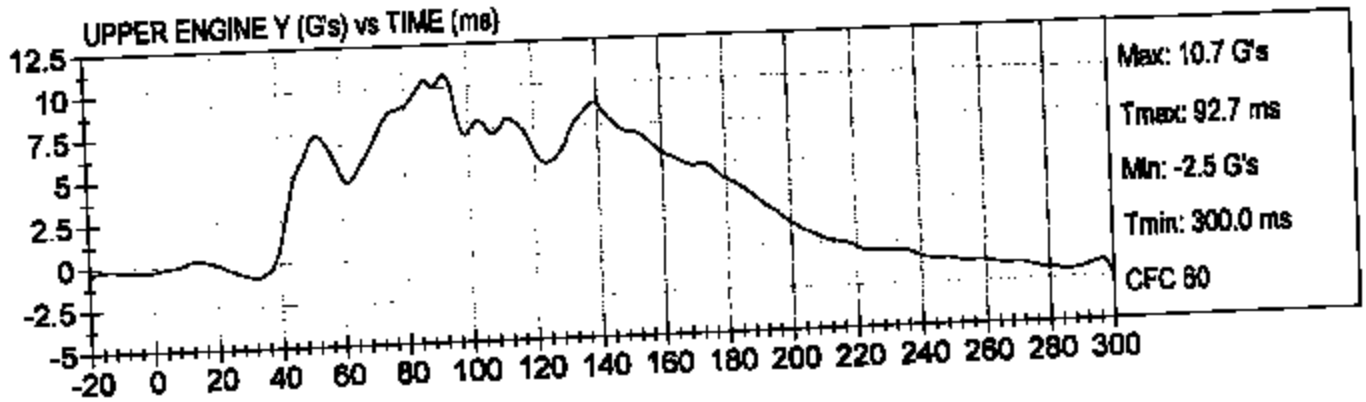


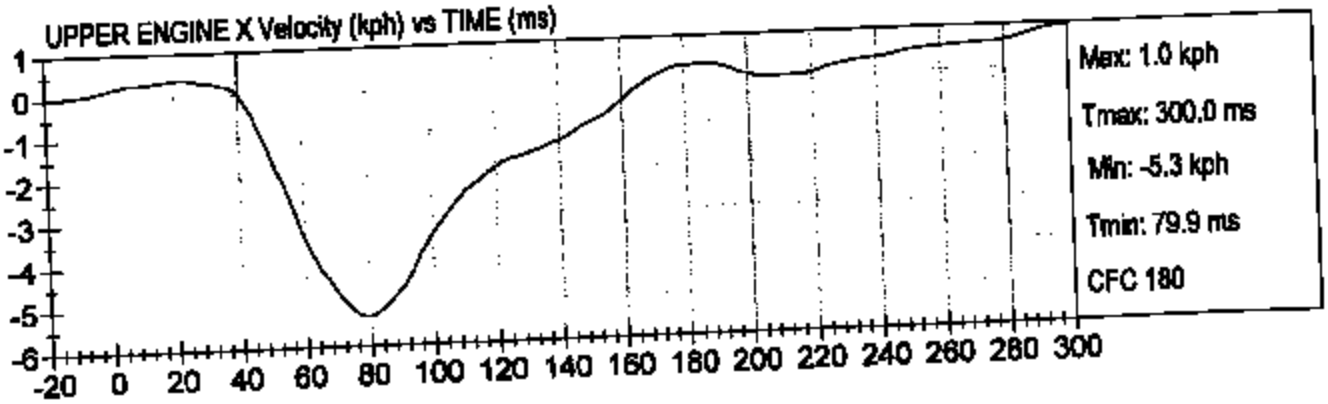


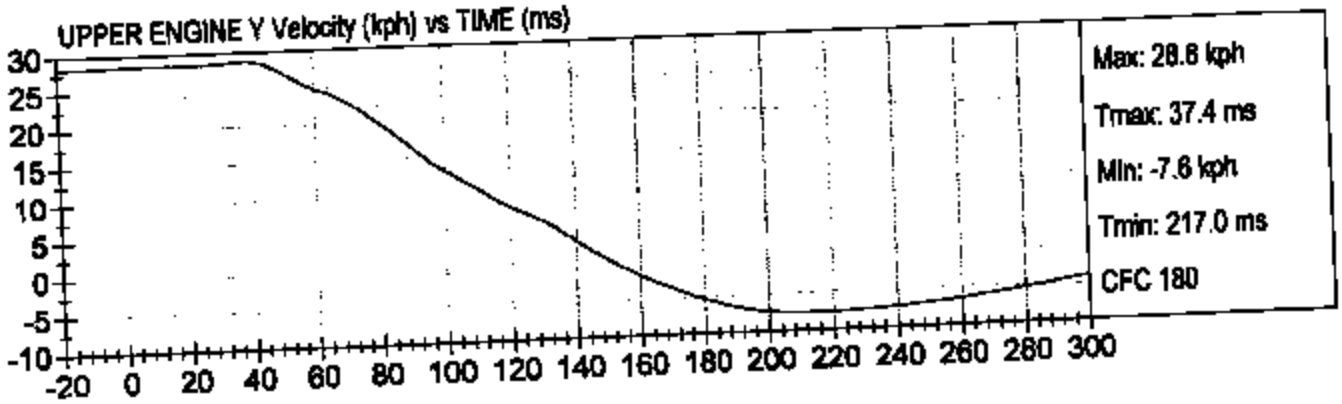
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)



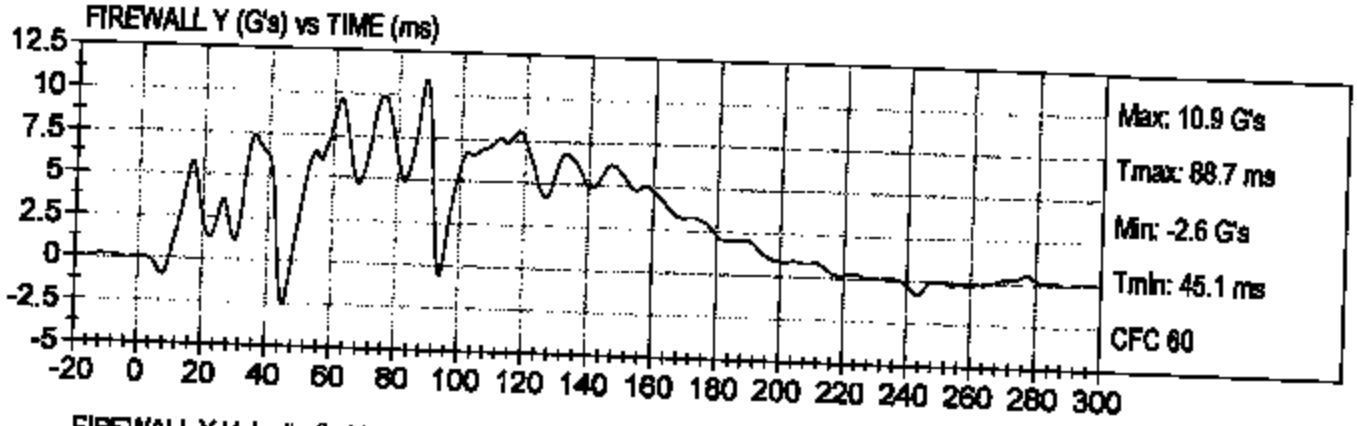


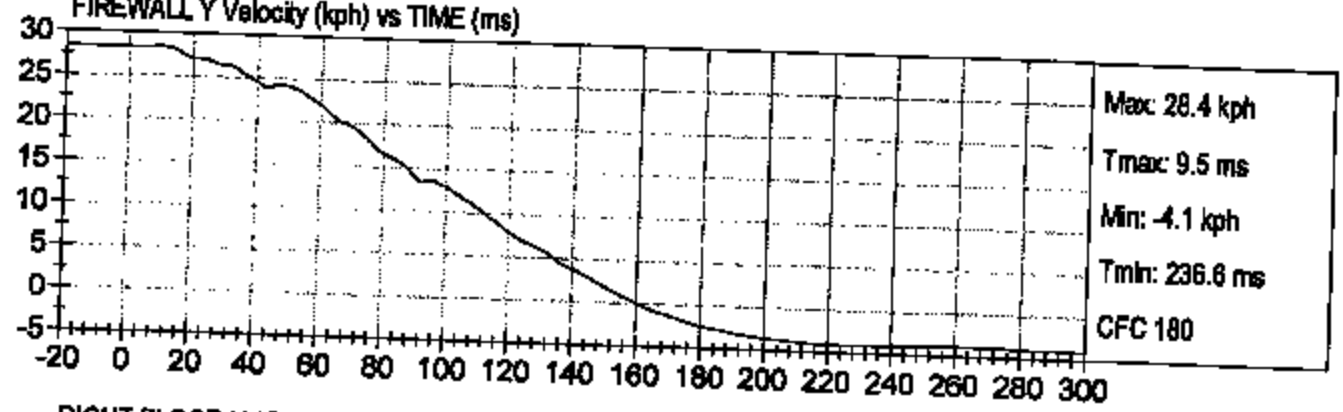


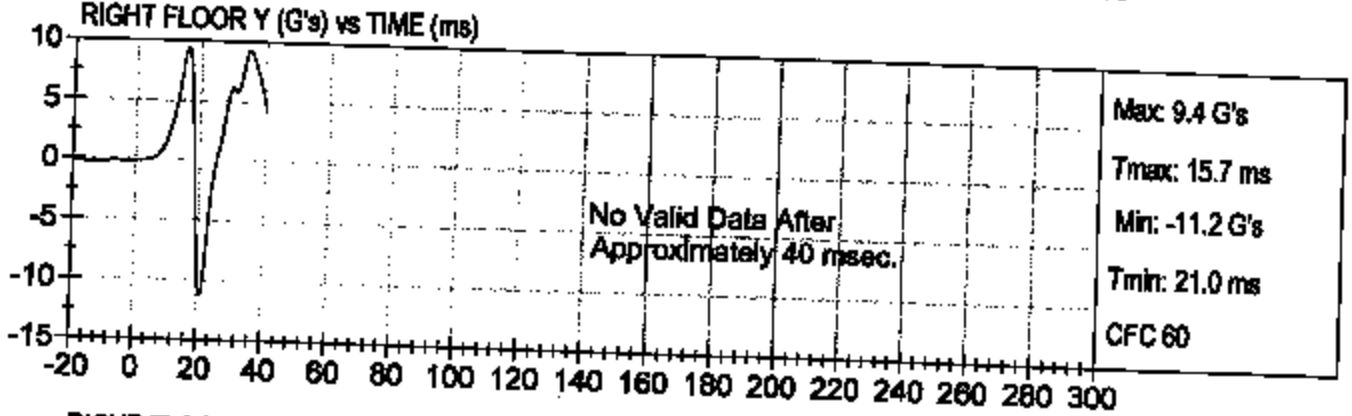


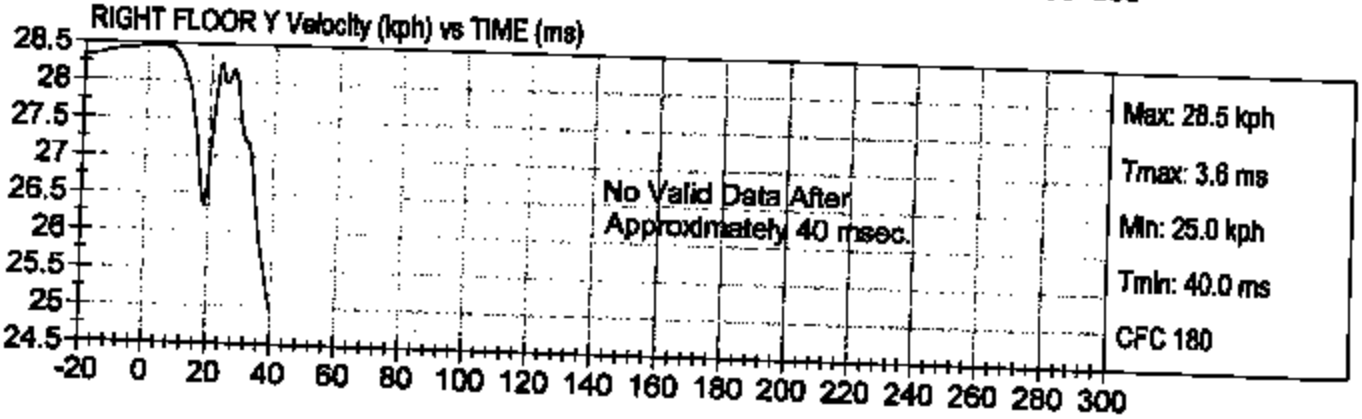
RIGID SIDE POLE IMPACT; FMVSS 201
2004 FORD FREESTAR (C40206)

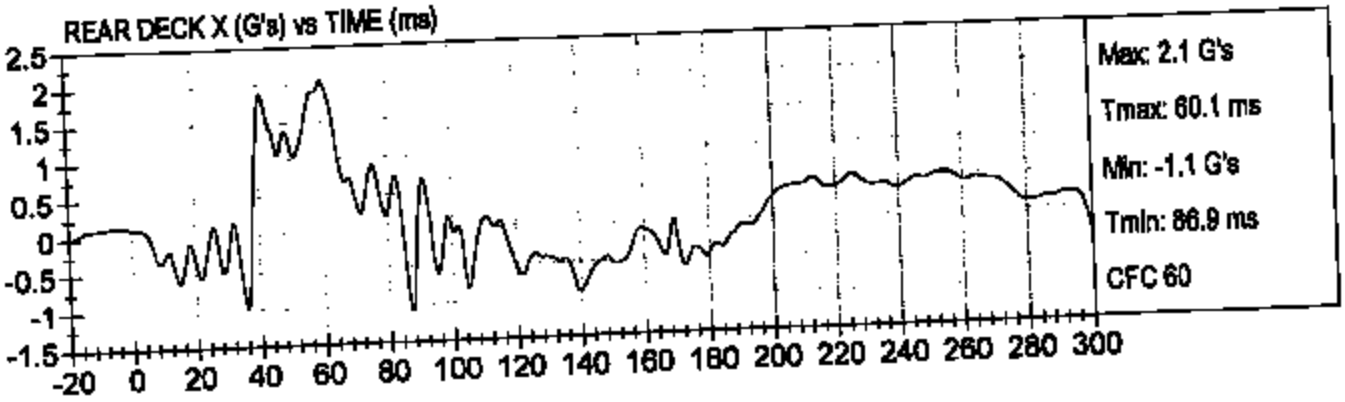
Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

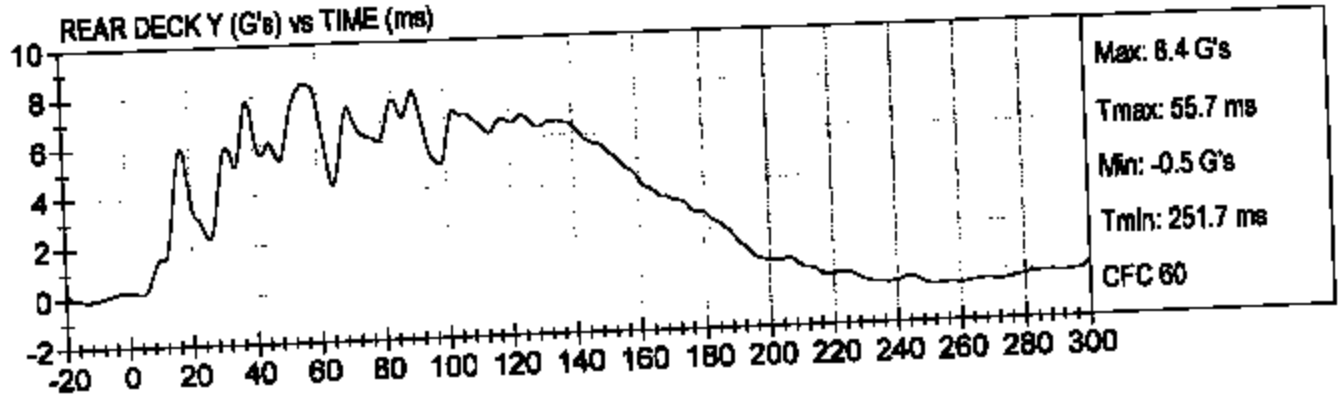


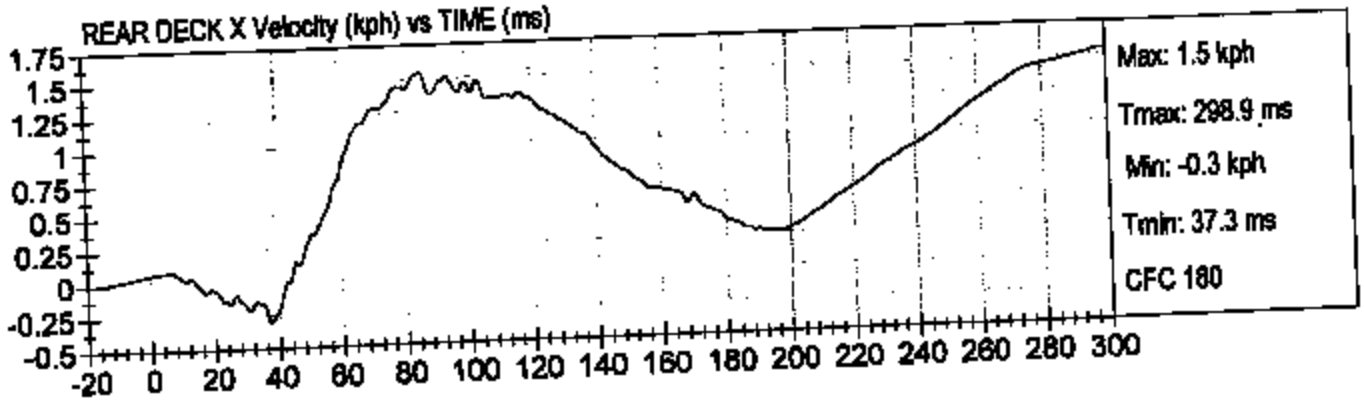


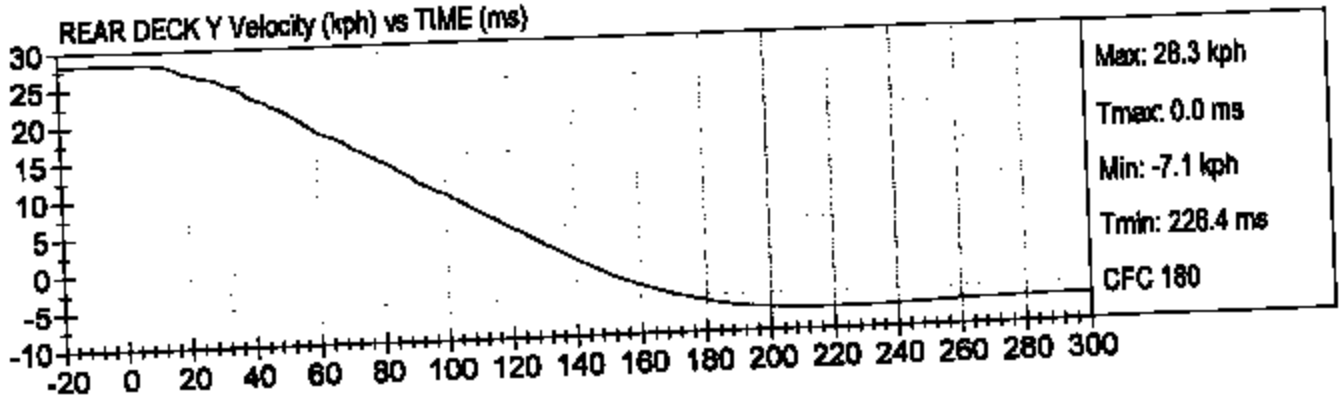





REAR DECK X (G's) vs TIME (ms)
Max: 2.1 G's
Tmax: 60.1 ms
Min: -1.1 G's
Tmin: 86.9 ms
CFC 60

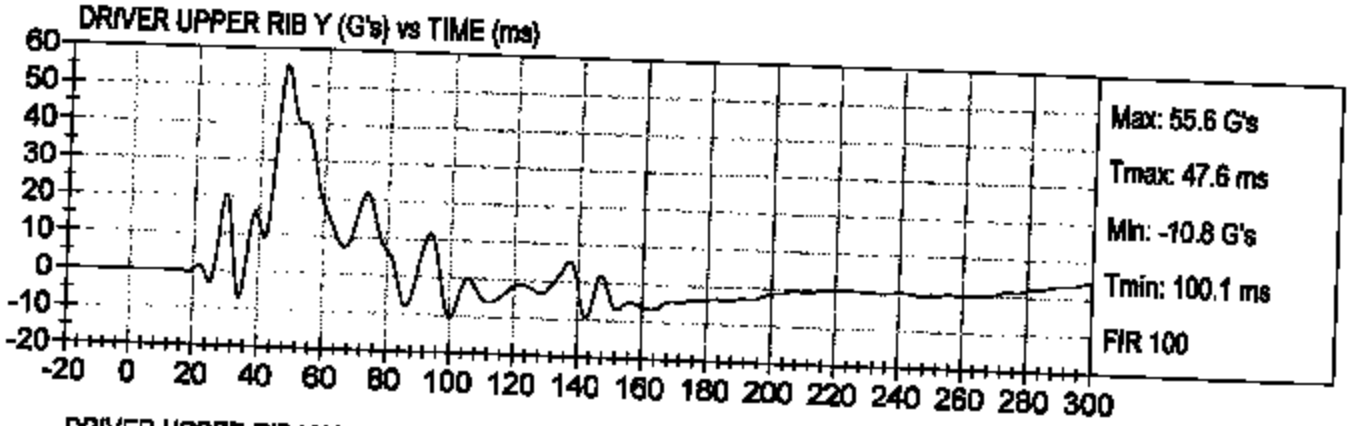

REAR DECK Y (G's) vs TIME (ms)
Max: 8.4 G's
Tmax: 55.7 ms
Min: -0.5 G's
Tmin: 251.7 ms
CFC 60

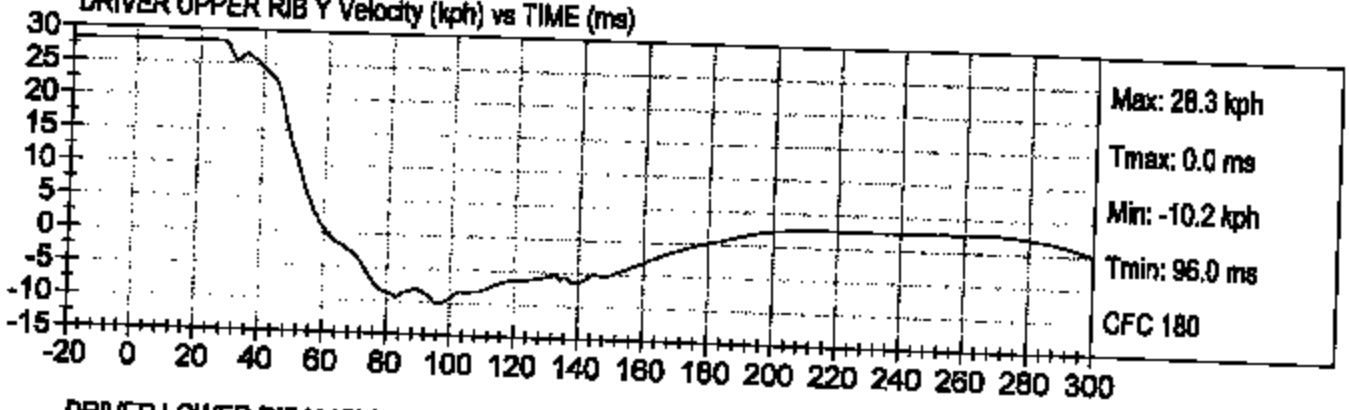

REAR DECK X Velocity (kph) vs TIME (ms)
Max: 1.5 kph
Tmax: 298.9 ms
Min: -0.3 kph
Tmin: 37.3 ms
CFC 180

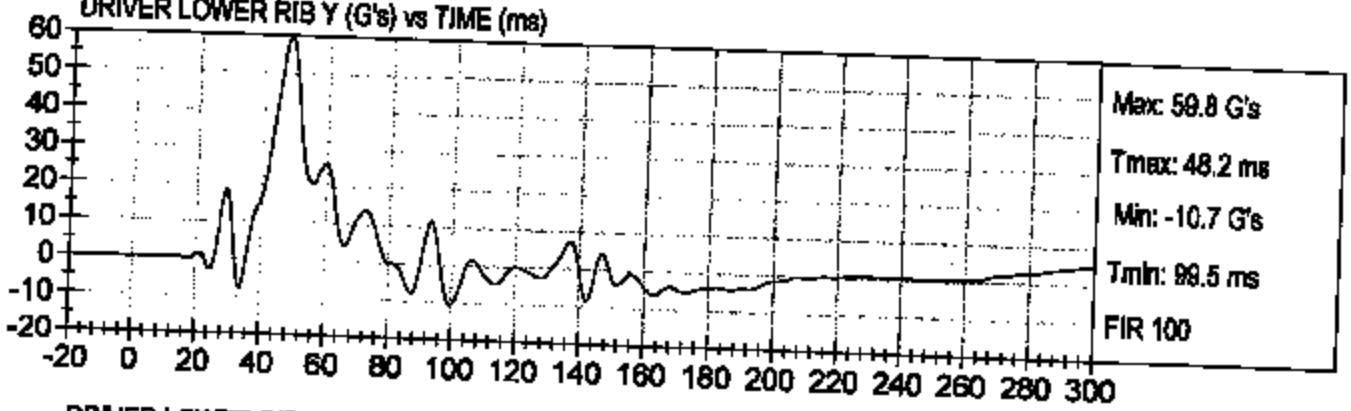

REAR DECK Y Velocity (kph) vs TIME (ms)
Max: 28.3 kph
Tmax: 0.0 ms
Min: -7.1 kph
Tmin: 226.4 ms
CFC 180

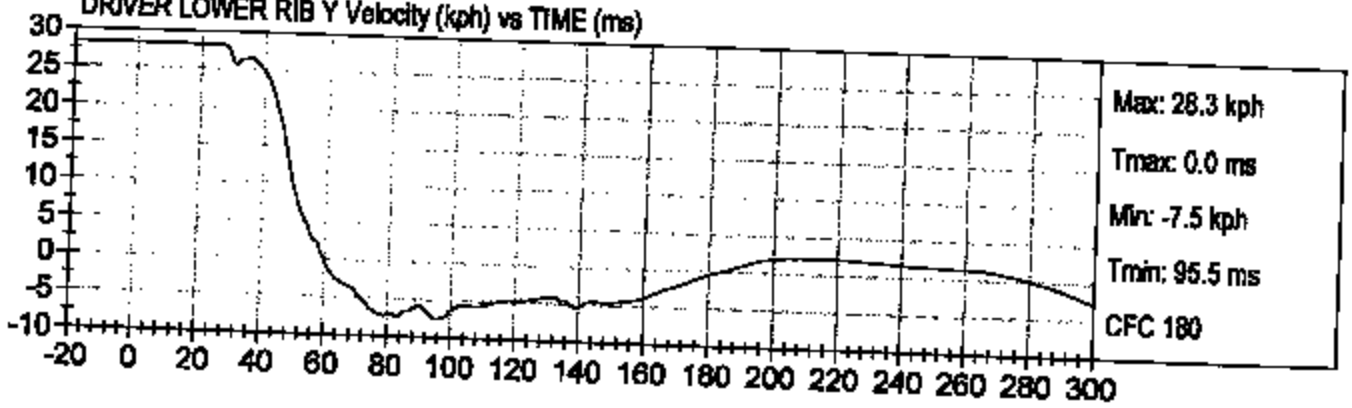
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.8 mph (28.3 km/h)



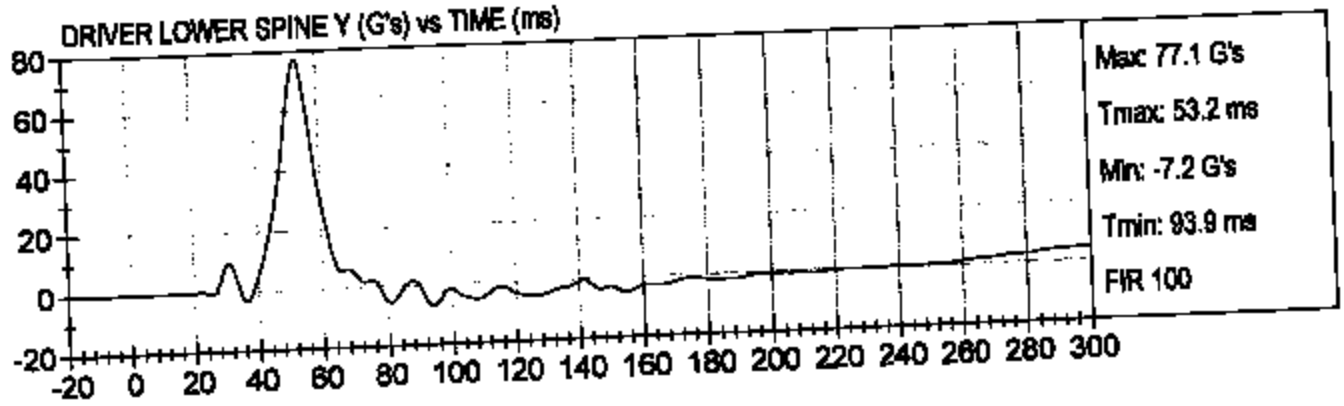


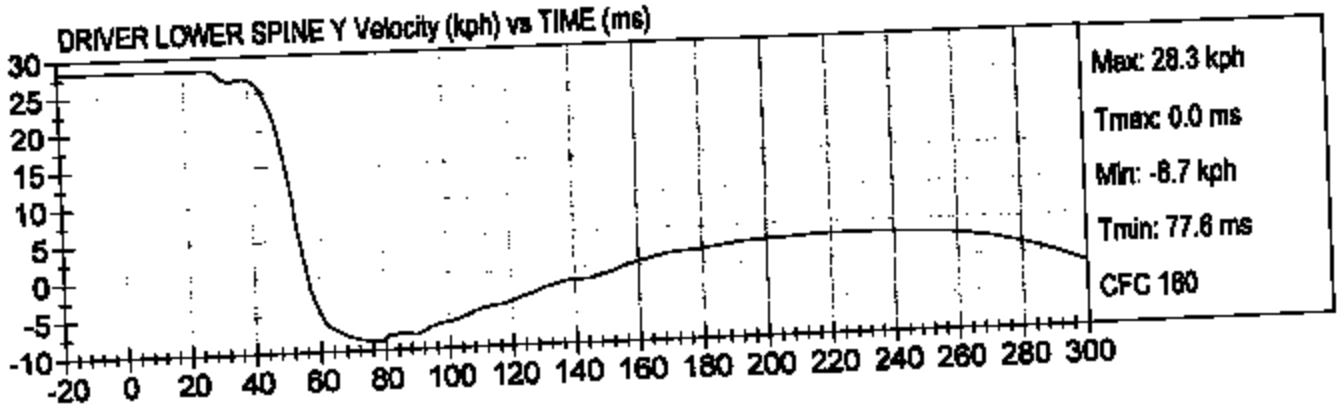


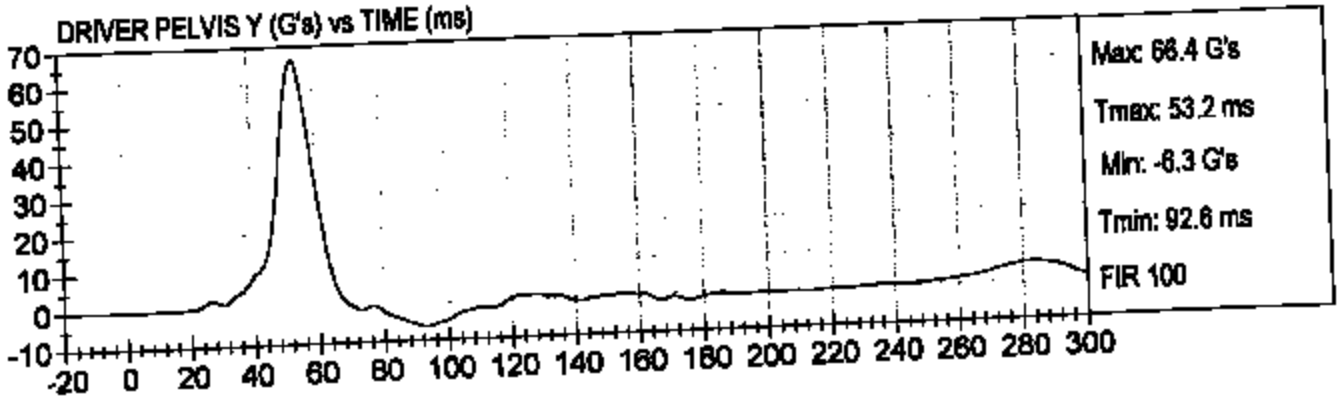


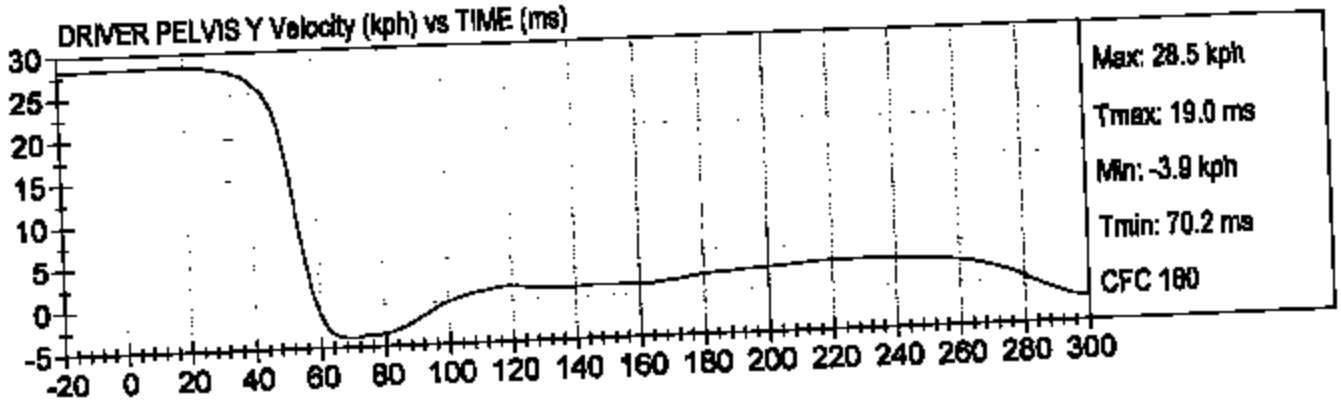
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)





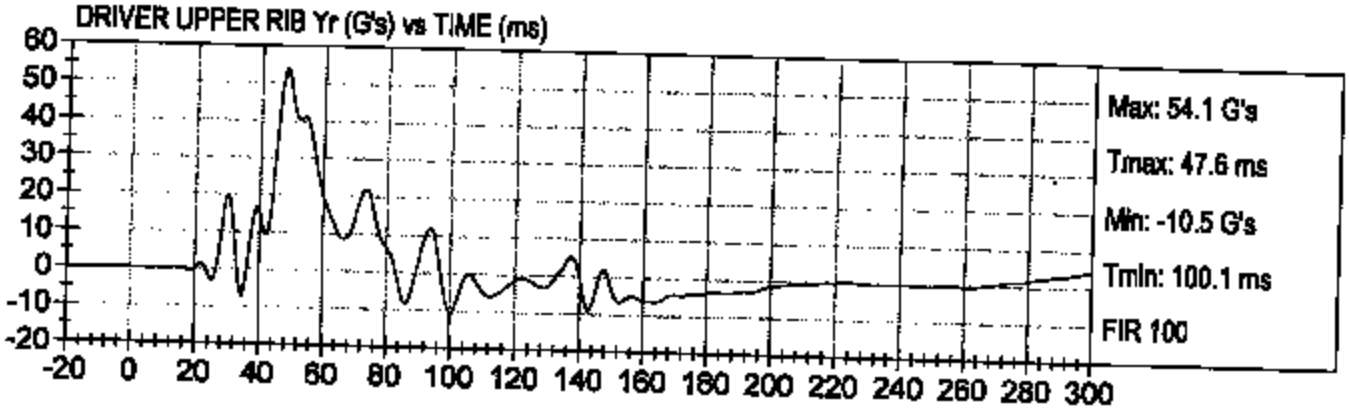




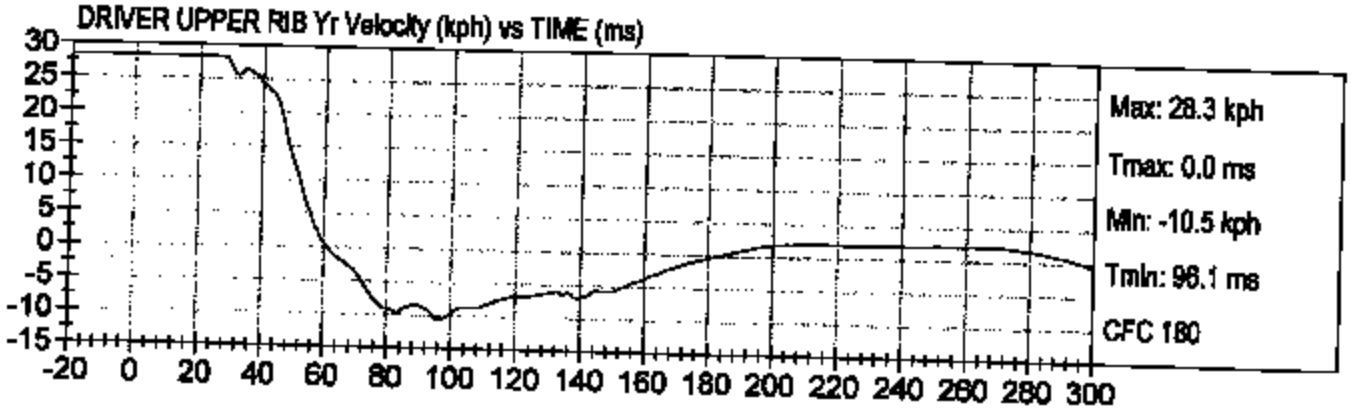
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)

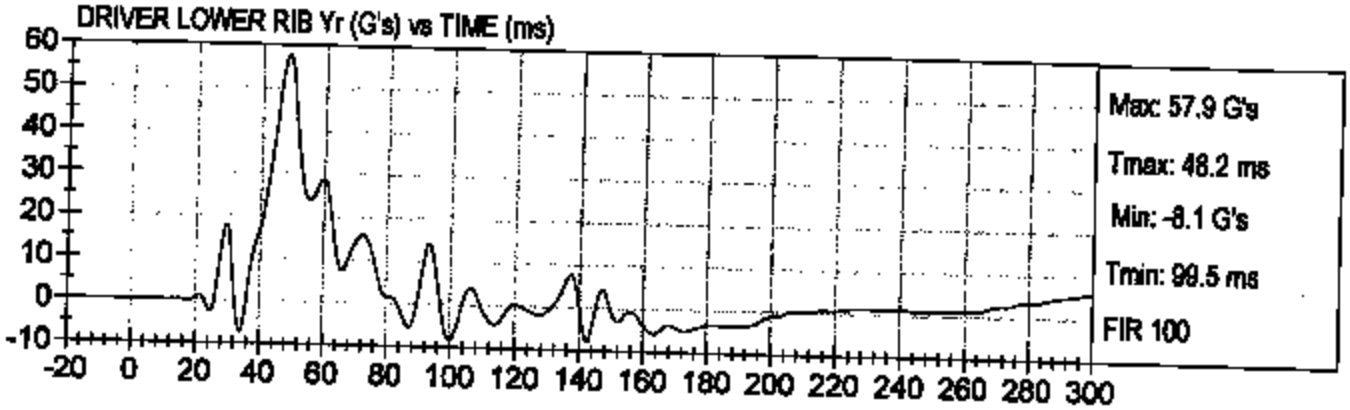
DRIVER UPPER RIB Yr (G's) vs TIME (ms)



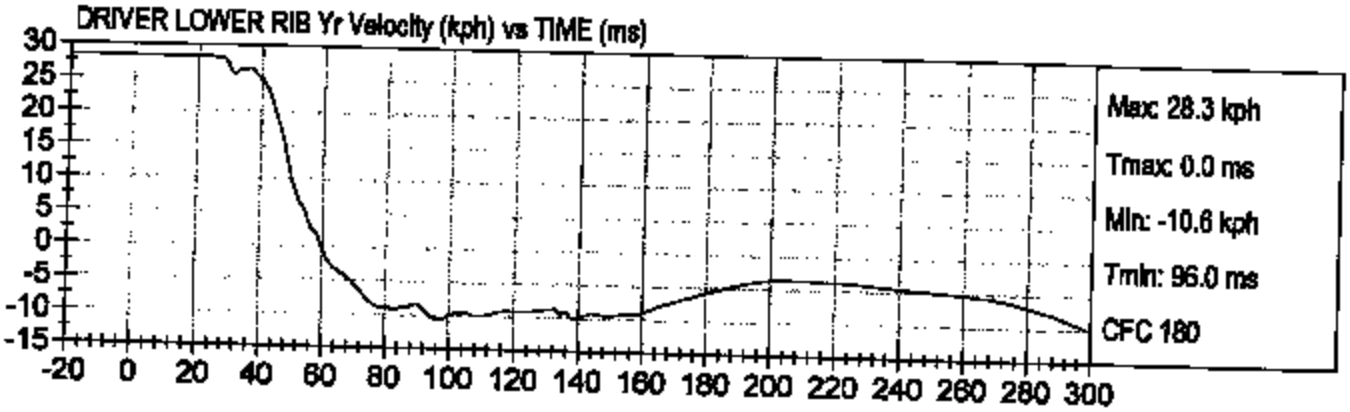
DRIVER UPPER RIB Yr Velocity (kph) vs TIME (ms)



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

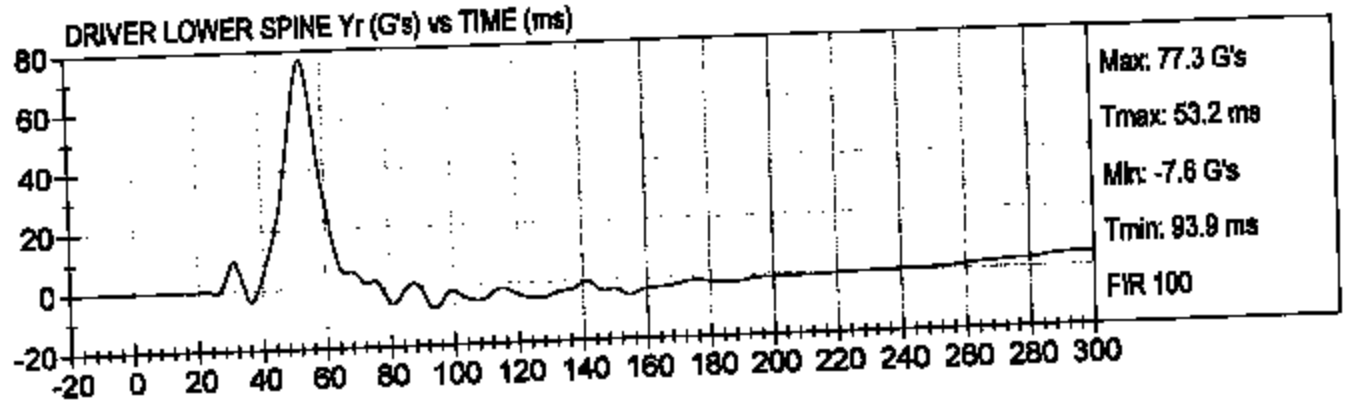


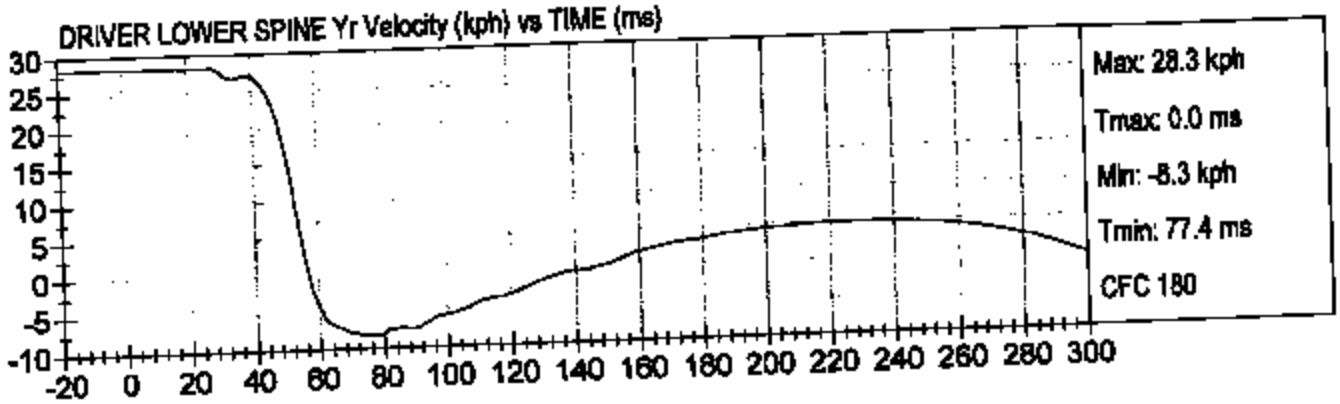
DRIVER LOWER RIB Yr Velocity (kph) vs TIME (ms)

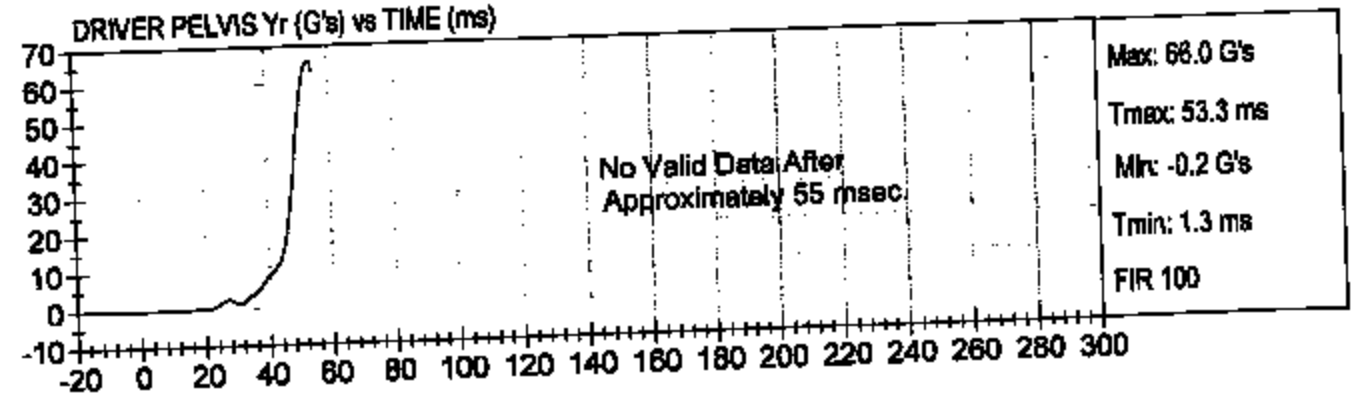


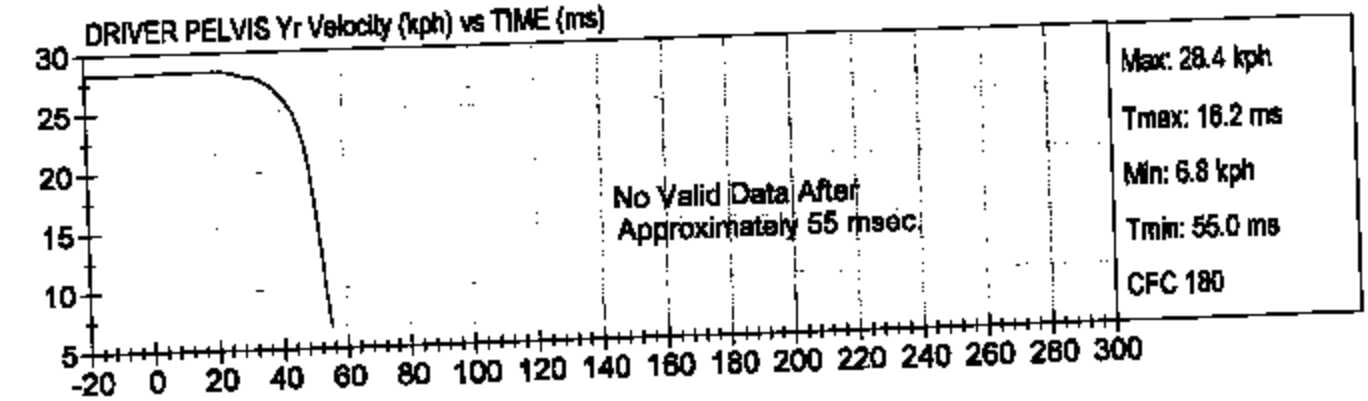
RIGID SIDE POLE IMPACT, FMVSS 201
2004 FORD FREESTAR (C40206)

Test Date: 05/20/05
Speed: 17.6 mph (28.3 km/h)









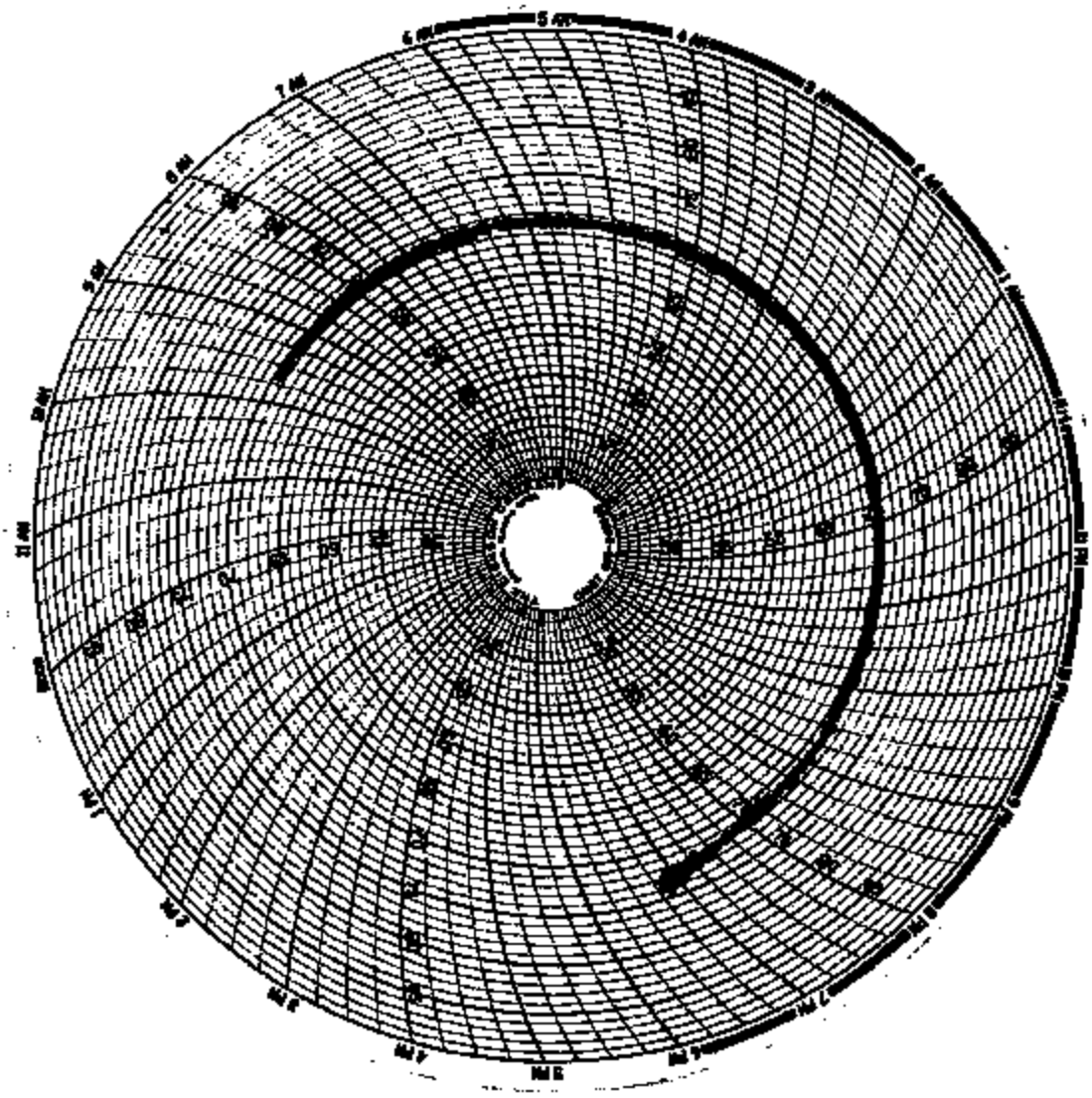
APPENDIX C

SID/HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Vehicle and Dummy Temperature

Test Vehicle: 2004 Ford Freestar
Test Program: FMVSS 201P

NHTSA No. C40205
Test Date: May 20, 2005



CERTIFICATION DATA

Dummy Serial Number: 037

Calibration Test Results Summary

Dummy Serial Number: 037

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 037 **Test I.D:** D051271

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	120 to 150	146	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Accelaration	G's	+/- 15	-13	Pass
		Overall Test Results		Pass

Laboratory Technician

05/10/2005
Test Date

Approved By

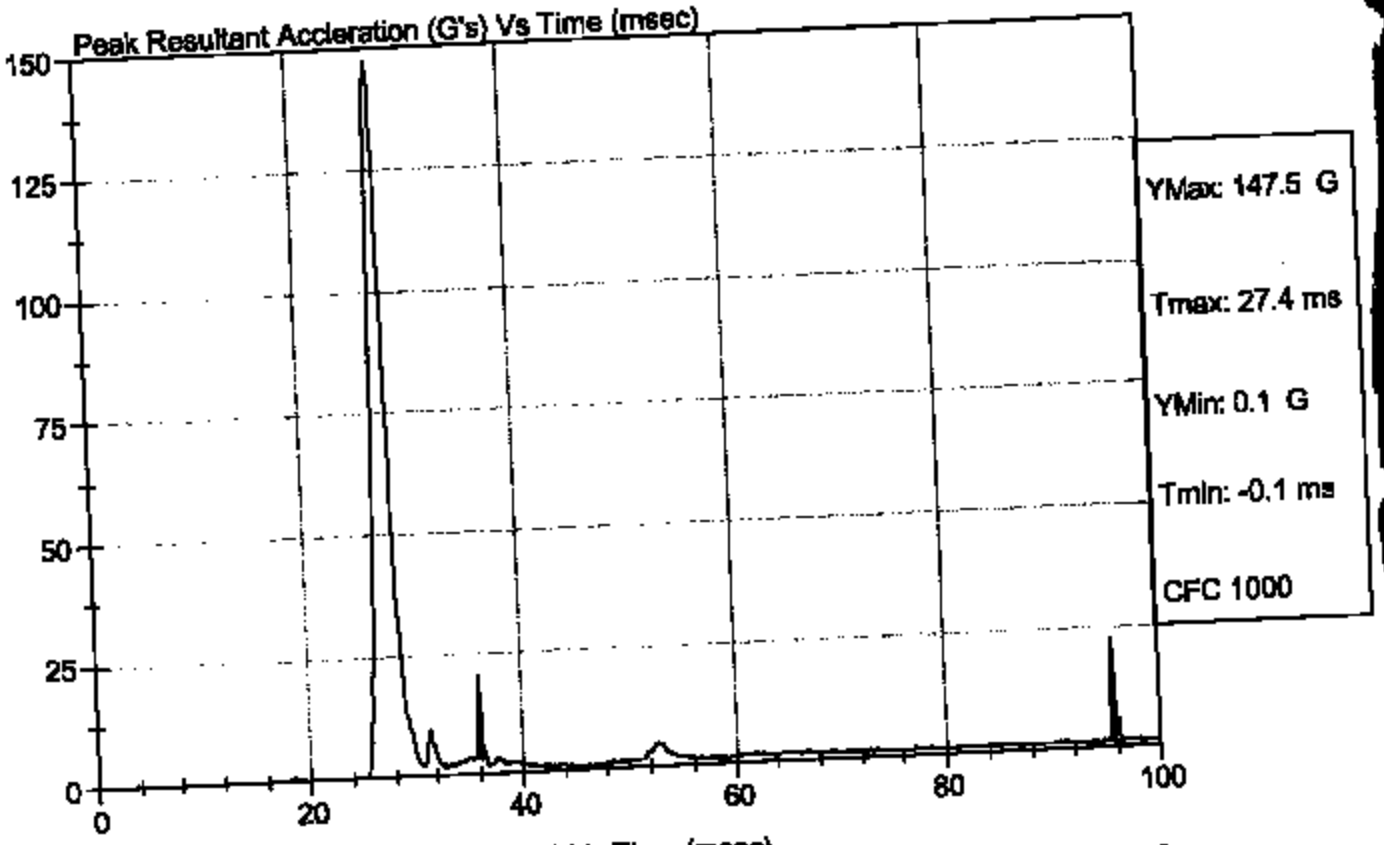
[redacted]

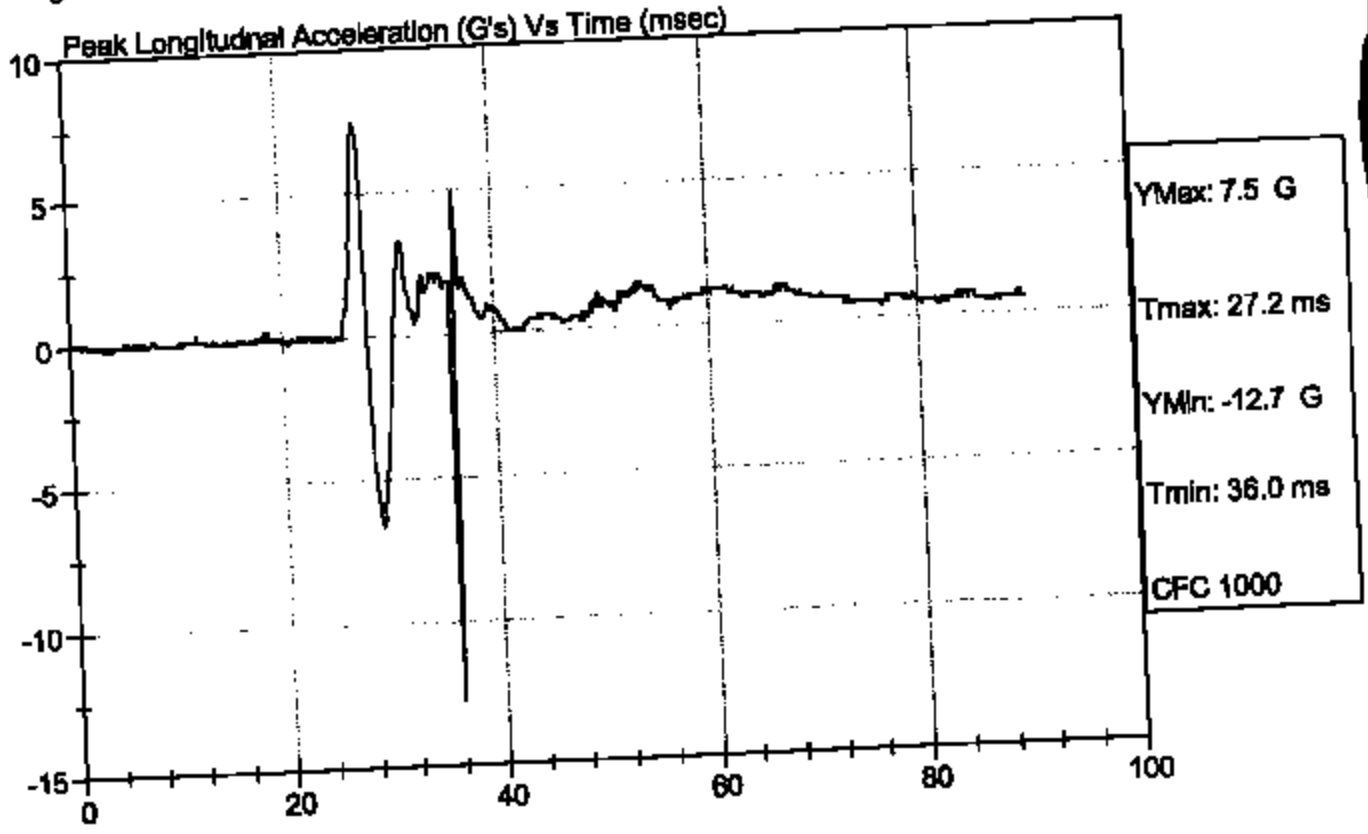
Test Description: Head Drop

Component: D051271

Test Date: 05/10/2005

Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 037 **Test I.D:** D051272

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	16.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.29	Pass
Upper Rib	G's	37 - 46	40	Pass
Lower Rib	G's	37 - 46	39	Pass
Lower Spine	G's	15 - 22	22	Pass
		Overall Test Results		Pass

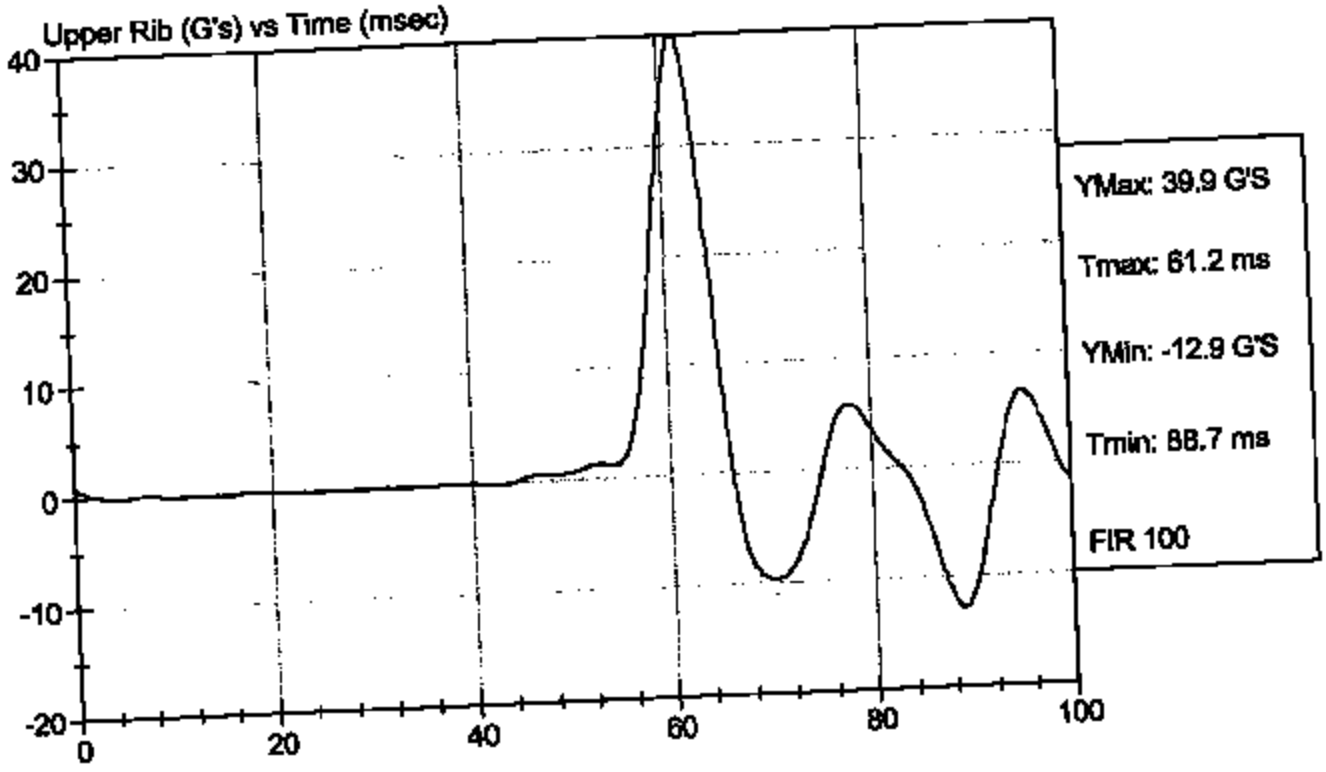
Laboratory Technician

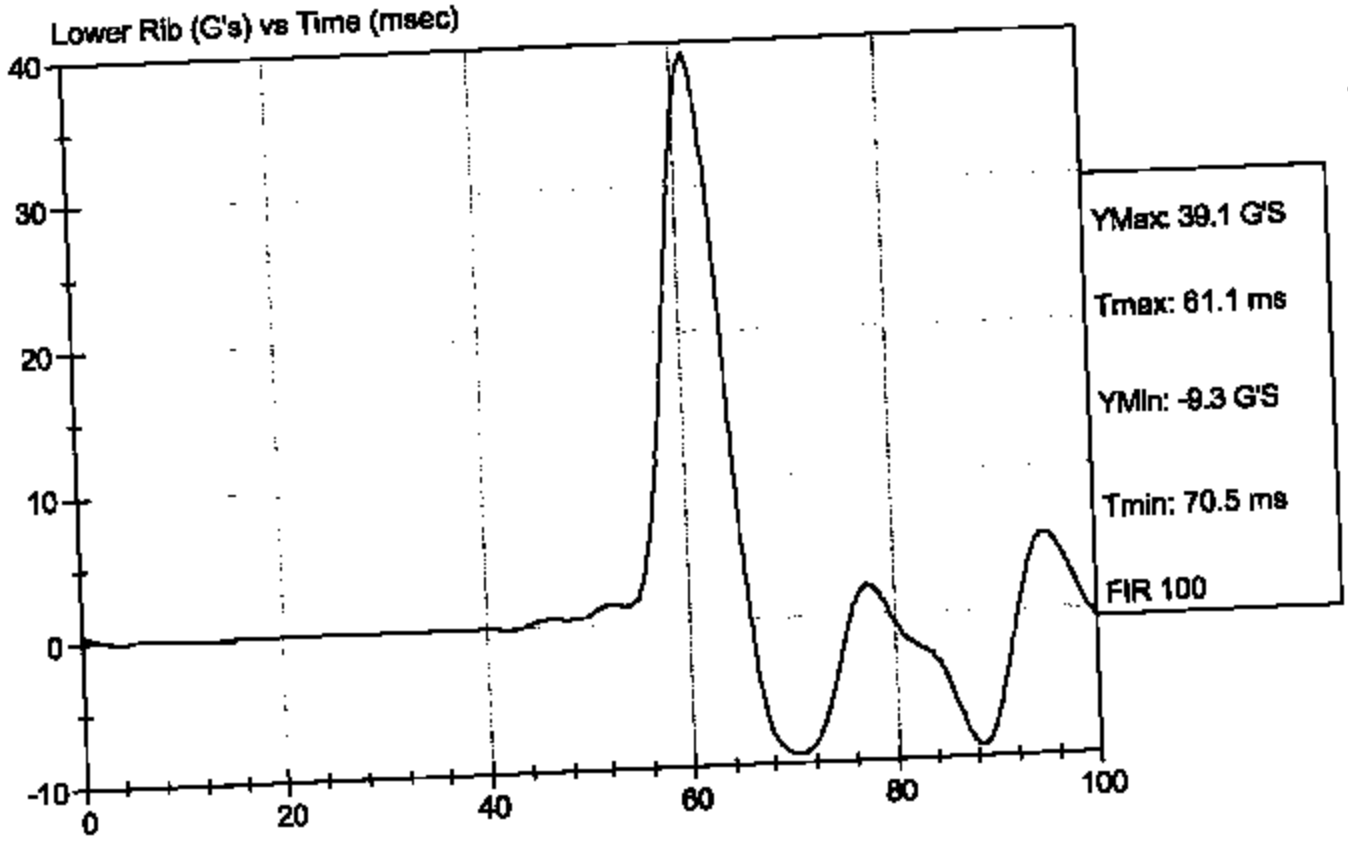
05/11/2005
Test Date

Approved By

Test Desc: Thorax Impact
Component ID: D051272

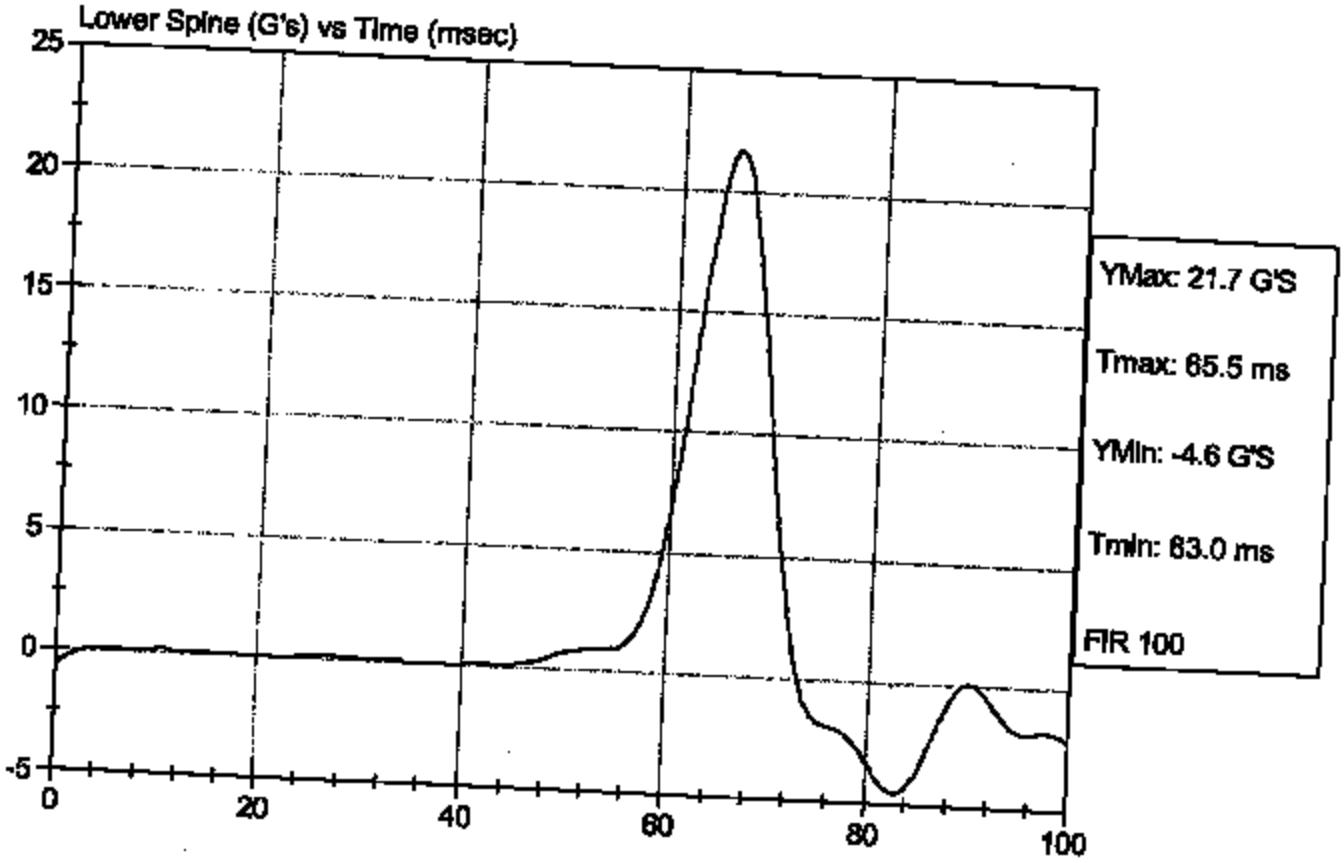
Test Date: 05/11/2005
Speed: 14.09 ft/sec, 4.29 m/sec





Test Desc: Thorax Impact
Component ID: D051272

Test Date: 05/11/2005
Speed: 14.09 ft/sec, 4.29 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 037 **Test I.D:** D051273

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	44	Pass
		Overall Test Results		Pass

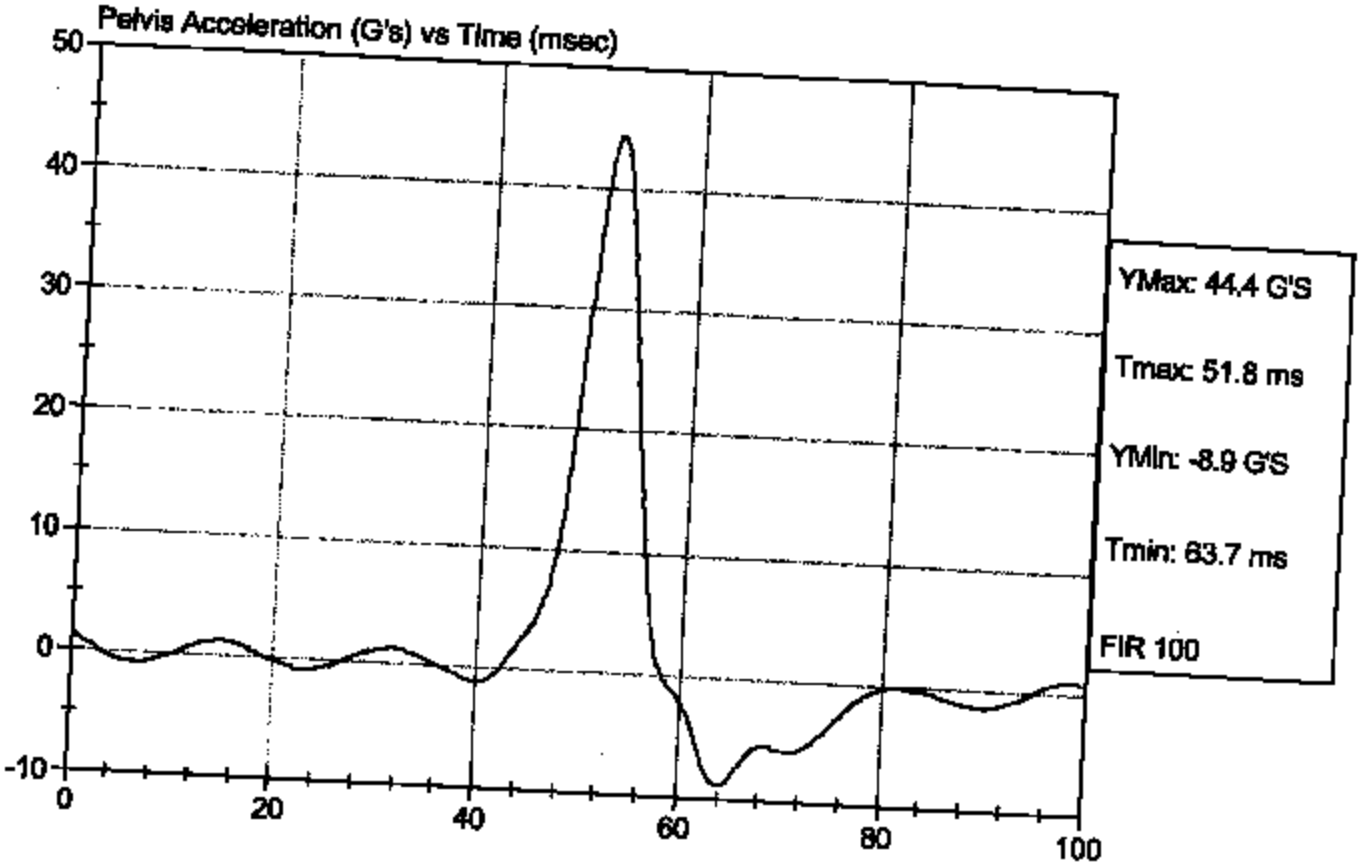
Laboratory Technician

05/11/2005
Test Date

Approved By

Test Desc: Pelvis Impact
Component ID: D051273

Test Date: 05/11/2005
Speed: 14.12 ft/sec, 4.30 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 037 **Test I.D:** D051274

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Force At 12.7 mm	N	104 -162	145	Pass
Force At 19 mm	N	163 - 222	203	Pass
Force At 25.4 mm	N	222 - 280	267	Pass
Force At 33 mm	N	325 - 391	371	Pass
		Overall Test Results		Pass

Laboratory Technician

05/10/2005
Test Date

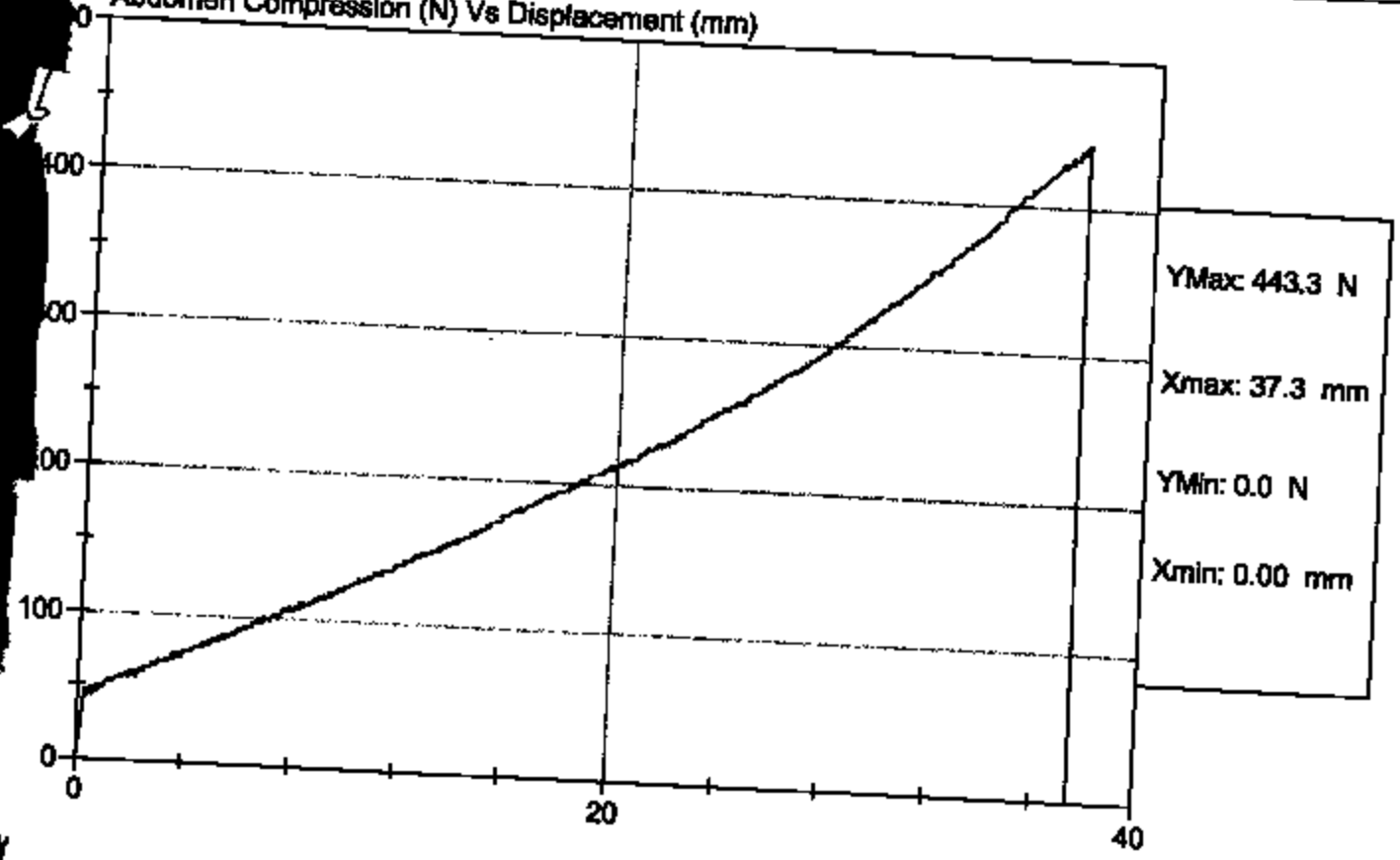
Approved By

Test Description: Abdomen Compression

Test Date: 05/10/2005

Component: D051274

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 037 **Test I.D:** D051275

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	119.6	Pass
Force At 30 deg	N	151.2 - 204.6	165.3	Pass
Force At 40 deg	N	204.6 - 258.0	216.1	Pass
Return Angle	Deg	12 Maximum	4	Pass
		Overall Test Results		Pass

Joe Flores
Laboratory Technician

05/10/2005
Test Date

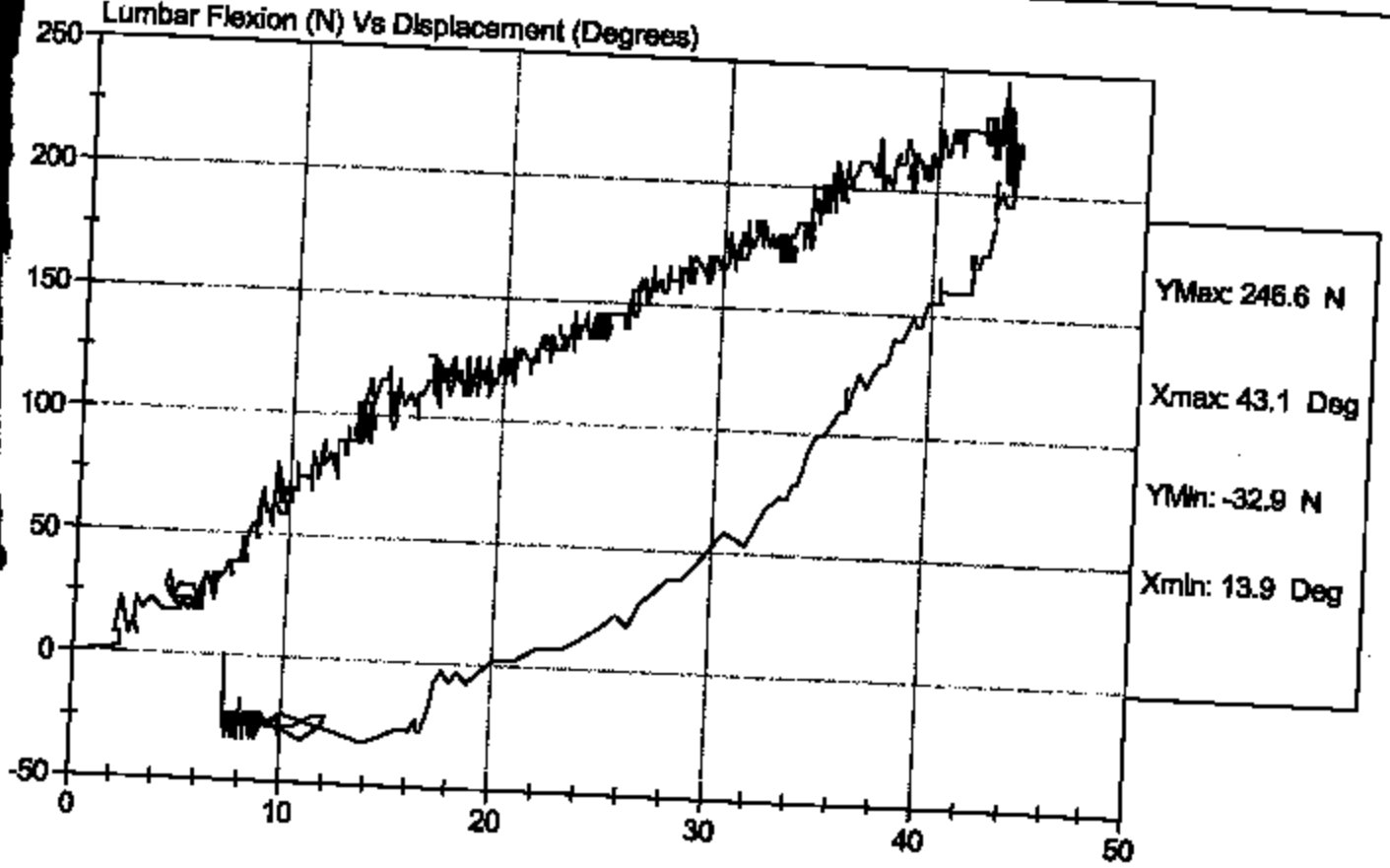
Jessica Hall
Approved By

Test Description: Lumbar Flexion

Test Date: 05/10/2005

Component: D051275

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 037 **Test I.D:** D051279

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	42	Pass
Impact Velocity		m/s	6.89 to 7.13	7.10	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.48	Pass
	20 msec	m/s	4.12 to 5.10	4.77	Pass
	30 msec	m/s	5.73 to 7.01	6.55	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.26	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	74	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	60.3	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	81	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	55	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	10	Pass

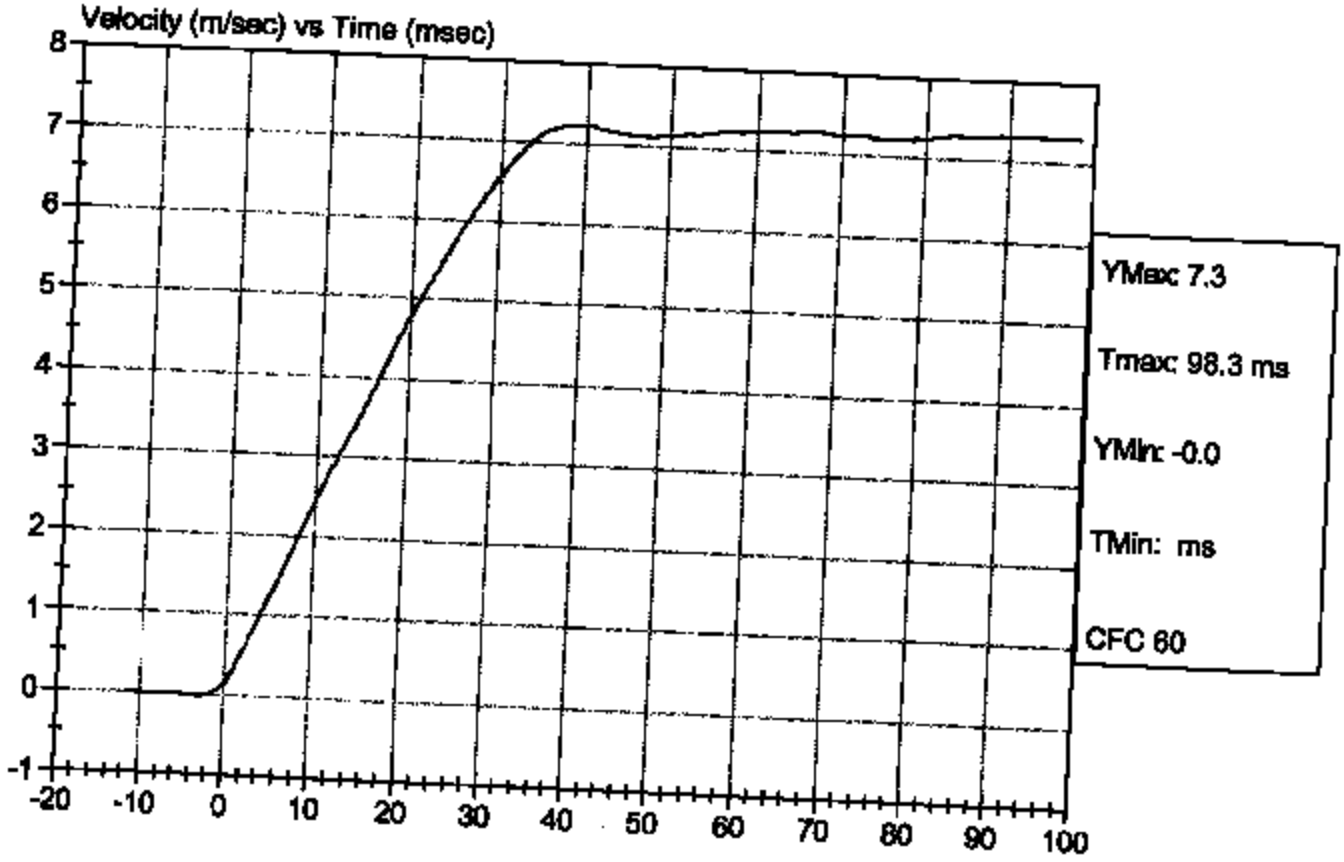
Ian Flores
Laboratory Technician

05/10/2005
Test Date

Jessica Hall
Approved By

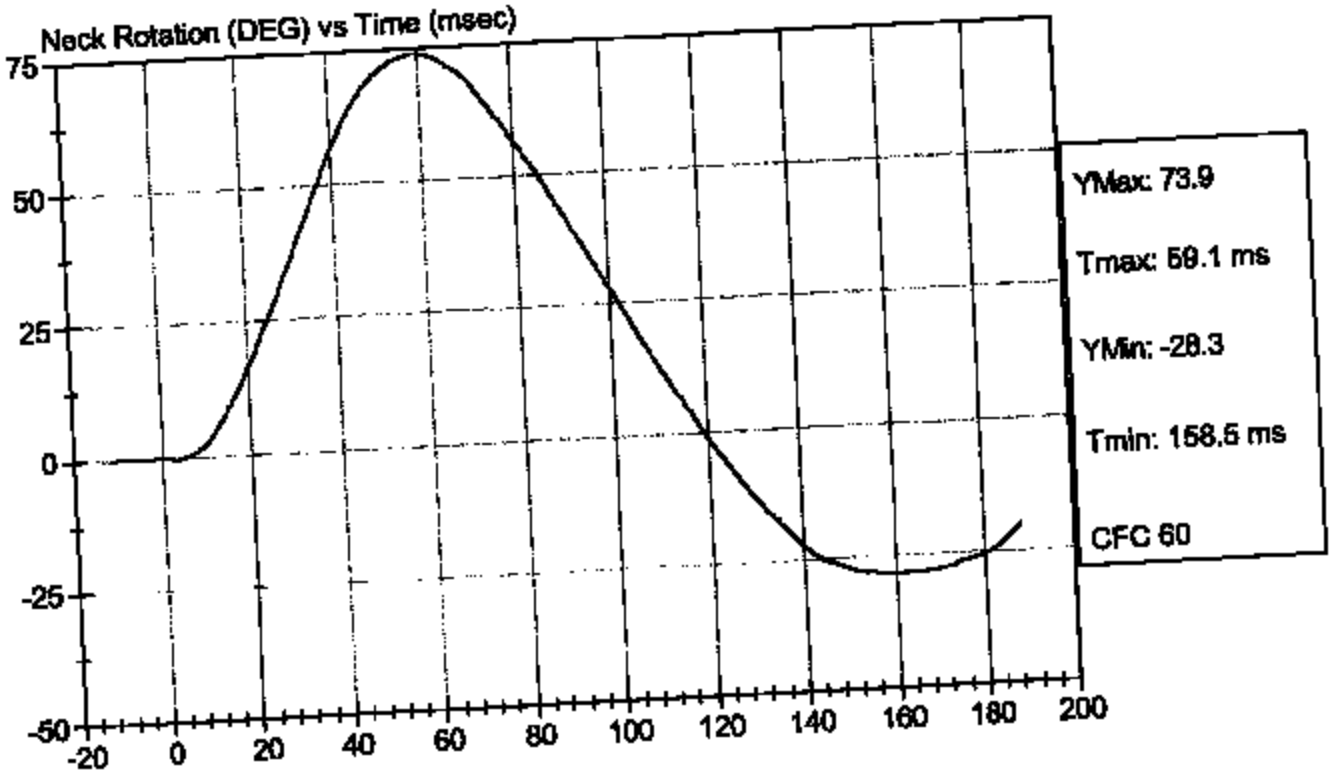
Test Desc: Neck Bending
Component ID: D051279

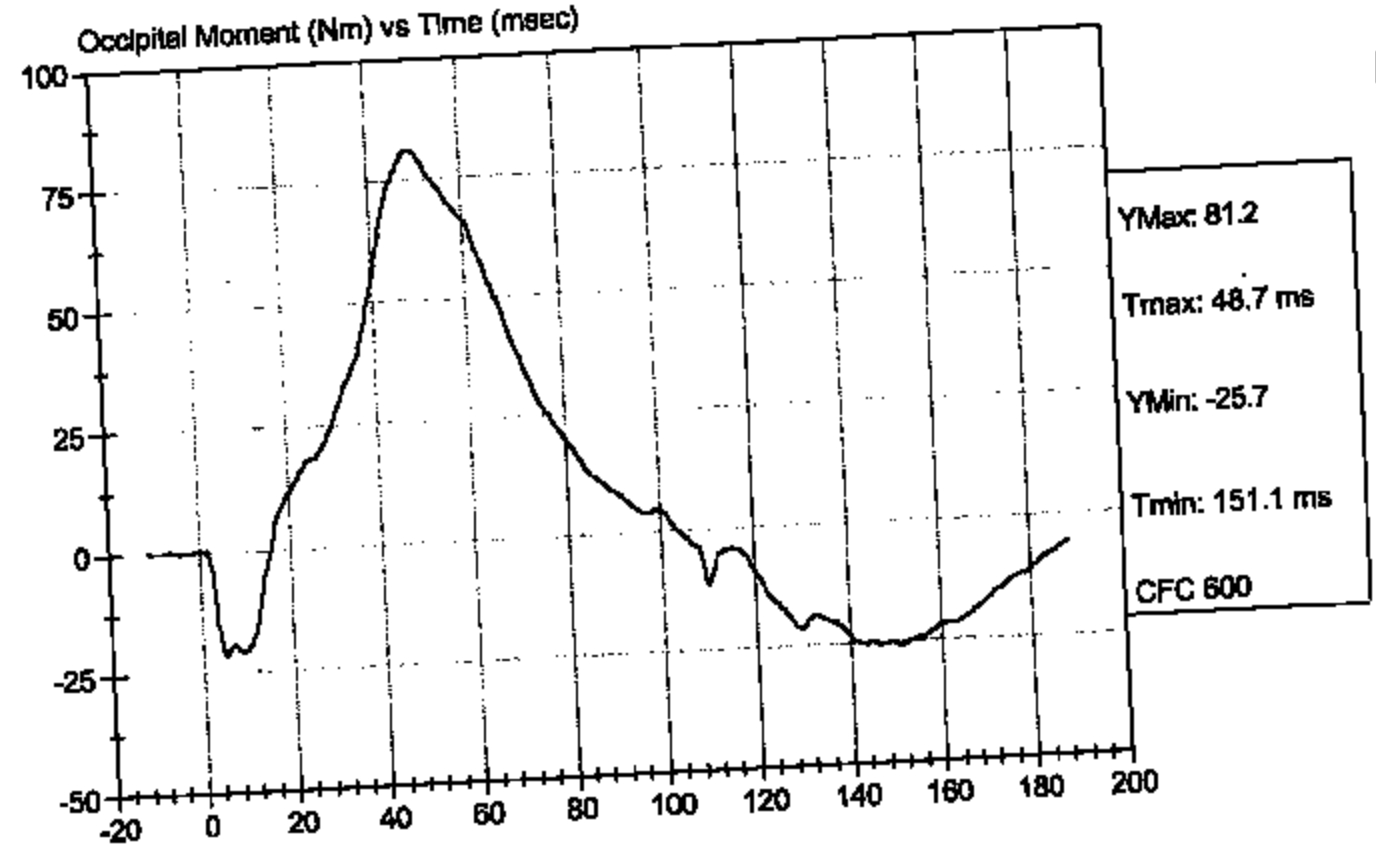
Test Date: 05/10/2005
Speed: 23.3 ft/sec, 7.10 m/sec



Test Desc: Neck Bending
Component ID: D051279

Test Date: 05/10/2005
Speed: 23.3 ft/sec, 7.10 m/sec





Calibration Test Results Summary

Dummy Serial Number: 037

Post-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all pendulum test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet

Side Impact Dummy

Head Drop Calibration (Lateral)

ATD Serial No: 037 **Test I.D:** D051421

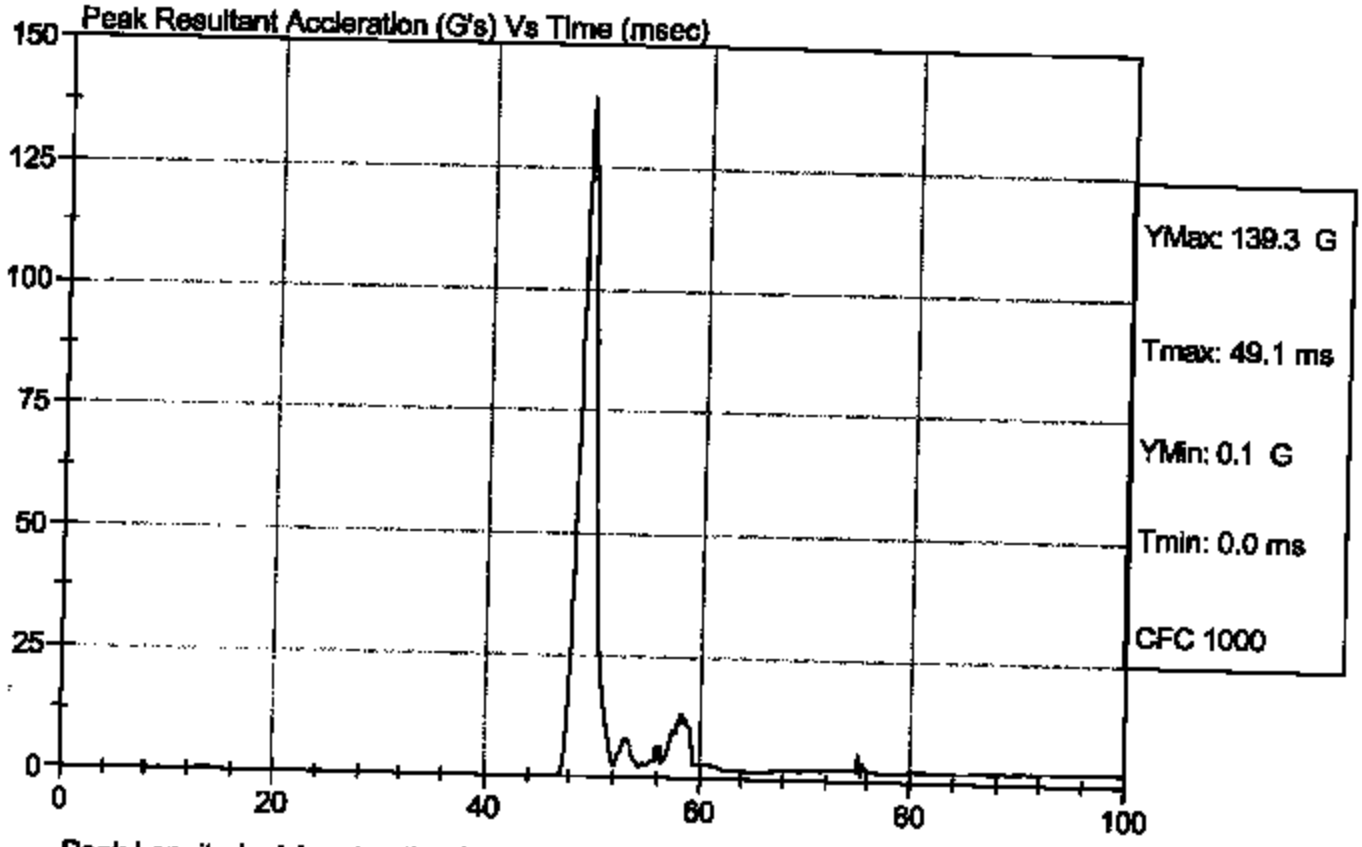
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Peak Resultant Acceleration	G's	120 to 150	139	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-10	Pass
		Overall Test Results		Pass

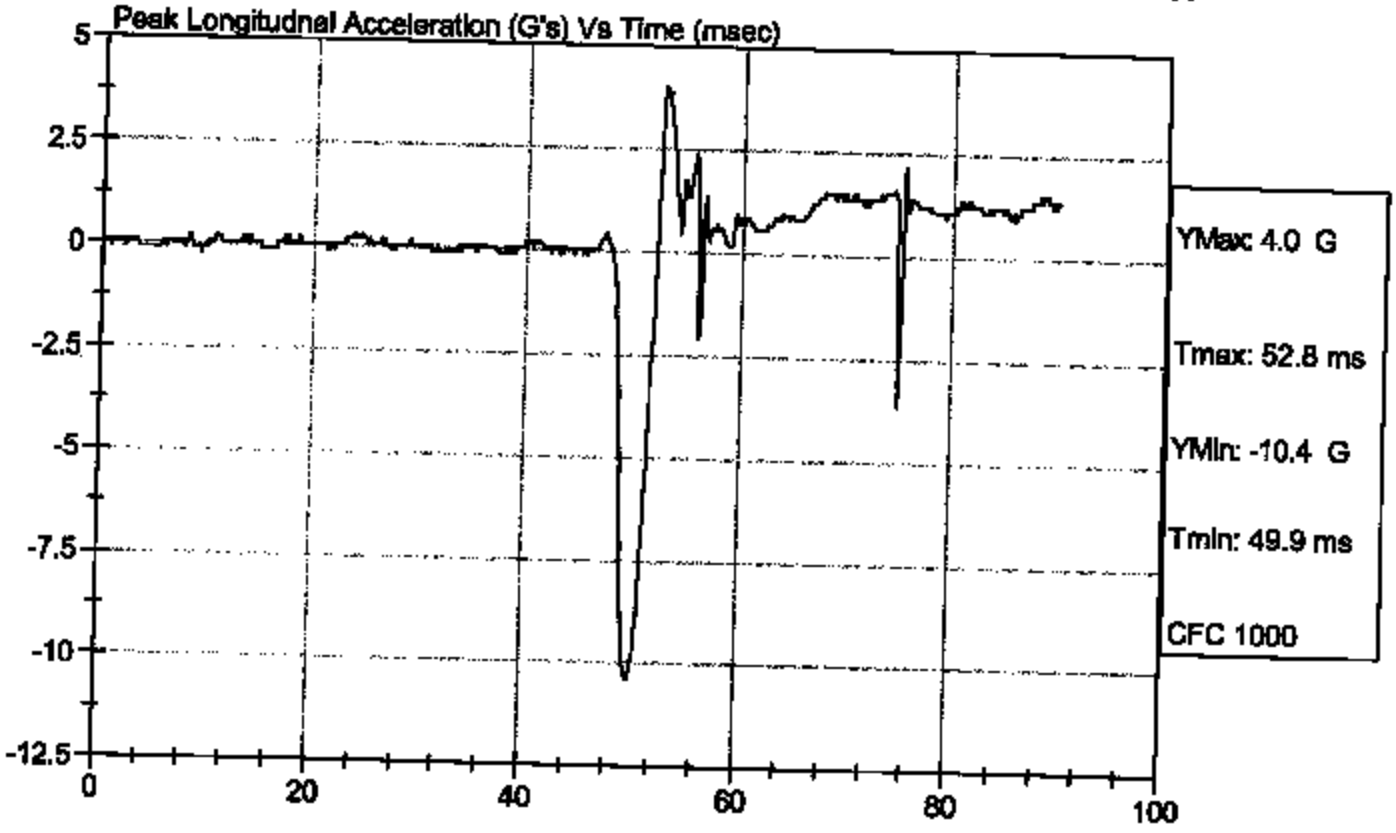
Laboratory Technician

05/24/2005
Test Date

Approved By

	Test Description: Head Drop	Test Date: 05/24/2005
	Component: D051421	Speed: 0 ft/s, 0.00 m/s





SID Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 037 **Test I.D:** D051422

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	4.27 - 4.33	4.32	Pass
Upper Rib	G's	37 - 46	41	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	22	Pass
		Overall Test Results		Pass

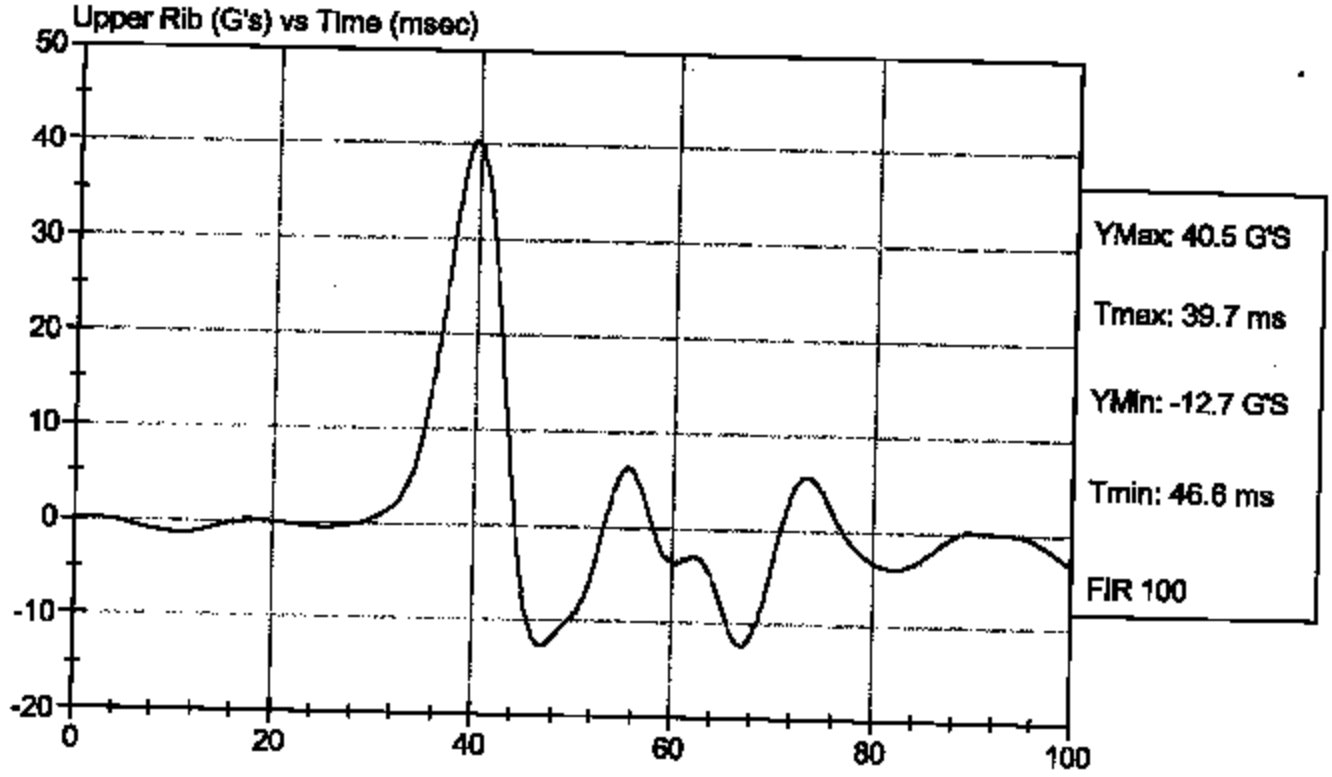
Laboratory Technician

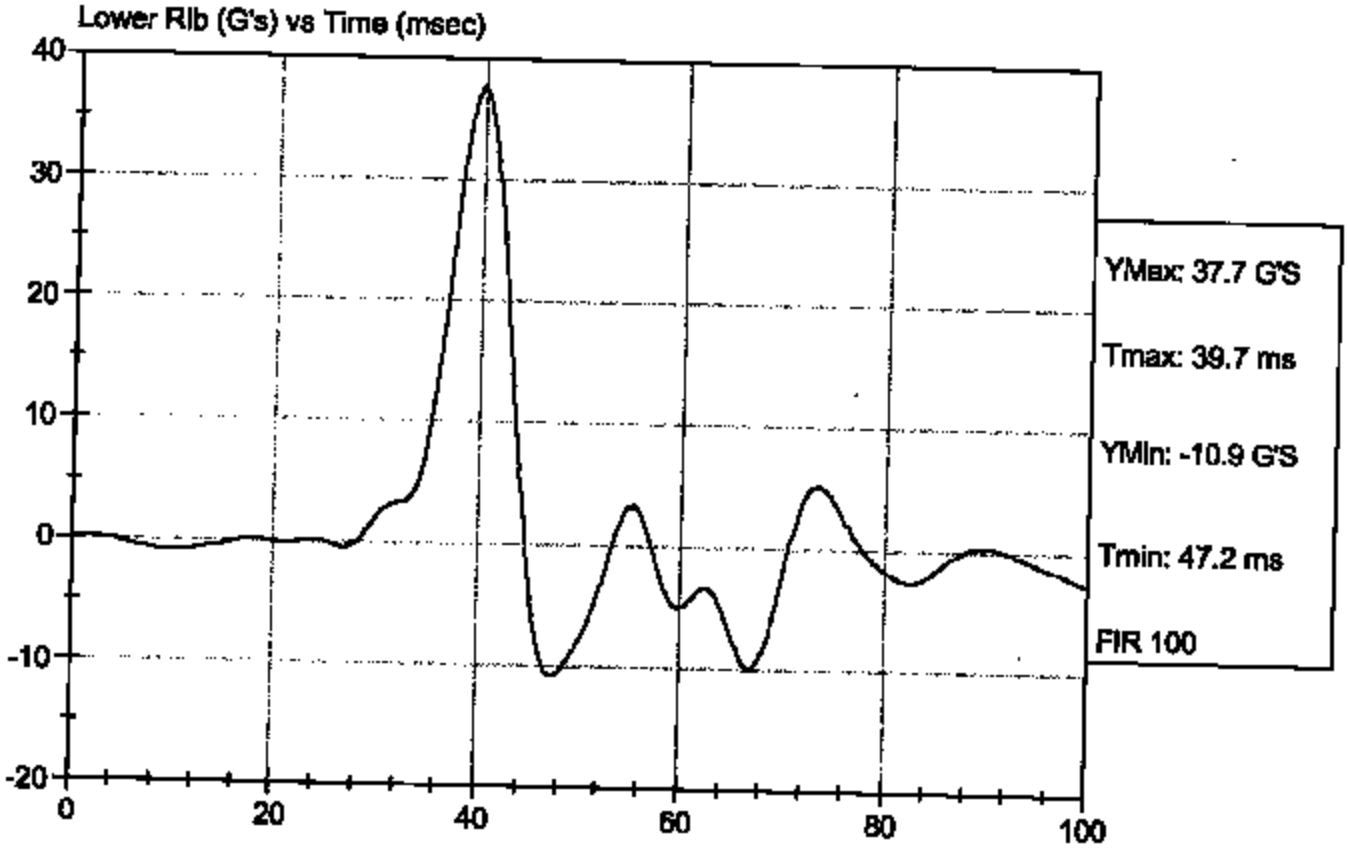
05/24/2005
Test Date

Approved By

Test Desc: Thorax Impact
Component ID: D051422

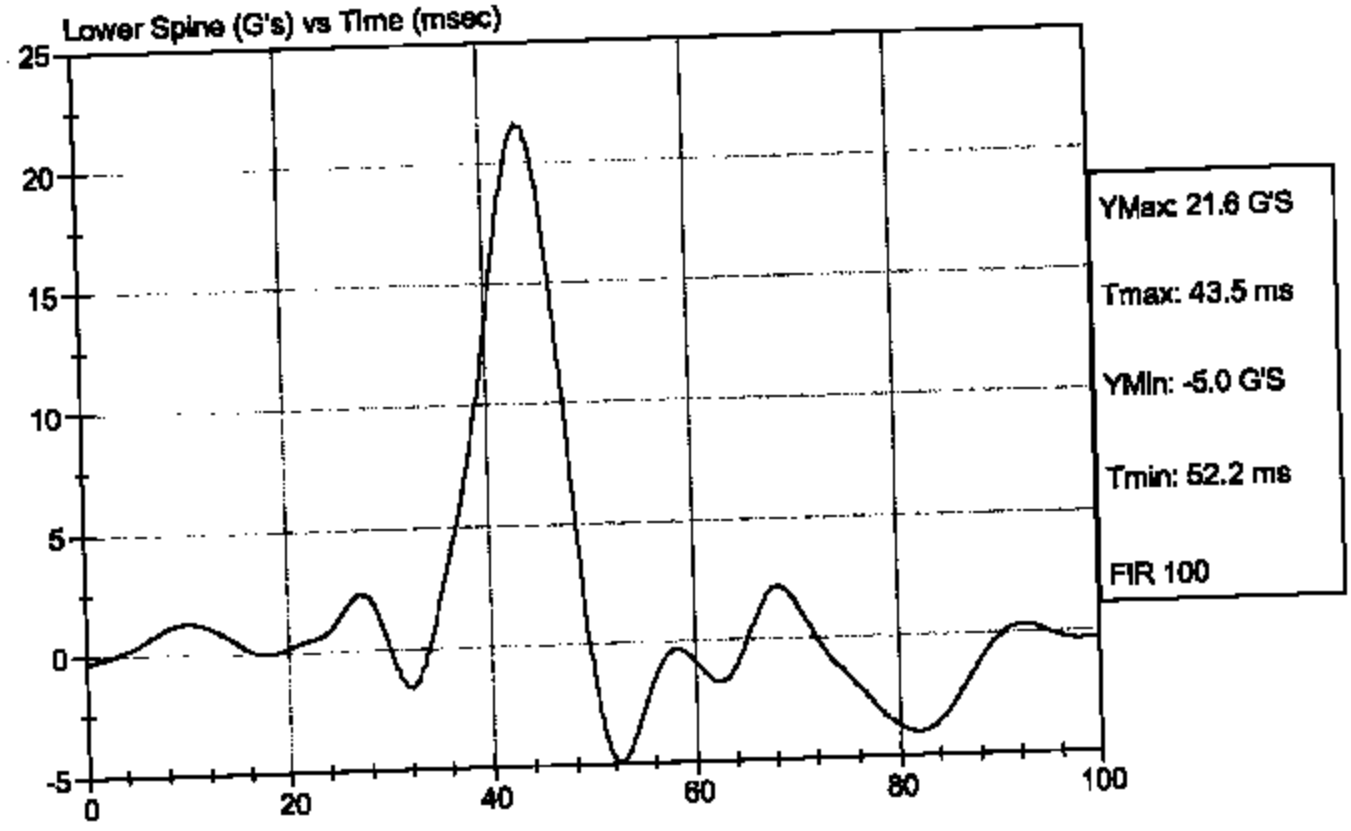
Test Date: 05/24/2005
Speed: 14.17 ft/sec, 4.32 m/sec





Test Desc: Thorax Impact
Component ID: D061422

Test Date: 05/24/2005
Speed: 14.17 ft/sec, 4.32 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 037 **Test I.D:** D051423

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	4.27 - 4.33	4.32	Pass
Pelvis Acceleration	G's	40 - 60	45	Pass
		Overall Test Results		Pass

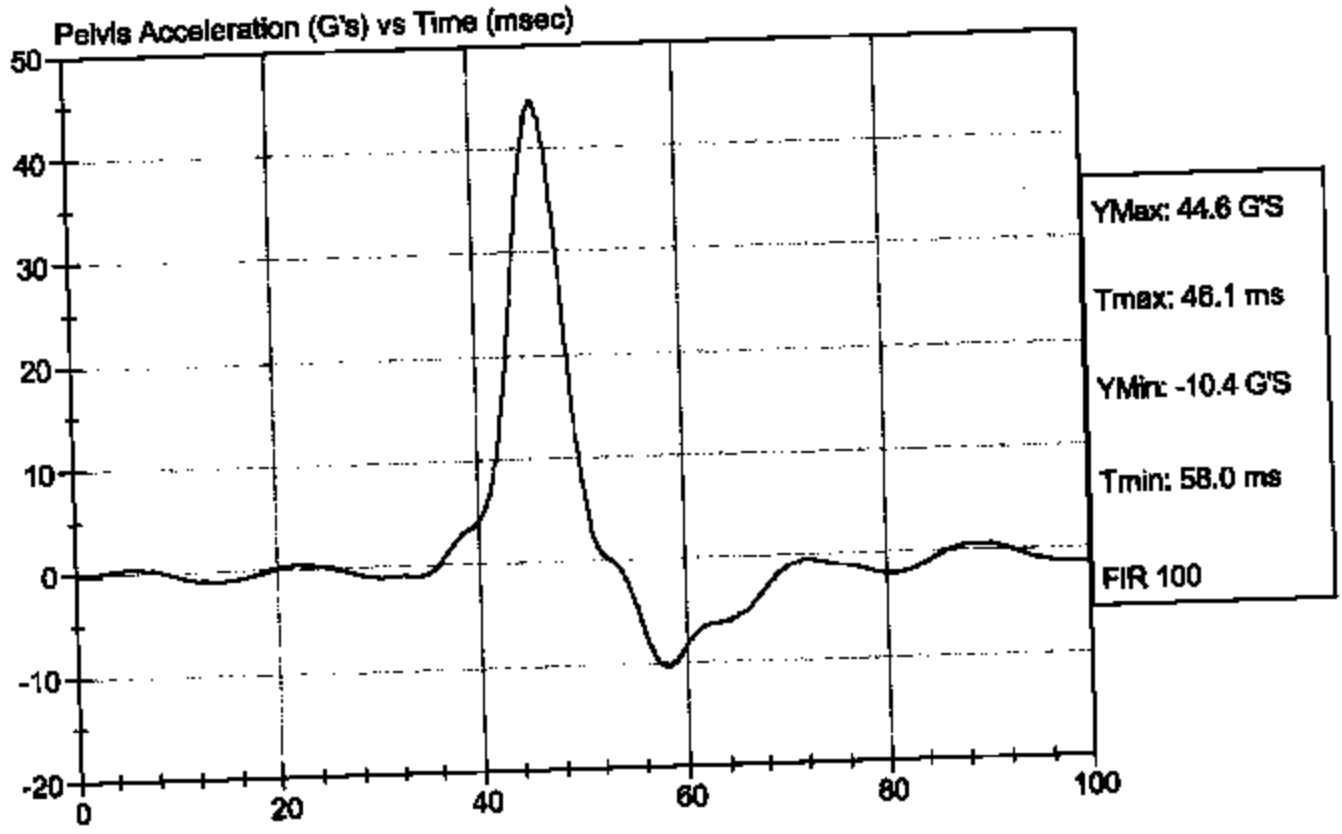
Laboratory Technician

05/24/2005
Test Date

Approved By

Test Desc: Pelvis Impact
Component ID: D051423

Test Date: 05/24/2005
Speed: 14.17 ft/sec, 4.32 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 037 **Test I.D:** D051424

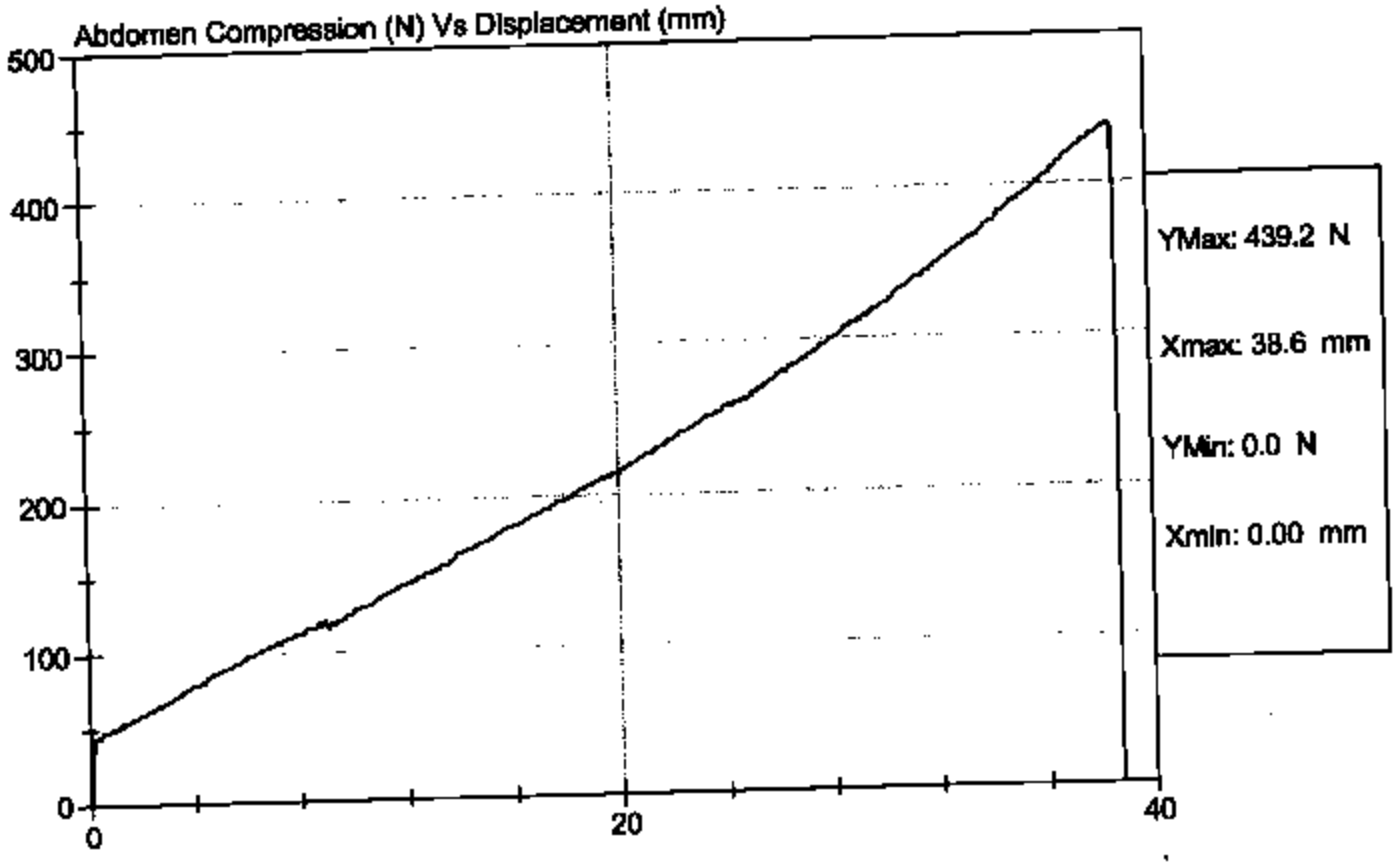
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Force At 12.7 mm	N	104 -162	149	Pass
Force At 19 mm	N	163 - 222	206	Pass
Force At 25.4 mm	N	222 - 280	268	Pass
Force At 33 mm	N	325 - 391	361	Pass
		Overall Test Results		Pass

Laboratory Technician

05/23/2005
Test Date

Approved By

Test Description: Abdomen Compression
Test Date: 05/23/2005
Component: D051424
Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 037 **Test I.D:** D051425

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	125.7	Pass
Force At 30 deg	N	151.2 - 204.6	166.3	Pass
Force At 40 deg	N	204.6 - 258.0	222.2	Pass
Return Angle	Deg	12 Maximum	4	Pass
		Overall Test Results		Pass

Laboratory Technician

05/23/2005
Test Date

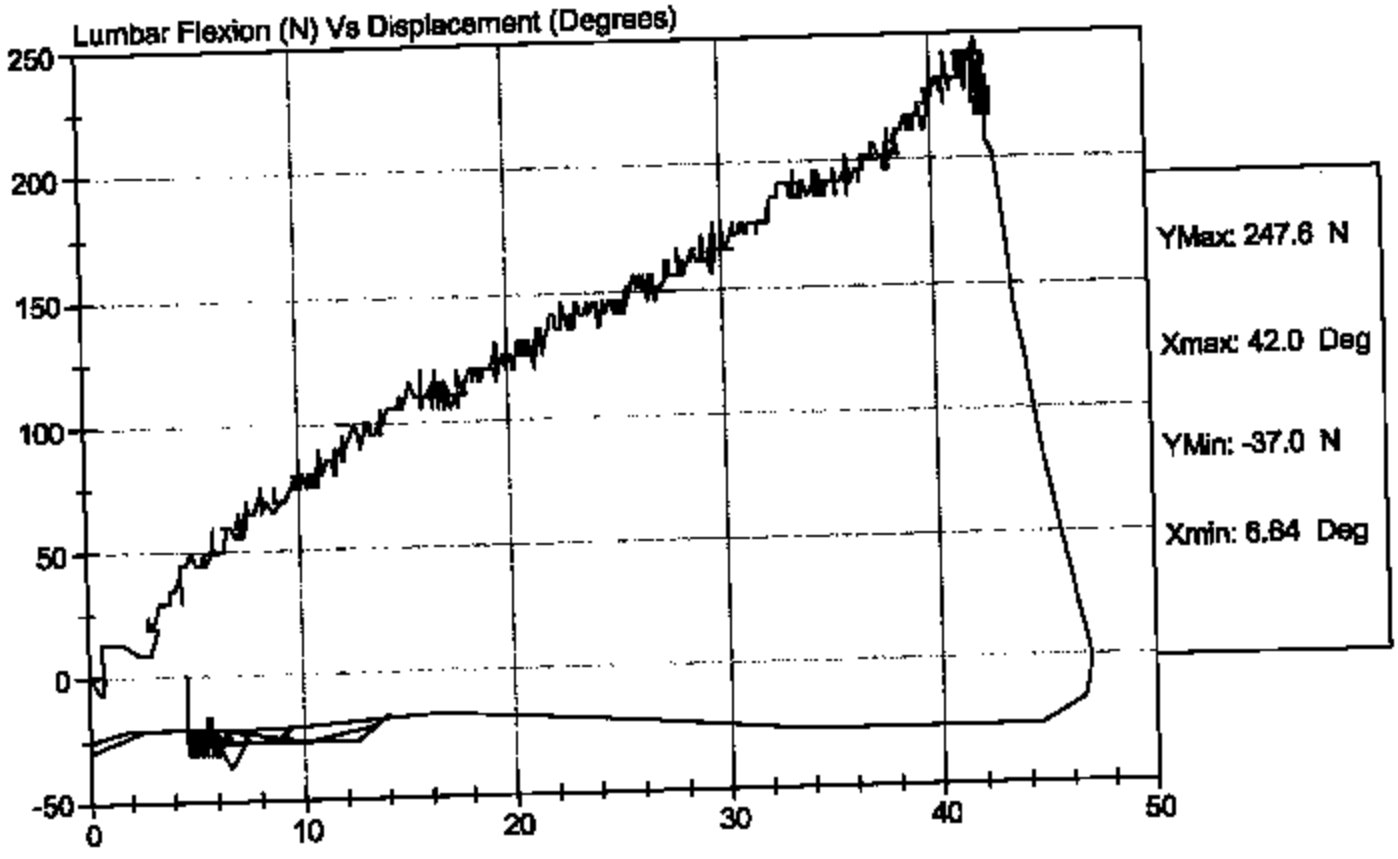
Approved By

Test Description: Lumbar Flexion

Test Date: 05/23/2005

Component: D051425

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet

Side Impact Dummy (SID)

Neck Pendulum Test

ATD Serial No: 037 **Test I.D:** D051429

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Impact Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.26	Pass
	20 msec	m/s	4.12 to 5.10	4.47	Pass
	30 msec	m/s	5.73 to 7.01	6.09	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.91	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	72	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	61	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	78	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	54	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	11	Pass

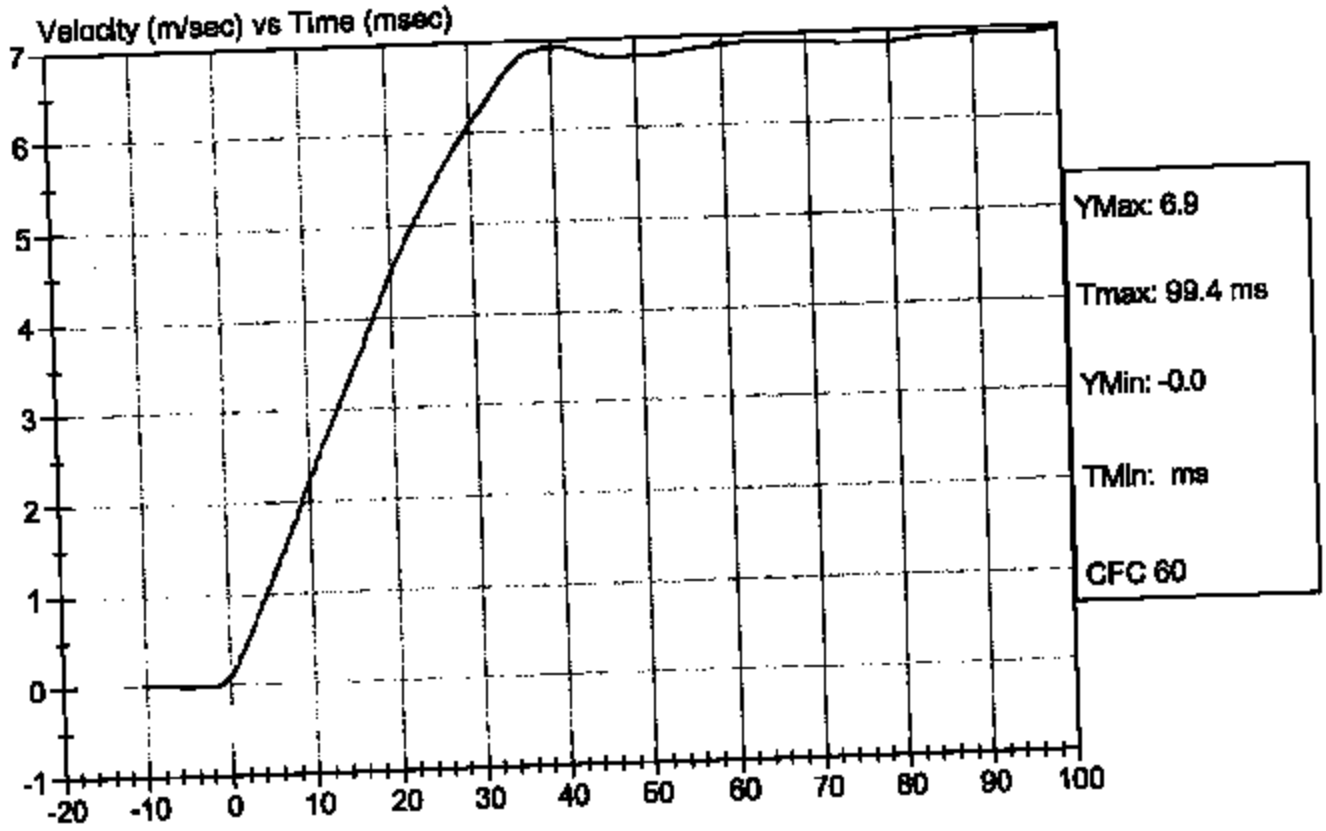
Laboratory Technician

05/23/2005
Test Date

Approved By

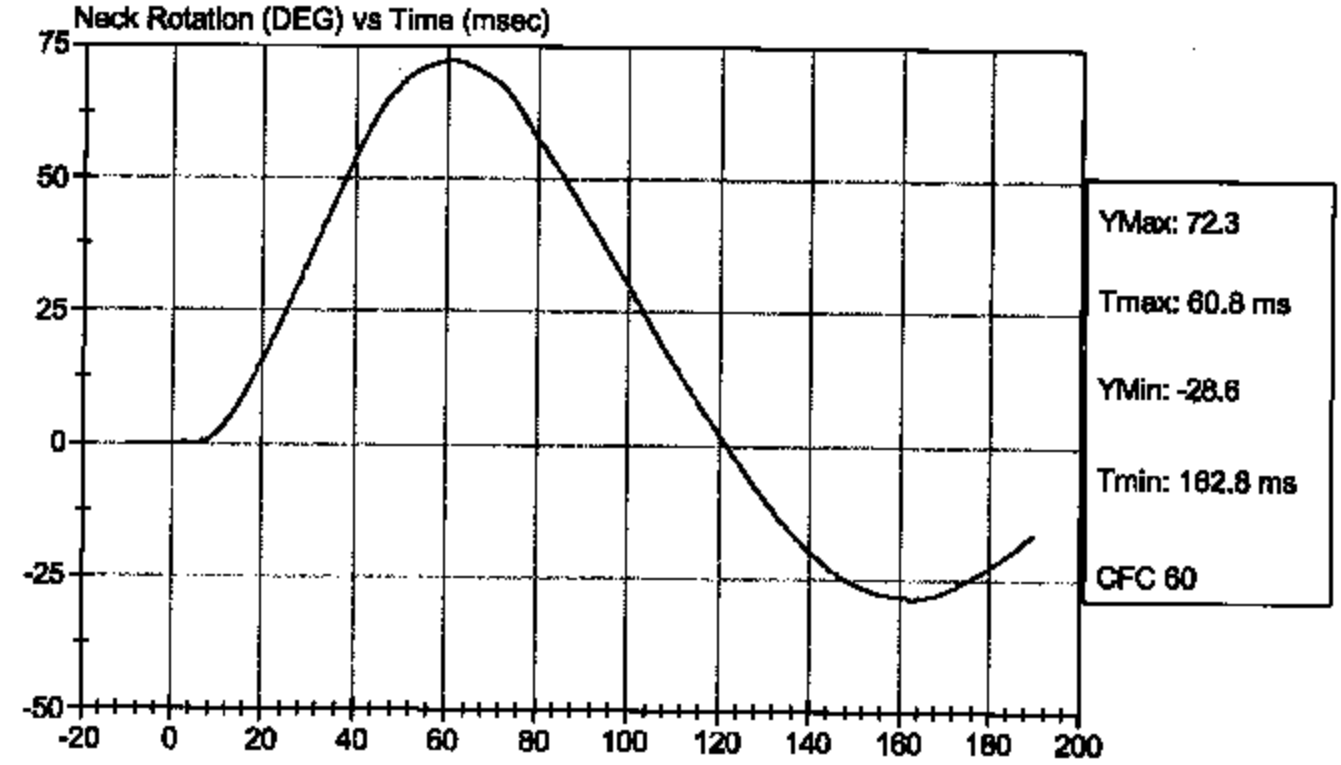
Test Desc: Neck Bending
Component ID: D051429

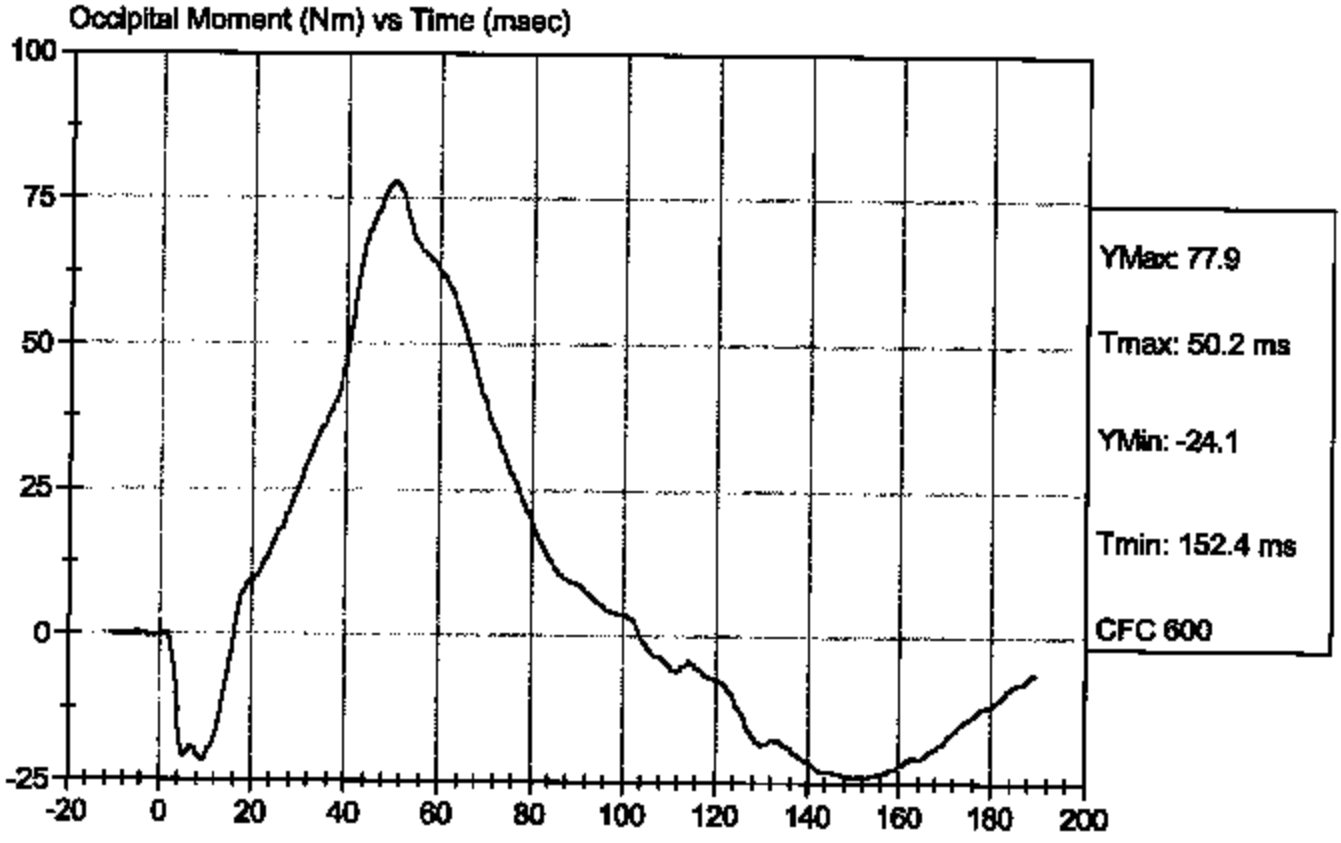
Test Date: 05/23/2005
Speed: 23.19 ft/sec, 7.07 m/sec



Test Desc: Neck Bending
Component ID: D051429

Test Date: 05/23/2005
Speed: 23.19 ft/sec, 7.07 m/sec





SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No: 037

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

Laboratory Technician

05/24/2005
Test Date

Approved By

APPENDIX D

CALIBRATION INFORMATION DATA

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR DRIVER S/N 037		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head CG X	C10770	Endevco	03/17/05
Head CG Y	AH5E5	Endevco	03/17/05
Head CG Z	C12863	Endevco	03/21/05
Neck Load Cell	1748	Denton	03/11/05
Upper Rib Y	G16-Z10	Entran	04/27/05
Lower Rib Y	G16-Z09	Entran	04/27/05
Lower Spine Y	F22-Z01	Entran	04/27/05
Pelvis Y	J14-J17	Entran	03/15/05
Upper Rib Redundant Y	F08-Z15	Entran	03/02/05
Lower Rib Redundant Y	F15-M11	Entran	03/02/05
Lower Spine Redundant Y	F09-N03	Entran	03/02/05
Pelvis Redundant Y	B26-J11	Entran	04/12/05

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Vehicle CG X	B19-Z04	Entran	03/09/05
Vehicle CG Y	B19-Z15	Entran	03/09/05
Vehicle CG Z	B16-Z17	Entran	03/09/05
Left Floor Y	C06-L09	Entran	03/24/05
Left A-Post @ Sill Y	B28-Z12	Entran	03/17/05
Left Lower A-Post Y	B26-Z16	Entran	03/17/05
Left Mid A-Post Y	C09-Y04	Entran	04/22/05
Left B-Post @ Sill Y	B19-Z01	Entran	03/03/05
Left Lower B-Post Y	B19-Z13	Entran	03/03/05
Left Mid B-Post Y	D03-Z25	Entran	04/25/05
Driver Seat Track Y	B26-Z15	Entran	03/17/05
LF Door Accel. #1 Y	J07-M16	Entran	04/28/05
LF Door Accel. #2 Y	L17-D09	Entran	03/09/05
LF Door Accel. #3 Y	I16-B06	Entran	03/09/05
Upper Engine X	C04-L16	Entran	03/24/05
Upper Engine Y	B28-Z09	Entran	03/17/05
Firewall Y	K03-J16	Entran	01/21/05
Right Floor Sill Y	C04-L08	Entran	03/24/05
Rear Deck X	C11-Z13	Entran	03/31/05
Rear Deck Y	C09-Y09	Entran	03/31/05