

REPORT NUMBER: SideNCAPMDB-MGA-20-049

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Moving Deformable Barrier Side Impact Test**

**FORD MOTOR CO.
2021 Ford F-150 4x2 SuperCrew
NHTSA No.: M20210222**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: June 18, 2021

Final Report Date: September 28, 2021

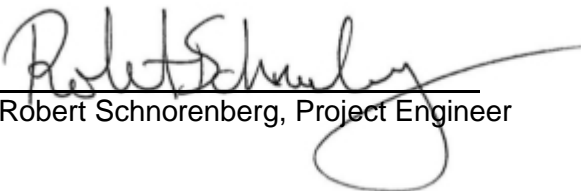
FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-100
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approval Date: September 28, 2021

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COR, New Car Assessment Program
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16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2021 Ford F-150 4x2 SuperCrew in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP MDB Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the MGA Research Corporation facility in Burlington, Wisconsin on June 18, 2021.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.99 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.2°C. The target vehicle post-test maximum crush was 299 mm at level 1. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	24
Maximum Thorax Rib Deflection	mm	44	18
Total Abdominal Force	N	2500	465
Pubic Symphysis Force	N	6000	668
Resultant Lower Spine Acceleration	g	82*	21

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	21
Resultant Lower Spine Acceleration	g	82	19
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1335
Maximum Thoracic Rib Deflection	mm	38*	7
Maximum Abdomen Rib Deflection	mm	45*	8

*Proposed IARV

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

17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590
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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2021 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00353. The purpose of this test is to generate comparative side impact performance in a 2021 Ford F-150 4x2 SuperCrew. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated March 2020.

SUMMARY

A 2021 Ford F-150 4x2 SuperCrew was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.99 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, Wisconsin on June 18, 2021. Pre-test and post-test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS NCAP Side Laboratory Test Procedure dated March 2020. The side impact event was documented by eleven (11) cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

- Primary and Redundant Head CG Triaxial Accelerometers
- Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Forward, Middle, and Rear Y-Axis Load Cells
- Lower Spine (T12) Triaxial Accelerometers
- Pubic Symphysis Y-Axis Load Cell

PASSENGER ATD (SID-IIs)

- Primary and Redundant Head CG Triaxial Accelerometers
- Head Triaxial Angular Rate Sensors
- Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Upper Rib and Lower Rib Y-Axis Displacement Potentiometers
- Lower Spine (T12) Triaxial Accelerometers
- Acetabulum and Iliac Wing Y-Axis Load Cells

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D contains the test equipment and instrumentation calibration data.

Dummy Injury readings were recorded as follows:

DUMMY INJURY VALUES

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	24
Maximum Thorax Rib Deflection	mm	44	18
Total Abdominal Force	N	2500	465
Pubic Symphysis Force	N	6000	668
Resultant Lower Spine Acceleration	g	82*	21

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	21
Resultant Lower Spine Acceleration	g	82	19
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1335
Maximum Thoracic Rib Deflection	mm	38*	7
Maximum Abdomen Rib Deflection	mm	45*	8

*Proposed IARV

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:	No		No	

The test data can be found on the NHTSA website at www.nhtsa.gov

GENERAL COMMENTS

Left Lower B-Post Y recorded questionable data after 22 ms.

Left Rear Sill Y recorded no valid data after 45 ms.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

**DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
Test Date: 6/18/2021

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20210222	Traction Control System (TCS)	Yes
Model Year	2021	Auto-Leveling System	No
Make	Ford	Automatic Door Locks (ADL)	Yes
Model	F-150 4x2 SuperCrew	Power Window Auto-Reverse	Yes
Body Style	4-Door Pickup Truck	Other Optional Feature	No
VIN	1FTEW1CP0MKD89798	Driver Front Airbag	Yes
Body Color	Agate Black Metallic	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	156 km / 97 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	2.7 L	Driver Torso Airbag	No
Type/No. Cylinders	V6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Longitudinal	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	10	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	RWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	Yes
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Safety Restraint	N/A

Does owner's manual provide instruction to turn off automatic door locks?	Yes
---	-----

DATA FROM CERTIFICATION LABEL

Manufactured By	FORD MOTOR CO.	GVWR (kg)	2903
Date of Manufacture	03/21	GAWR Front (kg)	1429
Vehicle Type	Truck	GAWR Rear (kg)	1542

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	3	3		6	
Capacity Weight (VCW) (kg)				801	(A)
DSC x 68.04 kg				408	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				136	(A-B)

* Rated Cargo and Luggage Weight (RCLW) limited to maximum of 300 lbs (136 kg).

VEHICLE SEAT TYPE

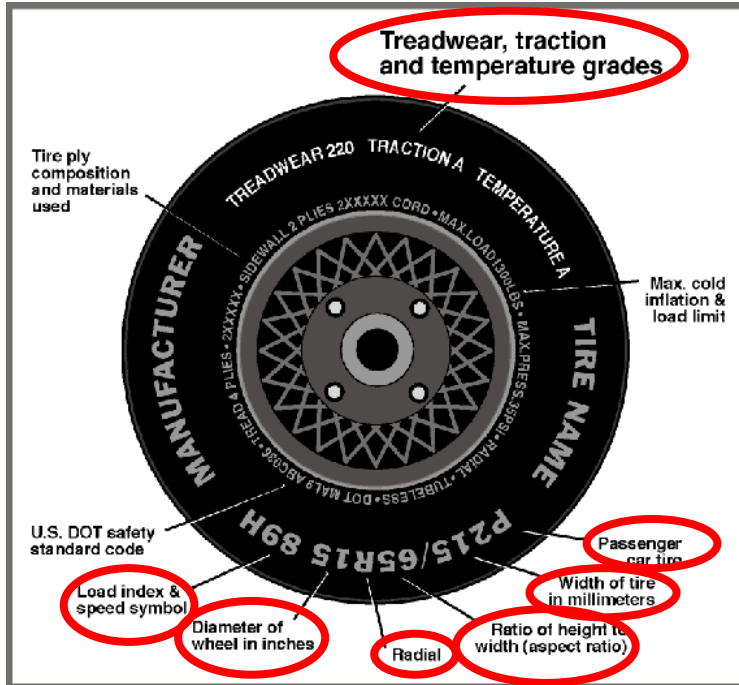
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	X					X	
Rear or Second Row			X		X		
Third Row Seat							

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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NHTSA No.: M20210222
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VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	245/70R17	245/70R17
Tire Size on Vehicle	245/70R17	245/70R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy LTX	Primacy LTX
Treadwear	540	540
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	110T	110T
Tire Material	Rubber	Rubber
DOT Safety Code Left	1M3X6 00NX 1121	1M3X6 00NX 1121
DOT Safety Code Right	1M3X6 00NX 1121	1M3X6 00NX 1121

DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

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TEST VEHICLE TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	285	285	270	285
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

MDB TIRE SPECIFICATIONS

	Requirement	Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	200 ± 21	kPa	200	200	200	200

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	624.5	446.0		674.0	558.0		676.5	559.5	
Right	kg	613.0	469.0		615.5	562.5		617.5	564.0	
Ratio	%	57.5%	42.5%		53.5%	46.5%		53.5%	46.5%	
Totals	kg	1237.5	915.0	2152.5	1289.5	1120.5	2410.0	1294.0	1123.5	2417.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2152.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	136	(C)
Calculated Test Vehicle Target Weight (TVTWTW)	kg	2417.5	(A+B+C)

Does the measured As Tested Vehicle Weight lie within the required weight range
 (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? **YES**

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement*
Left Front	mm	887	892	Yes
Right Front	mm	885	885	Yes
Right Rear	mm	943	947	Yes
Left Rear	mm	944	938	Yes
Vehicle CG (Aft of Front Axle)	mm	1721	1722	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	19	19	

* ND=Nose Down (-), NU=Nose Up (+) ** LD=Left Down (-), LU=Left Up (+)

*** The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well.

Test height adjustable suspension setting, if applicable:	Not Applicable
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DATA SHEET NO. 1 (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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NHTSA No.: M20210222
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WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Units	Weight
Weight of Ballast Added	kg	89
Components Removed: none	kg	

TEST SURFACE MARKINGS

	Units	Distance from 63° Impact Angle Line
Fore 25 mm Target	mm	1000
Aft 25 mm Target	mm	1008
Pre-Impact Angle Line	mm	100

Parallel Track Target	Units	X Location	Y Location
A	mm	0	0
B	mm		
C	mm		
D	mm		

DATA SHEET NO. 2
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat	Fixed	Fixed	Fixed
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As-Tested SCRL Angle (Mid) (°)	As-Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

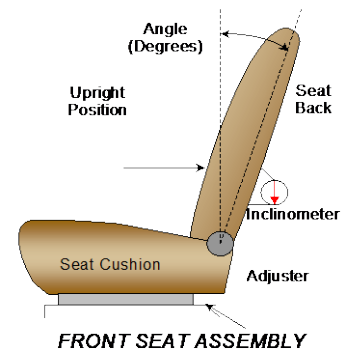
NHTSA No.: M20210222
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SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1 st as 1)	mm	Detent (1 st as 0)
Driver Seat	255	38	130	19
Front Passenger Seat	240	35	120	17
Front Center Seat	Fixed		Fixed	
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents (1 st as 1)	Degrees	Detent (1 st as 0)
Driver Seat	60.2	34	3.1	9
Front Passenger Seat	60.1	34	2.9	9
Front Center Seat	Fixed		Fixed	
Struck Side Rear Seat	Fixed		7.9	
Non-Struck Side Rear Seat	Fixed		7.9	
Rear Center Seat	Fixed		7.9	

Seat back angles measured on outboard headrest post.

DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on S1 - Vehicle Setup Information.

	Total # of Positions	Placed in Position #
Driver Seat	4	1 (Uppermost as 0)
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

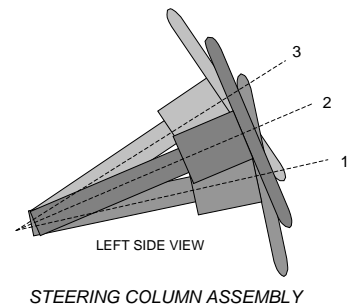
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	3	2 (Lowest as 0) / Fixed Fore-Aft
Rear Seat	1	1 (Lowest as 0) / Fixed Fore-Aft

STEERING COLUMN ADJUSTMENT

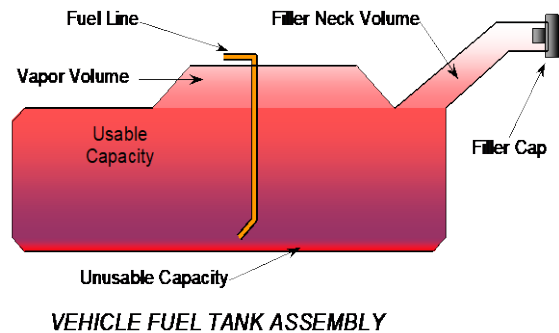
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

	Wheel Angle (°)	Fore/Aft Position (mm)
Lowermost, Position 1	70.5	
Geometric Center, Position 2	67.8	
Uppermost, Position 3	65.0	
Telescoping Steering Wheel Travel		52
Test Position	67.8	26



FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The electric fuel pump operates for 3 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 3 seconds following ignition actuation the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls the fuel pump is deactivated. Also, the fuel pump is shut-off by the restraint control module to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The filler neck is located on the driver's side.



DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEM DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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FUEL TANK CAPACITY DATA

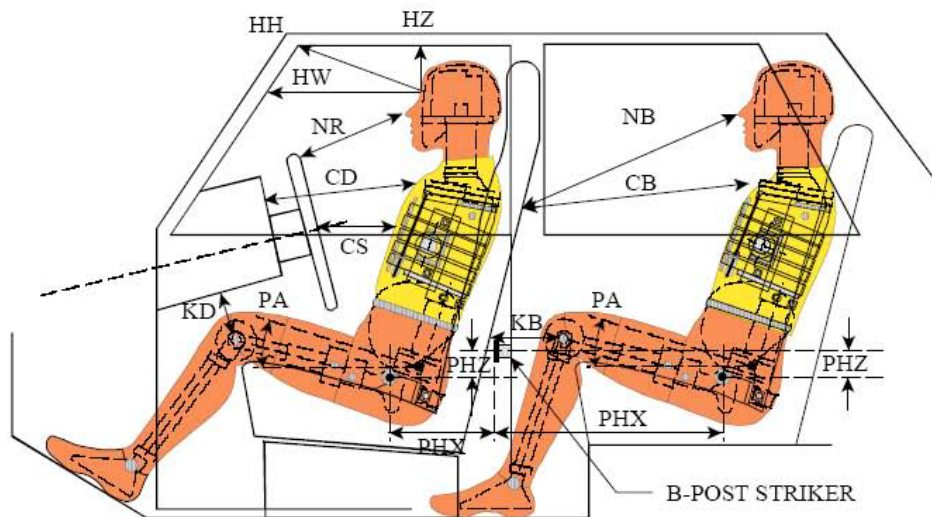
	Liters
Usable Capacity of Standard Tank (see S1 - Vehicle Setup Information)	102.2
Usable Capacity of Optional Tank (see S1 - Vehicle Setup Information)	140.4
Usable Capacity of Standard Tank as Specified in Owner's Manual	102.2
Usable Capacity of Optional Tank as Specified in Owner's Manual	140.4
93% of Usable Capacity	95.1
Actual Amount of Solvent Used	95.0
1/3 of Usable Capacity	34.1

Is the actual amount of solvent used in the test equal to 93% \pm 1%
 of the Usable Capacity stated in S1 - Vehicle Setup Information? **YES**

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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LEFT SIDE VIEW

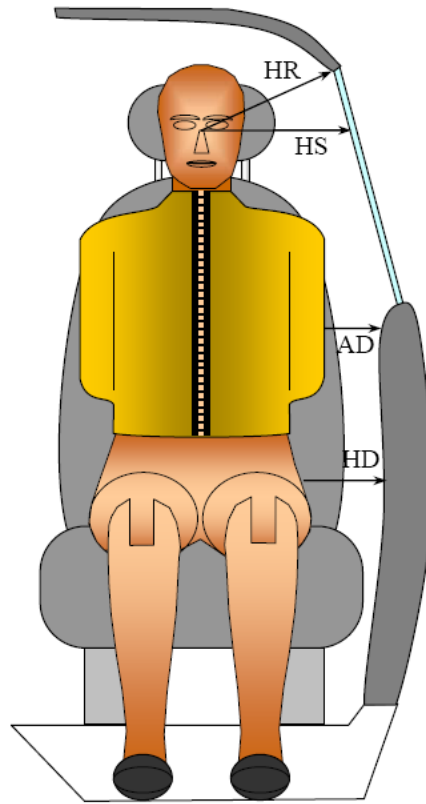
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	500	9.7		
HW		Head to Windshield	704	0		
HZ	HZ	Head to Roof Liner	195	90	319	90
NR	NB	Nose to Rim/Seat Back	459	16.4	668	0.4
CD	CB	Chest to Dashboard/Seat Back	615	1.9	668	10.7
CS		Chest to Steering Wheel	380	26.6		
KDL	KBL	Left Knee to Dash/Seat Back	224	20.8	387	17.5
KDR	KBR	Right Knee to Dash/Seat Back	195	22.1	390	17.5
PAX	PAX	Pelvic Tilt Angle X		24.9		22.3
PAY	PAY	Pelvic Tilt Angle Y		1.6		-0.7
PHX	PHX	Hip Point to Striker (X-Axis)	290		233	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	57		26	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
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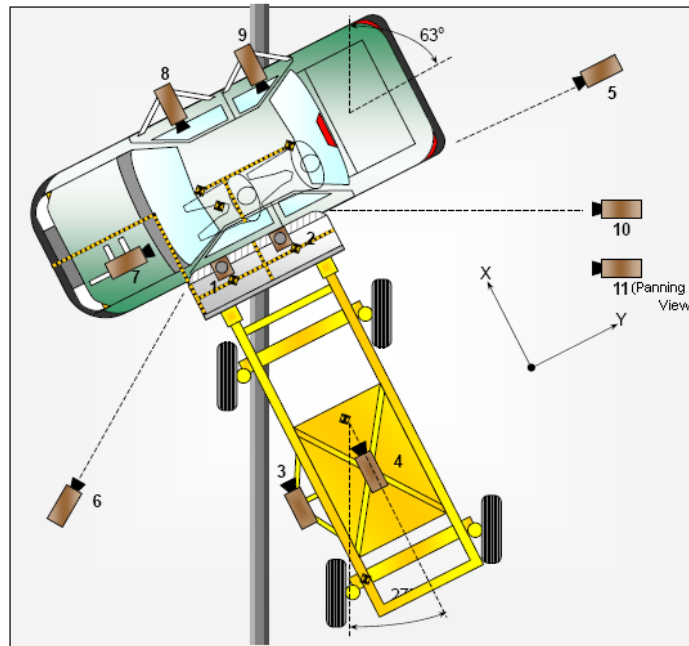


Code	Measurement Description	Driver	Passenger
		Length (mm)	
HR	Head to Side Header	201	278
HS	Head to Side Window	343	362
AD	Arm to Door	116	173
HD	Hip Point to Door	171	175

**DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates* (mm)			Lens (mm)	Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	760	-750	-4880	8.5	1000
2	Overhead Close-Up	0	90	-4900	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-105	6705	-1500	24	1000
6	Left Front	-2610	-6295	-1555	24	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8	1000
9	Passenger Side (OB)				8	1000
10	Real Time Left Rear					30
11	Real Time Inrun					30

Reference: Impact Point projected to Ground; +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

*All measurements accurate to ± 6 mm

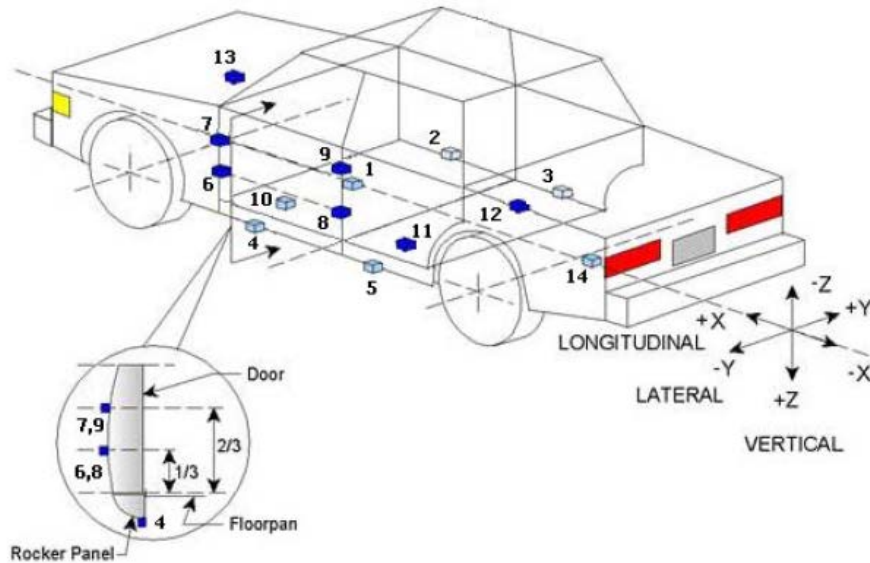
INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Passenger Dummy	19
Vehicle Structure	23
MDB Accelerometers	5
Total	63

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
Test Date: 6/18/2021



TEST VEHICLE ACCELEROMETER LOCATIONS

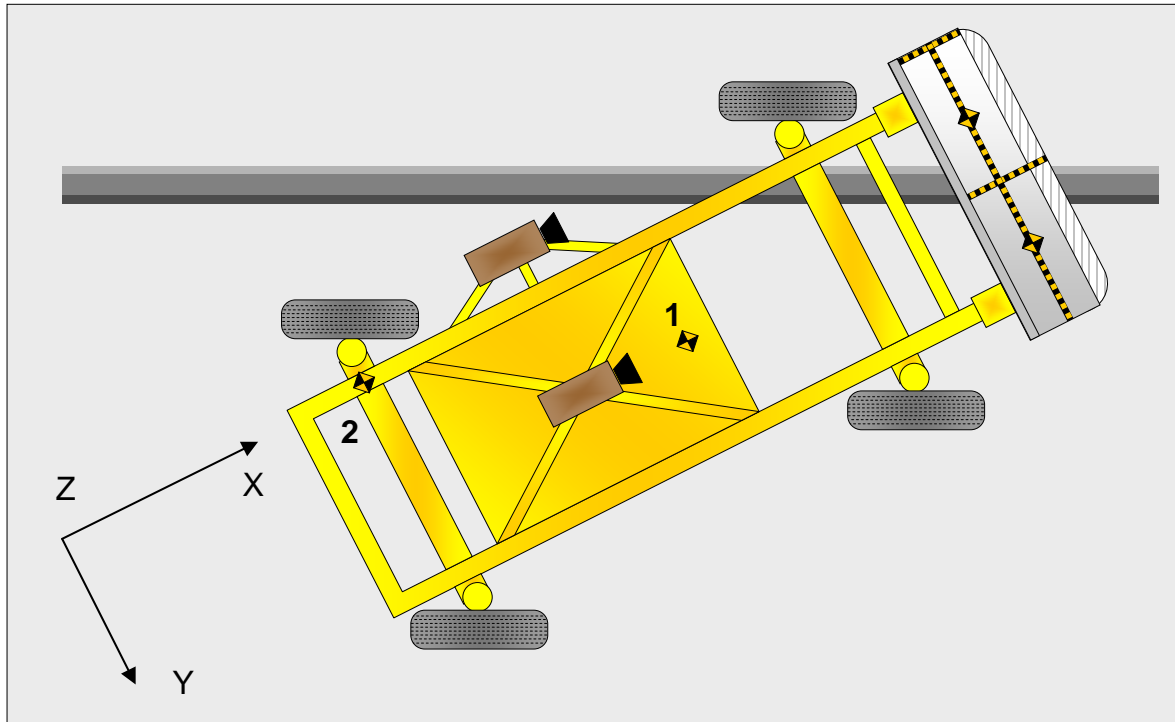
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	3221	0	-598
2	Right Sill at Front Seat	3347	835	-385
3	Right Sill at Rear Seat	2143	835	-400
4	Left Sill at Front Door	3737	-835	-375
5	Left Sill at Rear Door	2587	-835	-388
6	Left Lower A-Post	4216	-897	-695
7	Left Middle A-Post	4221	-900	-930
8	Left Lower B-Post	2985	-790	-800
9	Left Middle B-Post	2997	-790	-1040
10	Front Seat Track	3306	-445	-584
11	Rear Seat Structure	2426	-455	-599
12	Rt. Rear Occ. Compartment	2426	458	-598
13	Engine Block	4842	10	-1077
14	Rear Above Axle	1240	0	-795

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

**DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-1105	0	-330
2	MDB Rear	-2580	-650	-625

Reference: X – MDB Face (+ forward)
 Y – MDB Centerline (+ to right)
 Z – Ground Plane (+ down)

Width between left and right MDB contact switches	mm	1404
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**DATA SHEET NO. 8
POST-TEST OBSERVATIONS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Curtain Airbag	Curtain Airbag
Left Side of Head	Curtain Airbag, Headliner	Curtain Airbag
Back of Head	None	C-Pillar Trim
Left Shoulder	None	Curtain Airbag
Upper Torso	Side Torso/Pelvis Airbag, Seatback	None
Lower Torso	Side Torso/Pelvis Airbag, Seatback	Door Panel
Left Hip	Side Torso/Pelvis Airbag	Door Panel
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	
Disengaged from Latched Position	No	No	No	No	
Latch Separated from Striker	No	No	No	No	
Jammed Shut	Yes	Yes	No	No	
If Door Opened at Striker, Record Width of Opening at Striker (mm)					

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	None
Side Window Damage	LF window cracked
Other Notable Effects	RR tire deflated after impact

**DATA SHEET NO. 8 (CONTINUED)
POST-TEST OBSERVATIONS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Left Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
	Frontal Airbag	Yes	No	
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:	No		No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		3704
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		512
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-4
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	3

**DATA SHEET NO. 9
MDB SUMMARY OF RESULTS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Face	4119
Wheelbase of Framework Carriage	2591
CG Location aft of Front Axle	1127

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	368.2	320.6	
Right	kg	400.7	271.4	
Ratio	%	56.5	43.5	
Totals	kg	768.9	592.0	1360.9

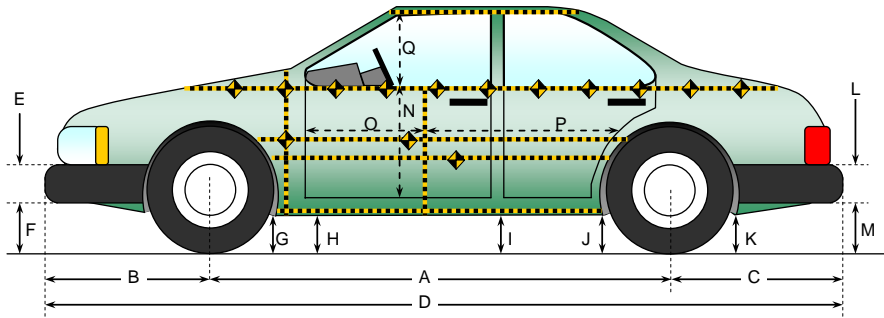
SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.99
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.47
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.2
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.9
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.7

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
Test Date: 6/18/2021



All measurements in (mm) with tolerance of ± 3 mm

LEFT SIDE VIEW

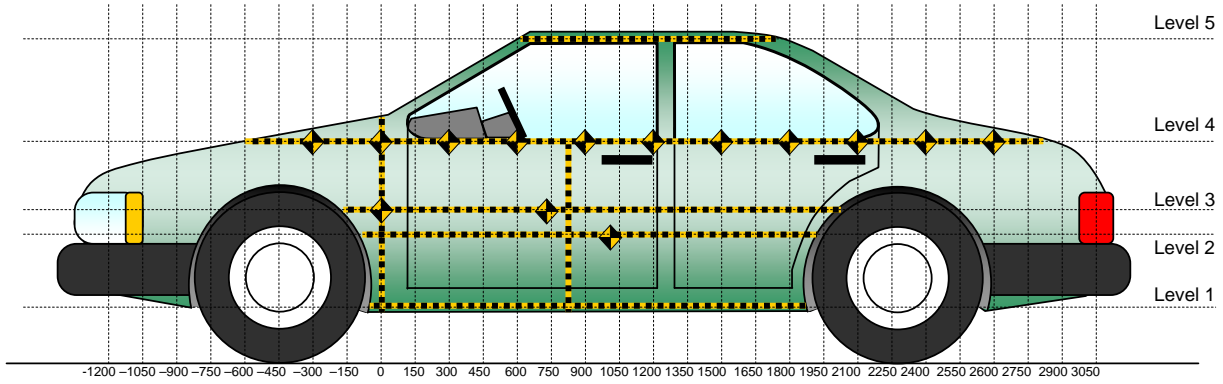
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3704	3682	22
B	Front Axle to FSOV	953	970	-17
C	Rear Axle to RSOV	1226	1236	-10
D	Total Length at Centerline	5883	5888	-5
E	Front Bumper Thickness	230	230	0
F	Front Bumper Bottom to Ground	282	303	-21
G	Sill Height at Front Wheel Well	333	327	6
H	Sill Height at Front Door Leading Edge	334	328	6
I	Sill Height at B Pillar	352	323	29
J1	Sill Height at Rear Wheel Well	368	342	26
J2	Pinch Weld Height at Rear Wheel Well	367	343	24
K	Sill Height Aft of Rear Wheel Well	389	358	31
L	Rear Bumper Thickness	165	165	0
M	Rear Bumper Bottom to Ground	350	263	87
N	Sill Height to Window Bottom Sill	832	803	29
O	Front Door Leading Edge to Impact CL	714	713	1
P	Rear Door Trailing Edge to Impact CL	1499	1460	39
Q	Front Window Opening	600	589	11
R	Right Side Length	5516	5456	60
S	Left Side Length	5516	5505	11
T	Vehicle Width at B Post	2056	2056	0
U	Front Wheel Track Width	1721		
V	Rear Wheel Track Width	1736		

**DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
Test Date: 6/18/2021



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	427	299	1800
2	Mid Door	724	268	1650
3	Occupant H-Point	861	241	1650
4	Window Sill	1123	159	1500
5	Window Top	1760	107	2400

Note: The measurements are taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

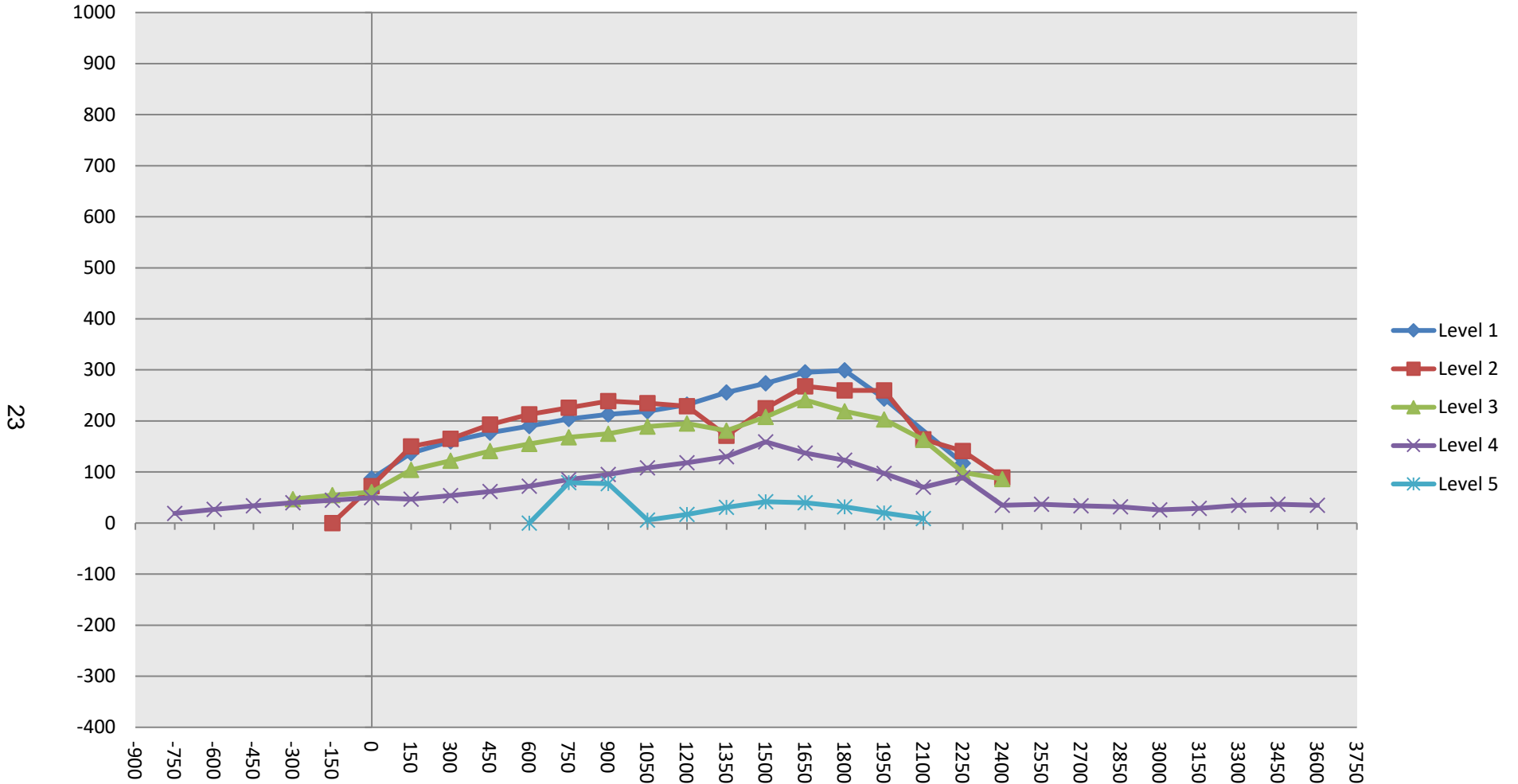
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050				237					237					0	
-900				202					210					8	
-750				177					196					19	
-600				160					187					27	
-450				147					181					34	
-300			84	137				131	177				47	40	
-150			84	127				139	172				55	45	
0	109	87	94	116		196	159	155	166		87	72	61	50	
150	119	96	97	115		256	246	201	162		137	150	104	47	
300	118	99	94	117		278	264	216	171		160	165	122	54	
450	115	100	91	114		292	293	232	176		177	193	141	62	
600	114	98	91	110		304	311	246	182		190	213	155	72	
750	113	98	89	103	363	317	324	257	188	442	204	226	168	85	79
900	113	97	89	98	352	326	336	264	193	429	213	239	175	95	77
1050	113	96	87	94	350	332	331	276	202	356	219	235	189	108	6
1200	111	95	86	93	348	343	324	281	211	365	232	229	195	118	17
1350	110	92	83	92	345	366	263	264	222	376	256	171	181	130	31
1500	110	94	85	92	345	384	319	293	251	387	274	225	208	159	42
1650	110	95	86	92	344	405	363	327	229	384	295	268	241	137	40
1800	112	95	86	92	344	411	355	305	215	376	299	260	219	123	32
1950	114	97	87	92	343	358	357	290	189	363	244	260	203	97	20
2100	117	97	88	93	343	291	261	251	163	352	174	164	163	70	9
2250	118	98	90	96	344	235	239	189	185	339	117	141	99	89	-5
2400	132	110	100	105	344	230	199	186	140	451	98	89	86	35	107
2550	120	104	100	105		141	131	131	142		21	27	31	37	
2700		87	90	108			121	121	142			34	31	34	
2850			83	108				110	140				27	32	
3000				108					134					26	
3150				107					136					29	
3300				110					145					35	
3450				118					155					37	
3600				123					158					35	
3750				129					161					32	
3900															

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021

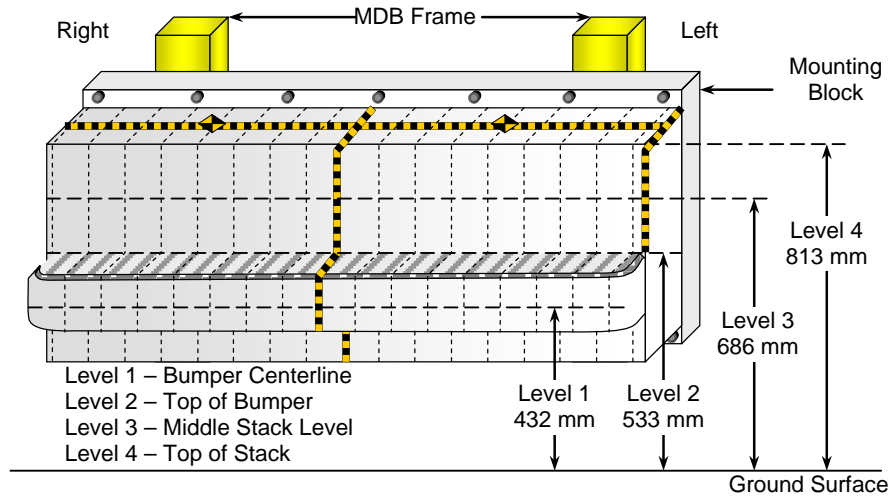


23

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Row	Vertical Location		From Centerline		Maximum Crush (mm)
	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	181
B	Top of Bumper	533	800	Left	172
C	Mid-Level	686	800	Left	146
D	Top of Stack	813	800	Left	158

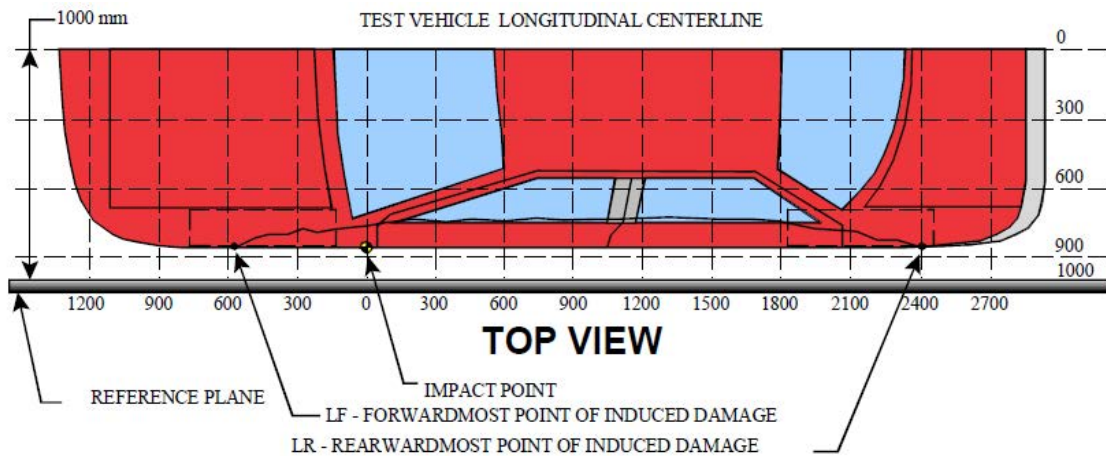
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
4	144	100	94	90	109	138	132	97	81	78	77	69	76	85	101	125	158
3	128	68	47	57	70	81	87	57	44	36	36	39	44	56	76	103	146
2	80	85	90	95	99	71	110	115	120	125	131	135	142	149	156	166	172
1	84	81	82	87	94	101	104	110	114	121	126	132	139	149	158	175	181

**DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
Test Date: 6/18/2021



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2335	3	150	96	54
2	1890	3	206	87	119
3	1445	3	249	84	165
4	1000	3	196	88	108
5	555	3	177	91	86
6	110	3	157	96	61

MDB DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	800 mm right of center	1	560	476	84
2	480 mm right of center	1	557	463	94
3	160 mm right of center	1	567	463	104
4	160 mm left of center	1	583	463	120
5	480 mm left of center	1	615	463	152
6	800 mm left of center	1	657	476	181

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side MDB Impact Test

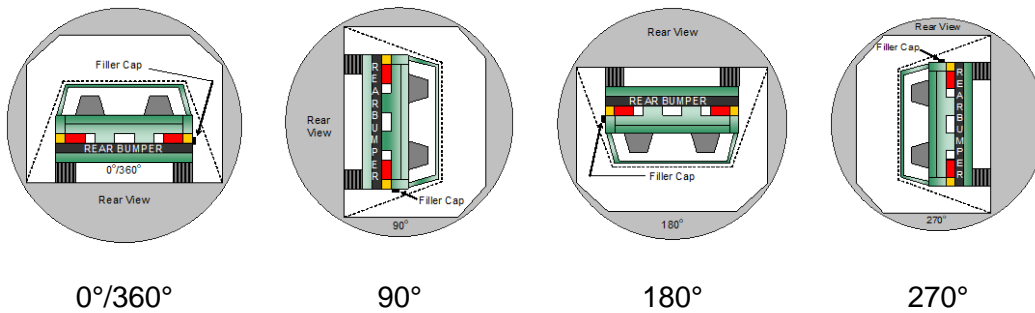
NHTSA No.: M20210222
Test Date: 6/18/2021

Test Time: 11:51 am

Temperature: 21.2°C

- A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.
 B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) 0.0 oz.
 C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) None
 D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	94	300	394
90° to 180°	87	300	387
180° to 270°	82	300	382
270° to 360°	87	300	387

FMVSS 301 ROLLOVER SPILLAGE TABLE (UNITS IN OUNCES)

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

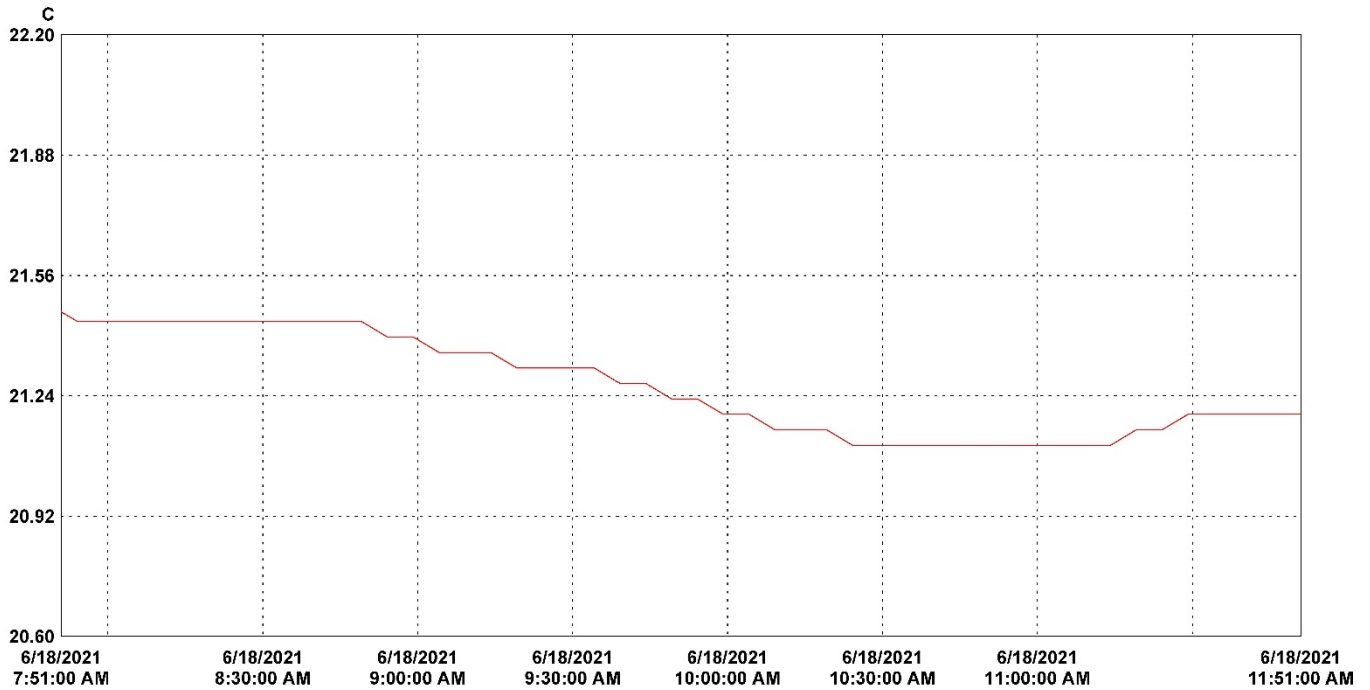
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 15
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210222
 Test Date: 6/18/2021



30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): M20210222 2021 Ford F-150 4x2 SuperCrew Side NCAP MDB.spg

LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	18352047	14182020 VSC_North_Hall 1	44	21.26	21.11	21.11	21.11	C	Temperature	14182020_VSC_North_Hall.spl

**APPENDIX A
PHOTOGRAPHS**

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Photo No. 001 - As Delivered Right Front Three-Quarter View of Test Vehicle



Photo No. 002 - As Delivered Left Rear Three-Quarter View of Test Vehicle

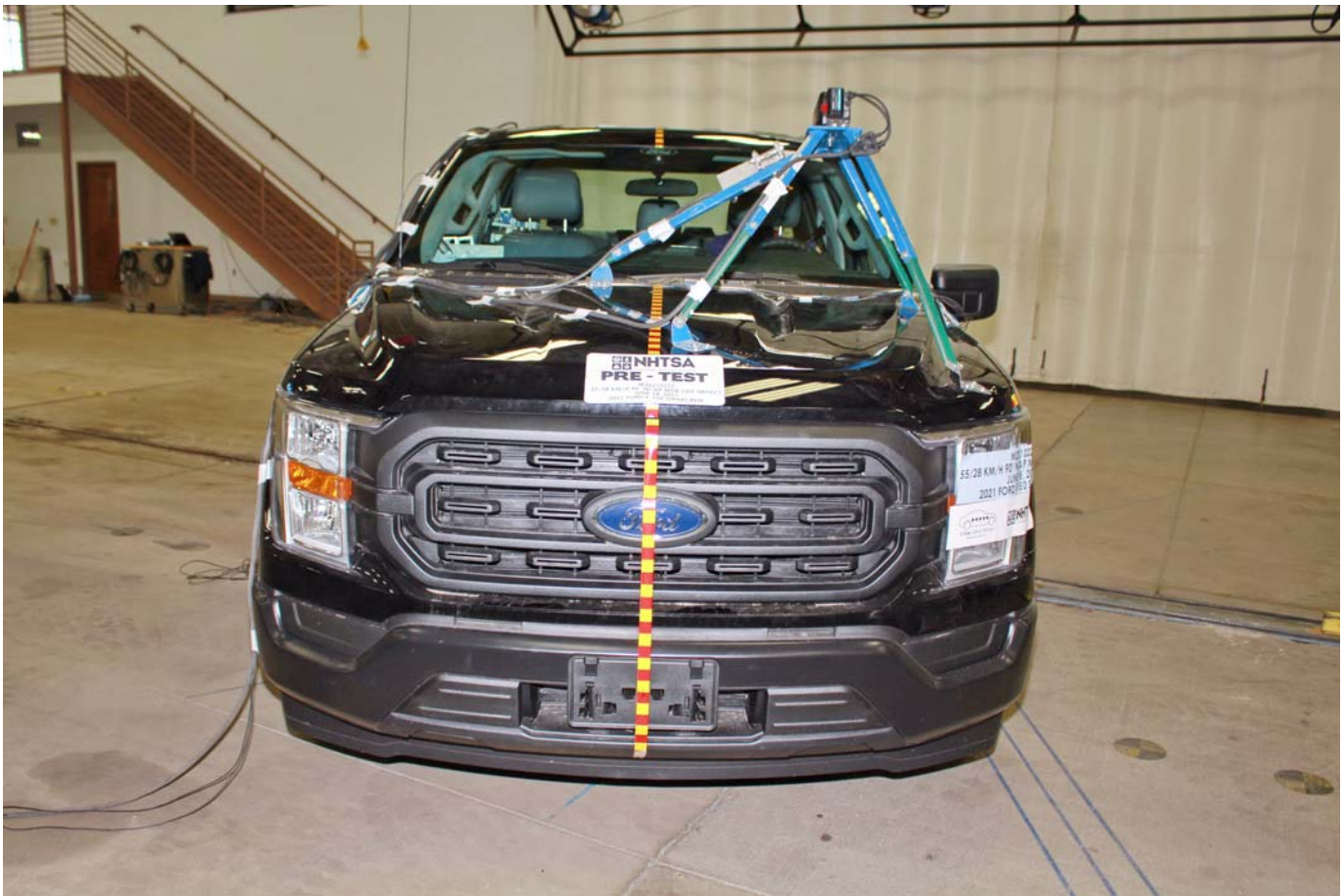


Photo No. 003 - Pre-Test Frontal View of Test Vehicle

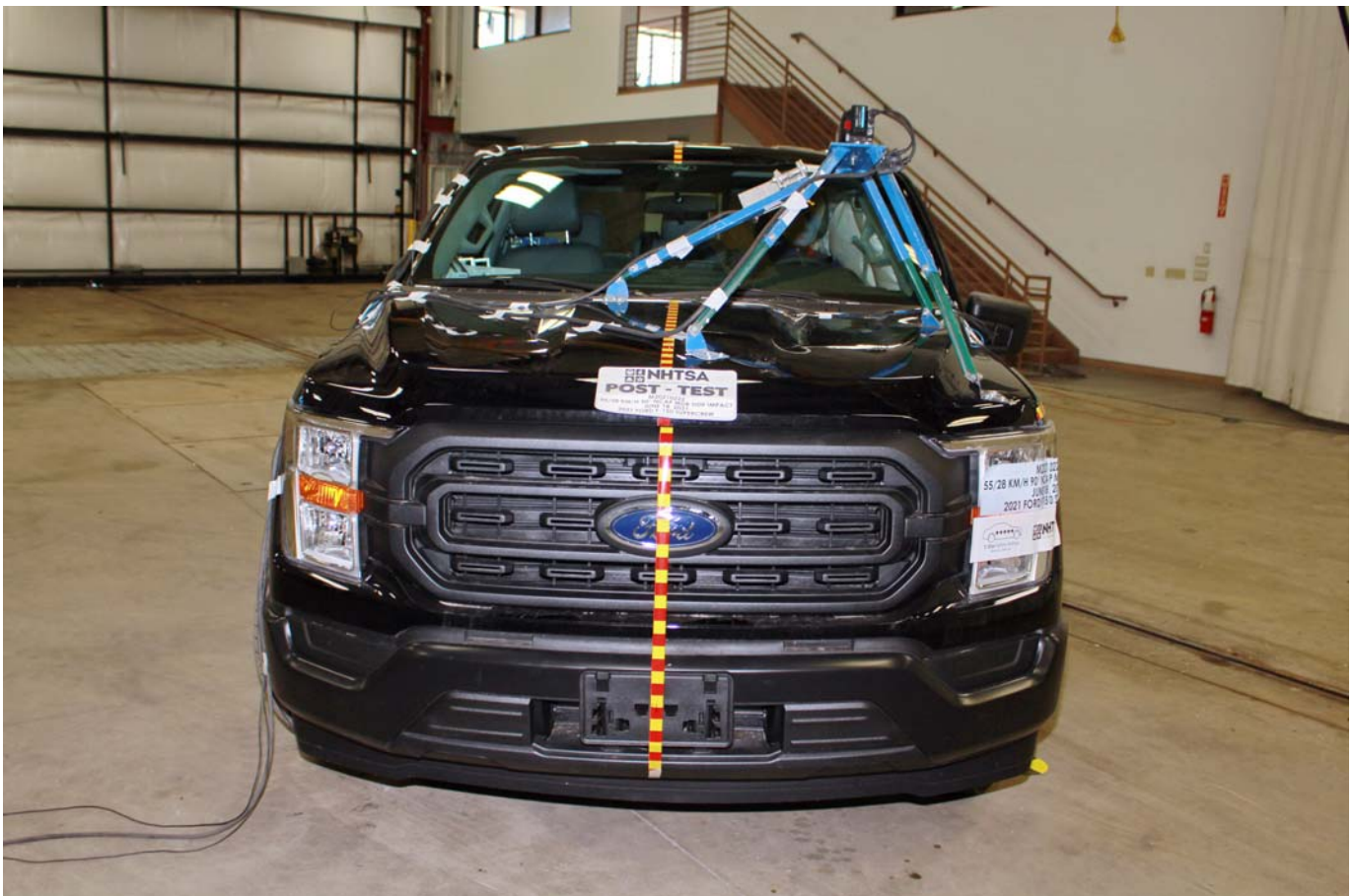


Photo No. 004 - Post-Test Frontal View of Test Vehicle



Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 007 - Pre-Test Left Side View of Test Vehicle



Photo No. 008 - Post-Test Left Side View of Test Vehicle



Photo No. 009 - Pre-Test Left Three-Quarter Rear View of Test Vehicle



Photo No. 010 - Post-Test Left Three-Quarter Rear View of Test Vehicle



Photo No. 011 - Pre-Test Rear View of Test Vehicle



Photo No. 012 - Post-Test Rear View of Test Vehicle



Photo No. 013 - Pre-Test Right Side View of Test Vehicle



Photo No. 014 - Post-Test Right Side View of Test Vehicle



Photo No. 015 - Pre-Test Overhead View of Test Area



Photo No. 016 - Post-Test Overhead View of Test Area



Photo No. 017 - Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 018 - Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle

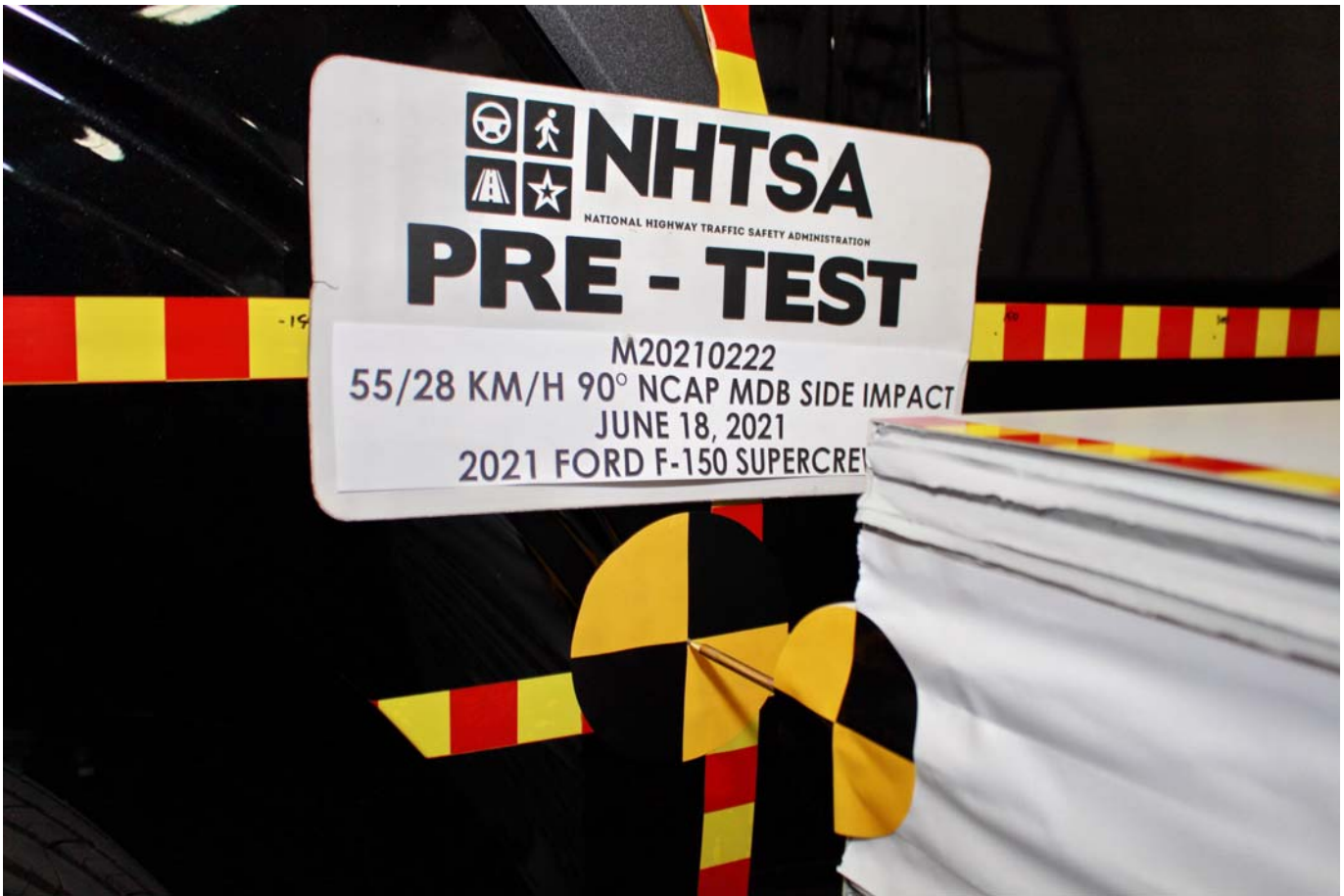


Photo No. 019 - Pre-Test Close-Up View of Impact Point Target



Photo No. 020 - Post-Test Close-Up View of Impact Point Target



Photo No. 021 - Pre-Test Left Front Door Latch Close-Up



Photo No. 022 - Post-Test Left Front Door Latch Close-Up



Photo No. 023 - Pre-Test Left Rear Door Latch Close-Up



Photo No. 024 - Post-Test Left Rear Door Latch Close-Up



Photo No. 025 - Pre-Test Front Close-Up View of Driver Dummy



Photo No. 026 - Post-Test Front Close-Up View of Driver Dummy



Photo No. 027 - Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Photo No. 028 - Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 029 - Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 030 - Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Photo No. 031 - Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 032 - Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Photo No. 033 - Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Photo No. 034 - Pre-Test Placement of Driver Dummy Feet



Photo No. 035 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 036 - Pre-Test Left Side View of Steering Wheel



Photo No. 037 - Pre-Test View of Disengaged Parking Brake



Photo No. 038 - Pre-Test View of Parking Brake



Photo No. 039 - Pre-Test Close-Up Left Side View of Driver Seat Track



Photo No. 040 - Pre-Test Close-Up Left Side View of Driver Seat Back



Photo No. 041 - Pre-Test Close-Up View of Driver Seat Back or Head Restraint



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Photo No. 043 - Post-Test Driver Dummy and Door Clearance View



Photo No. 044 - Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



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Photo No. 046 - Pre-Test Driver Inner Door Panel View



Photo No. 047 - Post-Test Driver Inner Door Panel View



Photo No. 048 - Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View



Photo No. 049 - Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Photo No. 050 - Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View



Photo No. 051 - Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View

PHOTOGRAPH NOT APPLICABLE

Photo No. 052 - Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View



Photo No. 053 - Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View



Photo No. 054 - Post-Test Driver Dummy Close-up Knee Contact View



Photo No. 055 - Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Photo No. 056 - Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 057 - Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 058 - Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



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Photo No. 064 - Pre-Test Placement of Rear Passenger Dummy Feet



Photo No. 065 - Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Photo No. 066 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Photo No. 067 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Photo No. 068 - Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint



Photo No. 069 - Pre-Test Rear Passenger Dummy and Door Clearance View



Photo No. 070 - Post-Test Rear Passenger Dummy and Door Clearance View



Photo No. 071 - Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 072 - Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 073 - Pre-Test Rear Passenger Inner Door Panel View



Photo No. 074 - Post-Test Rear Passenger Inner Door Panel View



Photo No. 075 - Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



Photo No. 076 - Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View



Photo No. 077 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View



Photo No. 078 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



Photo No. 079 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

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Photo No. 080 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View

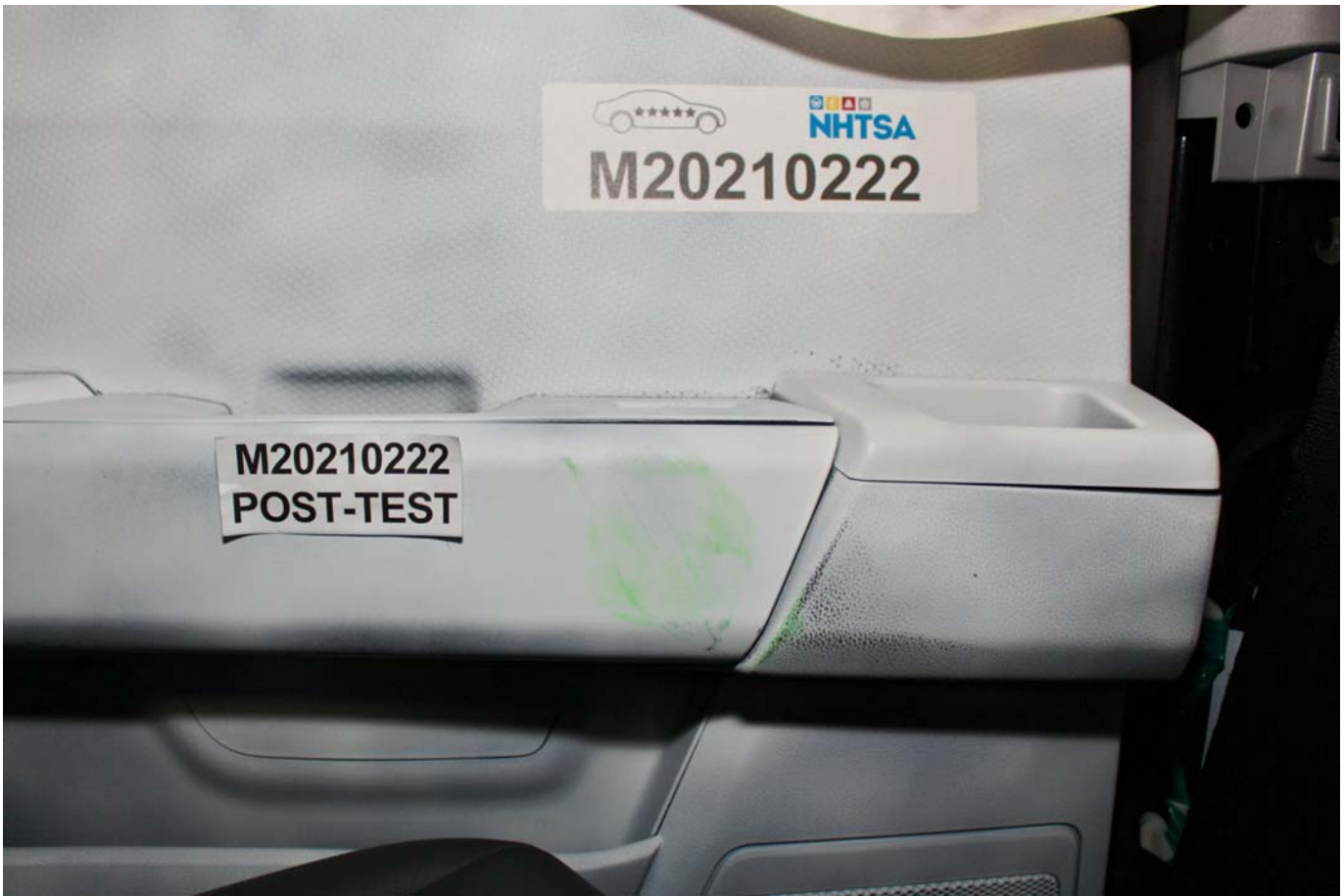


Photo No. 081 - Post-Test Rear Passenger Dummy Close-up Knee Contact View



Photo No. 082 - Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 083 - Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 084 - Pre-Test Front View of MDB Impactor Face



Photo No. 085 - Post-Test Front View of MDB Impactor Face

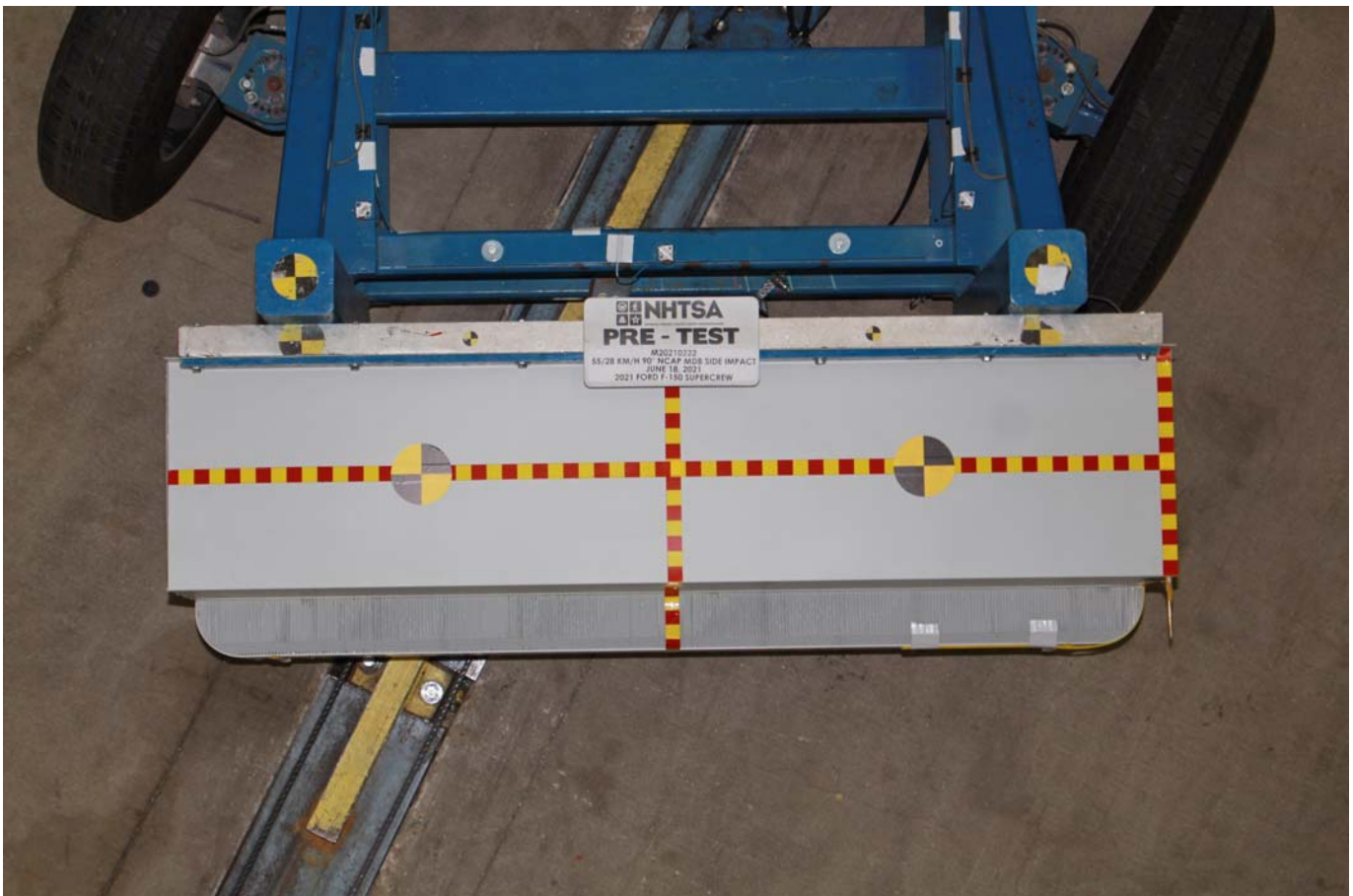


Photo No. 086 - Pre-Test Top View of MDB Impactor Face



Photo No. 087 - Post-Test Top View of MDB Impactor Face



Photo No. 088 - Pre-Test Left Side View of MDB Impactor Face



Photo No. 089 - Post-Test Left Side View of MDB Impactor Face



Photo No. 090 - Pre-Test Right Side View of MDB Impactor Face



Photo No. 091 - Post-Test Right Side View of MDB Impactor Face



Photo No. 092 - Close-Up View of Vehicle Certification Label



Photo No. 093 - Close-Up View of Vehicle Tire Information Placard or Label



Photo No. 094 - Pre-Test Ballast View



Photo No. 095 - Post-Test Primary and Redundant Speed Trap Read-Out



Photo No. 096 - FMVSS Photo No. 301 Static Rollover 0 Degrees



Photo No. 097 - FMVSS Photo No. 301 Static Rollover 90 Degrees



Photo No. 098 - FMVSS Photo No. 301 Static Rollover 180 Degrees



Photo No. 099 - FMVSS Photo No. 301 Static Rollover 270 Degrees



Photo No. 100 - FMVSS Photo No. 301 Static Rollover 360 Degrees

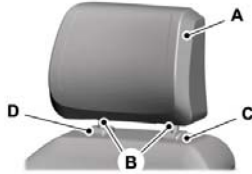
Front Seats

- Bend your legs slightly so that you can press the pedals fully.
- Position the shoulder strap of the seatbelt over the center of your shoulder and position the lap strap tightly across your hips.

Make sure that your driving position is comfortable and that you can maintain full control of your vehicle.

MANUAL SEATS (If Equipped)

Head Restraint Components



The head restraints consist of:

- A An energy absorbing head restraint.
- B Two steel stems.
- C Guide sleeve adjust and release button.
- D Guide sleeve unlock and remove button (if equipped).

Adjusting the Head Restraint

4-Way Head Restraints

WARNING: Fully adjust the head restraint before you sit in or operate your vehicle. This will help minimize the risk of neck injury in the event of a crash. Do not adjust the head restraint when your vehicle is moving.

WARNING: The head restraint is a safety device. Whenever possible it should be installed and properly adjusted when the seat is occupied. Failure to adjust the head restraint properly could reduce its effectiveness during certain impacts.

Note: Adjust the seat backrest to an upright driving position before adjusting the head restraint. Adjust the head restraint so that the top of it is level with the top of your head and as far forward as possible. Make sure that you remain comfortable. If you are extremely tall, adjust the head restraint to its highest position.

Pull the head restraint up to raise it.

To lower the head restraint:

1. Press and hold the adjust and release button.
2. Push the head restraint down.

To tilt the head restraint:



1. Adjust the seat backrest to an upright driving or riding position.

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Front Seats

2. Pivot the head restraint forward toward your head to the preferred position.

After the head restraint reaches the forward-most tilt position, pivot it forward again to release it to the rearward, untilted position.

Note: Do not attempt to force the head restraint backward after it is tilted. Instead, continue tilting it forward until the head restraint releases to the upright position.

Removing the Head Restraint

1. Pull up the head restraint until it reaches the highest adjustment position.
2. Press and hold the adjust and release button and the unlock and remove button.
3. Pull up the head restraint.

Note: You cannot remove head restraints that have audio system speakers.

Installing the Head Restraint

Align the steel stems into the guide sleeves and push the head restraint down until it locks.

Moving the Seat Backward and Forward

Manual Seat Adjustment

WARNING: Do not adjust the driver seat or seat backrest when your vehicle is moving. This may result in sudden seat movement, causing the loss of control of your vehicle.

WARNING: Make sure the seat fully locks into place by rocking it backward and forward. Not securing the seat into the locked position can be dangerous in a crash and could cause serious personal injury or death.



Adjusting the Seat Backrest

Manual Seat Adjustment



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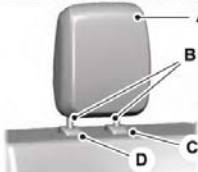
Photo No. 103 - Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Rear Seats (If Equipped)

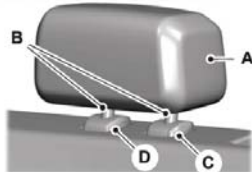
MANUAL SEATS

Head Restraint Components

Rear Seat Outermost Head Restraints



Rear Seat Center Head Restraint



The head restraints consist of:

- A An energy absorbing head restraint.
- B Two steel stems.
- C Guide sleeve adjust and release button.
- D Guide sleeve unlock and remove button (if equipped).

Adjusting the Head Restraint

Pull the head restraint up to raise it.

To lower the head restraint:

1. Press and hold the adjust and release button.
2. Push the head restraint down.

Removing the Head Restraint

1. Pull up the head restraint until it reaches its highest position.
2. Press and hold the adjust and release button and the unlock and remove button.
3. Pull up the head restraint.

Installing the Head Restraint

Align the steel stems into the guide sleeves and push the head restraint down until it locks.

Folding the Seats

You can flip each seat cushion up into a vertical storage position.



Rotate the seat up until it locks in place.

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Rear Seats (If Equipped)

Unfolding the Seats

WARNING: Make sure that cargo and other objects are not trapped under the seat cushion and that you return the seat cushion to the full-down position. Failure to do so may prevent the seat from operating properly, which could increase the risk of serious injury in a crash.



Pull the strap to lower the seat

HEATED SEATS (If Equipped)

Heated Seat Precautions

WARNING: Use caution when using the heated seat if you are unable to feel pain to your skin because of advanced age, chronic illness, diabetes, spinal cord injury, medication, alcohol use, exhaustion or other physical conditions. The heated seat could cause burns even at low temperatures, especially if used for long periods of time. Failure to follow this instruction could result in personal injury.

WARNING: Do not poke sharp objects into the seat cushion or seat backrest. This could damage the heated seat element and cause it to overheat. Failure to follow this instruction could result in personal injury.

WARNING: Do not place anything on the seat that blocks the heat, for example a seat cover or a cushion. This could cause the seat to overheat. Failure to follow this instruction could result in personal injury.

Do not:

- Place heavy objects on the seat.
- Operate the heated seat if water or any other liquid spills on the seat. Allow the seat to dry.

Switching the Heated Seats On and Off

The vehicle must be running to use this feature.

The rear seat heat controls are on the rear of the center console.

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Photo No. 104 - Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.nhtsa.gov

Additional Driver & Passenger Dummy Instrumentation Data

Passenger Head Angular Velocity (X)
Passenger Head Angular Velocity (Y)
Passenger Head Angular Velocity (Z)
Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Track Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

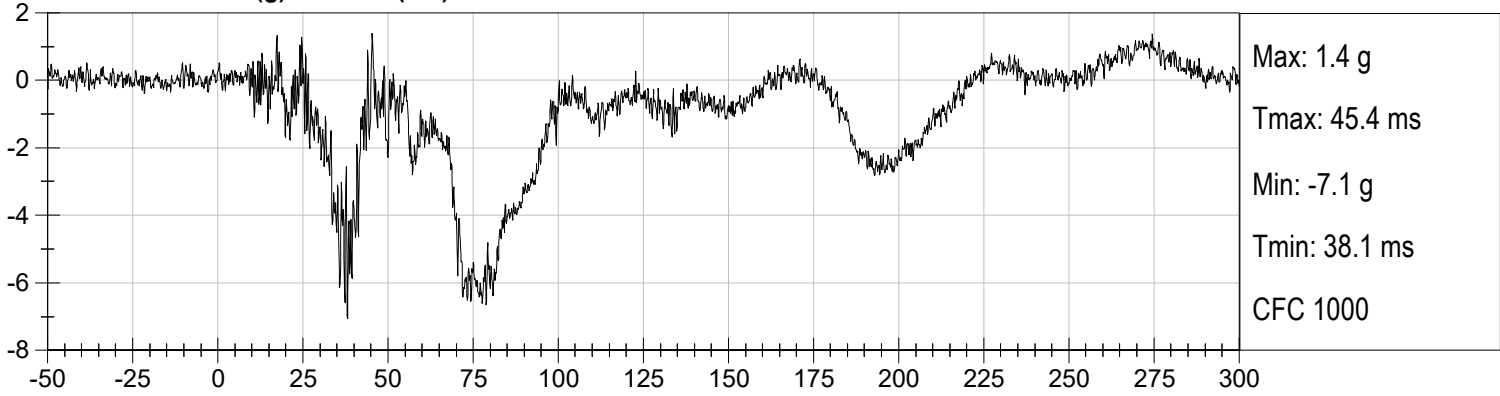
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

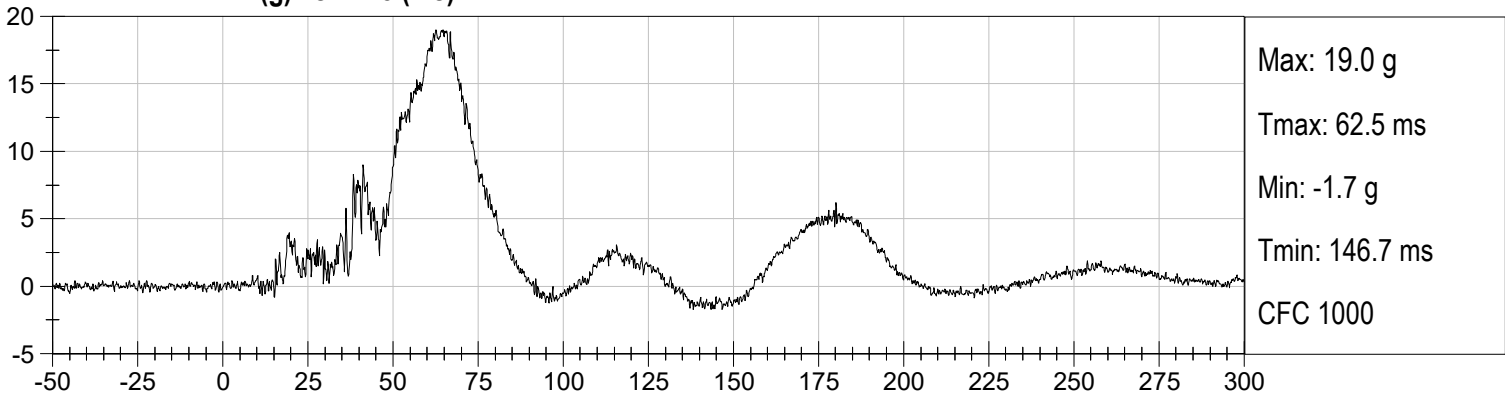
Left MDB Contact Switch

Right MDB Contact Switch

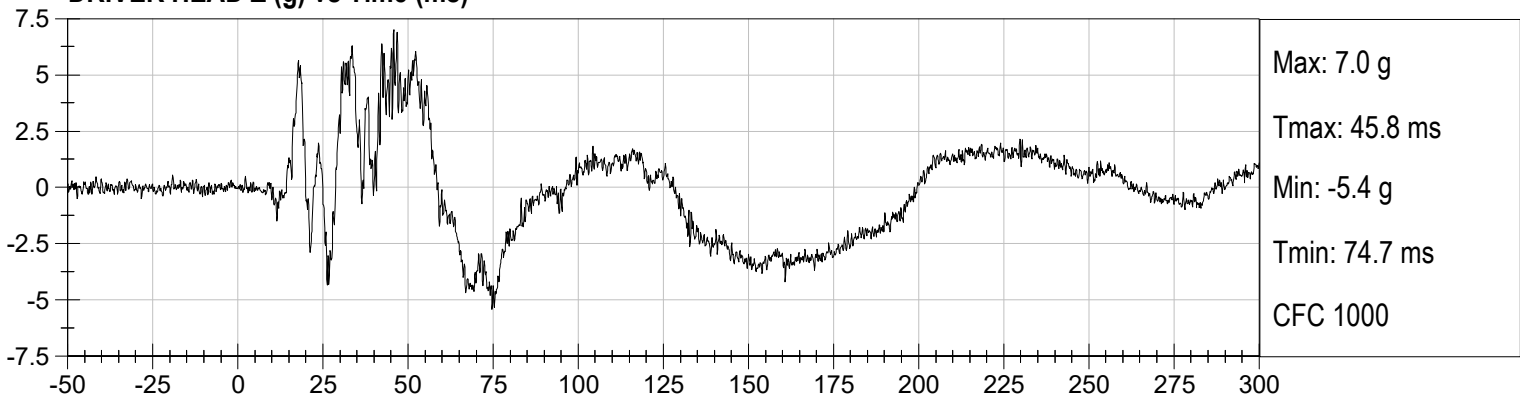
DRIVER HEAD X (g) vs Time (ms)



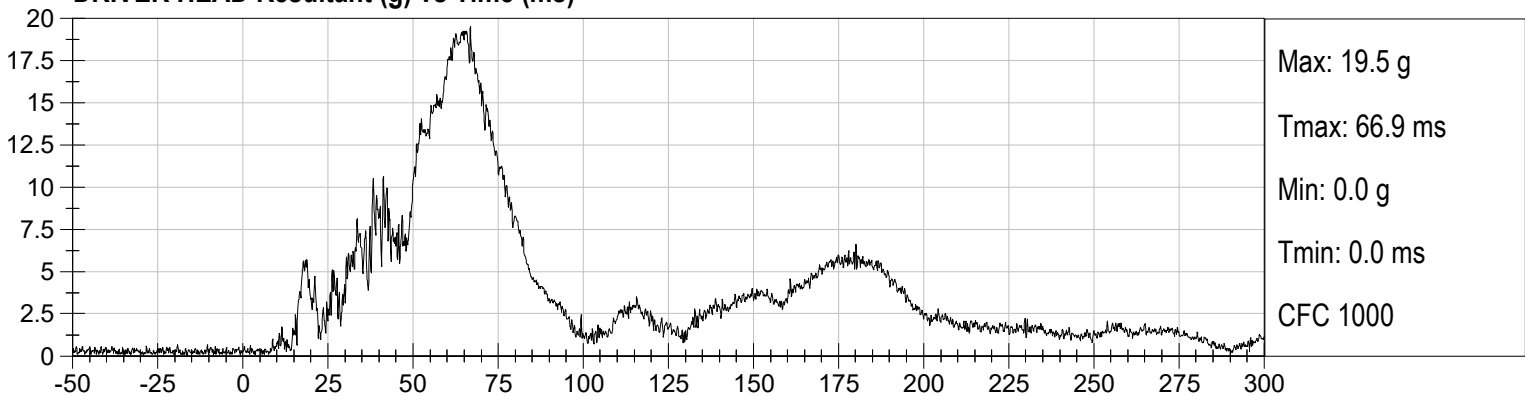
DRIVER HEAD Y (g) vs Time (ms)



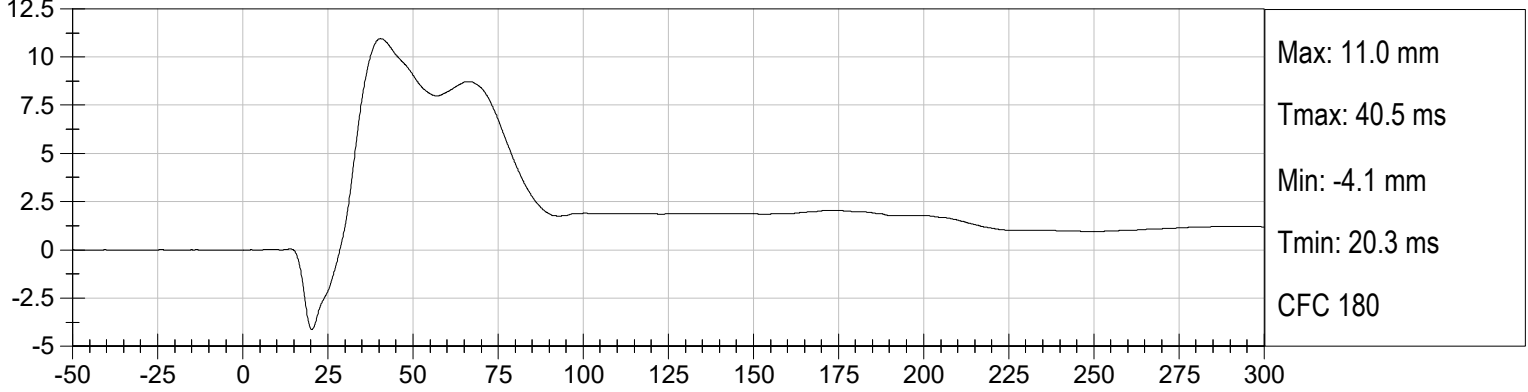
DRIVER HEAD Z (g) vs Time (ms)



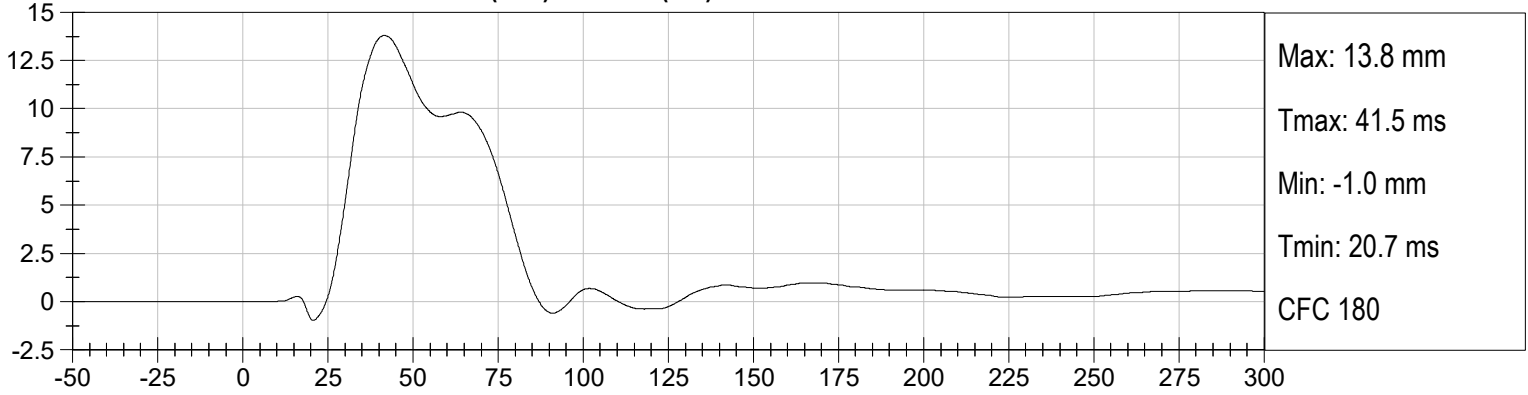
DRIVER HEAD Resultant (g) vs Time (ms)



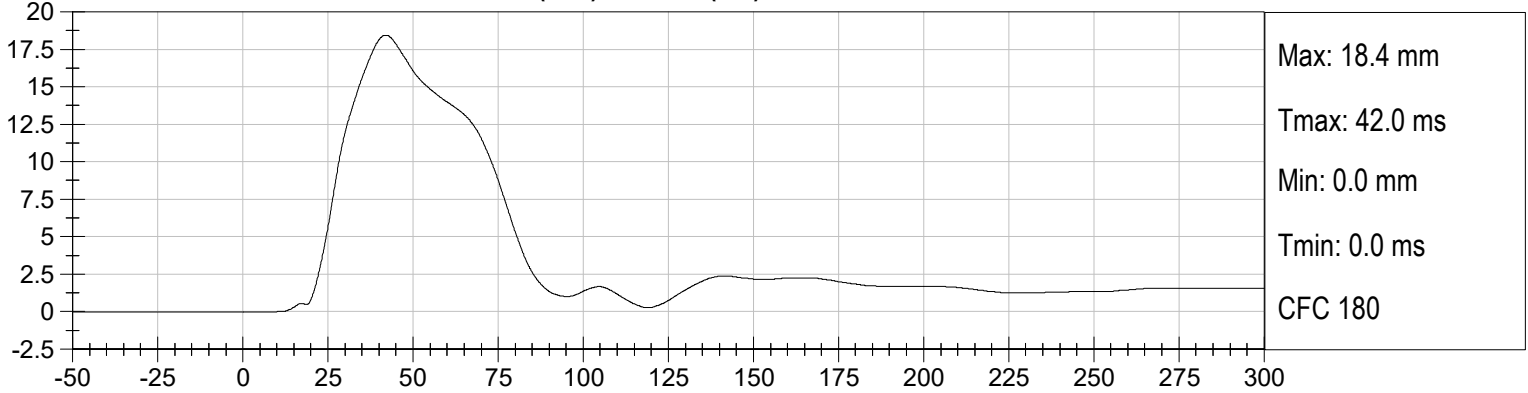
DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)



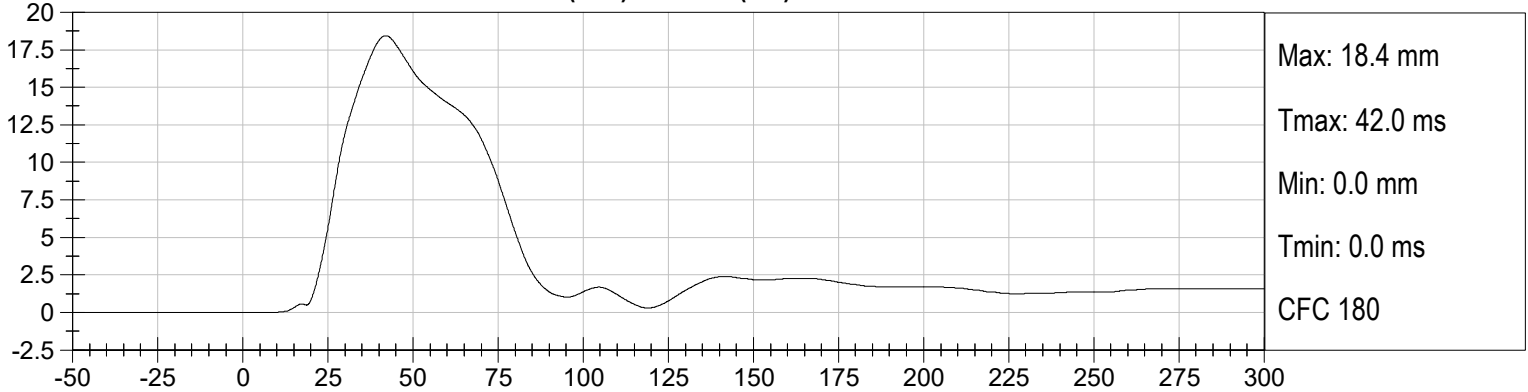
DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)



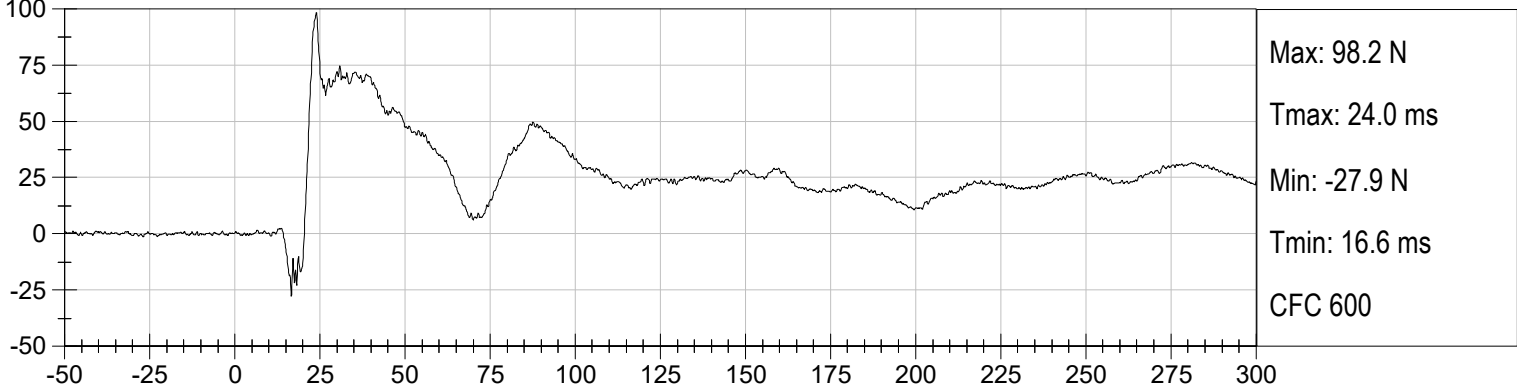
DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)



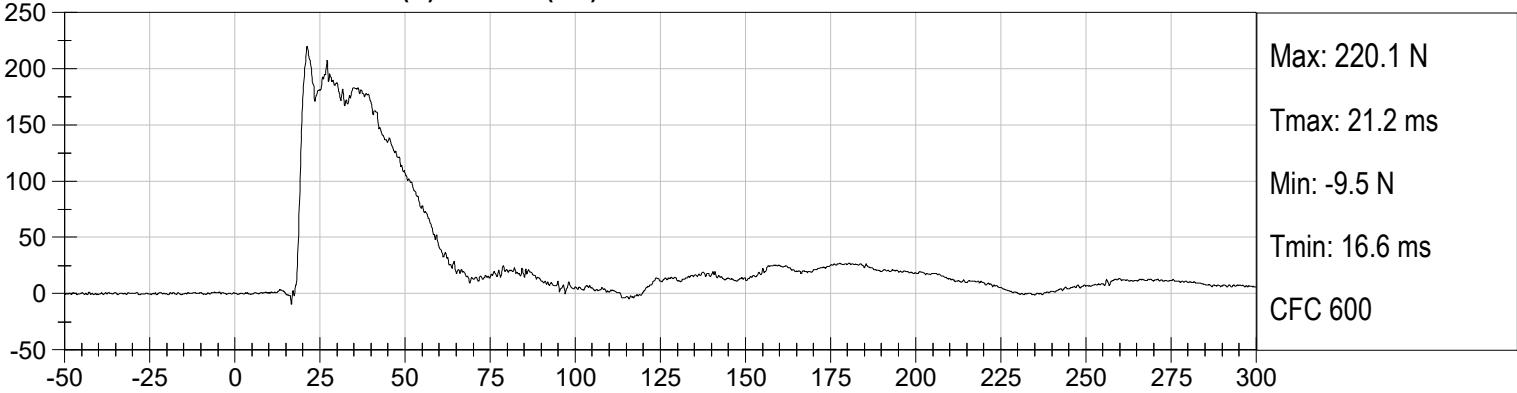
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)



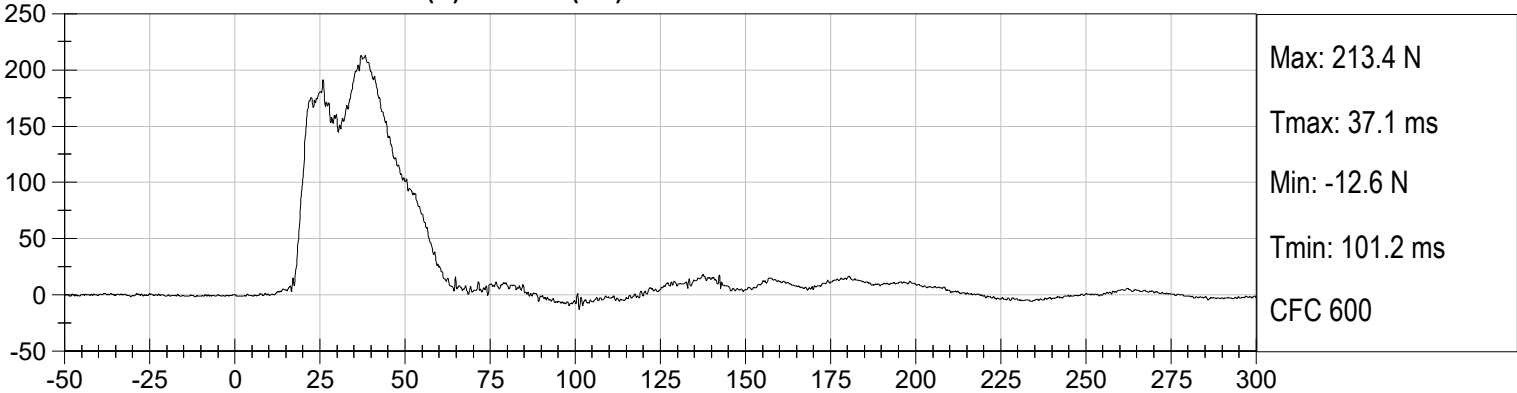
DRIVER FRONT ABDOMEN FY (N) vs Time (ms)



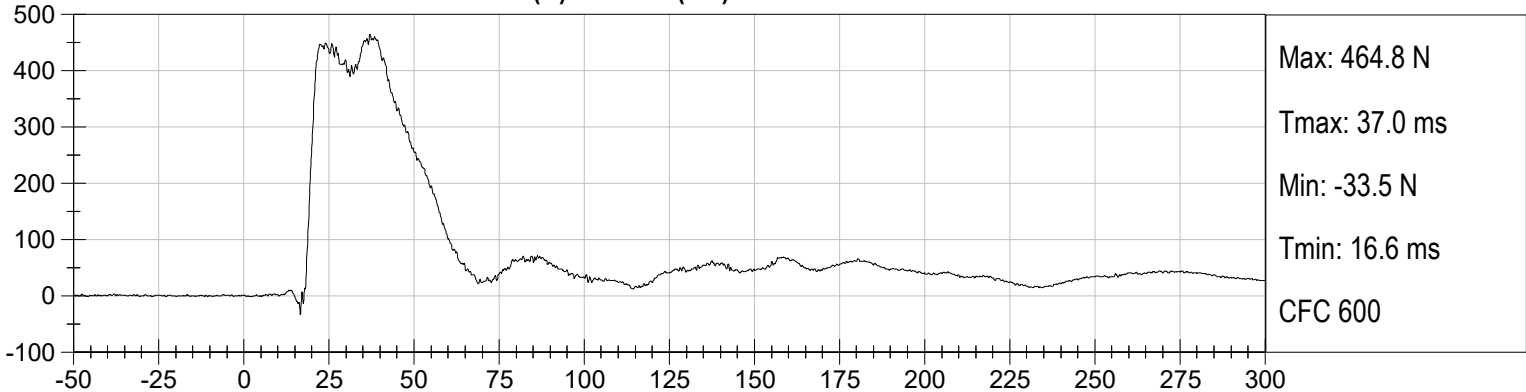
DRIVER MID ABDOMEN FY (N) vs Time (ms)

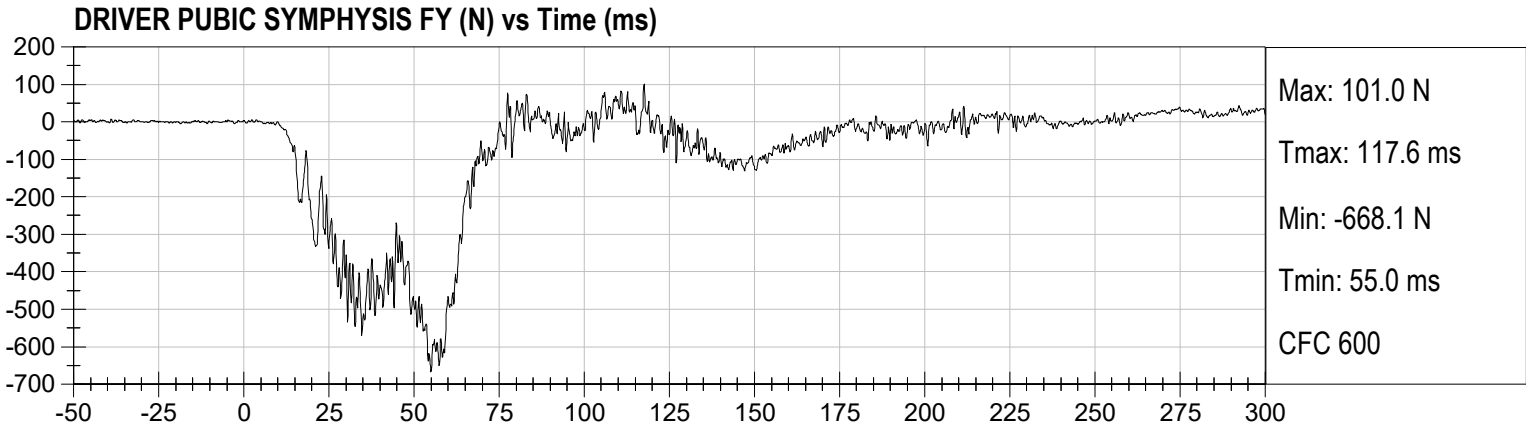


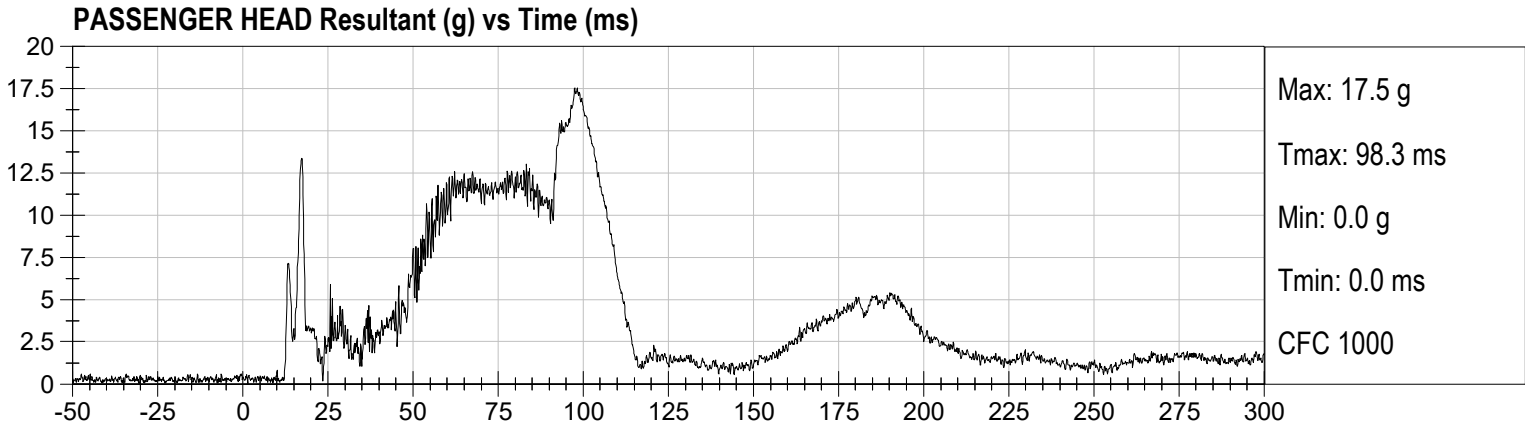
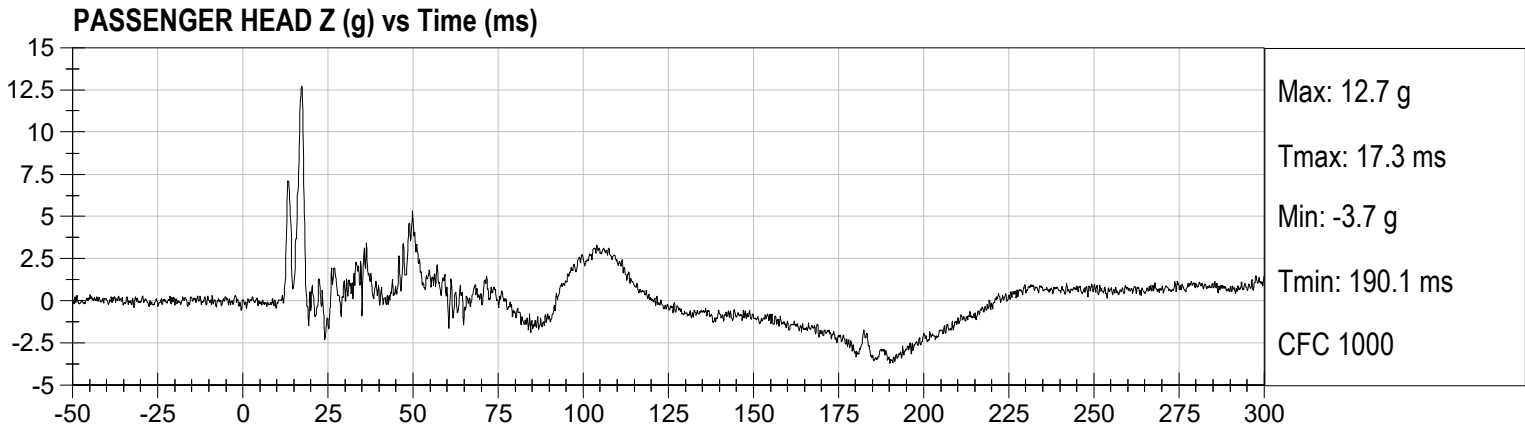
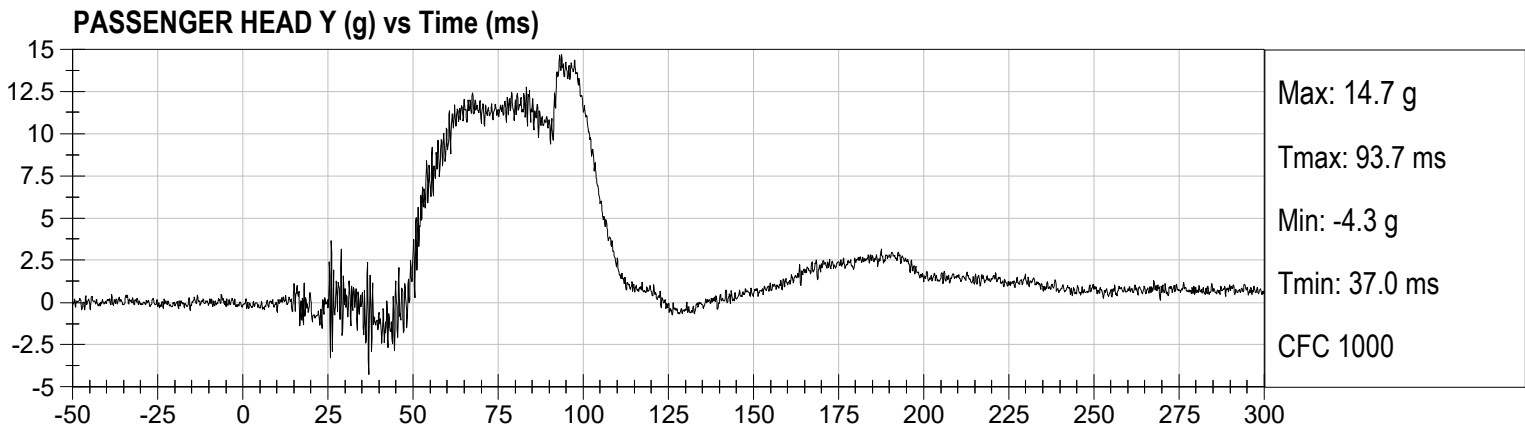
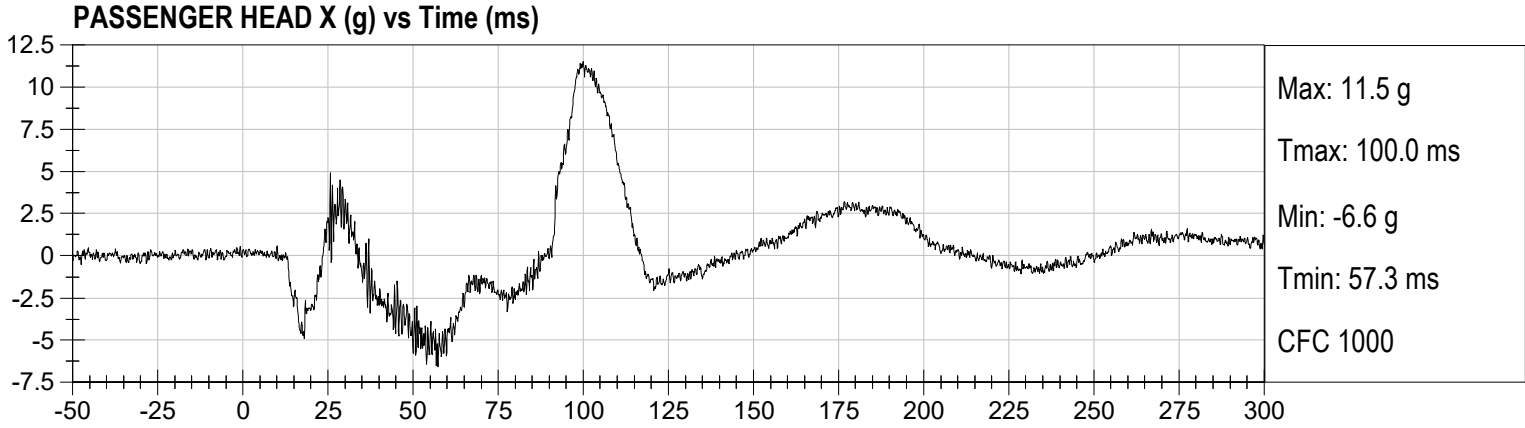
DRIVER REAR ABDOMEN FY (N) vs Time (ms)



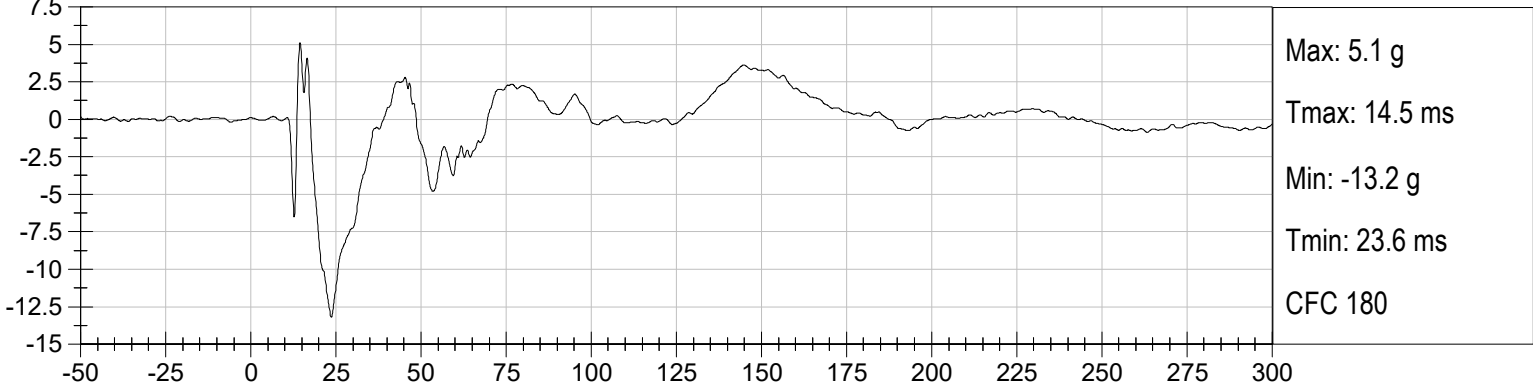
DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)



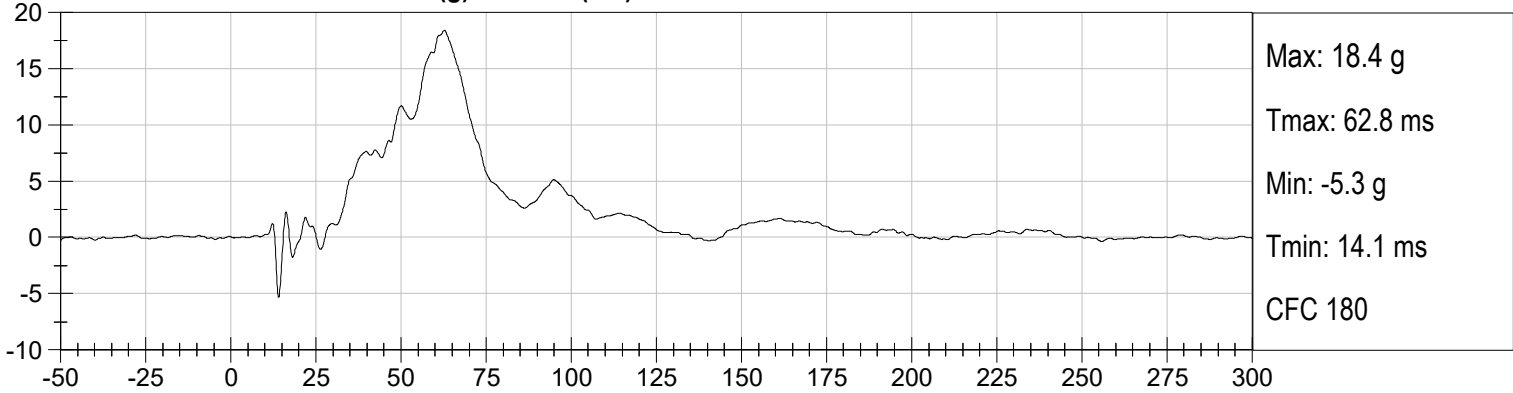




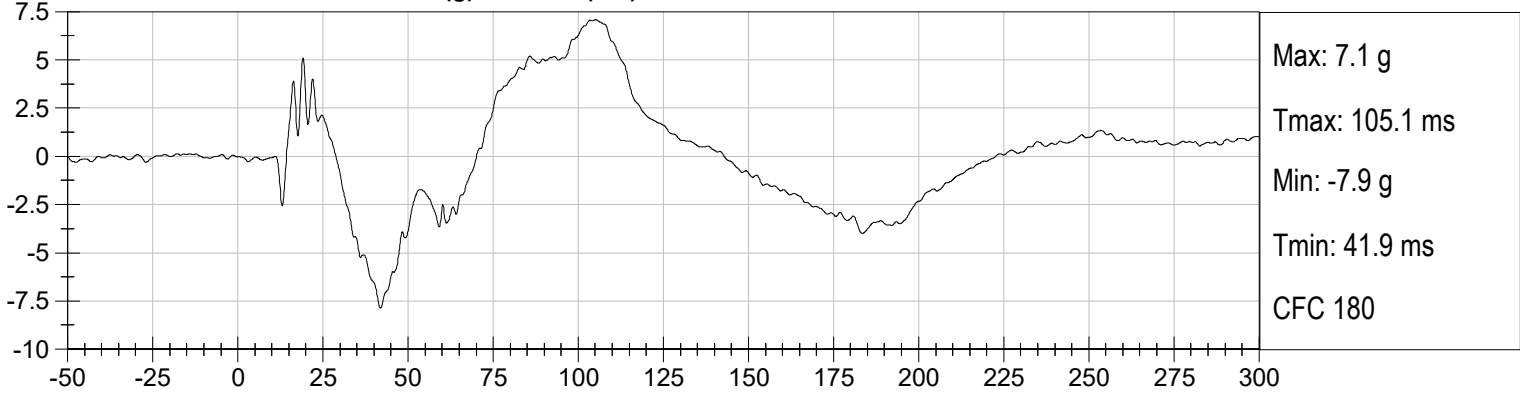
PASSENGER LOWER SPINE X (g) vs Time (ms)



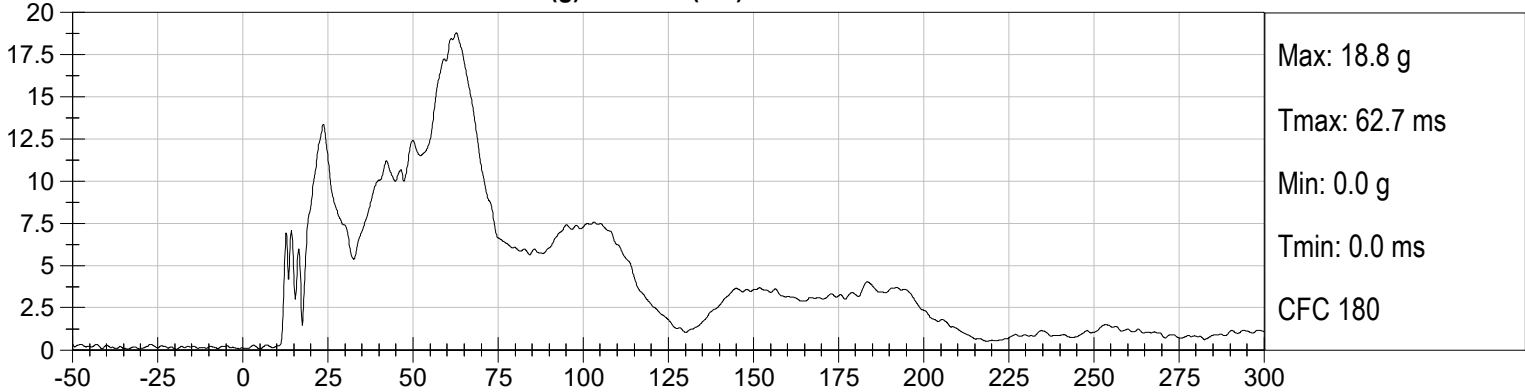
PASSENGER LOWER SPINE Y (g) vs Time (ms)



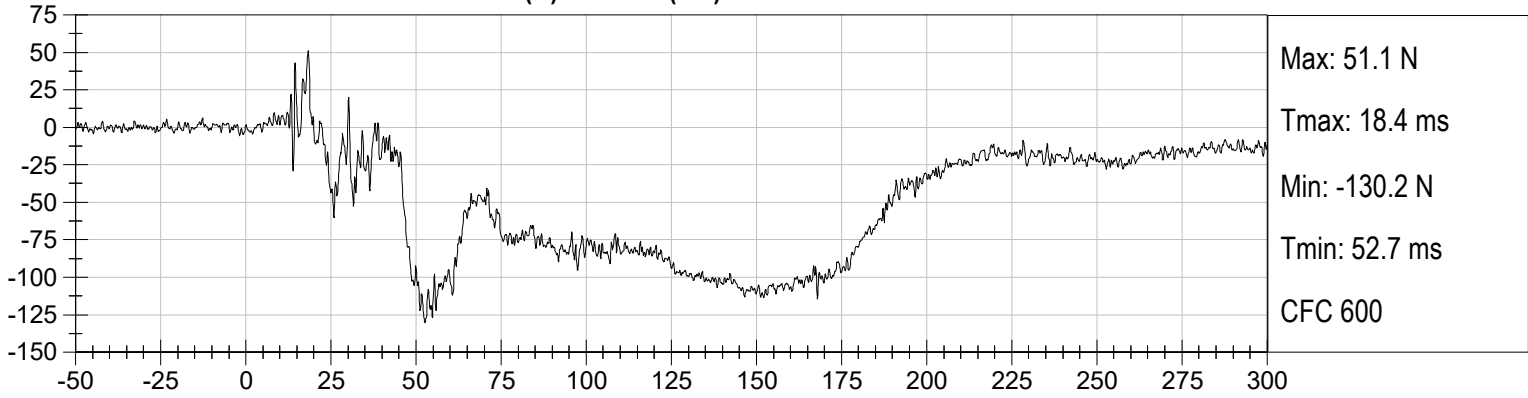
PASSENGER LOWER SPINE Z (g) vs Time (ms)



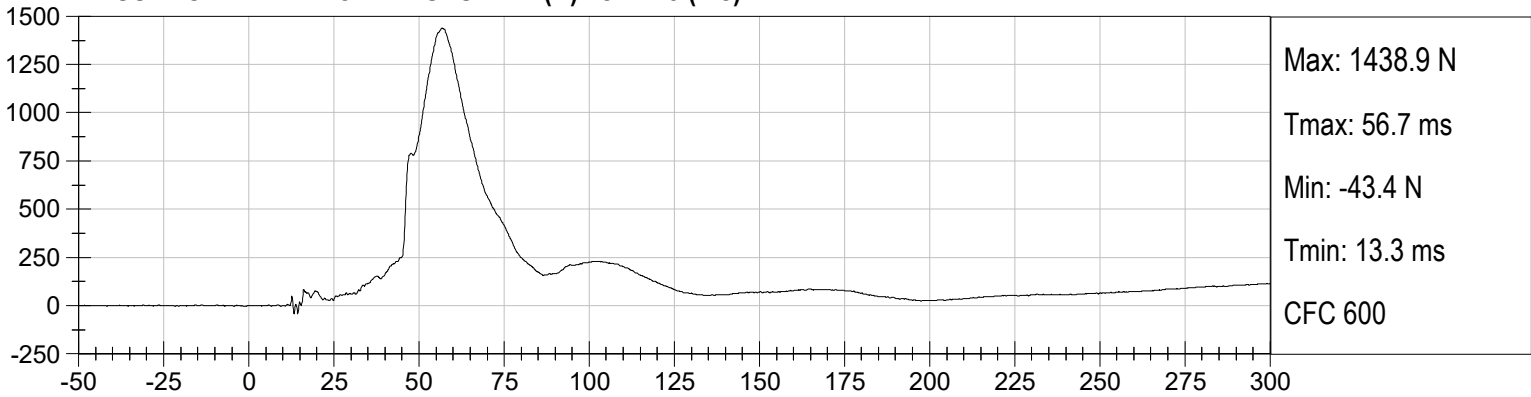
PASSENGER LOWER SPINE Resultant (g) vs Time (ms)



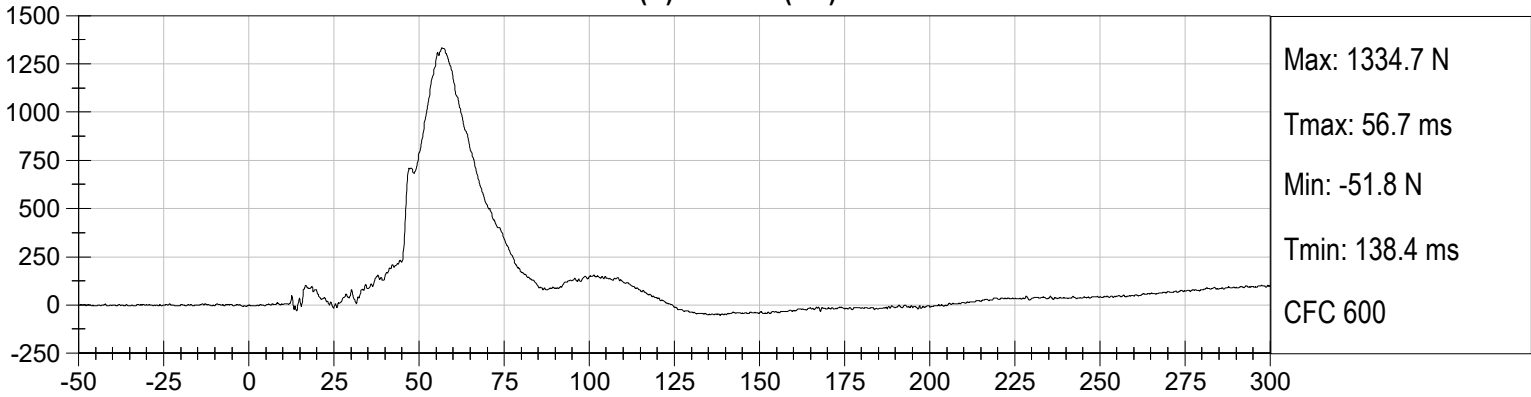
PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)



PASSENGER LEFT ACETABULUM FY (N) vs Time (ms)



PASSENGER LEFT LATERAL PELVIC FORCE (N) vs Time (ms)



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

**ES-2re External Measurements
SN: F032**

No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	Pass
7	Shoulder/Arm Width	461 - 479	464	Pass
8	Thorax Width	322 - 332	323	Pass
9	Abdomen Width	273 - 287	281	Pass
10	Pelvis Lap Width	359 - 373	370	Pass
11	Head Depth	196 - 206	203	Pass
12	Thorax Depth	262 - 272	264	Pass
13	Abdomen Depth	194 - 204	196	Pass
14	Pelvis Depth	235 - 245	236	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150 - 160	151	Pass
16	Back of Buttocks to Front Knee	597 - 615	607	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: F032

Test ID: D211901

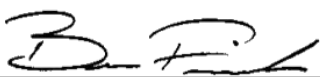
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	125 to 155	144	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass



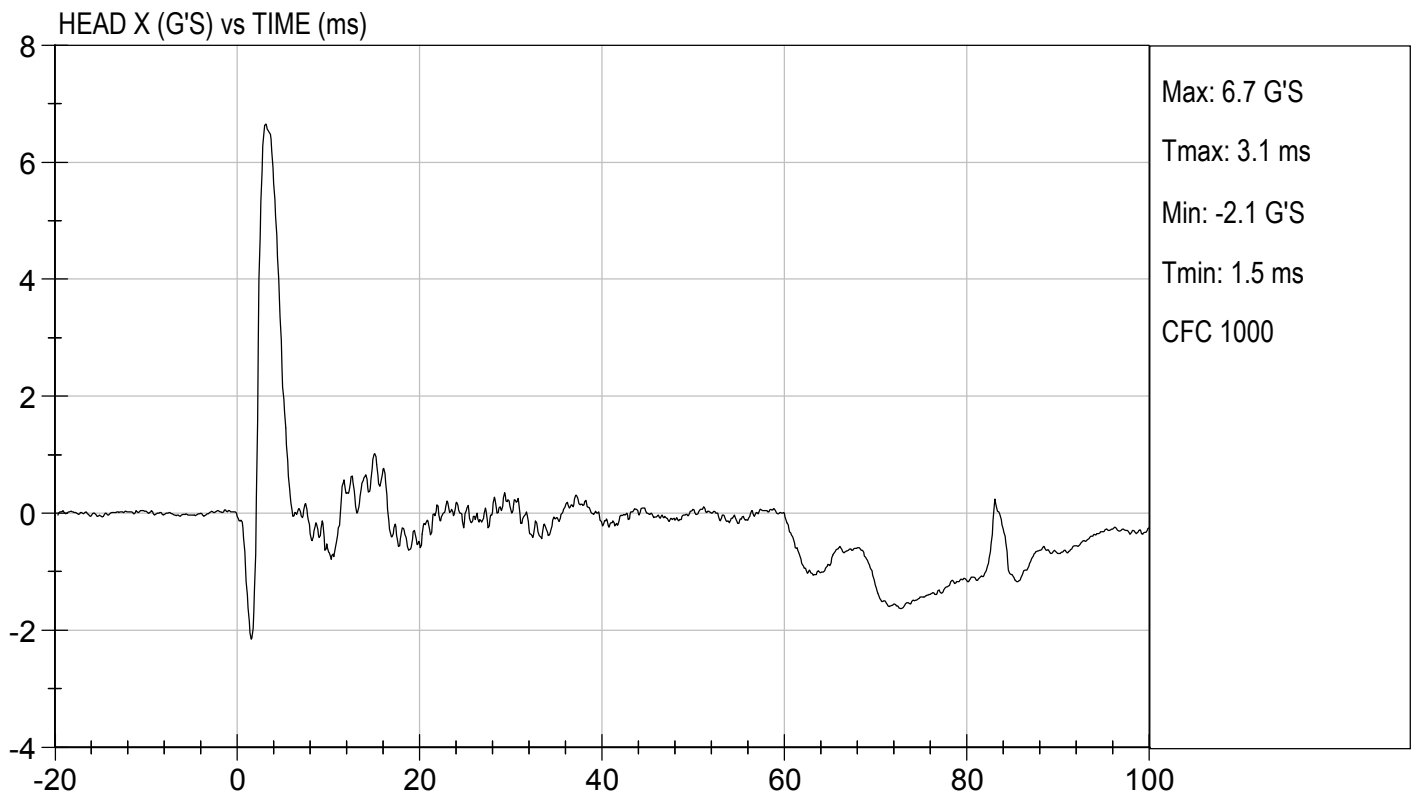
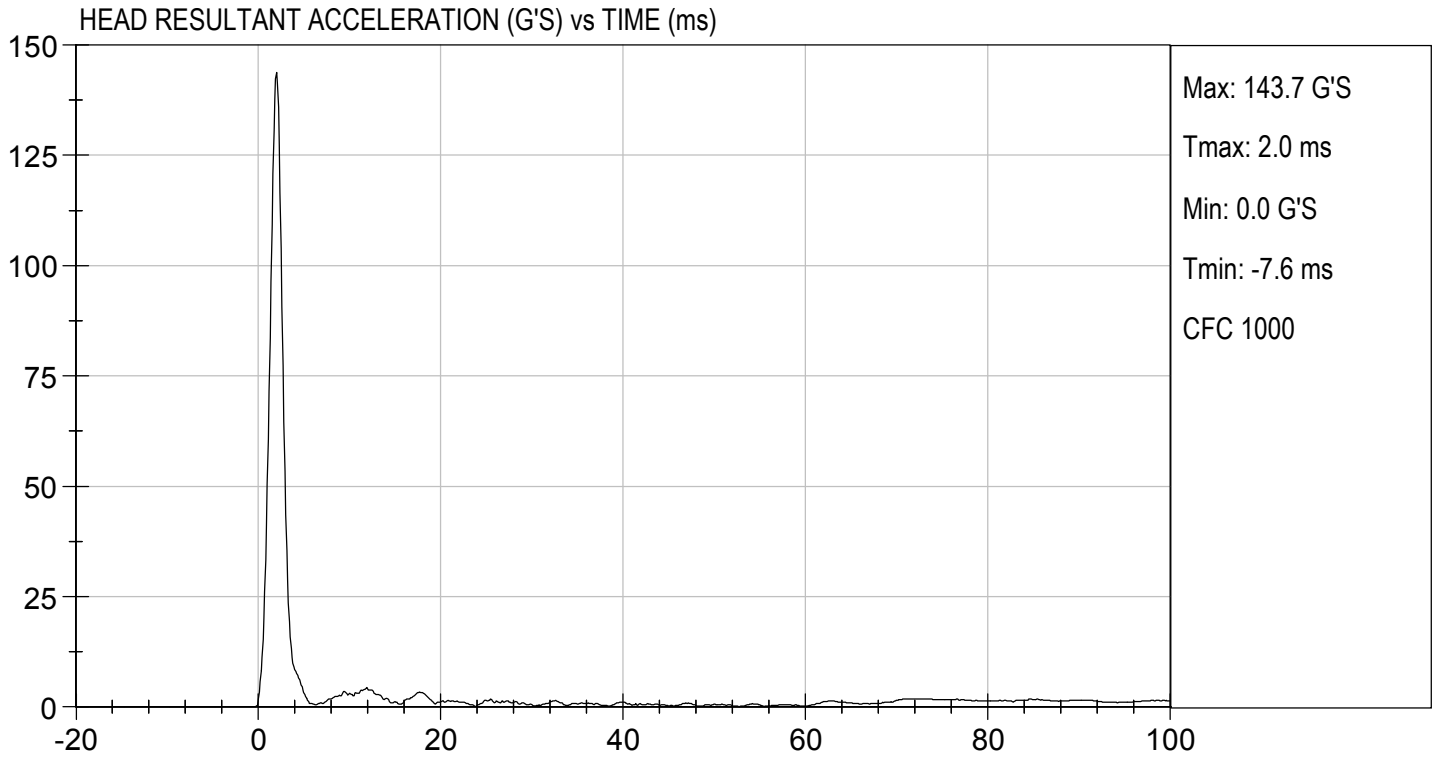
 Laboratory Technician

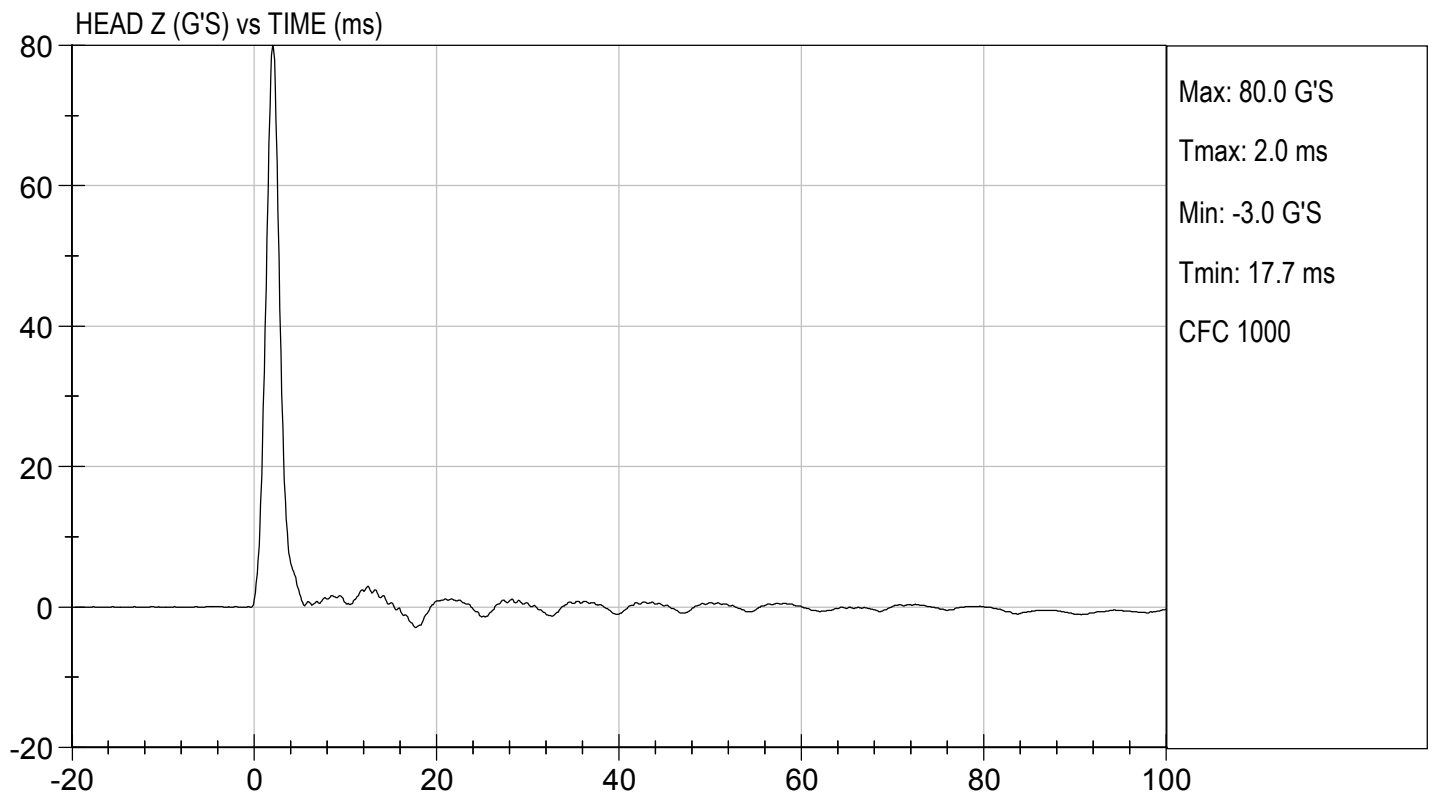
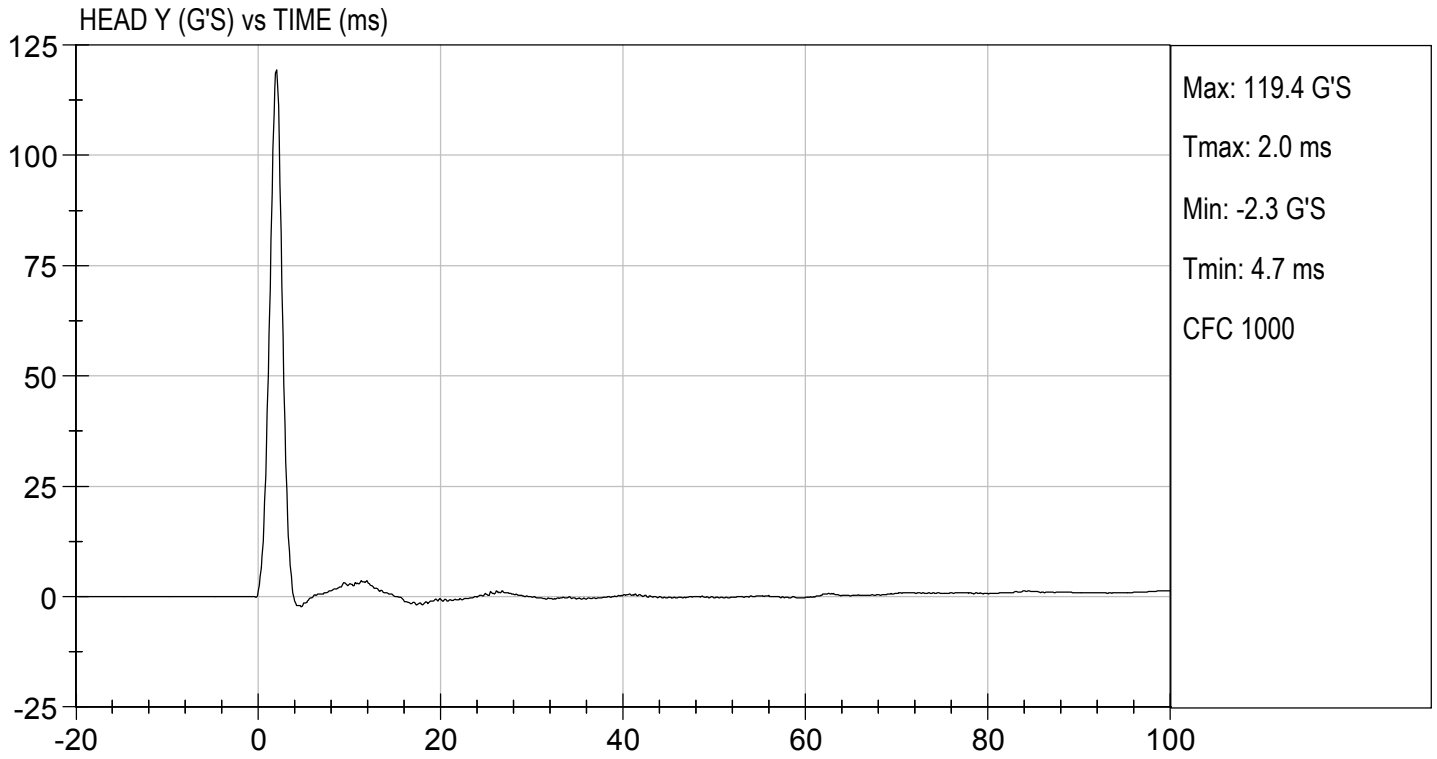
06/01/2021

 Test Date



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MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D.: D211902

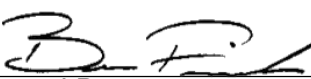
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.50	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.50	Pass
	17 ms	m/s	>= -3.70	-3.48	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.7	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	59.7	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	56.4	Pass
Overall Results					Pass



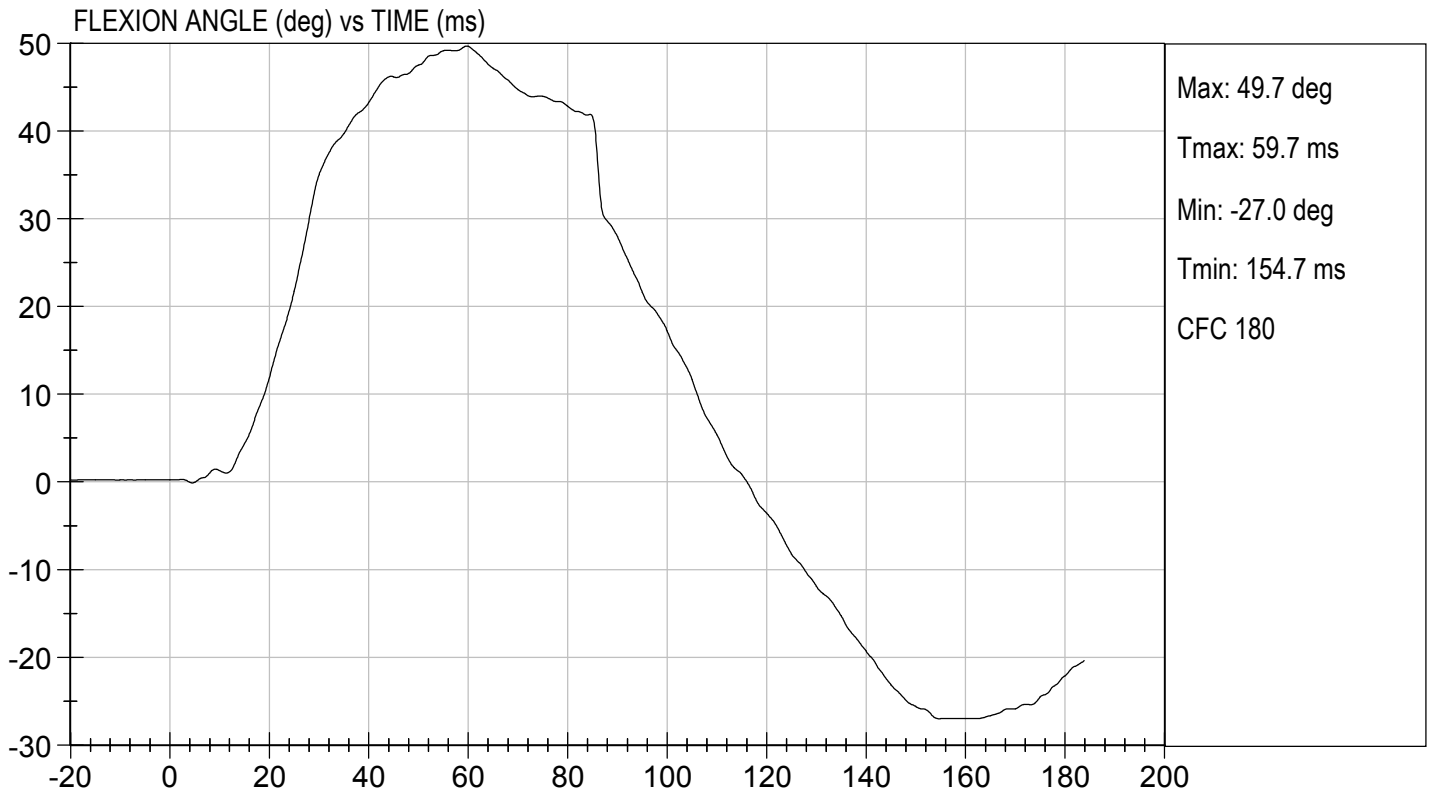
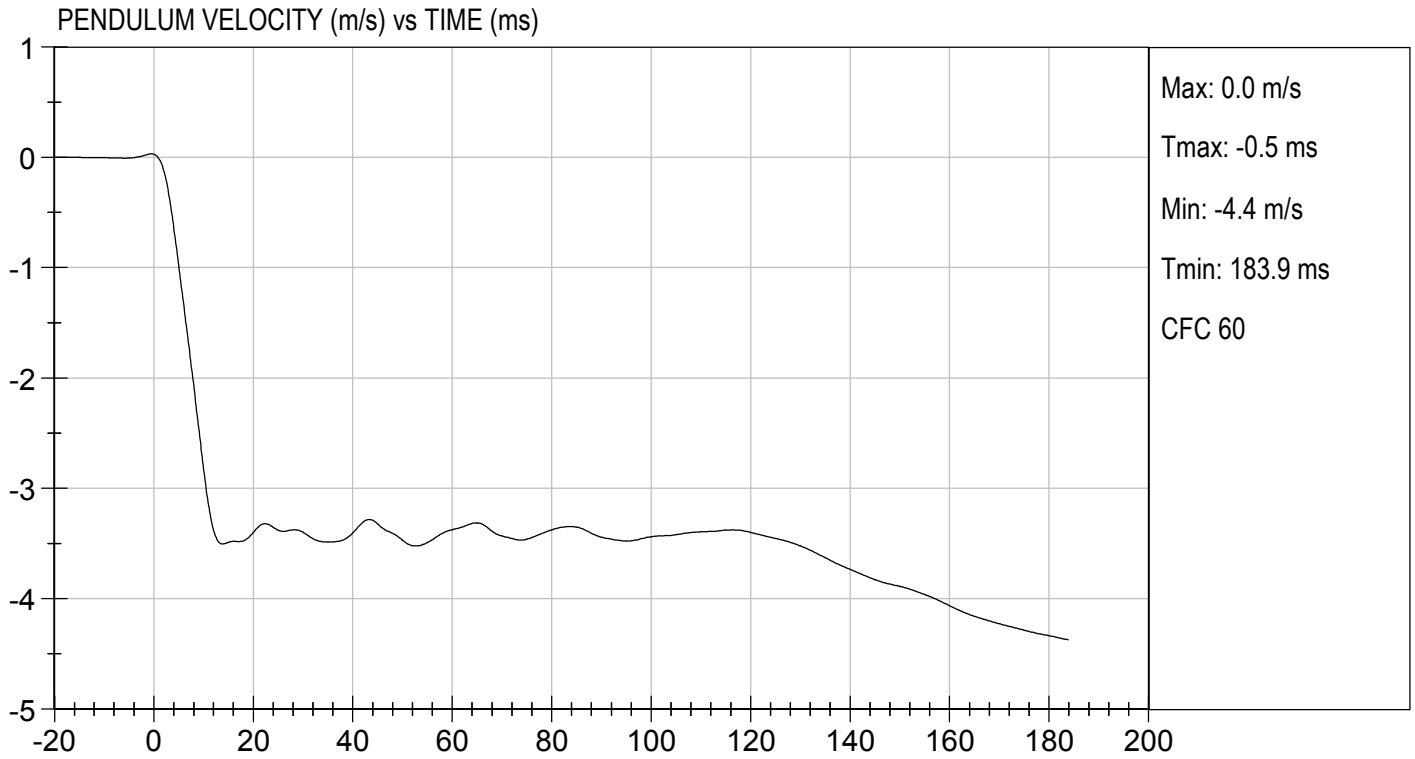
 Laboratory Technician

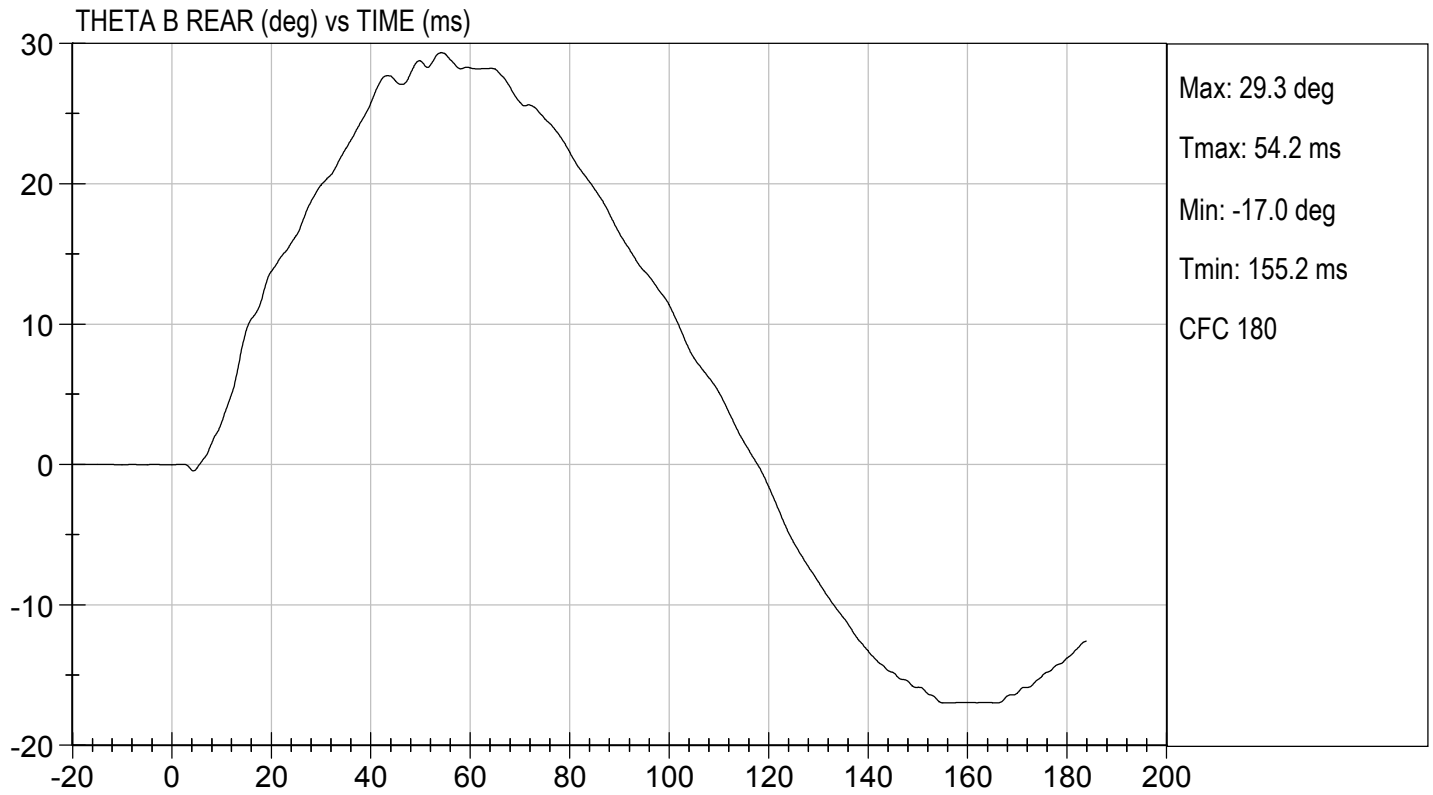
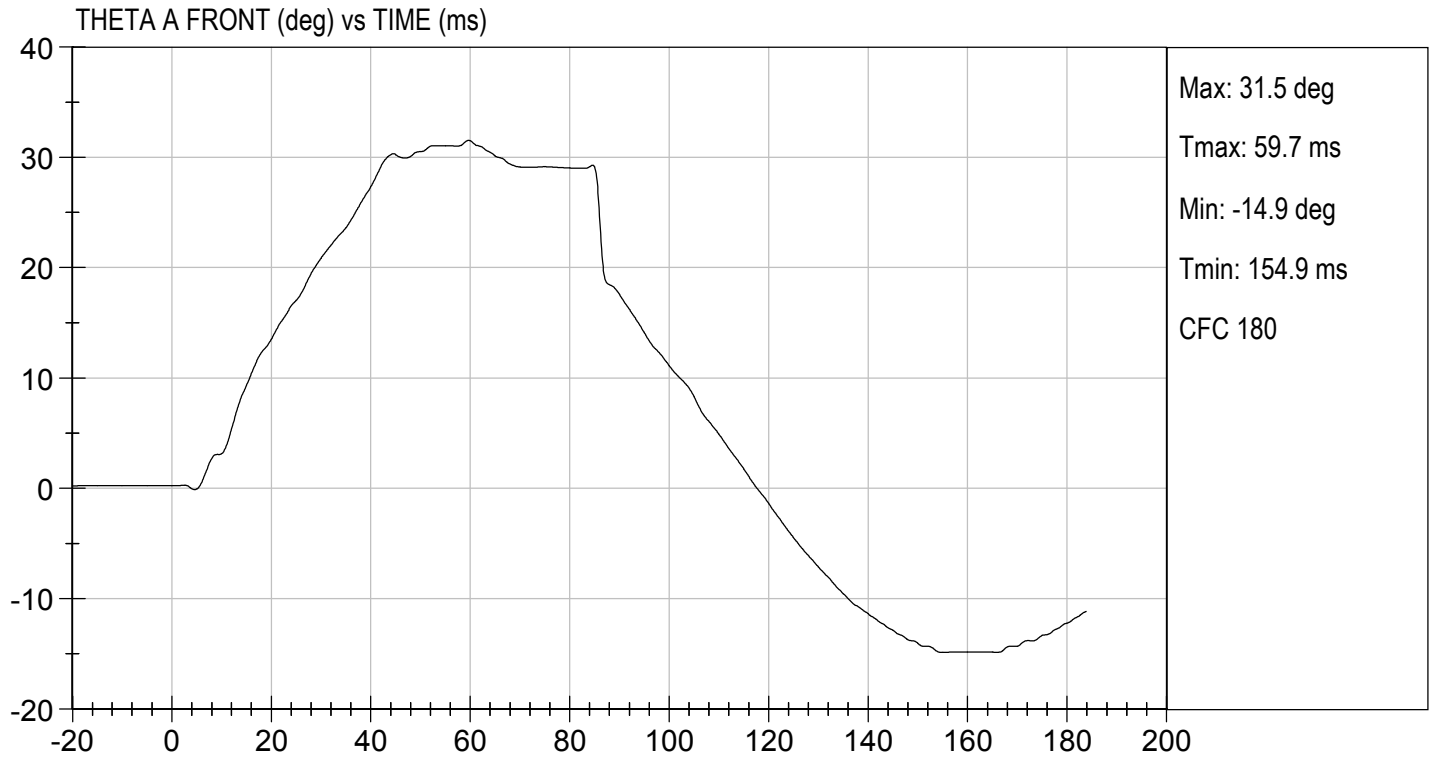
06/01/2021

 Test Date



 Approved By

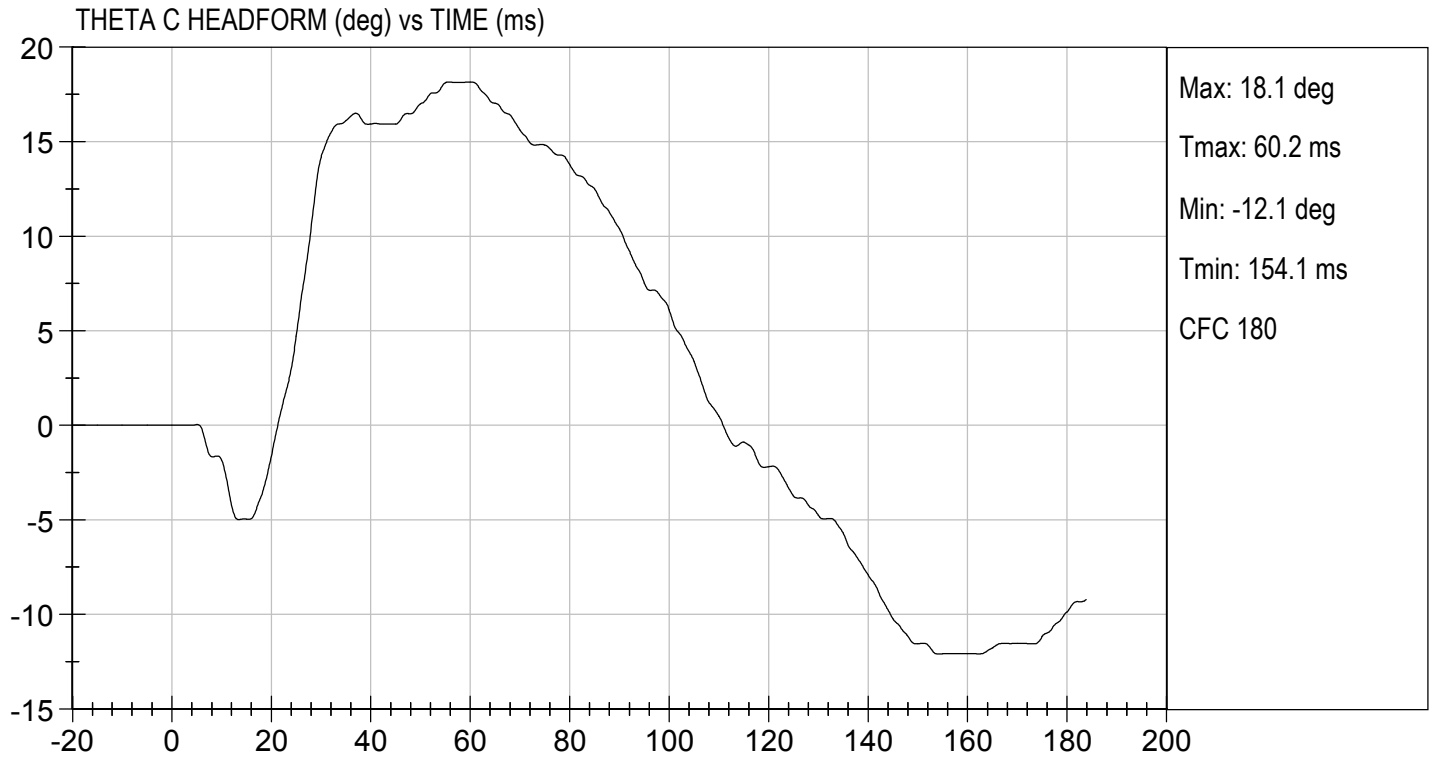






TEST DESC: NECK BENDING
VELOCITY: 11.49 ft/s, 3.50 m/s

TEST DATE: 06/01/2021
TEST #: D211902



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: F032

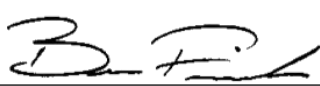
Test I.D: D211903

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.3	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.3	Pass
Overall Test Results				Pass



Laboratory Technician

05/28/2021
Test Date

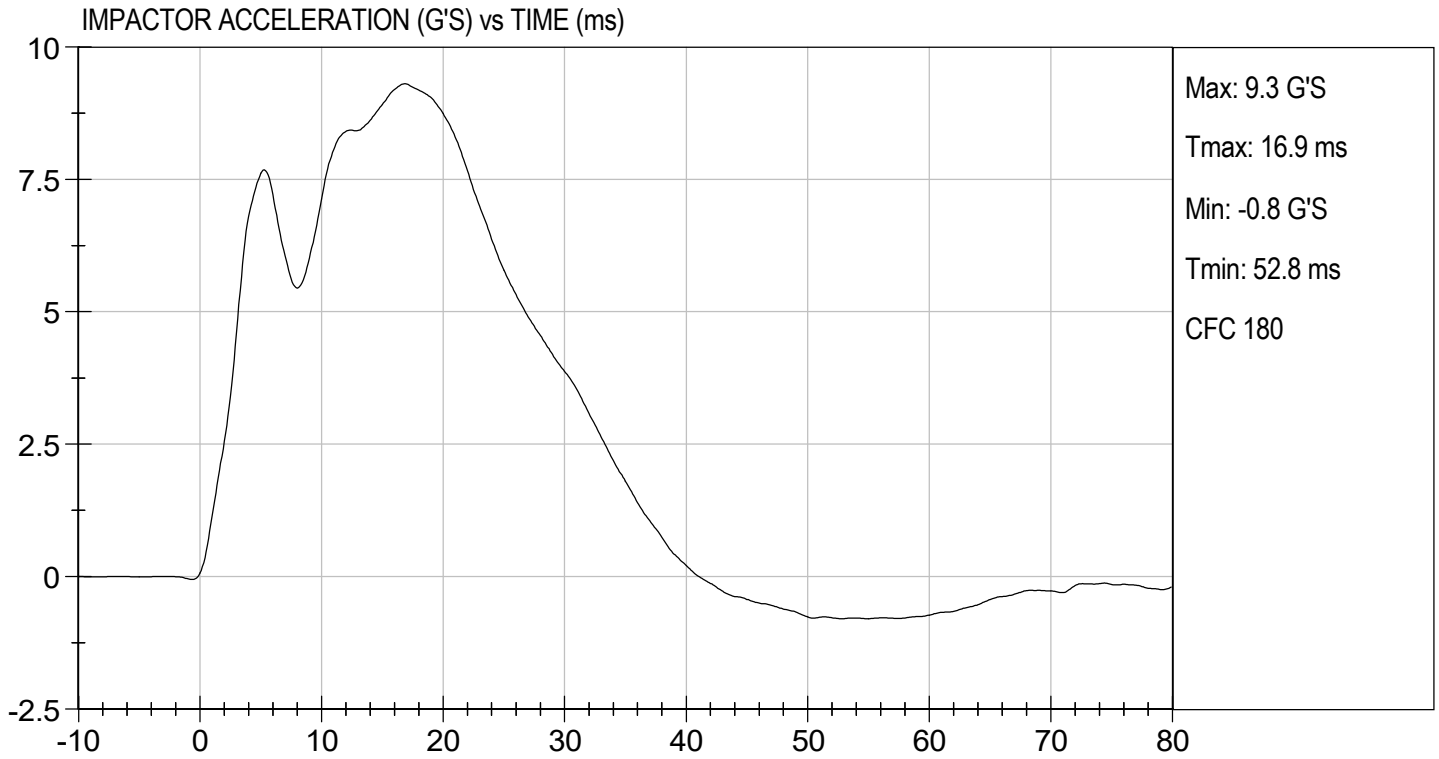


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TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.3 m/s

TEST DATE: 05/28/2021
TEST #: D211903



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

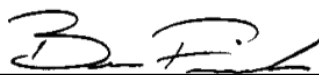
Test I.D: D211904

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.4	Pass
Overall Test Results				Pass

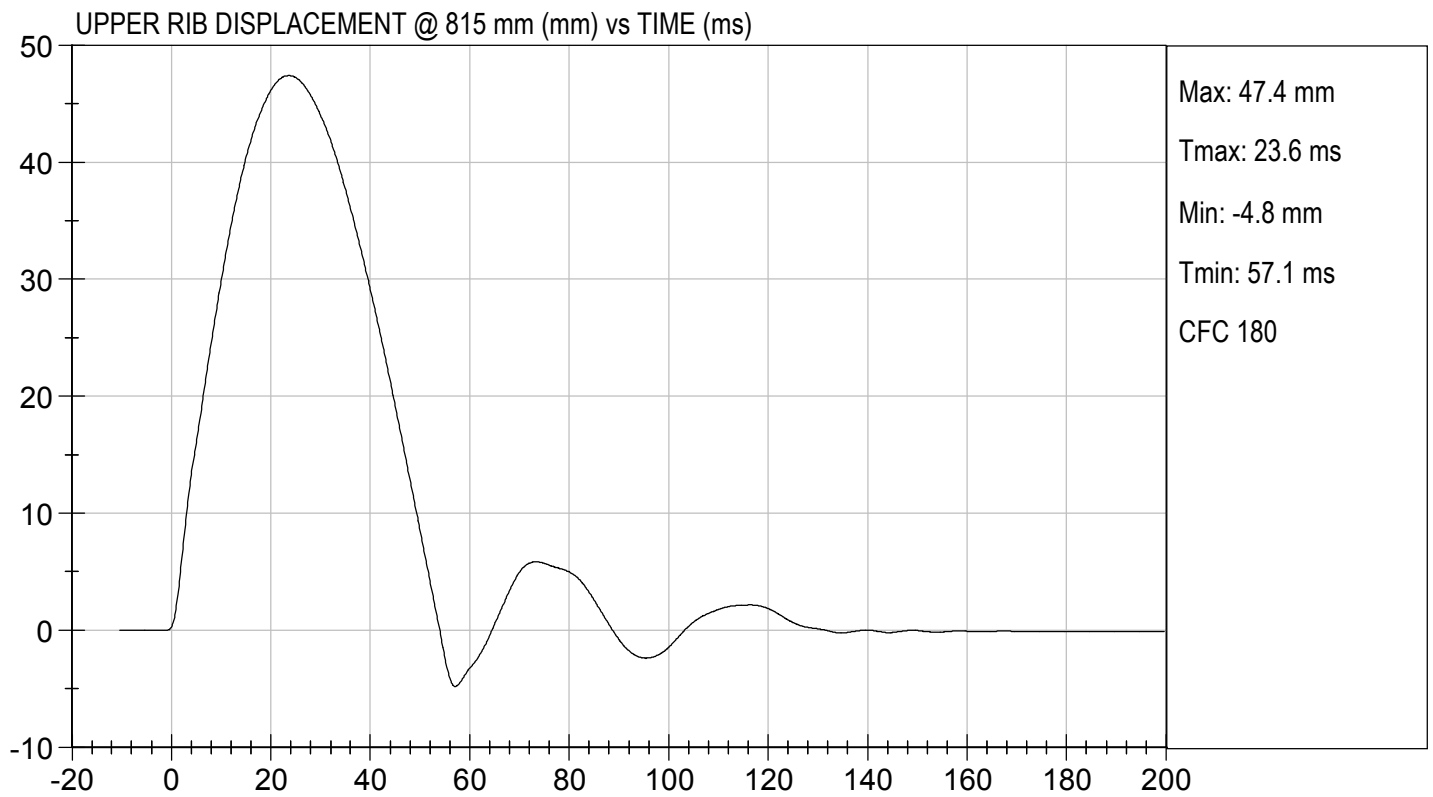
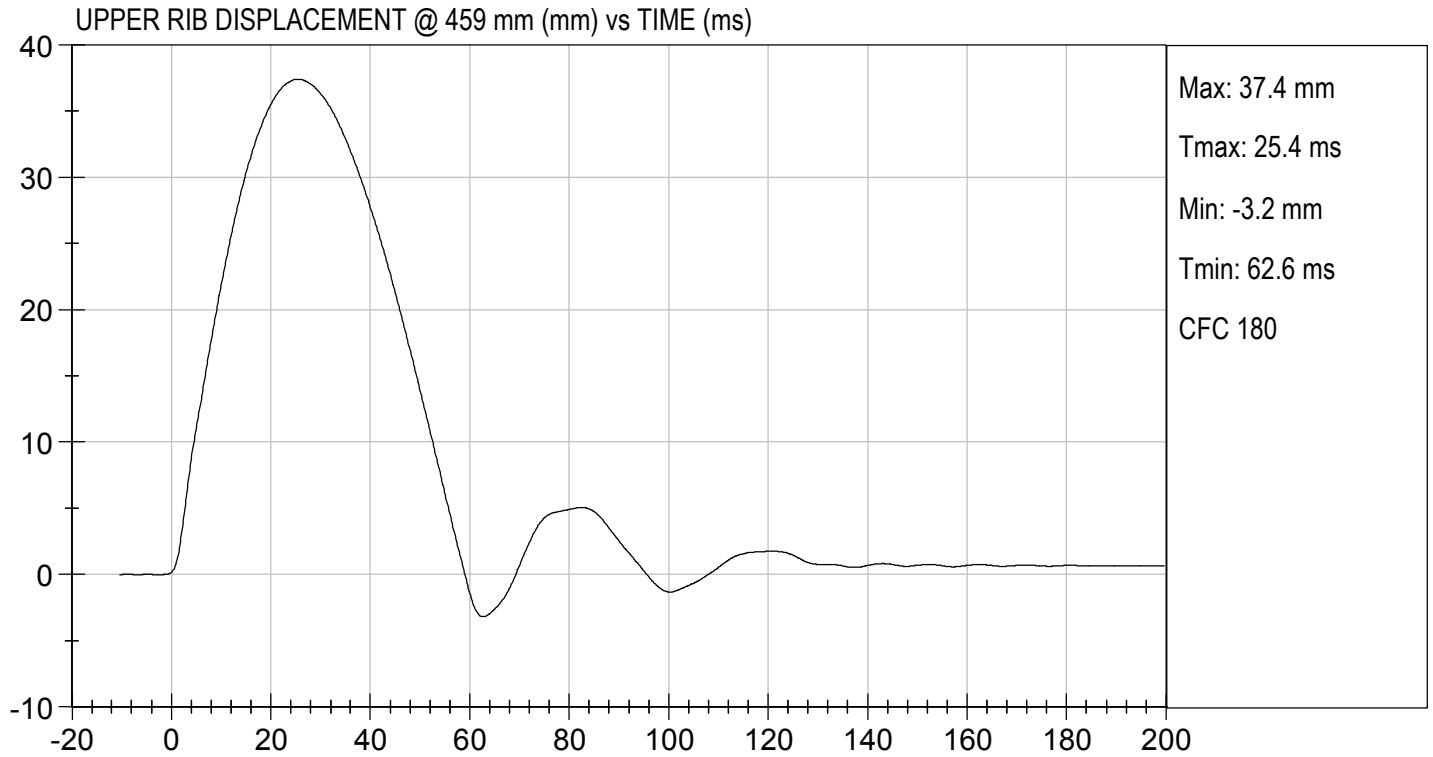


Laboratory Technician

06/01/2021
Test Date



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MID RIB TEST

ES-2re DUMMY

ATD Serial No: F032

Test I.D: D211905

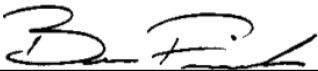
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.9	Pass
Overall Test Results				Pass



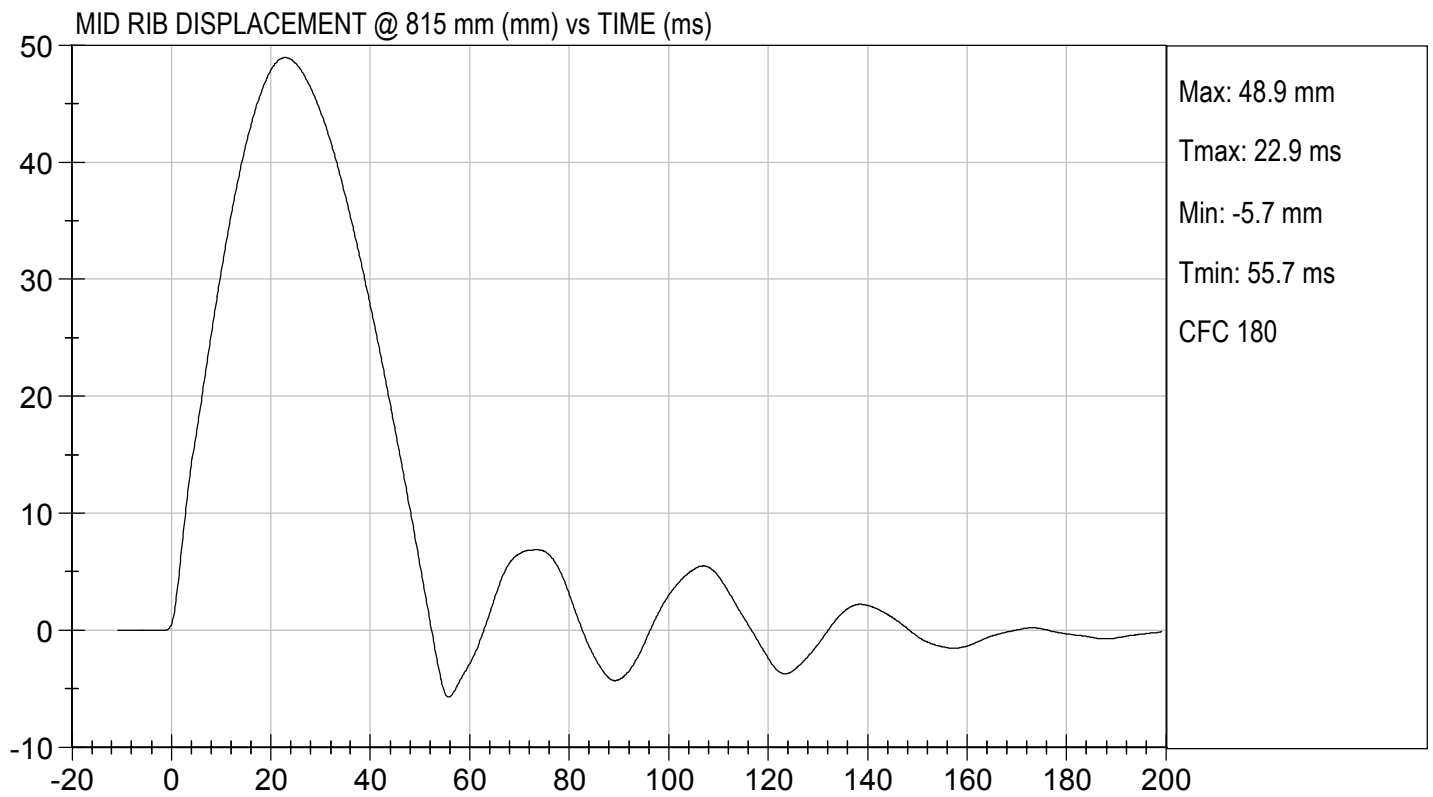
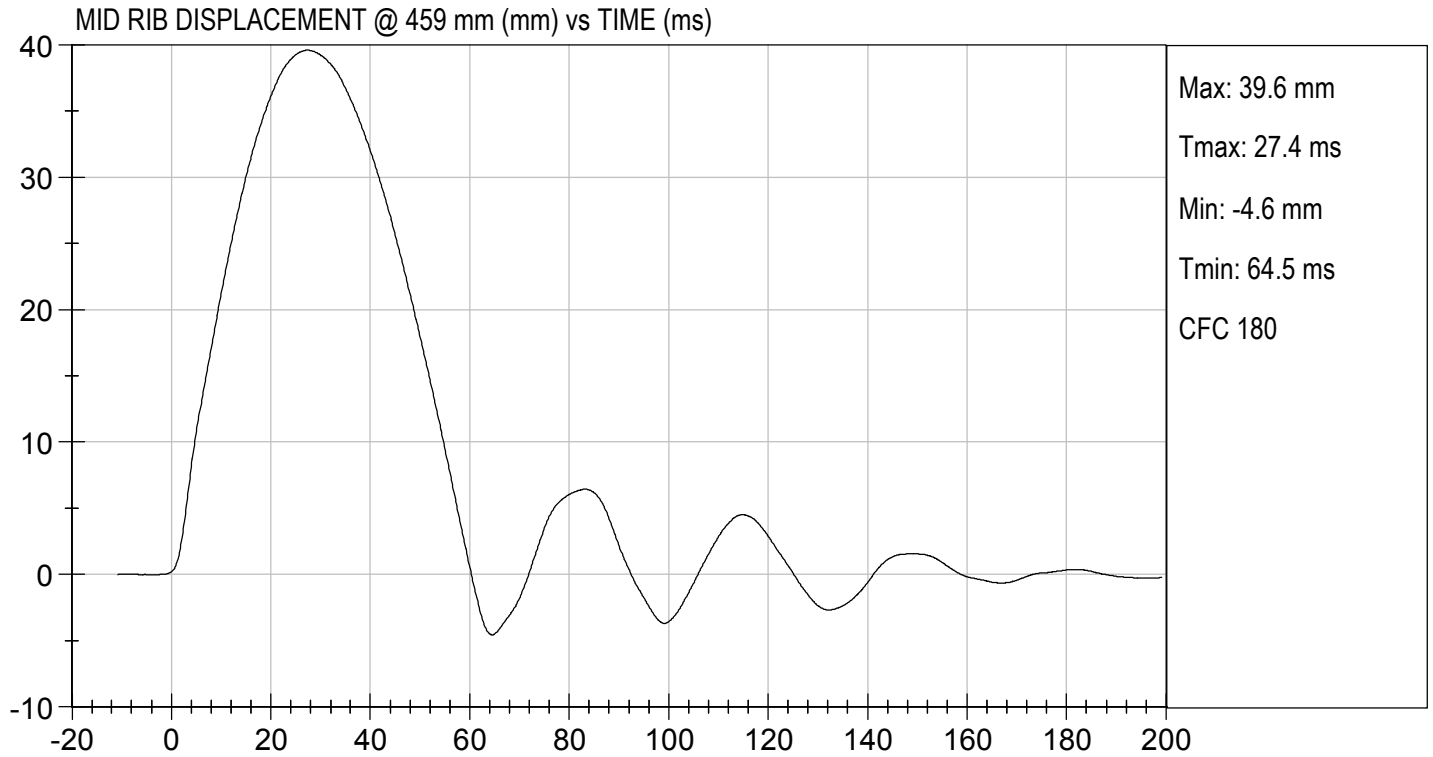
Laboratory Technician

06/01/2021

Test Date



Approved By



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

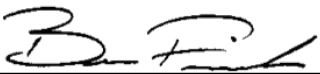
Test I.D: D211906

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.8	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.4	Pass
Overall Test Results				Pass

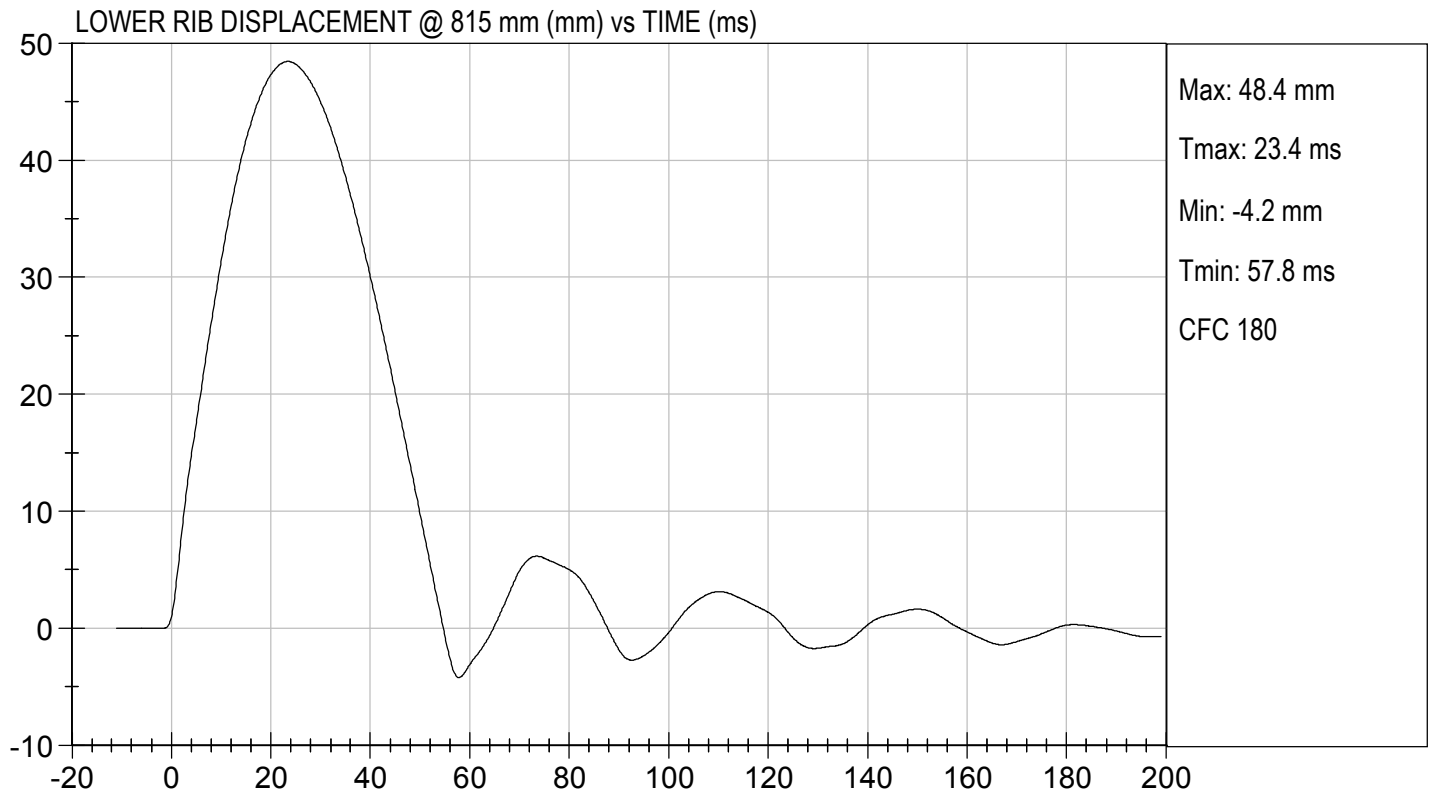
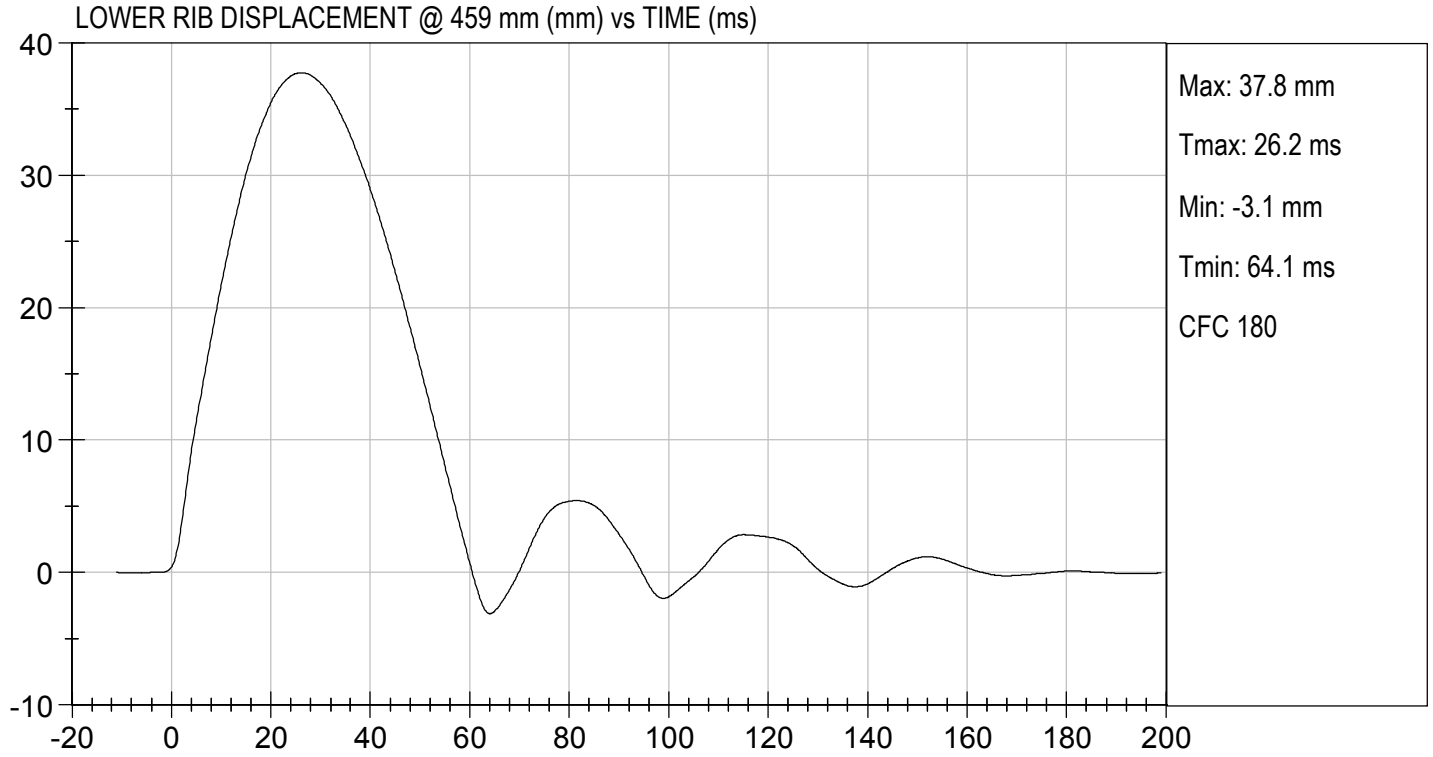


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06/01/2021
Test Date



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ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: F032

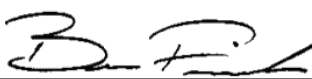
Test I.D: D211907

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	3.90 to 4.10	4.03	Pass
Maximum Impactor Force	N	4000 to 4800	4097	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	12.0	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2295	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.4	Pass
Overall Test Results				Pass

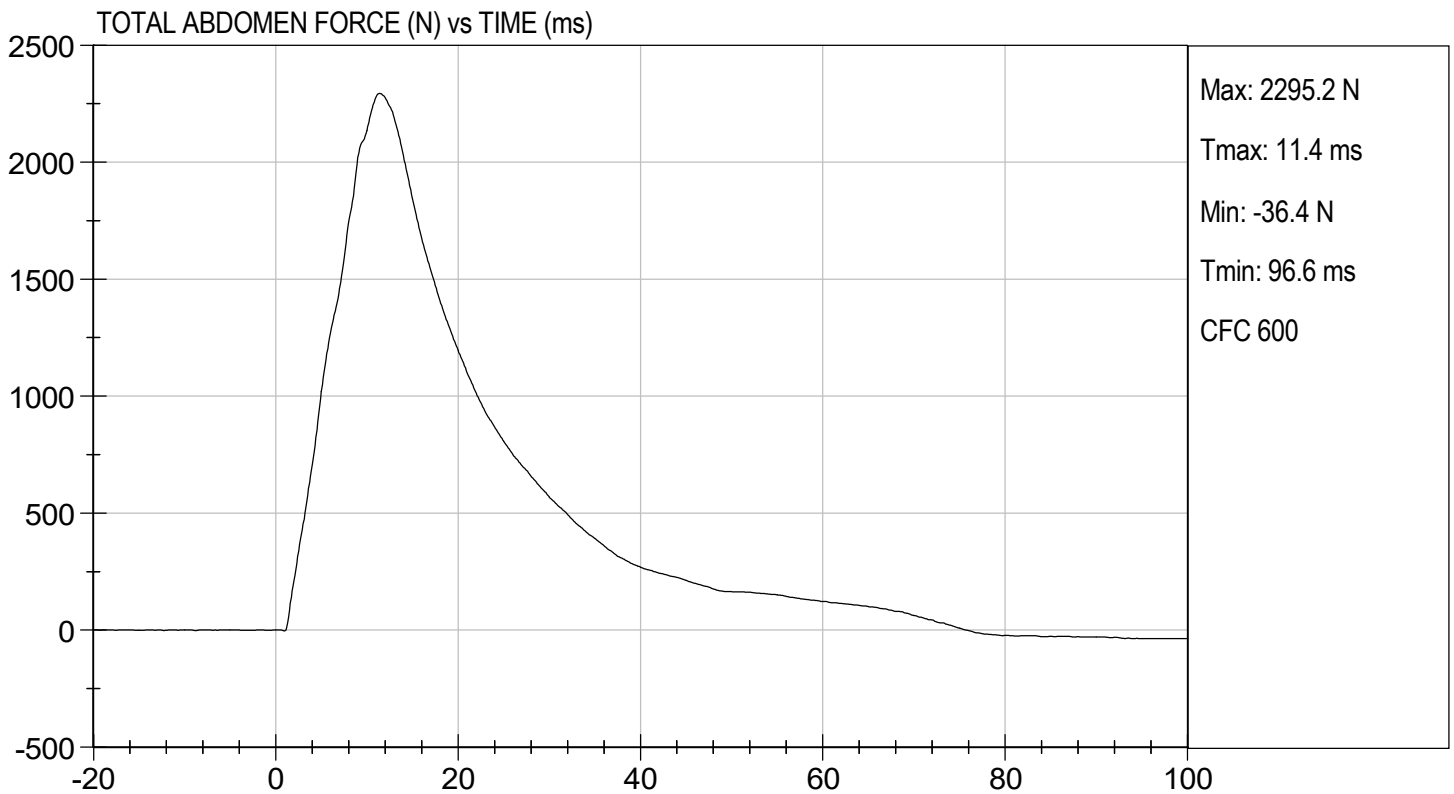
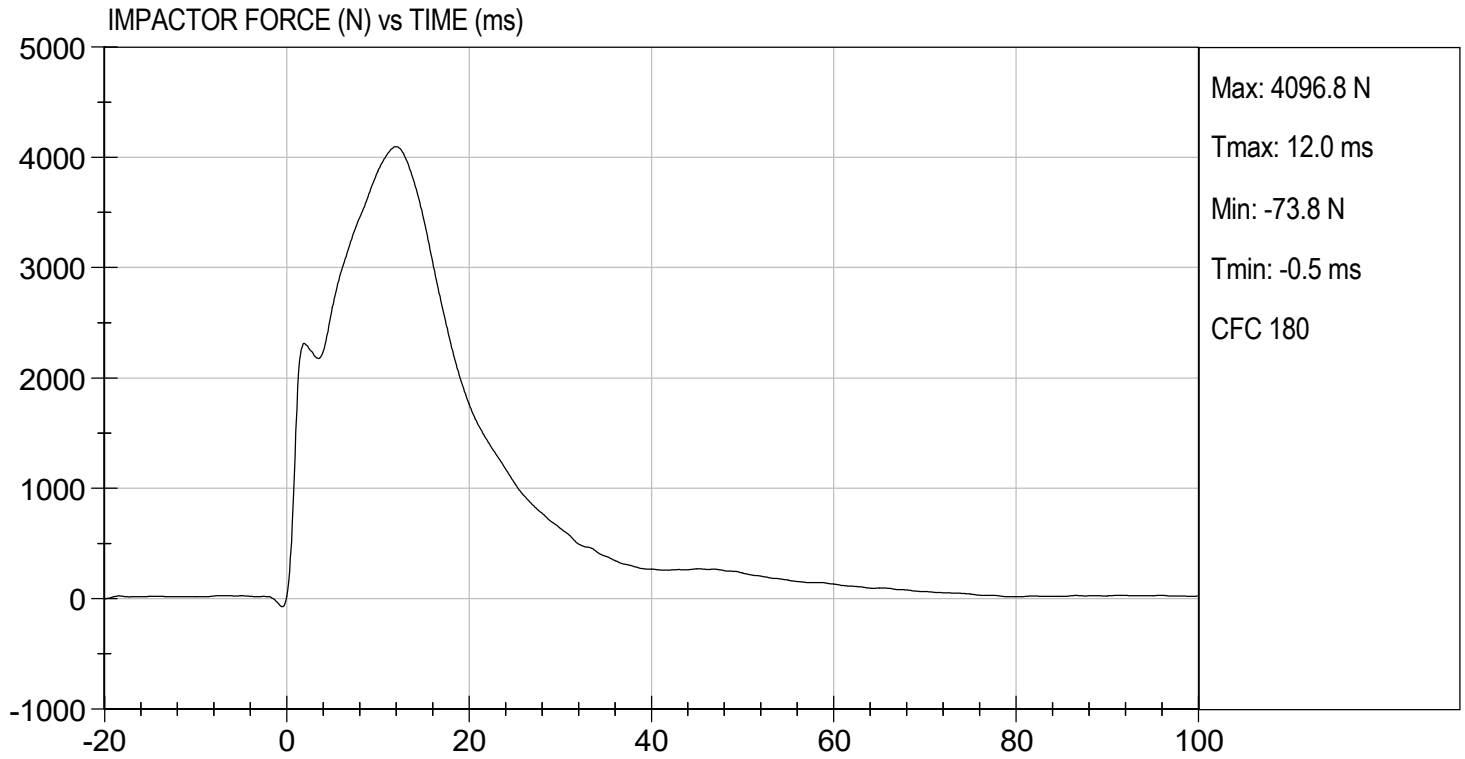


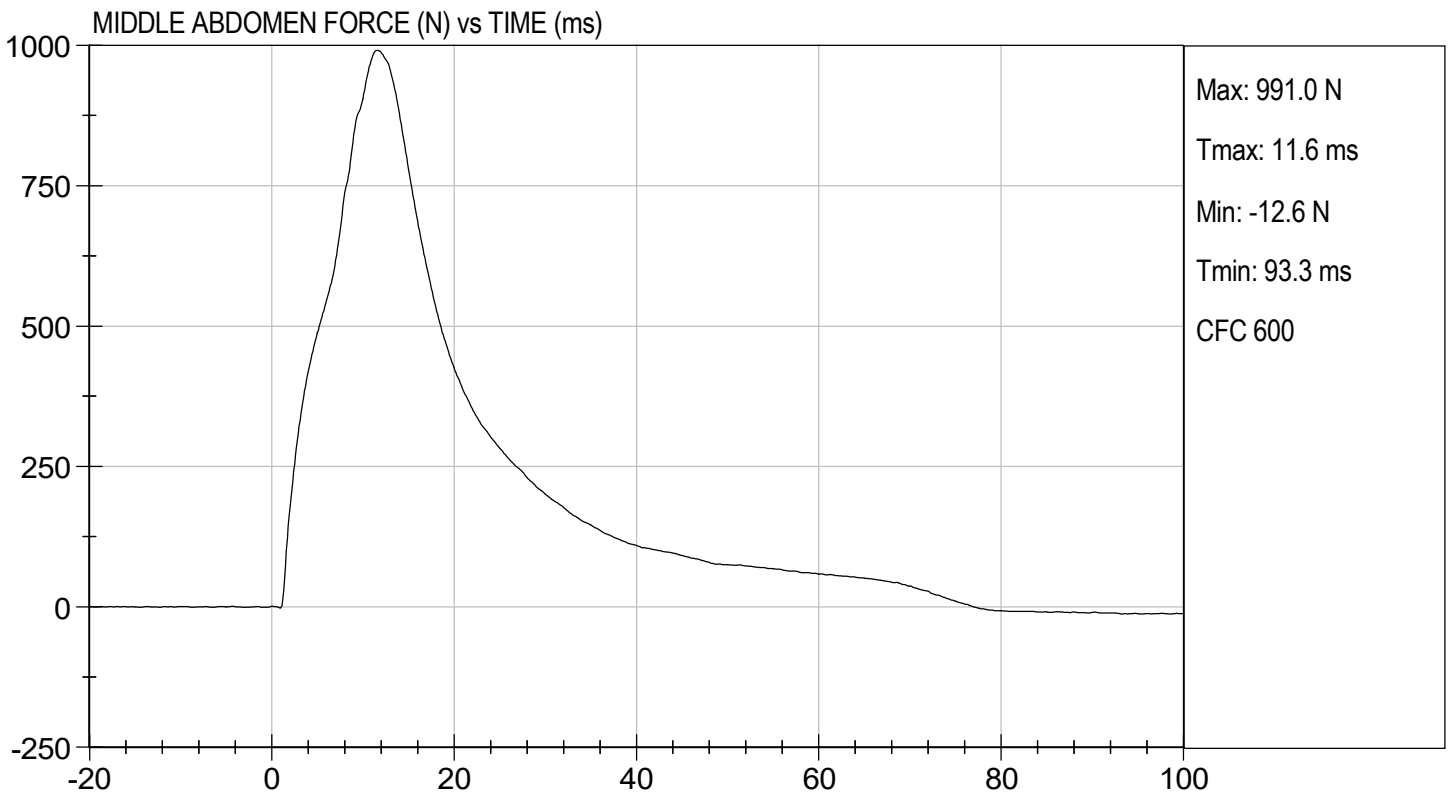
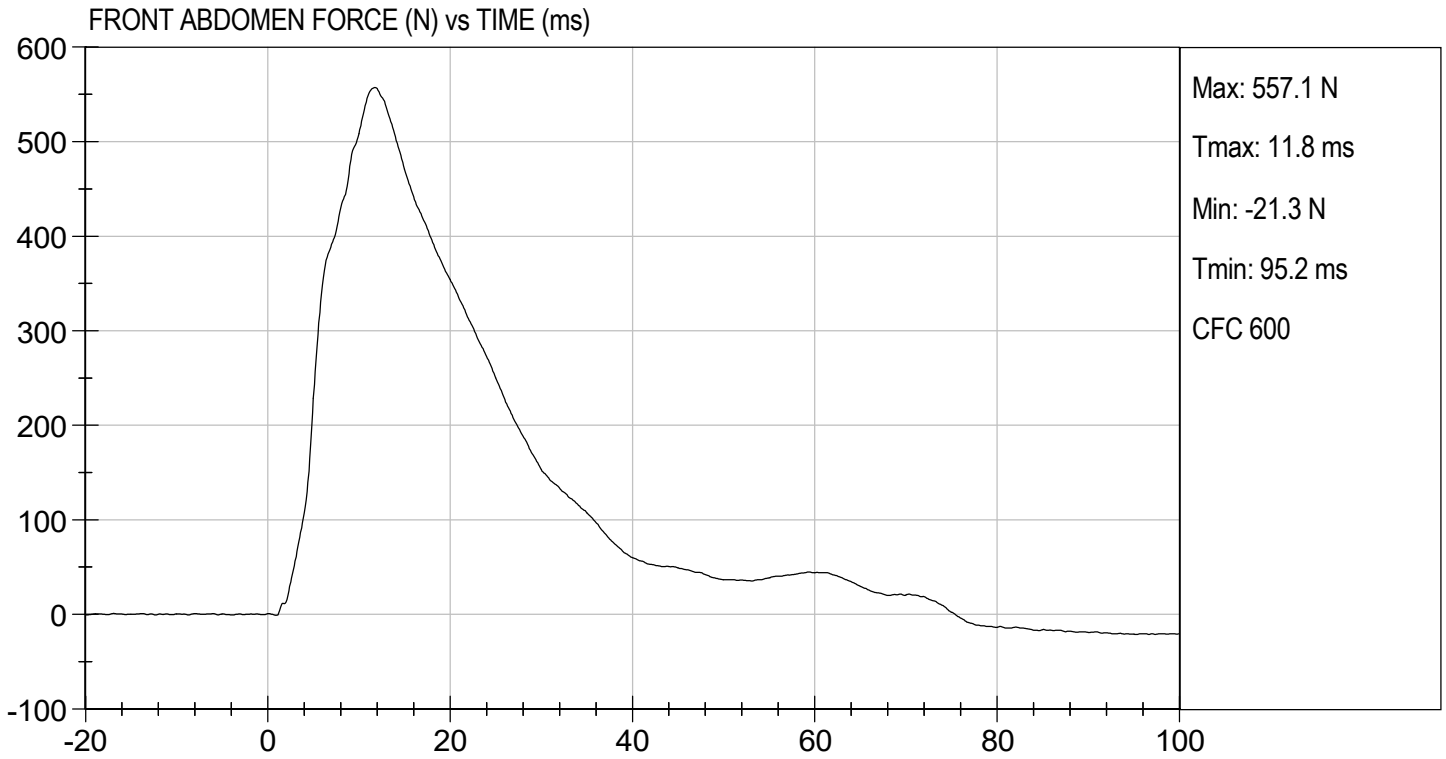
Laboratory Technician

05/28/2021
Test Date



Approved By

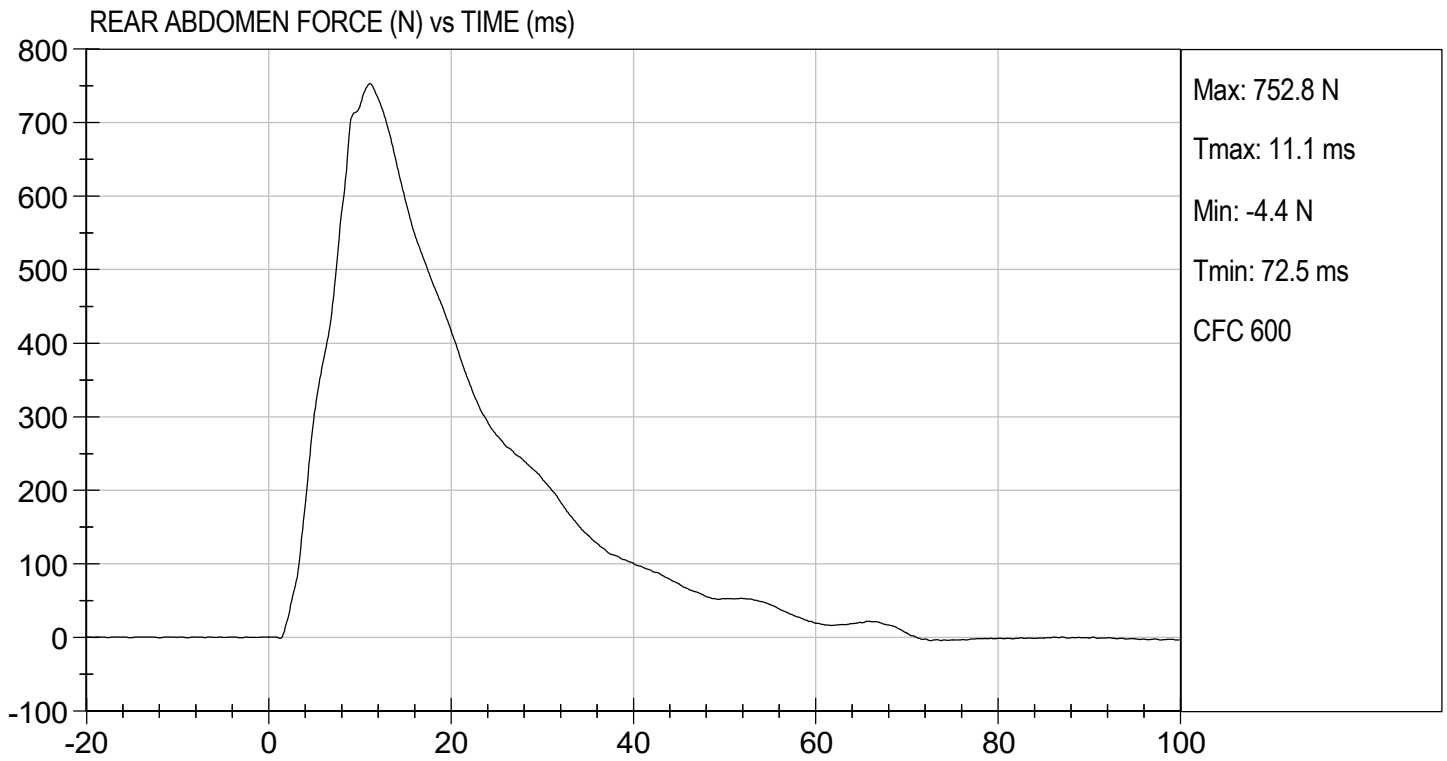






TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.23 ft/s, 4.03 m/s

TEST DATE: 05/28/2021
TEST #: D211907



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D.: D211908

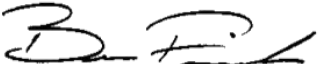
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass	
Laboratory Relative Humidity	%	10 to 70	40	Pass	
Pendulum Speed	m/s	5.95 to 6.15	6.12	Pass	
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.388	Pass
	27 ms	m/s	-6.50 to -5.80	-6.08	Pass
	30 ms	m/s	>= -6.50	-6.02	Pass
Maximum Flexion Angle	deg	45.0 to 55.0	45.8	Pass	
Time of Maximum Flexion Angle	ms	39.0 to 53.0	44.0	Pass	
Headform Rotation Decay to Initial Position	ms	37 to 57	38	Pass	
Overall Results				Pass	



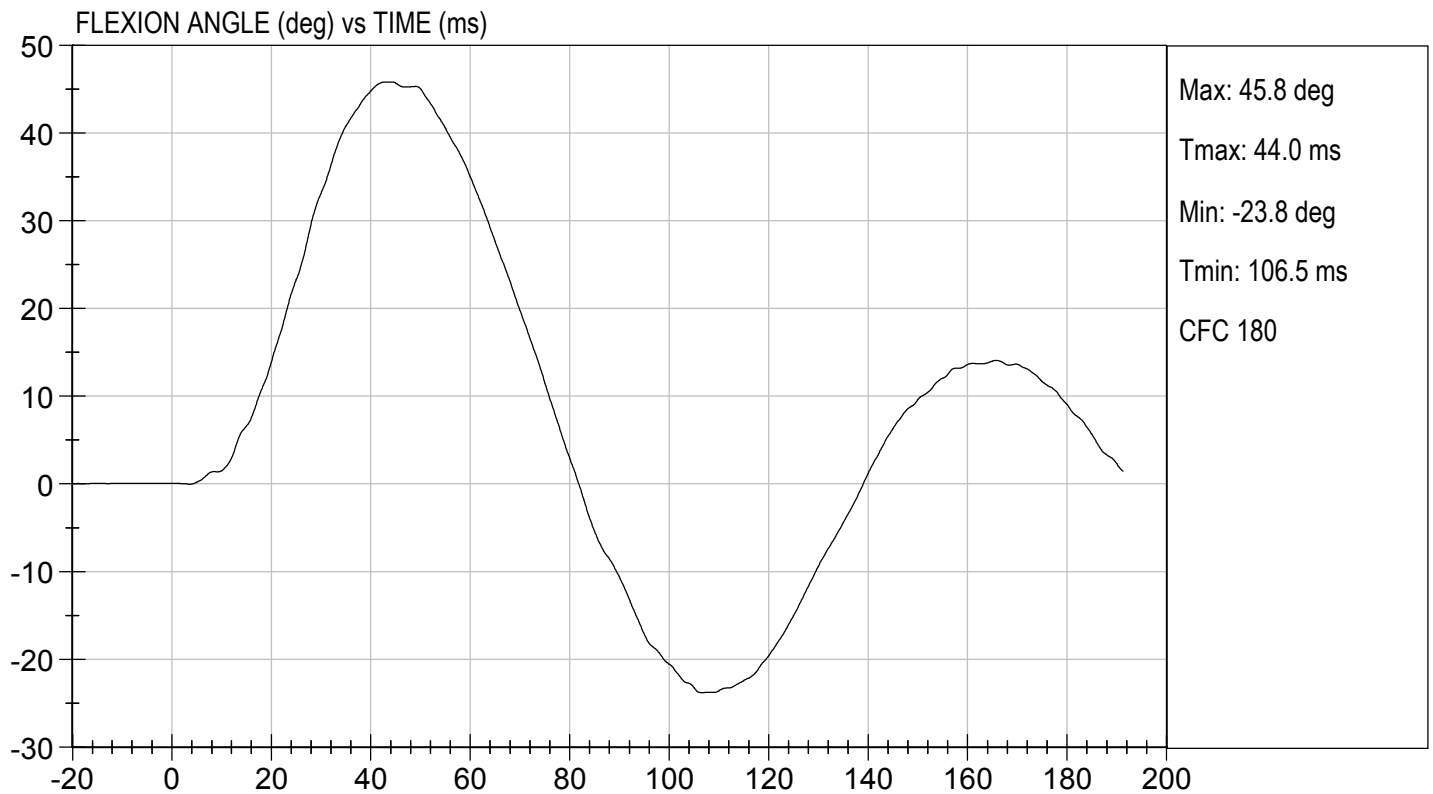
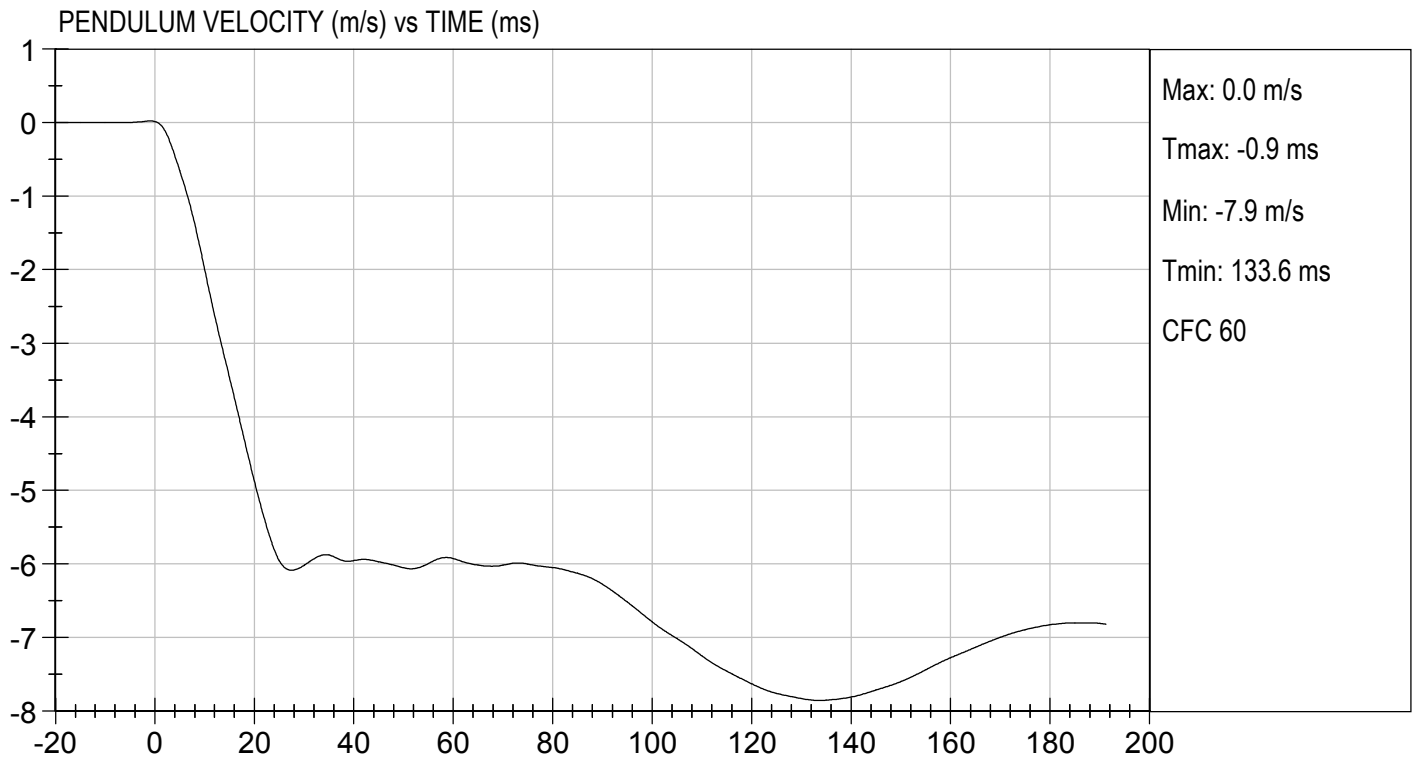
 Laboratory Technician

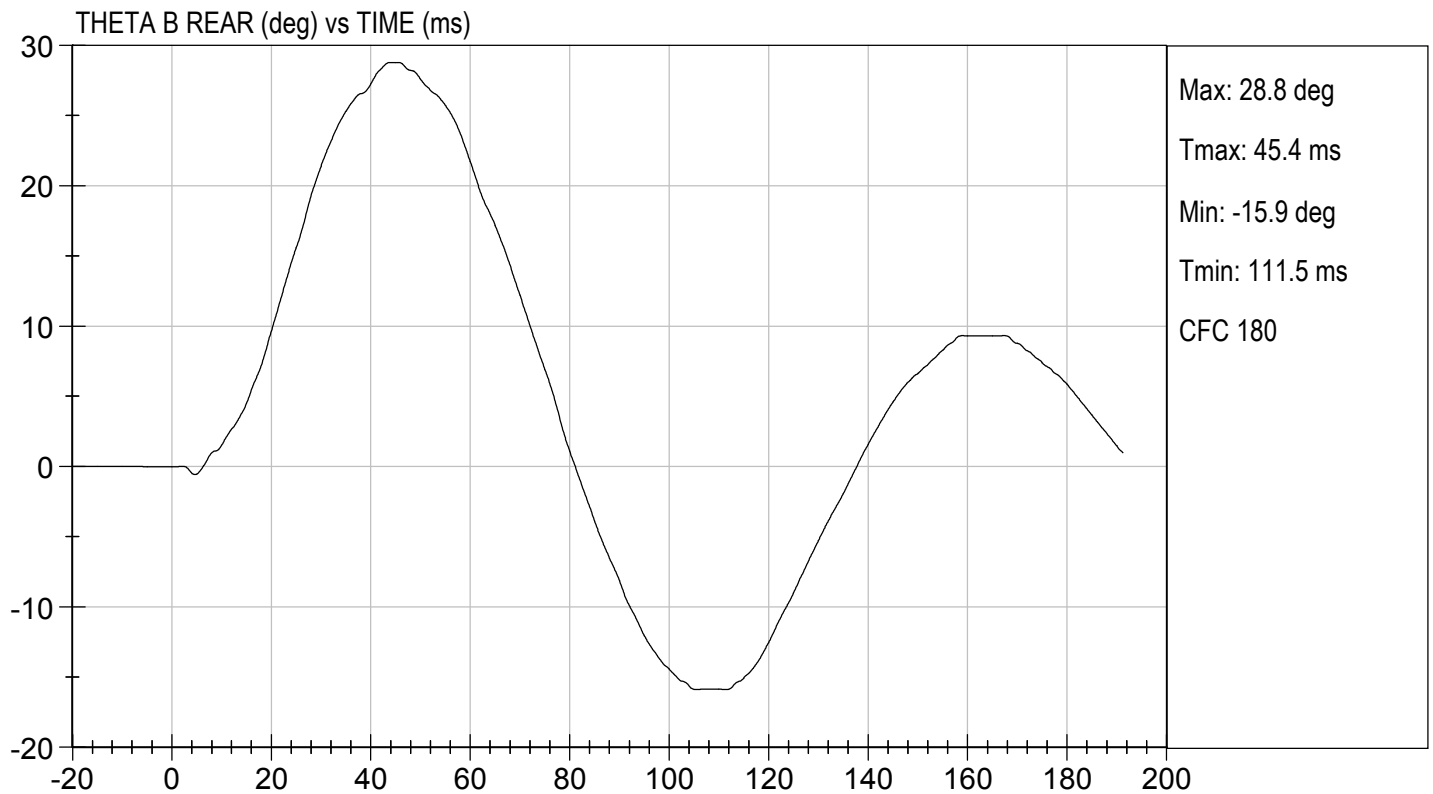
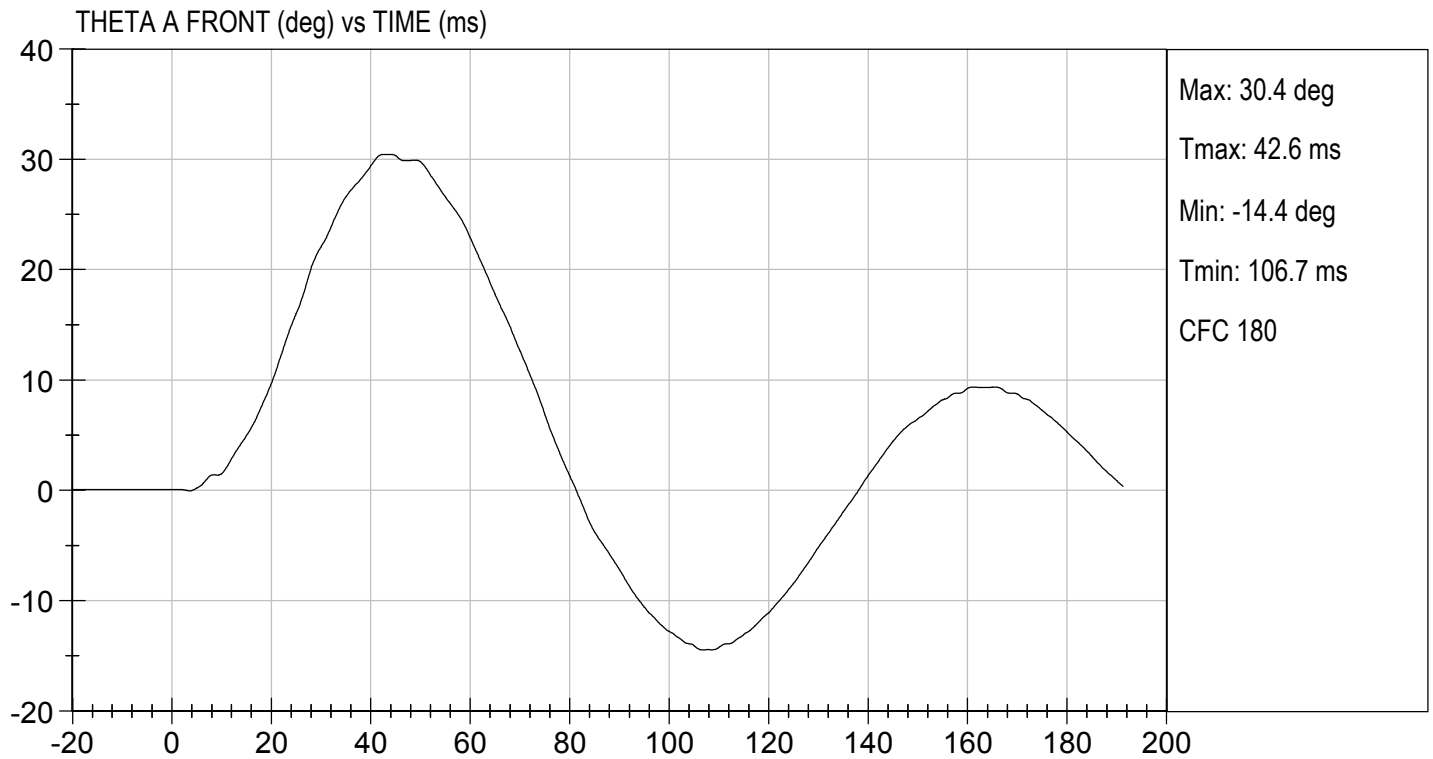
06/01/2021

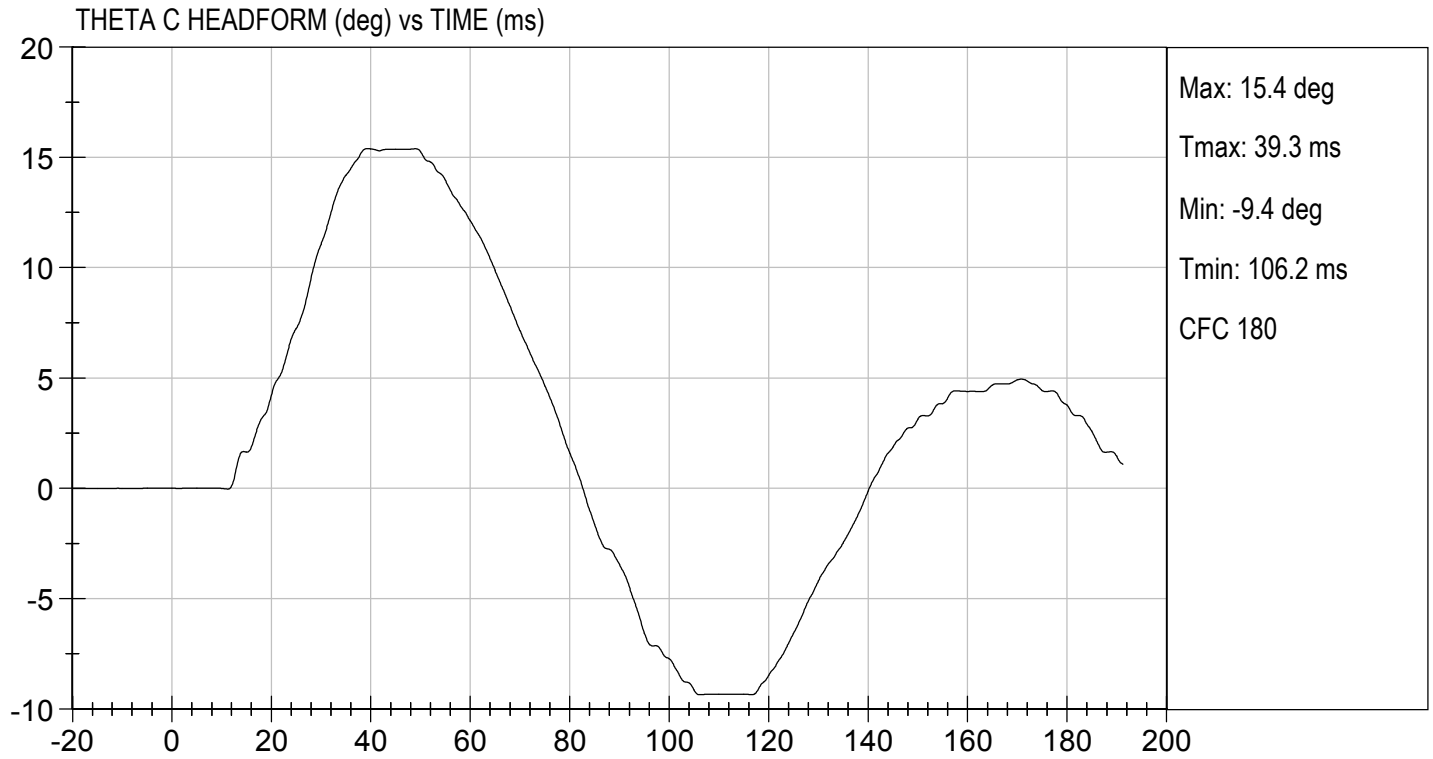
 Test Date



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MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: F032

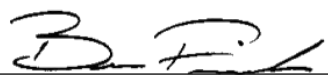
Test I.D: D211909

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	4.20 to 4.40	4.23	Pass
Maximum Impactor Force	N	4700 to 5400	4949	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	14.2	Pass
Maximum Pubic Force	N	1230 to 1590	1321	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.9	Pass
Overall Test Results				Pass

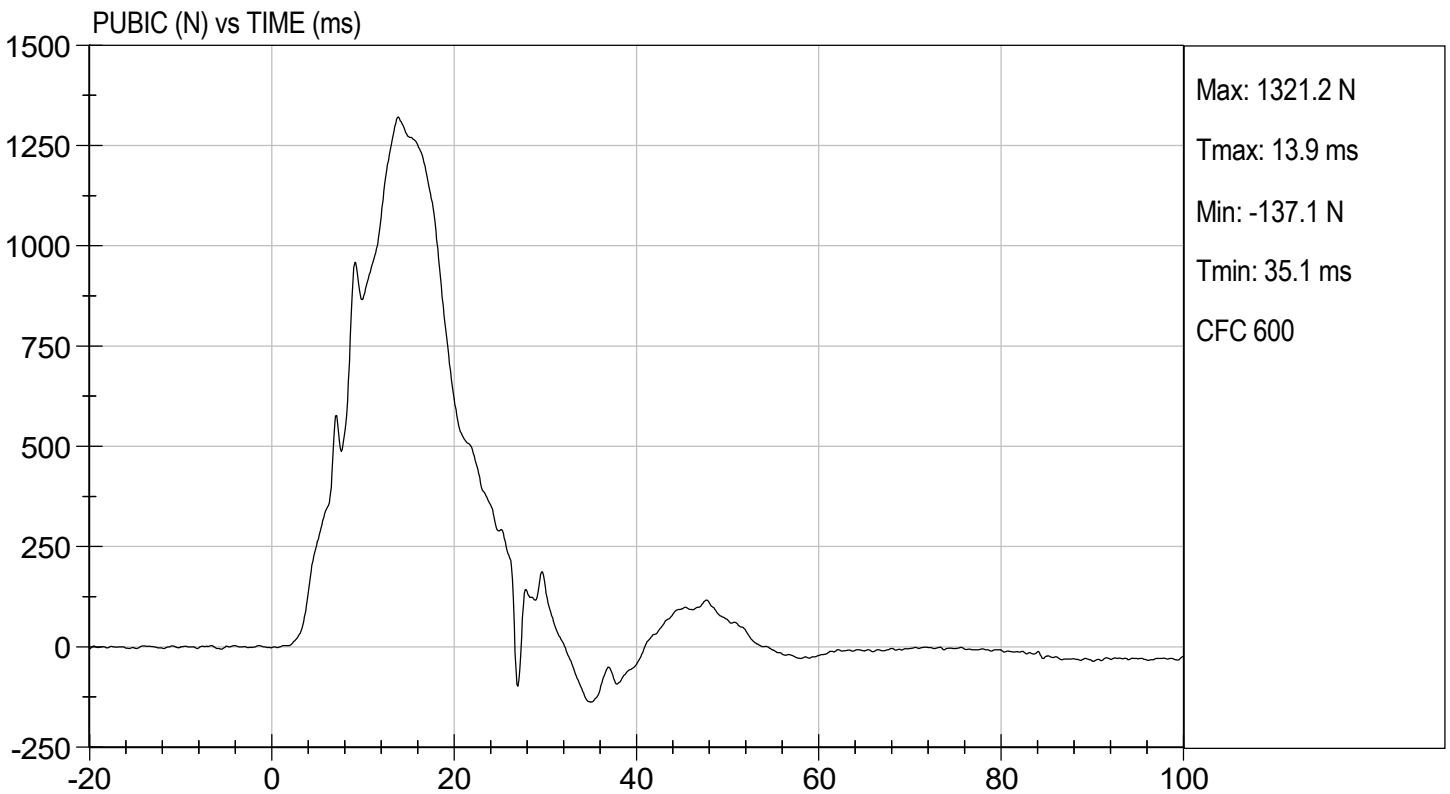
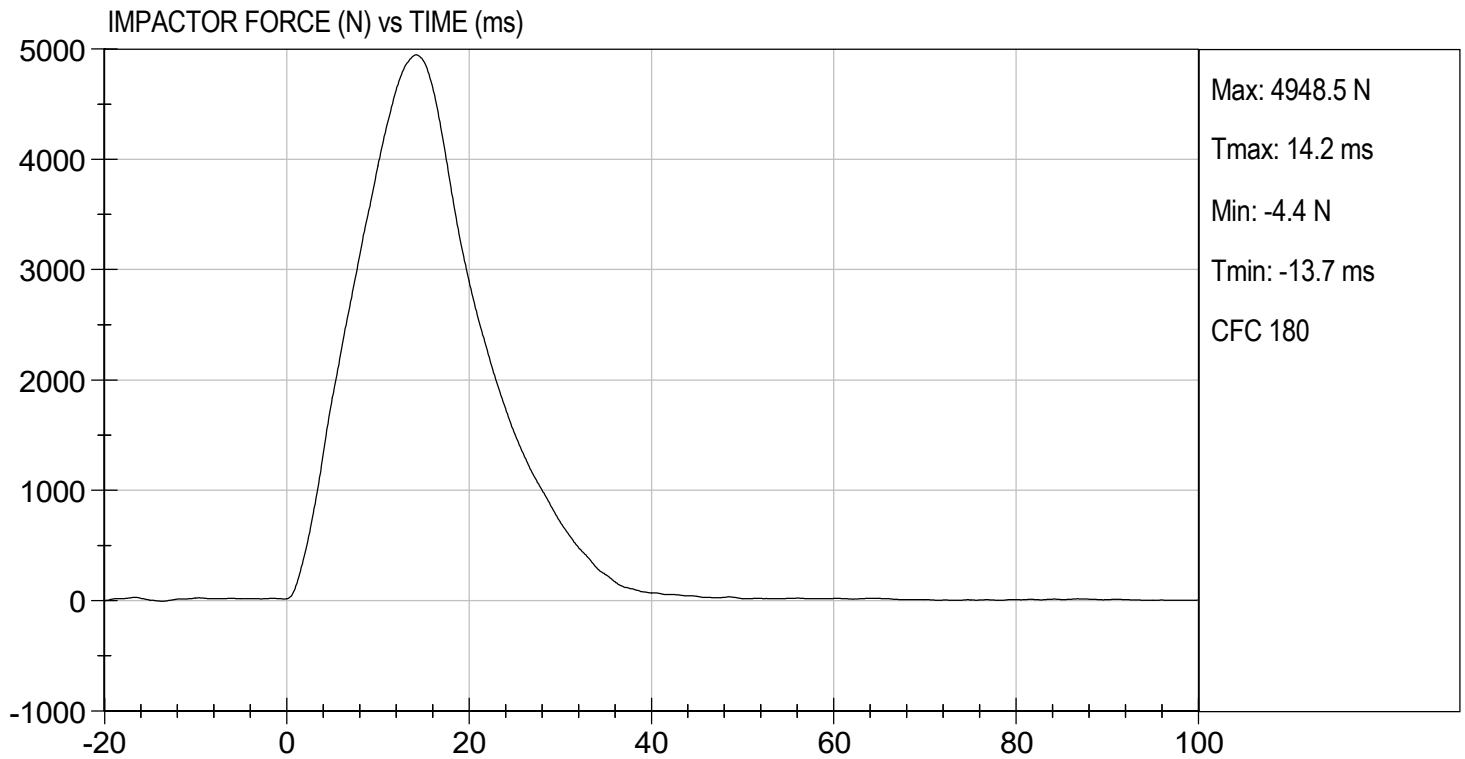


Laboratory Technician

05/28/2021
Test Date



Approved By



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: F032

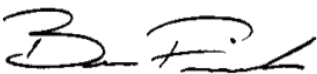
Test I.D.: D211900

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	5.40 to 5.60	5.46	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5878	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.5	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.6	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.5	Pass
Overall Test Results				Pass

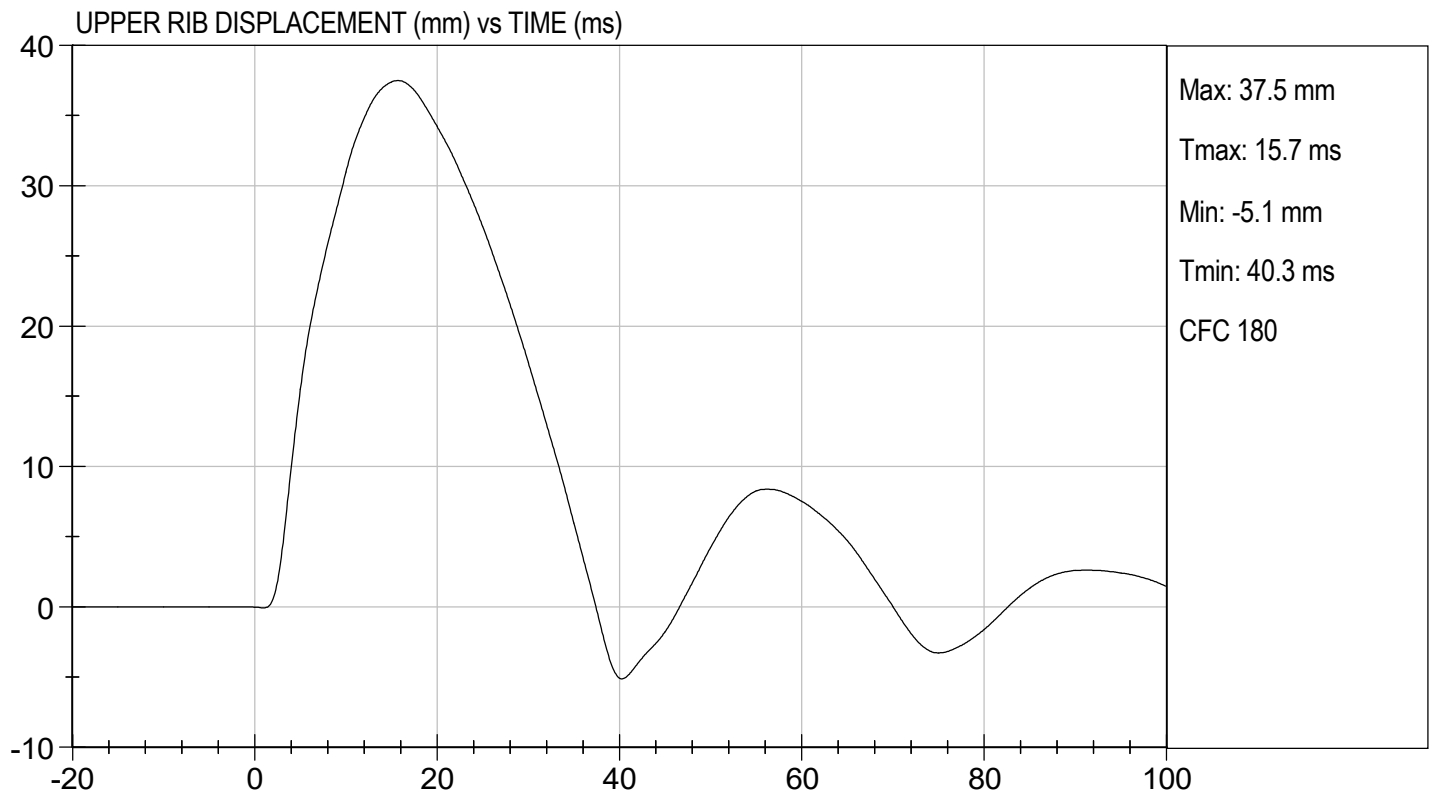
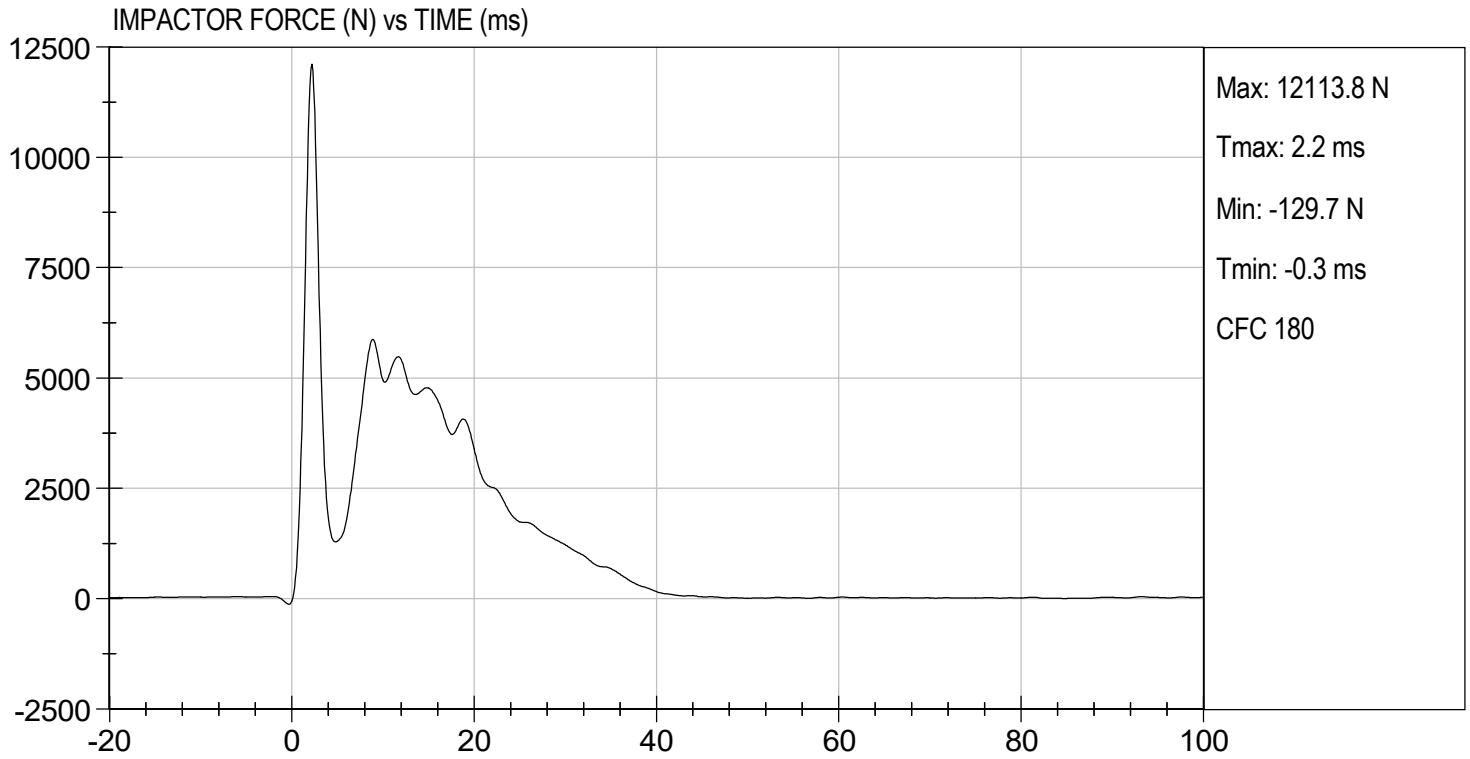


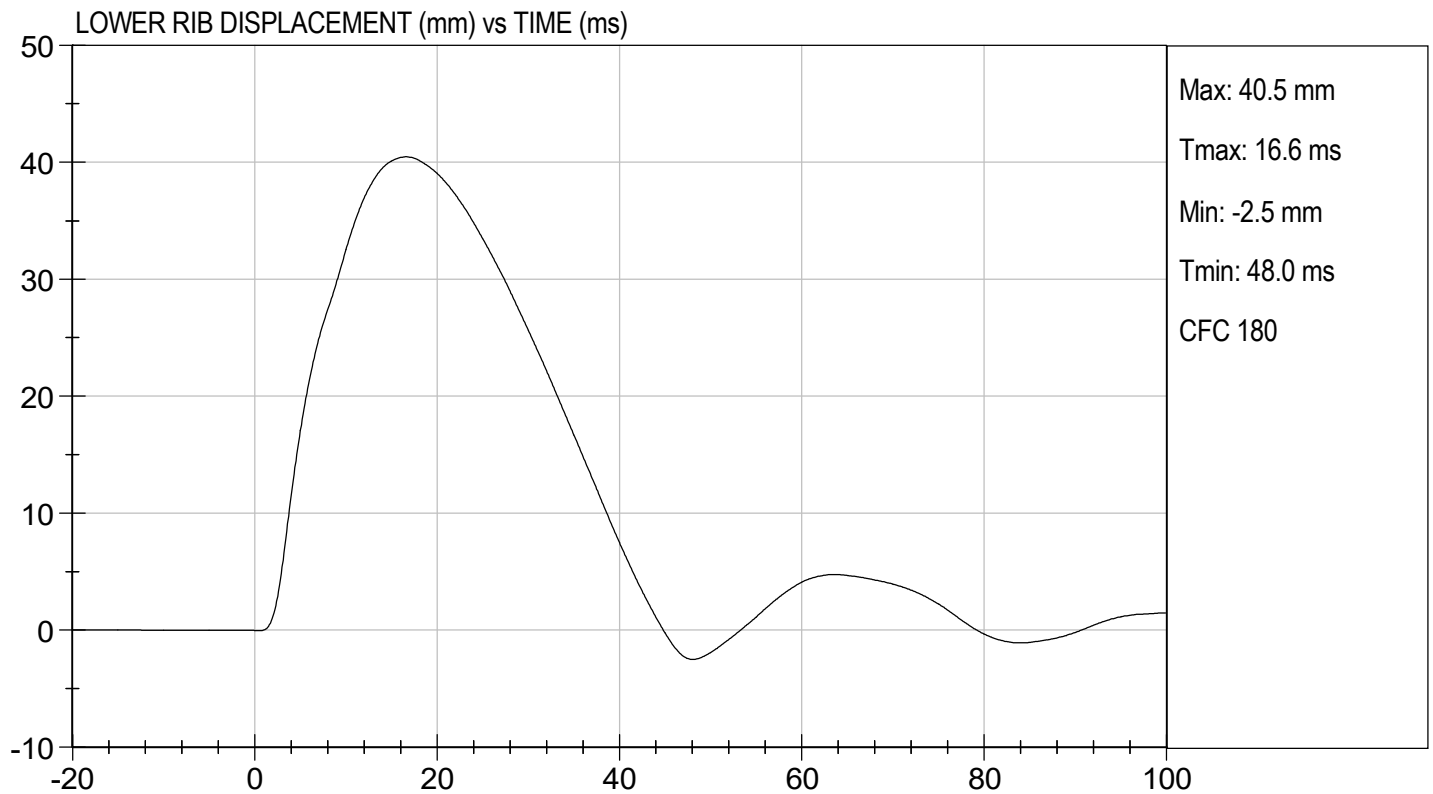
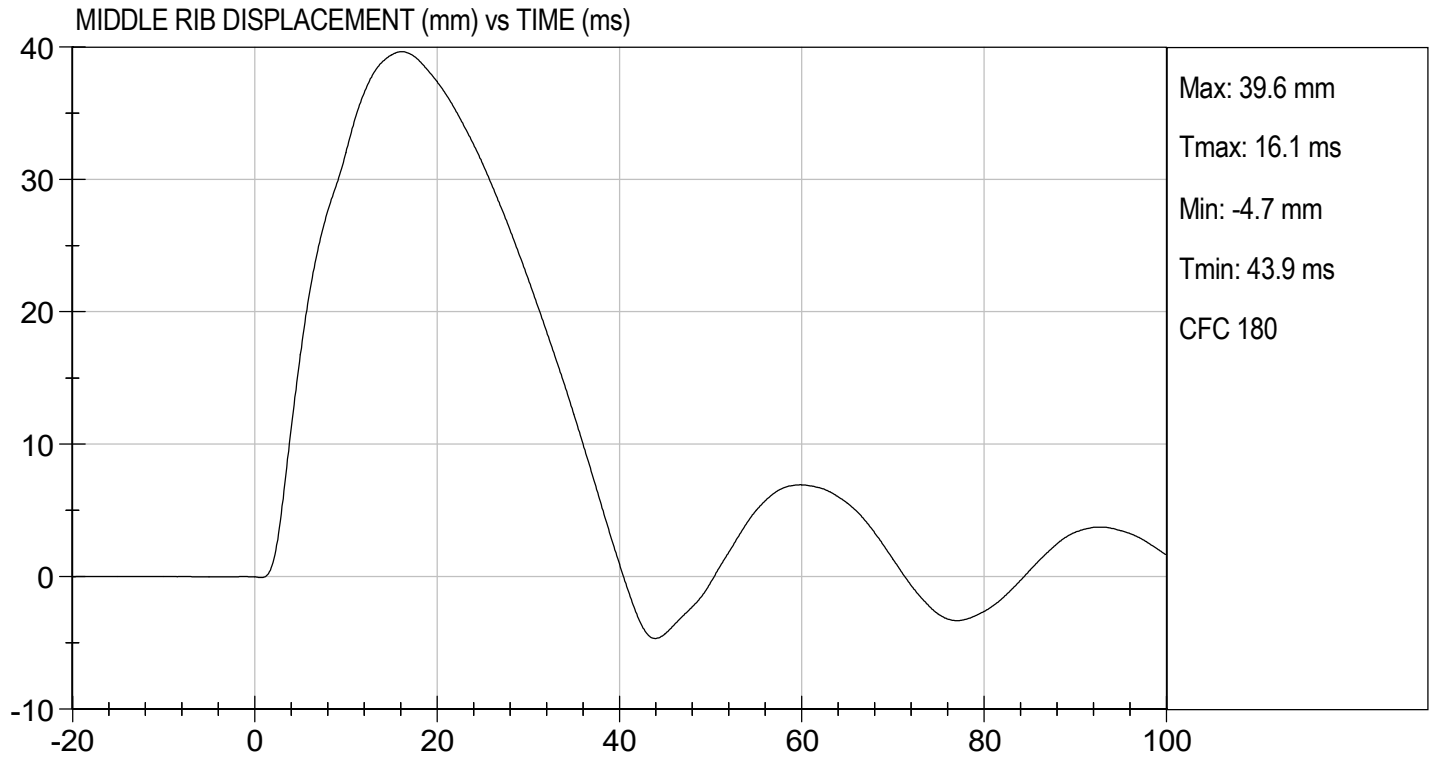
 Laboratory Technician

 05/28/2021
 Test Date



 Approved By





CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

**ES-2re External Measurements
SN: F032**

No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	Pass
7	Shoulder/Arm Width	461 - 479	464	Pass
8	Thorax Width	322 - 332	323	Pass
9	Abdomen Width	273 - 287	281	Pass
10	Pelvis Lap Width	359 - 373	370	Pass
11	Head Depth	196 - 206	203	Pass
12	Thorax Depth	262 - 272	264	Pass
13	Abdomen Depth	194 - 204	196	Pass
14	Pelvis Depth	235 - 245	236	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150 - 160	151	Pass
16	Back of Buttocks to Front Knee	597 - 615	607	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
ES-2re DUMMY

ATD Serial No: F032

Test ID: D212101

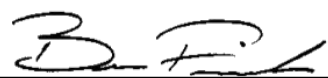
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Peak Resultant Acceleration	G's	125 to 155	140	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	7.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass



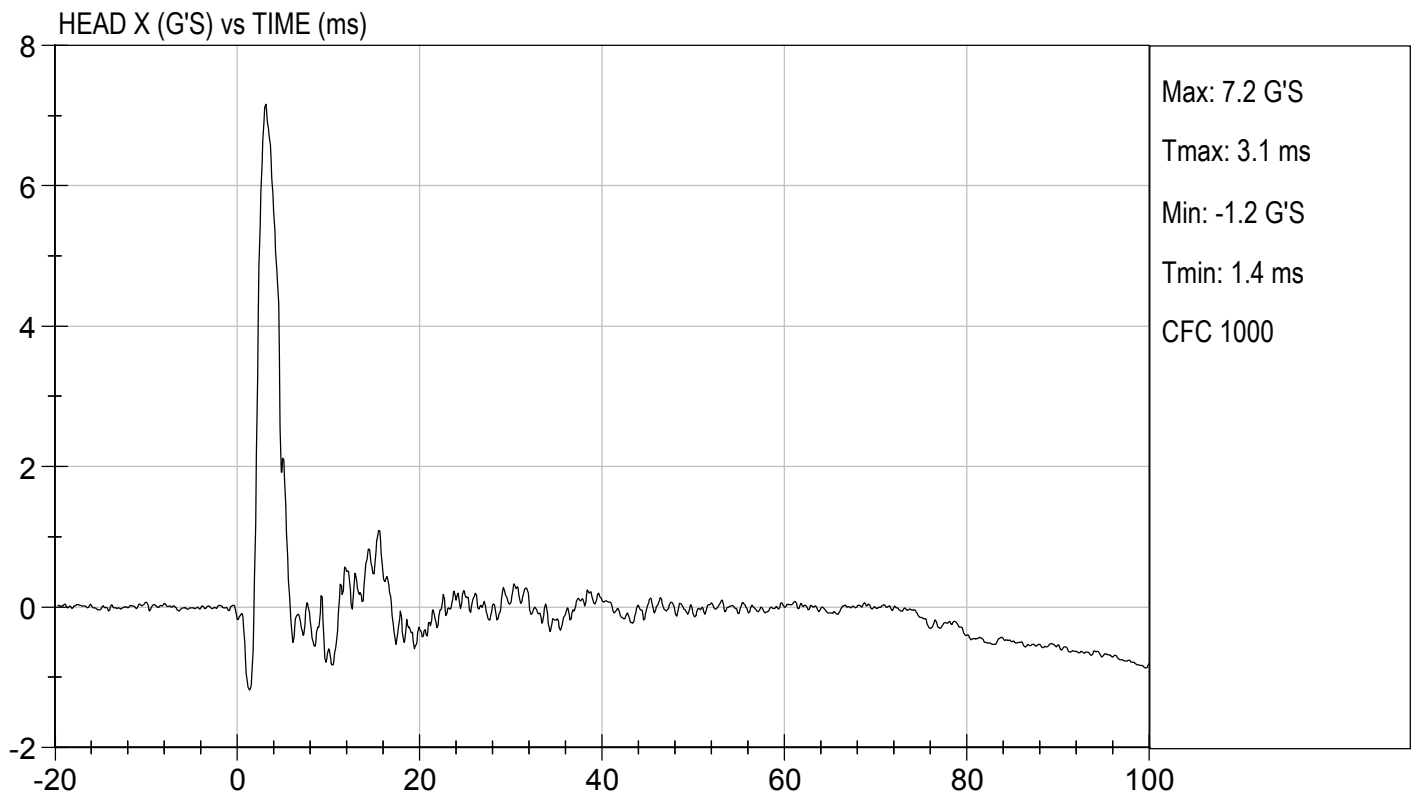
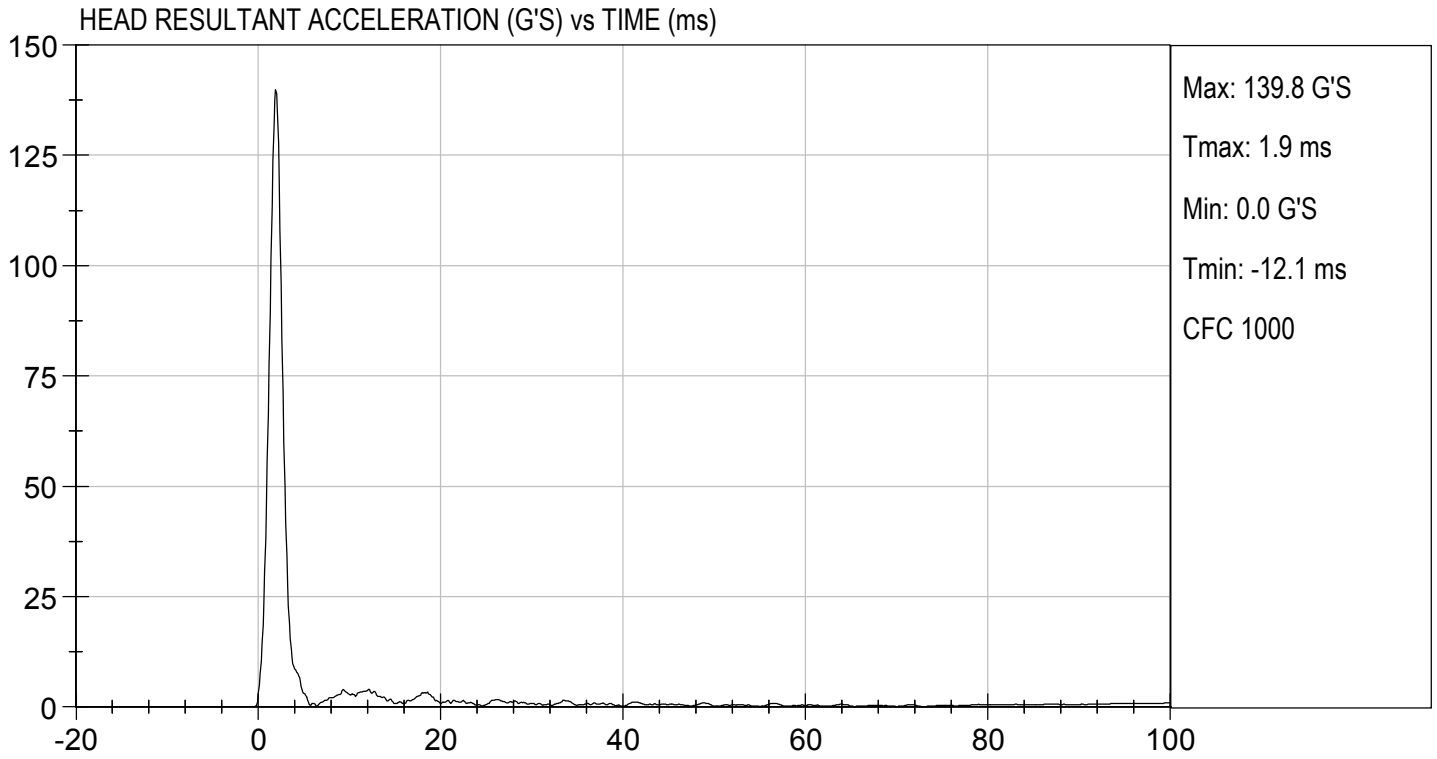
 Laboratory Technician

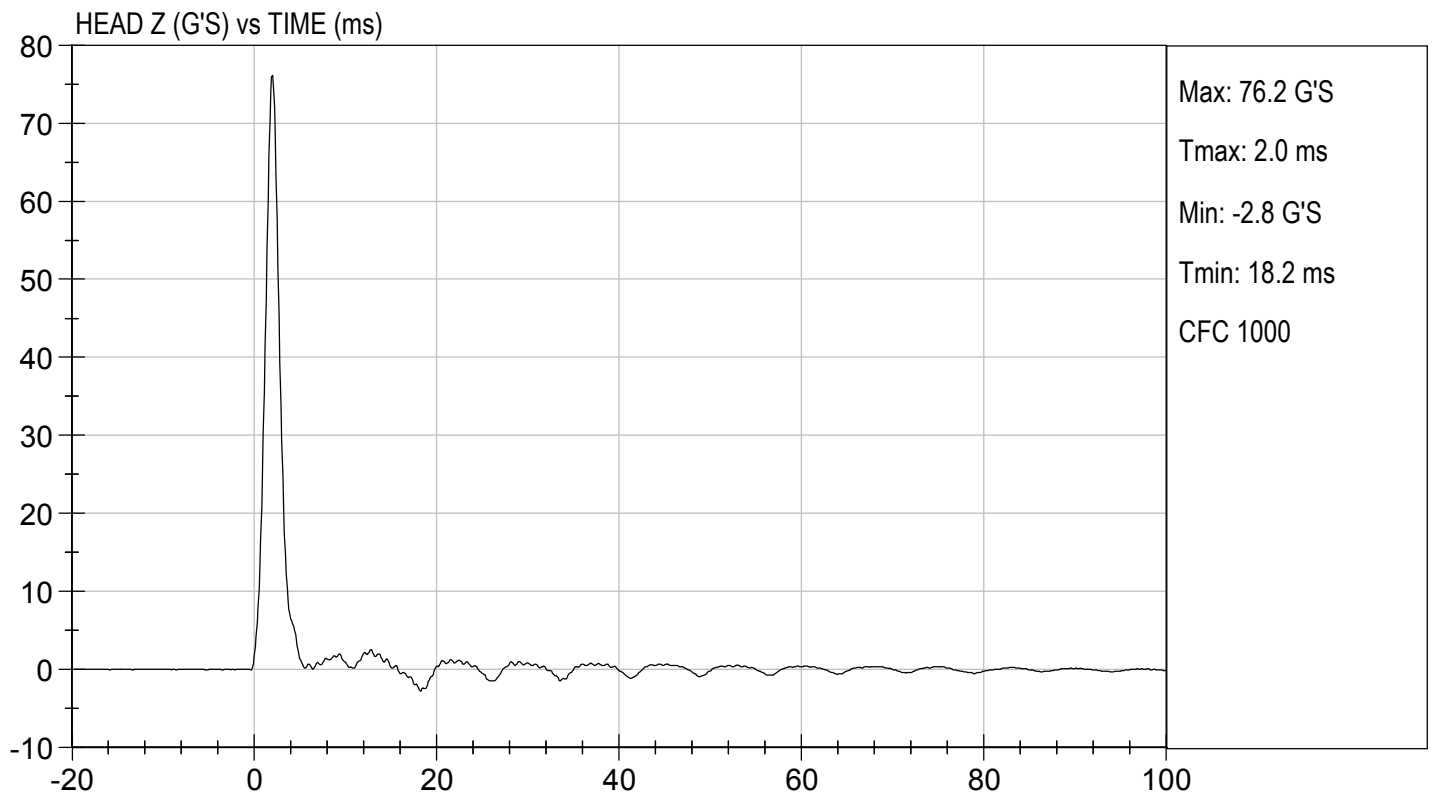
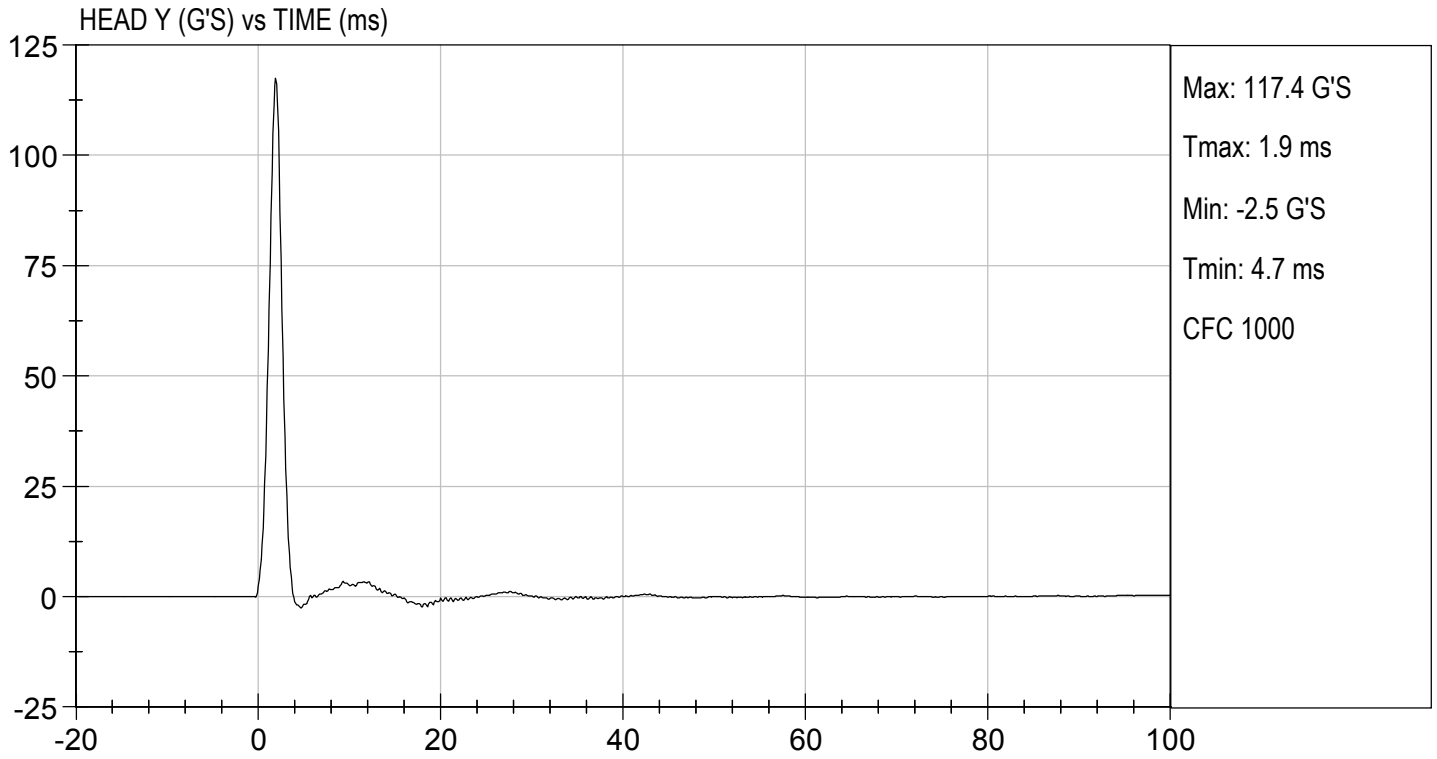
06/21/2021

 Test Date



 Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D.: D212102

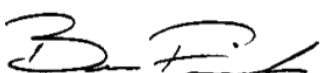
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	59	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.50	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.50	Pass
	17 ms	m/s	>= -3.70	-3.49	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.6	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	62.7	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	57.1	Pass
Overall Results					Pass



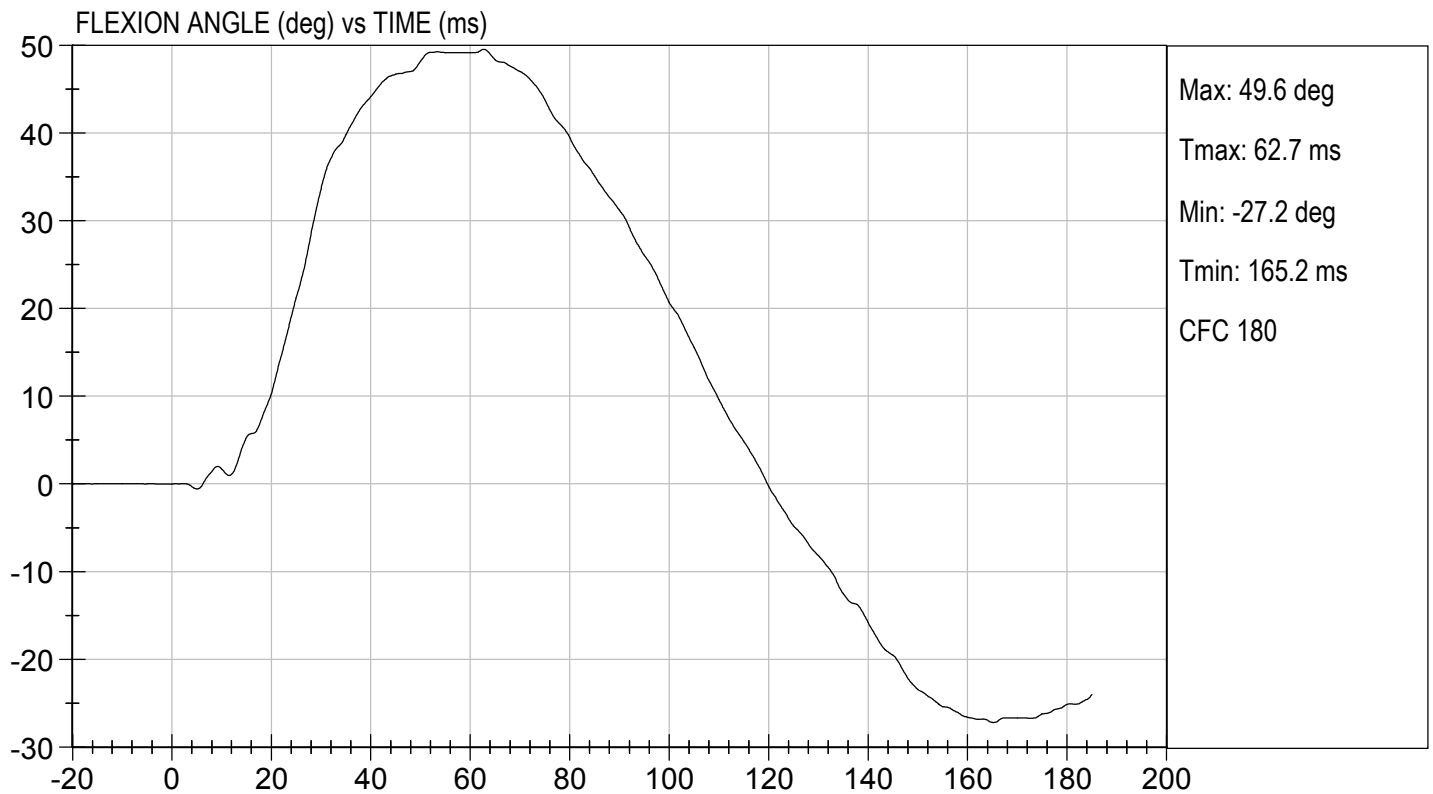
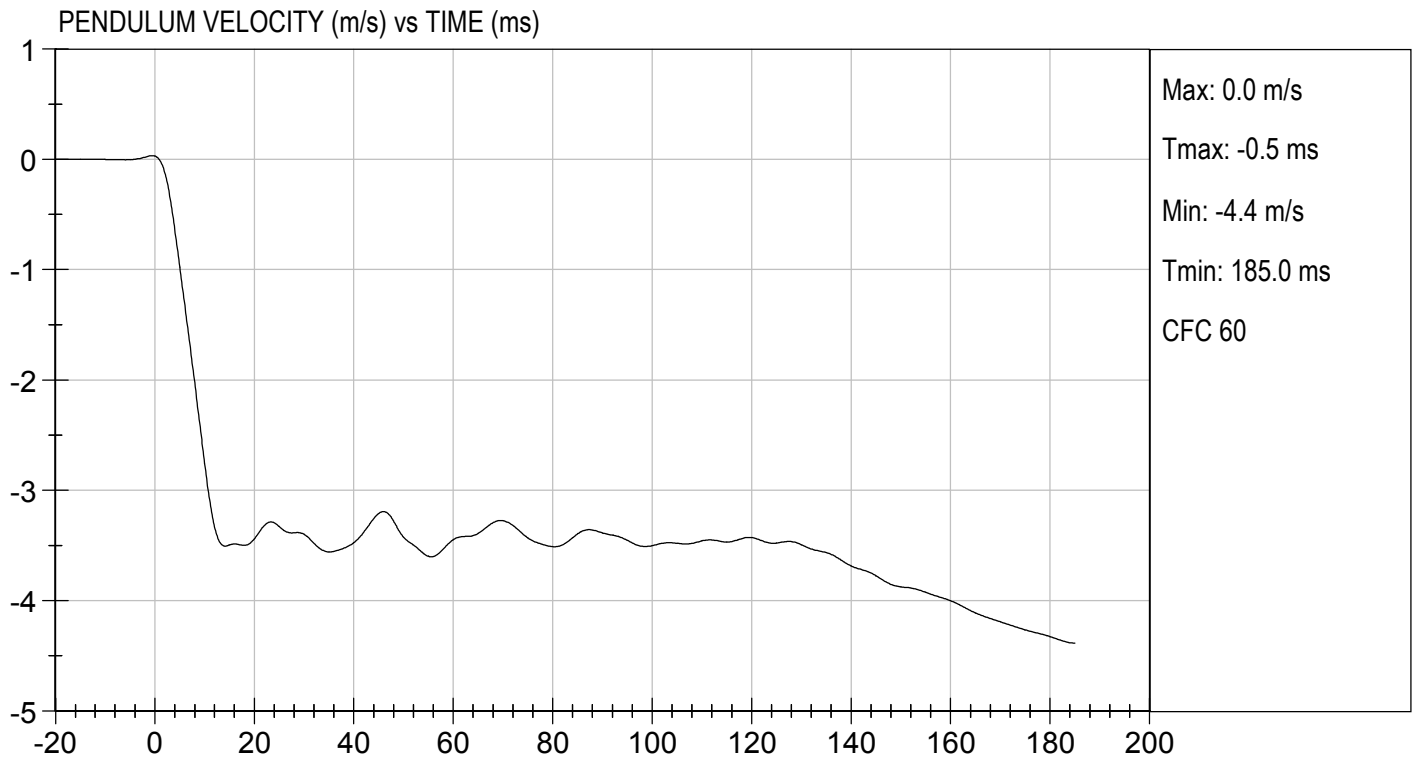
 Laboratory Technician

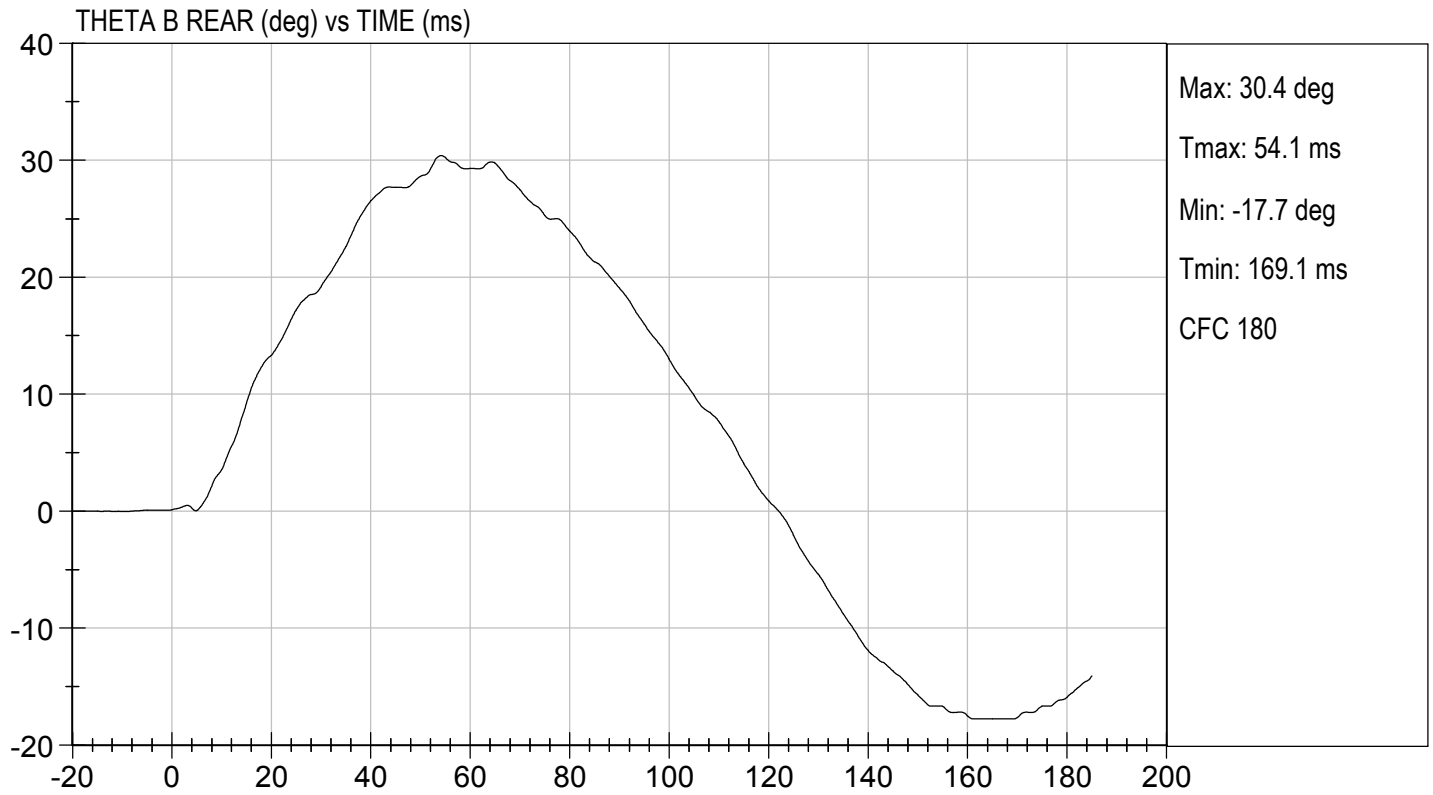
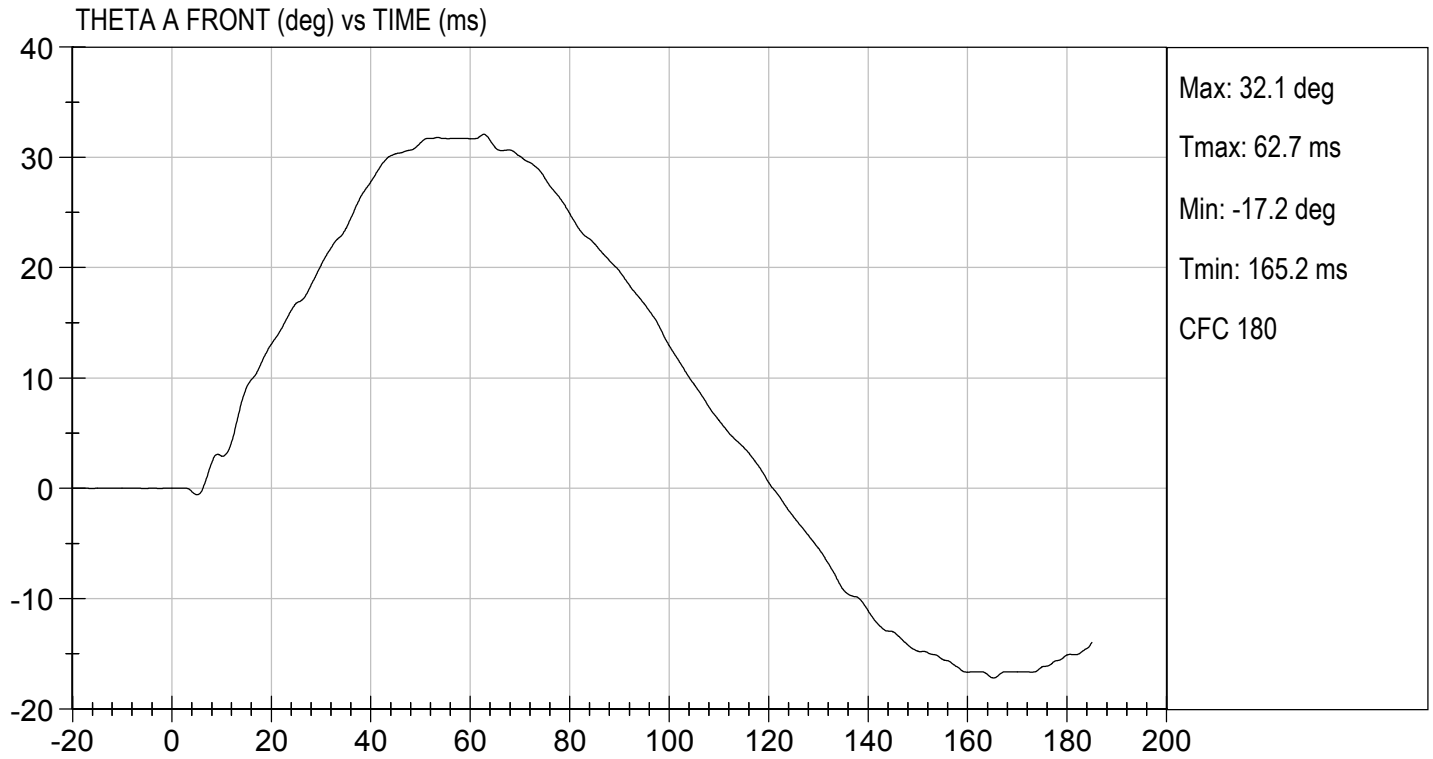
06/21/2021

 Test Date



 Approved By

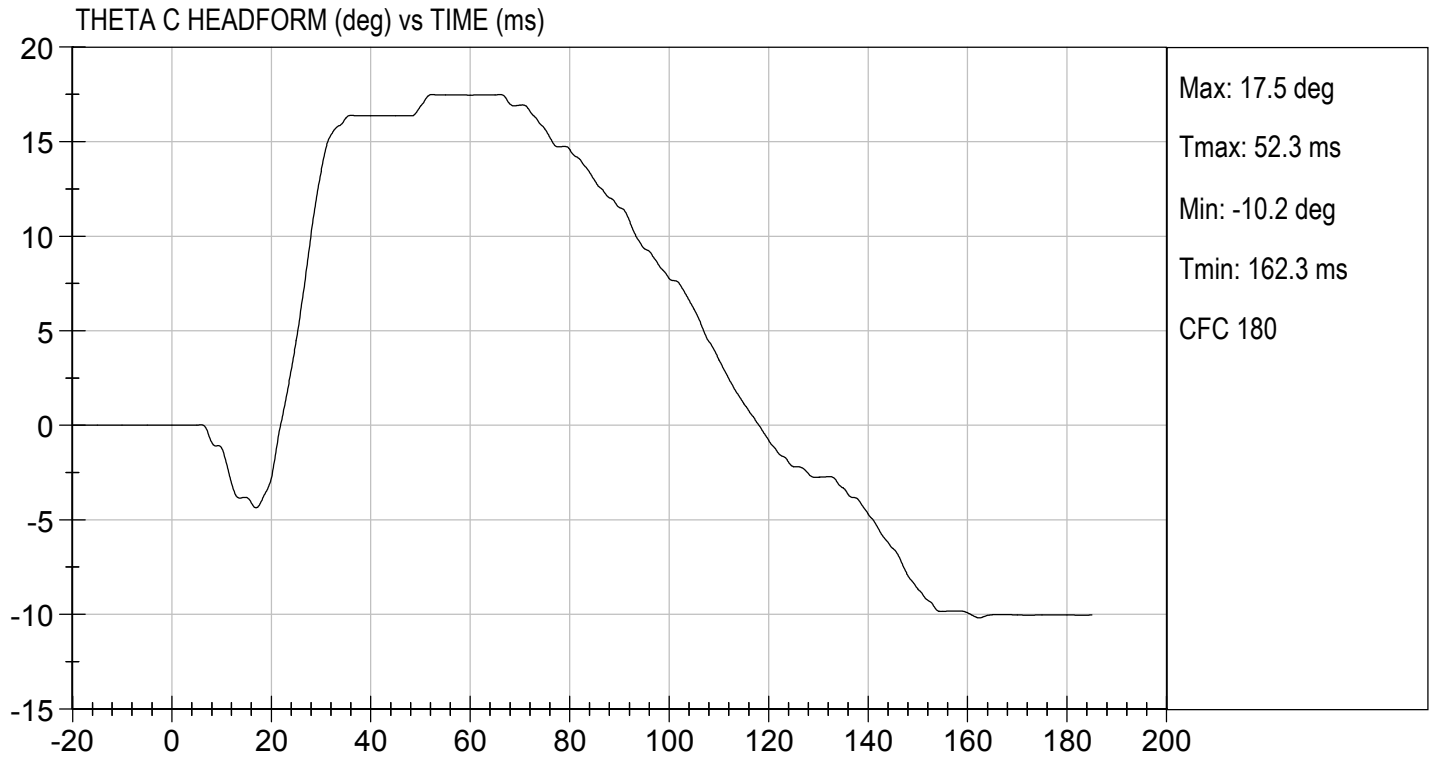






TEST DESC: NECK BENDING
VELOCITY: 11.49 ft/s, 3.50 m/s

TEST DATE: 06/21/2021
TEST #: D212102



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D: D212103

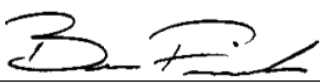
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.8	Pass
Overall Test Results				Pass



 Laboratory Technician

06/21/2021

 Test Date

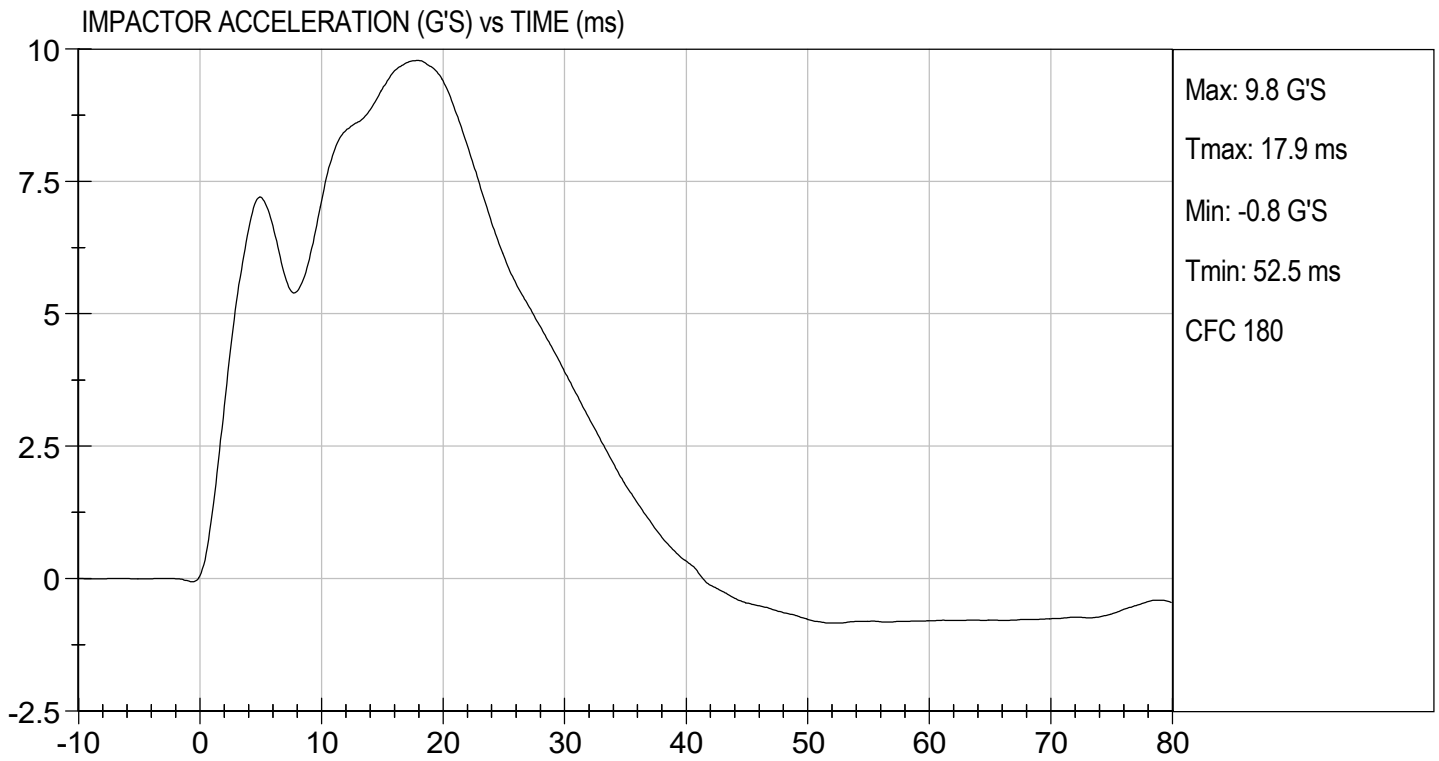


 Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 13.77 ft/s, 4.2 m/s

TEST DATE: 06/21/2021
TEST #: D212103



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

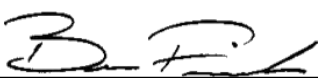
Test I.D: D212104

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.3	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.6	Pass
Overall Test Results				Pass

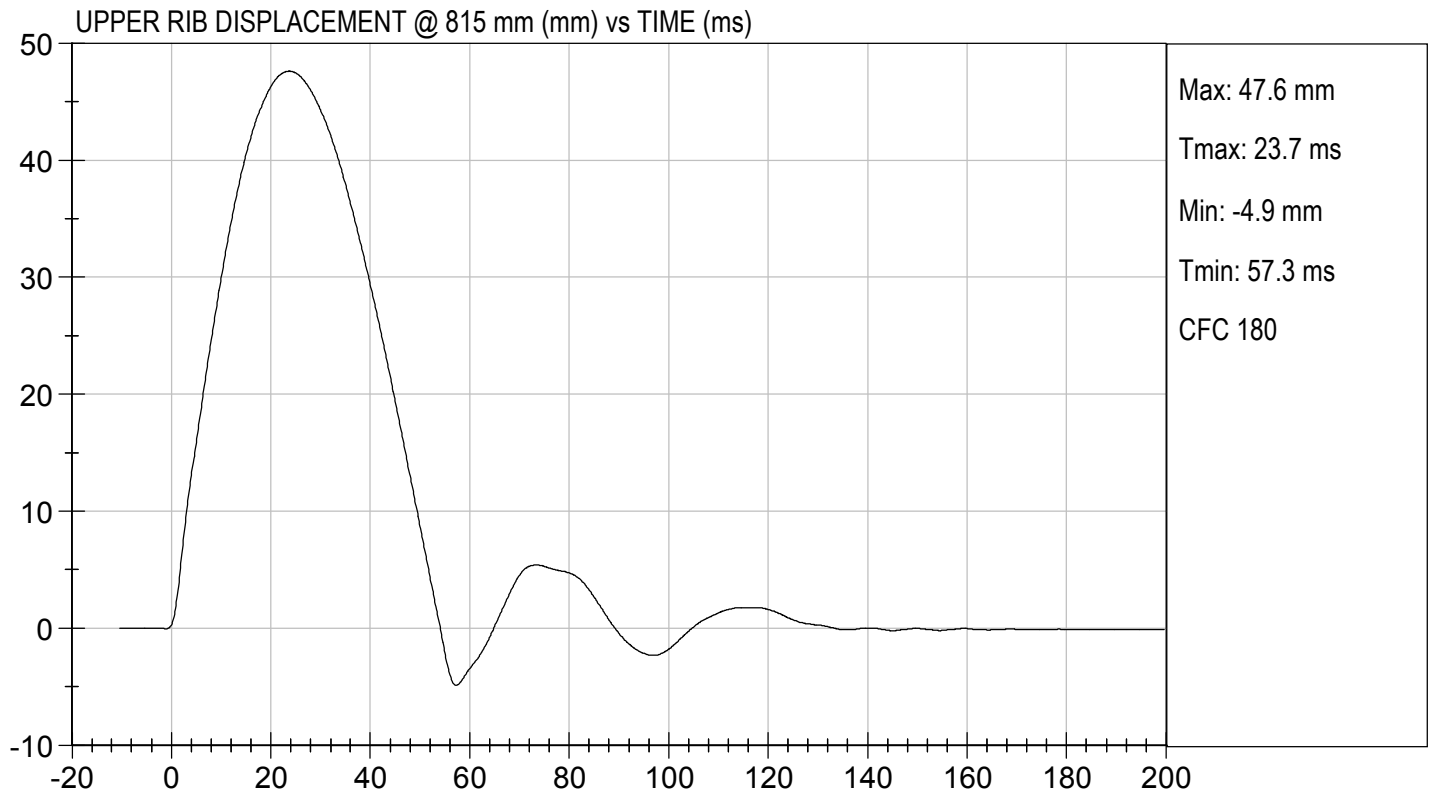
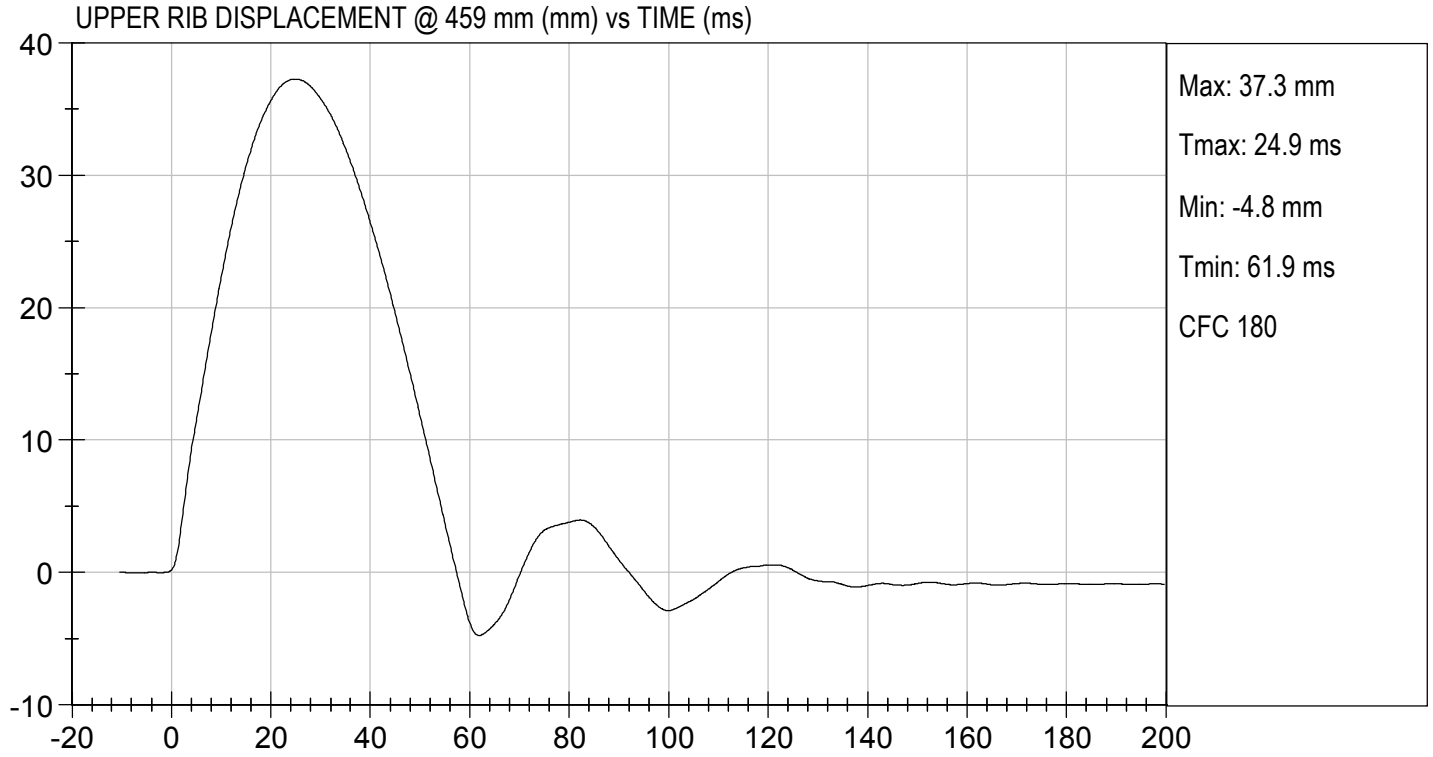


Laboratory Technician

06/21/2021
Test Date



Approved By



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

ATD Serial No: F032

Test I.D: D212105

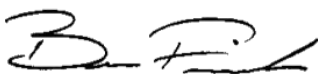
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.2	Pass
Overall Test Results				Pass



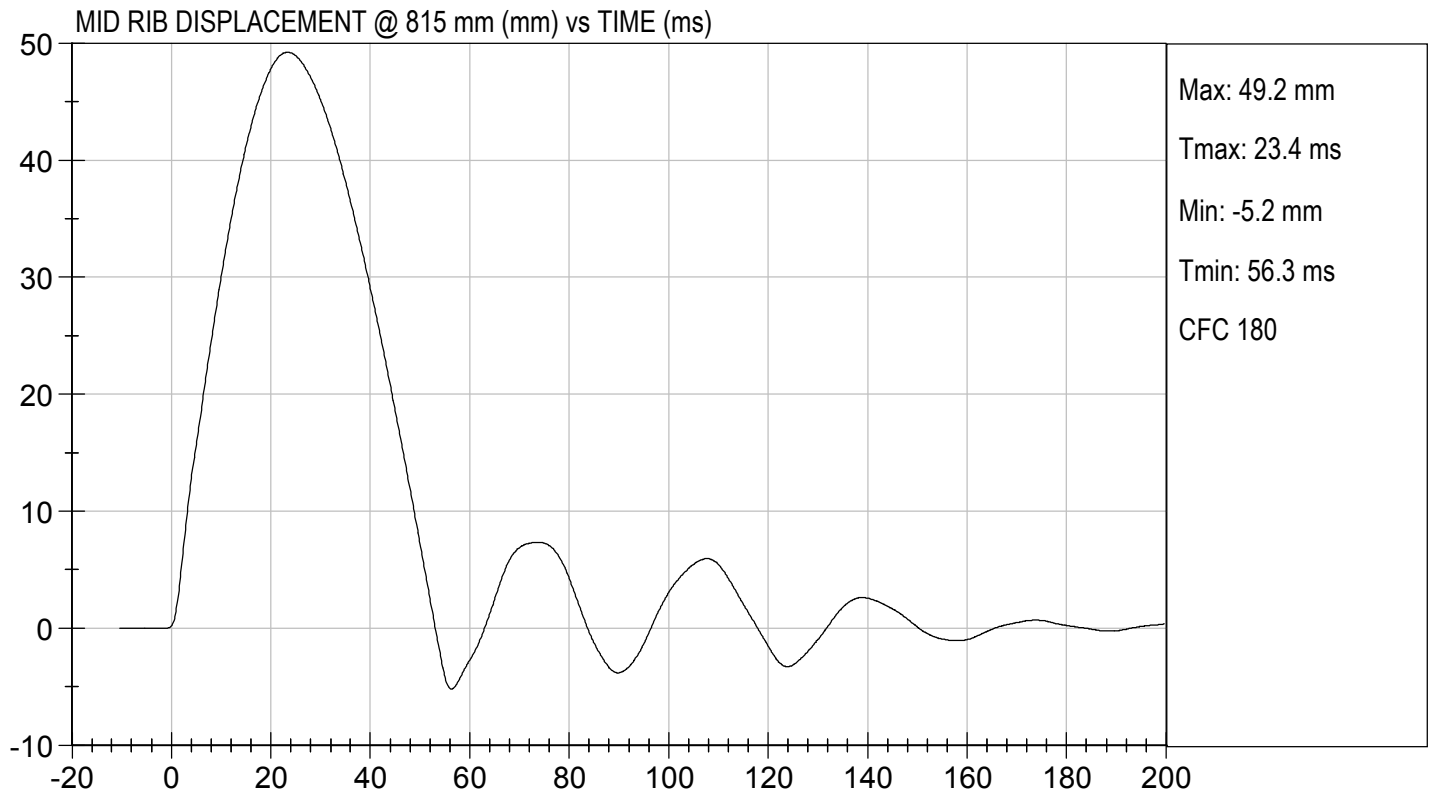
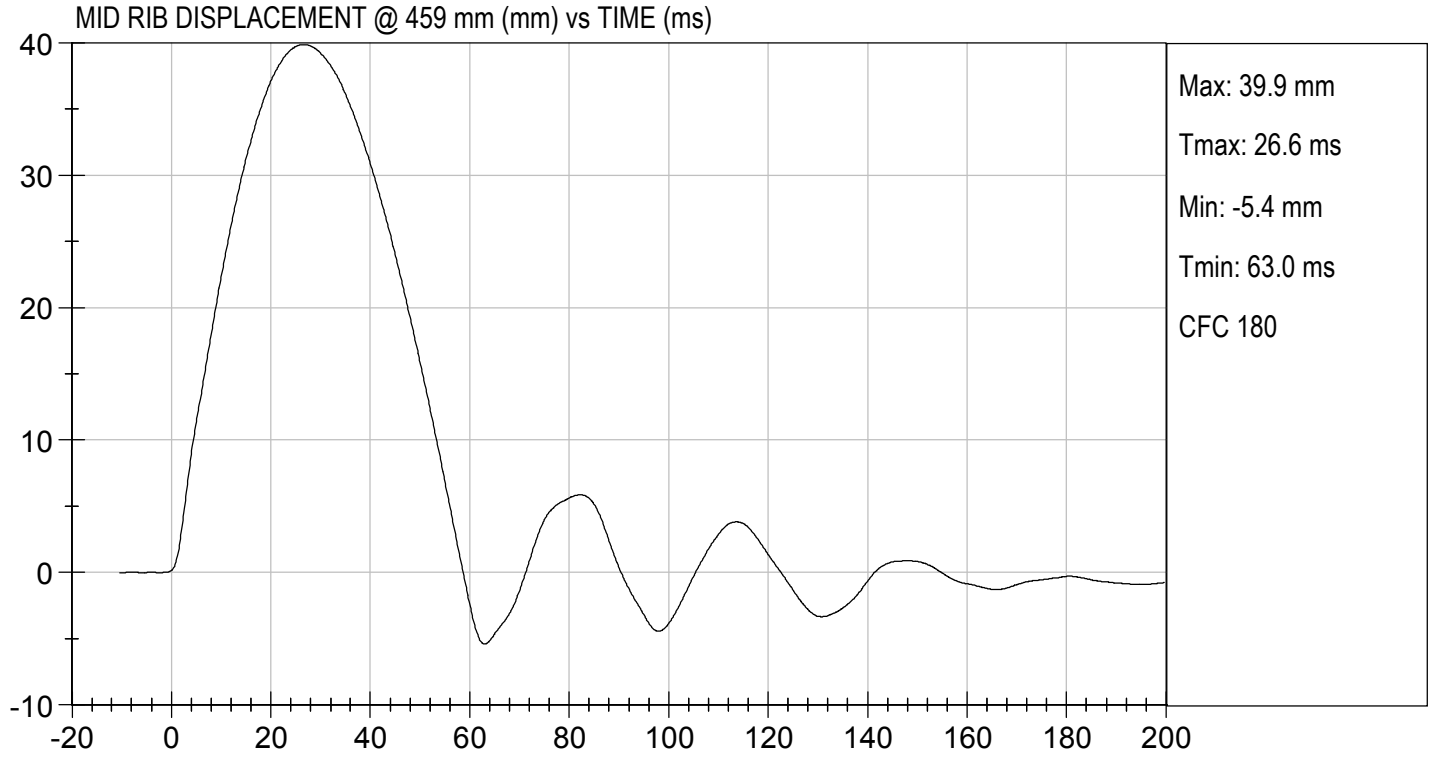
Laboratory Technician

06/21/2021

Test Date



Approved By



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

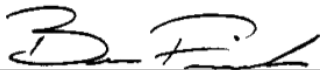
Test I.D: D212106

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.2	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.0	Pass
Overall Test Results				Pass

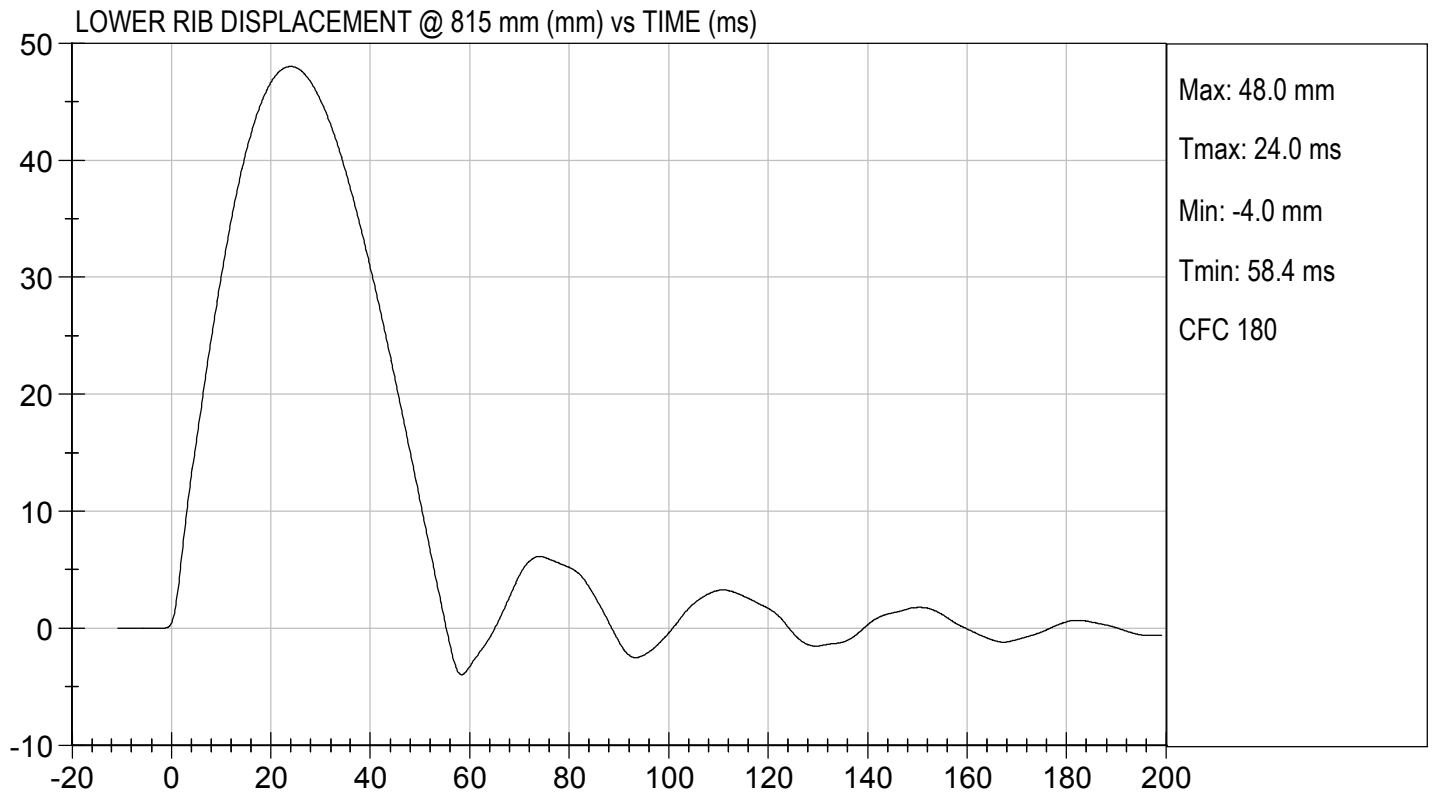
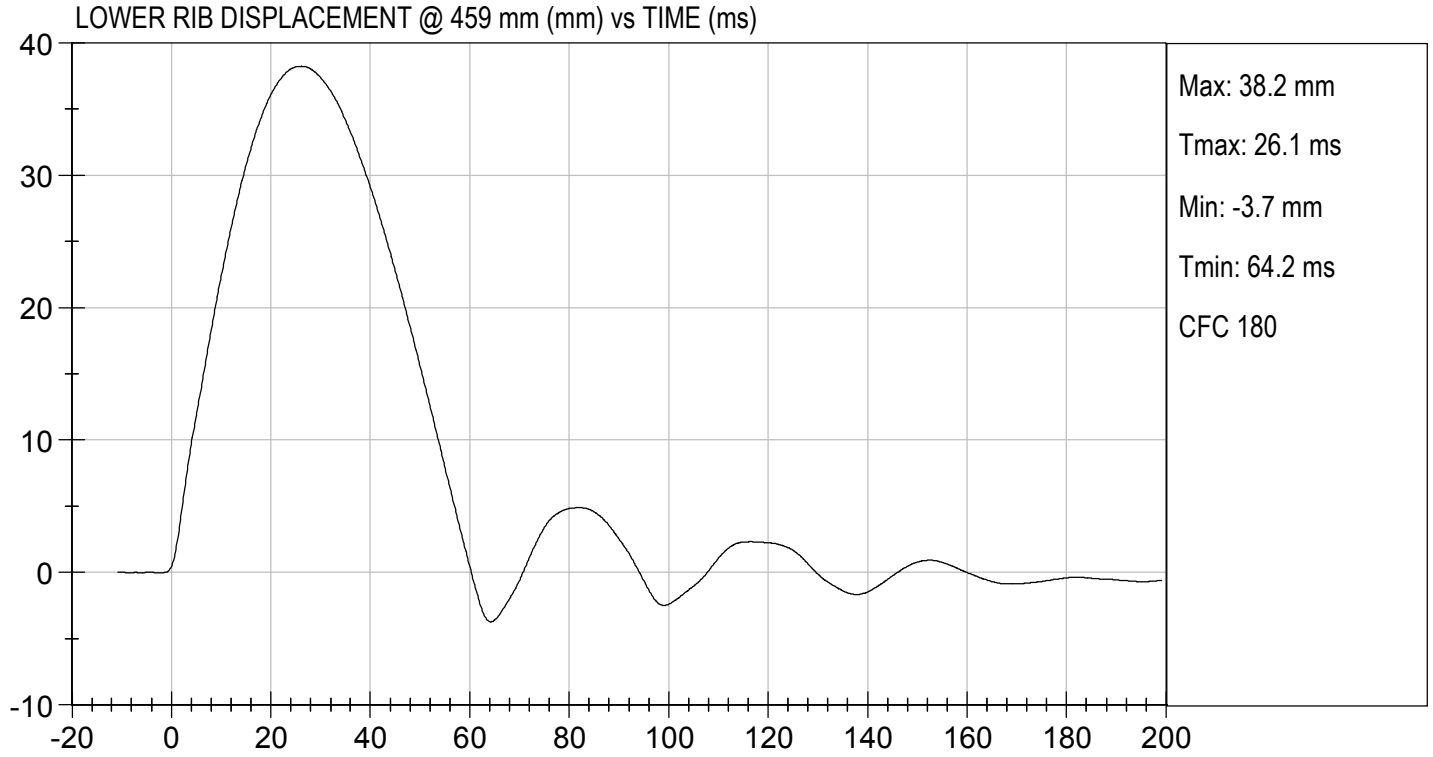


Laboratory Technician

06/21/2021
Test Date



Approved By



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: F032

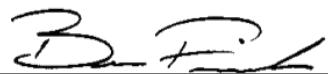
Test I.D: D212107

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	3.90 to 4.10	4.00	Pass
Maximum Impactor Force	N	4000 to 4800	4104	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	12.0	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2292	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.5	Pass
Overall Test Results				Pass

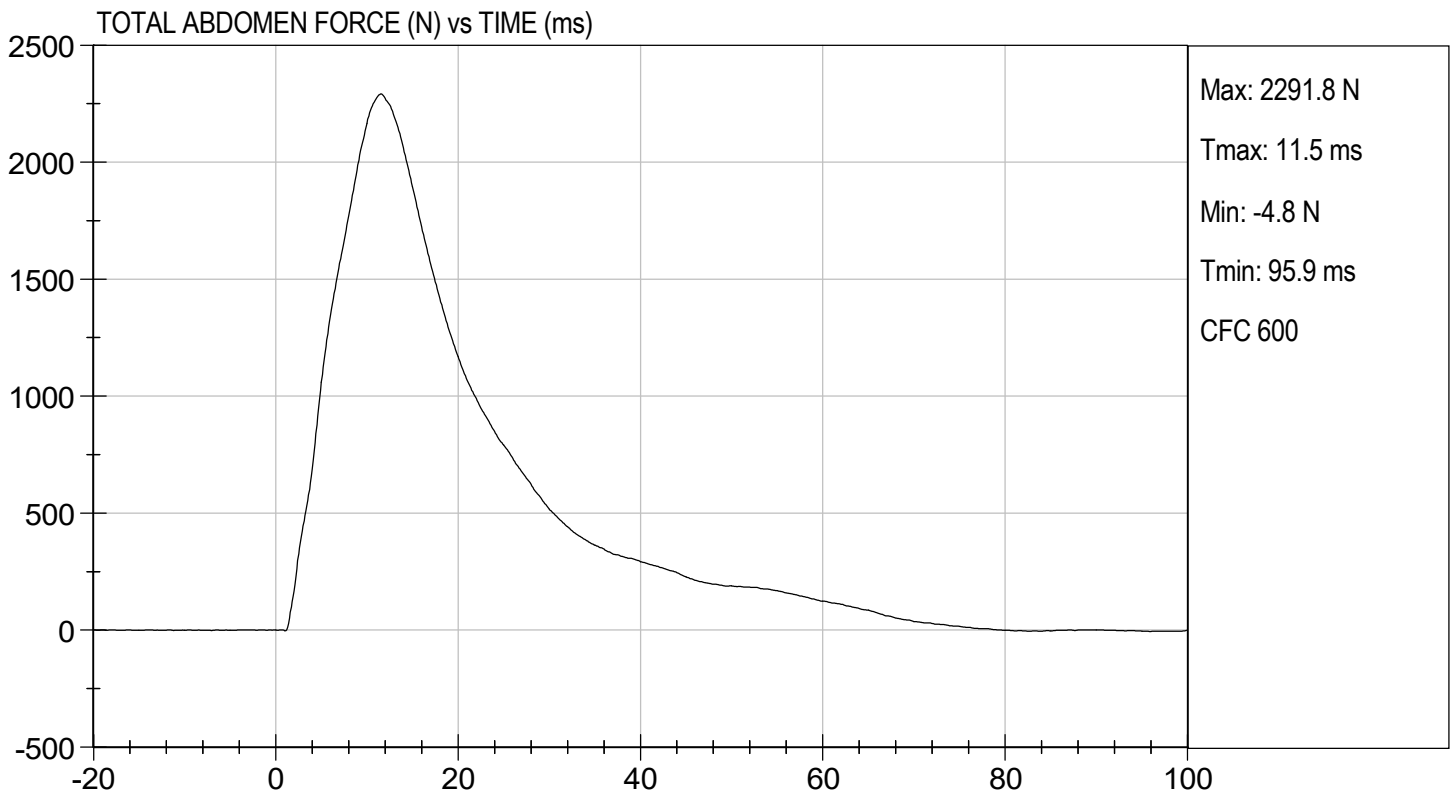
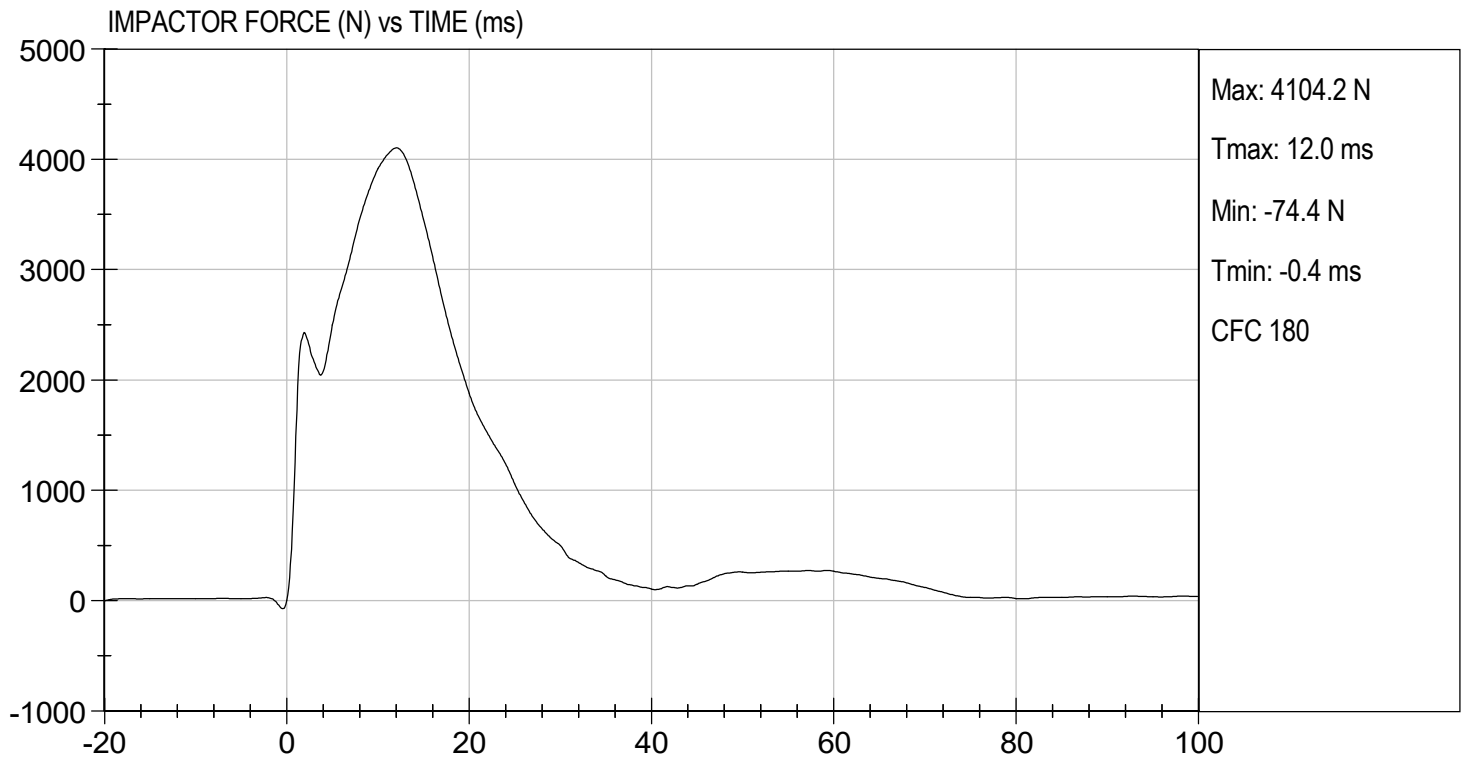


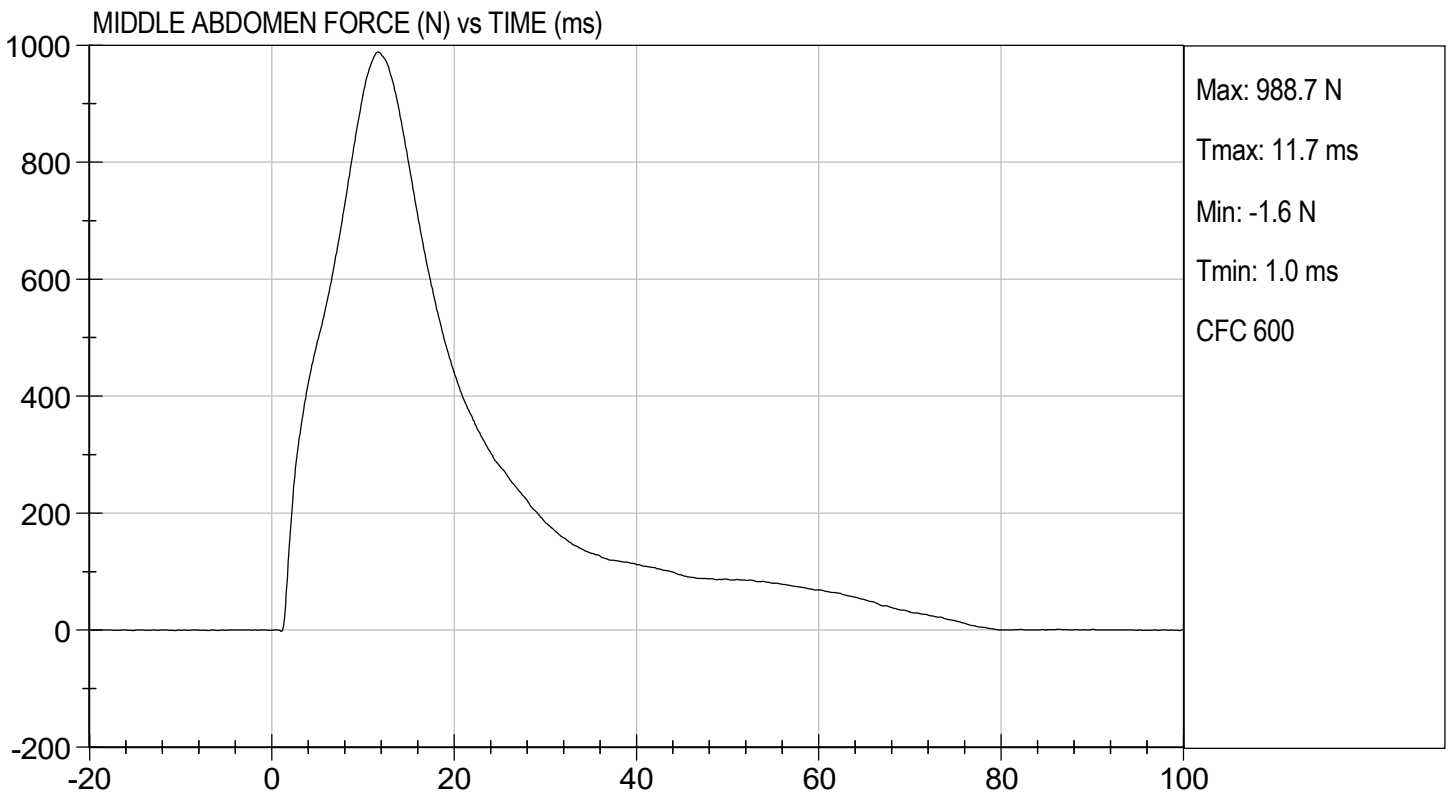
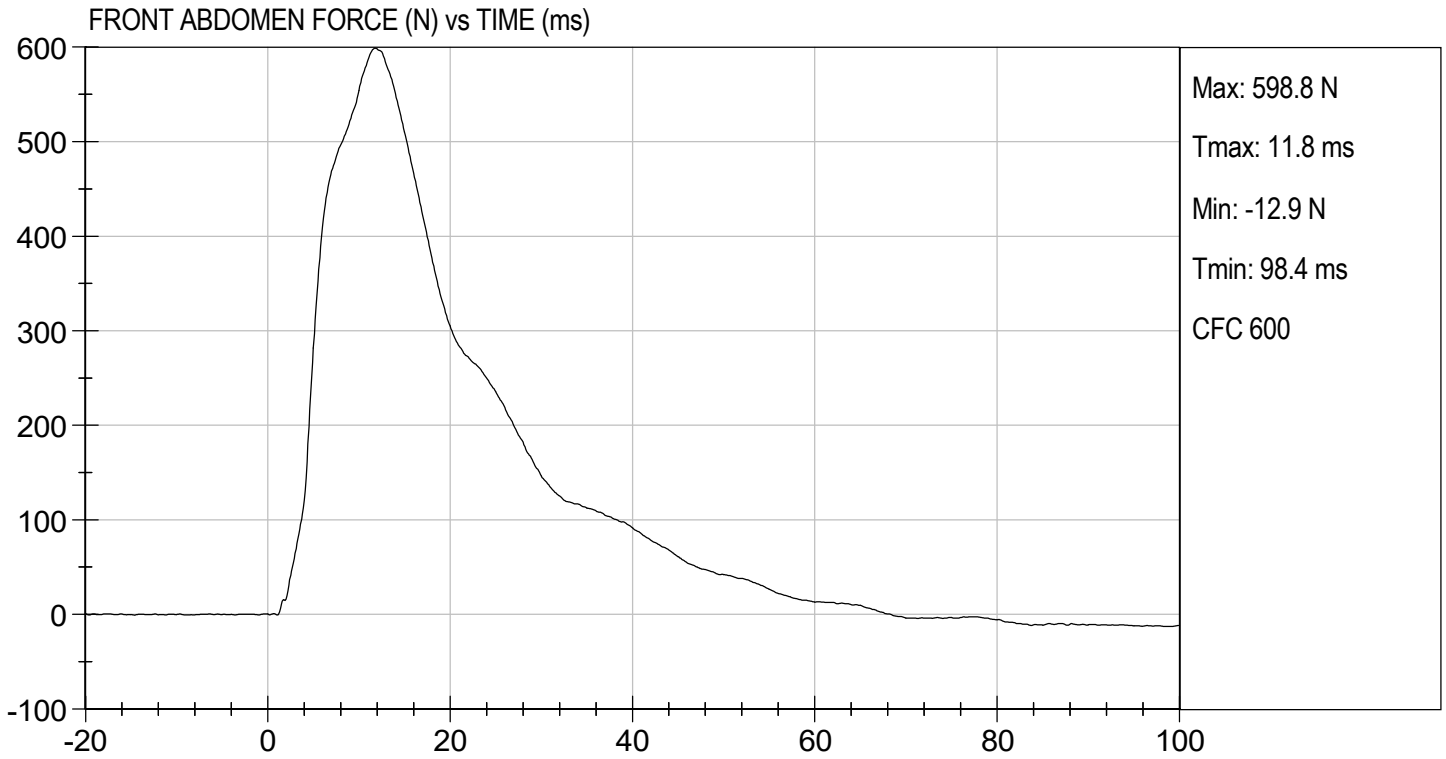
Laboratory Technician

06/18/2021
Test Date



Approved By

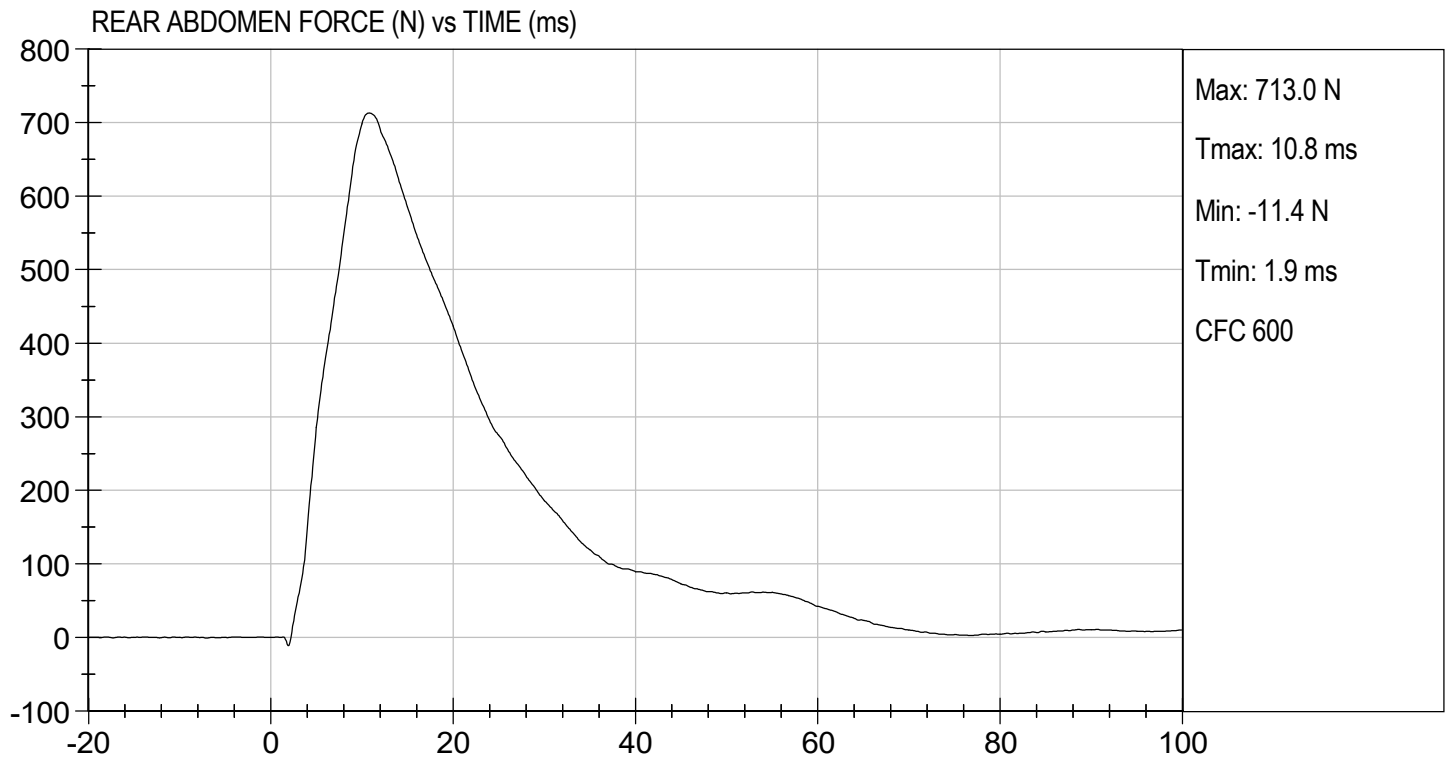






TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.12 ft/s, 4.00 m/s

TEST DATE: 06/18/2021
TEST #: D212107



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D.: D212108

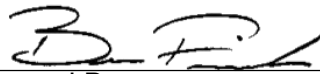
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass	
Laboratory Relative Humidity	%	10 to 70	59	Pass	
Pendulum Speed	m/s	5.95 to 6.15	6.05	Pass	
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.418	Pass
	27 ms	m/s	-6.50 to -5.80	-6.00	Pass
	30 ms	m/s	>= -6.50	-6.05	Pass
Maximum Flexion Angle	deg	45.0 to 55.0	47.0	Pass	
Time of Maximum Flexion Angle	ms	39.0 to 53.0	46.6	Pass	
Headform Rotation Decay to Initial Position	ms	37 to 57	37	Pass	
Overall Results				Pass	



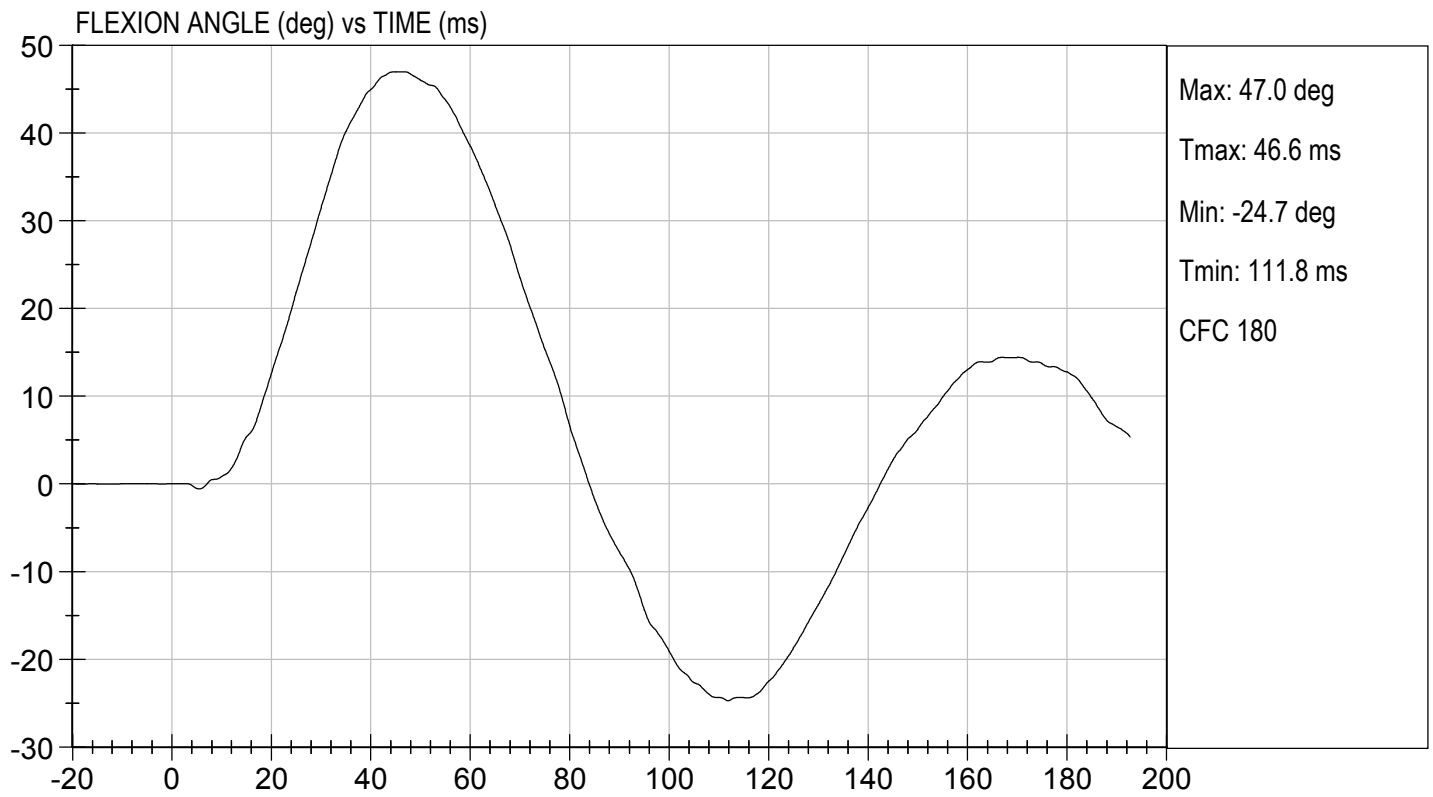
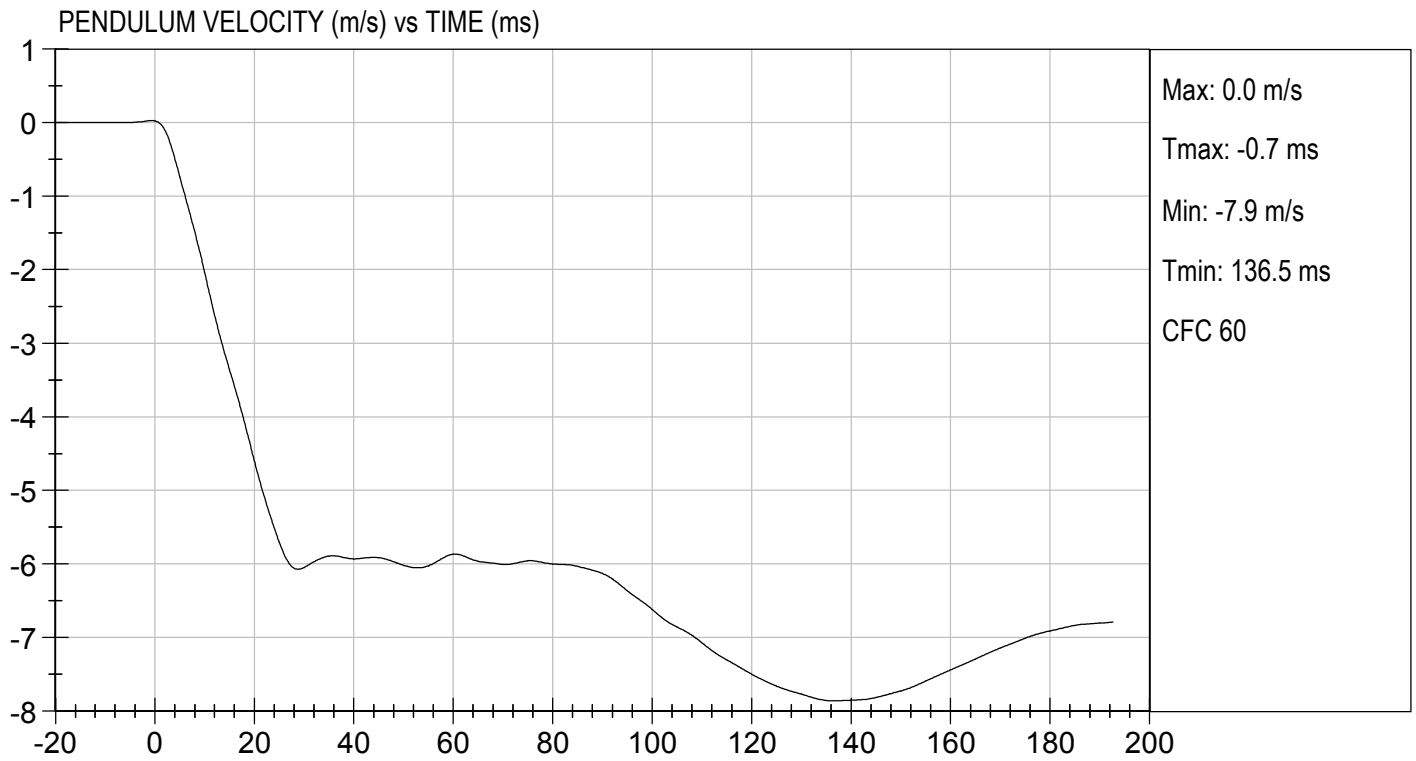
 Laboratory Technician

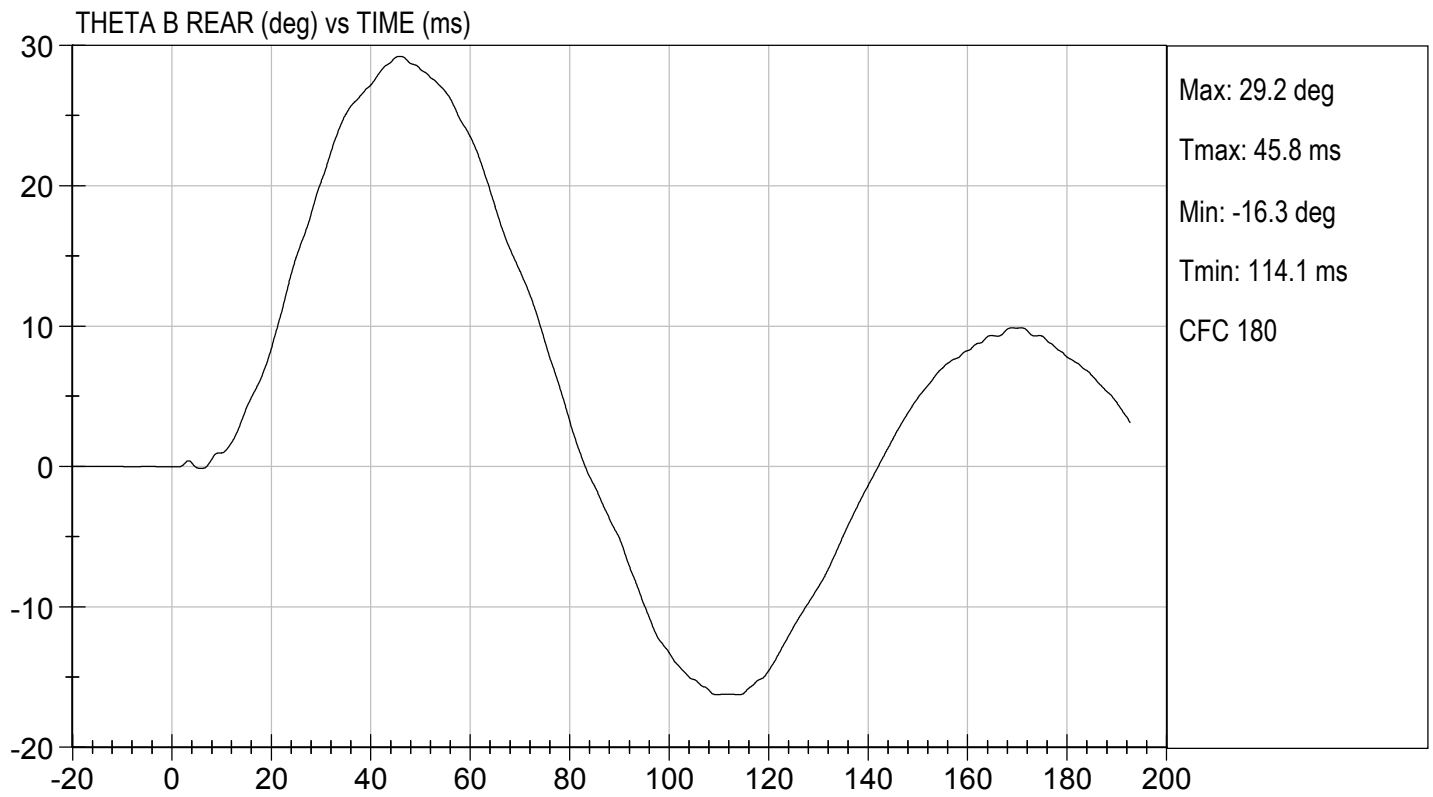
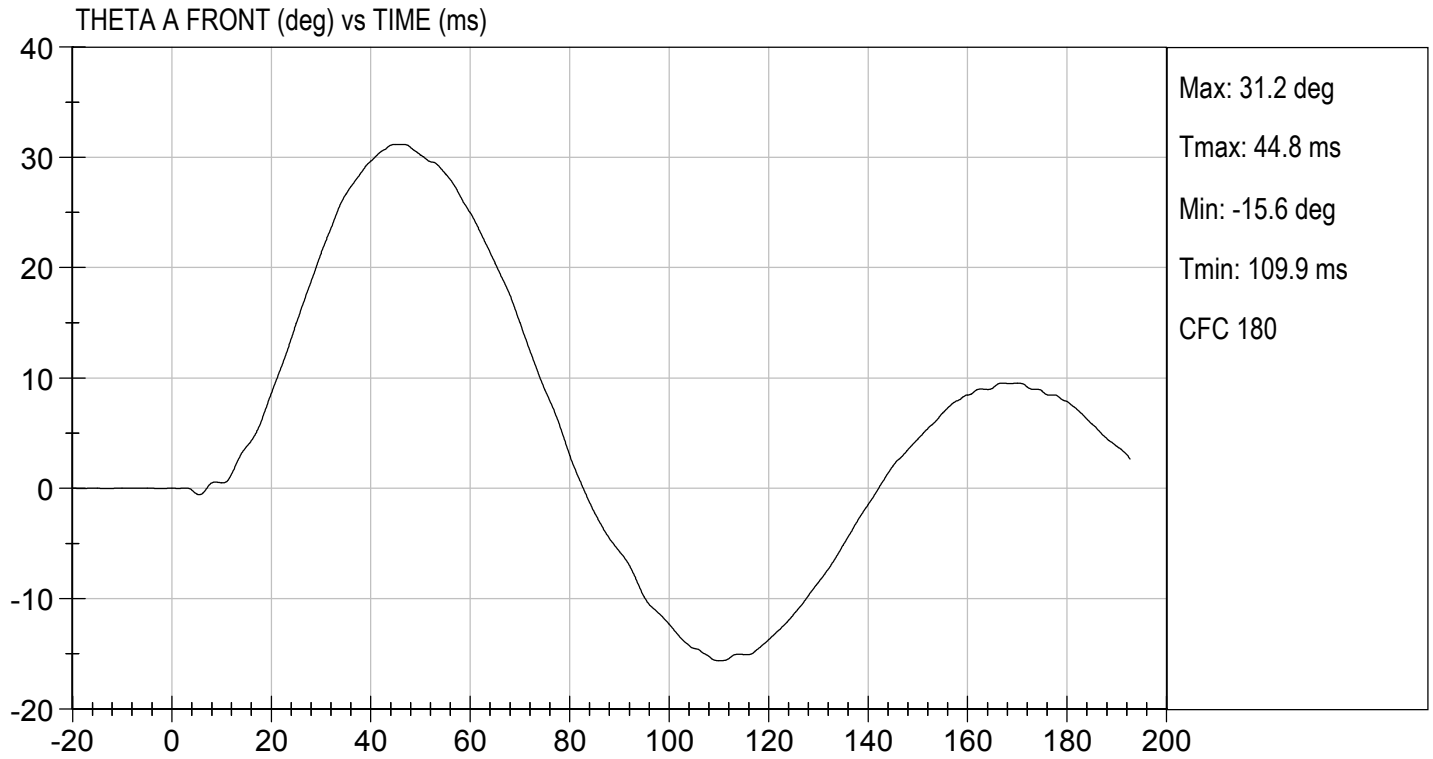
06/21/2021

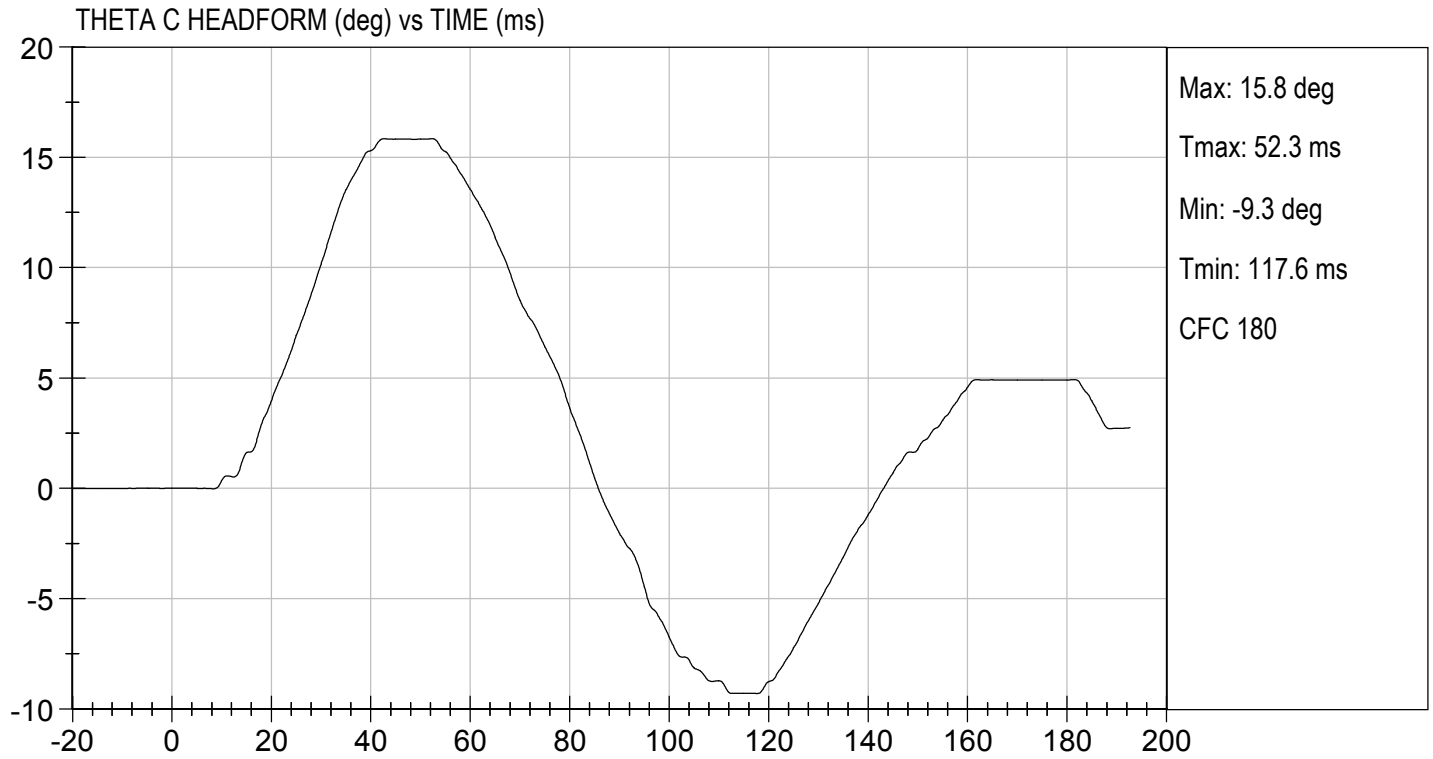
 Test Date



 Approved By







MGA RESEARCH CORPORATION

**PELVIS TEST
ES-2re DUMMY**

ATD Serial No: F032

Test I.D: D212109

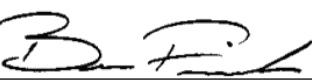
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	4.20 to 4.40	4.20	Pass
Maximum Impactor Force	N	4700 to 5400	4945	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.7	Pass
Maximum Pubic Force	N	1230 to 1590	1311	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.7	Pass
Overall Test Results				Pass



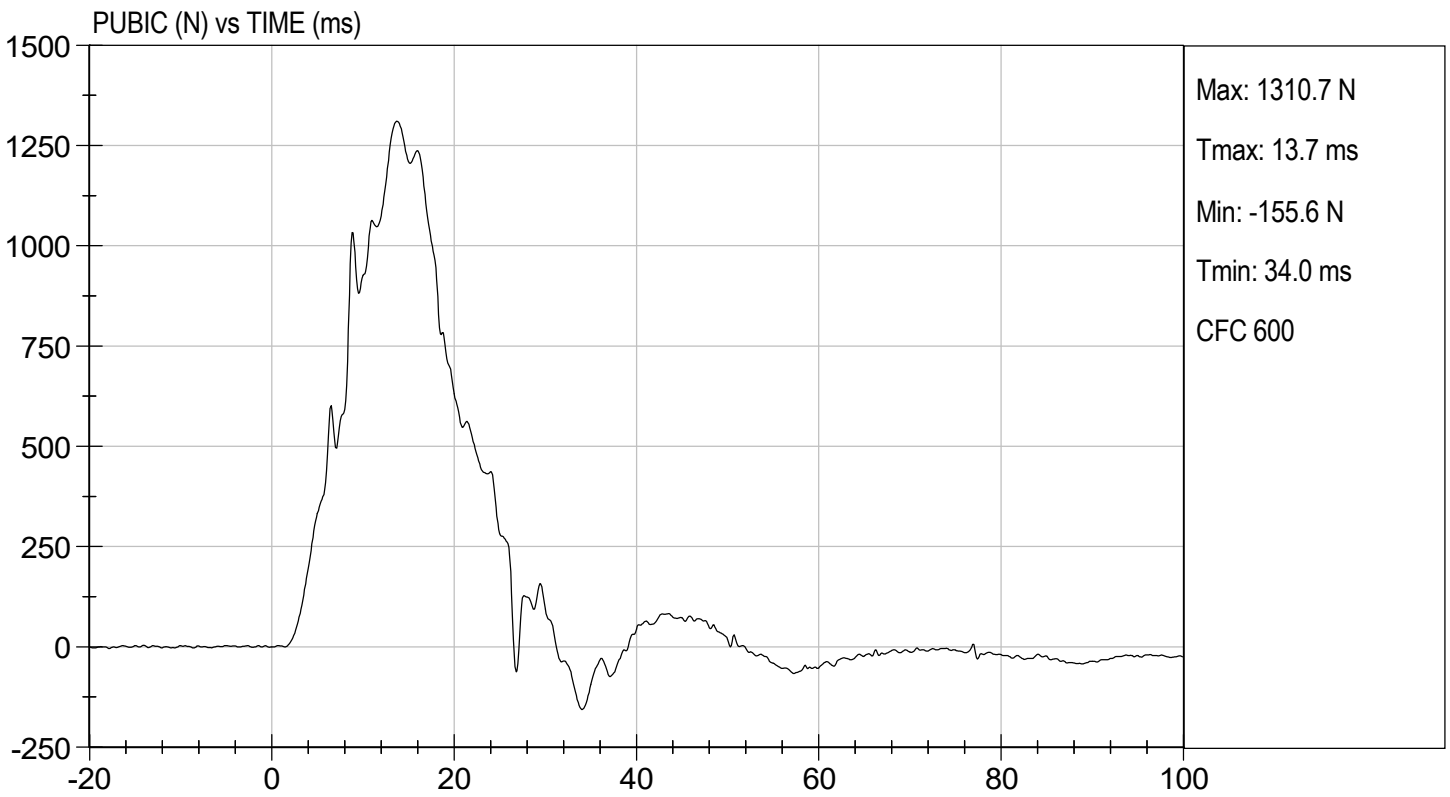
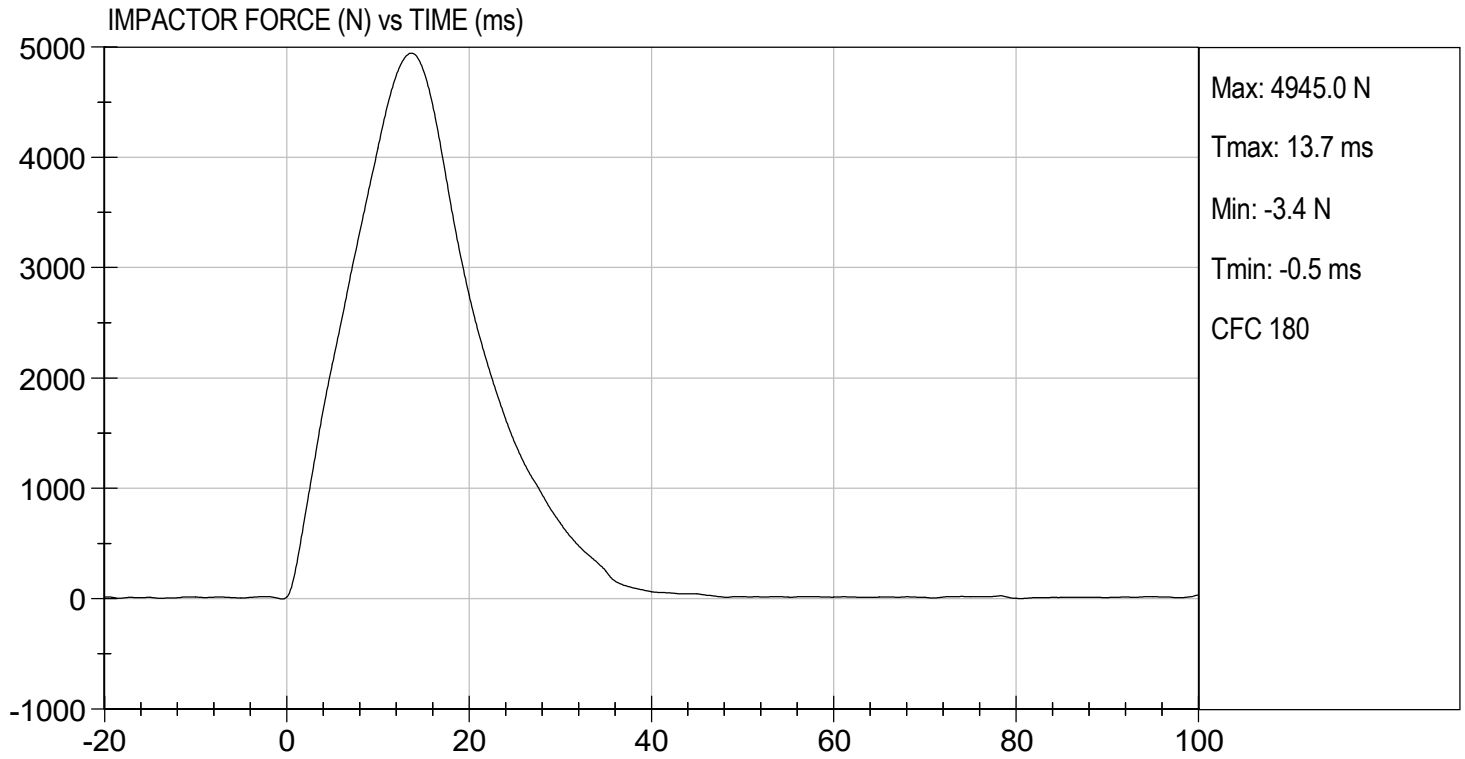
 Laboratory Technician

6/18/2021

 Test Date



 Approved By



MGA RESEARCH CORPORATION
THORAX IMPACT TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D: D212100

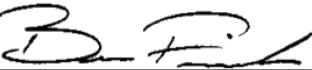
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	5.40 to 5.60	5.46	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5832	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.5	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.4	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.8	Pass
Overall Test Results				Pass



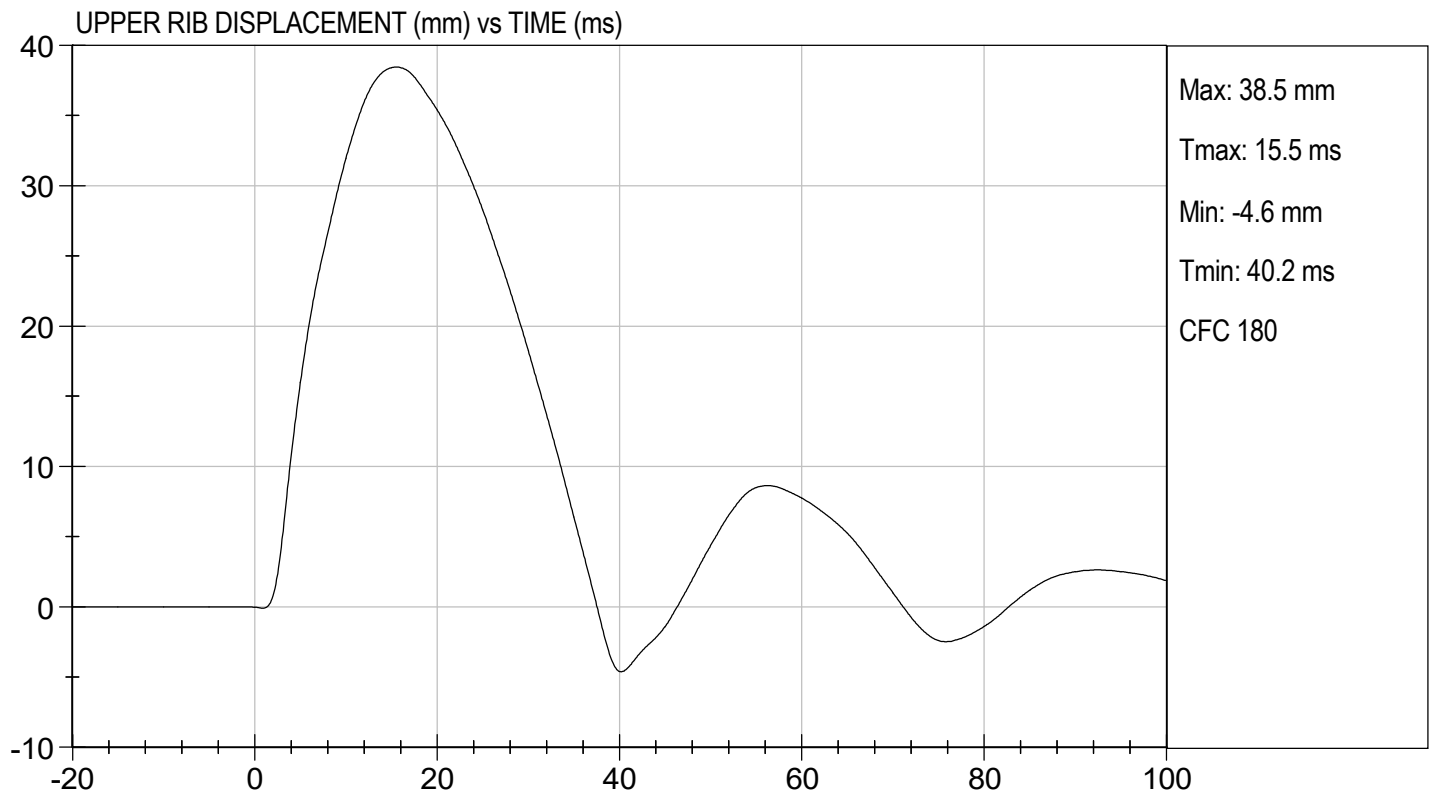
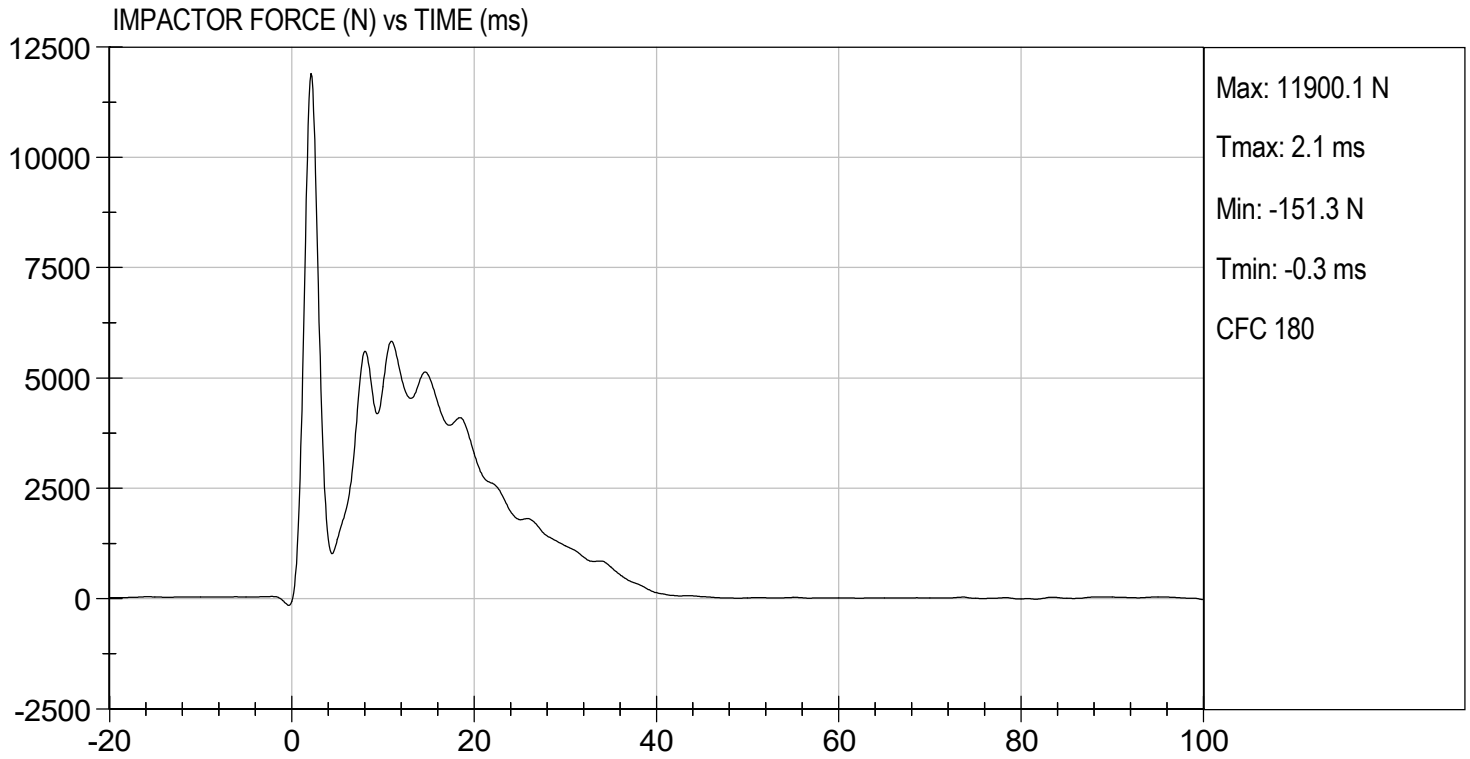
 Laboratory Technician

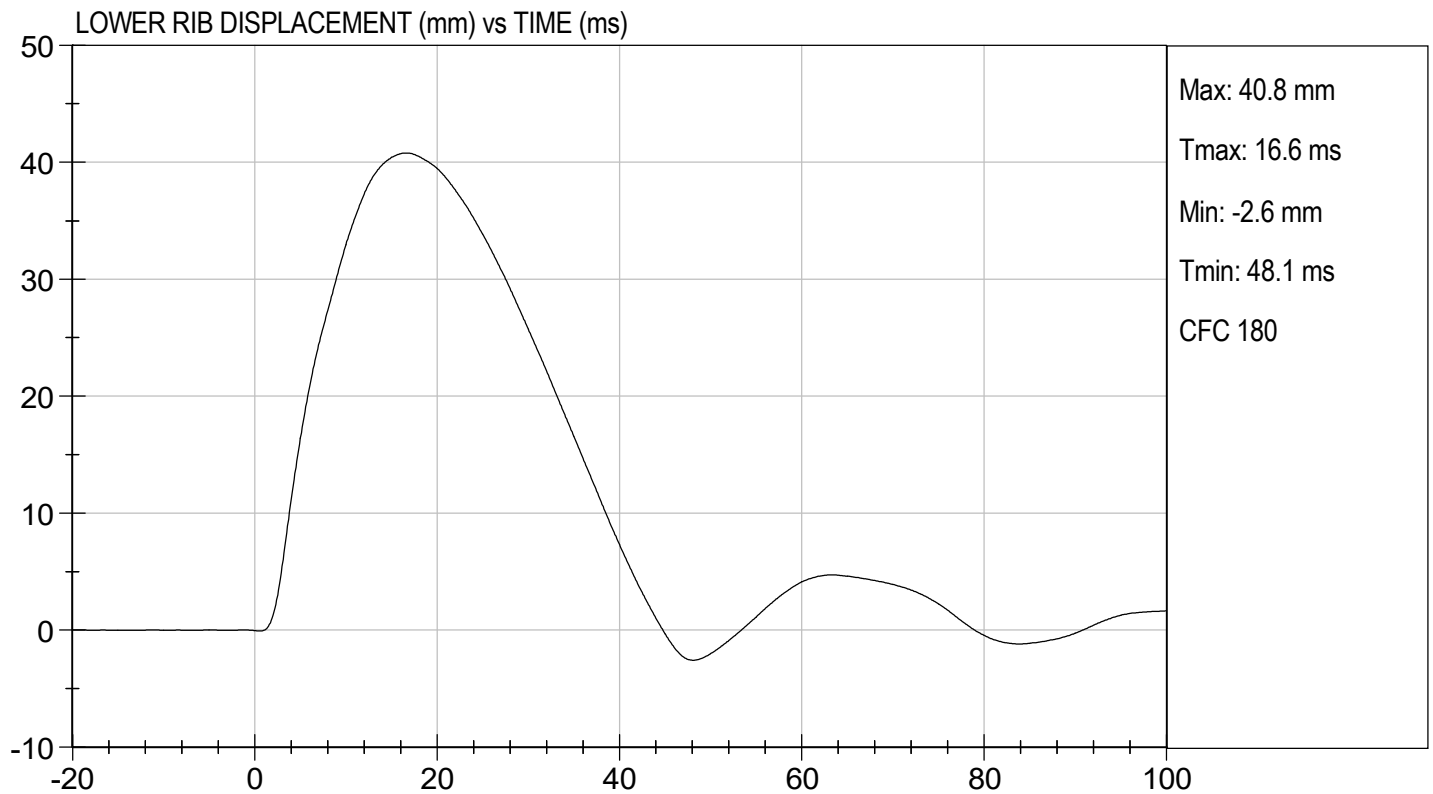
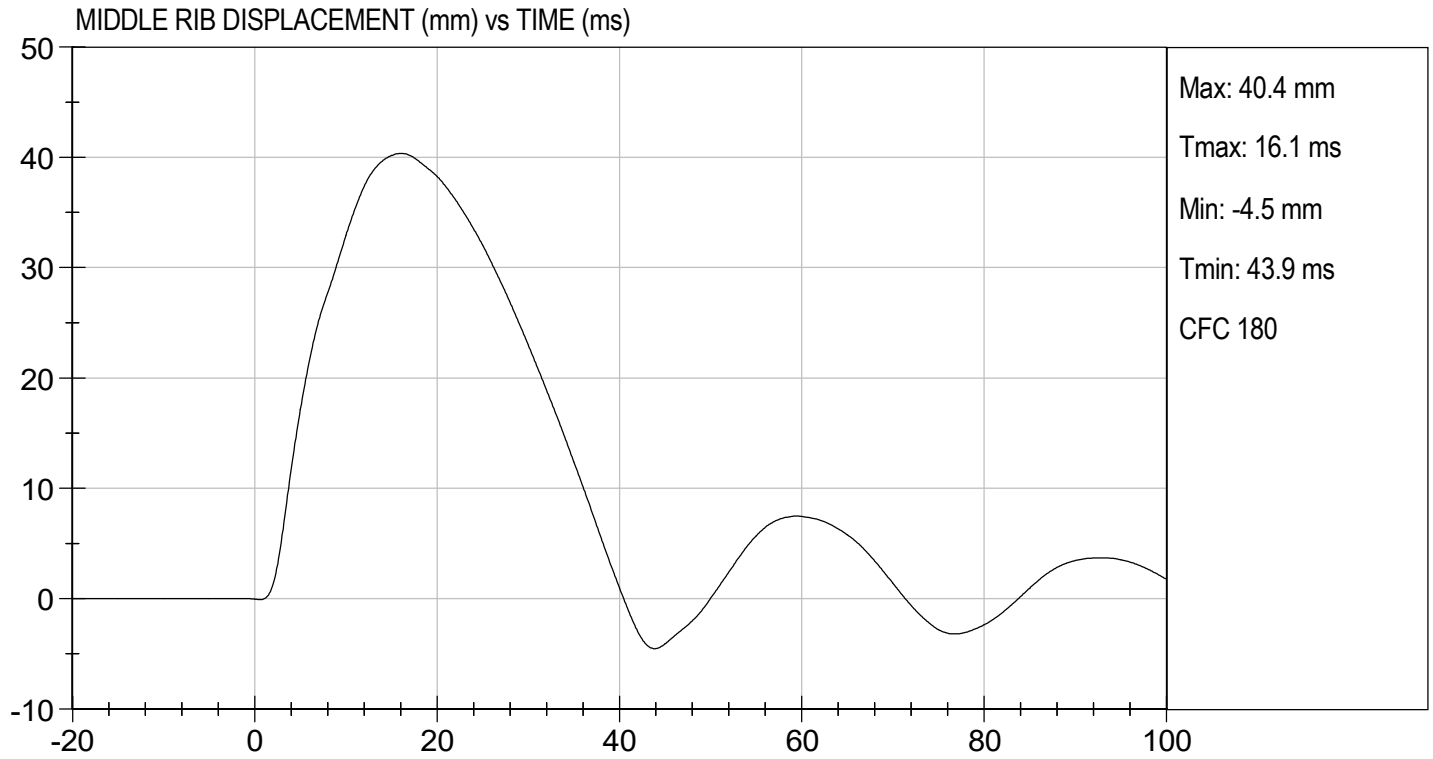
06/18/2021

 Test Date



 Approved By





CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 306

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	785	Pass
B	Shoulder Pivot Height	437 - 453	449	Pass
C	H-point Height	79 - 89	86	Pass
D	H-point from Seatback	141 - 151	147	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	120	Pass
G	Head Breadth	140 - 148	141	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	182	Pass
J	Head Circumference	541 - 551	550	Pass
K	Buttock to Knee Length	514 - 540	538	Pass
L	Popliteal Height	343 - 369	349	Pass
M	Knee Pivot to Floor Height	392 - 409	394	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	198	Pass
P	Foot Length	216 - 232	222	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	317	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	483	Pass
V	Shoulder Width	341 - 357	351	Pass
W	Foot Width	78 - 94	82	Pass
Y	Chest Circumference w/ jacket	851 - 881	863	Pass
Z	Waist Circumference	761 - 791	782	Pass

**MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY**

ATD Serial No: 306

Test ID: D211881

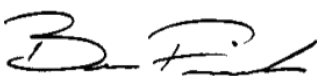
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	115 to 137	136	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-9.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass



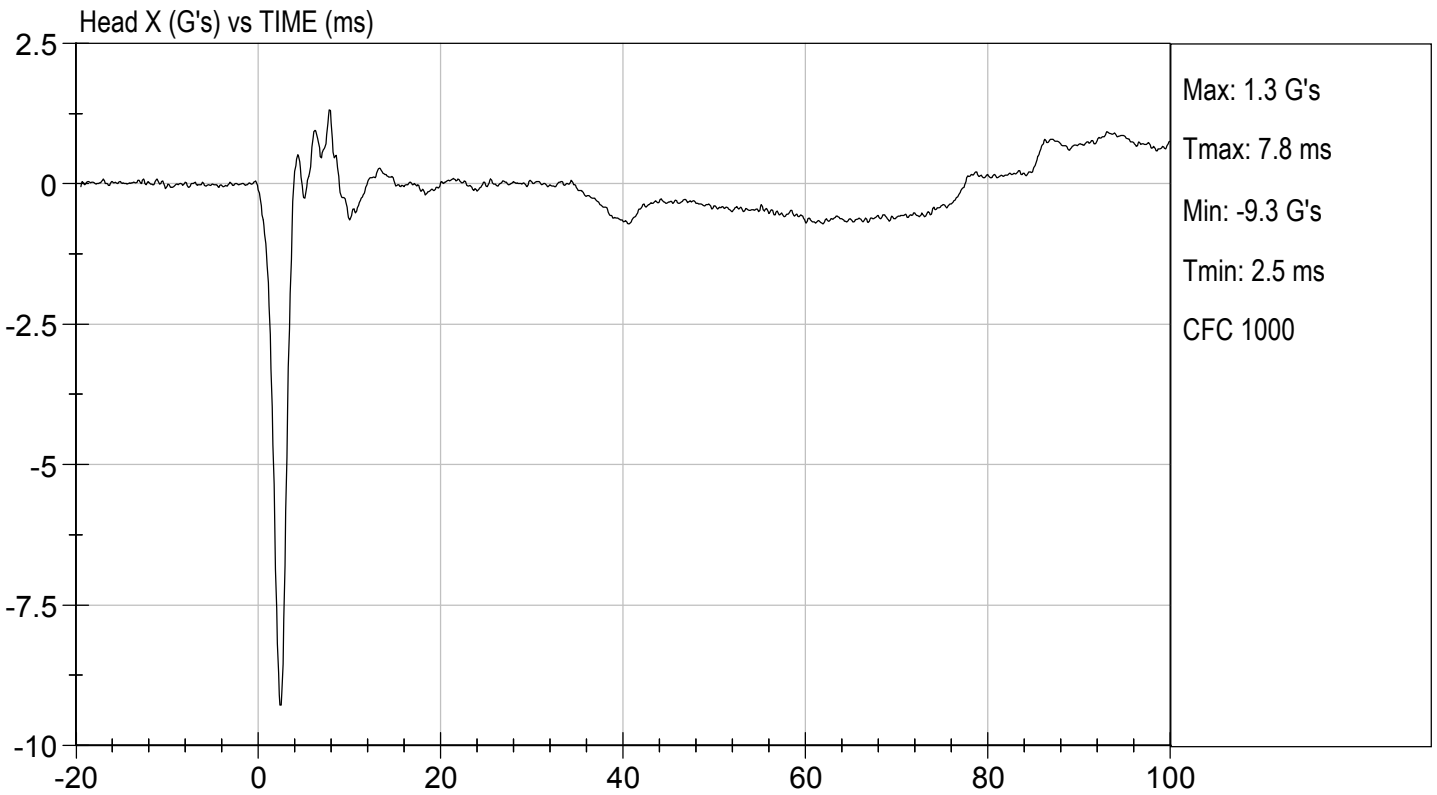
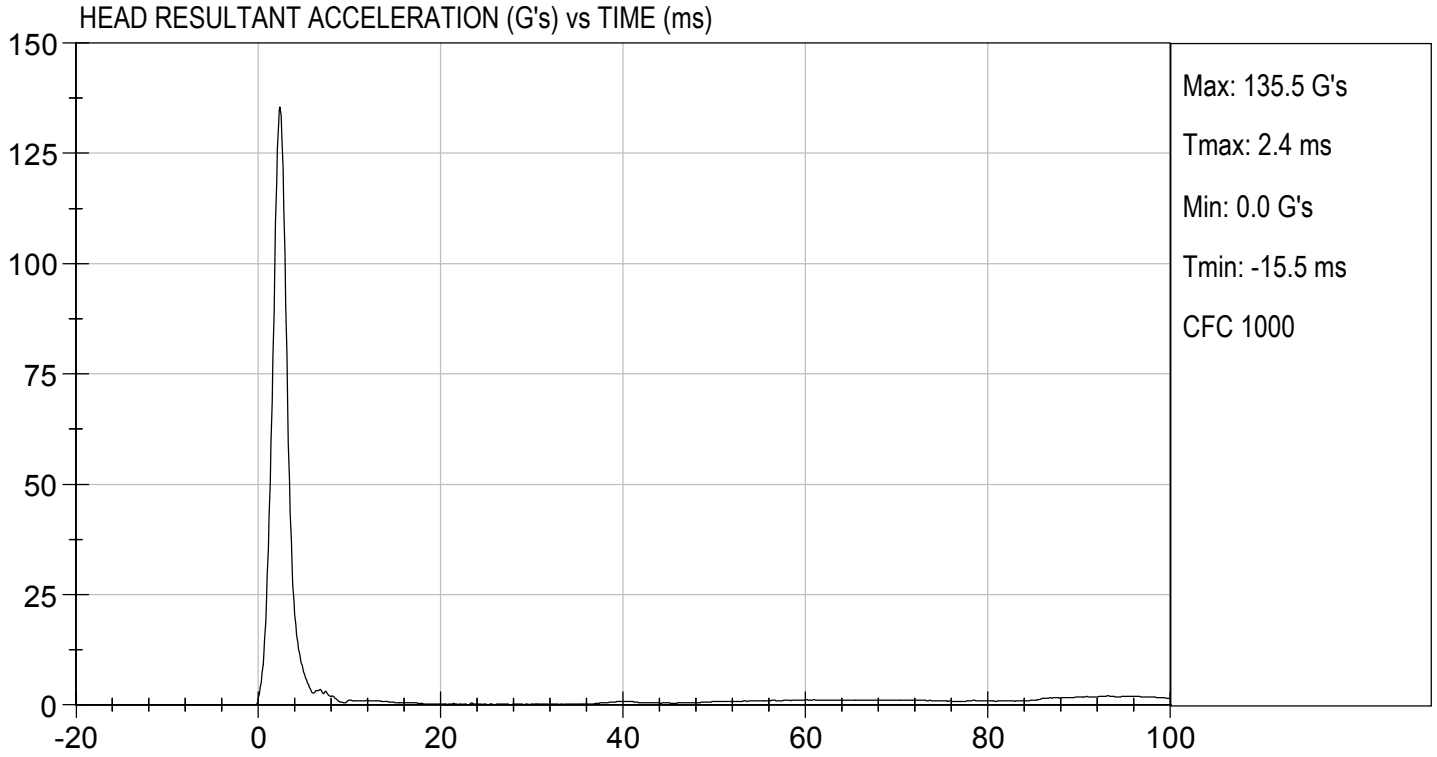
Laboratory Technician

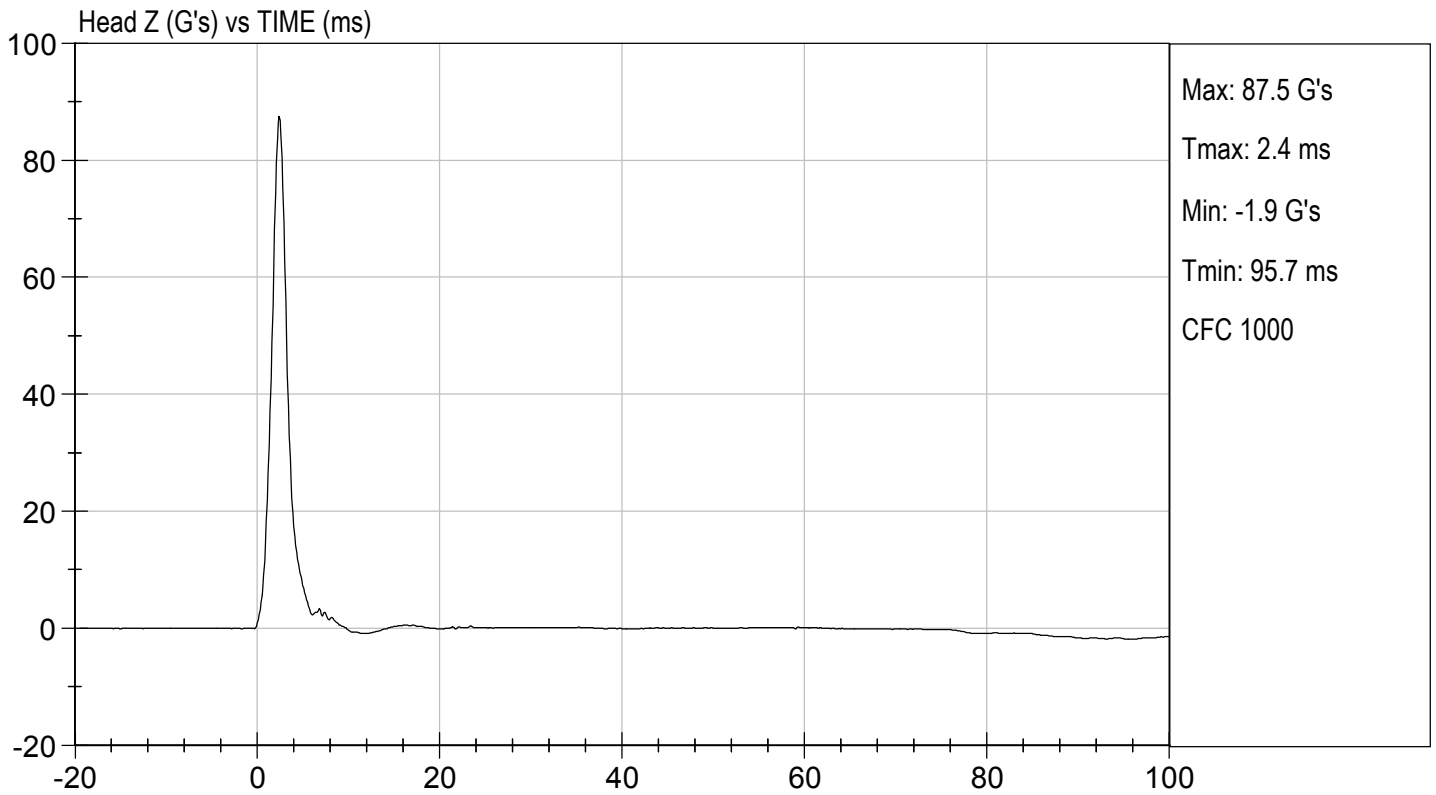
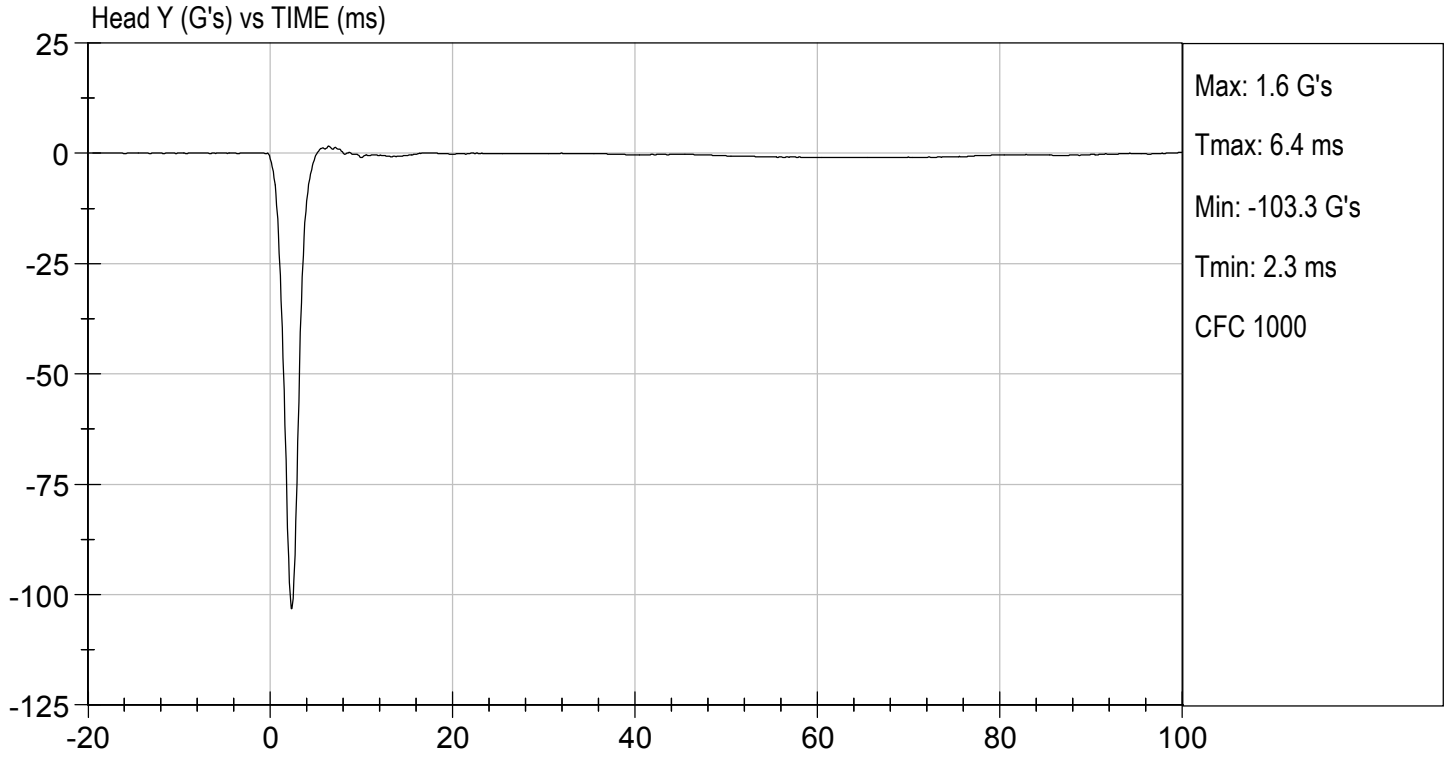
05/27/2021

Test Date



Approved By



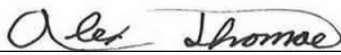


**MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY**

ATD Serial No: 306

Test I.D.: D211882

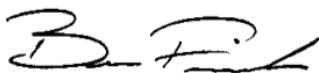
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.4	Pass	
Humidity	%	10 to 70	38	Pass	
Impact Velocity	m/s	5.51 to 5.63	5.63	Pass	
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.79	Pass
	15 ms	m/s	3.30 to 4.10	4.00	Pass
	20 ms	m/s	4.40 to 5.40	5.39	Pass
	25 ms	m/s	5.40 to 6.10	5.57	Pass
	25-100 ms	m/s	5.50 to 6.20	5.60	Pass
Maximum D-Plane Rotation	deg	71 to 81	72	Pass	
Time of Maximum D-Plane Rotation	ms	50 to 70	62	Pass	
Maximum Occipital Condyle Moment	Nm	-44 to -36	-36	Pass	
Time of Moment Decay to 0 Nm	ms	102 to 126	120	Pass	
Overall Test Results				Pass	



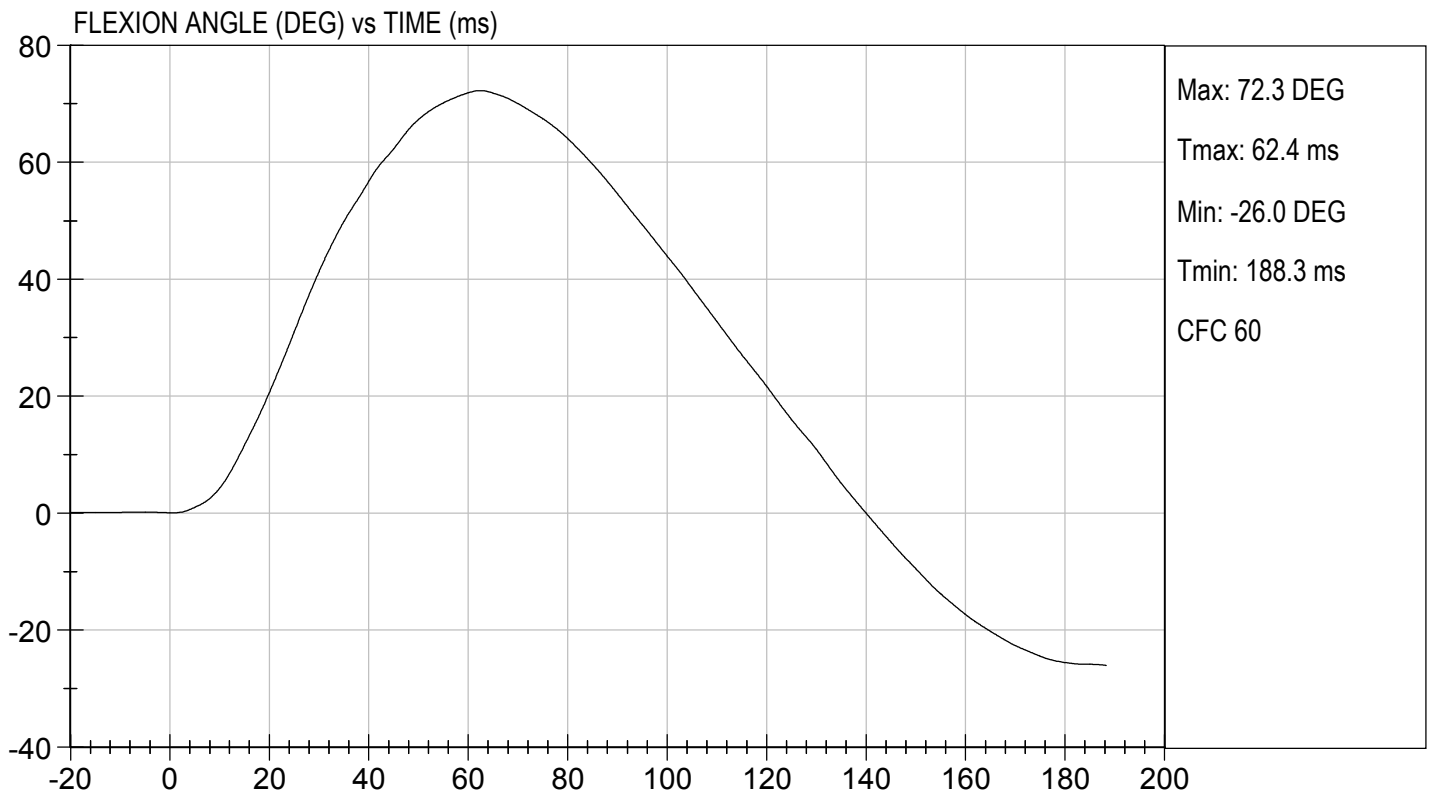
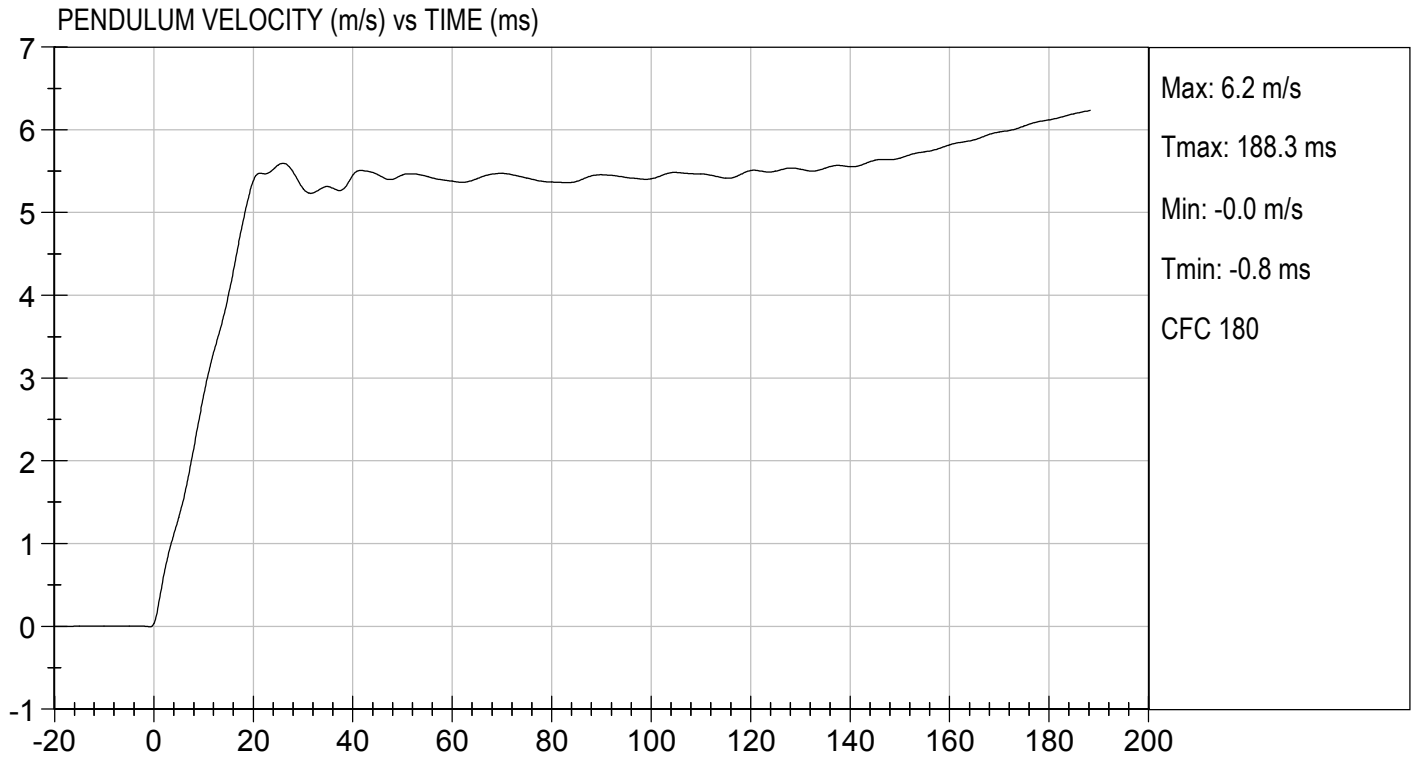
Laboratory Technician

05/28/2021

Test Date



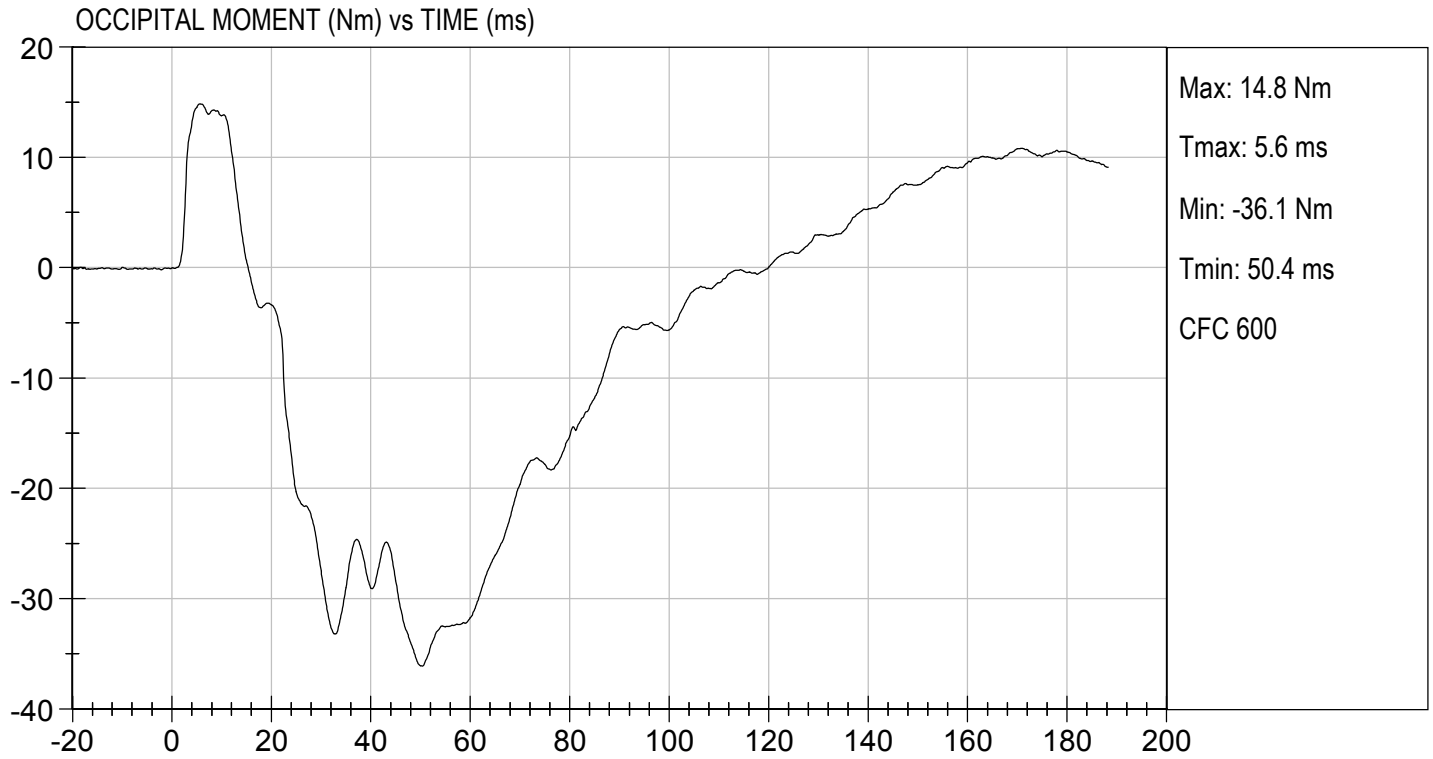
Approved By





TEST DESC: NECK BENDING
VELOCITY: 18.48 ft/s, 5.63 m/s

TEST DATE: 05/28/2021
TEST #: D211882



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test ID: D211883

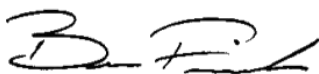
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass



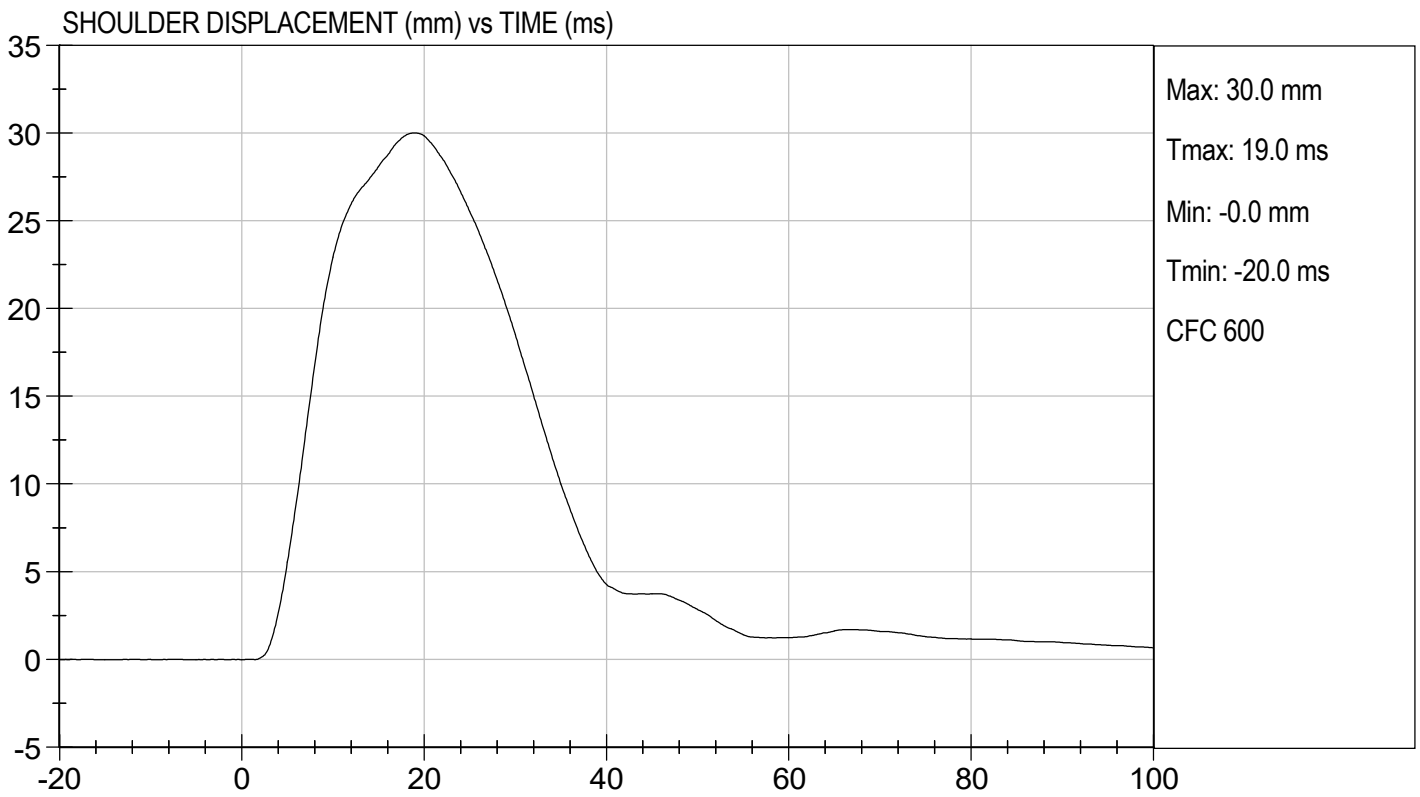
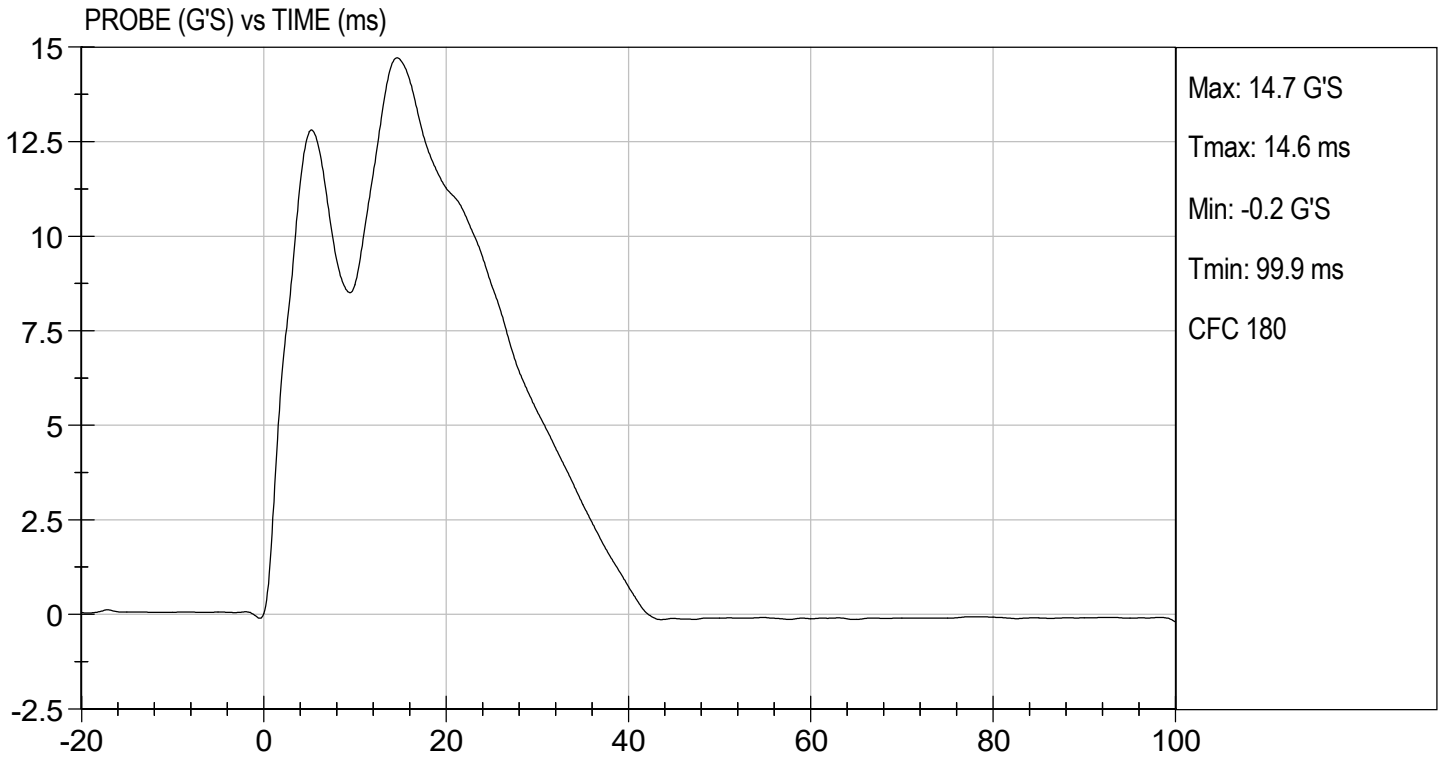
Laboratory Technician

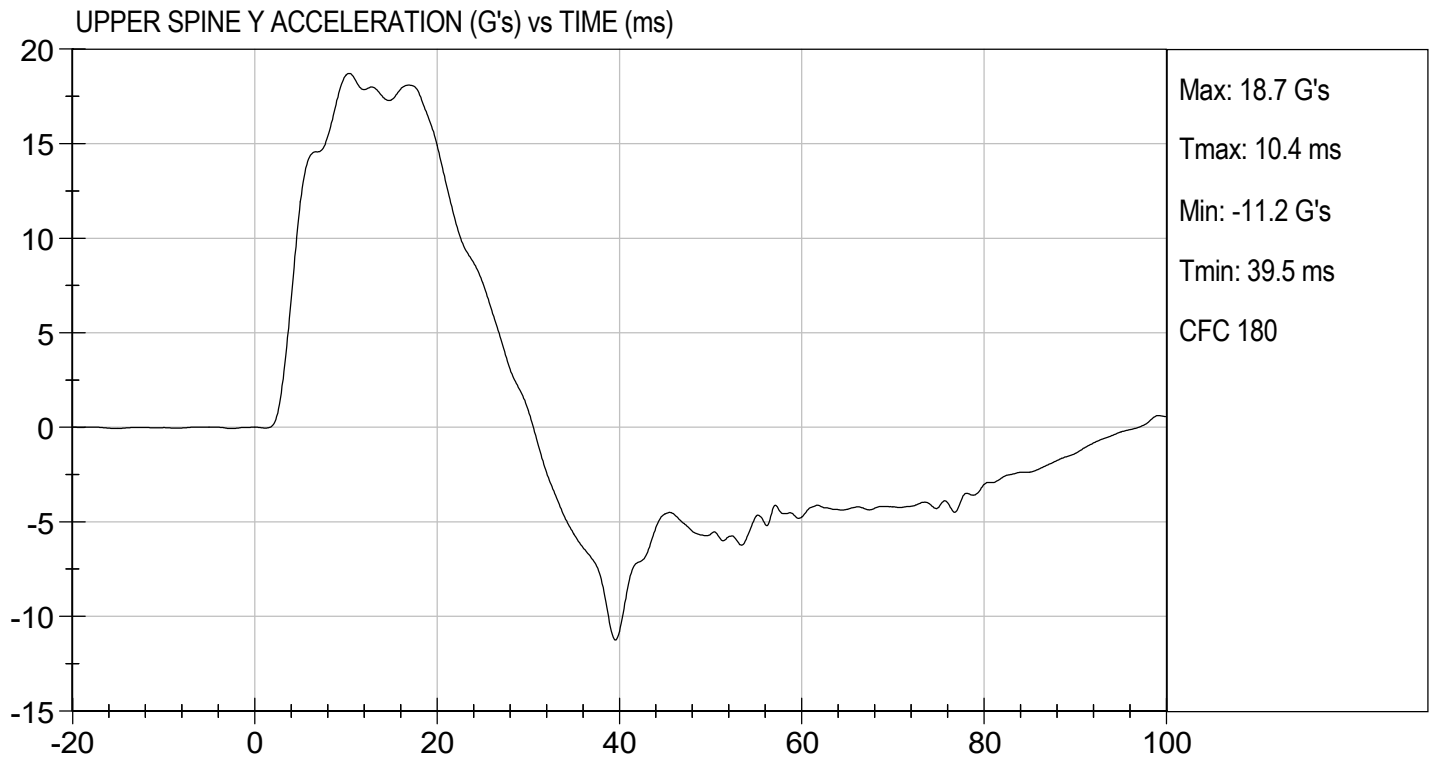
06/01/2021

Test Date



Approved By






**MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY**

ATD Serial No: 306

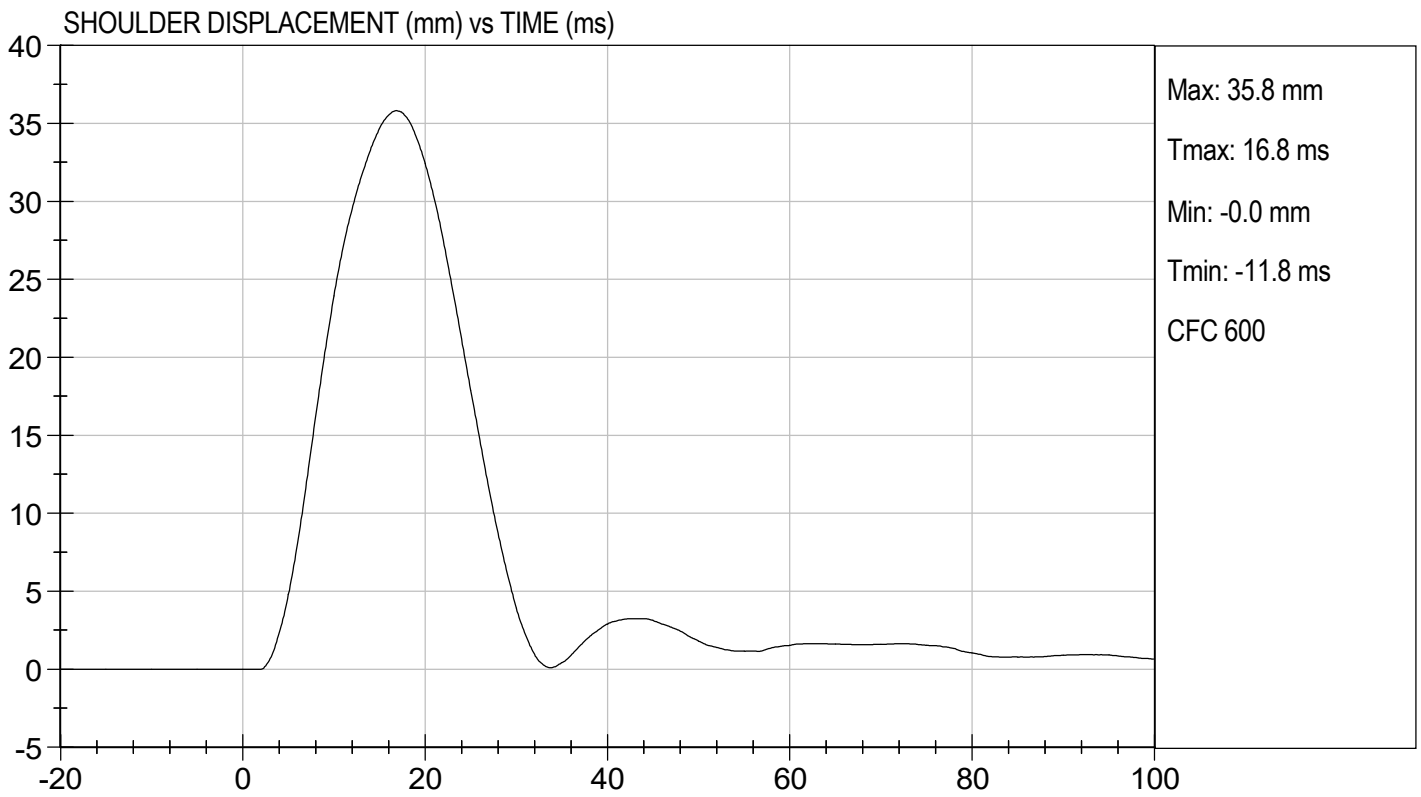
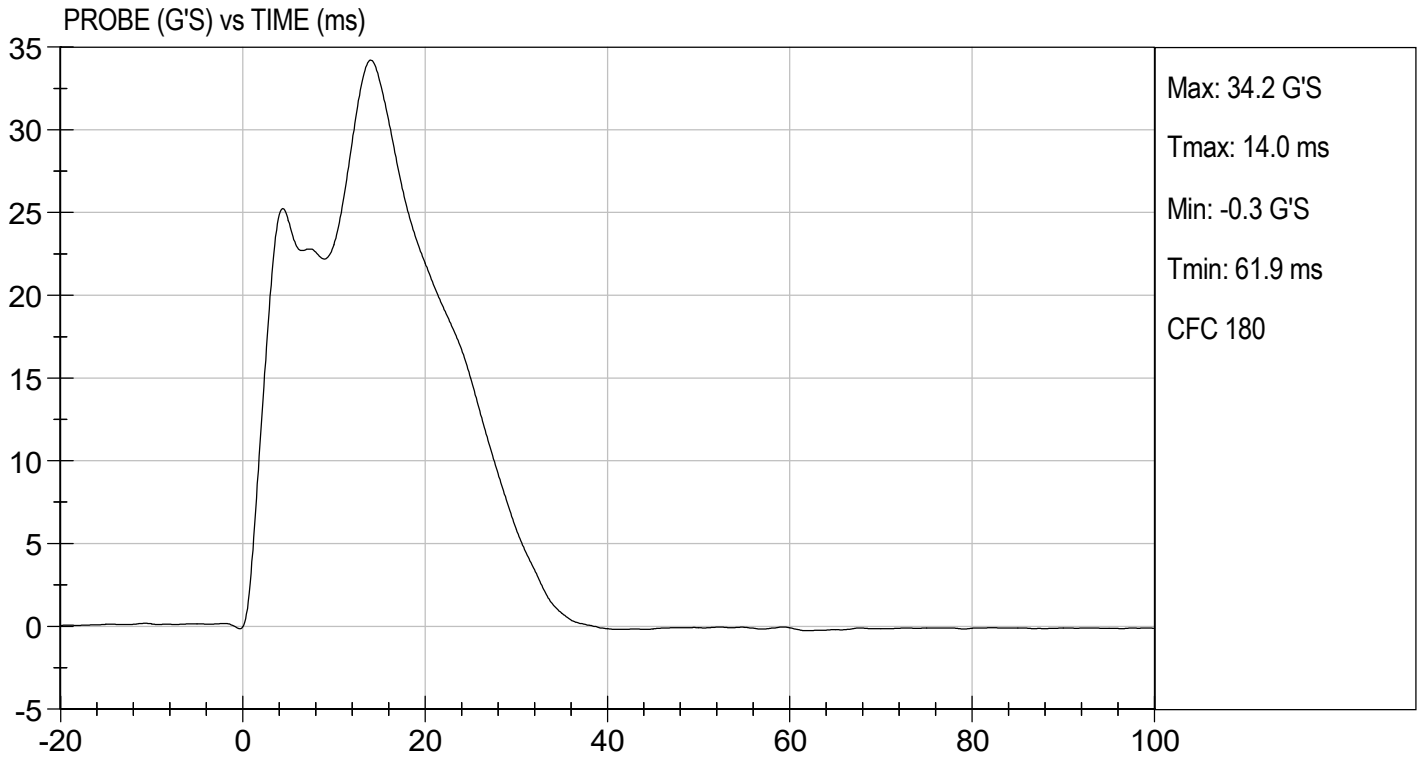
Test I.D: D211884

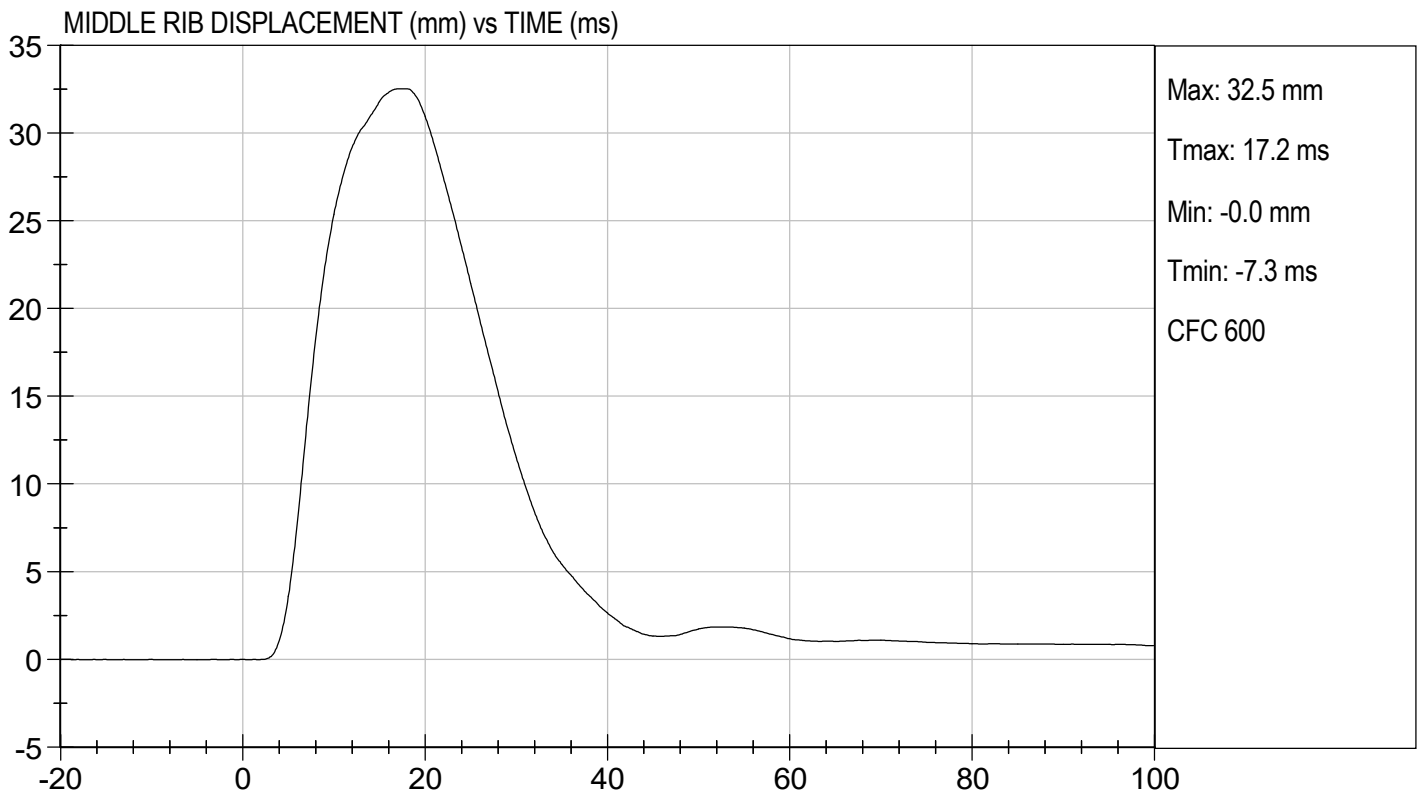
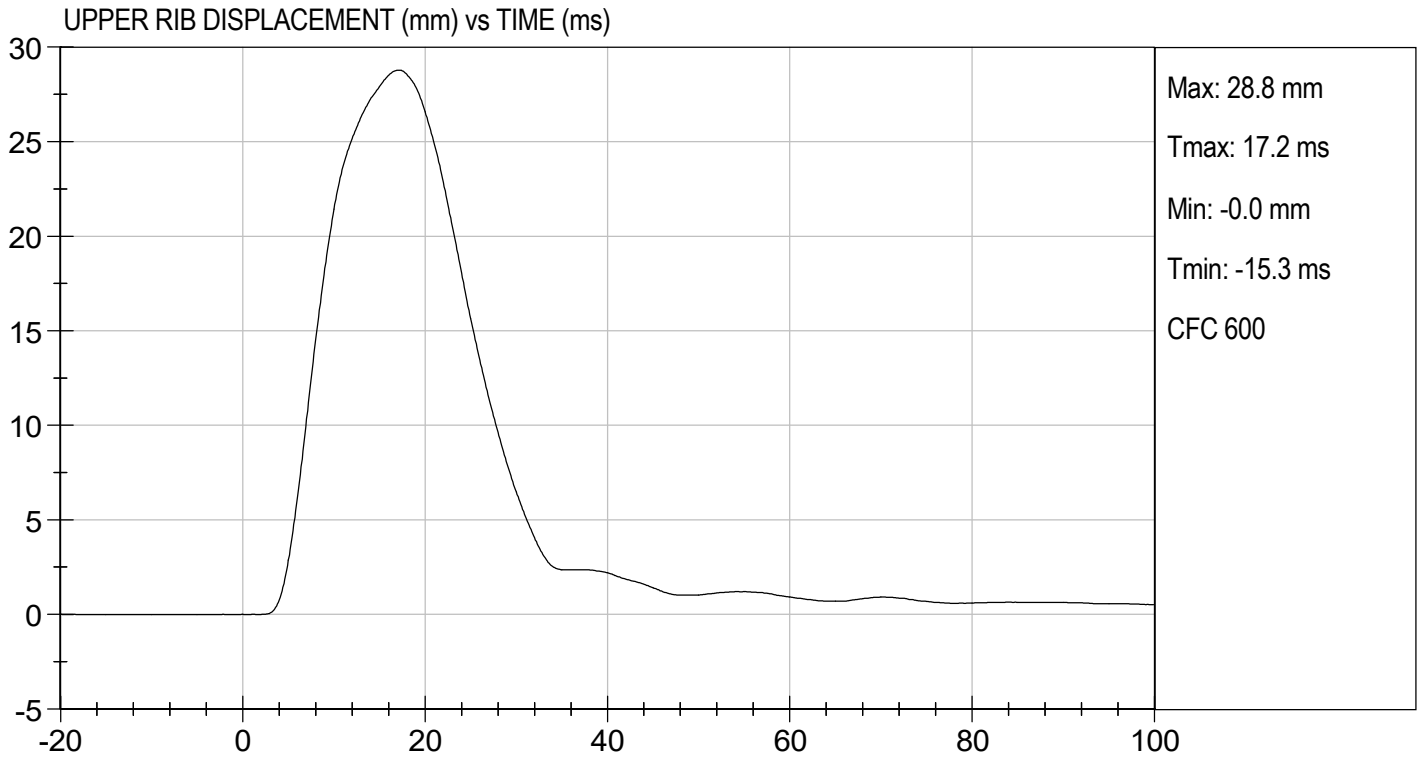
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	30 to 36	34	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	33	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	40	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results				Pass

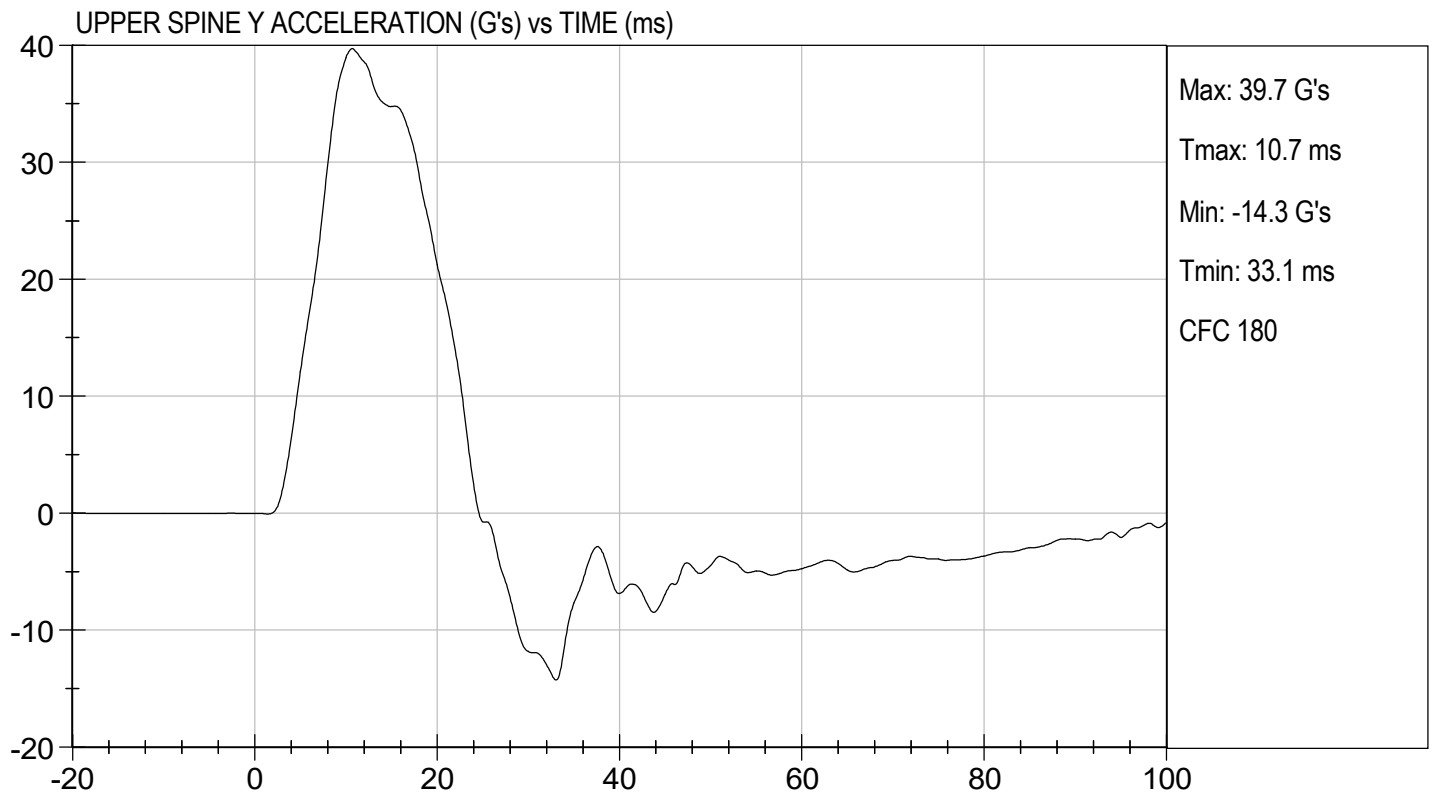
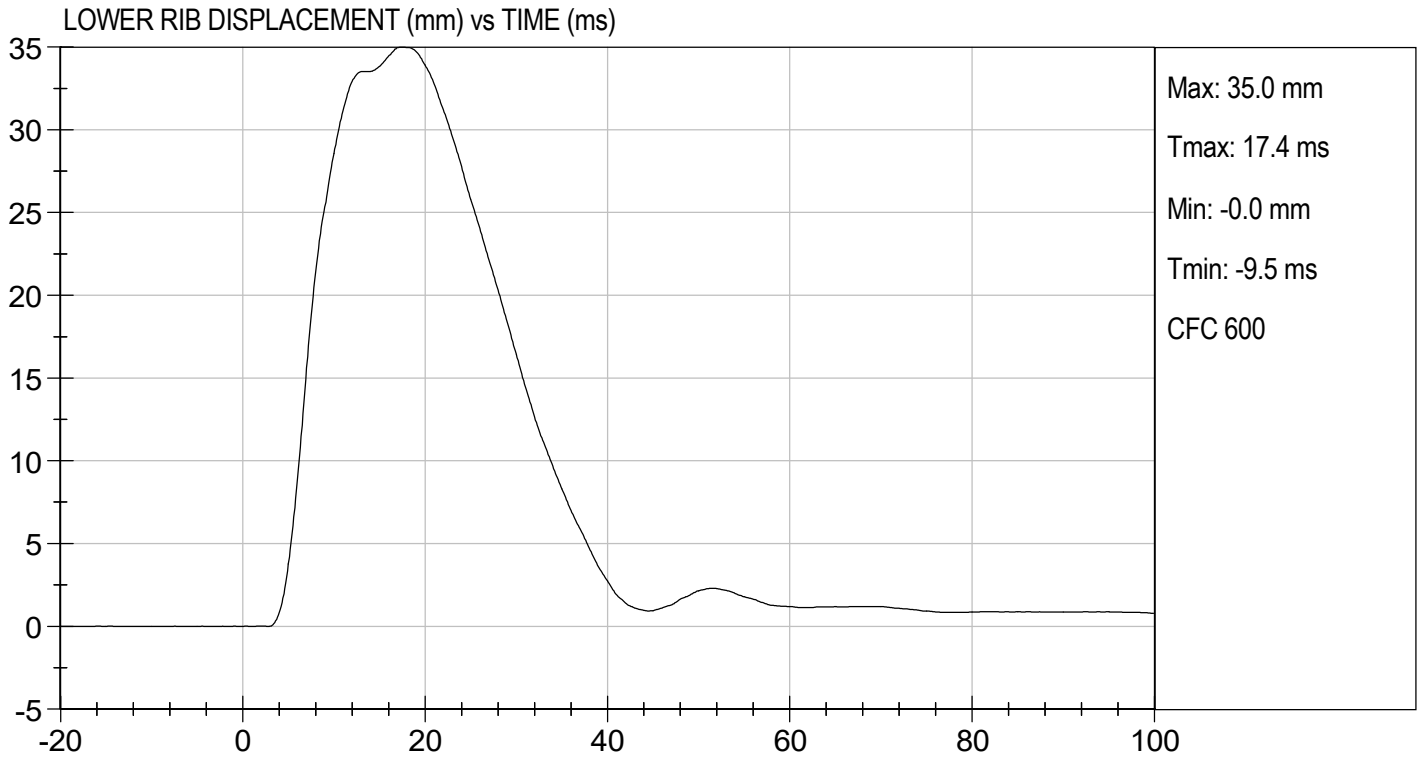

Laboratory Technician

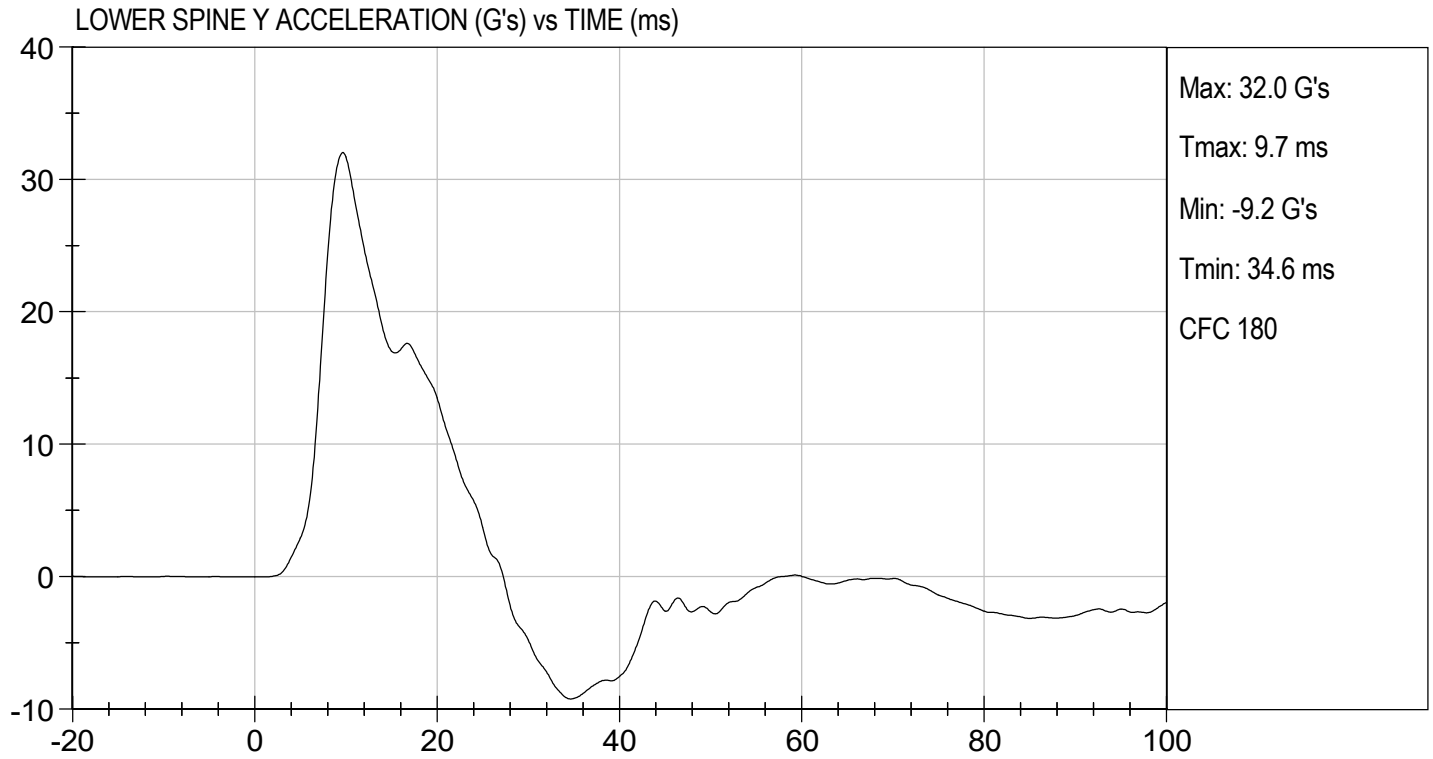
06/01/2021
Test Date


Approved By









MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D211885

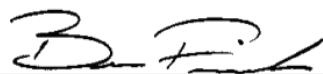
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	39	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	16	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass



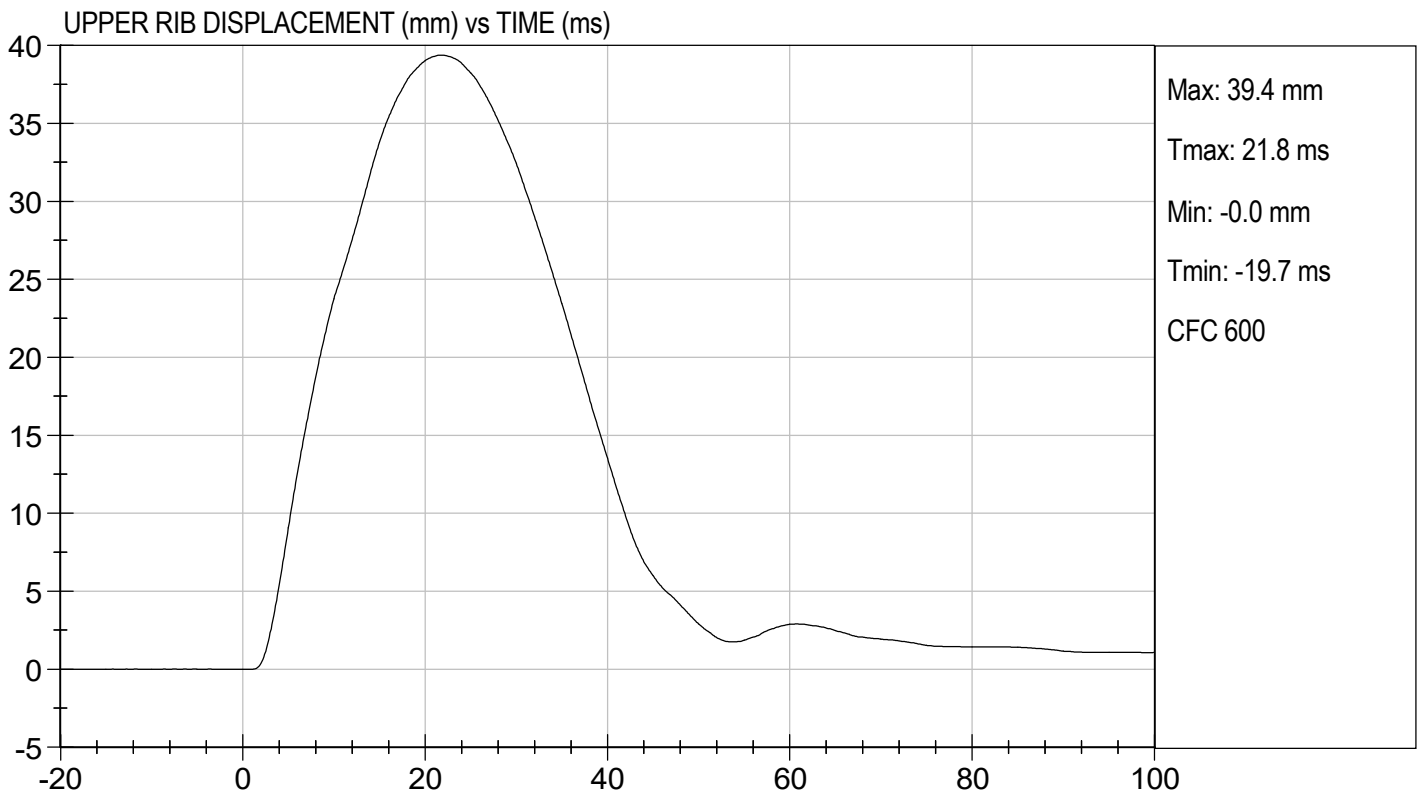
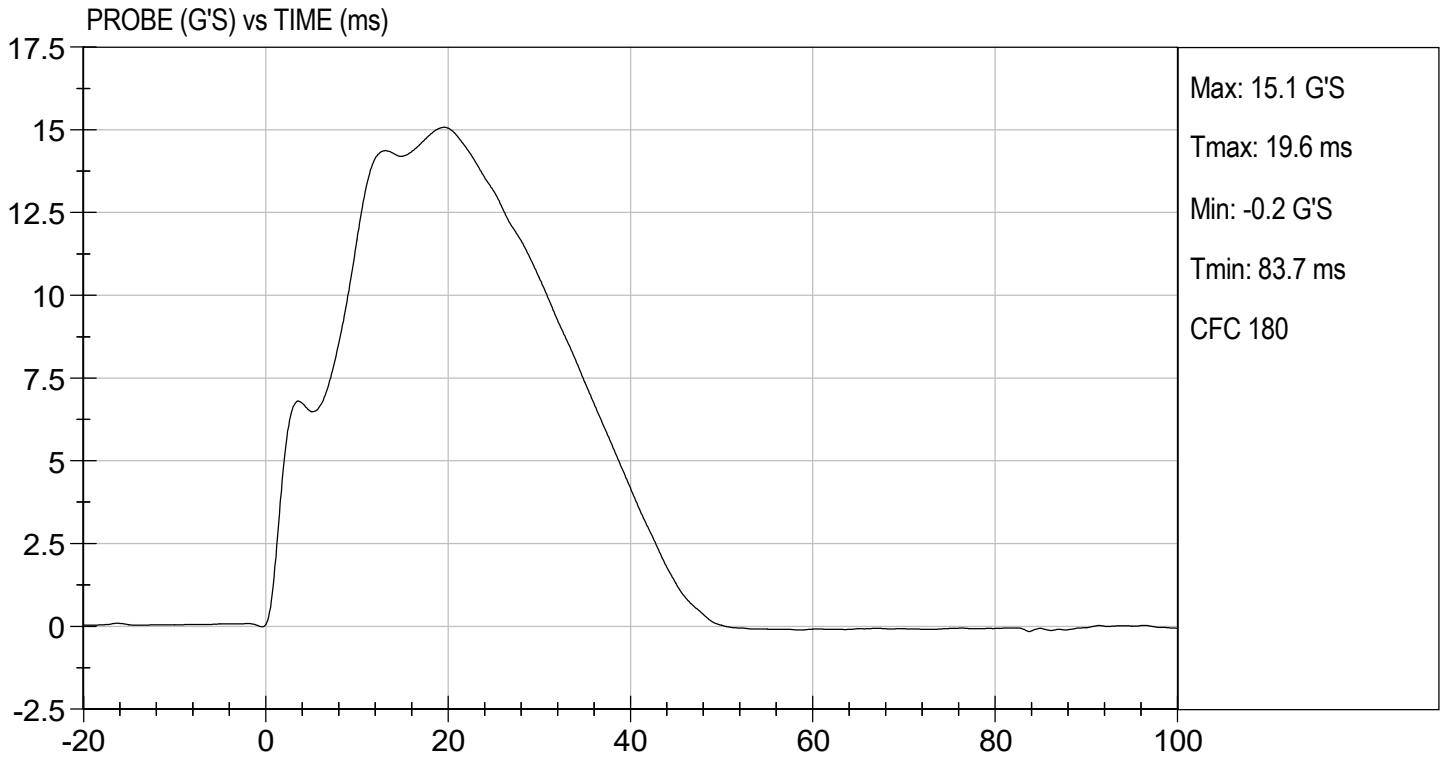
Laboratory Technician

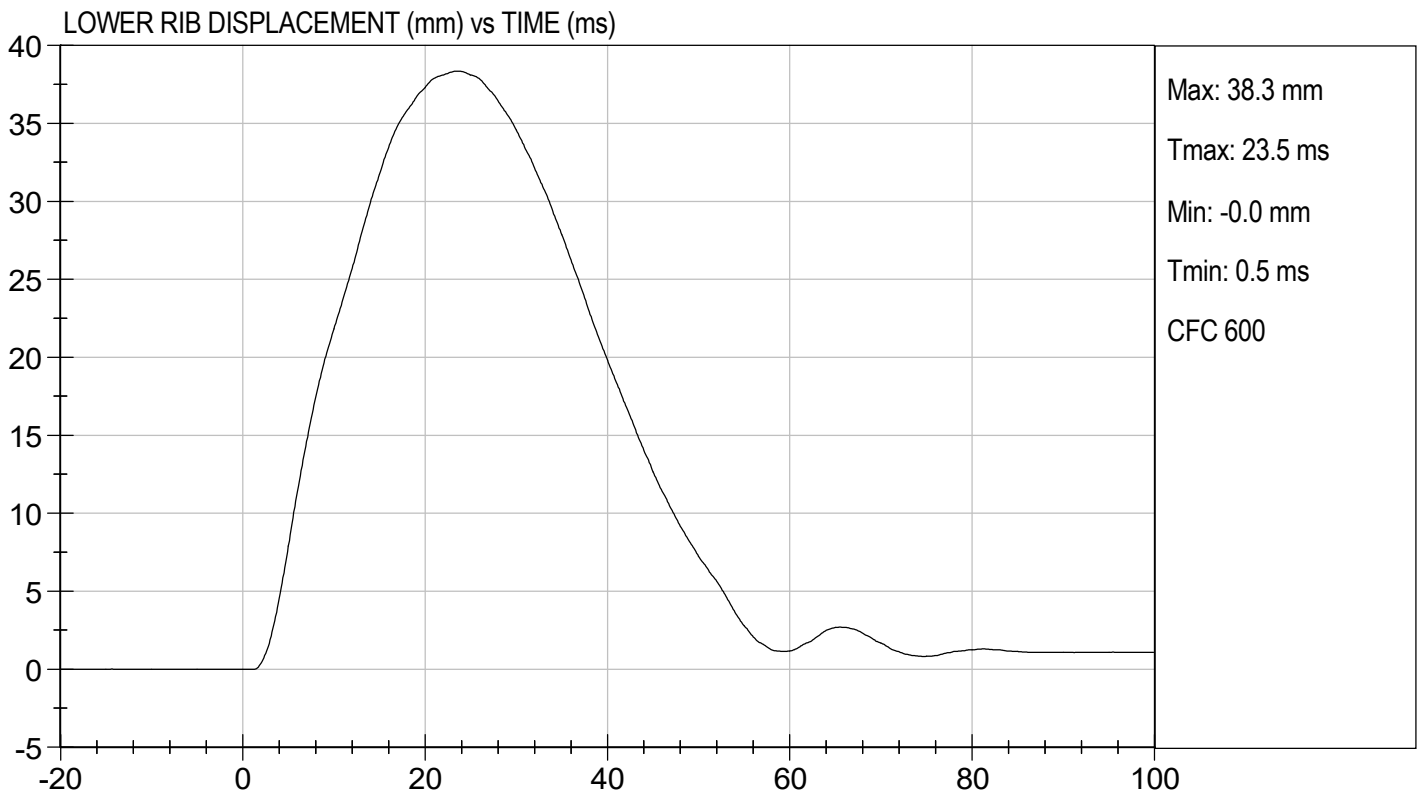
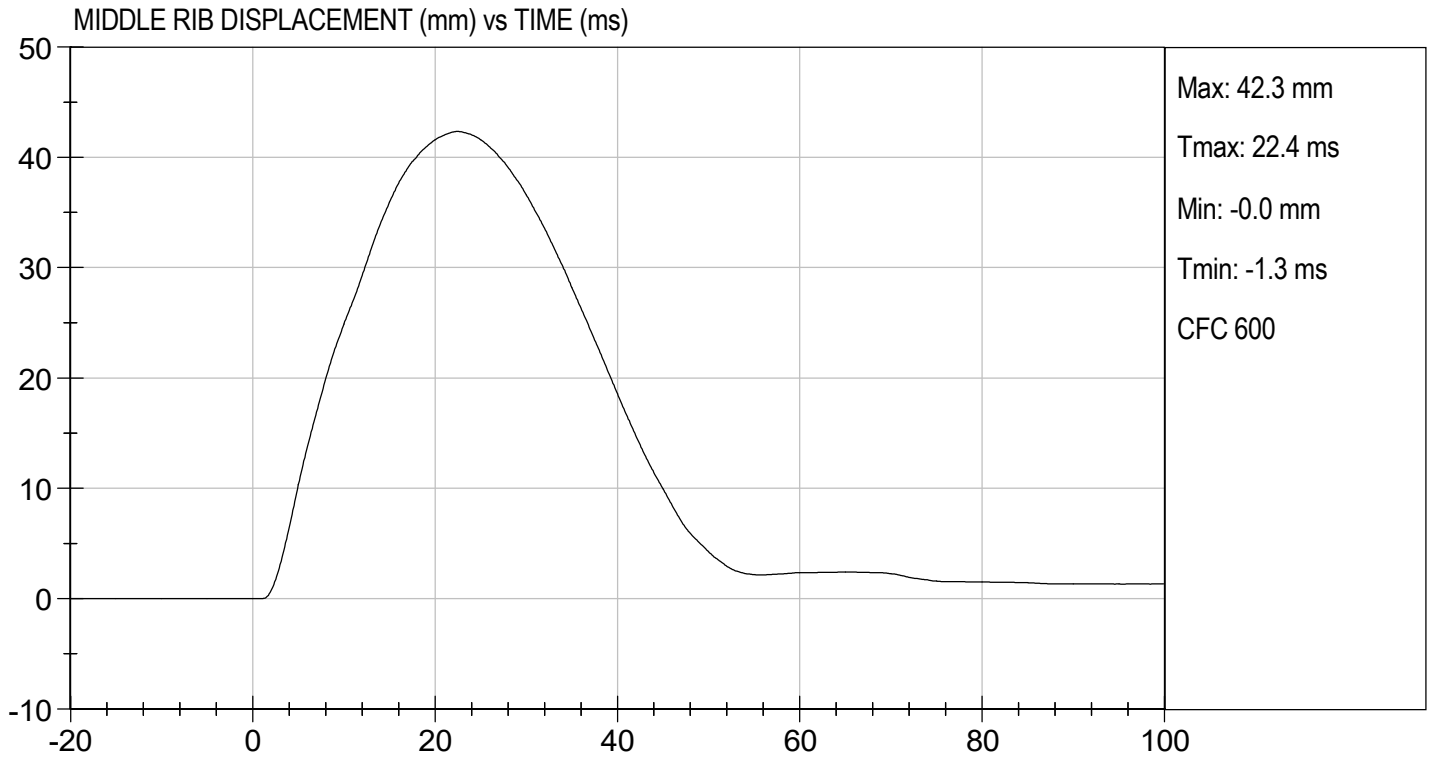
06/01/2021

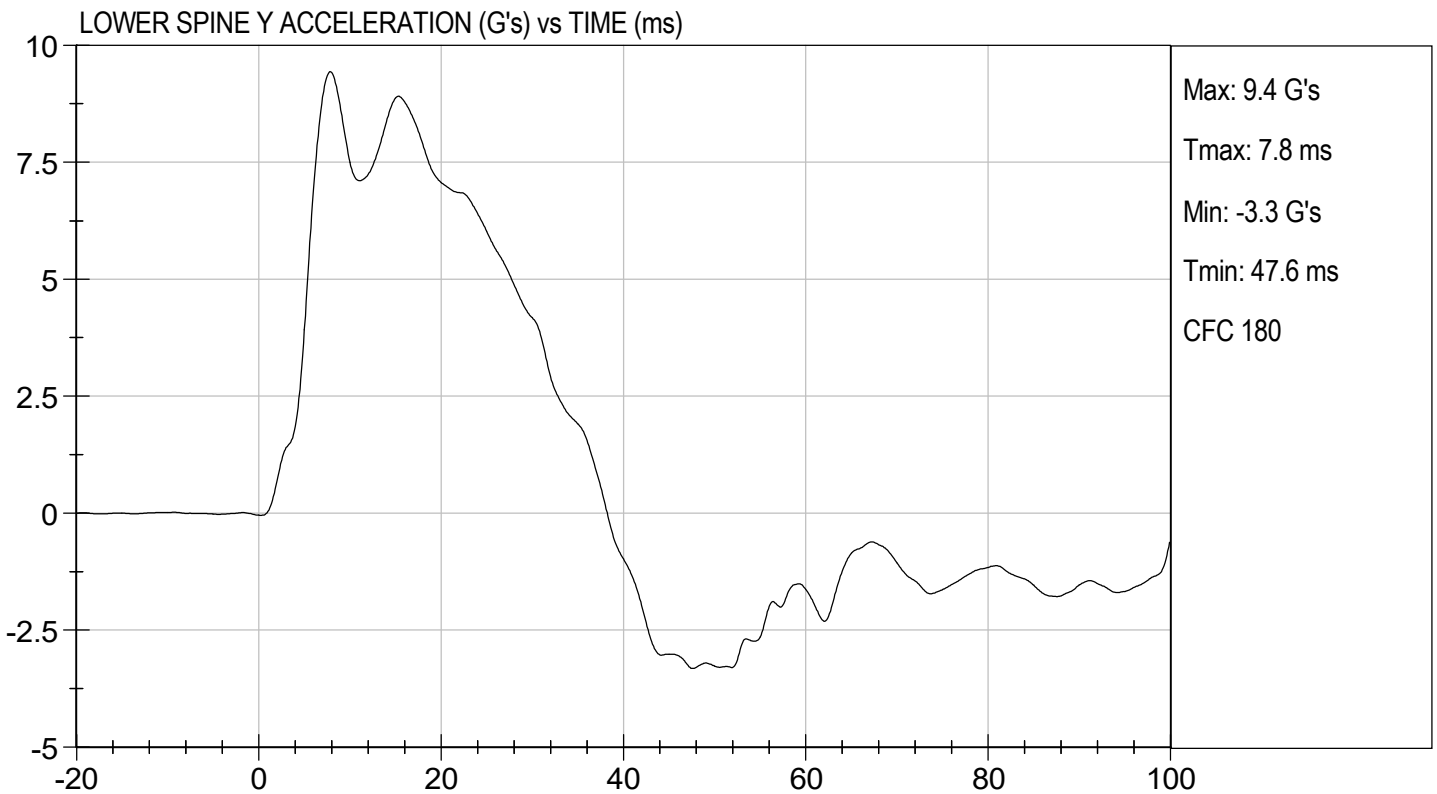
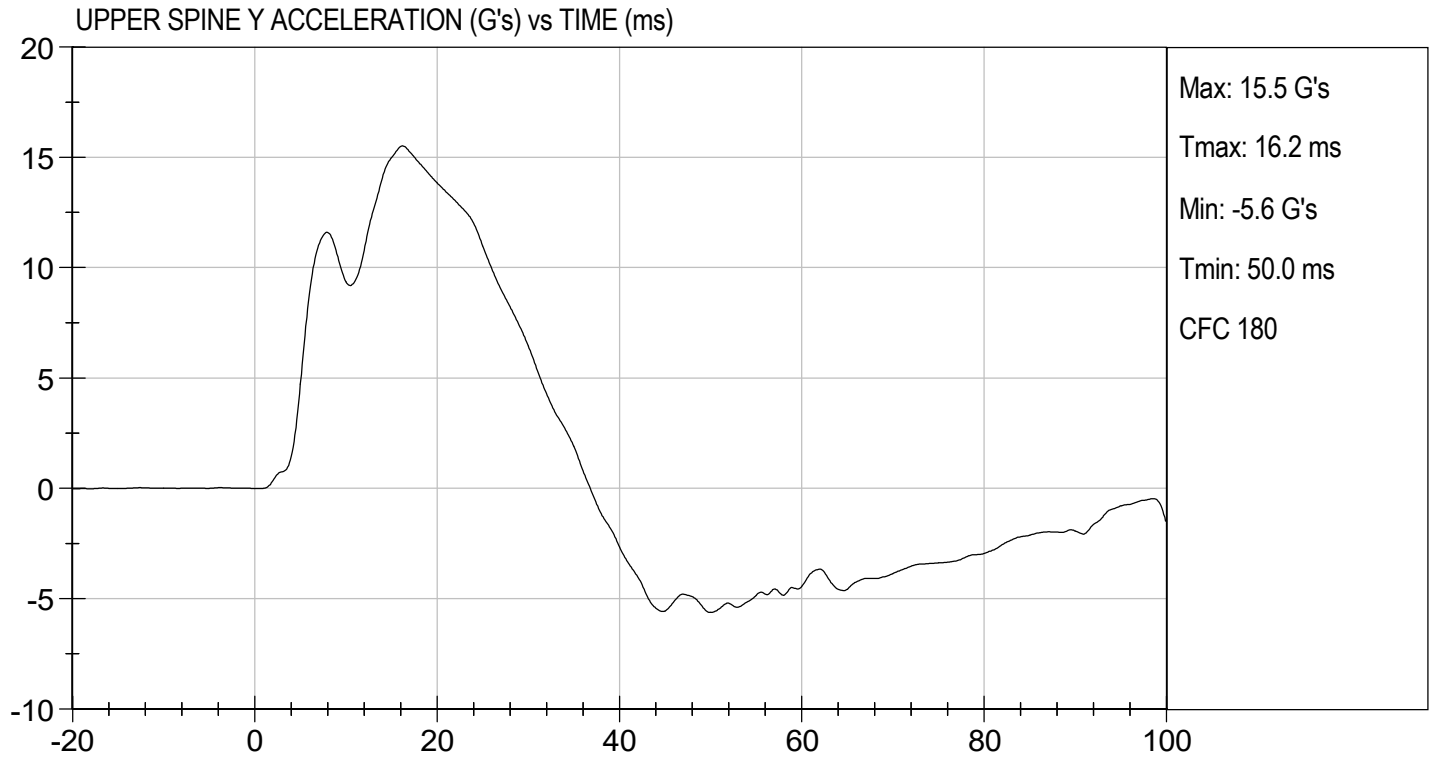
Test Date



Approved By







MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D211886

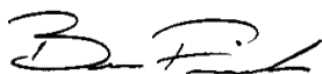
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	42	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass



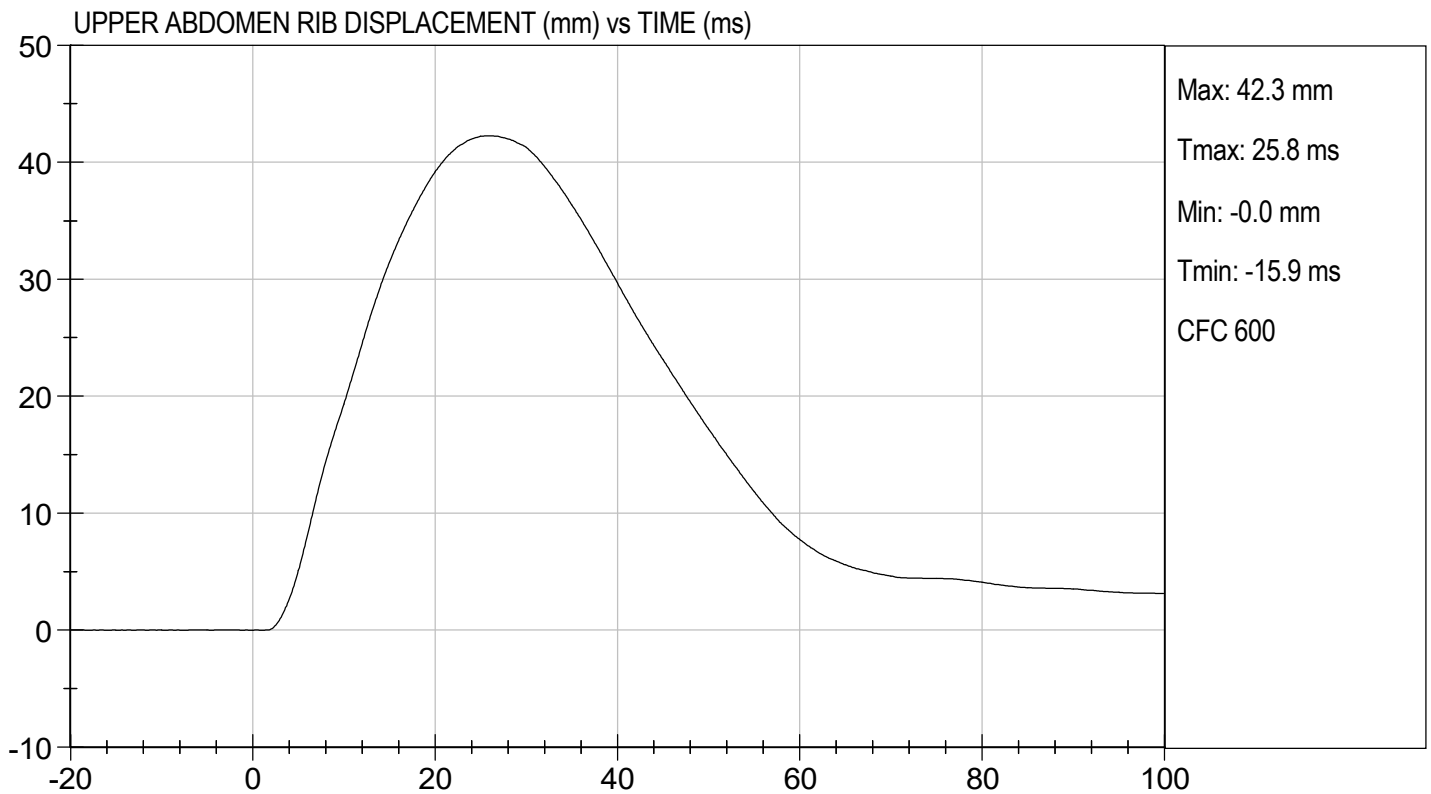
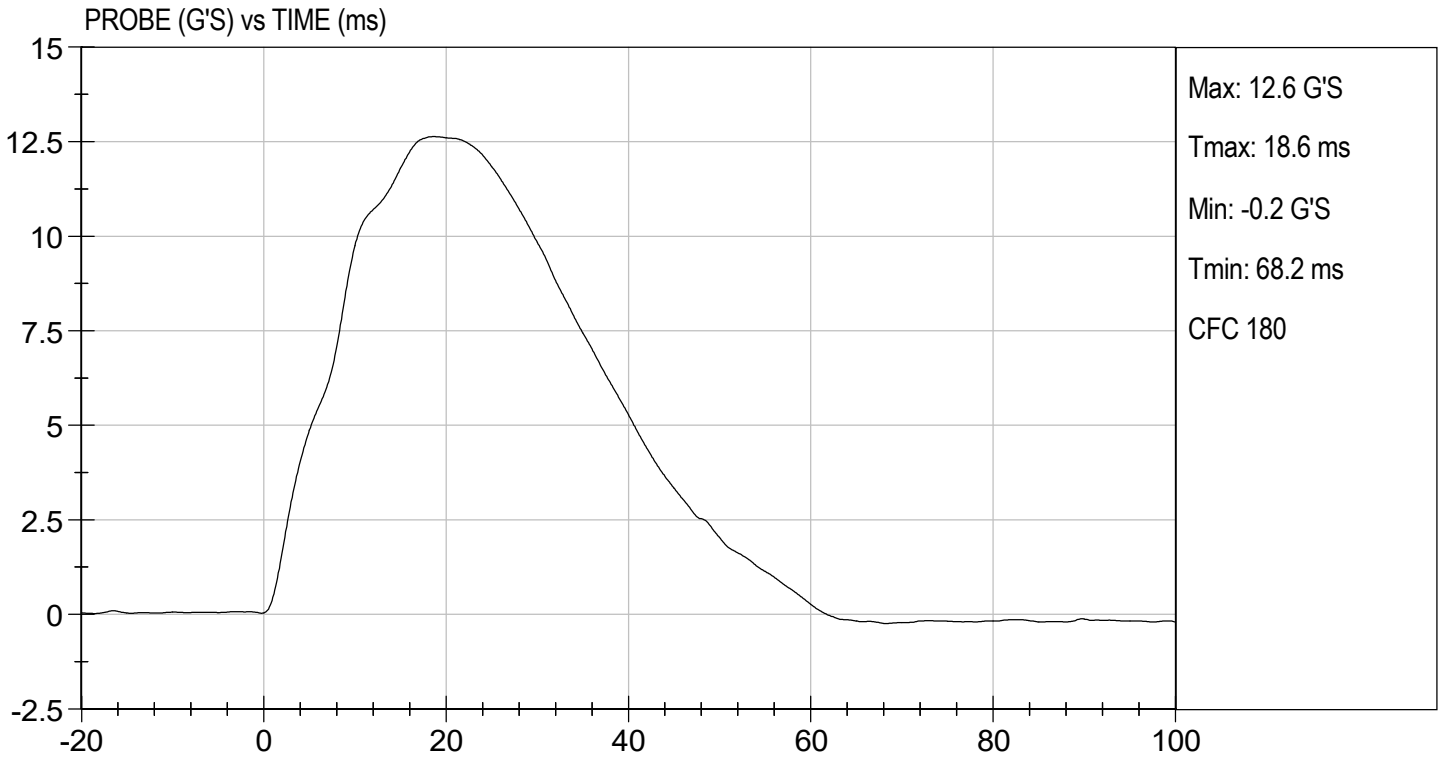
Laboratory Technician

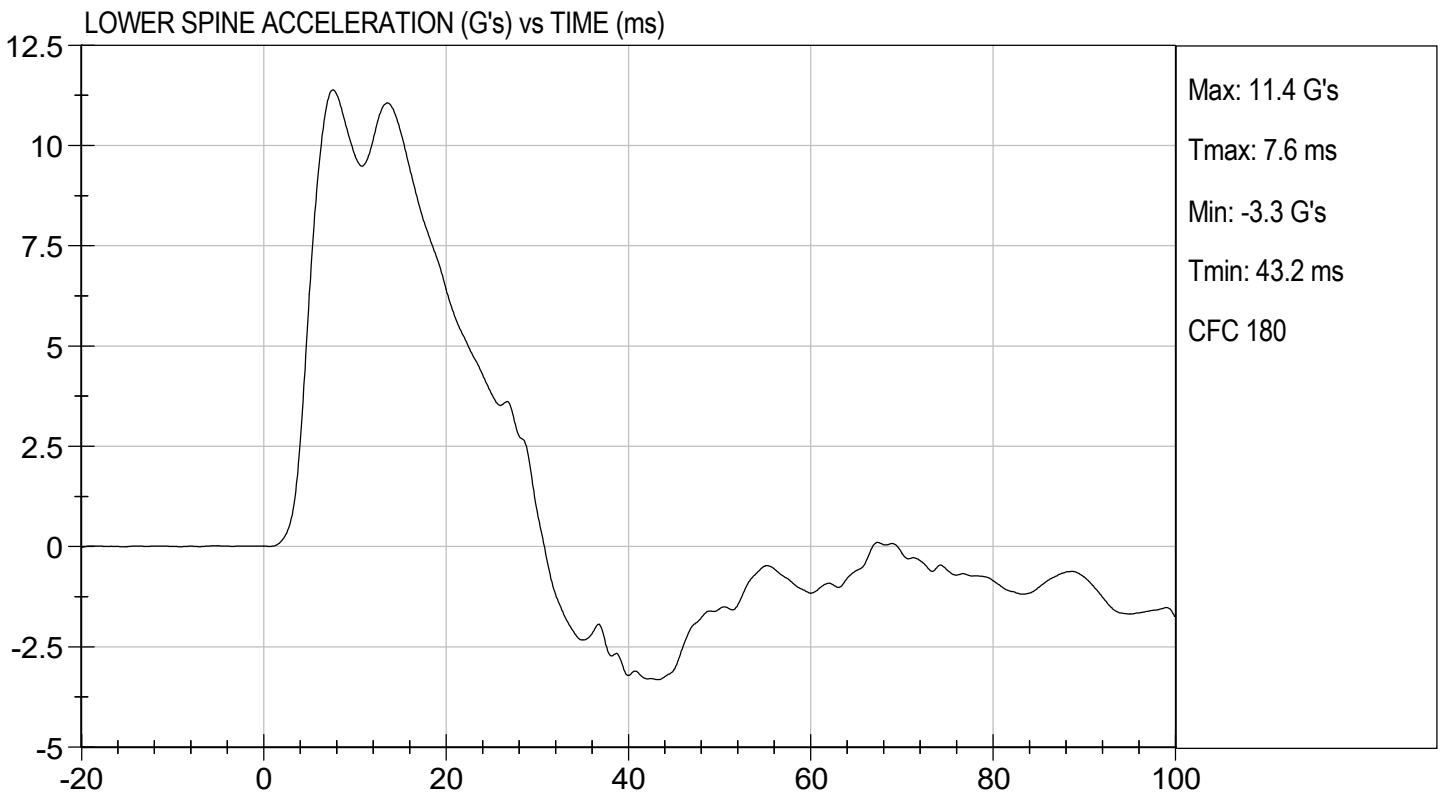
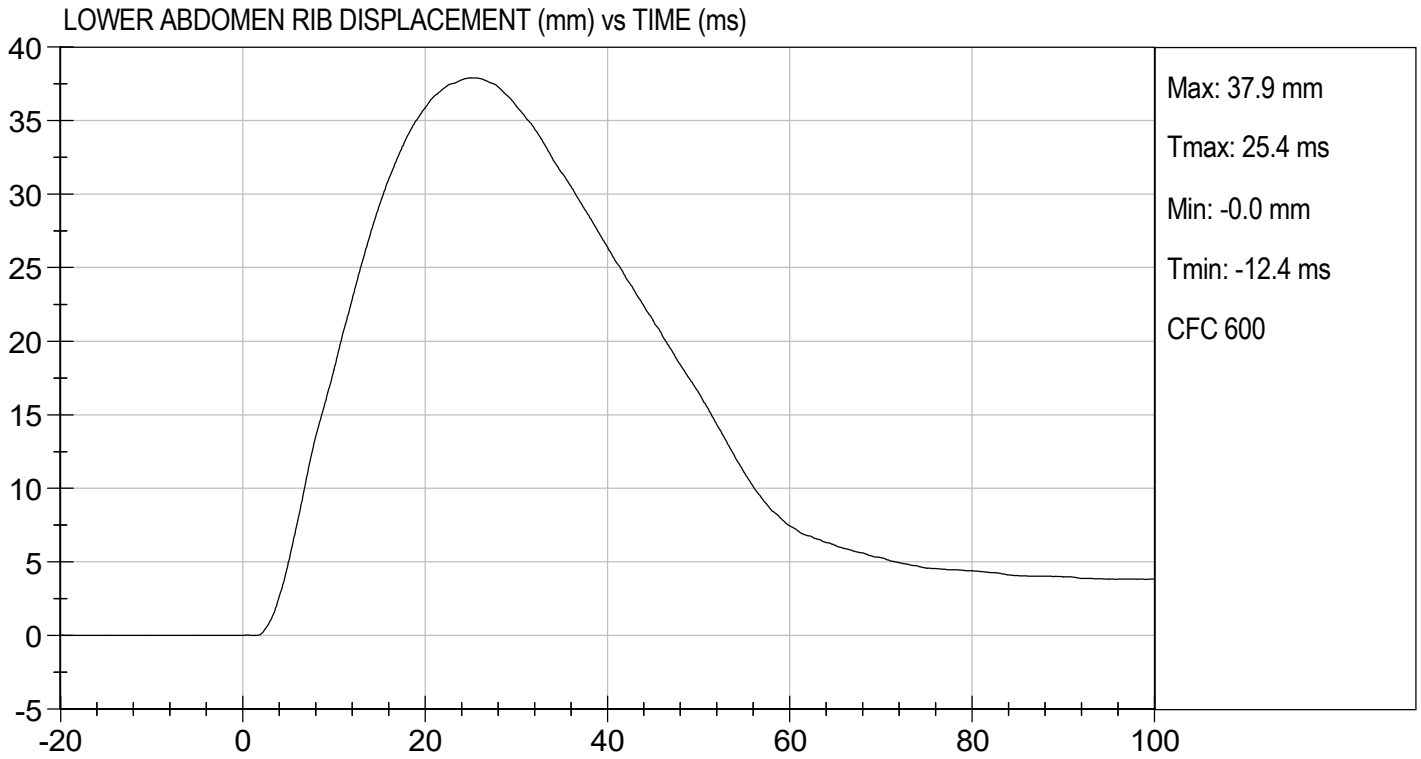
06/01/2021

Test Date



Approved By






MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

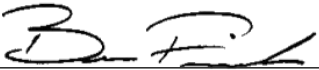
ATD Serial No: 306

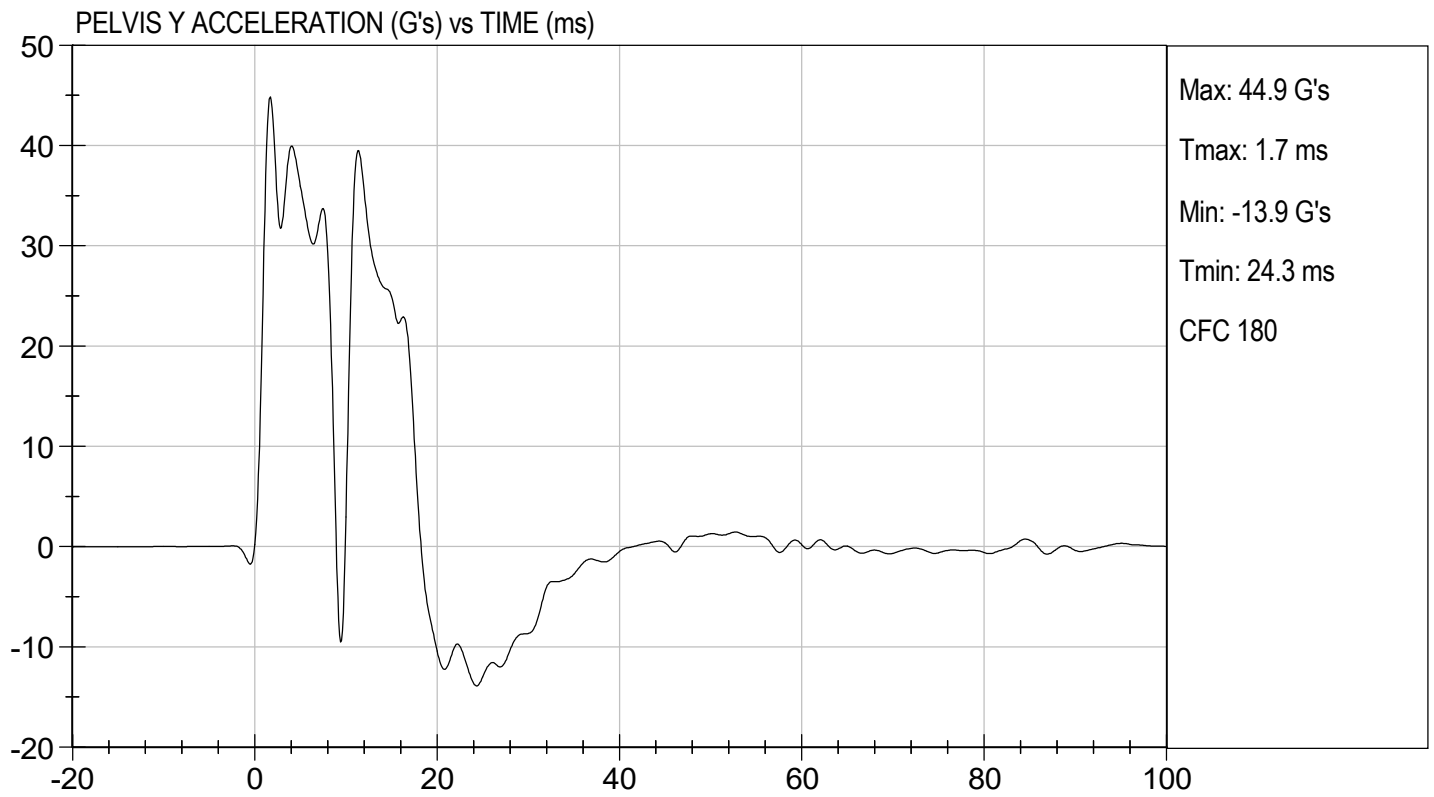
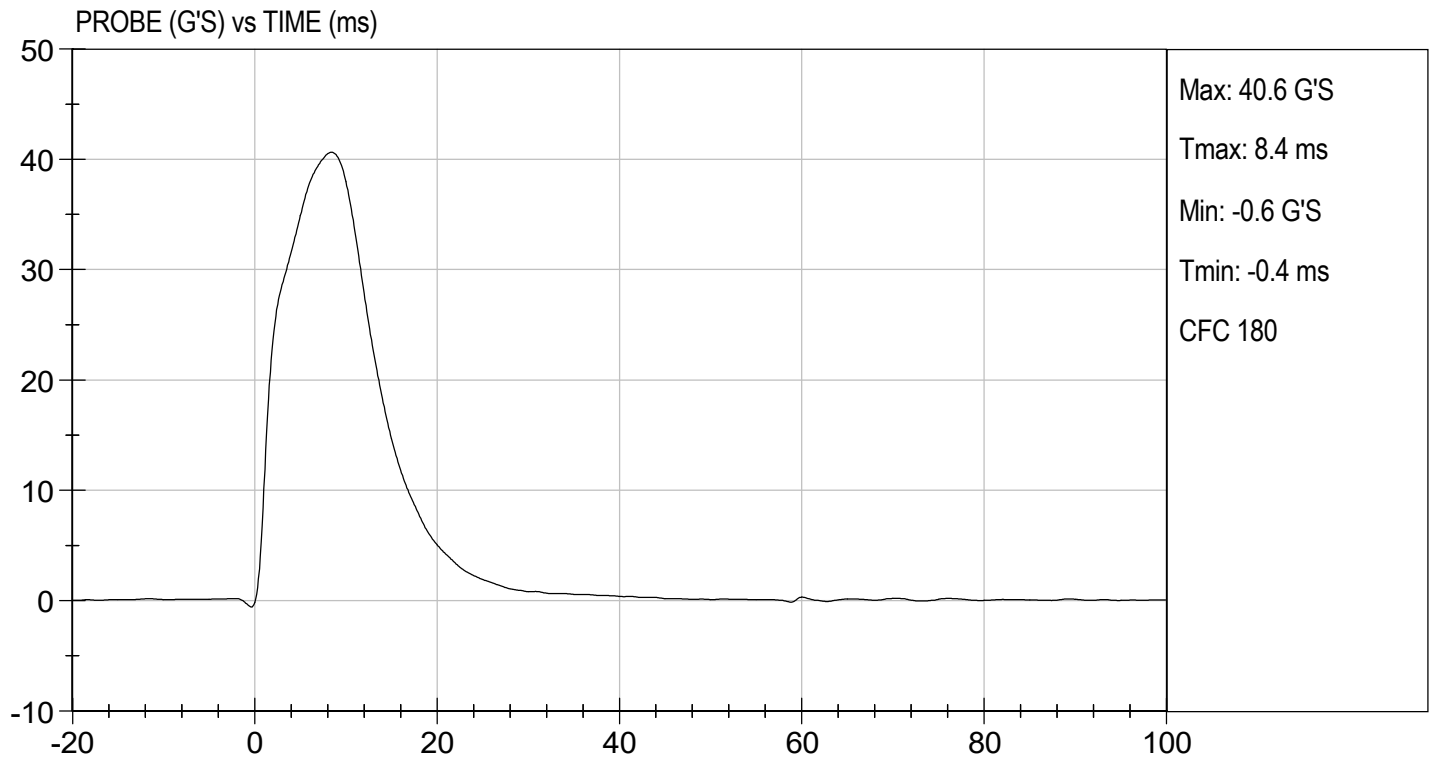
Test I.D: D211887

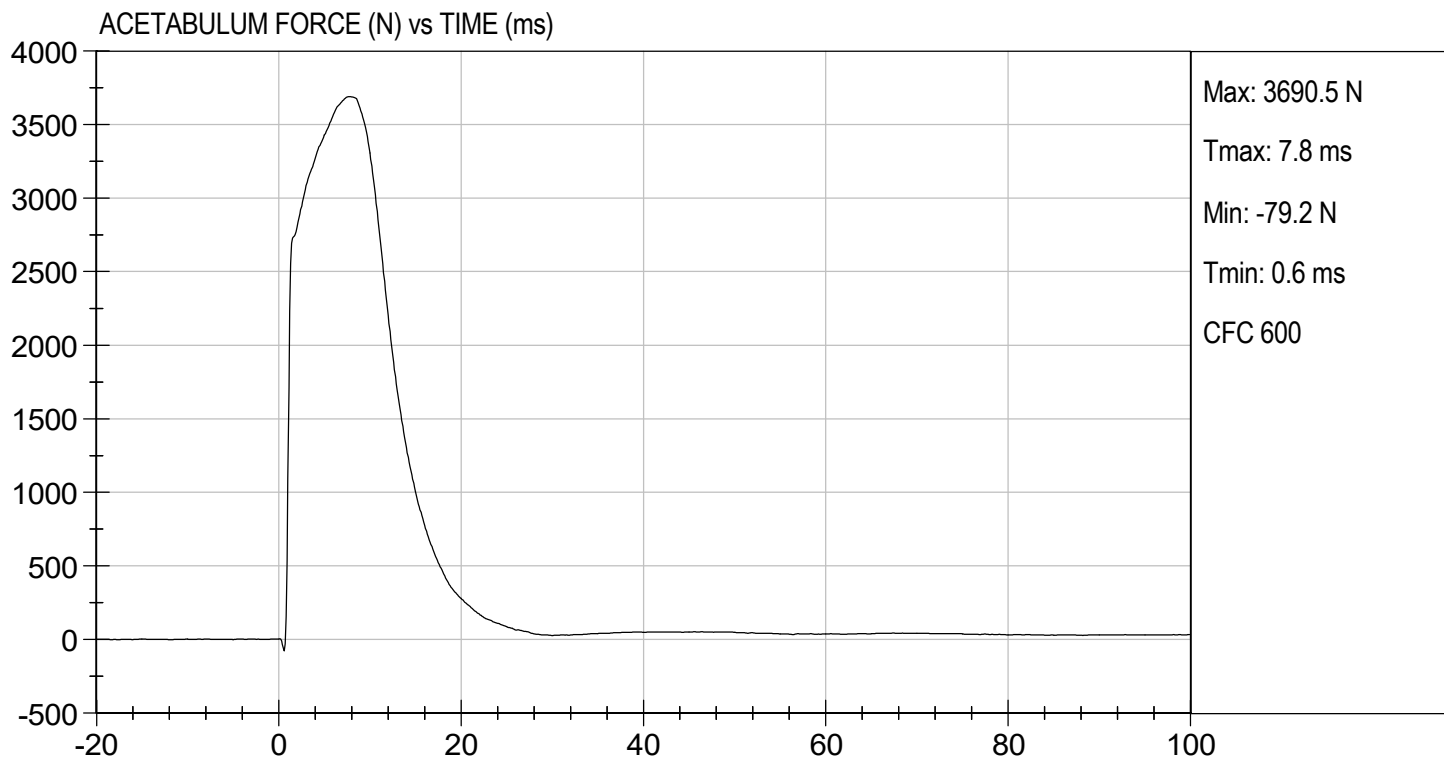
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	3,691	Pass
Overall Test Results				Pass


 Laboratory Technician

06/01/2021
 Test Date


 Approved By





MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D211888

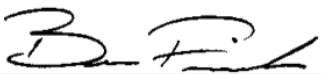
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	36 to 45	41	Pass
Pelvis Y Acceleration	G's	28 to 39	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,582	Pass
Overall Test Results				Pass



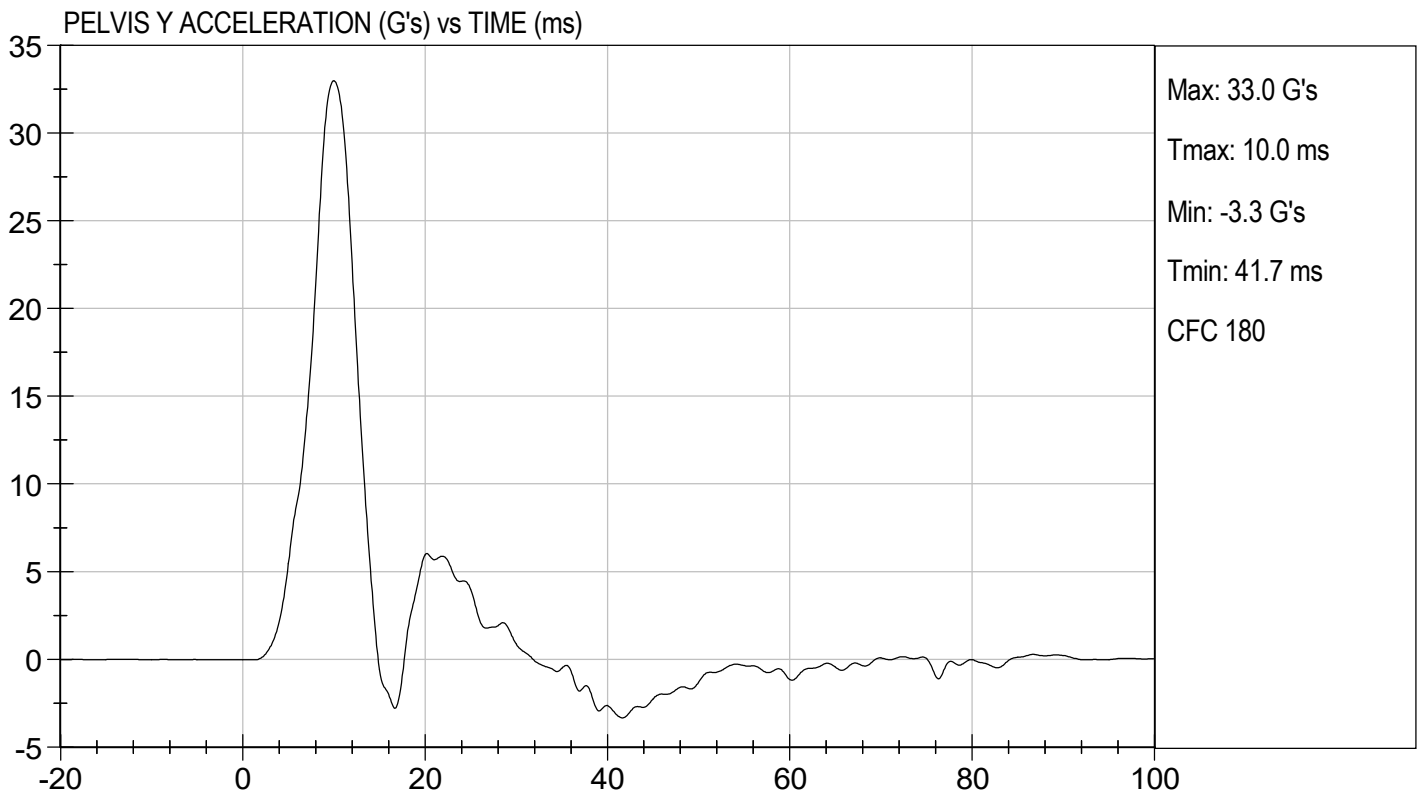
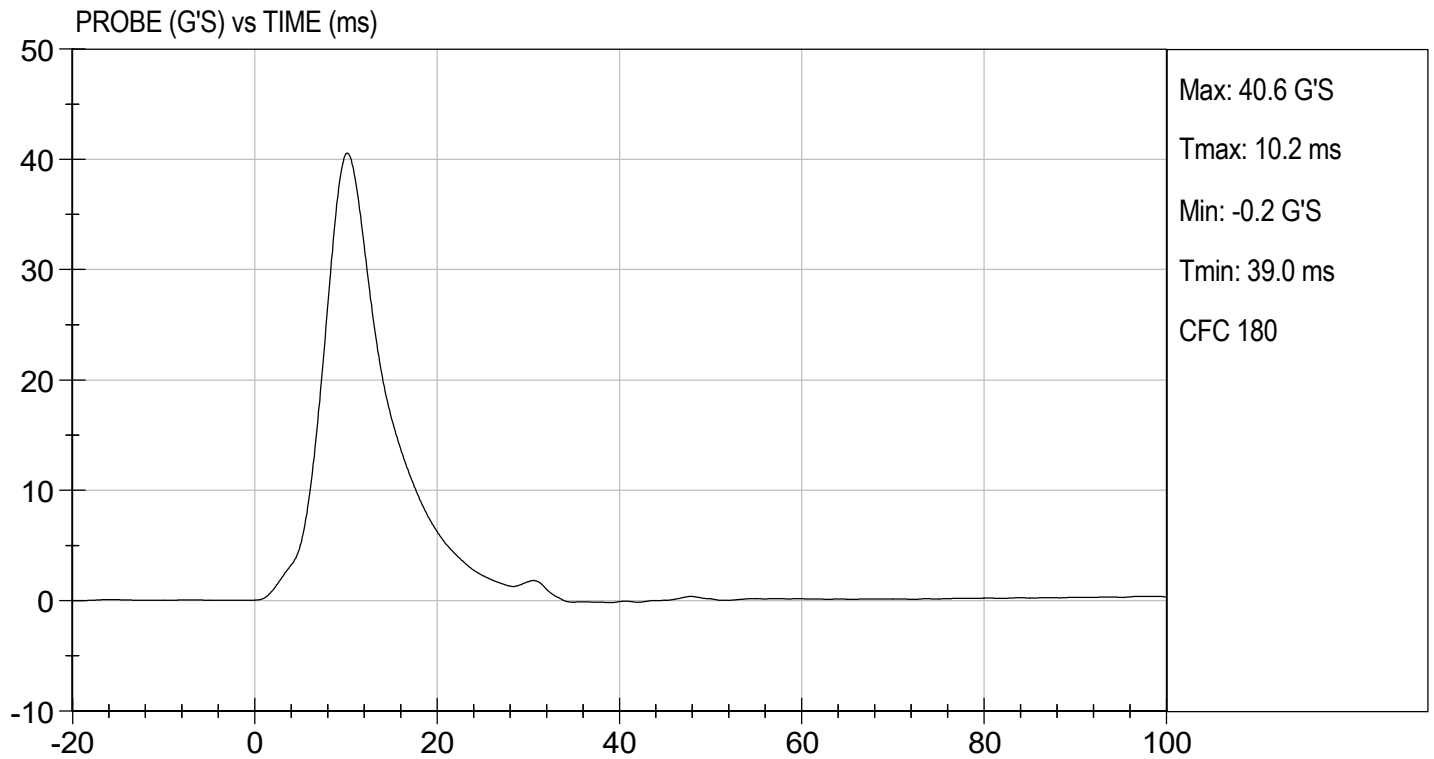
Laboratory Technician

05/28/2021

Test Date



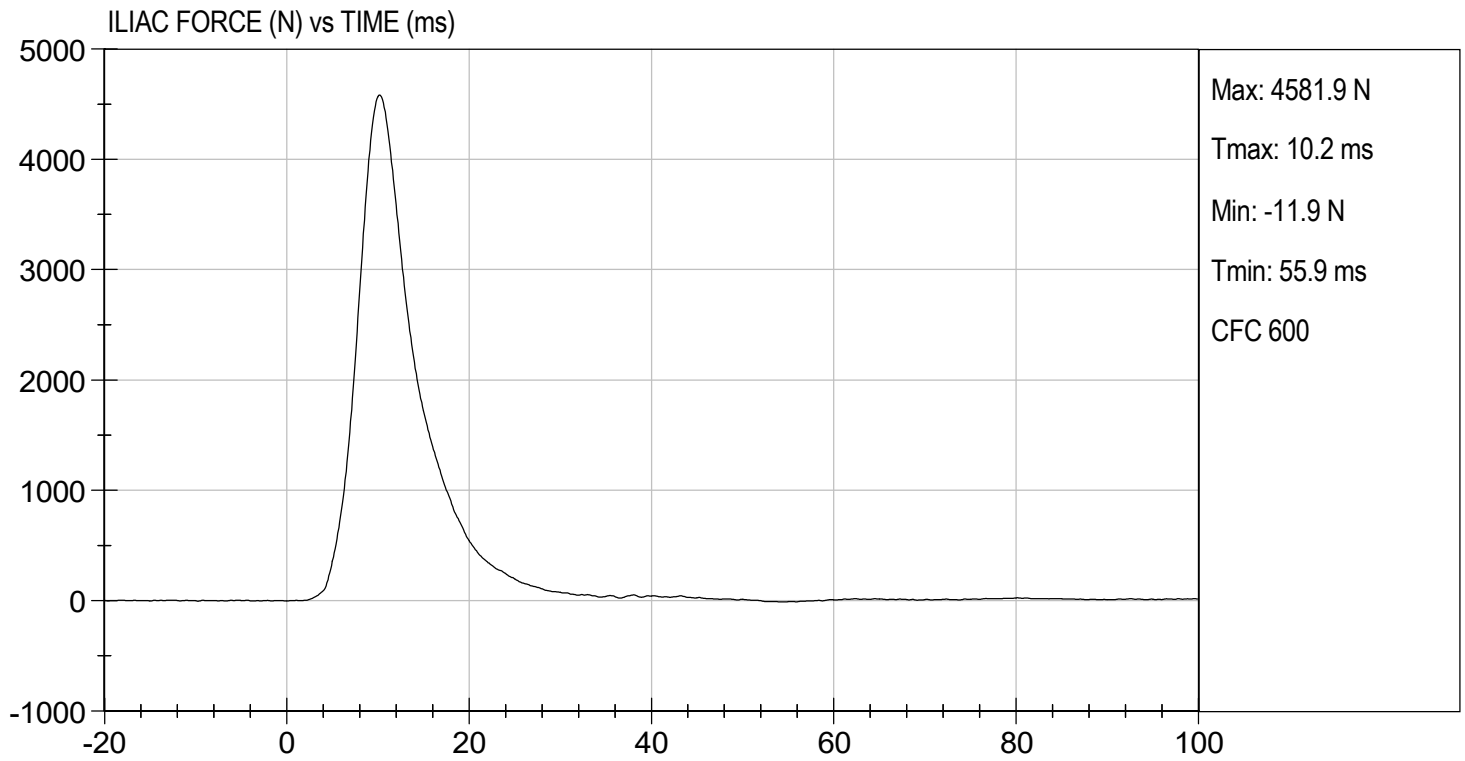
Approved By





TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 05/28/2021
TEST #: D211888



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 306

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	785	Pass
B	Shoulder Pivot Height	437 - 453	449	Pass
C	H-point Height	79 - 89	86	Pass
D	H-point from Seatback	141 - 151	147	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	120	Pass
G	Head Breadth	140 - 148	141	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	182	Pass
J	Head Circumference	541 - 551	550	Pass
K	Buttock to Knee Length	514 - 540	538	Pass
L	Popliteal Height	343 - 369	349	Pass
M	Knee Pivot to Floor Height	392 - 409	394	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	198	Pass
P	Foot Length	216 - 232	222	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	317	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	483	Pass
V	Shoulder Width	341 - 357	351	Pass
W	Foot Width	78 - 94	82	Pass
Y	Chest Circumference w/ jacket	851 - 881	863	Pass
Z	Waist Circumference	761 - 791	782	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

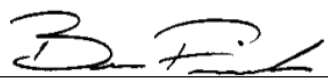
ATD Serial No: 306

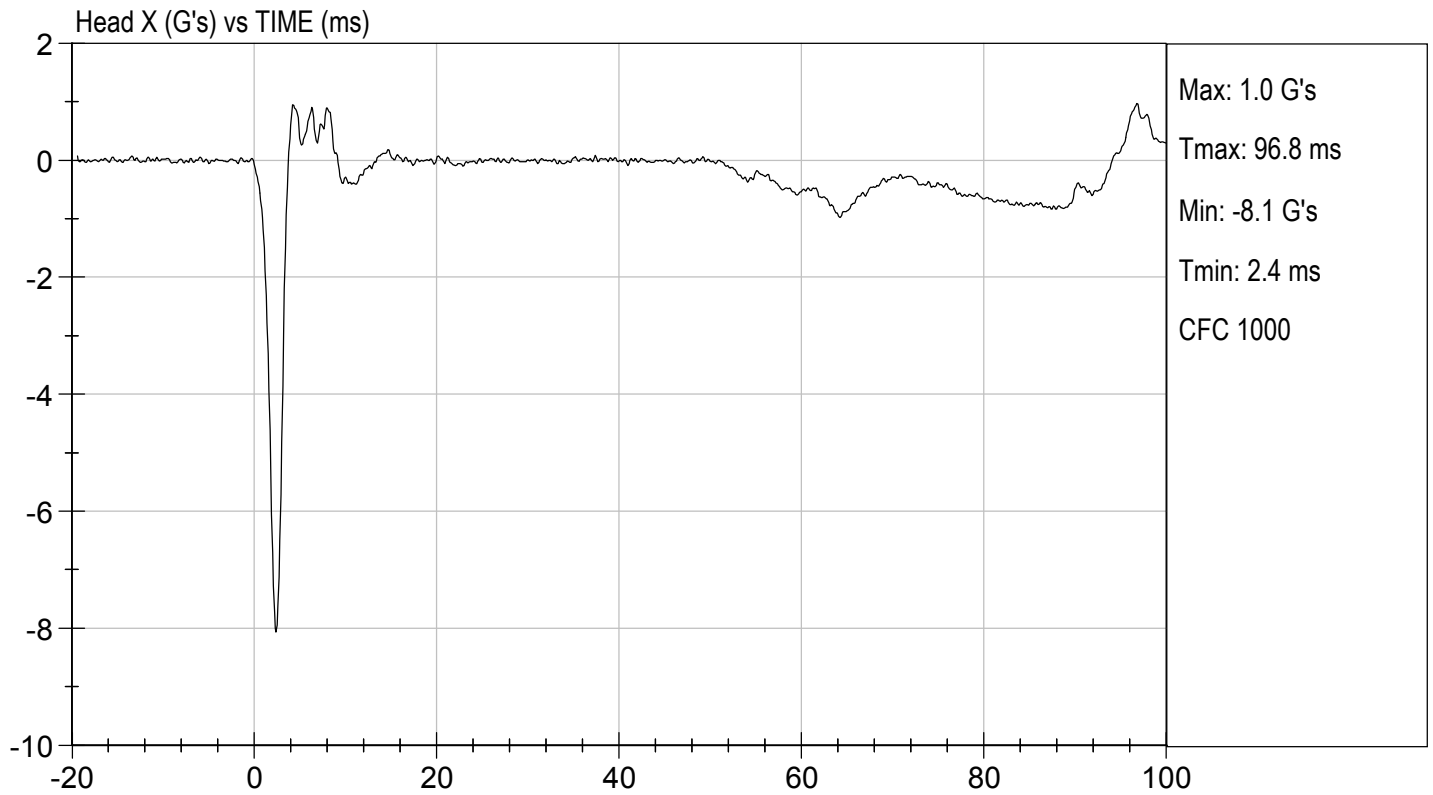
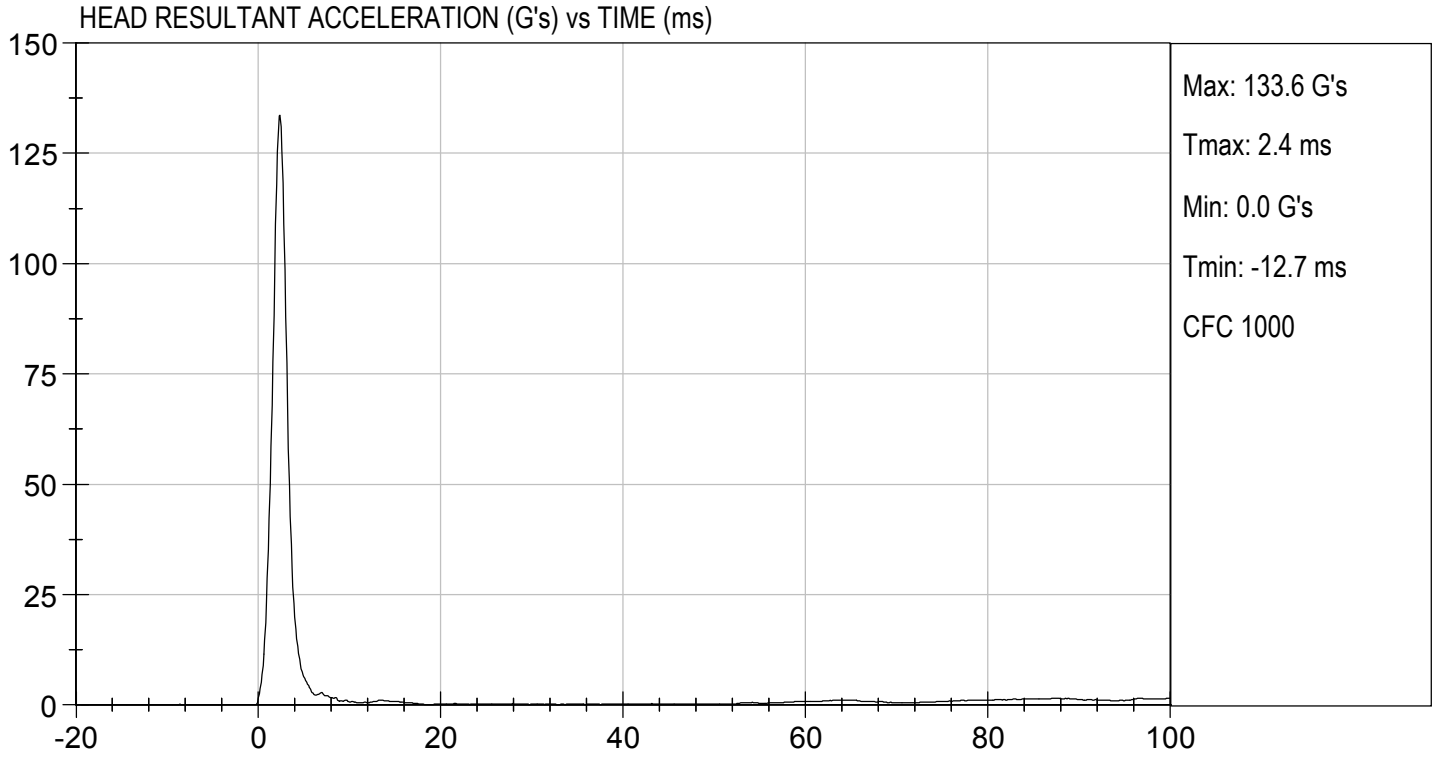
Test ID: D212091

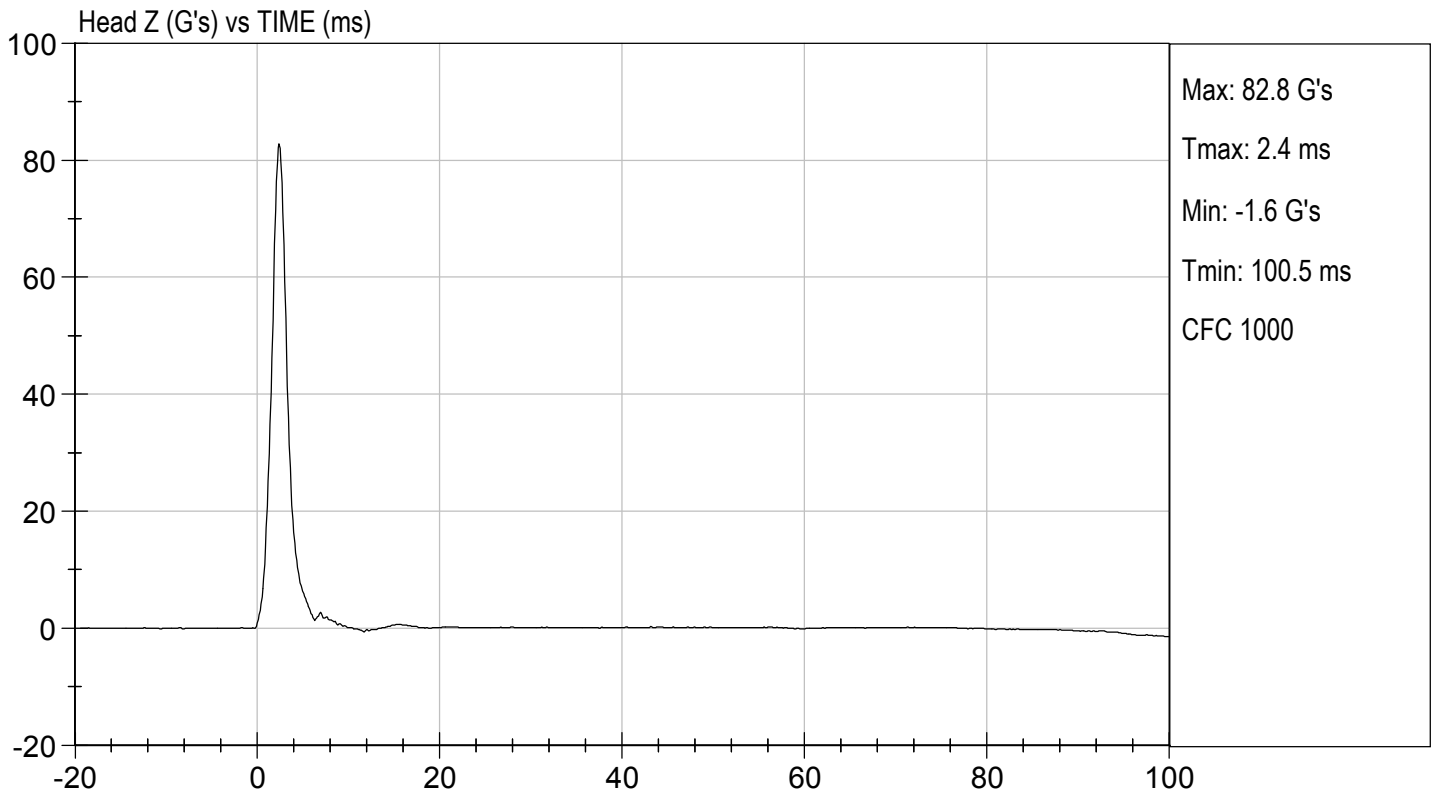
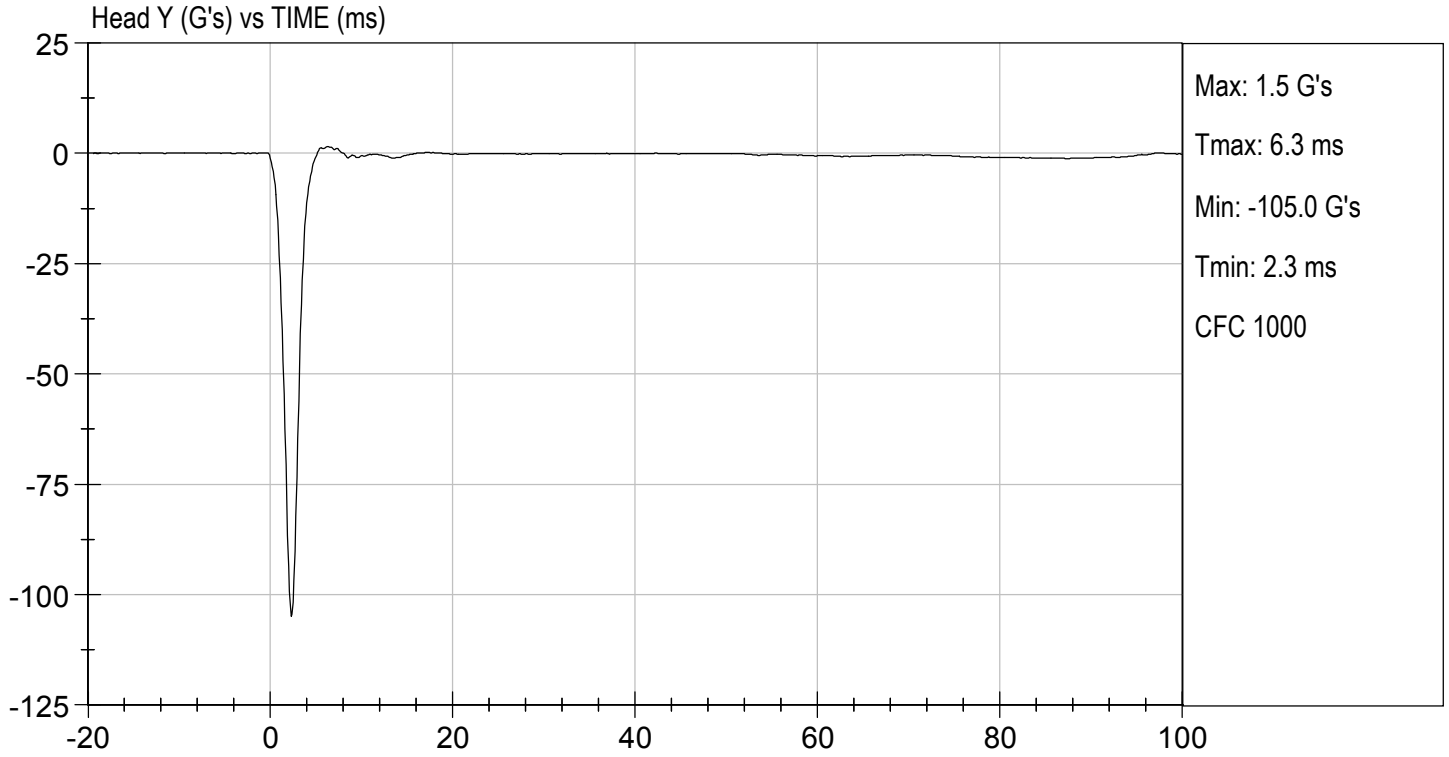
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	115 to 137	134	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

06/22/2021
 Test Date


 Approved By





**MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY**

ATD Serial No: 306

Test I.D.: D212092

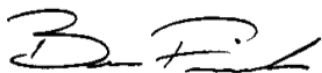
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.5	Pass	
Humidity	%	10 to 70	59	Pass	
Impact Velocity	m/s	5.51 to 5.63	5.52	Pass	
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.62	Pass
	15 ms	m/s	3.30 to 4.10	3.77	Pass
	20 ms	m/s	4.40 to 5.40	5.12	Pass
	25 ms	m/s	5.40 to 6.10	5.61	Pass
	25-100 ms	m/s	5.50 to 6.20	5.65	Pass
Maximum D-Plane Rotation	deg	71 to 81	79	Pass	
Time of Maximum D-Plane Rotation	ms	50 to 70	63	Pass	
Maximum Occipital Condyle Moment	Nm	-44 to -36	-36	Pass	
Time of Moment Decay to 0 Nm	ms	102 to 126	121	Pass	
Overall Test Results				Pass	



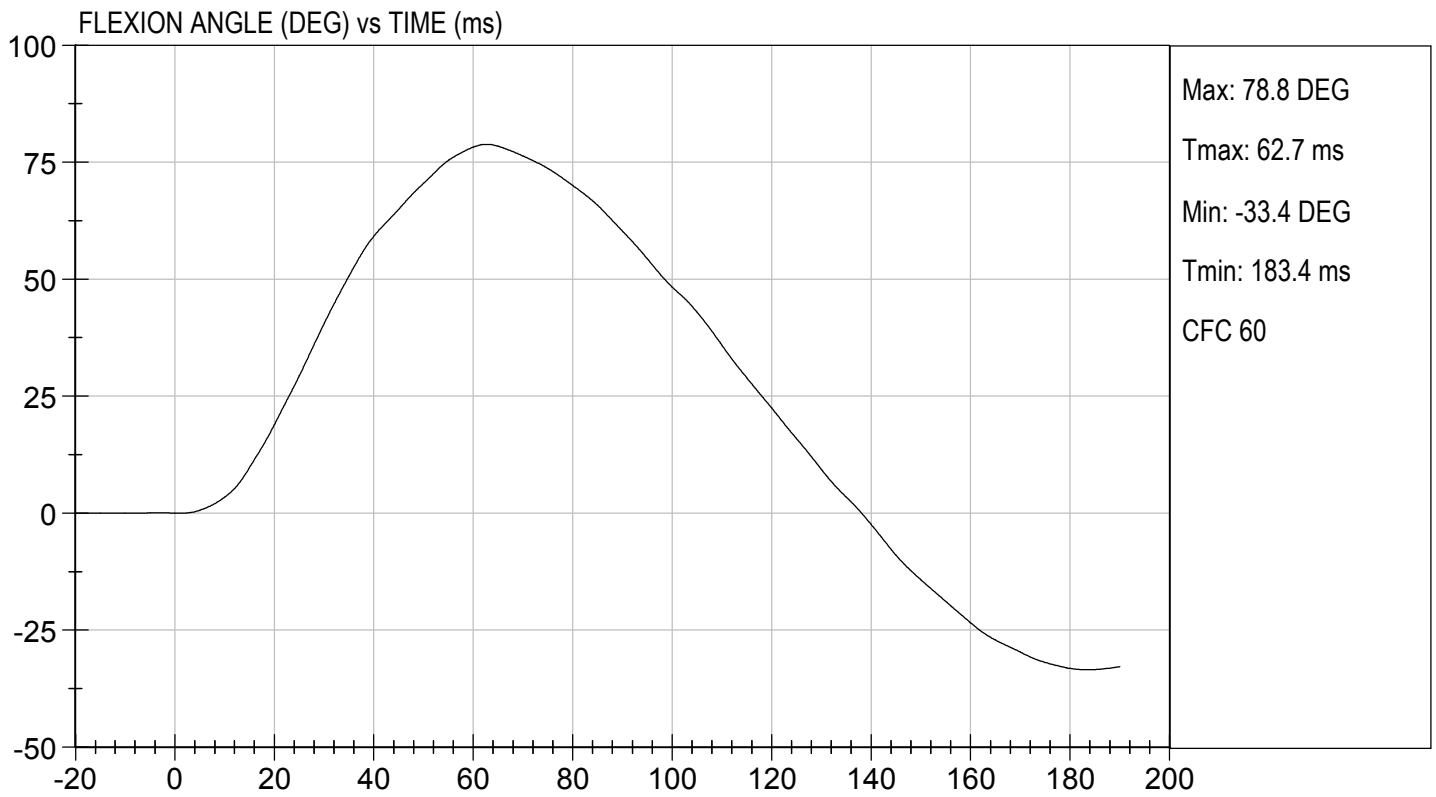
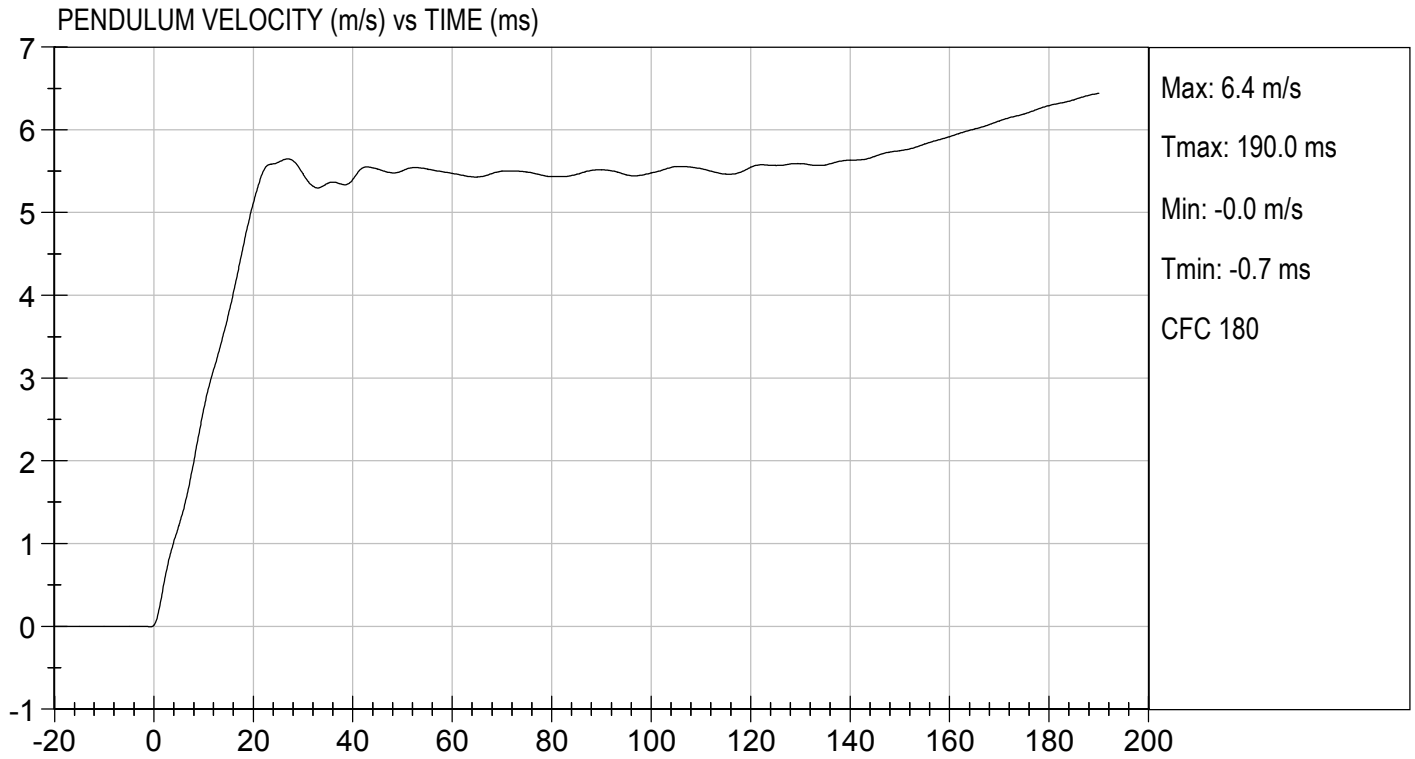
Laboratory Technician

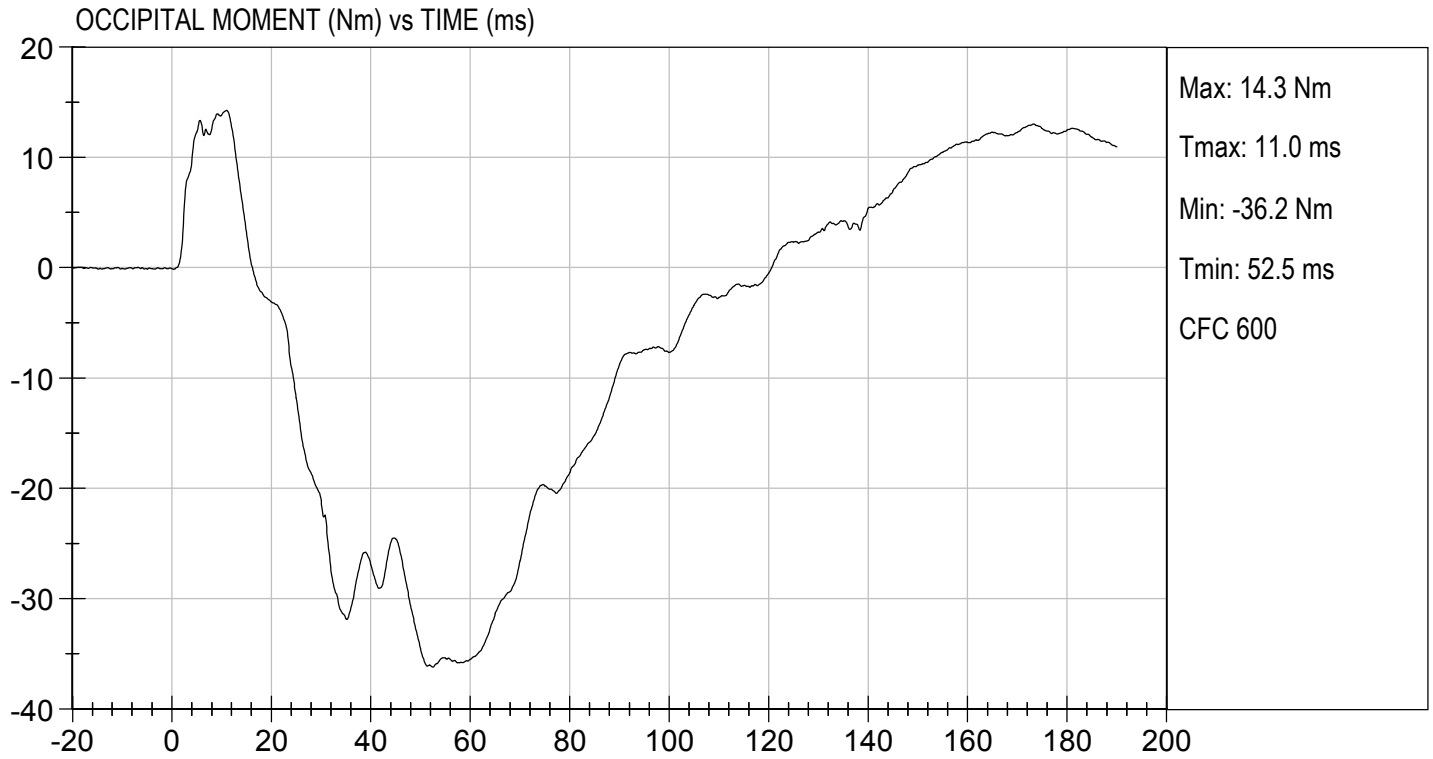
06/21/2021

Test Date



Approved By





**MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY**

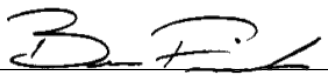
ATD Serial No: 306

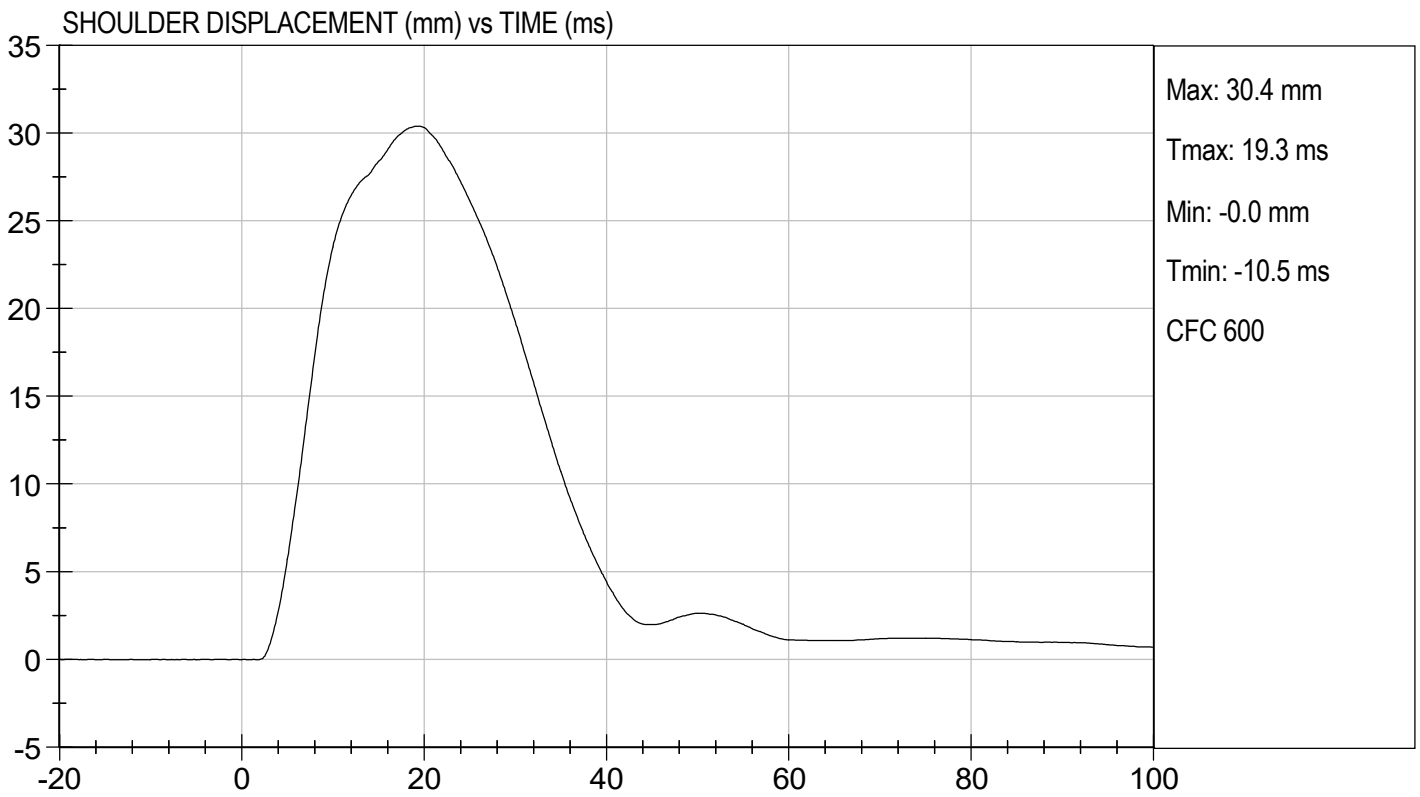
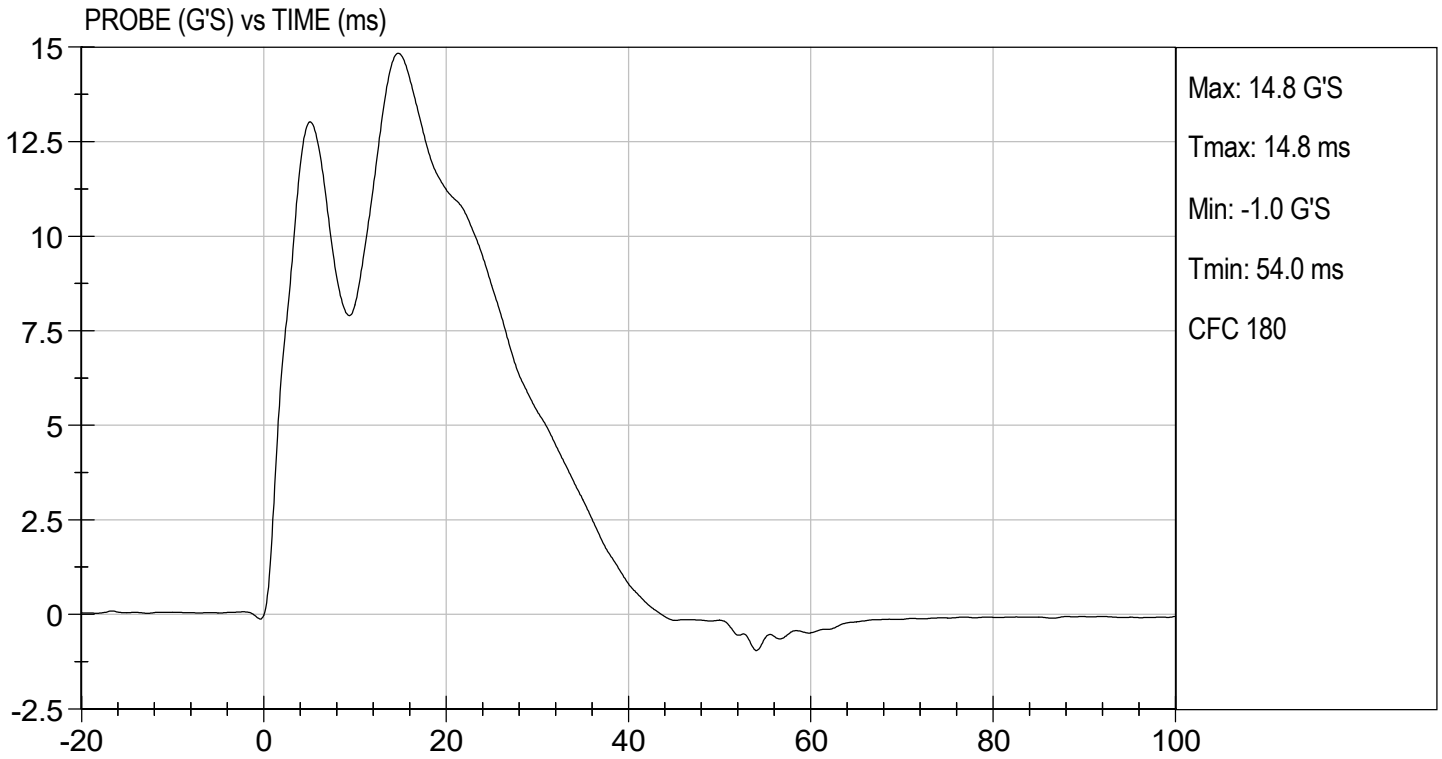
Test ID: D212093

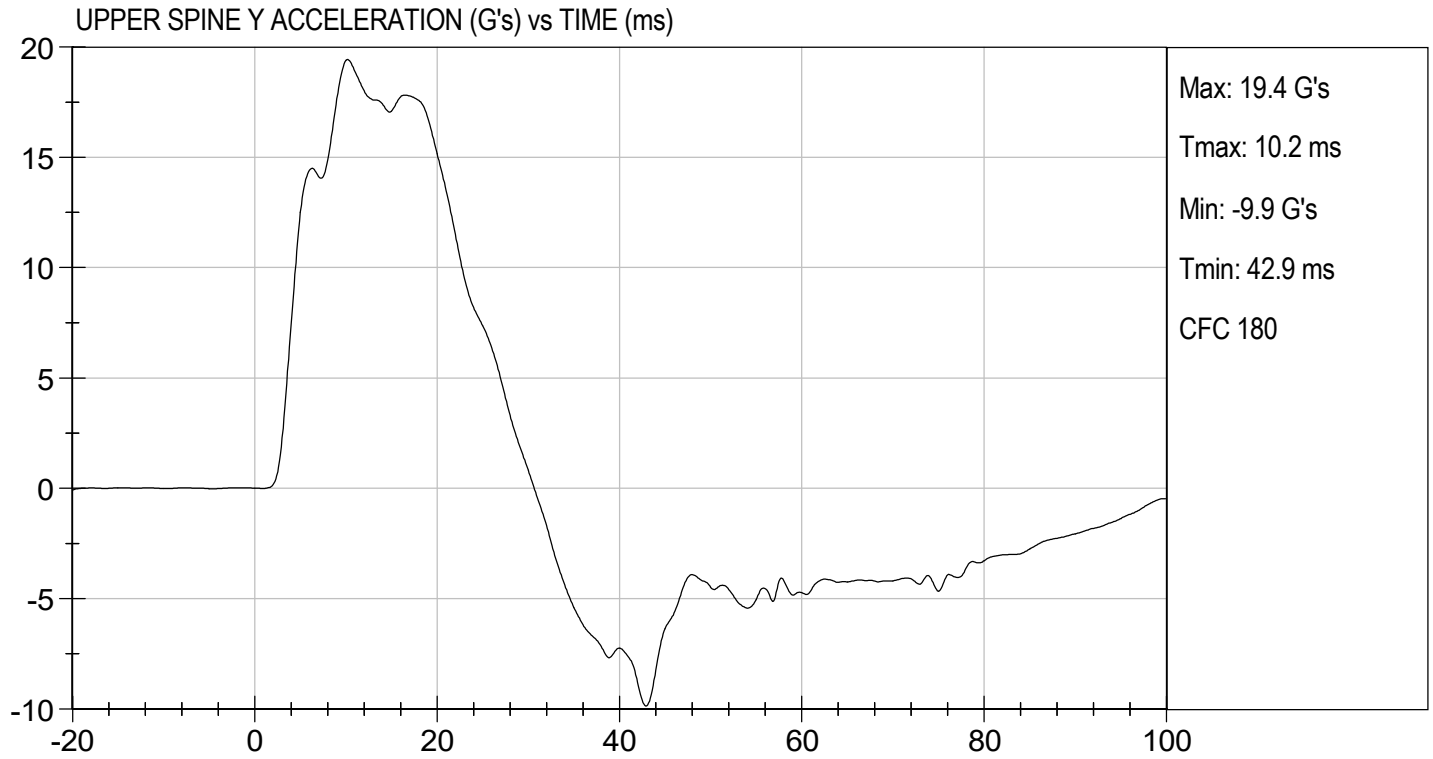
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass


Laboratory Technician

06/21/2021
Test Date


Approved By





MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

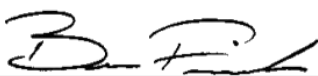
ATD Serial No: 306

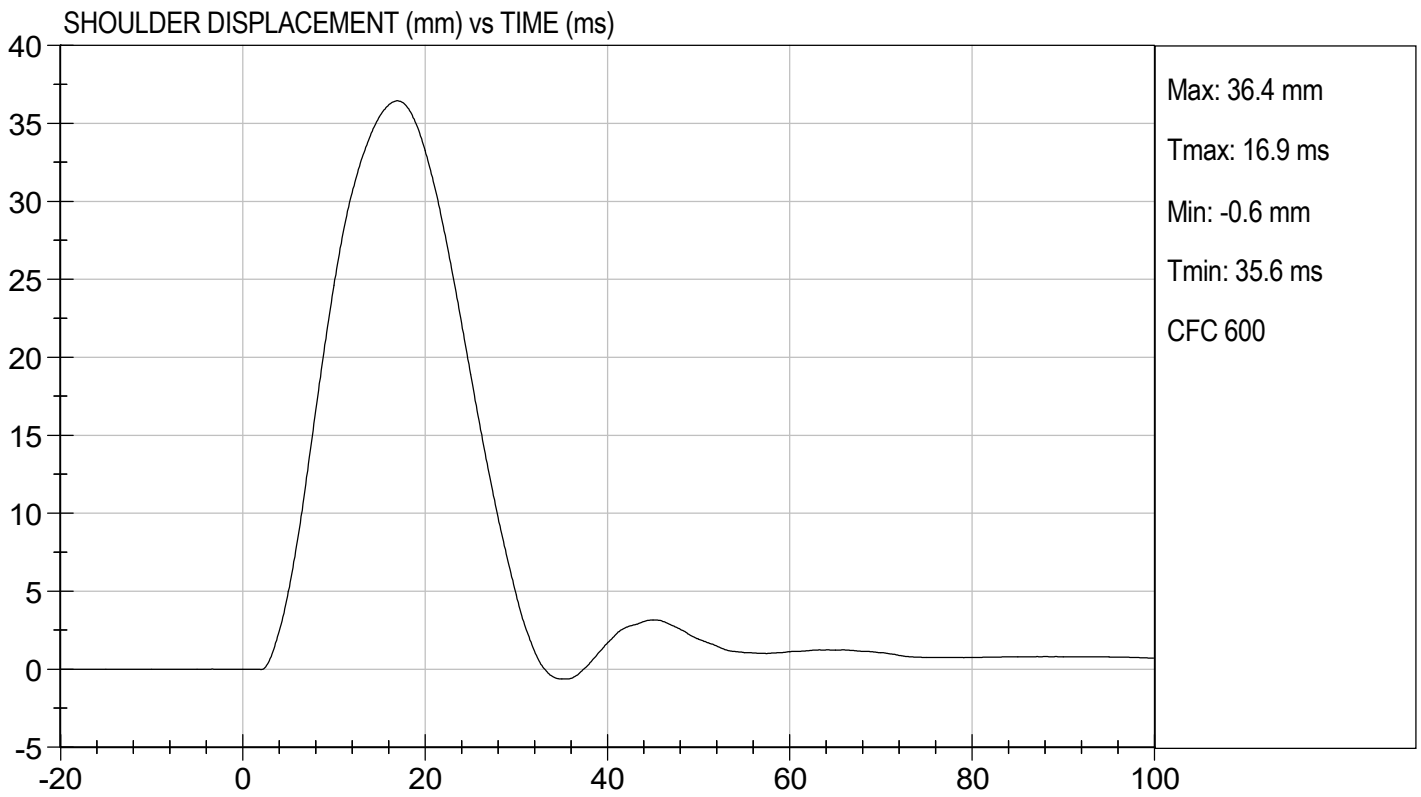
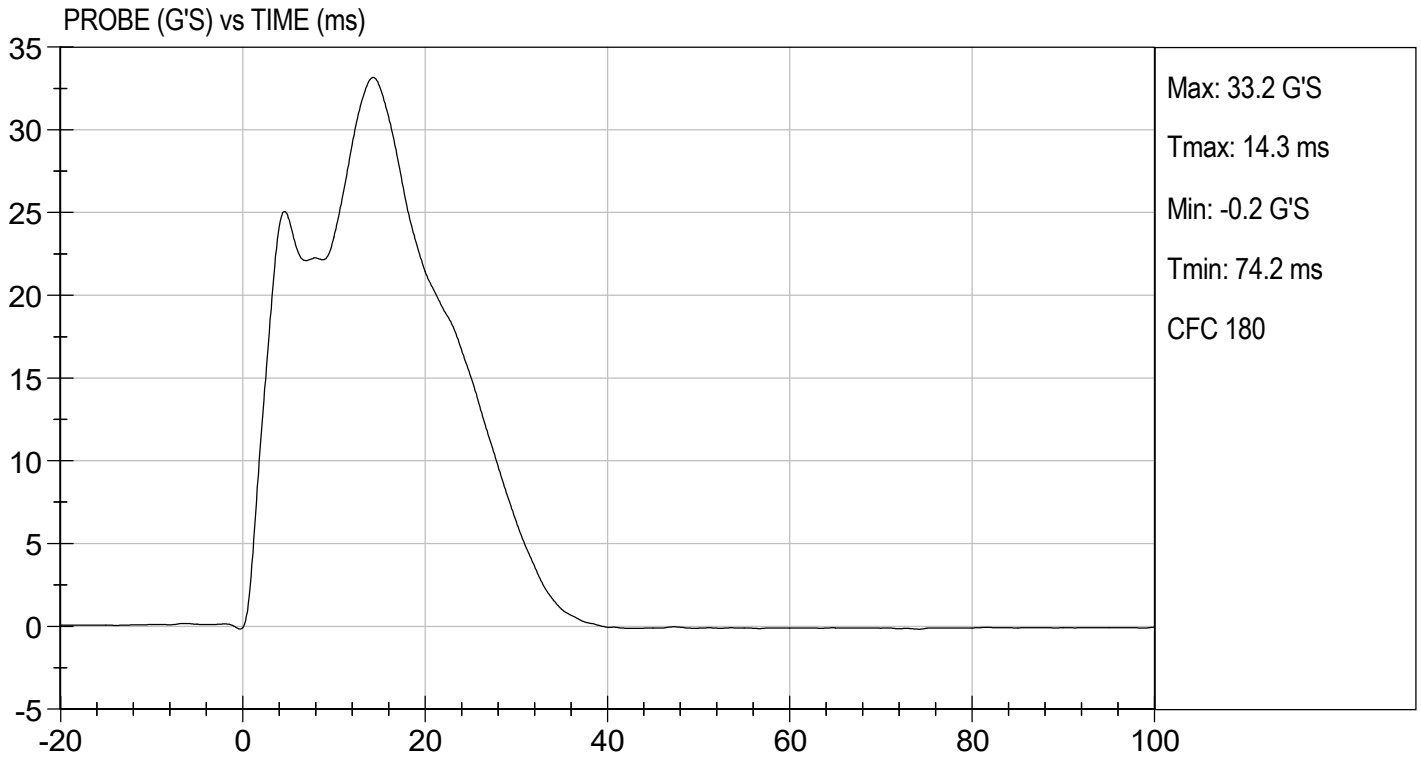
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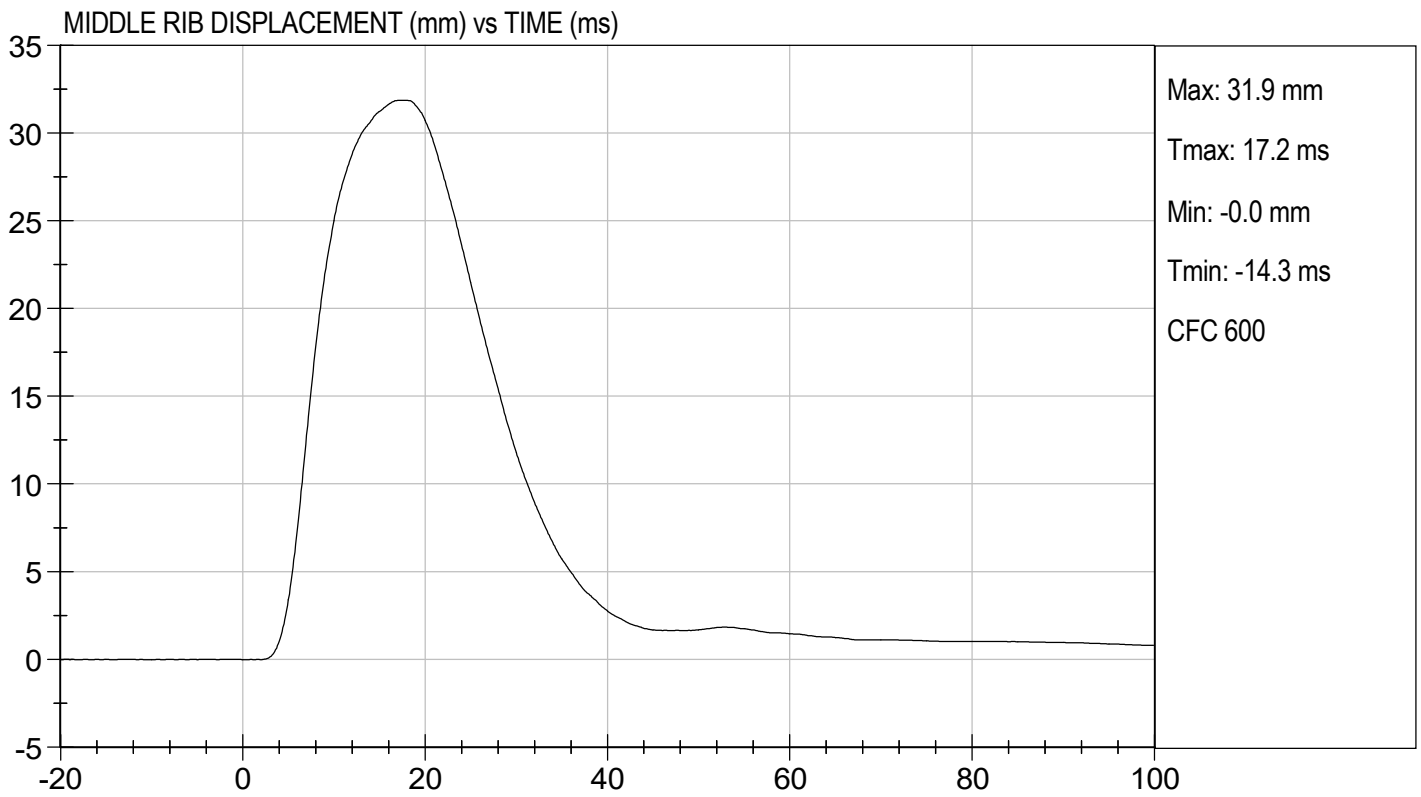
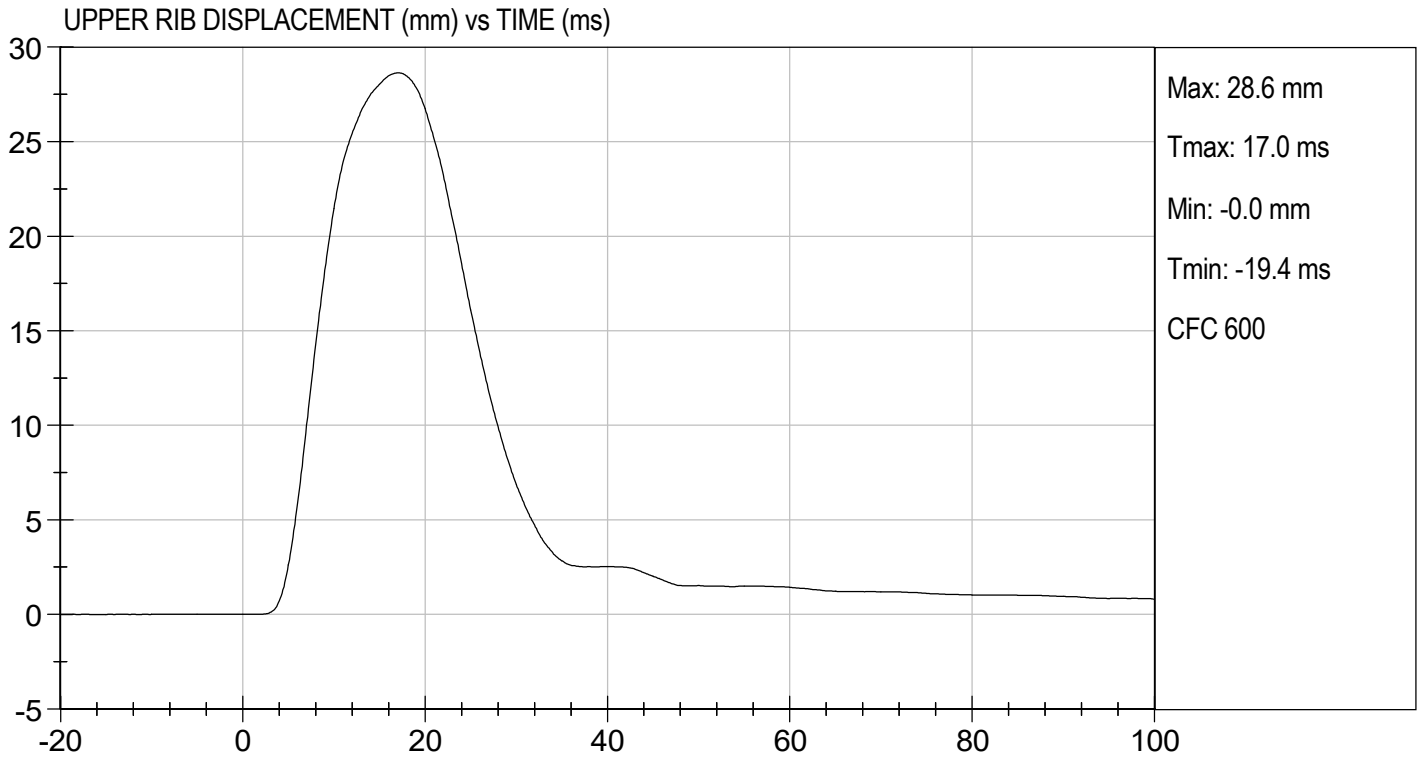
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	40	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass

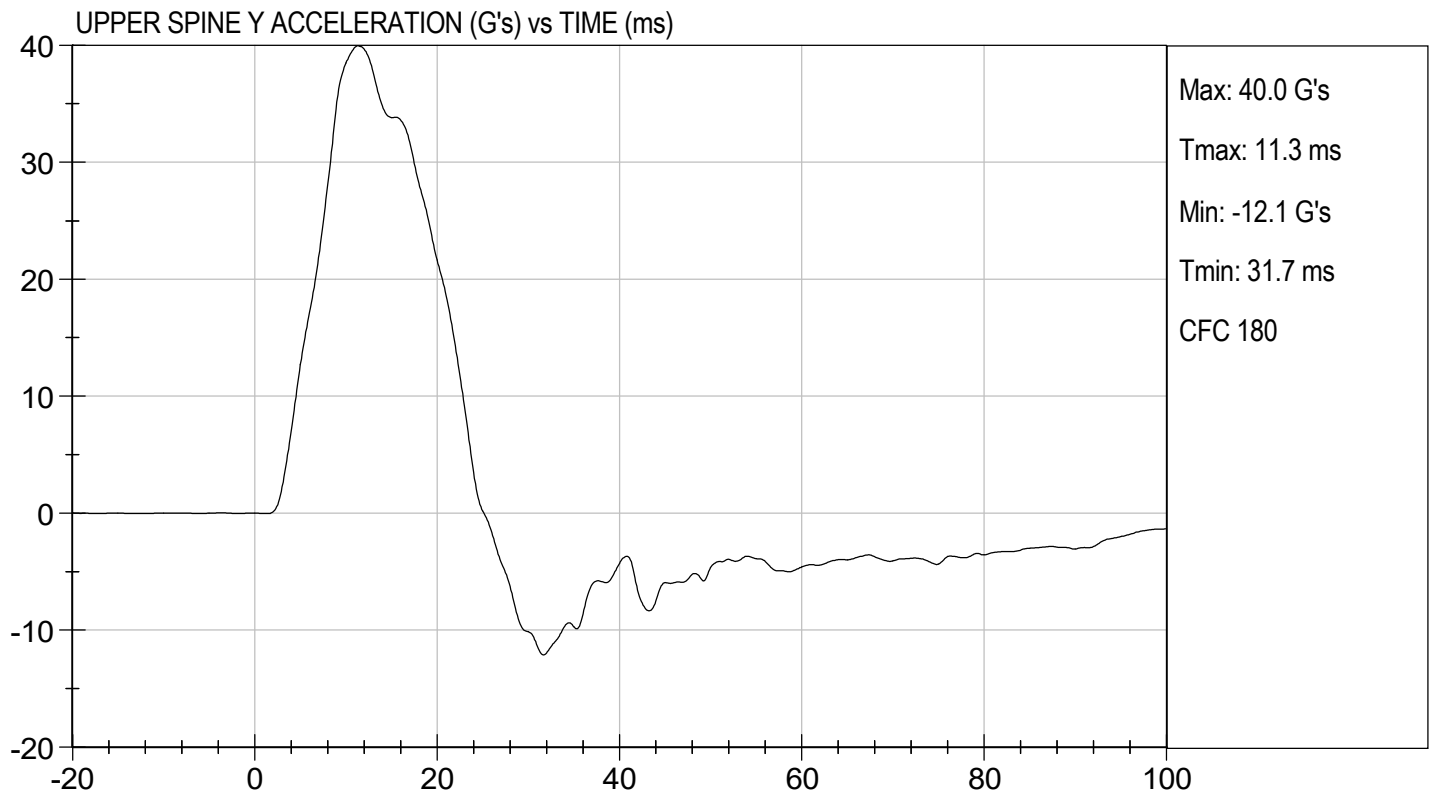
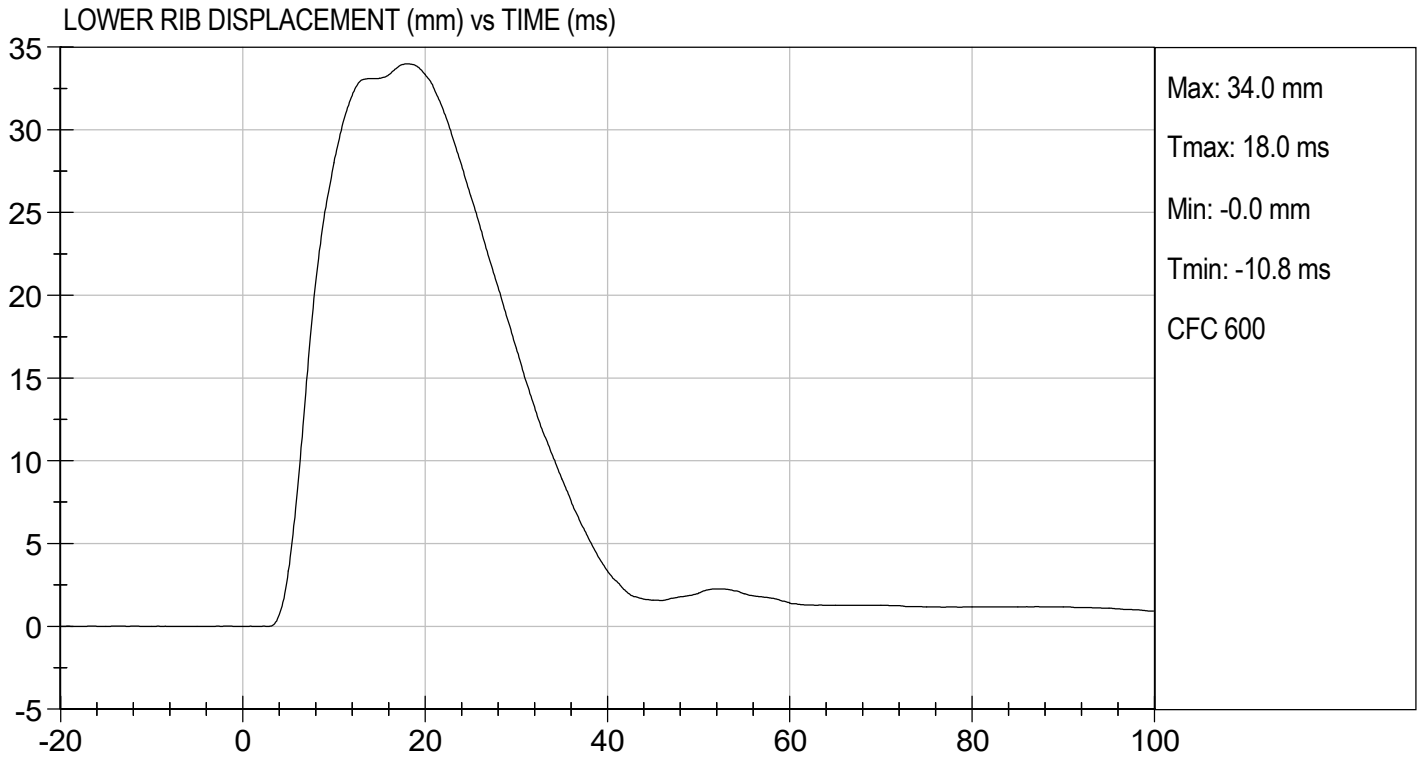

 Laboratory Technician

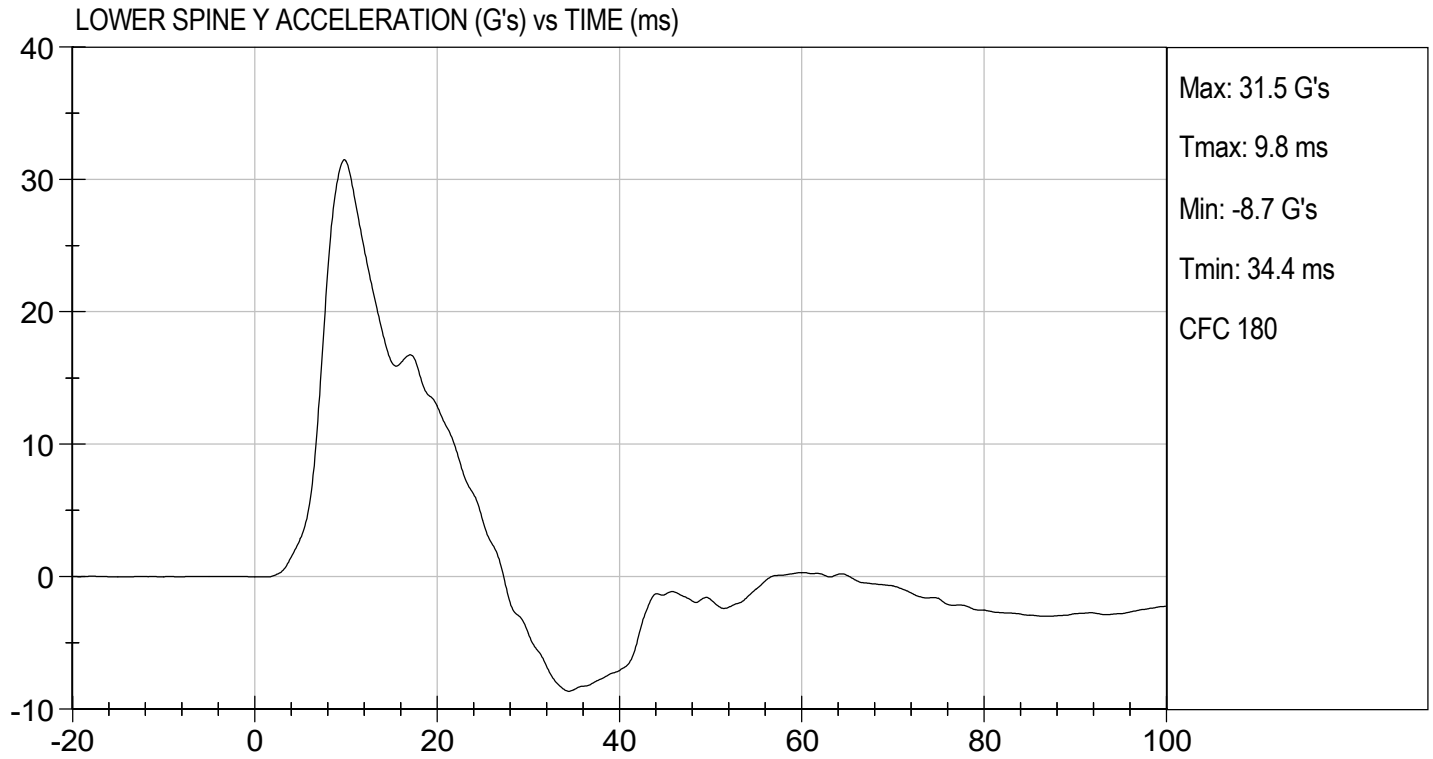
06/21/2021
 Test Date


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MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D212095

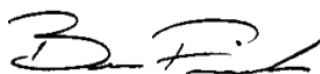
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	35	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass



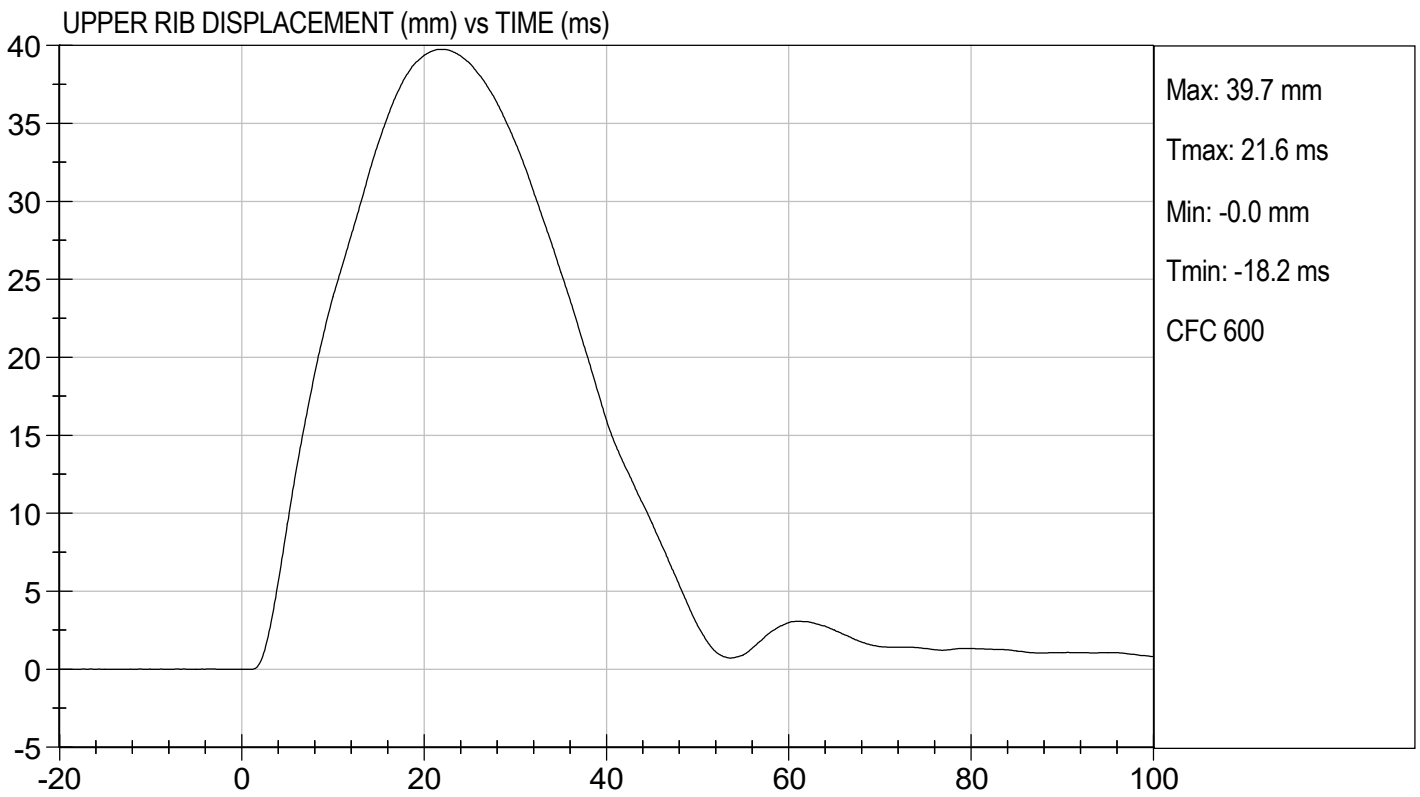
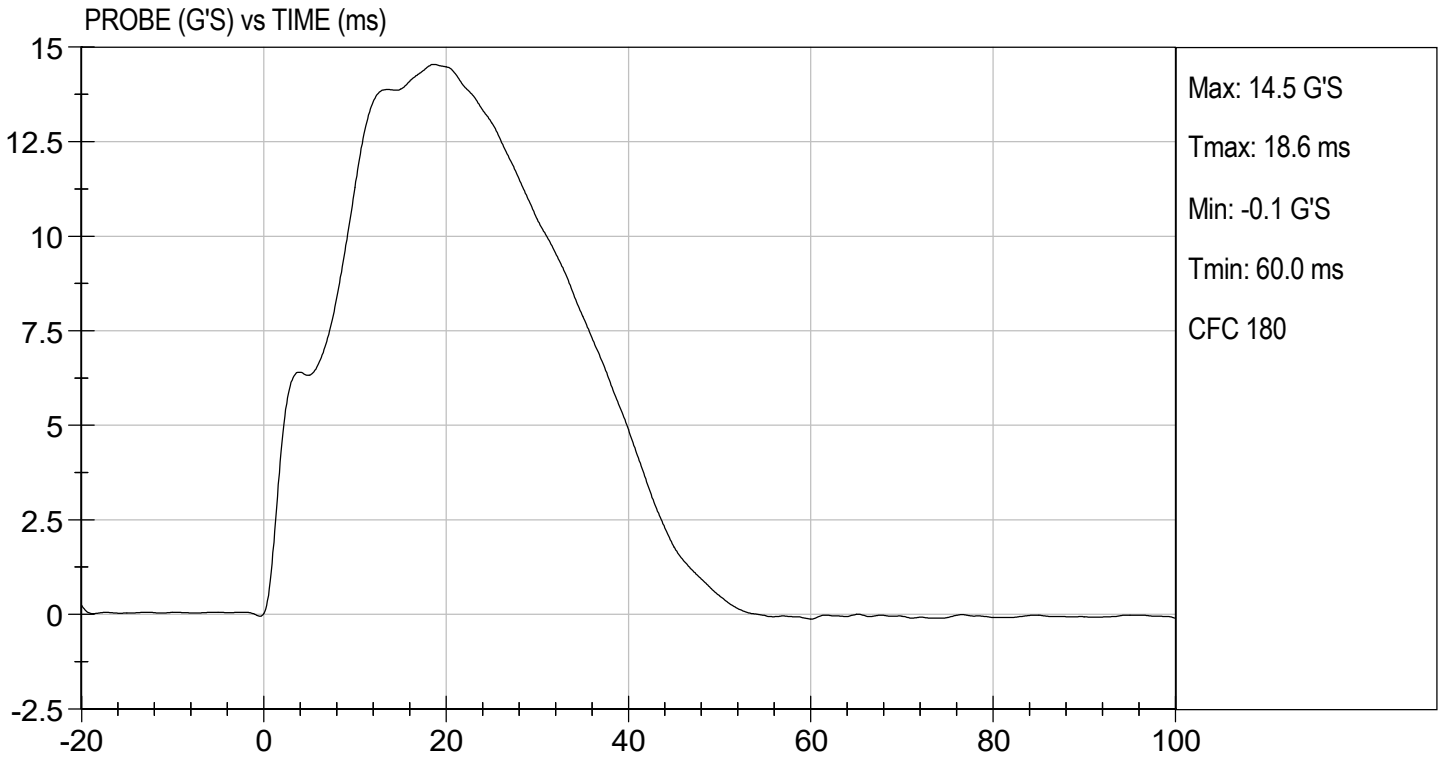
Laboratory Technician

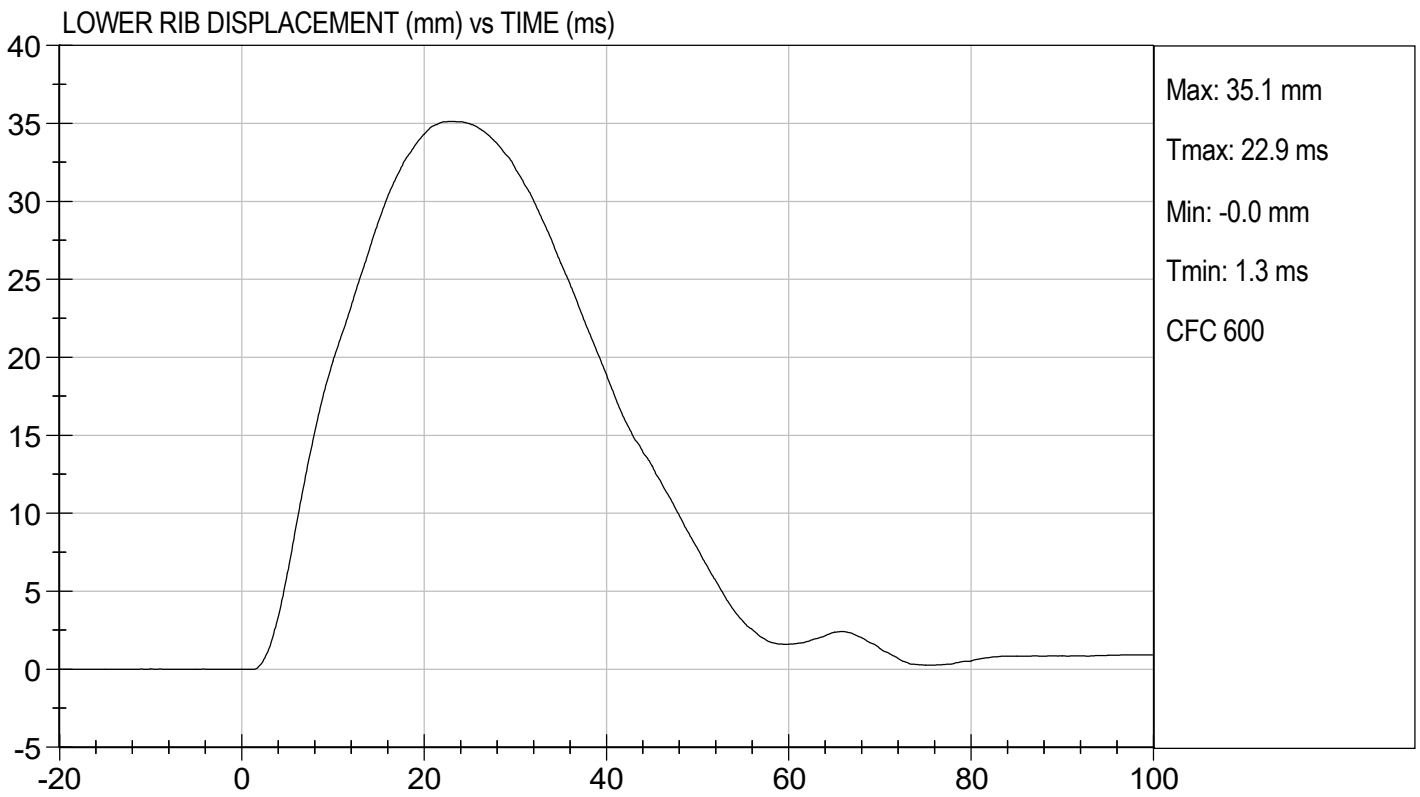
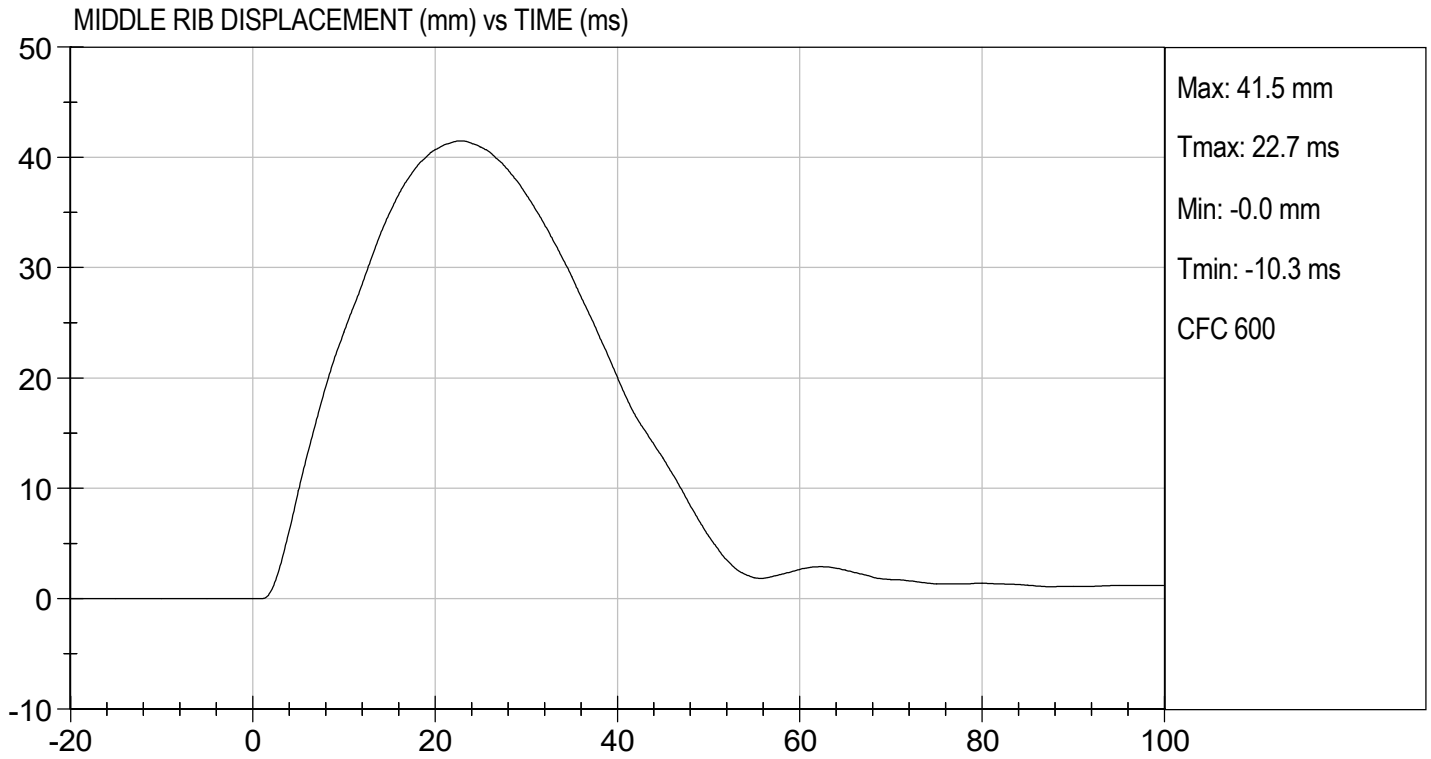
06/21/2021

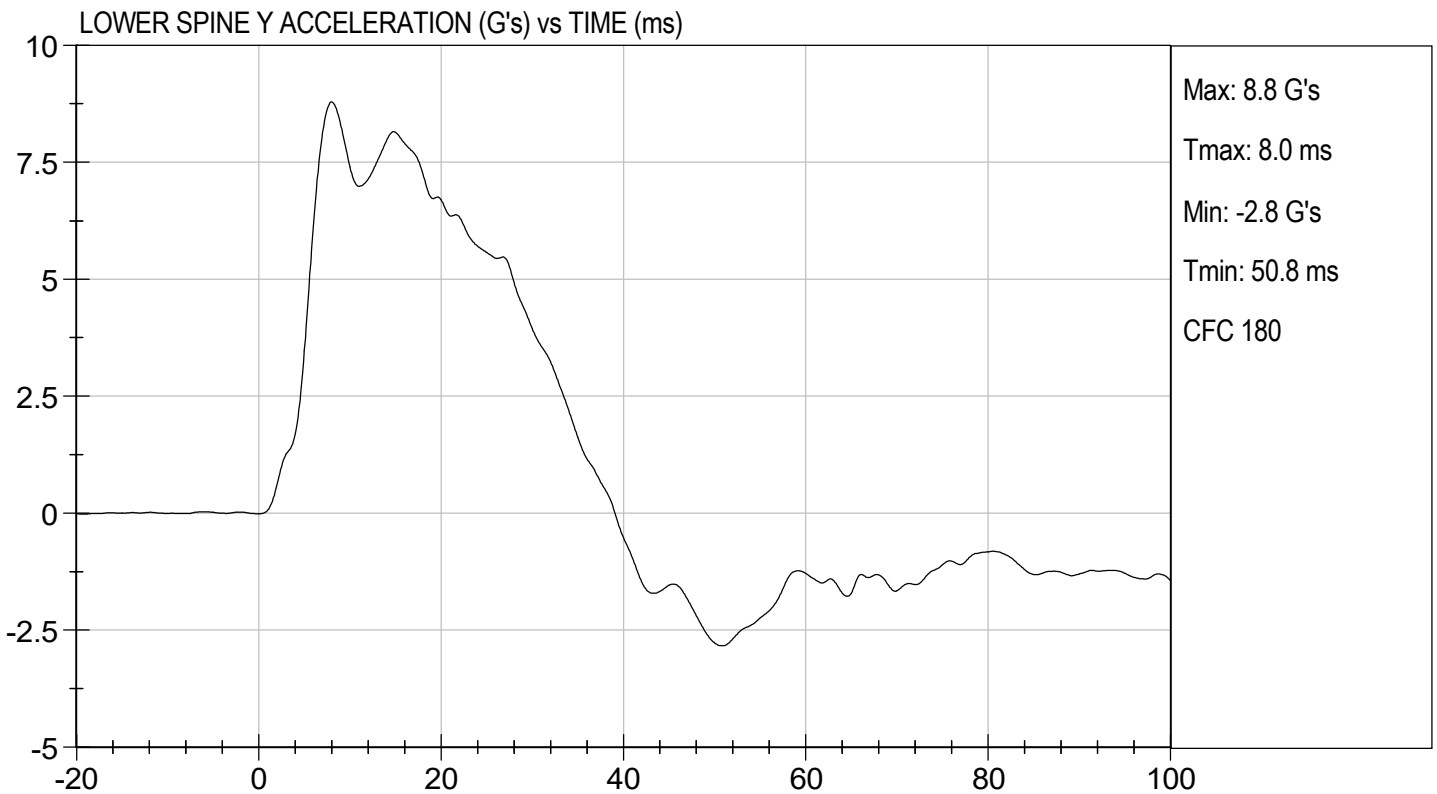
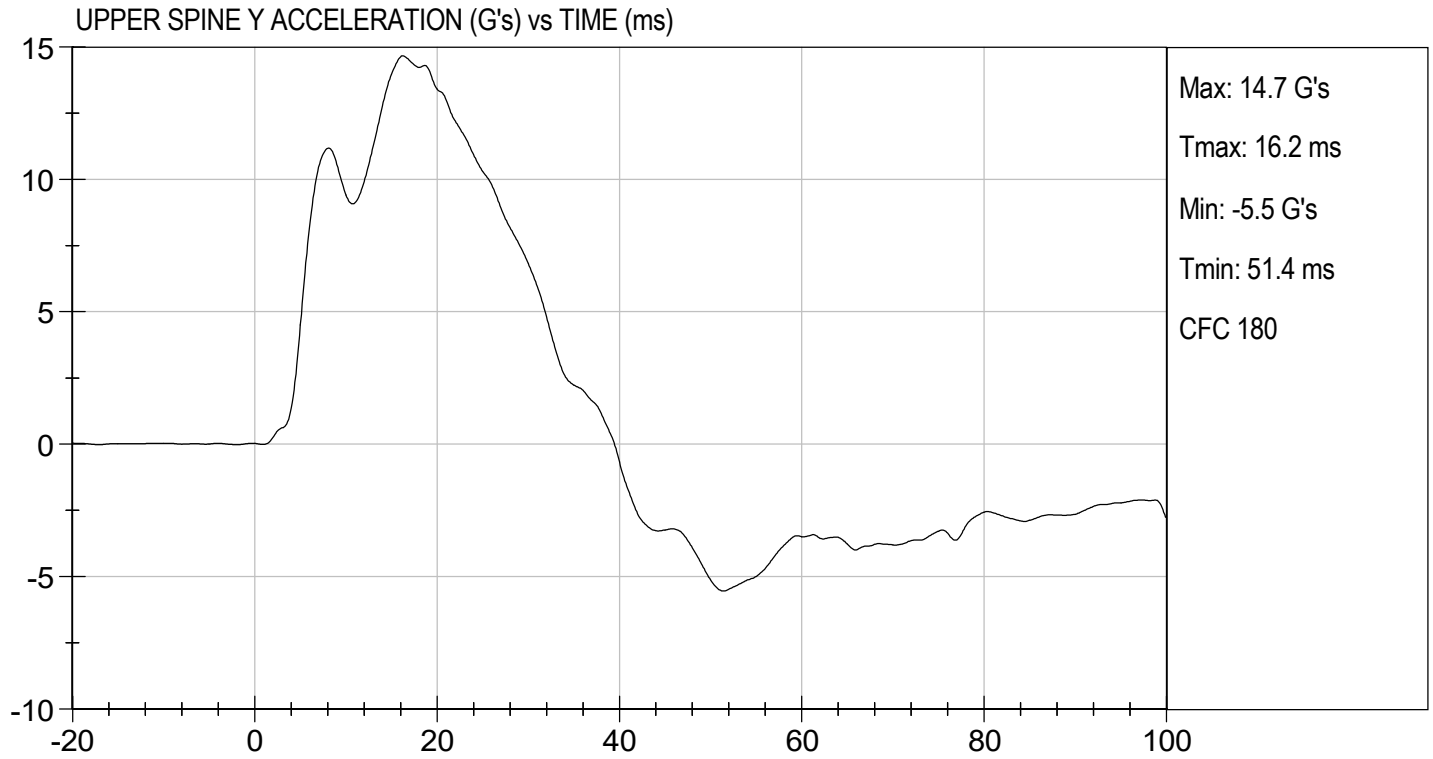
Test Date



Approved By







MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

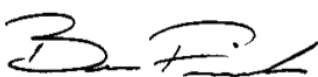
ATD Serial No: 306

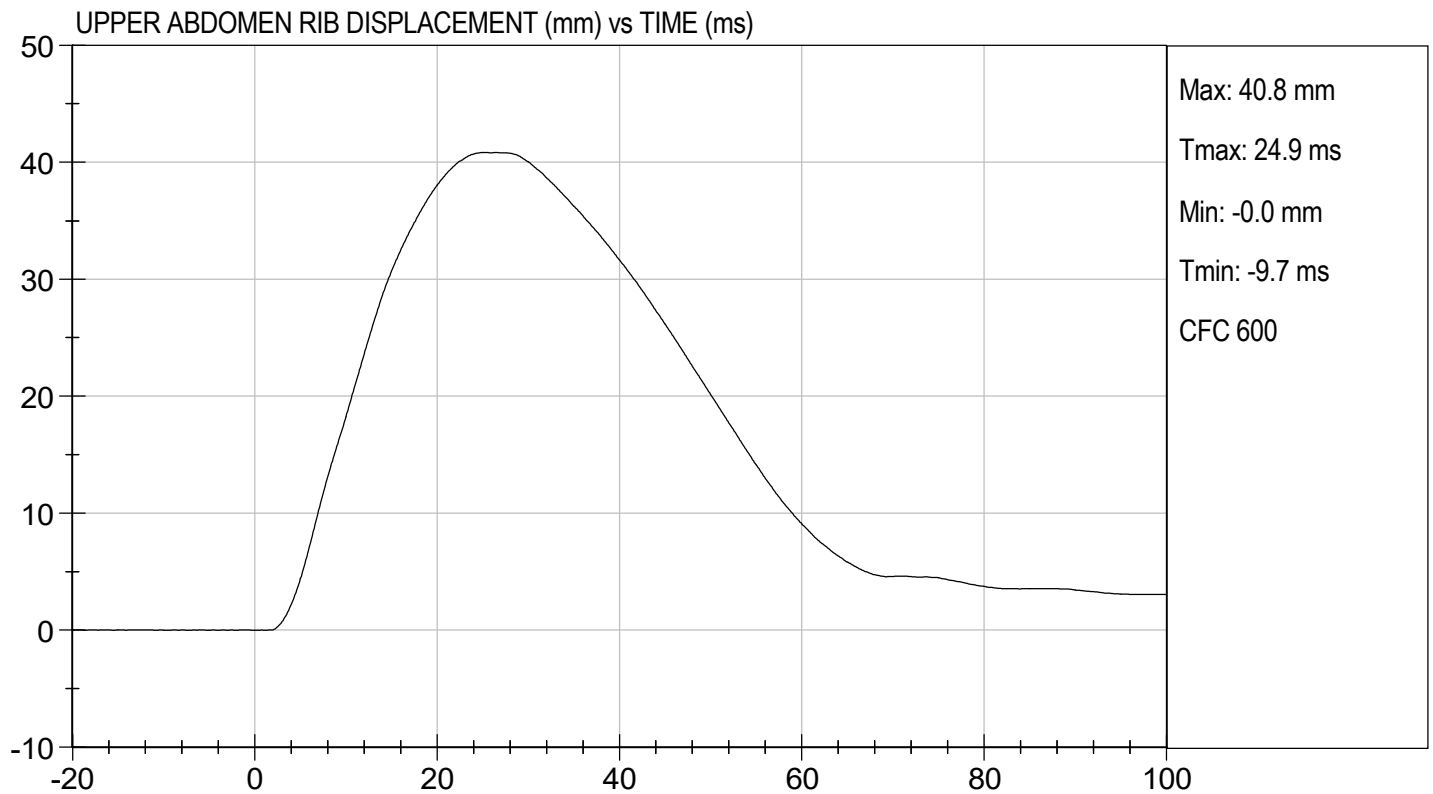
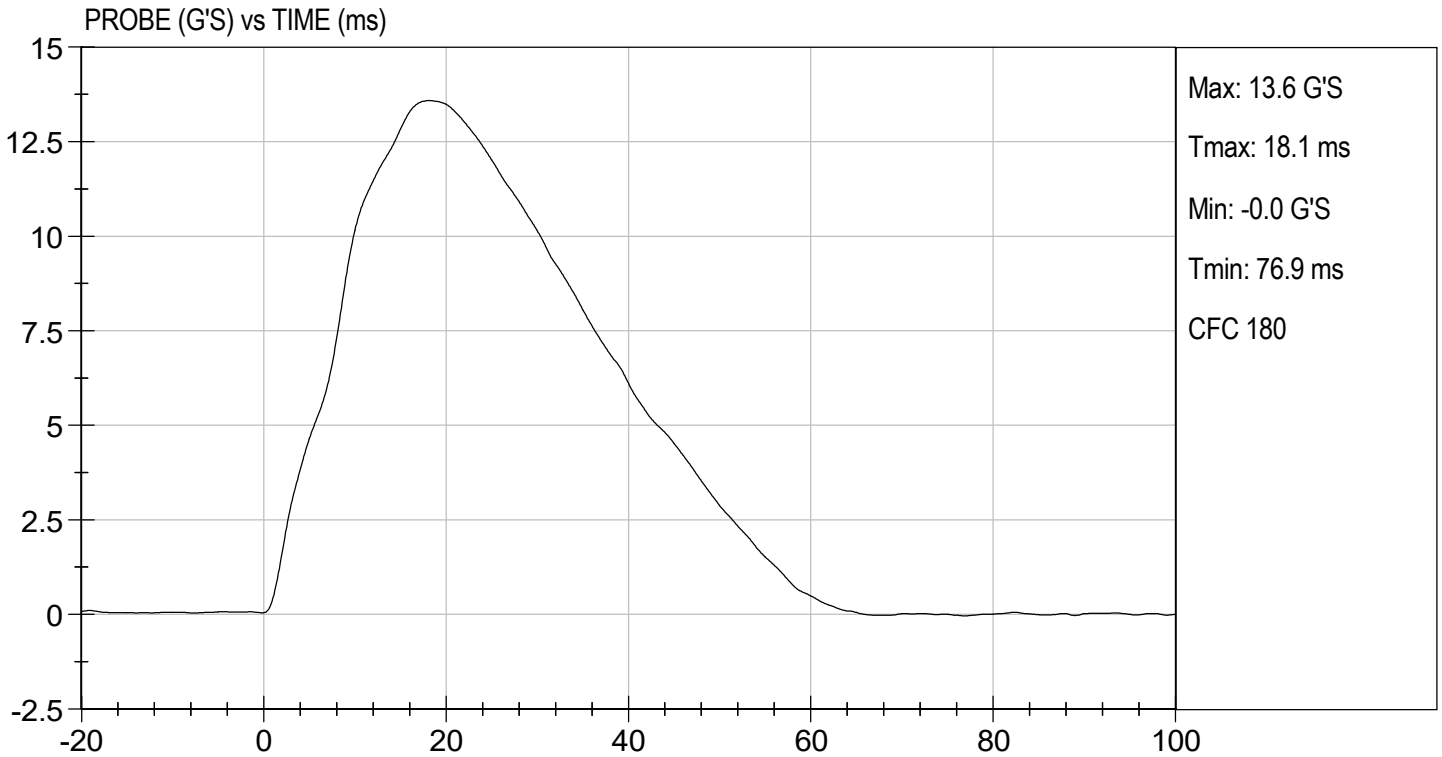
Test I.D: D212096

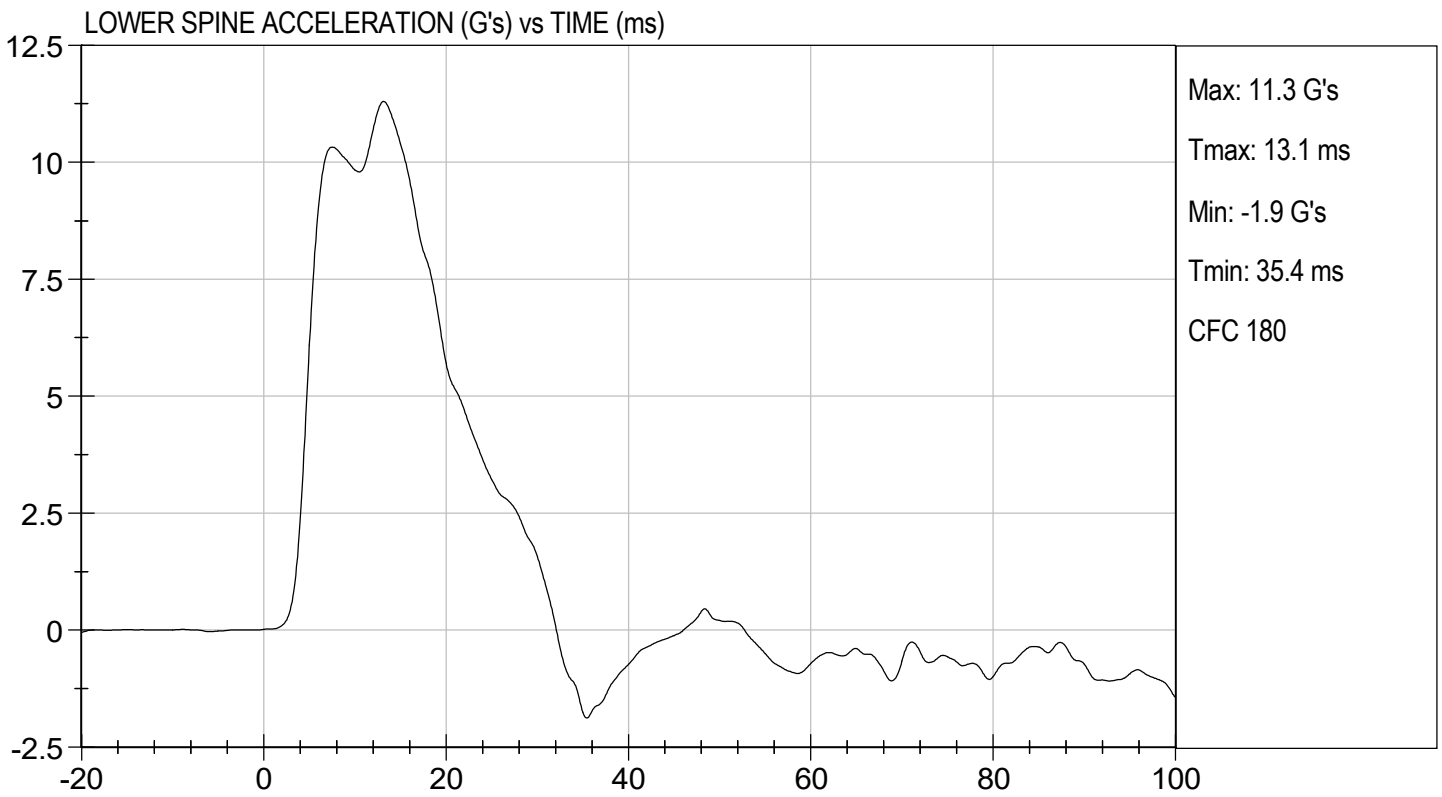
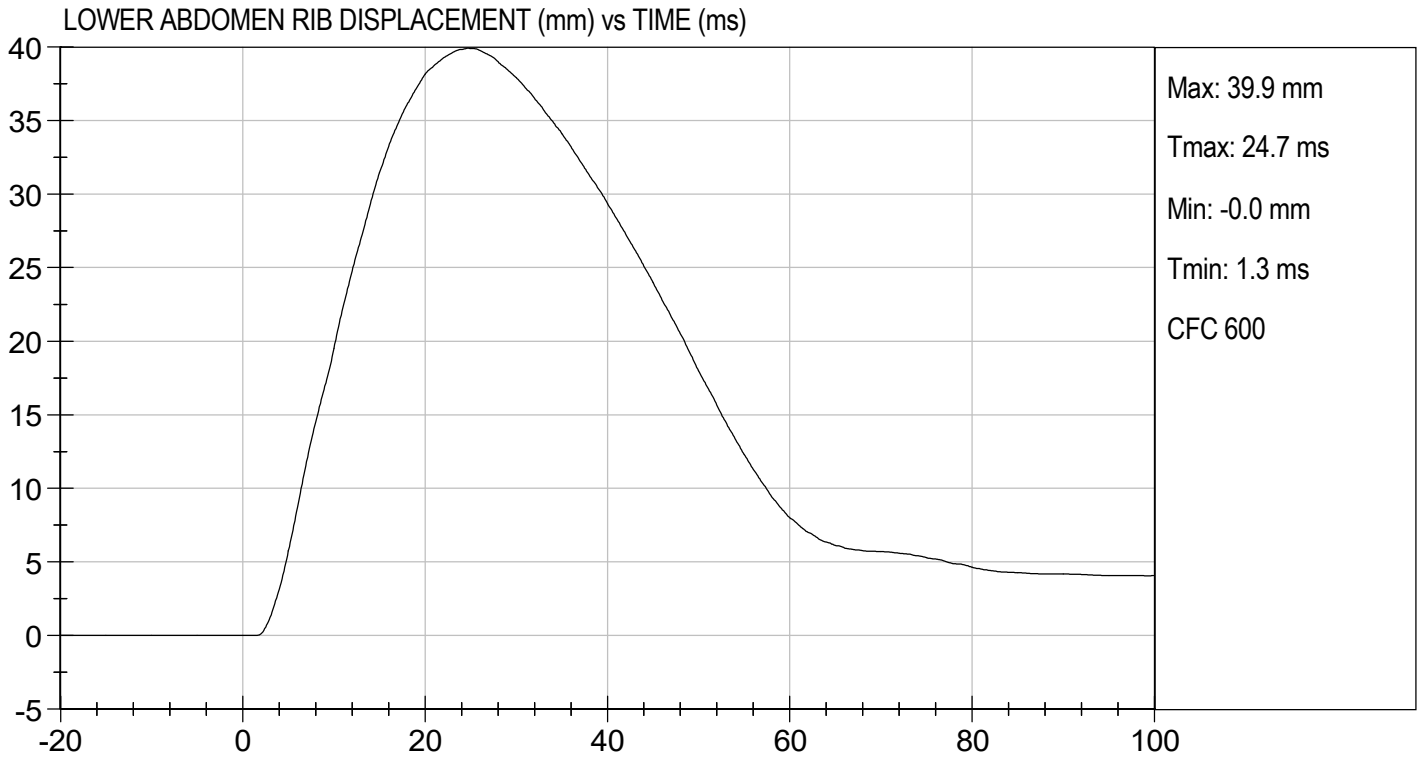
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


 Laboratory Technician

06/21/2021
 Test Date


 Approved By





MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

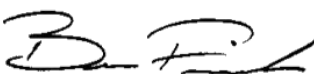
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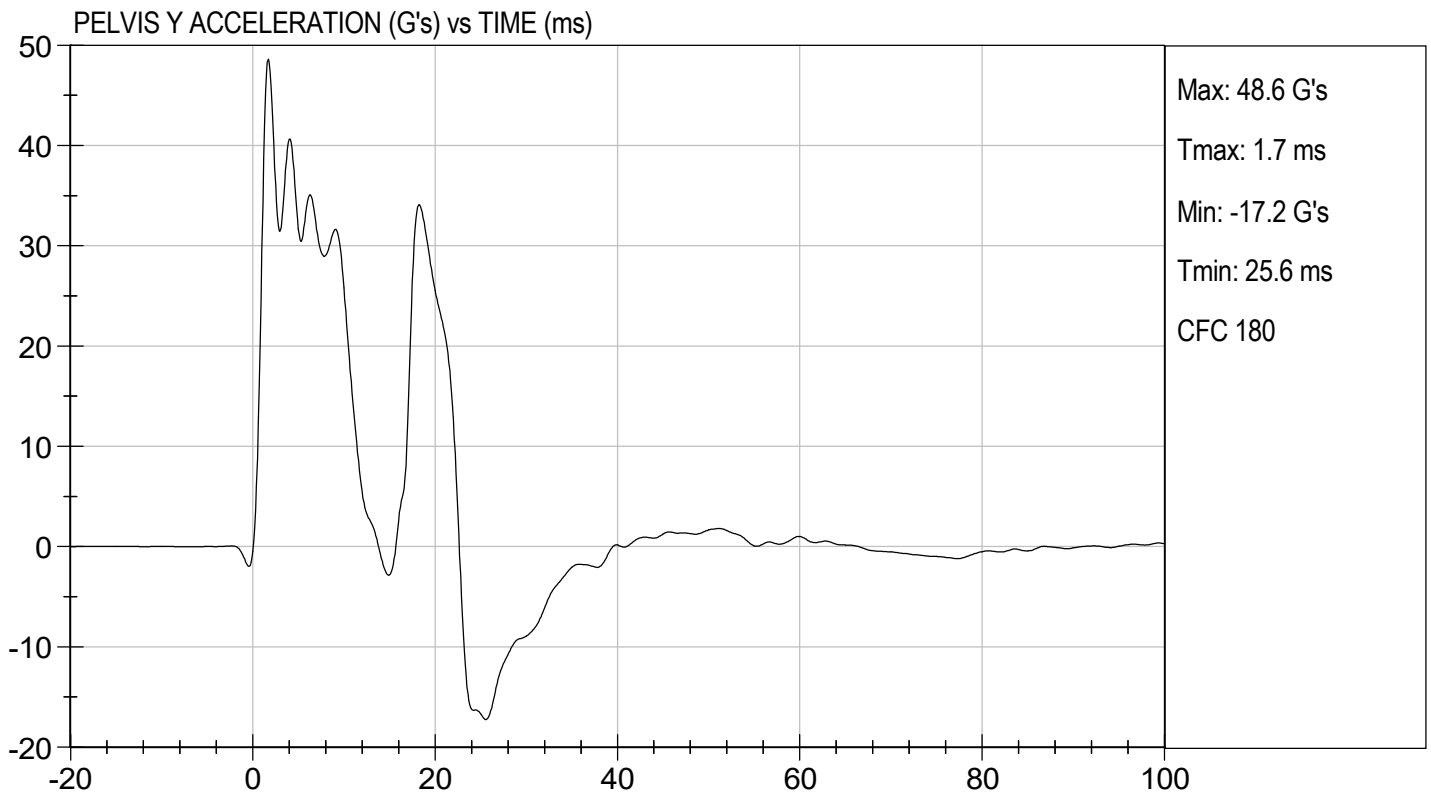
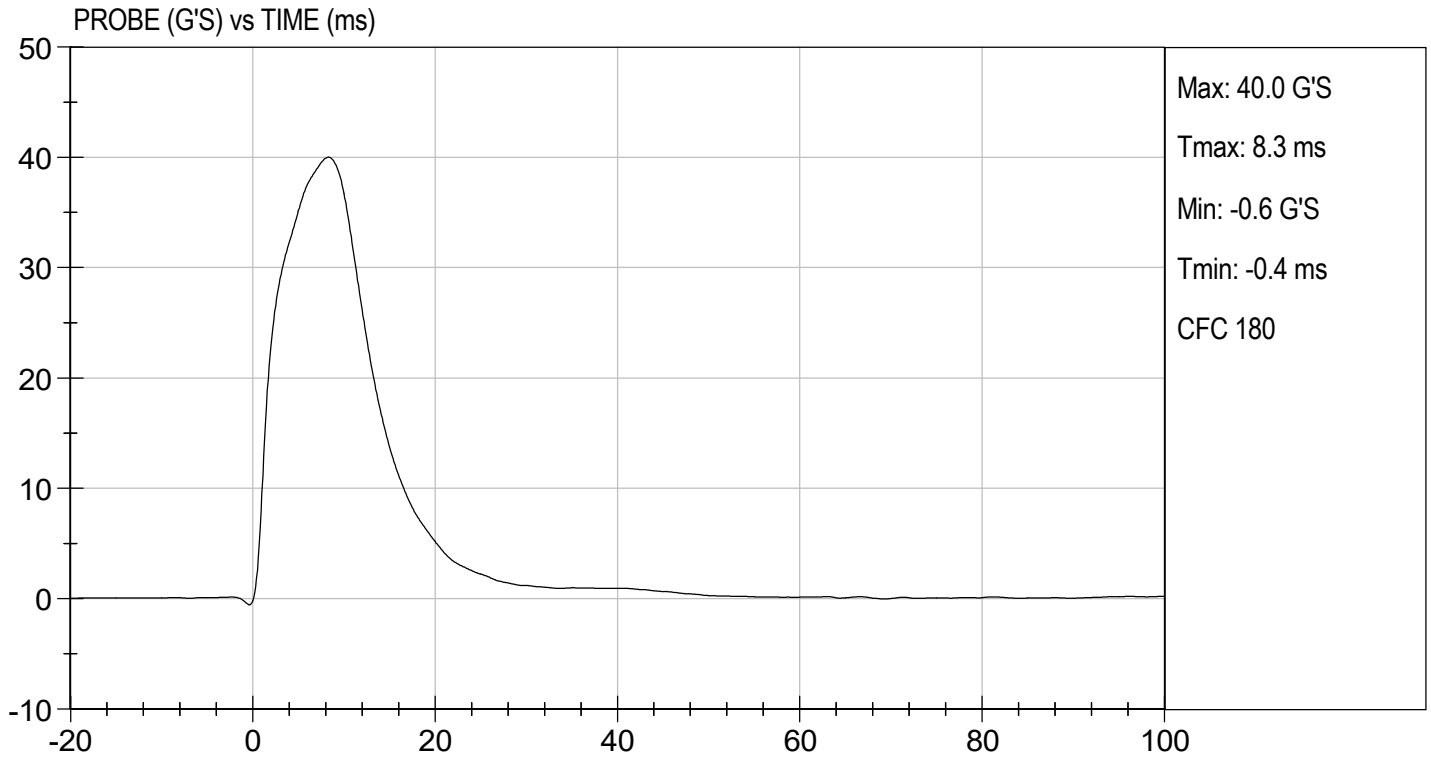
Test I.D: D212097

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	6.60 to 6.80	6.62	Pass
Maximum Probe Acceleration	G's	38 to 47	40	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	35	Pass
Peak Acetabulum Force	N	3600 to 4300	3,856	Pass
Overall Test Results				Pass


 Laboratory Technician

06/21/2021
 Test Date

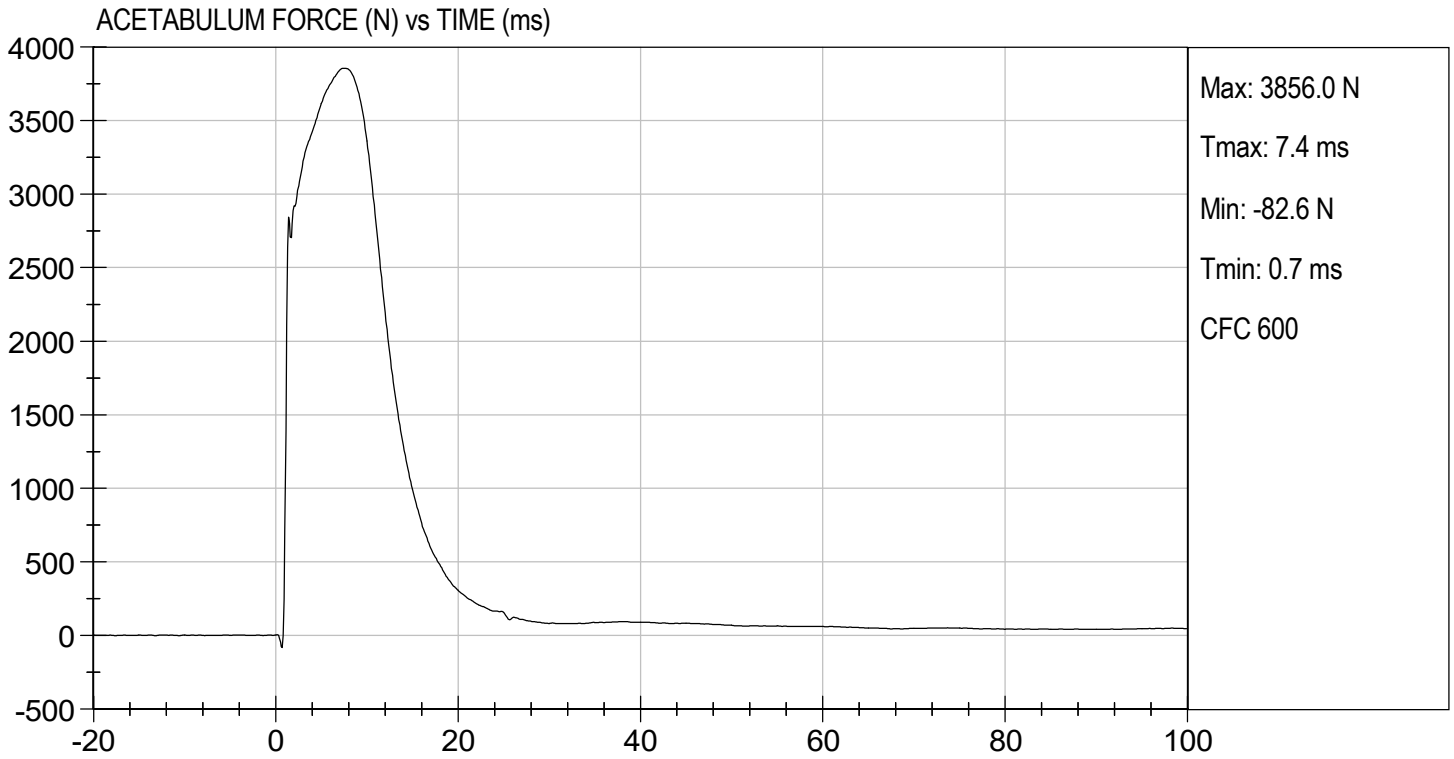

 Approved By





TEST DESC: PELVIS IMPACT
VELOCITY: 21.72 ft/s, 6.62 m/s

TEST DATE: 06/21/2021
TEST #: D212097



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D212098

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	59	Pass
Impact Velocity	m/s	4.20 to 4.40	4.21	Pass
Maximum Probe Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,838	Pass
Overall Test Results				Pass

Tanne Lison

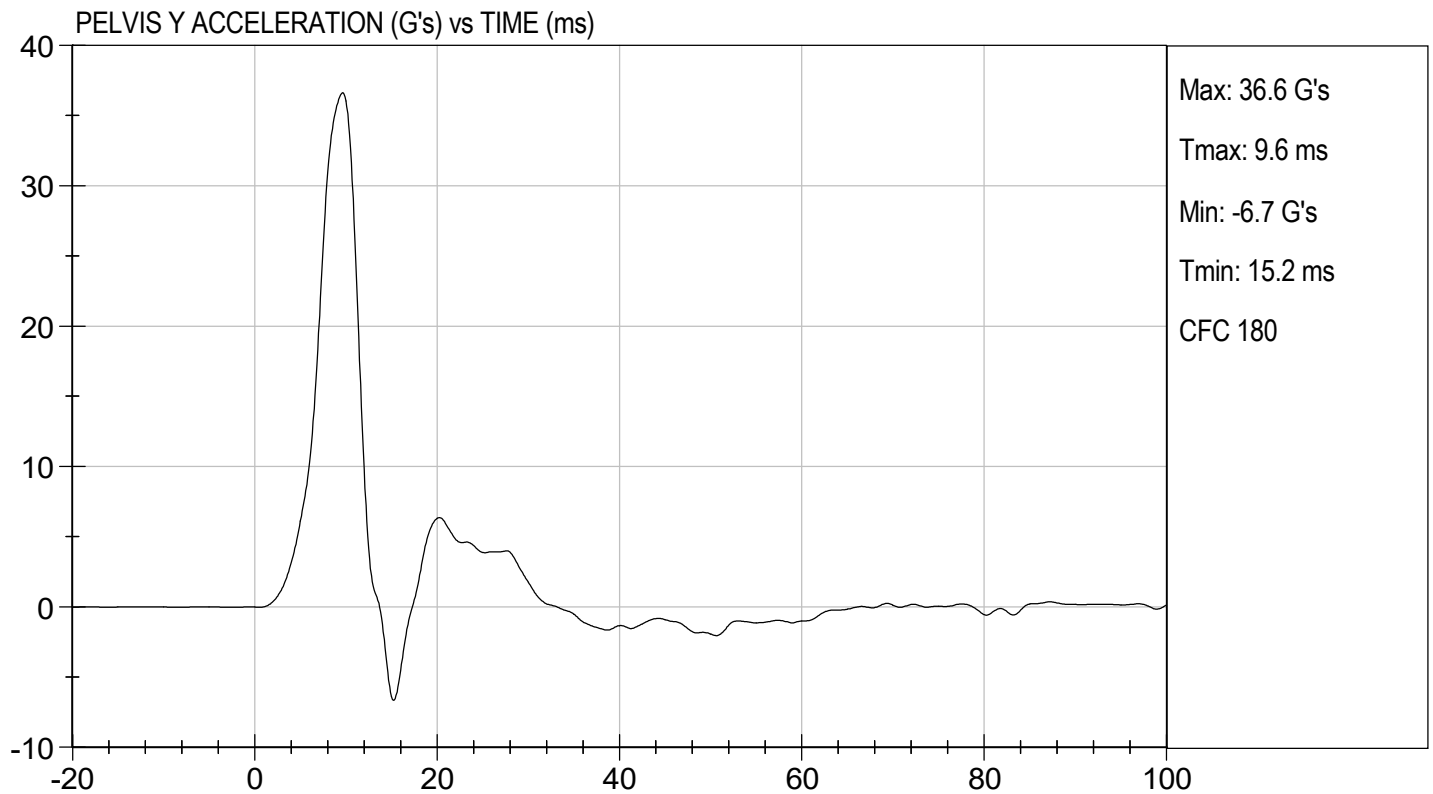
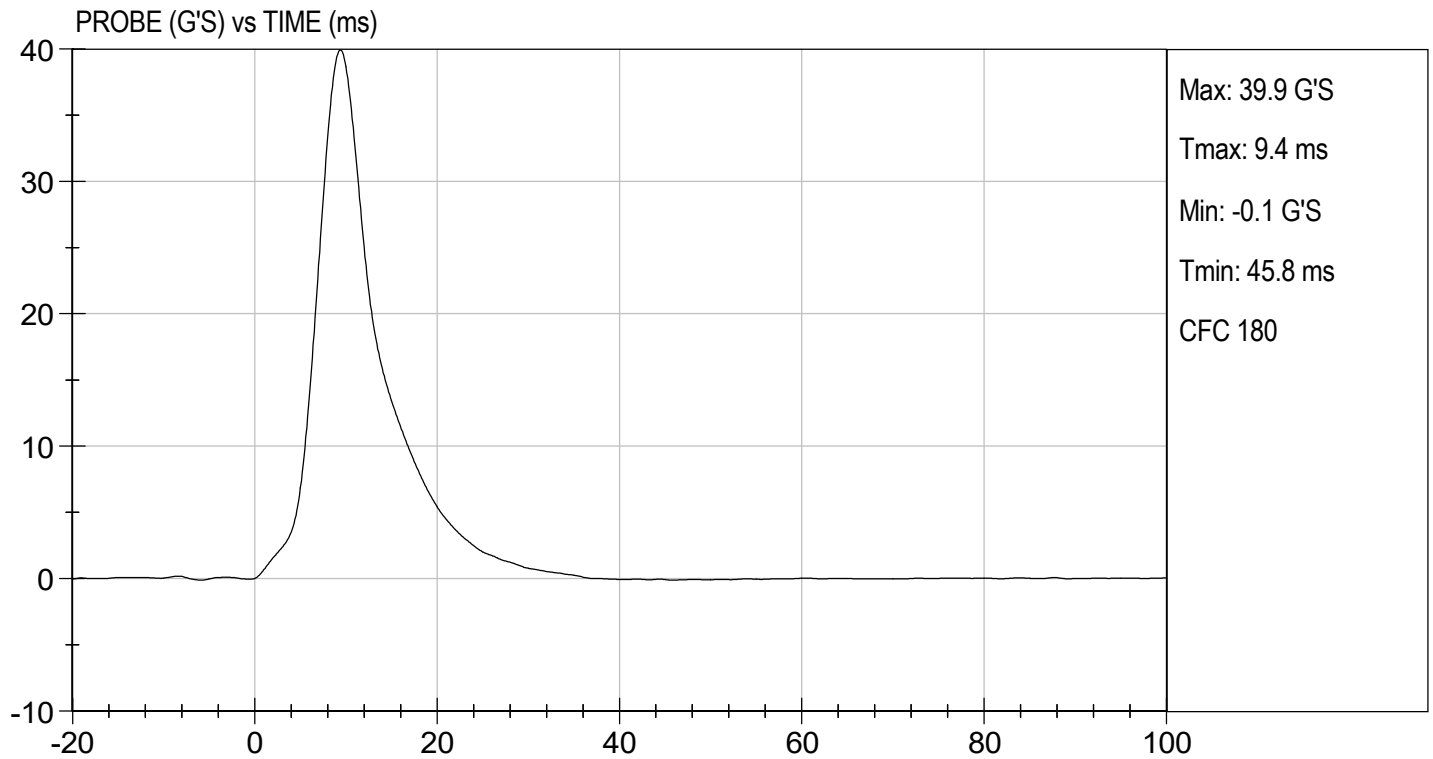
 Laboratory Technician

06/21/2021

 Test Date

B. F. K.

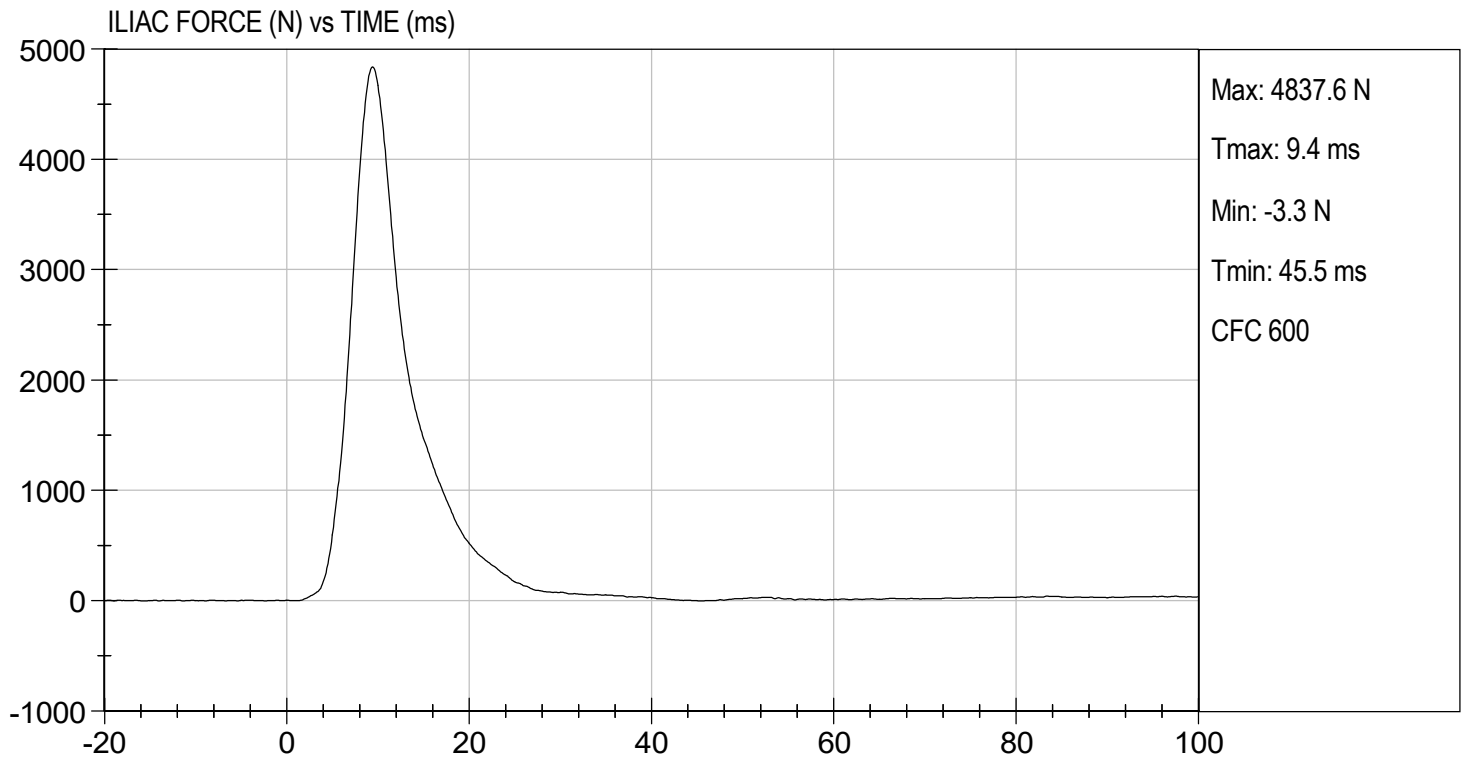
 Approved By





TEST DESC: ILLIAC
VELOCITY: 13.80 ft/s, 4.21 m/s

TEST DATE: 06/21/2021
TEST #: D212098





SID-IIs Pelvis Plug Certification Test

Plug S/N 14035

Test Number 13509

Report Number 13554

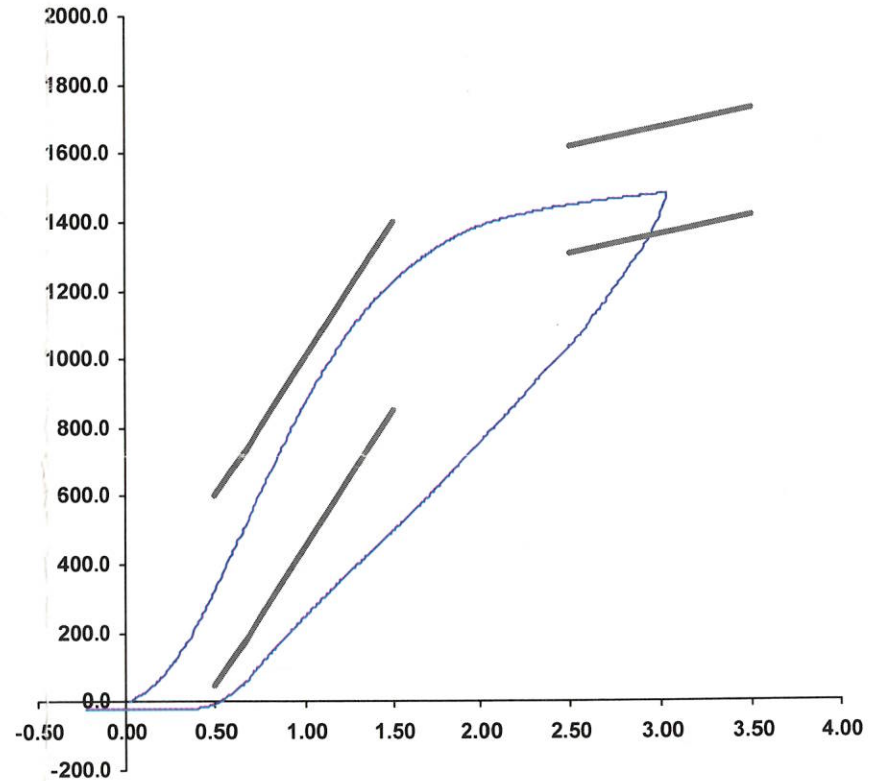
Test Date 5/22/2020 1:03:01 PM

	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	330.83	50.00	600.00
Force @ 1.5 mm (N)	1,221.30	850.00	1,400.00
Force @ 2.5 mm (N)	1,446.27	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,479.63	1,361.00	1,673.00

Testing Machine STM-20 5965542
 Load Cell S/N (FI360947), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator _____

Part Number 180-4450

Template No 107 22-May-20
 SACO Research

By: DC Date: 5-22-2020



SID-IIs Pelvis Plug Certification Test

Plug S/N 13788

Test Number 12977

Report Number 13021

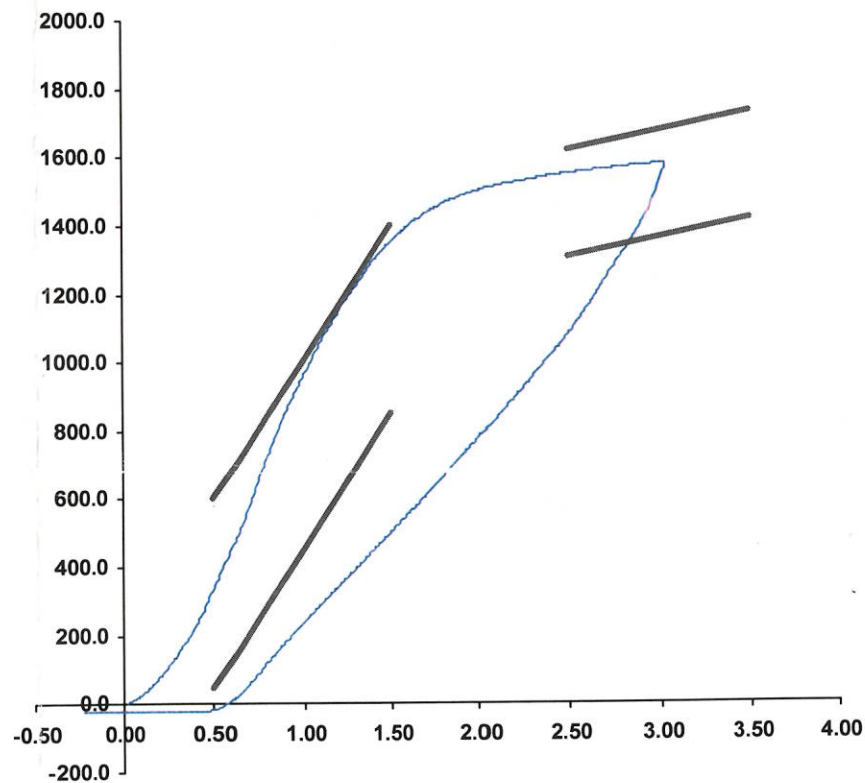
Test Date 4/7/2020 7:58:47 AM

	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	340.44	50.00	600.00
Force @ 1.5 mm (N)	1,351.33	850.00	1,400.00
Force @ 2.5 mm (N)	1,550.06	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,578.91	1,361.00	1,673.00

Testing Machine STM-20 5965542
 Load Cell S/N (FI360947), Units (LBS) 1000
 Preload Value (-N) 22.24
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator 13787

Part Number 180-4450

Template No 107 07-Apr-20
 SACO Research

By: XC Date: 4/7/2020

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

		ES-2re S/N F032			
		Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers		X	P79750	Endevco	01/20/2021
		Y	P79751	Endevco	01/20/2021
		Z	P79753	Endevco	01/20/2021
		Xr	P79711	Endevco	01/20/2021
		Yr	P79712	Endevco	01/20/2021
		Zr	P88170	Endevco	01/20/2021
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	12/21/2020
	Middle	Y	G169	Honeywell	12/21/2020
	Lower	Y	G164	Honeywell	12/21/2020
Abdomen Load Cells	Forward	Y	ABG1513	Denton	07/27/2020
	Middle	Y	ABG1531	Denton	07/27/2020
	Rear	Y	ABG1536	Denton	07/27/2020
Lower Spine Accelerometers (T12)		X	P79574	Endevco	01/20/2021
		Y	P82097	Endevco	01/20/2021
		Z	P82603	Endevco	01/20/2021
Public Symphysis Load Cell		Y	PG462	Denton	07/27/2020

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 306			
				Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers				X	P79445	Endevco	01/18/2021
				Y	P79721	Endevco	01/18/2021
				Z	P79724	Endevco	01/18/2021
				Xr	P84999	Endevco	01/18/2021
				Yr	P85000	Endevco	01/18/2021
				Zr	P85001	Endevco	01/18/2021
Head Angular Rate Sensors				X	ARS7391	DTS	08/04/2020
				Y	ARS7475	DTS	08/04/2020
				Z	ARS7516	DTS	08/04/2020
Displacement Potentiometers	Thoracic Rib	Upper	Y	G033	FTSS	12/22/2020	
		Middle	Y	2403	Servo	12/31/2020	
		Lower	Y	G1270	FTSS	12/22/2020	
	Abdominal Rib	Upper	Y	G032	FTSS	12/22/2020	
		Lower	Y	G1304	FTSS	12/22/2020	
Lower Spine Accelerometers (T12)				X	P96332	Endevco	01/18/2021
				Y	P96335	Endevco	01/18/2021
				Z	P96341	Endevco	01/18/2021
Acetabulum Load Cell				Y	ACG268	Denton	11/23/2020
Iliac Wing Load Cell				Y	IWG273	Denton	11/23/2020
Pelvis Plug (struck side)					14035	SACO	05/22/2020
Pelvis Plug (non-struck side)					13788	SACO	04/07/2020

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A383090	MSI	05/13/2021
	Vehicle Center of Gravity	Y	A340617	MSI	04/19/2021
	Vehicle Center of Gravity	Z	A383073	MSI	05/13/2021
2	Right Sill at Front Seat	X	PCB1244	PCB	05/28/2021
	Right Sill at Front Seat	Y	A383176	MSI	06/01/2021
	Right Sill at Front Seat	Z	PCB1391	PCB	05/28/2021
3	Right Sill at Rear Seat	X	A383078	MSI	06/01/2021
	Right Sill at Rear Seat	Y	A383112	MSI	06/01/2021
	Right Sill at Rear Seat	Z	A383154	MSI	06/01/2021
4	Left Sill at Front Door	Y	A370264	MSI	03/08/2021
5	Left Sill at Rear Door	Y	PCB1308	PCB	02/05/2021
6	Left A-Post Lower	Y	PCB1399	PCB	02/17/2021
7	Left A-Post Middle	Y	A340265	MSI	03/20/2021
8	Left B-Post Lower	Y	PCB688	PCB	05/25/2021
9	Left B-Post Middle	Y	T19009	Endevco	02/19/2021
10	Front Seat Track	Y	PCB1183	PCB	06/14/2021
11	Rear Seat Track or Structure	Y	PCB1143	PCB	06/14/2021
12	Right Rear Occ. Compartment	Y	PCB1404	PCB	02/10/2021
13	Engine Block	X	A383795	MSI	06/11/2021
	Engine Block	Y	A385792	MSI	06/11/2021
14	Rear Floorpan Above Axle	X	A385788	MSI	06/11/2021
	Rear Floorpan Above Axle	Y	A383756	MSI	06/11/2021
	Rear Floorpan Above Axle	Z	A385789	MSI	06/11/2021

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB1725D	PCB	05/28/2021
MDB Center of Gravity	Y	PCB1619D	PCB	05/25/2021
MDB Center of Gravity	Z	PCB1453D	PCB	05/25/2021
Left Frame at Rear Axle Centerline	X	PCB1715D	PCB	06/04/2021
Left Frame at Rear Axle Centerline	Y	PCB1441D	PCB	08/26/2020