

REPORT NUMBER: SideNCAPMDB-MGA-23-010

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

**KIA CORPORATION
2023 Kia Niro EX 5-Door SUV
NHTSA No.: M20234213**

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



Test Date: March 2, 2023

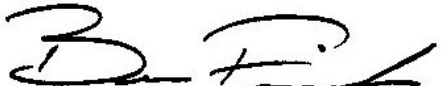
Final Report Date: January 3, 2024

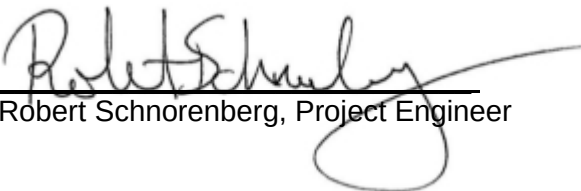
FINAL REPORT

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

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Robert Schnorenberg, Project Engineer

Approval Date: January 3, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

COR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing and FMVSS No. 305 Indicant Testing of 2023 Kia Niro EX 5-Door SUV, NHTSA No.: M20234213		5. Report Date January 3, 2024																																																					
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16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2023 Kia Niro EX 5-Door SUV 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 March 2, 2023. The impact velocity of the Moving Deformable Barrier (MDB) was 61.48 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 214 mm at level 3. The test vehicle's performance was as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (ES-2re)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>175.293</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>20.444</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>960.221</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>1554.820</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82*</td> <td>32.115</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>287.245</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>77.553</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>3599.217</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>41.129</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45*</td> <td>33.265</td> </tr> </tbody> </table> *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.				Measurement Description	Units	Driver ATD (ES-2re)		Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	175.293	Maximum Thorax Rib Deflection	mm	44	20.444	Total Abdominal Force	N	2500	960.221	Pubic Symphysis Force	N	6000	1554.820	Resultant Lower Spine Acceleration	g	82*	32.115	Measurement Description	Units	Passenger ATD (SID-IIs)		Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	287.245	Resultant Lower Spine Acceleration	g	82	77.553	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3599.217	Maximum Thoracic Rib Deflection	mm	38*	41.129	Maximum Abdomen Rib Deflection	mm	45*	33.265
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2023 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000017. The purpose of this test is to generate comparative side impact performance in a 2023 Kia Niro EX 5-Door SUV. 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 2023 Kia Niro EX 5-Door SUV 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 61.48 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 March 2, 2023. 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	175.293
Maximum Thorax Rib Deflection	mm	44	20.444
Total Abdominal Force	N	2500	960.221
Pubic Symphysis Force	N	6000	1554.820
Resultant Lower Spine Acceleration	g	82*	32.115

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	287.245
Resultant Lower Spine Acceleration	g	82	77.553
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3599.217
Maximum Thoracic Rib Deflection	mm	38*	41.129
Maximum Abdomen Rib Deflection	mm	45*	33.265

*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	No	
Seat Belt Load Limiter	Yes		No	
Other:	No		No	

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

GENERAL COMMENTS

None.

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: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20234213	Traction Control System (TCS)	Yes
Model Year	2023	Auto-Leveling System	No
Make	Kia	Automatic Door Locks (ADL)	Yes
Model	Niro EX	Power Window Auto-Reverse	Yes
Body Style	5-Door SUV	Other Optional Feature	No
VIN	KNDCR3LE5P5059019	Driver Front Airbag	Yes
Body Color	Cityscape Green	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	87 km / 54 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	1.6 L	Driver Torso Airbag	No
Type/No. Cylinders	Inline 4	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	6	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	FWD	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	No
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
		Other Safety Restraint	N/A

Does owner's manual provide instruction to turn off automatic door locks?	No
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DATA FROM CERTIFICATION LABEL

Manufactured By	KIA CORPORATION	GVWR (kg)	1910
Date of Manufacture	10/22	GAWR Front (kg)	1065
Vehicle Type	MPV	GAWR Rear (kg)	1050

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				390	(A)
DSC x 68 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				50	(A-B)

VEHICLE SEAT TYPE

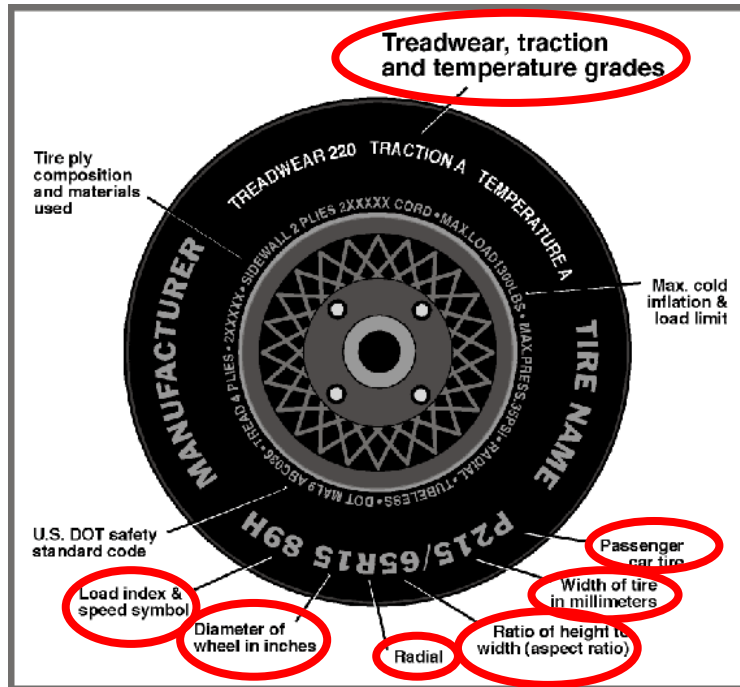
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	X					X	
Rear or Second Row				X	X		
Third Row Seat							

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

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	205/60R16	205/60R16
Tire Size on Vehicle	205/60R16	205/60R16
Tire Manufacturer	Nexen	Nexen
Tire Model	N Priz S	N Priz S
Treadwear	560	560
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel	1 Polyester, 2 Steel
Load Index/Speed Symbol	92H	92H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1UAXH DMAL 4222	1UAXH DMAL 4222
DOT Safety Code Right	1UAXH DMAR 4222	1UAXH DMAR 4222

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

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
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TEST VEHICLE TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	255	250	260	255
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	437.5	275.0		481.0	347.5		476.5	355.5	
Right	kg	413.5	284.5		419.5	334.5		414.0	343.5	
Ratio	%	60.3%	39.7%		56.9%	43.1%		56.0%	44.0%	
Totals	kg	851.0	559.5	1410.5	900.5	682.0	1582.5	890.5	699.0	1589.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1410.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	50	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	1589.5	(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	709	702	Yes
Right Front	mm	713	703	Yes
Right Rear	mm	697	701	Yes
Left Rear	mm	688	683	Yes
Vehicle CG (Aft of Front Axle)	mm	1198	1174	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	37	37	

* 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: 2023 Kia Niro EX 5-Door SUV
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WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Units	Weight
Weight of Ballast Added	kg	
Components Removed: Additional cargo area trim, LR/RR taillight	kg	6

TEST SURFACE MARKINGS

	Units	Distance from 63° Impact Angle Line
Fore 25 mm Target	mm	901
Aft 25 mm Target	mm	902
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: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
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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	23.1	13.6	18.4
Front Passenger Seat	16.9	13.7	15.3
Front Center Seat			
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 SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rear-Most	Mid	Forward- Most
Driver Seat	18.4	0	Max	66	66	66
			Mid	33	33	33
			Min	0	0	0
Front Passenger Seat	15.3	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
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

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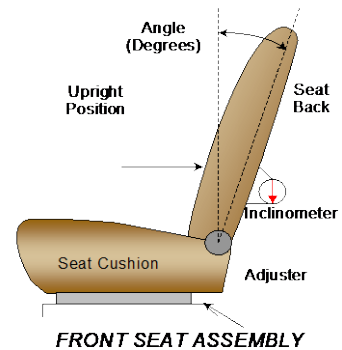
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SEAT FORE/AFT POSITIONS

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	260		130	
Front Passenger Seat	260	67	130	33
Front Center Seat				
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	63.1		2.2	
Front Passenger Seat	58.4	30	1.6	8
Front Center Seat				
Struck Side Rear Seat	Fixed		15.1	
Non-Struck Side Rear Seat	Fixed		15.1	
Rear Center Seat	Fixed		15.1	

Seat back angles measured on outboard headrest post.

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

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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	3	0 (Uppermost as 0)
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

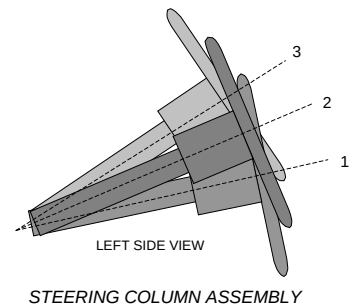
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	6	5 (Lowest as 0) / Fixed Fore-Aft
Rear Seat	2	0 (Lowest as 0) / Fixed Fore-Aft

STEERING COLUMN ADJUSTMENT

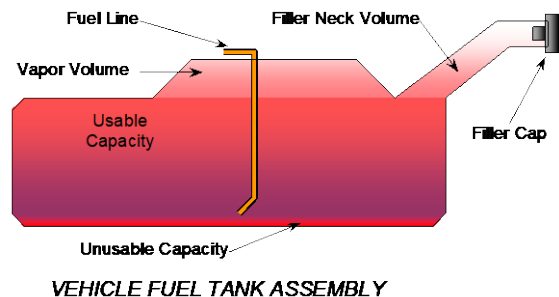
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

	Wheel Angle (°)	Fore/Aft Position (mm)
Lowermost, Position 1	65.7	
Geometric Center, Position 2	63.2	
Uppermost, Position 3	60.6	
Telescoping Steering Wheel Travel		53
Test Position	63.2	27



FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump normally operates when the vehicle's electrical system is activated. 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

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Test Date: 3/2/2023

FUEL TANK CAPACITY DATA

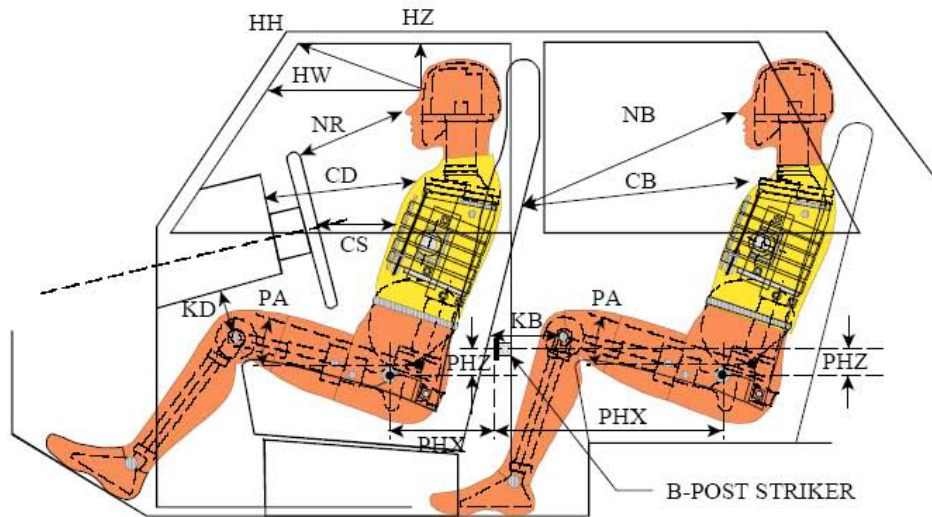
	Liters
Usable Capacity of Standard Tank (see S1 - Vehicle Setup Information)	42.0
Usable Capacity of Optional Tank (see S1 - Vehicle Setup Information)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	42.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	39.1
Actual Amount of Solvent Used	39.0
1/3 of Usable Capacity	14.0

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: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



LEFT SIDE VIEW

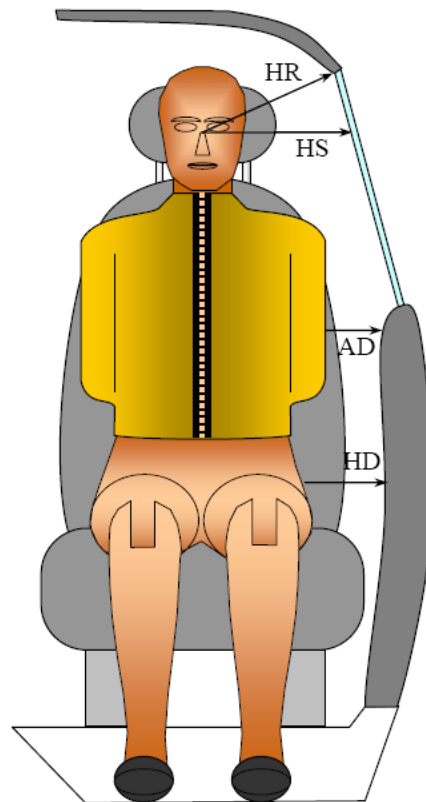
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	382	11.7		
HW		Head to Windshield	622	0		
HZ	HZ	Head to Roof Liner	184	90	317	90
NR	NB	Nose to Rim/Seat Back	463	19.1	512	6.8
CD	CB	Chest to Dashboard/Seat Back	626	4.6	519	2.3
CS		Chest to Steering Wheel	381	15.6		
KDL	KBL	Left Knee to Dash/Seat Back	240	30.0	255	15.1
KDR	KBR	Right Knee to Dash/Seat Back	249	31.2	280	15.5
PAX	PAX	Pelvic Tilt Angle X		19.8		26.4
PAY	PAY	Pelvic Tilt Angle Y		-0.4		-0.8
PHX	PHX	Hip Point to Striker (X-Axis)	195		251	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	270		232	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

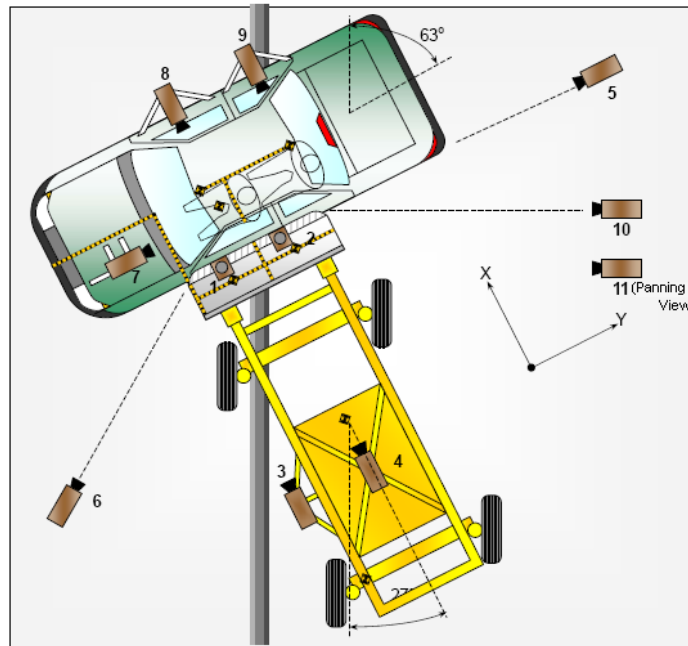


Code	Measurement Description	Driver	Passenger
		Length (mm)	
HR	Head to Side Header	196	281
HS	Head to Side Window	310	384
AD	Arm to Door	110	189
HD	Hip Point to Door	168	213

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates* (mm)			Lens (mm)	Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	855	540	-4775	8.5	1000
2	Overhead Close-Up	390	20	-4815	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-25	6095	-1495	24	1000
6	Left Front	2080	-5805	-1515	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

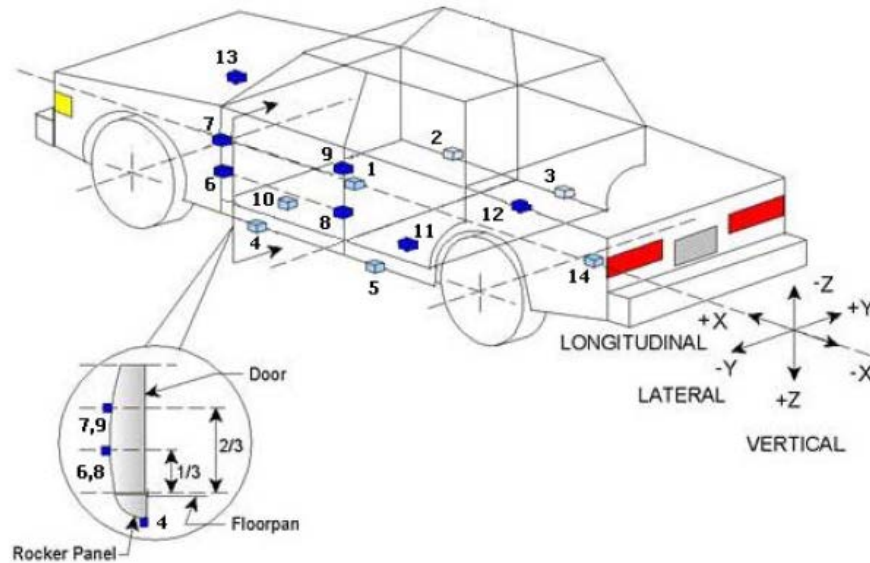
INSTRUMENTATION

	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: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

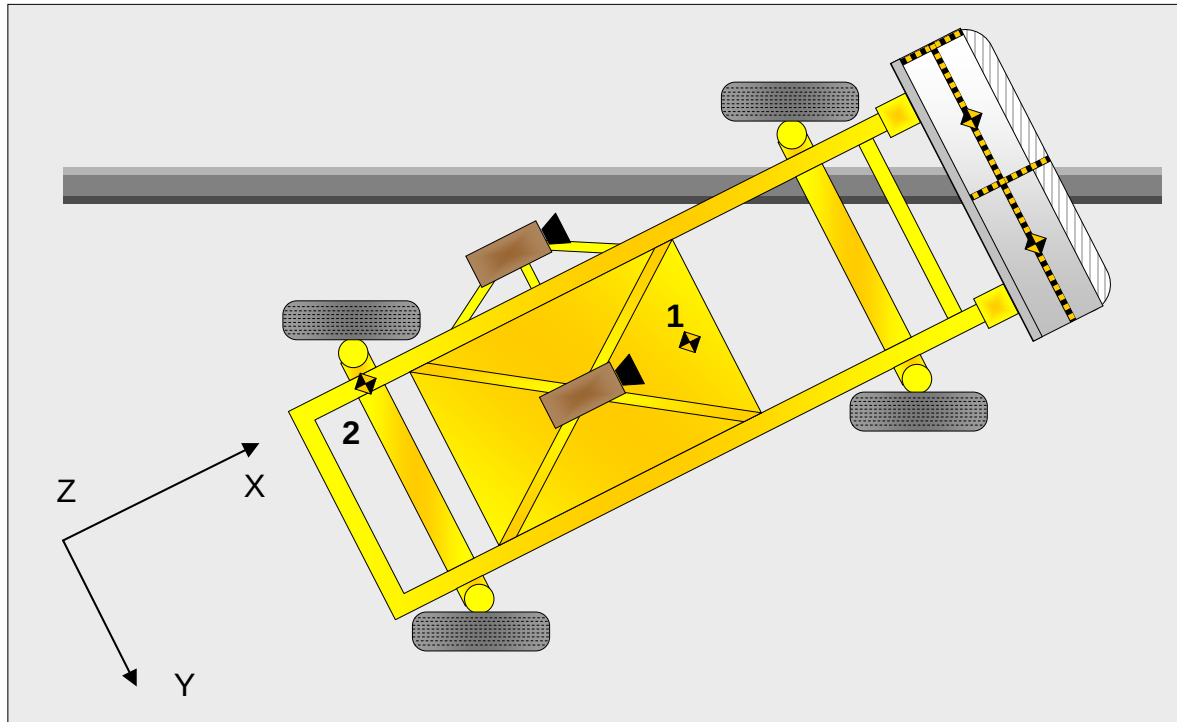
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2333	0	-320
2	Right Sill at Front Seat	2476	733	-208
3	Right Sill at Rear Seat	1268	733	-215
4	Left Sill at Front Door	2476	-733	-205
5	Left Sill at Rear Door	1268	-733	-205
6	Left Lower A-Post	2991	-832	-550
7	Left Middle A-Post	2991	-832	-773
8	Left Lower B-Post	1816	-720	-561
9	Left Middle B-Post	1816	-720	-768
10	Front Seat Track	2111	-366	-273
11	Rear Seat Structure	1605	-336	-235
12	Rt. Rear Occ. Compartment	1605	336	-235
13	Engine Block	3724	362	-831
14	Rear Above Axle	784	0	-457

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: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



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	1415
---	----	------

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag, Seatback
Top of Head	Curtain Airbag	Curtain Airbag, Seatback, Center Headrest
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Headrest	Curtain Airbag, Headrest, Seatback
Left Shoulder	Curtain Airbag	Door Panel
Upper Torso	Side Torso/Pelvis Airbag, Seatback	None
Lower Torso	Side Torso/Pelvis Airbag, Seatback	Door Panel
Left Hip	Side Torso/Pelvis Airbag, Seat Cushion	Seat Cushion, 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	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	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	None
Other Notable Effects	None

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

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023

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	No	
Seat Belt Load Limiter	Yes		No	
Other:	No		No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		2725
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		423
Actual Impact Point (Aft of Front Axle)	mm		422
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	1
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	1

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023

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

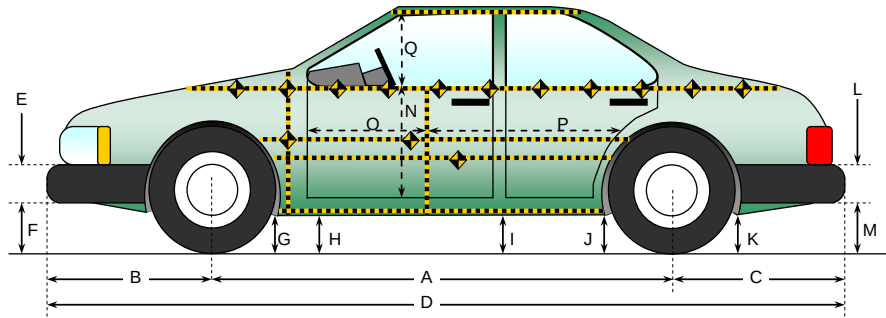
SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.48
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	61.80
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.8
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.4

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023



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

LEFT SIDE VIEW

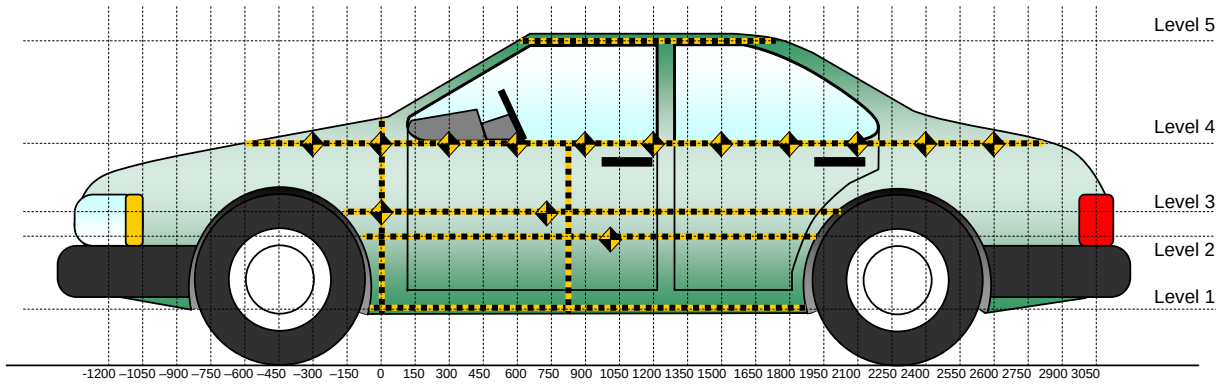
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2725	2712	-13
B	Front Axle to FSOV	925	945	20
C	Rear Axle to RSOV	784	776	-8
D	Total Length at Centerline	4434	4433	-1
E	Front Bumper Thickness	121	121	0
F	Front Bumper Bottom to Ground	208	217	9
G	Sill Height at Front Wheel Well	174	184	10
H	Sill Height at Front Door Leading Edge	179	184	5
I	Sill Height at B Pillar	176	186	10
J1	Sill Height at Rear Wheel Well	172	187	15
J2	Pinch Weld Height at Rear Wheel Well	173	187	14
K	Sill Height Aft of Rear Wheel Well	246	248	2
L	Rear Bumper Thickness	126	126	0
M	Rear Bumper Bottom to Ground	273	277	4
N	Sill Height to Window Bottom Sill	801	728	-73
O	Front Door Leading Edge to Impact CL	819	732	-87
P	Rear Door Trailing Edge to Impact CL	1171	1094	-77
Q	Front Window Opening	430	422	-8
R	Right Side Length	3454	3449	-5
S	Left Side Length	3454	3438	-16
T	Vehicle Width at B Post	1857	1810	-47
U	Front Wheel Track Width	1585		
V	Rear Wheel Track Width	1598		

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



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	239	29	1500
2	Occupant H-Point	556	199	1800
3	Mid Door	657	198	1800
4	Window Sill	984	97	1350
5	Window Top	1450	-4	1050

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: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

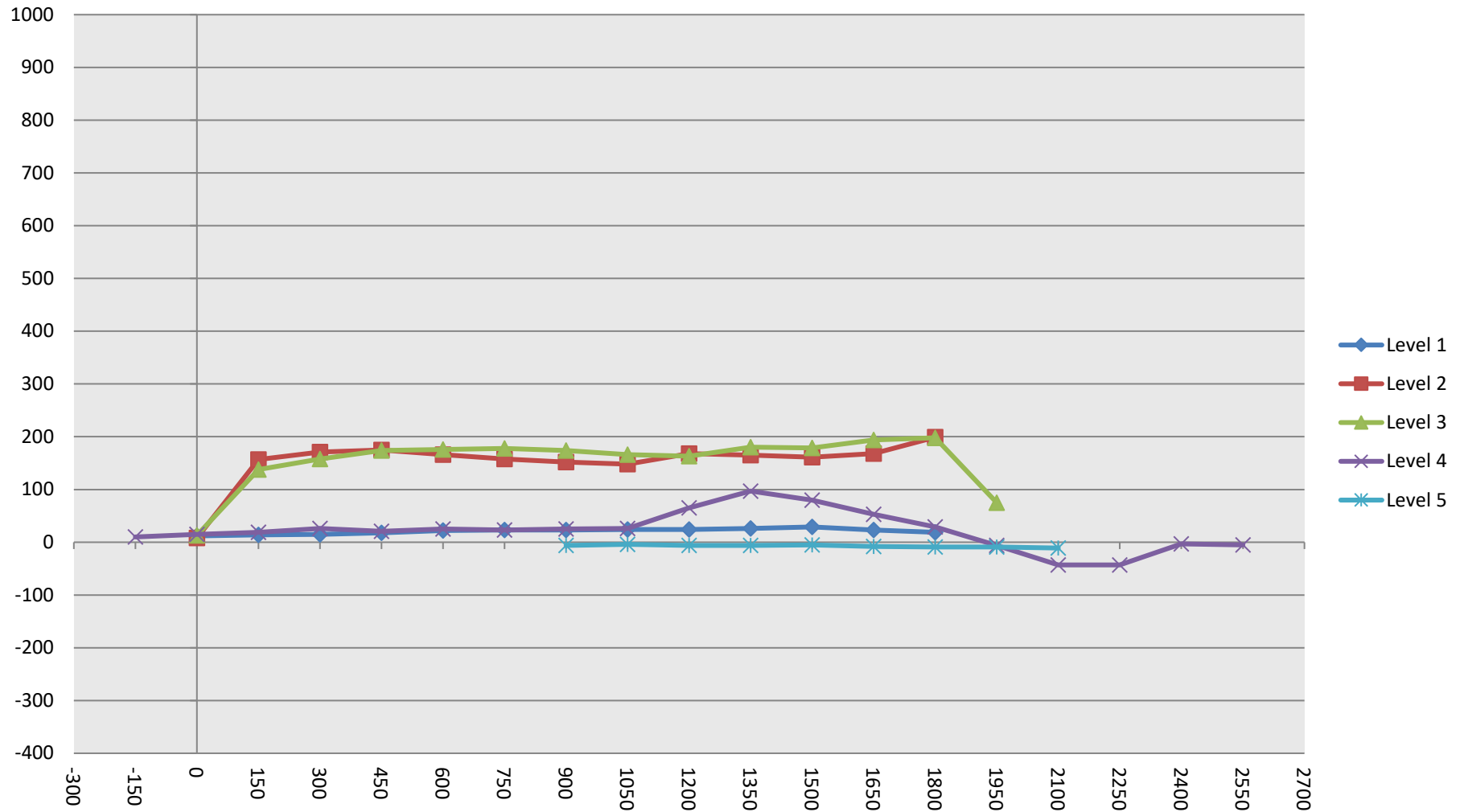
	Pre-Test					Post-Test					Exterior Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150				315					325					10	
0	246	204	210	303		258	212	223	318		12	8	13	15	
150	248	219	215	296		262	376	353	315		14	157	138	19	
300	250	220	215	290		265	391	373	316		15	171	158	26	
450	250	221	215	281		268	396	389	302		18	175	174	21	
600	250	223	216	274		272	389	392	299		22	166	176	25	
750	252	224	216	271		275	382	394	294		23	158	178	23	
900	255	224	218	265	502	278	376	392	290	496	23	152	174	25	-6
1050	255	225	218	261	497	279	373	384	287	493	24	148	166	26	-4
1200	258	225	219	260	498	282	393	382	325	492	24	168	163	65	-6
1350	260	229	220	262	499	286	394	400	359	493	26	165	180	97	-6
1500	260	229	222	262	500	289	390	401	342	495	29	161	179	80	-5
1650	249	222	219	266	504	272	390	413	319	496	23	168	194	53	-8
1800	231	206	207	268	507	250	405	405	297	498	19	199	198	29	-9
1950			203	274	514			278	268	505			75	-6	-9
2100				279	528				236	517				-43	-11
2250				280					237					-43	
2400				289					286					-3	
2550				307					302					-5	
2700															
2850															
3000															
3150															
3300															
3450															
3600															
3750															
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: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

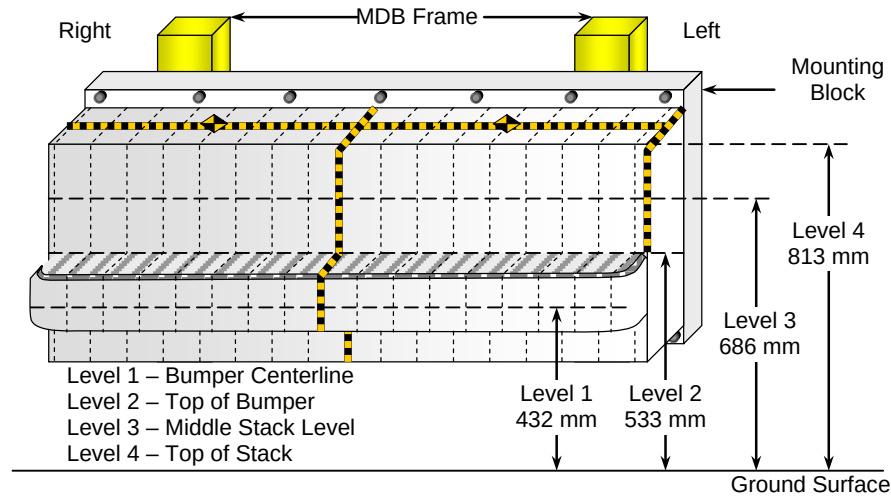
NHTSA No.: M20234213
Test Date: 3/2/2023



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	300	Right	192
B	Top of Bumper	533	800	Left	102
C	Mid-Level	686	800	Left	126
D	Top of Stack	813	800	Left	128

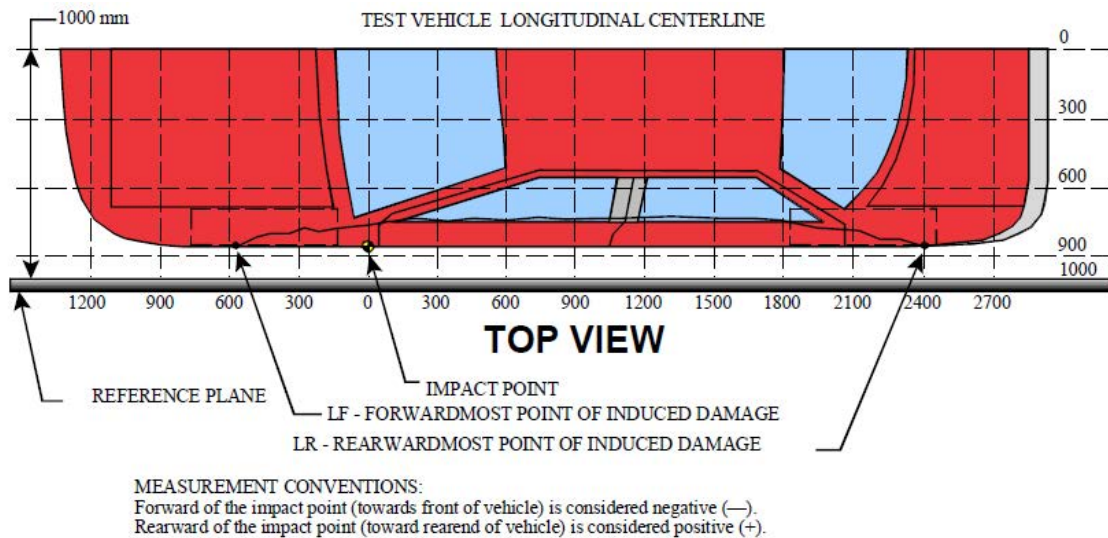
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	60	44	27	25	40	60	87	108	89	80	82	94	99	98	106	119	128
3	40	25	27	34	41	46	67	80	49	35	30	28	29	38	54	87	126
2	93	89	81	81	80	78	75	75	69	74	70	77	81	85	85	92	102
1	177	186	177	175	179	192	186	178	173	164	163	159	160	160	161	172	191

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2200	3	226	214	12
2	1750	3	425	211	214
3	1300	3	393	220	173
4	850	3	391	217	174
5	400	3	384	215	169
6	-50	3	217	216	1

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	653	476	177
2	480 mm right of center	1	646	463	183
3	160 mm right of center	1	645	463	182
4	160 mm left of center	1	619	463	156
5	480 mm left of center	1	632	463	169
6	800 mm left of center	1	667	476	191

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

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

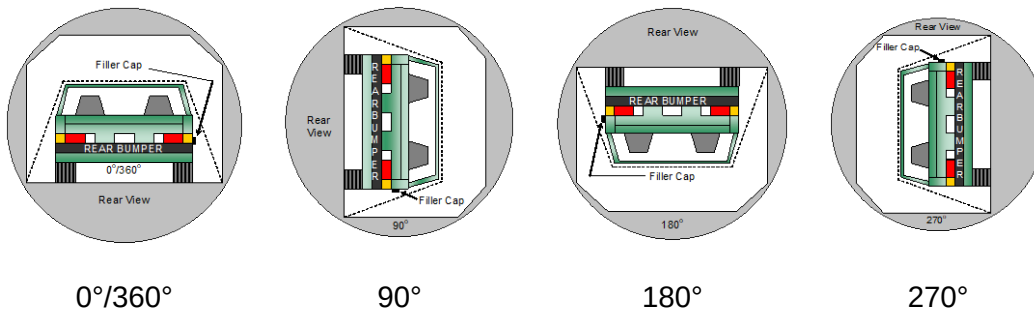
NHTSA No.: M20234213
Test Date: 3/2/2023

Test Time: 12:25 pm

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°	112	300	412
90° to 180°	111	300	411
180° to 270°	108	300	408
270° to 360°	112	300	412

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	

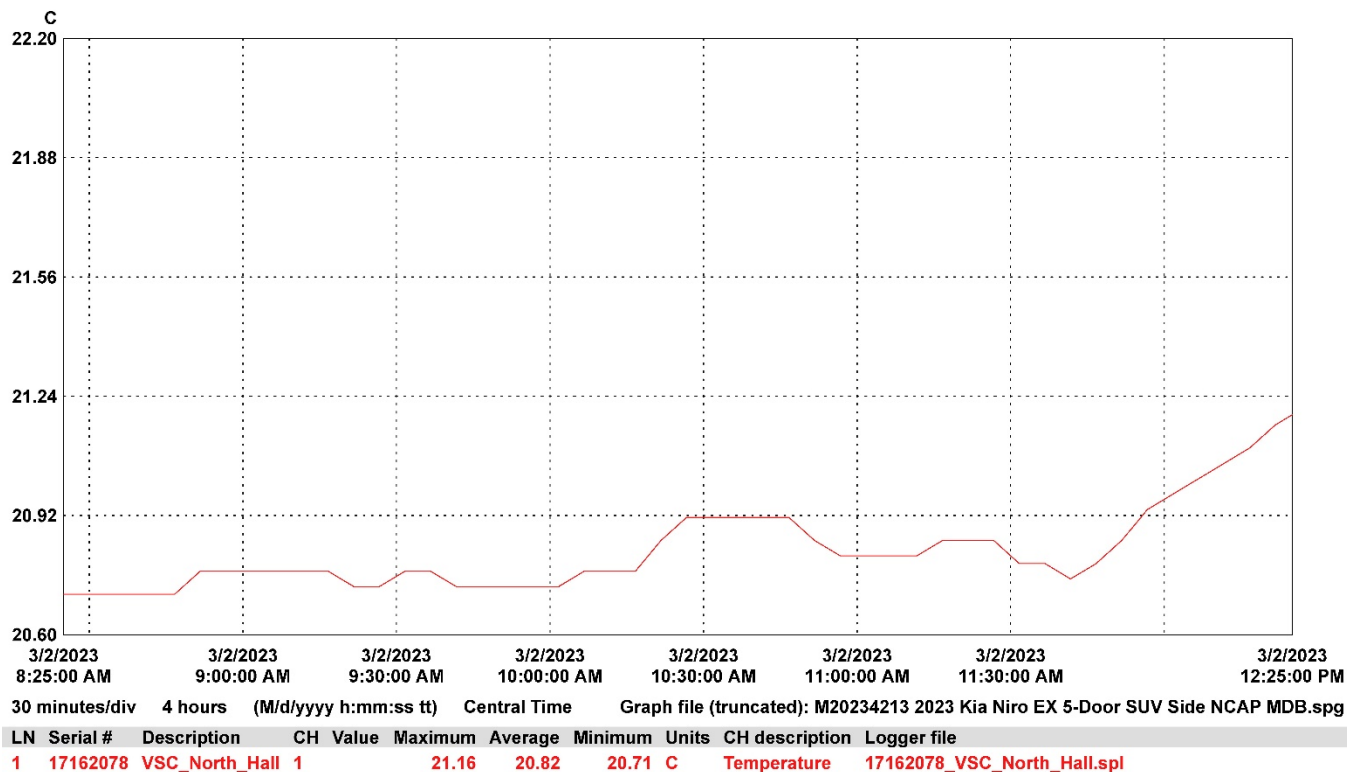
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023



DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

ELECTRIC VEHICLE PROPULSION SYSTEM

	Units	Observations and Conclusions
Type of Electric Vehicle		Gasoline / Electric Hybrid
Propulsion Battery Type		Lithium-Ion
Nominal Voltage	V	240
Physical Location of Automatic Propulsion Battery Disconnect		Under rear seat
Auxiliary Battery Type		Lithium-Ion

PROPULSION BATTERY SYSTEM DATA

	Units	Observations and Conclusions
Electrolyte Fluid Type		LiPF6 salt, carbonate solvent
Electrolyte Fluid Specific Gravity	g/L	1.23
Electrolyte Fluid Kinematic Viscosity	cSt	3.0
Electrolyte Fluid Color		Transparent & pale yellow
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)		Air-Cooled
Location of Battery Modules		X Inside Passenger Compartment
		Outside Passenger Compartment
		The high-voltage battery is located below the 2 nd row seat cushion.

PROPULSION BATTERY STATE OF CHARGE

<i>For all battery types:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	
Maximum State of Charge	
95% of Maximum State of Charge	
Test Voltage - No less than 95% of maximum State of Charge	
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	160.0 V
Maximum State of Charge	275.2 V
Test Voltage – Maximum practicable State of Charge within Normal Operating Range	234.8 V

**DATA SHEET NO. 305-2
PRE-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
Test Date: 3/2/2023

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Location(s)	Vehicle chassis ground near high voltage battery pack
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PROPULSION BATTERY SYSTEM

Details of Electric Energy Storage/Conversion System Test Points	Connected at + and – terminal ends of propulsion system
Additional Comments	None

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		57580164
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		6/21/2022

PROPULSION BATTERY VOLTAGE

Measurement shall be made with Energy Storage/Conversion System connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion system energized) position.
NOTE: If voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

Vb	V	234.8
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ELECTRIC ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) determined and supplied to contractor by COR.
--

V1	V	146.0
V2	V	148.1

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance Ro (in ohms) should be approximately 500 times the normal operating voltage of the vehicle (in volts) per SAE J1766.

Ro	Ω	146,000
----	---	---------

V1' Pre-Impact	V	17.7
V2' Pre-Impact	V	17.4

DATA SHEET NO. 305-3 (CONTINUED)
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$		
Ri1 Pre-Impact	Ω	2,131,810
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$		
Ri2 Pre-Impact	Ω	2,177,806
$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$		
Ri Pre-Impact	Ω	2,131,810
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$		
Ri / Vb Pre-Impact	Ω	9,079

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

DATA SHEET NO. 305-4
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		57580164
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		6/21/2022

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.2
----------------	---	-----

V1 Post-Impact	V	3.4	Impact Time	1	Minutes	21	Seconds
V2 Post-Impact	V	2.8		1	Minutes	25	Seconds
V1' Post-Impact	V	0.1		1	Minutes	34	Seconds
V2' Post-Impact	V	0.1		1	Minutes	30	Seconds

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$							
Ri1 Post-Impact	Ω	8,785,765	Impact Time	1	Minutes	34	Seconds
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 Post-Impact	Ω	8,728,714	Impact Time	1	Minutes	30	Seconds
$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$							
Ri Post-Impact	Ω	8,728,714	Impact Time	1	Minutes	30	Seconds
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$							
Ri / Vb Post-Impact	Ω	37,175	Impact Time	1	Minutes	34	Seconds

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
Not Applicable

	Yes (Fail)	No
Has the Propulsion Battery Module moved within the passenger compartment?		X

Describe intrusion of an outside Propulsion Battery Component into the passenger compartment [Supply photographs as appropriate]:
No Intrusion

	Yes (Fail)	No
Has an outside Propulsion Battery Component intruded into the passenger compartment?		X

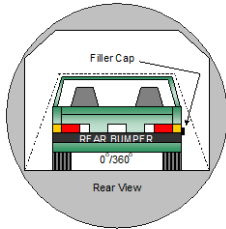
	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

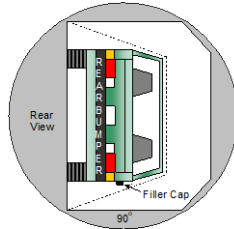
Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

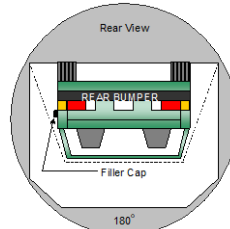
PROPULSION BATTERY SYSTEM COMPONENTS



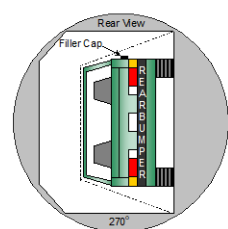
0°/360°



90°



180°



270°

PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	1	min	52	sec	5	min	6	min	52	sec	7	min
90° - 180°	1	min	51	sec	5	min	6	min	51	sec	7	min
180° - 270°	1	min	48	sec	5	min	6	min	48	sec	7	min
270° - 360°	1	min	52	sec	5	min	6	min	52	sec	7	min

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

NOTE: The maximum allowable Propulsion Battery Electrolyte Spillage is 5.0 Liters.

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0° to 90°	0	Not Applicable
90° to 180°	0	Not Applicable
180° to 270°	0	Not Applicable
270° to 360°	0	Not Applicable
Total Spillage	0	

	Yes (Fail)	No
Is the total Propulsion Battery Electrolyte Spillage greater than 5.0 Liters?		X
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		57580164
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		6/21/2022

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.2
----------------	---	-----

Record V1, V2, V1', V2' voltage measurements at the start of each successive increment of 90°, 180°, 270°, and 360° of the static rollover test.

	Voltage	Units	Test Phase	Time			
V1	0.0	V	0°		min		sec
	0.0		90°	2		53	
	0.0		180°	2		50	
	0.0		270°	2		15	
	0.0		360°	2		37	
V2	0.0	V	0°		min		sec
	0.0		90°	2		57	
	0.0		180°	2		54	
	0.0		270°	2		18	
	0.0		360°	2		41	
V1'	0.0	V	0°		min		sec
	0.0		90°	3		7	
	0.0		180°	3		5	
	0.0		270°	2		29	
	0.0		360°	2		51	
V2'	0.0	V	0°		min		sec
	0.0		90°	3		1	
	0.0		180°	2		58	
	0.0		270°	2		23	
	0.0		360°	2		45	

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Kia Niro EX 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20234213
 Test Date: 3/2/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

	Voltage	Units	Test Phase	Time			
Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']							
Ri1	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		7	
	Zero Volts		180°	3		5	
	Zero Volts		270°	2		29	
	Zero Volts		360°	2		51	
Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']							
Ri2	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	2		1	
	Zero Volts		180°	2		58	
	Zero Volts		270°	2		23	
	Zero Volts		360°	2		45	
Ri = The lesser of Ri1 and Ri2							
Ri	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		7	
	Zero Volts		180°	3		5	
	Zero Volts		270°	2		29	
	Zero Volts		360°	2		51	
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage							
Ri / Vb	Zero Volts	Ω/V	0°		min		sec
	Zero Volts		90°	3		7	
	Zero Volts		180°	3		5	
	Zero Volts		270°	2		29	
	Zero Volts		360°	2		51	

NOTE: The minimum Electrical Isolation Value is 500 Ω/V .

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

**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

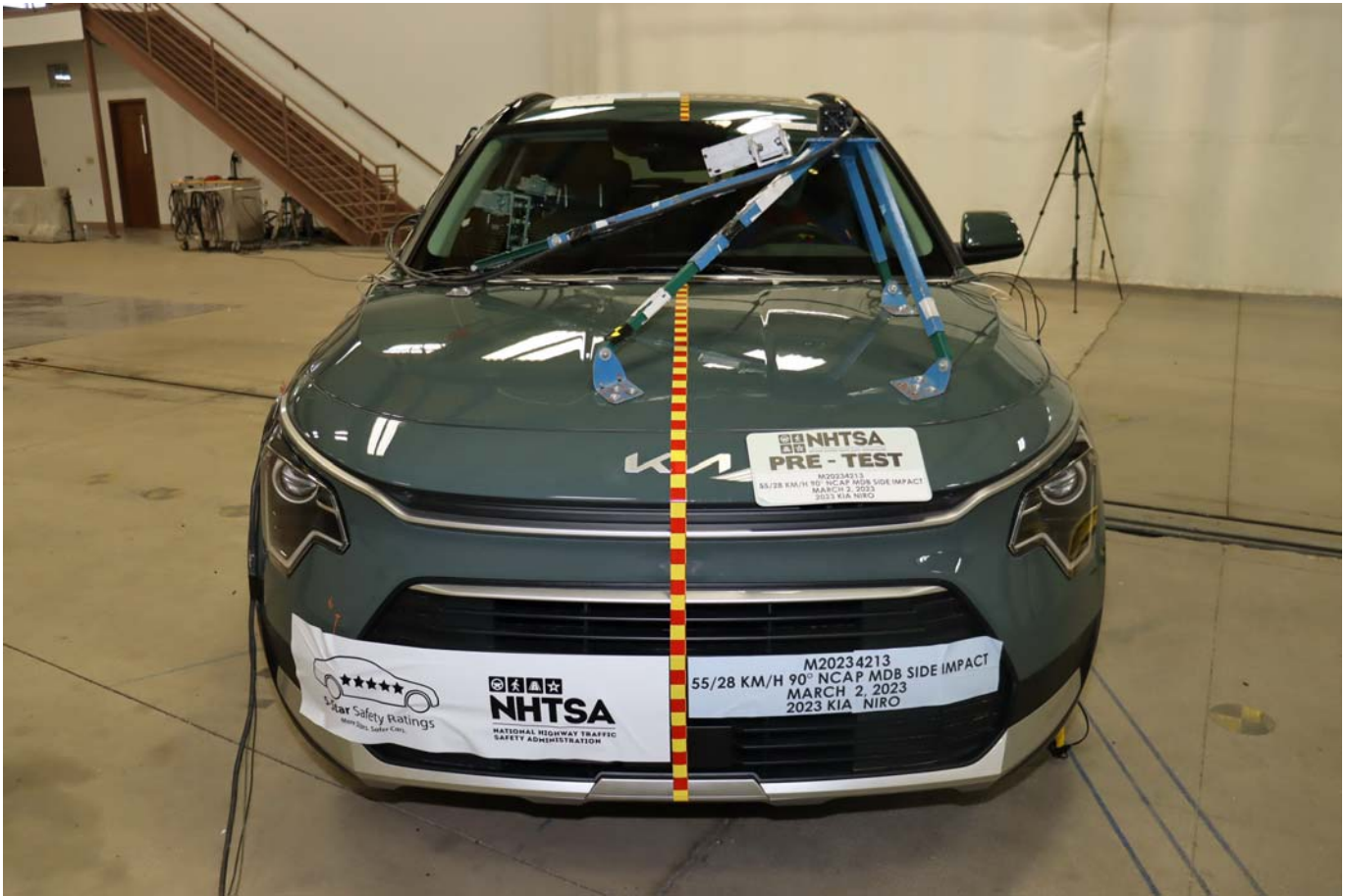


Photo No. 003 - Pre-Test Frontal View of Test Vehicle



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



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

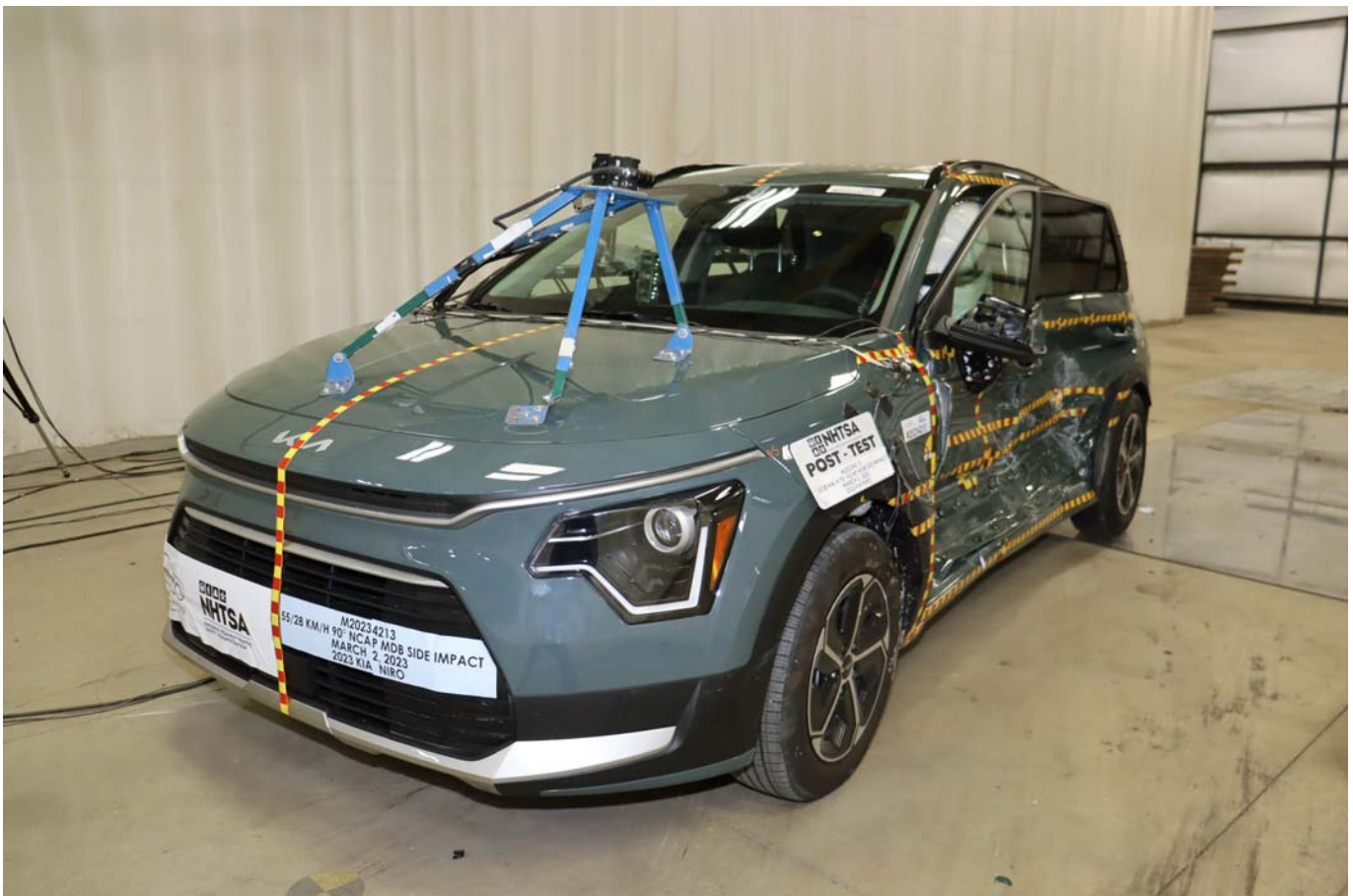


Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle



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

PHOTOGRAPH NOT AVAILABLE

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

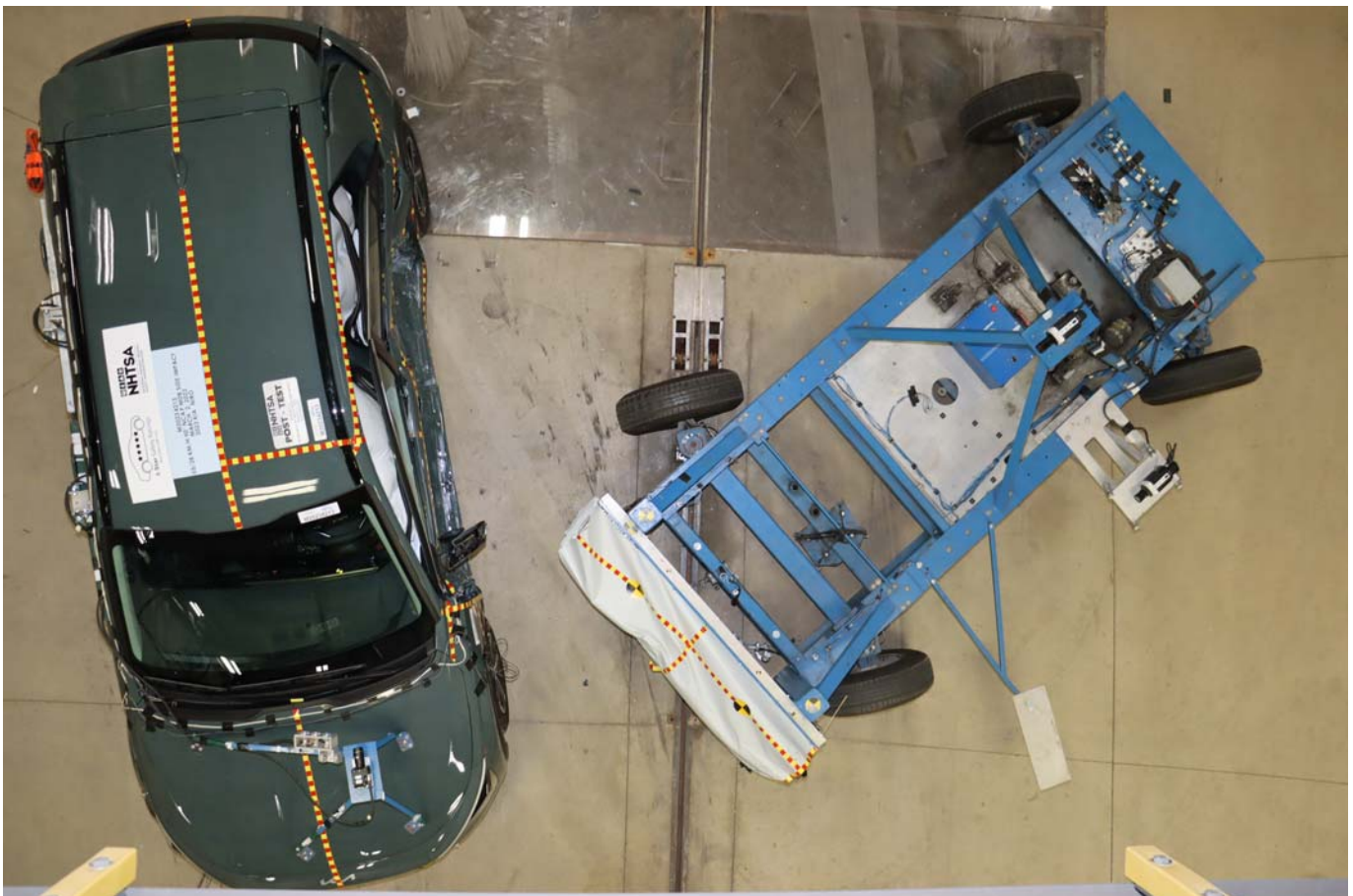


Photo No. 016 - Post-Test Overhead View of Test Area



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's 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

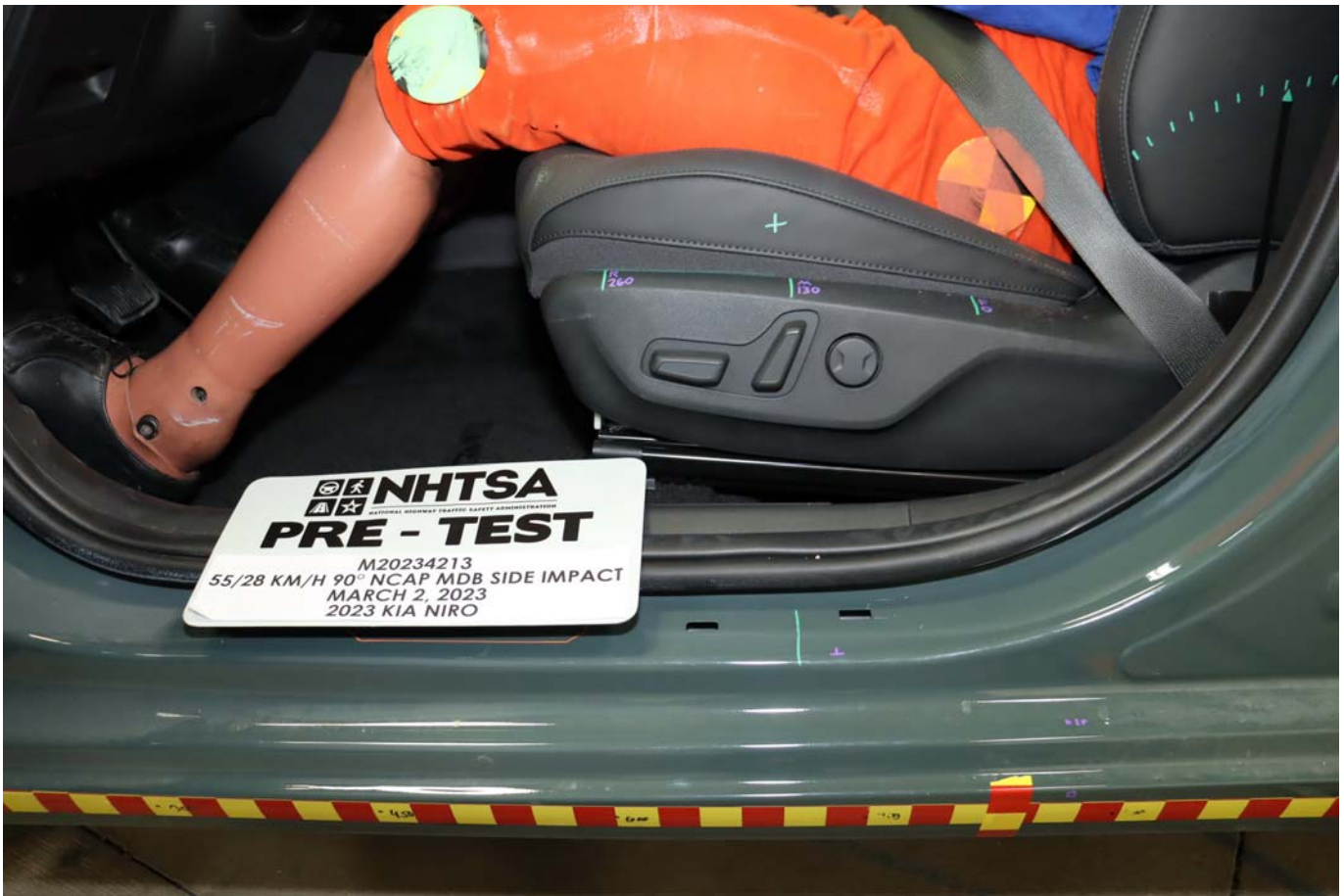


Photo No. 039 - Pre-Test Close-Up Left Side View of Driver Seat Track



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



Photo No. 042 - Pre-Test Driver Dummy and Door Clearance View



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



Photo No. 045 - Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment

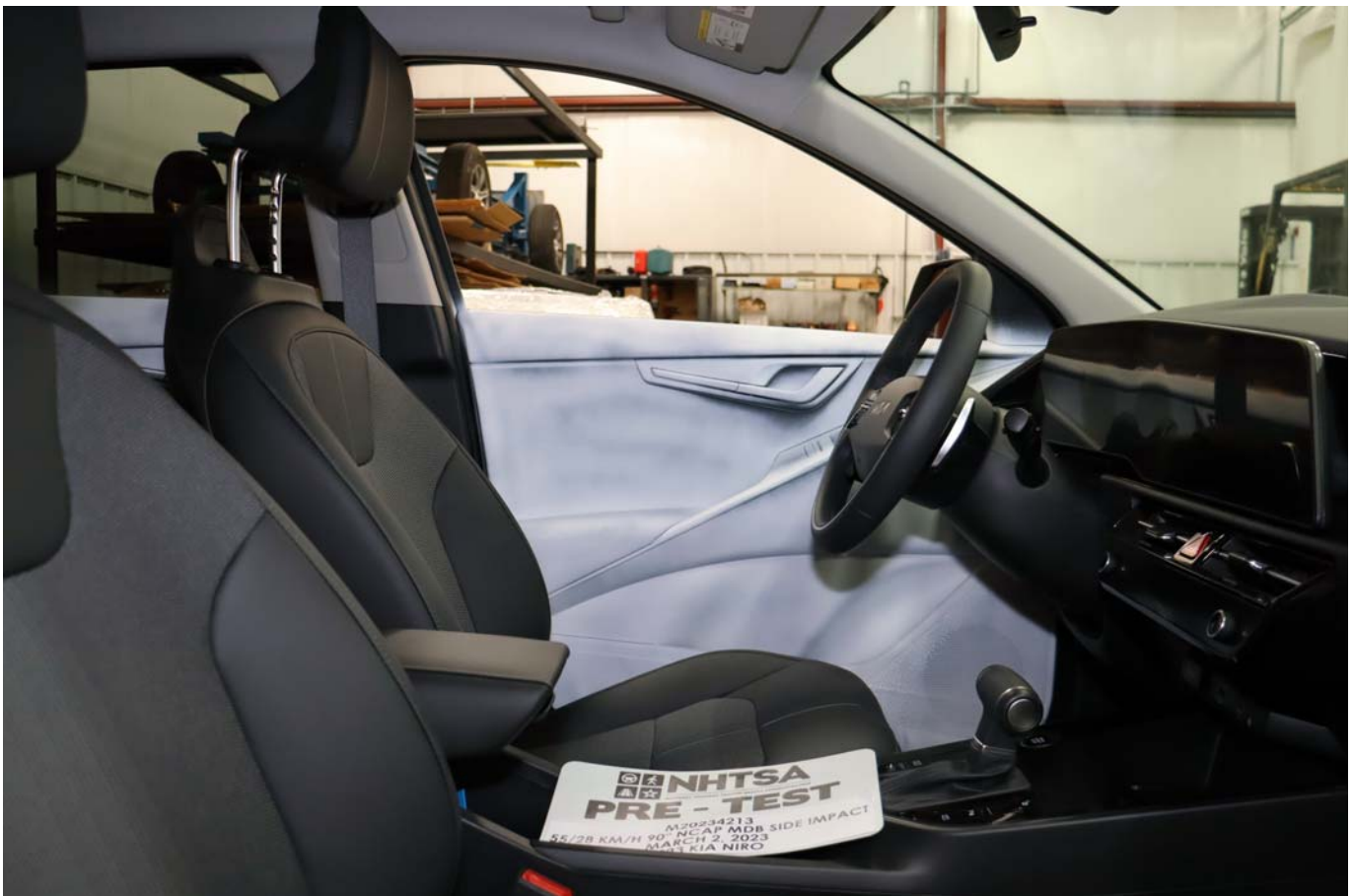


Photo No. 046 - Pre-Test Driver Inner Door Panel View



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



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

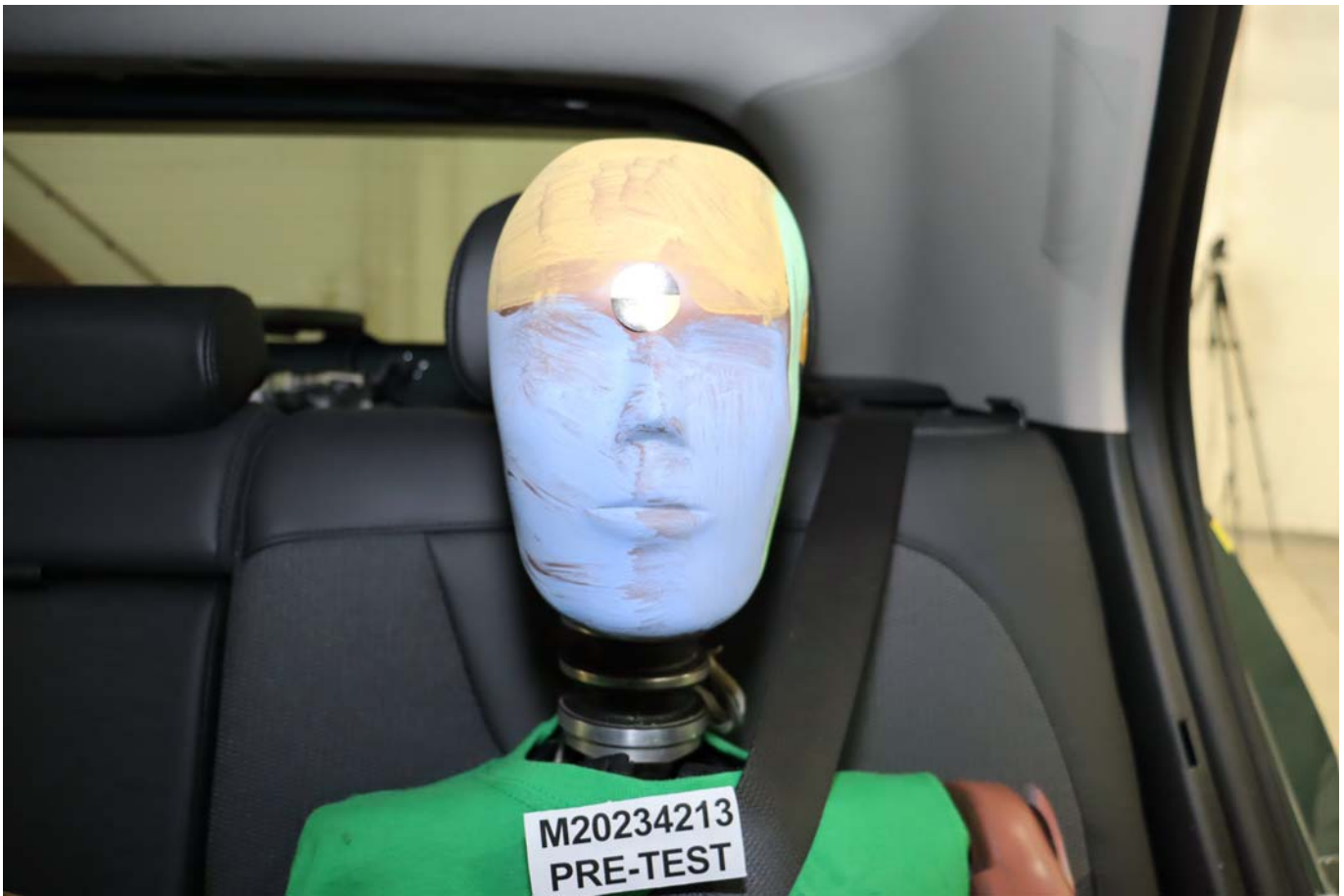


Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 060 - Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Photo No. 061 - Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



Photo No. 062 - Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Photo No. 063 - Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



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

PHOTOGRAPH NOT APPLICABLE

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

PHOTOGRAPH NOT APPLICABLE

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

PHOTOGRAPH NOT APPLICABLE

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

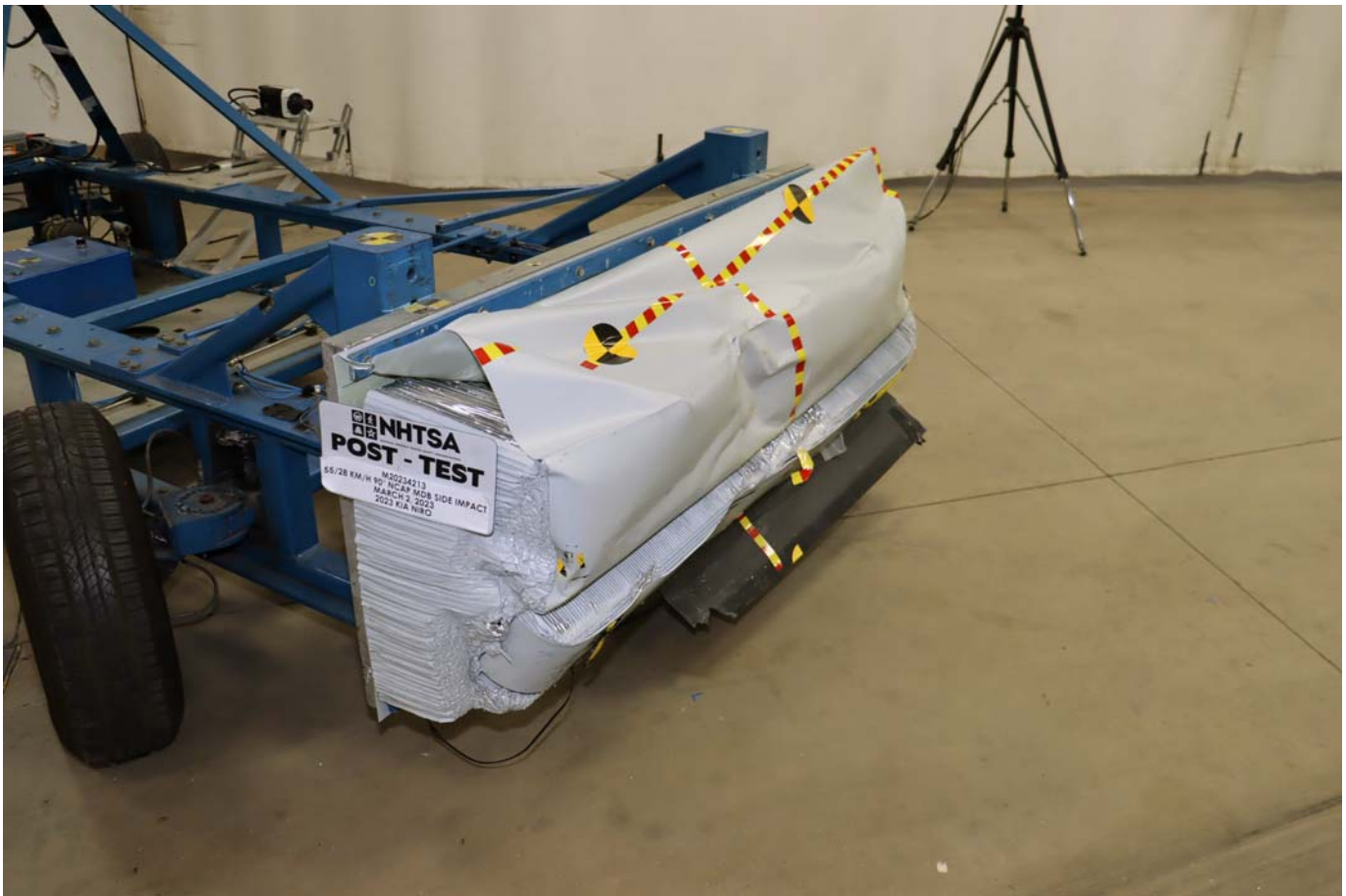


Photo No. 091 - Post-Test Right Side View of MDB Impactor Face



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



Photo No. 093 - Close-Up View of Vehicle's 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



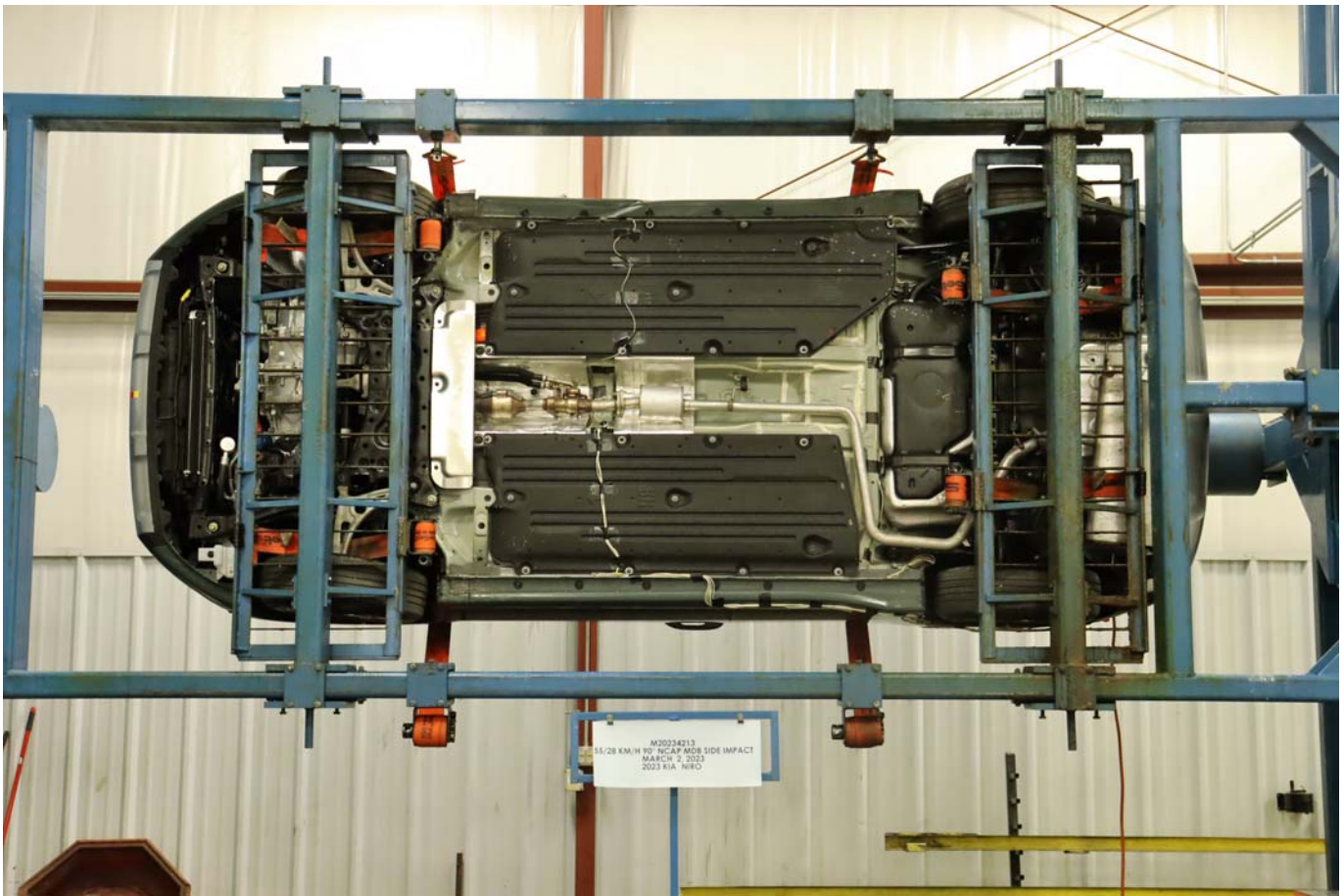


Photo No. 099 - FMVSS Photo No. 301 Static Rollover 270 Degrees



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



Photo No. 101 - Impact Event

2023 NIRO EX MODEL/OPT.CODE: G4242 / 010 EXTERIOR COLOR: CITYSCAPE GREEN INTERIOR COLOR: CHARCOAL VEHICLE ID NUMBER: KNDCR3LE5P5059019 PORT OF ENTRY: TACOMA	Sold To: W032 Rosen Kia 5565 S. 27TH STREET MILWAUKEE WI 53221 Ship To: W032	#1 Brand in Dependability Awarded to Kia															
STANDARD FEATURES	MANUFACTURER'S SUGGESTED RETAIL PRICE ▶ \$29,090.00	EPA DOT Fuel Economy and Environment Gasoline Vehicle															
STANDARD LX FEATURES MECHANICAL 1.6L 4-Cyl Engine w/ Hybrid Electric Motor 6-Speed Dual Clutch Automatic Transmission Drive Mode Select Electronic Parking Brake w/ Auto Hold	COMPARE EX FEATURES Added to/in place of standard LX features - Roof Rails - 10.25" Touchscreen w/ Navigation & MapCare - Kia Connect w/ 12-Mo. Trial.* Where Available** - SIRIUSXM® w/Free 3-Mo. Subscription* - Wireless Phone Charger - Smart Key w/ Push Button & Remote Start - Power Driver's Seat - Cloth & SynTex Seating Material - Heated Front Seats - Upgraded Interior Trim - Rain-Sensing Wipers - Fwd Collision-Avoidance Assist-Cyclist/Junction - Smart Cruise Control w/ Stop & Go - Parking Distance Warning - Reverse - Highway Driving Assist	Fuel Economy 53 MPG combined city/hwy 53 city 54 highway 1.9 gallons per 100 miles															
KIA DRIVE WISE DRIVER-ASSIST TECHNOLOGY Forward Collision-Avoidance Assist - Pedestrian Blind-Spot Collision Warning Rear Cross-Traffic Collision-Avoidance Assist Lane Following Assist Safe Exit Warning Driver Attention Warning High Beam Assist	ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features) Carpeted Floor Mats	You save \$3,750 in fuel costs over 5 years compared to the average new vehicle.															
SAFETY Dual Front Advanced Airbags & Driver's Knee Airbag Dual Front Seat-Mounted Side & Full-Length Curtain Airbags Electronic Stability Control & Hill-Start Assist Control Tire Pressure Monitoring System	MSRP INCLUDING OPTIONS \$29,245.00 INLAND FREIGHT AND HANDLING \$1,295.00	Annual fuel Cost \$850 Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only) 1 9 10 1 7 10 This vehicle emits 167 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at fuelconomy.gov.															
INTERIOR, COMFORT & CONVENIENCE 8" Touchscreen w/ Rear Camera Android Auto and Apple CarPlay Remote Keyless Entry USB / Media Port and 12 Volt Outlet Bluetooth® Wireless Technology Steering Wheel Controls (Bluetooth/Audio/Cruise) Dual Zone Automatic Climate Control 60/40 Split-Folding Rear Seats 4.2" Instrument Display Rear Occupant Alert	TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶ \$30,540.00	GOVERNMENT 5-STAR SAFETY RATINGS Overall Vehicle Score Not Rated Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight. <table border="1"> <tr> <td>Frontal</td> <td>Driver</td> <td>Not Rated</td> </tr> <tr> <td>Crash</td> <td>Passenger</td> <td>Not Rated</td> </tr> <tr> <td>Side</td> <td>Front seat</td> <td>Not Rated</td> </tr> <tr> <td>Crash</td> <td>Rear seat</td> <td>Not Rated</td> </tr> <tr> <td>Rollover</td> <td></td> <td>Not Rated</td> </tr> </table> Star ratings based on the risk of injury in a single-vehicle crash. Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236	Frontal	Driver	Not Rated	Crash	Passenger	Not Rated	Side	Front seat	Not Rated	Crash	Rear seat	Not Rated	Rollover		Not Rated
Frontal	Driver	Not Rated															
Crash	Passenger	Not Rated															
Side	Front seat	Not Rated															
Crash	Rear seat	Not Rated															
Rollover		Not Rated															
WARRANTY 10 Year/100,000 Mile Limited Powertrain Warranty 10 Year/100,000 Mile Limited Battery Warranty 5 Year/60,000 Mile Limited Basic Warranty 5 Year/60,000 Mile Roadside Assistance	TOTAL ADDITIONAL WEIGHT: 7.6	PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 1 % MAJOR SOURCES OF FOREIGN PARTS: KOREA: 90% NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS. FOR THIS VEHICLE FINAL ASSEMBLY POINT: HWASUNG, KOREA COUNTRY OF ORIGIN ENGINE: KOREA TRANSMISSION: KOREA															
*Additional terms and conditions apply. **Kia Connect may be currently unavailable for Model Year 2022 and newer vehicles sold or purchased in Massachusetts; please see kia.com for updates on availability. NOTE: When you purchase this vehicle, Kia America, Inc. collects personal information you provide to the dealership. For information on our collection and use of personal information and your rights, please see our Privacy Policy on www.kia.com.		fuelconomy.gov Calculate personalized estimates and compare vehicles Smartphone QR Code															

Photo No. 102 - Monroney Label

3. Release the switch once the seat reaches the desired position.

Adjusting lumbar support for driver's seat (if equipped)



The lumbar support can be adjusted by pressing the lumbar support switch on the side of the seat.

1. Press the front portion (1) of the switch to increase support or the rear portion (2) of the switch to decrease support.
2. Release the switch once it reaches the desired position.

Headrest for front seat

The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort.



The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a rear collision.

For maximum effectiveness in case of an accident, the headrest should be

adjusted so the middle of the headrest is as high as the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is similar with the height of the top of their eyes. Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

WARNING

Headrest removal/adjustment

- Do not operate the vehicle with the headrests removed. Headrests can provide critical neck and head support in a crash.
- Do not adjust the headrest height while the vehicle is in motion. Driver may lose control of the vehicle.

CAUTION

Excessive pulling or pushing may damage the headrest.

Adjusting the height up and down



To raise the headrest:

- Pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support.
- Lower the headrest to the desired position (3).

* NOTICE

If you recline the seatback towards the front with the headrest and seat cushion raised, the headrest may come in contact with the sun visor or other parts of the vehicle.



Forward and backward adjustment (for front seats)



The headrest may be adjusted forward to 3 different positions by pulling the headrest forward to the desired position. To adjust the headrest to its furthest backwards position, pull it fully forward to the farthest position and release it. Adjust the headrest so that it properly supports the head and neck.

Removing headrest

Type A



Type B



To remove the headrest:

1. Recline the seatback (2) with the recline lever or switch (1).
2. Raise headrest as far as it can go.
3. Press the headrest release button (3) while pulling the headrest up (4).

WARNING

Removing headrest

NEVER allow anyone to ride in a seat with the headrest removed or reversed. Headrests can provide critical neck and head support in a crash.

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

Reinstalling headrest

Type A



Type B



To reinstall the headrest:

1. Put the headrest poles (2) into the holes while pressing the release button (1).
2. Recline the seatback (4) with the recline lever or switch (3).
3. Adjust the headrest to the appropriate height.

WARNING

Headrest Reinstallation

To reduce the risk of injury to the head or neck, always make sure the headrest is locked into position and adjusted properly after reinstalling.

Seatback pocket (if equipped)

There is a pocket (1) in the front seat back for storing simple books or atlases, and USB charger (2) (if equipped) for rear passengers.



WARNING

Seatback pockets

Do not put heavy or sharp objects in the seatback pockets. In an accident they could come loose from the pocket and injure vehicle occupants.

Headrest for rear seat

The rear seat is equipped with headrests in all the seating positions for the occupant's safety and comfort.



The headrest not only provides comfort for passengers, but also helps protect the head and neck in the event of a collision.

To maximize the effectiveness in case of accidents, the headrest should be adjusted so the middle of the headrest is as high as the center of gravity of an occupant's head. Generally, the center of gravity of most people's heads is similar with the height as the top of their eyes. Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

Adjusting the height up and down



- To raise the headrest, pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

Removal and reinstallation



- To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest upward (2).
- To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height and ensure that it locks in position.

Armrest (if equipped)



To use the armrest, pull it forward from the seatback.

Folding the rear seat

The rear seatbacks may be folded to facilitate carrying long items or to increase the luggage capacity of the vehicle.

Folding down the rear seatback

1. Set the front seatback to the upright position and, if necessary, slide the front seat forward.
2. Lower the rear headrests to the lowest position.

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

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-01 - Auxiliary Power Module Warning Label



Photo No. 305-02 - Power Inverter Warning Label

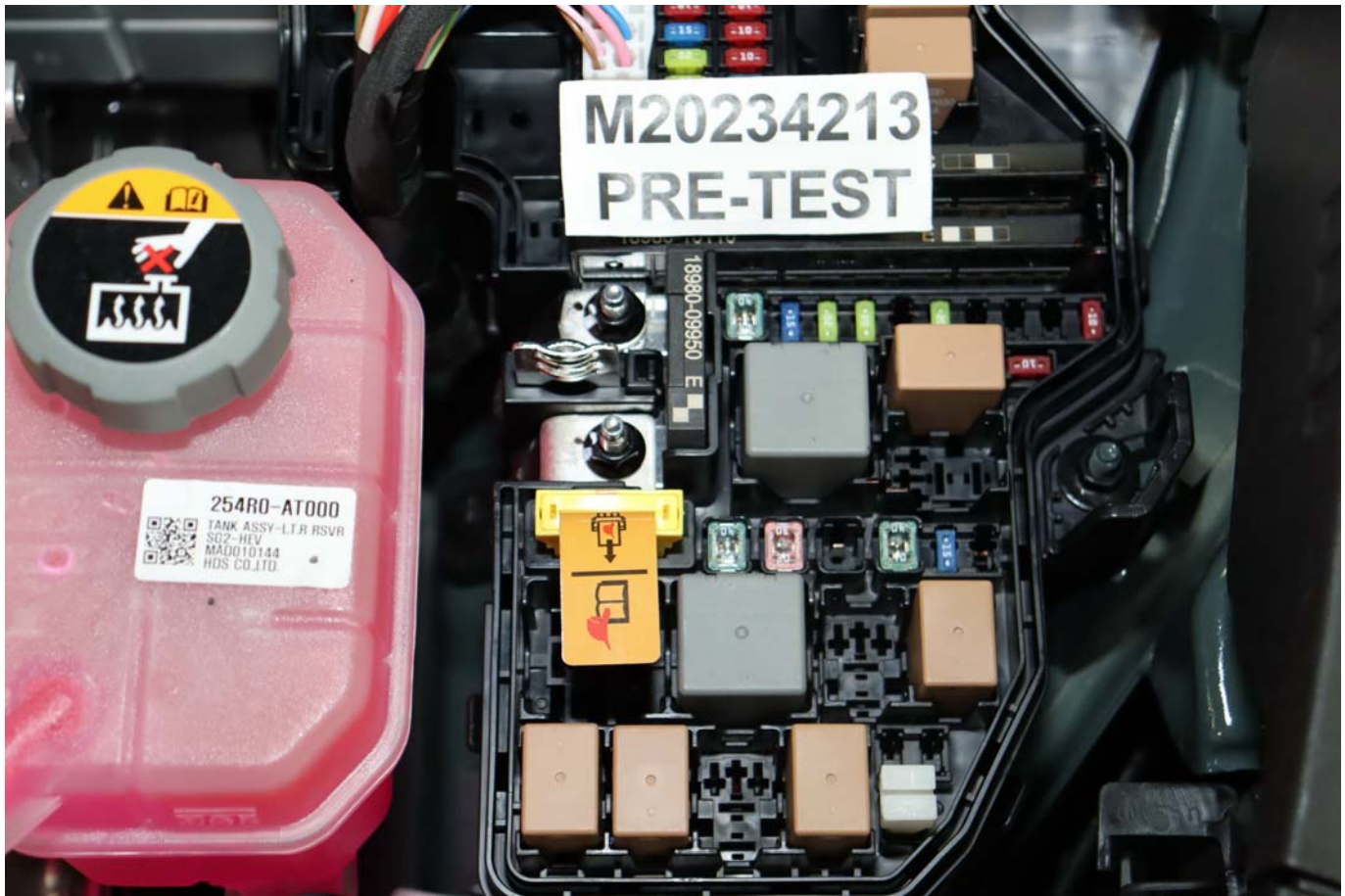


Photo No. 305-03 - First Responder Warning Label



Photo No. 305-04 - First Responder Warning Location



Photo No. 305-05 - Other Vehicle Label(s) Related to Electrical Propulsion System

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-06 - Manual High Voltage Service Disconnect in Place

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-07 - Manual High Voltage Service Disconnect Removed

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-08 - Manual High Voltage Service Disconnect Removed

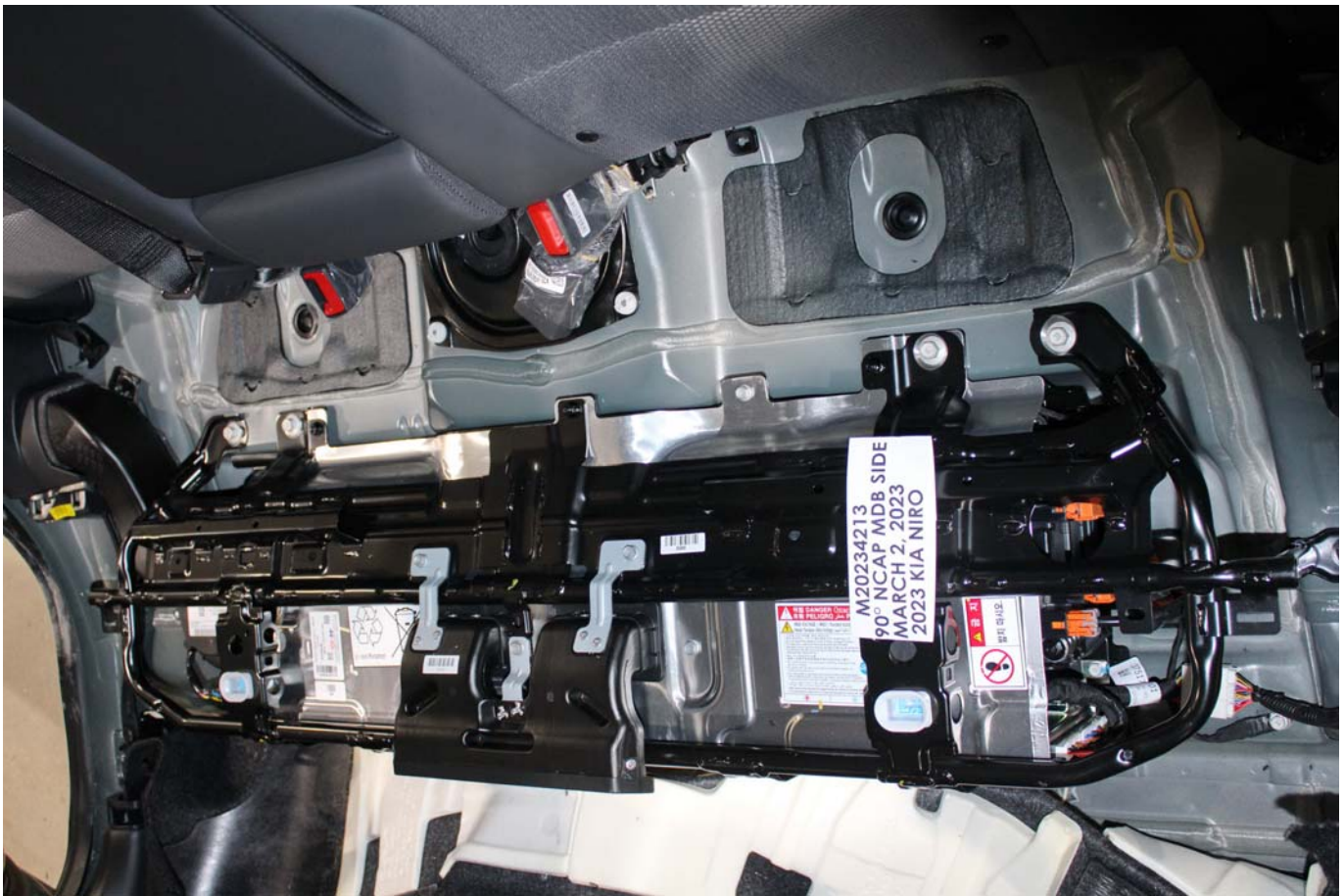


Photo No. 305-09 - Pre-Impact View of Propulsion Battery

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-10 - Post-Impact Front View of Propulsion Battery

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-11 - Post-Impact Rear View of Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-12 - Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-13 - Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-14 - Pre-Impact View of Propulsion Battery Module(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-15 - Post-Impact View of Propulsion Battery Module(s)

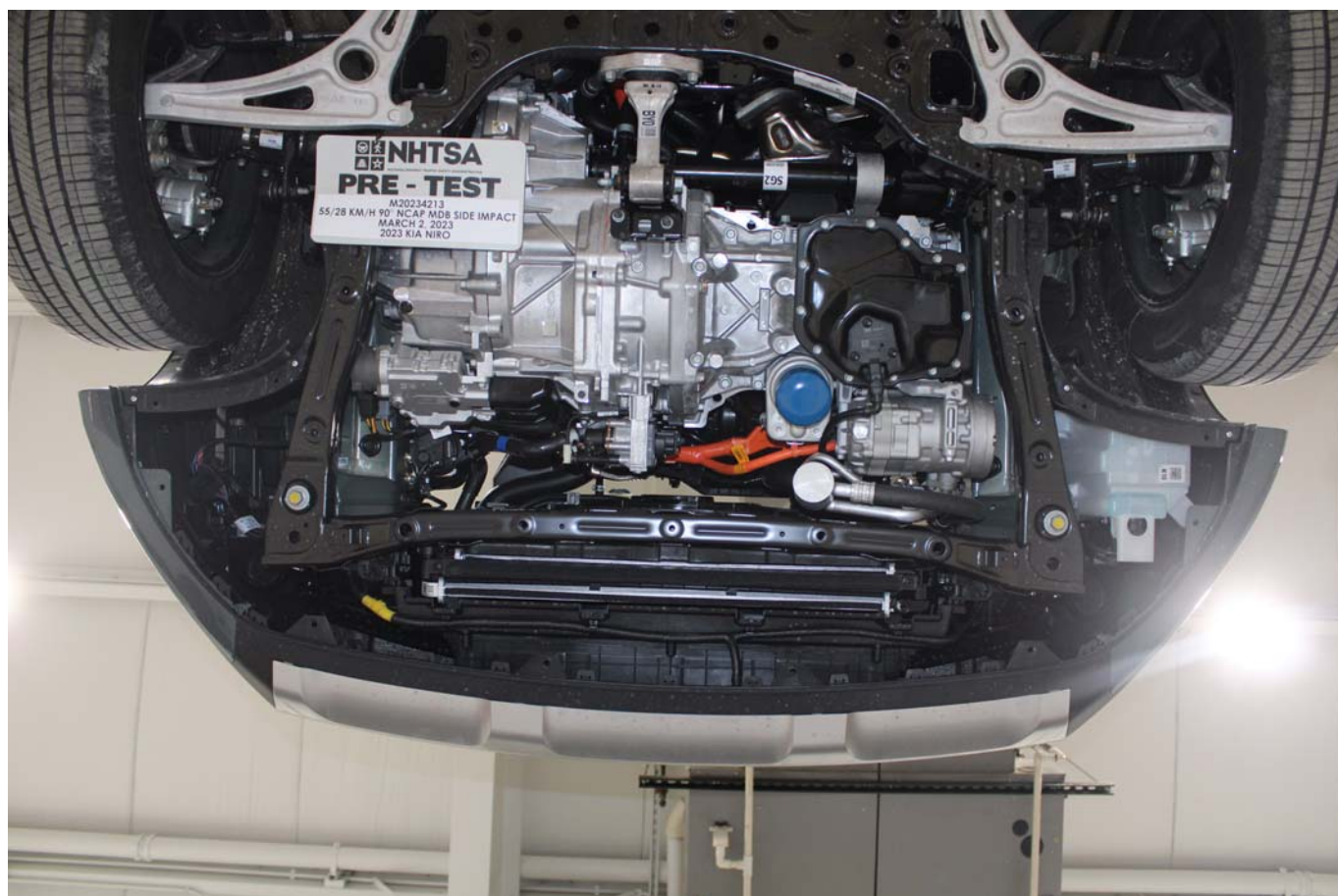


Photo No. 305-16 - Pre-Impact View of Electric Propulsion Drive

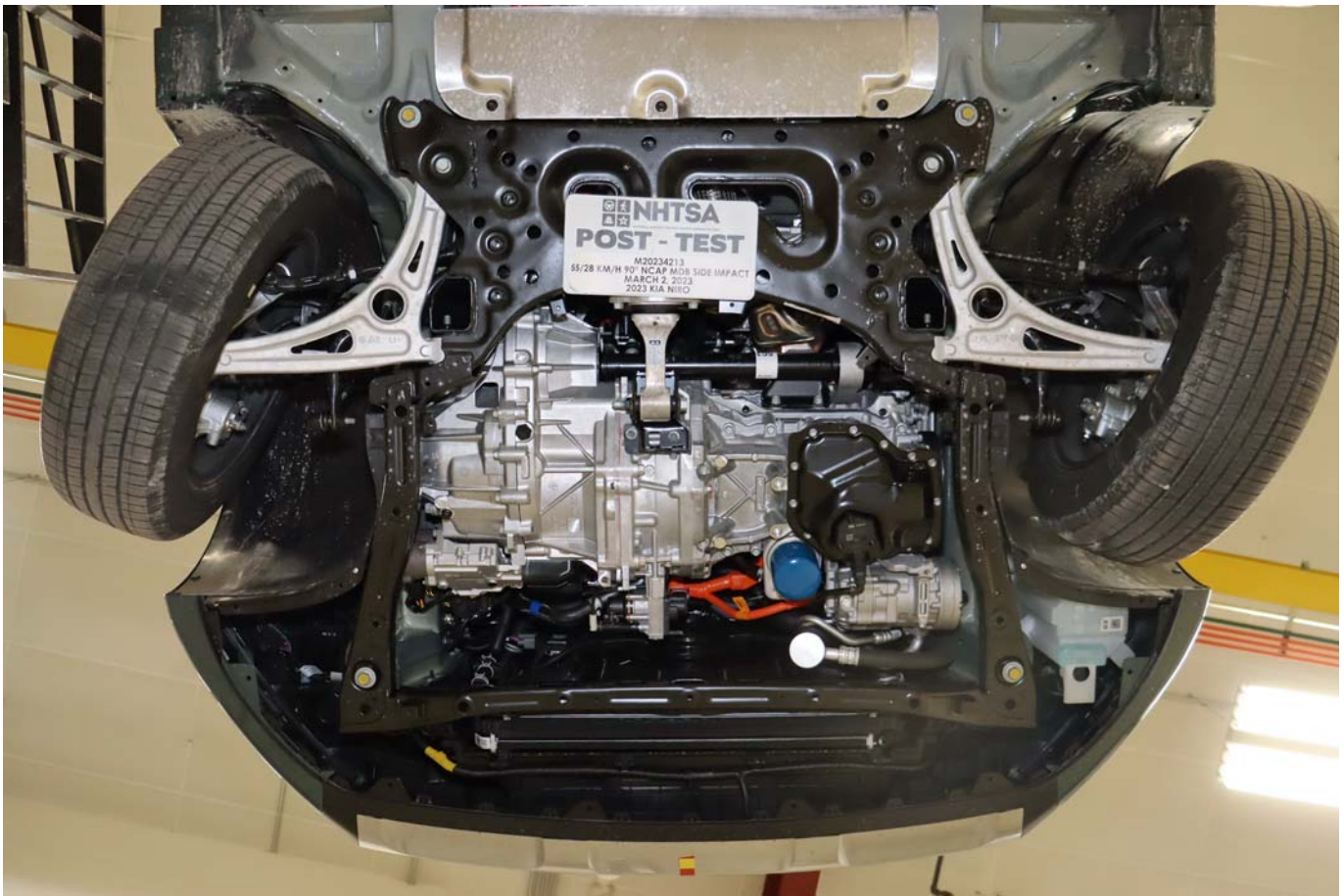


Photo No. 305-17 - Post-Impact View of Electric Propulsion Drive



Photo No. 305-18 - Pre-Impact View of High Voltage Interconnect(s)



Photo No. 305-19 - Pre-Impact View Propulsion Battery Venting System(s)

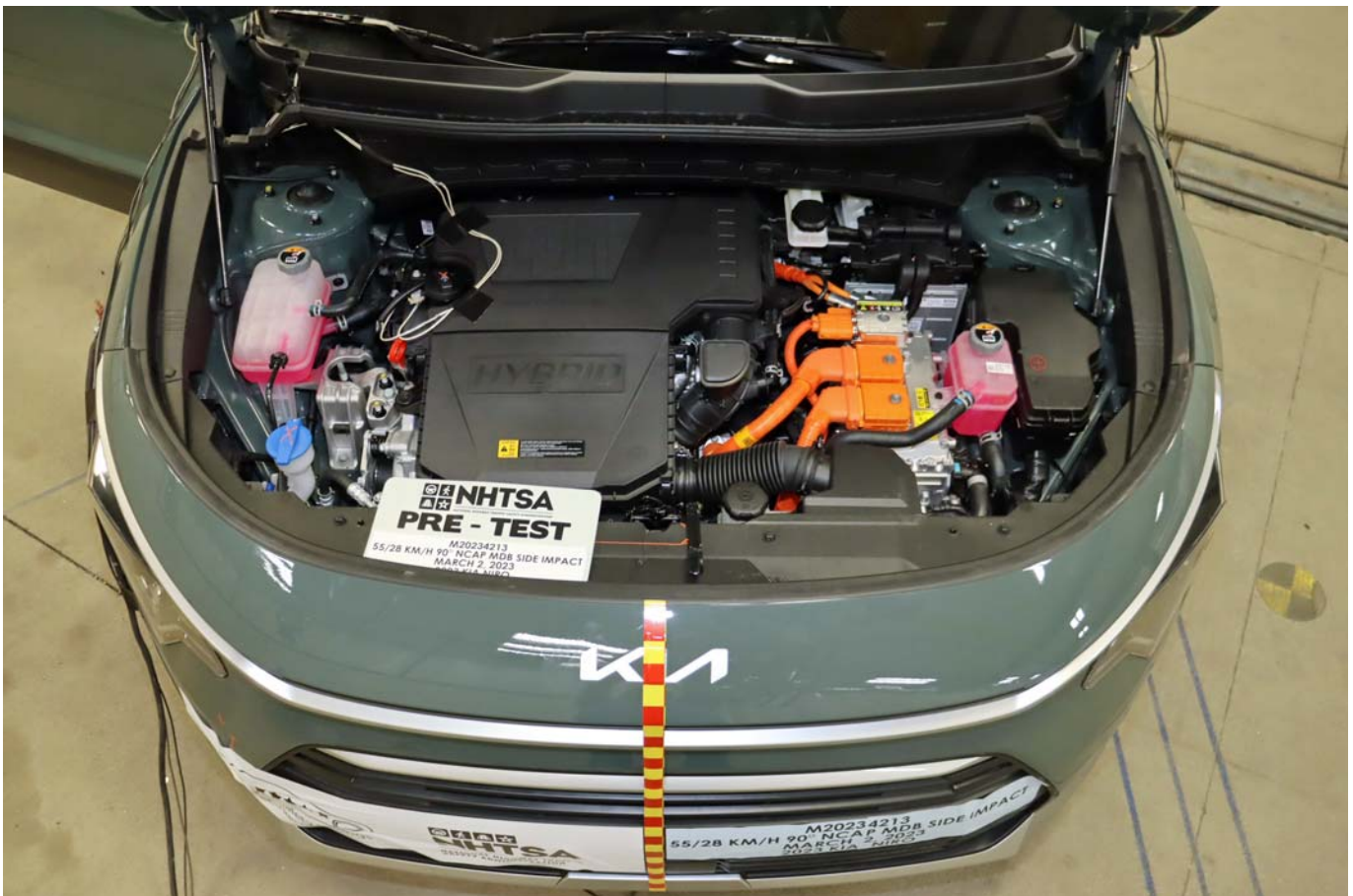


Photo No. 305-20 - Pre-Impact View of Other Visible Electric Propulsion Components



Photo No. 305-21 - Pre-Impact View of Ground Lead Attached



Photo No. 305-22 - Pre-Impact View of High Voltage Leads Attached



Photo No. 305-23 - Pre-Impact Close-Up View of High Voltage Leads Attached



Photo No. 305-24 - Pre-Impact View of Installed Test Interface Port



Photo No. 305-25 - Post-Impact View of Installed Test Interface Port

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-26 - Pre-Impact View of Other Test Devices



Photo No. 305-27 - Post-Impact View of Other Test Devices



Photo No. 305-28 - FMVSS No. 305 Static Rollover at 90 Degrees



Photo No. 305-29 - FMVSS No. 305 Static Rollover at 180 Degrees

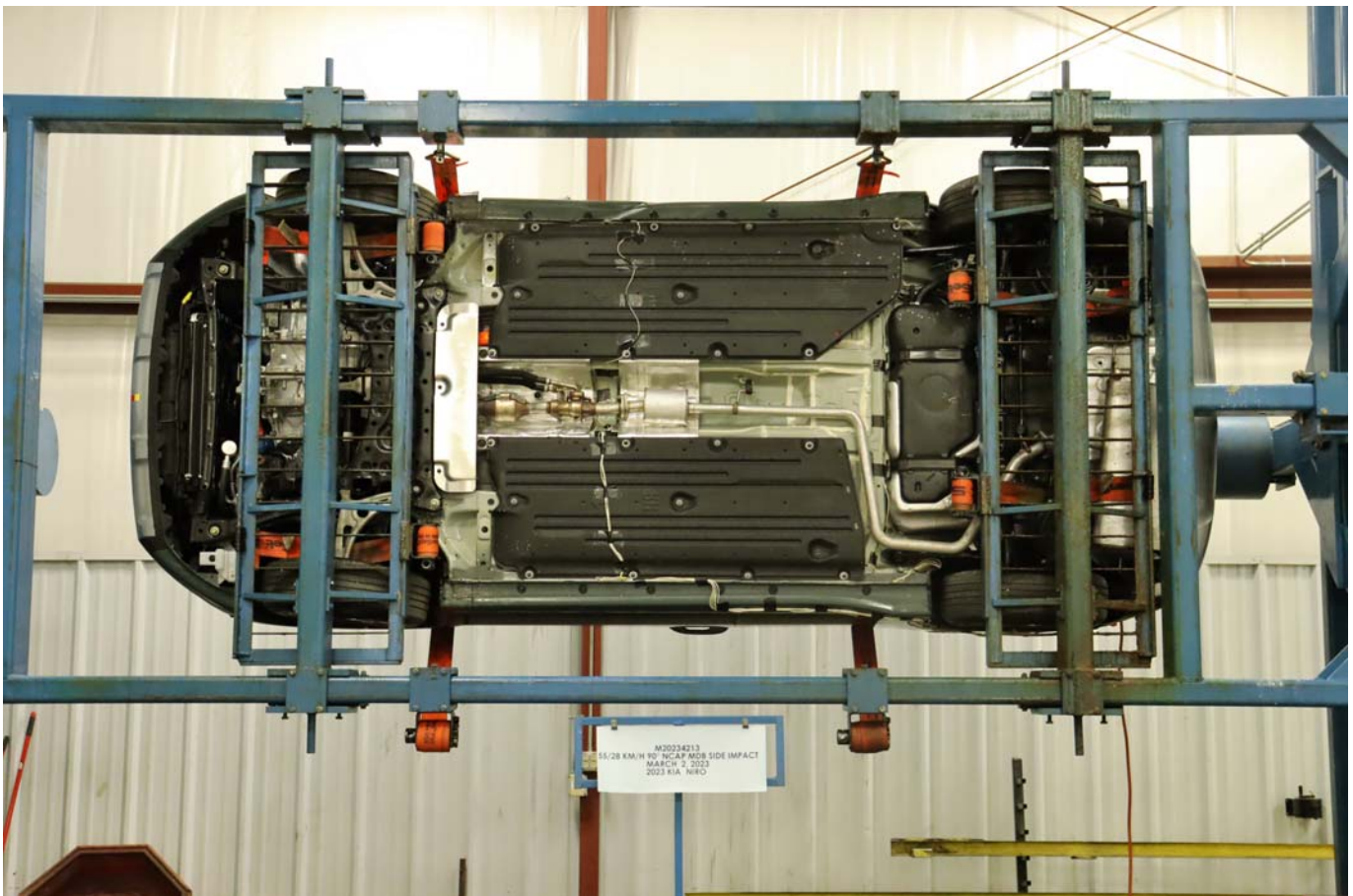


Photo No. 305-30 - FMVSS No. 305 Static Rollover at 270 Degrees



Photo No. 305-31 - FMVSS No. 305 Static Rollover at 360 Degrees



Photo No. 305-32 - Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Photo No. 305-33 - Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-34 - Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-35 - Post-Impact View of Battery Component Intrusion

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-36 - Post-Impact View of Battery Module Movement or Retention Loss

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-37 - Post-Impact View of Propulsion Battery Electrolyte Spillage Location

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-38 - Post-Test View of Propulsion Battery Electrolyte Spillage Location

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration Primary vs. Time	B-1
Figure No. 5.	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 6.	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
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Figure No. 17.	Passenger Head Resultant Acceleration Primary vs. Time	B-5
Figure No. 18.	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-6
Figure No. 19.	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
Figure No. 20.	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
Figure No. 21.	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
Figure No. 22.	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
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)

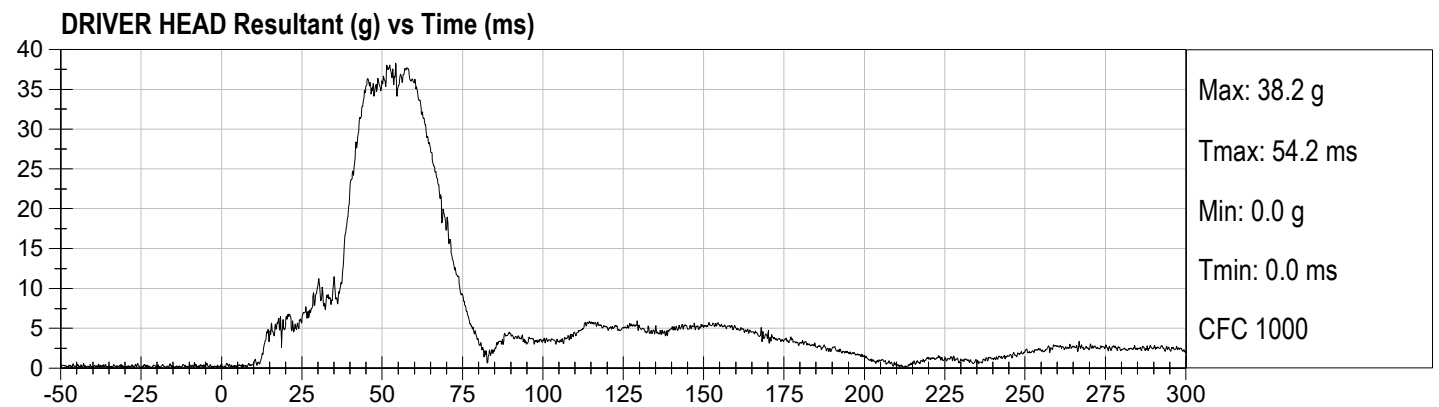
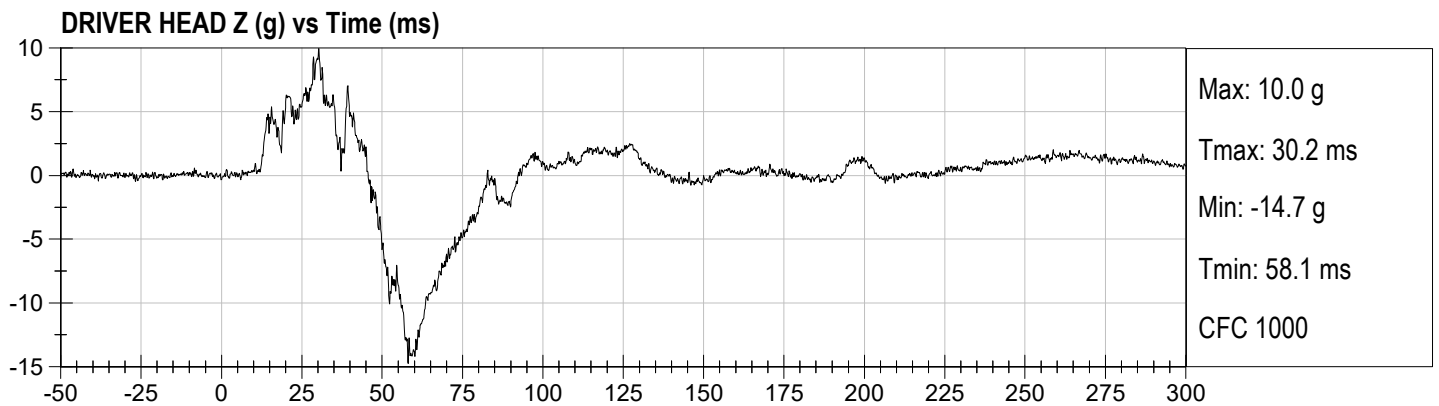
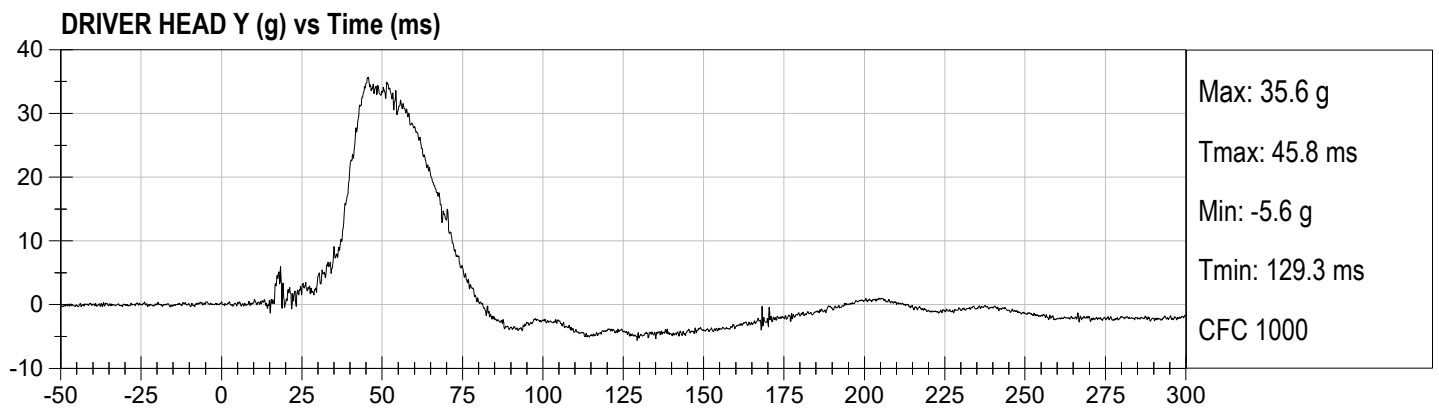
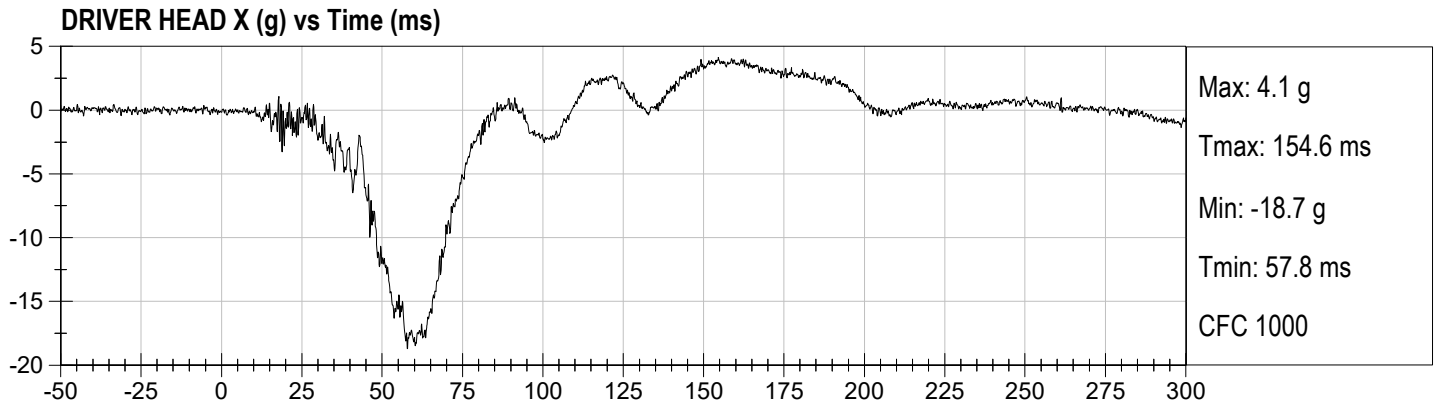
MDB Center of Gravity Acceleration (Z)

MDB Rear Acceleration (X)

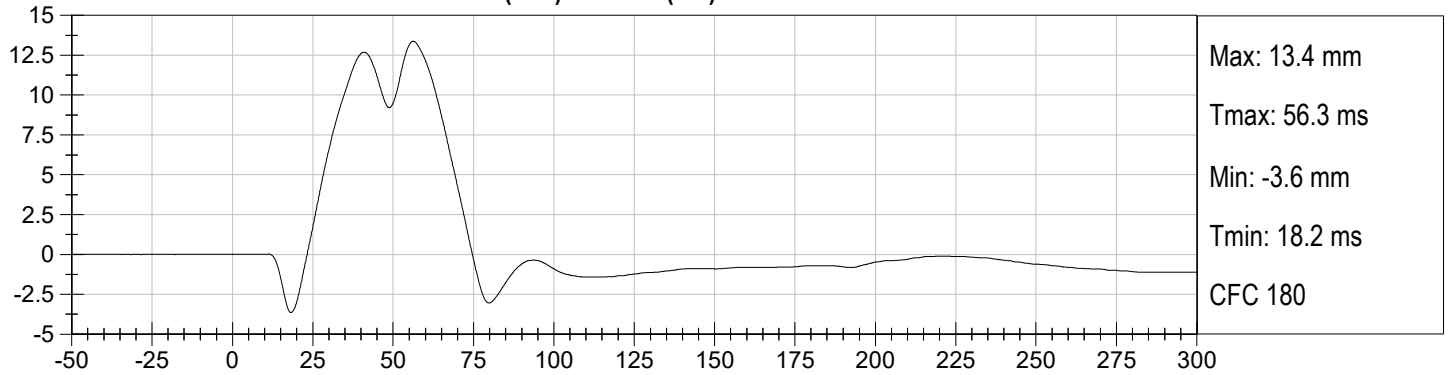
MDB Rear Acceleration (Y)

Left MDB Contact Switch

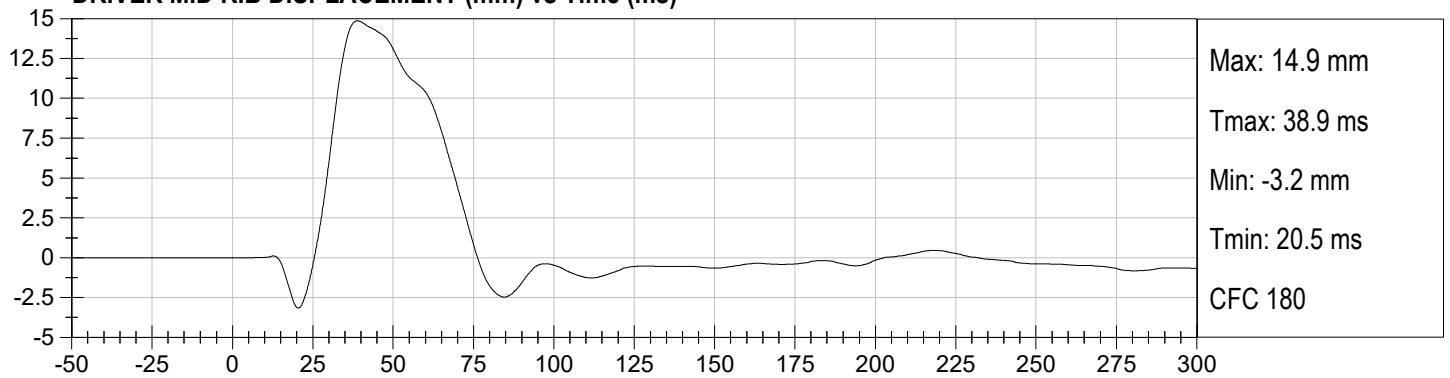
Right MDB Contact Switch



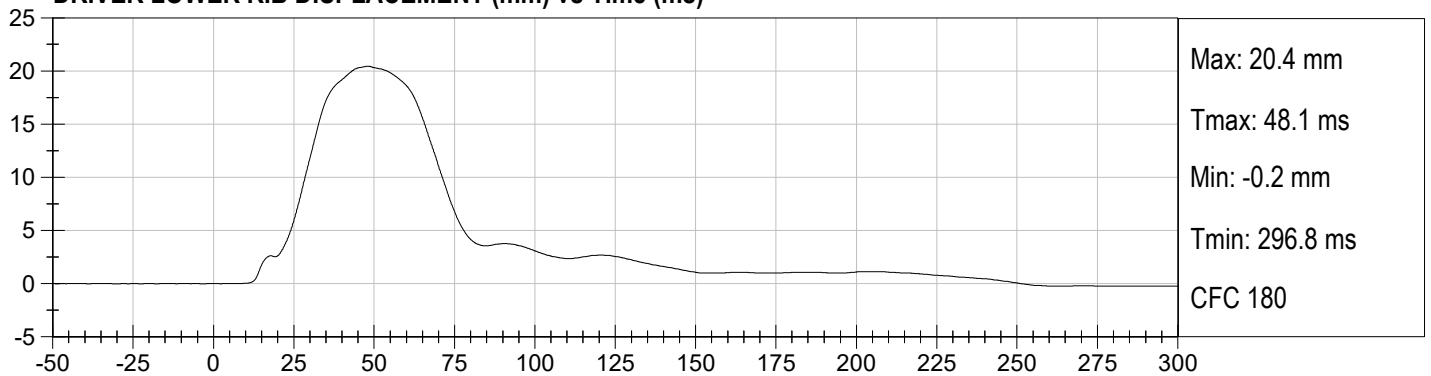
DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)



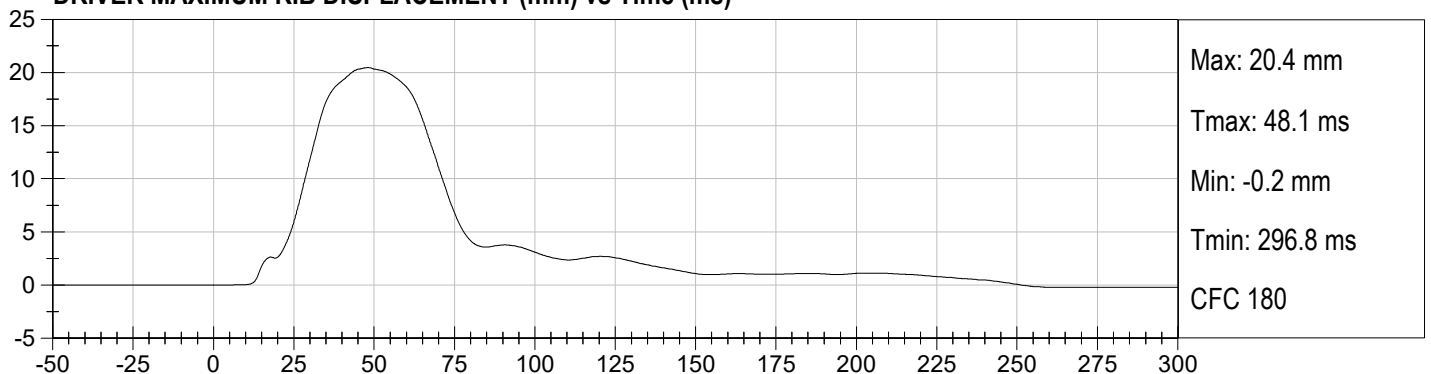
DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)



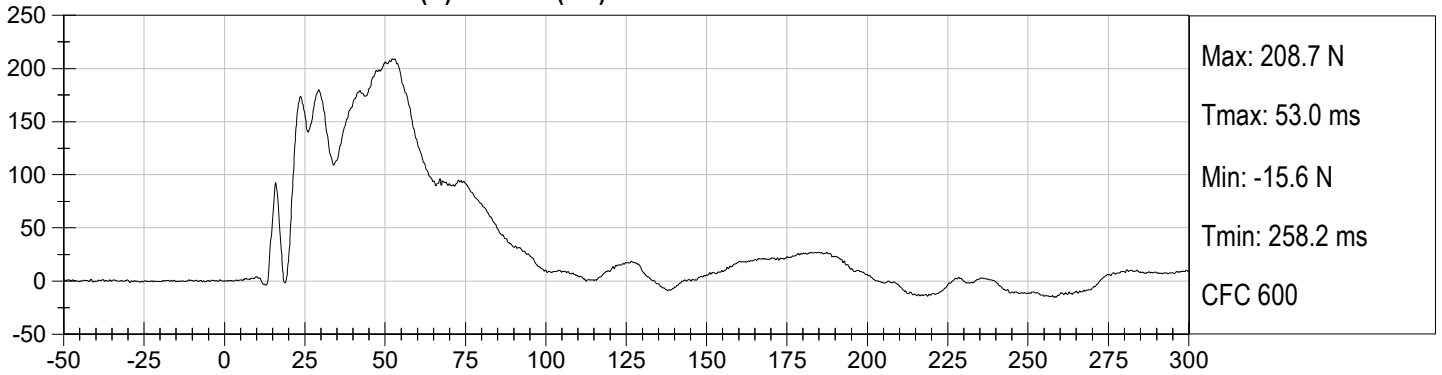
DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)



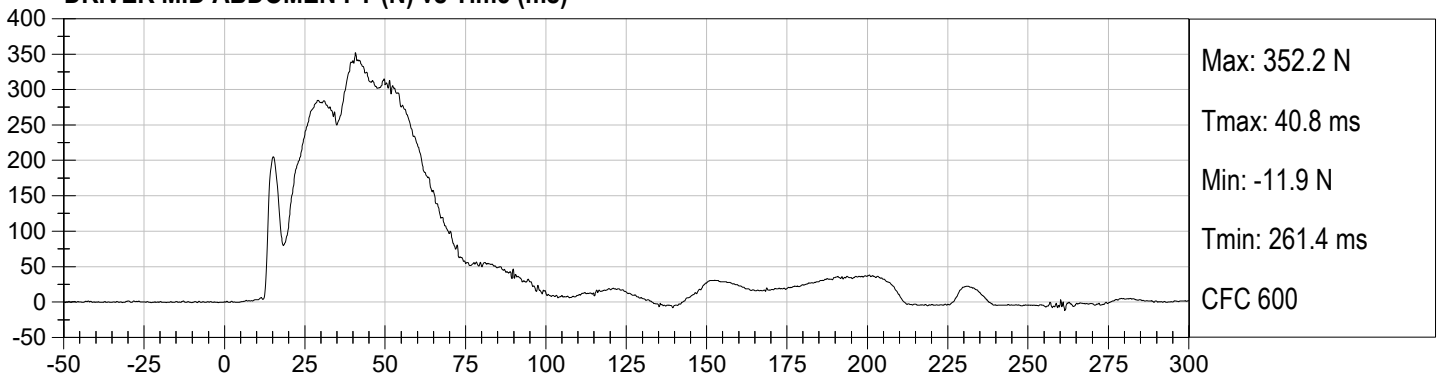
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)



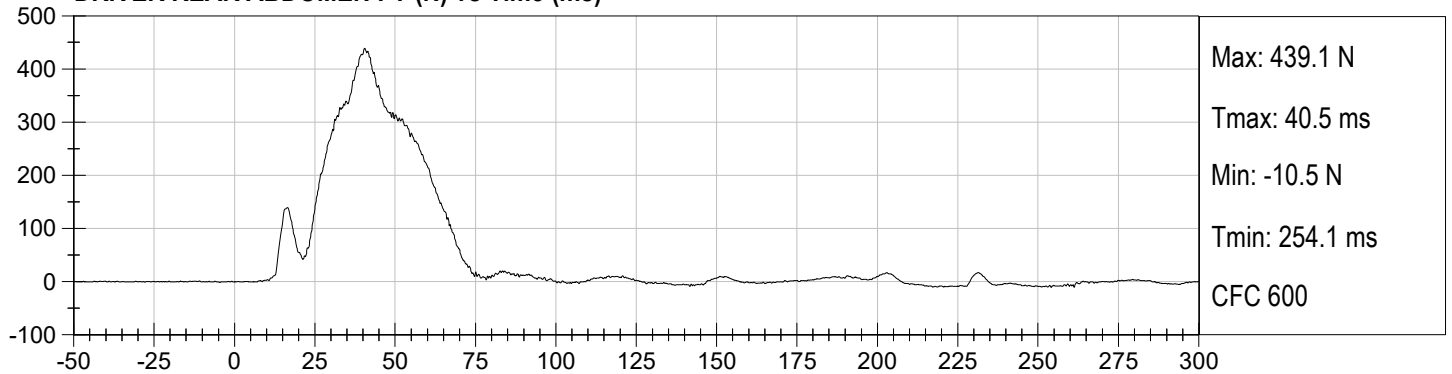
DRIVER FRONT ABDOMEN FY (N) vs Time (ms)



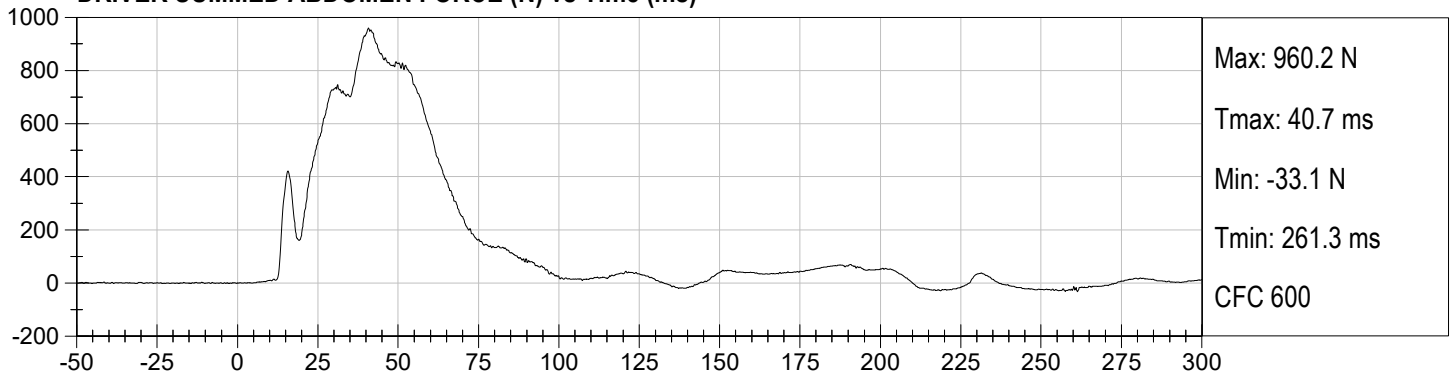
DRIVER MID ABDOMEN FY (N) vs Time (ms)

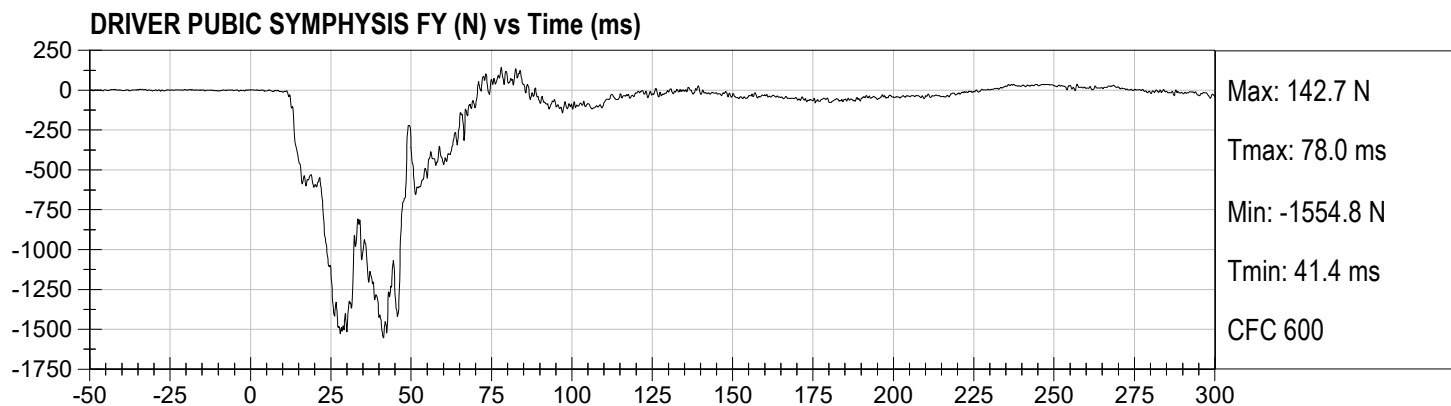


DRIVER REAR ABDOMEN FY (N) vs Time (ms)

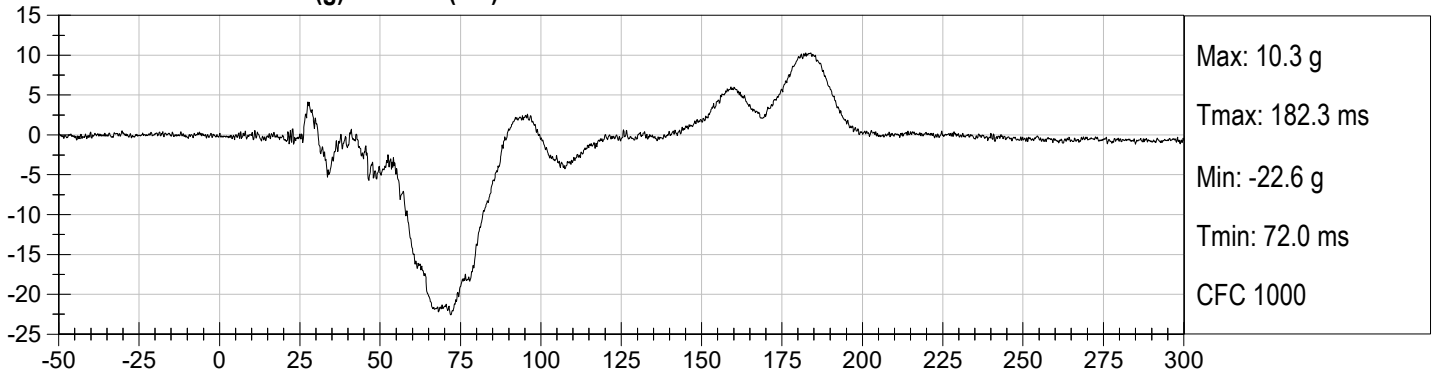


DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)

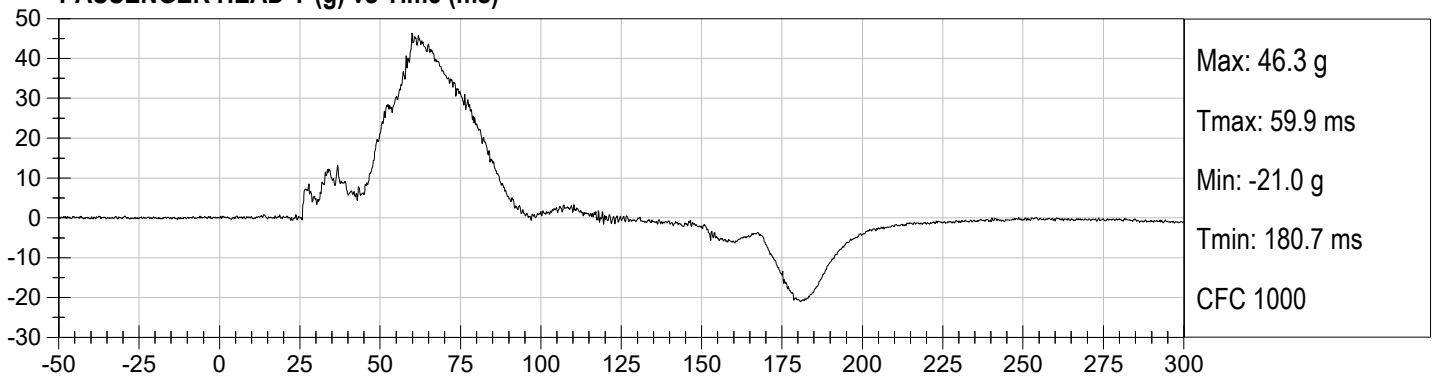




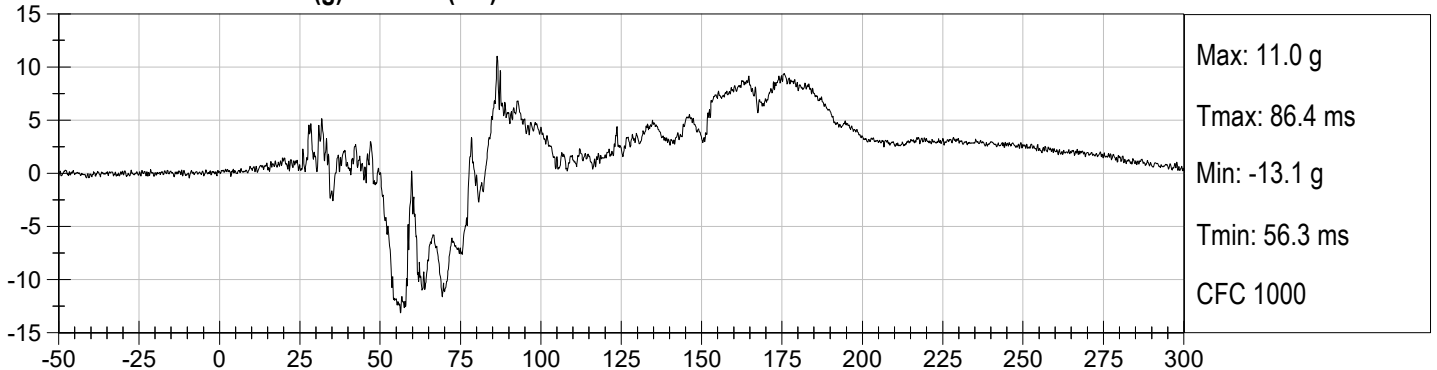
PASSENGER HEAD X (g) vs Time (ms)



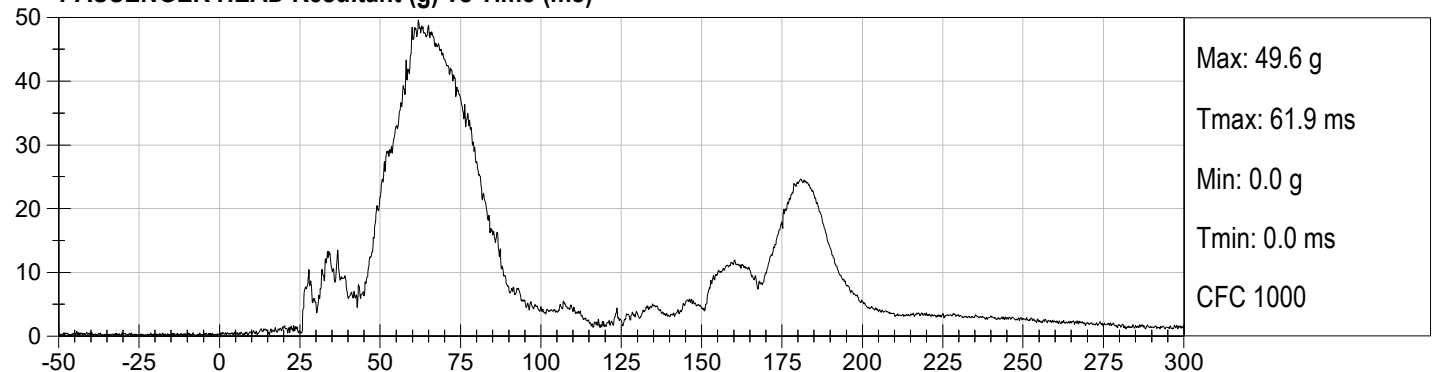
PASSENGER HEAD Y (g) vs Time (ms)

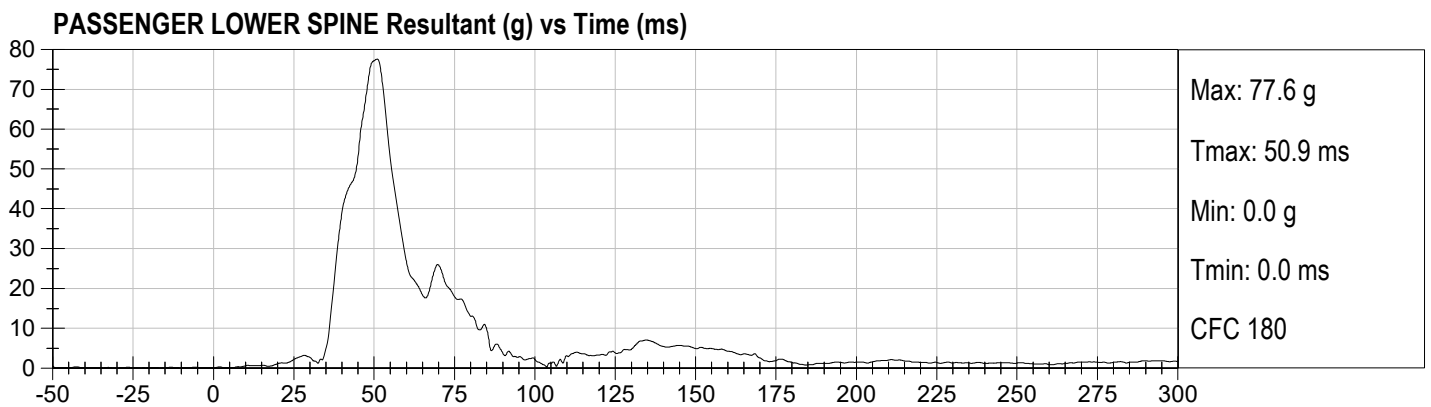
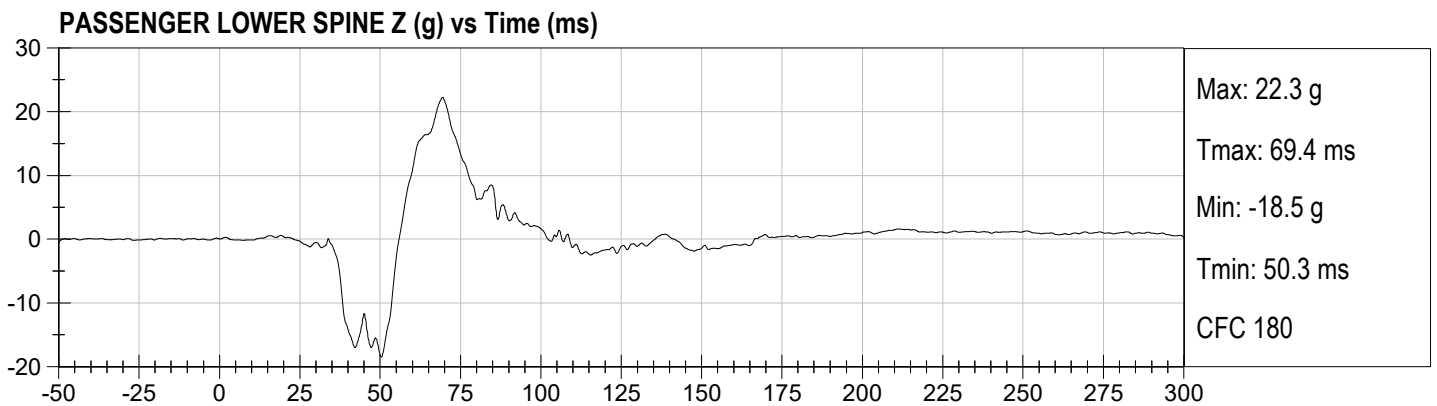
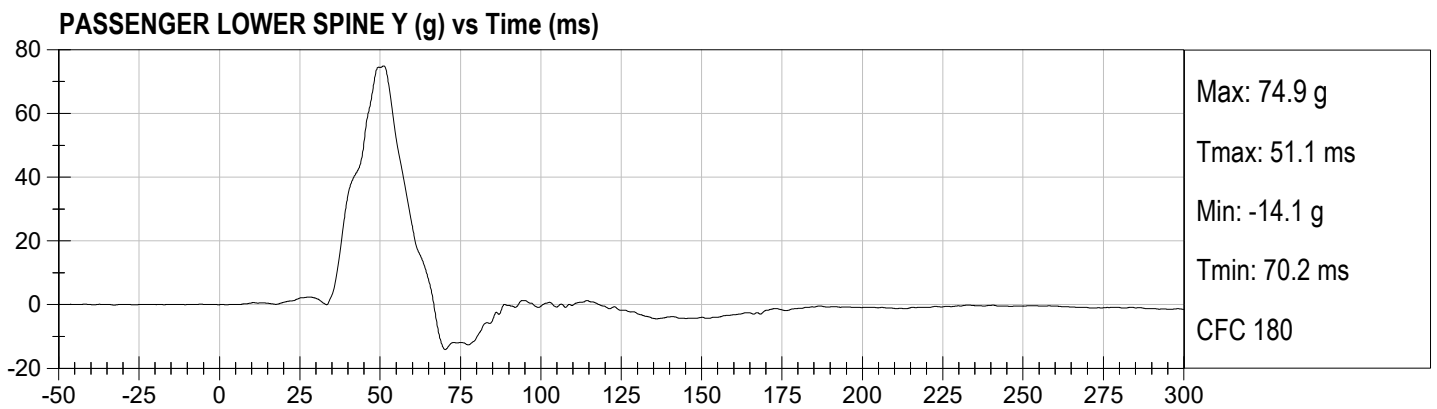


PASSENGER HEAD Z (g) vs Time (ms)

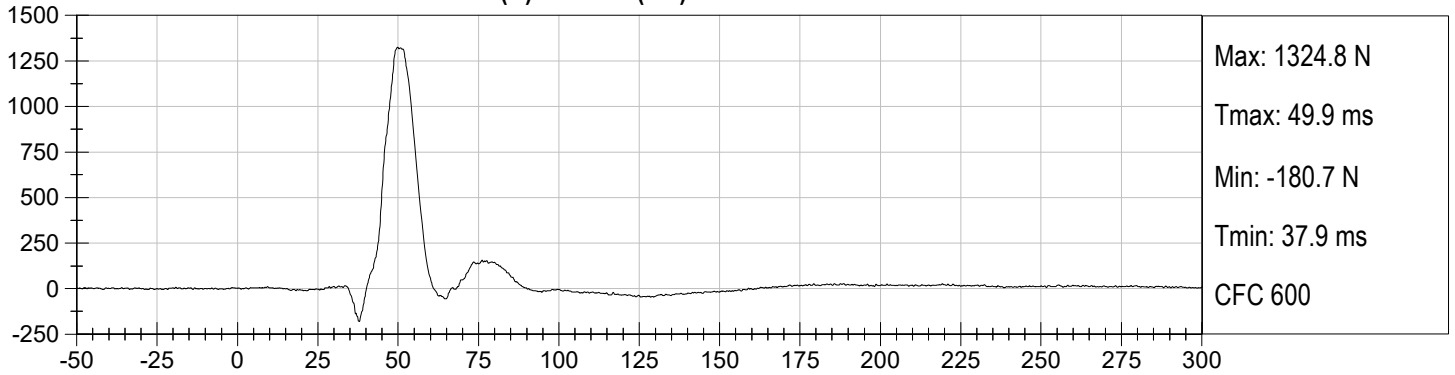


PASSENGER HEAD Resultant (g) vs Time (ms)

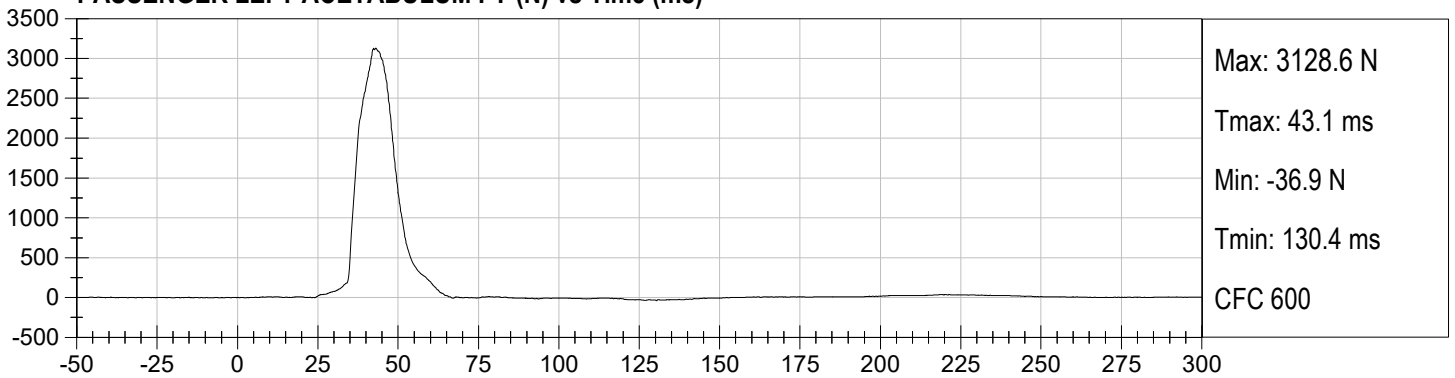




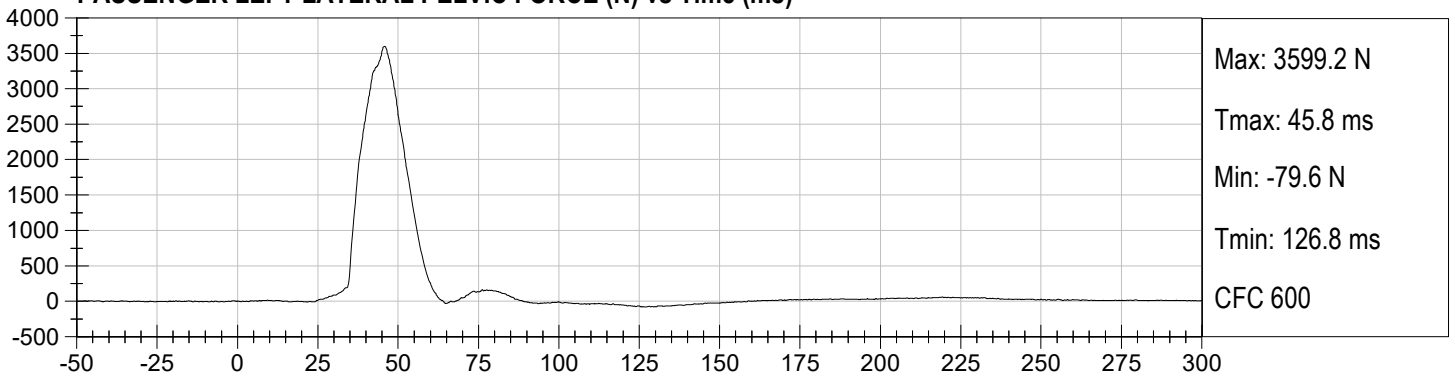
PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)



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



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



APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

QUALIFICATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

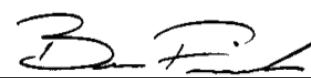
No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	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

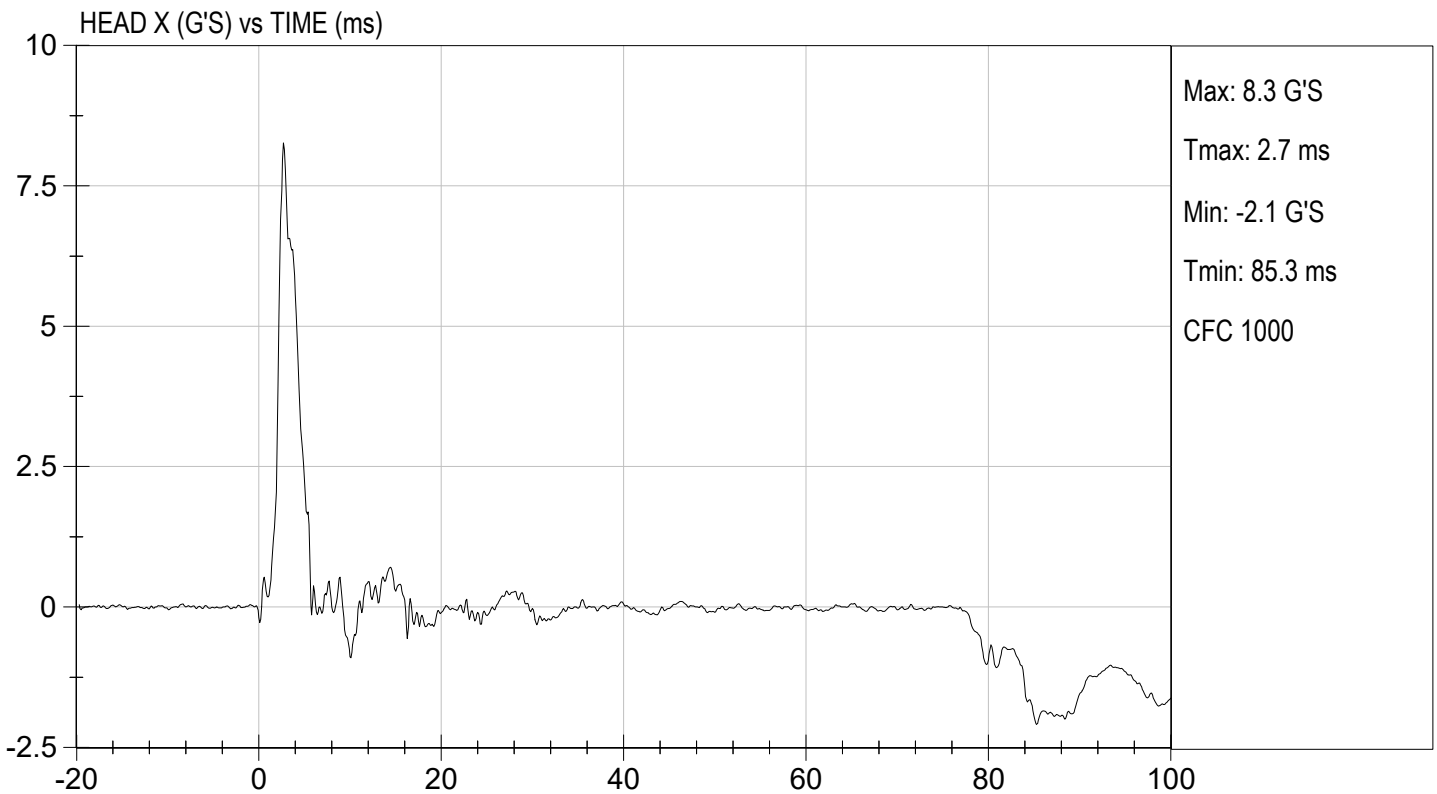
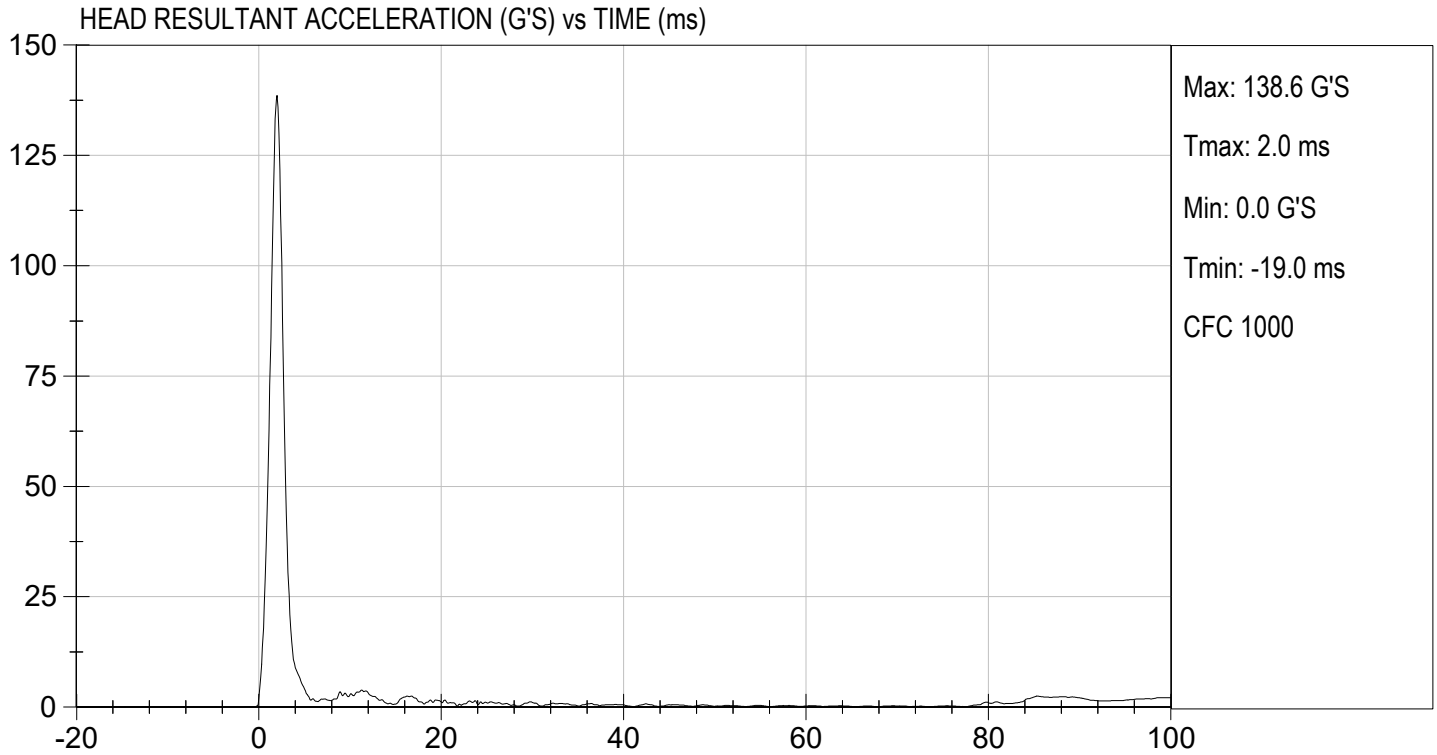
MGA RESEARCH CORPORATION**HEAD DROP TEST****ES-2re DUMMY**ATD Serial No: F032Test ID: D230171

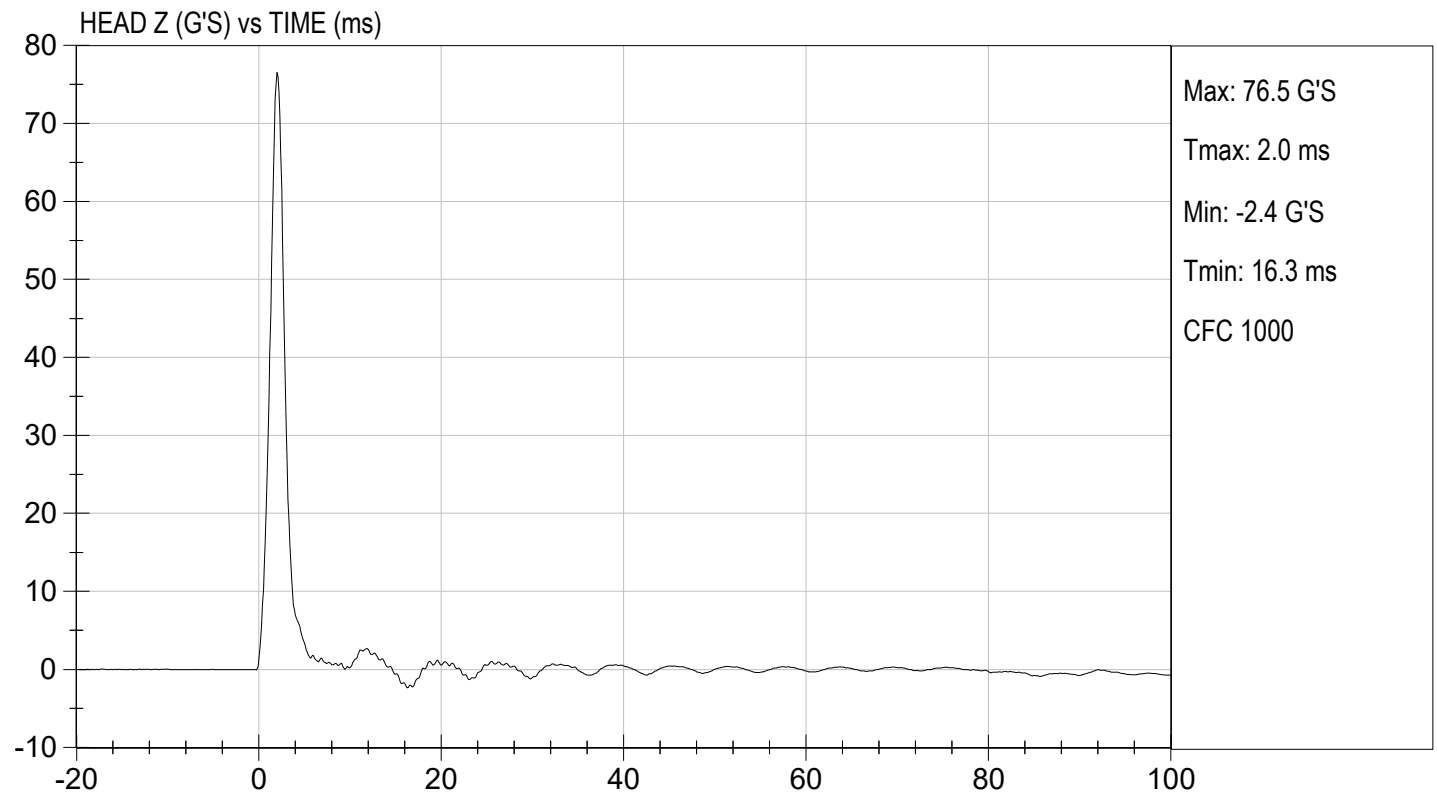
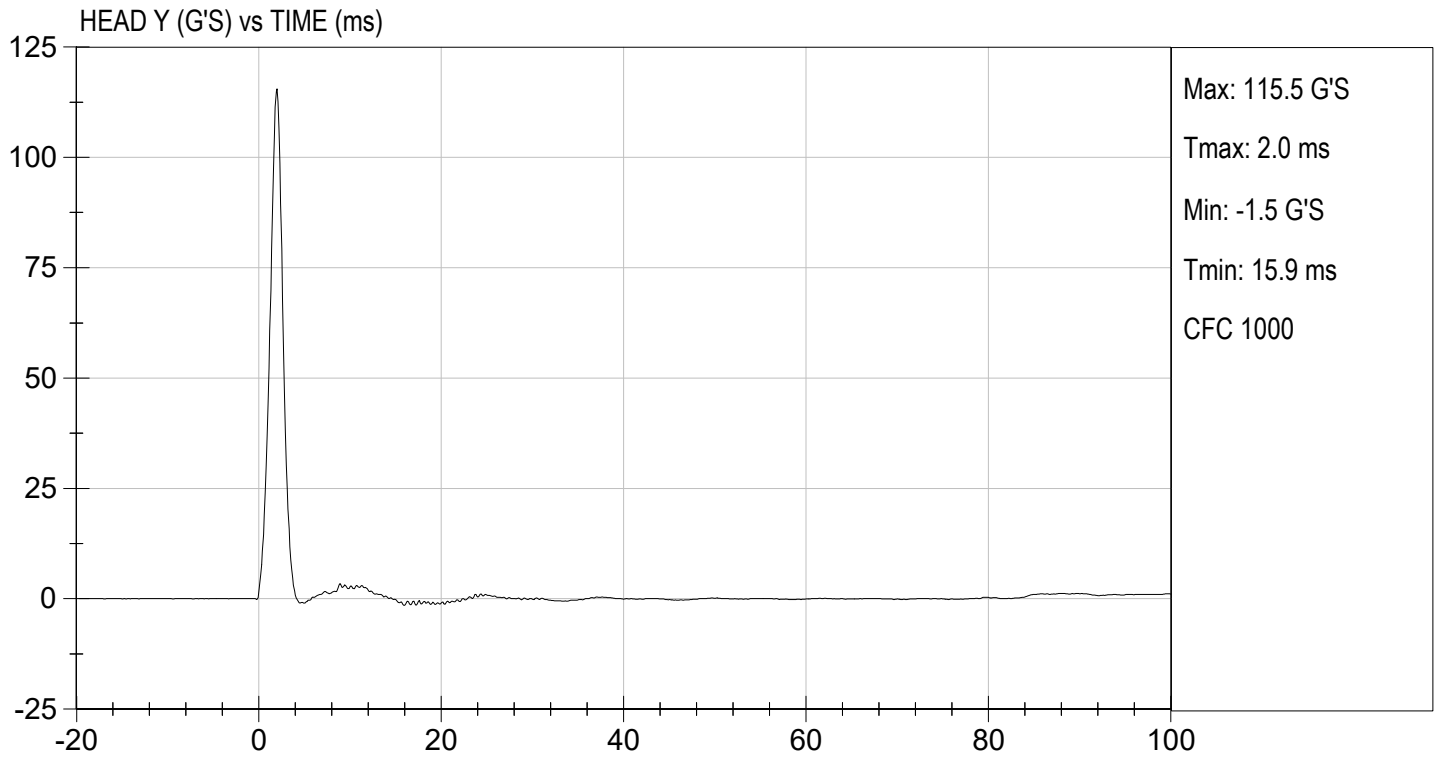
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	125 to 155	139	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	8.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

01/20/2023
Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

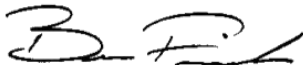
ATD Serial No: F032

Test I.D: D230172

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.47	Pass
	17 ms	m/s	>= -3.70	-3.53	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.2	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	55.3	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	64.3	Pass
Overall Results					Pass


 Laboratory Technician

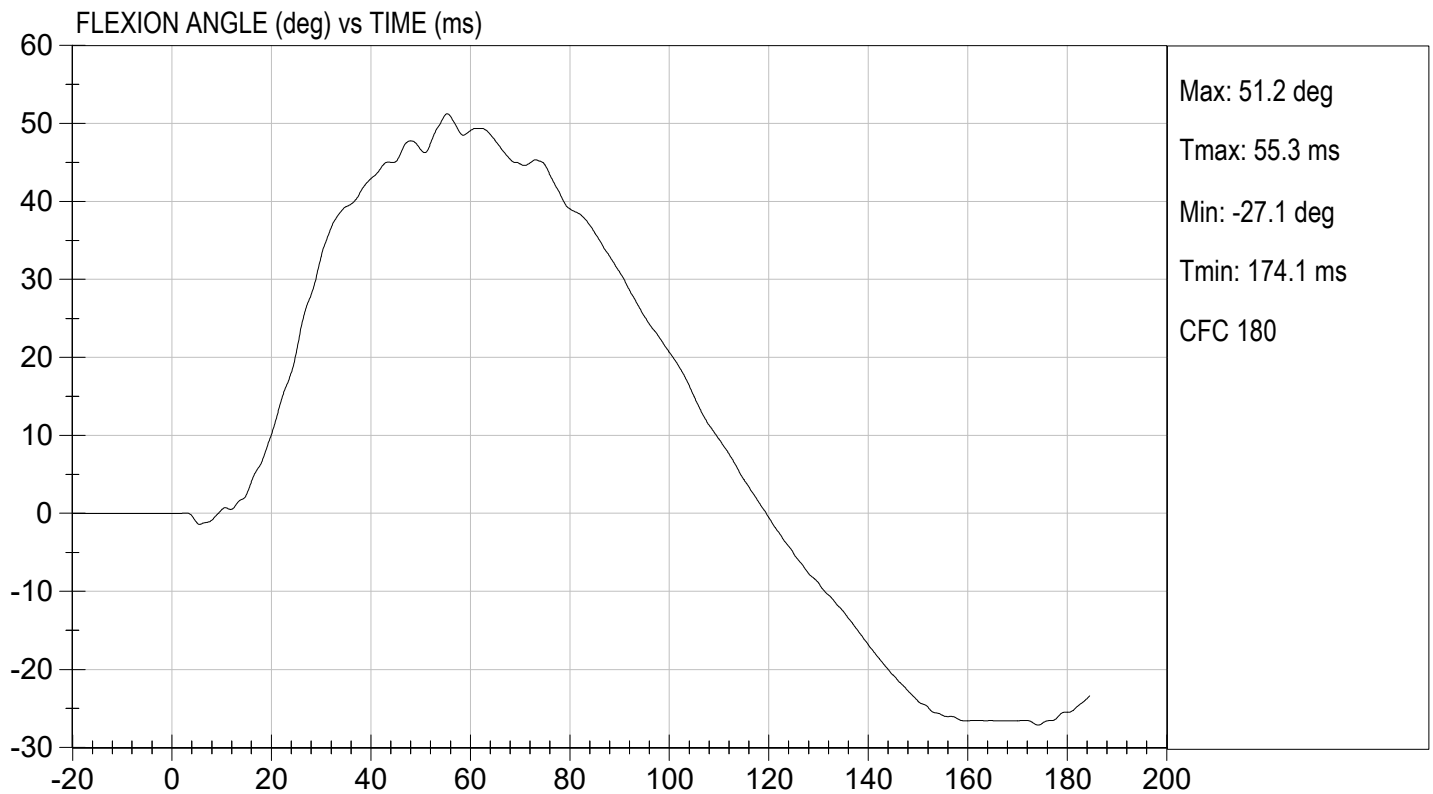
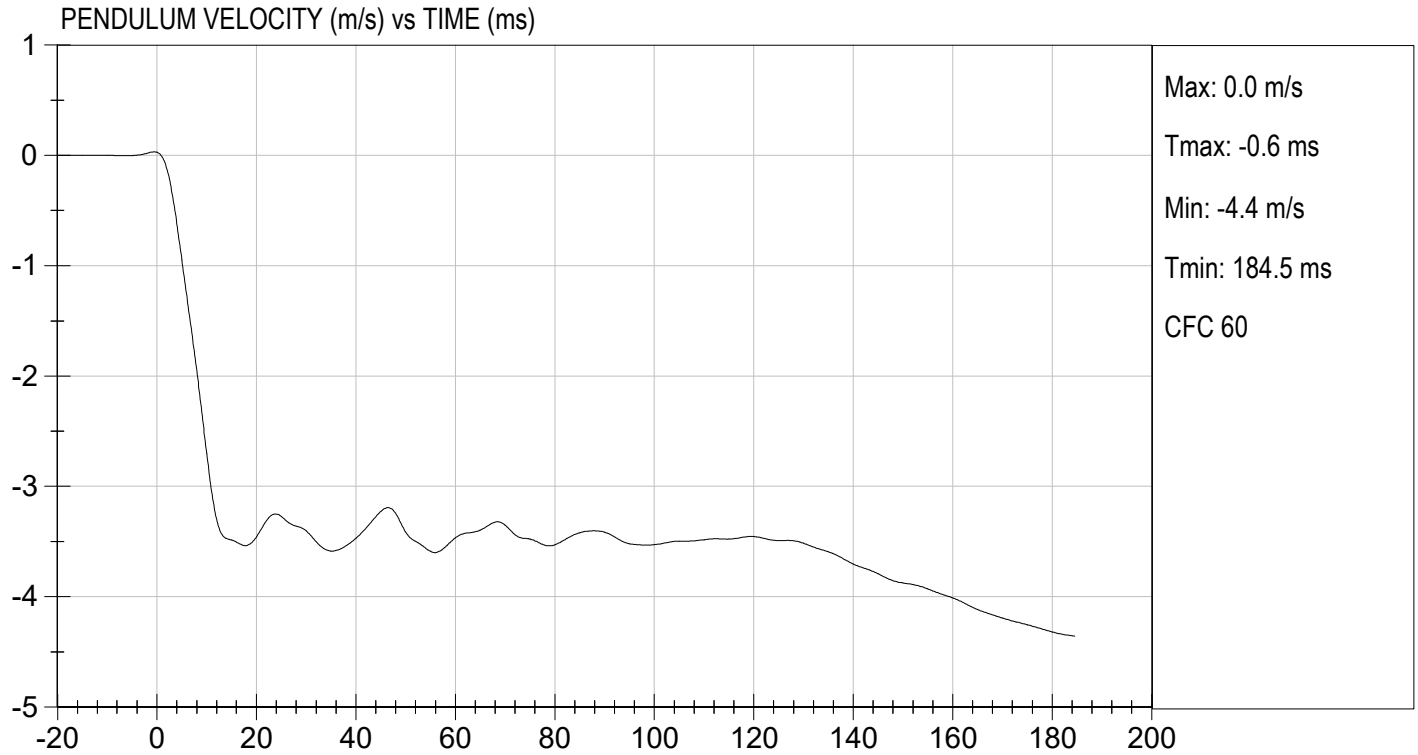
01/20/2023
 Test Date


 Approved By



TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

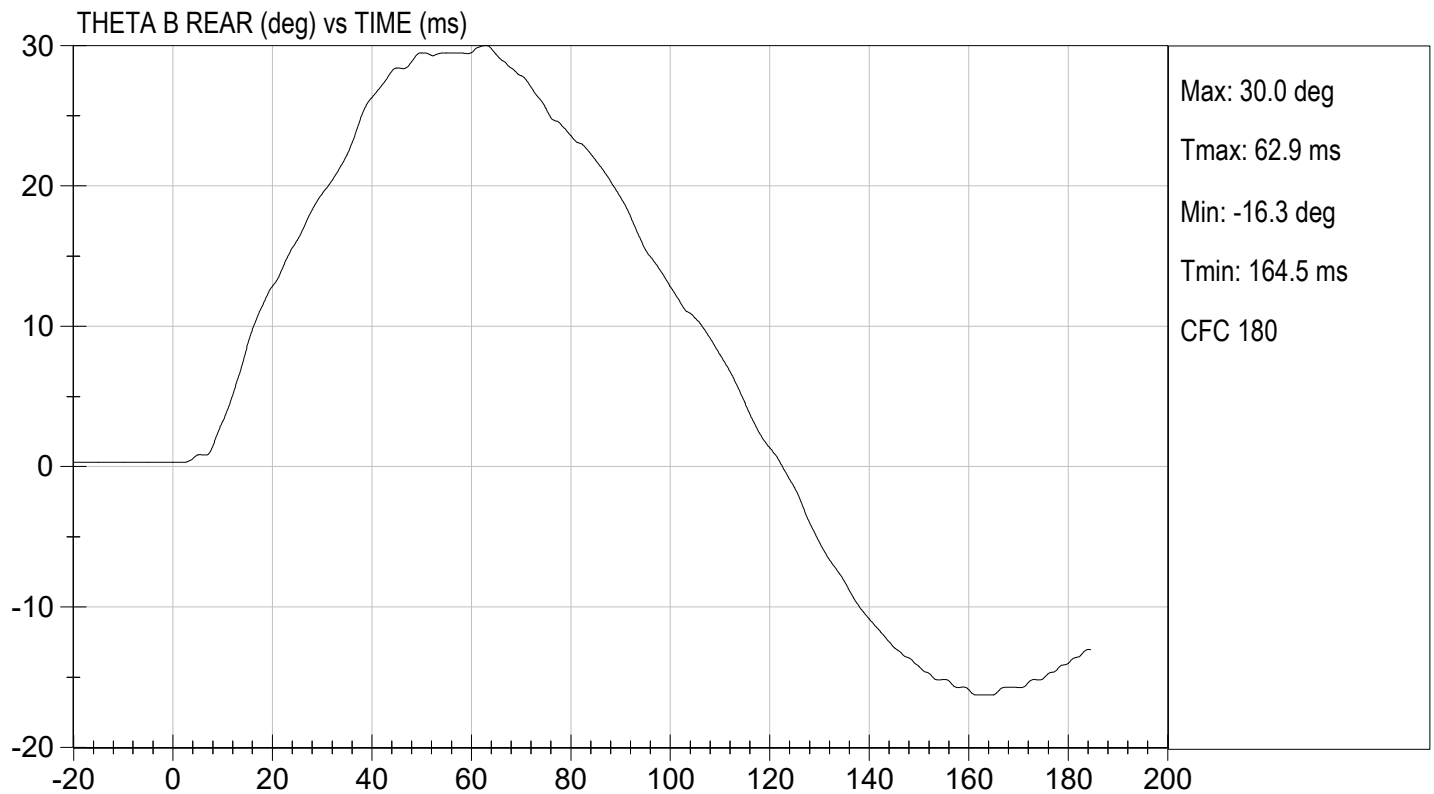
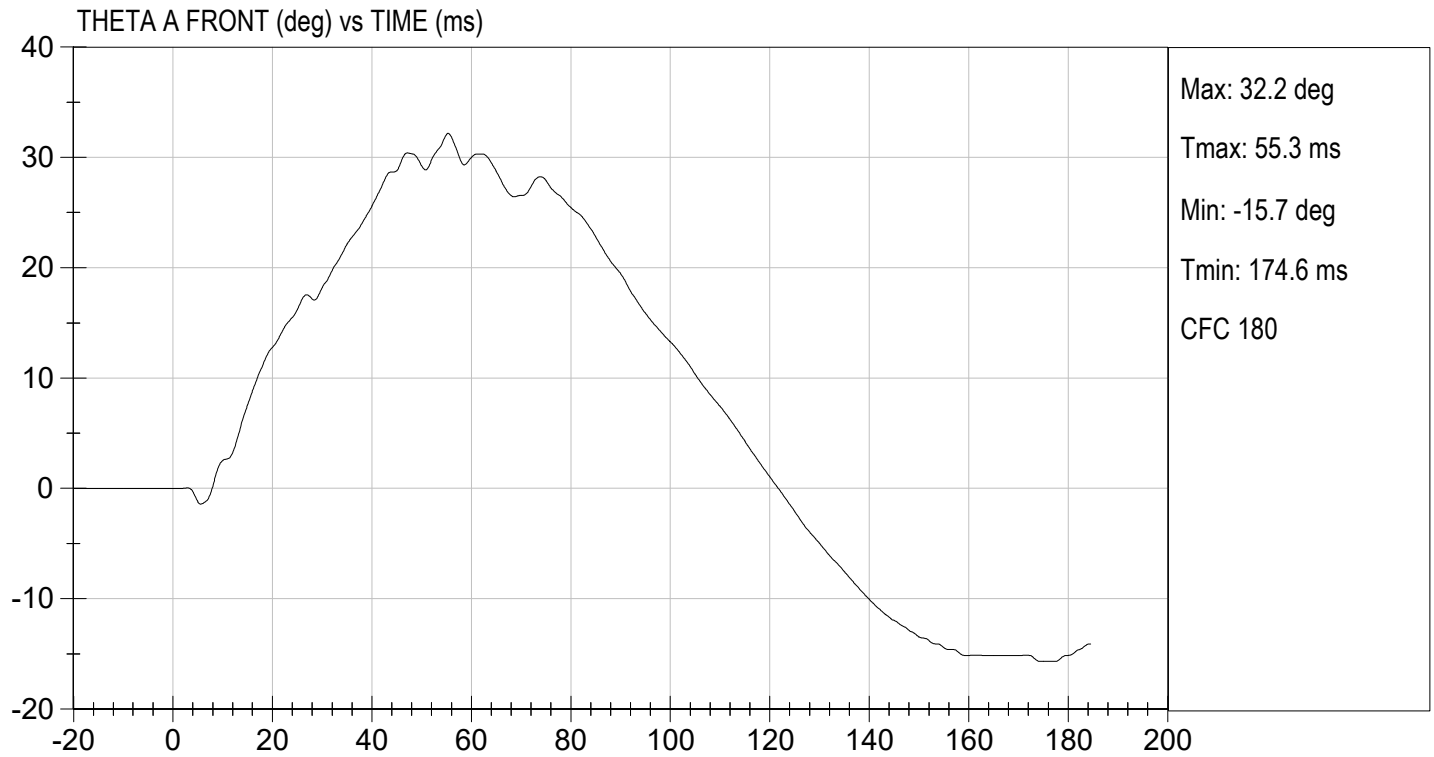
TEST DATE: 01/20/2023
TEST #: D230172





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

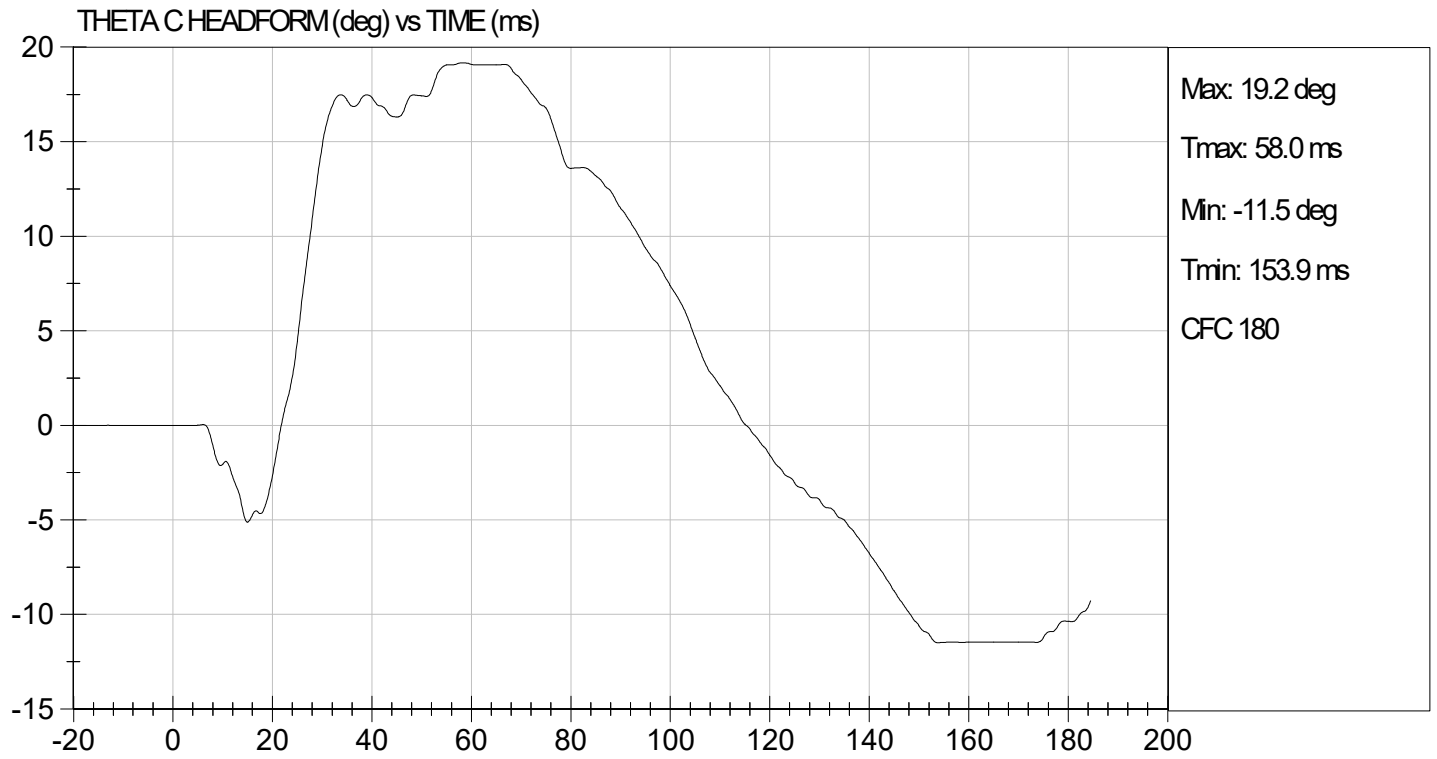
TEST DATE: 01/20/2023
TEST #: D230172





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 01/20/2023
TEST #: D230172



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

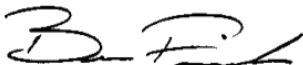
ATD Serial No: F032

Test I.D: D230173

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.3	Pass
Overall Test Results				Pass


Laboratory Technician

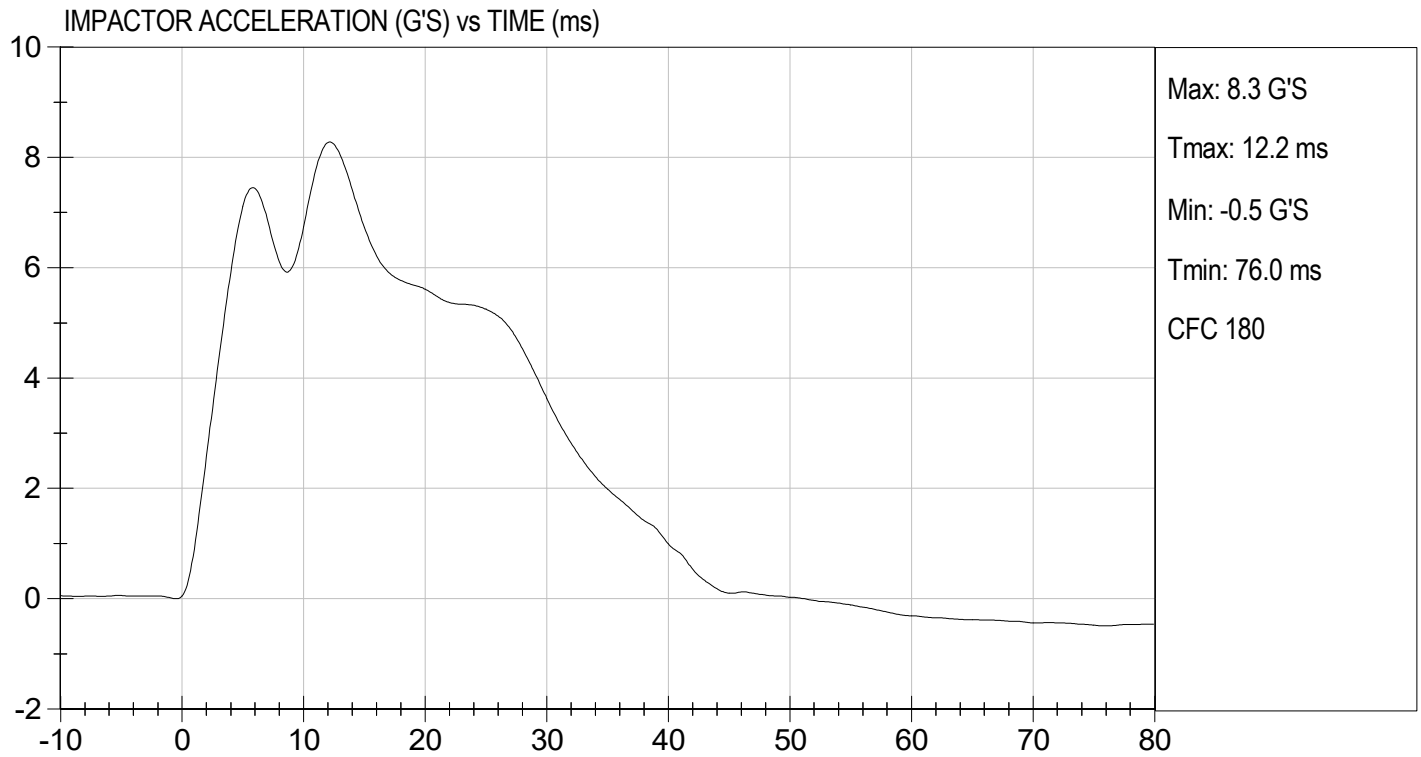
01/20/2023
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 01/20/2023
TEST #: D230173



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

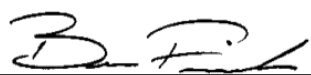
ATD Serial No: F032

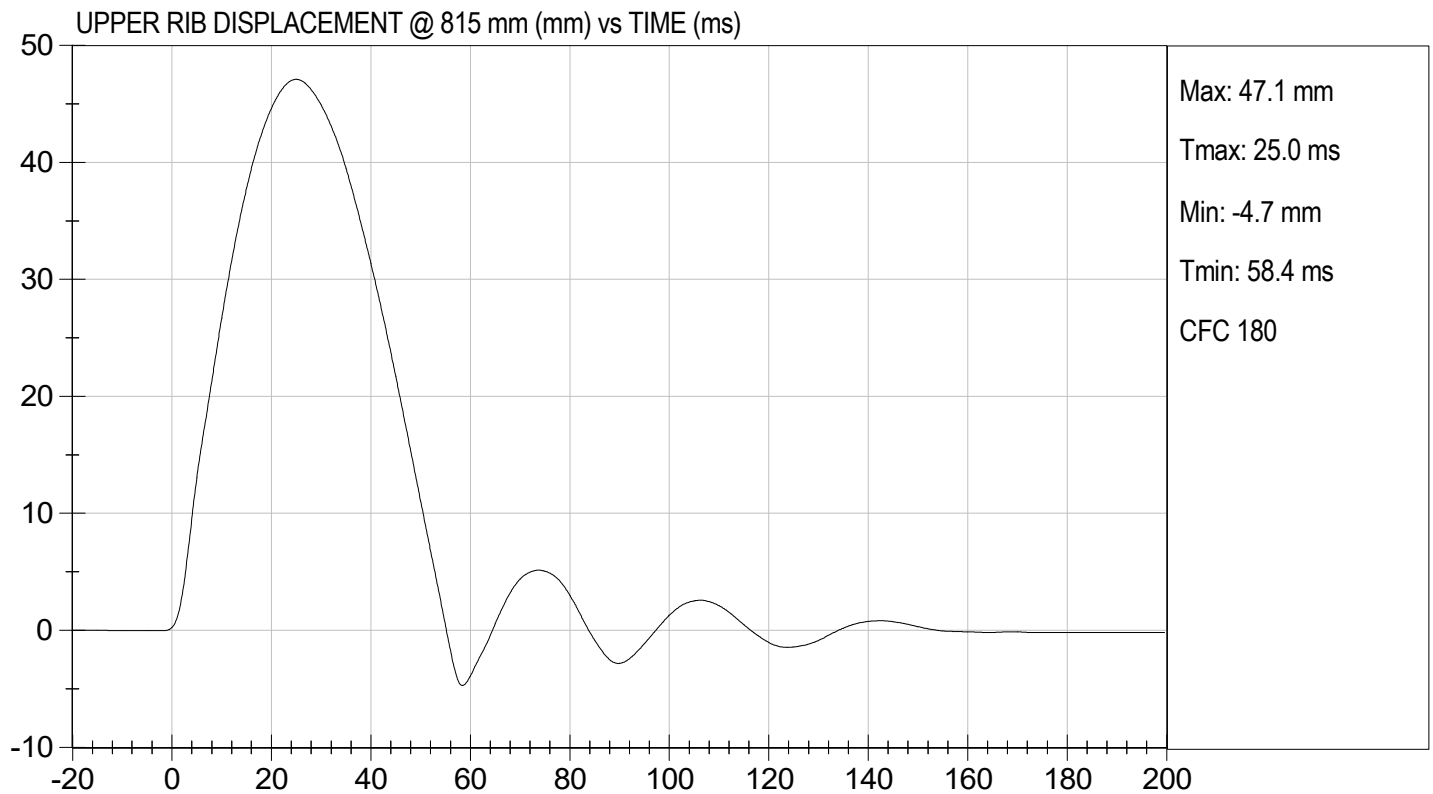
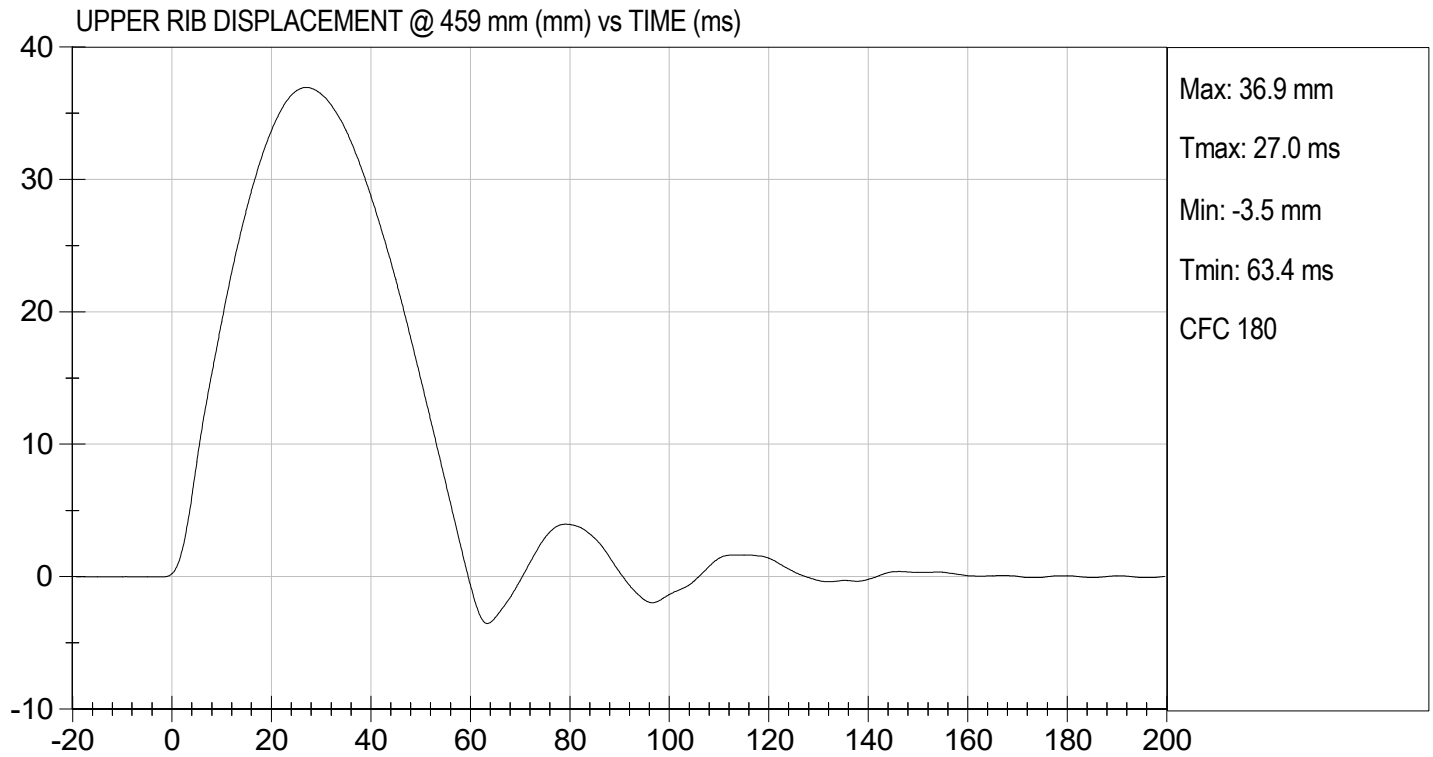
Test I.D: D230174

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.1	Pass
Overall Test Results				Pass


Laboratory Technician

01/20/2023
Test Date


Approved By



MGA RESEARCH CORPORATION

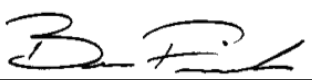
**MID RIB TEST
ES-2re DUMMY**

ATD Serial No: F032

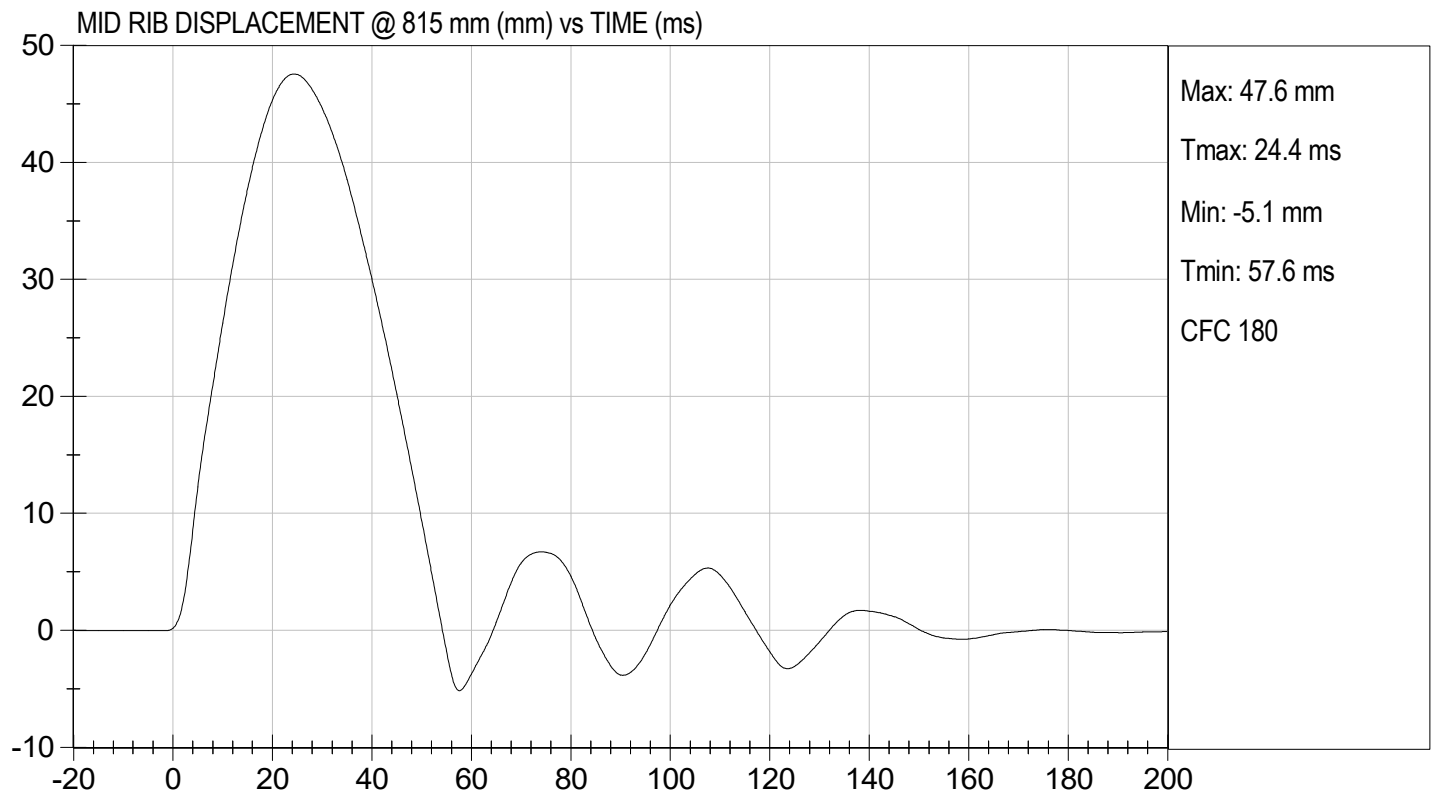
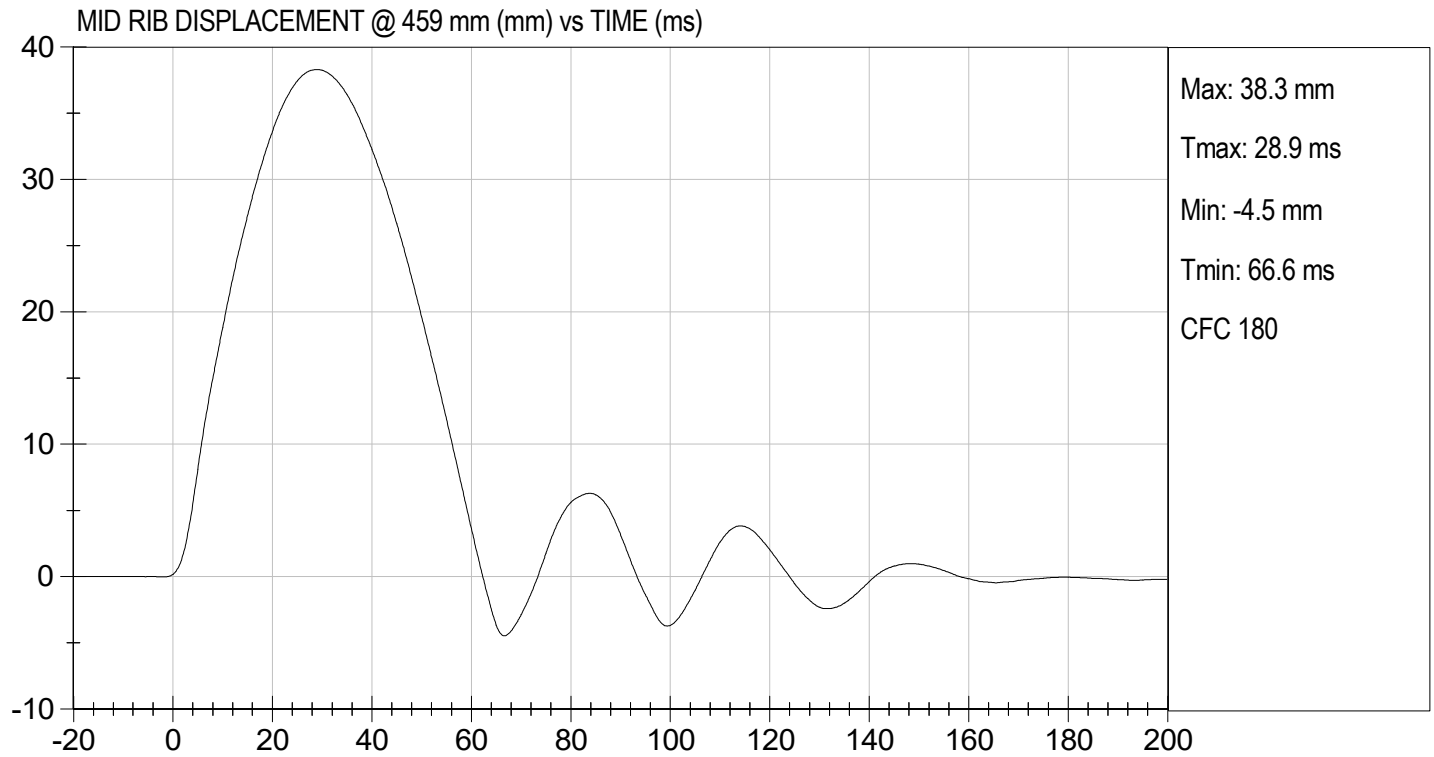
Test I.D: D230175

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.3	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.6	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

01/20/2023
Test Date



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

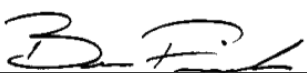
ATD Serial No: F032

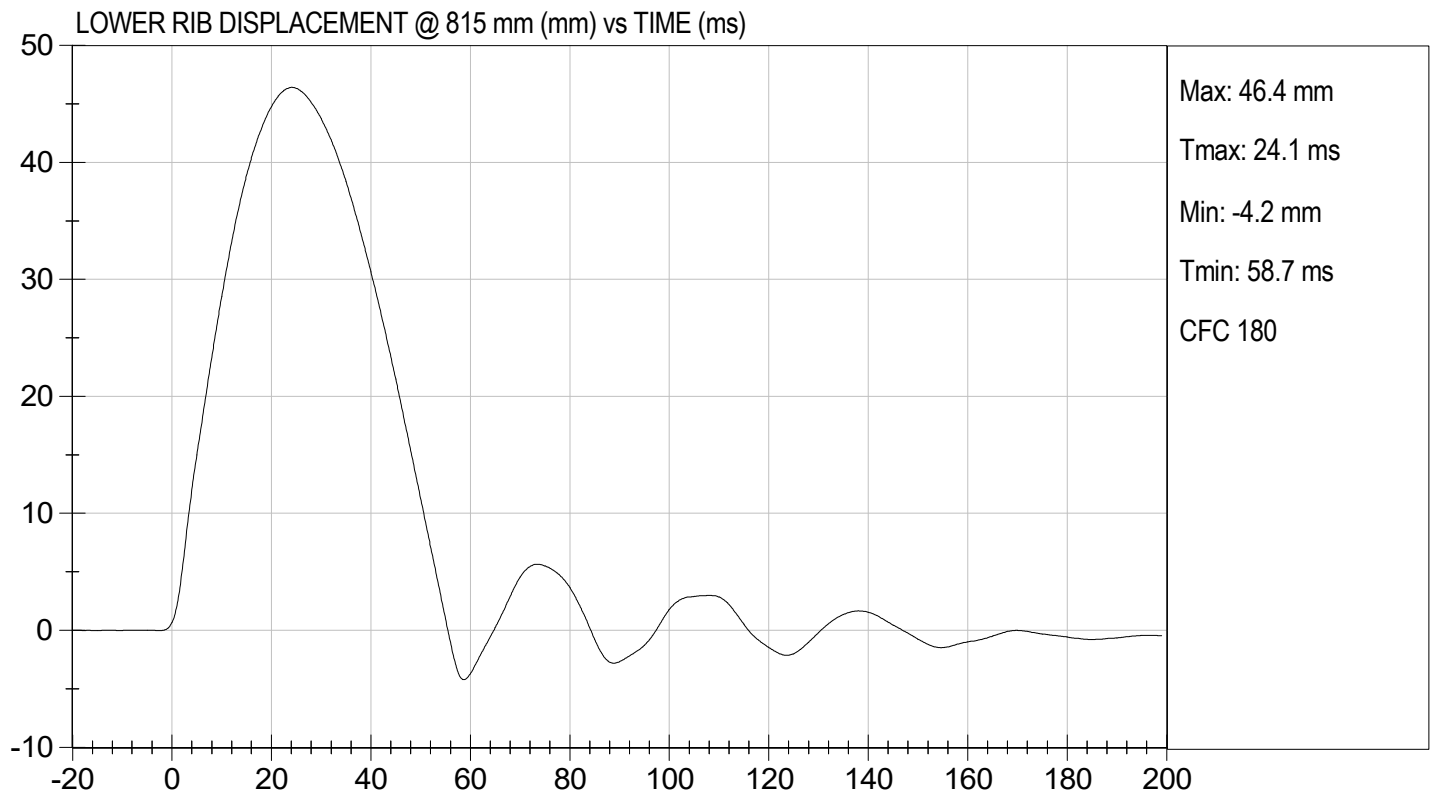
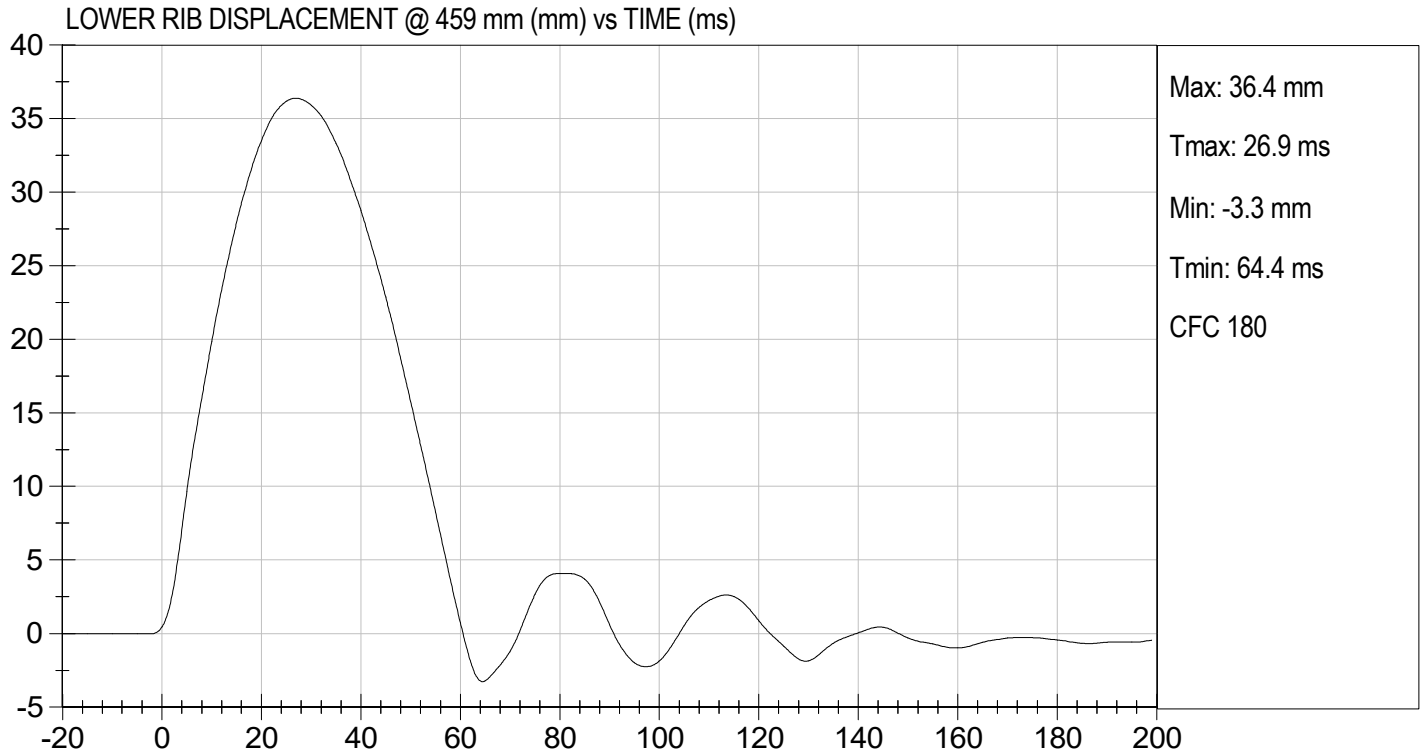
Test I.D: D230176

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	46.4	Pass
Overall Test Results				Pass


Laboratory Technician

01/20/2023
Test Date


Approved By

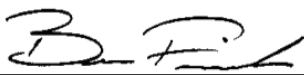


MGA RESEARCH CORPORATION**ABDOMEN TEST****ES-2re DUMMY**ATD Serial No: F032Test I.D: D230177

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4198	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.8	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2357	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.5	Pass
Overall Test Results				Pass


Laboratory Technician

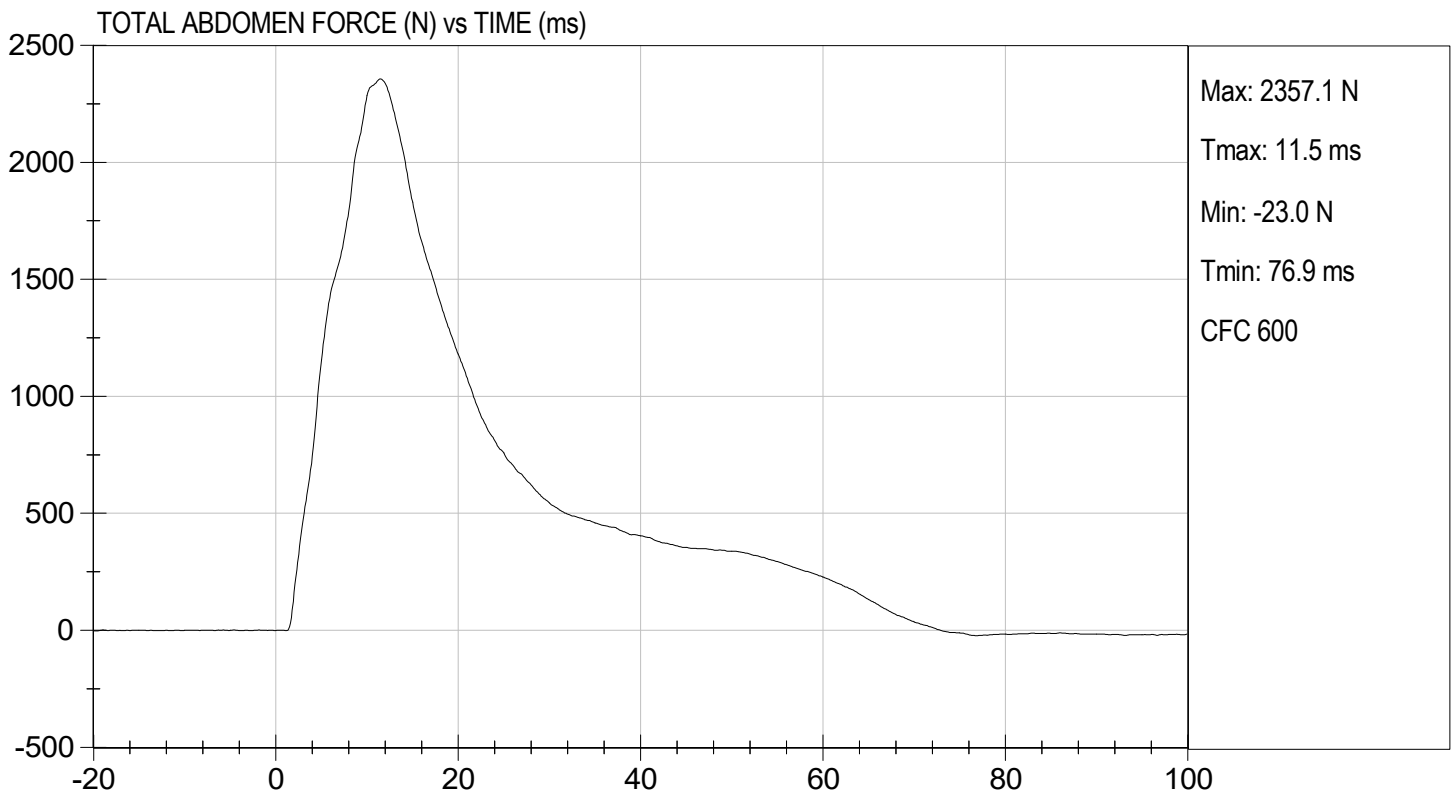
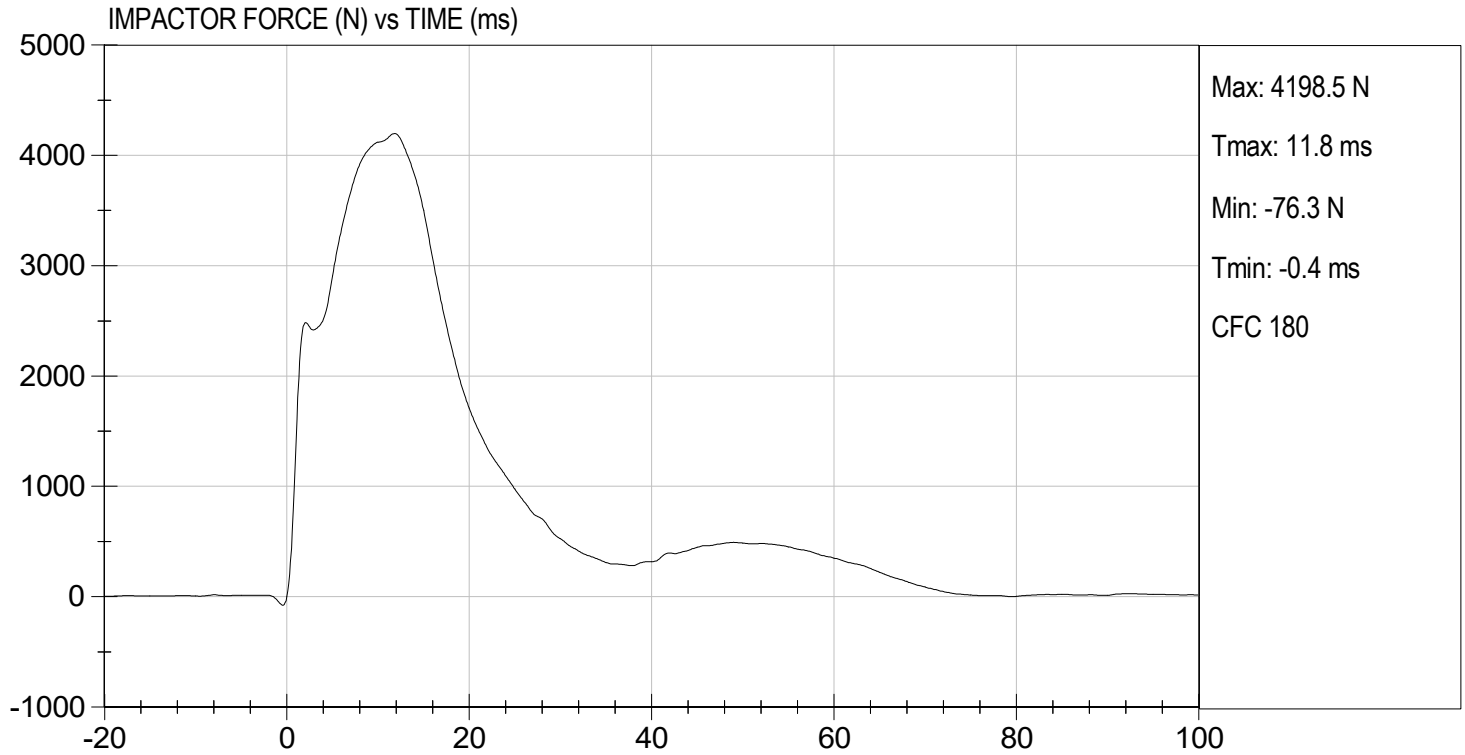
01/20/2023
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

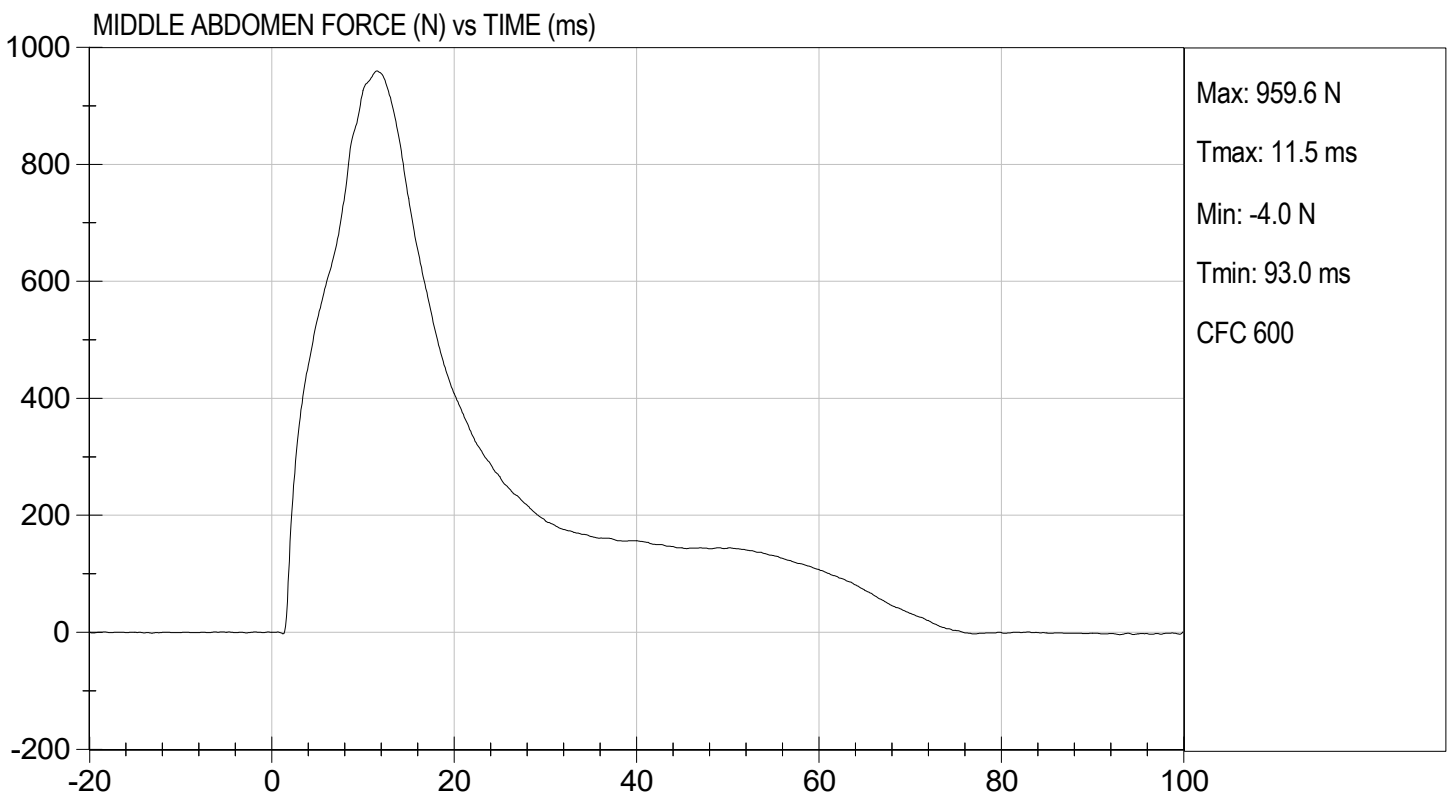
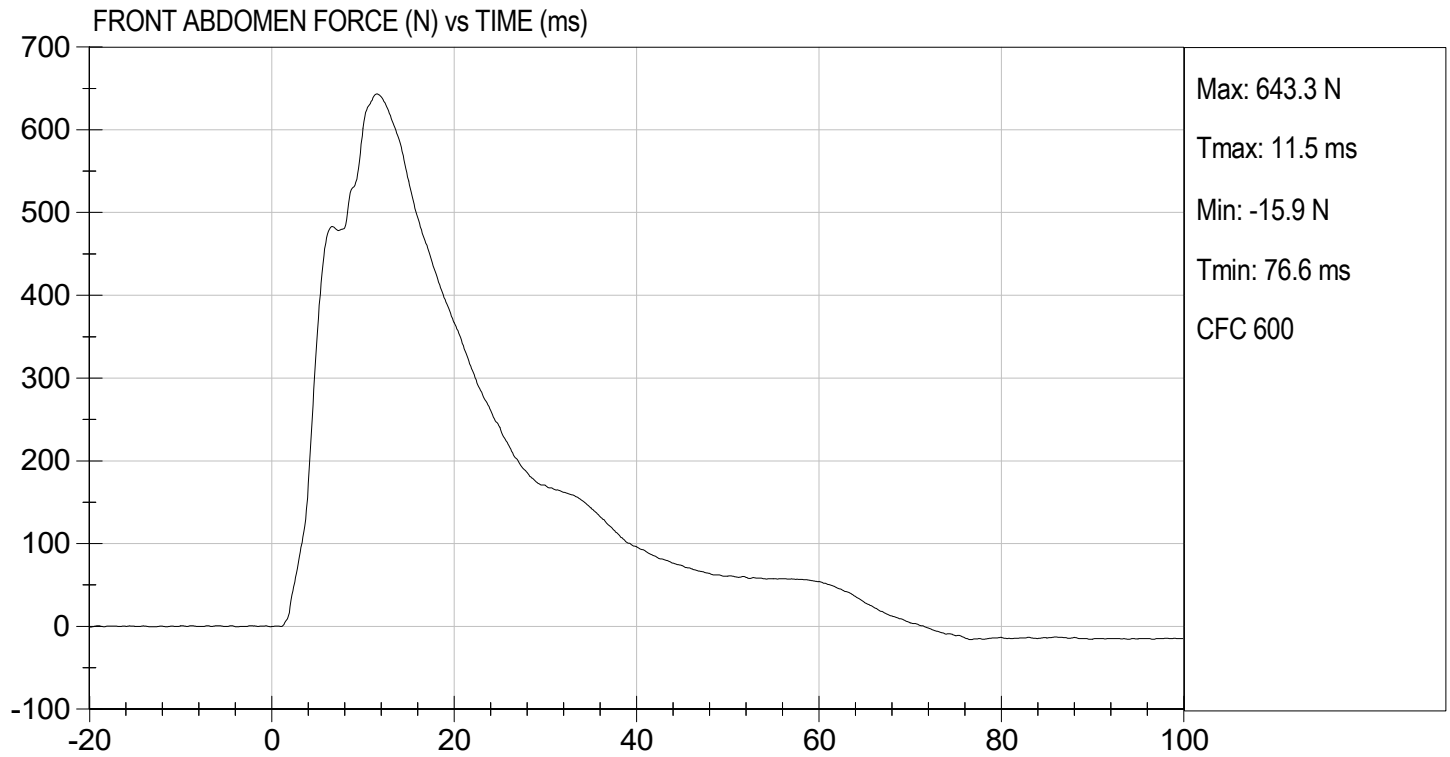
TEST DATE: 01/20/2023
TEST #: D230177





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

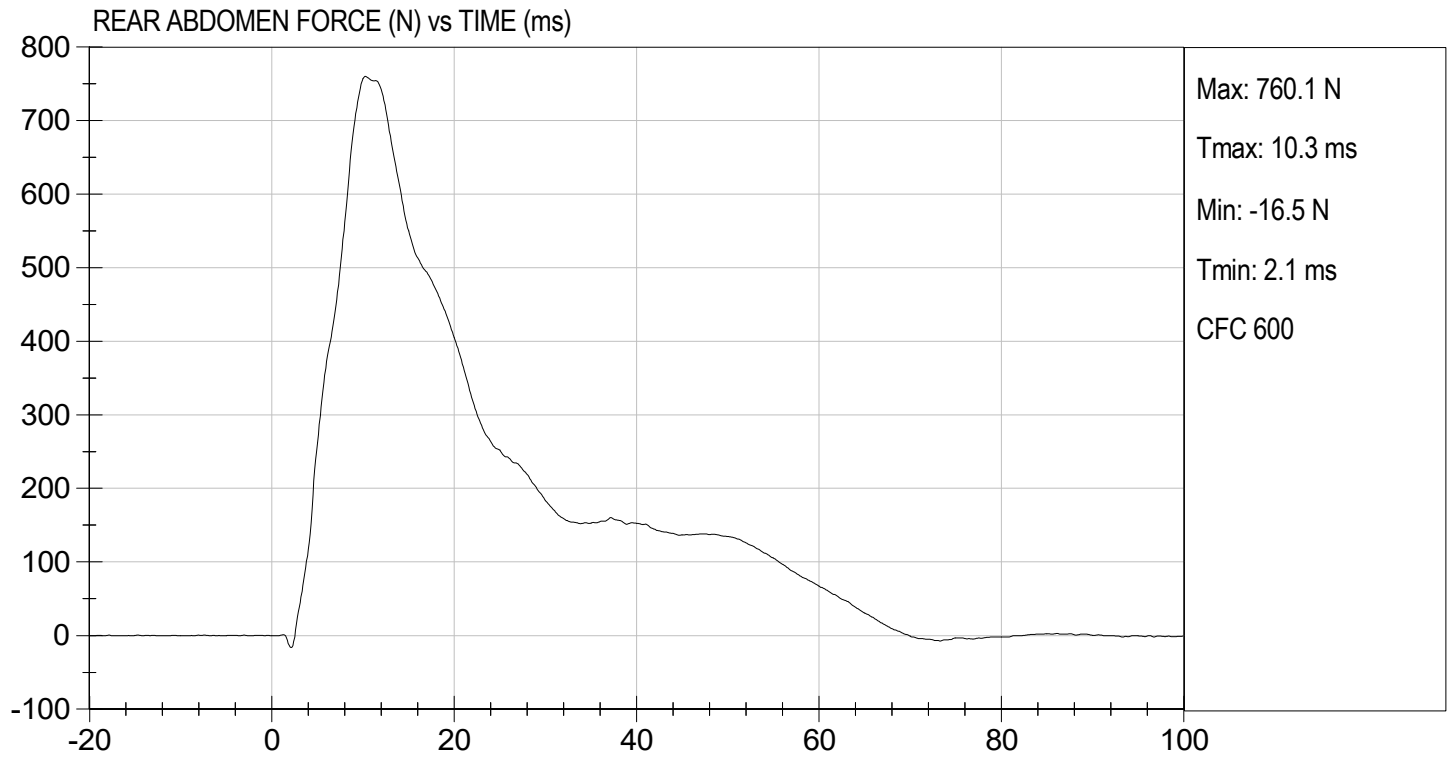
TEST DATE: 01/20/2023
TEST #: D230177





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 01/20/2023
TEST #: D230177



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

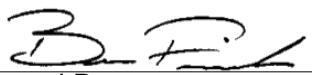
ATD Serial No: F032

Test I.D: D230178

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.10	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	-0.417	Pass
	27 ms	m/s	-6.50 to -5.80	-5.98	Pass
	30 ms	m/s	>= -6.50	-6.06	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.3	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	50.3	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
Overall Results					Pass


 Laboratory Technician

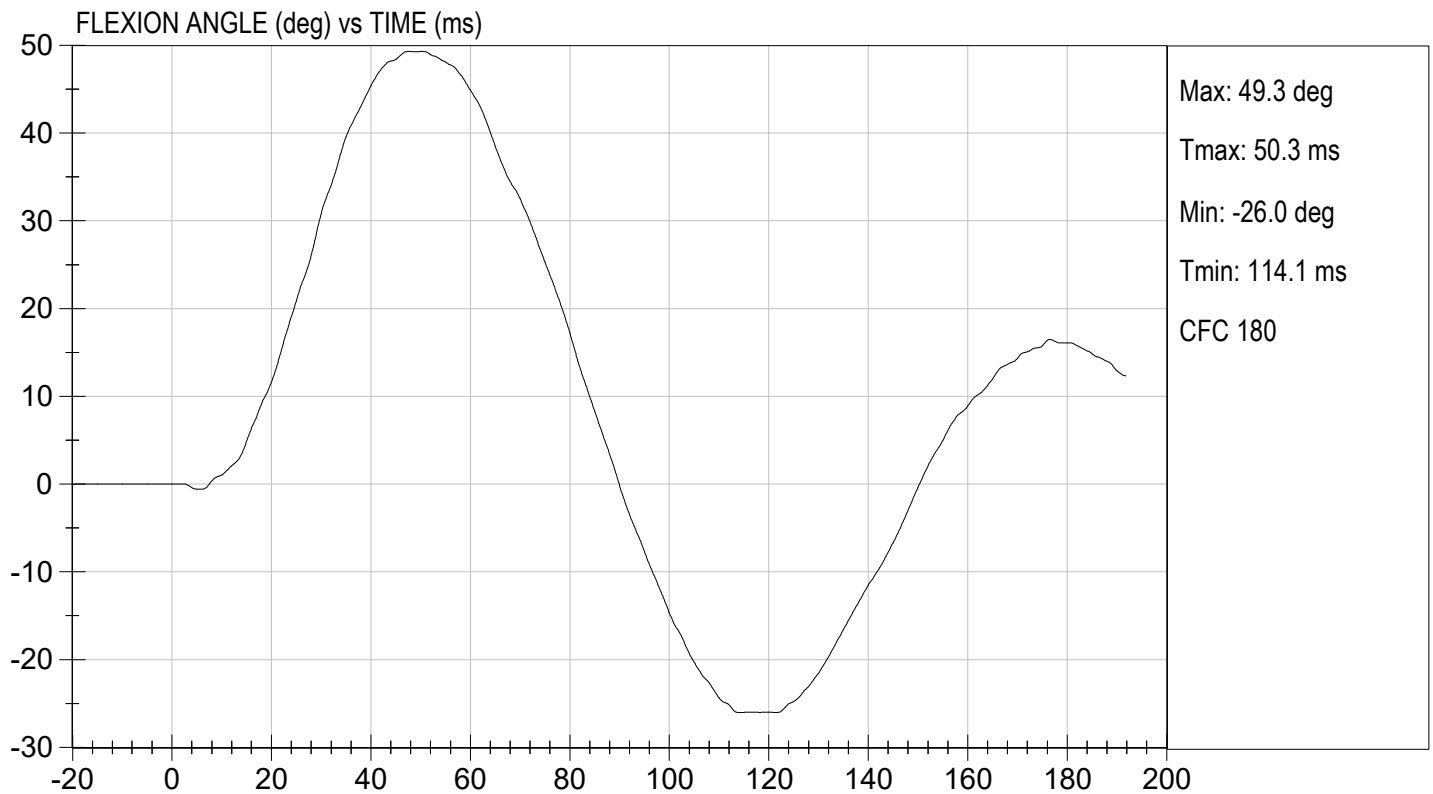
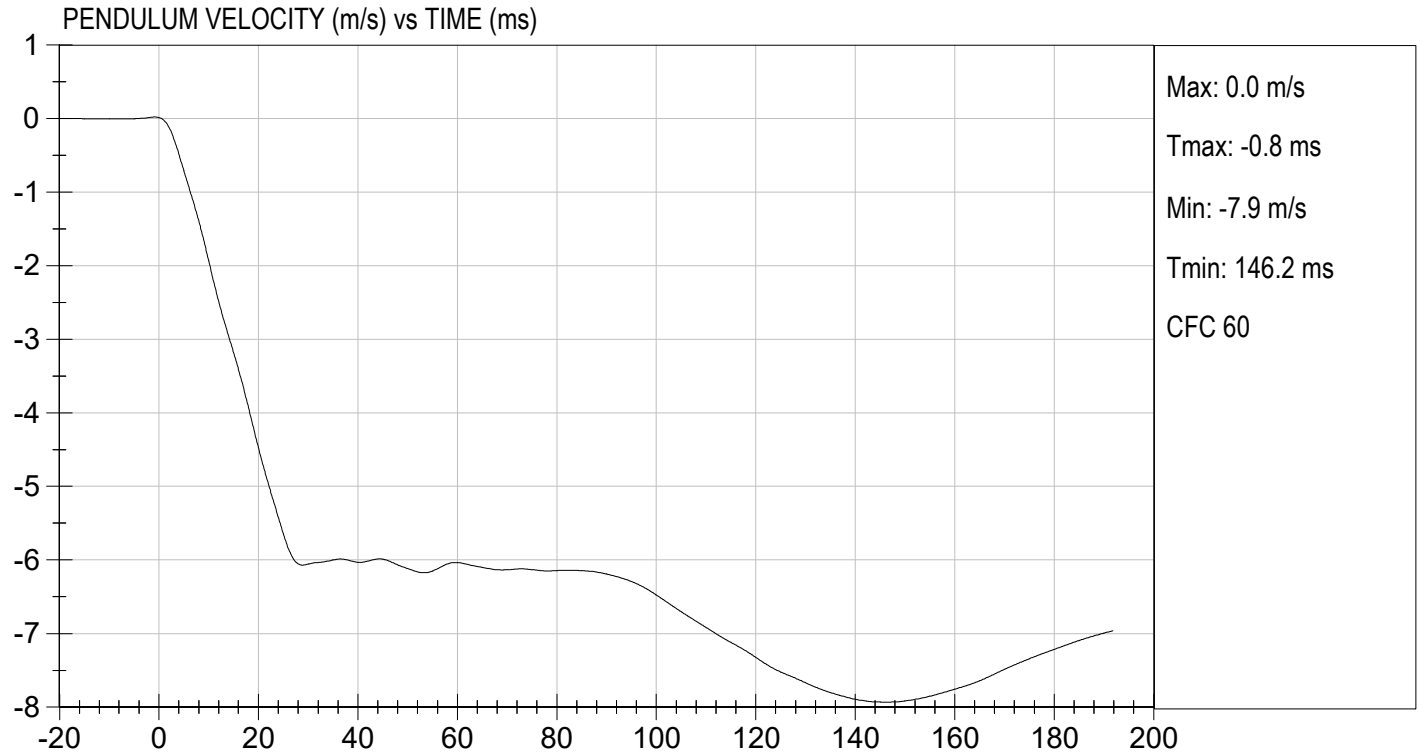
01/20/2023
 Test Date


 Approved By



TEST DESC: LUMBAR BENDING
VELOCITY: 20.00 ft/s, 6.10 m/s

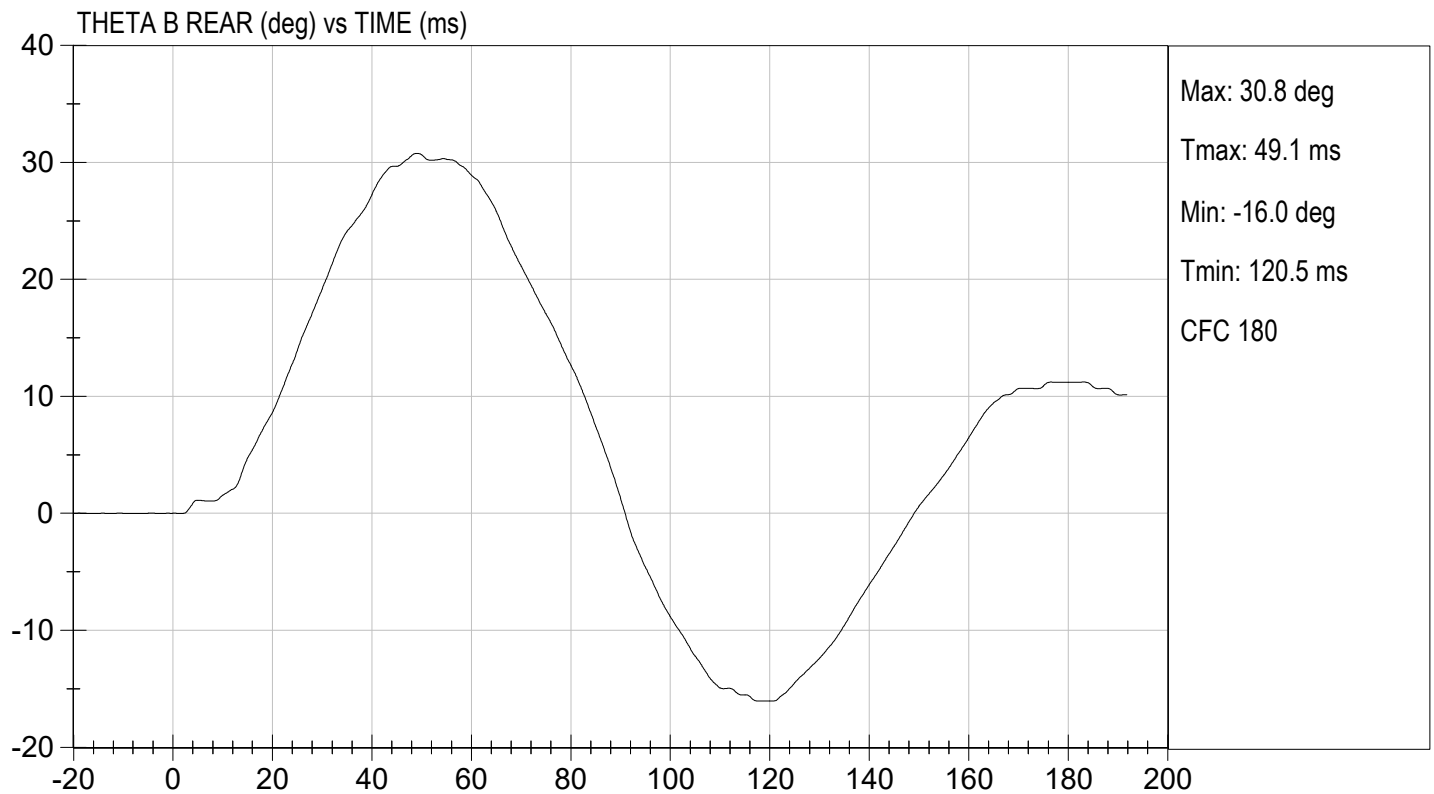
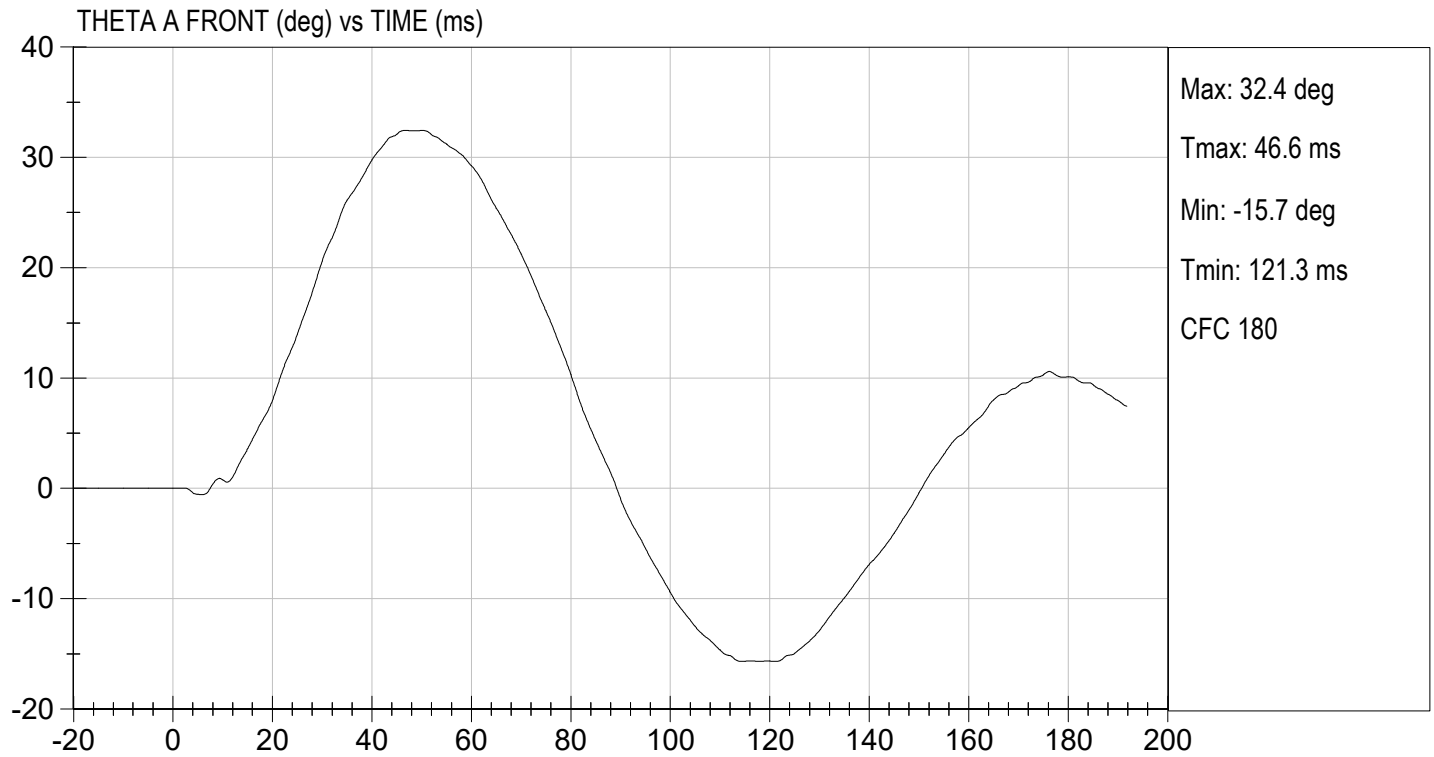
TEST DATE: 01/20/2023
TEST #: D230178





TEST DESC: LUMBAR BENDING
VELOCITY: 20.00 ft/s, 6.10 m/s

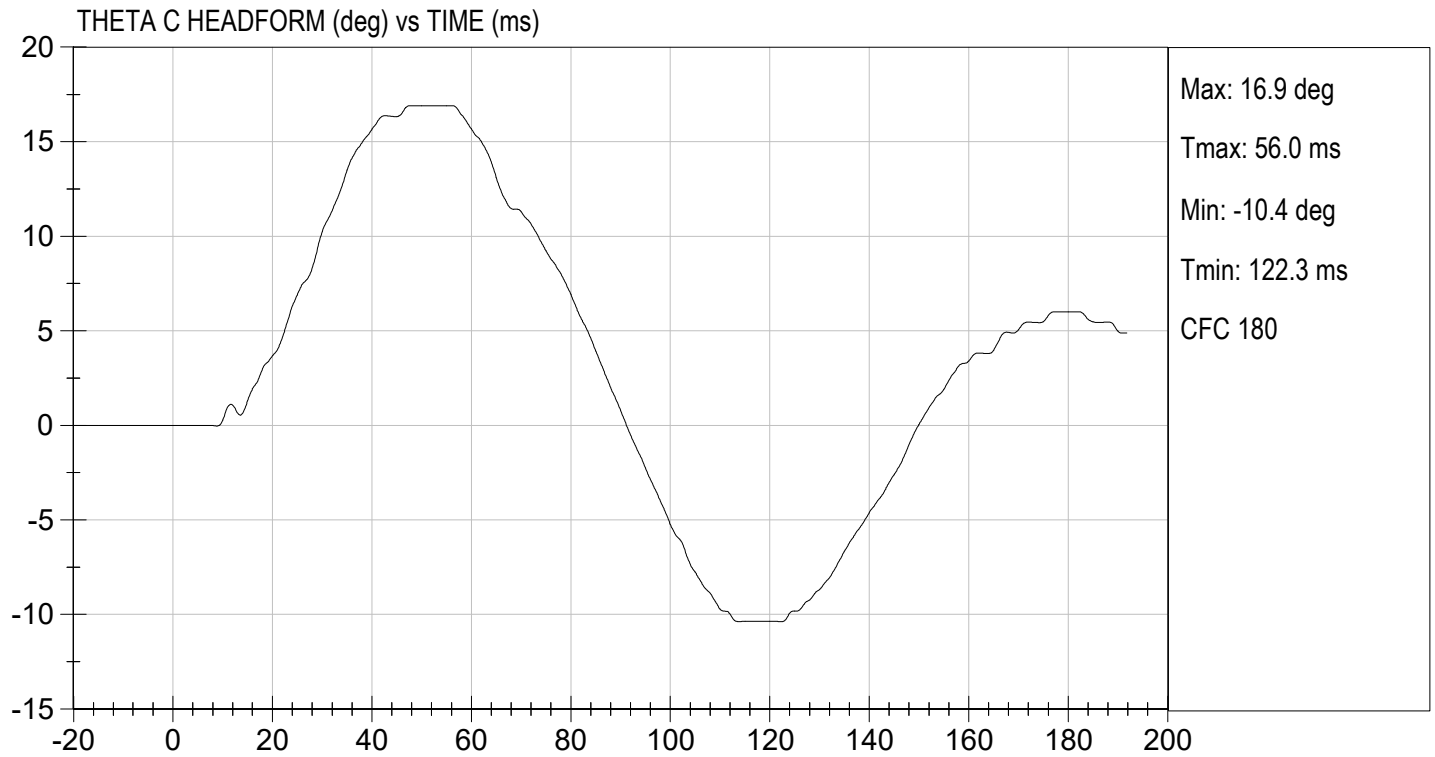
TEST DATE: 01/20/2023
TEST #: D230178





TEST DESC: LUMBAR BENDING
VELOCITY: 20.00 ft/s, 6.10 m/s

TEST DATE: 01/20/2023
TEST #: D230178

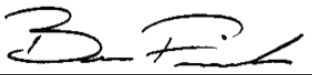


MGA RESEARCH CORPORATION**PELVIS TEST
ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D230179

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	5002	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.0	Pass
Maximum Pubic Force	N	1230 to 1590	1257	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	12.5	Pass
Overall Test Results				Pass


Laboratory Technician

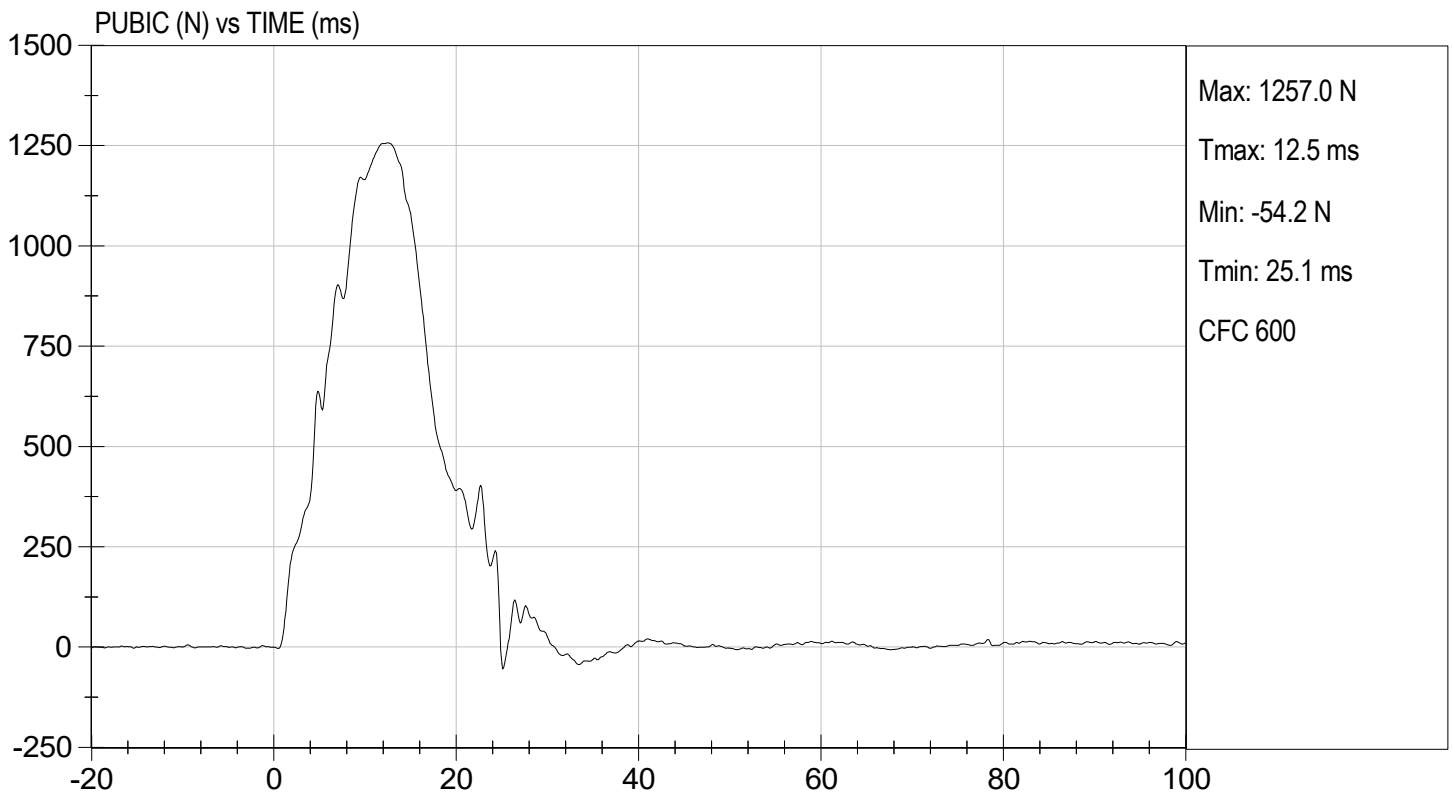
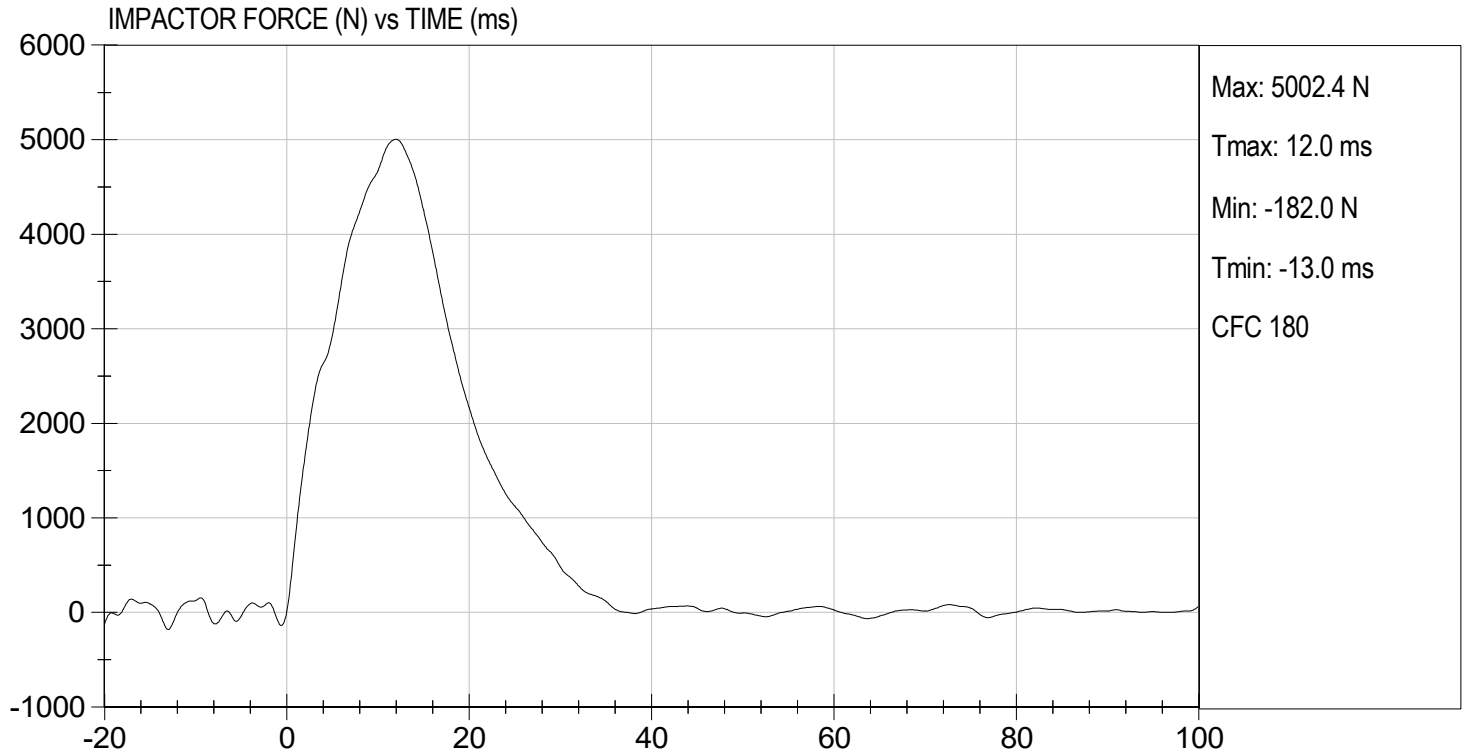
01/20/2023
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 14.10 ft/s, 4.3 m/s

TEST DATE: 01/20/2023
TEST #: D230179

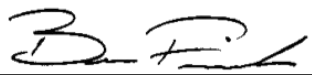


MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY**ATD Serial No: F032Test I.D: D230170

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	29	Pass
Probe Speed	m/s	5.40 to 5.60	5.52	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5655	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	39.4	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.1	Pass
Overall Test Results				Pass


Laboratory Technician

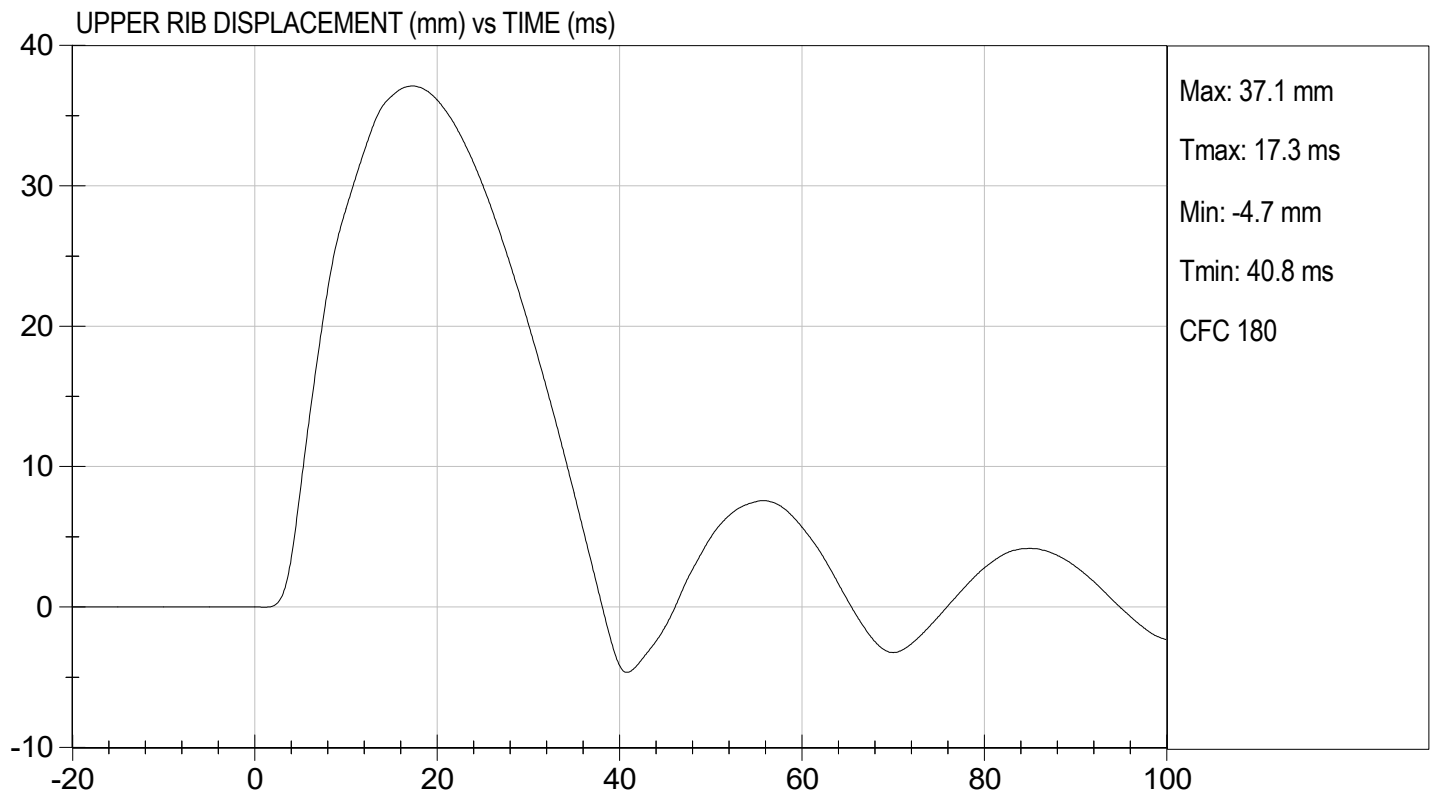
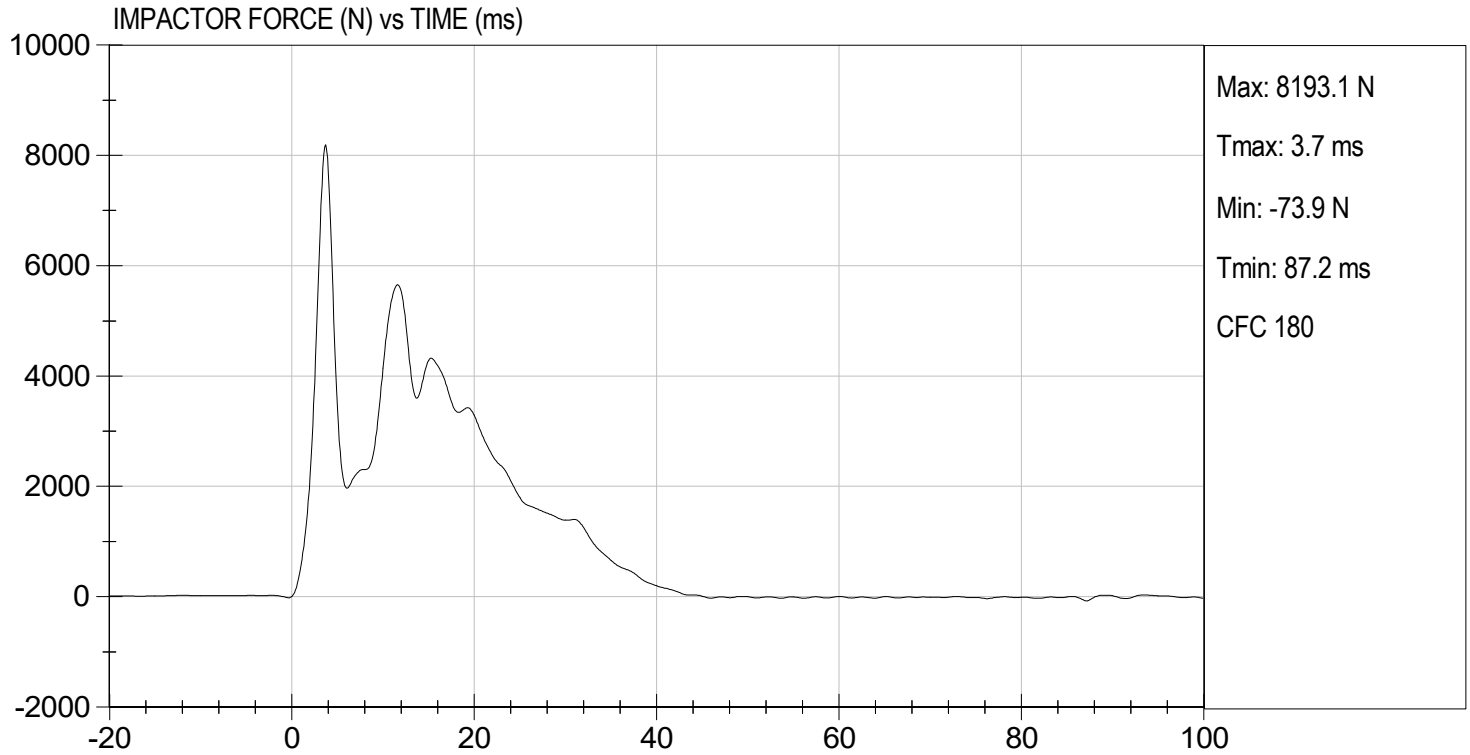
01/20/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 18.12 ft/s, 5.52 m/s

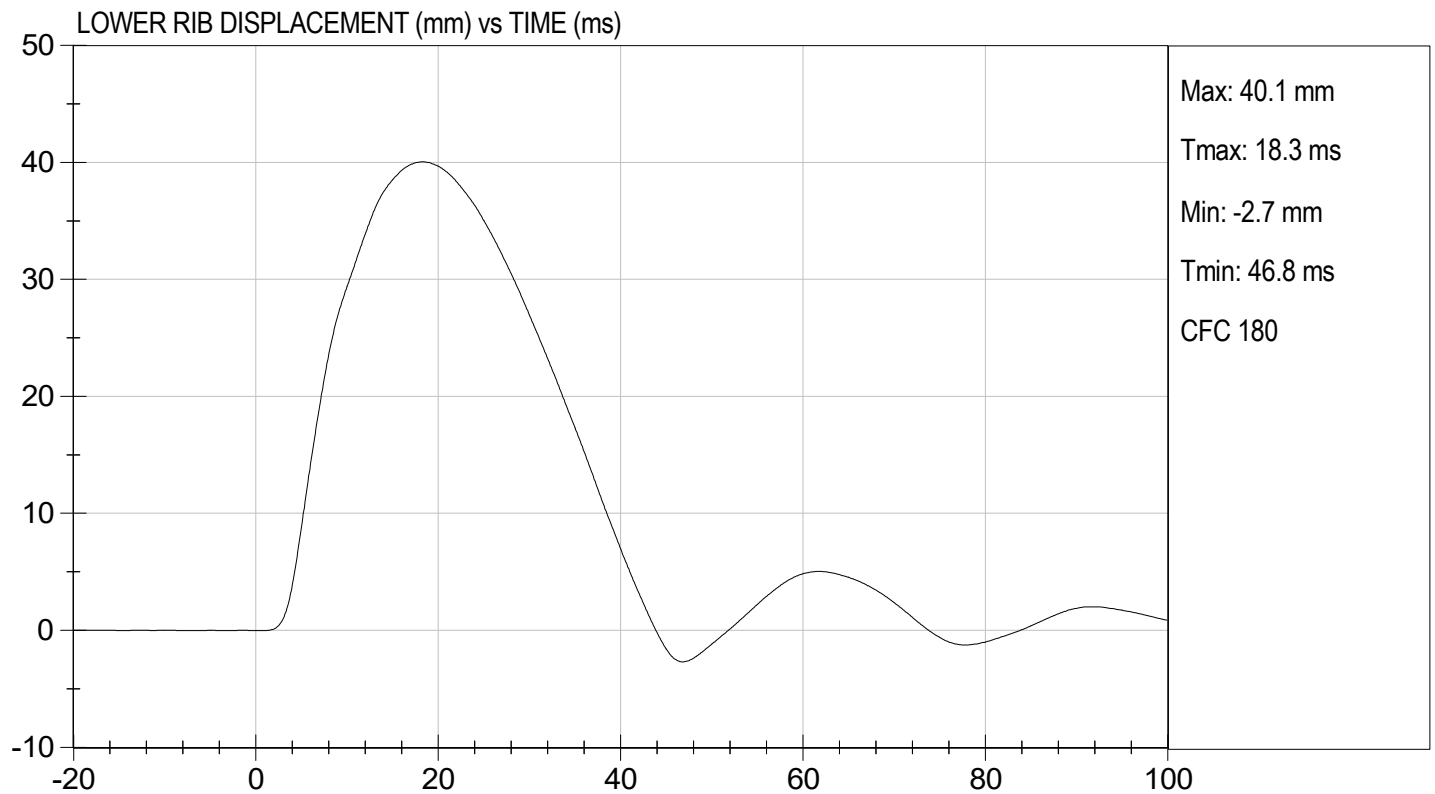
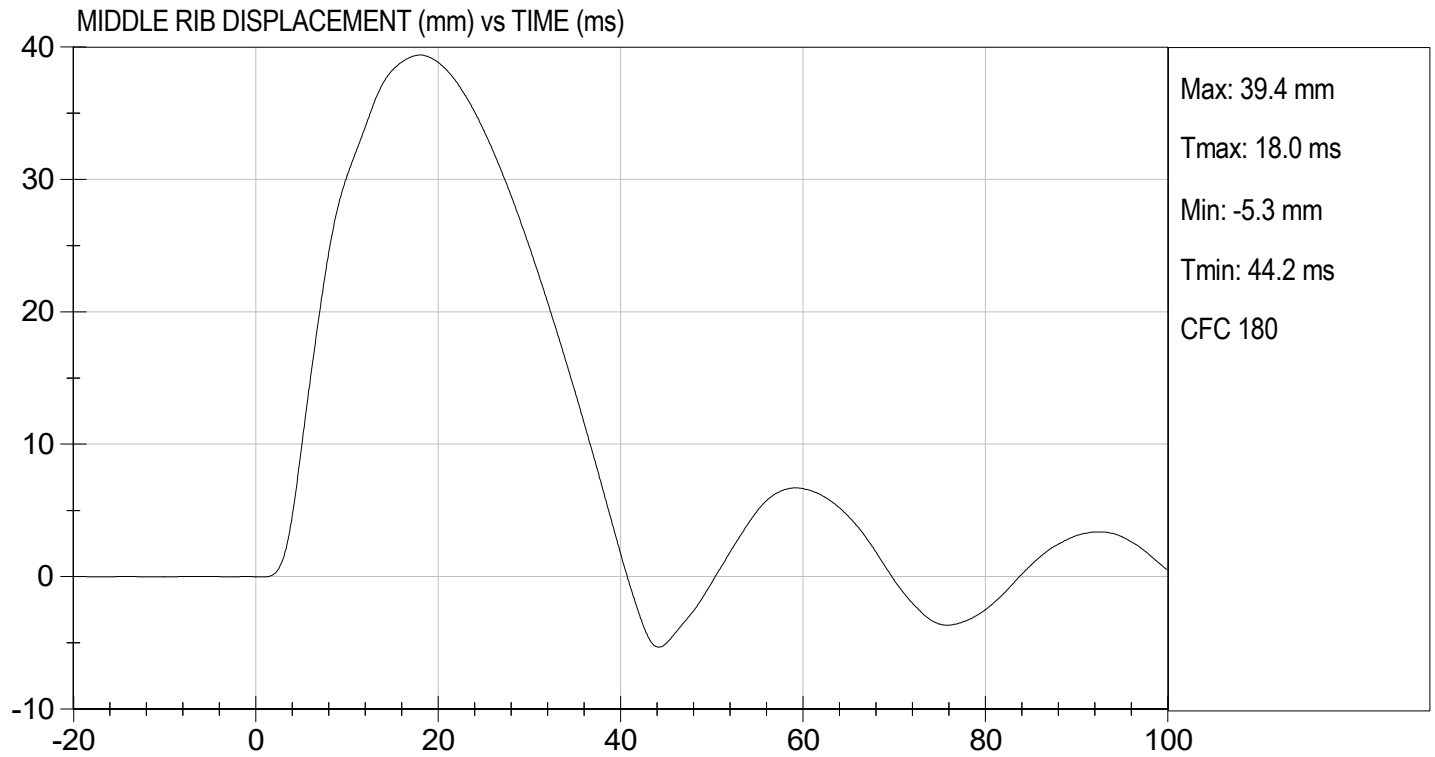
TEST DATE: 01/20/2023
TEST #: D230170





TEST DESC: THORAX IMPACT
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 01/20/2023
TEST #: D230170



QUALIFICATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

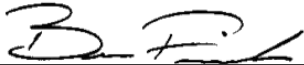
No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	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

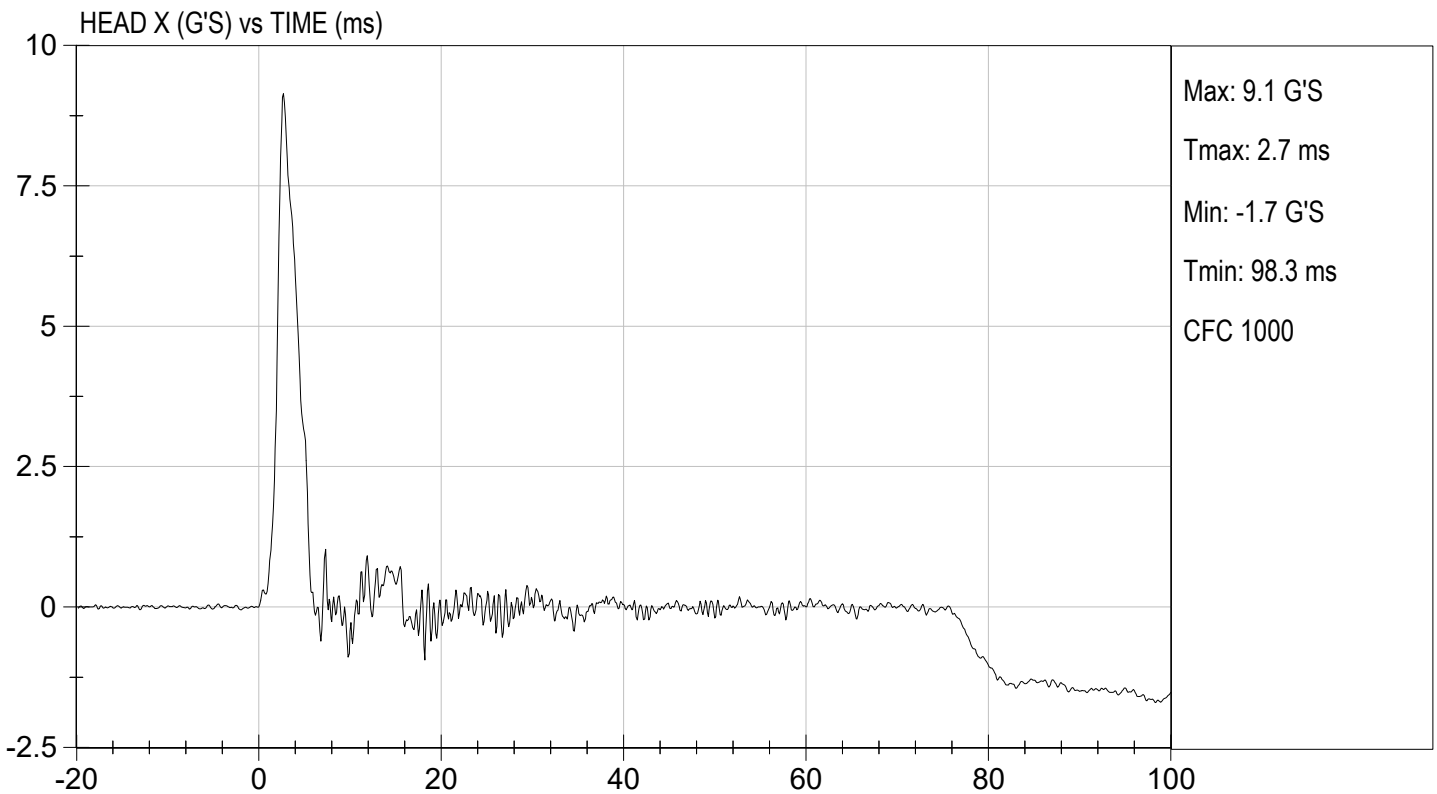
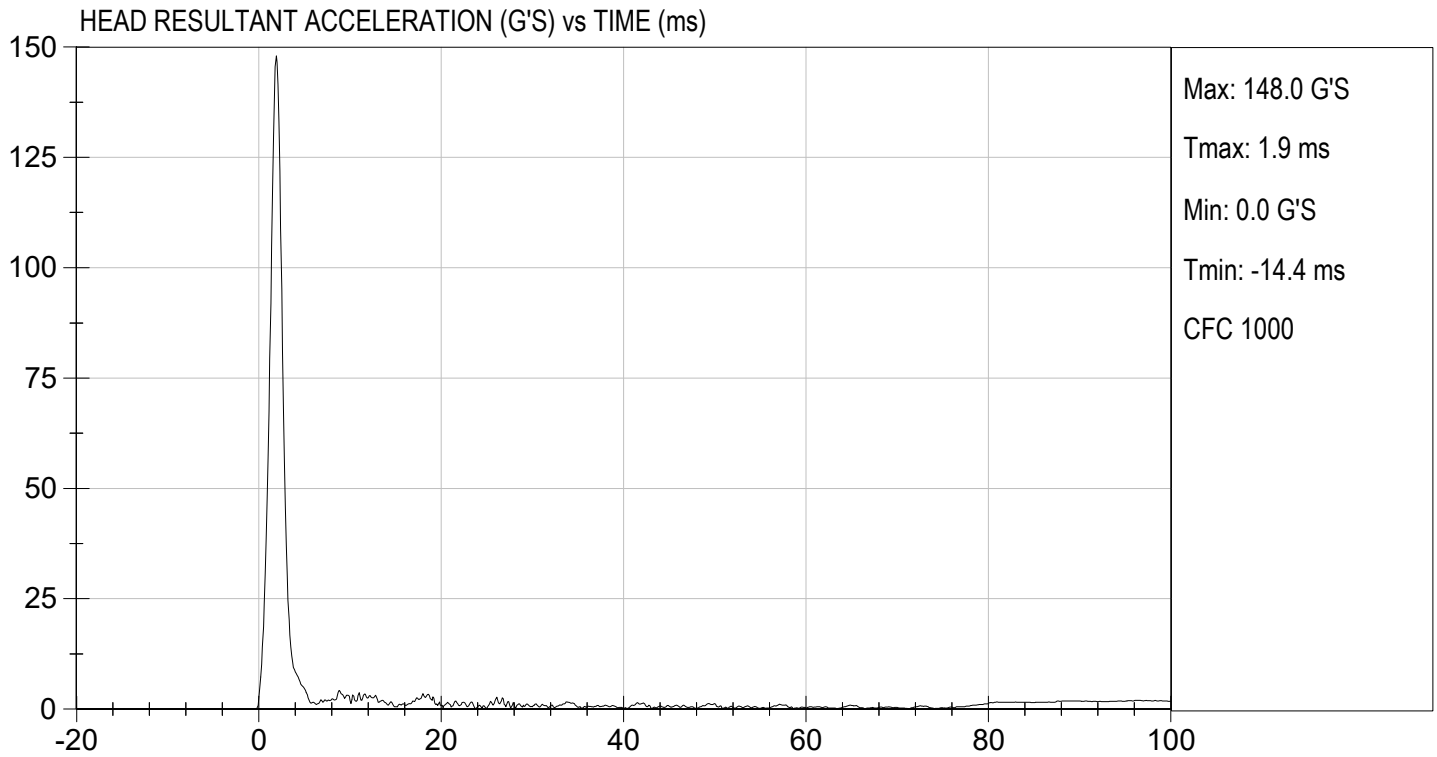
MGA RESEARCH CORPORATION**HEAD DROP TEST****ES-2re DUMMY**ATD Serial No: F032Test ID: D230561

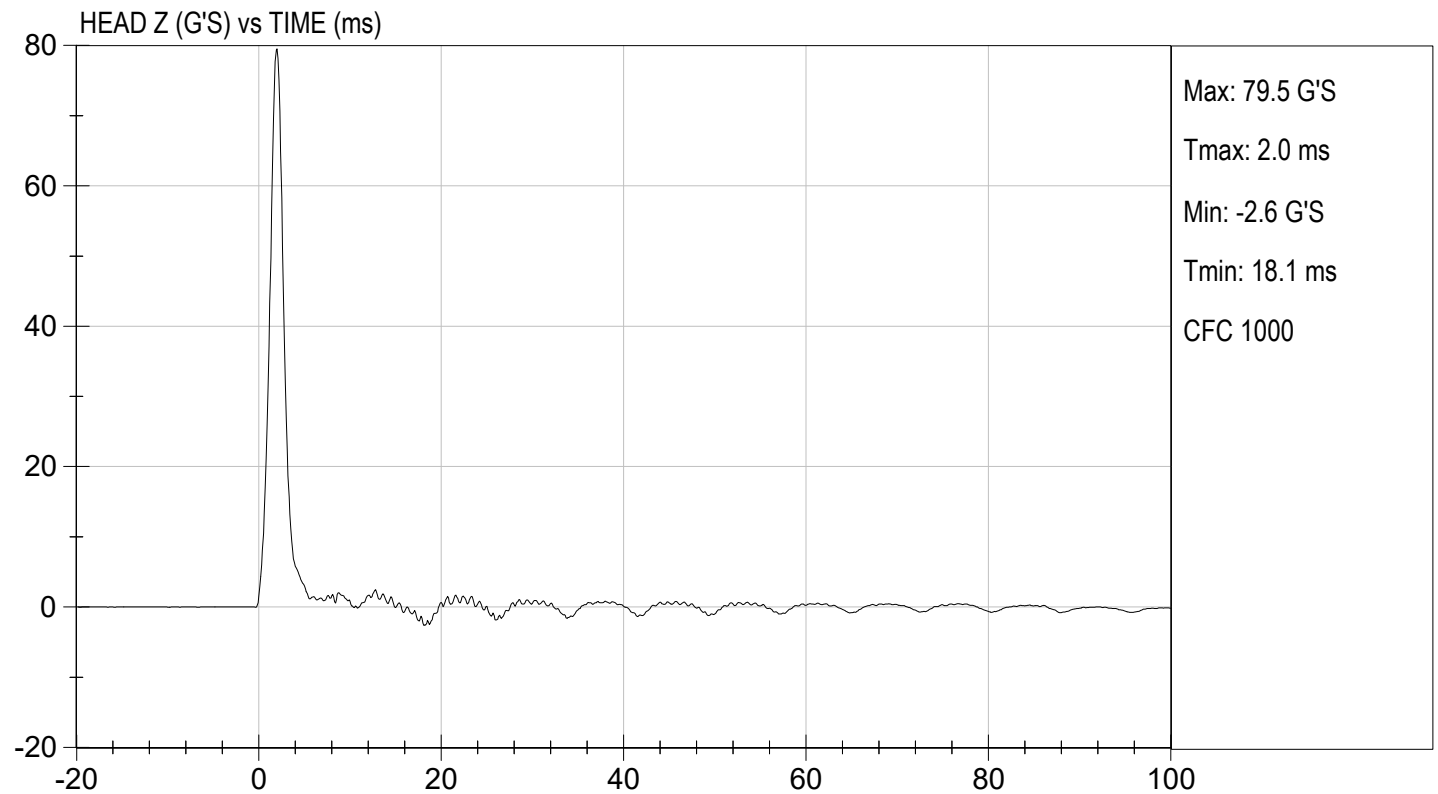
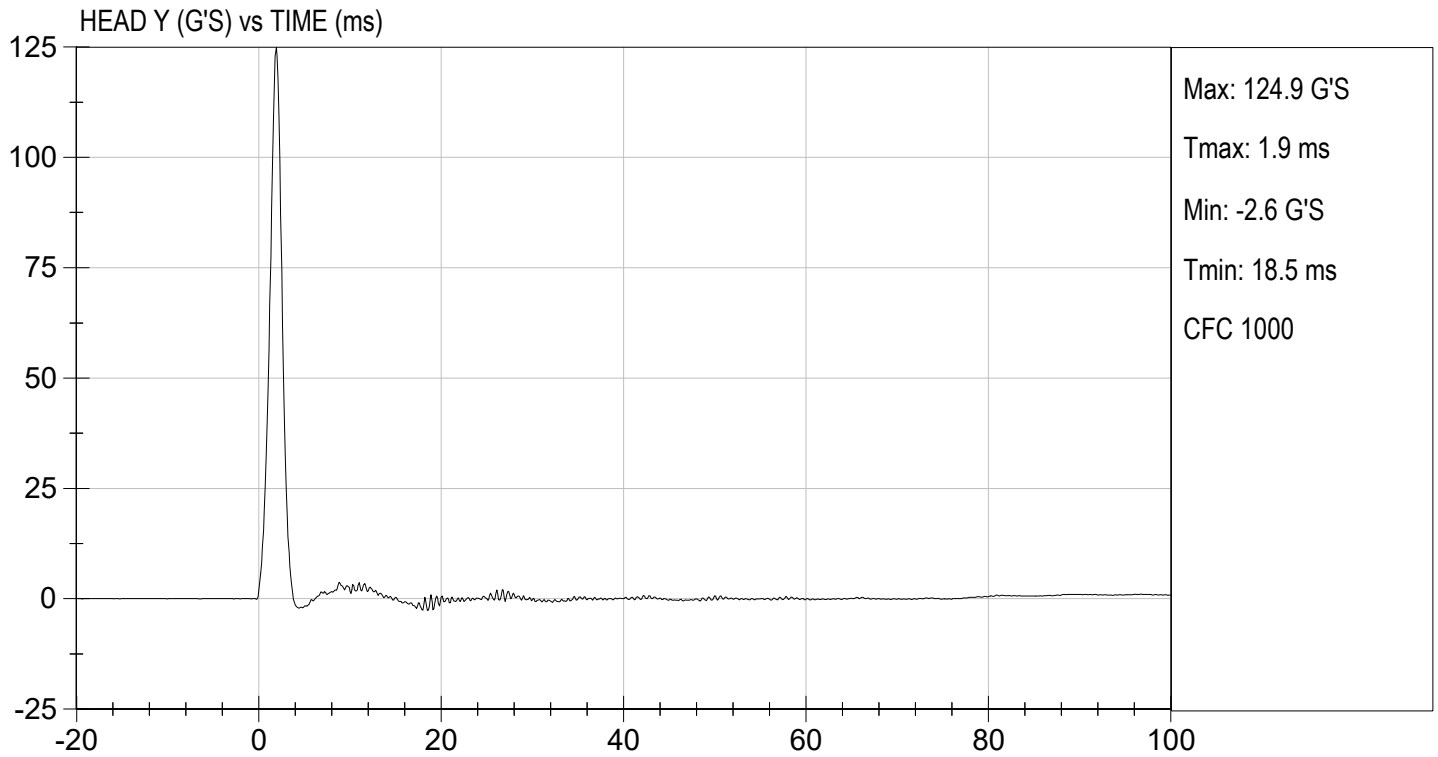
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	125 to 155	148	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	9.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

03/06/2023
Test Date


Approved By





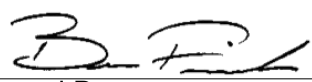
MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

ATD Serial No: F032

Test I.D: D230562

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	27	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	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.47	Pass
	17 ms	m/s	>= -3.70	-3.50	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.3	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	55.8	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	65.1	Pass
Overall Results					Pass


 Laboratory Technician

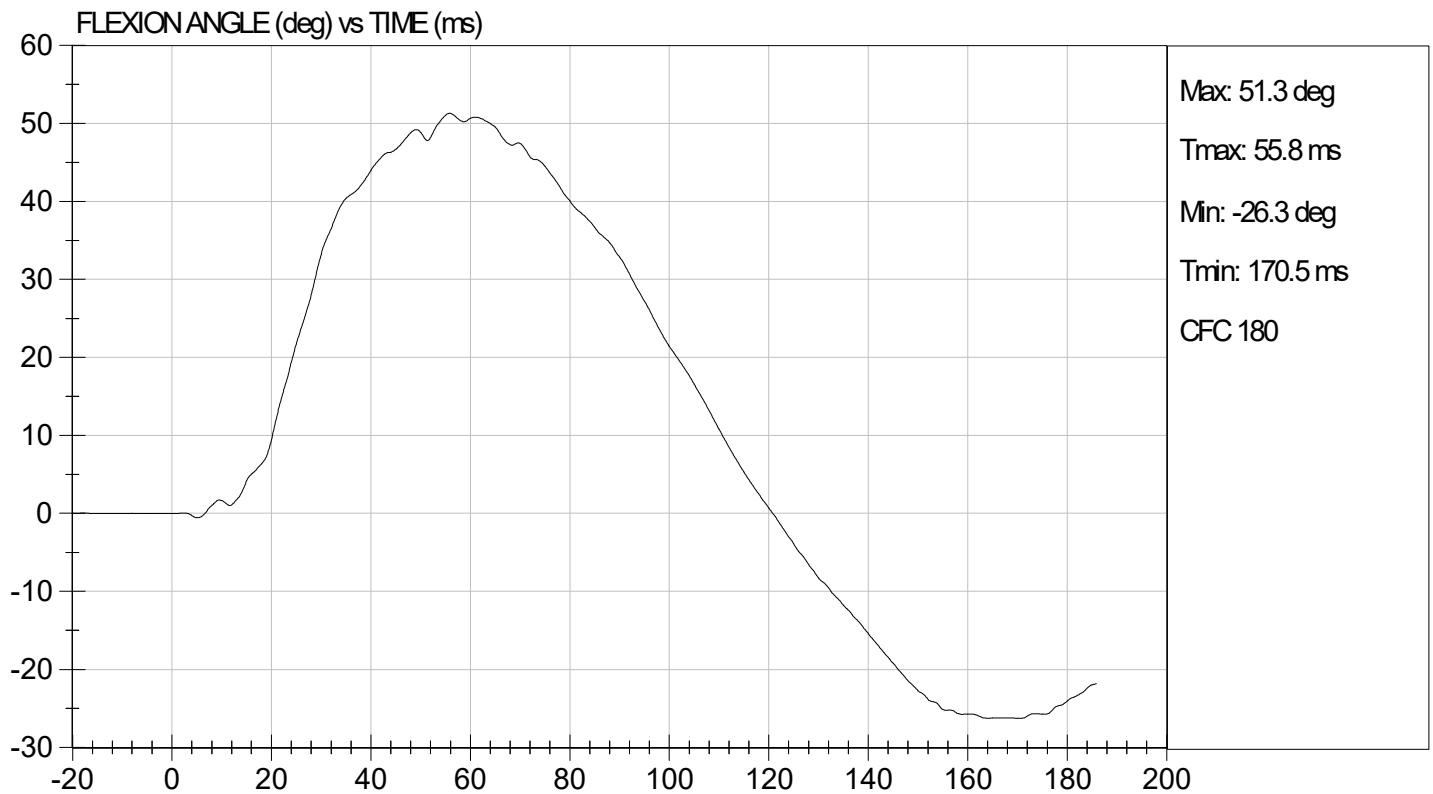
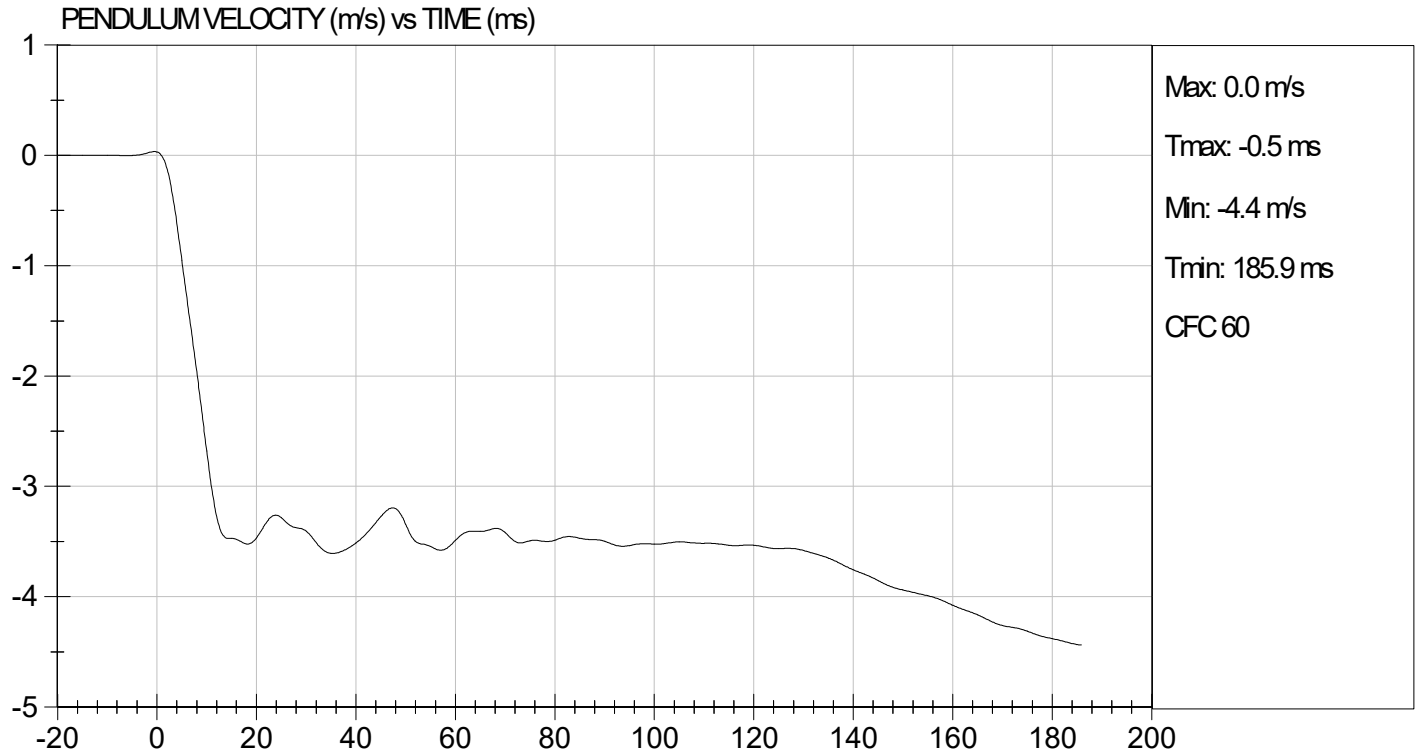

 Approved By

03/07/2023
 Test Date



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

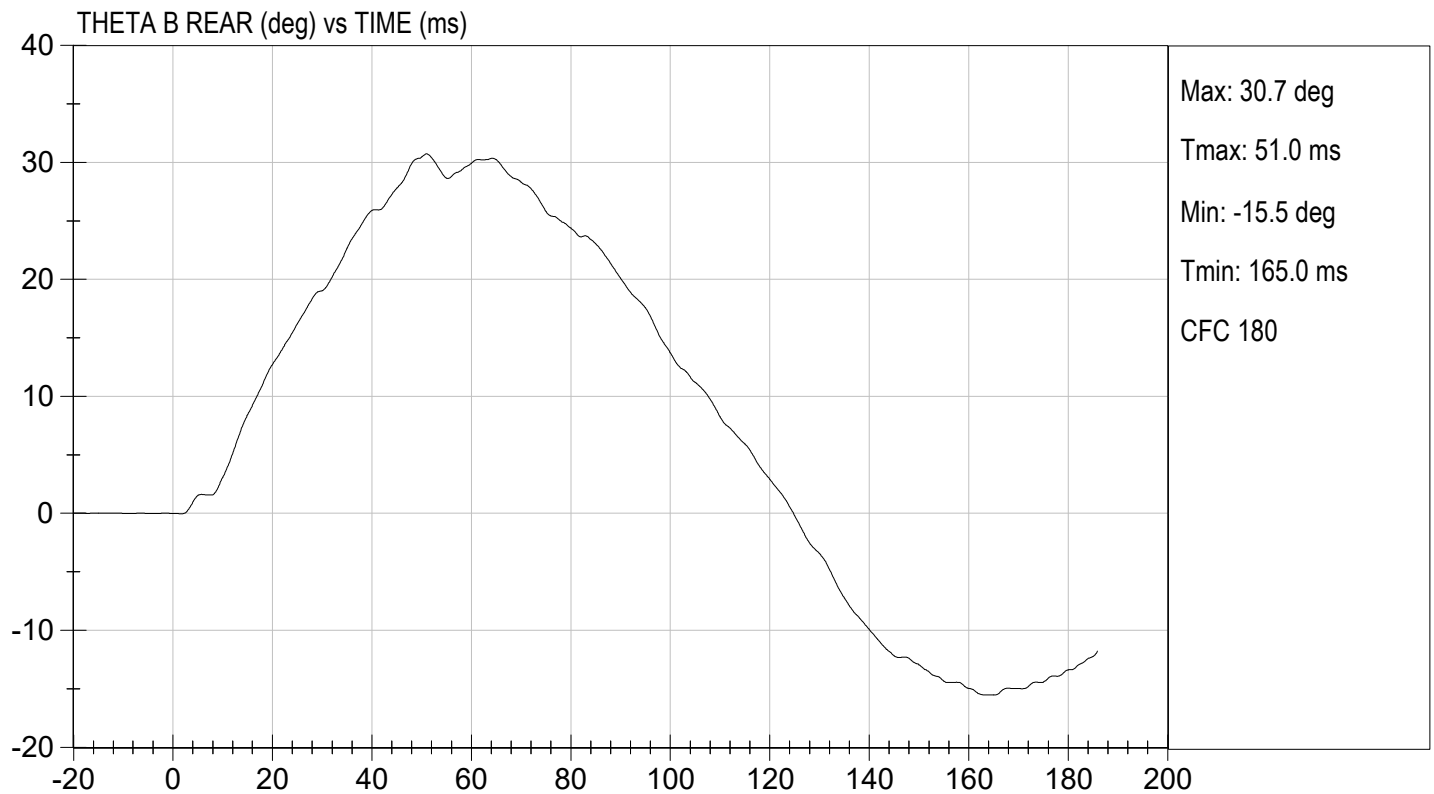
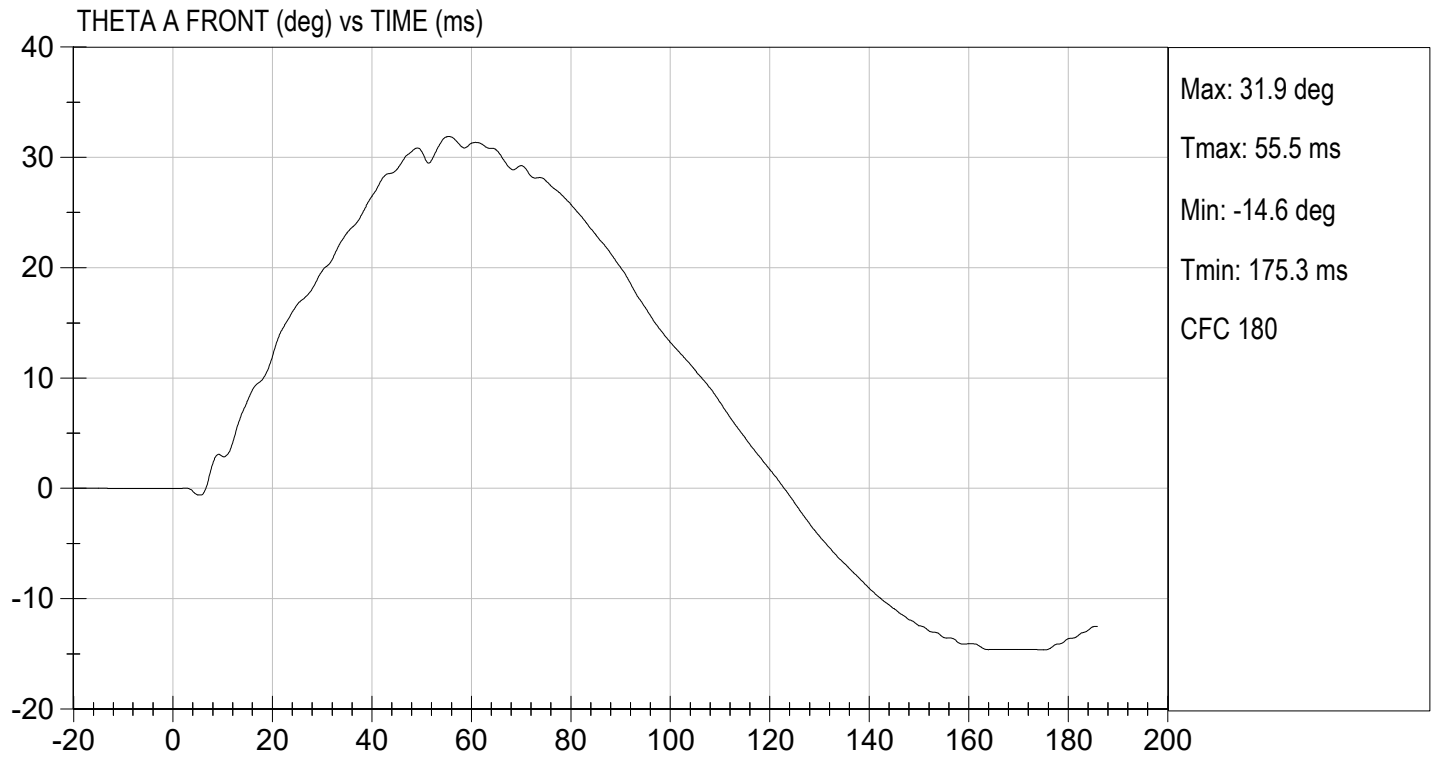
TEST DATE: 03/07/2023
TEST #: D230562





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

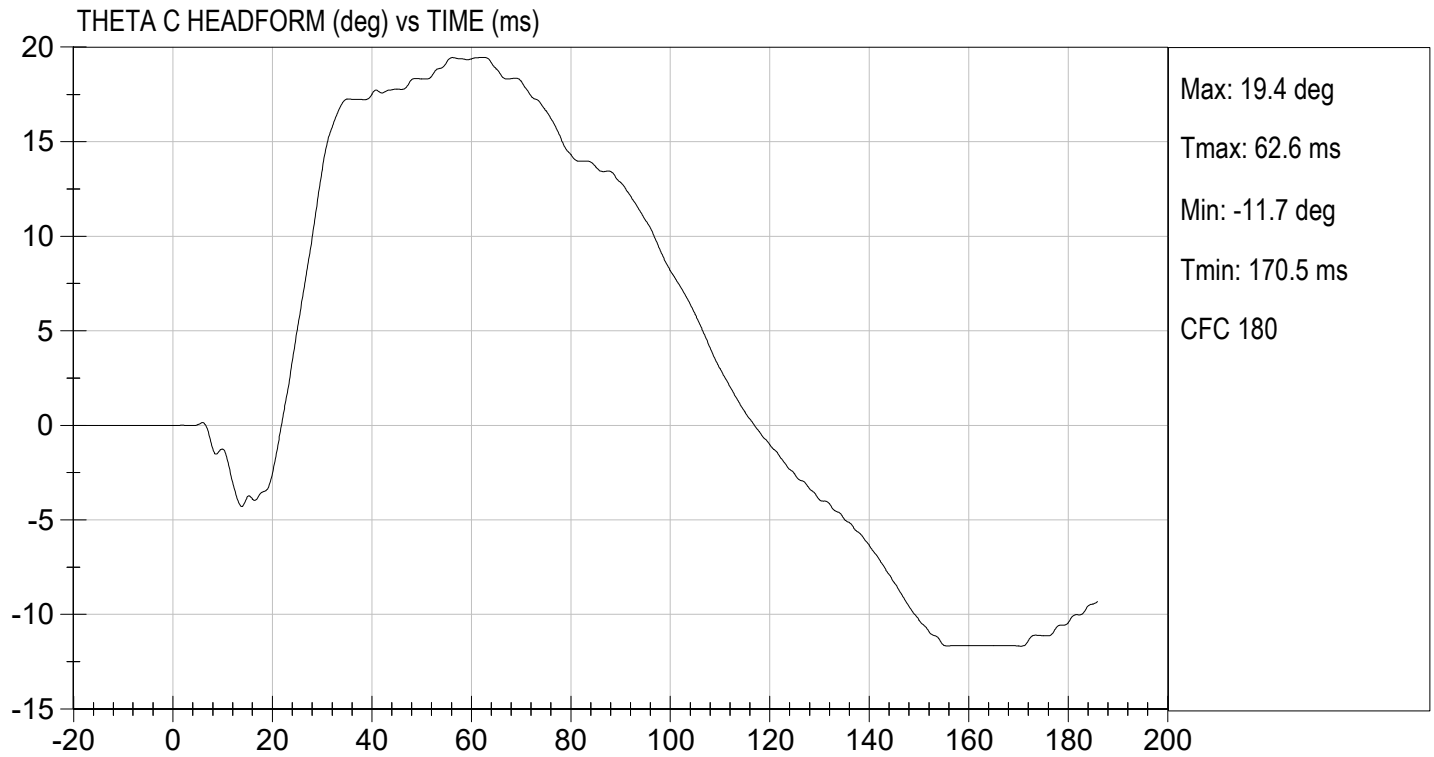
TEST DATE: 03/07/2023
TEST #: D230562





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

TEST DATE: 03/07/2023
TEST #: D230562



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
ES-2re DUMMY

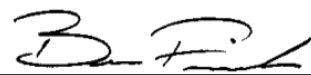
ATD Serial No: F032

Test I.D: D230563

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.3	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	10.4	Pass
Overall Test Results				Pass


Laboratory Technician

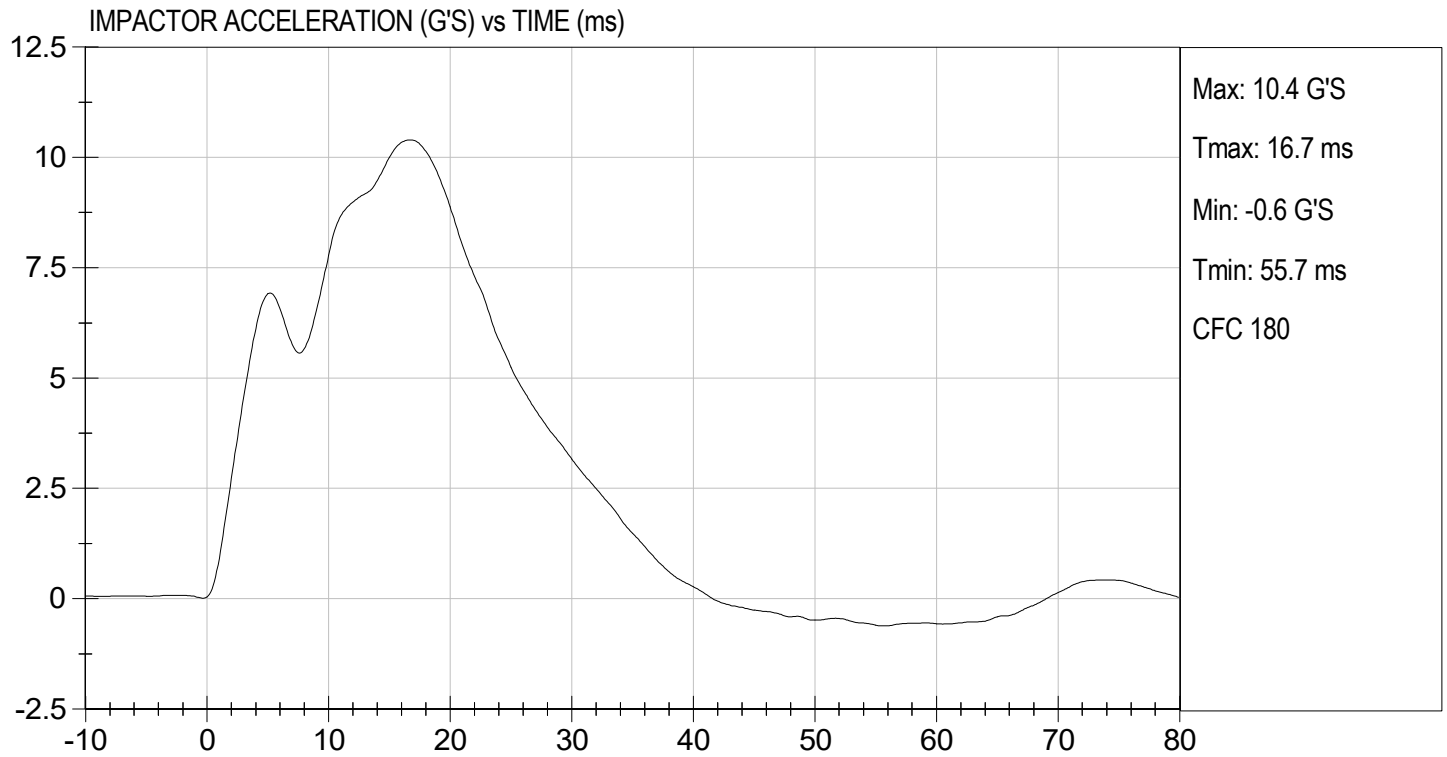
03/07/2023
Test Date


Approved By



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

TEST DATE: 03/07/2023
TEST #: D230563



MGA RESEARCH CORPORATION

UPPER RIB TEST

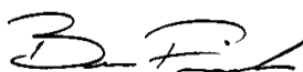
ES-2re DUMMY

ATD Serial No: F032

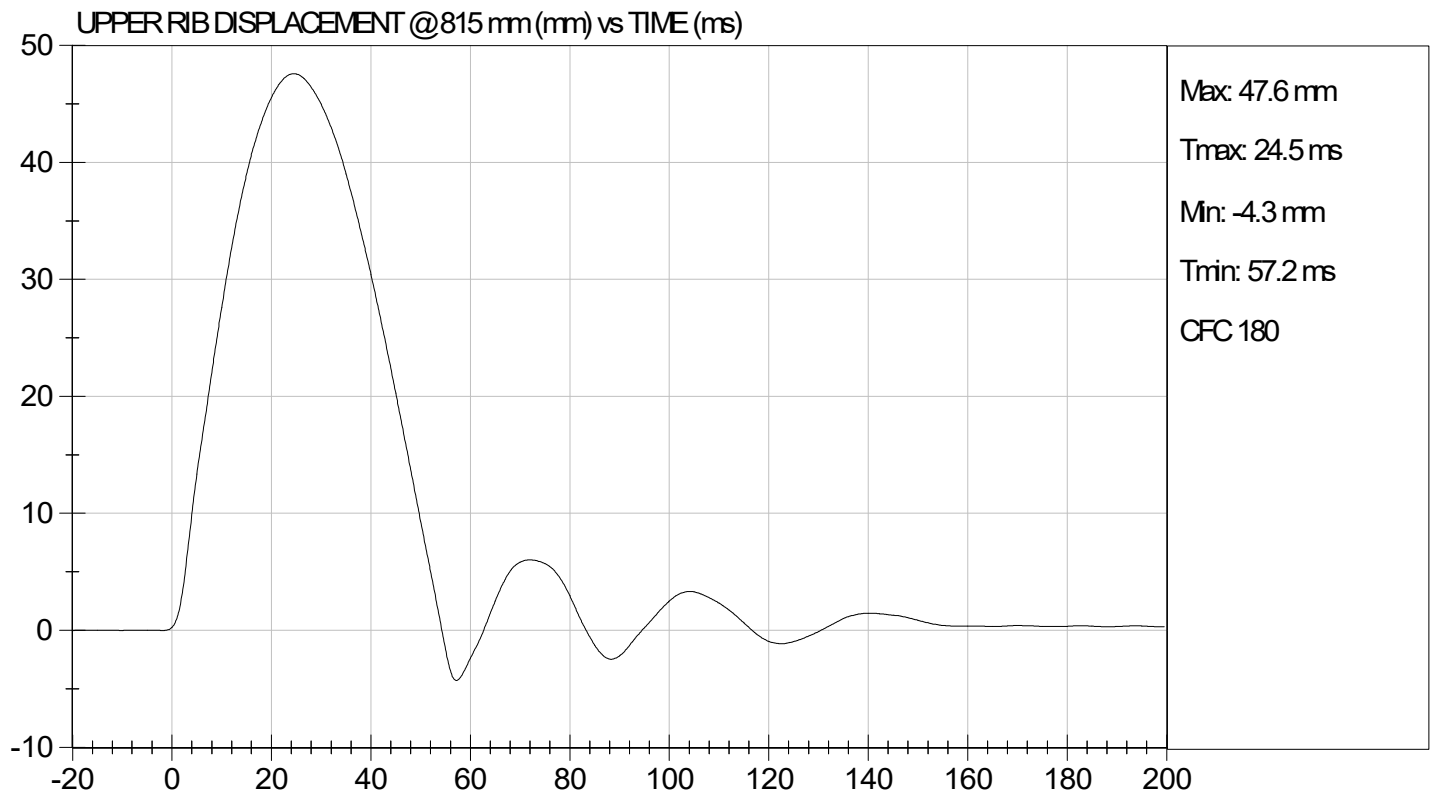
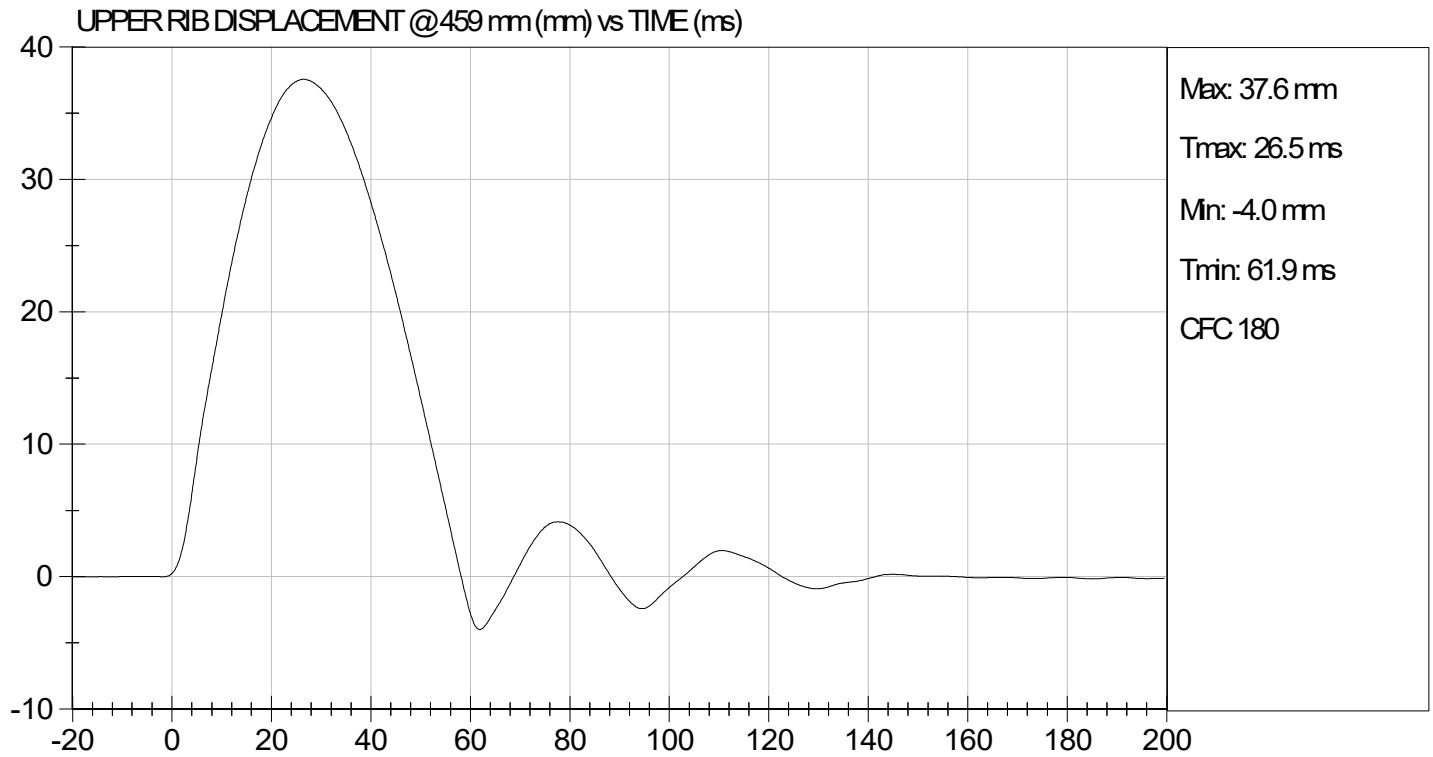
Test I.D: D230564

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.6	Pass
			Overall Test Results	Pass


Laboratory Technician


Approved By

03/06/2023
Test Date



MGA RESEARCH CORPORATION

**MID RIB TEST
ES-2re DUMMY**

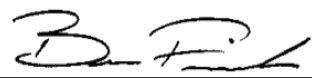
ATD Serial No: F032

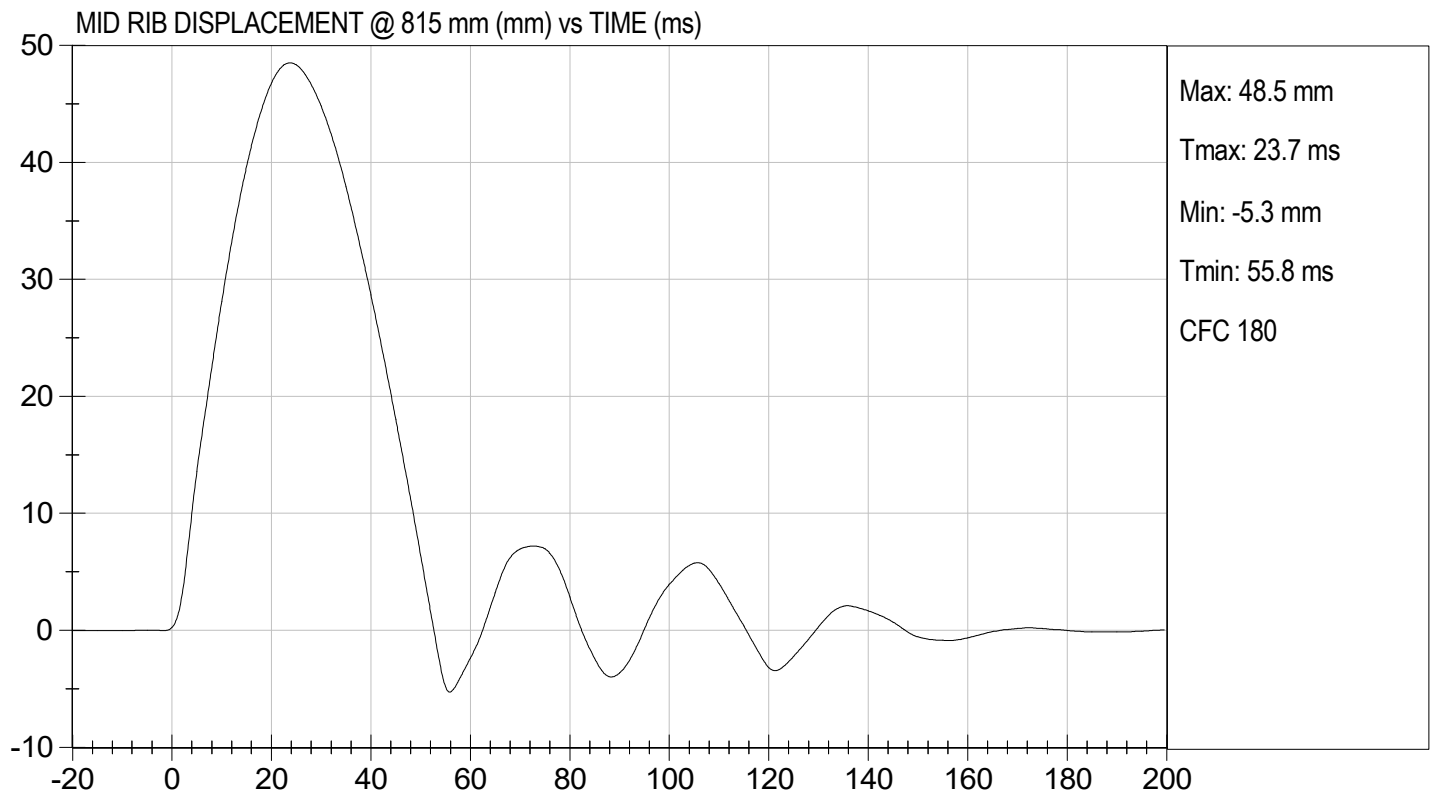
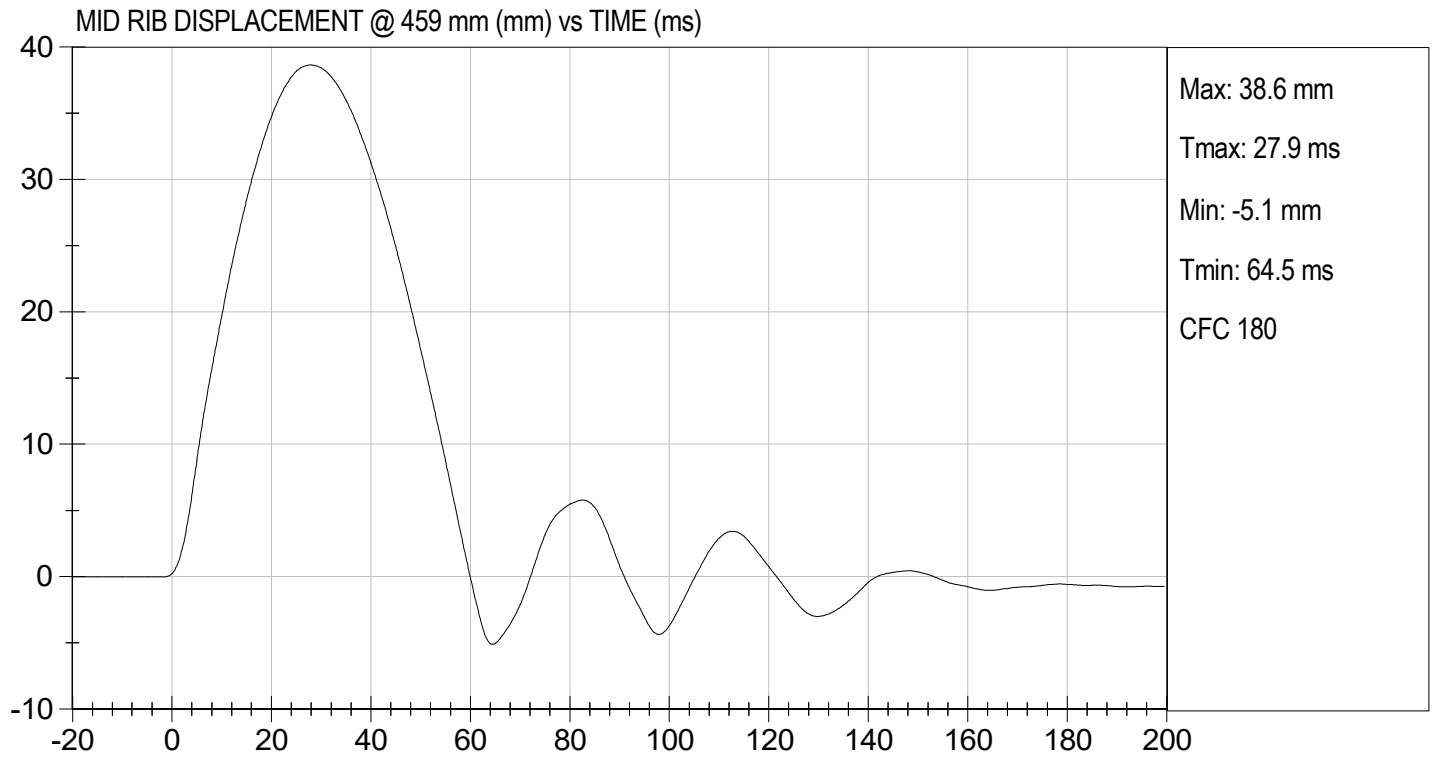
Test I.D: D230565

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.5	Pass
Overall Test Results				Pass


Laboratory Technician

03/06/2023
Test Date


Approved By



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

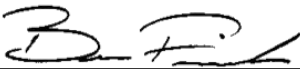
ATD Serial No: F032

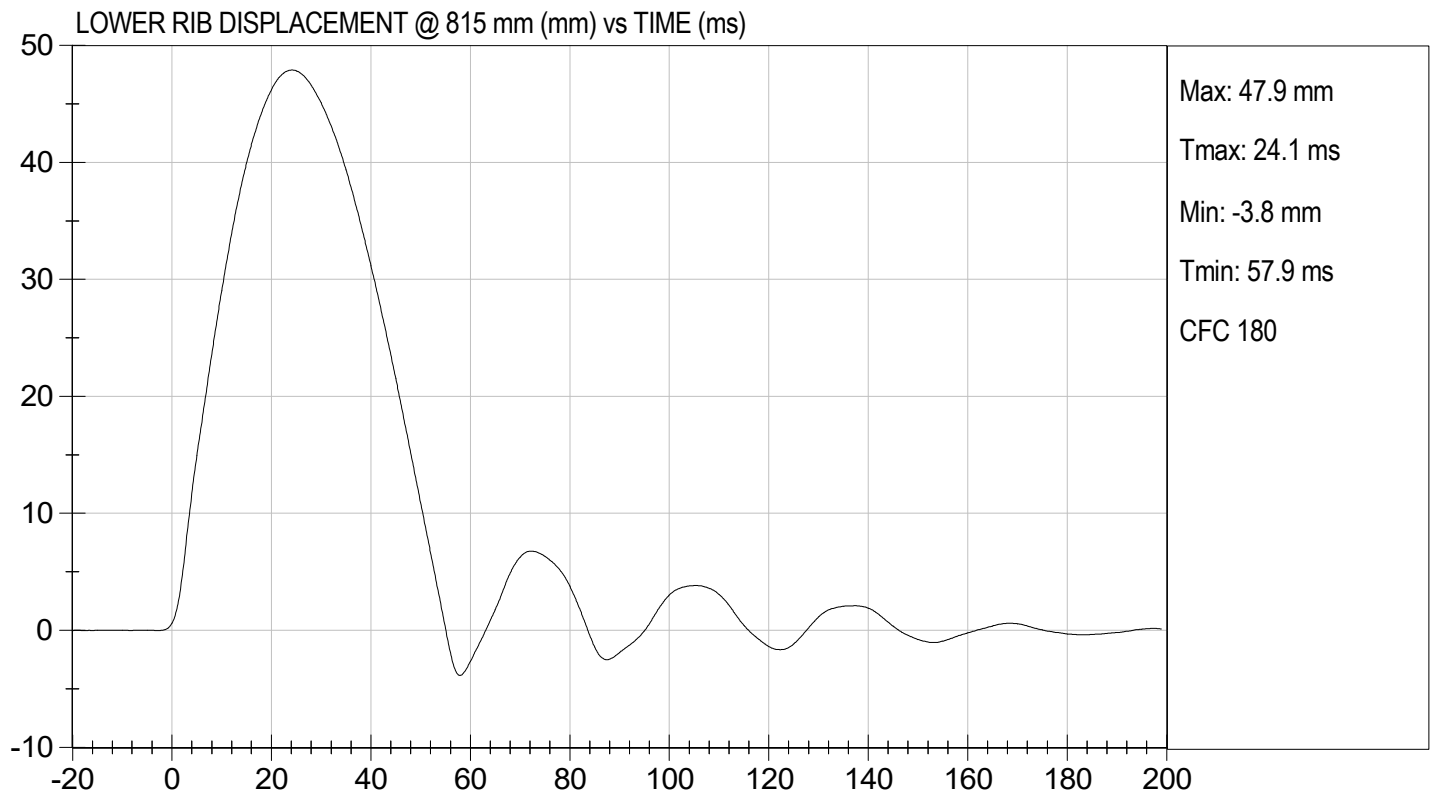
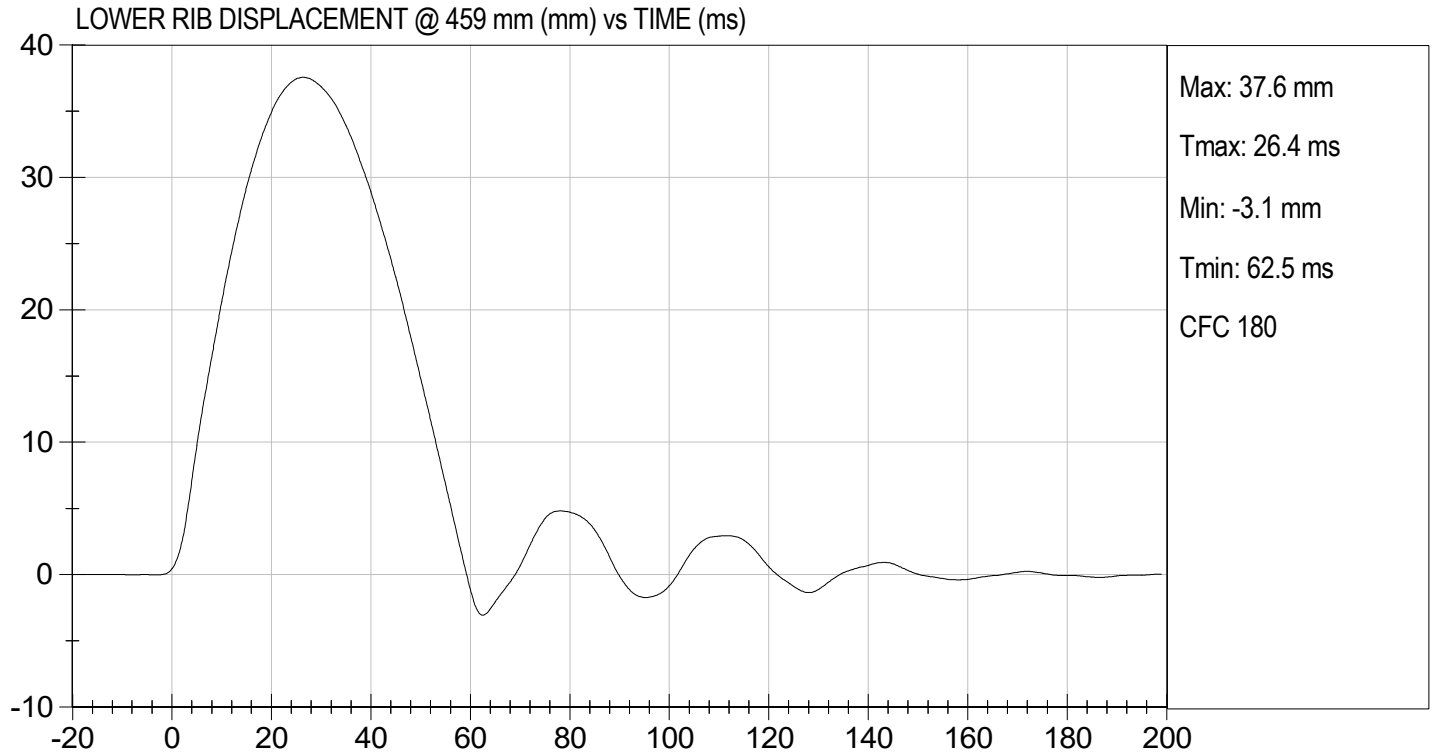
Test I.D: D230566

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.9	Pass
Overall Test Results				Pass


Laboratory Technician

03/06/2023
Test Date


Approved By

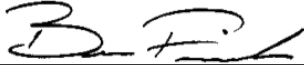


MGA RESEARCH CORPORATION**ABDOMEN TEST****ES-2re DUMMY**ATD Serial No: F032Test I.D: D230567

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	3.90 to 4.10	4.00	Pass
Maximum Impactor Force	N	4000 to 4800	4221	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.1	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2392	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.0	Pass
Overall Test Results				Pass


Laboratory Technician

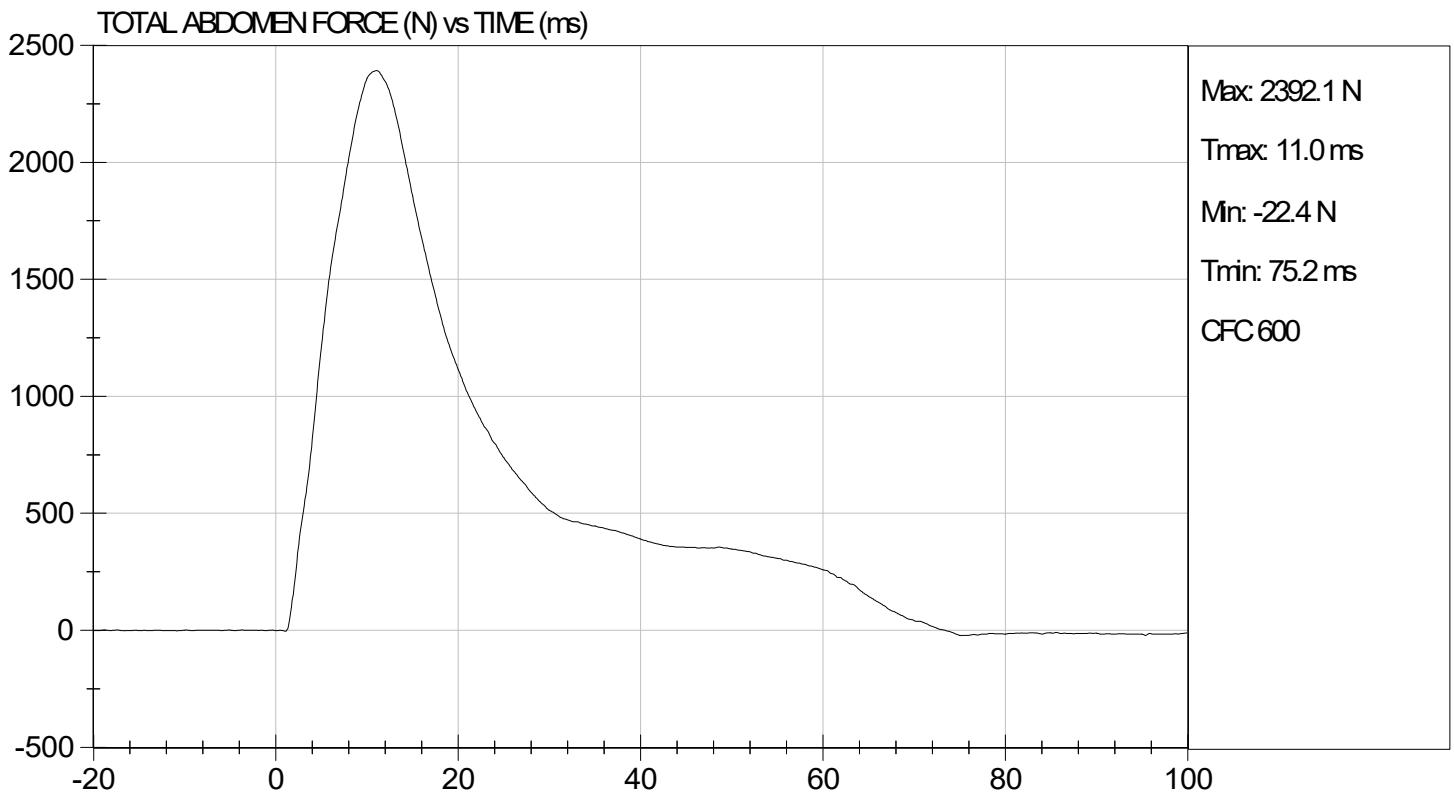
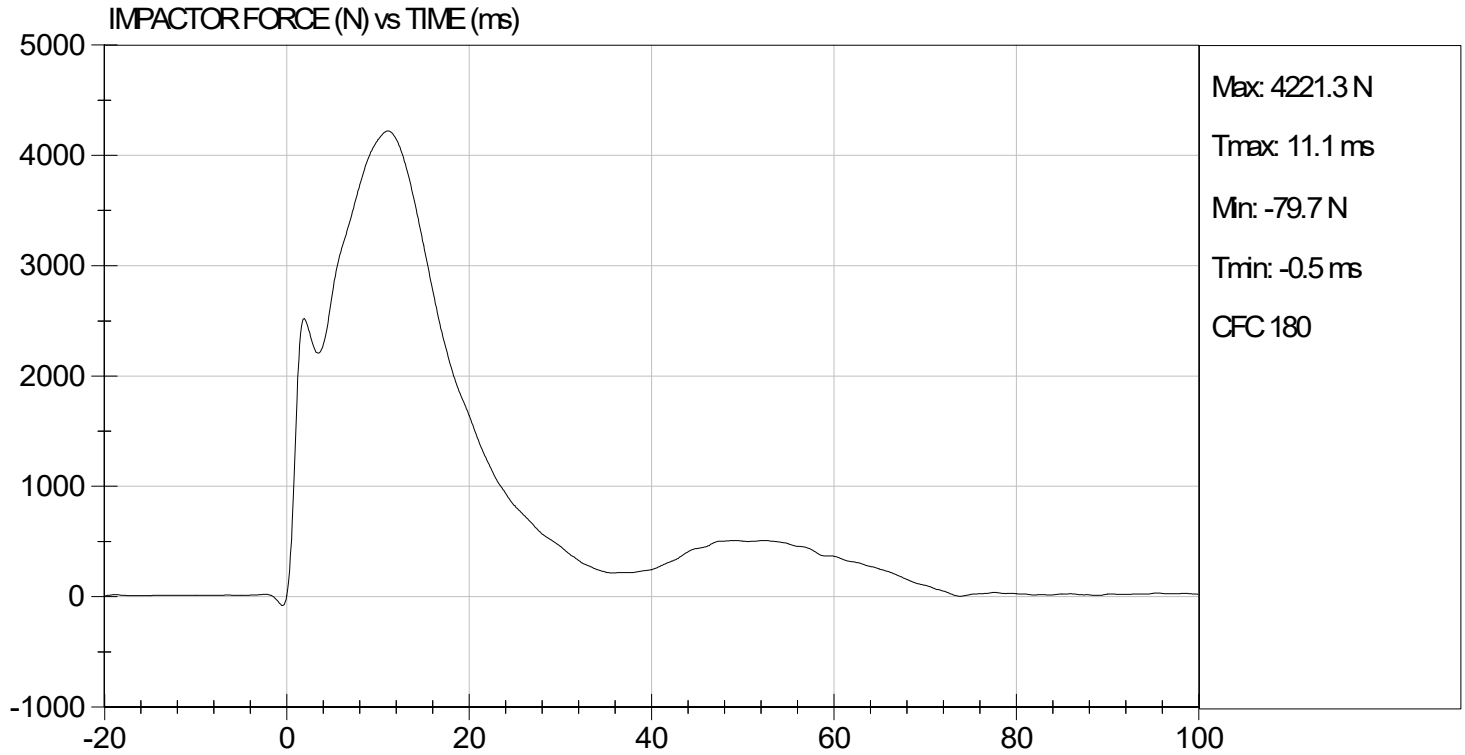
03/07/2023
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.13 ft/s, 4.00 m/s

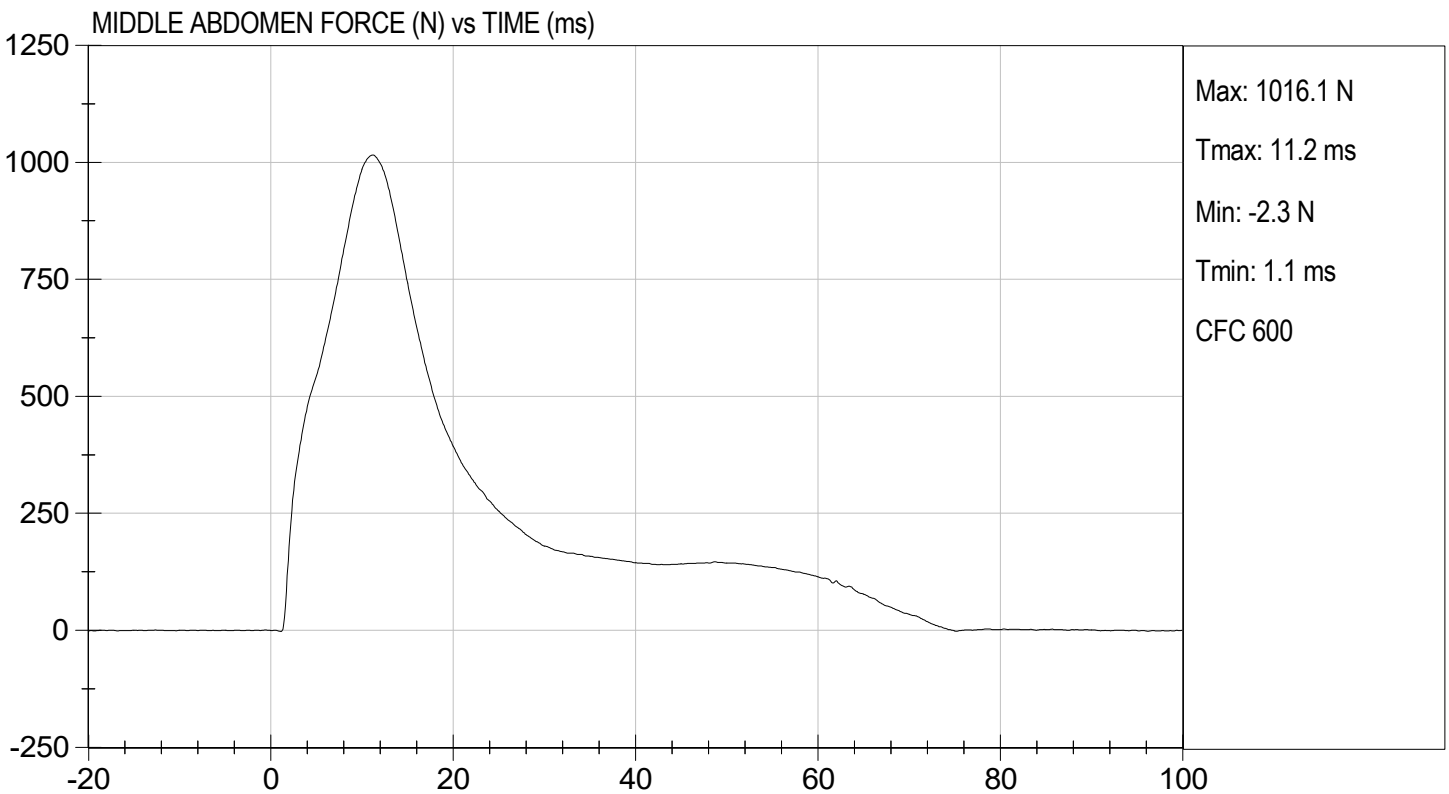
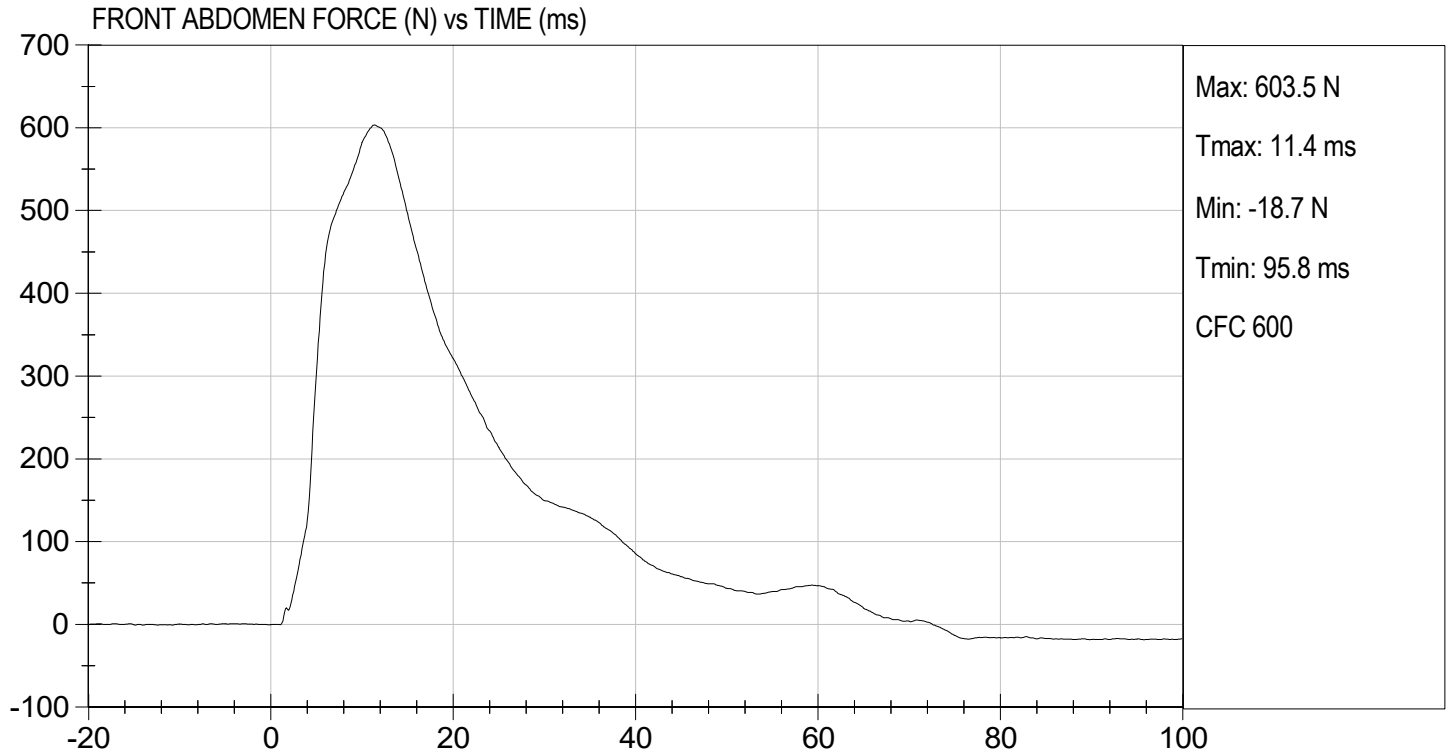
TEST DATE: 03/07/2023
TEST #: D230567





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.13 ft/s, 4.00 m/s

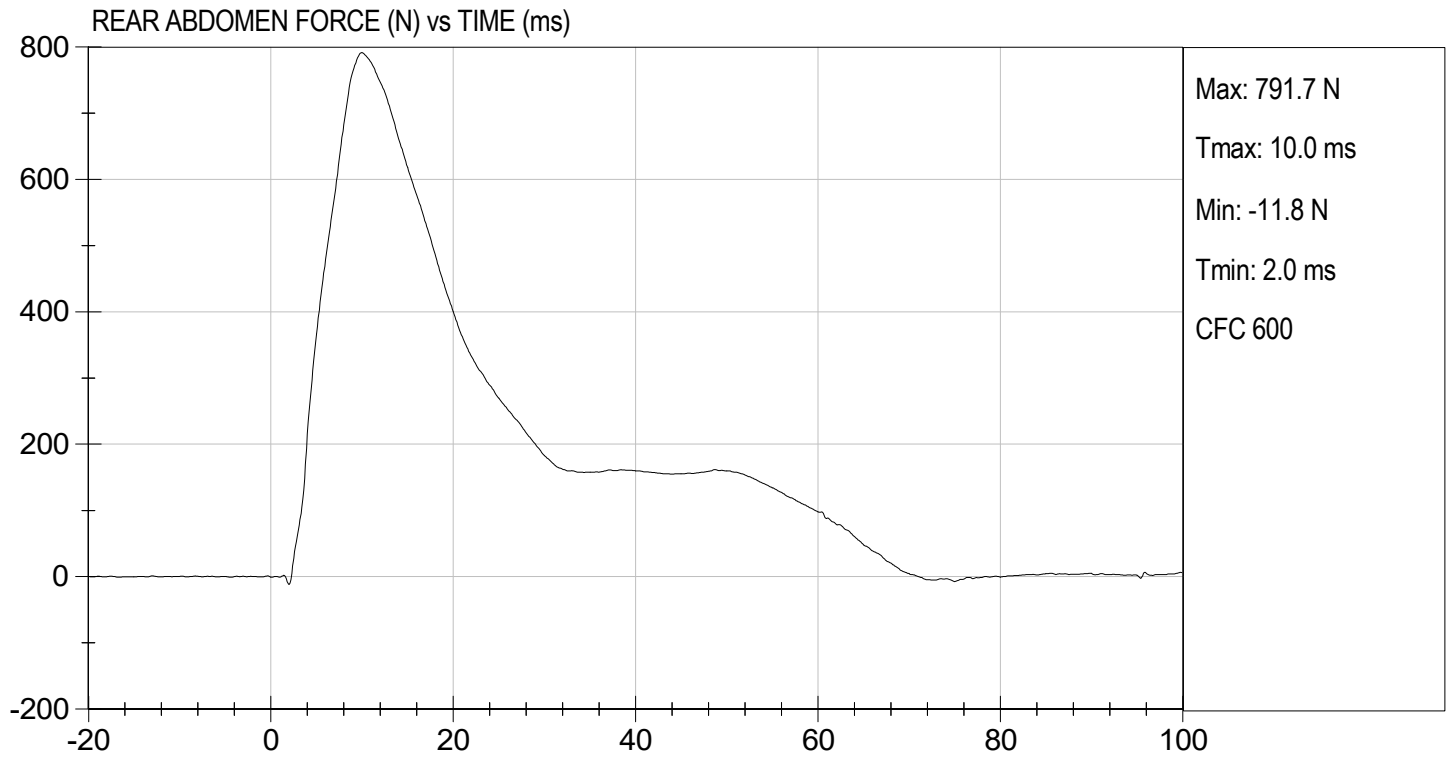
TEST DATE: 03/07/2023
TEST #: D230567





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.13 ft/s, 4.00 m/s

TEST DATE: 03/07/2023
TEST #: D230567



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
ES-2re DUMMY

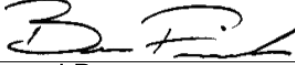
ATD Serial No: F032

Test I.D: D230568

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.406	Pass
	27 ms	m/s	-6.50 to -5.80	-6.03	Pass
	30 ms	m/s	>= -6.50	-6.09	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.9	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	51.8	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	38	Pass
Overall Results					Pass


 Laboratory Technician

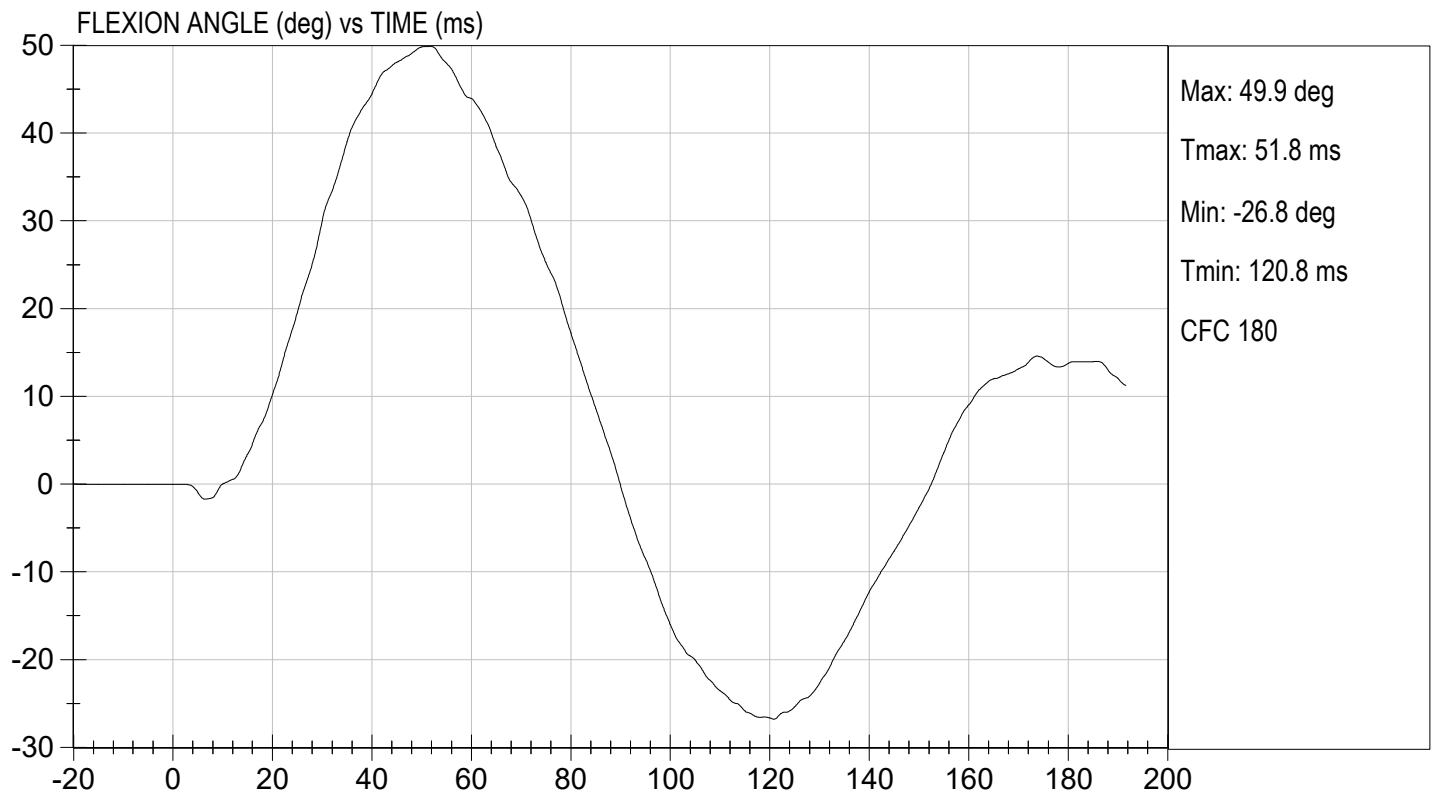
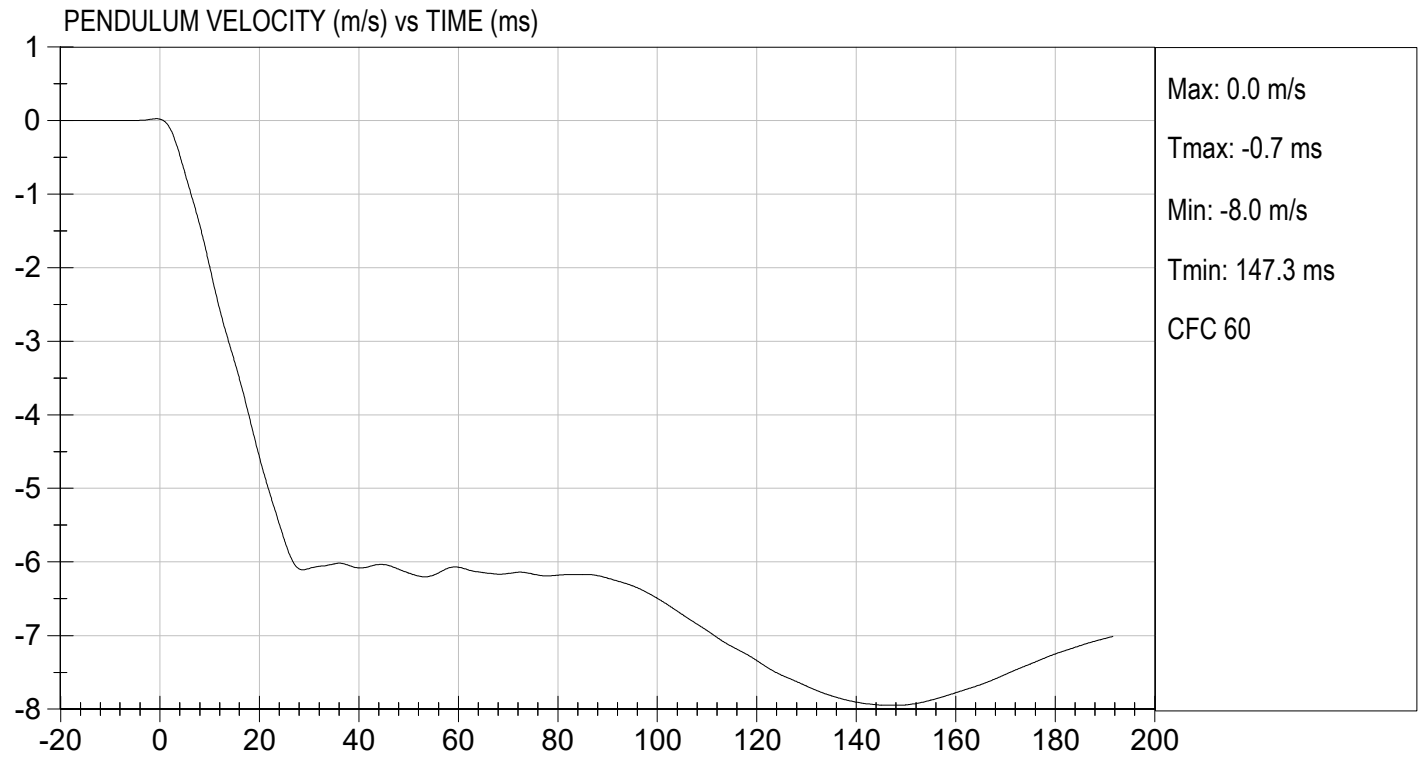
03/07/2023
 Test Date


 Approved By



TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

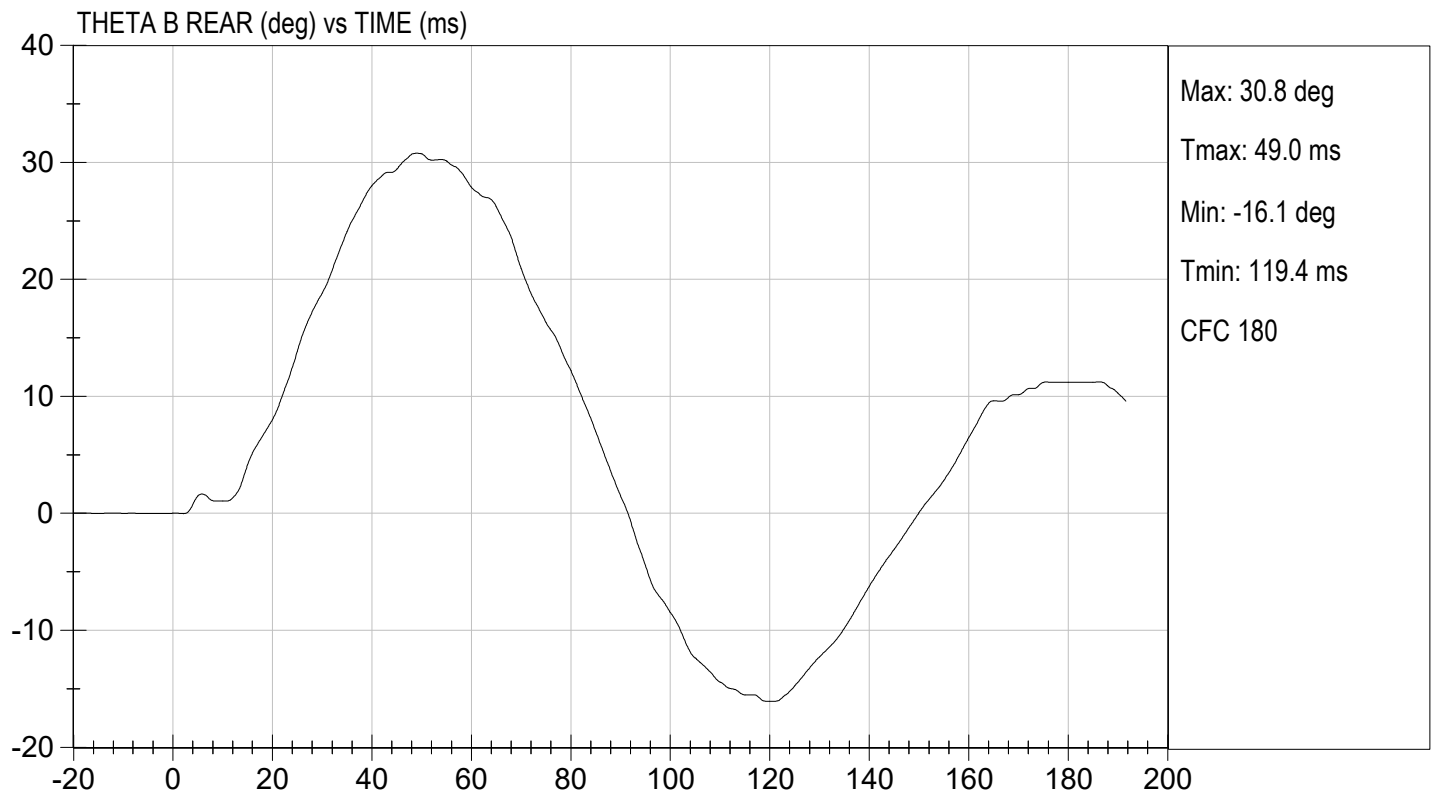
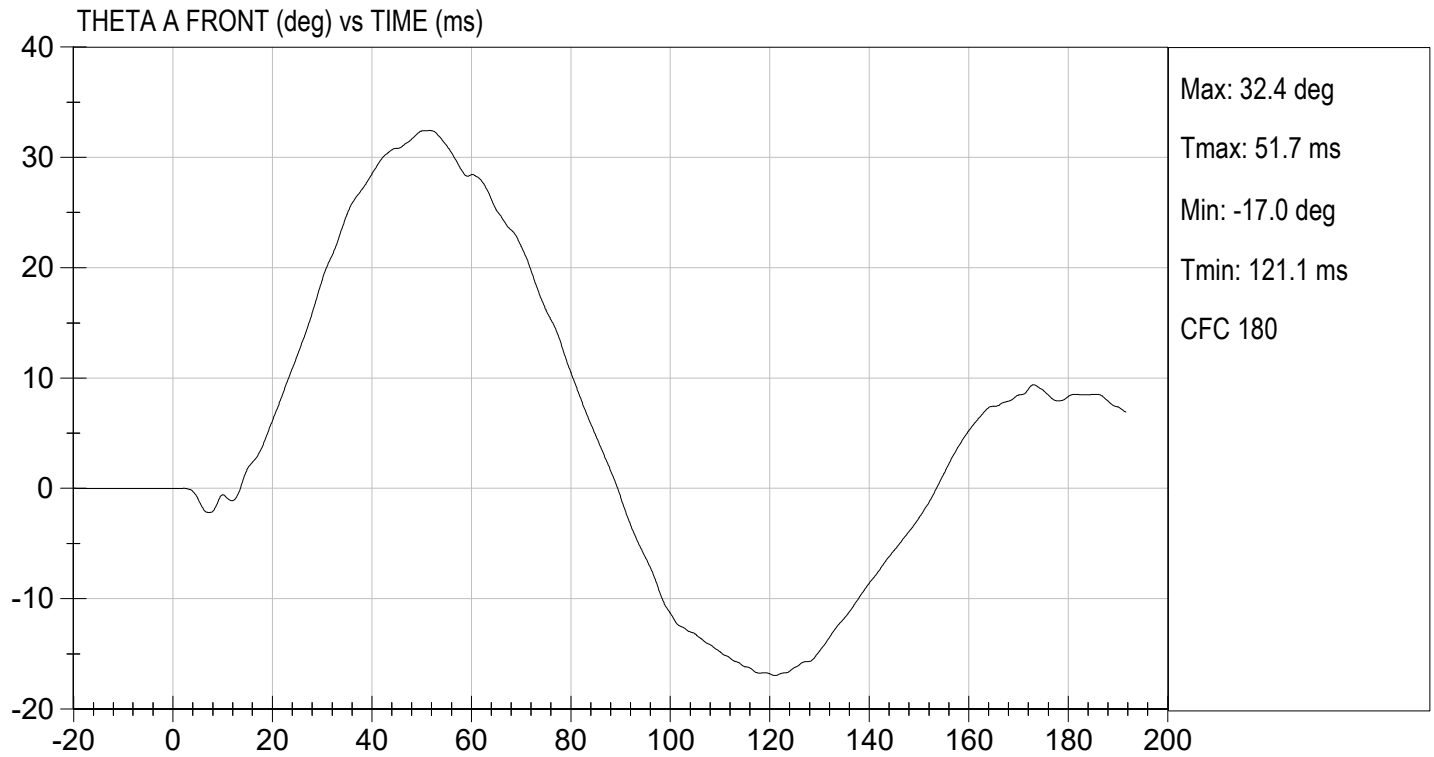
TEST DATE: 03/07/2023
TEST #: D230568





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

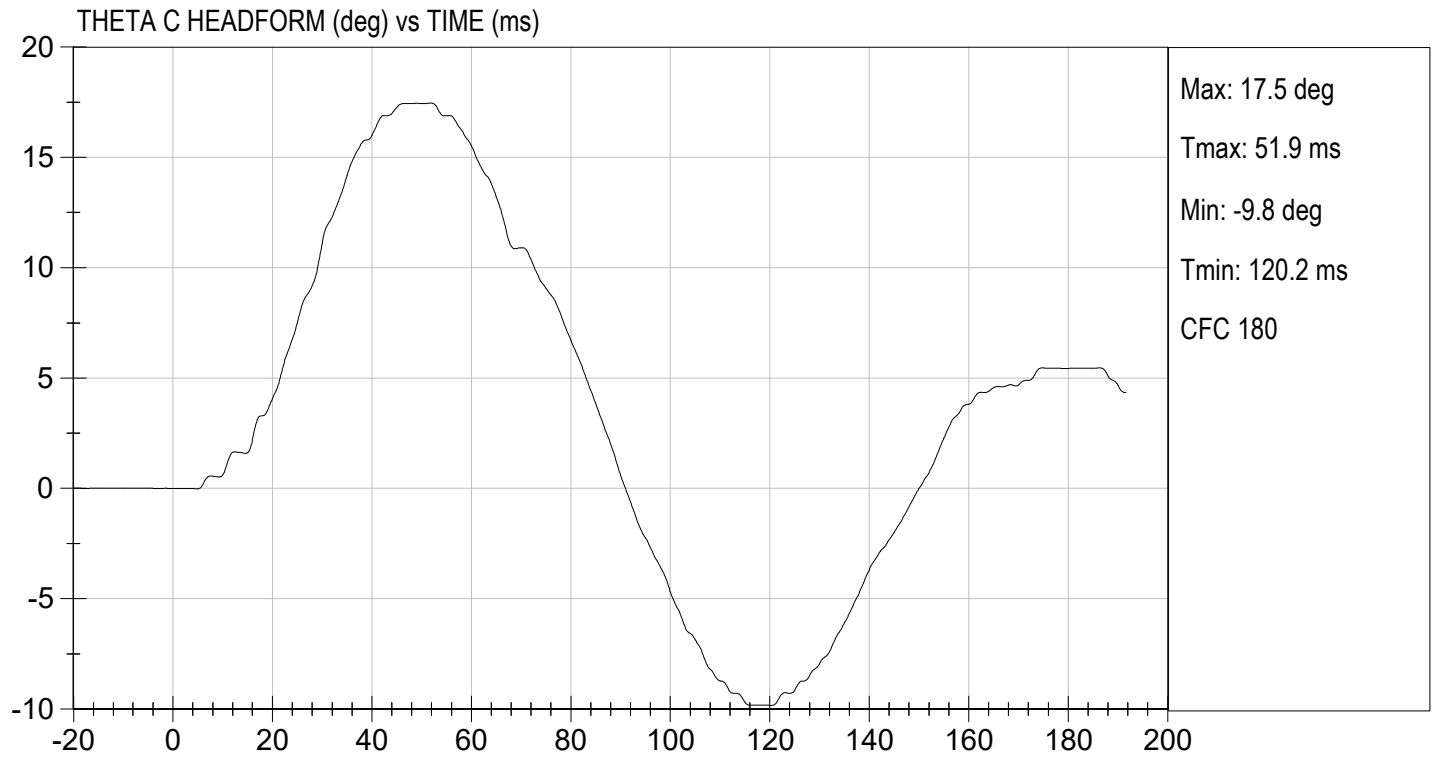
TEST DATE: 03/07/2023
TEST #: D230568





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 03/07/2023
TEST #: D230568

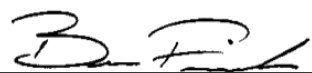


MGA RESEARCH CORPORATION**PELVIS TEST
ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D230569

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	4.20 to 4.40	4.38	Pass
Maximum Impactor Force	N	4700 to 5400	5218	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	12.1	Pass
Maximum Pubic Force	N	1230 to 1590	1269	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.3	Pass
Overall Test Results				Pass


Laboratory Technician

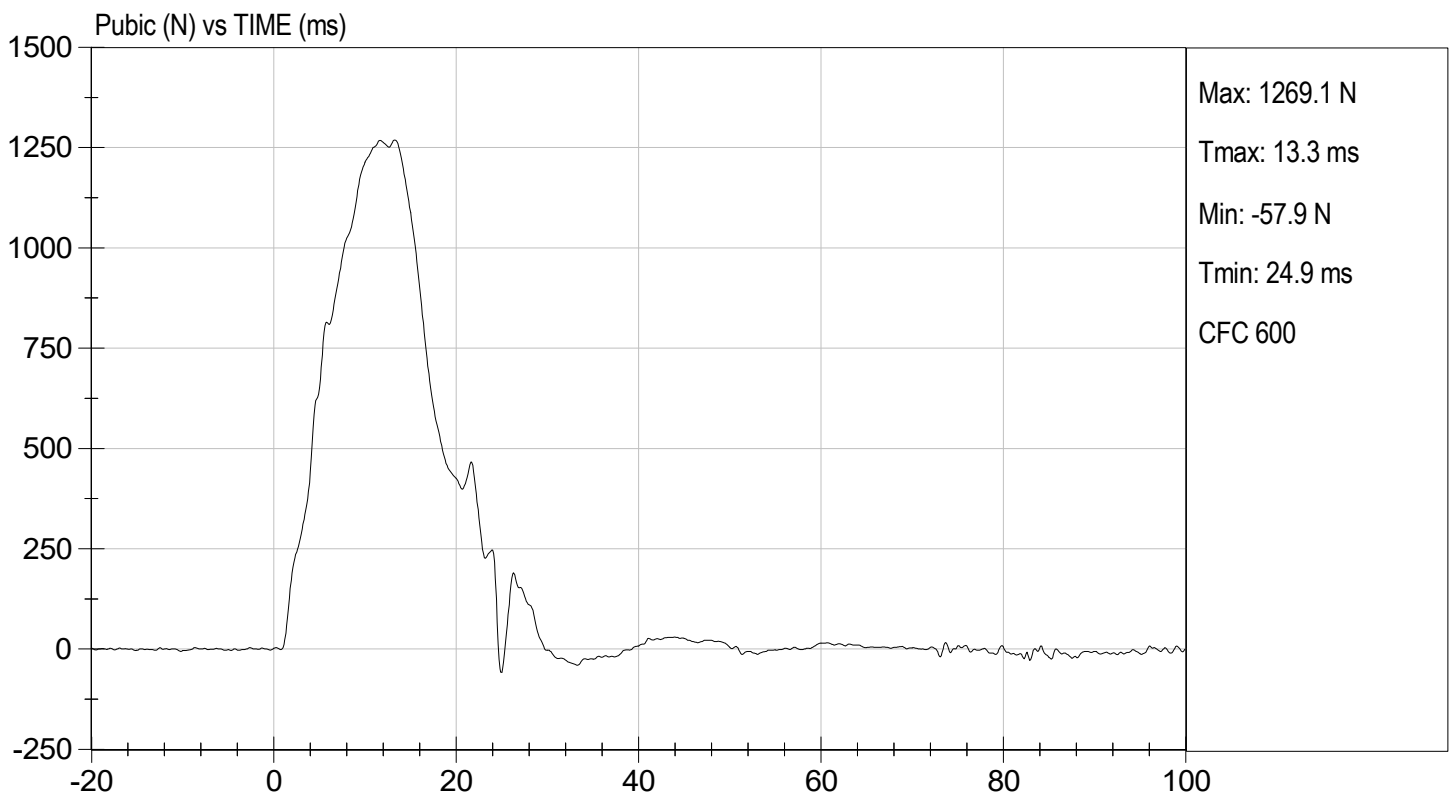
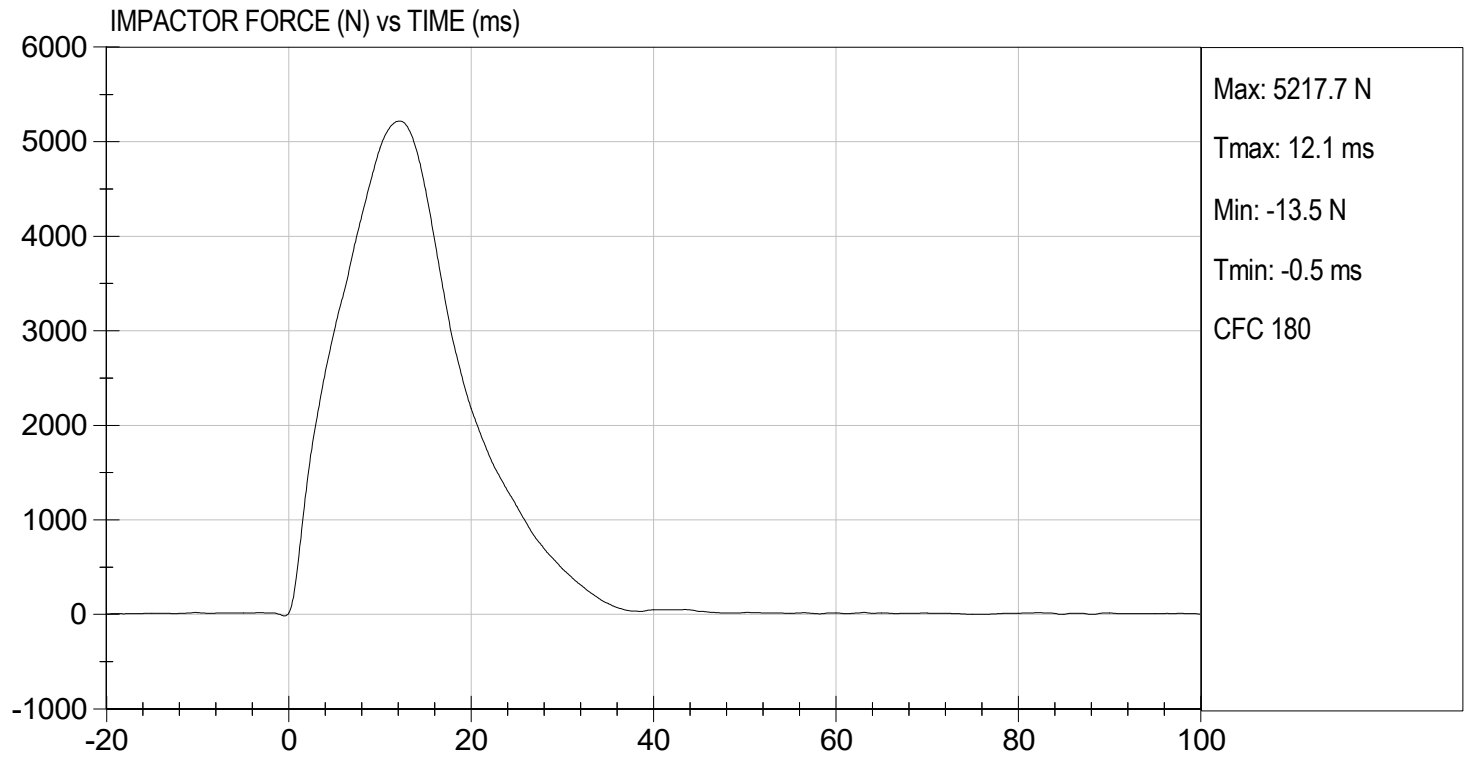
03/07/2023
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 03/07/2023
TEST #: D230569

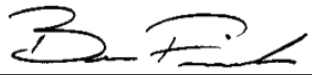


MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY**ATD Serial No: F032Test I.D: D230560

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	28	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	6021	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.1	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.5	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.8	Pass
Overall Test Results				Pass


Laboratory Technician

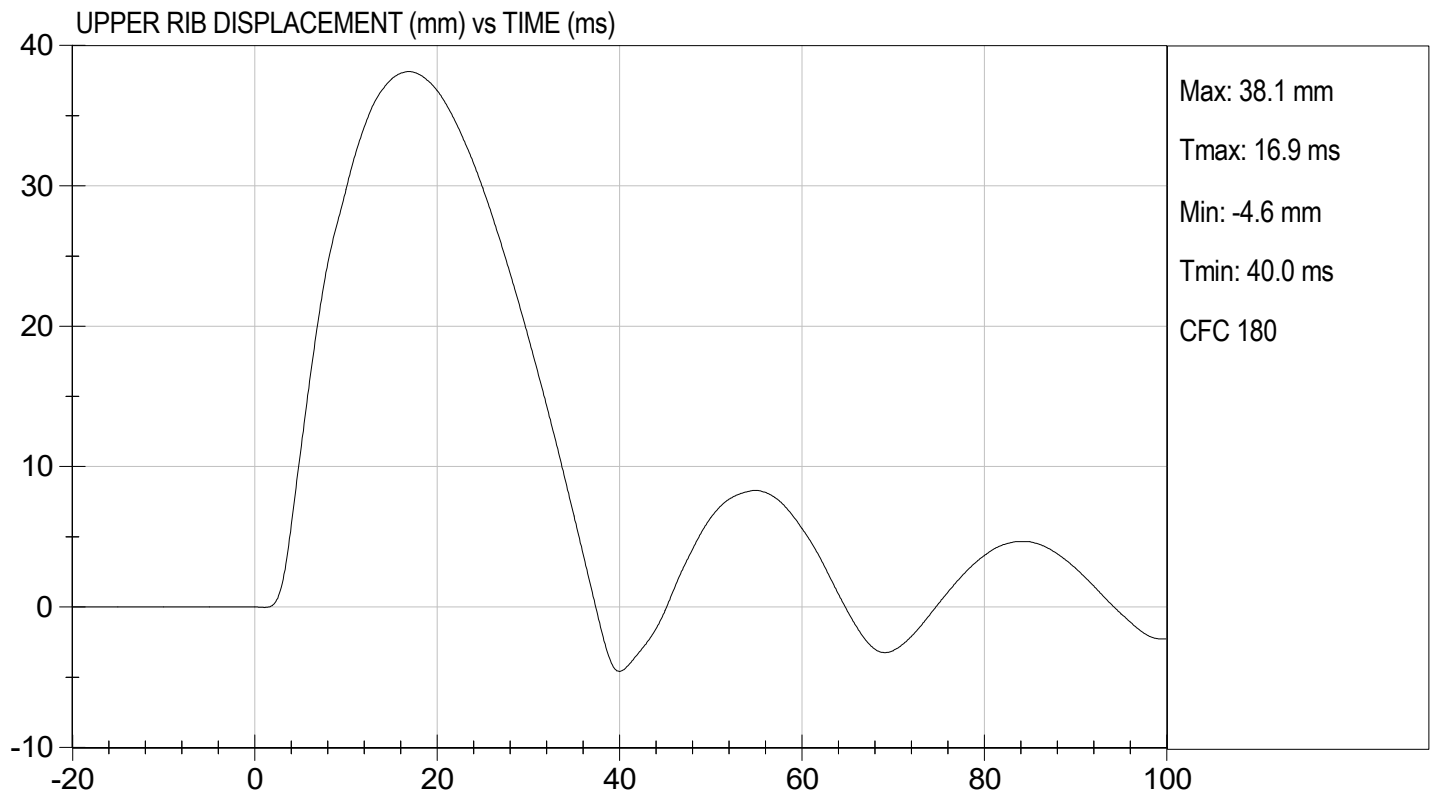
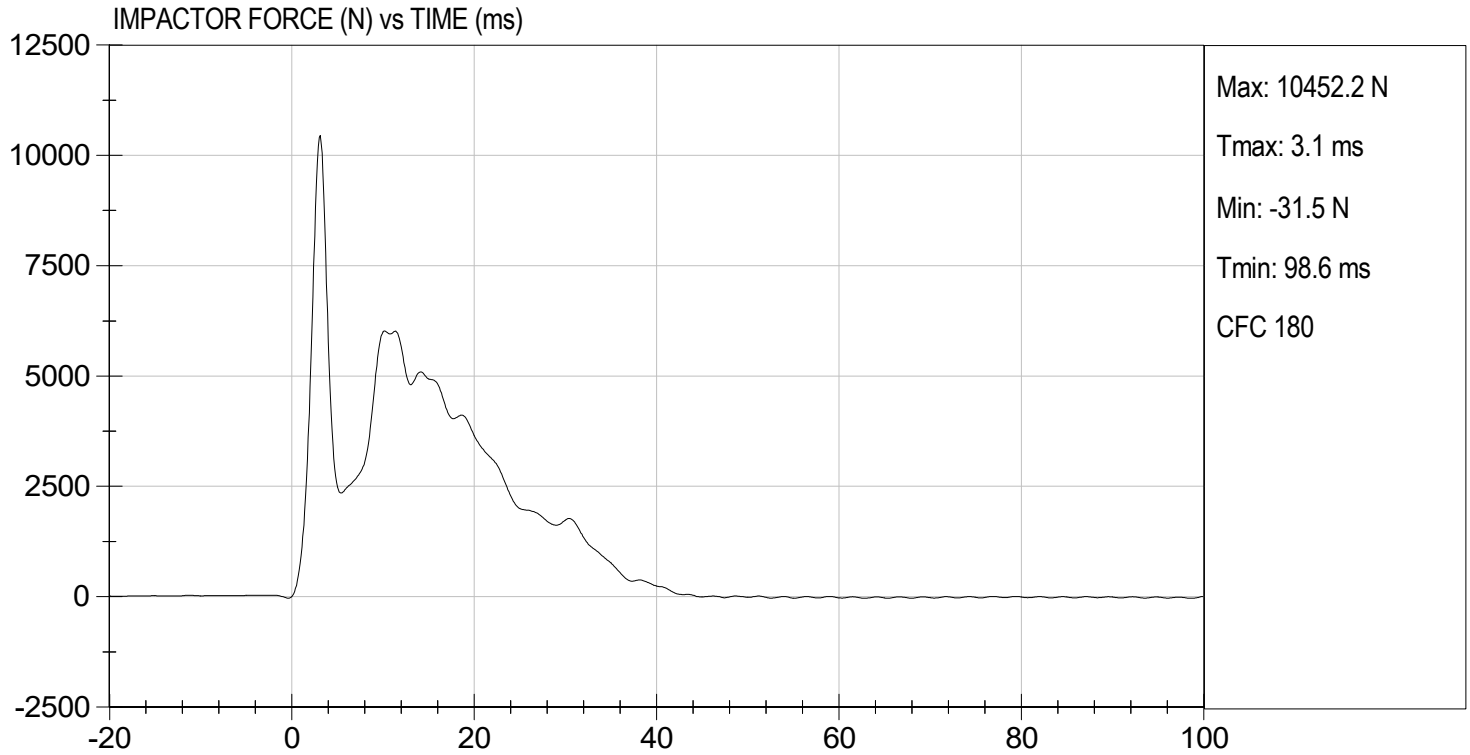
03/07/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

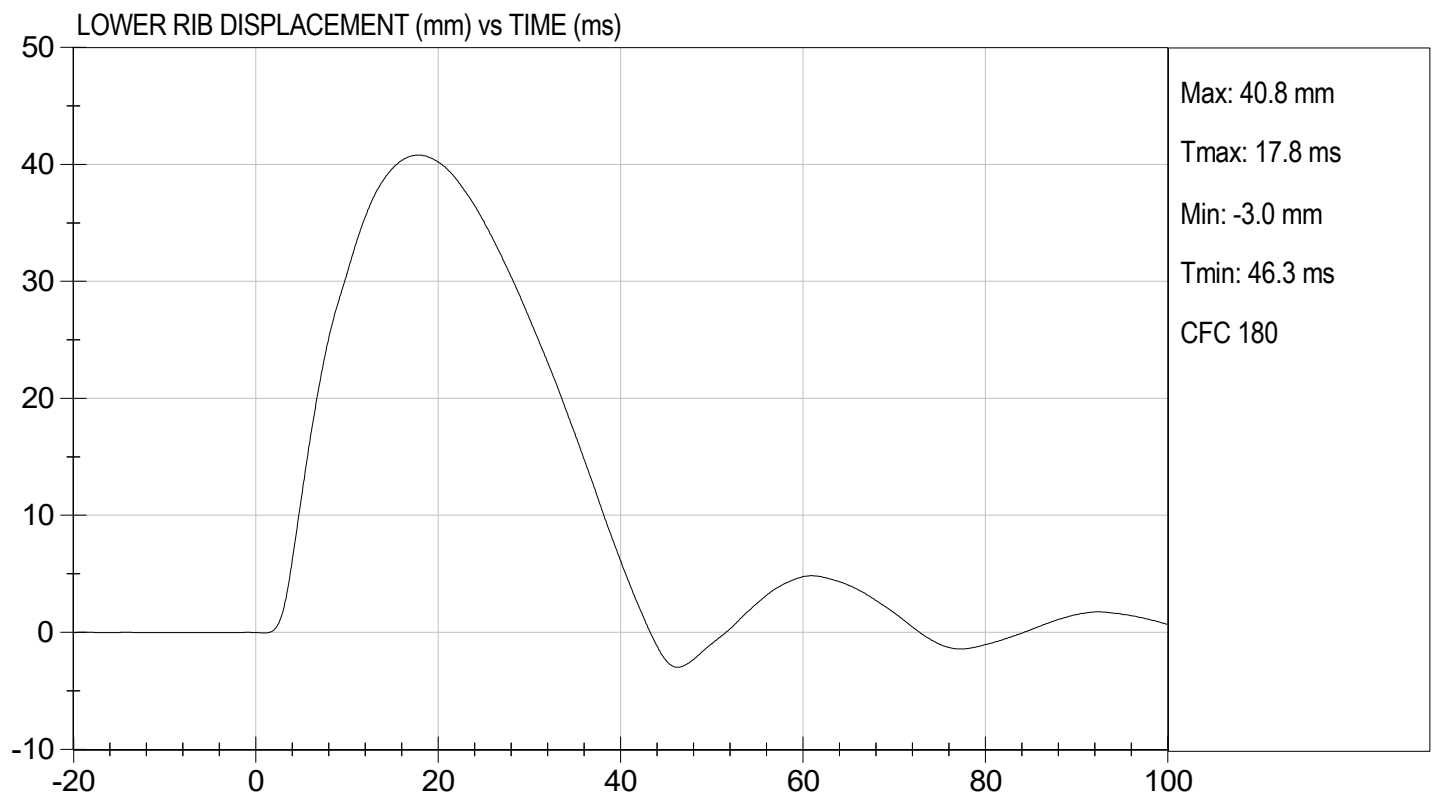
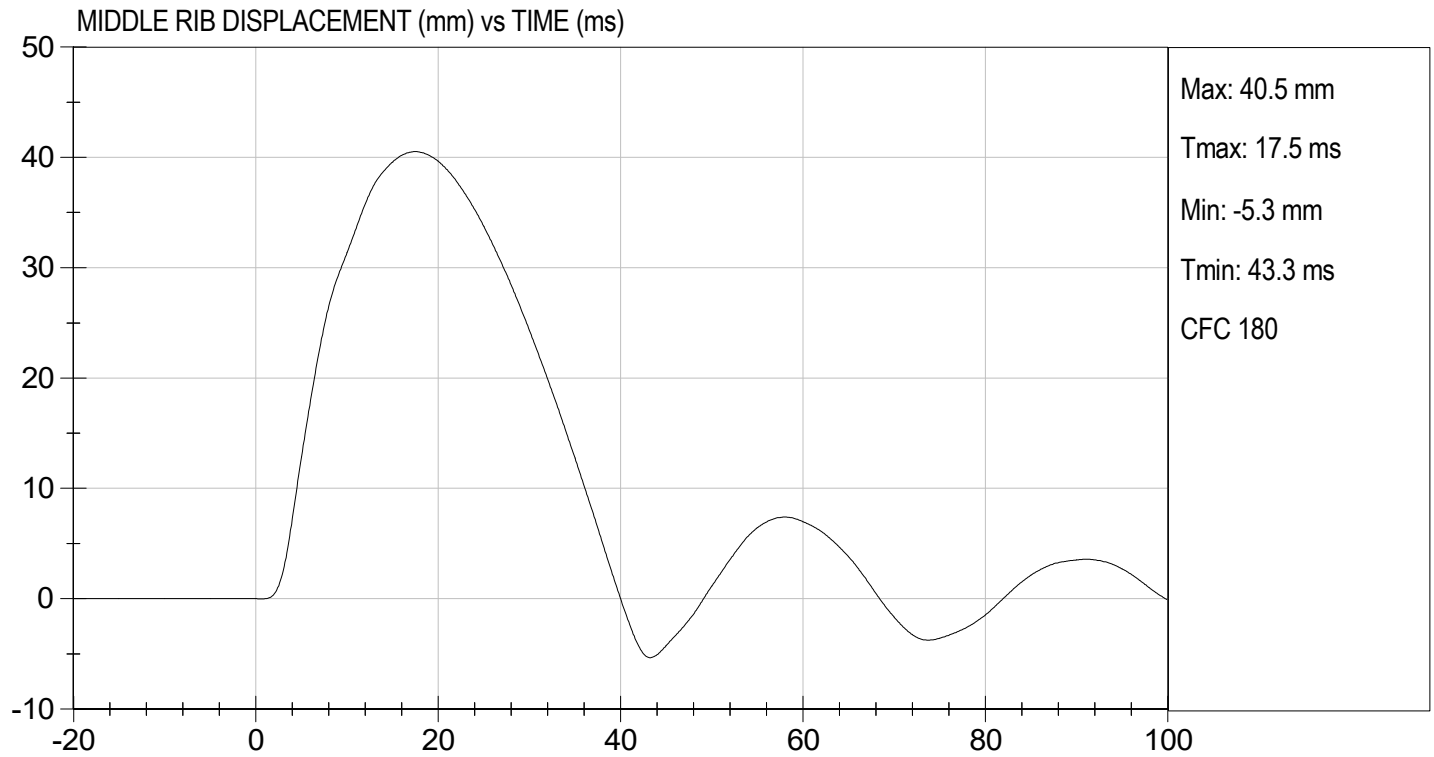
TEST DATE: 03/07/2023
TEST #: D230560





TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 03/07/2023
TEST #: D230560



QUALIFICATION 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

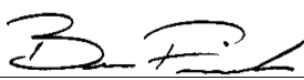
Test ID: D230161

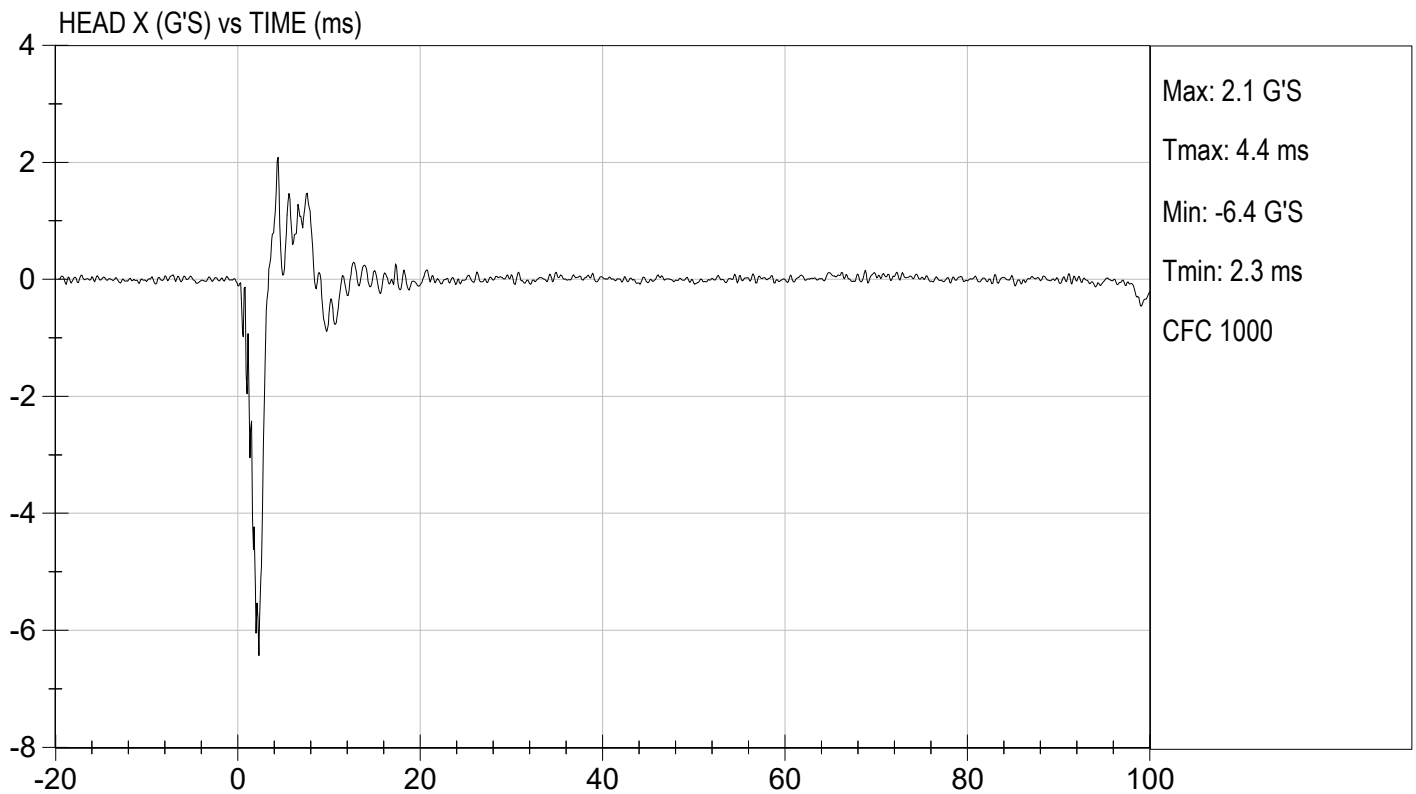
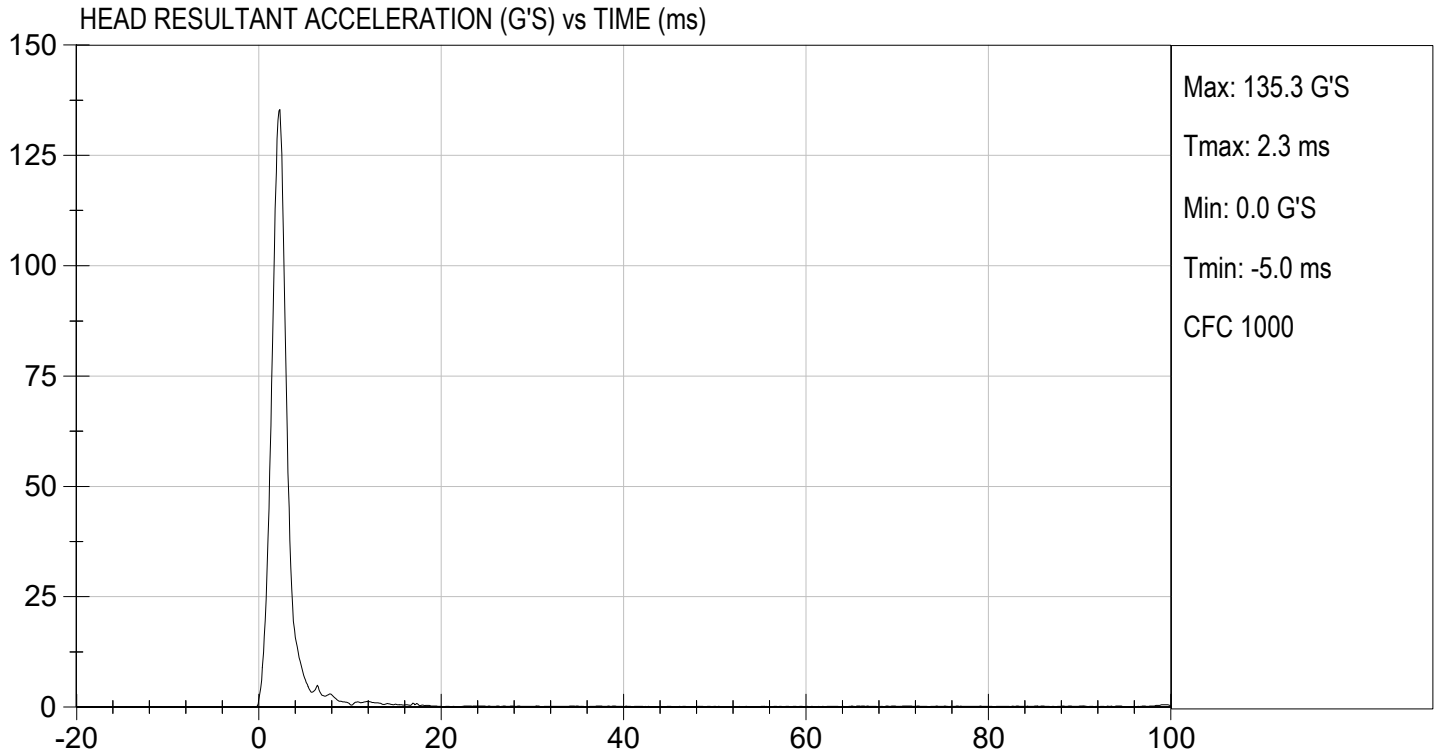
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	115 to 137	135	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-6.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
			Overall Test Results	Pass

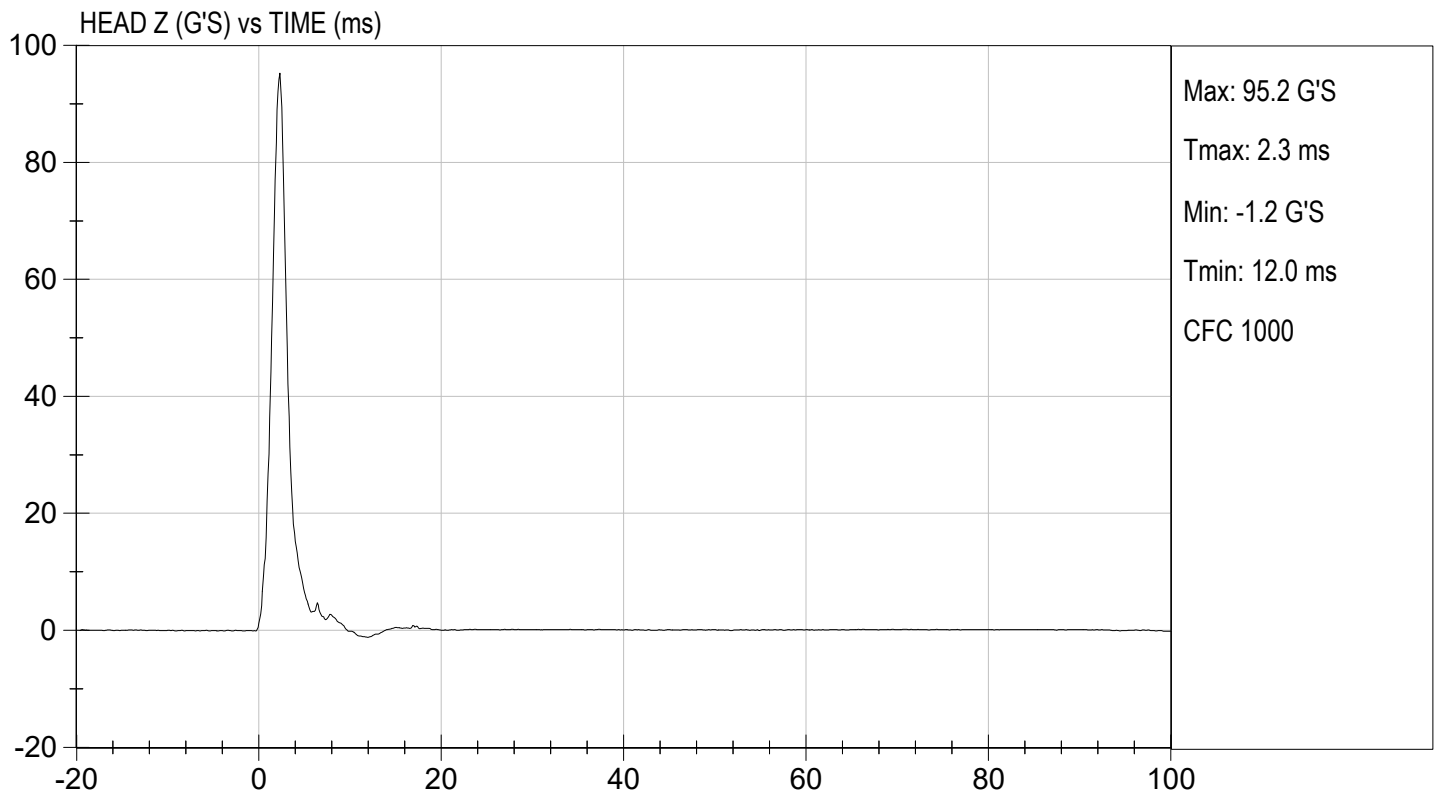
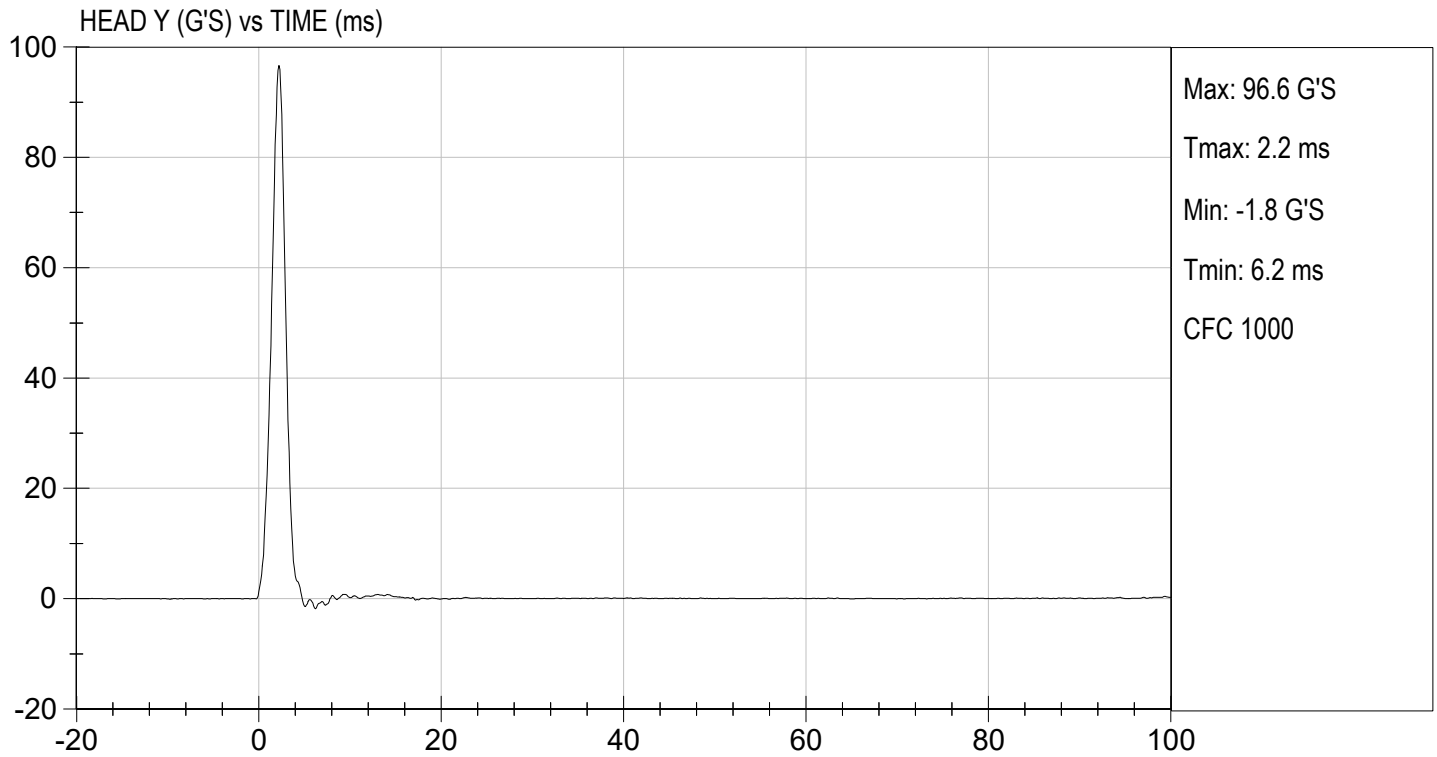

Laboratory Technician

01/20/2023

Test Date


Approved By





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

ATD Serial No: 306

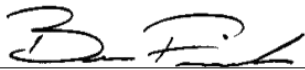
Test I.D: D230162

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.7	Pass
Humidity		%	10 to 70	30	Pass
Impact Velocity		m/s	5.51 to 5.63	5.63	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.35	Pass
	15 ms	m/s	3.30 to 4.10	3.67	Pass
	20 ms	m/s	4.40 to 5.40	5.20	Pass
	25 ms	m/s	5.40 to 6.10	5.66	Pass
	25-100 ms	m/s	5.50 to 6.20	5.69	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	60	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	113	Pass
Overall Test Results				Pass	


 Laboratory Technician

01/20/2023

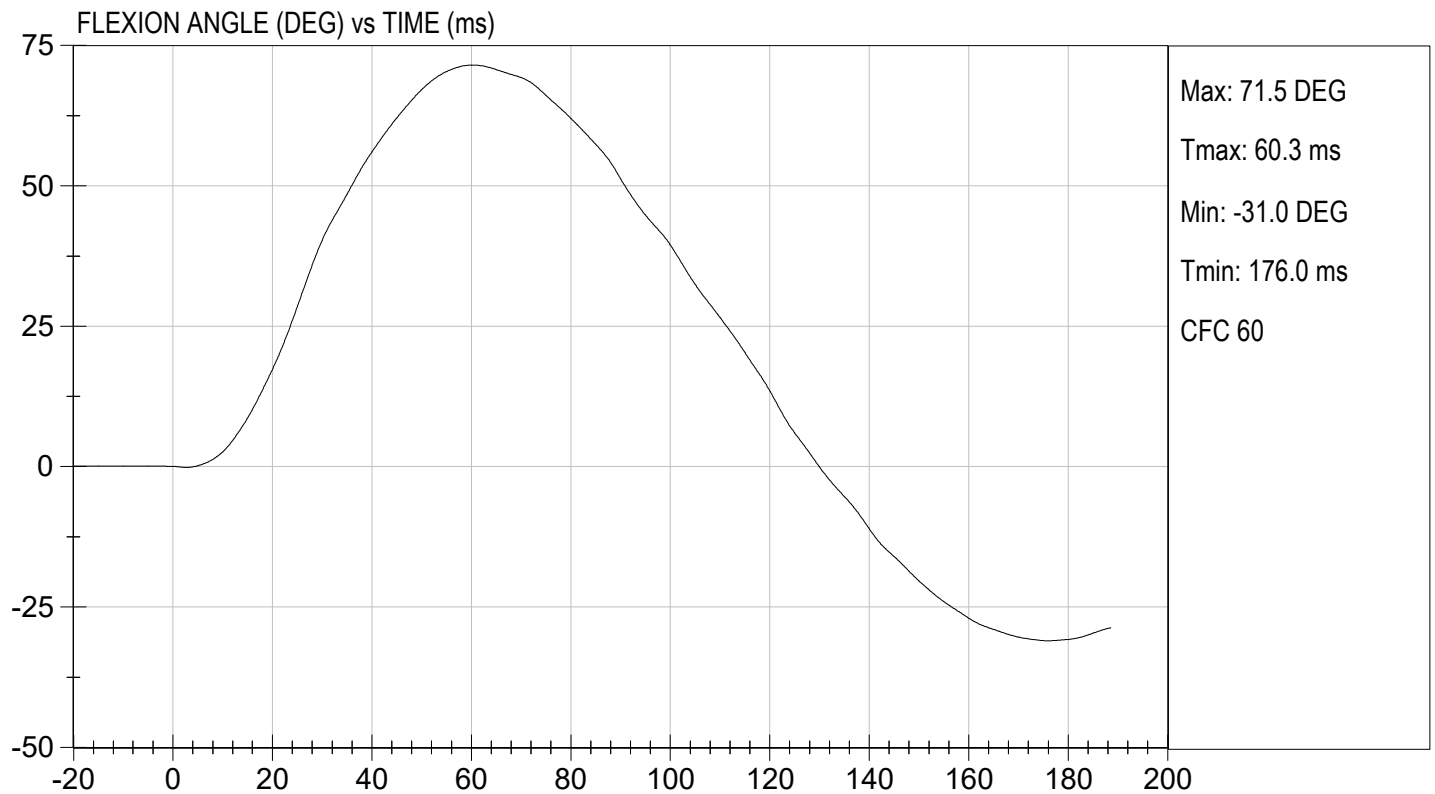
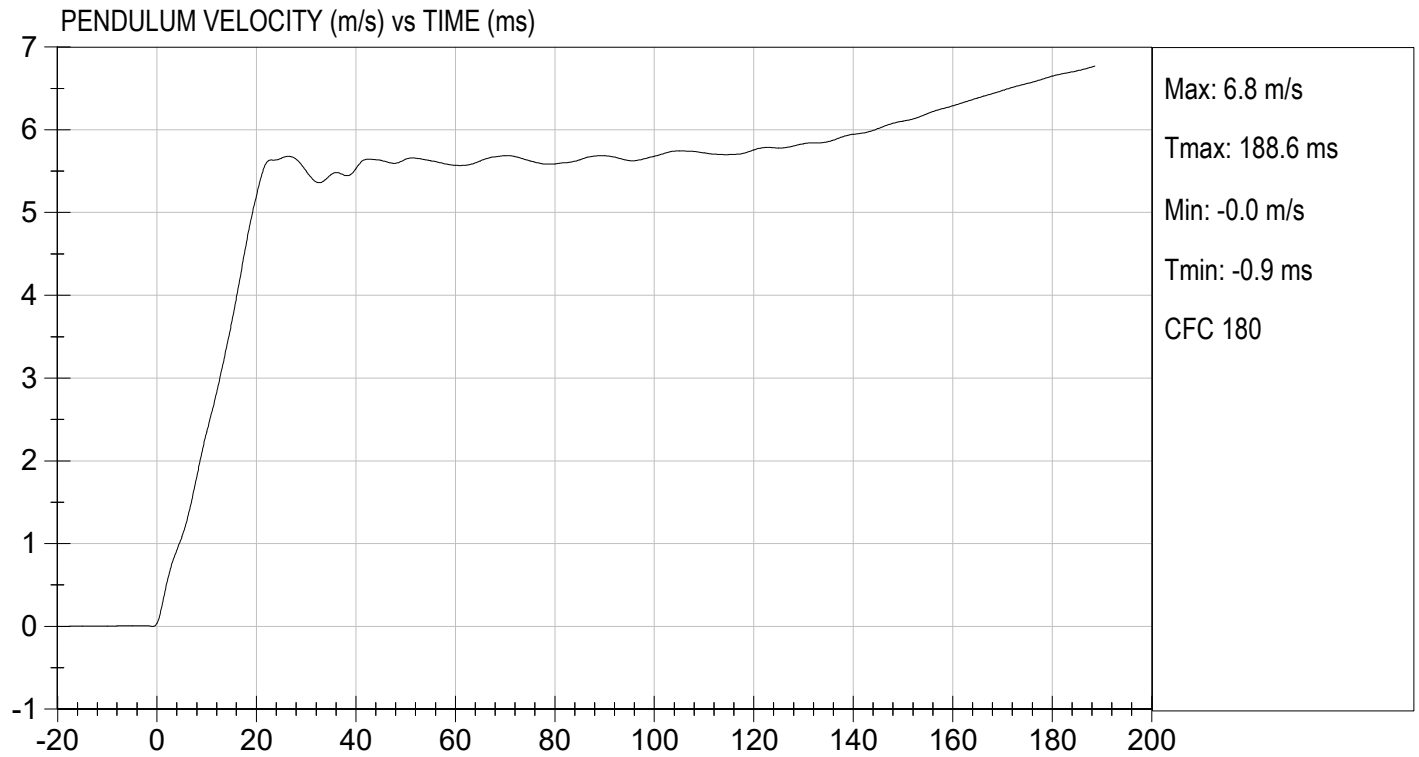
Test Date


 Approved By



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

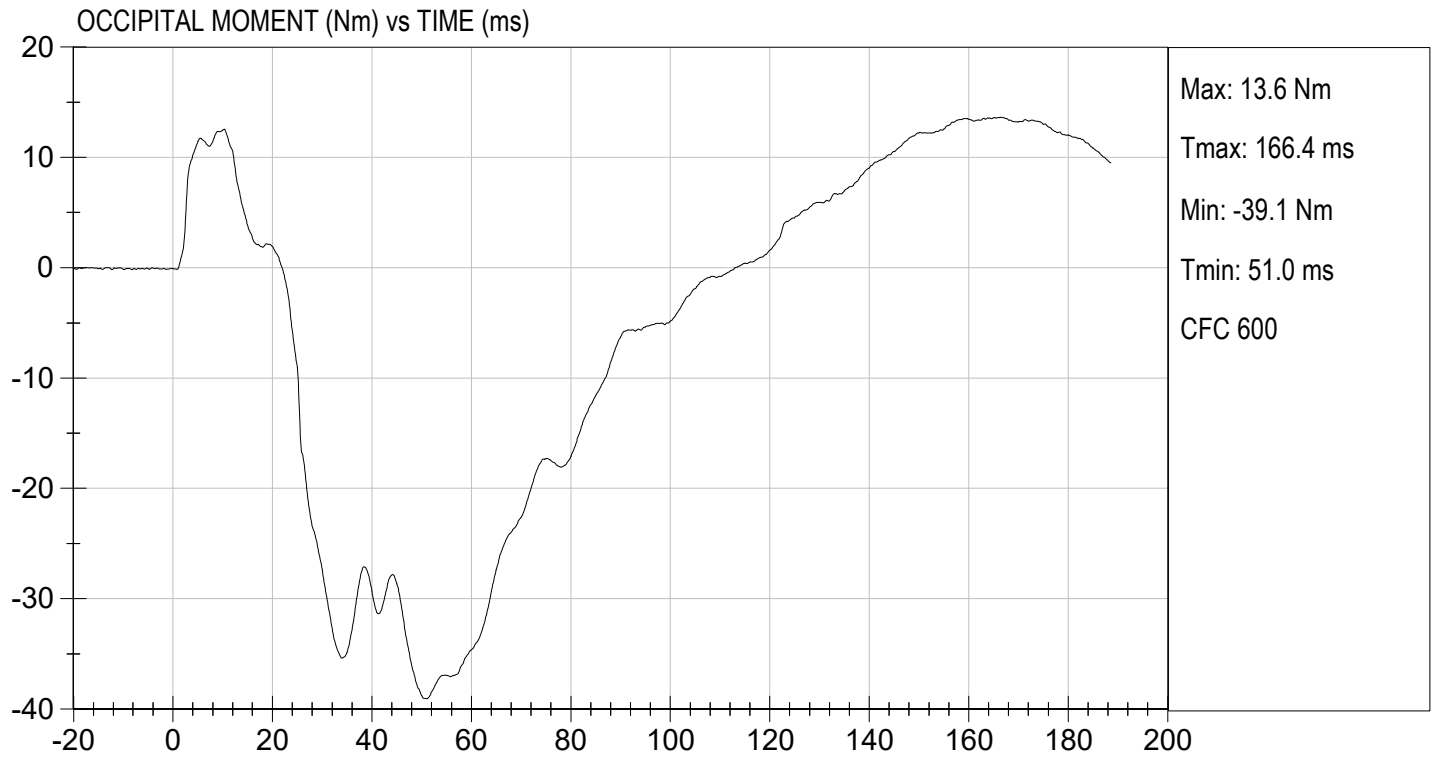
TEST DATE: 01/20/2023
TEST #: D230162





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

TEST DATE: 01/20/2023
TEST #: D230162



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

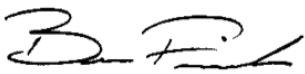
ATD Serial No: 306

Test ID: D230163

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	33	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results			Pass	


Laboratory Technician

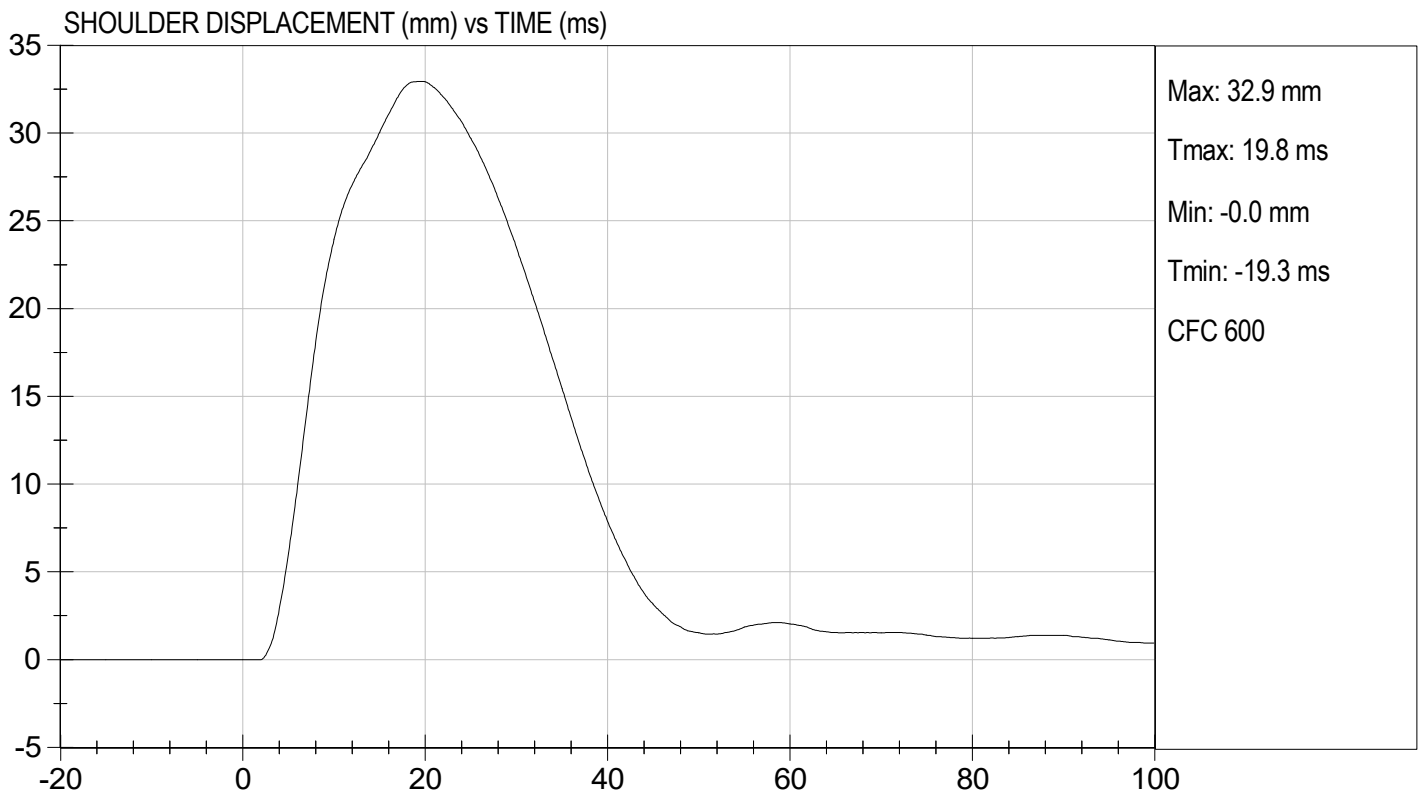
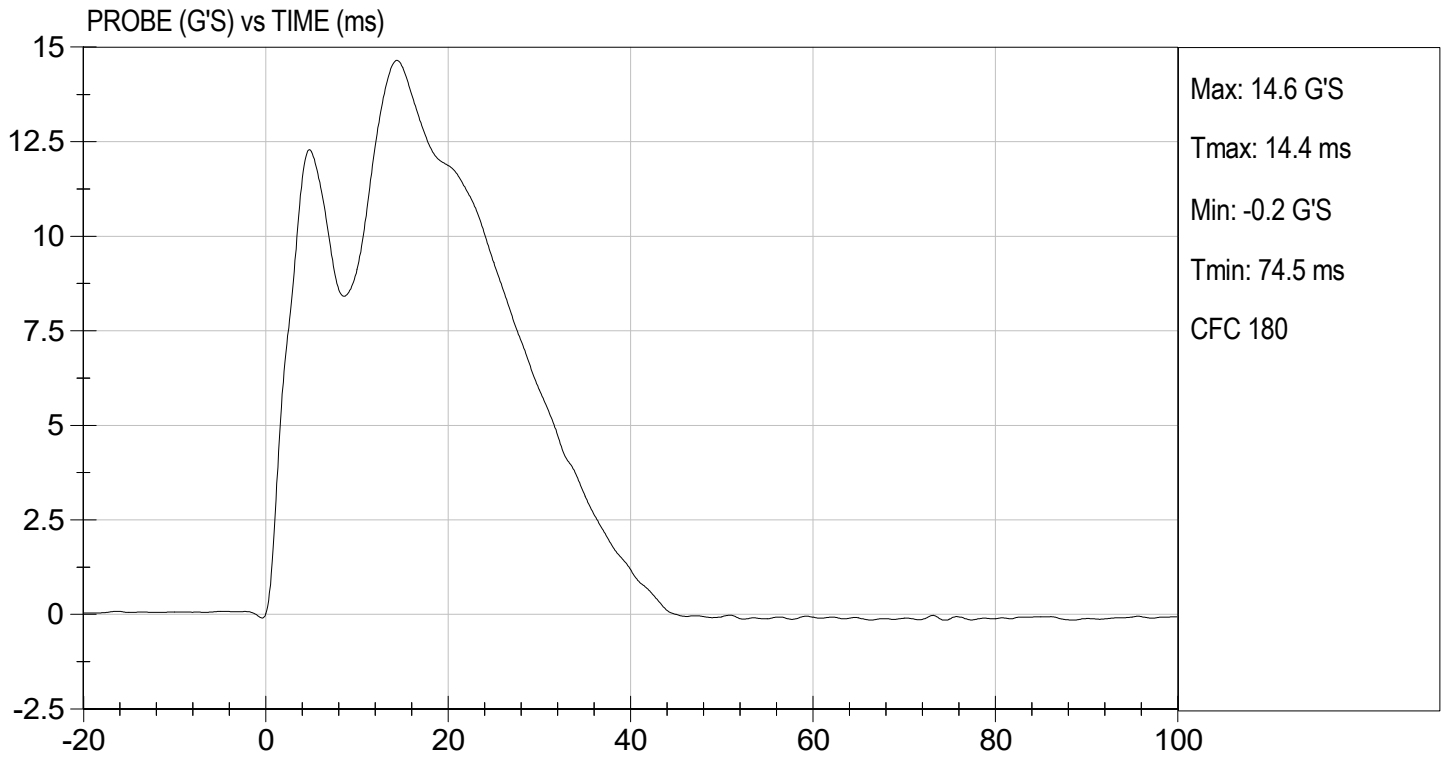
01/19/2023
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.00 ft/s, 4.27 m/s

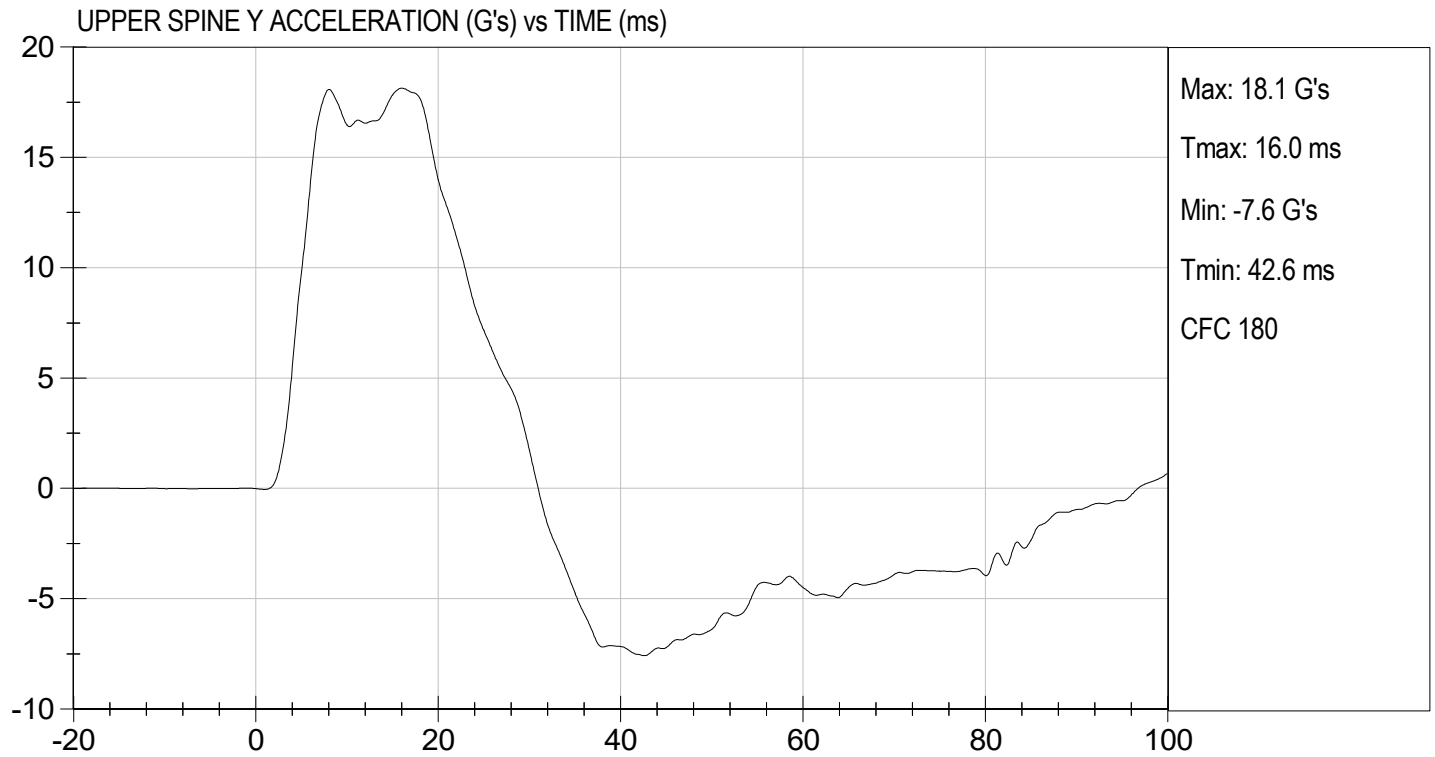
TEST DATE: 01/19/2023
TEST #: D230163





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.00 ft/s, 4.27 m/s

TEST DATE: 01/19/2023
TEST #: D230163



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

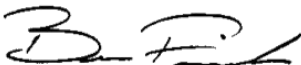
ATD Serial No: 306

Test I.D: D230164

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	30	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	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results				Pass


Laboratory Technician

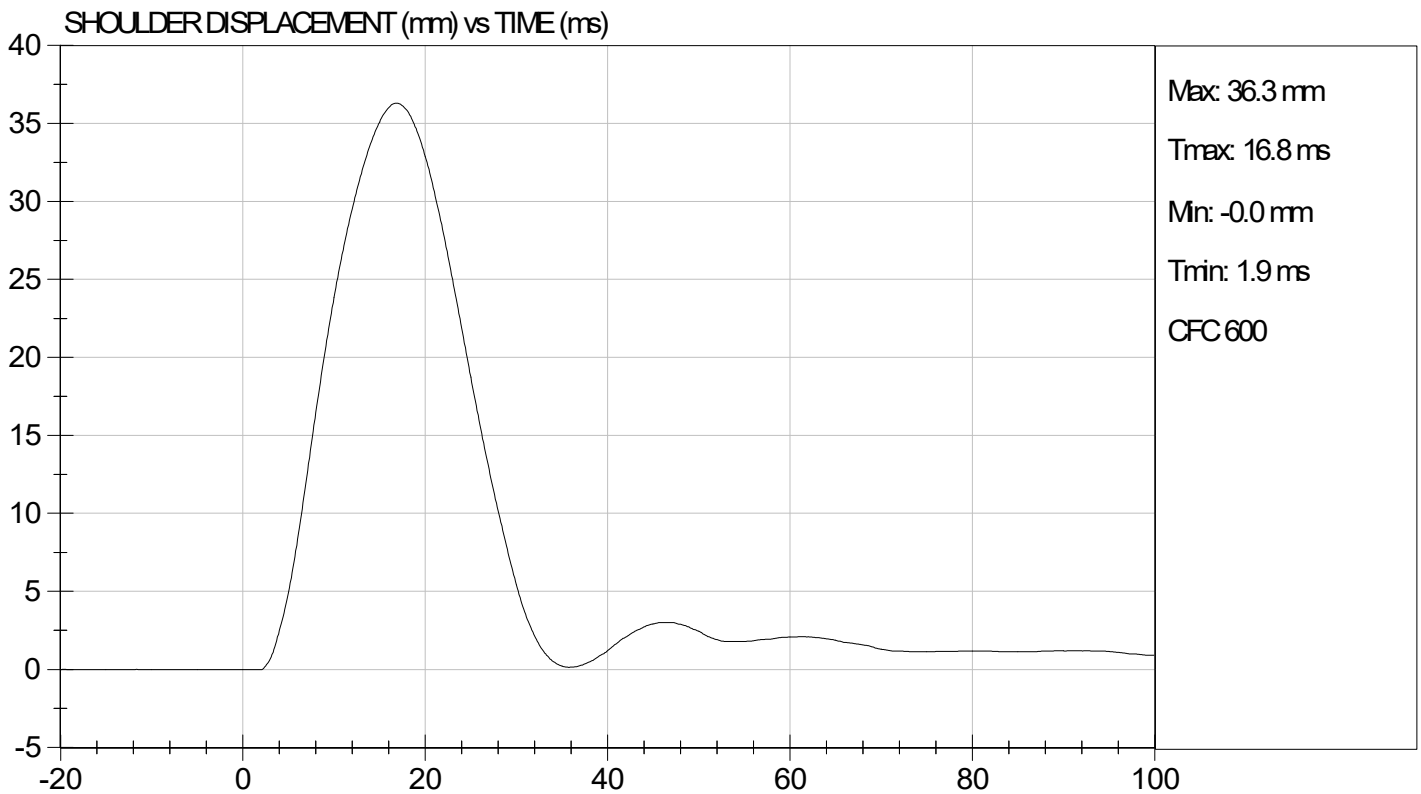
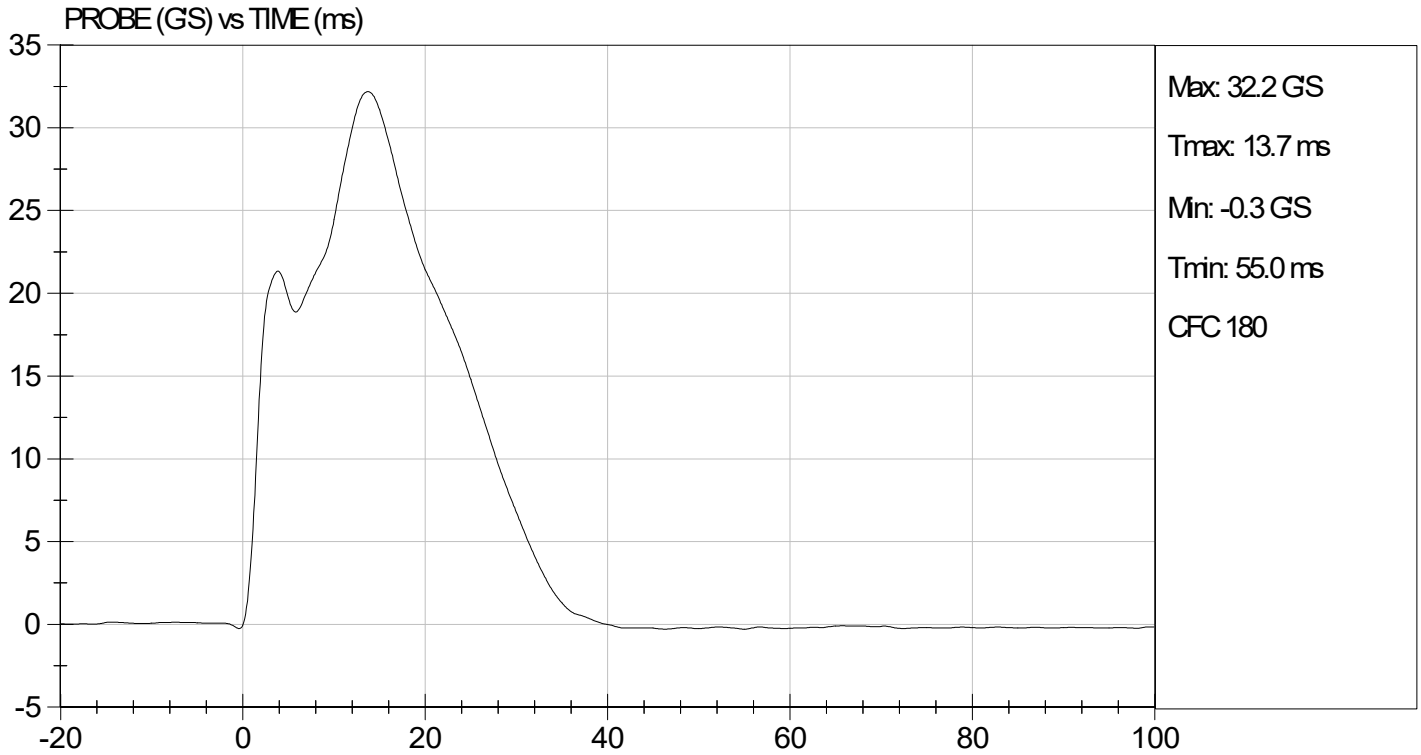
01/20/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

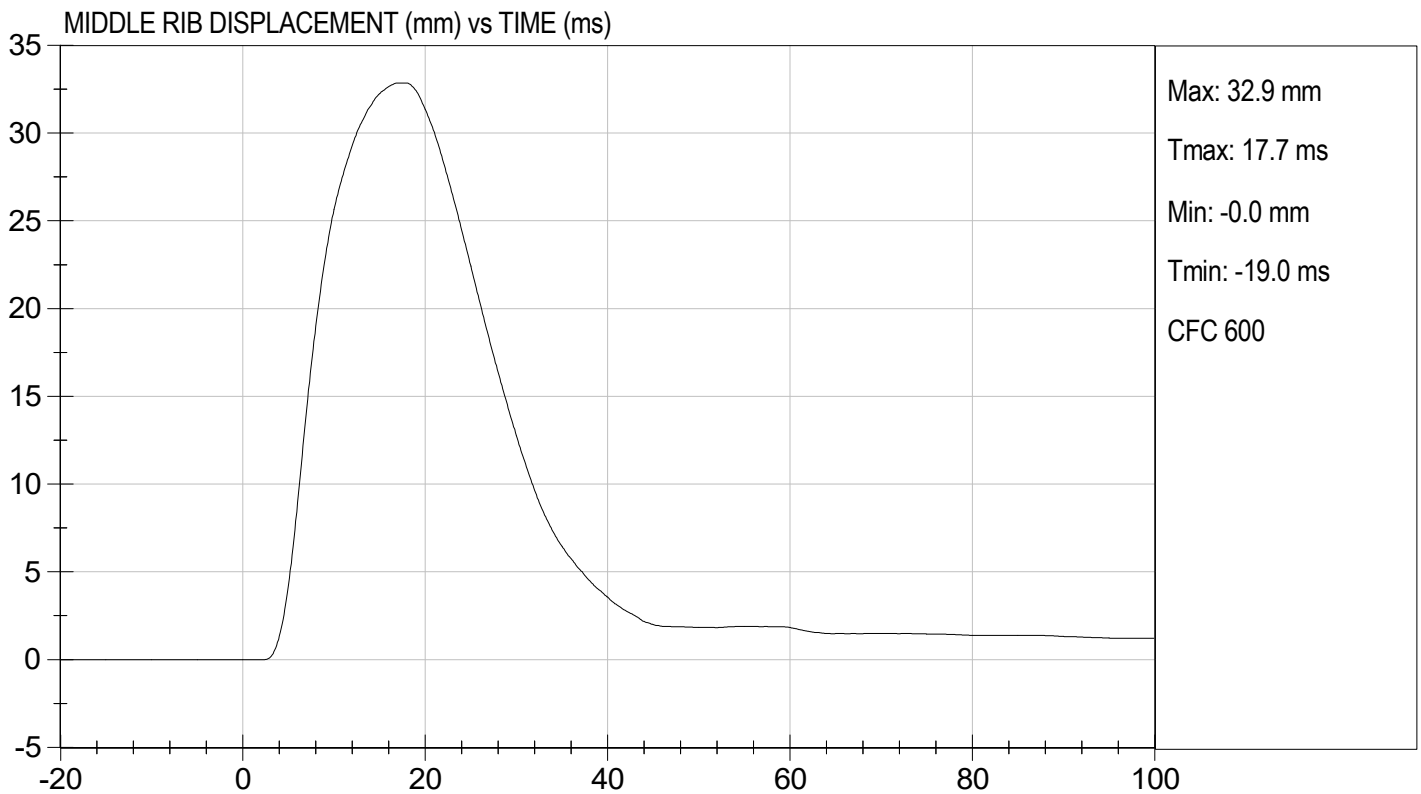
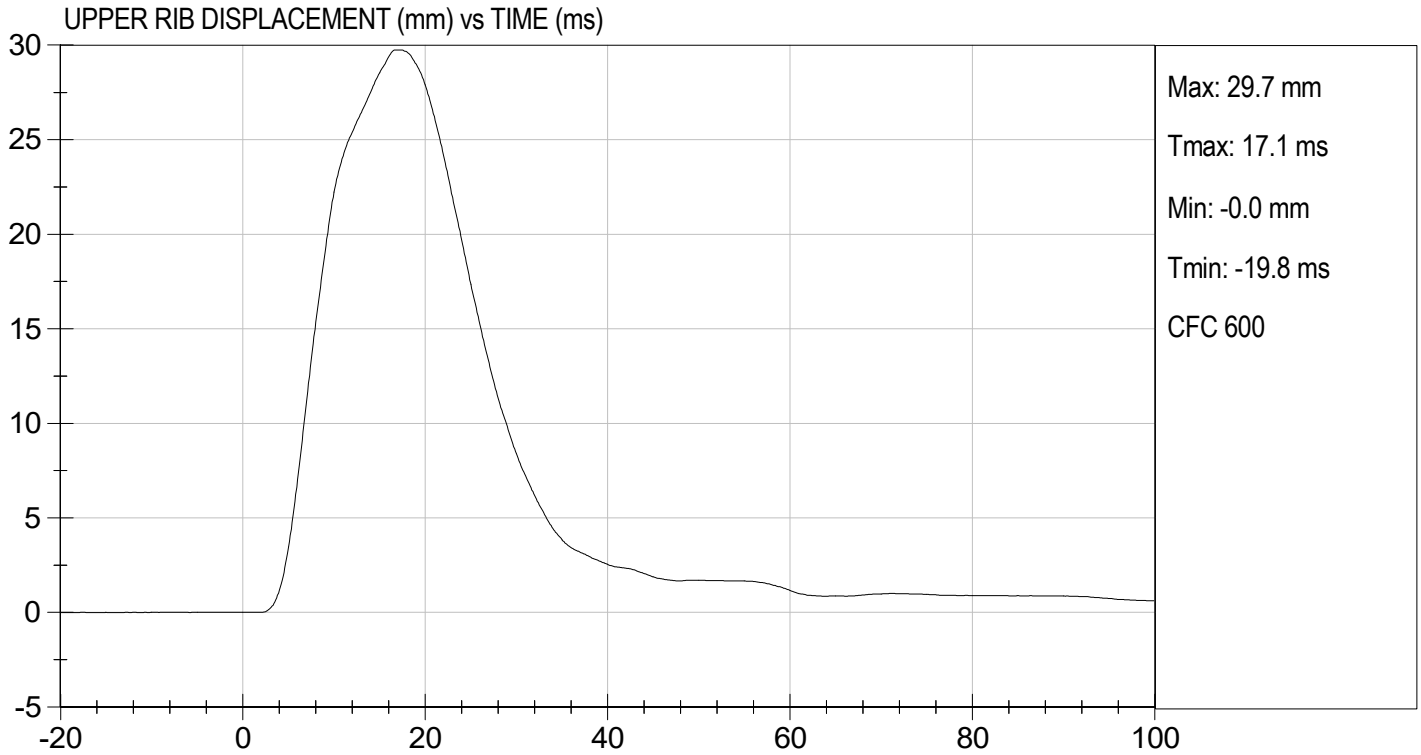
TEST DATE: 01/20/2023
TEST #: D230164





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

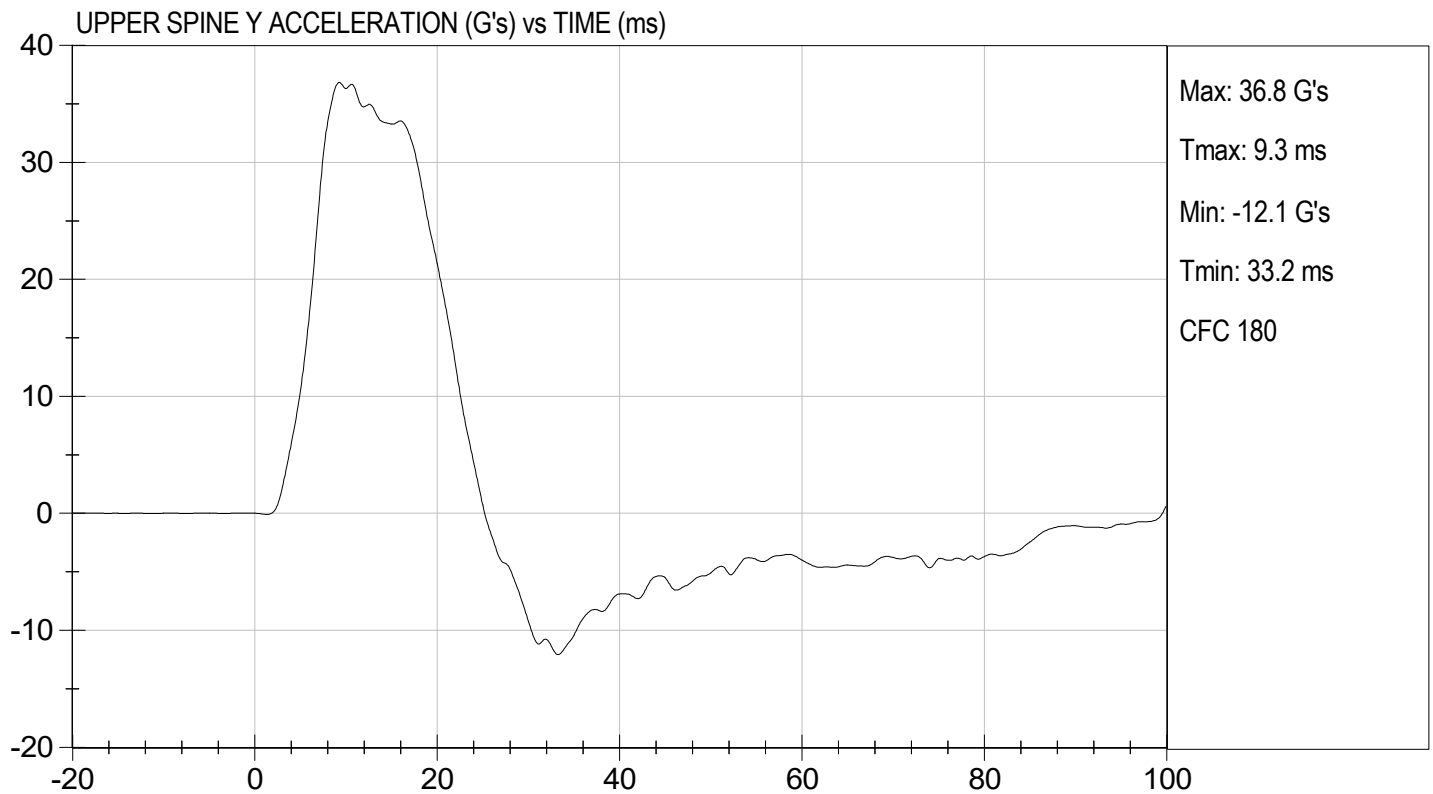
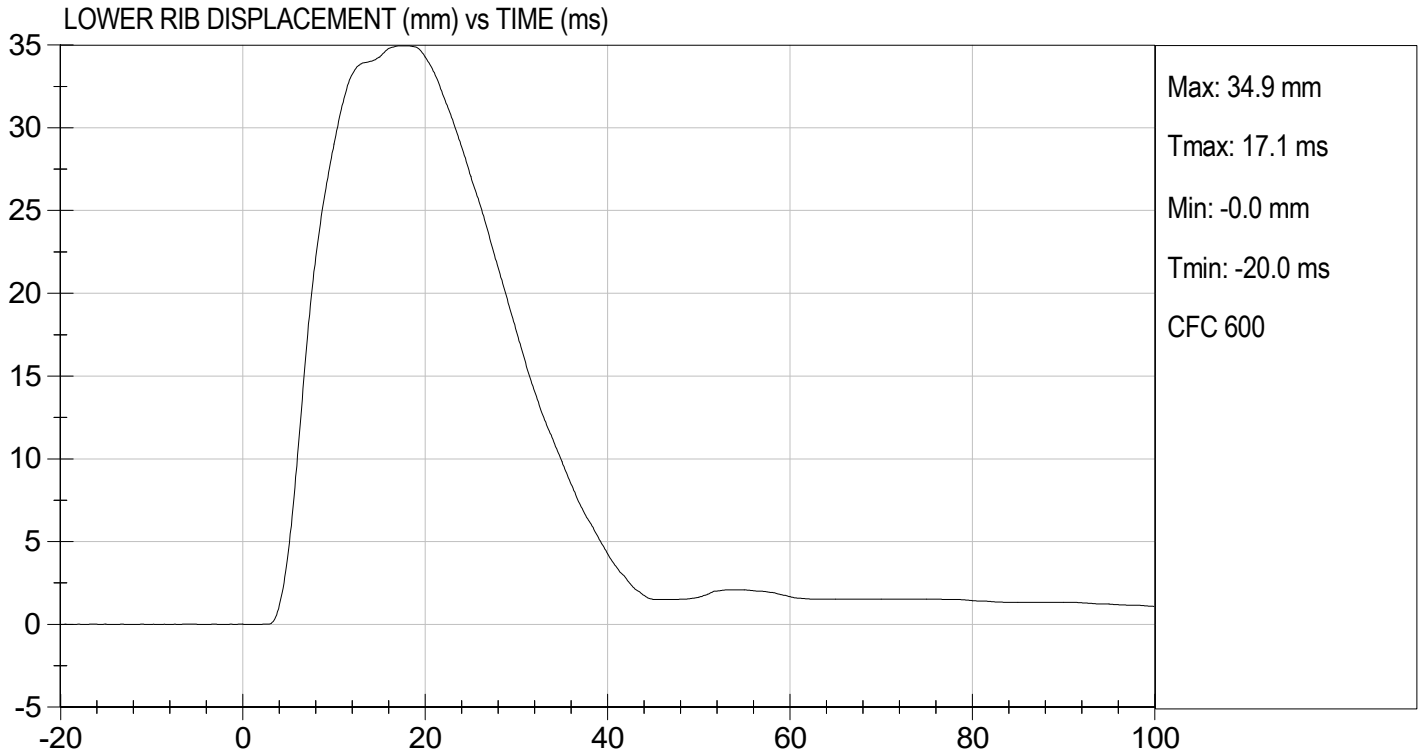
TEST DATE: 01/20/2023
TEST #: D230164





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

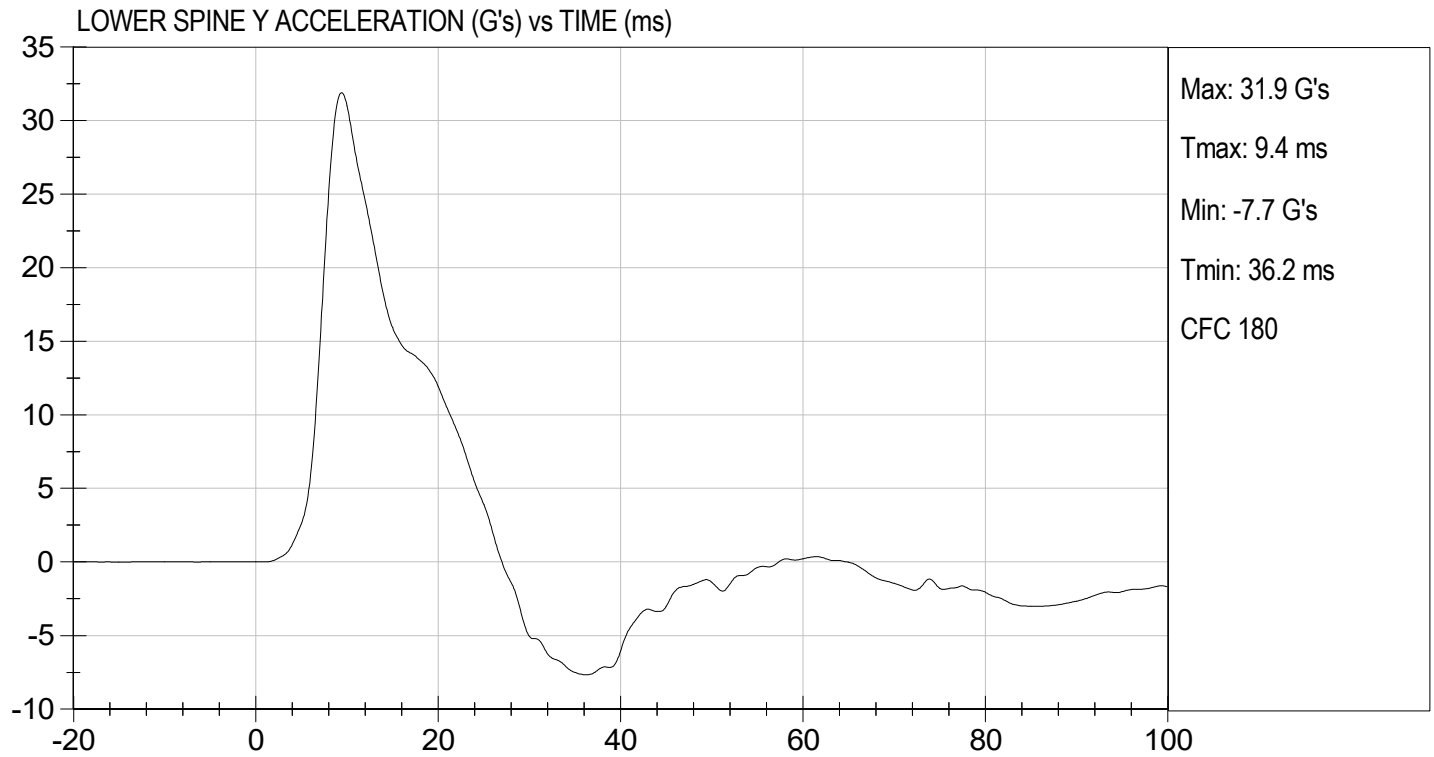
TEST DATE: 01/20/2023
TEST #: D230164





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/20/2023
TEST #: D230164



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

ATD Serial No: 306

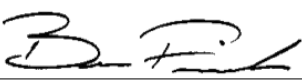
Test I.D: D230165

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	29	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	38	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	40	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

01/20/2023

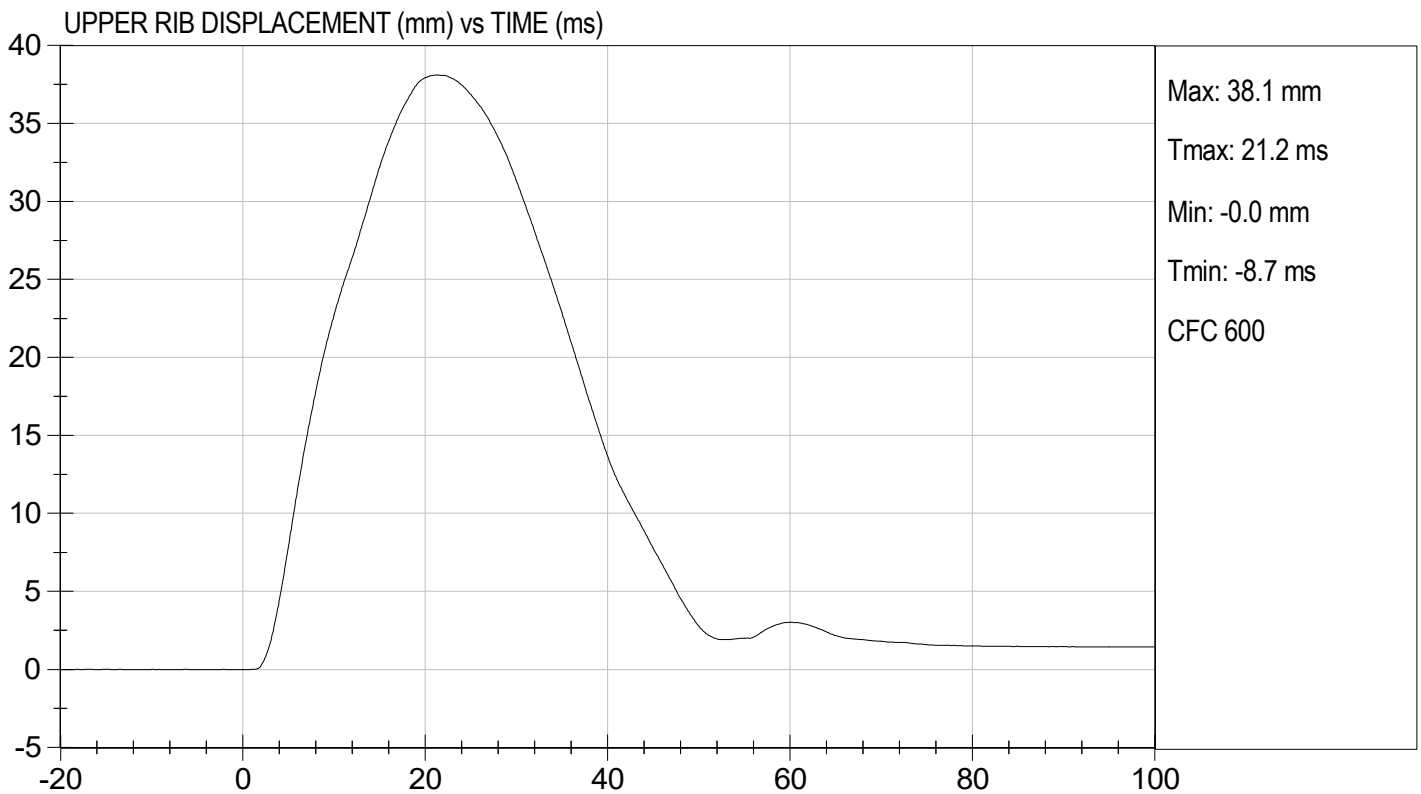
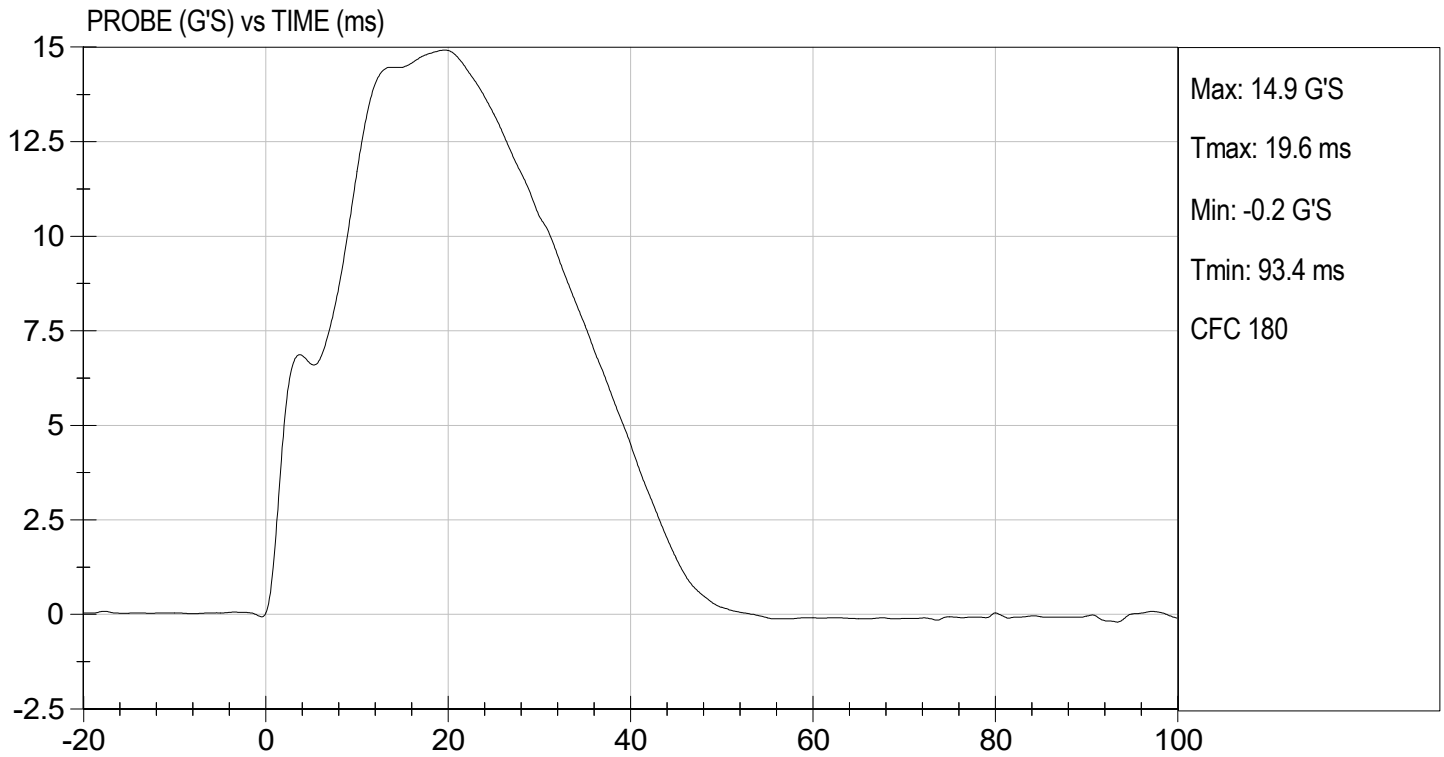
Test Date


Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

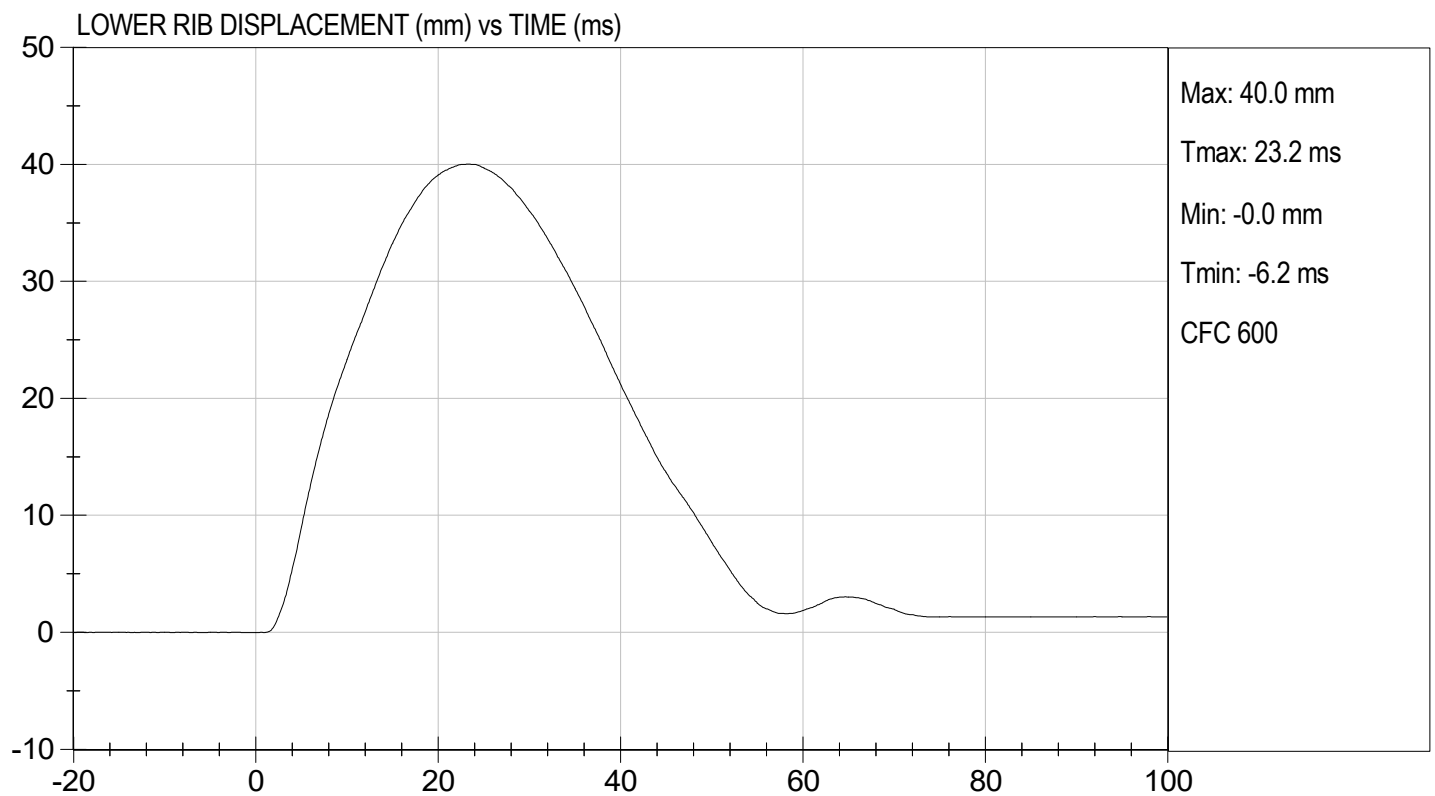
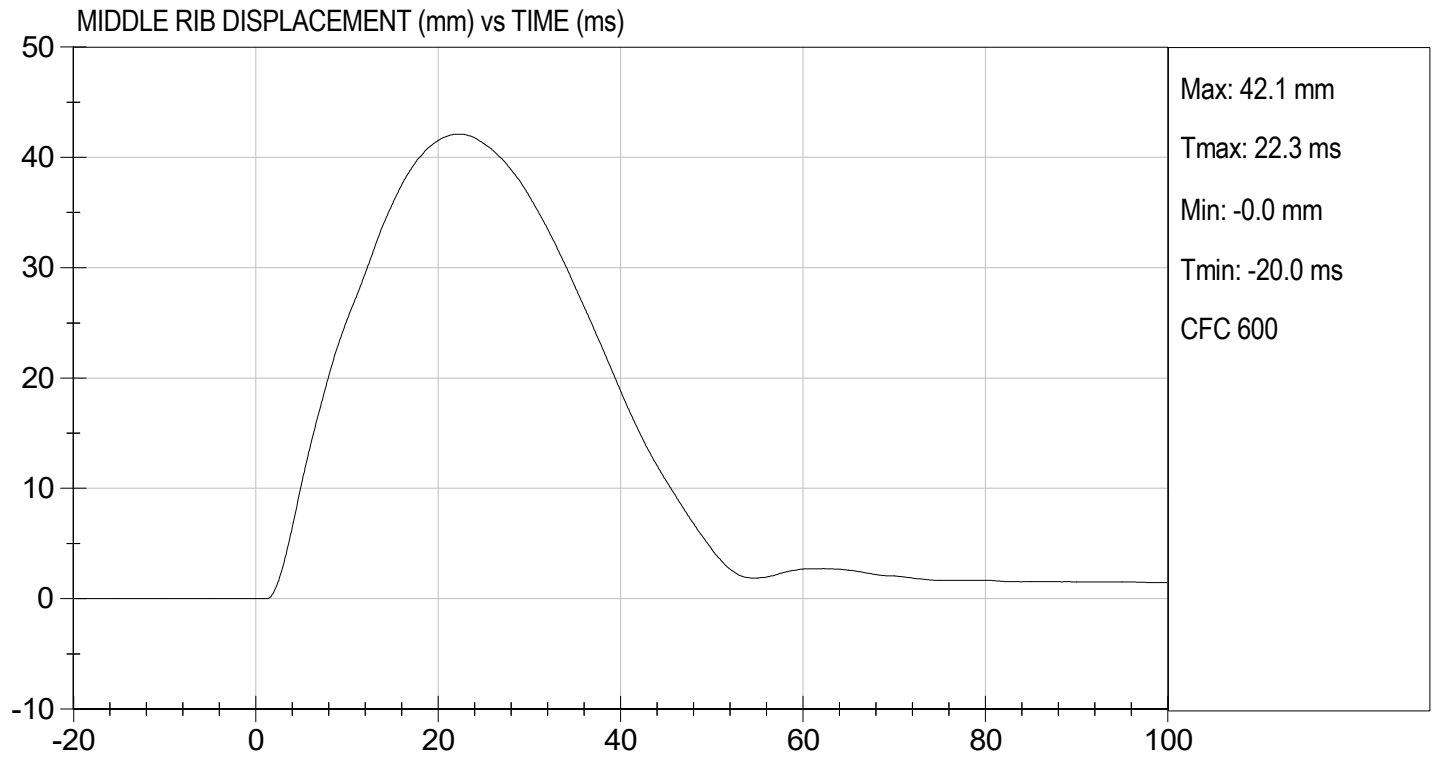
TEST DATE: 01/20/2023
TEST #: D230165





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

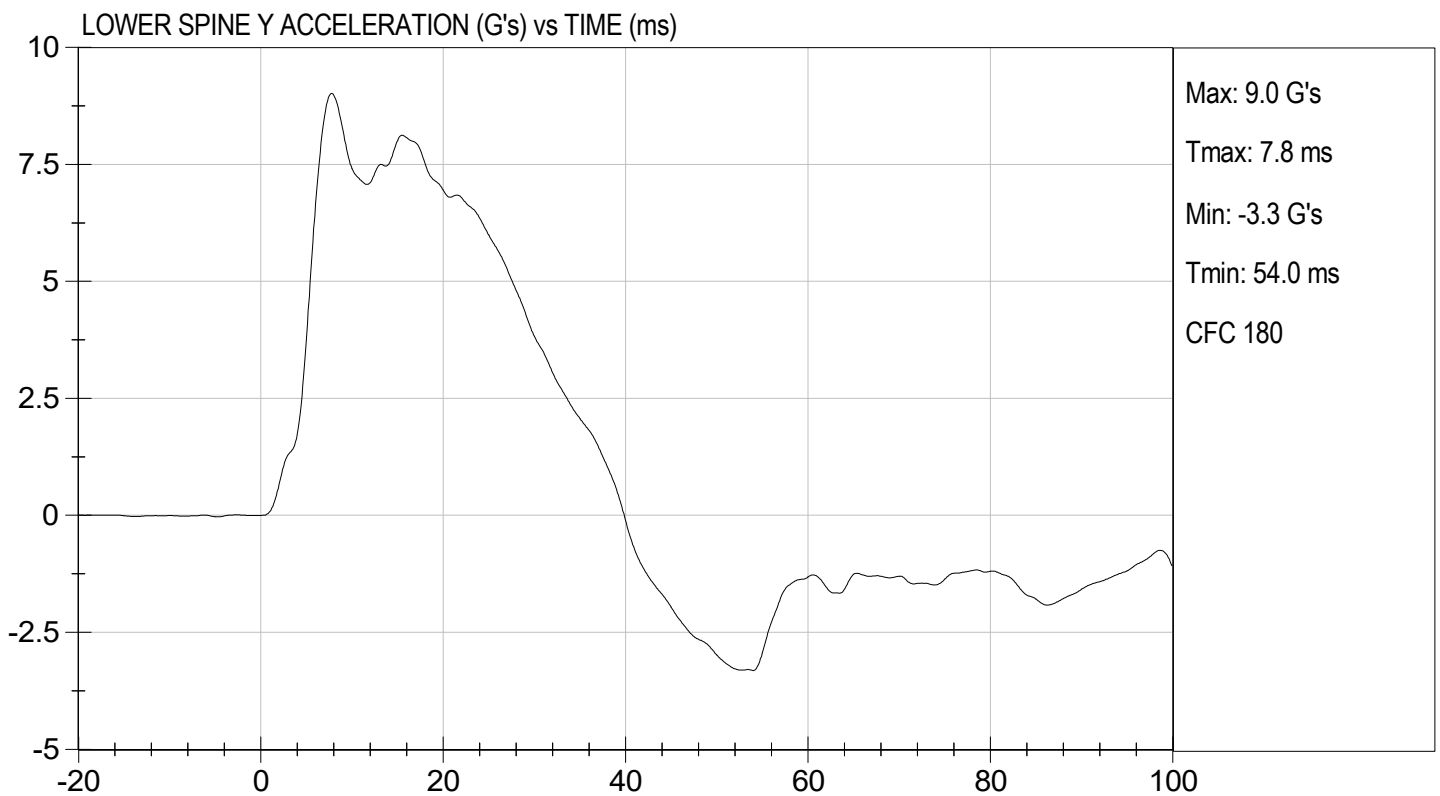
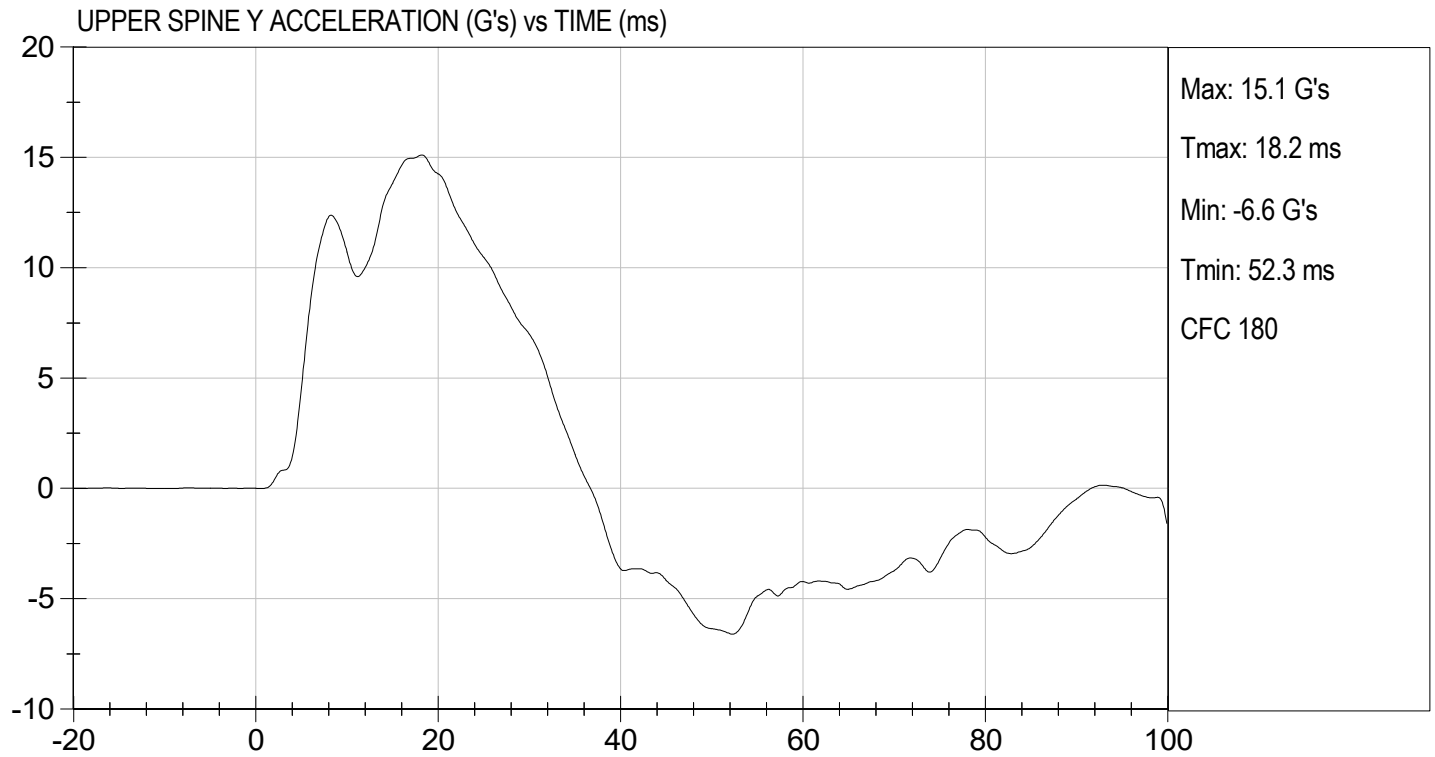
TEST DATE: 01/20/2023
TEST #: D230165





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 01/20/2023
TEST #: D230165



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-11s BUILD LEVEL D DUMMY

ATD Serial No: 306

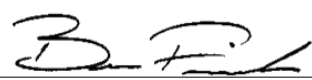
Test I.D: D230166

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	43	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

01/20/2023

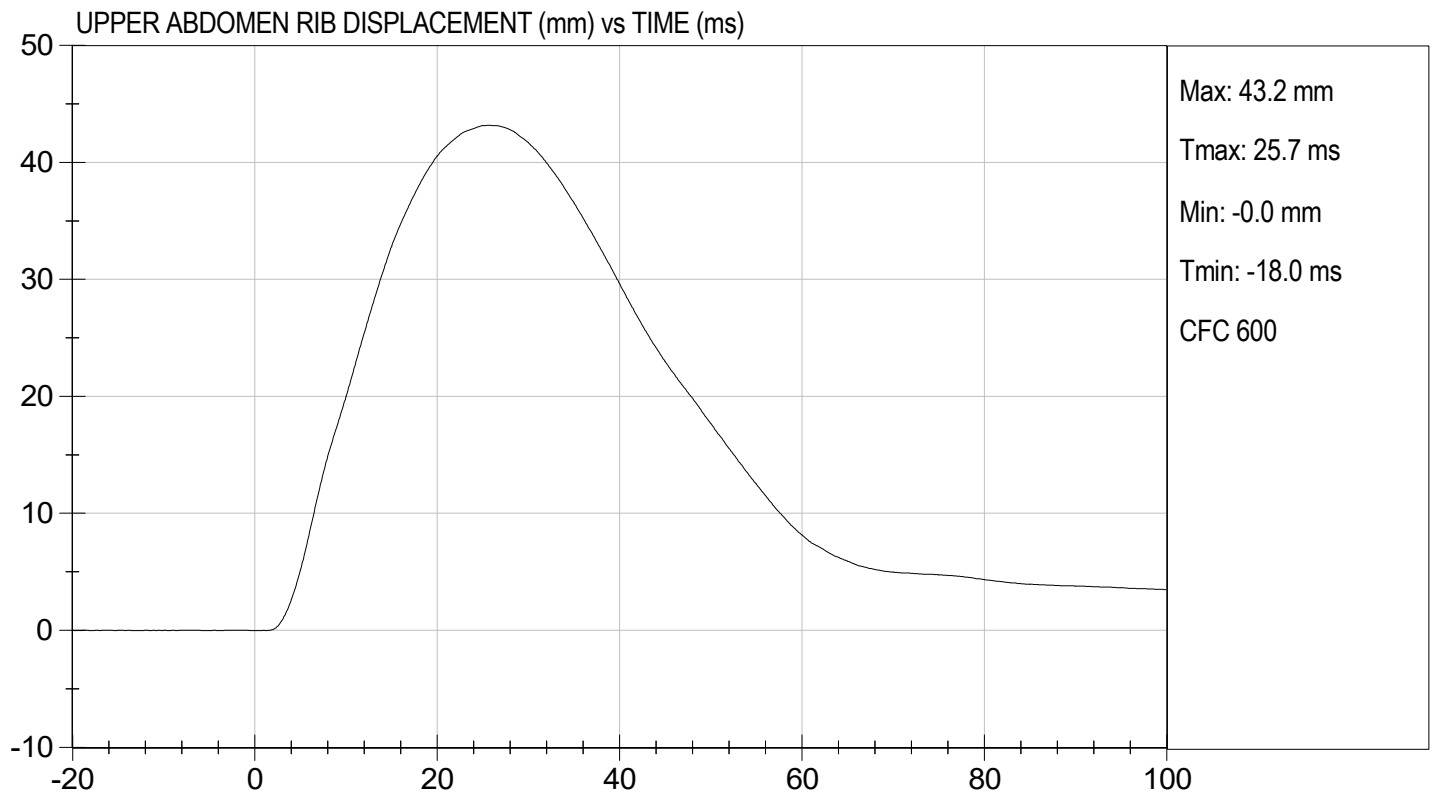
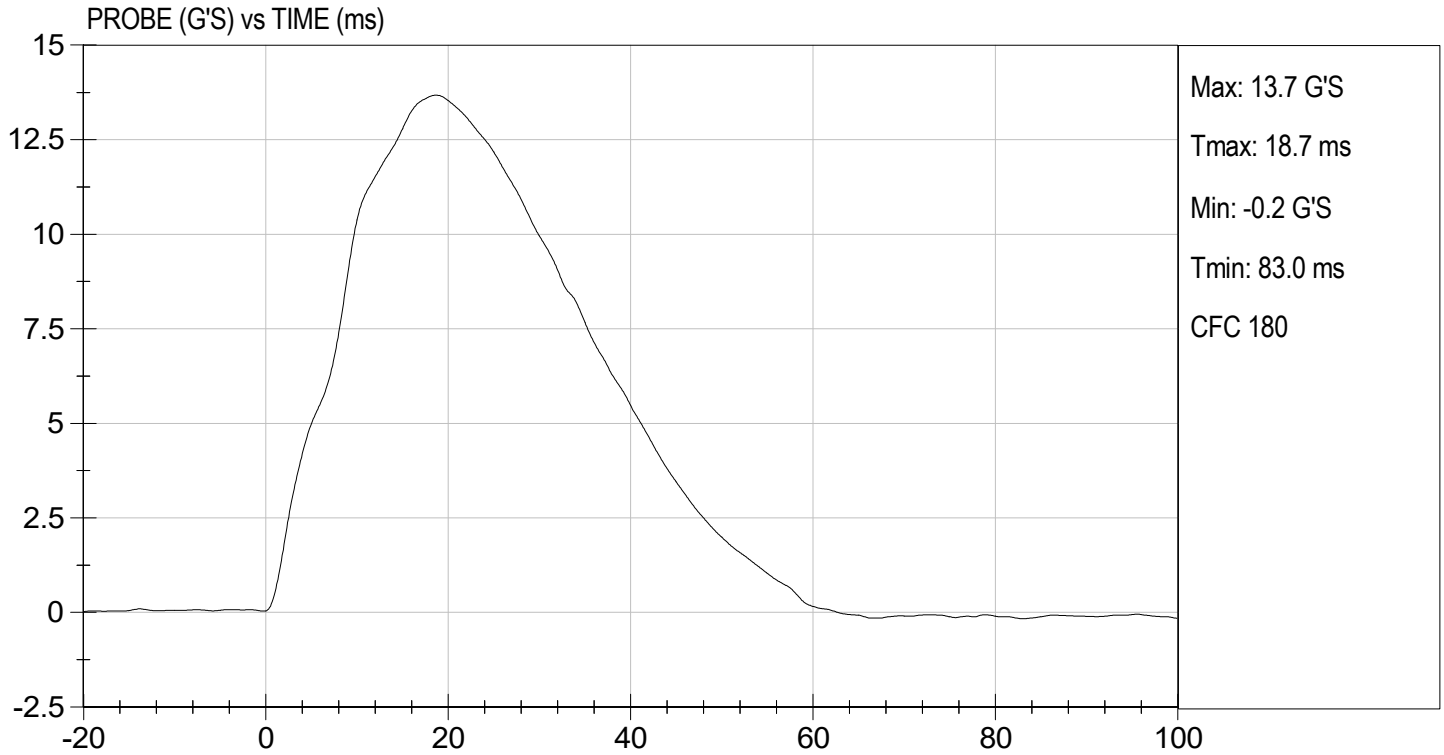
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

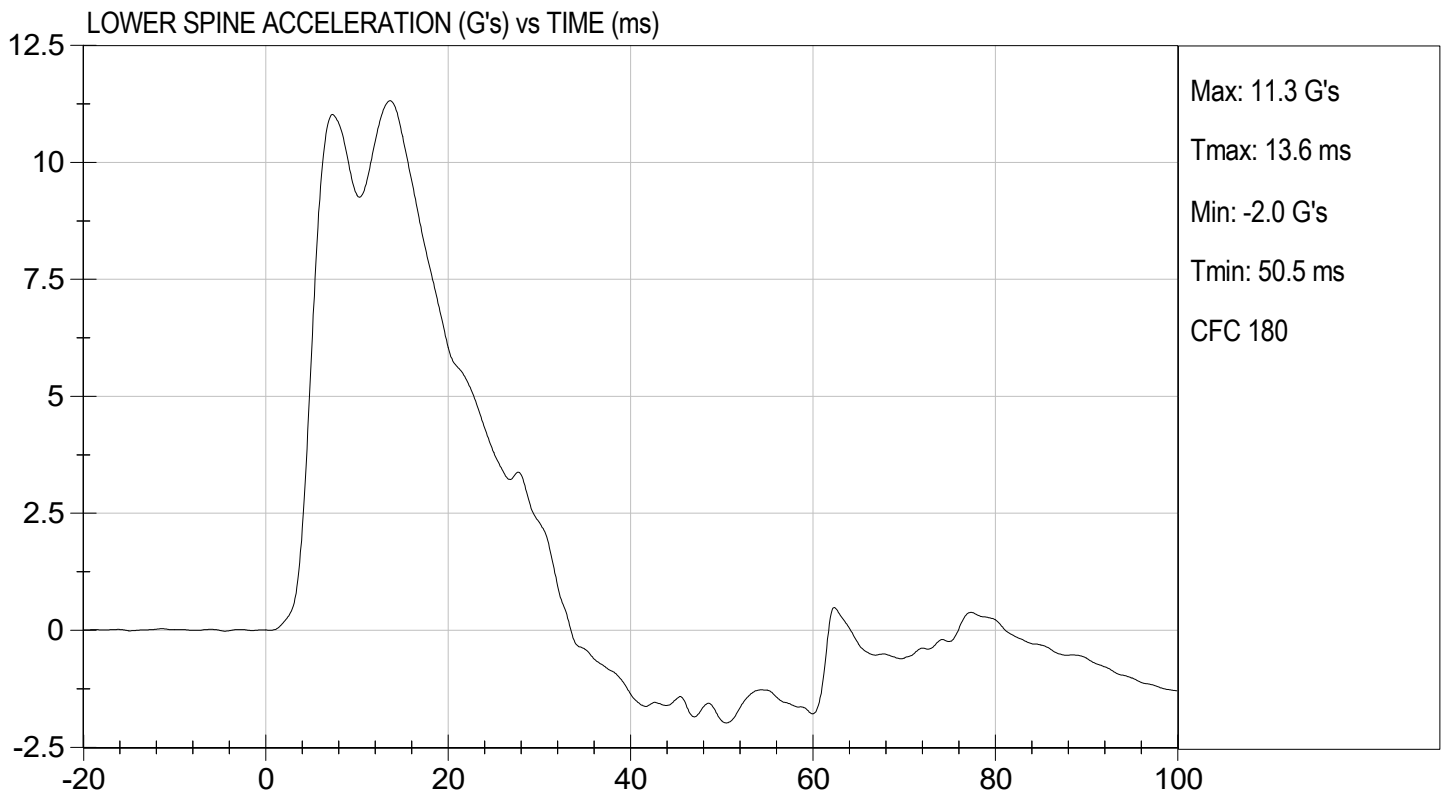
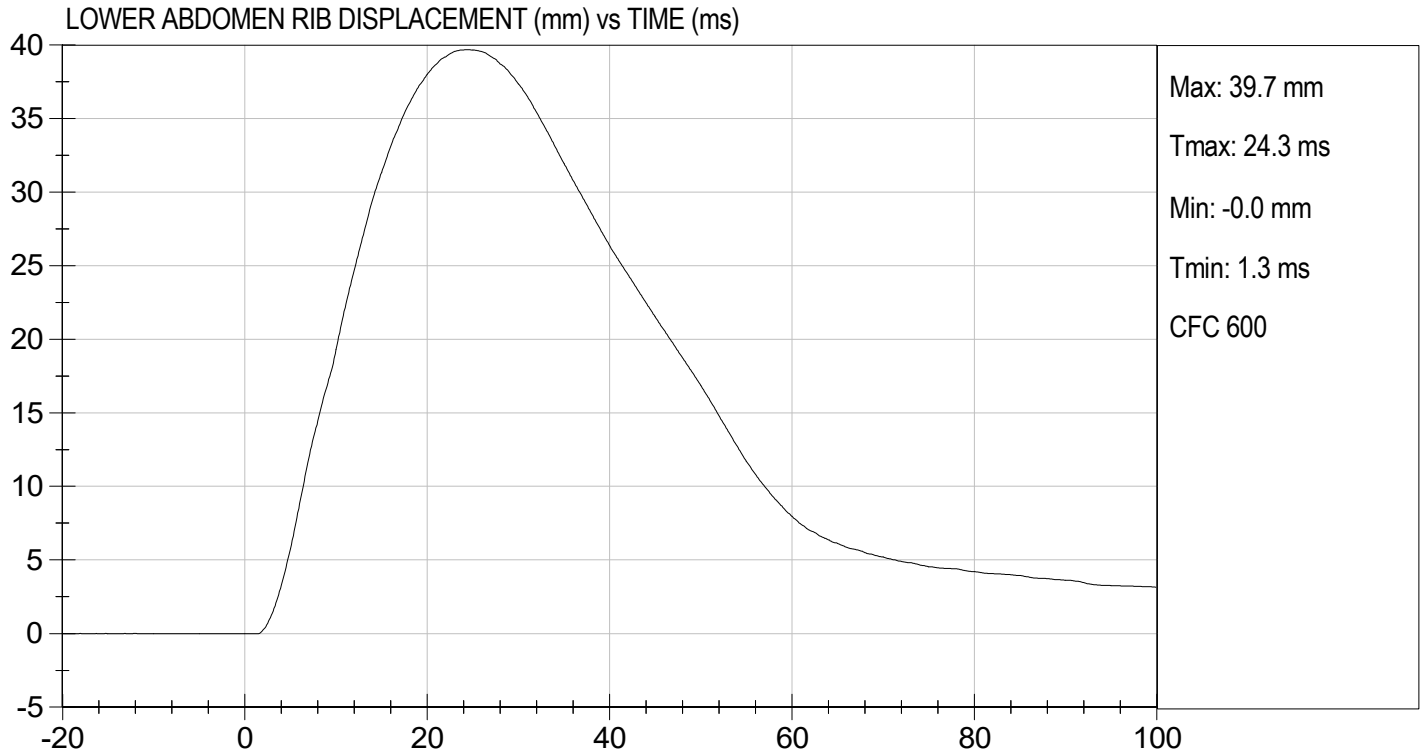
TEST DATE: 01/20/2023
TEST #: D230166





TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 01/20/2023
TEST #: D230166



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

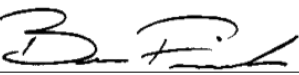
Test I.D: D230167

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	40	Pass
Peak Acetabulum Force	N	3600 to 4300	3,997	Pass
Overall Test Results				Pass


Laboratory Technician

01/20/2023

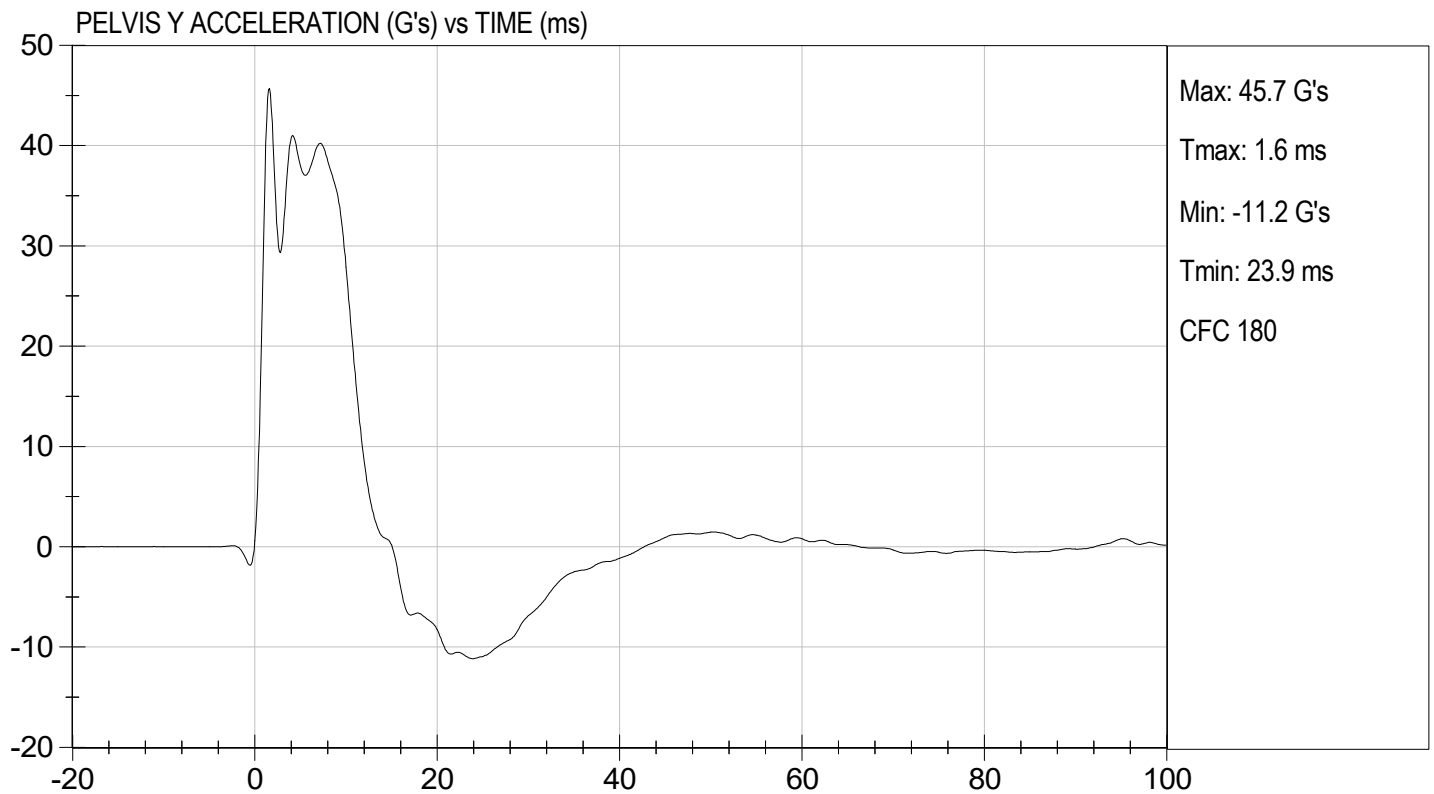
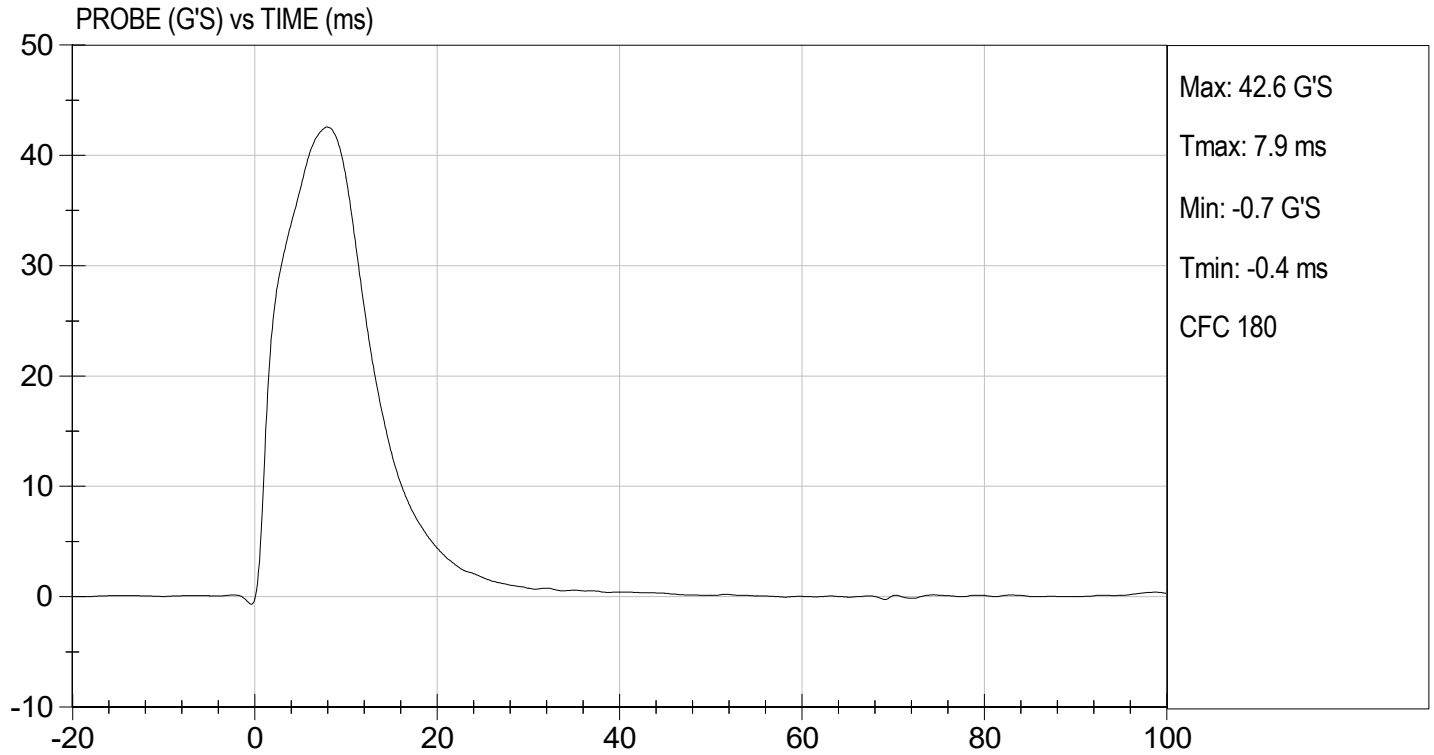
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

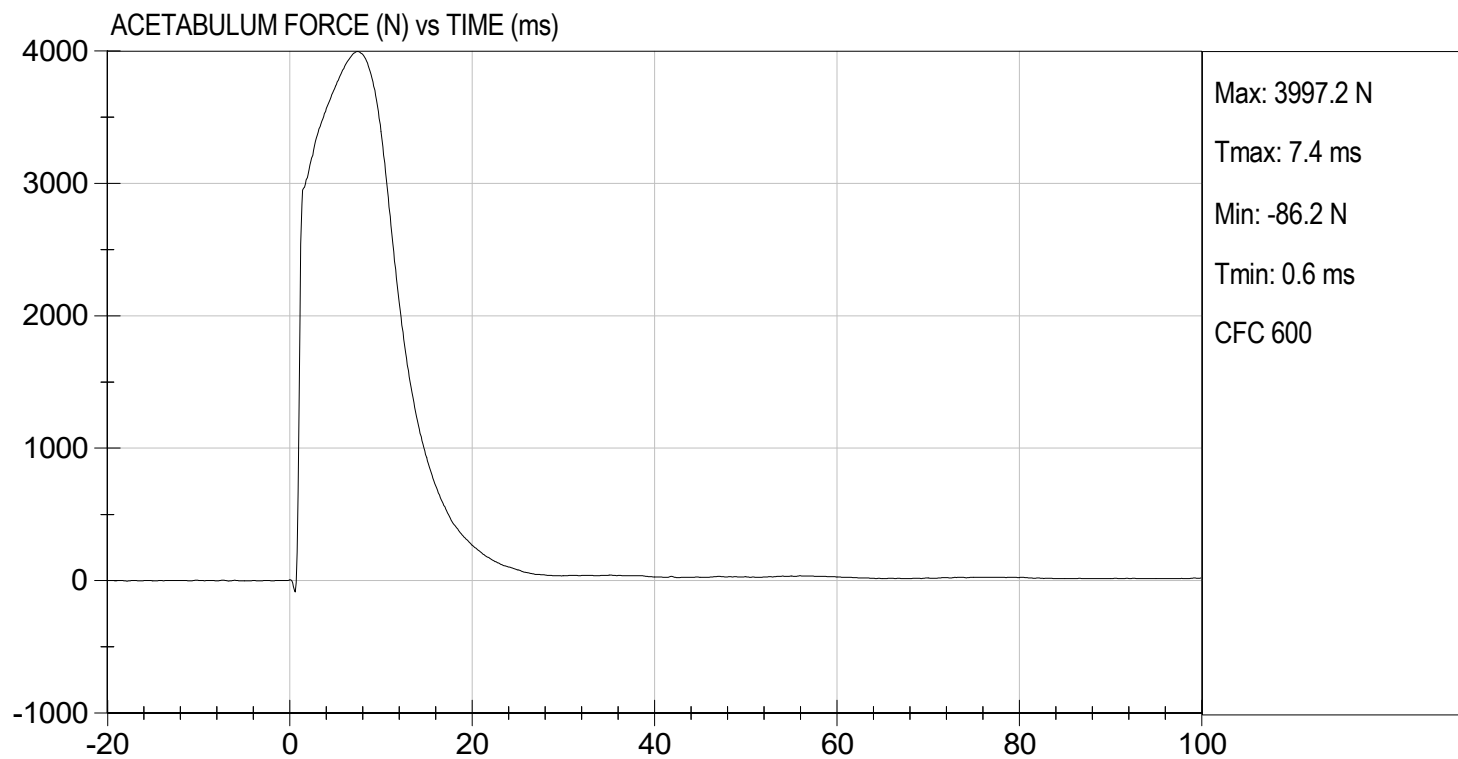
TEST DATE: 01/20/2023
TEST #: D230167





TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 01/20/2023
TEST #: D230167



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

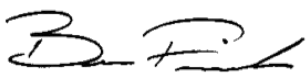
Test I.D: D230168

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	30	Pass
Impact Velocity	m/s	4.20 to 4.40	4.20	Pass
Maximum Probe Acceleration	G's	36 to 45	45	Pass
Pelvis Y Acceleration	G's	28 to 39	37	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,995	Pass
Overall Test Results				Pass


Laboratory Technician

01/20/2023

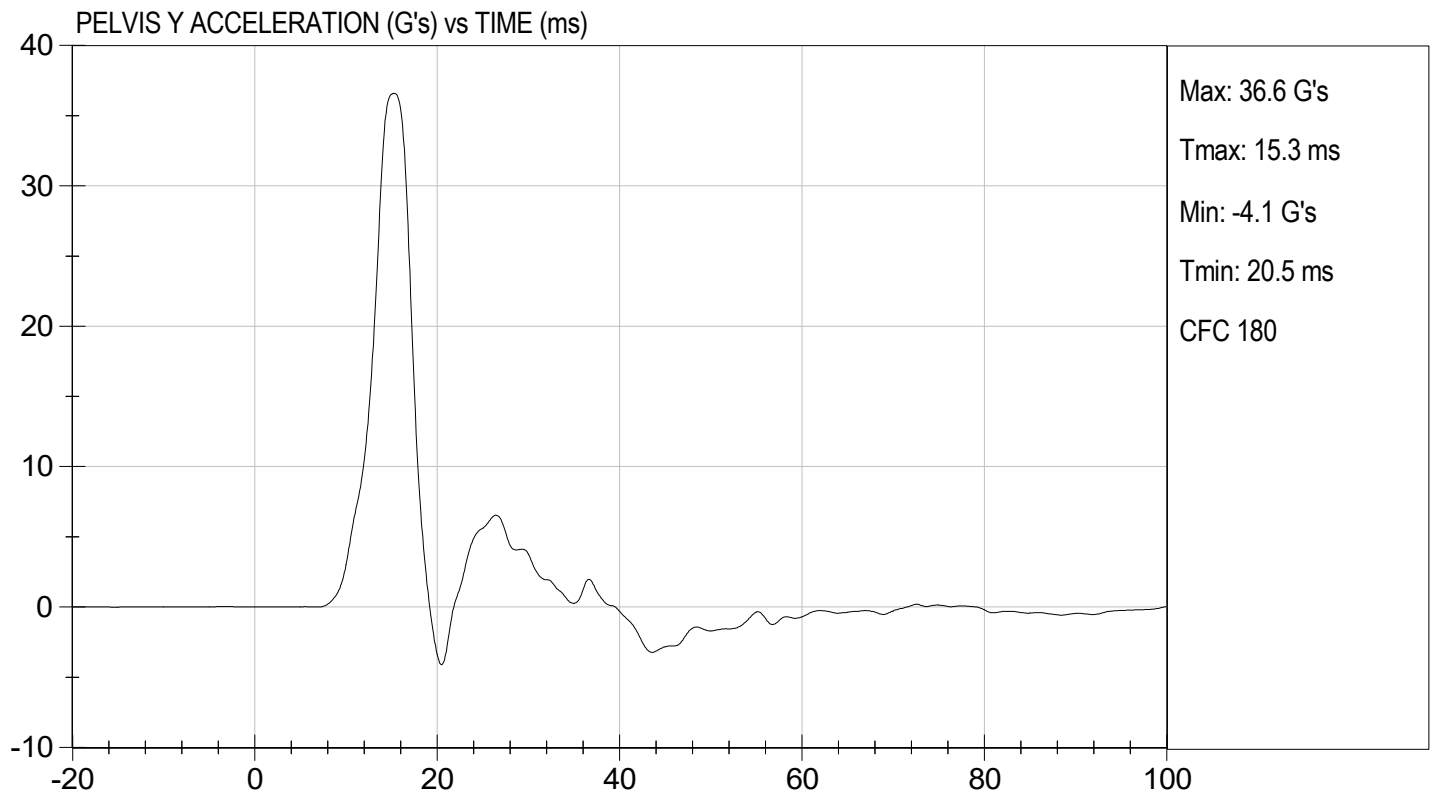
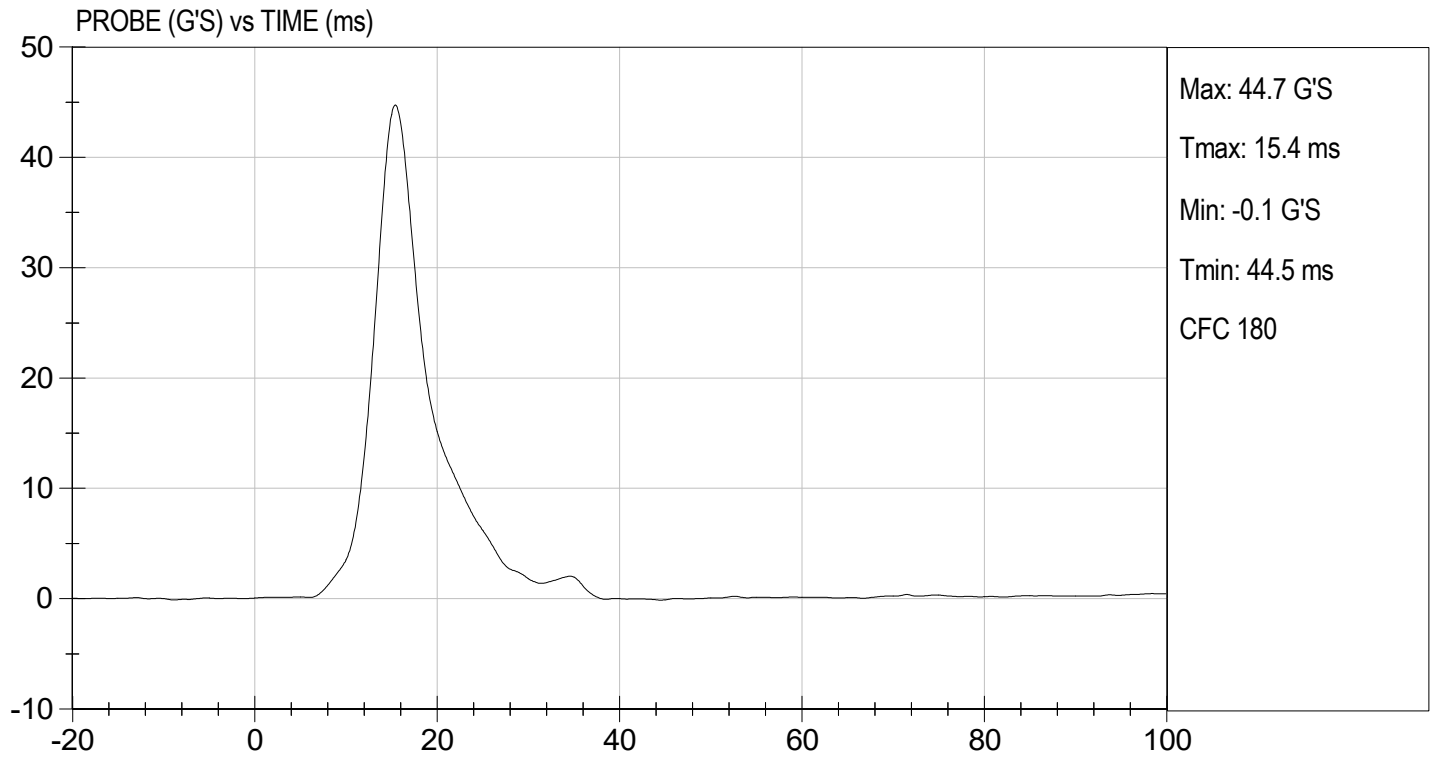
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 13.77 ft/s, 4.20 m/s

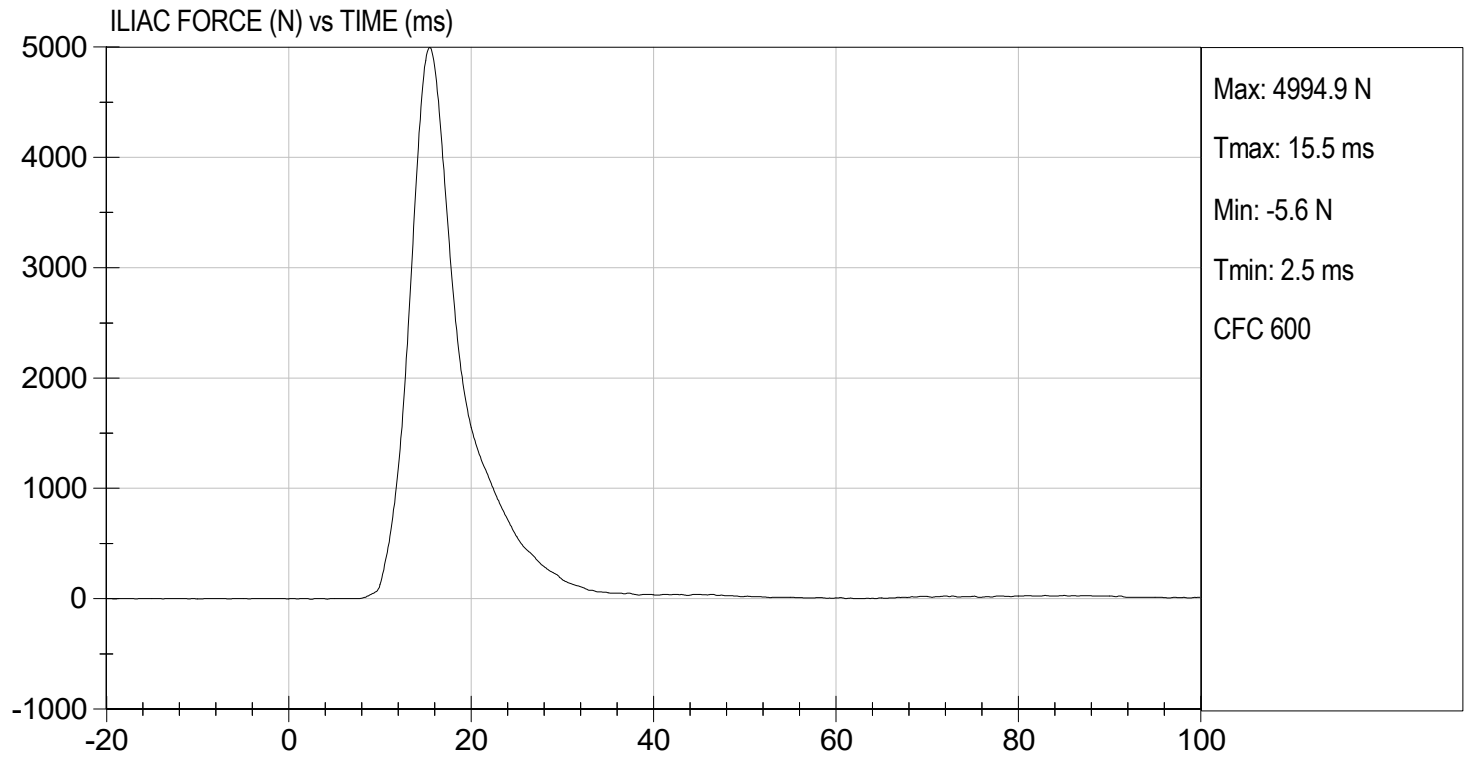
TEST DATE: 01/20/2023
TEST #: D230168





TEST DESC: ILLIAC
VELOCITY: 13.77 ft/s, 4.20 m/s

TEST DATE: 01/20/2023
TEST #: D230168



QUALIFICATION 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

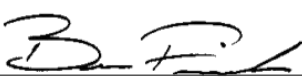
Test ID: D230571

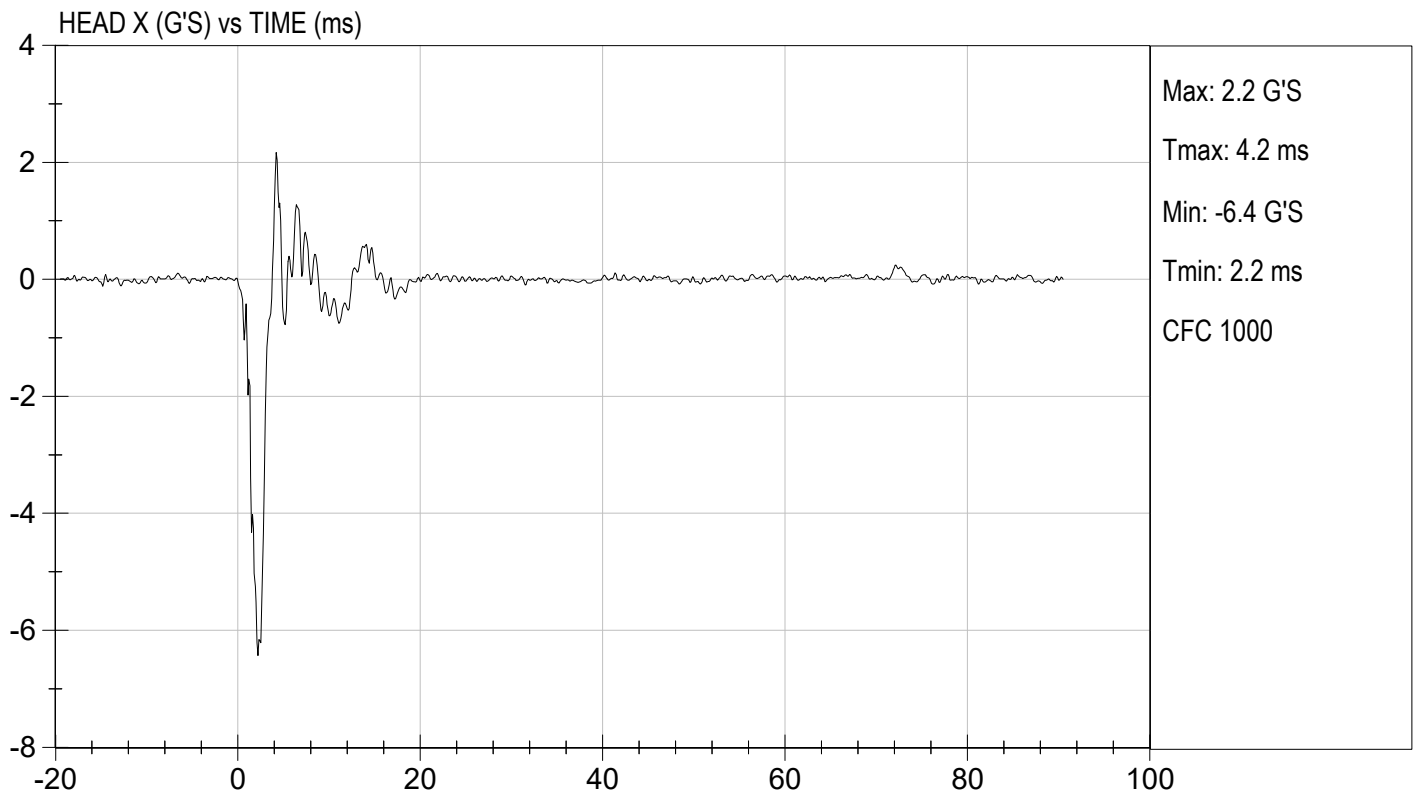
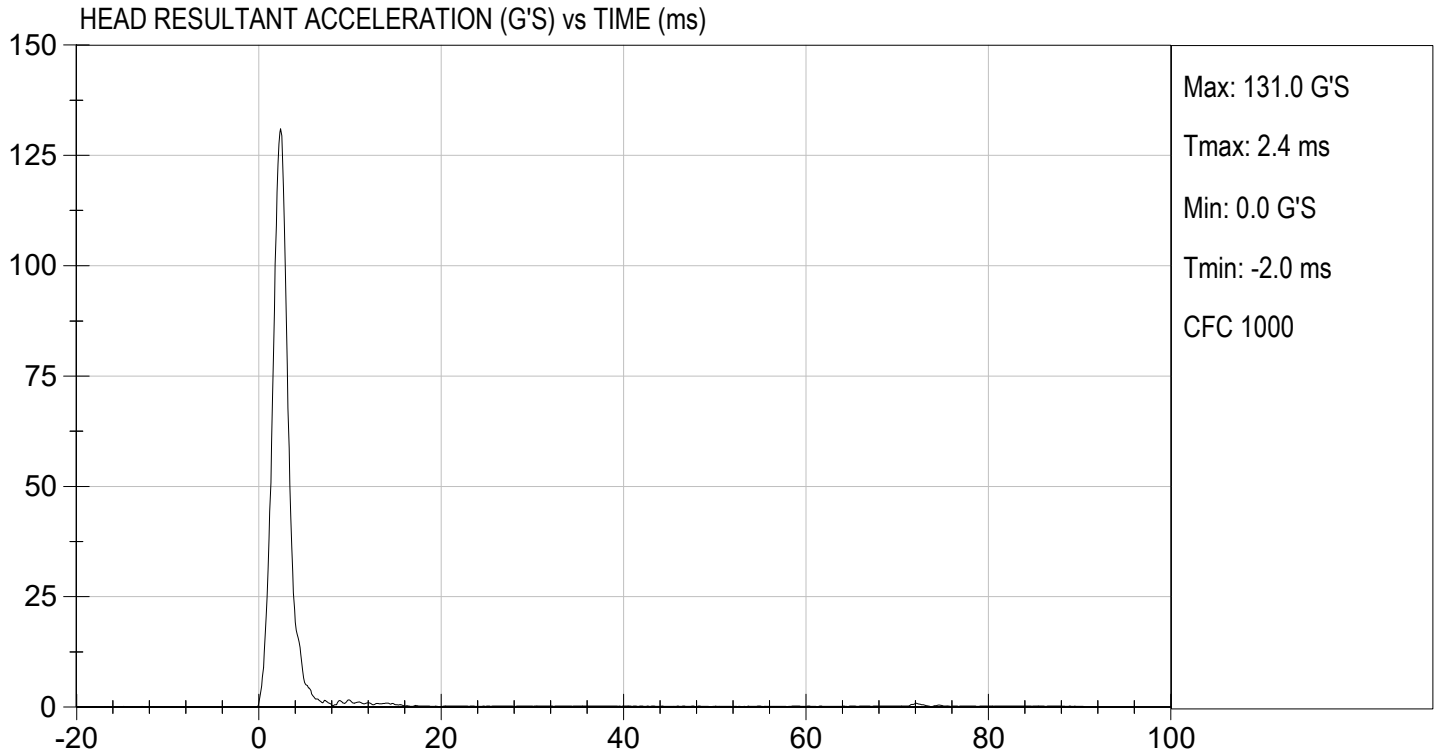
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Peak Resultant Acceleration	G's	115 to 137	131	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-6.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results			Pass	

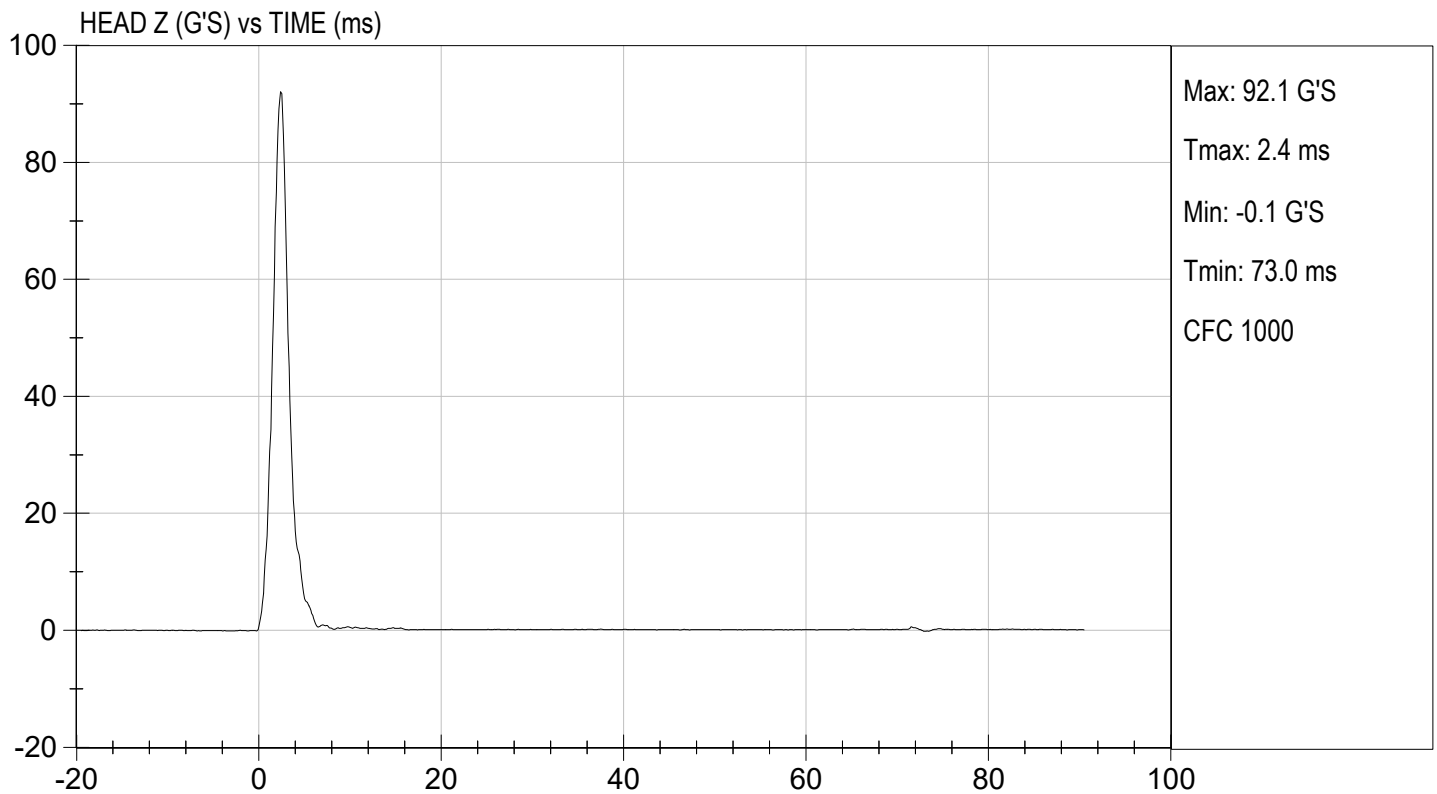
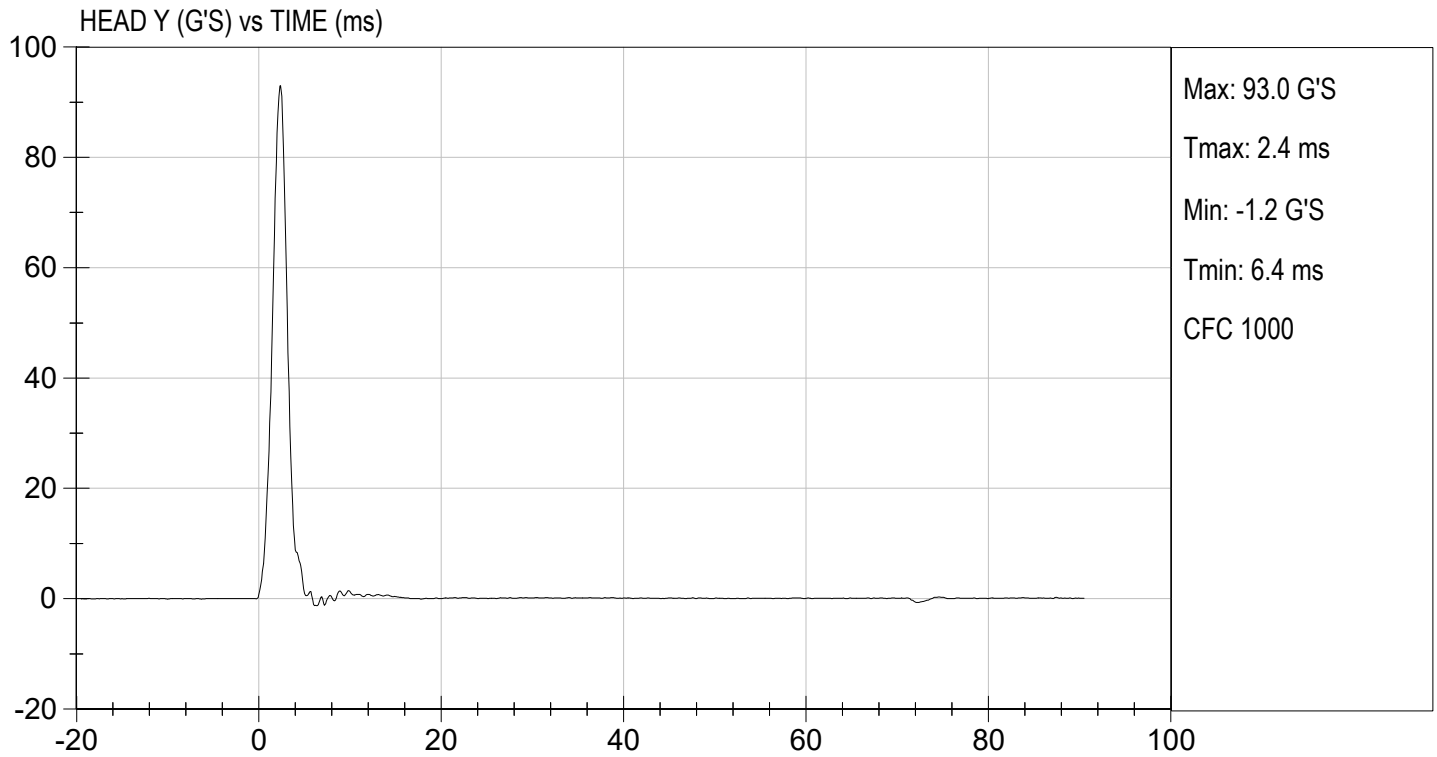

Laboratory Technician

03/06/2023

Test Date


Approved By



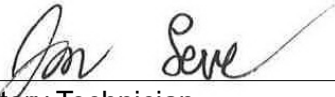


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

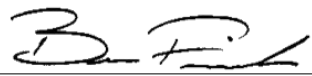
Test I.D: D230572

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.7	Pass
Humidity		%	10 to 70	27	Pass
Impact Velocity		m/s	5.51 to 5.63	5.63	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.39	Pass
	15 ms	m/s	3.30 to 4.10	3.51	Pass
	20 ms	m/s	4.40 to 5.40	5.10	Pass
	25 ms	m/s	5.40 to 6.10	5.67	Pass
	25-100 ms	m/s	5.50 to 6.20	5.69	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	62	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	113	Pass
Overall Test Results				Pass	


 Laboratory Technician

03/06/2023

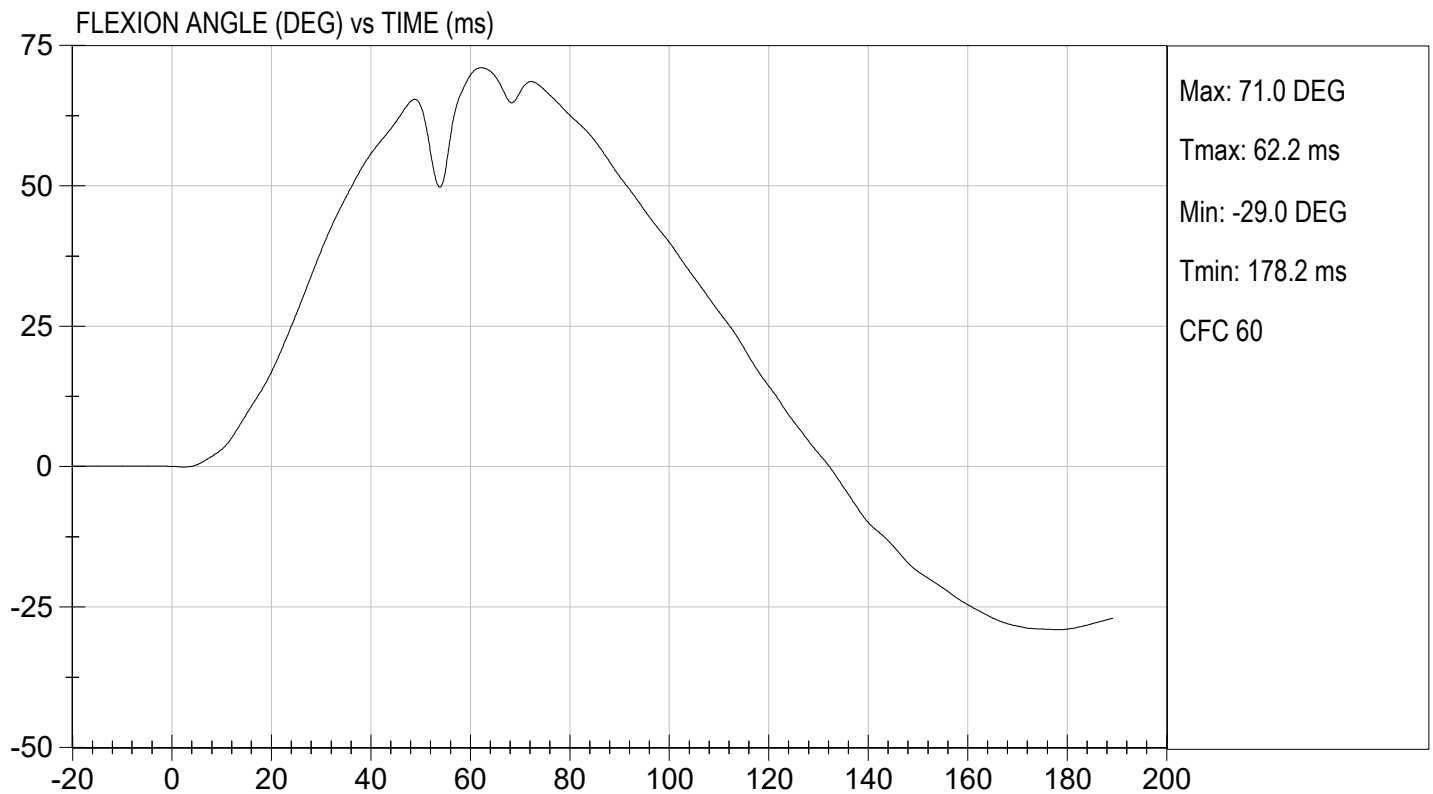
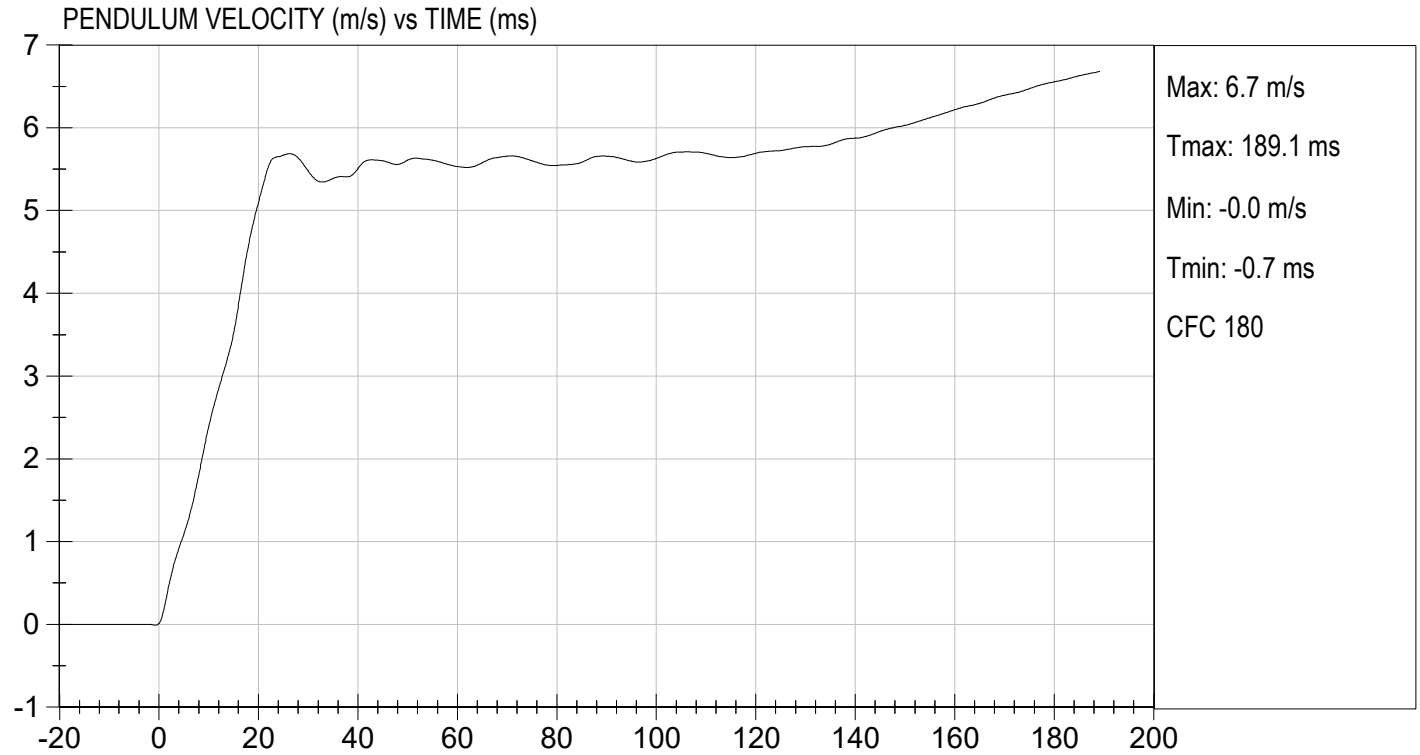
Test Date


 Approved By



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

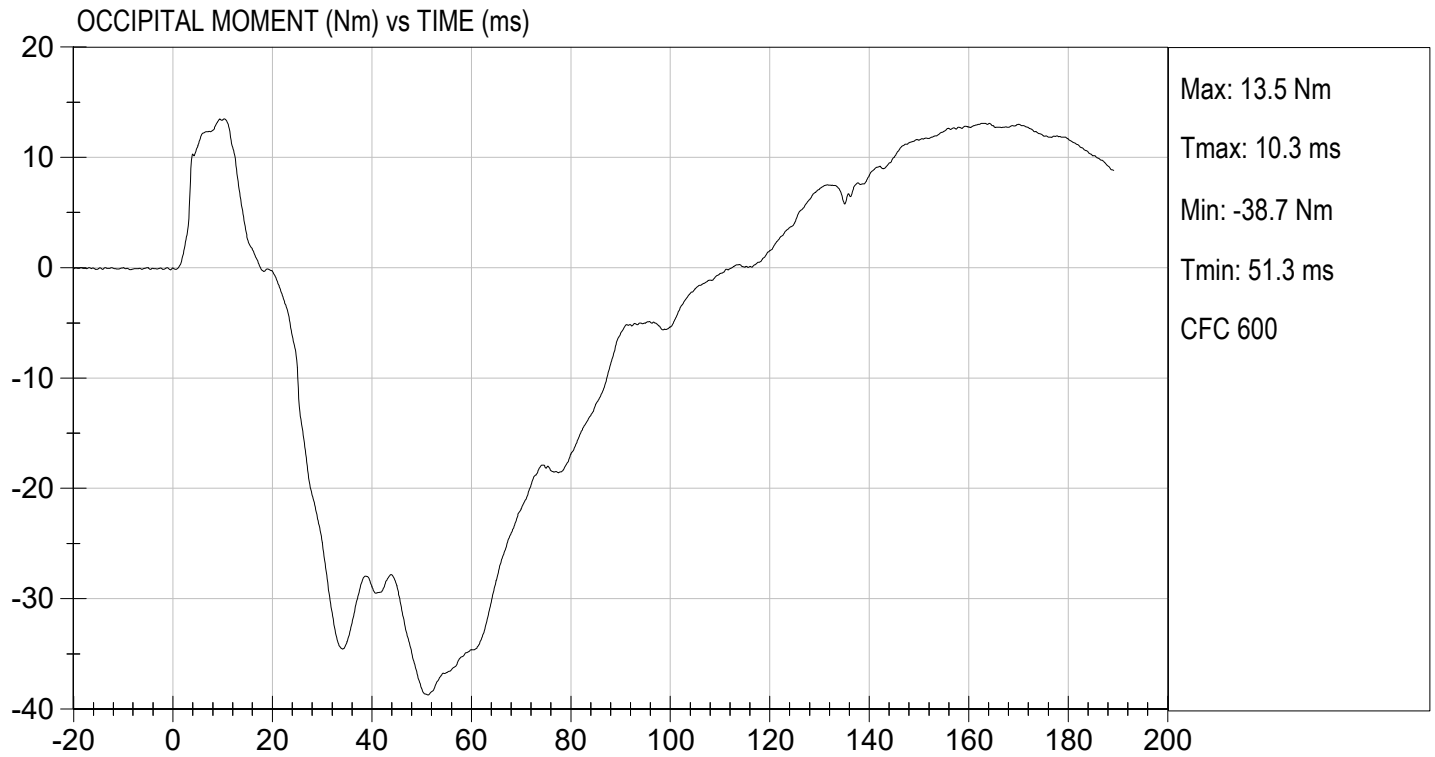
TEST DATE: 03/06/2023
TEST #: D230572





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

TEST DATE: 03/06/2023
TEST #: D230572



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

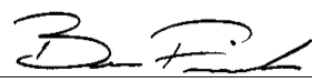
ATD Serial No: 306

Test ID: D230573

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results			Pass	


Laboratory Technician

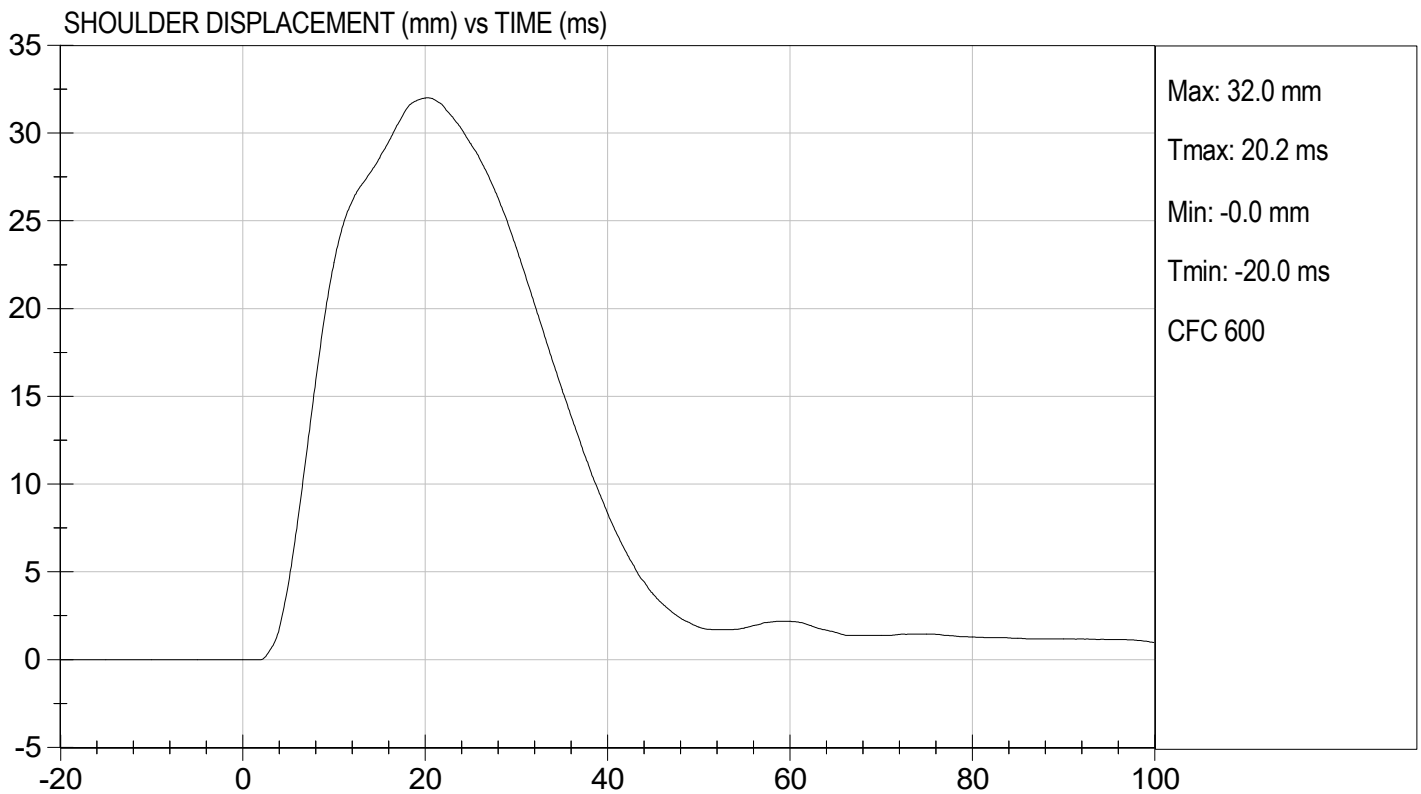
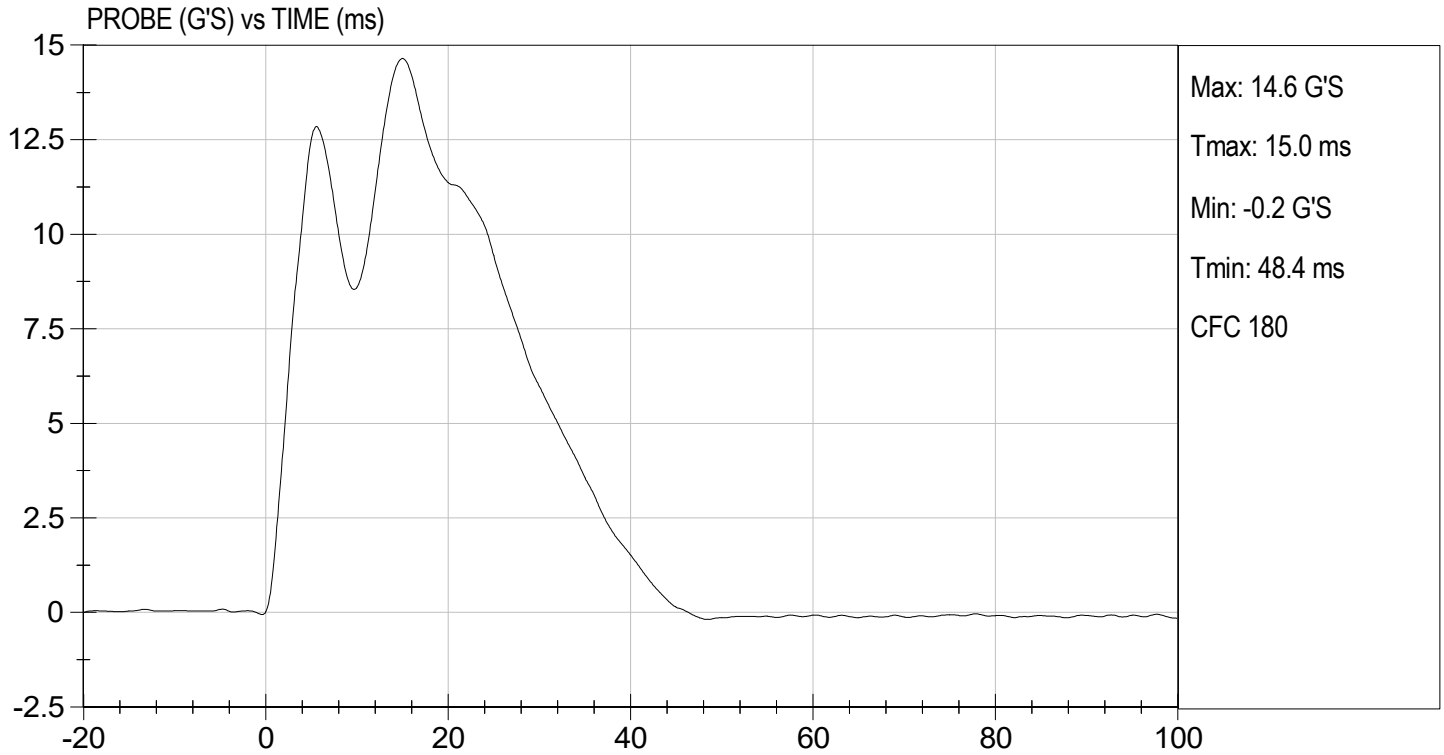
03/07/2023
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

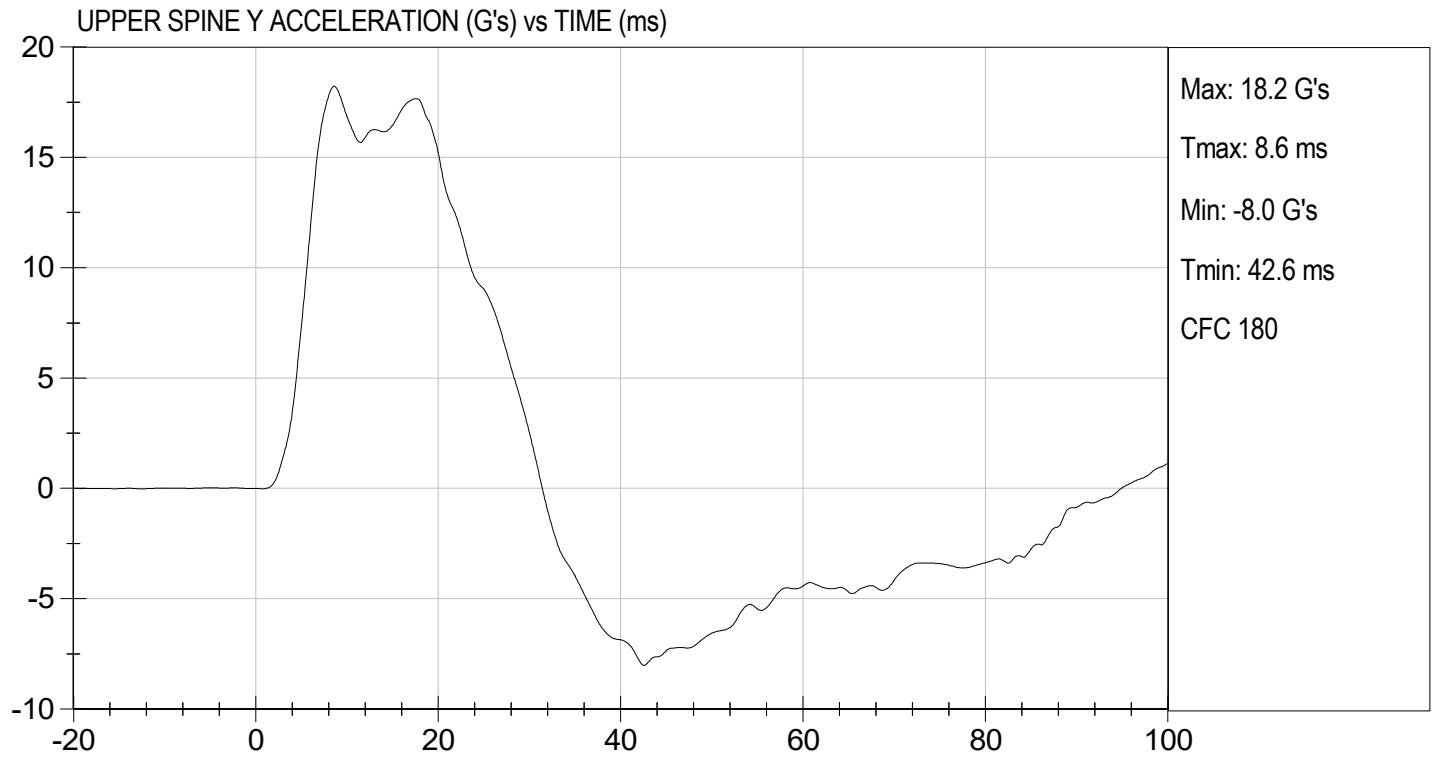
TEST DATE: 03/07/2023
TEST #: D230573





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 03/07/2023
TEST #: D230573



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

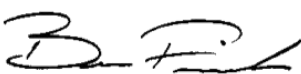
ATD Serial No: 306

Test I.D: D230574

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	28	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	39	Pass
Upper Rib Displacement	mm	25 to 32	32	Pass
Middle Rib Displacement	mm	30 to 36	34	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
Overall Test Results				Pass


Laboratory Technician

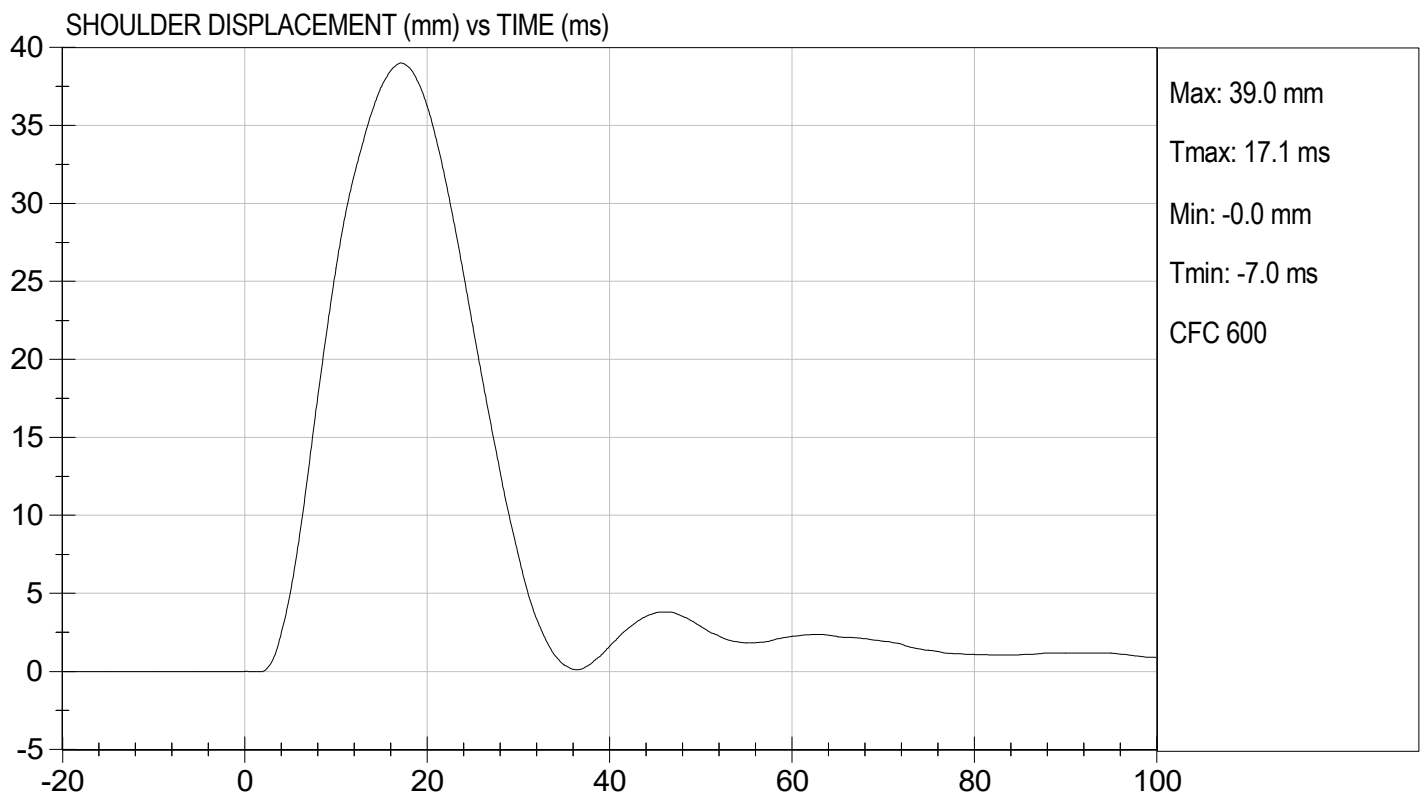
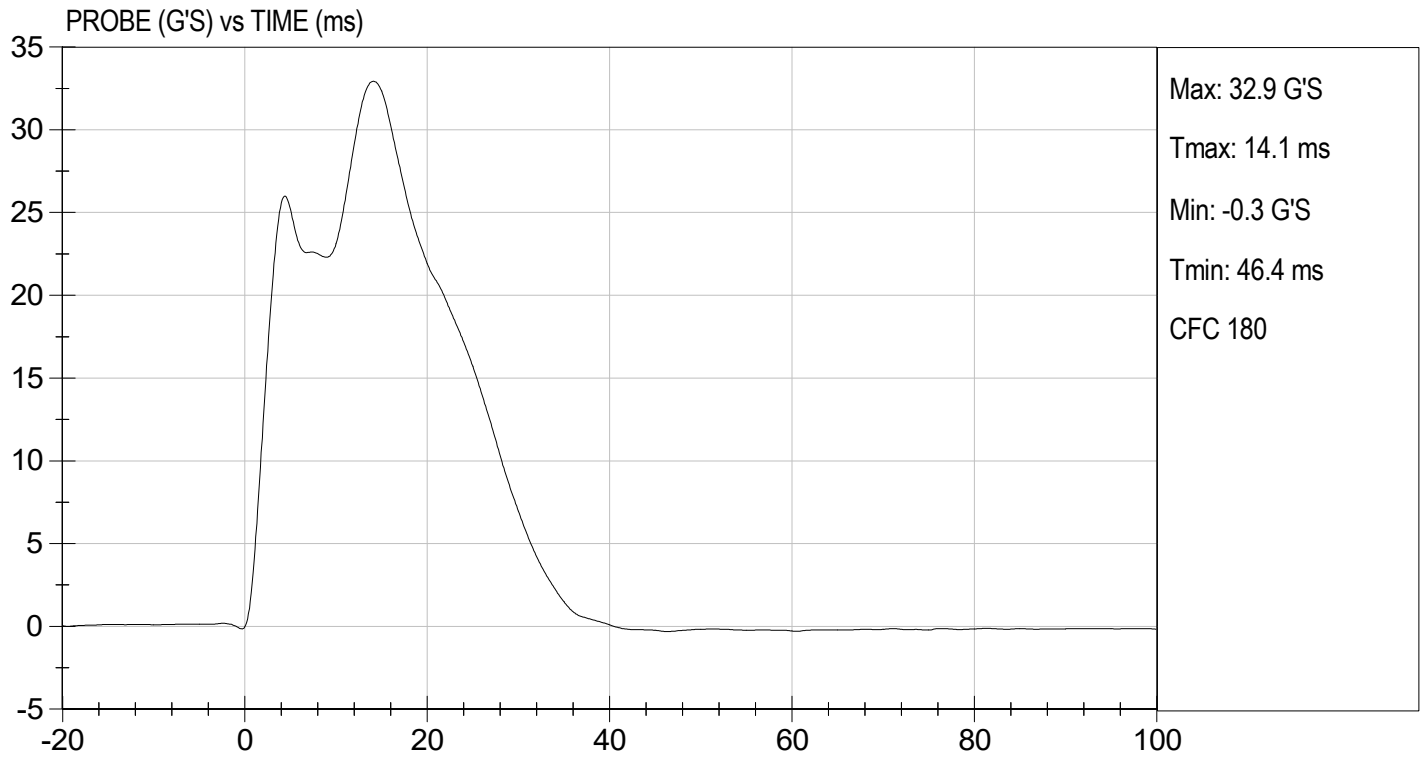
03/07/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

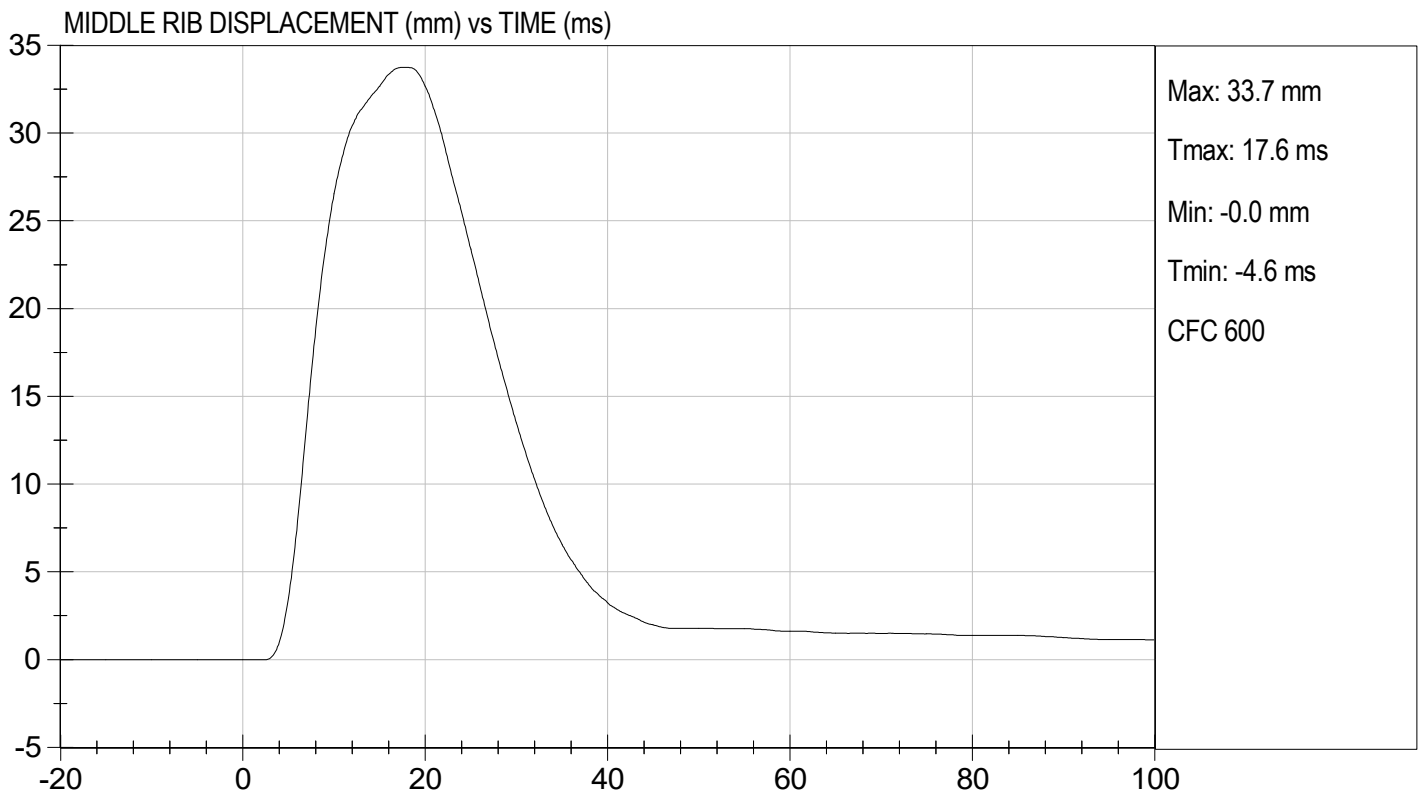
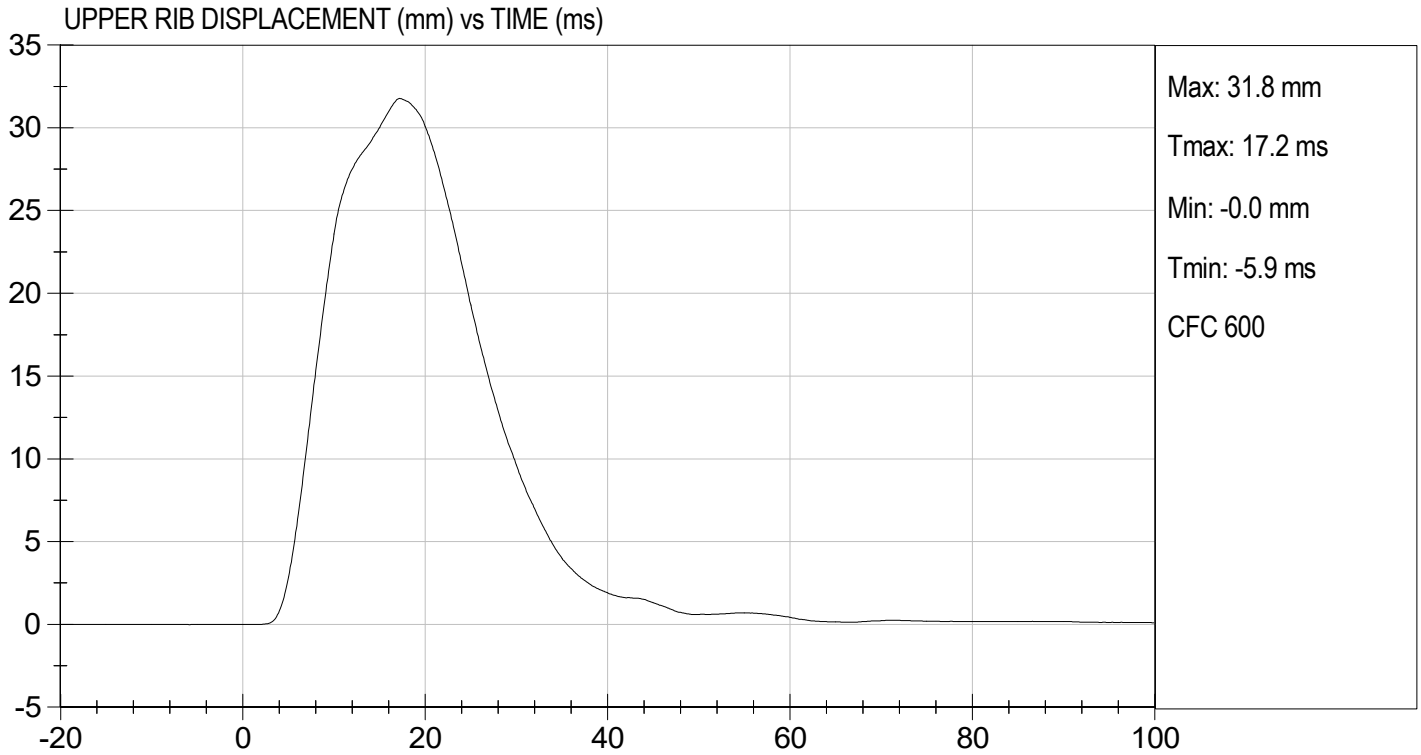
TEST DATE: 03/07/2023
TEST #: D230574





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

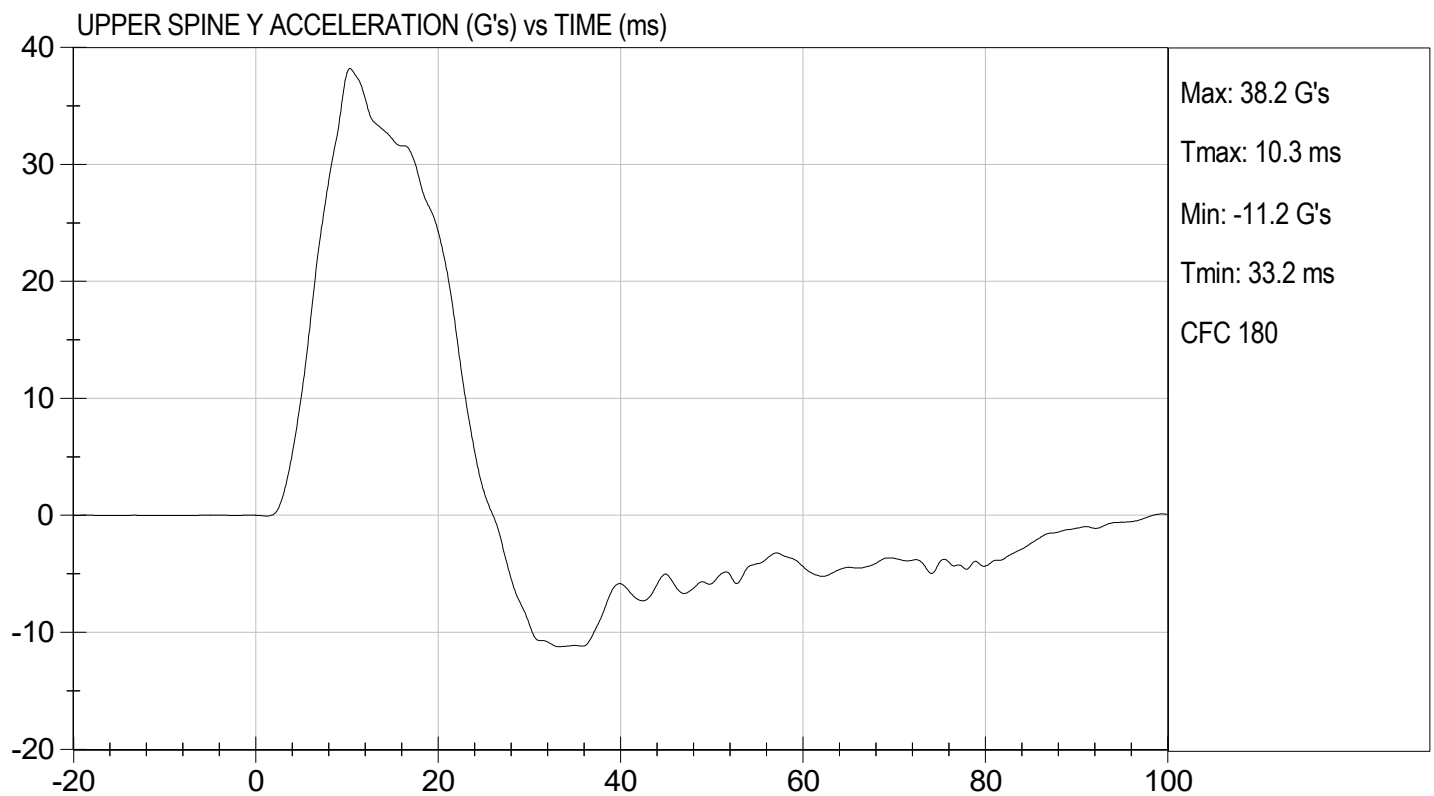
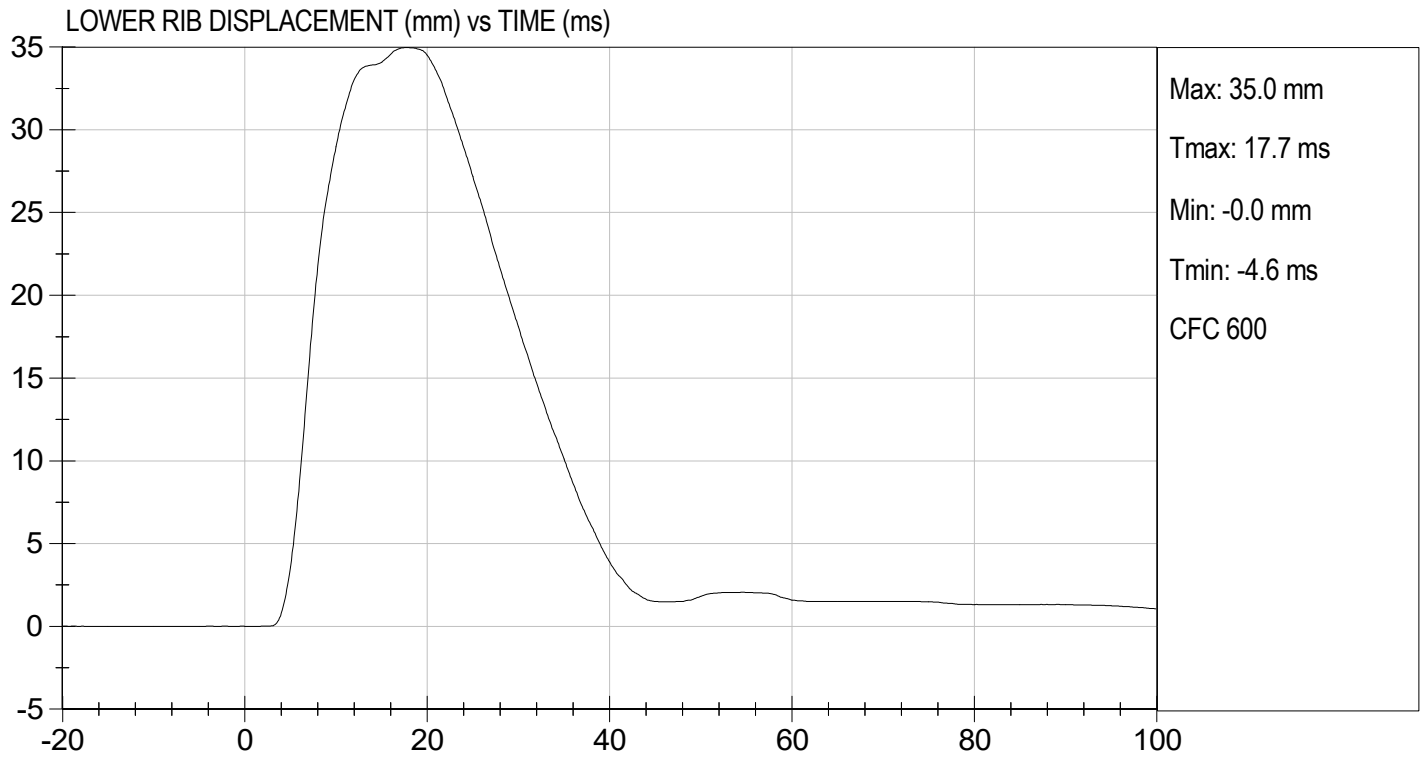
TEST DATE: 03/07/2023
TEST #: D230574





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

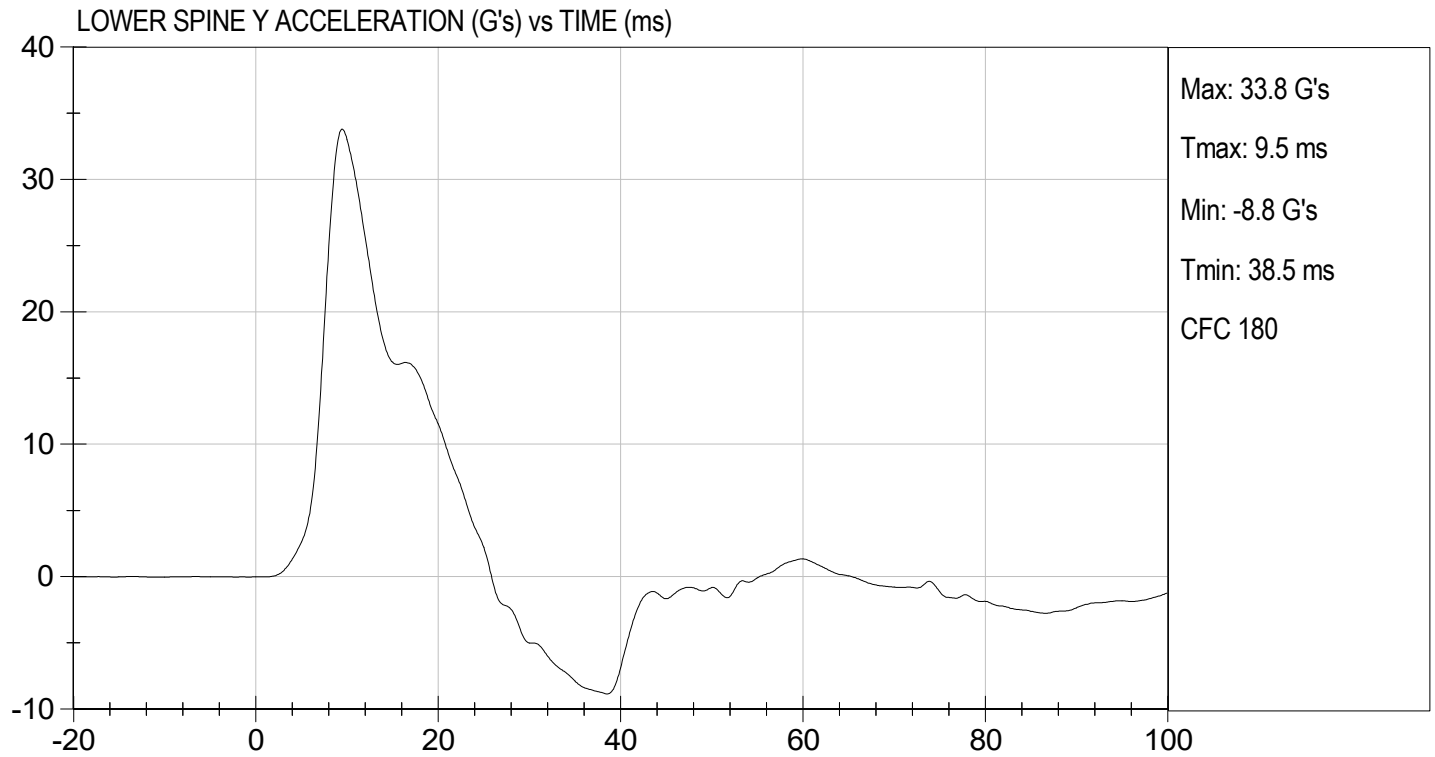
TEST DATE: 03/07/2023
TEST #: D230574





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/07/2023
TEST #: D230574



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

ATD Serial No: 306

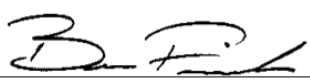
Test I.D: D230575

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	43	Pass
Lower Rib Displacement	mm	35 to 43	41	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	16	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
Overall Test Results				Pass


Laboratory Technician

03/07/2023

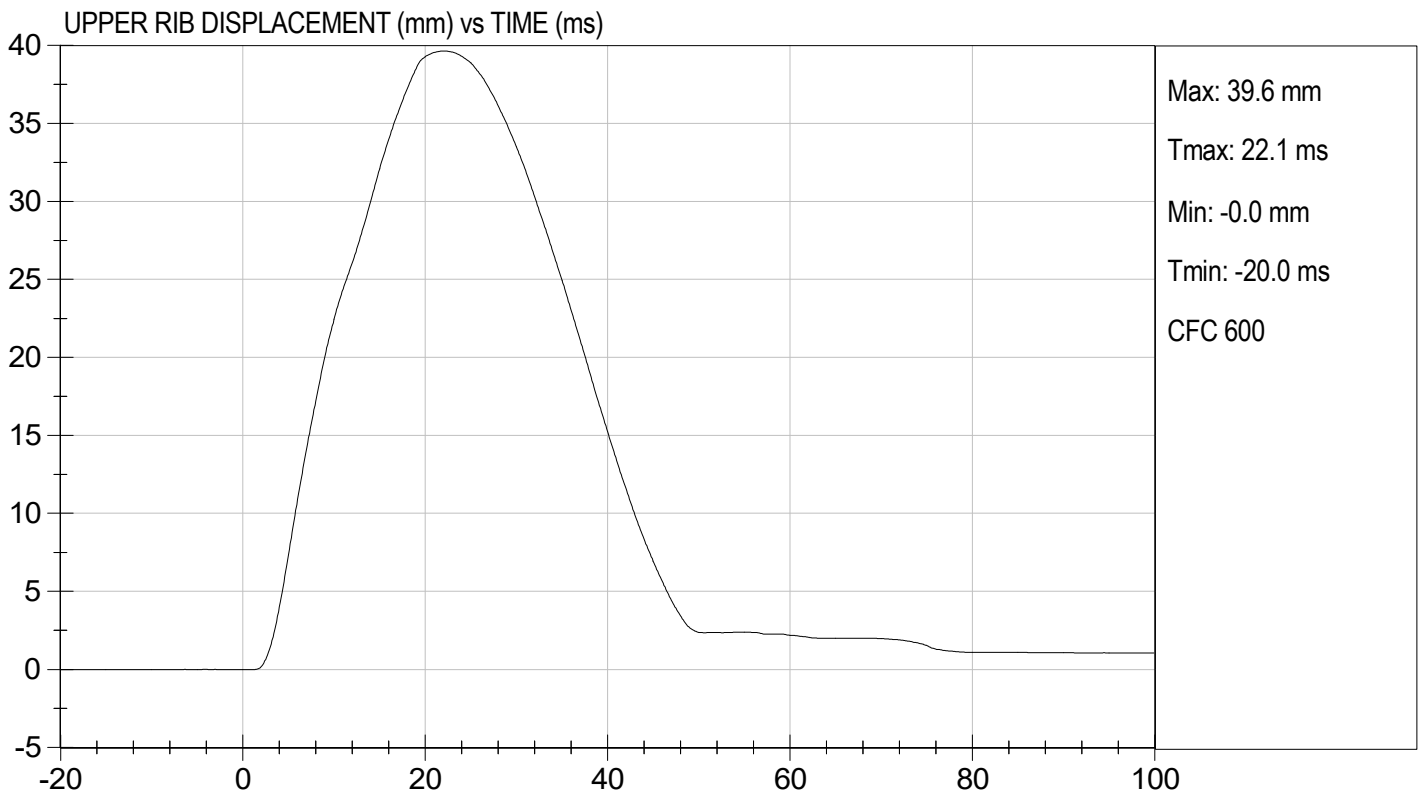
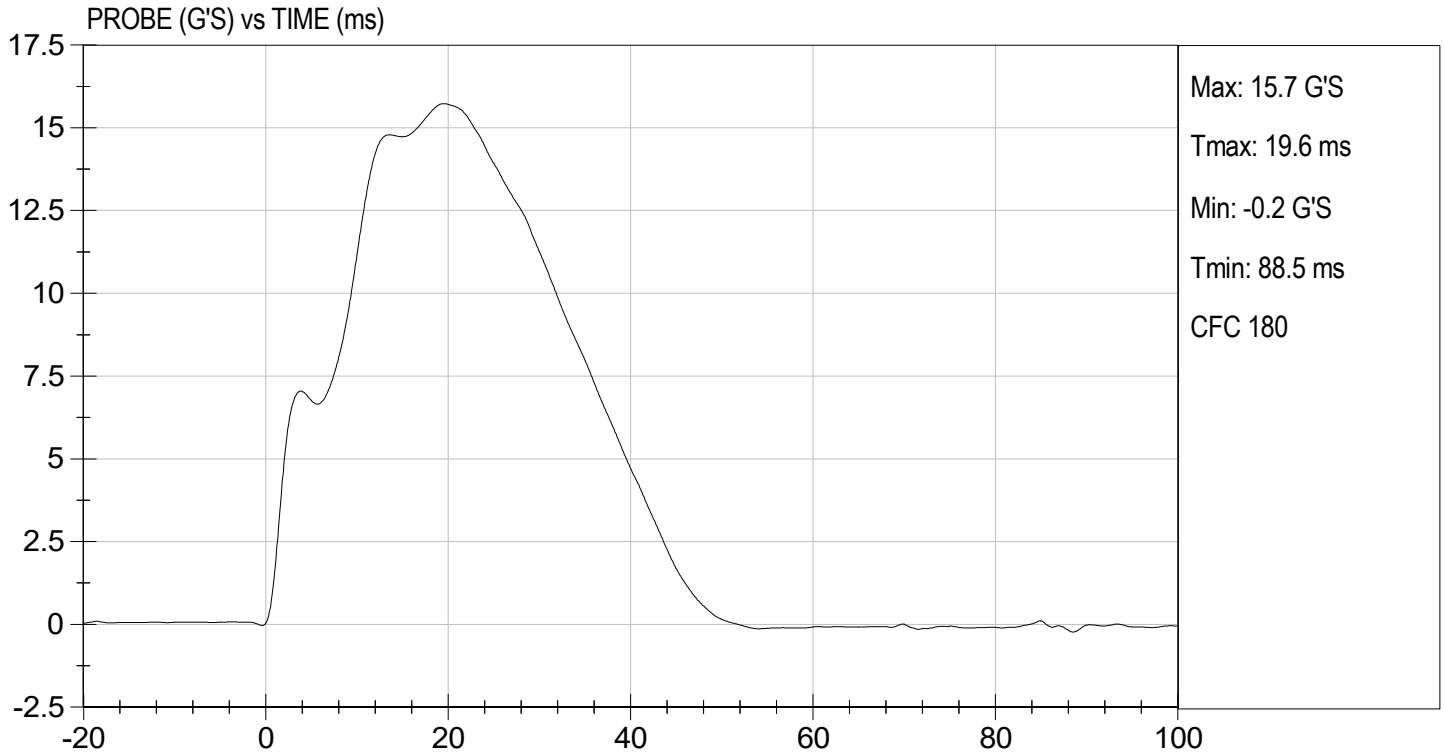
Test Date


Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

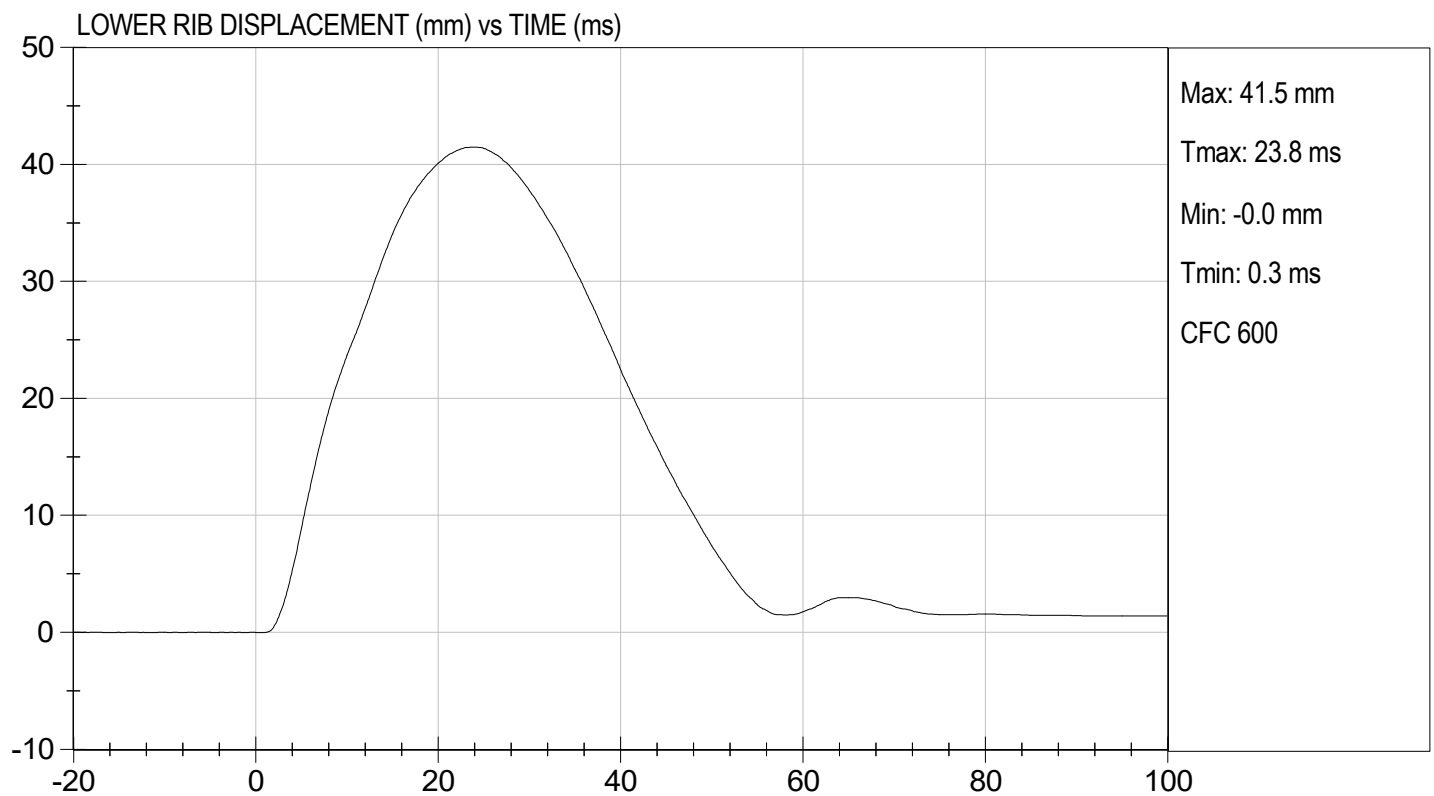
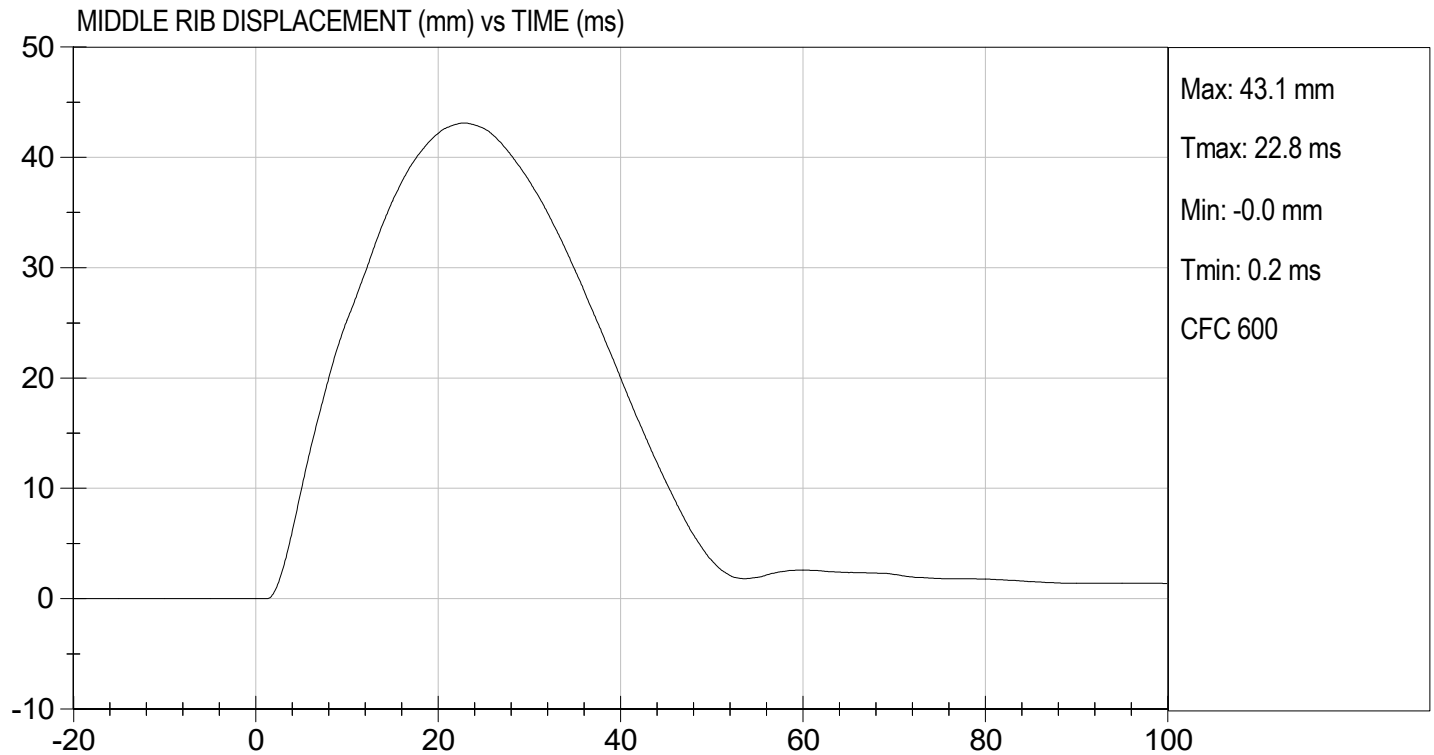
TEST DATE: 03/07/2023
TEST #: D230575





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

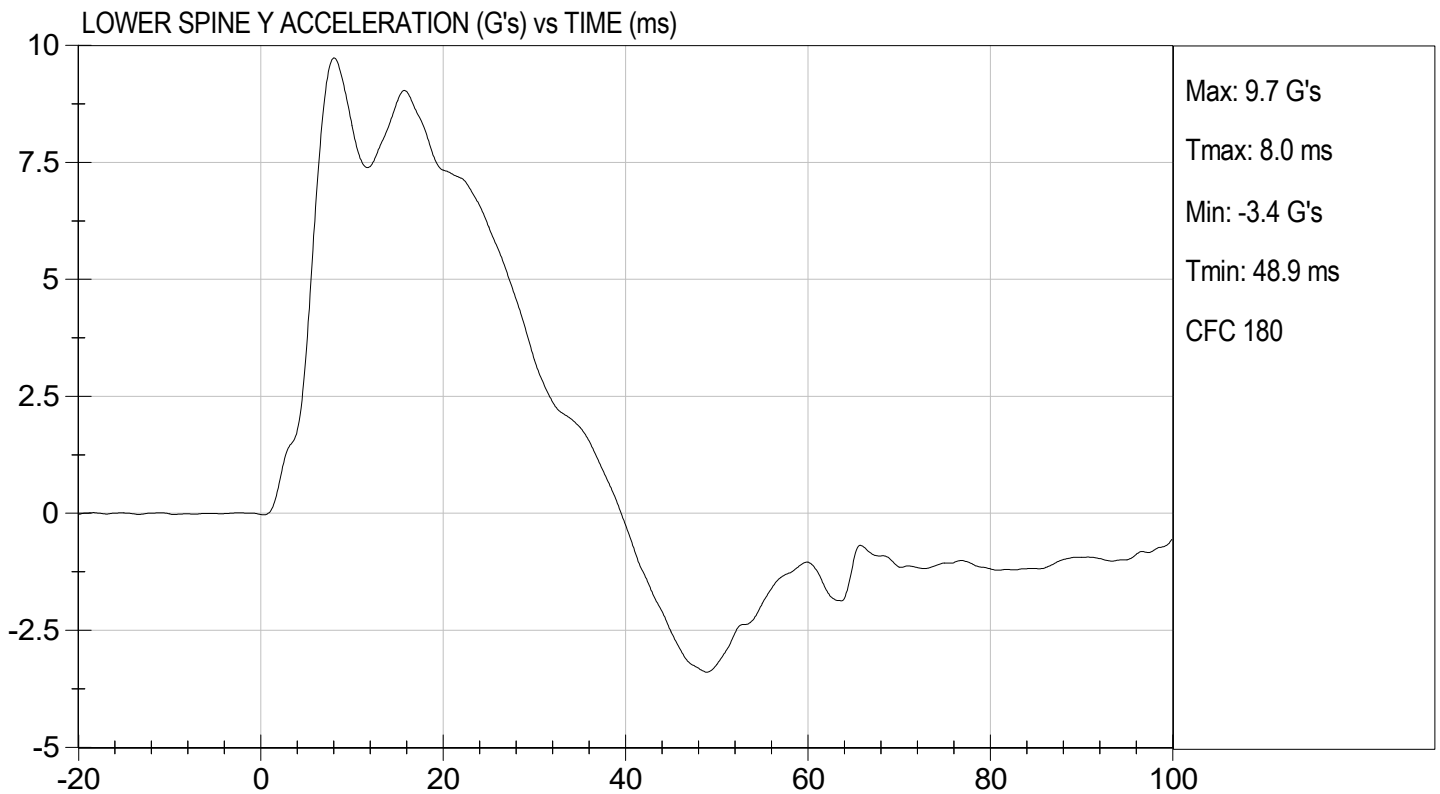
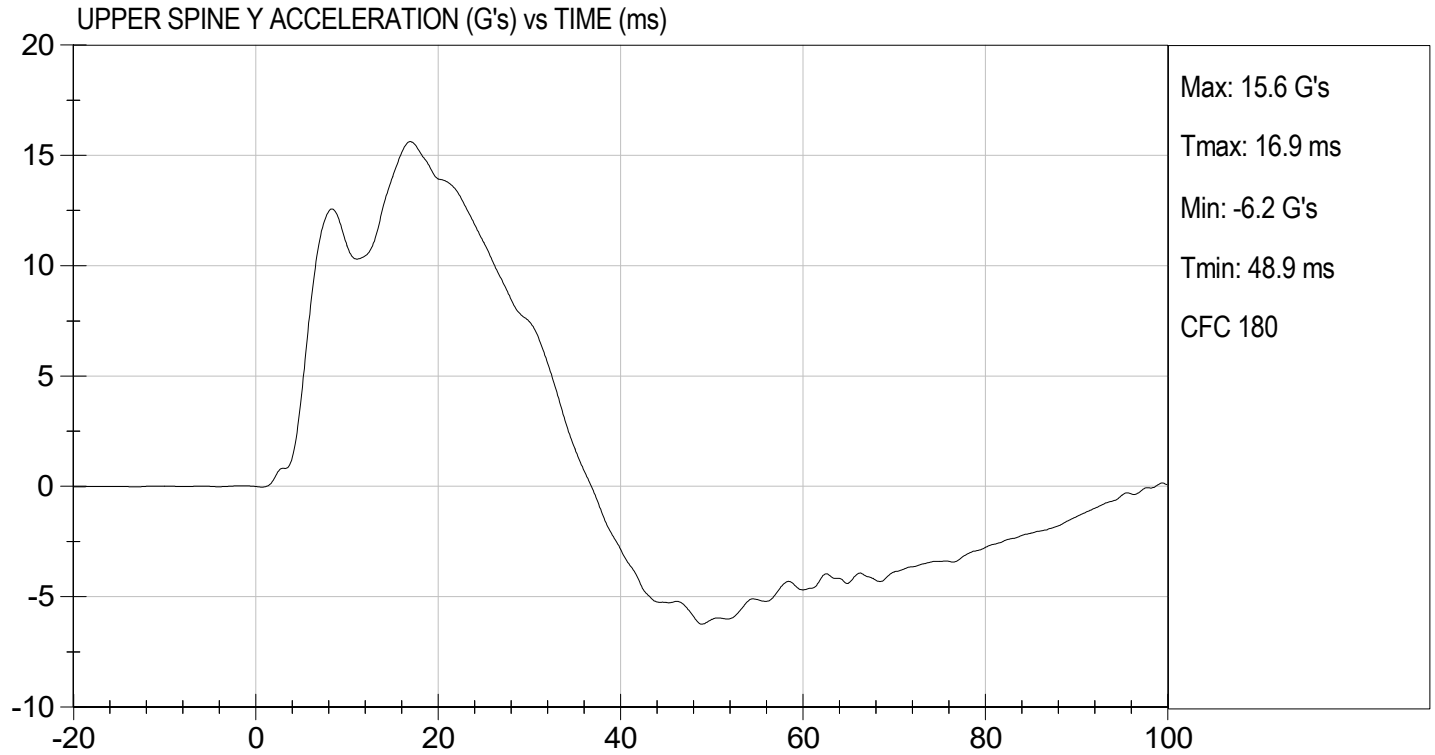
TEST DATE: 03/07/2023
TEST #: D230575





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/07/2023
TEST #: D230575



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

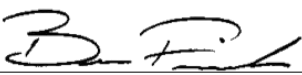
ATD Serial No: 306

Test I.D: D230576

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	44	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	39	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass


Laboratory Technician

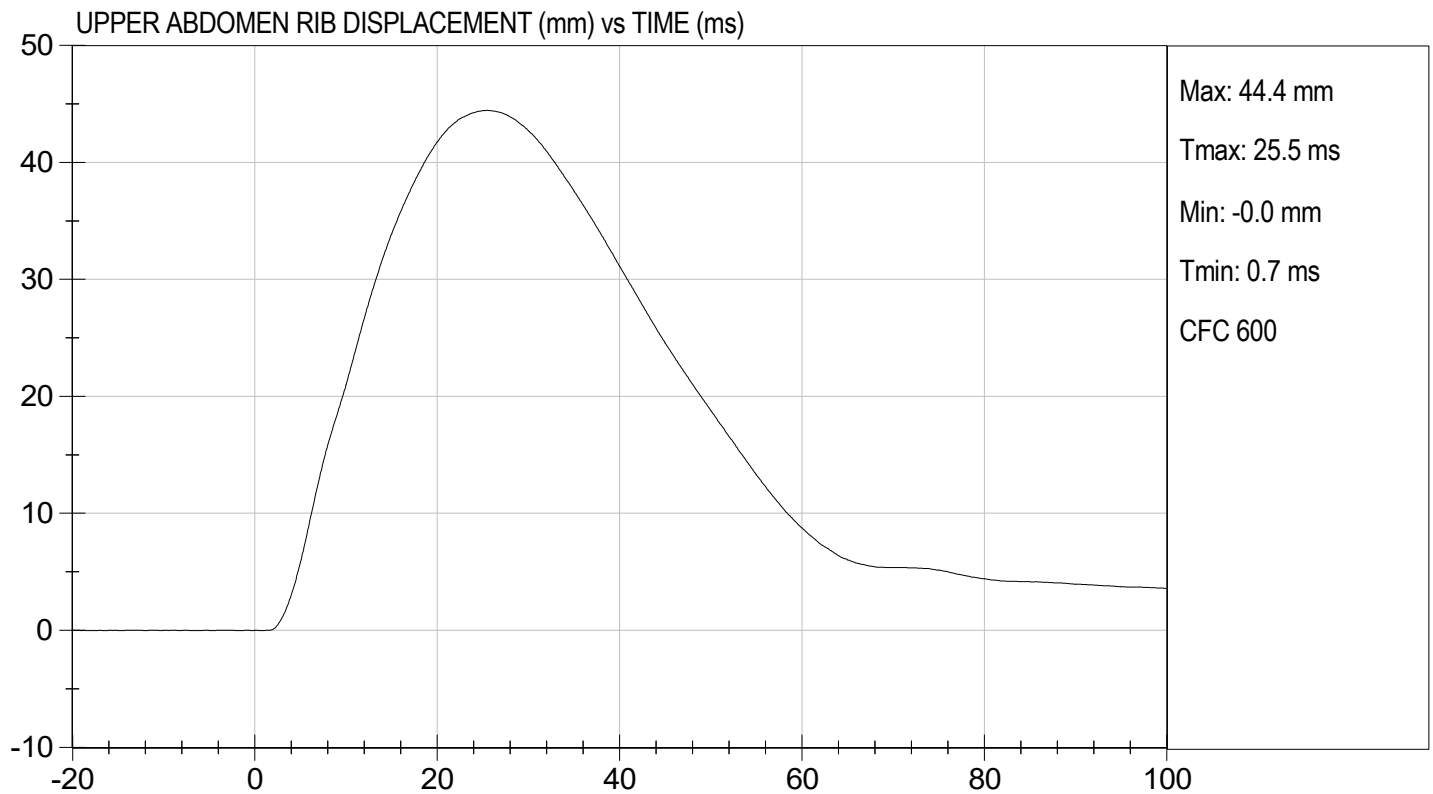
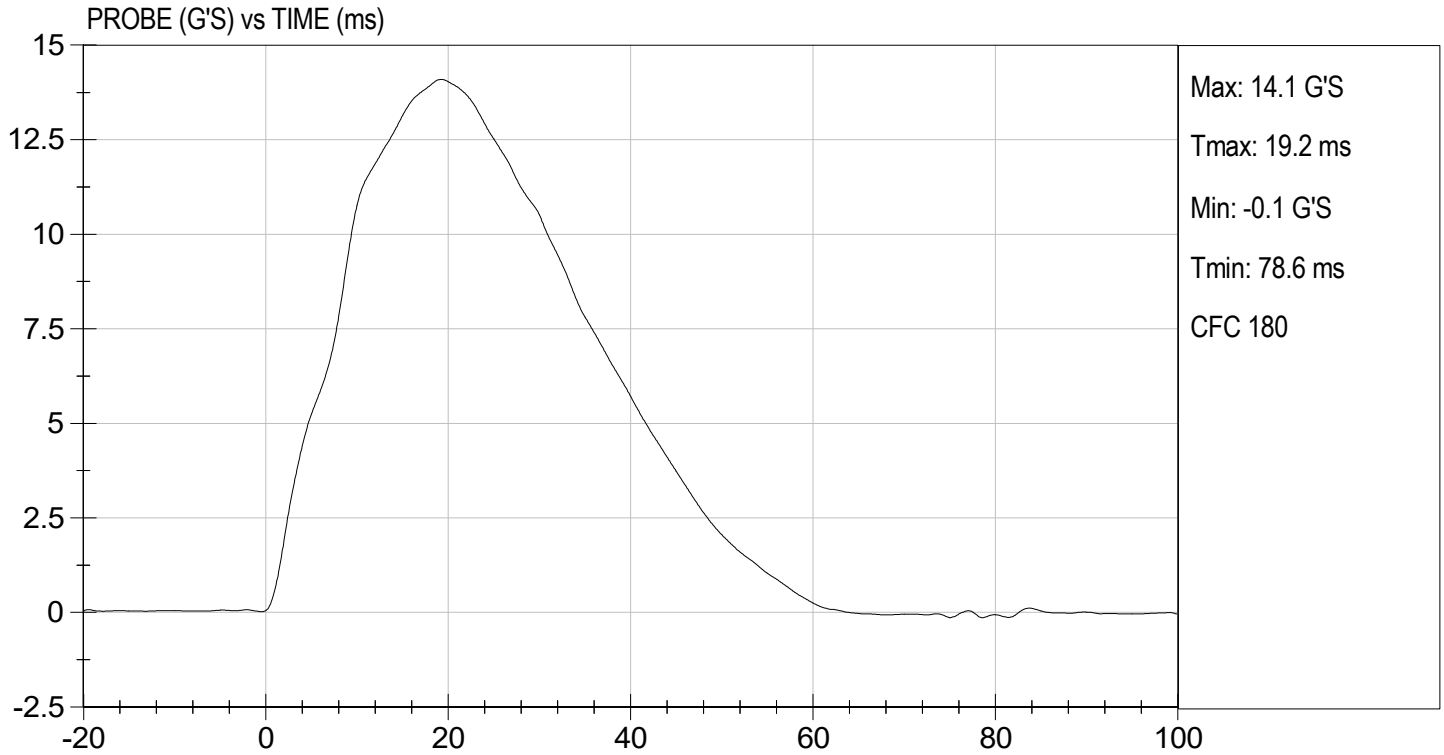
03/07/2023
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

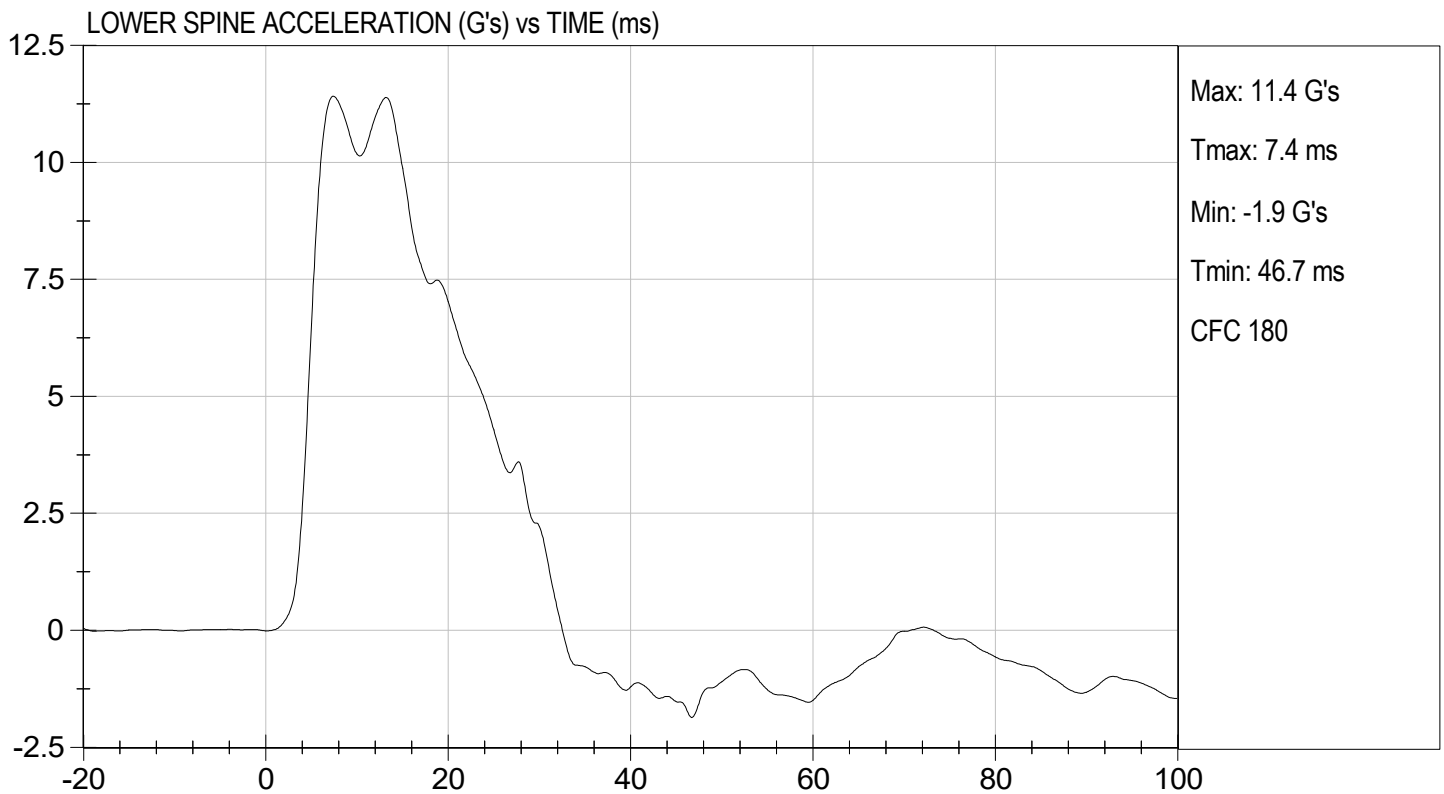
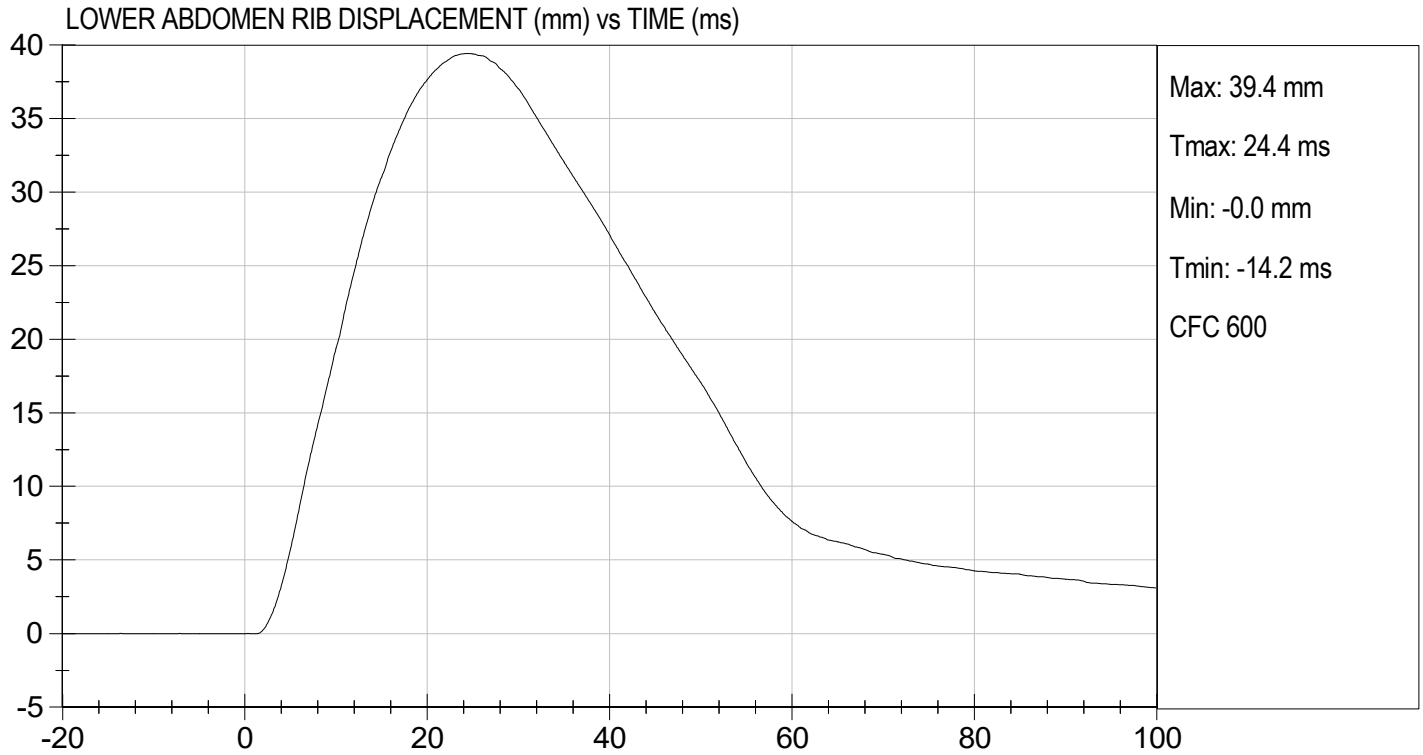
TEST DATE: 03/07/2023
TEST #: D230576





TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 03/07/2023
TEST #: D230576



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

Test I.D: D230577

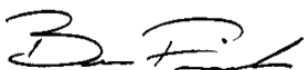
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	41	Pass
Peak Acetabulum Force	N	3600 to 4300	3,848	Pass
Overall Test Results				Pass



Laboratory Technician

03/07/2023

Test Date

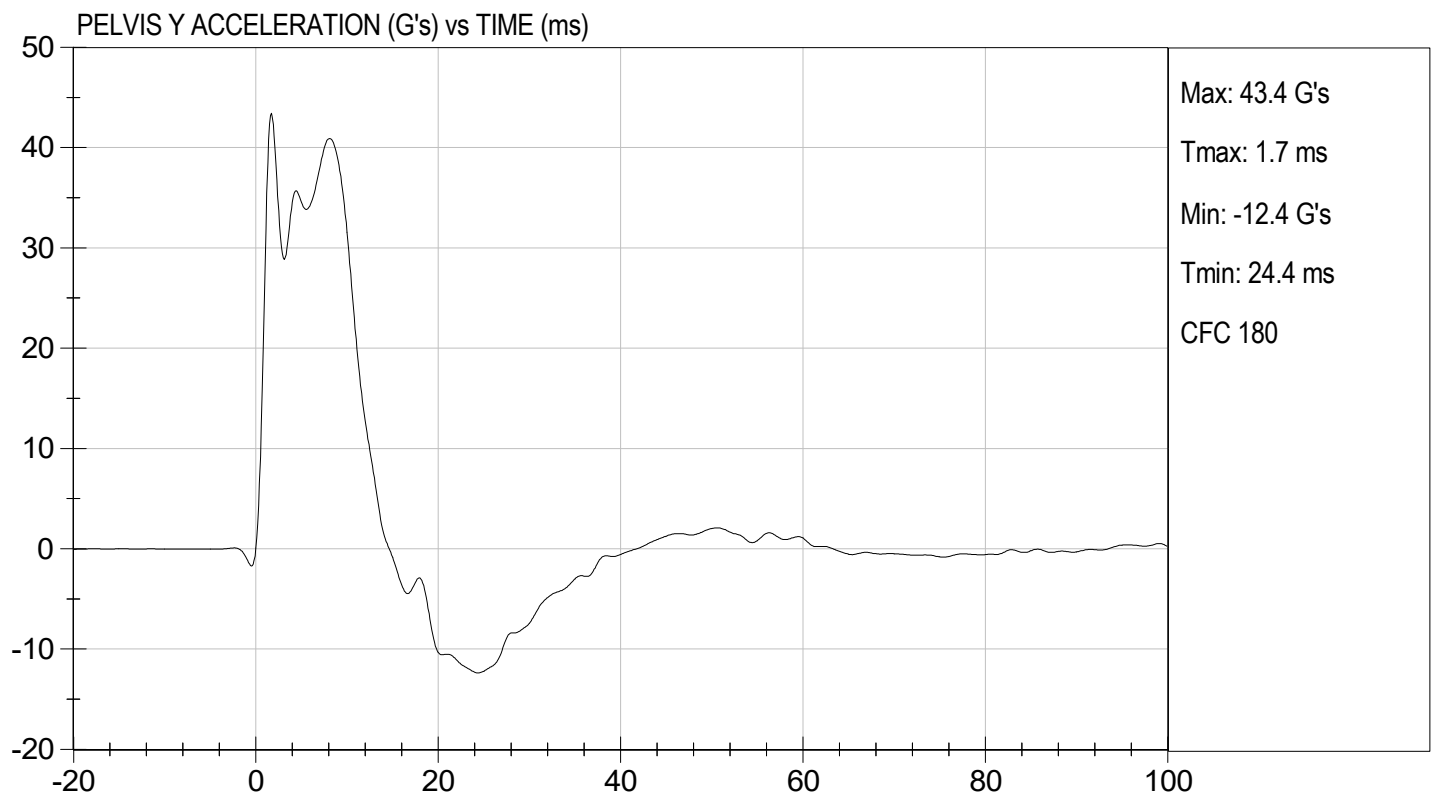
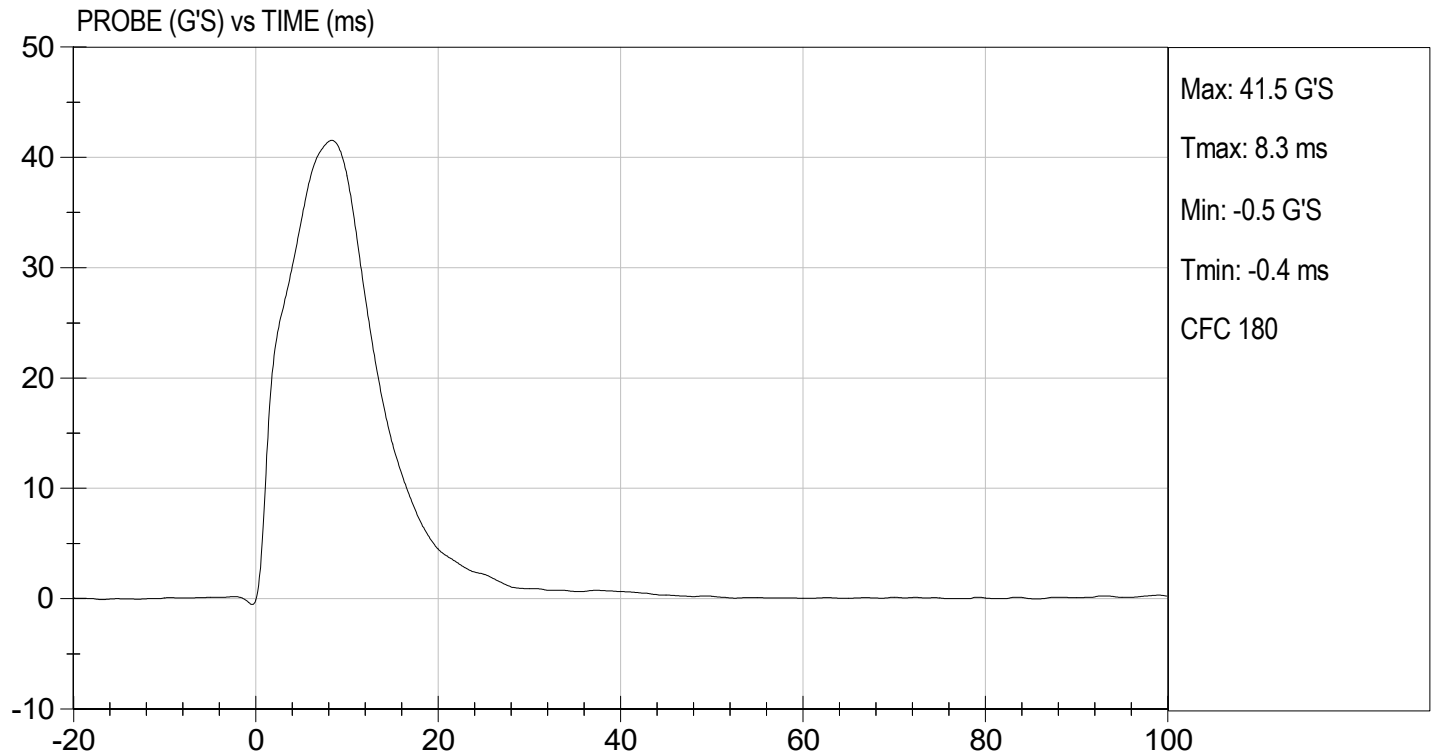


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

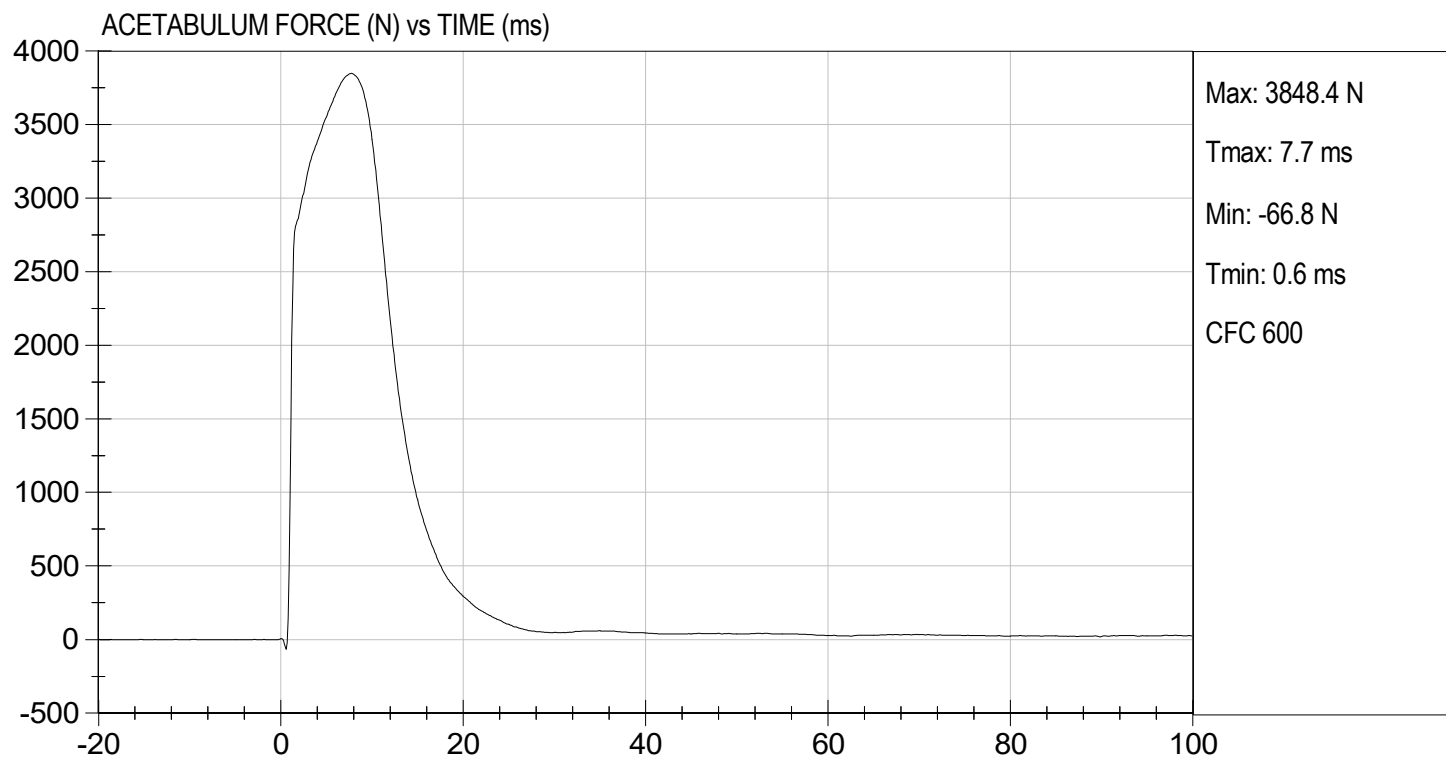
TEST DATE: 03/07/2023
TEST #: D230577





TEST DESC: PELVIS IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/07/2023
TEST #: D230577



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306

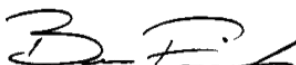
Test I.D: D230578

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	27	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	36 to 45	42	Pass
Pelvis Y Acceleration	G's	28 to 39	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,771	Pass
Overall Test Results				Pass


Laboratory Technician

03/07/2023

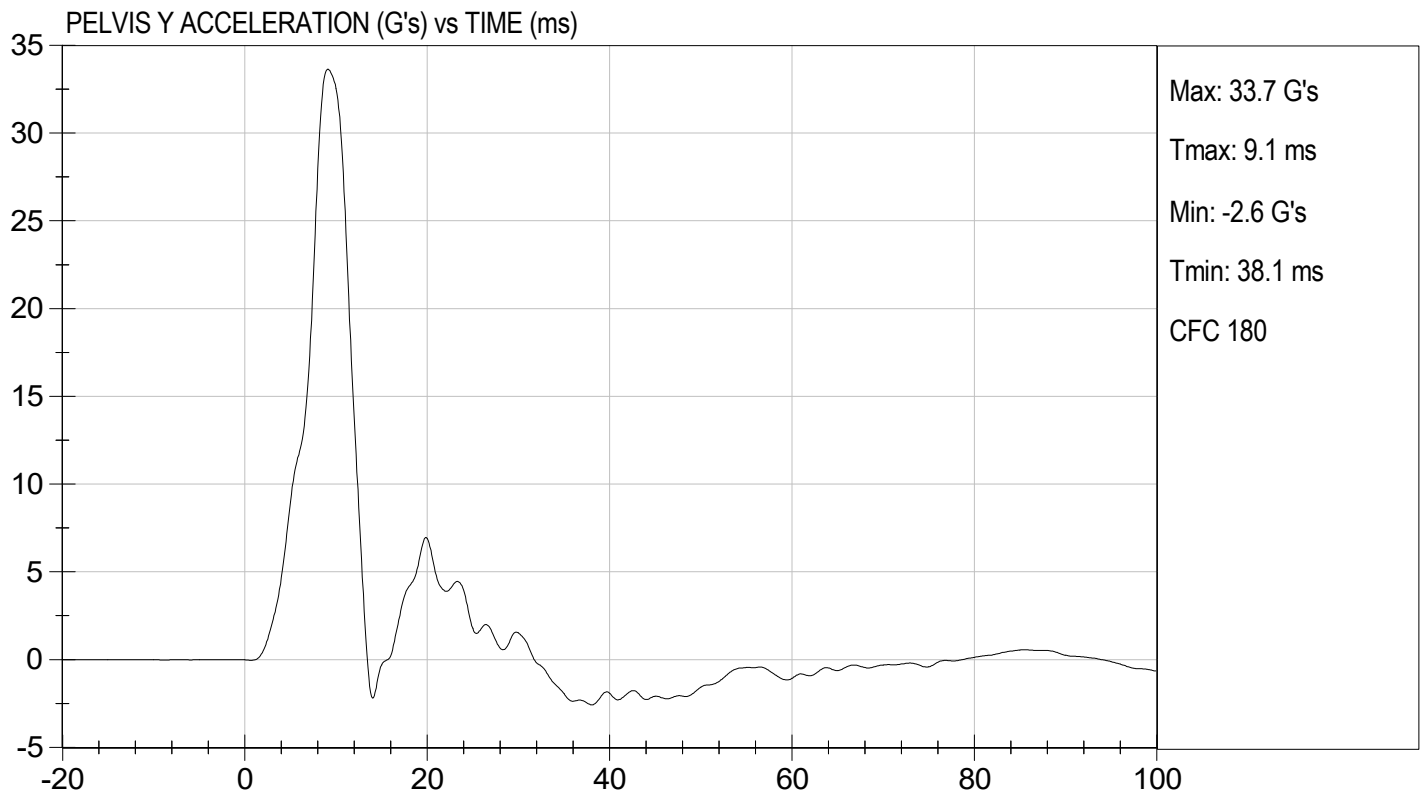
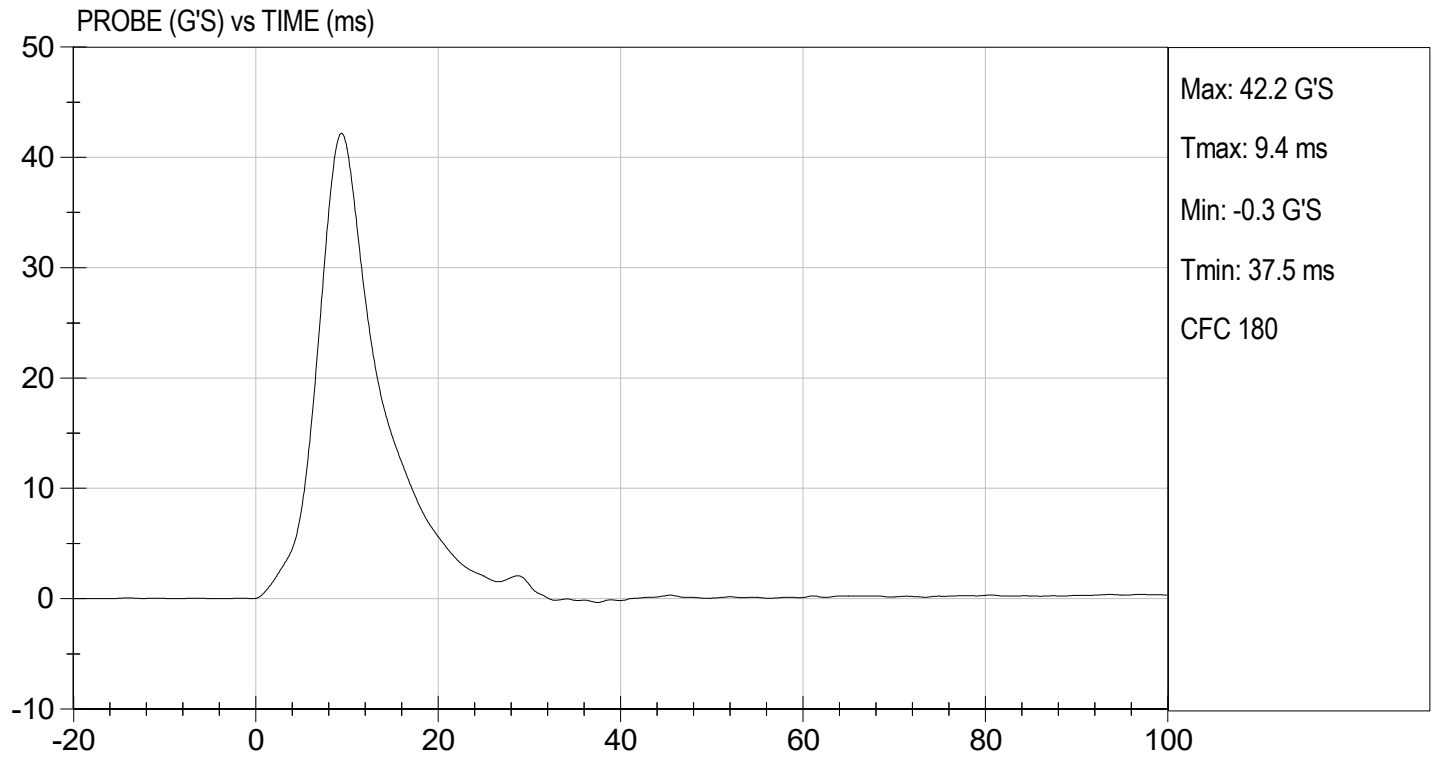
Test Date


Approved By



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

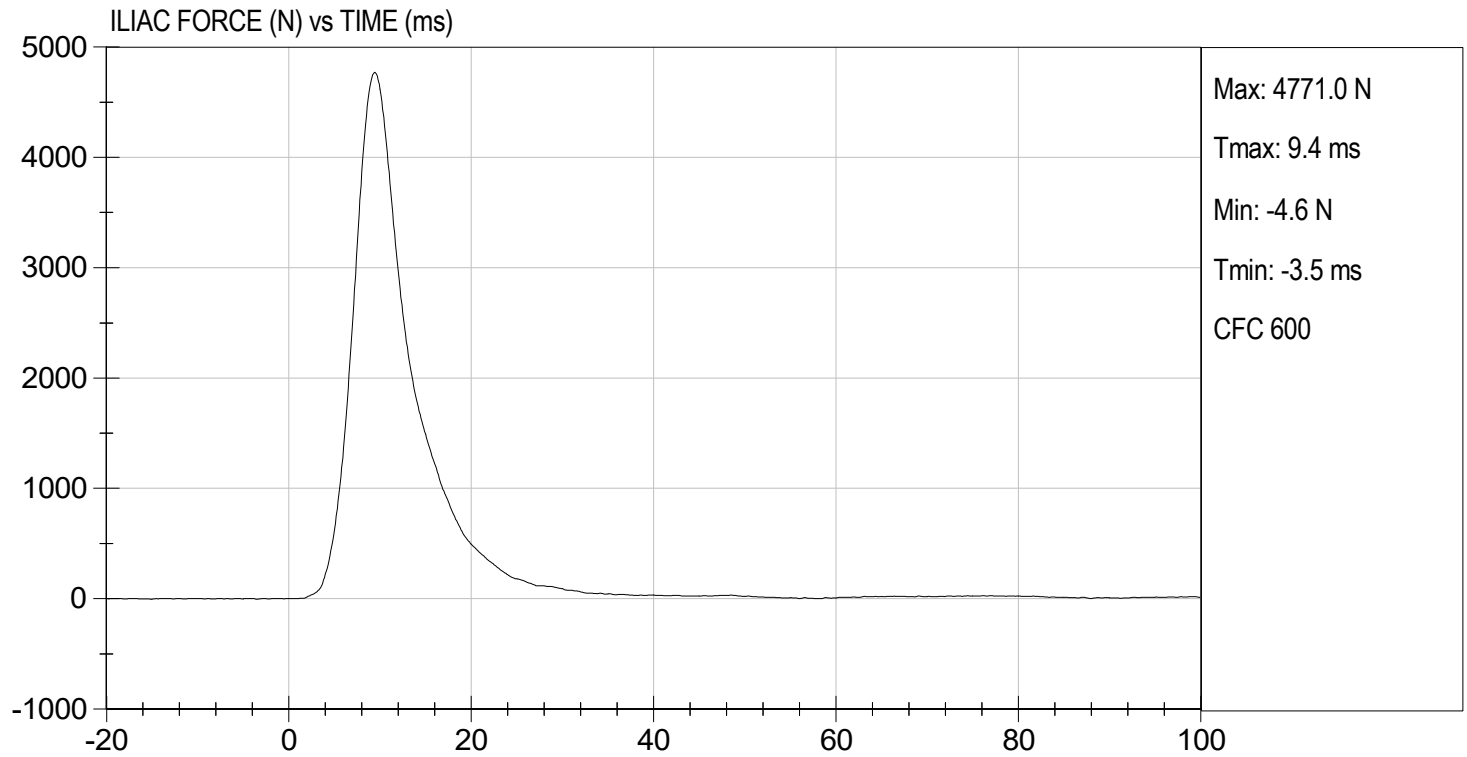
TEST DATE: 03/07/2023
TEST #: D230578





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

TEST DATE: 03/07/2023
TEST #: D230578





SID-IIs Pelvis Plug Certification Test

Plug S/N 15375

Test Number 19791

Report Number 19843

Test Date 7/26/2021 9:06:50 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	246	50	600
Force @ 1.5 mm (N)	1,155	850	1,400
Force @ 2.5 mm (N)	1,499	1,306	1,618
Force @ 3.0 mm (N)	1,552	1,361	1,673

Testing Machine STM-20 5965542

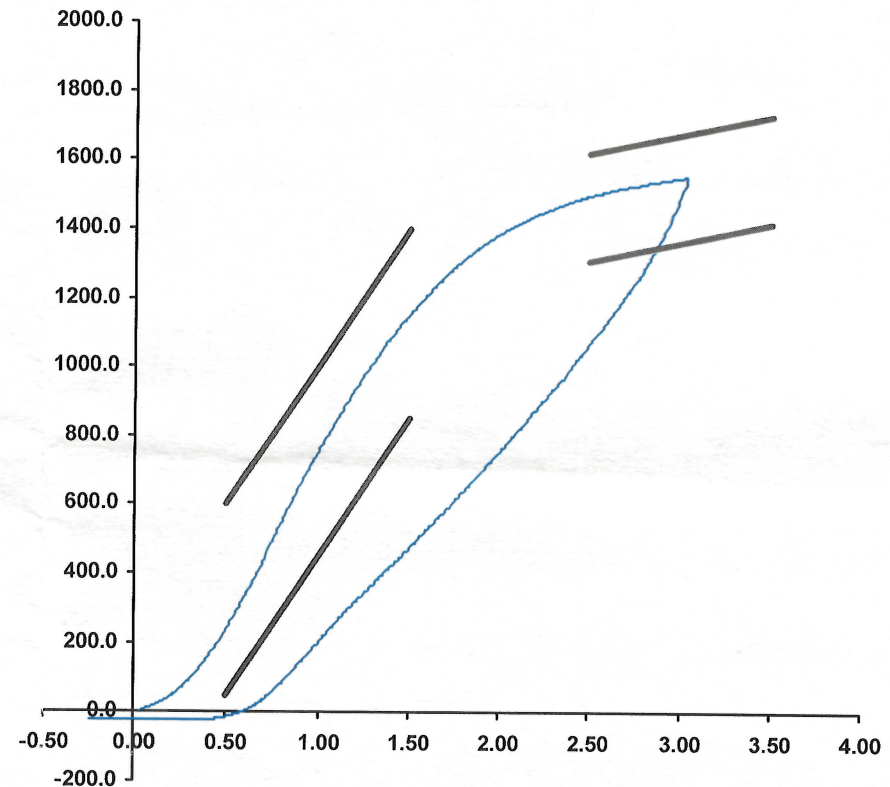
Load Cell S/N (FI360947), Units (LBS) 1000

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

26-Jul-21

SACO Research

By :

DC

Date :

7/26/2021



SID-IIs Pelvis Plug Certification Test

Plug S/N 15374

Test Number 19790

Report Number 19842

Test Date 7/26/2021 9:05:35 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	230	50	600
Force @ 1.5 mm (N)	1,092	850	1,400
Force @ 2.5 mm (N)	1,452	1,306	1,618
Force @ 3.0 mm (N)	1,519	1,361	1,673

Testing Machine STM-20 5965542

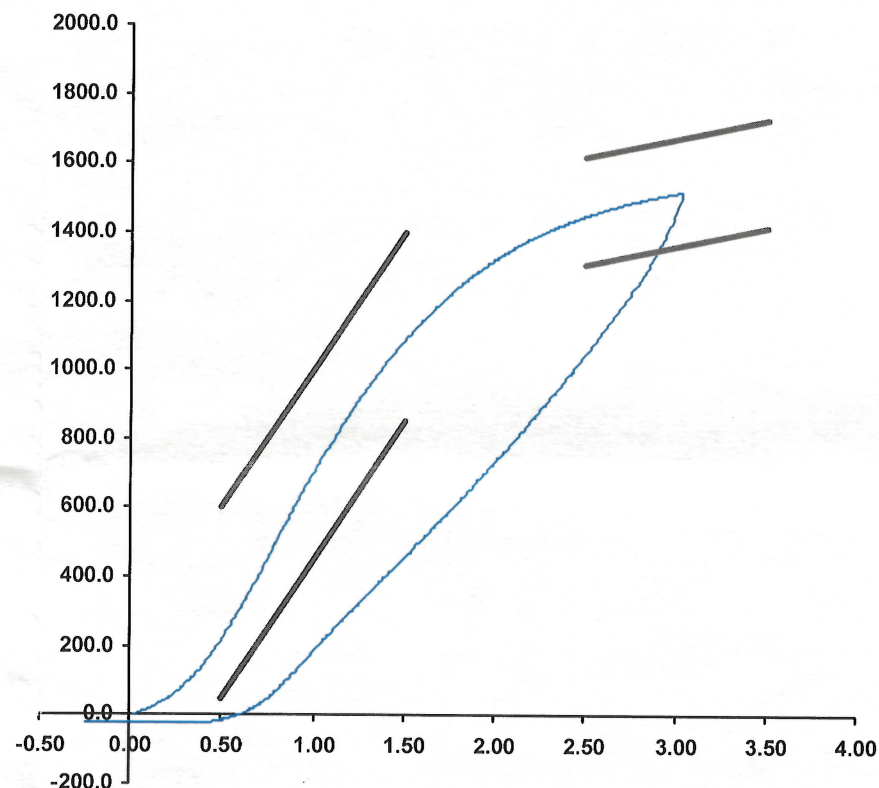
Load Cell S/N (FI360947), Units (LBS) 1000

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

26-Jul-21

SACO Research

By :

DC

Date :

7/26/2021

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N F032		
			Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers		X	P79568	Endevco	12/29/2022
		Y	P79569	Endevco	12/29/2022
		Z	P79570	Endevco	12/29/2022
		Xr	P86797	Endevco	12/29/2022
		Yr	P94957	Endevco	12/29/2022
		Zr	P97381	Endevco	12/29/2022
Thorax Rib Displacement Potentiometers	Upper	Y	G236	Honeywell	12/29/2022
	Middle	Y	G169	Honeywell	12/29/2022
	Lower	Y	G164	Honeywell	12/29/2022
Abdomen Load Cells	Forward	Y	ABG1513	Denton	06/14/2022
	Middle	Y	ABG1531	Denton	06/14/2022
	Rear	Y	ABG1536	Denton	06/14/2022
Lower Spine Accelerometers (T12)		X	P79574	Endevco	12/29/2022
		Y	T25676	Endevco	12/29/2022
		Z	P82603	Endevco	12/29/2022
Public Symphysis Load Cell		Y	PG462	Denton	06/14/2022

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 306			
				Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers				X	P79445	Endevco	12/29/2022
				Y	P79721	Endevco	12/29/2022
				Z	P79724	Endevco	12/29/2022
				Xr	P84999	Endevco	12/29/2022
				Yr	P85000	Endevco	12/29/2022
				Zr	P85001	Endevco	12/29/2022
Head Angular Rate Sensors				X	ARS7391	DTS	09/06/2022
				Y	ARS7402	DTS	09/06/2022
				Z	ARS7416	DTS	09/06/2022
Displacement Potentiometers	Thoracic Rib	Upper	Y	G033	FTSS	12/29/2022	
		Middle	Y	G2403	FTSS	12/29/2022	
		Lower	Y	G1270	FTSS	12/29/2022	
	Abdominal Rib	Upper	Y	G032	FTSS	12/29/2022	
		Lower	Y	MJ5171	Medius	12/29/2022	
Lower Spine Accelerometers (T12)				X	P96332	Endevco	12/29/2022
				Y	P96335	Endevco	12/29/2022
				Z	P96341	Endevco	12/29/2022
Acetabulum Load Cell				Y	ACG4285	FTSS	08/18/2022
Iliac Wing Load Cell				Y	IWG3023	FTSS	08/18/2022
Pelvis Plug (struck side)					15375	SACO	07/26/2021
Pelvis Plug (non-struck side)					15374	SACO	07/26/2021

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	T32723	Endevco	02/10/2023
	Vehicle Center of Gravity	Y	T32720	Endevco	02/10/2023
	Vehicle Center of Gravity	Z	T32742	Endevco	02/10/2023
2	Right Sill at Front Seat	X	A421061	MSI	10/26/2022
	Right Sill at Front Seat	Y	A405523	MSI	11/15/2022
	Right Sill at Front Seat	Z	A421063	MSI	10/26/2022
3	Right Sill at Rear Seat	X	A340206	MSI	10/20/2022
	Right Sill at Rear Seat	Y	A390900	MSI	10/20/2022
	Right Sill at Rear Seat	Z	A337234	MSI	10/20/2022
4	Left Sill at Front Door	Y	A340183	MSI	11/22/2022
5	Left Sill at Rear Door	Y	A340181	MSI	12/14/2022
6	Left A-Post Lower	Y	A411443	MSI	02/02/2023
7	Left A-Post Middle	Y	A405505	MSI	02/02/2023
8	Left B-Post Lower	Y	T29895	Endevco	08/22/2022
9	Left B-Post Middle	Y	P68311	Endevco	09/08/2022
10	Front Seat Track	Y	A340210	MSI	12/15/2022
11	Rear Seat Track or Structure	Y	A393858	MSI	01/04/2023
12	Right Rear Occ. Compartment	Y	A390962	MSI	11/15/2022
13	Engine Block	X	A390896	MSI	02/01/2023
	Engine Block	Y	A340699	MSI	02/01/2023
14	Rear Floorpan Above Axle	X	A370340	MSI	09/27/2022
	Rear Floorpan Above Axle	Y	A356220	MSI	10/20/2022
	Rear Floorpan Above Axle	Z	A390879	MSI	12/15/2022

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB1183D	PCB	01/10/2023
MDB Center of Gravity	Y	PCB1822D	PCB	01/10/2023
MDB Center of Gravity	Z	PCB1753D	PCB	01/10/2023
Left Frame at Rear Axle Centerline	X	PCB1438D	PCB	01/10/2023
Left Frame at Rear Axle Centerline	Y	PCB1653D	PCB	01/10/2023