

**REPORT NUMBER: SideNCAPMDB-MGA-24-003**

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

**MAZDA MOTOR CORPORATION  
2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
NHTSA No.: O20245402**

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



**Test Date: December 7, 2023**

**Final Report Date: October 23, 2024**

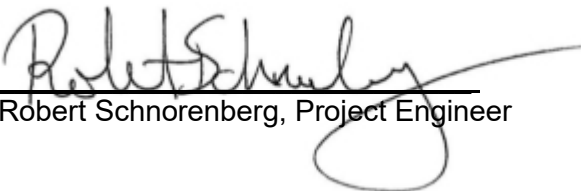
**FINAL REPORT**

**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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Approved by:   
Robert Schnorenberg, Project Engineer

Approval Date: October 23, 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: \_\_\_\_\_

## TECHNICAL REPORT DOCUMENTATION PAGE

<b>1. Report No.</b> SideNCAPMDB-MGA-24-003	<b>2. Government Accession No.</b>	<b>3. Recipient's Catalog No.</b>																																																					
<b>4. Title and Subtitle</b> Final Report of New Car Assessment Program Side Impact MDB Testing and FMVSS No. 305 Indicant Testing of 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV, NHTSA No.: O20245402		<b>5. Report Date</b> October 23, 2024																																																					
<b>7. Author(s)</b> Ben Fischer, Program Manager		<b>6. Performing Organization Code</b> MGA																																																					
<b>9. Performing Organization Name and Address</b> MGA Research Corporation 5000 Warren Road Burlington, WI 53105		<b>8. Performing Organization Report No.</b> SideNCAPMDB-MGA-24-003																																																					
<b>12. Sponsoring Agency Name and Address</b> U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-100) 1200 New Jersey Ave, SE Washington, D.C. 20590		<b>10. Work Unit No.</b>																																																					
<b>15. Supplementary Notes</b>		<b>11. Contract or Grant No.</b> 693JJ920D000017																																																					
<b>16. Abstract</b> A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2024 Mazda CX-90 MHEV Preferred Plus 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 December 7, 2023.  The impact velocity of the Moving Deformable Barrier (MDB) was 61.92 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.1°C. The target vehicle post-test maximum crush was 142 mm at level 3. The test vehicle's performance was as follows:		<b>13. Type of Report and Period Covered:</b> Final Test Report December 7, 2023 to October 23, 2024																																																					
		<b>14. Sponsoring Agency Code</b> NRM-100																																																					
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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.																																																							
<b>17. Key Words</b> New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		<b>18. Distribution Statement</b> Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590																																																					
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## TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3

<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat, Seat Belt, Steering Wheel Adjustment and Fuel System Data	8
3	Dummy Longitudinal Clearance Dimensions	12
4	Dummy Lateral Clearance Dimensions	13
5	Camera and Instrumentation Data	14
6	Test Vehicle Accelerometer Locations	15
7	MDB Accelerometer Locations	16
8	Post-Test Observations	17
9	MDB Summary of Results	19
10	Test Vehicle Profile Measurements	20
11	Test Vehicle Exterior Crush Measurements	21
12	MDB Exterior Static Crush Measurements	24
13	Vehicle and MDB Damage Profile Distances	25
14	FMVSS No. 301 Static Rollover Results	26
15	Dummy/Vehicle Temperature and Humidity Stabilization Data	27
305-1	General Test and Vehicle Parameter Data for Indicant FMVSS No. 305 Testing	28
305-2	Pre-Impact Data for Indicant FMVSS No. 305 Testing	29
305-3	Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing	30
305-4	Post-Impact Data for Indicant FMVSS No. 305 Testing	32
305-5	Static Rollover Test Data for Indicant FMVSS No. 305 Testing	35

<u>Appendix</u>		
A	Photographs	A
B	Vehicle and Dummy Response Data Plots	B
C	Dummy Qualification and Performance Verification	C
D	Test Equipment and Instrumentation Calibration	D

## **SECTION 1 PURPOSE AND SUMMARY OF TEST**

### **PURPOSE**

This moving deformable barrier side impact test is part of the MY 2024 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 2024 Mazda CX-90 MHEV Preferred Plus 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 2024 Mazda CX-90 MHEV Preferred Plus 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 61.92 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 December 7, 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 <sub>36</sub> )		1000	68.325
Maximum Thorax Rib Deflection	mm	44	14.582
Total Abdominal Force	N	2500	555.535
Pubic Symphysis Force	N	6000	995.041
Resultant Lower Spine Acceleration	g	82*	14.728

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC <sub>36</sub> )		1000	32.775
Resultant Lower Spine Acceleration	g	82	27.604
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1928.694
Maximum Thoracic Rib Deflection	mm	38*	11.016
Maximum Abdomen Rib Deflection	mm	45*	4.319

\*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	Yes	Yes
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:				

The test data can be found on the NHTSA website at [www.nhtsa.gov](http://www.nhtsa.gov)

### GENERAL COMMENTS

Driver side curtain airbag deployment was impeded by c-pillar trim.

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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	O20245402	Traction Control System (TCS)	Yes
Model Year	2024	Auto-Leveling System	No
Make	Mazda	Automatic Door Locks (ADL)	Yes
Model	CX-90 MHEV Preferred Plus	Power Window Auto-Reverse	Yes
Body Style	5-Door SUV	Other Optional Feature	No
VIN	JM3KKCHDXR1114503	Driver Front Airbag	Yes
Body Color	Deep Crystal Blue Mica	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	148 km / 92 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	3.3	Driver Torso Airbag	No
Type/No. Cylinders	Inline 6	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Longitudinal	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	8	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	AWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	Yes
Sunroof/T-Top	Yes	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	Yes
Power Seats	Driver Only	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Safety Restraint	N/A

Does owner's manual provide instruction to turn off automatic door locks?	Yes
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**DATA FROM CERTIFICATION LABEL**

Manufactured By	MAZDA MOTOR CORPORATION	GVWR (kg)	2911
Date of Manufacture	05/23	GAWR Front (kg)	1263
Vehicle Type	MPV	GAWR Rear (kg)	1694

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	2	3	7	
Capacity Weight (VCW) (kg)				539	(A)
DSC x 68 kg				476	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				63	(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				X	X		

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**VEHICLE TIRE INFORMATION**



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	265/55R19	265/55R19
Tire Size on Vehicle	265/55R19	265/55R19
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolandar	Geolandar
Treadwear	280	280
Traction	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	1 Nylon
Load Index/Speed Symbol	109V	109V
Tire Material	Rubber	Rubber
DOT Safety Code Left	1FDV 8YLGA 2023	1FDV 8YLGA 2023
DOT Safety Code Right	1FDV 8YLGA 1323	1FDV 8YLGA 1323

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**TEST VEHICLE TIRE PRESSURES**

	Units	LF	RF	LR	RR
As Delivered	kPa	235	240	240	240
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	536.5	542.5		582.5	611.5		569.5	637.5	
Right	kg	581.0	489.5		602.5	536.5		580.0	554.5	
Ratio	%	52.0%	48.0%		50.8%	49.2%		49.1%	50.9%	
Totals	kg	1117.5	1032.0	2149.5	1185.0	1148.0	2333.0	1149.5	1192.0	2341.5

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2149.5	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	63	(C)
Calculated Test Vehicle Target Weight (TVTWTW)	kg	2341.5	(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	847	837	Yes
Right Front	mm	846	836	Yes
Right Rear	mm	859	849	Yes
Left Rear	mm	845	835	Yes
Vehicle CG (Aft of Front Axle)	mm	1587	1534	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	26	20	

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

\*\*\* The "As Tested" vehicle attitude measurements must be equal to or within  $\pm 10$  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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW**

Component Description	Units	Weight
Weight of Ballast Added	kg	13
Components Removed: none	kg	

**TEST SURFACE MARKINGS**

	Units	Distance from 63° Impact Angle Line
Fore 25 mm Target	mm	1001
Aft 25 mm Target	mm	1001
Pre-Impact Angle Line	mm	100

Parallel Track Target	Units	X Location	Y Location
A	mm	0	0
B	mm	1520	3085
C	mm		
D	mm	3500	0

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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	21.6	14.4	18.0
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat			

**SEAT HEIGHT AND ANGLE**

Seat	As-Tested SCRL Angle (Mid) (°)	As-Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	18.0	0	Max	42	42	42
			Mid	21	21	21
			Min	0	0	0
Front Passenger Seat	Fixed	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			Max			
			Mid			
			Min			

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

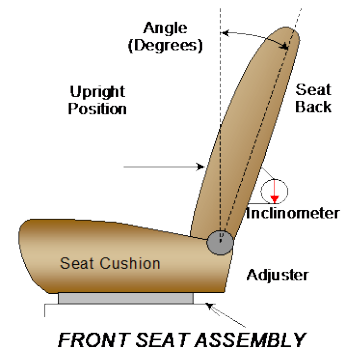
NHTSA No.: O20245402  
 Test Date: 12/7/2023

**SEAT FORE/AFT POSITIONS**

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1 <sup>st</sup> as 1)	mm	Detent (1 <sup>st</sup> as 0)
Driver Seat	254		127	
Front Passenger Seat	230		115	
Front Center Seat				
Struck Side Rear Seat	120	13	120	12
Non-Struck Side Rear Seat	120	13	120	12
Rear Center Seat				

**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 <sup>st</sup> as 1)	Degrees	Detent (1 <sup>st</sup> as 0)
Driver Seat	75.4		0.0	
Front Passenger Seat	73.5		5.5	
Front Center Seat				
Struck Side Rear Seat	18.2	10	2.7	0
Non-Struck Side Rear Seat	18.2	10	2.5	0
Rear Center Seat				

\*Seat back angles measured on outboard headrest post.

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
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NHTSA No.: O20245402  
 Test Date: 12/7/2023

**SEAT BELT ANCHORAGE ADJUSTMENT**

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

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

**HEAD RESTRAINT ADJUSTMENT**

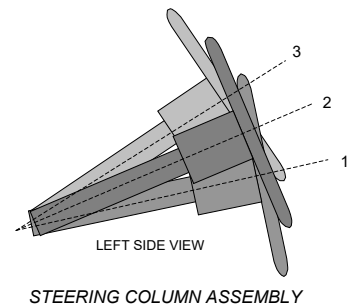
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	4	3 (Lowest as 0) / Fixed Fore-Aft
Rear Seat	4	0 (Lowest as 0) / Fixed Fore-Aft

**STEERING COLUMN ADJUSTMENT**

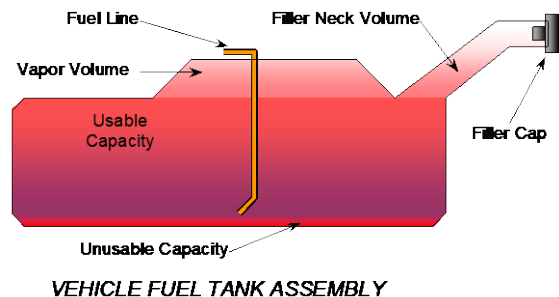
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

	Wheel Angle (°)	Fore/Aft Position (mm)
Lowermost, Position 1	67.5	
Geometric Center, Position 2	65.4	
Uppermost, Position 3	63.2	
Telescoping Steering Wheel Travel		70
Test Position	65.4	35



**FUEL PUMP**

The vehicle is equipped with an electronic fuel pump. The fuel pump operates during engine running and cranking. The filler neck is located on the driver's side.



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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**FUEL TANK CAPACITY DATA**

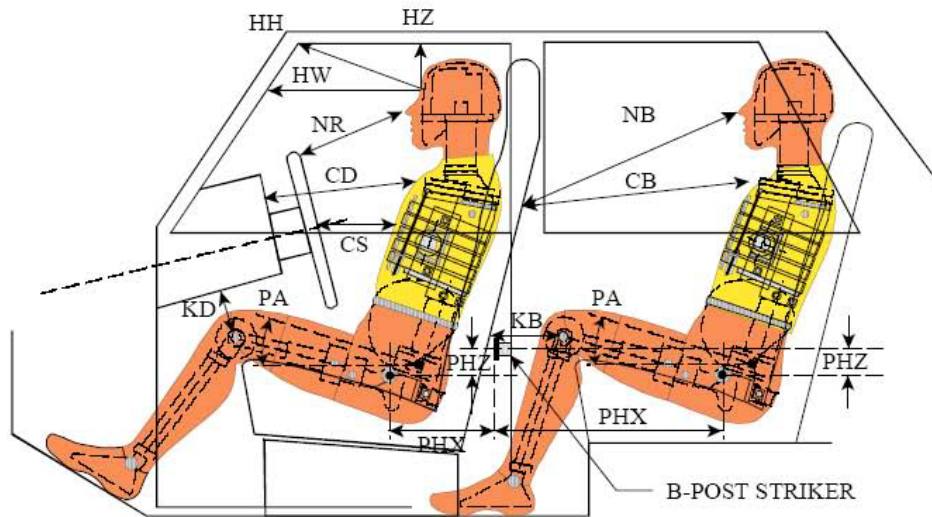
	<b>Liters</b>
Usable Capacity of Standard Tank (see S1 - Vehicle Setup Information)	70.0
Usable Capacity of Optional Tank (see S1 - Vehicle Setup Information)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	70.0
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	65.1
Actual Amount of Solvent Used	65.1
1/3 of Usable Capacity	23.3

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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



**LEFT SIDE VIEW**

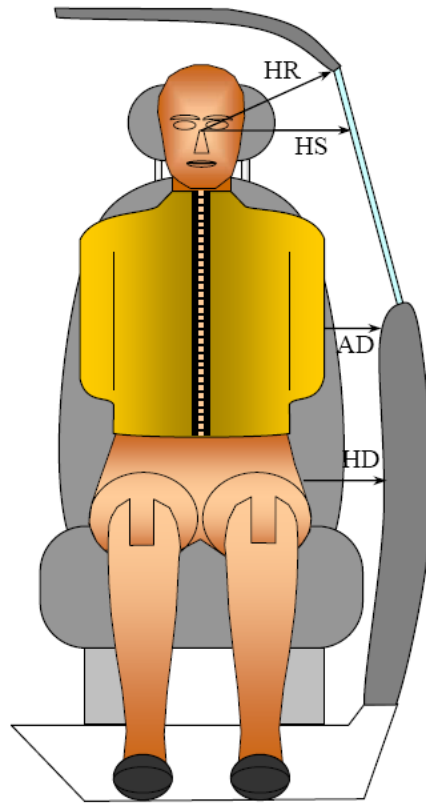
NOTE: 2-DOOR VEHICLE SHOWN.  
 REAR DUMMY PHX & PHZ  
 MEASUREMENTS FOR A 4-DOOR  
 VEHICLE WOULD USE THE C-POST  
 STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	337	18.4		
HW		Head to Windshield	593	0		
HZ	HZ	Head to Roof Liner	169	90	256	90
NR	NB	Nose to Rim/Seat Back	449	21.3	529	13.3
CD	CB	Chest to Dashboard/Seat Back	568	10.8	550	1.2
CS		Chest to Steering Wheel	364	6.5		
KDL	KBL	Left Knee to Dash/Seat Back	166	42.7	323	19.5
KDR	KBR	Right Knee to Dash/Seat Back	146	42.3	326	19.9
PAX	PAX	Pelvic Tilt Angle X		25.3		21.0
PAY	PAY	Pelvic Tilt Angle Y		-0.9		0.8
PHX	PHX	Hip Point to Striker (X-Axis)	196		390	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	140		262	

**DATA SHEET NO. 4**  
**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

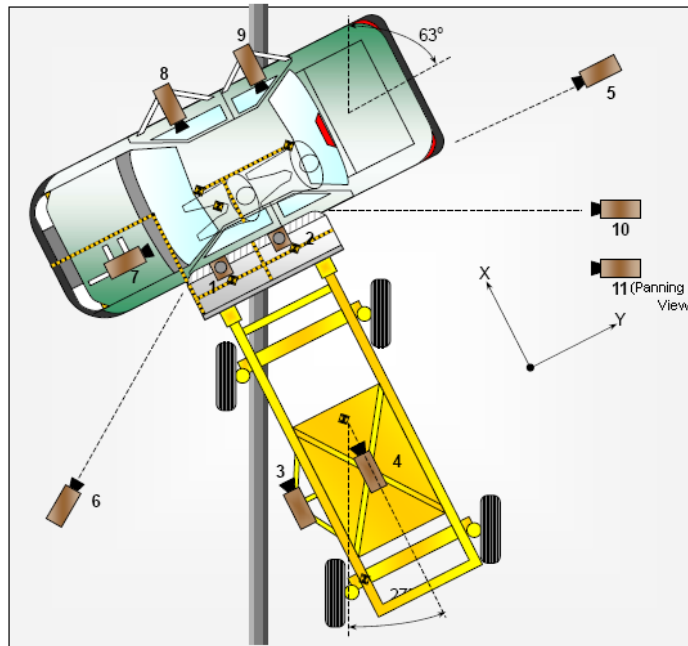


Code	Measurement Description	Driver	Passenger
		Length (mm)	
HR	Head to Side Header	200	295
HS	Head to Side Window	332	380
AD	Arm to Door	117	162
HD	Hip Point to Door	165	179

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



**CAMERA LOCATIONS AND DATA**

No.	Camera View	Coordinates* (mm)			Lens (mm)	Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	600	1310	-4995	8	1000
2	Overhead Close-Up	0	825	-4895	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-30	8090	-1505	24	1000
6	Left Front	-1545	-4455	-1520	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

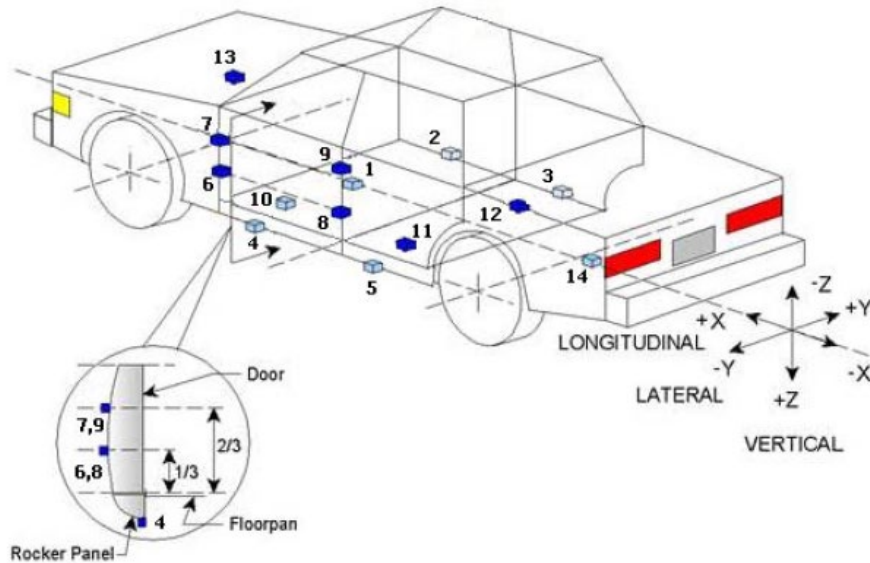
**INSTRUMENTATION**

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

**DATA SHEET NO. 6  
TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



**TEST VEHICLE ACCELEROMETER LOCATIONS**

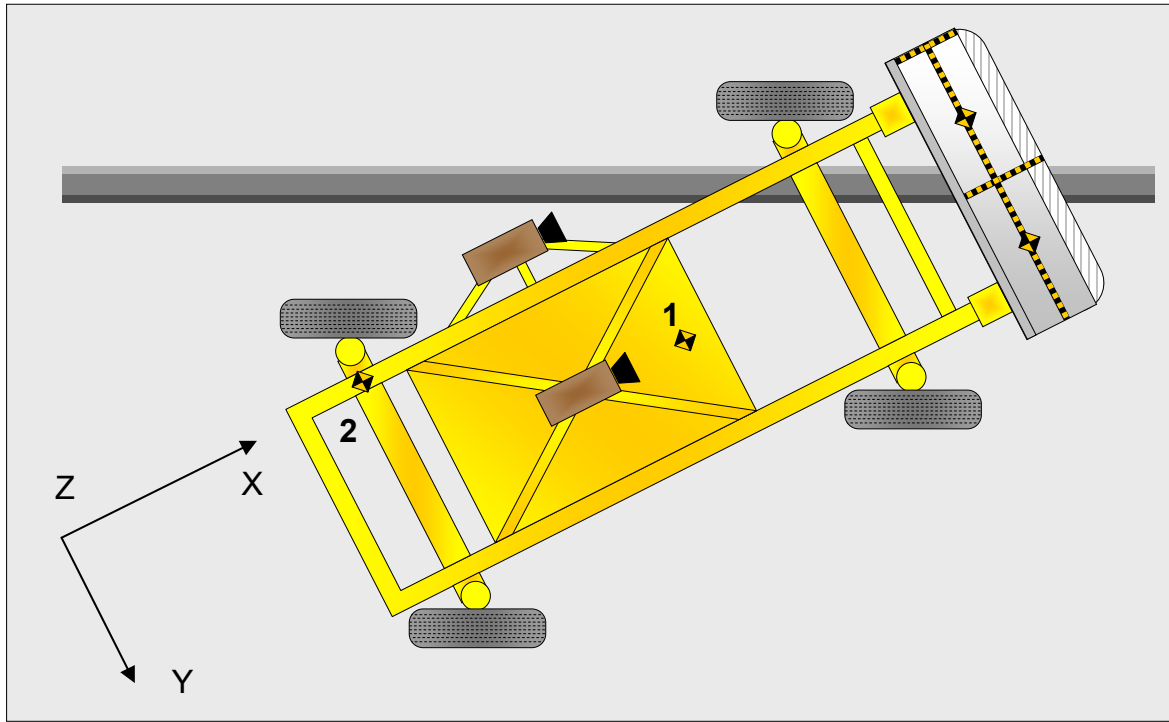
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2857	180	-351
2	Right Sill at Front Seat	2727	753	-268
3	Right Sill at Rear Seat	2115	752	-267
4	Left Sill at Front Door	2720	-757	-272
5	Left Sill at Rear Door	2115	-755	-267
6	Left Lower A-Post	3481	-863	-594
7	Left Middle A-Post	3473	-853	-895
8	Left Lower B-Post			
9	Left Middle B-Post			
10	Front Seat Track	2558	-366	-404
11	Rear Seat Structure	1829	-242	-533
12	Rt. Rear Occ. Compartment	1829	244	-533
13	Engine Block	4276	-3	-920
14	Rear Above Axle	969	1	-512

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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



**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	1396
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**DATA SHEET NO. 8  
POST-TEST OBSERVATIONS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**TEST DUMMY INFORMATION AND CONTACT POINTS**

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

**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
Sill Separation	No
Windshield Damage	No
Side Window Damage	None
Other Notable Effects	None

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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	Yes	Yes
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:				

**IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		3118
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		513
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-5
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	-1

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
Test Date: 12/7/2023

**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

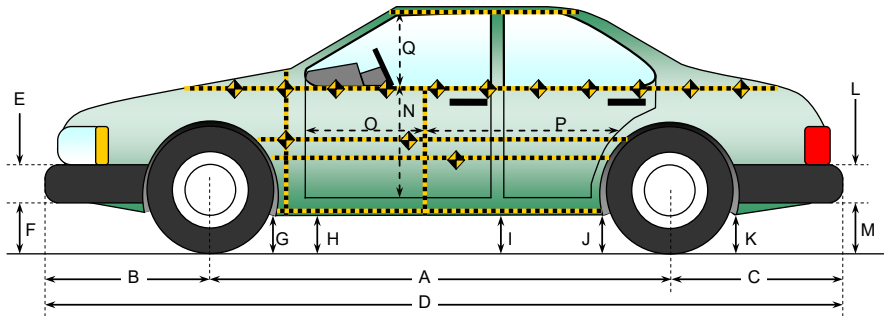
**SPEED AND ANGLE AT IMPACT DATA**

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.92
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.14
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.6
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	26.1

**DATA SHEET NO. 10  
TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



All measurements in (mm) with tolerance of  $\pm 3$  mm

**LEFT SIDE VIEW**

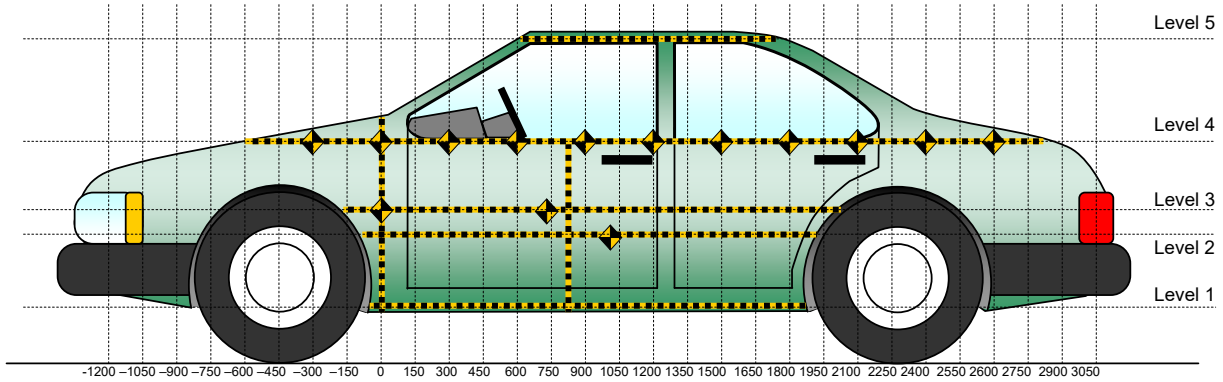
**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

Code	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	3117	3111	-6
B	Front Axle to FSOV	851	859	8
C	Rear Axle to RSOV	1125	1127	2
D	Total Length at Centerline	5093	5096	3
E	Front Bumper Thickness	81	83	2
F	Front Bumper Bottom to Ground	481	485	4
G	Sill Height at Front Wheel Well	266	264	-2
H	Sill Height at Front Door Leading Edge	266	264	-2
I	Sill Height at B Pillar	262	264	2
J1	Sill Height at Rear Wheel Well	259	265	6
J2	Pinch Weld Height at Rear Wheel Well	259	265	6
K	Sill Height Aft of Rear Wheel Well	281	293	12
L	Rear Bumper Thickness	106	105	-1
M	Rear Bumper Bottom to Ground	500	511	11
N	Sill Height to Window Bottom Sill	868	709	-159
O	Front Door Leading Edge to Impact CL	584	575	-9
P	Rear Door Trailing Edge to Impact CL	1375	1327	-48
Q	Front Window Opening	361	363	2
R	Right Side Length	4447	4448	1
S	Left Side Length	4449	4444	-5
T	Vehicle Width at B Post	2019	1912	-107
U	Front Wheel Track Width	1702		
V	Rear Wheel Track Width	1697		

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



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	429	113	150
2	Occupant H-Point	722	128	1650
3	Mid Door	748	131	1650
4	Window Sill	1118	27	1350
5	Window Top	1640	6	1350

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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

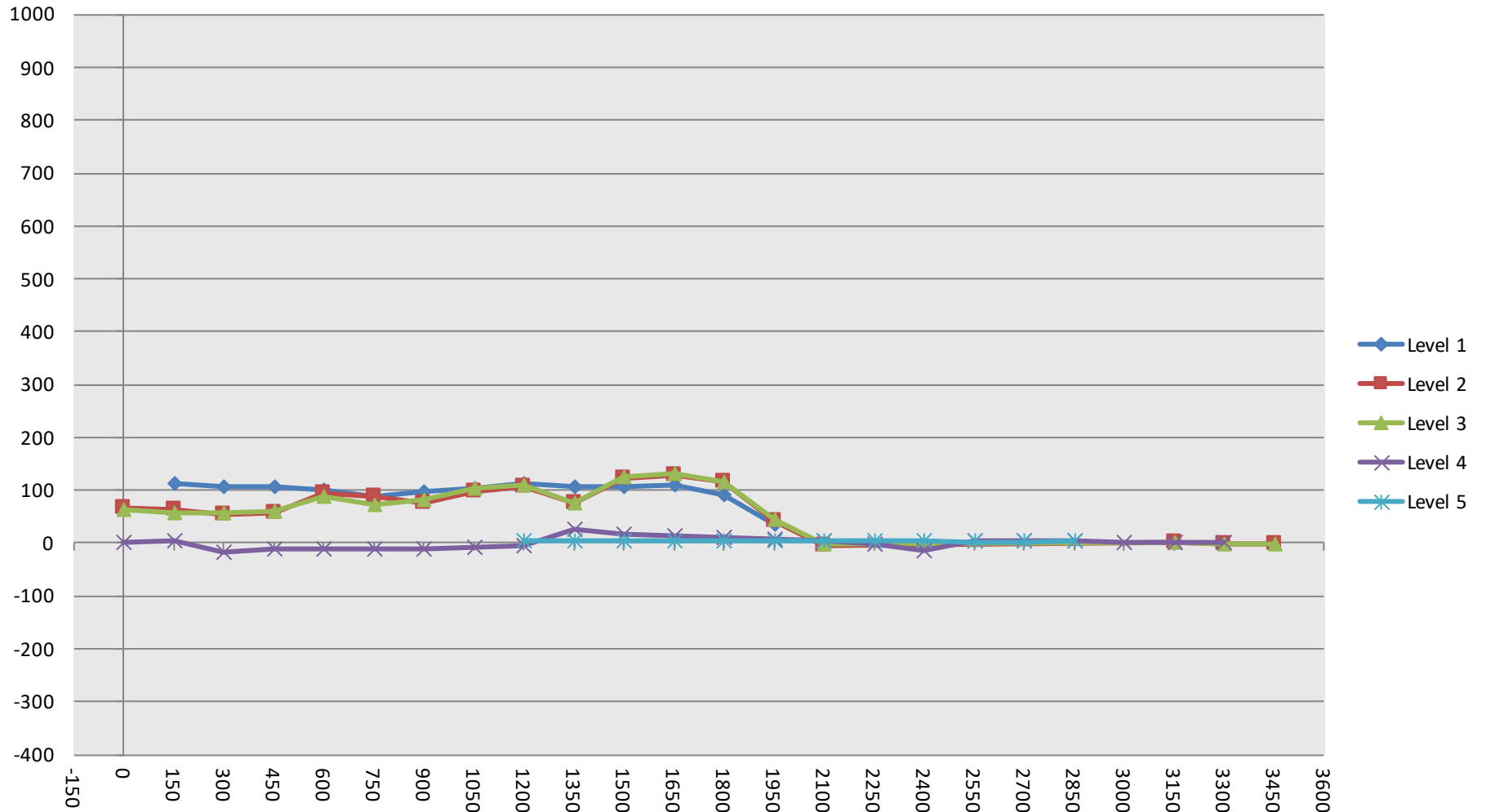
	Pre-Test					Post-Test					Exterior Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150															
0		971	967	824			906	905	822			65	62	2	
150	973	949	947	835		860	886	889	832		113	63	58	3	
300	967	940	938	844		859	887	882	861		108	53	56	-17	
450	963	936	935	852		857	880	874	863		106	56	61	-11	
600	961	934	933	866		861	841	846	876		100	93	87	-10	
750	959	933	933	878		870	846	859	888		89	87	74	-10	
900	957	933	933	887		859	858	851	897		98	75	82	-10	
1050	956	933	933	894		851	837	828	902		105	96	105	-8	
1200	955	934	933	899	654	843	828	824	903	649	112	106	109	-4	5
1350	954	933	932	901	656	847	857	855	874	650	107	76	77	27	6
1500	953	934	933	903	656	845	811	808	885	650	108	123	125	18	6
1650	954	936	935	904	655	844	808	804	889	650	110	128	131	15	5
1800	957	940	938	904	655	866	823	822	893	649	91	117	116	11	6
1950	964	949	947	903	654	929	907	903	896	649	35	42	44	7	5
2100		972	969	901	654		976	971	897	649		-4	-2	4	5
2250				899	653				901	648				-2	5
2400				897	652				910	647				-13	5
2550				895	646				890	643				5	3
2700				893	632				890	629				3	3
2850				891	606				888	602				3	4
3000				883					882					1	
3150		962	959	875			961	959	874			1	0	1	
3300		919	918	865			920	919	864			-1	-1	1	
3450		872	871				873	872				-1	-1		
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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

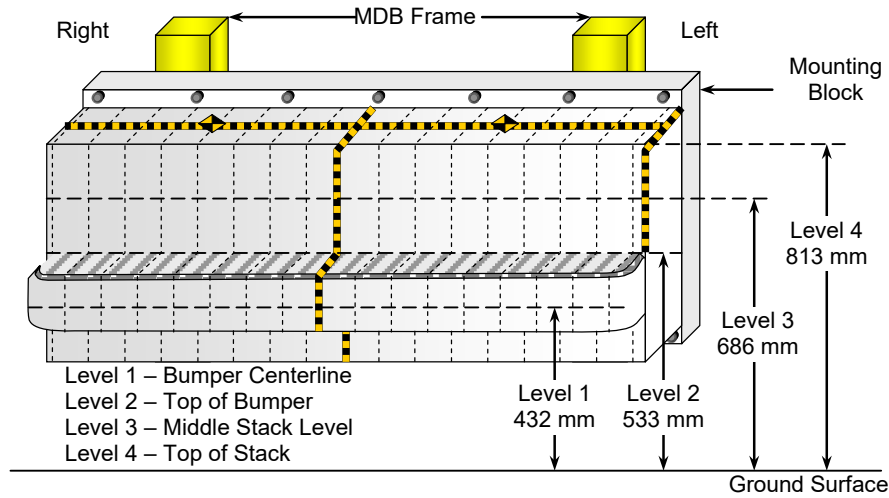
NHTSA No.: O20245402  
 Test Date: 12/7/2023



**DATA SHEET NO. 12**  
**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



**FRONT VIEW**

**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

Row	Vertical Location		From Centerline		Maximum Crush (mm)
	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	260
B	Top of Bumper	533	700	Right	206
C	Mid-Level	686	700	Left	173
D	Top of Stack	813	800	Left	222

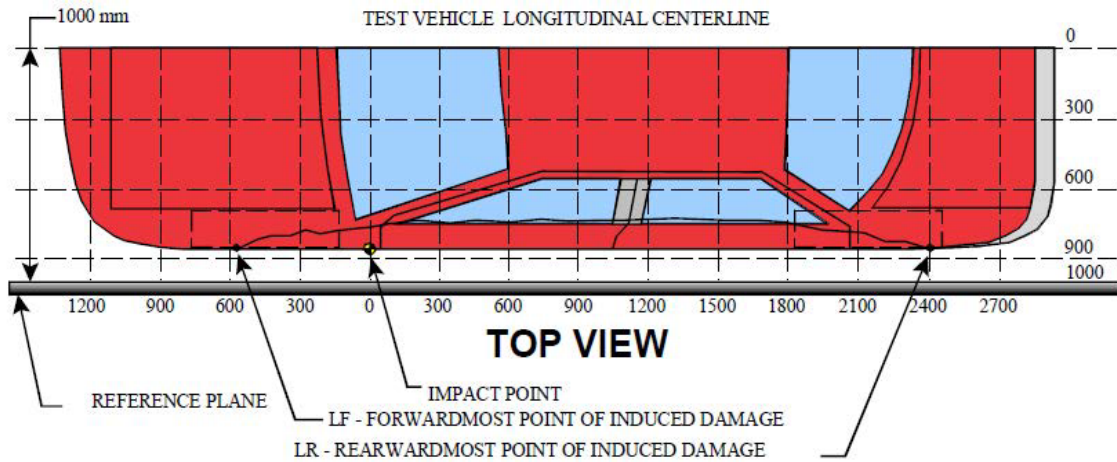
**DEFORMABLE BARRIER STATIC CRUSH**

Stack Level	Distance Right of Center (mm)								C <sub>L</sub>	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
4	130	112	112	129	154	127	107	106	108	122	140	154	145	153	174	202	222
3	130	122	124	134	153	151	135	133	116	102	102	109	130	157	163	173	168
2	204	206	199	199	192	188	198	192	196	198	197	196	196	196	197	203	200
1	260	259	255	252	251	250	249	249	247	250	255	250	247	246	247	248	245

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



MEASUREMENT CONVENTIONS:  
 Forward of the impact point (towards front of vehicle) is considered negative (-).  
 Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

**VEHICLE DAMAGE PROFILE DISTANCES**

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2200	3	970	970	0
2	1740	3	745	937	192
3	1280	3	791	933	142
4	820	3	828	932	104
5	360	3	836	936	73
6	-100	3	905	965	60

**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	736	476	260
2	480 mm right of center	1	718	463	255
3	160 mm right of center	1	709	463	246
4	160 mm left of center	1	713	463	250
5	480 mm left of center	1	713	463	250
6	800 mm left of center	1	721	476	245

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

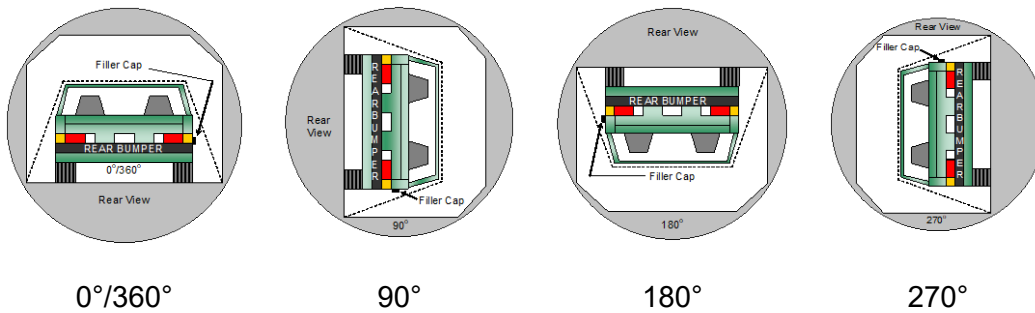
NHTSA No.: O20245402  
 Test Date: 12/7/2023

Test Time: 1:08 pm

Temperature: 21.1°C

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

**FMVSS 301 STATIC ROLLOVER DATA**



**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	94	300	394
90° to 180°	89	300	389
180° to 270°	84	300	384
270° to 360°	91	300	391

**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	

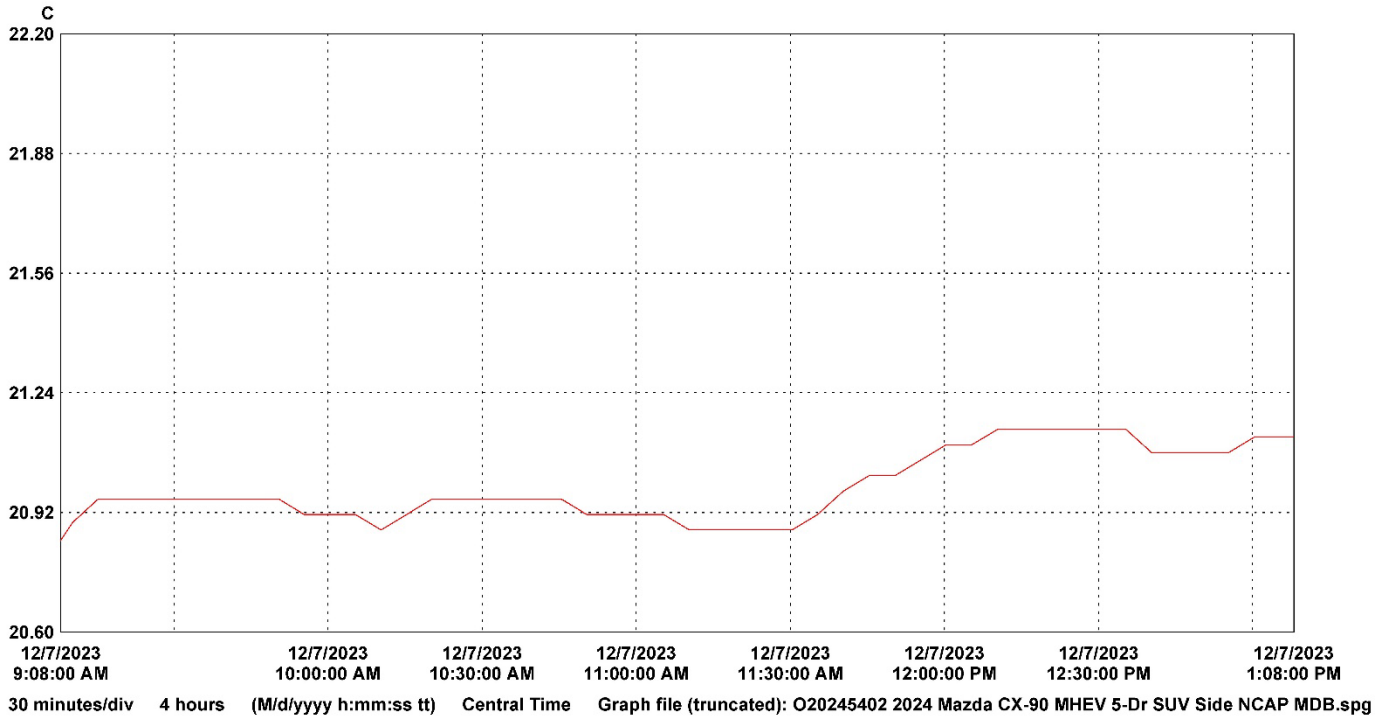
**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	17162078	VSC_North_Hall 1	1	21.14	20.99	20.87	C	Temperature	17162078_VSC_North_Hall (Mar 2024).spl	

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**ELECTRIC VEHICLE PROPULSION SYSTEM**

	Units	Observations and Conclusions
Type of Electric Vehicle		Gas-Electric Hybrid
Propulsion Battery Type		Lithium-ion battery
Nominal Voltage	V	44.4
Physical Location of Automatic Propulsion Battery Disconnect		Automatic Propulsion Battery Disconnect is In Lithium-ion battery.
Auxiliary Battery Type		Lead Battery

**PROPULSION BATTERY SYSTEM DATA**

	Units	Observations and Conclusions
Electrolyte Fluid Type		Class 4 Second petroleum
Electrolyte Fluid Specific Gravity	g/cm3	1.25
Electrolyte Fluid Kinematic Viscosity		No data
Electrolyte Fluid Color		Colorless
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)		Refrigerant (Green)
Location of Battery Modules		Inside Passenger Compartment
		X Outside Passenger Compartment
		The high-voltage battery is located on the underside of the vehicle.

**PROPULSION BATTERY STATE OF CHARGE**

<i>For all battery types:</i>	
Voltage range corresponding to <b>useable energy</b> 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 <b>useable energy</b> of the battery:	
Minimum State of Charge	42.7
Maximum State of Charge	47.2
Test Voltage – Maximum practicable State of Charge within Normal Operating Range	N/A

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV      NHTSA No.: O20245402  
 Test Program: NCAP Side MDB Impact Test      Test Date: 12/7/2023

**VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)**

Details of Vehicle Chassis Ground Point(s) & Location(s)	Underbody chassis ground attachment area
---	--

**PROPULSION BATTERY SYSTEM**

Details of Electric Energy Storage/Conversion System Test Points	
Additional Comments	

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**VOLTMETER INFORMATION**

	Units	Observations and Conclusions
Make		
Model		
Serial Number		
Internal Impedance Value	MΩ	
Resolution	V	
Last Calibration Date		

**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	
----	---	--

**ELECTRIC ISOLATION MEASUREMENTS**  
**PROPULSION BATTERY TO VEHICLE CHASSIS**

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

V1	V	
V2	V	

**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	
----	---	--

V1' Pre-Impact	V	
V2' Pre-Impact	V	

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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	
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$		
Ri2 Pre-Impact	Ω	
Ri = The lesser of Ri1 and Ri2		
Ri Pre-Impact	Ω	
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$		
Ri / Vb Pre-Impact	Ω	

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

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?		
Additional Comments	Not Applicable, vehicle was certified to FMVSS No. 305 S5.3(c).	

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**VOLTMETER INFORMATION**

	Units	Observations and Conclusions
Make		
Model		
Serial Number		
Internal Impedance Value	MΩ	
Resolution	V	
Last Calibration Date		

**ELECTRICAL ISOLATION MEASUREMENTS**

Vb Post-Impact	V						
V1 Post-Impact	V		Impact Time		Minutes		Seconds
V2 Post-Impact	V				Minutes		Seconds
V1' Post-Impact	V				Minutes		Seconds
V2' Post-Impact	V				Minutes		Seconds

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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		Impact Time		Minutes		Seconds
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 Post-Impact	Ω		Impact Time		Minutes		Seconds
Ri = The lesser of Ri1 and Ri2							
Ri Post-Impact	Ω		Impact Time		Minutes		Seconds
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$							
Ri / Vb Post-Impact	Ω		Impact Time		Minutes		Seconds

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

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?		
Additional Comments	Not Applicable, vehicle was certified to FMVSS No. 305 S5.3(c).	

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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

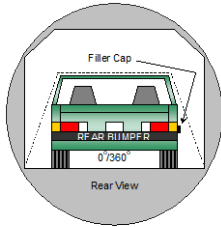
	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

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

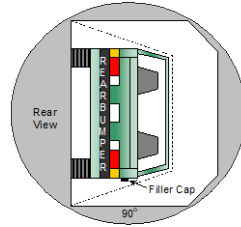
Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

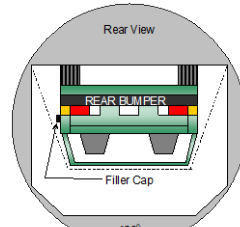
**PROPULSION BATTERY SYSTEM COMPONENTS**



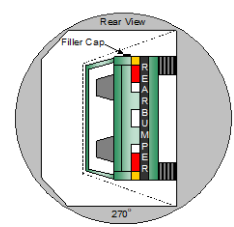
**0°/360°**



**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	
	1	min	34	sec	5	min	6	min	34	sec	7	min
0° - 90°	1	min	34	sec	5	min	6	min	34	sec	7	min
90° - 180°	1	min	29	sec	5	min	6	min	29	sec	7	min
180° - 270°	1	min	24	sec	5	min	6	min	24	sec	7	min
270° - 360°	1	min	31	sec	5	min	6	min	31	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: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**VOLTMETER INFORMATION**

	Units	Observations and Conclusions
Make		
Model		
Serial Number		
Internal Impedance Value	MΩ	
Resolution	V	
Last Calibration Date		

**ELECTRICAL ISOLATION MEASUREMENTS**

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

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		V	0°	min		sec
			90°			
			180°			
			270°			
			360°			
V2		V	0°	min		sec
			90°			
			180°			
			270°			
			360°			
V1'		V	0°	min		sec
			90°			
			180°			
			270°			
			360°			
V2'		V	0°	min		sec
			90°			
			180°			
			270°			
			360°			

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

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

**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		
$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$						
Ri1		Ω	0°	min	sec	
			90°			
			180°			
			270°			
			360°			
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$						
Ri2		Ω	0°	min	sec	
			90°			
			180°			
			270°			
			360°			
Ri = The lesser of Ri1 and Ri2						
Ri		Ω	0°	min	sec	
			90°			
			180°			
			270°			
			360°			
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$						
Ri / Vb		Ω/V	0°	min	sec	
			90°			
			180°			
			270°			
			360°			

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

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?	Yes	No (Fail)
Additional Comments	Not Applicable, vehicle was certified to FMVSS No. 305 S5.3(c).	

**DATA SHEET NO. 305A-1**  
**EVALUATE PROTECTION FROM DIRECT CONTACT WITH HIGH VOLTAGES SOURCES**  
**FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

For each data point where the IPXXB probe is used to evaluate electrical protection from direct contact with high voltage sources, provide a thumbnail photo and be as descriptive of the locations as possible. If an apparent failure is detected, include a photograph showing the direct contact between probe and the high voltage source and/or the probe lamp being illuminated.

**POST-CRASH / PRE-ROLLOVER**

Description of Evaluated Location	Probe Contact with High Voltage Source		Probe Lamp Illuminated	
	Yes, Fail	No, Pass	Yes, Fail	No, Pass
Inverter Assembly to Electrical Ground		X		X
Bottom of Engine Assembly to Electrical Ground		X		X
Inverter Assembly to Bottom of Engine Assembly		X		X

**STATIC ROLLOVER**

Description of Evaluated Location	Probe Contact with High Voltage Source		Probe Lamp Illuminated	
	Yes, Fail	No, Pass	Yes, Fail	No, Pass
Inverter Assembly to Electrical Ground		X		X
Bottom of Engine Assembly to Electrical Ground		X		X
Inverter Assembly to Bottom of Engine Assembly		X		X

**POST-ROLLOVER**

Description of Evaluated Location	Probe Contact with High Voltage Source		Probe Lamp Illuminated	
	Yes, Fail	No, Pass	Yes, Fail	No, Pass
Inverter Assembly to Electrical Ground		X		X
Bottom of Engine Assembly to Electrical Ground		X		X
Inverter Assembly to Bottom of Engine Assembly		X		X

**DATA SHEET NO. 305A-2**  
**EVALUATE PROTECTION AGAINST INDIRECT CONTACT WITH HIGH VOLTAGE SOURCES**  
**USING A RESISTANCE TESTER OR DC POWER SUPPLY, VOLTMETER AND AMMETER**  
**FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

*For any measuring points where protection against indirect contact with high voltage sources is evaluated, provide a thumbnail photo and be as descriptive of the locations as possible. If an apparent failure is detected, include a photograph showing the locations in question and the related measured values. If the resistance is calculated using separately measured resistances, describe each measurement and the final calculation as separate entries in the table below.*

Measuring Path	Pass	Fail
<b>BC:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and the electrical chassis.	< 0.1 Ω	≥ 0.1 Ω
<b>BB:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and any other simultaneously reachable exposed conductive parts of the electrical protection barriers within 2.5 meters.	< 0.2 Ω	≥ 0.2 Ω

**POST-CRASH / PRE-ROLLOVER**

Description of Evaluated Location	Measuring Path	Method 2 ONLY		Methods 1 & 2	Pass or Fail
	BC or BB	Voltage (V) Volts	Current (I) Amps	Resistance (R=V/I) Ω	
Inverter Assembly to Electrical Ground	BC			0.029	Pass
Bottom of Engine Assembly to Electrical Ground	BC			0.030	Pass
Inverter Assembly to Bottom of Engine Assembly	BB			0.037	Pass

**STATIC ROLLOVER**

Description of Evaluated Location	Measuring Path	Method 2 ONLY		Methods 1 & 2	Pass or Fail
	BC or BB	Voltage (V) Volts	Current (I) Amps	Resistance (R=V/I) Ω	
Inverter Assembly to Electrical Ground	BC			0.008	Pass
Bottom of Engine Assembly to Electrical Ground	BC			0.008	Pass
Inverter Assembly to Bottom of Engine Assembly	BB			0.025	Pass

\* Final resistance values reported after subtracting the resistance of the measurement device extensions.

**DATA SHEET NO. 305A-2 (CONTINUED)**  
**EVALUATE PROTECTION AGAINST INDIRECT CONTACT WITH HIGH VOLTAGE SOURCES**  
**USING A RESISTANCE TESTER OR DC POWER SUPPLY, VOLTMETER AND AMMETER**  
**FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV      NHTSA No.: O20245402  
 Test Program: NCAP Side MDB Impact Test      Test Date: 12/7/2023

*For any measuring points where protection against indirect contact with high voltage sources is evaluated, provide a thumbnail photo and be as descriptive of the locations as possible. If an apparent failure is detected, include a photograph showing the locations in question and the related measured values. If the resistance is calculated using separately measured resistances, describe each measurement and the final calculation as separate entries in the table below.*

Measuring Path	Pass	Fail
<b>BC:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and the electrical chassis.	< 0.1 Ω	≥ 0.1 Ω
<b>BB:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and any other simultaneously reachable exposed conductive parts of the electrical protection barriers within 2.5 meters.	< 0.2 Ω	≥ 0.2 Ω

**POST-ROLLOVER**

Description of Evaluated Location	Measuring Path	Method 2 ONLY		Methods 1 & 2	Pass or Fail
	BC or BB	Voltage (V) Volts	Current (I) Amps	Resistance (R=V/I) Ω	
Inverter Assembly to Electrical Ground	BC			0.008	Pass
Bottom of Engine Assembly to Electrical Ground	BC			0.007	Pass
Inverter Assembly to Bottom of Engine Assembly	BB			0.024	Pass

\* Final resistance values reported after subtracting the resistance of the measurement device extensions.

**DATA SHEET NO. 305A-3**  
**DETERMINE VOLTAGE BETWEEN EXPOSED CONDUCTIVE PARTS**  
**OF ELECTRICAL PROTECTION BARRIERS AND THE ELECTRICAL CHASSIS**  
**AND BETWEEN EXPOSED PARTS OF ELECTRICAL PROTECTION BARRIERS**

Test Vehicle: 2024 Mazda CX-90 MHEV Preferred Plus 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245402  
 Test Date: 12/7/2023

*For each data point where the voltage between exposed conductive parts of electrical protection barriers and the electrical chassis and between exposed conductive parts of electrical protection barriers is determined, provide a thumbnail photo and be as descriptive of the locations as possible. If an apparent failure is detected, include a photograph showing the locations in question and the related measured values.*

Measuring Path	Pass	Fail
<b>BC:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and the electrical chassis.	≤ 30 VAC ≤ 60 VDC	> 30 VAC > 60 VDC
<b>BB:</b> Between exposed conductive parts of the electrical protection barrier of the high voltage source and any other simultaneously reachable exposed conductive parts of the electrical protection barriers within 2.5 meters.	≤ 30 VAC ≤ 60 VDC	> 30 VAC > 60 VDC

**POST-CRASH / PRE-ROLLOVER**

Description of Evaluated Location	Measuring Path	Measured Voltage		Pass or Fail
	BC or BB	VAC (V) Volts	VDC (V) Volts	
Inverter Assembly to Electrical Ground	BC	0.0	0.0	Pass
Bottom of Engine Assembly to Electrical Ground	BC	0.0	0.0	Pass
Inverter Assembly to Bottom of Engine Assembly	BB	0.0	0.0	Pass

**STATIC ROLLOVER**

Description of Evaluated Location	Measuring Path	Measured Voltage		Pass or Fail
	BC or BB	VAC (V) Volts	VDC (V) Volts	
Inverter Assembly to Electrical Ground	BC	0.0	0.0	Pass
Bottom of Engine Assembly to Electrical Ground	BC	0.0	0.0	Pass
Inverter Assembly to Bottom of Engine Assembly	BB	0.0	0.0	Pass

**POST-ROLLOVER**

Description of Evaluated Location	Measuring Path	Measured Voltage		Pass or Fail
	BC or BB	VAC (V) Volts	VDC (V) Volts	
Inverter Assembly to Electrical Ground	BC	0.0	0.0	Pass
Bottom of Engine Assembly to Electrical Ground	BC	0.0	0.0	Pass
Inverter Assembly to Bottom of Engine Assembly	BB	0.0	0.0	Pass

**APPENDIX A  
PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 001	As Delivered Right Front Three-Quarter View of Test Vehicle	A-1
Photo No. 002	As Delivered Left Rear Three-Quarter View of Test Vehicle	A-1
Photo No. 003	Pre-Test Frontal View of Test Vehicle	A-2
Photo No. 004	Post-Test Frontal View of Test Vehicle	A-2
Photo No. 005	Pre-Test Left Front Three-Quarter View of Test Vehicle	A-3
Photo No. 006	Post-Test Left Front Three-Quarter View of Test Vehicle	A-3
Photo No. 007	Pre-Test Left Side View of Test Vehicle	A-4
Photo No. 008	Post-Test Left Side View of Test Vehicle	A-4
Photo No. 009	Pre-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 010	Post-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 011	Pre-Test Rear View of Test Vehicle	A-6
Photo No. 012	Post-Test Rear View of Test Vehicle	A-6
Photo No. 013	Pre-Test Right Side View of Test Vehicle	A-7
Photo No. 014	Post-Test Right Side View of Test Vehicle	A-7
Photo No. 015	Pre-Test Overhead View of Test Area	A-8
Photo No. 016	Post-Test Overhead View of Test Area	A-8
Photo No. 017	Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 018	Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 019	Pre-Test Close-Up View of Impact Point Target	A-10
Photo No. 020	Post-Test Close-Up View of Impact Point Target	A-10
Photo No. 021	Pre-Test Left Front Door Latch Close-Up	A-11
Photo No. 022	Post-Test Left Front Door Latch Close-Up	A-11
Photo No. 023	Pre-Test Left Rear Door Latch Close-Up	A-12
Photo No. 024	Post-Test Left Rear Door Latch Close-Up	A-12
Photo No. 025	Pre-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 026	Post-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 027	Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking	A-14
Photo No. 028	Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-14
Photo No. 029	Post-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-15
Photo No. 030	Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning	A-15

		<u>Page No.</u>
Photo No. 031	Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint	A-16
Photo No. 032	Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning	A-16
Photo No. 033	Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan	A-17
Photo No. 034	Pre-Test Placement of Driver Dummy's Feet	A-17
Photo No. 035	Pre-Test View of Belt Anchorage for Driver Dummy	A-18
Photo No. 036	Pre-Test Left Side View of Steering Wheel	A-18
Photo No. 037	Pre-Test View of Disengaged Parking Brake	A-19
Photo No. 038	Pre-Test View of Parking Brake	A-19
Photo No. 039	Pre-Test Close-Up Left Side View of Driver Seat Track	A-20
Photo No. 040	Pre-Test Close-Up Left Side View of Driver Seat Back	A-20
Photo No. 041	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	A-21
Photo No. 042	Pre-Test Driver Dummy and Door Clearance View	A-21
Photo No. 043	Post-Test Driver Dummy and Door Clearance View	A-22
Photo No. 044	Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	A-22
Photo No. 045	Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	A-23
Photo No. 046	Pre-Test Driver Inner Door Panel View	A-23
Photo No. 047	Post-Test Driver Inner Door Panel View	A-24
Photo No. 048	Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View	A-24
Photo No. 049	Post-Test Driver Dummy Close-up Head Contact with Side Airbag View	A-25
Photo No. 050	Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View	A-25
Photo No. 051	Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View	A-26
Photo No. 052	Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View	A-26
Photo No. 053	Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View	A-27
Photo No. 054	Post-Test Driver Dummy Close-up Knee Contact View	A-27
Photo No. 055	Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking	A-28
Photo No. 056	Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-28
Photo No. 057	Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-29

		<u>Page No.</u>
Photo No. 058	Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning	A-29
Photo No. 059	Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint	A-30
Photo No. 060	Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning	A-30
Photo No. 061	Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan	A-31
Photo No. 062	Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket	A-31
Photo No. 063	Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level	A-32
Photo No. 064	Pre-Test Placement of Rear Passenger Dummy's Feet	A-32
Photo No. 065	Pre-Test View of Belt Anchorage for Rear Passenger Dummy	A-33
Photo No. 066	Pre-Test Close-Up Left Side View of Rear Passenger Seat Track	A-33
Photo No. 067	Pre-Test Close-Up Left Side View of Rear Passenger Seat Back	A-34
Photo No. 068	Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint	A-34
Photo No. 069	Pre-Test Rear Passenger Dummy and Door Clearance View	A-35
Photo No. 070	Post-Test Rear Passenger Dummy and Door Clearance View	A-35
Photo No. 071	Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	A-36
Photo No. 072	Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	A-36
Photo No. 073	Pre-Test Rear Passenger Inner Door Panel View	A-37
Photo No. 074	Post-Test Rear Passenger Inner Door Panel View	A-37
Photo No. 075	Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View	A-38
Photo No. 076	Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View	A-38
Photo No. 077	Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View	A-39
Photo No. 078	Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View	A-39
Photo No. 079	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View	A-40
Photo No. 080	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View	A-40
Photo No. 081	Post-Test Rear Passenger Dummy Close-up Knee Contact View	A-41
Photo No. 082	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-41
Photo No. 083	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-42

		<u>Page No.</u>
Photo No. 084	Pre-Test Front View of MDB Impactor Face	A-42
Photo No. 085	Post-Test Front View of MDB Impactor Face	A-43
Photo No. 086	Pre-Test Top View of MDB Impactor Face	A-43
Photo No. 087	Post-Test Top View of MDB Impactor Face	A-44
Photo No. 088	Pre-Test Left Side View of MDB Impactor Face	A-44
Photo No. 089	Post-Test Left Side View of MDB Impactor Face	A-45
Photo No. 090	Pre-Test Right Side View of MDB Impactor Face	A-45
Photo No. 091	Post-Test Right Side View of MDB Impactor Face	A-46
Photo No. 092	Close-Up View of Vehicle's Certification Label	A-46
Photo No. 093	Close-Up View of Vehicle's Tire Information Placard or Label	A-47
Photo No. 094	Pre-Test Ballast View	A-47
Photo No. 095	Post-Test Primary and Redundant Speed Trap Read-Out	A-48
Photo No. 096	FMVSS No. 301 Static Rollover 0 Degrees	A-48
Photo No. 097	FMVSS No. 301 Static Rollover 90 Degrees	A-49
Photo No. 098	FMVSS No. 301 Static Rollover 180 Degrees	A-49
Photo No. 099	FMVSS No. 301 Static Rollover 270 Degrees	A-50
Photo No. 100	FMVSS No. 301 Static Rollover 360 Degrees	A-50
Photo No. 101	Impact Event	A-51
Photo No. 102	Monroney Label	A-51
Photo No. 103	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52
Photo No. 104	Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52
Photo No. 305-01	Auxiliary Power Module Warning Label	A-53
Photo No. 305-02	Power Inverter Warning Label	A-53
Photo No. 305-03	First Responder Warning Label	A-54
Photo No. 305-04	First Responder Warning Location	A-54
Photo No. 305-05	Other Vehicle Label(s) Related to Electrical Propulsion System	A-55
Photo No. 305-06	Manual High Voltage Service Disconnect in Place	A-55
Photo No. 305-07	Manual High Voltage Service Disconnect Removed	A-56
Photo No. 305-08	Manual High Voltage Service Disconnect Removed	A-56
Photo No. 305-09	Pre-Impact View of Propulsion Battery	A-57

		<u>Page No.</u>
Photo No. 305-10	Post-Impact Front View of Propulsion Battery	A-57
Photo No. 305-11	Post-Impact Rear View of Propulsion Battery	A-58
Photo No. 305-12	Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-58
Photo No. 305-13	Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-59
Photo No. 305-14	Pre-Impact View of Propulsion Battery Module(s)	A-59
Photo No. 305-15	Post-Impact View of Propulsion Battery Module(s)	A-60
Photo No. 305-16	Pre-Impact View of Electric Propulsion Drive	A-60
Photo No. 305-17	Post-Impact View of Electric Propulsion Drive	A-61
Photo No. 305-18	Pre-Impact View of High Voltage Interconnect(s)	A-61
Photo No. 305-19	Pre-Impact View Propulsion Battery Venting System(s)	A-62
Photo No. 305-20	Pre-Impact View of Other Visible Electric Propulsion Components	A-62
Photo No. 305-21	Pre-Impact View of Ground Lead Attached	A-63
Photo No. 305-22	Pre-Impact View of High Voltage Leads Attached	A-63
Photo No. 305-23	Pre-Impact Close-Up View of High Voltage Leads Attached	A-64
Photo No. 305-24	Pre-Impact View of Installed Test Interface Port	A-64
Photo No. 305-25	Post-Impact View of Installed Test Interface Port	A-65
Photo No. 305-26	Pre-Impact View of Other Test Devices	A-65
Photo No. 305-27	Post-Impact View of Other Test Devices	A-66
Photo No. 305-28	FMVSS No. 305 Static Rollover at 90 Degrees	A-66
Photo No. 305-29	FMVSS No. 305 Static Rollover at 180 Degrees	A-67
Photo No. 305-30	FMVSS No. 305 Static Rollover at 270 Degrees	A-67
Photo No. 305-31	FMVSS No. 305 Static Rollover at 360 Degrees	A-68
Photo No. 305-32	Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-68
Photo No. 305-33	Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-69
Photo No. 305-34	Post-Impact Propulsion Battery System Mounting and/or Intrusion Failure(s)	A-69
Photo No. 305-35	Post-Impact View of Battery Component Intrusion	A-70
Photo No. 305-36	Post-Impact View of Battery Module Movement or Retention Loss	A-70
Photo No. 305-37	Post-Impact View of Propulsion Battery Electrolyte Spillage Location	A-71
Photo No. 305-38	Post-Test View of Propulsion Battery Electrolyte Spillage Location	A-71



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

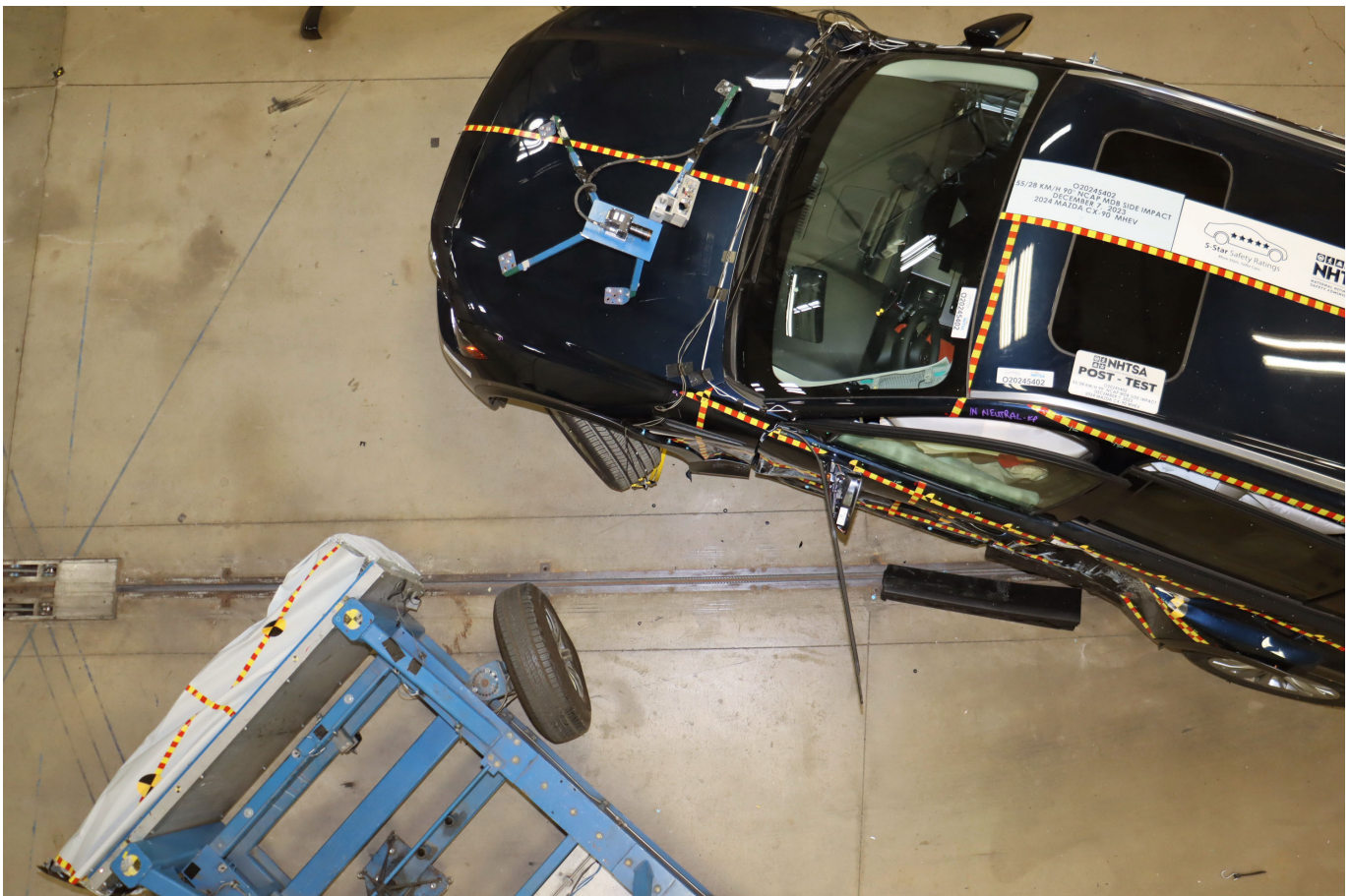


Photo No. 016 - Post-Test Overhead View of Test Area



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



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



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



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



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



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



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



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



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



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





Photo No. 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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

# PHOTOGRAPH NOT APPLICABLE

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

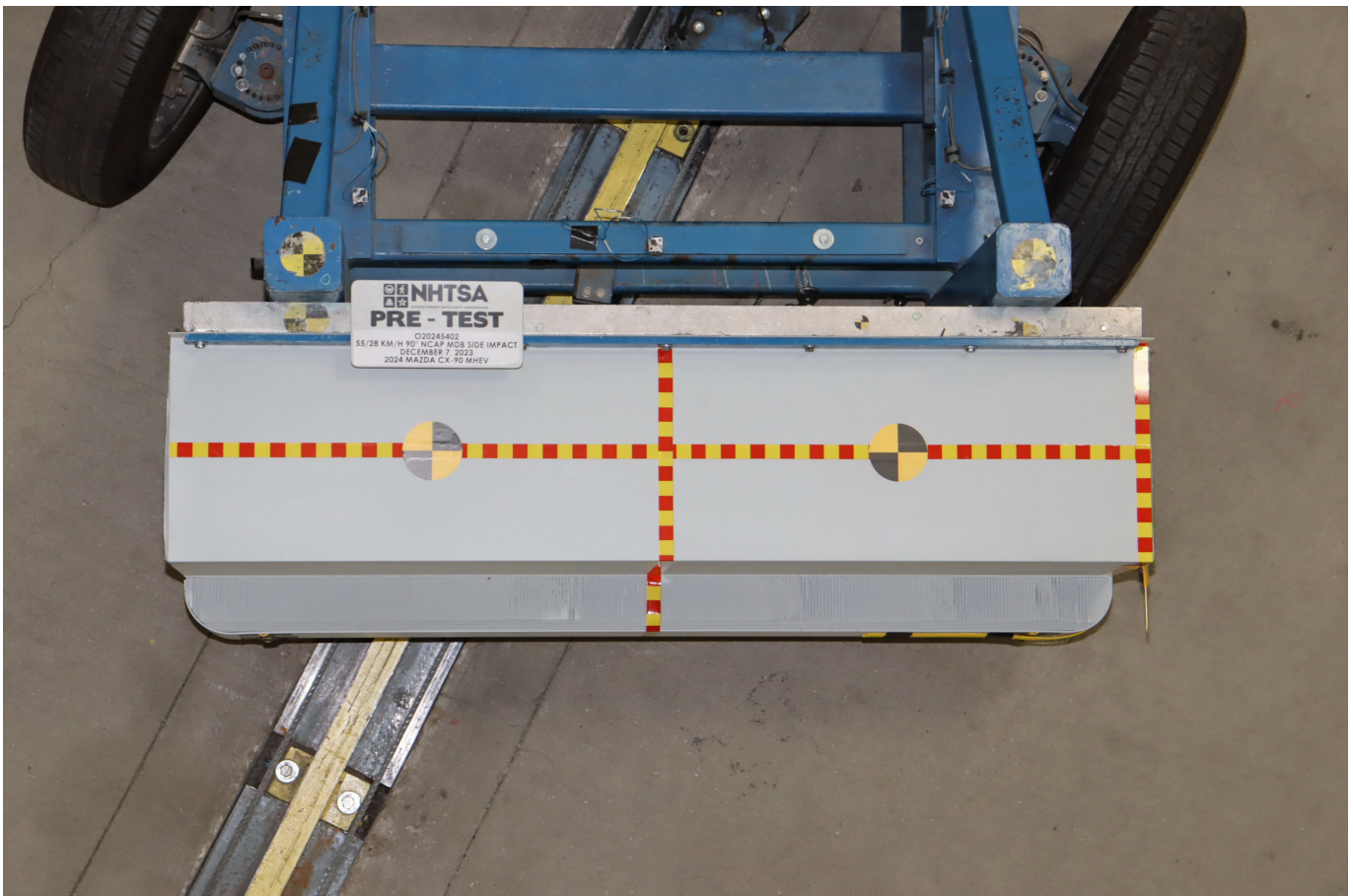


Photo No. 086 - Pre-Test Top View of MDB Impactor Face



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



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



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



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



Photo No. 101 - Impact Event

**Fuel Economy and Environment**

**Gasoline Vehicle**

**Fuel Economy**  
**25** MPG  
combined city/hwy  
**24** MPG  
city  
**28** MPG  
highway  
**4.0** gallons per 100 miles

Standard SUVs range from 13 to 102 MPG. The best vehicle rates 140 MPG.

**You spend \$1,000 more in fuel costs over 5 years compared to the average new vehicle.**

**Annual fuel cost \$2,150**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only) **5** (Best 10 Worst)

**Smog Rating** (tailpipe only) **6** (Best 10 Worst)

**fueleconomy.gov**  
Calculate personalized estimates and compare vehicles

**2024 Mazda CX-90**

Model: **2024 CX-90 3.3 TURBO PREFERRED PLUS**  
 Exterior Color: **DEEP CRYSTAL BLUE MICA**  
 Interior Color: **BLACK LEATHER**

*Miles-91*

**PARTS CONTENT INFORMATION:**

FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 0%  
 MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN 90%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: HOFU, JAPAN  
 COUNTRY OF ORIGIN: ENGINE: JAPAN  
 TRANSMISSION: JAPAN

This label is affixed pursuant to the Federal Automobile Disclosure Act. Gasoline, License and Title fees, State and Local taxes, and Dealer installed options are not included.

**STANDARD EQUIPMENT**

**ENGINE/MECHANICAL FEATURES**

- E-SKYACTIV G 3.3L I6 TURBO ENGINE
- 280 HORSEPOWER, 332 LB-FT TORQUE
- M HYBRID BOOST
- SKYACTIVDRIVE 8-SPEED AT

**EXTERIOR FEATURES**

- 19-INCH ALLOY WHEELS
- 265/55 R19 ALL-SEASON TIRES
- HEATED POWER MIRRORS W/TURN LAMPS
- REAR PRIVACY GLASS
- BODY-COLORED REAR ROOF SPOILER
- ALUMINUM ROOF RAILS

**INTERIOR FEATURES**

- LEATHER-TRIMMED SEATS (1ST & 2ND ROW SEATING POSITIONS)
- 8-WAY PWR DRIVER'S SEAT W/LUMBAR
- 4-WAY POWER PASSENGER SEAT
- HEATED FRONT SEATS
- MAZDA ADVANCED KEYLESS ENTRY
- PUSH BUTTON START
- LEATHER STEERING WHEEL
- PADDLE SHIFTERS

**SAFETY AND SECURITY FEATURES**

- 60MO/60K MI POWERTRAIN & 36MO/36K MI NEW VEHICLE LIMITED WARRANTY
- 24-HOUR ROADSIDE ASSISTANCE
- BLIND SPOT MONITORING WITH VEHICLE EXIT WARNING
- LANE DEPARTURE WARNING SYSTEM
- DRIVER ATTENTION ALERT
- REAR SEAT ALERT
- TIRE PRESSURE MONITORING SYSTEM

**1-ACTIV AWD**

- ABS WITH EBD
- KINEMATIC POSTURE CONTROL
- HILLS DESCENT CONTROL

**POWER MOONROOF**

- LED HEADLIGHTS W/AUTO ON/OFF
- LED DAYTIME RUNNING LIGHTS
- HIGH BEAM CONTROL
- RAIN-SENSING WINDSHIELD WIPERS
- POWER REAR LIFTGATE

**10.25" COLOR CENTER DISPLAY**

- 3-ZONE AUTOMATIC CLIMATE CONTROL
- 3RD ROW AC VENTS
- ANDROID AUTO™ & APPLE CARPLAY™
- AM/FM/HD RADIO/8 W/8 SPEAKERS
- BLUETOOTH/HANDS-FREE PHONE/AUDIO
- USB INPUTS (6) & 12V OUTLETS (2)
- 2ND ROW WINDOW SUNSHADES
- MAZDA CONNECTED SERVICES

**FRONTAL, KNEE, CURTAIN & SIDE IMPACT AIRBAGS**

- SMART BRAKE SUPPORT
- REAR CROSS TRAFFIC ALERT
- LANE KEEP ASSIST
- MAZDA RADAR CRUISE CONTROL
- REARVIEW CAMERA
- ANTI-THEFT ENGINE IMMOBILIZER

**MSRP \$45,900**

**OPTIONAL EQUIPMENT**

1CC	2ND - ROW CAPTAIN'S CHAIRS	7-PASSENGER SEATING	NO CHARGE
	2ND-ROW CAPTAIN'S CHAIRS WITH ARMRESTS AND CENTER WALK-THROUGH		
2PF	PREFERRED PLUS PACKAGE	WIRELESS PHONE CHARGER	NO CHARGE
	M-DRIVE - SPORT/OFF-ROAD/TOWING	WIRELESS APPLE CARPLAY™	
	5000 LB TOWING CAPACITY	WIRELESS ANDROID AUTO™	
	ACTIVE DRIVING DISPLAY		

Total Vehicle and Options \$45,900  
 Delivery, Processing and Handling Fee \$1,375  
**Total MSRP \$47,275**

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score Not Rated**  
 Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

<b>Frontal Crash</b>	<b>Driver Passenger</b>	<b>Not Rated</b>
<small>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</small>		
<b>Side Crash</b>	<b>Front seat Rear seat</b>	<b>Not Rated</b>
<small>Based on the risk of injury in a side impact.</small>		
<b>Rollover</b>		<b>Not Rated</b>
<small>Based on the risk of rollover in a single vehicle crash.</small>		

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.  
 Source: National Highway Traffic Safety Administration (NHTSA)  
[www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

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C90-PPF-XA-KEMFNAH-TA--TA--20230628

Photo No. 102 - Monroney Label

**Head Restraints**

Your vehicle is equipped with head restraints on all outboard seats and the second-row/third-row center seat\*. The head restraints are intended to help protect you and the passengers from neck injury.

**Warnings and Cautions for Using the Head Restraints**

**WARNING**

Always drive with the head restraints installed when seats are being used and make sure they are properly adjusted.

Driving with the head restraints adjusted too low or removed is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

After installing a head restraint, try lifting it to make sure that it does not pull out.

Driving with an unsecured head restraint is dangerous as the effectiveness of the head restraint will be compromised which could cause it to unexpectedly detach from the seat. (Third-row seat)

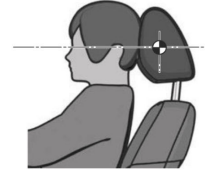
Always drive with the head restraints in their upright positions when the third-row seats are occupied, and make sure they are securely locked in place.

Driving with the head restraints folded down is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

**How to Use the Head Restraints**

**Adjusting the Head Restraints**

Adjust the head restraint so that the center is even with the top of the passenger's ears.



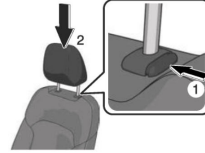
**To Raise a Head Restraint**

Pull up a head restraint.

**To Lower a Head Restraint**

Lower a head restraint while pressing the lock knob.

**Front seats**



**CAUTION**

When installing a head restraint, make sure that it is installed correctly with the front of the head restraint facing forward. If the head restraint is installed incorrectly, it could detach from the seat during a collision and result in injury.

The head restraints on each of the front and second-row/third-row seats are specialized to each seat. Do not switch around the head restraint positions. If a head restraint is not installed to its correct seat position, the effectiveness of the head restraint during a collision will be compromised which could cause injury.

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

**CAUTION**

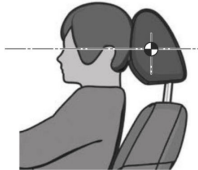
When installing a head restraint, make sure that it is installed correctly with the front of the head restraint facing forward. If the head restraint is installed incorrectly, it could detach from the seat during a collision and result in injury.

The head restraints on each of the front and second-row/third-row seats are specialized to each seat. Do not switch around the head restraint positions. If a head restraint is not installed to its correct seat position, the effectiveness of the head restraint during a collision will be compromised which could cause injury.

**How to Use the Head Restraints**

**Adjusting the Head Restraints**

Adjust the head restraint so that the center is even with the top of the passenger's ears.



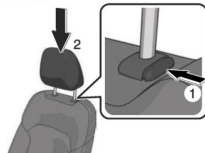
**To Raise a Head Restraint**

Pull up a head restraint.

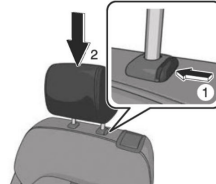
**To Lower a Head Restraint**

Lower a head restraint while pressing the lock knob.

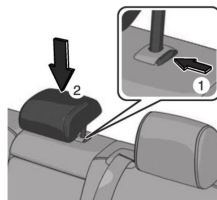
**Front seats**



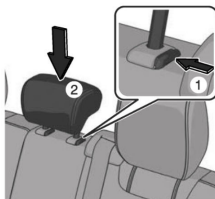
**Second-row seats (Left/Right seats)**



**Second-row center seat (6:4 Split Adjustable-type Bench Seat Type)**



**Third-row center seat (Three-seater type)**

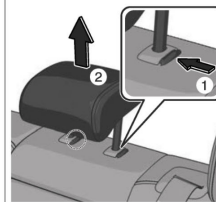


**Removing or Installing a Head Restraint**

**To Remove a Head Restraint**

Pull up a head restraint while pressing the lock knob.

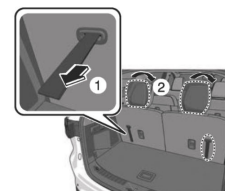
(Second-row center seat (6:4 Split Adjustable-type Bench Seat Type)) Pull up the center seat head restraint while pressing both lock knobs.



**To Install a Head Restraint**

Insert a head restraint while pressing the lock knob.

**Foldable Head Restraints (Third-row Seat)**



**NOTE**  
 The foldable head restraints cannot be adjusted or removed.

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



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

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 305-02 - Power Inverter Warning Label

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 305-03 - First Responder Warning Label

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 305-04 - First Responder Warning Location

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT AVAILABLE**

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)

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT APPLICABLE**

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

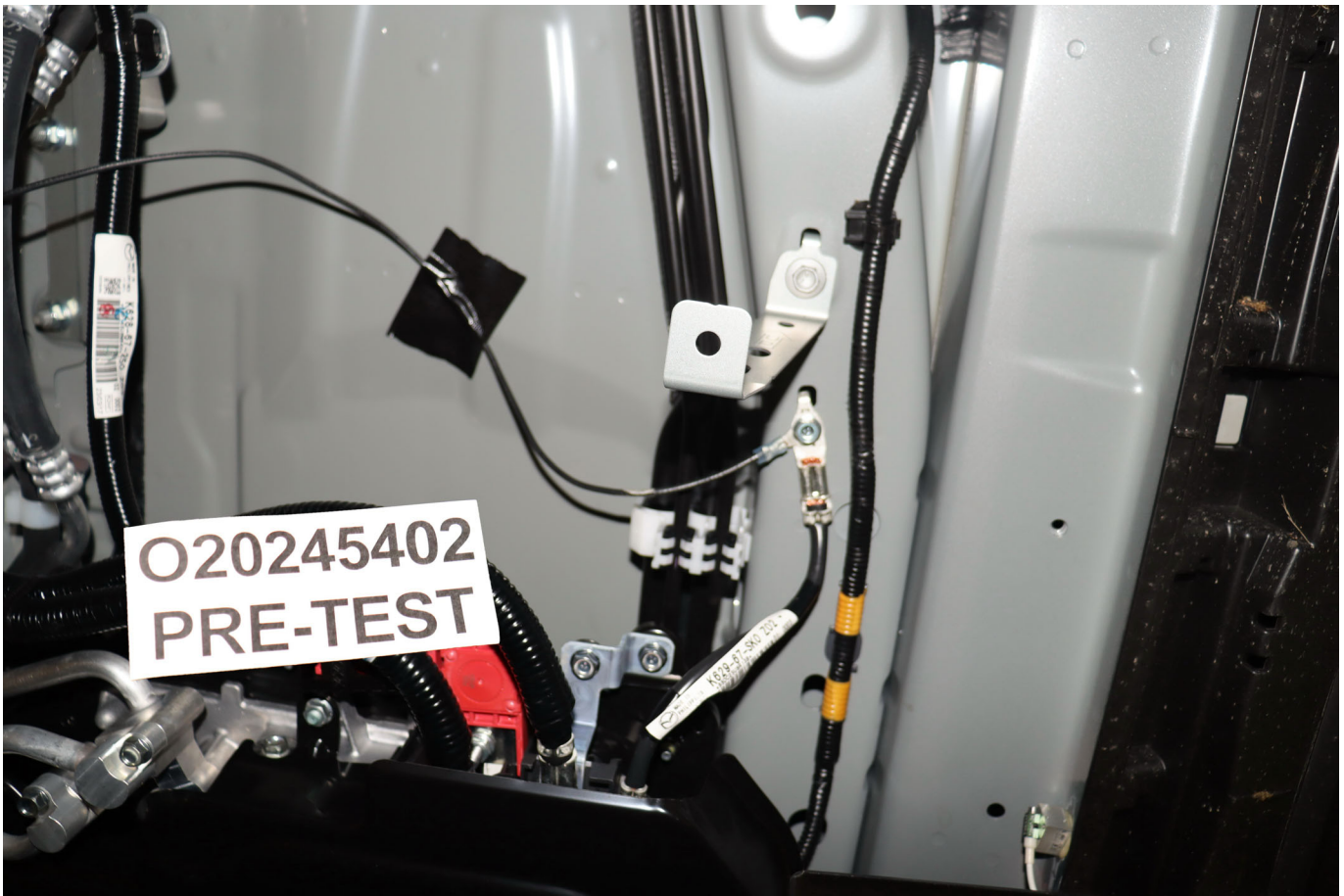


Photo No. 305-21 - Pre-Impact View of Ground Lead Attached

**PHOTOGRAPH NOT APPLICABLE**

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

# PHOTOGRAPH NOT APPLICABLE

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 APPLICABLE**

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

# PHOTOGRAPH NOT APPLICABLE

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

**PHOTOGRAPH NOT APPLICABLE**

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

**PHOTOGRAPH NOT APPLICABLE**

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**

<b><u>No.</u></b>	<b><u>Description</u></b>	<b><u>Page No.</u></b>
Figure No. 1.	Driver Head Acceleration (X) Primary vs. Time	B-1
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
Figure No. 7.	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 8.	Driver Thorax Rib Deflection Maximum vs. Time	B-2
Figure No. 9.	Driver Anterior Abdomen Force (Y) vs. Time	B-3
Figure No. 10.	Driver Middle Abdomen Force (Y) vs. Time	B-3
Figure No. 11.	Driver Posterior Abdomen Force (Y) vs. Time	B-3
Figure No. 12.	Driver Total Abdominal Force (Y) vs. Time	B-3
Figure No. 13.	Driver Pubic Symphysis Force (Y) vs. Time	B-4
Figure No. 14.	Passenger Head Acceleration (X) Primary vs. Time	B-5
Figure No. 15.	Passenger Head Acceleration (Y) Primary vs. Time	B-5
Figure No. 16.	Passenger Head Acceleration (Z) Primary vs. Time	B-5
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](http://www.nhtsa.gov)

**Additional Driver & Passenger Dummy Instrumentation Data**

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

### **Vehicle Instrumentation Data**

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

### **MDB Instrumentation Data**

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

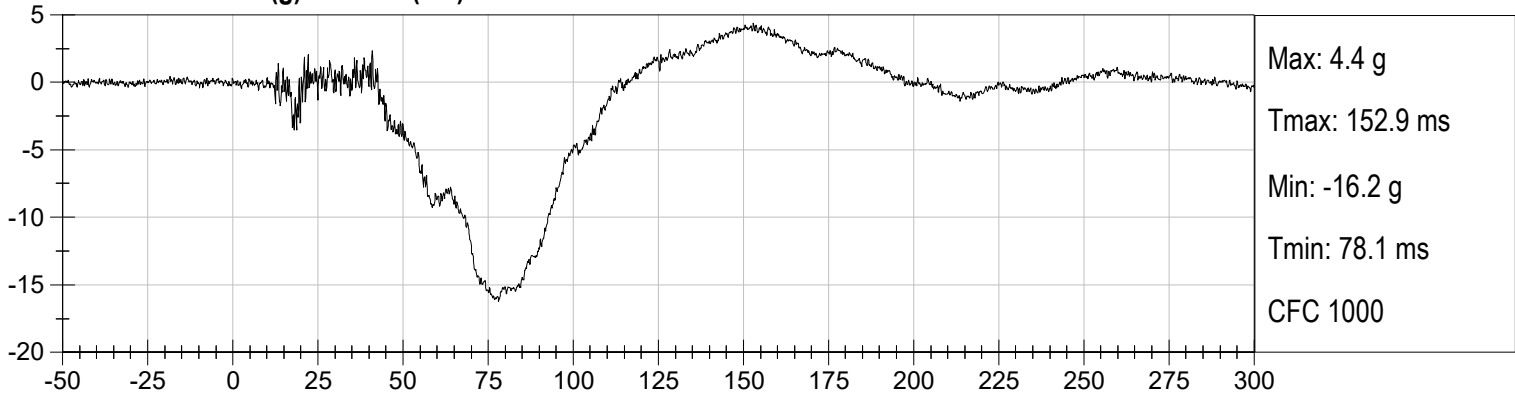
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

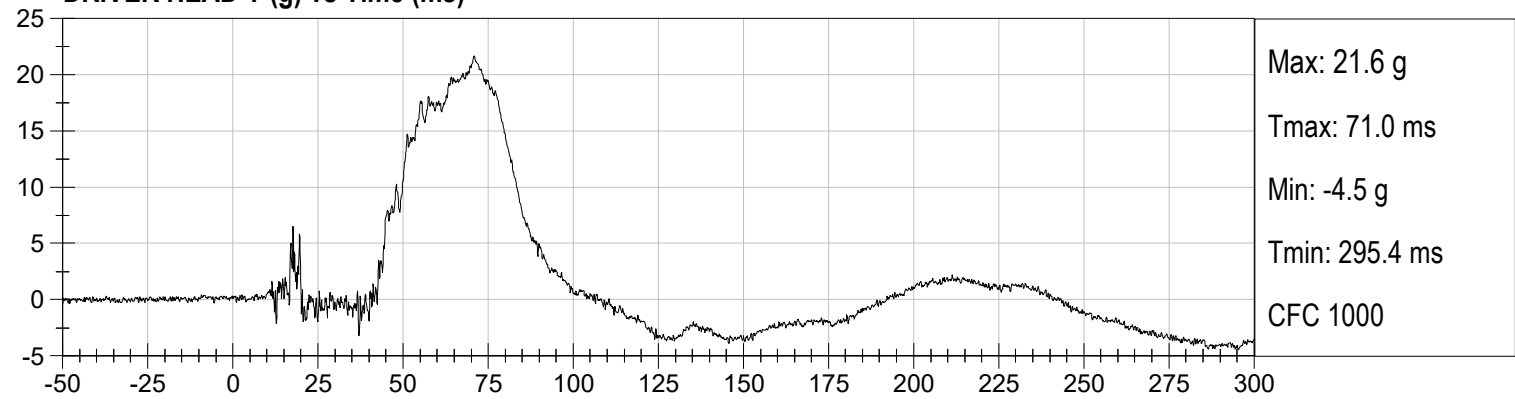
Left MDB Contact Switch

Right MDB Contact Switch

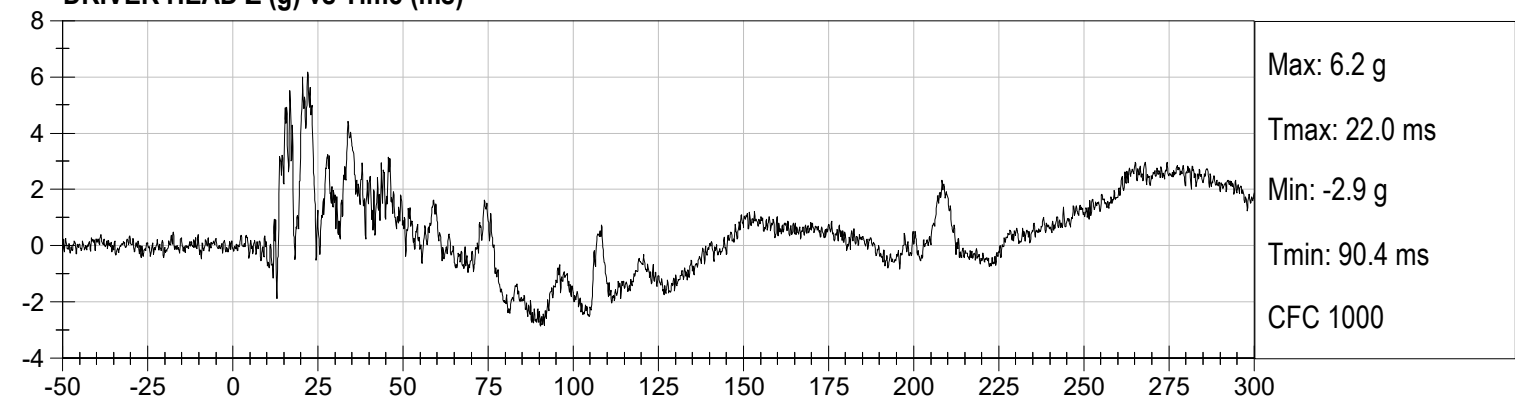
**DRIVER HEAD X (g) vs Time (ms)**



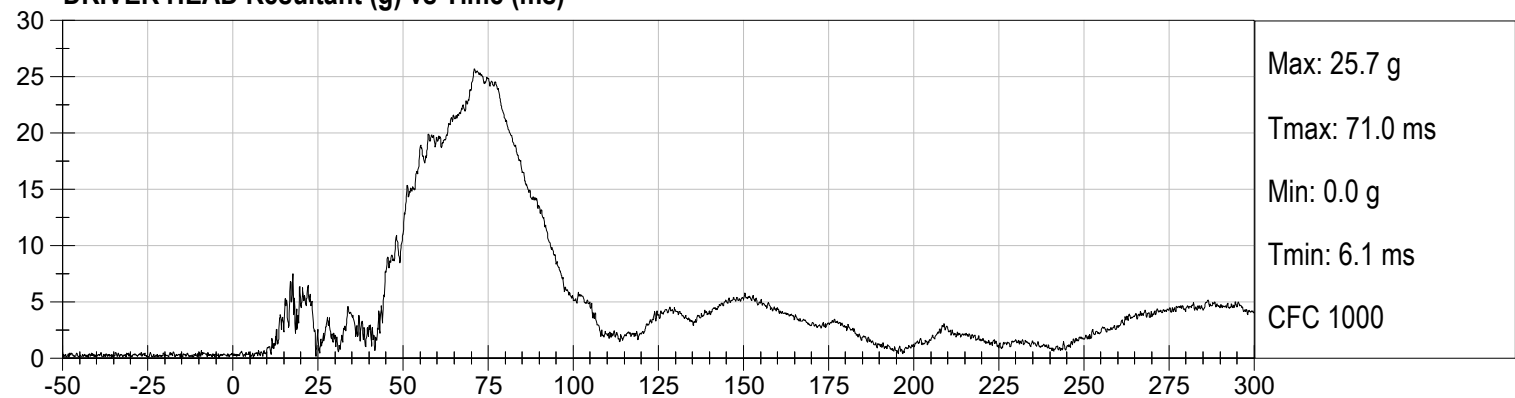
**DRIVER HEAD Y (g) vs Time (ms)**



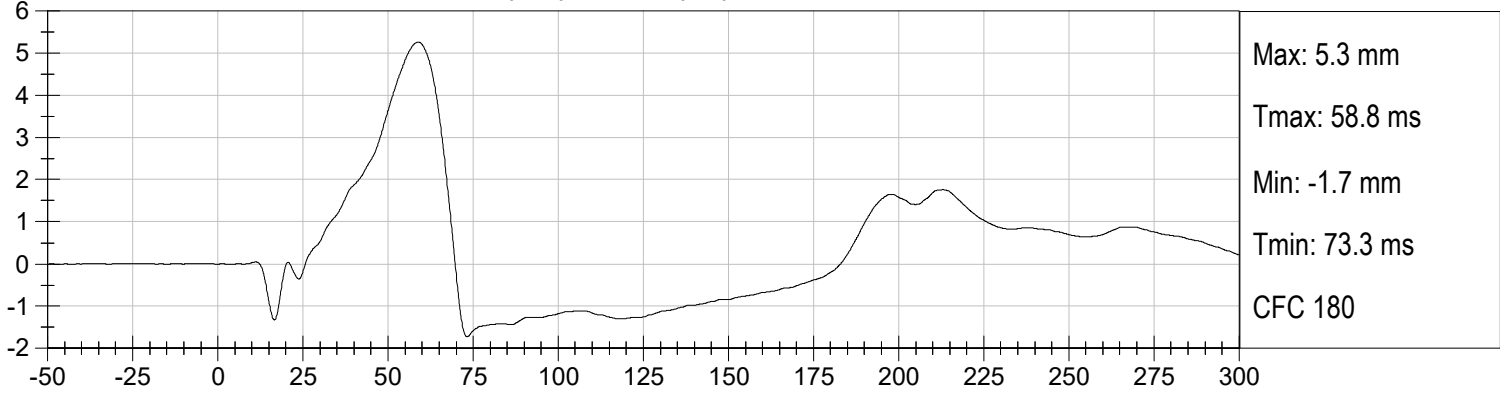
**DRIVER HEAD Z (g) vs Time (ms)**



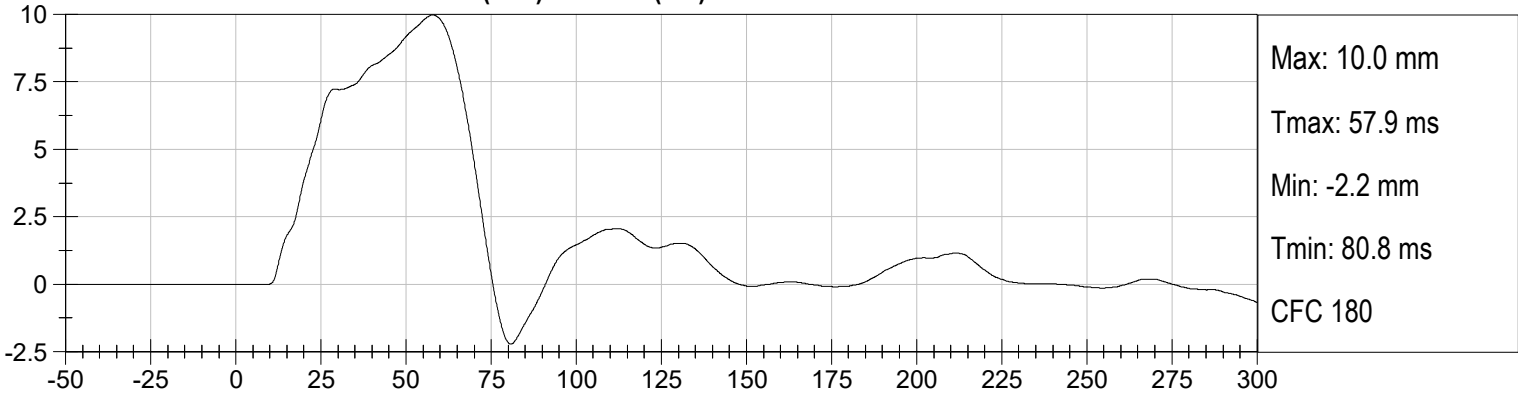
**DRIVER HEAD Resultant (g) vs Time (ms)**



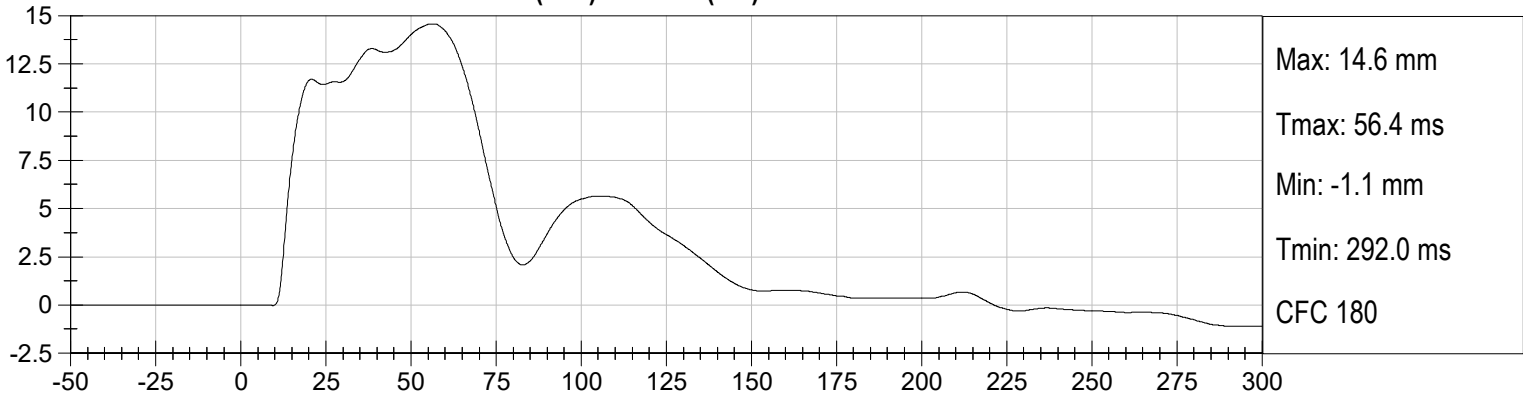
**DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)**



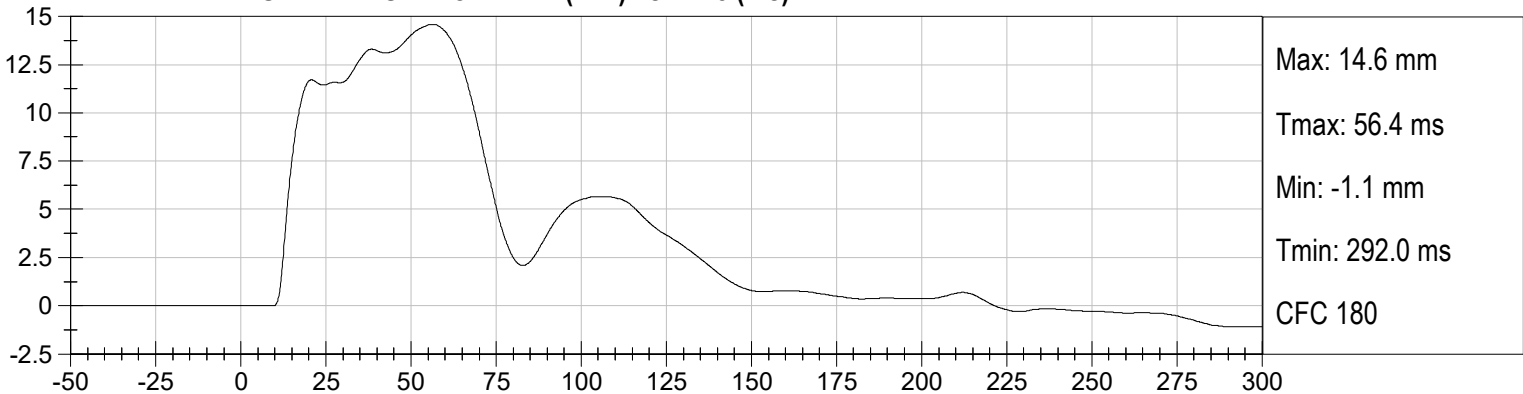
**DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)**



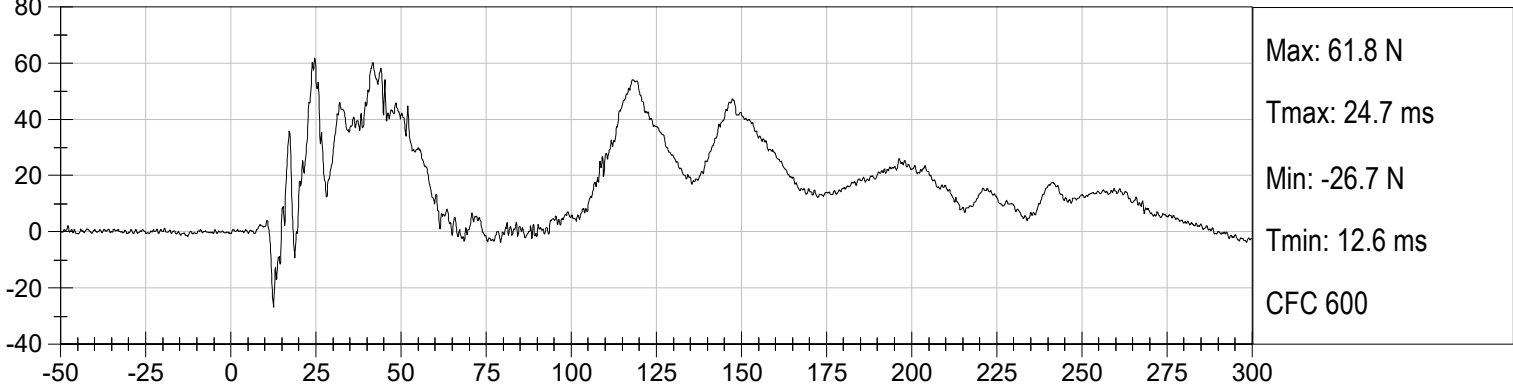
**DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)**



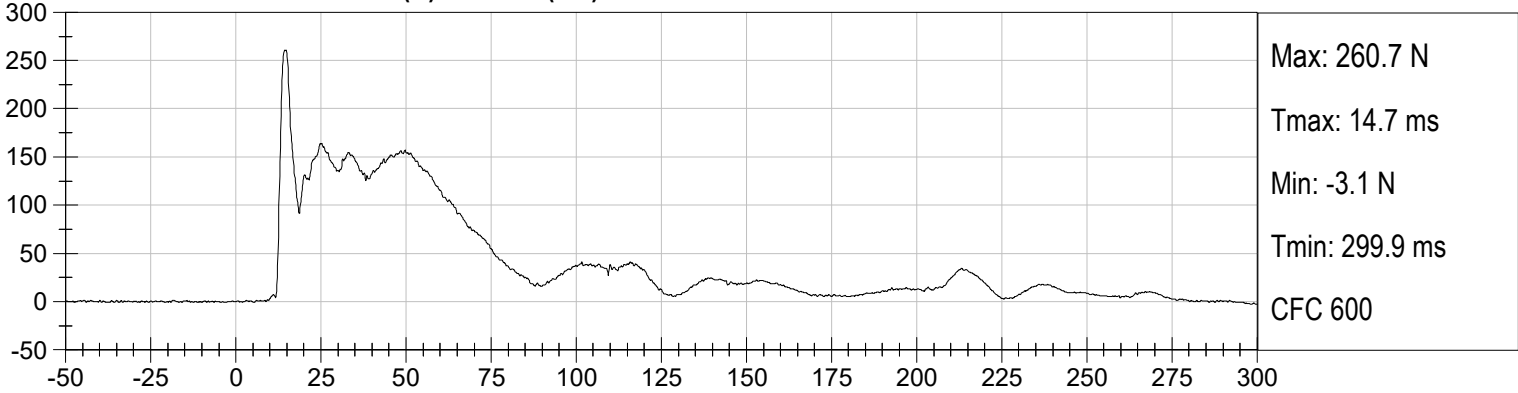
**DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)**



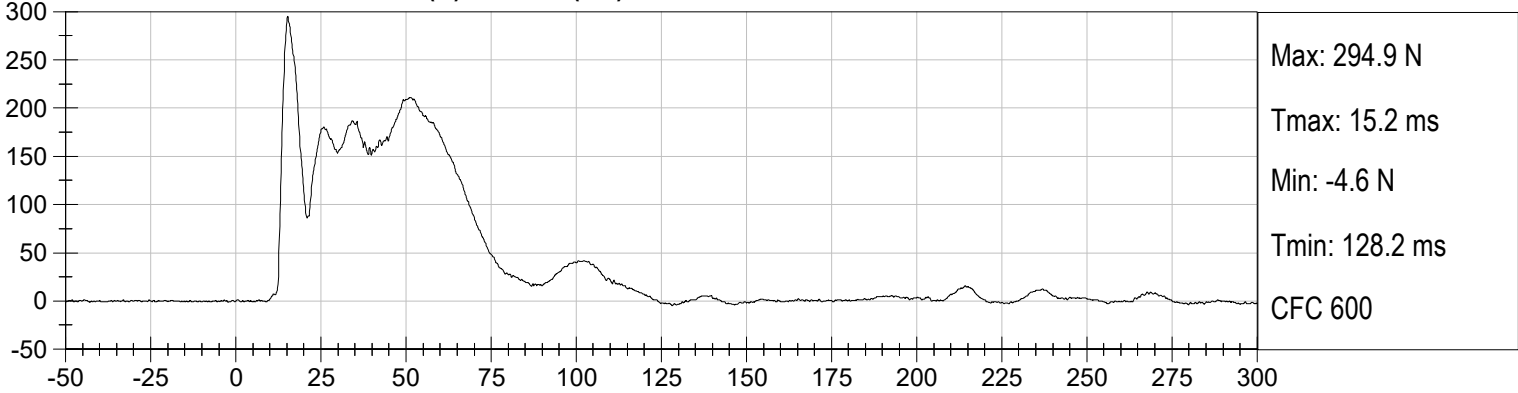
**DRIVER FRONT ABDOMEN FY (N) vs Time (ms)**



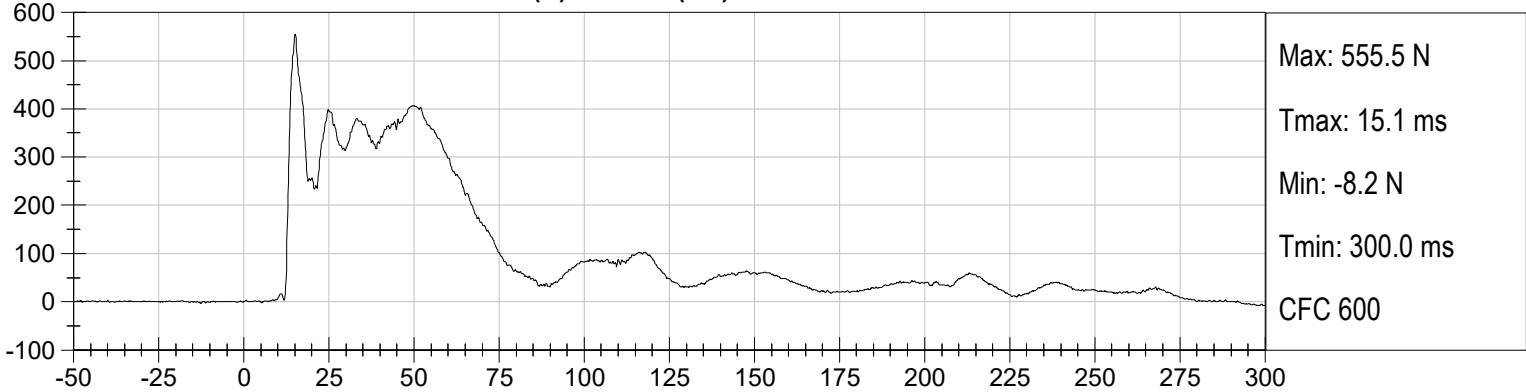
**DRIVER MID ABDOMEN FY (N) vs Time (ms)**

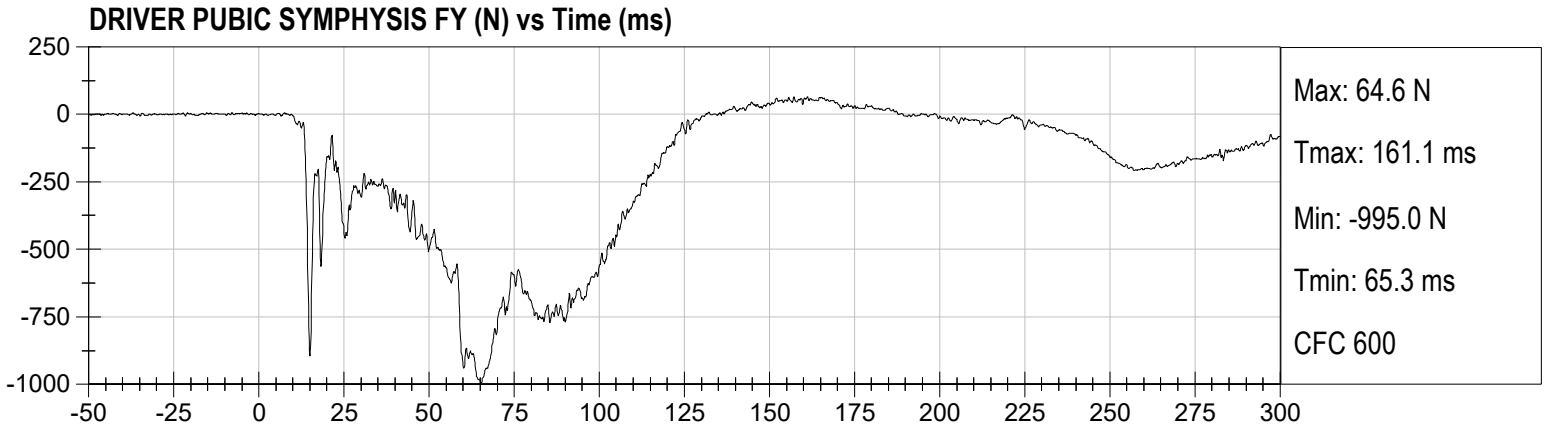


**DRIVER REAR ABDOMEN FY (N) vs Time (ms)**

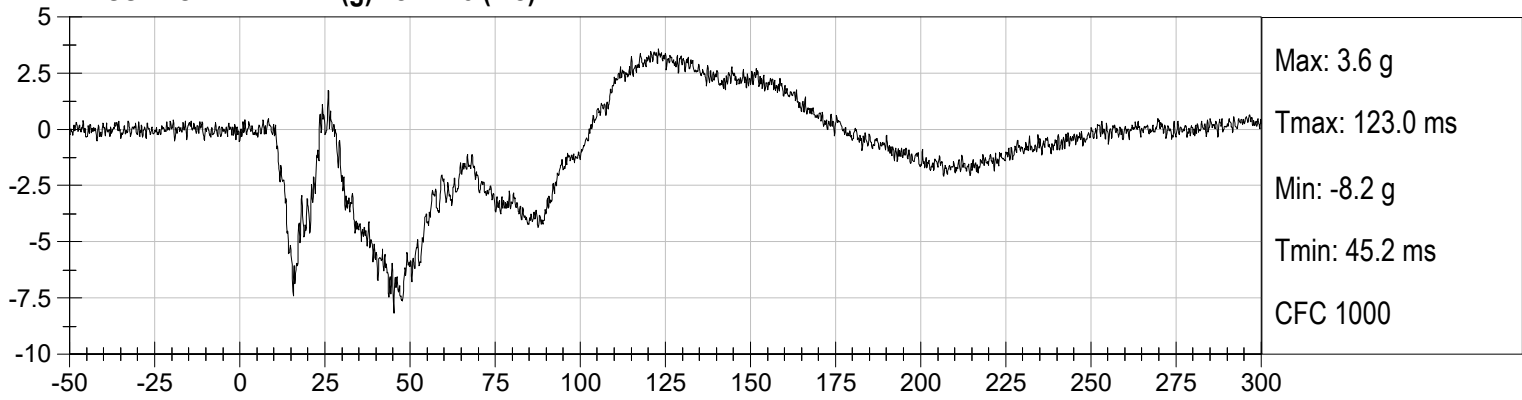


**DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)**

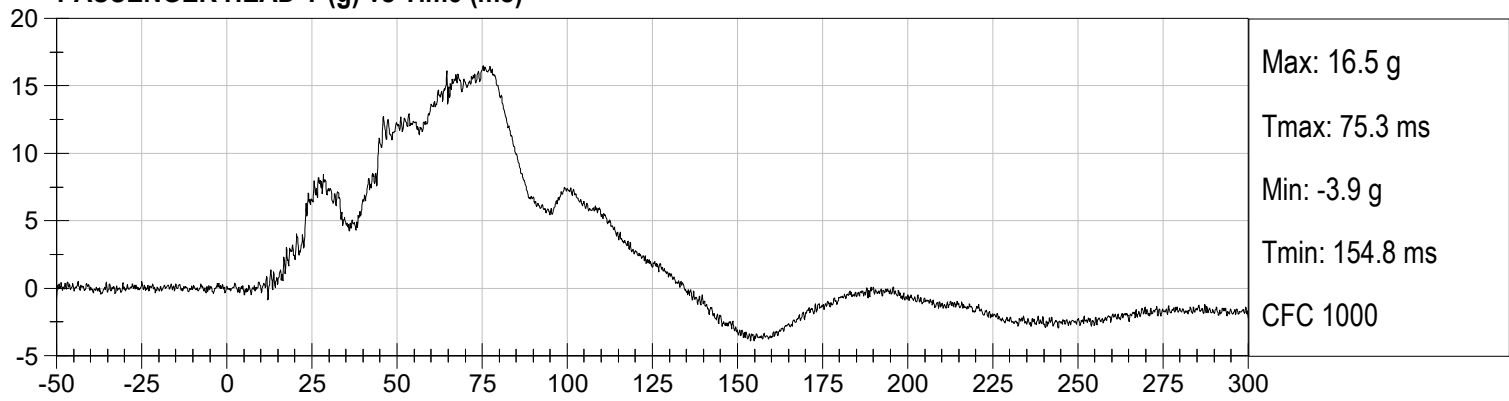




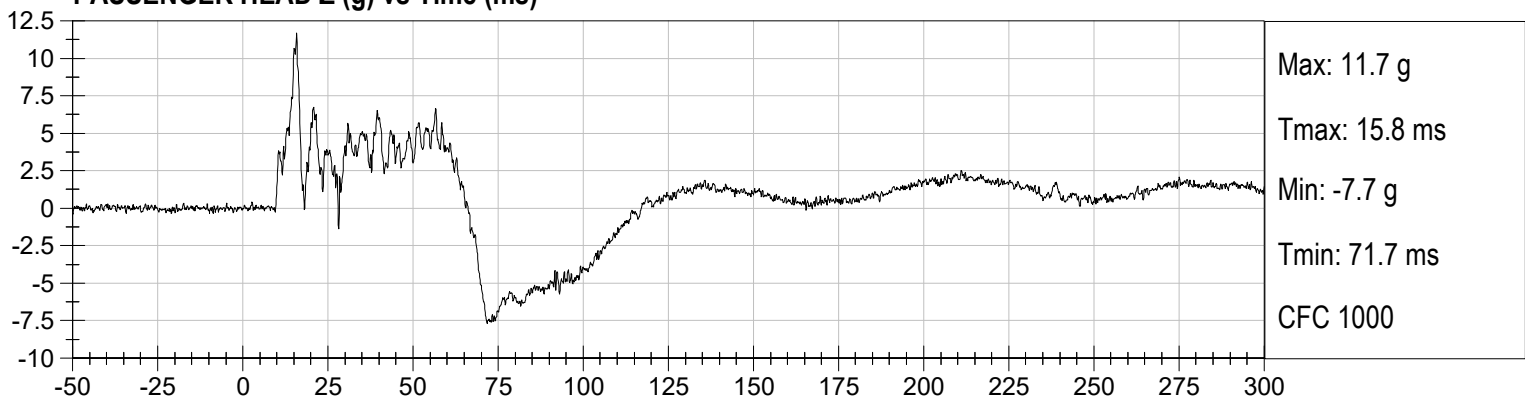
**PASSENGER HEAD X (g) vs Time (ms)**



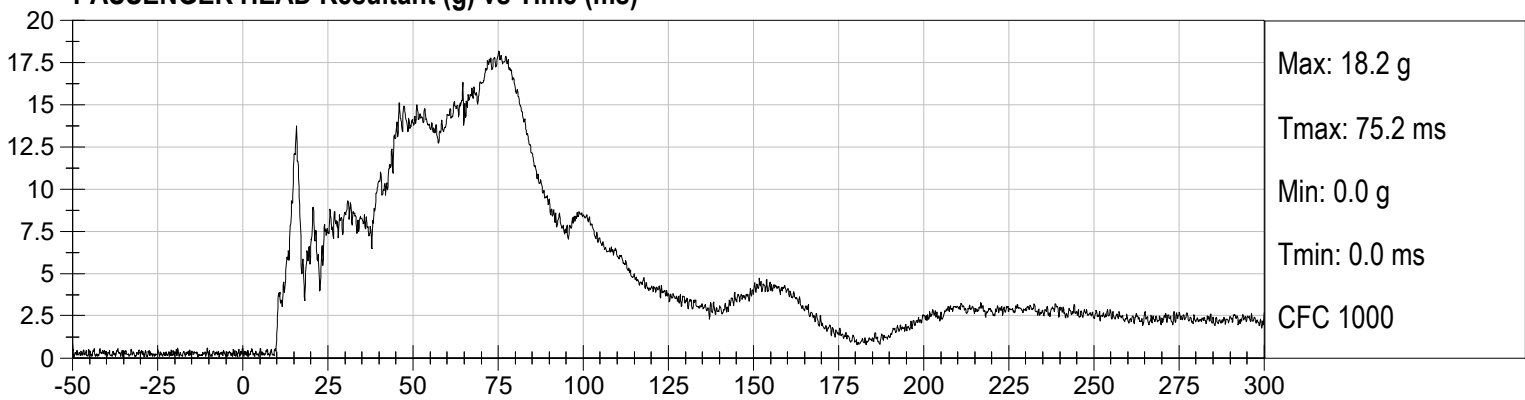
**PASSENGER HEAD Y (g) vs Time (ms)**



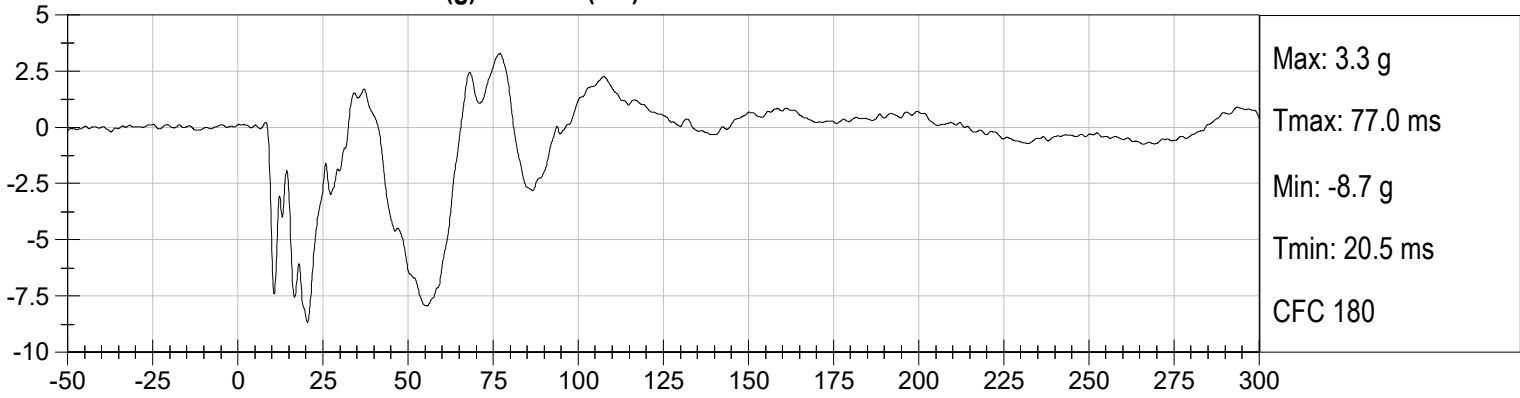
**PASSENGER HEAD Z (g) vs Time (ms)**



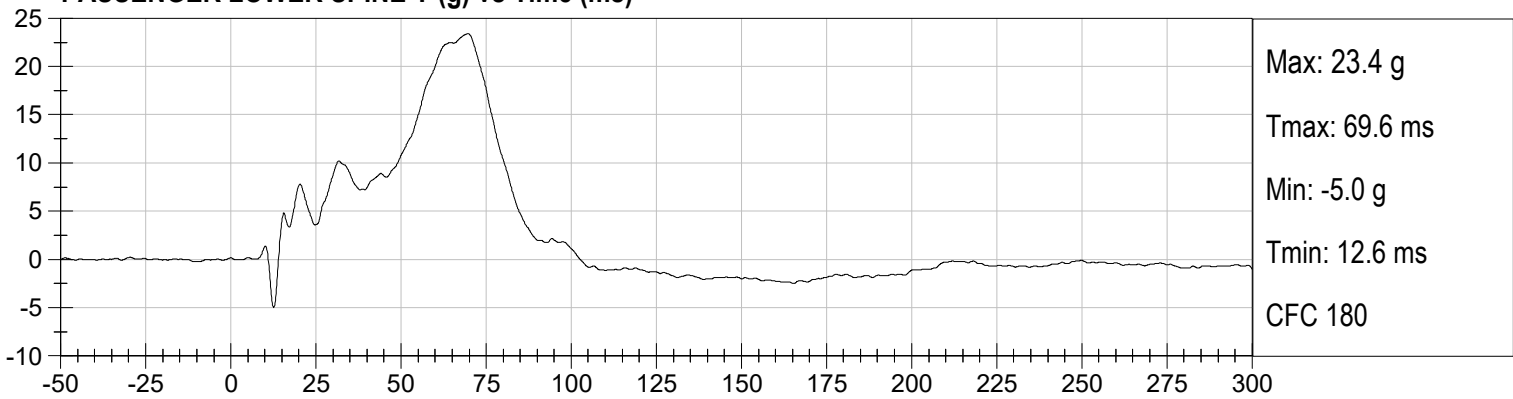
**PASSENGER HEAD Resultant (g) vs Time (ms)**



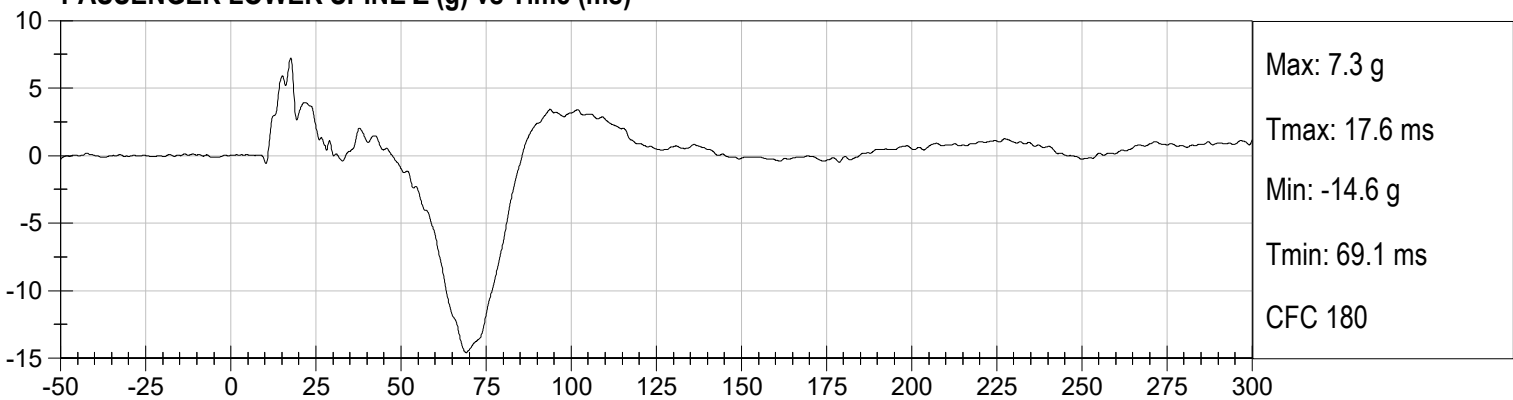
**PASSENGER LOWER SPINE X (g) vs Time (ms)**



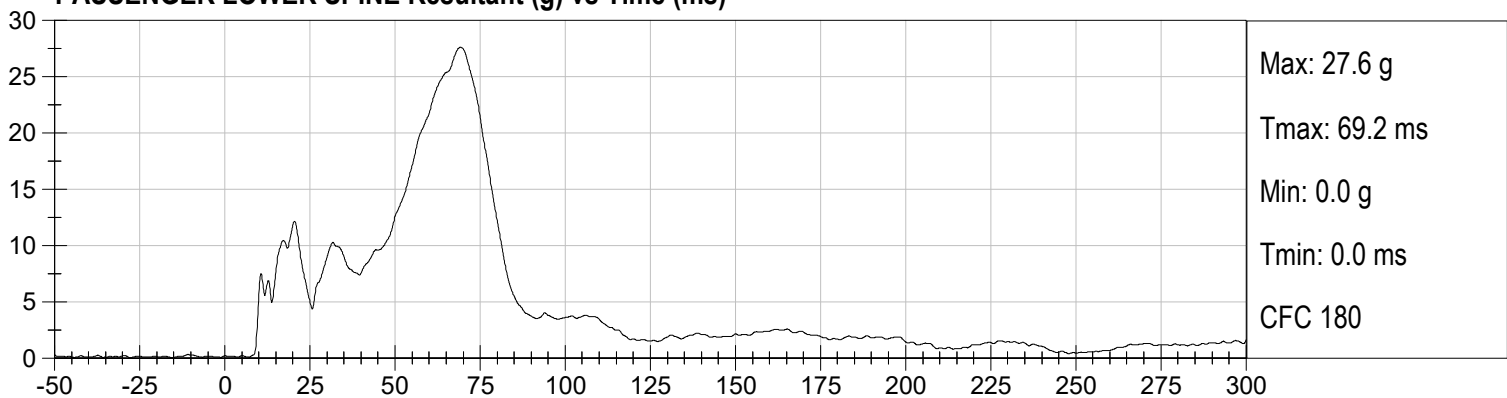
**PASSENGER LOWER SPINE Y (g) vs Time (ms)**



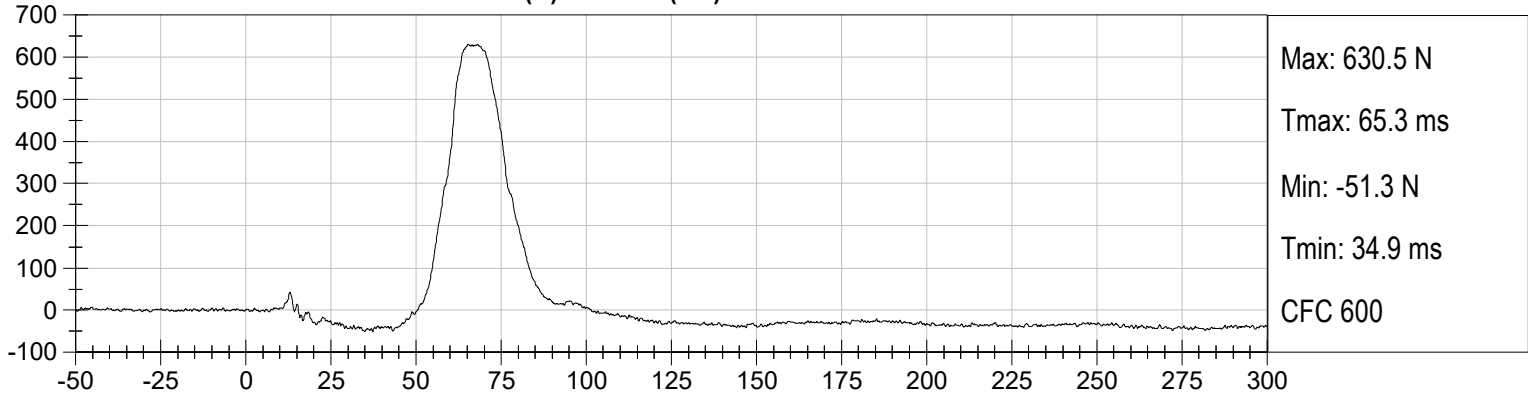
**PASSENGER LOWER SPINE Z (g) vs Time (ms)**



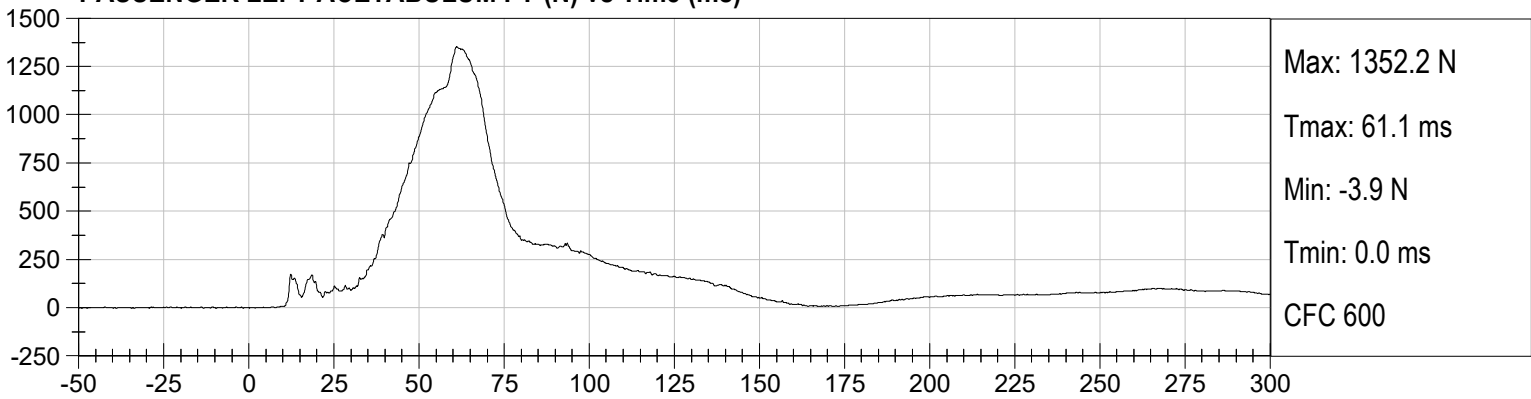
**PASSENGER LOWER SPINE Resultant (g) vs Time (ms)**



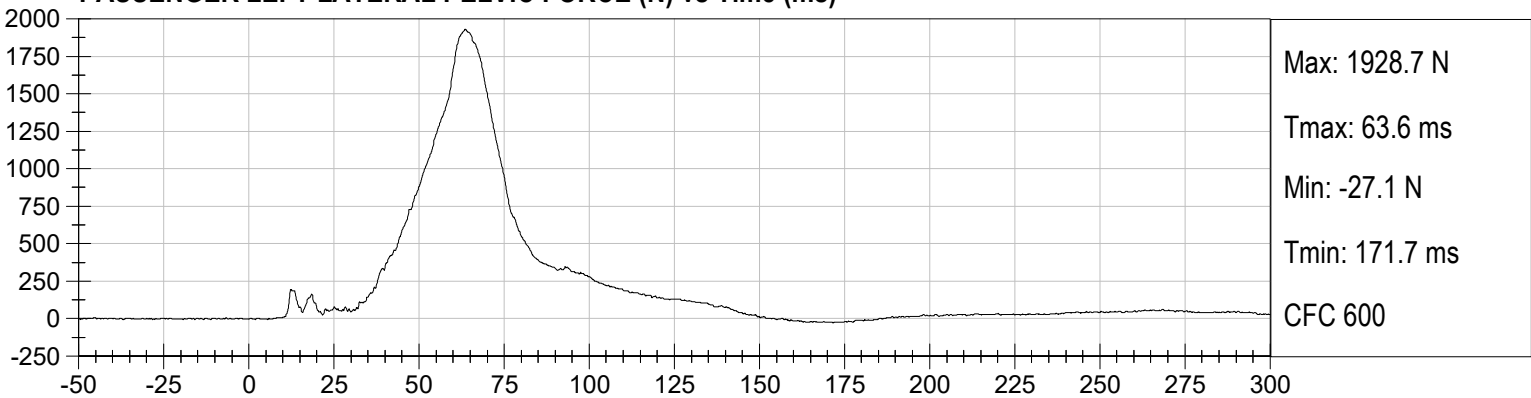
**PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)**



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



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



**APPENDIX C**  
**DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION**

**QUALIFICATION TEST RESULTS**

**PRE-TEST**

**EUROSID 2 (ES-2RE) MALE – DRIVER ATD**

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

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

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

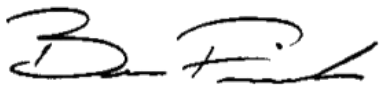
ATD Serial No:       F032      

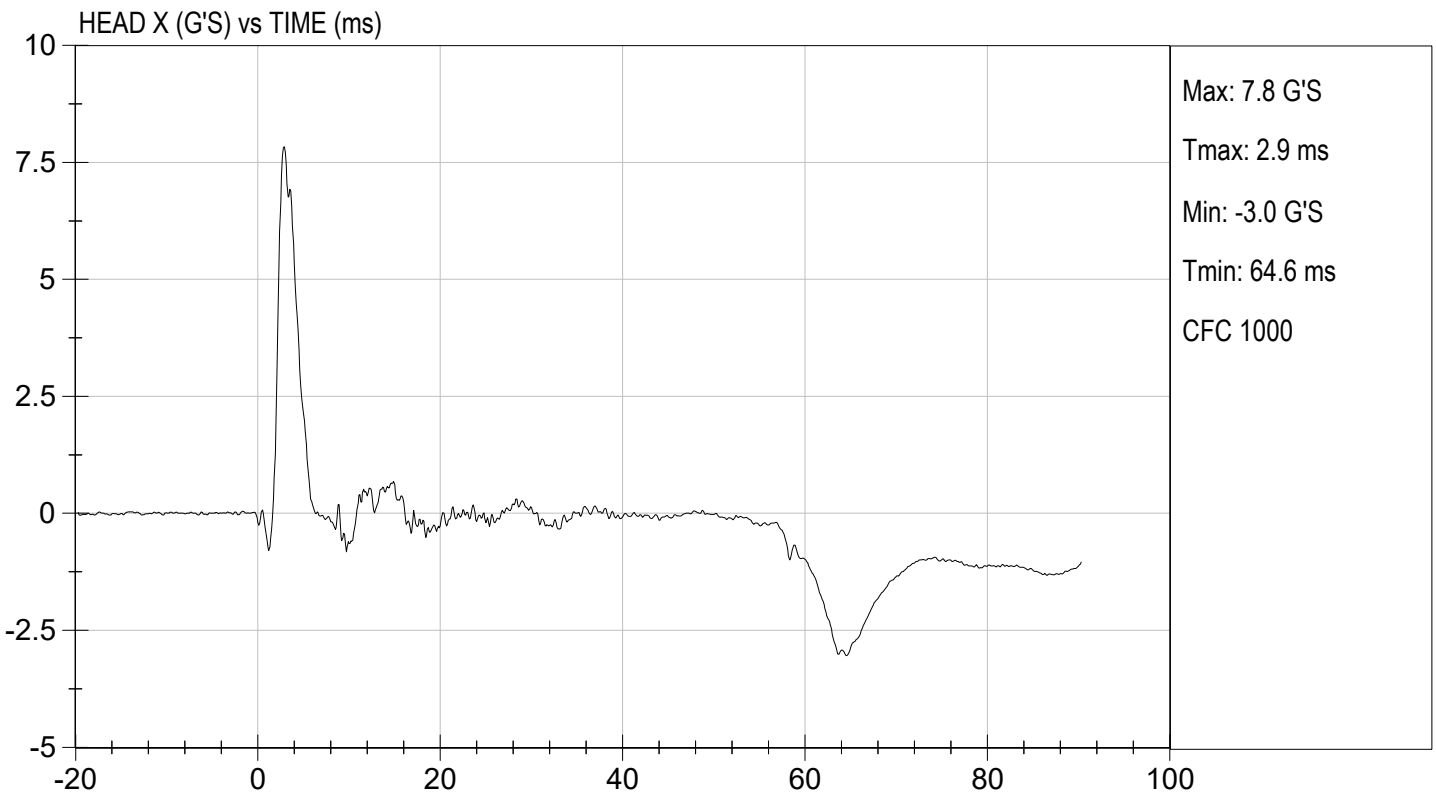
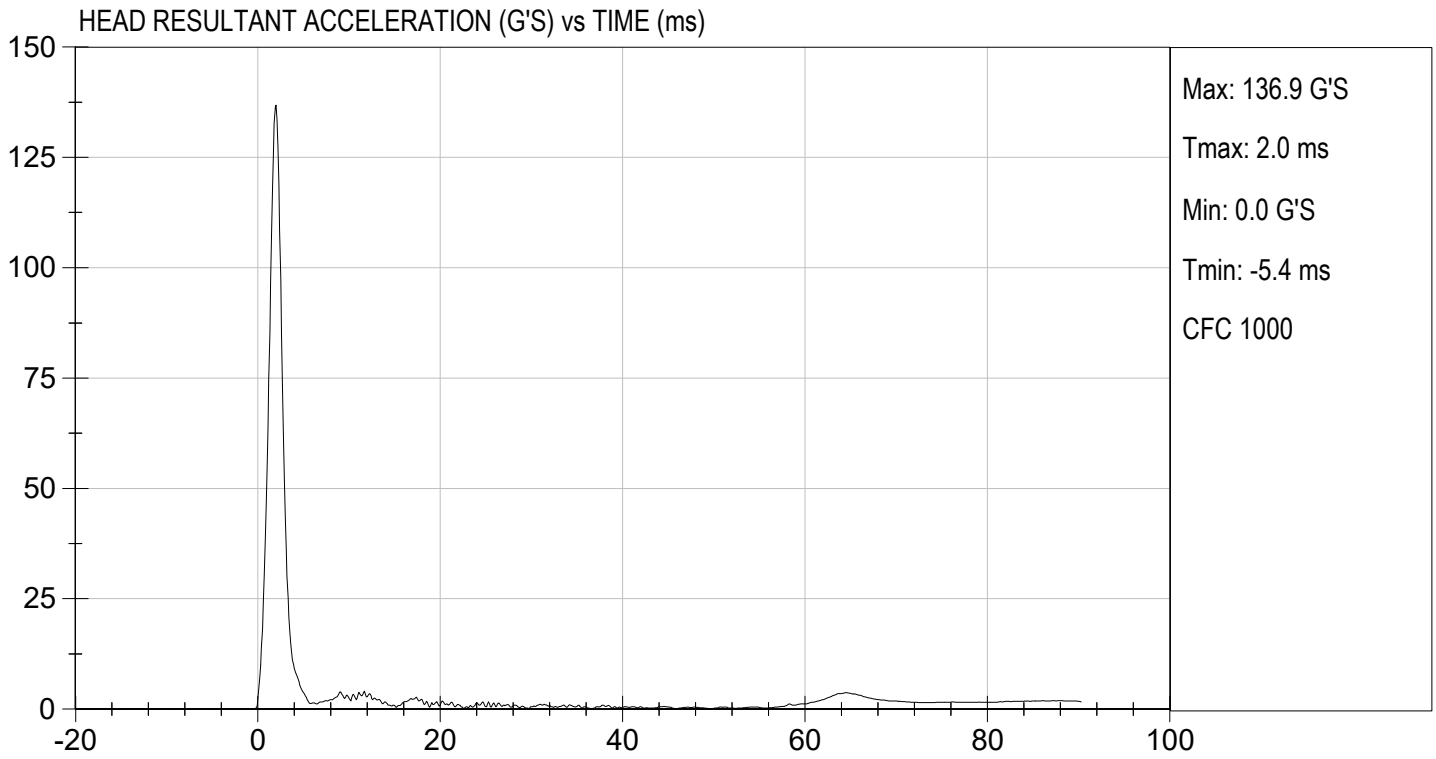
Test ID:       D233071      

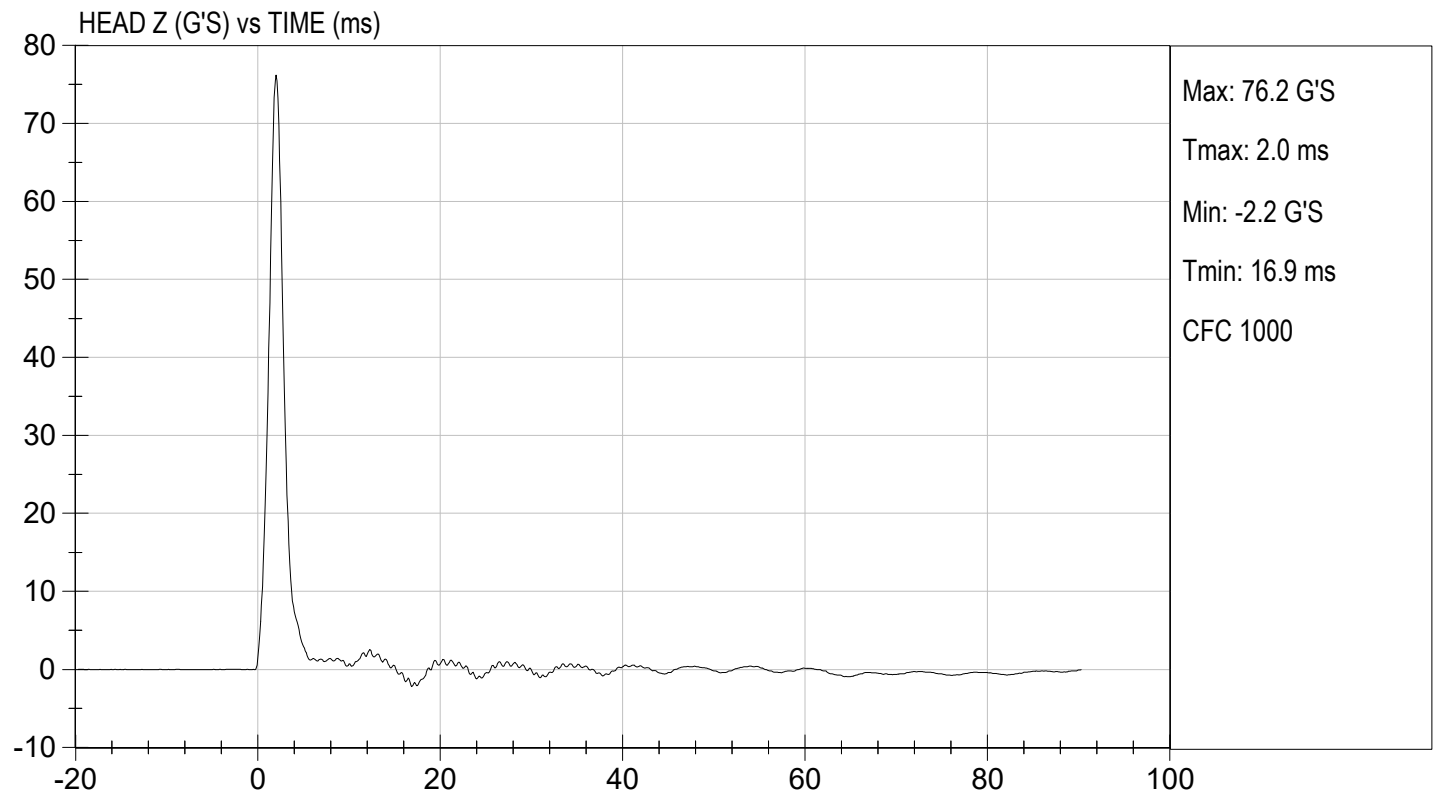
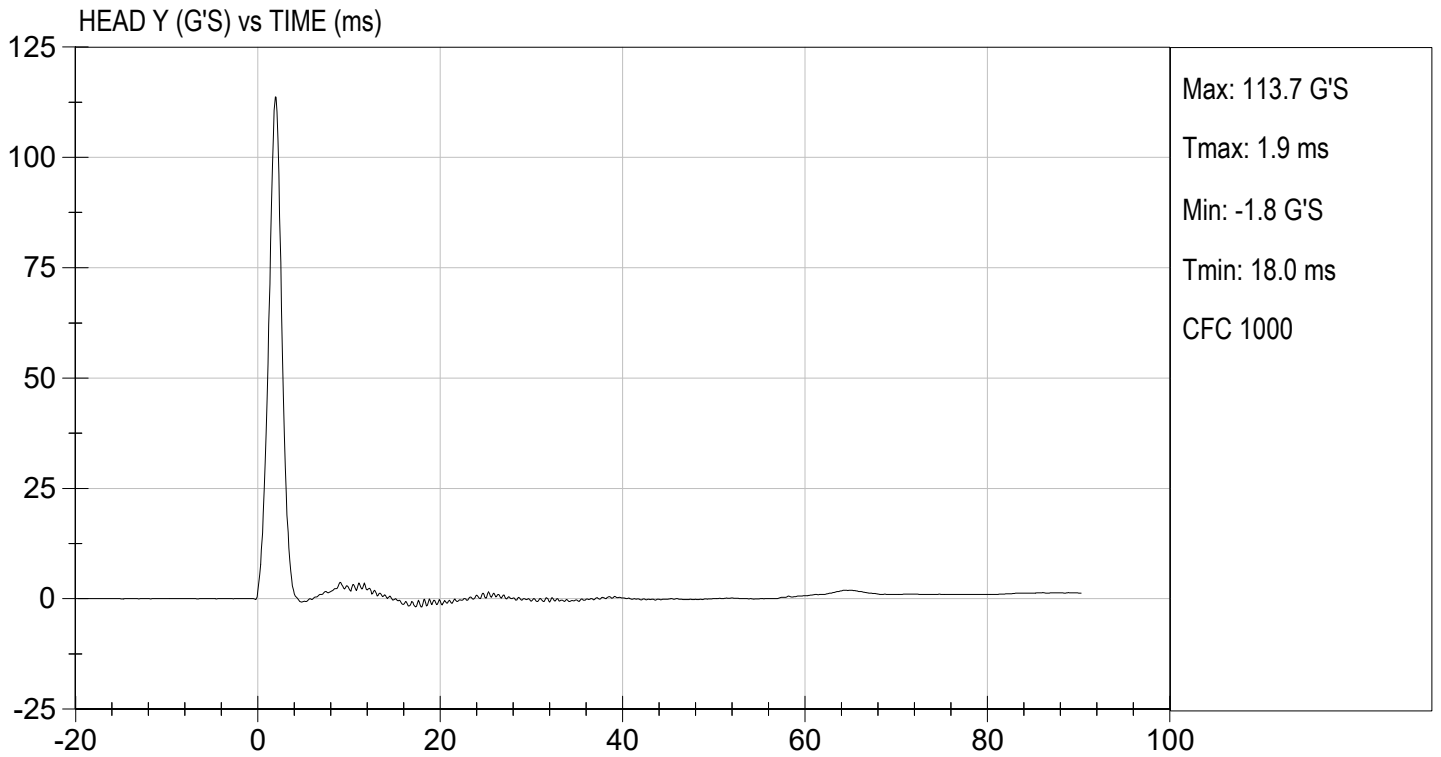
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	125 to 155	137	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	7.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass

  
 \_\_\_\_\_  
 Laboratory Technician

11/13/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

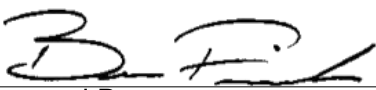
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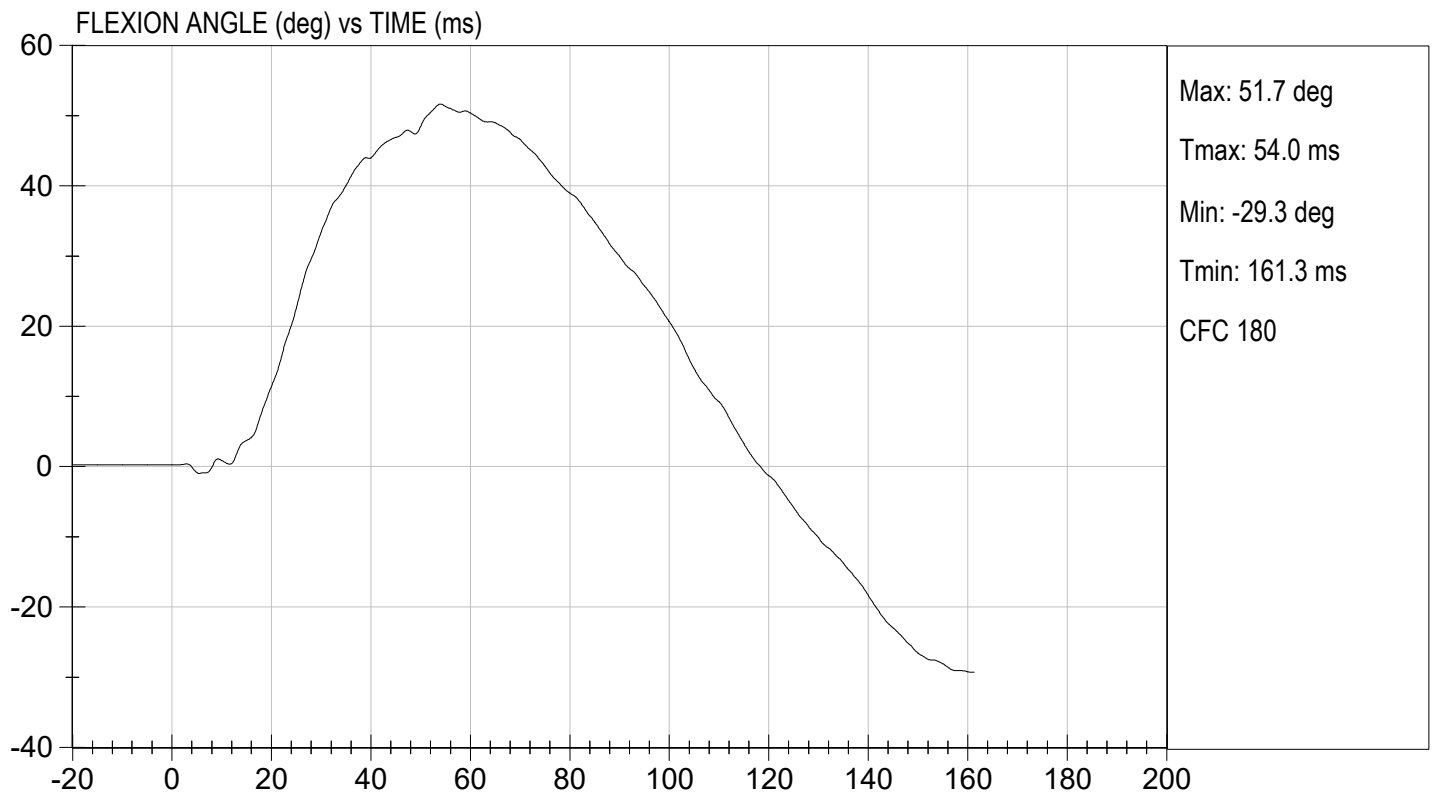
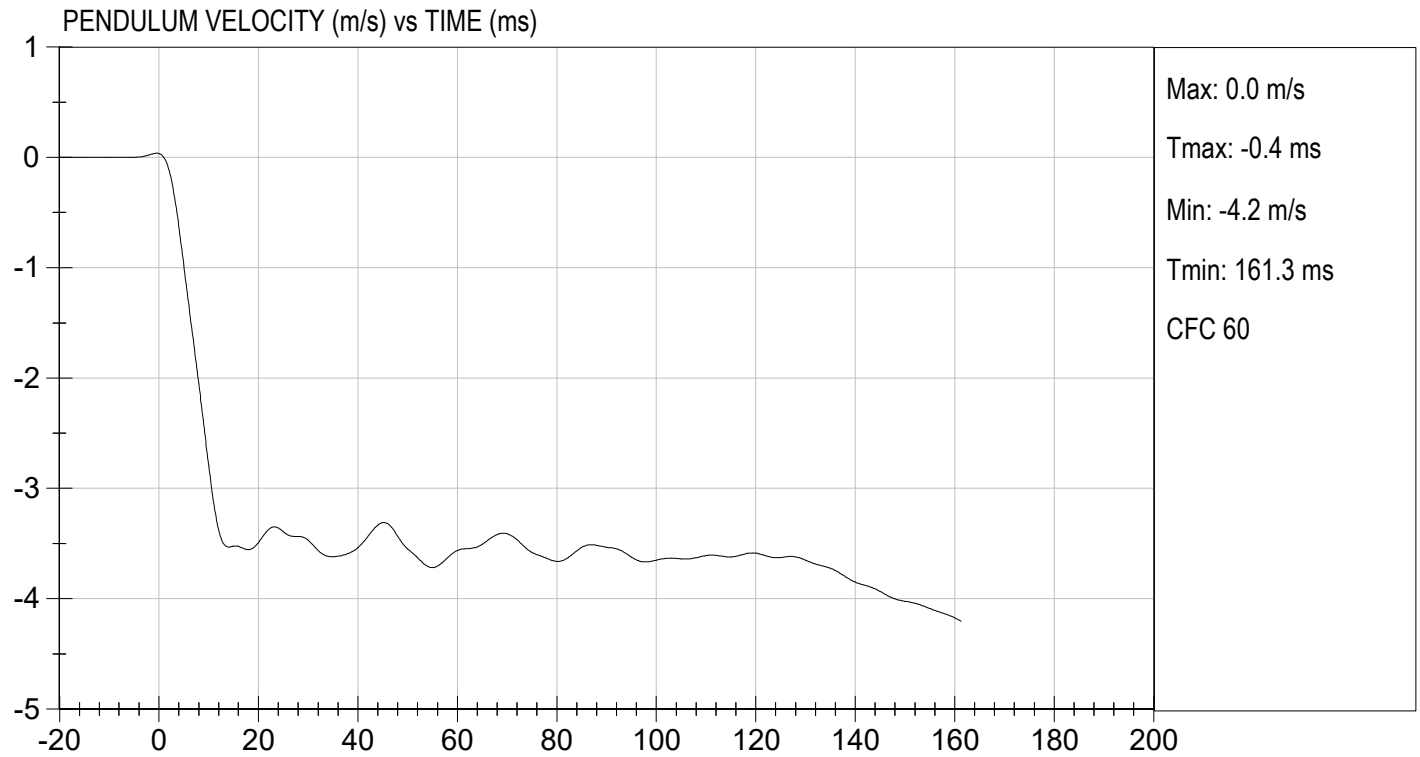
Test I.D.:           D233072          

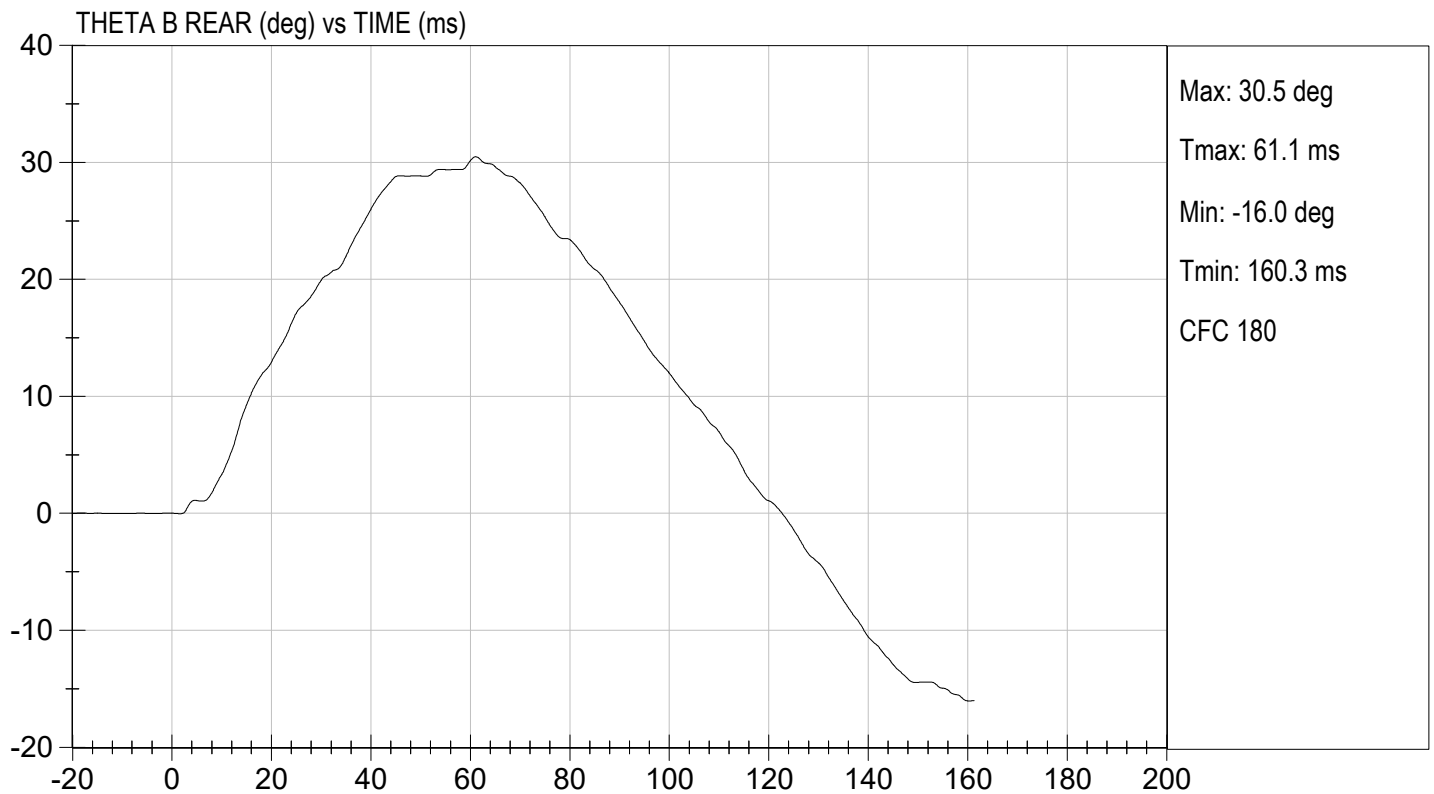
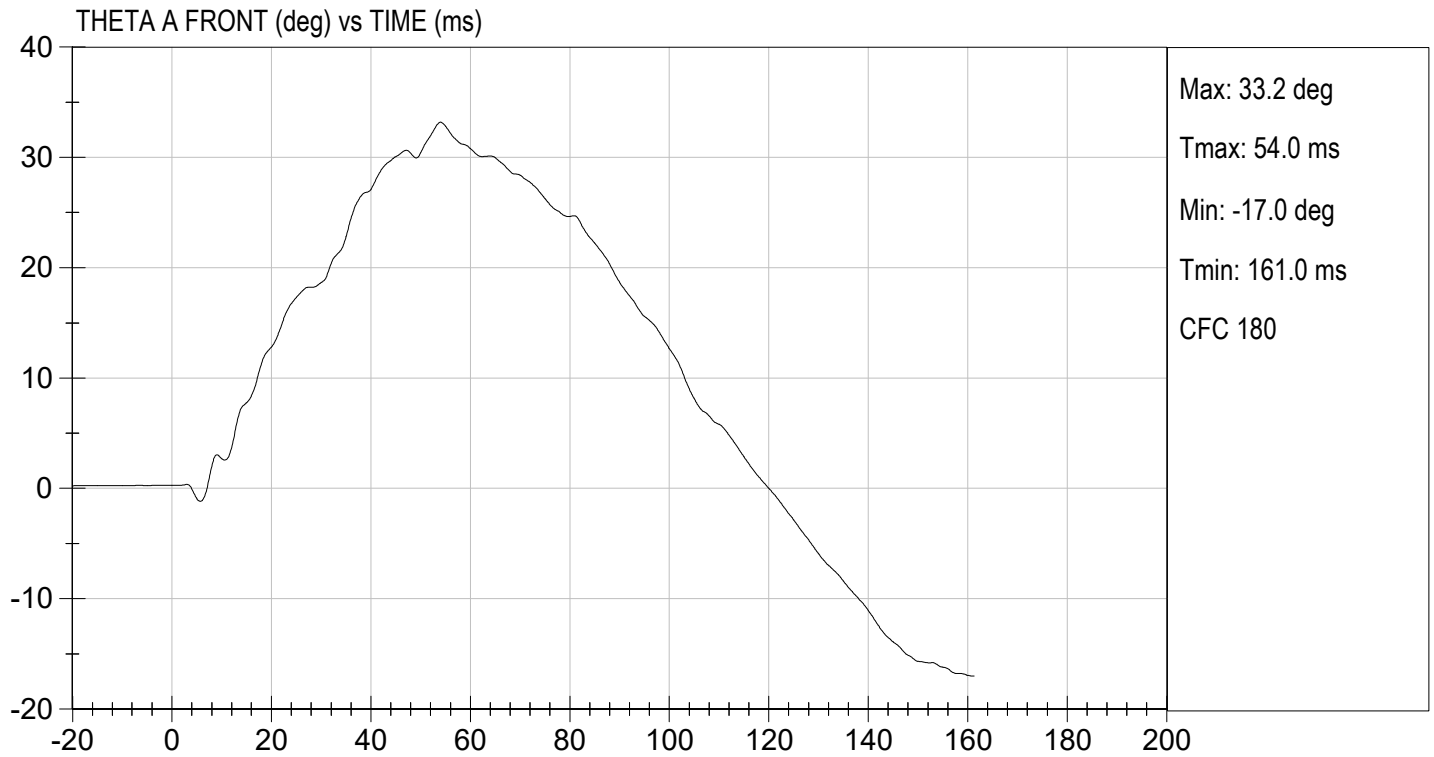
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.00	Pass
	3 ms	m/s	-0.25 to -0.375	-0.32	Pass
	14 ms	m/s	-3.20 to -3.70	-3.53	Pass
	17 ms	m/s	>= -3.70	-3.54	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.7	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	54.0	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	64.4	Pass
Overall Results					Pass

  
 \_\_\_\_\_  
 Laboratory Technician

11/13/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By

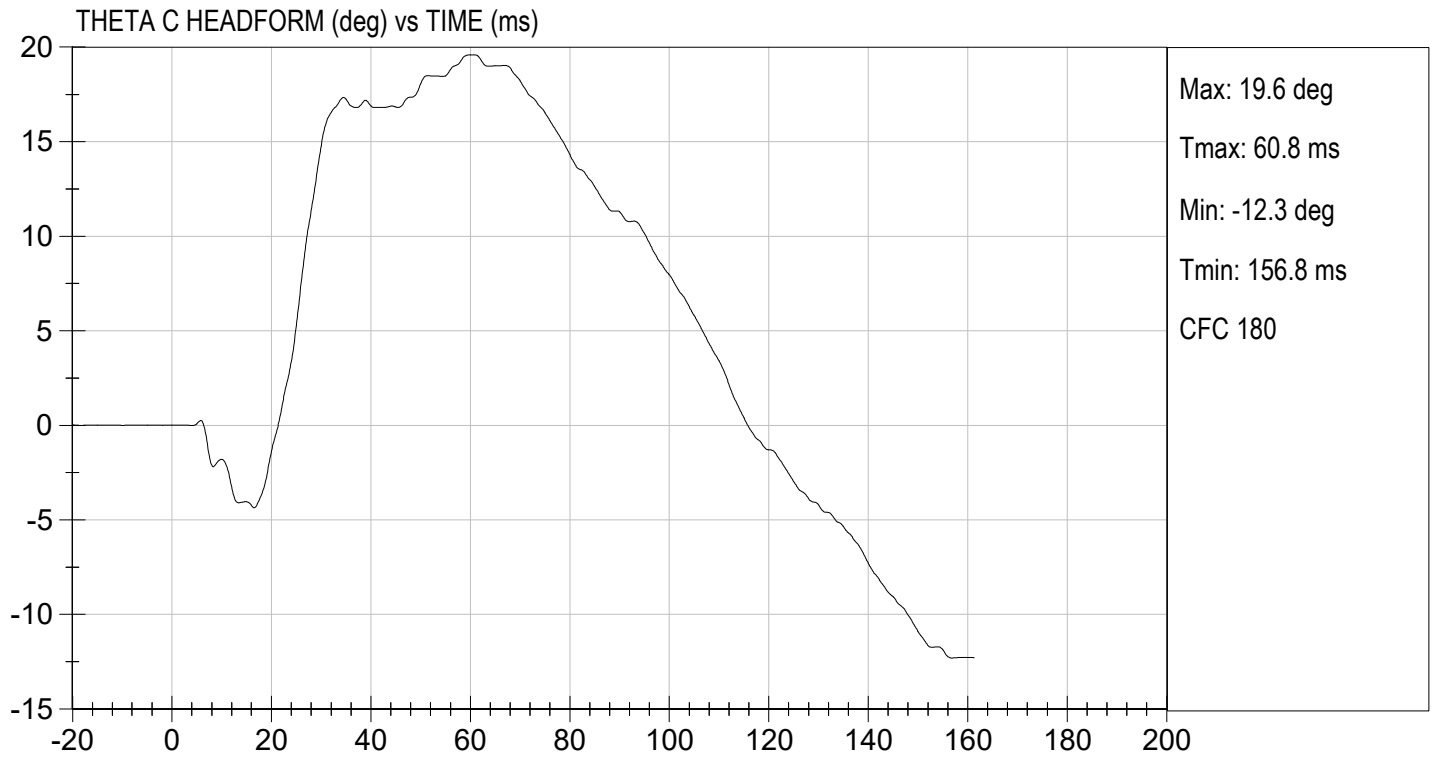






TEST DESC: NECK BENDING  
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 11/13/2023  
TEST #: D233072



**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

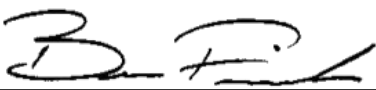
ATD Serial No:       F032      

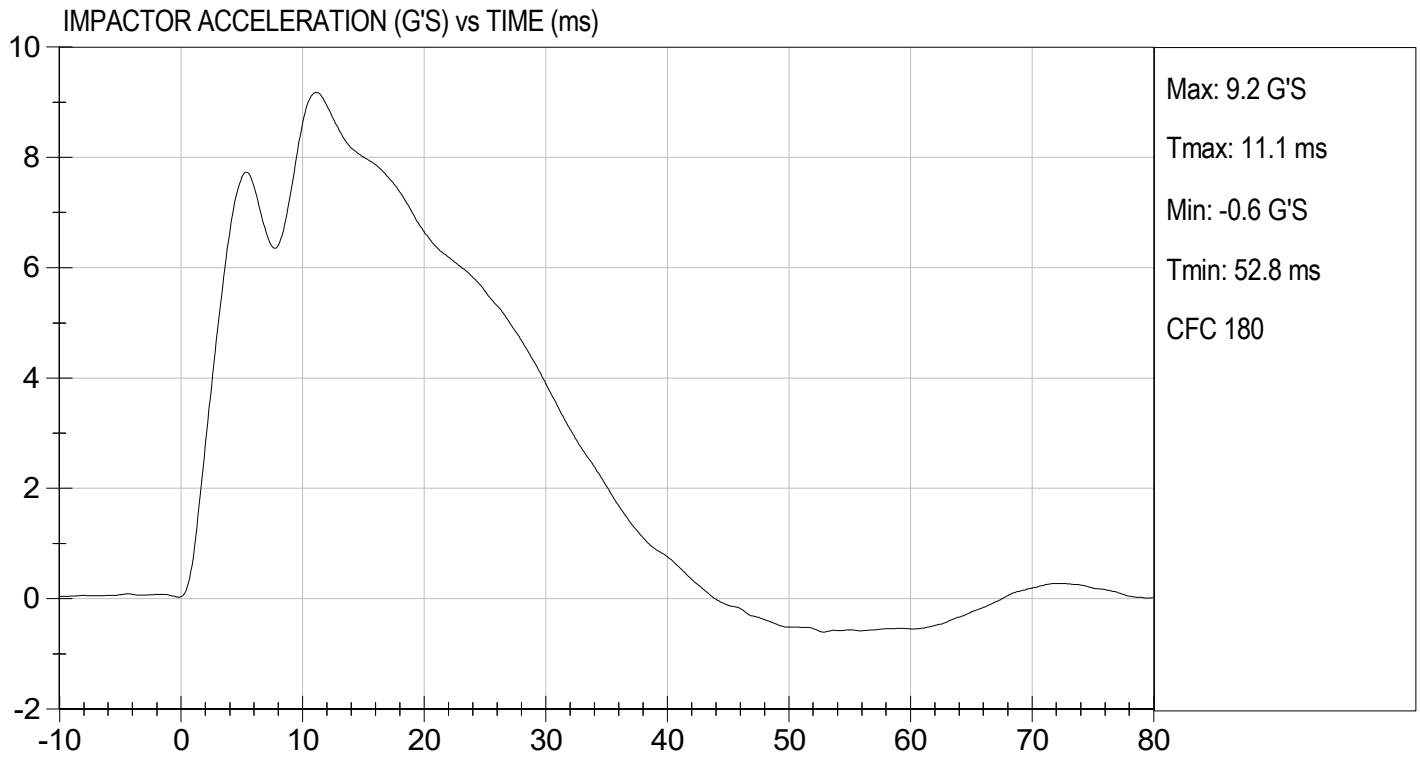
Test I.D:       D233073      

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	26	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.2	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

11/13/2023  
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

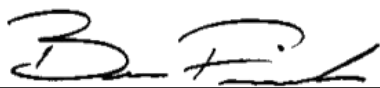
**ATD Serial No:**       F032      

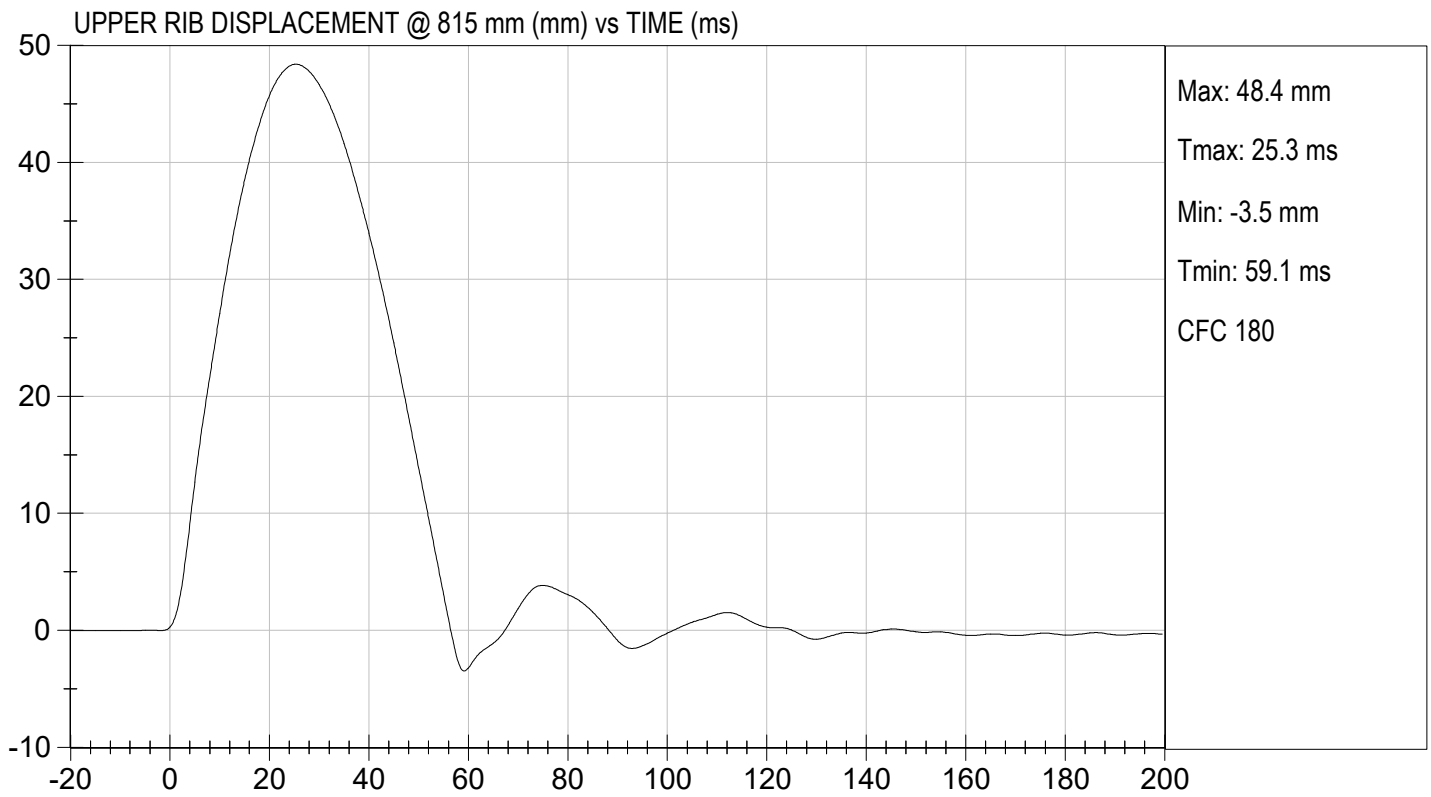
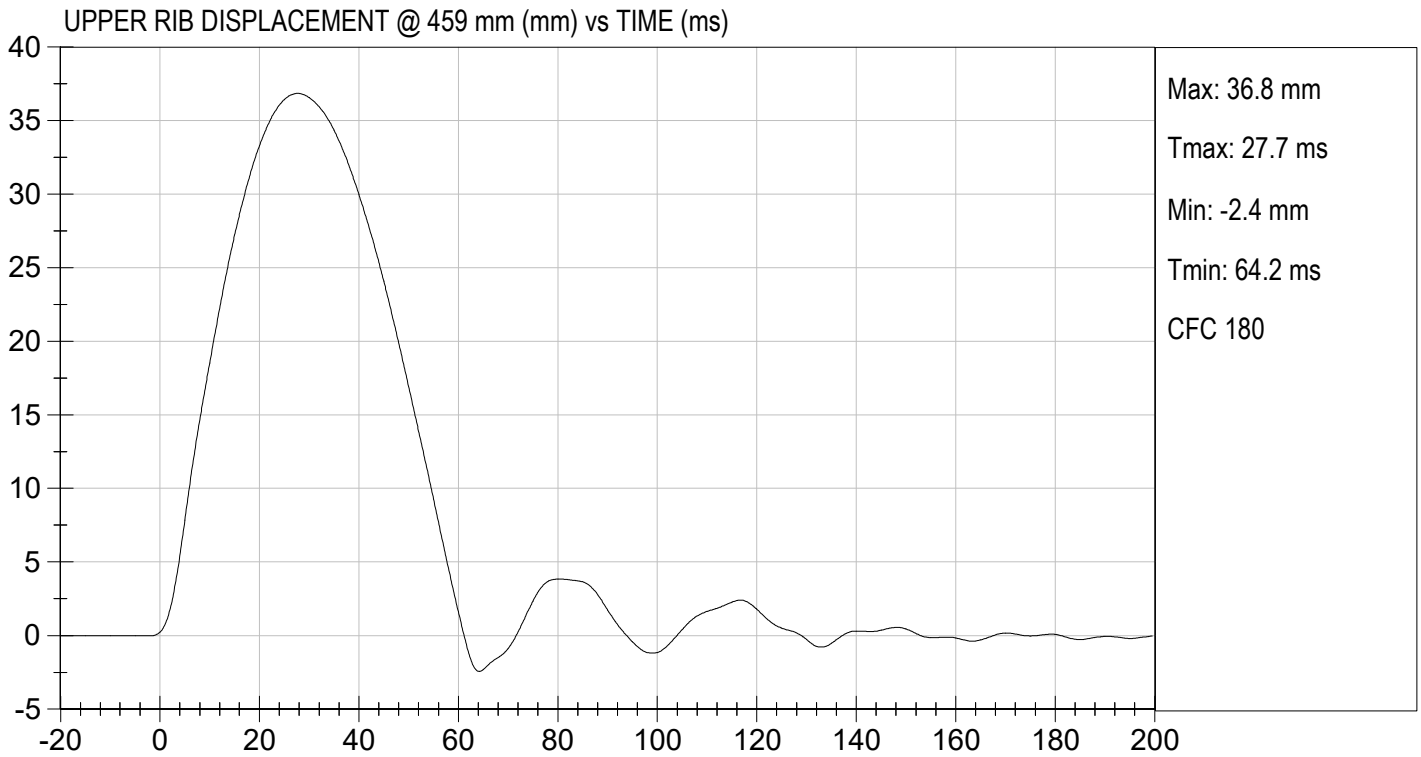
**Test I.D.:**       D233074      

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	27	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.8	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.4	Pass
			Overall Test Results	Pass

  
\_\_\_\_\_  
Laboratory Technician

11/13/2023  
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**MID RIB TEST**

**ES-2re DUMMY**

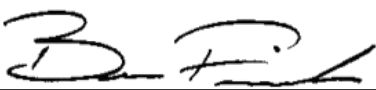
**ATD Serial No:**       F032      

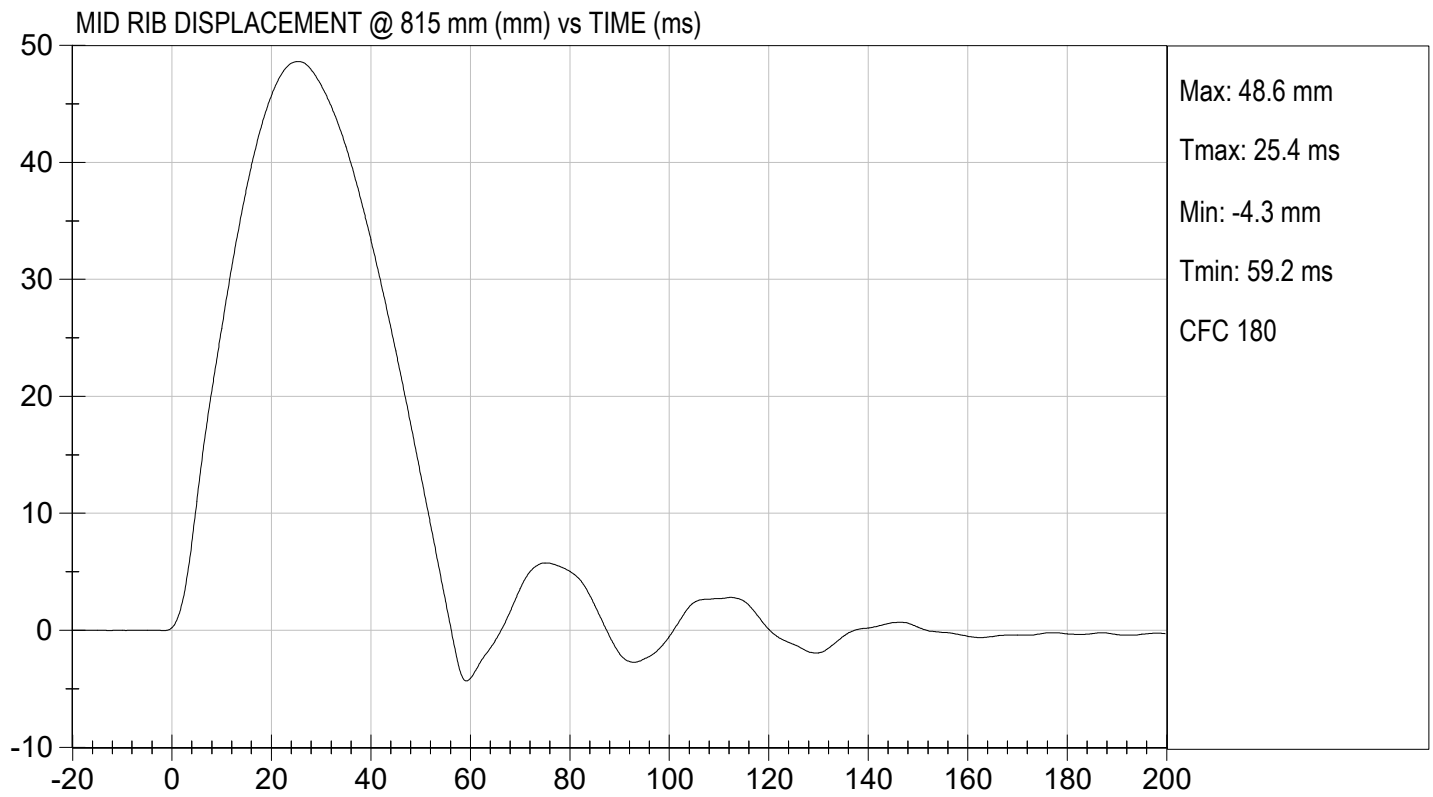
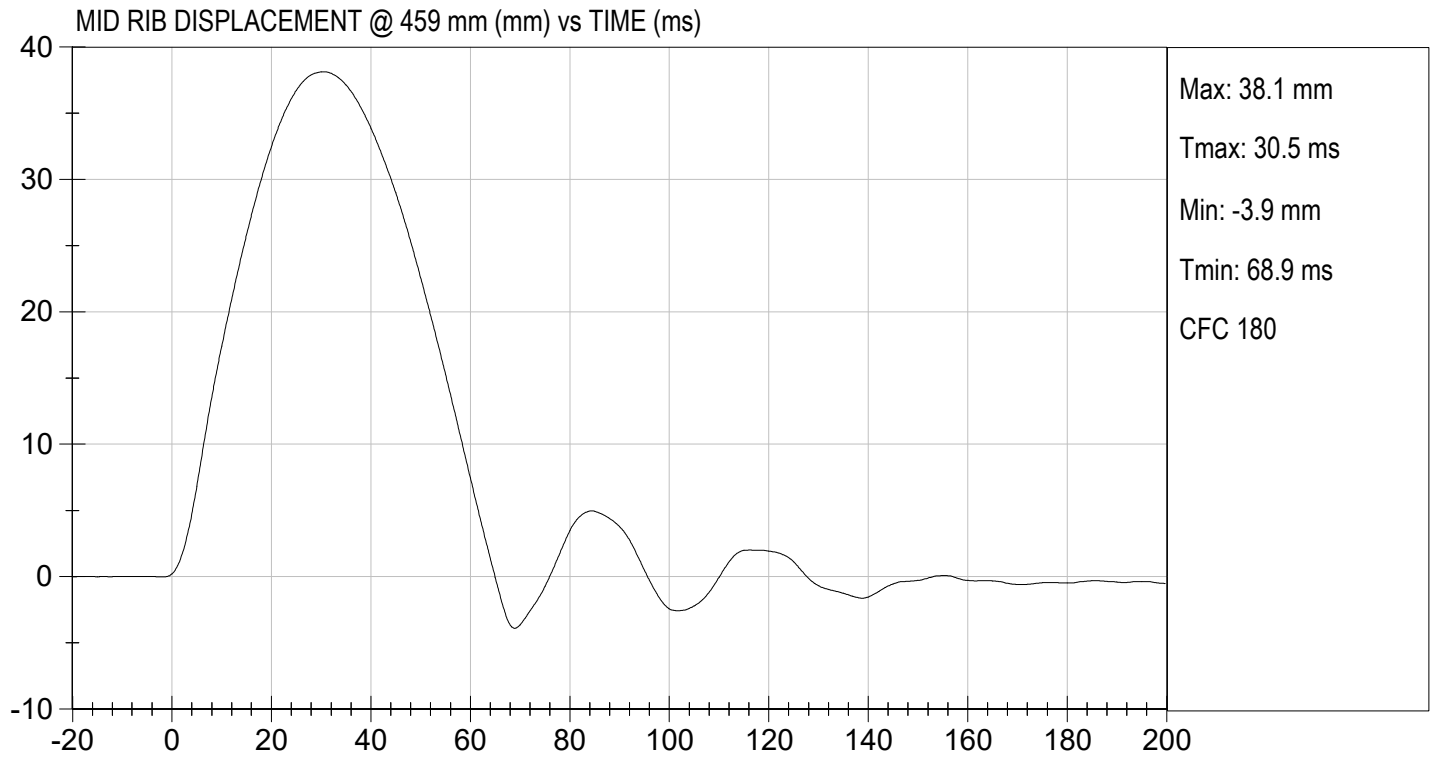
**Test I.D.:**       D233075      

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	27	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.1	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.6	Pass
			Overall Test Results	Pass

  
\_\_\_\_\_  
Laboratory Technician

      11/13/2023        
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

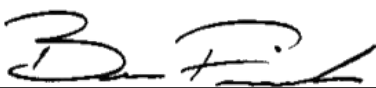
**ATD Serial No:**       F032      

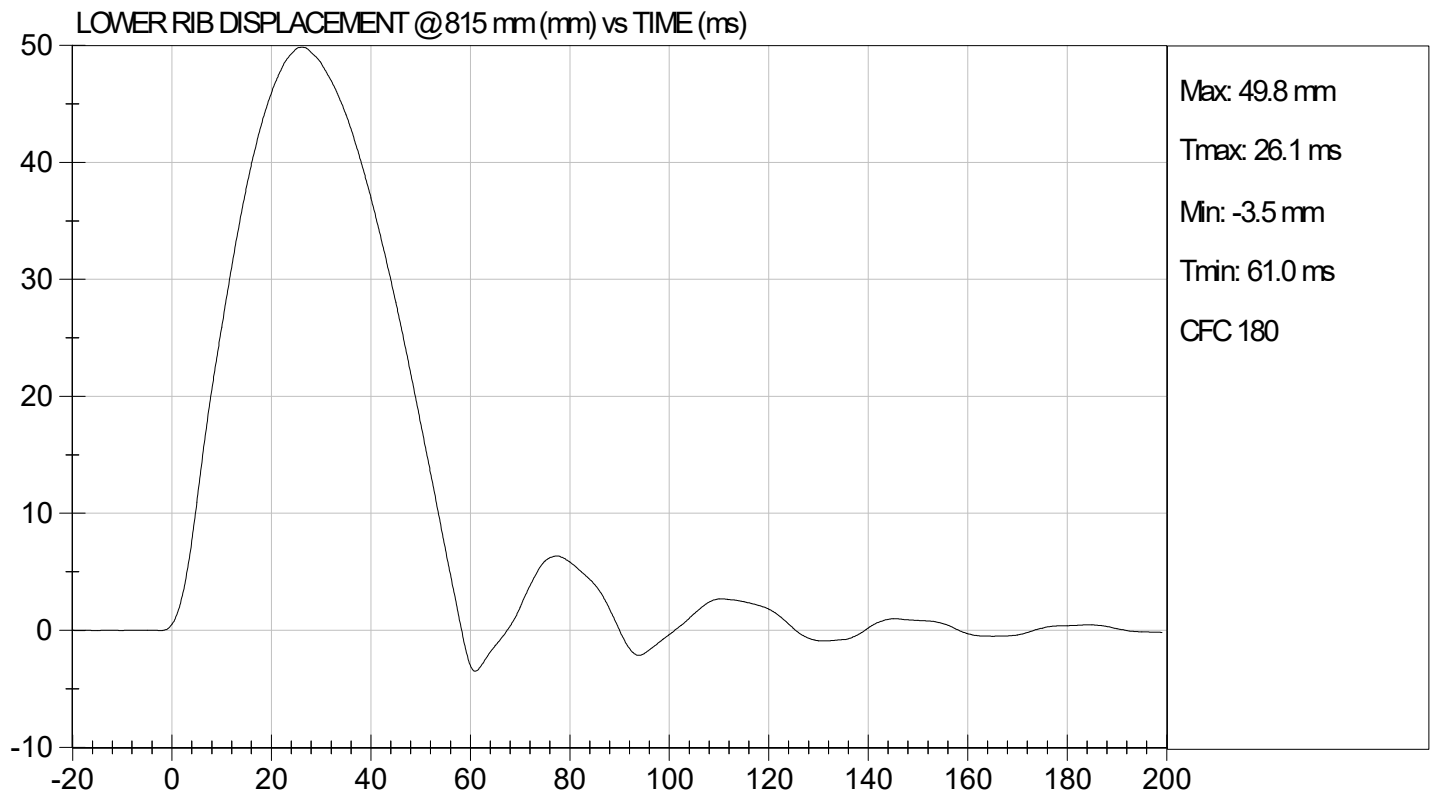
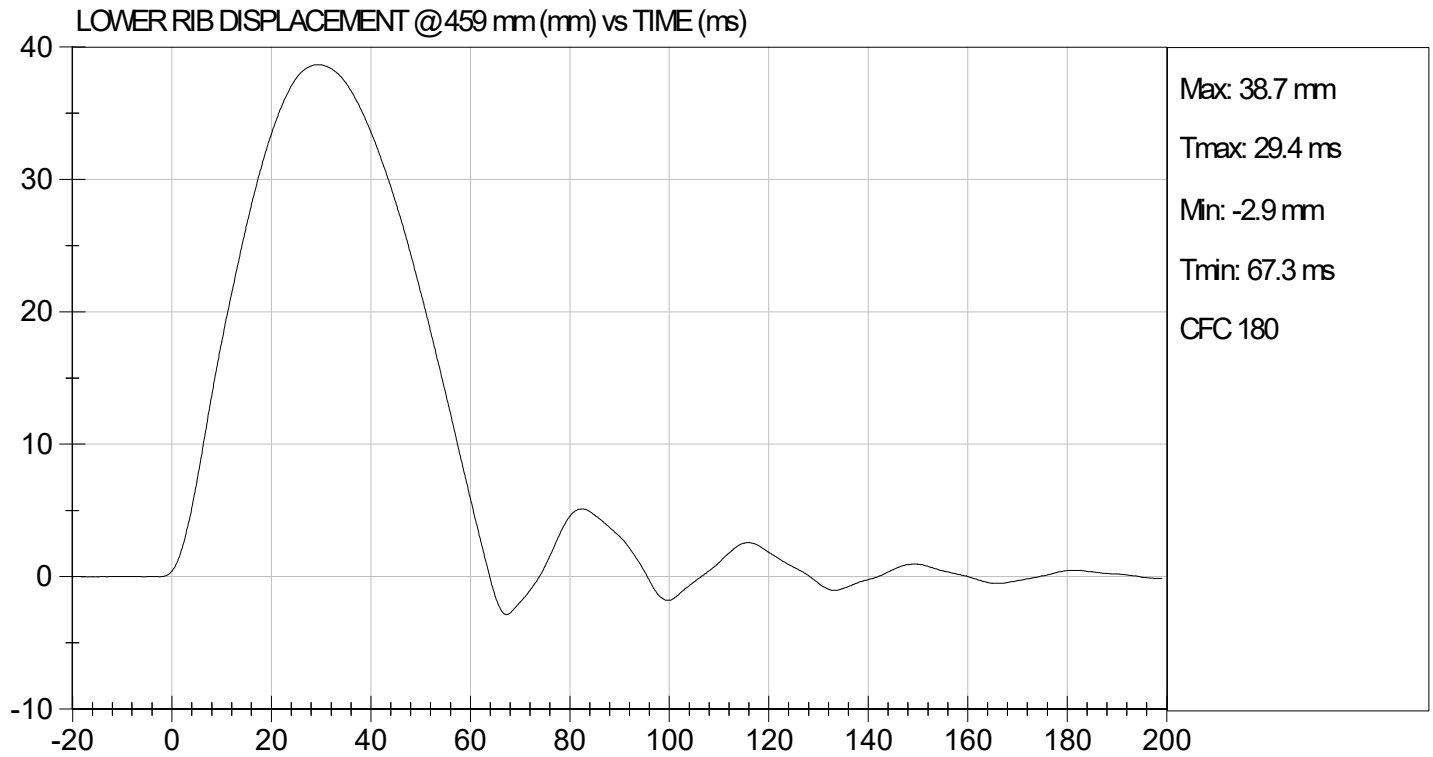
**Test I.D.:**       D233076      

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	27	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.7	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.8	Pass
			Overall Test Results	Pass

  
\_\_\_\_\_  
Laboratory Technician

      11/13/2023        
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**ABDOMEN TEST**

**ES-2re DUMMY**

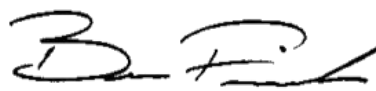
**ATD Serial No:**       F032      

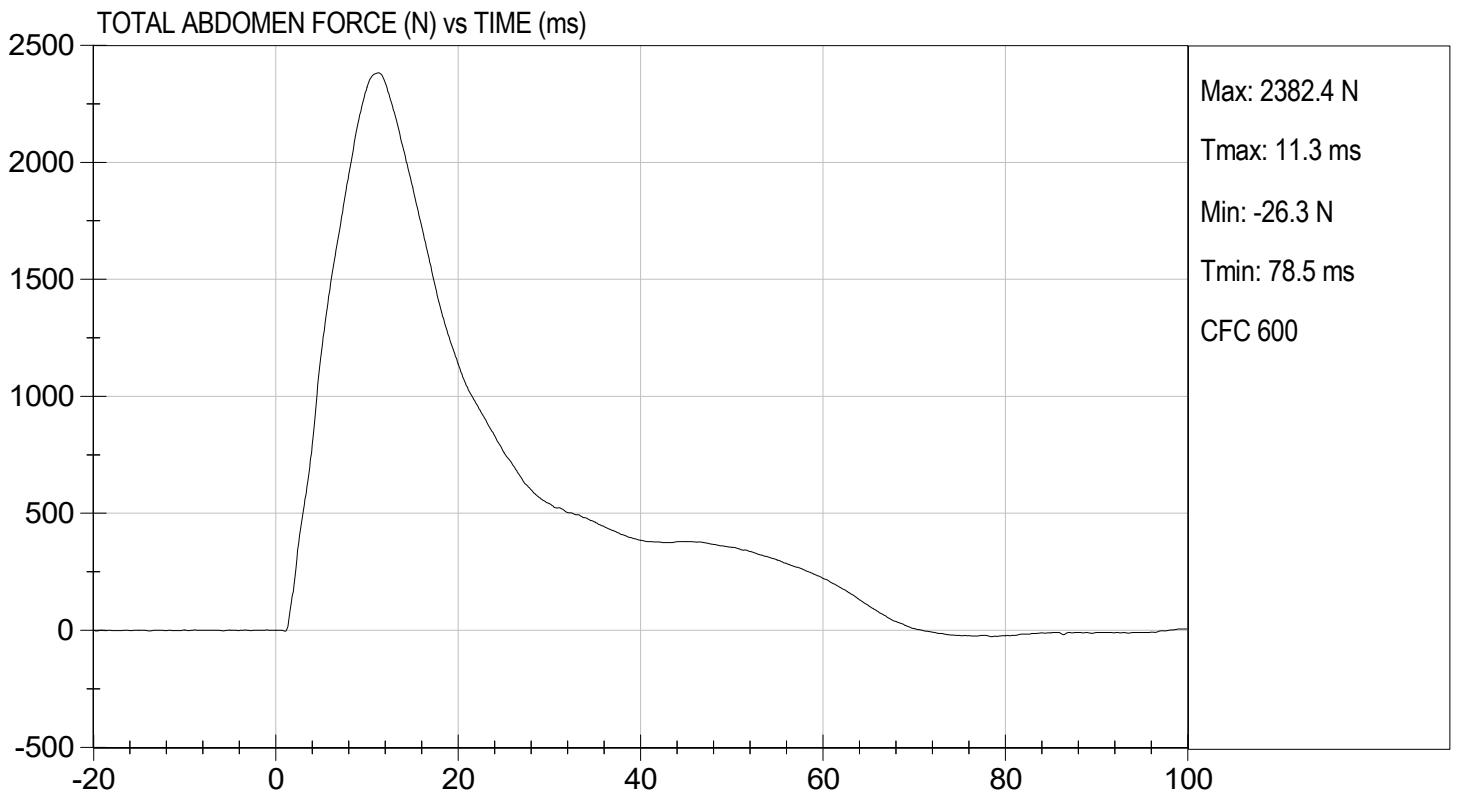
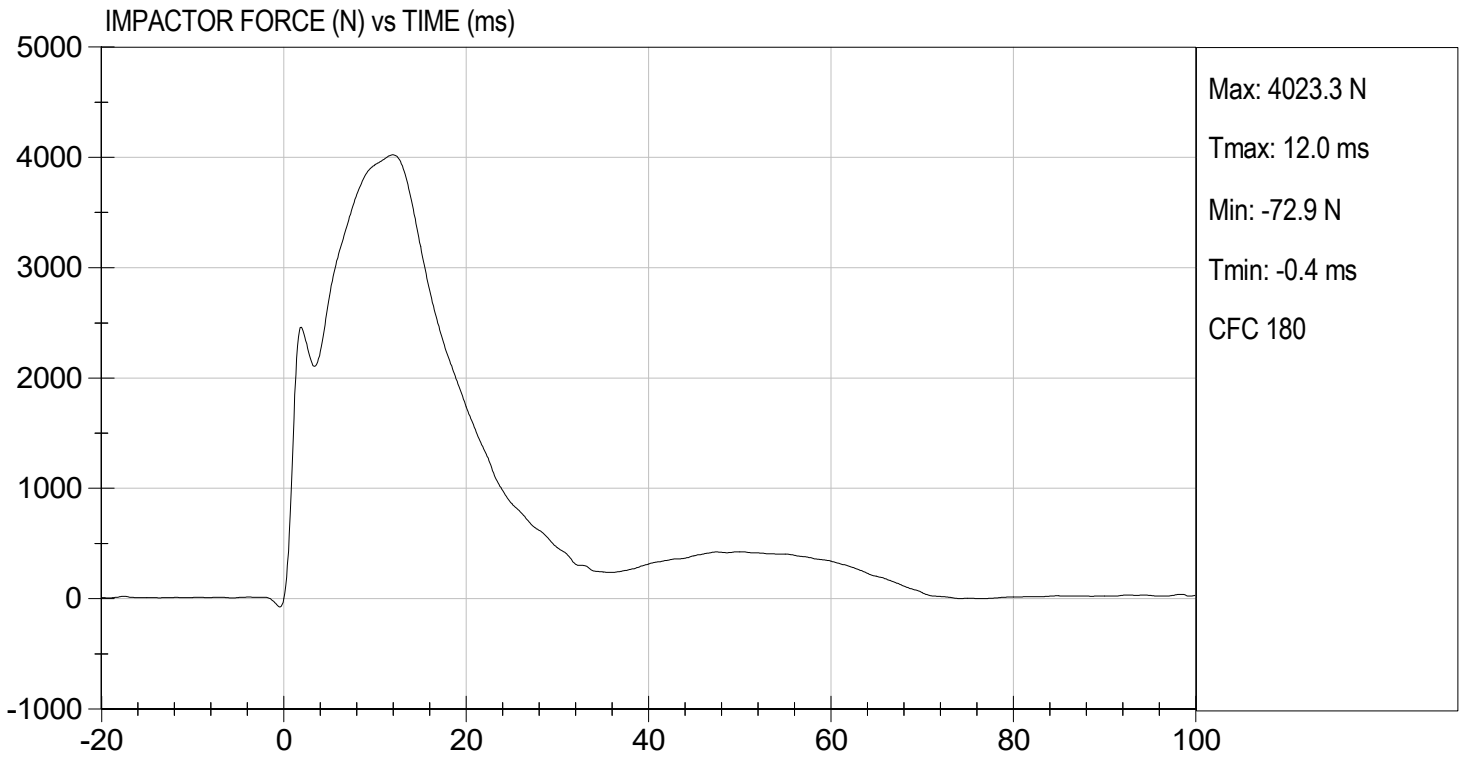
**Test I.D.:**       D233077      

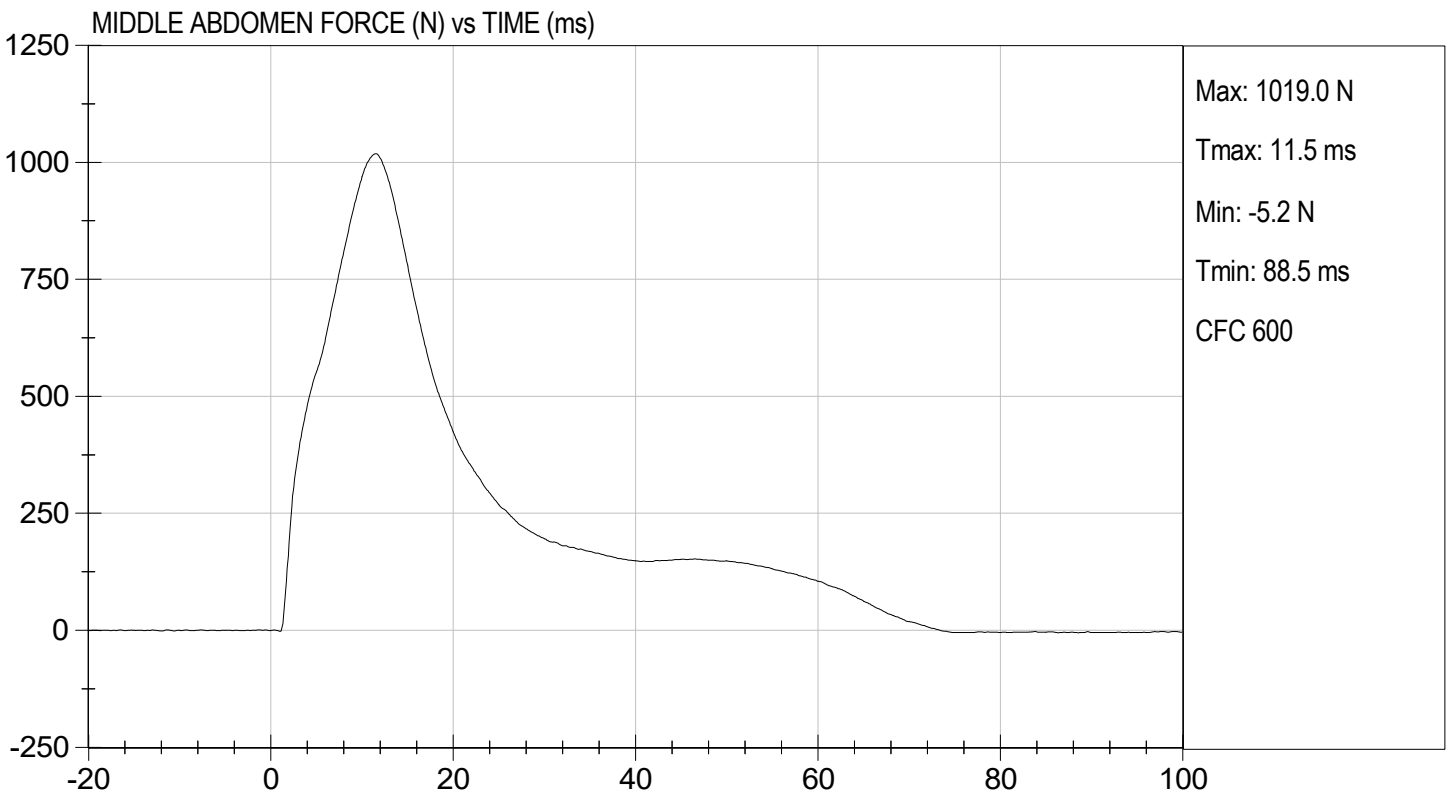
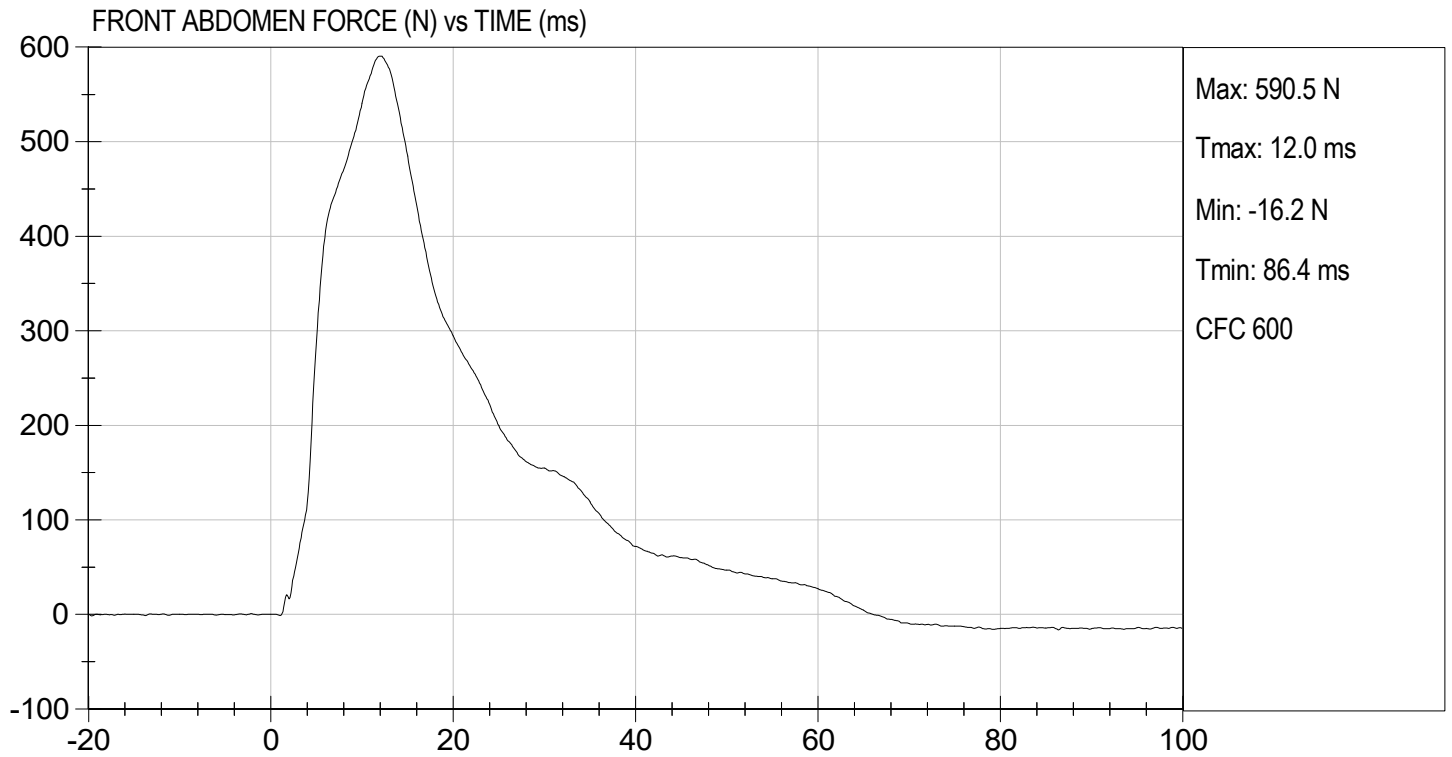
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4023	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	12.0	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2382	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.3	Pass
Overall Test Results				Pass

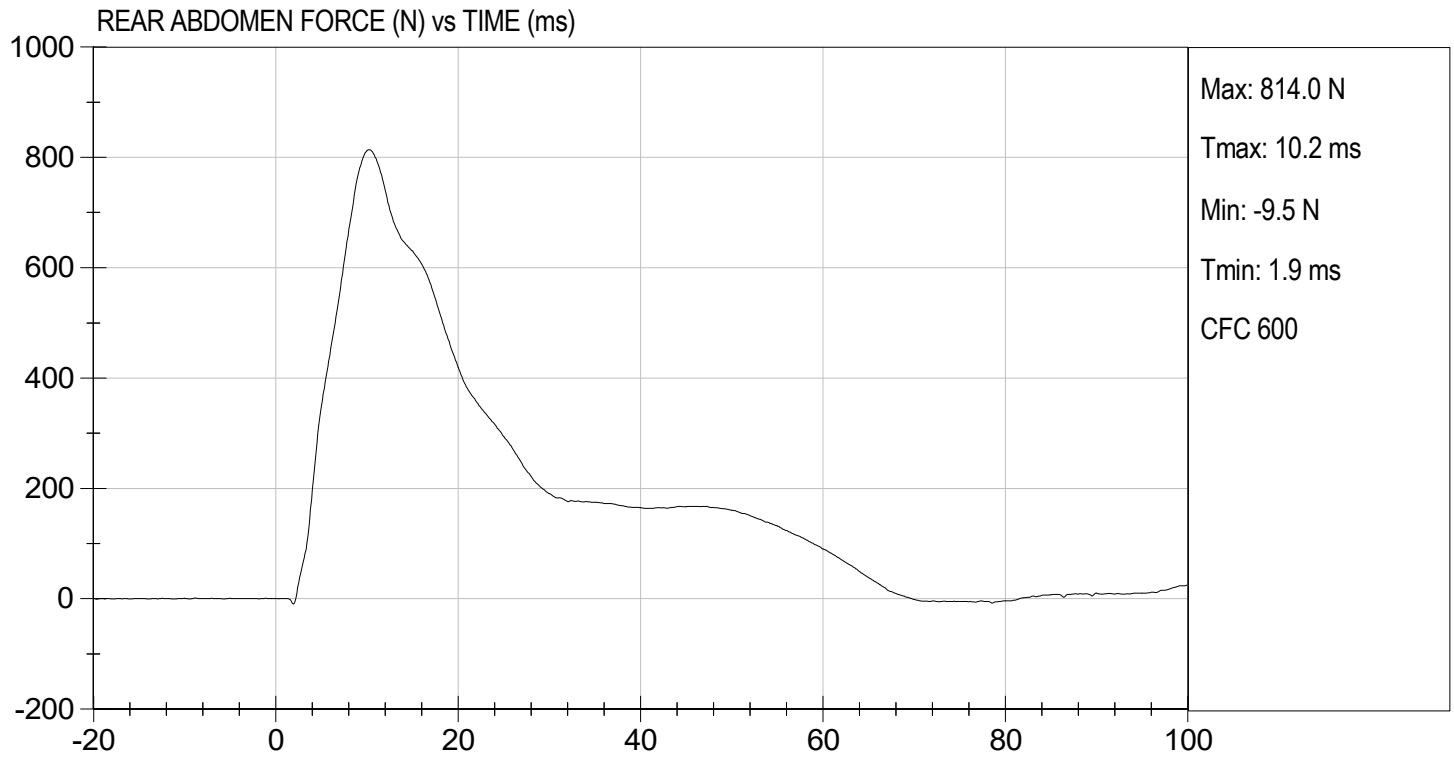
  
\_\_\_\_\_  
Laboratory Technician

11/13/2023  
Test Date

  
\_\_\_\_\_  
Approved By







**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

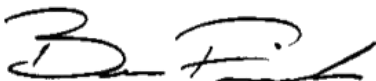
ATD Serial No:           F032          

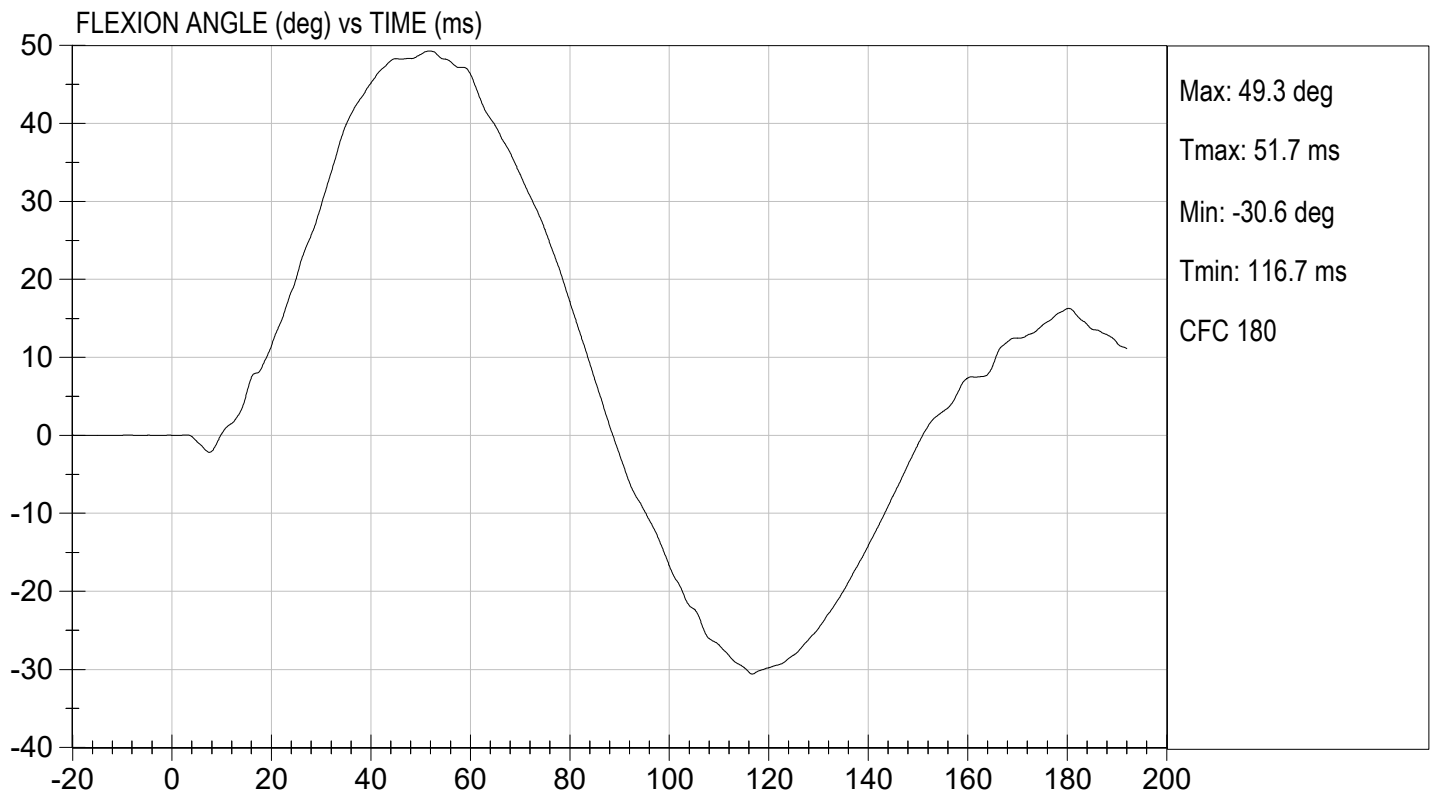
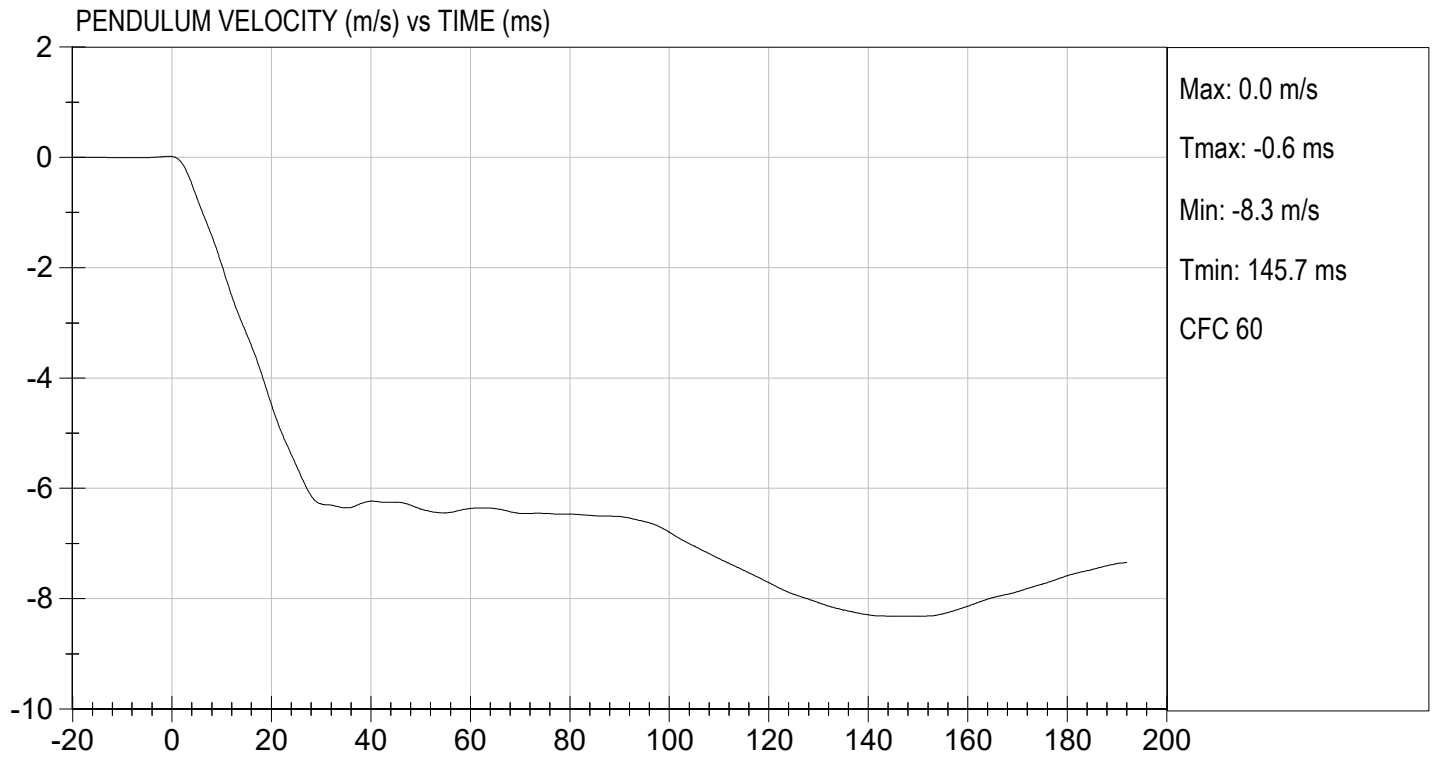
Test I.D.:           D233078          

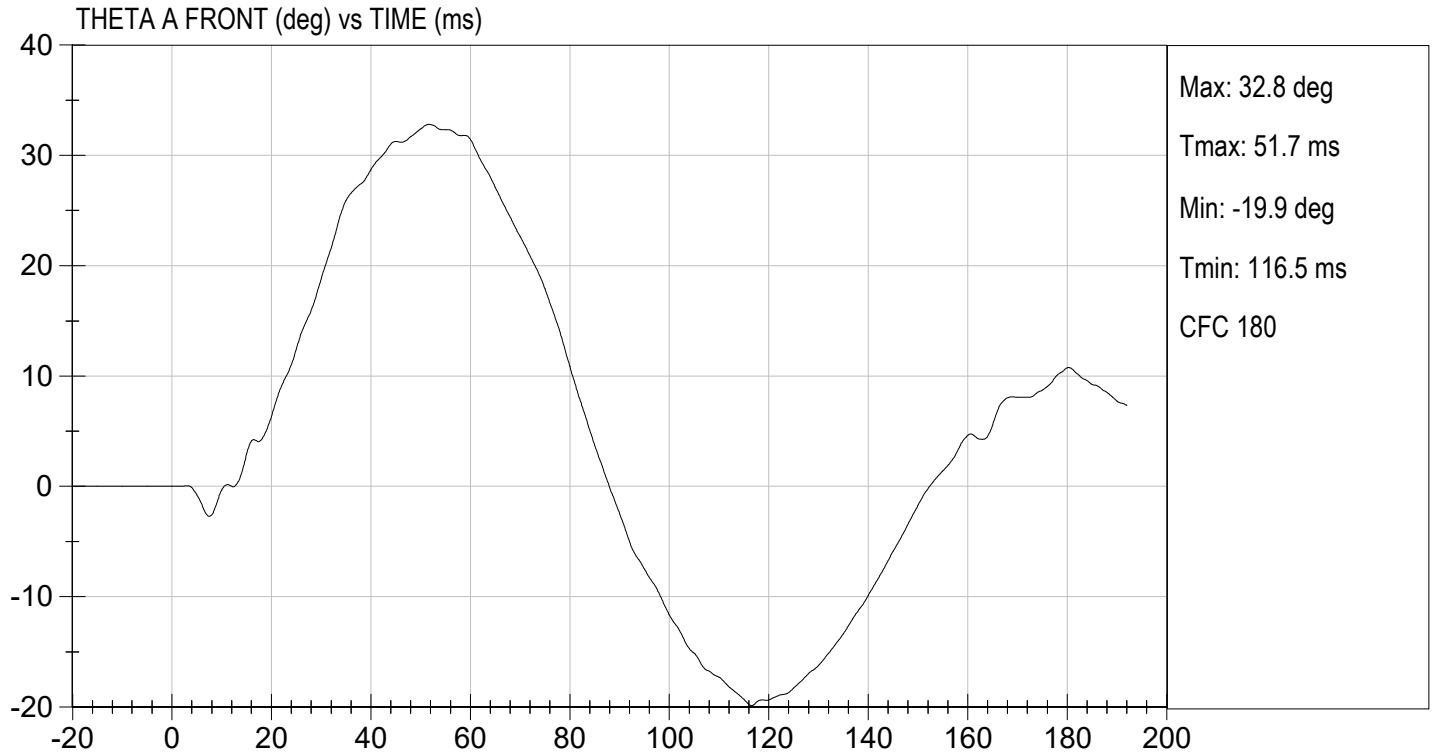
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass	
Laboratory Relative Humidity	%	10 to 70	26	Pass	
Pendulum Speed	m/s	5.95 to 6.15	6.12	Pass	
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.415	Pass
	27 ms	m/s	-6.50 to -5.80	-5.98	Pass
	30 ms	m/s	>= -6.50	-6.28	Pass
Maximum Flexion Angle	deg	45.0 to 55.0	49.3	Pass	
Time of Maximum Flexion Angle	ms	39.0 to 53.0	51.7	Pass	
Headform Rotation Decay to Initial Position	ms	37 to 57	37	Pass	
<b>Overall Results</b>				<b>Pass</b>	

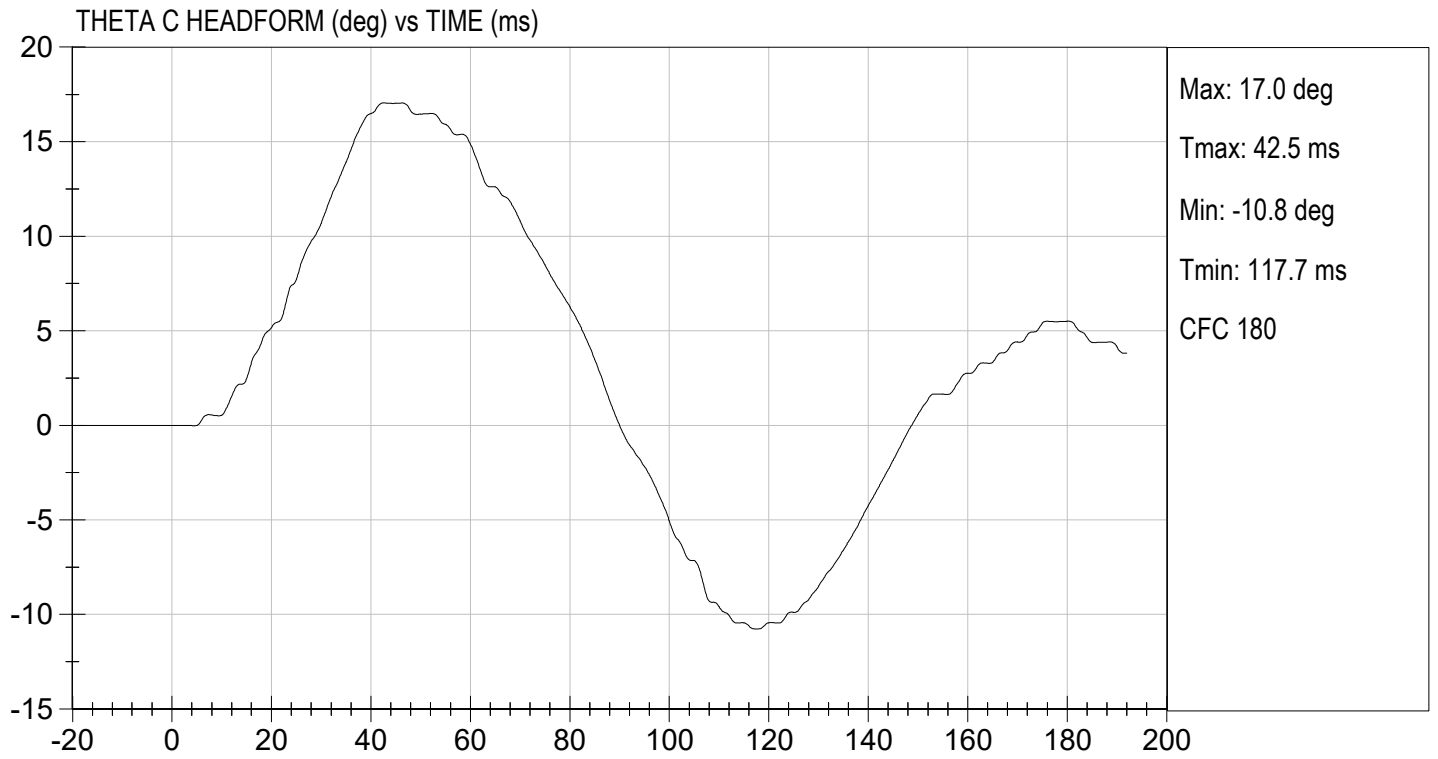
  
 Laboratory Technician

          11/13/2023            
 Test Date

  
 Approved By







**MGA RESEARCH CORPORATION**

**PELVIS TEST  
ES-2re DUMMY**

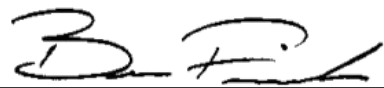
**ATD Serial No:**       F032      

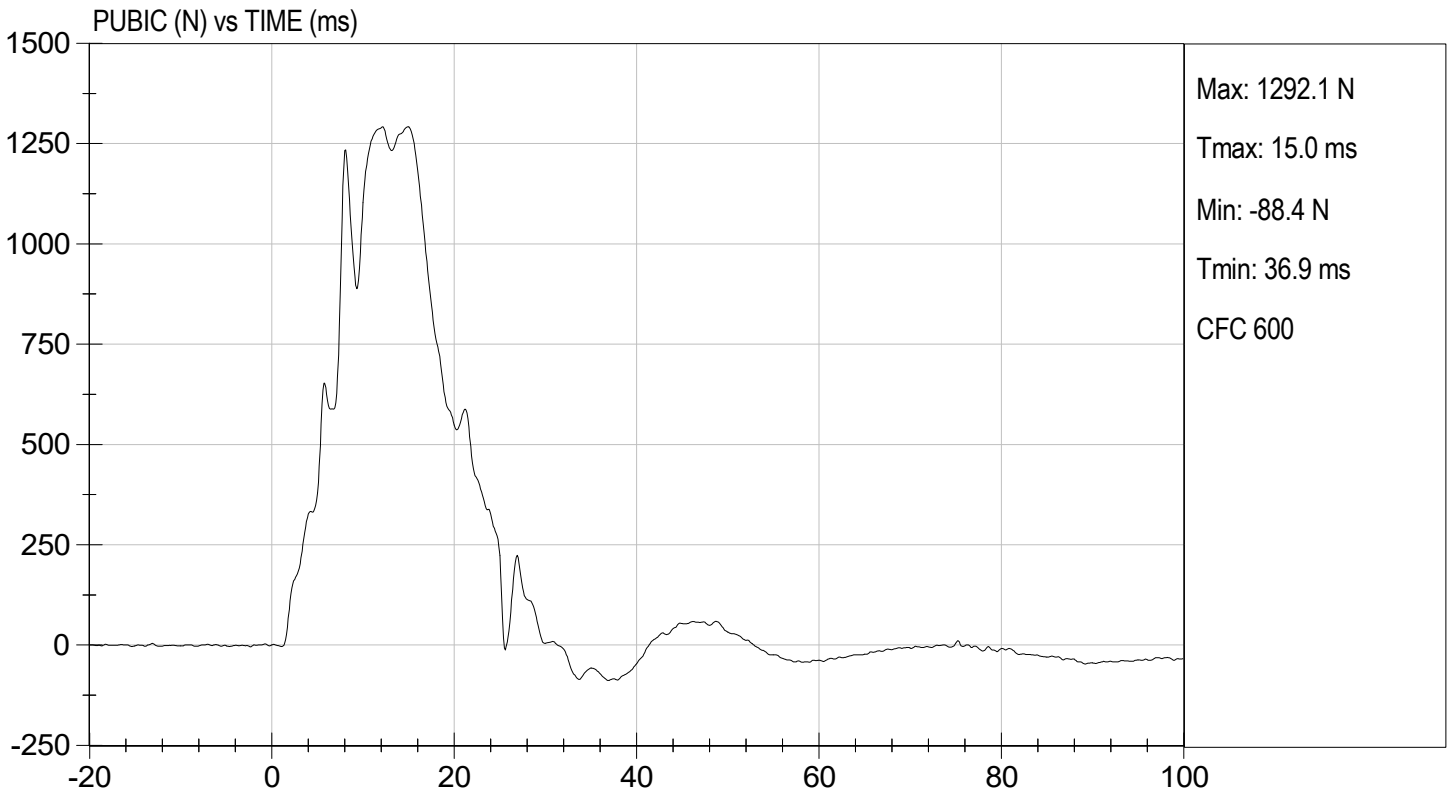
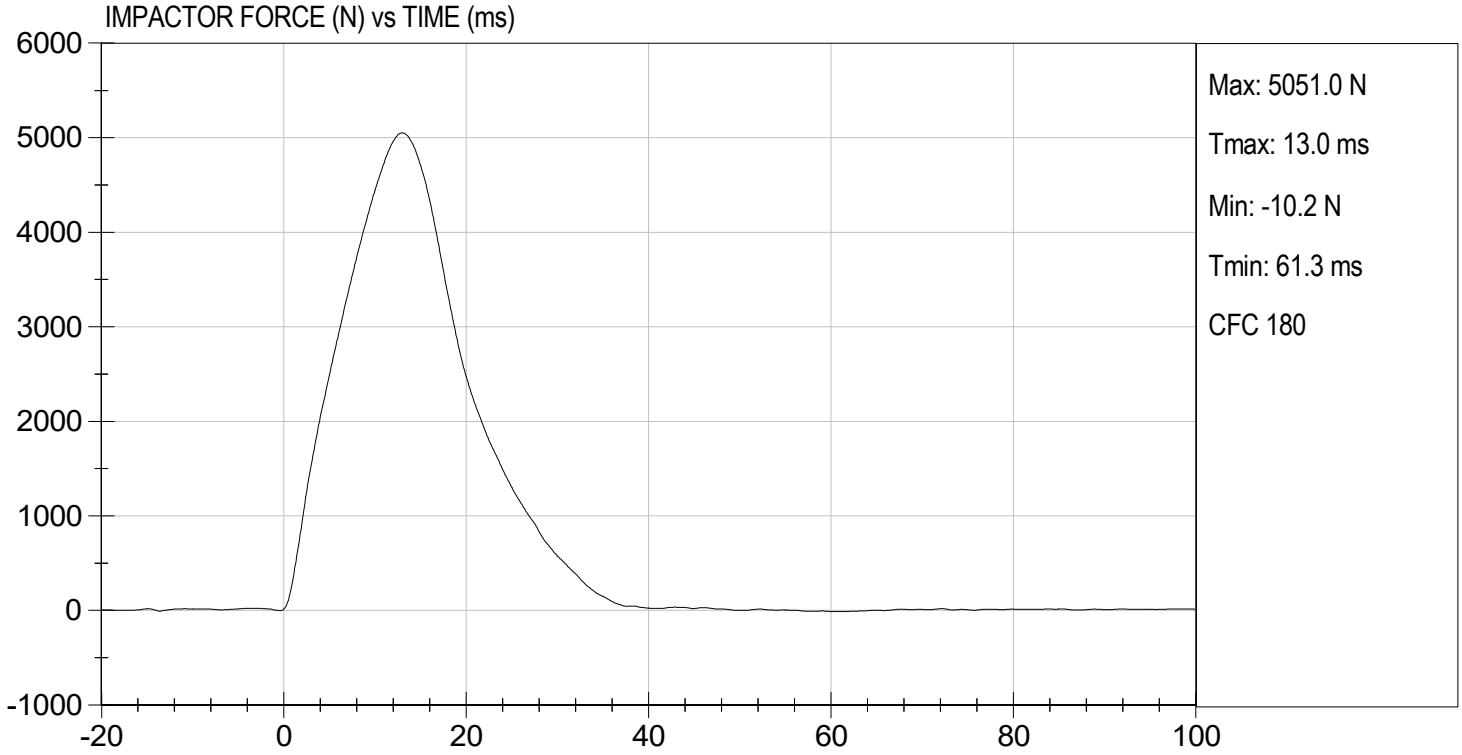
**Test I.D:**       D233079      

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	26	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	N	4700 to 5400	5051	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.0	Pass
Maximum Pubic Force	N	1230 to 1590	1292	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	15.0	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

11/13/2023  
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**  
**THORAX IMPACT TEST**  
**ES-2re DUMMY**

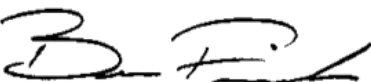
ATD Serial No:           F032          

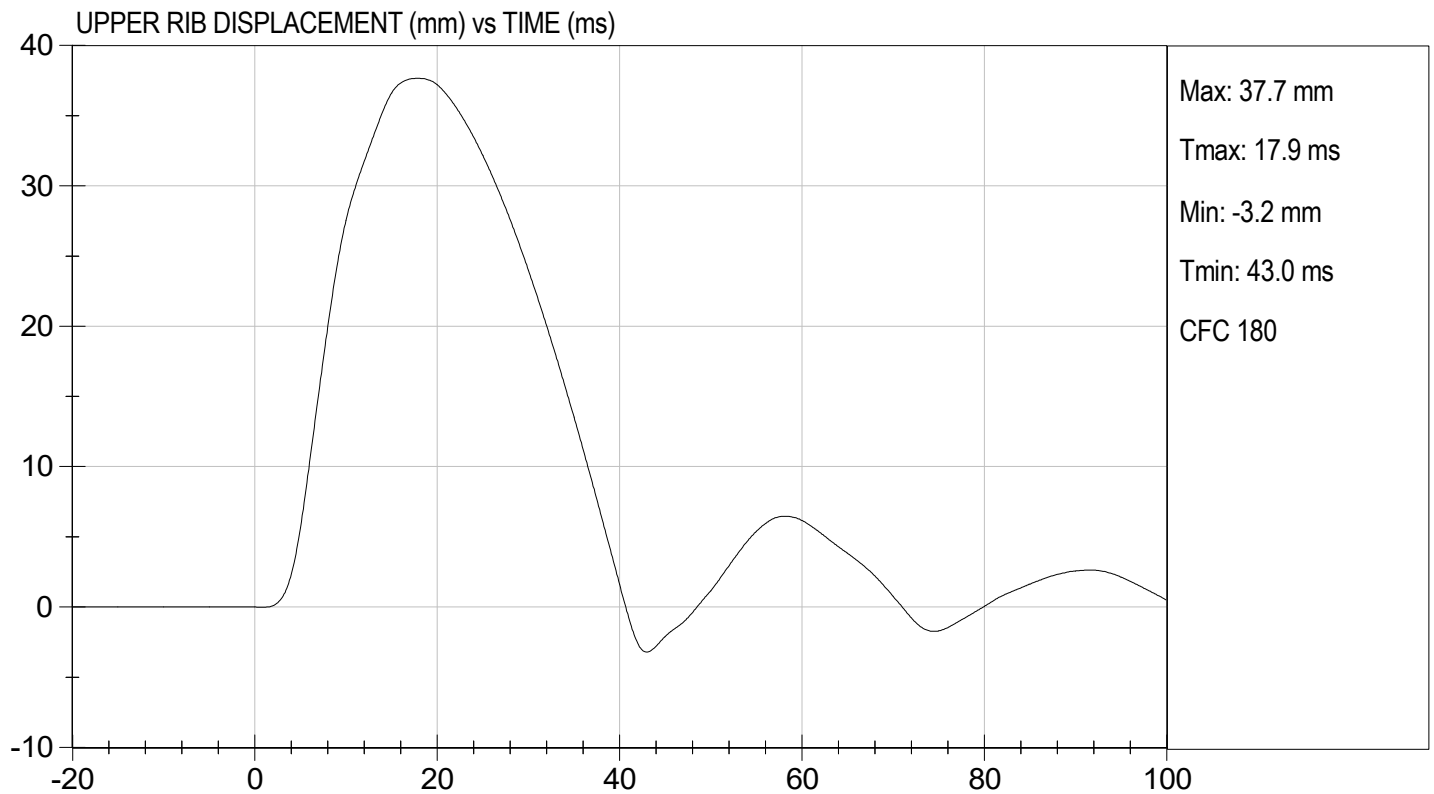
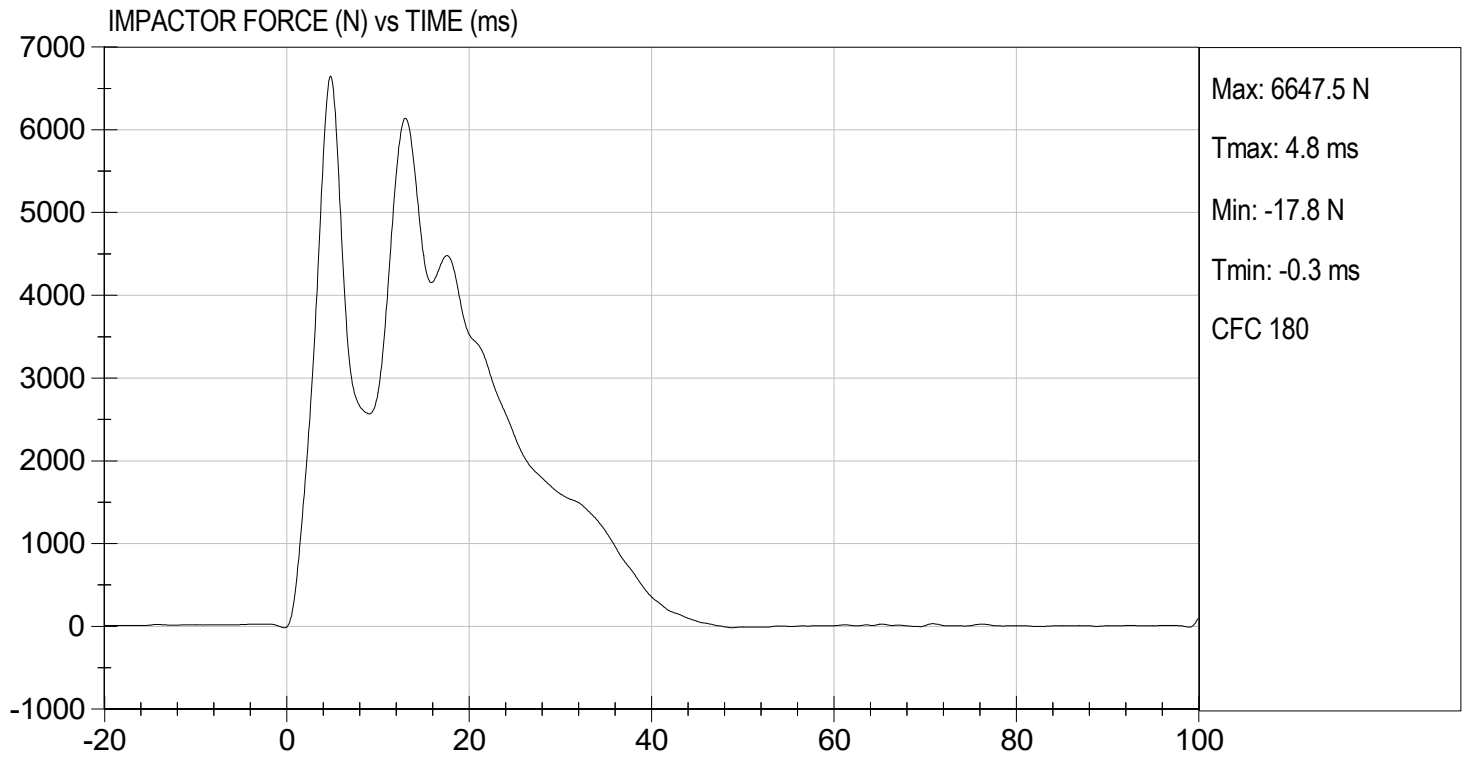
Test I.D:           D233070          

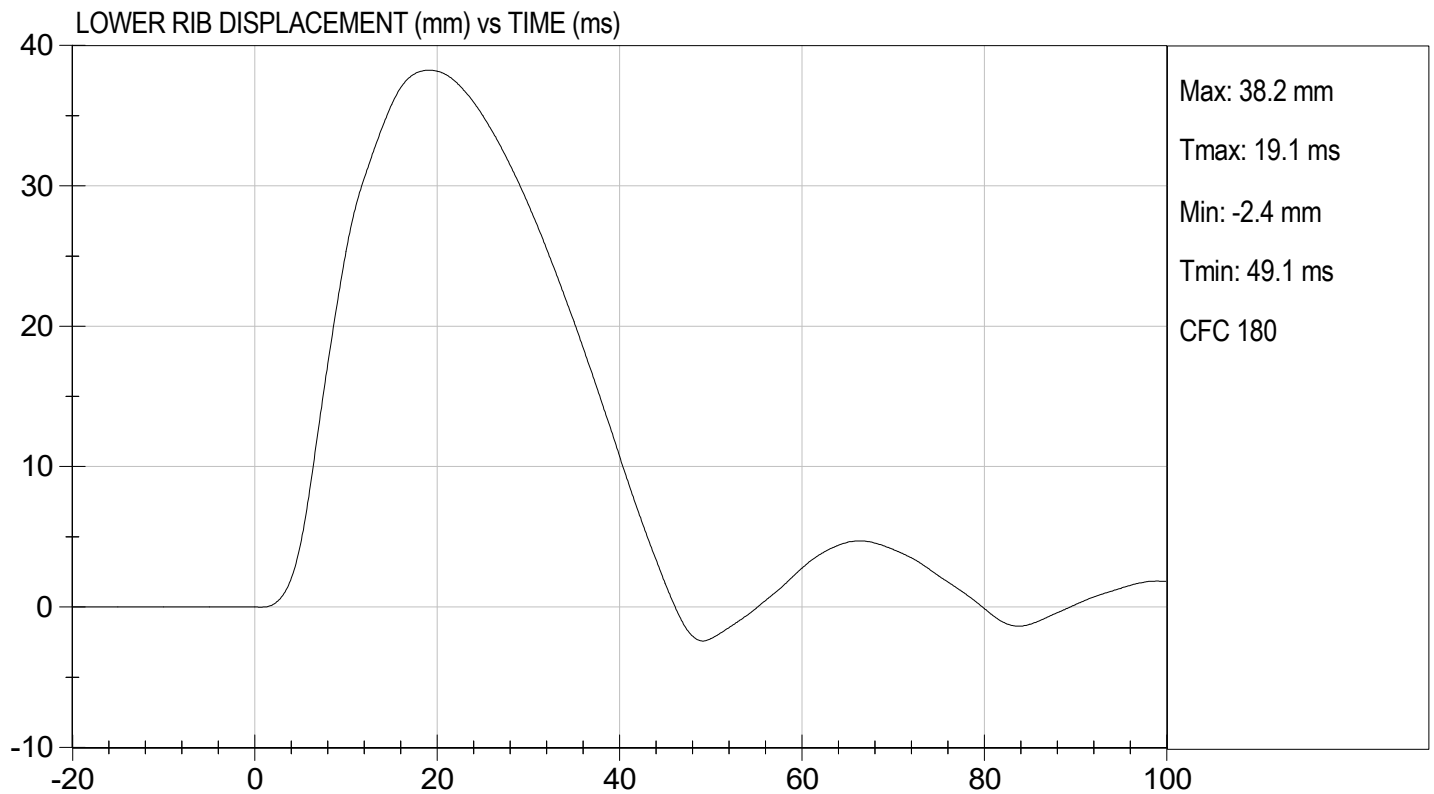
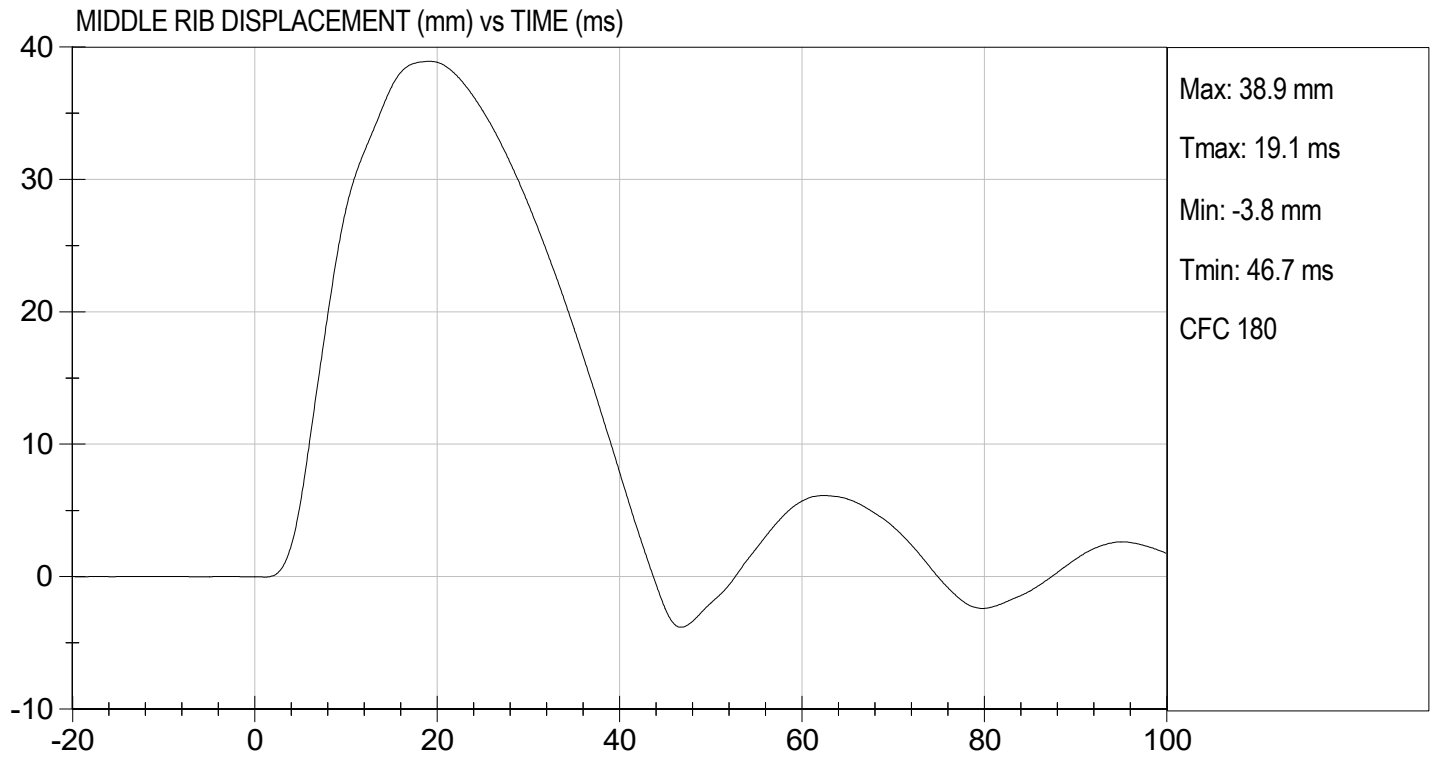
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	26	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	6141	Pass
Upper Rib Displacement	mm	34.0 to 41.0	37.7	Pass
Middle Rib Displacement	mm	37.0 to 45.0	38.9	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.2	Pass
Overall Test Results				Pass

  
 \_\_\_\_\_  
 Laboratory Technician

11/13/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





**QUALIFICATION TEST RESULTS**

**POST-TEST**

**EUROSID 2 (ES-2RE) MALE – DRIVER ATD**

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

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

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

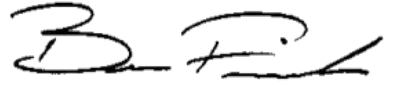
ATD Serial No:       F032      

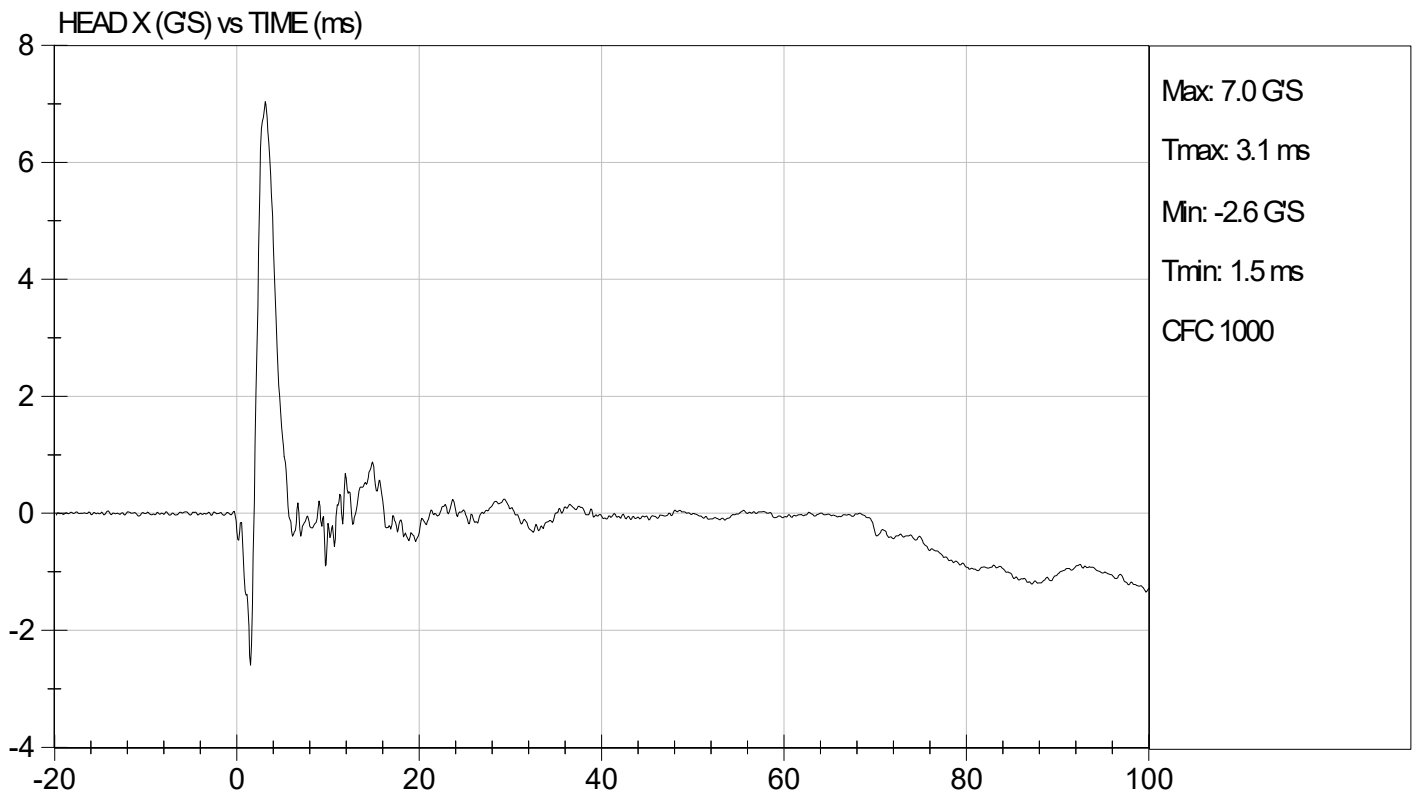
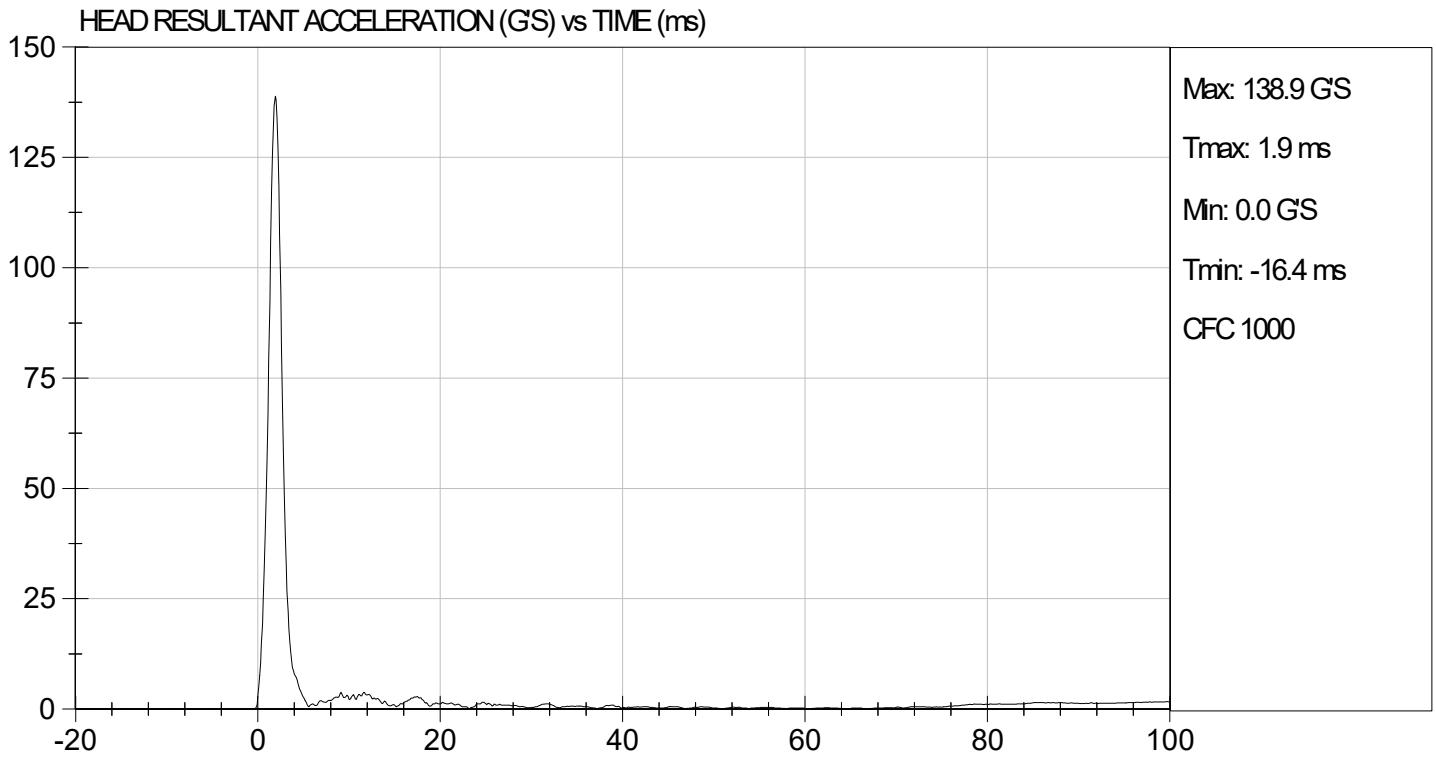
Test ID:       D233241      

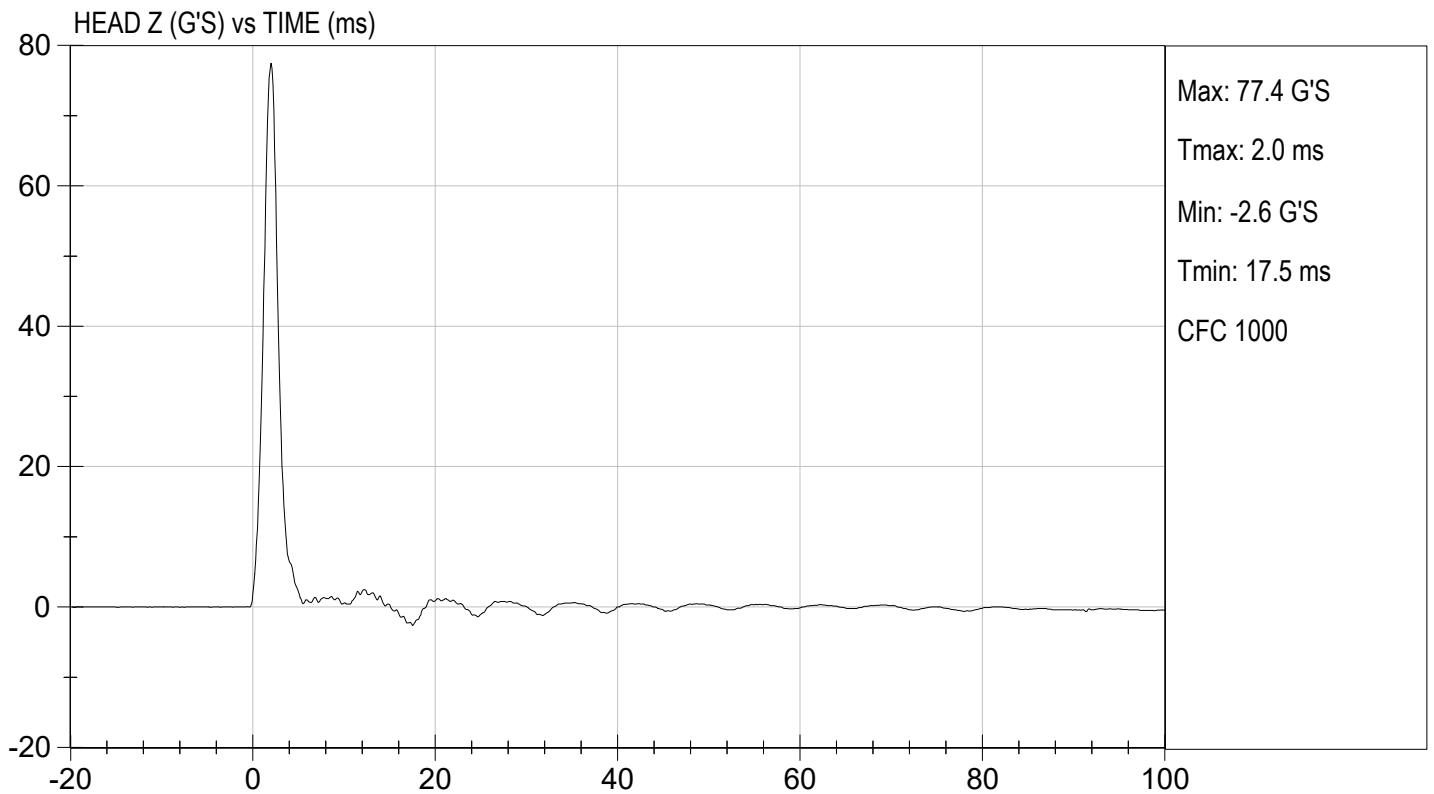
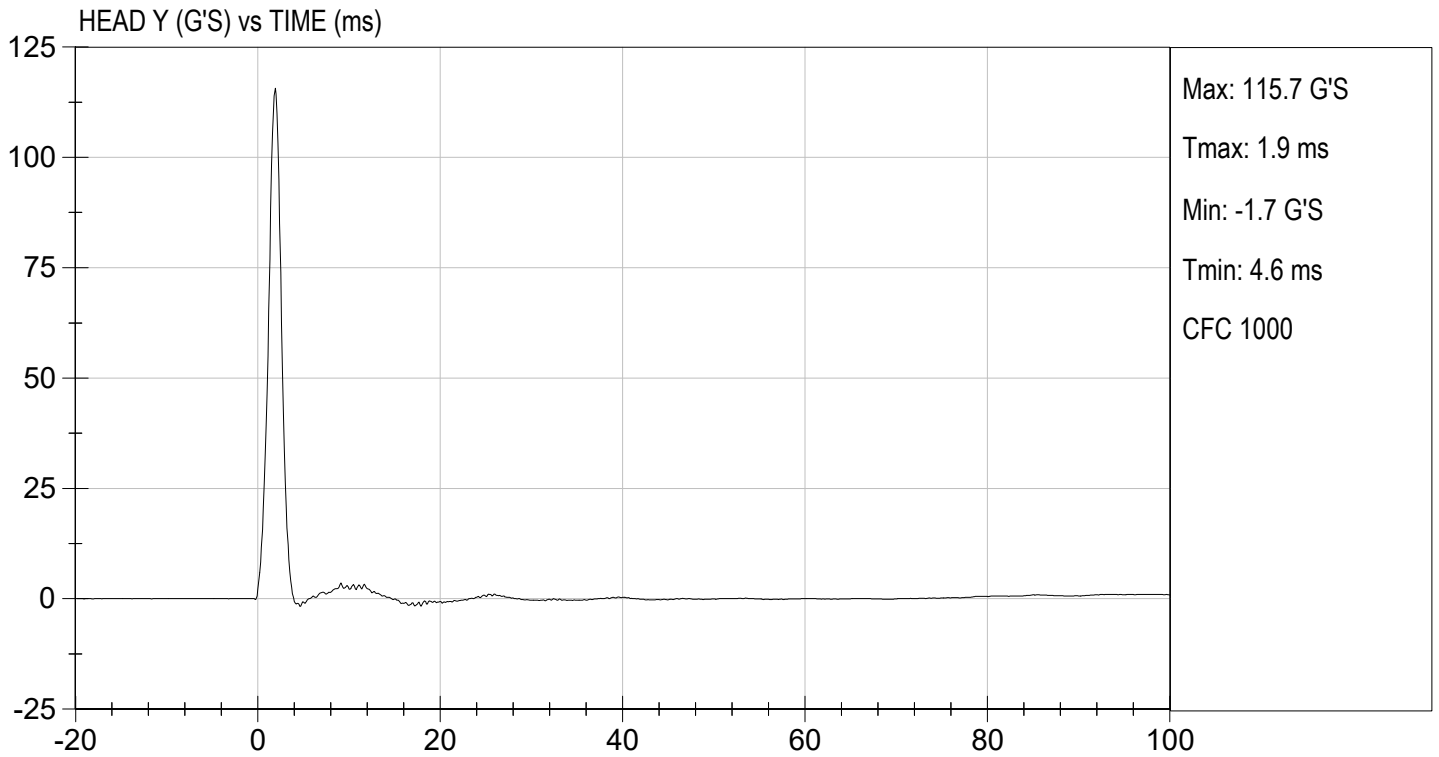
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	31	Pass
Peak Resultant Acceleration	G's	125 to 155	139	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	7.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
			Overall Test Results	Pass

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

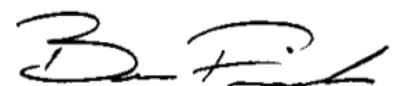
ATD Serial No:           F032          

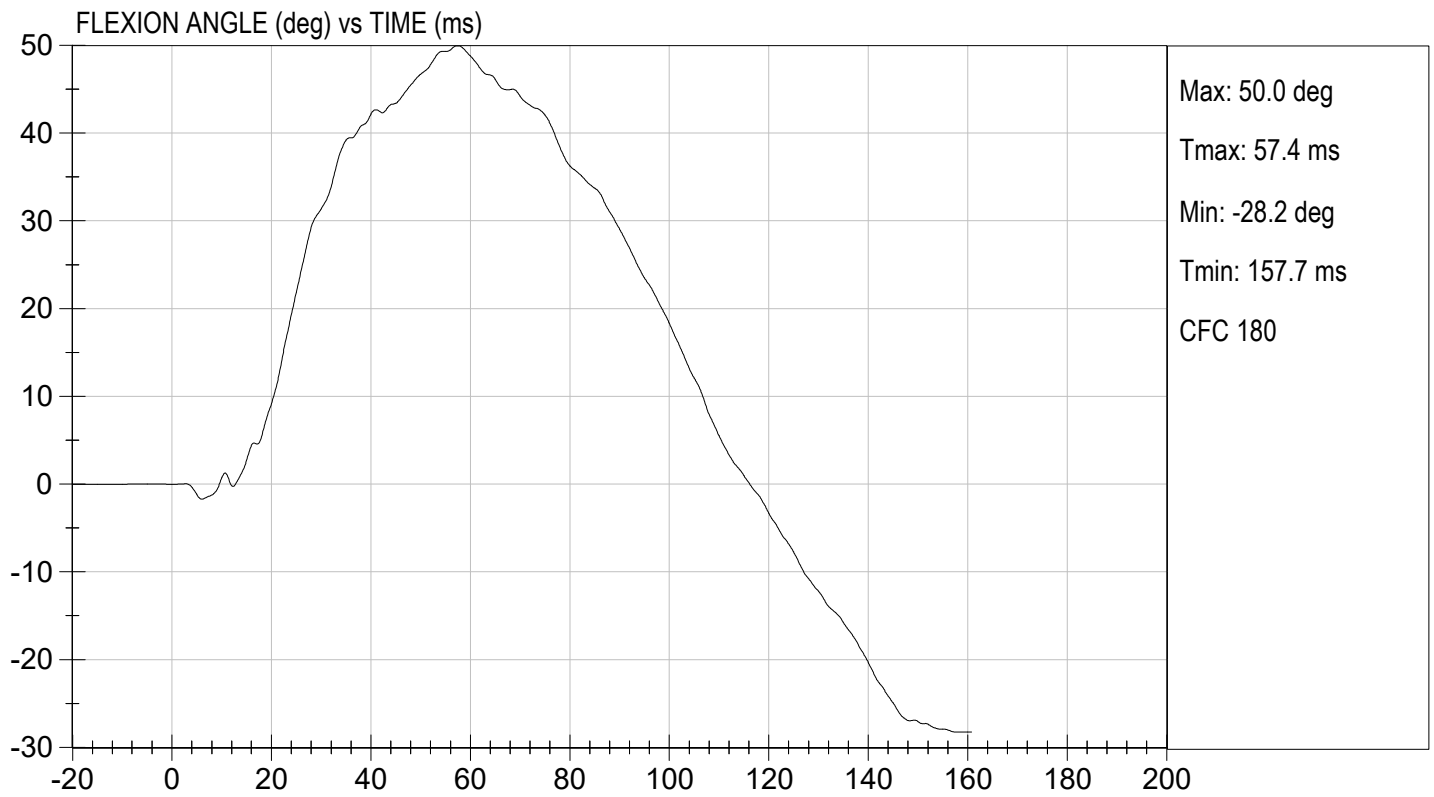
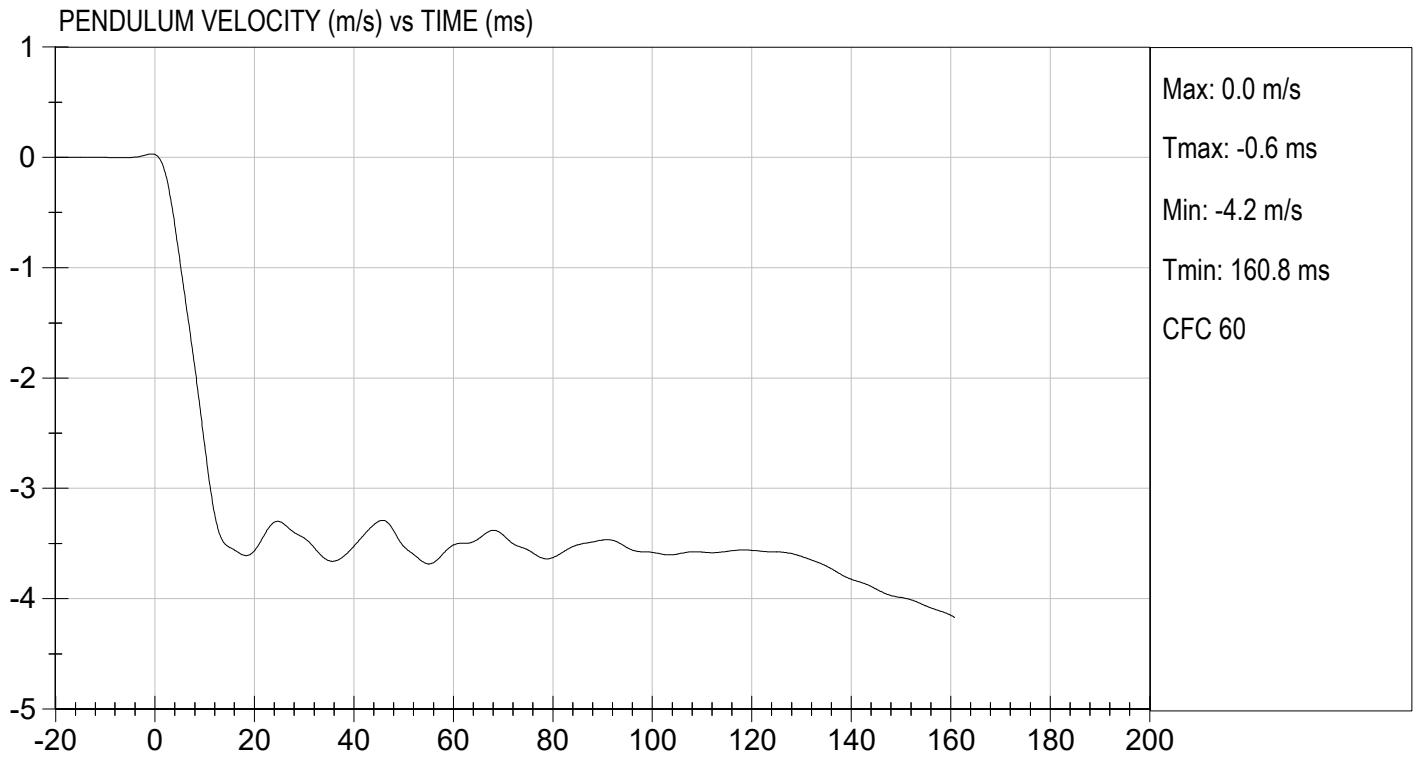
Test I.D:           D233242          

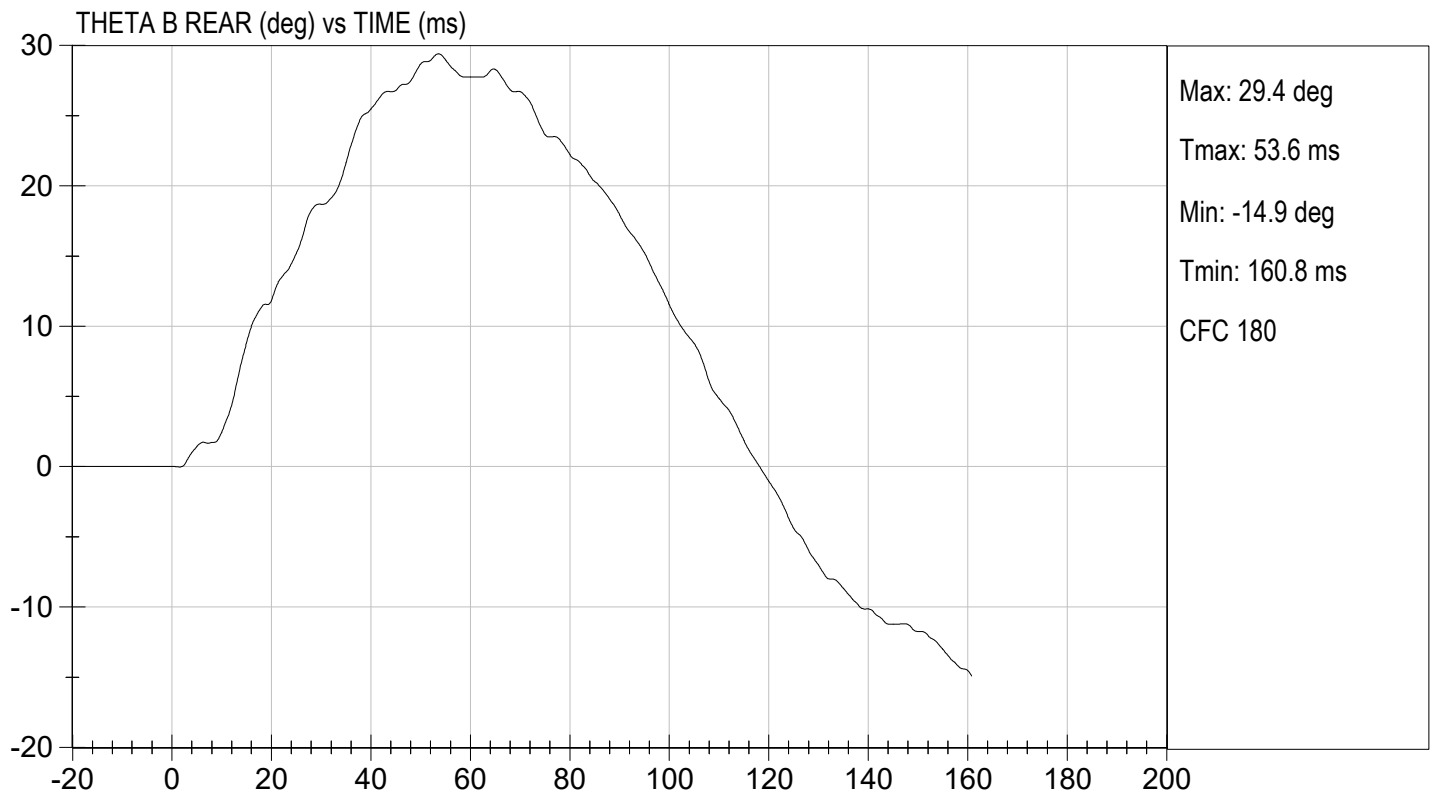
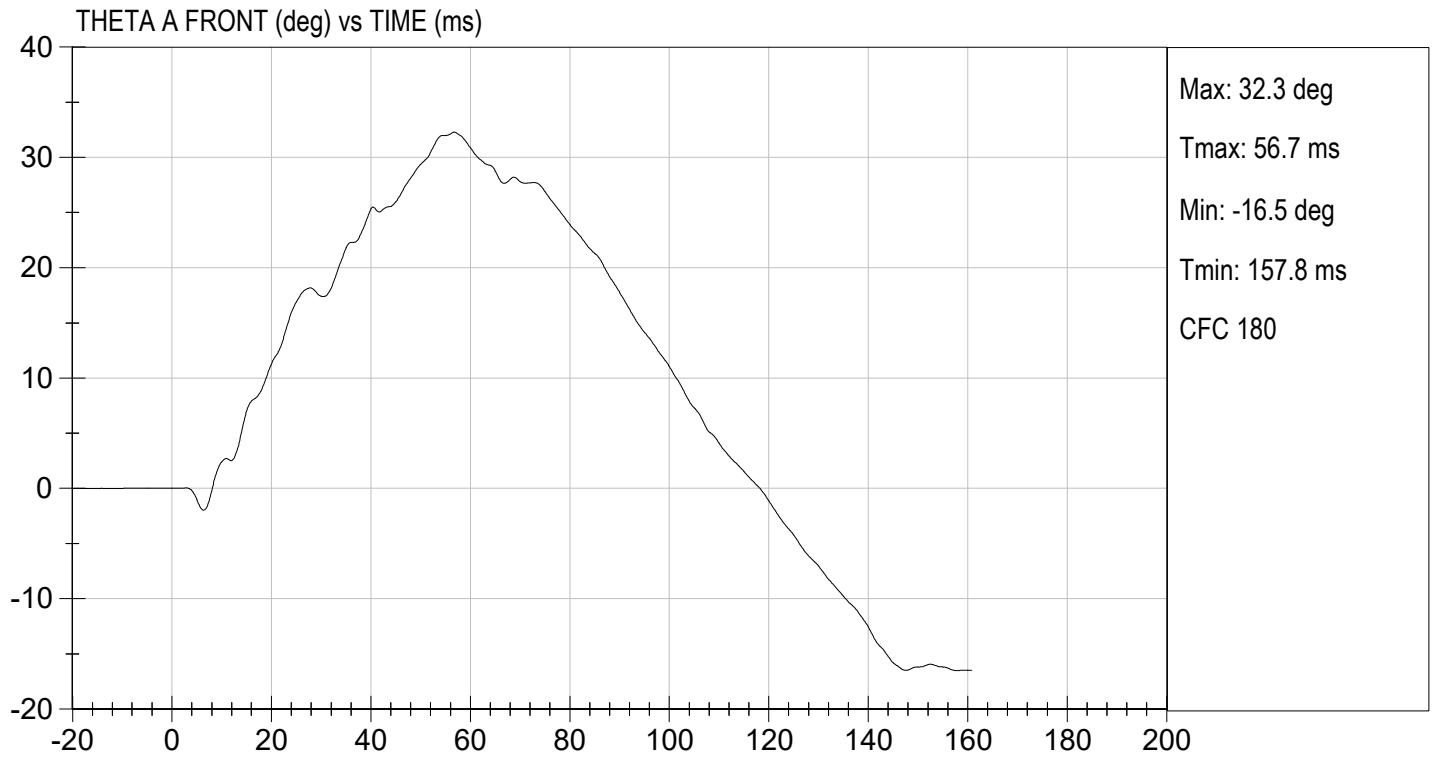
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.33	Pass
	14 ms	m/s	-3.20 to -3.70	-3.50	Pass
	17 ms	m/s	>= -3.70	-3.59	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.4	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	58.8	Pass
Overall Results					Pass

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

  
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 Approved By

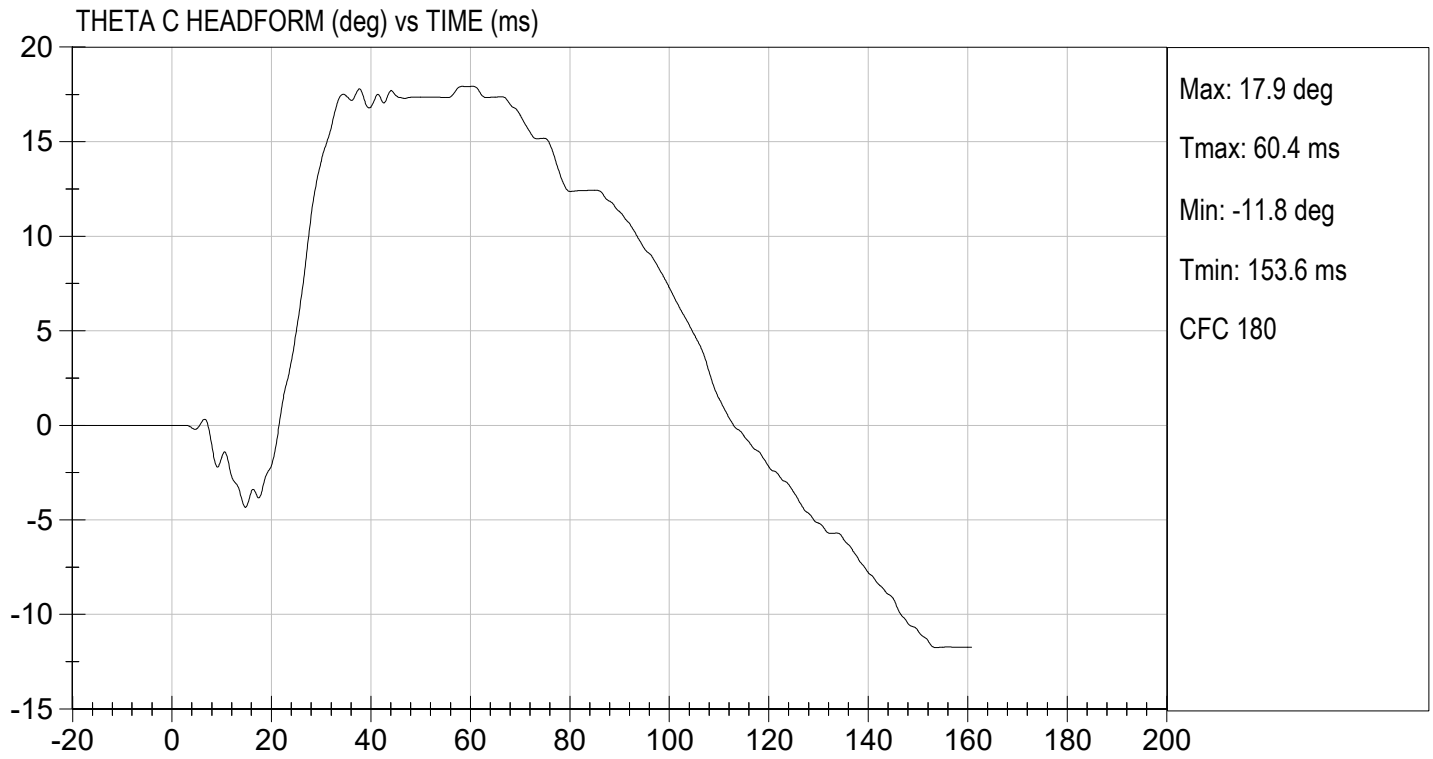






TEST DESC: NECK BENDING  
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 12/08/2023  
TEST #: D233242



**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

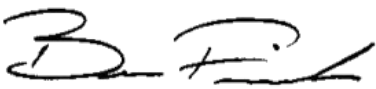
ATD Serial No:           F032          

Test I.D:           D233243          

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.7	Pass
Overall Test Results				Pass

  
 \_\_\_\_\_  
 Laboratory Technician

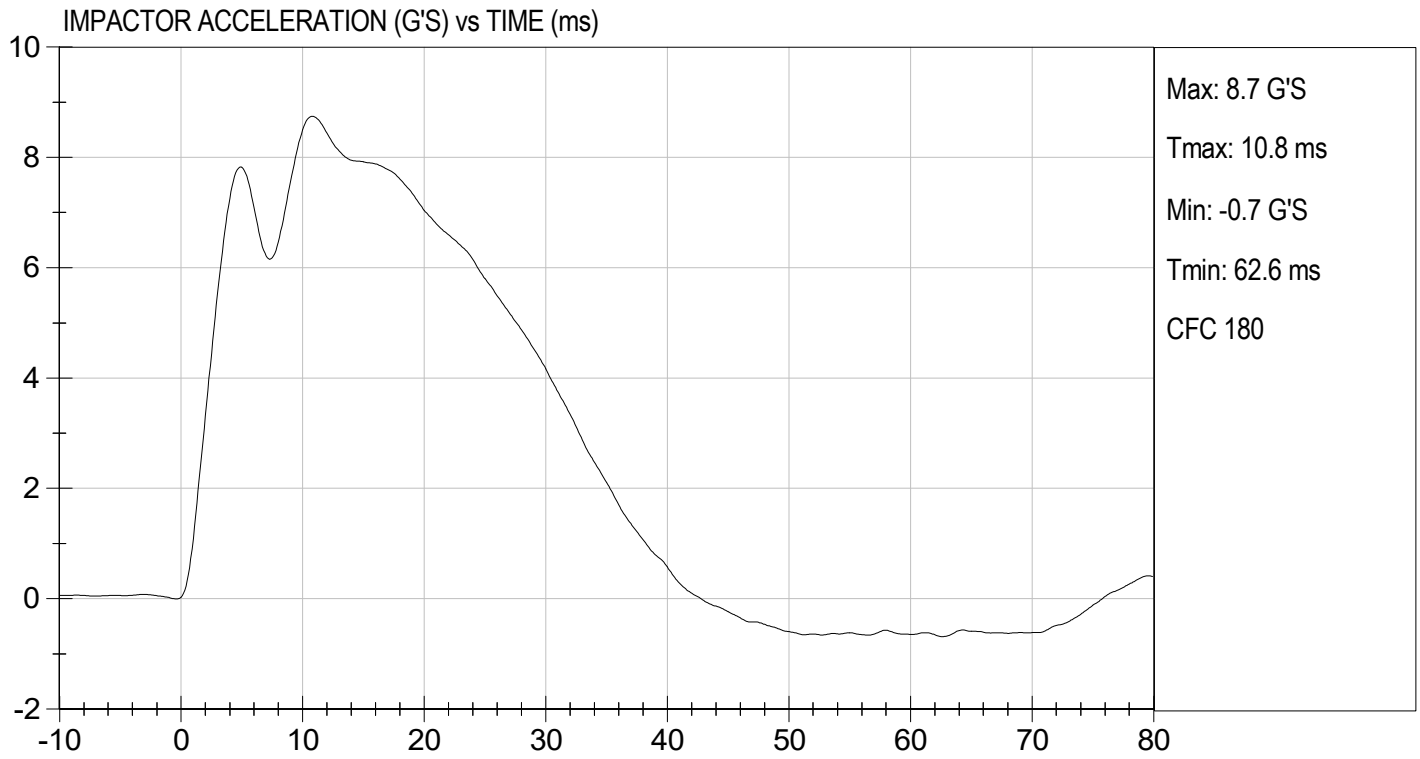
12/08/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By



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

TEST DATE: 12/08/2023  
TEST #: D233243



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

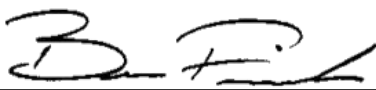
**ATD Serial No:**       F032      

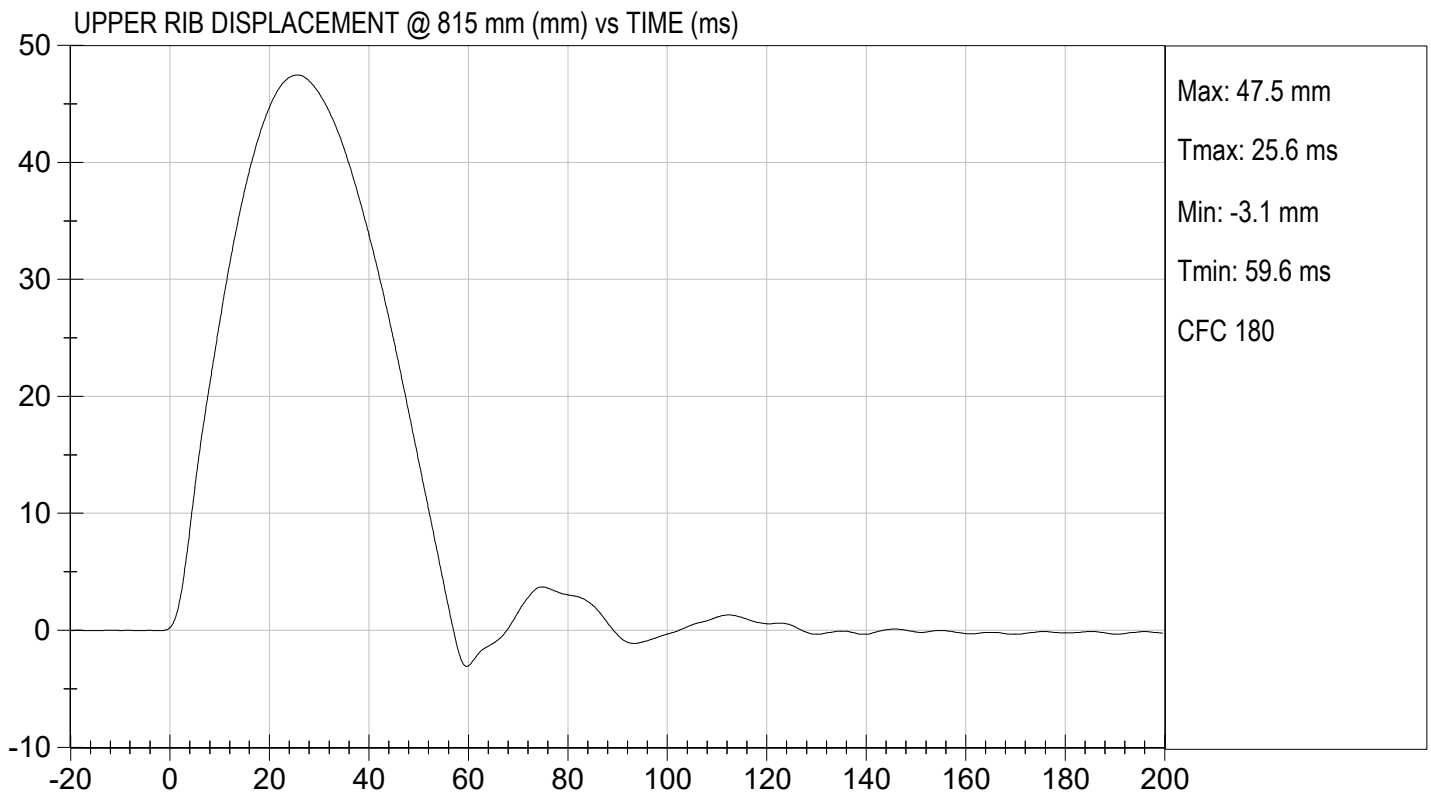
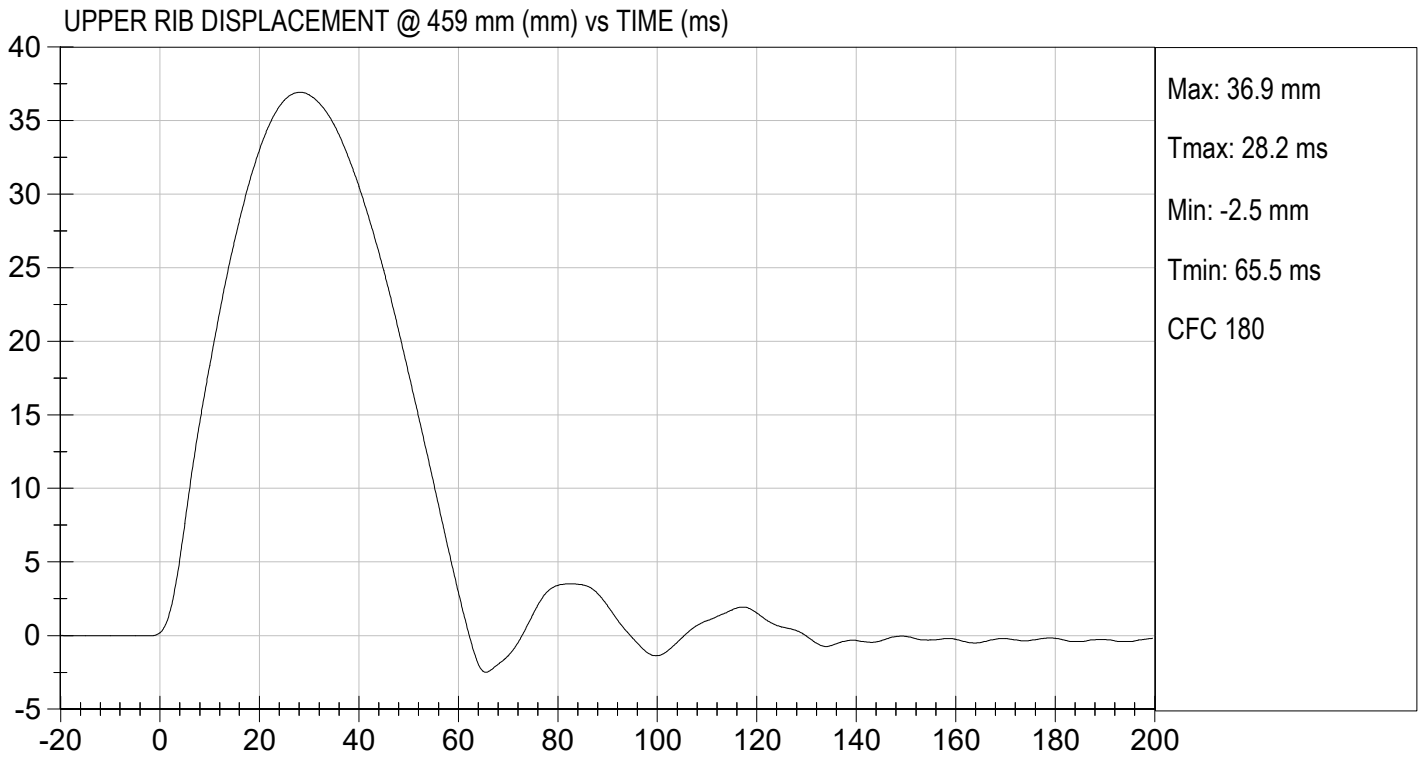
**Test I.D.:**       D233244      

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.5	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

      12/08/2023        
Test Date

  
\_\_\_\_\_  
Approved By



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

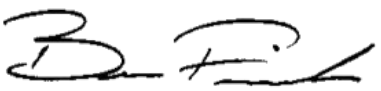
ATD Serial No:       F032      

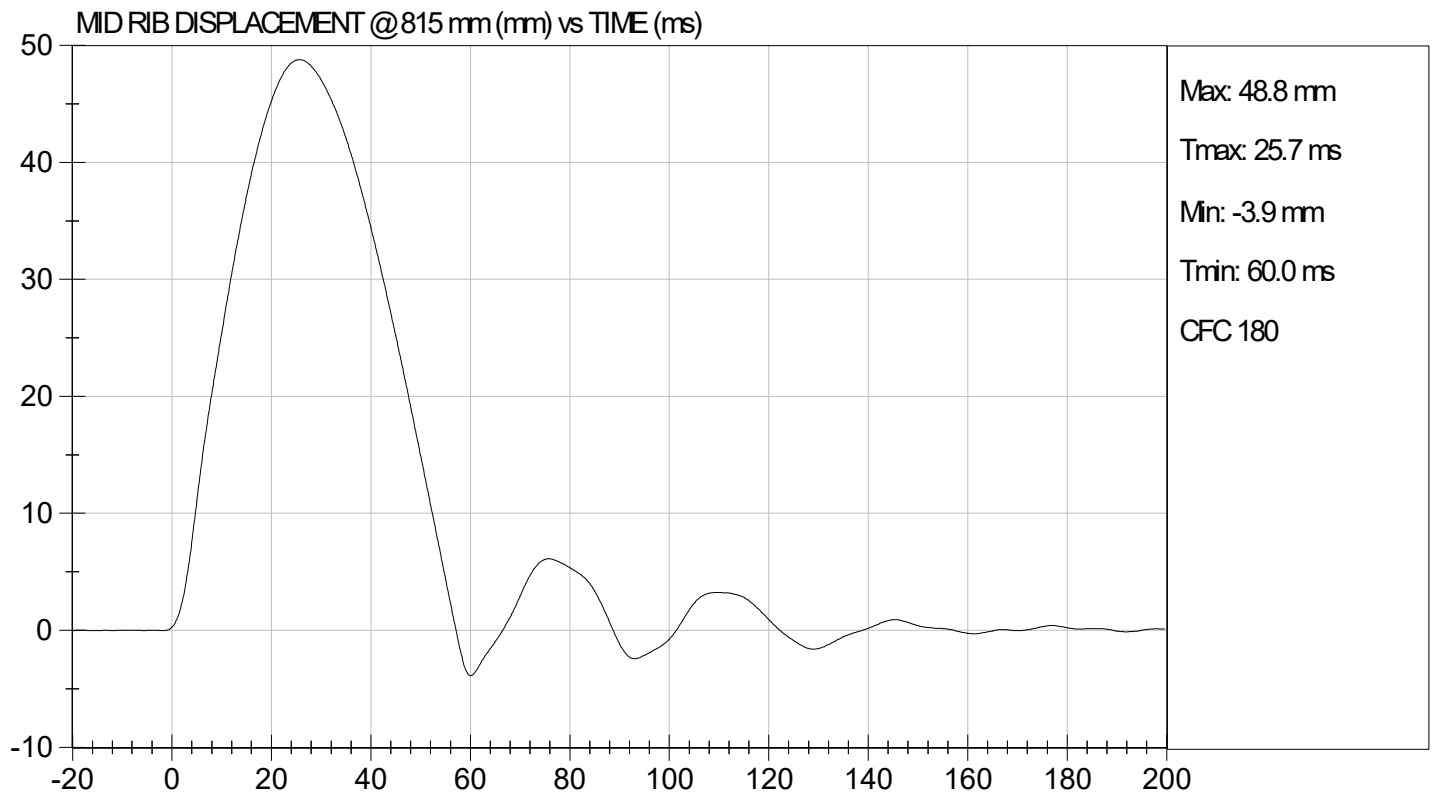
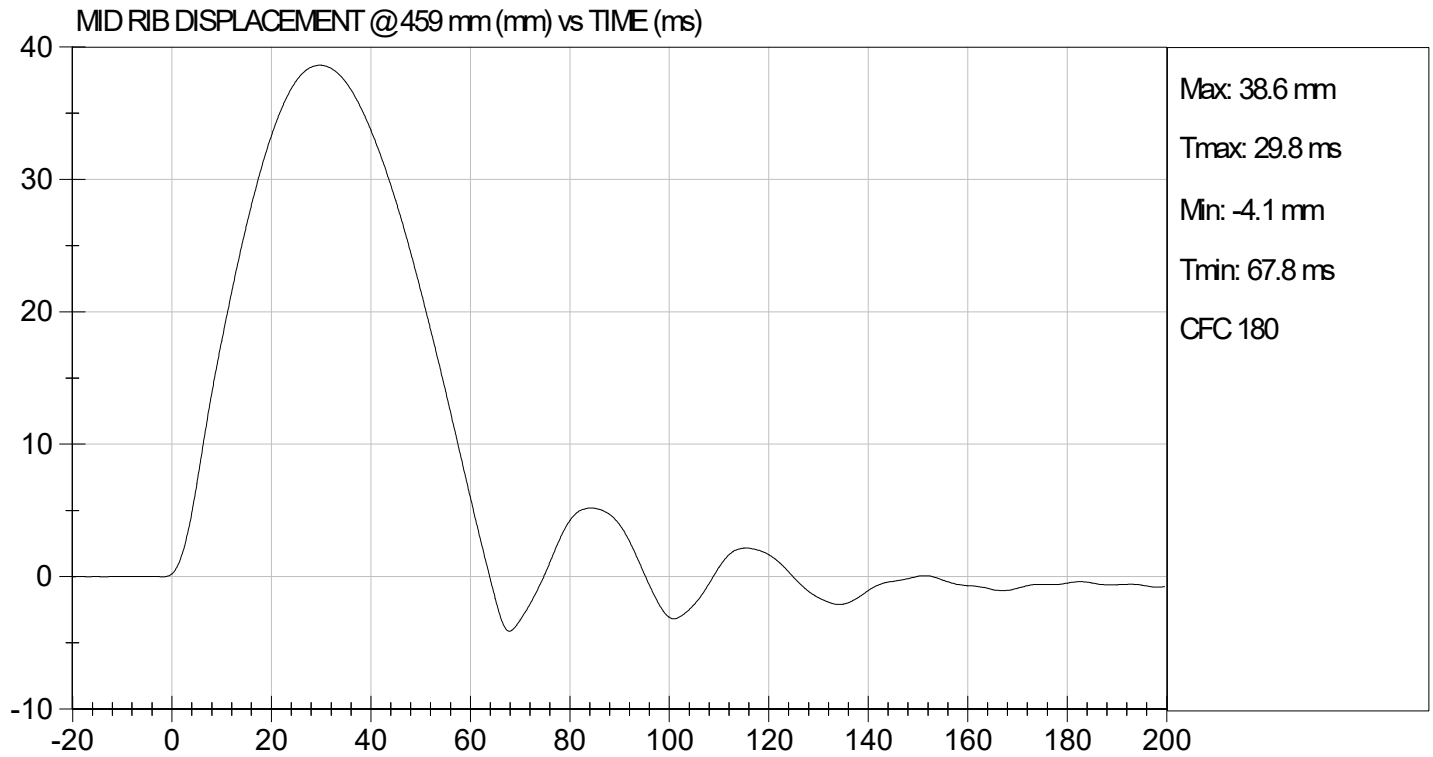
Test I.D:       D233245      

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.8	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

      12/08/2023        
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

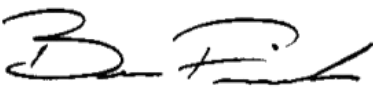
**ATD Serial No:**       F032      

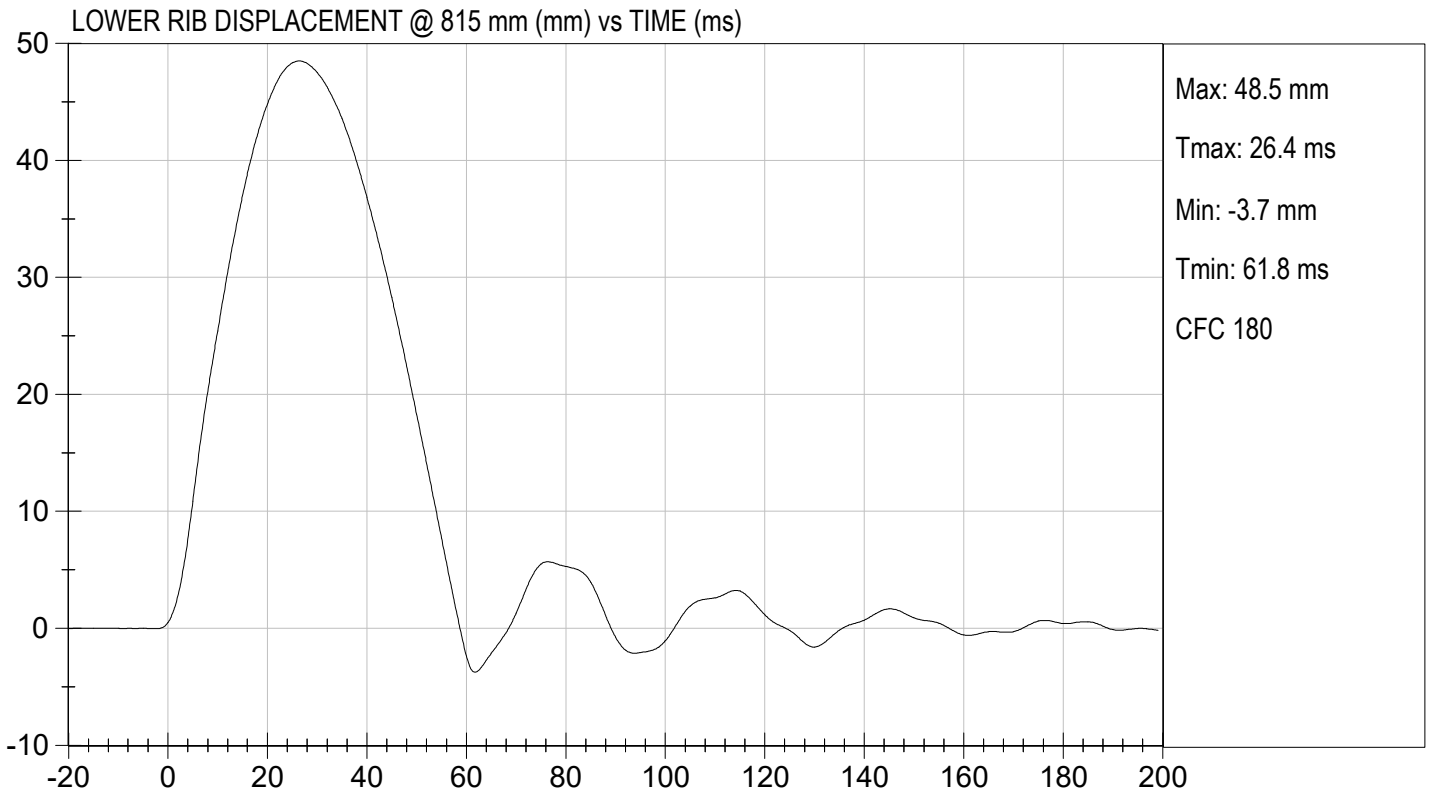
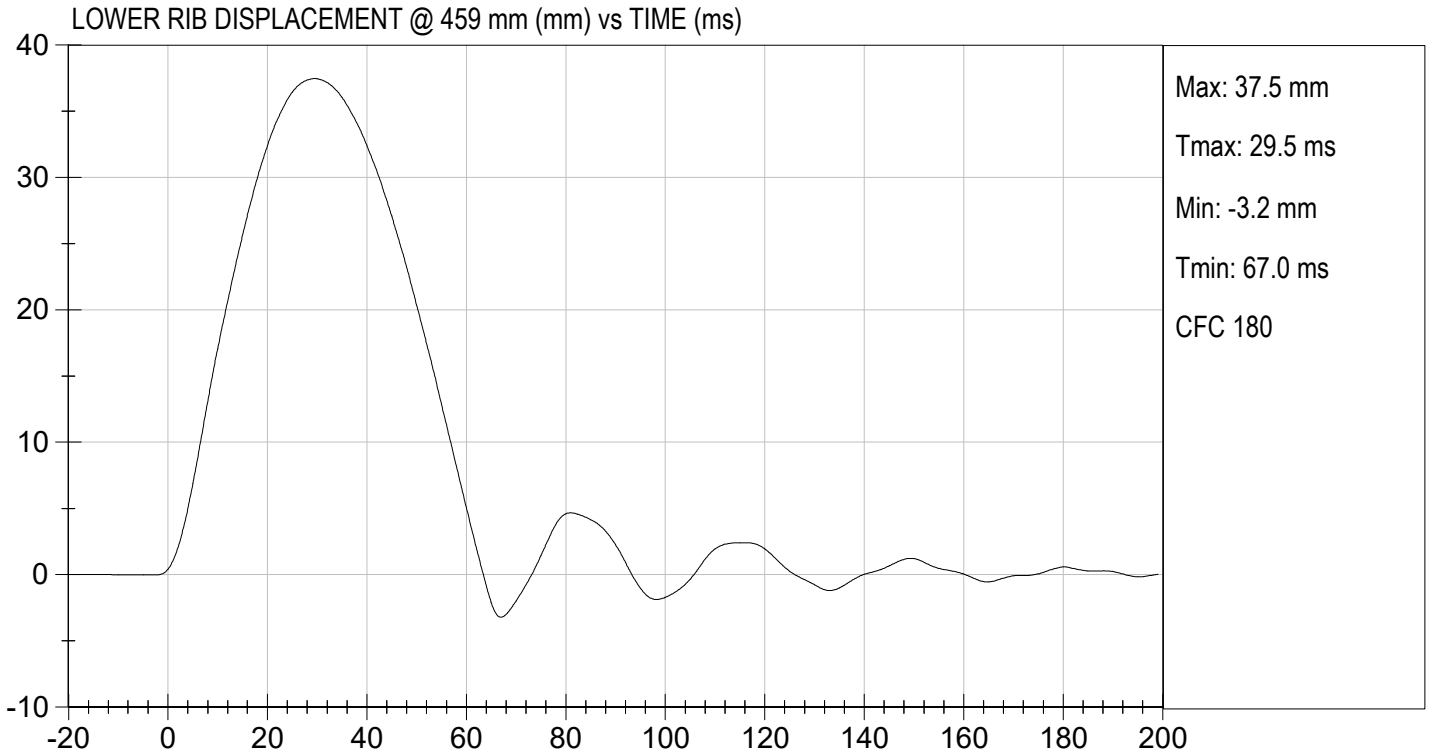
**Test I.D.:**       D233246      

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.5	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

      12/08/2023        
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**

**ABDOMEN TEST**

**ES-2re DUMMY**

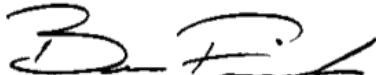
**ATD Serial No:**       F032      

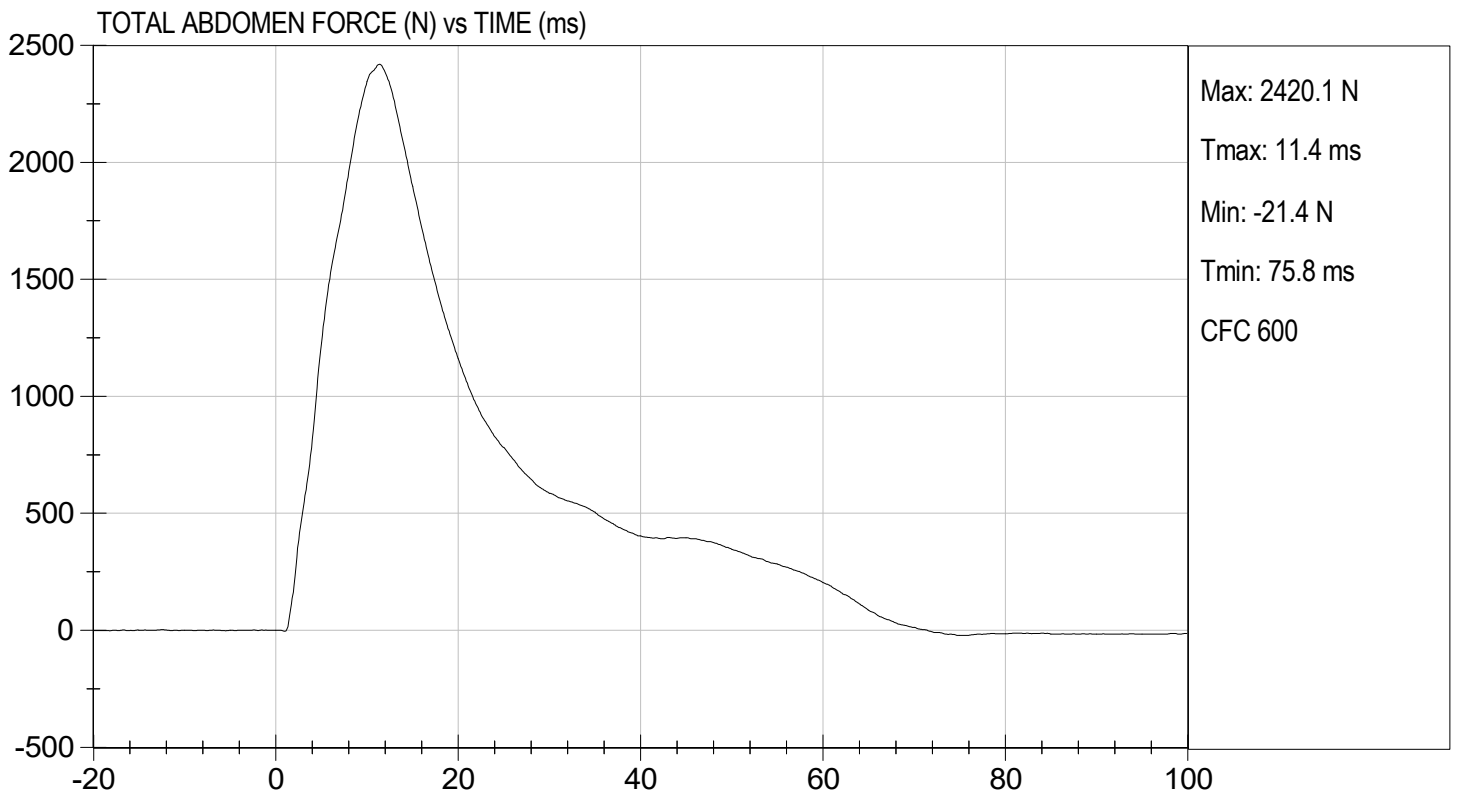
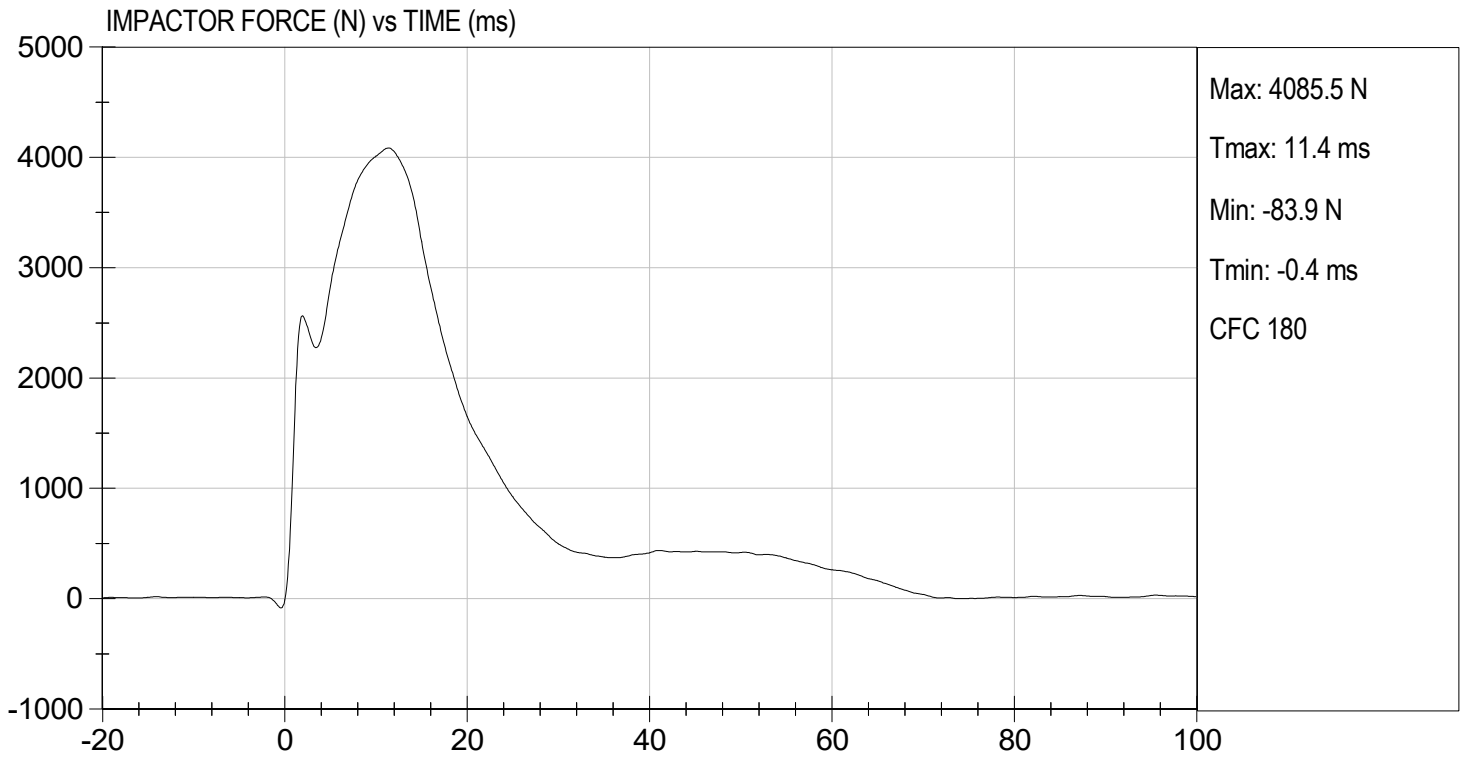
**Test I.D:**       D233247      

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4085	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.4	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2420	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.4	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

12/08/2023  
Test Date

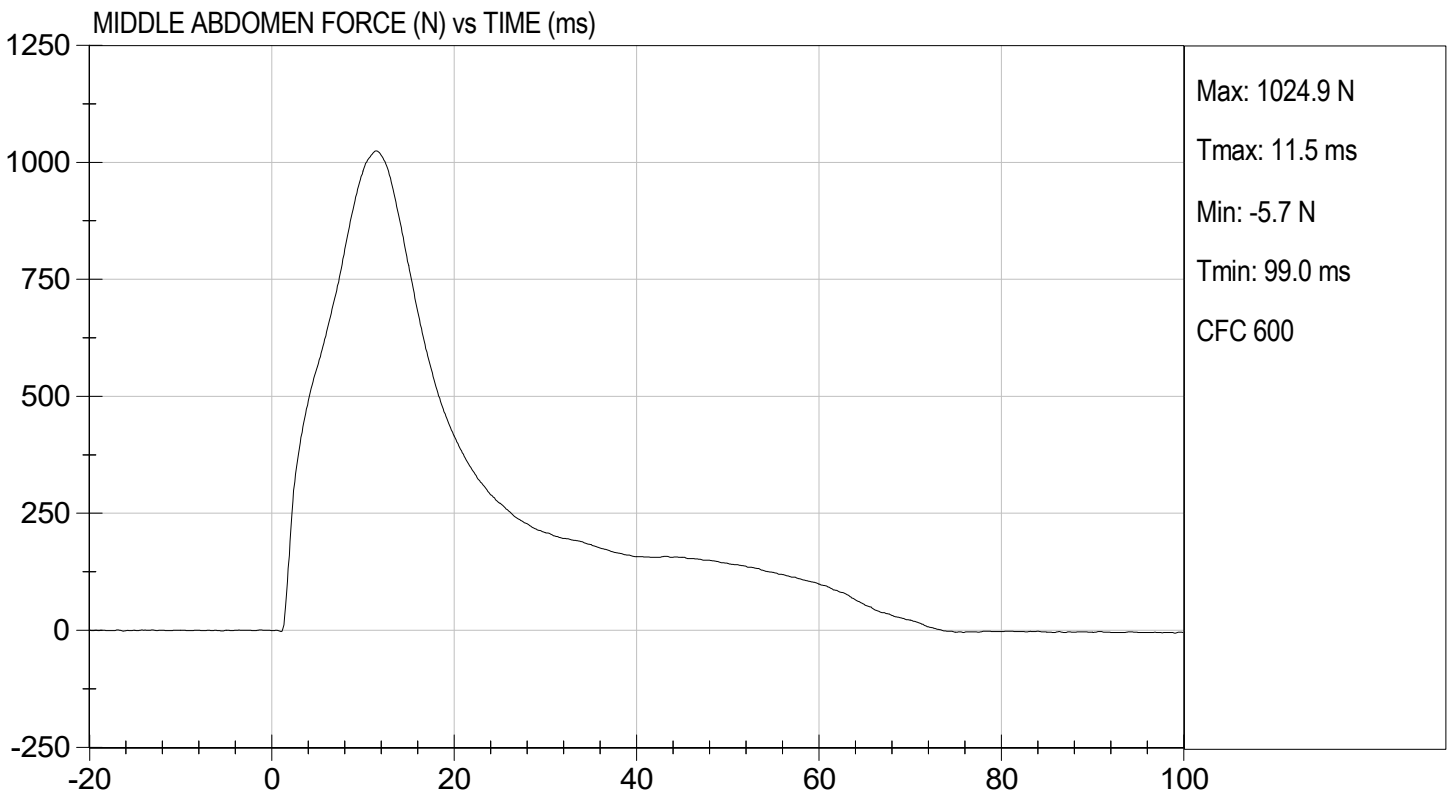
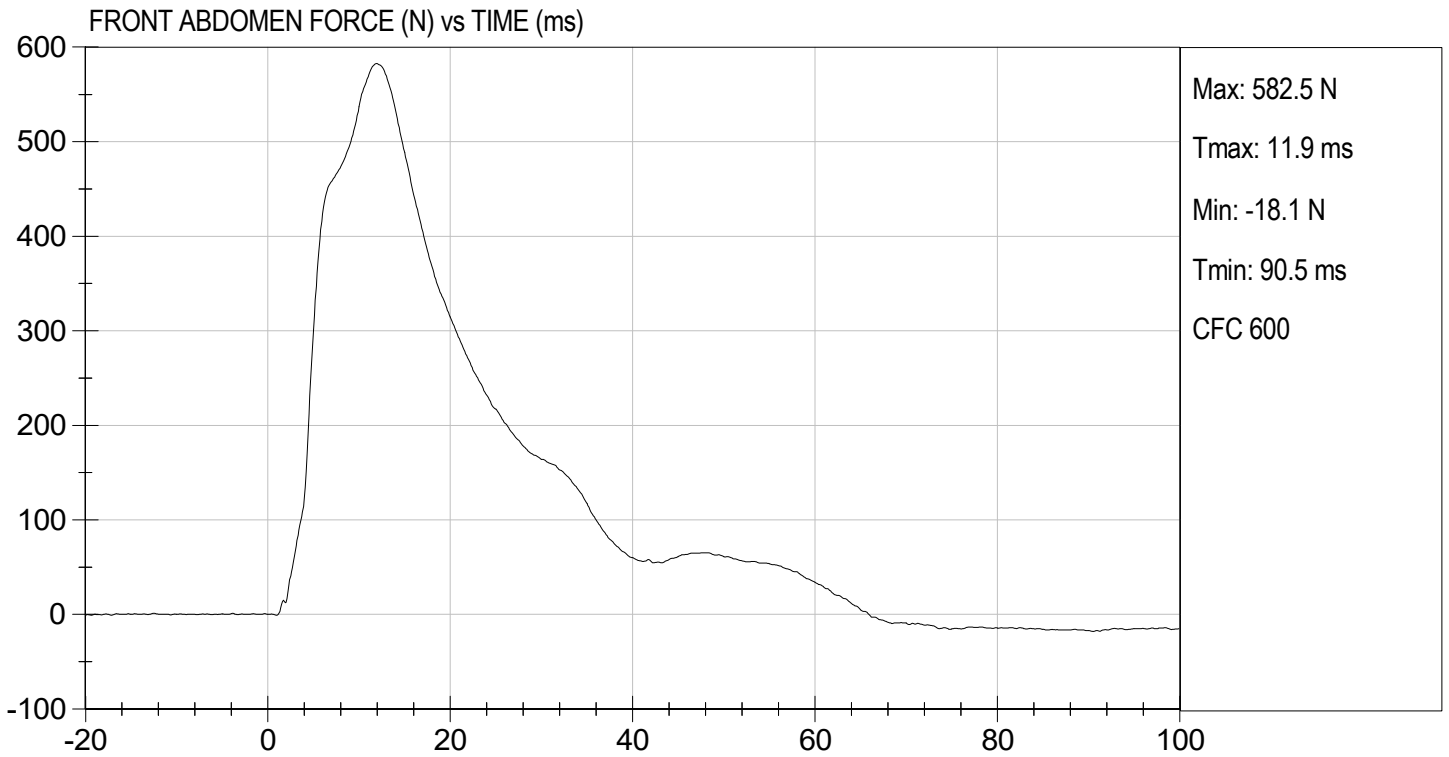
  
\_\_\_\_\_  
Approved By





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

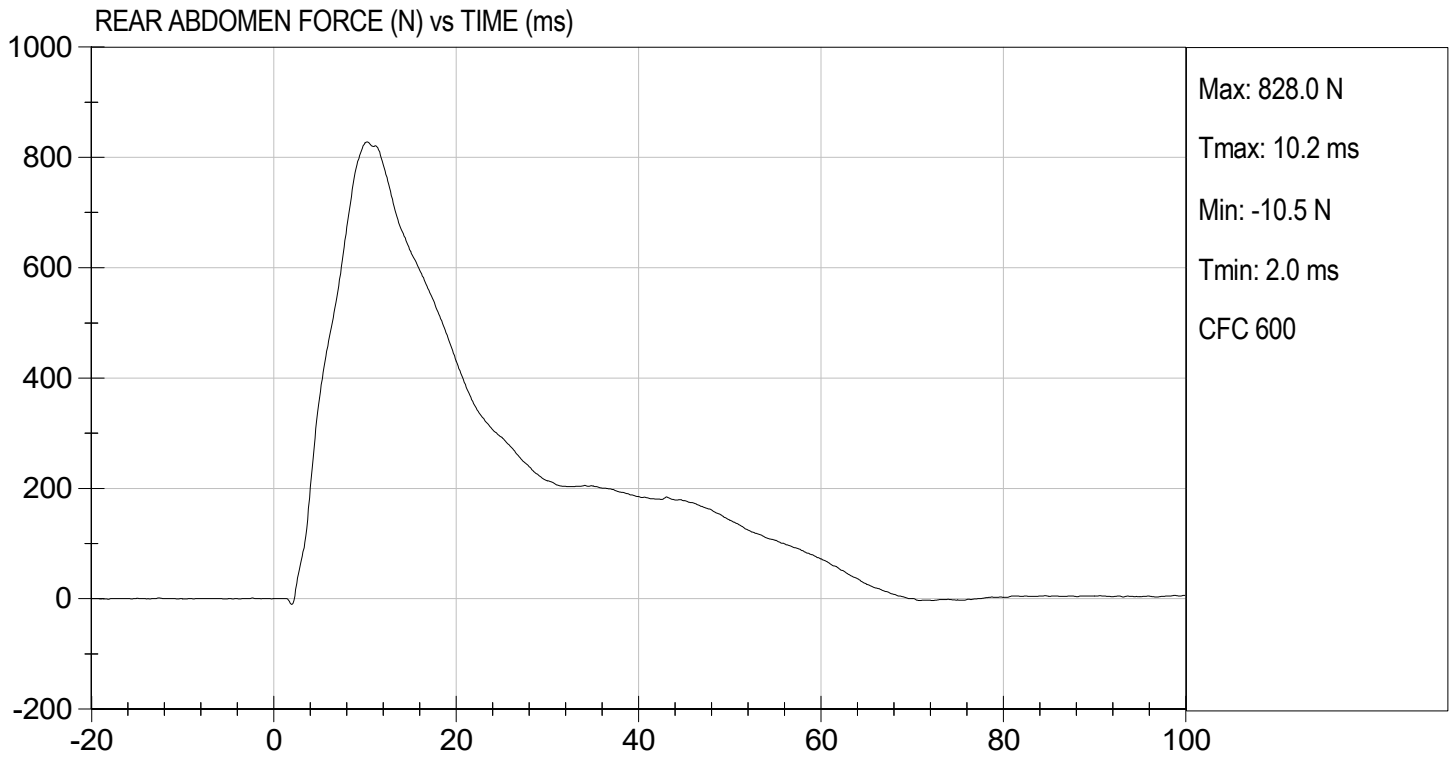
TEST DATE: 12/08/2023  
TEST #: D233247





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

TEST DATE: 12/08/2023  
TEST #: D233247



**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

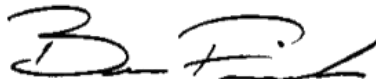
ATD Serial No:           F032          

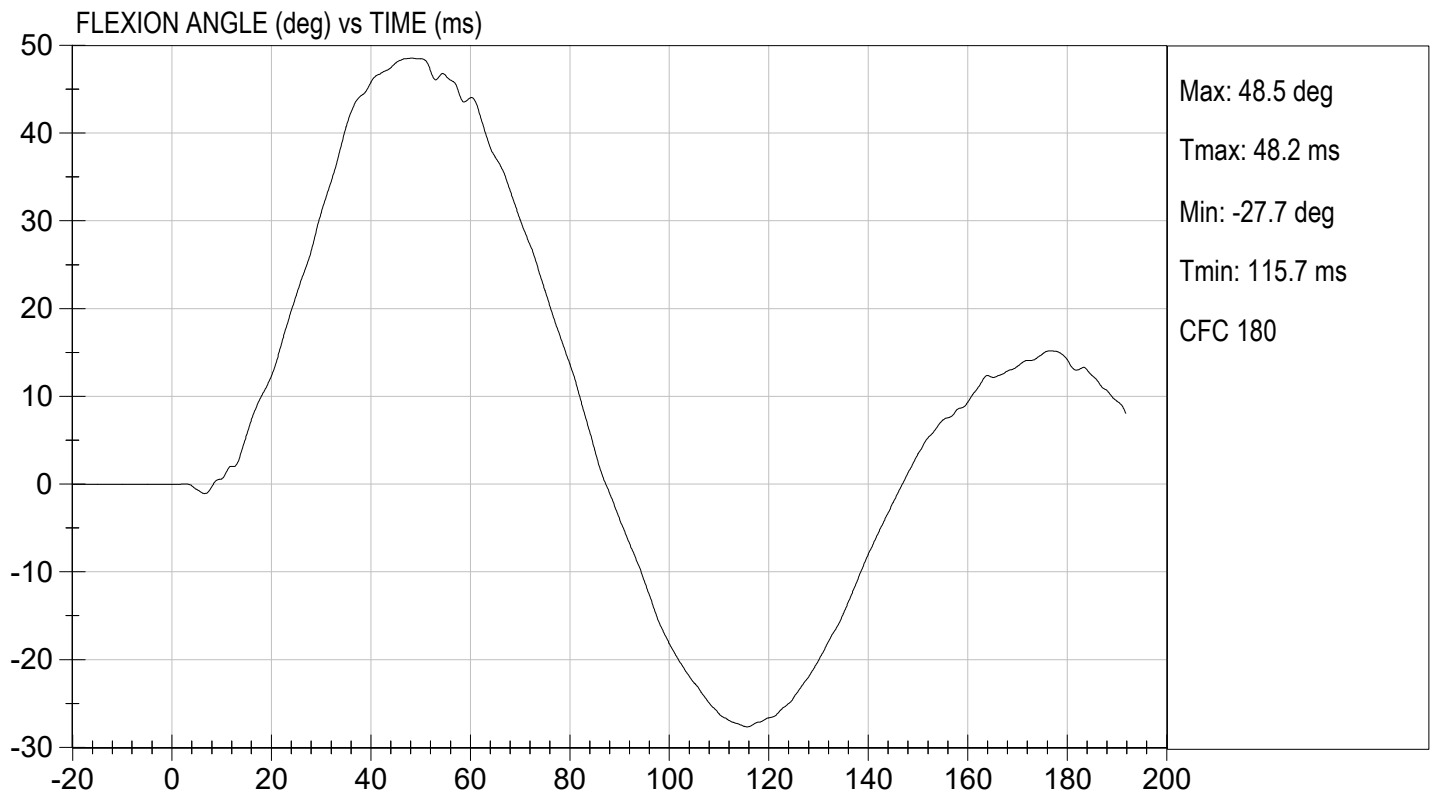
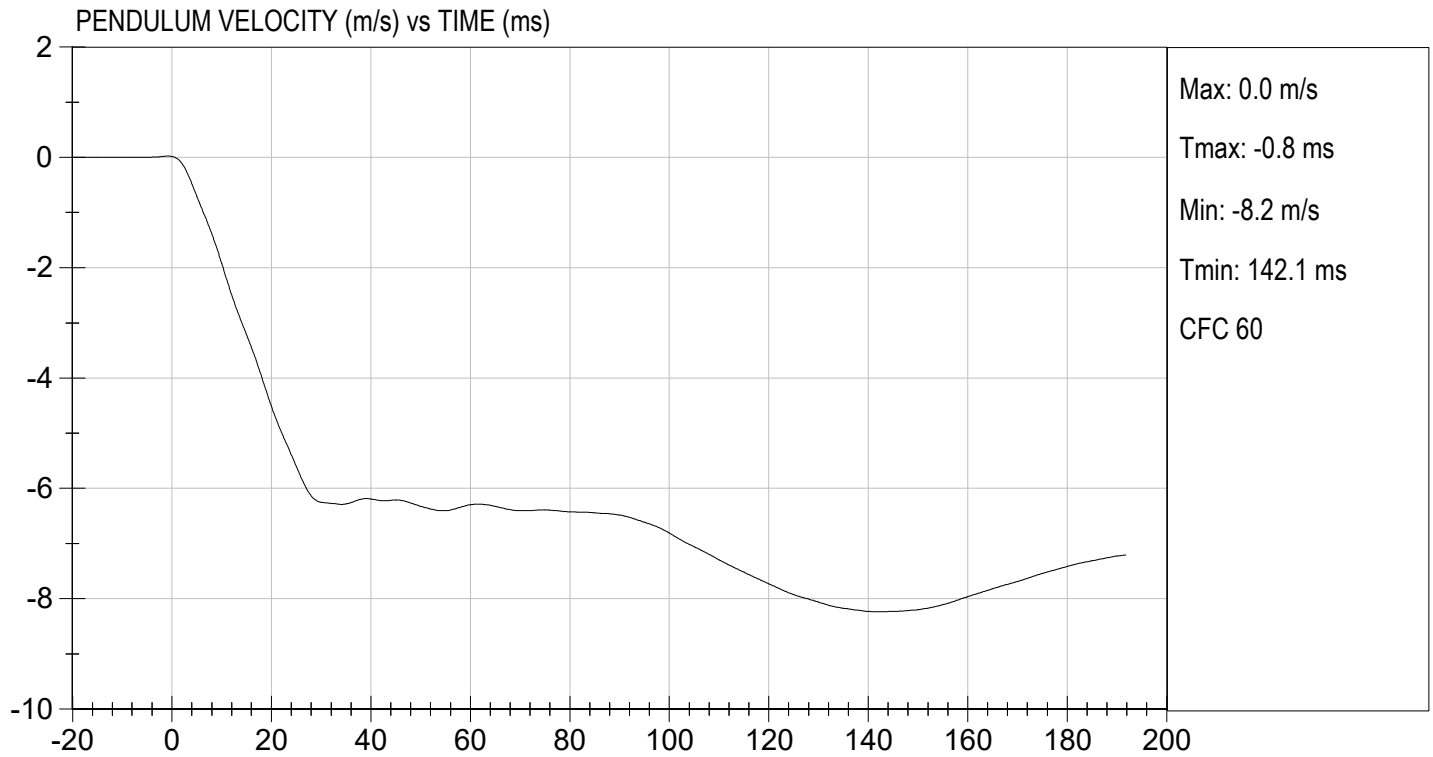
Test I.D.:           D233248          

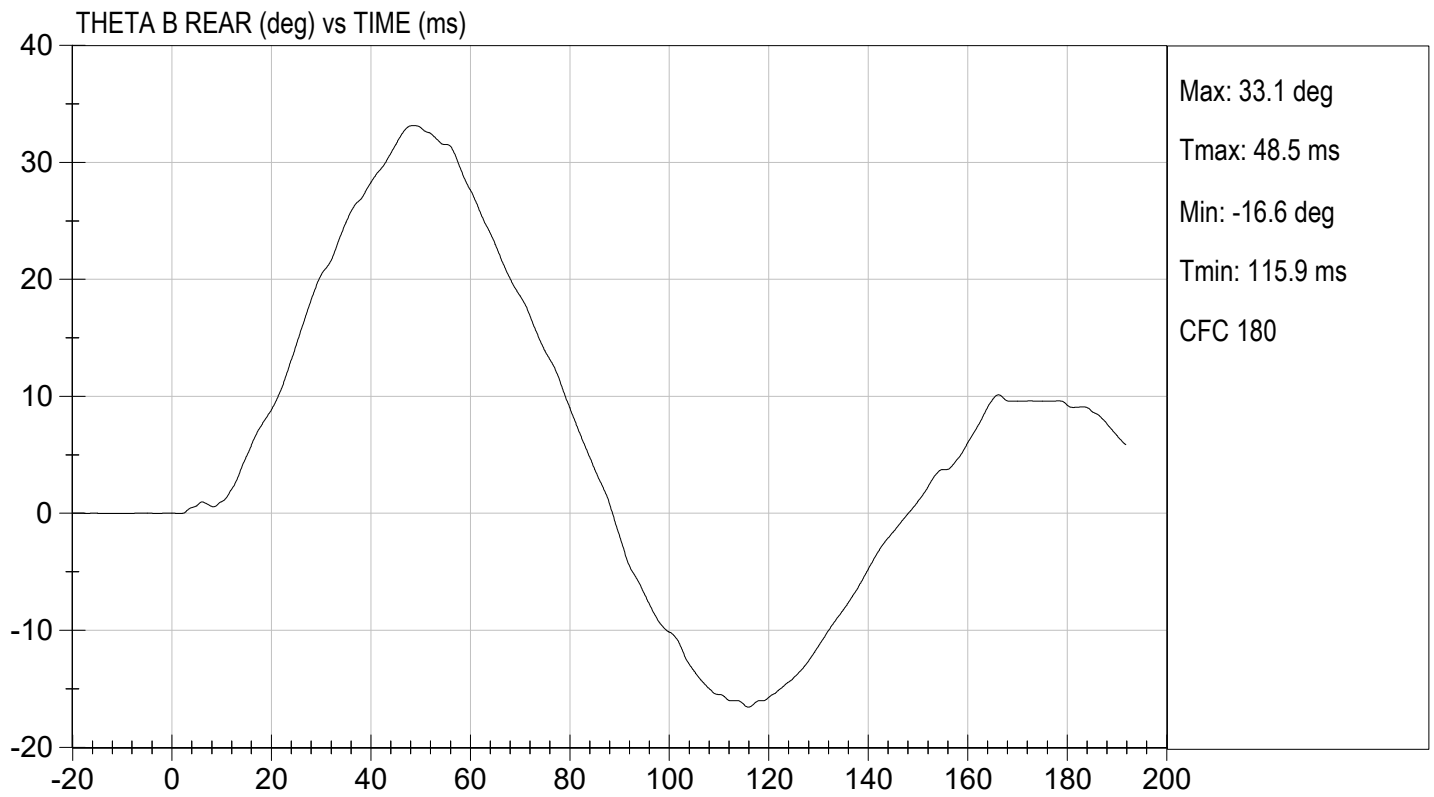
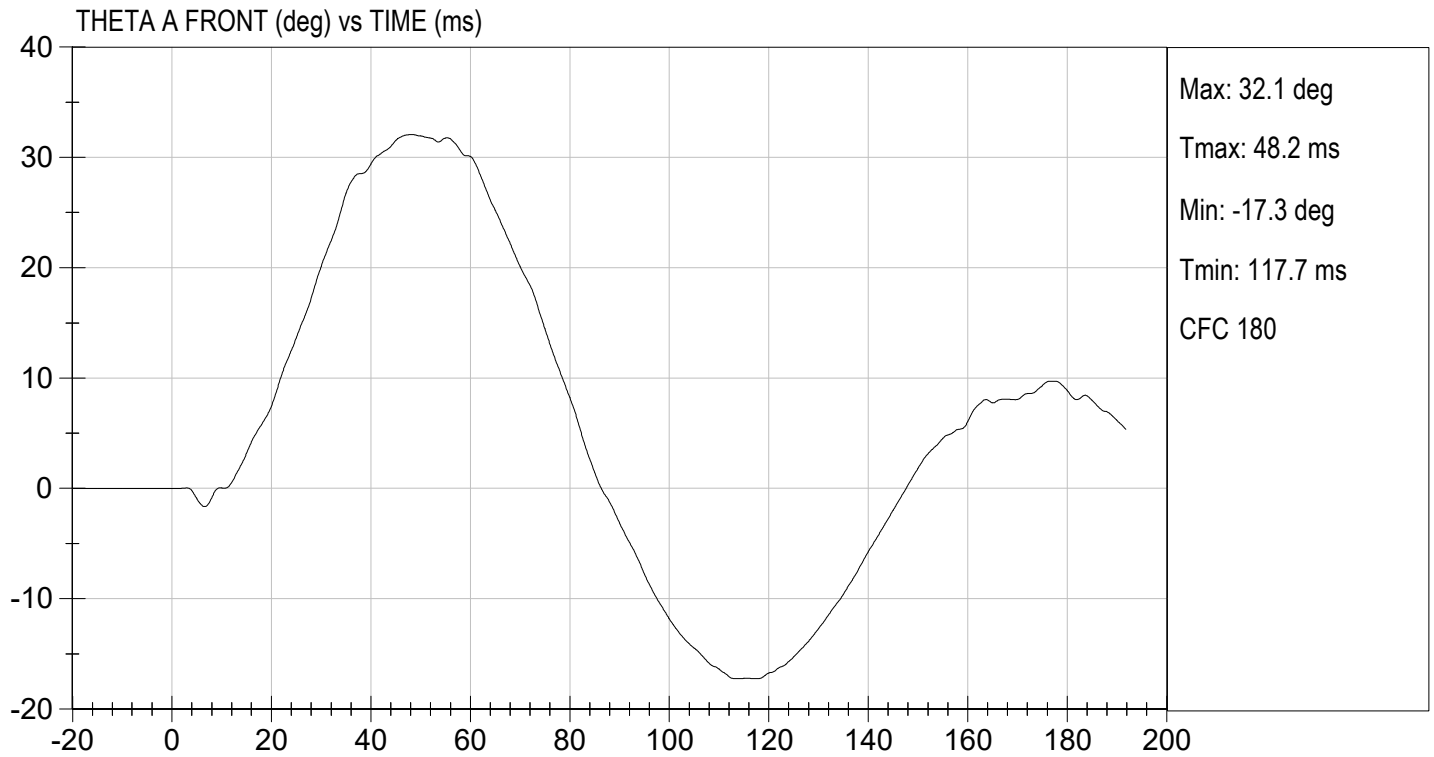
Tested Parameter	Units	Specification	Result	Pass/Fail	
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass	
Laboratory Relative Humidity	%	10 to 70	31	Pass	
Pendulum Speed	m/s	5.95 to 6.15	6.12	Pass	
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.410	Pass
	27 ms	m/s	-6.50 to -5.80	-5.99	Pass
	30 ms	m/s	>= -6.50	-6.25	Pass
Maximum Flexion Angle	deg	45.0 to 55.0	48.5	Pass	
Time of Maximum Flexion Angle	ms	39.0 to 53.0	48.2	Pass	
Headform Rotation Decay to Initial Position	ms	37 to 57	39	Pass	
<b>Overall Results</b>				<b>Pass</b>	

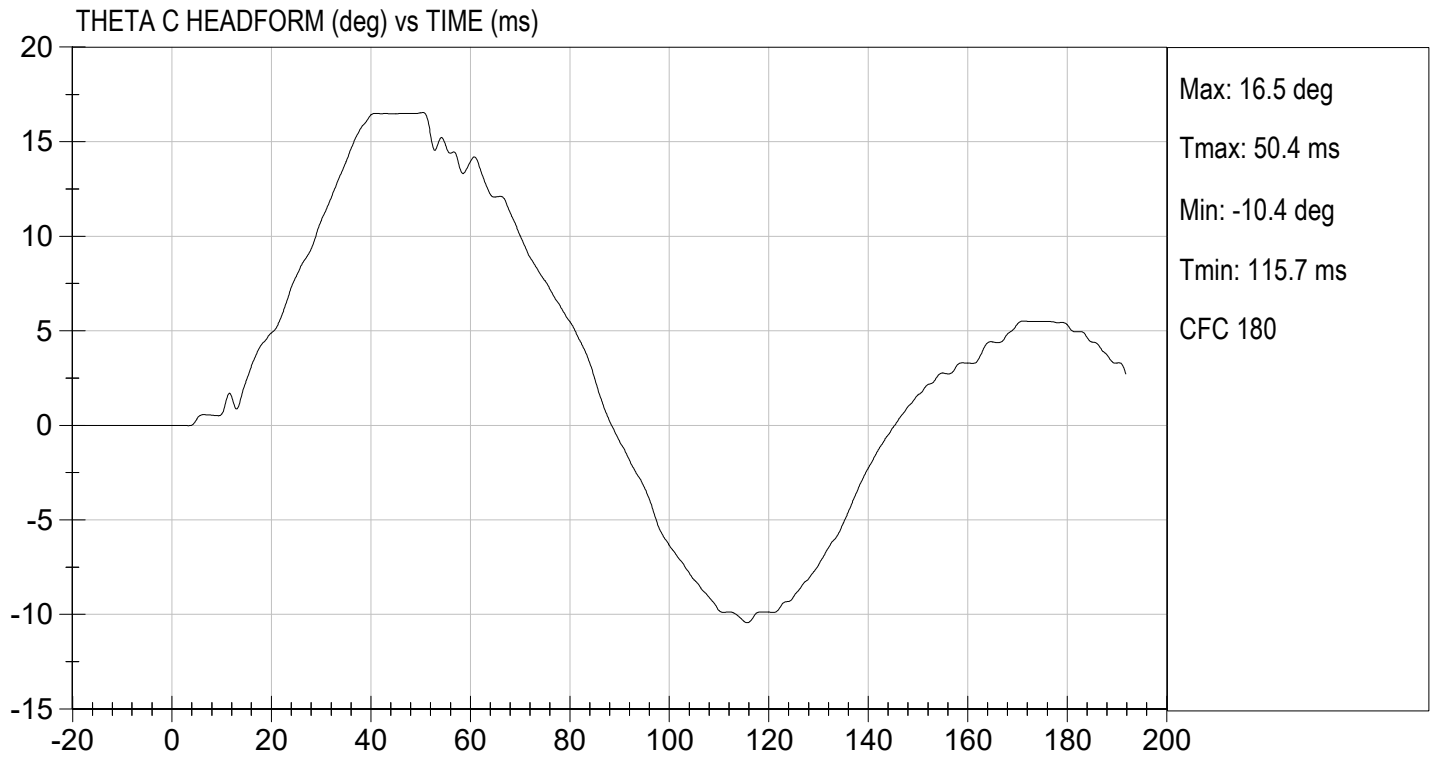
  
 Laboratory Technician

          12/08/2023            
 Test Date

  
 Approved By







**MGA RESEARCH CORPORATION**

**PELVIS TEST  
ES-2re DUMMY**

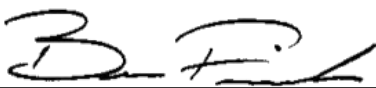
**ATD Serial No:**       F032      

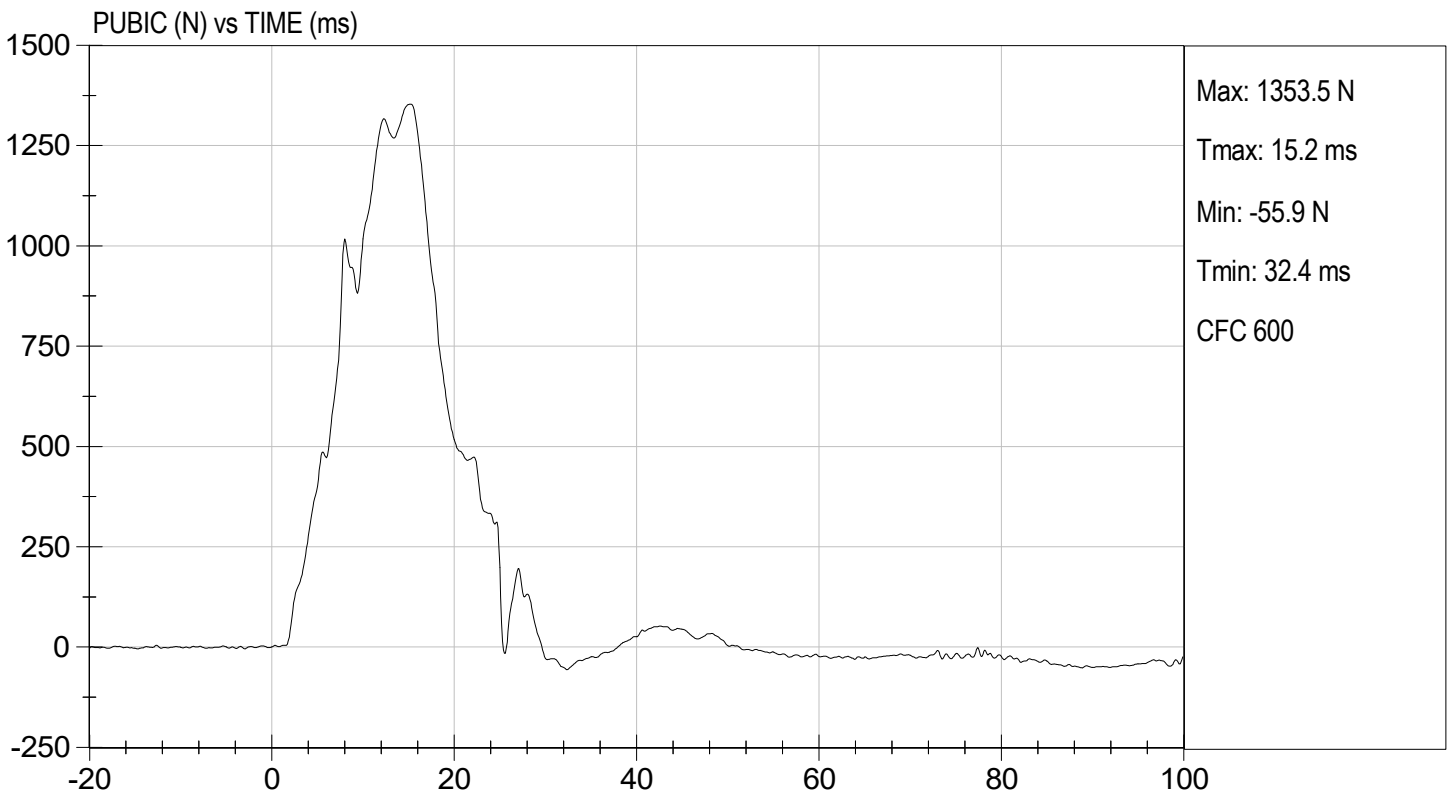
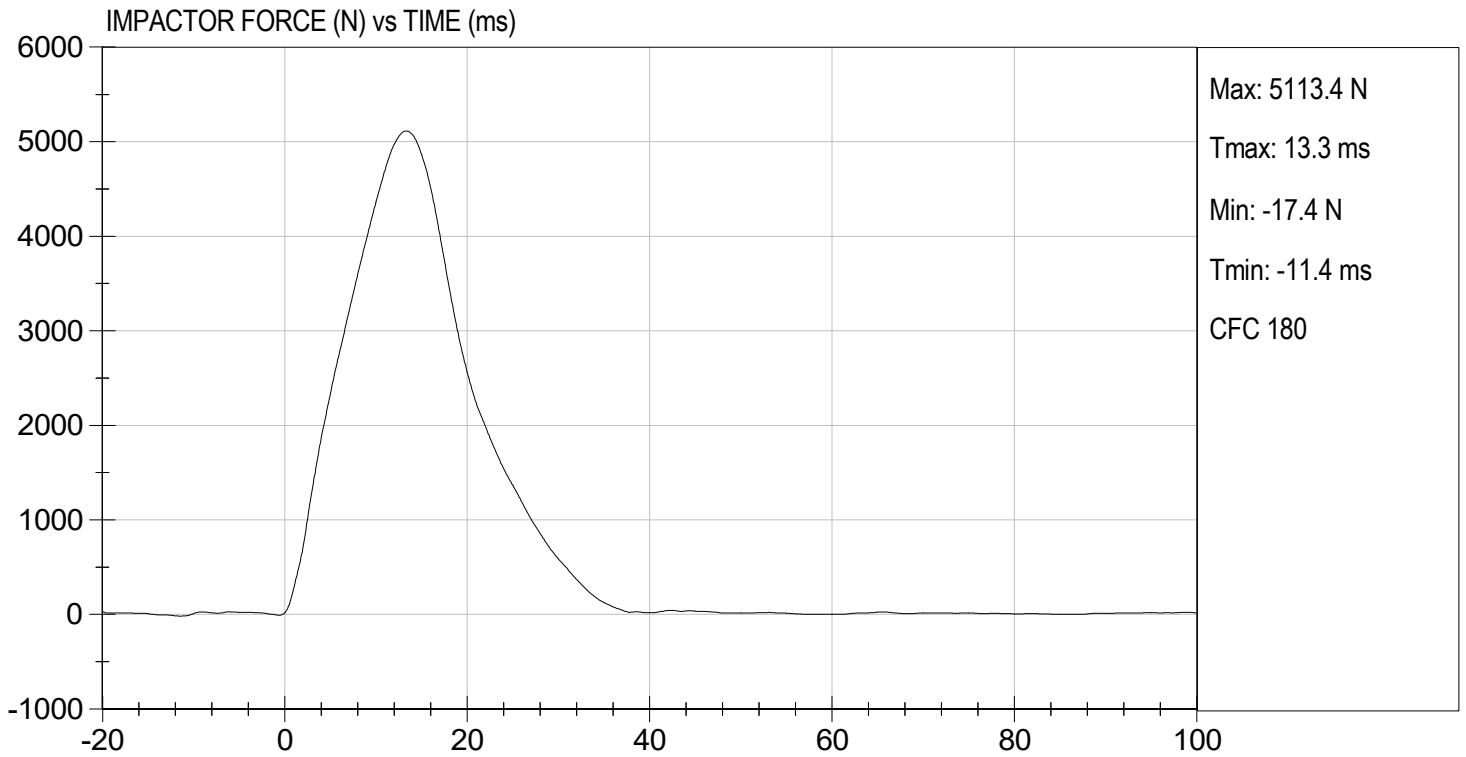
**Test I.D:**       D233249      

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	4.20 to 4.40	4.27	Pass
Maximum Impactor Force	N	4700 to 5400	5113	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.3	Pass
Maximum Pubic Force	N	1230 to 1590	1354	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	15.2	Pass
Overall Test Results				Pass

  
\_\_\_\_\_  
Laboratory Technician

      12/08/2023        
Test Date

  
\_\_\_\_\_  
Approved By



**MGA RESEARCH CORPORATION**  
**THORAX IMPACT TEST**  
**ES-2re DUMMY**

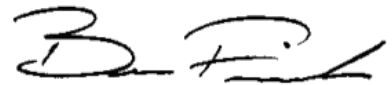
ATD Serial No:           F032          

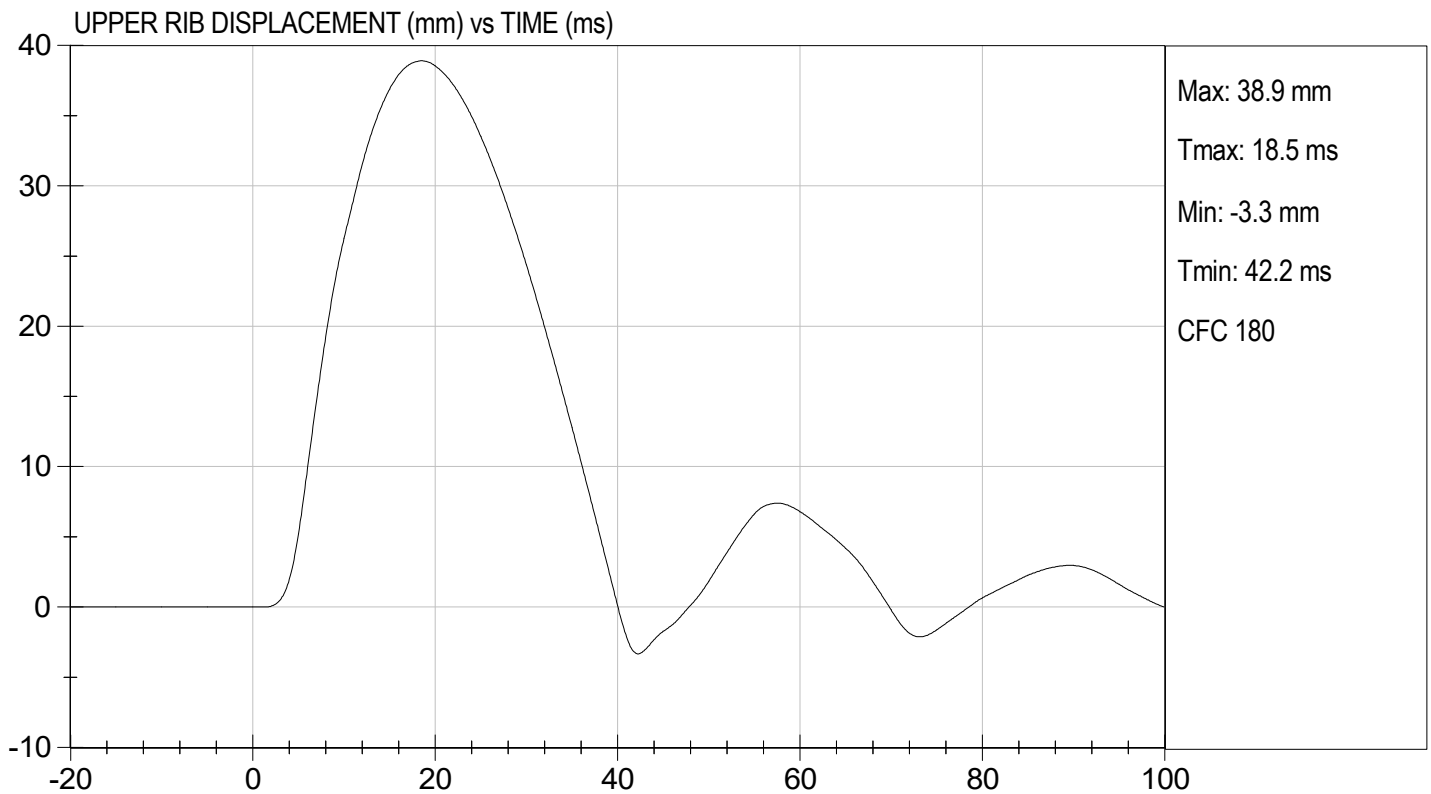
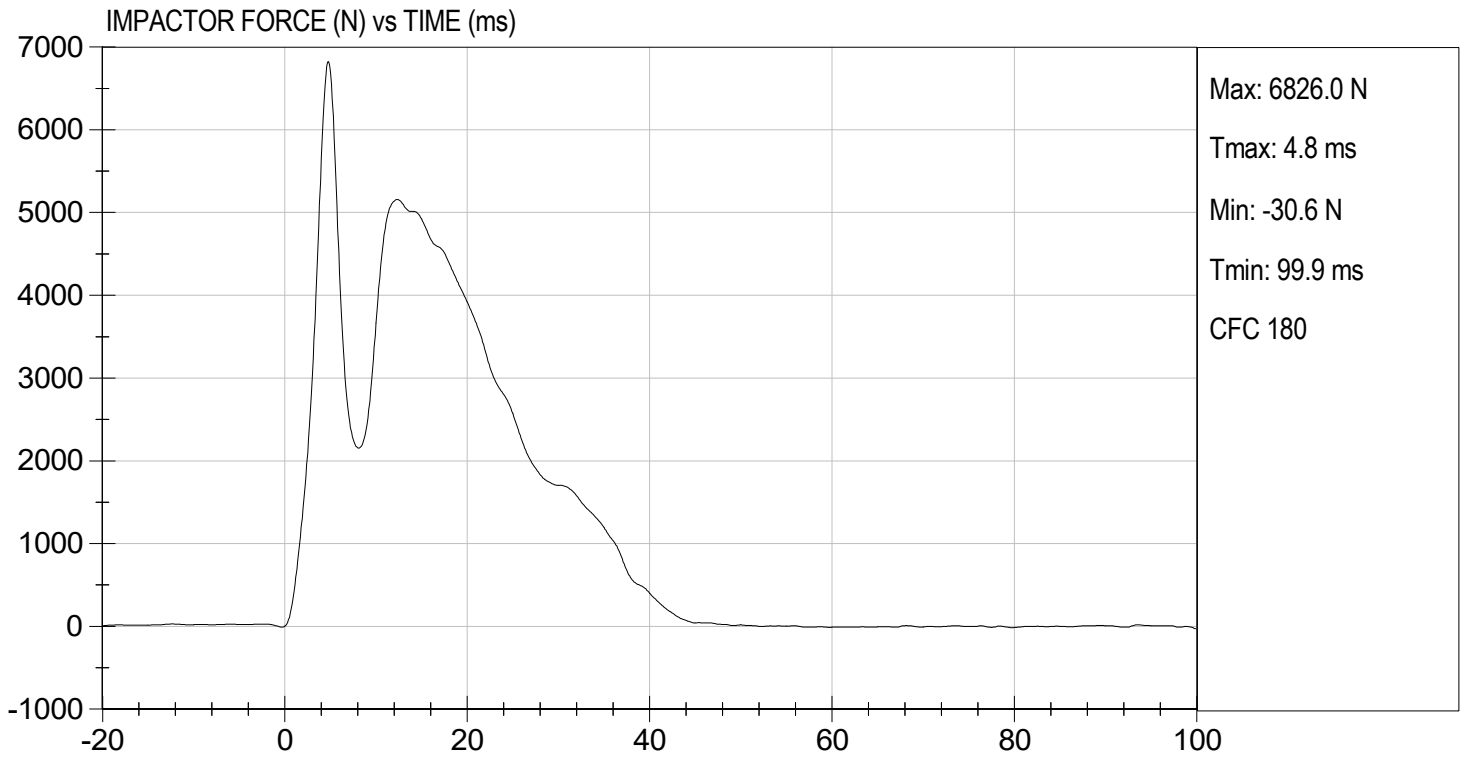
Test I.D:           D233240          

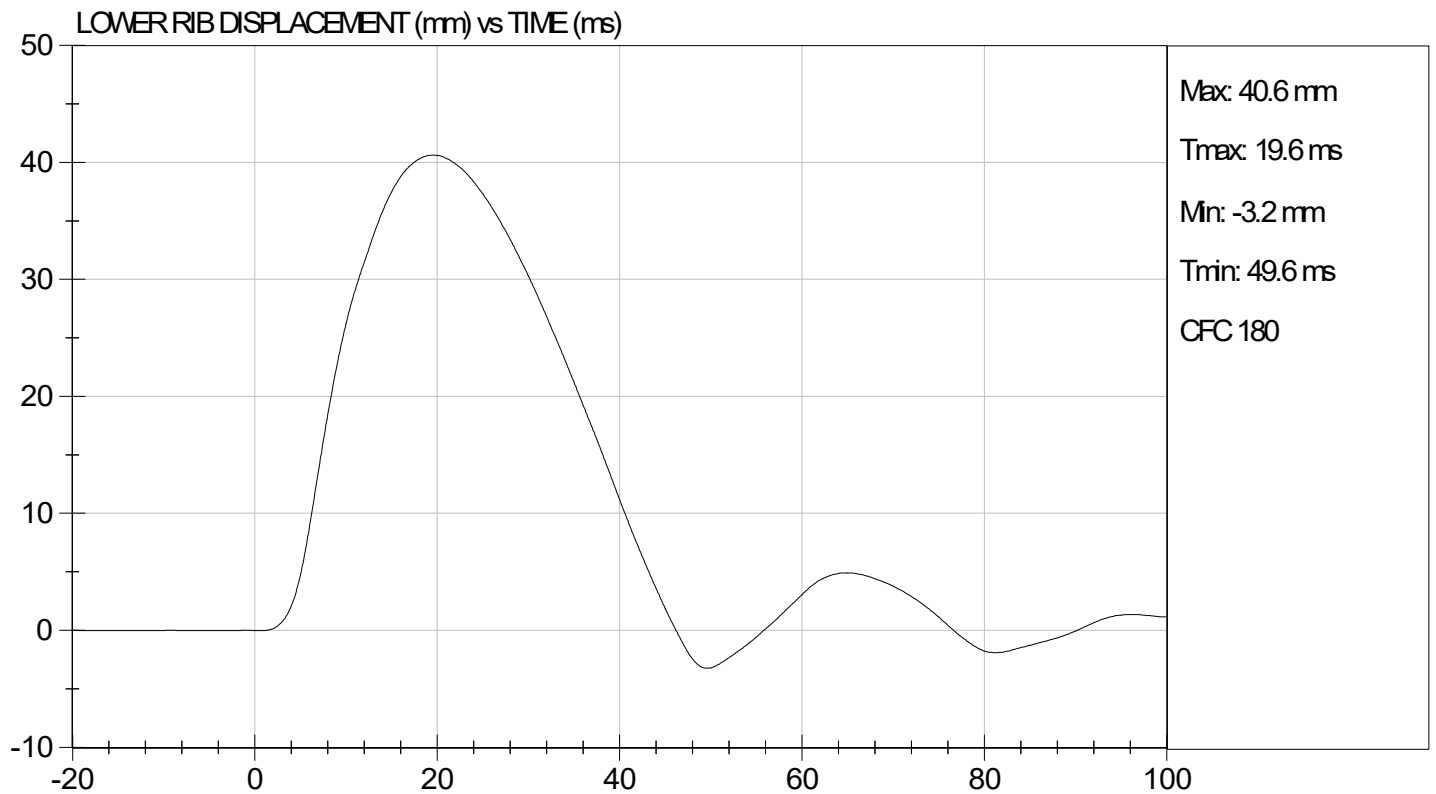
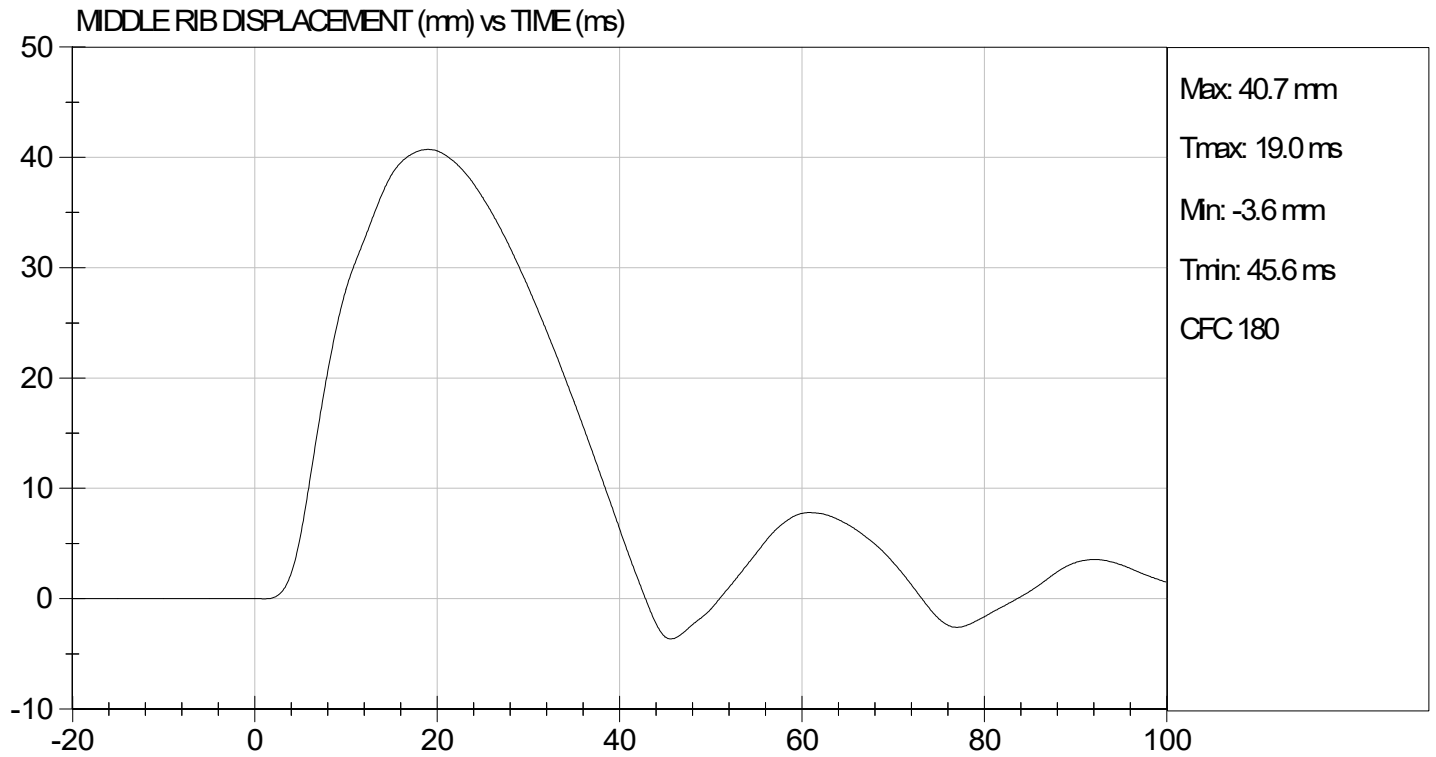
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	36	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5156	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.9	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.7	Pass
Lower Rib Displacement	mm	37.0 to 44.0	40.6	Pass
Overall Test Results				Pass

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





**QUALIFICATION TEST RESULTS**

**PRE-TEST**

**SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD**

**SID-IIsD External Measurements**  
**SN: 306**

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

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

ATD Serial No: 306

Test ID: D233081

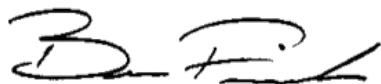
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	115 to 137	132	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-2.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass



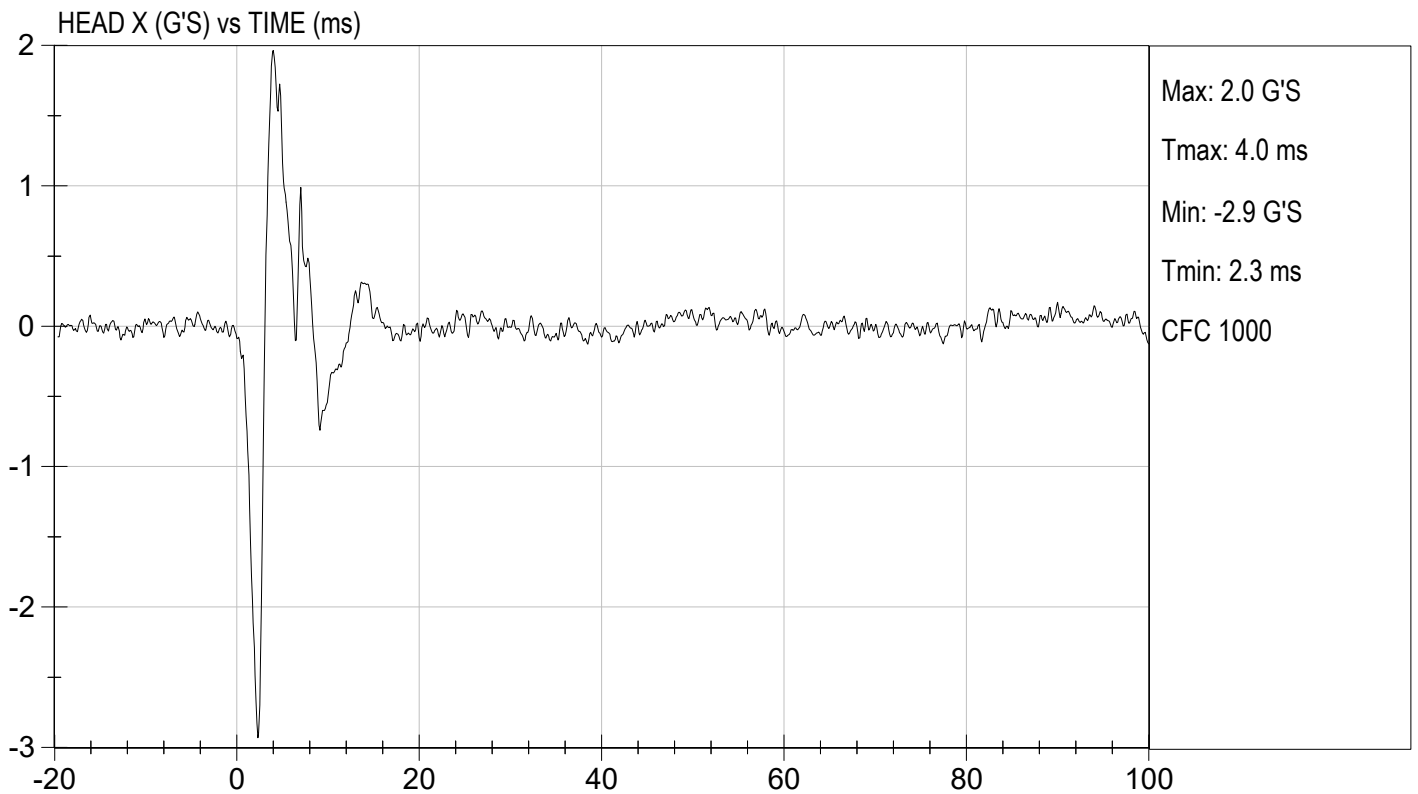
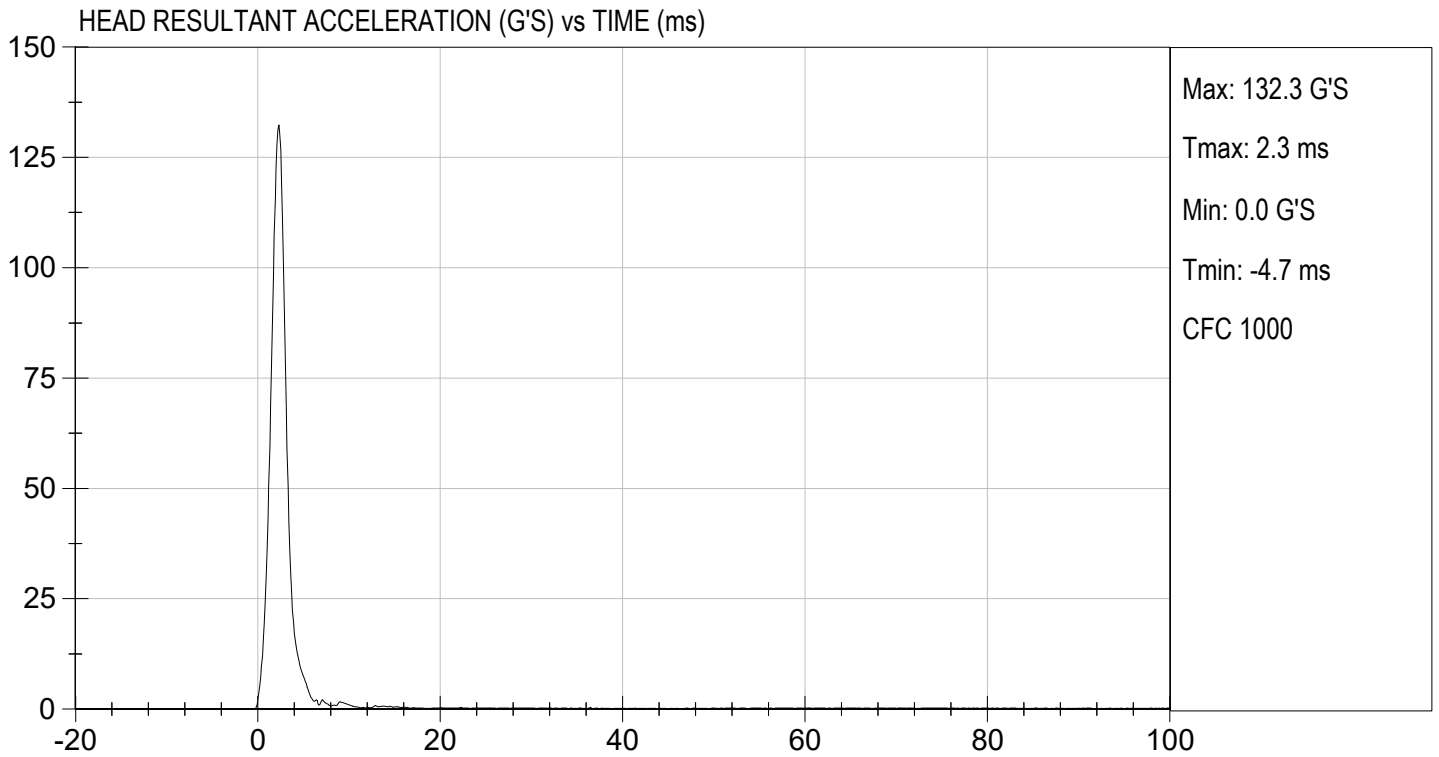
Laboratory Technician

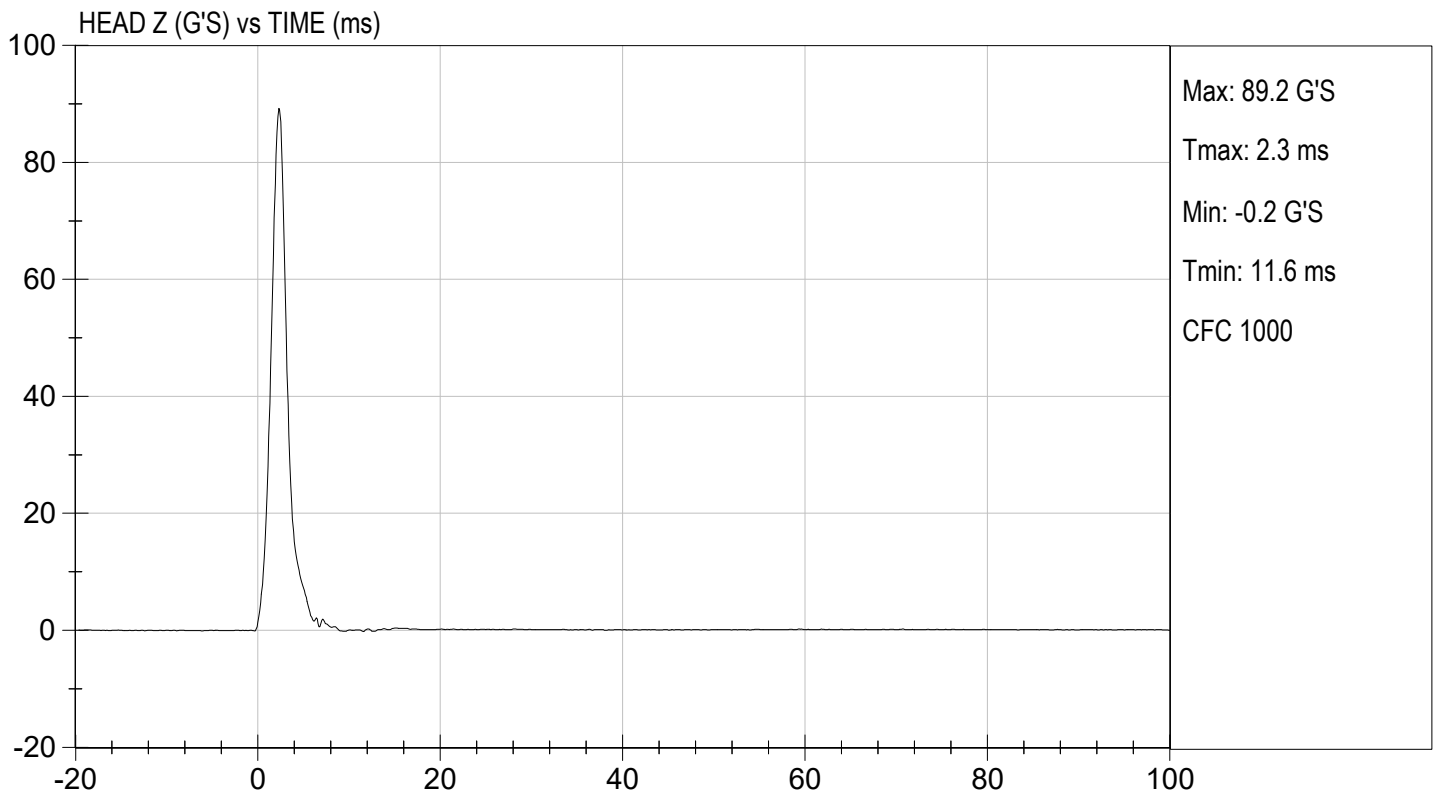
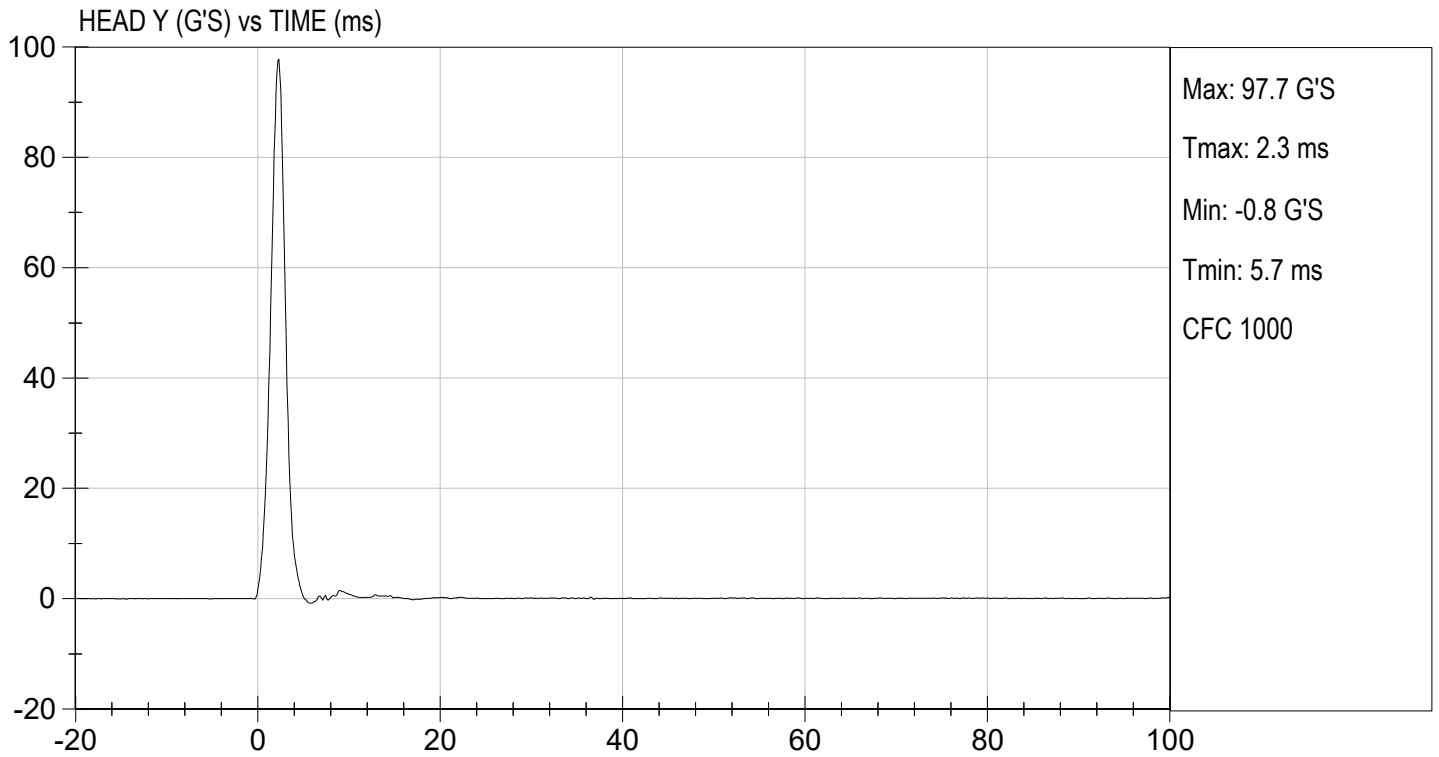
11/13/2023

Test Date



Approved By





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

ATD Serial No: 306

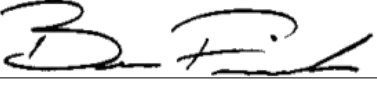
Test I.D.: D233082

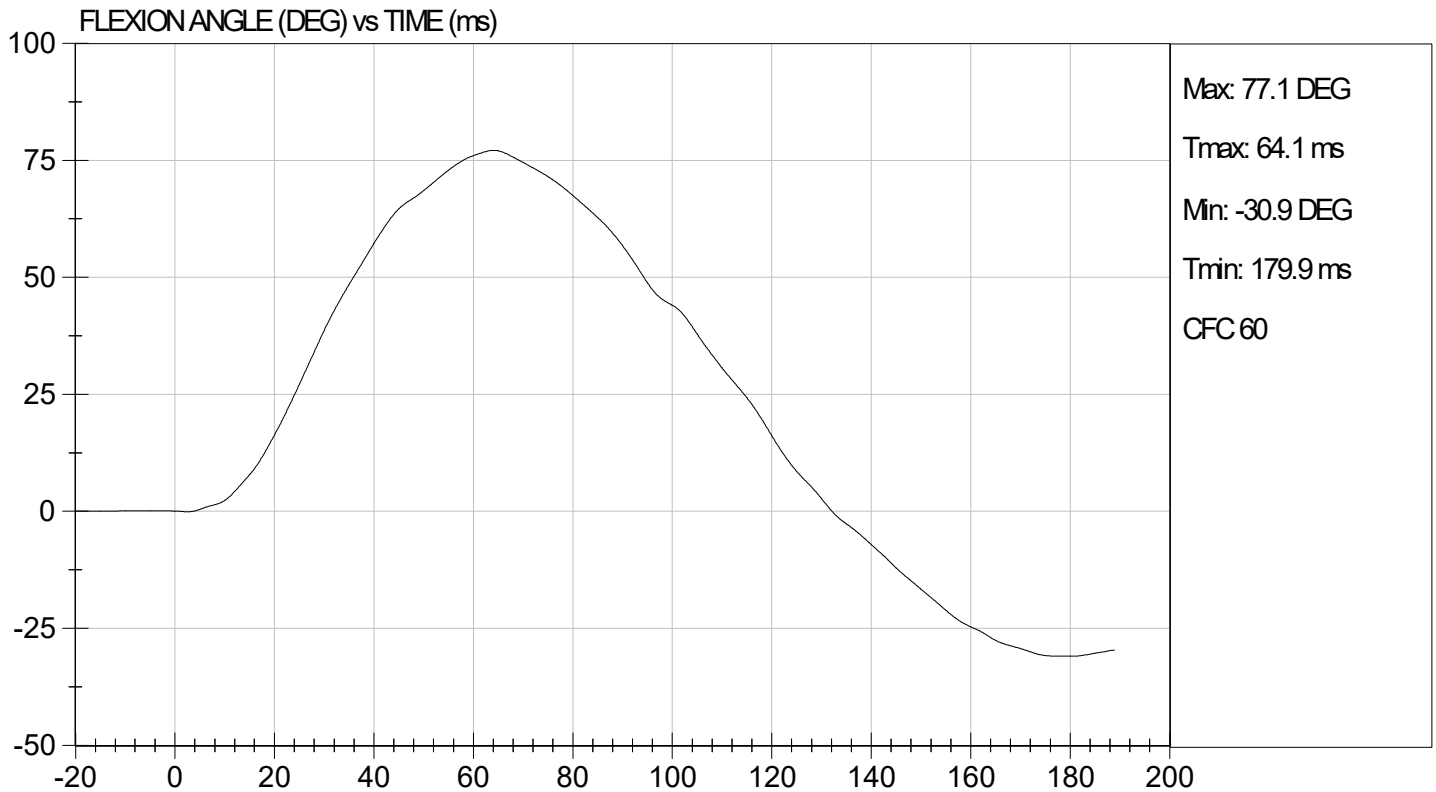
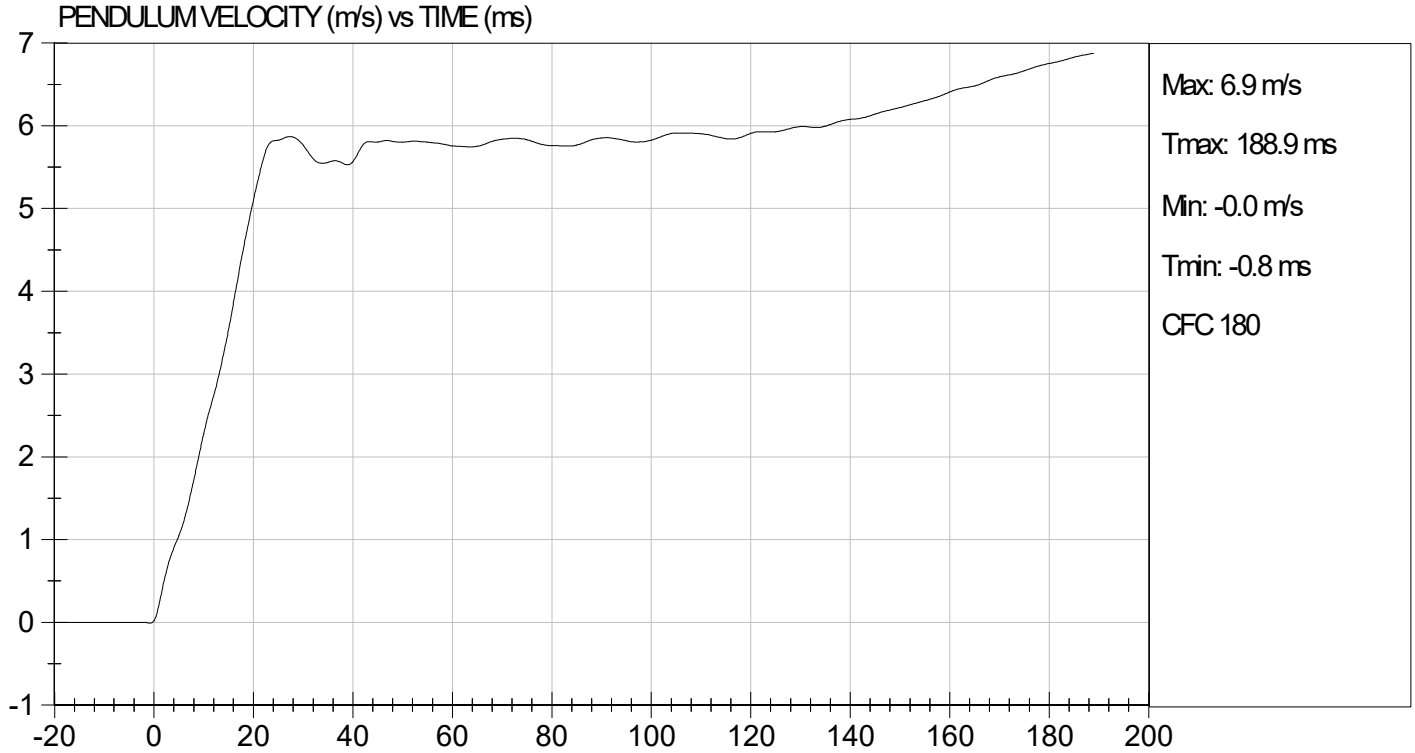
Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.8	Pass	
Humidity	%	10 to 70	26	Pass	
Impact Velocity	m/s	5.51 to 5.63	5.53	Pass	
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.28	Pass
	15 ms	m/s	3.30 to 4.10	3.54	Pass
	20 ms	m/s	4.40 to 5.40	5.10	Pass
	25 ms	m/s	5.40 to 6.10	5.83	Pass
	25-100 ms	m/s	5.50 to 6.20	5.87	Pass
Maximum D-Plane Rotation	deg	71 to 81	77	Pass	
Time of Maximum D-Plane Rotation	ms	50 to 70	64	Pass	
Maximum Occipital Condyle Moment	Nm	-44 to -36	-41	Pass	
Time of Moment Decay to 0 Nm	ms	102 to 126	119	Pass	
Overall Test Results				Pass	

  
Laboratory Technician

11/13/2023

Test Date

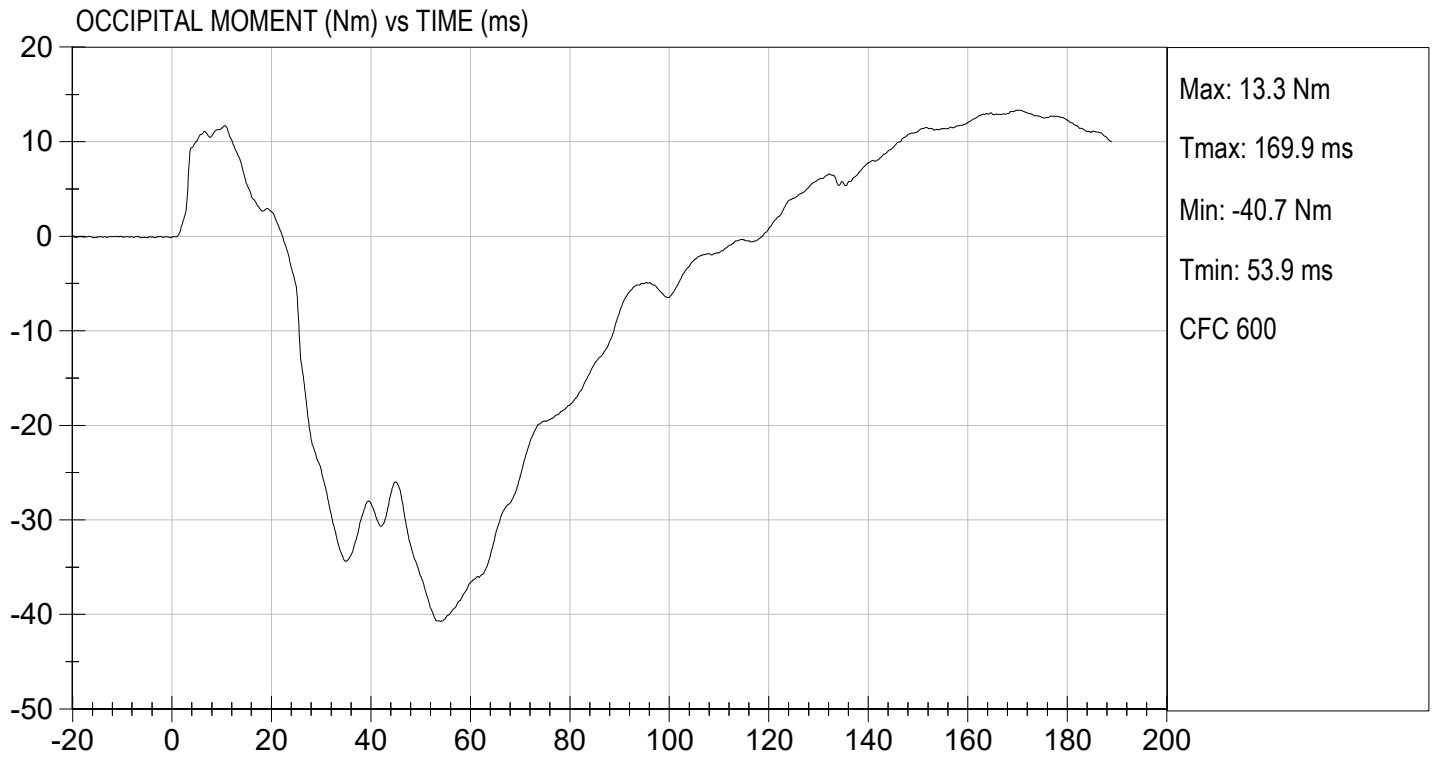
  
Approved By





TEST DESC: NECK BENDING  
VELOCITY: 18.15 ft/s, 5.53 m/s

TEST DATE: 11/13/2023  
TEST #: D233082



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

ATD Serial No: 306

Test ID: D233083

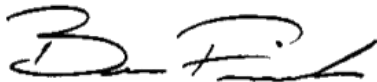
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	14	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
Overall Test Results				Pass



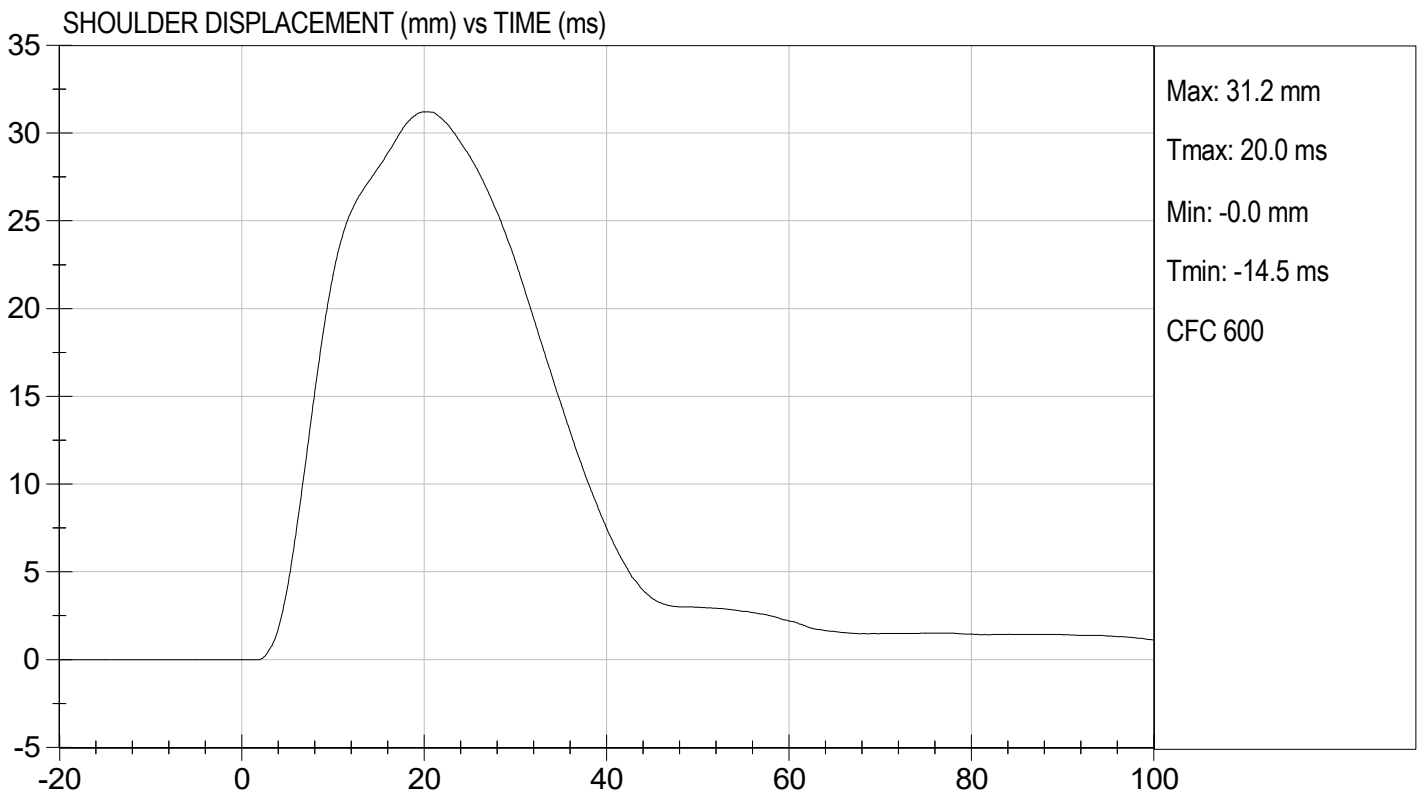
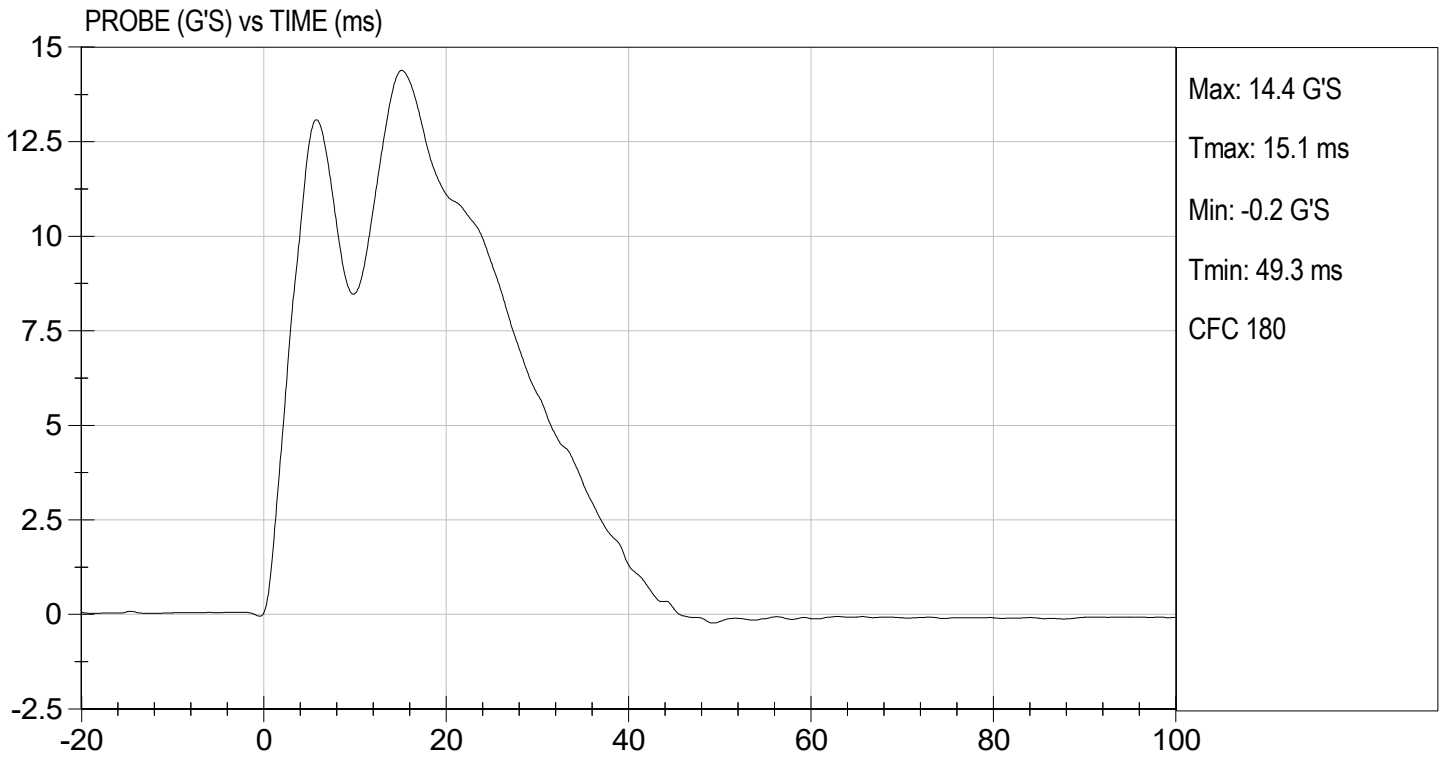
Laboratory Technician

11/13/2023

Test Date



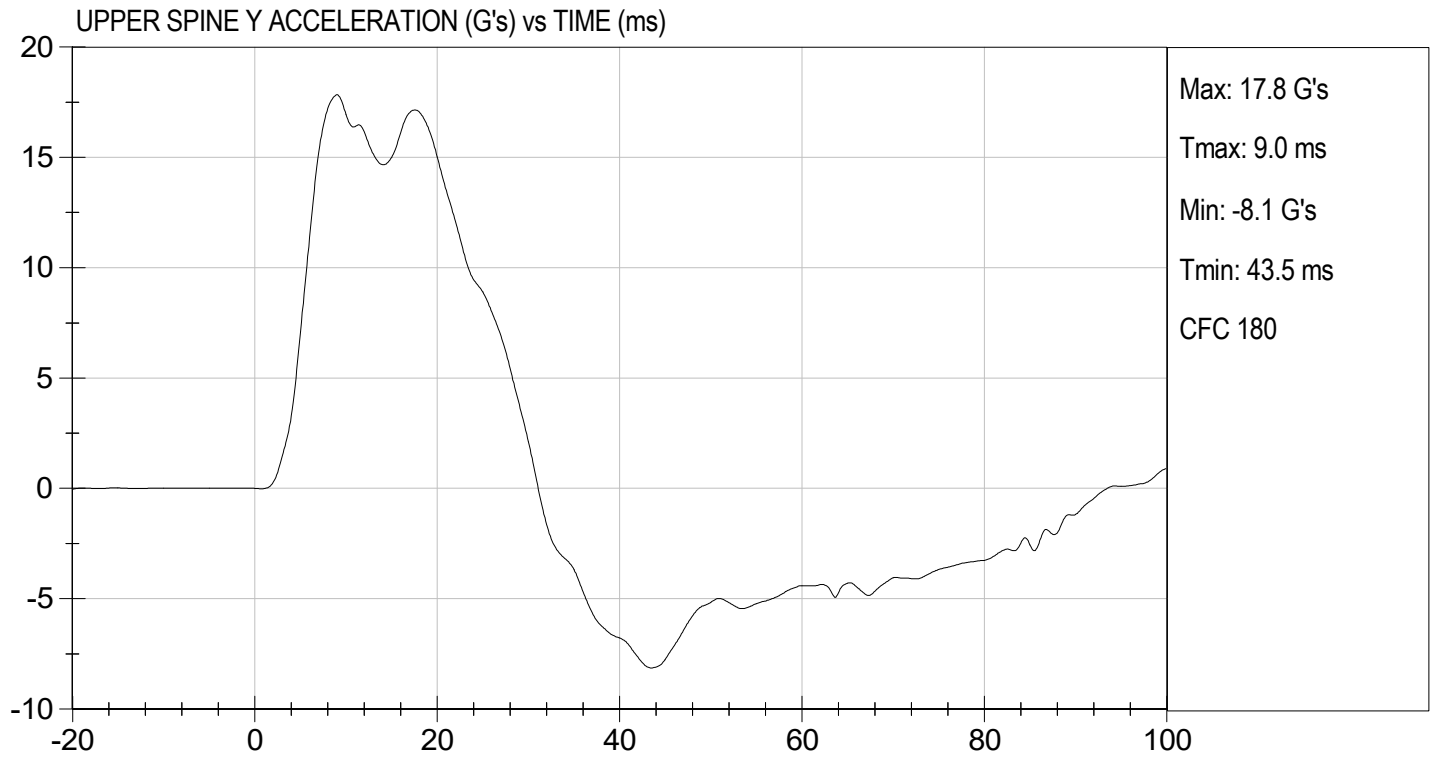
Approved By





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

TEST DATE: 11/13/2023  
TEST #: D233083



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

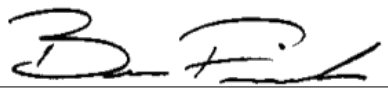
ATD Serial No: 306

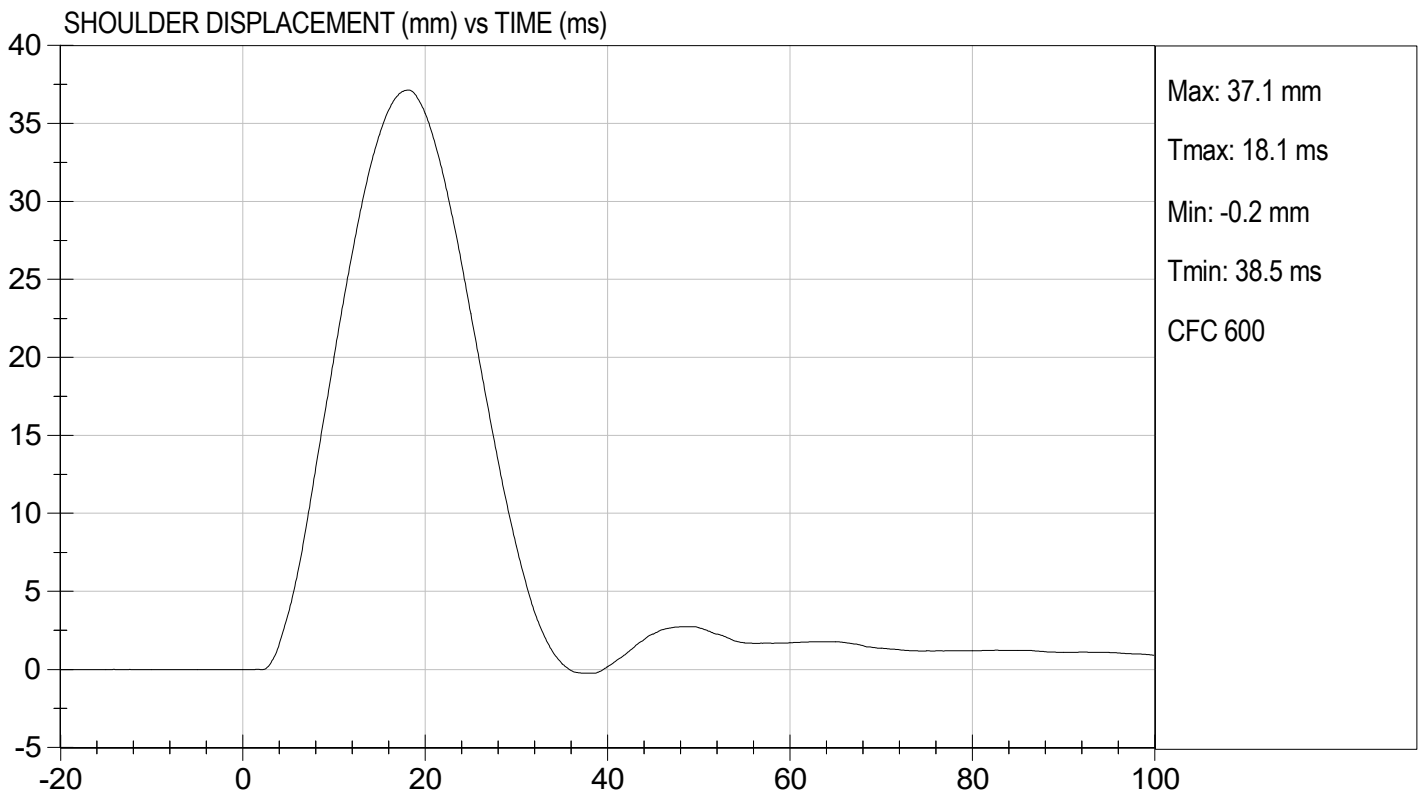
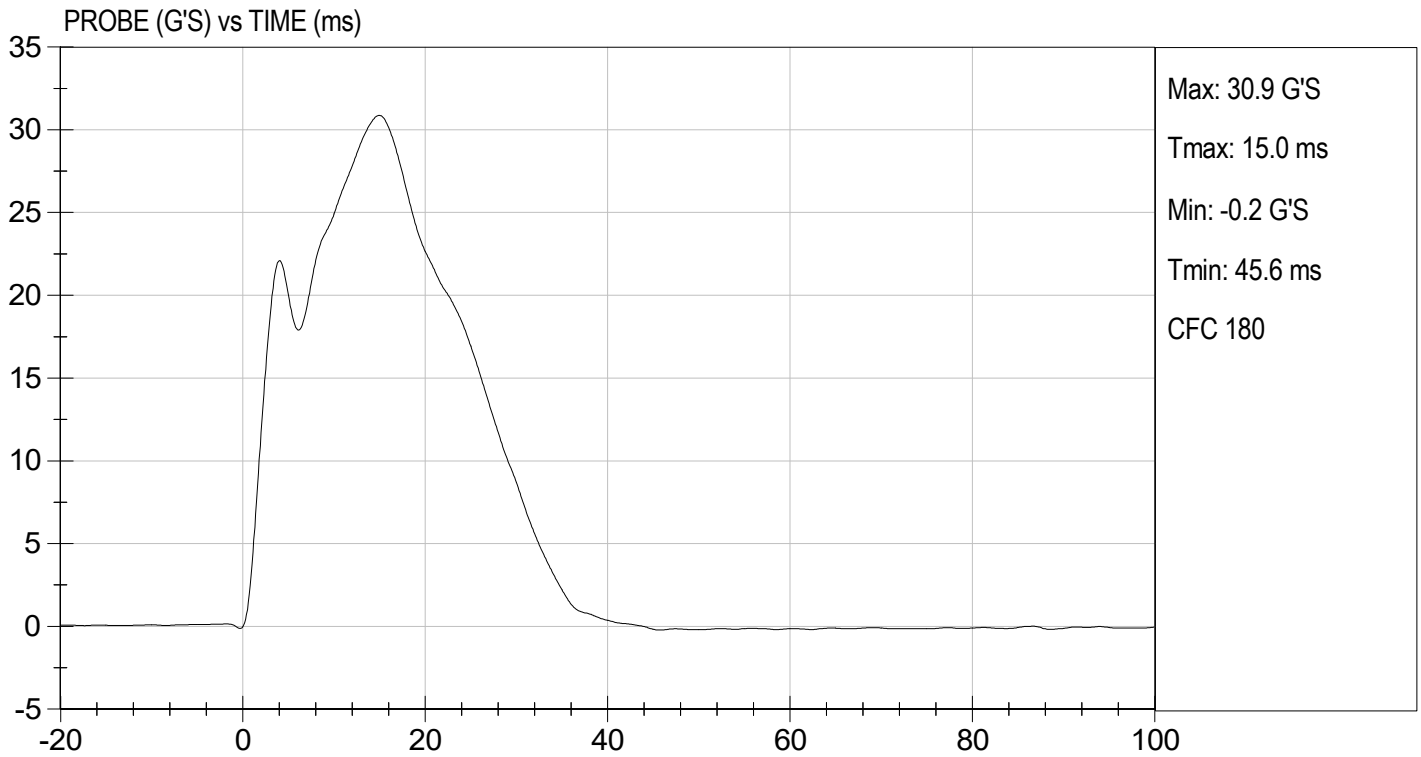
Test I.D: D233084

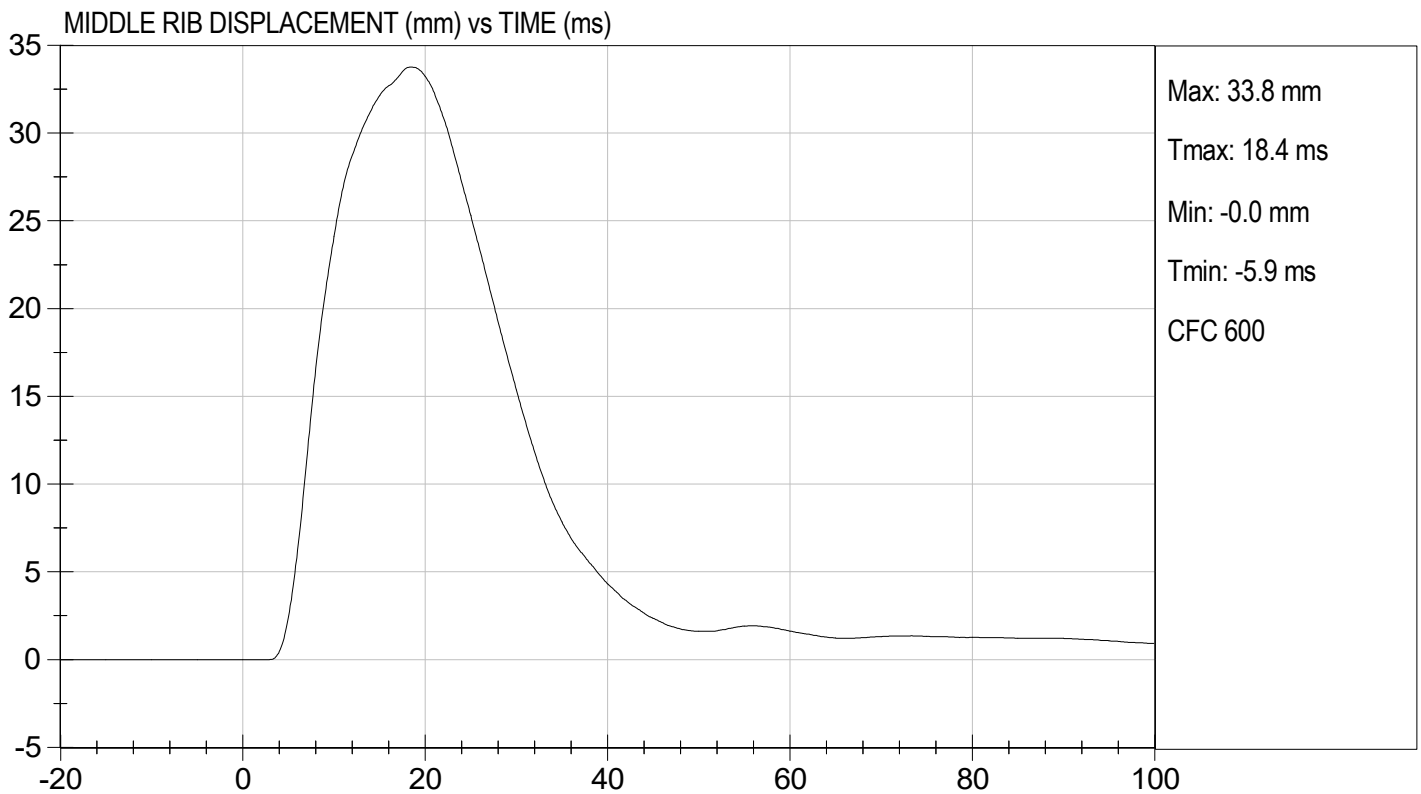
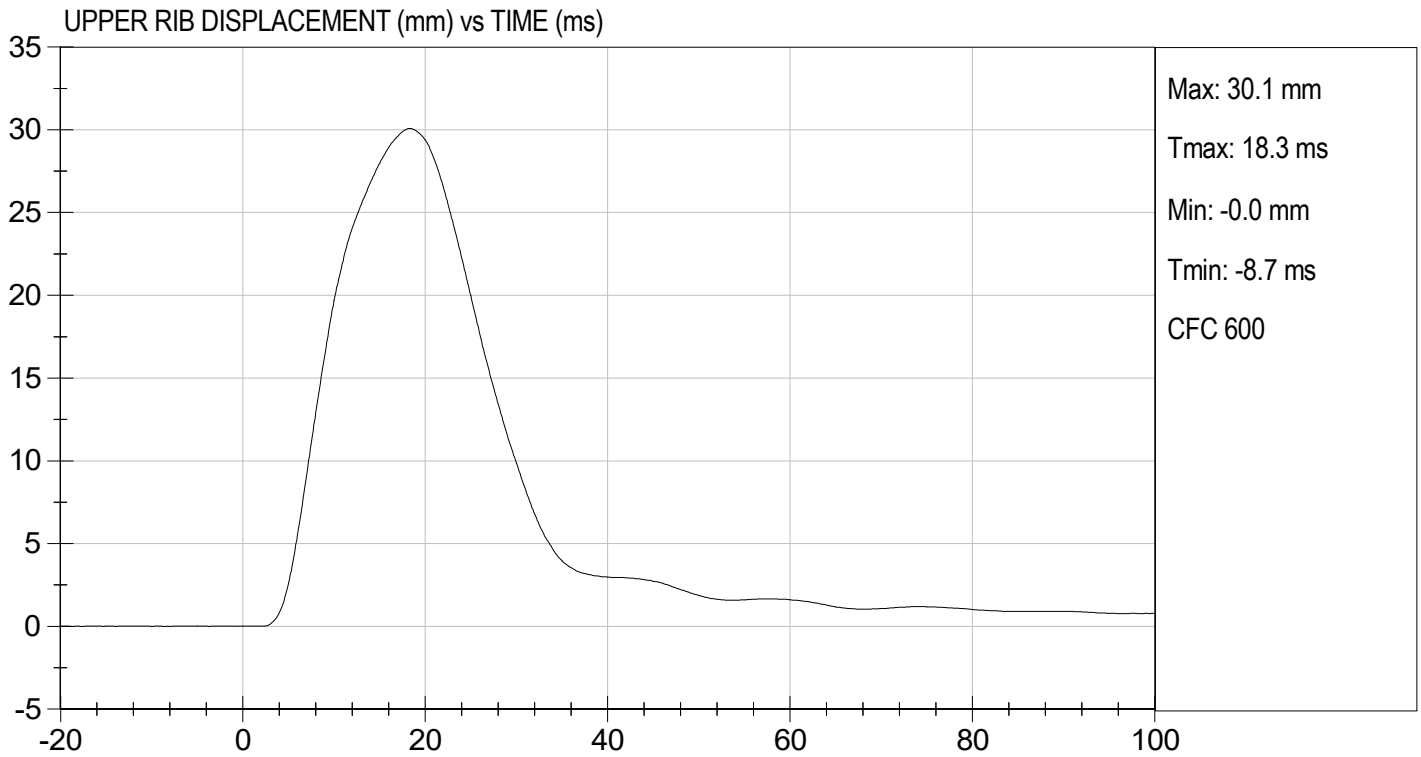
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	31	Pass
Shoulder Displacement	mm	31 to 40	37	Pass
Upper Rib Displacement	mm	25 to 32	30	Pass
Middle 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	35	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass

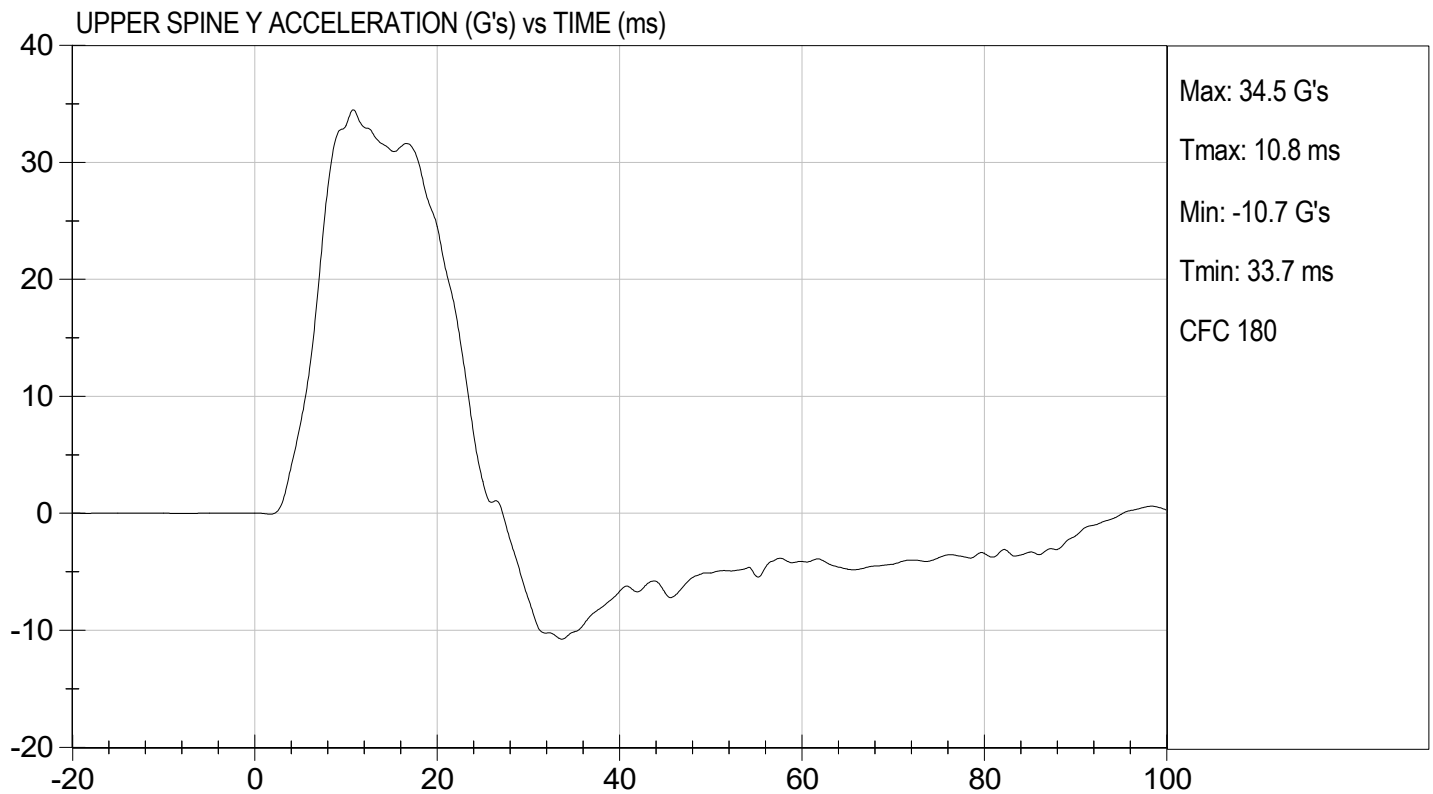
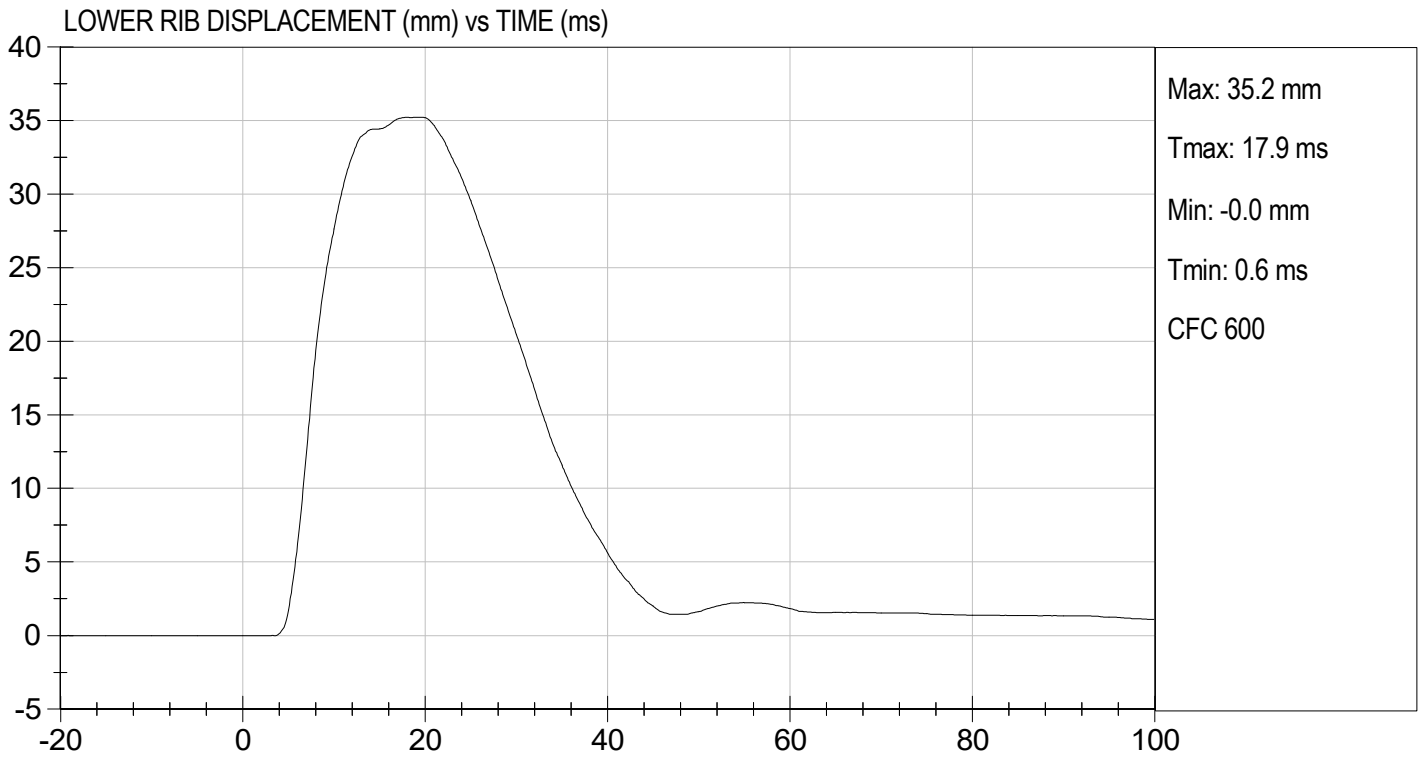
  
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 Laboratory Technician

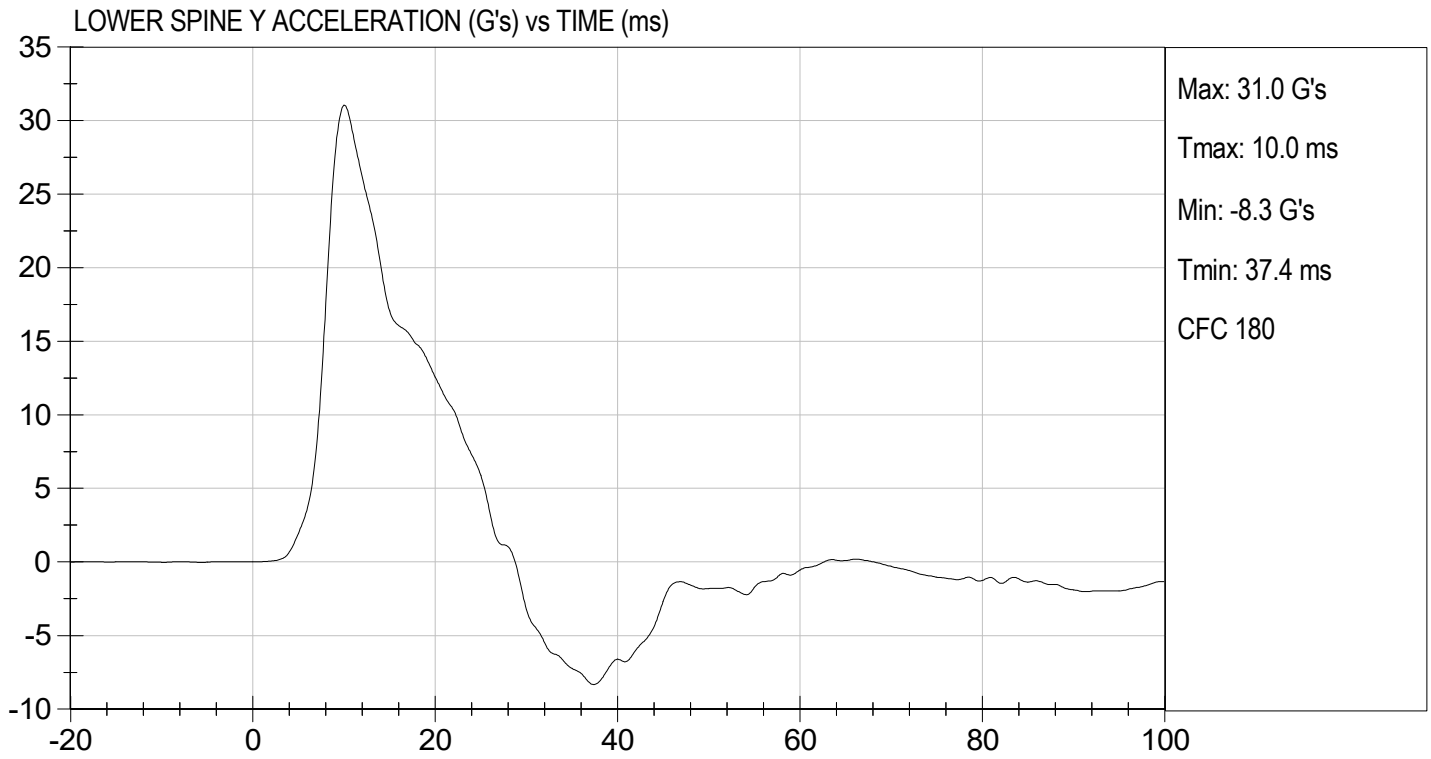
11/13/2023  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By









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

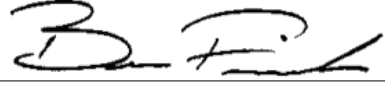
ATD Serial No: 306

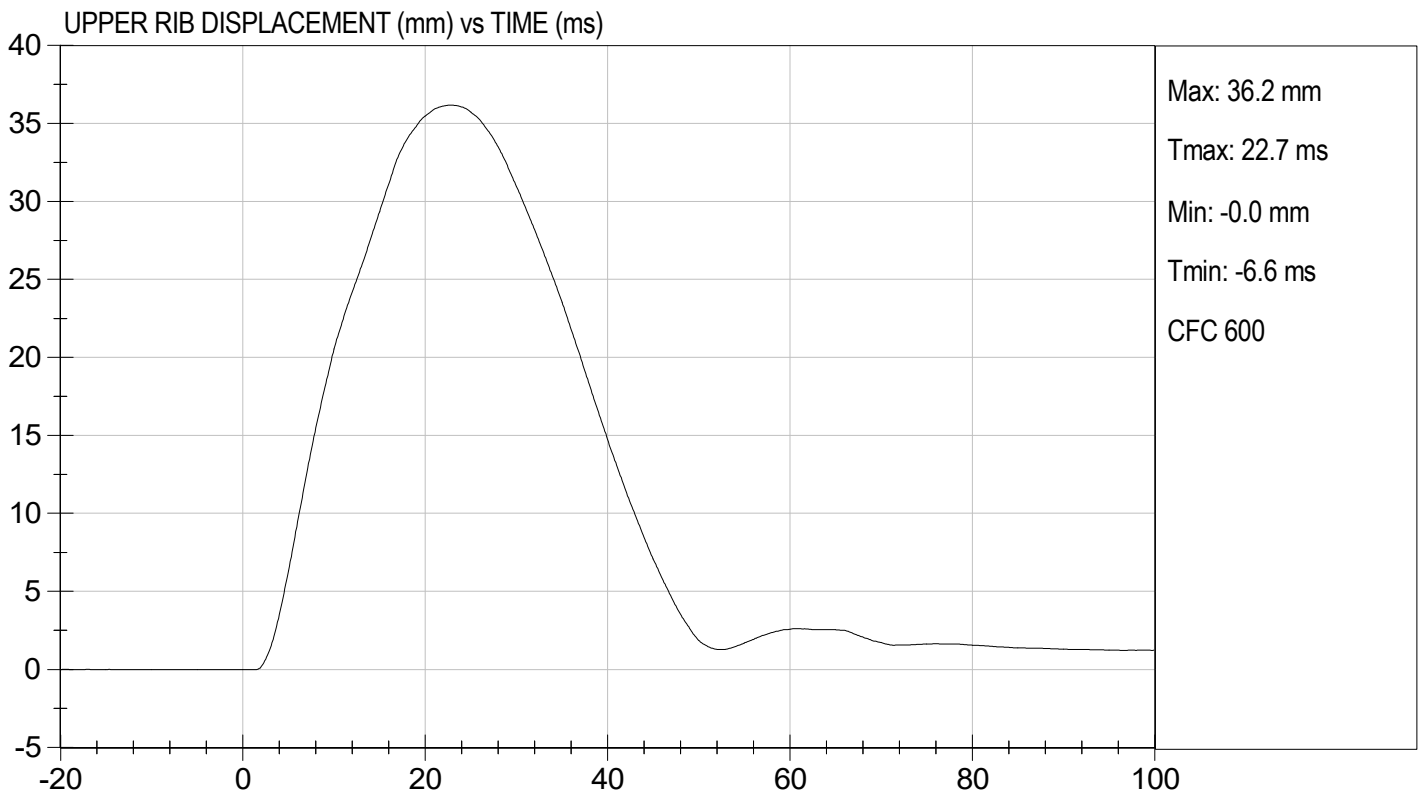
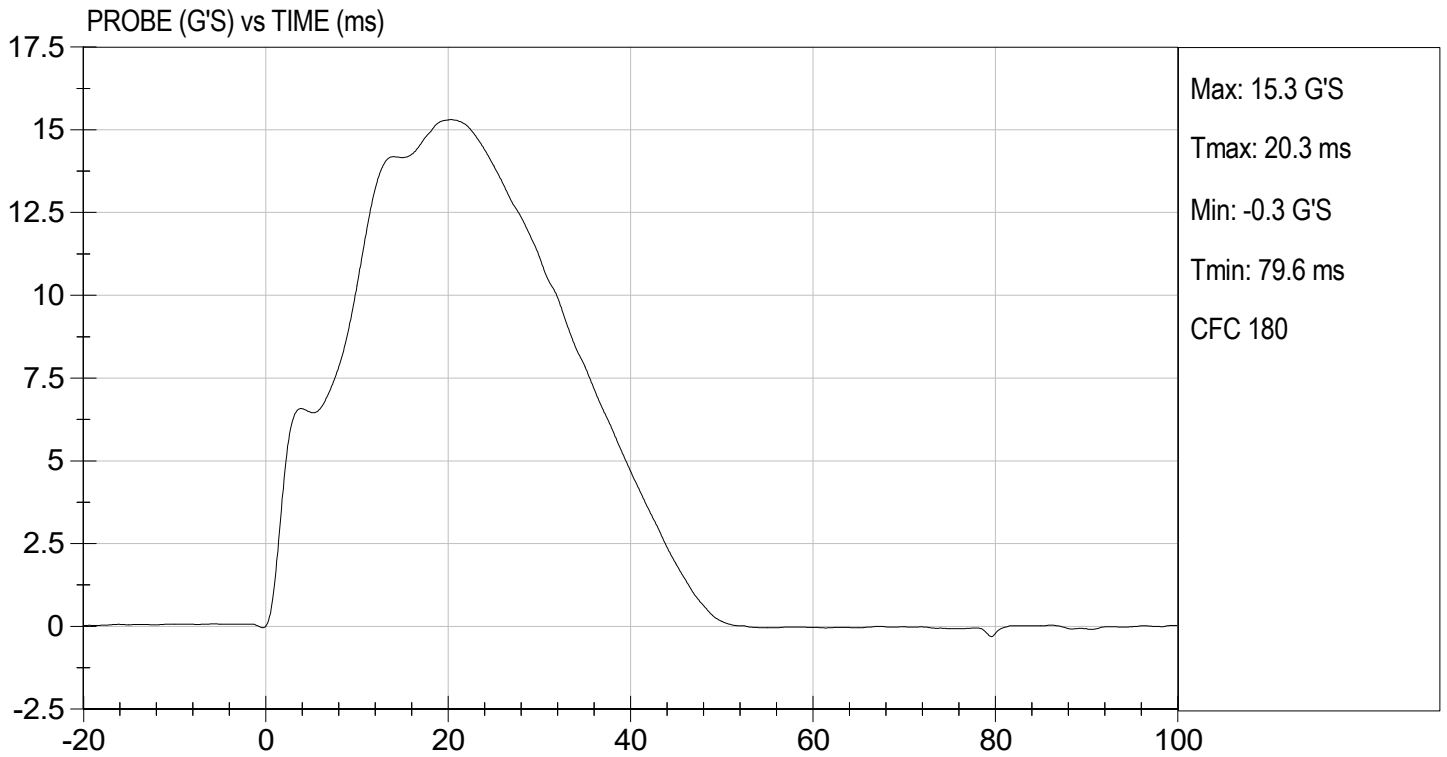
Test I.D: D233085

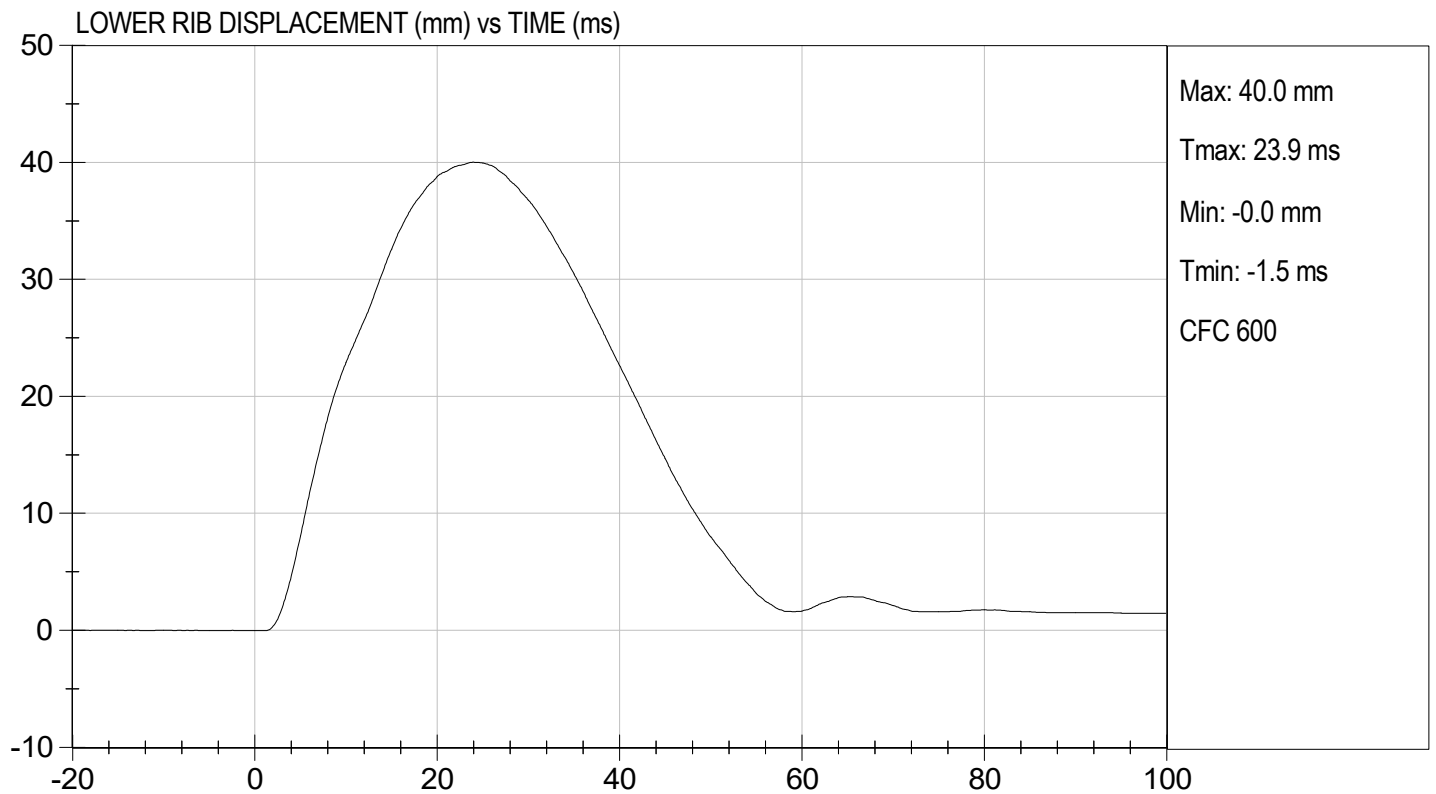
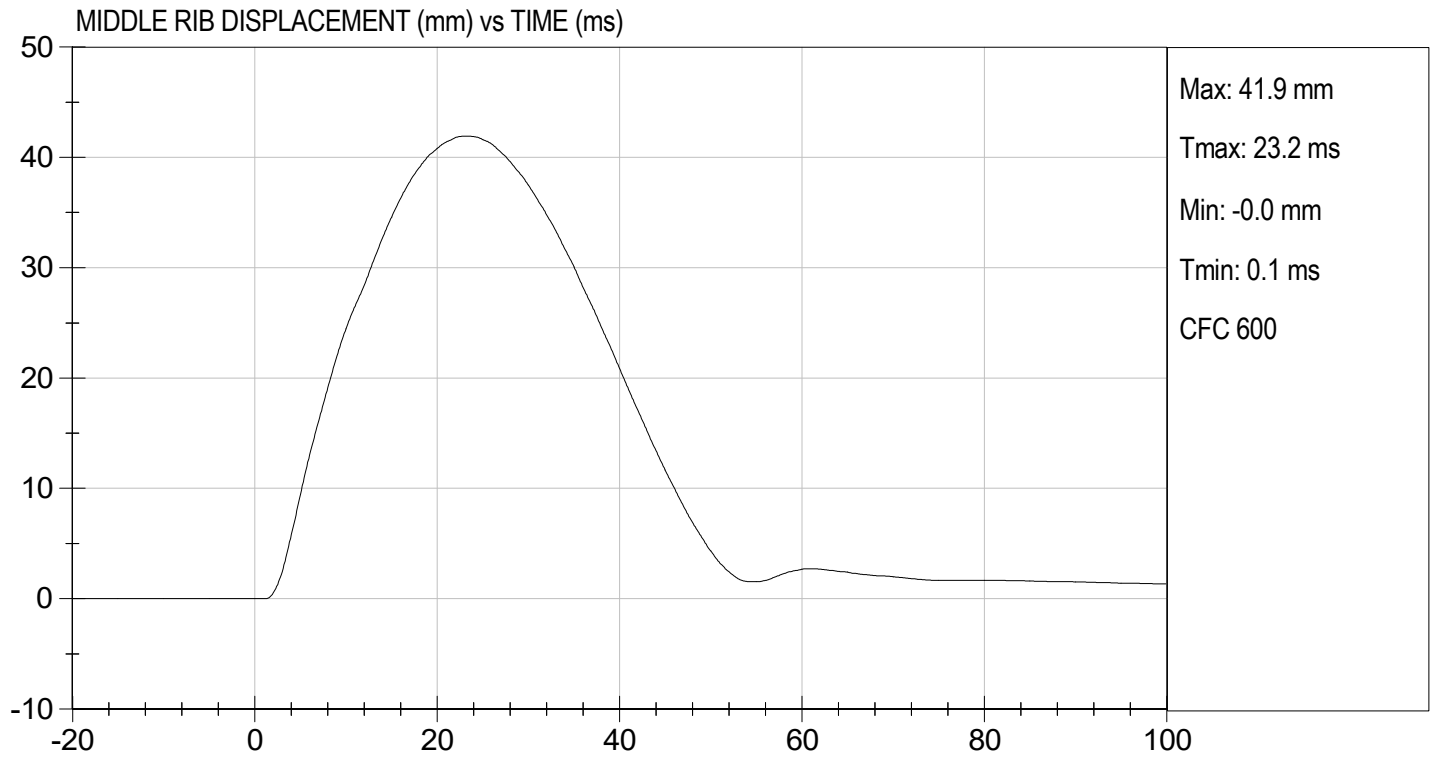
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	36	Pass
Middle Rib Displacement	mm	39 to 45	42	Pass
Lower Rib Displacement	mm	35 to 43	40	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass

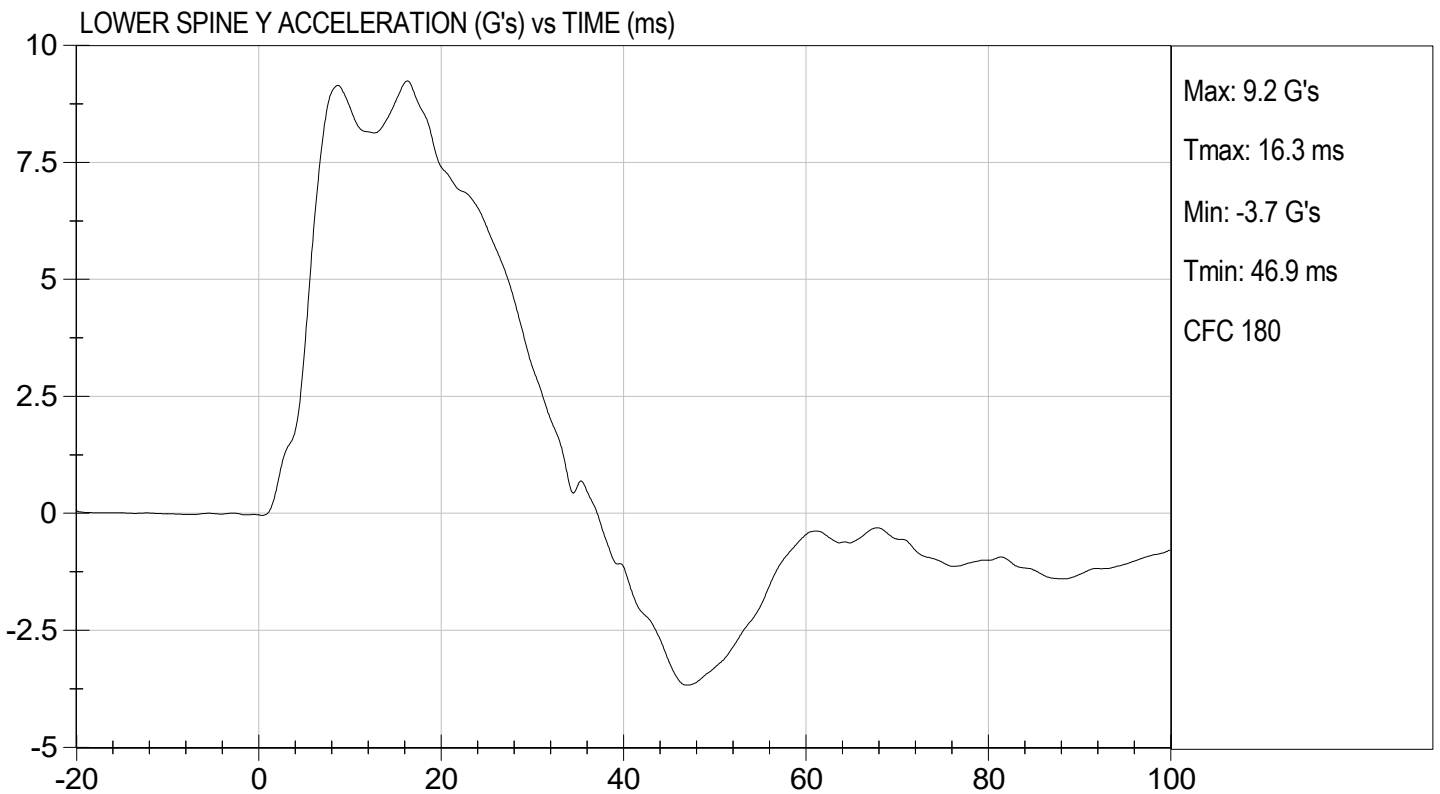
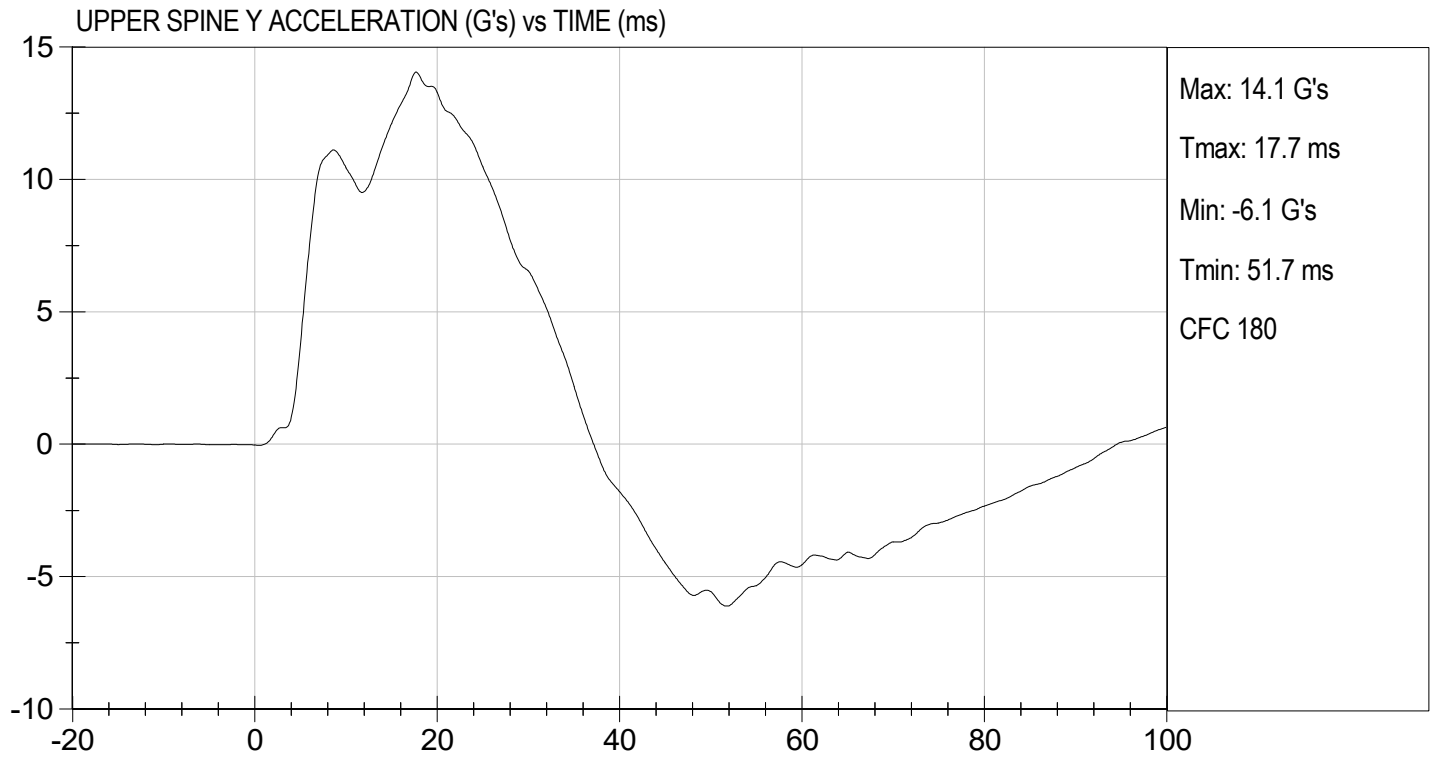
  
 Laboratory Technician

11/13/2023  
 Test Date

  
 Approved By







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

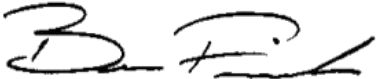
ATD Serial No: 306

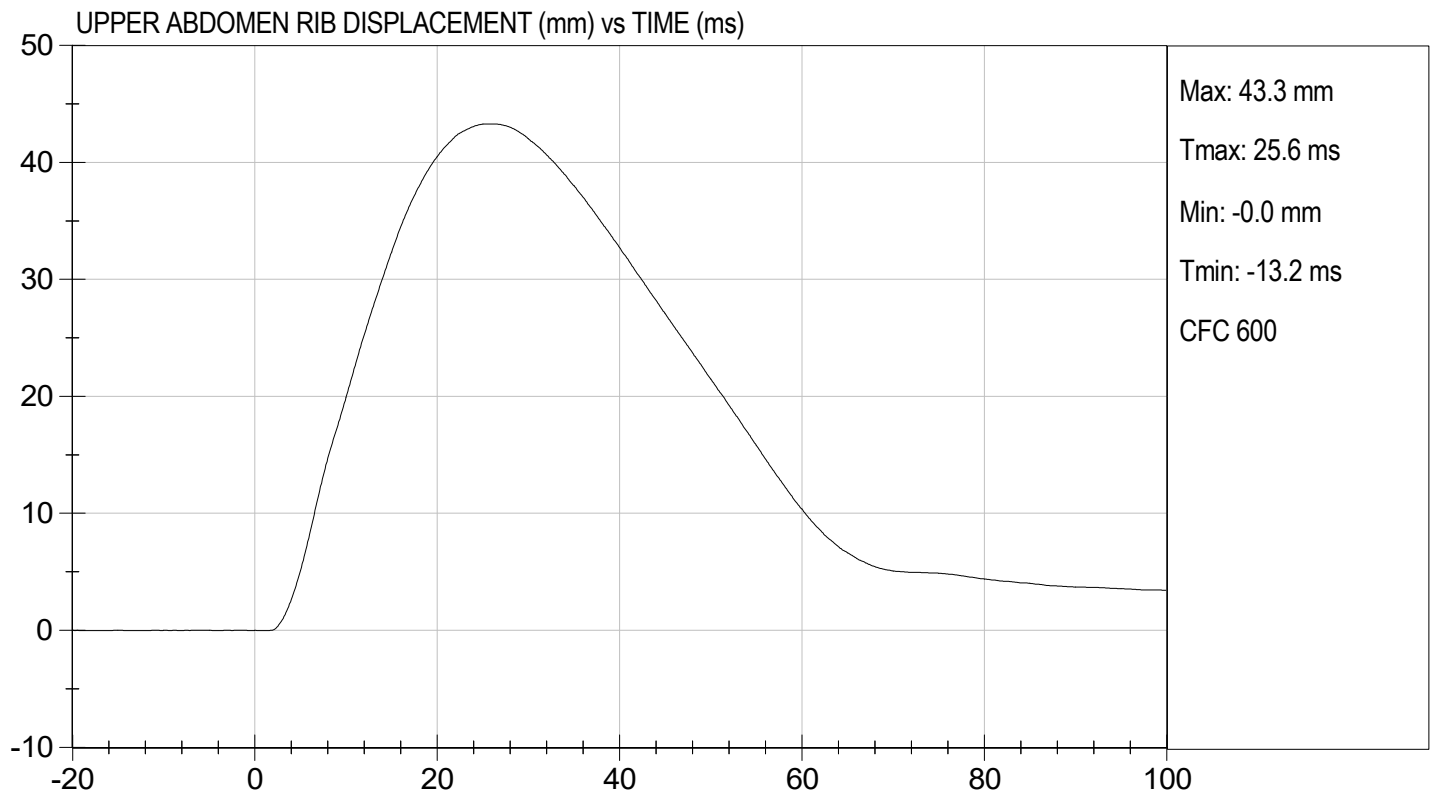
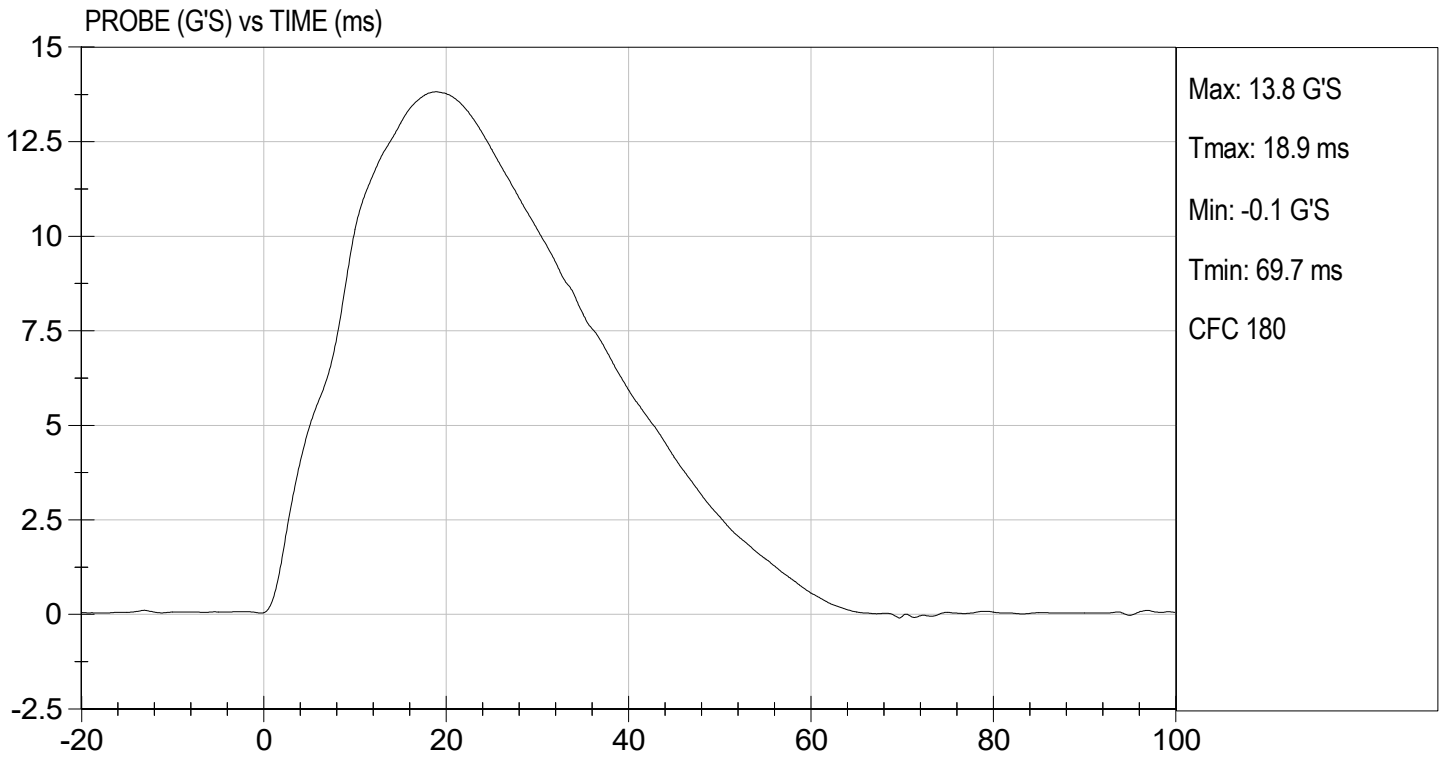
Test I.D: D233086

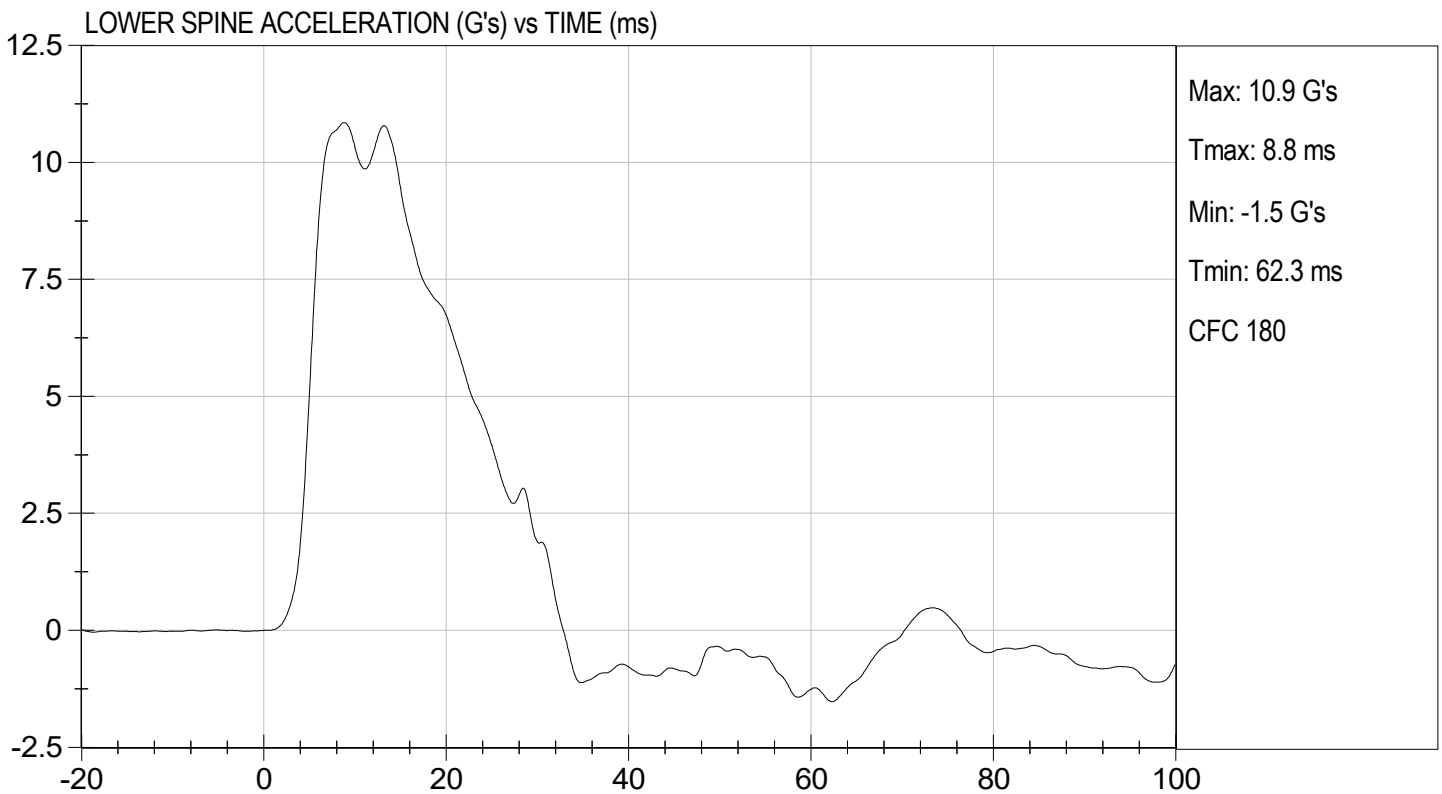
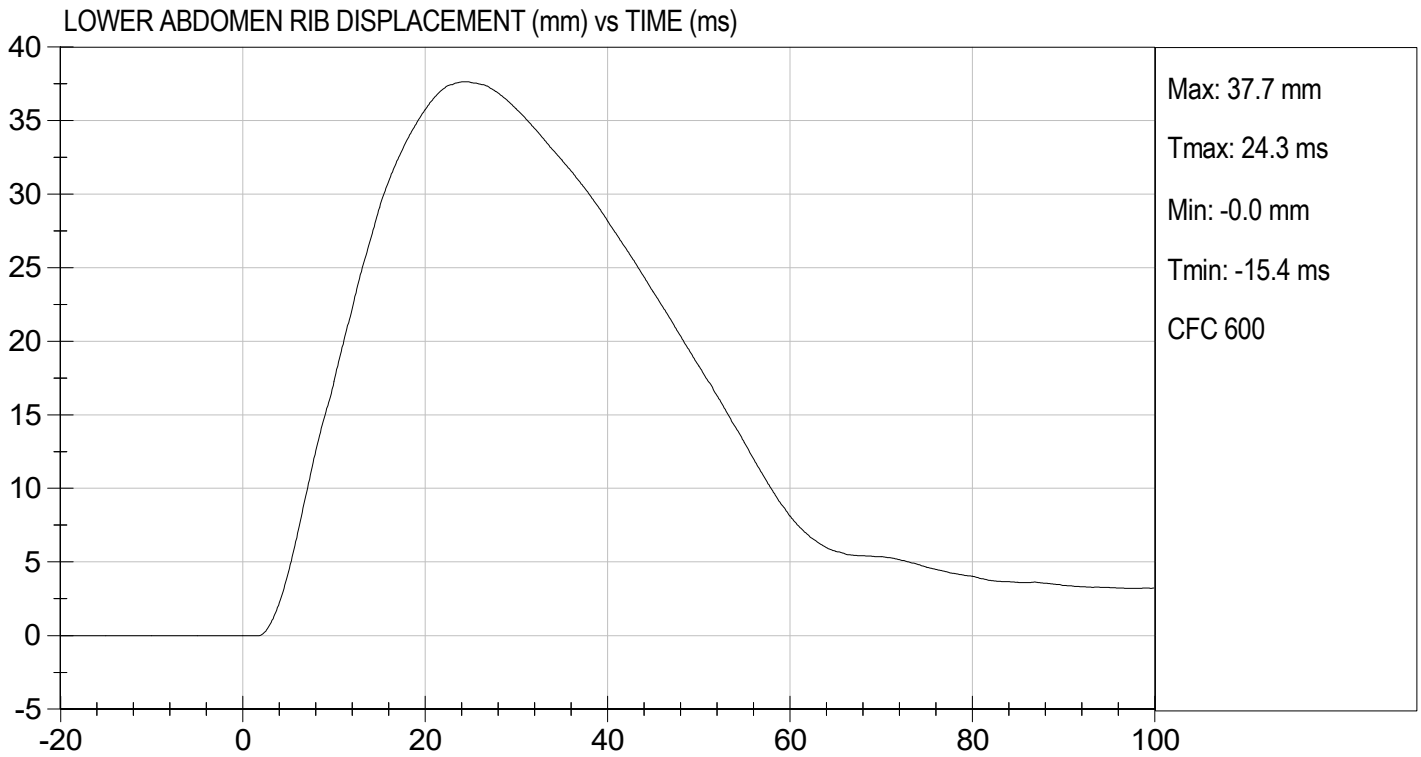
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	43	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass

  
 Laboratory Technician

11/13/2023  
 Test Date

  
 Approved By





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

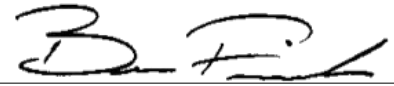
ATD Serial No: 306

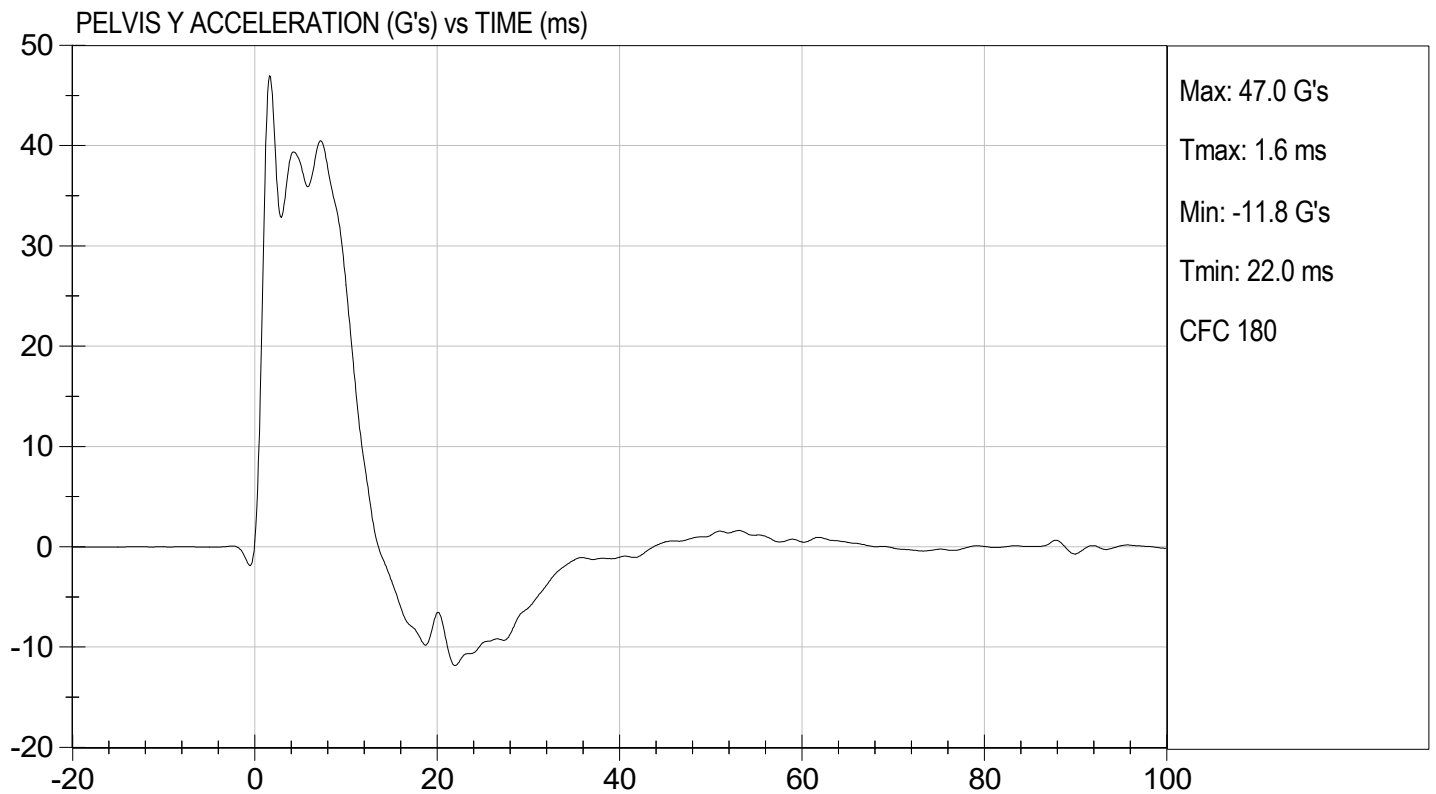
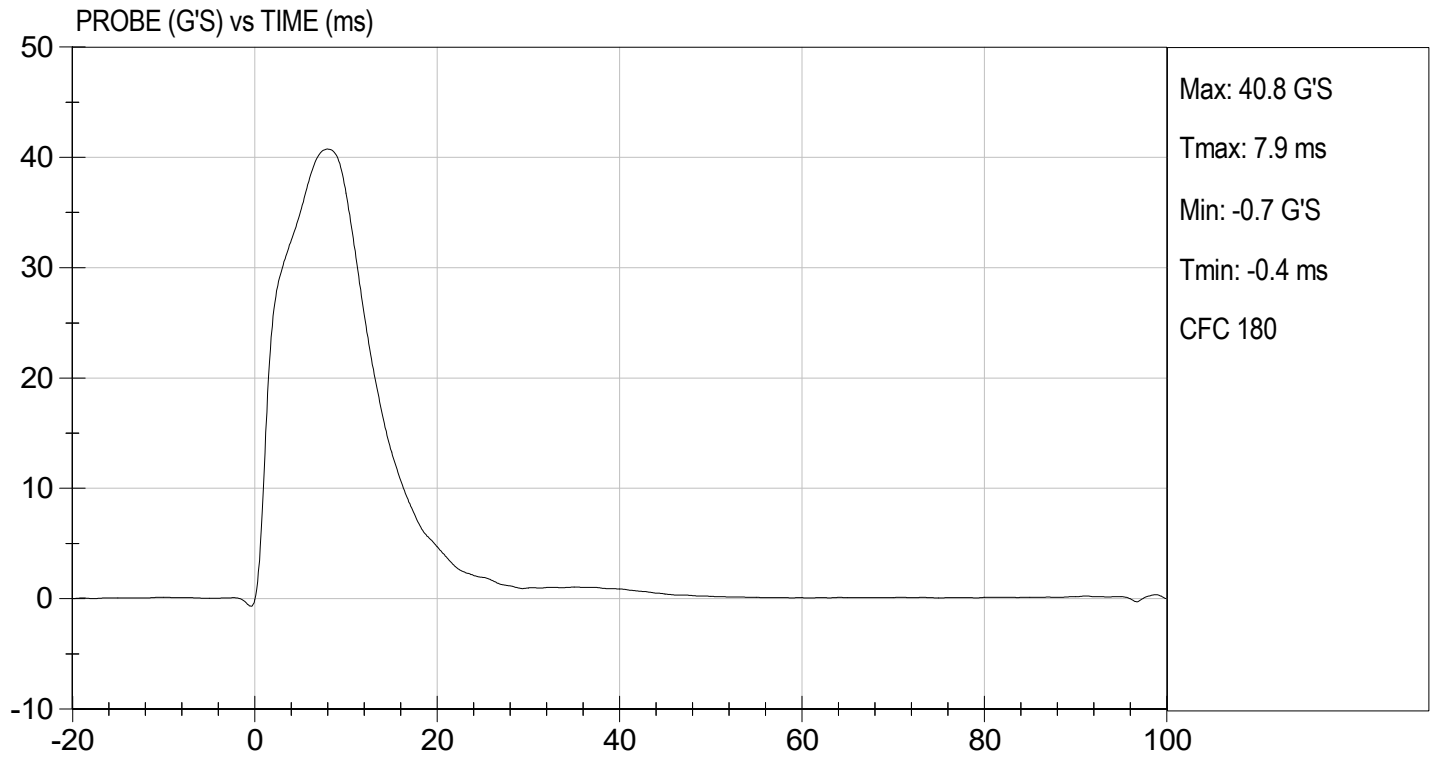
Test I.D: D233087

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	40.5	Pass
Peak Acetabulum Force	N	3600 to 4300	3,911	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 \_\_\_\_\_  
 Laboratory Technician

11/13/2023  
 \_\_\_\_\_  
 Test Date

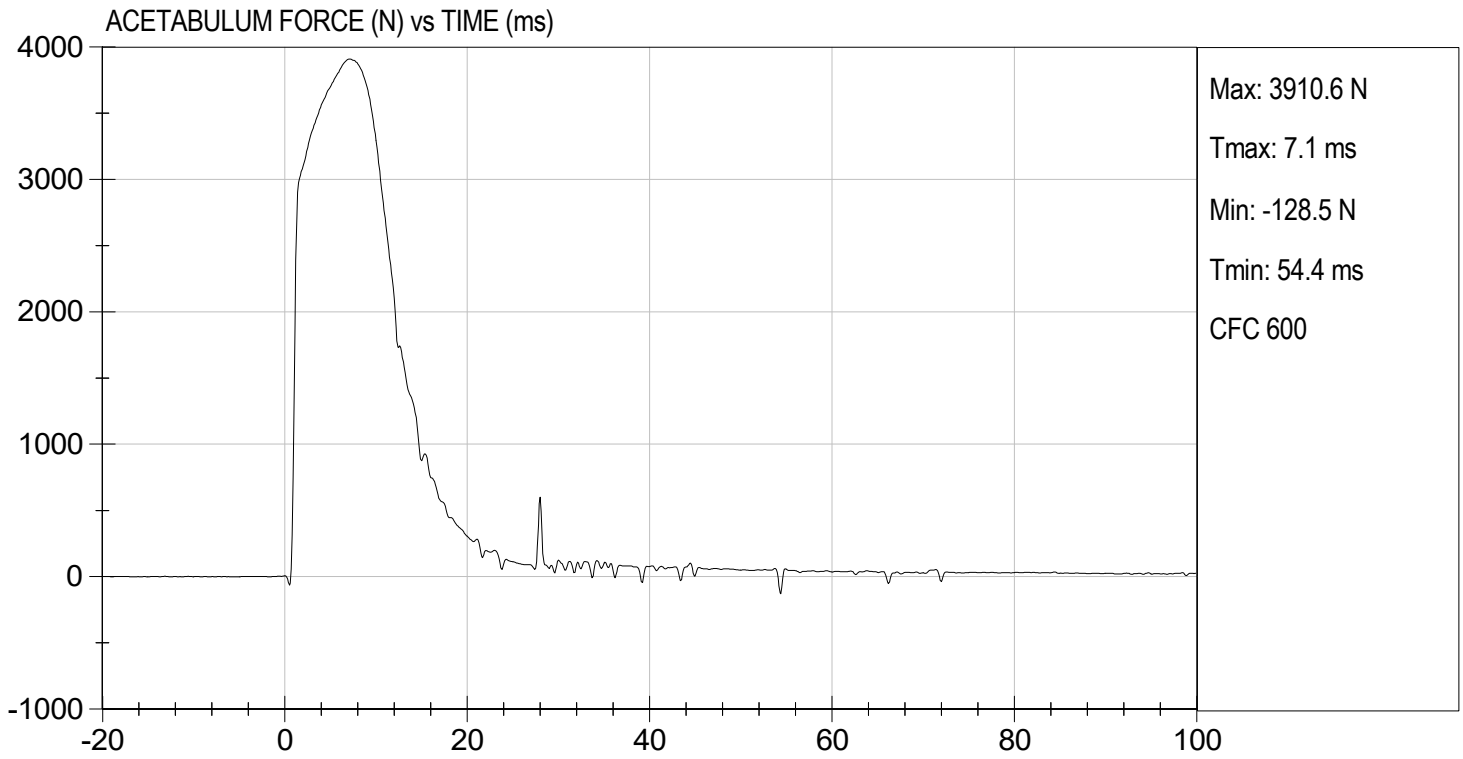
  
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 Approved By





TEST DESC: PELVIS IMPACT  
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 11/13/2023  
TEST #: D233087



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

ATD Serial No: 306

Test I.D: D233088

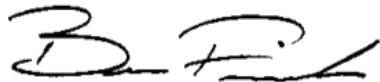
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	26	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,388	Pass
Overall Test Results				Pass



Laboratory Technician

11/13/2023

Test Date

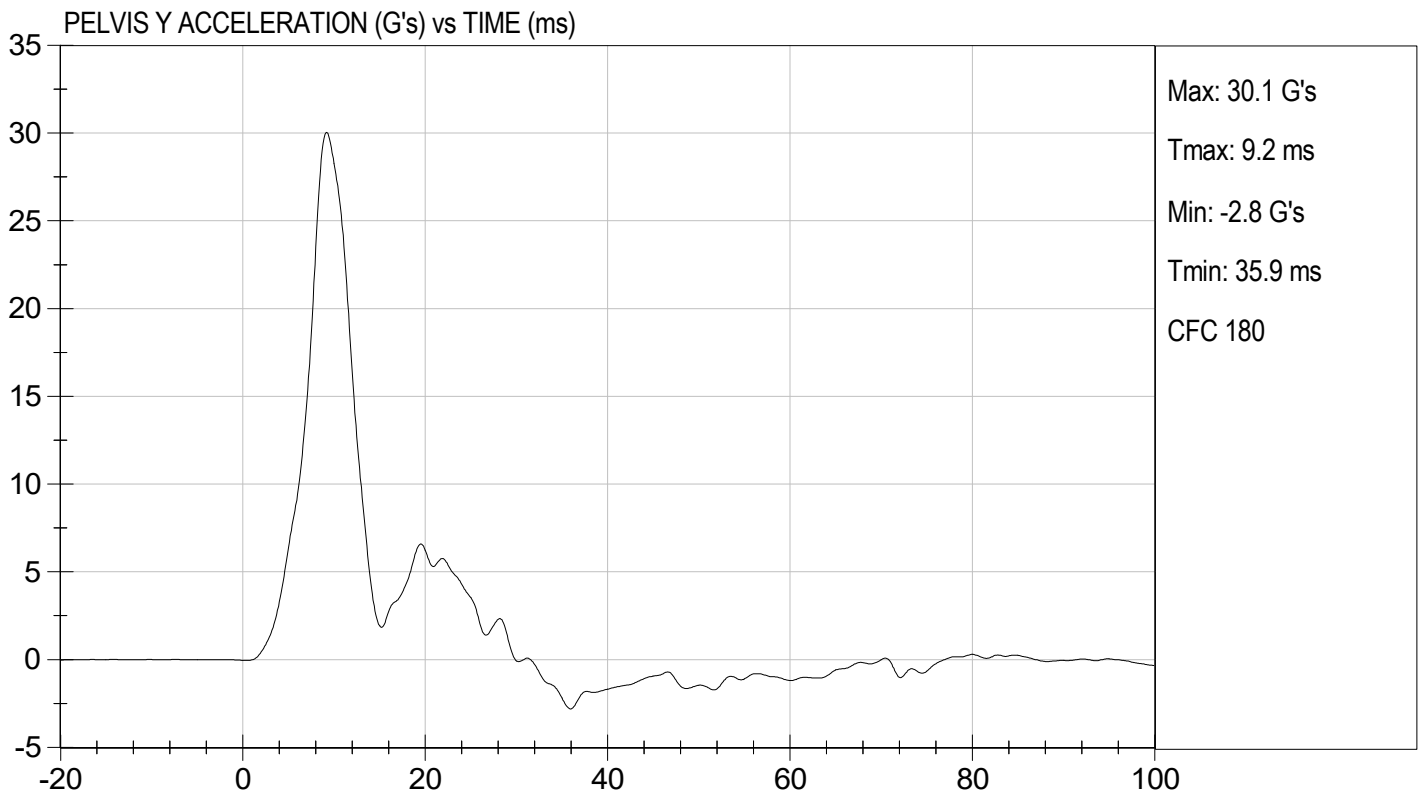
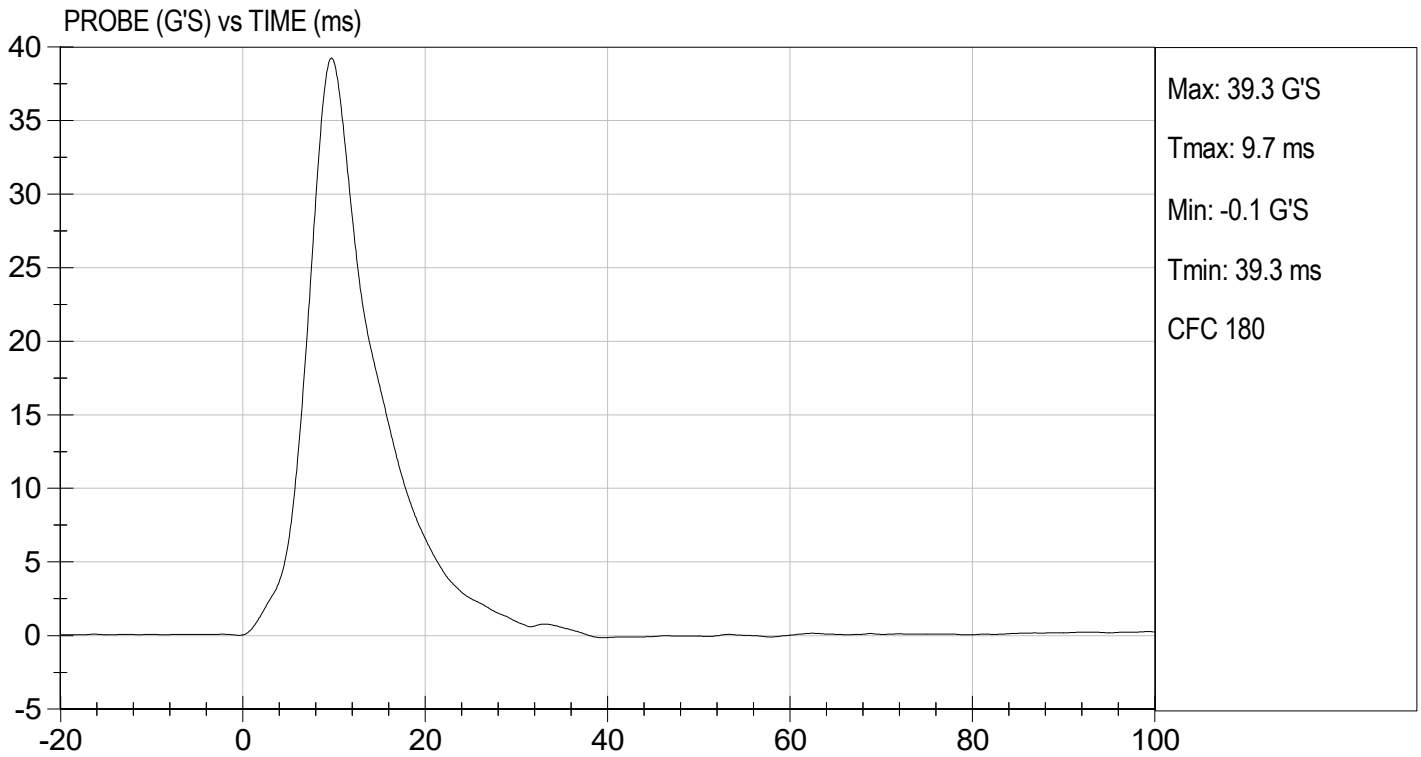


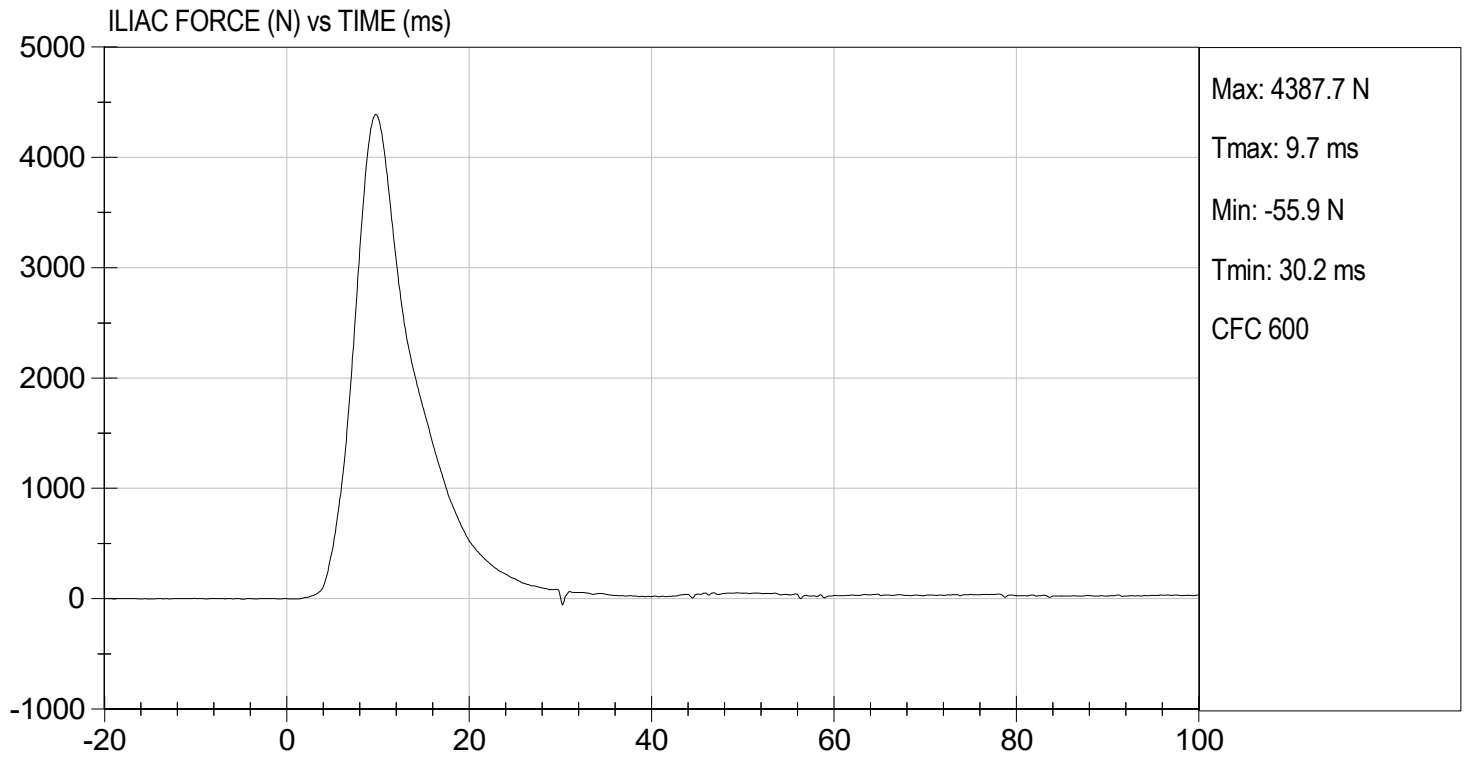
Approved By



TEST DESC: ILLIAC  
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 11/13/2023  
TEST #: D233088





**QUALIFICATION TEST RESULTS**

**POST-TEST**

**SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD**

**SID-IIsD External Measurements**  
**SN: 306**

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

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

ATD Serial No: 306

Test ID: D233251

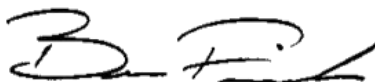
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	115 to 137	134	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-3.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass



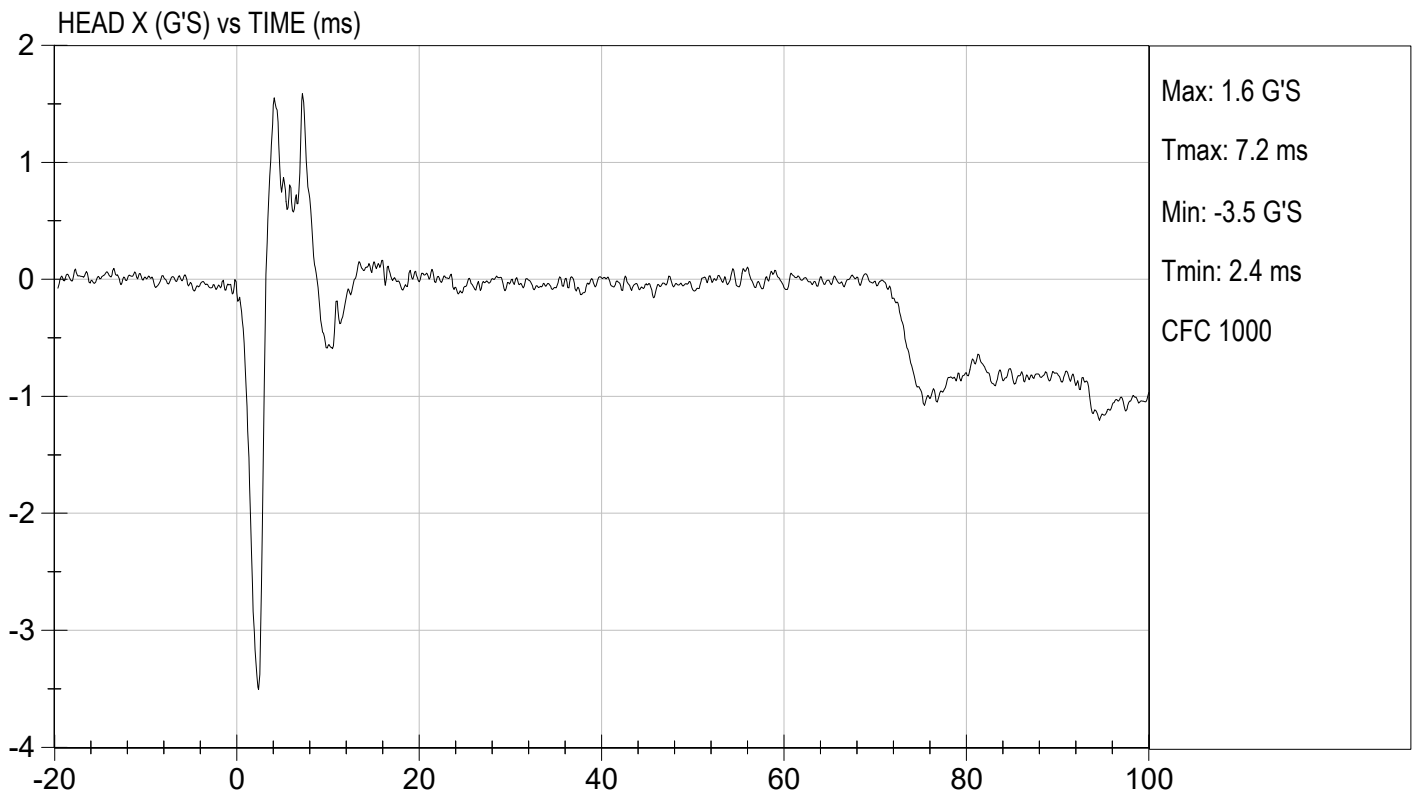
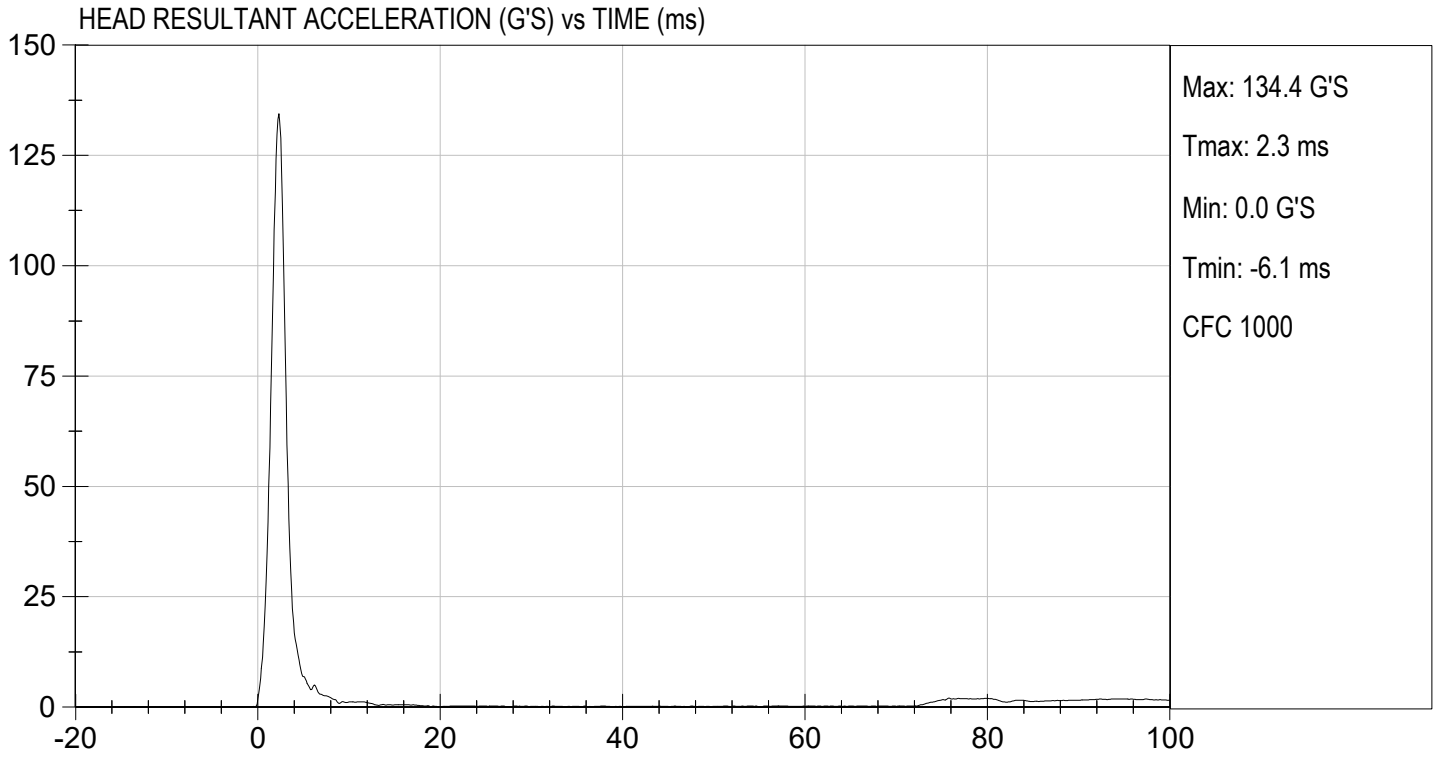
Laboratory Technician

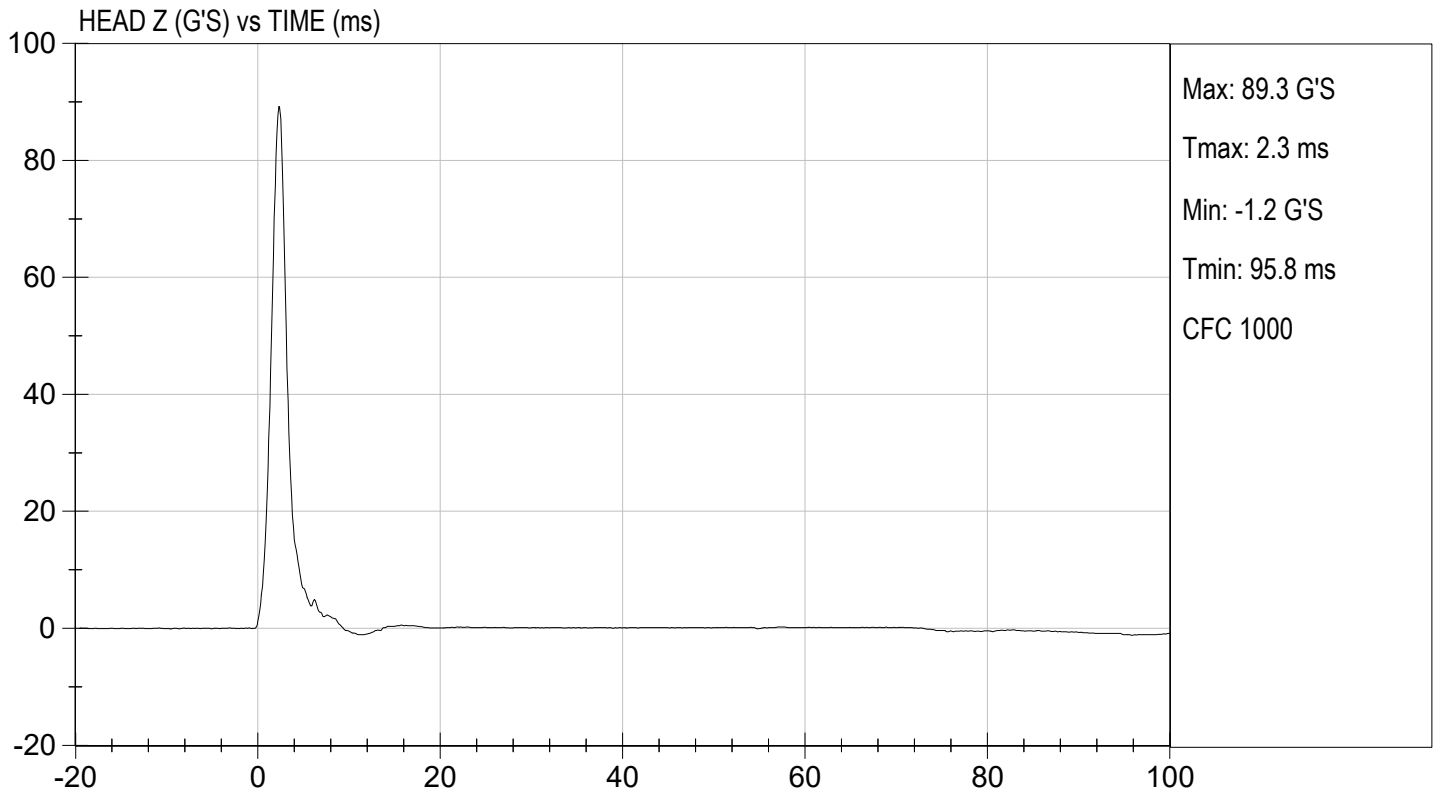
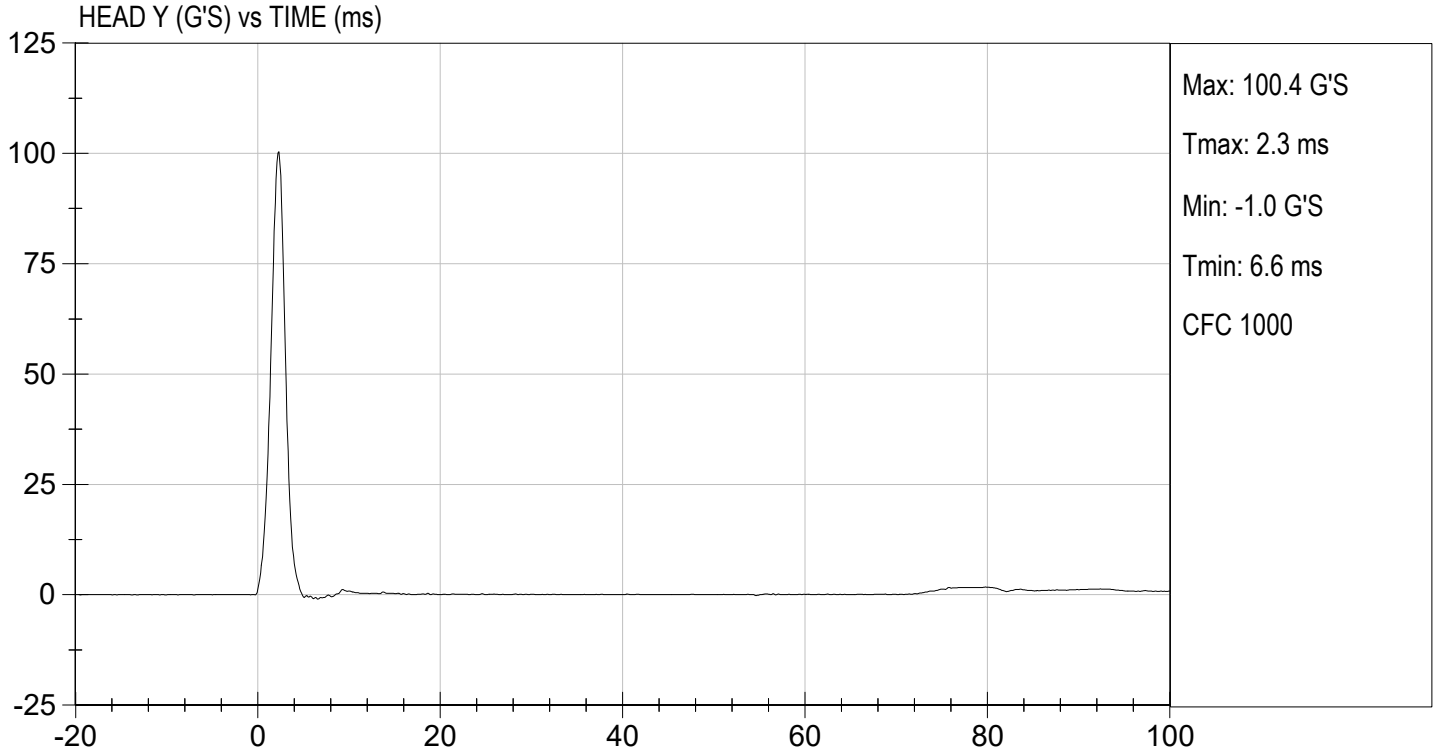
12/08/2023

Test Date



Approved By





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

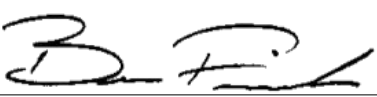
ATD Serial No: 306

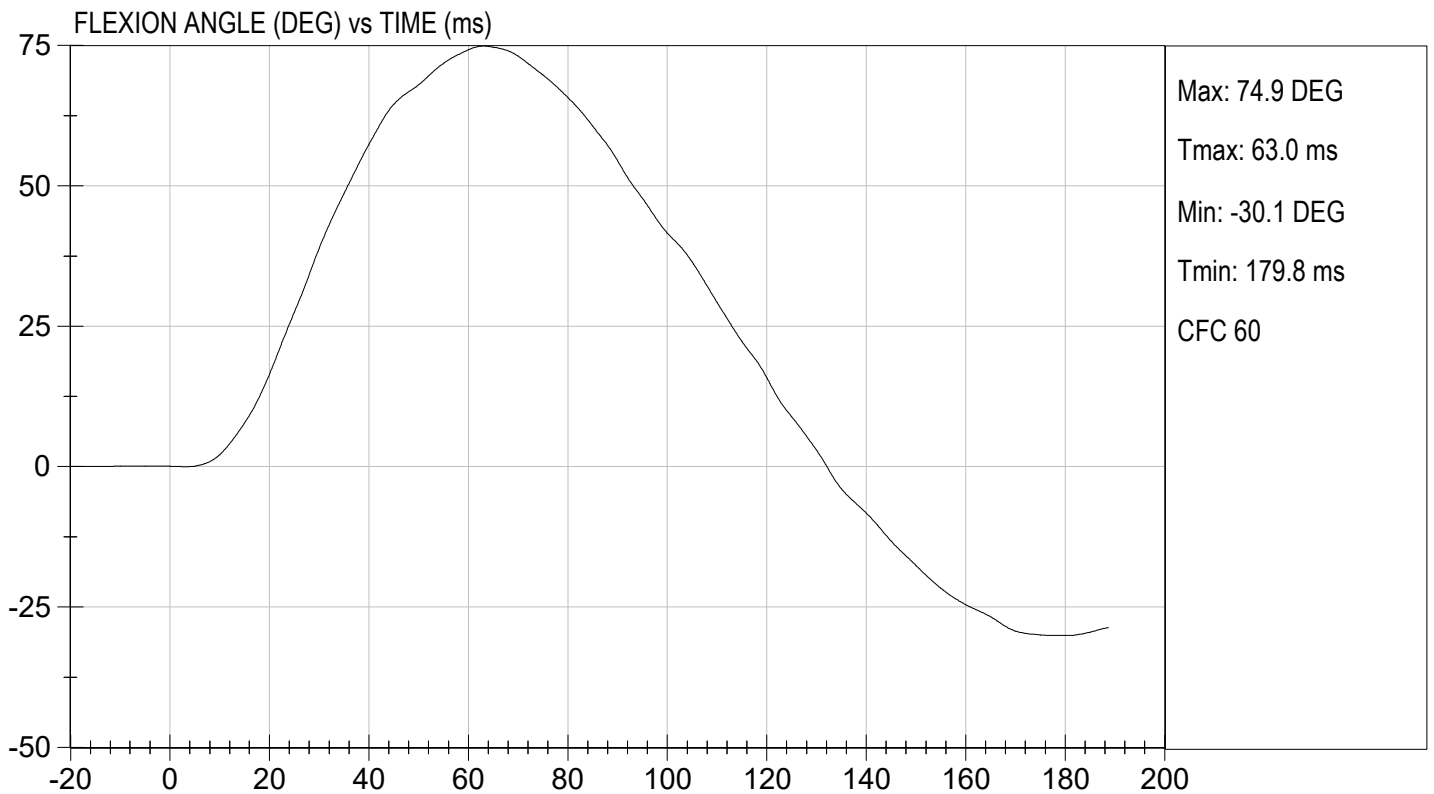
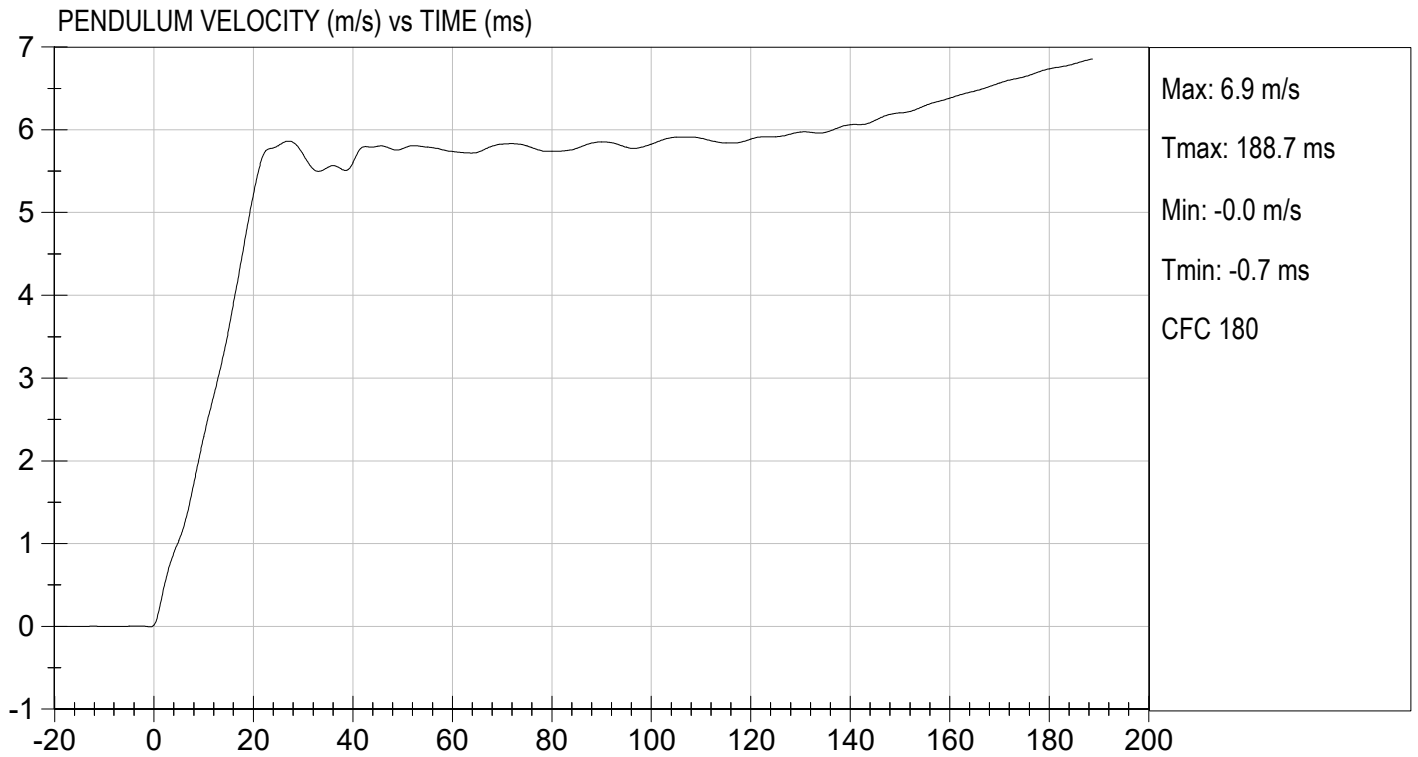
Test I.D.: D233252

Tested Parameter	Units	Specification	Result	Pass/Fail	
Temperature	deg C	20.6 to 22.2	21.4	Pass	
Humidity	%	10 to 70	36	Pass	
Impact Velocity	m/s	5.51 to 5.63	5.58	Pass	
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.29	Pass
	15 ms	m/s	3.30 to 4.10	3.58	Pass
	20 ms	m/s	4.40 to 5.40	5.22	Pass
	25 ms	m/s	5.40 to 6.10	5.81	Pass
	25-100 ms	m/s	5.50 to 6.20	5.86	Pass
Maximum D-Plane Rotation	deg	71 to 81	75	Pass	
Time of Maximum D-Plane Rotation	ms	50 to 70	63	Pass	
Maximum Occipital Condyle Moment	Nm	-44 to -36	-42	Pass	
Time of Moment Decay to 0 Nm	ms	102 to 126	119	Pass	
<b>Overall Test Results</b>				<b>Pass</b>	

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

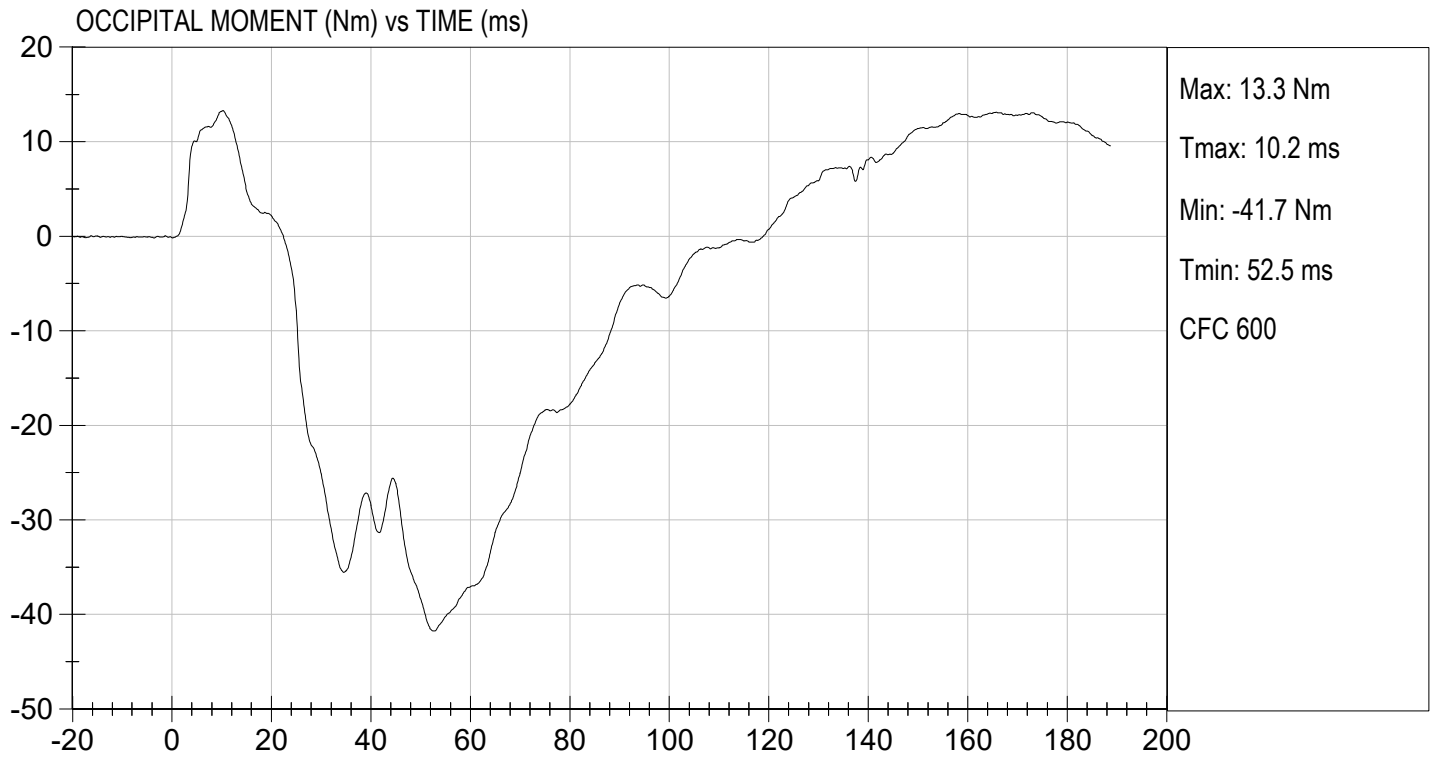
  
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 Approved By





TEST DESC: NECK BENDING  
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 12/08/2023  
TEST #: D233252



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

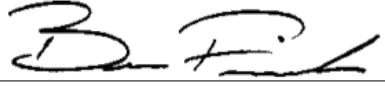
ATD Serial No: 306

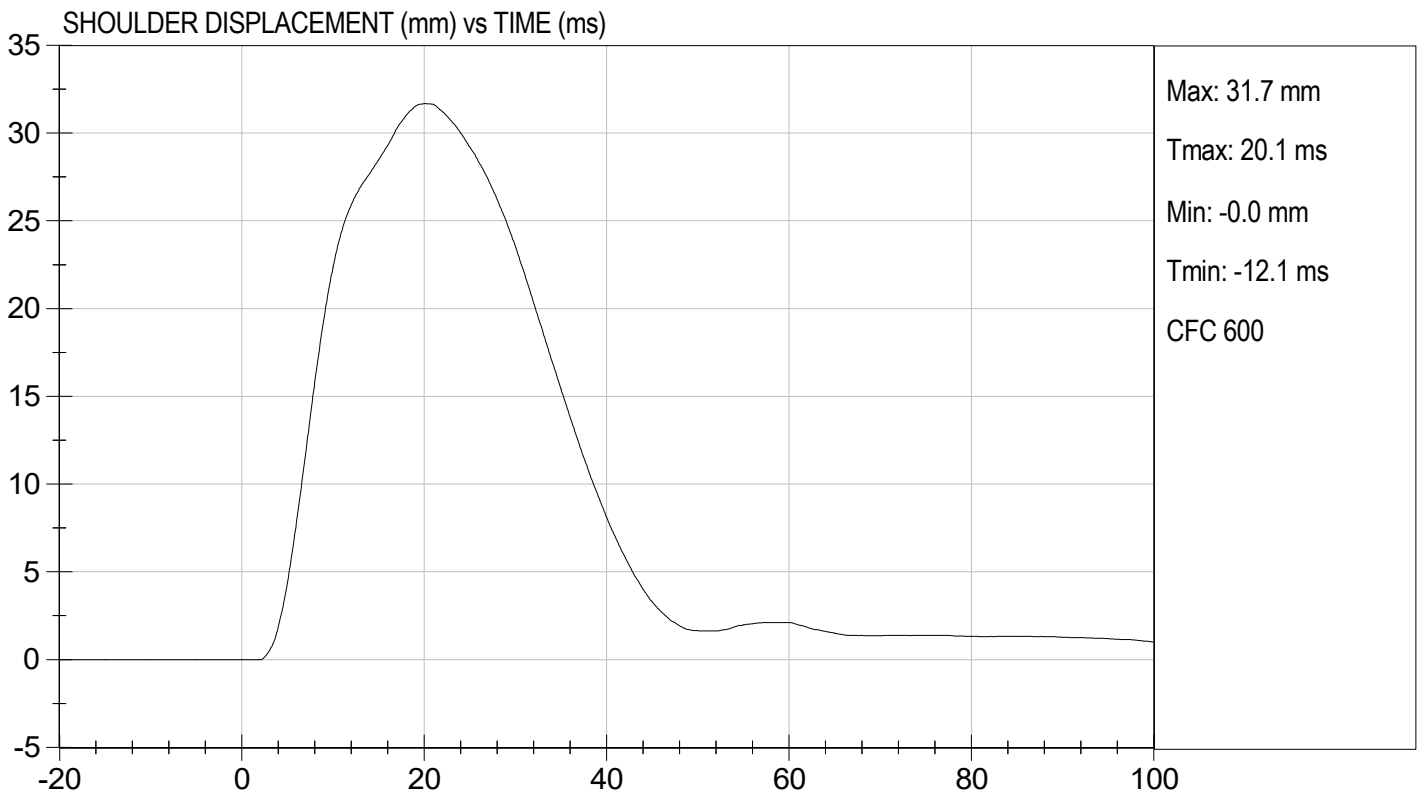
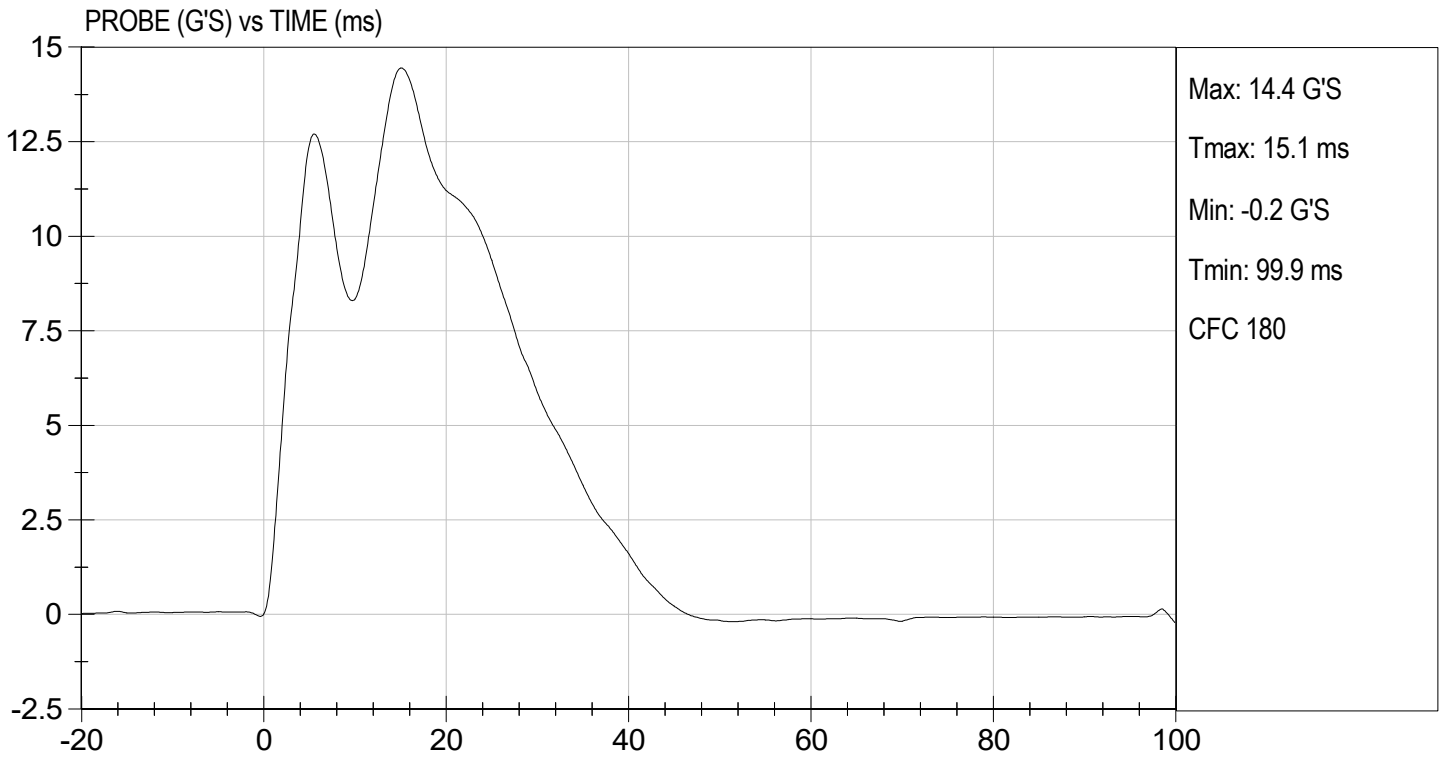
Test ID: D233253

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	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	14	Pass
Shoulder Displacement	mm	28 to 37	32	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	17	Pass
Overall Test Results				Pass

  
Laboratory Technician

12/08/2023  
Test Date

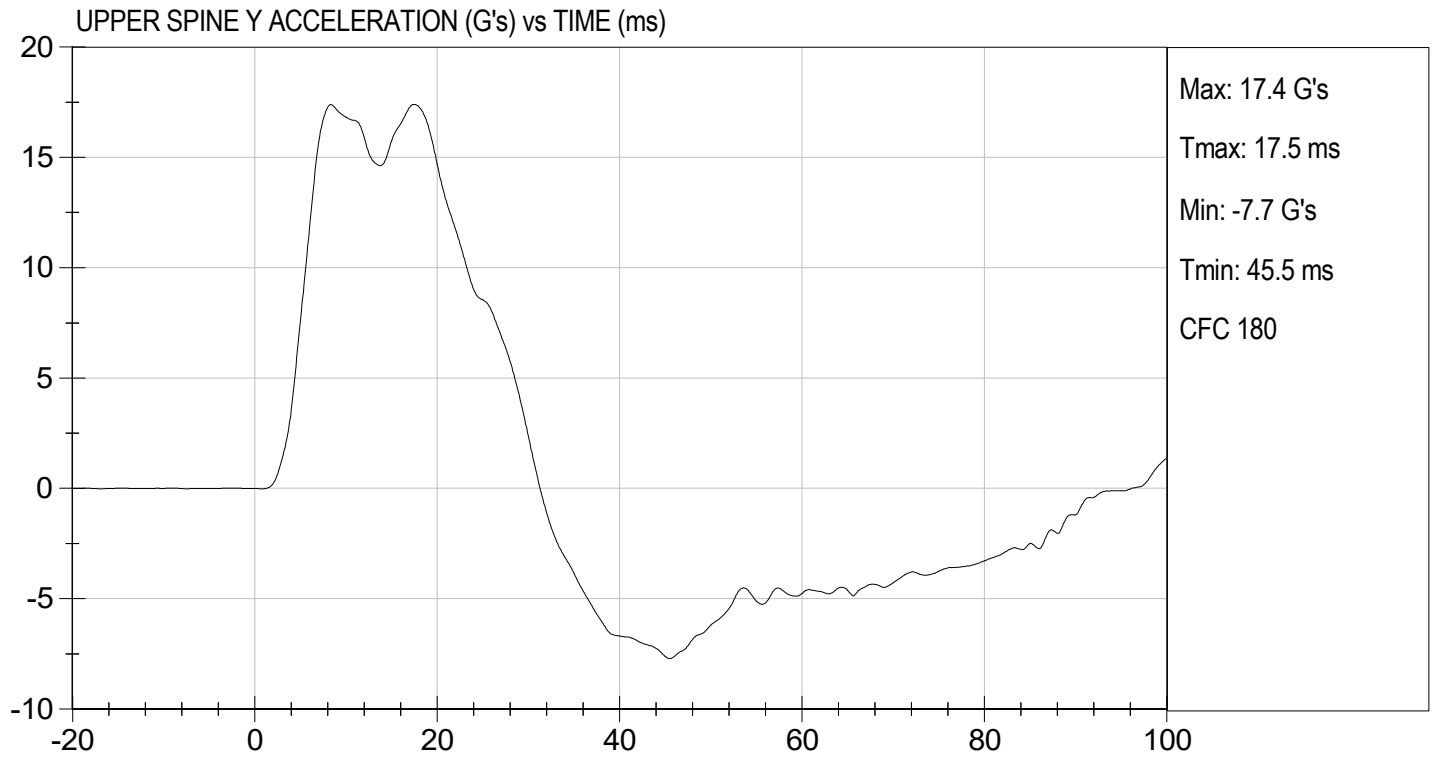
  
Approved By





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

TEST DATE: 12/08/2023  
TEST #: D233253



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

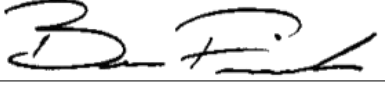
**ATD Serial No:** 306

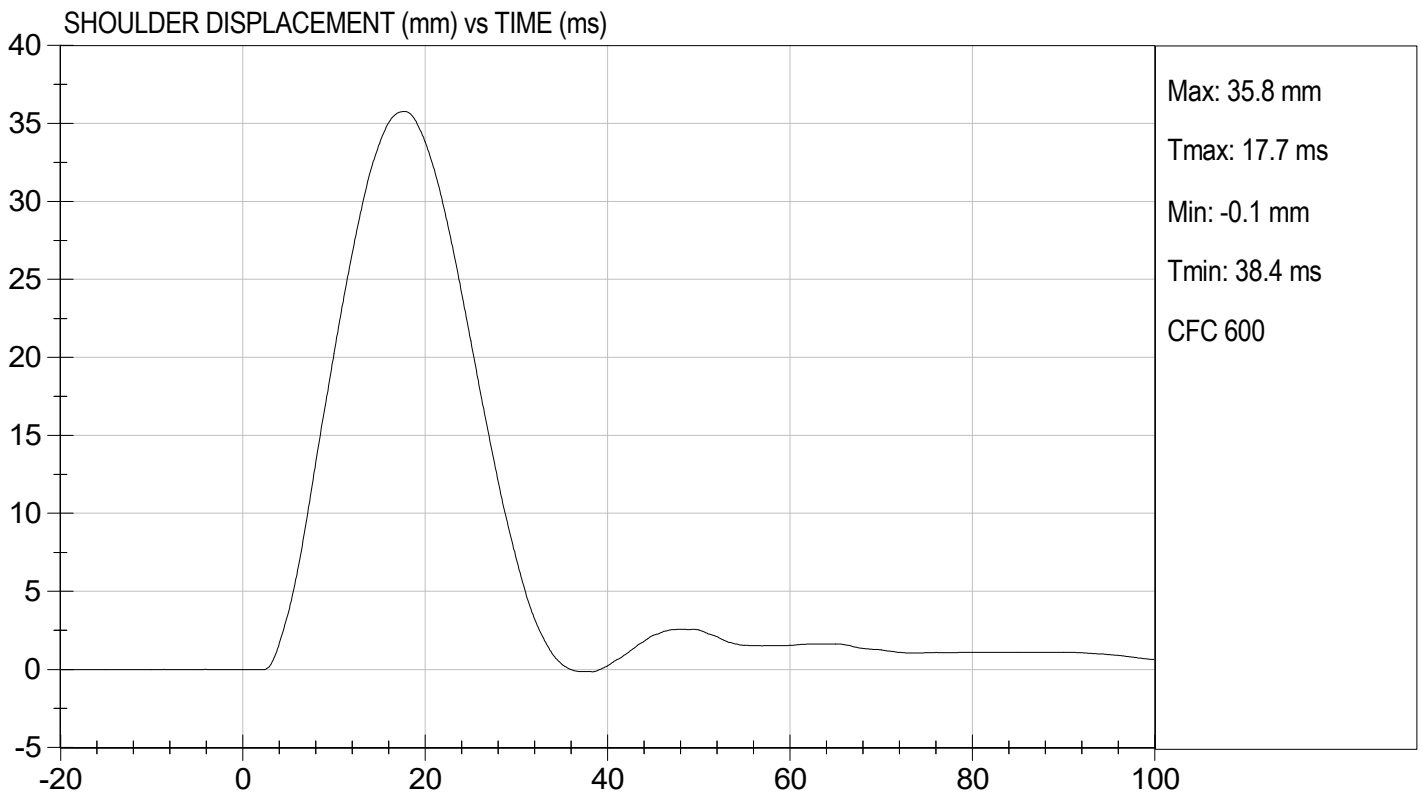
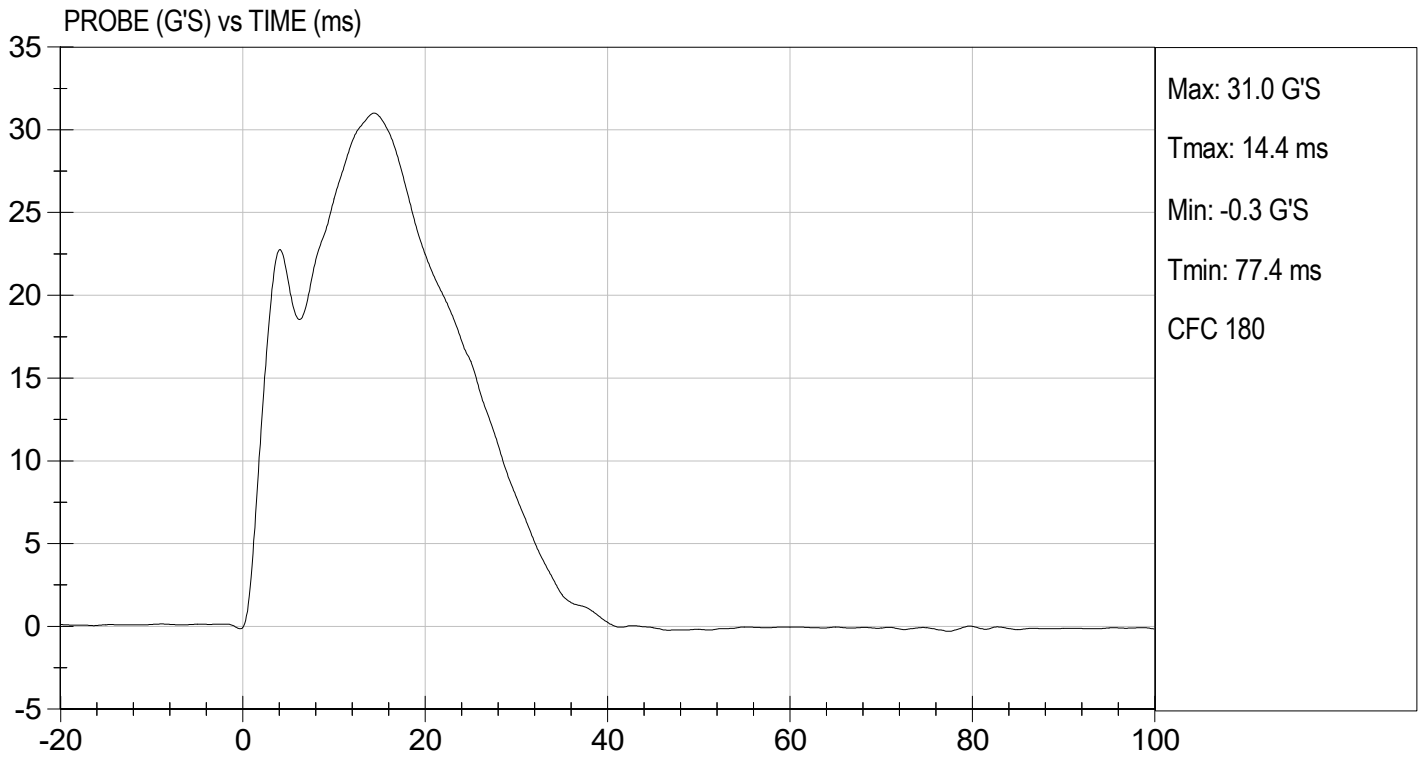
**Test I.D.:** D233254

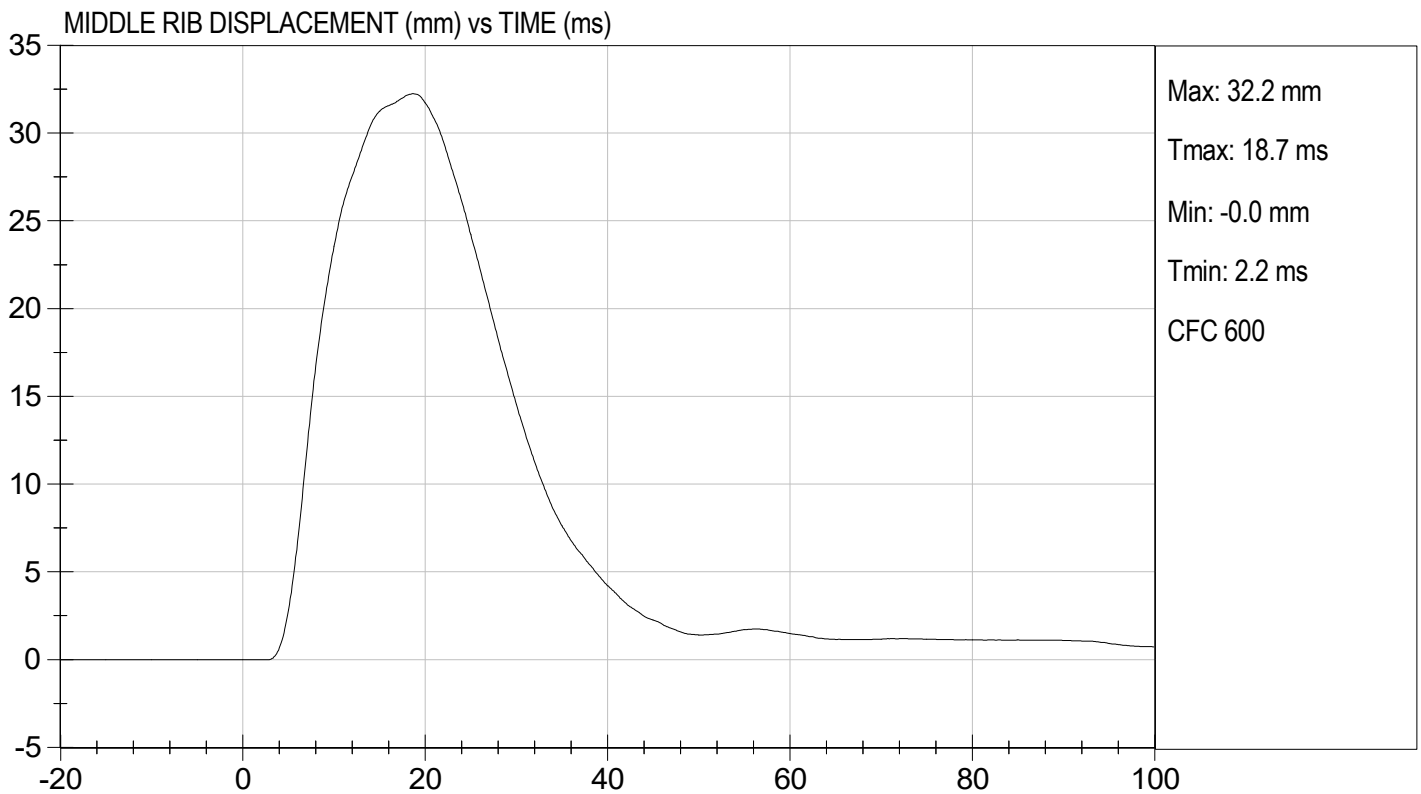
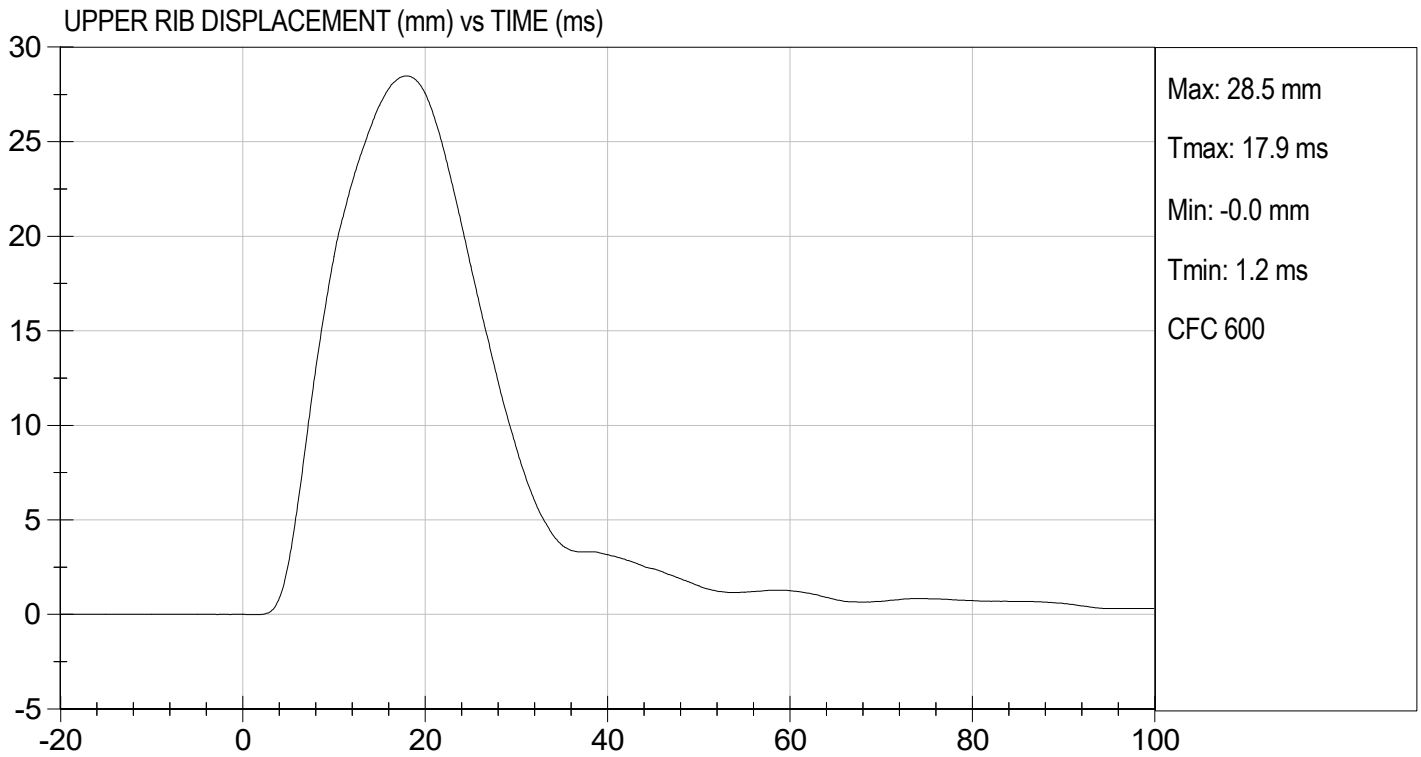
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	33	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	31	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	34	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	31	Pass
Overall Test Results				Pass

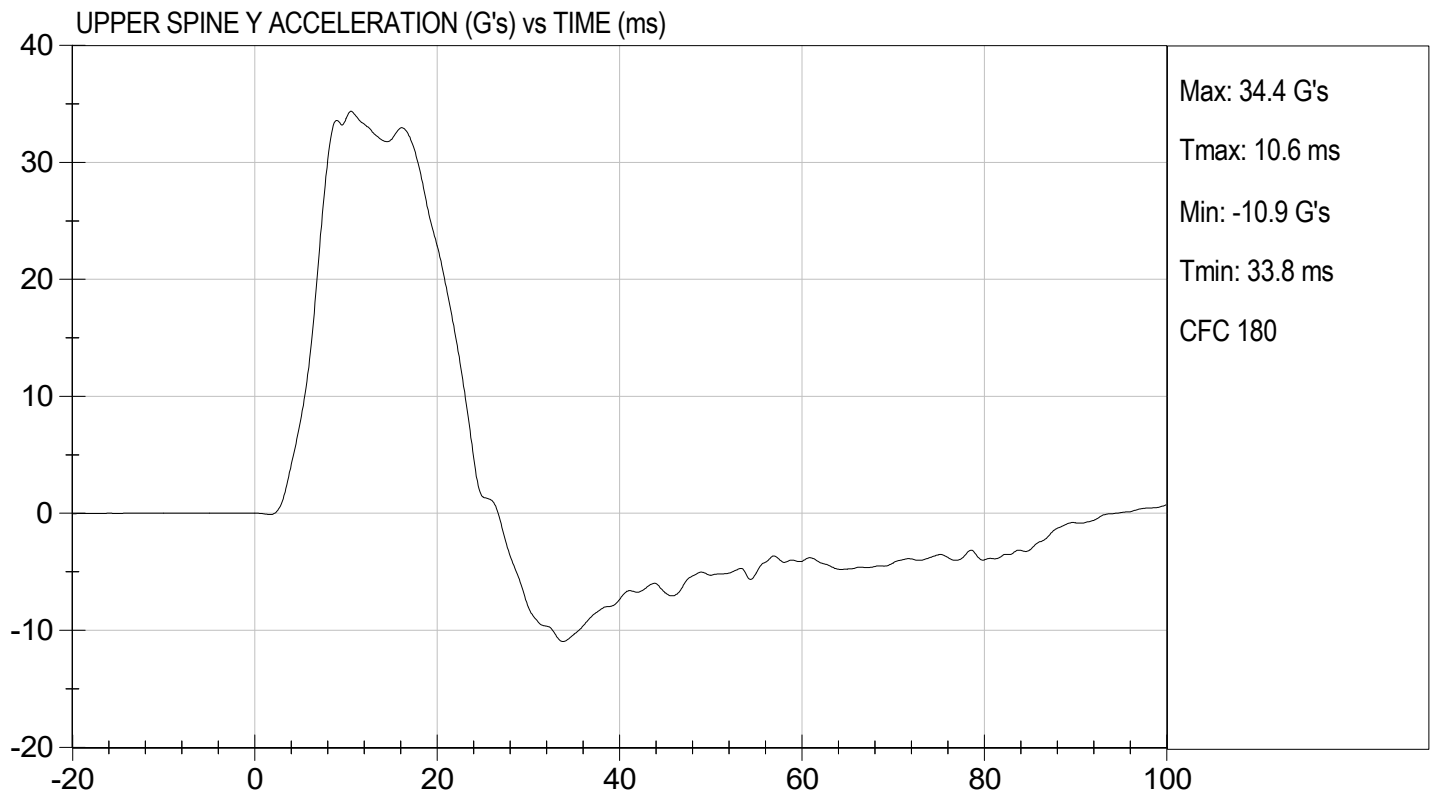
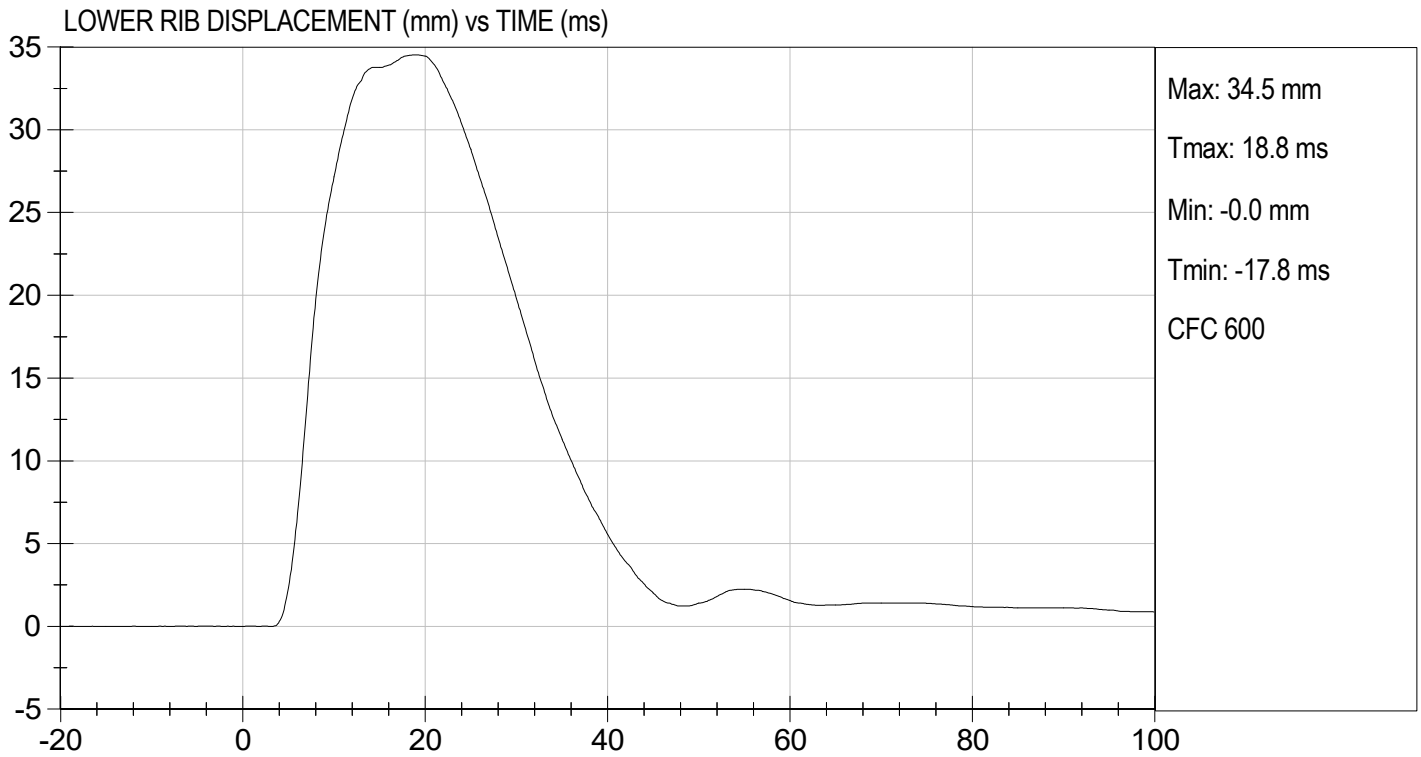
  
Laboratory Technician

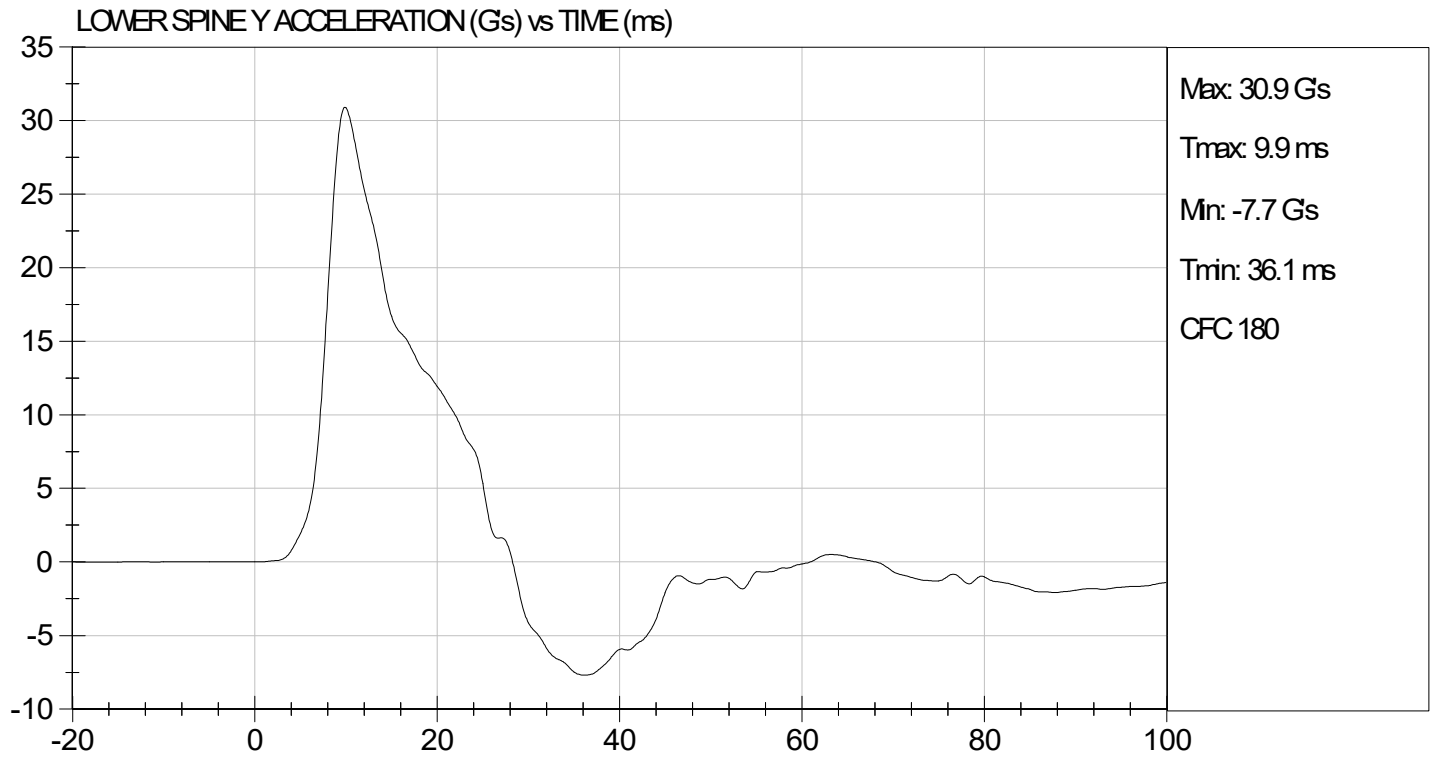
12/08/2023  
Test Date

  
Approved By









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

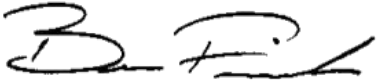
ATD Serial No: 306

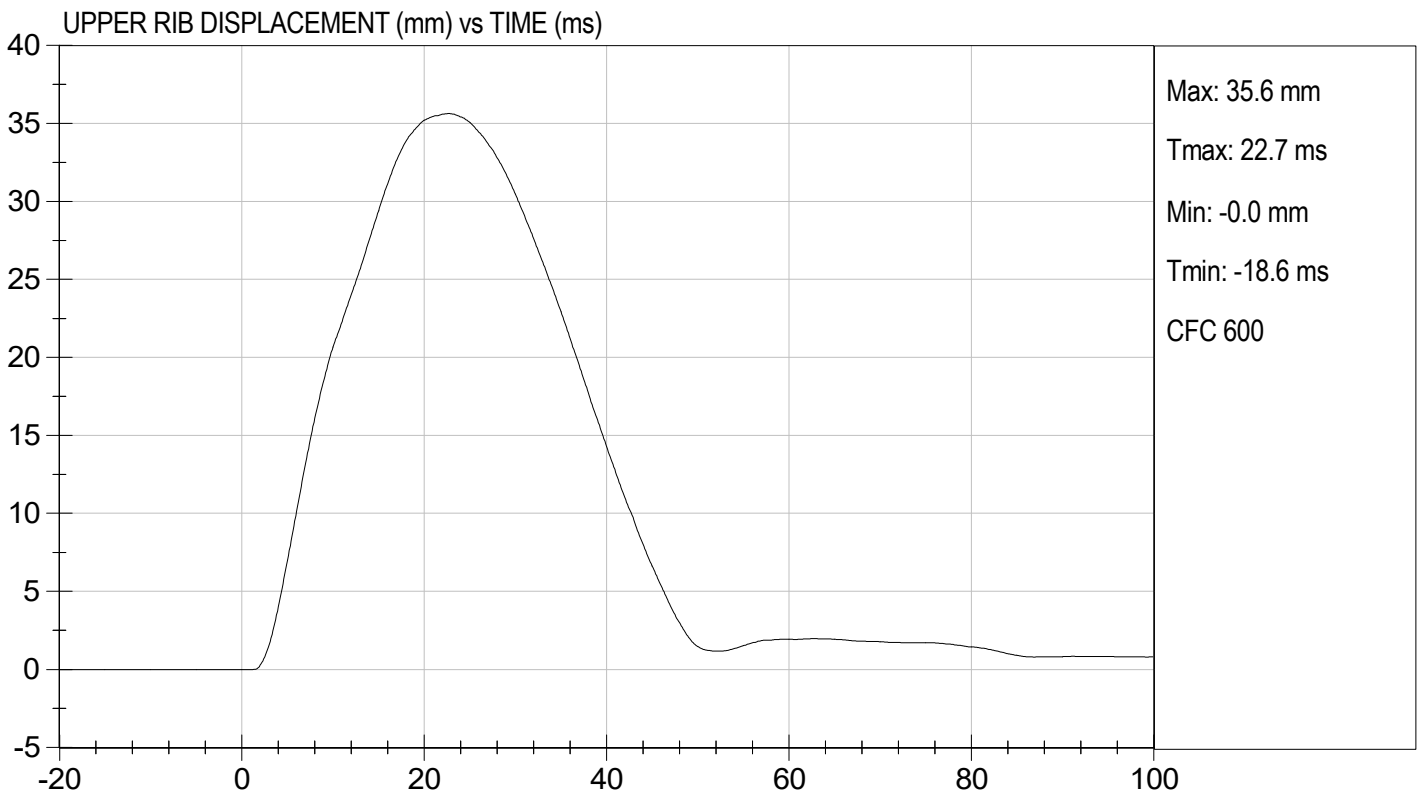
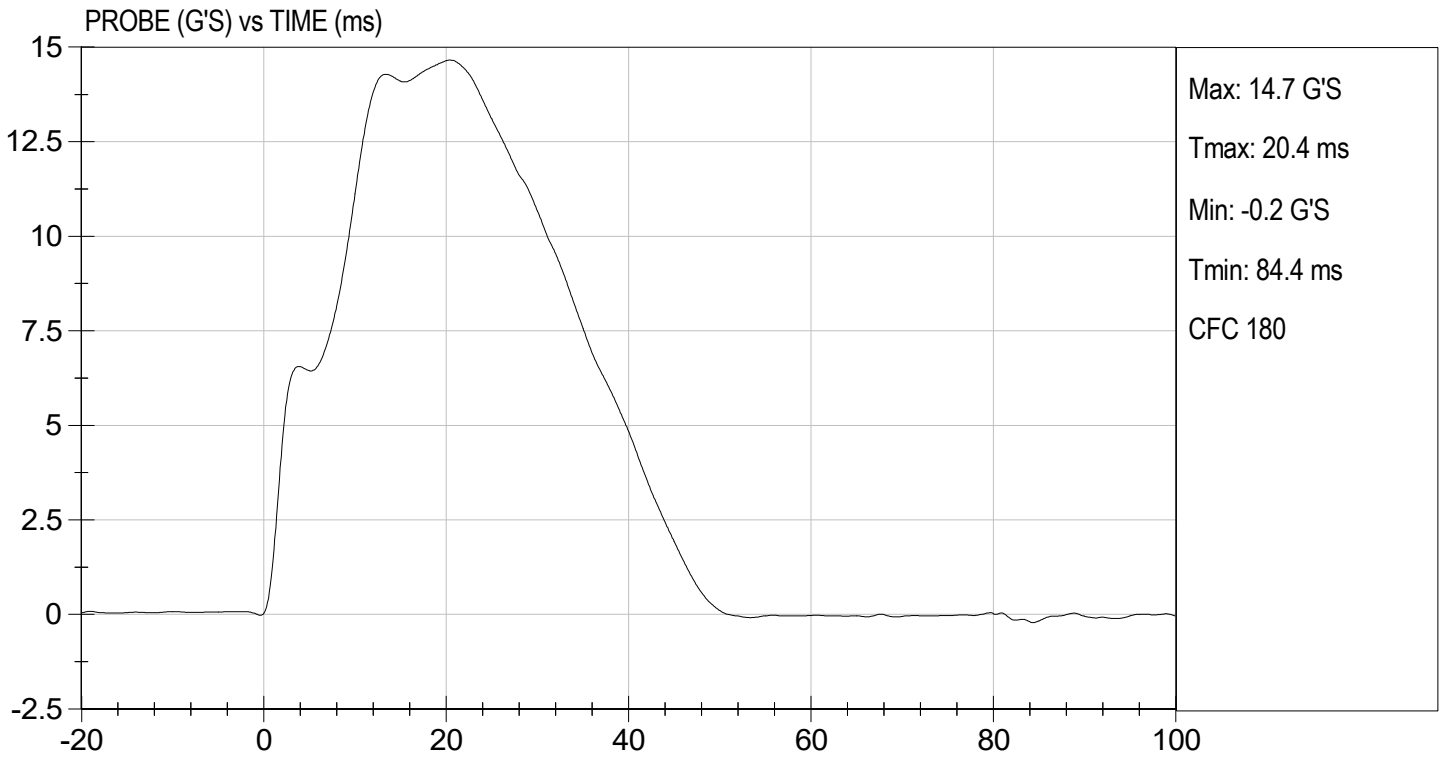
Test I.D: D233255

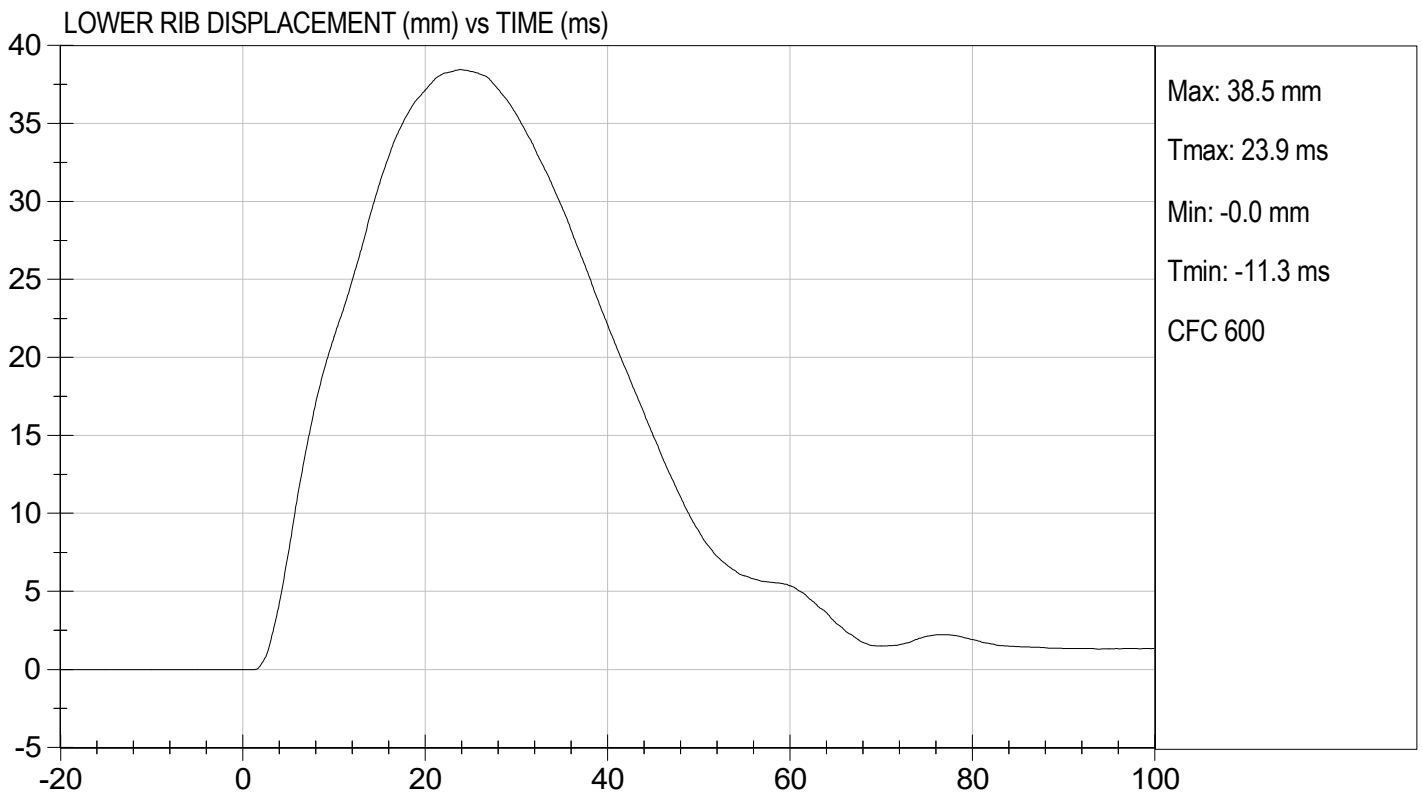
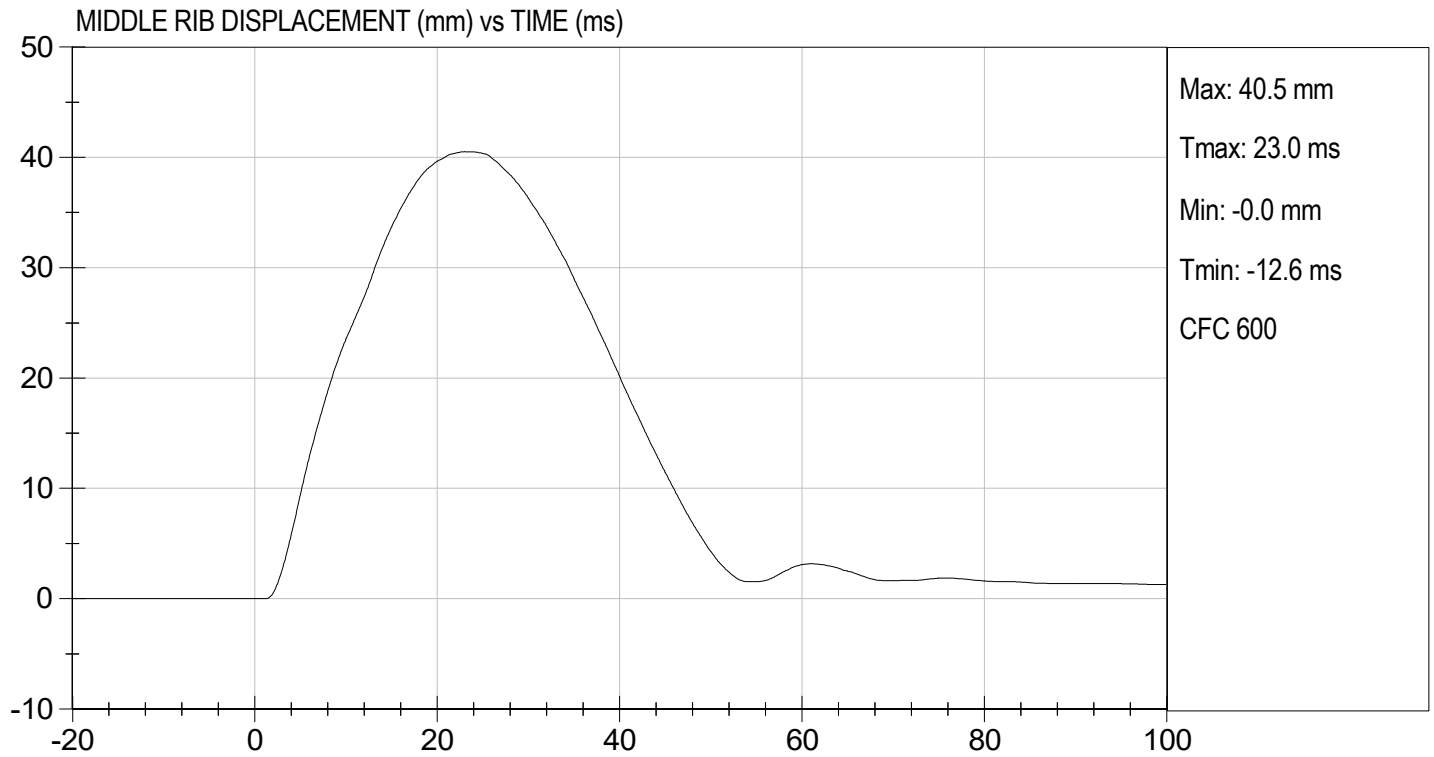
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	36	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	14	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
Overall Test Results				Pass

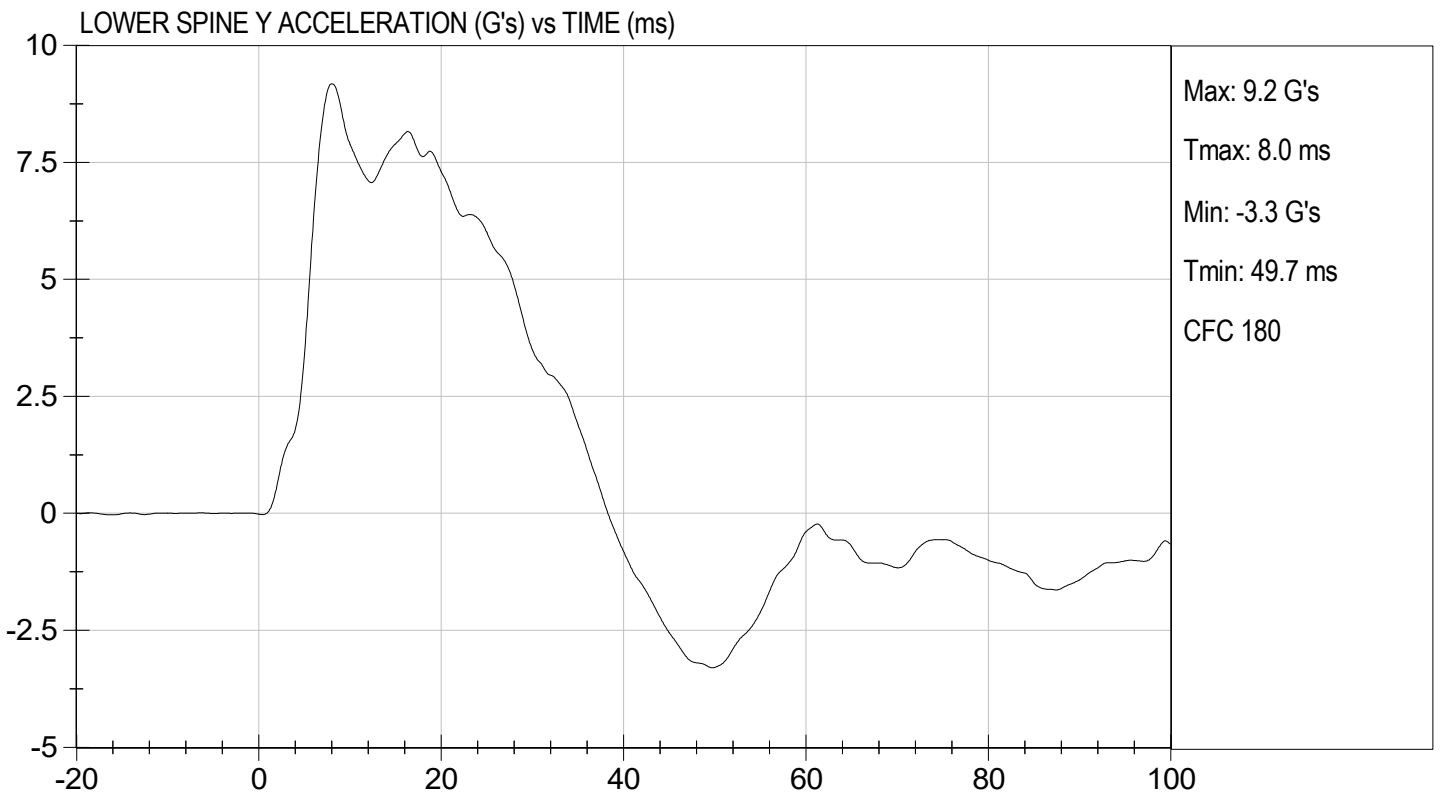
  
 Laboratory Technician

12/08/2023  
 Test Date

  
 Approved By







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

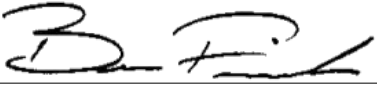
ATD Serial No: 306

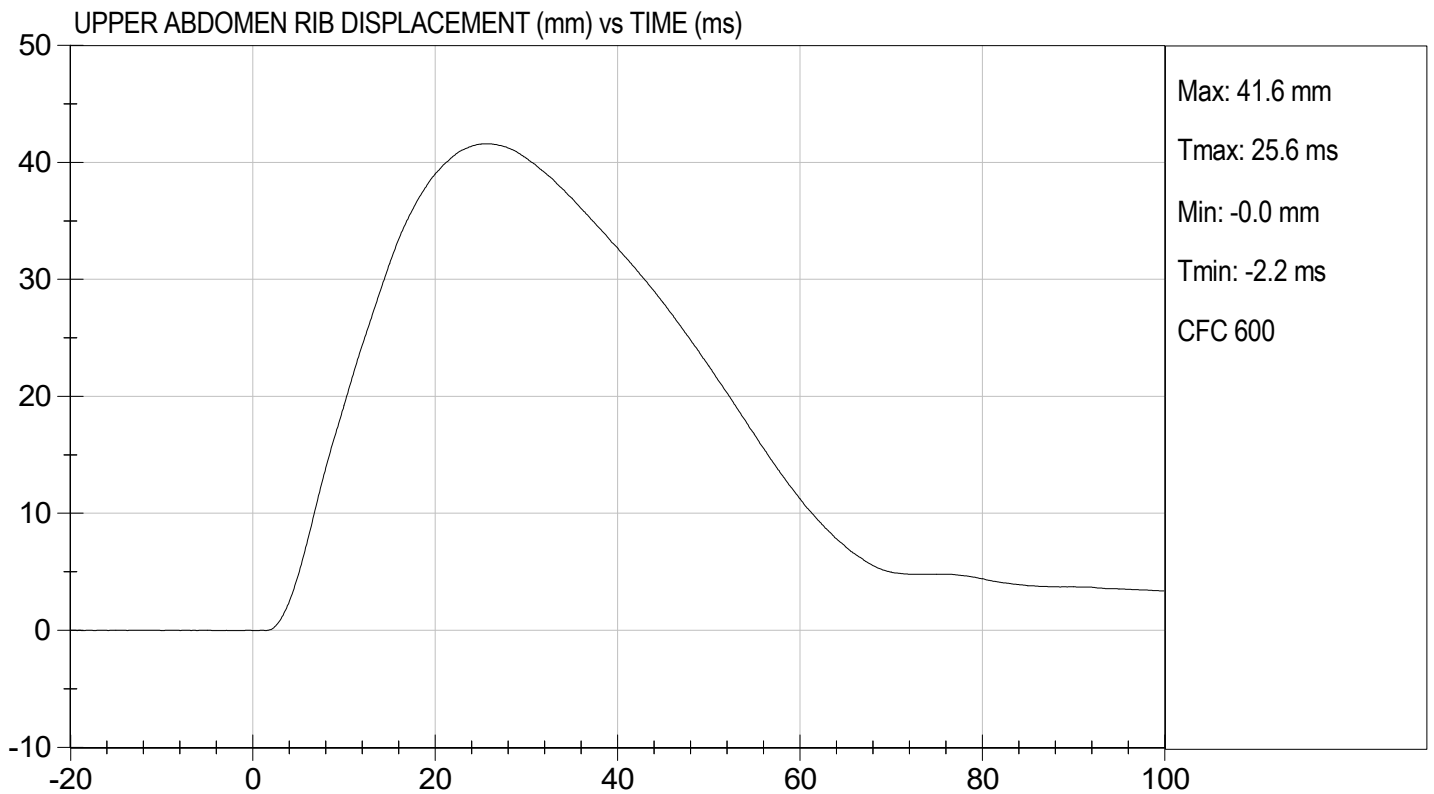
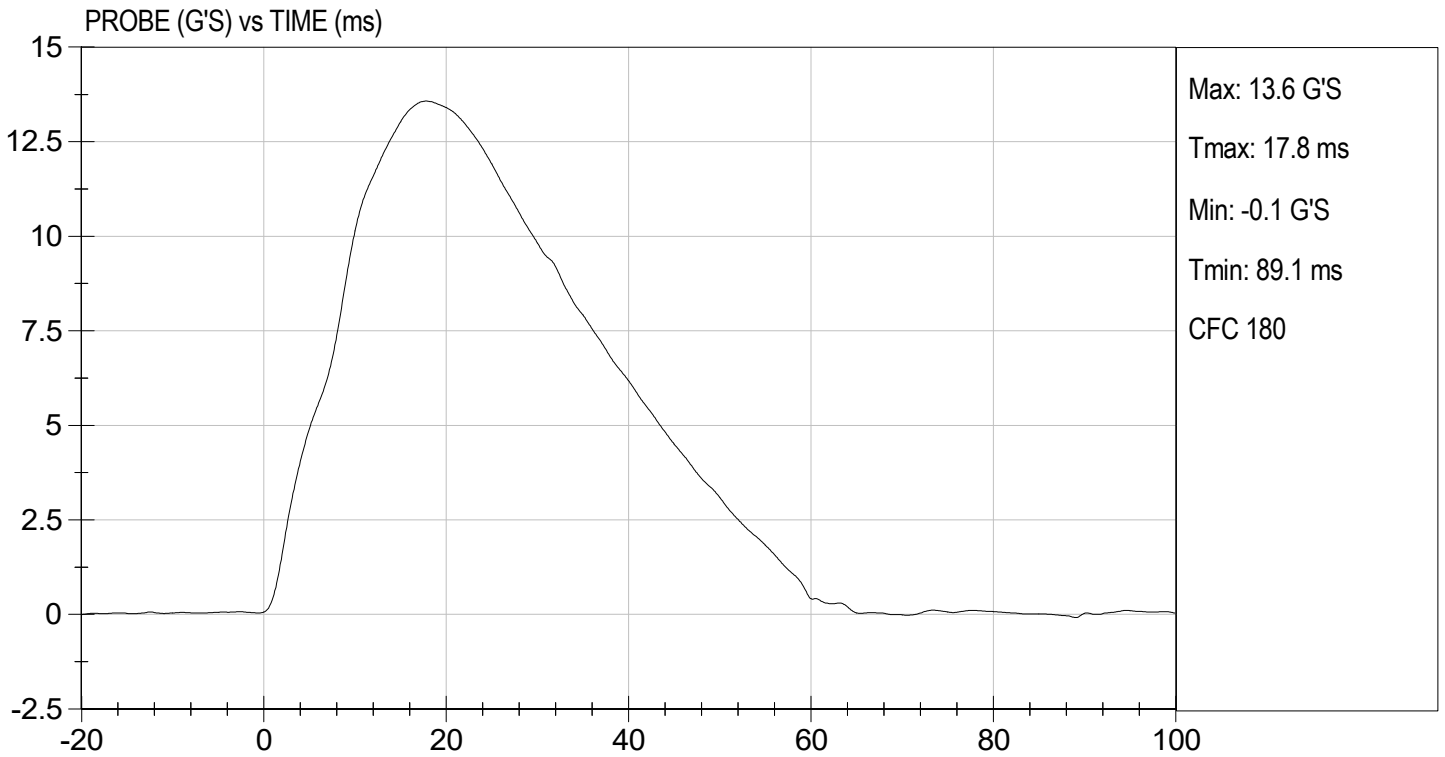
Test I.D: D233256

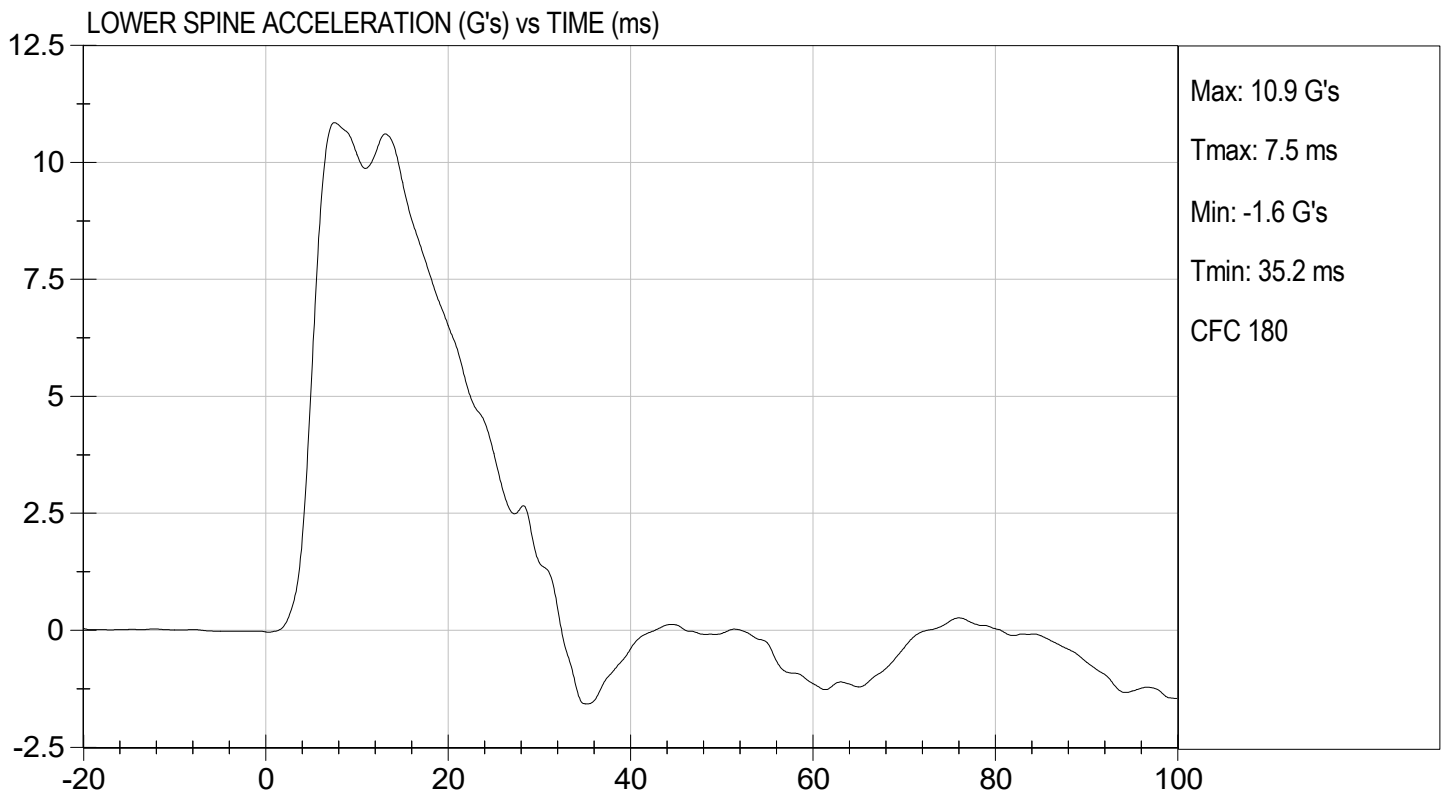
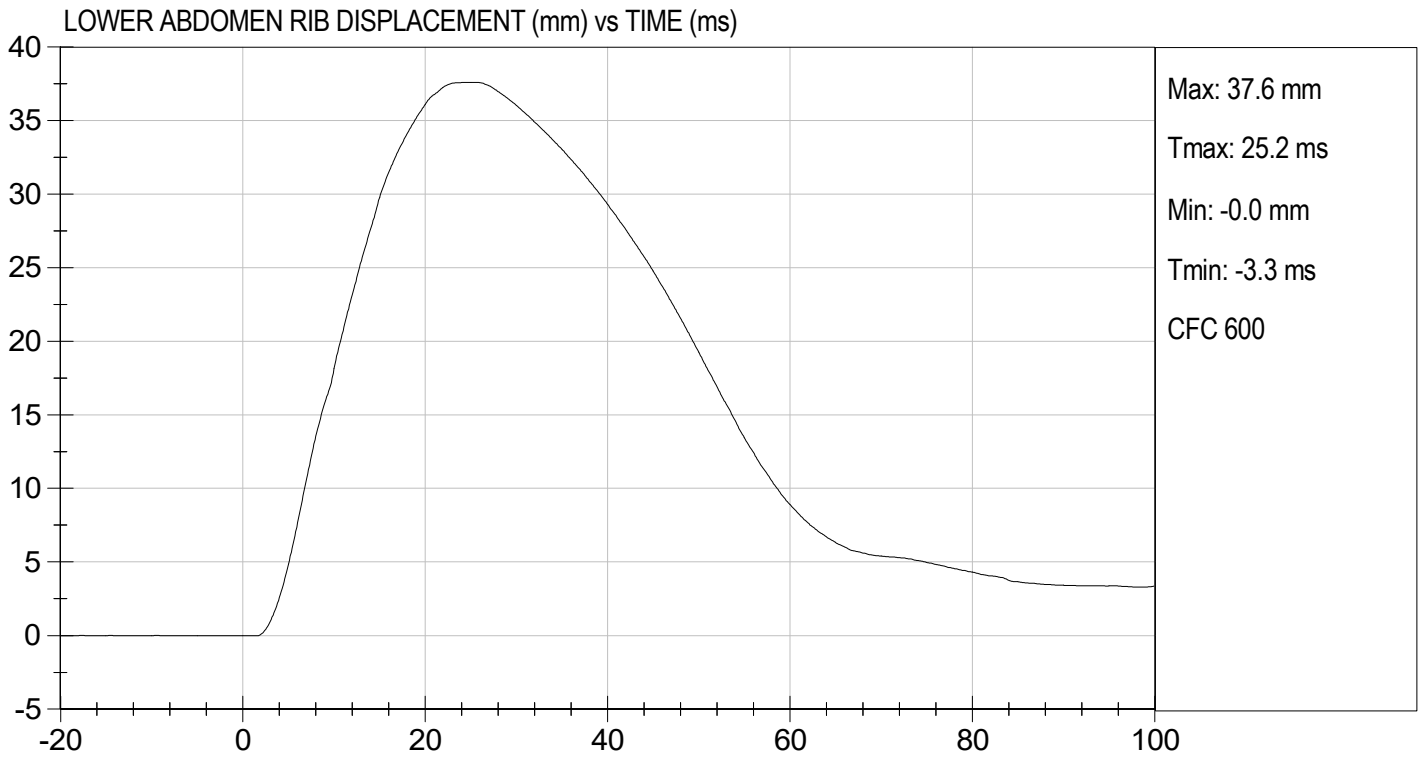
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	32	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	42	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	38	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results				Pass

  
 Laboratory Technician

12/08/2023  
 Test Date

  
 Approved By





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

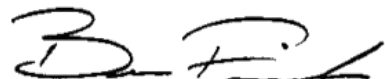
ATD Serial No: 306

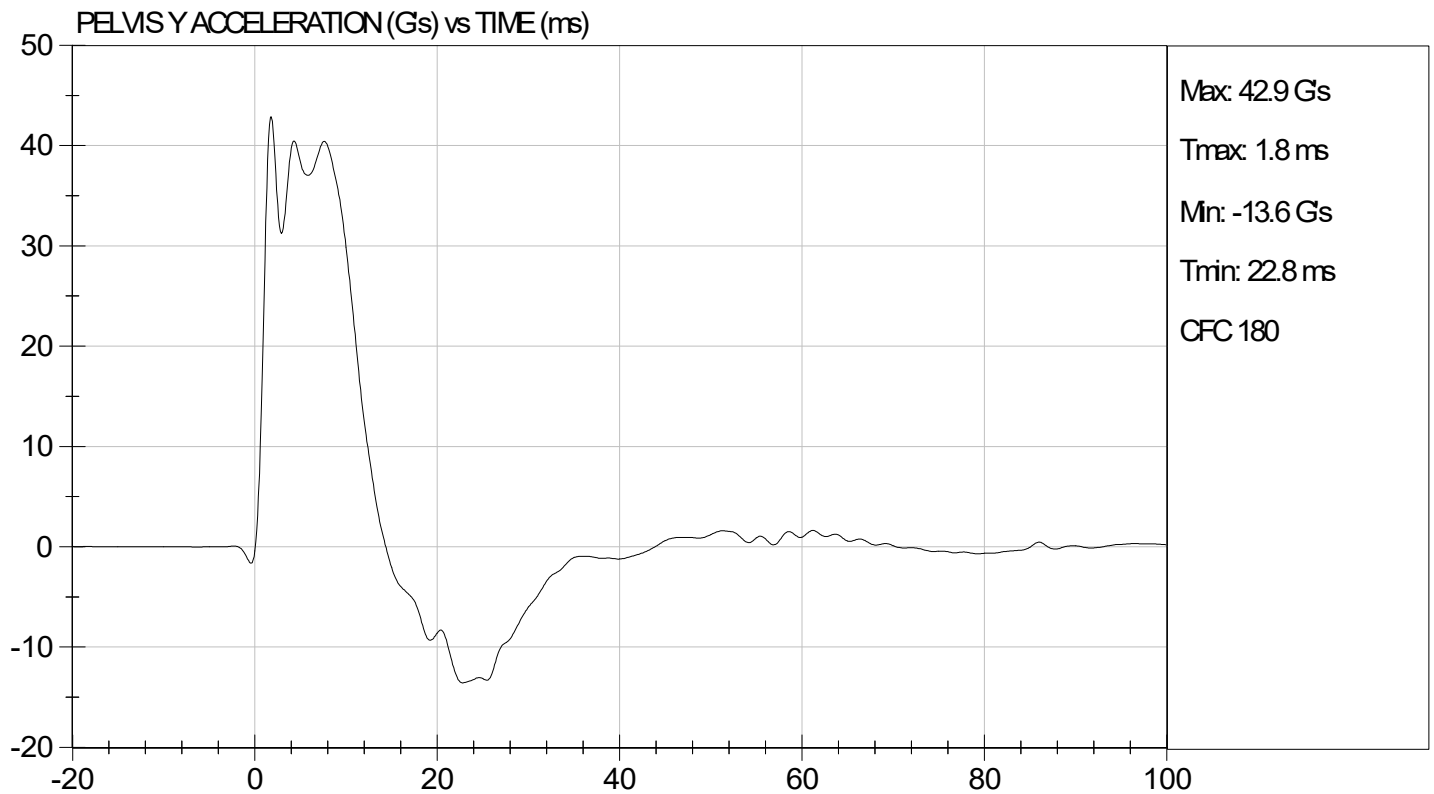
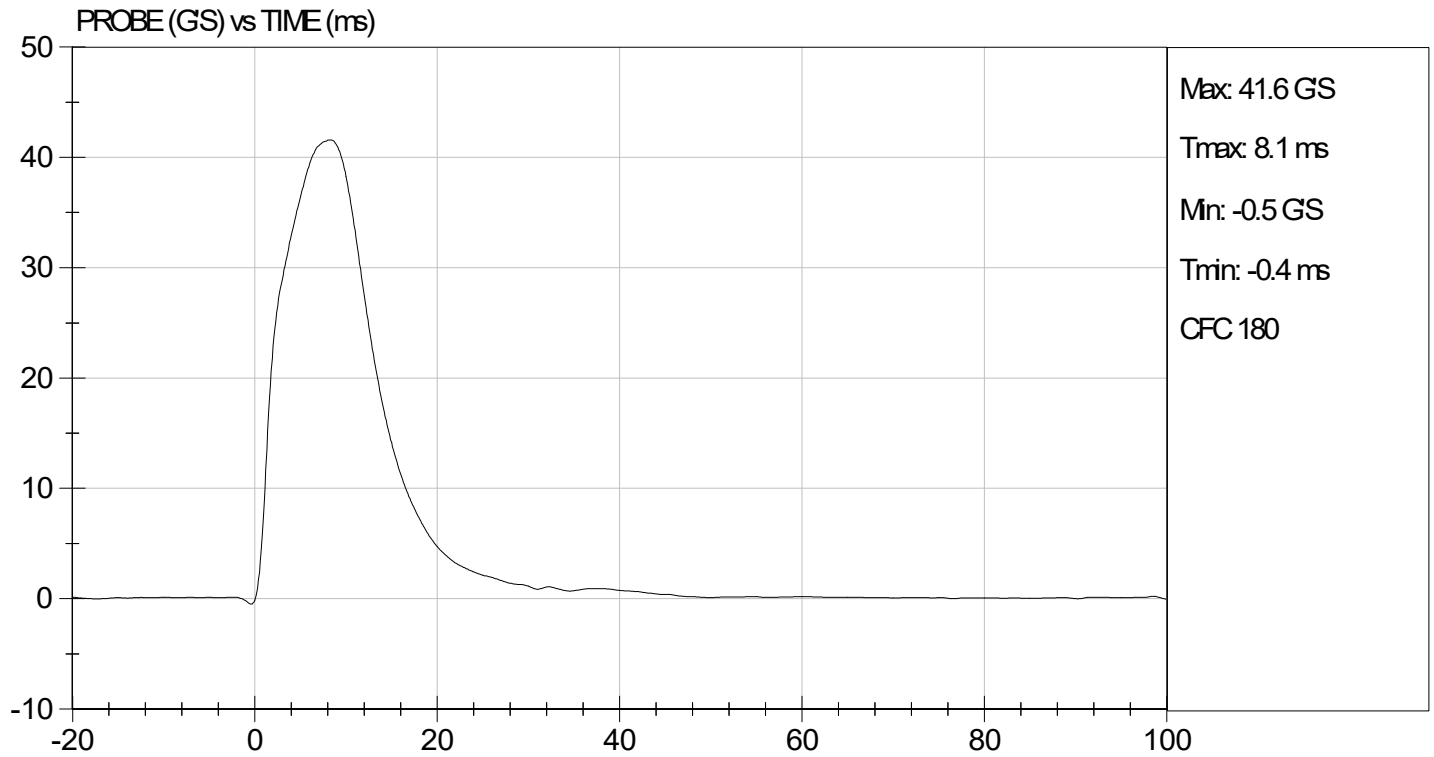
Test I.D: D233257

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	32	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	40.4	Pass
Peak Acetabulum Force	N	3600 to 4300	3,925	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

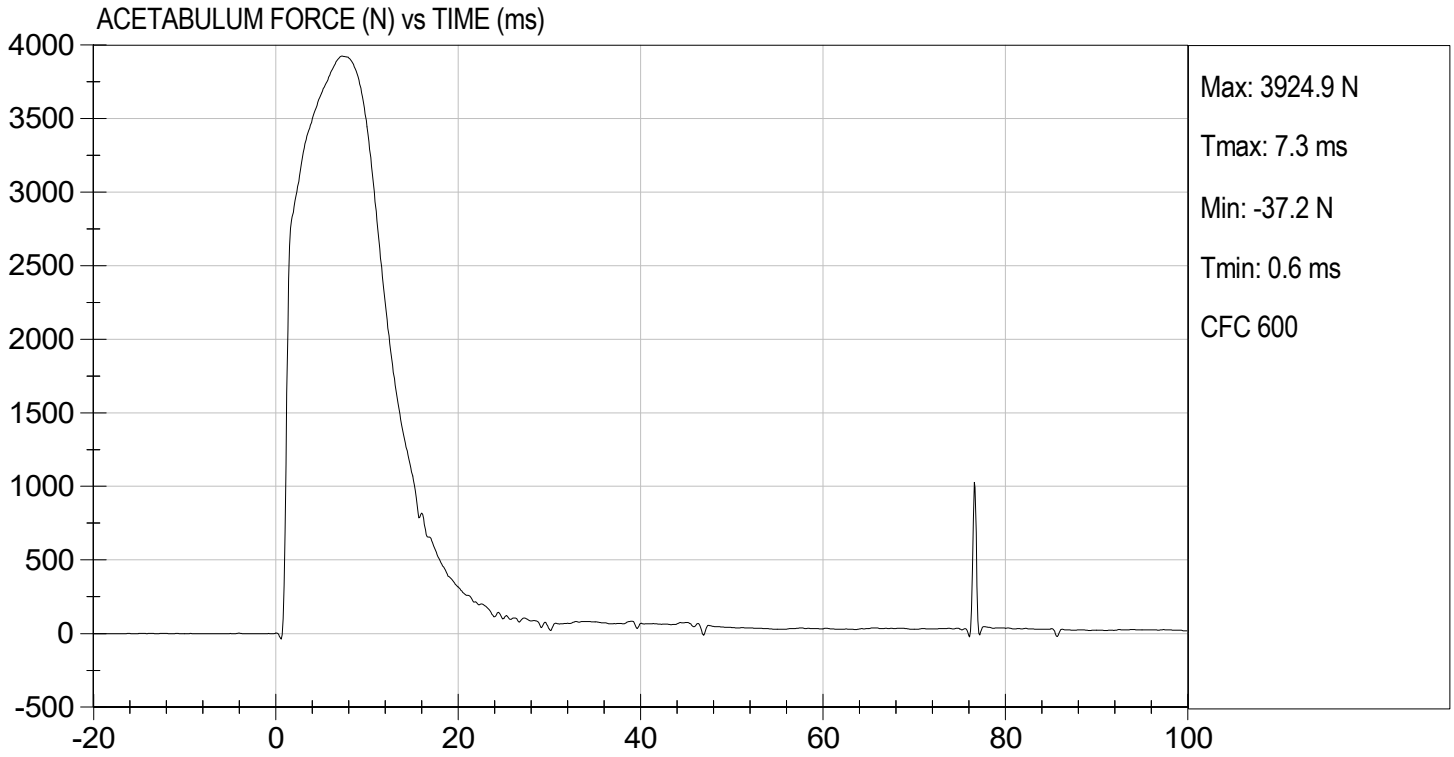
  
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 Approved By





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

TEST DATE: 12/08/2023  
TEST #: D233257



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

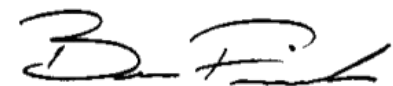
ATD Serial No: 306

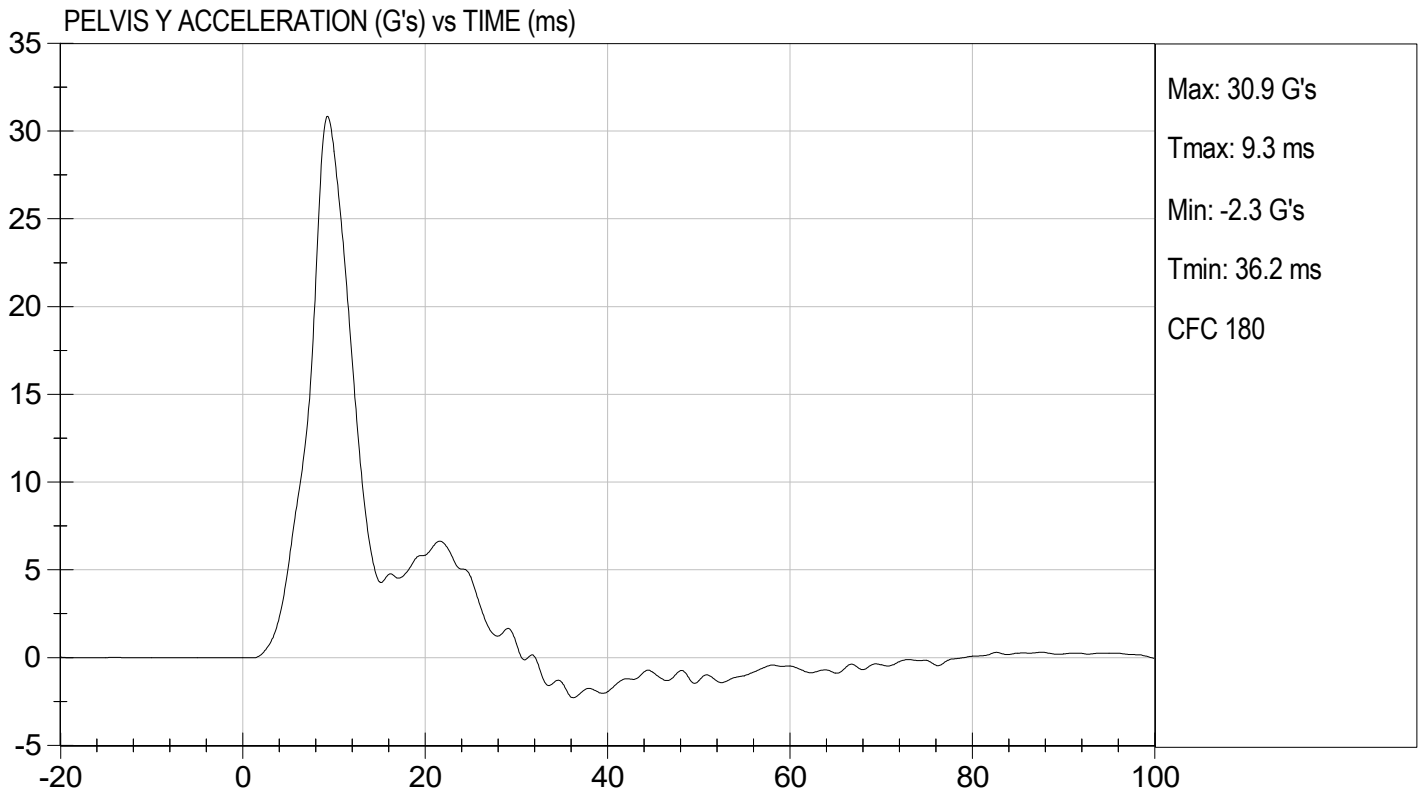
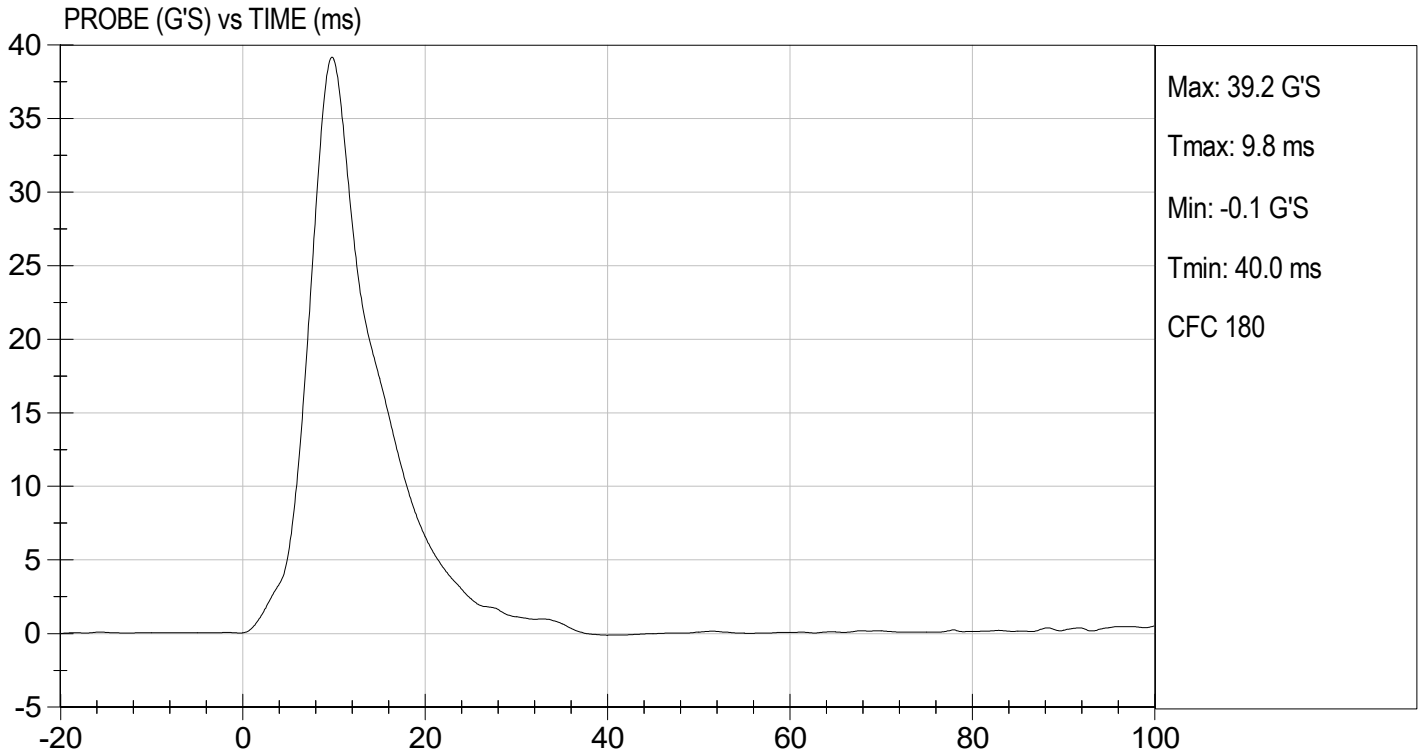
Test I.D: D233258

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	34	Pass
Impact Velocity	m/s	4.20 to 4.40	4.23	Pass
Maximum Probe Acceleration	G's	36 to 45	39	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,444	Pass
Overall Test Results				Pass

  
 \_\_\_\_\_  
 Laboratory Technician

12/08/2023  
 \_\_\_\_\_  
 Test Date

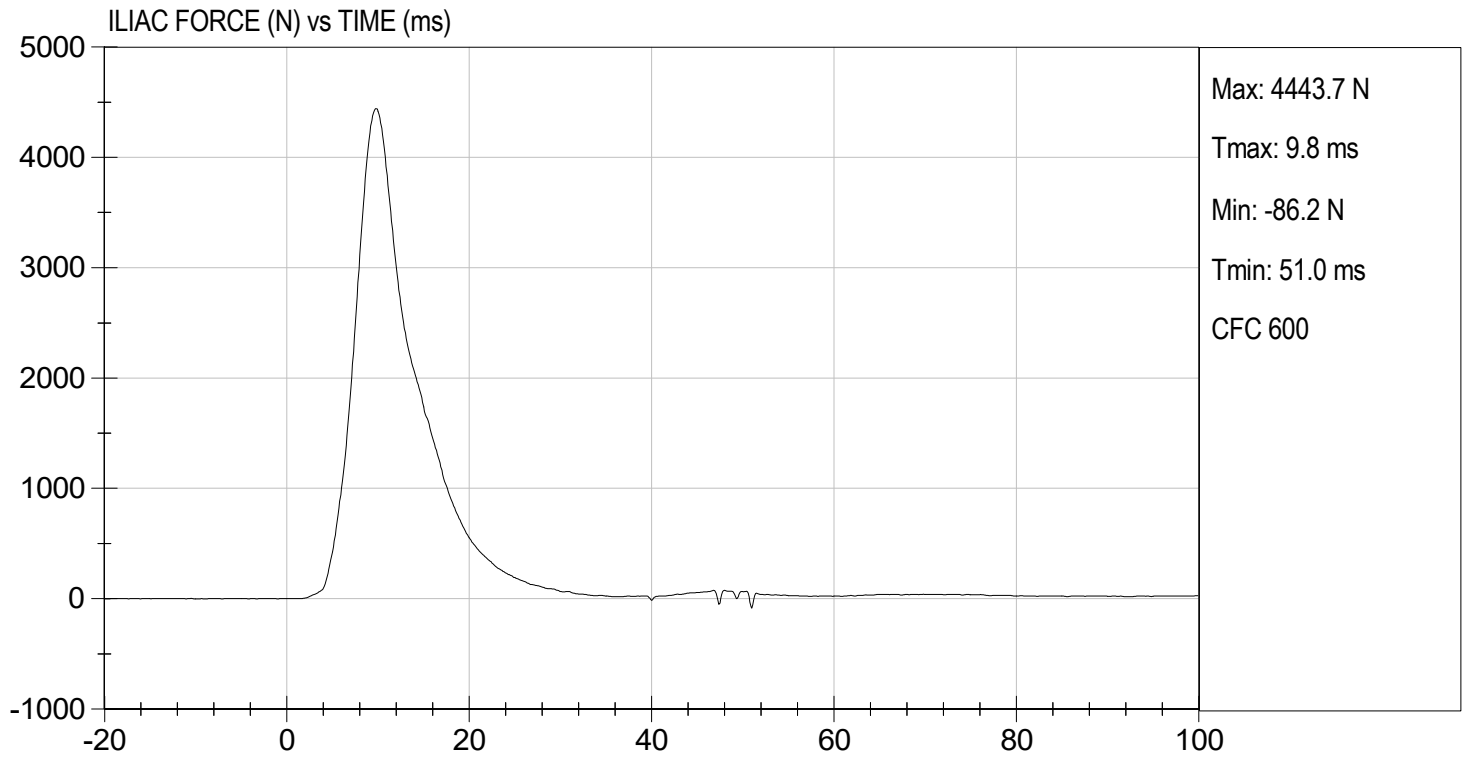
  
 \_\_\_\_\_  
 Approved By





TEST DESC: ILLIAC  
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 12/08/2023  
TEST #: D233258





**SID-IIs Pelvis Plug Certification Test**

Plug S/N 16852

Test Number 23688

Report Number 23745

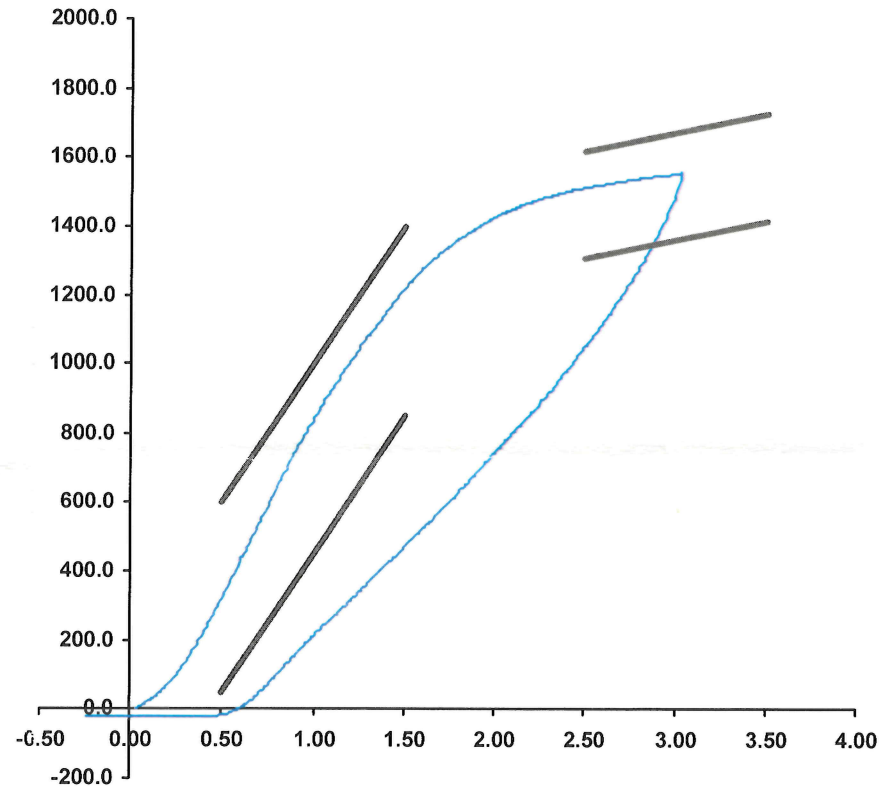
Test Date 8/1/2022 9:49:54 AM

	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	329	50	600
Force @ 1.5 mm (N)	1,226	850	1,400
Force @ 2.5 mm (N)	1,515	1,306	1,618
Force @ 3.0 mm (N)	1,556	1,361	1,673

Testing Machine STM-20 596542  
 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 01-Aug-22

SACO Research

By : DC Date : 8/1/22



**SID-IIs Pelvis Plug Certification Test**

Plug S/N 14902

Test Number 17371

Report Number 17418

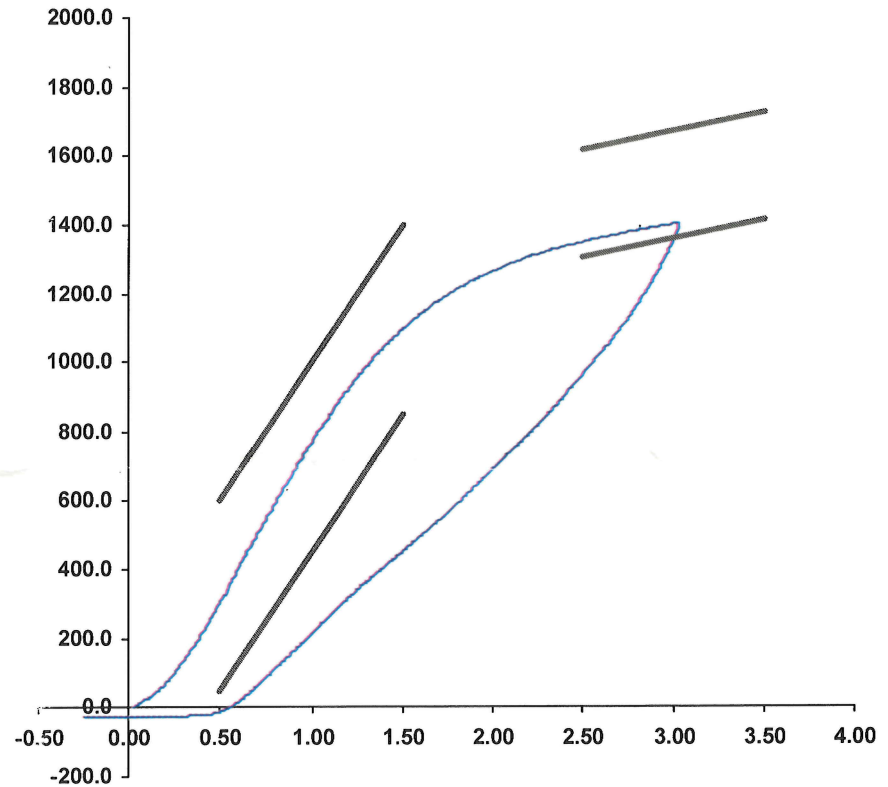
Test Date 1/31/2021 12:27:27 PM

	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	310	50	600
Force @ 1.5 mm (N)	1,098	850	1,400
Force @ 2.5 mm (N)	1,351	1,306	1,618
Force @ 3.0 mm (N)	1,403	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 31-Jan-21  
 SACO Research

By : DC Date : 1/31/2021

**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	11/20/2023
		Y	P79569	Endevco	11/20/2023
		Z	P79570	Endevco	11/20/2023
		Xr	P86797	Endevco	11/20/2023
		Yr	P94957	Endevco	11/20/2023
		Zr	P97381	Endevco	11/20/2023
Thorax Rib Displacement Potentiometers	Upper	Y	G236	Honeywell	11/20/2023
	Middle	Y	G368	Honeywell	11/20/2023
	Lower	Y	G164	Honeywell	11/20/2023
Abdomen Load Cells	Forward	Y	ABG1532	Denton	04/20/2023
	Middle	Y	ABG1534	Denton	04/20/2023
	Rear	Y	ABG1535	Denton	04/20/2023
Lower Spine Accelerometers (T12)		X	P79574	Endevco	11/20/2023
		Y	T14094	Endevco	11/20/2023
		Z	P82603	Endevco	11/20/2023
Public Symphysis Load Cell		Y	PG461	Denton	04/20/2023

**Table 2 – Dummy Instrumentation (SID-IIs)**

			SID-IIs S/N 306			
			Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers			X	P79003	Endevco	06/22/2023
			Y	P79445	Endevco	06/22/2023
			Z	P79724	Endevco	06/22/2023
			Xr	P84999	Endevco	06/22/2023
			Yr	P85000	Endevco	06/22/2023
			Zr	P85001	Endevco	06/22/2023
Head Angular Rate Sensors			X	ARS7566	DTS	04/07/2023
			Y	ARS7586	DTS	04/07/2023
			Z	ARS7602	DTS	04/07/2023
Displacement Potentiometers	Thoracic Rib	Upper	Y	G033	FTSS	06/22/2023
		Middle	Y	G2403	Servo	06/22/2023
		Lower	Y	G1270	FTSS	06/22/2023
	Abdominal Rib	Upper	Y	G032	FTSS	06/22/2023
		Lower	Y	MJ5171	Medius	06/22/2023
Lower Spine Accelerometers (T12)			X	P96332	Endevco	06/22/2023
			Y	P96335	Endevco	06/22/2023
			Z	P96341	Endevco	06/22/2023
Acetabulum Load Cell			Y	ACG259	Denton	08/17/2023
Iliac Wing Load Cell			Y	IWG286	Denton	08/17/2023
Pelvis Plug (struck side)				16852	SACO	08/01/2022
Pelvis Plug (non-struck side)				14902	SACO	01/31/2022

**Table 3 – Vehicle Instrumentation**

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	T37934	Endevco	10/24/2023
	Vehicle Center of Gravity	Y	T38375	Endevco	10/24/2023
	Vehicle Center of Gravity	Z	T39025	Endevco	10/21/2023
2	Right Sill at Front Seat	X	T39104	Endevco	10/28/2023
	Right Sill at Front Seat	Y	T39159	Endevco	11/01/2023
	Right Sill at Front Seat	Z	T38794	Endevco	10/25/2023
3	Right Sill at Rear Seat	X	T38480	Endevco	10/17/2023
	Right Sill at Rear Seat	Y	T39089	Endevco	10/30/2023
	Right Sill at Rear Seat	Z	T39145	Endevco	11/01/2023
4	Left Sill at Front Door	Y	T38332	Endevco	10/25/2023
5	Left Sill at Rear Door	Y	T39050	Endevco	10/25/2023
6	Left A-Post Lower	Y	T38285	Endevco	10/26/2023
7	Left A-Post Middle	Y	T37929	Endevco	10/25/2023
8	Left B-Post Lower	Y			
9	Left B-Post Middle	Y			
10	Front Seat Track	Y	T39023	Endevco	10/21/2023
11	Rear Seat Track or Structure	Y	T37973	Endevco	10/26/2023
12	Right Rear Occ. Compartment	Y	T38376	Endevco	10/24/2023
13	Engine Block	X	T38793	Endevco	10/25/2023
	Engine Block	Y	T39070	Endevco	10/30/2023
14	Rear Floorpan Above Axle	X	T38377	Endevco	10/24/2023
	Rear Floorpan Above Axle	Y	T37936	Endevco	10/26/2023
	Rear Floorpan Above Axle	Z	T37928	Endevco	10/25/2023

**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