REPORT NUMBER: SideNCAPMDB-MGA-20-031

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

AUDI AG
2020 Audi A6 45 TFSI quattro 4-Door Sedan
NHTSA No.: O20205800

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: December 4, 2020

Final Report Date: March 2, 2021

FINAL REPORT

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

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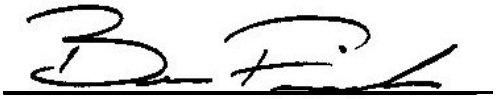
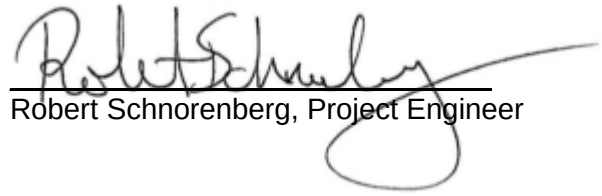
Prepared by: 
Ben Fischer, Project Manager

Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: March 2, 2021

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

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SideNCAPMDB-MGA-20-031		

4. Title and Subtitle	5. Report Date
Final Report of New Car Assessment Program Side Impact MDB Testing of 2020 Audi A6 45 TFSI Quattro 4-Door Sedan, NHTSA No.: O20205800	March 2, 2021
	6. Performing Organization Code MGA
7. Author(s) Ben Fischer, Project Manager	**8. Performing Organization Report No.** SideNCAPMDB-MGA-20-031
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105	**10. Work Unit No.**
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15. Supplementary Notes

16. Abstract

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2020 Audi A6 45 TFSI quattro 4-Door Sedan 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 4, 2020.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.34 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.5°C. The target vehicle post-test maximum crush was 250 mm at level 3. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	141
Maximum Thorax Rib Deflection	mm	44	25
Total Abdominal Force	N	2500	787
Pubic Symphysis Force	N	6000	1264
Resultant Lower Spine Acceleration	g	82*	29

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	116
Resultant Lower Spine Acceleration	g	82	32
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1662
Maximum Thoracic Rib Deflection	mm	38*	19
Maximum Abdomen Rib Deflection	mm	45*	23

*Proposed IARV

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

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

19. Security Classification of Report	20. Security Classification of Page	21. No. of Pages	22. Price
Unclassified	Unclassified	225	

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2020 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00353. The purpose of this test is to generate comparative side impact performance in a 2020 Audi A6 45 TFSI quattro 4-Door Sedan. 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 2020 Audi A6 45 TFSI quattro 4-Door Sedan 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 62.34 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 4, 2020. Pre-test and post-test photographs of the test vehicle, the MDB, and the dummies (ES-2re and SID-IIs) are included in this report.

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

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and Redundant Head CG Triaxial Accelerometers
Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
Abdomen Forward, Middle, and Rear Y-Axis Load Cells
Lower Spine (T12) Triaxial Accelerometers
Pubic Symphysis Y-Axis Load Cell

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

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

Dummy Injury readings were recorded as follows:

DUMMY INJURY VALUES

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	141
Maximum Thorax Rib Deflection	mm	44	25
Total Abdominal Force	N	2500	787
Pubic Symphysis Force	N	6000	1264
Resultant Lower Spine Acceleration	g	82*	29

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	116
Resultant Lower Spine Acceleration	g	82	32
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1662
Maximum Thoracic Rib Deflection	mm	38*	19
Maximum Abdomen Rib Deflection	mm	45*	23

*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:	No		No	

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

GENERAL COMMENTS

Left Mid A-Post Y recorded no valid data after 8 ms.
Driver Seat Track Y recorded no valid data after 5 ms.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20205800	Traction Control System (TCS)	Yes
Model Year	2020	Auto-Leveling System	No
Make	Audi	Automatic Door Locks (ADL)	Yes
Model	A6 45 TFSI quattro	Power Window Auto-Reverse	Yes
Body Style	4-Door Sedan	Other Optional Feature	No
VIN	WAUD8BF2XLN072276	Driver Front Airbag	Yes
Body Color	Vesuvius Gray Metallic	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	121 km / 75 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	2.0 L	Driver Torso Airbag	No
Type/No. Cylinders	Inline 4	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Longitudinal	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	7	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	Yes	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?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	AUDI AG
Date of Manufacture	02/20
Vehicle Type	Passenger Car

GVWR (kg)	2420
GAWR Front (kg)	1205
GAWR Rear (kg)	1270

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				500	(A)
DSC x 68.04 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				160	(A-B)

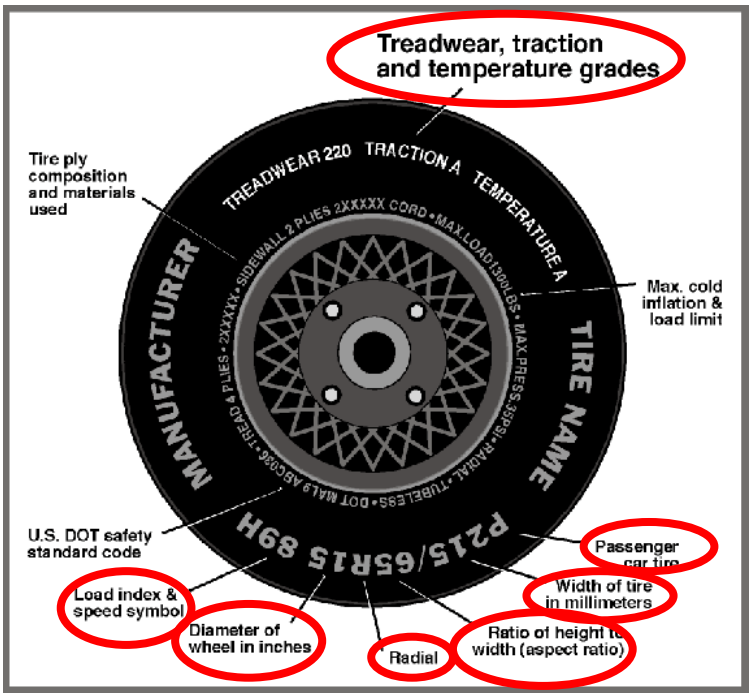
VEHICLE SEAT TYPE

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

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	240
Recommended Tire Size	245/45R19	245/45R19
Tire Size on Vehicle	245/45R19	245/45R19
Tire Manufacturer	Continental	Continental
Tire Model	ProContact TX	ProContact TX
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Rayon	1 Rayon
Tire Plies Body	1 Rayon, 2 Steel, 1 Polyamide	1 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	102H	102H
Tire Material	Rubber	Rubber
DOT Safety Code Left	AFA2 WD4C 4219	AFA2 WD4C 0220
DOT Safety Code Right	AFA2 WD4C 4419	AFA2 WD4C 4419

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

TEST VEHICLE TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	260	260	260	260
Tire Placard	kPa	220	220	240	240
Owner's Manual	kPa	220	220	240	240
As Tested	kPa	220	220	240	240

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	481.5	392.0		511.5	515.5		523.0	514.0	
Right	kg	505.5	428.0		498.5	563.0		510.0	524.5	
Ratio	%	54.6%	45.4%		48.4%	51.6%		49.9%	50.1%	
Totals	kg	987.0	820.0	1807.0	1010.0	1078.5	2088.5	1033.0	1038.5	2071.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1807.0	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	160	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	2096.0	(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	752	761	Yes
Right Front	mm	746	750	Yes
Right Rear	mm	721	713	Yes
Left Rear	mm	719	709	Yes
Vehicle CG (Aft of Front Axle)	mm	1465	1509	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	1	-13	

* ND=Nose Down (-), NU=Nose Up (+) ** LD=Left Down (-), LU=Left Up (+)
*** The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well.

Test height adjustable suspension setting, if applicable:	Not Applicable

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Units	Weight
Weight of Ballast Added	kg	154
Components Removed: none	kg	

TEST SURFACE MARKINGS

	Units	Distance from 63° Impact Angle Line
Fore 25 mm Target	mm	928
Aft 25 mm Target	mm	932
Pre-Impact Angle Line	mm	100

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

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

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	29.1	17.8	23.5
Front Passenger Seat	28.9	18.2	23.6
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As-Tested SCRL Angle (Mid) (°)	As-Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	23.5	0	Max	68	68	68
			Mid	34	34	34
			Min	0	0	0
Front Passenger Seat	23.6	0	Max	68	68	38
			Mid	34	34	34
			Min	0	0	0
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

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

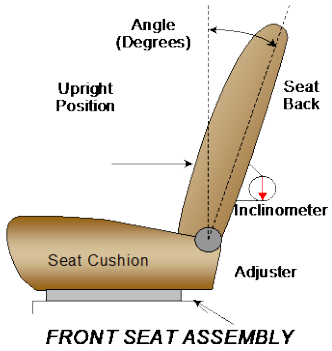
Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1st as 1)	mm	Detent (1st as 0)
Driver Seat	248		124	
Front Passenger Seat	245		123	
Front Center Seat				
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

SEAT BACK ANGLE ADJUSTMENT

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



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents (1st as 1)	Degrees	Detent (1st as 0)
Driver Seat	59.4		21.5	
Front Passenger Seat	52.4		21.0	
Front Center Seat				
Struck Side Rear Seat	Fixed		14.7	
Non-Struck Side Rear Seat	Fixed		14.7	
Rear Center Seat	Fixed		14.7	

Seat back angles measured at seatback center.

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

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

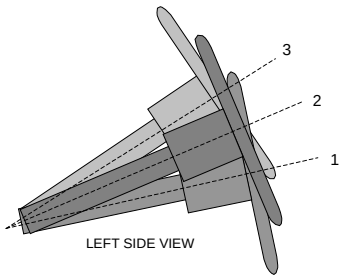
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	5	4 (Lowest as 0) / Forward
Rear Seat	2	0 (Lowest as 0) / Fixed Fore-Aft

STEERING COLUMN ADJUSTMENT

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

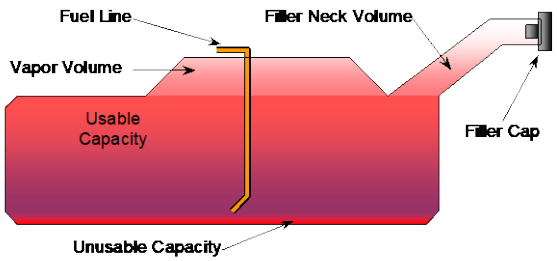
	Wheel Angle (°)	Fore/Aft Position (mm)
Lowermost, Position 1	71.6	
Geometric Center, Position 2	69.2	
Uppermost, Position 3	66.7	
Telescoping Steering Wheel Travel		60
Test Position	69.2	30



STEERING COLUMN ASSEMBLY

FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump does not activate when the vehicle's electrical system is activated. The filler neck is located on the passenger's side.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

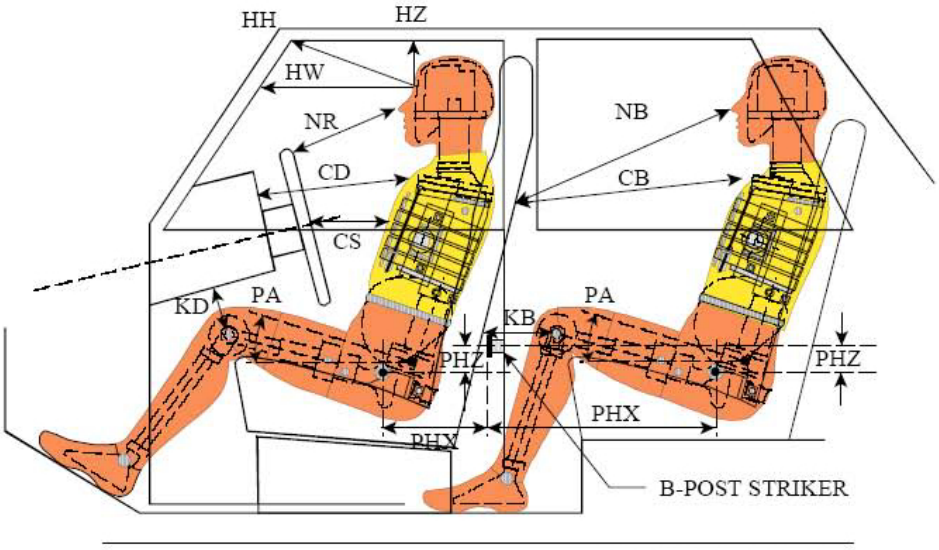
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of Standard Tank (see S1 - Vehicle Setup Information)	73.1
Usable Capacity of Optional Tank (see S1 - Vehicle Setup Information)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	73.1
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	67.9
Actual Amount of Solvent Used	67.8
1/3 of Usable Capacity	24.4

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan
Test Program: NCAP Side MDB Impact Test
NHTSA No.: O20205800
Test Date: 12/4/2020



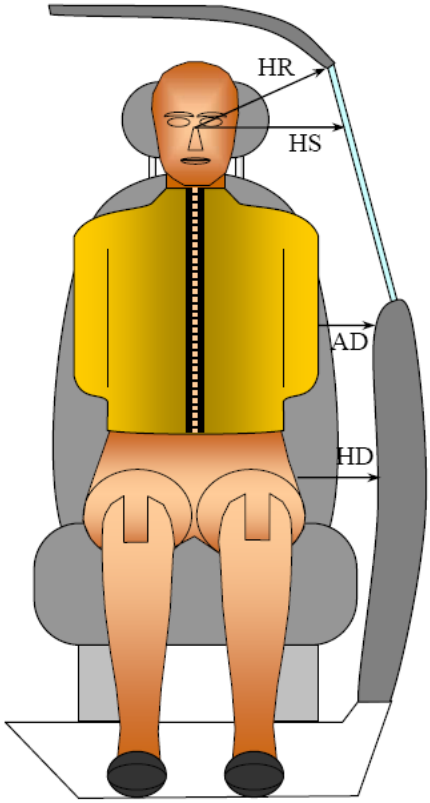
LEFT SIDE VIEW

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	378	21.7		
HW		Head to Windshield	673	0		
HZ	HZ	Head to Roof Liner	159	90	278	90
NR	NB	Nose to Rim/Seat Back	458	4.1	537	18.4
CD	CB	Chest to Dashboard/Seat Back	598	16.5	520	6.2
CS		Chest to Steering Wheel	406	1.4		
KDL	KBL	Left Knee to Dash/Seat Back	258	37.5	245	11.5
KDR	KBR	Right Knee to Dash/Seat Back	244	32.8	246	11.5
PAX	PAX	Pelvic Tilt Angle X		20.6		30.9
PAY	PAY	Pelvic Tilt Angle Y		-0.8		-0.6
PHX	PHX	Hip Point to Striker (X-Axis)	149		188	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	239		216	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

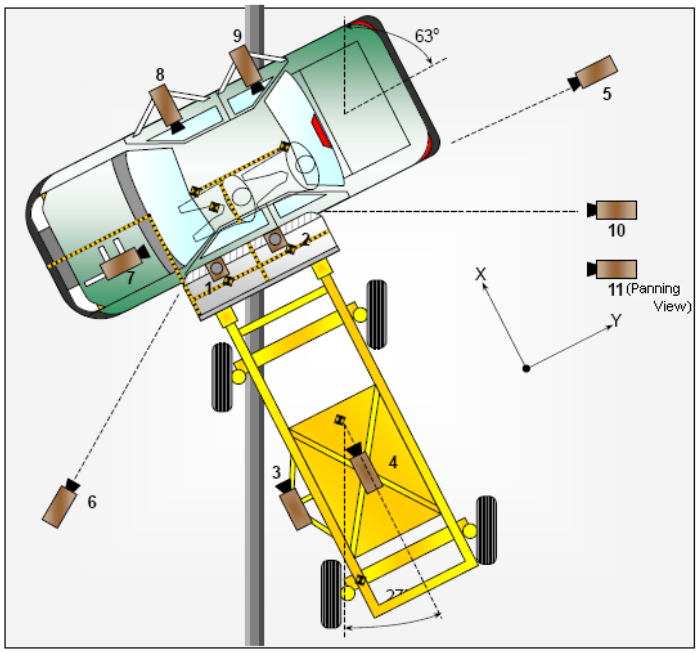
Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan
Test Program: NCAP Side MDB Impact Test
NHTSA No.: O20205800
Test Date: 12/4/2020



Code	Measurement Description	Driver	Passenger
		Length (mm)	
HR	Head to Side Header	193	262
HS	Head to Side Window	337	376
AD	Arm to Door	117	184
HD	Hip Point to Door	162	181

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates* (mm)			Lens (mm)	Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	900	440	-4995	8.5	1000
2	Overhead Close-Up	250	15	-4895	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	-35	6085	-1425	24	1000
6	Left Front	-2010	-6010	-1500	24	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8	1000
9	Passenger Side (OB)				8	1000
10	Real Time Left Rear					30
11	Real Time Inrun					30

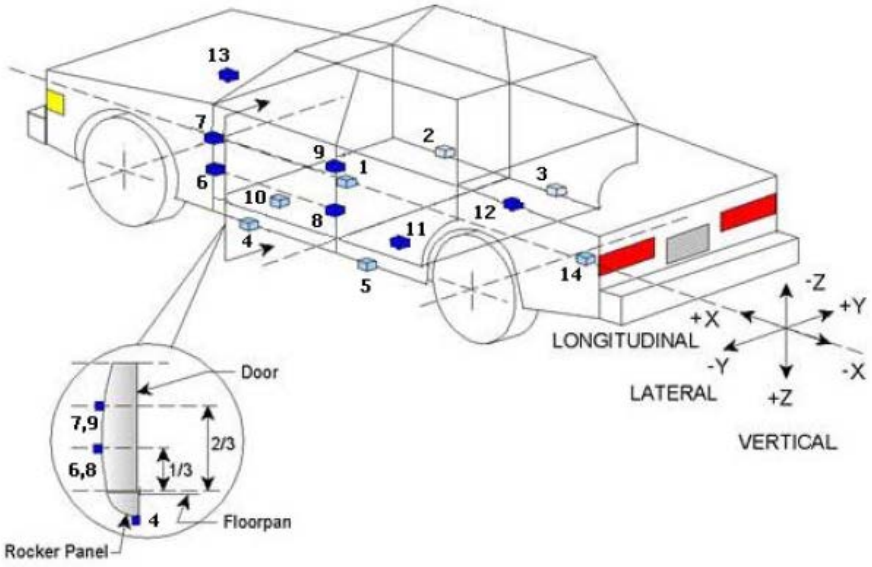
Reference: Impact Point projected to Ground; +X = To Front of MDB, + Y = To Right of MDB, +Z = Down
*All measurements accurate to ±6 mm

INSTRUMENTATION

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

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



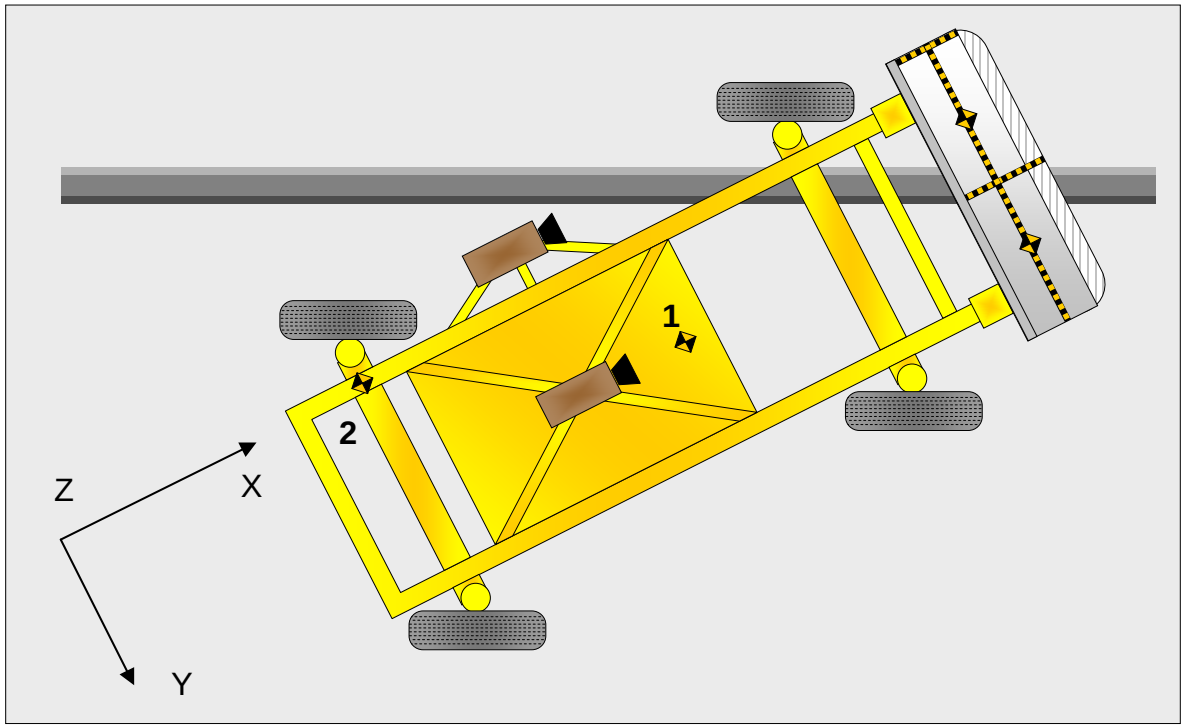
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2495	366	-170
2	Right Sill at Front Seat	2425	775	-205
3	Right Sill at Rear Seat	1547	775	-195
4	Left Sill at Front Door	2869	-775	-210
5	Left Sill at Rear Door	1821	-775	-205
6	Left Lower A-Post	3380	-855	-565
7	Left Middle A-Post	3375	-850	-755
8	Left Lower B-Post	2363	-735	-439
9	Left Middle B-Post	2323	-760	-694
10	Front Seat Track	2546	-415	-230
11	Rear Seat Structure	2028	-360	-250
12	Rt. Rear Occ. Compartment	2060	355	-230
13	Engine Block	4275	40	-815
14	Rear Above Axle	955	0	-545

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: 2020 Audi A6 45 TFSI quattro 4-Door Sedan
Test Program: NCAP Side MDB Impact Test
NHTSA No.: O20205800
Test Date: 12/4/2020



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	1399

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

TEST DUMMY INFORMATION AND CONTACT POINTS

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

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	None
Side Window Damage	LF, LR window broken
Other Notable Effects	None

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

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:	No		No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2922
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		531
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-23
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	0

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

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

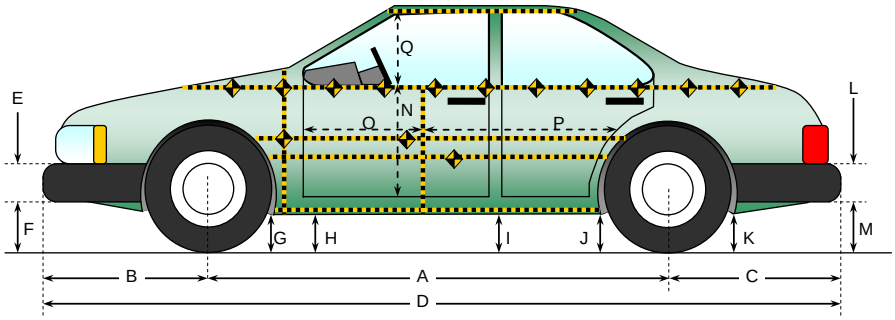
	Units	Front Axle	Rear Axle	Total
Left	kg	368.2	320.6	
Right	kg	400.7	271.4	
Ratio	%	56.5	43.5	
Totals	kg	768.9	592.0	1360.9

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.34
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.31
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.4
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	27.0

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan
Test Program: NCAP Side MDB Impact Test
NHTSA No.: O20205800
Test Date: 12/4/2020



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

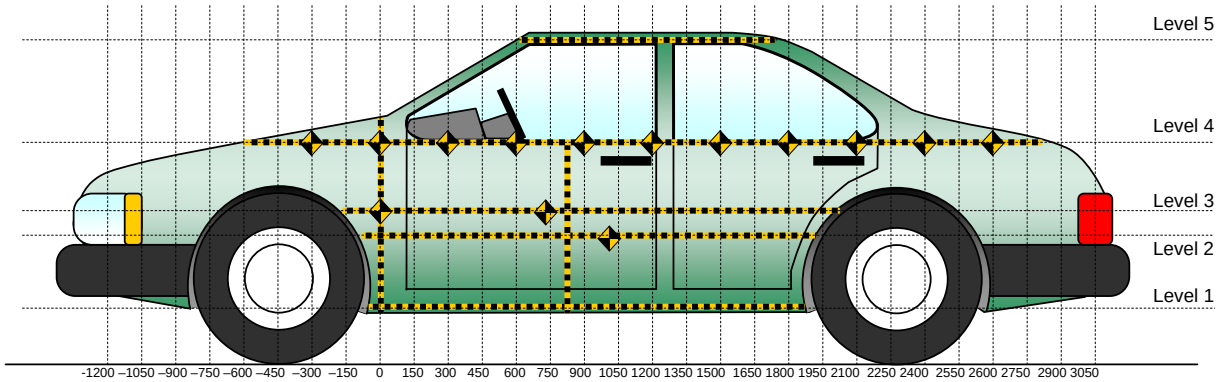
LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2922	2923	-1
B	Front Axle to FSOV	927	889	38
C	Rear Axle to RSOV	1098	1093	5
D	Total Length at Centerline	4947	4905	42
E	Front Bumper Thickness	61	61	0
F	Front Bumper Bottom to Ground	250	253	-3
G	Sill Height at Front Wheel Well	178	178	0
H	Sill Height at Front Door Leading Edge	170	176	-6
I	Sill Height at B Pillar	160	164	-4
J1	Sill Height at Rear Wheel Well	150	155	-5
J2	Pinch Weld Height at Rear Wheel Well	155	161	-6
K	Sill Height Aft of Rear Wheel Well	187	192	-5
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	240	258	-18
N	Sill Height to Window Bottom Sill	747	684	63
O	Front Door Leading Edge to Impact CL	778	734	44
P	Rear Door Trailing Edge to Impact CL	1237	1465	-228
Q	Front Window Opening	403	380	23
R	Right Side Length	3955	3962	-7
S	Left Side Length	3955	3958	-3
T	Vehicle Width at B Post	1912	1913	-1
U	Front Wheel Track Width	1611		
V	Rear Wheel Track Width	1605		

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



All Measurements Shown in mm

LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEAUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	294	35	1050
2	Occupant H-Point	473	164	1500
3	Mid Door	622	250	1800
4	Window Sill	940	153	1800
5	Window Top	1385	25	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

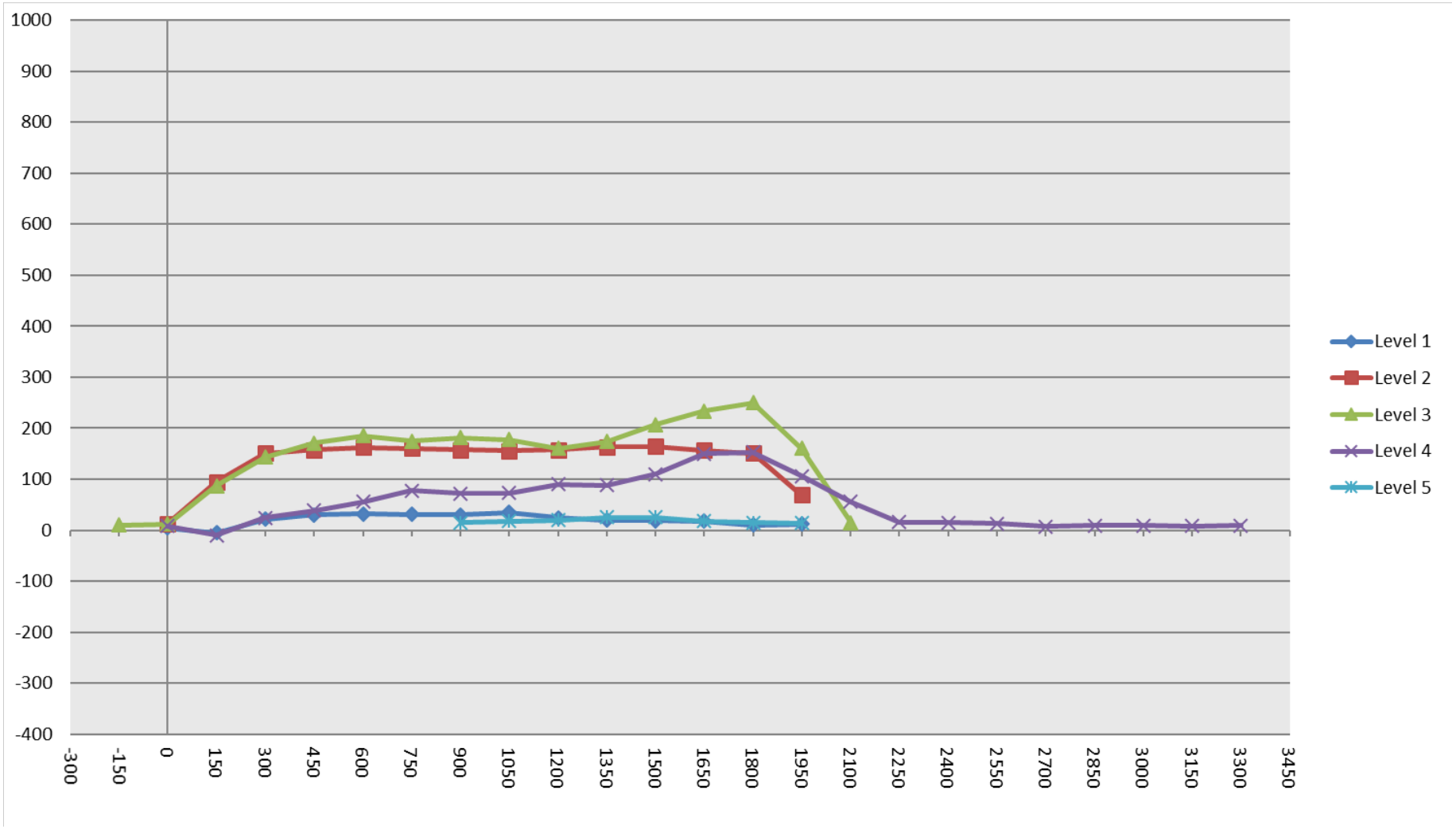
Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150			160					170					10		
0	185	168	164	277		189	181	176	285		4	13	12	8	
150	187	171	167	265		182	266	254	255		-5	95	87	-10	
300	188	176	169	261		210	327	312	285		22	151	143	24	
450	188	180	172	256		218	338	343	295		30	158	171	39	
600	188	181	171	253		220	343	356	309		32	162	185	56	
750	189	179	169	248		220	339	344	326		31	160	175	78	
900	190	178	169	245	524	220	336	350	317	539	30	158	181	72	15
1050	191	178	169	243	503	226	334	347	316	521	35	156	178	73	18
1200	193	179	170	240	501	217	337	330	330	521	24	158	160	90	20
1350	195	182	172	241	501	215	345	346	329	526	20	163	174	88	25
1500	198	185	175	241	502	217	349	382	351	527	19	164	207	110	25
1650	199	185	176	244	507	217	342	410	394	525	18	157	234	150	18
1800	198	178	172	244	515	208	329	422	397	530	10	151	250	153	15
1950	190	169	167	243	538	202	238	327	349	552	12	69	160	106	14
2100			162	236				177	292				15	56	
2250				232					248					16	
2400				231					246					15	
2550				241					254					13	
2700				256					263					7	
2850				284					293					9	
3000				315					324					9	
3150				353					361					8	
3300				414					423					9	
3450															
3600															
3750															
3900															

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

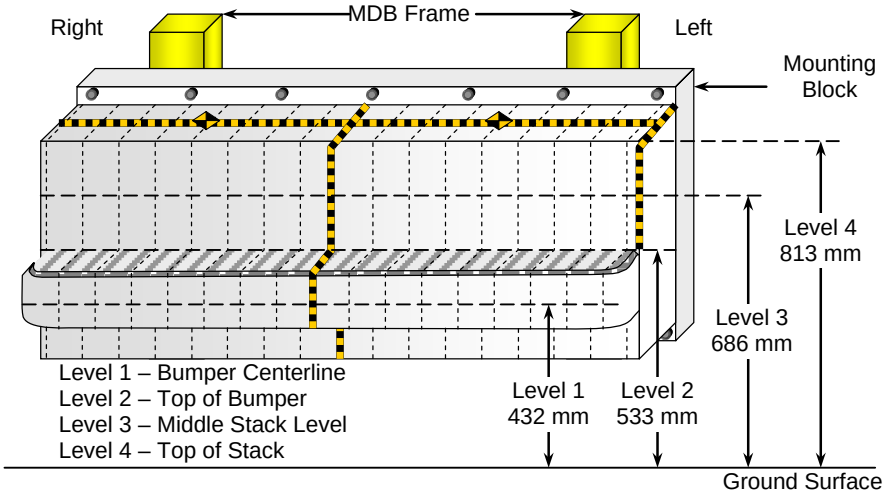
DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

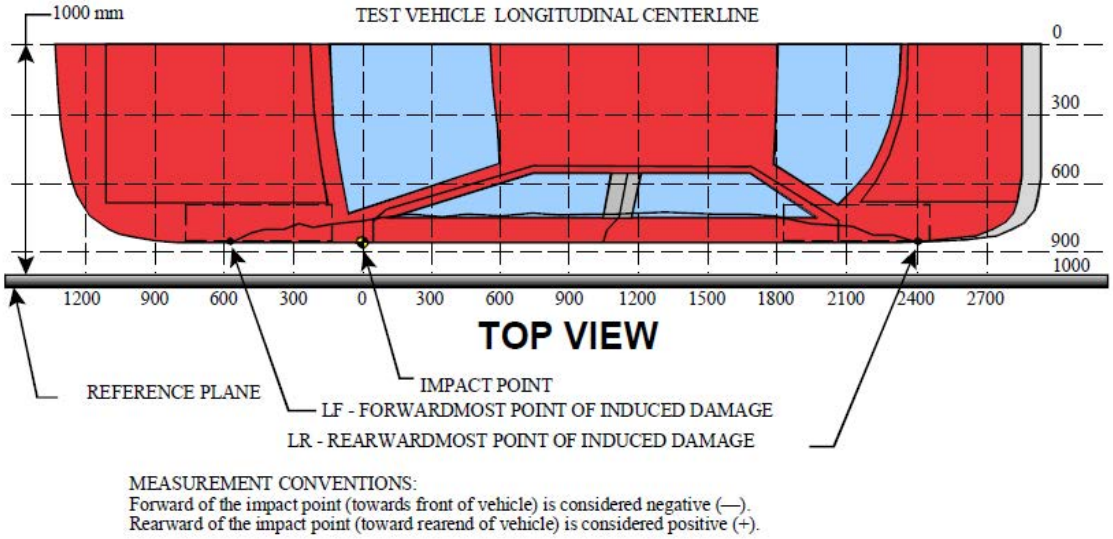
Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	274
B	Top of Bumper	533	800	Left	137
C	Mid-Level	686	800	Left	179
D	Top of Stack	813	800	Left	220

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C_L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
4	49	39	53	70	87	123	162	162	146	113	95	88	106	135	162	187	220
3	59	50	58	63	83	103	120	125	95	68	61	62	67	79	97	133	179
2	132	132	129	130	122	117	120	120	113	119	127	125	124	125	124	123	137
1	245	244	246	253	236	247	257	248	242	239	237	250	245	239	238	246	274

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



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	2070	3	213	171	42
2	1667	3	414	176	238
3	1264	3	342	171	171
4	861	3	347	169	178
5	458	3	346	172	174
6	55	3	196	165	31

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	721	476	245
2	480 mm right of center	1	712	463	249
3	160 mm right of center	1	711	463	248
4	160 mm left of center	1	699	463	236
5	480 mm left of center	1	712	463	249
6	800 mm left of center	1	750	476	274

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

Test Vehicle: 2020 Audi A6 45 TFSI quattro 4-Door Sedan
NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test
Test Date: 12/4/2020

Test Time: 11:34 am
Temperature: 21.5°C

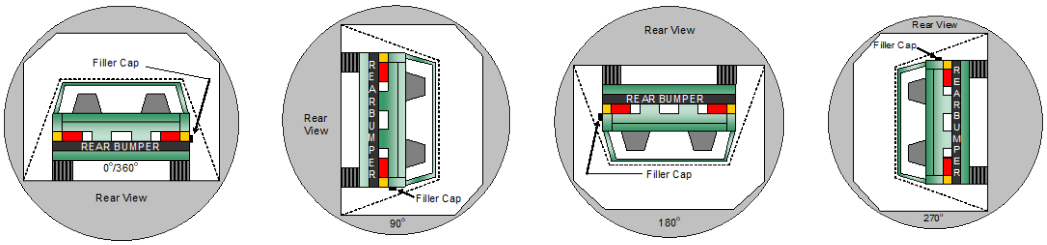
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.

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



0°/360° 90° 180° 270°

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	111	300	411
90° to 180°	110	300	410
180° to 270°	107	300	407
270° to 360°	111	300	411

FMVSS 301 ROLLOVER SPILLAGE TABLE (UNITS IN OUNCES)

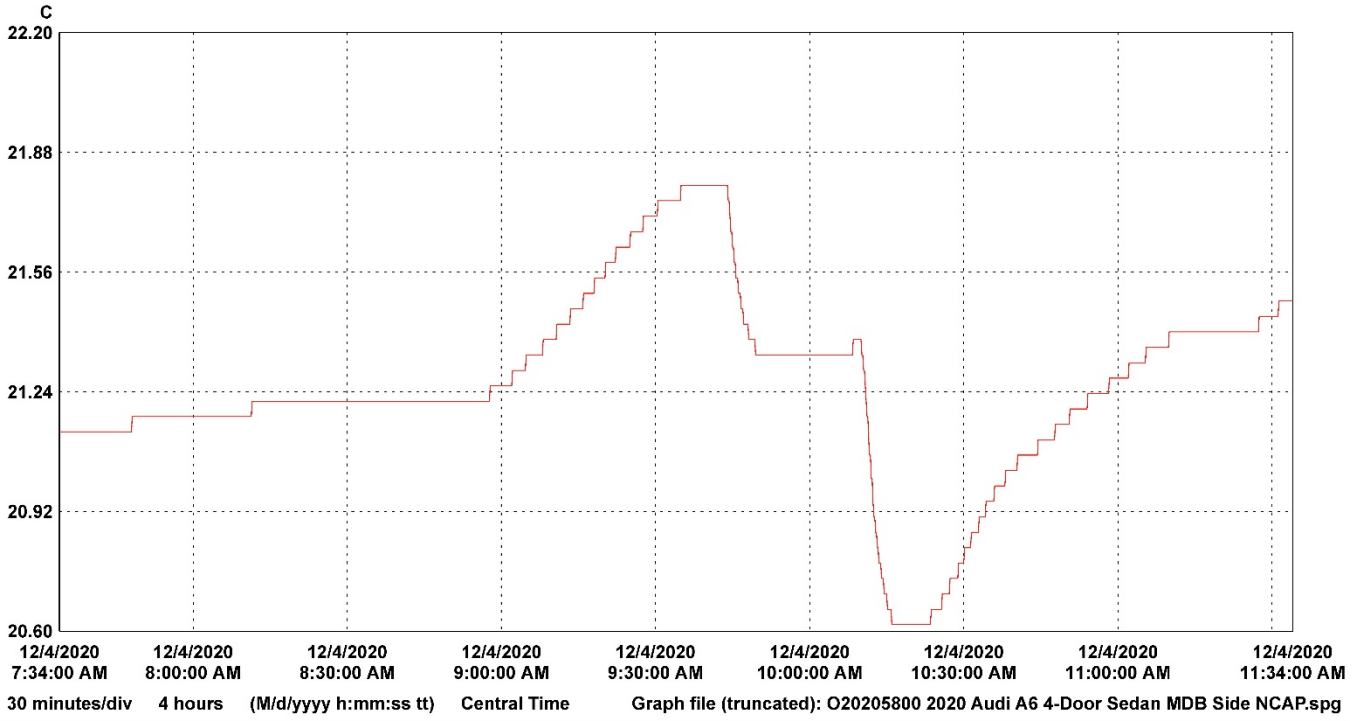
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

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: 2020 Audi A6 45 TFSI quattro 4-Door Sedan NHTSA No.: O20205800
Test Program: NCAP Side MDB Impact Test Test Date: 12/4/2020



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	14182020	VSC_North_Hall	1		21.79	21.26	20.62	C	Temperature	14182020_VSC_North_Hall.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

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

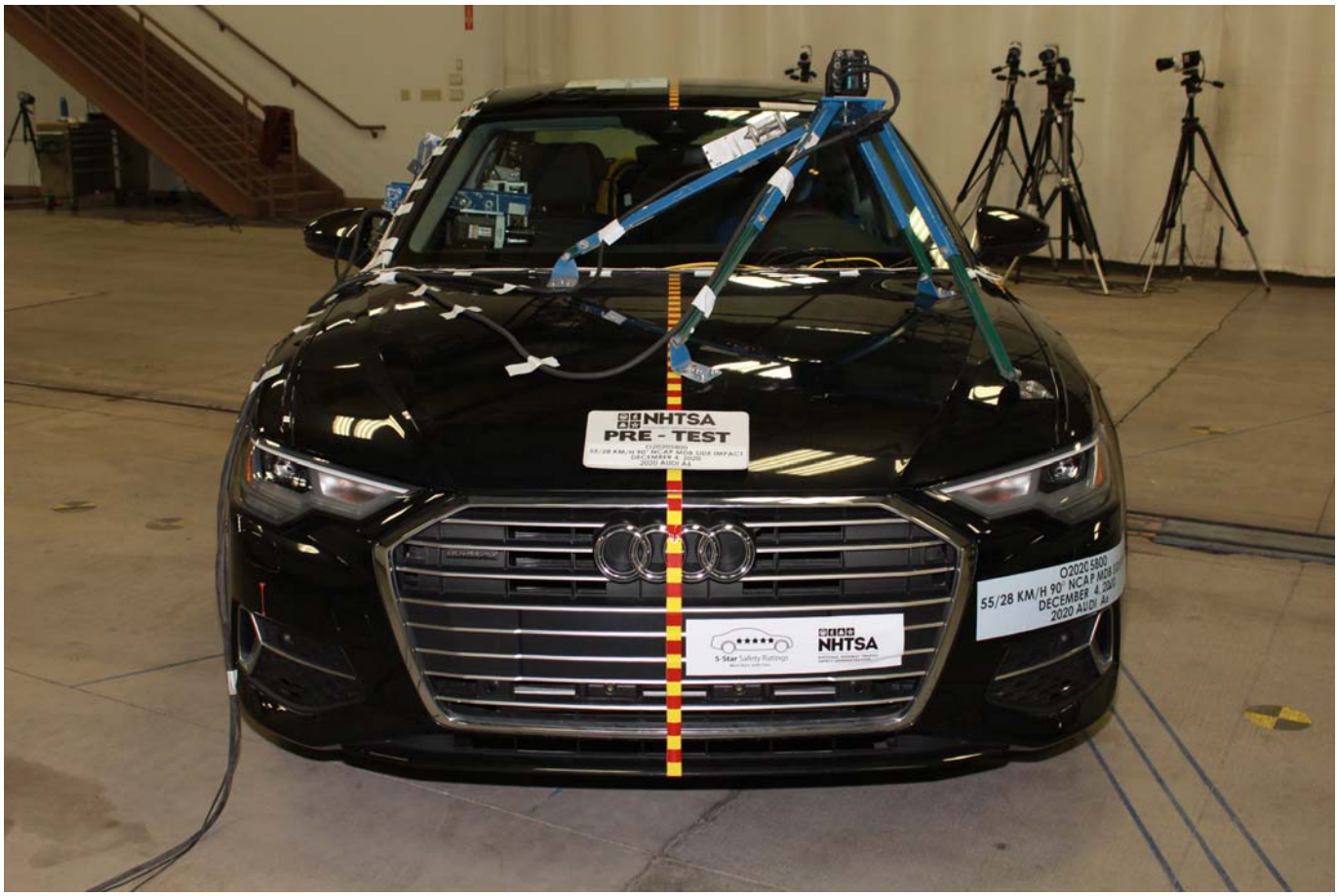


Photo No. 003 - Pre-Test Frontal View of Test Vehicle

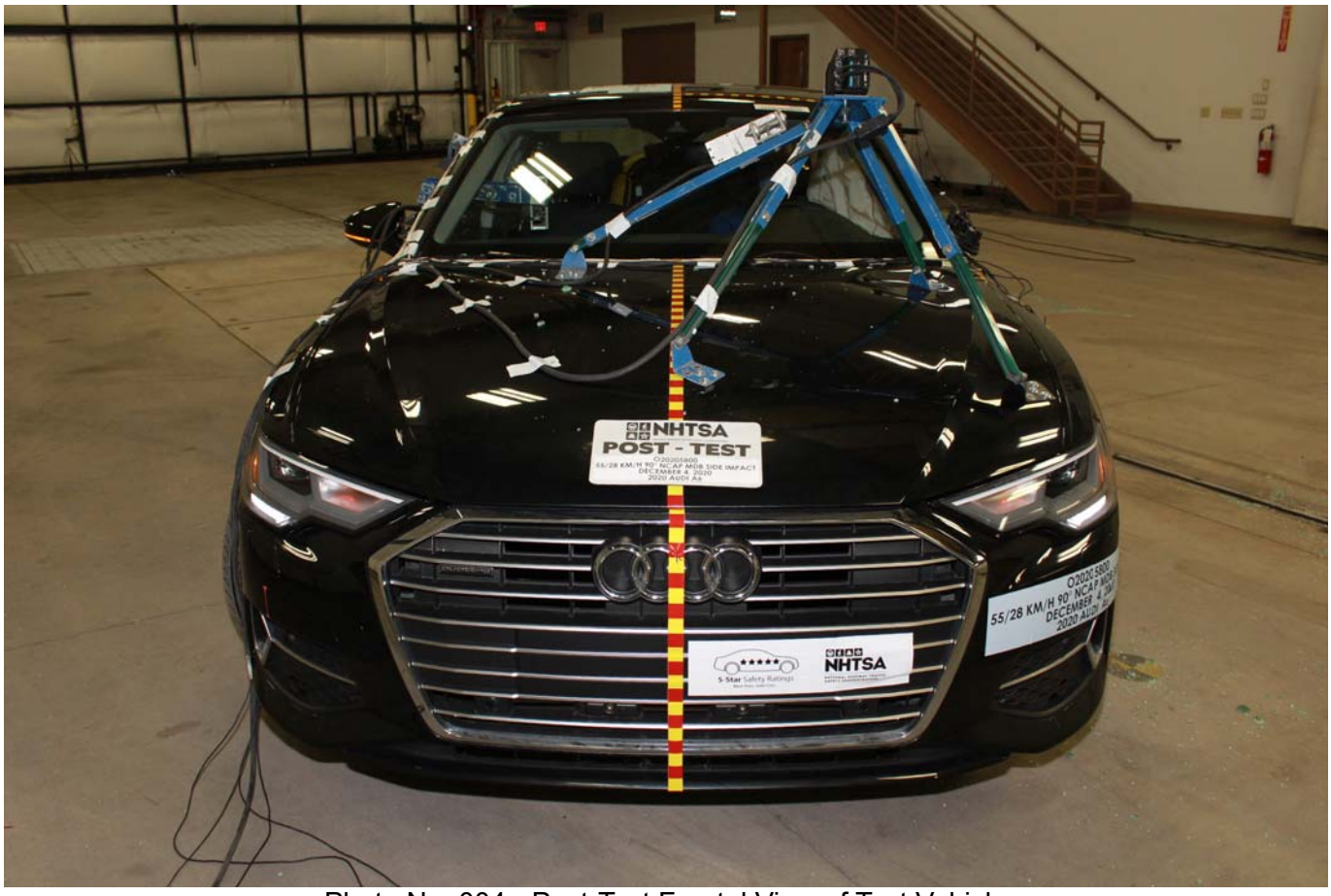


Photo No. 004 - Post-Test Frontal View of Test Vehicle

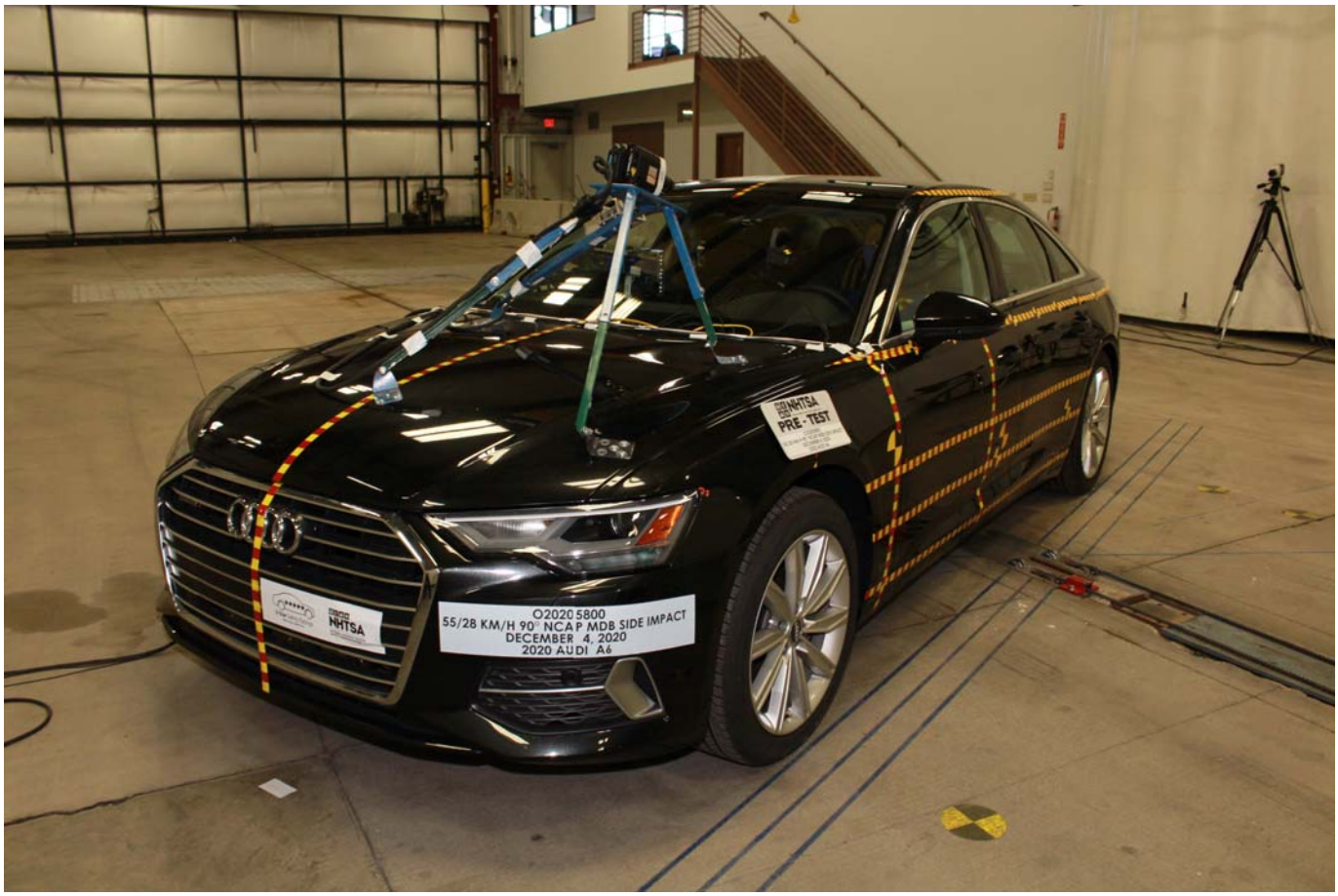


Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle

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

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

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

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

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

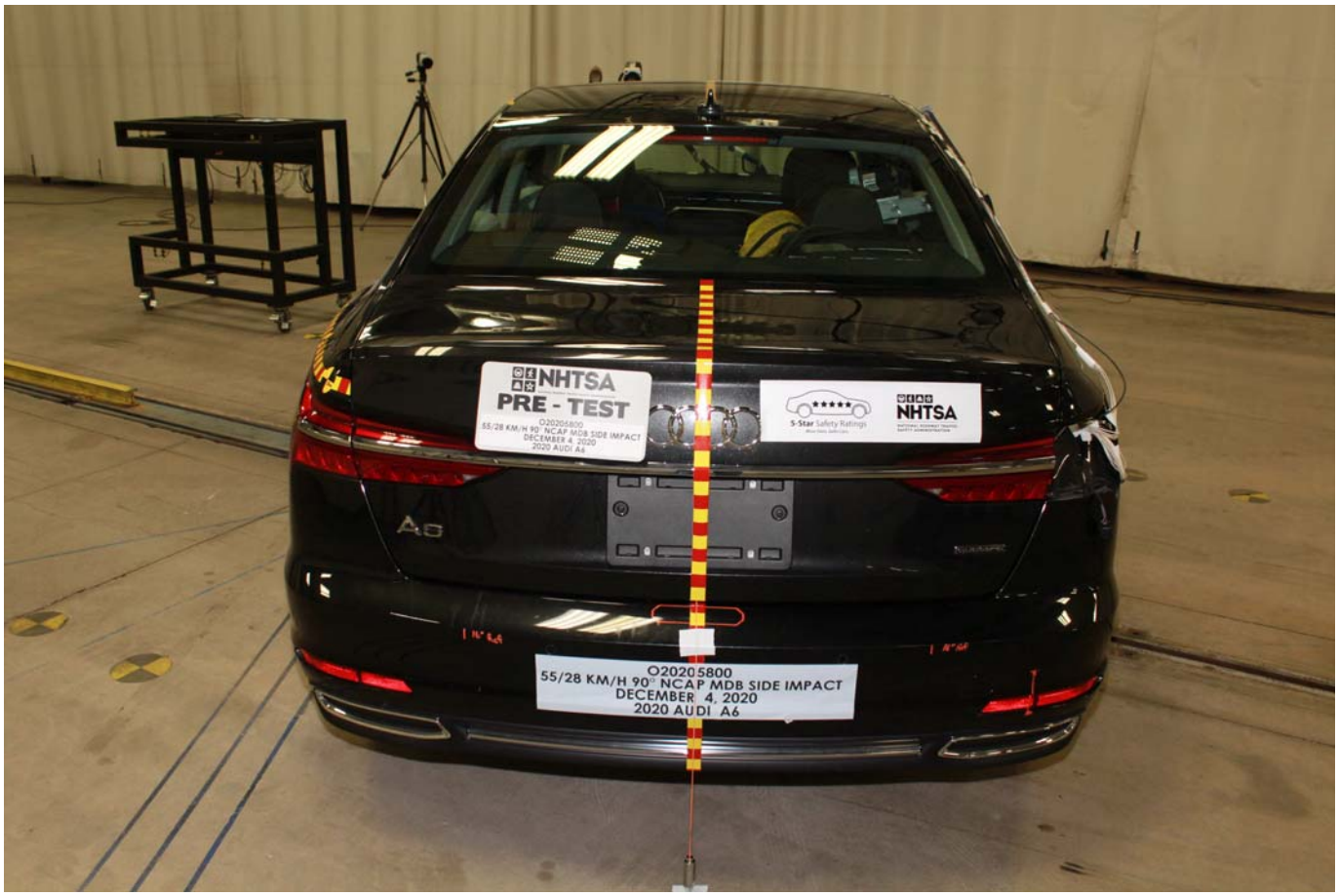


Photo No. 011 - Pre-Test Rear View of Test Vehicle

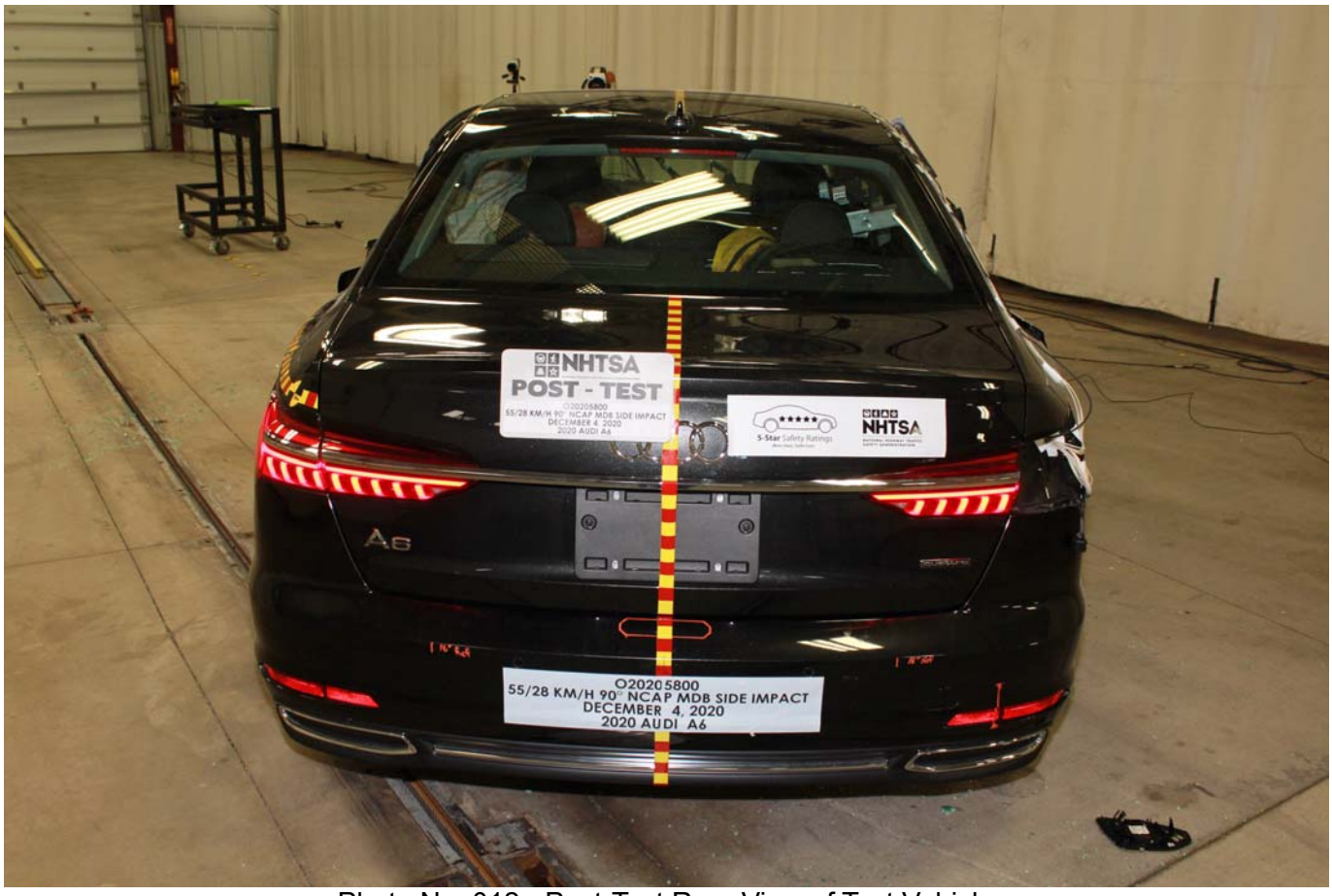


Photo No. 012 - Post-Test Rear View of Test Vehicle

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

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

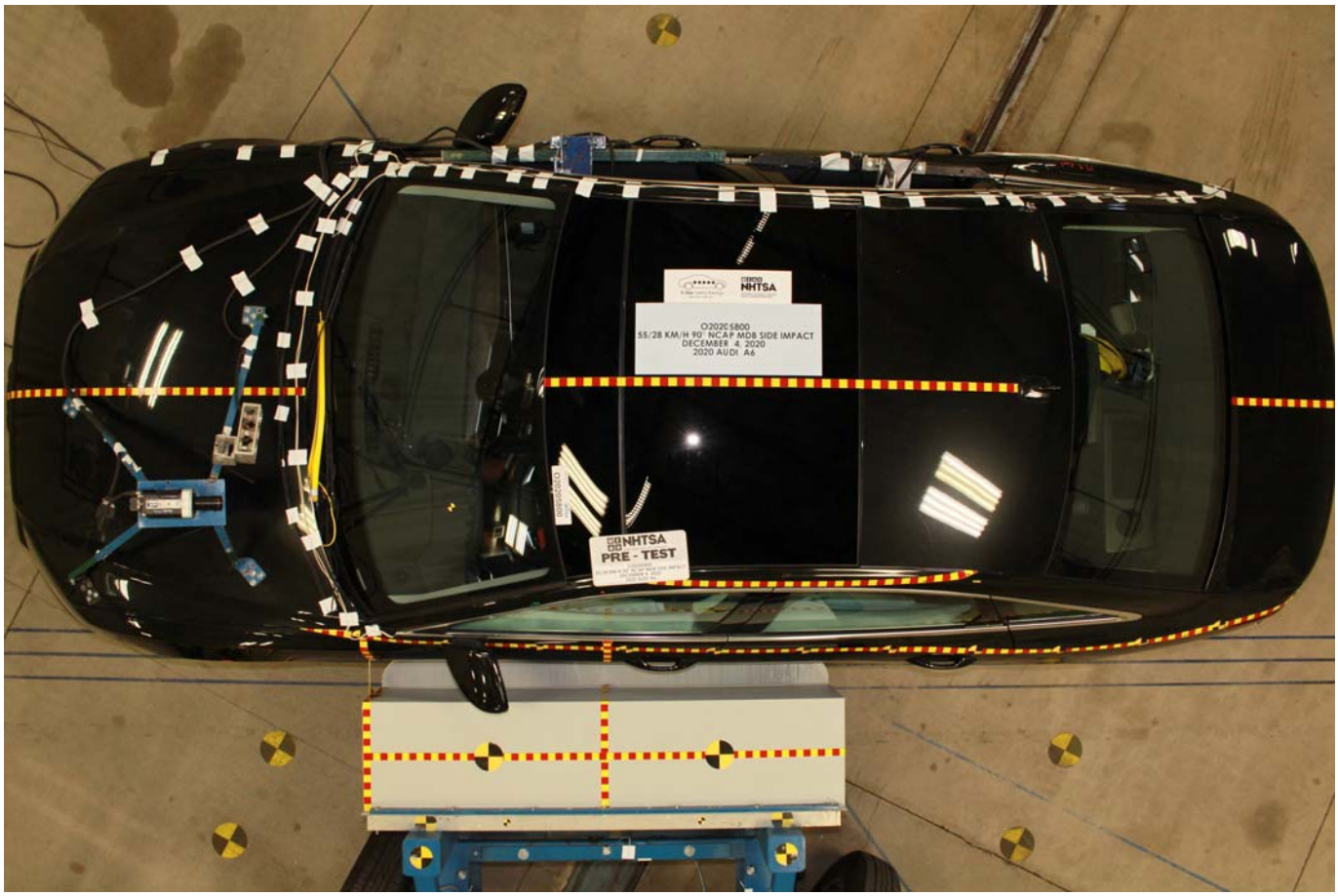


Photo No. 015 - Pre-Test Overhead View of Test Area

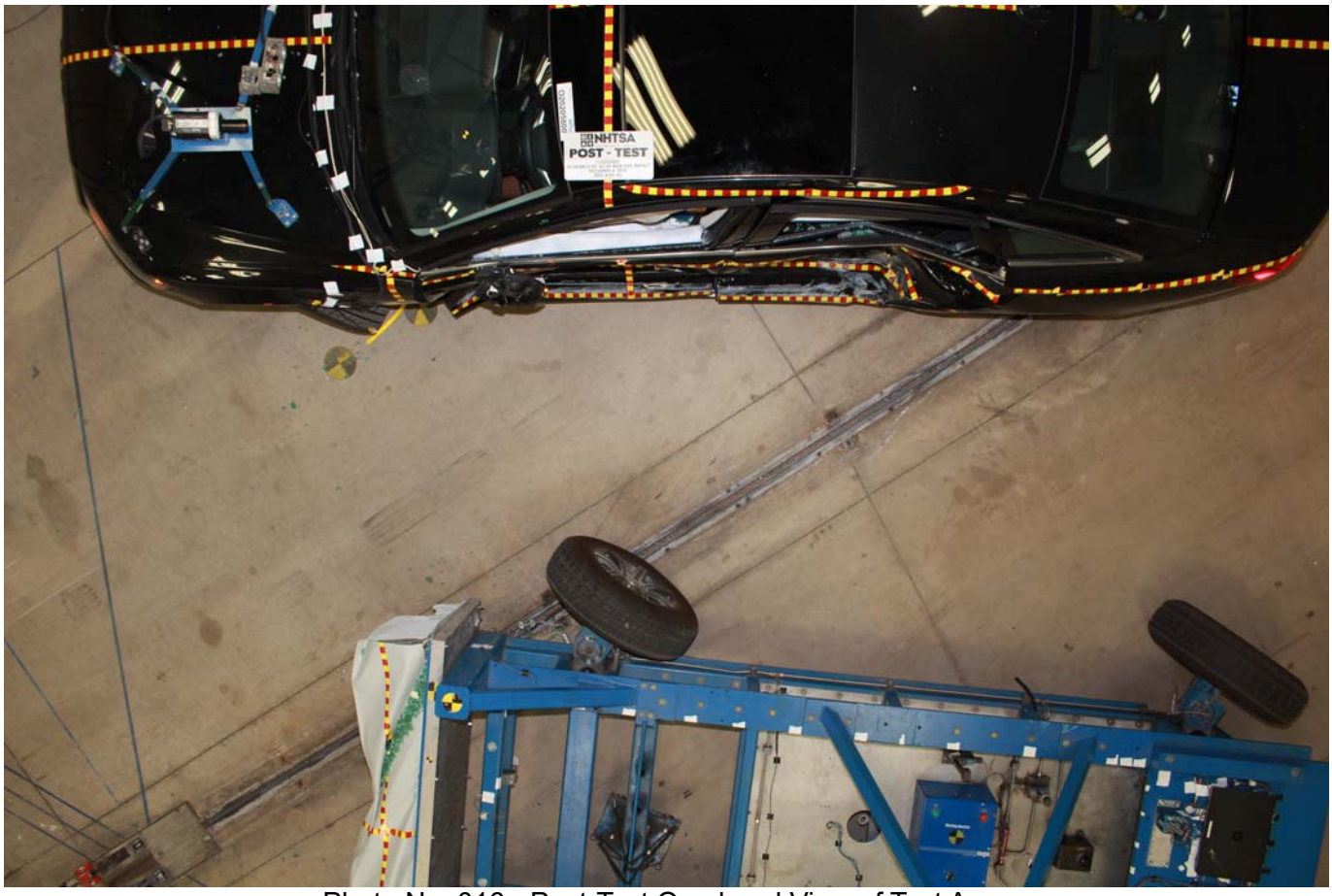


Photo No. 016 - Post-Test Overhead View of Test Area

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

PHOTOGRAPH NOT APPLICABLE

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

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

PHOTOGRAPH NOT APPLICABLE

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

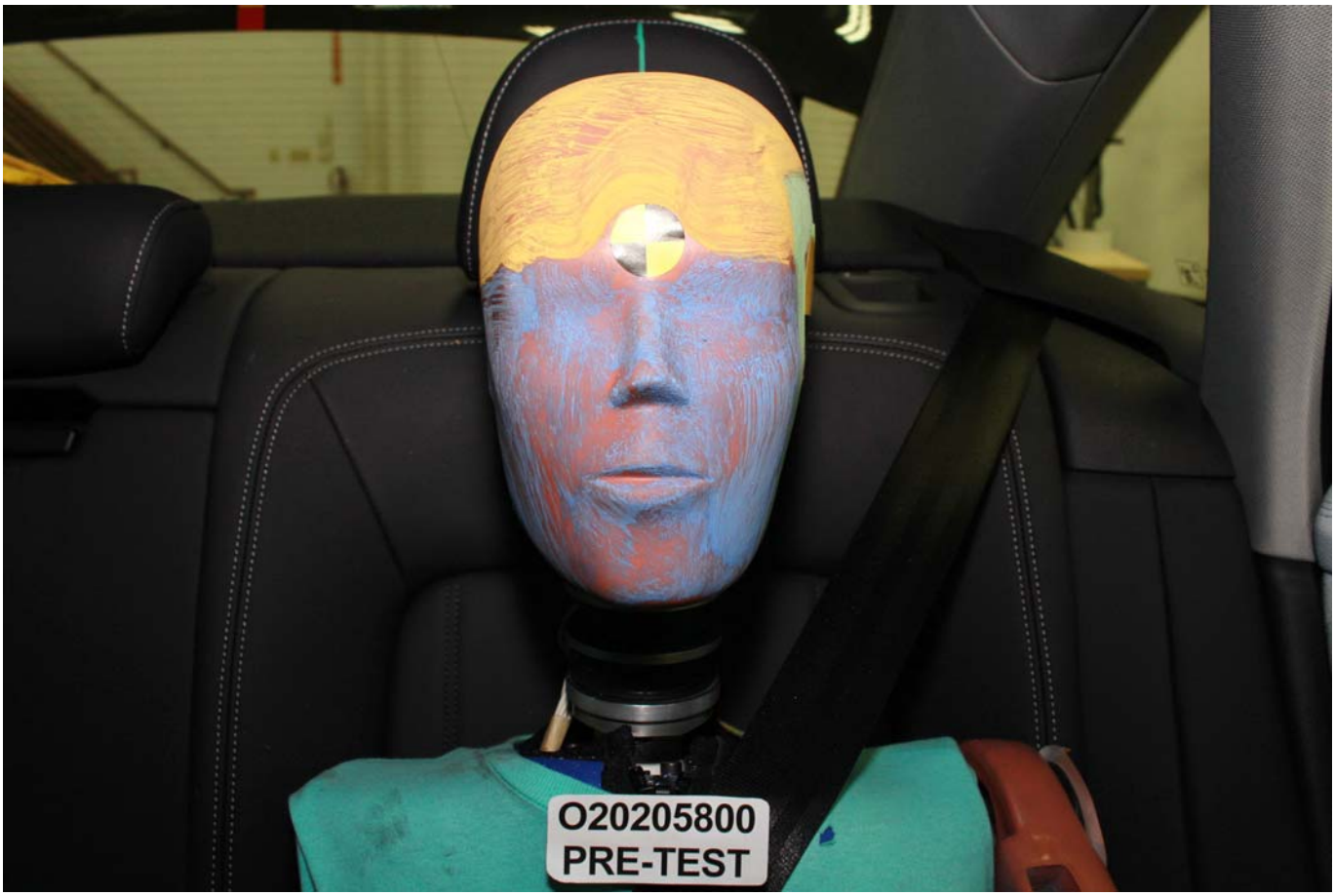


Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

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 Neck Showing Position of Adjustable Neck Bracket

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

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

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

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

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

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

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

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

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

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

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

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

PHOTOGRAPH NOT APPLICABLE

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

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

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

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

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

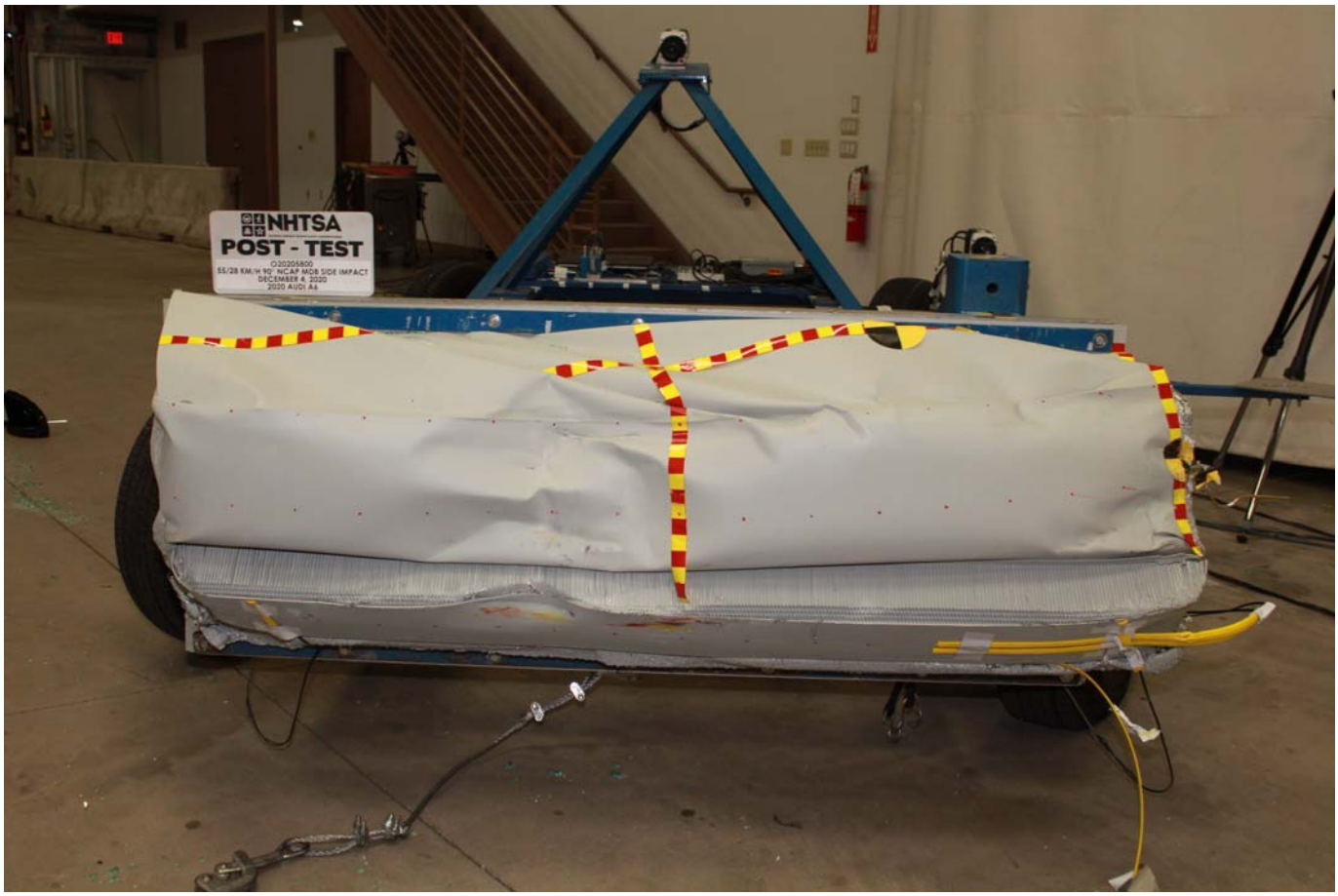


Photo No. 085 - Post-Test Front View of MDB Impactor Face

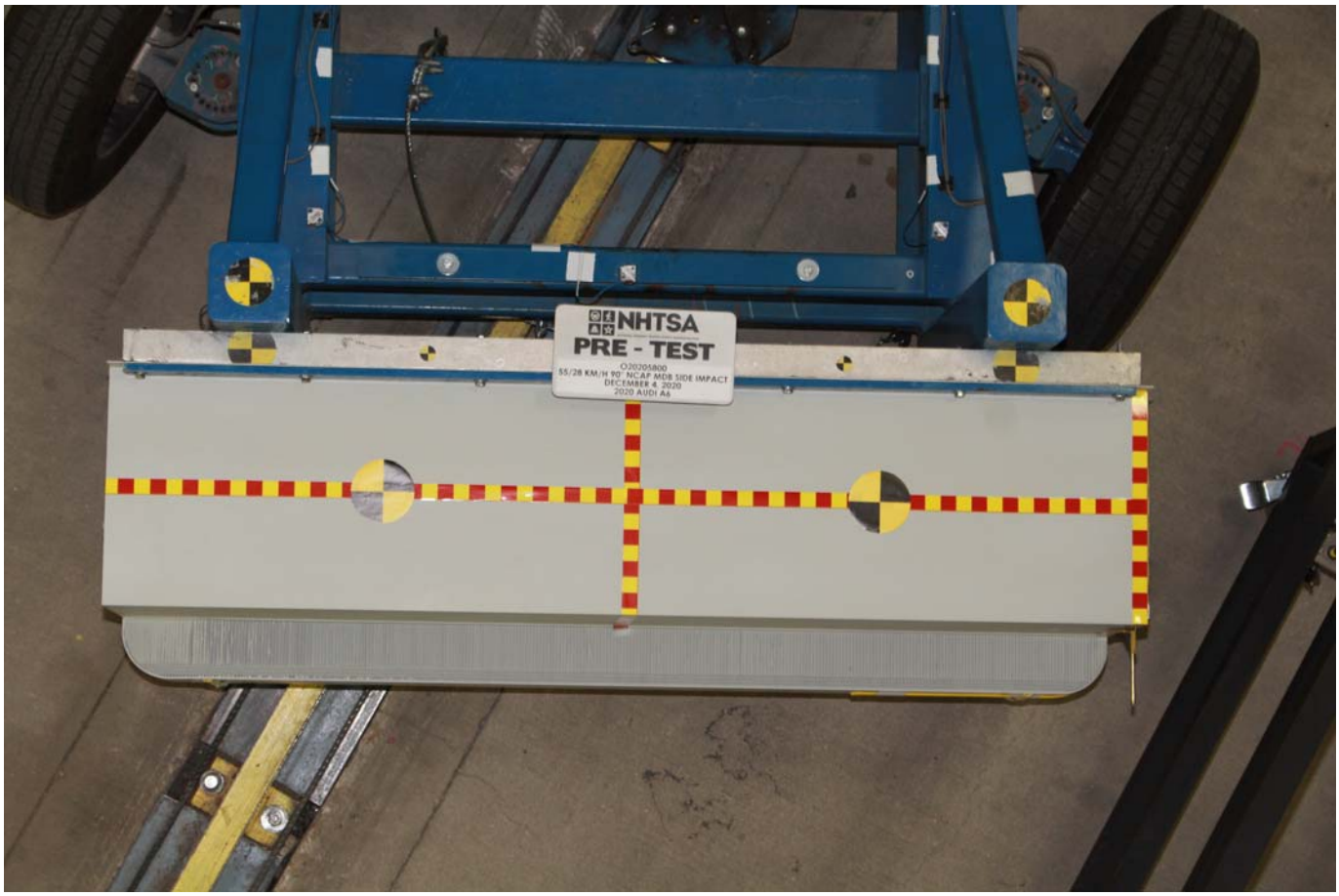


Photo No. 086 - Pre-Test Top View of MDB Impactor Face

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

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

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

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

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

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

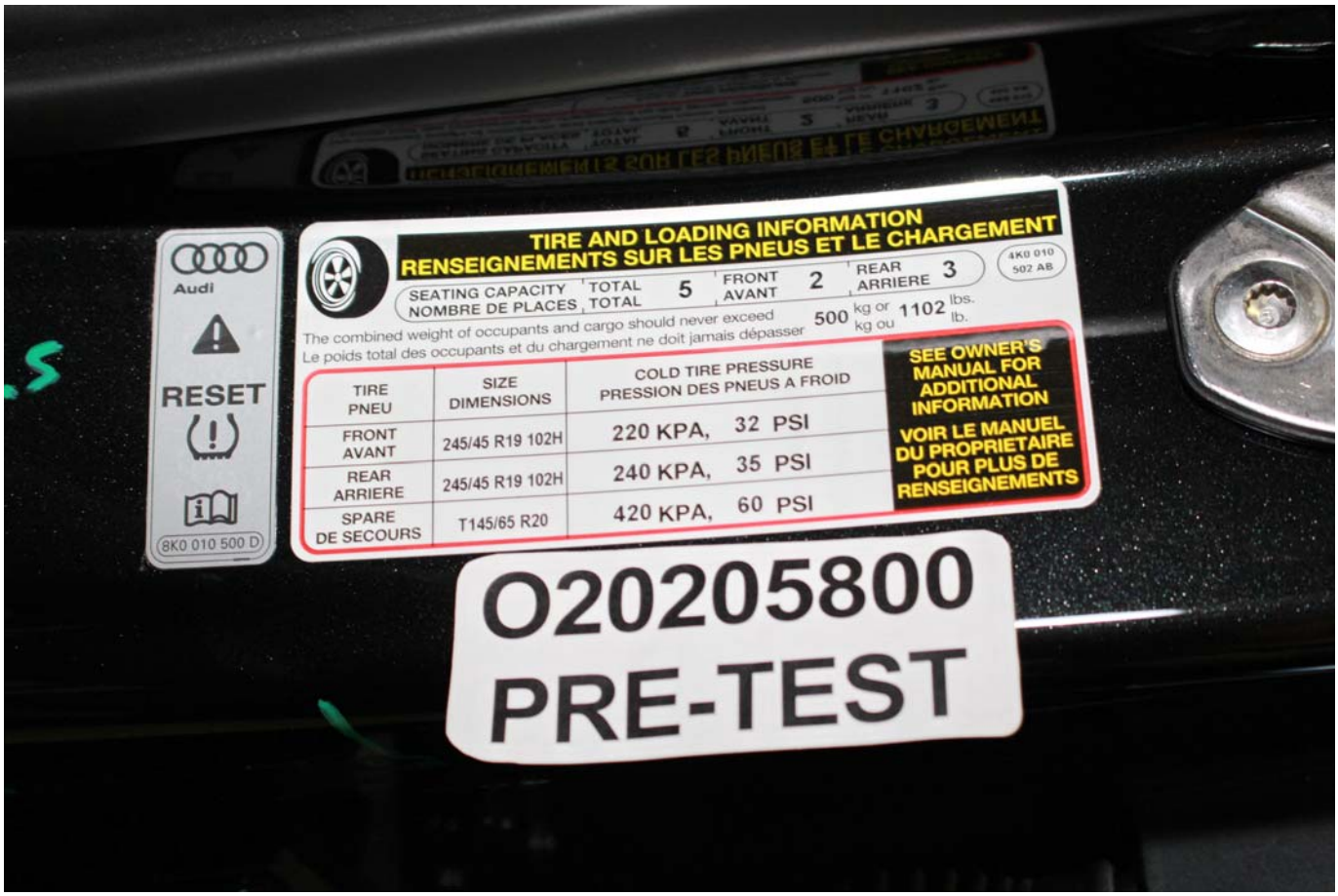


Photo No. 093 - Close-Up View of Vehicle Tire Information Placard or Label

Photo No. 094 - Pre-Test Ballast View

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


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

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

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

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

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

Photo No. 101 - Impact Event

LOC: BB 000 Dealer Stock Status: INVENTORY
Exterior: Vesuvius Gray Metallic

VIN: WAUD8BF2XLN072276
Interior: Black Interior

MODEL: 4A2B8Y-2020 Audi A6 45 TFSI quattro
2020167-ORIGINAL

2020 Audi A6 45 TFSI quattro

STANDARD EQUIPMENT (unless replaced by options)

TECHNICAL
- 2.0L TFSI® I4 engine
- quattro® all-wheel drive system
- 7-speed S tronic® transmission
- 19" 10-spoke-dynamic design wheels, all-season tires
- Energy recuperation with start-stop system
- Space-saving spare tire

COMFORT/TECHNOLOGY
- Audi connect® CARE (limited time subscription)
- Audi connect® PRIME & PLUS (6 month trial)
- Audi smartphone interface
- Audi sound system
- Auto dimming, power-folding, heated exterior mirrors w/ memory
- Dark Brown Walnut Wood inlays
- Garage door opener (HomeLink®)
- Heated, 8-way power front seats w/ driver memory and 4-way lumbar adjustment
- Lane departure warning
- Leather seating surfaces
- LED headlights with high beam assist
- MMI® Navigation w/ MMI® touch response and traffic information online
- Parking system plus
- Preparation for mobile phone (Bluetooth®)
- Power adjustable steering column with memory
- Power sunroof
- Split-folding rear seat back with pass-through (40/20/40)
- Three-zone automatic climate control
- 3-spoke multi-function steering wheel w/ shift paddles

SAFETY/CONVENIENCE
- Advanced Airbag Protection System with 8 airbags
- Anti-lock Braking System (ABS) w/ Brake Assist
- Audi pre sense basic (preventative occupant protection)
- Audi pre sense front
- Child safety locks in rear doors, power
- Electronic Stabilization Control (ESC) w/ Sport mode
- Electronic vehicle immobilization w/ anti-theft alarm
- LED Daytime Running Lights (DRLs) and taillights
- Lower Anchors and Tethers for CHildren (LATCH)
- Rearview camera
- Tire Pressure Monitoring System (TPMS)

WARRANTY/MAINTENANCE
- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty*
- 12 Year Limited Warranty Against Corrosion Perforation
- 4 Years Roadside Assistance coverage provided by a third party supplier

*Please refer to the 2020 Audi Warranty and Maintenance Booklet for complete coverage information.

MANUFACTURER'S SUGGESTED RETAIL PRICE

2020 Audi A6 45 TFSI quattro	**$54,900.00**
PACKAGES / OPTIONS	
Vesuvius Gray metallic	$595.00
Black interior	Included
Audi Beam - Rings	$450.00
Rear side airbags	$350.00
Interior Protection Package	$210.00
Paint Protection: Rear load sill/door cup/door edge	$175.00
Destination Charge	$995.00
Total Price:	**$57,675.00**

Fuel, license, title fees, taxes and dealer-installed accessories are not included.

MODEL: 4A2B8Y

VIN: WAUD8BF2XLN072276

DEALER: 403D08
D-PATRICK, INC.
200 N GREEN RIVER RD
EVANSVILLE, IN 47715
Port of Entry: HOUSTON

SHIP TO: 403D08
D-PATRICK, INC.
200 N GREEN RIVER RD
EVANSVILLE, IN 47715
COMM NUM: XY8551
Transportation Method: TRUCK

GVWR: 2,420 kg/ 5,335 lbs
GVWR Threshold: 36,299 kg/ 80,025 lbs
Accessories Weight: 14.336 kg/ 31.606 lbs

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.

Frontal	Driver	★★★★★
Crash	Passenger	★★★★

Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side	Front Seat	**Not Rated**
Crash	Rear Seat	**Not Rated**

Based on the risk of injury in a side impact.

Rollover ★★★★★
Based on the risk of rollover in a single-vehicle crash.

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

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
27 MPG
combined city/hwy
24 city
32 highway
3.7 gallons per 100 miles

Mid-Size Cars range from 12 to 136 MPG.
The best vehicle rates 136 MPGe.

You **spend** **$1,500** more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel **cost** **$1,800**

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 6 (1 Worst – 10 Best)
Smog Rating (tailpipe only): 5 (1 Worst – 10 Best)

This vehicle emits 330 grams of CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $3.25 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

PARTS CONTENT INFORMATION

For Vehicles In This Carline		For This Vehicle:	
U.S./Canadian Parts Content:	1%	Final Assembly Point:	NECKARSULM, GERMANY
Major Sources Of Foreign		Country Of Origin:	
Parts Content:	GERMANY: 51%		ENGINE: HUNGARY
	HUNGARY: 15%		TRANSMISSION: GERMANY

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

Photo No. 102 - Monroney Label

▸ To move the steering wheel forward or backward, press the switch forward or backward.

The steering wheel can also be adjusted when the ignition is switched off.

In vehicles with memory function, the steering column settings are stored together with the seat position.

Tips

Entry assistance makes it easier to enter or exit the vehicle by moving the steering wheel ⇨ *page 63*, **Driver seat entry assistance/ Front passenger seat entry assistance**.

Head restraints

General information

Applies to: vehicles with adjustable head restraints

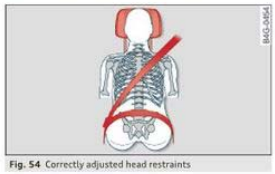


Fig. 54 Correctly adjusted head restraints

Make sure that:

– The upper edge of the head restraint is as even as possible with the top of your head
– The head restraint is as close as possible to the back of the head
– The head restraints on the occupied rear seats are positioned as high as possible.

WARNING

– There is one head restraint for each seat. All vehicle occupants must adjust the head restraint correctly before every trip. Having head restraints that are not adjusted correctly or not installed in the vehicle increases the risk of a neck injury during sudden or unexpected driving or braking maneuvers or in a collision.

– Only remove the rear seat head restraints if it is necessary to install a child safety seat ⇨ *page 73*. Stow the removed head restraints securely, for example in the luggage compartment. Reinstall the head restraints immediately once the child safety seat has been removed. Driving without head restraints increases the risk of serious neck injuries.

Front head restraints

Applies to: vehicles with adjustable head restraints

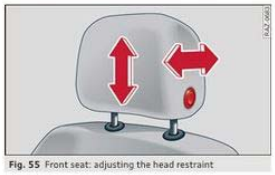


Fig. 55 Front seat: adjusting the head restraint

Adjusting the head restraints

▸ To adjust the head restraint upward or forward, slide it until it locks into place.
▸ To adjust the head restraint downward or backward, press the button on the side and slide the head restraint. Release the button and slide the head restraint farther until it locks into place.

Rear head restraints

Applies to: vehicles with adjustable head restraints

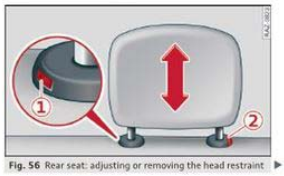


Fig. 56 Rear seat: adjusting or removing the head restraint ▶

Adjusting the head restraints

Applies to: vehicles with manually adjustable head restraints

▸ To adjust the head restraint upward, slide it until it locks into place.
▸ To adjust the head restraint downward, press the button ② and slide the head restraint. Release the button and slide the head restraint farther until it locks into place.

Removing the headrests

Applies to: vehicles with removable head restraints

▸ Applies to: vehicles with folding backrests: Fold the backrest forward slightly. See ⇨ *page 83*.
▸ Move the head restraint upward all the way.
▸ Insert a suitable object, such as the the extended vehicle key or mechanical key, into the release point ① on the inside or outside of the base.
▸ Press the button ② and pull the head restraint out of the backrest ⇨ ⚠ *in General information on page 64*.

Installing the headrests

Applies to: vehicles with removable head restraints

▸ Fold the backrest forward slightly ⇨ *page 83*.
▸ Slide the posts on the head restraint down into the guides until the posts click into place.
▸ Press the button ② and slide the head restraint all the way down. It should not be possible to remove the head restraint from the backrest without pressing the button.

Safety belts

General information

Each seat is equipped with a three-point safety belt. Safety belts that are worn correctly are the most effective way to reduce the risk of serious or fatal injuries in a collision. Therefore, wear your safety belt correctly and make sure that all vehicle passengers are also wearing their safety belts correctly when the vehicle is moving.

Even though your vehicle is equipped with an airbag system, every vehicle passenger must still always wear the appropriate safety belt. In addition to their normal protective function, safety belts also hold vehicle occupants in the correct seating position in the event of a collision so that the airbags can deploy correctly and provide additional protection. Safety belts provide protection during collisions when the airbags do not deploy or if they have already deployed.

WARNING

The risk of serious or fatal injury increases if the safety belt is not fastened, if it is worn incorrectly, or if it is damaged.
– All vehicle occupants, including the driver, must fasten their safety belts correctly before every trip and must always keep their safety belts fastened during the trip, regardless of whether the seat is equipped with an airbag or not. This also applies to children that are seated in a child safety seat that is appropriate for their weight and age and that is secured with a safety belt.
– In the event of a collision, vehicle occupants that are not wearing safety belts could be propelled through the vehicle interior and collide with vehicle components, such as the steering wheel, instrument panel, windshield, or doors. In some situations, vehicle occupants could also be ejected from the vehicle. Vehicle occupants in the rear seats who do not wear safety belts not only endanger themselves, but also other people in the vehicle.
– Only one person may be fastened with a safety belt at a time. Never secure more than one person, including children, with a single safety belt.
– Never allow children or infants to ride on another person's lap and be belted into the safety belt with them.
– Insert the belt buckle only in the belt latch belonging to the corresponding seat, so that the protective function is not impaired.
– To ensure the maximum protective function of the safety belts, all vehicle passengers must sit in the correct seating position ⇨ *page 60*.
– Check the condition of your vehicle's safety belts regularly ⇨ *page 267*. If you find damage to the belt webbing, the belt connections, the retractor, or the buckle, have the damaged safety belt replaced by an ▶

4K0012721BD

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

Sitting correctly and safely

▸ To move the steering wheel forward or backward, press the switch forward or backward.

The steering wheel can also be adjusted when the ignition is switched off.

In vehicles with memory function, the steering column settings are stored together with the seat position.

Tips

Entry assistance makes it easier to enter or exit the vehicle by moving the steering wheel ⇨ page 63, Driver seat entry assistance/ Front passenger seat entry assistance.

Head restraints

General information

Applies to: vehicles with adjustable head restraints

Fig. 54 Correctly adjusted head restraints

Make sure that:

– The upper edge of the head restraint is as even as possible with the top of your head
– The head restraint is as close as possible to the back of the head
– The head restraints on the occupied rear seats are positioned as high as possible.

WARNING

– There is one head restraint for each seat. All vehicle occupants must adjust the head restraint correctly before every trip. Having head restraints that are not adjusted correctly or not installed in the vehicle increases the risk of a neck injury during sudden or unexpected driving or braking maneuvers or in a collision.

– Only remove the rear seat head restraints if it is necessary to install a child safety seat ⇨ page 73. Stow the removed head restraints securely, for example in the luggage compartment. Reinstall the head restraints immediately once the child safety seat has been removed. Driving without head restraints increases the risk of serious neck injuries.

Front head restraints

Applies to: vehicles with adjustable head restraints

Fig. 55 Front seat: adjusting the head restraint

Adjusting the head restraints

▸ To adjust the head restraint upward or forward, slide it until it locks into place.
▸ To adjust the head restraint downward or backward, press the button on the side and slide the head restraint. Release the button and slide the head restraint farther until it locks into place.

Rear head restraints

Applies to: vehicles with adjustable head restraints

Fig. 56 Rear seat: adjusting or removing the head restraint ▶

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Sitting correctly and safely

Adjusting the head restraints

Applies to: vehicles with manually adjustable head restraints

▸ To adjust the head restraint upward, slide it until it locks into place.
▸ To adjust the head restraint downward, press the button ② and slide the head restraint. Release the button and slide the head restraint farther until it locks into place.

Removing the headrests

Applies to: vehicles with removable head restraints

▸ Applies to: vehicles with folding backrests: Fold the backrest forward slightly. See ⇨ page 83.
▸ Move the head restraint upward all the way.
▸ Insert a suitable object, such as the the extended vehicle key or mechanical key, into the release point ① on the inside or outside of the base.
▸ Press the button ② and pull the head restraint out of the backrest ⇨ ⚠ in General information on page 64.

Installing the headrests

Applies to: vehicles with removable head restraints

▸ Fold the backrest forward slightly ⇨ page 83.
▸ Slide the posts on the head restraint down into the guides until the posts click into place.
▸ Press the button ② and slide the head restraint all the way down. It should not be possible to remove the head restraint from the backrest without pressing the button.

Safety belts

General information

Each seat is equipped with a three-point safety belt. Safety belts that are worn correctly are the most effective way to reduce the risk of serious or fatal injuries in a collision. Therefore, wear your safety belt correctly and make sure that all vehicle passengers are also wearing their safety belts correctly when the vehicle is moving.

Even though your vehicle is equipped with an airbag system, every vehicle passenger must still always wear the appropriate safety belt. In addition to their normal protective function, safety belts also hold vehicle occupants in the correct seating position in the event of a collision so that the airbags can deploy correctly and provide additional protection. Safety belts provide protection during collisions when the airbags do not deploy or if they have already deployed.

WARNING

The risk of serious or fatal injury increases if the safety belt is not fastened, if it is worn incorrectly, or if it is damaged.
– All vehicle occupants, including the driver, must fasten their safety belts correctly before every trip and must always keep their safety belts fastened during the trip, regardless of whether the seat is equipped with an airbag or not. This also applies to children that are seated in a child safety seat that is appropriate for their weight and age and that is secured with a safety belt.
– In the event of a collision, vehicle occupants that are not wearing safety belts could be propelled through the vehicle interior and collide with vehicle components, such as the steering wheel, instrument panel, windshield, or doors. In some situations, vehicle occupants could also be ejected from the vehicle. Vehicle occupants in the rear seats who do not wear safety belts not only endanger themselves, but also other people in the vehicle.
– Only one person may be fastened with a safety belt at a time. Never secure more than one person, including children, with a single safety belt.
– Never allow children or infants to ride on another person's lap and be belted into the safety belt with them.
– Insert the belt buckle only in the belt latch belonging to the corresponding seat, so that the protective function is not impaired.
– To ensure the maximum protective function of the safety belts, all vehicle passengers must sit in the correct seating position ⇨ page 60.
– Check the condition of your vehicle's safety belts regularly ⇨ page 267. If you find damage to the belt webbing, the belt connections, the retractor, or the buckle, have the damaged safety belt replaced by an ▶

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

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

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

Additional Driver & Passenger Dummy Instrumentation Data

Passenger Head Angular Velocity (X)

Passenger Head Angular Velocity (Y)

Passenger Head Angular Velocity (Z)

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Passenger Upper Thorax Rib Deflection (Y)

Passenger Middle Thorax Rib Deflection (Y)

Passenger Lower Thorax Rib Deflection (Y)

Passenger Upper Abdomen Rib Deflection (Y)

Passenger Lower Abdomen Rib Deflection (Y)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Lower A-Post Acceleration (Y)

Middle A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Middle B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Track Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Engine Block (X)

Engine Block (Y)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

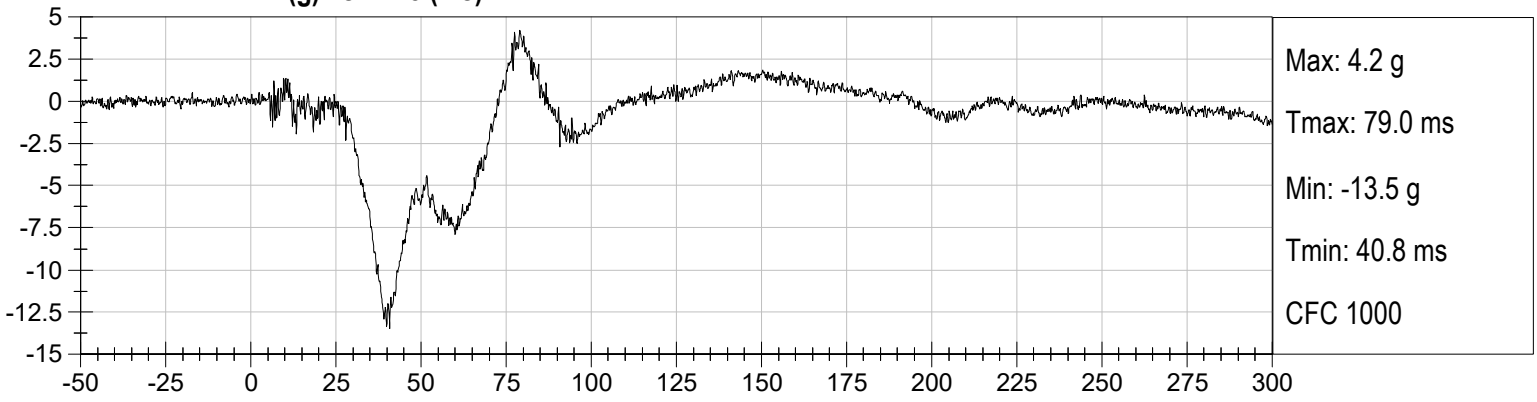
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

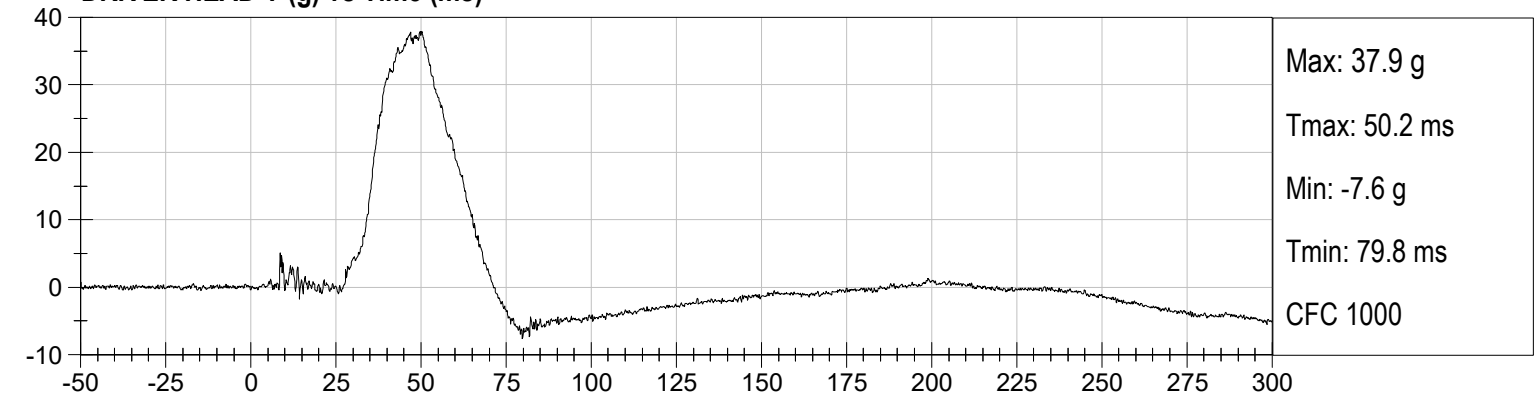
Left MDB Contact Switch

Right MDB Contact Switch

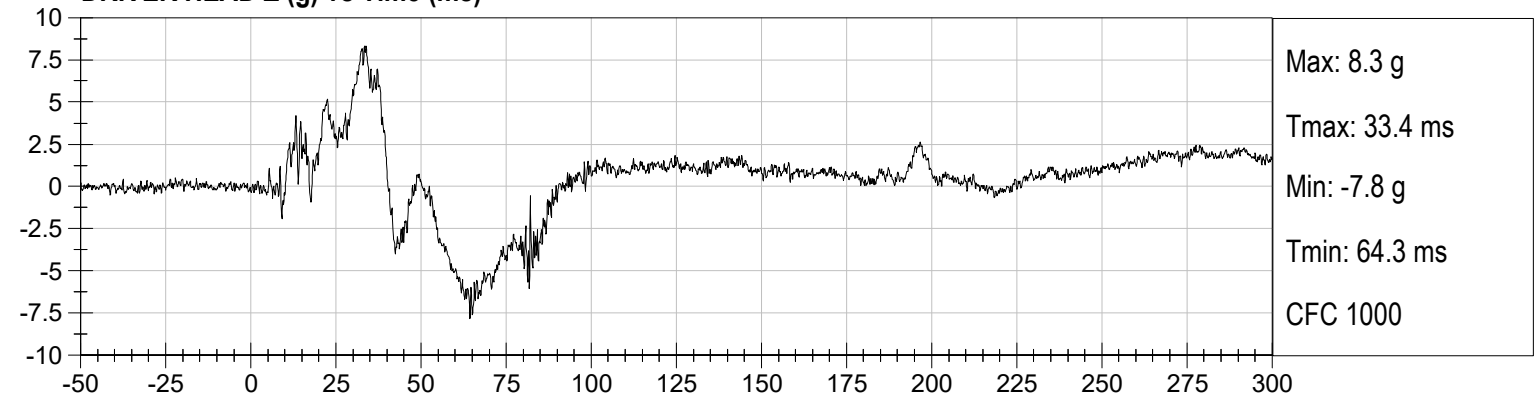
DRIVER HEAD X (g) vs Time (ms)



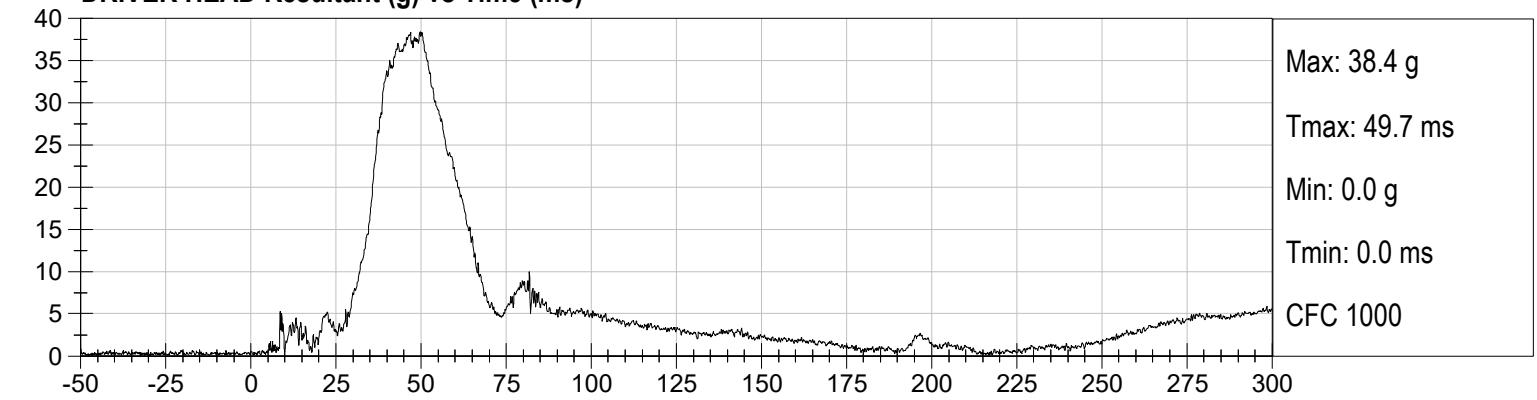
DRIVER HEAD Y (g) vs Time (ms)



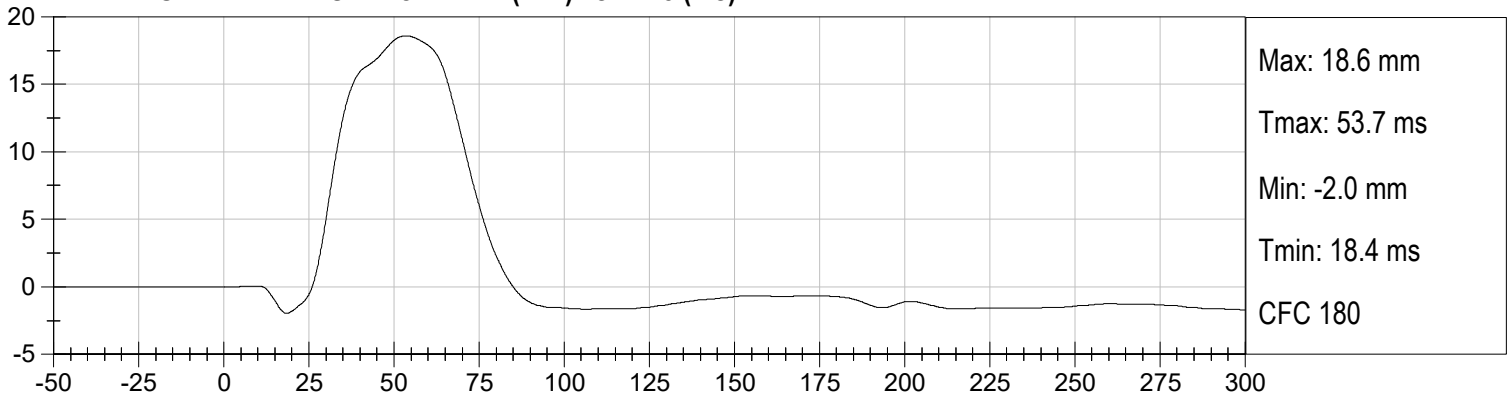
DRIVER HEAD Z (g) vs Time (ms)



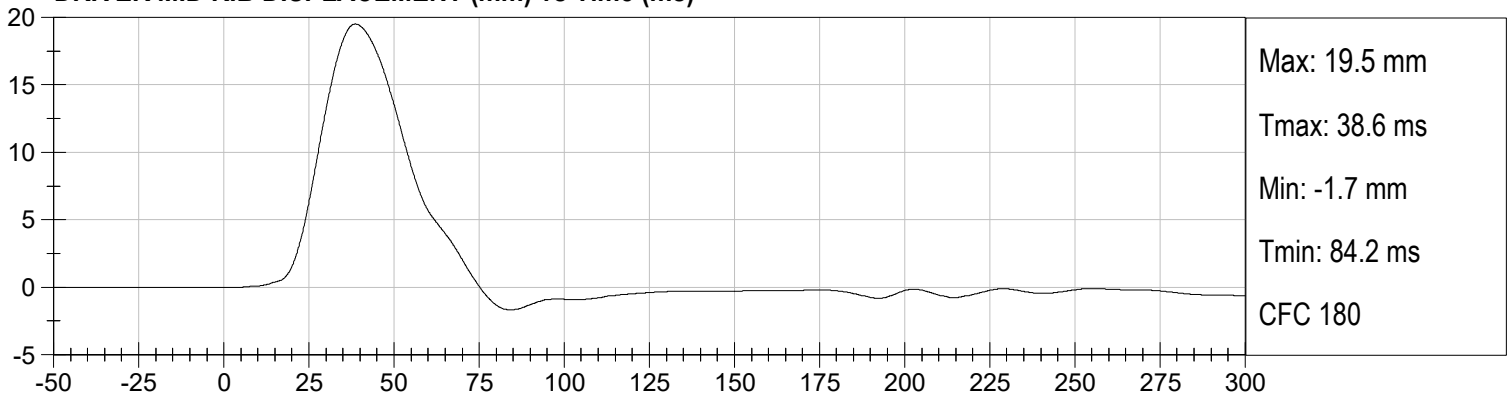
DRIVER HEAD Resultant (g) vs Time (ms)



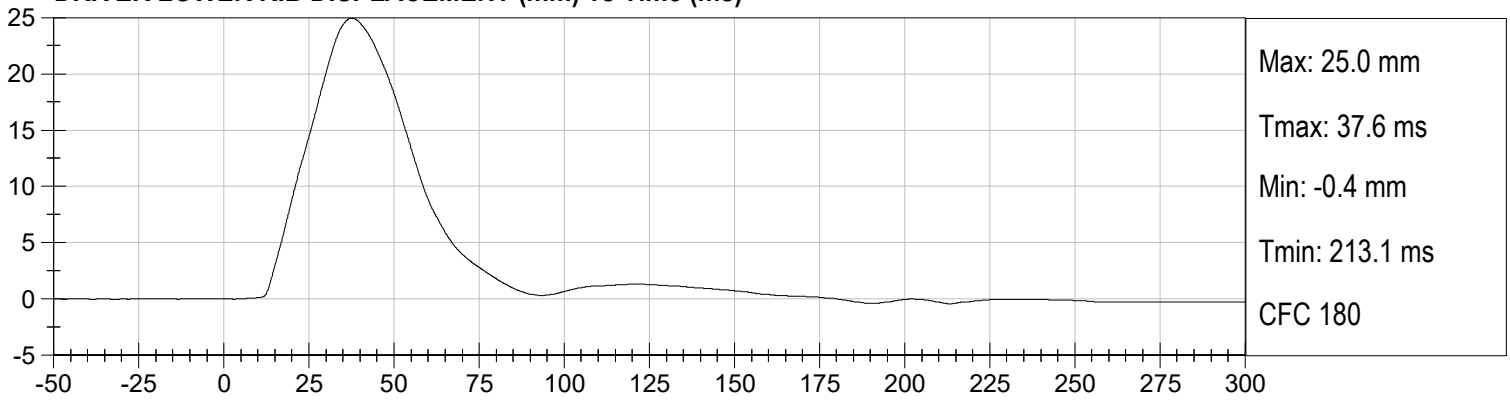
DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)



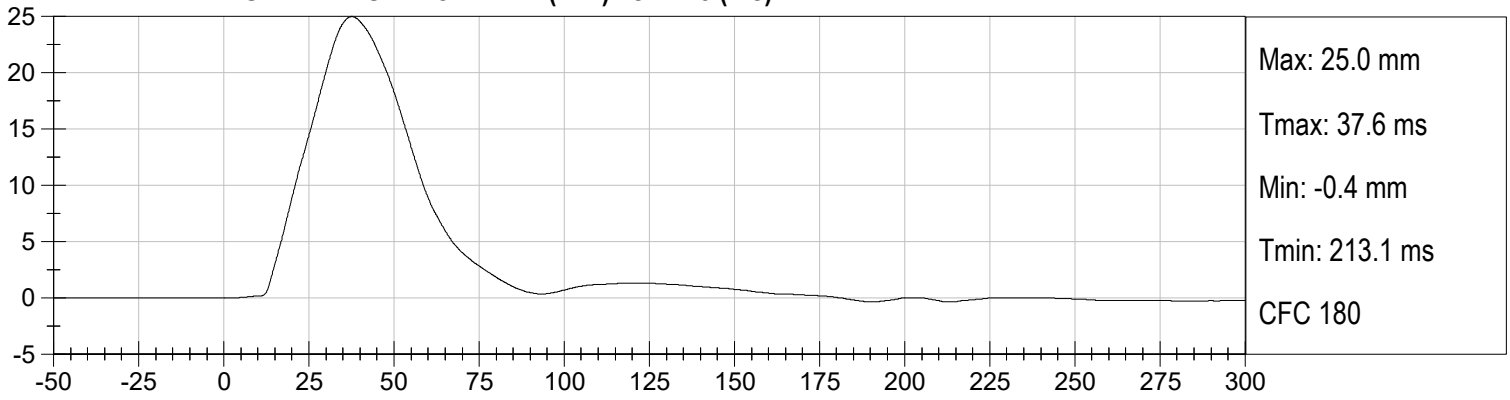
DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)



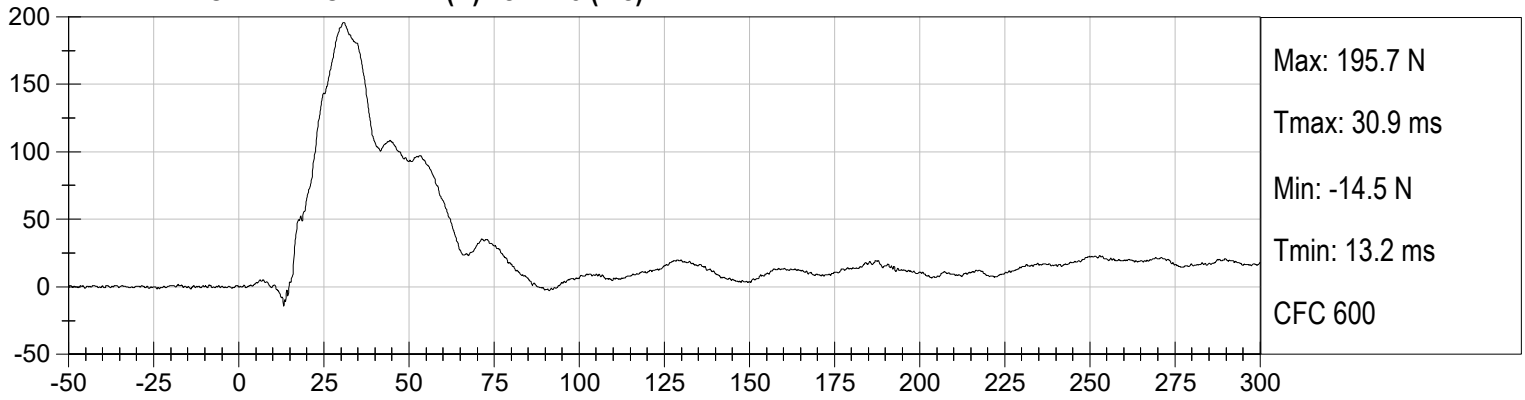
DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)



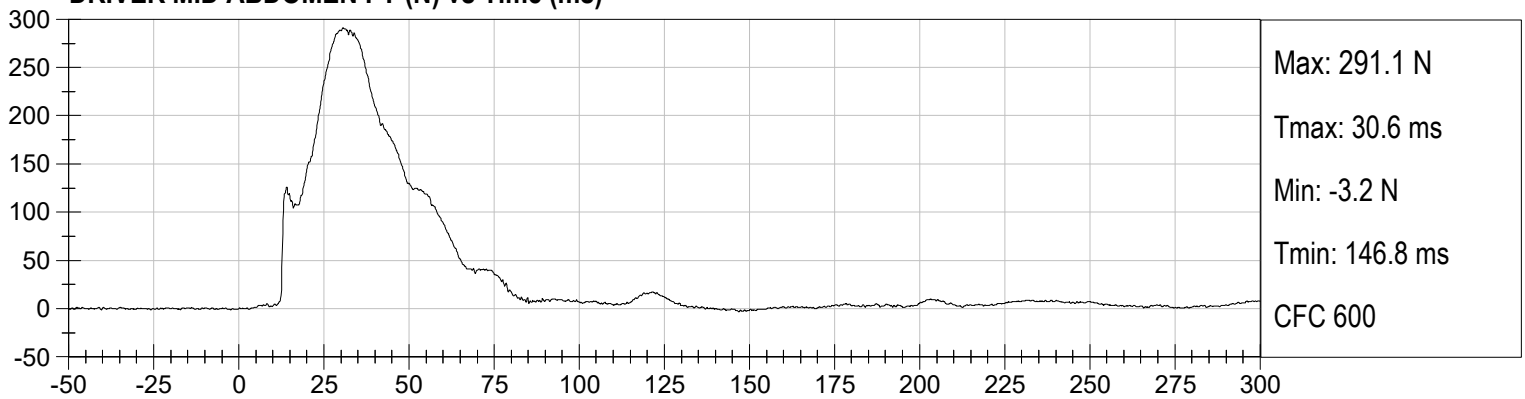
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)



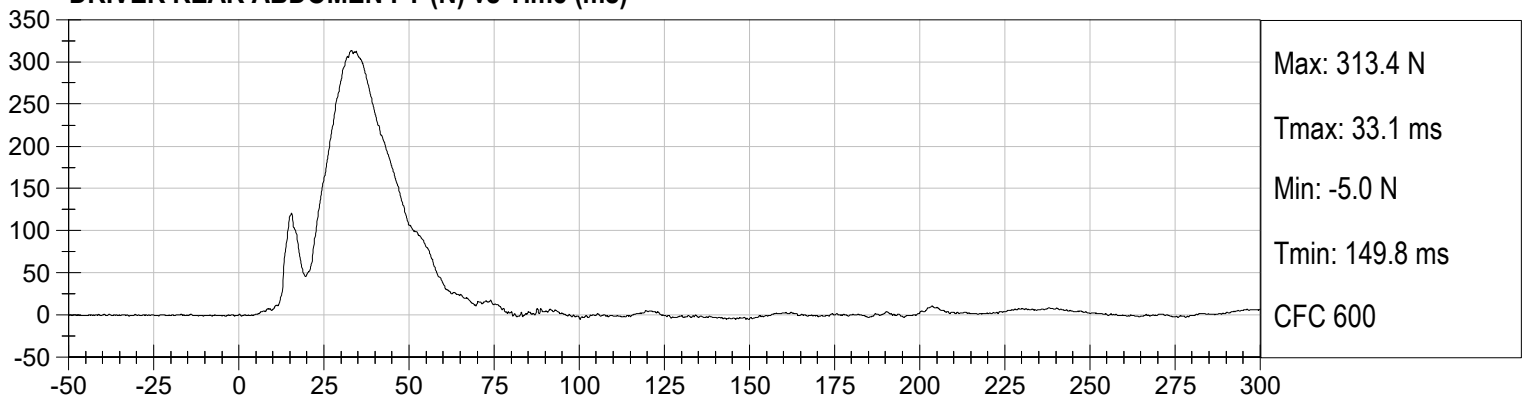
DRIVER FRONT ABDOMEN FY (N) vs Time (ms)



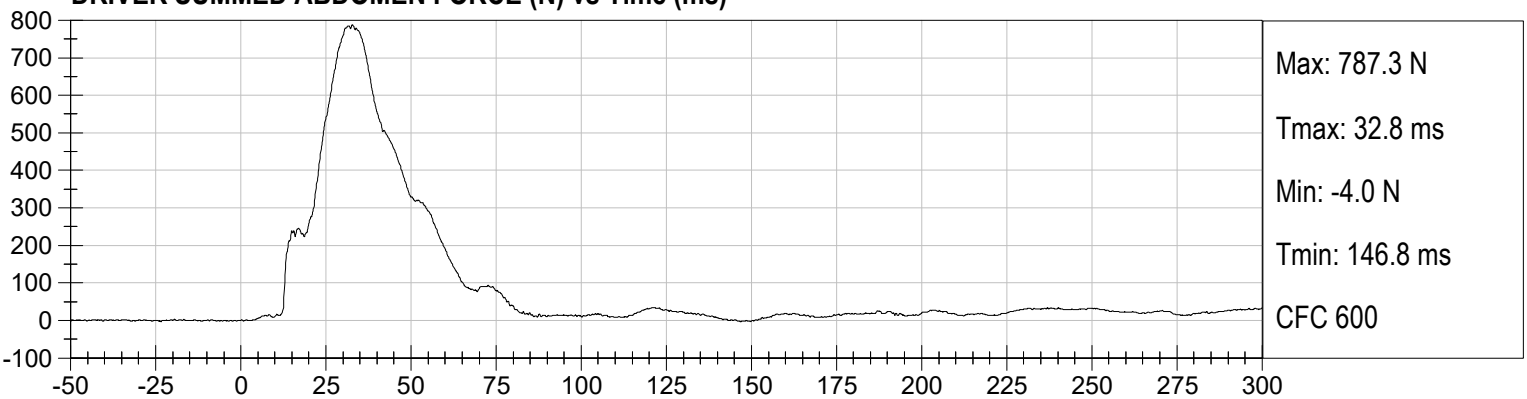
DRIVER MID ABDOMEN FY (N) vs Time (ms)



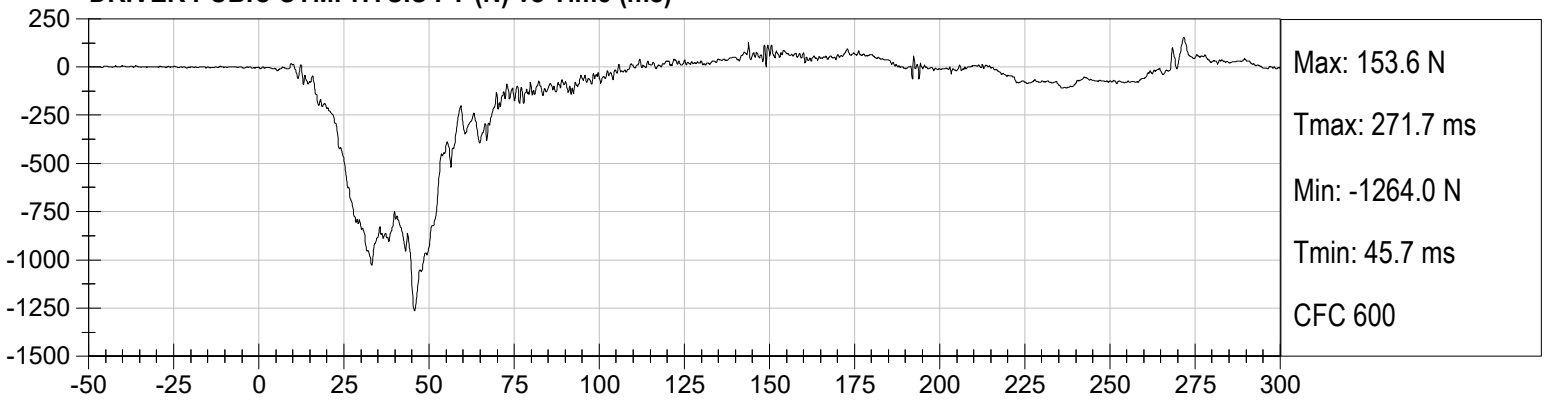
DRIVER REAR ABDOMEN FY (N) vs Time (ms)



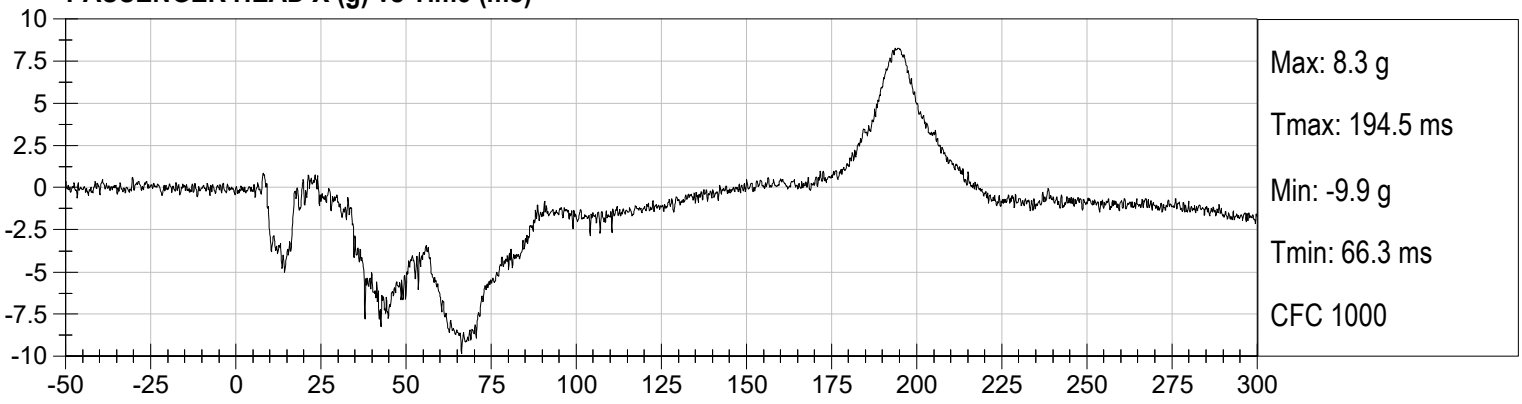
DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)



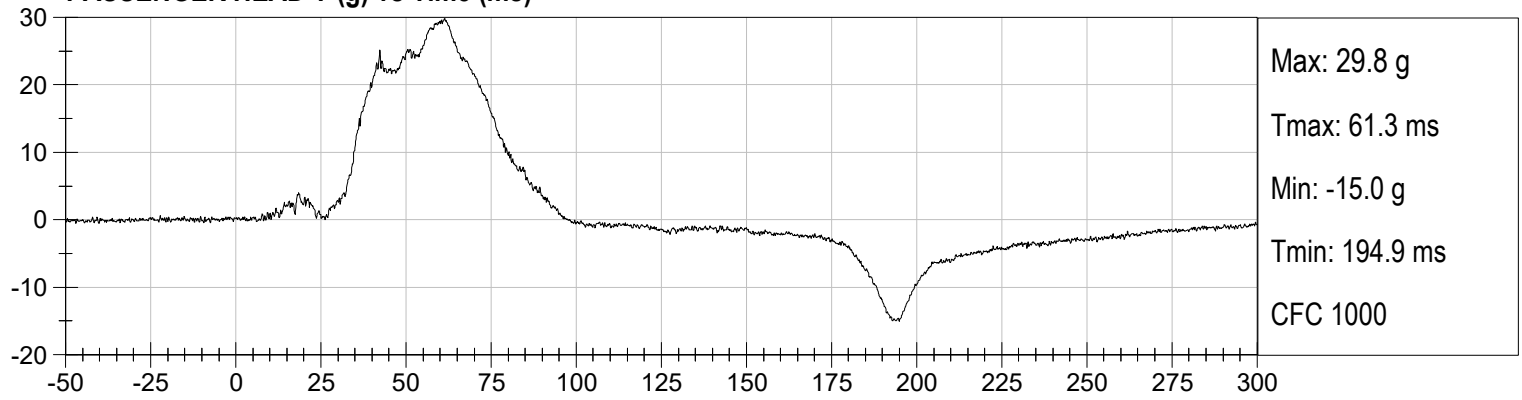
DRIVER PUBIC SYMPHYSIS FY (N) vs Time (ms)



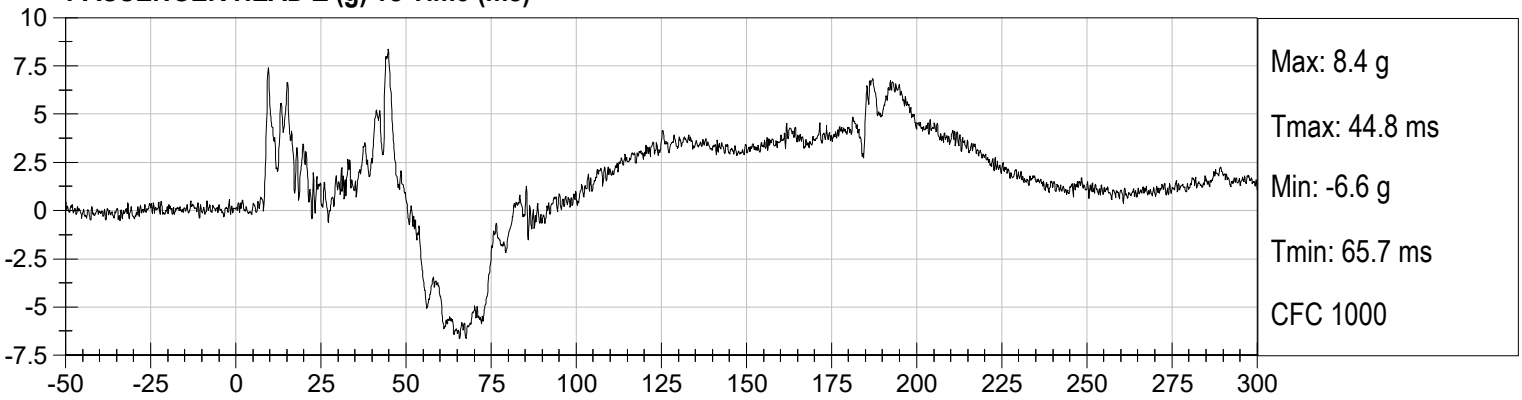
PASSENGER HEAD X (g) vs Time (ms)



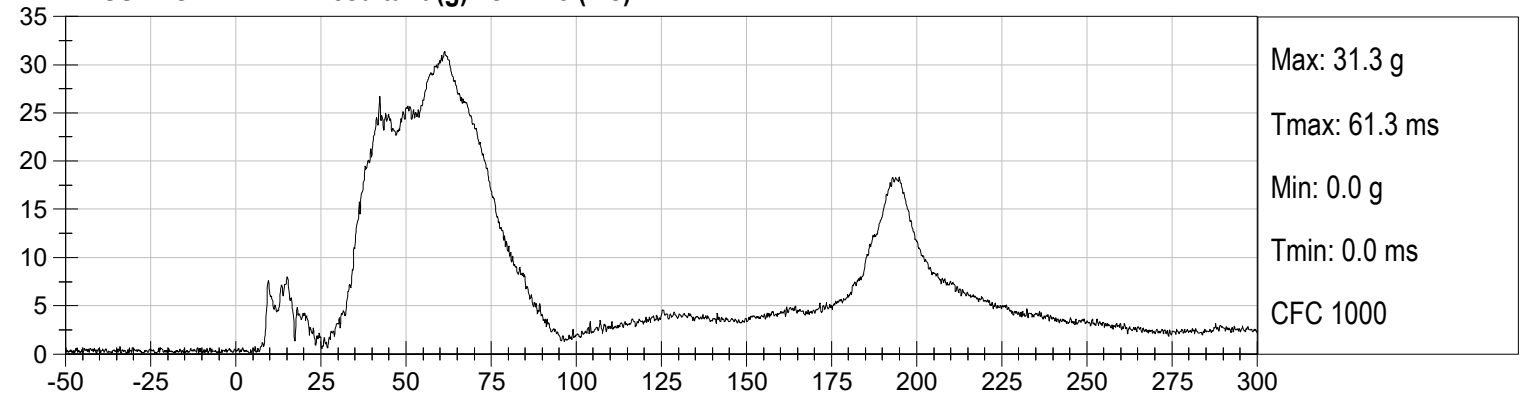
PASSENGER HEAD Y (g) vs Time (ms)



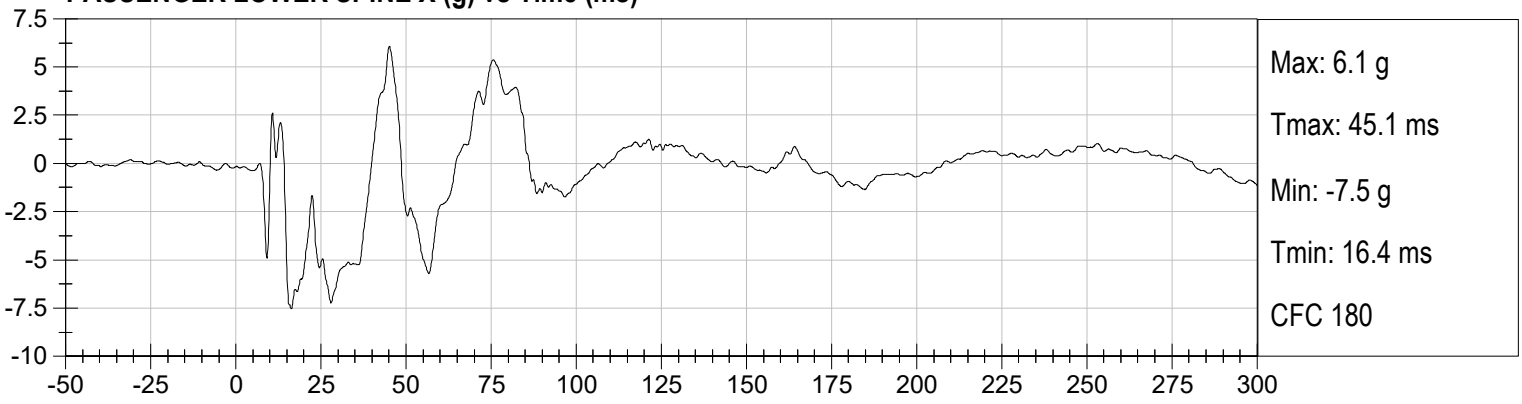
PASSENGER HEAD Z (g) vs Time (ms)



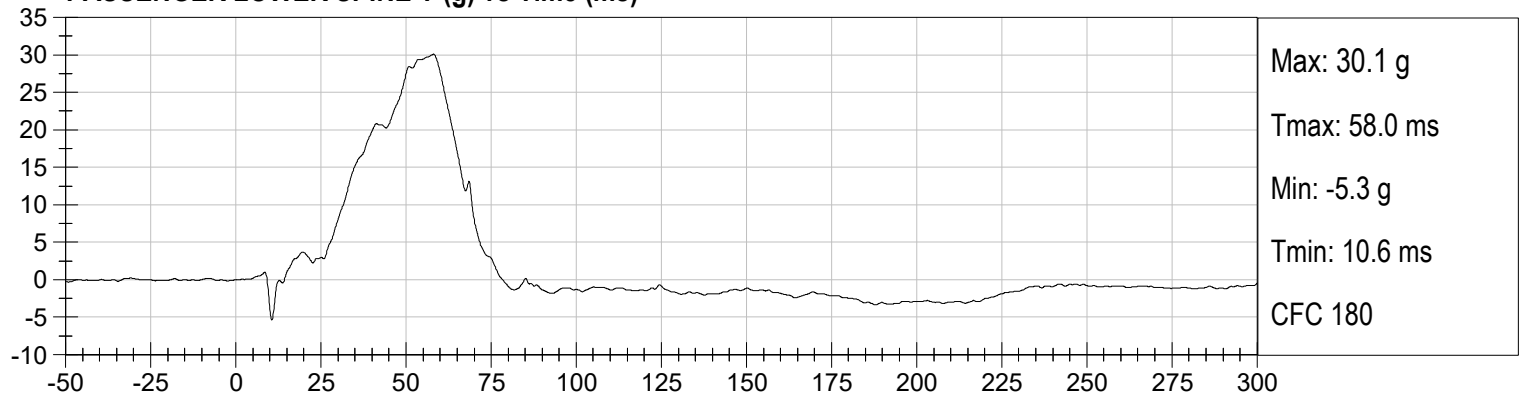
PASSENGER HEAD Resultant (g) vs Time (ms)



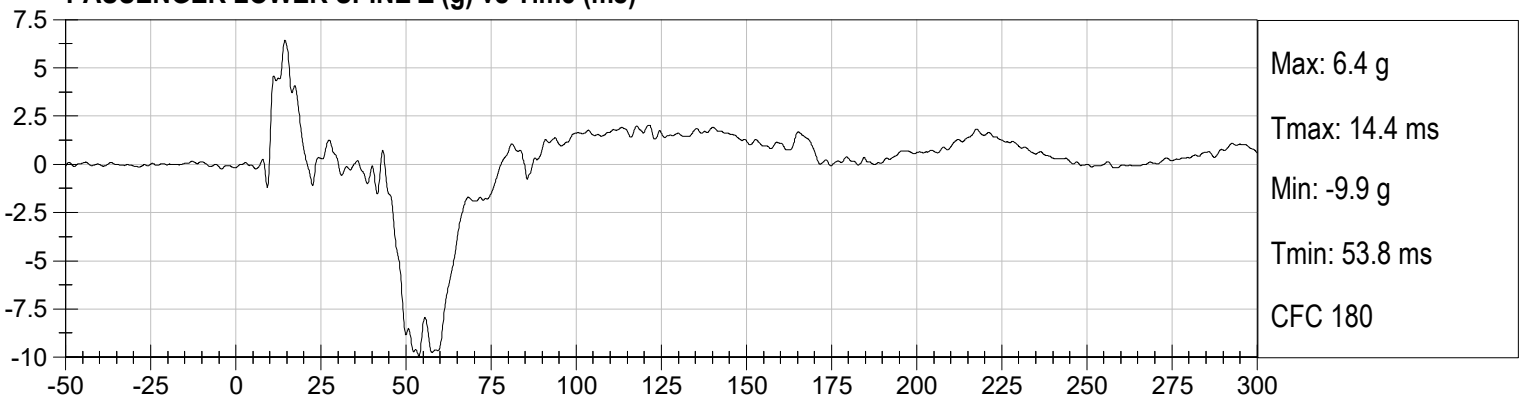
PASSENGER LOWER SPINE X (g) vs Time (ms)



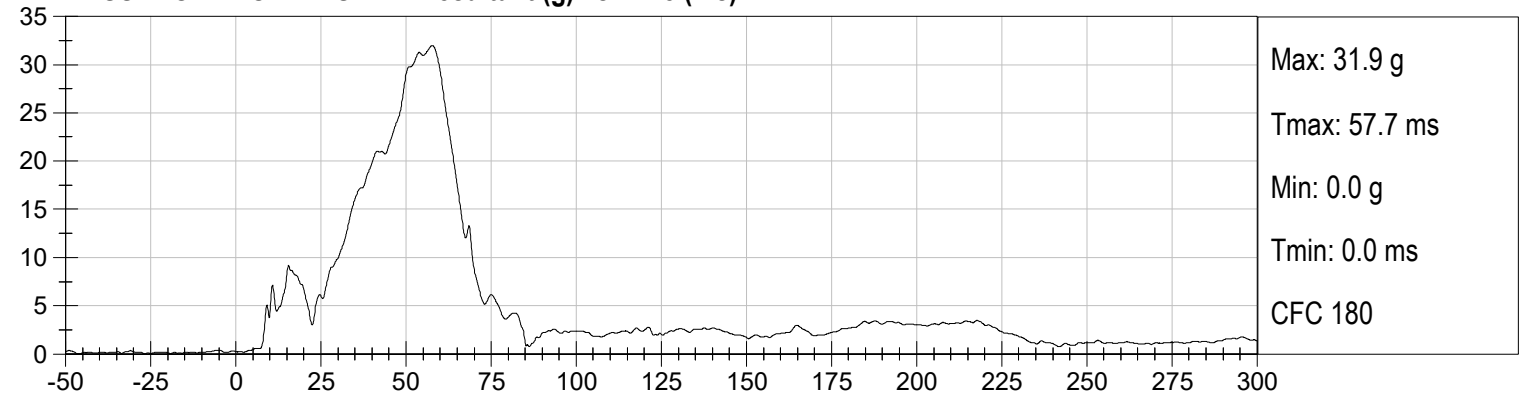
PASSENGER LOWER SPINE Y (g) vs Time (ms)



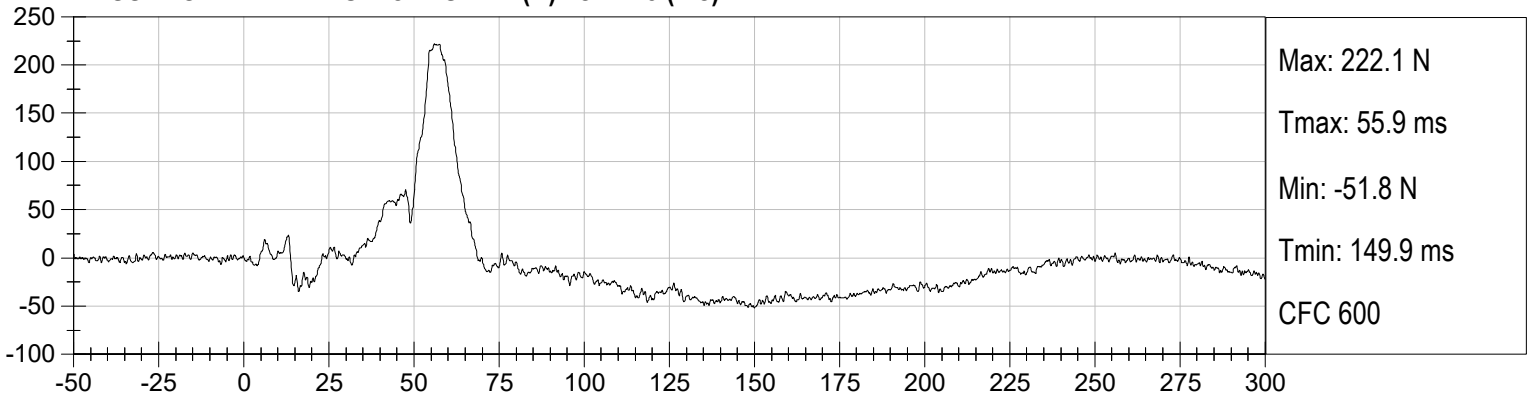
PASSENGER LOWER SPINE Z (g) vs Time (ms)



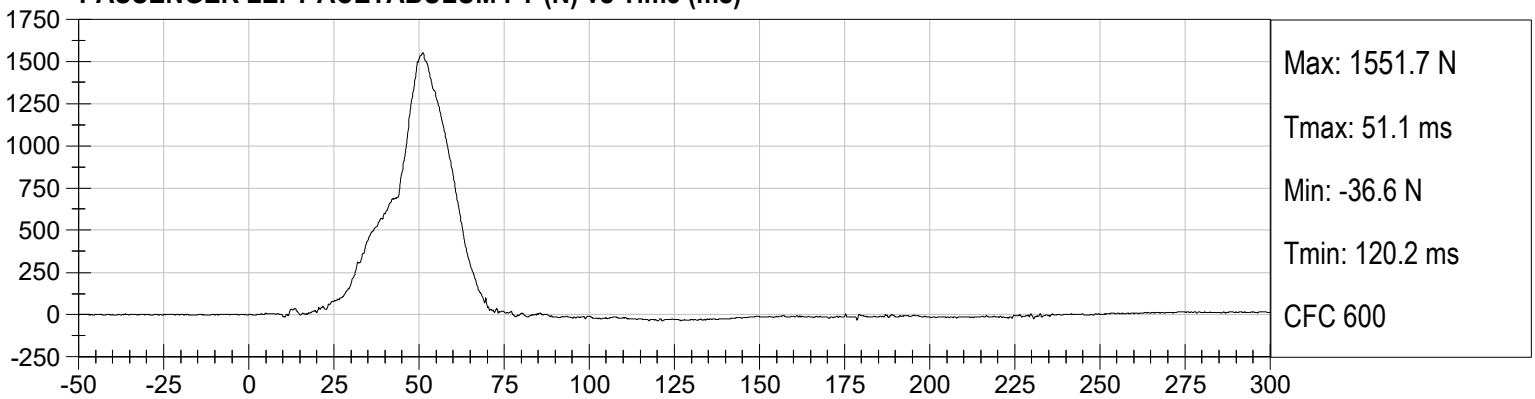
PASSENGER LOWER SPINE Resultant (g) vs Time (ms)



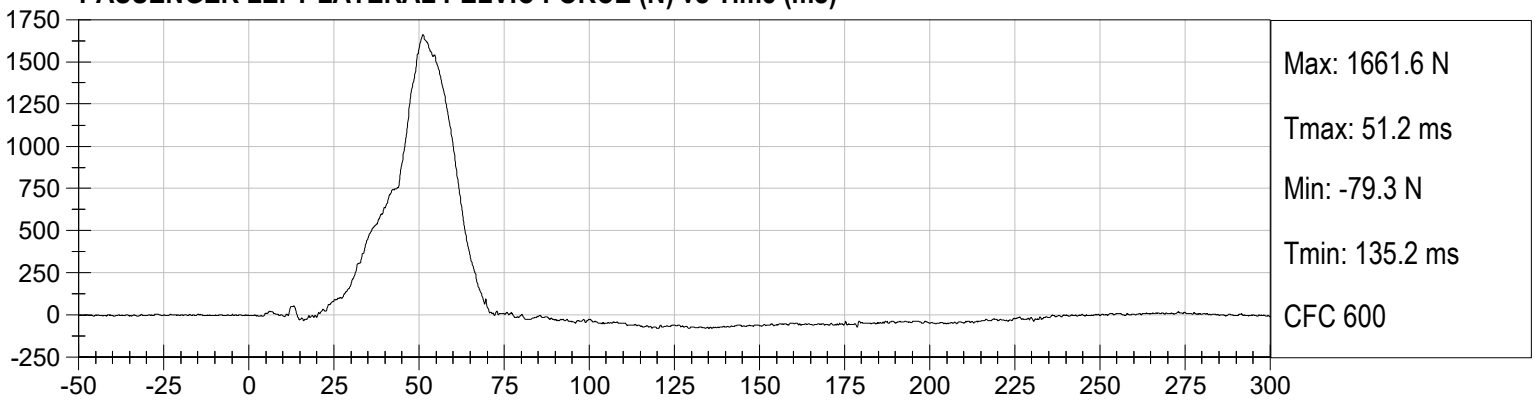
PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)



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



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



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: F032 **Test ID:** D203031

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	125 to 155	135	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

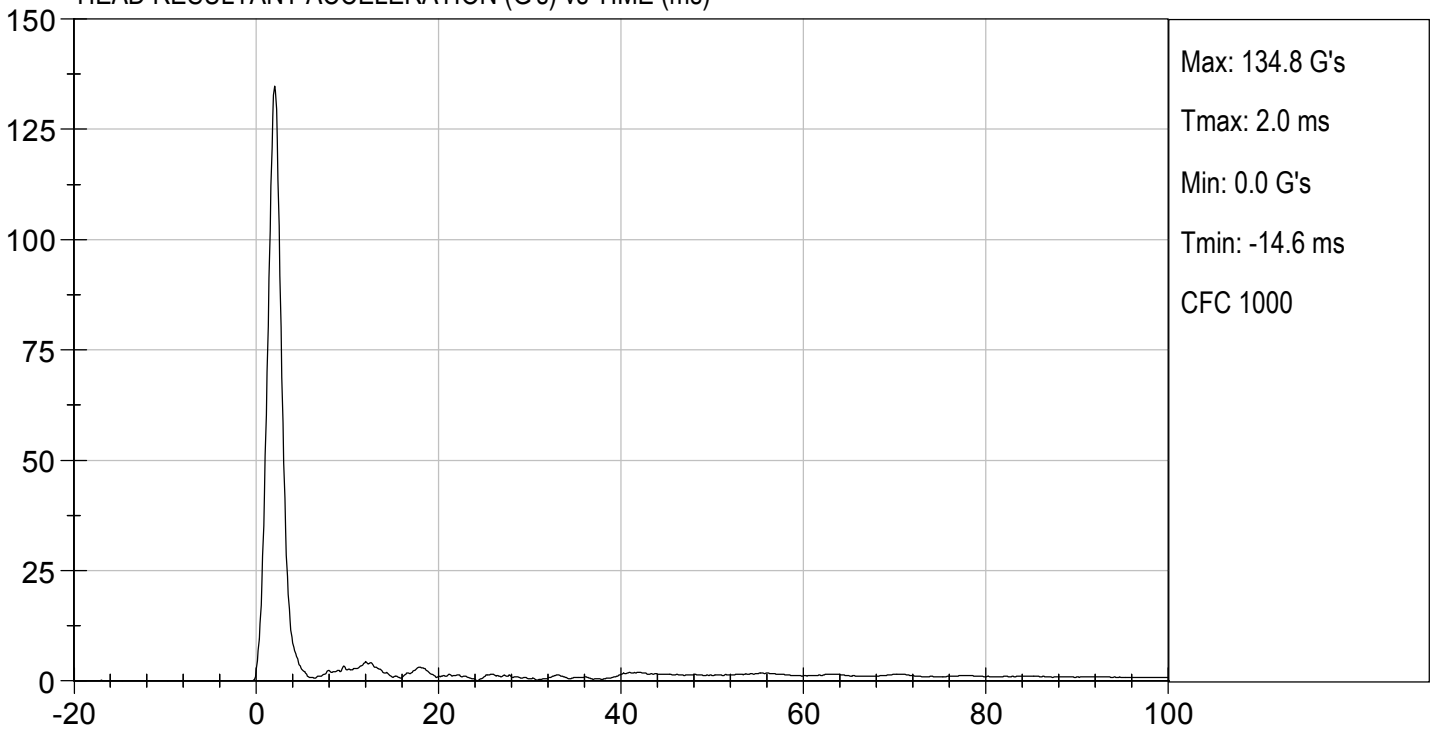
11/23/2020
Test Date

Approved By

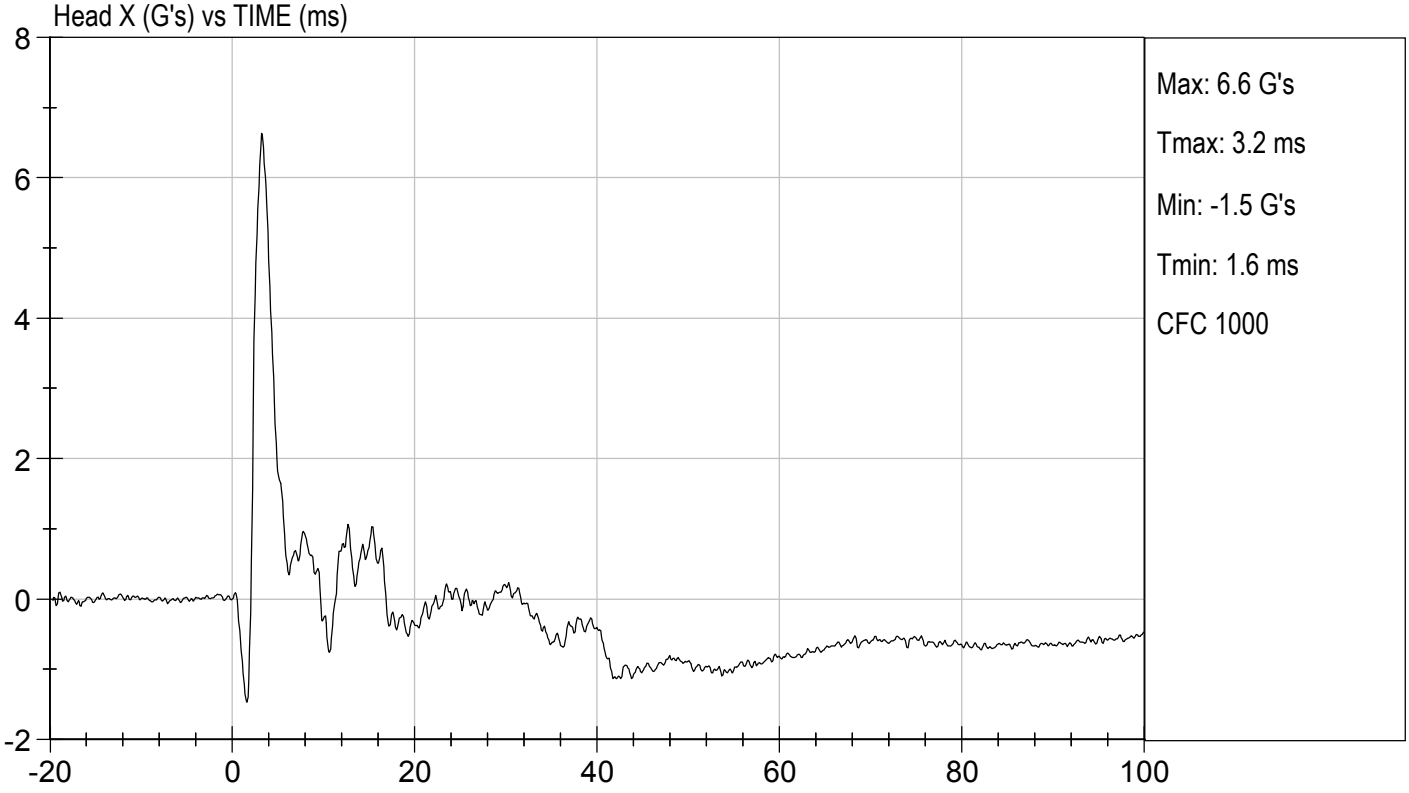
TEST DESC: HEAD DROP

TEST DATE: 11/23/2020
TEST #: D203031

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

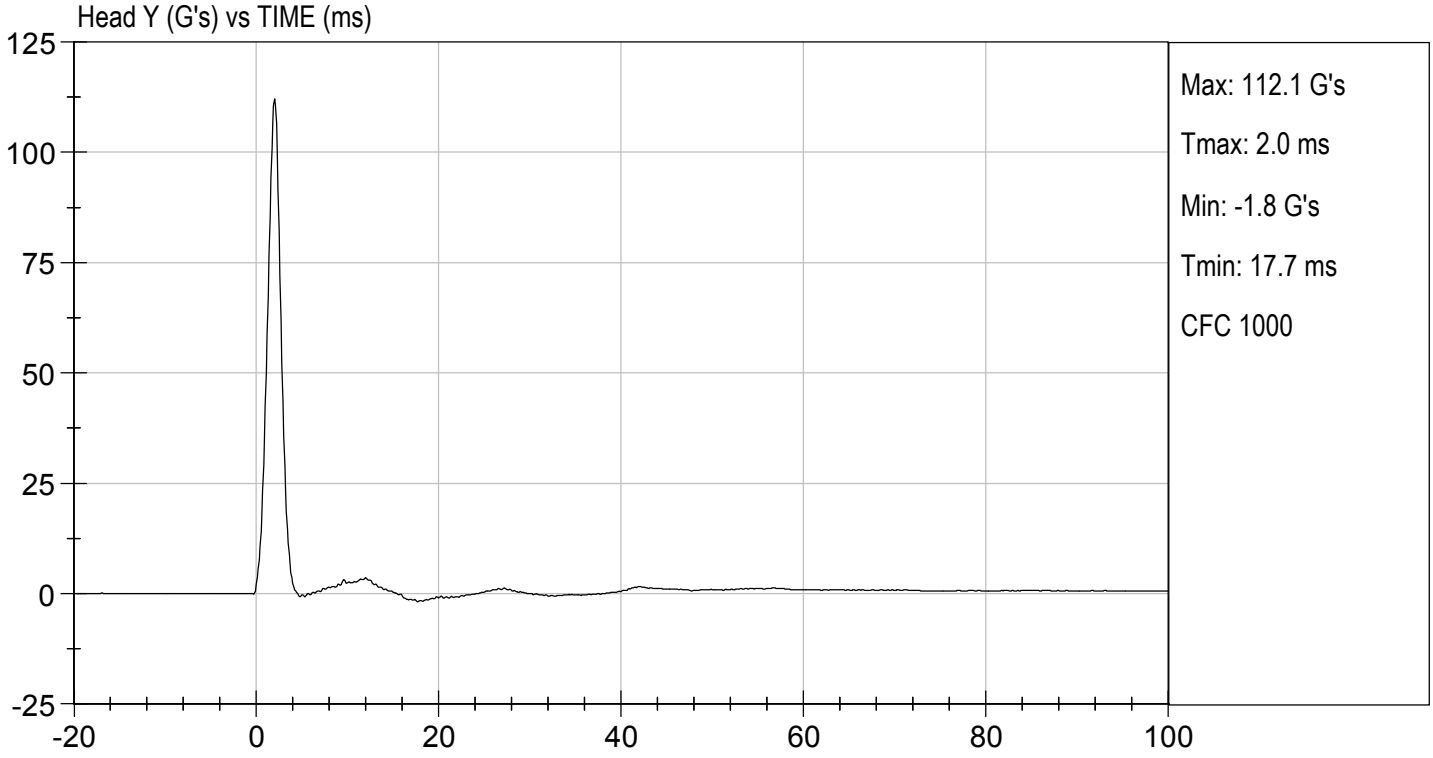


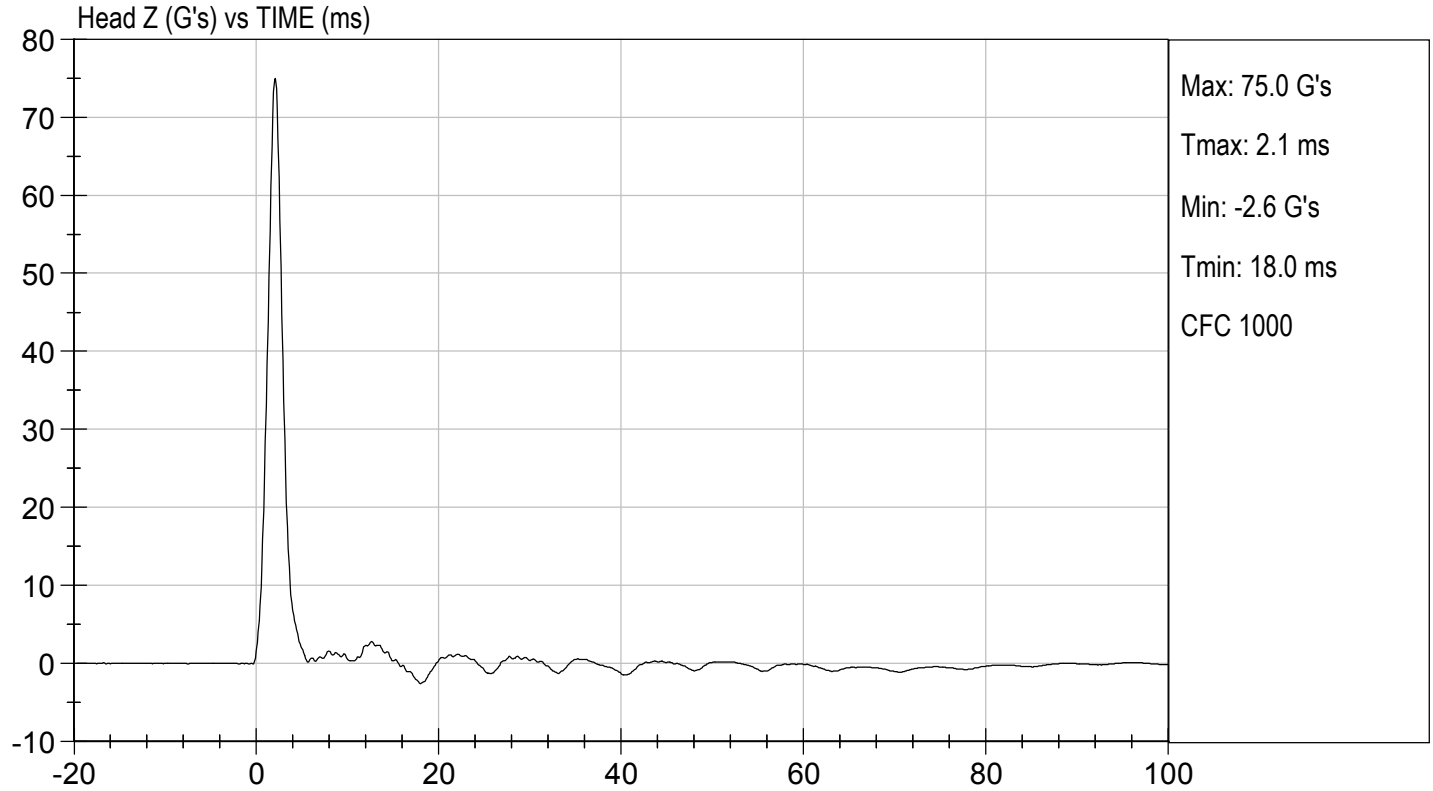
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 11/23/2020
TEST #: D203031





MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203032

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.48	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.53	Pass
	17 ms	m/s	>= -3.70	-3.47	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.8	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	57.1	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	63.2	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

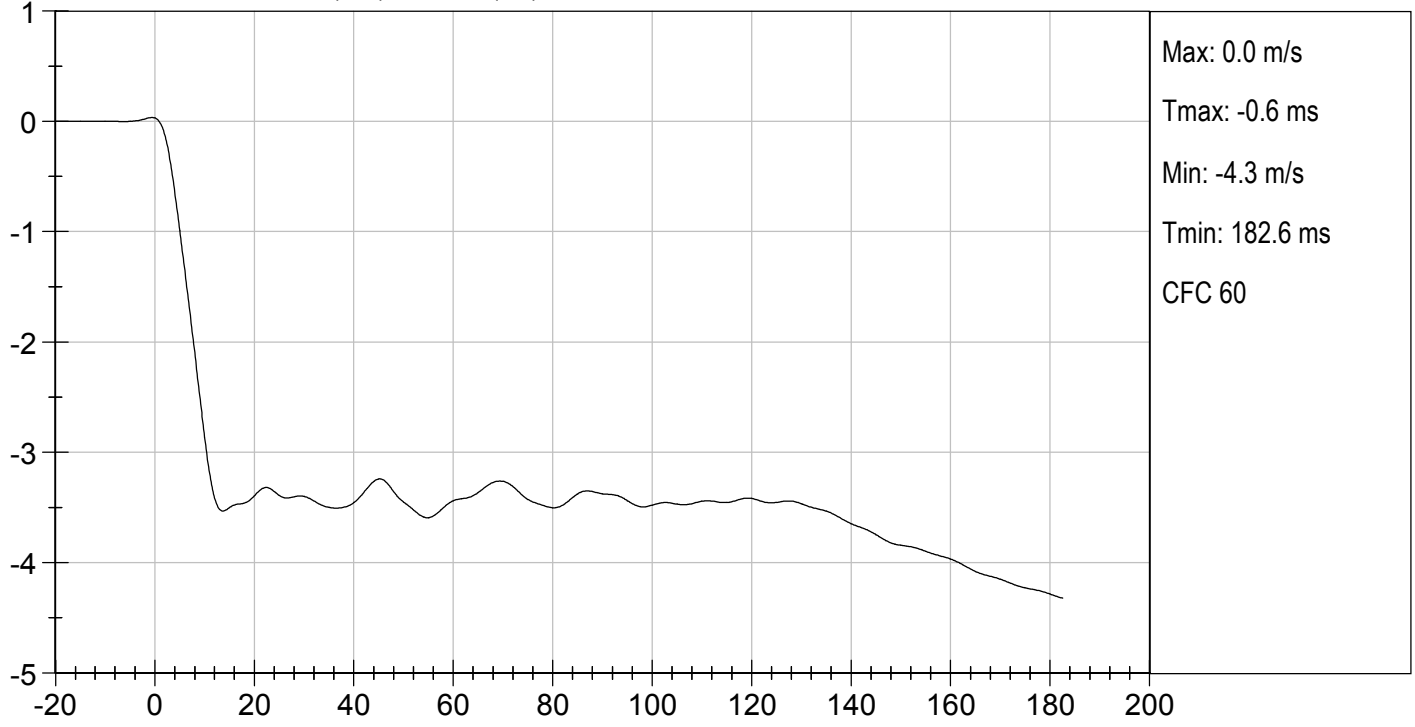
11/23/2020
Test Date

Approved By

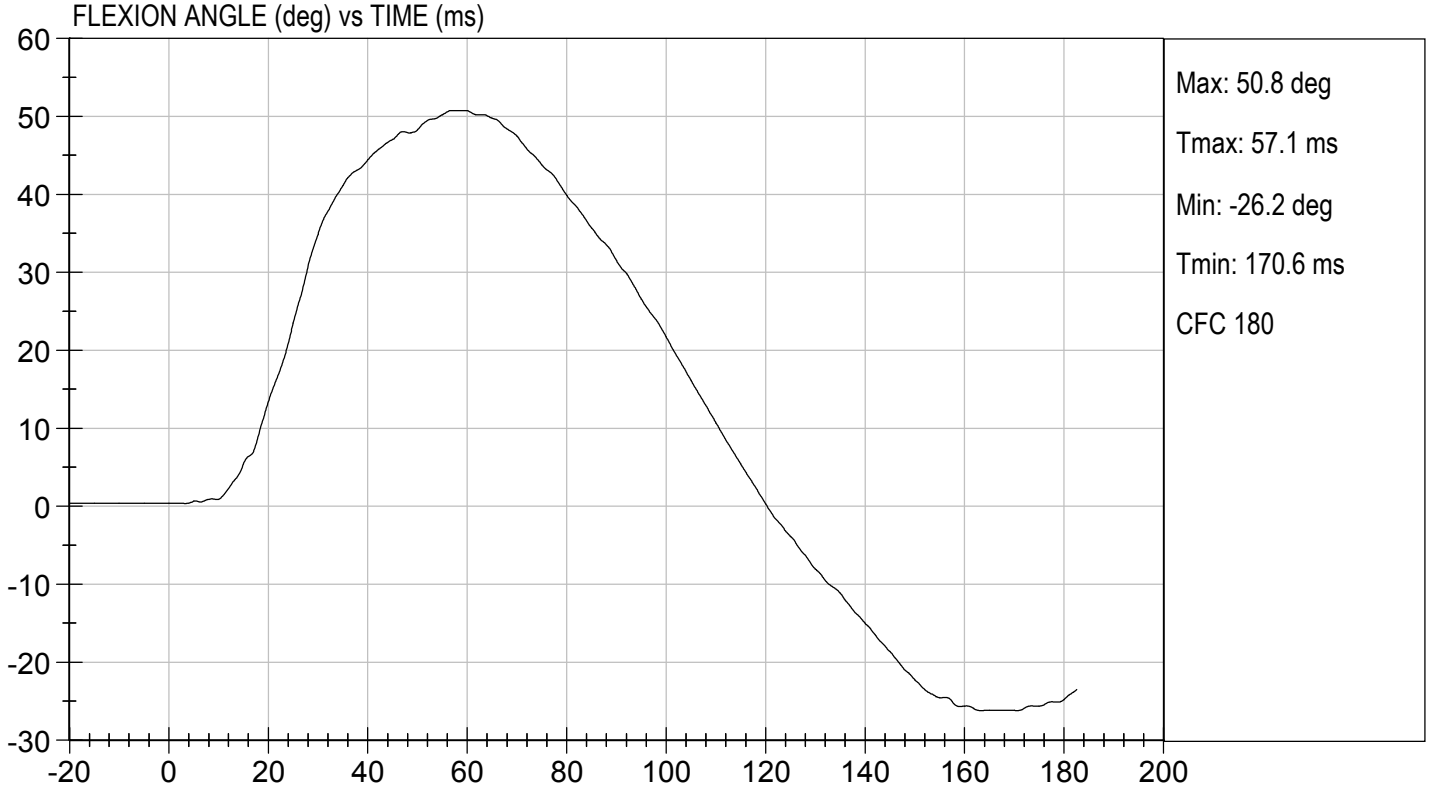
TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 11/23/2020
TEST #: D203032

PENDULUM VELOCITY (m/s) vs TIME (ms)



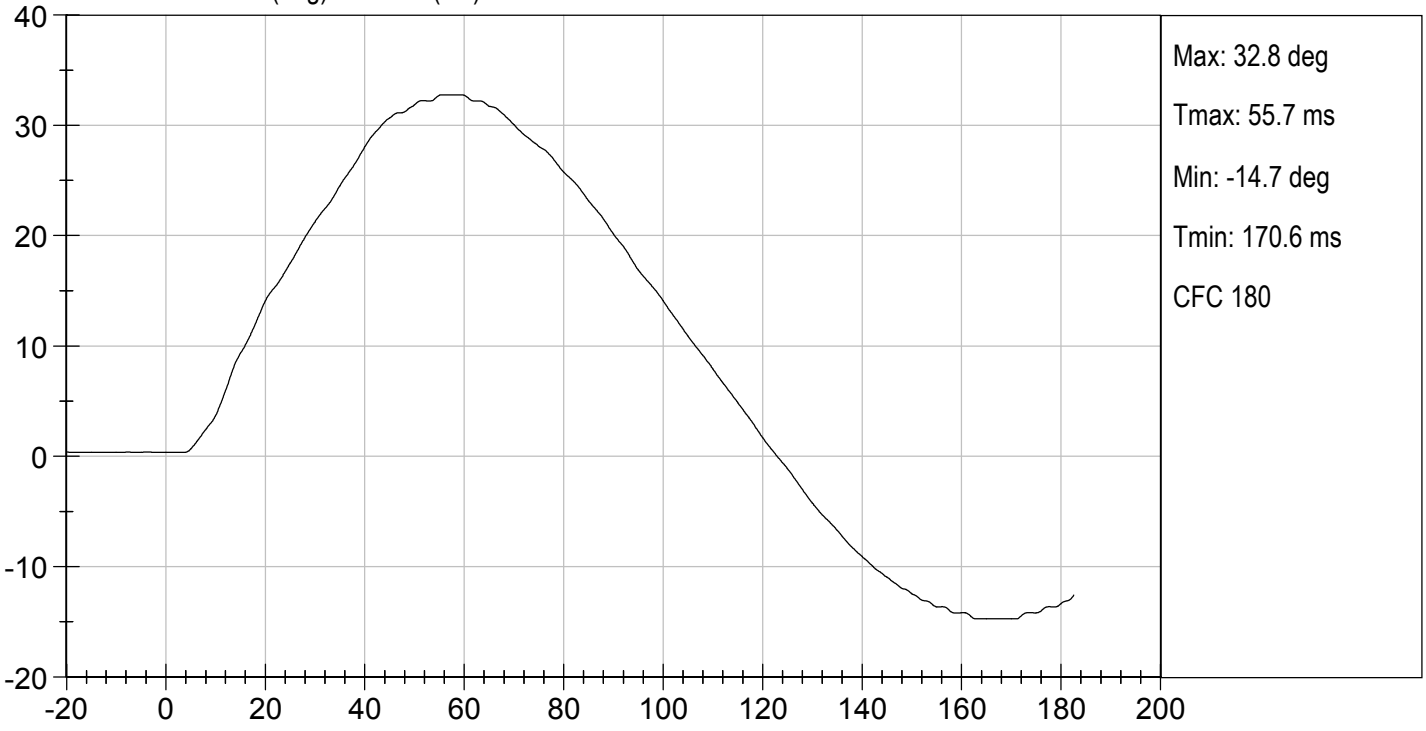
FLEXION ANGLE (deg) vs TIME (ms)



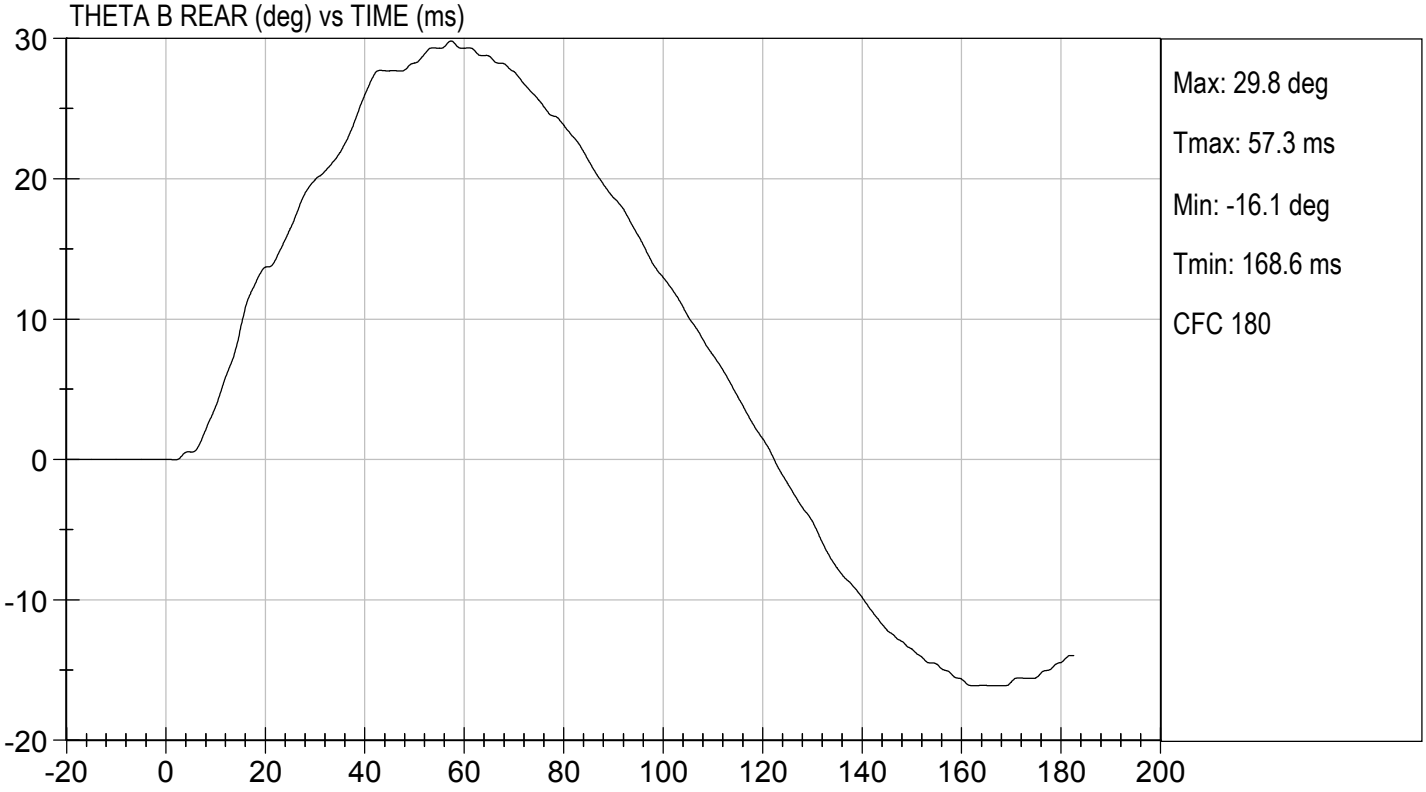
TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 11/23/2020
TEST #: D203032

THETA A FRONT (deg) vs TIME (ms)

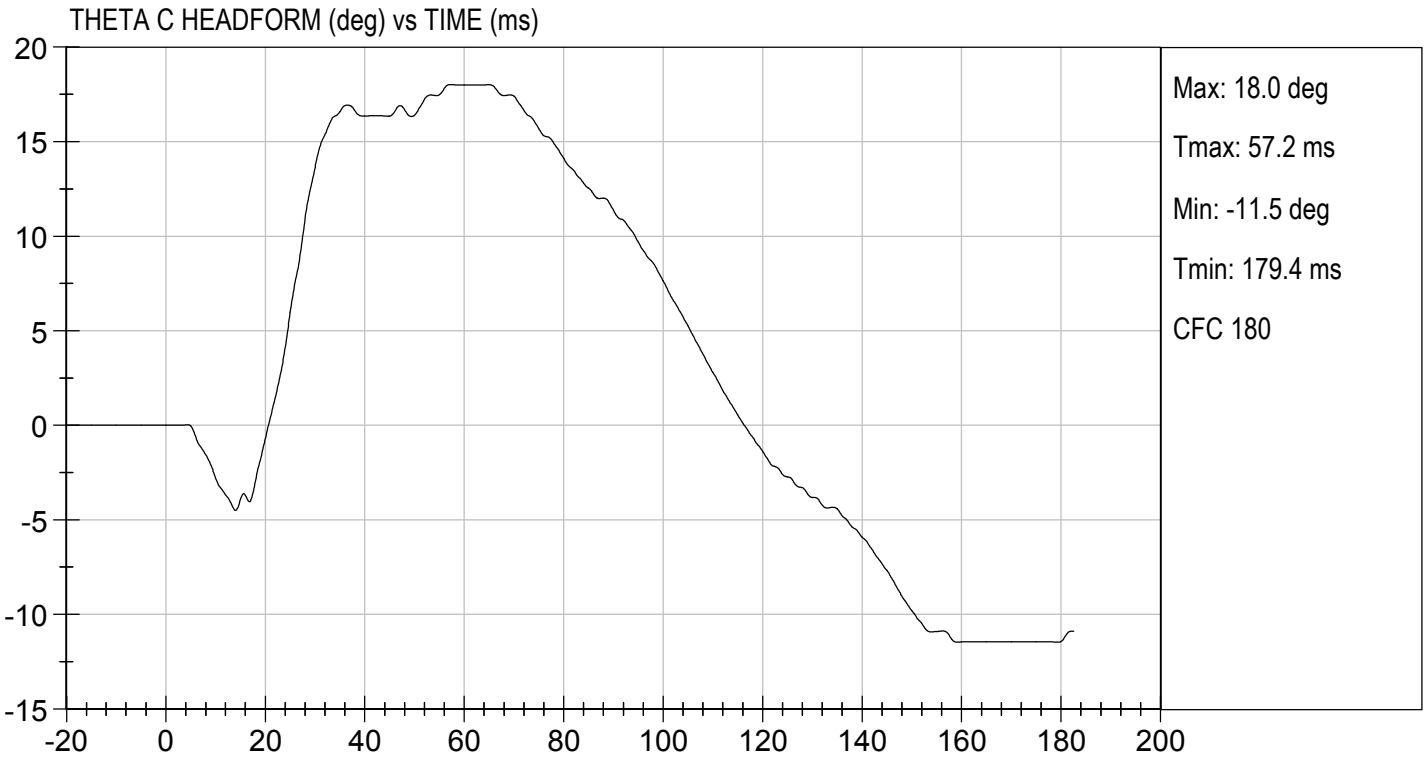


THETA B REAR (deg) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 11/23/2020
TEST #: D203032



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203033

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.23	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.8	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

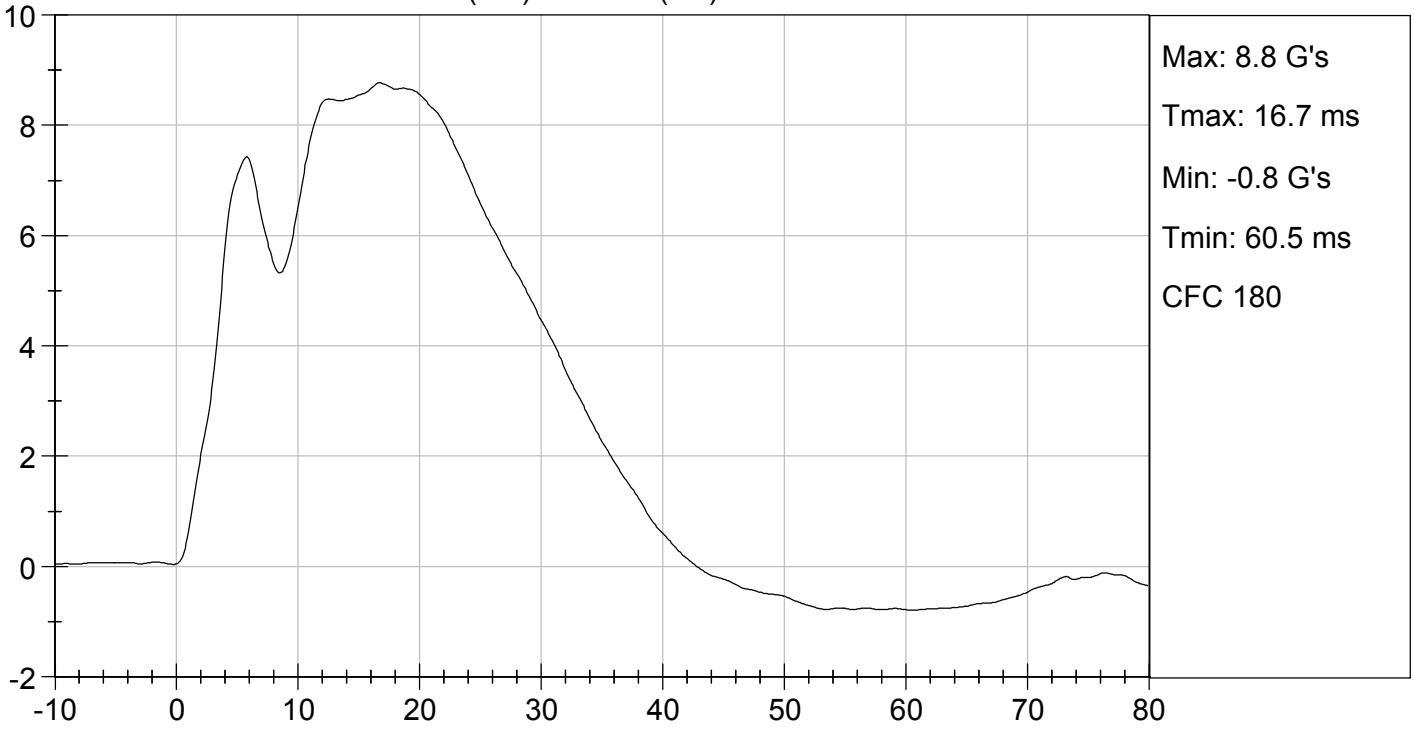
11/23/2020
Test Date

Approved By

TEST DESC: SHOULDER IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 11/23/2020
TEST #: D203033

IMPACTOR ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

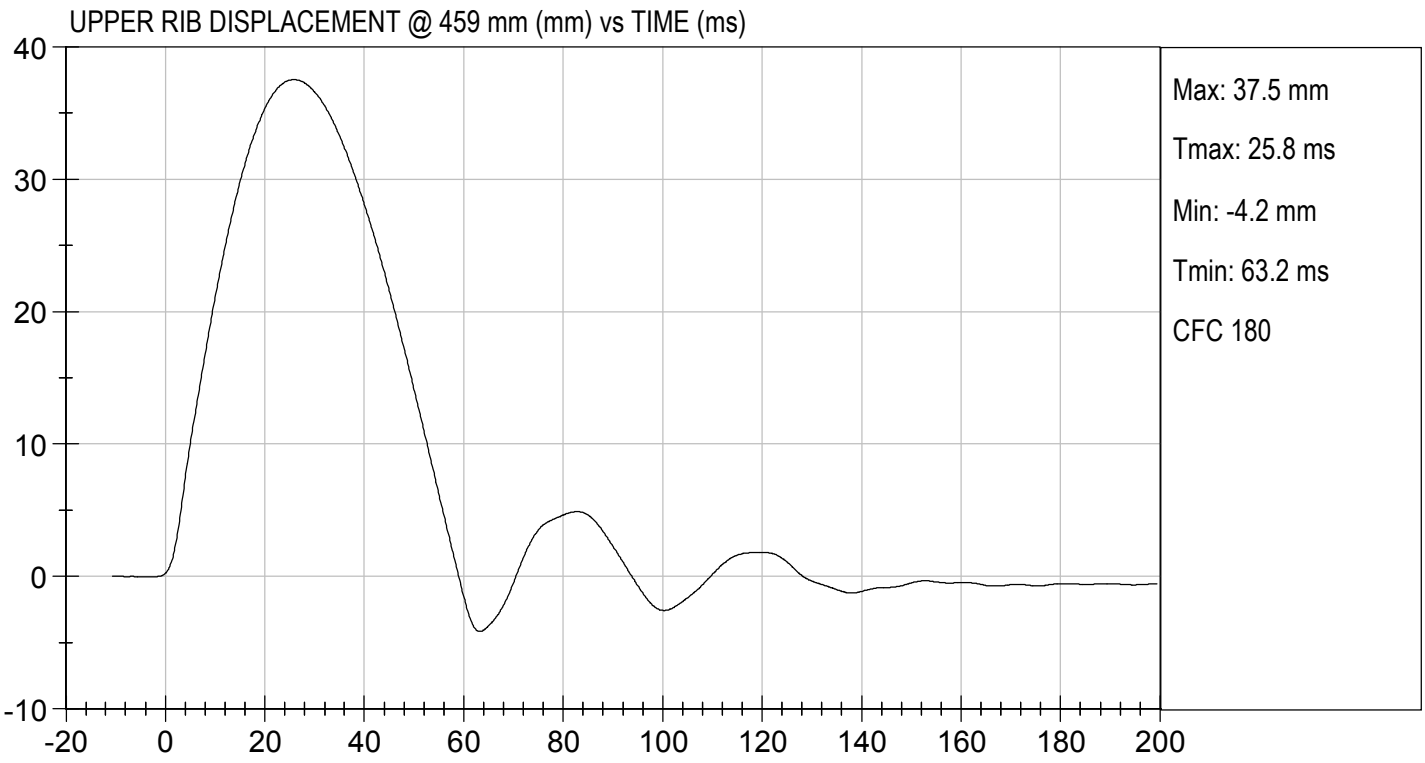
ATD Serial No: F032 **Test I.D:** D203034

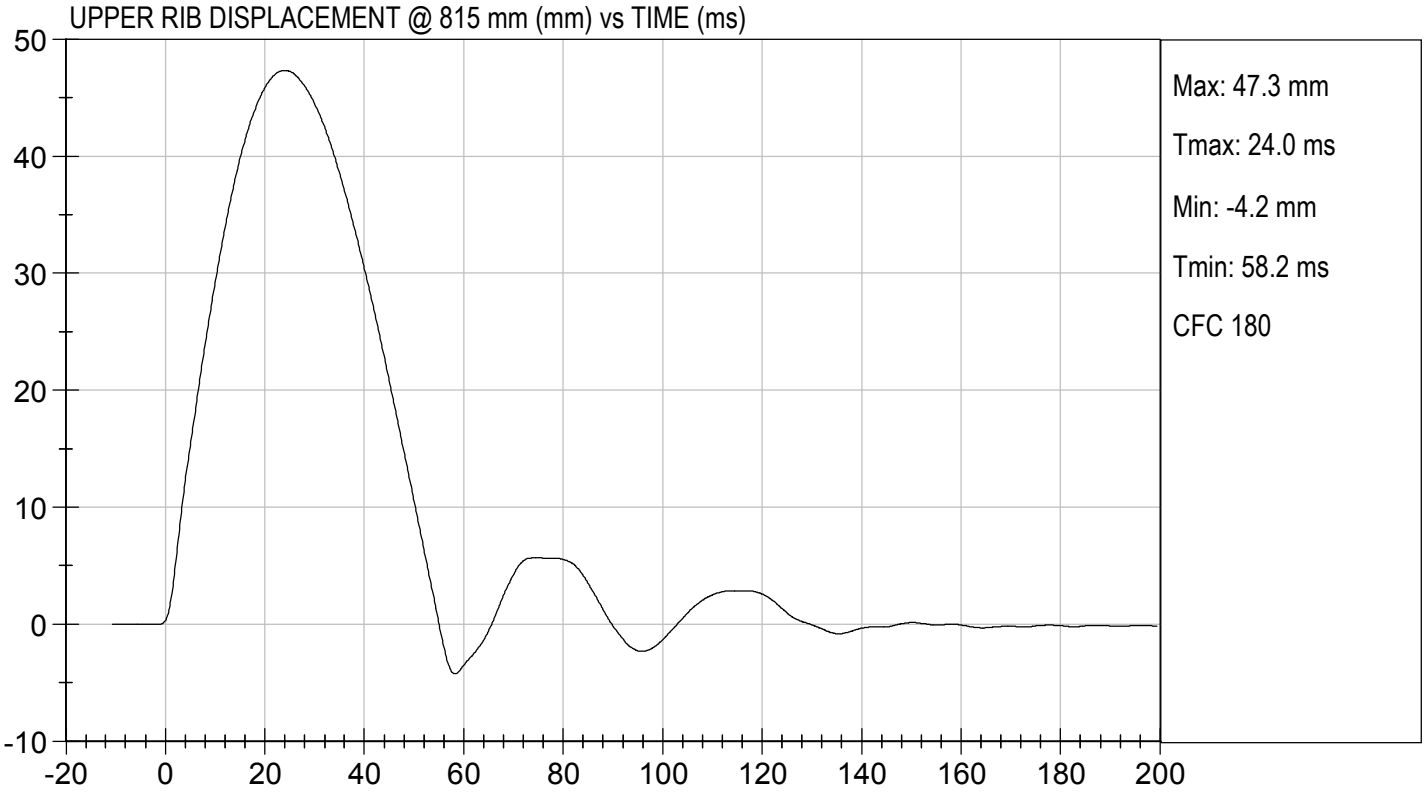
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.3	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

11/23/2020
Test Date

Approved By


UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 37.5 mm
Tmax: 25.8 ms
Min: -4.2 mm
Tmin: 63.2 ms
CFC 180


UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 47.3 mm
Tmax: 24.0 ms
Min: -4.2 mm
Tmin: 58.2 ms
CFC 180

MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

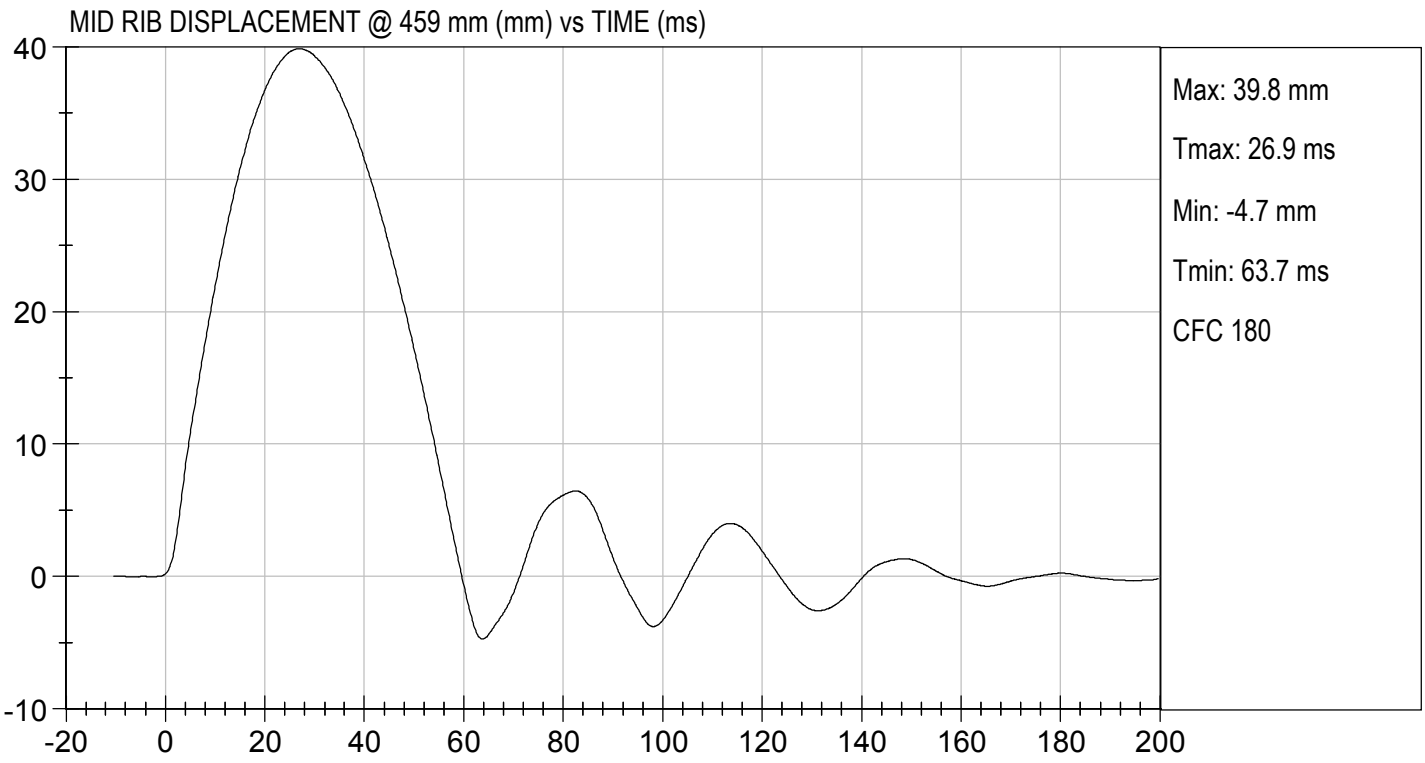
ATD Serial No: F032 **Test I.D:** D203035

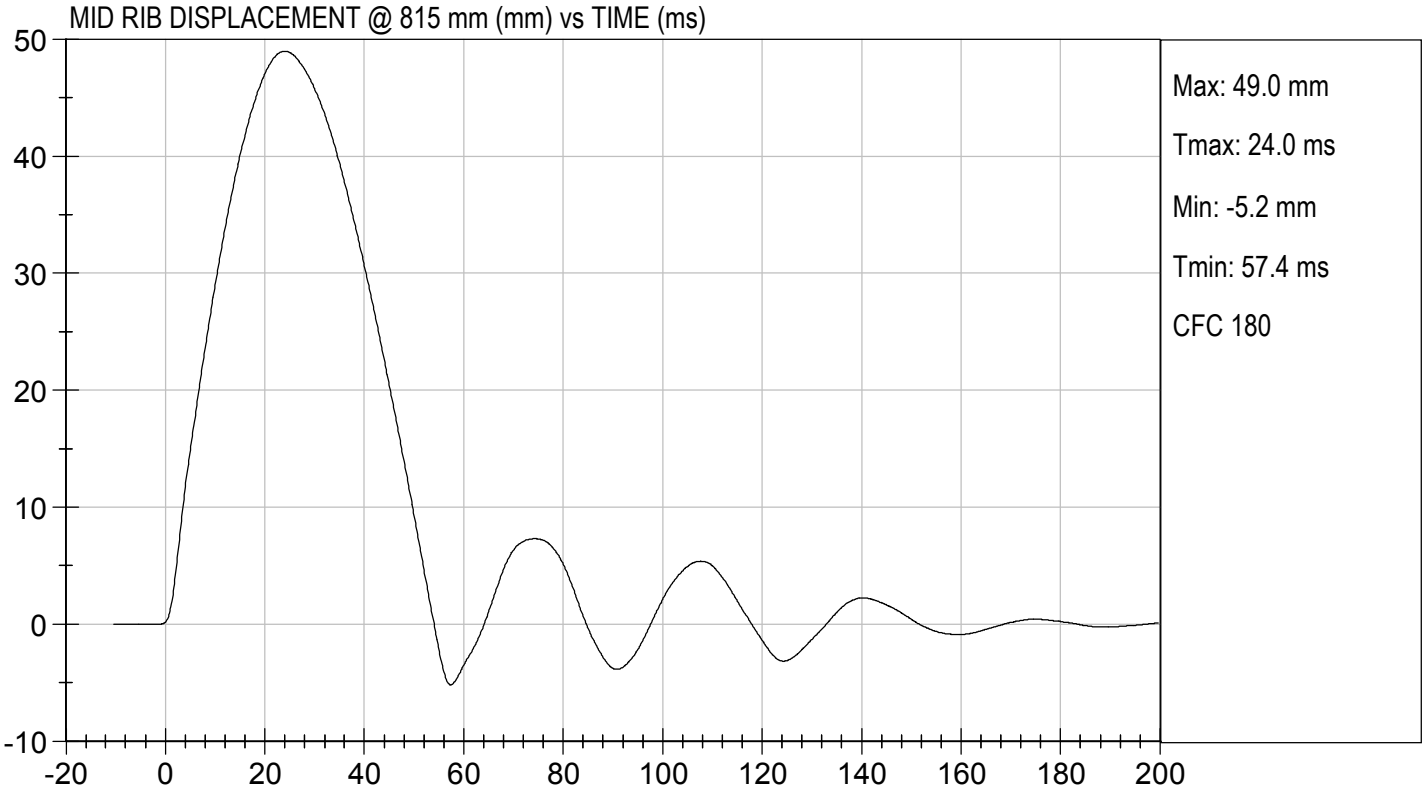
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.8	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.0	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

11/23/2020
Test Date

Approved By


MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 39.8 mm
Tmax: 26.9 ms
Min: -4.7 mm
Tmin: 63.7 ms
CFC 180


MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 49.0 mm
Tmax: 24.0 ms
Min: -5.2 mm
Tmin: 57.4 ms
CFC 180

MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

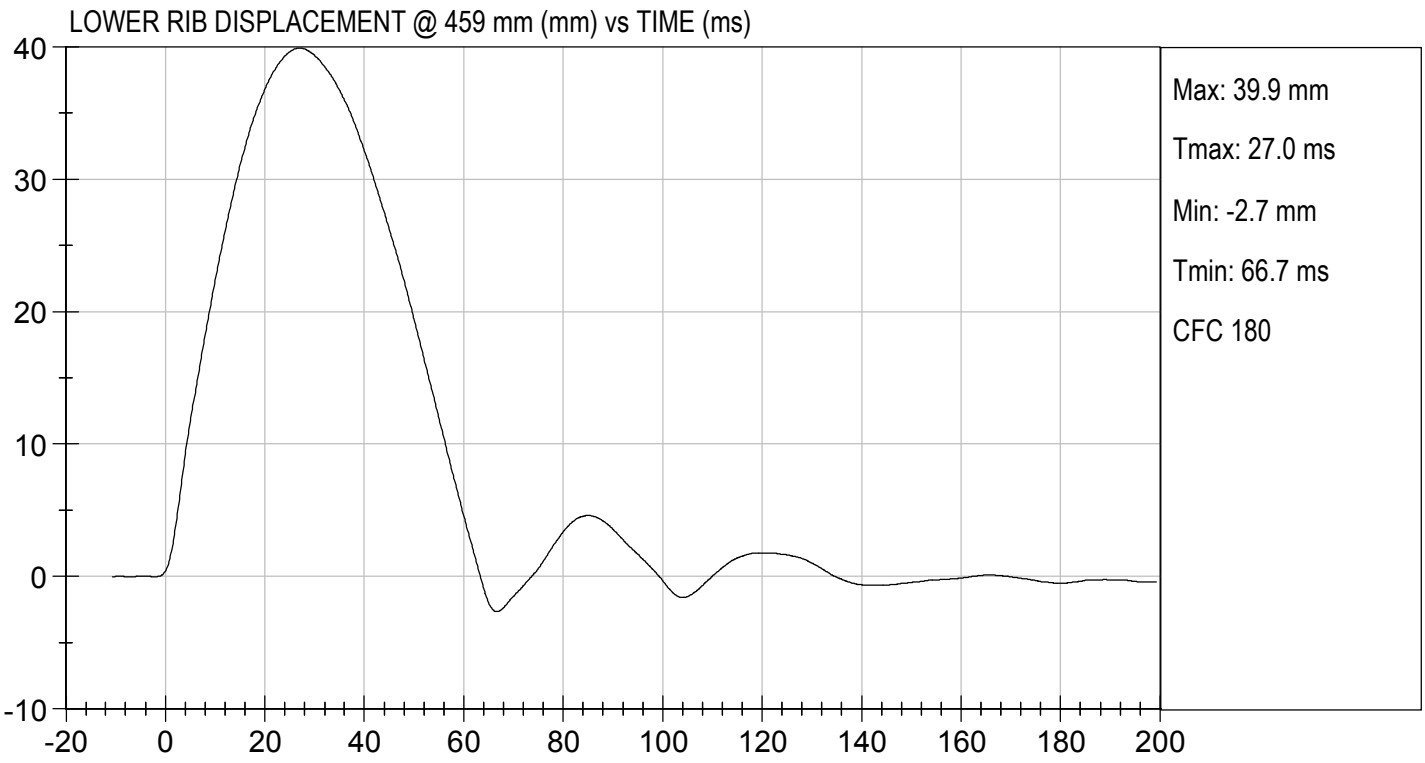
ATD Serial No: F032 **Test I.D:** D203036

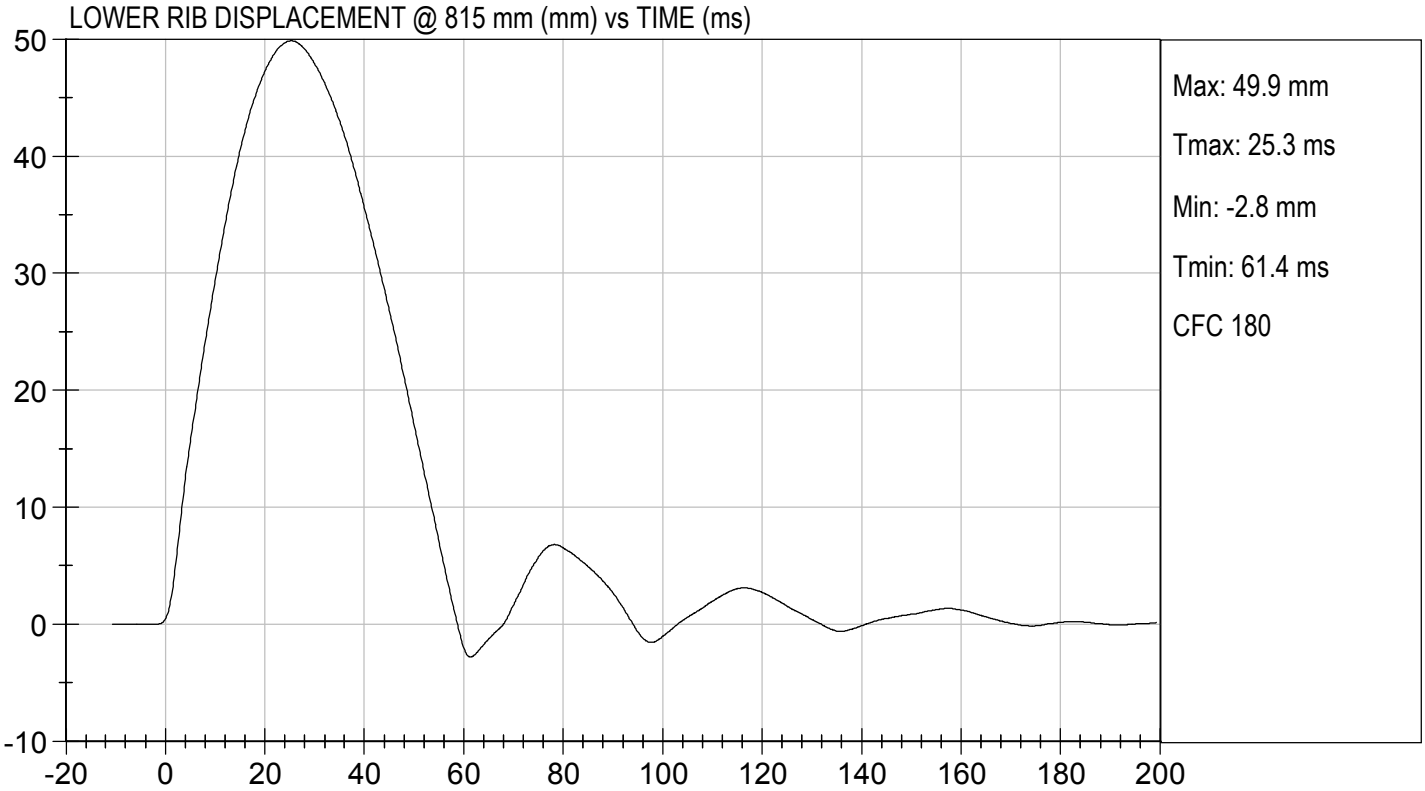
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.9	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

11/23/2020
Test Date

Approved By


LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 39.9 mm
Tmax: 27.0 ms
Min: -2.7 mm
Tmin: 66.7 ms
CFC 180


LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 49.9 mm
Tmax: 25.3 ms
Min: -2.8 mm
Tmin: 61.4 ms
CFC 180

MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203037

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	3.90 to 4.10	4.06	Pass
Maximum Impactor Force	N	4000 to 4800	4278	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.4	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2237	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.0	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

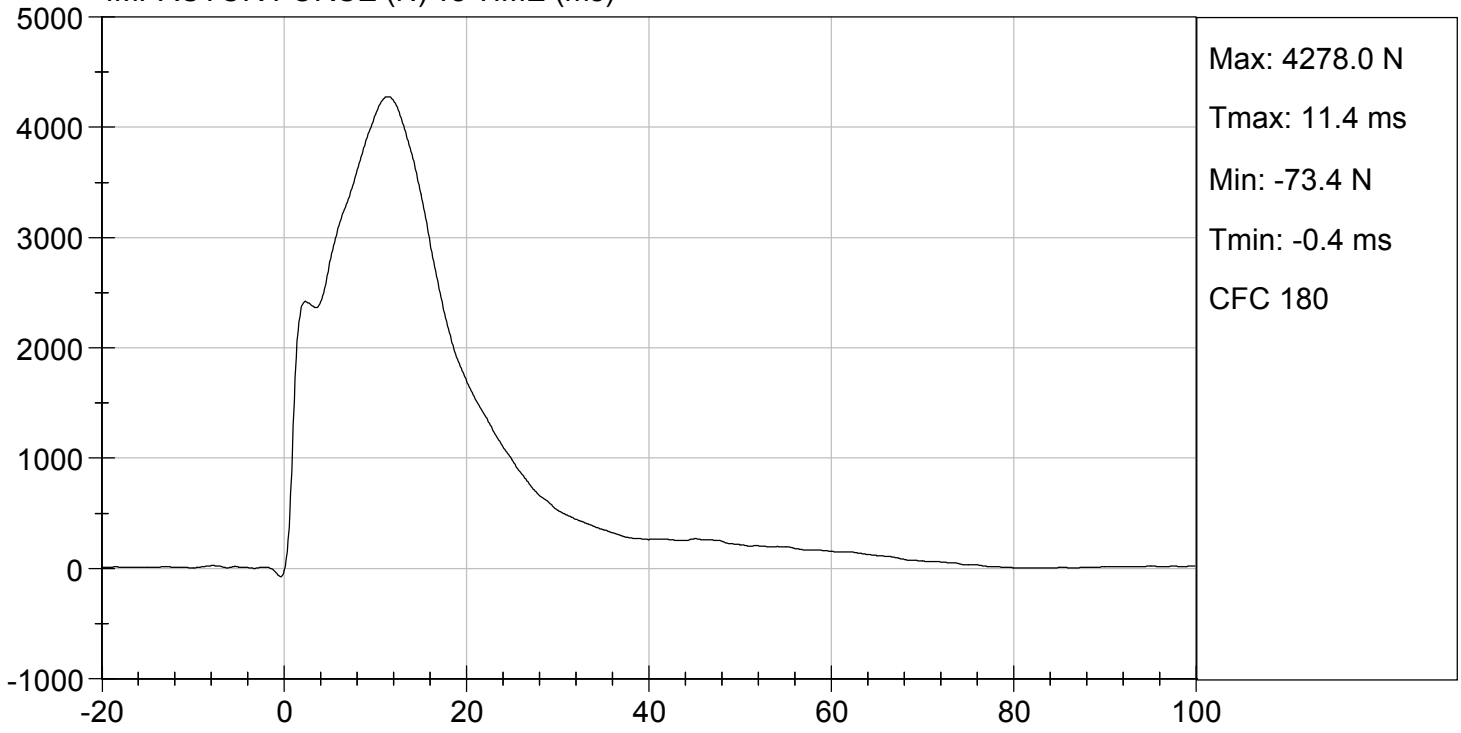
11/23/2020
Test Date

Approved By

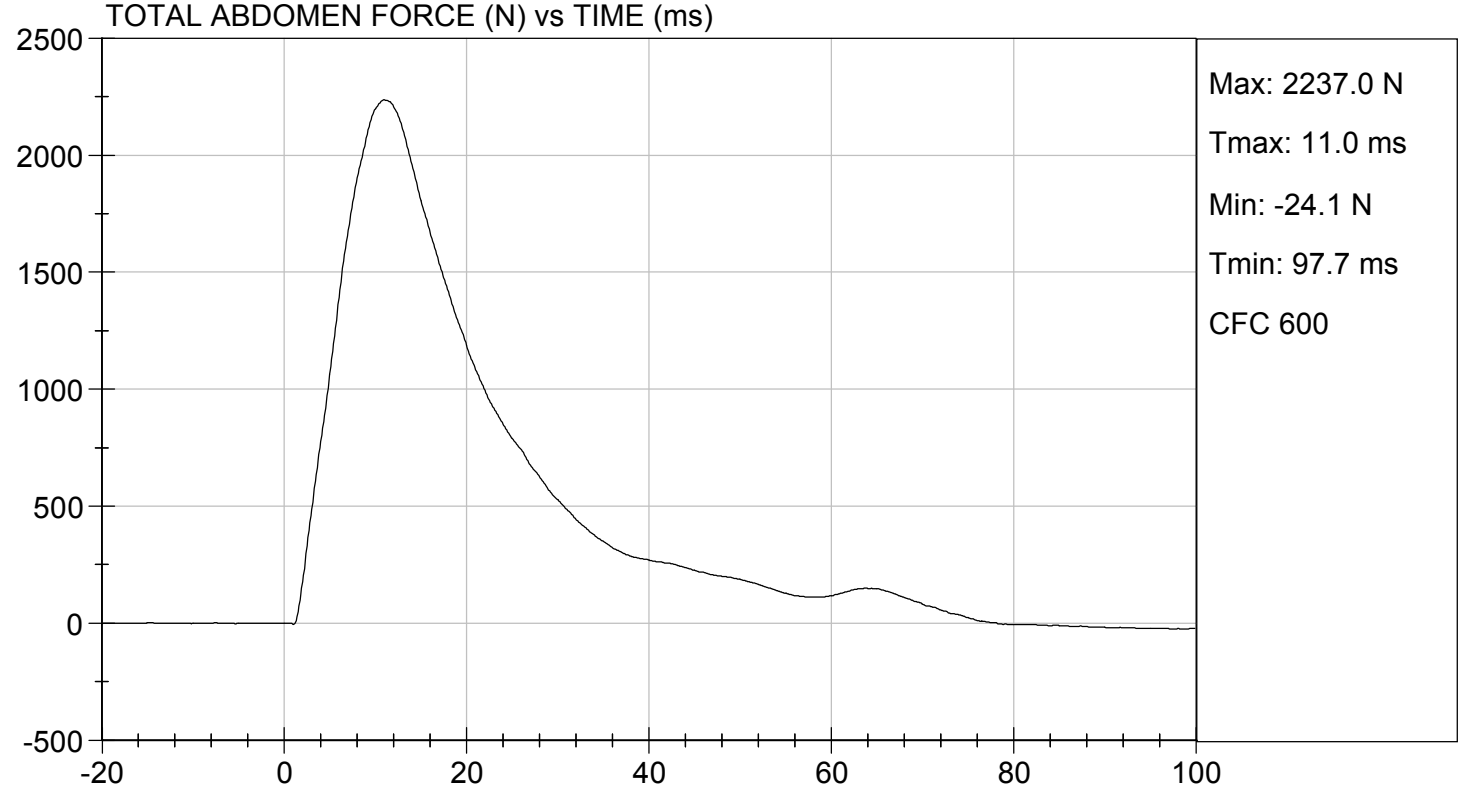
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/23/2020
TEST #: D203037

IMPACTOR FORCE (N) vs TIME (ms)



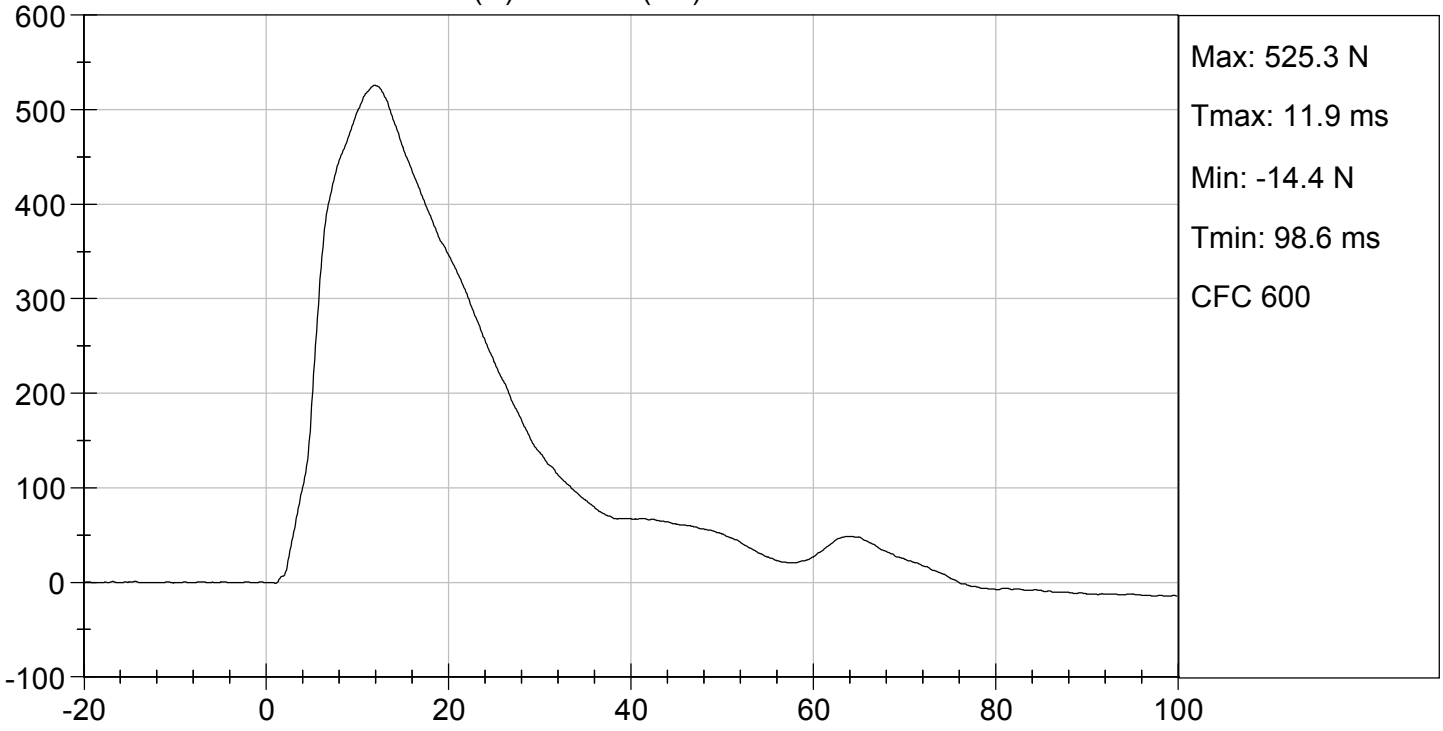
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



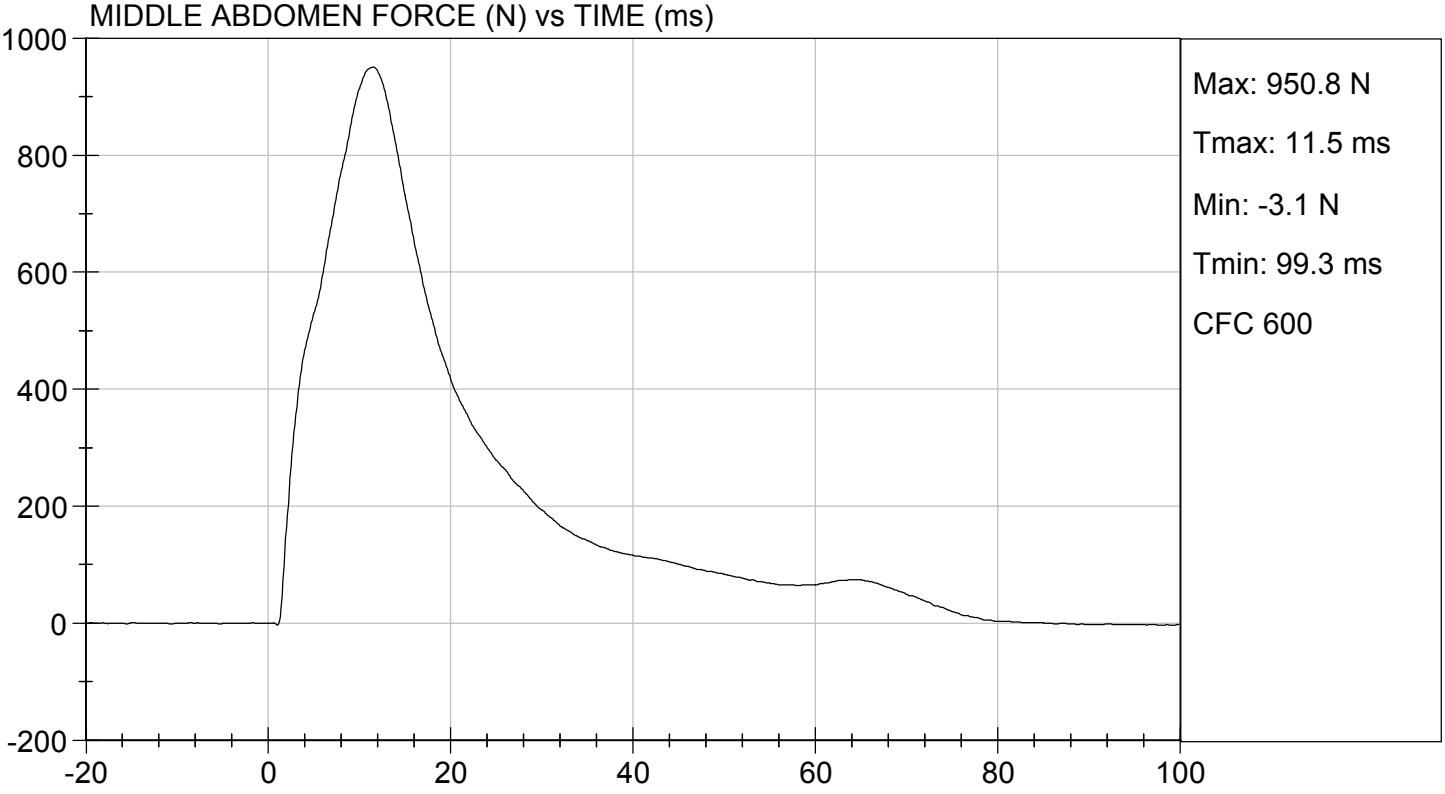
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/23/2020
TEST #: D203037

FRONT ABDOMEN FORCE (N) vs TIME (ms)



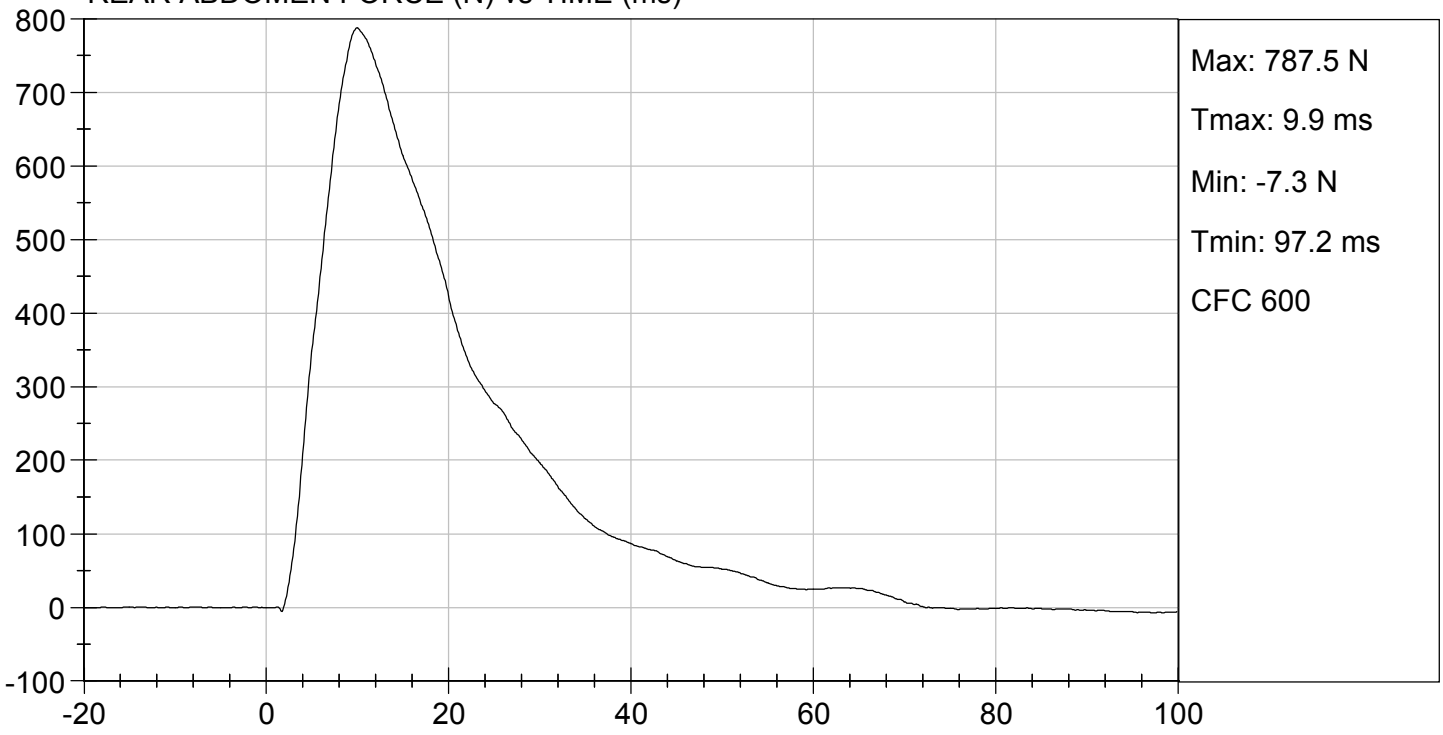
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.33 ft/s, 4.06 m/s

TEST DATE: 11/23/2020
TEST #: D203037

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203038

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.03	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.403	Pass
	27 ms	m/s	-6.50 to -5.80	-6.10	Pass
	30 ms	m/s	>= -6.50	-5.99	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.2	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	46.0	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	37	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

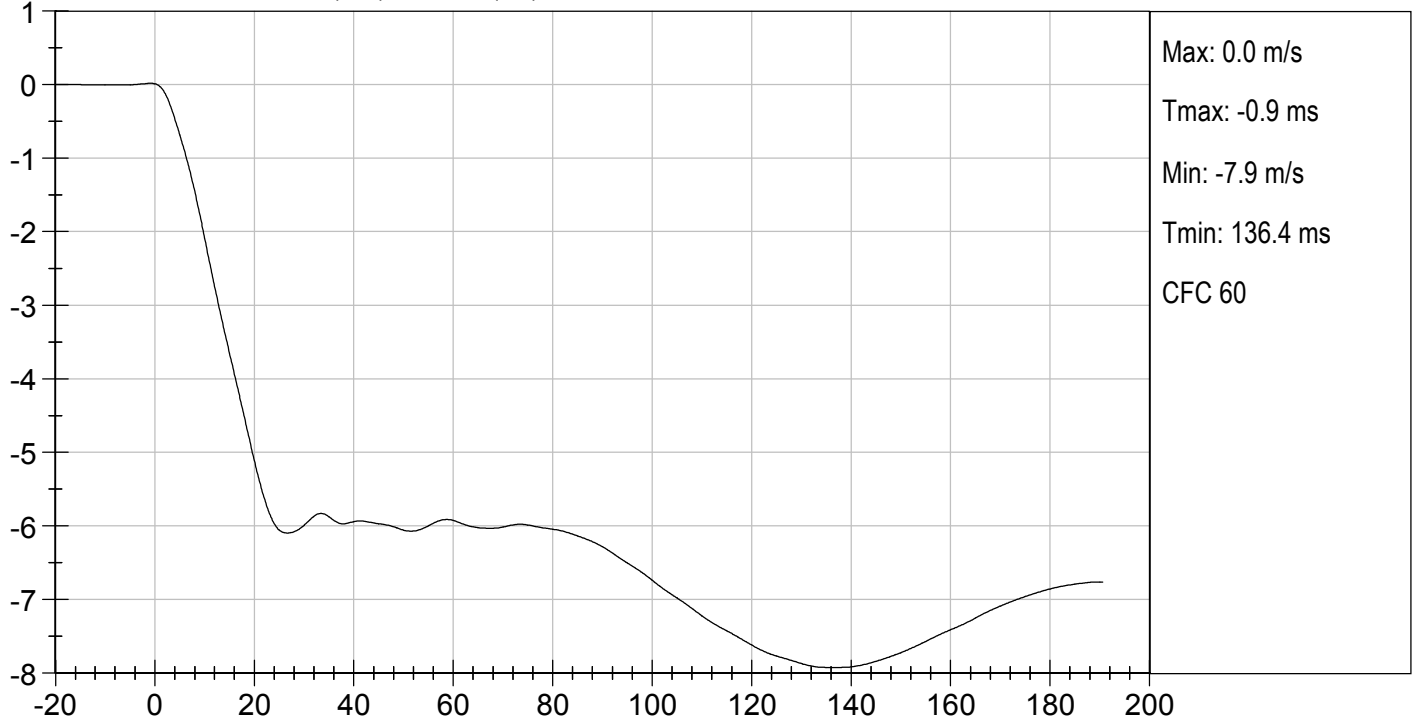
11/23/2020
Test Date

Approved By

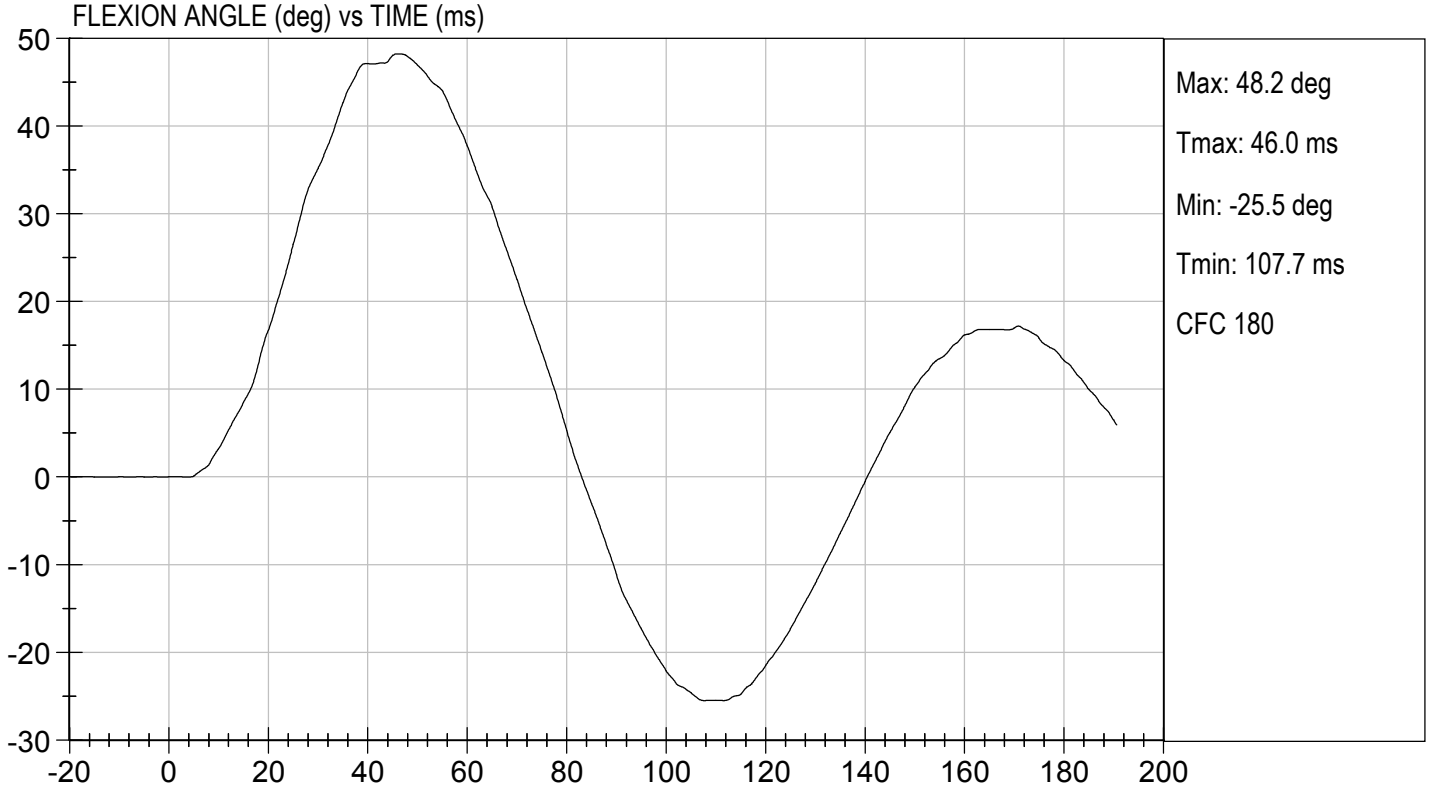
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/23/2020
TEST #: D203038

PENDULUM VELOCITY (m/s) vs TIME (ms)



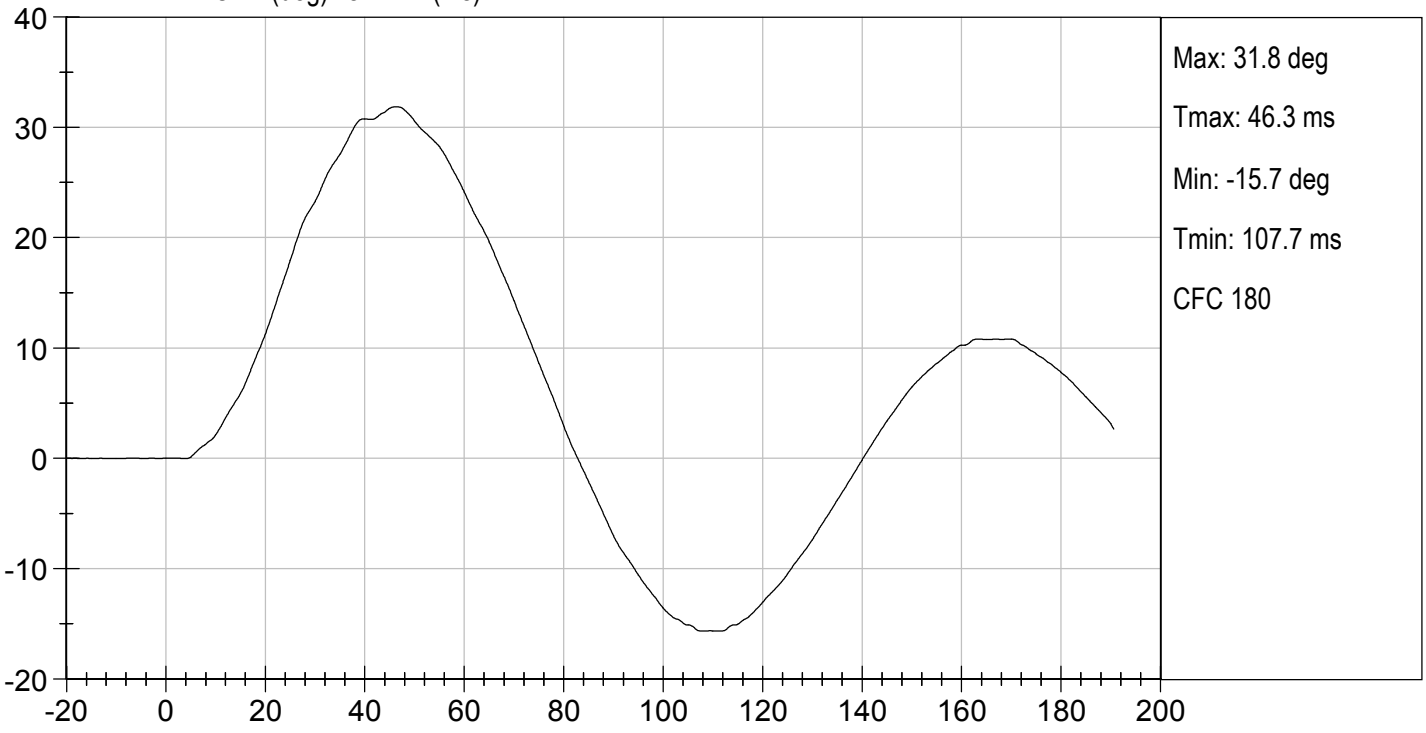
FLEXION ANGLE (deg) vs TIME (ms)



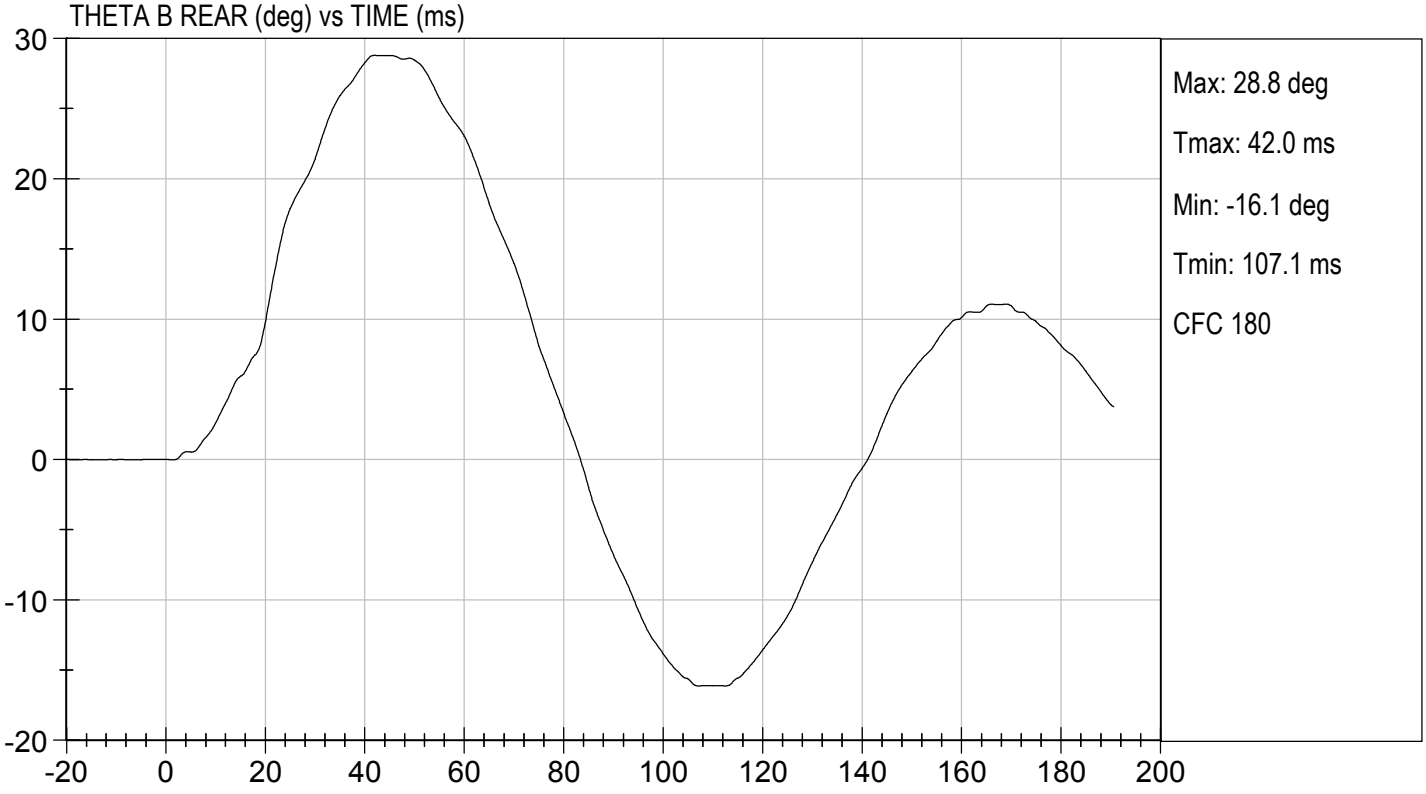
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/23/2020
TEST #: D203038

THETA A FRONT (deg) vs TIME (ms)

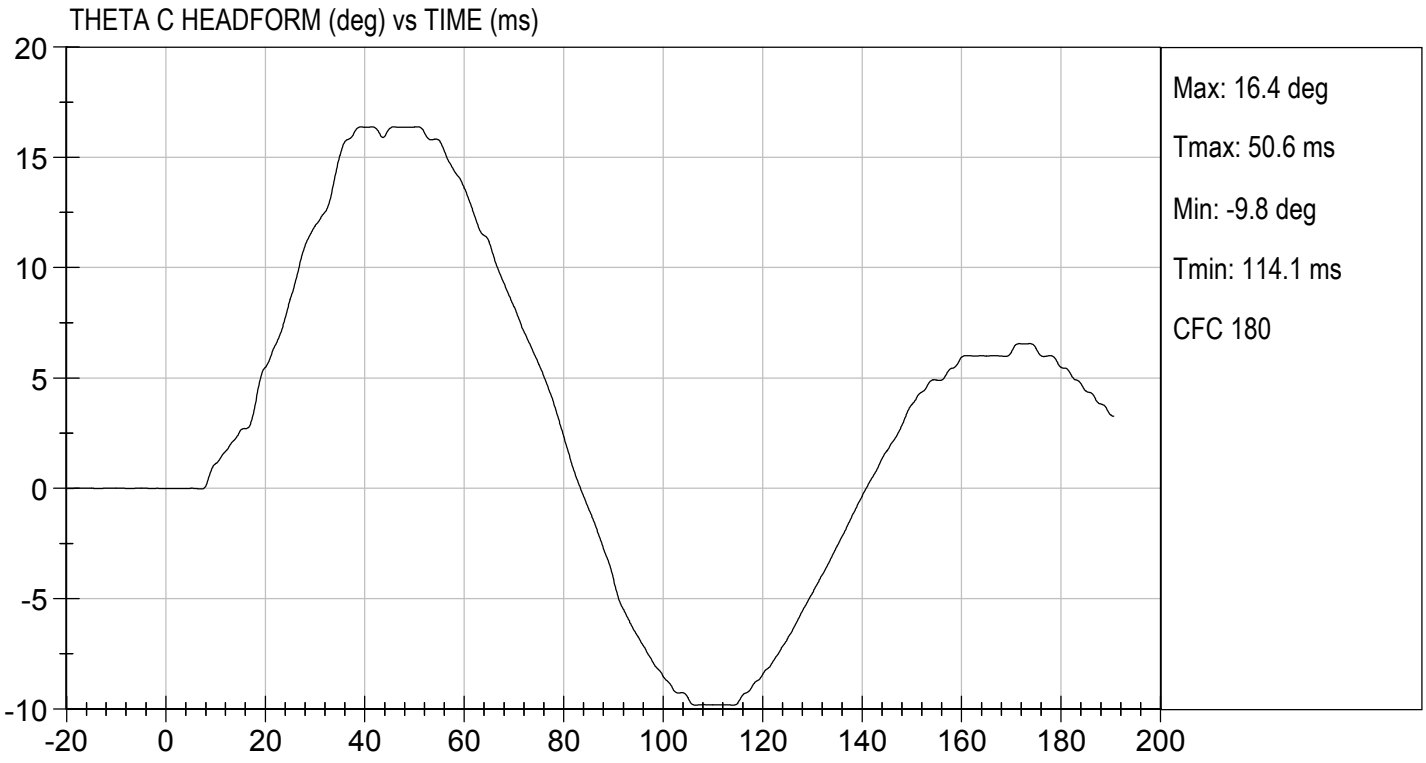


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 11/23/2020
TEST #: D203038



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203039

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	4.20 to 4.40	4.23	Pass
Maximum Impactor Force	N	4700 to 5400	5135	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.5	Pass
Maximum Pubic Force	N	1230 to 1590	1398	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.5	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

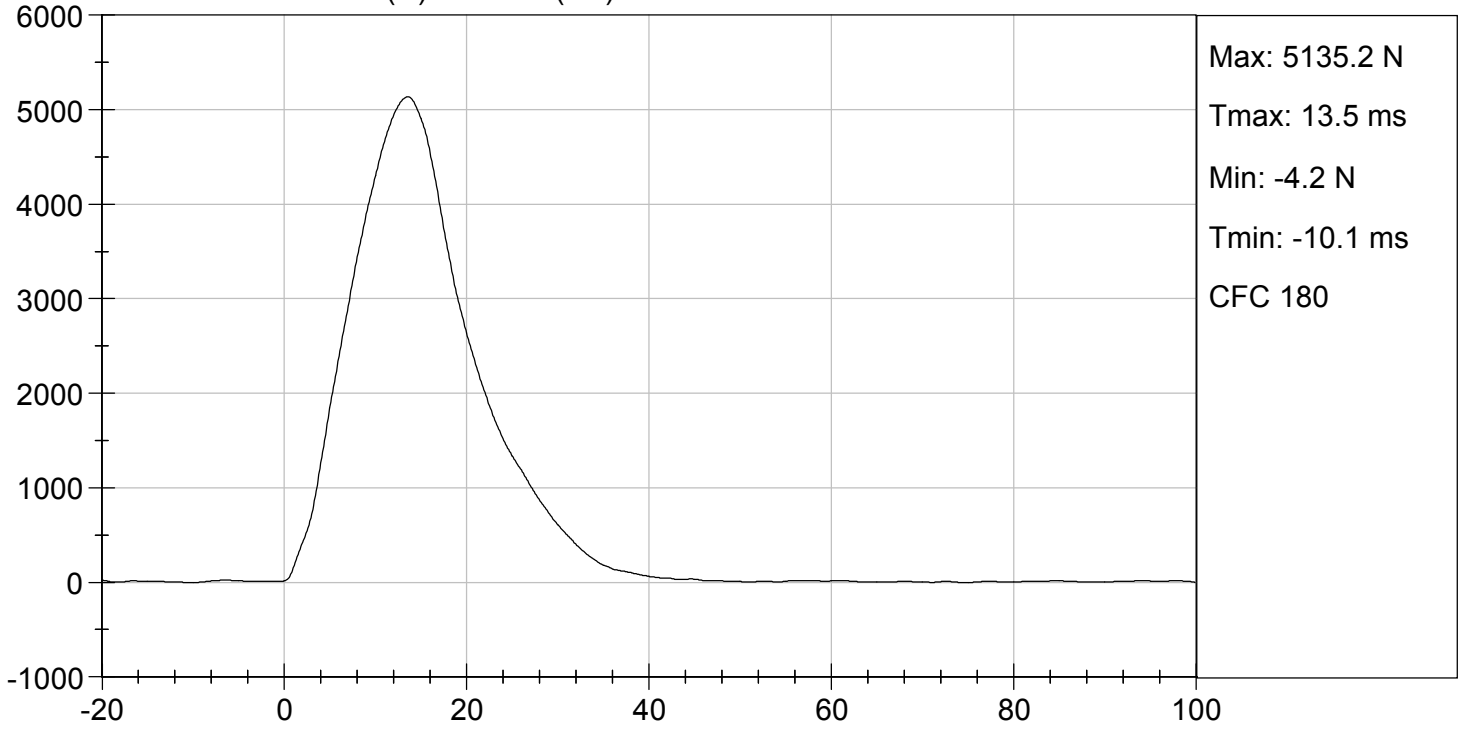
11/23/2020
Test Date

Approved By

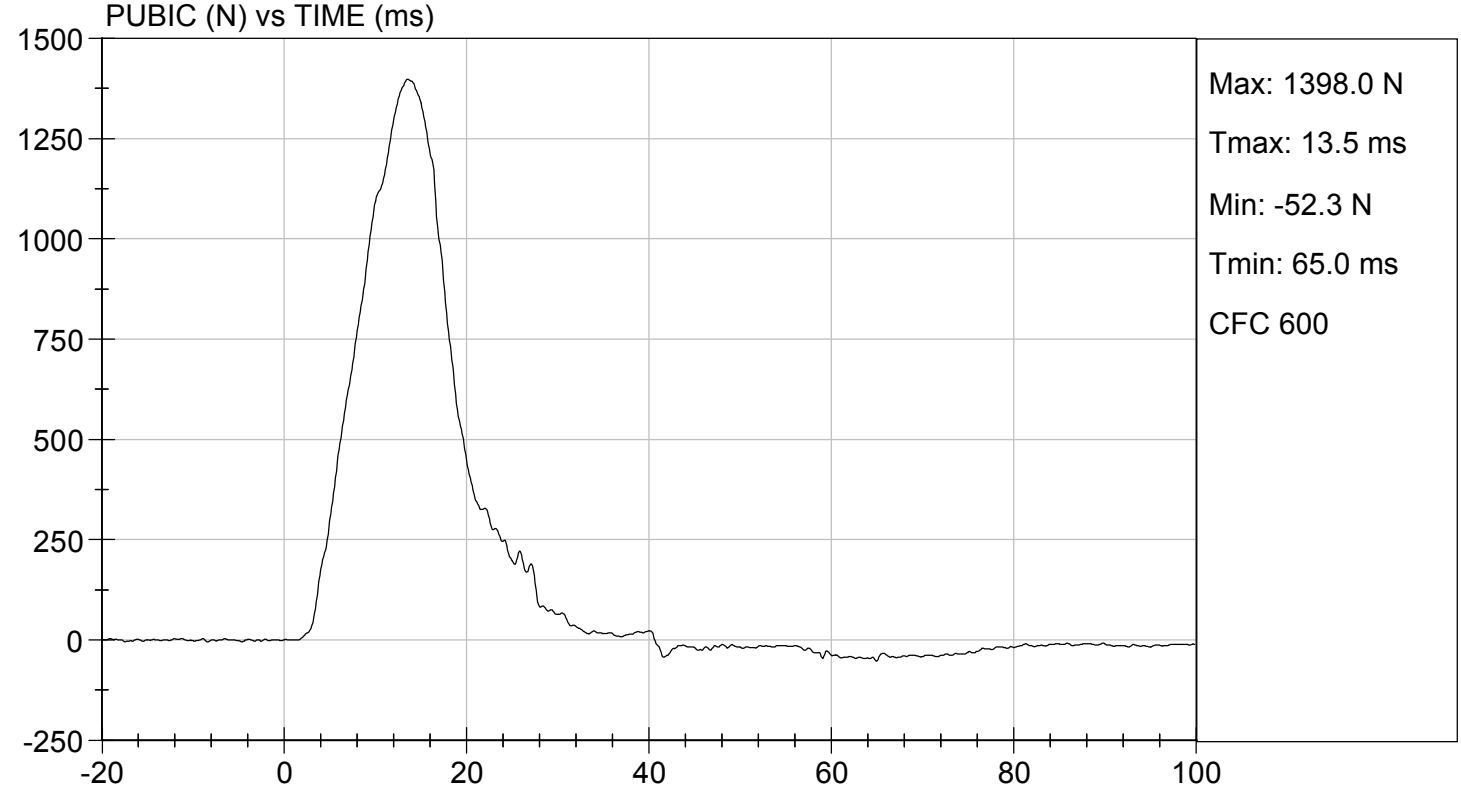
TEST DESC: PELVIS IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 11/23/2020
TEST #: D203039

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203030

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	24	Pass
Probe Speed	m/s	5.40 to 5.60	5.58	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5607	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.0	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.7	Pass
Lower Rib Displacement	mm	37.0 to 44.0	41.5	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

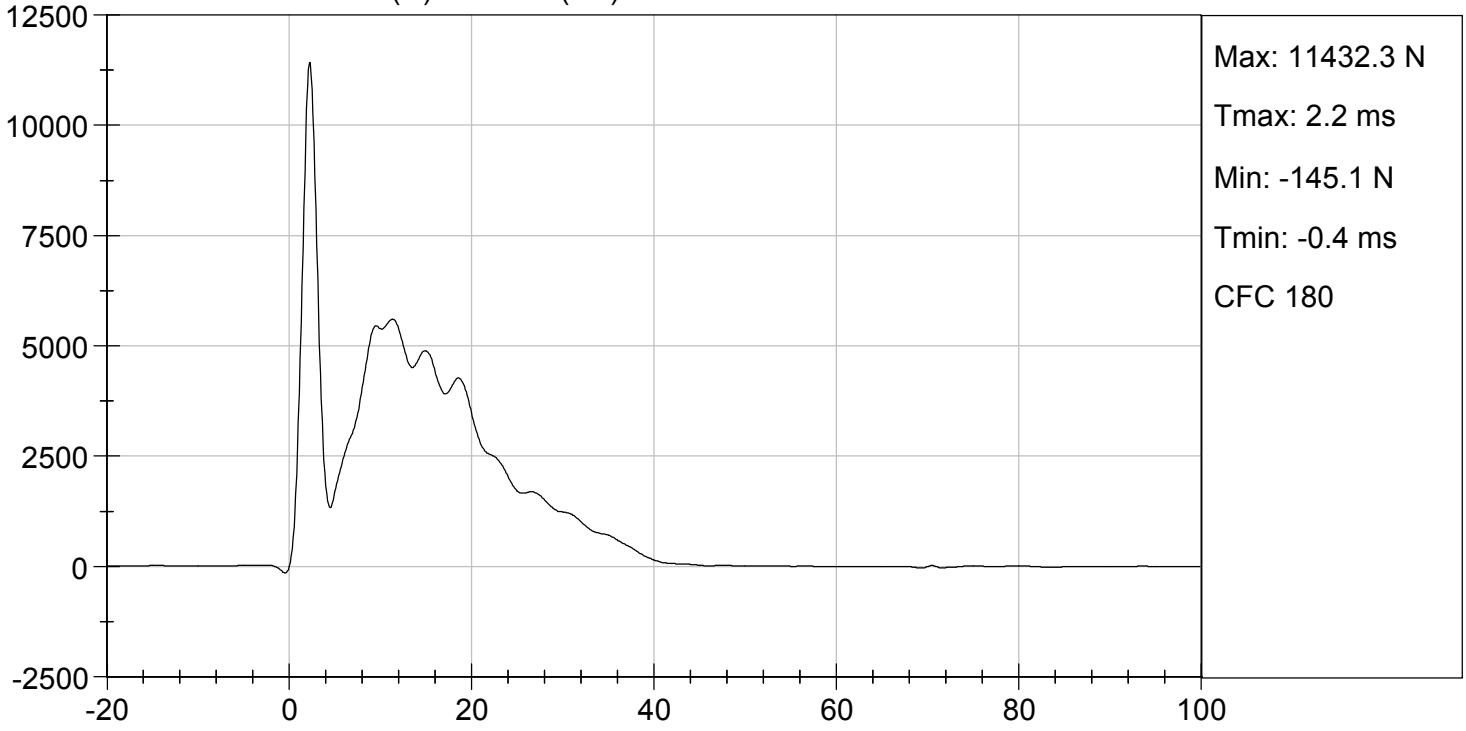
11/23/2020
Test Date

Approved By

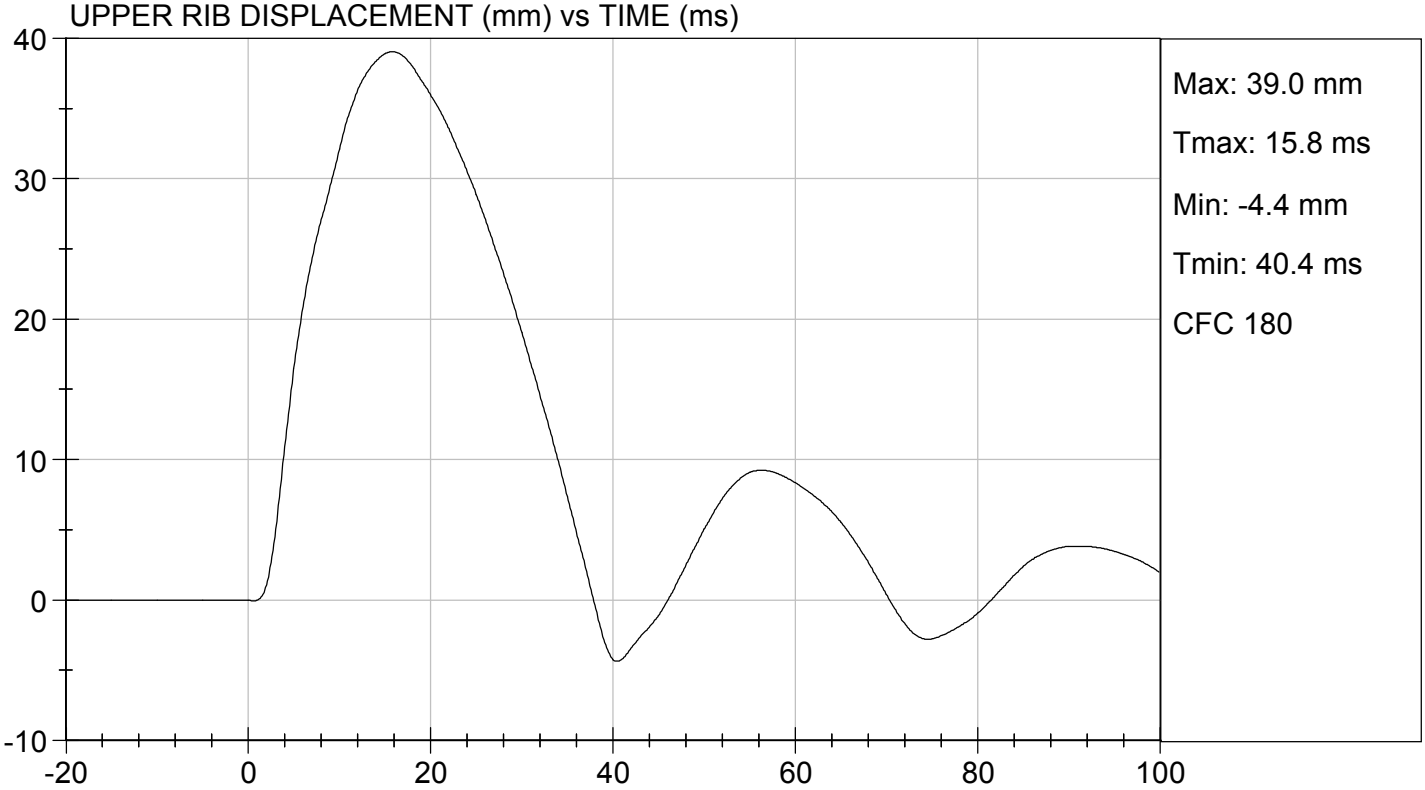
TEST DESC: THORAX IMPACT
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/23/2020
TEST #: D203030

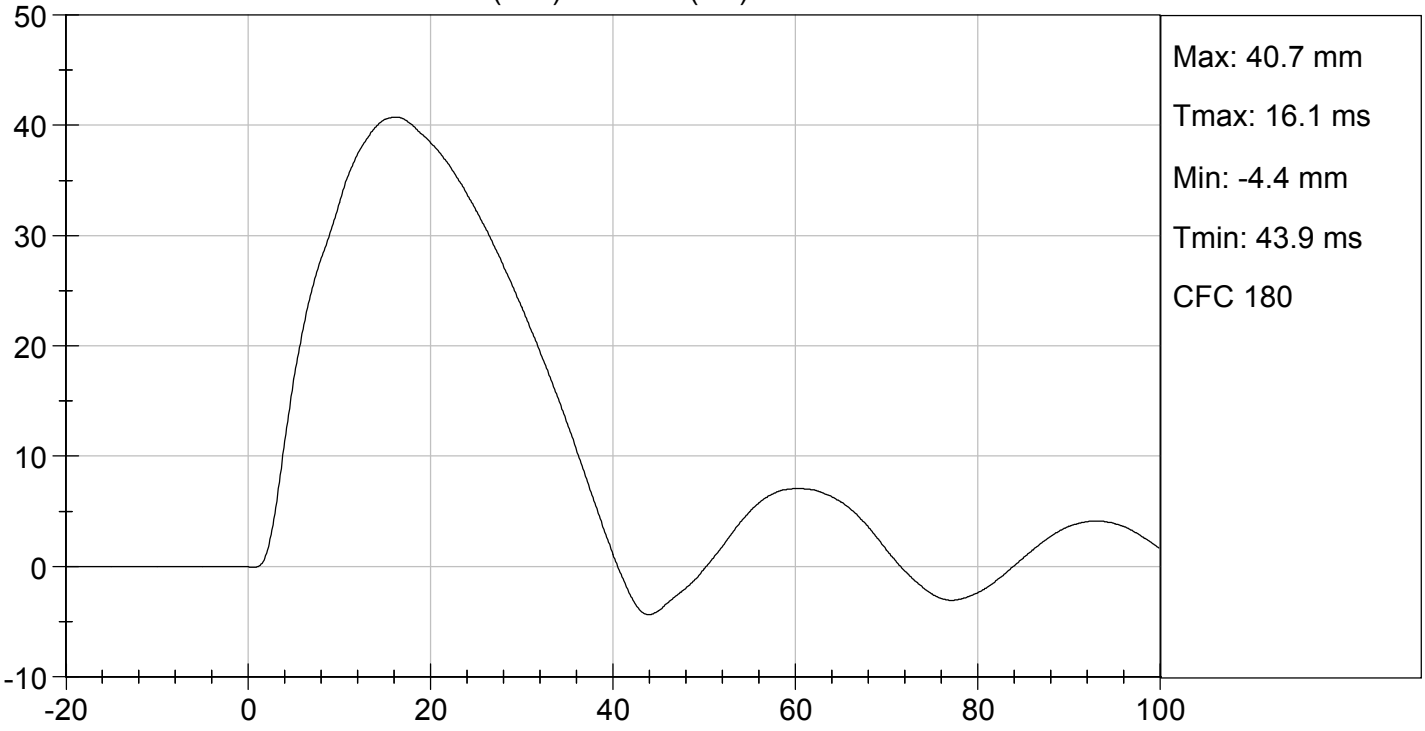
IMPACTOR FORCE (N) vs TIME (ms)



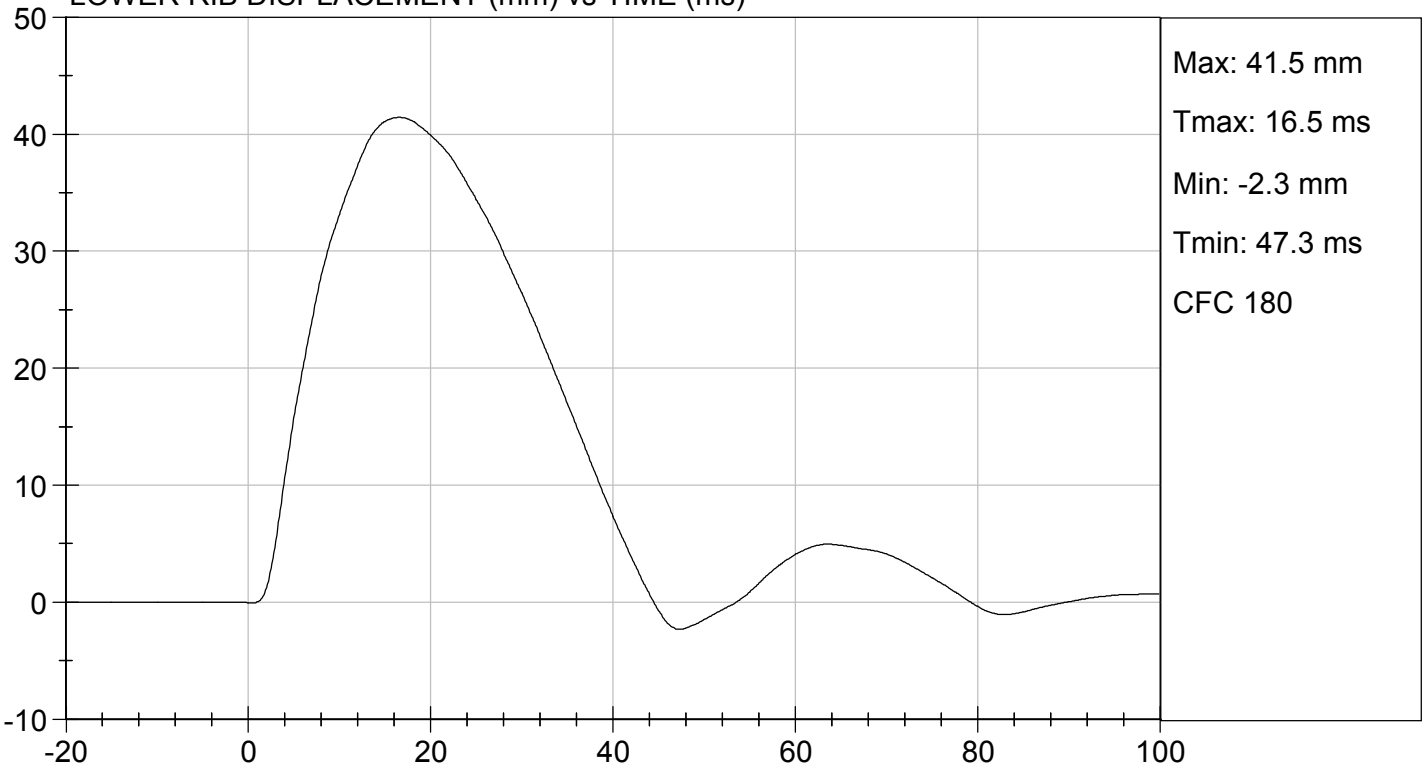
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

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

MGA RESEARCH CORPORATION

HEAD DROP TEST

ES-2re DUMMY

ATD Serial No: F032 **Test ID:** D203181

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	125 to 155	141	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	7.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
		Overall Test Results		Pass

Gerald Guerrero
Laboratory Technician

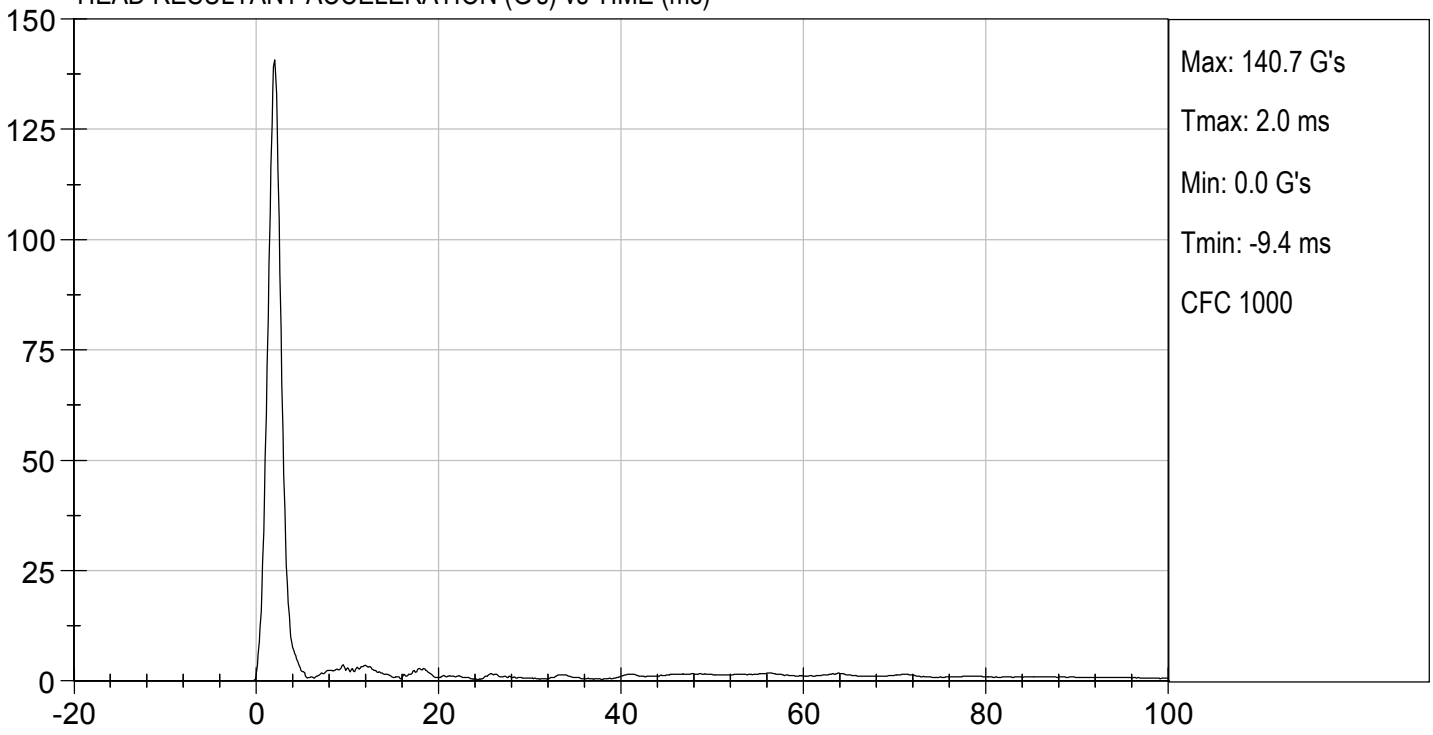
12/07/2020
Test Date

Approved By

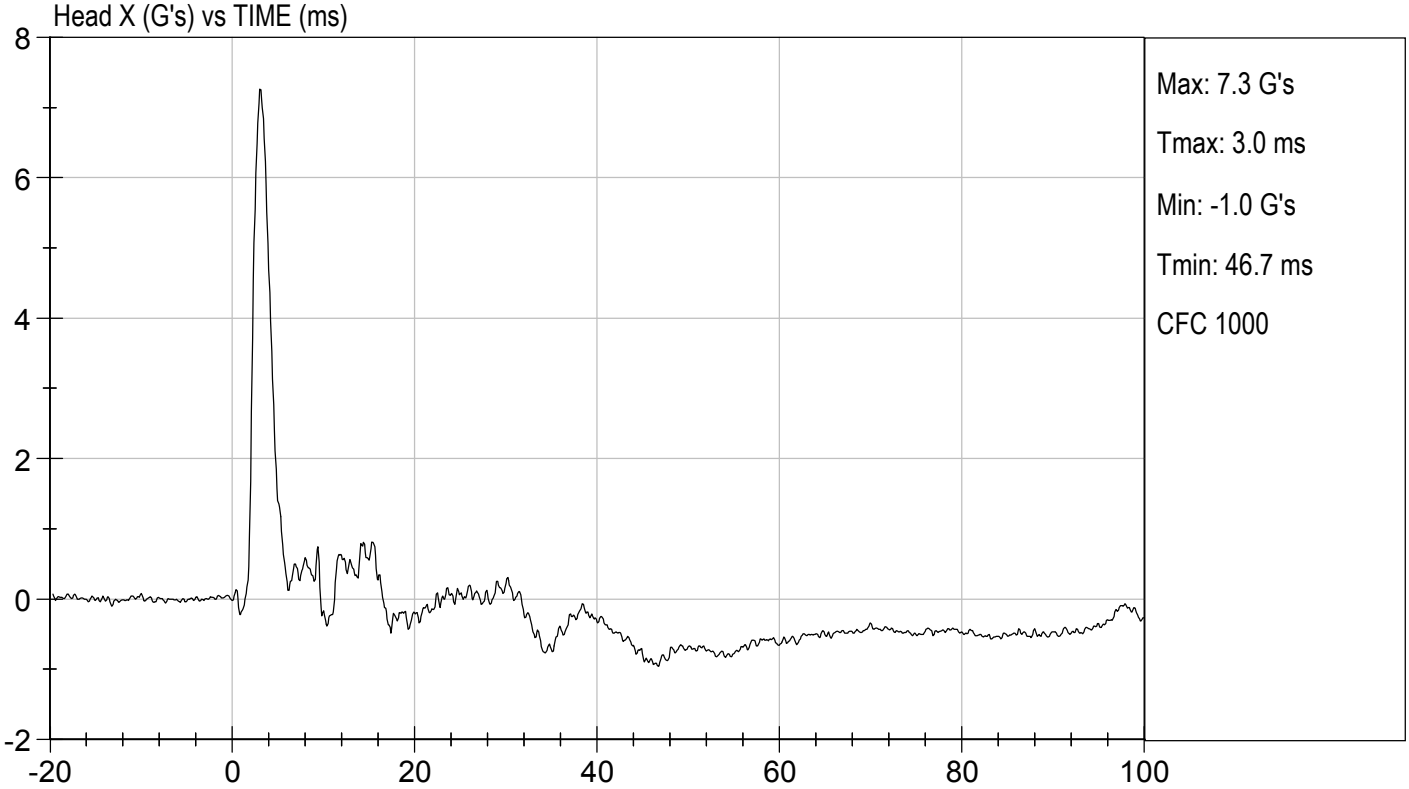
TEST DESC: HEAD DROP

TEST DATE: 12/07/2020
TEST #: D203181

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

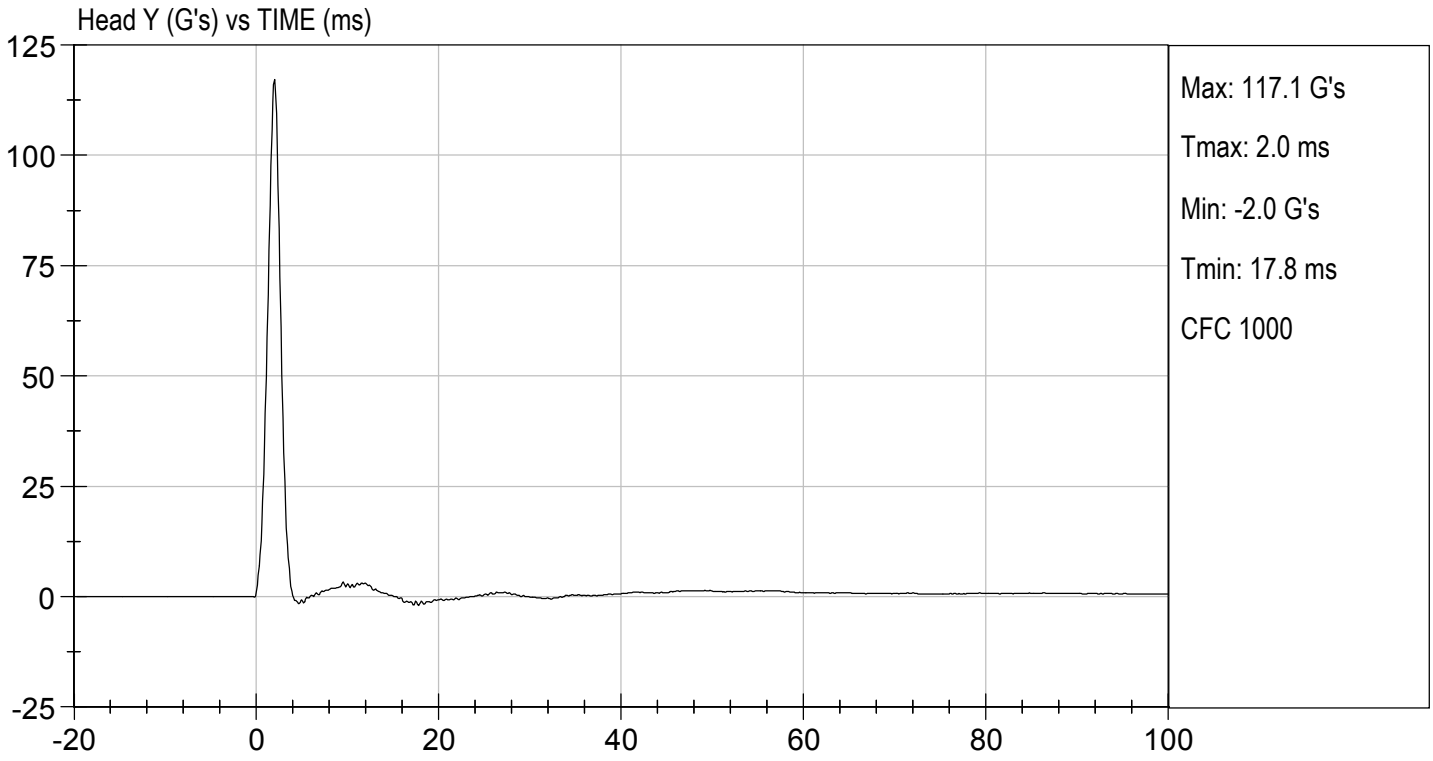


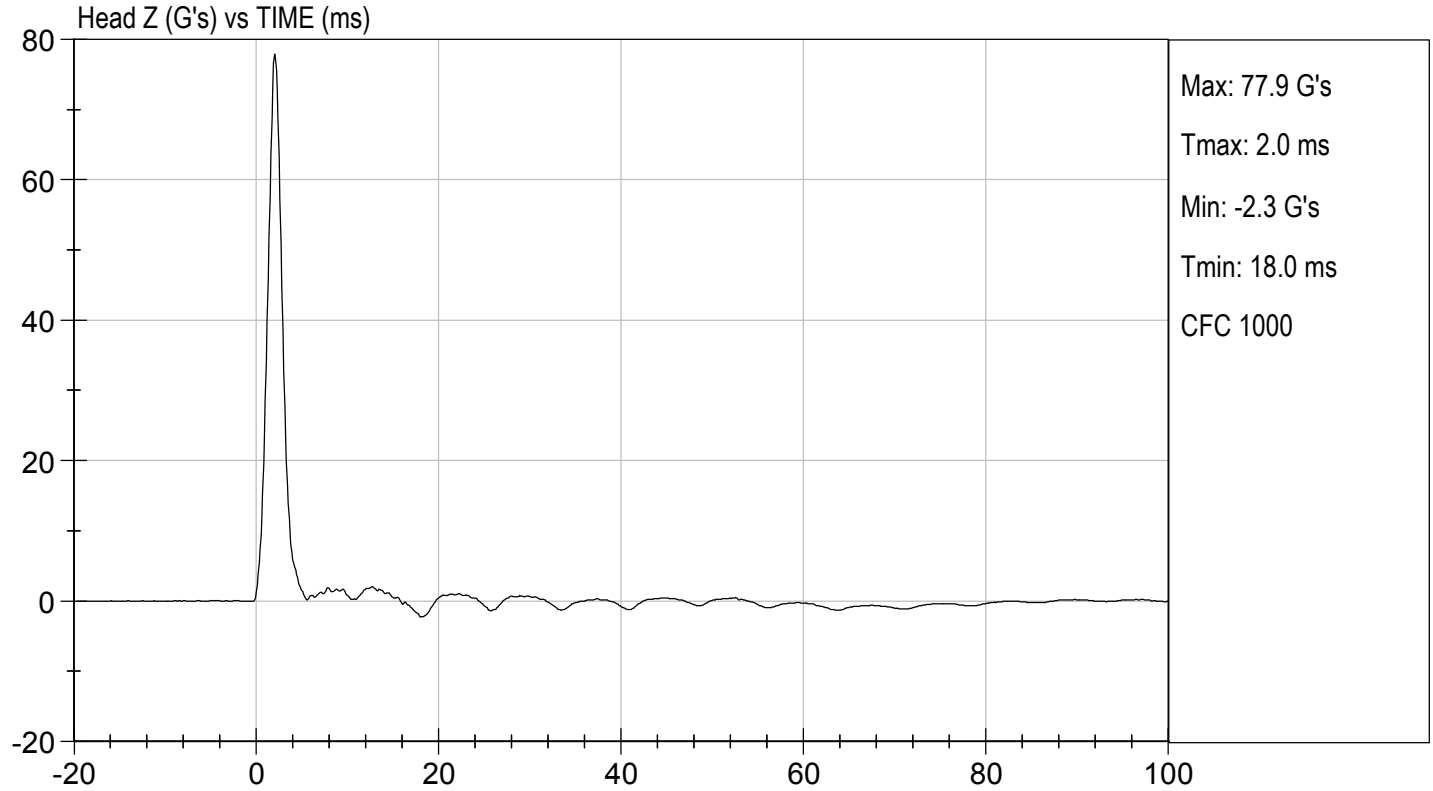
Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 12/07/2020
TEST #: D203181





MGA RESEARCH CORPORATION

NECK PENDULUM TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203182

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.50	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.51	Pass
	17 ms	m/s	>= -3.70	-3.51	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.0	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	58.9	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	58.7	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

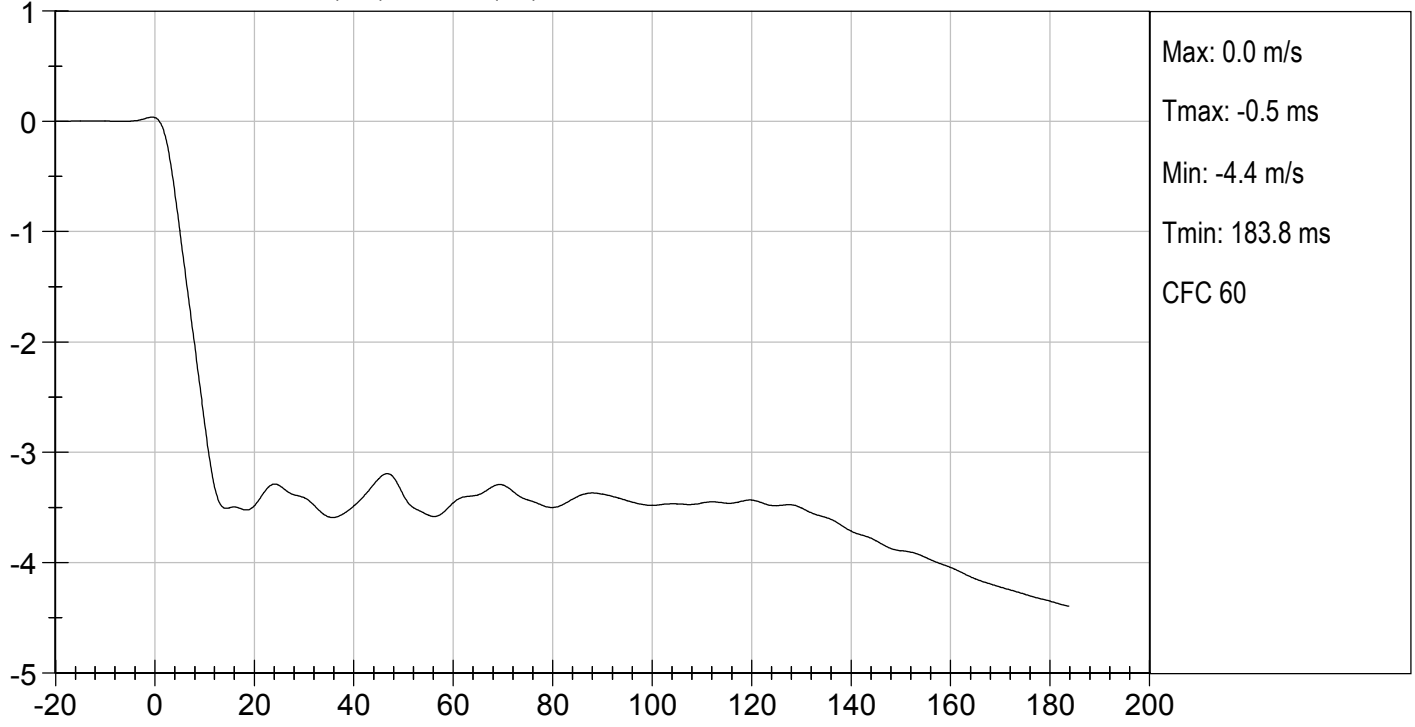
12/07/2020
Test Date

Approved By

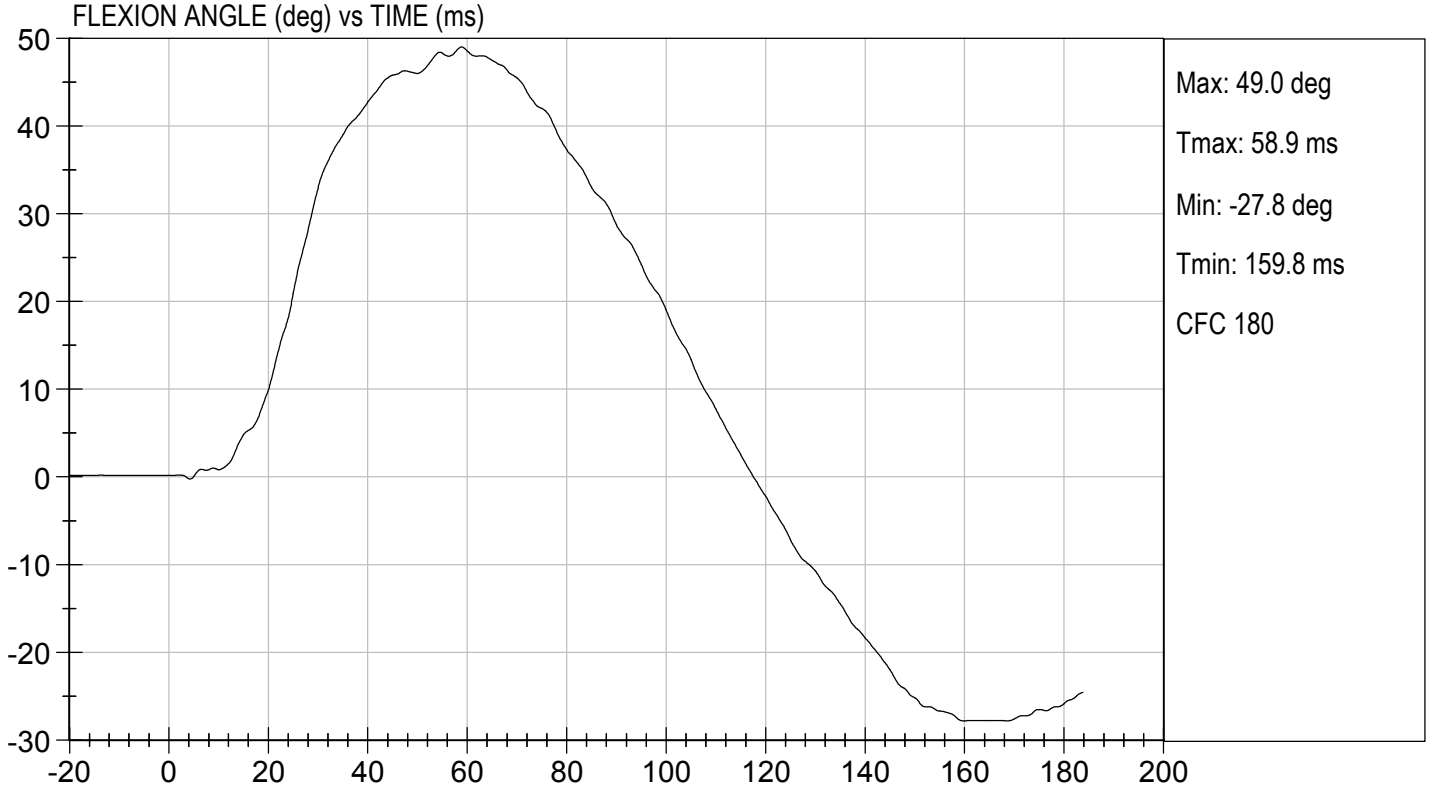
TEST DESC: NECK BENDING
VELOCITY: 11.49 ft/s, 3.50 m/s

TEST DATE: 12/07/2020
TEST #: D203182

PENDULUM VELOCITY (m/s) vs TIME (ms)



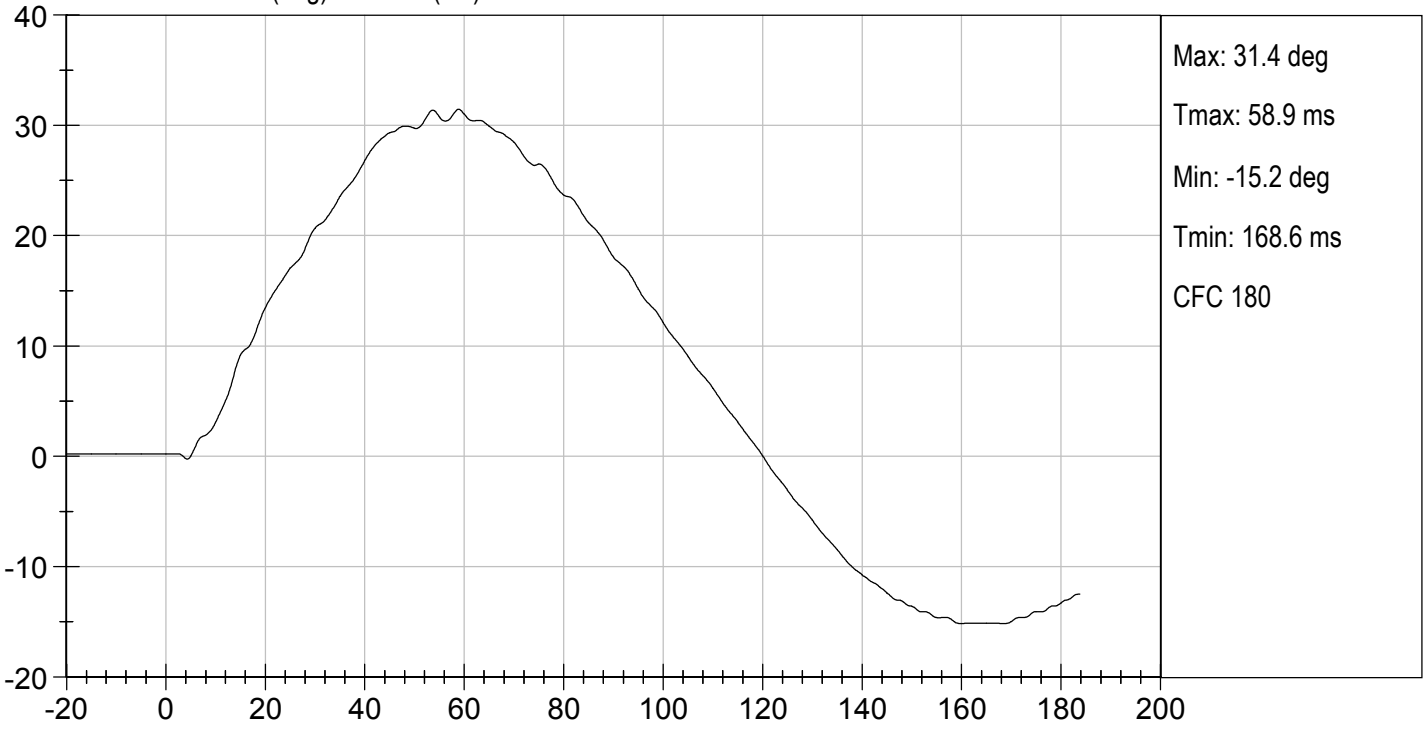
FLEXION ANGLE (deg) vs TIME (ms)



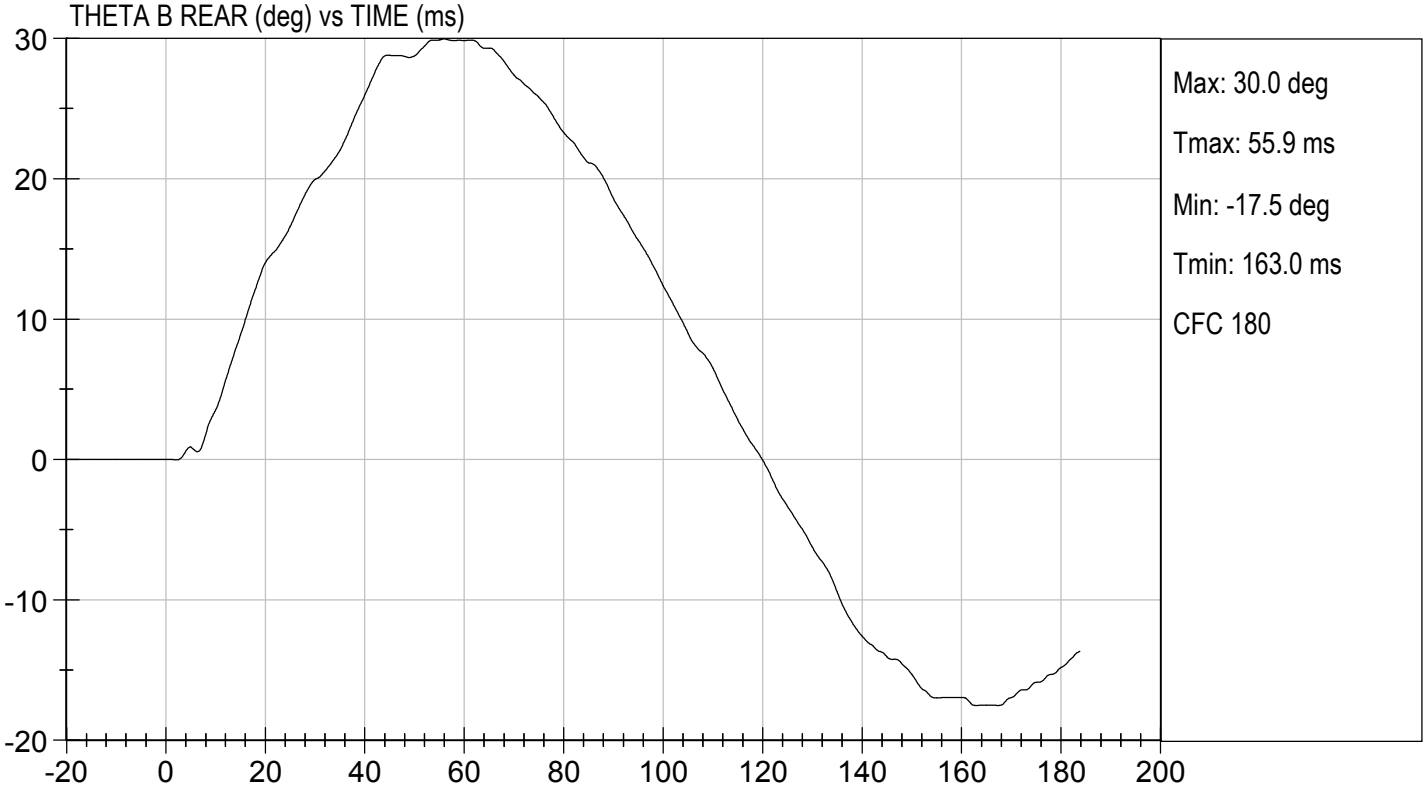
TEST DESC: NECK BENDING
VELOCITY: 11.49 ft/s, 3.50 m/s

TEST DATE: 12/07/2020
TEST #: D203182

THETA A FRONT (deg) vs TIME (ms)

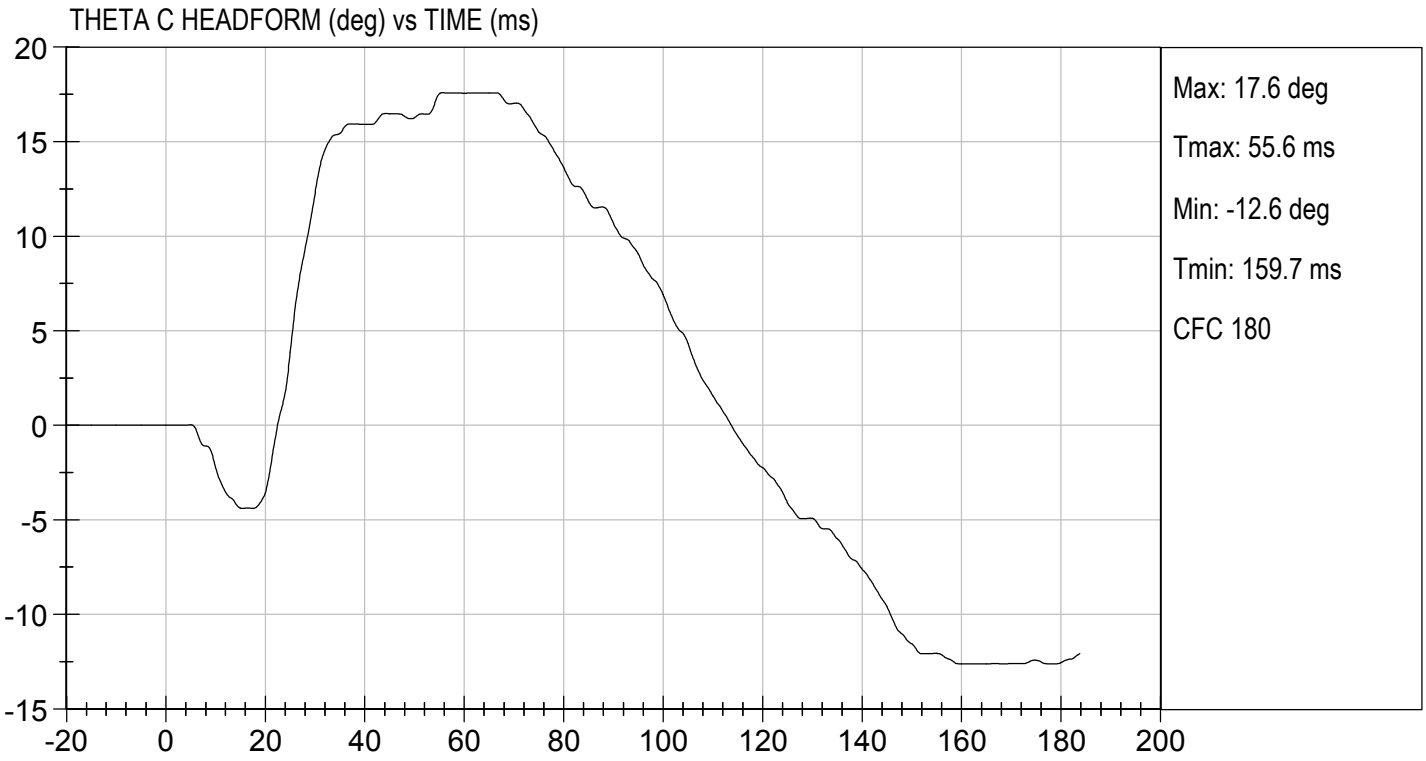


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 12/07/2020
TEST #: D203182



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203183

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.3	Pass
		Overall Test Results		Pass

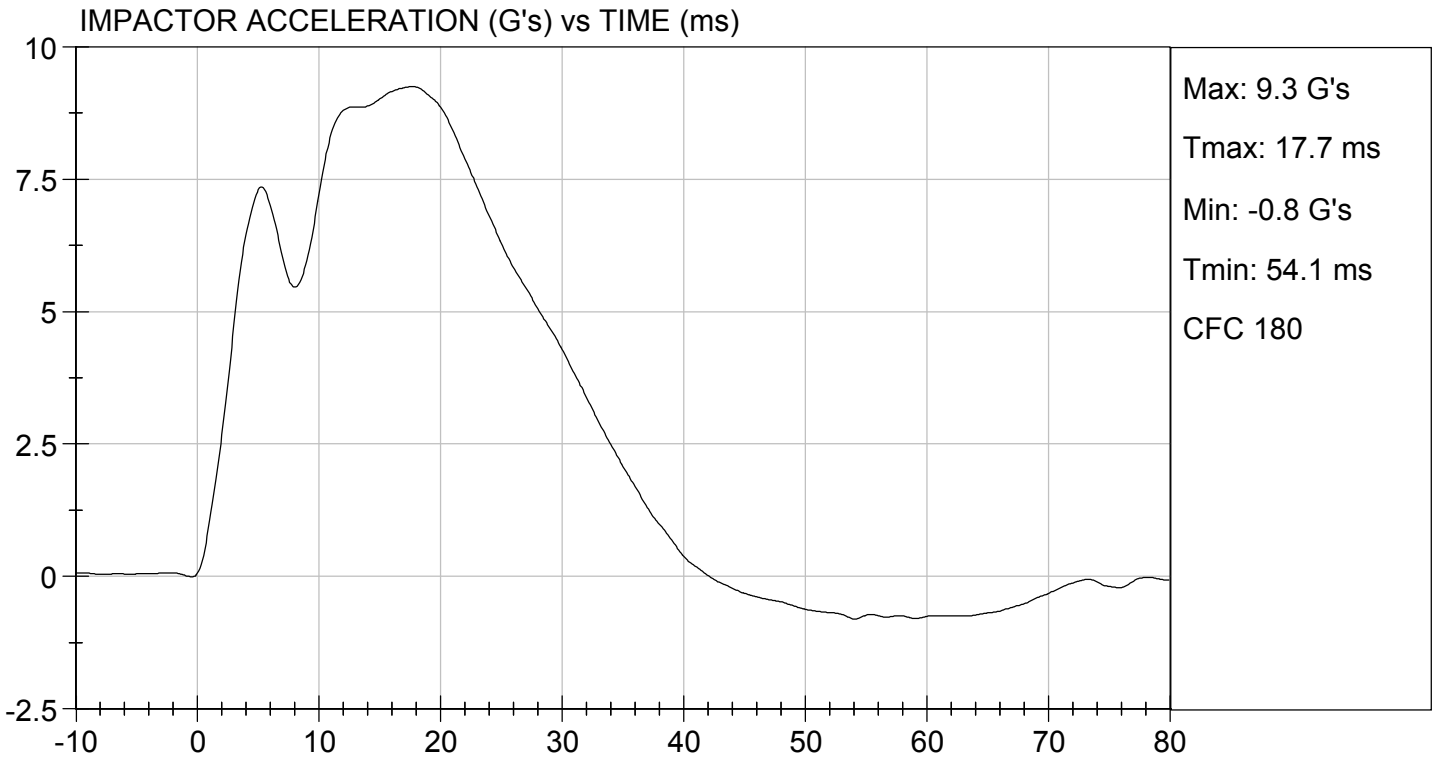
Gerald Guerrero
Laboratory Technician

12/05/2020
Test Date

Approved By

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

TEST DATE: 12/05/2020
TEST #: D203183



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

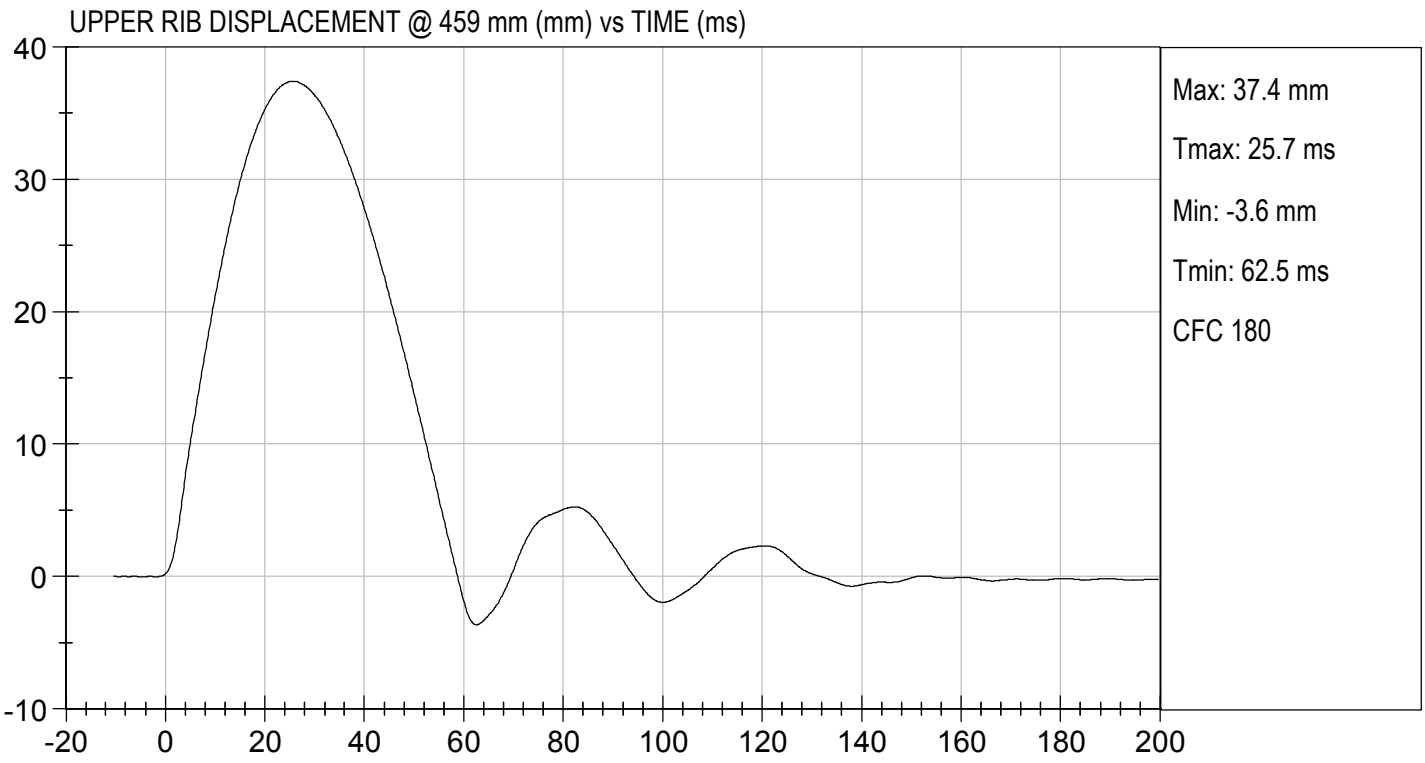
ATD Serial No: F032 **Test I.D:** D203184

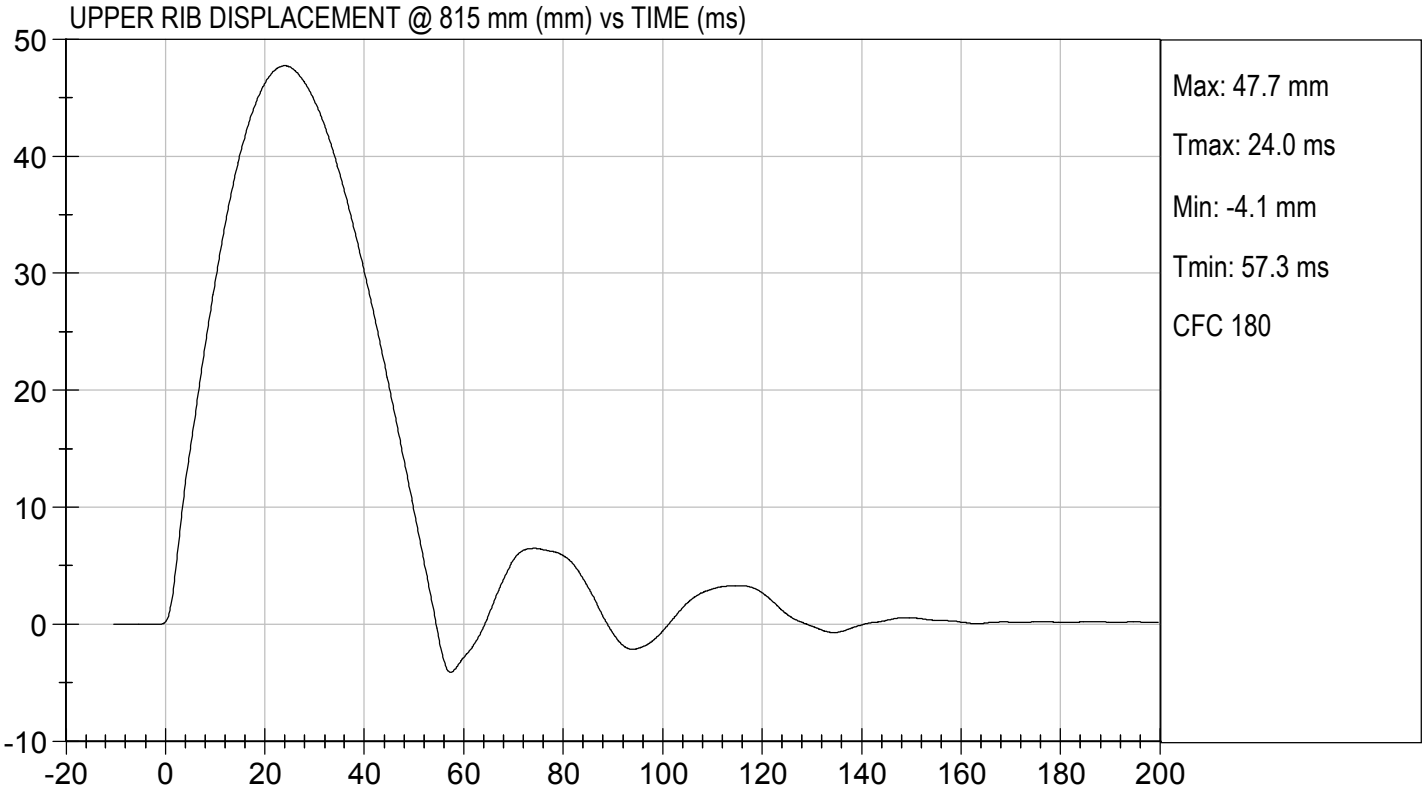
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.7	Pass
		Overall Test Results		Pass

Laboratory Technician

12/07/2020
Test Date

Approved By


UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 37.4 mm
Tmax: 25.7 ms
Min: -3.6 mm
Tmin: 62.5 ms
CFC 180


UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 47.7 mm
Tmax: 24.0 ms
Min: -4.1 mm
Tmin: 57.3 ms
CFC 180

MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

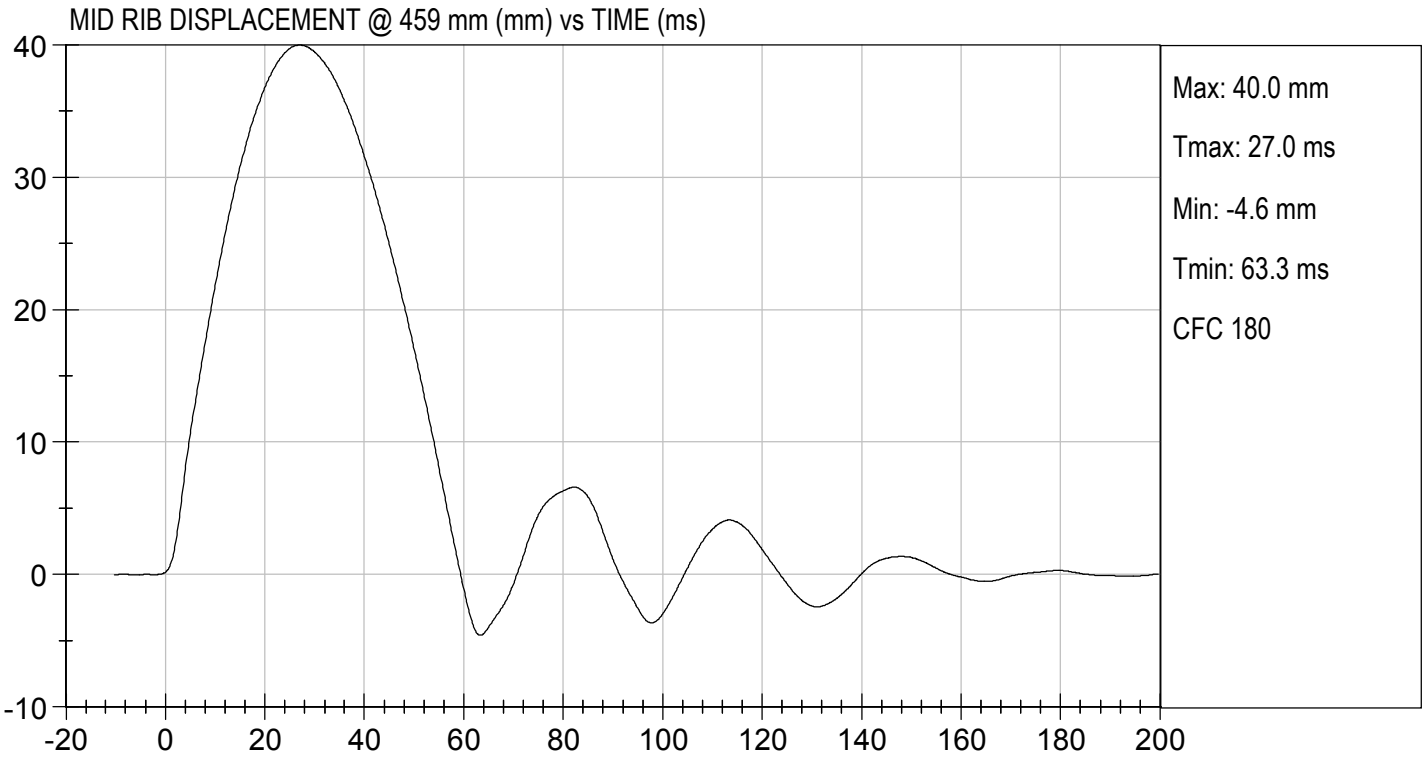
ATD Serial No: F032 **Test I.D:** D203185

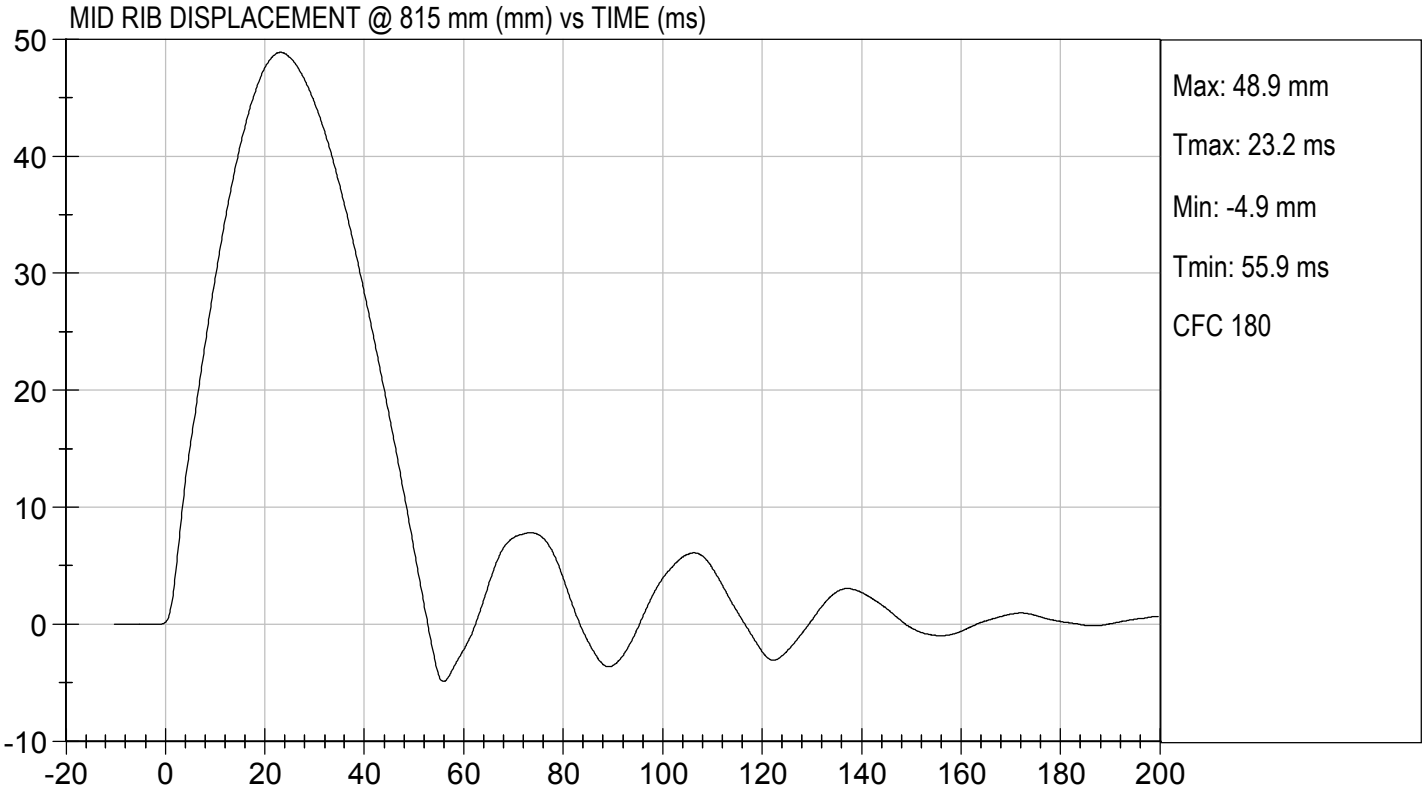
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Displacement at 459 mm	mm	36.0 to 40.0	40.0	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.9	Pass
		Overall Test Results		Pass

Laboratory Technician

12/07/2020
Test Date

Approved By


MID RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 40.0 mm
Tmax: 27.0 ms
Min: -4.6 mm
Tmin: 63.3 ms
CFC 180


MID RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 48.9 mm
Tmax: 23.2 ms
Min: -4.9 mm
Tmin: 55.9 ms
CFC 180

MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

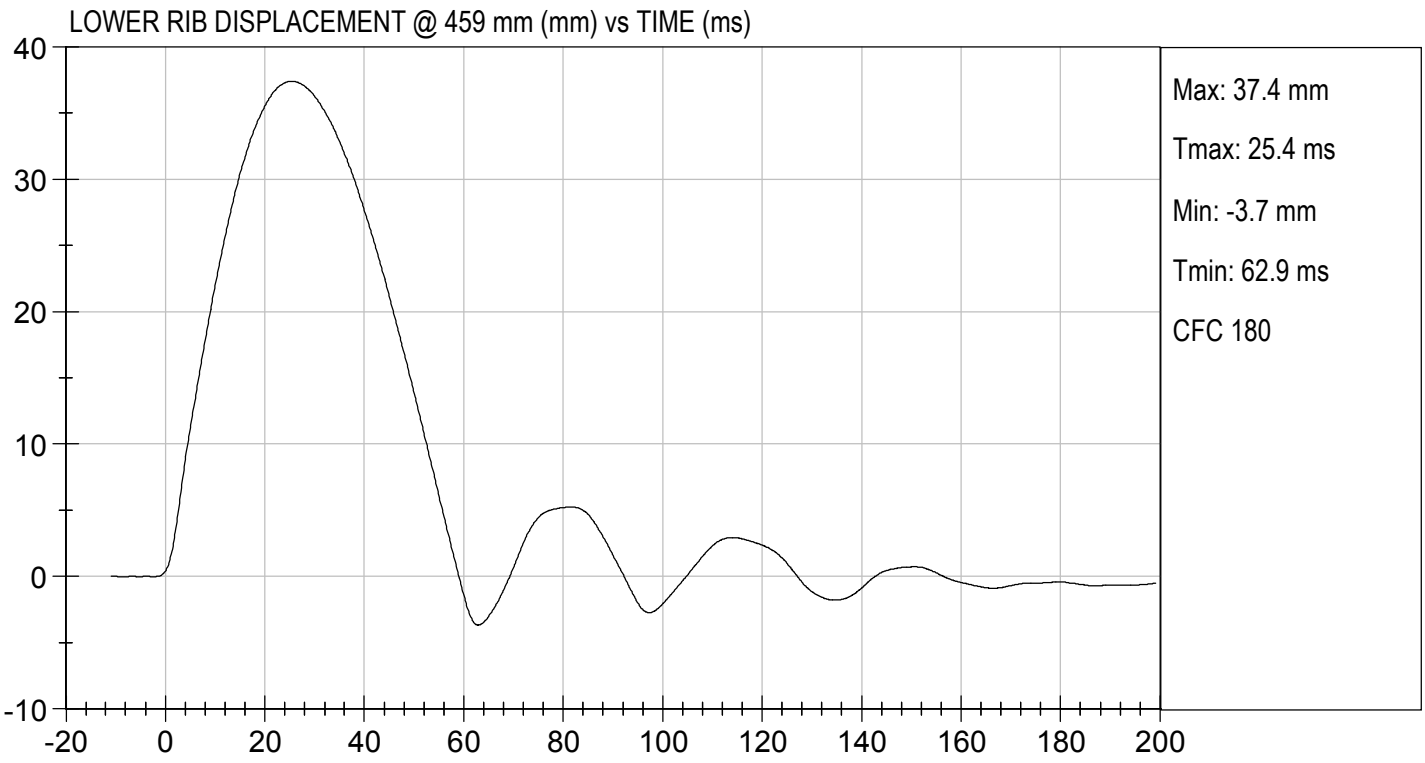
ATD Serial No: F032 **Test I.D:** D203186

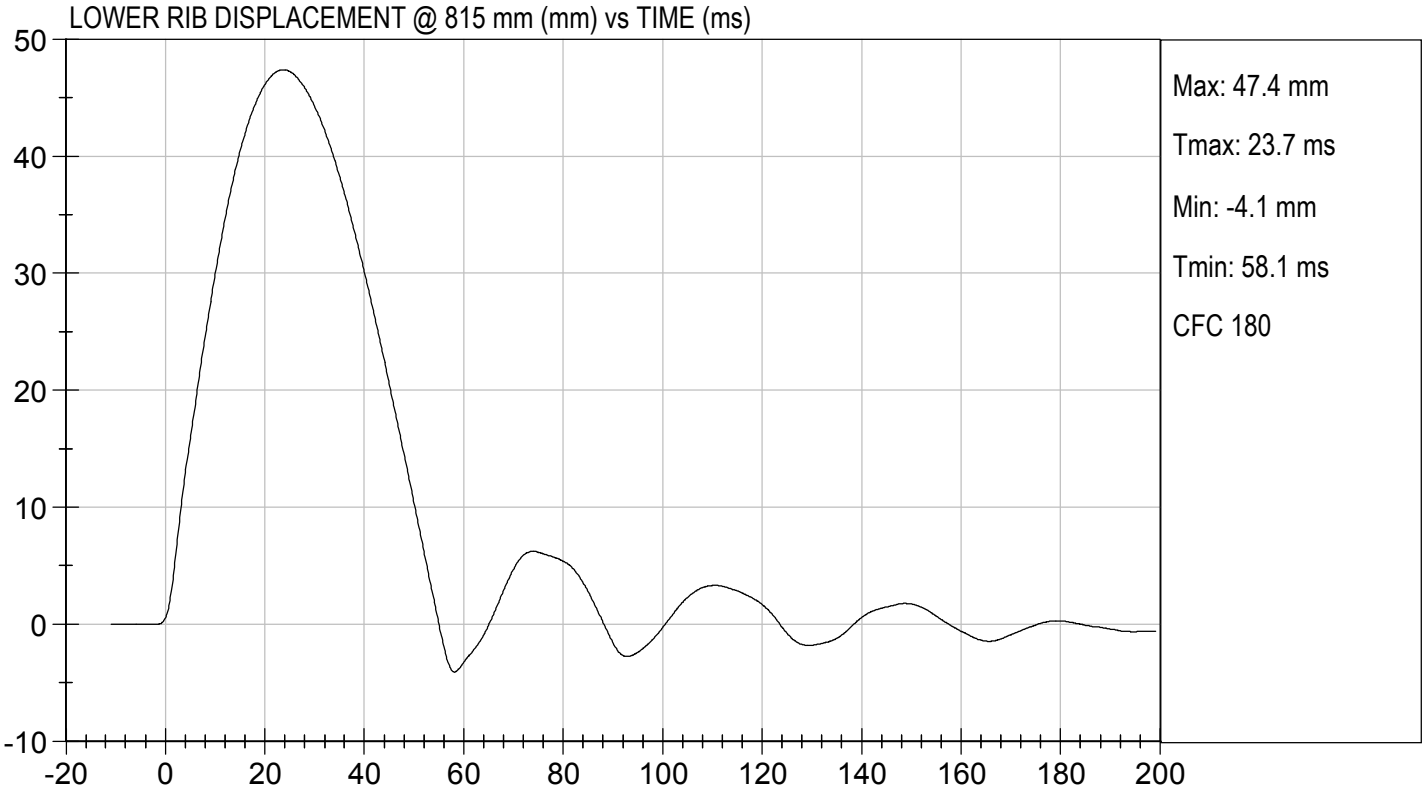
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.4	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.4	Pass
		Overall Test Results		Pass

Laboratory Technician

12/07/2020
Test Date

Approved By


LOWER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 37.4 mm
Tmax: 25.4 ms
Min: -3.7 mm
Tmin: 62.9 ms
CFC 180


LOWER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)
50
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 47.4 mm
Tmax: 23.7 ms
Min: -4.1 mm
Tmin: 58.1 ms
CFC 180

MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203187

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4157	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.0	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2277	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	10.9	Pass
		Overall Test Results		Pass

Laboratory Technician

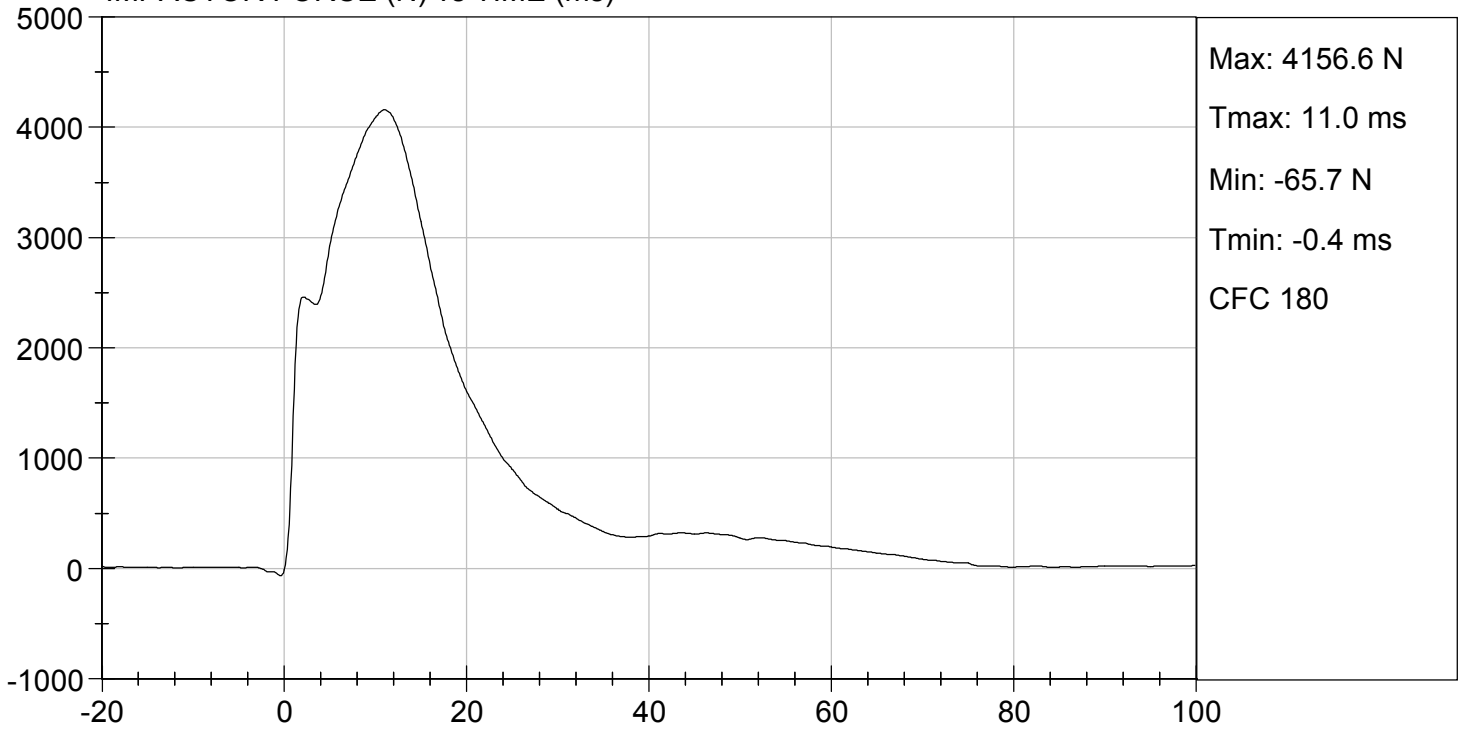
12/05/2020
Test Date

Approved By

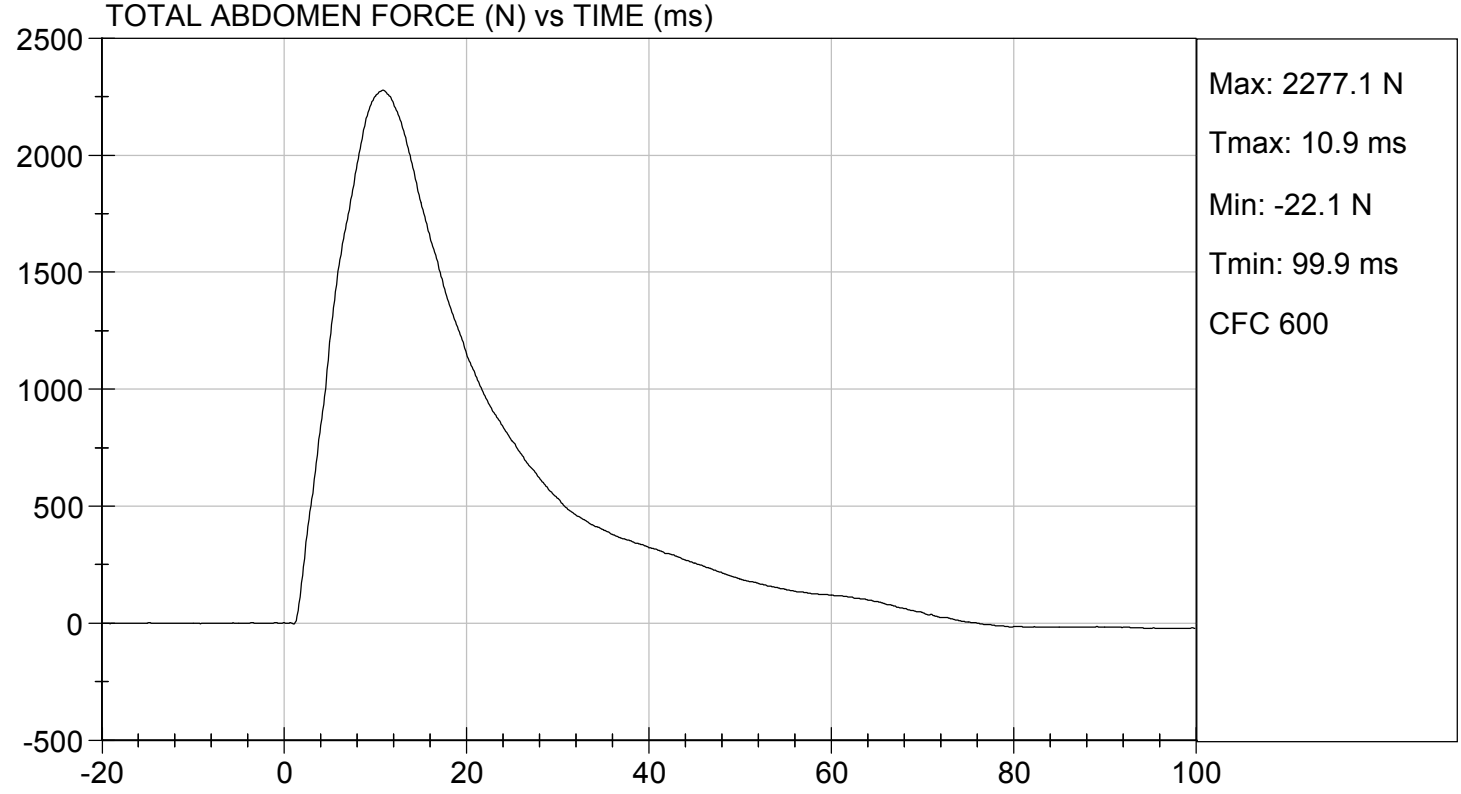
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 12/05/2020
TEST #: D203187

IMPACTOR FORCE (N) vs TIME (ms)



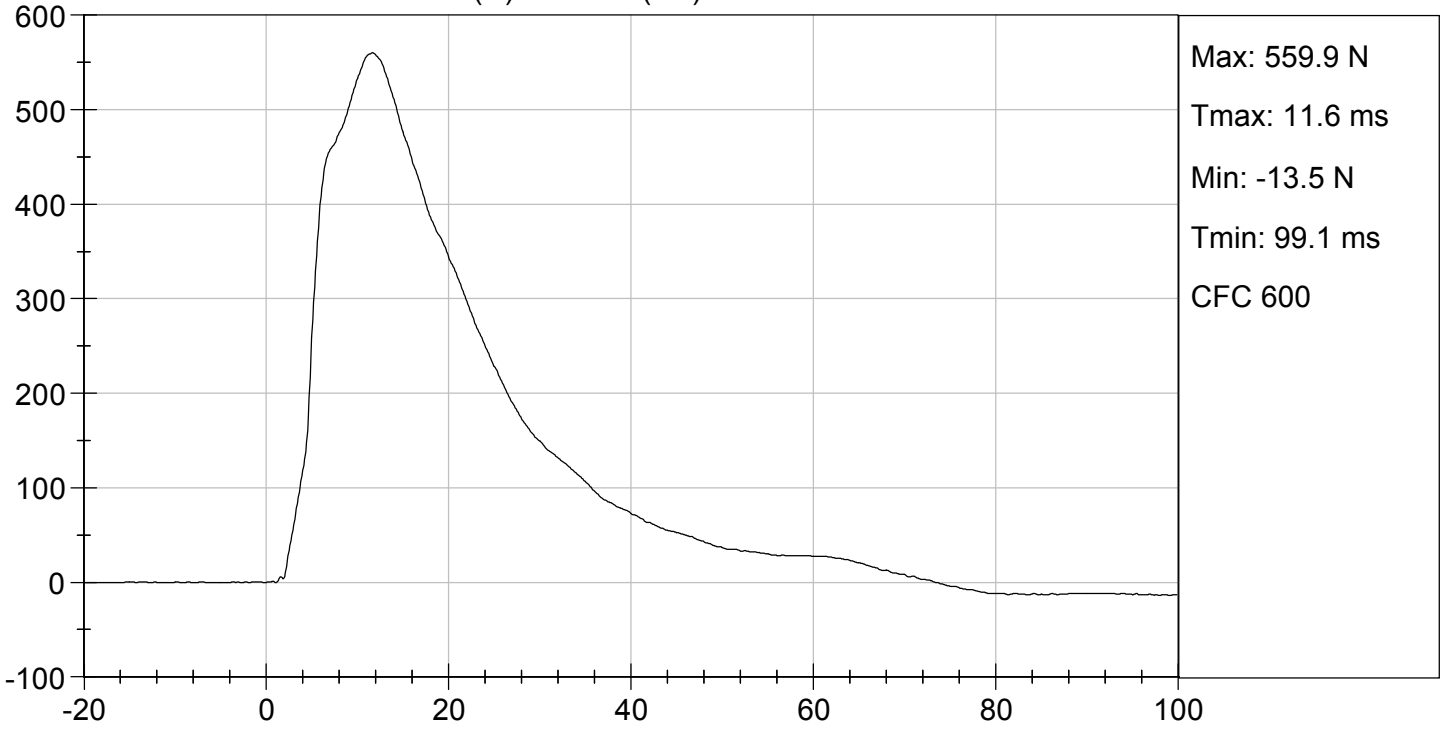
TOTAL ABDOMEN FORCE (N) vs TIME (ms)



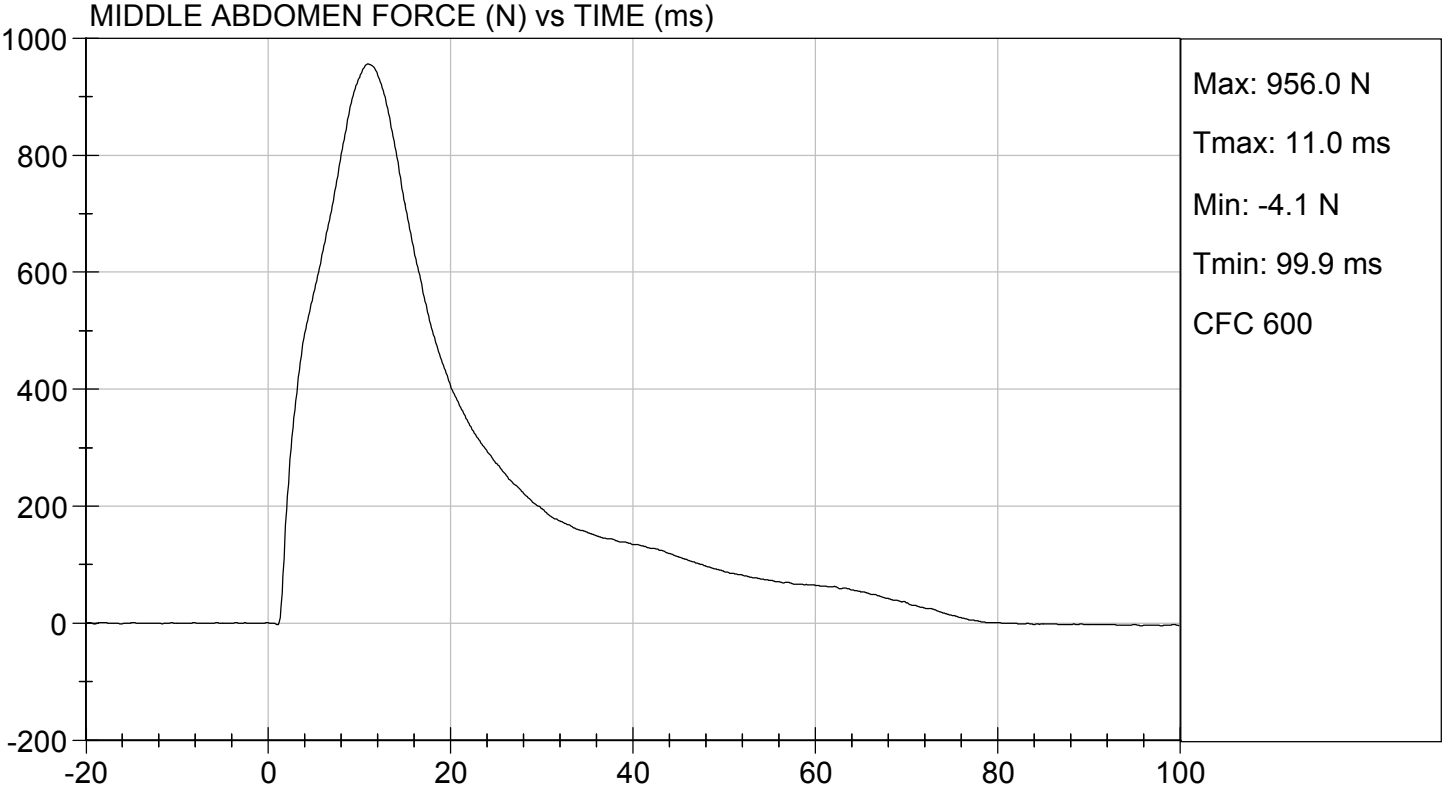
TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.44 ft/s, 4.10 m/s

TEST DATE: 12/05/2020
TEST #: D203187

FRONT ABDOMEN FORCE (N) vs TIME (ms)



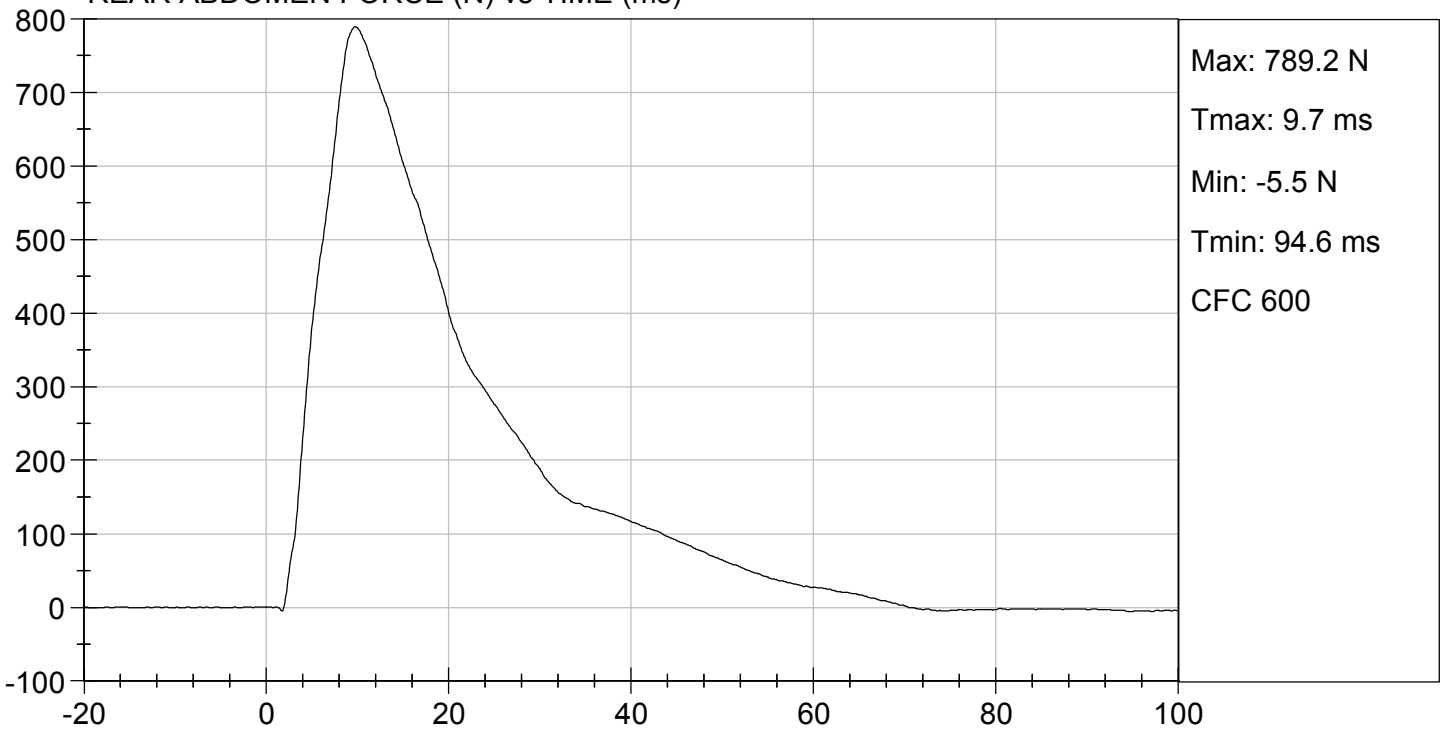
MIDDLE ABDOMEN FORCE (N) vs TIME (ms)



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

TEST DATE: 12/05/2020
TEST #: D203187

REAR ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203188

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	24	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	-0.394	Pass
	27 ms	m/s	-6.50 to -5.80	-6.10	Pass
	30 ms	m/s	>= -6.50	-5.96	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.1	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	44.7	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
			Overall Results		Pass

Gerald Guerrero
Laboratory Technician

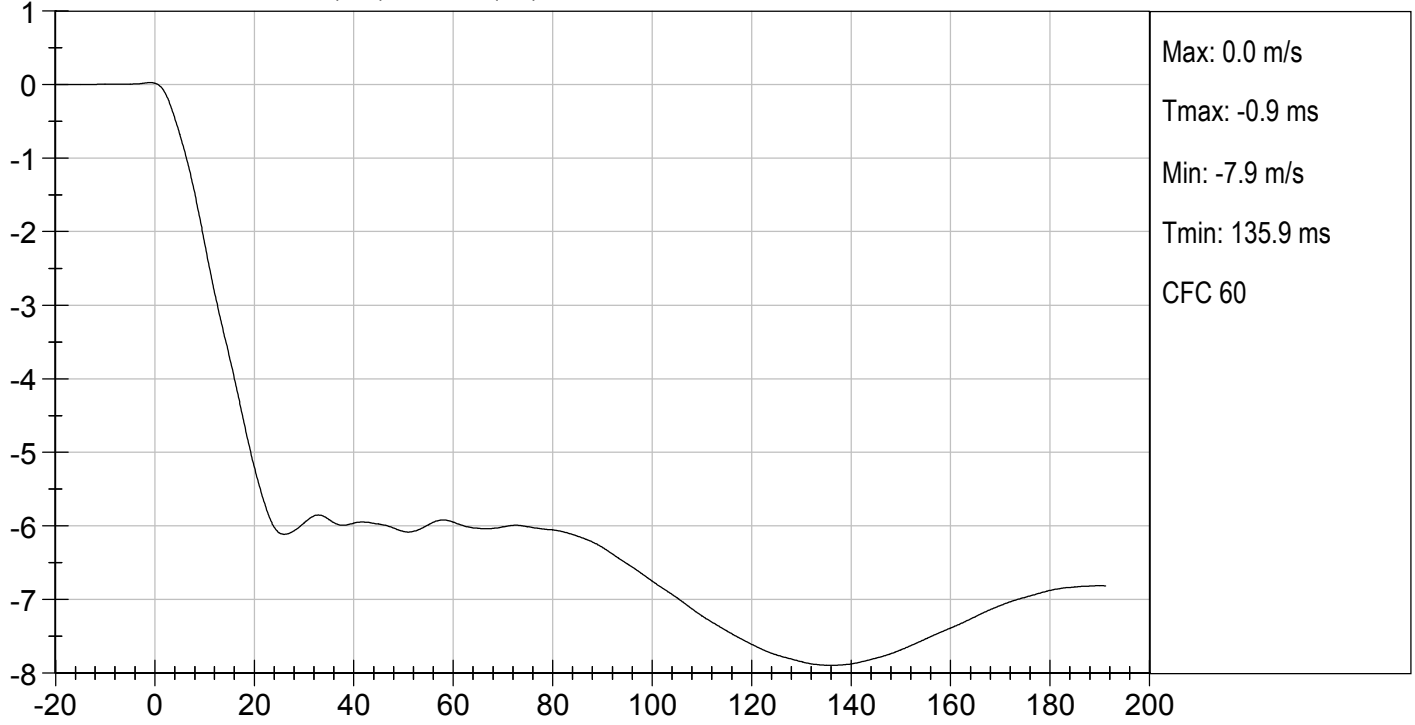
12/07/2020
Test Date

Approved By

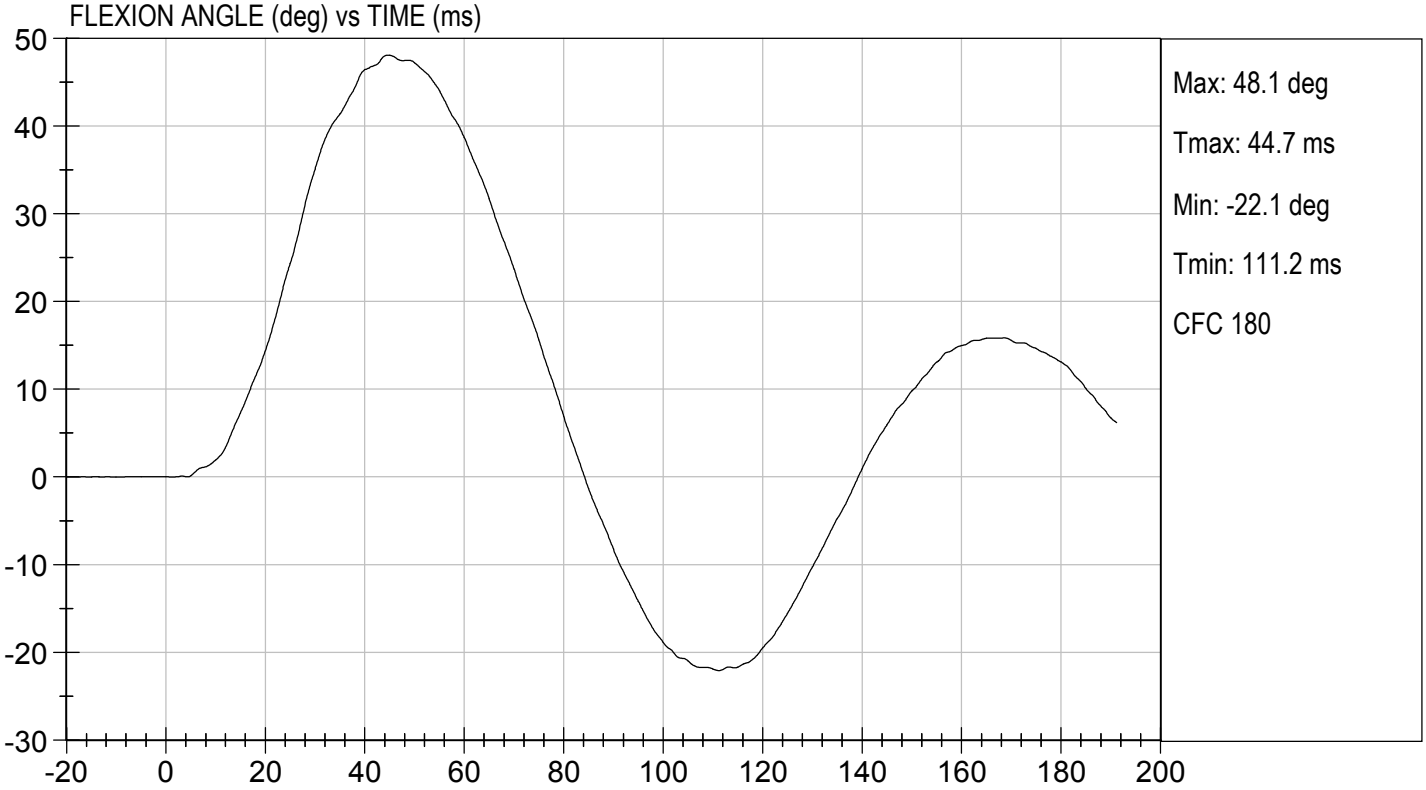
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 12/07/2020
TEST #: D203188

PENDULUM VELOCITY (m/s) vs TIME (ms)



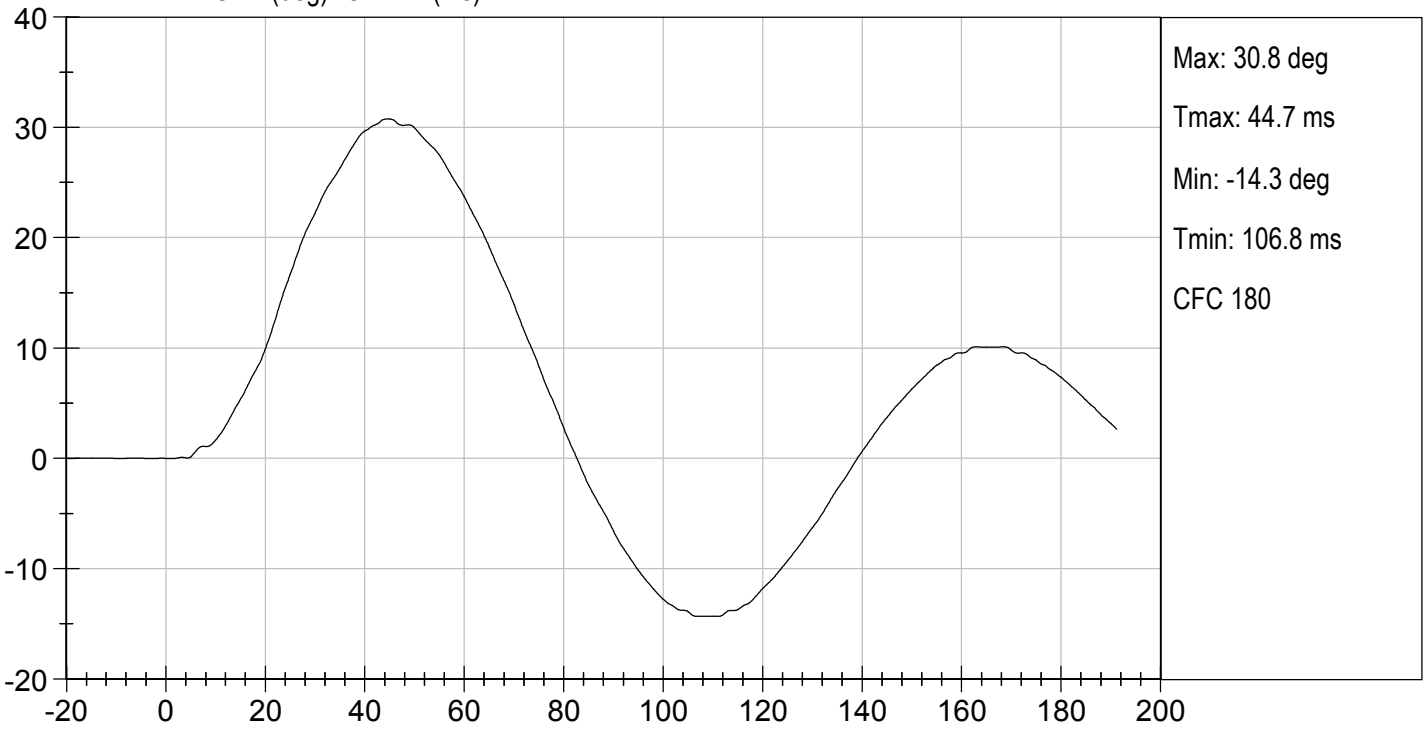
FLEXION ANGLE (deg) vs TIME (ms)



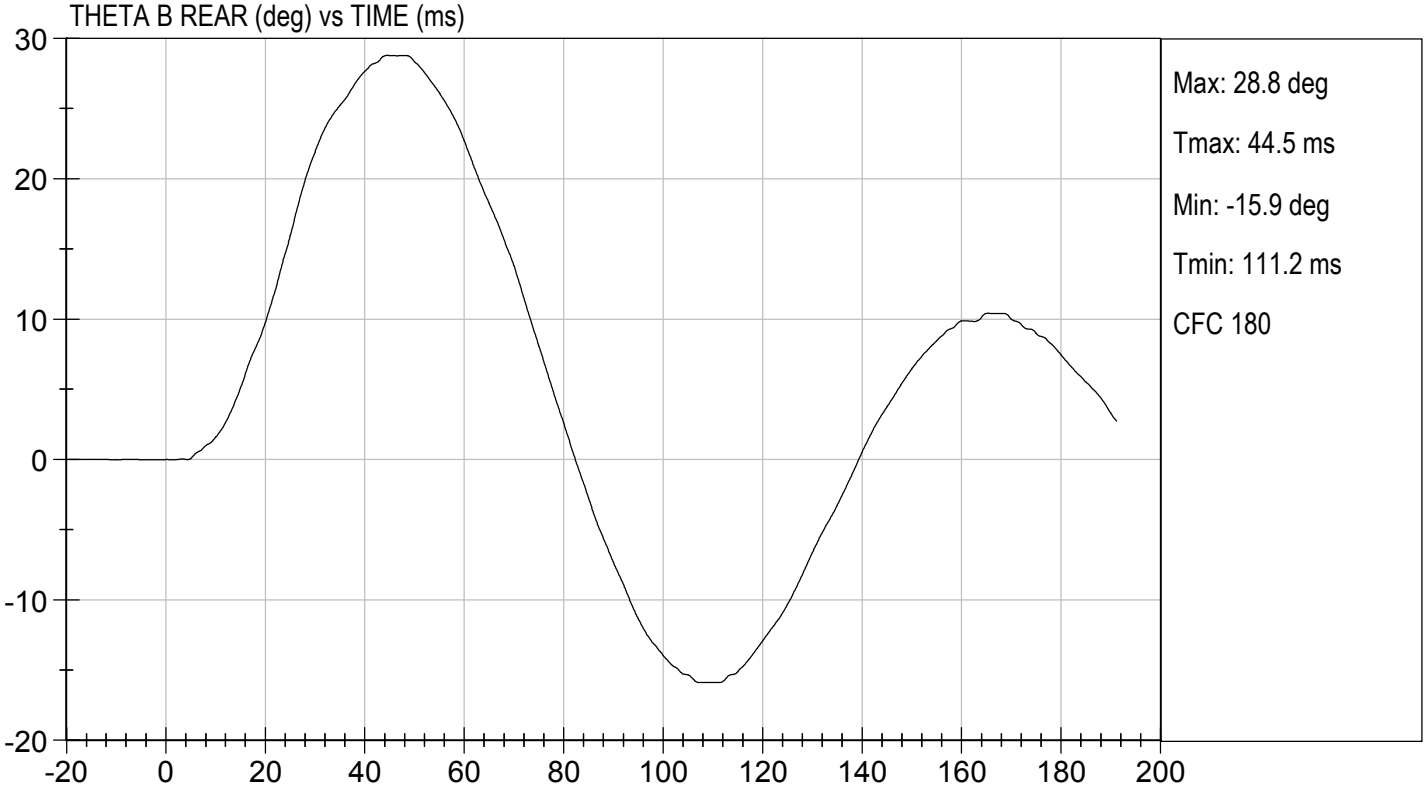
TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 12/07/2020
TEST #: D203188

THETA A FRONT (deg) vs TIME (ms)

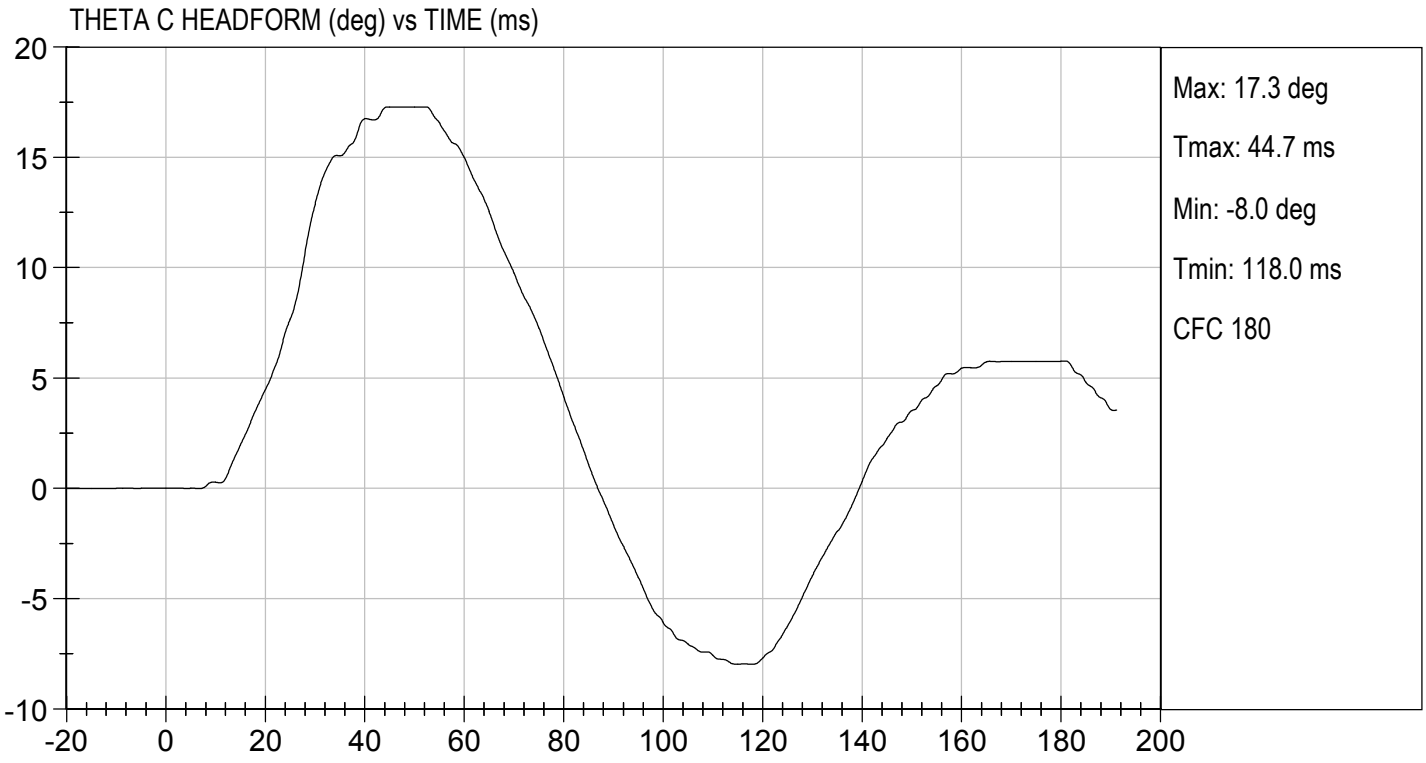


THETA B REAR (deg) vs TIME (ms)



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

TEST DATE: 12/07/2020
TEST #: D203188



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203189

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	4.20 to 4.40	4.23	Pass
Maximum Impactor Force	N	4700 to 5400	5123	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.3	Pass
Maximum Pubic Force	N	1230 to 1590	1335	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.2	Pass
		Overall Test Results		Pass

Laboratory Technician

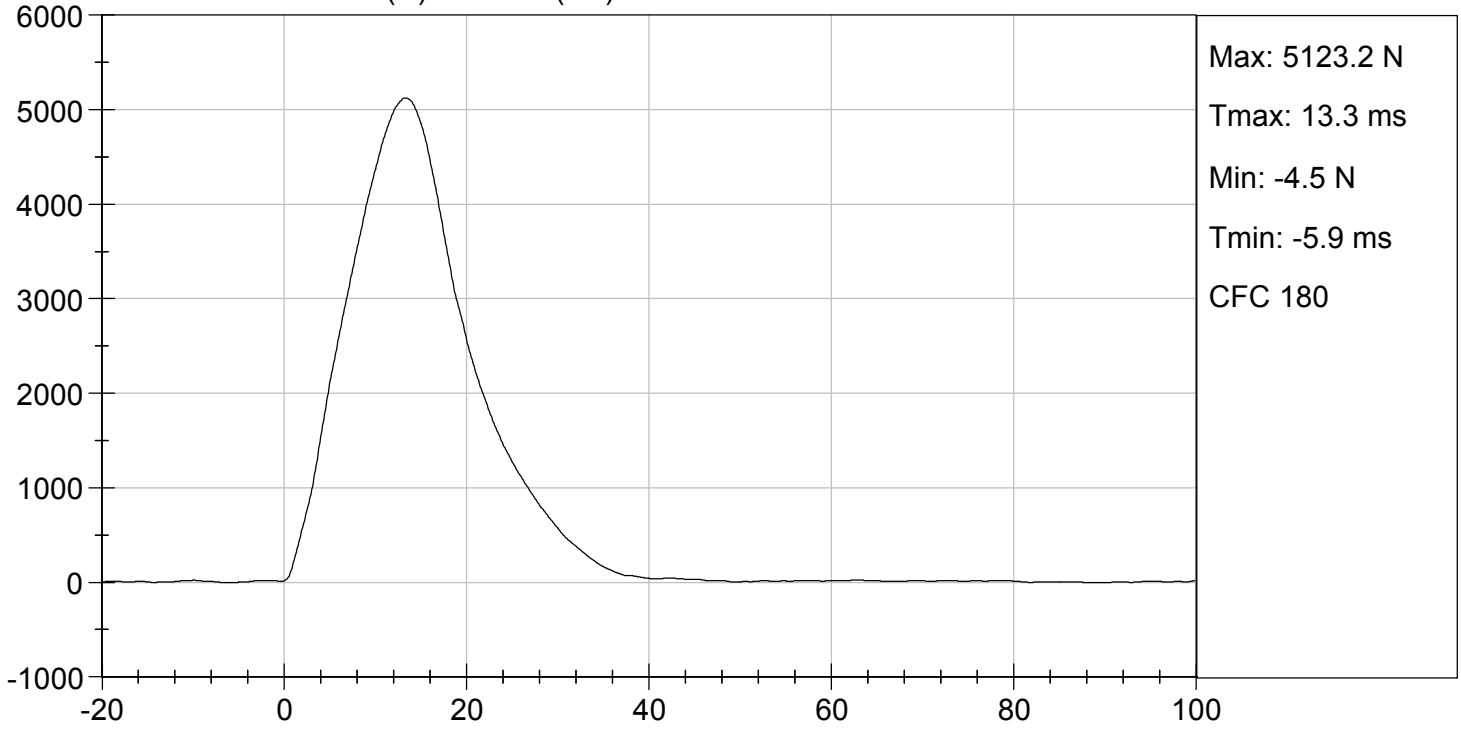
12/05/2020
Test Date

Approved By

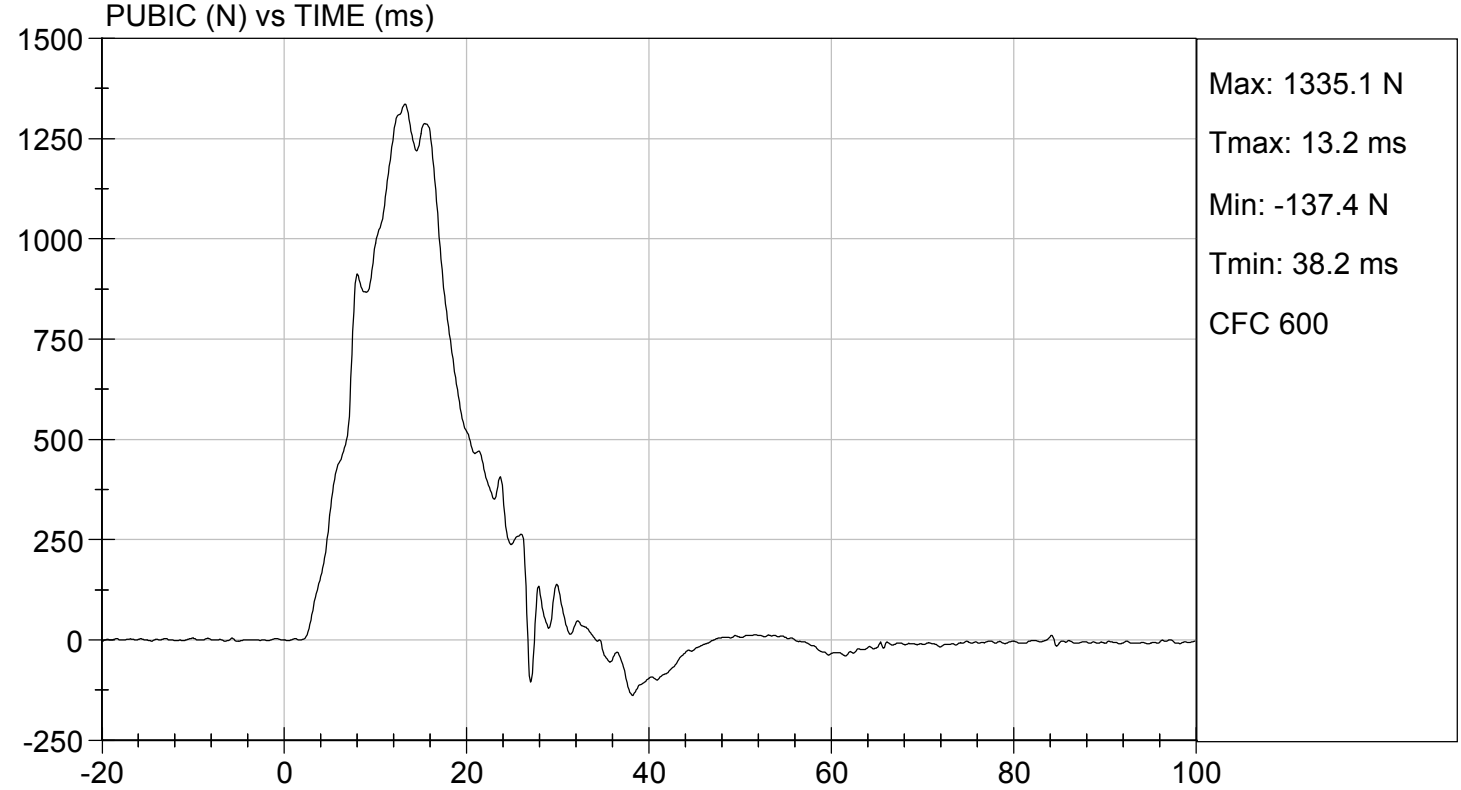
TEST DESC: PELVIS IMPACT
VELOCITY: 13.89 ft/s, 4.23 m/s

TEST DATE: 12/05/2020
TEST #: D203189

IMPACTOR FORCE (N) vs TIME (ms)



PUBIC (N) vs TIME (ms)



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

ES-2re DUMMY

ATD Serial No: F032 **Test I.D:** D203180

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	5.40 to 5.60	5.46	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5893	Pass
Upper Rib Displacement	mm	34.0 to 41.0	39.9	Pass
Middle Rib Displacement	mm	37.0 to 45.0	41.5	Pass
Lower Rib Displacement	mm	37.0 to 44.0	42.5	Pass
		Overall Test Results		Pass

Laboratory Technician

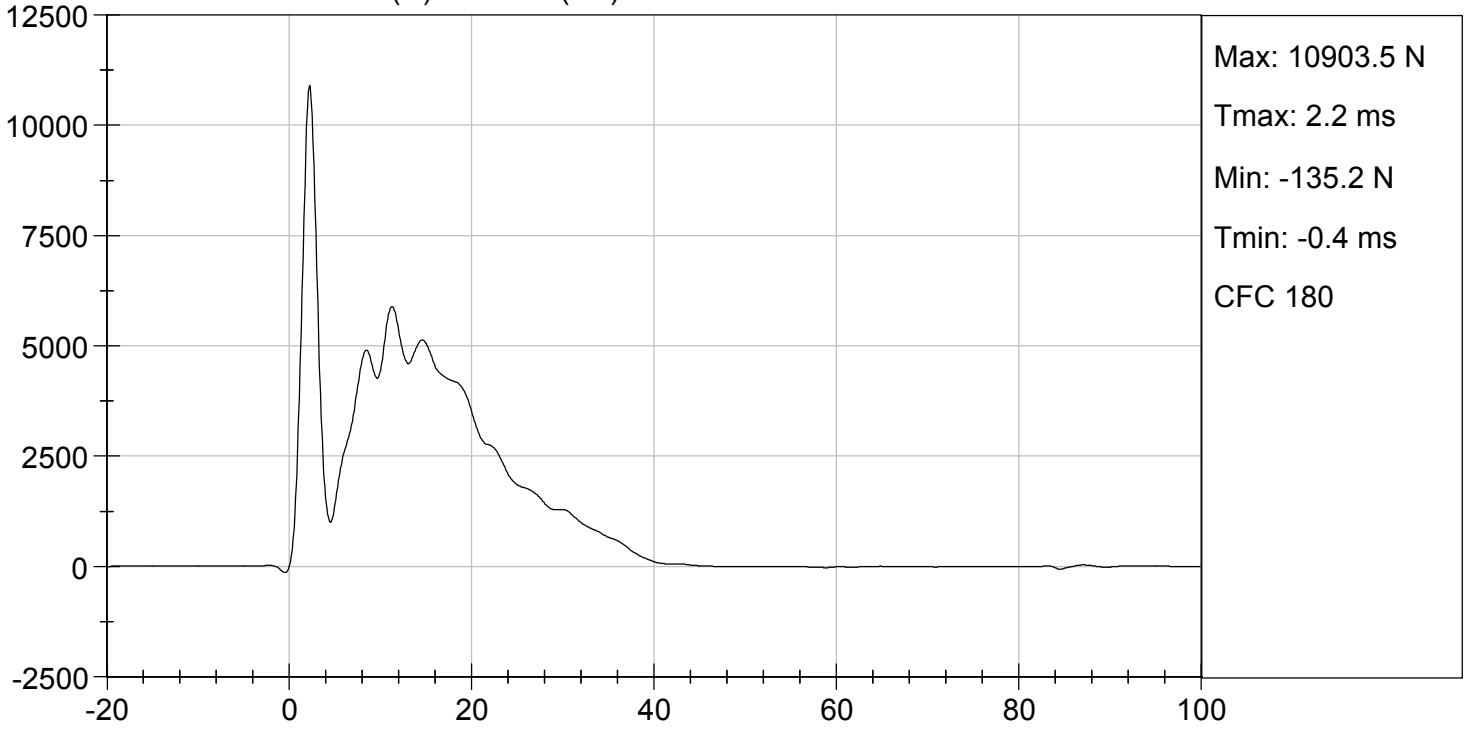
12/05/2020
Test Date

Approved By

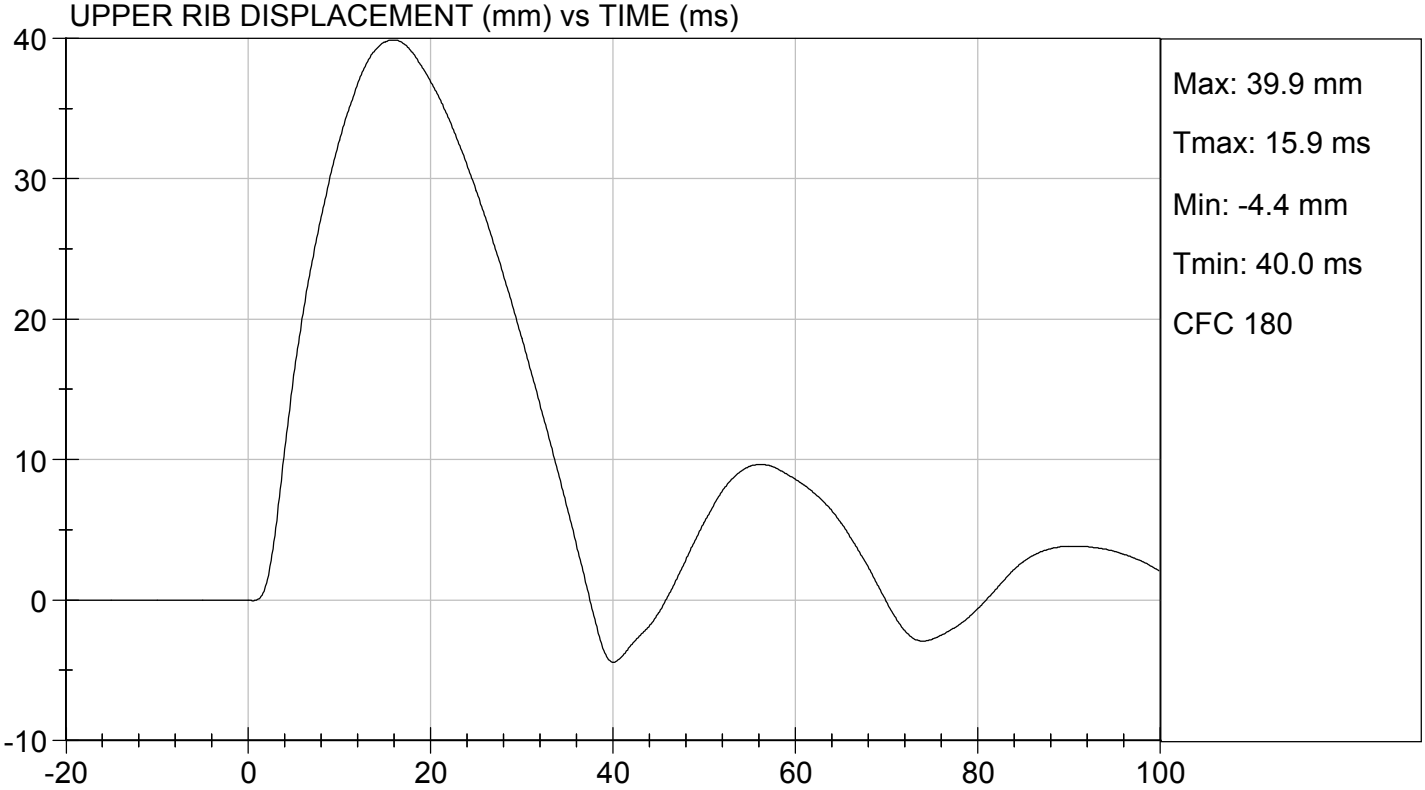
TEST DESC: THORAX IMPACT
VELOCITY: 17.92 ft/s, 5.46 m/s

TEST DATE: 12/05/2020
TEST #: D203180

IMPACTOR FORCE (N) vs TIME (ms)



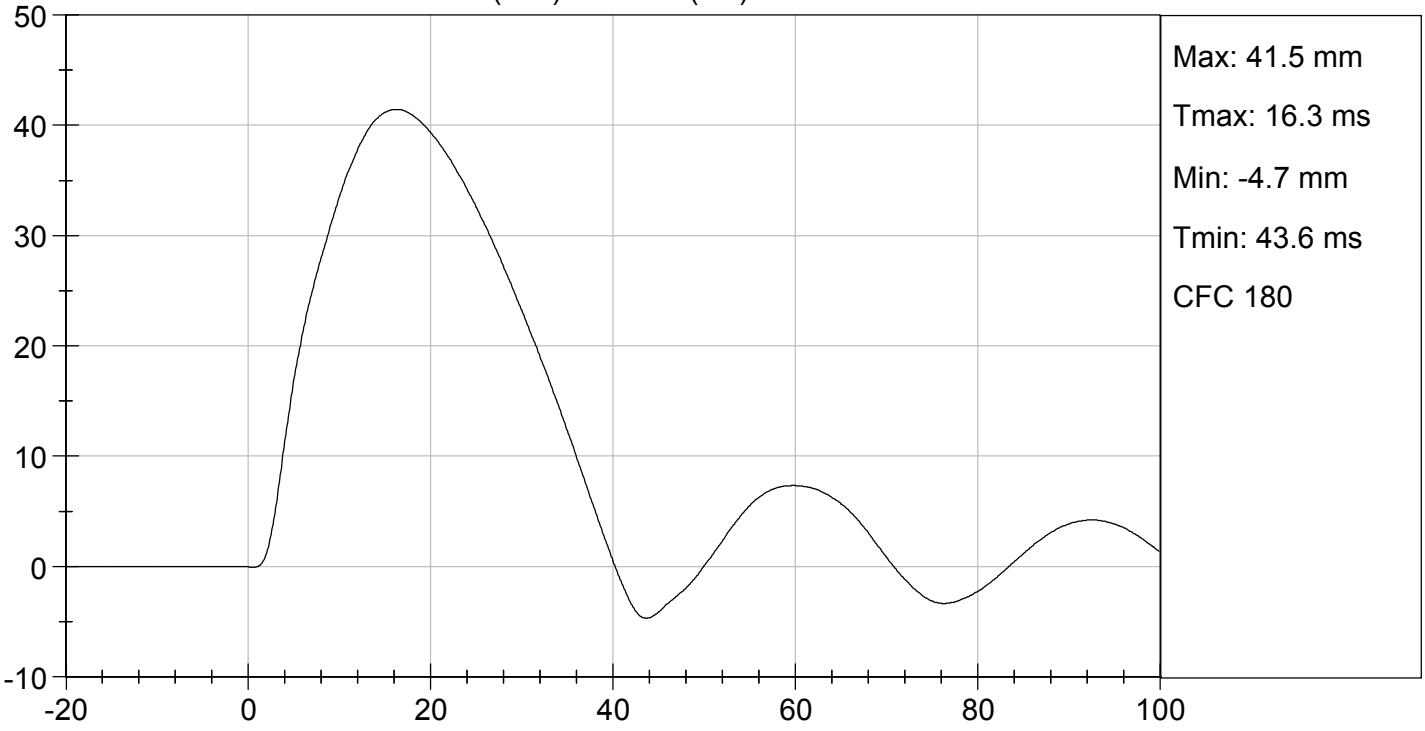
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



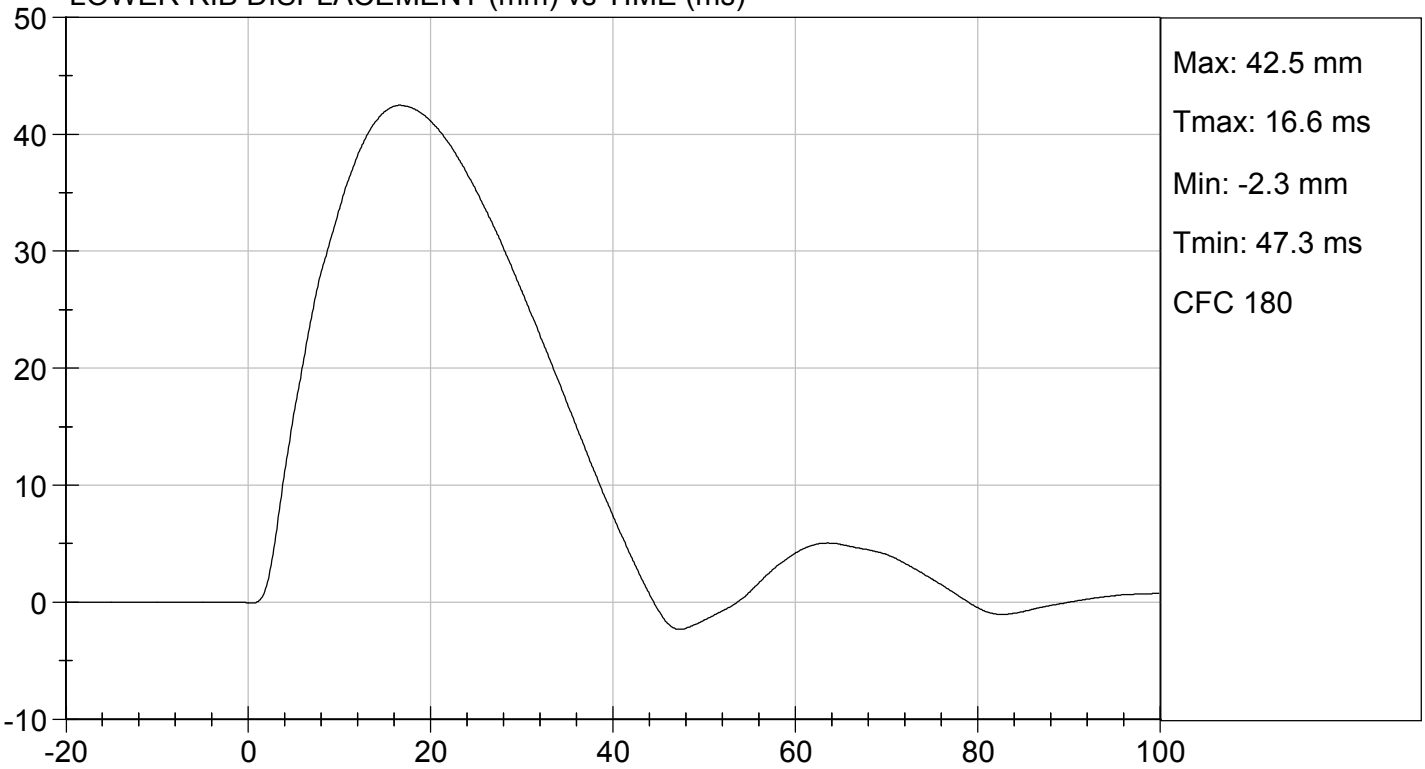
TEST DESC: THORAX IMPACT
VELOCITY: 17.92 ft/s, 5.46 m/s

TEST DATE: 12/05/2020
TEST #: D203180

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 296

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	784	Pass
B	Shoulder Pivot Height	437 - 453	442	Pass
C	H-point Height	79 - 89	83	Pass
D	H-point from Seatback	141 - 151	145	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	121	Pass
G	Head Breadth	140 - 148	142	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	180	Pass
J	Head Circumference	541 - 551	548	Pass
K	Buttock to Knee Length	514 - 540	535	Pass
L	Popliteal Height	343 - 369	358	Pass
M	Knee Pivot to Floor Height	392 - 409	404	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	206	Pass
P	Foot Length	216 - 232	219	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	316	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	481	Pass
V	Shoulder Width	341 - 357	346	Pass
W	Foot Width	78 - 94	85	Pass
Y	Chest Circumference w/ jacket	851 - 881	870	Pass
Z	Waist Circumference	761 - 791	772	Pass

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D203041

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	25	Pass
Peak Resultant Acceleration	G's	115 to 137	128	Pass
Peak Longitudinal Acceleration	G's	+/- 15	6.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

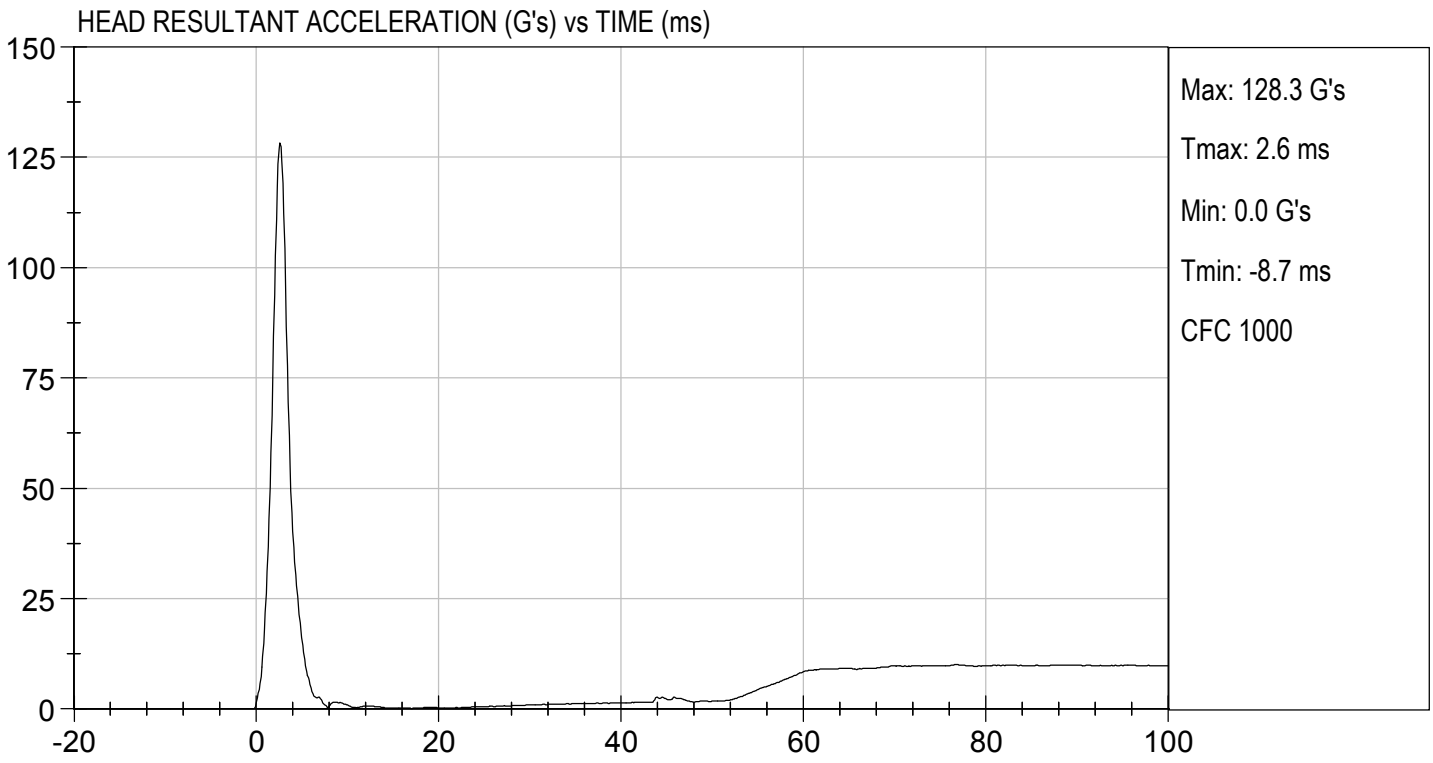
Laboratory Technician

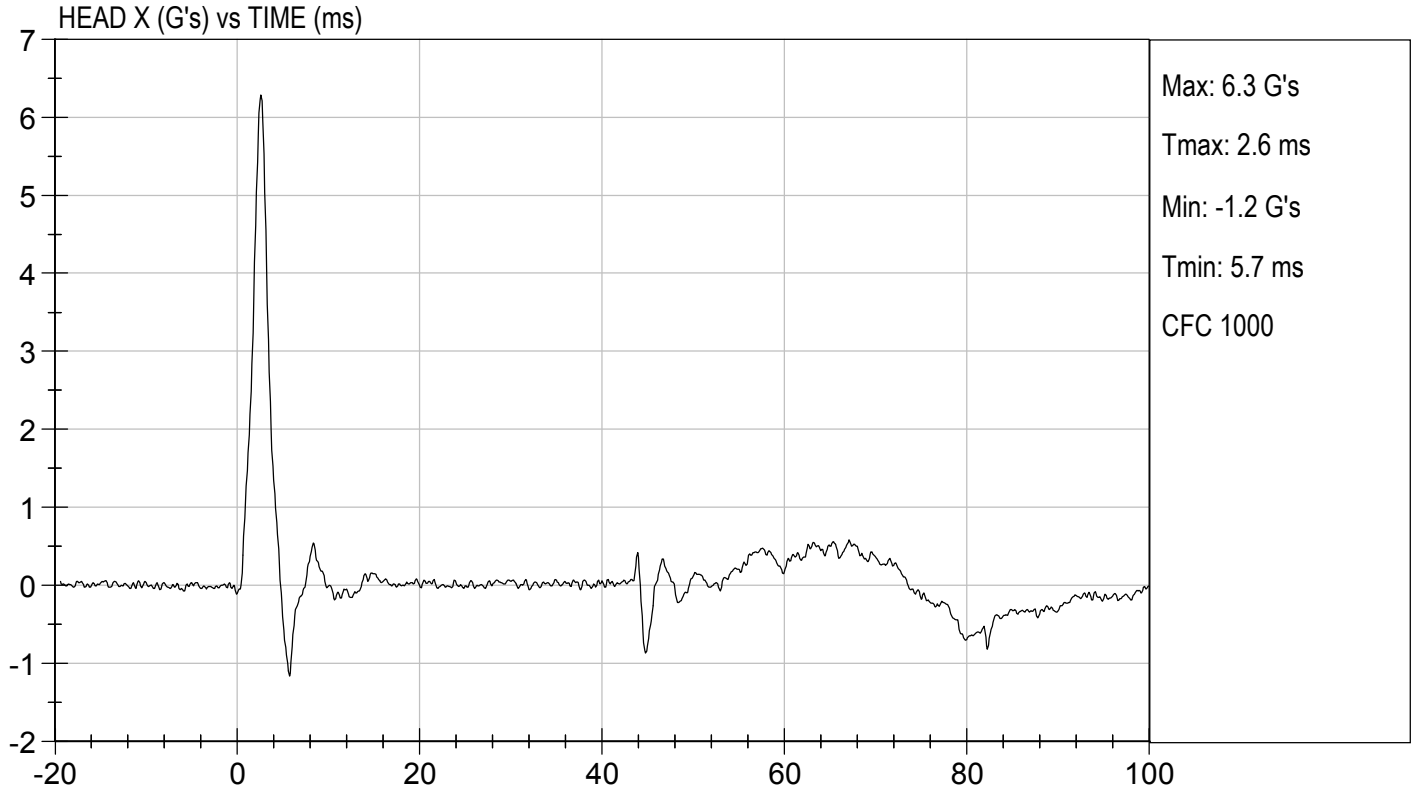
11/24/2020
Test Date

Approved By

TEST DESC: HEAD DROP

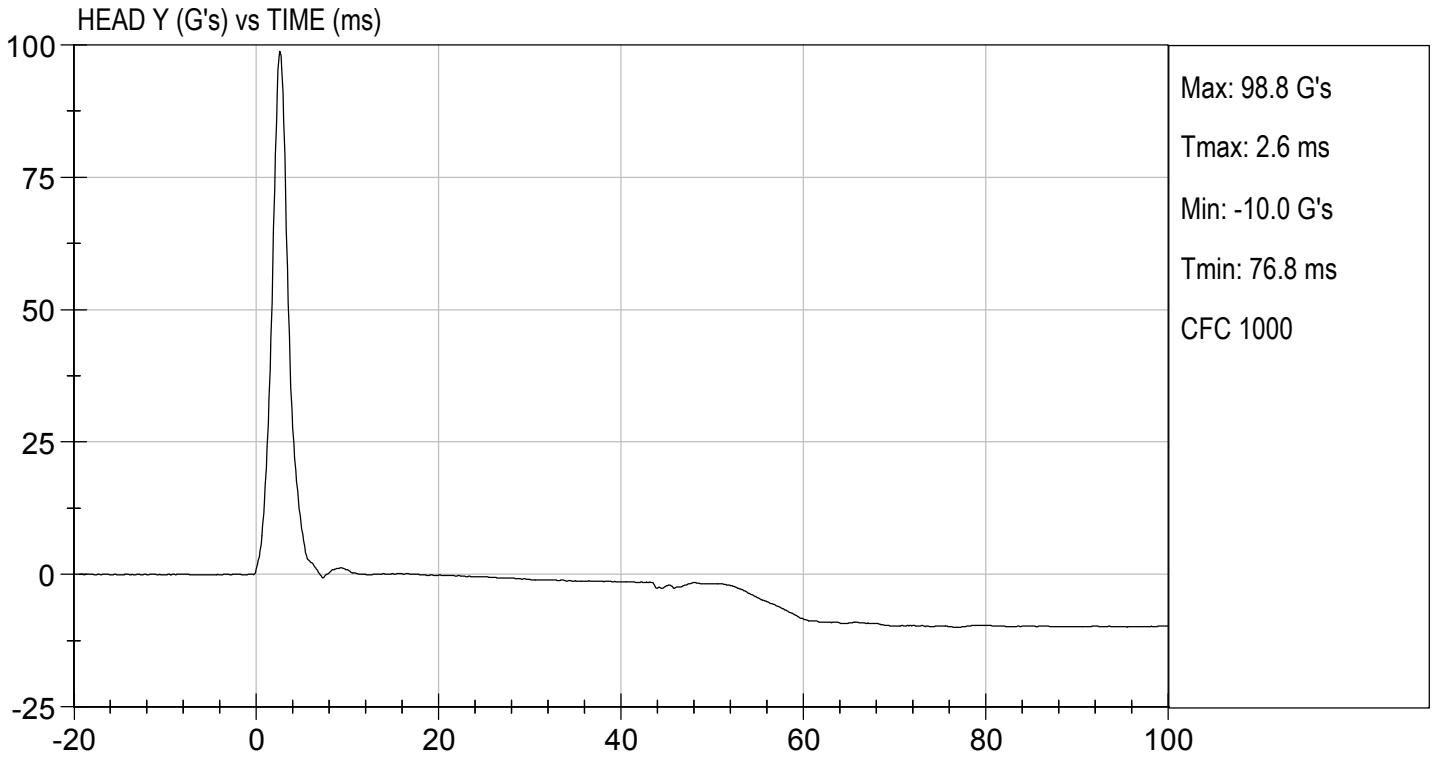
TEST DATE: 11/24/2020
TEST #: D203041

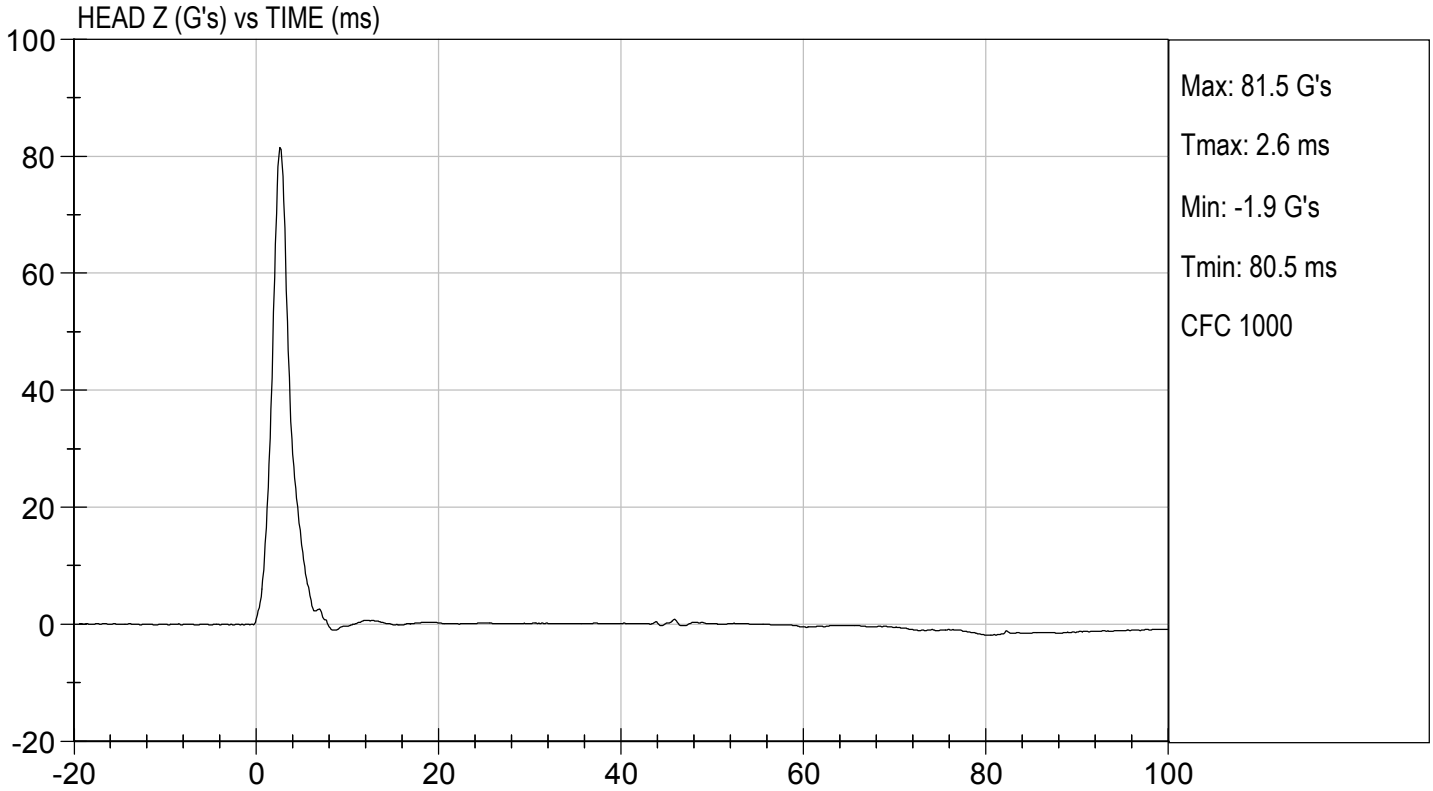




TEST DESC: HEAD DROP

TEST DATE: 11/24/2020
TEST #: D203041





MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 306 **Test I.D:** D203042

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.3	Pass
Humidity		%	10 to 70	26	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.73	Pass
	15 ms	m/s	3.30 to 4.10	3.84	Pass
	20 ms	m/s	4.40 to 5.40	5.14	Pass
	25 ms	m/s	5.40 to 6.10	6.04	Pass
	25-100 ms	m/s	5.50 to 6.20	6.04	Pass
Maximum D-Plane Rotation		deg	71 to 81	74	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	62	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-39	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	111	Pass
			Overall Test Results		Pass

Laboratory Technician

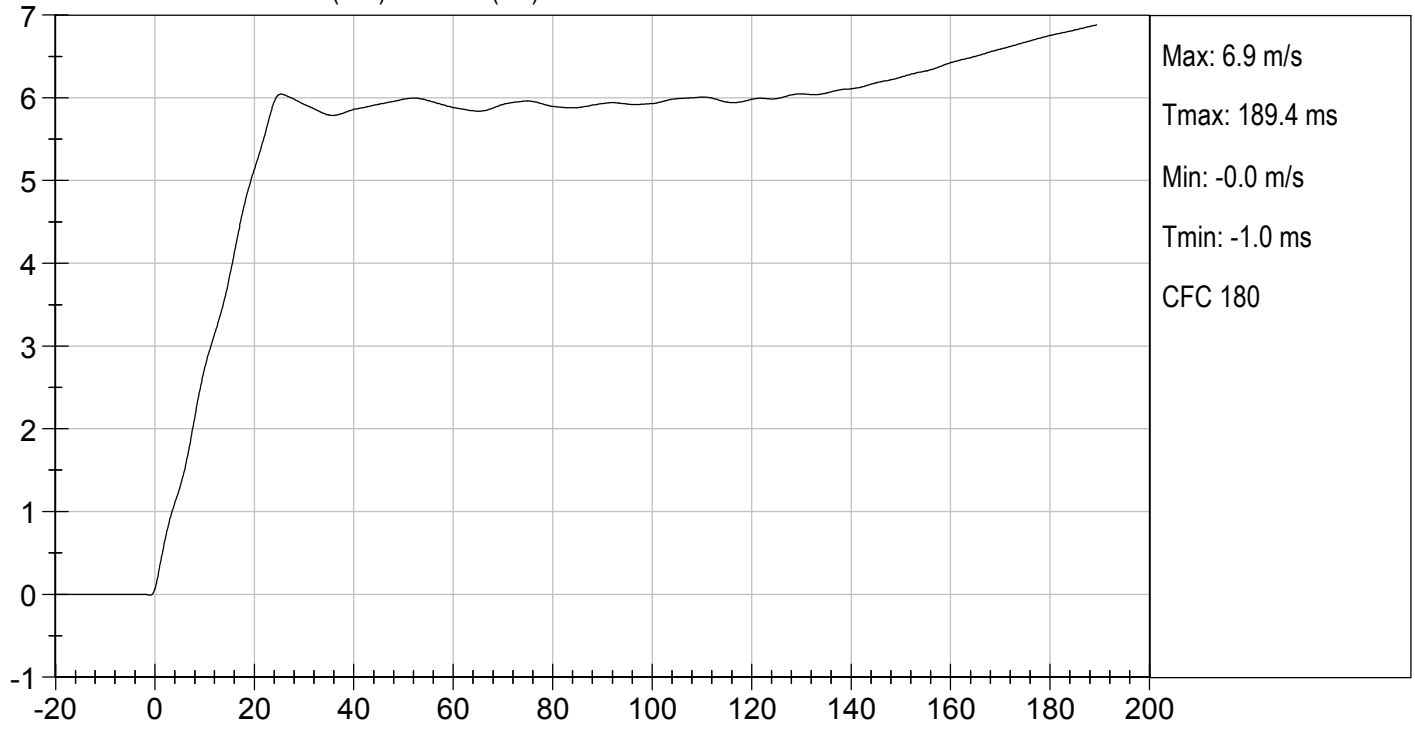
11/24/2020
Test Date

Approved By

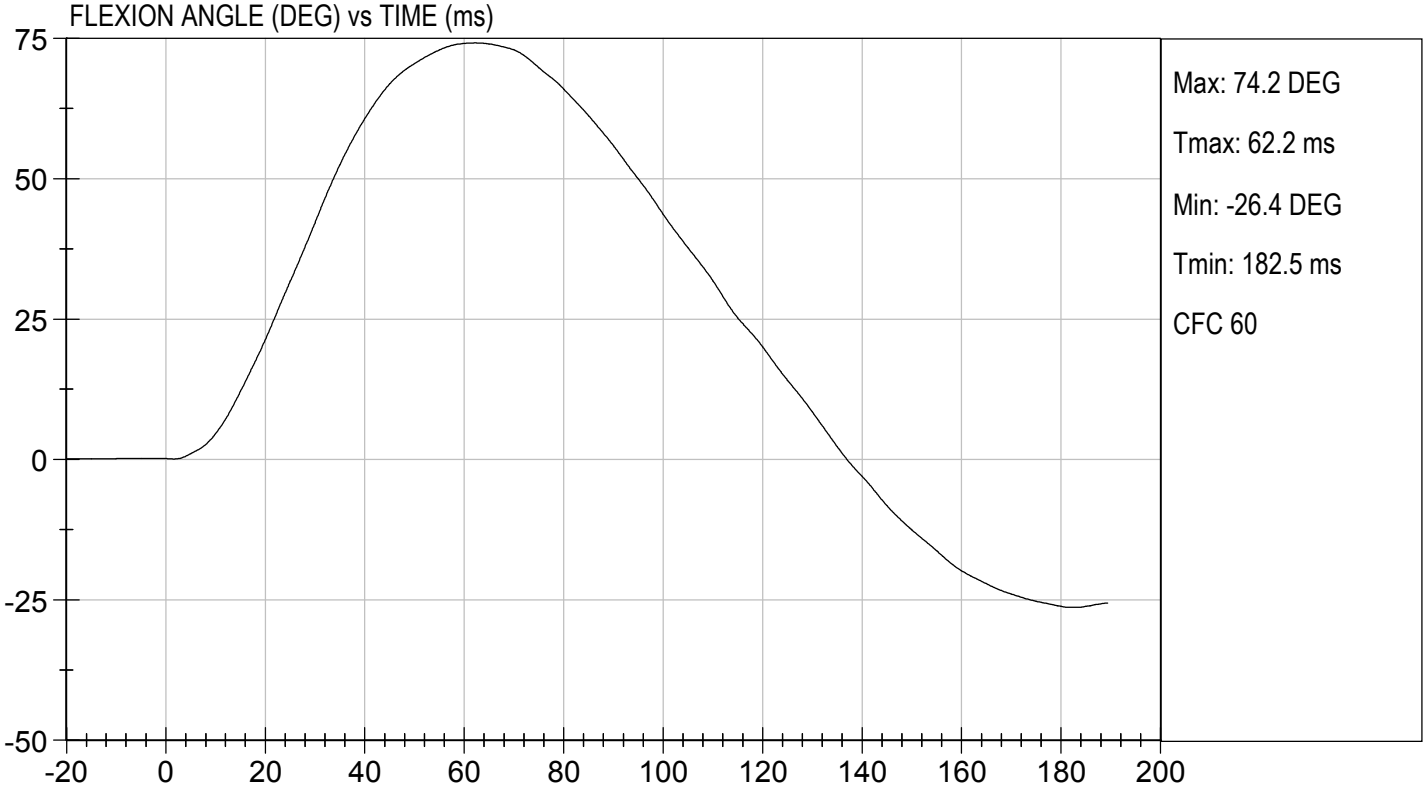
TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 11/24/2020
TEST #: D203042

PENDULUM VELOCITY (m/s) vs TIME (ms)

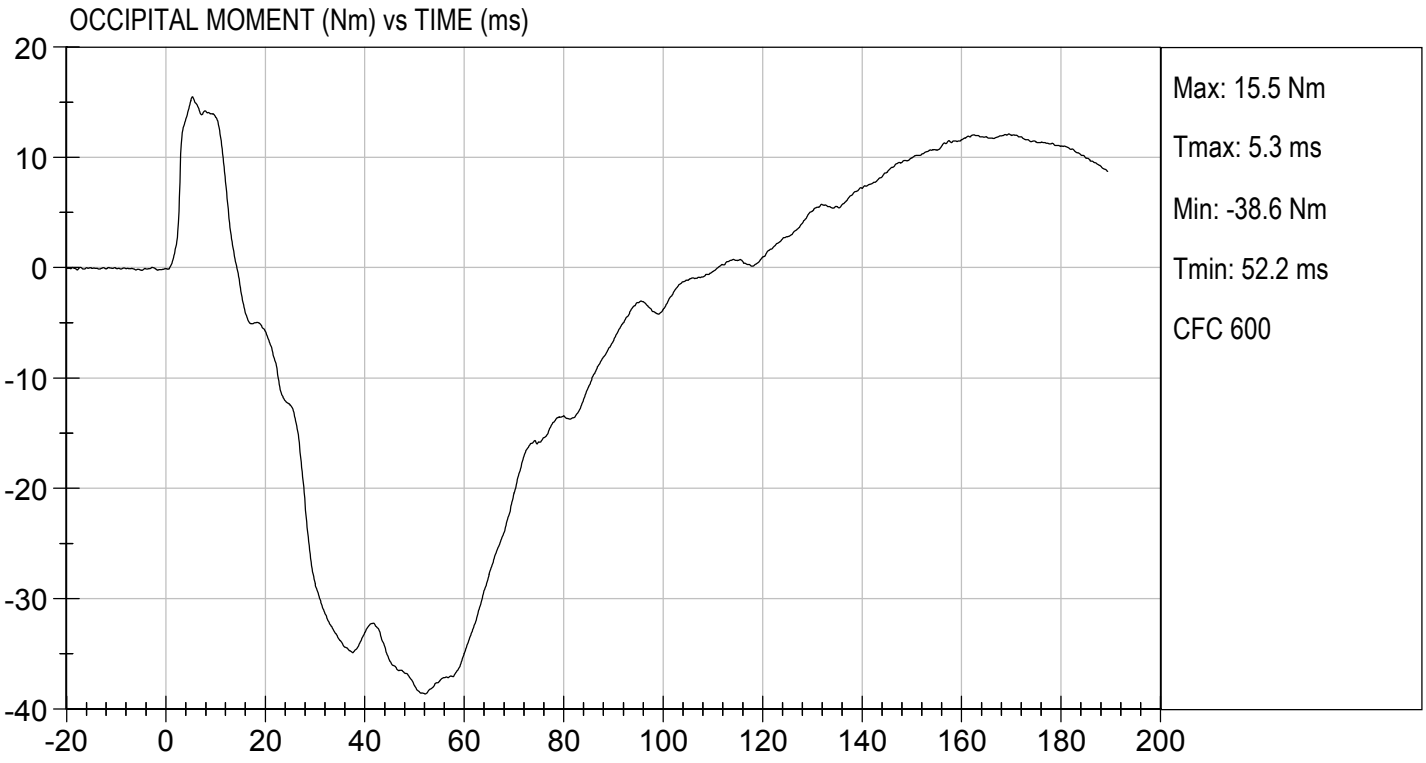


FLEXION ANGLE (DEG) vs TIME (ms)



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

TEST DATE: 11/24/2020
TEST #: D203042



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D203043

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
		Overall Test Results		Pass

Laboratory Technician

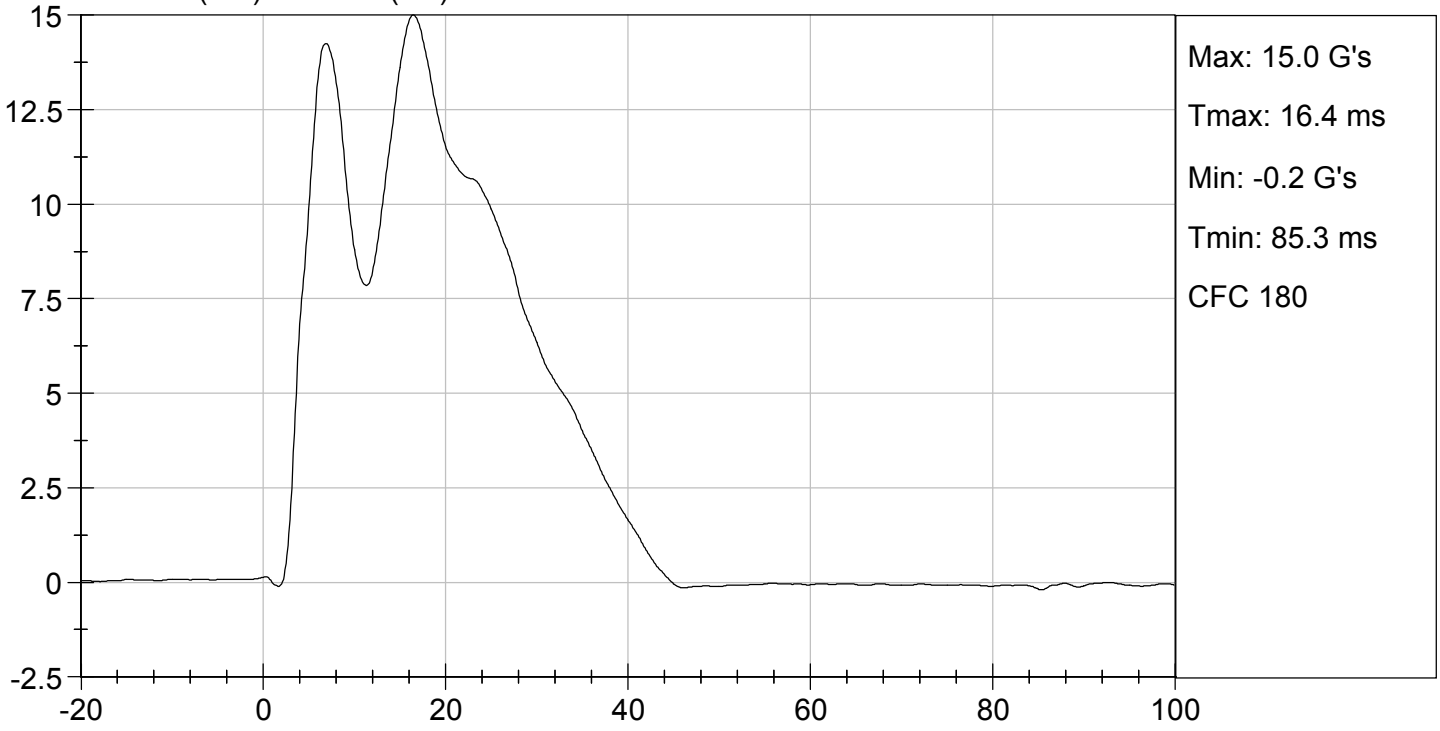
11/23/2020
Test Date

Approved By

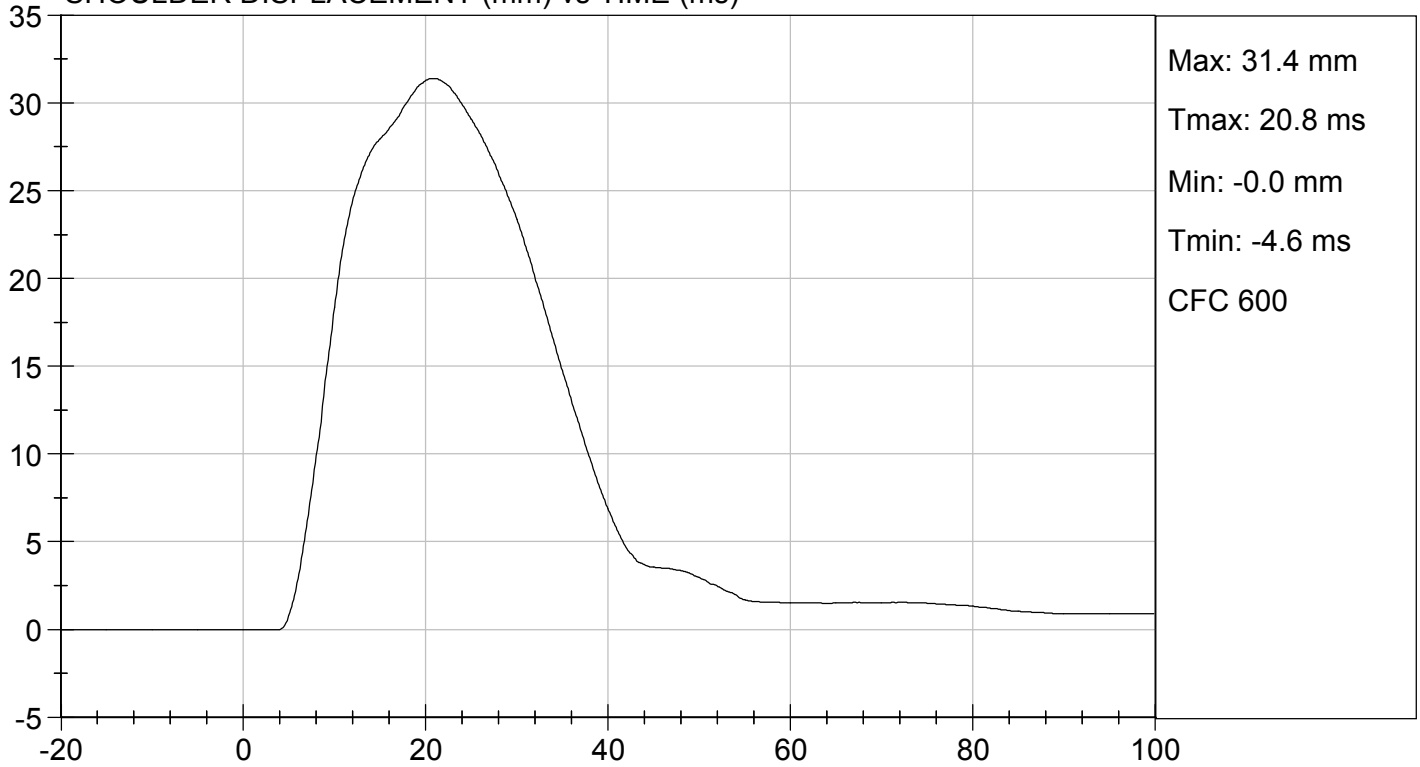
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 11/23/2020
TEST #: D203043

PROBE (G's) vs TIME (ms)

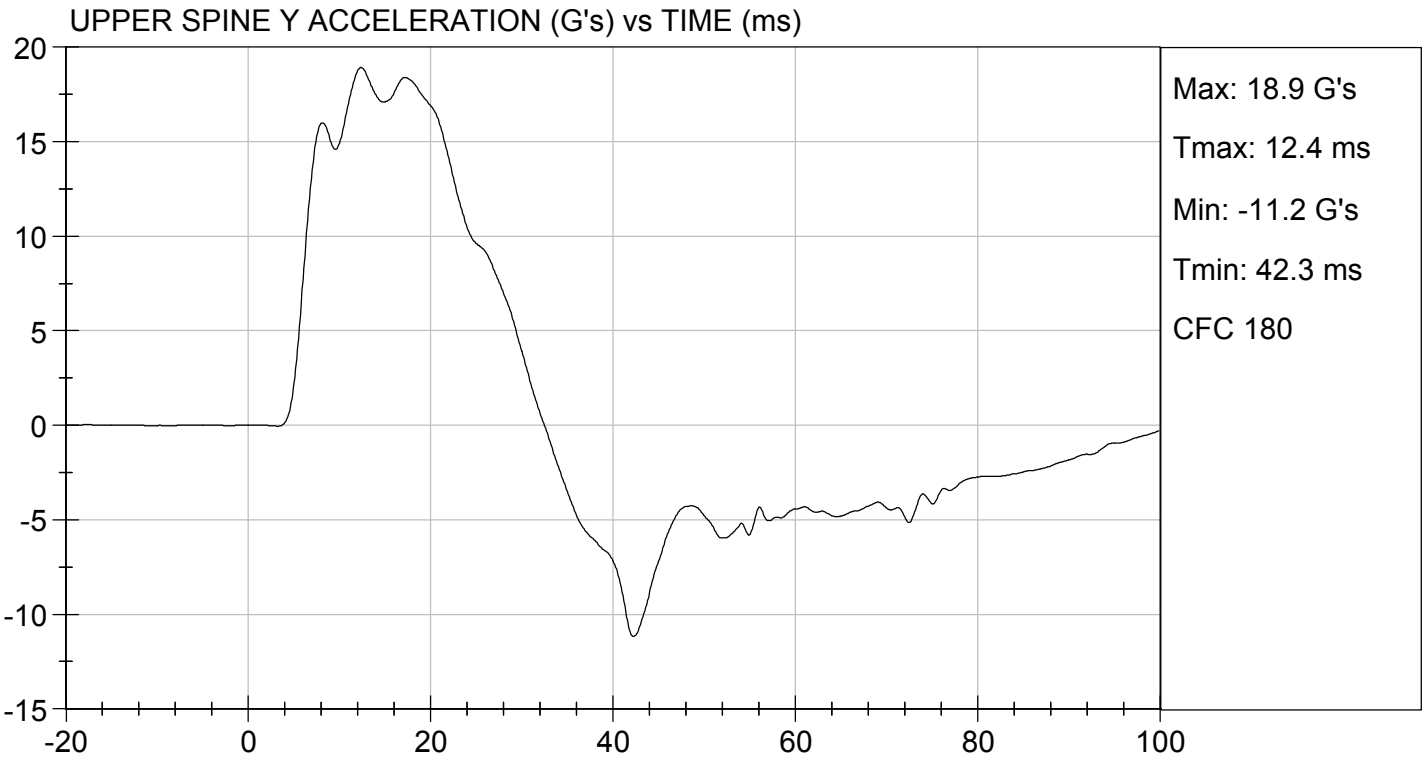


SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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

TEST DATE: 11/23/2020
TEST #: D203043



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203044

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	32	Pass
Shoulder Displacement	mm	31 to 40	37	Pass
Upper Rib Displacement	mm	25 to 32	29	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	37	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
		Overall Test Results		Pass

Laboratory Technician

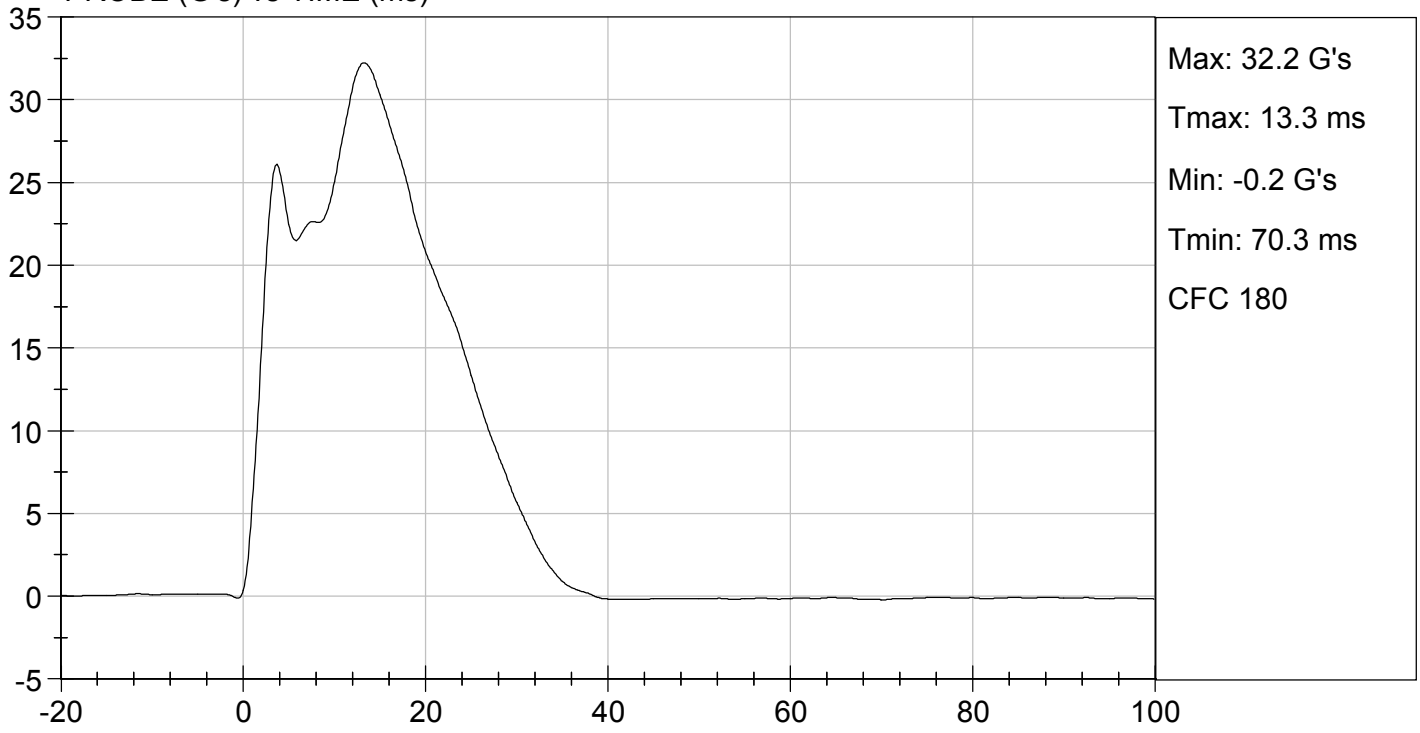
11/23/2020
Test Date

Approved By

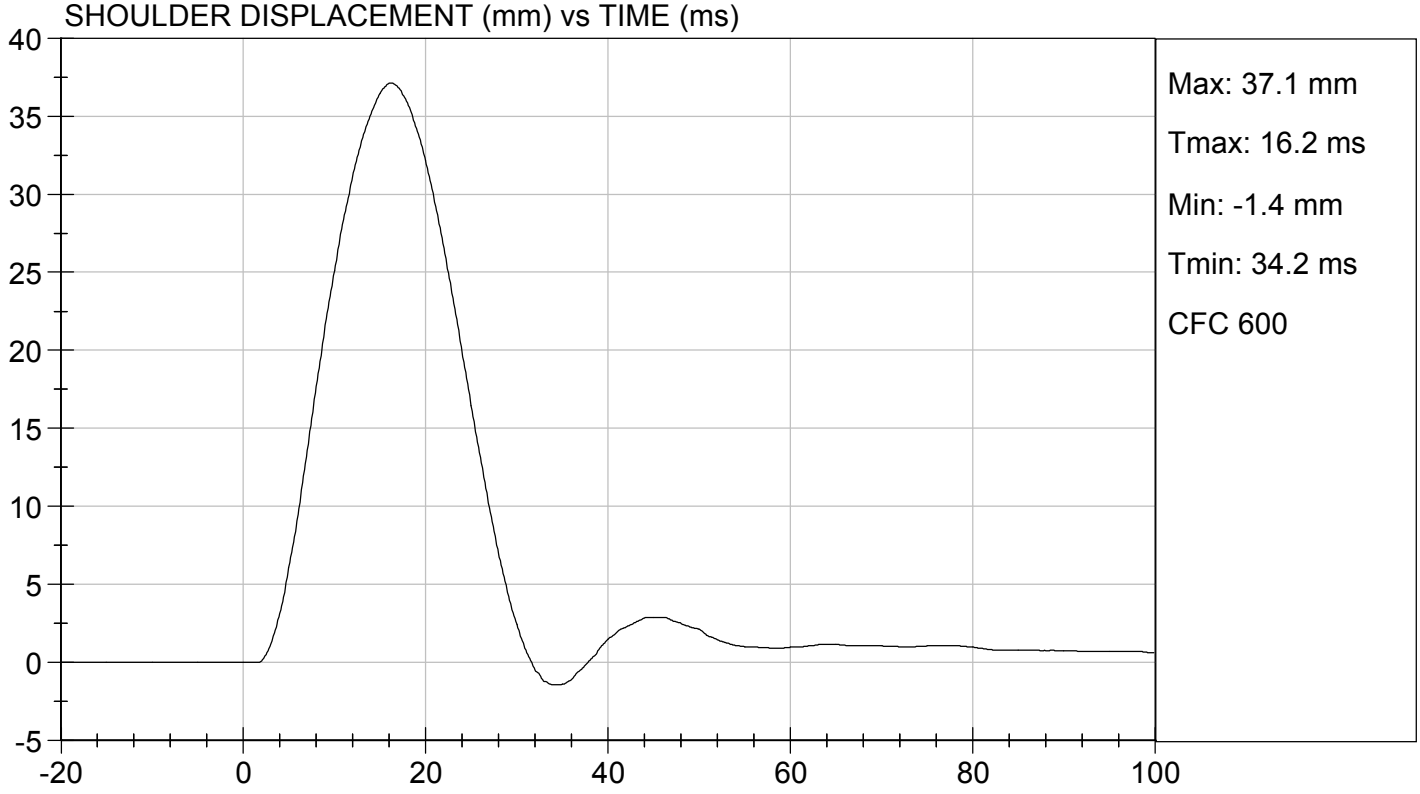
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 11/23/2020
TEST #: D203044

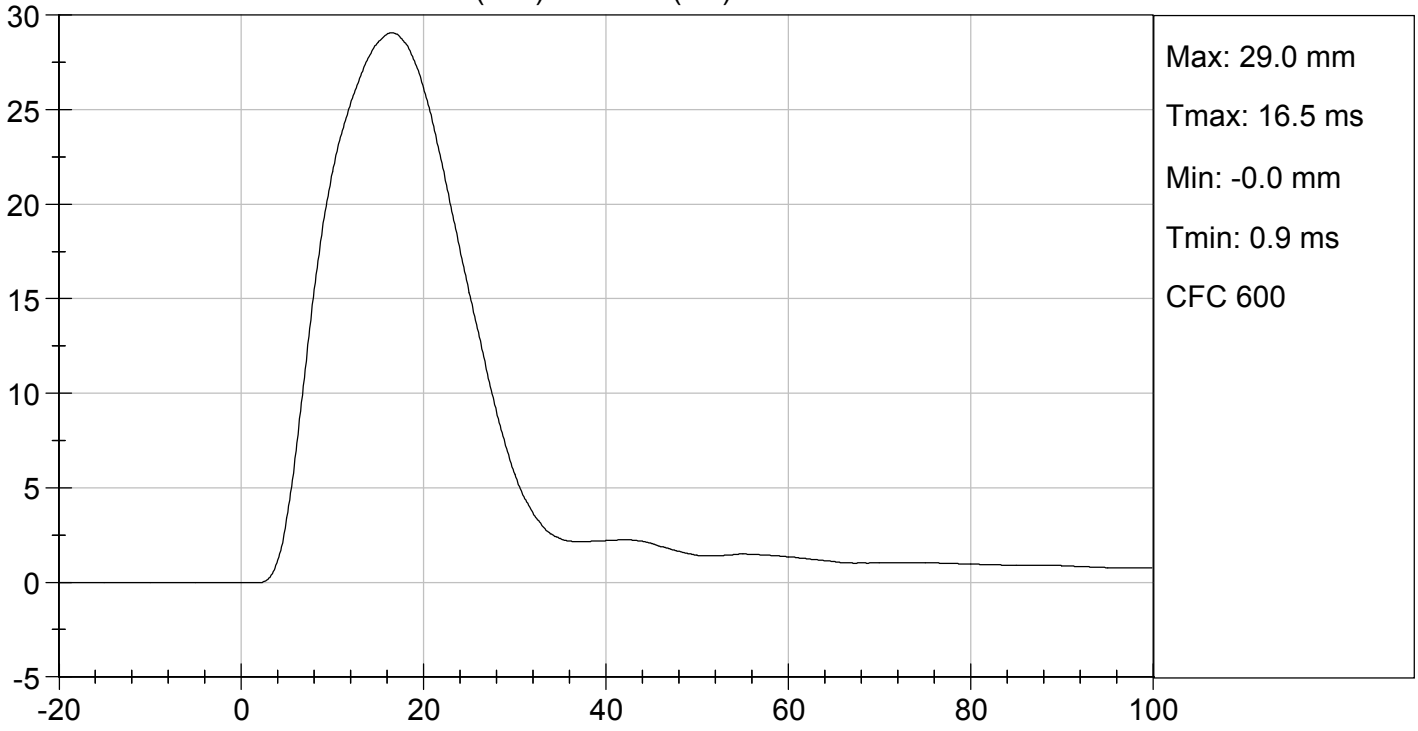
PROBE (G's) vs TIME (ms)



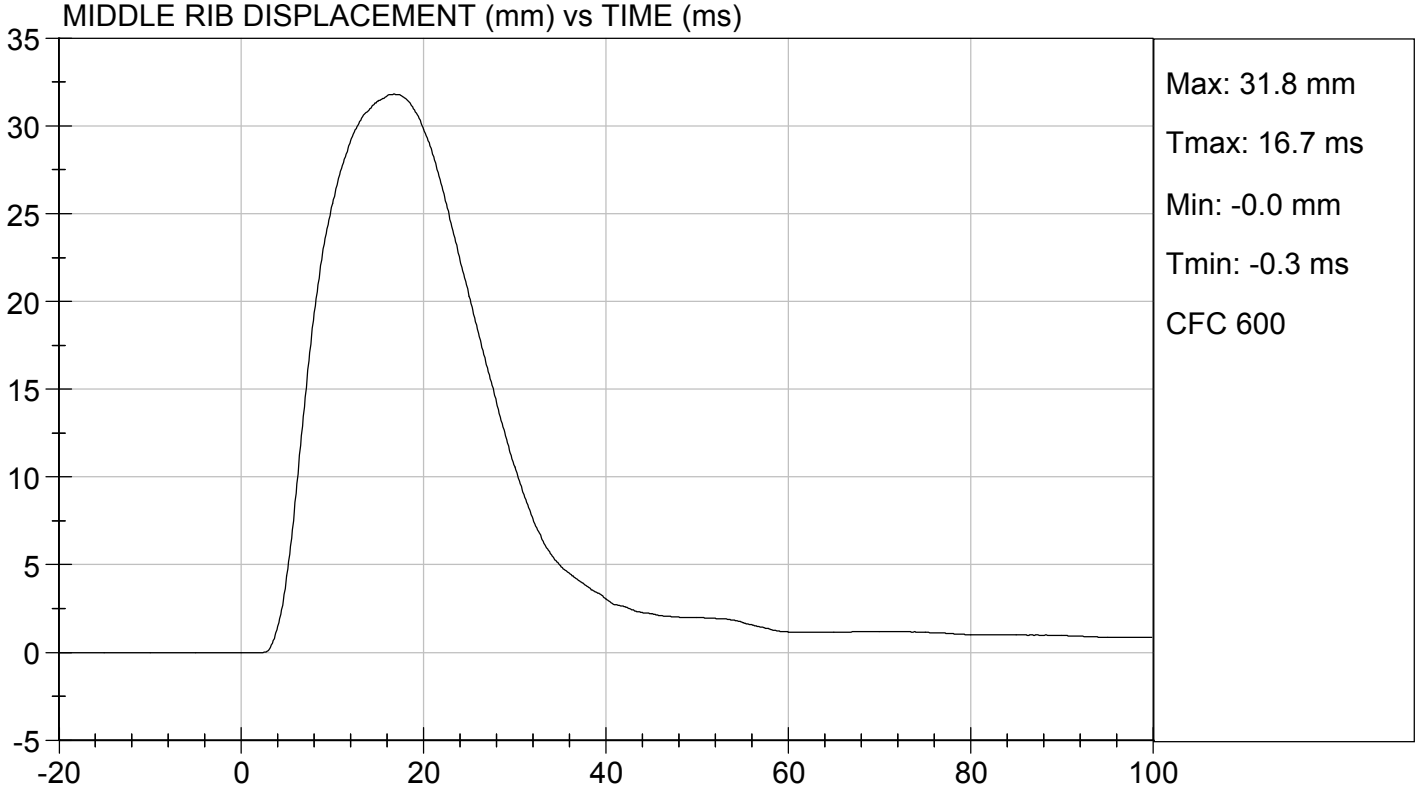
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



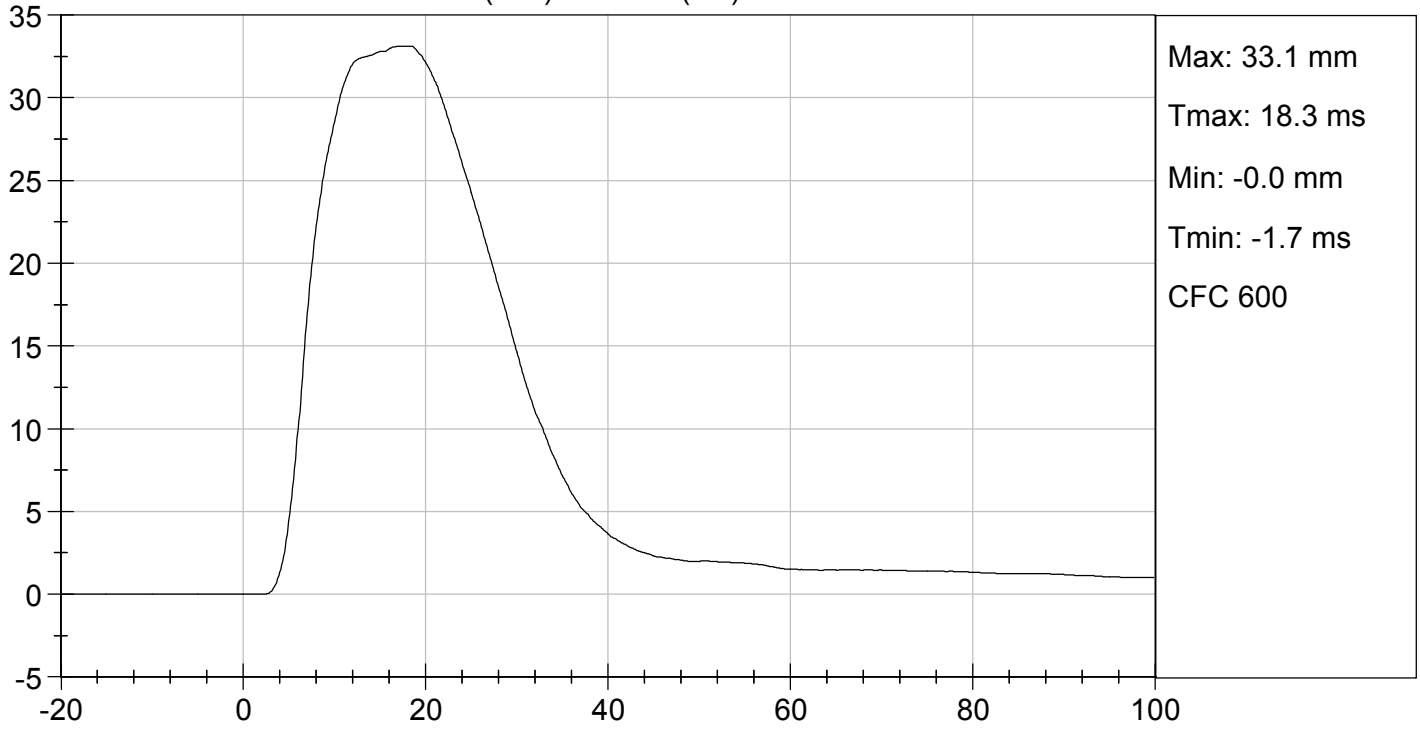
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



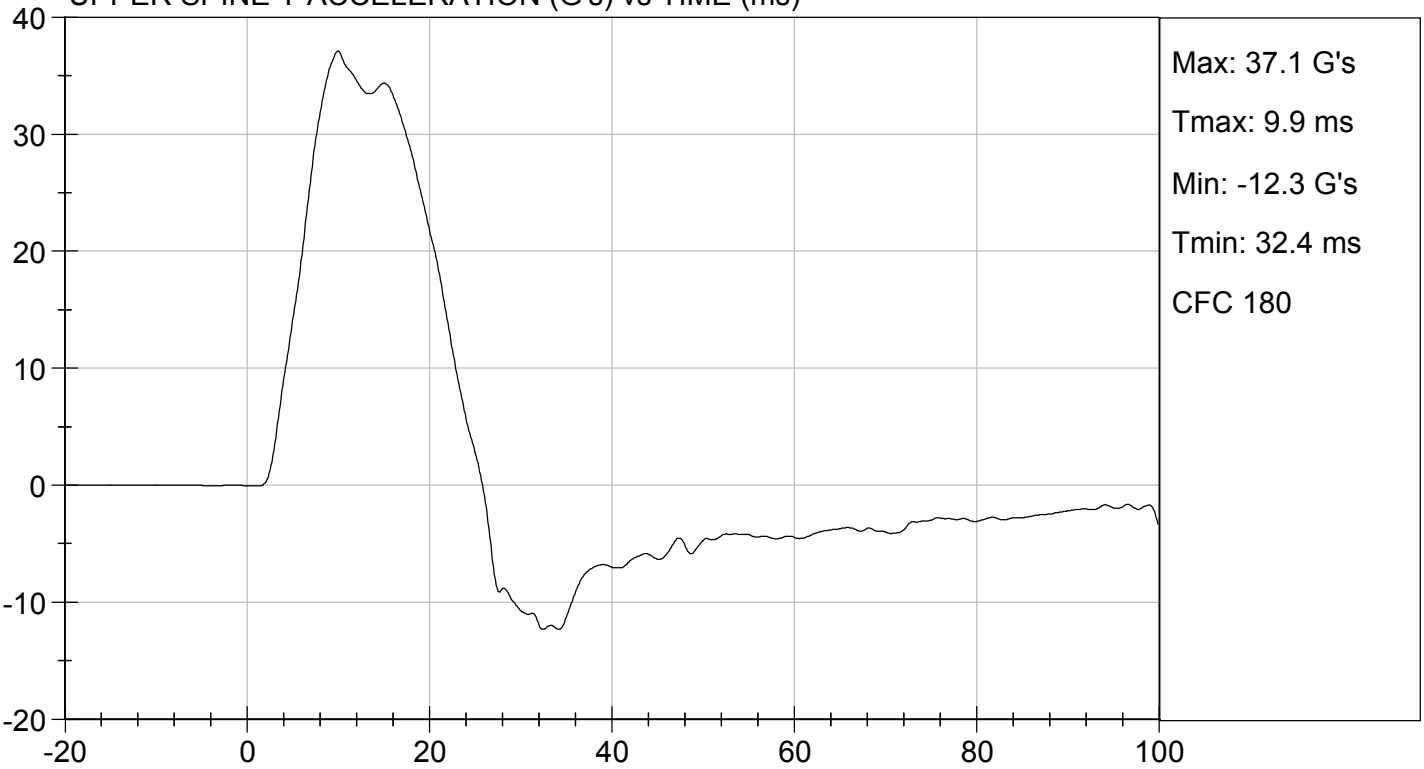
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 11/23/2020
TEST #: D203044

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

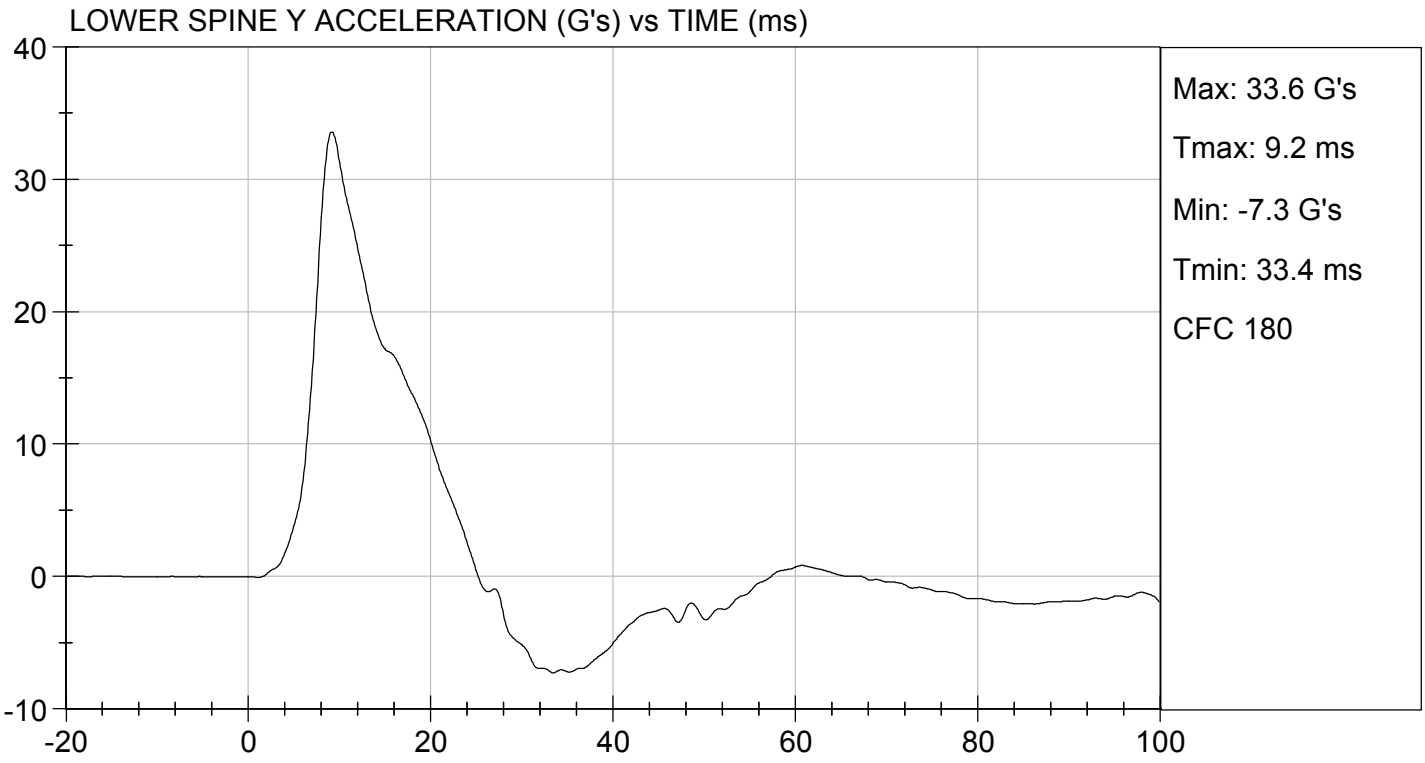


UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 11/23/2020
TEST #: D203044



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203045

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	43	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

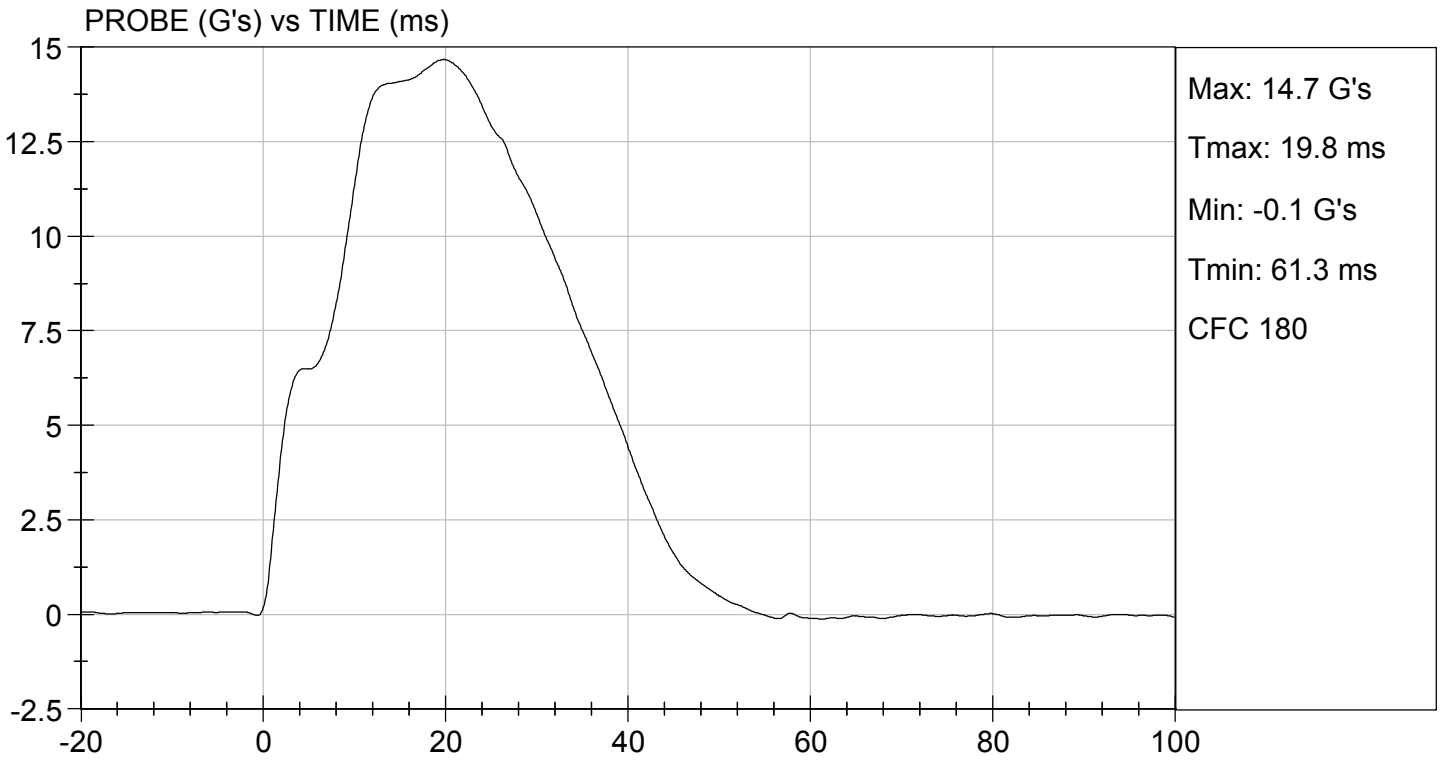
Laboratory Technician

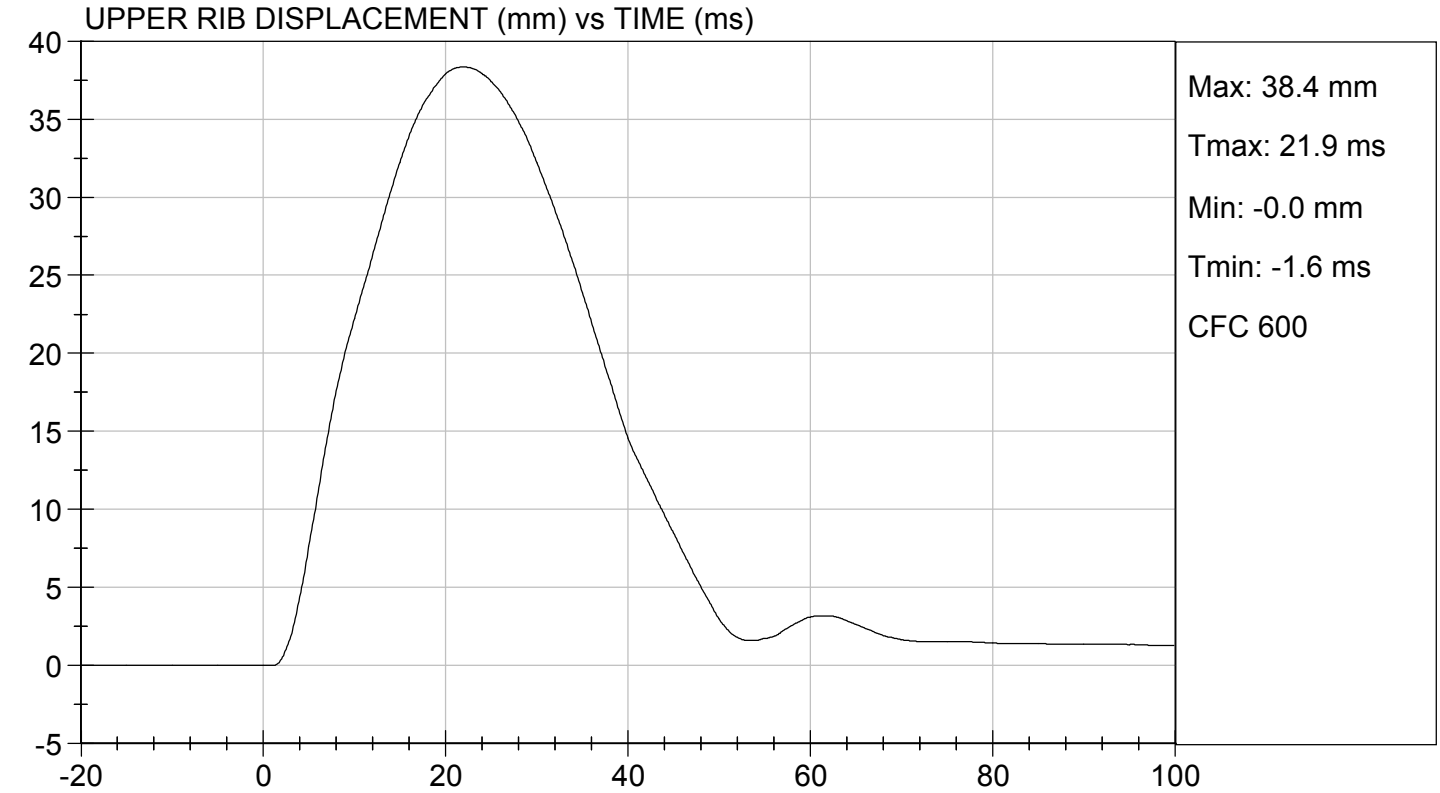
11/23/2020
Test Date

Approved By

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

TEST DATE: 11/23/2020
TEST #: D203045

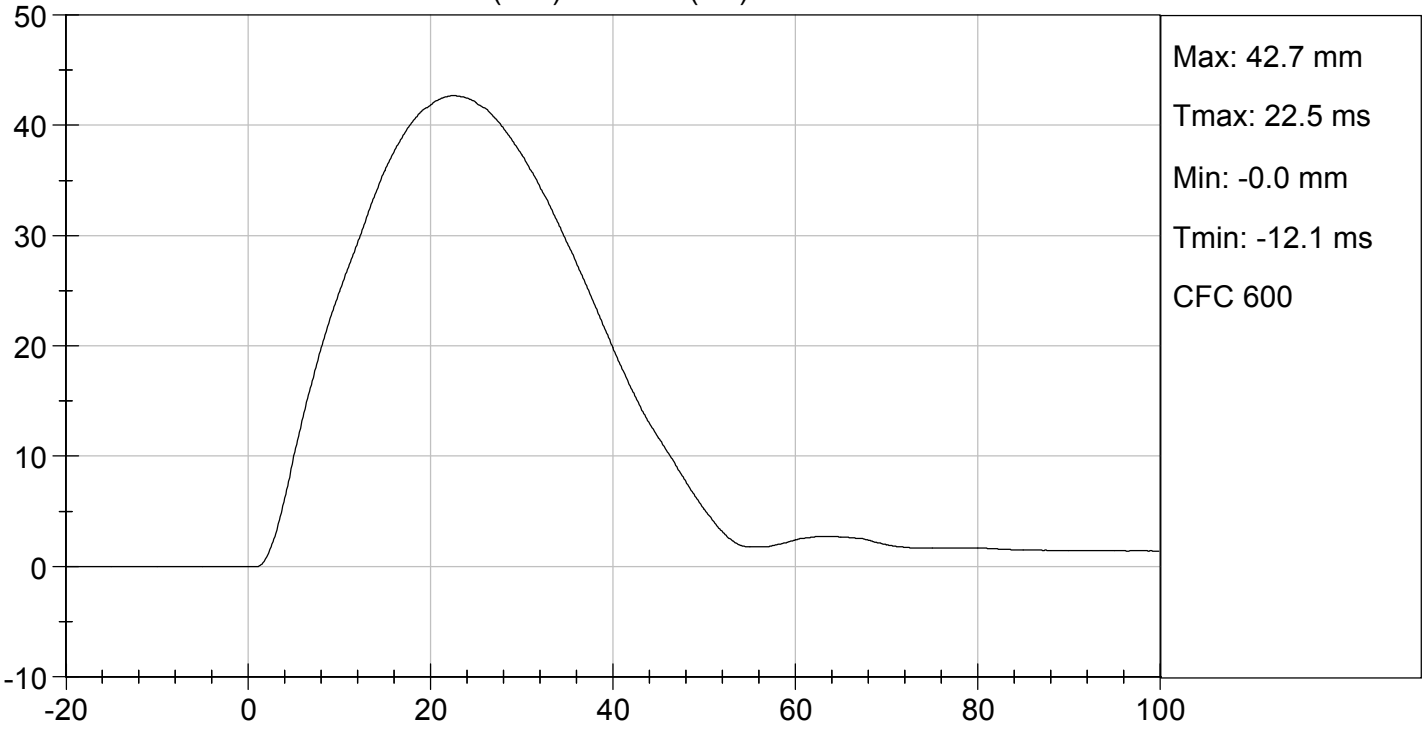




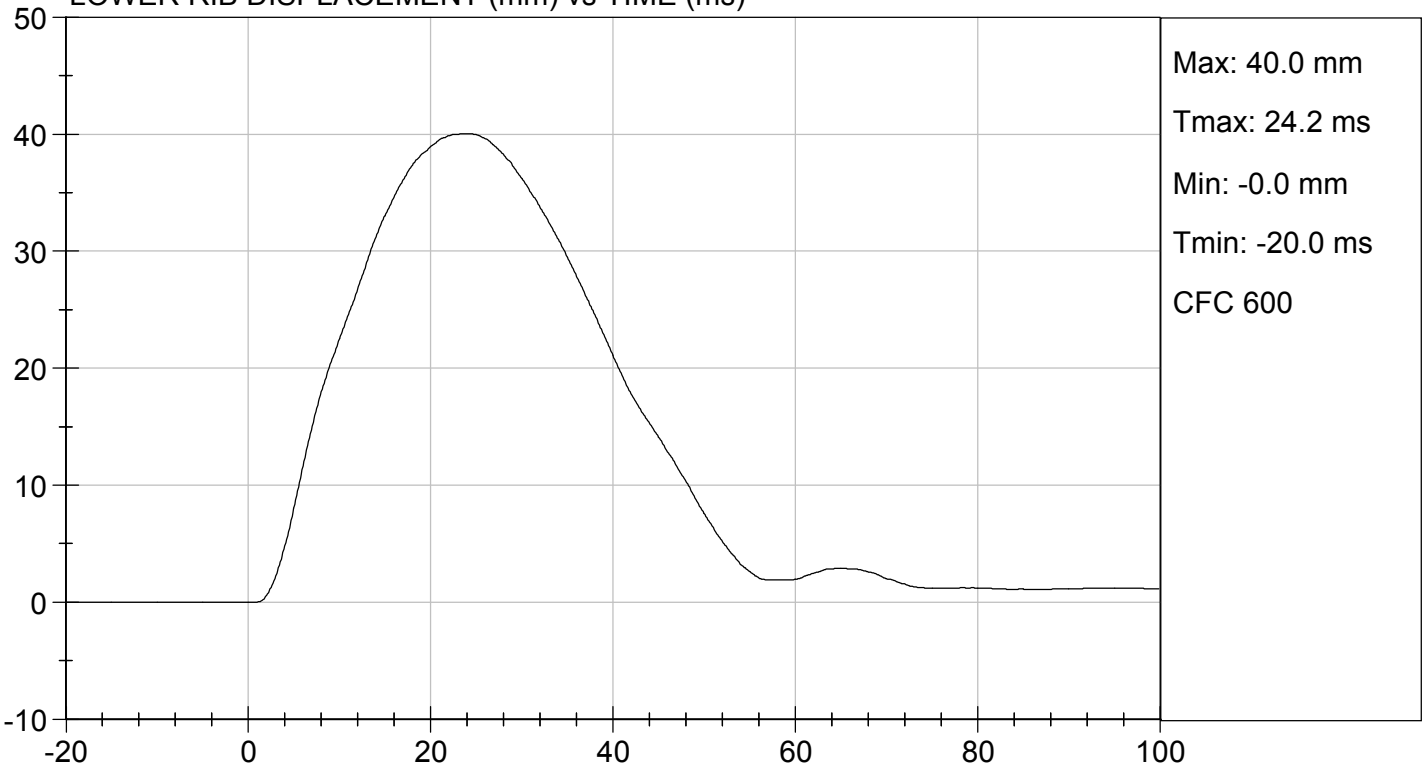
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 11/23/2020
TEST #: D203045

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



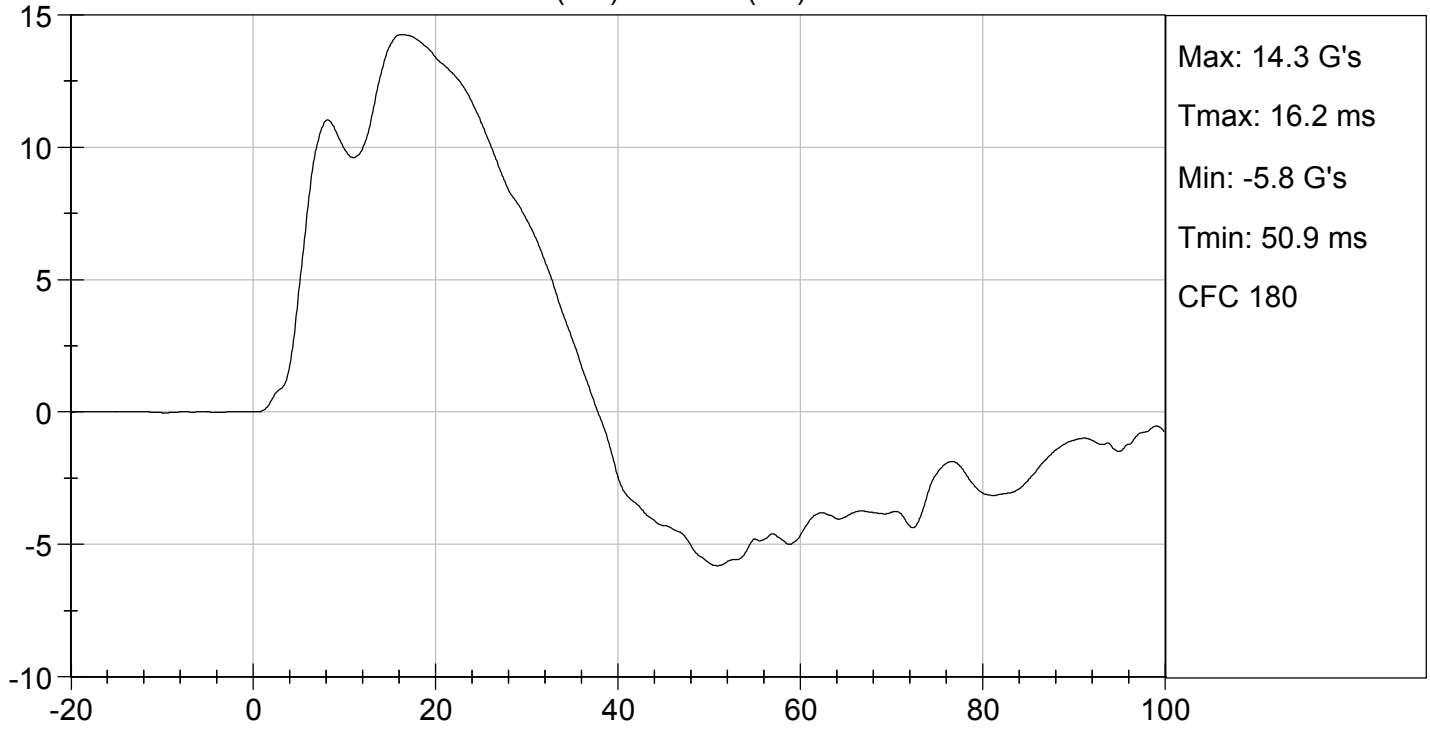
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



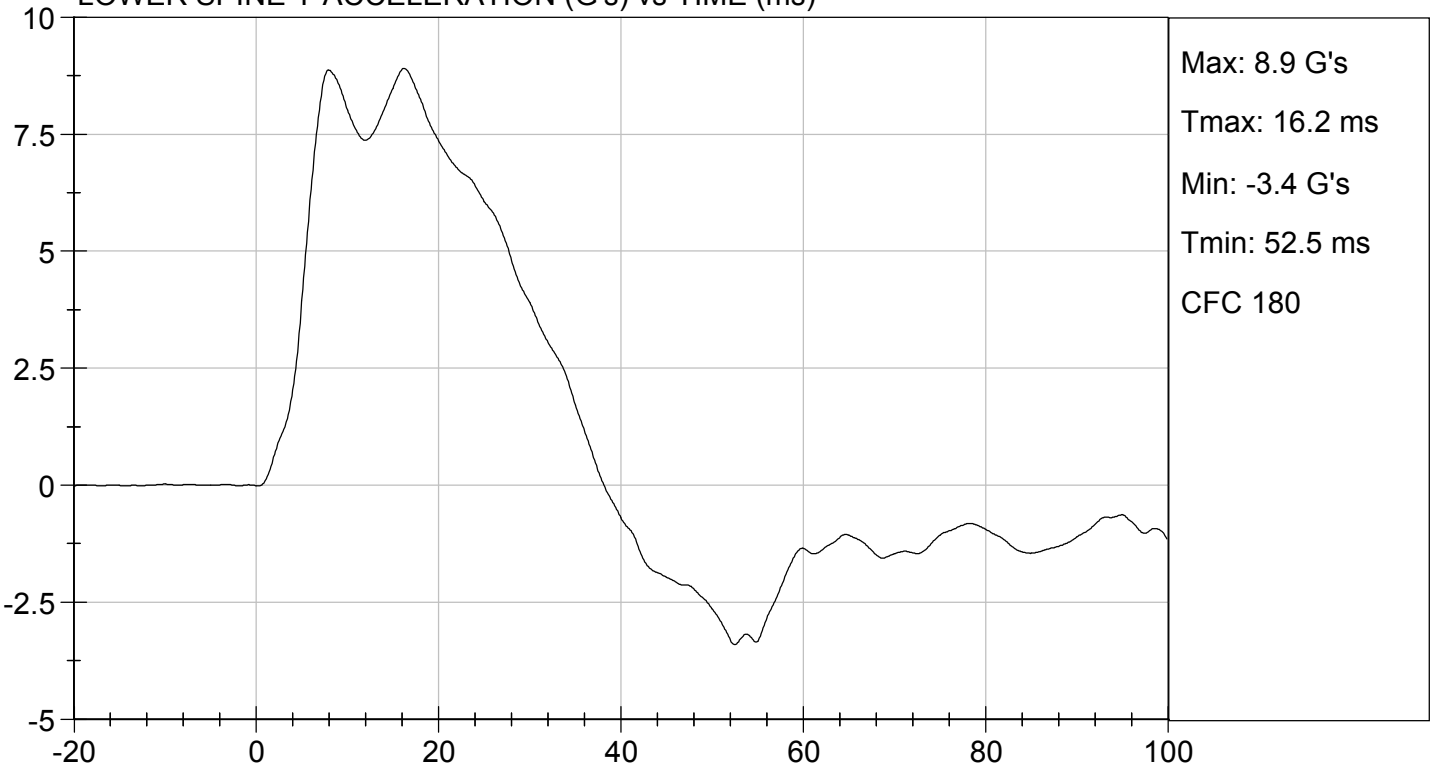
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 11/23/2020
TEST #: D203045

UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



LOWER SPINE Y ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203046

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	42	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
		Overall Test Results		Pass

Laboratory Technician

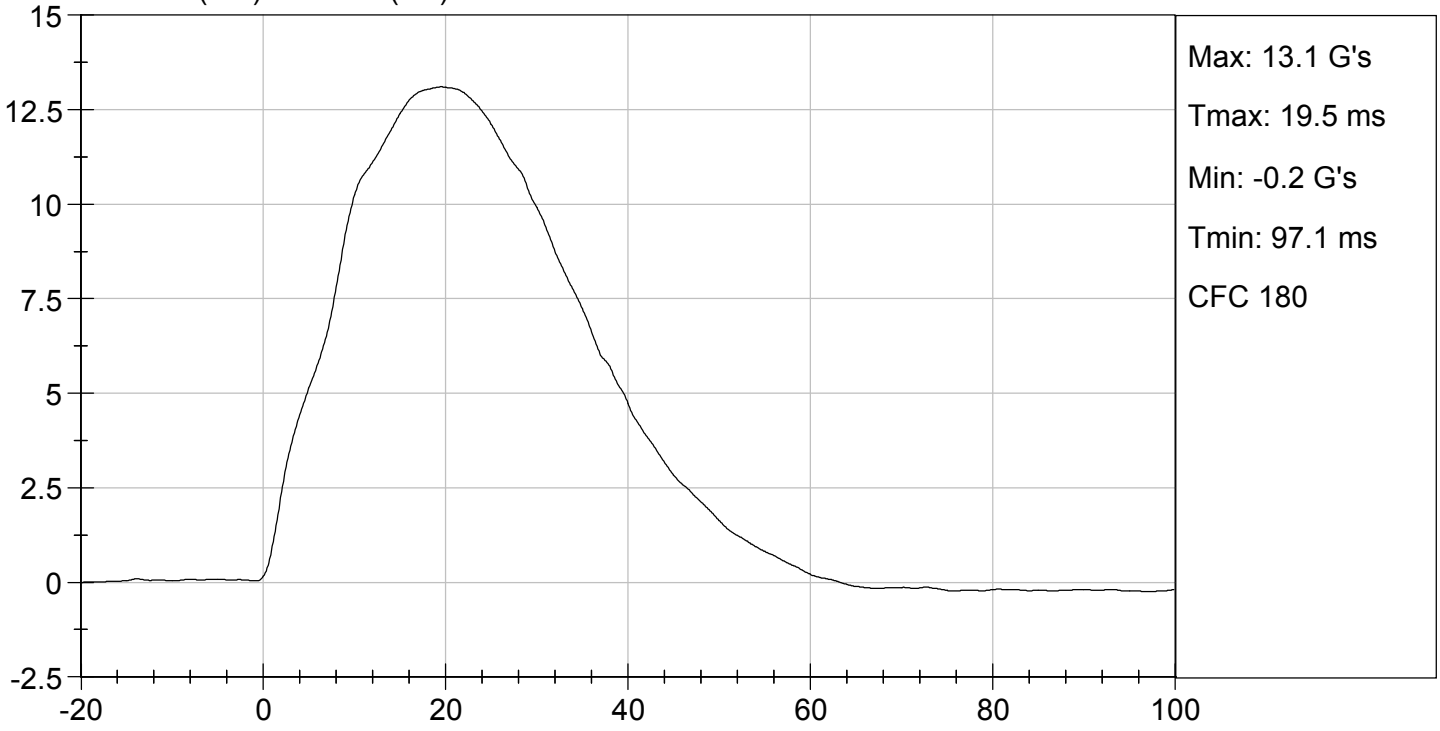
11/24/2020
Test Date

Approved By

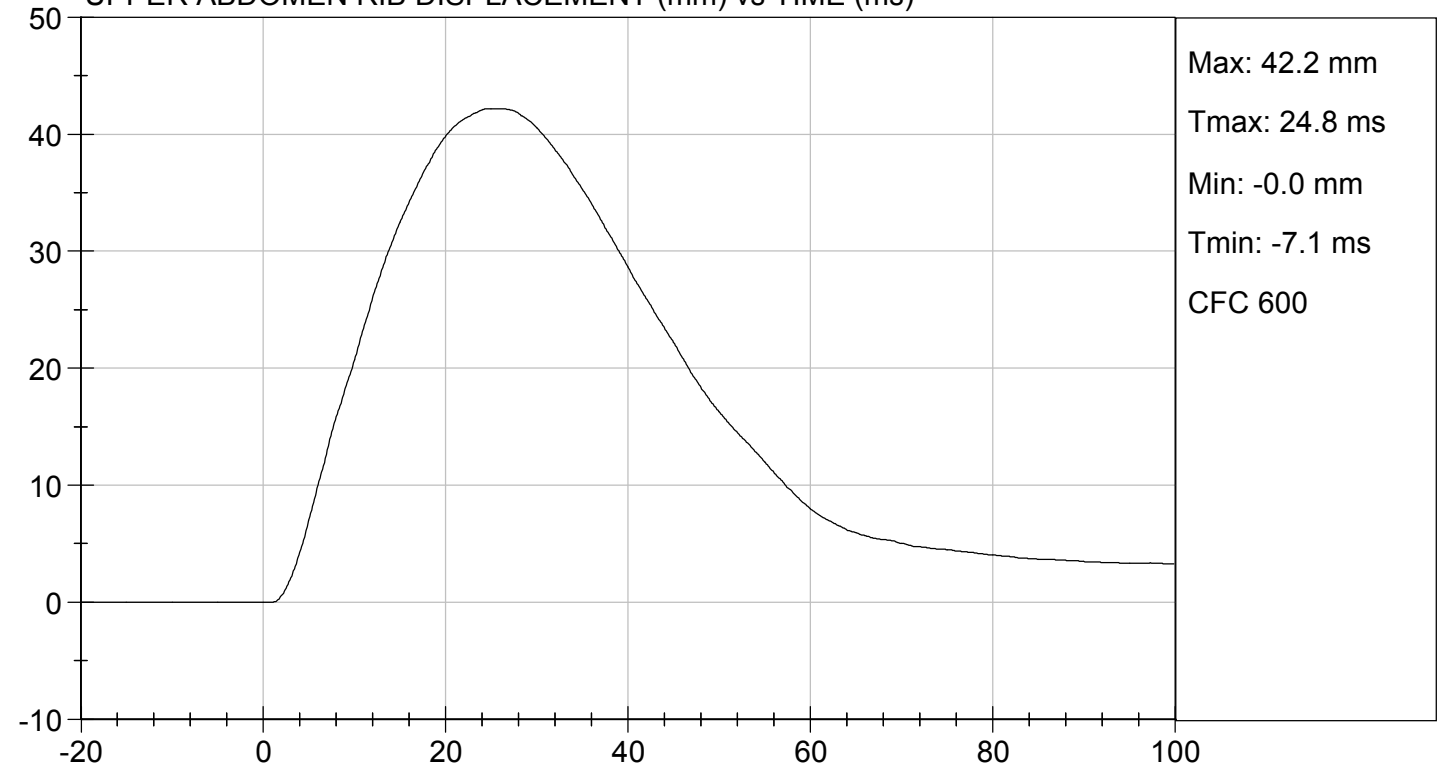
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 11/24/2020
TEST #: D203046

PROBE (G's) vs TIME (ms)



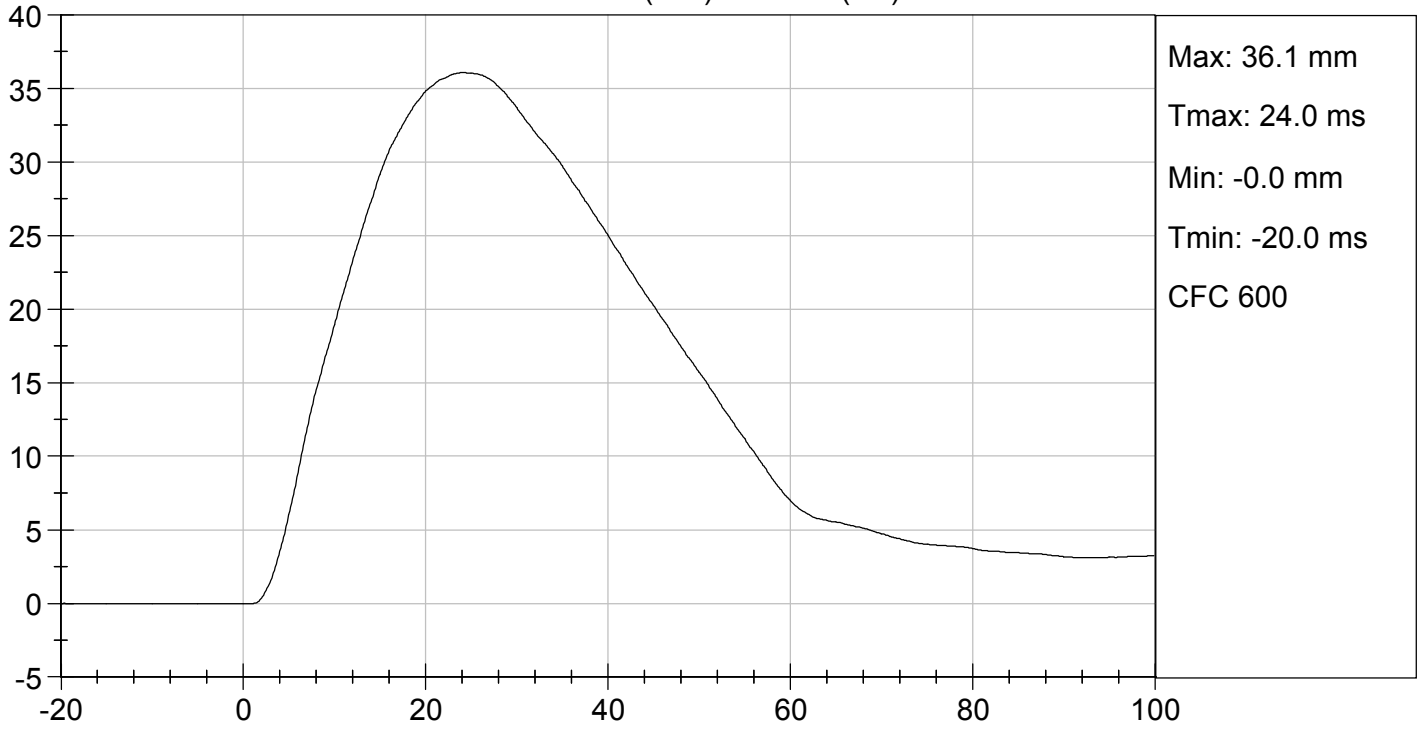
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



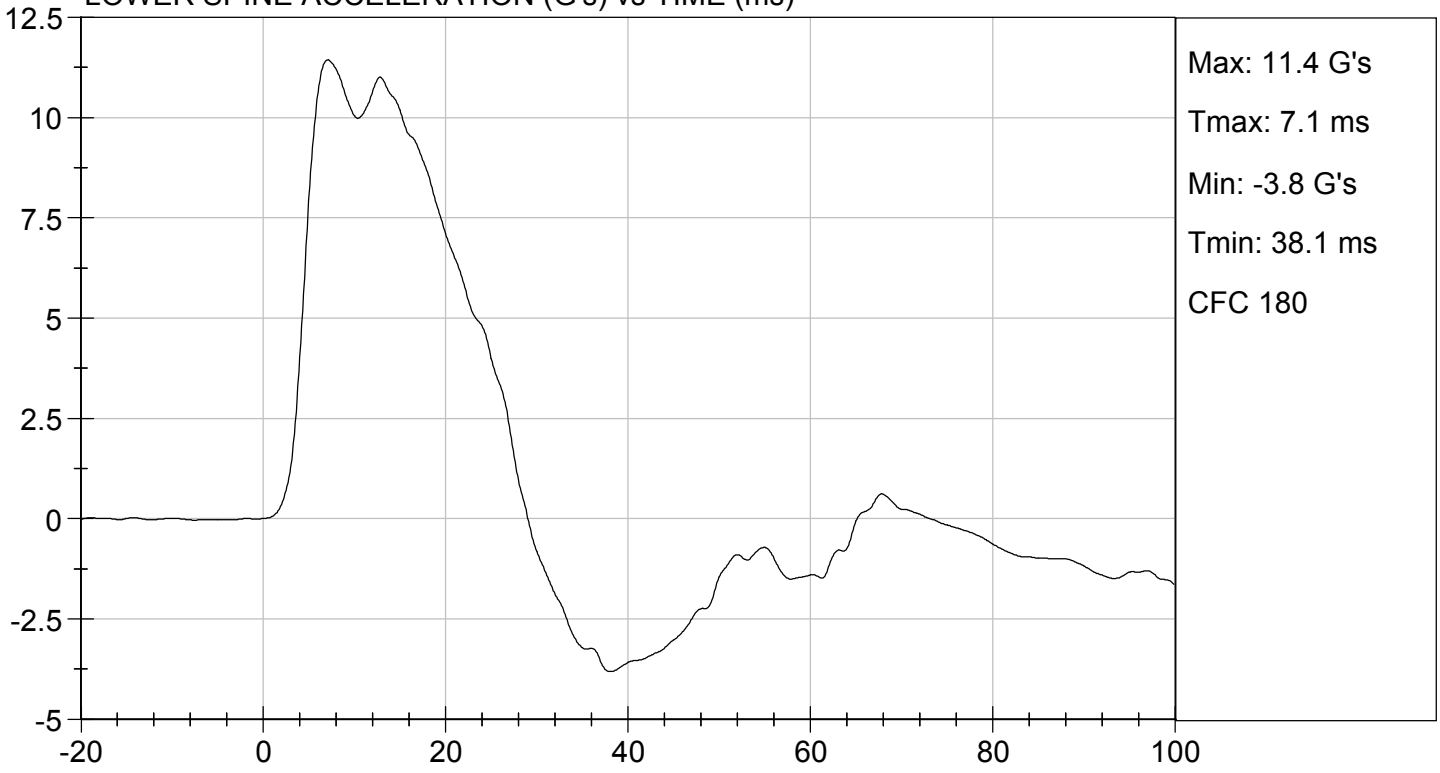
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 11/24/2020
TEST #: D203046

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



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203047

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39	Pass
Peak Acetabulum Force	N	3600 to 4300	3,866	Pass
		Overall Test Results		Pass

Laboratory Technician

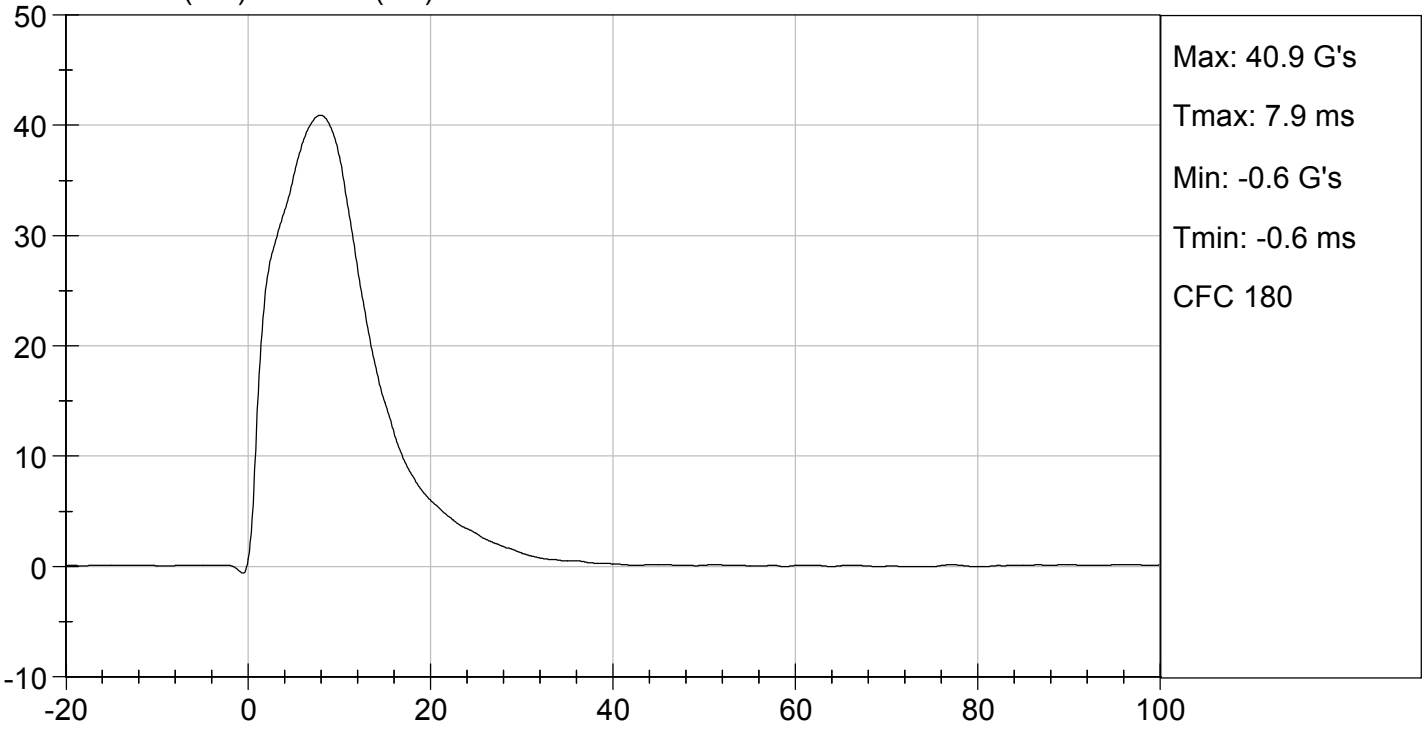
11/24/2020
Test Date

Approved By

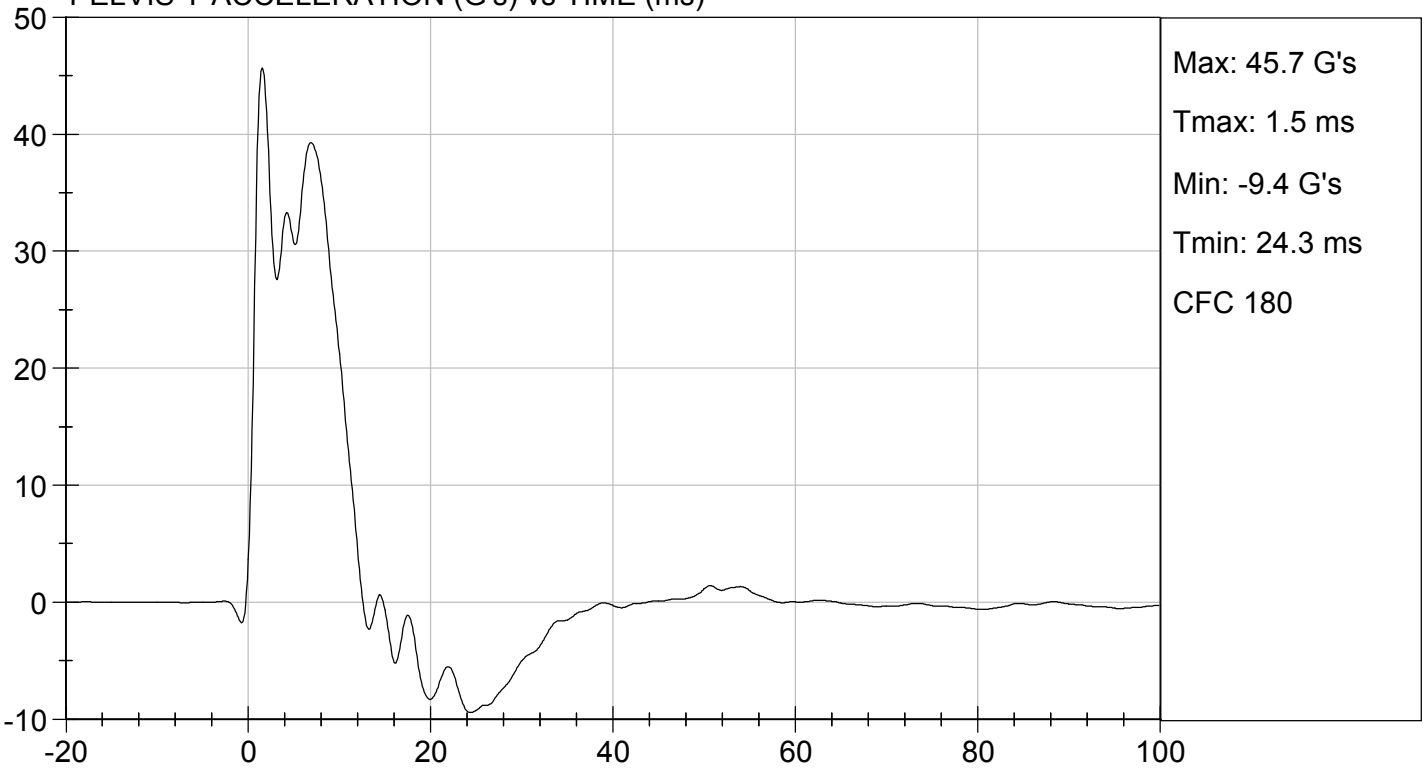
TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 11/24/2020
TEST #: D203047

PROBE (G's) vs TIME (ms)

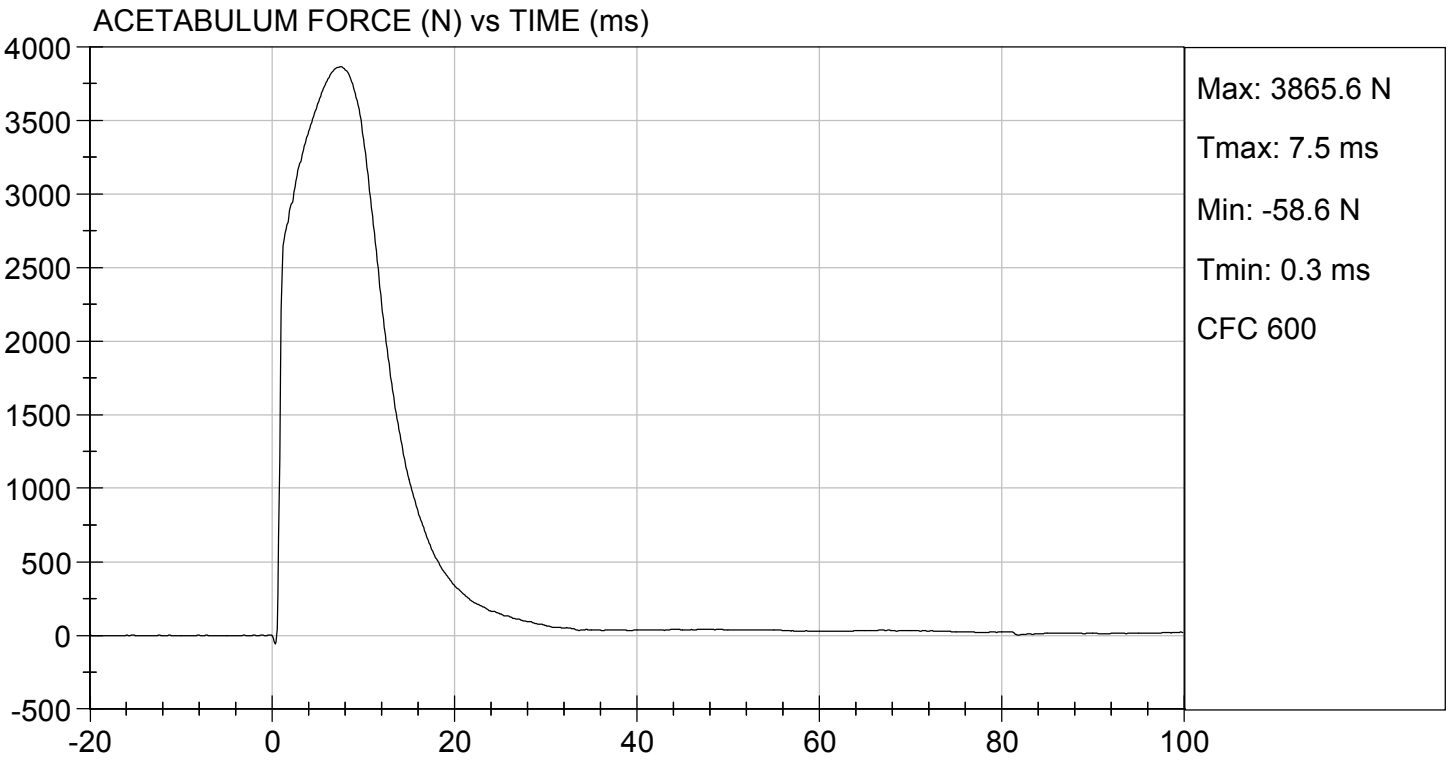


PELVIS Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 11/24/2020
TEST #: D203047



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203048

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	42	Pass
Pelvis Y Acceleration	G's	28 to 39	33	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,870	Pass
		Overall Test Results		Pass

Laboratory Technician

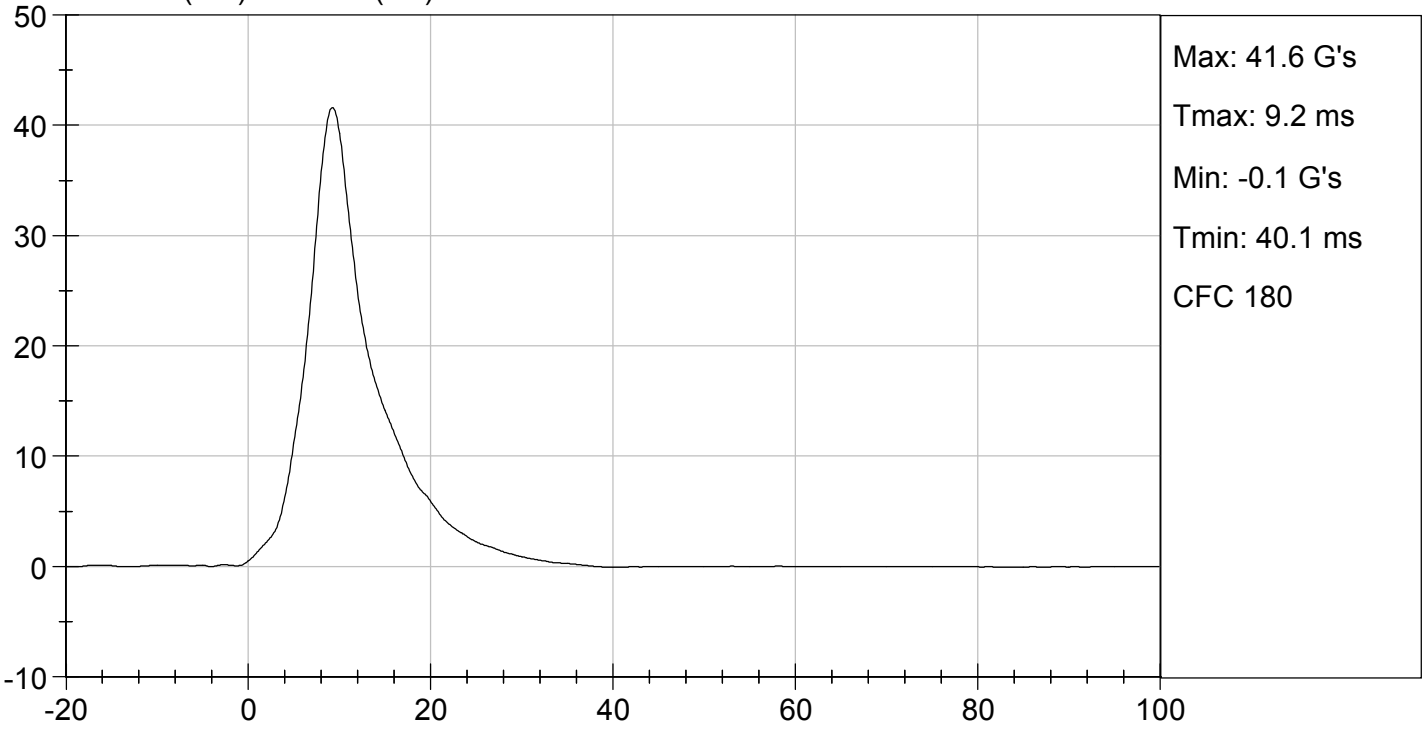
11/23/2020
Test Date

Approved By

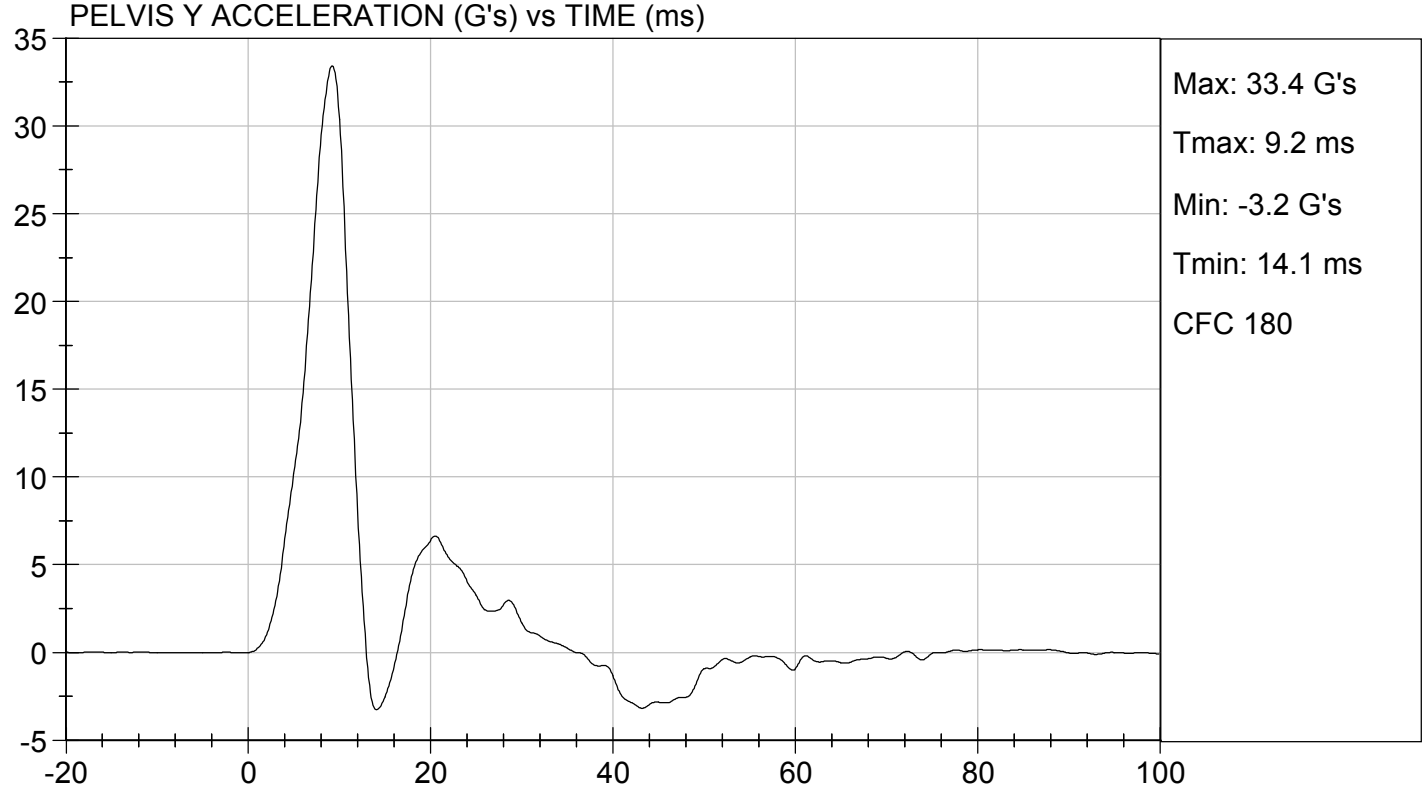
TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 11/23/2020
TEST #: D203048

PROBE (G's) vs TIME (ms)

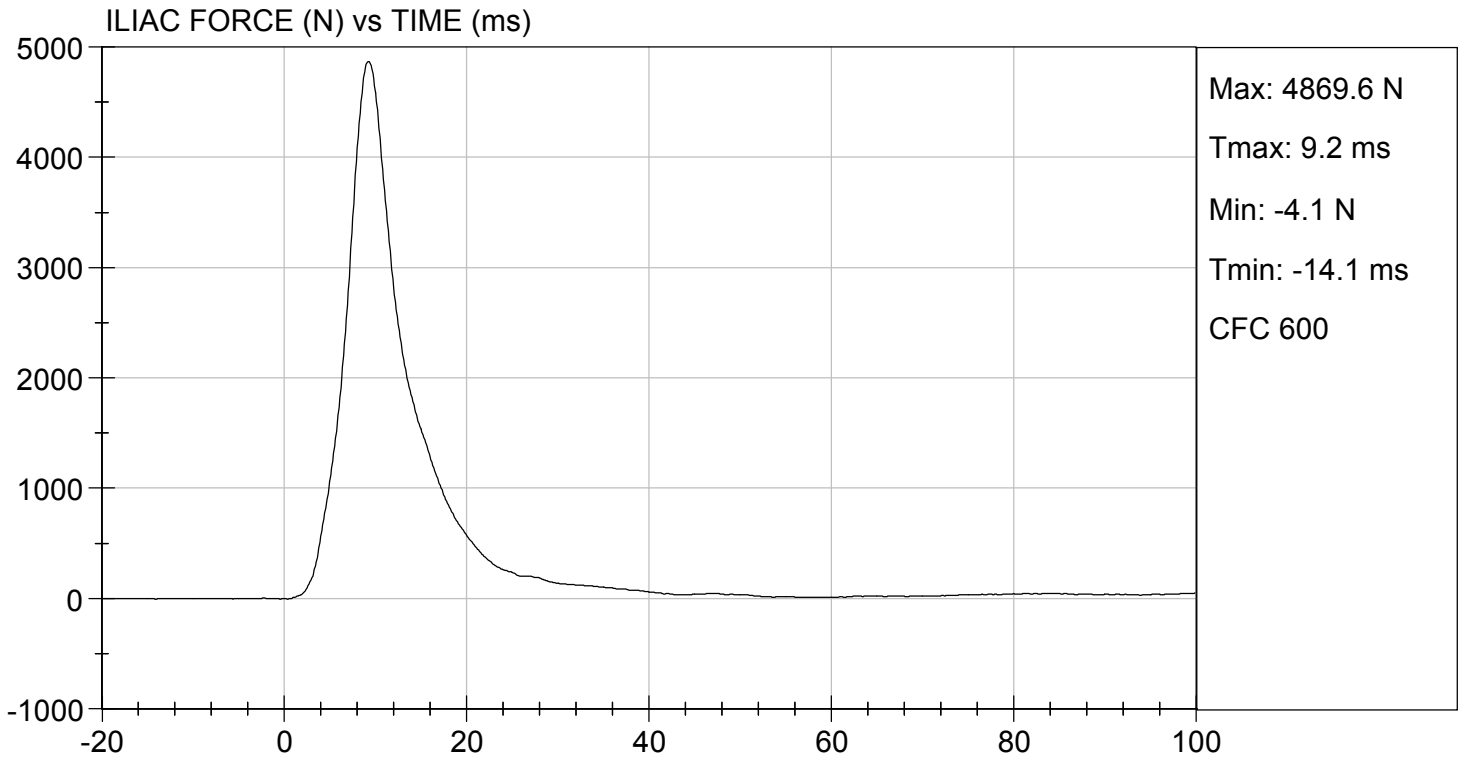


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 11/23/2020
TEST #: D203048



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 296

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	784	Pass
B	Shoulder Pivot Height	437 - 453	442	Pass
C	H-point Height	79 - 89	83	Pass
D	H-point from Seatback	141 - 151	145	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	121	Pass
G	Head Breadth	140 - 148	142	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	180	Pass
J	Head Circumference	541 - 551	548	Pass
K	Buttock to Knee Length	514 - 540	535	Pass
L	Popliteal Height	343 - 369	358	Pass
M	Knee Pivot to Floor Height	392 - 409	404	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	206	Pass
P	Foot Length	216 - 232	219	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	316	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	481	Pass
V	Shoulder Width	341 - 357	346	Pass
W	Foot Width	78 - 94	85	Pass
Y	Chest Circumference w/ jacket	851 - 881	870	Pass
Z	Waist Circumference	761 - 791	772	Pass

MGA RESEARCH CORPORATION

HEAD DROP TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D203171

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	115 to 137	124	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-2.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician

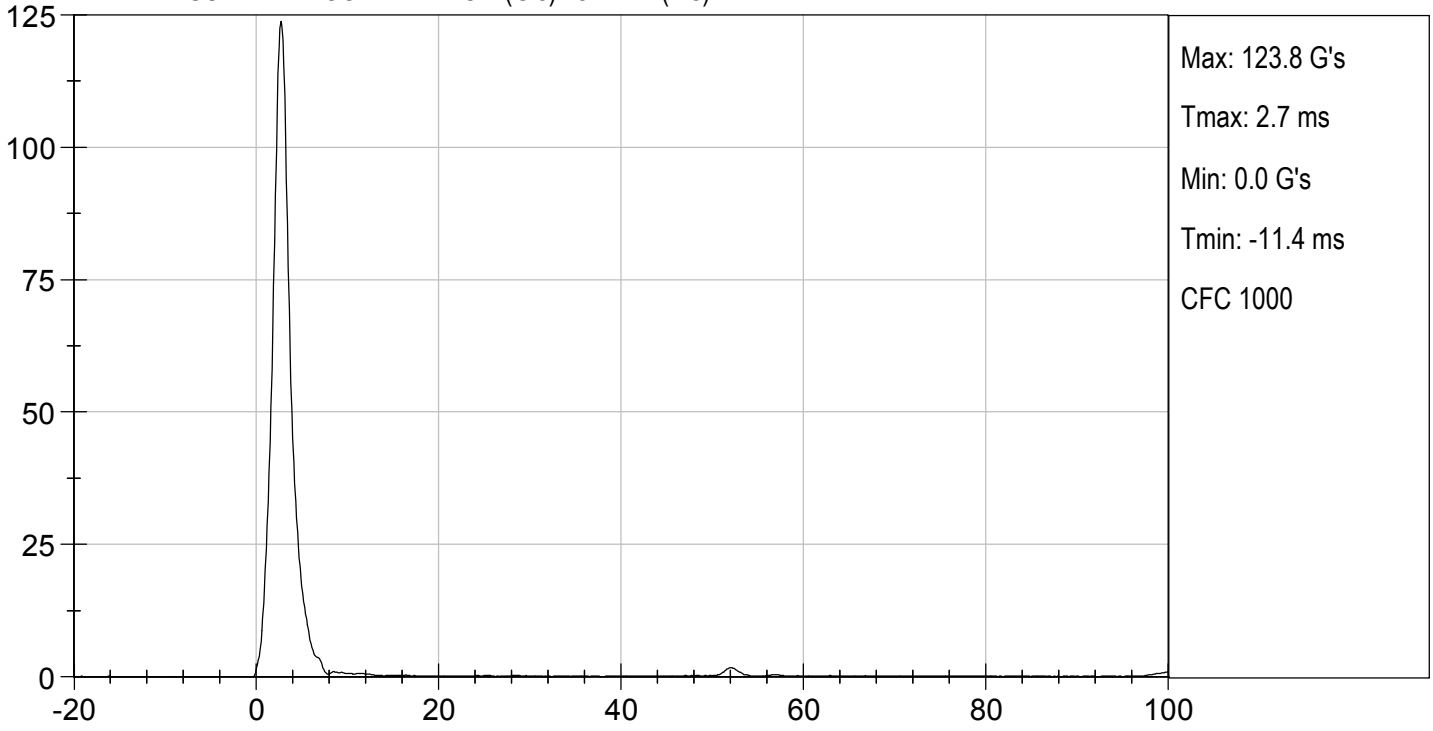
12/05/2020
Test Date

Approved By

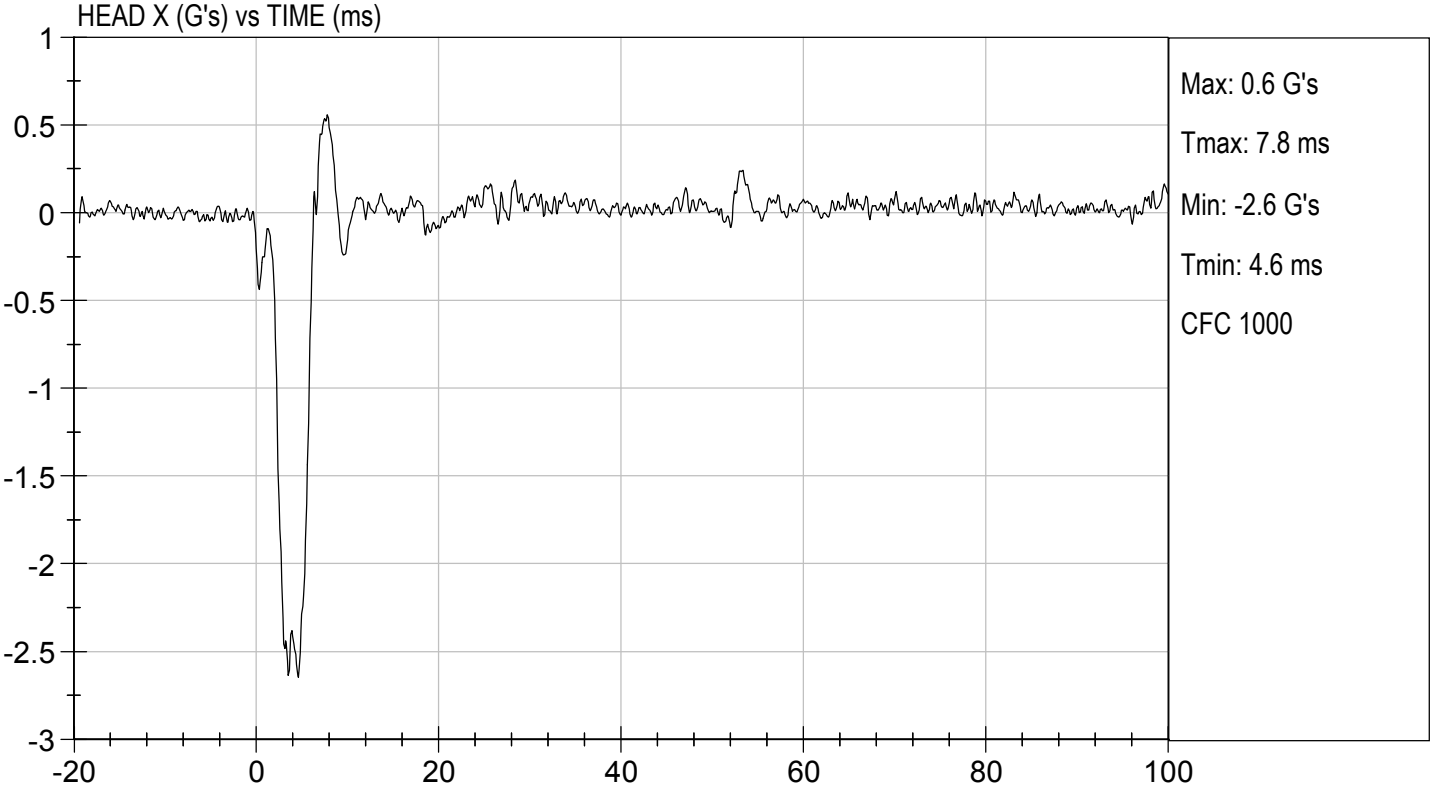
TEST DESC: HEAD DROP

TEST DATE: 12/05/2020
TEST #: D203171

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

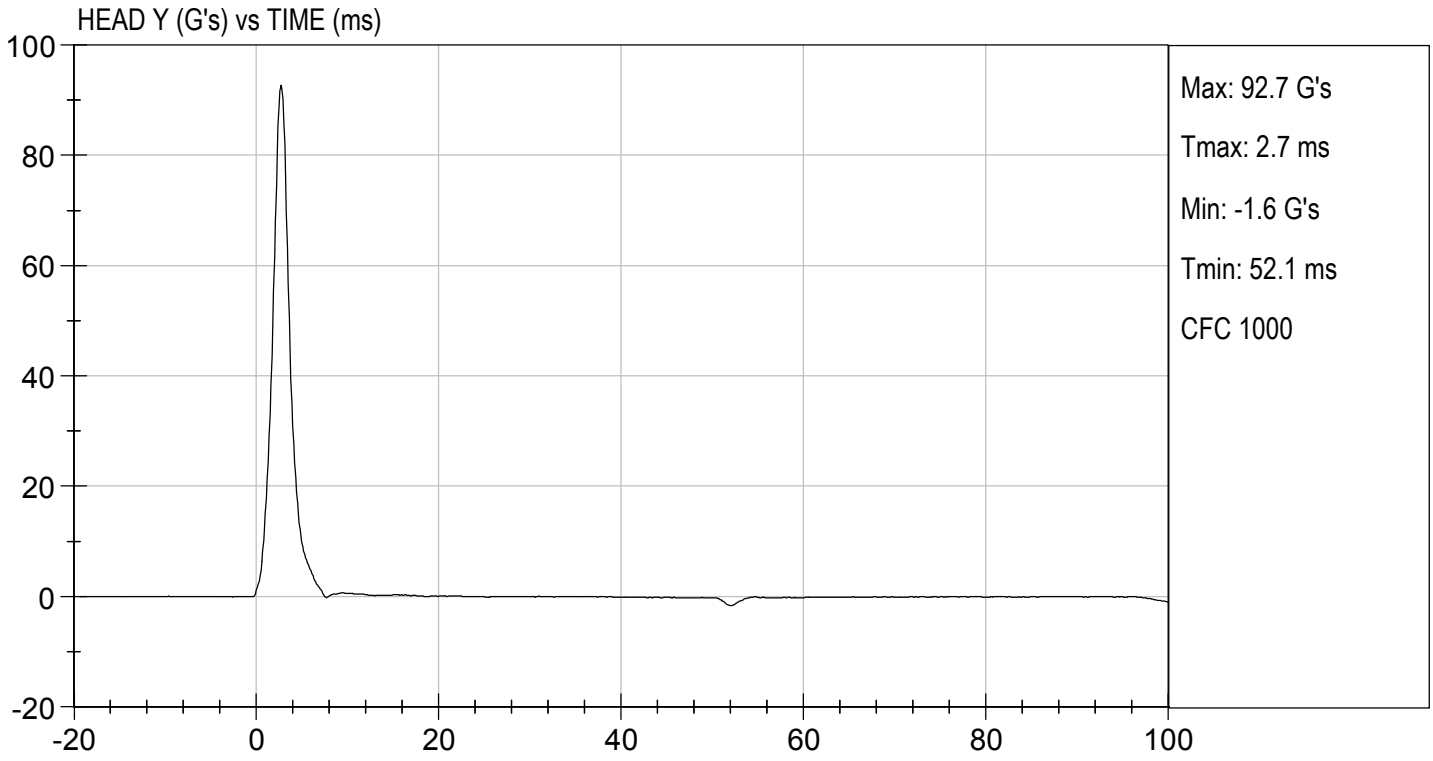


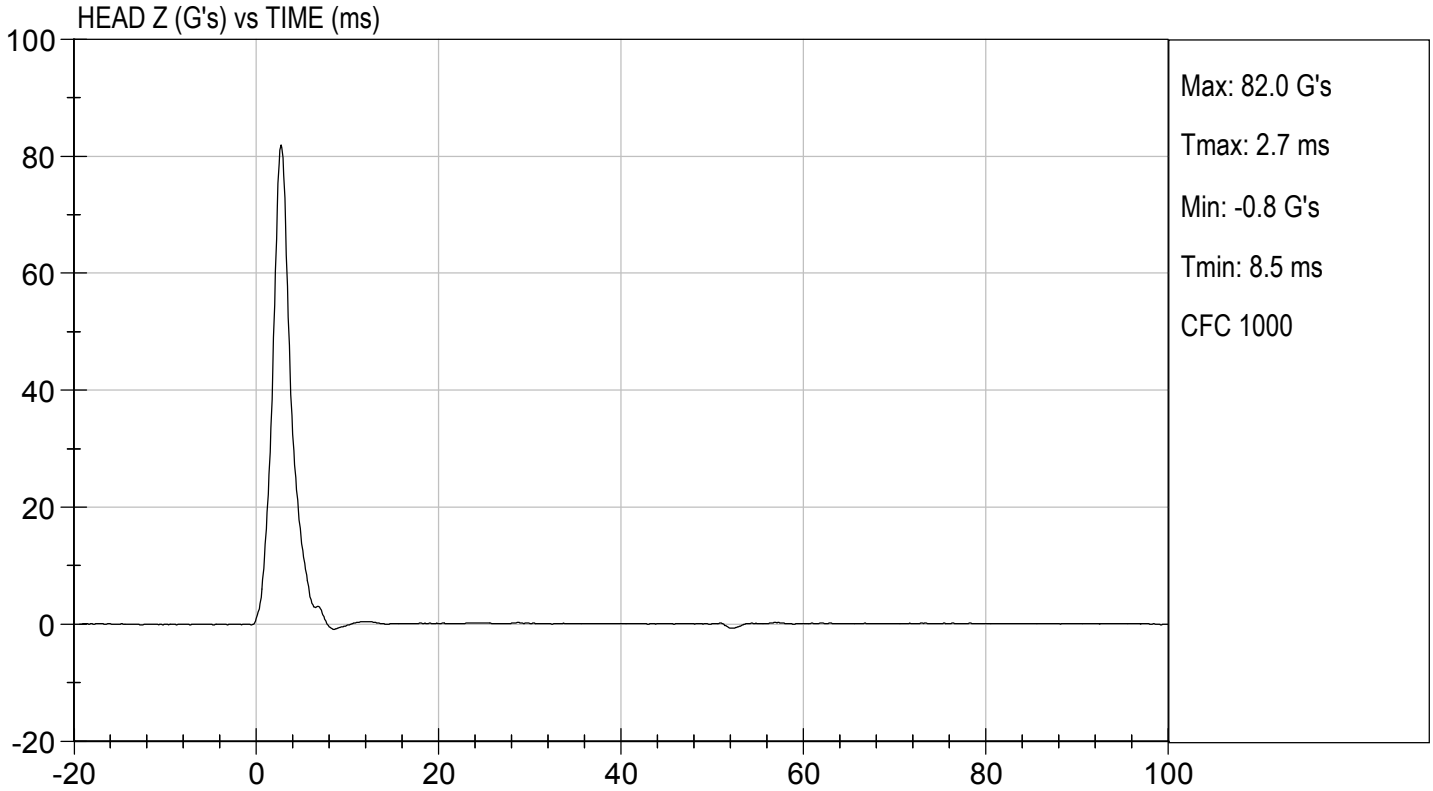
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 12/05/2020
TEST #: D203171





MGA RESEARCH CORPORATION

LATERAL NECK PENDULUM TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203172

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	32	Pass
Impact Velocity		m/s	5.51 to 5.63	5.64	Fail
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.71	Pass
	15 ms	m/s	3.30 to 4.10	3.82	Pass
	20 ms	m/s	4.40 to 5.40	5.16	Pass
	25 ms	m/s	5.40 to 6.10	5.64	Pass
	25-100 ms	m/s	5.50 to 6.20	5.66	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-34.61	Fail
Time of Moment Decay to 0 Nm		ms	102 to 126	120	Pass
			Overall Test Results		Fail

Laboratory Technician

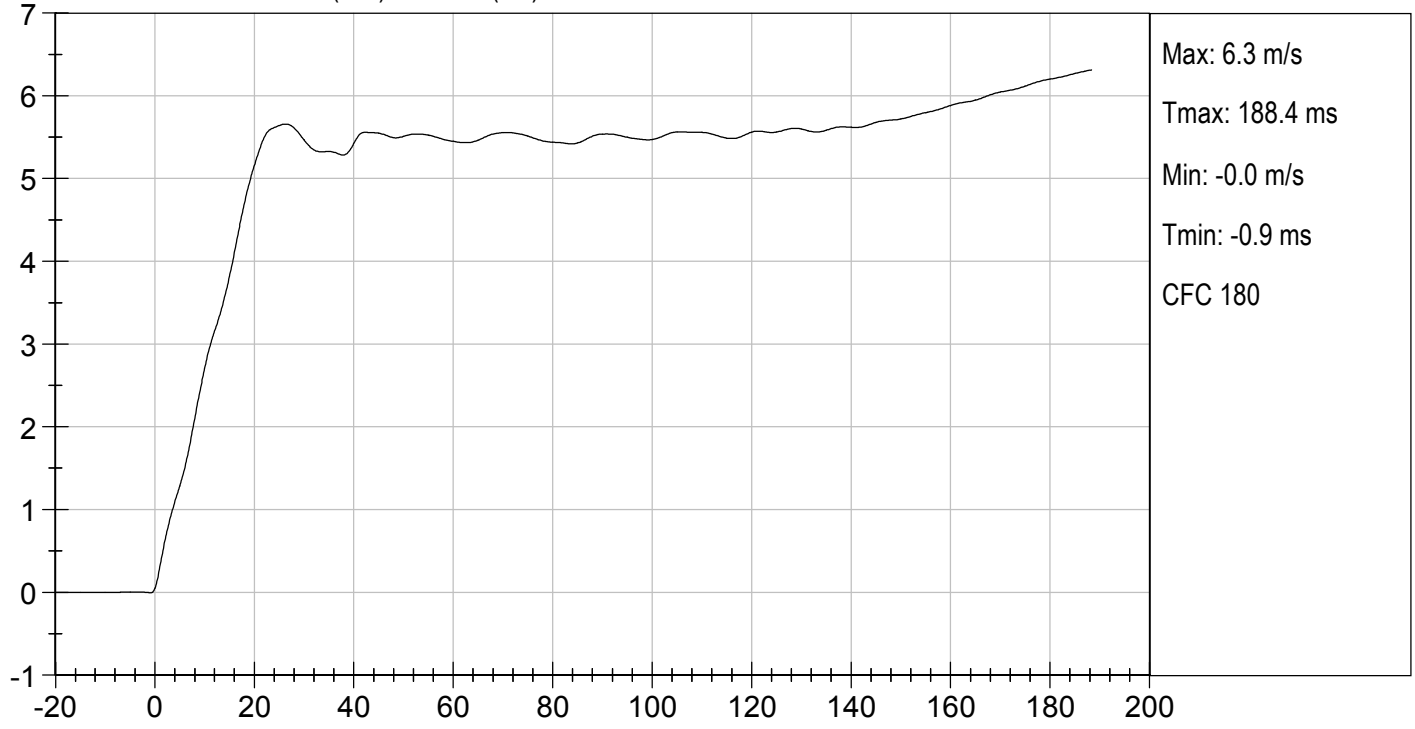
12/05/2020
Test Date

Approved By

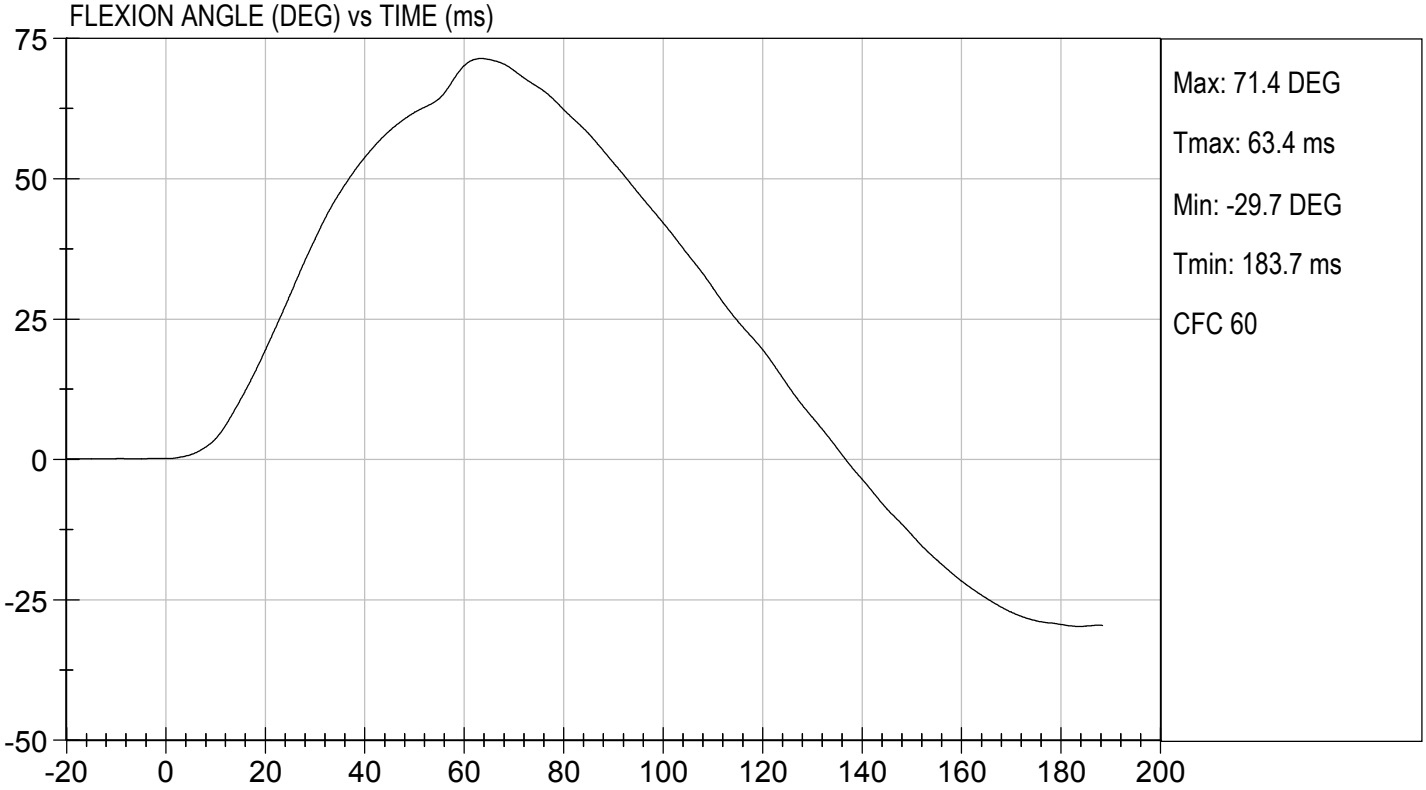
TEST DESC: NECK BENDING
VELOCITY: 18.52 ft/s, 5.64 m/s

TEST DATE: 12/05/2020
TEST #: D203172

PENDULUM VELOCITY (m/s) vs TIME (ms)

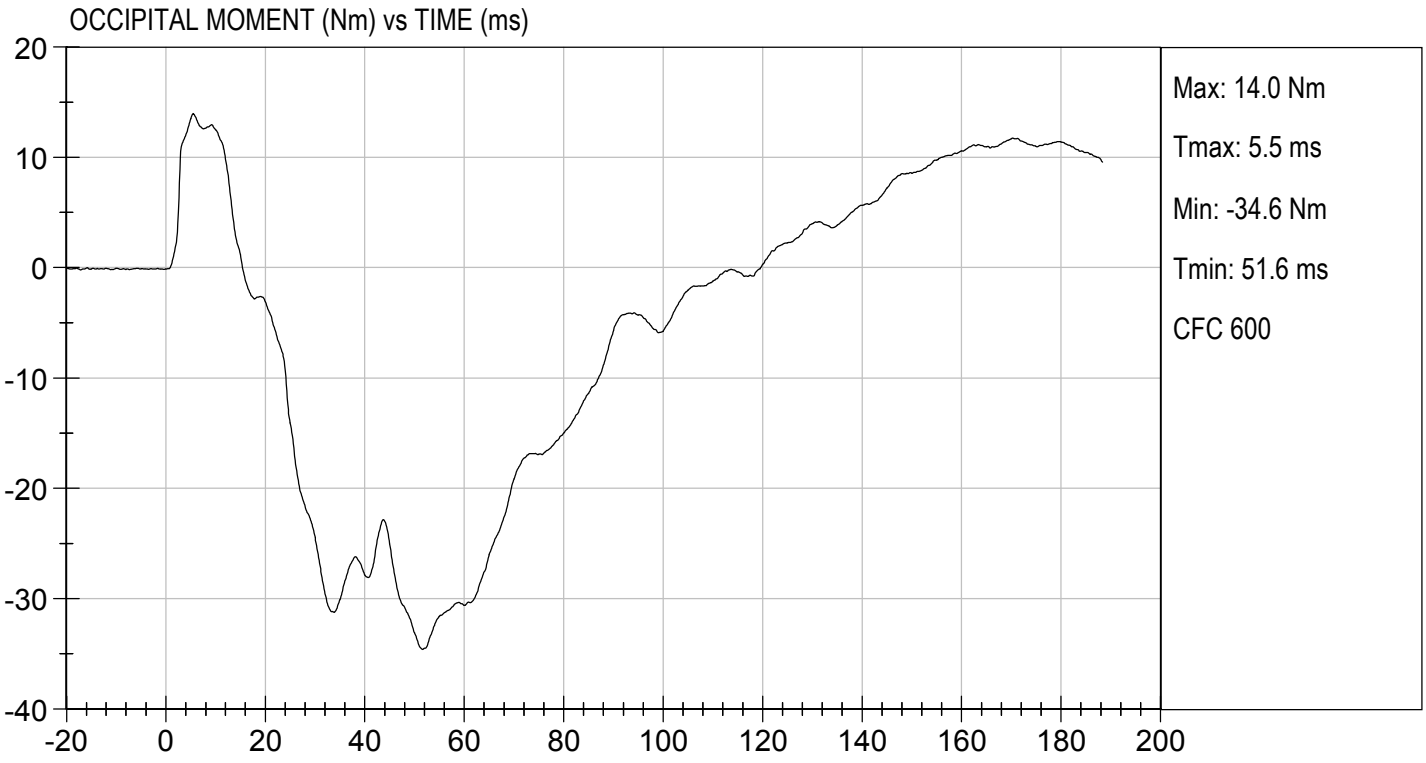


FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.52 ft/s, 5.64 m/s

TEST DATE: 12/05/2020
TEST #: D203172



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test ID:** D203173

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	31	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	18	Pass
		Overall Test Results		Pass

Laboratory Technician

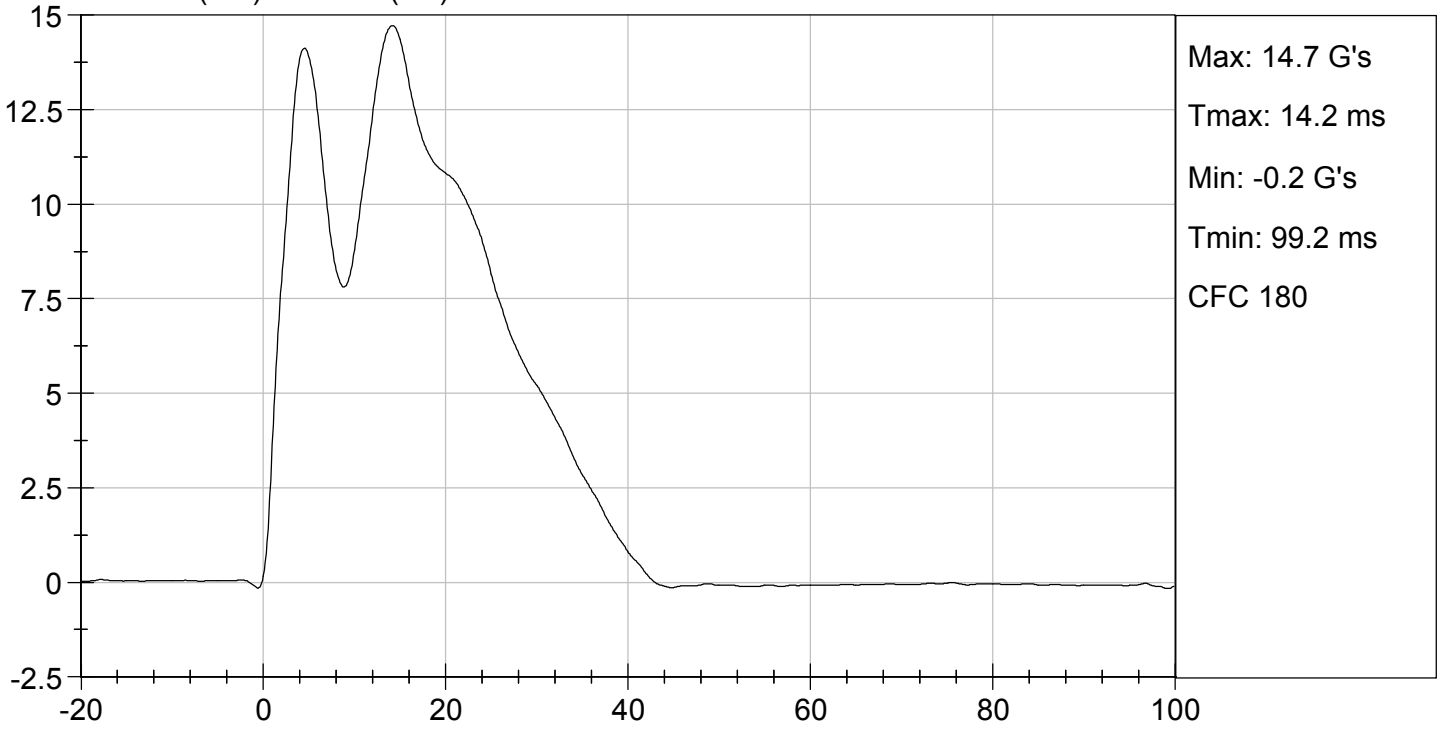
12/05/2020
Test Date

Approved By

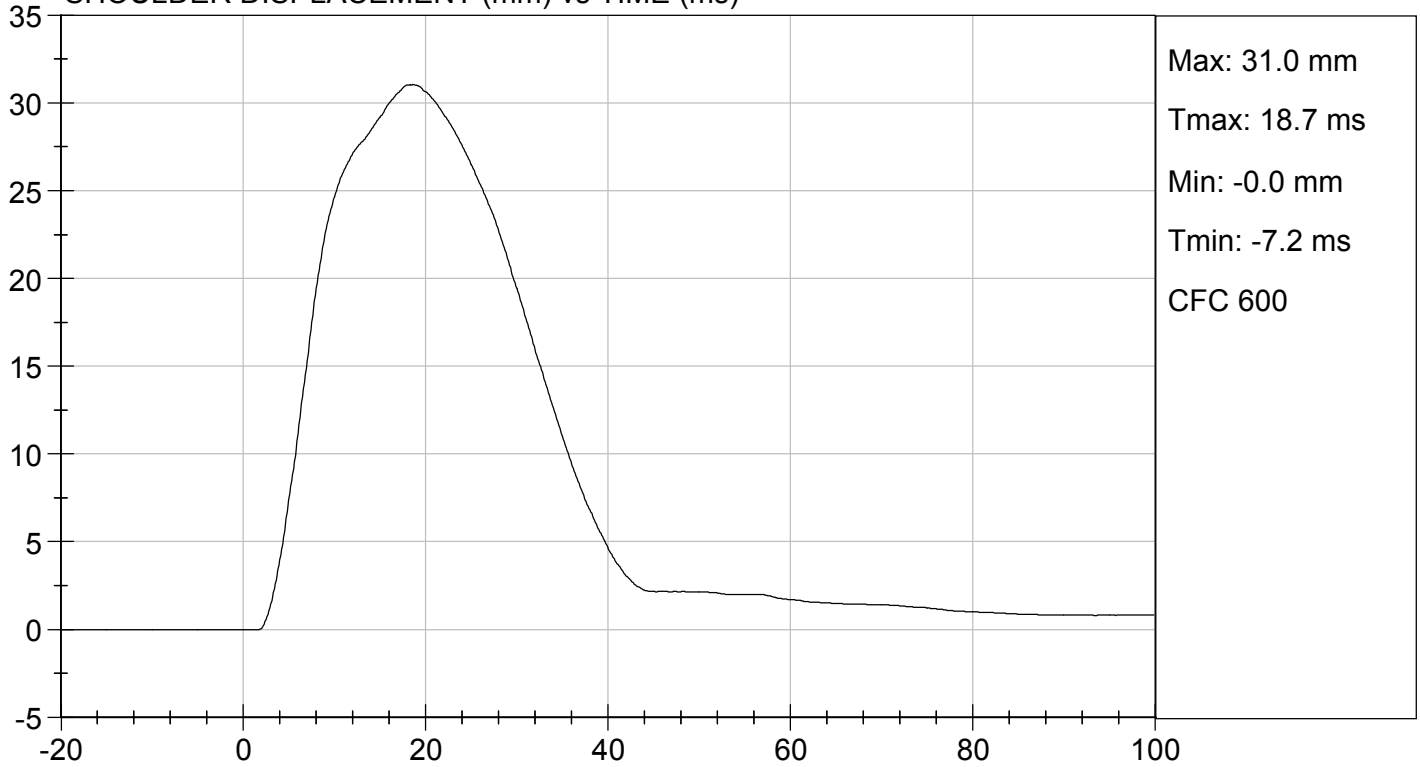
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 12/05/2020
TEST #: D203173

PROBE (G's) vs TIME (ms)

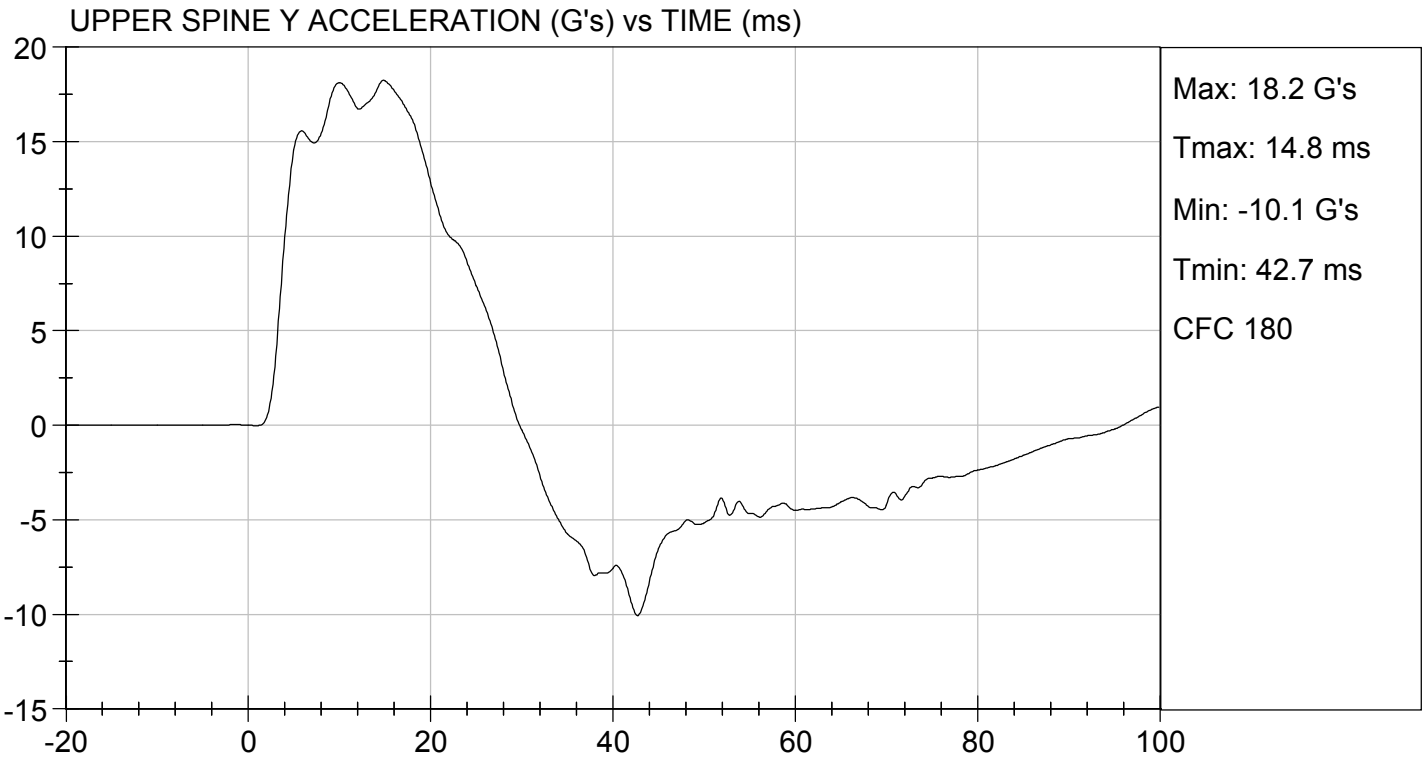


SHOULDER DISPLACEMENT (mm) vs TIME (ms)



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

TEST DATE: 12/05/2020
TEST #: D203173



MGA RESEARCH CORPORATION

THORAX (WITH ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203174

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	33	Pass
Shoulder Displacement	mm	31 to 40	38	Pass
Upper Rib Displacement	mm	25 to 32	30	Pass
Middle Rib Displacement	mm	30 to 36	32	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	36	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	34	Pass
		Overall Test Results		Pass

Laboratory Technician

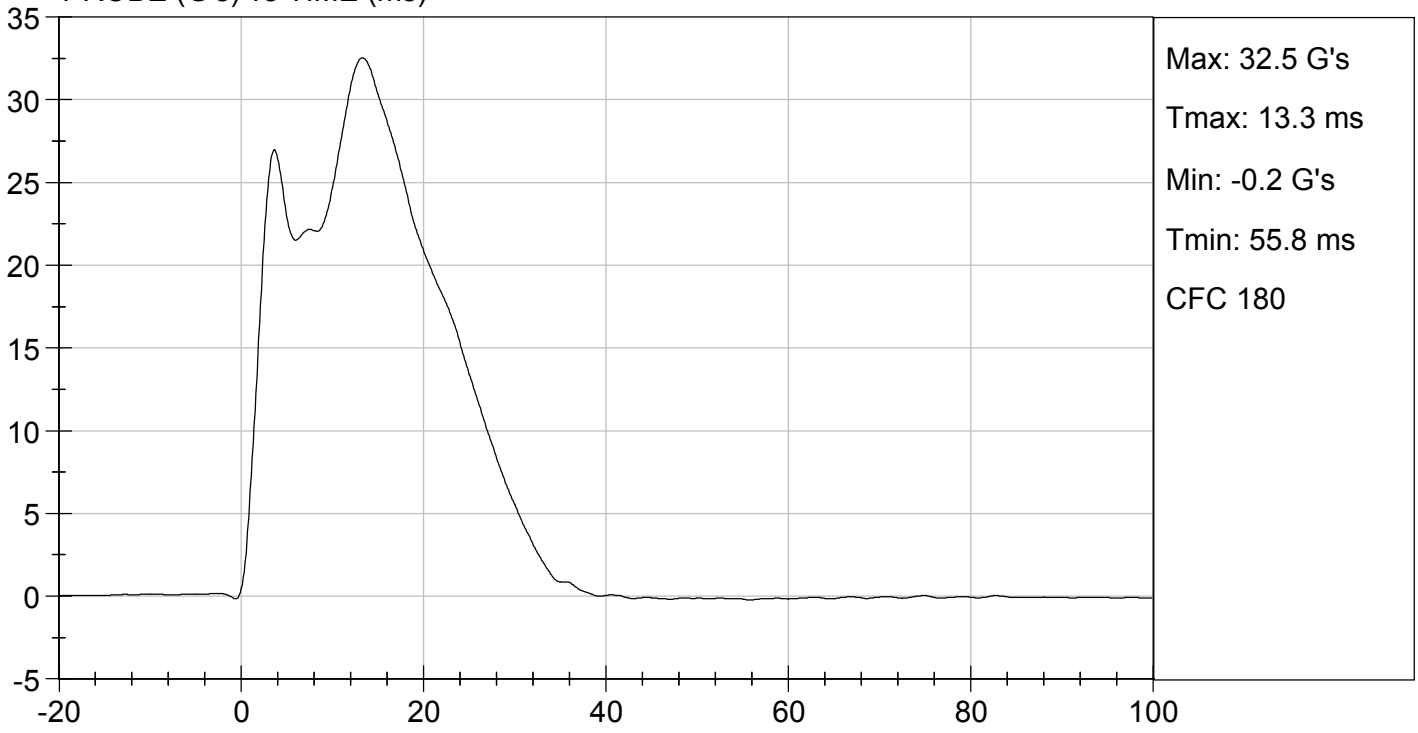
12/05/2020
Test Date

Approved By

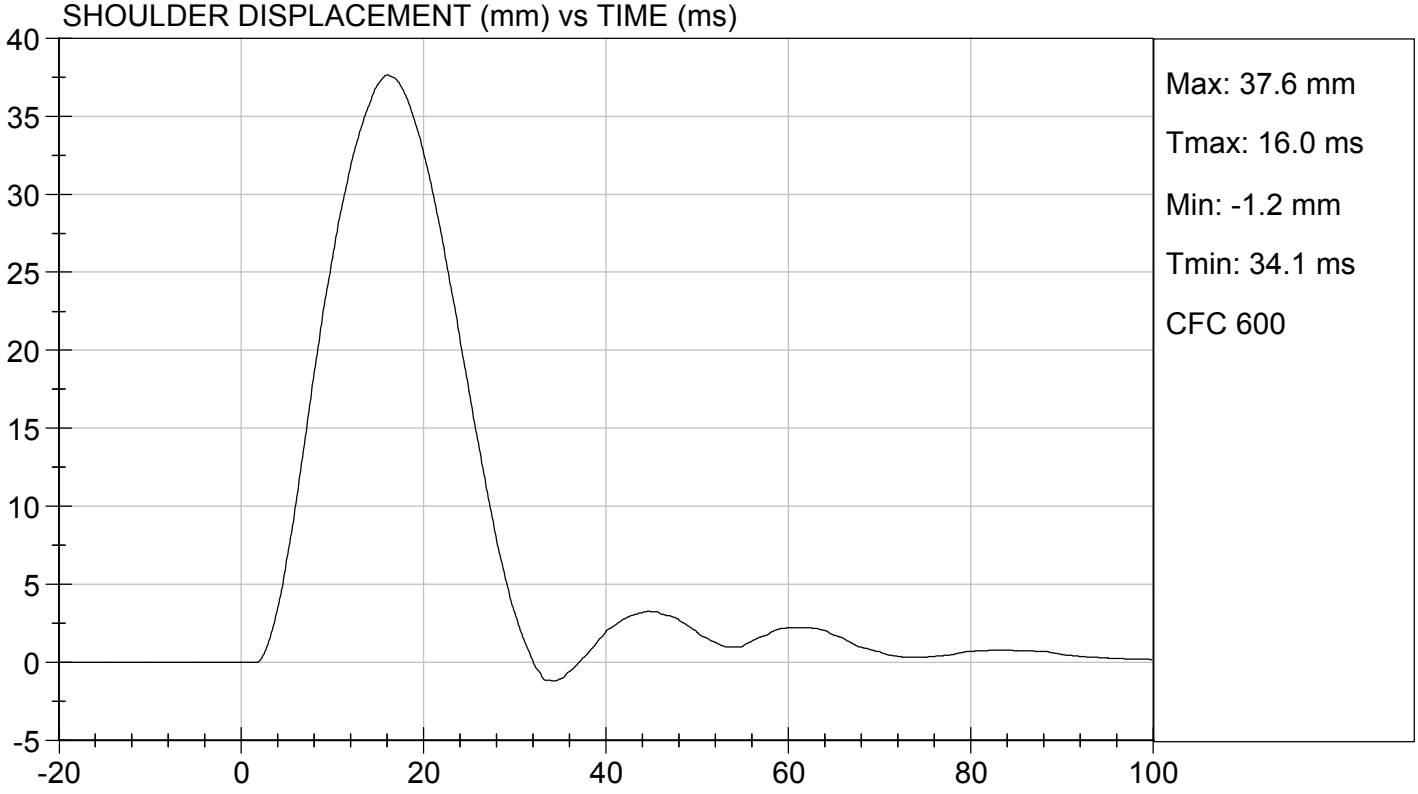
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 12/05/2020
TEST #: D203174

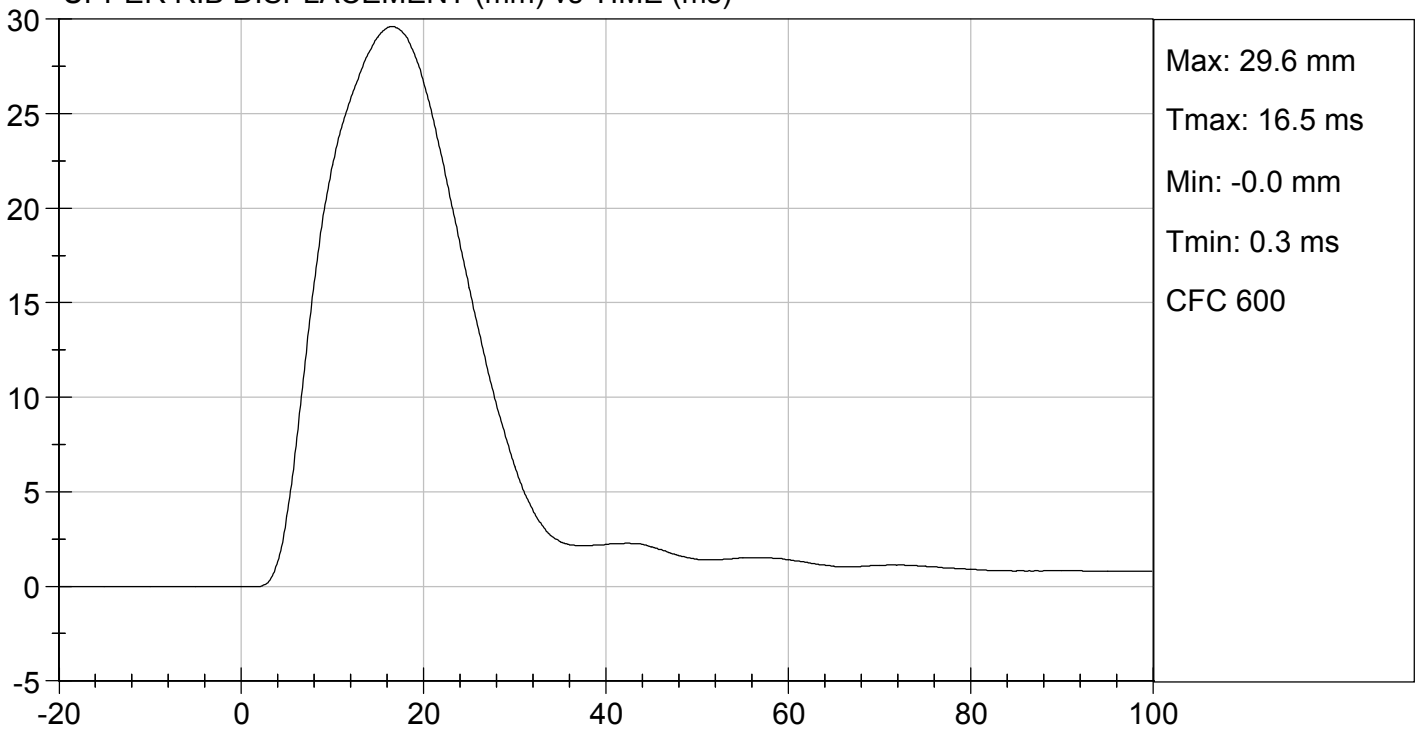
PROBE (G's) vs TIME (ms)



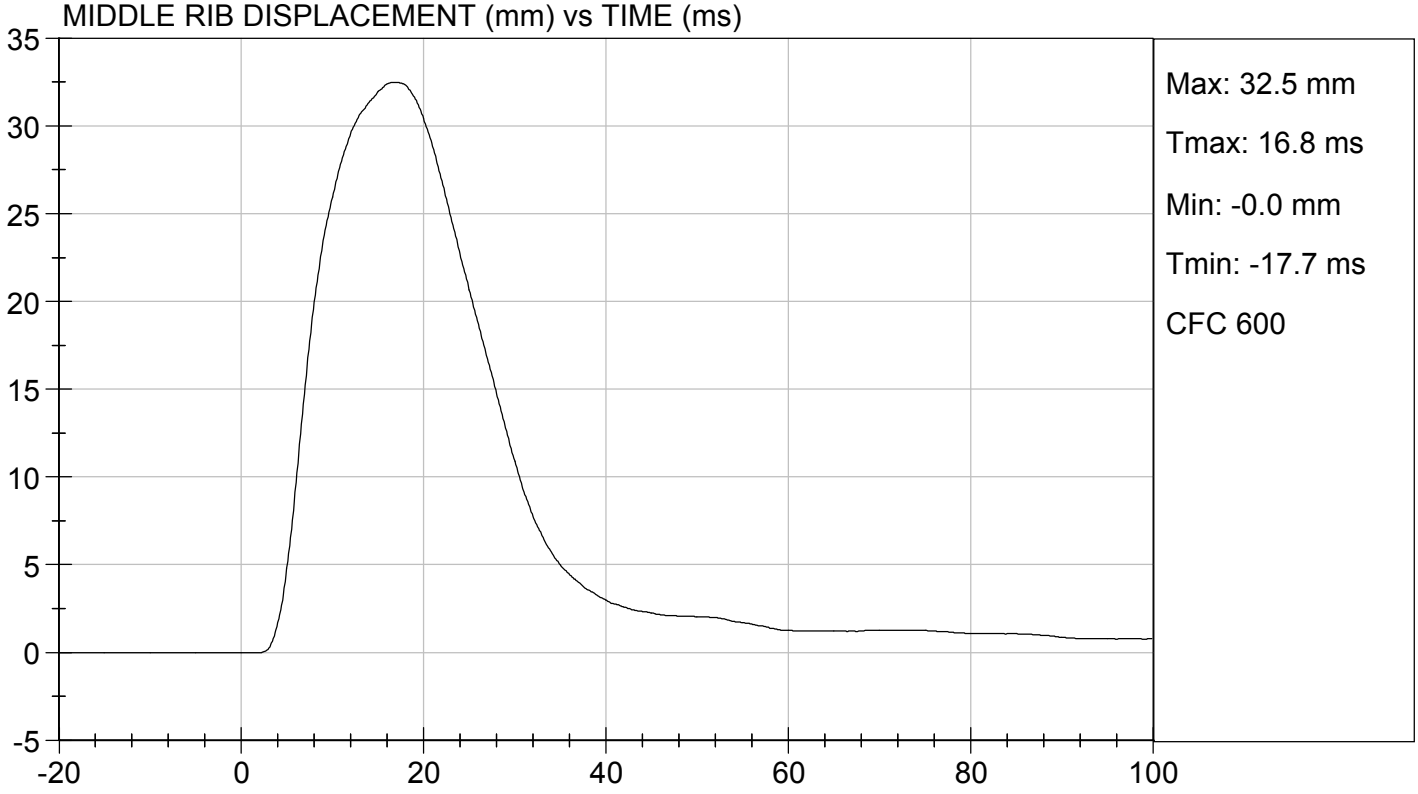
SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



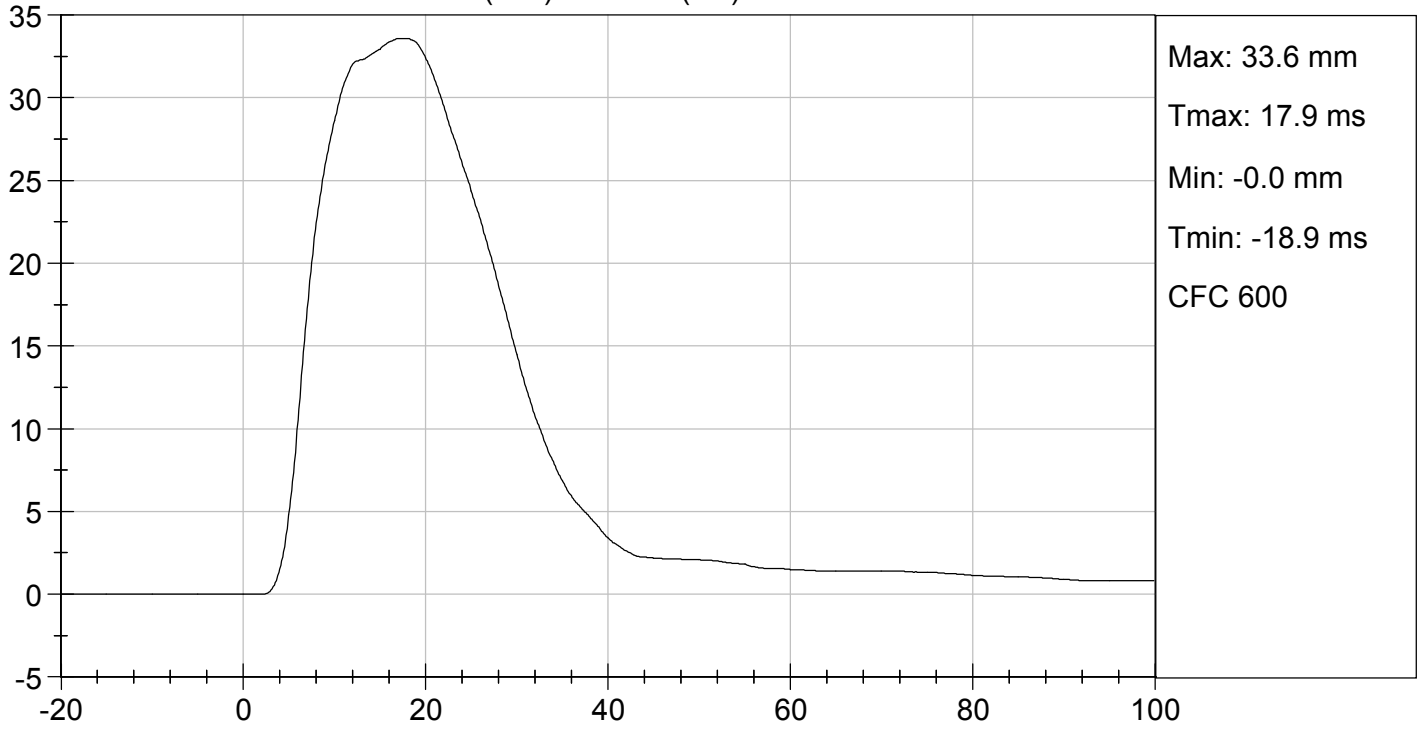
MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



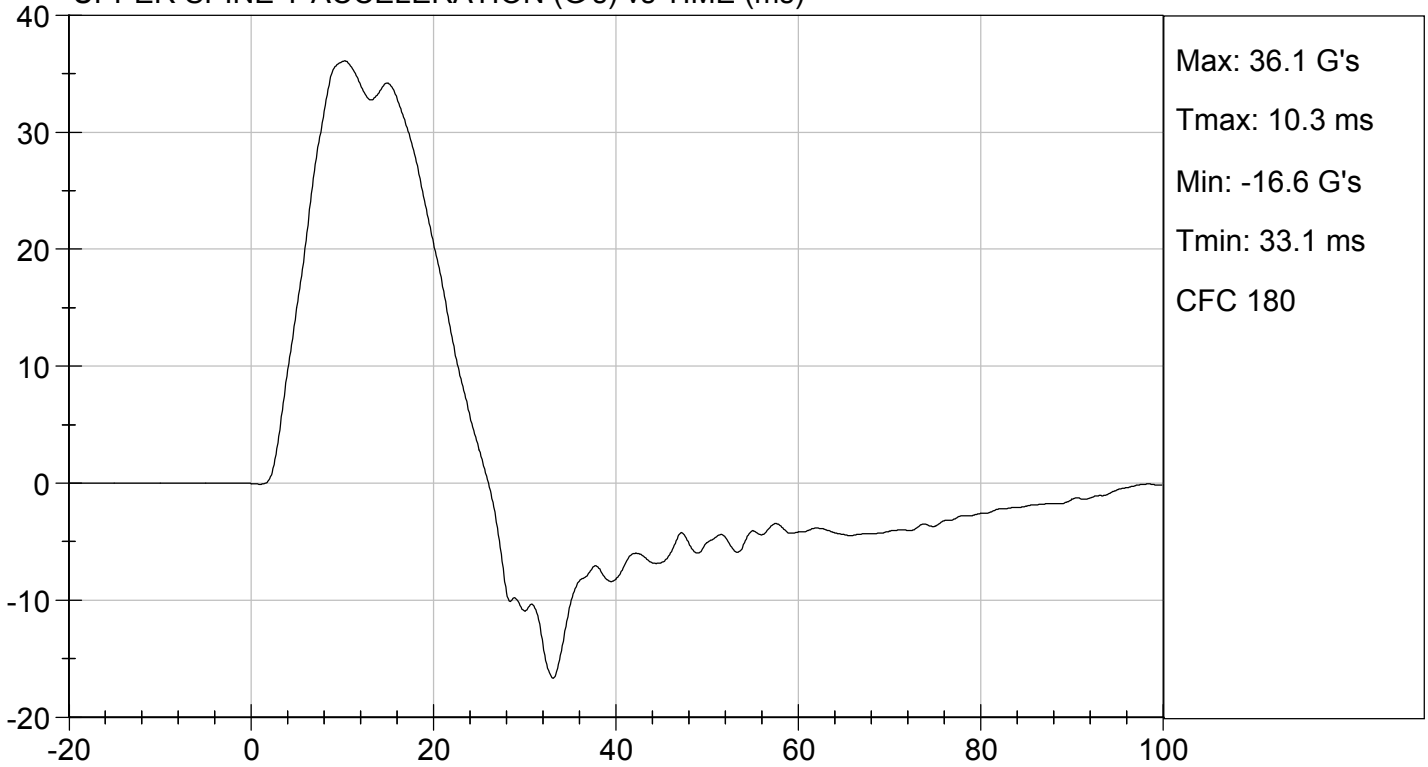
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 12/05/2020
TEST #: D203174

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

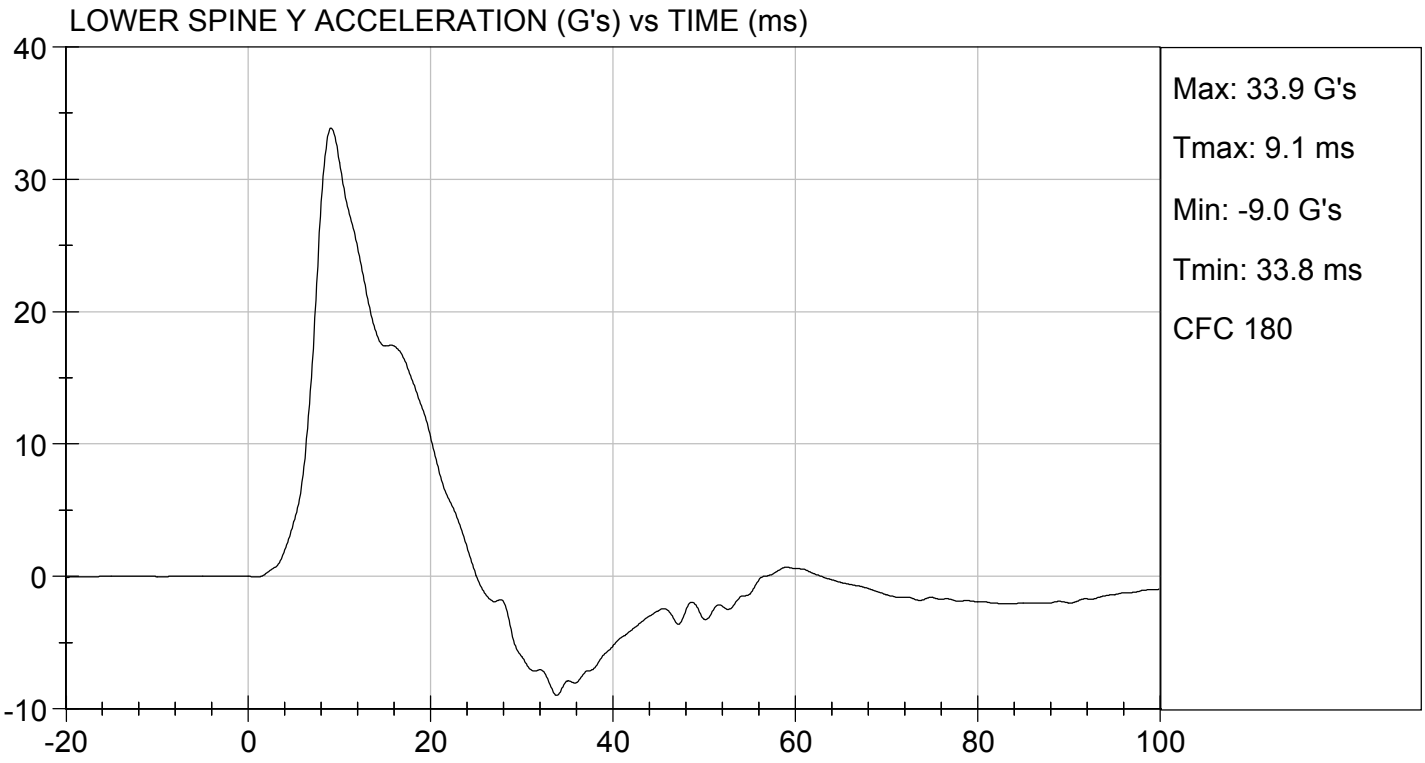


UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



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

TEST DATE: 12/05/2020
TEST #: D203174



MGA RESEARCH CORPORATION

THORAX (WITHOUT ARM) IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203175

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	15	Pass
Upper Rib Displacement	mm	32 to 40	40	Pass
Middle Rib Displacement	mm	39 to 45	44	Pass
Lower Rib Displacement	mm	35 to 43	40	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	9	Pass
		Overall Test Results		Pass

Alex Thomas
Laboratory Technician

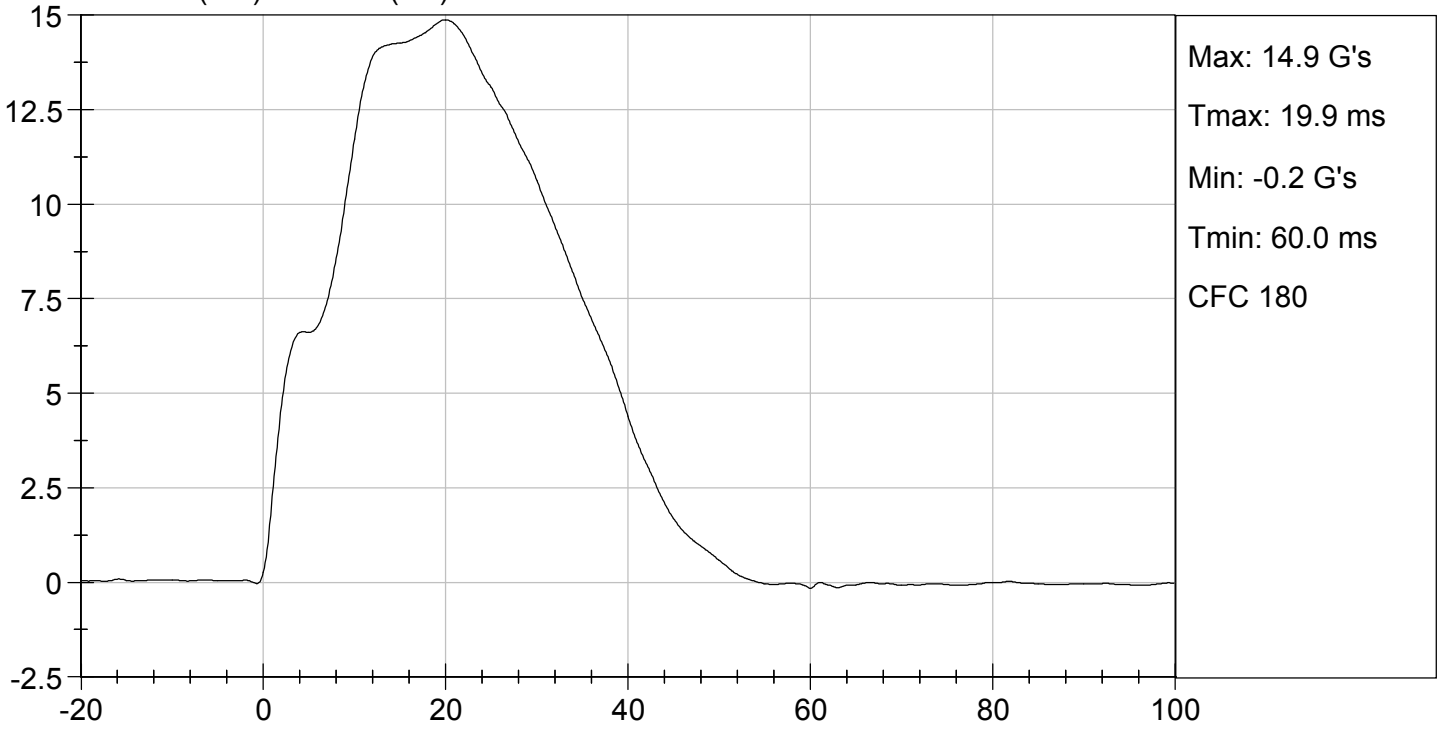
12/05/2020
Test Date

Approved By

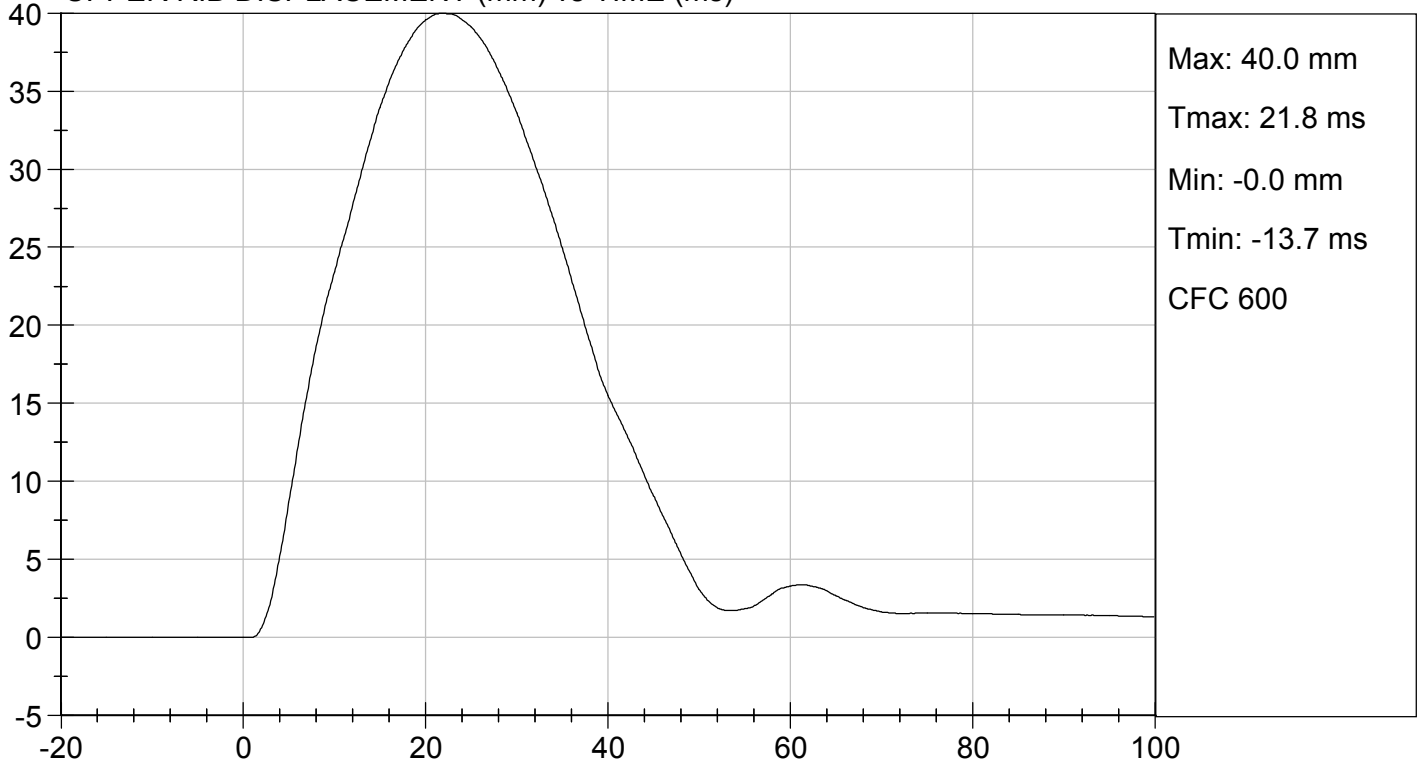
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 12/05/2020
TEST #: D203175

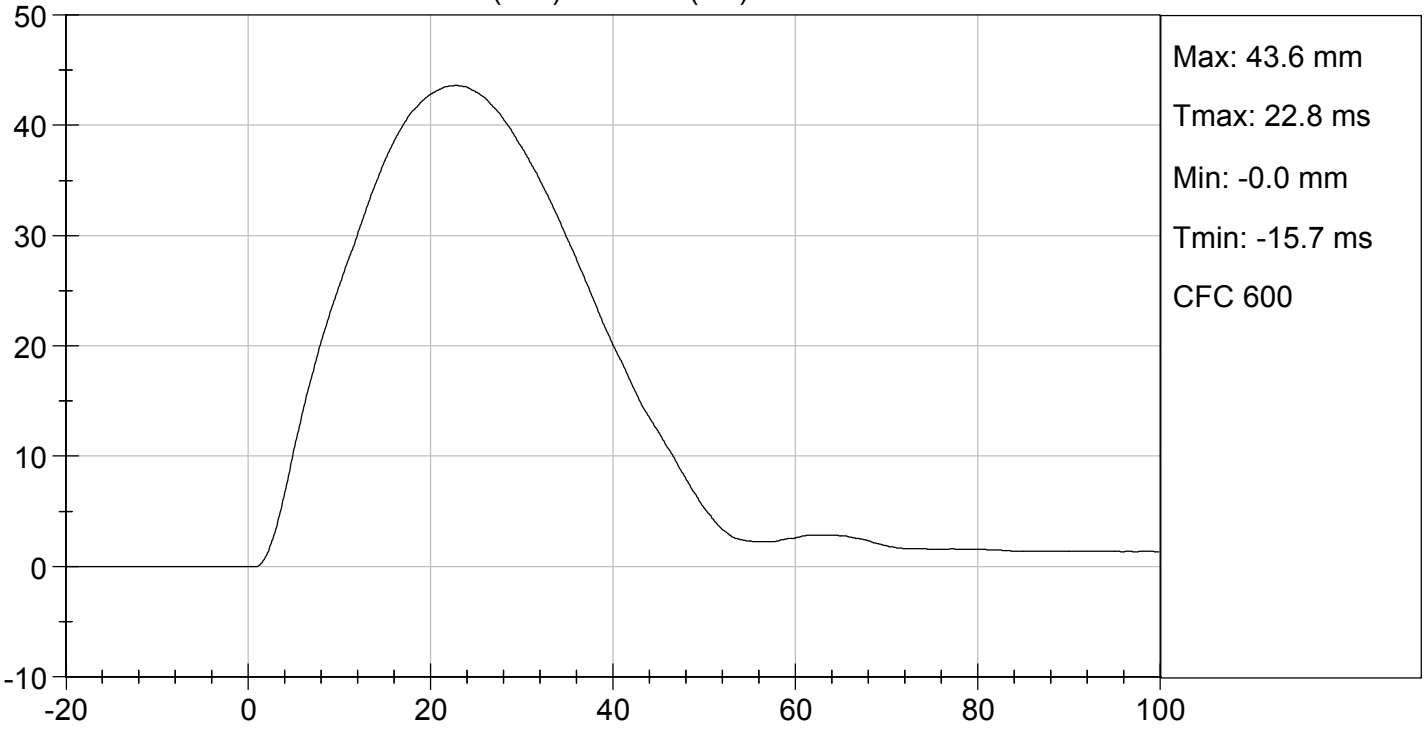
PROBE (G's) vs TIME (ms)



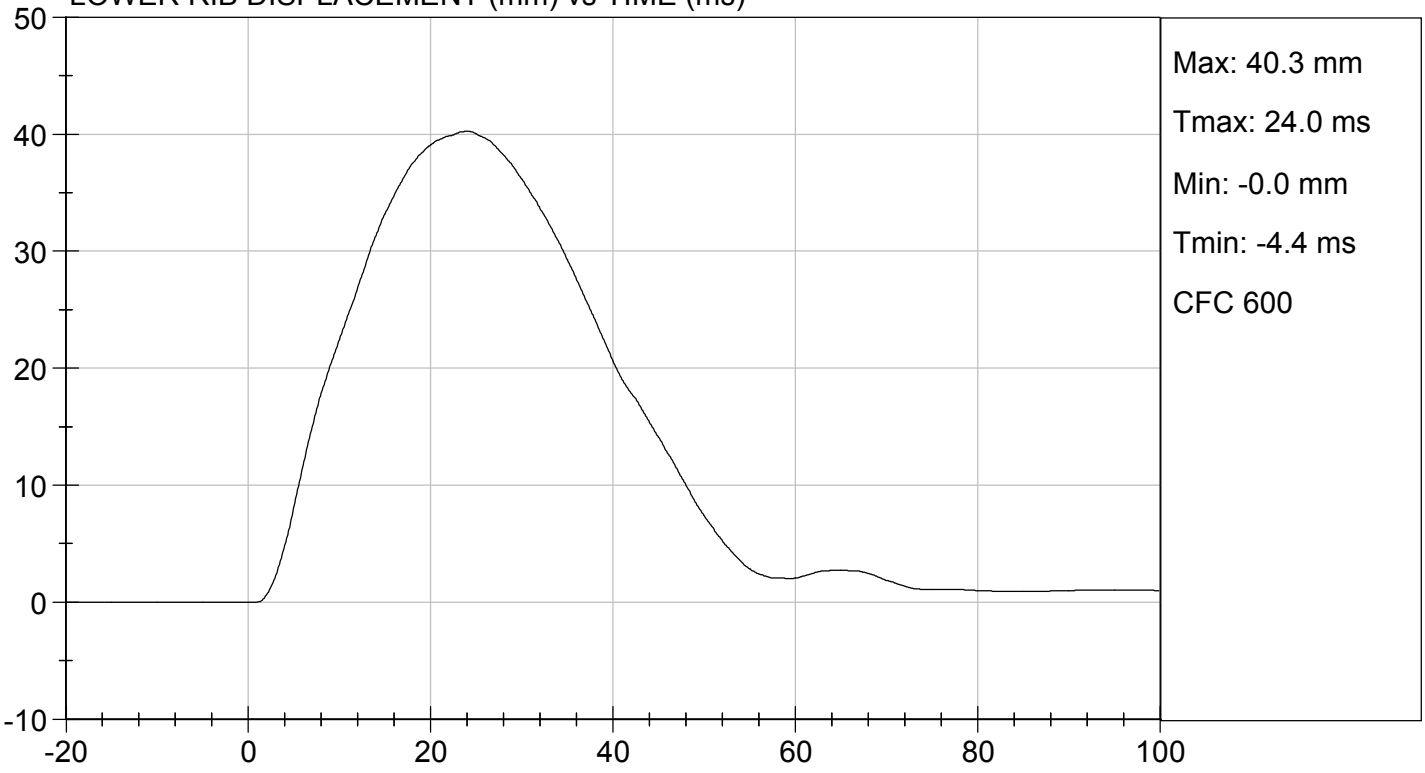
UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



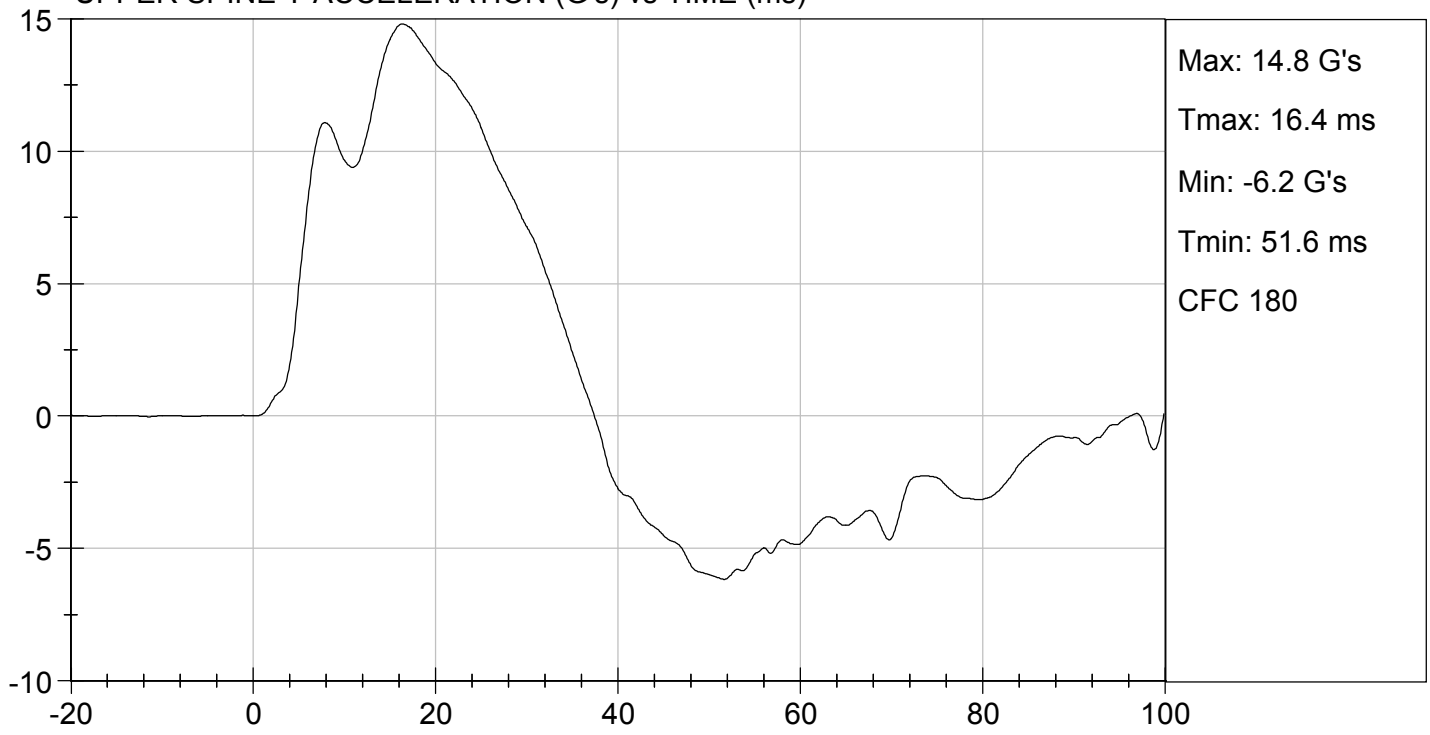
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



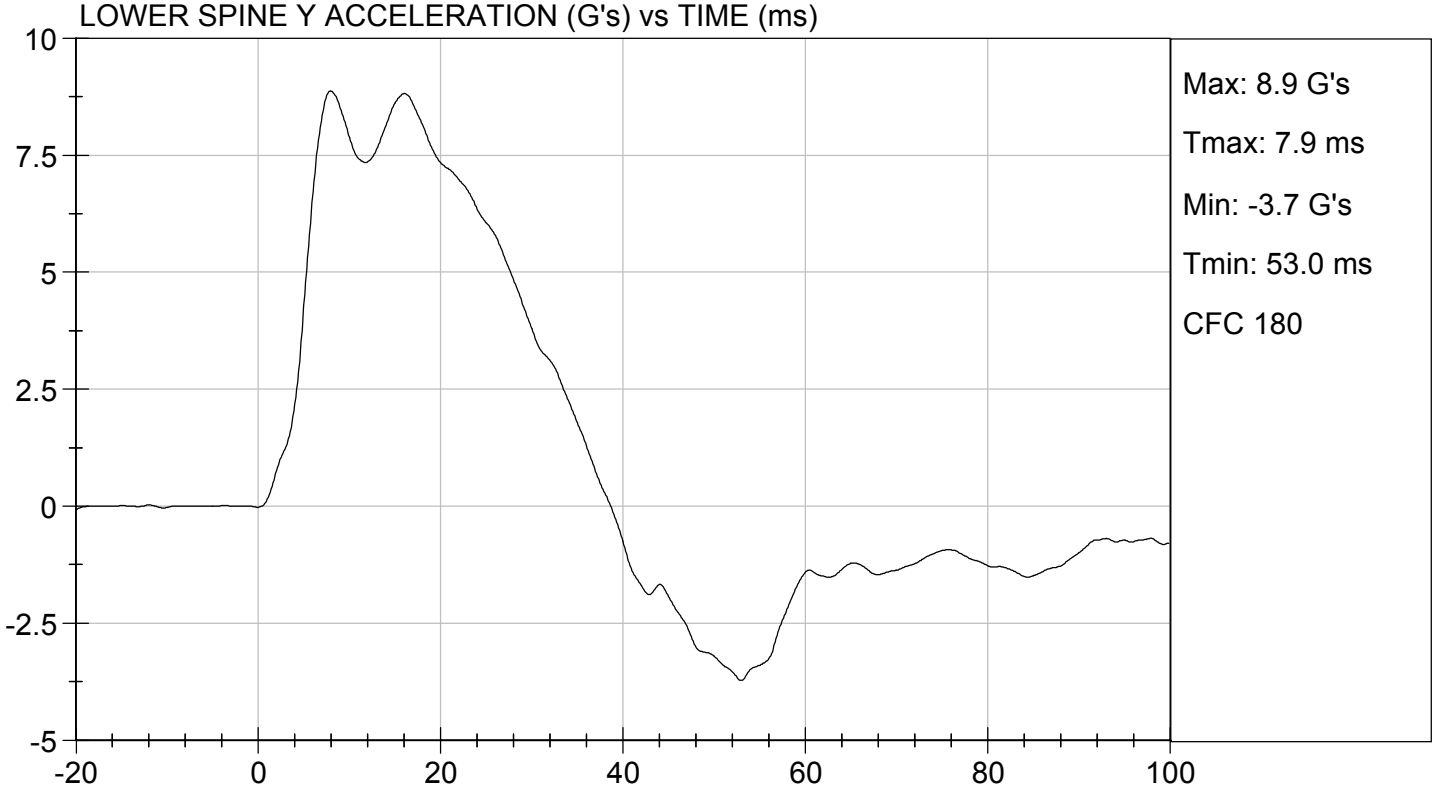
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 12/05/2020
TEST #: D203175

UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



LOWER SPINE Y ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203176

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	13	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	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

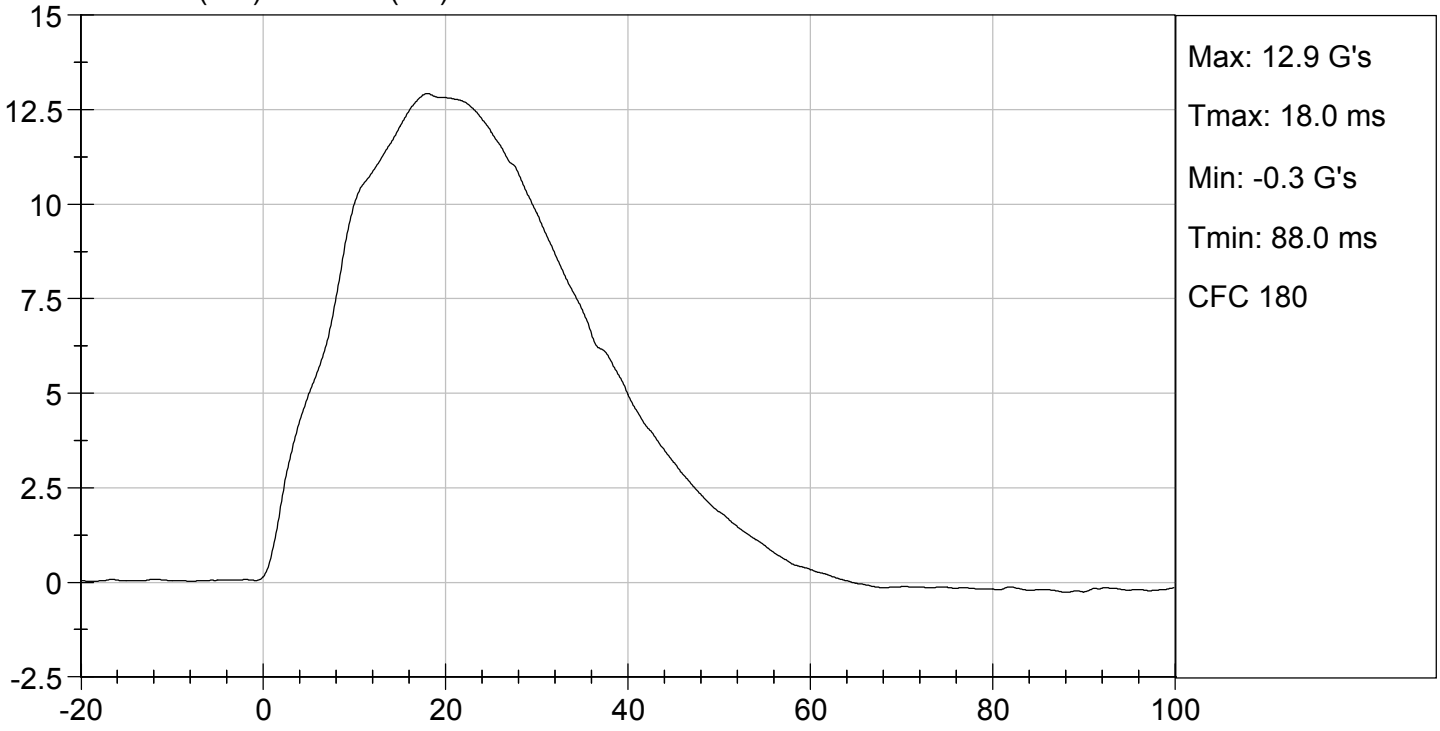
12/05/2020
Test Date

Approved By

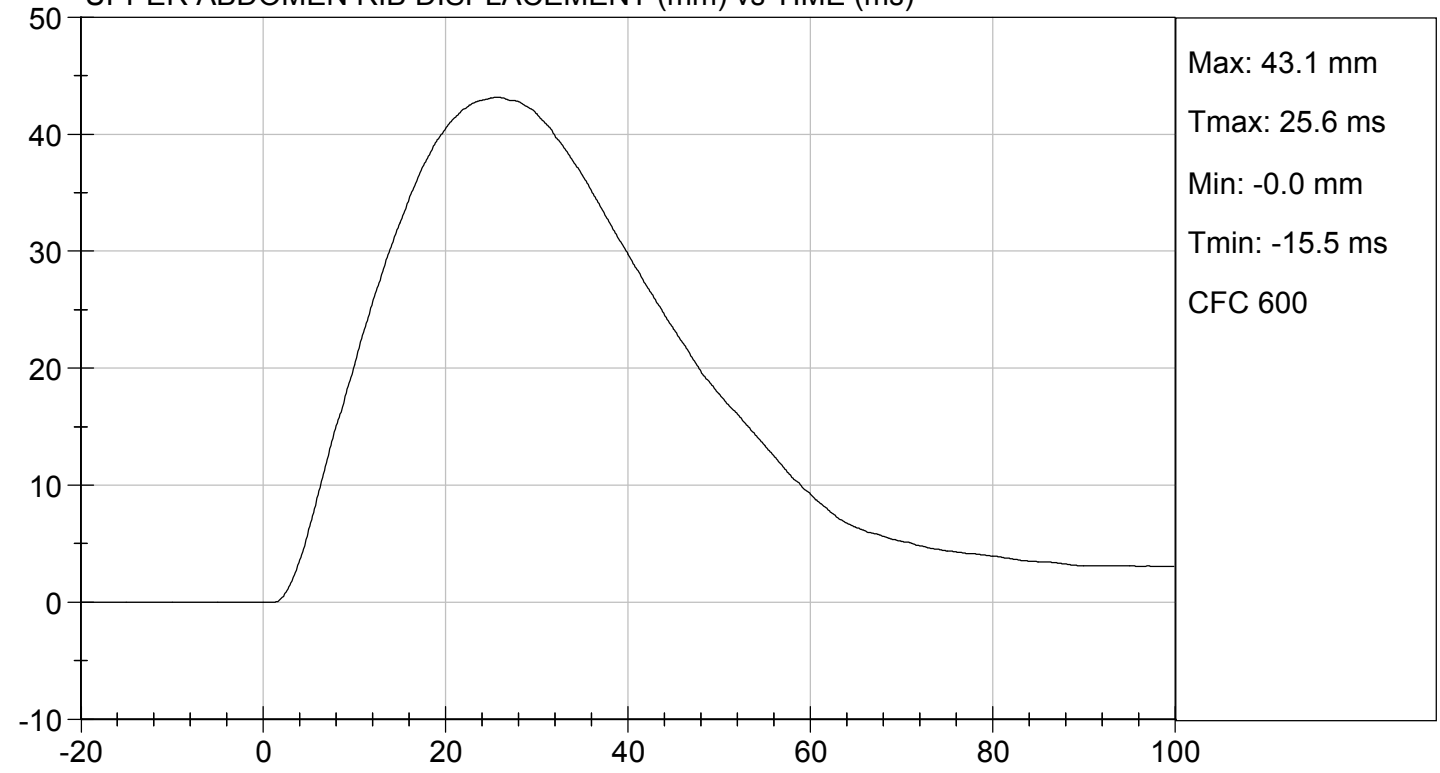
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 12/05/2020
TEST #: D203176

PROBE (G's) vs TIME (ms)



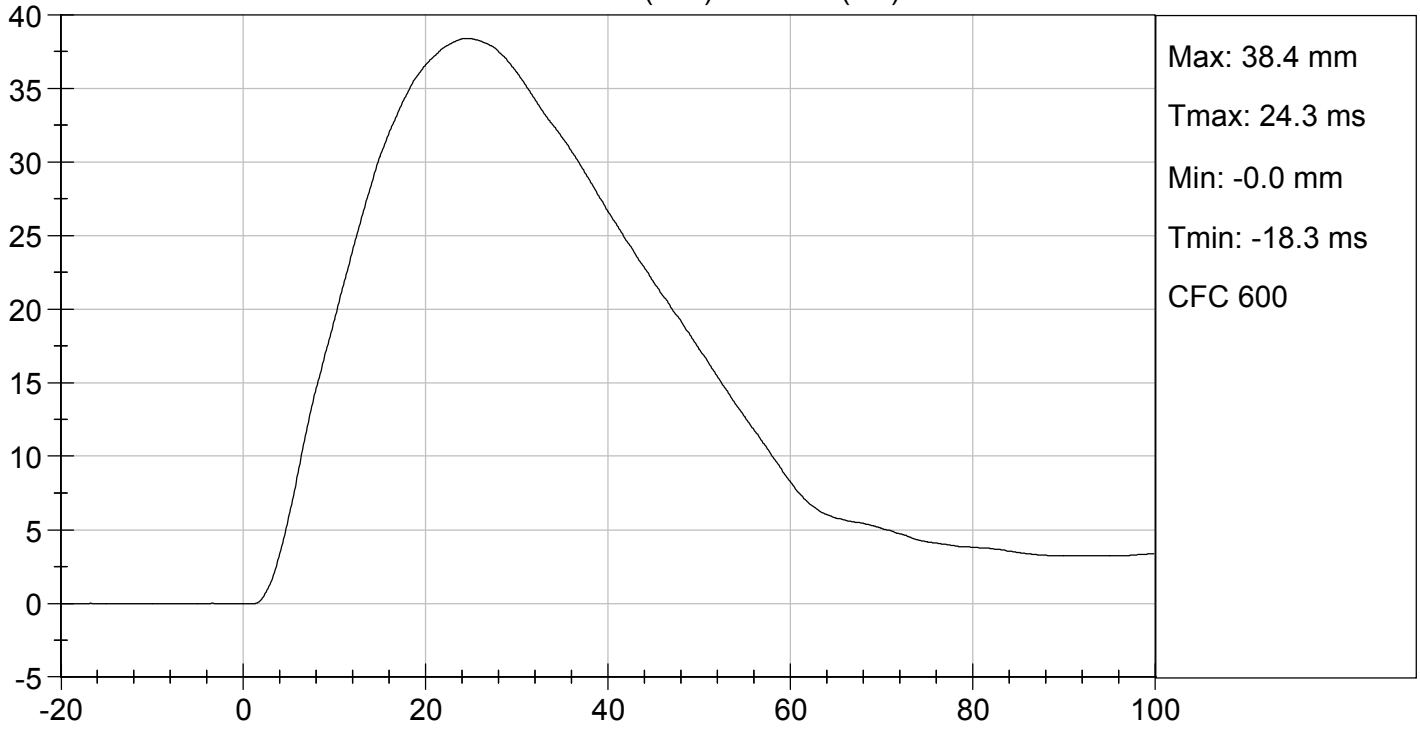
UPPER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



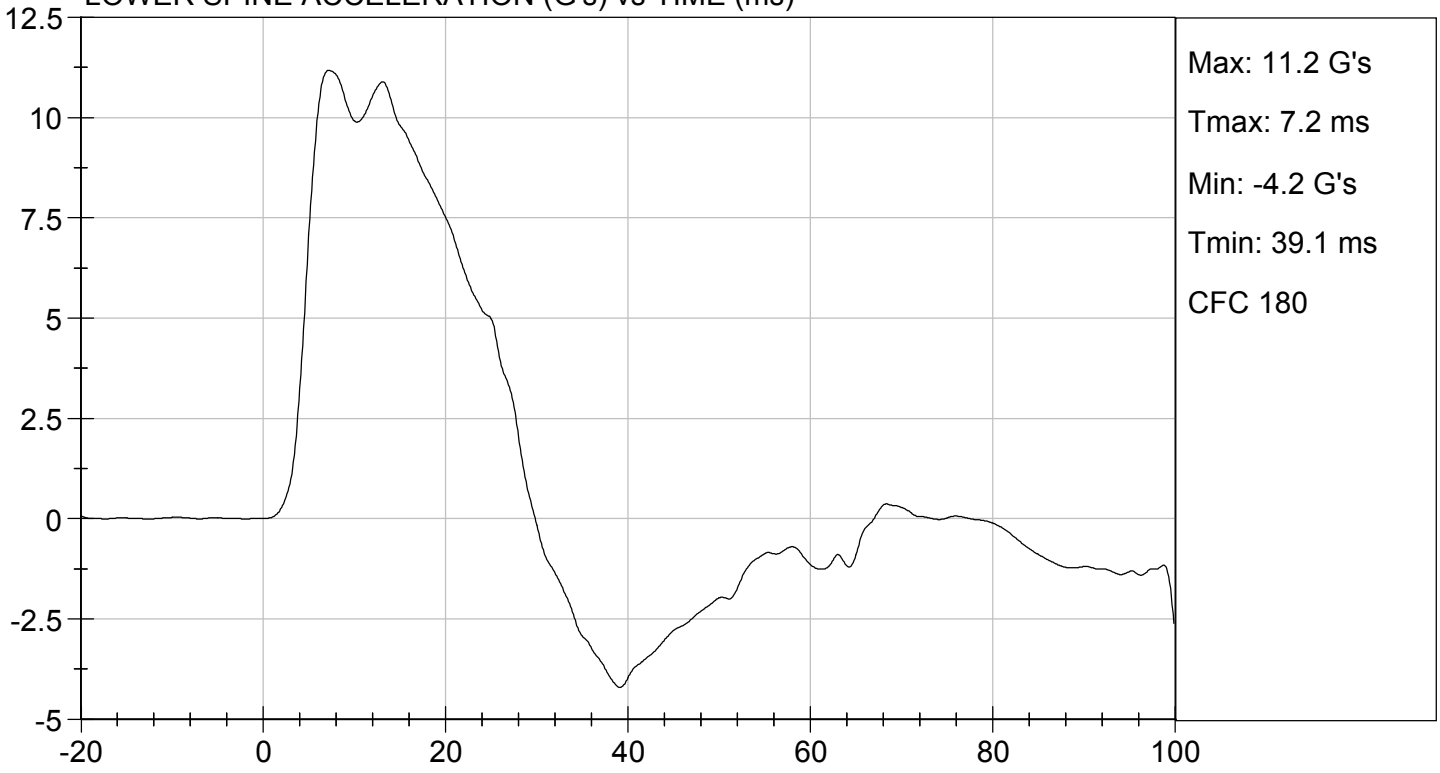
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 12/05/2020
TEST #: D203176

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



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203177

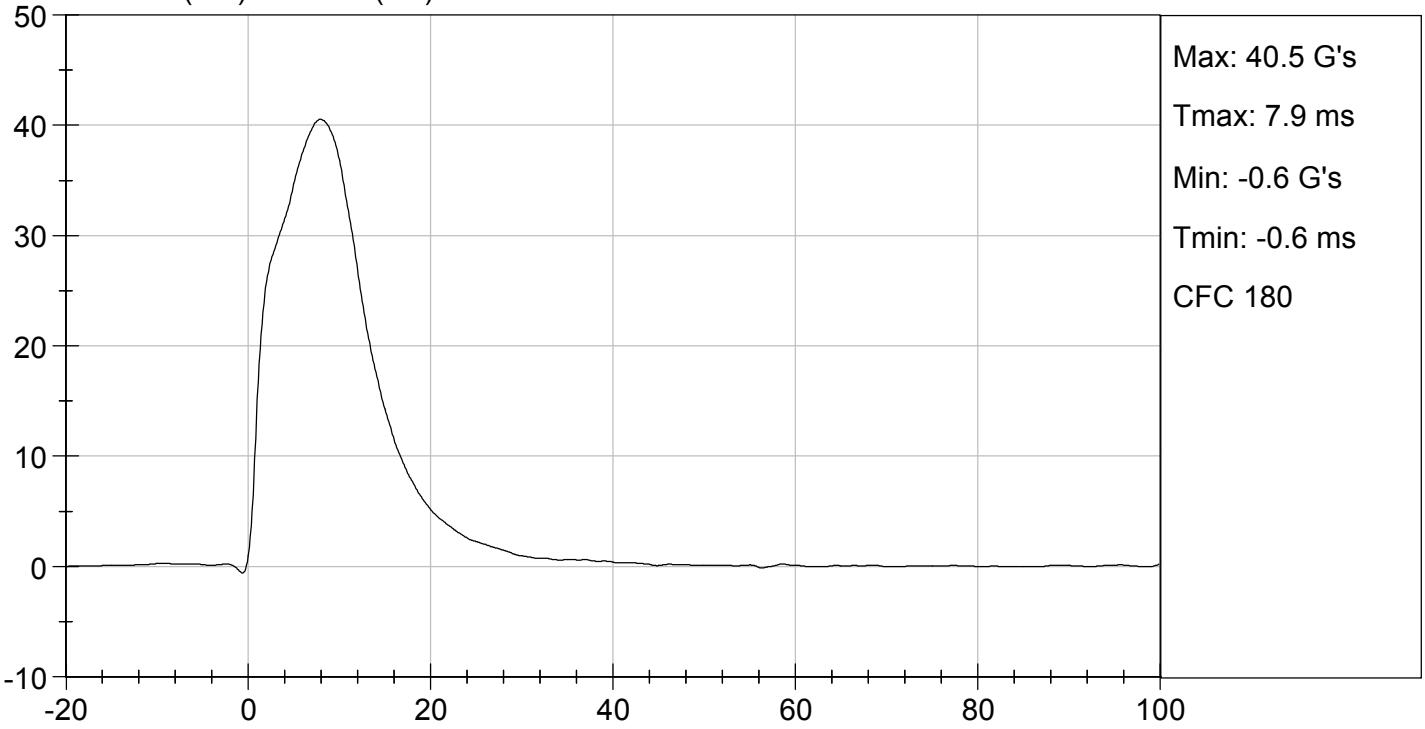
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	6.60 to 6.80	6.60	Pass
Maximum Probe Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	41	Pass
Peak Acetabulum Force	N	3600 to 4300	3,769	Pass
		Overall Test Results		Pass

Laboratory Technician

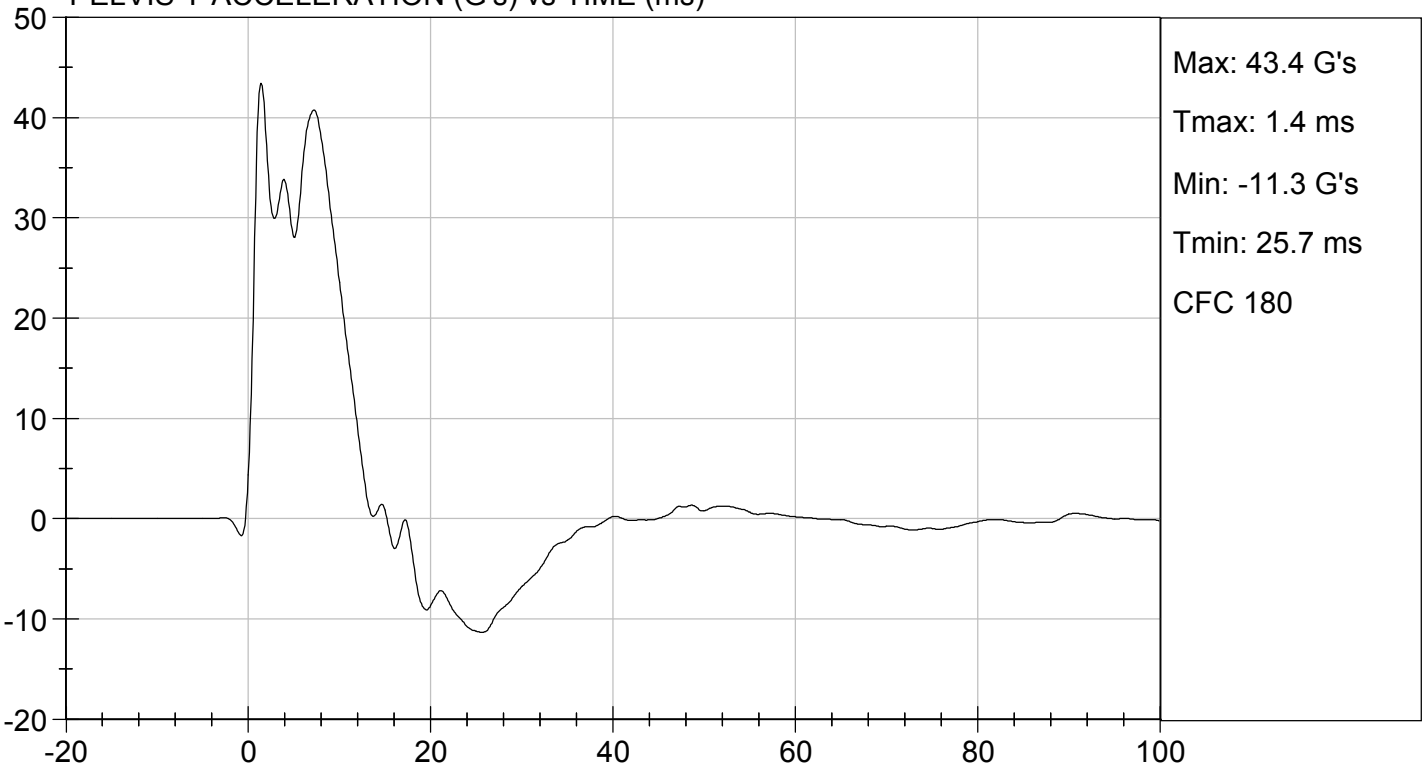
12/05/2020
Test Date

Approved By

PROBE (G's) vs TIME (ms)

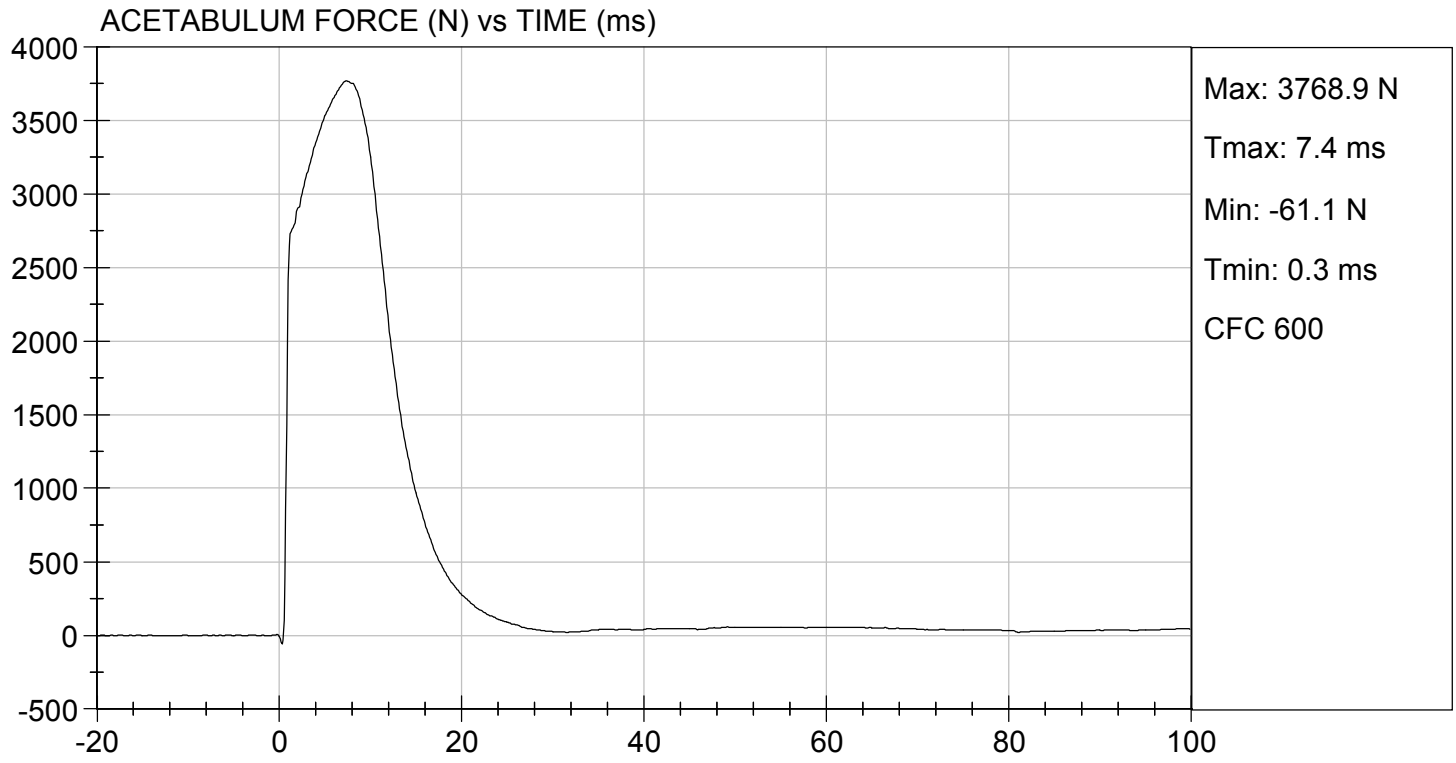


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: PELVIS IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 12/05/2020
TEST #: D203177



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296 **Test I.D:** D203178

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Humidity	%	10 to 70	23	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	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	4,392	Pass
		Overall Test Results		Pass

Laboratory Technician

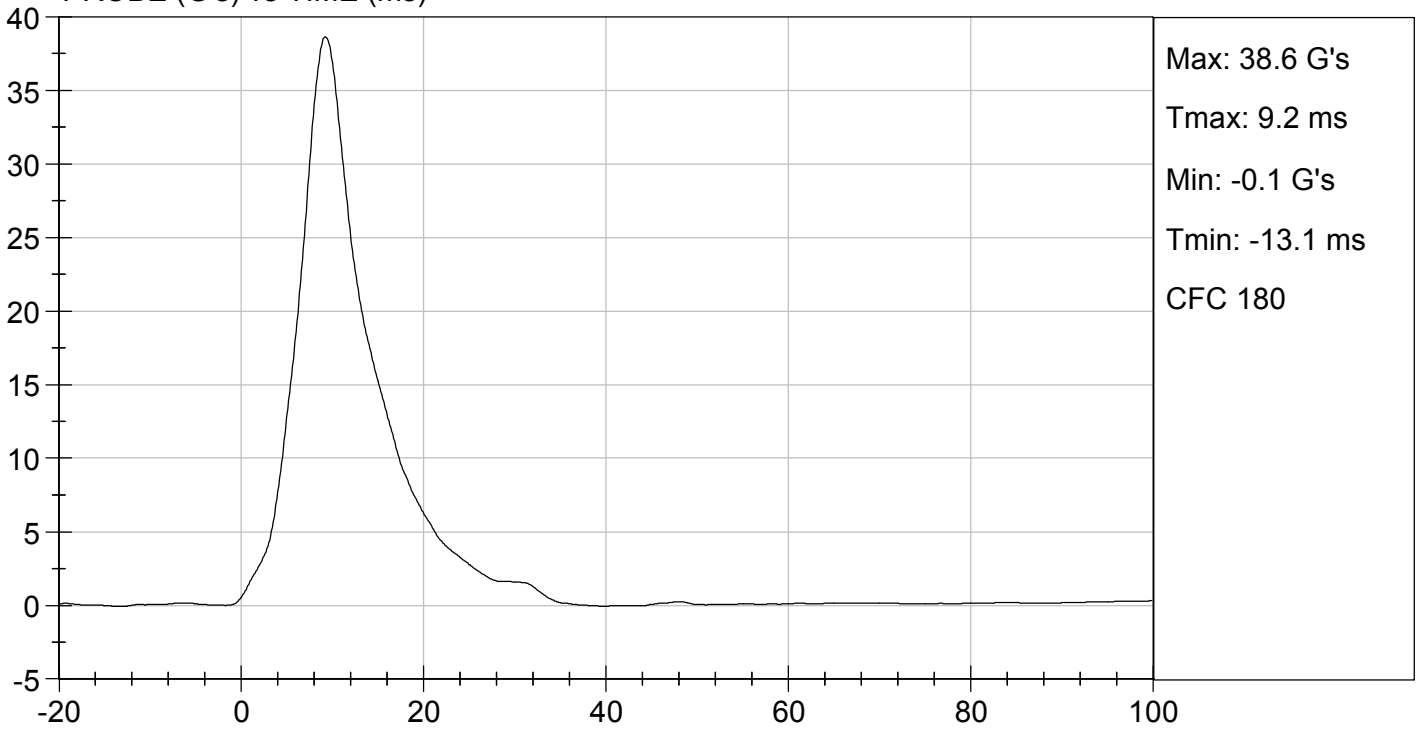
12/05/2020
Test Date

Approved By

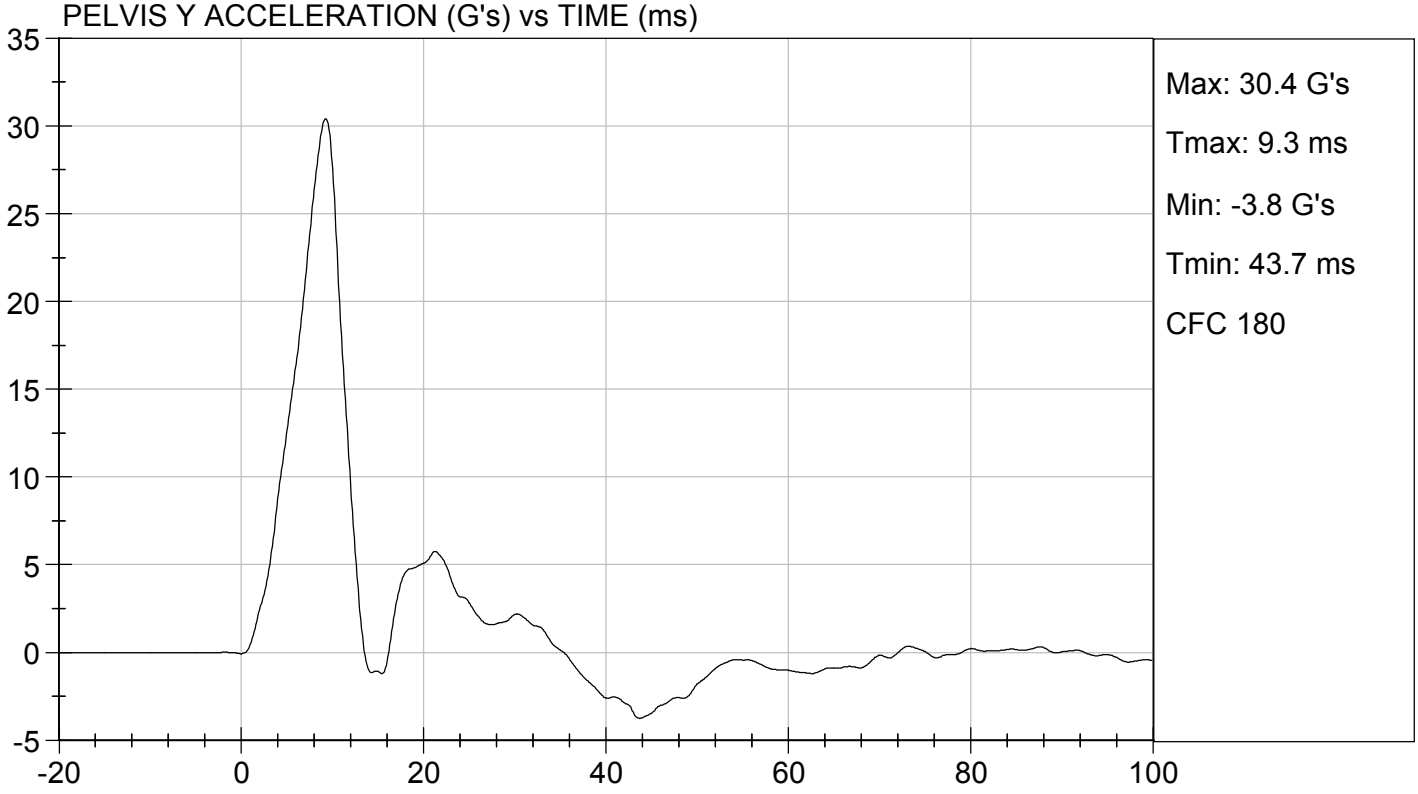
TEST DESC: ILLIAC
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/05/2020
TEST #: D203178

PROBE (G's) vs TIME (ms)

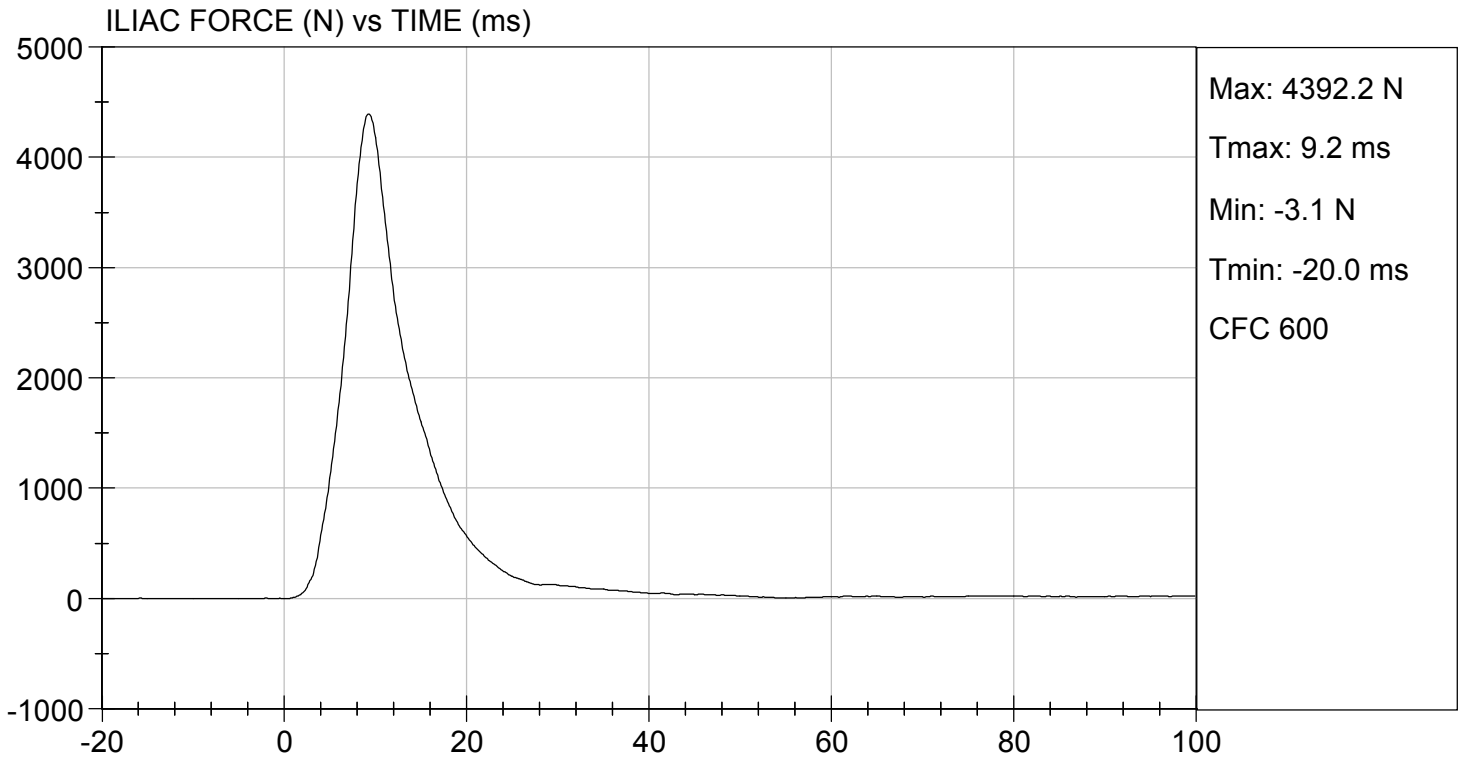


PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: ILLIAC
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 12/05/2020
TEST #: D203178



SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13556
Test Number 11200
Report Number 11238
Test Date 9/23/2019 12:16:31 PM

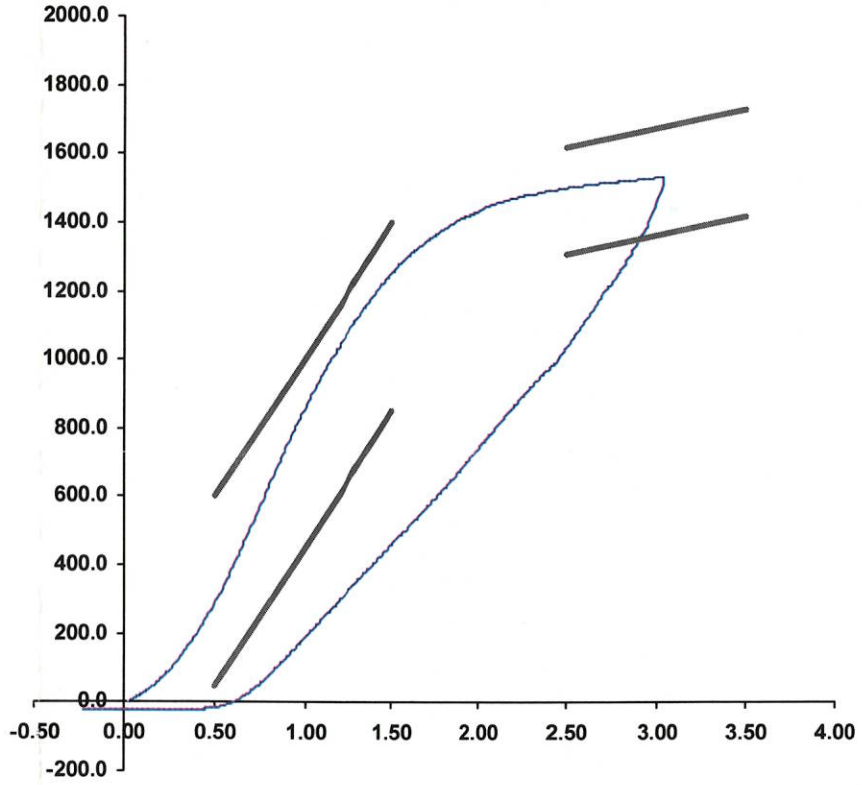
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	304.40	50.00	600.00
Force @ 1.5 mm (N)	1,257.41	850.00	1,400.00
Force @ 2.5 mm (N)	1,500.92	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,531.11	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 23-Sep-19
SACO Research

By : DC Date : 9/23/2019

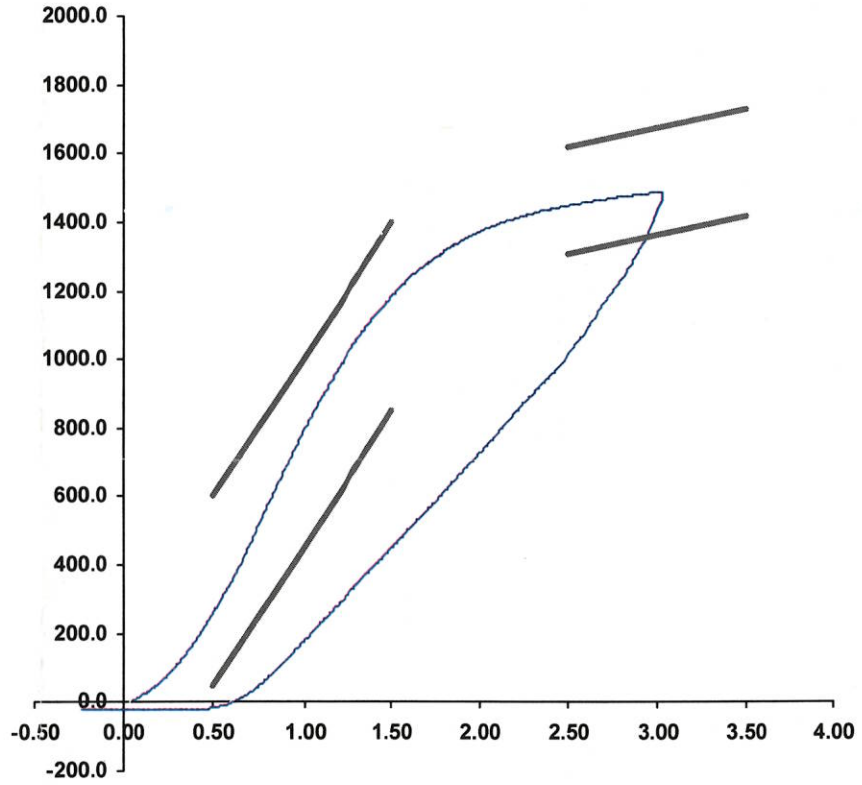
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13560
Test Number 11204
Report Number 11242
Test Date 9/23/2019 12:22:46 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	272.03	50.00	600.00
Force @ 1.5 mm (N)	1,185.72	850.00	1,400.00
Force @ 2.5 mm (N)	1,449.04	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,485.99	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator

Part Number 180-4450

Template No 107 23-Sep-19
SACO Research

By : DC Date : 9/23/2019

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N F032		
			Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers		X	P79711	Endevco	06/12/2020
		Y	P79712	Endevco	06/12/2020
		Z	P79750	Endevco	06/12/2020
		Xr	P79751	Endevco	06/12/2020
		Yr	P79753	Endevco	06/12/2020
		Zr	P88170	Endevco	06/12/2020
Thorax Rib Displacement Potentiometers	Upper	Y	G176	Honeywell	06/12/2020
	Middle	Y	G169	Honeywell	06/12/2020
	Lower	Y	G164	Honeywell	06/12/2020
Abdomen Load Cells	Forward	Y	ABG1513FY	Denton	07/27/2020
	Middle	Y	ABG1531FY	Denton	07/27/2020
	Rear	Y	ABG1536FY	Denton	07/27/2020
Lower Spine Accelerometers (T12)		X	P79574	Endevco	06/12/2020
		Y	P82603	Endevco	06/12/2020
		Z	P82097	Endevco	06/12/2020
Public Symphysis Load Cell		Y	PG462FY	Denton	07/27/2020

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 296		
				Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers			X	P85003	Endevco	06/30/2020
			Y	P94783	Endevco	06/30/2020
			Z	P94786	Endevco	06/30/2020
			Xr	P94938	Endevco	06/30/2020
			Yr	P96854	Endevco	06/30/2020
			Zr	P97386	Endevco	06/30/2020
Head Angular Rate Sensors			X	ARS7325	DTS	09/14/2020
			Y	ARS7354	DTS	08/04/2020
			Z	ARS7371	DTS	09/14/2020
Displacement Potentiometers	Thoracic Rib	Upper	Y	G012	Servo	06/30/2020
		Middle	Y	G1163	Servo	06/30/2020
		Lower	Y	G1158	Servo	06/30/2020
	Abdominal Rib	Upper	Y	G1146	FTSS	06/30/2020
		Lower	Y	G1126	FTSS	06/30/2020
Lower Spine Accelerometers (T12)			X	P79418	Endevco	06/30/2020
			Y	P79439	Endevco	06/30/2020
			Z	P79614	Endevco	06/30/2020
Acetabulum Load Cell			Y	ACG111FY	FTSS	02/24/2020
Iliac Wing Load Cell			Y	IWG226FY	FTSS	02/24/2020
Pelvis Plug (struck side)				13556	SACO	09/23/2019
Pelvis Plug (non-struck side)				13560	SACO	09/23/2019

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A337211	MSI	09/21/2020
	Vehicle Center of Gravity	Y	A337194	MSI	09/22/2020
	Vehicle Center of Gravity	Z	A340750	MSI	09/23/2020
2	Right Sill at Front Seat	X	T22741	Endevco	10/22/2020
	Right Sill at Front Seat	Y	T22880	Endevco	10/16/2020
	Right Sill at Front Seat	Z	T18380	Endevco	10/22/2020
3	Right Sill at Rear Seat	X	A337165	MSI	11/23/2020
	Right Sill at Rear Seat	Y	A337197	MSI	11/03/2020
	Right Sill at Rear Seat	Z	A337169	MSI	11/23/2020
4	Left Sill at Front Door	Y	P88169	Endevco	06/18/2020
5	Left Sill at Rear Door	Y	T19018	Endevco	06/18/2020
6	Left A-Post Lower	Y	A340699	MSI	10/07/2020
7	Left A-Post Middle	Y	A340250	MSI	08/20/2020
8	Left B-Post Lower	Y	A340749	MSI	10/11/2020
9	Left B-Post Middle	Y	A340727	MSI	10/11/2020
10	Front Seat Track	Y	T20721	Endevco	11/23/2020
11	Rear Seat Track or Structure	Y	T22621	Endevco	09/10/2020
12	Right Rear Occ. Compartment	Y	T22807	Endevco	09/08/2020
13	Engine Block	X	T22780	Endevco	10/16/2020
	Engine Block	Y	A337195	MSI	09/21/2020
14	Rear Floorpan Above Axle	X	T22611	Endevco	10/26/2020
	Rear Floorpan Above Axle	Y	T22877	Endevco	10/22/2020
	Rear Floorpan Above Axle	Z	T22558	Endevco	10/26/2020

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB796D	PCB	06/03/2020
MDB Center of Gravity	Y	PCB246D	PCB	06/03/2020
MDB Center of Gravity	Z	PCB794D	PCB	06/03/2020
Left Frame at Rear Axle Centerline	X	PCB1653D	PCB	06/03/2020
Left Frame at Rear Axle Centerline	Y	PCB1423D	PCB	06/03/2020